# FMB640 Protocols
# V0.07

# Contents

# FM64 DATA PROTOCOL

### *Difference between codec8 and codec8 extended*

| | Codec 8 | Codec 8 extended |
|---|---|---|
| *Codec ID* | *0x08* | *0x8E* |
| *AVL Data IO element length* | *1 Byte* | *2 Bytes* |
| *AVL Data IO element total IO count length* | *1 Byte* | *2 Bytes* |
| *AVL Data IO element IO count length* | *1 Byte* | *2 Bytes* |
| *AVL Data IO element AVL ID length* | *1 Byte* | *2 Bytes* |
| *Variable size IO elements* | *Does not include* | *Includes variable size elements* |

**Codec 8 and codec 8 extended differences**

Main differences between codec 08 and codec 08 extended are shown in table above. AVL data element sizes in codec 8 extended protocol was increased to 2 bytes and new variable type added. For more detailed description please look in codec 8 and codec 8 extended chapters.

# 1. CODEC 8 PROTOCOL SENDING OVER TCP

## 1.1 AVL data packet

Below table represents AVL data packet structure.

| 4 zeroes | Data field length | Codec ID | Number of Data 1 | AVL Data | Number of Data 2 | CRC-16 |
|---|---|---|---|---|---|---|
| *4 Bytes* | *4 Bytes* | *1 Byte* | *1 Byte* | *30- 147 Bytes* | *1 Byte* | *4 bytes* |

Number of data – number of encoded data (number of records).
In FM64 codec ID is constant 08.
Data field length is the length of bytes [codec id, number of data 2].
Number of data 1 should always be equal to number of data 2 byte.
CRC-16 is 4 bytes, but first two are zeroes and last two are CRC-16 calculated for [codec id, number of data 2]
Minimum AVL packet size is 30 bytes (all IO elements disabled).
Maximum AVL packet size for one record is 252 bytes

## 1.2 AVL Data

| Timestamp | Priority | GPS Element | IO Element |
|---|---|---|---|
| *8 Bytes* | *1 Byte* | *15 Bytes* | *6-123* |

Timestamp – difference, in milliseconds, between the current time and midnight, January 1, 1970 UTC.

## 1.3 Priority

| | |
|---|---|
| 0 | Low |
| 1 | High |
| 2 | Panic |

## 1.4 GPS Element

| Longitude | Latitude | Altitude | Angle | Satellites | Speed |
|---|---|---|---|---|---|
| *4 Bytes* | *4 Bytes* | *2 Bytes* | *2 Bytes* | *1 Byte* | *2 Bytes* |

| | |
|---|---|
| X | Longitude[1] |
| Y | Latitude[1] |
| Altitude | In meters above sea level[1] |
| Angle | In degrees, 0 is north, increasing clock-wise [1] |
| Satellites | Number of visible satellites[1] |
| Speed | Speed in km/h. 0x0000 if GPS data is invalid[1] |

Longitude and latitude are integer values built from degrees, minutes, seconds and milliseconds by formula.

$$\left(d + \frac{m}{60} + \frac{s}{3600} + \frac{ms}{3600000}\right) * p$$

| | |
|---|---|
| d | Degrees |
| m | Minutes |
| s | Seconds |
| ms | Milliseconds |
| p | Precision (10000000) |

If longitude is in west or latitude in south, multiply result by –1. To determine if the coordinate is negative, convert it to binary format and check the very first bit. If it is 0, coordinate is positive, if it is 1, coordinate is negative.

Example:

Received value: 20 9c ca 80
Converted to BIN: 00100000 10011100 11001010 10000000 first bit is 0, which means coordinate is positive
Convered to DEC: 547146368
For more information see two's compliment arithmetics.

## *1.5 IO element*

| Event IO ID | N of **Total** IO | N1 of **One Byte** IO | **1'st** IO ID | **1'st** IO Value | ... | **N1'th** IO ID | **N1'th** IO Value | N2 of **Two Bytes** IO | **1'st** IO ID | **1'st** IO Value | ... | **N2'th** IO ID | **N2'th** IO Value | N4 of **Four Bytes** IO | **1'st** IO ID | **1'st** IO Value | ... | **N4'th** IO ID | **N4'th** IO Value | N8 of **Eight Bytes** IO | **1'st** IO ID | **1'st** IO Value | ... | **N8'th** IO ID | **N8'th** IO Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1 Byte* | *1 Byte* | *1 Byte* | *1 Byte* | *1 Byte* | | *1 Byte* | *1 Byte* | *1 Byte* | *1 Byte* | *2 Bytes* | | *1 Byte* | *2 Bytes* | *1 Byte* | *1 Byte* | *4 Bytes* | | *1 Byte* | *4 Bytes* | *1 Byte* | *1 Byte* | *8 Bytes* | | *1 Byte* | *8 Bytes* |

Event IO ID – if data is acquired on event – this field defines which IO property has changed and generated an event. If data cause is not event – the value is 0.

[1] If record is without valid coordinates – (there were no GPS fix in the moment of data acquisition) – Longitude, Latitude and Altitude values are last valid fix, and Angle, Satellites and Speed are 0.

N total number of properties coming with record (N=N1+N2+N4+N8)
N1 number of properties, which length is 1 byte
N2 number of properties, which length is 2 bytes
N4 number of properties, which length is 4 bytes
N8 number of properties, which length is 8 bytes

| Permanent I/O elements (are always sent (with every record) to server if enabled) | | | |
|---|---|---|---|
| Property ID in AVL packet | Property Name | Bytes | Description |
| 1 | Digital Input Status 1 | 1 | Logic: 0 / 1 |
| 2 | Digital Input Status 2 | 1 | Logic: 0 / 1 |
| 3 | Digital Input Status 3 | 1 | Logic: 0 / 1 |
| 4 | Digital Input Status 4 | 1 | Logic: 0 / 1 |
| 179 | Digital Output 1 | 1 | Logic: 0 / 1 |
| 180 | Digital Output 2 | 1 | Logic: 0 / 1 |
| 50 | Digital Output 3 | 1 | Logic: 0 / 1 |
| 51 | Digital Output 4 | 1 | Logic: 0 / 1 |
| 9 | Analog Input 1 | 2 | Voltage: mV, 0 – 30 V |
| 10 | Analog Input 2 | 2 | Voltage: mV, 0 – 30 V |
| 11 | Analog Input 3 | 2 | Voltage: mV, 0 – 30 V |
| 245 | Analog Input 4 | 2 | Voltage: mV, 0 – 30 V *Depends on configuration |
| 21 | GSM signal level | 1 | Value in scale 0 – 5 |
| 22 | Data mode | 1 | Value in scale 0 – 5 |
| 24 | Speedometer | 2 | Value in km/h, 0 – xxx km/h |
| 66 | External Power Voltage | 2 | Voltage: mV, 0 – 30 V |
| 67 | Internal Battery Voltage | 2 | Voltage: mV |
| 68 | Internal Battery Current | 2 | Voltage: mA |
| 70 | PCB Temperature | 2 | 10 * Degrees ( °C ) |
| 71 | GNSS status | 1 | 0-off/ 1-no antenna/ 2- no fix/ 3-got fix/ 4-sleep/ 5-over current |
| 72 | Dallas Temperature 1 | 2 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 62 | Dallas Temperature ID1 | 8 | ID of Dallas Temperature Sensor 1 |
| 73 | Dallas Temperature 2 | 2 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 63 | Dallas Temperature ID2 | 8 | ID of Dallas Temperature Sensor 2 |
| 74 | Dallas Temperature 3 | 2 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 64 | Dallas Temperature ID3 | 8 | ID of Dallas Temperature Sensor 3 |
| 75 | Dallas Temperature 4 | 2 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 65 | Dallas Temperature ID4 | 8 | ID of Dallas Temperature Sensor 3 |
| 5 | Dallas Temperature 5 | 2 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 6 | Dallas Temperature ID5 | 8 | ID of Dallas Temperature Sensor 5 |
| 7 | Dallas Temperature 6 | 2 | 10 * Degrees ( °C ), -55 - +115, if 3000 – Dallas error |
| 8 | Dallas Temperature ID6 | 8 | ID of Dallas Temperature Sensor 6 |
| 76 | Fuel Counter | 4 | Difference of generated impulses on two signal lines |
| 240 | Movement | 1 | Logic: 0 / 1 |
| 239 | Ignition | 1 | Logic: 0 / 1 |
| 78 | iButton ID | 8 | iButton ID number |
| 178 | Network Type | 1 | 0 – 3 G; 1 – 2G |
| 181 | GPS PDOP | 2 | Probability * 10; 0-500 |
| 182 | GPS HDOP | 2 | Probability * 10; 0-500 |

