

USER GUIDE

RN-900FCC/IC

Version 1.9.11

Trademarks

Internet Explorer is a trademark of Microsoft Corp.

Mozilla is a trademark of the The Mozilla Organization.

Netscape is a trademark of Netscape Communications Corporation.

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately marked. The publisher cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

Disclaimer

While every effort has been made to make this book as complete and as accurate as possible, no warranty or fitness is implied. The information provided here is on an "as is" basis. The authors and the publisher shall have neither liability nor responsibility to any person or entity with respect to any loss or damages arising from the information contained in this book.

Copyright

Copyright © 2005 by Radionet Ltd.

All rights reserved. No part of this book shall be reproduced, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. No patent liability is assumed with respect to the use of the information contained herein. Although every precaution has been taken in the preparation of this book, the publisher and authors assume no responsibility for errors or omissions. Nor is any liability assumed for damages resulting from the use of the information contained herein.

Contact information

Radionet, Ltd.
Valkjärventie 7 C
FIN-02130 ESPOO
Finland

tel. +358 9 4392 1070
fax. +358 9 412 6762

<http://www.radionet.com>

Table of contents

Table of contents	3
Safety instructions	5
Note on electromagnetic emissions	5
Regulatory notice	5
Introduction	6
Package contents	6
Physical interfaces and description	7
Antenna	7
Aluminum enclosure	7
Connectors	7
Installation instructions	7
Installation direction	8
Antenna mast installation	8
Aligning the antenna	8
Power divider	8
Grounding	9
Power cabling using PSU-3 power supply	9
Power cabling using PSU-2 power supply (accessory)	9
Ethernet cabling	10
Protective connector cover	10
Applying coax seal tape	10
Configuration overview - Before you begin	11
Connecting to the Radionet RN-900FCC products	11
Establishing the initial connection	11
The configuration Home page	13
System	13
Associations	13
Networking	14
Action log	14
Navigating the configuration menu	14
Saving and committing changes	15
OK	15
Commit Settings	15

General	16
Associations and nodes	17
Networking	18
Changing Ethernet settings	18
Basic interface settings	18
Interface status	19
Editing existing IP addresses	19
Adding a new IP address	19
To add a new IP address	19
Changing bridge settings	19
Transparent bridging with Ethernet tunnel	19
Removing an interface from the bridge	20
To remove an interface from the bridge	20
Binding an interface to the bridge	20
To bind an interface to the bridge	20
Changing radio interface settings	20
Edit the SSID	21
Set the Wireless mode	21
Set the Operation mode	21
Choose the antenna type	21
Set the Operating Frequency	21
Set transmit power	22
Set the RTS threshold	22
Set the Fragmentation threshold	22
Suppress/Enable SSID broadcast	22
Enable AES encryption	22
WPA-PSK passphrase	22
Editing the routing table	23
Editing an existing route	23
Adding a new route	23
To add a new route	23
Default gateway	23
Security	24
Configuring remote login services	24
SSH	24
HTTP	25

HTTPS.....	25	APPENDIX 1: Detailed instructions for cabling	42
Configuring administrator accounts.....	25	Power cabling	42
Adding a new administrator account.....	26	Ethernet cabling	43
Deleting an administrator account.....	26	APPENDIX 2: Further reading	45
Editing administrator passwords	26	APPENDIX 3: Factory Settings	46
Services.....	27	APPENDIX 4: Allowed channels in 2,4 GHz and 5 GHz frequency	
DHCP server	27	bands	47
Configuring the DHCP server	27	APPENDIX 5: Allowed transmit power levels, and radio + antenna	
General DHCP Server Settings	27	combinations with Radionet FCC/IC-Canada products.....	48
Client IP pool	28		
Client network settings	28		
DHCP Relay.....	29		
MageIP.....	29		
SNMP	30		
Remote Syslog	31		
Utilities	32		
ARP table.....	32		
Viewing the ARP table	32		
Ping & Traceroute	33		
Ping.....	33		
Traceroute.....	34		
Arping.....	34		
Software.....	35		
Using the Software Update page	35		
Factory Defaults	36		
Log	37		
Viewing log entries.....	37		
Recent Entries.....	37		
Minimum Level.....	38		
Sort by	38		
The Action Log	38		
Adding a log entry	38		
Log messages	39		
Resetting the unit.....	40		
Warranty	41		
Disclaimer.....	41		

Safety instructions

This document must be reviewed for familiarization with the product and instructions before operation.

Verify that an un-interruptible safety earth ground exists from main power source and the ground circuitry of the product.

Verify that correct AC power source is available for the AC adapter to produce 12...30 VDC for the product.

Disconnect the product from operating power before cleaning.

ⓘ Warning!

A professional installer must install the base station and antennas.

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment. (FCC 15.21)

Note on electromagnetic emissions

This device complies with part 15 of the Federal Communications Commission (FCC) rules. Operation is subjected to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received including interference that cause undesired operation
3. Warning! Electromagnetic radiation. Please keep this product and related antennas at a distance 20 cm from human body.

Regulatory notice

The specifications and parameters of the device described in this document are subject to change without notice.

For American regulatory information, see www.fcc.gov. For Canadian regulatory information, see www.ic.gc.ca.

This equipment generates, uses and radiates energy on radio frequencies and, if not installed and used in accordance with this guide, 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 correct the interference by one or more of the following methods:

- reorient or relocate the receiving antenna
- move the equipment and receiver farther apart
- connect equipment to an outlet on a circuit different from that to which the receiver is connected

Please study first allowed regulatory guidelines shown in Appendix 5, which describe allowed product configurations. Radionet RN 900 FCC/IC-Canada product is only allowed to be used with Radionet antennas and accessories (PSU-3 power supply) and power dividers. In USA and Canada maximum allowed transmit power levels and channel frequencies are shown in Appendix 5.

Introduction

This guide contains information on how to operate and manage the Radionet RN-900FCC products.

Package contents

The Radionet RN-900FCC package contains the following items:

- Radionet RN-900FCC product
- Mounting kit with downtilt
- One weather proof power connector kit
- One weather proof RJ-45 connector kit
- Outdoor power supply unit PSU-3
- Factory default tool
- Mounting instruction
- Documentation CD-ROM

Physical interfaces and description

Key features of the Radionet RN-900FCC are:

- Aluminum enclosure supports outdoor installation
- Industrial temperature rating (-40...+55 °C)
- Two external antenna connectors
- Two 10/100 Base TX Ethernet ports
- Activity indication LED
- Detachable power connection with RS-485 connection for remote management

Antenna

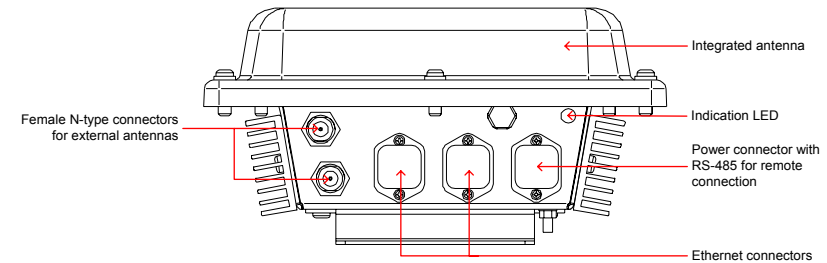
The Radionet RN-900FCC is delivered with an integrated 5 GHz 20dBi patch antenna. Integrated link antenna element is covered with a white radome to protect it.

Aluminum enclosure

The base station unit uses an aluminum enclosure that supports outdoor operating environments and supports an industrial temperature operating range.

Connectors

All connectors are located on the bottom of the housing. The RN-900FCC has two external antenna connectors and two Ethernet connectors.

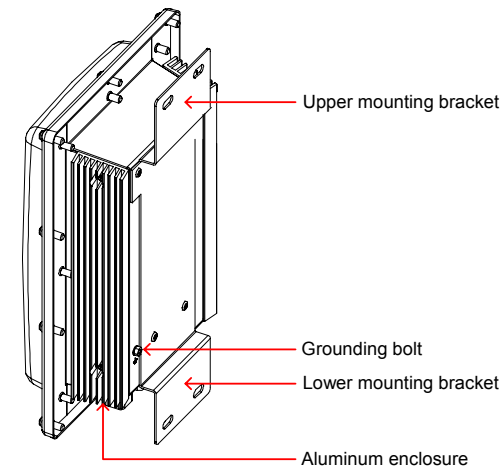


Overview of the Radionet RN-900FCC

Installation instructions

The Radionet RN-900FCC is designed for outdoor installation environment, on a tower, a tall building or an antenna mast.

A professional installer must install the base station and antennas. The installer should also be familiar with network structures, terms, and concepts.

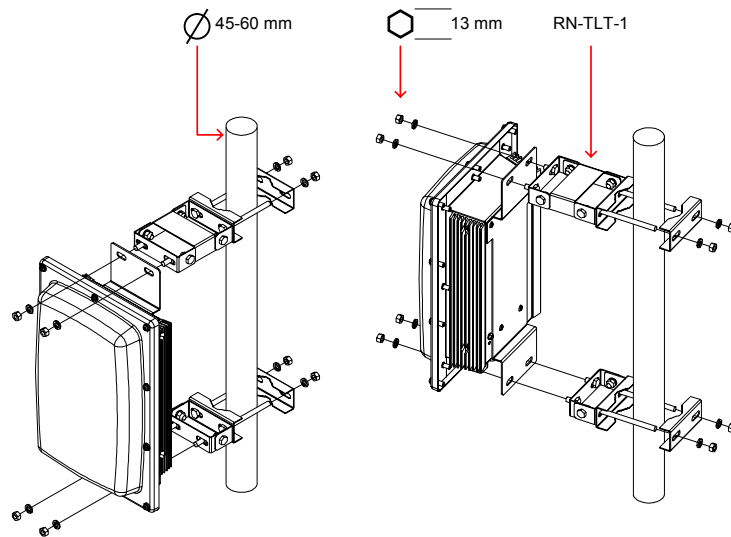


Installation direction

Connectors must always be downwards in outdoor installations. In indoor installations (e.g. warehouses etc.) direction can be freely selected if integrated antenna is not used.

Antenna mast installation

The following figures present installation in antenna mast pipe; antenna pipe diameters 45...60mm (approx. 1 3/4...2 1/3 inches).



Aligning the antenna

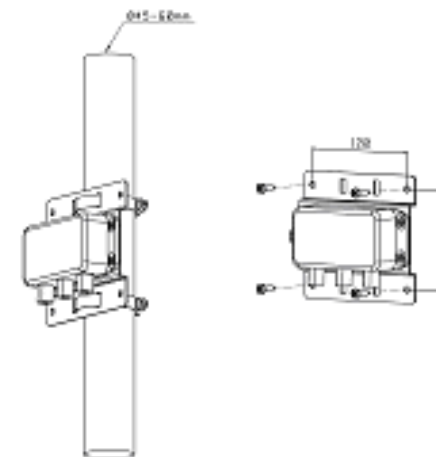
Installation technician must mechanically align the antennas for the best possible coverage.

Power divider

You may connect two sector antennas to one radio by using a power divider. For the best possible operation, the antennas using the same radio should point directly opposite directions from each other. Also the length of the cables between the antennas and the power divider should be the same to ensure even signal strength to both cells.

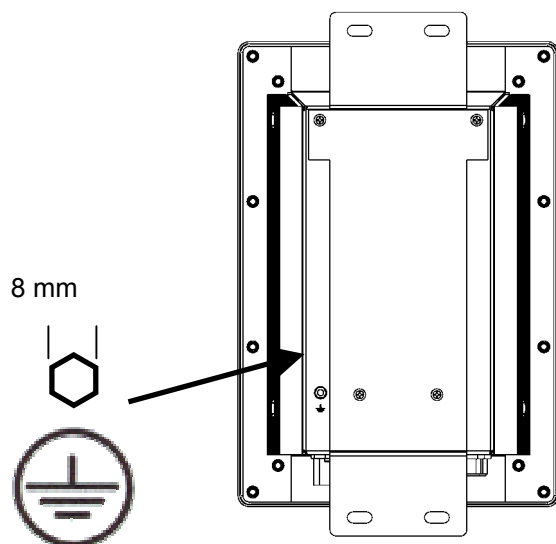
The power divider reduces the output signal level by 3 dBm.

The following figures present the installation of the power divider.



Grounding

Grounding bolt with hex nut is located on the backside of the base station. Unit must always be grounded to the building ground using 16 mm² (#6 AWG) grounding cable.



Power cabling using PSU-3 power supply

The PSU-3 power supply unit can feed one RN-900FCC base station product. The power supply is an external unit designed for operation in outdoor environment. The supply voltage of the power supply is 24 VDC. The power supply unit provides RS-485 connector for remote management of the base station unit. RS-485 pins must be wired from the base station unit to power supply if RS-485 remote management is needed. Wiring can be done by 4-wire power cable.

