

Version:

V1.0.0

GPS vehicle tracker communication protocol

Wetrack140

Revision History

Author	date	version	Check	Approve	description
Cheng Jun	2019-06-28	1.0.0			

Contents

1. Protocol packet format	4
2. Protocol specification.....	4
2.1 Login packet	4
2.2 Location/Alarm data packet.....	5
2.3 Device status information packet (heartbeat packets).....	12
2.4 Emergency alarm packet.....	13
2.5 Emergency alarm SMS format	15
Appendix Check algorithm.....	16

1. Protocol packet format

Device transmits to the server in ASCII string format data packets between each field with a comma "," separated begins with "\$", "*" end.

\$,HBT, MARK, V0.0.1,358688000000158,100.00%, 20%, 0.00%, 10,10,0000,00,0.1, *

2 Protocol specification

2.1 login packet

Field field	Description Description	Sample Data Data Example
Start Character	\$	\$
Packet Header	Baotou	LGN
Vendor ID	Manufacturer's Name	MARK
Vehicle Registration No.	Vehicle number on which the device is installed	DL1PC9821
IMEI	IMEI	123456789012345
Firmware Version	Version of the firmware used in the hardware.	V0.0.1
Protocol Version	Version of the frame format protocol.	AIS140
Latitude	The current setpoint value of the latitude	12.976545

Latitude Direction	N / S	N
Longitude	The current setpoint value longitude	77.549759
Longitude Direction	E / W	E

2.2 Positioning / alarm data packet

Field	Data Type	Valid Range	Sample Data	Description description
Start Character	String	\$	\$	\$
Header	String	constant string	NRM	The header of the packet / identifier
Vendor ID	String	constant string	MARK	Vendor identification header
Firmware Version	String	NA	V0.0.1	Version details of the firmware
Packet Type	String	NR / HP // TA / EA / IN / IF / BR / BD / BL / BH / CC / HA / HB / RT / OS / DT	NR	NR: Normal periodic packet HP: Health packet TA: Tamper alert EA: Emergency alert IN: Ignition On alert ACC ON IF: Ignition OFF alert ACC OFF BR: Mains reconnected alert BD: Mains disconnected alert BL: Low battery alert BH: Low battery charged alert

				CC: Configuration over the air alert HA: Harsh acceleration alert HB: Harsh braking alert RT: Harsh / Rash turning alert OS: Over Speed Alert OT: OTA EO: Emergency off GI-Enter fence alert GO-Exit fence alert
Alert ID	Uint8	1 to 16 0-255	01	Default message coming from each device
			02	Location Update (history) Would be sent, if GPRS is not available at the time of sending the message in protocol format Zero, BLANK, NIL, etc.
			03	Alert - Disconnect from main battery If device is disconnected from vehicle battery and running on its internal battery
			04	Alert - Low battery If device internal battery has fallen below a defined threshold
			05	Alert - Low battery removed

			06	Alert - Connect back to main battery Indicates that device is connected back to main battery
			07	Alert - Ignition ON Indicates that Vehicle's Ignition is switched ON
			08	Alert - Ignition OFF Indicates that Vehicle's Ignition is switched OFF
			09	Alert - GPS box opened (Optional) Optional message would be generated indicating GPS box opened
			10	Alert - Emergency state ON * When any of the emergency button is pressed
			11	Alert - emergency State OFF When emergency state of vehicle is removed
			12	Alert Over the air parameter change When any parameter is changed over the air. Shall include the name of parameter changed and source of command
			13	Harsh Braking Alert indicating for harsh braking.
			14	Harsh Acceleration Alert indicating for harsh acceleration.
			15	Rash Turning Alert indicating for Rash

				turning.
			16	Alert Indicating Emergency button wire disconnect / wire cut etc.
			17	Overspeed
			18	Geo-fence Entry
			19	Geo-fence Exit
			20	N/A
			21	N/A
			22	TILT
Packet Status	String	H / L	L	L = Live or H = History
IMEI	String	String of 15 characters	351,732,050,525,917	Identified of the sending unit. 15 digit standard unique IMEI no.
Vehicle Reg. No	String	String of 16 characters	AP09BU9365	Mapped vehicle registration number
GPS Fix	Uint8	0/1	1	1 = GPS fix OR 0 = GPS invalid
Date	Day: Uint8	Day: 1-31	15,122,017	Date value as per GPS date time per GPS

