

User Guide

Trimble[®] SNRx10 Radio Modem

DRAFT

Version 1.00
Revision B
Part Number 65190-00-ENG
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Class B Statement – Notice to Users. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will

not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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 Commission rules.

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This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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This product has been tested and found to comply with the requirements for a Class B device pursuant to European Council Directive 1999/5/EEC on EMC, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.



Australia and New Zealand

This product conforms with the regulatory requirements of the Australian Communications Authority (ACA) EMC framework, thus satisfying the requirements for C-Tick Marking and sale within Australia and New Zealand.



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Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

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Safety Information

This section identifies all of the warnings provided in this manual. Failure to observe warnings may result in personal injury or damage to equipment and machinery.

Safety messages

Always follow the instructions that accompany a Danger, Warning, or Caution. The information they provide is intended to minimize the risk of personal injury and/or damage to property. In particular, observe safety instructions that are presented in the following formats:



DANGER – This alert warns of an imminent hazard which, if not avoided, will cause severe injury or death.



WARNING – This alert warns of a potential hazard which, if not avoided, can cause severe injury.



CAUTION – This alert warns of a hazard or unsafe practice which, if not avoided, can cause injury or damage.

Note – An absence of specific alerts does not mean that there are no safety risks involved.

Cautions



CAUTION – Exposure to radio frequency (RF) energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-regulated equipment as a result of its actions in General Docket 79-144 on March 13, 1986. Proper use of this radio results in exposure below government limits. Trimble recommends the following precautions:

- Do not operate the transmitter when someone is within 20 cm (7.8 inches) of the antenna.
 - Do not operate the transmitter unless all RF connectors are secure and any open connectors are properly terminated.
 - Do not operate the transmitter near electrical blasting caps or in an explosive atmosphere.
 - Do not co-locate the antenna with any other transmitting device.
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About This Manual

In this chapter:

- Scope and audience
- Product documentation set
- Trimble training classes and technical assistance
- Your comments

Welcome to the *Trimble® SNRx10 Radio Modem User's Guide*. This manual provides user information for the Trimble® SNRx10 Radio Modem. The SNRx10 radio is designed specifically for earthmoving equipment-based rover radios in the construction industry.

1.1 Scope and audience

This manual describes how to configure, use, and troubleshoot an SNRx10 radio modem as a rover (on-machine) radio when the radio is not a component of a Trimble® GCS900 grade control system.

Note – To learn how to use the SNRx10 radio modem when it is a part of a GCS900 system, refer to the GCS900 documentation.

1.2 Product documentation set

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.

1.3 Trimble training classes and technical assistance

Contact your local Trimble dealer for:

- Technical support.
- Information about the support agreement contracts for software and firmware, and extended warranty programs for hardware.
- Information about training.
- Information notes and other technical notes.

1.4 To learn more about Trimble

For an interactive look at Trimble, visit www.trimble.com.

1.5 Your comments

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

Introduction

In this chapter:

- Function
- Features

The SNRx10 radio modem is a family of products. Products are available in the 450, 900 and 2400 MHz bands. These products share a common housing and electrical interface to simplify machine installation and integration.

2.1 Function



CAUTION – Exposure to radio frequency (RF) energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-regulated equipment as a result of its actions in General Docket 79-144 on March 13, 1986. Proper use of this radio results in exposure below government limits. Trimble recommends the following precautions:

- Do not operate the transmitter when someone is within 20 cm (7.8 inches) of the antenna.
- Do not operate the transmitter unless all RF connectors are secure and any open connectors are properly terminated.
- Do not operate the transmitter near electrical blasting caps or in an explosive atmosphere.
- Do not co-locate the antenna with any other transmitting device.

The SNRx10 product is a family of radio-modem modules. Modules are available for 450 MHz, 900 MHz and 2400 MHz frequency bands. These modules share a common housing and electrical interface to simplify machine installation and integration. The following table lists the available module combinations:

Product	450 MHz module	900 MHz module	2400 MHz module
SNR410	Y		Y
SNR910		Y	
SNR2410			Y
SNR910+2400 MHz		Y	Y



The 450 MHz band radio modules are used to receive GPS data in Compact Measurement Record® (CMR) and RTCM formats from a reference receiver, for precise machine positioning.

The 900 MHz band radio modules are used for the following tasks:

- to receive GPS data in CMR and RTCM formats from a reference receiver, for precise machine positioning.

- to communicate 2-way data between an office computer and the machine.

The 2400 MHz band radios are used for the following tasks:

- to communicate ATS location information and commands from a universal total station to a machine for precise positioning.
- to receive GPS data in CMR format from a reference receiver, for precise machine positioning.



2.2 Features

The SNRx10 meets stringent hardware requirements and is designed to survive in harsh environments. It is packaged in a rugged, waterproof, metal case and is designed to withstand severe environmental stress.

- Flexible antennas for machine installations.
- Common, upgradeable software for all radios
- Ruggedized, weatherproof casing
- Low power consumption
- LED status indicator
- Designed for machine mounting
- Heavy-duty 8-pin Bendix connector
- Power and data via a single cable
- Designed for use with unconditioned 9 VDC to 32 VDC power.
- Direct operation on 12- or 24-volt machine power
- CAN (J1939) port
- Dual RS-232 interface at either 9600, 38400, or 57600 baud
- Physical connection by means of the same 8-pin male Bendix connector previously used on SiteNet/SNR-series radios. For a description of the connector pinout, see 5.4 Connector (cable) pinout, page 45.
- Machine mounting kit option. For more information, see 4 Installation, page 33.

2.2.1 450 MHz radio module

The 450 MHz radio module is a multi-channel, ultra high frequency (UHF) radio unit and data modem.

Broadcast frequency, channel spacing, and antenna gain are regulated by countries-of-use. These are unique on a per-country basis. When you order, you must specify the broadcast frequencies, channel spacing, and country-of-use for the radio-modem.

For more information, contact your local dealer.

The 450 MHz module has the following features:

- Low latency CMR receiver
- Compatible with SiteNet 450 and TRIMMARK radios
- Selectable frequencies / channels
- License-free operation in some European countries
- Typical 1–3 km range

2.2.2 900 MHz radio module

The 900 MHz radio module is a frequency-hopping, spread-spectrum radio unit and data modem.

The 900 MHz module 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 (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 Industry Canada.

The 900 MHz module can be purchased with a reduced frequency range for use in Australia and New Zealand.

Use of the 900 MHz module outside the United States, Canada, Australia, or New Zealand 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 900 MHz module.

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.

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

The 900 MHz module has the following features:

- Frequency hopping, spread-spectrum technology
- Compatible with SNB900 and SiteNet radio networks
- Forty selectable networks
- License-free operation in the U.S., Canada, Australia, and New Zealand
- Typical 1–3 km range

2.2.3 2400 MHz radio module

The 2400 MHz radio module is a frequency-hopping, spread-spectrum radio unit and data modem.