RS-485 is a data communications interface standard approved by the Electronic Industries Association (EIA) for multipoint communications with serial devices. It is ideal for industrial applications due to its noise immunity.

The transmitted data is represented by voltage differences between the two wires of the power cable. RS-485 requires specific serial port hardware that supports RS-485 voltages and conventions.

Detailed cabling instructions are in Appendix 1.

Power cabling using PSU-2 power supply (accessory)

The PSU-2 power supply is an external unit designed for operation in outdoor environment. The PSU-2 power supply unit can feed up to two Radionet RN-900FCC products. The supply voltage of power supply is 12 VDC. The power supply unit has an inbuilt sealed lead-acid rechargeable battery to ensure at least few minutes of operation when the main supply voltage is lost. This battery back-up time depends on the condition of the battery. It is recommended to replace the battery from time to time, e.g. once a year. This

replacement time depends on ambient temperature of the power supply unit.

Ethernet cabling

The maximum length of Ethernet cabling without repeaters or amplifiers is 100 meters (330 feet). Ethernet cabling must fulfill CAT5 category FTP outdoor cable specifications. Detailed cabling instructions can be found in Appendix 1.

Protective connector cover

If the Ethernet connectors are not used you must cover the connectors by a protective cover. Radionet RN-900FCC is shipped with protective covers on both Ethernet connectors by default.

Applying coax seal tape

When using the unit with external antennas, you must weather seal the N connectors using seal tape. N connectors that are not properly sealed permit moisture to enter the connection, which leads to performance degradation or coverage problems.

Configuration overview - Before you begin

Ensure that the Radionet RN-900FCC is connected to your computer (with a cross wired Ethernet cable) or your network (through a switch or a hub). You will need to obtain the following information from your network administrator to successfully configure the Radionet RN-900FCC:

1. IP addresses for each interface of your Radionet RN-900FCC, if your network is not connected to a DHCP server.
2. The radio settings appropriate to your network and hardware (see page 20).

Connecting to the Radionet RN-900FCC products

The Radionet RN-900FCC is configured via a practical web-based configuration utility. The configuration utility can be accessed using an ordinary web browser, and allows you to edit, manage and monitor your Radionet RN-900FCC settings and functionality.

The configuration utility supports the following web browsers:

- Internet Explorer versions 5.0, or higher
- Mozilla versions 0.9, or higher
- Netscape Navigator versions 6.1, or higher
- Opera, versions 7, or higher

Other web browsers may also be acceptable, but have not been tested. Only the web browsers listed above can be guaranteed to function correctly when used to configure the Radionet RN-900FCC.

Establishing the initial connection

First, plug in the power cable of the Radionet RN-900FCC to power up the unit.

Establish a physical connection to the RN-900FCC. If you are using a laptop or a desktop computer, this can be done using a cross wired twisted pair Ethernet cable to connect your PC to ethernet1 port of the RN-900FCC.

Set your computer IP addresses as follows:

- IP address: 192.168.1.2
- Subnet mask: 255.255.255.0

Once the unit is powered up and your IP parameters are set, you may use your web browser to connect to the IP address of the Radionet RN-900FCC. The Radionet RN-900FCC is pre-configured with default IP addresses "192.168.1.1" on the ethernet1 interface.

Default IP address

Factory default value: 192.168.1.1

Default IP address may be later changed by an administrator (see page 19 for information about changing the IP address of an interface). To connect to the configuration utility, perform the following steps:

1. Enter the IP address of the Radionet RN-900FCC in your browser's address or location bar.
2. Press ENTER. This will bring you to the login screen shown in Figure 1.

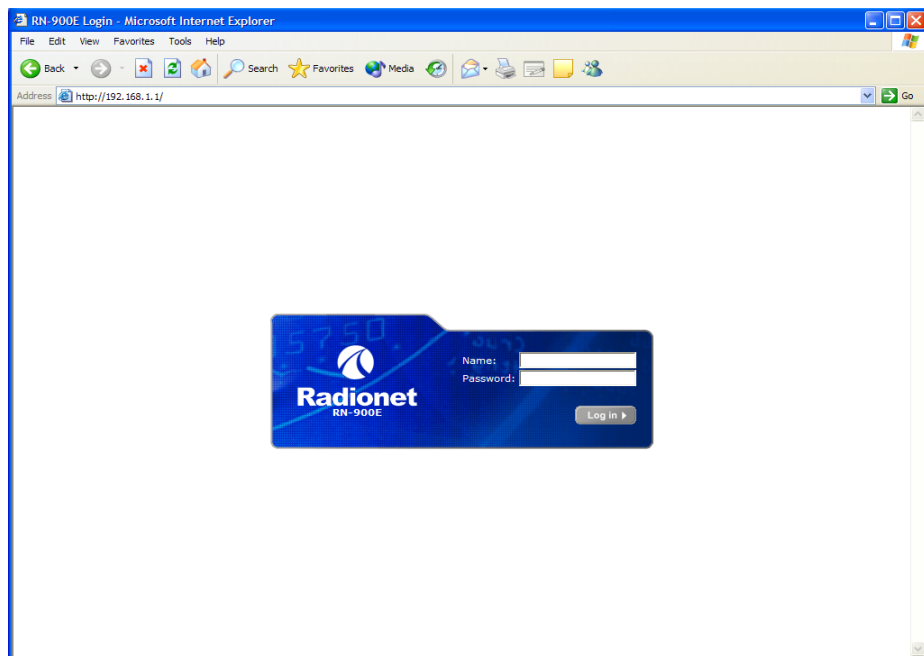


Figure 1: The login screen of Radionet RN-900FCC products

Providing username and password

Enter your administrator username and password into the fields on the login page. When shipped, the Radionet RN-900FCC is pre-set with a single default administrator account. To access this account, use the following login information:

Username: admin
Password: default

Username and passwords are case-sensitive. Additional administrator accounts and passwords can be set up from the Security menu (see page 24). To protect your Radionet RN-900FCC against unauthorized access, Radionet strongly recommends that you change the default password as soon as possible.

Click the OK button to send your login information to the Radionet RN-900FCC. Once you have successfully logged in, you will be presented with the Radionet RN-900FCC configuration menu and Home page.

Note! As a security measure, the RN-900FCC configuration utility will automatically log you out after 15 minutes of inactivity. If this happens, simply enter your administrator username and password at the login page again.

The configuration Home page

Upon logging in, you will first see the Radionet RN-900FCC configuration Home page, shown in Figure 2.

Note! Depending on your choice of web-browser, your screen may not appear exactly as depicted in this document.

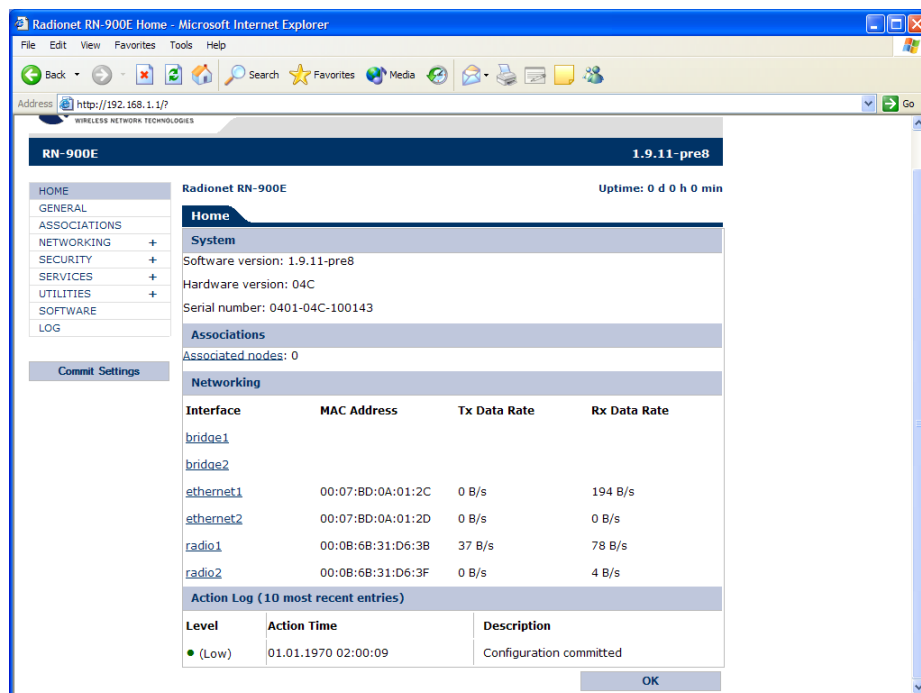


Figure 2: The configuration Home page

The Home page displays a brief summary of the configuration and current status of your Radionet RN-900FCC product. At the top of the page you can read the name and uptime of the device.

Additional information about the Radionet RN-900FCC is grouped under the four sections: System, Associations, Networking, and Action log. These constitute the remainder of the page.

System

The system info section displays the following information regarding your Radionet RN-900FCC unit.

Software version

The firmware version of the unit. For information about updating the Radionet RN-900FCC firmware, consult page 35.

Hardware version

The hardware version of the unit.

Serial number

The serial number of your unit. This number is important when you need to contact customer service.

Associations

If your Radionet RN-900FCC is used by wireless end-users, the number of associated nodes is displayed here.

Networking

The Networking section of the Home page contains information about the network interfaces of your Radionet RN-900FCC:

- bridge1 and bridge2. The bridge interfaces are virtual interfaces. Binding two or more of the remaining interfaces to the bridge will allow them to share a common IP address.
- 2 Ethernet ports, ethernet1 and ethernet2. Both ports are standard 10/100 Base-T Ethernet ports, capable of a connection rate up to 100Mbit/s.
- 2 radio interfaces, radio1 and radio2. These interfaces consist of a pair of radio transceiver/receivers, with an 802.11 MAC layer, used to obtain wireless connectivity.

For each active interface, the following information is displayed:

MAC Address

The unique hardware identification code of the interface.

Tx Data Rate/Rx Data Rate

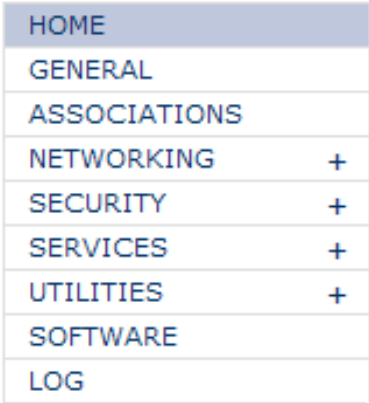
The rate of data being sent and received through the interface.

Action log

The ten most recent log entries are displayed at the bottom of the configuration Home page. For more information about accessing and editing the log, see page 37.

Navigating the configuration menu

Use the configuration menu on the left of the screen (see Figure 3), to access the other pages of the configuration utility. Clicking on one of the menu entries will open a sub-menu containing links to further configuration pages.



HOME	
GENERAL	
ASSOCIATIONS	
NETWORKING	+
SECURITY	+
SERVICES	+
UTILITIES	+
SOFTWARE	
LOG	

Figure 3: The configuration menu

HOME

The first page displayed at login, containing a summary of information about the Radionet RN-900FCC and its configuration. See figure 2 on page 13.

GENERAL

Contains general information about your Radionet RN-900FCC. See figure 6 on page 16.

ASSOCIATIONS

Lists additional devices connected to your WLAN. See figure 8 on page 17.

NETWORKING

Advanced options for configuring the Ethernet and radio interfaces of the Radionet RN-900FCC. Refer to page 18.

SECURITY

Add and remove administrators, and change administrator passwords. Refer to page 24.

SERVICES

Set up network services, such as DHCP. Refer to page 27.

UTILITIES

Network utilities to test the connectivity of your network. Refer to page 32.

SOFTWARE

Update your Radionet RN-900FCC with the latest firmware. Refer to page 35.

LOG

Edit and examine the Radionet RN-900FCC activity log. Refer to page 37.

Saving and committing changes

The two action buttons OK and Commit Settings are used to implement or undo changes to the configuration of the Radionet RN-900FCC.

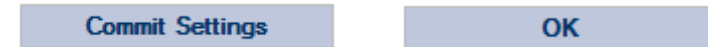


Figure 4: The action buttons

OK

Clicking this button after editing any configuration page will save the new settings to the Radionet RN-900FCC. The new settings will not be enabled until Commit Settings button is clicked (see below).

Commit Settings

Click the commit settings button to enable saved settings to persist after reboot of the Radionet RN-900FCC. The currently saved settings will be written into the non-volatile memory of the Radionet RN-900FCC and will be read at each reboot.

