SP80:
Technical Product Presentation

Author: Charleine Potin

Editor: Mark Silver

SP80 GNSS SYSTEM

- **SP 80 Sensor**
  - Multi-Constellation and Multi-frequency receiver
  - Z-BLADE™ Technology

- **Data collectors**
  - Spectra Precision T41, Ranger 3,Nomad
  - Ashtech MM10,MM20, ProMark 100& 120

- **FAST Survey, Survey Pro, SurvCE 4**
  - Complete suite of field applications
  - Real-time and raw data collection

- **Spectra Precision Office**
  - Real-time and raw data processing
  - Network solutions

	FW Release
SP80	1.2
Survey Pro	5.4.1
Fast Survey	4.0.7
Survey Pro Office	2.96 or 3.11 (PC 64 bits only)

RINEX Convertor for use with other processing schemes & OPUS.

GNSS Signals

- **New “6G” ASIC with 240 GNSS channels**
  - **GPS L1 C/A, L1P (Y),L2P(Y), L2C, L5**
  - **GLONASS L1 C/A ,L2 C/A,L3**
  - **GALILEO E1, E5a, E5b**
  - **BEIDOU B1(phase 2),B2**
  - **SBAS (WASS/EGNOS/MSAS/GAGAN) L1C/A**
  - **QZSS L1C/A,L2C,L1SAIF,L5**

- **Tracking and using of every combination of 6 GNSS systems**
  - **Including GLONASS-only or BeiDou-only modes**
- **Enhanced acquisition of weak GNSS signals**
- **Fast Search engine for quick GNSS acquisition (TTFF)**
- **Supports the recently approved RTCM 3.2 Multiple Signal Messages (MSM) - Standardized definition for broadcasting all GNSS signals.** **(**Useful only if base and rover support these new messages**)**

GNSS Performance

- **GNSS Performance**
  - Real-time accuracy
    - RTK: 8 mm + 1 ppm HRMS / 15 mm + 1 ppm VRMS
    - DGPS: 25 cm + 1 ppm HRMS / 5 cm + 1 ppm VRMS
  - Post-processing accuracy
    - Static: 3 mm + 0.5 ppm HRMS / 5 mm + 0.5 ppm VRMS
    - High-precision static: 3 mm + 0.1 ppm HRMS / 3.5 mm + 0.4 ppm VRMS

- **OPERATION modes**
  - RTK network rover
  - RTK UHF rover& Base
  - NTRIP / DIRECT IP Rover (Base with Fast Survey)
  - CSD Mode
  - Post-processing

GNSS Characteristics

- **Initializations**
  - Typically 2 seconds for baselines < 20 km (12.4 miles)
  - RTK Initialization range : over 40 km (24.8 miles)

- **Data characteristics**
  - Update rates to 20 Hz
  - Recording intervals 0.05 to 999 seconds
  - 2 GB internal memory (~1.5 GB available for data)
    (Over a year of 15 sec raw GNSS data from 14 satellites
  - Removable SD/SDHC memory card (up to 32 GB)
  - Supported data formats:
    - RTCM 3.2
    - RTCM 3.1
    - RTCM 2.3
    - ATOM
    - CMR/CMR +
    - NMEA 0183 messages output

Physical Spécifications

- **Small and lightweight**
  - Size: 22.2 x 19.4 x 7.5 cm
  - Weight: 1.17 kg
- **User interface**
  - Bright PMOLED display (B&W)
  - Log and scroll buttons
- **Input/output and communications**
  - RS232, USB 2.0, BT 2.1
  - 3.5G cellular
    - quad-band GSM / penta-band UMTS
  - WiFi (802.11 b/g/n)
  - (Optional) internal UHF 2W TRx
- **Environmental**
  - Operating temperature: -40ºC to +65ºC
  - Storage temperature: -40ºC to +85ºC
  - IP67 rating
  - 2m pole drop on concrete
- **Power**
  - 2 Li-Ion hot-swap batteries (2600 mAh)
  - Life time:
    - 10 hours :With GNSS, GSM or UHF RX on
    - 5 hours with UHF TX (2w) on
    - (hot –swappable batteries)
  - 9-28 V external DC power

Standard 2-year Warranty

- **Receivers have standard 2-year Warranty**
- **Can be extended to 3-years for $1,150 / head**
- **Extension can occur anytime during the first 24-months**

Includes Hard and Soft Cases

- **Both Hard and Soft cases are included:**

A Base/Rover Pair fits nicely into 1 combined case!

Standard Battery Technology

Standard Trimble Battery Technology

Plenty of knock-offs available

Factory batteries have amazing capacity and life

Front View

Impact-resistant glass-fiber reinforced casing

Bright display screen

Shock absorber

Power button

Scroll buttons

Battery A LED indicators

Log buttons

Battery B LED indicators

PMark & Pflex 800 buttons location

Sunlight-readable display

High contrast, operates in low temperature

Possibility to modify the backlight timeout ($PASHS,command)

Bottom View

Battery B compartment

Battery A compartment

- Dual hot-swappable batteries
  - Easy, one-hand battery exchange process
  - Full day, interruption-free operation

5/8" thread insert

Removable plate

Power/data connector (DC/RS232).

= Same as **EPOCH 50**

≠ **Different than previous Ashtech Connecters**

→ Now includes power for the GPS in same cable that connects to external radio!

Optional UHF module

- **UHF Radio Module Cable Enhancement**
  - **The connector is now captive when the radio is in the head, it can not vibrate off:**

Right Side View

Rubber flap protection.
Has to be fully closed to preserve waterlightness

SD Card Holder
The SD card can be used to record data, copy files from the internal memory, or install firmware. Should be inserted upside down.

Standard sim card holder (the sim card should be inserted upside down)

Left Side View

Rubber flap protection.
Has to be fully closed to preserve waterlightness

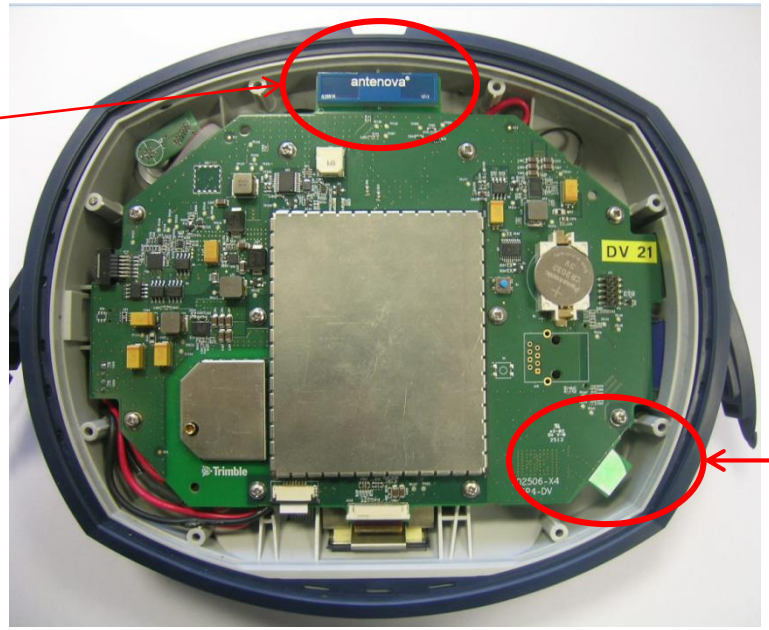
USB connector emulating serial port RS232 (requires a driver)

Real Time communication

- 3.5G quad-band GSM
- Built-in WiFi (802.11b/g/n) communication
- Bluetooth 2.1 +EDR

No More External Antennas

GSM antenna



WIFI & BT antenna

Real Time communication

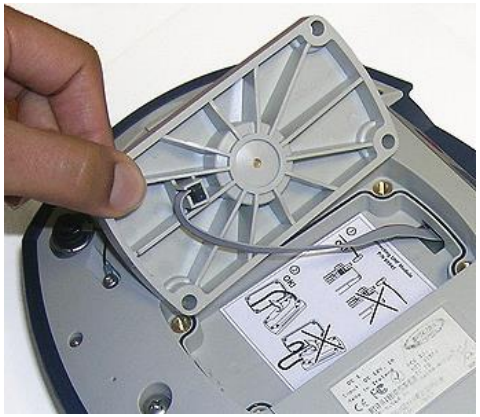
- **Internal TRx UHF radio (XDL radio)**
- **RS232 port (115 200 bauds, no RTS/CTS)**

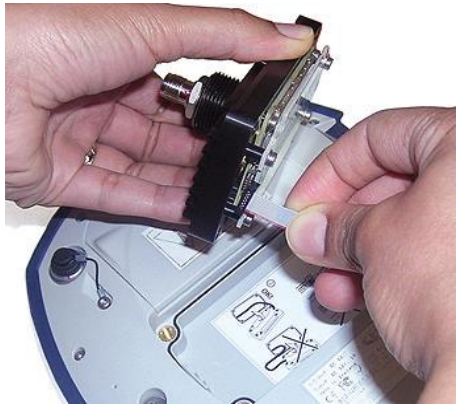
Port A	External RS232 port (115 200bds)
Port B	USB serial port
Port C	Bluetooth SPP
Port D	Internal UHF radio (38200 bds)
Port E	Modem Port for CSD connexion
Port M	Internal Memory
Port P	TCP/IP port (client)
Port Q	TCP/IP port (client)
Port S	Sd card memory

SP80 UHF (integrated TRx radio)

- PacCrest XDL micro radio
- Can be used as TX (0.5 or 2 Watts) or RX

- Installing the UHF module

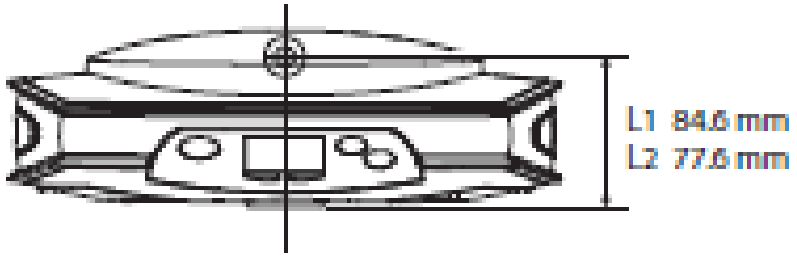




- Connected on SP80 port D (at 38,400 baud)
- It is automatically detected by the SP80

