T23 Fleet GPRS Specification
v0.94

Contents

1. Getting started

This document covers information starting from Tramigo T23 Tracking Device FirmWare (FW) version 1.08. New parameters and additions of the later FW versions are marked with *(from vX.XX and later).*

2. General specifications

This document describes the protocol used by the standard applications of Tramigo T23 devices. The communication is performed by exchanging messages of predefined contents. Each message contains a common header part and message specific payload.

The protocol specification itself does not define strict limitations on the communication channel for the messages. The standard applications for the tracking platforms provide implementations for server communication over UDP/IP or TCP/IP.

2.1 Features

2.1.1 Checksum

CRC-16 checksum is used to verify that the packets are received without errors.

CRC algorithm used with the application protocol is the CCITT CRC-16 with the generator polynomial x16 + x12 + x5 + 1 and initial value of FFFFh.

See appendix A for examples on calculating the message checksum.

2.1.2 Timestamp

The message header and payloads of certain messages contain an absolute time reference called timestamp. All timestamps referred by this document have the same definition unless otherwise stated.

The timestamp used in the protocol is calculated as the number of seconds since 1.1.1970 00.00 UTC.

NOTE: Although the timestamp definition closely resembles the UNIX timestamp definition, they have one essential difference. UNIX timestamp is tied to UTC time, i.e., leap seconds are taken into account in UNIX time and therefore the UNIX time is not incremented for leap seconds. However, as the protocol timestamp is a raw number of seconds since a defined origin, the application protocol timestamp is ahead of the UNIX time by the number of UTC leap seconds (25 as of Aug 2012).

2.1.3 Message acknowledgement

As the protocol messages can be delivered over either a reliable or an unreliable connection, the protocol contains an acknowledgement to indicate that a message has been received.

If acknowledgements are used, the sender can store sent packets until the acknowledgement is received. If the acknowledgement is not received within a defined time window, the sender can resend the same packet.

As the packet loss can occur either in uplink or downlink direction, it is possible that the server received a message but the acknowledgement was not delivered back to the mobile unit. In this case the same message will be received by the server twice. This must not be interpreted by the server as an error, but the duplicate message can be discarded by the server, if applicable.

The main purpose of the acknowledgements is to compensate packet loss in an unreliable connection (e.g. UDP). Other types of transmission errors (checksum mismatch, duplicate packet, unrecognized message, etc.) can be indicated to the server as incorrectly received packets in the acknowledgement status code.

2.2 Implementation rules

2.2.1 Byte order

All multibyte fields in the protocol messages are composed using little endian byte order (least significant byte is transmitted first). Although this is in contradiction with the standard IP network byte order (big endian), the byte order selection has been made because of all currently used and planned embedded platforms for Tramigo software use little endian as their native byte order.

Note: Legacy messages (protocol version 80) IMEI field byte order is big endian.

2.2.2 Byte alignment

All multibyte fields in the messages must be aligned into a byte boundary corresponding the size of the particular field, i.e., 16-bit words into 16-bit offsets from the beginning of the message etc.

When constructing the messages, all unused areas must be written as zero.

2.2.3 Decimal values

The messages can only contain integer fields. Where non-integer values must be delivered, they must be represented with fixed point fields (scaled values as integers).

3. GPRS commands

GPRS and GPRS related useful commands.

3.1 Command descriptions

Commands are explained with following format.

Command:	command name, case insensitive
Parameters:	command options, marked as <param>. If *italicized* then optional
Description:	brief description of the command
Default value:	default values of the command
Example:	command usage and responses

3.1.1 GPRS,APN

Command:	gprs,apn,<apn>,<*apn user*>,<*apn password*>
Parameters:	apn – Access Point Name *apn user - username* *apn password - password*
Description:	Sets the APN details to be used for GPRS connection
Default value:	**-**
Example:	gprs,apn,internet,test,test123

3.1.2 GET,APN

Command:	get,apn
Parameters:	-
Description:	Used for getting the APN details used for GPRS
Default value:	-
Example:	get,apn

