# Trimble® SNR900 Radio-Modem

## Operation Manual

**Part Number 52357-00-ENG**
**Revision B**
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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.

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The SNR900 operates in the 902 to 928 MHz frequency band. It is certified for unlicensed use in this band as a transmitter pursuant to 47 C.F.R. §§ 15.247, 15.249 (1993) (unlicensed, low-power devices) Subpart C of Part 15 of FCC Rules regarding Spread Spectrum Systems for the United States. License-free operation in Canada is covered by RSS-210 of Industrie Canada.

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CHAPTER

1

# Introduction

**In this chapter:**

- Welcome
- Related Information
- Technical Assistance
- Your Comments

## Welcome

This manual describes how to set up and use the SNR900 radio-modem.

This publication assumes that you are know how to use the Microsoft® Windows® operating system.

## Related Information

Sources of related information include the following:

- Readme.txt file – a Readme.txt file contains information added after the documentation was completed. To read this file, double-click it or use a text editor to open it. The installation program also copies it into the program directory.
- Release notes – the 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 are 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 your GPS system to its fullest potential. For more information, go to the Trimble website at 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 actions:

- Request technical support using the Trimble website at www.trimble.com/support.html
- Send an e-mail to trimble_support@trimble.com

## Your Comments

Your feedback about the supporting documentation helps us to improve it with each revision. E-mail your comments to ReaderFeedback@trimble.com.

CHAPTER

2

# Getting Started

**In this chapter:**

- Introduction
- Hardware Specification
- SNR900 Description

## Introduction

The SNR900 radio-modem broadcasts raw GPS data in Compact Measurement Record (CMR) format from a reference receiver to one or more roving receivers for precise machine positioning.

The SNR900 is compatible with the Trimble SiteNet™ 900 and TRIMCOMM™ 900 radio for broadcasting and receiving Radio Technical Commission for Maritime Services (RTCM) or CMR data.

Trimble recommends that you use the Trimble CMR+™ format whenever possible. This requires version 1.40 or later software in all of your radios.

## Hardware Specification

The SNR900 meets stringent hardware requirements and is designed to survive in harsh environments. It has the following features:

- Integrated low-profile antenna for machine installations.
- Physical connection by means of the same 8-pin male Bendix connector previously used on SiteNet 900 and TRIMCOMM radios. For a description of the connector pinout, see Pinout Information, page 36.

In addition, SNR900 is designed for use with unconditioned 10 VDC to 32 VDC power.

# SNR900 Description

The SNR900 is a frequency-hopping, spread-spectrum radio unit and data modem packaged in a rugged, waterproof, metal case and is designed to withstand severe environmental stress.

## Features

- Low latency CMR transmission
- Compatible with SiteNet and TRIMCOMM radio networks
- Upgradeable software
- Forty selectable networks
- License-free operation in the U.S., Canada, Australia, and New Zealand
- Ruggedized, weatherproof casing
- Typical 3–5 km range
- Low power consumption
- One CAN (J1939) port
- Two RS-232 interfaces at either 9600, 38400, or 57600 baud
- Low-profile antenna for machine applications
- Machine mounting kit option (for more information, see Mounting the SNR900 on a Machine, page 20)

## Frequency Band

The SNR900 operates in the 902 to 928 MHz frequency band. It is certified for unlicensed use in this band as a transmitter pursuant to 47 C.F.R. §§ 15.247, 15.249 (1993) (unlicensed, low-power devices) Subpart C of Part 15 of FCC Rules regarding Spread Spectrum Systems for the United States. License-free operation in Canada is covered by RSS-210 of Industrie Canada.

The SNR900 can be purchased with a reduced frequency range for use in Australia and New Zealand. It is available in single-frequency mode for other countries.

***Note –*** *The 902–928 MHz band is a shared-use band and as such is subject to interfering signals.*

This frequency band is allocated to other uses in other parts of the world, including cellular telephony. Regulations regarding its use vary greatly from country to country. Use of the SNR900 outside the United States must be approved by the local radio authority. Contact your local radio communications governing authority for regulations and restrictions on operation in the country or area where you want to use the SNR900.

CHAPTER

3

# Configuring the SNR900

**In this chapter:**

- Introduction
- Default Settings
- WinFlash Configuration Software
- Diagnostics and Firmware Upgrade

## Introduction

The SNR900 is a data modem and a radio in one unit. Two units can provide a radio data link between Trimble GPS receivers.

## Default Settings

The SNR900 serial ports are initially configured with the following settings:

- 38400 baud
- 8 data bits, no parity
- 1 stop bit

The SNR900 is also initially configured as a rover; its network setting is Network 1.

When the SNR900 powers up, it retrieves its default settings from its nonvolatile memory. The default settings can be changed whenever necessary.

## WinFlash Configuration Software

The Trimble WinFlash software is a Microsoft Windows-based application that configures the SNR900 for use in a network. Use WinFlash to configure all SNR900 radios required for a project.

***Note –*** *The Trimble CommSet software is required to configure Trimble SiteNet 900 radios.*

To configure a SNR900 using WinFlash, complete the following procedures:

1. Connect the office computer to the SNR900.
2. Configure the SNR900 using WinFlash.

These procedures are discussed in the following sections.

