

# **Trimble® SNB900**

## **Radio Modem**

### **User Guide**



**Version 1.0**  
**Revision A**  
**July 2004**

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications

**Prior to operating these radio modems, users are legally required to obtain frequency licenses, as required by the country-of-use. Please contact your local communications governing agency for the licensing requirements for each of these radio modems.**

### **Safety**

You must maintain a minimum separation distance of 21 cm (approximately 8 in) between yourself and the radiating antenna for this device to satisfy the RF Exposure requirements of the FCC and Industry Canada. The antenna may not be co-located with any other transmitting device. For mobile operation, the maximum gain of the antenna must not exceed 5 dBi.

**Declaration of Conformity (Canada)**

|                           |   |
|---------------------------|---|
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| <b>Model number</b>       | SNB900  |
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| <b>Specification code</b> | 17561031902A3 17  |
| <b>Specification</b>      | RSS210  |
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| <b>To frequency</b>       | 928M  |

# Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Introduction . . . . .</b>                   | <b>1</b>  |
|          | Welcome . . . . .                               | 2         |
|          | Related Information . . . . .                   | 2         |
|          | Technical Assistance . . . . .                  | 3         |
|          | Your Comments . . . . .                         | 3         |
| <b>2</b> | <b>Overview. . . . .</b>                        | <b>5</b>  |
|          | Introduction . . . . .                          | 6         |
|          | Features . . . . .                              | 6         |
|          | Use and Care . . . . .                          | 7         |
|          | Equipment Sets . . . . .                        | 7         |
|          | Optional Accessories . . . . .                  | 8         |
|          | SNB900 Description . . . . .                    | 8         |
|          | Power and I/O cables . . . . .                  | 10        |
|          | Default settings. . . . .                       | 10        |
| <b>3</b> | <b>Configuration and Installation . . . . .</b> | <b>11</b> |
|          | Introduction . . . . .                          | 12        |
|          | Configuration . . . . .                         | 12        |
|          | Configuring the serial I/O port . . . . .       | 12        |
|          | Connecting to an office computer . . . . .      | 13        |
|          | Getting started with WinFlash . . . . .         | 13        |
|          | Firmware updates . . . . .                      | 16        |
|          | Installation . . . . .                          | 16        |
|          | Installing an SNB900 as a base . . . . .        | 17        |
|          | Installing an SNB900 as a repeater . . . . .    | 18        |

|          |  |           |
|----------|--|-----------|
|          | Installing antennas . . . . .                      | 19        |
| <b>4</b> | <b>Characteristics and Specifications. . . . .</b> | <b>21</b> |
|          | Introduction . . . . .                             | 22        |
|          | Antenna Gain . . . . .                             | 22        |
|          | Omni-directional antennas . . . . .                | 22        |
| <b>5</b> | <b>Troubleshooting . . . . .</b>                   | <b>25</b> |
|          | Introduction . . . . .                             | 26        |
|          | Servicing . . . . .                                | 26        |
|          | Status Messages. . . . .                           | 26        |
|          | <b>Index . . . . .</b>                             | <b>29</b> |

# Introduction

**In this chapter:**

- Welcome
- Related Information
- Technical Assistance
- Your Comments

## Welcome

This manual describes how to set up and use a Trimble® SNB 900 radio modem.

Even if you have used other Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with GPS, visit the Trimble website ([www.trimble.com](http://www.trimble.com)) for an interactive look at Trimble and GPS.

This manual assumes that you know how to use your current Microsoft® Windows® operating system.

## Related Information

Sources of related information include the following:

- Release notes

Release notes describe new features of the product, information not included in the manuals, and any changes to the manuals. They are provided as a .pdf file on the CD and installed in the program directory (typically C:\Program Files\Trimble\<Folder>) when you install the software.

- Update notes

There is a warranty activation sheet with this product. Send it in to automatically receive update notes containing important information about software and hardware changes. Contact your local Trimble dealer for more information about the support agreement contracts for software and firmware, and an extended warranty program for hardware.

- Trimble training courses

Consider a training course to help you use this GPS system to its fullest potential. For more information, go to the Trimble website at [www.trimble.com/training.html](http://www.trimble.com/training.html).



## Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local dealer*. Alternatively, do one of the following:

- Request technical support using the Trimble website at [www.trimble.com/support.html](http://www.trimble.com/support.html)
- Send an e-mail to [trimble\\_support@trimble.com](mailto:trimble_support@trimble.com)

## Your Comments

Your feedback about the supporting documentation helps us to improve it with each revision. Send an e-mail with your comments to [ReaderFeedback@trimble.com](mailto:ReaderFeedback@trimble.com).



# Overview

## In this chapter:

- Introduction
- Features
- Use and Care
- Equipment Sets
- Optional Accessories
- SNB900 Description

## Introduction

The rugged Trimble® SNB900 radio modem is ideal for harsh environments, such as those associated with construction, seismic, and mining surveys. It is convenient and versatile: When used with a Trimble rover GPS receiver that has an internal radio modem, the SNB900 can be used to establish a robust wireless data broadcast network for real-time differential and real-time kinematic GPS applications.

## Features

The SNB900 has the following standard features:

- 900 MHz ISM
- +30 dBm
- 902–928 MHz frequency hopping on 50 channels (USA)
- High-speed wireless data rate
- Interfaces with Trimble survey-grade GPS receivers
- Supports up to two repeaters in a single network, three if an access point is used
- Rugged, weatherproof construction
- Two-line, 16-character VFD display
- Compatible with Trimble CMR+™ and RTCM SC-104
- Operational parameters configured using the WinFlash utility, a handheld controller, or the front panel
- Can be configured as a base, repeater, or rover
- Compatible with SNR900 and SiteNet™ 900 external radios, and Trimble 5700 and 5800 internal radios
- When connected to a Trimble Network Router (TNR) provides two-way IP connectivity to machine grade control systems.

*Note – In this manual, CMR™ and CMR+ formats are both represented by CMR+.*

## Use and Care

The SNB900 is configured as a base or rover, and can be connected to most Trimble survey-grade GPS receivers through a single serial I/O cable and power cable. When used as a repeater, the SNB900 operates autonomously and requires only a power and antenna connection, with no connection to the serial port.

To achieve line-of-sight (LOS) coverage to all points in a survey area, an SNB900 radio modem network can include up to two repeaters, depending on data format and output data rate. The rovers use the data packet from the base or repeater, whichever the rover receives first.

The radio modem is designed to withstand rough treatment typical of equipment used in the field. However, it is a precision electronic instrument and should be treated with reasonable care. It operates at temperatures from  $-40\text{ }^{\circ}\text{C}$  to  $+65\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $149\text{ }^{\circ}\text{F}$ ). The casing is sealed and weatherproof.



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**Caution** – Operating or storing the SNB900 outside the specified temperature range can damage the instrument.

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## Equipment Sets

The SNB900 is supplied as a stand-alone product, but additional parts are available. For example, additional parts enable you to connect the SNB900 to a Trimble MS750™, 5700, 5800, R7, or R8 GPS receiver.

## Optional Accessories

The following accessories can be purchased in addition to the standard system:

- 18 Ah battery with carry pouch (P/N 44103-18)
- Battery charger, 18 Ah (P/N 44111-00)
- 6 Ah battery with carry pouch and charger (P/N 34106-00)
- 10 Ah battery with carry pouch and charger (P/N 34107-00)

## SNB900 Description

The SNB900 is packaged in a weatherproof housing. The front panel has a VFD display for network frequency, radio status, and error messages. See Figure 2.1.



Figure 2.1 SNB900 front panel

The following main menus are available through the front panel:

- NETWORK – Network number
- MODE – Base, Repeater, or Rover modes
- DATA PORT CONFIG – Data port baud rate settings
- DEVICE STATUS – Radio programming information

When you start the radio modem, the Network menu opens automatically. Use the front panel control keys to select these additional menus:

- NEXT – Browse though the menu screens
- UP / DOWN – Scroll through items within the menus

Table 2.1 describes the main menu items and the selections they provide. Certain items displayed on the front panel will differ according to your units settings.

