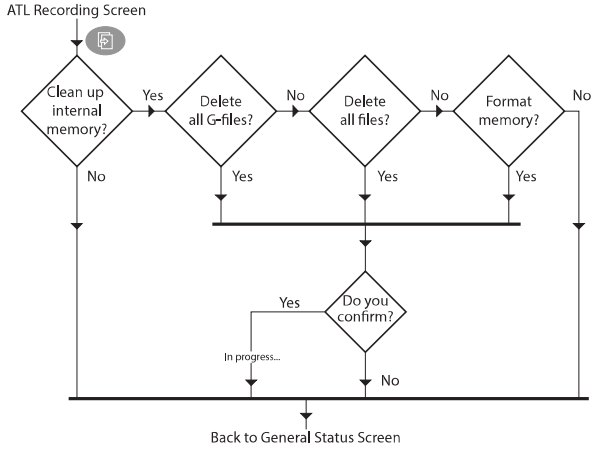
The SP85 embedded function can also be used to reformat the entire memory. See function flowchart below. See also *Memory Management on page 25*.



Charging Batteries – Using External Power

Batteries Vs. External Power Source

The SP85 can be powered by its internal, removable batteries, or by an external power source connected to its Power/Data connector (serial port A; DC input).

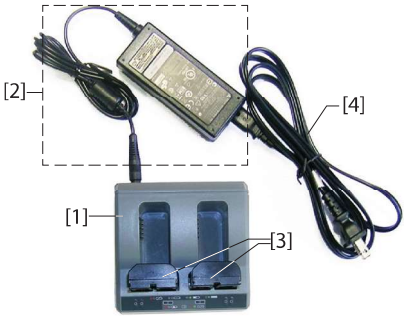
Typically, one 2.6 Ah battery provides approximately 5.0 hours of operation during an RTK survey. If you insert two fresh batteries in the receiver, you will get up to 10 hours of total operation (the two batteries are used one after the other with smooth automatic switching from the low to the fresh one without causing operation disruption).

If an external power source is connected to the power/data connector via the AC/DC power block, **it is used in preference to the internal batteries**. When there is no external power source connected, or if the connected one is not working, then the internal batteries will be used.

When a UHF Kit option is used in a base receiver operated for a whole day's work without interruption, Spectra Geospatial recommends that the receiver be powered from an external 12-V battery with higher capacity. The operating time will depend on the battery capacity and charge as well as the output power level set for the radio transmitter. See *Completing Base Radio Setup With External UHF Antenna on page 84*.

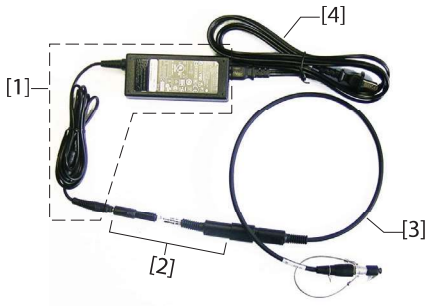
Charging Batteries, Scenario #1

- Remove the batteries from the receiver.
- Use the separate battery charger (**[1]**) and AC/DC power block (**[2]**) provided. The battery charger can accommodate two batteries (**[3]**) and charges them simultaneously.
- Connect the AC/DC power block to a power outlet using the appropriate power cord (**[4]**). For charging instructions refer to *Charging the Batteries on page 12*.



Charging Batteries, Scenario #2

- Keep the batteries in the receiver.
- Use the AC/DC power block (**[1]**) that you connect to the receiver's serial port through a jack/SAE adapter (**[2]**) and one of the possible two SAE/Lemo cables (**[3]**).



More details are provided on the next page explaining which cables can be used as cable **[3]**.

- Connect the AC/DC block to the power line using the appropriate power cord (**[4]**.

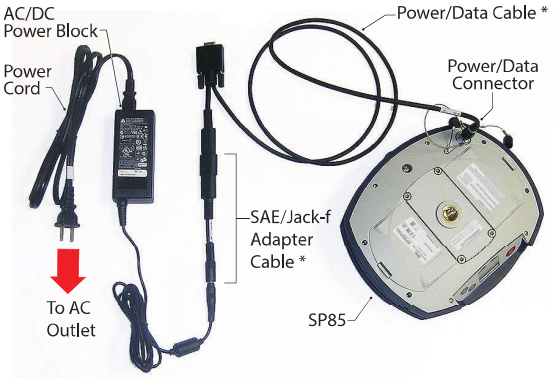
As in scenario #1, only one battery is charged at a time with this scenario, **provided the receiver is kept turned off and the internal temperature is within tolerances**. Charging will start automatically for the second battery when it is complete for the first one.