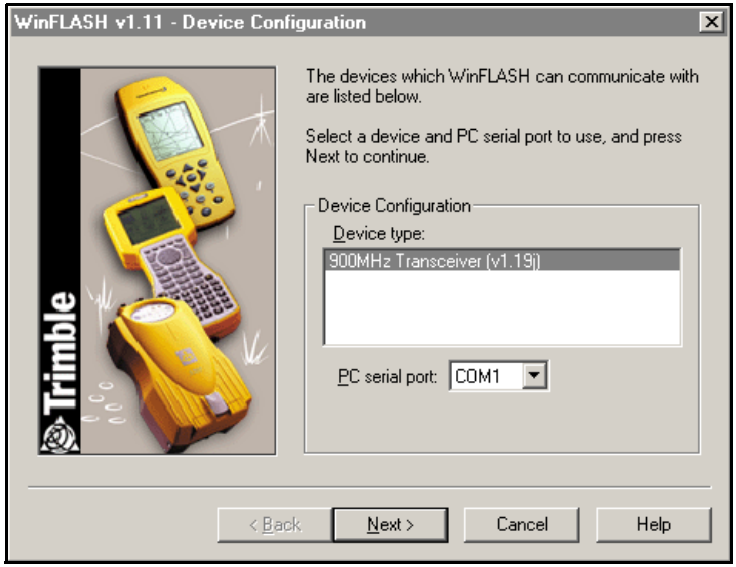
## Connecting to the SNR900

1. Connect a SNR900 machine service cable to the SNR900.
2. Connect the I/O DB-9 connector of the service cable to a serial port on your office computer.

   ***Note –*** *Figure 4.7 on page 27 shows an infrastructure cable (PN 38968-25) connected to the SNR900. Figure 4.10 on page 30 shows the service cable (PN 40942-xx) connected to the SNR900 and an office computer.*
3. Provide power to the radio through the power lead of the service cable.

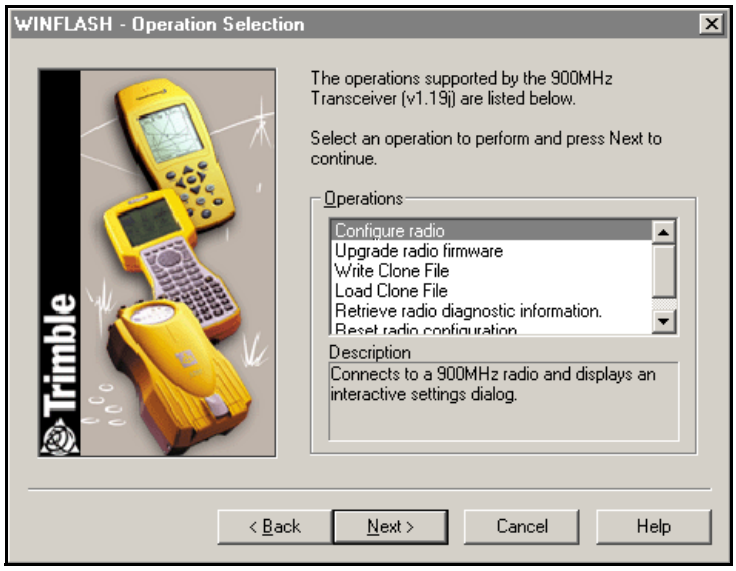
## Configuring the SNR900

1. Start WinFlash on your office computer. The following dialog appears:



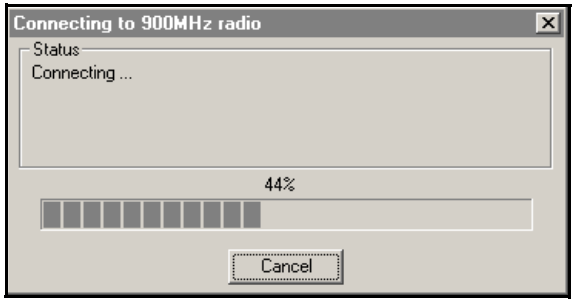

2. Select the appropriate *Device type* option and *PC serial port* option and click **Next**.

The following dialog appears:

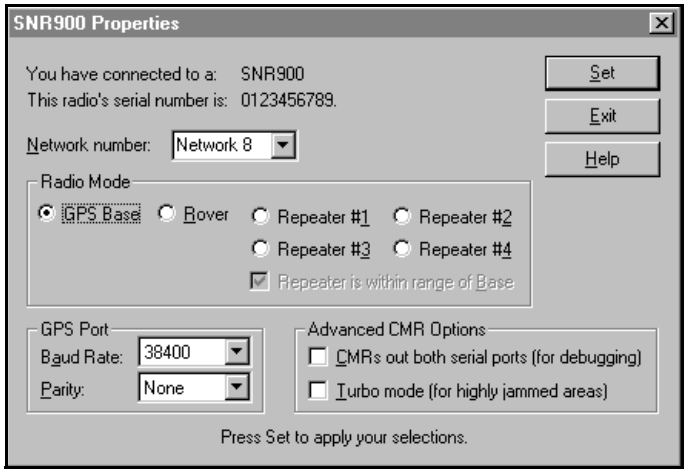



3. Select the *Configure radio* option in the *Operations* group and click **Next**.

4. Click **Finish** on the next screen to establish a connection with the radio. The following dialog appears while WinFlash is connecting to the radio:



5. When WinFlash has successfully connected to the radio, the *Properties* window appears:




6. From the *Properties* window, configure the *Network number*, *Radio Mode*, and *Port settings*. Once these settings are correct, click **Set** to send the settings to the radio. The following dialog appears:


7. To finish, click **Exit**. To make further changes, click **Menu**. The *Operation Selection* dialog shown in Step 2 on page 11 appears.

The following sections describe the settings that are available for the SNR900.

## Network

To change which GPS base station a SNR900 listens to, set the Network number. The SNR900 offers 40 different Network numbers.

***Note –*** *If you only have one GPS base station on your site, set all your radios to the same Network number. If you have more than one GPS base station on your site, each GPS base station must be on a separate radio network. Select a different Network number for each radio network.*

When you initially set up a radio network for your site, configure a rover to the Network number you require and listen to see if anyone is currently using this network in your area. If the rover sync light glows, you must select a different Network number for your site. This will avoid interfering with the other network user.