The 2400 MHz module operates in the 2400 to 2483.5 MHz frequency band (2400 to 2454 MHz in France). It is certified for unlicensed use in this band as a transmitter pursuant to 47 C.F.R. §§ 15.247 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 Industry Canada; in the European Union is covered by harmonized standard EN 300 328; in Australia and New Zealand by gazetted standard AS/NZS 4771:2000.

For more information about use in other countries, please contact your dealer.

The 2400 MHz module has the following features:

- License-free in the EU, U.S.A., Canada, Australia and New Zealand*
- Frequency-hopping, spread-spectrum technology
- Compatible with Trimble ATS and SPSx30 total stations
- Compatible with Trimble SPS881 GPS base stations with 2400 MHz radios
- Typical >1000m, line-of-sight range



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Configuration

In this chapter:

- Introduction
- Establishing a WinFlash connection
- Configure radio
- Configure ports
- Upgrade radio firmware
- Load radio option code
- Change radio protocol
- Change active radio

SNRx10 450 MHz, 900 MHz, and 2400 MHz band radio modules are configured using the Trimble® WinFlash device configuration utility. This chapter describes how to use WinFlash to configure your radio.

3.1 Introduction

The Trimble WinFlash software is a Microsoft® Windows®-based application that configures members of the SNRx10 series of radios for use in a wireless data network.

Note – SNRx10 data radios used as rover radios as part of a Trimble grade control system are configured using the system's interface.

The following sequence of steps is typical of a full SNRx10 radio-modem configuration procedure:

1. For an SNRx10 containing two or more modules, select the module to be configured. See 3.8 Change active radio, page 31.
2. Select the data transfer protocol the radio will use. See 3.7 Change radio protocol, page 30.
3. Configure the radio. See 3.3 Configure radio, page 20.
4. Configure the radio's serial data port(s). See 3.4 Configure ports, page 25.
5. Confirm the radio configuration. See 5.3 Retrieve radio diagnostic information, page 44.

3.2 Establishing a WinFlash connection



CAUTION – Make sure the radio and computer power supply is sufficient to complete the task of configuring the radio, and that all cables are secure. Breaking the connection between the radio and the computer part way through the configuration procedure, because of a loss of power or a cable disconnection, leaves the radio in an unusable state.

The physical connection to your radio is made using service cable PN 40942-03. This cable allows you to connect your computer and a power supply to the radio. Once the radio is connected to your computer and a power supply then you can connect to the radio's internal firmware using WinFlash.

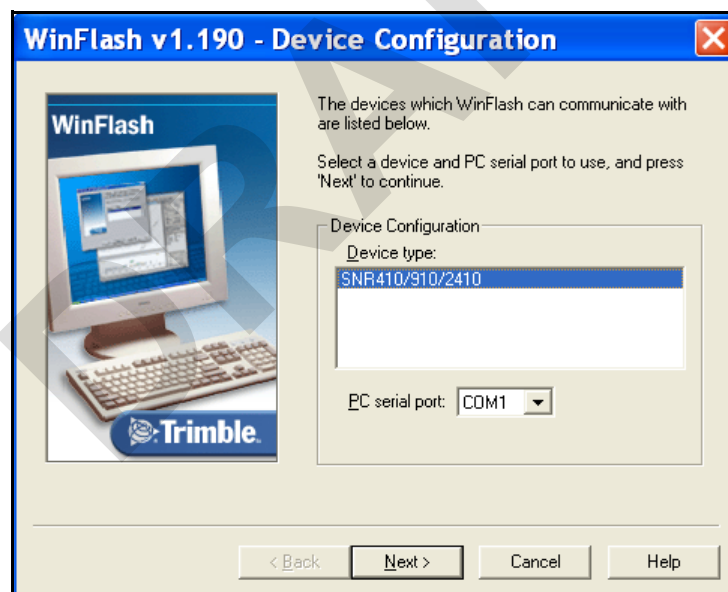
To establish a WinFlash connection to your radio, complete the following steps:

1. Connect the I/O DB-9 connector of the service cable to a serial port on your office computer.
2. Connect the 3-pin power connector to the power adapter (PN 38483).
3. Connect the 8-pin Bendix connector to the radio.

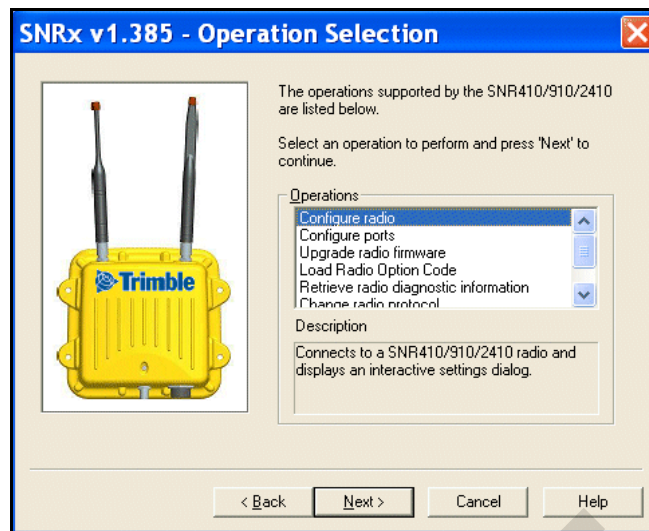


Figure 3.1 Radio service cable

4. Start WinFlash on your computer. A *Device Configuration* menu similar to the following appears:



5. Select the correct device type and RS-232 communications port by making the following choices:
 - In the *Device Type* field select *SNR410/910/2410*.
 - In the *PC Serial port* field select the serial port you used on your computer (typically COM1).
6. Select *Next*. The *Operations* menu appears:



Available configuration operations are as follows:

- Configure radio
- Configure ports
- Upgrade radio firmware
- Load radio option code
- Retrieve radio diagnostic information. See 5.3 Retrieve radio diagnostic information, page 44, for information on this operation.
- Change radio protocol
- Change Active Radio

3.3 Configure radio

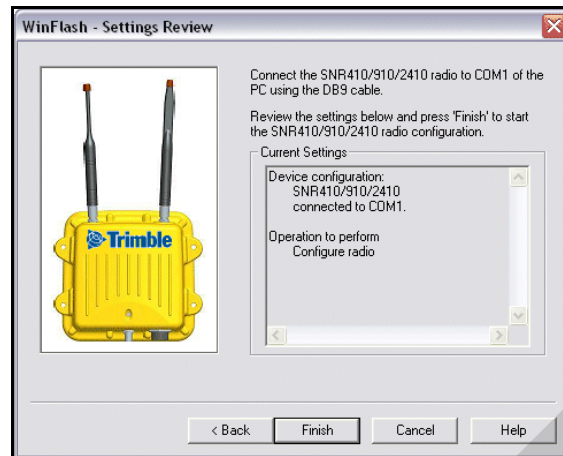
The *Configure radio* operation allows you to perform a variety of configuration tasks. The available tasks depend on the currently selected radio and the radio's protocol.



