

BITREK PROTOCOL

1. Initialize the connection.

The GPS tracker tries to establish a connection with the server. To initialize the connection the tracker sends the session initialization packet:

Data length - 15 (length IMEI). 2 bytes, binary data	Device identifier - IMEI. 15 bytes - ASCII-encoded IMEI							
0	15	'3'	'5'	'5'	'8'	'4'	'9'

If the server accepts the connection, it responds with 1 binary byte with the value 1. Otherwise sends 0.

An example of the connection (DEC/ASCII):

Tracker -> 0,15,'3','5','5','6','6','7','7','8','8','9','9','0','0','1','1'

Server <- 1 // Confirm connection

Server <- 0 // No confirmation of the connection (for example IMEI not found in database)

After initializing the connection device is ready to send data.

2. Structure of the data packet.

The data packet consists of a preamble, data length, available data (AVL) and checksum CRC16.

Preamble - 4 zeros	Data length AVL - 4 bytes, from the older to the younger	AVL - available data	CRC16 - 4 bytes, from the older to the younger
0,0,0,0	Dat_len		CRC16

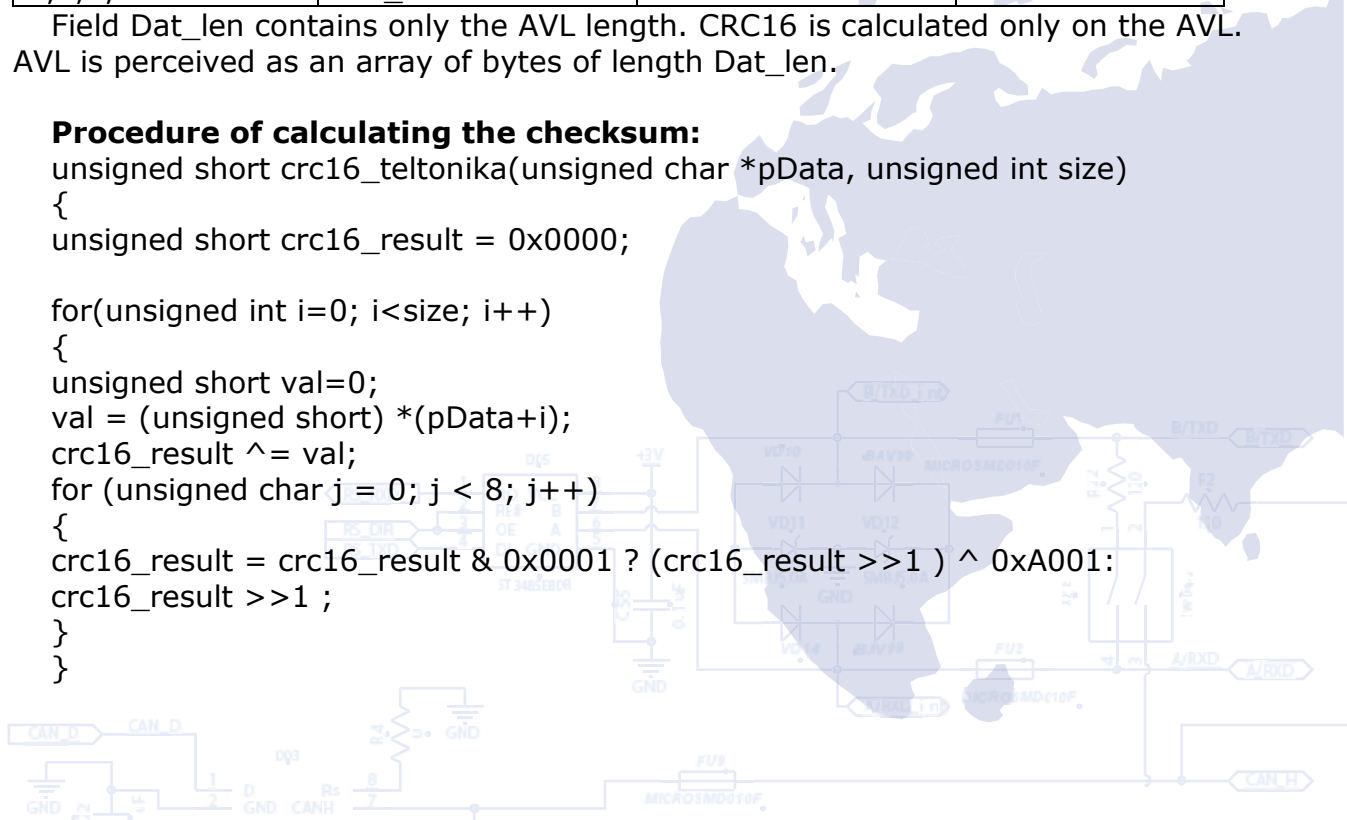
Field Dat_len contains only the AVL length. CRC16 is calculated only on the AVL. AVL is perceived as an array of bytes of length Dat_len.