## Mode

Each radio in a SNR900 network can be set to one of three operational modes:

- GPS Base – when it is connected to the base station GPS receiver that is generating CMR corrections
- Rover – when it is mounted on a machine that is connected to a receiver required to generate RTK positions
- Repeater – when it is used in a network to increase coverage

***Note –*** *A network can have many rovers but only one base radio. It can also have up to four repeaters, each uniquely identified by a different repeater number (#1, #2, #3, and #4). Repeaters can be chained two in a row.*

## Serial Port Baud Rate and Parity

The serial port baud rate list and the serial port parity setting list configure the baud rate and parity of the radio port that is connected to the GPS receiver. Set the baud rate to 38400 and the parity to None.

### Defaults

Table 3.1 shows the default factory settings for the SNR900.

**Table 3.1 SNR900 default settings**

| Item | Default setting |
|---|---|
| Network number | Network 1 |
| Radio mode | Rover |
| Baud rate | 38400 |
| Parity | None |

## Diagnostics and Firmware Upgrade

Use WinFlash to download a diagnostics file from the SNR900 to an office computer or to upgrade the radio firmware. These options are available in the *WinFlash Operation Selection* window.

For firmware upgrades, contact your Trimble dealer. The dealer will supply a new software file to perform the upgrade.

CHAPTER

4

# Installing the SNR900 Network

**In this chapter:**


- Introduction
- Physical Description
- Mounting the SNR900 on a Machine
- Cabling Configurations
- Antenna Description

# Introduction

Trimble recommends that you read this chapter before installing your SNR900 radios.

# Physical Description

The SNR900 radio-modem is encased in a rugged, waterproof metal case. It has an antenna mount on the top cap, and a connector and LED on the bottom cap. The physical aspects of SNR900 hardware are outlined below, followed by details covering interface connections and antenna installations.

## Connectors and Indicators

The SNR900 bottom cap is fitted with an 8-pin male Bendix connector and an LED indicator light. See Figure 4.1.

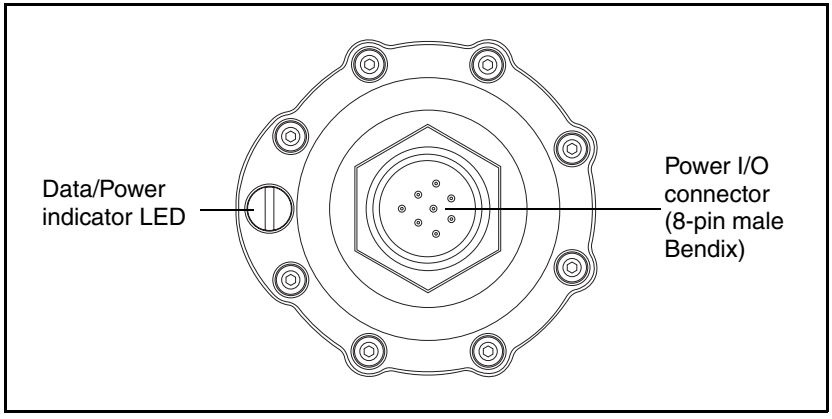



Figure 4.1 SNR900 bottom cap

The LED can be orange and/or green depending on the situation, as shown in Table 4.1.

**Table 4.1 Operational status**

| LED Color | Status |
|---|---|
| Orange (solid) | Power is available. |
| Orange and green (both solid) | With the SNR900 configured as a base radio (that is, a source of GPS), power is available. The base is always considered to be synchronized. “Sychronized” means that the radio can receive and transmit data. |
| | With the SNR900 configured as a repeater or rover, power is available and the radio is synchronized. Even if the radio is synchronized, the radio may not be receiving data. |
| Orange and green (both flashing at 1 Hz together) | Radio is in flashloader mode. To resolve this, turn the power off and on. If this mode repeats when the radio is turned back on, reload the firmware. |

***Note –*** *The top cap of the SNR900 has an antenna contact tip. The tip is designed for maximum efficiency and very low loss. Please take care not to damage this tip. Keep the low-profile antenna or flexible antenna base screwed on to the top of the radio when storing the SNR900, see page 32.*

Figure 4.2 shows the top cap.

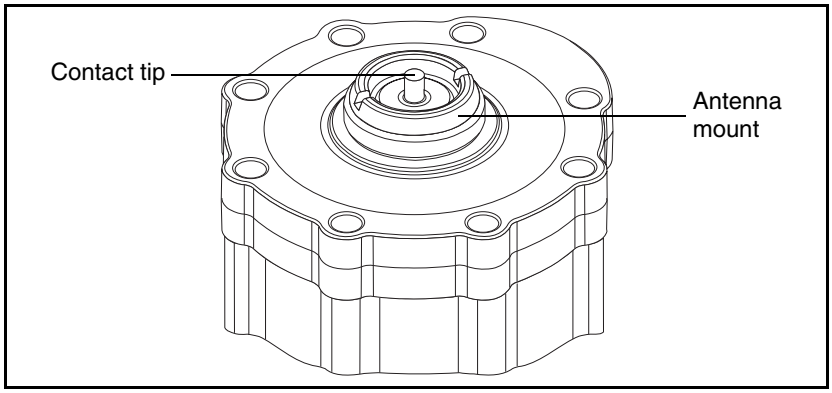



Figure 4.2 SNR900 top cap

## Mounting the SNR900 on a Machine

When mounting the SNR900 on a machine consider the following:

- Reduce damage by minimizing shock and vibration to the SNR900: Mount the radio-modem on a solid part of the cab.
- Locate the best antenna position: Mount the entire antenna above the roofline so that it has an uninterrupted view. This improves the performance of the SNR900.
- Prevent signal interference: Position the antenna away from other antennas (particularly if the other antenna is a two-way radio), rotating beacons and strobe lights.