3.1.3 GPRS,CONNECT

Command:	gprs,connect,<server to connect to>,<port>,<tcp/udp>
Parameters:	server to connect to – server IP address port – port number, for M1 Fleet Enterprise the default value is 9556 tcp/udp – protocol type
Description:	Start the GPRS connection
Default value:	**-**
Example:	gprs,connect,123.45.67.890,9556,tcp

3.1.4 GET,GPRSSERVER

Command:	get,gprsserver
Parameters:	-
Description:	GPRS connection parameters
Default value:	-
Example:	get,gprsserver

3.1.5 GPRS,MSGFORMAT

Command:	gprs,msgformat ,<message structure>,<report trip time interval in seconds >,<report distance interval in km>,<report non-trip time interval in seconds>,<report angle interval in degrees>
Parameters:	message structure - trip time interval in seconds - report distance interval in km –

report non-trip time interval in seconds –
report angle interval in degrees -

Description: Used for choosing the message structure to be used; report time interval and report distance interval are used when message structure value is non-0

Default value: message structure - 0
report trip time interval in seconds - 60
report distance interval in km - 0
report non-trip time interval in seconds – 60
report angle interval in degrees – 0

Example: gprs,msgformat,0,30,1,30,40

3.1.6 GET,GPRSMSGFORMAT

Command: get,gprsmsgformat
Parameters: -
Description: Used for getting the GPRS message structure
Default value: -
Example: get,gprsmsgformat

3.1.7 GPRS,RESET

Command: gprs,reset,<value in hours>
Parameters: value in hours – reset cycle time
Description: Reset the GPRS connection of the device to the server
Default value: -
Example: gprs,reset

3.1.8 GPRS,CLEARFLASH

Command: gprs,clearFlash
Parameters: -
Description: This command clears the GPRS reports saved on the flash and on the buffer
Default value: -
Example: gprs,clearFlash

3.1.9 RESETSETTINGS

Command: resetsettings
Parameters: -
Description: This command will reset all device configurations into its default values
Default value: -
Example: resetsettings

3.1.10 BOOT

Command: boot,<off/value in hours>
Parameters: off – boot disabled
value in hours – boot cycle time
Description: Command for rebooting the device. Periodic reboot recommended in certain network conditions.
Default value: 24
Example: boot - boots the device immediately
boot,48 - reboots the device every 48 hours
boot,off - disables the cyclic reboot

4. GPRS parameters

SET and GET parameters values. Parameters value range or unit are shown Inside the <> brackets. Parameters are case insensitive.

Example:

Command	Response
set,showtime,2	Set, parameter showtime, value 2, 04:20:20 Jun 11
get,showtime	Get, parameter showtime, value 2, 04:23:03 Jun 11
set,gsmresettimeout,10	Set, parameter gsmresettimeout, value 10, 04:30 Jun 11
get,gsmresettimeout	Get, parameter gsmresettimeout, value 10, 04:31 Jun 11

