

Users Manual For Nokia

FCC ID: NPD-R240-V01

The device incorporates a host control device manufactured by Nokia into which a Symbol PCMCIA radio LAN card is installed.

The following Users Manuals are included:

- 1) Manual from Nokia for End User
- 2) Manual from Nokia for Professional Installation
- 3) Manual from Nokia for User Installation

Wireless Router User Guide

Introduction

Your Nokia RoofTop Wireless Router is a revolutionary new product, providing you with broadband internet access using advanced wireless technology. Your wireless router is part of an interconnected wireless network, communicating with other wireless routers in your neighborhood using unlicensed 2.4 BHz radio spectrum.

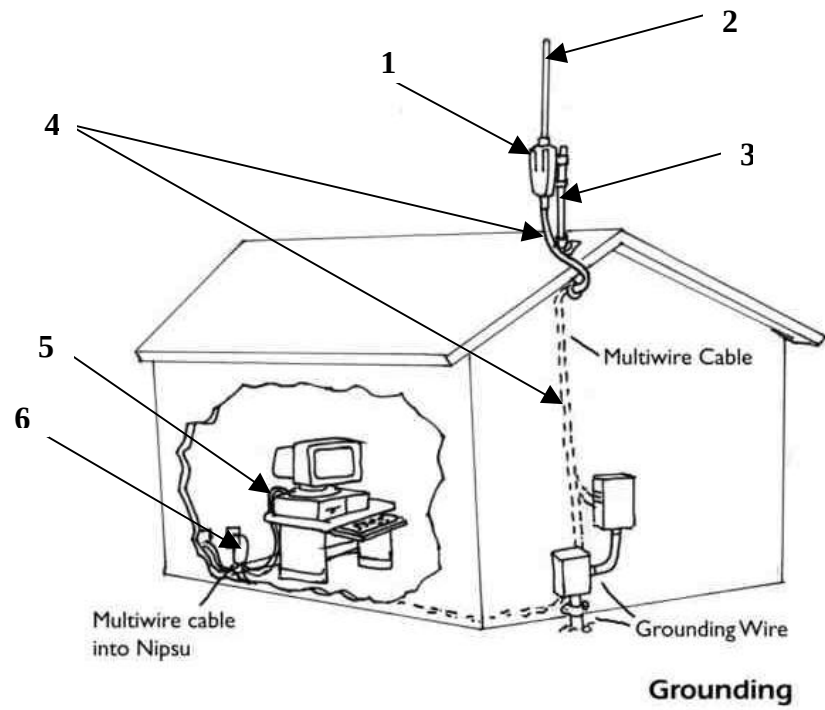
Your Nokia RoofTop Wireless Router not only provides you with fast “always-on” internet access, but is also an integral part of the network infrastructure. Some routers may rely on others to reach the internet. For this reason it is very important that you always keep your router powered ON, even if you are not using it. Your router may be forwarding and routing traffic for other routers in the network.

Components of your Nokia RoofTop Wireless Router system

Your wireless router system consists of:

1. Wireless router with integral antenna
2. Antenna mount
3. Multiwire cable connecting the wireless router and the Network/Power Unit

4. Ethernet cable
5. Network/Power Unit



Warnings and Safety Instructions

Important User Information

The Nokia RoofTop Wireless Router was designed and manufactured to meet strict quality and safety standards. It complies with the FCC rules, Part 15, Part 68 and with 21 CFR 1040.10 and 1040.11.

Some routers may rely on others to reach the internet. It is very important that your wireless router is always powered ON, even when you are not using it, as it may be forwarding and routing traffic for other routers in the network. For this reason, do not unplug your Network/Power Unit.

Instructions

- Read and follow all safety and operating instructions
- Heed all precautions and warnings in the instructions and on the equipment
- Keep instructions for future use

Hazard Warnings

- ?? **Environment** - Do not place the Network/Power Unit in a very cold, dusty, wet or high humidity environment. The unit should be situated away from all heat sources such as radiators, heat registers, stoves, amplifiers and other heat producing appliances.
- ?? **Fire or Electric Shock** - Do not expose the Network/Power Unit to any type of moisture, including rain. Do not use or install near water-related environments such as sinks, bathtubs, laundry areas, spas, swimming pools, or in wet basements. Take care not to spill any liquids on the unit.
- ?? **RF Exposure** – Disconnect power from the wireless router when working within 7 inches (16 cm) of the antenna

Grounding

- Be sure the wireless router and antenna system is grounded to provide protection from voltage surges and built-up static charges. Section 810 of the National Electrical Code ANSINFPA No 70-1984 provides information about proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, connection to grounding electrodes and requirements

for the grounding electrode. All grounding should be performed by a professional.

Accessories

?? Use only Nokia approved accessories for all installations.

Cleaning the Unit

?? Clean the Network/Power Unit with a dry cloth or paper towel. Do not use any liquids to clean the unit.

Mounting the Network/Power Unit

?? Install the Network/Power Unit to a grounded AC-outlet.

?? Place the cables so that they are not likely to be walked on or pinched by items placed on or against them. Pay particular attention to the point where cords and plugs exit the unit.

Interference

?? The wireless router can cause interference to (and interfere with) other devices operating in the 2.4 to 2.4835 GHz radio spectrum.

Service Only by Qualified Service Personnel

?? Do not open the unit or reconfigure the software.

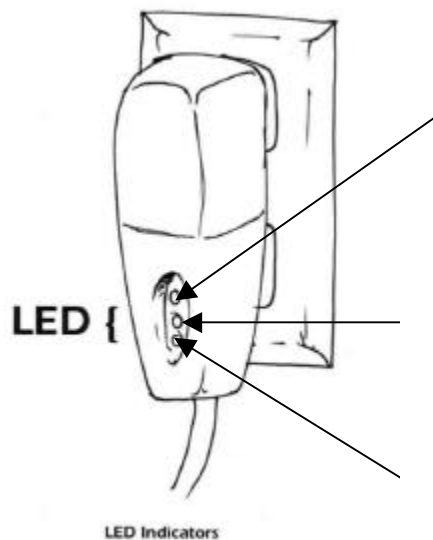
?? Do not attempt to service the wireless router or the Network/Power Unit.

?? The system should be serviced only by qualified service personnel.

Network/Power Unit

Front Panel

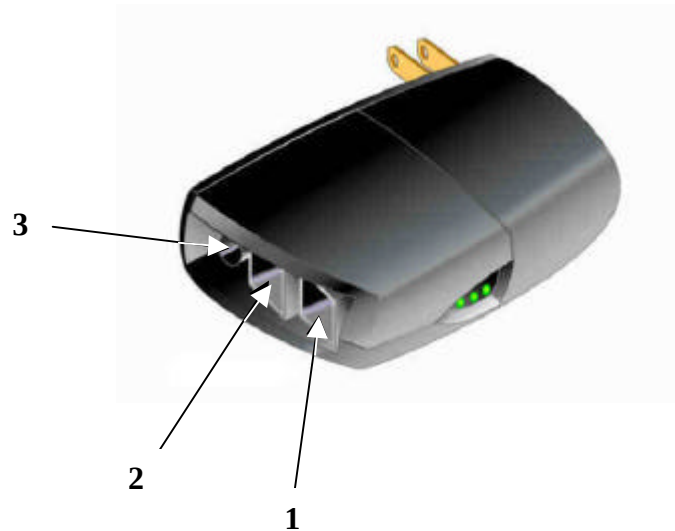
Your Network/Power Unit has LEDs which indicate the functioning of your unit. If you are experiencing problems with your wireless router, call your Internet Service Provider's service desk. The service personnel may ask you to refer to the LEDs on the Network/Power Unit. When you call, make sure you can see the LEDs to be able to give the information to the service personnel.



1. **PWR/ LAN** - shows the local area network activity and that the unit power is "ON"
2. **Anchor:** - shows the status in the network and gives wireless link information; if this light is off you may not have a connection to the internet

3. Network

Bottom Panel Connections



Bottom Panel Connections

1. **HomePNA 2.0 interface:** A standard phone jack (RJ-11)
2. **Ethernet interface:** A standard 10/100 BaseT Ethernet jack (RJ-45)
3. **Router outdoor unit connection :** This connector connects directly to your outdoor wireless router.

Connecting the Wireless Router to Your PC, LAN or Home PNA

Your wireless router is capable of providing internet access for a single PC via a direct connection or to multiple PCs via Local Area Network (LAN) or via Home PNA.

Direct Connection: When you connect your wireless router to a single PC, connect the Ethernet port on the Network/Power Unit and the network interface on your PC “crossover” Ethernet cable.

LAN Connection: When you connect your wireless router to multiple PCs via a hub, router, or switch, use standard “straight-through” Ethernet cables throughout the entire network.

Home PNA Connection: When you connect your wireless router to multiple PCs via home PNA, use standard Ethernet cables between the Network/Power Unit’s home PNA connection and the RJ11 phone jack. You can also connect the cable directly to your PC’s home PNA adapter.

The router automatically activates the Ethernet or home PNA, depending upon which connector is used. If a cable is connected to both connectors, the Ethernet port is activated.

Technical Support

Nokia provides technical support only for network operators and authorized resellers. Your Internet Service Provider (ISP) provides technical support for subscribers to a Nokia network. If you experience problems with your service or have any questions regarding the performance of your wireless router, please contact the ISP that is providing your internet service.

Disclaimer

Nokia is the manufacturer of the wireless router and provides no warranty service and repair. Nokia RoofTop wireless routers are provided "AS IS" with no warranty.

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If you experience any problems or malfunction of the wireless router, please contact the ISP that is providing your internet service.

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TRADEMARKS

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Other products mentioned in this document are trademarks or registered trademarks of their respective holders.

REGULATORY INFORMATION

Compliance in the United States

Emission Standards

UNINTENTIONAL EMISSIONS: FCC Part 15 CLASS B

INTENTIONAL EMISSIONS: FCC Part 15, Section 15.247

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 communications. However, there is no guarantee that interference will not occur in a particular installation.

Connection to telephone network

FCC Part 68

This equipment complies with Part 68 of the FCC Rules. The FCC Part 68 Label is located on the rear panel of the Network/Power Unit. This label contains, among other information, the FCC Registration Number and Ringer Equivalency Number (REN) for this equipment. You must, upon request, provide this information to your telephone company. The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all those devices ring when your telephone number is called. In most but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

Connection to the telephone network should be made by using standard modular telephone jacks, type RJ11. The plug and/or jacks used must comply with FCC Part 68 rules. If your telephone equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance, but if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper

functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

Compliance in Canada

Emission Standards

Canadian compliance (Industry Canada) When tested with at least one intended host: This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment entitled "Digital Apparatus", ICES-003 of the Canadian Department of Communications.

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Class B prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministre Canadien des Communications.