**Table 2.1 SNB900 menu hierarchy**

| Main menu | Menu selection     |                |                |            |            |       |
|-----------|--------------------|----------------|----------------|------------|------------|-------|
| Network   | (up to 4 networks) |                |                |            |            |       |
| Mode      | Base w/No Rpt      | Base w/One Rpt | Base w/Two Rpt | Repeater 1 | Repeater 2 | Rover |
| Data Port | 38400              | 38400          | 9600           | 9600       | 57600      |       |
| Config    | 8–none–1           | 8–odd–1        | 8–none–1       | 8–odd–1    | 8–none–1   |       |

Figure 2.2 shows the three electrical connectors on the rear panel:

- ANTENNA connector (reverse polarity female TNC)
- Power/Data connector (26-pin D Sub connector)
- Power/Data connector (seven-pin LEMO, 0-shell)



Figure 2.2 SNB900 rear panel

## Power and I/O cables

The SNB900 base equipment set comes with:

- Radio-to-receiver I/O cable
- Antenna cable with antenna mount
- Power supply
- Configuration cable, office computer to radio modem (this enables you to use WinFlash to modify the SNB900 configuration)

When configured as a base, the radio modem receives data at the DATA connector through the Lemo-to-Lemo cable that plugs into a Trimble GPS receiver, or using the 26-pin cable. When the unit is configured as a repeater, data connection is not required.

Power is connected to the unit at the POWER connector from a suitable power source, either a stable DC power supply or a battery.

## Default settings

The SNB900 radio modem is shipped from the factory with the following default settings:

- NETWORK – Network 1
- MODE – Base with No Repeater
- DATA PORT CONFIG – 38400 8–None–1



# Configuration and Installation

**In this chapter:**

- Introduction
- Configuration
- Installation

## Introduction

The SNB900 contains both a data modem and a radio. It can be used in a variety of configurations to form a complete wireless data network.

For example, you can configure the SNB900 to operate as:

- a base radio modem, broadcasting directly to a Trimble MS750, 5700, 5800, R7, or R8 rover GPS receiver that contains an internal radio modem
- a repeater
- an access point

## Configuration

For a list of the settings that an SNB900 arrives with, see Default settings, page 10. The default settings are stored in nonvolatile memory and serve as the initial settings each time you start the radio modem. Use WinFlash to reconfigure the settings as often as necessary. You can also use the front panel menus to change some of them.

### Configuring the serial I/O port

To use WinFlash, connect the radio modem to a computer that is running a Microsoft Windows 95, 98, Me, Windows NT® 4.0 or later, Windows 2000, or Windows XP operating system.

Connect the SNB900 to the computer, install WinFlash, and configure the serial I/O settings as described in the following sections.

Alternatively, configure the serial port communication settings from the front panel, using the *Data Port Config* menu.

**Note** – *The office computer must support a 38400 bps serial port data rate.*

## Connecting to an office computer

1. Connect the SNB900 adaptor from the I/O port to a serial COM port on the computer.
2. Connect the power cable from the POWER connector to a suitable power source.

## Getting started with WinFlash

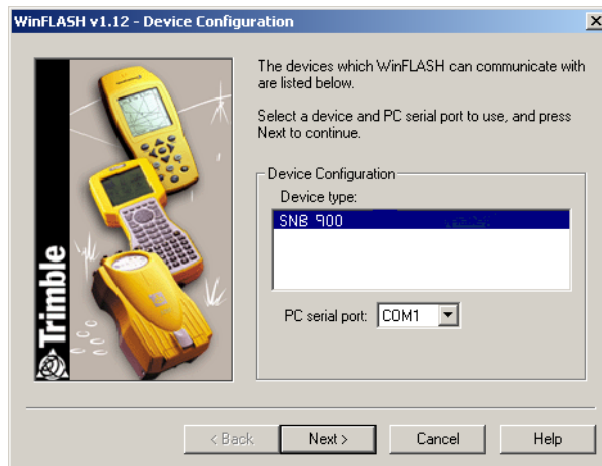
To configure the SNB900, run the WinFlash communications setup utility on an office computer. A Microsoft Windows 95, 98, Me, Windows NT 4.0 or later, Windows 2000, or Windows XP operating system is required.

## Installing WinFlash

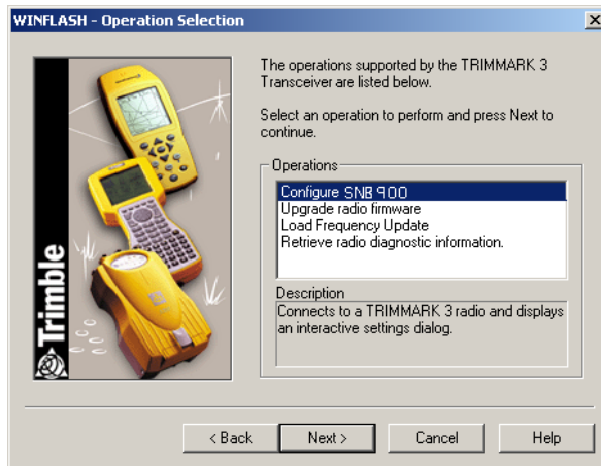
Please refer to the release notes on the SNB900 CD.

