INTEGRATION GUIDE

BLUETEXGPS-Mobitex

VERSION 2.6

REVISION HISTORY

VERSION	PRIMARY AUTOR(S)	DESCRIPTION OF VERSION	DATE COMPLETED
2.0	Fredrik Sandstål	Initial draft created tor internal distribution and review comments	2004-12-02
2.1	Tobias Nilsson	Added control panel userguide.	2004-12-09
2.2	Tobias Nilsson	Added example of one pospac18.	2004-12-10
2.3		Added certification papers	
2.4		Added vehicle installation advice	
2.5		Added information about pospac collection byte	2005-07-01
2.6	Tobias Nilsson	Layout update, information about new functions and settings.	2006-12-20

CONTENTS

PRODUCT PRINCIPLE

The main aim of the BlueTexGPS is to provide personal navigation and a back office positioning solution combined in one unit. This is achieved by integrating a GPS receiver, a Bluetooth chip and a Mobitex radio modem in the BlueTexGPS.

MOBITEX MESSAGING OPTIONS

The BlueTexGPS has the ability to save POSPAC18 messages internally and send many of them together. This means that the mobitex traffic load decreases as only one big message is sent instead of many small ones. The traffic load decreases because only one message head is sent. The actual amount of position data is of course the same. Up to 28 POSPAC18 messages can be packed in one mobitex transmission. Up to 1900 POSPAC18 messages can be stored locally. If the BlueTexGPS has lost contact with the mobitex network, all generated messages are stored locally. When network contact is acquired again, all messages are sent in the same order as they were generated.

CONFIGURATION OPTIONS

The sending and generation of the POSPAC18 messages are configurable through a protocol. The parameters are set over the serial Bluetooth interface, RS232 interface or by a message over the mobitex network.
The configurable parameters are:

- Receiver MANID for the POSPAC18 messages.
- POSPAC18 generation and sending time interval.
- Individual payload associated with the F1 to F6 function buttons on the BlueTexGPS keyboard.
- Additional function associated with any function button.
- Unit mode.
    - BlueTex mode: When checked direct access to the mobitex modem is. Not checked (normal mode) provides GPS-data for personal navigation.
    - Staffling on: Sets the amount of POSPAC18 messages that will be packed together in one transmission. When checked up to 28 messages are packed together. When not checked every message is sent individually.
- Power up and down method
- External I/O in the DSUB9 connector

FUNCTION BUTTONS

The buttons F1 to F6 can be configured to contain a payload. That payload will be attached to the pospac18 message when the button is pressed. If a button is pressed it will be indicated by the led at over the button.

There are two types of button types. Momentan and sticky. The momentan button is when a status is momentan and sticky is when a status stays active until the button is pressed again. There can only be one sticky button active at the time. Sticky and momental buttons is configurable.

If there is an external I/O it to has the function of a button. The indication of external I/O is done with the yellow led by the arrows. External I/O work as a sticky button and override sticky buttons F1 to F6. External I/O is configurable.

PROTOCOLS

There are several protocols to communicate with the unit.
The mobitex client-server communication is specified to use POSPAC18 and over the Bluetooth link, DSUB9 or SMS configuration can be done (read more below) and NMEA v0183 over the Bluetooth and in the DSUB9 connector is used to get the personal navigation system.

POSPAC18

The back office positioning solution is achieved by the BlueTexGPS by generating and sending the current position over the mobitex network as a HPID15 message. The message interval is configurable. The message data format is POSPAC18, i.e. the position, time, date and optional 3 byte payload is compressed to only 18 bytes. This has the benefit of minimizing the radio traffic and saving precious battery power. The 3 byte payload can be set to any user defined value. In the BlueTexGPS, the payload is used for indicating the status of the unit for the back office system. This status could say “normal operation”, “parked car”or “other obstacle” for instance.