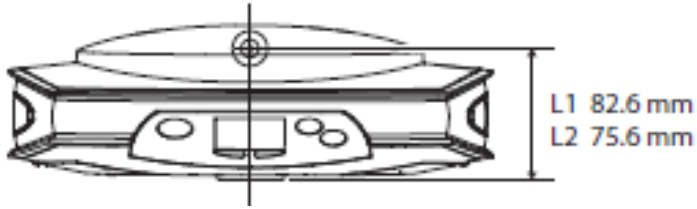
Phase center Location

Without UHF module



Antenna name :SPP91564_1

With UHF module

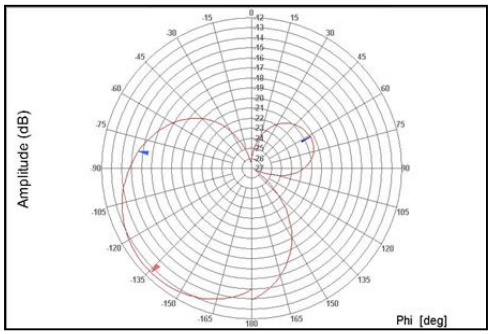


Antenna name :SPP91564_2

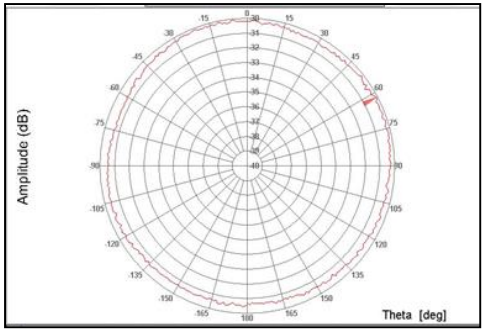
- The antenna phase center offset is reduced by 2mm
- The delta is automatically applied by the receiver (different antenna name)

SP80 UHF Rover

- **Inside-the-rod mounted UHF antenna design**
  - Patented UHF antenna / pole design
  - Physical UHF antenna protection
  - Cleaner design
  - Extends RTK radio range, shorter RF cable length internally



- Typical external UHF antenna radiation pattern
  - The radiated pattern is asymmetric
  - A real degradation of the reception level when the unit is oriented at 0º, and 120º azimuth
  - This is why reception on most rovers changes when you rotate the pole.



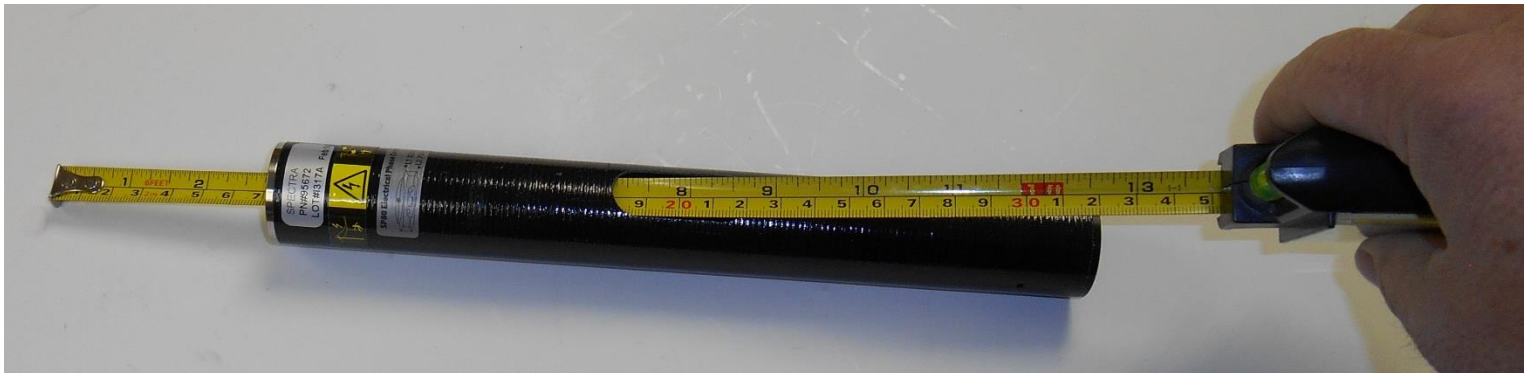
- Inside-the-rod UHF antenna radiation pattern
  - The radiation pattern does not suffer of any directional issues
  - The Rx level is almost flat whatever the azimuth is

Fiberglass Range pole, NOT Carbon Fiber!