ATTENTION – Before you attempt to configure the radio, use the procedures in 3.8 Change active radio, page 31, and 3.7 Change radio protocol, page 30, to make sure the required radio module and data transfer protocol are selected.

To access the radio module configuration screen(s), complete the following steps:

1. From the *Operations* menu, select *Configure radio* and click on *Next*. A *Settings Review* screen similar to the following appears:



2. Click on *Finish*. A progress bar appears while WinFlash attempts to connect to the radio. When WinFlash connects to the radio, a configuration dialog appears.

To configure the 450 MHz radio module, see 3.3.1 Configuring a 450 MHz module, page 22.

Configuration tasks for the protocols available with the 900 MHz radio module are listed in the following table:

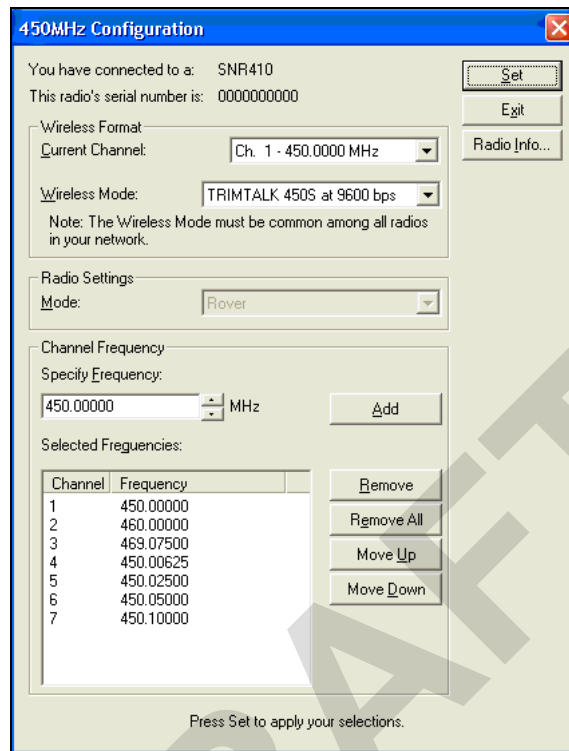
Task	TC/LIP	IP (2 way)
Setup network	See 3.3.2 Configuring a 900 MHz module using the one-way TC/LIP protocol, page 23	
Select, and setup, either traditional IP or Easy IP		See 3.3.3 Configuring a 900 MHz module using the IP protocol, page 23

To configure the 2400 MHz radio module, see 3.3.4 Configuring a 2400 MHz module, page 24.

3.3.1 Configuring a 450 MHz module

To configure a 450 MHz module complete the following steps:

1. When a *450MHz Configuration* dialog similar to the figure below appears, select the current channel and wireless mode that matches the base station.



If the channel of the base station does not appear in the *Current Channel* list, use the *Channel Frequency* area to enter new channels and frequencies. Specific frequencies can be keyed in or selected using the up/down arrows. Up to 20 channels/frequencies can be programmed.

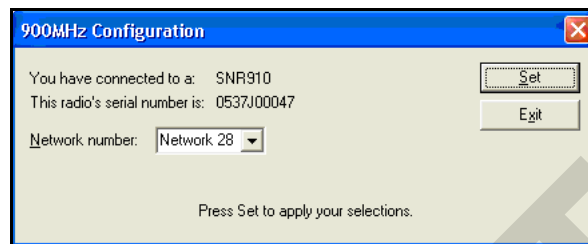
2. Click on *Set*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

3.3.2 Configuring a 900 MHz module using the one-way TC/LIP protocol

Note – 900 MHz modules used to communicate with the on-machine radios of a GCS900 system should always be configured for two way communication. For this reason, this section is not applicable to 900 MHz radios used as part of a Trimble machine control network.

To configure a 900 MHz module running the one way TC/LIP (Kea) protocol complete the following steps:

1. When a *900MHz Configuration* dialog similar to the figure below appears, select the network number.

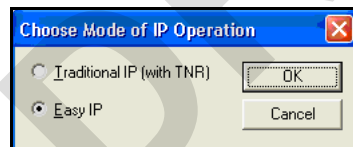


2. Click on *Set*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

3.3.3 Configuring a 900 MHz module using the IP protocol

To configure a 900 MHz module running the IP protocol complete the following steps:

1. When a *Choose Mode of IP Operation* dialog similar to the figure below appears, select the operating mode.

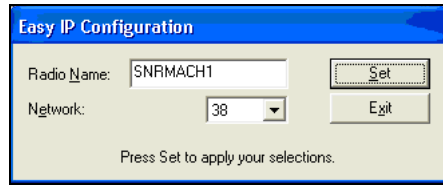


Available modes are as follows:

- Traditional IP
- Easy IP

Make sure *Easy IP* is selected.

2. Click on *OK* to confirm your selection. An *Easy IP Configuration* dialog similar to the following appears:

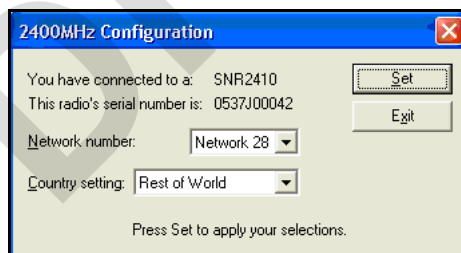


3. Complete the following steps:
 - a. Enter the radio name into the *Radio Name:* field. The radio name is a unique, arbitrary, non-whitespace, alphanumeric string of up to 10 characters.
 - b. Select the network number appropriate to the base radio you need to connect to.
4. Click on *Set*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

3.3.4 Configuring a 2400 MHz module

To configure a 2400 MHz module complete the following steps:

1. When a *2400MHz Configuration* dialog similar to the one below appears, complete the following steps:
 - a. Select the network number appropriate to the base radio you need to connect to.
 - b. Select the appropriate country setting.



2. Click on *Set*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

3.4 Configure ports

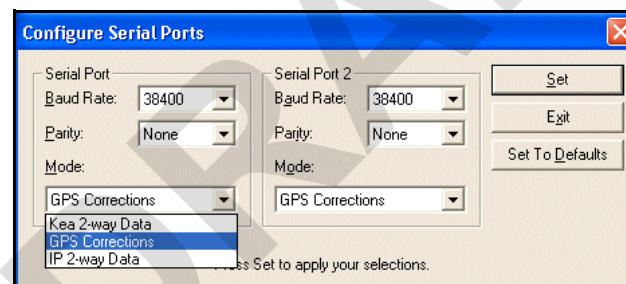
The *Configure ports* operation allows you to configure the radio's serial port.