| Permanent I/O elements (are always sent (with every record) to server if enabled) | | | |
|---|---|---|---|
| Property ID in AVL packet | Property Name | Bytes | Description |
| 199 | Trip Odometer | 4 | Distance between two records: m<br>Trip Distance: m<br>* Depends on configuration |
| 200 | Deep Sleep | 1 | 0 – normal mode, 1 – deep sleep mode |
| 205 | Cell ID | 4 | Base station ID.Vvalid CID ranges are from 0 to 65535 on GSM and CDMA networks and from 0 to 268435455 on UMTS and LTE networks. |
| 206 | Area Code | 2 | Location Area code (LAC), it depends on GSM operator. It provides unique number which assigned to a set of base GSM stations. Max value: 65536 |
| 241 | Current Operator Code | 4 | Currently used GSM Operator code |
| 201 | LLS 1 Fuel Level | 2 | Fuel level, measured by LLS sensor on COM1/COM2 or RS485, in kvants or liters. |
| 202 | LLS 1 Temperature | 1 | Fuel temperature, measured by LLS sensor on COM1/COM2 or RS485, in degrees Celsius. |
| 203 | LLS 2 Fuel Level | 2 | Fuel level, measured by LLS sensor on COM1/COM2 or RS485, in kvants or liters. |
| 204 | LLS 2 Temperature | 1 | Fuel temperature, measured by LLS sensor on COM1/COM2 or RS485, in degrees Celsius. |
| 210 | LLS 3 Fuel Level | 2 | Fuel level, measured by LLS sensor on RS485, in kvants or liters. |
| 211 | LLS 3 Temperature | 1 | Fuel temperature, measured by LLS sensor on RS485 interface |
| 212 | LLS 4 Fuel Level | 2 | Fuel level, measured by LLS sensor on RS485, in kvants or liters. |
| 213 | LLS 4 Temperature | 1 | Fuel temperature, measured by LLS sensor on RS485 interface |
| 214 | LLS 5 Fuel Level | 2 | Fuel level, measured by LLS sensor on RS485, in kvants or liters. |
| 215 | LLS 5 Temperature | 1 | Fuel temperature, measured by LLS sensor on RS485 interface |
| 224 | Ultrasonic UL220 Fuel Level 1 | 2 | Fuel level, measured by UL202 sensor on COM1 interface. |
| 225 | Ultrasonic UL220 Fuel Level 2 | 2 | Fuel level, measured by UL202 sensor on COM2 interface. |
| 208 | Ultrasonic UL220 Status 1 | 1 | UL202 sensor status reported on COM1 interface. |
| 209 | Ultrasonic UL220 Status 2 | 1 | UL202 sensor status reported on COM2 interface. |
| 207 | RFID ID COM1 | 8 | Read COM1 RFID value, depending on RFID mode, values can be: for RFID mode in hexadecimal format, RFID M7 mode in decimal format. |
| 216 | Total odometer | 4 | Total odometer distance value (m) |
| 217 | RFID ID COM2 | 8 | Read COM2 RFID value, depending on RFID mode, values can be: for RFID mode in hexadecimal format, RFID M7 mode in decimal format. |
| 218 | IMSI | 8 | IMSI code |
| 219-221 | CCID | Max 24 | SIM card CCID. 221 LSB - 219 MSB |
| 236 | Axis X | 2 | X accelerometer axis value, mg |

| Permanent I/O elements (are always sent (with every record) to server if enabled) | | | |
|---|---|---|---|
| Property ID in AVL packet | Property Name | Bytes | Description |
| 237 | Axis Y | 2 | Y accelerometer axis value, mg |
| 238 | Axis Z | 2 | Z accelerometer axis value, mg |
| 216 | Total odometer | 4 | Separate odometer element, not related with TRIP functionality. |
| 144 | SD status | 1 | 0 –not present, 1 –present |

There are 23 IO elements of 1 byte size.

Also 24 IO elements of 2 byte size.

Also 3 IO elements of 4 byte size.

And 8 IO elements of 8 byte size.