NOTICE - If your receiver is used with the UHF kit option, the temperature inside the receiver may be greater than 40°C at the end of your day. This may be due to the additional power consumed in the radio module or/and to high ambient temperature.

If this happens and you attempt to charge the batteries right at the end of your day using the AC/DC power block (that means, with one, or the two batteries left inside the receiver), the two battery LED indicators will start blinking red at a fast rate, meaning battery charging is not allowed to start at that time (see *Possible Error Statuses on page 31*).

You should not however worry too much and just keep the AC/DC power block connected to the receiver. As soon as the receiver temperature drops below 40°C, battery charging will start. One of the battery LED indicators will then start blinking red at a slow rate, meaning the corresponding battery is being charged. Then the second battery will be charged in turn. You can be sure your two batteries will fully charge overnight.

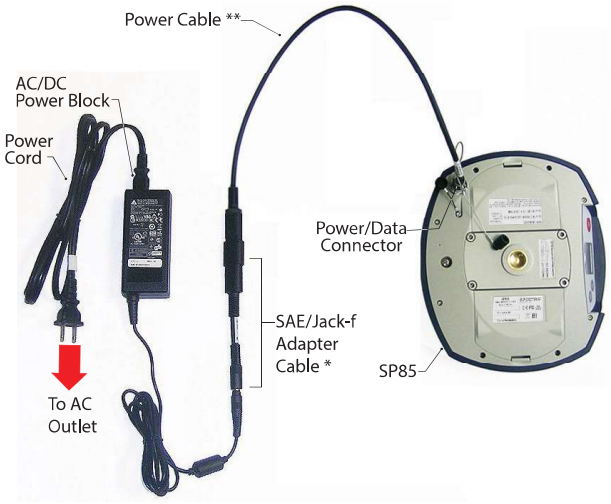
Using Cable P/N 59044-10-SPN from the Office Power Kit



*: These items are part of the SP85 Office Power Kit P/N 94336 (option).

Using Cable P/N 95715 from the Field Power Kit

This cable is primarily designed to power an RTK base from an external battery (see *Completing Base Radio Setup With External UHF Antenna on page 84*). But it can also be used in the office to connect to the AC/DC power block.



*: This item is part of the SP85 Office Power Kit P/N 94336 (option).
**: This item is part of the SP85 Field Power Kit P/N 94335 (option)

Anti-Theft and Startup Protections

Anti-Theft Protection

Purpose

The SP85 integrates an anti-theft function to protect your equipment while it is left operating unattended.
This protection is intended for a SP85 operated as a base.

The anti-theft protection will discourage the theft of an SP85 receiver by rendering it useless without the anti-theft password. It will also aid in recovery of a stolen receiver by sending messages to its real owner with the receiver's current location.

Enabling/Disabling the Anti-Theft Protection

The anti-theft protection is enabled and disabled from the data collector controlling the receiver. If you use the Spectra *Survey Pro* software on your data collector, a user-friendly interface will let you quickly enable or disable the anti-theft protection (see *Using Anti-Theft and Startup Protections in Survey Pro on page 60*).

If you are using other field software, please contact Technical Support for more information.

How the Receiver Operates With the Anti-Theft On

With the anti-theft protection enabled, and as long as no theft is detected, the receiver will operate normally.

What the Anti-Theft Protection Does Initially

At the time the anti-theft protection is enabled, the last valid position computed by the receiver is saved in memory. This position is saved as the anti-theft position.

NOTE: You won't be allowed to enable the anti-theft protection until the receiver can compute a position solution in standalone mode for its location, and the communication means (modem, WiFi) are operational to forward an alert in case of theft.

What Events Will Trigger a Theft Alarm?

From the moment the anti-theft protection is enabled (and an *anti-theft position* has been saved in the receiver), a theft condition will be detected, and an alert will be issued:

- If the receiver has unexpectedly been unable to deliver a valid position for the last 20 seconds or so.