To configure the radio's serial port, complete the following steps:

1. From the *Operations* menu, select *Configure ports* and click on *Next*. A *Settings Review* screen similar to the following appears:



2. Click on *Finish*. A progress bar appears while WinFlash attempts to connect to the radio. When WinFlash connects to the radio, a *Configure Serial Ports* dialog similar to the following appears:



3. Complete the following steps:
 - a. Set the baud rate to that of the system that the radio is connected to.
 - b. Set the parity as appropriate for the system that the radio is connected to.
 - c. Select the appropriate operating mode.

Mode	Band (MHz)	Description
GPS Corrections	450, 900, 2400	Output CMRs on serial port
IP 2-way Data	900	IP (PPP) 2-way data on serial port

Note – Default settings are 38400 baud, no parity.

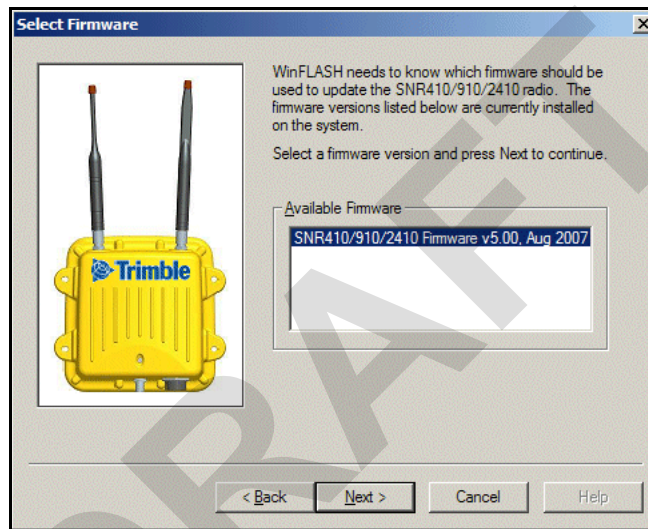
4. Click on *Set*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

3.5 Upgrade radio firmware

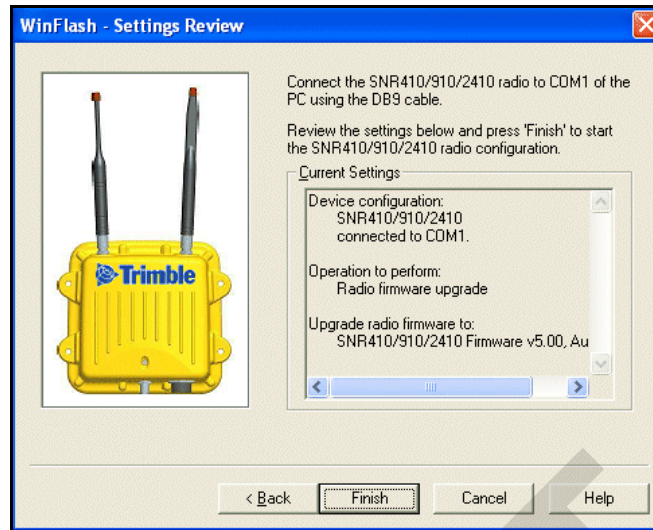
The *Upgrade radio firmware* operation allows you to install new firmware onto a radio module.

To upgrade the radio firmware, complete the following steps:

1. Obtain the new radio firmware file from your Trimble dealer.
2. From the *Operations* menu, select *Upgrade radio firmware* and click on *Next*.
3. A *Select Firmware* dialog similar to the following appears:



4. Select the name of the new firmware, and click on *Next*. A *Settings Review* screen similar to the following appears:



5. Click on *Finish*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

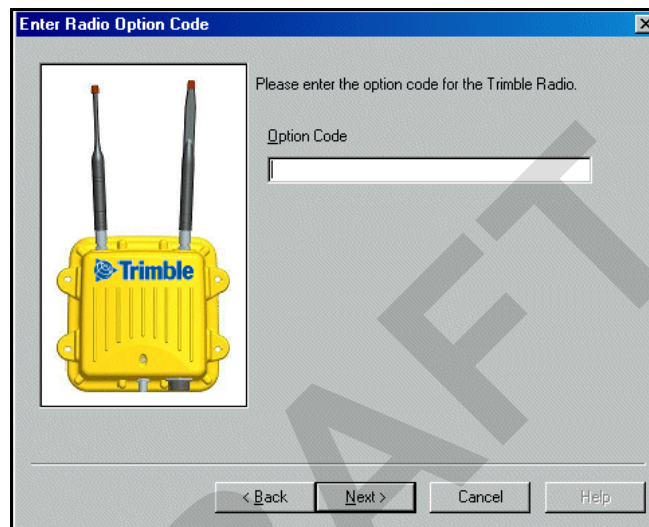
3.6 Load radio option code

The *Load Radio Option Code* operation allows you to enable optional extensions on a radio module.

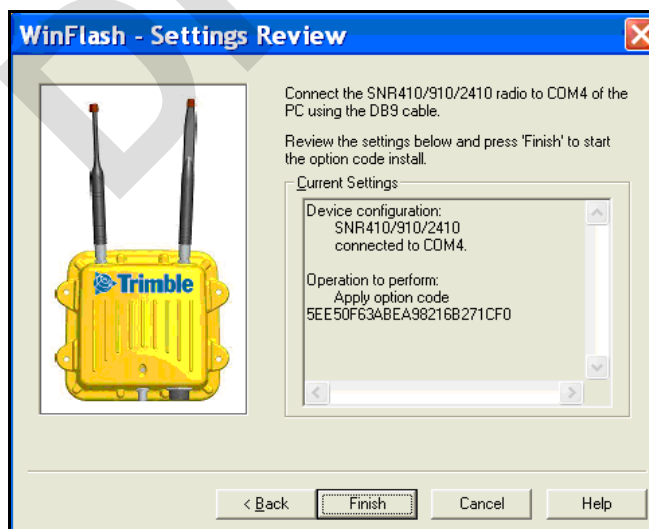
At the time of publication, the only option code available enables the use of the 2400 MHz band module in the SNR410 radio.

To load a radio option key, complete the following steps:

1. Obtain the option key file from your Trimble dealer.
2. From the *Operations* menu, select *Load Radio Option Code* and click on *Next*. A *Enter Radio Option Code* dialog similar to the following appears:

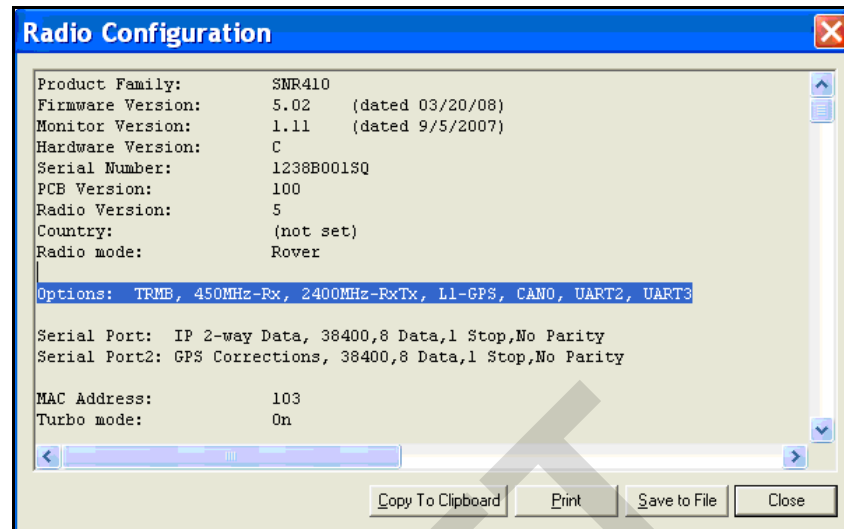


3. Enter the option key, and click on *Next*. A *Settings Review* screen similar to the following appears:



4. Press finish. A progress bar appears. Once the loading of the option code has completed, click on *Menu ...* to return to the *Operations* menu.