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| FMS elements | | | |
| 79 | Brake switch | 1 | 0 – Parking brake not set; 1 – Parking brake set; 2 – Error; 3 – Not available |
| 80 | Wheel based speed | 4 | 0-65536 (km/h)* |
| 81 | Cruise control active | 1 | 0 - switched off ; 1 - switched on; 2 – Error; 3 – Not available |
| 82 | Slutch switch | 1 | 0 – Pedal released; 1 – Pedal depressed; 2 – Error; 3 – Not available |
| 83 | PTO state | 1 | 0 – off/disabled; 5 – Set; 31 – not available |
| 84 | Accelerator pedal position 1 | 4 | 0-102 (%)* |
| 85 | Engine Percent Load At Current Speed | 1 | 0-125 (%)* |
| 86 | Engine total fuel used | 4 | 0 – 2105540607,5 (Liters)* |
| 87 | Fuel level 1 | 4 | 1-102 (%)* |
| 88 | Engine speed | 4 | 0 – 8031,875 (rpm)* |
| 89-103 | Axle weight | 4 | 32766 (kg)* |
| 104 | Engine total hours of Operation | 4 | 0 – 214748364 (Hours)* |
| 110 | Diagnostics supported | 1 | 0 – Diagnostics is not supported; 1 – Diagnostics is supported; 2 – Reserved; 3 – Not available |
| 113 | Service distance | 4 | -160 635 – 167040 km* |
| 122 | Direction indicator | 1 | 0 – Forward; 1 – Reverse; 2 – Error; 3 – Not available |
| 123 | Tachograph performance | 1 | 0 – No Handling Information; 1 – Handling Information; 2 – Error; 3 – Not available |
| 124 | Tachograpgh handling information | 1 | 0 - No handling information, 1- Handling information is available |
| 125 | System event | 1 | 0 – No Tacho Event; 1 – Tacho Event; 2 – Error; 3 – Not available |
| 127 | Engine coolant temperature | 1 | [-40 – 210] oC– Engine Cooilant Temperature* |
| 128 | Ambient Air Temperature | 2 | [-273 – 1770]oC – Ambient Air Temperature* |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 135 | Fuel rate | 2 | [0 – 3212,75] litres/h* |
| 136 | Instantaneous Fuel Economy | 2 | [0 – 125.5 km/litre ]* |
| 137 | At least one PTO engaged | 1 | 0 – No PTO Drive is Engaged; 1 – At least one PTO drive is engaged; 2 – Error; 3 – not available; |
| 138 | High resolution engine total fuel used | 4 | [0 – 4211081,215] litres or mililiters |
| 139 | Gross Combination Vehicle Weight | 2 | 0-642550 kg |
| 357 | Brake Pedal Position | 1 | 0-100 (%)* |
| Manual CAN elements | | | |
| 10216 | Manual CAN0 | 8 | ID Specific data |
| 10217 | Manual CAN1 | 8 | ID Specific data |
| 10218 | Manual CAN2 | 8 | ID Specific data |
| 10219 | Manual CAN3 | 8 | ID Specific data |
| 10220 | Manual CAN4 | 8 | ID Specific data |
| 10221 | Manual CAN5 | 8 | ID Specific data |
| 10222 | Manual CAN6 | 8 | ID Specific data |
| 10223 | Manual CAN7 | 8 | ID Specific data |
| 10224 | Manual CAN8 | 8 | ID Specific data |
| 10225 | Manual CAN9 | 8 | ID Specific data |
| 10226 | Manual CAN10 | 8 | ID Specific data |
| 10227 | Manual CAN11 | 8 | ID Specific data |
| 10228 | Manual CAN12 | 8 | ID Specific data |
| 10229 | Manual CAN13 | 8 | ID Specific data |
| 10230 | Manual CAN14 | 8 | ID Specific data |
| 10231 | Manual CAN15 | 8 | ID Specific data |
| 10232 | Manual CAN16 | 8 | ID Specific data |
| 10233 | Manual CAN17 | 8 | ID Specific data |
| 10234 | Manual CAN18 | 8 | ID Specific data |
| 10235 | Manual CAN19 | 8 | ID Specific data |
| 10298 | Manual CAN20 | 8 | ID Specific data |
| 10299 | Manual CAN21 | 8 | ID Specific data |
| 10300 | Manual CAN22 | 8 | ID Specific data |
| 10301 | Manual CAN23 | 8 | ID Specific data |
| 10302 | Manual CAN24 | 8 | ID Specific data |
| 10303 | Manual CAN25 | 8 | ID Specific data |
| 10304 | Manual CAN26 | 8 | ID Specific data |
| 10305 | Manual CAN27 | 8 | ID Specific data |
| 10306 | Manual CAN28 | 8 | ID Specific data |
| 10307 | Manual CAN29 | 8 | ID Specific data |
| 10308 | Manual CAN30 | 8 | ID Specific data |
| 10309 | Manual CAN31 | 8 | ID Specific data |
| 10310 | Manual CAN32 | 8 | ID Specific data |
| 10311 | Manual CAN33 | 8 | ID Specific data |
| 10312 | Manual CAN34 | 8 | ID Specific data |
| 10313 | Manual CAN35 | 8 | ID Specific data |
| 10314 | Manual CAN36 | 8 | ID Specific data |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 10315 | Manual CAN37 | 8 | ID Specific data |
| 10316 | Manual CAN38 | 8 | ID Specific data |
| 10317 | Manual CAN39 | 8 | ID Specific data |
| 10318 | Manual CAN40 | 8 | ID Specific data |
| 10319 | Manual CAN41 | 8 | ID Specific data |
| 10320 | Manual CAN42 | 8 | ID Specific data |
| 10321 | Manual CAN43 | 8 | ID Specific data |
| 10322 | Manual CAN44 | 8 | ID Specific data |
| 10323 | Manual CAN45 | 8 | ID Specific data |
| 10324 | Manual CAN46 | 8 | ID Specific data |
| 10325 | Manual CAN47 | 8 | ID Specific data |
| 10326 | Manual CAN48 | 8 | ID Specific data |
| 10327 | Manual CAN49 | 8 | ID Specific data |
| 10328 | Manual CAN50 | 8 | ID Specific data |
| 10329 | Manual CAN51 | 8 | ID Specific data |
| 10330 | Manual CAN52 | 8 | ID Specific data |
| 10331 | Manual CAN53 | 8 | ID Specific data |
| 10332 | Manual CAN54 | 8 | ID Specific data |
| 10333 | Manual CAN55 | 8 | ID Specific data |
| 10334 | Manual CAN56 | 8 | ID Specific data |
| 10335 | Manual CAN57 | 8 | ID Specific data |
| 10336 | Manual CAN58 | 8 | ID Specific data |
| 10337 | Manual CAN59 | 8 | ID Specific data |
| 10338 | Manual CAN60 | 8 | ID Specific data |
| 10339 | Manual CAN61 | 8 | ID Specific data |
| 10340 | Manual CAN62 | 8 | ID Specific data |
| 10341 | Manual CAN63 | 8 | ID Specific data |
| 10342 | Manual CAN64 | 8 | ID Specific data |
| 10343 | Manual CAN65 | 8 | ID Specific data |
| 10344 | Manual CAN66 | 8 | ID Specific data |
| 10345 | Manual CAN67 | 8 | ID Specific data |
| 10346 | Manual CAN68 | 8 | ID Specific data |
| 10347 | Manual CAN69 | 8 | ID Specific data |
| Eventual I/O elements | | | |
| 155 | Geofence zone 01 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 156 | Geofence zone 02 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 157 | Geofence zone 03 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 158 | Geofence zone 04 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 3 – over speeding start. |
| 159 | Geofence zone 05 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 160 | Geofence zone 06 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 161 | Geofence zone 07 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 162 | Geofence zone 08 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 163 | Geofence zone 09 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 164 | Geofence zone 10 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 165 | Geofence zone 11 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 166 | Geofence zone 12 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 167 | Geofence zone 13 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 168 | Geofence zone 14 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 169 | Geofence zone 15 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 170 | Geofence zone 16 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 171 | Geofence zone 17 | 1 | 0 – target left zone<br>1 – target entered zone |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 2 – over speeding end<br>3 – over speeding start. |
| 172 | Geofence zone 18 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 173 | Geofence zone 19 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 174 | Geofence zone 20 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 327 | Geofence zone 21 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 328 | Geofence zone 22 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 329 | Geofence zone 23 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 330 | Geofence zone 24 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 331 | Geofence zone 25 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 332 | Geofence zone 26 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 333 | Geofence zone 27 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 334 | Geofence zone 28 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 335 | Geofence zone 29 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 336 | Geofence zone 30 | 1 | 0 – target left zone |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 337 | Geofence zone 31 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 338 | Geofence zone 32 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 339 | Geofence zone 33 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 340 | Geofence zone 34 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 341 | Geofence zone 35 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 342 | Geofence zone 36 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 343 | Geofence zone 37 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 344 | Geofence zone 38 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 345 | Geofence zone 39 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 346 | Geofence zone 40 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 347 | Geofence zone 41 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 348 | Geofence zone 42 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 349 | Geofence zone 43 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 350 | Geofence zone 44 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 351 | Geofence zone 45 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 352 | Geofence zone 46 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 353 | Geofence zone 47 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 354 | Geofence zone 48 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 355 | Geofence zone 49 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 356 | Geofence zone 50 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 550 | Geofence zone 51 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 551 | Geofence zone 52 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 552 | Geofence zone 53 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 553 | Geofence zone 54 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 554 | Geofence zone 55 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 3 – over speeding start. |
| 555 | Geofence zone 56 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 556 | Geofence zone 57 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 557 | Geofence zone 58 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 558 | Geofence zone 59 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 559 | Geofence zone 60 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 560 | Geofence zone 61 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 561 | Geofence zone 62 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 562 | Geofence zone 63 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 563 | Geofence zone 64 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 564 | Geofence zone 65 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 565 | Geofence zone 66 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 566 | Geofence zone 67 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 567 | Geofence zone 68 | 1 | 0 – target left zone<br>1 – target entered zone |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 2 – over speeding end<br>3 – over speeding start. |
| 568 | Geofence zone 69 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 569 | Geofence zone 70 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 570 | Geofence zone 71 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 571 | Geofence zone 72 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 572 | Geofence zone 73 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 573 | Geofence zone 74 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 574 | Geofence zone 75 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 575 | Geofence zone 76 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 576 | Geofence zone 77 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 577 | Geofence zone 78 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 578 | Geofence zone 79 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 579 | Geofence zone 80 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 580 | Geofence zone 81 | 1 | 0 – target left zone |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 581 | Geofence zone 82 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 582 | Geofence zone 83 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 583 | Geofence zone 84 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 584 | Geofence zone 85 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 585 | Geofence zone 86 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 586 | Geofence zone 87 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 587 | Geofence zone 88 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 588 | Geofence zone 89 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 589 | Geofence zone 90 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 590 | Geofence zone 91 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 591 | Geofence zone 92 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 592 | Geofence zone 93 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 593 | Geofence zone 94 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 594 | Geofence zone 95 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 595 | Geofence zone 96 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 596 | Geofence zone 97 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 597 | Geofence zone 98 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 598 | Geofence zone 99 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 599 | Geofence zone 100 | 1 | 0 – target left zone<br>1 – target entered zone<br>2 – over speeding end<br>3 – over speeding start. |
