SOKKIA

Stratus

Operations Manual

Part Number 750-1-0063 Rev 2

Stratus Receiver FCC Notice

The equipment described in this manual has been tested pursuant to Part 15 of the FCC Rules and found to comply with the limits for a Class A digital device for use in commercial business, and industrial environments. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio and television reception. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, you can try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the receiver relative to the equipment which it interferes.
- Power the equipment from a different AC receptacle so that this equipment and the interfered equipment are on different branch circuits. If necessary, contact our customer service department or an authorized representative for additional advice.

Stratus Controller CE Notice

Warning: This is a Class A product. In domestic environments this product may cause radio interference in which case the user may be required to take adequate measures.

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Chapter 1   Introduction

1.1   What is Stratus?

Welcome to the *Stratus Operations Manual*. This manual will provide you with complete information about your Stratus system.

Stratus is a complete single-frequency GPS receiver system for precise surveying. The Stratus system components include the Stratus integrated receiver, data post-processing software, and all the necessary accessories to yield quality results with minimal time and effort. Optionally, the Stratus system can be used with a handheld controller. This manual will include instructions for using the Stratus receiver with the handheld controller.

GPS Receiver - The heart of the Stratus system is the Stratus GPS receiver. The receiver is a compact, highly integrated electronic device that incorporates a survey-grade GPS receiver, antenna, and batteries. The receiver quickly mounts on standard tribrachs, tripods, and poles. It collects and records signals broadcast from GPS satellites and stores this information in its internal memory. The integrated design eliminates troublesome cables found in the field with conventional GPS surveying systems. For more information on the Stratus receiver, see Chapter 5, **Receiver Operations**.

Controller Software - The Stratus software is used on a Windows CE handheld controller, such as the iPAQ, to provide a powerful link for any job. Infrared communication provides a wireless surveying experience as you transfer point identification, antenna height, and descriptions to the receiver. While your receiver is collecting data, you can use your

controller to monitor important GPS information. For more information on the Stratus controller software, see Chapter 8, **Software Job Setup**.

Desktop Software - The Stratus system includes the *Spectrum Survey Suite*, an easy-to-use software package that handles all aspects of managing and processing Stratus receiver data. The *Spectrum Survey Suite* software yields precise positioning results in graphical report formats that are easy to understand. For more information on the *Spectrum Survey Suite* software, refer to the *Spectrum Survey* and *Planning Reference Manuals*.

The essence of the Stratus system is accuracy, reliability, and simplicity–It's simple to learn, simple to operate and simple to produce high-quality results.

1.2   Ports and Icons

This icon identifies the **power/communications port** on the side of the Stratus receiver. This port is dual purpose for receiving power and for communicating with a handheld. In this document, when discussing this port with respect to its power capabilities, it is referred to as PWR. When discussing the communications capability of this port, it is referred to as COM.

This icon identifies the **power button** on the display panel of the Stratus receiver.

Located on the display panel, this icon identifies the **Internal Battery Life** gauge, displaying the status of the internal battery life. See Section 5.3.3.1, *Internal battery life gauge*, on Page 43.

Located on the display panel, this icon identifies the **Satellites Visible Tracking** gauge, displaying the number of visible satellites currently being tracked by the receiver. See Section 5.3.3.2, *Satellites visible tracking gauge*, on Page 44.

Located on the display panel, this icon identifies the **Memory**
gauge, displaying the amount of memory (free space)
remaining on your data card. See Section 5.3.3.3, *Memory gauge*,
on Page 45.

Located on the display panel, this icon identifies the
Occupation Time gauge, displaying how much continuous
data has been received of a quality sufficient for
post-processing. See Section 5.3.3.4, *Occupation time gauge*, on
Page 46.

For more information about these features, see Chapter 5,
Receiver Operations.

1.3   Features

Features of the Stratus system include the following:

- **Easy to use.** One button operation and simple interface
  ensures a no hassle survey experience, even for beginners.

- **No cables in the field.** Fully integrated with antenna, and
  battery power pack, to make surveying convenient.

- **Lightweight design.** Stratus receiver is the lightest on the
  market.

- **Status gauges.** Glowing LED gauges on the face of the
  receiver constantly monitor the amount of battery power
  you have left, remaining receiver memory, the number of
  satellites being tracked, and occupation time.

- **Windows**® **CE data collector (optional).** With a wireless
  Pocket PC and Stratus controller software, taking electronic
  field notes and monitoring receiver information is clean
  and simple.

- **Planning and Spectrum Survey software.** Use this
  software to plan and post-process your survey by finding
  the unknown coordinates of your survey's points.

The Stratus receiver features are summarized in Table 1. For detailed information, see Appendix A, **Stratus Specifications**.

Table 1: Stratus Receiver Basic Features

Basic Receiver Features
General
Rugged shock resistant, water proof, buoyant enclosure
Wireless controller interface (IrDA)
Static and kinematic survey performance
LED status gauges
Internal memory (4MB)
2 BDC46 internal rechargeable batteries (up to 30 hours of use)
Bi-directional IrDA port that can transfer data at rates up to 57600 bps (bits per second).
L1 GPS technology (C/A code and full-wavelength carrier phase), Pseudo range measurements
Fast re-acquisition
Data Logging Rate Interval
Computed Data: Position, speed, direction, & clock offset = 60 seconds
Measured Data (Observations): Pseudo range & carrier phase = 10 seconds
Receiver Control
Ability to save receiver configuration settings & almanac
Reset (hardware or software activated)
Serial port control
Satellite lockout and elevation cut-off

1.4   Where to Find Information

This manual provides sufficient information to enable you to effectively use your Stratus system. In addition to this manual, several other forms of documentation serve as supporting documents.

* **Stratus Receiver/Controller Jump Start**—Refer to this full-color document for simple instructions and illustrations to setup your Stratus system.

* **Stratus Quick Reference Card**—Take these wallet-sized cards to the field for quick instructions to operate your Stratus receiver.

* **Spectrum**® **Survey Reference Manual**—This manual provides comprehensive information about using *Spectrum Survey* software.

* **Planning Reference Manual**—This manual shows how to use *Planning* software to help determine satellite availability.

* **Your Pocket PC Reference Manual**—Read the Pocket PC reference manual provided with your handheld device for detailed device information.

1.5   Obtaining Technical Assistance

When contacting customer support, have available:

* serial number
* firmware version number
* concise description of the problem

Technical support for this product is available from the distributor where you purchased it. You also may contact one of the Sokkia subsidiaries listed on this page.

USA
Sokkia Corporation
16900 W 118th Terrace
P.O Box 726
Olathe, KS 66061
Phone +1-913-492-4900
Fax +1-913-492-0188
Web www.sokkia.com

Canada
Sokkia Corp.
1050 Stacey Court
Mississauga, Ontario
L4W 2X8
Phone +1-905-238-5810
Fax +1-905-238-9383
Web www.sokkia.com

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Datum House, Electra Way
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sokcsa@worldnet.att.net

1.6   Notes, Cautions, and Warnings

Notes, cautions, and warnings stress important information regarding the installation, configuration, and operation of the Stratus system.

The following shows the format for notes, cautions, and warnings throughout this manual.

Notes

☒ **Note:** Notes outline important information of a general nature.

Cautions

CAUTION
Cautions inform about possible sources of difficulty or situations that may cause damage to the product.

Warnings

WARNING
Warnings inform about situations that may cause you harm.

1.7   Stratus Usage Cautions

The following information describes cautions you should take when using the Stratus system.

CAUTION
• This device incorporates circuitry to absorb most static discharges. However, severe static shock may cause inaccurate operation of the unit. Use anti-static precautions where possible.
• This device is a precision instrument. Although it is designed for rugged operating conditions, it performs best when handled with care.
• When the access cover for the Stratus receiver is closed and latched, and the Power port is closed, the enclosure is sealed to provide protection against adverse environmental conditions. To minimize the possibility of damage, always keep the access door closed and latched except when exchanging batteries.
• The Stratus receiver can accept an input supply voltage in the range +8 to +16 VDC. This may not be the same range as other Sokkia products with which you are familiar. Do not operate the Stratus receiver outside the specified voltage range.
• We recommend that you do not use the Stratus receiver on a moving vehicle.

Chapter 2 — Quick Start

This chapter is a basic survey quick start that briefly introduces the hardware and software components in the Stratus system. To learn more about the system, including details about the components and how to use them, refer to the other chapters in this manual.

Once you are familiar with the Stratus system, use the quick start as a guide to walk you through a survey.
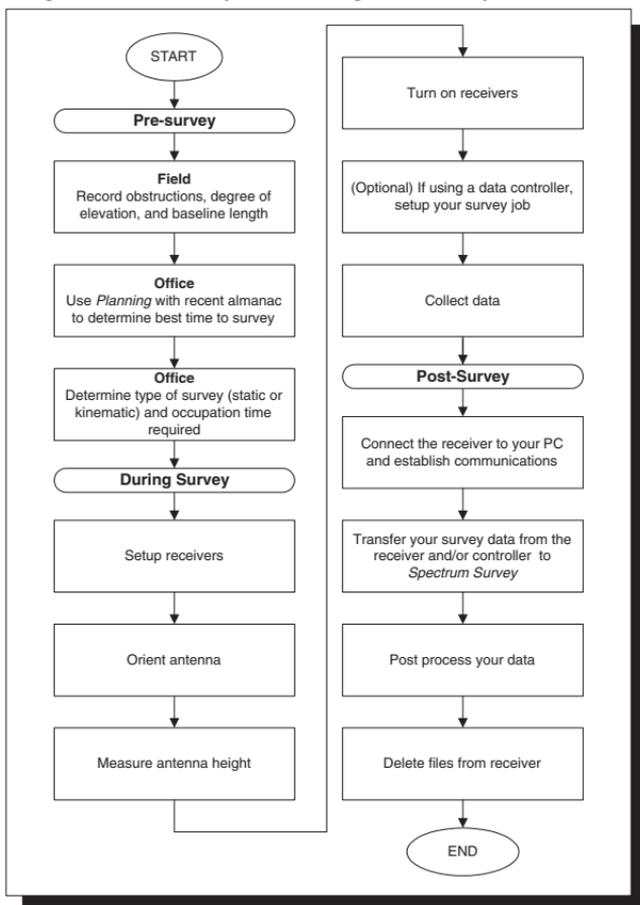
2.1   Pre-Survey

Planning your survey is a very important step towards receiving quality data. Before heading out to survey, you should follow these steps to ensure that you are surveying an area with minimum obstructions at the appropriate time.

In the field

1.   Visit the survey site prior to the survey time to see if there are any obstructions on the site.

⊠   **Note:** It is important that the survey site provides clear visibility of the sky in as many directions as possible (in other words, that it is relatively free from obstructions). Minimally, you should be able to track four satellites for static survey and five for kinematic.

2.   Use your GPS field book to record any obstructions, and their degree of elevation, for entry later in the *Planning* software.

3.   Determine where your survey points might be for an idea of the expected baseline lengths.

At the office

4.   Launch the *Planning* software. For detailed instructions on using this software, refer to your *Planning Reference Manual*.

5.   Make sure the *Planning* software has a recent almanac (no more than 30 days old). See the *Planning Reference Manual*.

6.   Enter your obstructions into the *Planning* software. *Planning* will use the almanac to look at the obstructions in relation to where the satellites are positioned in the sky. From this analysis, Planning will report and illustrate the most opportune time to survey.

7. Decide on the type of survey: static or kinematic. Static surveys require longer periods of occupation to provide centimeter level results (20 - 60 minutes). It is not necessary to interact with the Stratus receiver to collect static data. Kinematic surveys require short occupations (seconds - 5 minutes) but with a moderate reduction in accuracy.

8. Determine the occupation time required at each survey point by analyzing the satellite position, obstructions present, baseline lengths, and the type of survey. For more information on occupation times, see Section 5.3.3.4, *Occupation time gauge*, Page 46.

2.2   Setup your Receivers in the Field

When the survey time arrives, perform the following steps to setup your survey system in the field.

1. Setup your receiver.

2. Orient your antenna.

3. Measure the height of your antenna.

Detailed instructions on setting up receivers as base and rover are found in Chapter 3, **Setting up the Stratus**.

2.3   Collect Data

Once you have setup your survey, you will be ready to collect data. The Stratus receiver is a versatile GPS device that enables you to collect data in two ways: *with receiver only* and *with receiver and handheld controller*.

Receiver only

Without a handheld, you can only collect static data. Follow the steps in Section B.1, *Static Survey Workflow (No Controller)*, on Page 116, for instructions on collecting data with the receiver.

Receiver with controller

Using a handheld, you can collect both static and kinematic survey data. The controller interacts with the receiver via infrared (IR) communications.

Follow these steps to use the handheld with the receiver to collect data:

1. Create a new survey job (see Chapter 8, **Software Job Setup** for more information).

2. Review the GPS status (see Section 9.2, *View GPS Status*, on Page 101 for more information).

3. Perform survey: If you are performing a static survey, follow the steps in Section B.2, *Static Survey Workflow (With Controller)*, Page 119. If you are performing a kinematic survey, follow the steps in Section B.3, *Kinematic Survey Workflow*, Page 122.

4. Transfer observation information from the controller to the receiver. (see Section 7.5, *Synchronization*, on Page 58 for more information).

2.4   Post-Process your Survey

When you finish surveying in the field, you need to transfer your raw data into a post-processing software (such as Sokkia's *Spectrum Survey*) to determine your unknown coordinates.

Transfer data into Spectrum Survey

The following steps will help your transfer data from your receiver to Spectrum Survey:

1. Turn on your receiver and PC.

2. Attach the serial cable to the receiver and to the PC (usually COM1 port). See Section 4.1, *Power/Communications Port*, Page 25 for more information.

3. Launch *Spectrum Survey* on your PC and start a new project.

4. On the Project Startup dialog box, select Download, or if that dialog box does not appear, select **File │ Send/Receive** from the *Spectrum Survey* main menu. The *Download/ Upload* dialog box will display.
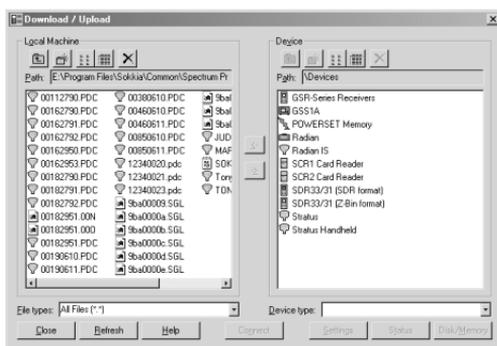
5. Choose **Stratus Receiver** from the *Device type* drop down list, or double-click the **<Stratus>** icon.

Stratus

6. Click <**Settings**> to make sure that communication settings are correct. A 115,200 baud rate is suggested.

7. Click <**OK**> to accept settings and return to the *Download/ Upload* dialog box.

8. Click <**Connect**> to establish communication with the receiver.

9. In the *Local Machine* window, select the path on your PC to save your files.

10. Select the data files you wish to transfer from the receiver list in the *Device* window and click the <⬅> button. The data files will be copied from the receiver to the designated directory.

⊠ **Note**: If communication between the receiver and the PC is interrupted during transfer, you must reconnect to the receiver and start the process again.

11. Select <**Disconnect**> at the bottom of the *Device* window after the files have been copied.

12. Repeat steps 3 - 11 until all data has been transferred from your Stratus receivers to your PC.

⊠ **Note:** In the case of a kinematic survey, you will also need to download files from the handheld controller. The process is the same as downloading from the receiver, except that you would choose **Stratus Handheld** from the *Device Type* window.

13. To import these files into your Spectrum Survey project, select **File | Data File Manager** from Spectrum Survey's main menu. The *Data File Manager* dialog box will appear.

14. Click **<Import>** to open the *Import Observations and Ephemeris* dialog box.

15. If your files are not displayed in this dialog box, use the **Look In** drop down list to navigate to the directory where you saved your stratus files.

16. Select your files and click **<Open>** to import them into the *Data File Manager* dialog box.

17. Click **<OK>** to import the files into your project.

⊠ **Note:** Complete instructions for using Spectrum Survey are found in the *Spectrum Survey Reference Manual*.

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18. Use Spectrum Survey to process your survey baselines.

2.5 Delete Files from Stratus

When you are finished transferring your data to *Spectrum Survey*, you may want to delete the files on your Stratus receiver. There are three methods you can use:

- Manually delete files from the receiver. (see Section 5.3.2, *Power/Memory settings*, on Page 41).

- Delete files from the receiver with your controller (see Section 9.1.3, *Turn off or reset the receiver*, on Page 100).

- Delete files from the receiver with Spectrum Survey (see your *Spectrum Survey Reference Manual*).

Chapter 3   Setting up the Stratus

The following sections explain how to setup and orient your Stratus system in the field.

The Stratus is used for static or kinematic survey, as a base or rover. This chapter will give an overview of the equipment and setup for typical uses of the system. For information on setting up your Stratus for field operations, refer to the setup steps in your *Stratus Jump Start*.

CAUTION
See Section 1.7, *Stratus Usage Cautions*, Page 8, for a list of items you should be aware of as you setup and use the Stratus.

When you arrive at your survey location, your first step is to setup your receiver(s). The setup steps a determined by the type of survey you choose to perform: kinematic or static.

- **Static** or **Kinematic base setup** (See Page 17)
- **Kinematic rover setup** (See Page 18)

3.1 Typical Static and Base Setup

To setup the receiver for a static survey, or to setup a kinematic base station, follow these steps:

1. Firmly mount the receiver on a fixed height tripod (or on a traditional tripod with a tribrach and adapter).

Figure 1: Typical Static Setup

2. Position the tripod and receiver over a known point.

3. Orient your antenna (see Section 3.1.1, *Orient your antenna*, on Page 18).

4. Level the tripod.

5. Measure the antenna height (see Section 3.3, *Measure Antenna Height*, on Page 19).

6. Turn on the receiver to complete the setup. Upon acquisition of satellites, the receiver will begin to collect data. See Section 2.3, *Collect Data*, on Page 11 for more information.