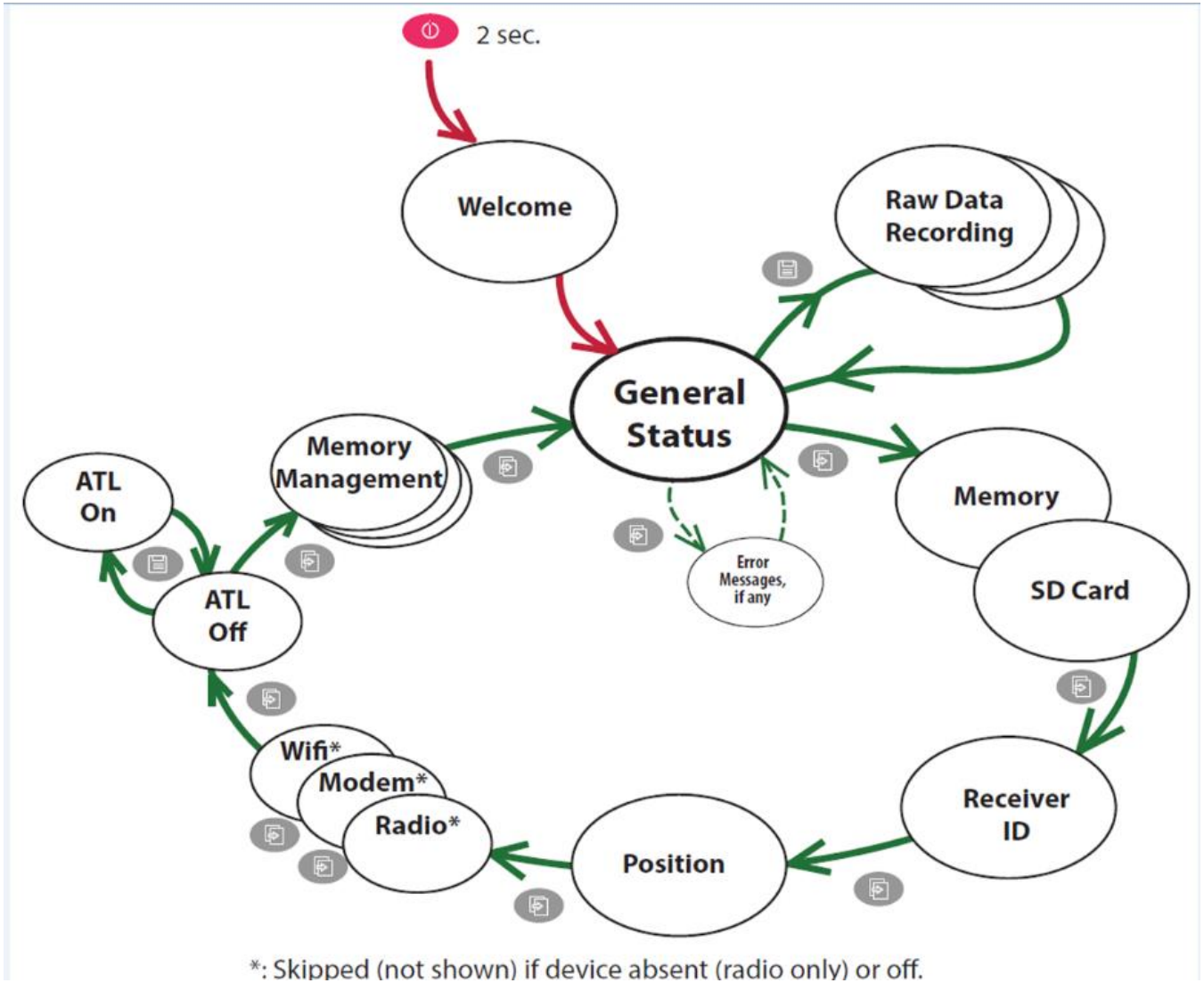
SP80 UHF Base Pole Extension

UHF Antenna (¼ wave) inside the base pole extension

External UHF Antenna

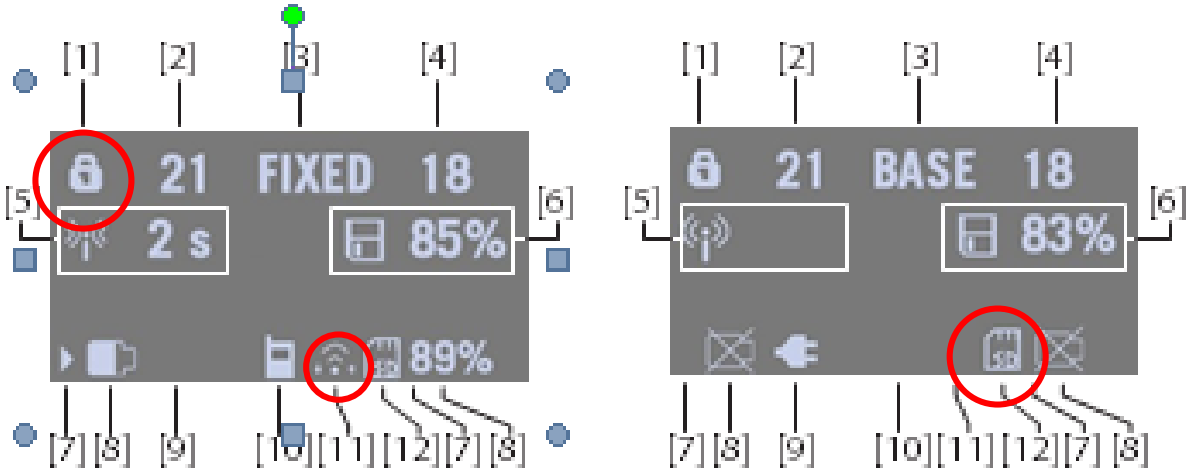


FRONT PANEL DISPLAY



FRONT PANEL : General status

ROVER **BASE**



- **3 New icons :**
  - **Wifi (11) :**

WiFi connection active

Data being transmitted over Wifi

1 to 3 waves depending on the signal level

  - **Anti-theft protection (1)**

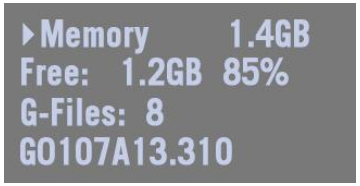
Antitheft protection active

  - **SD card (12)**

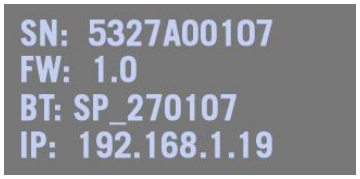
SD Card Present

FRONT PANEL DISPLAY

- **Memory /SD Card**



- **System Information**



- **Position Solution**

- **Radio**

Rover

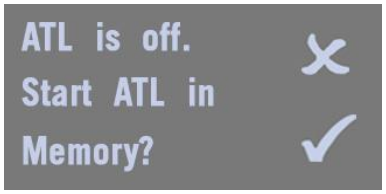
Base

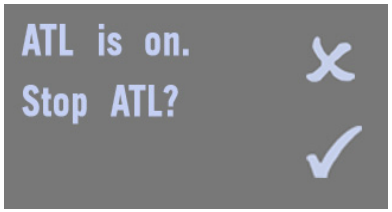
FRONT PANEL DISPLAY

- **Modem**

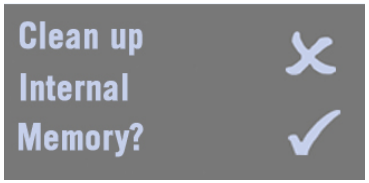
- **WiFi**

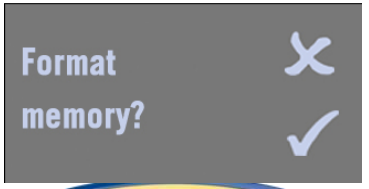
- **ATL recording**

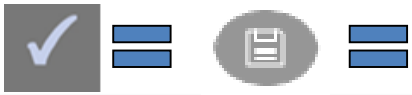




- **Memory Management**

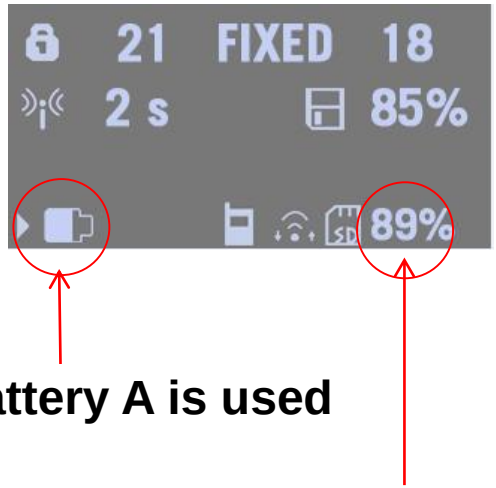






SPECTRA PRECISION

Monitoring Batteries



The battery A is used

battery B level

Battery is missing

The receiver is powered from the AC/DC power block, not by one of its batteries.

Color	Graphics	Meaning
Green		The battery is being used to power the receiver, or is fully charged and not used.
Red		The AC/DC power block has been connected to the receiver. The battery is being charged, or is fully charged and not used.
White		The battery is missing or not used (the LED is extinguished)

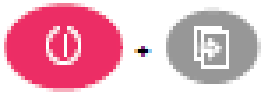
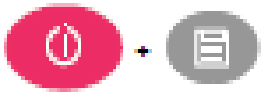
Blinking Rate	Graphics	Meaning
Solid (not blinking)		Battery missing, not used or with sufficient charge level
Slow (1 flash per second)		Normally charging or battery running low (discharging)
Fast (4 flashes per second)		Temperature alarm or battery too low

« battery low » alarm is raised when the battery is < 10 - 15 % (T).

The batteries can be charged inside the receiver with the external AC/DC power If the receiver is off and cool.

Special key Combinations

- **3 different key combinations (Receiver turned off)**

Key combination	Function
 (Power + Scroll buttons)	Starts a firmware upgrade sequence from the file stored in the SD Card.
 (Power + Log buttons)	Enters the Service mode in which the UHF module, if any, is temporarily connected to the receiver's serial port A for radio settings. Refer to *Configuring the UHF Module on page 48*.
 (Power + Scroll + Log buttons)	Restores factory settings (see list in *Restoring Factory Settings on page 58*).

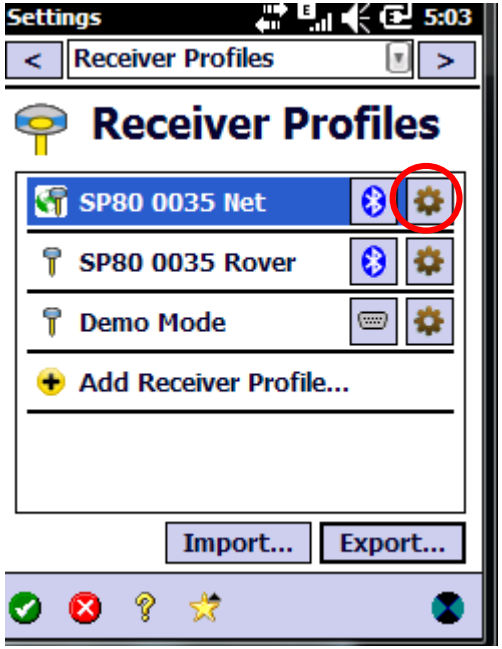
Operating Modes

- **SP80 Operating modes :**
  - **NRTIP/DIP ROVER**
  - **NTRIP/DIP BASE (Fast Survey Only)**
  - **CSD BASE & ROVER**
  - **UHF BASE & ROVER**
  - **POST-Processing**

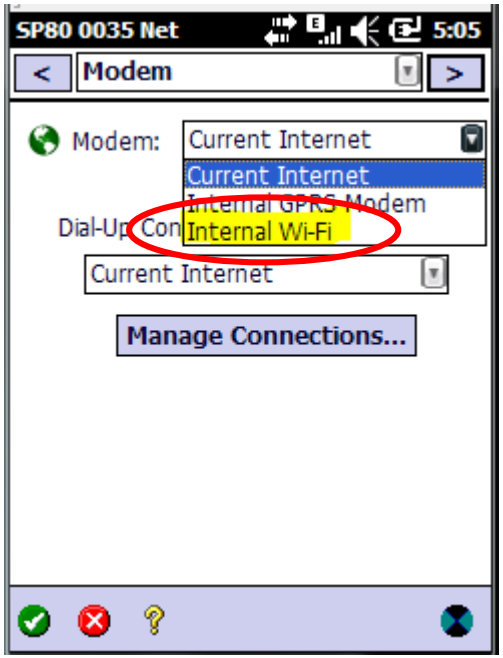
  - **No new operating modes**
  - **NTRIP/DIP connections can be supplied with GPRS or WiFI**
  - **New UHF radio module (XDL radio)**

WiFi set up with SURVEY PRO

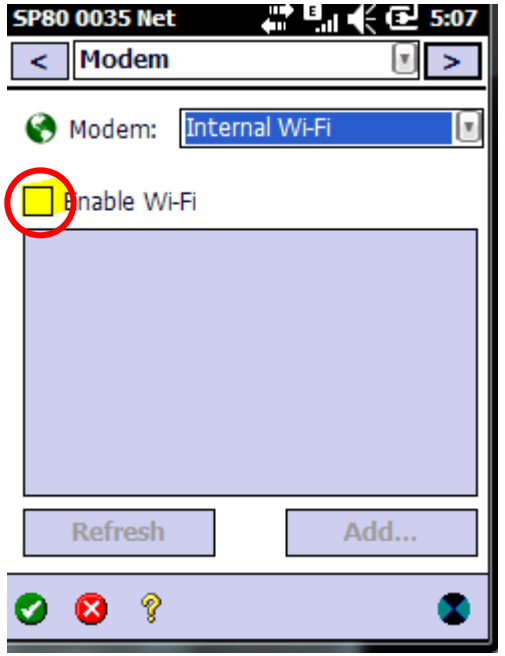
Select the receiver « net profile »
Go to the settings