Table 1. Get and Set command examples

Parameters and Descriptions

Name	Default	Range or Unit	Description
ShowTime,<0,1,2>	1	0 - no timestamp 1 - hours and minutes 2 – hours, minutes and seconds	Show timestamp at the end of the reports
ShowCellId,<0,1>	0	0 - disable 1 - enable	Used to show the cell id on status report
AllowRoamingSms,<0,1>	0	0 - disable 1 - enable	Allows SMS sending when in roaming (not yet activated)
AllowRoamingGprs,<0,1>	0	0 - disable 1 - enable	Allows GPRS connection when in roaming (not yet activated)
RoamingSmsWarning	?	?	(Not yet activated)
RoamingSmsLimit	?	?	(Not yet activated)
GprsWarning	?	?	(Not yet activated)
GprsLimit	?	?	(Not yet activated)
RoamingGprsWarning	?	?	(Not yet activated)
RoamingGprsLimit	?	?	(Not yet activated)
GprsMsgResponse,<0/1/2>	1	0 - No acknowledgement response to reports 1 - Acknowledgement response to important reports needed 2 - Acknowledgement response to all reports needed	Used to set a flag for requiring responses to the messages sent by the device to the server NOTE: All reports are important *excluding* periodic Status and Find reports. E.g. event triggered, alarm reports and trip reports.
GprsPingResponse,<0/1/2>	1	0 - no response to ping 1 - response needed, sent every PingFrequency timeout 2 - ping is sent only when there is a report to send and the PingFrequency timeout has already lapsed	Used to set a flag for requiring response to the PING message sent by the device to the server
TripShowLandmark,<0/1>	1	0 - disable 1 - enable	Used for setting a flag to disable/enable the land mark details on the trip report
GprsMaximumReconnectTime,<value in minutes>	15	value in minutes – maximum reconnect delay	Sets the maximum delay for the device before it reconnects to GPRS when it gets disconnected due to error
GprsMessageResendRetry,<number of retries>	3	number of retries – number of message sending retries	Number of sending retries for messages sent via GPRS
GprsErrorRetry,<number of retries>	5	number of retries – Number of sending retries	Number of sending retries for AT commands during connection process
GprsDataModeTimeout,<value in seconds>	10	value in seconds –	Maximum delay time for the GPRS to stay on

Name	Default	Range or Unit	Description
		switching timeout	DATA Mode state before switching back to AT mode
SmsSendTimeout,<value in minutes>	5	value in minutes – timeout value	Timeout for sending SMS
CallTimeout,<value in minutes>	5	value in minutes – timeout value	Timeout when device is calling a user
GprsDebug,<0/1>	0	0 - disabled 1 - enabled	Disable/enable GPRS message display on Tramigo Manager
GsmResetTimeout,<number of minutes>	10	number of minutes - timeoout	Time to reset the GSM task if there is no response from the modem
GsmBusyTimeout,<number of seconds>	30	number of seconds - timeout	Detection timeout for GSM modem response
GprsMinResetTimeout,<number of seconds>	30	number of seconds - timeout	Minimum delay before the device reset its connection when an error occurs
ShowReportQueue,<0/1>	0	0 - disabled 1 - enabled	Disable or enable the report queue on status report
GprsMsgResponseTimeout,<number of seconds>	30	number of seconds - timeout	Timeout to message send via GPRS
TripBootWaitTimeout,<number of minutes>	2	number of minutes - timeout	Timeout after reboot and the device state before reboot was trip process or trip end
RebootTimeout,<number of hours>	6	number of hours - timeout	Timeout when the device is on trip process and it needed to do a cyclic reboot
GprsSleepReconnectRetry,<number of retries>	3	number of retries -	Used when going to sleep and the GPRS server is down
GprsCyclicReportTimeout,<number of seconds>	60	number of seconds - timeout	Timeout for the next sending of find/status report
GprsSmsCheckTimeout,<number of minutes>	5	number of minutes - timeout	Timeout for the next checking of SMS (used only when GPRSCYCLICREPORTTIMEOUT is less than 60 seconds, meaning no automatic switching to AT-mode)
GprsSocketCheckTimeout,<number ofminutes>	10	number of minutes - timeout	Timeout for the next socket checking process
GprsAtResponseTimeout,<number of seconds	30	number of seconds - timeout	Timeout for no response to send AT-commands
GprsNoConnectTimeout,<number of minutes>	60	number of minutes - timeout	Timeout when the device cannot establish a connection to the server
PingFrequency,<number of minutes>	10	number of minutes - timeout	Timeout for the next sending of ping message via GPRS
GprsMinReconnectDelay,<number of seconds>	30	number of seconds - delay	Sets the minimum delay for the device before it reconnects to GPRS when it gets disconnected due to error
GprsMaxReconnectDelay,<value in minutes>	15	number of minutes - delay	Sets the maximum delay for the device before it reconnects to GPRS when it gets disconnected due to error
GpsWakeupProhibitionTimeout,<value in minutes>	180	value in minutes - delay	Delay before the GPS wakeup can be done, the GPS wake up is done only when IG is detected and there is no GPS fix

Table 2. GPRS parameters

5. T23 GPRS protocol formats

Greyed text: Field not implemented.

