

NOKIA

Commissioning and Maintenance

C33513.85--H0

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Summary of changes

Document	Date	Comment
C33513009SE_00	09 Mar 1999	Valid for program: P38205.01 release A (Nokia Hopper Manager C1.0)
C33513009SE_A0	11 Jun 1999	Valid for program: P38205.01 release B (Nokia Hopper Manager C2.0)
C33513009SE_B0	01 Nov 1999	Valid for program: P38205.01 release D (Nokia Hopper Manager C2.2)
DN99593046 Issue 2-0 en	14 Jan 2000	Valid for program: P38205.01 release E (Nokia Hopper Manager C3.0), new document numbering scheme adopted
DN99593046 Issue 5-0 en	07 Jul 2000	Valid for program: P38205.01 release F (Nokia Hopper Manager C4.1)
DN99593046 Issue 6-0 en	31 May 2001	Valid for program: P38205.01 release G (Nokia Hopper Manager C4.2), alarm list updated and form changed
DN99593046 Issue 7-0 en	30 Apr 2002	Valid for program: P38205.01 release H (Nokia Hopper Manager C4.3); FIU 19E and FIU RJ added
DN99593046 Issue 8-0 en	04 Feb 2003	Added information about FIU 19E, removed FIU 19RJ. Combined alarms: One fault code into one table.

1

About this document

This document describes the commissioning and maintenance of Nokia FlexiHopper microwave radio with FIU 19, FIU 19E, or RRIC indoor units. Many commissioning and maintenance actions are carried out using the Nokia Hopper Manager software.

The document contains the following instructions:

- introduction to Nokia Hopper Manager
- commissioning the Nokia FlexiHopper network element
- managing alarms
- maintaining
- upgrading.

Refer to the installation documents (included in this manual) for instructions on installing the FlexiHopper outdoor unit and FIU 19, FIU 19E, or RRIC indoor units. Fine alignment of the antenna, a part of the commissioning phase, is described in *Outdoor Unit Installation* document.

Cross-connections on the RRIC indoor unit are handled using the TruMan node manager (*release C6.0 or later*). For more information on TruMan, see the latest *TruMan User's Manual*. The documentation is delivered with the manager software.

Please familiarise yourself with Microsoft Windows before operating Nokia Hopper Manager or TruMan.

Note

Screenshots included are representations only. The actual node manager program may differ slightly from the shots depicted.

Note

FIU 19 (E) refers to FIU 19, and FIU 19E.

2

Nokia Hopper Manager

This chapter describes the principles of operating the Nokia Hopper Manager software; how to install and start the Manager program, connect to a network element, and exit the program. This chapter also shows the basic features contained in Nokia Hopper Manager, i.e. toolbar, printing, and online Help.

2.1 Installing the manager

This section describes how to install Nokia Hopper Manager on the hard disk of your computer.

This description assumes that:

- You have Nokia Hopper Manager on CD-ROM or an access to Nokia Online Services (NOLS) at www.online.nokia.com.
- The computer meets the system requirements given in the 'Technical Specifications' chapter of the *Product Description* document.
- Windows 95/98, Windows 2000, Windows XP or Windows NT 4.0 Workstation has been correctly installed.
- You are familiar with the version of Windows you are using.
- If you are installing under Windows NT, Windows 2000 or Windows XP, you have administrator rights.
- You are aware of other NMS/10-compliant manager products installed on your PC.

2.1.1 Installing from CD-ROM



To install Nokia Hopper Manager from CD-ROM:

1. Start Windows. It is recommended that you close all other applications before starting the installation.
2. Insert the CD-ROM into the drive.
3. If the autoplay function is activated, the installation program starts automatically. Otherwise, click the **Start** button, and then click **Run**. After the **Run** dialog box opens, click **Browse**. Find the CD-ROM drive and look for the file **Hinstall.exe**. Double click on the file. You are back in the **Run** dialog box. Click **OK** and the installation program begins.
4. From the program you can choose to read the installation notes or install the manager.
5. Click **Install** and follow the on-screen instructions.
6. Depending on the configuration of your computer it may be necessary to reboot the computer during the installation process. If installing the Nokia GCS Q1 communication component the computer may require a reboot when that component installation is completed. After this reboot the installation program requires restarting before installing Hopper Manager.

Note

When you are installing the Hopper Manager in Windows NT, Windows 2000 or Windows XP Professional, make sure that you have appropriate privileges. Only an ADMINISTRATOR user is able to perform the installation.

If you plan to install more than one Nokia node manager, install them under the same directory hierarchy tree. The common root directory is C:\NOKIAMGR by default. In Windows 2000 the common root directory by default is C:\Program Files\Nokia

2.1.2 Installing from NOLS



To install Nokia Hopper Manager from NOLS:

1. Start Windows. Close all other applications before installing Hopper Manager.
2. Extract the installation package that was downloaded from NOLS to a temporary location in your PC.
3. Locate the file HSetup.exe in the installation root directory. Double click on the file and the installation program begins.
4. Locate the file HSetup.exe in the installation root directory. Double click on the file and the installation program begins.
5. Click **Install** and follow the instructions on screen.
6. Depending on the configuration of your computer it may be necessary to reboot the computer during the installation process. If installing the Nokia GCS Q1 communication component the computer may require a reboot when that component installation is completed. After this reboot the installation program requires restarting before installing Hopper Manager.

Note

When you are installing the Hopper Manager in Windows NT, Windows 2000 or Windows XP Professional, make sure that you have appropriate privileges. Only an ADMINISTRATOR user is able to perform the installation.

If you plan to install more than one Nokia node manager, install them under the same directory hierarchy tree. The common root directory is C:\NOKIAMGR by default. In Windows 2000 the common root directory by default is C:\Program Files\Nokia

2.1.3 Uninstalling

To remove Nokia Hopper Manager from your system, open the Windows **Control Panel** and use **Add/Remove Programs** to remove the manager.

See Windows Help or manuals for further information.

Note

Removing Nokia Hopper Manager does not remove any data files you have created. Because of this the Nokia Hopper Manager directory structure may not be removed either.

2.2 Connecting the communication cable

If Nokia Hopper Manager is used for local management, the computer must be connected to the indoor unit using the communication cable. The cable has a D9 (female) serial connector at one end and a BQ (FIU 19) or an RJ-45 (FIU 19E) connector at the other.