| 175 | Auto Geofence | 1 | 0 – Target left zone, 1 – Target entered zone |
| 249 | Jamming detection | 1 | 1 – jamming start, 0 – jamming stop |
| 250 | Trip | 1 | 1 – trip start, 0 – trip stop |
| 251 | Immobilizer | 1 | 1 – iButton connected |
| 252 | Authorized driving | 1 | 1 – authorized iButton connected |
| 253 | ECO driving type | 1 | 1 – harsh acceleration, 2 – harsh braking, 3 – harsh cornering |
| 254 | ECO driving value | 1 | Depending on eco driving type: if harsh acceleration, braking and cornering – g*10 $m/s^2$ |
| 255 | Over Speeding | 1 | At over speeding start km/h, at over speeding end km/h |
| 242 | Data limit reached | 1 | Send When GPRS data limit was reached, 0 – data limit hit in home, 1 – data limit hit in roaming |
| 243 | Excessive Idling | 1 | Send When Idling with Ignition ON<br>1- Idling; 0 – Idling End |
| 246 | Towing detection | 1 | 0 – steady, 1 – towing |
| 247 | Crash detection | 5 | 1 – crash<br>2 – limited crash trace (device not calibrated)<br>3 - limited crash trace (device is calibrated)<br>4 - full crash trace (device not calibrated)<br>5 - full crash trace (device is calibrated) |
| 248 | Geozone Overspeeding | 1 | Geozene Idx, that generated event |
| 362 | Trace Order | 2 | |
| 358 | Custom Scenario 1 | 1 | |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 359 | Custom Scenario 2 | 1 | |
| 360 | Custom Scenario 3 | 1 | |
| 361 | Custom Scenario 4 | 1 | |
| Tachograph data | | | |
| 183 | Drive recognize | 1 | 0 – vehicle not in motion, 1 – vehicle in motion |
| 184 | Driver 1 working state | 1 | 0 – resting<br>1 – driver available<br>2 – work<br>3 – drive<br>6 – error<br>7 – not available |
| 185 | Driver 2 working state | 1 | |
| 186 | Overspeed | 1 | 1 – overspeeding, 0 – not overspeeding |
| 187 | Driver 1 card | 1 | 0 – card not present, 1 – card present |
| 188 | Driver 2 card | 1 | 0 – card not present, 1 – card present |
| 189 | Driver 1 time rel state | 1 | 0 – normal<br>1 – 15 min before 4.5h<br>2 – 4.5h reached<br>3 – 15 min before 9h<br>4 – 9 h reached<br>5 – 15 min before 16h<br>6 – 16h reached<br>7 – 12 reserved<br>13 – Other<br>14 – Error<br>15 – Not available |
| 190 | Driver 2 time rel state | 1 | |
| 191 | Speed | 2 | Km/h |
| 192 | Odometer | 4 | Total vehicle distance |
| 193 | Distance | 4 | Current journey distance |
| 194 | Timestamp | 4 | Timestamp of received information packet |
| 195 | Driver 1 ID MSB | 8 | Most significant 8 Bytes of driver 1 ID |
| 196 | Driver 1 ID LSB | 8 | Least significant 8 bytes of driver 1 ID |
| 197 | Driver 2 ID MSB | 8 | Most significant 8 Bytes of driver 2 ID |
| 198 | Driver 2 ID LSB | 8 | Least significant 8 bytes of driver 2 ID |
| 231-232 | Vehicle registration number | Max 16 | ASCII bytes |
| 233-235 | VIN number | Max 17 | ASCII bytes |
| 222 | Driver card1 issuing member state | 1 | Driver card 1 issuing member state, check table **43** |
| 223 | Driver card2 issuing member state | 1 | Driver card 2 issuing member state, check table **43** |
| 56 | Driver1 Continuous Driving Time | 2 | Driver1 Continuous Driving Time, minutes |
| 57 | Driver2 Continuous Driving Time | 2 | Driver2 Continuous Driving Time, minutes |
| 58 | Driver1 Cumulative Break Time | 2 | Driver1 Cumulative Break Time, minutes |
| 59 | Driver2 Cumulative Break Time | 2 | Driver2 Cumulative Break Time, minutes |
| 60 | Driver1 Duration Of | 2 | Driver1 Duration Of Selected Activity, minutes |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | Selected Activity | | |
| 61 | Driver2 Duration Of Selected Activity | 2 | Driver2 Duration Of Selected Activity, minutes |
| 69 | Driver1 Cumulative Driving Time | 2 | Driver1 Cumulative Driving Time, minutes |
| 77 | Driver2 Cumulative Driving Time | 2 | Driver2 Cumulative Driving Time, minutes |
| 47 | Tacho Data Source | 1 | Tacho Data Source |
| LVCAN elements | | | |
| 30 | LVCAN Speed | 1 | Value in km/h |
| 31 | LVCAN Acc Pedal | 1 | Value in persentages, % |
| 33 | LVCAN Fuel Consumed | 4 | Value in liters, L *10 |
| 34 | LVCAN Fuel Level (liters) | 2 | Value in liters, L |
| 35 | LVCAN Engine RPM | 2 | Value in rounds per minute, rpm |
| 36 | LVCAN Total Mileage | 4 | Value in meters, m |
| 37 | LVCAN Fule Level (percent) | 1 | Value in percentages, % |
| 12 | LVCAN Program Number | 4 | LVCAN Program Number |
| 13 | LVCAN ModuleID | 8 | Module ID |
| 14 | LVCAN Engine Work Time | 4 | Engine work time in minutes |
| 15 | LVCAN Engine Work Time (counted) | 4 | Total Engine work time in minutes |
| 16 | LVCAN Total Mileage (counted) | 4 | Total Vehicle Mileage, m |
| 17 | LVCAN Fuel Consumed (counted) | 4 | Total Fuel Consumed,liters * 10 |
| 18 | LVCAN Fuel Rate | 2 | Fuel Rate, liters *10 |
| 19 | LVCAN AdBlue Level (percent) | 1 | AdBlue, % |
| 20 | LVCAN AdBlue Level (liters) | 2 | AdBlue level, L |
| 23 | LVCAN Engine Load | 1 | Engine load, % |
| 25 | LVCAN Engine Temperature | 2 | Engine Temperature, 10 * Degrees ( °C ), |
| 26 | LVCAN Axle 1 Load | 2 | Axle 1 load, kg |
| 27 | LVCAN Axle 2 Load | 2 | Axle 2 load, kg |
| 28 | LVCAN Axle 3 Load | 2 | Axle 3 load, kg |
| 29 | LVCAN Axle 4 Load | 2 | Axle 4 load, kg |
| 32 | LVCAN Axle 5 Load | 2 | Axle 5 load, kg |
| 38 | LVCAN Control State Flags | 4 | **Byte0 (LSB):**<br>**0x01** – STOP<br>**0x02** – Oil pressure / level<br>**0x04** – Coolant liquid temperature / level<br>**0x08** – Handbrake system<br>**0x10** – Battery charging |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | **0x20** – AIRBAG<br>**Byte1:**<br>**0x01** – CHECK ENGINE<br>**0x02** – Lights failure<br>**0x04** – Low tire pressure<br>**0x08** – Wear of brake pads<br>**0x10** – Warning<br>**0x20** – ABS<br>**0x40** – Low Fuel<br>**Byte2:**<br>**0x01** – ESP<br>**0x02** – Glow plug indicator<br>**0x04** – FAP<br>**0x08** – Electronics pressure control<br>**0x10** – Parking lights<br>**0x20** – Dipped headlights<br>**0x40** – Full beam headlights<br>**Byte3:**<br>**0x40** – Passenger's seat belt<br>**0x80** – Driver's seat belt |
| 39 | LVCAN Agricultural Machinery Flags | 8 | **Byte0 (LSB):**<br>**0x01** – Mowing<br>**0x02** – Grain release from hopper<br>**0x04** – First front hydraulic turned on<br>**0x08** – Rear Power Take-Off turned on<br><br>**Byte1:**<br>**0x01** – Excessive play under the threshing drum<br>**0x02** – Grain tank is open<br>**0x04** – 100% of Grain tank<br>**0x08** – 70% of Grain tank<br>**0x10** – Drain filter in hydraulic system of drive cylinders is plugged<br>**0x20** – Pressure filter of drive cylinders hydraulic system is plugged<br>**0x40** – Alarm oil level in oil tank<br>**0x80** – Pressure filter of brakes hydraulic system is plugged<br><br>**Byte2:**<br>**0x01** – Oil filter of engine is plugged<br>**0x02** – Fuel filter is plugged<br>**0x04** – Air filter is plugged<br>**0x08** – Alarm oil temperature in hydraulic system of chasis<br>**0x10** – Alarm oil temperature in hydraulic system of drive cylinders<br>**0x20** – Alarm oil pressure in engine<br>**0x40** – Alarm coolant level<br>**0x80** – Overflow chamber of hydraulic unit<br><br>**Byte3:** |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | **0x01** – Unloader drive is ON. Unloading tube pivot is in idle position<br>**0x02** – No operator!<br>**0x04** – Straw walker is plugged<br>**0x08** – Water in fuel<br>**0x10** – Cleaning fan RPM<br>**0x20** – Trashing drum RPM<br>**Byte4:**<br>**0x02** – Low water level in the tank<br>**0x04** – First rear hydraulic turned on<br>**0x08** – Standalone engine working<br>**0x10** – Right joystick moved right<br>**0x20** – Right joystick moved left<br>**0x40** – Right joystick moved front<br>**0x80** – Right joystick moved back<br>**Byte5:**<br>**0x01** – Brushes turned on<br>**0x02** – Water supply turned on<br>**0x04** – Vacuum cleaner<br>**0x08** – Unloading from the hopper<br>**0x10** – High Pressure washer (Karcher)<br>**0x20** – Salt (sand) disperser ON<br>**0x40** – Low salt (sand) level<br>**Byte6:**<br>**0x01** – Second front hydraulic turned on<br>**0x02** – Third front hydraulic turned on<br>**0x04** – Fourth front hydraulic turned on<br>**0x08** – Second rear hydraulic turned on<br>**0x10** – Third rear hydraulic turned on<br>**0x20** – Fourth rear hydraulic turned on<br>**0x40** – Front three-point Hitch turned on<br>**0x80** – Rear three-point Hitch turned on<br>**Byte7:**<br>**0x01** – Left joystick moved right<br>**0x02** – Left joystick moved left<br>**0x04** – Left joystick moved front<br>**0x08** – Left joystick moved back<br>**0x10** – Front Power Take-Off turned on |
| 40 | LVCAN Harvesting Time | 4 | Harvesting Time, minutes |
| 41 | LVCAN Area of Harvest | 4 | Area of Harvest, $m^2$ |
| 42 | LVCAN Mowing Efficiency | 4 | Mowing efficiency, $(m^2)/h$ |
| 43 | LVCAN Grain Mown Volume | 4 | Mown Volume, kg |
| 44 | LVCAN Grain Moisture | 2 | Grain Moisture in proc, % |
| 45 | LVCAN Harvesting Drum RPM | 2 | Harvesting Drum RPM, RPM |
| 46 | LVCAN Gap Under Harvesting Drum | 1 | Gap Under Harvesting Drum, mm |
| 47 | LVCAN Security State Flags | 8 | **Byte0 (LSB):**<br>Every two bits in this byte correspond to a different |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | CAN bus number.<br>00 – CAN not connected, connection not required<br>01 – CAN connected, but currently module not received data<br>10 – CAN not connected, require connection<br>11 – CAN connected<br>Example: Byte0 - 0F hex – 00001111 binary<br>CAN4, CAN3, CAN2, CAN1<br>**Byte1:**<br>**Not used**<br>**Byte2:**<br>**0x20** – bit appears when any operate button in car was put<br>**0x40** – bit appears when immobilizer is in service mode<br>**0x80** – immobiliser, bit appears during introduction of a programmed sequence of keys in the car.<br>**Byte3:**<br>**0x01** – the key is in ignition lock<br>**0x02** – ignition on<br>**0x04** – dynamic ignition on<br>**0x08** – webasto<br>**0x20** – car closed by factory's remote control<br>**0x40** – factory-installed alarm system is actuated (is in panic mode)<br>**0x80** – factory-installed alarm system is emulated by module<br>**Byte4:**<br>**0x01** – parking activated (automatic gearbox)<br>**0x10** – handbrake is actuated (information available only with ignition on)<br>**0x20** – footbrake is actuated (information available only with ignition on)<br>**0x40** – engine is working (information available only when the ignition on)<br>**0x80** – revers is on<br>**Byte5:**<br>**0x01** – Front left door opened<br>**0x02** – Front right door opened<br>**0x04** – Rear left door opened<br>**0x08** – Rear right door opened<br>**0x10** – engine cover opened<br>**0x20** – trunk door opened<br>**Byte6:**<br>**0x01** – car was closed by the factory's remote control<br>**0x02** – car was opened by the factory's remote control<br>**0x03** – trunk cover was opened by the factory's remote control<br>**0x04** – module has sent a rearming signal<br>**0x05** – car was closed three times by the factory's remote control<br>- High nibble (mask 0xF0 bit) |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | **0x80** – CAN module goes to sleep mode<br>**Byte7:**<br>**Not used** |
| 141 | LVCAN Battery Temperature | 2 | 10* Degrees, ( °C ) |
| 142 | LVCAN Battery Level (percent) | 1 | Value in percentages, % |
| 143 | LVCAN Door Status | 2 | Door status value: Min – 0, Max – 16128<br>Door status is represented as bitmask converted to decimal value. Possible values:<br>0 – all doors closed,<br>0x100 (256) – front left door is opened,<br>0x200 (512) – front right door is opened,<br>0x400 (1024) – rear left door is opened,<br>0x800 (2048) – rear right door is opened,<br>0x1000 (4096) – hood is opened,<br>0x2000 (8192) – trunk is opened,<br>0x3F00 (16128) – all doors are opened,<br>or combinations of values |
| 176 | LVCAN DTC Errors | 1 | DTC errors count |