3.1.1   Orient your antenna

The orientation marker (a small triangle), is located on the top of the Stratus receiver, at the antenna measuring point above the battery compartment. Use this marker to orient your antenna with respect to the North.

⊠ **Note:** It is recommended that Stratus receivers used together should be oriented in the same direction.

To see an illustration of the orientation marker, see Figure 7 on Page 27.

3.2   Typical Rover Setup

A typical rover setup consists of an adjustable pole, Stratus receiver, and a controller, setup over an unknown point.

To setup the receiver for a kinematic survey, follow these steps:

1.   Mount the receiver on top of the pole.
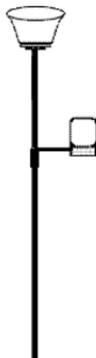
Figure 2: Typical Rover Setup

2.   Attach the controller to the handheld bracket.

3. (Optional) If the system is to remain standing, attach a tripod to the pole.

4. Measure the height of your receiver from the ground, see Section 3.3, *Measure Antenna Height*, on Page 19.

5. Turn on the receiver and controller. Upon acquisition of satellites, the receiver will begin collecting data. See Section 2.3, *Collect Data*, on Page 11 for more information.

6. To setup survey jobs with the Stratus software on the controller, see Chapter 8, **Software Job Setup**.

3.3   Measure Antenna Height

The antenna height is also known as Height of Instrument (HI).

⊠ **Note:** Accurately measuring and recording the antenna height is critical. Failure to accurately measure the height of the antenna from the initial known location will result in a three-dimensional error in position.

To measure the HI, perform the following steps:

1. Slip the Height Measurement Ring over the antenna slots on the top of the receiver. The ring should fit snugly. See Section 4.6, *Height Measurement Ring*, Page 31.

2. Choose a method for measuring the HI:

   • **Slant height** (Page 20)
   • **Vertical height** (Page 22)
   • **True vertical height** (Page 22)

3. Use an antenna measuring point on the top of the Height Measurement Ring to measure the distance between the antenna and the ground.

4. Record your measurements into your field book or Stratus controller.

⊠ **Note:** If you are using the controller, it is mandatory to record your instrument height in the appropriate fields.

3.3.1   Slant height

Typically, the slant height measuring method is used when:

• **using a tripod during static surveys**
• **establishing a base station**

To measure slant height, follow these steps:

1. Mount the measuring ring on the top of the receiver.

2. Use a tape measure to equate the distance from the antenna (top of receiver) to the survey mark on the ground.
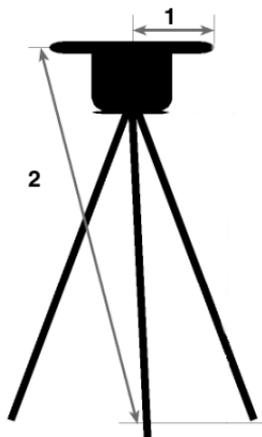
Figure 3: Slant Height

#	Description	#	Description
1	Radius (R) (100 mm)	2	Slant Height (SH)

3. Record the slant height using one of the following:

- **Field book - Slant** (See Page 21)
- **Controller - Slant** (See Page 21)

3.3.1.1 Record slant height in field book

If you are not using the handheld controller, it is recommended that you record the slant height in your *GPS Economy Field Book* (included with each receiver).

Perform the following steps to find your antenna's slant height:

1. Measure the slant height (SH) and record the receiver's Radius (R).

2. Use the following equation to find the vertical height of your antenna:

$$H = \sqrt{(SH)^2 - [R]^2}$$

⊠ **Note:** *Spectrum Survey* will compute the height of your antenna automatically once you enter the measurement method and slant height into the software. For more information, refer to your *Spectrum Survey Reference Manual*.

3.3.1.2 Record slant height in controller

If you are using the Stratus controller, you will only need to record the slant height of the receiver.

Follow these steps to record slant height using the controller:

1. On the controller, open the Stratus software.

2. Tap <**Static Survey**> or <**Kinematic Survey>** from the *Main Menu* to open the *Static Survey* or *Kinematic Job* dialog box.

3. Create a new, or select an existing observation. For instructions, see Chapter 8, **Software Job Setup**.

4. In the **Ant. Method** drop down list, select **Slant**.

5. In the **Ant. Height** field, type in your slant height measurement.

⊠ **Note:** You do not have to enter the radius measurement into your controller. *Spectrum Survey* will automatically compute the true vertical height of your antenna.

3.3.2   Vertical and true vertical height

Typically, if you are surveying using a graduated range pole or fixed height tripod, you would use the vertical or true vertical height measuring methods.
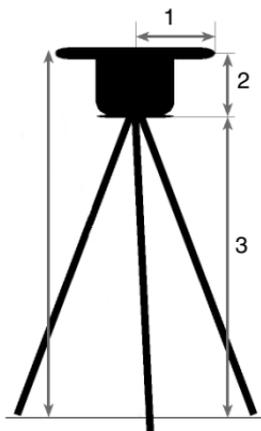
Figure 4: Vertical and True Vertical Height

#	Description	#	Description
1	Radius (100 mm)	3	Vertical Height
2	Vertical Offset (111 mm)		

Record the vertical height using one of the following:

- **Field book - Vertical** (See Page 23)
- **Controller - Vertical** (See Page 23)

Record the true vertical height using one of the following:

- **Field book - True Vertical** (See Page 23)
- **Controller - True Vertical** (See Page 24)

3.3.2.1   Record vertical height in field book

If you are not using the handheld controller, it is recommended that you record the vertical height of the range pole or tripod in your *GPS Economy Field Book* (included with each receiver).

3.3.2.2   Record vertical height in controller

If you are using the Stratus controller, you will only need to record the vertical height of the receiver.

The method for recording vertical height is analogous to static height with the exception that you choose **Vertical** from the **Ant. Method** drop down list. See Section 3.3.1.2, *Record slant height in controller*, on Page 21.

⊠ **Note:** You do not have to enter the vertical offset into your controller. *Spectrum Survey* will automatically compute the true vertical height of your antenna.

3.3.2.3   Record true vertical height in field book

If you are not using the handheld controller, it is recommended that you record the true vertical height in your *GPS Economy Field Book* (included with each receiver).

Perform these steps to record the true vertical height:

1. Record the height of the range pole or tripod.

2. Add the vertical offset to it (Vertical Height + Vertical Offset).

⊠ **Note:** If *Spectrum Survey* encounters a survey point designated as true vertical, the value will be assumed correct and no additional calculations will be made.

3.3.2.4   Record true vertical height in controller

If you are using the Stratus controller, you will only need to record the true vertical height of the receiver.

The method for recording true vertical height is analogous to static height with the exception that you choose **True Vertical** from the **Ant. Method** drop down list. See Section 3.3.1.2, *Record slant height in controller*, on Page 21.

Chapter 4 **Hardware Components**

Because most of its components are integrated into the Stratus enclosure, the Stratus system is easy to setup and learn. This chapter gives an overview of the hardware components of the Stratus system, but for detailed information, see Chapter 5, **Receiver Operations**.

The main Stratus components are:

- **Power/COM Port** (See Page 25)
- **Mounting Socket** (See Page 26)
- **GPS Antenna** (See Page 27)
- **Display Panel** (See Page 28)
- **Battery Compartment** (See Page 30)

4.1 Power/Communications Port

This external, dual purpose PWR/COM port, is located on the back of the receiver. Use this port in two ways: to supply the receiver with power from an external power supply, such as an external battery (see Section 4.1.1, *PWR port*, Page 26), or to communicate with other devices, such as your PC (see Section 4.1.2, *COM port*, Page 26).
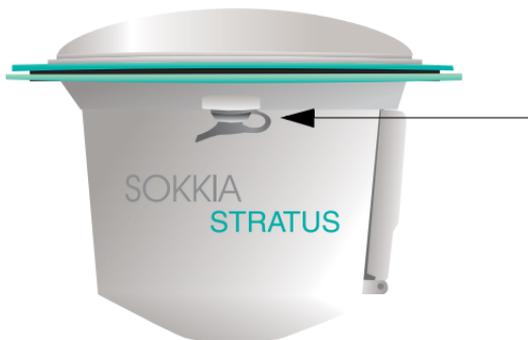
Figure 5: Location of PWR/COM Port

4.1.1   PWR port

When an external power supply is connected to the receiver's
PWR/COM port, the receiver will stop using its internal power
supply and rely on the external power supply for support.

For the receiver to operate with an external power source, the
minimum operating voltage for the external power input can
not be below the minimum receiver operating voltage. See
Appendix A, **Stratus Specifications** for more information.

4.1.2   COM port

You can use the external PWR/COM port to exchange
information, over a communications cable, from the receiver to
your PC or controller. If you do not have a communications
cable for your receiver, contact your local Sokkia dealer for
more information.

4.2   Mounting Socket

The underside of the Stratus receiver has a standard 5/8 inch
mounting socket for mounting the receiver on a tripod or
survey pole.
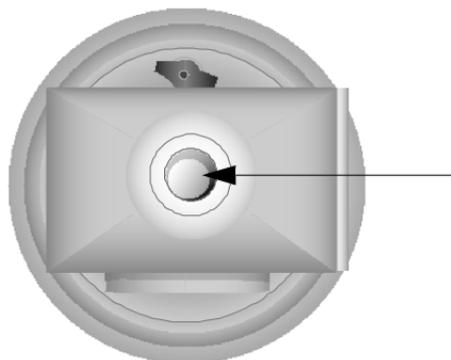
Figure 6: Location of the Mounting Socket

To set your receiver up in the field, see Chapter 3, **Setting up
the Stratus**.

4.3   GPS Antenna

The receiver features an integrated antenna, capable of maintaining a very stable phase center, and blocking multipath.
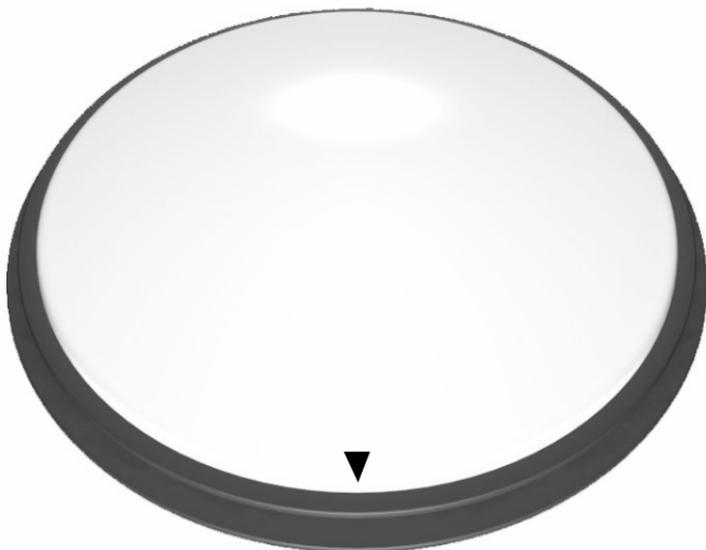
Figure 7: Antenna

On the top surface of the antenna, at the measuring point located right above the battery compartment, is a small triangle known as an **Orientation Marker**. Use this marker to orient your antenna with respect to the North. For more information, see Section 3.1.1, *Orient your antenna*, on Page 18.

Located around the circumference of the receiver are slots known as **Antenna Measuring Slots**. Slip the height measurement ring over these slots to measure the height of the antenna from the ground. To measure the height of your instrument, see Section 3.3, *Measure Antenna Height*, on Page 19.

4.4   Display Panel

The receiver has a display panel that provides information about your system. The display panel also encases the infrared (IR) port that communicates information from the receiver to the handheld controller.
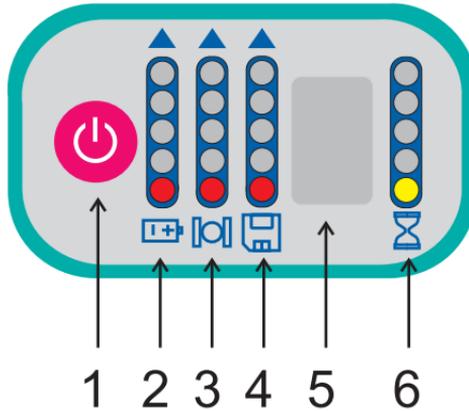
Figure 8: Display Panel

#	Description	#	Description
1	Power button	4	Memory Gauge
2	Internal Battery Life Gauge	5	Infrared (IR) Port
3	Satellite Visible Tracking Gauge	6	Occupation Time Gauge

The following describes the components found on the display panel.

Power Button ....The power button is used to turn the receiver on or off, delete all files in the receiver's memory, or reset the receiver back to its factory settings.

Visible Satellite ....This gauge displays how many
Tracking Gauge   satellites the receiver is tracking and collecting GPS data.

Occupation Time......................This gauge determines when
Gauge enough data has been collected
for various baseline lengths.

Internal Battery ....This gauge displays the
Life Gauge remaining life of the internal
batteries.

Available Memory....................This gauge estimates the
Gauge amount of internal data storage
available on the receiver.

Infrared (IR) Port ....The IR port is used for wireless
communication with the Stratus
controller.

To learn more about the display panel, see Section 5.3, *Display
Panel Operations*, on Page 40.

To use the infrared port to communicate between devices, see
Chapter 6, **Controller Configuration**.

4.5   Battery Compartment

The battery compartment on the side of the receiver provides easy accessibility to the internal batteries.
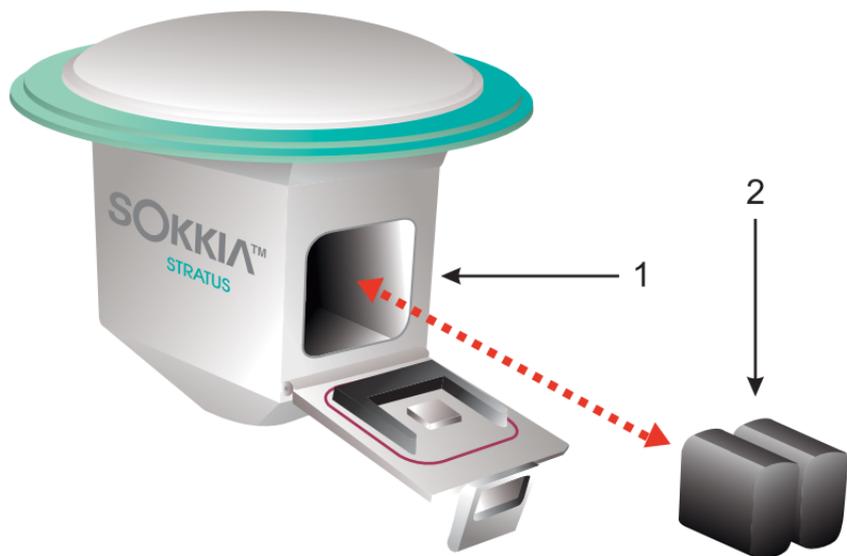
Figure 9: Battery and Battery Compartment

#	Description
1	Battery compartment
2	Internal batteries

For information about battery usage, see Section 5.1.1, *Power source*, Page 33.

4.6   Height Measurement Ring

Use this ring to measure the distance between the receiver's antenna and the ground. The ring rests on the top of the receiver, in between the antenna slots. On its outer rim are four measuring points to place the tip of your tape measure.

Figure 10: Measurement Points and Ring

#	Description
1	Measuring points
2	Height measuring ring

When using a HI tape measure, place the height measurement ring on the receiver, right side-up (the side with writing). Hook the tape measure's clip on a measuring point, and measure the distance between the ground and the antenna.

When using a generic tape measure, place the Height Measurement Ring on the receiver, upside-down (the side with no writing). Hook the tape measure's clip on a measuring point, and measure the distance between the ground and the antenna.

4.7   Serial Cable

The serial cable enables communication between your receiver and *Spectrum Survey* on your PC. This cable connects to a COM Port on your PC. Refer to *Stratus Jump Start* for instructions on connecting cables.

To transfer data from your receiver or controller to *Spectrum Survey* on your PC, see Section 2.4, *Post-Process your Survey,* Page 12.

4.8   Handheld Controller

As is explained throughout this manual, you can connect the Stratus receiver to a handheld controller for use in the field. For more information on setting up this controller, and installing its software, see Chapter 6, **Controller Configuration**.
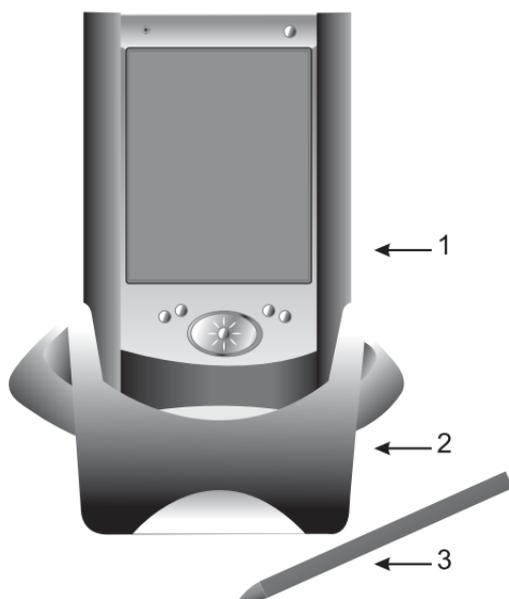
#	Description
1	Controller (PocketPC)
2	Cradle
3	Stylus

For more information about the features on your controller (Pocket PC), see your controller's reference manual.

