FALCOM
WIRELESS COMMUNICATIONS GMBH

Falcom STEPP II

Software version 1.6.6

and greater versions

Description

Version 1.02

Index of contents

Version history:

Version number	Author	Changes
1.00	Fadil Beqiri	Initial version
1.01	Fadil Beqiri	- On chapter 4 an important note added. - Manual layout improved, and all SMS commands and NMEA messages updated.
1.02	Fadil Beqiri	- New manual layout. - The description of PIN parameter added. - Due to the new released firmware version 1.6.6 the following chapters are added/updated; chapter 1.3 added, chapters 4.3.12 and 4.5.9 updated. - Up to 180.000 recordr instead of 100.000 can be stored into the History. - Chapter 6.4 added (default settings of firmware 1.6.6) - Chapter 6.5 added.

0 OVERVIEW OF DOCUMENT

Falcom STEPP II is a Plug & Play GSM/GPS device, which contains a software application that can be configured. The concept of the device is based on a simple implementation for a wide range of applications with low costs and high flexibility. In particular it offers a speedy development of systems solutions within the fields of:

- Fleet management with GPS-location
- Vehicle security

At the core of the above-mentioned system solutions is a classical set-up with client-server architecture. In this scenario, Falcom STEPP II represents the so-called mobile client (see image 1).

The integration of Falcom STEPP II requires a clear definition:

- The characteristics of the integrated software solution of Falcom STEPP II as a client of the user solution, and the possibilities for configuration.
- The instruction command for communicating with the client as the main part of the server application.
- The hardware interfaces and the respective, necessary installation guidelines. This part ensures the physical integration of the device to the target surroundings.

This document seeks to describe the Falcom STEPP II firmware and its possibilities for configuration.

Furthermore, in this document you will find a detailed description of the instruction command, providing a foundation for the set-up of own server applications for communicating with the mobile client (Falcom STEPP II).

The hardware interfaces and the respective installation guidelines are described in a separate document ("stepp_II_hardware_manual.pdf").

This software description reflects **Falcom STEPP II's firmware version 1.6.2 and greater versions**. By using a **Falcom SWING** it was developed as a communication device (**GSM Modem**). However, it can be used with other **software compatible** GSM modems such as **Falcom A2D-1, SAMBA, TWIST and Falcom TANGO.**

In chapter 1 "**STEPP II STARTERKIT**" you'll find a reference of the supplied hardware – components which will support you during the evaluation and configuration of Falcom STEPP II.

The STARTERKIT contains all hardware and software components required for an initial start-up and configuration of Falcom STEPP II.

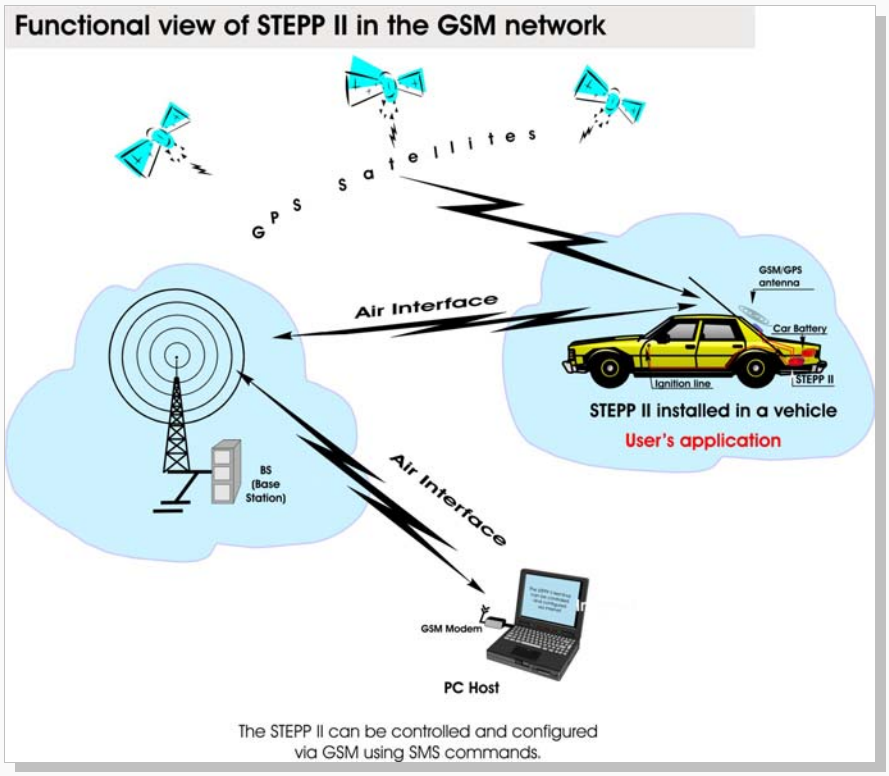


Image 1: Simplified presentation of the AVL client-server architecture. (Falcom offers a wide variety of GSM modems for enabling communication on the server side).

GSM modem used on the server side, Falcom recommends:

- ✓ Falcom SWING-SET
- ✓ Falcom TANGO
- ✓ SAMBA
- ✓ Falcom TWIST
- ✓ Or other software compatible devices

For more technical details on Falcom products, go to www.falcom.de.

0.1 Related documents

1. SiRF binary and NMEA protocol specification; www.falcom.de/Service/Manuals/SiRF
2. stepp_II_getting_started.pdf
3. "SteppConfig" Configuration software
4. stepp_II_hardware_manual.pdf

1 OVERVIEW & FEATURES OF THE SOFTWARE

This section tries to explain in general the Falcom STEPP II software (known as firmware) and its possibilities for configuration.

1.1 Features of the Software

The internal firmware of STEPP II terminal is a fundamental component which in combination with the excellent hardware performance makes the STEPP II to be on the top of applications where the fleet management is required. It is an application designed to be deployed in the field of fleet management. With Falcom STEPP II terminal running this application mounted in a fleet of vehicles, a remote administration center is enabled to optimize that fleet's operations. Of course, it is also plausible to use the application to monitor stationary devices (such as gas tanks, industrial machines, etc.).

This application provides the following features:

- positioning via GPS
- log data to flash memory
- download history data via locally or over-air.
- remote communications over GSM, more specifically:
  - ✓ SMS message generation and retrieval
  - ✓ data calls (incoming and outgoing)
  - ✓ handling of incoming calls of any type
- monitoring of triggers:
  - ✓ general-purpose I/Os (GPIO's)
  - ✓ ignition lines
- activation of general-purpose outputs in a number of ways:
  - ✓ separately activation/deactivation
  - ✓ impulse
  - ✓ periodic
- command line interface via locally or (remote) GSM data call, allowing for:
  - ✓ configuration
  - ✓ position, trigger, auxiliary queries
  - ✓ message generation
  - ✓ SIM card access
- remote configurability and queries via SMS or GSM data calls
- configurable triggered and explicitly requested transmission of:
  - ✓ positional data
  - ✓ trigger status
  - ✓ auxiliary information
  - ✓ periodic transmission
- password protection to limit access (both local and remote)
- Geo-fencing management, applied to a wide variety of events:
  - ✓ entered/exited/both, in/from marked zones
  - ✓ territory management (up to 99 different zones management)
  - ✓ route verification

- ✓ arrival/departure notification
- ✓ prohibited locations
- ✓ illegal entries
- ✓ unauthorized movement, and more

All aforementioned feature events can be controlled and GPS position can be received by means of any GSM phone. You can easily make configuration and feature changes either locally or over-air. All features can be configured and their state can be changed using configuration tool (named "SteppConfig"). A brief description is attached on the next section.

Current position of terminal (i.e. tracks, boats and cars) can be polled remotely over GSM DATA call.

1.2 Configuration software

For evaluation purposes FALCOM GmbH provides a configuration software which operates on both Microsoft Windows systems (such as Windows95®, Windows98®, Windows2000® and WindowsXP®) and GNU/Linux systems, that enables basic handling and visualization of the remote/local configuration. This configuration software is included in the delivery pack. The latest released versions of the STEPP II device firmware, configuration software (named "SteppConfig.exe") and manuals can be found on the CD.

With this configuration software it is possible to request GPS position data from the STEPP II terminal, to trigger its circuit activities, to receive alarm and status reports, as well as to execute remotely a wide range of configurations. In this case the software offers an interchangeable client/server communication.

This software can also be used as a configuration manager of the device where the following settings can be done:

- ❖ History function (*combinations between time, distance and velocity, about 180.000 records possible*)
- ❖ Setting alarm inputs (*for each input individually configurable telephone number, alarm text as SMS, last position*)
- ❖ Automatic tracking (*history or current position report by timer or other event*)
- ❖ Geo-fencing (*send report when approaching pre-defined zone coordinates, deviates off a pre-defined route or detects if a car leaves a pre-defined country*).

Depending on the configuration, the device exchanges data with a server application (e.g. Mapping-Software, etc.). The STEPP II can be configured by the user via local RS232-interface or remotely over the GSM (air link).

1.3 Version History

1.3.1 Firmware version 1.6.6

The firmware of Falcom STEPP II is constantly being improved and new features are added. All commands and parameters having the symbol ([1]) are available only in the Firmware 1.6.6 and greater versions.

The following features are improved and new parameters are added:

- The parameter GPSRESET initiates a Coldstart (feature of the previous firmware versions) after the user-specified time, if the GPS within that time in minutes no GPS-fix is obtained. The firmware 1.6.5 and greater versions initiate a Hotstart (as a default setting) instead of a Cold start that improves the performance of unit. The default setting of the GPS startup mode can also be manually changed. To change the default setting the second parameter *<startup_mode>* can be specified to: C, W and H corresponding to the Coldstart, Warmstart and Hotstart respectively. However, note that the GPSRESET can be sent without specifying the *<startup_mode>*. See also the GPSRESET parameter description.
- To specify a Master region at first you have to specify via the GEOMSG parameter the phone number where the message (text specified on the &CNF WATCH) has to be sent and then the &CNF WATCH with user-specified value can be sent to the target STEPP II device. In the firmware 1.6.5 and greater versions the GEOMSG settings are built-in the &CNF WATCH as one line (command). The purpose of this command is to save the end user time and simplify the configuration of a Master region. Once a Master region is configured, all user-defined parameter are performed and implemented. If the Master region is cleared (by sending the command &CNF WATCH 0), it does not mean that the GEOMSG settings will automatically be cleared. The GEOMSG settings can only be cleared separately, if these settings are no more required by the user (since these settings may still be used for other geofencing regions), by sending the command (&CNF UNIT GEOMSG) without parameter entry to the target device. See also the description in chapter 4.5.9.

1.3.2 Firmware version 1.6.2

Initial firmware version for the STEPP II device.

2 THE STEPP II STARTERKIT

Refer to the "stepp_II_getting_started.pdf" user manual.

3 PREPARING TO USE THE HISTORY AND GEO-FENCING FUNCTIONS

3.1 Tracking

3.1.1 History function

The History memory enables the receiver to store position, time and events in the on-board flash memory. When receiving valid GPS protocols, Falcom STEPP II is capable of saving up to 180.000 GPS protocols in its history memory.

When the memory space has been used up, the oldest protocols will automatically be deleted to make space for new incoming data (FIFO principle).

Image 3 shows a logical flow chart, for better understanding how Falcom STEPP II saves history data.

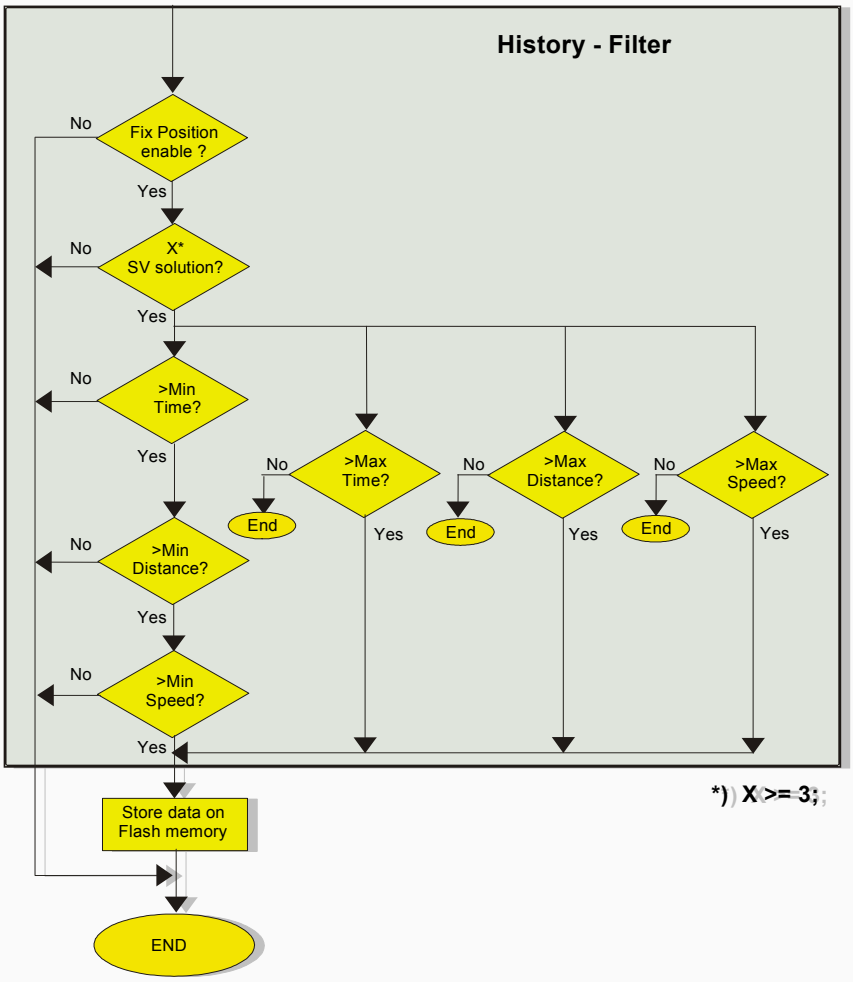


Image 3: History Filter

Taking the illustrated logic into consideration, several varieties of saving history data are possible.

3.1.1.1 Filter Settings

By configuring supplementary filters, the history function offers the possibility to reduce the number of stored data records. These filters prevent the history from storing unnecessary data, e.g. if a vehicle is not moving.

To set these filters, a configuration command can be sent to the device either locally (by connecting the device to a PC, whereby only NMEA messages are available for use) or over-air (GSM network, whereby both SMS commands and NMEA messages can be set via SMS).

3.1.1.2 Configuration examples

The following will explain the used filters for time, distance and speed.

The respective minimum values for time, speed and distance have an AND-Conjunction, meaning that if only value does not apply, then all three values are ignored and not saved in the history.

The maximum values have an OR-Conjunction. If one of the maximum parameters has been met, the GPS protocols will be saved in the history.

In accordance with the above flow chart, either all minimum parameters or just one maximum parameter have to be exceeded, and the NMEA protocols are stored in the history.

Parameter explanation:

The parameters used in examples below such as the *FixMin Time*, *FixMax Time*, *Dist.Min*, *Dist.Max*, *SpeedMin and Speed Max* correspond to the *<fmin>, <fmax>, <dmin>, <dmax>, <smin>* and *<smax>* used in the SMS commands and NMEA messages respectively.