| 226 | LVCAN CNG Status | 1 | 0 – engine not on CNG<br>1 – engine not on CNG |
| 227 | LVCAN CNG Used | 4 | CNG used Value in kg * 10 |
| 228 | LVCAN CNG Level | 2 | CNG level in percentages, % * 10 |
| 177 | LVCAN DTC Error Codes | 8 | DTC error code, with every new record next received error code will be sent to server. |
| EuroScan/DataCold IO Elements | | | |
| 390 | Temperature Probe 1 | 2 | Degrees, °C |
| 391 | Temperature Probe 2 | 2 | Degrees, °C |
| 392 | Temperature Probe 3 | 2 | Degrees, °C |
| 393 | Temperature Probe 4 | 2 | Degrees, °C |
| 394 | Temperature Probe 5 | 2 | Degrees, °C |
| 395 | Temperature Probe 6 | 2 | Degrees, °C |
| Ibox elements | | | |
| 256 | IBOX Fuel Level | 1 | Reflects the ratio of the volume of fuel remaining to the total volume of the primary fuel storage container<br>resolution: 0.5 % |
| 257 | IBOX Battery Voltage | 2 | Battery voltage in Volts (V)<br>resolution: 0.05 V |
| 258 | IBOX Total Electric Hours | 4 | Reflects the accumulated time of operation of the unit when running under electric power.<br>Resolution: 0.05 h |
| 259 | IBOX Total Vehicle Hours | 4 | This value represents the time a unit is „ON“ but not necessarily having the engine running. The unit could be ON and the engine OFF in the case of a Shutdown Alarm or when the unit is in „Null“ or „Idle“ mode.<br>Resolution: 0.05 h |
| 260 | IBOX Total Engine Hours | 4 | This PID reflects the accumulated time of operation of the engine.<br>Resolution: 0.05 h |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 261 | IBOX Zone 1 Alarm Type* | 1 | 0 – no alarm<br>1 – level 0 alarm (log-stored/routine maintenance requered)<br>2 – level 1 alarm (low fuel)<br>3 – level 2 alarm (maintenance past due)<br>4 – level 3 alarm (reserved for future use)<br>5 – level 4 alarm (reserved for future use)<br>6 – level 5 alarm (reserved for future use)<br>7 – level 6 alarm (reserved for future use)<br>8 – level 7 alarm (check / immediate required)<br>9 – level 8 alarm (reserved for future use)<br>10 – level 9 alarm (reserved for future use)<br>11 – level 10 alarm (reserved for future use)<br>12 – level 11 alarm (reserved for future use)<br>13 – level 12 alarm (reserved for future use)<br>14 – level 13 alarm (reserved for future use)<br>15 – level 14 alarm (shutdown or catasthropic system failure) |
| 262 | IBOX Zone 1 Alarm Code | 1 | manufacturer specific code of value 0 to 255 |
| 263 | IBOX Zone 1 Return Air Temperature 1 | 2 | zone1 return Air #1 Temperature in celsius *10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 264 | IBOX Zone 1 Supply Air Temperature 1 | 2 | zone1 supply #1 Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 265 | IBOX Zone 1 Temperature Setpoint | 2 | zone1 temperature Setpoint in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 266 | IBOX Zone 1 Evaporator Coil Temperature | 2 | zone1 evaporator Coil Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 267 | IBOX Zone 1 Return Air Temperature 2 | 2 | zone1 return Air #2 Temperature in celsius *10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 268 | IBOX Zone 1 Supply Air Temperature 2 | 2 | zone1 supply #2 Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 269 | IBOX Zone 1 Operating mode** | 1 | 0 – power off or unknown<br>1 – cooling<br>2 – heating<br>3 – defrost<br>4 – null<br>5 – pretrip<br>6/7 – manufacturer specific<br>Received data needs to be masked as E0 >> 5 to get described operating mode. |
| 270 | IBOX Zone 2 Alarm Type* | 1 | 0 – no alarm<br>1 – level 0 alarm (log-stored/routine maintenance requered)<br>2 – level 1 alarm (low fuel)<br>3 – level 2 alarm (maintenance past due)<br>4 – level 3 alarm (reserved for future use)<br>5 – level 4 alarm (reserved for future use)<br>6 – level 5 alarm (reserved for future use) |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 7 – level 6 alarm (reserved for future use)<br>8 – level 7 alarm (check / immediate required)<br>9 – level 8 alarm (reserved for future use)<br>10 – level 9 alarm (reserved for future use)<br>11 – level 10 alarm (reserved for future use)<br>12 – level 11 alarm (reserved for future use)<br>13 – level 12 alarm (reserved for future use)<br>14 – level 13 alarm (reserved for future use)<br>15 – level 14 alarm (shutdown or catasthropic system failure) |
| 271 | IBOX Zone 2 Alarm Code | 1 | Manufacturer specific code of value 0 to 255 |
| 272 | IBOX Zone 2 Return Air Temperature 1 | 2 | zone2 return Air #1 Temperature in celsius *10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 273 | IBOX Zone 2 Supply Air Temperature 1 | 2 | zone2 supply #1 Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 274 | IBOX Zone 2 Temperature Setpoint | 2 | zone2 temperature Setpoint in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 275 | IBOX Zone 2 Evaporator Coil Temperature | 2 | zone2 evaporator Coil Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 276 | IBOX Zone 2 Return Air Temperature 2 | 2 | zone2 return Air #2 Temperature in celsius *10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 277 | IBOX Zone 2 Supply Air Temperature 2 | 2 | zone2 supply #2 Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 278 | IBOX Zone 2 Operating Mode** | 1 | 0 – power off or unknown<br>1 – cooling<br>2 – heating<br>3 – defrost<br>4 – null<br>5 – pretrip<br>6/7 – manufacturer specific<br>Received data needs to be masked as E0 >> 5 to get described operating mode. |
| 279 | IBOX Zone 3 Alarm Type* | 1 | 0 – no alarm<br>1 – level 0 alarm (log-stored/routine maintenance requered)<br>2 – level 1 alarm (low fuel)<br>3 – level 2 alarm (maintenance past due)<br>4 – level 3 alarm (reserved for future use)<br>5 – level 4 alarm (reserved for future use)<br>6 – level 5 alarm (reserved for future use)<br>7 – level 6 alarm (reserved for future use)<br>8 – level 7 alarm (check / immediate required)<br>9 – level 8 alarm (reserved for future use)<br>10 – level 9 alarm (reserved for future use)<br>11 – level 10 alarm (reserved for future use)<br>12 – level 11 alarm (reserved for future use)<br>13 – level 12 alarm (reserved for future use) |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 14 – level 13 alarm (reserved for future use)<br>15 – level 14 alarm (shutdown or catasthropic system failure) |
| 280 | IBOX Zone 3 Alarm Code | 1 | Manufacturer specific code of value 0 to 255 |
| 281 | IBOX Zone 3 Return Air Temperature 1 | 2 | zone3 return Air #1 Temperature in celsius *10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 282 | IBOX Zone 3 Supply Air Temperature 1 | 2 | zone3 supply #1 Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 283 | IBOX Zone 3 Temperature Setpoint | 2 | zone3 temperature Setpoint in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 284 | IBOX Zone 3 Evaporator Coil Temperature | 2 | zone3 evaporator Coil Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 285 | IBOX Zone 3 Return Air Temperature 2 | 2 | zone3 return Air #2 Temperature in celsius *10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 286 | IBOX Zone 3 Supply Air Temperature 2 | 2 | zone3 supply #2 Temperature in celsius * 10<br>MIN: -1838.2 ºC<br>MAX: 1802.6 ºC |
| 287 | IBOX Zone 3 Operating Mode** | 1 | 0 – power off or unknown<br>1 – cooling<br>2 – heating<br>3 – defrost<br>4 – null<br>5 – pretrip<br>6/7 – manufacturer specific<br>Received data needs to be masked as E0 >> 5 to get described operating mode. |
| Mobileye elements | | | |
| 288 | MOBILEYE sound type | 1 | 0 – silent<br>1 – left line departure warning<br>2 – rigth line departure warning<br>3 – headway warning<br>4 – traffic sign recognition (if enabled via EyeWatch)<br>5 – urban forward collision warning<br>6 - forward collision warning/pedestrian collision warning |
| 289 | MOBILEYE peds in DZ | 1 | 0 – no warning<br>1 – pedestrians in danger zone warning |
| 290 | MOBILEYE peds FCW | 1 | 0 – no warning<br>1 – pedestrians in forward collsion warning |
| 291 | MOBILEYE time indicator | 1 | 0 – day indicated<br>1 – dusk indicated<br>2 – nigth is indicated |
| 292 | MOBILEYE error valid | 1 | 0 – no error<br>1 – error code is valid |
| 293 | MOBILEYE error code | 1 | error code as in mobileye user manual. Code is valid if error valid bit is set |
| 294 | MOBILEYE zero speed | 1 | 0 – hos vehicle moving |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| | | | 1 – host vehicle is stopped |
| 295 | MOBILEYE headway valid | 1 | 0 – then close in path vehicle is not detected<br>1 – then close in path vehicle detected |
| 296 | MOBILEYE headway measurement | 1 | headway measurement in seconds * 10 |
| 297 | MOBILEYE LDW off | 1 | 0 – lane departure warning are enabled<br>1 – lane depatture warnings are disabled due to low speed or configuration |
| 298 | MOBILEYE left LDW on | 1 | 0 – no left line departure warning<br>1 – left line depatrure warning event |
| 299 | MOBILEYE right LDW on | 1 | 0 – no right line departure warning<br>1 – right line depatrure warning event |
| 300 | MOBILEYE maintenance | 1 | indicator of internal error. (mobileye manual) |
| 301 | MOBILEYE failsafe | 1 | 0 – no failsafe modes<br>1 – indicates one of the internal failsafe modes (blur image, saturated image, low sun, partial bloking, partial transparent) |
| 302 | MOBILEYE FCW on | 1 | 1 – forward collision warning will be on for the entire warning length |
| 303 | MOBILEYE TSR enabled | 1 | 0 – trafic sign recognition OFF<br>1 – trafic sign recognition ON |
| 304 | MOBILEYE headway wrn. Repeat | 1 | 1 – indicates that headway repeatable feature is ON |
| 305 | MOBILEYE headway wrn. Level | 1 | Headway warning level:<br>0 – then no vehicle detected<br>1 – then close in path vehicle present with headway which is bigger than headway config<br>2 – then close in path vehicle present with headway which is smaller or equal than headway config or then headway is less than 0,6 |
| 306 | MOBILEYE TSR wrn. Level | 1 | indicates if current vehicle speed is bigger than recognized traffic sign<br>0 – vehicle speed < road speed<br>1 – vehicle speed > road speed + [0-5] kmh<br>2 – vehicle speed > road speed + [5-10] kmh<br>3 – vehicle speed > road speed + [10-15] kmh<br>4 – vehicle speed > road speed + [15-20] kmh<br>5 – vehicle speed > road speed + [20-25] kmh<br>6 – vehicle speed > road speed + [25-30] kmh<br>7 – vehicle speed > road speed + [30+] kmh |
| 307 | MOBILEYE tamper alert | 1 | 0 – no tamper alert<br>1 – tamper alert<br>It will be active if there is no vehicle or lane detection for duration of 10 minutes. |
| 308 | MOBILEYE high beam | 1 | 0 – high beam off<br>1 – high beam on |
| 309 | MOBILEYE low beam | 1 | 0 – low beam off<br>1 – low beam on |
| 310 | MOBILEYE wipers | 1 | 0 – wipers off<br>1 – wipers on |
| 311 | MOBILEYE right signal | 1 | 0 – right turn signal is off<br>1 – right turn signal is on |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 312 | MOBILEYE left signal | 1 | 0 – left turn signal is off<br>1 – left turn signal is on |
| 313 | MOBILEYE brake signal | 1 | 0 – brake signal is off<br>1 – brake signal is on |
| 314 | MOBILEYE wipers available | 1 | 0 – wipers data not available<br>1 – wipers data available |
| 315 | MOBILEYE low beam available | 1 | 0 – low beam data available<br>1 – low beam data available |
| 316 | MOBILEYE high beam available | 1 | 0 – high beam data not available<br>1 – high beam data available |
| 317 | MOBILEYE speed available | 1 | 0 – speed data not available<br>1 – speed data available |
| 318 | MOBILEYE speed | 1 | speed value 0-255 km/h |
| 319 | MOBILEYE TSR1 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 320 | MOBILEYE TSR2 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 321 | MOBILEYE TSR3 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 322 | MOBILEYE TSR4 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 323 | MOBILEYE TSR5 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 324 | MOBILEYE TSR6 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 325 | MOBILEYE TSR7 | 8 | RAW traffic sign recognition data as described in mobileye manual |
| 326 | MOBILEYE TSR VO | 8 | RAW vision only decision data as described in mobileye manual |
| TPMS IO Elements | | | |
| 400 | Total Tires Controlled | 1 | |
| 401 | Total Number of Axl | 1 | |
| 402 | Graphical position | 8 | |
| 410 | Tire 1 | 8 | Tire ID 1 |
| 411 | Tire 2 | 8 | Tire ID 2 |
| 412 | Tire 3 | 8 | Tire ID 3 |
| 413 | Tire 4 | 8 | Tire ID 4 |
| 414 | Tire 5 | 8 | Tire ID 5 |
| 415 | Tire 6 | 8 | Tire ID 6 |
| 416 | Tire 7 | 8 | Tire ID 7 |
| 417 | Tire 8 | 8 | Tire ID 8 |
| 418 | Tire 9 | 8 | Tire ID 9 |
| 419 | Tire 10 | 8 | Tire ID 10 |
| 420 | Tire 11 | 8 | Tire ID 11 |
| 421 | Tire 12 | 8 | Tire ID 12 |
| 422 | Tire 13 | 8 | Tire ID 13 |
| 423 | Tire 14 | 8 | Tire ID 14 |
| 424 | Tire 15 | 8 | Tire ID 15 |

