2. The receiver can return the syntax of each of the above commands by sending the following SMS:

   HELP<sp>command_name
   {Detail of command syntax returned}
   + Command explanation in plain

   Example:

   HELP MEM
   MEM <INT/SD>
   Sets recording memory

MEM: Setting Current Memory

Send this SMS to change the memory used by the receiver. This may be the internal memory or an external SD card connected to the receiver.

Command Syntax:

MEM<sp>INT
or
MEM<sp>SD

Example 1: Choosing the internal memory

MEM INT
SP85 5345900003
11:05:09

MEM INT: OK

Example 2: Choosing the external SD card:

MEM SD
SP85 5345900003
11:05:18

MEM SD: OK

MODE: Setting Receiver Mode

Send this SMS to change the receiver's operating mode: rover or base.

Command Syntax:

MODE<sp>BASE
or
MODE<sp>ROVER

Example 1: Selecting Base Mode

MODE BASE
SP85 5345900003
11:12:25

MODE BASE: OK

Example 2: Selecting Rover Mode

MODE ROVER
SP85 5345900003
11:12:45

MODE ROVER: OK

POS: Setting Reference Position

Send this SMS to change the receiver's reference position. You can choose to send the coordinates of this position or ask the receiver to use the last position it computed (and then keep the reference position to this value).

Command Syntax:

POS<sp>{Attribute}<sp>{Latitude}<sp>{Longitude}<sp>{Height}
or
POS<sp>CUR

Attribute	Position attribute: • PC1: Position attached to L1 phase center (default) • ARP: Position attached to ARP (Antenna Reference Position) • SPT: Position attached to ground mark (surveyed point)	PC1, ARP, SPT
Latitude	Latitude in degrees, minutes, seconds and fraction of second (5 decimal places) (ddmmss.sssss)	0 to ±90
Longitude	Longitude in degrees, minutes, seconds and fraction of second (5 decimal places) (dddmmss.sssss)	0 to ±180
Height	Height in meters	0 to ±9999.9999

Example 1: Sending the coordinates of the reference position

POS PC1 471756.29054 -13032.58254 88.225
SP85 5345900003
11:20:25

SET BASE POSTION: OK
Type: PC1
Latitude: 47 17'56.29054"N
Longitude: 001 30'32.58254"W
Height: +88.225m

Example 2: Asking the receiver to use the last computed position as the reference position

POS CUR
SP85 5345900003
11:21:15

SET BASE POSITION: OK
Type: PC1
Latitude: 47 17'56.29054"N
Longitude: 001 30'32.58254"W
Height: +88.225m

RADIO: Setting the Radio

Send this SMS to control the radio attached to the SP85.

Command Syntax:

1) Turning on the internal radio:

RADIO<sp>ON

2) Setting the radio channel after turning on the radio:

RADIO<sp>CHN<sp>{internal_or_external_radio}<sp>{radio_channel}

3) Turning off the internal radio:

RADIO<sp>OFF

Example 1: Turning on the radio:

RADIO ON
SP85 5345900003
11:18:05

RADIO ON: OK

Example 2: Setting the internal radio to use channel 2:

RADIO CHN INT 2
SP85 5345900003
11:13:05

RADIO CHN INT 2: OK
Channel: 2
RX Frequency: 444.0000MHz
TX Frequency: 445.0000MHz

NOTE: The SP85 response also returns the two frequencies corresponding to the choice of a given channel.

Example 3: Turning off the radio:

RADIO OFF
SP85 5345900003
11:27:16

RADIO OFF: OK

REC: Setting the Recording Mode

Send this SMS to control raw data recording in a remote SP85.

Command Syntax:

1) Starting recording raw data to the current memory at the currently selected recording rate:

REC<sp>ON

2) Starting recording raw data to the current memory at the specified recording rate:

REC<sp>ON<sp>{recording_rate}

3) Ending raw data recording:

REC<sp>OFF

Example 1: Starting raw data recording at 0.1 second:

REC ON 0.1
SP85 5345900003
11:32:04

REC ON 0.10: OK

Example 2: Ending raw data recording:

REC OFF
SP85 5345900003
11:35:19

REC OFF: OK

SEND LOG: Emailing Log Files

Send this SMS to ask the remote SP85 to email its last log files to the specified email address.