## Using WinFlash

1. Click the WinFlash icon on the office computer desktop. The *Device Configuration* dialog appears:

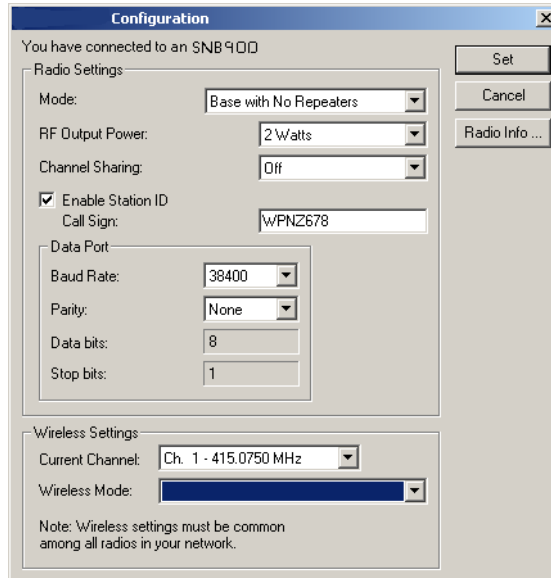


2. To connect to the radio modem, follow the instructions shown in the dialog:
  - a. Select the appropriate PC serial port (COM port).
  - b. Select SNB900 and click **Next**. The *Operation Selection* dialog appears:



3. Select an operation to perform and click **Next**. The *Settings Review* dialog appears.

- Confirm your selected operation and click **Finish**. A connection status window appears, and counts to 100%, and then displays the *SNB900 Configuration* dialog:



Use the *SNB900 Configuration* dialog to modify configuration settings:

- In the *Mode* field, select the appropriate operating mode depending on intended use. For example, *Base with No Repeaters*.
- In the *Data Port* group select the *Baud Rate* and *Parity*. This is the setting for communications between the receiver and radio.

**Note** – The default GPS Port settings for the SNB900 is 38400 baud rate with None parity. The default Mode setting is Base with No Repeaters.

- In the *Wireless Settings* group, select the current network.

**Note** – All radios in the network must be configured with the same network, or the radios will not communicate.

4. To update the configuration, click **Set**. When the status dialog confirms that the configuration is complete, return to the main menu or exit WinFlash.

Click the **RadiInfo** button to view a text list of all radio information, including the current configuration settings.



---

**Tip** – You can print or save to file the radio configuration information for future reference, or to send to Trimble Support to aid in troubleshooting radio problems.

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## Firmware updates

SNB900 firmware upgrades are periodically available from the Trimble website ([www.trimble.com](http://www.trimble.com)). The radio firmware can also be upgraded using WinFlash.

## Installation

Before setting up the equipment in the field, verify that each radio modem is set to the same network.

***Note** – High-power signals from a nearby radio station or radar transmitter can overwhelm the radio modem circuits. This does not harm the instrument, but can prevent it from functioning correctly. To avoid problems, try not to use the radio modem within 400 meters (1300 feet) of powerful radar, television, or other transmitters. Low-power transmitters, such as those in portable phones and walkie-talkies, do not normally interfere with SNB900 operation.*

An SNB900 can be installed in a network as a base station, access point, or repeater.

### Installing an SNB900 as a base

1. If necessary, reconfigure the serial port settings on the unit to those of the GPS receiver.

Configure the unit as a base with no repeaters, or with one or two repeaters. Ensure that all units in your network are configured according to their specific task within the network.

2. Before connecting the power cable:
  - a. Attach the base antenna onto the mounting pole.
  - b. Mount the entire antenna assembly on a tripod using the tripod mounting plate and connect the antenna cable to the SNB900 radio modem.
  - c. Attach the antenna cable to the ANTENNA port on the unit.
3. Connect the power cable from the SNB900 POWER port to an appropriate 12 V DC power source.



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**Caution** – Make sure that the polarity is correct when you connect the power cable. The base radio modem will not turn on if you reverse the polarity.