Chapter 5   Receiver Operations

Before using the receiver for the first time, ensure that you have followed the setup instructions in your *Stratus Jump Start Guide*.

CAUTION

See Section 1.7, *Stratus Usage Cautions*, on Page 8 for a list of issues to understand before operating the Stratus receiver.

5.1   Power Management

To save you time and money, the Stratus receiver has a power management system that monitors and helps you control the receiver's power usage. The following topics are discussed in this section:

- **Power source** (Page 33)
- **Power consumption** (Page 35)
- **Insufficient power supply** (Page 38)

5.1.1   Power source

The Stratus receiver uses two sources of power:

- **Internal power** (Page 34)
- **External power** (Page 34)

Battery chargers for the Li-Ion batteries and SLA batteries are available from Sokkia.

☒ **Note:** If both internal and external power supplies are available, the receiver will use the external battery before using the internal batteries.

5.1.1.1   Internal batteries

The primary method for supplying power to the receiver is via two internal, rechargeable Li-Ion camcorder batteries (BDC46).

These batteries will supply the receiver with approximately 30 hours of power while collecting data at 10-second intervals above 20° C (11° F).

WARNING
Using camcorder batteries other than specified or included with the Stratus receiver may result in defect or damage to the receiver.

5.1.1.2   External power

In addition to the camcorder batteries supplied with each Stratus receiver, optional external power sources are available for purchase from your Sokkia dealer. Optional power sources include:

- **SLA Battery.** Each battery will power the receiver for over 90 hours.

- **D-Cell Batteries.** Six batteries will give the receiver approximately 100 hours of power.

⊠ **Note:** To get the maximum amount of life out of your batteries, we recommend that you remove your internal batteries when using external batteries.

5.1.2 Power consumption

The Stratus receiver has been designed to minimize power usage. It operates on less than one watt of energy during a typical operation.

To monitor the amount of power left in the receiver's batteries, look at the **Internal Battery Life** gauge on the front of your receiver. The behavior of the gauge depends on the source you are using to power your receiver.

- **Internal Batteries.** If you are using internal batteries to power your receiver, the LEDs on your **Internal Battery Life** gauge will give off a solid glow. The higher up the lit LED is, the more power you have. The bottom LED displays the least power, and the top LED displays the most power.

- **External Power.** If you are using an external power source to power your receiver, the top LED on your **Internal Battery Life** gauge will blink. Although the receiver can indicate the presence of an external power supply, it cannot monitor the amount of life left in the external power supply.

For more information about the **Internal Battery Life** gauge, see Section 5.3.3.1, *Internal battery life gauge*, Page 43.

The receiver automatically monitors internal operations. If you turn off your receiver, but leave it connected to the external/internal batteries, the system will continue to draw an extremely small amount of power from the batteries for this task.

⊠ **Note:** All rechargeable batteries will discharge over time even if they are removed from the receiver.

5.1.3   Install or take out your batteries

You should install the rechargeable batteries that came with your receiver so that important automatic features are enabled while the receiver is not being used (see Section 5.1.2, *Power consumption*, Page 35 for more information).

The following sections will help you install or take batteries out of the receiver.

5.1.3.1   Opening and closing the battery compartment

To open the battery compartment door:

1.   Press down on the gray latch, release, and let go. The door will spring open.

2.   Lift up on the door handle.

3.   Swing the door handle out.

Figure 11: Battery Compartment Opened

To close the battery compartment door:

1.   Swing the door into the closed position.

2. Insert the lip of the connector end into the slot at the top of the battery compartment.

3. Push the door handle down until you hear a click.

Your receiver battery compartment is now closed and the batteries are sealed into the waterproof compartment.

5.1.3.2 Inserting and removing batteries

There are two battery compartments located within the receiver that house the internal batteries. Between the two compartments are two battery clips that hold the batteries into place within their compartments.

⊠ **Note:** If the **Internal Battery Life** gauge on the display panel indicates your batteries are depleted, you will need to change them. For more information about the display panel, see Section 4.4, *Display Panel*, Page 28.

To insert a battery:

1. Open the battery compartment door (see Figure 11 on Page 36).

2. Slide the battery into its compartment, metal connectors facing the inside of the compartment. The battery clip will click over the battery.

⊠ **Note:** If the battery does not fit into the battery compartment, and the battery clip does not snap into place over the battery, you may have put the wrong end of the battery into the compartment. Take the battery out, make sure there are no obstructions in the battery compartment, turn the battery around and try inserting it again.

To remove a battery:

1. Open the battery compartment door (see Figure 11 on Page 36).

2. Push on the battery clip near the battery you wish to remove.

3. When the battery springs out of the battery compartment, grasp it to pull it out.

⊠ **Note:** One battery can be removed and replaced without disrupting operations as long as the other battery has sufficient power or if external power is being used.

For a graphical representation of this process, see Figure 9 on Page 30. For more information on this process, refer to your *Stratus Jump Start Guide*.

5.1.4   Insufficient power supply

If the receiver's power supply drops below the minimum operating level, the receiver will turn off and become inactive.

Should this occur, you will not be able to turn the receiver on until a sufficient amount of power is restored.

To resume receiver operations, charge the internal batteries or connect a valid external power source to the receiver (see Section 5.1.1, *Power source*, Page 33). When a sufficient amount of power is available, the receiver will turn on when the power button is pushed.

CAUTION
The receiver may become inactive if the external power input is greater than the power specified. See Section 1.7, *Stratus Usage Cautions*, on Page 8 for more information.

⊠ **Note:** If battery power is too low to power the receiver, or if the batteries are removed during data collection, the current data file will save and close automatically with little data loss (< 60 seconds).

All data is stored to the receiver's internal memory. Once data is in memory, you do not need a battery or backup battery to maintain it.

5.2 System Controls

The receiver monitors system inactivity and interruptions while data is being collected. The following sections describe different ways that the receiver monitors its system.

5.2.1 System check

The receiver will perform an automatic system check when it is first turned on. The audible annunciator will alert you if there is a problem. For more information on the audible annunciator, see Section 5.3.1, *Audible annunciator*, Page 40.

5.2.2 Disable operation due to temperature

The receiver can operate between -20°C to +65°C (-4°F to +149°F) with internal batteries. If these temperatures are exceeded, the receiver will turn off.

You can turn on the receiver when the temperature returns to the specifications above.

5.2.3 Data logging interruption

If there is an interruption while logging data (you press the power button or there is insufficient battery power), your data files will automatically save, and only the last 60 seconds of data will be lost.

5.3   Display Panel Operations

On the front of the Stratus receiver is the display panel. This panel features:

- **audible annunciator** (See Page 40)
- **power button** (See Page 41)
- **status gauges** (See Page 42)

To see an illustration of the display panel, see Section 4.4, *Display Panel*, Page 28.

5.3.1   Audible annunciator

The receiver is equipped with an audible annunciator that issues a series of beeping noises to alert you to the system status and to warn of errors when possible.

The beeps may be for a single duration (one beep pattern when the condition first occurs) or continuous (the beep pattern will repeat itself for as long as the condition persists).

As well, the severity of the situation is indicated by the number of beeps.

One or two beeps ....indicates information that is noteworthy.

Three beeps ....indicates a warning

Four beeps ....indicates an error

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☒ **Note:** When you hear a three or four beep pattern, check your system immediately.

The annunciator will indicate the following conditions:

beeps	Duration	Condition
1	single	receiver on and ready for operation, initiated whenever you initially press the power button to turn on the receiver
2	single	receiver is turning off, initiated by pressing power button
2	single	memory erase, initiated by power button pressed
2	single	factory reset, initiated by power button pressed
2	single	acceptable data quality
3	single	insufficient data quality
3	continuous	remaining battery life is below 15 minutes
3	continuous	the memory is more than 80% full
4	continuous	memory error
4	continuous	power button stuck

☒ **Note:** During kinematic survey, you may hear the receiver beep two and three times in succession. For an explanation, see Section B.3.1, *Kinematic survey tips*, Page 126.

5.3.2   Power/Memory settings

The Stratus receiver power button is used for turning the receiver on or off. The power button will also enable you to delete all files in the receiver's memory, or reset the receiver back to factory settings.

The number of seconds that the power button is held depressed determines how the receiver will behave. At each time interval, the receiver will beep to guide you through the process.

The power button/memory options are as follows:

Action	Seconds	Description
Disregard	**>25**	If you hold the button past **25 seconds**, nothing will happen, and the receiver will return to normal operations. The receiver will not turn off, the data files will not be erased and the settings will not revert to factory settings.
Erase memory	**20-25**	With the receiver turned on, hold the button for **20 seconds** until the receiver beeps twice (for the third time) and the middle three memory gauge LEDs illuminate. When these LEDs illuminate, this process will be completed in less than 1 minute. Release the button to delete all the files in the receiver's memory.
Factory reset	**10-19**	With the receiver turned on, hold the power button for **10 seconds** until the receiver beeps twice (for the second time) and the middle LEDs on the internal battery life, satellite tracking, and available memory gauges illuminate. Release the button to reset all stored parameters on the receiver to their default values. You must release the button before 15 seconds or the reset will not be activated. Do not interrupt power during the erasing process.
Turn off	**3**	Hold the button for **3 seconds** until the receiver beeps twice and the middle three internal battery status gauge's LEDs illuminate. Release the button to turn the Stratus off.
Turn on	**1**	Hold button for **1 second** and release to turn the receiver on. To indicate that the receiver is on, the first battery LED will illuminate. During initialization the battery status gauge's LEDs will flash. After initialization, the receiver will beep once to indicate that the system is operational.

5.3.3   Receiver status gauges

When you turn on the receiver, it performs the following steps:

- opens a log file
- searches for satellite signals
- begins tracking satellites, and
- logs data

The receiver features four status gauges on its display panel that provide information to help successfully monitor GPS surveys. See Figure 8, **Display Panel**, Page 28 for an illustration of the status gauges.

The following sections describe the status gauges and explain how to interpret them. This information is also included in the *Stratus Quick Reference Guide*.

5.3.3.1 Internal battery life gauge

The internal battery life gauge displays the remaining life of the internal batteries according to the following table:

Table 2: Internal Battery Life Gauge

LED	Color	Battery Life Remaining*
Top	Yellow	at least 8 hours
4	Yellow	6 to 8 hours
3	Yellow	4 to 6 hours
2	Yellow	2 to 4 hours
Bottom	Red	0 to 2 hours
*Accurate up to 30 minutes		

The top LED will blink when external battery power is being used. Remaining external power will not be displayed.

⊠ **Note:** If battery power should become insufficient to power the receiver or if the batteries should be removed during data collection, the current data file will be saved and closed automatically with minimal data loss (< 60 seconds).

5.3.3.2 Satellites visible tracking gauge

[|O|]

The satellites visible tracking gauge displays how many satellites the receiver is tracking. The receiver begins tracking satellites when it is turned on.

For a satellite to be used, it must have a healthy signal, be above the elevation mask, and the receiver must have achieved lock (both carrier and code). When a satellite is tracked, the receiver will use it in the data collection process.

In normal operation, the satellites visible tracking gauge will have the following values:

Table 3: Satellites Visible Tracking Gauge

LED	Color	Satellites Used
Top	Yellow	10 to 12
4	Yellow	8 to 9
3	Yellow	6 to 7
2	Yellow	4 to 5
Bottom	Red	1 to 3

For the most accurate survey results, you should not survey unless you are using a minimum of six satellites. You should not collect data if three or fewer satellites are available.

5.3.3.3   Memory gauge

💾

The Stratus receiver provides 4 MB of internal data storage memory and can support up to 64 individual GPS data files. The memory gauge estimates the amount of internal data storage available on the receiver according to the following table:

Table 4: Memory Gauge

LED	Color	Memory Available
Top	Yellow	80% to 100%
4	Yellow	60% to 80%
3	Yellow	40% to 60%
2	Yellow	20% to 40%
Bottom	Red	0% to 20%

When a data file is open in internal memory, the appropriate LED will blink. The receiver beeps three times to alert you that less than 20 percent of data storage remains on your receiver.

All data is stored to solid state memory so no battery or backup battery is required to maintain data files.

☒ **Note:** If a non-recoverable error has occurred while writing data to internal memory, all five Memory gauge LEDs will blink simultaneously.

5.3.3.4 Occupation time gauge

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The occupation time gauge takes into consideration the number of satellites and the quality of satellite geometry to determine when enough data has been collected for a baseline of a given distance:

Table 5: Occupation Time Gauge

LED	Color	Baseline length
Top	Yellow	20 km or less
4	Yellow	15 km or less
3	Yellow	10 km or less
2	Yellow	5 km or less
Bottom	Yellow	2 km or less

Occupation times are approximate. The number of satellites tracked and changing satellite geometry affect occupation times. Adverse conditions, such as multipath interference or high levels of ionospheric activity, can adversely affect results. If such conditions are suspect, it is best to occupy the point longer to minimize the possibility that too little data is collected.

Baselines are calculated from GPS data collected by at least two receivers during a session. Ensure the data collection period at each receiver overlaps sufficiently.

⊠ **Note:** The bottom Occupation Time LED will blink quickly to indicate a firmware initialization failure. Should this occur, turn the receiver off and then on. If problems persist, contact technical support. See Section 1.5, *Obtaining Technical Assistance*, on Page 5.

5.3.4   Infrared communication port

On the control panel between the **Available Memory** and
Occupation gauge lies the infrared (IR) communication port.
Wireless communication between the receiver and the
controller can occur through this IR port window. To see how
the IR port is used to transfer data between the Stratus receiver
and controller, see Appendix B, **Survey Workflows**.

5.4   Receiver Almanac

On certain occasions, you will need to initialize your receiver to
update its current almanac. An almanac is a data file that
contains the approximate orbit information of all satellites. The
almanac describes satellite orbits over extended periods of time
(useful for months in some cases). This information takes
several minutes to 60 minutes to transfer from a GPS satellite to
a GPS receiver.

You will need to allow your receiver to collect almanac data if
one of the following conditions applies:

• This is the first time you are using your receiver (20 -
   60 minutes).
• You have moved your receiver 200 or more miles away
   from the last location it tracked satellites (several minutes).
• Thirty days have passed since you used the receiver to
   track satellites for more than 20 minutes (20 - 60 minutes).

To initialize your receiver, refer to the following steps:

1.   Install batteries into your receiver (See Section 5.1.3, *Install
     or take out your batteries*, Page 36).

2.   Place your receiver outside (must be within 200 miles of
     area to be surveyed) where it can track as many satellites as
     possible (6 - 7 recommended).

3.   Turn receiver on by pressing the power button for 1 second.

4. Leave the receiver in its current position until the almanac has finished collecting data from the satellites (several minutes - 60 minutes).

You are now ready to take your receiver into the field to collect GPS data. See Section 2.2, *Setup your Receivers in the Field*, on Page 11 to continue setting up your receivers.

☒ **Note:** These instructions provide information for loading a current almanac into your Stratus receiver. For information about loading a current almanac onto your handheld controller, see Section 7.6, *Controller Almanac*, Page 59.

Chapter 6   Controller Configuration

The Stratus controller software can be used on any handheld controller with the following configuration:

Minimum Handheld Controller Configuration	
Microsoft Windows CE 3.0	Resolution 240 x 320
16 MB RAM memory	100 MHz
Hard disk with 8 MB free; extra space required for data storage	IrDA port

⊠ **Note:** We recommend the Compaq iPAQ Pocket PC H3600 for fast performance.

To use the controller with the Stratus receiver or the PC, you will need to install the following software:

- **ActiveSync** (Page 49)
- **Stratus Controller** (Page 50)

This chapter will also discuss important memory features and power-saving configurations.

6.1   Install ActiveSync

To install the controller software, you must install Microsoft ActiveSync software on your PC. ActiveSync enables you to synchronize the information on your PC with the information on your controller. Once your devices are synchronized, you can transfer data between them.

  ☒ **Note:** The ActiveSync software should come with your Microsoft Windows CE materials. If it did not, or you want to upgrade it, you can transfer the latest version of ActiveSync at ***http://www.microsoft.com/downloads*** on the internet.

The following steps will help you install ActiveSync:

1. Insert the ActiveSync CD into your PC's CD-ROM drive.

2. The setup wizard will start and take you through the installation process. If the setup wizard does not start automatically, click **Start | Run**. Type **d:\setup** in the popup box (d is assumed to be your CD-ROM drive letter).

For more information about ActiveSync, see the *ActiveSync Help* available on the ActiveSync program interface.

6.2   Install Stratus Controller Software

The procedure for installing Stratus controller on your data collector is similar to installing a Windows-based application on your desktop computer.

  ☒ **Note:** Refer to the manufacturer's documentation that came with your data collector for more information on ActiveSync software.

To install Stratus controller software onto your handheld controller, follow these steps:

1. Connect your controller's cradle to your desktop PC with a synchronization cable (available from your Sokkia dealer).

2. Power on your receiver and your PC.

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3. On your *controller* select **Start | Settings | Connections | PC.**

4. Verify that either **USB** or **115200 Default** is selected in the list. Also verify that the **Automatically synchronize** checkbox is selected.

5. On your *PC* select **Start | Programs | Microsoft ActiveSync**.

6. If ActiveSync does not automatically synchronize your devices, select **File | Get Connected** in the ActiveSync program window. Your devices should synchronize. If you cannot get your devices to synchronize, refer to the help feature in your ActiveSync program.

7. Insert the *Sokkia Complete Product CD* into your computer's CD-ROM drive.

8. Tap **<Install Stratus Controller>** on the opening screen. The program will prompt you to extract the installation files to the PC before installing them on the data collector.