	Month: Uint8 Year: Uint16	Month: 1-12 Year: 2018-2999		date time (DDMMYYYY)
Time	Hour: Uint8 Minute: Uint8 Second: Uint8	Hour: 0-23 Minute: 0-59 Second: 0-59	131 304	Time value as per GPS date time in UTC format (hhmmss) Time, hhmmss format
Latitude	float	00.000000 - 90.000000	12.955446	Latitude value in decimal degrees
Latitude Dir	String	N / S	N	Latitude Direction. N = North, S = South
Longitud	float	00.000000 - 180.000000	077.637344	Longitude value in decimal degrees
Longitude Dir	String	E / W	E	Longitude Direction. E = East, W = West
Speed	Float	000.0 to 550.0	000.1	Speed of Vehicle as Calculated by GPS module in VLT. (In km / hrs.) Unit KM/ H
Heading	float	000.00 to 359.99	000.00	Course over ground in degrees
No of Satellites	Uint8	0-24	10	Number of satellites available for fix
Altitude	float	-1000.0 to 18000 meters -1000.0 To 18000Meter	00,913.2	Altitude of the device in meters
PDOP	float	000.0 to 099.9	001.6	Positional dilution of precision

HDOP	float	000.0 to 099.9	000.8	Horizontal dilution of precision
Operator Name	String	String of maximum 11 characters	VODAFONE IN	Name of the operator
Ignition	Uint8	0/1	1	1 = Ignition On, 0 = Ignition Off 1 = ACC ON 0= ACC OFF
Main Power Status	Bool	0/1	1	0 = Vehicle Battery disconnected 0 = disconnected from the mains 1 = Vehicle Battery reconnected 1= Reconnect main power
Main Input Voltage	float	7.0-40.0	11.9	Indicator showing source voltage in Volts.
Internal Battery Voltage	float Float	0.0-5.8	05.5	Indicator for level of battery charge remaining. Built-in battery voltage, in V
Emergency Status	Uint8	0/1	0	1 = On, 0 = Off
Tamper Alert Dismantle alarm (optional)	String character	O / C	C	C = Cover Closed O = Cover Open
GSM Signal Strength	Uint8	0-31	twenty one	Value Ranging from 0 - 31
MCC	String	000-FFF	404	Mobile Country Code
MNC	String	000-FFF	86	Mobile Network Code
LAC	String	0000-FFFF	797F	Location Area Code
Cell ID	String	0000-FFFF	4508	GSM Cell ID
NMR1 LAC	String	0000-FFFF	797F	Neighboring Location Area Code
NMR1 Cell Id	String	0000-FFFF	4509	Neighboring GSM Cell ID
NMR1 Signal	String	0-31	twenty two	Neighboring Signal strength

strength				
NMR2 LAC	String	0000-FFFF	C363	Neighboring Location Area Code
NMR2 Cell Id	String	0000-FFFF	1287	Neighboring GSM Cell ID
NMR2 Signal strength	String	0-31	11	Neighboring Signal strength
NMR3 LAC	String	0000-FFFF	797F	Neighboring Location Area Code
NMR3 Cell Id	String	0000-FFFF	4507	Neighboring GSM Cell ID
NMR3 Signal strength	String	0-31	10	Neighboring Signal strength
NMR4 LAC	String	0000-FFFF	797F	Neighboring Location Area Code
NMR4 Cell Id	String	0000-FFFF	4507	Neighboring GSM Cell ID
NMR4 Signal strength	String	0-31	05	Neighboring Signal strength
Digital Input Status	DIN1: bool DIN2: bool DIN3: bool DIN4: bool	DIN1: 0/1 DIN2: 0/1 DIN3: 0/1 DIN4: 0/1	0000	4 external digital input status (Status of Input 1 to Input 3 (0 = Off; 1 = On))
Digital Output Status	D01: bool D02: bool	D01: 0/1 D02: 0/1	00	2 external digital output status (0 = Off; 1 = On) Digital output state 0 = Off,1= On
Analog Input	Float	0-30.0 V	12.9V	External voltage input
Delta Distance	Int	0-4294967295 (0xFFFFFFFF)	1000000	Unit: m
Frame Number	Uint32	000001--999999	000 580	Sequence Number of the messages (000001