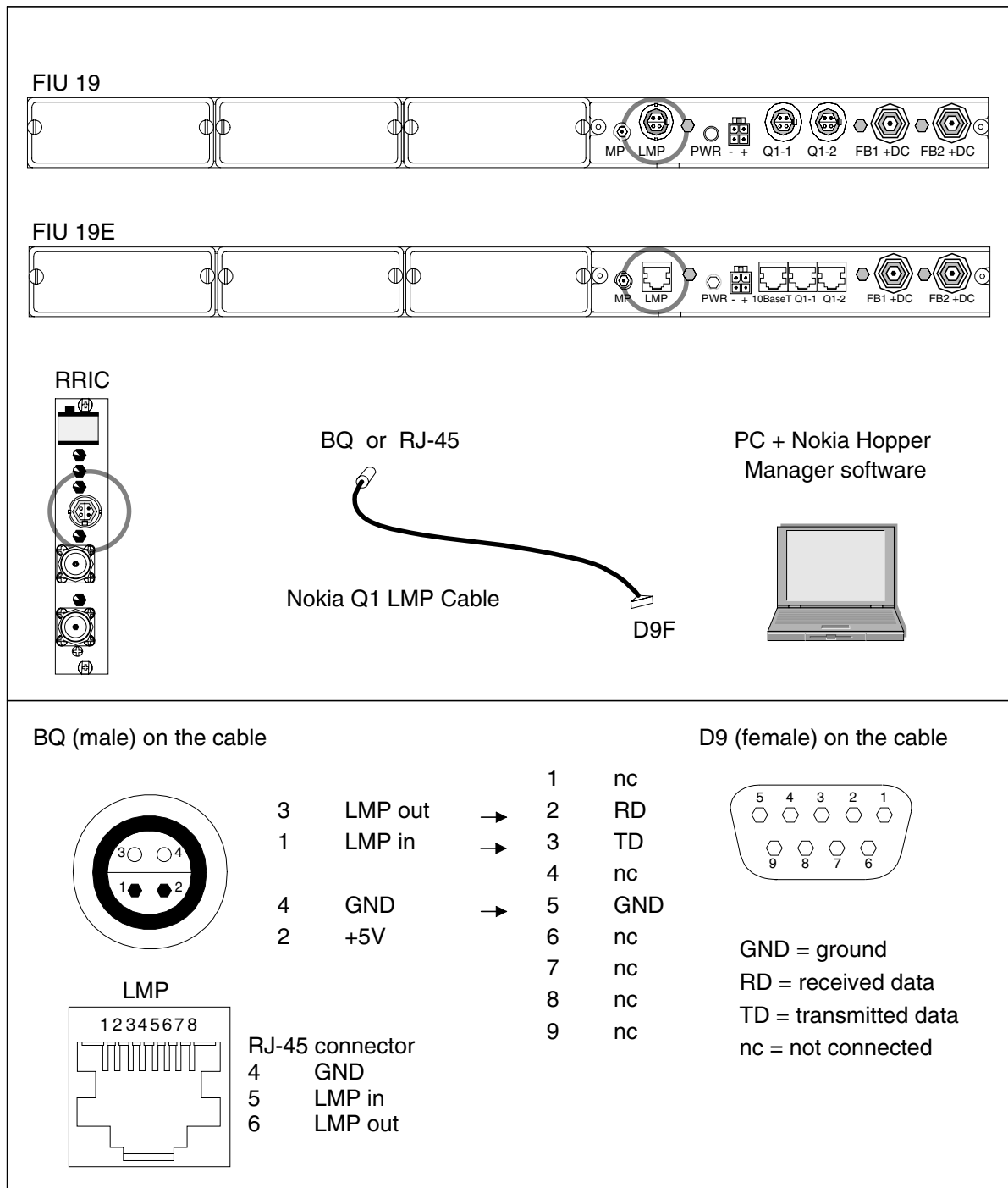


Figure 1. Connecting the communication cable

Connect the BQ/RJ-45 connector to the local management port (LMP) of the indoor unit (FIU 19, FIU 19E, or RRIC). Connect the other end to COM1 or COM2 port (sub D-9 connector) of the PC.

2.3 Getting started

This section assumes that:

- Nokia Hopper Manager is installed on your computer (for installation instructions see Section 2.1)
- You have read the `README.TXT` file which contains important last minute information.

Tips

- Make backups of all important files on your PC, including the Nokia Hopper Manager data files. The most recent backups are the best.
- The **Equipment View** window is your connection to the managed network element or node file. Closing the window closes your connection.

Notes

- Many of the changes or actions that can be performed in Nokia Hopper Manager do not take place until they have been sent to the node.
- Do not set the refresh time to a small value when monitoring alarms or other items. This can place undue strain on the Q1 bus and delay other events or applications. The default refresh time is 60 seconds.

Equipment view

The **Equipment View** window is opened whenever you are managing a network element or virtual node file (see Figure 2). The window displays the configuration of the managed network element. This window is also the connection to the network element. If this window is closed, the connection is closed.

The window shows the basic information about the network element, its name and address, etc. Figure 2 is a graphical representation of the network element. This shows the number and configuration of indoor units, plug-in units, outdoor units and Flexbus connections.

This window can also be used to access the settings and identifications of each unit. Pressing the right mouse button while the mouse pointer is over a unit displays a menu.

The status information for the radio hop and the LED status of the functional entities of the node can also be shown in this window. This information is updated periodically. The settings for this automatic refresh can be changed from the View Settings controls in the window.

Note

If you are connected to the network element by a low-speed connection, it may be better to disable this status information as it blocks the Q1 bus.

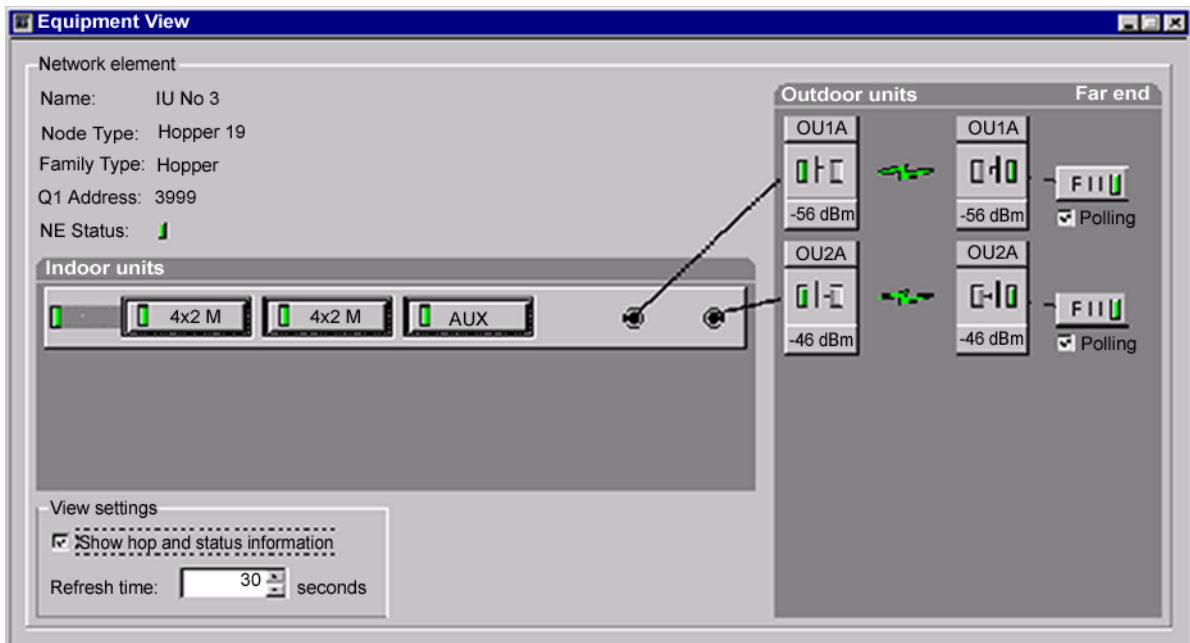


Figure 2. Nokia Hopper Manager window (FIU 19)

Note

The LED indicators in the **Equipment View** window show the status of each functional entity of the node. They are not the same as the front panel LEDs.

2.3.1 Starting Nokia Hopper Manager



To start Nokia Hopper Manager:

1. Start the computer and Windows.
2. On the **Start** menu, click **Programs**→**Nokia Application**→**Nokia Hopper Manager** or in Windows2000/XP **Programs** → **Nokia** → **Nokia Hopper Manager**.

When Nokia Hopper Manager is started, the **Nokia Hopper Manager** window appears. From this window you can reach all windows in the manager. No other windows are initially open.

2.3.2 Using Help

Nokia Hopper Manager offers a comprehensive context-sensitive online Help which is available at all times.



To access the Help system use one of the following methods:

1. Press F1 from any window or dialog box. The appropriate Help topic opens in the **Help** window.
2. Click **Help** → **Hopper Manager Help Topics** on the menu.
3. Click the **Hopper Manager Help** program icon on the Windows **Start** menu. Help is found under **Programs** → **Nokia Applications** → **Nokia Hopper Manager Help**. You can then select the required topic.

For further information on using Help, refer to Microsoft Windows Help or manuals.

2.3.3 Security

Security in Nokia Hopper Manager is governed by the network element.

Setting access rights

If security settings are in use, no configuration changes, temporary or permanent, can be made to the network element.

A password must be entered in order to make changes to the network element. The password gives you access rights which allow you to make changes until the rights expire. The timeout for the access rights is set in the **Settings** dialog box.

To configure security settings or to switch the node security off permanently, click **Configure** → **Node Security** → **Settings...** Clear the **Use security** box to disable security.

To gain access rights, enter the password when prompted by Nokia Hopper Manager or click **Configure** → **Node Security** → **Activate Access Rights...** and enter the password.

To cancel access rights, click **Configure** → **Node Security** → **Cancel Access Rights**. No further changes can be made to the network element.