Command Syntax:

SEND<sp>LOG<sp>{x_last_log_files}<sp>{email_address}

Example: Emailing the last 4 log files to the specified email address:

SEND LOG 4 rxg217@mmwerx.com
SP85 5345900003
11:40:11

SEND LOG 4 rxg217@mmwerx.com: OK
4 log file(s) sent

SEND PAR: Emailing Receiver Parameters

Send this SMS to ask the remote SP85 to email all its operating parameters to the specified email address.

Command SMS Syntax:

SEND<sp>PAR<sp>{email_address}

Example: Emailing all SP85 operating parameters to the specified email address:

SEND PAR rxg217@mmwerx.com
SP85 5345900003
11:42:51

SEND PAR rxg217@mmwerx.com: OK

Using the SP85 Built-in Electronic Tiltmeter

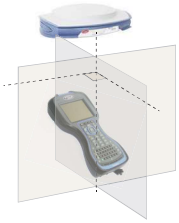
Benefit

When using the pole level to place the antenna phase center exactly over the surveyed point just before logging its position, you need to have an eye on the pole level and the other on the data collector screen, making your best to have the pole vertical at the very moment the point position is being logged. This is a critical phase.

With the SP85 built-in tiltmeter, the level information is forwarded directly to the field software and you don't need to look away from the data collector screen during the procedure:

- First you make the pole vertical following the eLevel instructions displayed on the data collector screen.
- Then, still looking at the data collector screen and keeping an eye on the eLevel, you can more comfortably take the necessary steps to log the point position while keeping the pole vertical.

Rover Setup



Making the pole vertical by reading the eLevel information displayed on the data collector screen will be more intuitive if you set up the rover as follows:

- First you secure the SP85 at the top of the pole.
- Then you mount the data collector on the pole, **making sure the orientation of its longitudinal axis is perpendicular to the SP85 front panel** (see picture).

Calibrating the Tiltmeter

Calibration Methods

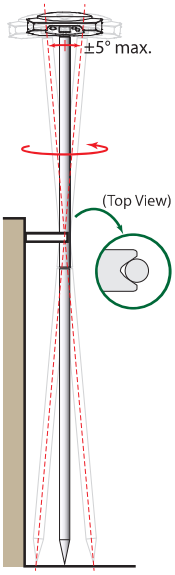
Use one of the two methods below to calibrate the tiltmeter:

- **Auto-Null Method** (Stable Method). This is the simplest method:
  - Secure the SP85 on top of an accurately leveled tripod or range pole and turn it on.

    NOTE: The accuracy of the eBubble depends on the accuracy of the physical bubble used to calibrate it. Thus it is important that the physical bubble be properly calibrated.

- Run a calibration (this can be done either directly from the receiver itself, or from the field software used). Let the system complete the calibration on its own.

  (The SP85 does not need to be rotated around its axis.)



- **Rotation Method** ("V-Groove method"). You need to prop and rotate the SP85 range pole against a V-shaped groove fitted on a wall, at some height above the ground (the higher the better; see diagram).
  - Avoid slippery floor to better control the rotating movement.
  - The range pole does not need to be strictly vertical. A tilt angle of ±5° maximum while rotating the pole is tolerated throughout the calibration procedure.
  - After turning on the SP85 and starting calibration (either from the receiver or the field software), start rotating the pole around its axis at a regular and slow speed, keeping the pole blocked into the V-groove (rotate clockwise or anti-clockwise, but always in the same direction).
  - Keep the pole rotating to cover an angle of between 360° and 540° (one to 1.5 full rotation) within the next 30 seconds.

    If calibration is successful, the receiver will buzz once: you can stop rotating the receiver around its pole. It will buzz twice if calibration fails, prompting you to resume the procedure. A failing calibration is usually the result of unsteady, too slow or too fast rotation.

How Often Do I Need to Calibrate the Built-in Tiltmeter? The SP85 tiltmeter should be calibrated every 30 days, or more often if a message issued by the SP85 asks you to do so. You may re-calibrate the tiltmeter as often as you wish.

NOTE: The electronic tiltmeter is affected by the temperature of the receiver, which will expire the calibration if the current temperature inside the receiver is more than 30 degrees Celsius different to when the last calibration was performed. This forces you to recalibrate the electronic tiltmeter.