Note! To make permanent changes to the configuration of the Radionet RN-900FCC:

1. Navigate to the appropriate configuration page and enter new settings.
2. Click the OK button to accept and apply your changes.
3. Using the menu, navigate to any further pages you wish to configure and repeat steps (1) and (2).
4. When you are satisfied with the configuration of the device, click the Commit Settings button to permanently record your changes.

General

The general screen presents common information about your Radionet RN-900FCC.



Figure 5: The General link

Click on the GENERAL link to view and set the following information of the RN-900FCC base station unit (see figure 6):

GENERAL SETTINGS

Contains the name, location and coordinates of your base station unit.

TIME ZONE

The correct time zone should be set here.

SYSTEM TIME

Enter the correct time and date here and click Set.

NETWORK TIME PROTOCOL

If you wish to synchronize the system time with a time server, click Enabled and enter the IP address of the server you want to you use.

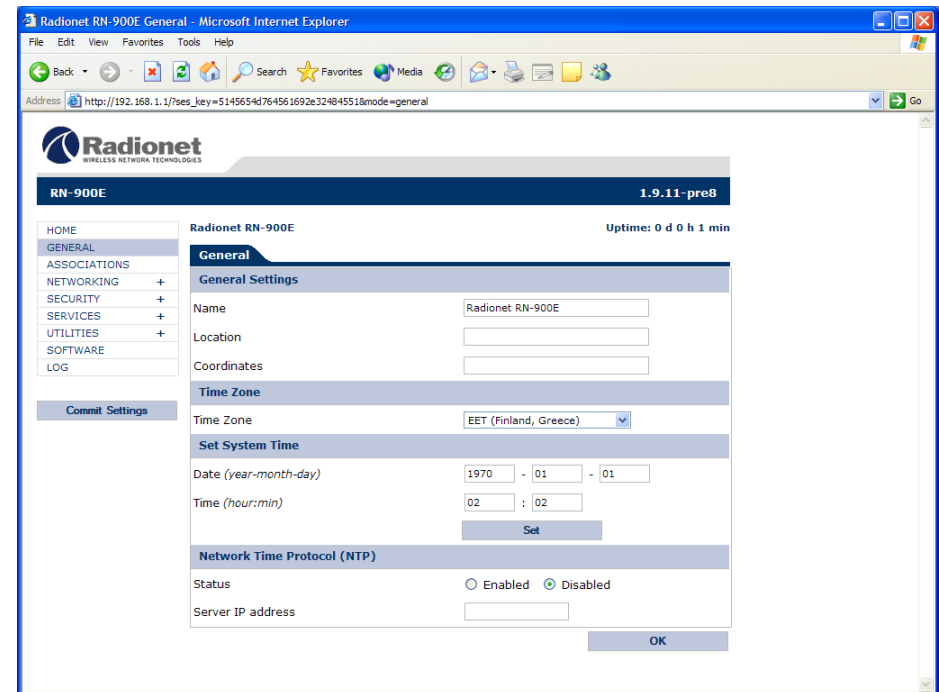


Figure 6: The General screen

Note! Remember to click on the OK button to apply your changes, and click Commit Settings to permanently accept the new configuration.

Associations and nodes

The Associations screen lists all nodes currently connected to the Radionet RN-900FCC, and provides information about the signal strength of each connection. Click on the ASSOCIATIONS link in the configuration menu to access the Associations page.

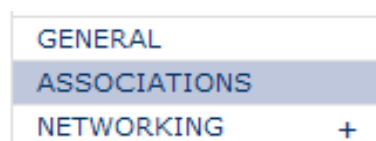


Figure 7: The Associations link

Nodes connected to the Radionet RN-900FCC are listed in rows across the Associations screen. Information about current connection conditions is displayed in the columns of the table.

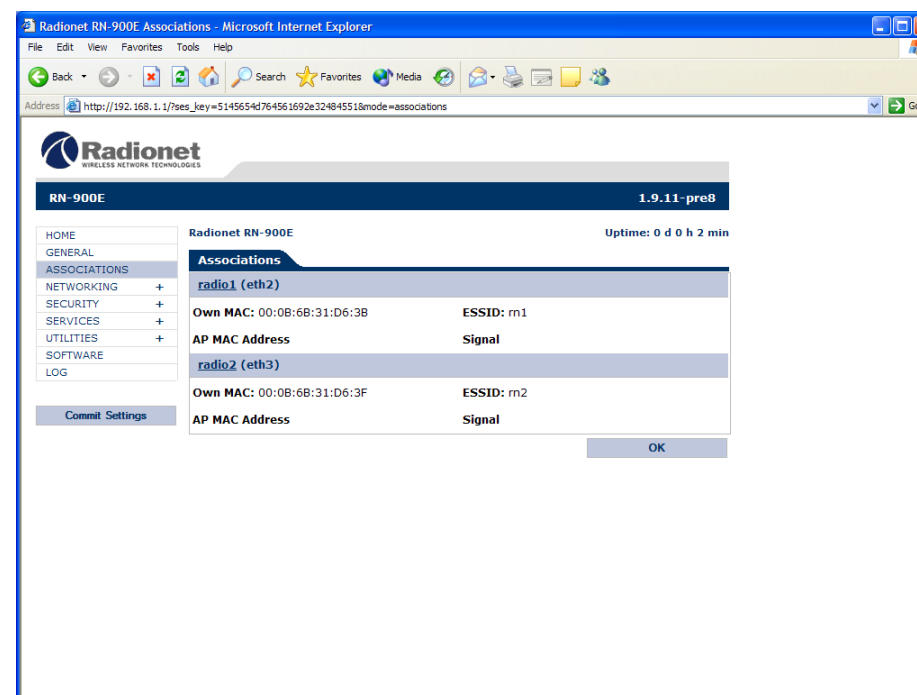


Figure 8: The Associations screen

AP MAC

The hardware address of the connected node.

Signal

The strength of the connection's radio signal.

Networking

Click on the NETWORKING entry in the configuration menu (Figure 9) to open links to the networking configuration pages, and the routing table.

Use these pages to set hostnames and IP addresses - or alternatively, specify a DHCP server - for the network interfaces of your Radionet RN-900FCC. The networking configuration pages can also be used to enable or disable interfaces, to bind interfaces to the bridge, or to set operating parameters for the special radio interfaces.

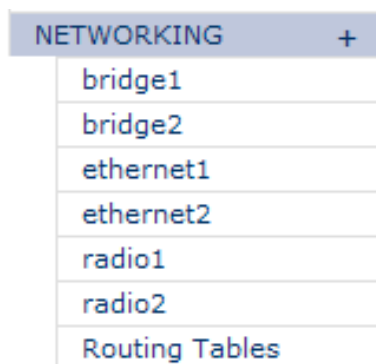


Figure 9: The Networking menu

Changing Ethernet settings

Click on the NETWORKING> ethernet1 or NETWORKING> ethernet2 link in the configuration menu to open the configuration page for the respective Ethernet interfaces. Figure 10 shows the configuration page for the ethernet1 interface.

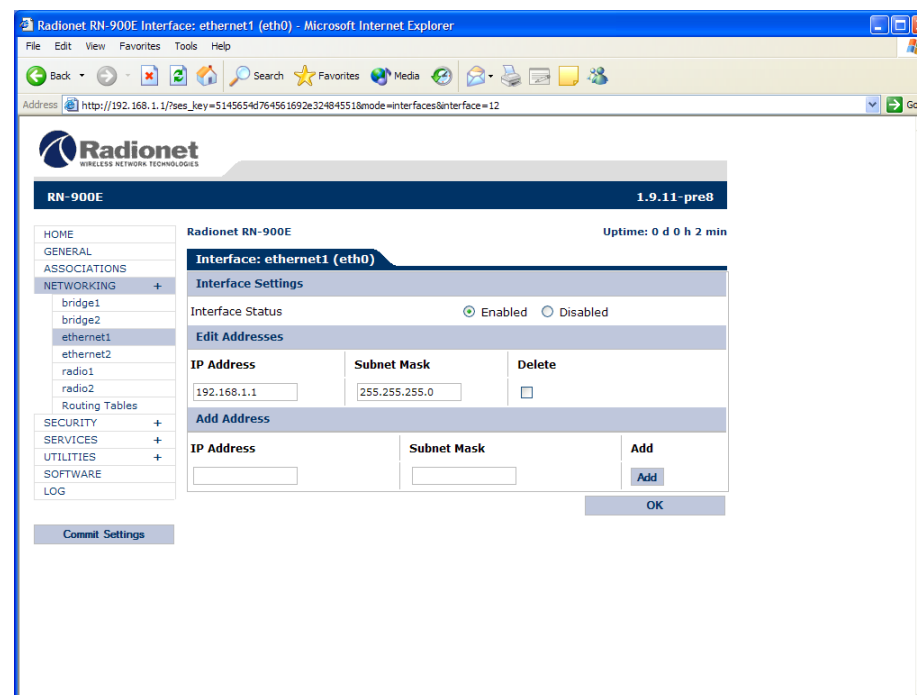


Figure 10: Configuring an Ethernet interface

Basic interface settings

The process of editing the basic interface settings is described below. Remember to click the OK button to apply the changes you make.

Interface status

This pair of radio buttons shows whether the selected interface is currently enabled. To enable the interface, click on the Enabled radio button. To disable the interface, click on the Disabled button. Click the OK button to apply the change.

Editing existing IP addresses

The current IP addresses of the selected interface are listed below the basic interface settings, in the Edit Addresses section of the configuration screen.

To modify an IP address click in the IP Address and/or Subnet Mask fields. Edit the IP address/subnet mask, and click the OK button.

To delete an IP address click the Delete checkbox beside the IP address(es) you wish to delete. Click the OK button to remove the checked address(es).

Adding a new IP address

Assign a new IP address to the selected interface by using the Add Address fields at the bottom of the configuration screen.

To add a new IP address

Enter a new IP address and subnet mask in the respective text fields of the selected interface, and click the Add button.

Note! Remember to click on the OK button to apply your changes, and click Commit Settings to permanently accept the new configuration.

Changing bridge settings

Click on the NETWORKING>bridge1 or bridge2 link in the configuration menu to open the configuration page for the bridge interfaces.

The process of editing the basic interface settings (interface label and status) is exactly as described for Ethernet interfaces in Section **Basic interface settings**, on page 18. Interface settings specific to the bridge interface are described here (see Figure 11 on page 20).

RN-900FCC should be configured so that the first Ethernet port (Ethernet 1) is used to connect the base station towards the Internet or a Radionet Network Controller.

Transparent bridging with Ethernet tunnel

A pair link units can be used as transparent bridge with Ethernet tunneling option. Both ends of the radio link must have the same tunnel setting. The bridge configuration shows option (Activate tunnel) to turn on tunneling for the radio interface. By default the tunnel is on. When bridging the Master end of a link only, disable the tunnel for the radio in the bridge. The tunnel setting has no effect when bridge is not enabled.

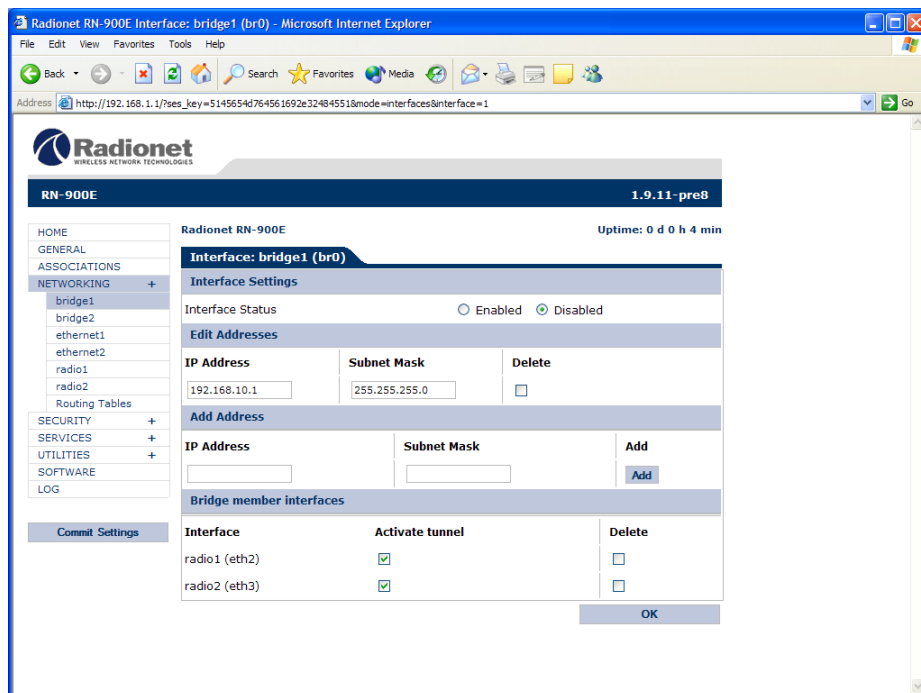


Figure 11: Configuring the bridge interface

Removing an interface from the bridge

The Bridge member interfaces section of the configuration page is used to remove interfaces from the bridge. Available interfaces are listed in the Interface combo box.