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REN: See the equipment for REN information.

Wireless Router User Guide

Introduction

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Components of your Nokia RoofTop Wireless Router system

Your wireless router system consists of:

1. Wireless router with integral antenna
2. Antenna mount
3. Multiwire cable connecting the wireless router and the network interface and power supply unit

-
- Diagram illustrating the correct grounding of a computer system. A house is shown with a computer inside. A multiwire cable (labeled 4) enters the house through the roof (labeled 1) and is grounded (labeled 2) outside. The multiwire cable is then run down the side of the house (labeled 3) and grounded (labeled 5) near the computer. The multiwire cable is then run into the computer (labeled 6). The diagram is labeled "Grounding".

Grounding

Warnings and Safety Instructions

Important User Information

The Nokia RoofTop Wireless Router was designed and manufactured to meet strict quality and safety standards. It complies with the FCC rules, Part 15, Part 68 and with 21 CFR 1040.10 and 1040.11.

This wireless router and its associated components are class B devices that must be installed and/or moved by a professional .

Some routers may rely on others to reach the internet. It is very important that your wireless router is always powered ON, even when you are not using it, as it may be forwarding and routing traffic for other routers in the network. For this reason, do not unplug your network interface and power supply unit .

Instructions

- Read and follow all safety and operating instructions
- Heed all precautions and warnings in the instructions and on the equipment
- Keep instructions for future use

Hazard Warnings

- ?? **Environment** - Do not place the network interface and power supply unit in a very cold, dusty, wet or high humidity environment. The unit should be situated away from all heat sources such as radiators, heat registers, stoves, amplifiers and other heat producing appliances.
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Accessories

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Cleaning the Unit

?? Clean the network interface and power supply unit with a dry cloth or paper towel. Do not use any liquids to clean the unit.

Mounting the Wireless Router Network Interface and Power Supply Unit

?? Install the network interface and power supply unit to a grounded AC-outlet.

?? Place the cables so that they are not likely to be walked on or pinched by items placed on or against them. Pay particular attention to the point where cords and plugs exit the unit.

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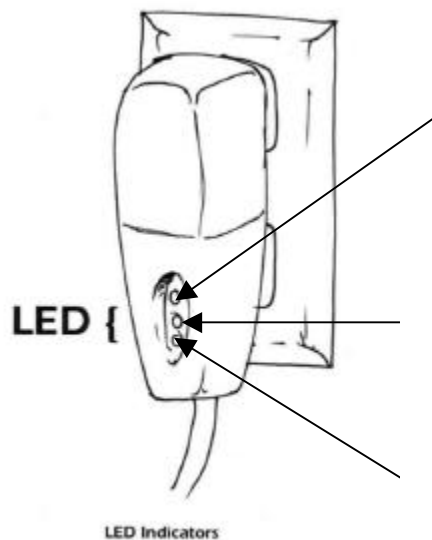
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?? The system should be serviced only by qualified service personnel.

Network Interface & Power Supply Unit

Front Panel

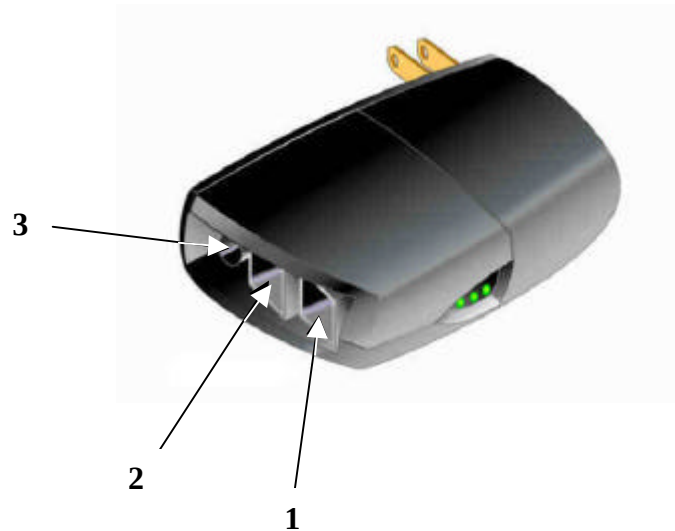
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Technical Support

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Disclaimer

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If you experience any problem or malfunction of the wireless router, please contact the ISP that installed the equipment.

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REGULATORY INFORMATION

Compliance in the United States

Emission Standards

UNINTENTIONAL EMISSIONS: FCC Part 15 CLASS B

INTENTIONAL EMISSIONS: FCC Part 15, Section 15.247

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 communications. However, there is no guarantee that interference will not occur in a particular installation.

Connection to telephone network

FCC Part 68

This equipment complies with Part 68 of the FCC Rules. The FCC Part 68 Label is located on the rear panel of the NIPSU unit. This label contains, among other information, the FCC Registration Number and Ringer Equivalency Number (REN) for this equipment. You must, upon request, provide this information to your telephone company. The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all those devices ring when your telephone number is called. In most but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

Connection to the telephone network should be made by using standard modular telephone jacks, type RJ11. The plug and/or jacks used must comply with FCC Part 68 rules. If your telephone equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance, but if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper

functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

Compliance in Canada

Emission Standards

Canadian compliance (Industry Canada) When tested with at least one intended host: This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment entitled "Digital Apparatus", ICES-003 of the Canadian Department of Communications.

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Class B prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministre Canadien des Communications.

Connection to telephone network

Notice: The Industry Canada (IC) label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical document(s). The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by a user to this equipment, or equipment malfunctions, may give the telephone communications company cause to request the user to disconnect the equipment.

Notice: The Ringer Equivalent Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

REN: See the equipment for REN information.

This equipment must be installed by a professional installer.

Manual – Professional Installation



Nokia RoofTop™ Wireless Router (R240/ R240A) Hardware Installation Guide

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IMPORTANT NOTE TO USERS

This device has been certified as an intentional radiator (transmitter) which requires that it is installed and/or moved by a trained professional.

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Other products mentioned in this document are trademarks or registered trademarks of their respective holders.

COMPLIANCE STATEMENTS

This hardware complies with the standards listed in this section.

Compliance in the United States

Emission Standards

UNINTENTIONAL EMISSIONS: FCC Part 15 CLASS B

INTENTIONAL EMISSIONS: FCC Part 15, Section 15.247

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- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and 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.

Any modifications made to the unit, unless expressly approved by Nokia could void the user's authority to operate the equipment.

FCC Rules and Regulations - Part 68

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Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to tariffs.

If trouble is experienced with this unit, for repair or warranty information, please contact customer service at the address and phone listed below. If the equipment is causing harm to the network, the telephone company may request that you disconnect the equipment until the problem is resolved.

DO NOT DISASSEMBLE THIS EQUIPMENT. It does not contain any user serviceable components. Attn: CUSTOMER SERVICE DEPT.

Compliance in Canada

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REN: See the equipment for REN information.

DISCLAIMER:

TO THE INSTALLER: THE INSTRUCTIONS PROVIDED IN THIS GUIDE ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND EXPRESS OR IMPLIED. NOKIA MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR INFRINGEMENT, INCLUDING ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS OR OTHER RIGHTS. THERE IS NO WARRANTY BY NOKIA THAT THE INSTRUCTIONS CONTAINED IN THE GUIDE WILL MEET YOUR REQUIREMENTS. THERE IS NO WARRANTY BY NOKIA THAT THE INSTRUCTIONS AND STATEMENTS CONTAINED IN THE GUIDE OR ITS CONTENT ARE TRUE, ACCURATE OR COMPLETE.

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1.1 Introduction

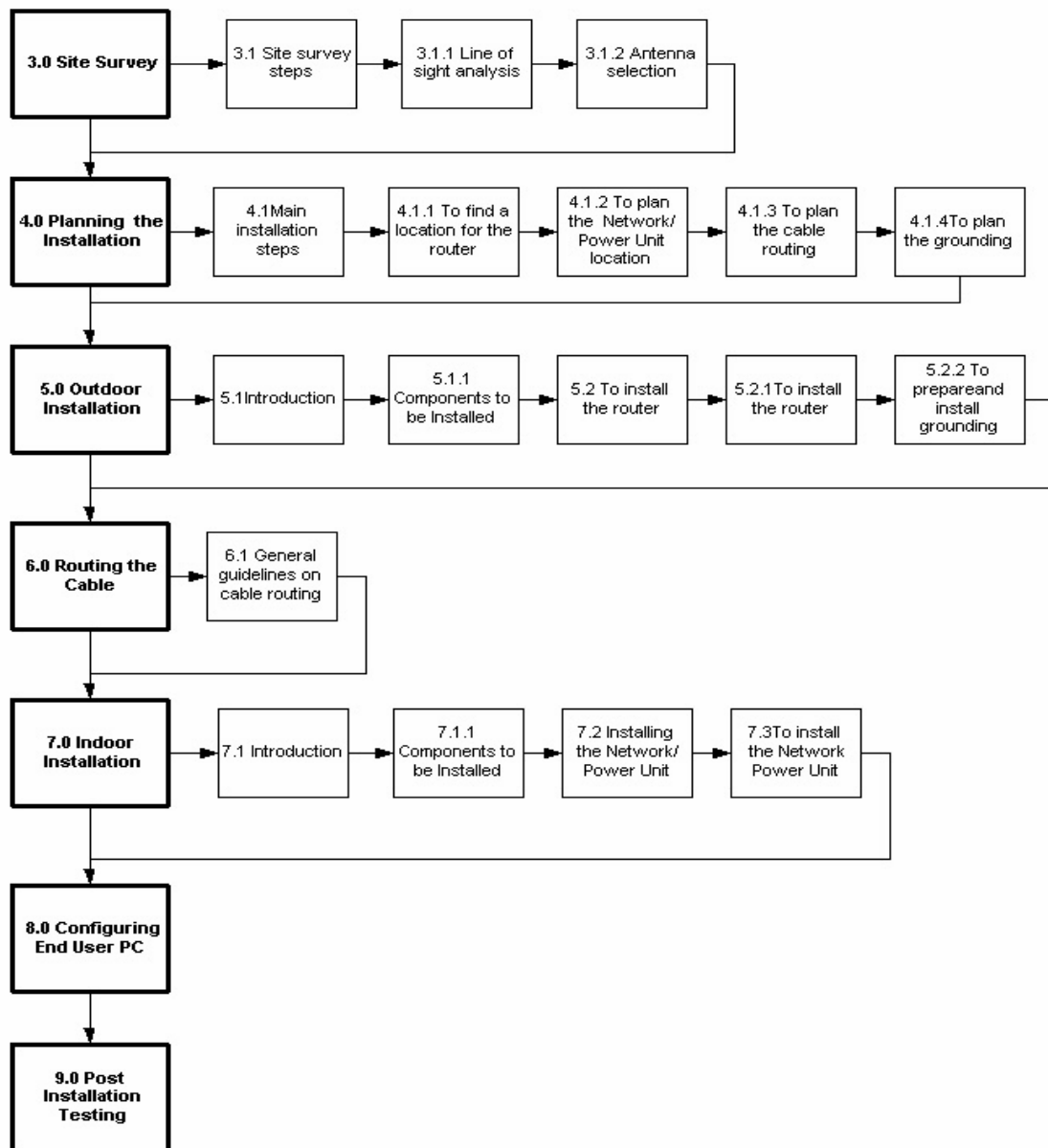
This document explains the procedures necessary to install the Nokia Rooftop Wireless Router.