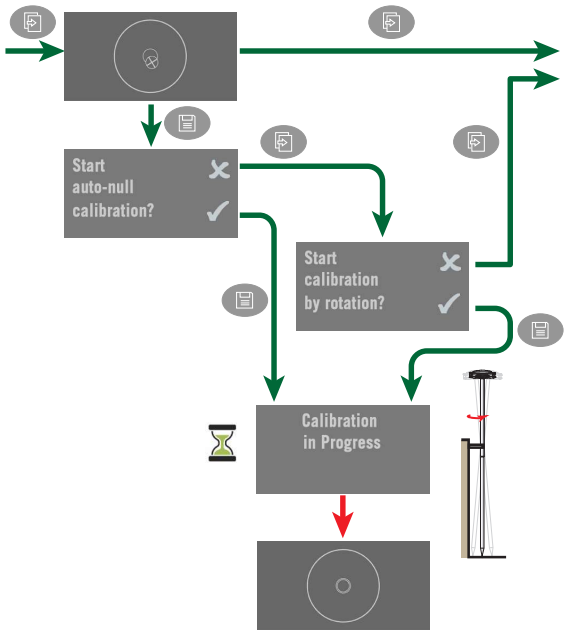
When calibrating the electronic tiltmeter, the pole the GNSS receiver is on should be as vertical and as stable as possible. In practice this means using at least a bipod to hold the pole as still as possible.

Furthermore, a bent pole will affect the measured tilt. If you calibrate the electronic tiltmeter using a bent pole and then change poles, the accuracy of points will be affected. Also, if you calibrate using a straight pole and then change to a bent pole, the receiver will not be plumb even though the electronic bubble will say it is, again affecting the accuracy of the measured points.

Calibrating the Tiltmeter in Standalone Mode

The tiltmeter can be calibrated directly from the SP85 front panel screen.

- Press repeatedly until the eLevel screen is displayed.
- Then press to enter the calibration mode. Follow the instructions in the flowchart below to complete a calibration according to one of the two possible methods.



Calibrating the Tiltmeter With Survey Pro

Unless already there, make the eLevel function available in Quick Pick (i.e. from the yellow star located in the Survey Pro command bar). You need to do this only once:

- Click on Quick Pick in the command bar and select **Quick Pick Editor** at the bottom of the list.
- Select **Extras** from the **Menu Items** field.
- Select **eLevel Bubble** in the list just underneath.
- Tap on the **Add-->** button. The **eLevel Bubble** function is added at the bottom of the Quick Pick list. It can now be run directly from this list.

Configure Survey Pro to operate with your SP85 using the desired receiver profile, then start calibration:

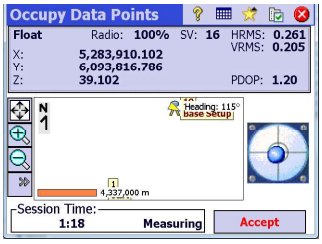
- Run **eLevel Bubble** from Quick Pick
- Tap on **Calibrate**. This opens the **Calibration** screen.

  At the top of the screen is the remaining time before calibration should be resumed.

  At the bottom of the screen you may choose the time allowed between two calibrations (can be set between 1 and 30 days)
- Choose the calibration method (**Auto-Null** or **Rotate**)
- Tap **Start** and follow the instructions. When calibration is complete, the message "**Calibration is done.**" is displayed.
- Tap **OK**, close the **Calibration** window, then the **eLevel Bubble** window.

Using the eLevel in Survey Pro

The eLevel is always shown on the point logging screens.



If the **eLevel Bubble** check box has been activated on the **Meas. Mode** tab for a given type of point (**Data**, **Topo**, **Check**, etc.), Survey Pro will check that the receiver is level before logging this type of point. If it's not, you won't be allowed to log the point.

If the **eLevel Bubble** check box is deactivated, you will still see the eLevel on the screen but Survey Pro will not stop you from logging the point if the receiver is not level.

REMINDER: To open the **Meas. Mode** tab, tap on top of the logging screen.

Using the UHF Kit Option

The SP85 UHF kit is an option that you can use to implement a radio-based, standalone RTK base/rover system (see *Optional Accessories on page 3* for more details on all the items provided in this kit).

With this configuration, you have full control of your base as you can choose where and when to install and operate it.

You will need two SP85 UHF kits to implement a complete radio-based RTK base/rover system. One kit will be installed on base side, the other on rover side.

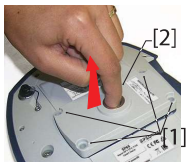
You will also need two UHF whip antennas, one at the base, one at the rover. UHF antennas may be ordered separately, or as part of specific accessories kits that you may need if you wish to install the UHF antenna used at the base on a separate pole. See *Other Optional Accessories on page 4* for further details.

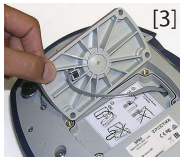
Configuring your radio modules is required before you can use them. This procedure is discussed in *Configuring the UHF Module on page 82*.