Procedure of calculating the checksum:

```

unsigned short crc16_teltonika(unsigned char *pData, unsigned int size)
{
    unsigned short crc16_result = 0x0000;

    for(unsigned int i=0; i<size; i++)
    {
        unsigned short val=0;
        val = (unsigned short) *(pData+i);
        crc16_result ^= val;
        for (unsigned char j = 0; j < 8; j++)
        {
            crc16_result = crc16_result & 0x0001 ? (crc16_result >> 1) ^ 0xA001:
            crc16_result >> 1 ;
        }
    }
}
    
```



```
return crc16_result;
}
```

3. AVL structure - available data.

CODEC ID - 1 byte	Number of records	N records				Number of records
8	N	0	1	N-1	N

CODEC ID == 8 - constant determining the decryption algorithm records. Number of records N - determines how many records with the structure described in paragraph 4 to expect in this package. At the end of the packet field count of records duplicated.

4. Record structure.

Timestamp - creation time of the packet of 8 bytes, from the older to the younger	Priority - priority data 1 byte	GPS-data , 15 bytes	IO-data , 6 bytes or more

Timestamp - the time elapsed since 00-00-00, 01.01.1970 until the record was created in milliseconds. Time tracker is determined by GPS and is always measured in GMT.

Priority - priority data. The field may be set to 0 - lowest priority, 1 - highest priority. Entries with a high priority are sent immediately after creation if possible. Record low priority are sent in the order of their creation.

GPS-data - fixed length field that stores data received by GPS.

Has the following structure:

Longitude - 4 bytes, from older to younger	Latitude - 4 bytes, from older to younger	Height - 2 bytes, from older to younger	Azimuth - 2 bytes, from older to younger	Number of satellites - 1 byte	Speed - 2 bytes, from older to younger

Longitude and latitude are transmitted in degrees and part of degrees is given to the accuracy 10000000. If the longitude is West (W) or South latitude (S) that is a negative value coordinates transmitted.

For example: If the longitude 301234678E is transmitted - it means 30.1234678 degrees east longitude.

Altitude transmitted in meters above sea level.

Azimuth is transmitted in whole degrees 0-359.

Number of satellites - a whole number of visible satellites. Determines the data validity. If the number of satellites equals to configured in tracker number of satellites on error GPS (default: 0) - all GPS-data regarded as invalid. Otherwise visible number of satellites is transferred.

The speed is transmitted in kilometers per hour.

IO - the data contains information about all analog and digital sensors that are configured to transfer data to the server. The field has a variable length depending on the number of sensors and their capacity.

The structure of the IO-data:

Event IO ID	0 - data not created by event, Not 0 - the ID sensor that generated the event
Number of total IO	Total number of transmitted sensors
Number of One Byte IO - N1	Number of sensors bit 1 byte

1'st One Byte IO ID	Sensor ID
1'st One Byte IO value	Sensor value
.....	
N1'th One Byte IO ID	Sensor ID
N1'th One Byte IO value	Sensor value
Number of Two Byte IO N2	Number of sensors bit 2 bytes
1'st Two Byte IO ID	Sensor ID
1'st Two Byte IO value	Sensor value
.....	
N2'th Two Byte IO ID	Sensor ID
N2'th Two Byte IO value	Sensor value
Number of Four Byte IO N4	Number of sensors bit 4 bytes
1'st Four Byte IO ID	Sensor ID
1'st Four Byte IO value	Sensor value
.....	
N4'th Four Byte IO ID	Sensor ID
N4'th Four Byte IO value	Sensor value
Number of Eight Byte IO N8	Number of sensors bit 8 bytes
1'st Eight Byte IO ID	Sensor ID
1'st Four Eight IO value	Sensor value
.....	
N8'th Eight Byte IO ID	Sensor ID
N8'th Eight Byte IO value	Sensor value

If the transmission is not configured IO-data, the minimum length of the field is 6 bytes - Event IO ID = 0, Number of total IO = 0, Number of One Byte IO - N1 = 0, Number of Two Byte IO N2 = 0, Number of Four Byte IO N4 = 0, Number of Eight Byte IO N8 = 0.