- To check that the option code has been loaded successfully, open the radio diagnostics dialog. To learn how to open the diagnostics dialog, see 5.3 Retrieve radio diagnostic information, page 44. A dialog similar to the following appears:



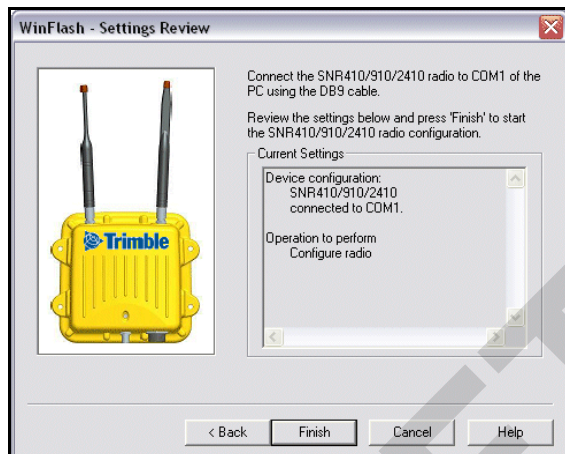
- Check the *Options:* entry. It should contain the entry “2400MHz-RxTx” as shown in the example below:
Options: TRMB, 450MHz-Rx, 2400MHz-RxTx, L1-GPS, CAN0, UART2, UART3
- Click on *Close* to return to the *Operations* menu.

3.7 Change radio protocol

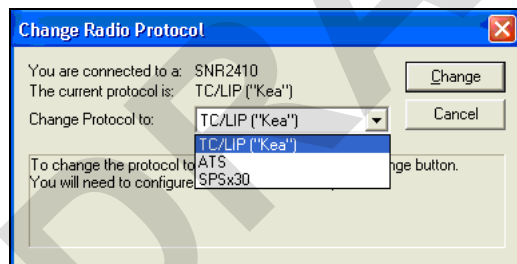
The *Change radio protocol* operation allows you to select the data transfer protocol the radio will use.

To select a data transfer protocol, complete the following steps:

1. From the *Operations* menu, select *Change radio protocol* and click on *Next*. A *Settings Review* screen similar to the following appears:



2. Click on *Finish*. A progress bar appears while WinFlash attempts to connect to the radio. When WinFlash connects to the radio, a *Change Radio Protocol* dialog similar to the following appears:



3. Select a protocol from the *Change protocol to:* drop down list. Available protocols are listed in the following table.

Protocol	Band (MHz)	Description
TC/LIP ("Kea")	450, 900, 2400	Radio will receive CMRs from base station. 2-way data is not supported.
ATS	2400	Radio communicates with Trimble ATS total stations.
SPSx30	2400	Radio communicates with Trimble SPS730 and SPS930 UTS total stations.
TC/LIP ("Kea" 2-way)	900	Radio will receive CMRs from base station. 2-way data is supported.
IP	900	Radio will receive CMRs from Kea base station. 2-way data is supported.

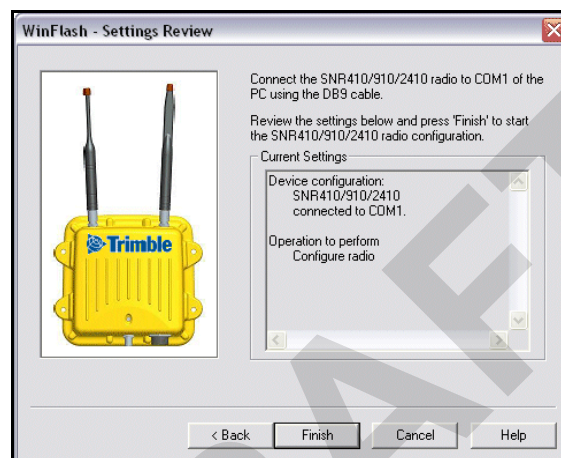
- Click on *Change*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

3.8 Change active radio

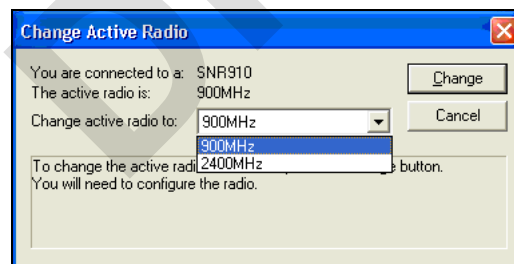
The *Change Active Radio* operation allows you to select the radio module to use or configure, when you radio has more than one module installed.

To select a radio module, complete the following steps:

- From the *Operations* menu, select *Change Active Radio* and click on *Next*. A *Settings Review* screen similar to the following appears:



- Click on *Finish*. A progress bar appears while WinFlash attempts to connect to the radio. When WinFlash connects to the radio, a *Change Active Radio* dialog similar to the following appears:



- From the drop down list, select the radio module you want to use, and click on *Change*. A progress bar appears. Once configuration has completed, click on *Menu ...* to return to the *Operations* menu; otherwise, click on *Exit* to leave WinFlash.

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Installation

In this chapter:

- Attach the SNRx10 radio modem bracket
- Install the SNRx10 radio modem

The SNRx10 radios are designed for new machine installations or existing installations. This chapter describes how to properly install the SNRx10 radio on a machine.

4.1 Attach the SNRx10 radio modem bracket

The SNRx10 radio mounting kit consists of:

- A mounting bracket
- An adapter plate



Tip – For detailed information on the various ways of assembling the radio and mounting bracket, refer to *SNRx10 Data Radio - Mounting Instructions* (PN 65189-00-ENG). This document is provided in the SNRx10 radio kit.