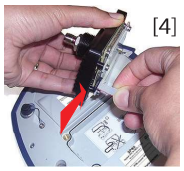
Internal vs. External Power Source for a Base Using a UHF Radio Transmitter: This point has already been discussed when introducing the possible base setups. Please refer to *Internal vs. External Power Source on page 39*.

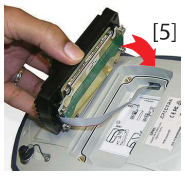
When a radio is used at the base, there is more power needed than in any other base setup. In this case, the use of an external power source (a 12 V battery) is recommended, especially if the base is operated unattended for a full day's work.

Installing the UHF Module into the Receiver



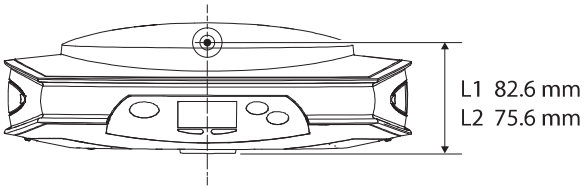






- Power off the SP85 and turn it upside down.
- Use the L-shaped Torx screwdriver provided in the SP85 UHF kit to loosen and remove the four screws (**[1]**) securing the 5/8" threaded insert plate.
- Insert a finger into the 5/8" threaded hole (**[2]**), then gently pull the plate out of the receiver, making sure you free the ribbon cable anchored to the plate without damaging it (**[3]**).
- Put away the 5/8" threaded insert plate in a safe place, possibly for subsequent use.
- Take a look at the instructions printed on the label located in the bottom of the recess.
- Connect the end of the ribbon cable (a 12-contact flat connector) to the UHF module (**[4]**) as instructed on the label (point 1).
- Insert the UHF module into the recess (**[5]**) as instructed on the label (point 2).
- Re-use the four screws and Torx screwdriver to secure the UHF module onto the receiver. Tighten the screws to preserve receiver watertightness (torque meter: 3 N.m).

NOTE: The insertion of the UHF module slightly modifies the ARP (*Antenna Reference Point*) of the GNSS antenna, thus reducing the antenna phase center offset by 2mm (see diagram below).



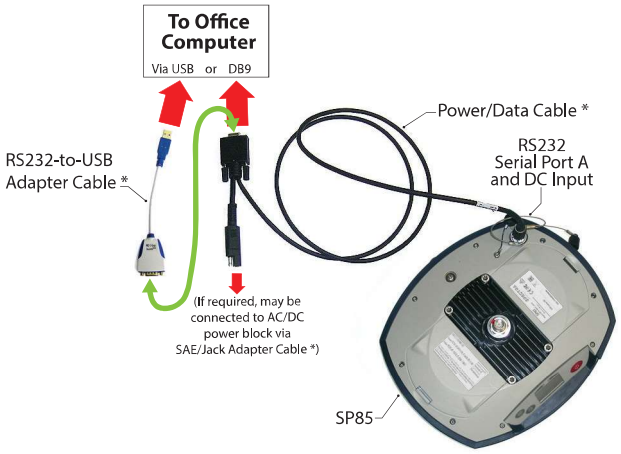
Be aware that the receiver will automatically apply this delta following the installation of the UHF module by assigning a different antenna name to the SP85. In fact, two distinct antenna names exist for the SP85. One describes the antenna parameters when no UHF module is used (antenna name with "-1" suffix), and the other when the UHF module is used ("-2" suffix).

When post-processing SP85 raw data files (G-files), SPSO (*Spectra Precision Survey Office* software) will automatically

recognize the presence or not of the UHF module while you collected your raw data by analyzing the antenna name mentioned in the G-files.

Configuring the UHF Module

- Use cable P/N59044-10-SPN from the SP85 Office Power Kit to connect the receiver to the computer (see diagram below).



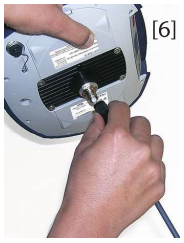
*: All these items are part of the SP85 Office Power Kit P/N 94336 (option). Use the RS232-to-USB adapter cable if your computer is fitted with USB connectors (and no DB9 connector).

NOTE: Cable P/N59044-10-SPN is a Y-shaped cable also allowing you to power the receiver from an AC outlet (via the AC/DC power block) rather than from the receiver batteries (see also *Charging Batteries, Scenario #2 on page 53*). When applied to the receiver's DC input, the external power source has priority over the internal batteries, which means the battery or batteries can be left safely inside the receiver (none of them will be drained).