Figure 4.4 shows a typical installation.

## Machine Mount Kit (PN 35087-00)

The machine mounting kit for the SNR900 comprises:

- Radio mount bracket (upper)
- Radio mount bracket (lower)
- Machine mount adapter plate (with U-bolts)
- Rubber shock mount kit

Figure 4.3 shows the SNR900 mounting kit and how the parts fit together.

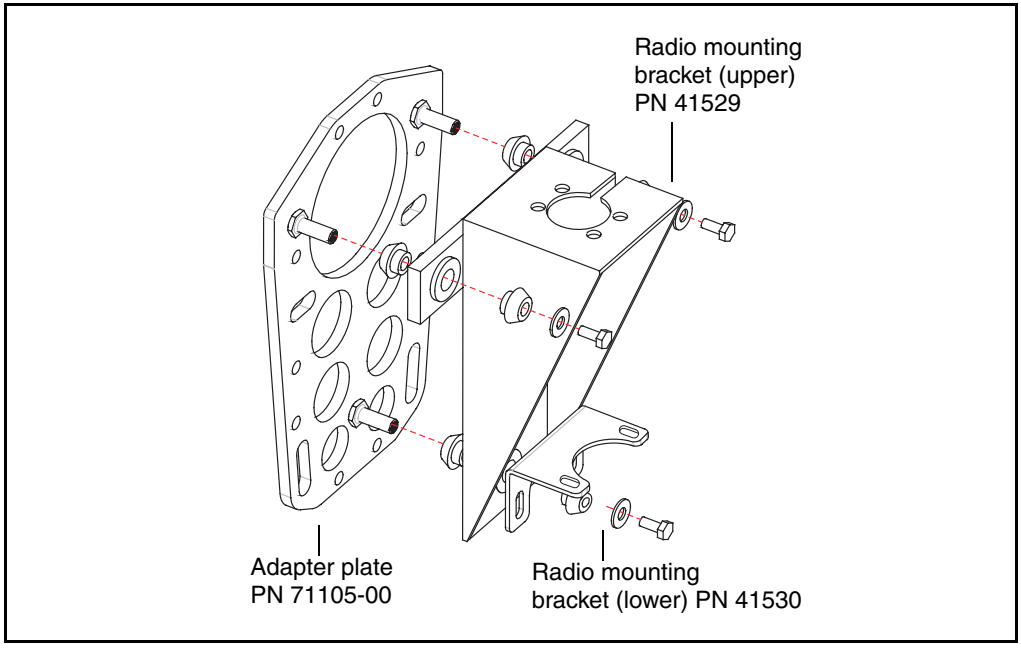



Figure 4.3 SNR900 mounting kit

### Mounting the SNR900

To mount the SNR900 onto a machine:

1. Bolt the SNR900 into the radio mounting bracket (upper and lower brackets).

   Ensure that the radio mounting screws are all fitted with washers and lock washers.

2. Securely mount the adapter plate to the machine. Do one of the following actions:

   – Use existing weld bosses (see Figure 4.4)

   – Weld some weld bosses to the cab

   – Clamp the plate to the top of a handrail at the top of the cab using the U-bolts

3. Bolt the radio mounting bracket to the adapter plate using the rubber shock mount kit. The bolts are included with the adapter plate.

**Tip –** Use threadlocking Loctite (PN 33803) or equivalent to secure the bolts when you assemble the shock mounts.

Figure 4.4 shows a SNR900 mounted at the rear of a cab roof. Notice how this installation ensures that all of the antenna is above the roof of the cab.


Figure 4.4 SNR900 mounted at the rear of a cab roof

# Cabling Configurations

The SNR900 is typically configured as a rover, but the cables and adapters necessary for other configurations are also available. Table 4.2 summarizes the cabling items available or provided with the SNR900 unit or available accessories.

**Table 4.2 SNR900 cabling and power accessories**

| Item | Part number |
|---|---|
| Power and I/O cable for machine installations, 5 m (17 ft) 8-pin female Bendix connector on each end | 32942-17 |
| Infrastructure/Base Station power and I/O cable, 7.5 m (25 ft) 8-pin female Bendix, with Y-split to TA-3 power connector, DBF-9, plus 12-pin Conxall | 38968-25 |
| Machine service cable (21-pin female Bendix, with Y-split to bare power leads and dual DBF-9 connector | 36938 |
| DC power adapter cable with TA-3 connector and battery clips | 44087-00 |
| Reference Station/Configuration cable, 30 m (99 ft) | 40942-99 |

## Power and I/O Cable for Machine Installations

The cable shown in Figure 4.5 connects the SNR900 to either the Trimble MS850 or the Trimble MS860™ GPS receiver on the machine. The GPS receiver outputs power to the SNR900 through this cable.

The straight connector attaches to the bottom cap of the SNR900, and the angled connector attaches to the 8-pin Bendix connector of the GPS receiver.