	Minimum (lowest value)	**Maximum (highest value)**
Time filter	FixMinTime (Seconds)	FixMaxTime (Seconds)
	AND	OR
Distance filter	Dist.Min (Meters)	Dist.Max (Meters)
	AND	OR
Speed filter	SpeedMin (km/h)	SpeedMax (km/h)
Combination of both	OR	
	Storing of protocol	

Table 1: Conditions for saving data in the history

	FixMin Time [s]	**FixMax Time [s]**	**Dist. Min[m]**	**Dist. Max [m]**	**SpeedMin [km/h]**	**Speed Max [km/h]**
Logs every 10 sec.	0	10	0	0	0	0
Logs every 100 m	0	0	0	100	0	0
Logs every second at speed ≥ 40 km/h	0	0	0	0	0	40

Table 2: Programming example

3.1.1.2.1 Examples of history configuration

When history logging is enabled and the minimum number of satellites is visible (*not included in tables below*), history records will be stored depending on the time, distance and speed conditions. The history records would be stored in the NMEA format as specified in Section 4.2.1. Below are some configuration examples, which can be sent to the STEPP II device as a command via SMS or using the NMEA messages, sent locally to the device.

Example 1

- ✓ Record every 50 m if the vehicle has a speed less then 25 km/h
- ✓ Record every 2 sec. if the vehicle is moving at a speed between 25 and 50 km/h
- ✓ Record every second if the vehicle is driving faster than 50 km/h

	FixMin Time [s]	FixMax Time [s]	Dist.Min [m]	Dist.Max [m]	SpeedMin [km/h]	Speed Max [km/h]
Example 1, settings	2	0	0	50	25	50
SMS command	&CNF [PWD] UNIT MSG=S132345678,4,2,0,0,50,25,50,RMCIOP					
NMEA message	$PSRF108,LOG=4,2,0,0,50,25,50*7A					

Example 2

- ✓ Record every 50m if the vehicle is driving faster than 25 km/h

	FixMin Time [s]	FixMax Time [s]	Dist.Min [m]	Dist.Max [m]	SpeedMin [km/h]	Speed Max [km/h]
Example 2, settings	0	0	50	0	25	0
SMS command	&CNF [PWD] UNIT MSG=S132345678,4,0,0,50,0,25,0,RMCIOP					
NMEA message	$PSRF108,LOG=4,0,0,50,0,25,0*4D					

Example 3

- ✓ Record every 2 sec. if the vehicle is moving at a speed between 25 and 50 km/h

	FixMin Time [s]	FixMax Time [s]	Dist.Min [m]	Dist.Max [m]	SpeedMin [km/h]	Speed Max [km/h]
Example 3, settings	2	0	0	0	25	50
SMS command	&CNF [PWD] UNIT MSG=S132345678,4,2,0,0,0,25,50,RMCIOP					
NMEA message	$PSRF108,LOG=4,2,0,0,0,25,50*4F					

Example 4

- ✓ Record every second if the vehicle is driving faster than 50 km/h

	FixMin Time [s]	FixMax Time [s]	Dist.Min [m]	Dist.Max [m]	SpeedMin [km/h]	Speed Max [km/h]
Example 4, settings	0	0	0	0	0	50
SMS command	&CNF [PWD] UNIT MSG=S132345678,4,0,0,0,0,0,50,RMCIOP					
NMEA message	$PSRF108,LOG=4,0,0,0,0,0,50*7A					

3.1.1.3 How to download the history records

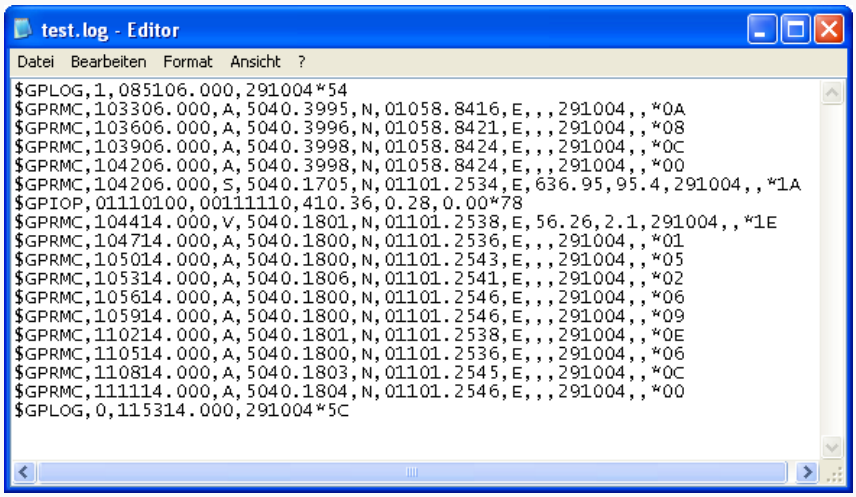
Stored GPS history data can be retrieved either locally (via serial link) or remotely (via data connection). An executable command, see chapters 4.6.3, can be sent to the device either locally or over-air (after a data call is established, a NMEA message can be sent to the STEPP II device).

Please, refer to the used terminal program, how to capture the incoming data into a *.log file format.

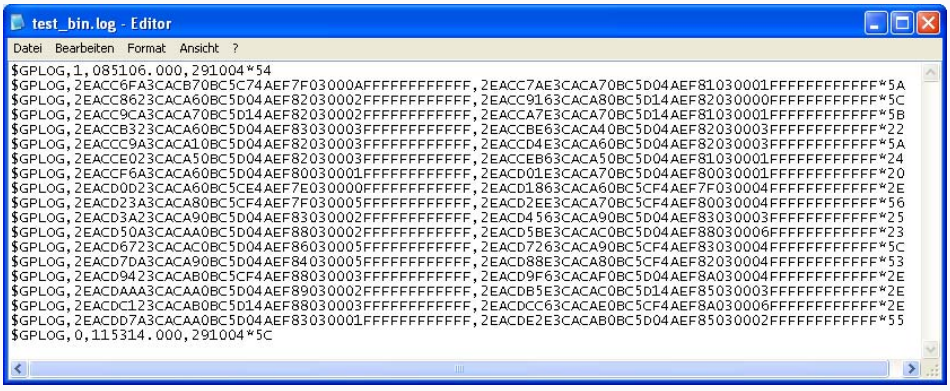
After the GPS history data are successfully downloaded and captured into a file on PC, the evaluation of the stored records can be performed using mapping software (Map&Guide or another one) and a suitable user developed program (the user developed program reads the GPS data position from the stored *.log file and sent them to a COM port where the Map software is connected). To do this, open the map software and select and select the COM port where the data will be read. Start the user developed program and sent the read data from the *.log file to the COM port where the Map software is connected. The route by means of the GPS data position from the selected file is being displayed in the map.

Please note that, if the stored records are in the binary format, they could not be accepted from the mapping software. A description about this format is attached in chapter 4.8.

3.1.1.3.1 NMEA and Binary history data



The stored position data in NMEA format begins with $GPLOG,1,..... and ends with $GPLOG,0,..... indicating the start date/time (29 October 2004 08:51:06) and end date/time (29 October 2004 11:53:14). All records between the start and end records include the stored GPS position data. A description about the NMEA messages is attached in chapter 4.2.1



The stored position data in binary format also begins with $GPLOG,1,..... and ends with $GPLOG,0,..... indicating the start date/time (29 October 2004 08:51:06) and end date/time (29 October 2004 11:53:14). All record data between the start and

end lines include the stored GPS data in the binary format. A description about this format is attached in chapter 4.8. This format offers a maximum data compression.

3.2 Geo-fencing

3.2.1 Configure Geo-fencing

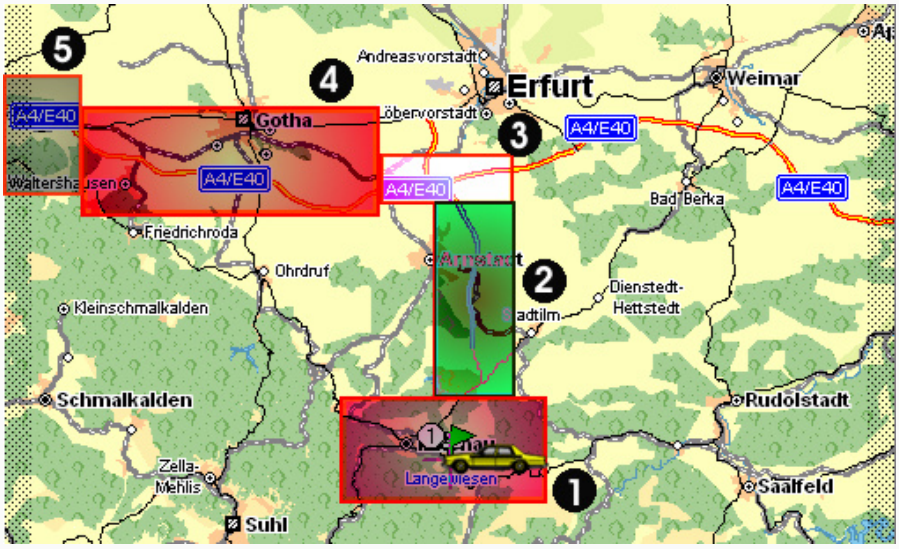
This section describes how the Geo-fencing works and how to set up a No-Go Zone Entry event to the terminal, it is assumed that the users have a basic understanding of conditional logic and geographic coordinates.

The term "No-Go Zone Entry" used in the manual, signifies defined customer area(s) on which configuration of events are possible.

3.2.1.1 How to do Geo-fencing with the STEPP II

The Geo-fencing is a term used to describe an event when the vehicle fited with a GSM/GPS unit places an electronic rectangle coordinates around your vehicle. Once a geo-fence is established, users can be automatically notified, as a result of exception reporting, if a vehicle enters and/or leaves the user pre-defined area(s). This functionality can be used for territory management, route verification, arrival/departure notification and prohibited locations. Exception reporting can also be applied to a wide variety of additional events, such as arrivals, departures, deliveries, pick-ups, illegal entries, unauthorized movement, and more. The STEPP II terminal based on the GPS system, recognizes if the vehicle crosses a user-defined geographic boundary, therefore, a SMS alert is issued. The constructed form of geographic boundary zones (restricted customer areas) is rectangular ones and they can be in different sizes, but the smallest size is 30 x 30 meters recommended.

The figure below shows possibilities of defining geographic zones.



3.2.1.2 Determine the Zone's Grid Coordinates

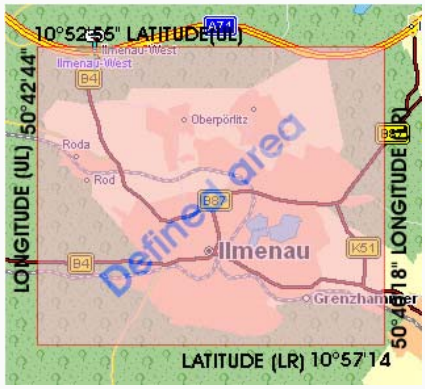
The STEPP II firmware supports three different kinds of coordinate format for latitude and longitude. These formats are based on the output of NMEA protocol format. So the coordinates may be one of the following types:

- Latitude, longitude(in degrees, minutes, seconds).
  - $GPRMC,141038.641,A,50'42'44'',N,10'52'55'',E,0.08,17.08,280104,,*09
- Latitude, longitude (in decimal degrees).
  - $GPRMC,141128.638,A,50.712222,N,10.881944,E,0.07,103.22,280104,,*3E
- Latitude, longitude (GPS NMEA format).
  - $GPRMC,141037.641,A,5042.5103,N,1052.0101,E,0.09,13.54,280104,,*0E

First, you have to use your mapping software (Map&Guide or another one) to determine the rectangle coordinates for your set zone. In order to do this, open the map software and locate the coordinate text that displays the geographic coordinates of your cursor location on the map:

For the Map&Guide, by moving the mouse cursor on the map the current coordinates (Longitude/Latitude in degrees, minute and second) are displayed at the bottom corner on the first panel of the viewer window.

Locate the zone you want to define on the map, and note down the upper left corner (UL) and the lower right corner (LR) coordinates of a rectangle that defines the zone, as shown in figure below.



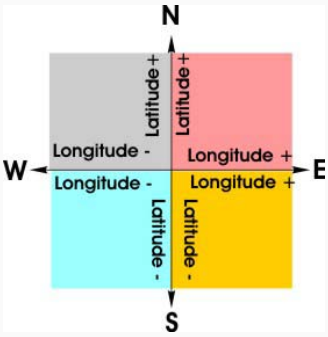
In our example (in degrees, minutes, seconds)**:**

- Latitude (UL) = 10°52'55" N
- Longitude (UL) = 50°42'44" W
- Latitude (LR) = 10°57'14" N
- Longitude (LR) = 50°40'18" W

☝ The coordinates can also be defined in other formats (Map&Guide uses degrees and decimal minutes notation).

In order to convert coordinates from degrees, minutes, seconds format to decimal format, refer to chapter 6.

You have now determined the grid coordinates for your rectangular zone. One last step before setting up the event, is to determine the sign of the coordinate values. Please remember that, Latitude North and Longitude East are positive and Latitude South and Longitude West are negative (see figure below):



3.2.1.3 *Set up the No-Go Zone Entry event*

Set up the event as normal, and enter the parameters as indicated in chapter 4.3.17.

&CNF UNIT GEO<*index*>=<*reg_name*>,<*reg_id*>,<*long_UL*>,<*lat_UL*>,<*long_LR*>,<*lat_LR*>, <*when*>
&CNF UNIT GEO01=Ilmenau,01,50.7122,10.8819,50.6716,10.9538,0
$PSRF108,GEO01=Ilmenau,01,50.7122,10.8819,50.6716,10.9538,0*1A

For our example:

This will result in an event being recorded in the STEPP II when the Latitude of the vehicle's current position is bigger than 10°57'14" AND smaller than 10°52'55"AND the Longitude of the vehicle's current position is bigger than 50°42'44" AND smaller than 50°40'18". That means the FALCOM STEPP II will send a SMS alert message if a vehicle leaves that defined zone.

Concerning the set No-Go Zone Entry event, the STEPP II terminal supports three different configuration types:

1 - if the vehicle enters the pre-defined zone.

2 - if the vehicle leaves the pre-defined zone.

3 - if the vehicle enters and leaves the pre-defined zone.

The other possibility is also supported, when the user sets up to 99 different zones with the same ID number. The STEPP II recognises those restricted zones as a single zone. The set up of zones has to be adjacent to or overlapped zones (no free space between zones). That means if the vehicle leaves the first zone and at the same time enters to the next one and others, (*depending on the amount of set zones*) the STEPP II compares the ID zones (the previous zone with the next one) if they correspond, no SMS message will be sent. When the vehicle leaves the current zone and does not contemporaneously enter to the next one, so a SMS alert message with corresponding zone identification text will be sent to the predefined phone number. In other words this geo-fencing feature allows you to establish an area where the vehicle can travel. If the vehicle travels outside this area, an exception report is sent to the target phone number.

Now simply download the new configuration to the vehicle by sending the commad in table above, and your STEPP II unit will start recording events based on the defined geographic zone.

> The STEPP II device can store up to 100 regions, one of which is the master region. The master region is pre-defined and is not configurable by a direct connected STEPP II , but it can be activated and deactivated by using the SMS messages (refer to the chapter 4.5). The area indicator of master region is "00".