In addition to the installation instructions, this document also describes the tasks required prior to installation. The actual instructions for installation commence in Chapter 5.0

1.1.1 Task flowchart

Shown below is a flowchart outlining the tasks required for the installation. It is also intended to assist in quickly locating the principal topics within this document. You can find detailed descriptions under their corresponding topics.

NOTE: The Nokia RoofTop Wireless Router has to be pre-configured by the Internet Service Provider prior to installation. If pre-configuration has not been carried out, the router will not function.





2.1 Introduction

It is important, when installing the Nokia Wireless Router, that the unit is not installed where it could be either damaged by its environment, or pose a hazard for the user. In this respect, when installing the unit be aware of the following Hazard Warnings and Regulatory Safety Requirements

2.2 Hazard warnings

- **Environment** - Do not place the Network Power Unit (NPU) in a very cold, dusty, wet or high humidity environment. The unit should be situated away from all heat sources such as radiators, heat registers, stoves, amplifiers and other heat producing appliances.
- **Fire or electric shock** - Do not expose the NPU to any type of moisture, including rain. Do not use or install near water-related environments such as sinks, bathtubs, laundry areas, spas, swimming pools, or in wet basements. Take care not to spill any liquids on the unit.
- **Use extreme caution** when installing antennas in areas with overhead power lines. Outdoor antennas and their supporting masts, guy wires, and cables are electrical conductors. Contact with high-voltage electrical wires can cause serious injury or death.
- **Because antennas and wireless routers** are elevated metal objects with connections to ground, they attract lightning. Attach an effective ground to the antenna and router to provide a safe path for the lightning.

2.3 Regulatory safety requirements

- **RF exposure** - detailed regulatory and safety requirements for RF exposure are available in Appendix C.
- **The antenna** - detailed regulatory and safety requirements for antennas is available in Appendix C.
- **Co-location** - In order to avoid degradation of performance, it is recommended that the antennas be placed at least one meter (3 feet) apart.
- **The Nokia RoofTop™ Wireless Router** and its associated components must be installed and configured by a trained professional.

NOTE: Awaiting table from Nokia SMEs



3.1 Site survey steps

NOTE: The Site Survey information is provided for use by the Internet Service Provider and is carried out by the ISP prior to installation. It is not necessary for the purposes of the actual hardware installation.

The goals of a site survey are to determine the feasibility of RF links at each site and to determine the antenna and cable requirements.

1. Determine the feasibility of RF links to other sites.

If the site has good links to other sites, it can be used as a forwarding system for other wireless routers in the network. If the router can link to one other router, it will be able to access the internet, but it will be unable to forward signals to other wireless routers.

Determine the RF path between the antenna at the site and the antennas at other, adjacent sites. For a directional link with a single antenna, there is only one RF path. For an omnidirectional antenna, determine all RF paths. The RF path can be determined by knowing the relative bearing from the current site to adjacent sites.

The feasibility of an RF link can be estimated based on:

- Distances between potential sites
- Line of sight for RF paths
- Antenna RF gains
- Cable and connector losses

2. Survey all obstructions to potential sites

Wherever possible, use an omnidirectional antenna. This ensures maximum connectivity and allows the system to forward “packets” of information for existing and future needs.

If the router requires a single link to another router, use a directional antenna.

(See also Section 3.1.1 Line of sight, below)

3. Select the antenna type to be used

The wireless router is supplied with an omnidirectional antenna, but on rare occasions a directional antenna may need to be used, depending on area and topography.

(See also Section 3.1.2 Antenna selection, below)

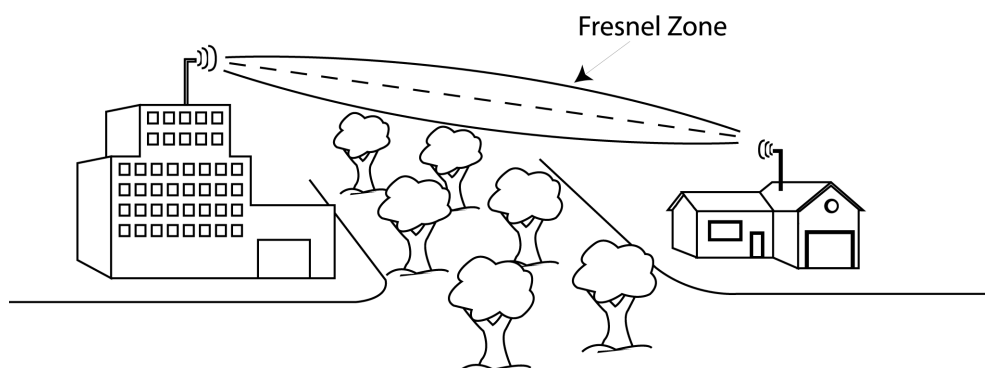
3.1.1 Line of sight analysis

3.1.1.1 Introduction

In order for the Nokia Wireless Router network to operate correctly, there must be line of sight paths for each link.

Determine that there is a visual line of sight and a radio line of sight between the router to be installed and its neighboring routers.

It is recommended that each router has a line of sight to at least **2** other routers to enable several options to route internet traffic to the airhead.



Line of Sight and Fresnel Zone - Illustration

Visual line of sight

Visual line of sight exists when an imaginary straight line can be drawn between two antennas without passing through any physical obstructions. Verifying visual line of sight is the first step in planning the Nokia Wireless Router System installation. Observation points must be high enough to allow the viewer to see over ground based obstructions.

Radio line of sight

A radio wave is not like a laser with a narrow, pointed beam. RF waves fan out from a single source and are diffracted or absorbed by objects that are near the visual line of sight. This area is called the Fresnel Zone. Clear radio line of sight exists when there are no physical obstructions in the Fresnel Zone. It is therefore essential that there is a clear radio path by raising the antenna as high as possible and away from objects near the radio path.

NOTE: An example of the Fresnel Zone dimensions is, for a one quarter mile link, the Fresnel Zone is approximately $7\frac{1}{2}$ feet above and below the line of site. Therefore the height of the antenna must clear the Fresnel Zone. For very short distances, wooden structures and non metallic objects have little effect on the RF signal. For long distance paths, there should be no obstacles close to the RF path.

3.1.1.2 To determine line of sight

1. Access the rooftop using a safe ladder, either tied or held by another surveyor.
2. Scan the other rooftops in the location. Ensure line of sight ensuring that other routers can be seen from the selected vantage point.

NOTE: The router being installed may be the first in the area. If this is the case, ensure that the other rooftops in the area can be seen from the selected vantage point.

3. If it is not possible to see other routers/ rooftops, it may be necessary to install the router on an adjoining tall structure, or to install a mast.

3.1.2 Antenna selection

3.1.2.1 General

In most installations, it is not necessary to be concerned about antenna selection. The Nokia Wireless Router is supplied with an omnidirectional antenna which is good for most installations.

For very specific cases, it may be necessary to use a directional antenna. The following explanations describe the two types of antenna and the special circumstances in which the directional antenna may be used.

3.1.2.2 Omnidirectional antennas

Omnidirectional Antennas radiate their RF pattern spherically, providing coverage in all directions. These are best suited for multipoint links and are used at all forwarding sites.

Omnidirectional antennas are the preferred solution to most installations.



Omnidirectional Antenna - RF Radiation Pattern

3.1.2.3 Directional antennas

Directional Antennas focus the RF beam in narrow patterns in one direction and provide communication over greater distances than omnidirectional antennas, but they are limited in the areas they cover.

NOTE: Directional antennas are useful for long distance or point-to-point contacts, but prevent future growth of the network, by preventing the wireless router from repeating signals to other units. They should be used only when where an omnidirectional antenna will not work.



Directional antennas - radiation pattern side view

In Nokia Wireless Router Networks, use a directional antenna only if:

- There are numerous obstructions in the area
- The nearest router is a considerable distance away
- The router is in a location where it does not need to route traffic for other subscribers and itself requires a maximum link distance to the neighboring router.

3.1.2.4 Notes on antenna polarization

Polarization refers to the direction of antenna element alignment. For antennas to properly communicate with each other, all antenna must be aligned (polarized) in the same direction.

- **Omnidirectional antenna**

This vertically polarized antenna can only be mounted vertically.

- **Directional antenna**

- Polarization is identified by an arrow on the rear panel
- Radiates from the front side and away from the mounting bracket
- Can be vertically or horizontally polarized

If you have a combination of vertical omnidirectional antennas and directional antennas, the directional antennas must be polarized vertically.

4.1 Main installation steps

The complete wireless router installation consists of five basic steps:

- 1.** The Nokia roofTop Wireless Router
- 2.** The Multiwire connection (between the router and the Network/ Power Unit)
- 3.** The Network/ Power Unit
- 4.** The grounding (where required)
- 5.** The indoor connections between the Network/Power Unit and the computer(s) in the property.

NOTE: Digital picture of components to be inserted here

When planning the installation the following needs to be considered:

- The hardware and tools required to complete the installation.
- Wireless router installation location.
- Multiwire routing between the router and the NPU.
- The power source location for the NPU.
- The routing path for the ethernet cabling.
- Antenna grounding and lightning arrestor requirements.

A full list of tools required for installation is available in Appendix D

4.1.1 To find a location for the router

When planning the location of the router the highest point on the roof should be used to ensure a clear line of site. Existing structures like chimneys, pipes, tv antenna poles etc should be used for mounting the router. Only if there is no suitable mounting point, should a mounting pole be used.

Height of the antenna is often limited to physical limitations of the site. For example, an antenna mast can be placed on a rooftop or installed on an existing structure or tower. Avoid using a mast if at all possible, but be sure that the antenna clears the roof line.

It is acceptable to use the TV antenna pole already installed. If the TV antenna is used, be sure to loosen the antenna mounting, slide the TV antenna down the pole leaving sufficient room to mount the router at the top of the pole.

4.1.2 To plan the Network/Power Unit location

The Network/ Power Unit can only be physically located by being plugged into an AC outlet. When locating the AC outlet for the Network/ Power Unit consider:

- The location of the customers PC - the Network/ Power Supply should be located as close to the PC as possible
- The route of the multiwire cabling
- The proximity of a telephone connection point (where applicable for HomePNA)

4.1.3 To plan the cable routing

- Take into account the customers wishes for cable routing
- Avoid pipes, downspouts and possible areas which may abrade the cabling.

