

RayTech RNS

Getting Started

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Important Information

About this manual

This manual describes how to get started using RayTech RNS marine navigation software.

It shows you how to ensure that the PC on which this software is to be installed meets the requirements for running this version of RayTech RNS.

It also shows how the peripheral equipment required for full functionality of the system should be interfaced with RNS.

Details of how to operate RayTech RNS after it has been successfully installed are described in the **RayTech RNS - User's Manual** which accompanies this product.

Intended use

RayTech RNS V5.0 is intended for recreational marine use. Users should note that only authorized government charts and associated Notices to Mariners contain all the information required for safe navigation.

Safety notices



WARNING:Navigation aid

When this product is used within a navigation system, it is only an aid to navigation. Its accuracy can be affected by many factors, including equipment failure or defects, environmental conditions and improper use or handling. It is the users responsibility to exercise common prudence and navigational judgements. This product should not be relied upon as a substitute for such prudence and judgement. Always maintain a permanent watch so that you can respond to situations as they develop.



WARNING:Product installation

This equipment must be installed and operated in accordance with the Raymarine instructions provided. Failure to do so could result in poor product performance, personal injury, and/or damage to your boat.

Disclaimers

This electronic chart is an aid to navigation designed to facilitate the use of authorized government charts, not to replace them. Only official government charts and notices to mariners contain all of the current information needed for the safety of navigation, and the Captain is responsible for their prudent use.

This program and its charts do not excuse the user from carrying the required official charts and documents.

Raymarine does not warrant that this product is error free or that it is compatible with products manufactured by any person or entity other than Raymarine.

This product utilizes digital chart data, and electronic information from the Global Positioning System (GPS) and weather information which may contain errors. Raymarine does not warrant the accuracy of such information and you are advised that errors in such information may cause the product to malfunction or give incorrect readings. Raymarine is not responsible for damages or injuries caused by your use or inability to use the product, by the interaction of the product with products manufactured by others, or by errors in chart data or information utilized by the product provided by third parties.

Except for the limited warranty regarding the magnetic media contained in the license agreement accompanying the product, this product is provided 'AS IS' without warranty of any kind, either express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, and any others which may arise from course of performance, course of dealing, or usage of trade.

The limits of electronic navigation

Experienced navigators know not to rely on a single method of navigation for determining their position. Two or more methods should be used to determine position and guard against errors placing you or your boat in a dangerous position. GPS based electronic navigation is an amazing application of technology, but like all other technology, has limits. A wise navigator will understand these limits and how they affect the safety of their boat and crew.

The GPS is made up of components starting with ground based computers to monitor and maintain the system made up of 24 satellites in orbit around the earth. The system ends at your boat's receiver. Like all systems it is not perfect and any part of it can fail. GPS accuracy varies between 2 and 50 meters.

NMEA 0183 1.0 / 1.5 only supports 2 digits of latitude and longitude, giving a precision of approximately 60 feet.

NMEA 2.0 / 2.1 supports 3 digits of latitude and longitude, giving a precision of approximately 6 feet.

Another limitation to the system accuracy is digital charts. These electronic charts are made by highly skilled cartographers. Surveys on which the cartography is based, were in some cases, made over 50 years ago. So despite everyone's best efforts, it may be possible to have errors in the final product.

Lastly, RayTech software was developed by highly skilled and talented software engineers and underwent a rigorous test and quality assurance program before being released. However, it is possible that software issues or malfunctions may remain undetected in the software. Whilst Raymarine make every effort to find, fix and repair software issues as they are discovered, this product is specifically not promised to be issue free.

Conventions used

In this manual the following conventions will be used:

- RNS refers to RayTech RNS V5.0.
- The names of keyboard keys are printed in boldface, such as **Enter**.
- Italics are used to show names, such as *Open Chart*, or softkeys such as *Find Vessel*.
- Instructions using menu options are written as menu **option/submenu option**. For example, the instructions might read 'Select **File/ Layers**'. This means go to the File menu on the drop-down menus and select it. A submenu will appear that contains the Layers option for you to select.
- 'Click' refers to clicking the mouse button. Unless otherwise stated, it refers to the left mouse button once.
- 'Right click' refers to clicking the right mouse button once.
- 'Double click' means to click the left mouse button twice quickly.

Product use

You may not use this product unless you agree to the terms and conditions of the license agreement.

In accepting these terms and conditions, you agree to be bound by the terms of the license agreement and to release and hold Raymarine harmless from and against any and all claims, obligations and liabilities with respect to the product, except those specifically reserved in the license agreement.

If you do not agree to the terms and conditions of the license agreement, you may return the program within thirty (30) days of the date of purchase by following the instructions contained within the license agreement.

System integration

Raytech RNS V5.0 has been designed to work transparently with Raymarine SeaTalk data communications package, or any other device that outputs data in National Marine Electronics Association (NMEA) 0183 format. These protocols allow information such as heading, wind speed and direction, sea temperature and other information to be accessed and displayed within RNS. Information generated by RNS can also be displayed on your boat's standard onboard instruments.

Technical accuracy

The technical information contained within this manual, to the best of our knowledge, was correct at the time of printing. However, Raymarine cannot accept liability for any inaccuracies or omissions it may contain.

In addition Raymarine's policy of continuous product improvement may change specifications without notice. As a result Raymarine cannot accept liability for any differences between the product and the manual.

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System overview and features

Introduction

This chapter introduces RayTech RNS and covers the following:

- What's in the box.
- System overview.

What do I get in the box?

When you open the box containing RNS, you will find various components, depending on which package you have purchased.

RayTech RNS - Part No.E83034

Component	Raymarine Part No.
RayTech RNS CD-ROM	47001-2
Softchart CD-ROM	47002-1
Maptech CD-ROM	47003-1
C-Map America CD-ROM set	47004-2
C-Map Asia and Europe CD-ROM set	47005-2
RayTech RNS license key	47007-1
RayTech accessory list	47015-1
RayTech RNS - Getting Started	81241-1
RayTech RNS User's Manual	81216-2
Global Positioning System (GPS) cable	E86001

RayTech Pathfinder PC - Part No. E86022

All of the components contained in Part No. E83034 above, plus:

hsb ² to controls box cable	4471-005-B
hsb ² to PCMCIA interface	47013-1
RayTech SeaTalk Interface box	E85004
SeaTalk to PC interface cable	E86001

If any of the above components are missing, you should contact, in the first instance, the Raymarine dealer where you purchased your package, or Raymarine Customer Support, the details of which can be found in the Technical Support section of this handbook, *page 39*.

System overview

RayTech RNS operates within a standard Windows environment, and enables you to utilize the latest digital charts and Global Positioning System (GPS) instrumentation to help you navigate your boat virtually anywhere in the world. RNS easily interfaces with your boats onboard navigational systems, offering you the flexibility to allow RNS to autopilot your boat to any destination you chose to plot.

RNS also incorporates the capability to download the latest weather and oceanographic information and display it on any chart. Advanced features are included that will enhance RNS's route plotting and fishfinding performance making it an ideal choice for the serious sailor or fisherman.

System features

RNS has been designed for ease of use and incorporates the following features:

Easy marine navigation

RNS takes the guesswork out of marine navigation by enabling easy and accurate planning and plotting of simple or complex routes. These can be stored and re-used, even changed whilst in use to take changing weather conditions or other factors into account.

Chart formats

RNS uses the latest digitized versions of the paper charts traditionally used in marine navigation, and supports the following chart formats:

- C-Map NT and NT Plus.
- Maptech NOAA/BSB.
- Maptech PCX.
- Maptech Photo Regions and Topographical charts.
- SoftCharts Nautical charts and PhotoNavigator.
- NDI/CHS charts.