To remove an interface from the bridge

1. Using the combo box, select the network interface to be removed.
2. Click the Delete checkbox beside the selected interface.
3. Click the OK button to remove the selected interface from the bridge.

Binding an interface to the bridge

The Add Interface to Bridge section of the configuration page is used to bind interfaces to the bridge. Available interfaces are listed in the Bridge Interface combo box.

To bind an interface to the bridge

Using the combo box, select the network interface to be bound to the bridge.

Click the Add link beside the selected interface.
Click the OK button to bind the selected interface to the bridge.

Changing radio interface settings

Click NETWORKING>radio1 or NETWORKING>radio2 links in the configuration menu to open the configuration pages for the first and second radio interfaces, respectively.

The process of editing the basic interface settings (interface label, status and DHCP settings) is exactly as described for Ethernet interfaces in Section **Basic interface settings**, on page 18, except

that you cannot set the IP address, since both of the radios are automatically configured to be used in the bridge interface (see page 19).

Interface settings specific to the radio interfaces are described here (see Figure 12). Depending on the product version you are configuring some of the Radio Settings might be missing or appear differently.

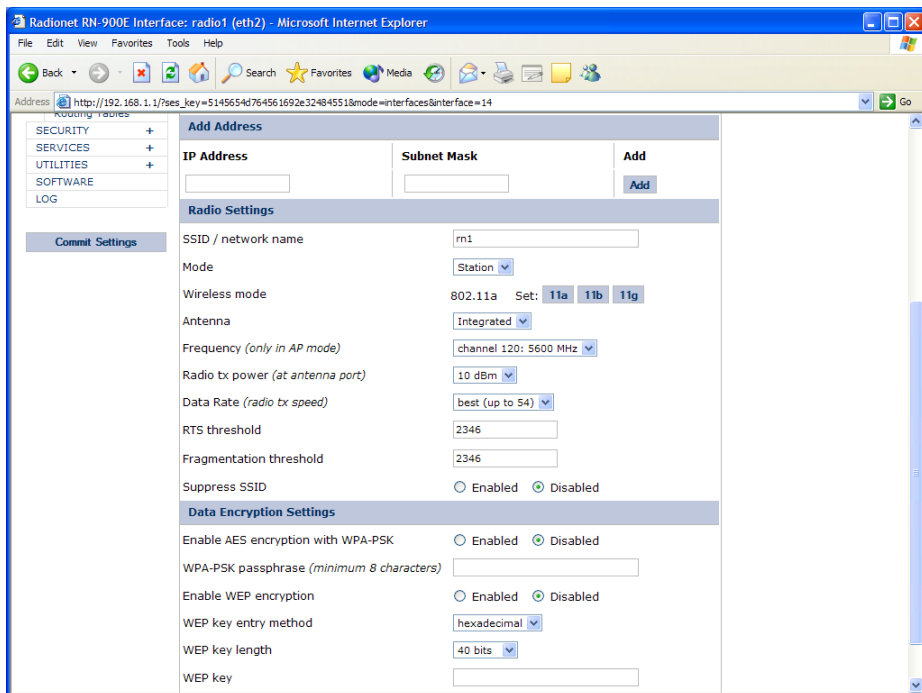


Figure 12: Configuring the radio interfaces

Edit the SSID

To change the SSID of a radio interface, enter the new SSID in the SSID/network name text box and click OK. The SSID may contain a maximum of 32 characters. End-user devices should be configured to use the same network name in order to communicate.

Set the Wireless mode

Use the Wireless mode buttons to specify whether the interface will operate as an 802.11a, 802.11b or 802.11g interface.

Set the Operation mode

Use the Mode combo box to specify whether the interface will operate as an AP or a Station.

Choose the antenna type

Choose whether you want to use an integrated or external antenna. Integrated antenna is available for radio 1 only.

Set the Operating Frequency

Use the Frequency combo box to select an operating frequency for the link connection (Master mode only) or the client access. The operating frequency is expressed in MHz.

Set transmit power

Do not exceed the maximum EIRP power ($\text{EIRP} = \text{tx power} - \text{cable loss} + \text{antenna gain}$), which is limited by the local radio authority.

When using external antennas, the cable loss should also be taken in account. Use the Radio tx power combo box to select your desired power level and click the OK button.

Set the RTS threshold

This value determines the maximum packet size allowed before the RTS/CTS handshaking protocol takes effect. To avoid packet loss when multiple slaves are sending packets to a master, the RTS/CTS protocol will be activated whenever a packet exceeds the specified threshold. A threshold value of 1 implies automatic RTS/CTS. Values in the range {1-2346} are supported. To change the RTS threshold, enter the new value in the RTS threshold text box and click the OK button.

Set the Fragmentation threshold

In a noisy radio environment, packet fragmentation is used to split large frames to smaller frames to minimize the decrease in network capacity. If the size of a frame exceeds the fragmentation threshold, the frame will be fragmented into small frames. Values in the range {256-2346} are supported. To change the Fragmentation threshold, enter the new value in the Fragmentation threshold text box and click the OK button.

Suppress/Enable SSID broadcast

This pair of radio buttons indicates whether the SSID is broadcast over the wireless network. Disabling SSID broadcast can increase wireless network security. Click the appropriate radio button to Enable or Disable SSID broadcast and click the OK button. Suppressing SSID can however limit the capability of end-users to connect to a base station, and is discouraged in public hotspot/hotzone installations.

Enable AES encryption

If you wish to enable AES encryption, choose Enabled on this pair of radio buttons.

WPA-PSK passphrase

If AES encryption is enabled also a WPA-PSK passphrase needs to be set. The passphrase must be the same in all devices of a Point-to-Point or Point-to-Multipoint link connection.

Note! Remember to click on the OK button to apply your changes, and click Commit Settings to permanently accept the new configuration.

Editing the routing table

To set up routing information for the Radionet RN-900FCC, click on the NETWORKING > Routing tables link in the configuration menu. This will open the routing table configuration page (see Figure 13).

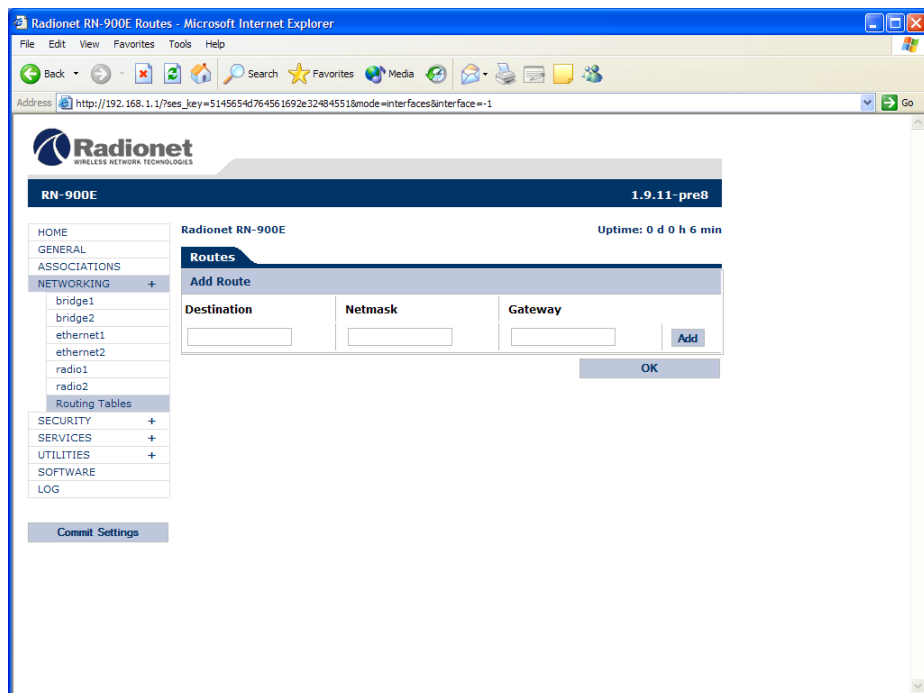


Figure 13: The Routing table

Editing an existing route

Existing routes are displayed in the Edit routes section of the configuration screen.

To modify an existing route click in the Destination, Gateway and/or Netmask fields. Edit the existing information and click the OK button.

Adding a new route

Assign a new route by using the Add Route fields at the bottom of the configuration screen.

To add a new route

Enter the destination network in the Destination text field, and the associated gateway and subnet mask in the Gateway and Netmask fields. Click the Add link beside the new route information.

Default gateway

To set the default gateway, use "0.0.0.0" for both, the Destination and the Netmask.

Note! Remember to click on the OK button to apply your changes, and click Commit Settings to permanently accept the new configuration.

Security

Click on the SECURITY entry in the configuration menu to access the remote login and administrator setup screens.

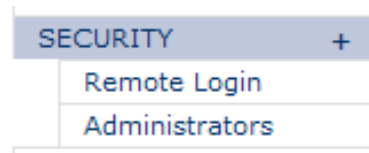


Figure 14: The Security menu

Use these pages to expand or limit access to the configuration interface of the Radionet RN-900FCC. The remote login page allows you to determine which protocols can be used to connect to the configuration interface of the base station unit. The administrator page lets you modify a list of users who are authorized to make changes to the Radionet RN-900FCC.

Configuring remote login services

To set the accepted configuration login services, click the SECURITY> Remote Login link in the configuration menu.

The configuration system of the Radionet RN-900FCC supports the SSH and HTTP services. Use the radio buttons, as illustrated in Figure 15, to enable or disable each service.

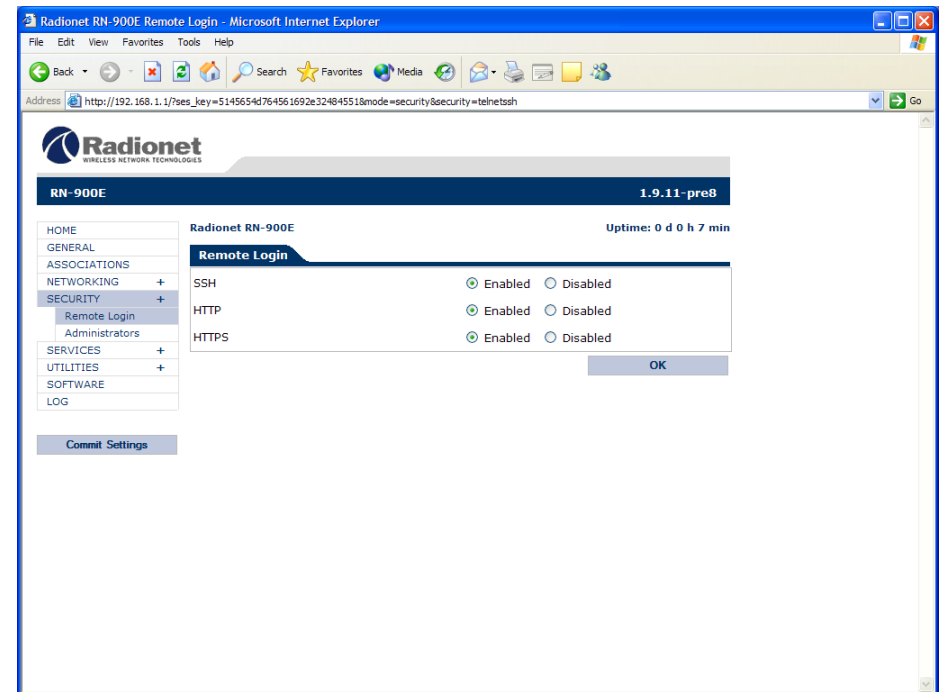


Figure 15: Remote login services

SSH

The SSH service allows an administrator to access the Radionet RN-900FCC configuration system from a text-based terminal.

HTTP

The HTTP service enables an administrator to connect to the Radionet RN-900FCC configuration system using a web browser.

HTTPS

The HTTPS service enables an administrator to establish an encrypted and secure HTTPS connection (encrypted using SSL, Secured Sockets Layer) to the Radionet RN-900FCC configuration system using a web browser.

WARNING! Under no circumstances should you disable all remote login services! At least one remote login service should remain operational, to enable you to access and configure the Radionet RN-900FCC.

Click the OK and Commit Settings buttons to retain any changes you make.

Configuring administrator accounts

Click on the SECURITY> Administrators link in the configuration menu to open the Administrators configuration page.