Select the internal Wifi

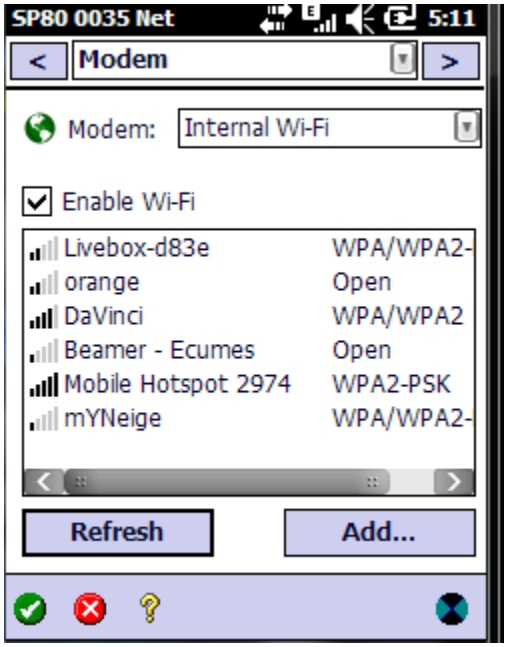


- Click on Enable Wifi

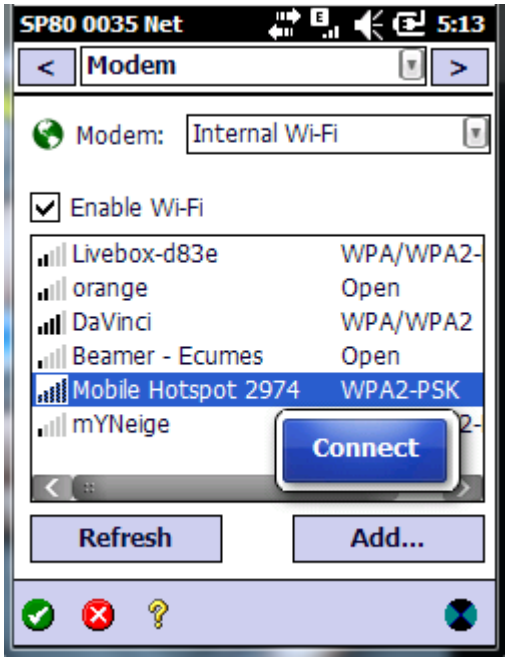


WiFi set up with SURVEY PRO

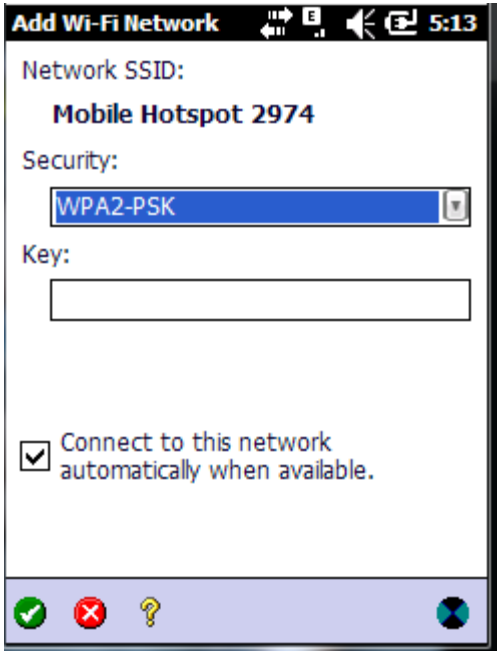
Select the WiFi network



Connect



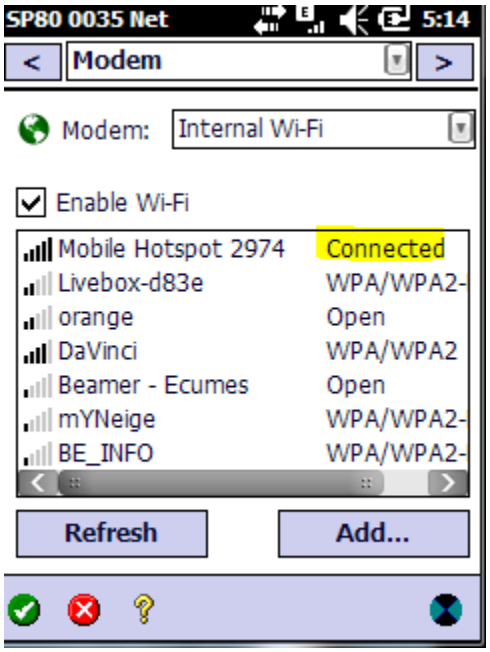
Enter the key



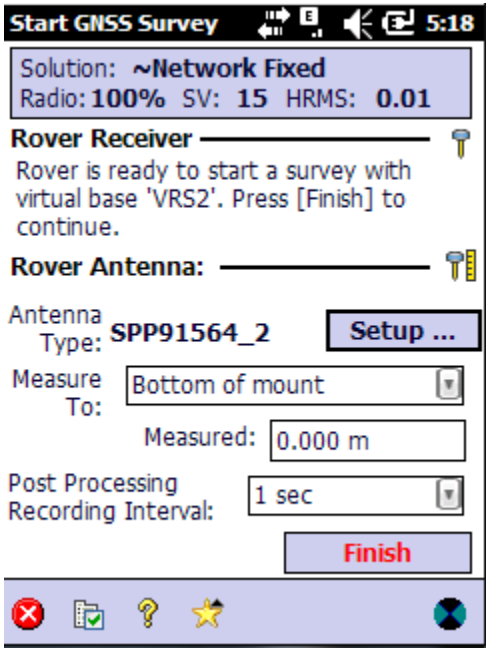
Is blinking

WiFi set up with SURVEY PRO

The SP80 is connected via Wifi



You can start your survey as you do usualy

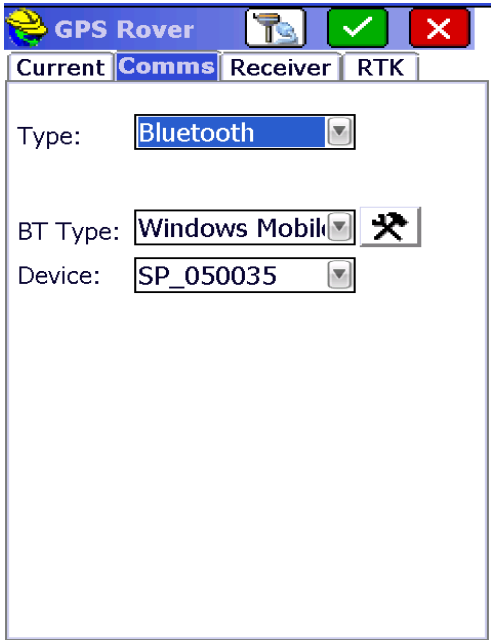


Is stable

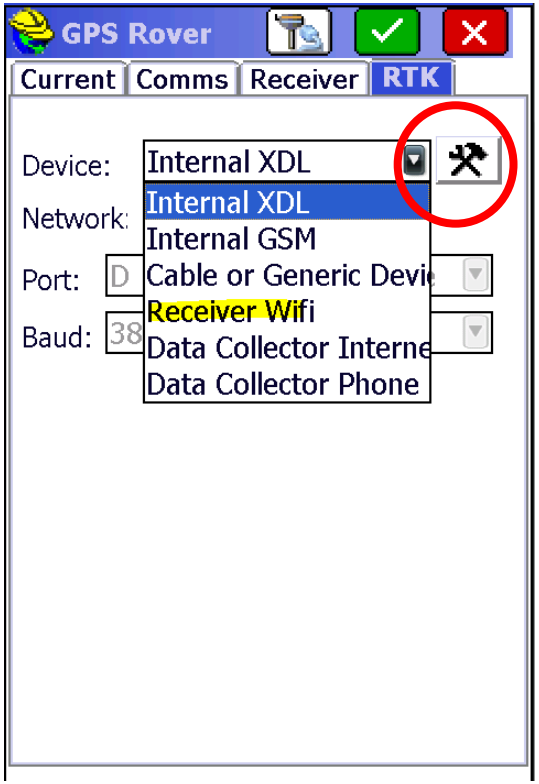
SP80 is fixed

WiFi set up with Fast Survey

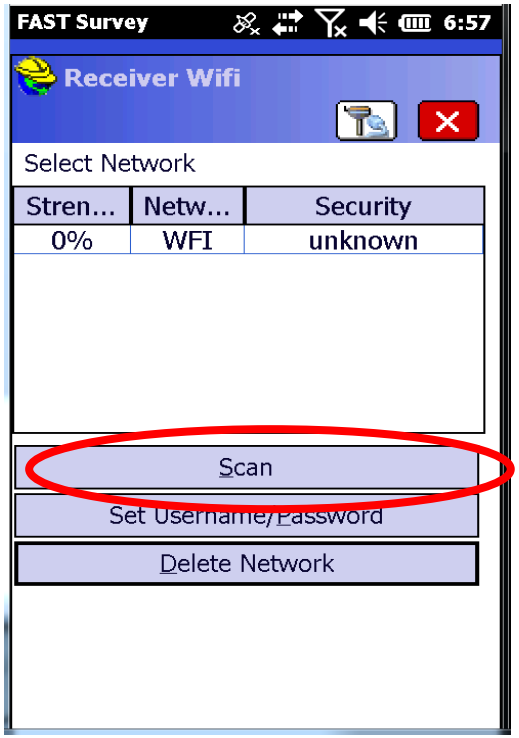
Select the receiver « net profile »
Go to the settings