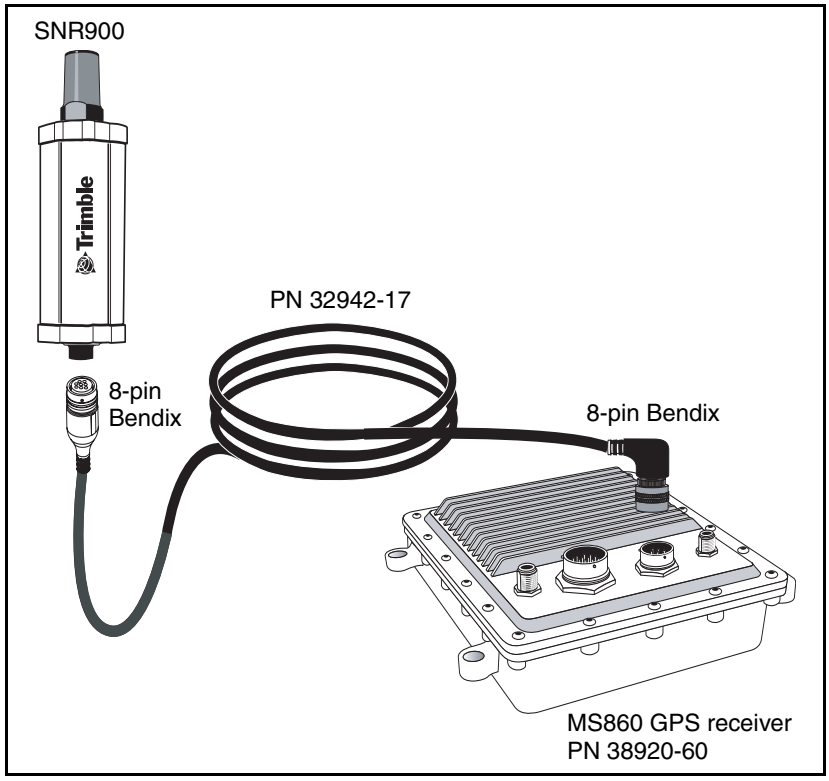



Figure 4.5 Power and I/O cable (PN 32942-17)

## Infrastructure/Base Station Power and I/O Cable

The cable shown in Figure 4.6 is used for base station and repeater installations of SNR900s. Cables come in the lengths shown in Table 4.3.

**Table 4.3 Available cable lengths**

| Part number | Cable length |
|---|---|
| 38968-25 | 7.5 m (25 ft) |
| 40942-03 | 1 m (3 ft) |
| 40942-40 | 12 m (40 ft) |
| 40942-99 | 30 m (99 ft) |

***Note –*** *Most installations of infrastructure radios require either a 7.5 m (25 ft) or a 30 m (99 ft) length.*

Seal unused connectors by covering them with plastic tape.

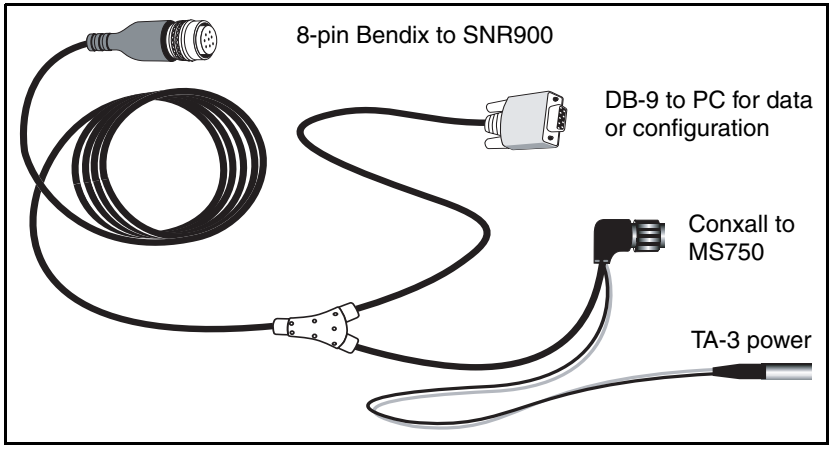



Figure 4.6 Radio power and I/O cable (PN 38968-25)

The 7.5 m (25 ft) infrastructure cable (PN 38968-25) connects directly to the SNR900. The 12-pin Conxall connector connects directly to the Trimble MS750™ GPS receiver with a split to power via a TA-3 connector. This cable also splits to a DBF-9, which can be used to configure the SNR900.

When you install this cable with a MS750 base station, the complete cabling configuration looks similar to that shown in Figure 4.7.