BYTE NR	NAME	SIZE (BITS)	COMMENT
1-2	Date	16	7 bits for year, 4 bits for month, 5 bits for day 0000010 1001 10011 for 19th September 2002
3-4	Time	1+16	Number of seconds since midnight. MSB is put in the field “extra bits”.
5	Lat. deg.	8	Latitude degrees. 0=90° south, 90=equator, 180=90° north
6-7	Lat. frac.	1+16	5 decimals for latitude (accuracy < 0,8m). MSB is put in the field ”extra bits”.
8	Long. deg.	1+8	Longitude degrees. 0=180º west, 180=0º, 360=180º east. MSB is put in the field ”extra bits”.
9-10	Long. frac.	1+16	5 decimals for longitude (accuracy < 0,8m). MSB is put in the field ”extra bits”.
11	Speed	1+8	Speed in km/h. Max 512 km/h. MSB is put in the field ”extra bits”.
12	Direction	8	Circle split in 256 parts
13	Temp	8	0 = -128ºC, 128 = 0ºC, 255 = 127ºC
14	RSSI	8	0-255
15-17	Payload	24	
18	GPS-q	2	0 = no gps, 1 = gps position, 2 = differential gps position
18	Extra bits	5	The 5 extra bits from the fields with +1 above is collected in the order the appear in the package. (time, lat frac,

			long deg, long frac, speed).
18	Not used	1	Always zero
	Summary	144	18 bytes

POSPAC18 EXEMPLE

MOBITEX CODED POSPAC18: 097DBF2D958BA3C616F10000802000000040

BINARY CODED POSPAC18:

0000 1001
0111 1101
1011 1111
0010 1101
1001 0101
1000 1011
1010 0011
1100 0110
0001 0110
1111 0001
0000 0000
0000 0000
1000 0000
0010 0000
0000 0000
0000 0000
0000 0000
0100 0000

Translated:

NAME	BINARY	REAL DATA	
date:	0000 100 1011 11101	04-11-29	
time:	1011 1111 0010 1101	48941s = 815.6833 min = 13.59472 hours	
lat deg:	1001 0101	= 149 - 90 = 59	59.35747 deg north
lat frac:	1000 1011 1010 0011	35747	
long deg:	1100 0110	= 198 - 180 = 18	18.05873 deg east
long frac:	0001 0110 1111 0001	05873	
speed:	0000 0000	0 km/h	
Dir:	0000 0000	0	
temp:	1000 0000	0 celsius	
rssi:	0010 0000	32	
payload:	0000 0000 0000 0000 0000 0000		
GPS-q:	01	valid position	
extra:	00 000		
Not used:	0		

MOBITEX COMMUNICATION

The mobitex communication is based on the mobitex interface specification, administrated by Technical Guidance Council and the Mobitex Operators Association, version 1551-CNH160 013 Uen, Rev B.

The POSPAC18 is packed in a standard M message with HPID 15. The message contains one or more POSPAC18 depending on staffel settings.

The configuration settings over the mobitex network is plain data. The format for configuration over mobitex is shown in the Control panel data protocol part of this document.

There is no ack message from the server, the network ack is enough to ensure that the messages get through to the server.

GPS NMEA v0183

The GPS data have the standard format of NMEA v0183.

SPECIFICATION OF NMEA v0183 SENTENCES

ZDA – Time and date.
`$GPZDA,hhmmss.ss,xx,xx,xxxx,,*hh<CR><LF>`

Field data:
1: UTC
2: Day (01 to 31)
3: Month (01 to 12)
4: Year
5: unused
6: unused
hh: checksum

GGA – GPS fix data.
`$GPGGA,hhmmss.ss,llll.lll,a,nnnnn.nnn,b,t,uu,v.v,w.w,M,x.x,M,y.y,zzzz*hh<CR><LF>`

Field data:
1: UTC of Position
2,3: Latitude, N (North) or S (South)
4,5: Longitude, E (East) or W (West)
6: GPS Quality Indicator: 0 = No GPS, 1 = GPS, 2 = DGPS
7: Number of Satellites in Use
8: Horizontal Dilution of Precision (HDOP)
9,10: Antenna Altitude in Meters, M = Meters
11,12: Geoidal Separation in Meters, M=Meters. Geoidal separation is the difference between the WGS-84 earth ellipsoid and mean sealevel
13: Age of Differential GPS Data. Time in seconds since the last Type 1 or 9 Update
14: Differential Reference Station ID (0000 to 1023)
hh: Checksum