- Press simultaneously  +  to switch the receiver to **Service mode**. Through this mode, the receiver offers direct access to the UHF module via the receiver's port A.
- Run Pacific Crest *ADLCONF* software on the computer and configure the radio to meet your requirements. Refer to *ADLCONF* instructions to complete this step.

Completing Rover Radio Setup

Once the UHF module has been secured to the receiver (see *Installing the UHF Module into the Receiver on page 81*) and properly configured, do the following:



[6]

- Screw the UHF whip antenna onto the coaxial connector of the UHF module (**[6]**). The antenna will therefore be oriented vertically upside down when used.

  NOTE: Being placed in vertical position, the UHF antenna will stay as sensitive as if it were oriented the other way round.

- Take the top rod of the fiberglass range pole provided in the SP85 UHF kit. Insert first its end with special tapping, not 5/8" tapping, around the UHF antenna (**[7]**).

  CAUTION - This special tapping uses a thinner thread compared to the standard 5/8" one. For this reason, be careful when you start screwing the rod into the UHF module. Make sure the rod fits well in the threaded part of the UHF module.

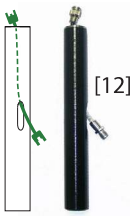
[7]

- Screw the top rod onto the threaded part of the UHF module. Spin the rod, rather than the receiver, when doing this.
- The receiver + top rod assembly can then be mounted on top of the other part of the range pole (the bottom rod).
- Complete the setup of your SP85 + UHF radio rover system by attaching the data collector onto the range pole. You are now ready for a survey.

Completing Base Radio Setup With External UHF Antenna

Two types of base setups are possible with an external UHF antenna:

- **The UHF antenna may be installed in vertical position on the same tripod as the base receiver.**
  For this setup, you may use one of the available two PacCrest radio accessory kit options.(see *Other Optional Accessories on page 4*; the two kits are similar in terms of the hardware provided to install the UHF antenna).
  Follow the instructions below:
  - Secure the bracket onto one of the legs of the tripod (see **[8]**).
  - If you wish to keep GNSS reception optimum, you may keep the UHF antenna below the GNSS receiver by fastening the counterpoise of the antenna directly onto the bracket (see **[9]**). (The antenna counterpoise is part of, and is located at one end of the coaxial cable provided.)
    Then screw the antenna support onto the counterpoise and mount the UHF antenna on top of it (see [10]).
  - If you prefer to optimize the radio range with this setup, raise the UHF antenna by inserting the two-element pole provided between the bracket and the antenna counterpoise (see **[11]**).
- **The UHF antenna may be installed on a separate tripod at some distance from the base receiver**, but still remaining compatible with the length of the coaxial cable you will be using. The UHF antenna should be installed at the highest possible height.



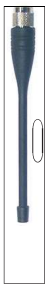
[12]

[13]

On receiver side, after the UHF module has been secured to the receiver and properly configured, do the following whatever your choice of antenna setup:

- Pass the male connector of the coaxial adapter cable (PN 96845) through the oblong hole of the pole extension (PN 95672) and make it go out of it at its upper end (see **[12]**).
- Connect it to the coaxial output of the UHF module.
- Screw the pole extension to the threaded part on the UHF module (see **[13]**). Spin the pole extension, rather than the receiver, taking care not to jam the coaxial cable extension when doing this.
- Secure the receiver/pole extension assembly onto the tripod.
- Connect the other end (female connector) of the coaxial cable extension to the coaxial cable coming down from the UHF antenna.
- Set up the base on the chosen reference point.

Completing Base Radio Setup With Internal UHF Antenna



The UHF antenna is connected directly to the UHF module and is hidden in the pole. The pole is installed on top of a tripod. Follow the same instructions as with a rover (see *Completing Rover Radio Setup on page 83*) to install the internal UHF antenna, but this time you will be using:

- A quarter-wave antenna (P/N 67410-11 or 67410-12, depending on the frequency band used) instead of a half-wave antenna. This shorter antenna is available as an optional accessory (see *Other Optional Accessories on page 4*).
- The pole extension with the oblong hole (from the UHF option kit). You don't need to use the coaxial adapter cable.

Running the SP85 Web Server Interface

Introduction

The SP85 Web Server interface is a web-based, receiver built-in application providing remote access to the receiver's operating parameters. The Web Server is a first-choice tool to review or modify the configuration of a receiver.