4.1.1 Select a location for the radio mounting bracket

When you mount the radio on a machine, consider the following points:

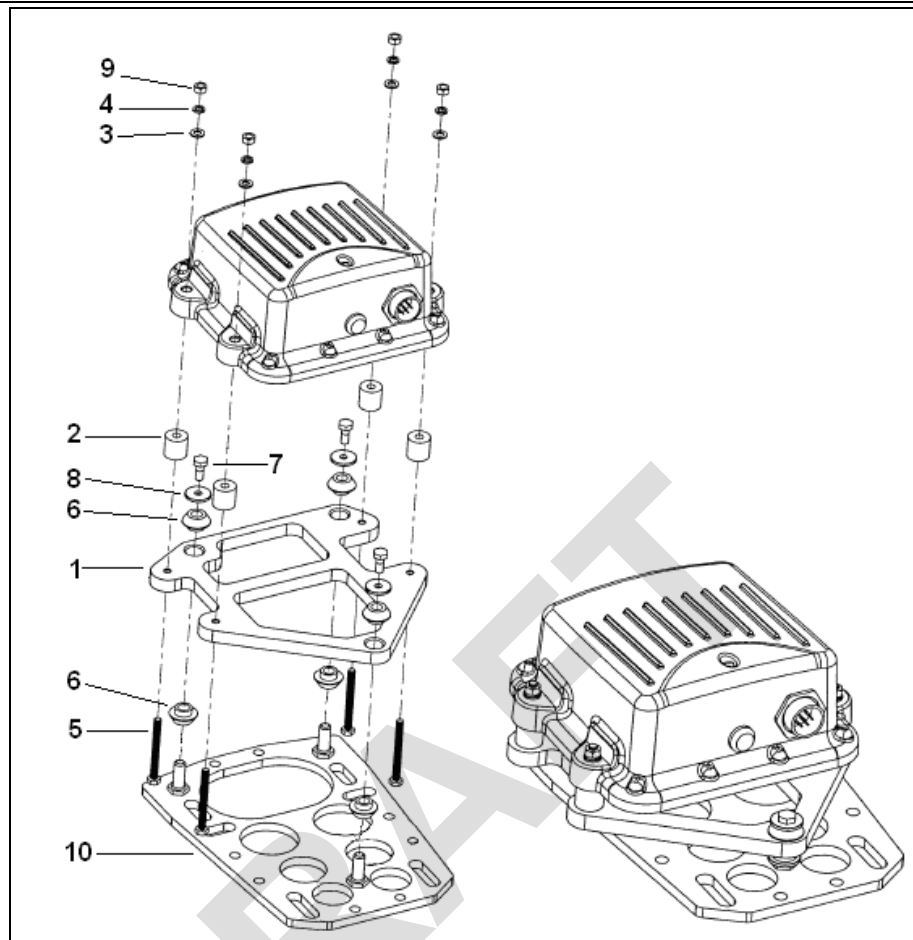
- Reduce damage by minimizing shock and vibration to the radio. Use the shock mounts to mount the radio onto a solid part of the cab.
- Locate the radio with an uninterrupted view. Mount the entire radio above the roofline to improve the performance of the radio.
- Prevent signal interference. Position the radio away from other antennas, particularly if one of the other antennas is a two-way radio. Also position the radio away from rotating beacons, air conditioning fans, and strobe lights.
- The radio cable must be able to reach from the main harness to the radio. To achieve this, consider the following points:
 - The length of the radio cable, which connects to the rear harness cable.
 - The location of the rear harness radio connector and the route for the radio cable.
- The radio assembly must be mounted on a solid part of the cab.

4.1.2 Install the radio mounting bracket

To attach the radio adapter plate to the machine, complete the following steps:

1. Securely mount the adapter plate to the cab of the machine. Use one of the following methods:
 - Bolt the adapter plate to the cab using the two supplied mounting bolts.
 - Weld the plate to the cab.
2. Bolt the radio onto the mounting bracket. Ensure the mounting screws are all fitted with washers and lock washers.
3. Bolt the radio mounting bracket to the adapter plate, using the rubber shock mount kit. The bolts are included with the adapter plate.
 - Use thread locking Loctite (P/N 33803), or equivalent to secure the bolts when assembling the shock mount kit.
 - Remove paint from edges of the adapter plate prior to welding.

The following illustration shows a typical assembly strategy:

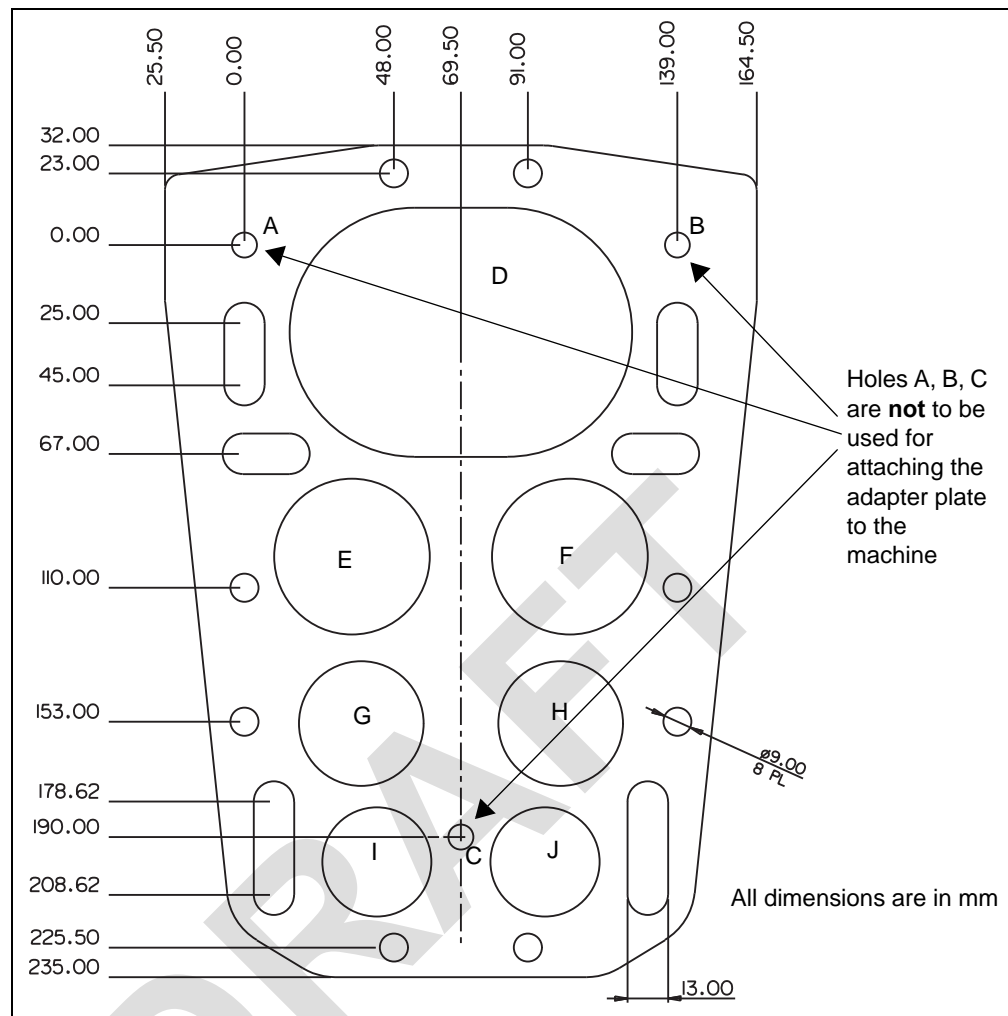


Callout	Description	Part Number	Quantity
1	Adapter plate	313-9363	1
2	Spacer	313-9364	4
3	Washer M6	2801-5341	4
4	Split lock washer M6	62969	4
5	Hex screw M6 x 1 x 60mm	9839-3860	4
6	Rubber shock mount	36496	6
7	Screw 1/4" x 5/8"	73142	3
8	Isolation washer	34594	3
9	Hex nut M6	2803-0587	4
10	Machine bracket	71105	1

Secure all bolted joints with Loctite adhesive PN 39588

For more information see *SNRx10 Data Radio - Mounting Instructions* (PN 65189-00-ENG).