GLL - Geographic Position - Latitude/Longitude.
`$GPGLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,A,i*hh<CR><LF>`

1,2: Latitude, N (North) or S (South)
3,4: Longitude, E (East) or W (West)
5: UTC of position
6: Status: A = Valid, V= Invalid
7: Mode Indicator
A=Autonomous Mode
D=Differential Mode
E=Estimated (dead reckoning) Mode
M=Manual Input Mode
S=Simulated Mode
N-Data Not Valid
hh: Checksum

VTG - Track Made Good and Ground Speed.
`$GPVTG,x.x,T,x.x,M,x.x,N,x.x,K,i*hh<CR><LF>`

1: Track made good in degrees true.
2: Track made good in degrees magnetic.
3,4: Speed over the ground (SOG) in knots.
5,6: Speed over the ground (SOG) in kilometer per hour.
7: Mode Indicator: A=Autonomous Mode, D=Differential Mode, E=Estimated (dead reckoning) Mode, M=Manual Input Mode, S=Simulated Mode, N-Data Not Valid
hh: Checksum

GSA - GPS DOP and Active Satellites

$GPGSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh<CR><LF>

1: Mode: M = Manual, A = Automatic. In manual mode, the receiver is forced to operate in either 2D or 3D mode. In automatic mode, the receiver is allowed to switch between 2D and 3D modes subject to the PDOP and satellite masks.
2: Current Mode: 1 = fix not available, 2 = 2D, 3 = 3D
3-14: PRN numbers of the satellites used in the position solution. When less than 12 satellites are used, the unused fields are null
15: Position dilution of precision (PDOP)
16: Horizontal dilution of precision (HDOP)
17: Vertical dilution of precision (VDOP)
hh: Checksum

GSV - GPS Satellites in View

$GPGSV,x,x,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx,xx,xx,xxx,xx*hh<CR><LF>

1: Total number of GSV messages
2: Message number: 1 to 3
3: Total number of satellites in view
4: Satellite PRN number
5: Satellite elevation in degrees (90° Maximum)
6: Satellite azimuth in degrees true (000 to 359)
7: Satellite SNR (C/No), null when not tracking
8-11: PRN, elevation, azimuth and SNR for second satellite
12-15: PRN, elevation, azimuth and SNR for third satellite
16-19: PRN, elevation, azimuth and SNR for fourth satellite
hh: Checksum

RMC - Recommended Minimum Specific GPS/Transit Data

$GPRMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a, x.x,x.x,xxxxxx,x.x,a,i*hh<CR><LF>

1: UTC of Position Fix.
2: Status: A = Valid, V = navigation receiver warning
3,4: Latitude, N (North) or S (South).
5,6: Longitude, E (East) or W (West).
7: Speed over the ground (SOG) in knots
8: Track made good in degrees true.
9: Date: dd/mm/yy
10,11: Magnetic variation in degrees, E = East / W= West
12: Position System Mode Indicator; A=Autonomous, D=Differential, E=Estimated (Dead Reckoning), M=Manual Input, S=Simulation Mode, N=Data Not Valid
hh: Checksum

CONTROL PANEL DATA PROTOCOL

There is two main commands that the BlueTexGPS respond to. One set command and one get command. The set command contains all settings for the unit.

The settings can be set over the bluetooth link, serial interface in DSUB9 or over the air. The serial port and bluetooth link uses 9600 in baud rate, 8 bit, no parity and 1 stop bit.

The format for commands are the same for the bluetooth link and the serial interface in the DSUB9 connector but is not the same for the over air configuration.

GET SETTINGS WITH SERIAL OR BLUETOOTH INTERFACE

The command is in hex code: 0xE60401BD where E6 04 are start bytes 01 is the identification of a request and BD is the end byte.

BlueTexGPS sends its settings on this format.