Comprehensive Weather/ Oceanographic reporting

RNS offers you the capability to download and display the latest weather and ocean conditions, and then superimpose this information upon your charts in several layers. Weather and oceanographic charts (in GRIB format) can be downloaded directly from the Internet or requested via e-mail. These files can be animated to show predicted weather conditions over a specified period of time. Typical weather files contain information in 6, 12 or 24 hour intervals, covering a period of several days, giving you a comprehensive presentation of atmospheric and marine conditions.

Advanced graphical user interface

RNS is operated via an easy-to-use Graphical User Interface (GUI) complete with many customizable toolbars, softkeys and 'floating' data boxes. Using an intuitive menu hierarchy, you can display only those tools that you commonly use, or customize screens to show you only pertinent information, with just a few mouse clicks. RNS's flexible GUI enables you to quickly and easily tailor its powerful resources to suit your needs.

3D contour display

An advanced 3D contour display works in conjunction with Maptech Contour Professional cartography to show your boat, the ocean floor, and other related information using a 3D vector-style display. This enables you to view any area, such as a favorite fishing spot, harbor entrance with a full three dimensional page. Images can be rotated through 360°, enabling you to view your boat's position from virtually any angle.

Sailboat racing

The sail racer features are targeted towards the professional sailboat racer, and include

- DataTrak.
- Polars.
- Route Optimization.
- Advanced weather routing.
- Pre-start display.
- Navigation numbers.
- Specialized racing toolbar.

Fishing

The fishing features are targeted towards the serious fisherman and provide two major elements in the search for fish:

- Ocean plankton/ water clarity - using data from the OrbView 2 satellite.
- Sea surface temperature (SST) - using data from U.S. Government weather satellites.

Getting Started

Introduction

This section deals with making sure that your PC is ready to install and run RayTech RNS and details:

- System requirements.
- Whether your PC is ready to install RNS.
- Upgrading drivers and adapters.
- Installing RNS.

System requirements

Before you can begin installing RayTech RNS, you need to make sure that the PC you intend to use meets the minimum hardware requirements for running the software. Whilst RayTech RNS will run successfully on the minimum requirement, for best performance, the optimum requirements are recommended.

The minimum and optimum requirements are:

Minimum system requirements

The minimum system requirements are:

- Pentium III 1 GHz processor.
- 128 MB RAM.
- Windows 2000/XP.
- CD-ROM drive.
- Serial port.
- PCMCIA port - only required if you are connecting your PC to hsb².
- Monitor - capable of displaying 800 x 600 resolution, 16 bit color.

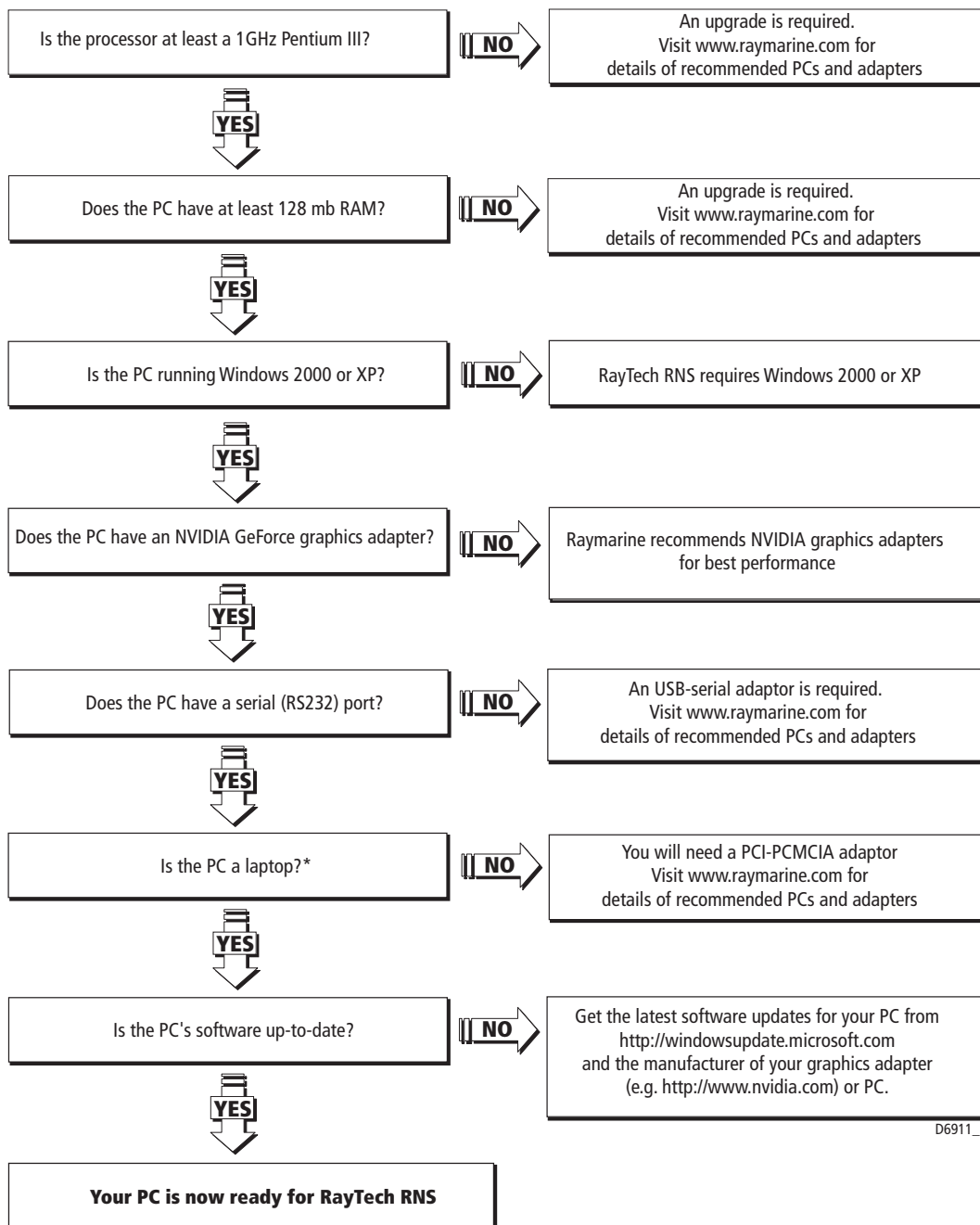
Optimum system requirements

The optimum system requirements are:

- Pentium IV processor or faster.
- 256 MB RAM or higher.
- NVIDIA GeForce 4 processor.
- Windows XP.
- Monitor - capable of displaying 1024 x 768 resolution, 16 bit color.

Is my PC ready to use RNS?

Use this flowchart to see if your system will run RNS:



D6911_1

Note: **If you are not planning to buy the Pathfinder PC kit, or you are not intending to use RayTech's hsb² networking capability for chart, radar, sonar sharing, you can skip this check.*

Upgrading drivers and adapters

Prior to installing RayTech RNS, Raymarine strongly recommend updating your PC display drivers and verifying that you have the latest versions of Microsoft DirectX and your Display adapter driver installed.

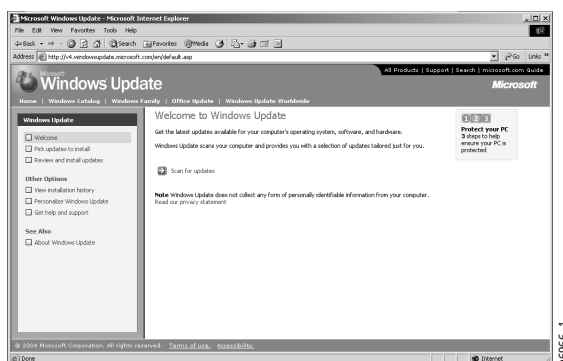
Note: *It will be necessary to have the PC connected to the internet for these checks and updates to be carried out.*

Driver update

To ensure that your PC is current with regard to Windows operating system patches you should execute the Windows Update utility.