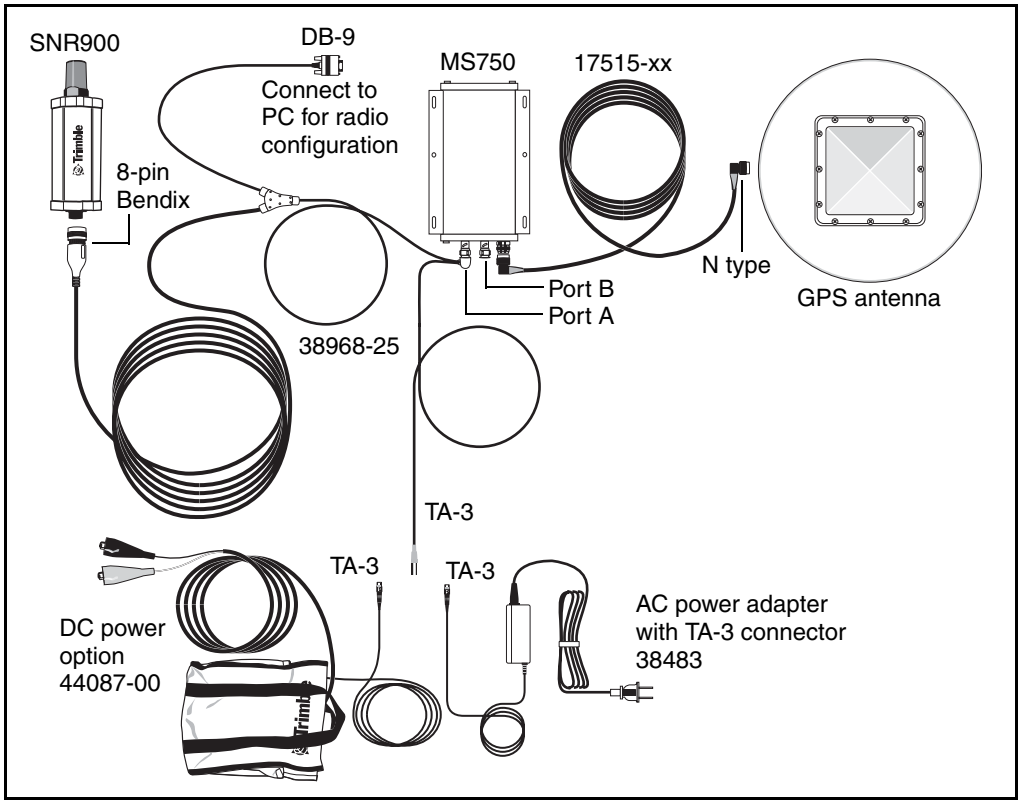



Figure 4.7 MS750 base station using cable PN 38968-25

The 30 m (99 ft) infrastructure cable (PN 40942-99) connects directly to the SNR900 and splits out to power via a TA-3 connector and communications via dual female DB-9 connectors.

The DB-9 connectors can connect to a GPS receiver and to a PC at the same time. This is particularly useful for troubleshooting. This cable requires its own power for the radio. It has no Conxall connector for the MS750 GPS receiver. You can connect it to the MS750 with the hammerhead connector B1/B2 cable PN 37382 that comes with the base (reference) station kit. The cable has a TA-3 connector for power to the radio only. The MS750 must be powered separately with the cables provided in the base station. See Figure 4.8.

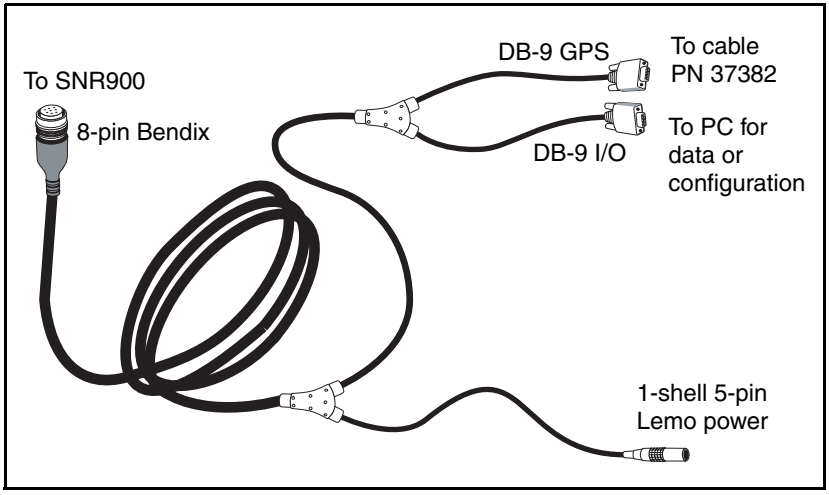



Figure 4.8 Service cable assembly (PN 40942-03, -40, -99)

The 1 m (3 ft) cable (PN 40942-03) is designed for use with a survey backpack.

When you install cable 40942-*xx* with a MS750 base station, the complete cabling configuration looks similar to that shown in Figure 4.9.

***Note –*** *The 40942-99 cable is the 99 ft base station cable for the SNR900 radio. To fit the SNB900 radio, you need an adapter.*

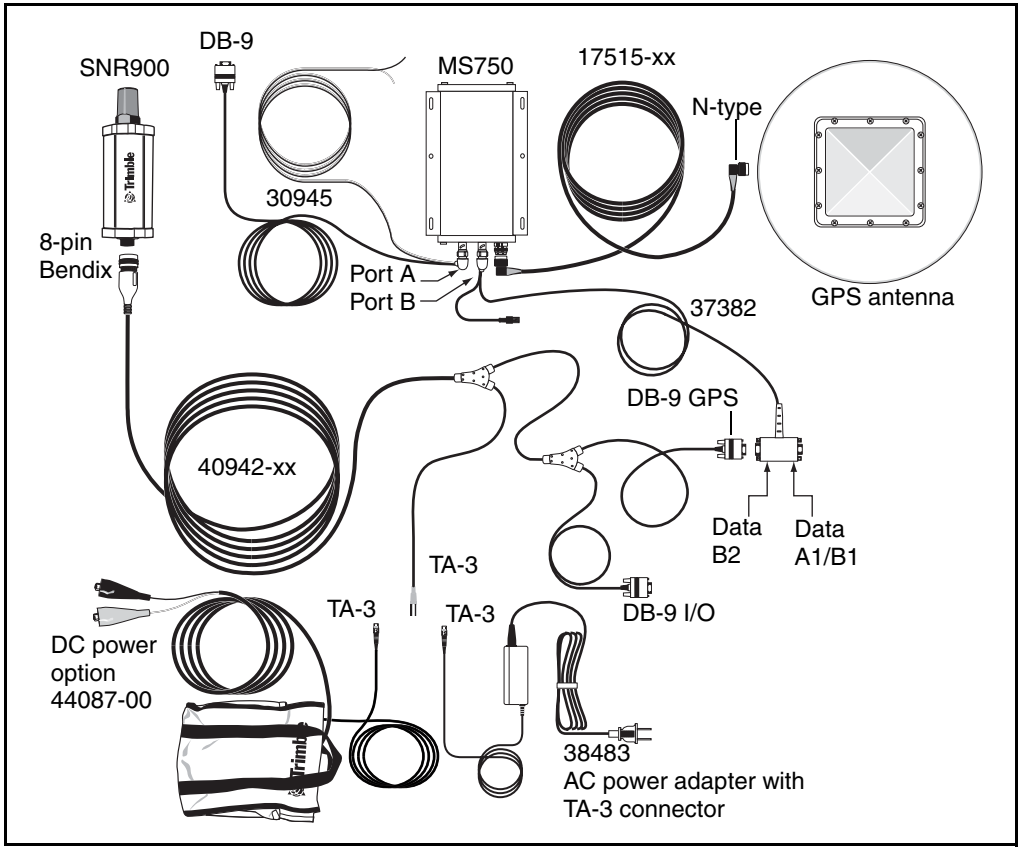



Figure 4.9 MS750 base station using cable PN 40942-*xx*

## Machine Service Cable

Figure 4.10 shows cable 40942-*xx* when used to configure SNR900 radios with a laptop.