NAME	LENGTH	TYPICAL VALUE	COMMENTS
Start	3 byte	0x46594D(FYM)	
Battery	2 byte		NOT USED
Rec man1	3 byte	0x30D5BC	
Rec man2	3 byte	0x30D5BC	Received for future usage
Update time	2 byte		
Payload 1	3 byte	0x000100	
Payload 2	3 byte	0x000200	
Payload 3	3 byte	0x020000	
Payload 4	3 byte	0x000400	
Payload 5	3 byte	0x000800	
Payload 6	3 byte	0x001000	
	1 byte	0x00	NOT USED
SW-version	1 byte	0x0A	
	1 byte	0x00	NOT USED
Sticky	1 byte	0x07	
Power up	1 byte	0x30	
Timeout	1 byte	0x31	
Staffelcount	1 byte	0x0E	
	4 byte	0x31324620	NOT USED
State	1 byte	0x2A	State byte, se table below
MANID	6 byte		6 byte ASCII formated
	2 byte	0x2020	NOT USED
Payload 7	3 byte	0x002000	Used by External I/O

State byte:

Mobitexstate	1 bit		1 when mobitex state
Enable staffel	1 bit		1 when staffel is enable
	1 bit		NOT USED
BT-powersave	1 bit		1 when bt-powersave is enable
Battery state	1 bit		Always 0, developer usage only
External I/O	1 bit		1 when External I/O is enable
	2 bit		NOT USED- RESERVED

If staffel, BT-powersave and external I/O is enable the state byte will be (0x02+0x08+0x20) 0x2A.

SET SETTINGS WITH SERIAL OR BLUETOOTH INTERFACE

NAME	LENGTH	TYPICAL VALUE	COMMENTS
Start	3 byte	0xE60402	
Rec man1	3 byte	0x30D5BC	
Rec man2	3 byte	0x30D5BC	Reserved for future usage
MANID	3 byte	0x000000	Manid of modem in BlueTexGPS if known, else zeroes.
Update time	2 byte		
Payload 1	3 byte	0x000100	
Payload 2	3 byte	0x000200	
Payload 3	3 byte	0x020000	
Payload 4	3 byte	0x000400	
Payload 5	3 byte	0x000800	
Payload 6	3 byte	0x001000	
	1 byte	0xBD	Always 0xBD
State	1 byte	0x2A	State byte, se table
Sticky	1 byte	0x07	
Power up	1 byte	0x30	
Timeout	1 byte	0x31	

	1 byte	0xBD	Always 0xBD
Staffelcount	1 byte	0x0E	
Payload 7	3 byte	0x002000	Used by External I/O
	1 byte	0x00	NOT USED, reserved for future usage
	1 byte	0xBD	End byte

SET SETTINGS OVER THE AIR

BlueTexGPS can be configured over the air. The message is a data package with fix length, of 110, sent over the mobitex network. Remote configuration has low priority. If BlueTexGPS has other things to do it will not send data back.

Format:

^<length>M:<from><to><format><time><settings start><settings><end>

Parameters:

NAME	LENGTH	TYPICAL VALUE	COMMENTS
Length	4 byte	006E	The length of the message, 110 in hex.
From	6 byte	30D5BC	Sender manid
To	6 byte	30D47B	Manid of the unit to configure
Format	4 byte	0002	Always 0002 to indicate that it is a data
Time	6 byte	000000	Always 000000, network will add a network time
Settings start	3 byte	E60402	Always E60402 to set settings
settings			Se table below
End	3 byte		Mobitex checksum and 0x0D

Settings:

NAME	LENGTH	TYPICAL VALUE	COMMENTS
Rec MAN	6 byte	3200444	
Not used	6 byte	FFFFFFF	Reserved for future usage
Update time	4 byte	0120	Tics in hex, 120 tics per sec.
Payload 1	6 byte	000100	
Payload 2	6 byte	000200	
Payload 3	6 byte	000400	
Payload 4	6 byte	000800	
Payload 5	6 byte	001000	
Payload 6	6 byte	002000	
External I/O	1 byte	0	0 = disable, 2 = enable.
BT-powersave & staffel.	1 byte	0	8 = disable both. 2 = enable both 0 = enable bt-powersave A = enable staffel
Sticky	2 byte	01	One bit for every button 01 = button 1 is sticky 02 = button 2 is sticky 03 = button 1 and 2 is sticky and so on up to 3F
BD	2 byte	BD	Always BD
Power up	2 byte	30	30 = on/off button 31 = motion 33 = charge power
BD	2 byte	BD	Always BD
Staffel count	2 byte	28	Number of positions to staffel, 00 to 1C
Payload 7	6 byte	004000	Payload used by external I/O

The unit respond with its new settings.