For further details see Chapter 6, Routing the cable into the property.

4.1.4 To plan the grounding

Test the existing grounding system at the property. Where the existing grounding is not acceptable, consider...

- Route of the grounding cable from the router, avoiding other pipes, down spouts etc
- Location for the grounding rod



5.1 Introduction

5.1.1 Components to be installed

The Outdoor portion of the Nokia RoofTop Wireless Router system comprises:

- Wireless router with integral antenna
- Grounding kit for router (if required)
- Router mounting hardware
- Antenna (if non-integral) and mounting hardware
- A shielded multiwire cable containing 7 twisted pairs of wires. This is used to connect the wireless router with the NPU. Nokia provides several different lengths of cable with D-Connectors already installed to the end of the cable. The multiwire cable must be Cat-5 cable, size AWG 22 or 24.
- Flexible RF cable in the case of non-integral antenna (see below)
- RF Cable adaptor, Nokia Code WR 46899A (see below)

-
- “Wall plate” for cable feed-through into house. - **Check with Petri**

5.1.1.1 RF-cable for non-integral antenna

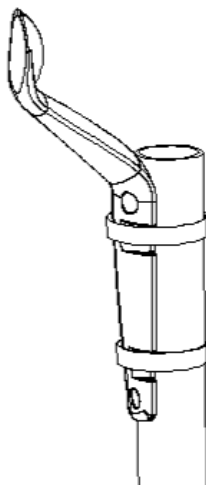
Nokia provides a flexible jumper cable for the connection between a router and a directional antenna.

NOTE: When using an RF cable instead of the integral antenna, a special RF adapter must be used (Nokia Code: WR 468993A).

5.2 To install the router

1. Mount the wireless router bracket to the mounting point, ensuring that the bracket is fixed securely. Where the installation is for a directional antenna, mount the router bracket approximately 18 inches below the top of the mast.

NOTE: For directional antenna information, see Section 5.2.1 Directional antenna.



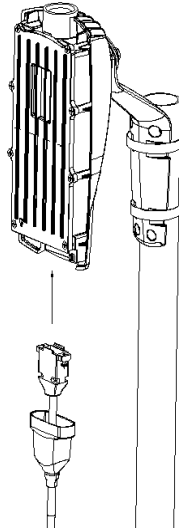
Router bracket fixed to mast

-
2. Attach the omnidirectional antenna by screwing it into the top of the wireless router. Carefully guide the antenna down onto the RF pin to prevent the pin being bent out of shape. Ensure secure connection, but do not overtighten (**Definition of “overtighten”**).



Attach the omni-directional antenna

3. Connect the multiwire connection to the D-Connector in the bottom of the wireless router. Tighten the two screws on the connector and slide the rubber sleeve over the connections to prevent the ingress of water.

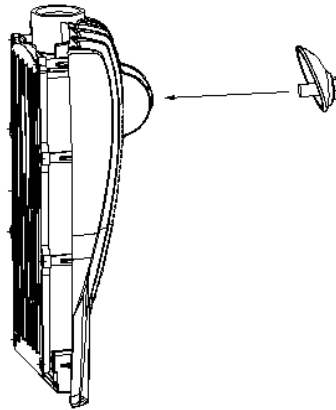


Attach multiwire connection and Ground wire

NOTE: Take care when tightening the D-Connector to the router. It is easy to damage the router casing if the screws are overtightened.

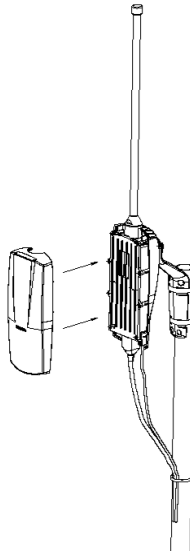
4. Using cable ties and/ or adhesive tape, secure the multiwire connection and ground wire (where used) to the mast. Take care to avoid placing strain on the connectors when securing the cables to the mast. Use ties/ tape about every two feet down the length of the mast. Always cover the cable ties with electrical tape to prevent excess pressure on the D-connector should the cable tie fail.

-
- 5.** Attach mounting bracket to back of router. Ensure that the bolt fits correctly and is not cross threaded. There is no need to tighten the bolt, play is required to attach the router to the mast mounting bracket.



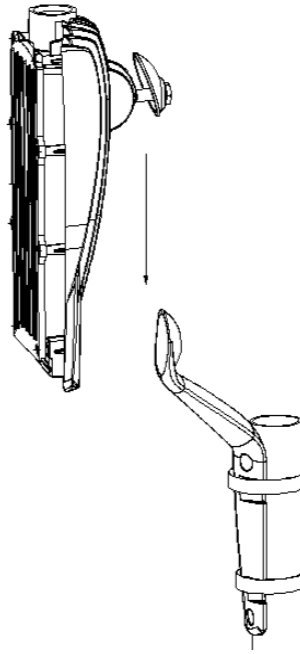
Attach mounting bracket to router

- 6.** Attach the front panel of the wireless router.



Attach front panel of wireless router

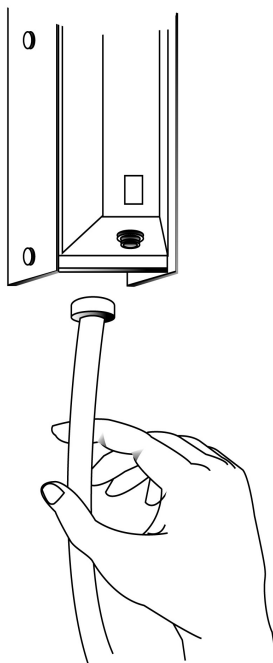
-
7. Slide the router and its bracket onto the router mount. Make sure that the router is mounted perfectly vertical on the mount, using a level as necessary, and tighten the bolt in the back of the router. Be careful not to overtighten the bolt. Overtightening of the bolt will strip the thread in the back of the aluminum casting of the wireless router.



Slide the router mount onto the mast bracket

5.2.1 Directional antenna

- 1.** Attach the antenna to the top part of the mast, using the mounting clamp. Tighten the nuts to fasten the antenna securely.
- 2.** Using the Jumper Cable (pigtail), connect the wireless router to the directional antenna ensuring that the connections are properly tight, but do not overtighten.

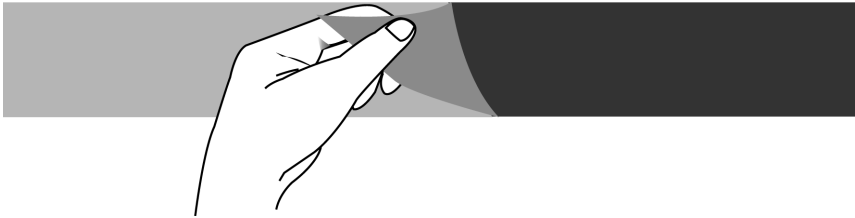


Connect the wireless router to the directional antenna with the jumper cable

3. Weatherproof the connections as follows.

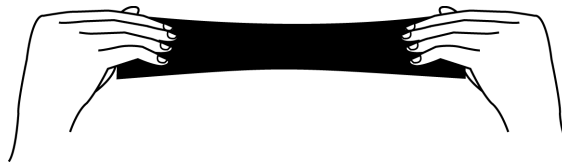
NOTE: Good weatherproofing is the key to antennas that work well in all weather conditions. If water or moisture enters the cable or connector, it will significantly reduce the signal levels and can ruin the cable and connectors.

4. Cut an 8” strip of weatherproofing tape and remove the plastic backing from the tape.



Remove plastic backing from the tape

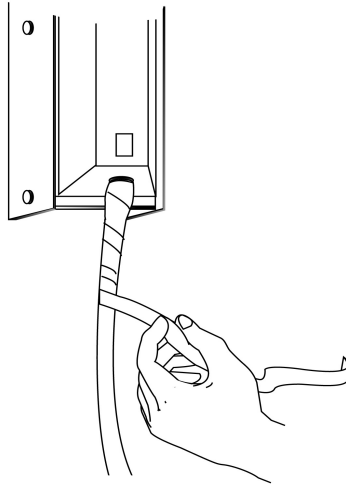
5. Stretch and apply the tape in the direction of the connector thread to ensure that the connector does not come loose during the weatherproofing process.



Stretching tape

6. Starting at least 2 inches from the connector, apply the tape, moving along the cable towards the connector so that it covers the bottom of the antenna and the top of the connector without gaps and with a layer of overlapping. This is an area where water can enter the connector and cable.

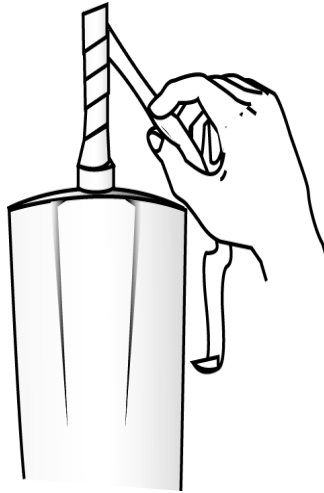
NOTE: Make sure you apply the tape in the direction of the threads.



Covering the directional antenna connection with weatherproof tape

NOTE: Squeeze the tape against the antenna and connector to remove any air gaps and apply the tape so that it overlaps half of the width of the tape.

-
7. Seal the connection on the router, starting at least 2 inches from the connector, apply the tape, moving along the cable towards the connector so that it covers the bottom of the antenna and the top of the connector without gaps and with a layer of overlapping. This is an area where water can enter the connector and cable.



Covering the Router connection with weatherproof tape

NOTE: Care should be taken when weatherproofing RF connectors. Do not stress or bend the cable during the weatherproofing process.

8. Attach the mast (where applicable) to the property securely and as appropriate to the requirements of the site. Ensure that direction of the antenna and its' polarization are correct aligned.