- Whenever the protected receiver computes a valid position that is distant by more than 100 meters (around 330 feet) from the *anti-theft position*.

What Will Happen When a Theft is Detected?

The protected receiver will switch to "theft mode", that is:

- The buzzer will regularly emit a sound alarm in quick succession, and for an indefinite period of time.
- The front panel display will read: "**ANTI-THEFT ALARM**".
- All output messages will be stopped (the protected base receiver will no longer generate and transmit corrections, or any other NMEA or raw data messages).
- If the internal GSM modem is used, a text message (SMS) and/or an email will be sent every 1 minute to, respectively, the phone number(s) and/or email recipient(s) you indicated when programming the anti-theft protection. Both the text message and email will contain the base's last computed position to help you track the thief.
- The three front panel buttons of the protected receiver will be made inactive, which means no one can:
  - Power off the receiver
  - Reset the receiver
  - Upgrade the receiver.

What if the Thief Removes the Batteries?

If the thief removes the batteries before vanishing into thin air with your receiver, be sure the theft will be detected sooner or later. Next time the receiver is powered back on, because the protection is still active, the theft alarm will be set as soon as a valid position is computed and found distant by more than 100 meters from the memorized *anti-theft position*, or no valid position is delivered for 20 seconds or so.

There won't be any possibility for the thief to quit that mode and so the receiver will stay completely unusable (even if the SIM card is removed with intent to use a radio link instead for example). A theft alert will be issued however only if the communication channel (cellular modem, WiFi) has been left operational.

Disabling Anti-Theft Before Turning Off the Receiver

If your base is set up every day at the same location and you wish to keep the protection active day after day, the anti-theft

protection may be left enabled between work sessions. This will not trigger any false Anti-Theft alarm.

On the contrary, if the base is moved to a different location every day, we recommend you disable the anti-theft protection before you turn off the receiver. If you don't, when starting the next operating session on a new location, an Anti-Theft alarm will be raised mistakenly, requiring that you enter the Anti-Theft password on the data collector to remove the protection and stop the alarm, which may be annoying and a waste of time.

As a safety measure, a power-off confirmation message will show up if you attempt to turn off the receiver with the anti-theft protection still active (see screen in the left-hand column). Confirm power off by pressing the **Log** button (otherwise, press **Scroll** to reject the request so you can disable the Anti-Theft protection, using your field software, before turning off the receiver).

Lost your Anti-Theft Password?

If you lose that password, you will be unable to remove the Anti-Theft protection. You will need to call Technical Support, which will provide a specific password so you can disable the protection.

The Theft Alarm is Part of the Level-1 Alarms List

The theft alarm is managed as a level-1 alert (see *Alerts on page 102*). As such, it is submitted to the same rules as the other level-1 alerts when it comes to issuing a notification email or SMS.

However, in Survey Pro, you are given the ability to configure the receiver to issue notification emails or SMS only for the theft alert.

Startup Protection

Purpose

The SP85 integrates a protection from illegal use. With this protection active, only authorized operators will be allowed to use the receiver after they have entered their password.

Enabling/Disabling Startup Protection

This protection may be enabled or disabled from the data collector controlling the receiver. If you use the Spectra *Survey Pro* software on your data collector, a user-friendly interface will let you quickly enable or disable the startup protection (see *Using Anti-Theft and Startup Protections in Survey Pro on page 60*).

If you are using other field software, please contact Technical Support for more information.

How SP85 Operates with Startup Protection Active

The receiver operates with minimum functionality as long as the password has not been typed in from the data collector keyboard. It will operate normally as soon as the requested password has been entered.

Remember the password needs to be entered after each power-up sequence (and not only once), and as long as the protection is kept active.

When you enter the password to unlock the receiver, you can however decide at the same time that the startup protection should be deactivated (in that case, the password will not be required next time you power up the receiver).

Difference Between Startup and Anti-Theft Protections

The difference is that startup protection only prevents the receiver from being used illegally, whereas anti-theft protection is used to detect a possible theft after the receiver has been left operating unattended as a base.

Shared Resources

Anti-Theft and startup protections share the same password. If you change the password for anti-theft, then you have also changed the password for startup protection (and vice versa).