9. Tap **<Install> | <Yes>**. The necessary files are transferred to the **\Program Files\Sokkia Stratus** folder on the controller. After a few minutes, you will be prompted to check your controller screen to confirm the program was installed successfully.

10. Confirm the installation. On the controller, tap the **<Start>** button. You should see the **<Stratus>** icon.

11. Start the controller software by selecting **Start | Stratus**.

6.3 Settings

Adjusting certain settings on your controller can optimize its performance in the field.

To optimize the performance of your Stratus controller software for the field, the following controller settings are recommended. Also, please refer to your handheld controller's materials for additional settings.

6.3.1   Allocate memory

You can specify how much of the memory available on your data collector you want to be used to run programs such as Stratus controller or to use for data storage.

To provide more space on the controller for your survey information, allocate more memory for storage. Experiment with the memory allocation to find a setting that is suitable for your needs.

To access memory settings, select **Start | Settings | System** from the *Explorer* menu and choose the **<Memory>** icon. Adjust the slider bar as necessary to allocate memory.

6.3.2   Conserve battery power

There are several steps you can take to ensure that you get the most surveying time out of your data collector in the field. Use your Windows CE Help to walkthrough the following energy saving suggestions.

- Make sure that your data collector is fully charged before proceeding to the field.
- Turn off the backlight unless it is absolutely necessary, or if available, set the backlight to power down automatically when the data collector is idle.
- Consider removing CompactFlash™ or other memory cards if you have their option but do not need their services.
- If possible, set your data collector to automatically sleep when it is idle. This will not interfere with Stratus controller surveying processes. The software will pick up where it left off when you use your data collector.

Chapter 7 Software Basic Operations

The Stratus controller software interface is simple to learn. In this chapter, the features of the controller software are introduced. Instructions for using the software are found in Chapter 8, **Software Job Setup**.

7.1 Desktop

The following shows the Stratus software basic desktop, with a typical dialog box open:
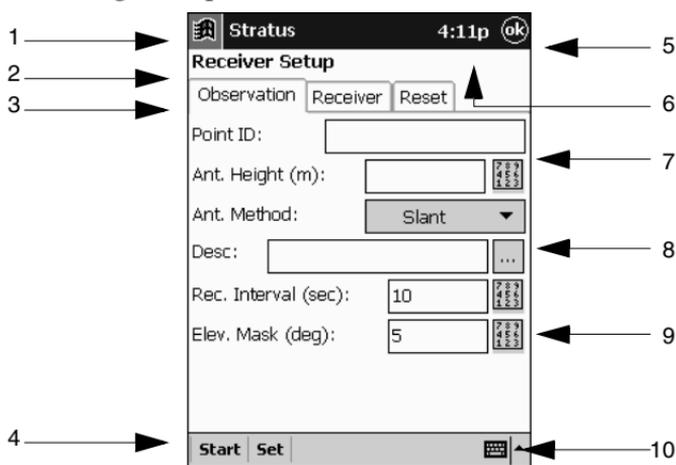
Figure 12: Stratus Desktop

#	Description	#	Description
1	Start Menu (path to access help)	6	Time
2	Dialog box name	7	Field
3	Tabbed window	8	Drop down list
4	Command buttons	9	Keypad
5	OK/Exit button	10	Keyboard

The following icons are found on the Stratus basic desktop:

Tap the **Microsoft Windows Start** icon to access the **Windows Explorer** drop down menu.

Tap **Help**, located on the Windows **Explorer** menu, to access the electronic help file for the controller software. For more information, see Section 7.7, *Help File*, Page 60.

Tap **<OK>** in the upper right-hand corner to return to the previous dialog box. This button is analogous to an **<Exit>** button.

This **Keyboard** icon is the alpha-numeric keyboard symbol. Tap this button at any time to type in notes or fill in necessary fields. The format of this button will vary depending upon the Windows CE platform you are using. For more information, see Section 7.3, *Keyboard*, Page 56.

The **Keypad** will appear by fields that require numeric input. You can tap this button to do simple numeric entries in its corresponding field. For more information, see Section 7.4, *Keypad*, Page 57.

7.2 Main Menu

The following shows the Stratus *Main Menu* screen.
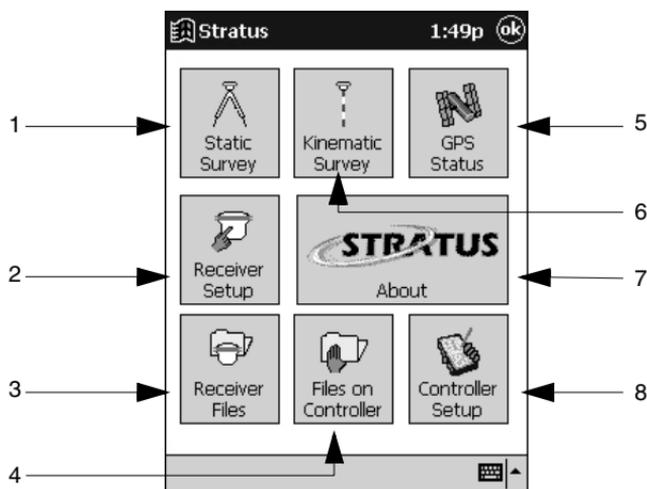
Figure 13: Stratus Main Menu

#	Description	#	Description
1	**Static Survey** (see Section 8.2.1, *Static observations*, Page 64)	5	**GPS Status** (see Section 9.2, *View GPS Status*, Page 101)
2	**Receiver Setup** (see Section 9.1, *Receiver Setup*, Page 97)	6	**Kinematic Survey** (see Section 8.3.1, *Kinematic observations*, Page 72)
3	**Receiver Files** (see Section 8.8, *View/Delete Files on the Receiver*, Page 93)	7	**About** (tap this button to view the software version information)
4	**Files on Controller** (see Section 8.4, *Open an Existing Job*, Page 87)	8	**Controller Setup** (see Section 8.1, *Modify Unit Settings*, Page 61)

7.3   Keyboard

The keyboard, opened by tapping the keyboard icon at the bottom of the Stratus desktop, is used to type information into text fields in the Stratus software.

The layout of the keyboard changes depending on whether you have the **<CAP>** key selected.
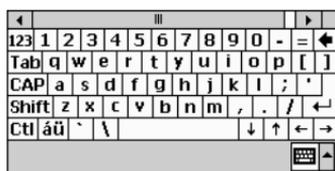
Figure 14: Keyboard Without Caps
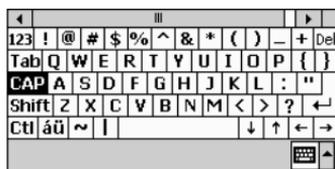
Figure 15: Keyboard With Caps

⊠ **Note:** The keyboard, if displayed, will hide information on the bottom portion of the dialog box. To hide it, tap the keypad icon at the bottom of the dialog box.

7.4   **Keypad**

The keypad is opened by tapping the keypad icon.

The keypad icon is displayed next to fields that require numeric input. When you click this icon, a numeric entry dialog box will appear.

☒ **Note:** Alternatively, you can use the keyboard to enter numeric data in a field.

The numeric entry dialog box contains an edit field to display your data, number buttons, and buttons to correct or clear your data.

When finished, click **<OK>** to return to the previous dialog box. The number you entered in the numeric entry dialog box will appear in the field associated with the keypad button that you selected.

7.5   Synchronization

Communication between the controller and receiver takes place when settings are applied, status information is updated, or site information is entered. Information on the controller can quickly be transferred to the receiver, and vice versa, using the infrared (IR) port.

Because information is not constantly flowing between the controller and the receiver, continuous IR communication is unnecessary. Whenever you make changes on the data collector that require the receiver to be updated or synchronized, the controller will display the *Synchronize* dialog box.
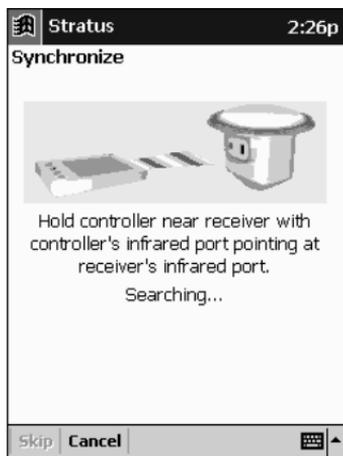
For synchronization to work, ensure that the controller is at maximum 1m (3ft.) away from the receiver, but optimally 30-61cm (1-2ft.) away. Also make sure that the controller's IR port is pointing at the receiver's IR port.

During synchronization, the *Synchronize* dialog box will display messages, both on the screen and audibly, to guide you through the process.

If you decide to use the receiver with the controller to configure and initiate data collection, a communication link will be established between the receiver and controller during synchronization. Once established, the handheld will control the behavior of the receiver.

⊠ **Note:** Although the controller transfers most settings to the receiver, it is unable to transfer personal notes. You will have to transfer these files directly from the controller to your PC. For instructions, see your *PDA reference manual*.

7.6   Controller Almanac

For surveying, you will need to have a current almanac (less than a month old) loaded on the controller.

To obtain a new almanac, follow these steps:

1.   Select **<GPS Status>** from the main menu of the Stratus software. See Section 7.2, *Main Menu*, Page 55.

2.   If your almanac is over a month old, or you do not have an almanac existing on the device (GPSDRVR.ALM), you will be prompted to connect to the Stratus.

3.   The almanac transfer/update may take around 15-45 seconds.

For information on transferring a current almanac to the receiver, see Section 5.4, *Receiver Almanac*, Page 47.

7.7 Help File

To assist you in using the Stratus system, a help file is included in the Stratus controller software. You can access the help anytime during your survey by doing the following:

• Tap the **< Help >** button at the bottom of the dialog box (shown to the left). If this button does not appear at the bottom of your dialog box, refer to the next option.

• Tap the **<Microsoft Windows Start>** button at the top of your dialog box (shown to the left) to open the **Explorer** menu. Select **Help** from the bottom of the list.

⊠ **Note:** Tapping **Help** will only open the Stratus help program when the Stratus software is running and active on the desktop. Otherwise, tapping **Help** will open the help for whichever software program is currently running, or if one is not, then it will open the iPAQ controller help file.

Chapter 8   Software Job Setup

This chapter discusses how to create, access, and delete jobs and observation files.

The Stratus controller records your survey information in survey jobs. Each job consists of one or more observation files which can either be static or kinematic data.

Observation settings can be edited, updated, and applied to the receiver at any time during a session until the observation ends.

☒ **Note:** During a static or kinematic survey, the data you collect is placed into observations on the receiver. The settings for these observations can be modified with the controller, and then saved on your controller in a job file. If you prefer to keep each observation setting in an individual file, see Section 9.1, *Receiver Setup*, Page 97.

For more information on how the controller works with the receiver, See Appendix B, **Survey Workflows**.

8.1   Modify Unit Settings

The controller software enables you to customize Stratus for your local region and project requirements. To access these settings, tap <**Controller Setup**> on the *Main Menu*.

The *Controller Setup* dialog box will display.
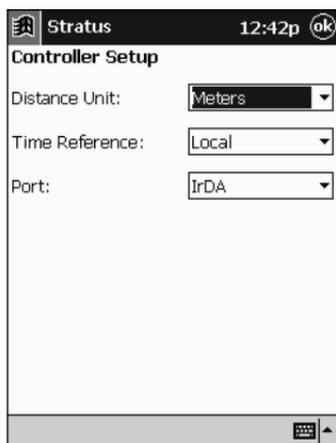
You can modify settings in the following fields:

Distance Unit............................Select whether distances will be displayed in **Feet** or **Meters**.

Time Reference.........................Select whether survey time will be referenced according to **GPS** or **Local** time (current time).

Port...Choose whether the controller will communicate with the PC using an IrDA or Serial port. For more information, see Chapter 6, **Controller Configuration**.

Tap **<OK>** to apply your unit settings.

8.2   Create a New Static Survey Job

To create a new static survey job, tap <**Static Survey**> on the *Main Menu*.
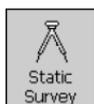
The *Static Survey* dialog box will display.
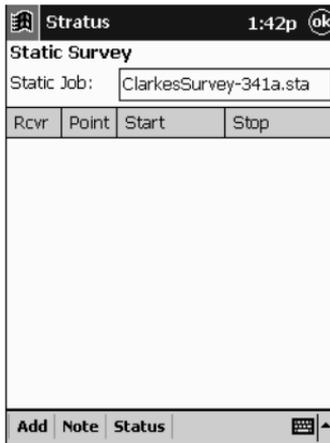
A default job name, (For Example, **ClarkesSurvey-341a.sta**), will display in the **Static Job** field. This name consists of the following:

Owner's name	Day	Unique character	File Extension
ClarkesSurvey	341	a	sta

Owner's name .... Determined by what is set in the *Owner Information* dialog box, accessed by selecting **Start | Settings** from the controller's *Explorer* menu, then tapping the *Personal* tab.

Day .... Displayed as the GPS three-digit day of the year.

Unique .... This incremental character is used to
Character   differentiate multiple jobs during the same day.

File Extension .... This identifies the file type associated with the job. A static job has the file extension *.sta.

Available on the *Static Survey* dialog box are several buttons:

<Status> .... Tap to open the *GPS Status* dialog box to receive information about the status of satellites currently being tracked by your receiver. For more information on this process, see Section 9.2, *View GPS Status*, Page 101.

<Note> .... Tap to open the *Note* dialog box. Use the keyboard to type any information you want about your job.

<Add> .... Tap to add observations to your new job. You will be required to synchronize to the receiver for each observation. For more information on that process, see Section 8.2.1, *Static observations*, Page 64.

<OK> .... If at this time you do not want to add observations, tap **<OK>** to close the dialog box. The *End Survey* dialog box will appear. For more information on the options on the *End Survey* dialog box, see Section 8.7, *End a Survey Job*, Page 92.

8.2.1 Static observations

Once you have created or opened an existing job, you can create new static observations, or review existing observations.

The *Static Survey* dialog box is accessed by tapping **<Static Survey>**, located on the *Main Menu*.

To begin a new observation, tap **<Add>** on the **S*tatic Survey*** dialog box. The *Add Static Observation* dialog box will open.

🔳 **Stratus**	12:43p

Add Static Observation

Point ID: 1000

Ant. Height (m):

Ant. Method: Slant

Desc:

Rec. Interval (sec): 10

Elev. Mask (deg): 5

Start | Set | Cancel ⌨|▲

You populate the *Add Static Observation* dialog box with the information for your survey.

The following fields are available for you to fill in:

Point ID .... Record a meaningful survey point ID in this field. Use the keyboard at the bottom of the dialog box, or select an ID from the drop-down list (if applicable).

Ant. Height .... Tap **<Keypad>**, shown to the left, to enter the height of your antenna (see Section 3.3, *Measure Antenna Height*, Page 19).

Ant. Method .... This field determines how you are going to measure the vertical offset of the receiver itself. Select one of three antenna measurement methods: **Slant**, **Vertical**, and **True Vertical**. For more information about these measurement types, see Section 3.3, *Measure Antenna Height*, Page 19.

Desc .... Type in this field any descriptions about the static job, or select a predefined description from the drop-down list. For more information on defining descriptions, see Section 9.3, *Load Descriptions*, Page 107.

Rec. Interval (sec) .... Enter the rate at which you want to store the raw observations to the receiver (this should match all of your other receivers). Tap **<Keypad>** to set the number of seconds the receiver will wait between each reading (for more information, see Section 3.1, *Typical Static and Base Setup*, Page 17).

Elev. Mask (deg) .... Tap **<Keypad>** to set the number of degrees from the horizon that the receiver will disregard satellite information.

<Start> .... Transfer observation settings to the receiver and begin collecting data for a new file in the receiver.

<Set> .... Save updated information to the currently active file on the receiver.

<Cancel> .... Tap to exit the *Add Static Observation* dialog box without synchronizing with the receiver or saving changes.

When you finish entering your information, aim the controller at the receiver and tap **<Start>** to open the *Synchronize* dialog box. Your data and commands will be transferred to the receiver. You could also tap **<Set>** to use the existing file.

⊠ **Note:** When you tap **<Start>** or **<Set>**, you will be asked to supply the antenna height if you have not done so already.

⊠ **Note:** If the receiver is already recording an observation that has been set by a controller, you may be prompted to *confirm new observation*. Respond **<OK>**.

When the synchronization is complete (after all data is transferred) the *Static Observation* dialog box will appear displaying three tabs:

- **Receiver** (See Page 68)
- **Observation** (See Page 70)
- **Note** (See Page 70)

When you are finished with the information on the tabs, tap **<OK>** to close the *Static Observation* dialog box and return to the *Static Survey* dialog box.

	Stratus		2:37p (ok)
Static Survey			
Static Job:		ClarkesSurvey-345a.sta	

Rcvr	Point	Start	Stop
0015	1000	1:55:24 PM	250*

Add | Note | Status
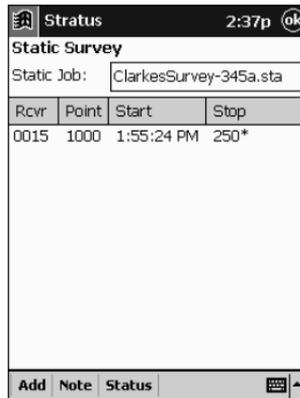
You can now **<Add>** further observations to the survey job.

⊠ **Note:** For every static observation you create by **<Add>**, you need to synchronize with your receiver(s).

When you are finished adding observations, you can exit this dialog box by tapping **<OK>**. The *End Survey* dialog box will appear. For an explanation of the choices on the *End Survey* dialog box, see Section 8.7, *End a Survey Job*, Page 92.