The following illustration shows the hole spacing on the adapter plate:



4.2 Install the SNRx10 radio modem

To install the SNRx10 radio onto the machine, complete the following steps:

1. Ensure the radio adapter plate and mounting bracket are installed correctly.
2. Ensure that all radio mounting screws are fitted with washers **and** with lock washers.

3. Run the radio cable to the harness cable over the safest route. Plug the round connector into the base of the SNRx10 radio. Bundle any extra cable and cable tie.



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Troubleshooting

In this chapter:

- System troubleshooting techniques
- Visual status indicators
- Connector (cable) pinout

Occasionally, problems will occur. Good troubleshooting techniques can significantly reduce the time it takes to isolate the problem and, ultimately, the length of downtime.

5.1 System troubleshooting techniques

5.1.1 General troubleshooting

Check these items when troubleshooting:

- Are all the devices on the system receiving power? Use the information in 5.2 Visual status indicators, page 43, to quickly check the power status of the rover radio.
- Are all the radios in the system communicating? Use the information in 5.2 Visual status indicators, page 43, to make sure the rover radio is synchronized with the base radio and receiving data.
- Are all cable connections secure and undamaged?
- What were the steps that led to the problem occurring?
- Can the problem be repeated?

5.1.2 Rover radio troubleshooting

Complete the following steps to check the state of the rover radio:

1. Follow the procedure in 5.3 Retrieve radio diagnostic information, page 44, to access the radio diagnostics. Check the following items:
 - Does the rover radio have the correct firmware version loaded? If not, contact your Trimble dealer to get the latest firmware load.
 - Is the country setting correct? If not, and you are using a 2400 MHz modules, use the procedure in 3.3 Configure radio, page 20, to set the correct country. Otherwise, contact your Trimble dealer.
 - Is the network setting correct? If not, use the procedure in 3.3 Configure radio, page 20, to set the correct network number.
 - For 900 MHz modules running the Easy IP protocol, is the radio mode set to “Rover”? If not, use the procedure in 3.3 Configure radio, page 20, to set the module to “Rover”.
 - Are the serial port settings correct for your on-machine system? If not, use the procedure in 3.4 Configure ports, page 25, to enter the correct settings.
 - For 900 MHz modules running the Kea 2-way protocol, is the MAC address set correctly? If not, use the procedure in 3.3 Configure radio, page 20, to set the correct MAC address.
 - Is the protocol set correctly? If not, use the procedure in 3.7 Change radio protocol, page 30, to set the correct protocol.

2. For 900 MHz modules running the Easy IP protocol, is the radio name set correctly? Use the procedure in 3.3 Configure radio, page 20, to make sure that the name does not contain spaces? If the current name contains spaces, enter a correctly formed name.
3. Use CSG Test Suite to check the reliability of the CMR reception.

Note – CSG Test Suite can be downloaded from the Trimble web site. Navigate to Support & Training/Support > Support A-Z > SiteNet™ 900 > Downloads. Install the software on the same computer that you run WinFlash on, and use the same service cable to connect to the radio.

Reception integrity should be greater than 90%. If reception integrity is lower than 90% suspect a damaged antenna. If the antenna is known to be good, suspect a failed radio. Swap in a known good radio, and retest. If integrity is still low, suspect a problem with the base station or with the radio network setup. For example, is the rover within line of sight of the base or repeater?

5.1.3 Base radio troubleshooting

It is beyond the scope of this manual to give detailed instructions on troubleshooting GPS base station and/or wireless network access point problems. For detailed troubleshooting information, refer to the documentation supplied with your base station radio. In general, you should check these items when troubleshooting:

- Are all the devices on the system receiving power?
- Are all the radios in the system communicating?
- Are all cable connections secure and undamaged?

If the base radio is a Trimble SNB900 radio modem, observe the following points:

1. Check the connection between the base GPS receiver and the SNB900 Lemo port.
2. For SNB900 base stations that are also network access points for wireless data networks (referred to as co-located bases), check the connection between the LAN and the SNB900 modem port
3. Check the SNB900 settings by observing the front panel. The following should be displayed on the front panel during proper operation:

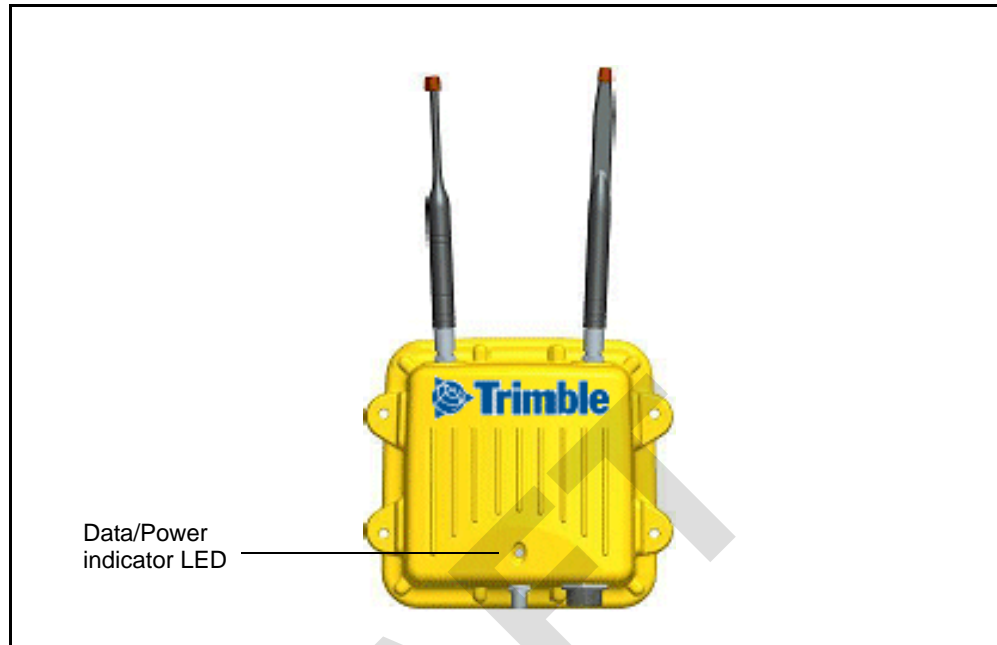
Note – You must scroll down to view some items. Also, some items are alternated with others on the display, so observe the display for a few seconds to make sure you view all alternate items.