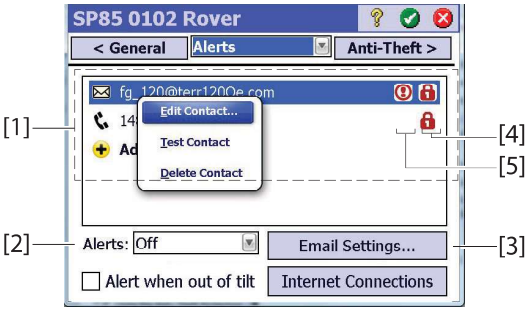
Can Anti-Theft and Startup Protections Be Both Active?

Yes. There is no contradiction between the two protections, which complement each other. If the startup protection is active and a theft alarm occurs, then you will have to enter the password twice (assuming you've recovered the stolen receiver): The first one will deactivate the anti-theft alarm, and the second one will make you a legal user of the receiver.

Using Anti-Theft and Startup Protections in Survey Pro

- Power on the SP85. Wait until the boot sequence is over.
- On the data collector, launch Survey Pro and open a job.
- Select **Switch to GNSS** to select the GNSS survey mode.
- Connect Survey Pro to your SP85 via Bluetooth.
- Create the suitable receiver profile for your SP85.
- Go back to **Manage Instruments** and select the receiver profile you have just created.
- Tap on  .
- First select the **Alerts** tab, then the **Anti-Theft** tab. These two tabs contain all the information you need to set the anti-theft and startup protections. These are detailed below.

Alerts Tab



- **[1]** List of contacts (email addresses, phone numbers) notified of alerts, including theft, when these occur. See *Managing Contacts and Notifications on page 62*

- **[2] Alerts**: Select which alerts will be notified to the registered contacts.

Alert Field Setting	Notifications
Off	None
Standard	Only for level-1 alerts
Full	For level-1 and level-2 alerts

- **[3] Email Settings**: This button allows you to configure your email account (i.e. that of the embedded email sender).

  You need to provide Survey Pro with the SMTP server name, the SMTP port number (default: 25), the user name and password for outgoing mail, and the sender's email address (noreply@SP85.com by default).
- **[4]**: Exclamation mark shown in this column for all contacts defined to receive alert messages.
- **[5]**: Padlock shown in this column for all contacts defined to receive anti-theft messages.

Anti-Theft tab

- **[6] Change Password**: Tap on this button to enter and confirm the password that will allow the field operator to disable the anti-theft protection and startup protection (see *Startup Protection on page 59*).

  NOTE: You cannot change the password while the anti-theft protection is active.
- **[7] Enable** (anti-theft): This button allows you to enable the anti-theft function directly from this screen (as you would from **Survey** > **Anti-Theft**).

Before you enable anti-theft, please read the currently active password shown in plain on the screen. This is to make sure you will keep it in mind (you'll need it to disable the anti-theft protection). After anti-theft has been enabled, the **Enable** button turns into a **Disable** button.

- **[8] Prompt to enable Anti-Theft**: When this box is enabled, users will be prompted to turn anti-theft on when they set a base or start a standalone, static, post-processing session.

  Keeping this box disabled means users will not be prompted.

  Users may enable or disable anti-theft protection at any time through **Survey** > **Anti-Theft**.
- **[9] Test**: Tapping on this button will cause the receiver front panel to display "ANTI-THEFT ALARM" for about 10 seconds. Notifications will be sent via email or/and SMS text messaging to the registered contacts, as appropriate. This test is useful to check that there is no mistake in the entered email addresses and phone numbers.
- **[10] Enable** (startup protection): This button allows you to enable the startup protection. For more information on this function, please refer to *Startup Protection on page 59*.

  Before you enable the startup protection, please read the currently active password shown in plain on the screen. This is to make sure you will keep it in mind (you'll need it to be allowed to use the receiver next time you turn it on). After the startup protection has been enabled, the **Enable** button turns into a **Disable** button.

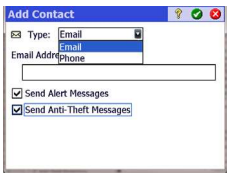
Managing Contacts and Notifications

This area on the **Alerts** tab allows you to define which contacts should be informed, through which transmission media, and which type of notification they should receive.

- Tap on **Add Contact**.