Receiver tab - static observation

The *Receiver* tab displays important information about your receiver, and it can be used to stop the current observation.
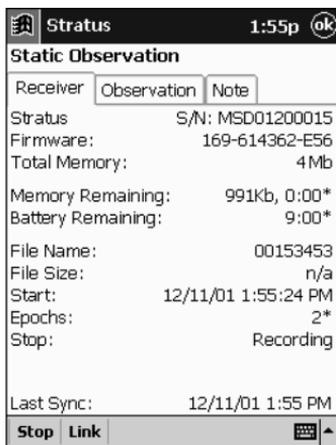
The *Receiver* tab displays the following information:

Stratus S/N .... Displays the serial number of the Stratus receiver.

Firmware......................... Displays the controller's current firmware.

Total Memory................. The amount of memory available on your receiver.

Memory........................... Displays the estimated time (hours and
Remaining   minutes) you have left to fill the receiver's memory.

Battery .... Displays the approximate time in
Remaining   hours and minutes of battery power remaining at the current data collection rate.

⌧ **Note:** The memory and battery remaining are only shown if the file is recording.

File Name .... Lists the observation file name.

File Size .... Displays the estimated size of the file on the receiver. The file size is only shown if the file is complete (stopped).

Start .... Displays the start time of the observation.

Epochs .... Lists the estimated number of epochs (recording intervals) that have occurred in the file. If an observation is currently recording, this field will continue to update.

Stop .... Displays the survey stop time. If the receiver is still recording, this field will display **Recording**.

Last Sync .... Lists the time and date that the current receiver was last synchronized with the Stratus controller.

<Stop> .... Tap this button to access the *End Observation* dialog box (see Section 8.6, *End an Observation*, on Page 90), where you can exit the observation. If you open an existing observation that is not currently logging data, this button will become inactive.

<Link> .... Tap this button to synchronize with the receiver and update the information displayed in the *Receiver* tab.

Observation tab - static observation

The *Observation* tab enables you to view or modify survey information.

The fields on this dialog box are analogous to those found on the *Add Static Observation* dialog box. For more information, see Section 8.2.1, *Static observations*, Page 64.

Note tab - static observation

On the *Note* tab you can enter miscellaneous information about your current observation.

When this tab is opened, an alphanumeric keyboard should appear automatically in the bottom portion of the dialog box. If the keyboard does not appear, tap < ⌨️▲ > to make it open.

For more information on this keyboard, see Section 7.3, *Keyboard*, Page 56.

8.3   Create a New Kinematic Survey Job

To create a new kinematic survey job, tap <**Kinematic Survey**> on the *Main Menu*.
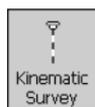
The *Kinematic Job* dialog box will display.
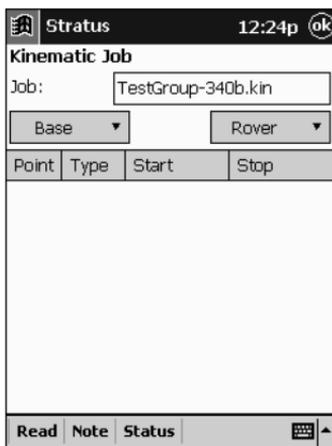
The **Job** field on this dialog box is analogous to the **Static Job** field found on the *Static Survey* dialog box (see Section 8.2, *Create a New Static Survey Job*, Page 62). One exception is that the file extension for a kinematic file is *.kin.

The *Kinematic Job* dialog box displays several buttons:

<OK>,............................these buttons are analogous to the
<Status>, **<Note>**   buttons on the *Static Job* dialog box.
                                   See Section 8.2, *Create a New Static
                                   Survey Job*, Page 62.

<Read>...........................tap this button to take a kinematic
                                   reading. Read requires you to have
                                   synchronized with the rover receiver
                                   (**Rover | New Rover**) before the
                                   reading will take place. For more
                                   information, see Section 8.3.1.3, *Take
                                   reading*, Page 80.

<Base>...........................tap this button to open the *Base Setup*
                                   dialog box. Base observations are
                                   required for post-processing but the
                                   controller does not require you to
                                   synchronize with the base receiver. For
                                   more information, see Section 8.3.1.1,
                                   Base setup, Page 74.

<Rover>..........................tap this button to open the *Rover Setup*
                                   dialog box. For more information, see
                                   Section 8.3.1.2, *Rover setup*, Page 77.

You are now ready to add observations to your new kinematic
job. For more information on that process, see Section 8.3.1,
Kinematic observations, Page 72.

8.3.1   Kinematic observations

After you create a new kinematic job (see Section 8.3, *Create a
New Kinematic Survey Job*, Page 71), or have opened an existing
kinematic job , you can begin a new kinematic observation with
your receiver. The *Kinematic Job* dialog box is accessed by
tapping **<Kinematic Survey>**, located on the *Main Menu*.

A kinematic survey requires two receiver configurations: base and rover. You must create new observations for each of these receiver configurations.

- **Base Receiver** (Page 74)
- **Rover Receiver** (Page 77)

When your base and rover receivers are setup and logging data, you can evaluate the information your receivers are logging. This is called *taking a reading*.

- **Take Reading** (Page 80)

The following sections will help you setup kinematic observations on your controller, and guide you though the process to take a reading.

⊠ **Note:** When you are synchronizing your controller with the receiver, if another observation is currently logging, the controller will prompt you with the warning message *"Receiver is already recording. Do you want to start a new observation?"* At this point, you can decide to start a new observation, or you can choose **<No>** and return to the previous screen.

When you finish working in the *Kinematic Job* dialog box, tap **<OK>**. The *End Survey* dialog box will appear. For information on the choices on this dialog box, see Section 8.7, *End a Survey Job*, Page 92.

8.3.1.1 Base setup

With the *Kinematic Job* dialog box open, tap
<Base> | **New Base**. The *Base Setup* dialog box opens.

The *Base Setup* dialog box is used to setup your base receiver
information with your controller. On this dialog box are three
tabs:

- **Observation tab** (Page 75)
- **Receiver tab** (Page 76)
- **Note tab** (Page 77)

When you are finished entering information into these tabbed
pages, tap **<OK>** to return to the *Kinematic Job* dialog box.

Observation tab - base setup

In the *Observation* tab, you can modify base observation information.

The fields on this tab are analogous to those found on the *Add Static Observation* dialog box (see Section 8.2.1, *Static observations*, Page 64), with the addition of the following check box:

Known Point.................. If this receiver is being placed over a known point, select this checkbox.

☒ **Note:** For kinematic surveys, it is wise to setup the base over a known point so that later that coordinate may be keyed into Spectrum Survey and held "fixed". For more information, consult the *Spectrum Survey Reference Manual*.

Rec. Interval................... Ensure your recording interval is the same as what will be used on your kinematic rover receiver. Generally, with kinematic work you would want to go with a lower recording interval (For Example, two seconds)

At the bottom of the *Base Setup* dialog box is **<Start>** and **<Set>**. When you finish entering information on the *Observation* tab, tap **<Start>** to begin synchronization with the Stratus receiver. Tap <**Set**> to apply the settings to the current receiver observation file.

⊠ **Note:** If you have more than one base station, it is recommended that you use the same recording interval(10). If the recording intervals do not match, the results will be less accurate, and a warning box will appear when you tap **<Start>** or **<Set>**.

Receiver tab - base setup

The *Receiver* tab displays information about your receiver, and it enables you to **<Stop>** the current observation.

```
┌─────────────────────────────────────┐
│ 📖 Stratus          12:43p  ⓞⓚ      │
│ Base Setup                          │
│ ┌──────────┬──────────┬──────┐      │
│ │Observation│ Receiver │ Note │      │
│ Stratus             S/N: MSD01200015│
│ Firmware:            169-614362-E56 │
│ Total Memory:                   2Mb │
│                                     │
│ Memory Remaining:    1.3Mb, 77:00*  │
│ Battery Remaining:          6:00*   │
│                                     │
│ File Name:               00153441   │
│ File Size:                     n/a  │
│ Start:       12/10/01 12:41:37 PM   │
│ Epochs:                       11*   │
│ Stop:                   Recording   │
│                                     │
│                                     │
│ Last Sync:      12/10/01 12:41 PM   │
│ Stop │ Link │              ⌨ ▲      │
└─────────────────────────────────────┘
```

⊠ **Note:** Information will not populate on this tab until you enter information on the *Observation* tab and synchronize with the receiver. For more information on synchronization, see Section 7.5, *Synchronization*, Page 58.

The fields on this tab are analogous to those found on the ***Static Observation*** dialog box. For more information, see *Receiver tab - static observation*, Page 68.

To end the observation, see Section 8.6, *End an Observation*, on Page 90.

Note tab - base setup

This tab is analogous to the *Note* tab found in the ***Static Observation*** dialog box. For more information, see *Note tab - static observation*, Page 70.

8.3.1.2   Rover setup

With the ***Kinematic Job*** dialog box open, tap **<Rover> | New Rover**. The ***Rover Setup*** dialog box opens.

The ***Rover Setup*** dialog box is used to record rover setup information on your controller. On this dialog box are two tabs:

• **Observation tab** (Page 78)
• **Receiver tab** (Page 79)

When you are finished entering information into these tabbed pages, tap **<OK>** to return to the ***Kinematic Job*** dialog box.

> ⊠ **Note:** You can have many base receivers, but only one rover receiver at a time for collecting observations. If you try to setup a second rover, the software will warn you that there can only be one rover. You will have the option to stop the current rover receiver and replace it with another.

Observation tab - rover setup

In the *Observation* tab, you can modify rover observation information.

The fields on this tab are analogous to those found on the *Add Static Observation* dialog box (see Section 8.2.1, *Static observations*, Page 64), with the addition of the following fields:

Rec. Interval .... Make sure that the recording interval is the same as what was used on your base receiver. see Section 8.3.1.1, *Base setup*, on Page 74.

End Reading .... End the reading automatically or manually. Select **Auto Epochs**, **Auto Seconds**, or **Manually** from the drop down list.

End Method	Description
Auto Epochs - default	Counts out the value you have for reading duration in terms of epochs recorded. Reading will end once epoch count has been reached.
Auto Seconds	Counts out the value you have for reading duration in terms of actual seconds. Reading will end once time has been reached.
Manually	Forces you to manually stop each reading.The reading will begin and end when you tap **<Stop/Start>***.
* Note: The **<Stop/Start>** button will read **<Stop>** while the observation is in progress. Otherwise, it will read **<Start>**.	

Reading Duration .... Select the number of epochs or seconds the reading will record. This field will appear dimmed if **Manually** was selected in the **End Reading** field.

Receiver tab - rover setup

Select the *Receiver* tab to review important information about your receiver and to stop your rover receiver.

☒ **Note:** Information will not populate on this tab until you enter information on the *Observation* tab and synchronize with the receiver.

The fields on this tab are analogous to those found on the *Static Observation* dialog box. For more information, see *Receiver tab - static observation*, Page 68.

To end the observation, see Section 8.6, *End an Observation*, on Page 90.

8.3.1.3 Take reading

After you setup your rover and base station, you are ready to take a reading. To access the *Take Reading* dialog box, tap **<Read>** from the *Kinematic Job* dialog box.

```
┌─────────────────────────────────┐
│ 📖 Stratus            1:54p  (ok)│
│ Take Reading                     │
│ Observation │ Receiver │ Note │  │
│ Point ID:      1001           ▼  │
│ ☑ Static Obs    ☐ Known Pt. Type │
│ Ant. Height (m):  1.000      ▦   │
│ Ant. Method:      Vertical   ▼   │
│ Desc:                     ▼  ...  │
│ Start:                           │
│ Epochs:                          │
│ Stop:                            │
│ ─────────────────────────────── │
│ Read │ Status            ▦ ▲     │
└─────────────────────────────────┘
```

You will have access to three tabs:

- **Observation tab** (Page 81)
- **Receiver tab (**Page 86)
- **Note tab** (Page 86)

When you are finished entering information into these tabbed pages, tap **<OK>** to return to the *Kinematic Job* dialog box.

Observation tab - take reading

In the *Observation* tab, you can modify information about a specific reading observation. It is from the tab that you start and stop kinematic readings for initializing the receiver and collecting kinematic observations.

The fields on this tab are analogous to those on the *Add Static Observation* dialog box (see Section 8.2.1, *Static observations*, Page 64), with the addition of the following fields:

Known Pt. Type............. If this receiver is being placed over a known point, you can note that in the software. Select this checkbox to access a drop-down list of choices: **New Known**, **Known**, **Revisit Known**, and **<See Note>**. The name of this checkbox changes to the name you select from this list. When no point type has been selected, this checkbox will read **Known Pt. Type**.

Start .... Lists the time the most recent reading began.

Epochs/Seconds............. Lists the estimated number of recording intervals that have occurred in the file. The intervals are either recorded in epochs or seconds, depending on what was chosen in **End Reading**. See *Observation tab - rover setup*, Page 78.

Stop................................. Lists the time the most recent reading ended.

<Status>......................... This button is analogous to the button on the *Static Job* dialog box. See Section 8.2, *Create a New Static Survey Job*, Page 62.

Init. Type........................ This checkbox, when tapped, will display a drop-down list of observation types: **Static Obs**, **Known Coord**, **Known Vector**, **Re-Initialize**, and **<See Note>**. The name of this checkbox changes to the name you select from this list. When no observation type has been selected, this checkbox will read **Init. Type**.

Select **Re-Initialize** if you are visiting a spot where you previously initialized the receiver. For the other choices in this list, see the following sections for an explanation of what you should select for initializing over an unknown or known point or vector:

- **Initializing over an unknown point** (See Page 83)
- **Initializing over a known point** (See Page 83)
- **Initializing over a known vector** (See Page 84)

<Read>............................ or **<Stop>** or **<Save>**. Tap this button to take an automatic or manual kinematic reading.

See the following sections for an explanation of automatic and manual kinematic readings:

- **Automatically stop reading** (See Page 85)
- **Manually stop reading** (See Page 86)

<u>Initializing over an unknown point</u>

Setting up your rover over an unknown point can mean that you will have to initialize the receiver for approximately 20-60 minutes (depending on the baseline length). Follow these steps for an unknown point:

1. Select the **Static Obs.** option for the **Init. Type** check box.

2. Tap **<Read>**.

3. Initialize over the point until the **Occupation Time** gauge LEDs display that enough data has been collected to accurately determine your position. See Section 5.3.3.4, *Occupation time gauge*, on Page 46.

4. Tap **<Stop>**.

<u>Initializing over a known point</u>

When you setup your rover over a known point, you can dramatically decrease the amount of time required to initialize the receiver. Follow these steps for a known point:

1. Select the **Known Coordinate** option for the **Init. Type** check box.

2. Tap **<Read>**.

3. Initialize for approximately the time that you set for reading durations.

⊠ **Note:** The reading duration is set in the **End Reading** field for the rover setup. See *Observation tab - rover setup*, Page 78.

---

4. Tap **<Stop>**.

5. The known coordinates will not automatically initialize on the handheld. To complete the initialization, the data must be transferred into *Spectrum Survey*.

6. Open the point in Spectrum Survey's ***Point Editor.***

7. Select the **Use as a reference coordinate** check box.

8. Type in the correct (known) coordinates.

9. Click **<OK>** to save the information.

⊠ **Note:** Spectrum Survey will use the point as a known point and adjust all other coordinates off that point. For detailed information, refer to your *Spectrum Survey Reference Manual*.

Initializing over a known vector

When you setup your rover over a known vector, you can dramatically decrease the amount of time required to initialize the receiver. Follow these steps for a known vector:

1. Select the **Known Vector** option for the **Init. Type** check box.

2. Tap **<Read>.**

3. Initialize for approximately the time that you set for reading durations.

⊠ **Note:** The reading duration is set in the **End Reading** field for the rover setup. See *Observation tab - rover setup*, Page 78.

---

4. Tap **<Stop>**.

5. The known coordinates will not automatically initialize on the handheld. To complete the initialization, the data must be transferred into *Spectrum Survey.*

6. Open the point in Spectrum Survey's *Vector Editor.*

7. On the **Processing** tab, select the **Fix vector for GPS initialization** check box.

8. Type in the correct coordinates.

9. Click **<OK>** to save the information.

Automatically Stop Reading

For readings to automatically stop, the **End Reading** field must be set to **Auto Seconds** or **Auto Epochs** (see *Observation tab - rover setup*, Page 78).

Before you can collect kinematic data, you must first initialize the receiver. See *Initializing over an unknown point*, Page 83 or *Initializing over a known point*, Page 83 for instructions.

After initialization, and once you are over the point you want to survey, follow these steps:

1. Tap **<Read>**. The controller will collect information until it reaches the number set in the **Reading Duration** field. Then the button will automatically change to **<Save>**.

2. Tap **<Save>** to store the observation in the database. The button will now say **<Read>**.

3. Move to your next survey point and repeat these steps until you complete the survey.

⊠ **Note:** At any time before the duration time occurs, you can tap **<Stop>** to end the observation. Should this happen, the observation will automatically be saved in the database.

When observations are set to manually stop

For readings to continue until you decide to stop them, the **End Reading** field must be set to **Manually** (see *Observation tab - rover setup*, Page 78).

Before you can collect kinematic data, you must first initialize the receiver. See *Initializing over an unknown point*, Page 83 or *Initializing over a known point*, Page 83 for instructions.

After initialization, and once you are over the point you want to survey, follow these steps:

1. Tap **<Read>**. The controller will collect information until you tap **<Stop>**.

2. Move to your next survey point and repeat these steps until you complete the survey.

Receiver tab - take reading

Select the *Receiver* tab to stop your observations and review important information about your rover receiver.

> ⊠ **Note:** If you stop the reading, you will be required to setup a new rover before you can continue the kinematic survey.