5.1 Message structure

Each protocol message contains the message header and a message specific payload definition located directly after the message header.

A general structure of a protocol message is illustrated below.

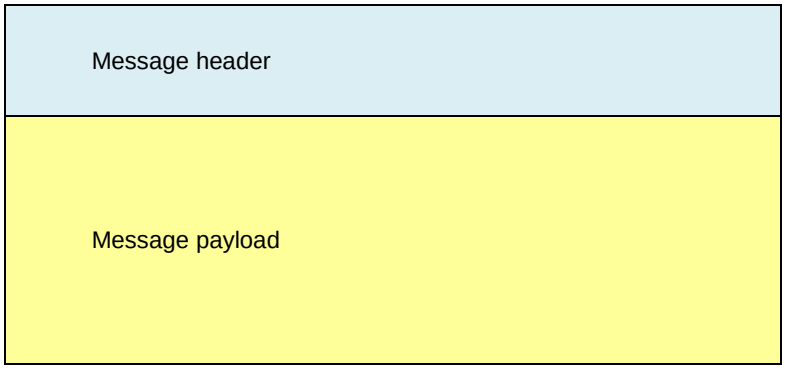

Table 3. Message structure

5.2 Compact (protocol 01, message type 256)

5.2.1 Message header

Each protocol message must contain a 20-byte message header, which contains common fields for all messages. The message header is used for identifying the source of the message, verifying its integrity and indicating the type of the message payload.

The contents of the message header are illustrated below. Byte offsets refer to the beginning of the message header.

Byte Offset	Field	Description
00h	Protocol version (1 byte)	GPRS protocol version. This identifies how the whole message should be decrypted. The current version is 0x01
01h	Version ID (1 byte)	Current version is 0x00
02h	Sequence number (2 bytes)	A two byte counter for the sequence of the messages sent out. The counter is incremented by 1 every time a message will be sent out. The sequence number order will differ from the timestamp order from time to time when the message being sent comes from the stored messages in the flash
04h	Message ID (2 bytes)	The ID of the message to be sent. The current value is 0x0100
06h	Packet length (2 bytes)	Total length in bytes of the GPRS message, header length + SMS message length + terminator length
08h	Status bits (2 bytes)	No defined values as of now. Currently being used as the report format. The value could be ASCII, 0x01, or UNICODE, 0x02
0Ah	Payload checksum (2 bytes)	Checksum of the message payload (the whole SMS message)
0Ch	Sender ID (4 bytes)	The unique ID of the sending device. It is the last 8 characters of the IMEI of the device
10h	Message timestamp (4 bytes)	The timestamp when the message was created. It is the running number of seconds that started from January 1, 1970

Table 4. Message header

5.2.2 Payload

Snapshot report without TLD text fields. This message is used when the TLD reference location has not changed since the previous report containing full TLD information, and the device has been configured to reduce the amount of transmitted data by sending the reference ID only.

Payload size is 64 bytes.