  For each new contact you add, you need to define:

  - The communication media used for this contact (email or phone)
  - The contact's email address or phone number
  - **Send Alert Messages**: Check this box if the contact is supposed to receive alert messages. Keep it cleared otherwise.

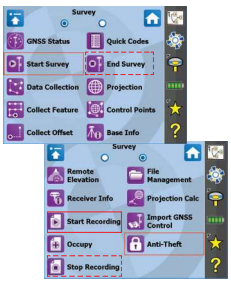


- **Send Anti-theft Messages**: Check this box if the contact is supposed to receive anti-theft messages. Keep it cleared otherwise.

- Tap ✔ to save the new contact.
- Create as many contacts as necessary through the same procedure.
- Tap ✔ again when you are done with the list of contacts.

Enabling/Disabling the Anti-Theft Protection

After you have set the receiver's **Alerts** and **Anti-Theft** tabs to meet your requirements, go to the **Survey** menu and then select one of the following functions:



- **Anti-Theft**: This function shows the current status of the anti-theft protection (**Enabled**, **Disabled** or **Alarm Raised**). It can be used to enable or disable the protection at any time.

  You need to enter the password previously defined on the **Anti-Theft** tab before you are allowed to disable the anti-theft protection. If the theft alarm has been raised, you can only disable the anti-theft protection.
- **Start Survey**: When you use this function to set an RTK base, and provided the **Prompt to enable Anti-Theft** box has been enabled (see *Anti-Theft tab on page 61*), the anti-theft protection will be enabled automatically. (A message will warn you that the protection has been activated and information will be given to tell you how to disable it.)

  Later the protection will be disabled automatically when you use the **End Survey** function.
- **Start Recording**: When you use this function to start a static data recording, and provided the **Prompt to enable Anti-Theft** box has been enabled (see *Anti-Theft tab on page 61*), the anti-theft protection will be enabled automatically. (A message will warn you that the protection has been activated and information will be given to tell you how to disable it.)

  Later the protection will be disabled automatically when you use the **Stop Recording** function.

Communicating with SP85 Using a Mobile Phone

Introduction

The SP85 can receive and process specially formatted SMS's causing it to respond accordingly. This functionality gives you extra flexibility for remote control and monitoring of your SP85.

Typically, you will use this functionality if you are operating your own base/rover system and, being at some distance from your base, you would like to communicate with it for monitoring or remote control purposes. The use of SMS's is however not restricted to communicating with a base: You can also use them to communicate with a rover.

SP85's SMS functionality may be:

- Disabled
- Set up to process SMS's only from registered phone numbers.
- Or set up to process SMS's from any phone number.

By default, the SP85 accepts SMS's from any phone number.

Any command you send should be in the form:

```
Command_name[<sp>parameter_1][<sp>parameter_2]
[<sp>parameter_3][<sp>parameter_4]
```

(Commands may be typed in using upper- or lower-case characters.)

Any response the remote SP85 returns will be in the form:

```
SP85<sp>{Receiver Serial Number}
HH:MM:SS

Command_name[<sp>parameter_1][<sp>parameter_2]
[<sp>parameter_3][<sp>parameter_4]:<sp>OK
[Optional_parameters_when_appropriate]
```

Where:

- <sp>: Space character
- {...}: Definition of the parameter you must type (and not the parameter itself).
- [...]: Parameter required for some commands only.

- Date expressed in day/month/year and time in hours:minutes:seconds.
- Line in bold characters: Command SMS sent to SP85
- Line in normal characters: Response SMS from SP85

Commands List

Command Name & Syntax	Function
ANH VERT x.xx ANH SLANT y.yy	Sets antenna height (vertical measurement) Sets antenna height (slant measurement)
ANR OFF ANR PC1 ANR ON ANR SPT ANR ARP	Sets L1 phase center as reference location Sets L1 phase center as reference location Sets ground mark as antenna reference location Sets ground mark as antenna reference location Sets ARP as reference location
ATH ON ATH OFF {password}	Activates anti-theft function Deactivates anti-theft function
GETID	Returns SP85 identification information
GETMEM	Returns memory status
GETPOS	Returns last computed position
GETPOWER	Returns power status
HELP HELP {command name}	Returns the list of available commands Returns the syntax of the specified command
MEM INT MEM SD	Sets internal memory as current memory Sets external SD card as current memory
MODE BASE MODE ROVER	Sets the SP85 as a base receiver Sets the SP85 as a rover receiver
POS... POS CUR	Provides coordinates to be the reference position Sets last computed position as reference position
RADIO ON RADIO CHN INT {channel} RADIO CHN EXT {channel} RADIO OFF	Powers up the radio Sets channel number in internal radio device Sets channel number in external radio device Turns off radio
REC ON REC ON 0.5 REC OFF	Starts data recording at currently set recording rate Same but you choose the recording rate Stops data recording
SEND LOG n ...@...	Asks the SP85 to email its last “n” log files to the specified email recipient
SEND PAR ...@...	Asks the SP85 to email its operating parameters to the specified email recipient