In order to configure the STEPP II remotely via SMS or data connection, please, refer to the chapters 4.5 and 4.6, a comprehensive description is also added.

- After the user has defined and activated geo-fencing zone(s), and then the STEPP II device is switched off; in the next start-up, STEPP II compares its obtained valid position with the positions of activated geo-fencing zone(s). If they are identical (means, within the activated area), a SMS will be sent to the target phone number specified on the GEOMSG parameter.

4 CONFIGURATION COMMANDS - FOR FALCOM STEPP II

This chapter explains the configuration commands for Falcom STEPP II.

There are two categories of configuration commands:

- Commands for SMS remote configuration
- Commands for direct configuration of a Falcom STEPP II connected to software "SteppConfig"

In Table 3 you will find an overview of the commands for SMS remote configuration of a Falcom STEPP II.

Important:

Take into account, that all configuration commands sent to the STEPP II (via SMS, data connection or locally) should match exactly the parameter format (Syntax) described in this manual.
!!! Note that incorrect assigned parameters into a configuration command may carry the STEPP II device into the instability conditions (such as the STEPP II could not be available, could not pick up a voice call etc.) and its configuration can only locally be improved (via a direct connected STEPP II device).

4.1 SMS and PSRF Command syntax

4.1.1 SMS Command syntax

The SMS commands can be sent to the device same as a SMS text, but their format have to be considered. The "&CNF" or "&REQ" command header must be set at the beginning of each command line. In commands described below, the SMS password is indicated as [*PWD*] enclosed in square brackets or *PWD*, indicating that it is an optional field.

Types of SMS commands:

Command type	Syntax	Function
Readable command	&REQ [*PWD*] CNF	This command returns the current set value of the parameter or parameters.
Writable command	&CNF [*PWD*] UNIT <*Parameter_name*>=<*value*>	This command sets user-definable parameter values.
Executable command	&CNF [*PWD*] <*Parameter_name*> <*value*>	This command performs an event to the device.
Clear Command	&CNF [*PWD*] <*Parameter_name*>	This command deactivates that parameter name (deletes the value(s)) which previously has (have) been specified.

4.1.1.1 SMS Command structure

In the table below you will find two types of the SMS commands, which can be sent to the STEPP II device.

- ✓ The SMS command including the parameter [*PWD*] has to be used, if the parameter [*PWD*] is already specified, otherwise the device will not accept commands without entering that password.
- ✓ The SMS command excluding [*PWD*] parameter can be used, if the [*PWD*] parameter is empty (not specified from the user).

All SMS commands have to be sent in uppercase (capital letters), otherwise, the configuration could not be accepted. If a sent command (via SMS, data connection or locally) is incorrectly typed (based on the structure in the table below) by the user, the device ignores (refuses) that command and no configuration is performed or you may carry the STEPP II device into the instability conditions.

If more than one parameter (combining commands on the same writable command line) should be sent within a command (SMS message), they should be separated by colons ":" (indicated as [:]). The square brackets have to be omitted when you input that command.

IIf a command (message including one of the parameter names <Parameter_name>) is sent **without** value then the corrent status (value) of that parameter stored into the FLASH memory will be deleted (deactivated), except the "&REQ<*space*>CNF" read command.

The <*space*> string included in the command structure indicates that the command header and/or parameter has to be separated by spaces (" ").

Do not use the quotation marks if a <value> is a character string, e.g. <*text*>.

Types of SMS commands:

Command type	Structure
Readable command	&REQ<*space*>[PWD]<*space*>CNF or &REQ<*space*>CNF
Writable command	&CNF<space>[PWD]<space>UNIT<space> <Parameter_name>=<value>,<value>,….<value> or &CNF<space>UNIT<space> <Parameter_name>=<value>,<value>,….<value>
Combining commands on the same writable command line	&CNF<space>[PWD]<space>UNIT<space> <Parameter_name>=<value>,<value>,….<value>[:] <Parameter_name>=<value>,<value>,….<value>[:] …. or &CNF<space>UNIT<space> <*Parameter_name*>=<*value*>,<*value*>,….<*value*>[:] <*Parameter_name*>=<*value*>, <*value*>,….<*value*>[:] ….
Executable command	&CNF<space>[PWD]<space> <*Parameter_name*><space> <*value*>,<*value*>,….<*value*> or &CNF<space> <*Parameter_name*><space><*value*>,<*value*>,….<*value*>

Clear Command	&CNF<space>[PWD]<space><*Parameter_name*> or &CNF<space><*Parameter_name*>

4.1.2 NMEA Messages syntax

The NMEA message can be sent to the remote device same as a SMS text, but the format of these messages has to be considered. The "$PSRF<m_id>" NMEA command must be set at the beginning of each command line. The last two characters <CR><LF> are "control" characters and are not normally printed (for this reason they are customarily shown enclosed in brackets.

The NMEA standard message has the following formats and in this format it will also be accepted by the STEPP II device:

Command	Parameter	Checksum	End Sequence
$PSRF<m_id>	<*Date*>	<**CKSUM*>	<CR><LF>

The $PSRF message header and the parameter <m_id> message identifier create a NMEA command.

The parameter <Date> can contain different valid parameters, which are supported by the STEPP II device.

The checksum <*CKSUM> consists of a "*" character followed by two hex values.

In order to calculate the Checksum, use your own application. Below a small source code written in Visual Basic:

```
{****************************************}
  Public Sub CheckSum(field As String)
  If field = "" then CS = "*"
  CS = 0
  For i = 1 to Len(field)
  CS = CS Xor Asc(Mid$(field, i, 1))
  Next
  CS = Hex(CS)
  If Len(CS) =1 then
  CS = "0" & CS
  CS = "*" & CS
  END SUB
{****************************************}
```

Therefore, the string over which the checksum has to be calculated is:

field = PSRF<*m_id*>,<*data*>

excluding "$"character.

All fields in all proprietary NMEA messages are required, none are optional.

All NMEA messages are comma delimited ",".

Types of NMEA messages:

NMEA Message type	Syntax	Function
Selectable message	$PSRF103,<*msg*>,00,<*rate*>,01 <**CkSum*><CR><LF>	This NMEA message select the supported messages which can be polled once, or set up periodically.

Writable message	$PSRF108,<*Parameter_name*> =<*value*><**CkSum*><CR><LF>	This NMEA message sets user-definable parameter values.
Executable message	$PSRF109,<*r_data*>,<*s_date*>, <*s_time*>,<*e_date*>,<*e_time*> <**CkSum*><CR><LF>	This NMEA message sets user-definable parameter values to download the stored history data.

4.1.2.1 NMEA messages improved structure

All NMEA messages have to be sent in uppercase (capital letters) otherwise the configuration could not be accepted. If a send message (via SMS, data connection or locally) is incorrectly typed by the user (based on the structure in the table below), the device ignores (refuses) that command and no configuration is performed. Due to the incorrectly typed of NMEA message you may carry the STEPP II device into the instability conditions.

If more than one parameter (combining message on the same writable message line) has to be sent within a command (NMEA message), they should be separated by colons ":" (indicated as [:]). The square brackets have to be omitted when you input that command.

If a parameter <parameter_name> of NMEA message is sent **without** value to the device then this parameter is deactivated by setting an undefined value.

Different from the SMS command, the parameters of NMEA message are not separated by spaces (" ").

The Falcom STEPP II acceptes following formats:

Command type	**Structure**
Selectable Message	$PSRF103,<*msg*>,00,<*rate*>, 01<**CkSum*><CR><LF>
Writable Message	$PSRF108,<*parameter_name*>=<*value*><**CkSum*><CR><LF>
Combining message on the same writable message line	$PSRF108,<*parameter_name*>=<*value*>,<*value*>,….<*value*>[:] <*parameter_name*>=<*value*>,<*value*>,….<*value*>[:]… <**CkSum*><CR><LF>
Executable message	$PSRF109,<*r_data*>,<*s_date*>,<*s_time*>,<*e_date*>,<*e_time*> <**CkSum*><CR><LF>

4.1.3 Response message structure

A SMS alarm report is presented in numeric and/or text format, which includes the parameters, marked with blue colour listed in the table below. An improved description including an example is attached in the table 4.

If the responded message does not fit in (due to limited text length within a SMS of 160 characters) one SMS message, it is sent in several SMS messages. In this case, CNF is replaced by CNFxx, where xx is the message index starting from 00. In the last message, CNF is replaced by ENDxx. See the Example 2 in table below.

Types of response message:

Respond message type	Structure
From read command	+CMT: <*SMS header*> <*device_name*><space>**END**<*index*><space> <*parameter_name*>=<*configuration*> or +CMT: <*SMS header*> <*device_name*><space>**CNF**<*index*><space> <*parameter_name*>=<*configuration*> … … … +CMT: <*SMS header*> <*device_name*><space>**END**<*index*><space> <*parameter_name*>=<*configuration*>
Example 1	stepp_II **CNF01** NAME=stepp_II:LOG=3,1,900,0,0,0,0:GEO01=Langewiesen,1,5041 stepp_II **CNF02** PIN=1111:NMEA=9600-8N1,GGA.1,GLL.1,GSA.1, GSV.1,RMC.1,IOP.1,GS stepp_II **CNF03** PORTS=P1#E,0,0,P2#Z,5,5,P3#A, 0,0,P4#A,0,0:UNIT=FAL STEPP V1.6.2 stepp_II **END04** GPSFIX=5040.4012 1058.8418 782464386 3976357 771535 4910975
From execution command (if an alarm is triggered)	<*device_name*><space><*alarm_text*><CR><LF> <*first_protocol*><CR><LF> <*second_protocol*><CR><LF>
Example 2	<*device_name*>*alfa_car*<alarmtext>*AlarmImput1*<CRLF> <*first_protocol*> *$GPRMC,103530.000,A,5040.3986,N,01058.8636,* *E,0.06,171.45,290903,,*04<CRLF*> <*second_protocol*>*$GPIOP,11000001,00010000,4.82,3.69,4.06*72

4.1.4 Combining commands on the same command line

You may enter several SMS commands or NMEA messages on the same line. This eliminates the need to type the message header or NMEA message before each parameter configuration. Instead, it is only needed once at the beginning of the command line. Use a colon ":" as command delimiter.

The command line buffer accepts a maximum of 160 characters due to the SMS limitation of 160 characters. If this number is exceeded, the sent commands will be ignored from the STEPP II device or ERROR is returned.

4.2 NMEA messages transmitted/selected by/to STEPP II device

The STEPP II device transmits NMEA sentences every second, depending on the configuration. The identifiers for the NMEA messages transmitted by the STEPP II device are listed below. Excepting **GPIOP** and **GPGSM** all other messages are based on the NMEA standard messages.

- ✓ **GPGGA** GPS Fix Data
- ✓ **GPRMC** Recommended Minimum Specific GPS Data
- ✓ **GPGSV** GPS Satellites in View
- ✓ **GPGSA** GPS DOP and Active Satellites
- ✓ **GPGLL** Geographic Position in Latitude/Longitude.
- ✓ **GPIOP** STEPP II Device Input/Output Ports
- ✓ **GPGSM** STEPP II Device GSM Status.

A full description and definition of the listed NMEA messages is provided in the next subsection of this section.

4.2.1 Description of NMEA output messages

The following table is intended as a quick reference to explain the formats used in the tables below.

Format	Description
hhmmss.ss	Time: hh hours, mm minutes, ss.ss seconds.
ddmmyy	Date: day dd, month mm, year yy.
ddmm.mmmm	Latitude: dd degrees, mm.mmmm minutes.
dddmm.mmmm	Longitude: ddd degrees, mm.mmmm minutes.
dd.dddddd	Latitude/longitude: dd.dddddd degrees.
dd'mm'ss"	Latitude/longitude: dd degrees, mm minutes, ss seconds
x	Integer.
xx	Integer having exactly two digits (using leading zeros).
x.x	Number including fraction.
hh	Two-digit hexadecimal number (using uppercase A–F).
bbbbbbbb	Eight-digit binary number.
a	ASCII text.
"a"	ASCII text in quotation marks.
<CR><LF>	Carriage return and line feed.

The $GPGGA message includes time, position, GPS quality and number of satellites in use.

Example:

$GPGGA,133726.569,5040.4365,N,01058.5646,E,1,03,8.9,92.9,M,,,,0000*3F

Field	Format	Example	Description
1	$GPGGA	$GPGGA	Start of sentence
2	hhmmss.ss	133726.569	UTC time
3	ddmm.mmmm	5040.4365	Latitude
4	a	N	Latitude direction (N/S)
5	dddmm.mmmm	01058.5646	Longitude

6	a	E	Longitude direction (W/E)
7	x	1	GPS fix quality: 0: invalid 1: GPS fix 2: DGPS fix
8	xx	03	Number of satellites in use
9	x.x	8.9	Horizontal dilution of precision (relative accuracy of horizontal position)
10	x.x	92.9	Altitude above mean sea level (geoid)
11	M	M	Altitude units (meters)
12	x.x		Height of geoid above earth ellipsoid
13	M		Geoid height units (meters)
14	x		Time since last DGPS update (seconds)
15	xxxx	0000	DGPS reference station ID
16	*hh	*3F	Checksum
17	<CR><LF>		End of message termination

Table 1: The GPGGA message data format.

The $GPRMC message includes time, date, position, course and speed data.

Example:

$GPRMC,133725.569,A,5040.4365,N,01058.5650,E,0.05,302.98,251004,,*00

Field	Format	Example	Description
1	$GPRMC	$GPRMC	Start of sentence
2	hhmmss.ss	133725.569	UTC time
3	a	A	Position validity (A: valid, V: invalid or S*: Last stored valid position)
4	ddmm.mmmm	5040.4365	Latitude
5	a	N	Latitude direction (N/S)
6	dddmm.mmmm	01058.5650	Longitude
7	a	E	Longitude direction (W/E)
8	x.x	0.05	Speed (knots)
9	x.x	302.98	Heading (degrees)
10	ddmmyy	251004	Date
11	x.x		Magnetic variation (degrees)
12	a		Magnetic variation direction (W/E)
13	*hh	*00	Checksum
14	<CR><LF>		End of message termination

Table 2: The GPRMC message data format.

---

* This remark is a reference from description of $GPRMC and $GPGLL messages, only. The STEPP II device will store the latest valid GPS fix. In case of user requests the vehicle position and the up to date position of the device is invalid, the device holds the latest stored valid GPS fix (longitude, latitude and altitude) and sends it to the target phone number in a string formatted as shown below. The validity status indicator in capital letter inside the $GPRMC and $GPGLL protocols will be switched from **V** to S –letter.

Example:

```
Send:
    &REQ PWD POS 0
        //The user request of vehicle position was at 12:39:55.

Receive:
    $GPRMC,094055.121,S,5040.4014,N,01058.8657,E,,,280103,,*16
        //a RMCprotocol will be sent to the message sender with switched
        status indicator from "V" to "S". The attached time (the UTC time
        between the message header and status indicator) does not
        correspond to the time of position request (current time). The latest
        valid GPS position holds form storage will be sent to the SMS receiver
        including the recorded time (e.g. 09:40:55).
```

The received $GPRMC message above that is sent to the SMS receiver instead of the device sends an invalid GPS position as below:

```
Receive:
  $GPRMC,123955.221,V,0000.0000,N,00000.0000,E,,,280103,,*34
```

This feature allows the user of the device to calculate the time on which the device has not been able to obtain the location fix. In this case the calculation time of the invalid GPS position is 02 hours and 59 minutes.