GET SETTINGS OVER THE AIR

Format:

^<length>M:<from><to><format><time><request command><end>

Parameters:

NAME	LENGTH	TYPICAL VALUE	COMMENTS
Length	4 byte	0028	The length of the message, 40 in hex.
From	6 byte	30D5BC	Sender manid
To	6 byte	30D47B	Manid of the unit to configure
Format	4 byte	0002	Always 0002 to indicate that it is a data
Time	6 byte	000000	Always 000000, network will add a network time
Request command	8 byte	E60401BD	Always E60401BD to get settings
End	3 byte		Mobitex checksum and 0x0D

Example:

^0028M:30D5BC30D47B0002000000E60401BDXX

where XX is the mobitex check sum.

BLUETOOTH LINK

The BlueTexGPS is connectable over Bluetooth via the serial port profile. The raw NMEA v0183 data is directly forwarded from the GPS-receiver to the Bluetooth serial port. The GPS data is sent once every second at 9600 bits/second, 8 bit, no parity and one stop bit. The control panel data over the Bluetooth link uses the same baud rate and bit settings as the GPS data.

DSUB9 CONNECTOR

In the DSUB9 connector it is possible to use a standard RS232 interface, 9600 bits/second, 8 bit, no parity and one stop bit, this interface may be used the same way as the Bluetooth link above. The DSUB9 may also be configured to host a external input/output.

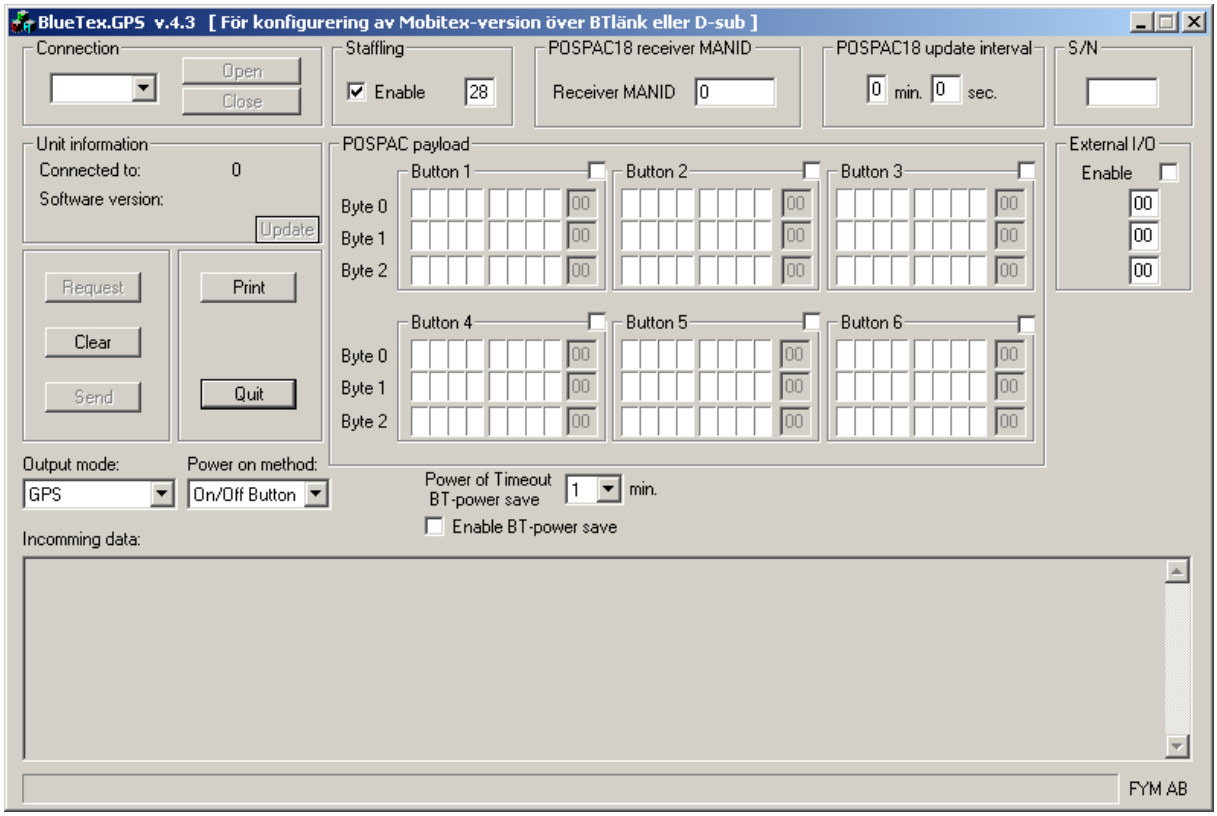
When external I/O is enabled the serial interface on the DSUB9 will stop. To activate it again for configuration press the on/off button for 2 seconds. The external I/O is indicated by the yellow led.