| Property ID in AVL packet | Property Name | Bytes | Description |
|---|---|---|---|
| 425 | Tire 16 | 8 | Tire ID 16 |
| 426 | Tire 17 | 8 | Tire ID 17 |
| 427 | Tire 18 | 8 | Tire ID 18 |
| 428 | Tire 19 | 8 | Tire ID 19 |
| 429 | Tire 20 | 8 | Tire ID 20 |
| 430 | Tire 21 | 8 | Tire ID 21 |
| 431 | Tire 22 | 8 | Tire ID 22 |
| 432 | Tire 23 | 8 | Tire ID 23 |
| 433 | Tire 24 | 8 | Tire ID 24 |

### *1.6 Codec 8 Example*

```
Received data:
00000000000008c08010000013feb55ff7400 0f0ea850209a6900094 0000 12000001e0
901000200030004001601470 3f0001504c8000c0900730a00460b00501300464306d74400
00b5000bb60007422e9f180000cd0386ce000107c700000000f10000601a4600000134480
0000bb84900000bb84a00000bb84c00000000024e000000000000000cf00000000000000
0001000003fca
In total 152 Bytes.
```

00000000 **4 zeroes**, 4 bytes
0000008c **data length**, 4 bytes
**08** - **Codec ID**
0- **Number of Data** (1 record)

**1'st record data**

0000013feb55ff74 - **Timestamp** in milliseconds (1374042849140)
**GMT**: Wed, 17 Jul 2013 06:34:09 GMT
00 - **Priority**

**GPS Element**

0f0ea850 - Longitude 252618832 = 25,2618832° N
209a6900 - Latitude 546990336 = 54,6990336 ° E
0094 - Altitude 148 meters
0000 - Angle 0°
12 - 18 Visible sattelites
0000 - 0 km/h speed

**IO Element**

**00** - IO element ID of Event generated (in this case when 00 - data generated not on event)
**1e** - 30 IO elements in record (total)
**09** - 9 IO elements, which length is 1 Byte

**01** – IO element ID = 01
**00** – IO element's value = 0
02 – IO element ID = 02
**00** – IO element's value = 0
03 – IO element ID = 03
**00** – IO element's value = 0
04 – IO element ID = 04
**00** – IO element's value = 0
16 – IO element ID = 22 (dec)
**01** – IO element's value = 1
47 – IO element ID = 71 (dec)
**03** – IO element's value = 3
F0 – IO element ID = 240 (dec)
**00** – IO element's value = 0
15 – IO element ID = 21 (dec)
**04** – IO element's value = 0
C8 – IO element ID = 200 (dec)
**00** – IO element's value = 0

**0C** – 12 IO elements, which value length is 2 Bytes
09 – IO element ID = 9 (dec)
**0073** – IO element's value
0a – IO element ID = 10 (dec)
**0046** – IO element's value
0b – IO element ID = 11 (dec)
**0050** – IO element's value
13 – IO element ID = 19 (dec)
**0046** – IO element's value
43 – IO element ID = 67 (dec)
**06d7** – IO element's value
44 – IO element ID = 68 (dec)
**0000** – IO element's value
B5 – IO element ID = 181 (dec)
**000b** – IO element's value
B6 – IO element ID = 182 (dec)
**0007** – IO element's value
42 – IO element ID = 66 (dec)
**2e9f** – IO element's value
18 – IO element ID = 24 (dec)
**0000** – IO element's value
cd – IO element ID = 205 (dec)
**0386** – IO element's value
CE – IO element ID = 206 (dec)
**0001** – IO element's value