Example: AVL transcript data (in HEX):
080100000113fc208dff00209cca800f14f650006f00d604000400040301011503160
30001460000015d0001
08 - CODEC ID
01 - 1 record in the package

Record:

00000113fc208dff – timestamp 25 Jul 2007 06:46:38
00 – priority 0
GPS-element:
209cca80 – latitude 547146368 = 54,7146368 ° E
0f14f650 - longitude 253032016 = 25,3032016° N
006f – altitude 111 meters
00d6 – azimuth 214 °
04 – 4 visible sattelites
0004 –4 km/h speed

IO-element:

00 – record was not created by event
04 – 4 IO - elements in record
03 – 3 IO - element bit 1
01 – IO - element bit 1, id=1
01 – 1 - value of io-element with id =1
15 – IO - element bit 1, id=21
03 – 3 - value of io-element with id =21
16 – IO - element bit 1, id=22
03 – 3 - value of io-element with id =22
00 – 0 IO - element bit 2
01 – 1 IO - element bit 4
46 – IO - element bit 1, id=70
0000015d – 349 - value of io-element with id =70,
00 - 0 IO - element bit 8
01 – 1 record data

5. Data transfer to the server.

After initializing the connection, device is ready to transfer data to the server. AVL is transmitted packets, as described in paragraph 2. The server receives the packet, checks its integrity and sends a confirmation:

- ✓ 0 – if package has incorrect hash total or isn't analyzed,
- ✓ A number is bigger than 0, which equals to quantity of extracted records from received package

Verification is transmitted in 4-bytes format - from older to younger.

Example: If package like in p.2 was sent, tracker will wait: - 00000001

If unverification received (00000000) tracker makes 3 attempts to send the data, and then will delete them from memory as bad.

6. Indexes IO-elements in the array real enum options

Nº	Parameter	Transmission ID	Type parameter	Appointment	IO - byte
1	dILow1	1	0340/0341/0342/0343 /0344/0345	Digital input responsive to the log. 0	1
2	dILow2	2	0350/0351/0352/0353 /0354/0355	Digital input responsive to the log. 0	1
3	dILow3	3	0360/0361/0362/0363 /0364/0365	Digital input responsive to the log. 0	1
4	dILow4	4	0370/0371/0372/0373 /0374/0375	Digital input responsive to the log. 0	1
5	dIHigh1	5	0540/0541/0542/0543 /0544/0545	Digital input responsive to the log. 1	1

Nº	Parameter	Transmission ID	Type parameter	Appointment	IO - byte
6	dIHigh2 Ignition	6	0550/0551/0552/0553 /0554/0555	Digital input responsive Responsive to the log. 1	1
7	dIOpen	7	0560/0561/0562/0563 /0564/0565	Button opening	1
8	dIRST	8	0570/0571/0572/0573 /0574/0575	Reset button	1
9	GSMCSQ	21	0470/0471/0472/0473 /0474/0475	Level of GSM signal	1
10	Profile	22	0480/0481/0482/0483 /0484/0485	Profile number	1
11	Movement	240	0510/0511/0512/0513 /0514/0515	State of motion	1
12	AIN1	9	0300/0301/0302/0303 /0304/0305	Analog input 1	2
13	AIN2	10	0310/0311/0312/0313 /0314/0315	Analog input 2	2
14	VBAT	67	0420/0421/0422/0423 /0424/0425	Battery voltage	2
15	PSV	66	0410/0411/0412/0413 /0414/0415	Power supply voltage	2
16	GPSSpeed	24	0490/0491/0492/0493 /0494/0495	Speed on GPS	2
17	GPSPower	69	0450/0451/0452/0453 /0454/0455	Presence of a GPS-signal	2
18	pcbTemp	70	0440/0441/0442/0443 /0444/0445	Temperature of the device	4
19	Odometr	199	0500/0501/0502/0503 /0504/0505	Relative virtual odometer (km)	4
20	Odometr	200	0710/0711/0712/0713 /0714/0715	Absolute virtual odometer (km)	4
21	Fuel counter	76	0460/0461/0462/0463 /0464/0465	Difference between two pulses generated on the signal lines	4
22	FuelLevel 1	100	0580/0581/0582/0583 /0584/0585	Survey work filtered 1st fuel level sensor (1 network address)	2
23	FuelLevel 2	101	0590/0591/0592/0593 /0594/0595	Survey work filtered 2nd fuel level sensor (2 network address)	2
24	GND/1_wir e	78	0400/0401/0402/0403 /0404/0405	Electronic key identifier iButton	
25	Fuel Temp 1	102	0600/0601/0602/0603 /0604/0605	Fuel temperature from fuel level sensor 1	1
26	Fuel Temp 2	103	0610/0611/0612/0613 /0614/0615	Fuel temperature from fuel level sensor 2	1
28	Tsens 0	106	0630/0631/0632/0633 /0634/0635	Indications temperature sensor 0	2
29	Tsens 1	107	0640/0641/0642/0643 /0644/0645	Indications temperature sensor 1	2
30	Tsens 2	108	0650/0651/0652/0653	Indications temperature	2