The Radionet RN-900FCC is shipped factory-set with the following single administrator account:

Username: admin
Password: default

It is strongly recommended that you change the factory-set password to one of your own as soon as possible, in order to prevent unauthorized access to the configuration system of your Radionet RN-900FCC unit.

Note! When changing the password, the new password will also be your new SSH password.

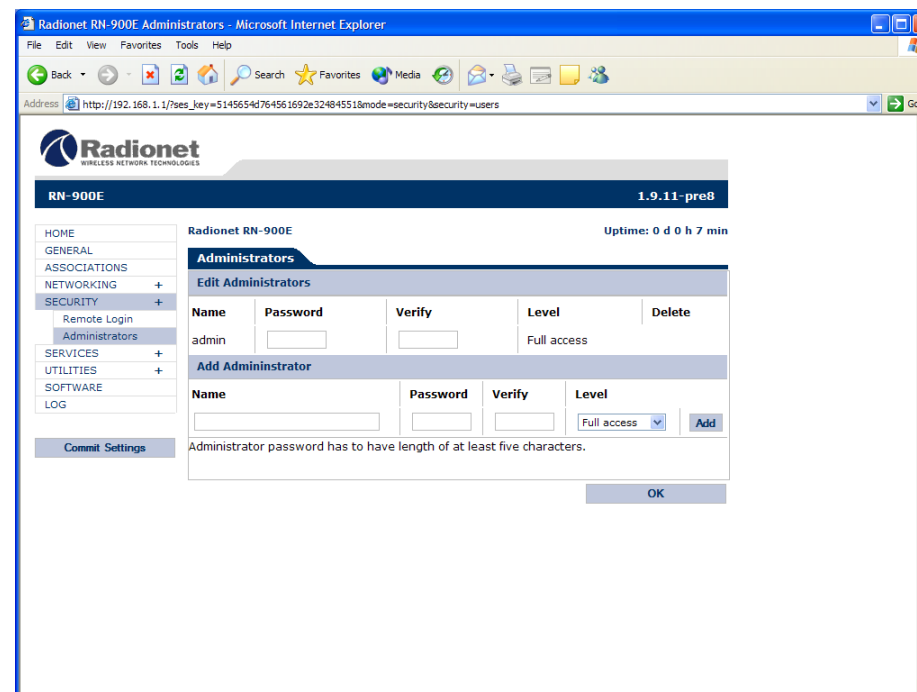


Figure 16: Editing administrator information

Adding a new administrator account

Any number of additional administrators may be created, using the Add user section of the Administrators configuration page. To create a new administrator account, enter the required information in the text fields provided:

Name

Provide a login name for the new administrator. This is the name that must be entered at the configuration interface's login screen (see page 12).

Password

Provide a password for the new administrator. For security reasons, the password is being displayed on the screen as a series of asterisks. Note that the password must also be entered in the Verify field (see below) in order to be accepted.

Verify

New passwords must be entered both here and in the Password field (see above). The requirement to enter the password twice is a precaution against a mistyped password. The passwords in the Password and Verify fields must match, or the new administrator account will not be created.

Level

Administrators may be assigned to one of two levels. To set the access level of an administrator, select the desired level from the combo box:

Full access

An administrator with Full access has a complete control over the Radionet RN-900FCC configuration interface, and may create, modify and save any of the available settings.

Read access

Administrators with Read access are able to examine logs and configuration information, but are barred from implementing any changes to the settings of the Radionet RN-900FCC.

Click the OK button to make the new administrator account active. To retain a permanent record of the new administrator, continue by clicking on the Commit Settings button.

Deleting an administrator account

To delete an existing administrator account, click the Delete checkbox at the end of an administrator record, and click the OK button. To make the deletion permanent, click on the Commit Settings button.

The administrator account that is currently logged in cannot be deleted.

Editing administrator passwords

The list of current administrators is displayed at the top of the Administrator configuration screen. To change the password of an administrator account, simply enter the new password in the text fields and click OK.

Services

DHCP server

DHCP server is a system to dynamically allocate IP addresses to a client network. To set up network services, begin by clicking on the SERVICES link in the configuration menu.

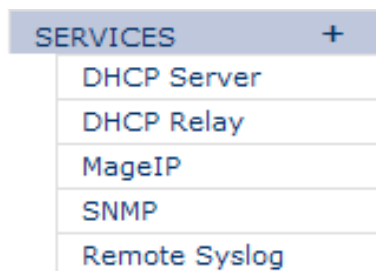


Figure 17: The Services menu

Configuring the DHCP server

You may access the DHCP configuration page through the SERVICES> DHCP menu link. The DHCP server enables the Radionet RN-900FCC to dynamically assign IP addresses to clients on the local network.

The DHCP configuration page is divided into three sections, General DHCP Server Settings, Client pool and Client network settings. Each section is described below. To activate the DHCP server, complete the configuration fields with values appropriate to your network.

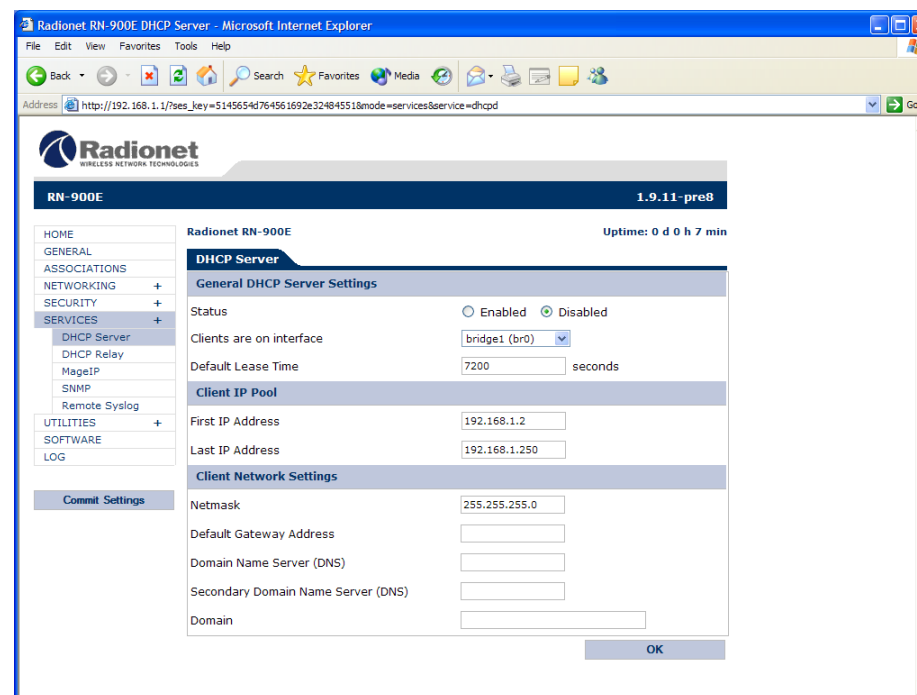


Figure 18: Configuring the DHCP server

General DHCP Server Settings

The general settings determine whether or not the DHCP server is active, over which network interface it operates, and lease times for IP addresses.

Status

Select the Enabled radio button to make the DHCP server active. Clicking the Disabled button tells the Radionet RN-900FCC not to activate the DHCP server.

Interface

This setting determines which interface of the Radionet RN-900FCC will act as a DHCP server interface. Choose bridge, ethernet1, ethernet2, radio1 or radio2 from the options using the combo box.

Default lease time

Enter the default lease time here, in seconds. This value will be used if the client does not request a specific lease time.

Client IP pool

The client pool refers to the range of available IP addresses that will be served by the DHCP server of the Radionet RN-900FCC. Specify the address range by providing the lowest and highest IP addresses that will be served.

First IP address

Enter the lowest IP address that will be served to clients.

Last IP address

Enter the highest IP address that will be served to clients.

Client network settings

In addition to a dynamically assigned IP address, the DHCP server will provide the following network information to clients. Enter the appropriate values for your network.

Netmask

The subnet mask that will be passed to the clients.

Default Gateway Address

The IP address of the clients' default gateway.

Domain Name Server (DNS)

The IP address of the clients' DNS server.

Secondary Domain Name Server (DNS)

The IP address of the clients' secondary DNS server.

Domain

The domain name that will be served to hosts.

Remember to click the OK button to apply all changed DHCP settings. To permanently record the DHCP configuration, click on the Commit Settings button.

DHCP Relay

On this page you may enable or disable DHCP relaying.

If you choose to enable the DHCP Relay, you must select the interfaces for client distribution and the DHCP Server from the corresponding combo boxes. DHCP requests received from the client distribution interface are forwarded to the DHCP server. Also enter the IP address of the DHCP Server in the Server IP Address field. If there is a network controller (NC), which also acts as a DHCP server and MageIP is in use, you should enter the IP of your NC in this field.

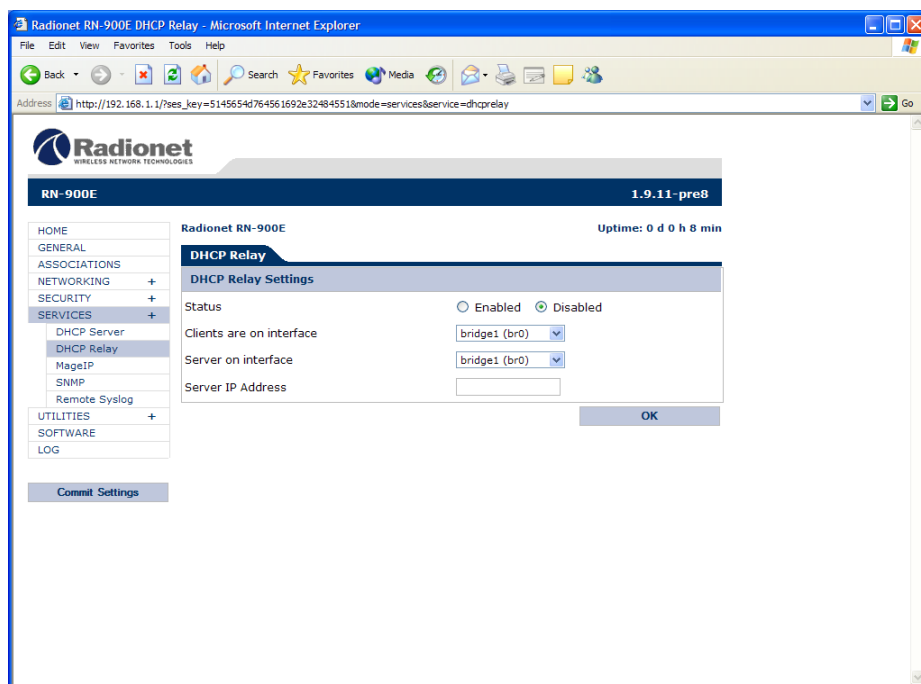


Figure 19: The DHCP Relay page

MageIP

MageIP is the mobility management protocol present in Radionet base stations used in conjunction with a Radionet Network Controller.

In the MageIP menu, under services, you may configure the MageIP service enabled or disabled.

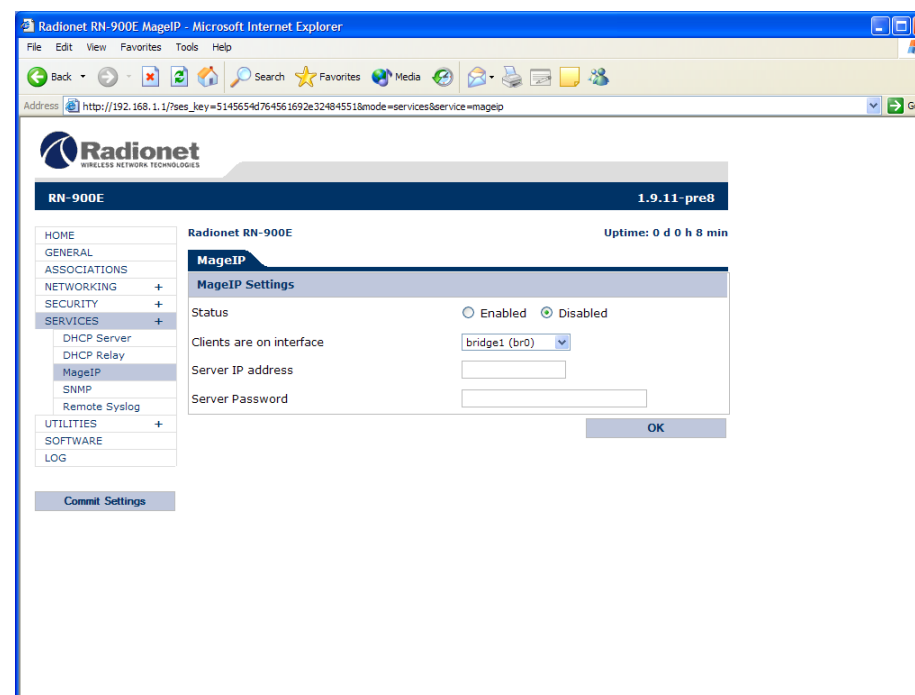


Figure 20: The MageIP page

To enable MageIP, the client distribution interface must be set. Choose the correct interface from the Interface combo box. The client interface is the interface end-users are going to be connected

to; typically there should be no reason not to leave it to the default setting of 'bridge'.