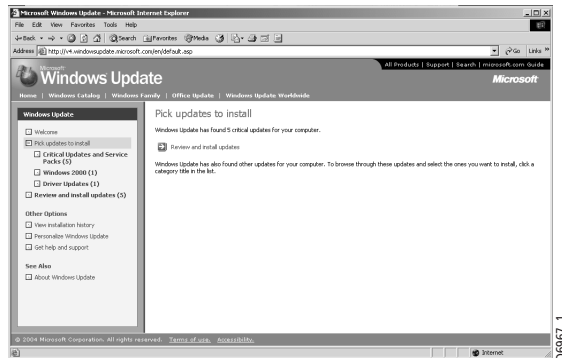
To run the Windows Update utility:

1. On the computer taskbar, click *Start*. The pop-up menu is displayed.
2. Select and click *Windows Update*. The PC will connect to the Microsoft Windows Update site.
3. The Welcome screen is displayed.

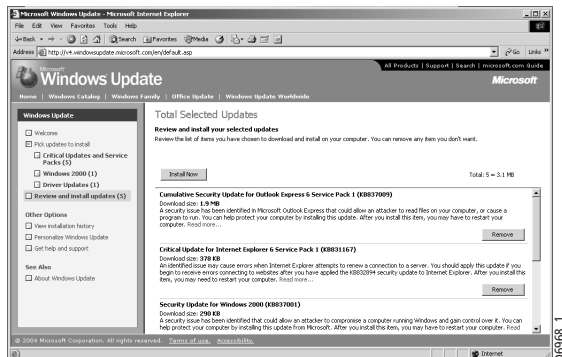


4. Click *Scan for Updates*.

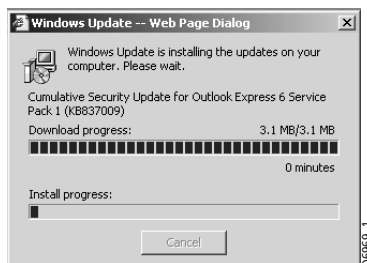
Your computer is scanned to find which update patches are required. The screen updates to show the progress of the scan. When the scan is complete the Review Updates screen is displayed.



5. Click *Review and Install Updates*. The available updates are displayed.



6. Click *Install Now*. Installation of the updates starts, with progress being shown on screen.



Upon completion of the installation a dialog box appears. This will tell you that installation is complete and that you need to restart your computer for the updates to be activated.

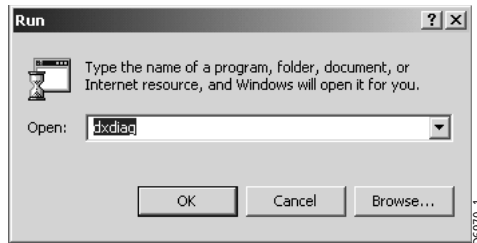
7. Check Restart Now. Click *OK*. Your computer will restart and Windows will be updated.
8. Repeat steps 1 through 7 until all applicable updates have been installed.

DirectX

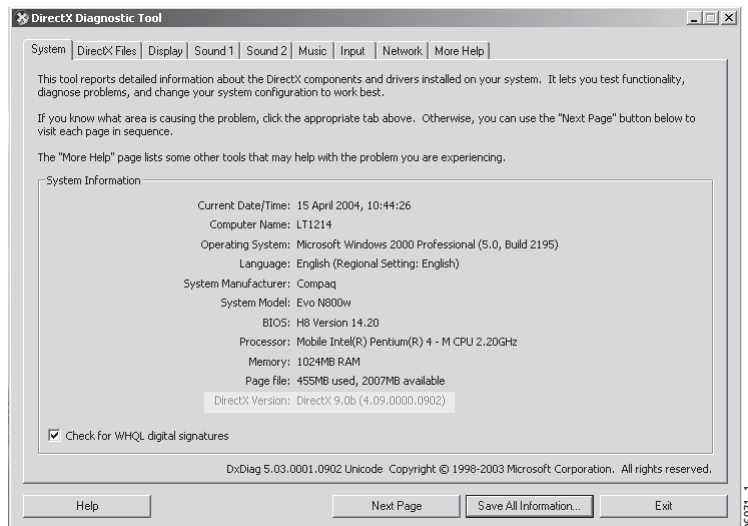
To ensure that you have the latest version of DirectX installed you should run the DirectX diagnostics utility.

To run DirectX diagnostics utility:

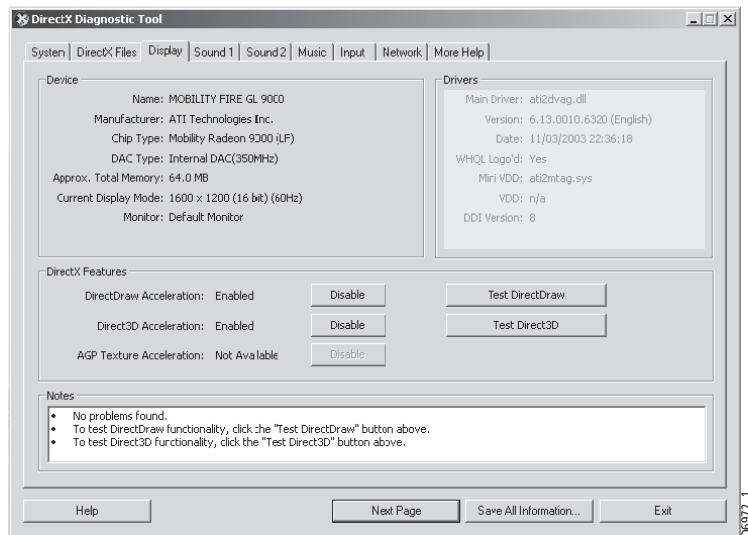
1. On the computer taskbar, click *Start*. The pop-up menu is displayed.
2. Select and click *Run*. The Run dialog box is displayed.



3. Type in, dxdiag. Click *OK*. The DirectX diagnostic tool will be displayed.



4. Make a note of the version number installed on your computer (highlighted in the picture above).
5. Click the *Display or Display 1* tab. The display adapter screen is displayed.



6. Make a note of the display adapter name, manufacturer, chip type and driver version installed on your computer (highlighted in the picture above).
7. Point your internet browser to - <http://www.microsoft.com/windows/directx/downloads/default.asp> and check the current version of DirectX. If the version installed is not current, download and install the latest version.
8. Point your internet browser to the display adapter manufacturer's site and check the current version available. If the version installed is not current, download the latest version.

Useful websites

You may find the following websites useful when ensuring your PC has the latest drivers and adapters available:

Manufacturer

Intel software

VIA software

AMD software

SIS software

ATI graphics

NVIDIA graphics

Website

www.intel.com

www.viarena.com

www.amd.com

www.sis.com.tw

www.ati.com

www.nvidia.com

Installing RNS

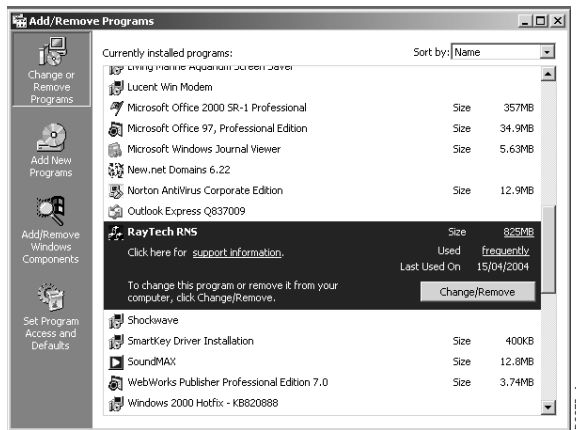
Having checked that your computer meets the operating requirements, and upgraded the drivers and adapters as necessary your computer is now ready for installing RayTech RNS.