If you forget your password, contact the Nokia Customer Services.



To change the password:

1. Select **Configure** → **Node Security** → **Settings** → **Change Password**.
2. Type in the old password.
3. Type in the new password.

2.3.4 Toolbar

The toolbar provides shortcuts to commonly used menu items.

The toolbar is normally displayed under the menu bar at the top of the **Nokia Hopper Manager** window. The toolbar can be switched on or off by clicking **Tools** → **Options** → **Toolbar** on the menu.



Figure 3. Nokia Hopper Manager toolbar

Table 1. Toolbar tools list

Item	Name	Description
1	New	Creates a new file to manage
2	Open	Opens an existing file
3	Save	Saves the current file
4	Print	Prints current management data
5	Cut	Cuts data to the clipboard
6	Copy	Copies data to the clipboard
7	Paste	Pastes data from the clipboard
8	Connect locally	Connects via LMP to a network element
9	Disconnect	Closes the connection
10	Refresh	Refreshes the equipment data
11	Send	Sends changed data
12	Cross-connection	Views/edits the cross-connections list (Not in use with RRIC. See Section 3.8)
13	Alarms	Views current alarms
14	Statistics	Displays network element statistics

Note

Item 12, 'Cross-connection', is not in use with the RRIC indoor unit. With RRIC, cross-connections are handled using TruMan Node Manager (see Section 3.8).

All functions of the toolbar can be performed either through the Nokia Hopper Manager menus or by pop-up menus in each window.

2.3.5 Status bar

The status bar appears at the bottom of **Nokia Hopper Manager** window. The status bar shows messages for the selected menu command or operation, and the current target for management. The messages displayed in the status bar can be of the following types:

- Help messages, which relate to the currently selected menu or toolbar button. Press F1 to open Online Help.
- Status messages, which inform you about the current status of the actions.
- Information on the current node connection or file.

Some of the secondary windows of Nokia Hopper Manager also have their own status bars. These are described in **Help**, related to the window in question.

The status bar can be switched on or off by clicking **Tools** → **Options** → **Status Bar** on the menu.

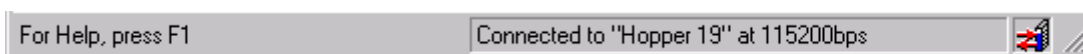


Figure 4. Nokia Hopper Manager status bar

2.3.6 Menu overview

All Hopper Manager functions can be accessed through the application menus. The main functions under the menus are briefly described in Figure 5.

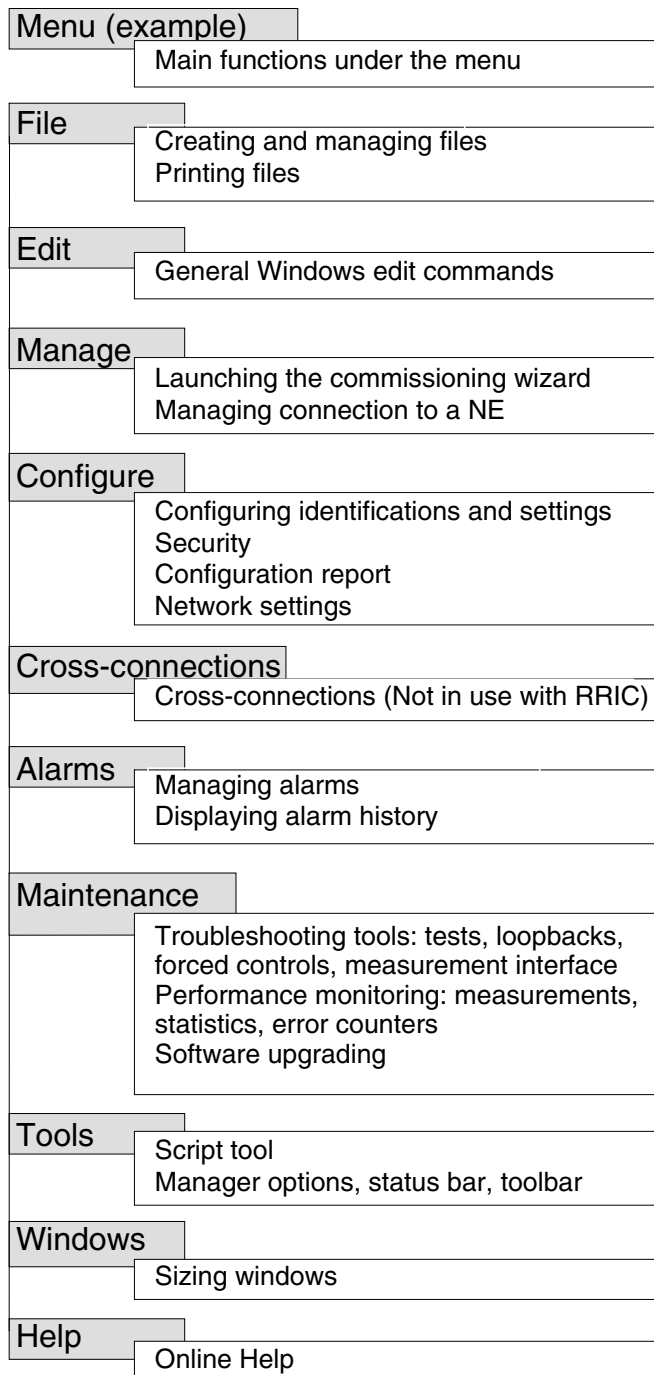


Figure 5. Overview of the Nokia Hopper Manager menus

2.3.7 Printing

You can print the information in the currently active window to the default Windows printer. The window is printed in text format.



To print the information in a window:

1. Select the window you want to print. If the window is not open, it can be opened from the toolbar or menu.
2. Click **File** → **Print...** on the menu.

In a similar way, you can export information in the active window to a text file. To do this, click **File** → **Export File....**

You may also print screens and windows as a graphic picture using Microsoft Windows. See the Windows Help or manuals for further information.

2.4 Working offline/configuring a virtual node

You have two modes for using Nokia Hopper Manager, online and offline. Online mode manages an actual network element and any changes are made directly to the equipment. Offline mode allows you to manage a virtual node (see also Section 3.4). All the configuration information is saved to the node file, except for the fault settings. Measurements and performance statistics are also unavailable. This node file is a representation of a real network element.

By using this feature it is possible to create a template which can be used to commission numerous installations with similar configurations. You can also use this to make changes to an installation while at the office before going into the field.

To create a new virtual node file, click **File** → **New**. Alternatively, while managing an actual network element, click **File** → **Save As...** to save an image of that network element to disk. The file is saved with a default extension of **.NOD** and can be stored wherever you prefer. This file provides a basis for a virtual node or can be used as a backup.

To work on an existing file click **File** → **Open...**

When creating a virtual node file for the first time, you must specify the equipment configuration. When managing an online node, the configuration is read directly from the equipment.

To send the settings of a node file to the local network element, connect the LMP cable (see Section 2.2) and click **Manage** → **Send All**.

Note

When in offline mode, Nokia Hopper Manager does not verify the entered configuration. The configuration is verified with the actual equipment when it is sent to the node. If the created configuration does not correspond to the actual installed equipment, a warning message is displayed.

2.5 Establishing a connection to a node

Local connections to network elements can be easily managed with Nokia Hopper Manager. Alternatively, you can use Nokia Q1 Connection Tool.

2.5.1 Connecting locally

The following steps describe how to connect directly to a local network element for the first time. The steps assume that you have physically connected your computer to the LMP port of the network element with the serial communication cable (see Section 2.2).



To set up a direct connection to the network element:

1. Click **Tools** → **Options** → **Manager Options** on the menu. In the **Manager Options** dialog box, click the **Serial Port** tab and set the serial port and the baud rate for the connection (see Figure 6).
2. Click **Manage** → **Connect Locally** to connect to the network element via the serial port.