Nº	Parameter	Transmission ID	Type parameter	Appointment	IO - byte
			/0654/0655	sensor 2	
31	Tsens 3	109	0660/0661/0662/0663 /0664/0665	Indications temperature sensor 3	2
32	Tsens 4	110	0670/0671/0672/0673 /0674/0675	Indications temperature sensor 4	2
33	Operator code	111	0680/0681/0682/0683 /0684/0685	Setting the display of the operator code	
34	FuelLeveler	112	0690/0691/0692/0693 /0694/0695	Unfiltered value of fuel level sensor 1	2
35	FuelLeveler	113	0700/0701/0702/0703 /0704/0705	Unfiltered value of fuel level sensor 2	2
36	Fuel Temp 5	127	0520/0521/0522/0523 /0524/0525	Fuel temperature from fuel level sensor 3	1
37	Fuel Temp 6	128	0530/0531/0532/0533 /0534/0535	Fuel temperature from fuel level sensor 4	1
38	FuelLevelfilt 5	129	0850/0851/0852/0853 /0854/0855	Survey work filtered 4th fuel level sensor (5 network address)	
39	FuelLevelfilt 6	130	0860/0861/0862/0863 /0864/0865	Survey work filtered 5th fuel level sensor (6 network address)	
40	FuelLevelunfilt 5	131	0870/0871/0872/0873 /0874/0875	Survey work is not filtered 4th fuel level sensor (5 network address)	
41	FuelLevelunfilt 6	132	0880/0881/0882/0883 /0884/0885	Survey work is not filtered 5th fuel level sensor (6 network address)	
42	Fuel Temp 7	133	0890/0891/0892/0893 /0894/0895	Temperature fuel sensor - taken only temperature. (7 network address)	1
43	MODULE trailer equipment	135	0390/0391/0392/0393 /0394/0395	Identify module of towed equipment (network address 4)	
44	Fuel counter 1	136	0180/0181/0182/0183 /0184/0185	Fuel pulse counter to the direct stream DAT_low3	4
45	Fuel counter 2	137	0190/0191/0192/0193 /0194/0195	Fuel pulse counter to return flow DAT_low4	4
46	dLow1	125	0830/0831/0832/0833 /0834/0835	To connect the engine speed sensor Frequency input 1	1
47	dLow2	126	0840/0841/0842/0843 /0844/0845	To connect the engine speed sensor Frequency input 2	1
48	modem status	117	0750/0751/0752/0753 /0754/0755	Transfer modem status 0 - modem does not work	

Nº	Parameter	Transmission ID	Type parameter	Appointment	IO - byte
				1 - enabled and works	
49	GSM network status	118	0760/0761/0762/0763 /0764/0765	Registration status in the GSM network 0 - not registered and does not search operators 1 - registered in home network 2 - not registered, but search operators 3 - registration is prohibited 4 - indefinite status 5 - registered roaming	
50	GPRS network status	119	0770/0771/0772/0773 /0774/0775	Registration status in the GPRS network 0 - not registered and does not search operators 1 - registered in home network 2 - not registered, but search operators 3 - registration is prohibited 4 - indefinite status 5 - registered roaming	
51	Status content GPRS	120	0780/0781/0782/0783 /0784/0785	Activation status of the GPRS content 0 - content GPRS is not activated 1 - content GPRS is activated	
52	SIM-card status	121	0790/0791/0792/0793 /0794/0795	SIM-card status 0 - SIM-card is not detected 1 - SIM-card is detected 2 - SIM card is detected, but not ready to work 3 - SIM-card is detected and completely ready to work	
53	configuration RS485 RFID	105	0620/0621/6522/0623 /0624/0625	Electronic key identifier RFID (network address 3)	8