				to 999999)
OTA Response	String	Source :(instruction format, an instruction ID, status) For example (USB / SMS / SERVER1 / SERVER2, CFG_HBT, 0 = Fail 1 = Success)		(SERVER1, CFG_HBT, 1)
Checksum	String	00 - FF	ED	Insures No error in transmission
End character	String	*	*	*

Description:

1. For the other packet type is added, can be added on their own, but can not duplicate existing packet type.
- 2, For other alarm ID is added, can be added on their own, but can not duplicate existing alarm ID.

2.3 Device status information packet (heartbeat packets)

Field	Sample Data	Description
Start Character	\$	Start character
Packet Header	HBT	Baotou
Vendor ID	MARK	
Firmware Version	V1.0.0	Firmware version of the device currently being used
IMEI	351,732,050,525,917	Device IMEI number
Internal Battery Percentage	65	Built-in battery percentage

Low battery threshold Percentage	20	Low battery alarm threshold percentage
Memory percentage	Indicates flash memory used in percentage	0.33
Data update rate when ignition ON	10	ACC ON data upload interval (s)
Data update rate when ignition OFF ACC OFF	60	ACC OFF data upload interval (s)
Digital Input status	0001 (DIN1 = 0, DIN2 = 0, DIN3 = 0, DIN4 = 1)	Digital input status
Analog Input status	12.9	Analog input status (in V)
End Character	*	End character

2.4 Emergency alarm package

Field	Sample Data	Description
Start Character	\$	Start character
Packet Header	EPB	EPB, The unique identifier for all messages from VLT EPB, a fixed value
Vendor ID	MARK	
Message Type	EMR	Message Types supported. Emergency Message (EMR) or Stop Message (SEM) Emergency alarm pack EMR = SEM = packages released emergency alarm

IMEI	351,732,050,525,917	Identified of the sending unit. 15 digit standard unique IMEI no.
Packet Type	NM	NM - Normal Packet, real-time upload SP - Stored Packet, fill biography
Date&Time	18122017124850	Date value as per GPS date time per GPS time (DDMMYYYYhhmmss)
GPS Fix	A	A = GPS fix OR V = GPS invalid
Latitude	12.955451	Latitude value in decimal degrees
Latitude Direction	N	Latitude Direction. N = North, S = South
Longitude	077.637313	Longitude value in decimal degrees
Longitude Direction	E	Longitude Direction. E = East, W = West
Altitude	00,908.0	Altitude of the device in meters unit of M
Speed	000.0	Speed of Vehicle as Calculated by GPS module in VLT. (In km / hrs.) Unit KM / H
Distance	0000.0	Distance calculated from previous GPS data. Calculation of distance starts once SOS is pressed and cleared once SOS is cleared
Provider	G	G - Fine GPS N - Coarse GPS or data from the network N = G = GPS positioning base station location
Vehicle Reg. No	AP09BU9365	Mapped vehicle registration number
Reply Number	NA	The mobile number to which Test response needs to be sent
End Character Terminator	*	End character
Checksum	FFFFFF96	The 32 bit checksum of all the characters from the header up to the CRC field