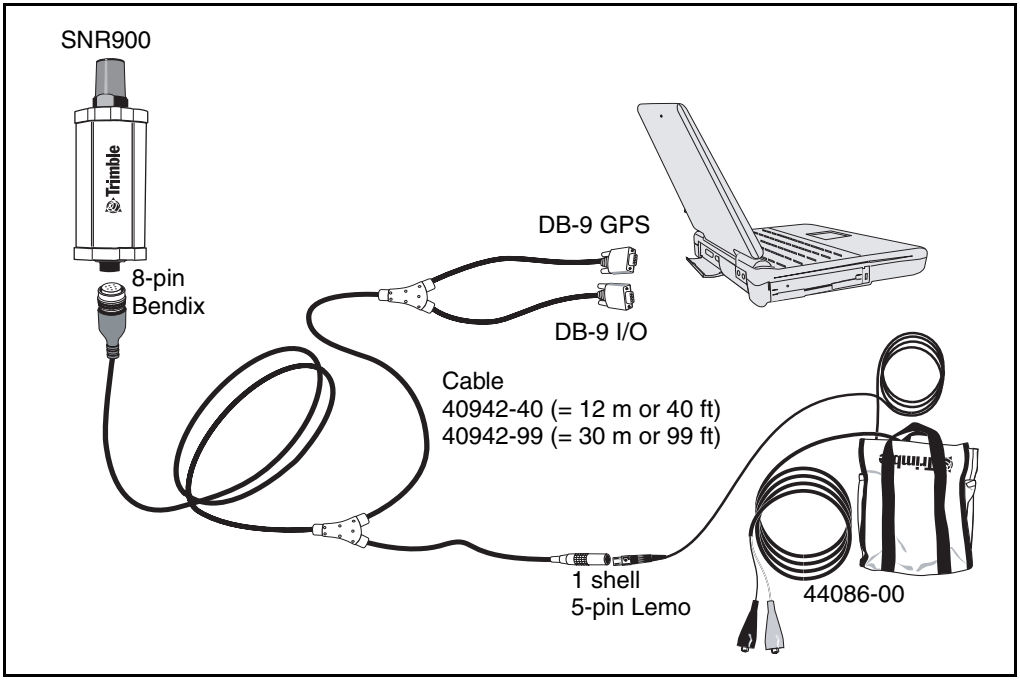



Figure 4.10 Machine service cable (PN 40942-*xx*)

## Antenna Description

The standard SNR900 antenna is a 0 dB, low-profile antenna. An optional infrastructure installation kit comes with an antenna base and 5 dB whip antenna tip. The 5 dB antenna measures 81 cm (32") in length, including the base. See Figure 4.11.

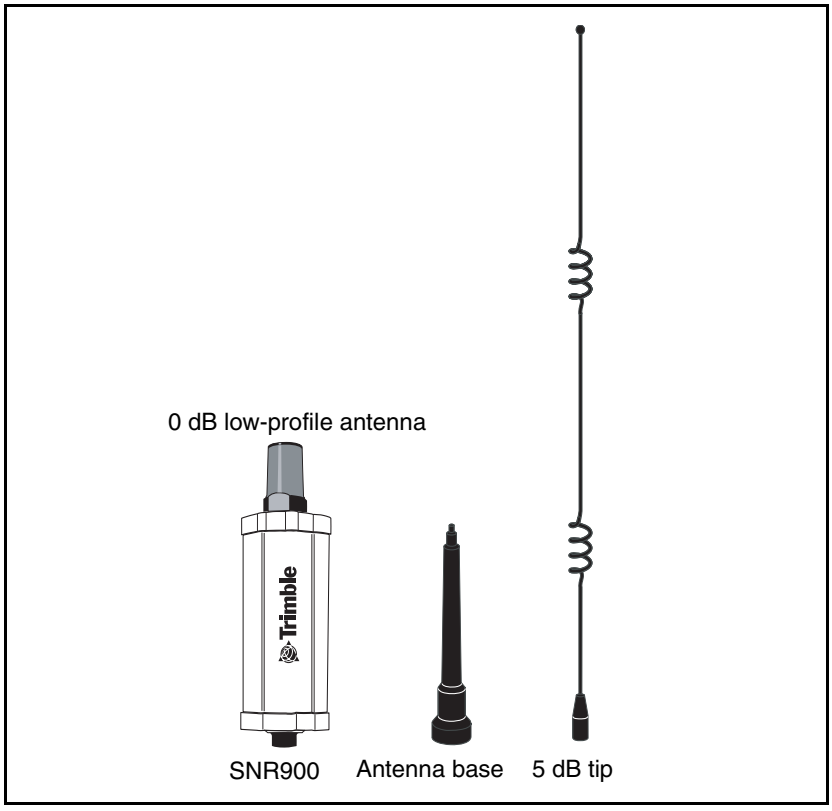



Figure 4.11 SNR900 with antennas

## Antenna Considerations

***Note –*** *Please use care when removing the radio antenna. The SNR900 antenna contact tip is designed for maximum efficiency and very low loss. To maintain its integrity, do* ***not*** *remove the top cap from the radio housing.*

Make sure that you mount the base and repeater radios as high as possible. An increase in the antenna height increases your line of sight and is the most effective way to increase the radio's range.