However, to make sure that RNS V5.0 operates correctly you should, before installation, execute the Windows Add/Remove Programs utility and remove any previously installed KiwiTech or RayTech program(s).

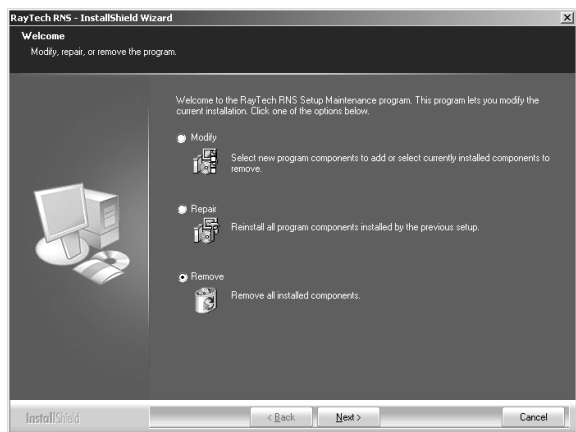


To run the Add/Remove Programs utility:

1. On the computer taskbar, click *Start*. The pop-up menu is displayed.
2. Select and click *Control Panel*. The control panel is displayed.
3. Click *Add/Remove Programs*. The Add/Remove Programs dialog box is displayed.



4. Select the program you wish to remove.
5. Click *Change/Remove*. The Change/Remove wizard is displayed.



6. Check *Remove*. Click *Next*. Follow the on-screen instructions to remove the selected program.

Your RNS software can now be installed from either a CD-ROM or downloaded directly from the Internet.

Installation from a CD

To install RNS using a CD-ROM:

1. Insert the RNS CD into the computer's CD-ROM drive. After a few moments the Install Shield Wizard Welcome screen is displayed.
2. Click *Next*, and follow the on-screen instructions.

If the Install Shield Wizard does not automatically run;

1. Select **Start/Run** from the computer taskbar and type **e:\setup.exe** (substitute the drive letter of your CD-ROM drive for 'e' if it is different). After a few moments the Install Shield Wizard Welcome screen is displayed.
2. Click *Next*, and follow the on-screen instructions.

Installation from the internet

To install RNS from the internet:

1. Point your internet browser to [http://www.raymarine.com/RayTech software](http://www.raymarine.com/RayTech%20software)
2. Follow the on-screen instructions.

Note: *RNS is a very large file (85mb). Dial-up connections are not recommended for this operation.*

Using RNS for the first time

License keys

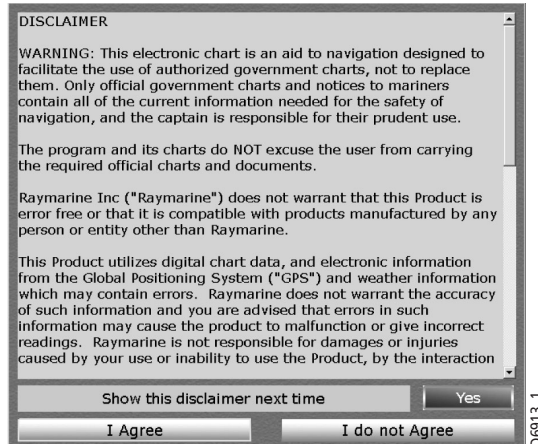
To operate RNS with your boat's instruments and use the advanced features, it is necessary to purchase a license key. There are two types of license key that can be purchased for RNS:

- **5.0 Upgrade License** - this type of key is required if you are upgrading to RNS V5.0 from a previous version.
- **5.0 License** - this type of key is included when you purchase RNS V5.0.

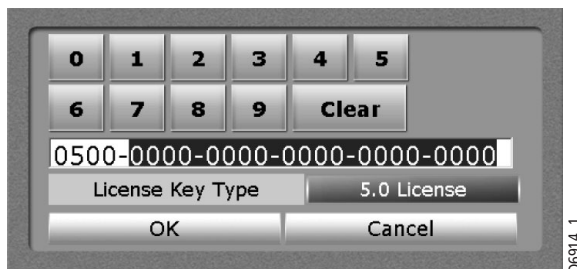
Both types of key can be purchased from <http://www.raymarine.com/RayTech>.

To start using RNS after installing it:

1. Select **Start/Programs/RayTech/RNS V5.0** from the computer taskbar. The program will load and display a disclaimer dialog.



2. Read the disclaimer.
3. If you agree to the terms of the disclaimer, click **I Agree**. If not, click **I do not Agree**, and the program will terminate.
4. After clicking **I Agree**, the license key dialog box will be displayed.



5. Select the type of license key you are entering. See below.
6. Enter your license key using the on-screen keyboard. Move the cursor over the required number and click to enter.
7. Select **OK**. The dialog box closes.

System integration

Introduction

This chapter provides an overview of system integration and the protocols that interface with RayTech RNS.

You may find that your system does not use all the protocols or contain all the instrumentation that is described in it. However it is hoped that the information supplied will help in your understanding of how systems can be integrated and used successfully.

What is System Integration?

System integration enables various instruments and displays to communicate with each other and use the collected data to increase the functionality of the system.

This data exchange is only possible if the data gathering is accurate, and transfer between instruments is fast and accurate.

Fast and accurate data transfer is achieved by using a combination of the following data protocols:

- SeaTalk.
- SeaTalk².
- hsb².
- National Marine Electronics Association (NMEA)0183.

What is SeaTalk?

SeaTalk

The SeaTalk protocol was originally developed by Autohelm (part of Raymarine) and enables compatible instruments to be connected by a single cable carrying power (12 volts, 150 mA) and data in/out, without a central processor, creating a simple network.

Additional instruments and functions can be added to a SeaTalk system, simply by plugging them into the network. SeaTalk equipment can also communicate with other non-SeaTalk equipment via the NMEA 0183 standard.

SeaTalk²

SeaTalk² protocol was developed as the Controller Area Network (CAN) based version of SeaTalk.

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What is hsb²?

The high speed bus ² (hsb²) protocol was developed by Raymarine to enable up to ten multiple displays to be linked together. This enables all of the screens to display data from any unit connected the bus to any other unit which is connected to the bus. This data can be displayed in full, split and overlay screen modes.

What is NMEA?

NMEA 0183

The NMEA 0183 Data Interface Standard was developed by the National Marine Electronics Association of America. It is an international standard to enable equipment from many different manufacturers to be connected together and share information.

The NMEA 0183 standard carries similar information to SeaTalk. However it has the important difference in that one cable will only carry information in one direction. For this reason NMEA 0183 is generally used to connect a data receiver and a transmitter together, e.g. a compass sensor transmitting heading to a radar display.

This information is passed in 'sentences', each of which has a three-letter sentence identifier. It is therefore important when checking compatibility between items that the same sentence identifiers are used, e.g. VTG carries Course and Speed Over Ground data, GLL carries latitude and longitude, DBT carries water depth and MWV carries relative wind angle and wind speed data.

Installation Guidelines

EMC installation guidelines

All Raymarine equipment and accessories are designed to best industry standards for use in the recreational marine environment.

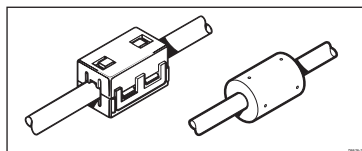
Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised. Although every effort has been made to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product.

The guidelines given here describe the conditions for optimum EMC performance, but it is recognized that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the maximum separation possible between different items of electrical equipment.