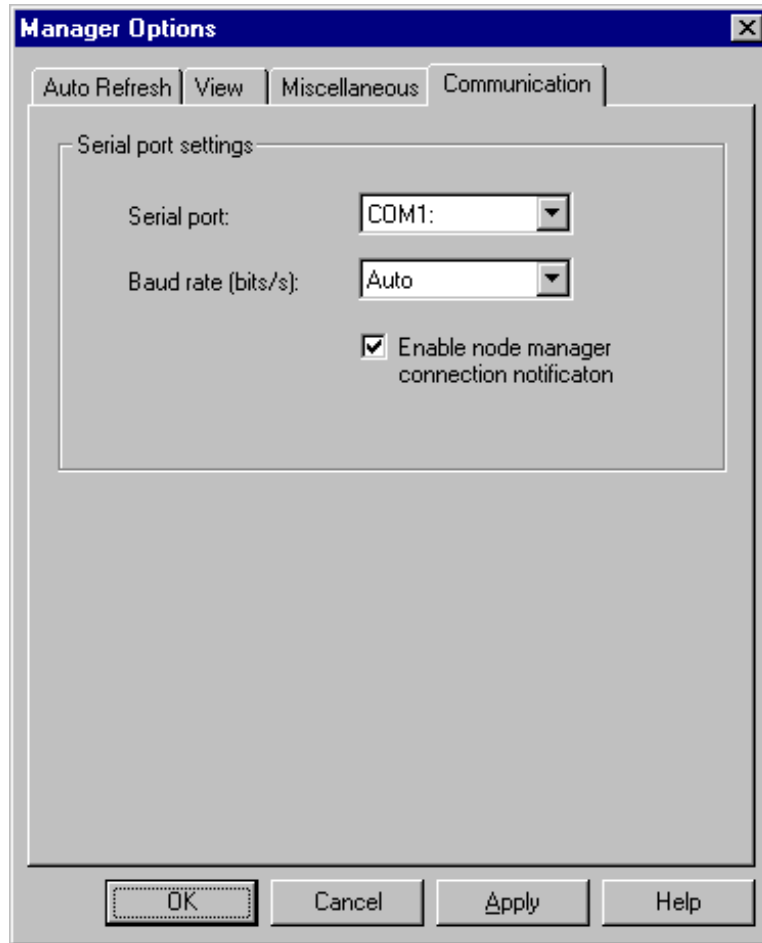


Figure 6. Manager options: Serial port

Manager Options: Miscellaneous page

The miscellaneous page of the Manager Options dialog box controls the verification settings for Nokia Hopper Manager and the logging of alarms and measurements (see Figure 7). If a verification is checked, the Manager asks you if it should continue with the particular action whenever it occurs.

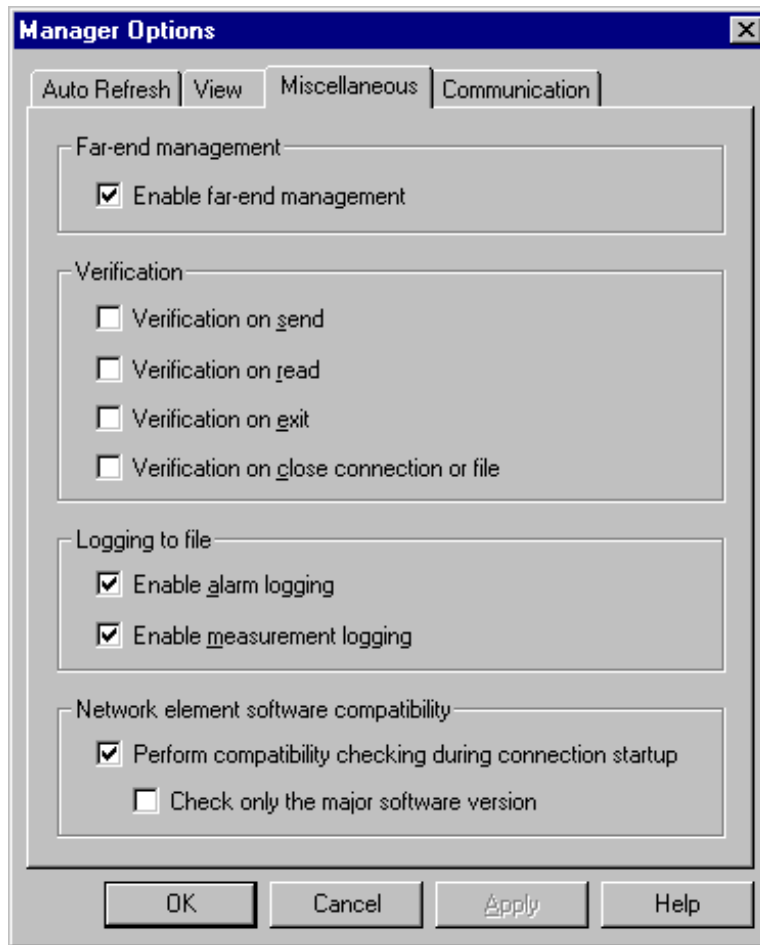


Figure 7. Manager Options: Miscellaneous

- **Enable far-end management**

The far-end management switch enables the use of all far-end information and settings with the Hopper Manager. If this option is disabled, no far-end information is read by alarms and performance monitoring. No far-end or hop setting changes can be made.

- **Verification**

By enabling the following options the Nokia Hopper Manager asks for verification before:

- sending data from the network element
- reading data from the network element
- disconnecting from the network element
- exiting.

- **Logging to file**

Enable the following options for the Nokia Hopper Manager to log:

- all alarm activity to a file
- all measurement values to a file

- **Network element software compatibility**

When connecting to the node, a warning might appear about updating the Hopper Manager software. The Manager contains a list of all previously released network element software versions. The **Perform compatibility checking during connection startup** is on by default and gives the warning when unfamiliar software is encountered.

When the **Check only the major software version** option is enabled, the check for compatibility is performed only for major releases. The network element software versions consist of a major and a minor release code, for example D1, with D being the major version and 1 the minor. If this option is enabled, version D2 is recognised as compatible. Thus, this prevents warnings from appearing because of minor software releases.

2.5.2 Connecting via Q1 address

The network element can also be accessed via the Nokia Connection Tool.



To access the network element when you know its Q1 address:

1. Click **Manage** → **Connect...**
2. Define the needed parameters/select a previously configured connection. Detailed information on using the Nokia Connection Tool is available in *GCS User's Manual*.

2.5.3 Nokia Ethernet connection (LAN)

The Nokia Ethernet connection is done in the same way as connecting via Q1 address. Refer to section 2.5.2.

2.6 Closing the connection to the node

To close the connection to the node, click **Manage** → **Disconnect** on the menu.

2.7 LMP far-end management

You can manage some aspects of the remote radio in the radio hop by using the Nokia Hopper Manager connected to the local management port (LMP) of the indoor unit.

To open the far-end management, position the cursor on the far-end unit and click the right mouse button.

Note

This use of this feature is dependent on the indoor unit and is not supported by all indoor unit types. Only units directly involved in the radio hop can be managed. This does not include any plug-in units at the far-end.

2.7.1 Performance monitoring

The performance of the remote terminal in the radio hop can be monitored along with the near-end units.

Alarms

Alarms for the far-end units directly involved in the radio hop can be displayed. This includes, for example, the indoor and outdoor unit functional entities that are part of the hop.

Measurements and error counters

All error counters for the far-end units are displayed and the user can also select various measurements for the far-end units.

Statistics

Statistics for the far-end functional entities involved in the radio hop can be displayed.

2.7.2 Identifications

Basic identification information about the remote units involved in the radio hop can be displayed.

2.7.3 Configuration for FlexiHopper

The configuration of the FlexiHopper radio hop can be changed. These configurations include the capacity, the frequency and interleave status. New commissioning is needed whenever the configurations are changed.

Note

MartisDXX FBU interface unit can also be used with Nokia FlexiHopper microwave radio. For more information on FBU, refer to *Nokia FBU Manager User's Guide*.

3

Commissioning Nokia FlexiHopper

This chapter gives instructions on the commissioning of Nokia FlexiHopper microwave radio when it is used with FIU 19 (E) or RRIC indoor unit. All basic commissioning settings are done with Nokia Hopper Manager, which contains a commissioning wizard to aid in the tasks. In addition to the settings made with the manager, the antenna is fine-aligned during the commissioning.