The $GPGSV includes the number of satellites in view satellite ID numbers and their elevation, azimuth and signal-to-noise ratio.

Example:

$GPGSV,3,1,10,05,79,067,39,30,63,277,35,14,37,269,,09,36,145,*78
$GPGSV,3,2,10,24,28,098,36,06,24,212,,04,24,058,29,17,16,129,*7F
$GPGSV,3,3,10,01,13,328,34,25,05,311,*74

Field	Format	Example	Description
1	$GPGSV	$GPGSV	Start of sentence
2	x	3	Number of messages (1 to 3)
3	x	3	Message number (1 to 3)
4	xx	10	Number of satellites in view (1 to 12)
5	xx	01	Satellite PRN number
6	xx	14	Satellite elevation (degrees) (00 to 90), may be null
7	xxx	328	Satellite azimuth (degrees) (000 to 359), may be null
8	xx	34	Satellite signal to noise ratio in dB (00 to 99), may be null
9		25	Similar to 5–8 for next satellite, may all be null
10		05	Similar to 5–8for next satellite, may all be null
11		311	Similar to 5–8 for next satellite, may all be null
12	*hh	*74	Checksum
13	<CR><LF>		End of message termination

Table 3: The GPGSV message data format.

The $GPGSA message includes the list of satellites being used.

Example:

$GPGSA,A,2,05,09,04,,,,,,,,,13.4,8.9,10.0*3D

Field	Format	Example	Description
1	$GPGSA	$GPGSA	Start of sentence
2	a	A	Operating mode: M: Manual, operate in 3-D mode. A: Automatically choose 2-D or 3-D mode.
3	x	2	Fix mode: 1: Fix not available 2: 2-D fix 3: 3-D fix
4	xx,xx, . . .	05	PRN numbers of satellites in use (unused fields null)
5	x.x	13.4	Position dilution of precision
6	x.x	8.9	Horizontal dilution of precision
7	x.x	10.0	Vertical dilution of precision
8	*hh	*3D	Checksum
9	<CR><LF>		End of message termination

Table 4: The GPGSA message data format.

The $GPGLL message includes the latitude, longitude, UTC time of position fix and status..

Example:

$GPGLL,5040.4025,N,01058.8342,E,113704.665,A*32

Field	Format	Example	Description
1	$GPGLL	$GPGLL	Start of sentence
2	ddmm.mmmm	5040.4025	Latitude
3	a	N	Latitude direction (N/S)
4	dddmm.mmmm	01058.8342	Longitude
5	a	E	Longitude direction (W/E)
6	hhmmss.sss	113704.665	UTC Position
7	a	A	Position validity (A: valid, V: invalid or S*: invalid)
8	*hh	*32	Checksum
9	<CR><LF>		End of message termination

Table 5: The GPGLL message data format.

The $GPIOP message includes the status of the digital/analogue inputs and output ports. A detailed description is also attached in chapter 4.7.

Example:

$GPIOP,01000000,00000000,0.28,0.28,4.15*72

Field	Format	Example	Description
1	$GPIOP	$GPIOP	Start of sentence
2	bbbbbbbb	01000000	Inputs: 8–1 (1: on, 0: off) 1–4: Inputs 1–4 5–6: Unused 7: Car battery status

			8: Ignition status
3	bbbbbbbb	00010000	Outputs: 8–1 (1:on, 0: off) 1–4: Outputs 1–4 5 : always is set to 1, indicates the outputs are operational. 6–8: Unused
4	x.x	0.28	Analog input 1 (V)
5	x.x	0.28	Analog input 2 (V)
6	x.x	4.15	Backup battery level (V)
7	*hh	*72	Checksum
8	<CR><LF>		End of message termination

Table 6: The GPIOP message data format.

The $GPGSM message includes the GSM operator and reception status. Keep in mind that the GPGSM message can be sent in one of three different modes. The first parameter after the message header $GPGSM identifies the mode on which the device is currently processing. Each of the following tables, recognizing the GPGSM message, specifies one of three modes.

In the $GPGSM message the number of the caller will also be transmitted if the caller number is not available in the access/authorization list.

Table below shows the mode 0 which indicates that the sentence gives the GSM module status.

Example:

$GPGSM,0,1,0,"T-Mobile D",20,5518,4caa*32

Field	Format	Example	Description
1	$GPGSM	$GPGSM	Start of sentence
2	x	0	GSM status mode: 0
3	b	1	Registration (1:registered, 0: unregistered)
4	x	0	GSM status
5	"a"	"T-Mobile D"	Network operator name
6	xx	20	GSM field strength (0 to 31) 0: $-$113 dB 31: $-$51 dB
7	a	5518	Area code
8	a	4caa	Cell ID
9	*hh	*32	Checksum
10	<CR><LF>		End of message termination

Table 7: The GPGSM message data format in GMS status mode.

Table below shows the mode 1 which indicates that an SMS message was received.

Example:

$GPGSM,1,+490172123456,"","My Message"*54

Field	Format	Example	Description
1	$GPGSM	$GPGSM	Start of sentence
2	x	1	SMS message received mode: 1
3	a	+49123456	Sender number
4	"a"	""	Sender phonebook entry
5	"a"	"My message"	SMS message text
6	*hh	*54	Checksum
7	<CR><LF>		End of message termination

Table 8: The GPGSM message data format in SMS message received mode.

Table below shows the mode 2, which indicates that there was an incoming call.

Example:

$GPGSM,2,V,+490172123456,""*11

Field	Format	Example	Description
1	$GPGSM	$GPGSM	Start of sentence
2	x	2	Received call mode: 2
3	a	V	Call type: D: data call V: voice call A: listen call
4	a	+49123456	Caller number
5	"a"	""	Caller phonebook entry
6	*hh	*11	Checksum
7	<CR><LF>		End of message termination

Table 9: The GPGSM message data format in received call mode.

4.3 Supported parameter

The Falcom STEPP II operating with firmware version 1.6.2 and greater supports the following listed parameters *<parameter_name>*. Each parameter name is distinguished as caption (section). Within a section you will find two tables; the first one indicates the *<parameter_name>=<value>* format (the command syntax); the second one shows the example(s) how the SMS command and/or NMEA message can be sent to the STEPP II device.

Keep in mind that, if one of following parameter names, described in the chapters below, is supposed to be sent via the NMEA message ($PSRF108), which is transmitted in the form of "sentences", then their format must be considered by the user. The sentence begins with "$" character, next come the four letters "talker ID" and three letter "sentence ID", followed by a number of parameters separated by commas, and terminated by a calculated checksum, and a carriage return/line feed.

4.3.1 NAME

Syntax	NAME=<name>

This parameter allows you to define or change the device name.

<name>

It identifies the name of STEPP II device. When the device sends a SMS message to the message sender or target phone number, it identifies itself using this identifier.

How the parameter could be sent:

SMS command	&CNF *PWD* UNIT NAME=alfa_car &CNF UNIT NAME=alfa_car &CNF UNIT NAME
NMEA message	$PSRF108,NAME=alfa_car*1D $PSRF108,NAME*05

Notes

- If the device name has already been set, each other <name> message sent to the device overwrites the existent entry.
- A SMS command sent **without** value deletes the existent entry.

4.3.2 PIN

Syntax	PIN=<*new_pin*>

The parameter lets the STEPP II device store the entered PIN *<new_pin>* of the used SIM card. The PIN entry can only locally be performed by using the $PSRF108 message.

<new_pin>

It specifies the PIN number of the used SIM card. This may be for example the SIM PIN to register onto the GSM network, or the SIM PIN to replace the current PIN number with a new one.

How the parameter could be sent:

SMS command	`Not supported`
NMEA message	`$PSRF108,PIN=1321*69`

Notes

- Successful PIN authentication only confirms that the entered PIN was recognized and correct. The PIN acception does not necessarily imply that the STEPP II is registered to the desired network. Typical example: PIN was entered and accepted, but the STEPP II fails to register to the network. This may be due to missing network coverage, denied network access with currently used SIM card, no valid roaming agreement between home network and currently available operators etc.
- To verify the present status of network registration, please refer to the LED states in the hardware manual of the STEPP II device. The next way to verify if it is available, establisch remotely a voice or data call.
- No PIN request is more pending, if the PIN number of used SIM card once has been specified and it is sent to the STEPP device. The STEPP stores that specified PIN and uses it upon request of the GSM part. No more PIN entry is required from your part, as long as the used SIM card is not replaced by a new one.
- A SMS command sent **without** value deletes the existed entry.

4.3.3 PWD

Syntax	PWD=<*password*>

This parameter allows you to define or to change the device password for SMS configuration.

<password>

It specifies the password (string type) for the device configuration via SMS. The user-specified password protects the STEPP II device from the prohibited accesses. Password consists of a string with a length up to 40 characters.

How the parameter could be sent:

SMS command	`&CNF PWD UNIT PWD=tommy001`
	`&CNF UNIT PWD=tommy001`
	`&CNF tommy001UNIT PWD`

NMEA message	`$PSRF108,PWD=tommy001*2F`

Notes

- If the device password has already been set, and the user would like to change it, the SMS command:

  `&CNF tommy001 UNIT PWD=tommy002`

  has to be sent to the device.
- A SMS message sent to the device **without** value deletes the current password (assumed the password has already been set).

4.3.4 RING

Syntax	RING=<*ring_melody*>

This parameter is intended for modifying on your own preferences the ring melody for voice calls.

<ring_melody>

It chooses the type of ring melody. We have chosen to let you decide your own preferences when you start using ring melody. You have a choice of 10 different ring melodies. The ringer melody value <ring_melody> can be set in the range of 0 to 10.

If the value <ring_melody> is set to 0, the loudspeaker plays no melody. If one of following values (1 to 9) is set, then each setting plays a different melody on the loudspeaker (audio output).

To use the buzzer rather than the loudspeaker, set the value to 10.

How the parameter could be sent:

SMS command	`&CNF PWD UNIT RING=2` `&CNF UNIT RING`
NMEA message	`$PSRF108,RING=2*1F` `$PSRF108,RING*10`

Notes

- If the ring melody has already been defined, and the user would like to change it, the SMS command:

  `&CNF UNIT RING=8`

  has to be sent to the device.
- A SMS message sent to the device **without** value deletes the current value of the ring melody and sets it to the factory setting 3.

4.3.5 PORT<index>

Syntax	PORT<*index*>=<*trig_type*>,<*on_time*>,<*off_time*>

This parameter is intended for changing the present status of the STEPP II digital outputs.

<index>:

It specifies the index of output ports. The index can be set from 1 to 4 corresponding to the provided output ports of the Falcom STEPP II respectively.

<trig_type>:

It specifies the trigger type, it can be set to A, E, I or Z.

A = the user-specified PORT<index> will be set to the OFF state.

E = the user-specified PORT<index> will be set to the ON state.

I = the user-specified PORT<index> will be set to E or A for a given <on_time> time which means an impulse will be generated.

Z = the user-specified the PORT<index> will periodically be triggered to ON and OFF sates giving a periodic <on_time> and <off_time> impulses in second(s) respectively which means cyclic ON/OFF.

<on_time>

Specifies the number of seconds for ON time period.

<*off_time*>:

Specifies the number of seconds for OFF time period.

How the parameter could be sent:

SMS command	&CNF UNIT PORT1=Z,1,1 &CNF UNIT PORT2=E &CNF UNIT PORT3=A &CNF UNIT PORT4=I,2
NMEA message	$PSRF108,PORT1=Z,1,1*4D $PSRF108,PORT2=E*51 $PSRF108,PORT3=A*54 $PSRF108,PORT4=I,2*45

Notes

- If the command &CNF UNIT PORT<index>=I,5 (whereby the <off_time> is not required) is sent to the device, the user-defined output alters its state from ON to OFF or vice versa for the user-specified <on_time> time, independent of the output state. The software negates internally the <on_time> regarding the current state of user-defined output PORT<index>.

4.3.6 KEY<index>

Syntax	KEY<*index*>=<*type*><*phone;phone_1;...phone_n*>,<*text*>,<*protocols*>,<*edge*>

This parameter is intended to configure the alarm inputs of the STEPP II.

<*index*>:

It specifies the index of the provided alarm inputs. The index can be set from 1 to 4 corresponding to the four digital inputs of the STEPP II device respectively. The index 7 corresponds to the battery line and 8 to the ignition line. See related documents [4].

<*type*>:

It specifies the alarm type. It can be set to S, D, V or A corresponding to SMS, Data call, Voice call or Alarm (listen-in mode) call respectively, see also section 6.2.

<*phone;phone_1;...phone_n*>:

It specifies the phone number(s) where the alarm has to be sent. More than one number can be entered using a semicolon as a separator between two phone numbers. The <phone;phone_1;...phone_n> field consists of a numeric with a length up to 100 digits. Remember the length of SMS, up to 160 characters (!).

<*text*>:

It specifies the identification text which will be sent in case of alarm to the message sender or user-specified <phone;phone_1;...phone_n> number, only if the alarm type <type> is set to S (for SMS connection). The <text> field consists of a string with a length up to 40 characters.

<*protocols*>:

It defines the output NMEA messages (see chapter 4.2) which will be sent to the message sender or user-specified <phone;phone_1;...phone_n> number, only if the alarm type <type> is set to S (for SMS).

<*edge*>:

It defines the edge that triggers the alarm. It can be set to:

1 by rising edge, Low to High trigger state,
2 by falling edge, High to Low trigger state or
3 by both, High to Low or Low to High trigger states.

How the parameter could be sent:

SMS command	&CNF UNIT KEY1=S0123456,alarm triggered in KEY1,RMCIOP,1 &CNF UNIT KEY2=V0123456;01234678,,,2 &CNF UNIT KEY3=D0123456,,,3 &CNF UNIT KEY4=A0123456,,,2 &CNF UNIT KEY4
NMEA message	$PSRF108,KEY1=S0123456,alarm triggered in KEY1,RMCIOP*7C $PSRF108,KEY2=V0123456;01234678*0D $PSRF108,KEY3=D0123456,,RMCIOP*22 $PSRF108,KEY4=A0123456*2A

Notes

- If a digital input has already been configured, each other command sent to the device overwrites the existing configuration.
- If an imput is configured to establish a voice or a data call the context of <text>and <protocols> fields can be removed (not required to be set).
- If the field <edge> is not specified the alarm will be triggered by rising edge (Low to High state) of the user-defined input (default setting).
- If the STEPP II device is configured to establish a voice or a data call to target phone number and the target phone/mobile is switched off or it is already not registered in the GSM network, the STEPP II device tries up to 3 times to reach that phone number. In case of an unsuccessful connection, the STEPP II ignores it.
- If more than one phone number is specified in the <phone;phone_1;...phone_n> field and the STEPP II device is configured to establish a Voice or a Data call to target phone numbers, then it tries up to 3 times to reach one of the specified phone numbers.
- To delete the present configuration of a digital input, a SMS command **without** value has to be sent to the device.

4.3.7 IN<index>

Syntax	IN<*index*>=<*type*> <*phone;phone_1;… phone_n*>,<*text*>,<*min_val*>,<*max_val*>,<*protocols*>

This parameter is intended to configure the alarm analogue inputs of the STEPP II. When the analog input <index> goes beyond the <min_val> or <max_val> limits an alarm is triggered and STEPP II sends a notification text <text> on specified <phone;phone_1;… phone_n> mobile phones with attached one or two protocols <protocols>, if the type of GSM connection <type> is set to S (for SMS connection).