You need a web browser running on a controller (data collector, field computer, mobile phone, etc.) to start the Web Server.

Running the Web Server requires that an IP connection be implemented between the controller and the SP85. On receiver side, WiFi must be used (the receiver modem cannot be used here because it is more and more difficult, not to say impossible, to connect to a modem through a public, static IP address).

The embedded WiFi device may be used in two different modes:

- Access Point mode
- Client mode.

The easiest way to run the Web Server is undoubtedly to set the WiFi device in Access Point mode. This chapter however deals with the two possible WiFi modes through which you can access the SP85 Web Server interface.

WiFi in Access Point Mode

This is the easiest way to implement the IP connection.

- Turn on the WiFi device from the dedicated SP85 display screen (see *Wifi Power Control Screen on page 26*). The device is then automatically switched to the WiFi Access Point mode.

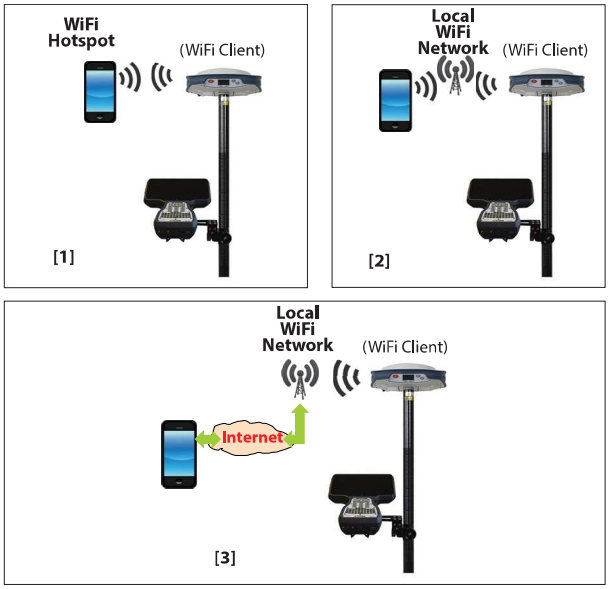
- Then type the following IP address in the web browser:

  192.168.130.1

  Enter the login and password (defaults: "admin" for login, "password" for password). This launches the SP85 Web Server interface: Its home page appears in the web browser.

WiFi in Client Mode

If however the SP85 WiFi device is currently used in client mode (busy receiving RTK corrections for example), then you may still use it in this mode to run the SP85 Web Server interface (see the three possible cases in the diagram below).



- **[1]**: The smart phone can be set to be a *WiFi hotspot*. The SP85 just has to connect to the WiFi network controlled by the smart phone. Once connected to this network, the SP85 provides its IP address on the Receiver Identification screen. Just type this address in a web browser on the smart phone to start the SP85 Web Server interface.
- **[2]**: Both the smart phone and the SP85 are in the vicinity of a third-party local WiFi network. Once the SP85 and smart phone are both connected to the WiFi network, read the SP85's IP address on the receiver identification screen. On the smart phone, run a web browser and type the IP address. This starts the SP85 Web Server interface.

- **[3]**: The path used for the IP connection is here more heterogeneous (modem on controller side, Internet, local WiFi network on receiver side): You will probably need help from a network specialist to make that connection work.

The general procedure to run the SP85 Web Server interface in this case is outlined below:

1. Use your field software (Survey Pro - see subsection below for details) to search for and connect to a local WiFi network (this automatically turns the WiFi device into Client mode).

   If you are using another field software application, please contact Technical Support.
2. Use the SP85 front panel screen to turn on WiFi. After the WiFi device has been turned on, two scenarios are then possible:
   - The SP85 has the name of a WiFi network in memory and automatic connection to this network at power up has been requested. If this network is working and within range, then the SP85 will automatically connect to this network.
   - The SP85 has no WiFi network name in memory. Then you should find which WiFi network to use and ask the SP85 to connect to it before you move on to the next step. See the two subsections below.
3. Select the Receiver ID screen on the front panel display to read and write down the receiver's IP address. This address is provided by the local WiFi network and is shown on the Receiver ID screen, in the lower line (see *Receiver Identification on page 19*).
4. If you are using setup type **[2]**, make sure the controller is connected to the same WiFi network as the SP85.
5. On your controller, run a web browser and then type the IP address you read on the SP85 front panel. Enter the login and password (defaults: "admin" for login, "changeme" for password). This launches the SP85 Web Server interface: Its home page appears in the web browser.

   For more information on the application, open its on-line Help.