See below for details.

ANH: Setting Antenna Height

Send this SMS to change the receiver antenna height. You can either send a vertical or slant measurement (both in meters) of the antenna height.

Command Syntax:

ANH<sp>VERT<sp>{vertical measurement}
or
ANH<sp>SLANT<sp>{slant measurement}

Example 1: Sending vertical height measurement

ANH VERT 2.124
SP85 5345900003
11:02:14

ANH VERT 2.124 m: OK

Example 2: Sending slant height measurement:

ANH SLANT 1.645
SP85 5345900003
11:02:14

ANH SLANT 1.645 m: OK

ANR: Setting Antenna Reduction Mode

Send this SMS to change the location for which the receiver computes a position.

Command Syntax:

1) Position computed for antenna L1 phase center location:

ANR<sp>OFF
or
ANR<sp>PC1

2) Position computed for ground mark location:

ANR<sp>ON
or
ANR<sp>SPT

3) Position computed for antenna reference point (ARP):

ANR<sp>ARP

Example:

ANR ON
SP85 5345900003
11:03:40

ANR ON: OK

ATH: Setting Anti-Theft

Send this SMS to enable or disable the anti-theft function. For example, anti-theft can be disabled remotely just at the end of a work day to allow another operator not working with a data collector to be able to fetch the base without causing the anti-theft alarm to go off.

Command Syntax:

1) Enabling anti-theft (be sure to know the password before you send this SMS):

ATH<sp>ON

2) Disabling anti-theft:

ATH<sp>OFF<sp>{password}

Example:

ATH ON
SP85 5345900003
11:04:25

ATH ON: OK

GETID: Reading Receiver Identification Information

Send this SMS to query the receiver for its serial number, firmware version and warranty expiration date. (The SP85 serial number is part of almost every SMS the SP85 sends back in response to a command.)

Command Syntax:

GETID

Example:

GETID
SP85 5345900003
11:05:01

Version: 2.00
Version date: 01/03/2015
Expiration date: 26/11/2015

GETMEM: Reading Memory Status

Send this SMS to query the receiver for the status of the currently used memory.

Command Syntax:

GETMEM

Example:

GETMEM
SP85 5345900003
11:08:29

Current memory: internal
Free memory: 1.4GB (99%)
G-Files: 3
ATL Files: 1
Free SD Card: 7.2GB (99%)
G-Files: 2
ATL Files: 0

GETPOS: Reading Computed Position

Send this SMS to query the receiver for the last computed position.

Command Syntax:

GETPOS

Example:

GETPOS
SP85 5345900003
11:11:17

47 17'12.12345"N
001 30'14.54321"W
+75.254 m (SPT)
Type: FIXED
Mode: ROVER
Age: 1 s
Satellites: 22
Antenna height: 2.000 m (vert)

GETPOWER: Reading Receiver Power Status

Send this SMS to query the receiver for the current status of its power supply.

Command Syntax:

GETPOWER

Example 1:

GETPOWER
SP85 5345900003
11:13:47

Source: left-hand battery
Left battery: 80% (7.3V)
Right battery:
External power:

Example 2:

GETPOWER
SP85 5345900003
11:14:04

Source: external power
Left battery: 80% (7.3V)
Right battery: 100% (7.4V)
External power: 12.2 V

HELP: Reading the List of Commands

1. Send this SMS if you want to be reminded of all the possible commands you may use to control/monitor a receiver through SMS's.

Command Syntax and SP85 Response:

HELP

ANH
ANR
ATH
GETID
GETMEM
GETPOS
GETPOWER
MEM
MODE
POS
RADIO
REC
SEND