Offset	Field	Description
00h	Report trigger (2 bytes)	Reason for creating the particular message. Values are defined in Reference 1
02h	State flags (2 bytes)	Placeholder for state flags. No flags defined yet, must be written as zeros.
04h	Latitude (4 bytes)	Current latitude, signed integer Units: 0.0000001 degrees
08h	Longitude (4 bytes)	Current longitude, signed integer Units: 0.0000001 degrees
0Ch	GSM signal quality (2 bytes)	GSM signal quality, unsigned integer Units: -dBm
0Eh	Satellites in fix (2 bytes)	Number of satellites used for calculating the position fix
10h	Satellites in track (2 bytes)	Number of satellites currently tracked by the GPS receiver
12h	GPS antenna state (2 bytes)	State of the GPS antenna. 0 = LNA off 1 = Short circuit 2 = Internal 3 = External
14h	Speed (2 bytes)	Current speed, unsigned integer Units: 0.1 m/s
16h	Direction (2 bytes)	Current direction, unsigned integer. Units: degrees (0=north, 90=east, 180=south, 270=west)
18h	Distance (4 bytes)	Current odometer distance, unsigned integer Units: m
1Ch	Battery voltage (2 bytes)	Voltage of the internal battery. Units: mV
1Eh	Battery charger status (2 bytes)	Status of the internal battery charger. 0 = Power disconnected 1 = Charging 2 = Battery full 3 = Charging error
20h	Fix timestamp (4 bytes)	Timestamp of the instant when the previous valid fix was calculated.
24h	Status flags (2 bytes)	Bit flags for the unit status. Flag positions are defined in Table 6. Status flag bit *positions*
26h	GSM MCC (2 bytes)	Mobile Country Code of the current GSM operator
28h	GSM MNC (2 bytes)	Mobile Network Code of the current GSM operator
2Ah	GSM LAC (2 bytes)	Location Area Code of the current serving GSM cell
2Ch	GSM CID (2 bytes)	Cell ID of the current serving GSM cell
2Eh	GSM network status (2 bytes)	Status of the GSM network registration 0 = No Network 1 = Home network 2 = Searching 3 = Registration denied 5 = Roaming network
30h	GSM module temperature (2 bytes)	Temperature of the GSM module, signed integer Units: degrees C

32h	Maximum speed (2 bytes)	Maximum speed since the previous report Units: km/h
34h	Minimum speed (2 bytes)	Minimum speed since the previous report Units: km/h
36h	GPS signal quality (1 byte)	GPS signal quality 0-100 Units: percentage
37h	GSM signal quality (1 byte)	GSM signal quality 0-100 Units: percentage
38h	TLD reference location ID (2 bytes)	IF of the closest TLD location used as reference to previously indicated full TLD information Zero if TLD location is not available
3Ah	Bearing to reference (2 bytes)	Bearing from the current location to the reference TLD location Units: degrees, 0=north, 90=east, etc.
3Ch	Distance to reference (4 bytes)	Distance from the current location to the reference TLD location Units: meters

Table 5. Message payload

0	Trip in progress
1	Accelerometer motion active
2	Shock sensor motion active
13	Accelerometer communication error
14	Temperature warning
15	Battery low

Table 6. Status flag bit positions

5.2.3 Acknowledgement

[MESSAGE HEADER] with Message ID = 255 + PAYLOAD:

Byte Offset	Field	Description
00h	Message Reference	Sequence number of the message being acknowledged.
02h	Ack code	Acknowledgement code. 0 = OK 1 = Duplicate message 200 = Checksum mismatch 201 = Unrecognized message

5.3 TLD full report (protocol 01, message type 257)

5.3.1 Message header

Each protocol message must contain a 20-byte message header, which contains common fields for all messages. The message header is used for identifying the source of the message, verifying its integrity and indicating the type of the message payload.

The contents of the message header are illustrated below. Byte offsets refer to the beginning of the message header.

Byte Offset	Field	Description
00h	Protocol version (1 byte)	GPRS protocol version. This identifies how the whole message should be decrypted. The current version is 0x01
01h	Version ID (1 byte)	Current version is 0x00
02h	Sequence number (2 bytes)	A two byte counter for the sequence of the messages sent out. The counter is incremented by 1 every time a message will be sent out. The sequence number order will differ from the timestamp order from time to time when the message being sent comes from the stored

		messages in the flash
04h	Message ID (2 bytes)	The ID of the message to be sent. The current value is 0x00FE
06h	Packet length (2 bytes)	Total length in bytes of the GPRS message, header length + SMS message length + terminator length
08h	Status bits (2 bytes)	No defined values as of now. Currently being used as the report format. The value could be ASCII, 0x01, or UNICODE, 0x02
0Ah	Payload checksum (2 bytes)	Checksum of the message payload (the whole SMS message)
0Ch	Sender ID (4 bytes)	The unique ID of the sending device. It is the last 8 characters of the IMEI of the device
10h	Message timestamp (4 bytes)	The timestamp when the message was created. It is the running number of seconds that started from January 1, 1970

Table 7. Message header

5.3.2 Payload

Snapshot report with TLD text fields as 8-bit data. This message is used when the TLD reference location has changed since the previous report and new reference location needs to be indicated with all TLD fields present. The device may use this message if the TLD text information in the location database is in ASCII or if all characters in the TLD location are using the same UCS2 MSB.