Additionally you need to fill in the Server IP Address and Server Password fields. Since the MageIP server resides in a network controller unit, you should configure the IP address of the network controller as the Server IP address.

Server password is the password defined in the Network Controller HTTP management menu for this base station.

To use MageIP, you also need to enable DHCP Relay and use the network controller as DHCP server.

SNMP

Simple Network Management Protocol is a protocol designed for centralized management of network devices. Radionet RN-900FCC supports the reading of networking-related values (bytes sent/received for example) with SNMP.

Currently the Radionet RN-900FCC supports MIB-II, a known SNMP definition for general network devices.

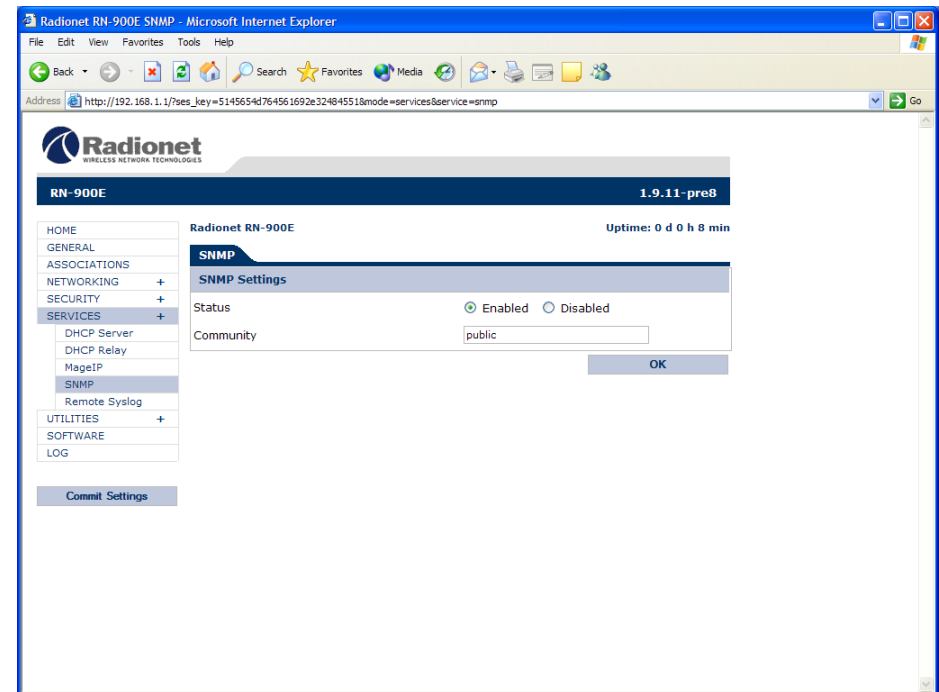


Figure 21: The SNMP page

To configure SNMP, you need to enable it first by selecting the 'Enabled' option after 'Status', and then enter the community name in the 'Community' field. Community is the term used in SNMP for the authentication of a network management software, very much like a password. It is important to select a good community name since malicious users can exploit some of the information available with SNMP; it allows to gather quite a lot of information about the network in a very easy manner.

Remote Syslog

Remote syslog sends system messages to remote system over UDP. This allows logs to be gathered from multiple devices. Some network management systems utilize syslog in addition to SNMP to monitor state of the network and the devices.

To use remote syslog, set the status to enabled state and enter the IP address of the host, which collects the logs as destination. Also it is possible to set the destination port number. Usually the syslog servers run on default UDP port 514.

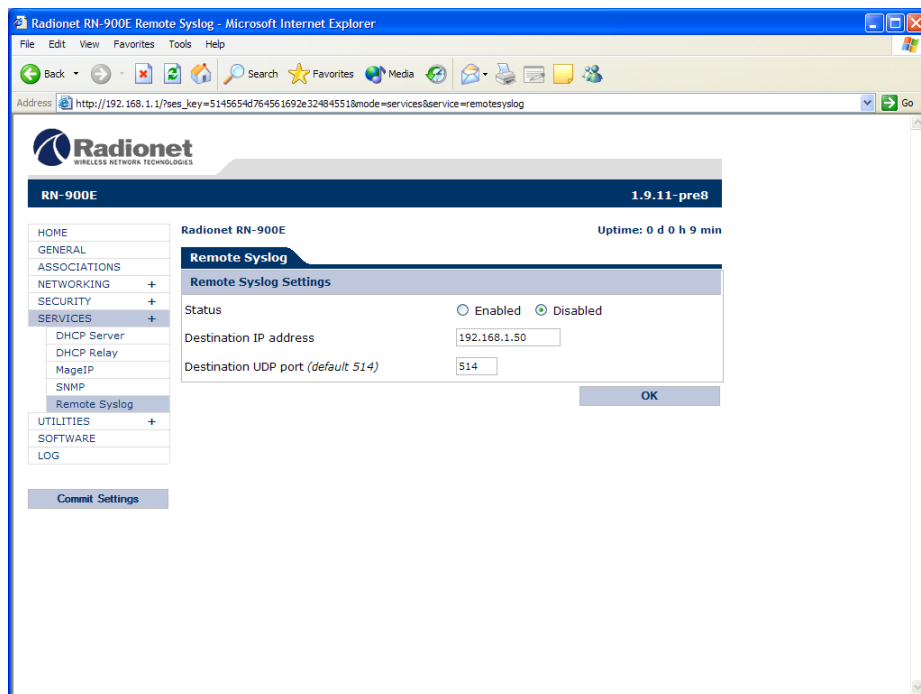


Figure 22: The Remote syslog page

Utilities

During configuration of your wireless network, you may wish to test the status and connectivity of nodes. The configuration system of the Radionet RN-900FCC comes with a set of useful features; ability to view the current state of the unit's ARP Table and Ping & Traceroute testing tools. To access these features, click on the UTILITIES link in the configuration menu.

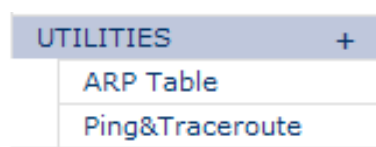


Figure 23: The Utilities menu

ARP table

A table of the most recent IP-to-physical address bindings.

Viewing the ARP table

The ARP (Address Resolution Protocol) table lists the most recently acquired associations between MAC (physical-layer) addresses and IP addresses on the network. Click on the link UTILITIES>Arp Table to view the most recent ARP table.

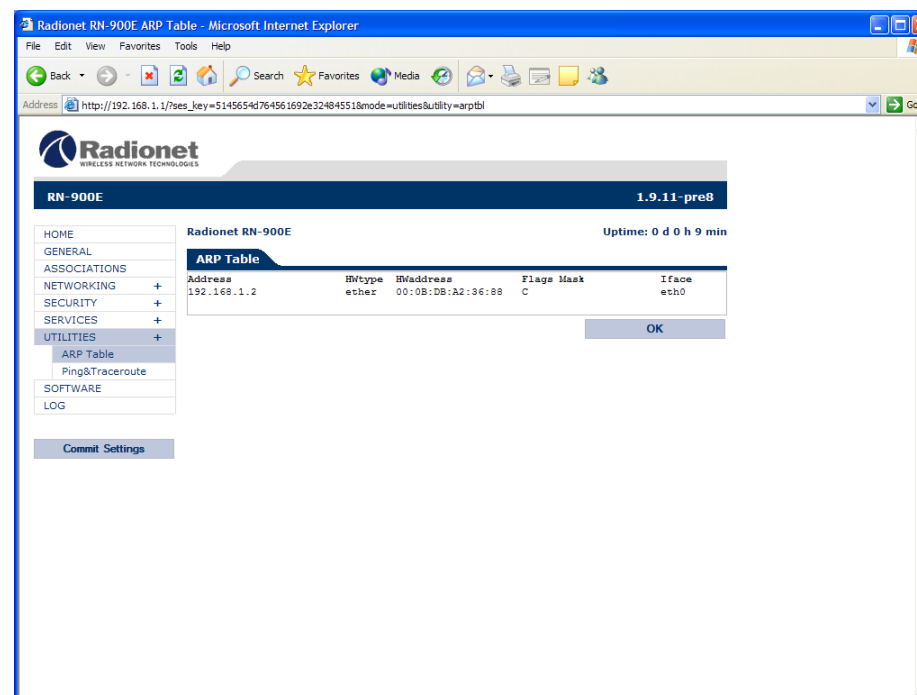


Figure 24: The ARP table

Locally connected hosts are displayed as rows in the table. The table's columns provide information about each host:

Address

The IP address of a host.

HWtype

A label signifying the type of a physical connection of a host. All nodes connected to the Radionet RN-900FCC will display ether, indicating an Ethernet connection. This is true even in case of wireless connections, as the wireless interfaces transmit Ethernet frames.

HWaddress

Hardware address. The Ethernet or WLAN MAC address of a host.

Flags

The symbols listed in the Flag column indicate how the address has been obtained. The symbol C indicates complete entries in the ARP cache.

Mask

The subnet mask of the host. As the ARP table only retains local addresses, this column should remain empty for all entries.

Iface

The name of the interface of the Radionet RN-900FCC through which the host was found.

Ping & Traceroute

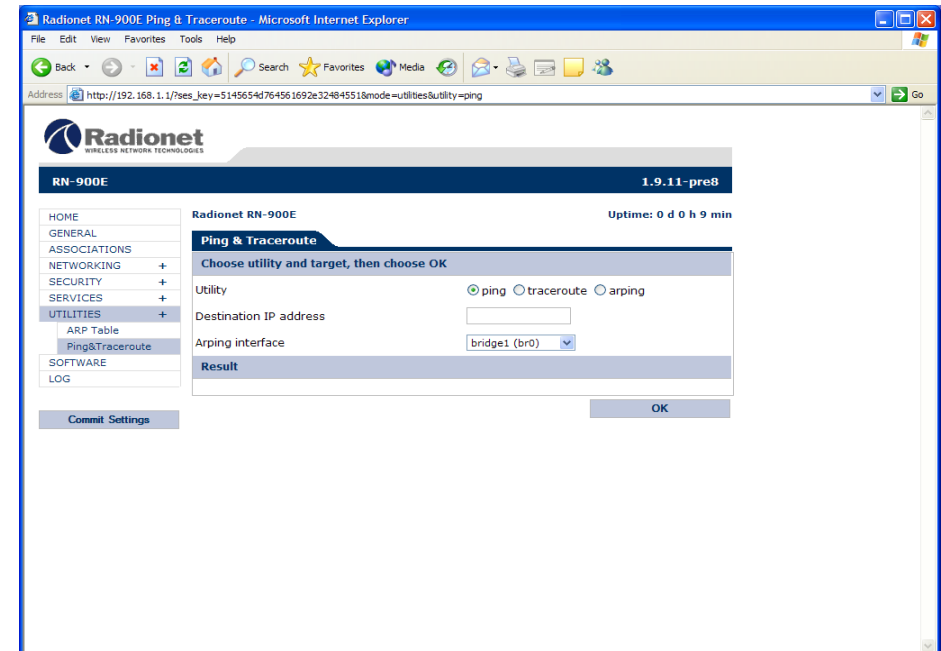


Figure 25: Ping&Traceroute

Ping

The ping utility sends five ICMP request packets and waits for a reply. The response shows the time it takes (round trip time, rtt) to reply for each packet (time in milliseconds). The statistics summarize received reply packets (received and packet loss). Last line shows minimum, average and maximum round trip times. Also the maximum deviation from average is shown, though the five packets used here are not sufficient for rtt statistics. Firewalls may block ping packets.

Traceroute

Traceroute maps a route to a given host. The host and intermediate routers send ICMP replies to requests sent by the base station. It should be used primarily for manual fault isolation. Traceroute helps to detect faulty routing or the location where packets are lost (after the last router that responds).

Each result line represents intermediate or target host and contains:

- Index (starting from 1)
- IP address
- Round trip time for each of three test packets. Replaced with an asterix if a packet is lost. Some routers may not send reply packets or they may be blocked by a firewall.

Arping

Arping is similar to ping, but uses ARP protocol instead of ICMP. ARP is not routed, so arping works only to locally connected hosts. Some hosts that do not answer to ping because of firewall settings answer to arping.

The utility sends five request packets and reports a round trip time for each response.

