SP80:
Technical Product Presentation

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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

RINEX Convertor for use with other processing schemes & OPUS.

<table>
<thead>
<tr>
<th>Software</th>
<th>FW Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP80</td>
<td>1.2</td>
</tr>
<tr>
<td>Survey Pro</td>
<td>5.4.1</td>
</tr>
<tr>
<td>Fast Survey</td>
<td>4.0.7</td>
</tr>
<tr>
<td>Survey Pro Office</td>
<td>2.96 or 3.11 (PC 64 bits only)</td>
</tr>
</tbody>
</table>
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: -40°C to +65°C
  - Storage temperature: -40°C to +85°C
  - 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 Trimble Battery Technology

Plenty of knock-offs available

Factory batteries have amazing capacity and life
Sunlight-readable display
High contrast, operates in low temperature
Possibility to modify the backlight timeout ($PASHS,command)
Bottom View

- Battery A compartment
- 5/8" thread insert
- Power/data connector (DC/RS232).

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

- Removable plate
- Optional UHF module

Same as EPOCH 50

Different than previous Ashtech Connecters

Now includes power for the GPS in same cable that connects to external radio!
- **UHF Radio Module Cable Enhancement**
  - The connector is now captive when the radio is in the head, it can not vibrate off:
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.

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

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

<table>
<thead>
<tr>
<th>Port A</th>
<th>External RS232 port (115 200 bds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port B</td>
<td>USB serial port</td>
</tr>
<tr>
<td>Port C</td>
<td>Bluetooth SPP</td>
</tr>
<tr>
<td>Port D</td>
<td>Internal UHF radio (38200 bds)</td>
</tr>
<tr>
<td>Port E</td>
<td>Modem Port for CSD connexion</td>
</tr>
<tr>
<td>Port M</td>
<td>Internal Memory</td>
</tr>
<tr>
<td>Port P</td>
<td>TCP/IP port (client)</td>
</tr>
<tr>
<td>Port Q</td>
<td>TCP/IP port (client)</td>
</tr>
<tr>
<td>Port S</td>
<td>Sd card memory</td>
</tr>
</tbody>
</table>
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 0°, and 120° 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

*: Skipped (not shown) if device absent (radio only) or off.
FRONT PANEL : General status

- 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**
  - Memory: 1.4GB
  - Free: 1.2GB (85%)
  - G-Files: 8
  - G0107A13.310

- **System Information**
  - SN: 5327A00107
  - FW: 1.0
  - BT: SP_270107
  - IP: 192.168.1.19

- **Position Solution**
  - 17 FIXED
  - 47° 17' 56.2926 N
  - 001° 30' 32.5897 W
  - W84 +76.36 m

- **Radio**
  - **Rover**
    - D Rx XDL ON
    - 2 445.1625 MHz
    - TRANS 9600 Bds
    - MED FEC SCR 4FSK
  - **Base**
    - D Tx XDL ON
    - 2 445.1625 MHz
    - TRANS 9600 Bds
    - 1 W FEC SCR 4FSK
FRONT PANEL DISPLAY

- **Modem**
  - GSM ONLINE
  - “Orange F”
  - 3G 60%
  - NTRIP: BRST0

- **WiFi**
  - Wifi CONNECTED
  - Livebox-093c
  - 80%
  - NTRIP: BRST0

- **ATL recording**
  - ATL is off.
  - Start ATL in Memory?
  - ATL is off.
  - Start ATL on SD Card?
  - ATL is on.
  - Stop ATL?

- **Memory Management**
  - Clean up Internal Memory?
  - Delete all G-Files?
  - Delete all Files?
  - Format memory?

- NO
- YES
The battery A is used

Battery is missing

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

« 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.
• 3 different key combinations (Receiver turned off)

<table>
<thead>
<tr>
<th>Key combination</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Power + Scroll buttons]</td>
<td>Starts a firmware upgrade sequence from the file stored in the SD Card.</td>
</tr>
<tr>
<td>![Power + Log buttons]</td>
<td>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.</td>
</tr>
<tr>
<td>![Power + Scroll + Log buttons]</td>
<td>Restores factory settings (see list in Restoring Factory Settings on page 58).</td>
</tr>
</tbody>
</table>
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
The SP80 is connected via Wifi

Is stable

You can start your survey as you do usualy

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

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 \[\rightarrow\] Rover with Paccrest Radios