3.1 Precautions

The following prerequisites must be fulfilled before starting the commissioning:

- The equipment has been installed in accordance with the installation instructions in this manual and the antenna has been pre-aligned to the far-end station.
- You have the necessary tools to fine-align the antenna (see *Outdoor Unit Installation*).
- You have a PC with communication cable and Nokia Hopper Manager installed on it (see Section 2.1). It is also recommended that you familiarise yourself with the operation of the manager beforehand.



Caution

Before setting on the Tx power to the outdoor unit, make sure that the equipment has been set to the Tx channel frequency and capacity (see Section 3.3) given by the local authorities. This should be done to avoid transmitting on a wrong or too wide a radio channel, and thus, interfering with other radio transceivers.

3.2 Work order

3.2.1 FIU 19 (E) and RRIC

The following work order is recommended when commissioning a Nokia FlexiHopper with FIU 19 (E) or RRIC network element:

1. Switch the power *on* (see Section 3.3).
2. Connect the LMP cable between the PC and the indoor unit (see Section 2.2) and start Nokia Hopper Manager (see Section 2.3.1).
3. Set up the connection to the network element (see Section 2.5) and run commissioning wizard (see Section 3.4).
4. Fill in the basic settings in the wizard (see Section 3.4).
 - Give the site information (*optional*).
 - Select station type and protection mode.
 - Set Flexbus (outdoor unit) capacities.
 - Set Q1 and LMP port baud rates and addresses.
 - Select the Q1 bus routing.
 - Set the transmit frequency, maximum transmit power, and interleaving status.
 - Set installation information (*optional*) and the node clock.
5. Fine-align the antenna (see Section 3.5).
6. Make the cross-connections with the manager.
 - *FIU 19 (E)*: using Nokia Hopper Manager (see Section 3.7)
 - *RRIC*: using TruMan (see Section 3.8). After the cross-connections have been made, save a copy of the TRU configuration to disk.
7. Make any additional settings with the manager (see Section 3.6). These settings can include:
 - ALCQ/ATPC
 - identification data.
 - node IP address (FIU 19E only)
8. Reset the statistics and the error counters (see Section 3.10).
9. Monitor the hop for at least half an hour (see Section 3.9.3).
10. Save a copy of the node to a file (see Section 2.4).
11. Back up the IU and OU configurations (*recommended in 2IU+2OU protected mode*, see Sections 3.6.4 and 3.6.5).

12. Run the Commissioning Report from the manager.
13. Export the alarm log to a file (if needed). (See Sections 4.1 and 5.2).
14. Close the connection to the node (see Section 2.6).

Steps 6 - 7 can also be performed the other way around.

3.2.2 FIU 19 (E)

When Nokia FlexiHopper and FIU 19 (E) are used in 2IU+2OU protected mode, the commissioning is started in a slightly different order. The steps presented below replace Steps 1 - 3 above.

1. Switch the power to IU A *on* (see Section 3.3), but leave IU B switched *off*.



Caution

Ensure that the IU B is switched off.

2. Connect the LMP cable between the PC and the IU A (see Section 2.2) and start Nokia Hopper Manager (see Section 2.3.1).
3. Set up the connection to the network element (see Section 2.5).
4. Run the commissioning wizard (see Section 3.4) and set the protection mode to **2IU+2OU Protected**. Make other protection settings, if required. Press **Finish** and answer **Yes** to the question about resetting the indoor unit.
5. After Nokia Hopper Manager has performed the reset wait 30 seconds and switch the power to IU B *on*.
6. Wait 30 seconds so that IU B has started and is operating correctly.

Either Refresh the **Equipment View** in Nokia Hopper Manager or close the connection and open it again.

The **Equipment View** shows now two indoor units and the expansion unit (although some equipment may appear ghosted/disabled).

7. Start the commissioning wizard and complete the commissioning by following steps 4 - 13 in Section 3.2.1 above.

Do not change the protection mode after both indoor units have been switched on.

3.3 Switching power on

3.3.1 FIU 19 (E)

Switch the power to the indoor unit by pressing the FIU 19 (E) power switch (PWR). Indicator LEDs are lit (see Section 4.3). If the Flexbus OU power supply is set on, the outdoor units are powered too.

The Flexbus plug-in unit does not have a power switch. Power to the plug-in unit is on whenever the additional power supply cable is connected to a power source.

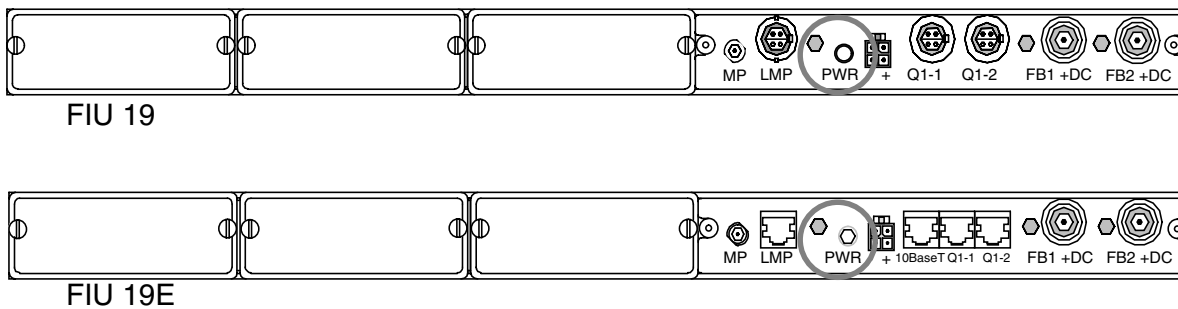


Figure 8. FIU 19 and FIU 19E power switches

The setting for the OU Tx power is located in the outdoor unit. If the OU Tx power has been set *on* (factory setting is *off*), the outdoor unit starts transmitting immediately when it is powered. To avoid transmitting accidentally (see Section 3.1), we recommend that you set the OU Tx power *off* before moving any outdoor unit.

If you are unsure of the Flexbus OU power setting or the OU Tx power setting and wish to avoid unintentionally transmitting when the IU power is switched on, do the following before switching the power on:

1. Disconnect the Flexbus cables. Switch power on at the power switch. If a Flexbus LED starts blinking, the OU power supply for that particular Flexbus interface is on.
2. Connect to FIU 19 (E) and commission with the wizard. In the appropriate dialog box, set the Flexbus OU power supply off. Check that the Flexbus LED also goes off.
3. Switch the power off at the power switch.
4. Connect the Flexbus cables. Switch power on at the power switch.
5. Run the commissioning wizard again.

3.3.2 RRIC

RRIC has no separate power switch. RRIC is powered whenever the BTS subrack is powered (see the BTS manual). Indicator LEDs show the power status (see Section 4.3).

If you are unsure of the Flexbus OU power setting or the OU Tx power setting and wish to avoid accidentally transmitting (see FIU 19 (E) above), do the following before connecting the Flexbus cables:

1. Check the Flexbus LEDs. If a Flexbus LED is blinking, the OU power supply for that particular Flexbus interface is on.
2. Connect to RRIC and commission with the wizard. In the appropriate dialog box, set the Flexbus OU power supply off. Check that the Flexbus LED also goes off.
3. Connect the Flexbus cables.
4. Run the commissioning wizard again.

3.4 Commissioning with the wizard

Commissioning is the process of bringing a newly installed network element into use. This configures the system for operational use and defines all the system parameters needed for basic functions. If necessary, the commissioning process can also be performed on a previously commissioned network element.

To commission a network element, click **Manage** → **Commission...** This starts the commissioning wizard.

The commissioning wizard is also used when creating a virtual node file using the command **File** → **New...** on the menu. In this situation it is necessary first to create the equipment structure to be used. The commissioning wizard (**New File Wizard**) first asks you to select the indoor units, plug-in units, and outdoor units for your virtual node file. After a node file has been created and saved, it is possible to reconfigure the file and its equipment structure by clicking **Configure** → **Node File...** on the menu.

The wizard contains several pages. Each page requests information about the structure of the equipment to be used in the file. Some pages may not appear depending on the equipment structure present in the network element or the way the wizard is used. There is a brief hint on each page, but more detailed help is also available by pressing the F1 key or pressing the **Help** button on each page.