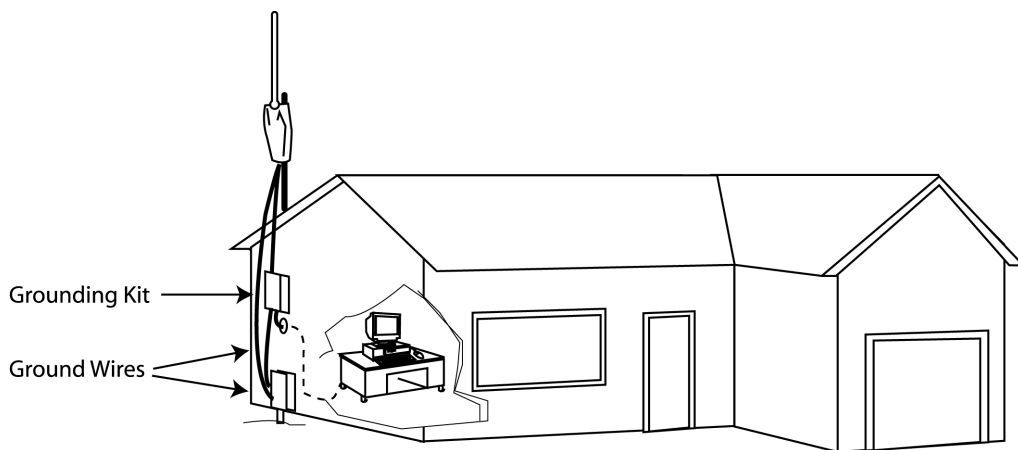
5.2.2 To prepare and install grounding

NOTE: Grounding is only installed where the existing grounding system is not sufficient for router grounding purposes.

Because antennas are elevated metal objects with connections to ground, they attract lightning.

Attaching an effective ground to the router provides a path for the lightning.

- 1.** Connect the grounding box connector marked “Surge” towards the antenna and the connector marked “Protected” to the Network/ Power Unit (NPU) end of the cabling.
- 2.** Protect the connections as previously described, using weatherproofing tape.
- 3.** Locate the lightning arrestor close to the point of entry to the home.
- 4.** Provide a good, very low resistance wire connection from the wireless router to the ground.
- 5.** Use #12 copper wire connected to the router grounding clamp and a ground rod next to the building.



Grounding of router and NPU

6.1 General guidelines on cable routing

- Always ask the customer where they would prefer the cables to be routed
- Where possible, route the cables inside the wall/ roof spaces
- THINK where the cables are going to go! Avoid air ducts, water and gas pipes.
- Try to use existing entries into the home to avoid having to drill holes.
- Try to make the cable entry to the computer connections as close to the customers PC as possible, using the shortest cable possible.
- Where wires have to be routed outside of the building, make sure that they are supported with cable clips at 18 to 24 inch intervals and are not unsightly. Make sure that there is a “drip loop” at the point of entry to prevent water ingress into the property. Seal any drilled holes using silicon sealant.



7.1 Introduction

7.1.1 Components to be installed

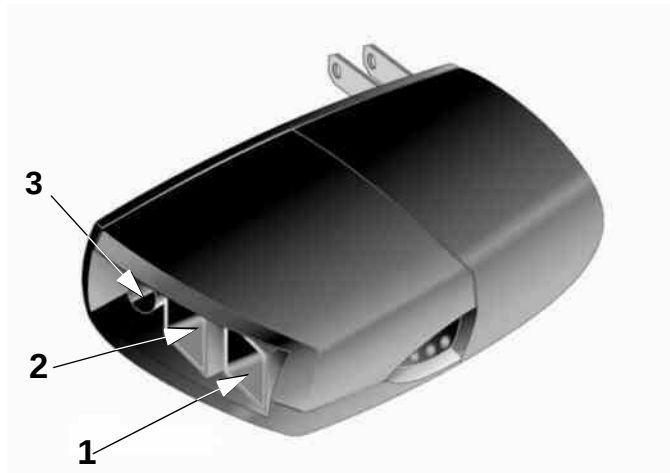
The Indoor portion of the Nokia Wireless Router System consists of:

- Network Power Unit (NPU)
- Ethernet or home PNA connection cable

7.2 Network/ Power Unit (NPU)

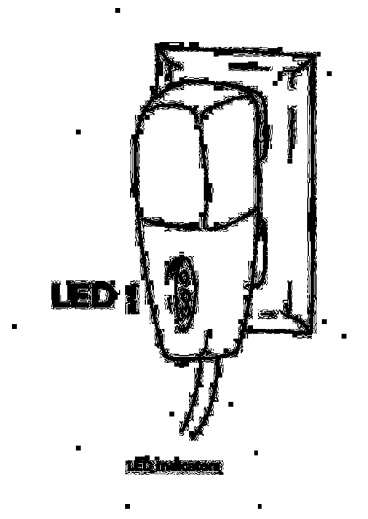
1. HomePNA 2.0 interface, a standard phone jack (RJ-11)
2. Ethernet interface, a standard 10/100 BaseT Ethernet jack (RJ-45)
3. Router outdoor unit connection: A multiwire cable from Router unit is connected to this.

The connector is a punch down connector inside the unit.



7.3 To install the Network/ Power Unit

NOTE: This chapter is incomplete. Awaiting further technical information and illustrations from Nokia SMEs



1. Trim back the multiwire cable insulation taking care not to cut any of the smaller wires in the cable.
2. Remove the Network/Power Unit from its' packaging and loosen the strain relief (the unit is already disassembled).
3. Place the cable through the strain relief and slot the appropriate wire into the appropriate slot in the connection. Using the punch down tool, fix the wire into the Network/ Power Unit.

NOTE: Place illustration of connectors here!!

4. When all wires are connected securely, reconnect the cable strain relief in the unit to prevent the multiwire cable from being pulled out of the unit.

-
5. Replace the Network/Power Unit cover and replace the screws. Do not overtighten the screws.
 6. Plug the Network/Power Unit into the wall AC outlet. The LEDs on the unit should flash three times to indicate that the unit is connected to the router.
 7. Connect the ethernet cable from the Network/ Power Unit to the PC or home PNA adapter or network hub.

NOTE: Shielded ethernet cables must be used on all installations.

The LEDs indicate the following information:

LED	Description
Power/ LAN	<u>Solid On</u> Power on, but no ethernet packets seen <u>Slow Flash</u> Waiting for the router to complete boot cycle <u>Intermittent Flash</u> Off during packet transmit or receive. Otherwise ON <u>Off</u> No power or the router is not functioning (IROS is off)

LED	Description
Anchor	<u>Solid On</u> The link to the neighbor in the path to the AirHead has an uplink and downlink speed of 2Mb and the path to the AirHead is less than, or equal to 3 hops <u>Slow Flash</u> The link to the neighbor in the path to the AirHead has an uplink and downlink speed of 1Mb and the path to the AirHead is less than, or equal to 3 hops <u>Fast Flash</u> More than 3 hops to the AirHead or The unit has neighbors but there is no path to the AirHead <u>Off</u> The router has no neighbors
Network	<u>Solid On</u> More than, or equal to 2 independent neighbors, with at least one 2Mbps path to the AirHead and the path to the AirHead is less than or equal to 3 hops <u>Slow Flash</u> Greater than, or equal to 2 independent neighbors with a 1 Mbps path to the Air-Head and the AirHead is less than, or equal to 3 Hops <u>Fast Flash</u> The unit has 1 neighbor with a 2 Mbps path to the AirHead and the AirHead is less than, or equal to 3 Hops <u>Off</u> None of the above

7.3.1 Connection options

There are three ways to connect the Wireless Router to the computer system:

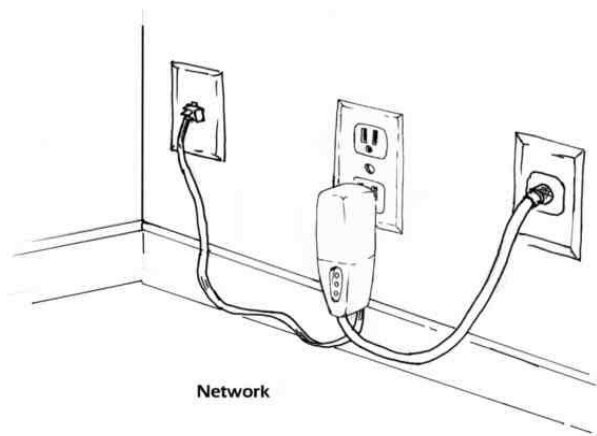
- Network Hub Connection, using 10/ 100bT ethernet interface.
- Direct Personal Computer Connection, using 10/ 100bT ethernet crossover cable.
- Home PNA Connection.

The Router automatically activates the ethernet or Home PNA, depending upon which connector is used. If the cable is connected to both connectors, the ethernet port is activated.

All these options are described in more detail below.

7.3.2 Network

Use a standard Ethernet Cable with an RJ45 connector at the Wireless Router and the appropriate connector at the LAN Ethernet connection.



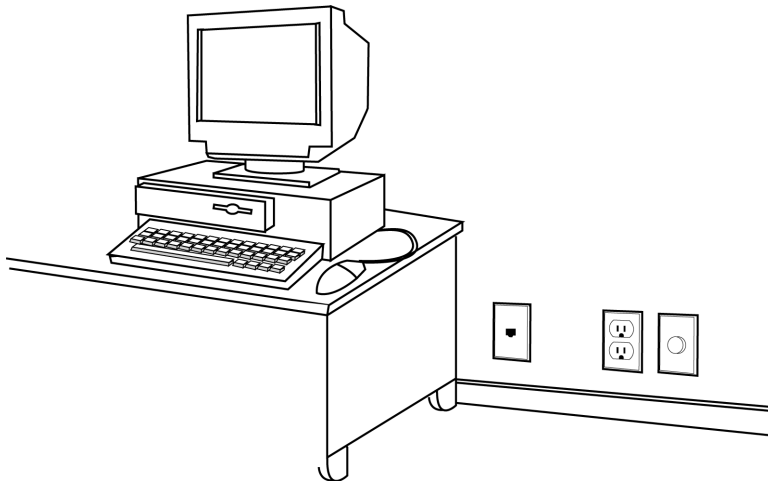
Network Connection

7.3.3 Direct personal computer connection

Connect an Ethernet crossover cable between the Network Interface and Power Supply Unit and the Personal Computer Ethernet connection. Use an RJ45 connector at the Network/ Power Unit and the appropriate connector for the Personal Computer Ethernet connection. See appendix for wiring diagram for crossover cable.

Connect the Network/ Power Unit, computer and LAN as shown in the following diagram.

Use one crossover cable whenever a network hub is not being used and always use it at the PC.



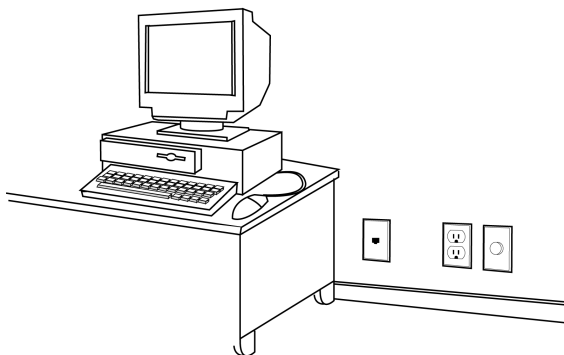
Direct PC connection

NOTE: Changing the Ethernet configuration from a LAN connection to a direct PC connection requires changing from a standard Ethernet cable to a crossover cable.