**07** – 7 IO elements, which value length is 4 Bytes

C7 – IO element ID = 199 (dec)
**00000000** – IO element's value
f1 – IO element ID = 241 (dec)
**0000601a** – IO element's value

```
46          - IO element ID = 70 (dec)
00000134    - IO element's value
48          - IO element ID = 72 (dec)
00000bb8    - IO element's value
49          - IO element ID = 73 (dec)
00000bb8    - IO element's value
4a          - IO element ID = 74 (dec)
00000bb8    - IO element's value
4c          - IO element ID = 76 (dec)
00000000    - IO element's value

02 - 2 IO elements, which value length is 8 Bytes
   4e                    - IO element ID = 78 (dec)
   0000000000000000      - IO element's value
   cf                    - IO element ID = 207 (dec)
   0000000000000000      - IO element's value

01          – Number of Data (1 record)
00003fca    - CRC-16, 4 Bytes (first 2 are always zeroes)
```

## *1.7 Communication with server*

First when module connects to server, module sends its IMEI. First comes short identifying number of bytes written and then goes IMEI as text (bytes).

For example IMEI 123456789012345 would be sent as 000f333536333037303432343431303133

First two bytes denote IMEI length. In this case 000F means, that imei is 15 bytes long.

After receiving IMEI, server should determine if it would accept data from this module. If yes server will reply to module 01 if not 00. Note that confirmation should be sent as binary packet. I.e. 1 byte 0x01 or 0x00.

Then module starts to send first AVL data packet. After server receives packet and parses it, server must report to module number of data received as integer (four bytes).

If sent data number and reported by server doesn't match module resends sent data.

Example:

Module connects to server and sends IMEI:

000f333536333037303432343431303133

Server accepts the module:

01

Module sends data packet:

| *Codec type* | *AVL data packet header* | *AVL data array* | *CRC* |
|---|---|---|---|
| | Four zero bytes, 'AVL data array' length – 254 | CodecId – 08<br>NumberOfData – 2.<br>(Encoded using continuous bit stream. Last byte padded to align to byte boundary) | CRC of 'AVL data array' |
| Codec8 | 00000000000000FE | 0802...(data elements)...02 | 00008612 |

Server acknowledges data reception (2 data elements):
00000002

# 2. CODEC 8 SENDING DATA OVER UDP/IP

## 2.1 UDP channel protocol

UDP channel is a transport layer protocol above UDP/IP to add reliability to plain UDP/IP using acknowledgment packets. The packet structure is as follows:

| ***UDP datagram*** | | | |
|---|---|---|---|
| UDP channel packet x N | Packet length | 2 bytes | Packet length (excluding this field) in big endian byte order |
| | Packet Id | 2 bytes | Packet id unique for this channel |
| | Packet Type | 1 byte | Type of this packet |
| | Packet payload | m bytes | Data payload |

| ***Packet Type*** | |
|---|---|
| 1 | Data packet requiring acknowledgment |

Acknowledgment packet should have the same *packet id* as acknowledged data packet and empty data payload. Acknowledgement should be sent in binary format.

| ***Acknowledgment packet*** | | |
|---|---|---|
| Packet length | 2 bytes | 0x0003 |
| Packet id | 2 bytes | same as in acknowledged packet |
| Packet type | 1 byte | 0x02 |

## 2.2 Sending AVL data using UDP channel

AVL data are sent encapsulated in UDP channel packets (*Data payload* field).

| ***AVL data encapsulated in UDP channel packet*** | | |
|---|---|---|
| AVL packet id (1 byte) | Module IMEI | AVL data array |

*AVL packet id* (1 byte) – id identifying this AVL packet
*Module IMEI* – IMEI of a sending module encoded the same as with TCP
*AVL data array* – array of encoded AVL data

| ***Server response to AVL data packet*** |
|---|

| *Server response to AVL data packet* | |
|---|---|
| AVL packet id (1 byte) | Number of accepted AVL elements (1 byte) |

*AVL packet id* (1 byte) – id of received AVL data packet

*Number of AVL data elements accepted (1 byte)* – number of AVL data array entries from the beginning of array, which were accepted by the server.

Scenario:

Module sends UDP channel packet with encapsulated AVL data packet (*Packet* type=1 or 0). If packet type is 0, server should respond with valid UDP channel acknowledgment packet. Since server should respond to the AVL data packet, UDP channel acknowledgment is not necessary in this scenario, so *Packet type=1* is recommended.

Server sends UDP channel packet with encapsulated response (*Packet type=1* – this packet should not require acknowledgment)

Module validates *AVL packet id* and *Number of accepted AVL elements*. If server response with valid *AVL packet id* is not received within configured timeout, module can retry sending.

Example:

Module sends the data:

| ***Codec*** | ***UDP channel header*** | ***AVL packet header*** | ***AVL data array*** |
|---|---|---|---|
| | Len – 253,<br>Id – 0xCAFE,<br>Packet type – 01<br>(without ACK) | AVL packet id – 0xDD,<br>IMEI – 1234567890123456 | CodecId – 08,<br>NumberOfData – 2.<br>(Encoded using continuous bit stream) |
| Codec8 | 00FDCAFE01 | DD000F313334353637383930313233435 | 0802...(data elements)...02 |

Server must respond with acknowledgment:

| ***UDP channel header*** | ***AVL packet acknowledgment*** |
|---|---|
| Len – 5,<br>Id – 0xABCD,<br>Packet type – 01 (without ACK) | AVL packet id – 0xDD,<br>NumberOfAcceptedData – 2 |
| 0005CAFE01 | DD02 |

## Another example, with all IO id's enabled

```
Server received data:
00a1cafe011b000f33353633303730343234343130313308010000013febdd19c8000f0e9
ff0209a7180006900001200000001e0901000200030004001601470 3f0001504c8000c0900
910a00440b004d13004443155544000 0b5000bb60005422e9b180000cd0386ce000107c70
0000000f10000601a460000013c4800000bb84900000bb84a00000bb84c00000000024e00
000000000000000cf0000000000000000 01
```

**Data length**: 00a1 or 161 Bytes (not counting the first 2 data length bytes)
**Packet identification**: 0xCAFE 2 bytes
**Packet type**: 01
**Packet id**: 1b
**Imei length**: 000f
**Actual imei**: 333536333037303432343431303133
Codec id: 08
Number of data: 01
Timestamp: 0000013febdd19c8
Priority: 00
GPS data: 0f0e9ff0209a7180006900001200000

UDP protocol is the same as TCP except message header is 7 bytes, which consist of: data length, packet identification, packet type and packet id.
Then goes imei length and imei itself.
And after that goes AVL data. And at the very end number of data byte. There is no CRC in UDP.

# 3. CODEC 8 EXTENDED PROTOCOL SENDING OVER TCP

## 3.1 AVL data packet

Below table represents AVL data packet structure.

| 4 zeroes | Data field length | Codec ID | Number of Data 1 | AVL Data | Number of Data 2 | CRC-16 |
|---|---|---|---|---|---|---|
| *4 Bytes* | *4 Bytes* | *1 Byte* | *1 Byte* | *38 - 768 Bytes* | *1 Byte* | *4 bytes* |

**AVL data packet structure**

Number of data – number of encoded data (number of records).
Codec ID is constant 0x8E.
Data field length is the length of bytes [codec id, number of data 2].
Number of data 1 should always be equal to number of data 2 byte.
CRC-16 is 4 bytes, but first two are zeroes and last two are CRC-16 calculated for [codec id, number of data 2]
Minimum AVL packet size is 53 bytes (all IO elements disabled).