All text fields are represented as 2-byte UCS2 codes, using a common most significant bit. For ASCII encoded text the UCS2 MSB field is set to zero.

The beginning of the payload is identical to *Compact (protocol 01, message type 256).* The additional fields are defined below.

Payload size is 162 bytes.

Offset	Field	Description
00h	Compact (64 bytes)	Protocol 01, message type 256
40h	Name1 length (1 byte)	Length of Name1 string
41h	Name2 length (1 byte)	Length of Name2 string
42h	Name3 length (1 byte)	Length of Name3 string
43h	Class (1 byte)	TLD location class: Uses the same UCS2 MSB as the name fields
44h	UCS2 MSB (1 byte)	Most significant bit of the UCS2 encoded characters Zero for ASCII encoding
45h	Reserved (1 byte)	Reserved for future use
46h	Country code (2 bytes)	TLD location country code, uses the same UCS2 MSB as the name fields
48h	Name1 (40 bytes)	Name1 string. Not necessarily NULL-terminated. Actual length is given in the Name1 length field. Unused bytes must be written as zeros
70h	Name2 (30 bytes)	Name2 string. Not necessarily NULL-terminated. Actual length is given in the Name2 length field. Unused bytes must be written as zeros
8Eh	Name3 (20 bytes)	Name3 string. Not necessarily NULL-terminated. Actual length is given in the Name3 length field. Unused bytes must be written as zeros

Table 8. Message payload

5.4 Real-time (protocol version 81)

To be implemented.

5.5 Wialon (protocol version 82)

To be implemented.

5.6 Custom (protocol version 100-110)

To be implemented.

5.7 Legacy GPRS (protocol version 80)

Payload parsing compatible with T22 and T23 SMS.

5.7.1 Message header

Each protocol message must contain a 20-byte message header, which contains common fields for all messages. The message header is used for identifying the source of the message, verifying its integrity and indicating the type of the message payload.

The contents of the message header are illustrated below. Byte offsets refer to the beginning of the message header.

Byte Offset	Field	Description
00h	Protocol version (1 byte)	GPRS protocol version. This identifies how the whole message should be decrypted. The current version is 0x80
01h	Version ID (1 byte)	Current version is 0x00
02h	Sequence number (2 bytes)	A two byte counter for the sequence of the messages sent out. The counter is incremented by 1 every time a message will be sent out. The sequence number order will differ from the timestamp order from time to time when the message being sent comes from the stored messages in the flash
04h	Message ID (2 bytes)	The ID of the message to be sent. The current value is 0x00FE
06h	Packet length (2 bytes)	Total length in bytes of the GPRS message, header length + SMS message length + terminator length
08h	Status bits (2 bytes)	No defined values as of now. Currently being used as the report format. The value could be ASCII, 0x01, or UNICODE, 0x02
0Ah	Payload checksum (2 bytes)	Checksum of the message payload (the whole SMS message)
0Ch	Sender ID (4 bytes)	The unique ID of the sending device. It is the last 8 characters of the IMEI of the device **Note:** IMEI field byte order is *big endian*.
10h	Message timestamp (4 bytes)	The timestamp when the message was created. It is the running number of seconds that started from January 1, 1970

Table 9. Message header

5.7.2 Payload example

The body of the GPRS message.

Tramigo: Parked, 0.12 km E of McDonald's H.V. dela Costa, Makati, 11:07 Mar 27

5.7.3 Message Terminator

This is used to terminate the GPRS message sent. It contains 4 bytes. The current terminator is " EOF". It is made up of the character SPACE followed by the characters E, O and F.