<index>:

The analog input index. The index can be set to 1 or 2 for the provided analog inputs respectively.

<type>:

It specifies the alarm type. It can be set to S, D, V or A corresponding to a SMS, Data call, Voice call or Alarm (listen-in mode) call respectively; see also section 6.2,.

<phone;phone_1;… phone_n>:

It specifies the phone number(s) where the alarm has to be sent. More than one number can be entered using a semicolon as a separator between two numbers. The <phone;phone_1;… phone_n> field consists of a numeric with a length up to 100 digits. Remember the SMS length, up to 160-characters.

<text>:

It specifies the identification text, which will be sent to the target phone number, only if the alarm type <type> is set to S (for SMS connection).

<min_val>:

It defines the minimum value before analog input triggered.

<max_val>:

It defines the maximum value before analog input triggered.

<protocols>:

It defines the input NMEA messages (see chapter 4.2), which will be sent to the message sender, only if the alarm type <type> is set to S (for SMS).

How the parameter could be sent:

SMS command	&CNF UNIT IN1=S0123456,alarm in analogue input 1,2,4,IOP &CNF UNIT IN2=S0123456,alarm in analogue input 1,3,5,IOP &CNF UNIT IN2
NMEA message	$PSRF108,IN1=S0123456,alarm in analogue input 1,2,4,IOP*14 $PSRF108,IN2=S0123434,alarm in analogue input 2,3,5,IOP*10 $PSRF108,IN2*37

Notes

- If an analogue input has already been configured, each other SMS command sent to the device overwrites the existing configuration.
- If an imput is configured to establish a voice or a data call the context of <text>and <protocols> fields can be removed (not required to be set).
- If the STEPP II device is configured to establish a voice or a data call to a target phone number and the target phone/mobile is switched off or it is already not registered in the GSM network, the STEPP II device tries up to 3 times to reach that phone number. In case of an unsuccessful connection, the STEPP II ignores it.
- If more then one phone number is specified in <phone;phone_1;… phone_n> field and the STEPP II device is configured to establish a Voice or a Data call to target phone numbers, then the STEPP II tries up to 3 times to reach one of the specified phone numbers.
- To delete the present configuration of an analogue input, a SMS message **without** value has to be sent to the device.

4.3.8 TEL<index>

Syntax	TEL<*index*>=<*type*><*ath_phone*>

This parameter allows you to determine the index in the authorized list where the phone number has to be saved.

<index>

It specifies the entry index of list from 0 to 9 to save the given <ath_phone> number.

<type>:

It specifies the alarm type. It can be set to S, D, V or A corresponding to an SMS, Data call, Voice call or Alarm (listen-in mode) call respectively; see also section 6.2,

<ath_phone>

It determines the authorized network numbers. The specified phone number(s) may also be called "device administrator(s)"

How the parameter could be sent:

SMS command	&CNF UNIT TEL0=S+49123456 &CNF UNIT TEL1=V+49123457 &CNF UNIT TEL2=A+49123458 &CNF UNIT TEL3=D+49123459 &CNF UNIT TEL3
NMEA message	$PSRF108,TEL0=S+49123456*20 $PSRF108,TEL1=V+49123457*25 $PSRF108,TEL2=A+49123458*3E $PSRF108,TEL3=D+49123459*3B $PSRF108,TEL3*6C

Notes

- If you define at least one phone number into the authorized list, the access permissions are allowed only for that number(s) (i.e. except the authorized persons, no other person can access the STEPP II device)
- The access permissions are allowed for all users, if the authorized list is empty (i.e. unspecified persons who knows the phone number of the STEPP II can access it).
- Using the entry type the STEPP II can establish different call types.
- The STEPP II allways compares the caller number with the number(s) stored in the autorized list, and if no identical numbers are found, calls could not be established.
- If the caller number is identical to one of the numbers stored in the autorized list, however the types <type> are different, for example, the type of stored phone numbers is S (specified for SMS) and caller connection is a Voice, Data or Alarm type, the call could not be established. STEPP II hangs-up that call and sends a SMS to the caller including GPS protocols.
- If type <type> connection is not specified, the <ath_phone> number will be available only for Data call (default setting).
- To delete a phone number from the authorized list, a SMS command **without** value has to be sent to the device.

4.3.9 VOL

Syntax	VOL=<*spk_lev*>,<*mic_lev*>

This parameter allows you to adjust the loudspeaker and microphone volume levels. The values of the volume can be specified by entering one of the supported values in a range of 0 to 15.

<*spk_lev*>:

The speaker level value can be defined from 0 (silent) to 15 (loudest).

<*mic_lev*>:

The microphone level value can be defined from 0 (silent) to 15 (loudest).

How the parameter could be sent:

SMS command	`&CNF UNIT VOL=10,12`
NMEA message	`$PSRF108,VOL=10,12*44`

4.3.10 LOG

Syntax	LOG=<*sat*>,<*tmin*>,<*tmax*>,<*dmin*>,<*dmax*>,<*smin*>,<*smax*>

Configuring triggers specifies to the STEPP II device under what circumstances a position should be logged to memory. This parameter allows you to specify/modify the parameters of the history data. The history logging depends on the view satellites and the minimum or maximum time, distance and speed. If all minimum values or just one maximum value is exceeded, then the STEPP II begins storing the NMEA protocols in the history.

Once all parameters required for the new configuration have been specified, transferred (via SMS or locally) and accepted from the device, the STEPP II begins to implement the parameters.

New configurations take effect immediately, so they become permanently enabled until changed.

<*sat*>

It determines the minimum number of in view satellites able to start the history logging.

<*tmin*>

It specifies the minimum time. The unit is second [s]

<*tmax*>

It specifies the maximum time. The unit is second [s]

<*dmin*>

It specifies the minimum distance. The unit is meter [m]

<*dmax*>

It specifies the maximum distance. The unit is meter [m]

<*smin*>

It specifies the minimum speed. The unit is kilometer per hour [km/h]

<*smax*>

It specifies the maximum speed. The unit is kilometer per hour [km/h]

How the parameter could be sent:

SMS command	&CNF UNIT LOG=4,5,3600,0,0,0,0
NMEA message	$PSRF108,LOG=4,5,3600,0,0,0,0*7F

Notes

- To understand and to set properly the <sat>,<tmin>,<tmax> and <dmin>, <dmax>,<smin> and <smax> parameters, please, refer to the chapter 3.1.1.2. In that chapter you will find detailed information.
- If all <tmin>,<dmin> and <smin> limits are exceeded, a history record will be stored. Any null value is ignored.
- If any of <tmax>,<dmax>,<smax> limits is exceeded, a history record will be stored. Any null value is ignored.

4.3.11 ACK

Syntax	ACK=<ack>

This parameter enables you to activate/deactivate the confirmation of SMS sent by STEPP II. If active it confirms successful receipt of a new message (SMS delivering or SMS status report) routed directly to the message sender. Device shall manually disable routing to the message sender by setting the <ack> value to zero. Default setting is 1.

<ack>

Indicates that new SMS status report whether or not has to be received. Following values are available for use:

0 no indications (confirmations) are routed to the message sender.

1 indications (confirmations) are routed to the message sender.

How the parameter could be sent:

SMS command	&CNF *PWD* UNIT ACK=0 &CNF *PWD* UNIT ACK=1
NMEA message	$PSRF108,ACK=0*46 $PSRF108,ACK=1*47

Notes

- If value <ack> is set to 1, the STEPP II device will send back a response to indicate the new configuration has correctly been received and upon success the result code representation "<name> OK" will be displayed to the message sender. If the sent command was a bad command or has a bad parameter the result code representation "<name> bad command" or "<name> bad parameter" will be displayed to the message sender respectively. The response message representation always corresponds to the sent command.
- The device shall not send another result code to the message sender until the previous one is acknowledged (assumed the <ack> value has been set to 1).

4.3.12 GPSRESET

Syntax	GPSRESET=<*n_gps*> GPSRESET=<*n_gps*>,<*startup_mode*[1]>

This parameter allows the STEPP II device to reset the GPS core (in user defined interval of time). It will occur only if the STEPP II is unable to calculate a valid position due to the failure of satellites in view (less then 3 satellites or other conditions). This procedure repeats itself until the valid position computation (a GPS-fix) of GPS receiver is completed.

<*n_gps*>

It specifies the number of minutes to reset the GPS core. The <n_gps> is an integer value, and its unit is minute.

<*startup_mode*[1]>

It specifies the startup-mode of integerated GPS receiver in the STEPP II device. The GPS receiver can manually be initiated to one of three different start up specified in the <startup_mode>. In order to perform one of three different start up modes the <startup_mode> can be set to C, W or H corresponding to Cold, Warm or Hot start respectively. The default setting of startup procedure is set to H corresponding to the Hot start with a period of time of 10 minutes.

How the parameter could be sent:

SMS command	&CNF *PWD* UNIT GPSRESET=10 &CNF *PWD* UNIT GPSRESET=10,C
NMEA message	$PSRF108,GPSRESET=10*2F $PSRF108,GPSRESET=10,C*40

Notes

- After each GPS reset, a SMS message including the GPS position **may** be delivered from the device, if the user-defined configuration in the MSG or GEOMSG parameter is exceeded. The SMS message will be sent to the user-specified phone number in the <m_phone> or <g_phone> field respectively.
- The GPS part resets itself (makes a hot start) every 10 minutes if no configuration is performed (= default setting) and if no GPS fix is obtained. The STEPP II operating with firmware 1.6.2 and earlier versions perform Cold starts, only.
- Please not that, the new <startup_mode> parameter is supported by the firmware 1.6.5 and greater versions, only.

4.3.13 GSMRESET

Syntax	GSMRESET=<*n_gsm*>

This parameter allows the STEPP II device to reset the GSM core (in user defined interval of time).

<*n_gsm*>

Indicates the set time of reset. The <*n_gsm*> is an integer value, and its unit is in minute.

How the parameter could be sent:

SMS command	&CNF *PWD* UNIT GSMRESET=3 &CNF *PWD* UNIT GSMRESET

NMEA message	$PSRF108,GSMRESET=3*00 $PSRF108,GSMRESET*0E

Notes

- If a STEPP II originated data call is set up (indicated by the result code "CONNECT 9600") and no GPS protocols or data are being transmitted to the other call party, the STEPP II device resets the GSM engine after user-defined timeout is exceeded. The countdown starts when the result code "CONNECT 9600" appears to the called party.
- To stop the GSM reset, a SMS message **without** value has to be sent to the device.

4.3.14 GSMCALL

Syntax	GSMCALL=<*n_call*>

This parameter determines the amount of time to wait for data transmission. When a data connection is already established (indicated by the called party result code "CONNECT 9600" and no data is being sent), the STEPP II waits additionally <n_call> seconds before it sends the user defined protocols. The countdown starts when the result code "CONNECT 9600" appears to the called party.

<*n_call*>

Number of seconds to wait for data transmission.

How the parameter could be sent:

SMS command	&CNF *PWD* UNIT GSMCALL=10 &CNF *PWD* UNIT GSMCALL
NMEA message	$PSRF108,GSMCALL=10*65 $PSRF108,GSMCALL*59

Notes

- When a data connection is already established, within the wait <n_call> time, other commands can be sent to the device.

4.3.15 MSG

Syntax	MSG=<*type*><*m_phone*>,<*sat*>,<*tmin*>,<*tmax*>,<*dmin*>,<*dmax*>,<*smin*>, <*smax*>,<*protocols*>

This parameter can be used to configure the STEPP II device for periodically delivering the GPS protocols. The configuration depends on the on view satellites and the minimum or maximum time, distance and speed. If all minimum values or just one maximum value is exceeded, then the STEPP II triggers an alarm SMS to the specified <m_phone> phone number.

An SMS message is sent to the specified <m_phone> phone number when the minimum number of satellites <sat> is available and the condition specified in all <tmax>,<dmax> and <smax> values or just one of <tmin>,<dmin> and <smin> values are satisfied. The SMS message may contain up to two GPS protocols specified in the <protocols> field. Messages are not sent more frequently than one message every 30 seconds (default setting).

<*type*>:

It specifies the alarm type. It can be set to S, D, V or A corresponding to a SMS alarm, Data call, Voice call or Alarm (listen-in mode) call respectively, see also section 6.2

<m_phone>:

It specifies the phone number where the alarm has to be sent.

<sat>

It specifies the minimum number of satellites in view (recommended > 3)

<tmin>

It specifies the minimum time. The unit is second [s]

<tmax>

It specifies the maximum time. The unit is second [s]

<dmin>

It specifies the minimum distance. The unit is meter [m]

<dmax>

It specifies the maximum distance. The unit is meter [m]

<smin>

It specifies the minimum speed. The unit is kilometers per hour [km/h]

<smax>

It specifies the maximum speed. The unit is kilometers per hour [km/h]

<protocols>:

It defines the input GPS protocols, which will be sent to the message sender, only if the alarm type <type> is set to S (for SMS).

How the parameter could be sent:

SMS command	&CNF [PWD] UNIT MSG=S132345678,4,60,0,0,0,0,0,RMCIOP &CNF [PWD] UNIT MSG=S0125156105,4,60,0,0,0,0,0,RMCIOP
NMEA message	$PSRF108,MSG=S132345678,4,60,0,0,0,0,0,RMCIOP*06 $PSRF108,MSG=S0125156105,4,60,0,0,0,0,0,RMCIOP*62

Notes

- If all <tmax>,<dmax> and <smax> limits are exceeded and the minimum number of satellites <sat> is available, SMS messages will periodically be sent to the specified phone number. Any null value is ignored.
- If any of <tmin>,<dmin> and <smin> limits is exceeded and the minimum number of satellites <sat> is available, SMS messages will periodically be sent to the specified phone number. Any null value is ignored.
- To stop transferring of such protocols the command **&REQ POS 0** or **&CNF UNIT MSG** (without parameters) has to be sent to the device.
- The phone number <m_phone> can also be another participant (message receiver), different from the message sender. The STEPP II device transfers the GPS protocols to the assigned participant. This feature allows the specified participants to have knowledge of the device location and/or device events (depending on the user-specified protocol(s)). This feature can be enabled from the device manager (one of the authorized phone numbers, if specified), without the need to enter the phone numbers of these participants in the authorized list. In this way the participants could not access the STEPP II device, however he/they will be informed from the STEPP II device about its current location or other events. This feature can also be called "alarm forwarding", diverting incoming calls to another phone number.

4.3.16 GEOMSG

Syntax	GEOMSG=<*type*><*g_phone*>,<*sat*>,<*tmin*>,<*tmax*>,<*dmin*>,<*dmax*>,<*smin*>,<*smax*>,<*protocols*>

This parameter is the same one as the MSG parameter, however it must be used for geo-fencing configuration, only. That means a SMS message is sent to the specified phone number <g_phone>, and not to the phone number m_phone specified by the MSG parameter. Additionally, the parameter GEOMSG is independent of the MSG parameter configuration.

A SMS message is sent to the specified phone number <g_phone> when the minimum number of satellites <sat> is available and the condition specified in all <tmax>,<dmax> and <smax> values or just one of <tmin>,<dmin> and <smin> values are satisfied. The SMS message may contain up to two GPS protocols specified in <protocols> parameter. Messages are not sent more frequently than one message every 30 seconds.