More about the external I/O option in the section named “installing external sensors”.

NOTE: The first thing to do to continue reconfiguration is to disable external I/O with the configuration command, any other command will turn off the RS232 interface and return to external I/O.

USING THE CONTROL PANEL

Below is a screendump of the BlueTexGPS control panel.



Connect

To connect to a BlueTexGPS unit select the serial port that the Bluetooth device give you. Press the Open button and wait. When connected the units manid and the software information will be showed. If you connect to the unit to soon after power on you may get a invalid manid (negative) from the unit. Press the Update button to refresh the information.

The settings

The Receiver MANID is the manid of the unit you want the unit to send its information to. Update interval is the time between the pospac generated. If you don't select staffling on one message will be sent to the receiver manid every time a pospac is created, if you select staffling on one message will be sent when there are a selected number of pospacs in the unit. In the screenshot 28 is selected.

The update interval is the time between the captured positions. It is not possible to set it less then 10 sec.

Every pospac will be sent with a payload. The payload for each button is defined bit wise in the payload fields, every byte will be calculated and shown as a hex number. If the checkbox for the button is checked the button will keep its payload in the memory and make the unit send it as default until the button is pressed ones more.

Mobitex mode makes a direct connection between the serial port (Bluetooth) and the mobitex modem. This mode is for configuration of the mobitex modem. When the unit reboot it will go back to normal mode.

If BT-powersave is active BlueTexGPS will turn off the bluetooth module after some minutes, the timeout is set in minutes and is used for power on and off to,

There are tree power on methods, on/off button is default and the unit power on and off by pressing the on/off button at the front of BlueTexGPS. When the unit is configured as motion it starts when motion is detected and power off when there is no motion for some minutes. The Charge power mode work as in motion mode but it is the charger that trigs power on and off. The timeout for motion and charge power is the same as for bt-powersave.

When external I/O is enable the serial interface in the dsub9 will be turned off, to activate it again press the on/off button about 2 sec.

The S/N field is only for printing, it will be printed when printing to help keep the printed settings apart.

Sending the settings

To send the settings to the unit connected press the send button. The program will automatically ask the unit for its settings and verify that it was set correct, if it was not an error message will appear.

View a units settings

To view a units settings press the request button. The program will ask the unit for its configurations and display them in the fields (this will overwrite the data in the fields). If you just want to update the field for software version and the units manid press the update button instead.

Clearing the fields

The clear button clear all the fields. It will not clear the settings in the connected unit. The clear command is also called when you do a request or sending the data to the unit.

The print function

The print button will print the settings on a printer of your choice.