The fields on this tab are analogous to those found on the *Static Observation* dialog box. For more information, see *Receiver tab - static observation*, Page 68.

Note tab - take reading

This tab is analogous to the *Note* tab found in the *Static Observation* dialog box. For more information, see *Note tab - static observation*, Page 70.

8.4   Open an Existing Job

To access job files that you have previously created, tap
<Files on Controller> from the *Main Menu*.

The *Files on Controller* dialog box will appear.
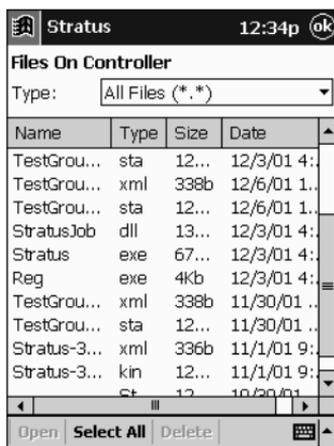
This dialog box displays by default all the files located on your
controller that can be opened by the Stratus software.

If you want to narrow which files are displayed in this dialog
box, use the **Type** drop down list to change the display from
All Files to one of the following:

- **Static Job Files (*.sta)**
- **Kinematic Job Files (*.kin)**
- **Receiver Files (*.str)**
- **Description Libraries (*.txt)**

When you locate the job file that you want to access, tap on the
file in the list to select it. Then, tap **<Open>** and the
appropriate *Survey* dialog box will display your selected job.

You are now ready to add observations to your job. For more information on that process, see Section 8.2.1, *Static observations*, Page 64 or Section 8.3.1, *Kinematic observations*, Page 72.

If at this time you do not want to add observations, tap **<OK>** to close the dialog box. The *End Survey* dialog box will appear. For more information on the options on the *End Survey* dialog box, see Section 8.7, *End a Survey Job*, Page 92.

8.5   Open an Existing Observation

It is possible to set the receiver to collect data for an observation even while the *Static Observation* or *Kinematic Job* dialog boxes are closed. In such a case, you may want data to be collected over a long period of time before you **<Stop>** the data collection.

To access an observation file that is currently recording on the receiver, tap the **<Files on Controller>** icon, located on the *Main Menu*.

The *Files on Controller* dialog box will appear.
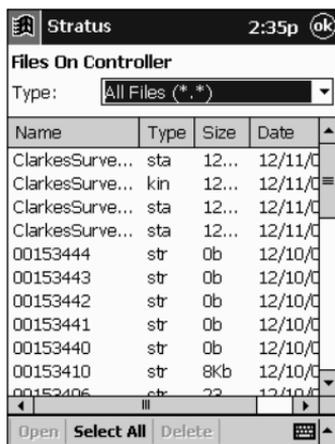
Tap to select the file that contains your observation and tap **<Open>**.

☒ **Note:** Although the following explains how to open an existing static observation, the instructions are the same for opening an existing kinematic observation.

The *Static Survey* dialog box will appear.
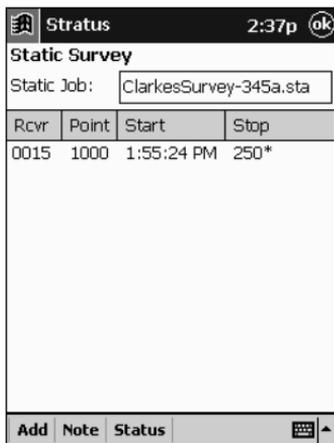
The observation is displayed in the main window of the *Static Survey* dialog box. The **Stop** column displays the number of epochs that have been collected since the **Start** time indicated.

If you have enough data collected, and you want to end the observation, follow these steps:

1. Tap on the observation file to automatically open the *Static Observation* dialog box.

2. On the *Receiver* tab, tap **<Stop>**.

3. The *End Observation* dialog box will automatically appear. For more information on the options found on this dialog box, see Section 8.6, *End an Observation*, Page 90.

---

4. When the observation ends, you will be returned to the *Static Survey* dialog box. Notice now that the information under the **Stop** column now displays the time that the observation was stopped.

5. To close this dialog box, tap **<OK>**. The *End Survey* dialog box will automatically appear. For more information on the choices found on this dialog box, see Section 8.7, *End a Survey Job*, Page 92.

6. Use the *End Survey* dialog box to continue to collect observations.

8.6   End an Observation

At the bottom of the *Receiver* tabbed pages of the dialog boxes titled *Static Survey* (See Page 64), *Base Setup* (See Page 74), *Rover Setup* (See Page 77), and *Receiver Setup* (See Page 97), is a button labeled **<Stop>**. Once an observation begins, you must tap **<Stop>** to end the observation. The *End Observation* dialog box will open.
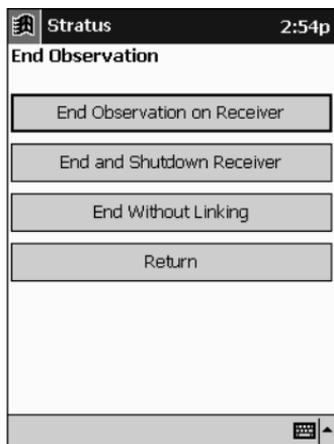
Select one of the four available buttons:

End Observation......................If you are finished with the
on Receiver   current observation, but you
                                         would like to begin another, tap
                                         this button.

The controller will synchronize with the receiver to close the
observation, and when successful, you will be returned to the
appropriate *Observation* or *Setup* dialog box.

End and......................................This is the suggested method. If
Shutdown Receiver   you are finished with the current
                                         observation, and you want to
                                         shut down the receiver, tap this
                                         button.

The controller will synchronize with the receiver to close the
observation, the receiver will turn off, and you will be returned
to the appropriate *Observation* or *Setup* dialog box.

*End without Linking..............If you would like to end the
                                         current observation without
                                         linking to the receiver, tap this
                                         button. In this case, you will
                                         need to shut down the
                                         receiver(s) manually.

Return ....If you accidently tapped the
                                         <**Stop**> button on the *Receiver*
                                         tab, tap this button to return to
                                         the previous dialog box.

*This will not appear if you are exiting through the *Receiver Setup*
dialog box.

8.7   End a Survey Job

You typically end a survey job when you have collected as
many observations as you need for your job. To end a survey
job, tap **<OK>** in the *Static Survey* (See Page 61) or
Kinematic Job (See Page 71) dialog boxes. The *End Survey*
dialog box will appear.
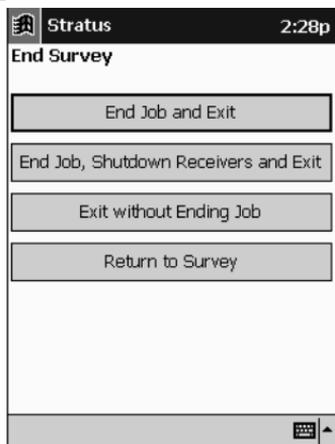
The *End Survey* dialog box displays the following four buttons:

End Job and Exit........................Tap this button to end your
current job, but keep your
receiver turned on for the next
job. You can also end a job and
exit (without synchronizing) by
turning off the receiver using its
power button.

End Job, Shutdown...................Tap this button to end your job
Receiver and Exit   and shutdown any receivers that
the controller show are currently
operating.

⊠ **Note:** Stratus will tell you what receiver(s) to shut down by
indicating with the unit's serial number(s).

Exit without .... If your receiver is collecting
Ending Job observation data, but you would
like to leave the *Static Job* or
Kinematic Job dialog box without
stopping the observation, tap this
button. The *Main Menu* will open
for you to browse the controller.

Return to Survey .... If you accidently tapped **<OK>** in
the *Static Survey* or
Kinematic Survey dialog box, tap
this button to return to the
previous dialog box.

8.8 View/Delete Files on the Receiver

To access a list of files that are currently stored on your receiver,
tap **<Receiver Files>** from the *Main Menu*.

The *Receiver Files* dialog box will appear.
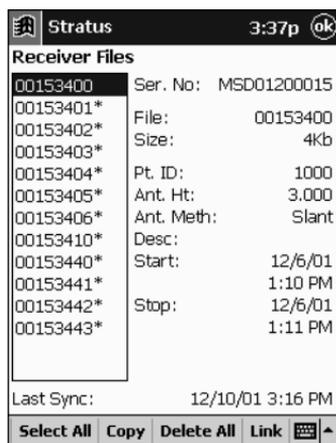
In the *Receiver Files* dialog box, you can view the current files
on your receiver, or delete them all to free up space on your
receiver.

⊠ **Note:** For the list of files to appear, please ensure that both the receiver and the controller are powered up and running. If you have not synchronized with the receiver, you must click **\<Link\>** to obtain the list of files.

When the *Receiver Files* dialog box is updated, you can view the details of each file by tapping on it to select it. The right side of the *Receiver Files* dialog box will update to display the properties for the selected file.

The fields on this dialog box are analogous to those found on the ***Static Observation*** dialog box. For more information, see *Kinematic observations*, Page 72.

The **Receiver Files** dialog box displays several buttons:

\<Link\>............................To make sure that the list of files on the controller accurately reflects the files on the receiver, you should synchronize the two devices.

To synchronize, aim the controller at the receiver and tap the **\<Link\>** button. The controller will synchronize with the receiver, and the receiver files will appear in the dialog box.

\<Select All\>....................Tap this button to automatically select every file displayed in the dialog box.

⊠ **Note:** After you tap **\<Select All\>**, the button will change to read **\<Desel. All\>**. Now when you tap this button, all files will automatically be deselected. This button automatically toggles between **\<Select All\>** and **\<Desel. All\>**.

\<Copy\>............................Tap this button to copy the selected file(s) from the receiver to the controller.

Performing the copy enables you to copy any needed files to your controller before deleting them off the receiver to make space. Files that have not been copied from the receiver are identified by an asterisk (*****) symbol next to the file name.

<Delete All> .... To delete all files from the receiver, aim the controller at the receiver and tap **<Delete All>**. The *Synchronization* dialog box will open. Once the controller has synchronized with the receiver, the files will be deleted.

⊠ **Note:** During deletion, the middle three memory gauge LEDs will illuminate.

8.9 View/Delete Files on the Controller

To delete a job(s) from your controller, tap **<Files on Controller>** from the *Main Menu*.

In the *Files on Controller* dialog box will appear.

Name	Type	Size	Date
00153444	str	0b	12/10/0
00153443	str	0b	12/10/0
00153442	str	0b	12/10/0
00153441	str	0b	12/10/0
00153440	str	0b	12/10/0
00153410	str	8Kb	12/10/0
00153406	str	23...	12/10/0
00153405	str	4Kb	12/10/0
00153404	str	4Kb	12/10/0
00153403	str	4Kb	12/10/0
00153402	str	22Kb	12/10/0

The main window on this dialog box displays all the jobs that are currently on your controller.

As well, the following buttons are displayed:

<Delete> .... To delete a job, select it from the list of files and tap this button.

<Select All>.................... To delete all the files on the controller at once, tap this button to select all the files, then tap **<Delete>**.

<Open> .... If you are unsure if you want to delete a particular job, and it was created on the controller (*.kin or *.sta file), you can open the job to look at it before deleting it. Tap the file to select it, then tap **<Open>** to view the job.

The Stratus software enables you to modify observation file and receiver settings easily by transferring changes from the controller to the receiver. As well, you can use the software to reset or turn off the receiver.

Stratus software also enables you to view the condition and position of GPS satellites currently being tracked by your receiver. This is important because you should only collect data during times when you are most likely to receive good data.

9.1 Receiver Setup

To modify observation file and receiver settings, or to turn off or reset the receiver, tap <**Receiver Setup**> on the *Main Menu*.

The *Receiver Setup* dialog box will appear.

On this dialog box are three tabs:

- **Observation tab** (Page 98)
- **Receiver tab** (Page 99)
- **Reset tab** (Page 100)

Use these tabs to:

- change or apply observation settings that control how data is collected
- verify receiver information and status
- reset the receiver to its factory default settings
- shut off the receiver with the controller

When you are finished entering information into these tabbed pages, tap **<OK>** to return to the *Main Menu*.

9.1.1 Observation settings

To create or change general receiver observation settings, tap on the *Observation* tab.

Enter your information into the fields. This tab is analogous to the fields on the *Static Survey* dialog box. For more information, see Section 8.2.1, *Static observations*, on Page 64.

The *Observation* tab also displays several buttons. When finished entering data, tap:

<**Start**> .... to begin a new observation. The controller will synchronize with the receiver to start recording epochs.

<OK>.............................. if you do not want to keep these settings

<**Set**> .... to apply the settings to the current receiver observation file. The controller will synchronize with the receiver to transfer the current receiver settings.

⊠ **Note:** When you tap <**Start**> or **<Set>**, the *Synchronize* dialog box will display instructions to apply settings to the receiver via the IR port or serial cable, depending on your port selection. See Section 8.1, *Modify Unit Settings*, Page 61. Observations started on the *Observation* tab are stopped on the *Receiver* tab.

9.1.2   Receiver information

To review receiver information or transfer current GPS conditions from your receiver, tap the *Receiver* tab.

🗒 **Stratus**	10:17a ⓞⓚ
Receiver Setup	

Observation	Receiver	Reset

Stratus	S/N: MSD01200015
Firmware:	169-614362-E56
Total Memory:	2Mb
Memory Remaining:	1.1Mb, 66:10*
Battery Remaining:	3:40*
File Name:	00153451
File Size:	n/a
Start:	12/11/01 10:11:24 AM
Epochs:	34*
Stop:	Recording
Last Sync:	12/11/01 10:11 AM

| Stop | Link | | ⌨ ◄ |

At the bottom of this tab are two buttons:

<Link>............................tap this button to synchronize the
controller with the receiver.

When the controller and receiver are synchronized, the
information displayed on this tab accurately reflects the
condition of your receiver. The fields on this tab are analogous
to those seen on the *Static Observation* dialog box. See
Kinematic observations, Page 72.

<Stop>............................Tap this button when you want to end
the data collection.

9.1.3   Turn off or reset the receiver

To reset your receiver settings, tap on the *Reset* tab.
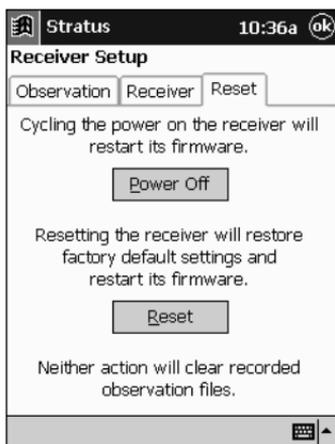
This tab has two buttons:

<Power Off> ....tap this button to turn off the receiver.
To manually turn off your receiver, see
Section 5.3.2, *Power/Memory settings*,
Page 41.

<**Reset**> .... tap this button to return the receiver to its factory default settings. The receiver will beep and the middle three LEDs of each status indicator will blink for two seconds.

⊠ **Note:** Your observation files will not be deleted when you reset the receiver.

9.2 View GPS Status

Throughout the course of your GPS survey, make certain that GPS satellite conditions are acceptable for collecting usable data. It is common to check the GPS status immediately prior to each static or kinematic survey observation.

⊠ **Note:** Although monitoring GPS status can help ensure good survey results, careful survey planning is essential. Refer to Section 2.1, *Pre-Survey*, on Page 10 for more information.

To monitor GPS satellite conditions, tap <**GPS Status**> on the *Main Menu*, or from within the *Kinematic* or *Static* dialog boxes, tap <**Status**> .

The *GPS Status* dialog box will appear displaying three tabs:

- **Sky Plot** (See Page 102)
- **Satellites** (See Page 104)
- **Last Sync** (See Page 106)

9.2.1 Sky Plot

On the *GPS Status* dialog box, tap the *Sky Plot* tab. A chart will appear that displays the location of the satellites in your range, the elevation mask, and geographic coordinates. The chart is setup as follows:

- The position of your receiver's antenna is at the center of the target.
- The degrees of elevation are represented by the concentric circles around the antenna position.
- The satellite numbers are displayed on the chart based on their actual location in the sky. For example, SV 11 is at a 75° azimuth, and is elevated above the horizon by 30°.

The following illustration explains what is seen on the *Sky Plot*.
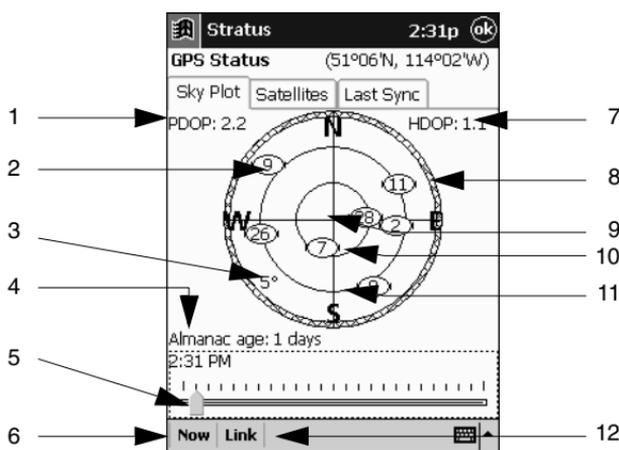
#	Description	#	Description
1	PDOP	7	HDOP
2	Satellite Location	8	Azimuth
3	Elevation Mask	9	90° above Horizon
4	Almanac Age	10	60° above Horizon
5	Time Bar and Dial	11	30° above Horizon
6	Now Button	12	Link Button

The *Sky Plot* displays the following information:

PDOP .... The Positional Dilution of Precision displays the effect of satellite geometry on 3-D position and time computations. Values considered to be 'good' are small (less than 3). Values greater than 7 are considered poor.

Satellite .... The satellites will appear as circled
Location   numbers on the sky plot.