2.5 Emergency alarm SMS format

Field	Sample Data	Description
Alert No	EMR	Message Types supported. Emergency Message (EMR) or Stop Message (SEM) Emergency alarm pack EMR = SEM = packages released emergency alarm
IMEI	351,732,050,525,91 7	Identified of the sending unit. 15 digit standard unique IMEI no.
Latitude	12.955451	Latitude value in decimal degrees
Latitude Direction	N	Latitude Direction. N = North, S = South
Longitude	077.637313	Longitude value in decimal degrees
Longitude Direction	E	Longitude Direction. E = East, W = West
GPS Fix	A	A = GPS fix OR V = GPS invalid
Speed	000.0	Speed of Vehicle as Calculated by GPS module in VLT. (In km / hrs.) Unit KM / H
MCC	404	Mobile Country Code
MNC	86	Mobile Network Code
LAC	797F	Location Area Code Cell 0 LAC
Cell ID	4508	GSM Cell ID Cell 0 Cell ID
DateTime	DD / MM / YYYY HH: MM: SS	

Appendix checksum algorithm

/* 32-bit checksum */

static const uint32 crc32tab [] = {

```

    0x00000000L, 0x77073096L, 0xee0e612cL, 0x990951baL,    0x076dc419L, 0x706af48fL, 0xe963a535L, 0x9e6495a3L,
    0x0edb8832L, 0x79dcb8a4L, 0xe0d5e91eL, 0x97d2d988L, 0x09b64c2bL, 0x7eb17cbdL, 0xe7b82d07L, 0x90bf1d91L,
    0x1db71064L, 0x6ab020f2L, 0xf3b97148L, 0x84be41deL, 0x1adad47dL, 0x6ddde4ebL, 0xf4d4b551L, 0x83d385c7L,
    0x136c9856L, 0x646ba8c0L, 0xfd62f97aL, 0x8a65c9ecL, 0x14015c4fL, 0x63066cd9L, 0xfa0f3d63L, 0x8d080df5L,
    0x3b6e20c8L, 0x4c69105eL, 0xd56041e4L, 0xa2677172L,    0x3c03e4d1L, 0x4b04d447L, 0xd20d85fdL, 0xa50ab56bL,
    0x35b5a8faL, 0x42b2986cL, 0xdbbbc9d6L, 0xacbcf940L,    0x32d86ce3L, 0x45df5c75L, 0xdcd60dcfL, 0xabd13d59L,
    0x26d930acL, 0x51de003aL, 0xc8d75180L, 0xbf06116L,    0x21b4f4b5L, 0x56b3c423L, 0xcfba9599L, 0xb8bda50fL,
    0x2802b89eL, 0x5f058808L, 0xc60cd9b2L, 0xb10be924L,  0x2f6f7c87L, 0x58684c11L, 0xc1611dabL, 0xb6662d3dL,
    0x76dc4190L, 0x01db7106L, 0x98d220bcL, 0xefd5102aL,  0x71b18589L, 0x06b6b51fL, 0x9fbfe4a5L, 0xe8b8d433L,
    0x7807c9a2L, 0x0f00f934L, 0x9609a88eL, 0xe10e9818L,  0x7f6a0dbbL, 0x086d3d2dL, 0x91646c97L, 0xe6635c01L,
    0x6b6b51f4L, 0x1c6c6162L, 0x856530d8L, 0xf262004eL,  0x6c0695edL, 0x1b01a57bL, 0x8208f4c1L, 0xf50fc457L,
    0x65b0d9c6L, 0x12b7e950L, 0x8bbbeb8eaL, 0xfcb9887cL,  0x62dd1ddfL, 0x15da2d49L, 0x8cd37cf3L, 0xfbd44c65L,
    0x4db26158L, 0x3ab551ceL, 0xa3bc0074L, 0xd4bb30e2L,    0x4adfa541L, 0x3dd895d7L, 0xa4d1c46dL, 0xd3d6f4fbL,
    0x4369e96aL, 0x346ed9fcL, 0xad678846L, 0xda60b8d0L,    0x44042d73L, 0x33031de5L, 0xaa0a4c5fL, 0xdd0d7cc9L,
    0x5005713cL, 0x270241aaL, 0xbe0b1010L, 0xc90c2086L,    0x5768b525L, 0x206f85b3L, 0xb966d409L, 0xce61e49fL,
    0x5edef90eL, 0x29d9c998L, 0xb0d09822L, 0xc7d7a8b4L,  0x59b33d17L, 0x2eb40d81L, 0xb7bd5c3bL, 0xc0ba6cadL,
    0xedb88320L, 0x9abfb3b6L, 0x03b6e20cL, 0x74b1d29aL,  0xead54739L, 0x9dd277afL, 0x04db2615L, 0x73dc1683L,
    0xe3630b12L, 0x94643b84L, 0x0d6d6a3eL, 0x7a6a5aa8L,  0xe40ecf0bL, 0x9309ff9dL, 0x0a00ae27L, 0x7d079eb1L,
    0xf00f9344L, 0x8708a3d2L, 0x1e01f268L, 0x6906c2feL,  0xf762575dL, 0x806567cbL, 0x196c3671L, 0x6e6b06e7L,
    0xfed41b76L, 0x89d32be0L, 0x10da7a5aL, 0x67dd4accL,  0xf9b9df6fL, 0x8ebeeff9L, 0x17b7be43L, 0x60b08ed5L,
    0xd6d6a3e8L, 0xa1d1937eL, 0x38d8c2c4L, 0x4fdff252L,  0xd1bb67f1L, 0xa6bc5767L, 0x3fb506ddL, 0x48b2364bL,
    0xd80d2bdaL, 0xaf0a1b4cL, 0x36034af6L, 0x41047a60L,  0xdf60efc3L, 0xa867df55L, 0x316e8eefL, 0x4669be79L,