Select Receiver Wifi

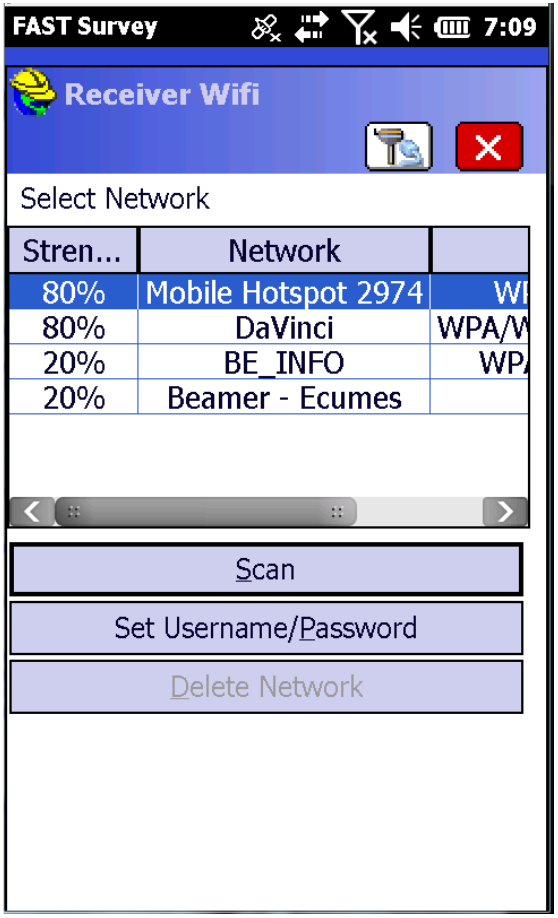


Launch the scan

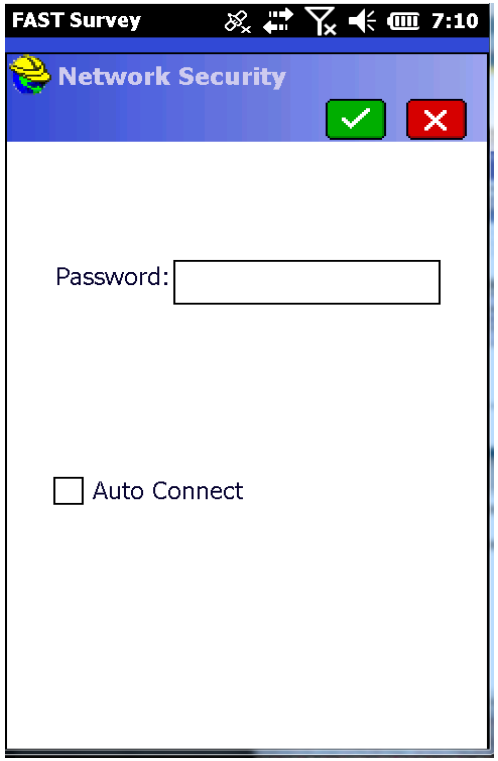


WiFi set up with Fast Survey

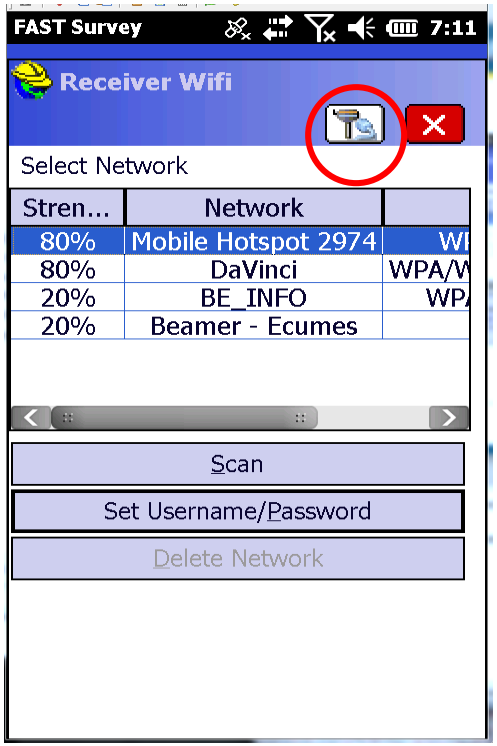
Select the WiFi network



Enter the WiFi key

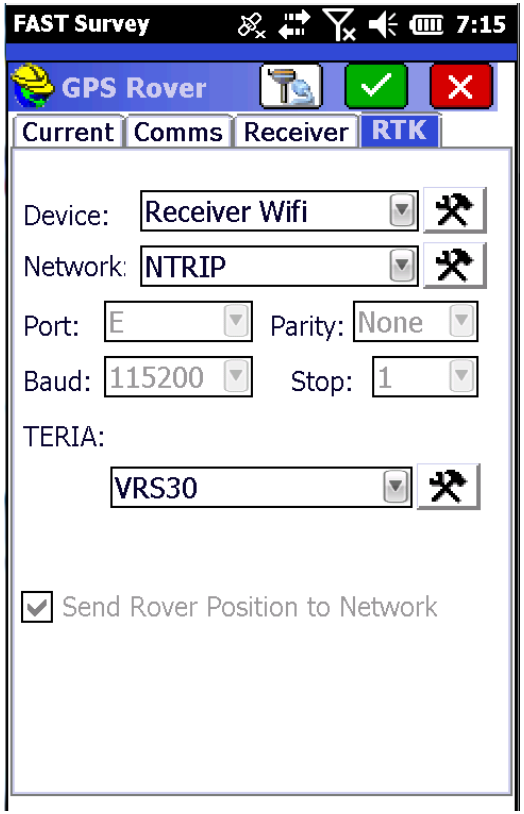


Connect…



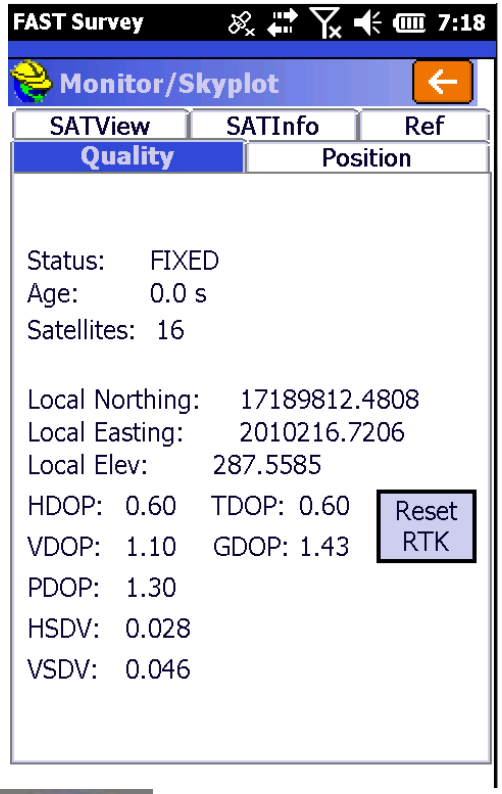
WiFi set up with Fast Survey

Connect the SP80 to the NTRIP network



Is stable

The position is fixed

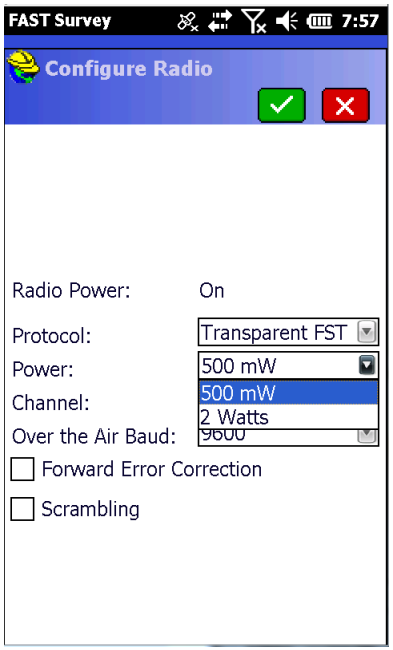


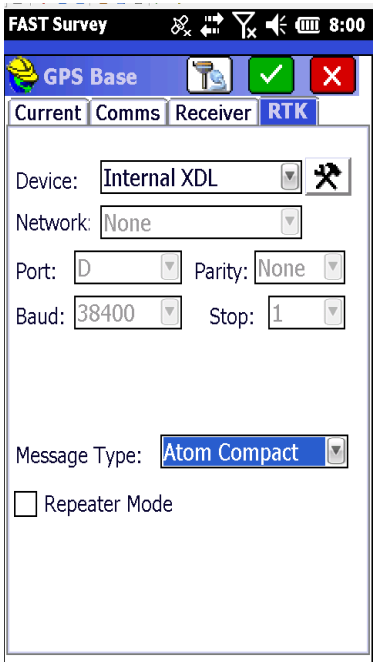
Corrections received over WiFi

SP80 UHF Mode

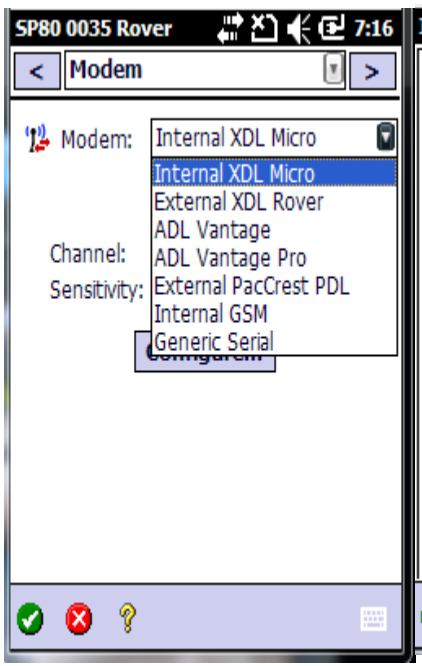
- **New integrated TRX radio : Pacrest XDL micro radio**
- **Automatically detected by the SP80** (antenna name : SPP91564_2)
- **2 TX power : 0.5 and 2 watt**

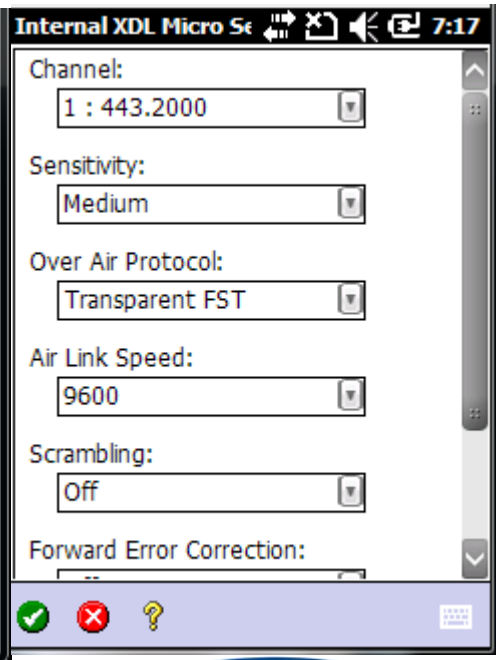
Base set up (Fast survey)





Rover set up (Survey Pro)





UHF Radio Settings

- **SP80 base with XDL micro* or ADL radio → Rover with Pacrest Radios**

Settings		BASE		ROVER	
Format	ATOM COMPACT	Receiver	Radio	Reciever	Radio
		SP80, ProMark800 ProFlex 800 ProMark 500 ProFlex 500	Pacific Crest Radios*	SP80, ProMark800 ProFlex 800 ProMark 50 ProFlex 500	Pacific Crest Radios*
	CMR+*	SP80,ProMark800 ProFlex 00 ProMark 500 ProFlex 500	Pacific Crest Radios*	Epoch50 , Other brand receivers	Pacific Crest Radios*
		Epoch50 , Other brand receivers	Pacific Crest Radios*	SP80,ProMark800 ProFlex 800, ProMark 500, ProFlex 500	Pacific Crest Radios*
Protocol		Transparent FST		Transparent FST	
Baud rate		9600 bauds		9600 bauds	
FEC		OFF		OFF	
Scrambling		OFF		OFF	

SP80 base with XDL micro* :

•some frequencies should not to be used (see application note)

•CMR+ because we recommend to use the most compact format

UHF Radio Settings

- **Base with Ulink Radio** → **SP80 base with XDL**

Settings	Base - Ulink radio	SP80 - XDL radio
Format	ATOM compact	
Protocol	Transparent	Ulink
Baud rate	4800 bauds	4800
FEC	Not applicable	OFF
Scrambling	Not applicable	OFF

UHF Radio Settings

- **SP80 base with XDL micro /ADL radios → Rover with Ulink Radio**

Settings	SP80 with XDL or ADL radios	Rover - Ulink radio
Format	ATOM compact	
Protocol	Ulink	Transparent
Baud rate	4800 bauds	4800
FEC	Not applicable	OFF
Scrambling	Not applicable	OFF

We don’t recommend this configuration: It’s better to use the SP80 as ROVER to profit from the SP80 performances

UHF Radio Settings (Dealer only)

- **ADLCONF PC software & ADLCONF dealer dongle**
- **ConfRadio supports when set to direct cable**

PROCEDURE

- **Power ON the SP 80 by pressing simultaneously these 2 buttons**  **until you can read on the SP80 display :**

- **Connect the SP80 to your PC via serial cable (38,400 bau)**
- **Launch ADL CONF (don’t forget to connect the ADLCONF dealer dongle to the computer)**
- **Configure the radio**