<type>:

It specifies the type of alarm. It can be set to S, D, V or A corresponding to a SMS alarm, Data call, Voice call or Alarm (listen-in mode) call respectively, see also section 6.2

<g_phone>:

It specifies the phone number where the alarm has to be sent.

<sat>

It specifies the minimum number of satellites in view (recommended > 3)

<tmin>

It specifies the minimum time. The unit is second [s]

<tmax>

It specifies the maximum time. The unit is second [s]

<dmin>

It specifies the minimum distance. The unit is meter [m]

<dmax>

It specifies the maximum distance. The unit is meter [m]

<smin>

It specifies the minimum speed. The unit is kilometers per hour [km/h]

<smax>

It specifies the maximum speed. The unit is kilometers per hour [km/h]

<protocols>:

It defines the input NMEA messages (see chapter 4.2) that will be sent to the message sender, only if the alarm type <type> is set to S (for SMS).

How the parameter could be sent:

SMS command	&CNF [PWD] UNIT GEOMSG=S132345678,4,60,0,0,0,0,0,RMCIOP &CNF [PWD] UNIT GEOMSG=S0125156105,4,60,0,0,0,0,0,RMCIOP &CNF UNIT GEOMSG
NMEA message	$PSRF108,GEOMSG=S132345678,4,60,0,0,0,0,0,RMCIOP*4B $PSRF108,GEOMSG=S0125156105,4,60,0,0,0,0,0,RMCIOP*70 $PSRF108,GEOMSG*16

Notes

- If all <tmax>,<dmax> and <smax> limits are exceeded and the minimum number of satellites <*sat*> is available, SMS messages will periodically be sent to the specified phone number. Any null value is ignored.
- If any of <tmin>,<dmin> and <smin> limits is exceeded and the minimum number of satellites <sat> is available, SMS messages will periodically be sent to the specified phone number. Any null value is ignored.
- To stop transferring of protocols the command **&CNF UNIT GEOMSG** (without parameters) has to be sent to the device.
- The phone number <g_phone> can also be another participant (message receiver), different from the message sender. The STEPP II device transfers the GPS protocols to the assigned participant. This feature allows the specified participants to have knowledge of the device location and/or device events (depending on the user-specified protocol(s)). This feature can be enabled from the device manager (one of the authorized phone numbers, if specified), without the need to enter the phone numbers of these participants in the authorized list. In this way the participants could not access the STEPP II device. This feature can also be called "alarm forwarding".

4.3.17 GEO<index>

Syntax	GEO<*index*>=<*reg_name*>,<*reg_id*>,<*long_UL*>,<*lat_UL*>,<*long_LR*>,<*lat_LR*>,<*when*>

This parameter allows the STEPP II device to determine an area (geofencing region). Up to 99 areas are possible. Chapter 3.2 gives more information about the features of geofencing.

<index>:

The region index (00–99). The 00 region is the master region.

<reg_name>:

String, optional region name up to 20 characters are available. The text is sent in any message related to the respective region.

<reg_id>:

The region ID is an optional positive number that identifies an area. It can be the same one for different areas that are overlapped to each other.

<long_UL>,<long_UL>,<lat_LR>,<lat_LR>:

The region boundaries. Three different formats for Latitude/Longitude can be used (degrees, minutes, secondes or decimal or NMEA format). For more information, see chapter 6.1.

<when>:

Controls when to send periodical messages related to the region (in addition to the messages when a region boundary is crossed). Indicates the type of activation which can be set to:

0 the alarm is issued by leaving the defined zone.

1 the alarm is issued by entering into the defined zone.

2 the alarm is issued by entering and leaving the defined zone.

How the parameter could be sent:

SMS command	&CNF UNIT GEO01=Ilmenau,01,50.69181,10.89674,50.67472,10.94447,0 &CNF UNIT GEO02=Langewiesen,02,50.68175,10.95133,50.66715,10.98726,1 &CNF UNIT GEO03=Manebach,03,50.68505,10.85257,50.67375,10.86674,2 &CNF UNIT GEO03
NMEA message	$PSRF108,GEO01=Ilmenau,01,50.69181,10.89674,50.67472,10.94447,0 *1C $PSRF108,GEO02=Langewiesen,02,50.68175,10.95133,50.66715,10.98726,1*00 $PSRF108,GEO03=Manebach,03,50.68505,10.85257,50.67375,10.86674,2*1C $PSRF108,GEO03*4C

Notes

- Please note that, to prevent the alarms SMS sent from the STEPP device after each geo-fencing area configuration, at first configure the geo-fencing area(s) via SMS, and finally configure the destination number <g_phone> where the SMS alarm should be sent to. It could be performed using the command:

  &CNF UNIT GEOMSG=S012345678,3,0,0,0,0,0,0,RMCGGA
- Different possibilities can be combined when specifying the control indicator <when> in the command to be sent.
- If the minimum time <tmin> specified by the GEOMSG parameter is exceeded, SMS messages will periodically be sent to the message receiver as long as the device is entered in a restricted area.
- To delete the present configuration of GEO<index>, a SMS message **without** value has to be sent to the device.

4.3.18 DEL

Syntax	DEL=<*asci_code*>

The responded SMS message from the STEPP II device includes the end sequence <CR><LF> between each of the <alarm_text>, <first_protocol> and <second_protocol> as default setting, see chapter 4.1.3. The default delimiter <CR><LF> can be replaced with user configurable delimiter by setting the DEL parameter to an ASCII value (i.e. 32 for space and 13 for CR).

Parameter Description

<asci_code>:

it specifies the ASCI code value.

How the parameter could be sent:

SMS command	&CNF UNIT DEL=124
NMEA message	$PSRF108,DEL=124*45

Notes

- Do not use this command, if not required.

4.4 How to send SMS message to the STEPP II device

Syntax

Write Command	The text mode has to be set using AT+CMGF=1 AT+CMGS=<*STEPP_II_phone_number*><CR> <*text*> <*ctrl-z*>/<*esc*>
Response(s)	+ CMGS: <m_ref> OK/ERROR If sending fails see notes below.

Command Description

The write command transmits a short message from GSM modem (connected to a PC/laptop) to the STEPP II device using a terminal program.

After invoking the write command wait for the prompt ">" and then start to write the message (SMS command(s) or NMEA message(s)). To send the message, simply press <*CTRL-Z*>. After the prompt a timer will be started to observe the input. To abort sending use <*ESC*>. Abortion is acknowledged with "OK", though the message will not be sent. The message reference <m_ref> is returned to the GSM modem on successful message delivery.

This description is applied for the GSM modems distributed by Falcom GmbH. Please refer to the user manual of the used GSM modem and search for the "How to send SMS message to the network".

Parameter Description

<STEPP_II_phone_number>

It specifies the target phone number (STEPP II phone number).

<CR>

It specifies the <RETURN> key or carriage return ASCI code (13), which has to be entered to enable the text entry <*text*>.

<text>

It specifies the text (NMEA message or SMS command) which has to be sent to the target device (STEPP II terminal), see chapters 4.5 and 4.6

<ctrl-z>

It specifies the keyboard shortcut <**CTRL**+**Z**> for sending the text to the specified phone number <*STEPP_II_phone_number*>.

Notes

- The maximum length of a received SMS by the STEPP II device is predefined up to 160 characters using the 7 bit GSM coding scheme. If the length is longer then 160 characters the STEPP II ignores that SMS command.
- If sending fails, for example, if a message is too long, a result code is responded with "ERROR".
- Note that some providers do not recognize an @ symbol used within a <*text*> field, see commands in the next chapters. A widely used alternative is typing "*" as defined in GSM 03.40 (GPP TS 23.40).
- All characters (SMS command or NMEA message) entered behind the prompt ">" will be recognized as GSM characters.

Example:

AT+CMGS=012345678
> &CNF UNIT NAME=alfa_car <CTRL+Z>

4.5 SMS configuration Commands– supported from firmware 1.6.2

To control your STEPP II device you can simply send SMS commands over-air (GSM network). Please, keep in mind, the STEPP II device works properly using SMS commands, only when PIN authentication of the used SIM card and basis configurations have locally been done (if PIN is required) and it is also registered in the GSM network.

SMS messages described below can be used to configure the STEPP II device, to request specific information via SMS such as the position and to instruct the device to initiate a GSM connection such as a data call. After the configuration is accepted and completed, the STEPP II device sends back its information via SMS in various situations. The stored history data can be retrieved at a later time over-air via GSM data connection. Based on the user remote configuration the stored history data into the FLASH memory can also locally be received for further evaluation.

The STEPP II device offers two different access permissions that can be performed by using the SMS commands:

- If a SMS password and/or at least one phone number is defined into the authorized list, the access permissions are allowed only for specific users (i.e. except the authorized persons, no other person can access the STEPP II device)
- If no SMS password and/or none phone number is specified into the authorized list, the access permissions are allowed for all users (i.e. unspecified persons who knows the phone number of the STEPP II can access it).

If a SMS password is defined, the STEPP II device will not accept SMS commands without that password, so it should be included in SMS messages after the message header such as &REQ or &CNF. The SMS password is indicated as [*PWD*] or *PWD*, indicating that it is an optional field. Additionally, the *PWD* parameter protects the STEPP II device from the unidentified accesses.

The device also provides four digital outputs, four digital inputs, two analogue inputs and digital inputs for the ignition and battery status in a car. Each of the inputs can be configured to trigger the device to send a SMS message or initiate a data, alarm or voice call.

All SMS commands have to be sent in uppercase (capital letters) otherwise the configuration could not be accepted.

None of these SMS commands can be sent locally through serial interface to the device. These commands can only be sent as a SMS message (over GSM network).

4.5.1 &CNF [PWD] UNIT NAME=VALUE[:NAME=VALUE] Write device configuration

Command	&CNF [PWD] UNIT <patameter_name>=<value>:<parameter_name>=<value>...:<parameter_name>=<Value>
Examples	&CNF *PWD* UNIT NAME=name &CNF *PWD* UNIT RING=2 &CNF *PWD* UNIT PWD=password &CNF *PWD* UNIT PORT1=Z,1,1 &CNF *PWD* UNIT KEY1=S123456,Alarm Input 1,RMC &CNF *PWD* UNIT TEL0=V+4912345678 &CNF *PWD* UNIT VOL=10,12 &CNF *PWD* UNIT LOG=4,5,3600,0,0,0,0 &CNF *PWD* UNIT IGN=15 &CNF *PWD* UNIT IN1= S123456,Alarm Analogue1,2,3,IOP &CNF *PWD* UNIT TEL1=S0123456:VOL=7,10 &CNF *PWD* UNIT TEL1 &CNF UNIT VOL=10,12 ……

Command Description

Using this command the STEPP II device can be configured and a range of parameters can be set. Each parameter can be configured and adapted to the user requirements.

Parameter Description

<parameter_name>

It indicates that the inserted parameter name will be changed or new configured. It depends on the parameter name to be handled; please, refer to the chapter 4.3. In that chapter you will find more details about the supported parameter.

The following parameter name *<parameter_name>* can be used:

NAME	It allows you to define or change the device name.
PWD	It allows you to define or to change the device password.
RING	It is intended for modifying to your own preferences the ring melody for voice calls.
PORT<index>	It is intended for changing the present status of the STEPP II digital outputs and its *<index>* specifies the index of output ports.
KEY<index>	It is intended for configuring the digital inputs of the STEPP II and its *<index>* specifies the index of digital inputs.
IN<index>	It is intended for configuring the analogue inputs of the STEPP II and its *<index>* specifies the index of analogue inputs.
TEL<index>	It allows you to define the phone numbers which have to be saved in the access/authorization list, and the *<index>* specifies the entry index of list.

VOL	It allows you to adjust the loudspeaker and microphone volume levels.
LOG	It allows you to modify/set the parameters for the history data.
ACK	It allows you to activate/deactivate the confirmation of SMS sent by STEPP II.
GPSRESET	It allows the STEPP II device to reset periodically the GPS core.
GSMRESET	It allows the STEPP II device to reset periodically the GSM core.
GSMCALL	It allows you to determine the amount of time to wait for data transmission.
MSG	It allows you to configure the STEPP II device for periodically delivering of GPS protocols.
GEOMSG	It allows you to configure the STEPP II to get the geo-fencing messages periodically or only one-time.
GEO<index>	It allows the STEPP II device to determine an area (geofencing region).
DEL	It allows you to specifiy a delimiter in the received SMS messages.

<value>

It specifies the value(s) of the entered parameter name. The value depends on the parameter name to be handled; please, refer to the chapter 4.3. In that chapter you will find more details about the supported parameter.

Notes

- If more than one parameter has to be sent within a SMS message (command), they should be separated by colons [:]. In the table above, the type *<S>* is used to initiate that type of GSM connection is SMS. The *<0123456>* is the phone number to connect to and *<text>* is the text to be sent. Keep in mind that the length of text within a SMS is limited to 160 characters.
- If no authorized numbers are set, the device accepts all incoming calls and messages. To prevent the STEPP II device from accepting all calls and messages, up to ten authorized numbers are available.
- If the type *<type> (if the entered parameter supports it)* of GSM connection is set to D, V or A corresponding to a Data call, Voice call or Alarm (listen-in mode) call respectively, no text *<text>* and protocol *<protocols>* are required.
- The values of the loudspeaker and microphone volumes recommanded to be specified at 6.
- If a message including one of the aforementioned parameter is sent **without** value then the current status (value) of that parameter stored into the FLASH memory will be deleted (deactivated).
- In the history of STEPP II the events of $GPIOP protocol can also be saved.

4.5.2 &CNF [PWD] PASS Define a password for SMS configuration

Command	&CNF [PWD] PASS *<password>*

Examples	`&CNF PWD PASS <password>`
	`&CNF PASS <password>`
	`&CNF PWD PASS`

Command Description

Use this command when you want individually to define or to change a password specified for the lock of unidentified accesses. A password consists of a string of numeric digits with a length in the range of up to 40 characters. Additionally, the password may also be configured using the PWD parameter name. Accordingly, the password may be called "device password". The password is not associated with the PIN of the SIM card.

Parameter Description

<password>

It specifies the password for the configuration by SMS. Password consists of a string with a length up to 40 characters.

Notes

- The unblocking procedure is performed, if no password value *<password>* is allocated, whereby the old password [*PWD*] has to be included. If you have forgotten the parameter [*PWD*], the unblocking procedure is described in chapter 6.3.

4.5.3 &REQ [PWD] POS [n] Request vehicle position with defined period

Command	&REQ [*PWD*] POS *<n>*

Examples	`&REQ PWD POS 0`
	`&REQ PWD POS 5`
	`&REQ POS 10`

Command Description

Using this command the STEPP II device position can be requested, either for just one time or periodically. The position (a SMS message containing the $GPGGA and $GPRMC NMEA sentences) is returned to the message sender.

Parameter Description

<n>

Request device (vehicle) position every *<n>* minute(s).

Notes

- If no period *<n>* is given, the sending of position is stopped.
- If a period *<n>* is specified (in seconds), the <tmin> on the MSG parameter is also modified so that the position is sent periodically.
- If the period *<n>* is set to 0, the periodic messages are stopped and the position (GPGGA and GPRMC) is sent once.