---

4. If the GPS receiver is outputting data, the base should now be in operation. Check the display on the SNB900 to make sure that the TRAN (transmitting) message is flashing.
5. Make sure that you are on the correct channel and power output.

## Installing an SNB900 as a repeater

To achieve coverage to all points in a survey area, an SNB900 network can include up to two repeaters. The repeaters retransmit data packets in a way that avoids mutual interference with the base and each other. The operation of the repeaters is transparent to the rovers. The rover will use the data packets from the base or repeater, whichever it receives first.

To install a SNB900 as a repeater:

1. If using only one repeater, make sure that the SNB900 is configured for *Repeater 1*. If using a second repeater, make sure that it is configured for *Repeater 2*.
2. Before connecting the power cable:
  - a. Assemble the repeater antenna, attach it to its mount, and then connect the complete assembly to the antenna mounting pole.
  - b. Use the tripod mounting plate to mount the antenna assembly and pole on a tripod, and then connect the antenna cable to the SNB900 at the Radio Antenna port.
3. Connect the power cable from the SNB900 POWER port to an appropriate 12 V DC power source. The *Network* menu that appears on the front panel shows which network is in use.



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**Caution** – Connect the power cable with the correct polarity. Reversing polarity does not damage the base radio modem, but will blow the protective 10 Amp fuse in the power cable.

---

4. Select the repeater radio modem channel to match the base radio modem channel. To do this, press the **UP** or **DOWN** key until the appropriate channel setting is displayed.
5. Verify that the channel assignments are the same for all base, rover, and repeater units.



The repeater should now be in operation. When the repeater receives data broadcast from the base, RPT (Repeat) flashes in the top right corner of the SNB900 display.

## Installing antennas

### Safety

You must maintain a minimum separation distance of 20 cm (approximately 8 in) between yourself and the radiating antenna for this device to satisfy the RF Exposure requirements of the FCC. For mobile operation, the maximum gain of the antenna must not exceed 0 dBi.

### Height

When installing and locating antennas, place them as high as legally possible above the ground and surrounding obstructions, such as trees, vehicles, buildings, and hills.

*Note – Antenna height is the most important factor in achieving maximum range with radio modems. Doubling the antenna height results in a 40% increase in line-of-sight range. Use low loss cable if you have to increase the length of the antenna cable to accommodate your installation. Consult your license for the legal limits on antenna height.*

### Line-of-sight obstructions

If you place an antenna near an object, especially a metal object, you can severely limit its efficiency. When an antenna is mounted on an antenna mast, try to make sure that the radiating element of the antenna is above any possible obstruction.



# Characteristics and Specifications

**In this chapter:**

- Introduction
- Antenna Gain

## Introduction

This chapter summarizes the general characteristics and specifications of the SNB900.

## Antenna Gain

The antennas supplied with an SNB900 do not increase the energy radiated by the radio modem. They concentrate the energy from the radio modem in a particular direction. The degree to which they concentrate radio frequency energy in any particular direction is called *directivity* and is measured in decibels (dB). The greater the antenna gain in dB, the higher the directivity and the more the radiated energy from the antenna is concentrated in some direction.

### Omni-directional antennas

An antenna that radiates energy equally in all directions (that is, at every azimuth) in the horizontal plane is called *omni-directional*. An omni-directional antenna is not omni-directional in the vertical plane, and must be oriented vertically.

Figure 4.1 shows the radiated energy patterns of the omni-directional antennas.

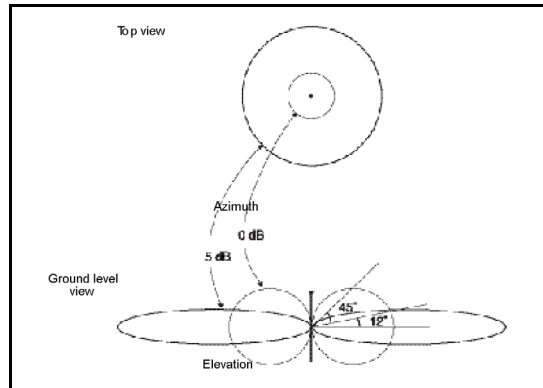


Figure 4.1 Omni-directional antenna gain patterns

The top view shows radiated energy patterns in the horizontal, or azimuth plane of the antennas, the plane that perpendicularly bisects the length of the antenna. For omni-directional antennas, all azimuths receive equal energy, but the 5 dB antenna radiates almost four times more power in the horizontal plane than the 0 dB antenna. In an open field, four times more power approximately doubles the range.