SMS & Email ALERTS

- The receiver can be set up to send via SMS (Text Messages) and / or email raised alarms

- 2 alarms categories :
  - Standard (high priority alarms) : E.g. Low battery, Connection lost, Memory full, Anti-theft alarm…
  - Full alarms (all alarms) : not recommended

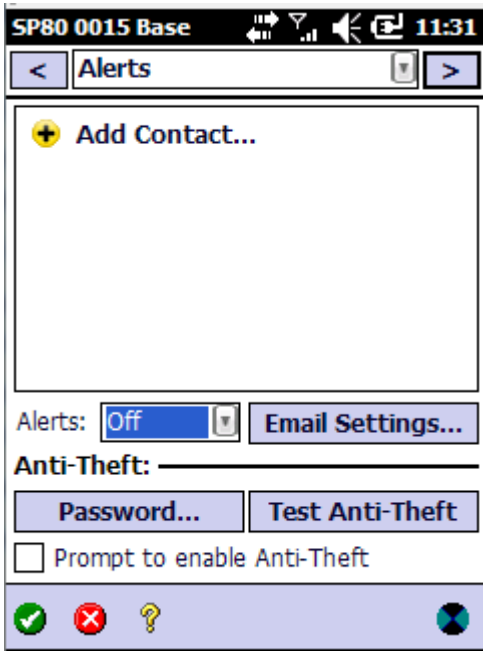
- Remark :
  - with CSD (GSM data) sim card, only SMS can be sent
  - With WiFi, only email can be sent

SMS & Email ALERTS –set up with Survey Pro

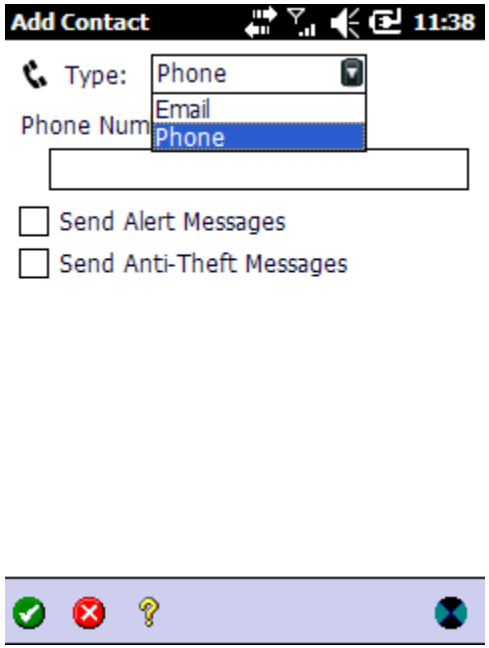
- **Make sure that the Modem or WiFi is On (if not, the modem has to be powered on via the "SP80 net" profile)**

SMS Set Up

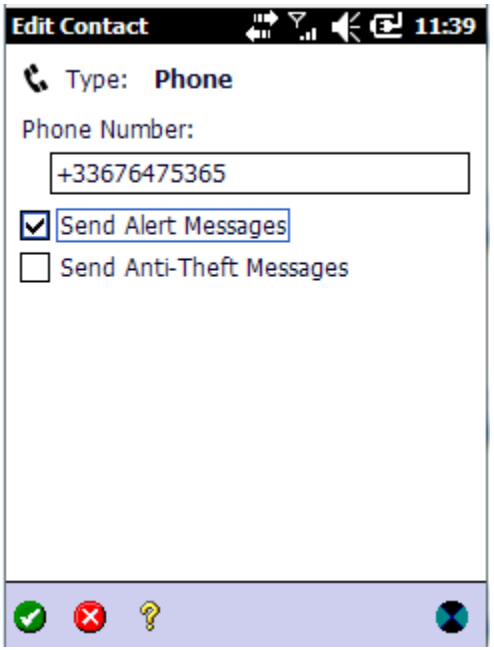
Go To the SP80 profile/settings and ALERTS menu



Select Phone



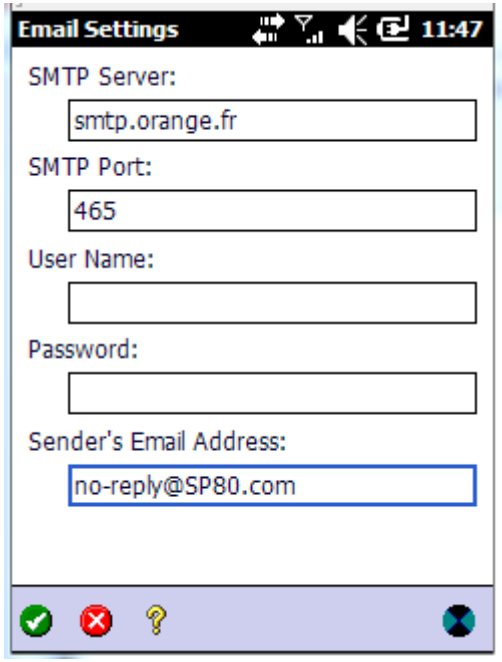
Enter the phone number



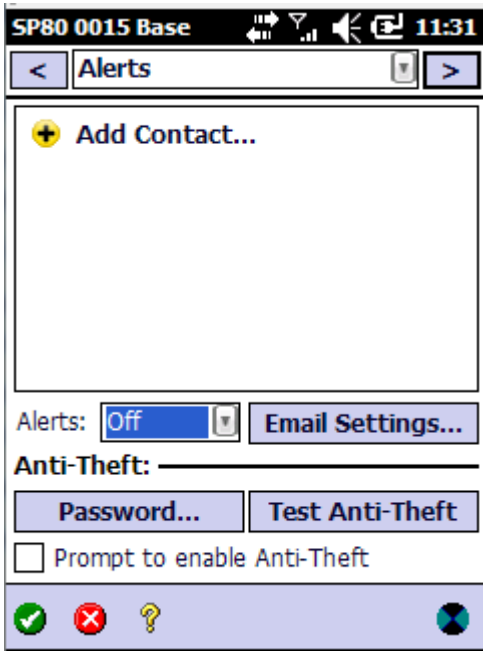
SMS & Email ALERTS –set up with Survey Pro

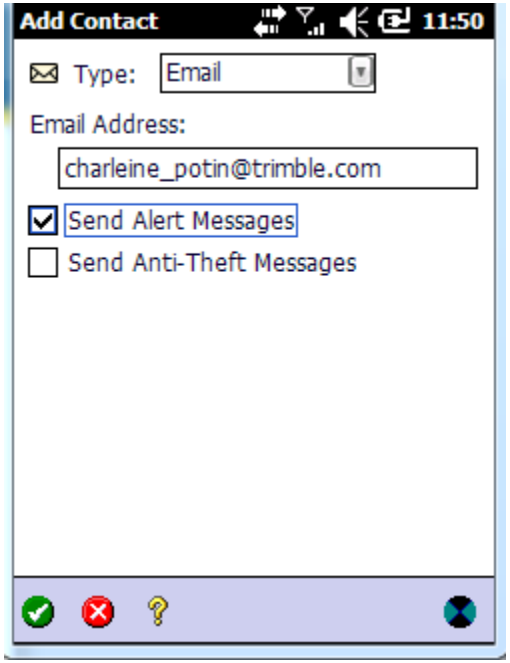
EMail Set Up

Enter your email Settings



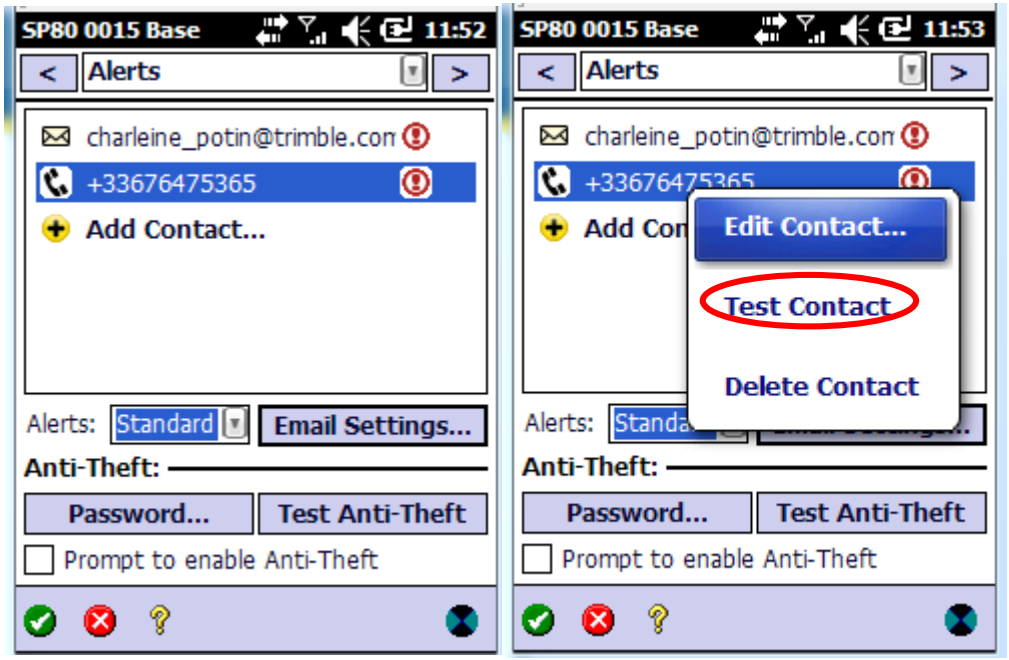
Add contact





SMS & Email ALERTS –set up with Survey Pro

You can Edit, Test, and delete a contact



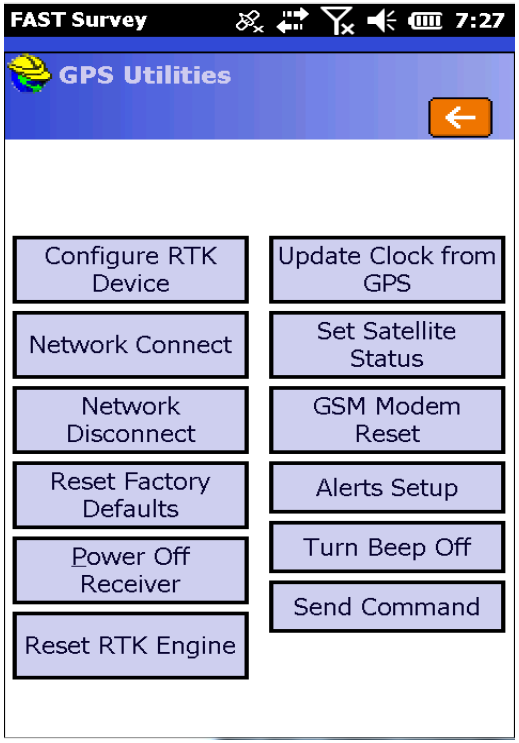
SP80
S/N: 5405900035
Date : 18/03/2014 17:39:07 GMT