Note

The commissioning wizard defines the minimum number of settings required for an operational network element. To access the other settings and identification information click the appropriate item from the Hopper Manager **Configure** menu. See Section 3.6.



Commissioning settings

When commissioning the network element online, fill in the following settings:

1. Check for any connected outdoor units by selecting the appropriate Flexbus interfaces from the list and clicking **Start**. This turns on the Flexbus power. Nokia Hopper Manager notifies you when any connected outdoor units are found (see Figure 9).

If you know that the Flexbus power is already on (for example, it can be seen on the **Equipment View** window), you can bypass the scanning process and move to the next page.

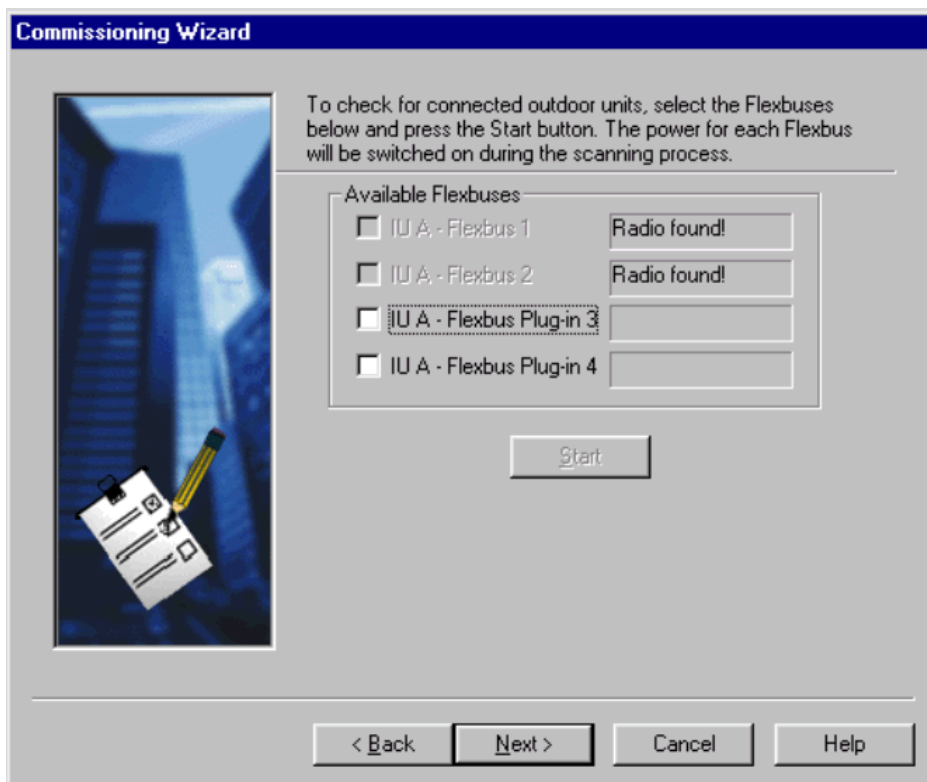


Figure 9. Flexbus scanning page

2. Enter the site information (*optional*):
 - equipment name
 - group name
 - site name
 - site location.
3. Select the station type and protection mode (see Figure 10). See *Product Description* for more information on the available protection methods and station types.

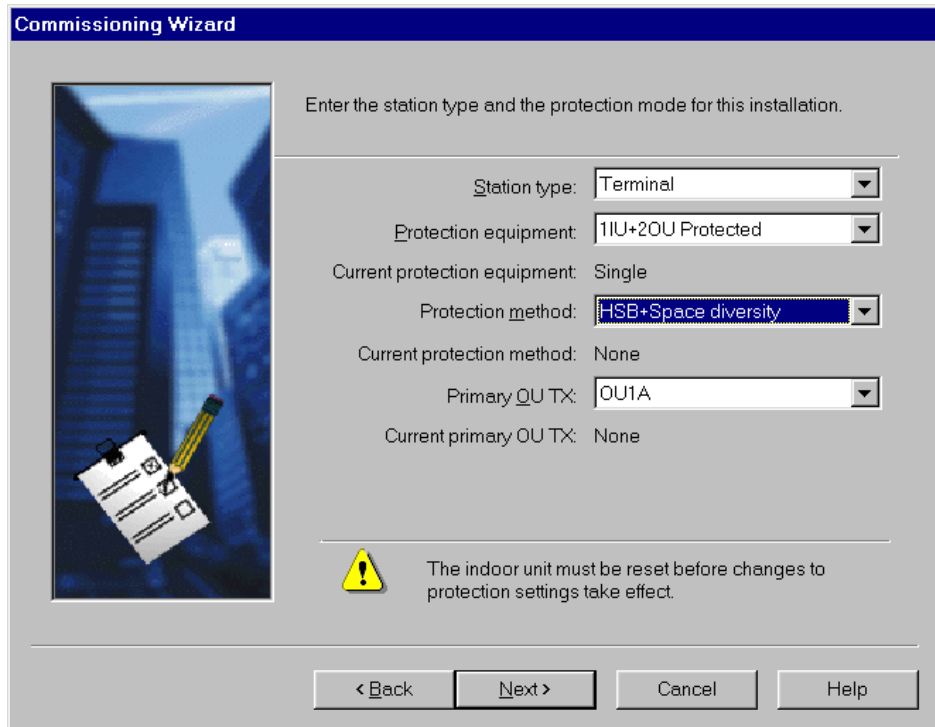


Figure 10. Station type and protection mode page

4. Select if the Flexbus interfaces are in use and set their capacities.

Note

If using SNMP, steps 5 and 6 are not needed.

5. Select the settings for the Q1 port and the local management port. See *Product Description* for more information.
 - baud rate
 - Q1 group address
 - Q1 address
6. Select the Q1 bus routing, which defines the way Q1 commands are routed through the network element. See *Product Description* for more information.
7. Select the settings for the outdoor units connected to each Flexbus interface:

- Tx frequency
 - Maximum Tx power
 - Tx power on/off
 - Interleaver status (optimal, *depth-4* is recommended).
8. When you have entered all the required settings a summary of commissioning settings is displayed. It contains all the settings you have defined for the radio(s). Check that the settings are correct and click **Next** to send the settings to the node. You can also go back in case you want to adjust the settings on previous pages.
 9. After sending the commissioning settings, you can check the hop status of all the connected outdoor units. For each Flexbus interface the connected outdoor unit is shown along with its current state and received input level.

Note

The status of the hop is not ready before both ends of the hop are commissioned successfully.

10. On the last page you can set the node clock and installation information for the units. After you have done this, click **Finish** to complete the wizard.

3.5 Aligning the antenna

The fine-alignment of the antenna is performed after the transmit frequency has been set. The outdoor unit at the other end of the hop must be pre-aligned to this station and must be sending a signal on the correct frequency. Align the antenna according to instructions found in *Outdoor Unit Installation* part of this manual.

Note

ALCQ must be off during the alignment (see Section 3.6.4).

After the both ends of the hop have been fine-aligned once, it may be necessary to repeat the alignment to get the best performance. In the optimal situation, there is a crew working at both ends of the hop. This way problems with antenna alignment can be fixed more easily.

When the antennas have been aligned for the radios at both ends of the radio hop, verify that the Rx-input level determined by the transmission planning is met.

To access the measurements, click **Maintenance** → **Performance** → **Measurements** on the menu. The Rx-input level is also shown in the **Equipment View** if the status information display is enabled.

If the input level remains below the values calculated in the transmission planning, this may be caused, for example, by incorrect antenna alignment (antenna aligned to the side lobe, for example).

3.6 Configuring identifications and settings

All Nokia FlexiHopper unit identifications and settings are accessed through the **Configure** menu of Hopper Manager. Alternatively, the pop-up menus can be used.

To view or change unit identifications, click **Configure** → **Identifications...**, and then select the appropriate unit on the **Select Object** dialog box (Figure 11). A window detailing the identifications of the selected unit opens. Click **Modify** to open a window detailing the identifications of the selected unit.