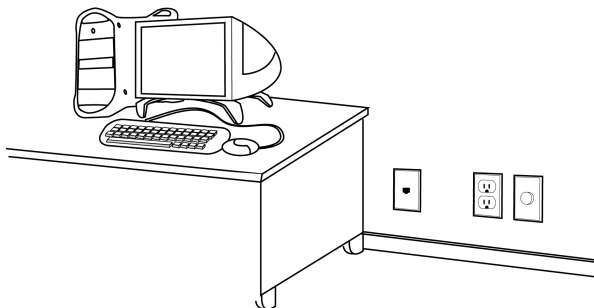
7.3.4 Home PNA connection

- Connect the phone cable between a Network/ Power Unit HomePNA connection and RJ11 phone jack or directly to the PC-HomePNA adapter.
- Connect PC to adapter according to manufacturers instructions.

Room 1



Room 2



8.1 Introduction

After the router installation is complete, the customers PC needs to be configured for use with the Nokia Wireless Router system. The customer may carry out the configuration themselves, or the installer may be required to carry out the configuration for the customer. This depends upon the agreement with the Internet Service Provider.

The ISP provide all the information required prior to installation.

8.1.1 To configure the customer's personal computer

This section covers the Microsoft Windows™ operating system.

- 1.** Check that the PC has a network interface card (NIC).

If the PC does not have a NIC, either install it or help the customer to install it (depending on what has been agreed with the ISP).

- 2.** Define the TCP/IP Properties. In the IP Address field, either select the "Obtain IP Address Automatically" or enter the IP Address and Subnet Mask in accordance with information provided by the ISP.
- 3.** In the Default Gateway field, enter the IP address of the default gateway, provided by the ISP.

8.1.2 To configure the customer's Macintosh

9.1 Introduction

It is necessary to ensure that the system is working correctly after full wireless router, Network/ Power Unit installations and PC configuration are complete.

To carry out the test, follow the procedure shown below.

9.1.1 Functional testing

Ensure that the router functions correctly by carrying out the following:

- 1.** Ensure that the NPU is inserted properly into the AC-outlet. The LEDs flash three times to indicate that the router is functioning correctly.
- 2.** Turn on the customer's PC. Wait for 3-5 minutes to allow the router to anchor to the network.
- 3.** Check the LEDs to indicate active internet connection, according to Chapter 7- Indoor installation.

-
4. Open the web-browser and browse a few Internet pages to ensure that the system downloads web sites correctly

NOTE: AOL customers will need to use dial-up connections for the AOL browser to perform correctly. The router supports only Netscape and Internet Explorer browsers.

5. Check the data speed by placing a “throughput test” to www.2wire.com. Generally, speeds of 200kb are acceptable, but are not reflective of the performance of the router.
6. Where there are problems with download or speed of connection, check the installation first. If this does not solve the problem, then contact the ISP.



Ethernet crossover cable

The wiring for an Ethernet Crossover cable for 10Base-T is as follows:

RJ45 Plug

Pin 1 (Tx+) to Pin 3 (Rx+)

Pin 2 (Tx-) to Pin 6 (Rx-)

Pin 3 (Rx+) to Pin 1 (Tx+)

Pin 6 (Rx-) to Pin 2 (Tx-)



Technical specifications

This appendix describes technical specifications for Nokia RoofTop™ Wireless Router Models R240 & 240A Outdoor-Mounted Unit.

Data Capacity per Cell	12 Mbps (6x2 Mbps per channel)
AirHeads per Cell	Up to 6
Routers per Cell	Up to 240
Routers per AirHead	Up to 40
Antenna Type (typical)	8 dBi Omnidirectional (integrated)
Link Range (typical)	
1 Mbps Data Rate	1.75 Miles
2 Mbps Data Rate	0.50 Miles
Radio/ Modem Specifications	
Frequency Band (GHz)	2.4000 - 2.4835
Radio Type	Frequency Hopping Spread Spectrum
Modulation	2 and 4 level GF SK

Transmit Power (typical)	12 dBm - 27.5 dBm (Dynamically adjusts in 1dB steps)
Receiver Sensitivity(10^{-5} BER)	- 82 dBm (typical)
1Mbps Data Rate	-72 dBm (typical)
2 Mbps Data Rate	
Interfaces and Connectors	
Ethernet	10/100 Base -TX, autosensing, RJ-45
Phoneline Networking	Home PNA 2.0/ 1.0, RJ-11
RF	N-Female (optional)
Router Environment	
Operational Temperature	- 40° C to 55° C (-40° to 131° F)
Relative Humidity	100%
Weight	
Router	3.3 lbs (including antenna and mount)
Dimensions	
Router	4"W x 2 ³ / ₈ "D x 8 ¹ / ₄ "H
NPU	1 ³ / ₄ "W x 2 ³ / ₄ "D x 5 ¹ / ₂ "H
Antenna (8dBi)	21 ¹ / ₂ "H x 3 ³ / ₄ " Diameter
Power Consumption	16 Watts @ 120 VAC
External Power Supply	NA
Management	Nokia Wireless Router Manager, SNMP MIB II, Telnet
Internet Protocols	IP, TCP, UDP, ICMP, RIPv1, RIPv2, SNMP, TFTP, IGMP, ARP, Proxy-ARP, Telnet, DHCP Relay, DHCP Server, NAT.
Agency Compliance	FCC Class B, FCC CFR 47 Part 15, FCC Part 68 ICES-003, RSS-210, CS-03

Regulatory safety requirements

RF Exposure

In order to comply with FCC exposure guidelines, the antenna of the wireless router must be installed at a distance of 16cm (7 inches) from persons. If wireless routers are installed closer than 1 meter (3 feet) apart horizontally, the exposure distance must be read from the table below.

NOTE: It is not recommended that wireless routers be installed closer than 1 meter apart horizontally, unless more than 1 meter vertical separation is used.

Antennas		1	2	3	4	5	6
MPE	Cm	16 cm	22 cm	27 cm	31 cm	35 cm	38 cm
Distance	Inches	7 inches	9 inches	11 inches	13 inches	14 inches	15 inches

Tool requirements

Manual – User Installation



**Nokia RoofTop™ Wireless Router
(R240/ R240A) Hardware Installation
Guide (self-install)**



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IMPORTANT NOTE TO USERS

This device has been certified as an intentional radiator (transmitter) which requires that it is installed and/or moved by a trained professional.

TRADEMARKS

Nokia is a registered trademark of Nokia Corporation. Nokia RoofTop™ is a registered trademark of Nokia Networks.

Other products mentioned in this document are trademarks or registered trademarks of their respective holders.

COMPLIANCE STATEMENTS

This hardware complies with the standards listed in this section.

Compliance in the United States

Emission Standards

UNINTENTIONAL EMISSIONS: FCC Part 15 CLASS B

INTENTIONAL EMISSIONS: FCC Part 15, Section 15.247

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 communications. 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 and correct the interference by one or more of the following measures:

- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and 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.

Any modifications made to the unit, unless expressly approved by Nokia could void the user's authority to operate the equipment.

FCC Rules and Regulations - Part 68

This equipment complies with Part 68 of the FCC Rules. The FCC Part 68 Label is located on the rear panel of the Network/Power Unit. This label contains, among other information, the FCC Registration Number and Ringer Equivalency Number (REN) for this equipment. You must, upon request, provide this information to your telephone company. The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all those devices ring when your telephone number is called. In most but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

Connection to the telephone network should be made by using standard modular telephone jacks, type RJ11. The plug and/or jacks used must comply with FCC Part 68 rules. If your telephone equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance, but if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to tariffs.

If trouble is experienced with this unit, for repair or warranty information, please contact customer service at the address and phone listed below. If the equipment is causing harm to the network, the telephone company may request that you disconnect the equipment until the problem is resolved.

DO NOT DISASSEMBLE THIS EQUIPMENT. It does not contain any user serviceable components. Attn: CUSTOMER SERVICE DEPT.

Compliance in Canada

Canadian compliance (Industry Canada) When tested with at least one intended host: This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment entitled "Digital Apparatus", ICES-003 of the Canadian Department of Communications.

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Class B prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministre Canadien des Communications.

Notice: The Industry Canada (IC) label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical document(s). The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by a user to this equipment, or equipment malfunctions, may give the telephone communications company cause to request the user to disconnect the equipment.

Notice: The Ringer Equivalent Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

REN: See the equipment for REN information.

DISCLAIMER:

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1.1 Introduction

This document explains the procedures necessary to install the Nokia Rooftop Wireless Router.



2.1 Introduction

It is important, when installing the Nokia Wireless Router, that the unit is not installed where it could be either damaged by its environment, or pose a hazard for the user. In this respect, when installing the unit be aware of the following Hazard Warnings and Regulatory Safety Requirements

2.2 Hazard warnings

- **Environment** - Do not place the Network Power Unit (NPU) in a very cold, dusty, wet or high humidity environment. The unit should be situated away from all heat sources such as radiators, heat registers, stoves, amplifiers and other heat producing appliances.
- **Fire or electric shock** - Do not expose the NPU to any type of moisture, including rain. Do not use or install near water-related environments such as sinks, bathtubs, laundry areas, spas, swimming pools, or in wet basements. Take care not to spill any liquids on the unit.
- Use extreme caution when installing antennas in areas with overhead power lines. Outdoor antennas and their supporting masts, guy wires, and cables are electrical conductors. Contact with high-voltage electrical wires can cause serious injury or death.
- Because antennas and wireless routers are elevated metal objects with connections to ground, they attract lightning. Attach a grounding wire to the antenna and router to provide a safe path to ground for lightning.
- Do not install the router near medical equipment or in a hospital or medical environment without ensuring that there will be no interference with such equipment.
- Persons with pacemakers should not go close to the router on the roof. If you have any reason to suspect that interference is taking place with a pacemaker, switch off the router immediately.

2.3 Regulatory safety requirements

- **RF exposure** - When the Network/Power Unit is plugged in, do not go closer than 7 inches (17 cm) of the antenna on the roof



3.1 Main installation steps

The complete wireless router installation consists of five basic steps:

- 1.** The Nokia roofTop Wireless Router
- 2.** The Multiwire connection (between the router and the Network/Power Unit)
- 3.** The Network/ Power Unit
- 4.** The grounding (where required)
- 5.** The indoor connections between the Network/Power Unit and the computer(s) in the property.

When planning the installation the following needs to be considered:

- The hardware and tools required to complete the installation.
- Wireless router installation location.
- Multiwire routing between the router and the NPU.
- The power source location for the NPU.
- The routing path for the ethernet cabling.
- Antenna grounding and lightning arrestor requirements.

3.1.1 To find a location for the router

When planning the location of the router the highest point on the roof should be used to ensure a clear line of sight. Existing structures like chimneys, pipes, tv antenna poles etc. should be used for mounting the router. Only if there is no suitable mounting point, should a mounting pole be used.