Test message for SMS verification

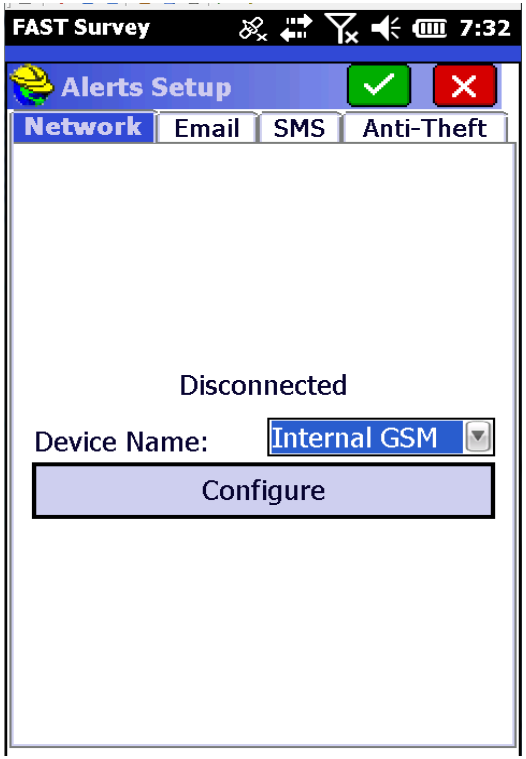
Alarm email :

SMS & Email ALERTS –set up with Fast Survey

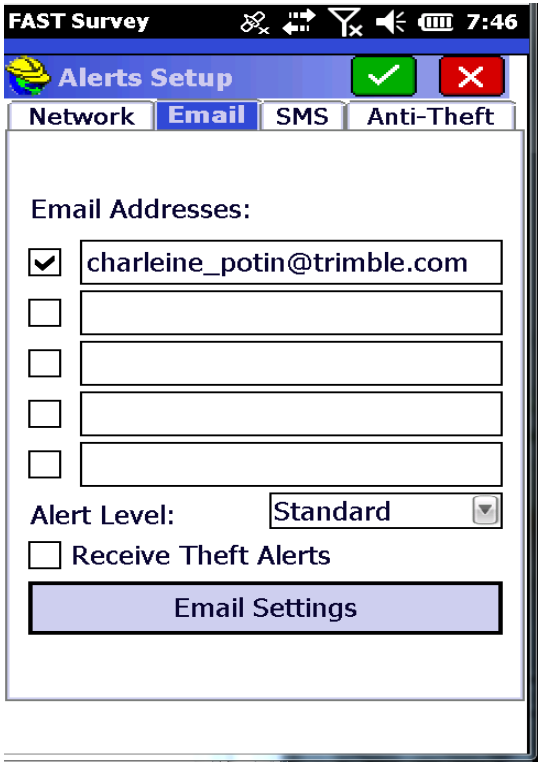
Go to GPS Utility
click on Alerts set up



Check that the GPRS
or the WiFI is on



Enter the email address



With Fast Survey, when the radio is power on, the GPRS or the WiFi is automatically power Off.

ANTI-THEFT Protection

Purpose :

- **Locks the base receiver to a specific location (remote or public places)**
- **Allows tracking of the SP80 position if moved**
- **Makes receiver useless without the antitheft password**

How it works :

- **At the time the antitheft is enabled, the computed position is saved in memory and if the receiver has been configured for that, an SMS/Email containing the antitheft password is sending to the antitheft contacts .**
- **If the receiver computes a position distant by more than 100 M (can be modified by $PASHS command) or if the position has not been computed for the last 20 s, a theft condition is detected.**

SPECTRA PRECISION

ANTI-THEFT Protection

What happens :

- **The buzzer regularly emits a sound alarm**
- **SP80 front panel alarm >**

- **All output messages are stopped**
- **the SP80 configuration cannot be changed (input commands are rejected)**
- **The 3 front panel buttons are inactive (upgrade, reset, power off no more possible)**
- **If the receiver has been configured for anti-theft, SMS and/or emails are sent every minute to the contacts indicated in the anti-theft menu**
- **Both SMS and emails contain the base's last computed position to help you track the thief**
- **If the batteries are removed before the thief takes the receiver, next time the receiver is powered on, the theft alarm will be set and the receiver will remain completely unusable.**

ANTI-THEFT Protection

Antitheft Disable :

- **Enter the antitheft password (you have defined and received when you have enable the antitheft feature)**
- **If the antitheft protection is still active when you power off the receiver, the following screen is displayed on the SP80 front panel**

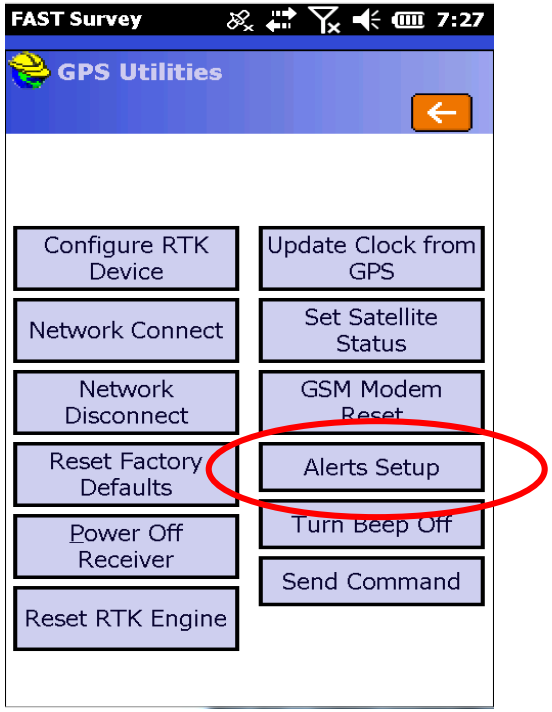
- **By pressing the Scroll button to reject the power off, you can disable the antitheft protection.**

Antitheft password lost

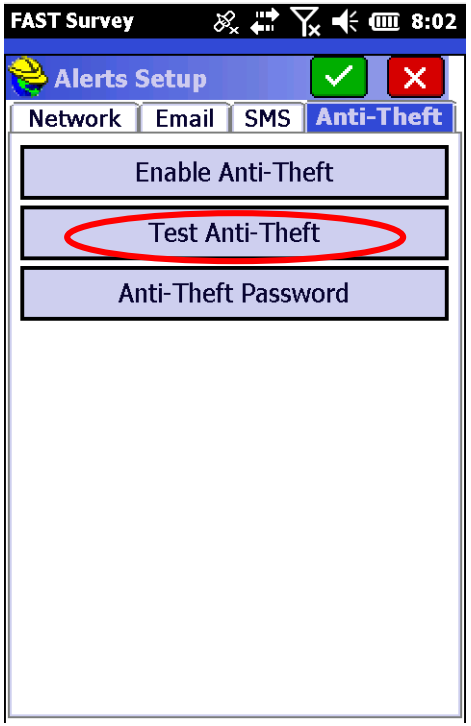
- **Call the technical support which will provide you a specific password computed for the specific SP80 Serial Number**

ANTI-THEFT Protection - set up with fast survey

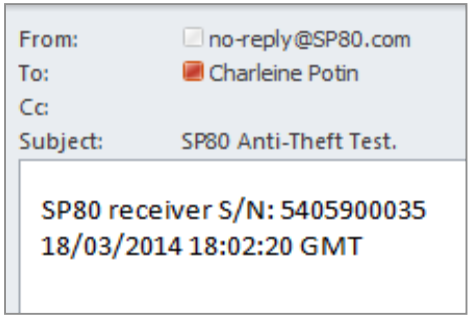
Go to GPS Utility
click on Alerts set up