```



```
0xcb61b38cL, 0xbc66831aL, 0x256fd2a0L, 0x5268e236L, 0xcc0c7795L, 0xbb0b4703L, 0x220216b9L, 0x5505262fL,
0xc5ba3bbeL, 0xb2bd0b28L, 0x2bb45a92L, 0x5cb36a04L, 0xc2d7ffa7L, 0xb5d0cf31L, 0x2cd99e8bL, 0x5bdeae1dL,
0x9b64c2b0L, 0xec63f226L, 0x756aa39cL, 0x026d930aL, 0x9c0906a9L, 0xeb0e363fL, 0x72076785L, 0x05005713L,
0x95bf4a82L, 0xe2b87a14L, 0x7bb12baeL, 0x0cb61b38L, 0x92d28e9bL, 0xe5d5be0dL, 0x7cdcefb7L, 0x0bdbdf21L,
0x86d3d2d4L, 0xf1d4e242L, 0x68ddb3f8L, 0x1fda836eL, 0x81be16cdL, 0xf6b9265bL, 0x6fb077e1L, 0x18b74777L,
0x88085ae6L, 0xff0f6a70L, 0x66063bcaL, 0x11010b5cL, 0x8f659effL, 0xf862ae69L, 0x616bffd3L, 0x166ccf45L,
0xa00ae278L, 0xd70dd2eeL, 0x4e048354L, 0x3903b3c2L, 0xa7672661L, 0xd06016f7L, 0x4969474dL, 0x3e6e77dbL,
0xaed16a4aL, 0xd9d65adcL, 0x40df0b66L, 0x37d83bf0L, 0xa9bcae53L, 0xdebb9ec5L, 0x47b2cf7fL, 0x30b5ffe9L,
0xbdbdf21cL, 0xcabac28aL, 0x53b39330L, 0x24b4a3a6L, 0xbad03605L, 0xcdd70693L, 0x54de5729L, 0x23d967bfL,
0xb3667a2eL, 0xc4614ab8L, 0x5d681b02L, 0x2a6f2b94L, 0xb40bbe37L, 0xc30c8ea1L, 0x5a05df1bL, 0x2d02ef8dL
```

```
};
```

```
uint32 GetCrc32 (const unsigned char * buf, uint32 size)
```

```
{
    uint32 i, crc;
    crc = 0xFFFFFFFF;
    for (i = 0; i <size; i++)
    {
        crc = crc32tab [(crc ^ buf [i]) & 0xff] ^ (crc >> 8);
    }
    return crc ^ 0xFFFFFFFF;
}
```