Incoming data

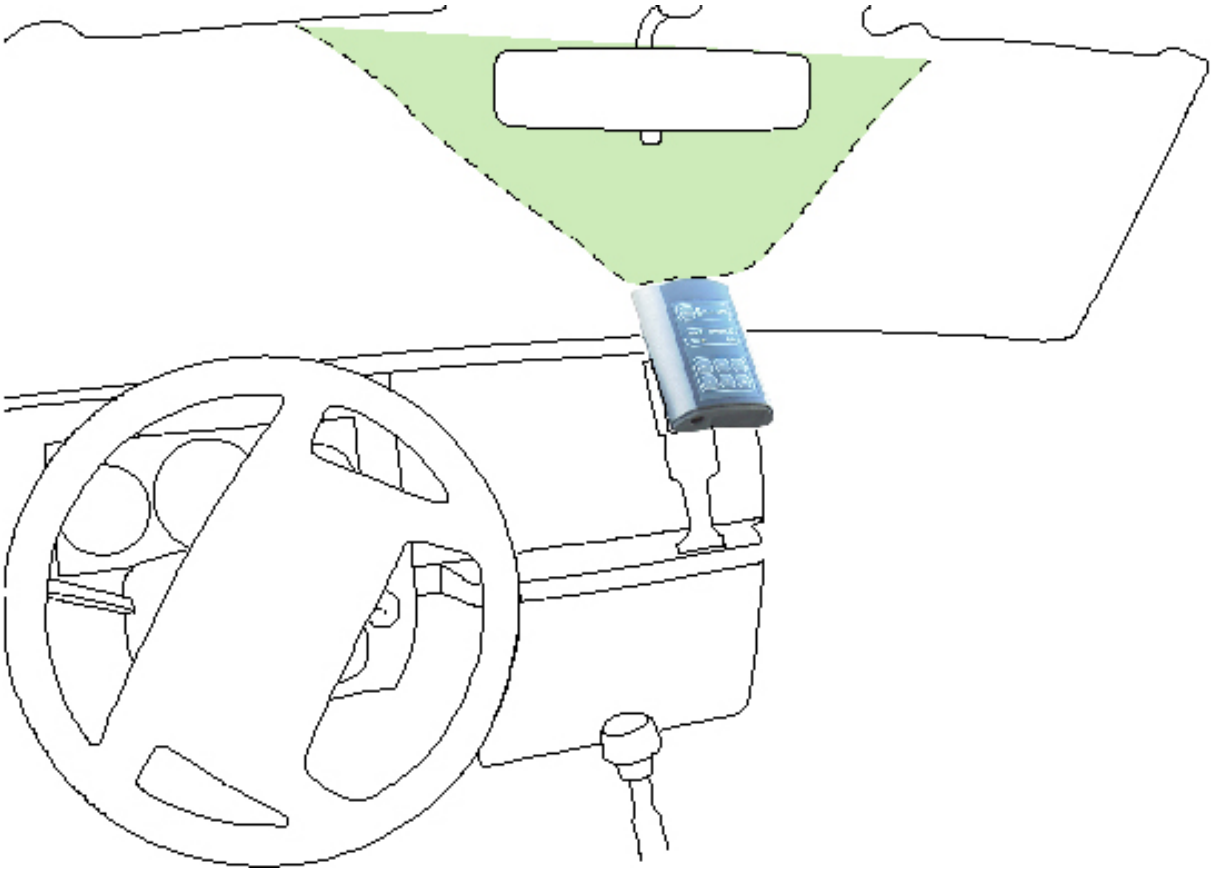
In the incoming data field the raw data that the program receives over the serial port will be shown. This is under normal conditions GPS data.

Disconnecting

To disconnect just press the close button.

INSTALLATION ADVICE

The BlueTexGPS has a built-in GPS antenna. For optimal GPS performance, the unit should be placed viewing as much clear sky as possible. For example on the dashboard looking out the windscreen, see picture. The green/shadowed area show the optimal reception angle of the GPS antenna.



EXTERNAL SENSORS

It is possible to connect external sensors in the DSUB9 connector and use it to indicate an external I/O event.

To be able to do so a setting has to be done with control data. This will stop the serial data on the DSUB9 and activate for external I/O.

There is some different sensors developed, they are listed under accessories.