Much of the energy from the 5 dB antenna is concentrated in elevation to within  $\pm 12^\circ$  of horizontal. A rover antenna within this sector receives stronger signals from a 5 dB antenna. However, at angles greater than  $12^\circ$  from horizontal, the 0 dB gain antenna radiates more energy.

Antenna gain has exactly the same effect on signal reception as it does on signal transmission. A high gain rover antenna can increase range performance as long as it is oriented correctly with respect to the transmitting antenna. For high gain antennas, this means keeping the antenna element vertical and at the same elevation as the transmitting antenna. Otherwise, it may be better to use an antenna with less gain.



# Troubleshooting

**In this chapter:**

- Introduction
- Servicing
- Status Messages

## Introduction

This chapter lists status messages and describes how you can use these to isolate and correct system configuration or operational issues.

## Servicing

There are no user-serviceable parts in an SNB900 radio modem. Contact your Trimble representative or local service provider for assistance.

## Status Messages

A status message can appear as a one or two line message on the front panel.

| Message  | Description  | Action  |
|--|--|---|
| Battery Low  | The battery voltage is below 11.6 volts.   | Replace the battery as soon as possible.  |
| Battery Low,<br>Radio<br>Turned Off  | The battery voltage has dropped below 10.8 volts and the radio has stopped transmitting.   | Replace the battery. The SNB900 resets and starts to transmit again.  |
| <i>Note – Battery low voltage levels are approximate and may vary according to factors such as battery condition, radio modem operating mode, and environmental factors.</i> |  |   |
| Comm Port<br>Error, Check<br>Data Rate   | The communications settings between the GPS receiver and the radio modem are incompatible. | Use the controller or the front panel to reconfigure the GPS receiver and radio modem to the same settings. |



---

|                       |   |  |
|-----------------------|---|--|
| Warning:<br>Radio Hot | The radio is nearing its maximum operating temperature. | Reduce the data rate.<br>Shade the radio modem from direct sunlight. |
|-----------------------|---|--|



**Caution** – The housing of the SNB900 is hot to touch if the Radio Hot message is displayed. Use caution and reasonable care when handling an SNB900 that is in this state.

---

|                                     |  |   |
|-------------------------------------|--|---|
| Warning:<br>Radio Hot<br>Output Off | The unit has exceeded its maximum internal operating temperature of +85 °C (+185 °F) and has stopped transmitting. | Allow the SNB900 to cool down. Reduce the power output and the data rate.<br>Shade the SNB900 from direct sunlight. |
|-------------------------------------|--|---|



**Warning** – Operating or storing an SNB900 outside the specified temperature range can damage the instrument.

---

|                                |  |  |
|--------------------------------|--|--|
| Connect<br>Antenna to<br>Radio | The radio modem is attempting to transmit but does not sense an antenna connected to the antenna port. | Connect the radio antenna to the SNB900. If these are already connected, the cable and/or antenna may have failed. |
|--------------------------------|--|--|

*Note* – This message never appears if the SNB900 is configured as a rover.

---

|                            |   |   |
|----------------------------|---|---|
| ERROR: Bad<br>Radio Config | The radio was configured incorrectly. This can occur when the radio firmware is upgraded. | Reconfigure the radio modem using WinFlash or the controller. |
|----------------------------|---|---|

---

|   |                        |   |
|---|------------------------|---|
| HARDWARE<br>ERROR:<br>XX (code<br>number) | This is a fatal error. | Return the SNB900 for servicing.<br>Write down the error code and contact your Trimble representative or local service provider for assistance. |
|---|------------------------|---|