For optimum EMC performance, it is recommended that wherever possible:

- Raymarine equipment and cables connected to it are:
 - At least 3 ft. (1m) from any equipment transmitting, or cables carrying radio signals, e.g. VHF radios, cables and antennas. In the case of Single Side Band (SSB) radios, the distance should be increased to 7 ft. (2m).
 - More than 7 ft. (2m) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
 - The equipment is supplied from a separate battery to that used for engine start. Voltage drops below 10 V, and starter motor transients, can cause the equipment to reset. This will not damage the equipment, but may cause the loss of some information and may change the operating mode.
- Raymarine specified cables are used. Cutting and rejoining these cables can compromise EMC performance and must be avoided unless doing so is detailed in the installation manual.
- If a suppression ferrite is attached to a cable, this ferrite should not be removed. If the ferrite needs to be removed during installation, it must be reassembled in the same position.

Suppression Ferrites



The illustration shows typical cable suppression ferrites used with Raymarine equipment. Always use the ferrites supplied by Raymarine.

Connections to other equipment

If your Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a suppression ferrite **MUST** always be attached to the cable near to the Raymarine unit

Basic NMEA and RS-232 cabling principles

This section explains some of the basic principles involved with NMEA and RS-232 electrical connections.

Knowledge of this information is not required to connect t RNS to your peripheral instrumentation: however, it is provided for the advanced user as a pertinent technical background.

NMEA basics

Most marine electronic devices that output data do so over NMEA ports. These ports are known as a 'balanced pair', which means that the data signal is carried over two wires (via an RS-422 electrical layer, in computer/datacom terminology). The signal level is determined by calculating the voltage difference between the two wires, hence the NMEA output signal is called a Differential Data Signal (DDS). This DDS should not be confused with Differential Global Positioning System (DGPS), which is a GPS system error correction method.

DDS are designed to be error-resistant by keeping the positive and negative leads close together for the entire cable run. This means that they both pick up the same levels of noise, which is ultimately subtracted from the signal, preserving the signal's data integrity.

NMEA ports typically have four connections (two for each lead); Transmit (positive/negative) and Receive (positive/negative). Some devices may use a single-direction port, meaning that they can transmit or receive only.

To connect one NMEA device to another:

1. Connect device A's positive Transmit (Tx+) lead to device B's positive Receive (Rx+) lead.
2. Connect device A's negative Transmit (Tx-) lead to device B's negative Receive (Rx-) lead.

IMPORTANT: When performing the above connection, make sure that you connect the devices directly; DO NOT use the boat's DC grounding circuit to carry the Tx- signal.

You may encounter a device that does not properly implement the NMEA specification, and shares it's Tx- lead with the device DC power ground circuit. In this case, you must still run a cable directly between the Tx- and Rx- leads as previously stated. DO NOT share the DC power ground circuit.

RS-232 basics

Most desktop and laptop computers have RS-232 ports. These ports use a 3 wire interface, in which the transmit and receive leads reference the same signal ground. It is important not to confuse the RS-232 cable's ground with the boat's power ground

circuit. While the boat's power ground may, co-incidentally, be at the same level as the RS-232 signal ground, there is no industry standard that requires this. Since the RS-232 transmit and receive data signals reference a common signal ground to maintain their integrity, you must connect the signal ground circuit directly between the two RS-232 linked devices.

To wire one RS-232 device to another:

1. Connect device A's Tx lead to device B's Rx lead.
2. Connect device A's Rx lead to device B's Tx lead.
3. Connect device A's signal ground (SGnd) lead to device B's SGnd lead.

RS-232 uses a common ground, which differs in electrical specification from NMEA's transmit/receive- pair arrangement. Because of these signal level differences, the way you interconnect an RS-232 device and an NMEA device varies with the application.

Note: *You may also encounter voltage differences when interconnecting older RS-232/NMEA hardware. Take care to ensure the correct connections.*

To wire an RS-232 device to *provide input* to an NMEA device:

1. Connect the RS-232 device TX lead to the NMEA device RX+ lead.
2. Connect the RS-232 device SGnd lead to the NMEA device RX- lead.

To wire an RS-232 device to *provide and receive input* from an NMEA device:

1. Connect the RS-232 device Tx lead to the NMEA device Rx+ lead.
2. Connect the RS-232 device Rx lead to the NMEA device Tx+ lead.
3. Connect the RS-232 device SGnd lead to the NMEA device Tx- and Rx- leads.

There are some infrequent cases where binding the NMEA device Tx- and Rx- leads together may cause difficulties. If you do encounter problems, you will need to use an RS-232 to NMEA converter between the two devices. A converter is required in rare cases, but is a good place to begin troubleshooting if problems arise with the RS-232/ NMEA connection. It should be noted that the modern Furuno radar systems do require a converter.

Circuit grounding issues

The most important issue in electrical connections is proper circuit grounding. In addition to all of the other electrical gremlins that poor grounding gives rise to, instrument signals are easily scrambled if they are badly grounded. This results in erratic and unreliable displays. Installations using both AC and DC current have a separate ground circuit for each. In such cases, the checklist that follows will ensure that the ground circuits are kept fully isolated:

- Always use isolating transformers or a separate power-inverter to run PC, monitors and other sensitive electronic instruments or devices.

- Always use an isolating transformer with weather FAX audio cables.
- Always use an RS-232/NMEA converter with optical isolation on the signal lines.
- Always use PC's and other devices that are directly DC powered.

Cables and cable runs

When installing system cables consider the following:

- All cables should be adequately secured, protected from physical damage and exposure to heat. Avoid running cables through bilges or doorways, or close to moving or hot objects.
- Acute bends must be avoided.
- Where a cable passes through an exposed bulkhead or deckhead, a watertight feed-through should be used.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.
- **Do not pull cables through a bulkhead or deckhead using a cord attached to the connector. This could damage the connections.**

Proper cable shielding

For all but the shortest length cable runs, data cables must be shielded to prevent them from picking up electrical noise from other devices, and to keep them from radiating potential interference. If you encounter a data corruption problem, a good place to begin troubleshooting is with the cable shielding, especially on longer cable runs. Make sure the cable shielding hasn't been scraped off by being squeezed through a tight area.

Preventing interference and crosstalk

You should always run data cables:

- as isolated as possible.
- as far away from high current carrying AC and DC power lines as possible.
- as far away from antennas as possible.

While it may be convenient to bundle power and data cables together, this causes crosstalk between them, which results in scrambled and unusable data. If you must cross a power cable when running a data cable, try to make the crossing as close to 90° as possible; never run power and data cables parallel within the same bundle.

If you have long cable runs planned for data cables, and are using NMEA equipment, use a shielded twisted pair cable to eliminate the danger of interference and crosstalk.

Interfacing RNS

Introduction

This section shows you how to connect various instruments and devices that can interface with RNS with systems that use:

- NMEA devices.
- SeaTalk devices.
- hsb² devices.

Connecting RNS to your instruments

The connection between the PC that is running RNS and your instruments is achieved using a 9-pin cable, Raymarine Part No. E86001. One end connects directly to your PC's Serial Port, the other to the various devices.

Connecting directly to a GPS

Connecting RNS to a Global Positioning System (GPS) is the simplest way to get position data.

To connect RNS directly to a GPS:

1. Verify that GPS NMEA output is turned ON.
2. Set the GPS datum to WGS84.
3. Using Raymarine Cable Part No.E86001, connect the cables as follows:

Cable color	GPS lead
Yellow (Rx)	NMEA + output may also be labelled Tx, Tx+, Data out +, or NMEA OUT +.
Black (SGnd)	Not used
Green (Tx)	Not used
Black (SGnd)	NMEA - output may also be labelled TX-, Data out-, NMEA- out, or Ground.

Connecting directly to NMEA equipped instruments

Most instrument systems are equipped to accept incoming NMEA data from your GPS, and will output additional collected NMEA data, such as position, heading, speed, water depth etc.