To test the Anti-Theft feature, enter first email contact address

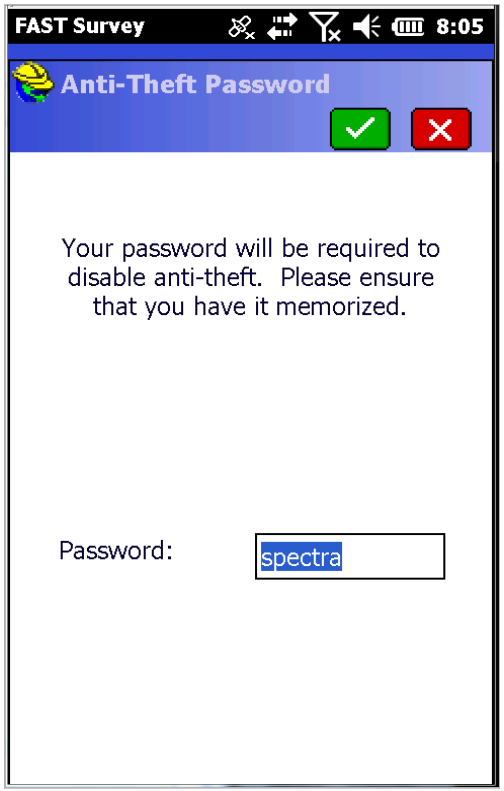


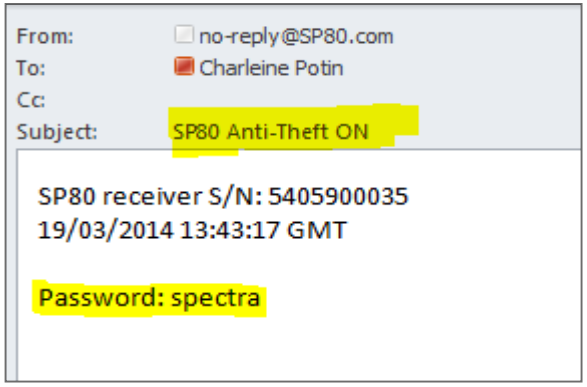
Received email



ANTI-THEFT Protection-set up with fast survey

Enable Anti-Theft

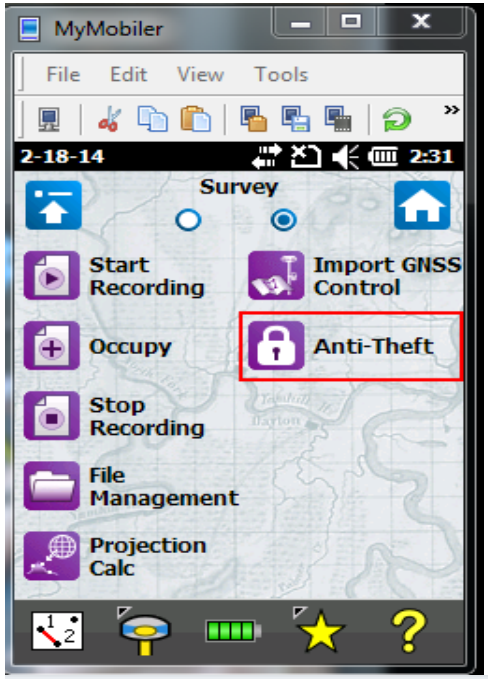


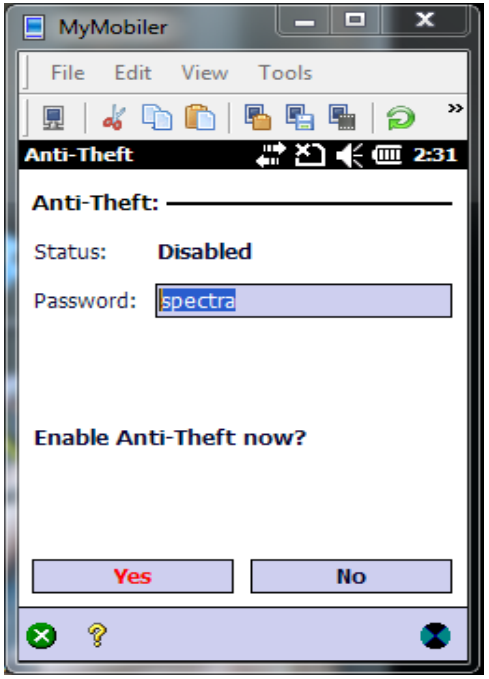


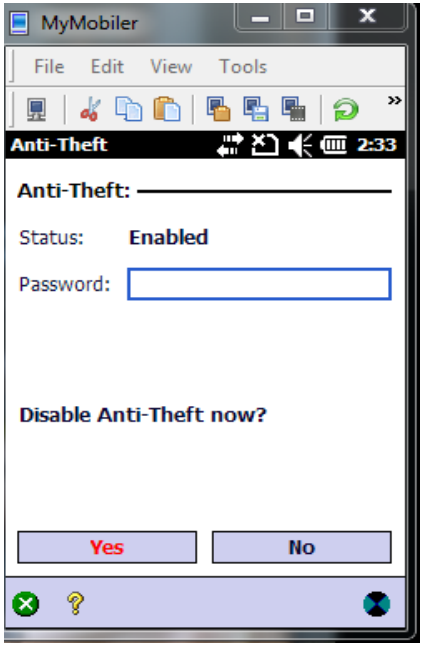
Disable Anti-Theft

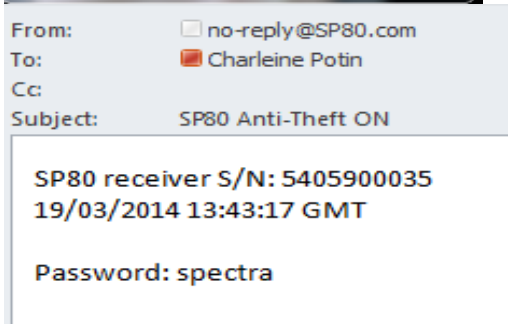
ANTI-THEFT Protection-set up with Survey Pro

- Make sure that the GPRS or WiFi is ON
- Go To Survey Anti-Theft Menu (under Survey view by default)



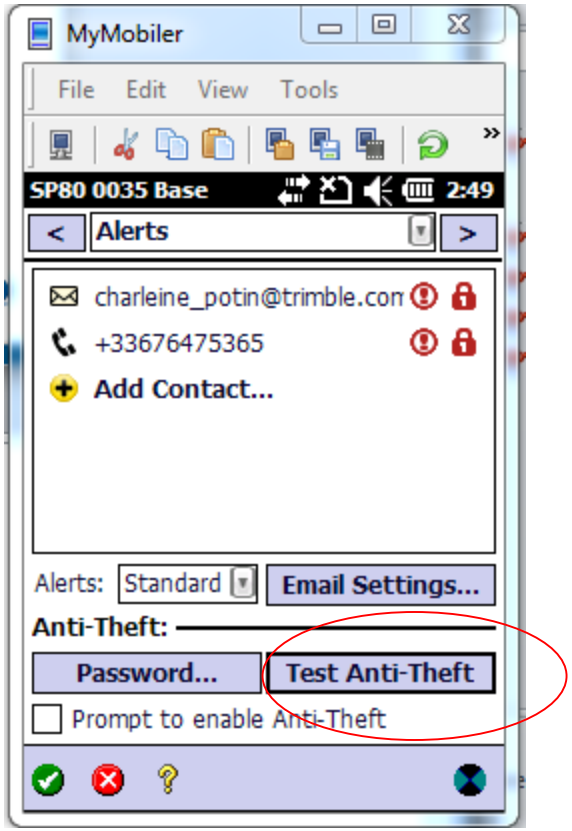


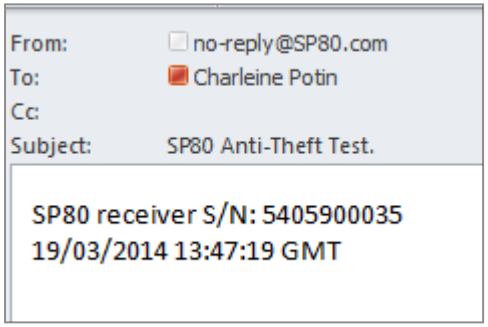


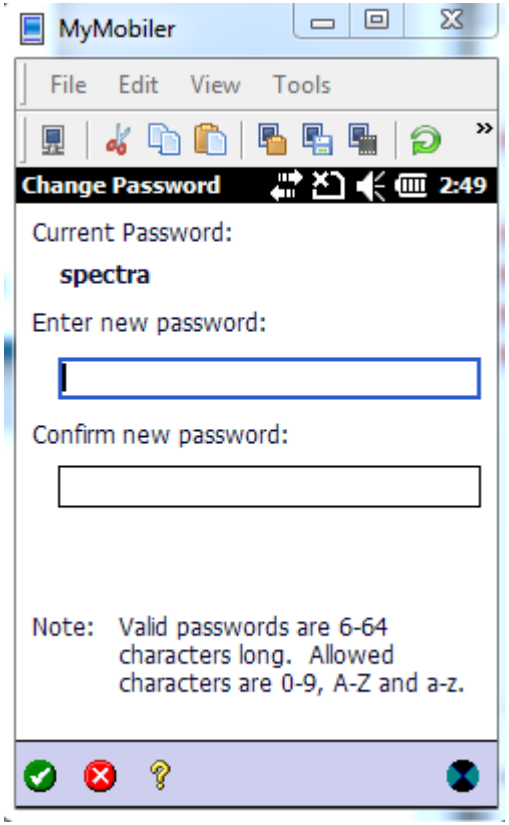


ANTI-THEFT Protection-set up with Survey Pro

To test the Anti-theft feature, you have to go back on the receiver settings/Alerts menu







Memory Management

To download files recorded on the SP80 internal memory:

- Insert a SD card
- Wait the following display >
- Press the Record button
- Wait until the copy annimation completes
- Remove the SD card

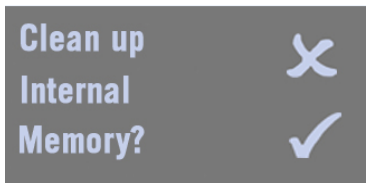
To « FORMAT » the SP80 internal memory:

- Press the Scrool button until ‘Clean up’ shown and press the record button
-
- Then press to see the screen 3
- Press button and confirm

or

- Press button to see the screen 4 and format the memory

It can usefull to format the internal memory when the % of free memory is <99% after deleting all the files



screen 1

screen 2

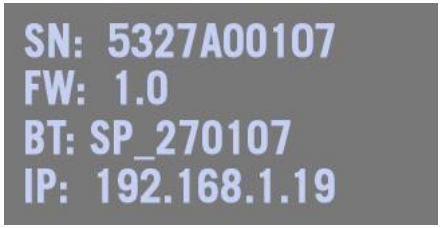
screen 3

screen 4

Upgrade procedure

To upgrade a SP80 firmware :

•Power off the SP80
•Connect the SP80 to external power, or instert two charged batteries
•Copy the .tar file on a not write-protected SD card (free memory > 64 MB)
•Insert the SD card into the SP80
•Press the power and Scroll buttons simultaneously for at least 3 seconds
•After about 10 s, the Spectra Precision logo is replaced with « Uploading Mode»
•Let the receiver proceed with the upgrade (about 6-7 min)
•Take care not turn off the receiver while the upgrade, it may reboot once or twice during the update
•Remove the SD card
•Check the FW release



SP80 ICD ($PASHS COMMANDs)

- New useful commands :
  - $PASHS,BKL,d1 to set the timeout for the OLED backlight
    d1 = 0 ⟹ NO timeout (useful for demo), default value = 10s
  - PASHS,ATH,LEN,d to set the anti-theft protection distance
    default value = 100 meters: could be useful to reduce it for demo
  - « Reset to factory settings »
    - $PASHS,INI,1 to reset the receiver configuration
    - $PASHS,TST,CONFIG,DEL reset the receiver configuration & permanent data (APN…)
  - Commands for new features (WiFi, Antitheft…)

- Few commands have disappeared:
  - $PASHS, PAR,SAV, or LOD to save or load the receiver configuration ☹
  - $PASHS,MDM,INI….

- And some have been modified…

TO send $PASHS Commands,

- You can use : Fast Survey, ASHCOM, WINCOM….
- Via : Bluetooth, USB *

USB: the USB link is an RS2323 emulator. To use it, you need first to install a driver (USB driver installer). You have to do it before connecting the SP80 to your computer and after each receiver power off, you have to disconnect the usb cable and reconnect it)