5.7.4 Acknowledgement

Send ASCII bytes with format

IF ACKNOWLEDGED:

gprs,ack,[SEQUENCE NUMBER]
[SEQUENCE NUMBER] = actual sequence number from LEGACY HEADER

IF **NOT** ACKNOWLEDGED:

gprs,nack,[SEQUENCE NUMBER]
[SEQUENCE NUMBER] = actual sequence number from LEGACY HEADER

Note: If unit receives gprs,nack,[SEQUENCE NUMBER], unit will resend report of the same sequence number until server acknowledges. Unit will delete not acknowledge reports after configurable number of retries.

6. GPRS T23 OTA update

Tramigo GPRS Over The Air (OTA) firmware (FW) update process for T23 Series.

Note: Tramigo GPRS OTA follows the Y-MODEM protocol.

This is implemented in Tramigo M1 Fleet Enterprise.

No.	Step	GPRS Server Message	Message from the device
1	GPRS server initiates the firmware upgrade	**gprs,fw,update**	
2	Device acknowledges the request and send a reply		message header + fw,update + _EOF ** the underscore means space
3	GPRS server starts sending the FW name and size of the file	header --> byte0 -> 0x00; byte1 --> sequence number --> 0x00; byte2 --> complement of byte1 body --> firmware name and size trailer --> CRC of the message body	
4	If correct, the device sends an acknowledge byte and a CRC16 byte		0x06 0x43
	If the file size is bigger than the flash area or the flash area is not ready, the device sends 2 abort bytes		0x18 0x18
	If the file name is empty, the device sends an acknowledge byte and stops the OTA		0x06
5	After the device has successfully received the filename and file size, the server starts sending the firmware in binary format	header --> byte0 -> 0x00; byte1 --> sequence number --> 0x01; byte2 --> complement of byte1 sequence number starts from 1 as the first firmware packet followed by 2 and so on body --> firmware content size is 1Kb trailer --> CRC of the message body	
6	If the packet received is wrong, the device sends a CRC16 byte and the server should resend the current packet		0x43
7	If after some retries and the device cannot receive the correct packet or if the GPRS connection is lost, the device sends a message informing the server to restart the OTA starting from the packet number sent by the device		message header + fw,update,<packet number> + _EOF ** the underscore means space
8	once all the packets has been received, the device starts reflashing itself and after a successful reflash the device sends a successful reflash message		message header +fw,update,successful,<message> + _EOF ** the underscore means space

Table 10. OTA process

7. Pocket GPRS Message Formats

7.1 Error (ID 2)

Description: Error indication. This message is used to deliver error indications.

Payload size: 12 bytes

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Error code (2 bytes)
02h	Padding (2 bytes)
04h	Extra 1 (4 bytes)
08h	Extra 2 (4 bytes)

Offset	Field	Description
00h	Error Code	Identifier of the type of the error. Values are defined in Table 11
04h	Extra 1	An error specific extra code, defined in a separate document.
08h	Extra 2	An error specific extra code, defined in a separate document.

Code	Description
1	File download
2	File upload
3	Unknown file transfer
4	OTA update
5	Firmware Download
6	Geofence database download
7	Geofence activate file download
8	Eventlog upload
9	Fatal Error

Table 11. Error message codes

7.2 Indication (ID 4)

Description: Generic indication message. Similar to the ERROR message but is used for communicating events that are not actual errors.

Payload size: 12 bytes

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Indication code (2 bytes)
02h	Padding (2 bytes)
04h	Extra 1 (4 bytes)
08h	Extra 2 (4 bytes)

Offset	Field	Description
00h	Indication Code	Identifier of the type of the error. Values are defined in Table 12
04h	Extra 1	An error specific extra code, defined in a separate document.
08h	Extra 2	An error specific extra code, defined in a separate document.

Code	Description
1	Safe mode enter
2	Safe mode exit

3	Temperature warning
4	Temperature alarm
5	Firmware Download
6	Geofence database download
7	Geofence activation file download
8	Eventlog upload
9	File downloaded
10	File Uploaded
11	Unknown file Transfer
12	Reboot

Table 12. Indication message codes

7.3 Conn_Open (ID 5)

Description: Server handshake message. Indicates that a communication channel between the unit and the server has been opened.