Height of the antenna is often limited to physical limitations of the site. For example, an antenna mast can be placed on a rooftop or installed on an existing structure or tower. Avoid using a mast if at all possible, but be sure that the antenna clears the roof line.

It is acceptable to use the TV antenna pole already installed. If the TV antenna is used, be sure to loosen the antenna mounting, slide the TV antenna down the pole leaving sufficient room to mount the router at the top of the pole.

3.1.2 To plan the Network/Power Unit location

The Network/ Power Unit can only be physically located by being plugged into an AC outlet. When locating the AC outlet for the Network/ Power Unit consider:

- The route of the multiwire cabling
- The proximity of a telephone connection point (where applicable for HomePNA) or routing of the Ethernet cable

3.1.3 To plan the cable routing

- Avoid pipes, downspouts and possible areas which may abrade the cabling.

For further details see Chapter 6, Routing the cable into the property.

3.1.4 To plan the grounding

Test the existing grounding system at the property. Where the existing grounding is not acceptable, consider:

- Route of the grounding cable from the router, avoiding other pipes, down spouts etc
- Location for the grounding rod



4.1 Introduction

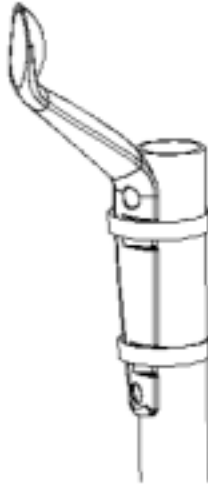
4.1.1 Components to be installed

The Outdoor portion of the Nokia RoofTop Wireless Router system comprises:

- Wireless router with integral antenna
- Grounding kit for router (if required)
- Router mounting hardware
- A shielded multiwire cable containing 7 twisted pairs of wires. This is used to connect the wireless router with the NPU. Nokia provides several different lengths of cable with D-Connectors already installed on the end of the cable.
- RF Cable adaptor, Nokia Code WR 46899A

4.2 To install the router

1. Mount the wireless router bracket to the mounting point, ensuring that the bracket is fixed securely.



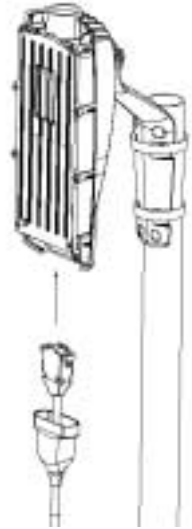
Router bracket fixed to mast

2. Attach the antenna by screwing it into the top of the wireless router. Carefully guide the antenna down onto the RF pin to prevent the pin being bent out of shape. Ensure secure connection, but do not overtighten.



Attach the omni-directional antenna

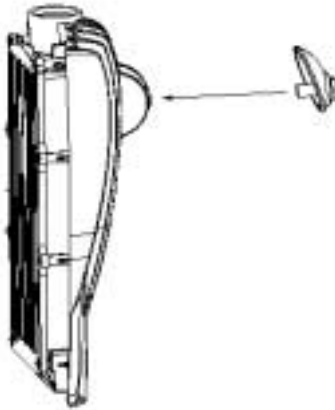
-
3. Connect the multiwire connection to the D-Connector in the bottom of the wireless router. Tighten the two screws on the connector and slide the rubber sleeve over the connections to prevent the ingress of water.



Attach multiwire connection and Ground wire

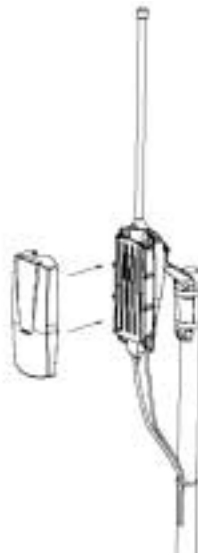
NOTE: Take care when tightening the D-Connector to the router. It is easy to damage the router casing if the screws are overtightened.

4. Using cable ties and/ or adhesive tape, secure the multiwire connection and ground wire (where used) to the mast. Take care to avoid placing strain on the connectors when securing the cables to the mast. Use ties/ tape about every two feet down the length of the mast. Always cover the cable ties with electrical tape to prevent excess pressure on the D-connector should the cable tie fail.
5. Attach mounting bracket to back of router. Ensure that the bolt fits correctly and is not cross threaded. There is no need to tighten the bolt, play is required to attach the router to the mast mounting bracket.



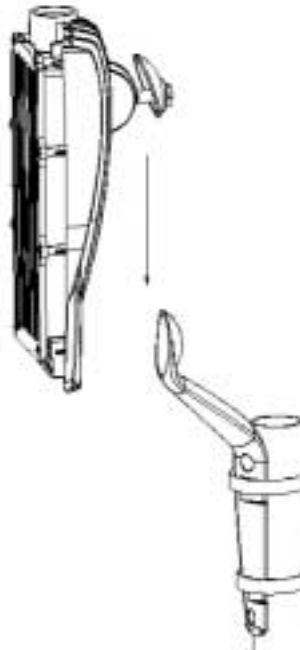
Attach mounting bracket to router

-
- 6.** Attach the front panel of the wireless router.



Attach front panel of wireless router

7. Slide the router and its bracket onto the router mount. Make sure that the router is mounted perfectly vertical on the mount, using a level as necessary, and tighten the bolt in the back of the router. Be careful not to overtighten the bolt. Overtightening of the bolt will strip the thread in the back of the aluminum casting of the wireless router.



Slide the router mount onto the mast bracket

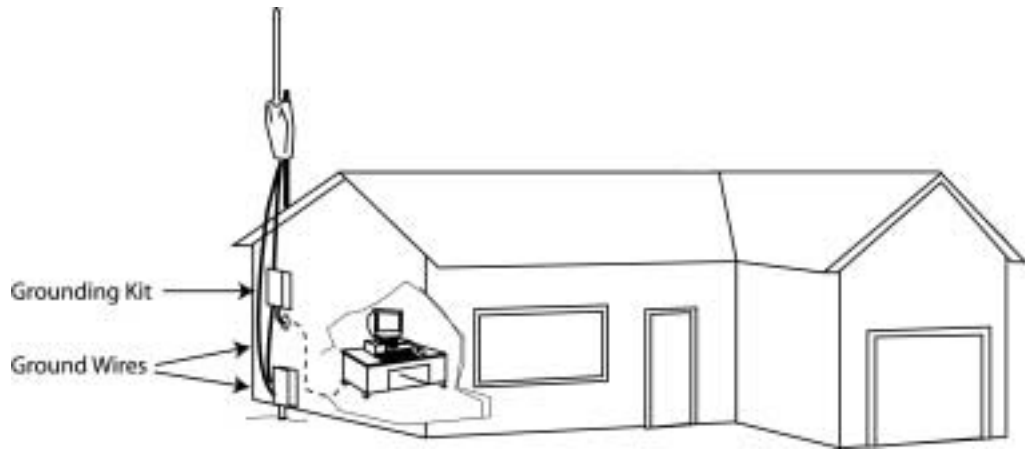
4.2.1 To prepare and install grounding

NOTE: Grounding is only installed where the existing grounding system is not sufficient for router grounding purposes.

Because antennas are elevated metal objects with connections to ground, they attract lightning.

Attaching an effective ground to the router provides a path for the lightning.

- 1.** Connect the grounding box connector marked “Surge” towards the antenna and the connector marked “Protected” to the Network/ Power Unit (NPU) end of the cabling.
- 2.** Protect the connections as previously described, using weatherproofing tape.
- 3.** Locate the lightning arrestor close to the point of entry to the home.
- 4.** Provide a good, very low resistance wire connection from the wireless router to the ground.
- 5.** Use #12 copper wire connected to the router grounding clamp and a ground rod next to the building.



Grounding of router and NPU



5.1 General guidelines on cable routing

- Where possible, route the cables inside the wall/ roof spaces
- THINK where the cables are going to go! Avoid air ducts, water and gas pipes.
- Try to use existing entries into your home to avoid having to drill holes.
- Try to make the cable entry to the computer connections as close to the your PC as possible, using the shortest cable possible.
- Where wires have to be routed outside of the building, make sure that they are supported with cable clips at 18 to 24 inch intervals and are not unsightly. Make sure that there is a “drip loop” at the point of entry to prevent water ingress into the property. Seal any drilled holes using silicone sealant.



6.1 Introduction

6.1.1 Components to be installed

The Indoor portion of the Nokia Wireless Router System consists of:

- Network Power Unit (NPU)
- Ethernet or home PNA connection cable

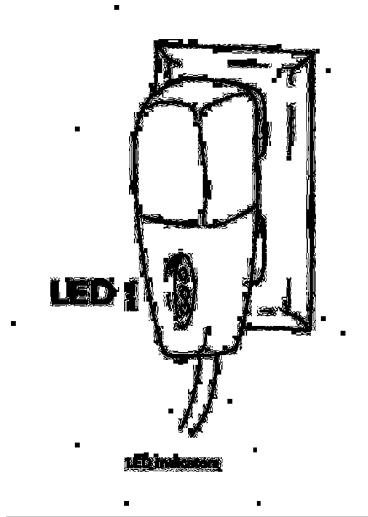
6.2 Network/ Power Unit (NPU)

1. HomePNA 2.0 interface, a standard phone jack (RJ-11)
2. Ethernet interface, a standard 10/100 BaseT Ethernet jack (RJ-45)
3. Router outdoor unit connection: A multiwire cable from Router unit is connected to this.

The connector is a punch down connector inside the unit.



6.3 To install the Network/ Power Unit



1. Trim back the multiwire cable insulation taking care not to cut any of the smaller wires in the cable.
2. Remove the Network/Power Unit from its' packaging and loosen the strain relief (the unit is already disassembled).
3. Place the cable through the strain relief and slot the appropriate wire into the appropriate slot in the connection. Using the punch down tool, fix the wire into the Network/ Power Unit.
4. When all wires are connected securely, reconnect the cable strain relief in the unit to prevent the multiwire cable from being pulled out of the unit.
5. Replace the Network/Power Unit cover and replace the screws. Do not overtighten the screws.
6. Plug the Network/Power Unit into the wall AC outlet. The LEDs on the unit should flash three times to indicate that the unit is connected to the router.

-
7. Connect the ethernet cable from the Network/ Power Unit to the PC or home PNA adapter or network hub.

NOTE: Shielded ethernet cables must be used on all installations.