- *Easy IP* – Easy IP protocol selected for two way data networks
- *Sync* alternating with one or both of *Trans* and/or *Rcv* – the base radio is active
- *Base* or *AP-Base1* – the radio is configured as a base
- *Net <network number>* – the network number of the radio

- *CMR Out* or *CMR xx%* – the radio is transmitting CMRs. If *CMR xx%* is shown, the percentage value must be greater than 90%.
 - *Firmware <version and date>* – firmware version and release data
 - *Country Code <country code>* – country code
4. For SNB900 co-located bases, use the DOS command **Ping** to check the integrity of the office computer and the machine by pinging the following components:
 - the SNB900 access point
 - the SNRx10 on the machine
 - the computer on the machine
 5. For SNB900 co-located bases, connect to the SNB900 access point via your office computer web browser by entering the IP address of the SNB900 as the destination web address. Check the following items:
 - LAN configuration on the *Configure Ethernet* page
 - connected device status on the *Access Point Status* page
 6. For SNB900 co-located bases, check the following configuration settings on your office computer:
 - check the IP address of the office computer using the **ipconfig /all** DOS command
 - check the routing to the on-machine radio using the **TraceRt** DOS command
 - office computer firewall settings
 7. For SNB900 co-located bases, use the *Configure* operation of WinFlash to check the following configuration settings:
 - Enabled options: the Access Point (AP) option must be enabled, and if the Security option is enabled the option should either be turned off or configured with a list of valid rover radio IP addresses
 - The Easy IP configuration, particularly the Lemo Port and Modem Port configuration
 - Advanced settings for proper naming of network devices

5.2 Visual status indicators

The SNRx10 radio housing is fitted with an LED indicator light, as shown in the figure below.



The LED can flash in a number of different patterns depending on the situation, as shown below.

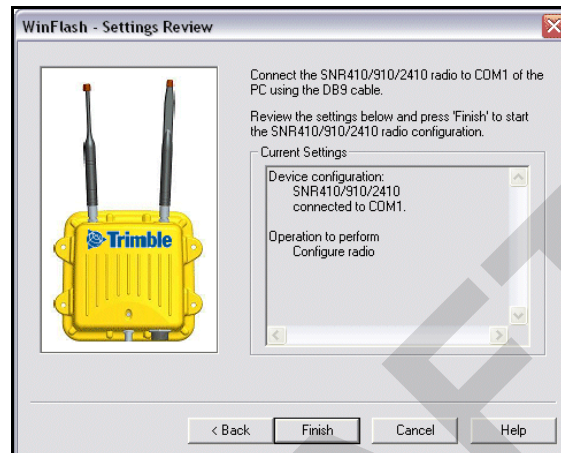
LED pattern	Status
Off	No power to radio.
On solid	Power is available, but the radio is not synchronized.
Irregular flashing	Power is available, the radio is synchronized, but the radio is losing data.
Regular 1 Hz flashing	Power is available, the radio is synchronized, and receiving data.

5.3 Retrieve radio diagnostic information

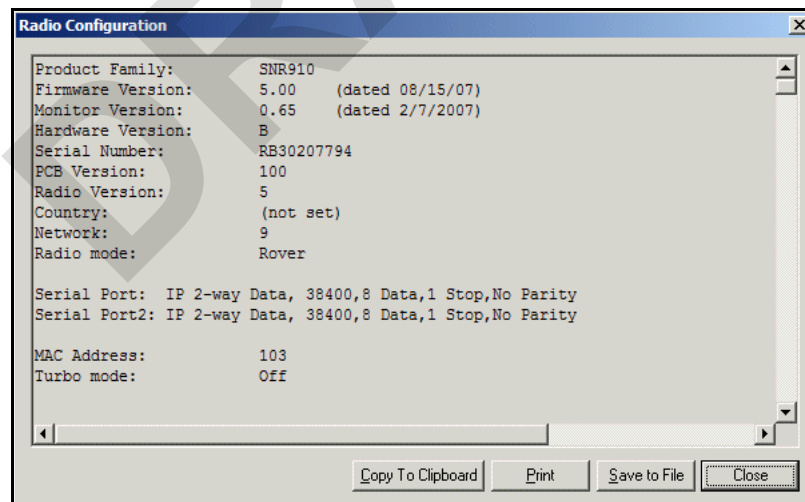
The *Retrieve radio diagnostic information* operation allows you to review the configuration of a radio module.

To review a radio's configuration, complete the following steps:

1. Follow the procedure in 3.2 Establishing a WinFlash connection, page 18, to connect to the radio and open the *Operations* menu.
2. From the *Operations* menu, select *Retrieve radio diagnostic information* and click on *Next*. A *Settings Review* screen similar to the following appears:



3. Click on *Finish*. A progress bar appears while WinFlash attempts to connect to the radio. When WinFlash connects to the radio, a *Radio Configuration* dialog similar to the following appears:



4. Review the following settings:
 - Firmware Version - most recent (see site for latest firmware)
 - Country Code - correct for site
 - Network - correct for site

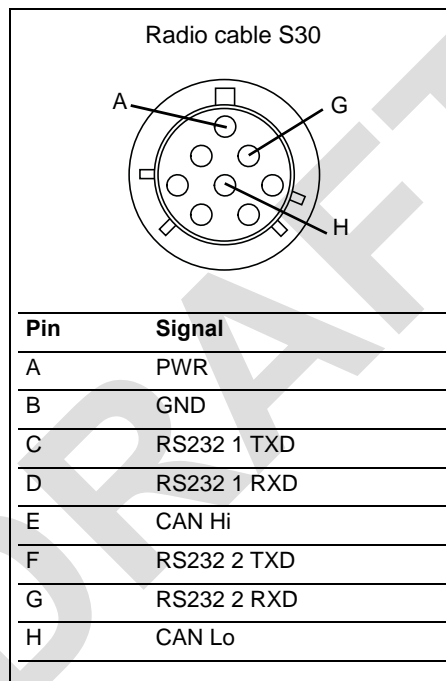
- Radio mode - always a rover
- Serial port - correct for on-machine configuration
- Protocol - correct for site



Tip – Click on one of *Copy to Clipboard*, *Print*, or *Save to File* to save the diagnostics information to the clipboard, as hardcopy, or as a file. Use this feature to save radio module configuration settings for your own records, or to send to your deal to help in troubleshooting.

5. Click on *Close*. The *Operations* menu appears.

5.4 Connector (cable) pinout



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