To connect directly to an NMEA equipped instrument system:

Connect the cables as follows:

Cable color	NMEA instrument lead
Yellow (Rx)	NMEA + output may also be labelled Tx, Tx+, Data out +, or NMEA OUT +.
Black (SGnd)	NMEA - Input may also be labelled RX-, Data In -, NMEA IN-, or Ground.
Green (Tx)	NMEA + Input may also be labelled Rx, Rx+, Data In +, or NMEA IN +.
Black (SGnd)	NMEA - output may also be labelled TX-, Data out-, NMEA- out, or Ground.

Connecting directly to radar

In order for RNS to be able to display variable range markers (VRM's), electronic bearing lines (EBL's) and cursor information, the radar system you use must be able to output the NMEA RSD string.

To display MARPA targets, your radar system must be able to output NMEA TLL or TTM strings. If you are using this feature, make sure your radar system is correctly tracking MARPA targets before connecting it to RNS.

To connect RNS directly to a radar system:

Connect the cables as follows:

Cable color	NMEA instrument lead
Yellow (Rx)	NMEA + output may also be labelled Tx, Tx+, Data out +, or NMEA OUT +.
Black (SGnd)	Not used
Green (Tx)	Not used
Black (SGnd)	NMEA - output may also be labelled TX-, Data out-, NMEA- out, or Ground.

Connecting directly to an autopilot

The following cabling instructions apply to most autopilot systems, however, you should also refer to the Manufacturer's handbook that came with your autopilot.

Your autopilot must support NMEA 2.3 strings APA or APB.

To connect RNS directly to an autopilot:

Connect the cables as follows:

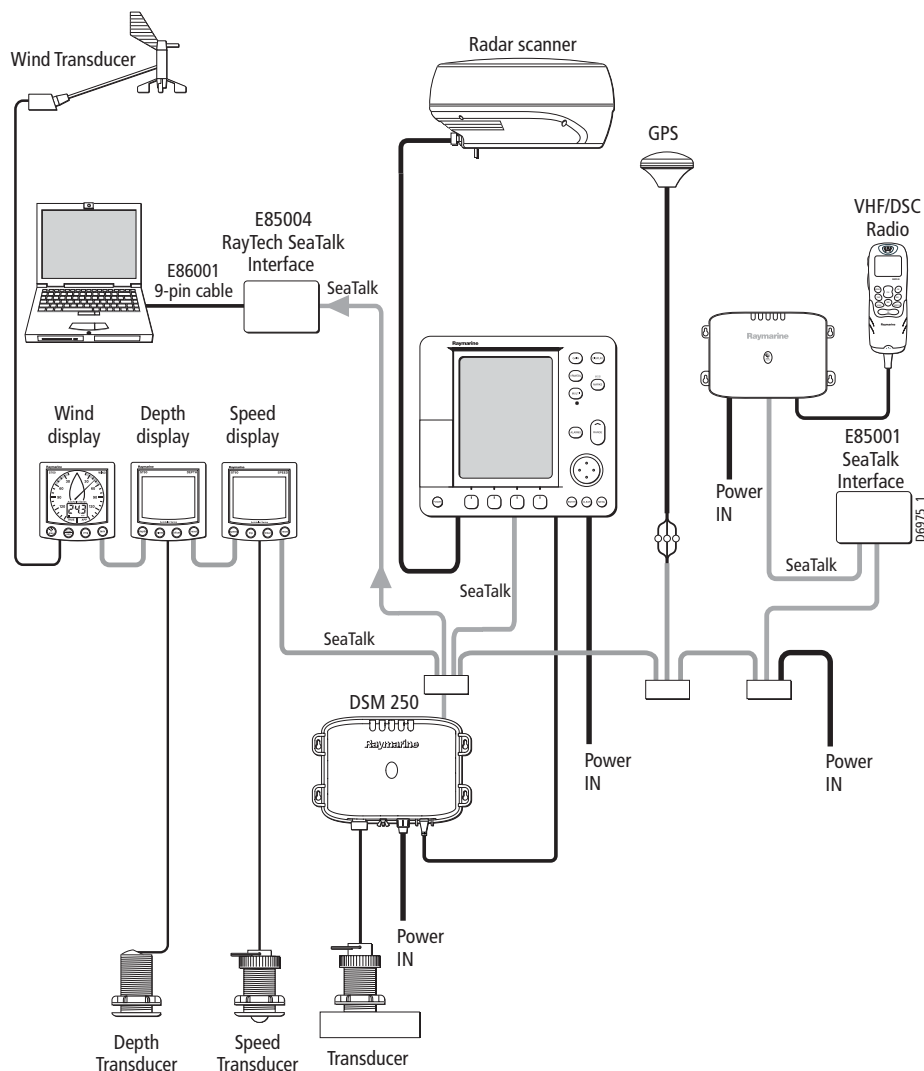
Cable color	Autopilot lead
Yellow (Rx)	Not used
Black (SGnd)	Not used
Green (Tx)	NMEA + Input may also be labelled Rx, Rx+, Data In+, or NMEA IN+.
Black (SGnd)	NMEA - Input may also be labelled Rx-, Data In-, NMEA IN-, or Ground.

Connecting specific instruments and devices

The sections that follow detail how to connect RNS to specific Manufacturer's instruments and devices.

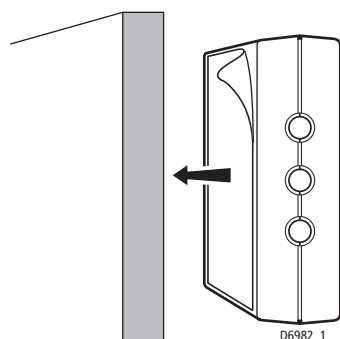
SeaTalk devices

The following drawing shows how to connect an instrument system instruments using the Raymarine SeaTalk data format.



Detailed connection of the 9-pin cable, Raymarine Part No. E 86001, and the SeaTalk system using the RayTech SeaTalk Interface, Raymarine Part No. E85004 is detailed in the following section.

To mount the interface box:



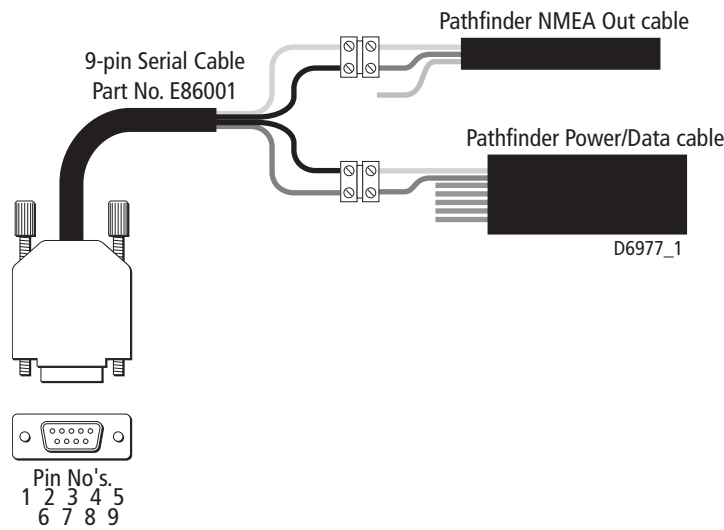
1. Once you have found a suitable location, thoroughly clean the surface with an alcohol based cleaner.
2. Remove the protective backing from the SeaTalk interface box and firmly press on to the mounting surface.
3. Alternatively the interface box may be attached using the two self-tapping screws provided.
4. Remove the top of the interface box by gently squeezing the lid at each end, and pulling it away from the base.
5. Route all the necessary cables into the interface box.
6. Connect the wires as shown in the illustration above.
7. Secure the cables close to the interface box.
8. Replace the top of the box.