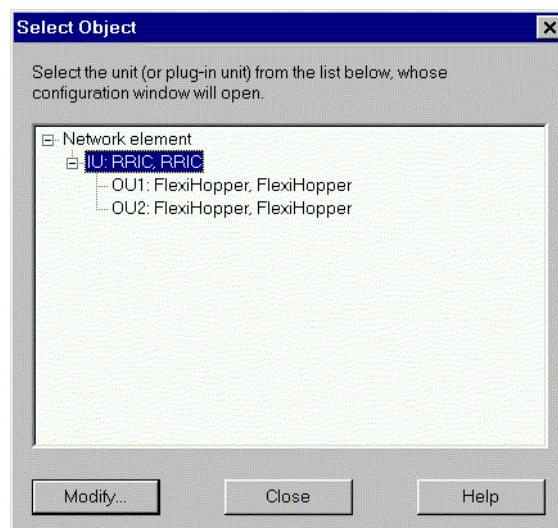


Figure 11. Select Object dialog box

To view or change unit settings, click **Configure** → **Settings...**, and then select the appropriate unit on the **Select Object** dialog box (Figure 11). Click **Modify** to open a window detailing the settings of the selected unit.

The changes you make are sent to the node as you click on the **OK** button at the bottom of the dialog box in question.

Note

If certain settings are changed (for example, transmit frequency or Flexbus capacity), also the settings of the terminal at the other end of the hop have to be changed correspondingly. Certain options are disabled while configuring a virtual node.

3.6.1 Identifications

Identifications are displayed separately for the network element, and each functional entity (IU, OU, plug-in unit).

User defined identifications for a network element or a unit can include notes on the installation, for example. Identifications used in alarm display can also be changed. Some of the information cannot be altered because it is read directly from the equipment.

To change the identifications of a functional entity, type in the desired identification in the box.

3.6.2 Network element settings

To view or change network element settings, select **Network Element** in the **Select Object** dialog box and click the **Modify** button. The **Network Element Settings** dialog box opens. Click the tabs to switch between pages.

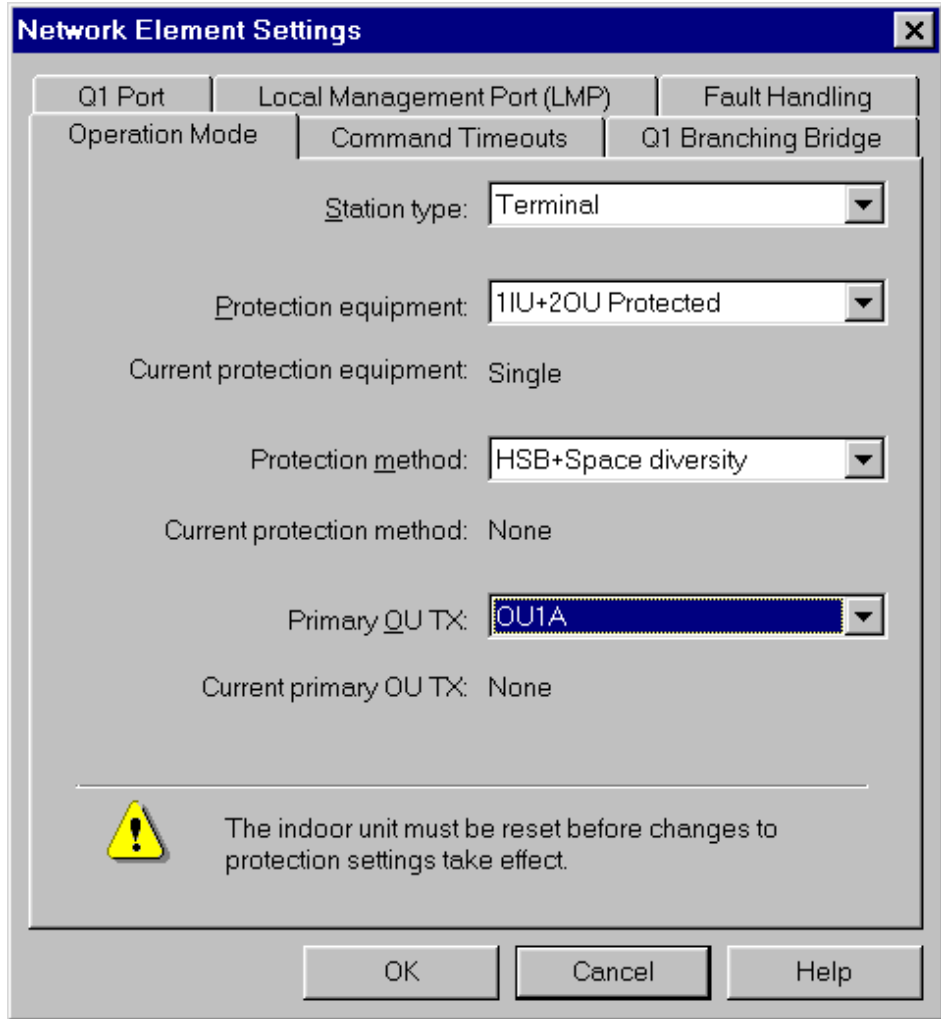


Figure 12. Network Element Settings dialog box

Operation Mode

To change the station type, protection equipment, protection method, or primary OU in a protected setup select the value from the list. See *Product Description* for more information on the available protection methods.

Note

The indoor unit must be reset before changes to the protection settings take effect (see Section 3.6.5).

Note

When using 1-antenna HSB protection, configure the radio connected to the coupler input with lower insertion loss as the primary OU transmitter (see *Outdoor Unit Installation*).

Q1 Branching Bridge

To change the Q1 branching settings, select or clear the boxes to achieve the desired setting. See *Product Description* for more information on different branching options.

Q1 Port

To change the Q1 group address, Q1 address, or baud rate of the Q1 ports, type in the desired value or select it from the list. See *Product Description* for more information.

Note

When FIU 19 (E) or RRIC is used in connection with a Nokia Talk-family BTS, the Q1 port baud rate must be set to 9600. This is the rate used by the BTS.

Local Management Port (LMP)

To change the Q1 group address, Q1 address, or baud rate of the LMP, type in the desired value or select it from the list. See *Product Description* for more information.

Fault Handling

If the indoor unit is used with BTS fault supervision with older style fault codes, you can check the box on this page to activate the old style fault handler for reasons of compatibility. See *Product Description* for more information.

Command Timeouts

Control is the time period after which forced controls automatically expire and the network element resumes normal operating mode. **Confirm** is the time period during which confirmation is required for certain commands.

To set values for command timeouts, type in the desired value (control 60...6500 seconds, confirm 60...600 seconds).

3.6.3 General unit settings

Performance management

Many of the units that contain configuration settings also have performance management settings. The performance management settings include various threshold values for alarms as well as gating times for BER measurements.

On the **Performance management** page of the unit **Settings** dialog box you can check and edit these performance management settings.



To edit a value in performance management settings

1. Open the **Settings** dialog box for the required unit.
2. From the dialog, choose the **Performance Management** page.
3. Select a **Supervision block** and then the value in the main list.
4. Press the **Edit** button to change the value.