ACCESSORIES

ARTICLE NR	NAME	
888200095	Button sensor	
888200095_2	Led sensor	
942004	Car charger	
245102	Car hold simple	
245106	Car hold with external connections	
888200095_3	Inductive sensor	

ANTENNA PERFORMANCE

The internal antennas are pcb integrated monopoles and made in 1.0 mm thick FR4.

Input Impedance

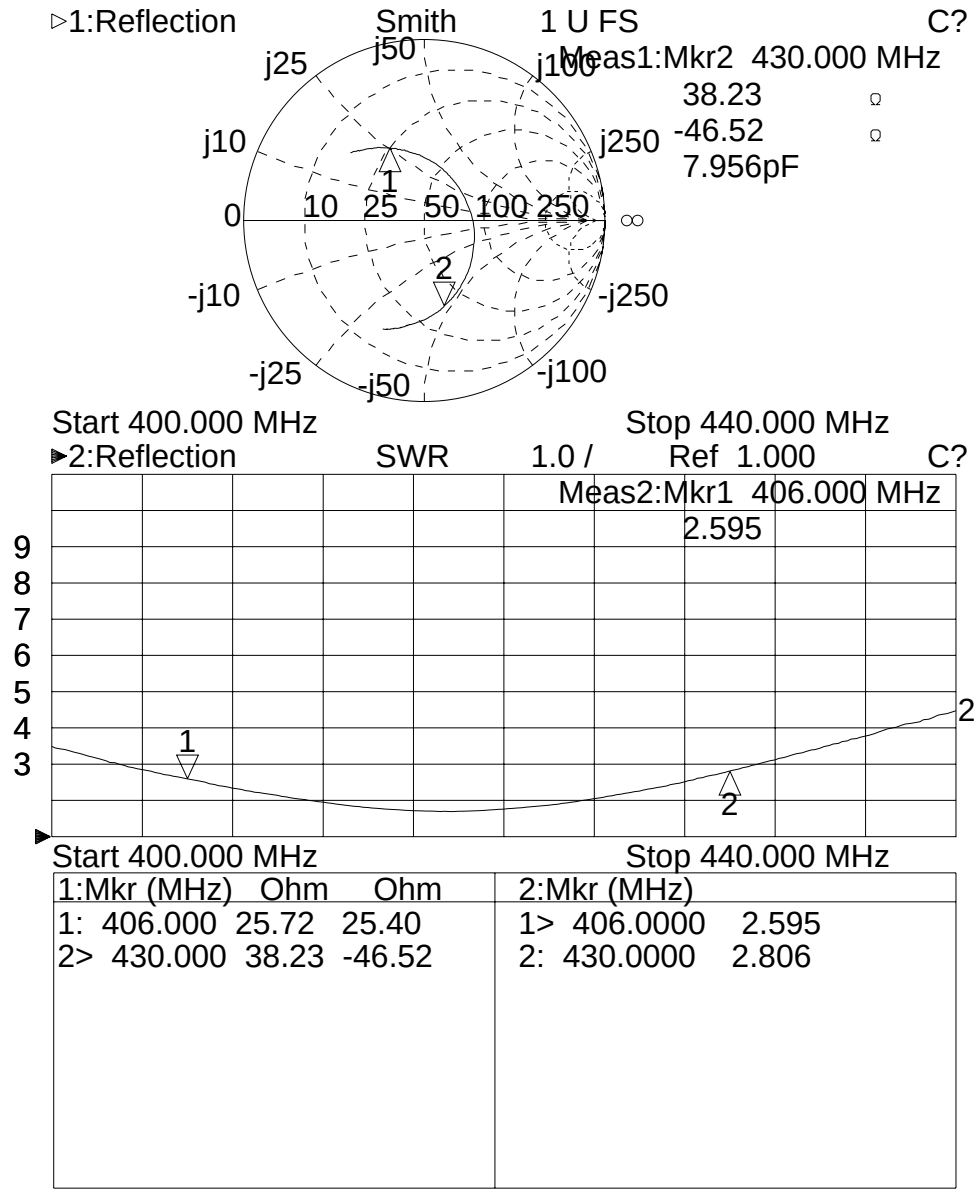


Fig: Smith chart and VSWR, BlueTexGPS EU.