Payload size: 12 bytes

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Reason (2 bytes)

Offset	Field	Description
00h	Reason	Reason for opening the connection. Values are defined in Table 13

Code	Description
0	Reason information not available
10	Timer wakeup
11	Power supply wakeup
12	I/O wakeup
13	Shock sensor wakeup
14	Accelerometer wakeup
30	GPRS error recovery
31	Critical system error
32	Internal reboot
40	External reset

Table 13. Connection open reason codes

7.4 Conn_Close (ID 6)

Description: Indicates that the communication channel between the unit and the server has been closed.

Payload size: 2 bytes

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Reason (2 bytes)
02h	Sleep time (2 bytes))

Offset	Field	Description
00h	Reason	Reason for closing the connection. Values are defined in Table 14
02h	Sleep time	Estimated sleep time, if asynchronous wakeup trigger do not occur during the sleep period. Zero if the information is not available.

		Note that the unit may not necessarily reopen the server connection after wakeup, so the sleep time information does not mean the maximum time before the next message from the unit. Units: minutes

Code	Description
1	Server address removed
2	Entering sleep
3	Temperature shutdown
4	Undervoltage shutdown
99	Unknown

Table 14. Connection close reason codes

7.5 System_Report (ID 7)

Description: Contains system level information of the unit. This message is currently used for delivering the version number only.

Payload size: 6 bytes

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Version major (2 bytes)
02h	Version minor (2 bytes)
04h	Version build (2 bytes)

Offset	Field	Description
00h	Version major	Major number of the software version.
02h	Version minor	Minor number of the software version.
04h	Version build	Build number of the software version.

7.6 Console_Data (ID 14)

Description: Message for delivering maintenance console data with the protocol messages.

Payload size: Variable

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Data length (2 bytes)	
02h	Set identifier (2 bytes)	
04h	Flags (1 byte)	Encoding (1 byte)
06h	Reserved (2 bytes)	
08h	Data	

Offset	Field	Description
00h	Data length	Length of the Data field in bytes
02h	Set identifier	Identifier of a data set. In response messages the set identifier is the same as in the original message. Can be used for combining long strings delivered in multiple messages.
04h	Flags	Status flags, see description below.
05h	Encoding	Identifier of the character encoding in the Data field.

		1 = 8-bit ASCII 2 = UTF-8 3 = UCS2 little endian 4 = UCS2 big endian
08h	Data	Actual console data payload. No termination characters, length is defined by the Data length field

7	6	5	4	3	2	1	0
RESP							

Offset	Field	Description
7	RESP	Response bit. This bit is set if the message contains a response to a received message.

7.7 Acknowledgement (ID 255)

Description: Acknowledgement of a received message.

Payload size: 4 bytes

Support: This element defines support for the corresponding message in Generation 1 (TG2) and Generation (TG2) products.

00h	Message reference (2 bytes)
02h	Ack code (2 bytes)

Offset	Field	Description
00h	Message reference	Sequence number of the message being acknowledged.
02h	Ack code	Acknowledgement code. 0 = OK 1 = Duplicate message 200 = Checksum mismatch 201 = Unrecognized message

Reference 1

Code	Description
1	User interface event
3	Travelled distance
4	Timer
5	Shock sensor
6	GSM temperature alert
7	GSM operator changed
8	GSM cell ID changed
9	Battery low
10	Charger status changed
11	GPS antenna status changed
15	Battery power
16	External power
17	Battery ok
18	Heading changed
19	Accelerometer motion start
20	Accelerometer motion end
21	GPS based trip start
22	GPS based trip end
23	Shock sensor motion start
24	Shock sensor motion end
25	Pinning active
26	Pinning inactive
27	GSM registration status changed
28	User interface action
29	Ignition off
30	Ignition on
31	Crash detected
33	GPS fix lost
34	GPS fix acquired
35	GPS first fix