The LEDs indicate the following information:

LED	Description
Power/ LAN	<u>Solid On</u> Power on, but no ethernet packets seen <u>Slow Flash</u> Waiting for the router to complete boot cycle <u>Intermittent Flash</u> Off during packet transmit or receive. Otherwise ON <u>Off</u> No power or the router is not functioning (IROS is off)

LED	Description
Anchor	<u>Solid On</u> The link to the neighbor in the path to the AirHead has an uplink and downlink speed of 2Mb and the path to the AirHead is less than, or equal to 3 hops <u>Slow Flash</u> The link to the neighbor in the path to the AirHead has an uplink and downlink speed of 1Mb and the path to the AirHead is less than, or equal to 3 hops <u>Fast Flash</u> More than 3 hops to the AirHead or The unit has neighbors but there is no path to the AirHead <u>Off</u> The router has no neighbors
Network	<u>Solid On</u> More than, or equal to 2 independent neighbors, with at least one 2Mbps path to the AirHead and the path to the AirHead is less than or equal to 3 hops <u>Slow Flash</u> Greater than, or equal to 2 independent neighbors with a 1 Mbps path to the Air-Head and the AirHead is less than, or equal to 3 Hops <u>Fast Flash</u> The unit has 1 neighbor with a 2 Mbps path to the AirHead and the AirHead is less than, or equal to 3 Hops <u>Off</u> None of the above

6.3.1 Connection options

There are three ways to connect the Wireless Router to the computer system:

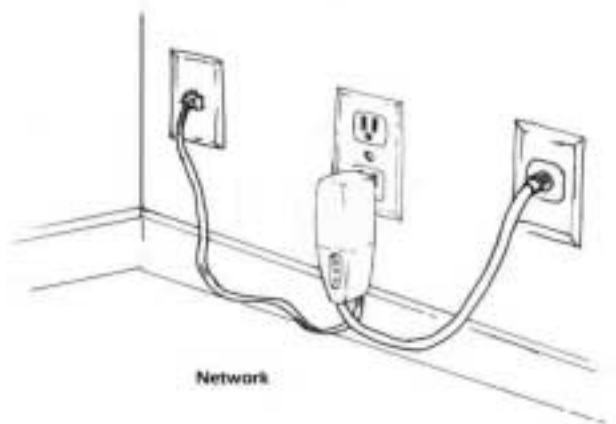
- Network Hub Connection, using 10/ 100bT ethernet interface.
- Direct Personal Computer Connection, using 10/ 100bT ethernet crossover cable.
- Home PNA Connection.

The Router automatically activates the ethernet or Home PNA, depending upon which connector is used. If the cable is connected to both connectors, the ethernet port is activated.

All these options are described in more detail below.

6.3.2 Network

Use a standard Ethernet Cable with an RJ45 connector at the Wireless Router and the appropriate connector at the LAN Ethernet connection.



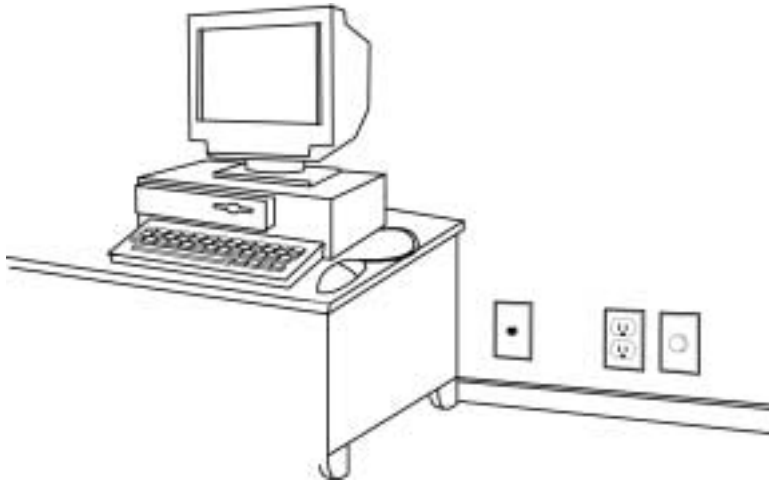
Network Connection

6.3.3 Direct personal computer connection

Connect an Ethernet crossover cable between the Network Interface and Power Supply Unit and the Personal Computer Ethernet connection. Use an RJ45 connector at the Network/ Power Unit and the appropriate connector for the Personal Computer Ethernet connection. See appendix for wiring diagram for crossover cable.

Connect the Network/ Power Unit, computer and LAN as shown in the following diagram.

Use one crossover cable whenever a network hub is not being used and always use it at the PC.

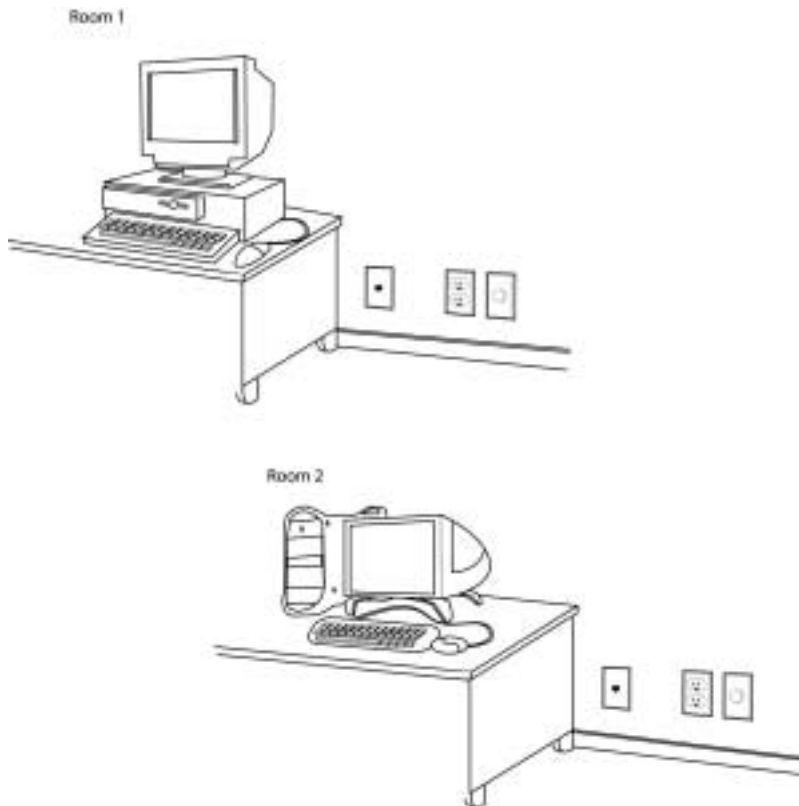


Direct PC connection

NOTE: Changing the Ethernet configuration from a LAN connection to a direct PC connection requires changing from a standard Ethernet cable to a crossover cable.

6.3.4 Home PNA connection

- Connect the phone cable between a Network/ Power Unit HomePNA connection and RJ11 phone jack or directly to the PC-HomePNA adapter.
- Connect PC to adapter according to manufacturers instructions.



7.1 Introduction

After the router installation is complete, your PC needs to be configured for use with the Nokia Wireless Router system. The ISP provides all the information required prior to installation.

7.1.1 To configure the your personal computer

This section covers the Microsoft Windows™ operating system.

- 1.** Check that the PC has a network interface card (NIC).

If the PC does not have a NIC, install it.

- 2.** Define the TCP/IP Properties. In the IP Address field, either select the "Obtain IP Address Automatically" or enter the IP Address and Subnet Mask in accordance with information provided by the ISP.
- 3.** In the Default Gateway field, enter the IP address of the default gateway, provided by the ISP.

8.1 Introduction

It is necessary to ensure that the system is working correctly after full wireless router, Network/ Power Unit installations and PC configuration are complete.

To carry out the test, follow the procedure shown below.

8.1.1 Functional testing

Ensure that the router functions correctly by carrying out the following:

- 1.** Ensure that the NPU is inserted properly into the AC-outlet. The LEDs flash three times to indicate that the router is functioning correctly.
- 2.** Turn on your PC. Wait for 3-5 minutes to allow the router to anchor to the network.
- 3.** Check that the LEDs indicate an active internet connection (according to Chapter 6 - Indoor installation).

-
4. Open a web-browser and browse a few Internet pages to ensure that the system downloads web sites.

NOTE: AOL customers will need to use dial-up connections for the AOL browser to perform correctly. The router supports only Netscape and Internet Explorer browsers.

5. Check the data speed by placing a “throughput test” to www.2wire.com. Generally, speeds of 200kb are acceptable.
6. Where there are problems with download or speed of connection, check the installation first. If this does not solve the problem, then contact the ISP.

Ethernet crossover cable

The wiring for an Ethernet Crossover cable for 10Base-T is as follows:

RJ45 Plug

Pin 1 (Tx+) to Pin 3 (Rx+)

Pin 2 (Tx-) to Pin 6 (Rx-)

Pin 3 (Rx+) to Pin 1 (Tx+)

Pin 6 (Rx-) to Pin 2 (Tx-)



Technical Specifications

This appendix describes technical specifications for Nokia RoofTop™ Wireless Router Models R240 & 240A Outdoor-Mounted Unit.

Data Capacity per Cell	12 Mbps (6x2 Mbps per channel)
AirHeads per Cell	Up to 6
Routers per Cell	Up to 240
Routers per AirHead	Up to 40
Antenna Type	8 dBi Omnidirectional (integrated)
Link Range (typical)	
1 Mbps Data Rate	1.75 Miles
2 Mbps Data Rate	0.50 Miles
Radio/ Modem Specifications	
Frequency Band (GHz)	2.4000 - 2.4835
Radio Type	Frequency Hopping Spread Spectrum
Modulation	2 and 4 level GF SK

Transmit Power (typical)	12 dBm - 27.5 dBm (Dynamically adjusts in 1dB steps)
Receiver Sensitivity(10^{-5} BER)	
1Mbps Data Rate	- 82 dBm (typical)
2 Mbps Data Rate	-72 dBm (typical)
Interfaces and Connectors	
Ethernet	10/100 Base -TX, autosensing, RJ-45
Phoneline Networking	Home PNA 2.0/ 1.0, RJ-11
Router Environment	
Operational Temperature	- 40° C to 55° C (-40° to 131° F)
Relative Humidity	100%
Weight	
Router	3.3 lbs (including antenna and mount)
Dimensions	
Router	4"W x 2 ³ / ₈ "D x 8 ¹ / ₄ "H
NPU	1 ³ / ₄ "W x 2 ³ / ₄ "D x 5 ¹ / ₂ "H
Antenna (8dBi)	21 ¹ / ₂ "H x ³ / ₄ " Diameter
Power Consumption	16 Watts @ 120 VAC
Management	Nokia Wireless Router Manager, SNMP MIB II, Telnet
Internet Protocols	IP, TCP, UDP, ICMP, RIPv1, RIPv2, SNMP, TFTP, IGMP, ARP, Proxy-ARP, Telnet, DHCP Relay, DHCP Server, NAT.
Agency Compliance	FCC Class B, FCC CFR 47 Part 15, FCC Part 68 ICES-003, RSS-210, CS-03