RayTech SeaTalk Interface box troubleshooting

If, after connecting your interface box, you have any problems interfacing RNS with your PC the following check list may help cure the problem:

Symptom	Cause	Action
RNS LED unlit	No power supply	Check the SeaTalk bus connectors are correct between the interface box and power supply
SeaTalk LED unlit	Not connected to other SeaTalk products	Check the connections between the interface box and other SeaTalk products
NMEA LED unlit	1. Not connected to PC	Check the connections between the interface box and your PC
	2. RNS application not running	Ensure your PC is functioning correctly and RNS is running
	3. RS-232 port not assigned to instruments	Ensure instrument settings within RNS are assigned to the correct RS-232 port.

Connecting NMEA directly to Raymarine Pathfinder displays:



To connect NMEA directly to Raymarine Pathfinder displays:

Connect the cables as follows:

E86001 serial data cable

Yellow	PC Data IN (+)	Pin 2
Black	PC Data Ground (-)	Pin 5
Green	PC Data OUT (+)	Pin 3

Pathfinder power cable

Yellow	NMEA 1 IN (-)
Orange	NMEA 1 IN (+)
Blue	NMEA 2 IN (-)
Green	NMEA 2 IN (+)
Red	DC power (+)
Black	DC power (-)
Silver	RF Ground

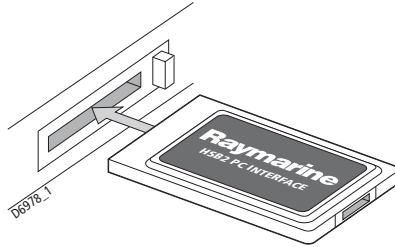
Pathfinder NMEA Out cable

Blue	NMEA OUT (+)
White	NMEA OUT (-)
Silver	Not used

Connecting an hsb² PCMCIA PC kit

To connect an hsb² PCMCIA card to your PC system:

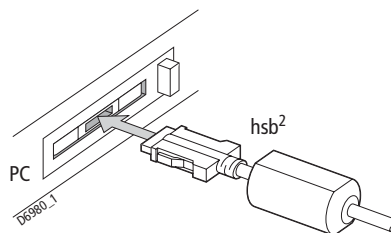
1. Place the RayTech CD-ROM into your computer's CD-ROM drive.
2. Plug your hsb² PCMCIA card into the PCMCIA slot.



The Add New Hardware wizard is displayed.



3. Follow the on-screen instructions.
4. Click *Finish*.
5. Attach the hsb² /PC interface connector to the exposed socket on the PCMCIA card.



6. Attach an hsb² transceiver cable from the hsb²/PC interface to your hsb² system.
7. Ensure that each end of the hsb² chain has an in-line terminator fitted.

PCI to PCMCIA cardbus adapter

Wherever possible Raymarine recommend using a PC with a PCMCIA slot fitted as standard, e.g. a laptop. However, if RNS is being integrated into a desk top PC then it may be necessary to add a Type II compliant PCMCIA adapter. The following are typical installation instructions, but if you experience problems, contact your PC Manufacturer:

1. Install driver CD-ROM supplied with PCMCIA card adapter.
2. Follow the on-screen instructions to install driver software.
3. When the software is successfully installed, shut down and turn off the PC.
4. Open the PC case and plug the PCMCIA card adapter into a spare PCI slot.
5. Close the PC case and power up, as Windows opens the 'Found New Hardware' wizard will appear. Follow the on-screen instructions.
6. Once you have installed the PCMCIA card adapter follow the instructions detailed in *To connect an hsb2 PCMCIA card to your PC system: on page 32*

Connecting to an Autohelm system

The optimum way to connect RNS to a Raytheon Autohelm system is to use the SeaTalk interface, Raymarine Part No. E85004.

To connect RNS directly to an Autohelm system:

Connect the cables as follows:

Cable color	NMEA instrument lead
Yellow (Rx)	RS-232 + output
Black (SGnd)	NMEA - input may also be labelled Rx-, Data IN -, or NMEA IN -, or Ground.
Green (Tx)	NMEA + input may also be labelled Rx, Rx+, Data IN +, or NMEA IN +.
Black (SGnd)	NMEA - output may also be labelled Tx -, Data Out -, NMEA OUT-, or Ground.

Connecting to B & G Instruments

RNS connects to the B & G 290, 390, 690, 790 and 2000 instrumentation systems via the B & G Performance Board. Using the performance board has the advantage of enabling RNS to automatically send data back to the B & G unit for remote display.

For details of how to connect to other B & G instruments, refer to the section NMEA basics *page 22*.

To install RNS to a B & G Performance Board:

1. Install a jumper on the performance board between Pin 7 (RTS) and Pin 8 (CTS).
2. Set the Output Baud Rate setting (cross track error calculation value 2) to 6.4 bps.
Refer to the relevant Manufacturers handbook for instructions.
3. Connect the cables as follows:

Cable color	Performance board pin
Yellow (Rx)	Pin 10
Black (SGnd)	Not used
Green (Tx)	Pin 9
Black (SGnd)	Pin 11

To connect RNS to a B & G NMEA FFD display

Connect the cables as follows:

Cable color	NMEA FFD lead color
Yellow (RX)	Violet (NMEA output)
Black (SGnd)	Not used
Green (Tx)	Not used
Black (SGnd)	Black (Ground)

Connecting to KVH Instruments

RNS connects to KVH instruments via the KVH NMEA box or Race box interface devices. Connecting via the Race box has the advantage of automatically sending RNS data back to the KVH system displays. Using the Race box also requires you to use the NMEA box, because the Race box does not propagate all of the NMEA data.

For details of how to connect to an NMEA box, refer to the section NMEA basics in this appendix.

To connect RNS to a Race box:

Connect the cables as follows:

Cable color	Race box terminal
Yellow (Rx)	NMEA interface terminal 13 (Tx NMEA)
Black (SGnd)	NMEA interface terminal 14 (Negative)
Green (Tx)	Race interface terminal 3 (Rx NMEA)
Black (SGnd)	Race interface terminal 5 (Negative)

Connecting to Ockam Instruments

RNS connects to Ockam instruments via the Ockam Model 050D RS-232 Interface (not supplied). You must also set two switches on the Ockam unit.

You can connect RNS using any Ockam RS-232 interface, however for optimum reliability of data transfer the Model 050D is recommended.

To connect to a Model 050D RS-232 interface:

1. On the interface, set switch *S1* to **4**.
2. Set switch *S2* to **D**.
3. Connect the cables as follows:

Cable color	Ockam 050D pin
Yellow (Rx)	Pin 4
Black (SGnd)	Not used
Green (Tx)	Pin 2
Black (SGnd)	Pin1

Connecting a USB C-Card Reader

This section describes connecting a USB C-Card reader to your PC system.