## 3.2 AVL Data

| Timestamp | Priority | GPS Element | IO Element |
|---|---|---|---|
| *8 Bytes* | *1 Byte* | *15 Bytes* | *14 - 744* |

**AVL Data structure**

## 3.3 Priority

| | |
|---|---|
| 0 | Low |
| 1 | High |
| 2 | Panic |

**Priority element values**

## 3.4 GPS Element

| Longitude | Latitude | Altitude | Angle | Satellites | Speed |
|---|---|---|---|---|---|
| *4 Bytes* | *4 Bytes* | *2 Bytes* | *2 Bytes* | *1 Byte* | *2 Bytes* |

**GPS element structure**

## 3.5 IO Element

| | |
|---|---|
| Event IO ID | *2 bytes* |
| N of **Total** IO | *2 bytes* |
| N1 of **One Byte** IO | *2 bytes* |
| **1'st** IO ID | *2 bytes* |
| **1'st** IO Value | *1 bytes* |
| … | |
| **N1'th** IO ID | *2 bytes* |
| **N1'st** IO Value | *1 bytes* |
| N2 of **Two Byte** IO | *2 bytes* |
| **1'st** IO ID | *2 bytes* |

| | |
|---|---|
| **1'st** IO Value | *2 bytes* |
| … | |
| **N2'th** IO ID | *2 bytes* |
| **N2'st** IO Value | *2 bytes* |
| N4 of **Four Byte** IO | *2 bytes* |
| **1'st** IO ID | *2 bytes* |
| **1'st** IO Value | *4 bytes* |
| … | |
| **N4'th** IO ID | *2 bytes* |
| **N4'st** IO Value | *4 bytes* |
| N2 of **Eight Byte** IO | *2 bytes* |
| **1'st** IO ID | *2 bytes* |
| **1'st** IO Value | *8 bytes* |
| … | |
| **N8'th** IO ID | *2 bytes* |
| **N8'st** IO Value | *8 bytes* |
| NX of **X Byte** IO | *2 bytes* |
| **1'st** IO ID | *2 bytes* |
| **1'st** IO Length | *2 bytes* |
| **1'st** IO Value | *defined by length* |
| … | |
| **NX'st** IO ID | *2 bytes* |
| **NX'st** IO Length | *2 bytes* |
| **NX'st** IO Value | *defined by length* |

**IO element structure**

| | |
|---|---|
| N | total number of properties coming with record (N=N1+N2+N4+N8+NX) |
| N1 | number of properties, which length is 1 byte |
| N2 | number of properties, which length is 2 bytes |
| N4 | number of properties, which length is 4 bytes |
| N8 | number of properties, which length is 8 bytes |
| NX | number of properties, which length is defined by length element |

### *3.6 Communication with server*

Communication with server is the same as with codec 8 protocol, except in codec8 extended protocol codec id is 0x8E.

Example:
Module connects to server and sends IMEI:
000f333536333037303432343431303133
Server accepts the module:
01
Module sends data packet:

| *AVL data packet header* | *AVL data array* | *CRC* |
|---|---|---|
| Four zero bytes,<br>'AVL data array' length – 254 | Codec Id – 8E,<br>NumberOfData – 02.<br>(Encoded using continuous bit stream. Last byte padded to align to byte boundary) | CRC of 'AVL data array' |
| 00000000000000FE | 8E02...(data elements)...02 | 00008612 |

**Table 21 – IO element structure**

Server acknowledges data reception (2 data elements):
00000002

### *3.7 Example*

Received data:
000000000000005F8E010000015FBA40B62000 0F0DCDE420959D30008A0000060000000000060001 00EF 00 0001 0011001E 0001 00100000CBDF 0002 000B000000003544C875000E0000000029BFE4D1 0001 0100 001 1 00000000000000000000000000000000 01 0000D153

00000000 **4 zeroes**, 4 bytes
0000005F **data length**, 4 bytes
8E – **Codec ID**
**01**- **Number of Data** (1 record)
**1'st record data**
0000015FBA40B620– **Timestamp** in milliseconds (1510658324000)
**GMT**: Tuesday, November 14, 2017 11:18:44 AM
00 – **Priority**
**GPS Element**
0F0DCDE4 – Longitude 252562916 = 25, 2562916º N
20959D30 – Latitude 546676016 = 54,6676016 º E
008A – Altitude 138 meters
0000 – Angle 0º
06 – 6 Visible sattelites
0000 – 0 km/h speed
**IO Element**
0000 – IO element ID of Event generated (in this case when 0000 – data generated not on event)
0006 – 6 IO elements in record (total)
0001 – 1 IO elements, which length is 1 Byte
00EF – IO element ID = 239 (dec)
**00** – IO element's value
0001 – 1 IO elements, which length is 2 Byte
0011 – IO element ID = 17 (dec )
**001E** – IO element's value
0001 – 1 IO elements, which length is 4 Byte
0010 – IO element ID = 16 (dec )
0000CBDF – IO element's value
0002 – 2 IO elements, which length is 8 Byte
000B – IO element ID = 11 (dec )
000000003544C875 – IO element's value
000E – IO element ID = 14 (dec )

0000000029BFE4D1 – IO element's value
0001 – 1 IO elements, which length is X Byte
0100 – IO element ID = 256 (dec )
0011 – IO element length = 17 (dec )
00000000000000000000000000000000 – IO element's value

**01** – Number of Data (1 record)
0000D153 – CRC-16, 4 Bytes (first 2 are always zeroes)

# 4. CODEC 8 EXTENDED PROTOCOL SENDING OVER UDP

## 4.1 AVL data packet

AVL data packet is the same as with codec 8, except codec ID is changed to 0x8E.
Example:
Module sends the data:

| UDP channel header | AVL packet header | AVL data array |
|---|---|---|
| Len – 253,<br>Id – 0xCAFE,<br>Packet type – 01 | AVL packet id – 0xDD,<br>IMEI – 1234567890123456 | Codec Id – 8E,<br>NumberOfData – 02.<br>(Encoded using continuous bit stream) |
| 00FDCAFE01 | DD000F313334353637383930313233343 5 | 8E02…(data elements)…02 |

**Table 22 – Example packet sent to server**

Server must respond with acknowledgment:

| UDP channel header | AVL packet acknowledgment |
|---|---|
| Len – 5,<br>Id – 0xCAFE,<br>Packet type – 01 | AVL packet id – 0xDD,<br>NumberOfAcceptedData – 2 |
| 0005CAFE01 | DD02 |

**Table 23 – Example packet server response**

## 4.2 Example

Server received data:
00a1cafe011b000f333536333037303432343431303133 8E010000013febdd19c8000f0e9ff0209a71800690000120000001e0901000200030004001601470 3f0001504c8000c0900910a00440b004d130044431555440000b5000bb60005422e9b180000cd0386ce000107c700000000f10000601a460000013c4800000bb84900000bb84a00000bb84c00000000024e0000000000000000cf0000000000000000 01

**Data length**: 00a1 or 161 Bytes (not counting the first 2 data length bytes)
**Packet identification**: 0xCAFE 2 bytes
**Packet type**: 01
**Packet id**: 1b
**Imei length**: 000f
**Actual imei**: 333536333037303432343431303133
Codec id**:** 8E
Number of data: 01
Timestamp: 0000013febdd19c8
Priority: 00
GPS data: 0f0e9ff0209a718000690000120000

# 5. SENDING DATA USING SMS

AVL data or events can be sent encapsulated in binary SMS. TP-DCS field of these SMS should indicate that message contains 8-bit data (for example: TP-DCS can be 0x04).

| ***SM data (TP-UD)*** | |
|---|---|
| *AVL data array* | *IMEI:* 8 bytes |

*AVL data array* – array of encoded AVL data
*IMEI* – IMEI of sending module encoded as a big endian 8-byte long number.

# 6. SMS EVENTS

When Configured to generate SMS event user will get this SMS upon event

**<Year/Month/Day> <Hour:Minute:Second> P**:<profile_nr> **<SMS Text**> **Val**:<Event Value> **Lon**:<longitude> **Lat**:<latitude> **Q:**<HDOP>

Example:
2016./04/11 12:00:00 P:3 Digital Input 1 Val:1 Lon:51.12258 Lat: 25.7461 Q:0.6

# 7. NUMERIC STATE TABLE

| | | | |
|---|---|---|---|
| No information available | 0 | Iceland | 1C |
| Austria | 1 | Kazakhstan | 1D |
| Albania | 2 | Luxembourg | 1E |
| Andorra | 3 | Lithuania | 1F |
| Armenia | 4 | Latvia | 20 |
| Azerbaijan | 5 | Malta | 21 |
| Belgium | 6 | Monaco | 22 |
| Bulgaria | 7 | Republic of Moldova | 23 |
| Bosnia and Herzegovina | 8 | Macedonia | 24 |
| Belarus | 9 | Norway | 25 |
| Switzerland | 0A | Netherlands | 26 |
| Cyprus | 0B | Portugal | 27 |
| Czech Republic | 0C | Poland | 28 |
| Germany | 0D | Romania | 29 |
| Denmark | 0E | San Marino | 2A |
| Spain | 0F | Russian Federation | 2B |
| Estonia | 10 | Sweden | 2C |
| France | 11 | Slovakia | 2D |
| Finland | 12 | Slovenia | 2E |
| Liechtenstein | 13 | Turkmenistan | 2F |
| Faeroe Islands | 14 | Turkey | 30 |
| United Kingdom | 15 | Ukraine | 31 |
| Georgia | 16 | Vatican City | 32 |
| Greece | 17 | Yugoslavia | 33 |
| Hungary | 18 | RFU | 34..FC |
| Croatia | 19 | European Community | FD |
| Italy | 1A | Rest of Europe | FE |
| Ireland | 1B | Rest of the world | FF |

# 8. CHANGE LOG

| Nr. | Date | New version number | Comments |
|---|---|---|---|
| 1 | 2018.04.27 | 0.1 | Drafted |
| 2 | 2018.08.02 | 0.3 | Added Codec08 extended protocol support description |
| 3 | 2018.09.27 | 0.4 | Vehicle Data IO added. Dublicates removed from ALLCAN,FMS. Kline Removed. |
| 4 | 2018.10.12 | 0.5 | Added Ibox, Mobileye elements. Modified UDP channel protocol. |
| 5 | 2019.02.22 | 0.6 | Minor text changes. |
| 6 | 2019.06.11 | 0.7 | VIN number MAX bytes changed |