Figure 4.12 shows the optional infrastructure antenna mounting for the SNR900.

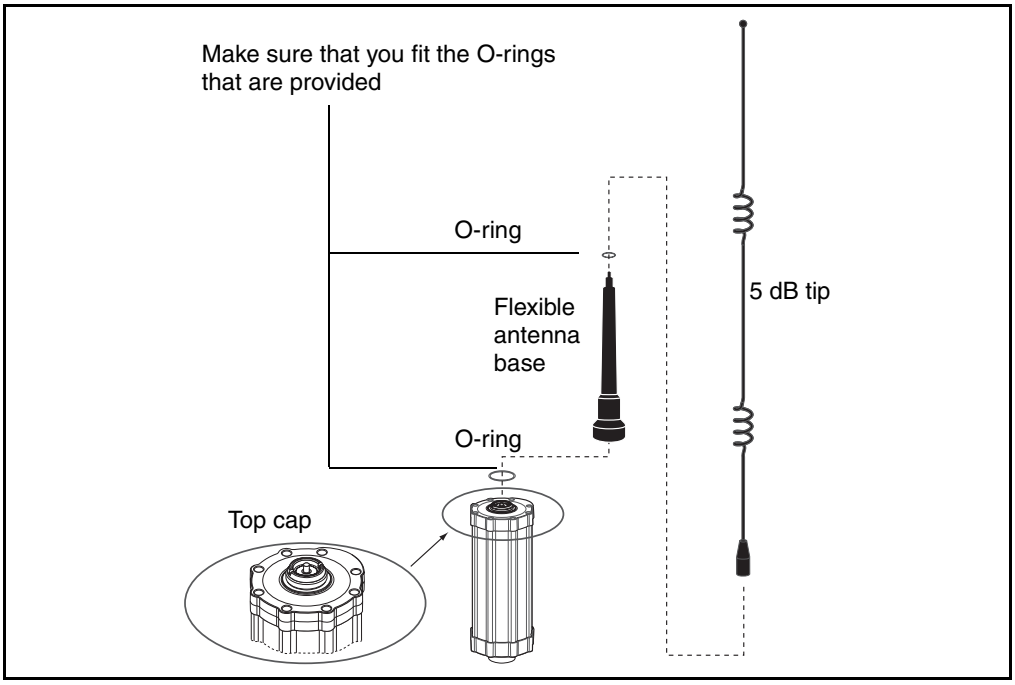



Figure 4.12 Infrastructure antenna mounting

APPENDIX

# A

# Technical Specifications

**In this chapter:**

- Technical Information
- Pinout Information

# Technical Information

Table A.1 shows the technical information for the SNR900 radio-modem. This information is subject to change without notice.

**Table A.1 Technical information**

| Specification | |
|---|---|
| Physical: | |
| Size | 85 mm (3.4") W x 250 mm (10") H |
| Weight | 0.9 kg (2.0 lb) |
| Environmental: | |
| Operating temperature | –40° to +70°C |
| Storage temperature | –40° to +85°C |
| Humidity | Exceeds MIL-STD-810E (aggravated cyclic humidity), sealed to ±34.5 kPa ±5 psi), immersible to 1 m |
| Vibration | 8 gRMS, 20–2000 Hz random vibration |
| Shock: | |
| Operational | ±40 g 10 msec |
| Survival | ±75 g 6 msec |
| **Electrical** | |
| Power consumption: | |
| Receive | 380 mA (4.6 W at 12 VDC)[1] |
| Transmit (peak current) | 1100 mA (13.2 W at 12 VDC)[1] |
| Protection | Reverse polarity; load dump |
| Input range | 10 VDC to 32 VDC unconditioned |
| Connector: | |
| Type | 8-pin male Bendix |
| Provides | Power, 2 serial ports, CAN interface |
| Indicators | Power, status, and network sync LED |

**Table A.1 Technical information (continued)**

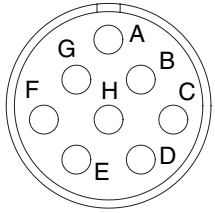
| Specification | |
|---|---|
| **Radio-modem performance** | |
| Range | |
| Optimal | 10 km (6 miles), line-of-sight |
| Typical | 3–5 km (2–3 miles)<br>Varies with terrain and operating conditions. Repeaters may be used to extend range. |
| Frequency range | 902–928 MHz[2] |
| Networks | Forty user selectable networks |
| Transmit power | Meets FCC requirements of 1 W maximum power output |
| Wireless data rates | 128 kbps |
| Modes | Base/Repeater/Rover |

[1] Power consumption, as well as the permissible number of repeaters in a network, depends on the information content and wireless data rate (that is, CMR vs RTCM SC-104 Ver. 2.x packets at 1 Hz epoch rates).

[2] Broadcast frequency and radiated power are regulated by countries-of-use. These are unique on a per country basis. The broadcast frequencies, and country-of-use for the radio-modem must be specified at time of order.

# Pinout Information

Figure A.1 shows the pinout information for the 8-pin male Bendix connector on the base of the SNR900 radio-modem.




| Pin | Function | Pin | Function |
|---|---|---|---|
| A | Power to radio | E | CAN Hi |
| B | GND | F | RS-232 TXD3 |
| C | RS-232 TXD2 | G | RS-232 RXD3 |
| D | RS-232 RXD2 | H | CAN Lo |

Figure A.1 SNR900 connector (8-pin Mil-Spec)

***Note –*** *This pinout is the same as that on the SiteNet 900 radio. The SNR900 is a plug-in replacement for any application using the SiteNet 900 radio.*

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