To install a USB C-Card reader to your PC:

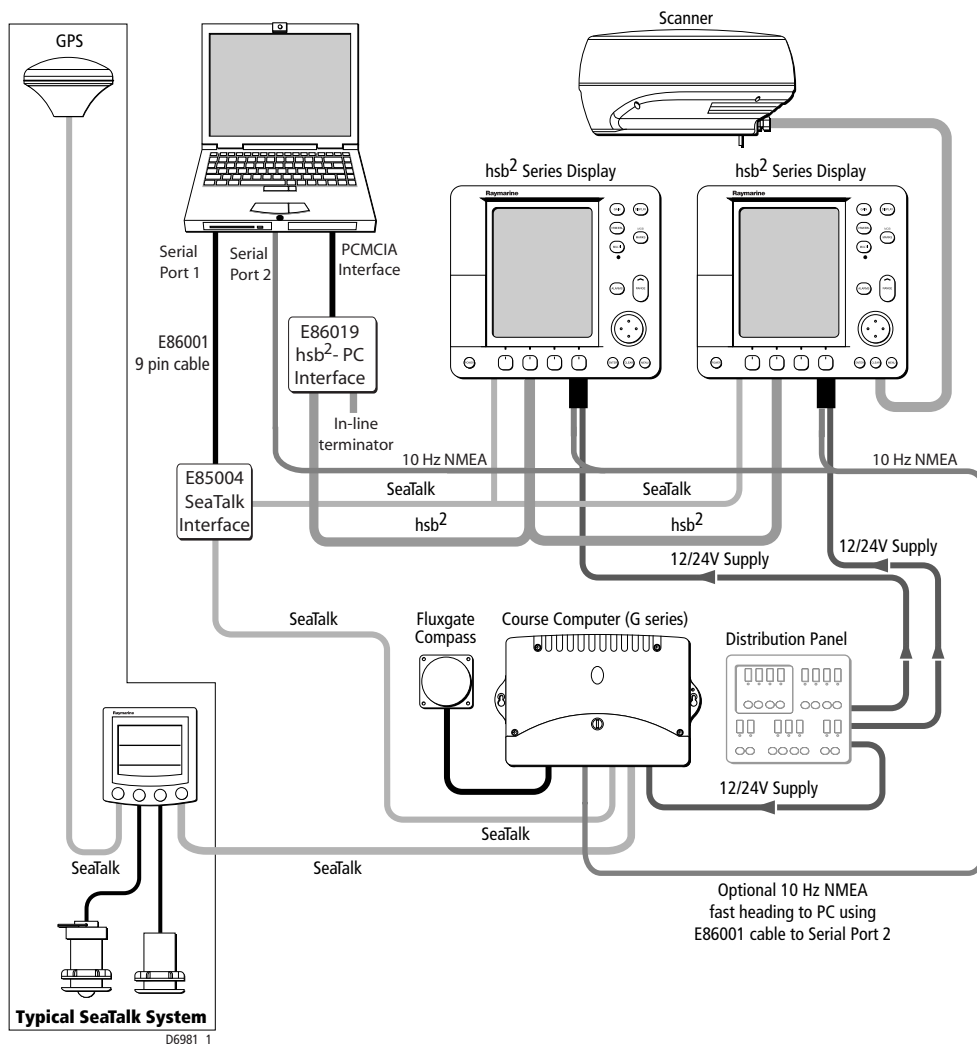
1. Plug your C-Map USB C-Card reader into your computer.
2. Click *Start* on the computer taskbar. The pop-up menu is displayed.
3. Click *Control Panel*. The control panel is displayed.
4. Click *Add/Remove Hardware*. The Add/Remove Hardware wizard is displayed.



5. Click Next. Follow the on-screen instructions.

Fully integrated system

The following illustration shows an example of a fully integrated system using SeaTalk, hsb² and NMEA connections to pass data to and from RNS.



Integrated system checks

When RNS is installed on your PC and connections have been made to hsb² and SeaTalk, carry out the following checks:

General

Power up the whole system including PC, hsb² displays, instruments and any other navigation equipment that is connected to the system.

SeaTalk

1. Check GPS setup page on one of your Raymarine hsb² displays and ensure that there is a FIX.
2. Select the chart screen on RNS and click *Find Vessel*. Make sure that the vessel symbol is centered on the screen in the correct location. If it is not check all SeaTalk connections.
3. Check Nav data (a half- screen data page) on a Raymarine hsb² display. This should show available SeaTalk data from instruments (wind, speed, depth, etc.) and auto-pilot (heading, rudder position, pilot status, etc.).
4. Select suitable databoxes on RNS and ensure all SeaTalk data is displayed.

hsb²

1. Check on one of your Raymarine hsb² displays that all the expected options (chart, radar, sonar) are available by pressing the **DISPLAY** button.
2. Set up RNS to show all of the same options as listed in 1. Make sure the radar and sonar picture match from your hsb² display to RNS. If they do not, check all hsb² connections.
3. Chart data can be shared via hsb². With a chart cartridge installed in a Raymarine hsb² display, check that the same cartography is displayed on RNS.

On the RNS chart page, turn raster charts OFF, and C-Map ON. Click the *RANGE* button to zoom in and check that the chart data is correct.

Technical support

Introduction

Raymarine provides a comprehensive customer support service, on the world wide web, through our worldwide dealer network and by telephone helpline. If you are unable to resolve a problem, please use any of these facilities to obtain additional help.

World wide web

Please visit the Customer Support area of our website at: **www.raymarine.com**.

As well as providing a comprehensive Frequently Asked Questions section and servicing information, the website also gives e-mail access to the Raymarine Technical Support Department and details of the locations of Raymarine agents, worldwide.

If you don't have access to the world wide web, contact Technical Support where specialists are available to answer questions about installing, operating and troubleshooting all Raymarine products.

Help us to help you

When requesting service, please quote the following product information:

- Equipment type(s).
- Model number(s).
- Serial number(s).
- Software version number(s).

Contacting Raymarine in the US

You can contact Raymarine in the US using the previously detailed world wide web or by calling one of the telephone numbers below:

Accessories and parts

You can obtain Raymarine accessories and parts directly from your authorized Raymarine dealer.

However, if your Raymarine dealer does not have the item you want, contact Raymarine Technical Services at:

1-800-539-5539, extension 2333, or
(603)- 881 - 5200

You can use these numbers Monday through Friday 0815 hrs to 1700 hrs Eastern Standard Time or Eastern Daylight Savings Time.

If you are not sure which item is appropriate for your system or unit, you should first contact the Technical Support Department to verify your requirements at:

1 - 800 - 539 - 5539, extension 2444, or
(603) - 881 - 5200

Product repair and service

In the unlikely event that a Raymarine unit should develop a problem, contact your authorized Raymarine dealer for assistance. The dealer is best equipped to handle your service requirements and can offer timesaving help in getting your equipment back into normal operation.

If repairs cannot be obtained conveniently, you can obtain product service by returning the unit to:

Raymarine Product Repair Center,
22 Cotton Road, Unit D,
Nashua, NH 03603 - 4219

The Product Repair Center is open Monday through Friday 0815 hrs to 1700 hrs Eastern Standard Time or Eastern Daylight Savings Time.

All products returned to the Repair Center are registered upon receipt and a confirmation letter is sent to acknowledge the repair status and the reference number of the product.

We will make every effort to carry out the repair and return your unit as quickly as possible.

Contacting Raymarine in Europe

You can obtain technical support, service and accessories from your authorized Raymarine dealer, or by contacting:

Raymarine Limited
Anchorage Park
Portsmouth
PO3 5TD
England
Tel: +44 (0)23 9271 4713
Fax: +44 (0)23 9269 4642

List of Abbreviations

Abbreviation	Definition
AC	Alternating Current
CAN	Controller Area Network
CD	Compact Disc
DC	Direct Current
DDS	Differential Data Signal
DGPS	Differential Global Positioning System
EBL	Electronic Bearing Line
EMC	Electromagnetic Compatibility
GHz	Giga Hertz
GPS	Global Positioning System
GRiB	GRidded Binary
GUI	Graphical User Interface
m	meters
mA	milli Amperes
MARPA	Mini Automatic Radar Plotting Aid
MB	Mega Bytes
MHz	Mega Hertz
NMEA	National Marine Electronics Association
NOAA	National Oceanographic and Atmospheric Association
PC	Personal Computer
RAM	Random Access Memory
ROM	Read Only Memory
Rx	Receive
SSB	Single Side Band
SST	Sea Surface Temperature
Tx	Transmit
USB	Universal Serial Bus
VHF	Very High Frequency
VRM	Variable Range Marker