Software

From time to time, firmware upgrades may become available for your Radionet RN-900FCC. Check the Radionet website, <http://www.radionet.com/>, for a list of updates currently available. Firmware updates are distributed as files. The procedure for updating the Radionet RN-900FCC firmware is as follows:

1. Locate the appropriate update file on the Radionet website.
2. Right-click on the file name to save it on your computer. You will find it most convenient if you save the file on the same computer that you use to access the Radionet RN-900FCC configuration utility.
3. Log in to the Radionet RN-900FCC configuration utility, and open the Software update screen to upload the update file to the Radionet RN-900FCC unit (see below).

Using the Software Update page

The Software Update page provides the means of transferring the firmware update file from your computer to the Radionet RN-900FCC unit. To access the Software Update screen, click on the SOFTWARE link in the configuration menu.

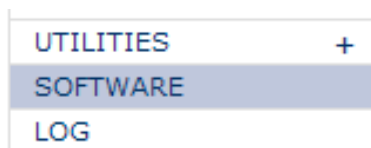


Figure 26: The Software update menu link

At the top of the page, the current software and hardware version numbers are displayed, along with the unit's serial number. Near the bottom of the page, a blank text box and a pair of buttons allow you to select and upload the new firmware (see Figure 27).

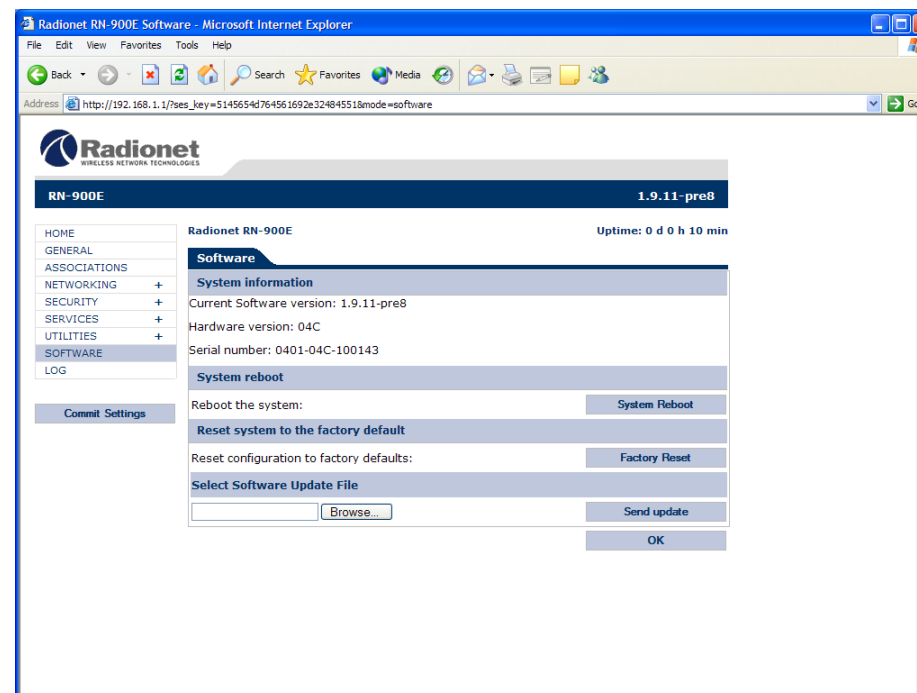


Figure 27: The Software update screen

Provide the location of the downloaded update file. You may either:
Type the full path of the file into the blank Select Software Update File text box, or

Use the Browse button to open a file-request dialog box. Locate the folder containing the file, then click on the update file name, and click the Open button.

Once the location of the update file has been provided, click the Send update button to upload the file to the Radionet RN-900FCC. It may take time for the update file to be transferred.

Important! The Radionet RN-900FCC is automatically rebooted after the new firmware has been loaded. The procedure takes approximately four minutes. Do not unplug the power cable during this procedure. The new firmware has been successfully loaded when you can reach the login page again.

Factory Defaults

Click here to undo all changes to the device and revert the initial factory-determined settings. Note that these newly loaded defaults will be lost upon reboot of the Radionet RN-900FCC unless they are permanently stored via the Commit Settings button.

Important! Depending on the changes made, it may take up to 1 minute for newly committed settings to take effect. Do not switch off the Radionet RN-900FCC during this time!

Changes made to a page only take effect if the OK button is clicked. Note that changes to a page will not take effect if you navigate away from the page (using the configuration menu or your browser's Back button) before saving.

Log

Use the Log page (see Figure 28) to add entries to the system log of the Radionet RN-900FCC. You may also read log entries made by the system and other administrators.

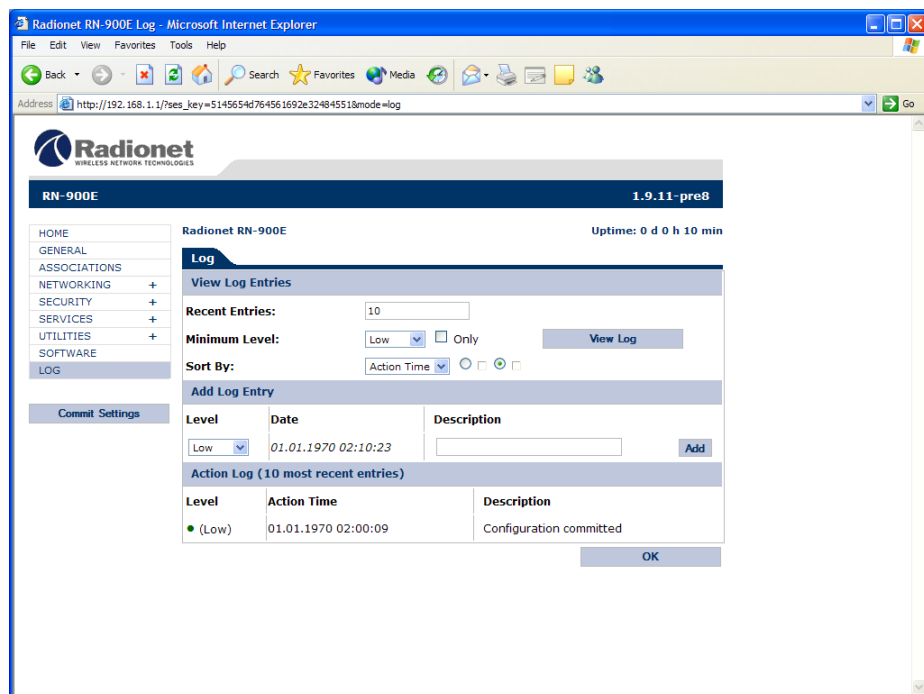


Figure 28: The Log page

The Radionet RN-900FCC generates log entries automatically. Log entries may also be added by administrators as maintenance notes.

Log entries are divided into three levels of severity: Low, High and Critical.

Low severity

Informational messages and notifications of unexceptional events.

High severity

Error messages and warnings. Log entries at this level indicate a problem with the hardware or software of the Radionet RN-900FCC that may affect its performance.

Critical severity

Emergency messages and critical alerts. If you are seeing log entries at this severity level, the Radionet RN-900FCC has become unstable and requires your immediate attention.

The severity level of each log entry is noted in the Action Log (see below).

Viewing log entries

The ten most recent log entries are displayed in the Action log, at the bottom of the Log screen. To view more log entries, or to display log entries matching specific criteria, complete the View log entries form shown in Figure 28. The available parameters are described below:

Recent Entries

Enter the number of log entries you wish to view. Only the most recent entries will be displayed.

Minimum Level

Select the minimum severity level of the log entries you wish to view. Messages with a severity below the level you select will not be displayed. Select All to display all log entries, regardless of level. Checking the Only box will limit displayed log entries to only those exactly matching the selected severity level.

Sort by

Select how you want to view the log entries. Sorting by Action time will display log entries in chronological order. Selecting Description will display the log entries in alphabetical order. Choosing Level will group log entries by severity level (see above). The radio buttons Ascending and Descending apply to all forms of sorting, and allow you to display the log entries in standard or reverse order respectively.

Press the View Log button to refresh the screen and update the Action log with your selected criteria.

The Action Log

The Action log (see Figure 28), at the bottom of the Log screen, displays either the last ten log entries or the results of a log search (see Viewing log entries, previous page). Each log entry comprises three columns, containing information about the event that generated the log:

Level

The severity level of the event, either Low, High or Critical (see above).

Action time

The time and date when the log entry was generated or submitted.

Description

A brief description of the event that caused the log entry.

Adding a log entry

As an administrator, you may wish to add a log entry manually. This may be useful to notify other administrators if you have recently maintained or reconfigured the Radionet base station unit. To add a log entry, complete the Add Log Entry form (shown in Figure 29).

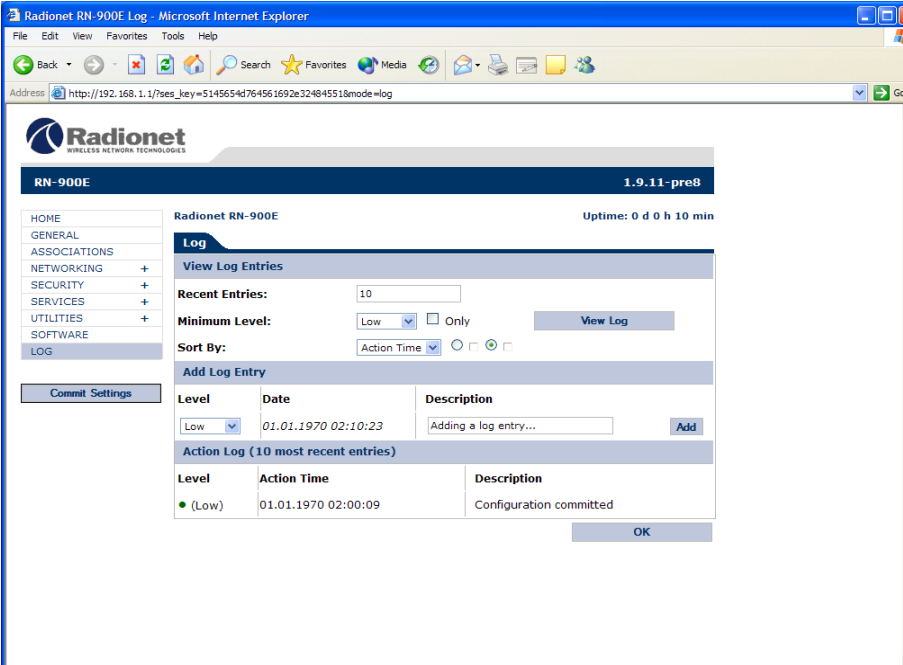


Figure 29: Manually adding a log entry

To add a log entry, follow the steps below:

1. Decide the severity level of the note you wish to create, and select the corresponding value from the Level combo box.
2. Enter the text of your note into the Description box.
3. Click the Add button. The time and date will be automatically recorded with your new log note.

Log messages

The Radionet RN-900FCC generates the following messages during normal operation.

Configuration committed

This message is generated during normal operation, whenever settings are successfully written to the Radionet RN-900FCC using the Commit Settings button.

Associated

New association. The log message contains the MAC address of the peer.

Association lost

The association has been lost. This message contains the MAC address of the peer that lost the association.

The next two types of log messages result from exceptional behavior of the unit and might need your attention.

Error committing configuration

This critical message indicates a problem with the unit. The specific error may be identified from the text accompanying the message in the action log.

Boot triggered by watchdog

This critical message indicates that the watchdog has rebooted the system because of a hardware or software problem.

Resetting the unit

Resetting the unit to factory defaults is committed with the factory default tool delivered with the package.

Follow these steps to reset the unit.

1. Switch off the unit.
2. Place the pins of the factory default tool into the two little connector openings next to the Ethernet 2 connector (Ethernet 1 in RN-700E/UK units).
3. Power up the unit.
4. Wait while the unit reboots. During the start-up process, the led-indicator is blinking green in the beginning, then it turns to red and when the process is finished it turns to solid green (not blinking).
5. You may disconnect the factory default tool when the led-indicator lights as solid green.
6. The unit is now reset to factory defaults.

Warranty

Radionet Ltd. provides a 12 months guarantee for equipment failure. Guarantee period starts from the delivery of the product. Equipment failure is defined as a fault that is caused by a component failure or a system malfunction that prevents the use of the product according to specifications, in circumstances where the product has been used within the specified conditions in terms of environmental conditions and appropriate interfaces (data interfaces, power supply). Equipment guarantee does not cover failures caused by natural forces (thunder), variations in electricity supply, purposeful mistreatment or misuse like reverse engineering of the product.

Radionet Ltd. Guarantees that the product is compliant with the FCC 15.247 (802.11 a/b/g), FCC 15.407 (802.11a), IC 15.247 (802.11 a/b/g), IC 15-407 (802.11a) and IEC 60950 standards.