4.5.4 &REQ [PWD] POS Configure and request vehicle position with defined period

Command	&REQ [PWD] POS <sat>,<tmin>,<tmax>,<dmin>,<dmax>,<smin>,<smax>,<protocols>
Examples	&REQ *PWD* POS 4,0,0,0,0,0,0,RMCIOP &REQ *PWD* POS 4,0,0,0,50,25,50,RMC &REQ *PWD* POS 4,30,0,0,50,25,50,RMC &REQ *PWD* POS 4,60,0,0,50,25,50,GGAIOP &REQ POS 4,60,0,0,50,25,50,GGAIOP

Command Description

Using this command the STEPP II device can be configured and based on the user limited configuration. It is able to implement it and in case of limited configuration is exceeded, the STEPP II sent the position requested by the user; either for just one time or periodically (depends on the user set <tmin> value). The position (a SMS message containing one of possible combination of NMEA sentences, e.g. $GPRMC and $GPIOP) is returned to the message sender every <tmin> second(s).

To understand and properly set the following parameters, please, refer to the chapter 3.1.1.2. In that chapter you will find detailed information about the set parameters.

Parameter Description

<sat>

It specifies the minimum number of satellites in view (recommended > 3)

<tmin>

It specifies the minimum time. The unit is second [s]

<tmax>

It specifies the maximum time. The unit is second [s]

<dmin>

It specifies the minimum distance. The unit is meter [m]

<dmax>

It specifies the maximum distance. The unit is meter [m]

<smin>

It specifies the minimum speed. The unit is kilometers per hour [km/h]

<smax>

It specifies the maximum speed. The unit is kilometers per hour [km/h]

<protocols>:

It defines the input GPS protocols that will be sent to the message sender. The STEPP II device can send a set combination of provided NMEA sentences every user defined <tmin> time.

Notes

- If the STEPP II is unable to calculate a valid position due to the satellites in view (less then 3 satellites), und the device is configured to send periodically the messages, then it stops sending of messages, und when a valid position is being obtained it starts again sending out of user defined messages.
- The <tmin> parameter has to be ≥ 30.
- The <sat> parameter has to be ≥ 4

- If the number of satellites <sat> is set to **0** the STEPP II device ignores all other parameters and sends out to the message sender the $GPGGA and $GPRMC protocols, only.
- Keep in mind, if the &REQ [*PWD*] POS command (with user-defined parameters) is sent to the STEPP II device, the MSG parameters are also modified. The difference between the &REQ [*PWD*] POS command and the MSG parameter is:
- The STEPP II device transfers the user-defined GPS protocols only to message sender, if the &REQ [*PWD*] POS (with parameters) is sent to the STEPP II device.
- Using the MSG parameter, the STEPP II device transfers the user-defined GPS protocols to the specified phone number <m_phone> which can also be another message receiver, different from the message sender.
- If the parameter <tmin> is set to "0" the SETPP II will send a single message to the message sender.

4.5.5 &REQ [PWD] CNF Read the configuration of device

Command	&REQ [PWD] CNF
Examples	`&REQ PWD CNF`
Respond SMS	stepp_II CNF01 NAME=stepp_II:LOG=3,1,900,0,0,0,0:GEO01=Langewiesen,1,5041 stepp_II CNF02 PIN=1111:NMEA=9600-8N1,GGA.1,GLL.1,GSA.1,GSV.1,RMC.1,IOP.1,GS stepp_II CNF03 PORTS=P1#E,0,0,P2#Z,5,5,P3#A,0,0,P4#A,0,0:UNIT=FAL STEPP V1.6.2 stepp_II END04 GPSFIX=5040.4012 1058.8418 782464386 3976357 771535 4910975

Command Description

Using this command the STEPP II device delivers to the message sender in one or more SMS messages whole configuration settings stored in the internal FLASH memory. If parameter *PWD* is already specified, the *PWD* value will not be delivered from the device.

Notes

- If the configuration does not fit in (due to limited text length within a SMS of 160 characters) one SMS message, it is sent in several SMS messages. In this case, CNF is replaced by CNFxx, where xx is the message index starting from 00. In the last message, CNF is replaced by ENDxx. See respond messages in table above.

4.5.6 &REQ [PWD] CONNECT Initiate a return call as a data call

Command	&REQ [*PWD*] CONNECT *<phone>*

Examples	`&REQ PWD CONNECT 1234567`
	`&REQ CONNECT +491234567`
	`&REQ PWD CONNECT 0221345789`
	`&REQ PWD CONNECT`

Command Description

Using this command the STEPP II device can be instructed to start a GSM connection. It initiates a return call from the device as a data call and transfers the set GPS protocols.

The target phone number can also be another receiver (not the message sender). The STEPP II device will transfer its GPS positions to the target user-specified phone number.

Parameter Description

<phone>

It specifies the target phone number where the GSM data connection has to be established. The specified call number should be for data call.

Notes

- If no number is given, the device will start a data connection to the message sender.

4.5.7 &REQ [PWD] PHONE<index> [phone] Initiate a listen or voice call

Command	&REQ [PWD] PHONE<index> <phone>
Examples	&REQ PHONE1 0123405 &REQ PHONE2 0123045

Command Description

Using this command the STEPP II device can be instructed to start a GSM connection. It initiates a return call from the device as an alarm or voice call.

The target phone number can also be another receiver (not the message sender). The STEPP II device will establish an alarm or voice call to the target specified phone number. Please, refer to the chapter 6.2 for more information about the voice and alarm calls.

Parameter Description

<index>

It specifies the entry index of call connection type. The following values are supported:

1 initiates a return call from the device as an alarm (listen-in mode) call

2 initiates a return call from the device as a voice call

<phone>

It specifies the target phone number where the GSM call connection has to be established. The specified call number should be for voice call.

Notes

- If no number is given, the device will start a voice or alarm call to the message sender.

4.5.8 &REQ [PWD] START [latitiude],[longitude] Request vehicle position every defined period

Command	&REQ [PWD] START <latitiude>,<longitude>
Examples	&REQ *PWD* START &REQ *PWD* START 50.70 10.98

Command Description

The GPS system can be reset to a particular latitude and longitude using this SMS message. This command resets the GPS receiver and GSM engine of the STEPP II as well.

Parameter Description

<latitiude>

It specifies the Latitude of the device. Its unit is degree.

<longitude>

It specifies the Longitude of the device. Its unit is degree.

Notes

- If the message sender knows the coordinates of the STEPP II device, the latitude and longitude can be specified for a quick position fix.

4.5.9 &CNF [PWD] WATCH [radious],[text] Set a master region

Command	&CNF [PWD] WATCH *<radius>,<text>* &CNF [PWD] WATCH <radius>,<text>,<type><g_phone>,<sat>, <tmin>,<tmax>,<dmin>,<dmax>, <smin>,<smax>,<protocols>[1]

Examples	`&CNF PWD WATCH 200,The alfa car is stolen`
	`&CNF PWD WATCH 200,The alfa_car is stolen,S0125156105,4,0,0,0,0, 0,0,RMC`
	`&CNF PWD WATCH 0`

Command Description

This SMS command can be performed by monitoring an abandoned vehicle fitted with STEPP II device. Sending this command, the STEPP II device generates automatically a Master region (GEO00) with a given *<radius>* value. The center of the generated Master region is the current STEPP II position. If the vehicle goes out of this Master region, an alarm will be sent to the pre-defined phone number <g_phone> from the GEOMSG parameter.

The firmware 1.6.5 and greater versions support the GEOMSG settings to be included into the &CNF WATCH as one line (command). So a Master region can be configured at once, instead of sending at first the command GEOMSG parameter and then initialize the Master region via &CNF WATCH (feature of the firmware 1.6.2 and early versions) by using two separated SMS.

Parameter Description

<radius>

Optional positive number, unit is meter. Place the vehicle into a restricted circle zone, whereby the current position (including Latitude and Longitude) of the STEPP II is the center of circle and <radius> is the radius of circle.

<text>

String, the SMS message which will be delivered from the STEPP II device to the target phone number <g_phone> specified by the GEOMSG parameter. This parameter is optional, up to 20 character can be set.

<type[1]>

It specifies the type of alarm. It can be set to S, D, V or A corresponding to a SMS alarm, Data call, Voice call or Alarm (listen-in mode) call respectively, see also section 6.2.

<g_phone[1]>

It specifies the phone number where the alarm has to be sent.

<sat[1]>

It specifies the minimum number of satellites in view (recommended > 3)

<tmin[1]>

It specifies the minimum time. The unit is second [s]

<tmax[1]>

It specifies the maximum time. The unit is second [s]

<dmin[1]>

It specifies the minimum distance. The unit is meter [m]

<dmax[1]>

It specifies the maximum distance. The unit is meter [m]

<smin[1]>

It specifies the minimum speed. The unit is kilometers per hour [km/h]

<smax[1]>

It specifies the maximum speed. The unit is kilometers per hour [km/h]

<protocols[1]>

It defines the input NMEA messages (see chapter 4.2) that will be sent to the message recipient, only if the alarm type <type> is set to S (for SMS).

Notes

- A SMS alarm message is issued, if the vehicle fitted with STEPP II moves beyond the user-defined master region. Please, note that, if master region is activated, other set Geo-fencing areas are deactivated.
- If the value <radius> is set to 0, then the device deactivates the master region and automatically activates the other set Geo-fencing areas (if defined).
- !!!! Please note that, operating with firmware 1.6.2 and early versions, you have to configure first the destination number where the SMS alarm should be sent to. This could be done by using the command:
- &CNF UNIT GEOMSG=S012345678,3,60,0,0,0,0,0,IOPRMC
- (this is only an example, other configuration events are also possible). Finally configure the Master region via SMS command.
- The parameters <sat>,<tmin>,<tmax>,<dmin>,<dmax>,<smin>, <smax> or <protocols> integrated into the &CNF WATCH command are the same one provided by the GEOMSG, but they are supported to be entered in the &CNF WATCH command by using the firmware 1.6.5 and greater versions, only.
- If one of the parameters <sat>,<tmin>,<tmax>,<dmin>,<dmax>, <smin>,<smax> or <protocols> is specified, the GEOMSG settings are also modified based on the user defined value.
- If the Master region is deactivated (by sending the command &CNF WATCH 0), the GEOMSG settings are still available. The GEOMSG settings can only be cleared separately. If these settings are no more required for other geofencing regions by the user, to clear the command (&CNF UNIT GEOMSG) without parameter has to be sent to the STEPP II device.

4.6 NMEA Commands – supported from firmware 1.6.2

The NMEA messages can also be sent to the STEPP II terminal via SMS configuration. If more than one NMEA message are to be sent in one SMS message, they should be separated by inserting the End Sequence termination line (carriage return and line feed). Please note that, if an SMS password is enabled, NMEA sentences starting with $PSRF108 are not accepted via SMS configuration.

All of these NMEA messages can be sent to the device either locally through serial interface or as a SMS over-air (GSM network).

If a Data call is established to the STEPP II device, the NMEA messages can also be directly transmited.

4.6.1 $PSRF108,NAME=VALUE[:NAME=VALUE] Write device configuration

Command	$PSRF108,<*parameter_name*>=<*value*>:<*parameter_name*>=<*value*> ...:<*parameter_name*>=<*Value*><*CkSum><CR><LF>
Examples	$PSRF108,PIN=0000*68 $PSRF108,NAME=tommy001*6B $PSRF108,RING=2*1F $PSRF108,PWD=123456*7B $PSRF108,PORT1=Z,1,1*4D $PSRF108,KEY1=S123456,Alarm Input 1,RMC*65 $PSRF108,TEL0=V+4912345678*2A $PSRF108,VOL=10,12*44 $PSRF108,LOG=4,5,3600,0,0,0,0*7F $PSRF108,IN1=S123456,Alarm Analogue1,2,3,IOP*72 $PSRF108,TEL1=S0123456:VOL=7,10*7F $PSRF108,TEL1*6E

Command Description

Using this command the STEPP II device can be configured and a range of parameters can be set. Each parameter can be configured and adapted to the user preference.

Parameter Description

<parameter_name>

It indicates that the inserted parameter name will be changed or new configured. It depends on the parameter name to be handled. Please, refer to the chapter 4.3. In that chapter you will find more details about the supported parameter.

The following parameter name <*parameter_name*> can be used:

PIN	It allows you to set the PIN of used SIM card (only locally).
NAME	It allows you to define or change the device name.
PWD	It allows you to define or to change the device password.
RING	It is intended for modifying to your own preferences the ring melody for voice calls.

PORT<index>	It is intended for changing the present status of the STEPP II digital outputs and its *<index>* specifies the index of output ports.
KEY<index>	It is intended for configuring the digital inputs of the STEPP II and its *<index>* specifies the index of digital inputs.
IN<index>	It is intended for configuring the analogue inputs of the STEPP II and its *<index>* specifies the index of analogue inputs.
TEL<index>	It allows you to define the phone numbers which have to be saved in the access/authorization list, and the *<index>* specifies the entry index of list.
VOL	It allows you to adjust the loudspeaker and microphone volume levels.
LOG	It allows you to modify/set the parameters for the history data.
ACK	It allows you to activate/deactivate the confirmation of SMS sent by STEPP II.
GPSRESET	It allows the STEPP II device to reset periodically the GPS core.
GSMRESET	It allows the STEPP II device to reset periodically the GSM core.
GSMCALL	It allows you to determine the amount of time to wait for data transmission.
MSG	It allows you to configure the STEPP II device for periodically delivering of GPS protocols.
GEOMSG	It allows you to configure the STEPP II to get geo-fencing messages periodically or one-time regions for periodically delivering of GPS protocols.
GEO<index>	It allows the STEPP II device to determine an area (geofencing region).
DEL	It allows you to specifiy a delimiter on the received SMS messages.

<value>

It specifies the value(s) of the entered parameter name. The value depends on the parameter name to be handled; please, refer to the chapter 4.3. In that chapter you will find more details about the supported parameter and an improved value description.

<*CkSum>

CheckSum has to be calculated.

Notes

- If more than one parameter has to be sent within this message, they should be separated by colons [:]. Keep in mind, if this message is supposed to be sent as a SMS, the length of text within a SMS is limited to 160 characters.
- If no phone numbers are set in the authorized list, the device accepts all incoming calls and messages. To prevent the STEPP II device from

accepting all calls and messages, at least an authorized number has to be available in the authorized list.

- If a message including one of the aforementioned parameter is sent **without** value then the corrent value of that parameter stored into the FLASH memory will be deleted (deactivated).
- The events of $GPIOP protocol can also be stored in the history data.

4.6.2 $PSRF103,[msg],00,[rate],01[*CkSum]<CR><LF> Select protocols to be sent to

Command	$PSRF103,<msg>,00,<rate>,01<*CkSum><CR><LF>
Examples	$PSRF103,00,00,00,01*24 $PSRF103,00,00,01,01*25 $PSRF103,01,00,00,01*25 $PSRF103,01,00,01,01*24 $PSRF103,02,00,00,01*26 $PSRF103,02,00,01,01*27 $PSRF103,03,00,00,01*27 $PSRF103,03,00,01,01*26 $PSRF103,04,00,00,01*20 $PSRF103,04,00,01,01*21

Command Description

This command is used to control the output of supported NMEA messages GGA, GLL, GSA, GSV, RMC, GPIOP and GPGSM. Using this command message, NMEA messages may be polled once, or setup for periodic output.