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# Index

## Numerics

5700 GPS receiver *see* Trimble 5700 GPS receiver

5800 GPS receiver *see* Trimble 5800 GPS receiver

## A

accessories 8

antenna

5 dB, 0 dB 23

directional 23

gain 22

installing 19

obstructions 19

omni-directional 22

orienting 22

radiated energy 22

safety 19

antenna connector 9

## B

base

installing SNB900 as 17

SNB900 configured as 7

battery charger, accessory 8

Battery Low message 26

Battery Low, Radio Turned Off message 26

baud rate 9

browsing menu screens 9

## C

carry pouch, accessory 8

caution

polarity 17

Radio Hot message 27

temperature 7

changing default settings 12

characteristics 22

Class B Statement iii

CMR, CMR+ 6, 7

COM port 13

Comm Port Error, Check Data Rate

message 26

comments, sending to Trimble 3

compatibility 6

configuring serial I/O port 12

Connect Antenna to Radio message 27

connecting to an office computer 13

connectors 9

copyright ii

## D

data connection, base configuration 10

data connector 9, 10

data modem in SNB900 12

DATA PORT CONFIG menu 8

data port configuration, default 10

Declaration of Conformity iv  
default

- data port configuration 10
- menu 9
- mode 10
- network 10
- settings, changing 12

Device Configuration dialog 13

DEVICE STATUS menu 8

directional antenna 23

display 8

## E

electrical connectors 9

electronic interference 16

energy radiated by antenna 22

error messages 8

ERROR, Bad Radio Config message 27

external radios 6

## F

factory settings 10

factory settings, changing 12

features 6

feedback on documentation 3

firmware updates 16

font panel, messages 26

front panel display 8

## G

GPS receivers 12

grade control systems 6

## H

HARDWARE ERROR, XX (code number)  
message 27

## I

installing

- antenna 19

- prerequisites 16

- SNB900 as a base 17

- SNB900 as a repeater 18

- SNB900 in a network 17

interference, reducing electronic 16

## L

Limitation of Liability iii

line-of-sight (LOS) 7, 19

## M

machine grade control systems 6

menu display 8

menu hierarchy 9

menu, browsing 9

message

- RPT (Repeat) 19

- TRAN 17

messages

- error 8

- troubleshooting 26

Microsoft Windows 12

MODE menu 8

mode, default 10

MS750 GPS receiver 7, 12

## N

network frequency display 8

NETWORK menu 8

network, default 10

network, installing SNB900 in 17

network, same for all radio modems 16

NEXT menu 9

Notice to Users iii

## O

obstructions, line-of-sight 19  
office computer, connecting to 12  
omni-directional antenna 22  
operating mode 15  
operating system 12  
Operation Selection dialog 14  
orienting the antenna 22  
overview 5

## P

parity 9  
polarity, power cable 17, 18  
power and I/O cables 10  
power cable polarity 17, 18  
POWER connector 10  
power connector 9  
power source 17  
power/data connector 9

## R

R7 GPS receiver *see* Trimble R7 GPS receiver  
R8 GPS receiver *see* Trimble R8 GPS receiver  
radar interference 16  
radio in SNB900 12  
radio information 16  
radio interference 16  
radio modem network 7  
radio modem network 16  
radio status display 8  
rear panel 9  
release notes 2  
repeater

installing SNB900 as 17, 18  
maximum number 7  
SNB900 used as 7

router 6  
rover, SNB900 configured as 7  
RPT (Repeat) message flashing 19  
RTCM SC-104 6

## S

Safety iii  
safety, antenna 19  
scrolling 9  
serial I/O port, configuring 12  
setting up the equipment 16  
settings  
    changing default 12  
    default 10  
Settings Review dialog 14  
setup utility, communications 13  
setup, interference 16  
SiteNet external radio 6  
SNB900 Configuration dialog 15  
SNR900 radio, compatible with 6  
specifications 22  
standard features 6  
status messages 26  
support 3  
survey-grade GPS receivers 6  
    connecting to 7

## T

technical support 3  
temperature, operating 7  
trademarks ii  
TRAN message flashing 17  
Trimble 5700 GPS receiver 7, 12  
    internal radio 6  
Trimble 5800 GPS receiver 7, 12

## Index

---

- internal radio 6
- Trimble Network Router (TNR) 6
- Trimble R7 GPS receiver 7, 12
- Trimble R8 GPS receiver 7, 12
- Trimble website 2
- troubleshooting 26

## U

- UP/DOWN menu 9
- update notes 2
- updating firmware 16
- use and care 7

## V

- VFD display 8

## W

- warning
  - radio hot 27
  - temperature 27
- Warning, Radio Hot message 27
- Warning, Radio Hot Output Off message 27
- warranty ii
- website, Trimble 2
- WinFlash
  - configuration cable 10
  - operating system requirements 12
  - starting 13
- wireless settings 15