Failed equipment shall be returned to Radionet or its distributing partner within 30 days of the failure. Customer shall send the product to Radionet Ltd. for repair and analysis. In case of severe equipment fault, Radionet may then send a replacing unit. Customer will pay the shipment cost related with the return of the product. Radionet will pay for the shipment cost when equipment is returned after repair, or shipment of a replacement unit.

Disclaimer

The guarantee and maintenance policy of Radionet is that the equipment is handled as an integrated unit. When spare parts or accessories are considered these are outside of the scope of this equipment guarantee. Instructions for spares and their use are specified separately. In no event shall Radionet Ltd. be responsible for the consequences of an equipment malfunction to the customer's activities in business or other activities. Radionet is neither responsible to compensate any damages or consequences to customers, or stakeholders of that, which are caused by incorrect, unspecified, illegal, misuse or wrongful implementation of the equipment in use. See product documentation for detailed instructions on use and installation, according to the specified purpose of use.

APPENDIX 1: Detailed instructions for cabling

Power cabling

Pin 1	0
Pin 2	+ 12...30 V DC +-5%
Pin 3	RS-485 Tx/Rx-
Pin 4	RS-485 Tx-Rx+

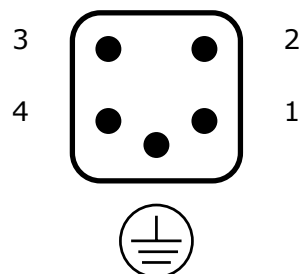


Figure 1: The power connector pin configuration for the Radionet RN-900FCC.

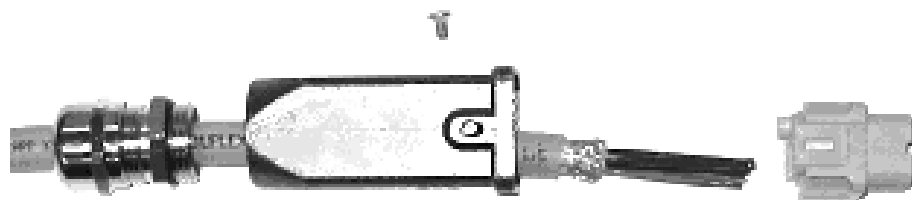


Figure 2: The assembly of the power connector

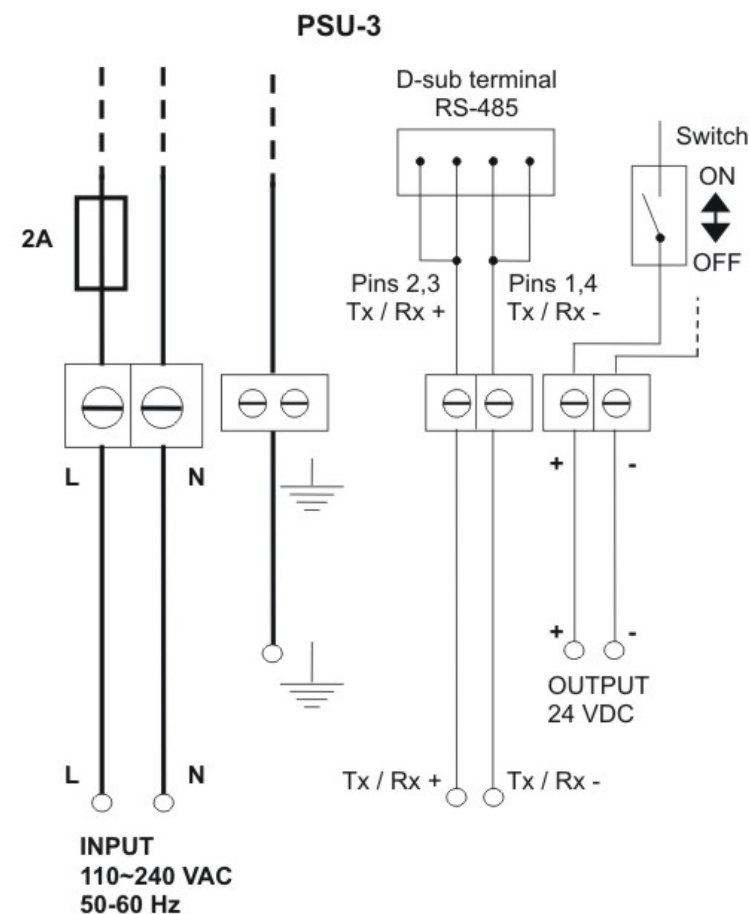


Figure 3: Wiring diagram of PSU-3 power supply

The conductor area of the power cable must be adequate to avoid malfunction of the unit and overheating of the power cable. The length of the power cable must not exceed 50 meters (165 feet).

See the table below for correct cabling between the Radionet RN-900FCC and the power supply unit.

Distance	Conductor area mm ² (AWG size)
1 - 30 meters (1 - 100 feet)	1,5 mm ² (#14 AWG)
30 - 50 meters (100 - 165 feet)	2,5 mm ² (#12 AWG)

Ethernet cabling

Maximum length of the Ethernet cable is 100 meters (330 feet). The Ethernet cable must fulfil CAT5 category FTP outdoor cable specification.

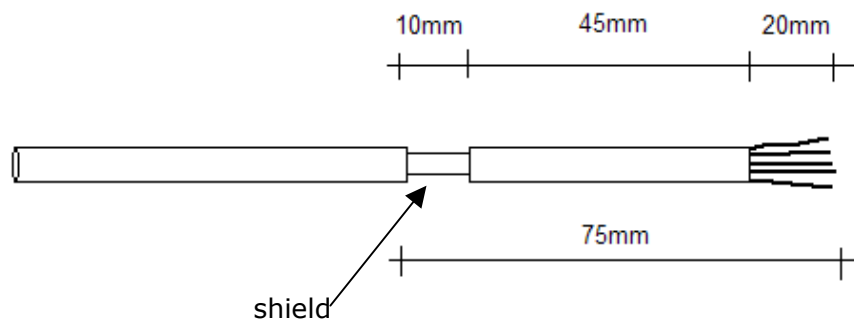


Figure 3: Stripping of an Ethernet cable.

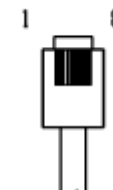


Figure 4: RJ-45 connector pin numbering

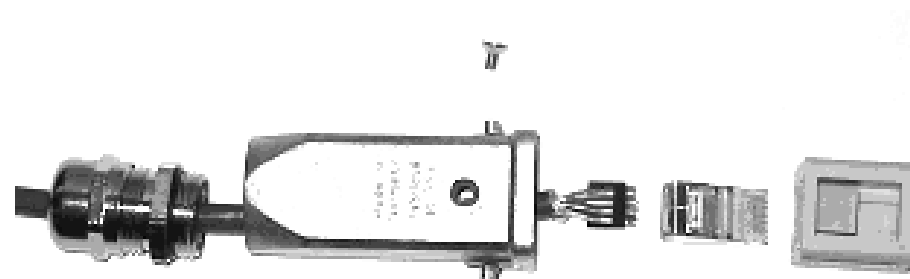


Figure 5: The assembly of an Ethernet connector

Twisted pair Ethernet cable:

RJ-45 pin number	Color	Color
1	White/orange	White/orange
2	Orange	Orange
3	White/green	White/green
4	Blue	Blue
5	White/blue	White/blue
6	Green	Green
7	White/brown	White/brown
8	Brown	Brown

Cross over Ethernet cable:

RJ-45 pin number	Color	Color:
1	White/orange	White/green
2	Orange	Green
3	White/green	White/orange
4	Blue	Blue
5	White/blue	White/blue
6	Green	Orange
7	White/brown	White/brown
8	Brown	Brown

Recommended Ethernet cable types:

Cable manufacturer	Cable type
LAPP CABEL	UNITRONIC. EtherLine-P Flex CAT.5 4 x 2 x AWG26 Art. Nr. 2170300

APPENDIX 2: Further reading

IEEE 802.11 LAN/MAN standards
Physical and MAC layer standards for WLAN networks
<http://www.ieee802.org/11/>

IEEE 802.11a-1999 Wireless LAN Medium Access Control (MAC) and
Physical Layer (PHY) specifications-Amendment 1: High-speed
Physical Layer in the 5 GHz band

IEEE 802.11h-2003 Wireless LAN Medium Access Control (MAC) and
Physical Layer (PHY) Specifications: Spectrum and Transmit Power
Management Extensions in the 5GHz band in Europe
Wi-Fi interoperability
<http://www.wi-fi.com>

Wi-Fi test requirements for 802.11a/h (Wi-Fi 5), WPA
Wi-Fi technology and business news
Wi-Fi Planet: <http://www.wi-fiplanet.com>
Wi-Fi security
AES Strong data encryption method substitutes WEP as more secure
wireless encryption solution: <http://csrc.nist.gov/CryptoToolkit/aes>

APPENDIX 3: Factory Settings

The Radionet RN-900FCC is shipped with the settings listed below. Clicking the Factory defaults button in the configuration utility will reset the settings of the unit to these values.

Category	Setting	Value
Bridge 1:	IP address	192.168.10.1
	Subnet mask	255.255.255.0
	Status	Enabled
	DHCP	Disabled
	Bridge member interfaces	radio1 radio2
Bridge 2:	IP address	192.168.11.1
	Subnet mask	255.255.255.0
	Status	Enabled
	DHCP	Disabled
	Bridge member interfaces	Ethernet1 Ethernet2
Ethernet 1:	IP address	192.168.1.1
	Status	Enabled
	DHCP	Disabled
Ethernet 2:	IP address	192.168.2.1
	Status	Enabled
	DHCP	Disabled
Radio settings:	SSID	rn1/rn2
	Antenna, radio1	Integrated
	Antenna, radio2	External
	Freq	2412/2462
	TX Power	10 dBm
	RTS Threshold	2346

Routing tables:	Fragmentation Threshold	2346
	SSID suppression	Disabled
		(empty)
Remote login:	All services	Enabled
Administrators:	Name	Admin
	Password	default
	Level	Full access
DHCP server:	Status	Disabled
	Interface	bridge
	Default Lease time	7200 secs
	Maximum Lease time	7200 secs
	Client pool	192.168.1.2- 192.168.1.250
	Domain Name Server (DNS)	(none)
	Gateway	(none)
	Netmask	255.255.255.0
	Domain	empty

APPENDIX 4: Allowed channels in 2,4 GHz and 5 GHz frequency bands

USA and Canada channels

Standard: 2.4 GHz (IEEE 802.11b/g)	
No	Carrier center frequency (MHz)
1	2 412
2	2 417
3	2 422
4	2 427
5	2 432
6	2 437
7	2 442
8	2 447
9	2 452
10	2 457
11	2 462

Standard: 5 GHz (IEEE 802.11a)	
No	Carrier center frequency (MHz)
149	5 745
153	5 765
157	5 785
161	5 805
165*	5 825

* not yet included in 1999 version of IEEE 802.11a

APPENDIX 5: Allowed transmit power levels, and radio + antenna combinations with Radionet FCC/IC-Canada products

Product model	Application	Radios	Transmitter characteristics	Frequency area (GHz)	Radio unit transmit power levels (dBm)	Antennas	Max configurable transmit power levels	Max e.i.r.p allowed FCC/IC-Canada
RN-900 FCC/IC-Canada	Point-to-point link	1* IEEE 802.11a	5 GHz OFDM radio	5.725-5.850 GHz (5 channels)	+ 2, 7, 10, 13 or 16 at antenna port	Integrated 20 dBi antenna	36 dBm (4W)	4 W
RN-900 FCC/IC-Canada	Point-to-multipoint link/access	2* IEEE 802.11a	5 GHz OFDM radio	5.725-5.850 GHz (5 channels)	+ 2, 7, 10, 13 or 16 dBm at antenna port	External antennas allowed: Radionet PlanAir HiperAccess 14 dBi, or PlanAir Hiperlink 22 dBi	36 dBm, max 16 dBm at antenna port, + 22 dBi external antenna, and jumper cable (causes 2dBm power loss)	4 W
RN-900 FCC/IC-Canada	Point-to-multipoint links/Access	2* IEEE 802.11b/g	2.4 GHz DSSS/OFDM radio	2.4-2.4835 GHz (11 channels)	+2, 7, 10, 13 or 16 dBm at antenna port	External antennas allowed: Radionet PlanAir Access (12 dBi gain), PlanAir Link (14 dBi gain), PlanAir HomeAccess (13 dBi)	28-30 dBm (1W), max 16 dBm at antenna port, + 12 14 dBi gain in external antennas, and jumper cable (causes 2 dBm power loss)	1 W