Elevation Mask .... The satellite's elevation from the horizon.

Almanac Age .... Represents the number of days that have passed since the almanac file was received. Use a recent almanac that is no older than 30 days.

Time Bar and................. Move the dial on the time bar to see
Dial   where your satellites will be at different times of the day.

<Now> .... This button snaps the dial on the time bar over the present time.

HDOP.............................. The Horizontal Dilution of Precision represents the horizontal geometry of the current satellite locations. Values considered 'good' are small (3 or less); values greater than 7 are considered poor.

Azimuth.......................... The angle (in a clockwise direction) between the north and the location of the satellite.

Horizon........................... Represents degrees above the horizon. To determine a satellites elevation from the horizon, compare its position on the chart in relation to these lines.

<Link> .... Tap this button to refresh the controller's satellite and site information.

9.2.2   Satellites

On the *GPS Status* dialog box, tap the *Satellites* tab. A graph is displayed that shows how many satellites are available and the PDOP level for your survey.

You should plan your survey to maximize the satellite number available, and minimize the PDOP level.

The graph is setup as follows:

Vertical Axis ....shows the number of satellites and PDOP values. The line at seven indicates a suggested PDOP limit.

Horizontal Axis ....shows the time of day. By default, the time displayed is the current hour with a range of 12 hours. Both ends can be adjusted to a maximum range of 24 hours, with 12 hours before and after the current hour.

The following illustration explains what is seen on the *Satellites* tab.
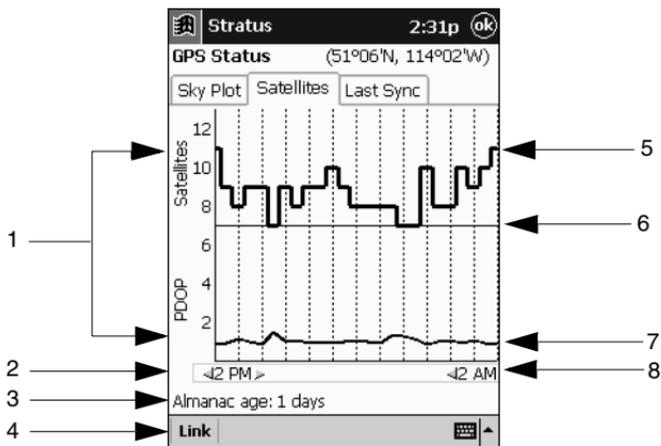
#	Description	#	Description
1	Satellite & PDOP value	5	Satellites Available
2	Begin Time	6	Min/Max No. Indicator
3	Almanac Age	7	PDOP
4	Link Button	8	End Time

The following information is available on this tab:

Satellite & PDOP Value...........Calculates the number of satellites available and the corresponding PDOP value.

Begin Time................................Click these arrows to set from which hour you want to view satellite information.

Almanac Age ....This field description is analogous to the same field on the *Sky Plot* tab.

<Link> ....This field description is analogous to the same field on the *Sky Plot* tab.

Satellites Available...................Displays the number of satellites your receiver is tracking. Minimally, you want to track at least five satellites.

Min/Max No...............................This indicator line divides the graph. Ideally, **Satellites Available** should be shown graphed above this line, and **PDOP** should be shown graphed below this line.

PDOP Bar ....This field description is analogous to the **PDOP** field on the *Sky Plot* tab.

End Time...................................Click these arrows to set until which hour you want to view satellite information.

9.2.3 Last Sync

On the *GPS Status* dialog box, tap the *Last Sync* tab to view the time and date that your handheld controller last synchronized with a receiver.

Synchronizing updates the controller with the receiver's GPS status information and timing. For more information, see Section 7.5, *Synchronization*, Page 58.

The *Last Sync* tab displays the following information:

Satellites Tracked.......... Number of satellites within the receivers range.

PDOP .... This field description is analogous to the same field on the *Sky Plot* tab.

HDOP............................. This field description is analogous to the same field on the *Sky Plot* tab.

VDOP............................. Vertical Dilution of Precision represents the vertical geometry of the current satellite locations. Values considered 'good' are small (3 or less); values greater than 7 are considered poor.

PRN .... The Pseudo Random Noise identifies the number associated with each satellite.

Azimuth.......................... This field description is analogous to the same field on the *Sky Plot* tab.

Elevation......................... Angular distance of a satellite above the horizon.

Last Sync........................ Lists the time and date that the current receiver was last synchronized with the Stratus controller.

<Link> .... This field description is analogous to the same field on the *Sky Plot* tab.

⊠ **Note:** Satellites shown with asterisks after PRN, azimuth, and elevation are visible, but not tracked.

9.3 Load Descriptions

Pre-defined descriptions can be created on your handheld controller with any generic word processing software, then loaded into your Stratus software.

To load descriptions into the Stratus software, you must alter the text in your controller's **description.txt** file, either by editing the existing file, or overwriting the file with one you created on your PC. The following explains both options.

Altering descriptions on the controller

To alter descriptions in the **description.txt** file already residing on the controller, perform these steps:

1. From the controller's start menu, tap **Start | File Explorer** to open the *File Explorer* dialog box.

2. At the top of the *File Explorer* dialog box is a drop down list. Tap on it to select **My Device**.

3. Tap on the **Program Files** folder. The *Program Files* dialog box will appear.

4. Tap on the **Sokkia Stratus** folder to open the *Sokkia Stratus* dialog box.

5. Tap on the **description.txt** file. It will open in the *Pocket Word* program, or a similar text editor.

6. The **description.txt** file contains, on each line, some predefined descriptions. Scroll down to the end of this file and type your descriptions at the bottom of the description list.

Altering descriptions on the PC

To create descriptions in a **description.txt** file on your PC, then overwrite the current **description.txt** file on the controller, perform these steps:

1. Open a text editor (such as *Notepad*) on your PC.

2. (Optional) If you want to edit the current **description.txt** file, transfer it from the controller to your PC, then open it with the text editor. To transfer data from your controller to the PC, see Section , *Transfer data into Spectrum Survey,* Page 12.

3. Make changes to the file.

4. Save your changes to the document, and transfer the revised file to your controller.

⊠ You must separate each description with a carriage return in the text file for the description to appear correctly in the *Desc* field**.**

Appendix A   **Stratus Specifications**

Stratus Receiver Specifications	
Physical	
Size (diameter x height)	155 mm x 125 mm
Weight	0.83 kg (1.75 lbs) with two internal batteries 0.62 kg (1.40 lb) w/o internal batteries
Description of Enclosure	The enclosure is constructed of molded plastic and encircled by a rubber bumper. The Stratus is weather resistant and will withstand wind driven rain and temporary submersion in water. A sealed access door on the side of the enclosure allows the insertion and removal of batteries.
Environmental	
Operating Temperature	-20°C to +65°C (-4°F to +149°F) w/internal batteries -40°C to +65°C (-40°F to +149°F) w/external battery
Storage Temperature	-30°C to +85°C (-22°F to +185°F) w/internal batteries -40°C to +85°C (-40°F to +185°F) w/external battery
Humidity	85% RH @ 38°C (100°F) 95% RH @ 65°C (149°F)
Altitude	1219 m (4000 ft.)
Drop	2.2 m (7.2 ft.) - survival on hard surface, pole-mounted 1 m (3.3 ft.) - survival on hard surface, stand-alone
Vibration (Random Profile)	
The Stratus can acquire and track satellites while undergoing vibration levels as follows. It assumes that C/No (5.5G RMS) is between 10-3000 Hz based on three standards: Assuming appropriate mounting, the Stratus conforms to random vibration templates for RTCA/DO-160D, Section 8 (Curve C template); MIL-STD-202F, Test Condition I (Curve A template); and ASAE EP455, Section 5.15.1 nominal template.	

Stratus Receiver Specifications	
Power Requirements	
Voltage	Internal: 7.2 VDC External: 8-16 VDC
Power	890 mW (typical)
Power Management	
Once battery reserves are depleted, the Stratus becomes inactive. Normal operations are resumed when you connect an external power source to the system or when you install charged batteries.	
Real-Time Clock	
A real-time internal clock enables the Stratus to turn off between scheduled data-collection sessions. When the Stratus is on, this clock is synchronized to GPS time of $\pm$1 second.	
Performance (Subject To GPS System Characteristics)	
Frequency	1575.42 MHz (L1 GPS)
Codes tracked	C/A
Internal Memory	4 MB
Channels	12 channels
Time to First Fix	Cold: 2 min. typical Warm: 45 sec. (position, time, no ephemeris) Hot: 15 sec. (position, time, ephemeris)
Data Recording Interval Accuracy	1 - 999 seconds (default 10 seconds) Static, Kinematic
Re-acquisition	1 s - typical
Accuracy Carrier Phase Post-Processed	Static Vertical: 10mm + 2ppm * D Horizontal: 5mm + 1ppm * D Occupation: 4 Satellites, 30sec rate, >1h **Kinematic** Vertical: 15mm + 1ppm * D Horizontal: 12mm + 1ppm * D, D $\leq$ 10km 10mm + 2ppm * D, D > 10km
Height Limit	Up to 18,288 m (60,000 feet), in accordance with export licensing

Stratus Receiver Specifications
* Posted accuracies are root-mean-square (RMS) and assume that survey procedures as outlined in the user manual are followed, and that processing is performed using Spectrum Survey. To achieve optimum results, certain conditions must be met including: minimum of 5 satellites, low PDOP, low multi-path, no obstructions, low atmospheric activity, and fixed integer solutions are computed. If these procedures are not followed and these conditions are not met, results will be degraded.

Internal Batteries	
Model	Sokkia BDC46
Capacity	1300 mAh, 7.2 VDC
Chemistry	Li-Ion
Operating Time at 20°C	30 hours, typical
Charge Time	3 hours typical for two batteries (using Sokkia charger)

External Battery	
Model	Sokkia model
Capacity	Alkaline D-Cell (x6)
Operating Time at 20°C	100 hours, typical

Input/Output Data Interface	
Electrical format	EIA/TIA-232-E
EIA/TIA-232-E Baud Rate	4800, 9600, 19200, 57600 bps (19200 bps default)
Signals supported	TX, RX

Integrated Antenna	
Antenna Offset	0

⊠ **Note:** See your Pocket PC reference manual for specific Pocket PC model features.

Appendix B   Survey Workflows

This chapter provides instructions for performing static and kinematic surveys with your Stratus system.

Although the information in the workflows also exists throughout the pages of this manual, the survey workflows are provided to help you quickly navigate through the processes you just learned. When possible, links back to the information in the body of this manual are provided.

For a brief overview of the basic Stratus survey steps, refer to Chapter 2, **Quick Start**.

The Stratus system can collect survey information these ways:

- **Static survey with no controller** (See Page 116)

- **Static survey with a controller** (See Page 119)

- **Kinematic survey with a controller** (See Page 122)

B.1   Static Survey Workflow (No Controller)

The following show the steps for performing a static survey without using a controller.

```
                    ┌─────────┐
                    │  START  │
                    └─────────┘
                         │
                         ▼
              ╭─────────────────────╮
              │     In the Field     │              ┌──────────────────────┐
              ╰─────────────────────╯              │  Turn off receivers  │
                         │                          └──────────────────────┘
                         ▼                                     │
         ┌──────────────────────────┐                         ▼
         │ Setup, level, and orient │           ┌──────────────────────────┐
         │   Stratus receivers over │           │ Move one or more receivers│
         │   endpoints of baseline  │           │ (keep one receiver on    │
         └──────────────────────────┘           │  known point)            │
                         │                        └──────────────────────────┘
                         ▼                                     │
         ┌──────────────────────────┐                         ▼
         │ Measure and record       │           ┌──────────────────────────┐
         │ antenna height and       │           │ Repeat "In the Field"    │
         │ tripod height            │           │ steps until you have     │
         └──────────────────────────┘           │ observed all vectors     │
                         │                        └──────────────────────────┘
                         ▼                                     │
         ┌──────────────────────────┐                         ▼
         │   Turn on the receivers  │              ╭──────────────────────╮
         └──────────────────────────┘              │    In the Office     │
                         │                          ╰──────────────────────╯
                         ▼                                     │
         ┌──────────────────────────┐                         ▼
         │ Ensure Satellites        │           ┌──────────────────────────┐
         │ Visible Tracking gauge   │           │ Transfer raw data from   │
         │ displays yellow LED, and │           │ the receiver to the PC   │
         │ Memory gauge LED flashes.│           └──────────────────────────┘
         └──────────────────────────┘                         │
                         │                                     ▼
                         ▼                        ┌──────────────────────────┐
         ┌──────────────────────────┐           │ Process and adjust       │
         │ Record Point ID and      │           │ GPS data                 │
         │ Description in GPS Field  │           └──────────────────────────┘
         │ Book.                    │                         │
         └──────────────────────────┘                         ▼
                         │                              ┌─────────┐
                         ▼                              │   END   │
         ┌──────────────────────────┐                  └─────────┘
         │ Collect data for 20-60   │
         │ minutes                  │
         └──────────────────────────┘
```

Basically, a static survey consists of turning on your receiver to collect data at a site, then when finished, turning off the receiver. Follow this procedure for every site until you have collected all the required data.

☒   **Note:** Each time you turn on the receiver, a new *.str file is created. The antenna/site information must be recorded in a manual GPS logbook.

Static Survey - In the Field Without a Controller

To collect data in a basic static survey, you must do the following:

1. Setup a Stratus receiver over one survey point (endpoint) of your baseline. To setup your receiver, see Section 3.1, *Typical Static and Base Setup*, Page 17.

⊠ **Note:** During the static survey process, one of your survey points should be either a known or assumed known point to provide control for the survey network.

2. Orient your receiver (see Section 3.1.1, *Orient your antenna*, Page 18).

3. Measure the antenna height (see Section 3.3, *Measure Antenna Height*, Page 19).

4. Record the antenna height in your GPS logbook.

5. Turn on the receiver. It will initialize in approximately 60 seconds.

⊠ **Note:** If this is the first time you are using the Stratus receiver since purchased, or if it is first being used after a full reset was performed on the receiver, then initialization may take up to 10 minutes.

6. After initialization, Stratus automatically opens a new data file with a default name and begins tracking satellites.

⊠ **Note:** Only common data is processed. Use care when setting up multiple receivers to ensure that they collect data during the same time period.

7. A **Satellites Visible Tracking** LED should be yellow to confirm that the receiver is tracking a sufficient number of satellites. A **Memory** LED should flash as data is recorded to memory. For more information on these LEDs, see Section 5.3.3, *Receiver status gauges*, Page 42.

8. Record the point ID and description in your GPS field book.

9. Record GPS data to your receiver for 20 to 60 minutes (the amount of time is dependent on your baseline length and recording interval).

10. Turn off the receiver when you are satisfied that enough GPS data has been collected over the point for optimal accuracy, using the **Occupation Time** gauge as a guide (see Section 5.3.3.4, *Occupation time gauge*, Page 46). The current data file will automatically save and close.

11. Move one or more receivers to a new point. Keep at least one receiver on a known or previously measured point.

12. Repeat steps 2 - 11 until all desired vectors have been observed.

Static Survey - In the Office Without a Controller

13. Transfer raw GPS data from the receiver to the PC (see Section 2.4, *Post-Process your Survey*, Page 12).

14. Process and adjust GPS data to obtain the point coordinates of the baseline in Spectrum Survey. Refer to your *Spectrum Survey Reference Manual* for more information.

⊠ **Note:** When you data is imported into Spectrum Survey, you should see the vector combinations. If you do not, then select **Tools | Define Combinations**, lower the minimum overlap value, and select **<OK>**. On some shorter occupations, this may be necessary.

B.2 Static Survey Workflow (With Controller)

The following show the steps for surveying with a controller.

START

In the Field

Setup, level, and orient Stratus receivers over endpoints of baseline

Measure and record antenna height and tripod height

Turn on the receivers

Ensure **Satellites Visible Tracking** gauge displays yellow LED, and **Memory** gauge LED flashes.

Turn on your controller and select **Start | Stratus**

Monitor gauges to determine if you are tracking enough satellites

Obtain a new almanac

Use the **Sky Plot** to help determine optimal GPS survey conditions

Tap **<Static Survey>** to start a new job

Tap **<Add>** to fill in information about your survey

Tap **<Start>** to begin the observation

Monitor **Occupation Time** gauge to determine when enough data is collected

Tap **<Stop>** to end observation

Move your receiver(s) to a new point

End your survey

In the Office

Transfer raw GPS data from the receiver and the controller to the PC

Process and adjust GPS data

END

To collect data with the Stratus controller, you must do the following:

Static Survey - In the Field With a Controller

1. Perform steps 1 to 7 of Section B.1, *Static Survey Workflow (No Controller)*, Page 116.

2. Turn on your controller and select **Start | Stratus** from the Windows CE task bar. The controller will display the controller *Main Menu* screen.

3. Monitor the receiver LEDs. When you have a minimum of four satellites tracking (the second bottom LED of the **Satellites Visible Tracking** gauge is illuminated), you are ready to collect data. For more information, see Section 5.3.3.2, *Satellites visible tracking gauge*, Page 44.

4. Obtain a new almanac (see Section 7.6, *Controller Almanac*, Page 59).

5. In the *GPS Status* dialog box, use the **Sky Plot** to help determine the optimal GPS survey conditions. See Section 9.2.1, *Sky Plot*, Page 102.

6. Tap **<OK>** to exit the *GPS Status* dialog box.

7. Tap **<Static Survey>** to start a new job.

8. Tap **<Add>** to open the *Add Static Observation* dialog box and fill in information about your survey. See Section 8.2.1, *Static observations*, Page 64.