Parameter Description

<msg>

It specifies the NMEA message which will be configured. Following values are available:

00	corresponds to the GPGGA message
01	corresponds to the GPGLL message
02	corresponds to the GPGSA message
03	corresponds to the GPGSV message
04	corresponds to the GPRMC message
07	corresponds to the GPIOP message
08	corresponds to the GPGSM message

00

predefined value

<rate>

specifies the message period in seconds. Following values can be set:

00	disables the message specified in the *<msg>* field
01	enables the message specified in the *<msg>* field

01

predefined value.

<*CkSum>

CheckSum has to be calculated.

Notes

- If the field *<rate>* is specified to 0, the selected message *<msg>* will be disabled (switched OFF).

4.6.3 $PSRF109,[data][*ChSum]<CR><LF> Download the history data

Command	$PSRF109,<*r_data*>,<*s_date*>,<*s_time*>,<*e_date*>,<*e_time*> <**CkSum*><CR><LF>
Examples	$PSRF109,1,280104,155811,300104,150000*36

Command Description

Download history from STEPP II using specified parameters. This command enables you to retrieve stored GPS history data either from a directly connected STEPP II or from communicating one via a data line.

The data into the on-board memory are stored according to UTC Time (Universal Time Coordinated). Therefore, the parameters of this command are also based on the UTC time.

Parameter Description

<r_data>

It specifies the download history format. The default for the download date format is set to 0 (NMEA format). The GPS data can be configured in the following data formats:

0 corresponds to the request history in the **NMEA** format

1 corresponds to the request history in the **binary** format

<s_date>

Specifies the start date. Its format is DDMMYY

<s_time>

Specifies the start time. Its format is HHMMSS

<e_date>

Specifies the end date. Its format is DDMMYY

<e_time>

Specifies the end time. Its format is HHMMSS

<*CkSum>

CheckSum has to be calculated.

Notes

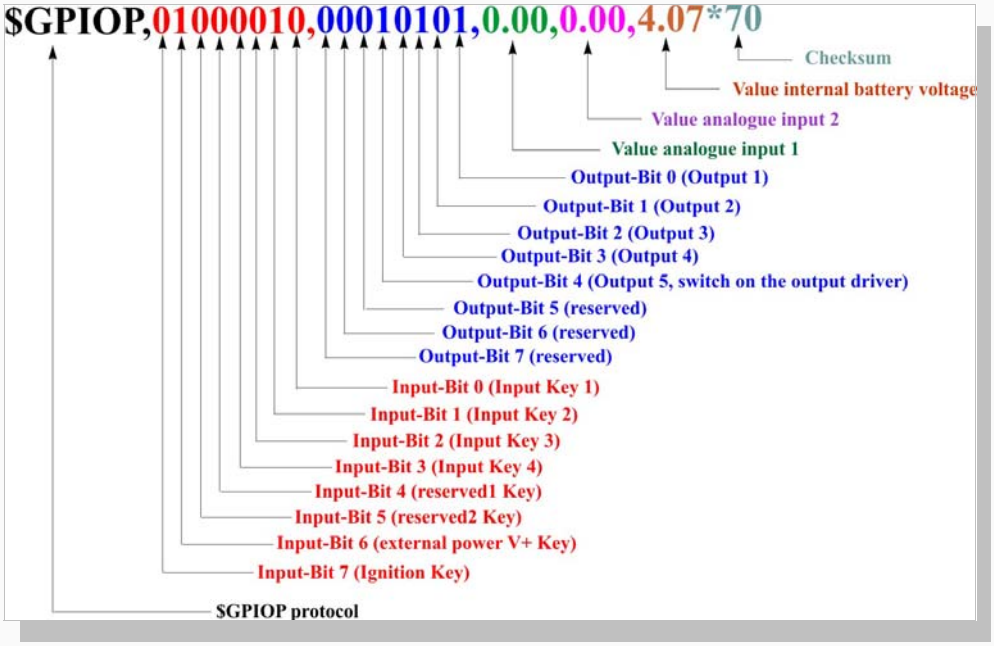
- To download the history data, please consider the UTC Time, otherwise you will download the stored data in the incorrect time.

4.7 GPIOP format protocol

The $GPIOP status protocol appears in the following format:

$GPIOP 8-Bit value – Input 8-Bit value – Output Value analogue input 1 Value analogue input 2 Value internal battery voltage GPS	Status protocol I I I I I I I I - Input-Bits KEY8..KEY1 OOOIOOOO - Output-Bits PORT8..PORT1 adc1 – A/D – Wandler 1 – Molex Pin2 adc2 – A/D – Wandler 2 – Molex Pin4 Voltage of internal battery configured GPS protocol In the example the inputs / outputs marked red have been set. Note that, the fifth output (`bit 4` counting from left to right) will always be set to logic HIGH (1). This output could not be accessed from the user, it only indicates that the output driver is suitched on. I I I I I I I I = Input 2 and 8 (Ignition) active OOOOOOOO = Output 1 and 3 activated
$GPIOP,01000010,00010101,0.00,0.00,4.07*70	

The below schematic shows the structure and description (of each bit) of the $GPIOP protocol message.



4.8 Description of the binary format

The binary format stored in the memory of the STEPP II device has the following structure.

Name	Format	Checksum	End Sequence
$GPLOG	<*data_1*>,<*data_2*>	<**CKSUM*>	<CR><LF>
$GPLOG,19590B9E336B822E685F2C626403001042150020025,195910DE33BBCB2EB69C2CA7B105001000100000000*62<*CR*><*LF*>			

A record line in the binary format consists of two data records - the <data_1> and <data_2> fields, similar regarding the build structure, with a maximum data compression. Data records <data_1> and <data_2> are comma delimited ",". This format can be applied when a large amount of recorded data in a short time is required to be downloaded from the STEPP II device remotely via a data call connection.

The following table is intended as a quick reference to explain the stored binary data.

Name	Bytes	Binary (hex)		Units	ASCII (Dec)	
		Scale	Example		Scale	Example
$GPLOG	-	-	-	-		
<*data_1*> first data record						
GPS time* (since 01/06/1980)	4		19590B9E	Seconds		425266078
X-position**	3		336B82	m		3369858
Y-position**	3		2E685F	m		3041375
Z-position**	3		2C6264	m		2908772
SVs in Fix***	1		03			3
Velocity	2	*100	0010	m/s	Vs÷100	0.1
GPIO	2		4215		-	has to be converted in the binary format, see chapter 4.8.1
Analogue 1	2		0020		V÷36.3/256	2.83
Analogue 2	2		0025		V÷36.3/256	4.54
Delimiter[,]	-	-	-	-	-	-
<*data_2*> second data record						
It has the same structure as first data record, but it may contains different values.						
*0D	-	-	-	-		

* GPS time — The number of seconds since Saturday/Sunday Midnight UTC, with time zero begging this midnight. Used with GPS Week Number to determine a specific point in GPS Time.

** X, Y, Z position — Coordinates of user's position in ECEF (meters). The Earth-centered Earth-Fixed (ECEF) is a Cartesian coordinate system with its origin located at the center of the Earth. The coordinate system used by GPS to describe 3-D location. For WGS-84 (World Geodetic System 1984) reference ellipsoid. ECEF coordinated have the Z-axis aligned with the Earth's spin axis, The X-axis through the insertion of the Prime meridian and the Equator and

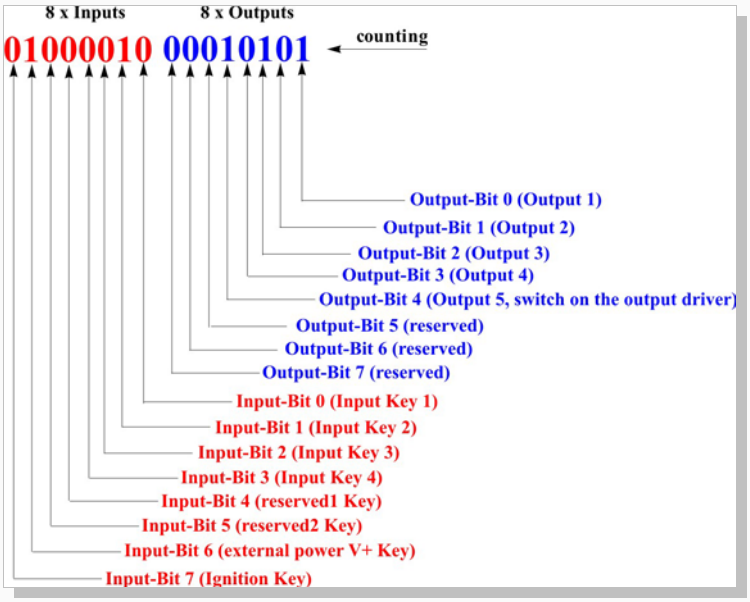
the Y-axis is rotated 90 degrees East of the X-axis about the Z-axis.

***SVs in Fix — For validated and invalidated solution definition, see table below.

SVs in Fix		Description
Hex	**ASCII**	
0 x 00	0	No navigation solution
0 x 01	1	1 Satellite solution
0 x 02	2	2 Satellite solution
0 x 03	3	3 Satellite solution
0 x 04 **to** 0 x 0C	4 **to** 12	> 3 Satellite solution
Example		
0 x 6	6	6 satellites are in view

4.8.1 Convert the GPIO hexadecimal value to binary format

In order to identify the status of provided GPIO states, you have to convert the corresponding hexa value in the binary format. The schematic below shows the structure of the GPIO protocol message converted from hexa value (4215) in the binary format. The GPIO state consists of a 16 bit values (4 Bytes), where the first 8 bits (0-7 bits, counting begin from right to left) inicate the outputs state and the last 8 bits (8-15 bits) indicate the inputs state. Each bit contains the current state of the corresponding STEPP II device input/output. If the bit x is set to *1/0*, it means that the input or output is set to *HIGH/LOW* state, respectively.



5 HOW TO UPDATE THE NEW FIRMWARE INTO THE STEPP II

Please refer to the "stepp_II_user_guide.pdf" user manual, chapter 2.

6 APPENDIX A

6.1 How to convert the coordinates

In order to convert coordinates from degrees, minutes, seconds format to decimal format, use this easy formula:

```
degrees + (minutes/60) + (seconds/3600)
```

The example coordinate above (UL) would be calculated as:

In our example:

- Latitude (LR) = 10°52'55" N
- Longitude (LR) = 50°42'44" W

Latitude (UL)

- X° Y' Z" = [10 + (52/60) + (55/3600)] = 10.8819*// Latitude (UL)*
- X° No conversion required

Longitude (UL)

- X° Y' Z" = [50 + (42/60) + (44/3600)] = 50.7122*// Longitude (UL)*
- X° No conversion required

The example coordinate above (LR) would be calculated as:

In our example:

- Latitude (LR) = 10°57'14" N
- Longitude (LR) = 50°40'18" W

Latitude (LR)

- X° Y' Z" = [10 + (57/60) + (14/3600)] = 10.9538 // *Latitude (LR)*
- X° No conversion required

Longitude (LR)

- X° Y' Z" = [50 + (40/60) + (18/3600)] = 50.6716*// Longitude (LR)*
- X° No conversion required

6.2 The difference between the Voice and Alarm calls

The hardware of the Falcom STEPP II supports two different audio channels (interfaces), which can be used for different user requirements:

- Voice Call (available on the AMP 15-pin connector)
- Alarm Call (available on the MOLEX 16-pin connector)

6.2.1 Voice channel

The voice channel of Falcom STEPP II allows the message sender to conduct a normal telephone conversation with the Falcom STEPP II. For this, Falcom STEPP II operates in Hands-Free mode. Requirements are to connect a loud speaker to the pins 9 and 10 and a Hands-Free microphone to the pins 7 and 8 of the Falcom STEPP II 15-pin connector.

Falcom STEPP II will automatically answer an incoming call after the second or third ring.

☝ Condition for receiving an incoming call is that the caller's number has to be configured.

6.2.2 Alarm channel

The alarm channel allows the message sender to establish a voice call (listen-in mode) to the Falcom STEPP II, without activating the loud speaker connected to the Falcom STEPP II.

In this case, connect a Hands-Free microphone to pins 1 and 3 of the Falcom STEPP II 16-pin connector.

☝ Condition for receiving an incoming call is that the caller's number has to be configured.

6.3 What to do if the defined password of device fails ?

The NMEA message in the table below is mainly intended for use if the parameter [*PWD*] has been specified, and you have forgotten the specified password of STEPP II device. In this case no configuration could be made via SMS commands.

Command	`$PSRF108,PWD=<value>*XX` `$PSRF108,PWD*XX`
Examples	`$PSRF108,PWD=tommy001*6B` `$PSRF108,PWD*41`

Command Description

This command has to be sent only locally to the STEPP device (by connecting the device to a PC/laptop). After the password is specified or deleted, the device can be accessed remotely via SMS.

Parameter Description

<value>

It allows you to define the password of device.

6.4 Default settings of the firmware 1.6.5

The standard STEPP firmware 1.6.5 has the following default settings, all others settings are deacivated and require a manual configuration.

General settings	Value	Description
COM port settings	9600	baudrate
	8	databit
	N	parity
	1	stopbit
Protocol format	NMEA	NMEA format
Protocols	GGA	GPGGA protocol will be delivered every second
	GSA	GPGSA protocol will be delivered every second
	GSV	GPGSV protocol will be delivered every second
	RMC	GPRMC protocol will be delivered every second
Parameters		
ACK	1	Each SMS message sent to the STEPP device will be confirmed to the message sender.
GPSRESET	10,H	The GPS rreceiver makes a hotstart (H) every 10 minutes, if no GPS-fix is obtained.
TEL<index>	<type>=[empty]	If type <type> connection on this parameter is not specified, the <ath_phone> number will be available only for Data call.
KEY<index>	<edge>=[empty]	If the field <edge> is not specified the alarm will be triggered by rising edge (Low to High state) of the user-defined input.
MSG	<tmin>=[< 30]	Messages are not sent more frequently than one message every 30 seconds, if the <tmin> is specified less then 30.
DEL	<CR><LF>	The responded SMS message from the STEPP device includes the end sequence <CR><LF> between each of message.

6.5 Pin assignments of the XF55-AVL corresponding to the Firmware version 2.0RC1

PORT<index>, IN<index> and KEY<index> allocated by the firmware version 1.6.5				STEPP II (pin assignments on the 16-pin Molex connector)	
OUTPUTS					
	<index>	**Parameter Name**	**Corresponds**	**PIN**	**PIN NAME**
PORT	1	PORT1	TO	7	Out_1
	2	PORT2		5	Out_2
	3	PORT3		9	Out_3
	4	PORT4		11	Out_4
Analogue INPUTS					
	<index>	**Parameter Name**	**Corresponds**	**PIN**	**PIN NAME**

KEY	1	IN1	TO	4	Analog Input 1
	2	IN2		2	Analog Input 2
Digital INPUTS					
	<index>	**Parameter Name**	**Corresponds**	**PIN**	**PIN NAME**
KEY	1	KEY1	TO	12	Inp_1
	2	KEY2		10	Inp_2
	3	KEY3		8	Inp_3
	4	KEY4		6	Inp_4
	5	KEY5		-	-
	6	KEY6		-	-
	7	KEY7		15	VC+
	8	KEY8		13	IGN