### Settings

<table>
<thead>
<tr>
<th>Format</th>
<th>Receiver</th>
<th>Radio</th>
<th>Reciever</th>
<th>Radio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATOM</td>
<td>SP80, ProMark800, ProFlex 800 ProMark 500 ProFlex 500</td>
<td>ProMark800, ProFlex 800 ProMark 50 ProFlex 500</td>
<td>Paccrest Radios*</td>
<td>Paccrest Radios*</td>
</tr>
<tr>
<td>COMPACT</td>
<td>SP80, ProMark800, ProFlex 800 ProMark 500 ProFlex 500</td>
<td>ProMark800, ProFlex 800 ProMark 50 ProFlex 500</td>
<td>Paccrest Radios*</td>
<td>Paccrest Radios*</td>
</tr>
<tr>
<td>CMR+</td>
<td>Epoch50, Other brand receivers</td>
<td>Paccrest Radios*</td>
<td>Epoch50, Other brand receivers</td>
<td>Paccrest Radios*</td>
</tr>
</tbody>
</table>

### Protocol

<table>
<thead>
<tr>
<th></th>
<th>BASE</th>
<th>ROVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>Transparent FST</td>
<td>Transparent FST</td>
</tr>
<tr>
<td>Baud rate</td>
<td>9600 bauds</td>
<td>9600 bauds</td>
</tr>
<tr>
<td>FEC</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Scrambling</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

SP80 base with XDL micro*:

- *some frequencies should not to be used* \((\text{see application note})\)
- *CMR+ because we recommend to use the most compact format*
# UHF Radio Settings

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

<table>
<thead>
<tr>
<th>Settings</th>
<th>Base - Ulink radio</th>
<th>SP80 - XDL radio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>ATOM compact</td>
<td></td>
</tr>
<tr>
<td>Protocol</td>
<td>Transparent</td>
<td>Ulink</td>
</tr>
<tr>
<td>Baud rate</td>
<td>4800 bauds</td>
<td>4800</td>
</tr>
<tr>
<td>FEC</td>
<td>Not applicable</td>
<td>OFF</td>
</tr>
<tr>
<td>Scrambling</td>
<td>Not applicable</td>
<td>OFF</td>
</tr>
</tbody>
</table>
### UHF Radio Settings

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

<table>
<thead>
<tr>
<th>Settings</th>
<th>SP80 with XDL or ADL radios</th>
<th>Rover - Ulink radio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>ATOM compact</td>
<td></td>
</tr>
<tr>
<td>Protocol</td>
<td>Ulink</td>
<td>Transparent</td>
</tr>
<tr>
<td>Baud rate</td>
<td>4800 bauds</td>
<td>4800</td>
</tr>
<tr>
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<td>OFF</td>
</tr>
<tr>
<td>Scrambling</td>
<td>Not applicable</td>
<td>OFF</td>
</tr>
</tbody>
</table>

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 \( \Rightarrow \) + until you can read on the SP80 display:

  ![Service Mode
  Radio Linked to Port A]

- 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
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

**EMAIL SETTINGS**

SMTP Server: smtp.orange.fr

SMTP Port: 465

User Name: [Blank]

Password: [Blank]

Sender’s Email Address: no-reply@SP80.com

**ADD CONTACT**

Type: Email

Email Address: charlene_potin@trimble.com

Send Alert Messages

Prompt to enable Anti-Theft

Send Anti-Theft Messages

**SP80 0015 BASE**

Alerts: Off

Email Settings...

Anti-Theft: [Blank]

Password... Test Anti-Theft

Prompt to enable Anti-Theft
SMS & Email ALERTS – set up with Survey Pro

You can Edit, Test, and delete a contact

Alarm email:

From: no-reply@SP80.com
To: Charleine Potin
Cc: 
Subject: SP80 Alarm: Low battery, 58,0

SP80 receiver S/N: 5405900035
19/03/2014 16:50:11 GMT

SP80
S/N: 5405900035
Date: 18/03/2014 17:39:07 GMT
Test message for SMS verification
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.
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.
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

```
Anti-Theft
still active
Continue?
```

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

Your password will be required to disable anti-theft. Please ensure that you have it memorized.

Password: spectra

Disable Anti-Theft

Please enter your Anti-Theft password:

Password: 
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)

```
SP80 receiver S/N: 5405900035
19/03/2014 13:43:17 GMT
Password: spectra
```
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 animation completes
- Remove the SD card

To « FORMAT » the SP80 internal memory:
- Press the Scroll 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 be useful to format the internal memory when the % of free memory is <99% after deleting all the files.
Upgrade procedure

To upgrade a SP80 firmware:
• Power off the SP80
• Connect the SP80 to external power, or insert 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 to turn off the receiver while the upgrade, it may reboot once or twice during the update
• Remove the SD card
• Check the FW release

SN: 5327A00107
FW: 1.0
BT: SP_270107
IP: 192.168.1.19
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)