9. When finished, tap **<Start>** to begin your static observation.

10. Occupy the point until your **Occupation Time** gauge LED is illuminated for your given baseline length (2, 5, 10, 15 or 20km) between the base and rover. For more information, see Section 5.3.3.4, *Occupation time gauge*, Page 46.

11. Select *Receiver* and tap **<Stop>** to end the observation. For more information see Section 8.6, *End an Observation*, Page 90.

12. The *Synchronizing* dialog box will display. Your information is transferred to the receiver. An audible message will inform you when synchronization is complete.

13. Move your receiver(s) to new points. Keep at least one receiver on a known or previously measured point.

⊠ **Note:** To add other static observations, repeat steps 8 to 13.

14. To end your survey job, tap **<OK>** to close the *Survey* dialog box. The *End Survey* dialog box will open.

15. Select how you want to end your job from the list of options on the *End Survey* dialog box. For more information, see Section 8.7, *End a Survey Job*, Page 92.

Static Survey - In the Office With a Controller

16. Transfer raw GPS data from the receiver and the controller (*.sta) to the PC (see Section 2.4, *Post-Process your Survey*, Page 12).

17. Process and adjust GPS data to obtain the point coordinates of the baseline in Spectrum Survey. Refer to your *Spectrum Survey Reference Manual* for more information.

⊠ **Note:** When you data is imported into Spectrum Survey, you should see the vector combinations. If you do not, then select **Tools | Define Combinations**, lower the minimum overlap value, and select **<OK>**. On some shorter occupations, this may be necessary.

B.3   Kinematic Survey Workflow

The following outlines a typical stop-and-go kinematic survey:

START

General Setup

Setup, level, and orient Stratus receivers over endpoints of baseline

Measure and record antenna height and tripod height

Turn on the receivers

Ensure **Satellites Visible Tracking** gauge displays yellow LED, and **Memory** gauge LED flashes.

Turn on your controller and select **Start | Stratus**

Monitor gauges to determine if you are tracking enough satellites

Obtain a new almanac

Use the **Sky Plot** to help determine optimal GPS survey conditions

Tap **<Kinematic Survey>** to start a new job

Base Setup

Tap **Base | New Base**

Tap **<OK>** after synchronization

Rover Setup

Turn on the receiver

Tap **Rover | New Rover**

Enter information and tap **<Start>**

Tap **<OK>**

Go to Collect Data

Collect Data

Collect Data

Position rover over first survey point

Tap **<Read>**

Select **Static OBS**

Verify **Point ID** and **Antenna Height**, and tap **<Read>**

Initialize the receiver

Tap **<Stop>** to end initialization

Deselect **Static OBS**

Move rover to a survey point

Tap **<Read>** to start observation

Tap **<Save>** when the epoch counter reaches completion

Collect another observation

Yes

No

End Survey

Tap **<OK>** in *Kinematic Observation* when survey is complete

Tap **<OK>** In *Kinematic Survey* to end survey job.

Choose *End Survey* option

Go to base receiver and tap the observation type tagged **Base**

On the *Receiver* tab, tap **<Stop>**

Choose *End Survey* option

Turn off receivers

In the Office

Transfer raw GPS data from the receiver and the controller to the PC

Process and adjust GPS data

END

Kinematic Survey - In the Field

1. Perform steps 1 to 6 of Section B.2, *Static Survey Workflow (With Controller)*, Page 119. These steps describe how to setup a Stratus receiver, as a base, over a known survey point (endpoint) of your baseline.

⊠ **Note:** During the kinematic survey process, one survey point should be a known or an assumed known point. This point will provide control for the survey network.

2. Tap **<Kinematic Survey>** to start a new survey job.

Kinematic Survey - Base Setup

3. To setup the base receiver, tap **Base | New Base** in the *Kinematic Job* dialog box. For more information see Section 8.3.1.1, *Base setup*, Page 74.

4. After synchronization with the base, tap **<OK>** in the upper right-hand corner of the screen.

Kinematic Survey - Rover Setup

5. Turn on the rover receiver.

6. To setup the rover receiver, tap **Rover | New Rover** in the *Kinematic Job* dialog box. For more information see Section 8.3.1.2, *Rover setup*, Page 77.

7. Fill in the fields on the *Rover Setup* dialog box.

8. Tap **<Start>** and synchronize with the receiver. This will create a new file on the receiver.

⊠ **Note:** If you use **<Set>**, then it will use the existing file already logging on the receiver. No new file will be created.

9. Tap **<OK>**.

Kinematic Survey - Collect Data

⊠ **Note:** There must be a base receiver collecting data for the rover data to process. Do not stop the base observation until the kinematic survey is complete.

10. Position the rover over your first survey point (In this example, it is assumed that the coordinate is not known. If you do want to setup over a known control point, see *Observation tab - take reading*, Page 81 for an explanation).

⊠ **Note:** If you set your rover on an unknown point, initialization may take an estimated 30 minutes, depending on the length of your baseline. See Section 5.3.3.4, *Occupation time gauge*, Page 46.

11. Tap **<Read>** to open the *Take Reading* dialog box and start your first kinematic site.

12. Because your first reading needs to be a kinematic initialization site, tap the **Init. Type** check box and select **Static OBS**. This checkbox may already read **Static OBS**, if so, then leave this check box selected.

13. If you are satisfied with the **Point ID** and **Antenna Height**, tap **<Read>** to begin initialization.

14. Allow the receiver to initialize until the LED illuminated on the **Occupation Time** gauge correctly identifies the distance of your baseline. See Section 5.3.3.4, *Occupation time gauge*, Page 46.

⊠ **Note:** Neither the **Auto Epoch** or **Auto Seconds** applies on an initialization site (static obs). To stop the observation, you must manually select the **<Stop>** button.

15. Tap **<Stop>** to end the initialization.

16. The remainder of your readings will be kinematic, so deselect the **Static OBS** check box.

17. Move your rover to a survey point (For Example, a fire hydrant or curb).

18. Tap **<Read>** to start this observation. Your rover will collect data for a few seconds to a few minutes depending on your reading settings (to set your epoch number and recording interval, see *Observation tab - rover setup*, Page 78).

19. Wait until the Epoch counter reaches its completion, and then select **<Save>** to store the existing **Point ID** information.

20. Continue steps 17 to 19 for all kinematic observations.

☒ **Note:** You can manually stop an observation at any time by tapping **<Stop>**. The observation is automatically stored in the database.

Kinematic Survey - End Survey

21. When your survey is complete, tap **<OK>** on your *Kinematic Observation* dialog box. The *Kinematic Survey* dialog box will open.

22. If you are ready to end your job, tap <**Ok**>. The *End Survey* dialog box will appear.

23. Choose an option in the *End Survey* dialog box. For more information, see Section 8.7, *End a Survey Job*, Page 92.

24. Go to your base receiver and from the *Kinematic Job* dialog box, tap on the observation type that is tagged **Base**.

---

25. Select the *Receiver* tab and tap **<Stop>**.

26. Choose an option in the *End Survey* dialog box. For more information, see Section 8.7, *End a Survey Job*, Page 92.

27. Turn off the receivers. The current data file will automatically save and close.

Kinematic Survey - In the Office

28. Follow the steps in *Static Survey - In the Office With a Controller*, Page 121.

B.3.1   Kinematic survey tips

Tip 1

If you hear **three beeps** coming from the Stratus receiver during kinematic work, this means you have lost carrier phase lock. Follow these steps:

1. Move to area free of obstructions and wait for **two beeps**, indicating you have regained lock.

2. Go back to a previous known observation (mandatory)

3. Select the same **Point ID** from the drop down list, and select the **Re-Initialize** check box.

4. Make sure the reading completes its full cycle.

5. You are now ready to continue your survey.

Tip 2

Make sure during kinematic work that the rover receiver is never shut down while you are "on the go". If this happens, then you will need to re-synchronize. See Section 7.5, *Synchronization*, Page 58.

Glossary

Almanac

An almanac is a data file that contains the approximate orbit information of all satellites. This information takes around 20 - 60 minutes to transfer from a GPS satellite to a GPS receiver. When the GPS receiver receives the information, rapid satellite signal acquisition becomes possible. The acquisition time on receiver start-up is significantly faster when aided by a current almanac. The approximate orbital data is used to preset the receiver with the approximate position and carrier Doppler frequency (the frequency shift caused by the rate of change in range to the moving satellites) of each satellite.

Almanac age

Almanac age represents the number of days that have passed since the almanac file was received. It is recommended you use a recent almanac, usually no more than 60 days old.

Antenna height

The distance between the position of the observed point and the phase center of the GPS antenna.

Antenna measuring points

The antenna measuring points are located around the circumference of the Height Measurement Ring. Use them to measure the height of the antenna from the ground.

Antenna slots

Four raised squares located around the circumference of the top of the receiver. Use these slots to hold the Height Measurement Ring in place.

Assumed known point

A point with coordinates that are considered to be known for the purpose of calculating relative positions in a survey.

Azimuth

The angle (in a clockwise direction) between the north and the location of the satellite.

Baseline
 A three-dimensional vector distance between a pair of stations that simultaneous GPS data has been collected and processed with differential techniques. The most accurate GPS result.

Base receiver
 A receiver in a kinematic survey that serves as the known point (or assumed known point) on a baseline. This receiver provides control for the survey network.

Base station
 In differential positioning, a base station is the end of the baseline that is assumed known and its position fixed.

Differential positioning
 Determines the relative coordinates using two or more receivers that are simultaneously tracking the same satellites. Dynamic differential positioning is a real-time calibration technique achieved by sending corrections to the roving user from one or more reference stations. Static differential GPS involves determining baseline vectors between pairs of receivers.

Dilution of Precision (DOP)
 The geometry of the visible satellites is an important factor in achieving high quality results. The geometry changes with time due to the relative motion of the satellites, and a measure for this accuracy is the Dilution of Precision (DOP) factor. DOP is a description of the effect of satellite geometry on position and time computations. Values that are considered to be 'good' are small, approximately 3. Values greater than 7 are considered poor. Thus, a small DOP is associated with widely separated satellites. Standard DOP terms for GPS include:

GDOP Geometric Dilution of Precision	GDOP is a composite measure reflecting the effects of satellite geometry on position and time computations.
PDOP Position Dilution of Precision	PDOP reflects the effects of satellite geometry on position computation.
HDOP Horizontal Dilution of Precision	HDOP reflects the effects of satellite geometry on the horizontal component of the position computation.
VDOP Vertical Dilution of Precision	VDOP reflects the effects of satellite geometry on the vertical component of the position computation.
TDOP Time Dilution of Precision	TDOP reflects the effects of satellite geometry on the time computation.

Elevation mask angle
An adjustable feature of GPS receivers that specifies a satellite must be at least a specified number of degrees above the horizon before the signals from the satellite can be used. Directly overhead equals 90° elevation. Satellites at low elevation angles (5° or less) have lower signal strengths and are prone to loss of lock, causing noisy solutions.

Ephemeris
A list of (accurate) positions or locations of a celestial object as a function of time broadcast by a satellite. Available as *interruption ephemeris* or as post-processed *precise ephemeris*. This positional data is used for subsequent calculations.

Epoch
Time stamp for a measurement interval or data frequency, Example: 15 seconds or 30 seconds. See also *recording interval*.

Firmware
The electronic heart of a receiver where coded instructions relating to receiver function and data processing algorithms are stored for operation.

GDOP
See *Dilution of Precision*.

Global Positioning System (GPS)
A passive, satellite-based navigation system operated by the Department of Defense. Its primary mission is to provide passive global positioning/navigation for land-, sea- and air-based operations. GPS consists of the following:
• Space segment (up to 24 NAVSTAR satellites in 6 different orbits)
• Control segment (5 monitor stations, 1 master control station and 3 upload stations)
• User segment (GPS receivers)
NAVSTAR satellites carry extremely accurate atomic clocks and broadcast coherent simultaneous signals.

GPS time
The time system upon which GPS is based. GPS time is an atomic time system and is related to International Atomic Time in the following manner:
International Atomic Time (IAT) = GPS + 19.000 sec.

HDOP

See *Dilution of Precision*.

Height measurement ring

A ring used to measure the correct distance between the Stratus receiver's antenna and the ground. The ring rests on the top of the receiver's antenna, in between the antenna slots. On it's outer rim are four measuring points you can place the tip of your tape measure. When using a HI tape measure, place the Height Measurement Ring on the receiver right side-up. Hook it's clip on an antenna measuring point on the side of the measurement ring with writing on it. When using a generic tape measure, place the Height Measurement Ring on the receiver upside-down. Hook it's clip on an antenna measuring point on the side of the measurement ring without writing.

HI

Height of Instrument. See also *antenna height*.

HI tape measure

A tape measure with a modified tape that takes into account the length of the tape body and point.

Kinematic survey (stop-and-go)

Kinematic surveys require occupations as short as a few seconds, but with a moderate reduction in accuracy. During kinematic surveys, a Stratus base station records control data over a known point while one or more rovers takes brief GPS readings at each unknown position. GPS data is collected while rovers are stationary or in motion. The data is later processed. Each point where the rover position is fixed yields an accurate measurement. Because many points may be quickly surveyed, kinematic surveying allows for high productivity and is useful for surveys that require a large number of points over a local region (topographic, as-built surveys). Kinematic surveying requires a Stratus Controller.

⊠ **Note**: Typical kinematic surveys require initialization time.

Known point

A point whose coordinates have been determined to the required accuracy.

L1

The primary L-band signal radiated by each NAVSTAR satellite at 1575.42 MHz. The Ll signals modulated with the C/A and P codes, and with the NAV message.

Multipath

The reception of a satellite signal both along a direct path and along one or more reflected paths. The reflected signals are caused by reflecting surfaces near the GPS antenna. The multipath signal results in an incorrect pseudorange measurement. The classical example of multipath is the ghosting that appears on television when an airplane passes overhead.

Observation

The act of recording (GPS) data at a site. An example usage of the term would be, 'The observation at point 0001 lasted 1 hour'. Observation is usually interchangeable with the term occupation.

Obstruction

Physical feature that blocks the satellite direct line of site from the point of observation. GPS signals are very weak. They can be blocked from reaching the GPS antenna by objects between the antenna and the satellites. Classic examples of obstructions are trees and buildings.

Occupation

See *observation*.

Orientation Marker

A small triangle located on one of the antenna measuring points (located on the top of the receiver). Use this marker to orient your antenna with respect to the North.

Phase center

The phase center of a GPS antenna is the physical location on the antenna where the raw GPS signals are observed. This is the physical location where the computed position will be determined. GPS antennas are manufactured to place the phase center as closely as possible to the physical center of the antenna housing. To determine the position of a survey marker on the ground, the GPS antenna (and thus the phase center) is centered over the marker and the HI is measured to the survey marker for use during processing.

Point ID

An alpha-numeric identifier for a survey point. Each survey point must have a unique site ID. Otherwise, the processing software will have problems determining which point certain observations belong to.

Position Dilution of Precision (PDOP)

See *Dilution of Precision*.

Post-Processing

The reduction and processing of GPS data after the data was actually collected in the field. Postprocessing is usually accomplished on a computer in an office environment where appropriate software is employed to achieve optimum position solutions.

PPM

Part Per Million

PRN number

Pseudo-Random Number used to identify each satellite. Also known as Satellite Number.

Pseudorange

A measure of the apparent propagation time from the satellite to the receiver antenna expressed as a distance. Pseudorange is obtained by multiplying the apparent signal-propagation time by the speed of light. Pseudorange differs from the actual range by the amount that the satellite and user clocks are offset by propagation delays and other errors. The apparent propagation time is determined from the time shift required to align (correlate) a replica of the GPS code generated in the receiver with the received GPS code. The time shift is the difference between the time of signal reception (measured in the receiver time frame) and the time of emission (measured in the satellite time frame).

Raw data

GPS data that is not processed or differentially corrected.

Recording interval

The time interval between the recording of GPS raw data to the GPS receiver memory. For example, a recording interval of 10 seconds indicates GPS raw data will be stored to the GPS receiver memory once every 10 seconds. See also *epoch*.

Rover
The GPS receiver that moves from point to point during a kinematics GPS survey.

Session
A session is a group of simultaneously collected GPS raw data. For example, if four GPS receivers collected data simultaneously on four points, the entire data set is considered a session. Within a session, GPS vectors can be computed between all points.

Site
A location or survey point where GPS data is collected.

Site ID
See *point ID*.

Slant height
The distance from the survey marker to the edge of the antenna ground plane. Using the slant height and radius of the GPS antenna, the true vertical height or HI of the antenna can be determined. The HI is used in the processing to determine the location of the survey marker on the ground.

Static surveying
Static surveys are often performed as control surveys or boundary surveys. During static surveys, two or more Stratus receivers are placed at the ends of the baselines being measured and each receiver collects data for a session (15-60 minutes depending on baseline length). This process is repeated for a number of lines yielding a set of connected baselines that form a survey network. Static surveys require longer periods of occupation to provide centimeter level results. It is not necessary to interact with the Stratus receiver to collect static data.

Stop-and-Go Survey
See *Kinematic*

SV
Space Vehicle or Satellites Visible.

Task bar, Explorer
A thin bar at the top of the Windows CE screen. On the task bar, you can access the *Start* menu, time of day, and other features.

TDOP
See *Dilution of Precision*.

True Vertical Height
The exact distance from the survey marker to the phase center of the antenna. No offsets apply.

VDOP
See *Dilution of Precision*.

Vector
The spatial line described by 3-D components between two points. In GPS surveying, a vector is the product of processing raw data collected on two points simultaneously.

Vertical Height
When measuring the antenna height, the distance from the survey marker to the bottom of the antenna/receiver. The vertical offset added to the vertical height will equal the true vertical height.

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