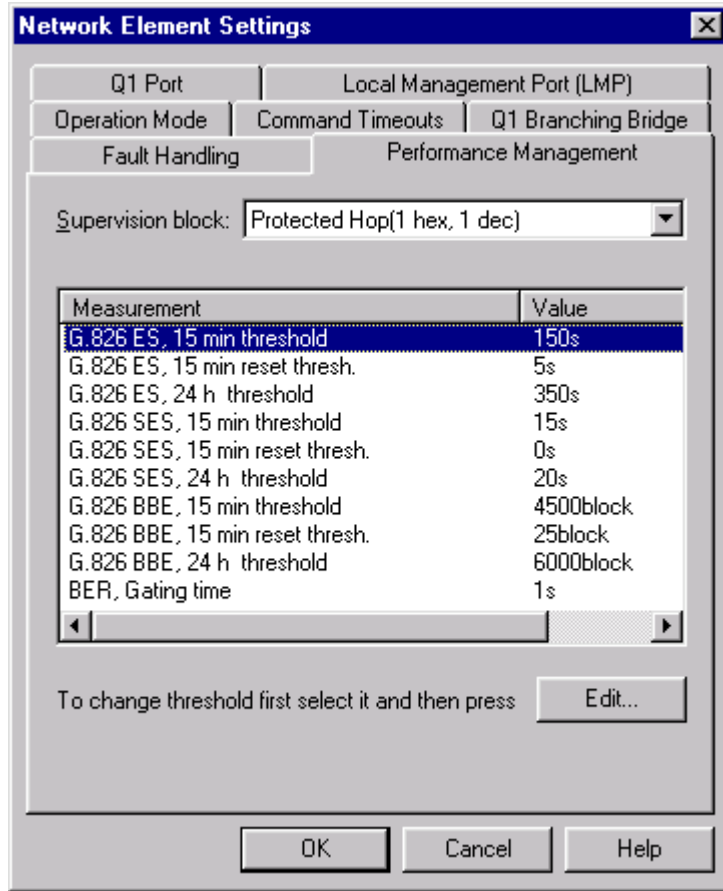


Figure 13. Performance management settings

Configuration backup

The Nokia FlexiHopper outdoor unit and the FIU 19 (E) and RRIC indoor units support configuration backup. This feature makes it possible to create a backup copy of important unit configuration information to other units in the network element. This information can be restored to quickly commission a unit which is replaced, or in case of an error.

Backups can be made automatically, or manually with the Nokia Hopper Manager. Restorations are done manually with the Nokia Hopper Manager.

On the **Configuration Backup** page of the unit **Settings** dialog box you can configure the automatic backup feature or manually perform the backup and restoration.

To set the automatic backup, select **Automatically backup unit settings**. Once this has been done, any changed unit settings is backed up. There is a short delay between the change and the backup.

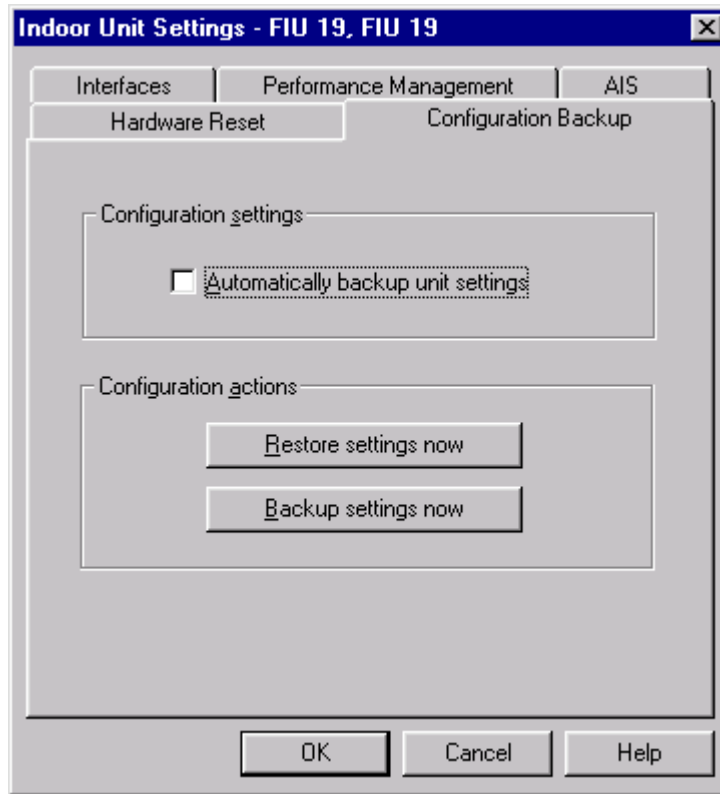


Figure 14. Configuration backup settings

Note

User notes are not included in the backup.

Note

Always disable automatic backup before replacing a unit.

Manual actions

To backup the settings manually, click **Backup settings now**.

To restore the settings for a unit, click **Restore settings now**.

In some cases, when restoring settings, some other action may be required before the settings are taken into use. For example, if restoring a protected configuration of FIU 19 (E) to an indoor unit, it may be necessary to reset the unit before the protection setting is activated.

Note

Always perform a reset, if the node is managed with SNMP. The reset causes a traffic cut.

3.6.4 Outdoor unit settings

To check or change outdoor unit settings, select an outdoor unit on the **Select Object** dialog box. The **FlexiHopper Settings** dialog box opens (Figure 15). Click the tabs to switch between pages.

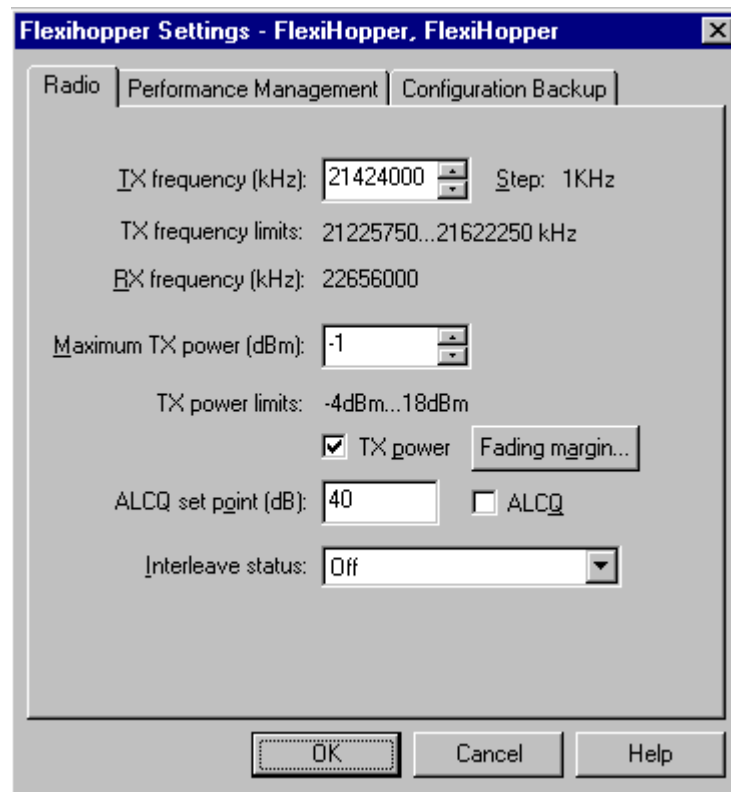


Figure 15. FlexiHopper Settings dialog box (in single use)

Radio

On the **Radio** page you can make the transmit power, transmit frequency, ALCQ, and interleaving settings for the outdoor unit(s).

In a protected setup, some settings are common to both radios, depending on the protection method (HSB or diversity).

To turn the transmit power on/off, select/clear the **Tx power** check box.

To change the transmit frequency, type the new value in the **Tx frequency (kHz):** box or click the arrows to adjust the frequency.

Frequency step is read from the equipment. In offline mode the step is 1 kHz.

To change the transmit power, type the new value in the **Maximum Tx power (dBm):** box or click the arrow to adjust the power.

Minimum and maximum values for the transmit power are read from the equipment.

To switch ALCQ on/off, select/clear the **ALCQ** check box.

For the ALCQ to function, you must set a value in the **ALCQ set point (dB):** box. This value can be obtained from transmission planning.

Note

For more detailed information on ALCQ, refer to the *ALCQ and Automatic Fading Margin Measurement in FlexiHopper Microwave Radio* application note that can be obtained upon request.

To change the interleaving mode, select a new value from the **Interleave status:** box.

Possible values for interleave status are **Off**, **Depth 2**, and **Depth 4**. See *Product Description* for more information on interleaving. Note that the outdoor unit stops transmitting while this setting is being changed. Change the setting accordingly also at the other end of the hop.

Performance management

See Section 3.6.3 for more information on **Performance management**.

Configuration backup

See Section 3.6.3 for more information on **Configuration backup**.

3.6.5 Indoor unit settings

To check or change indoor unit settings, select FIU 19 (E) or RRIC unit on the **Select Object** dialog box. The **Indoor Unit Settings** dialog box opens (Figure 16). Click the tabs to switch between pages.

The content of the dialog box varies, depending on the equipment configuration (FIU 19 (E) or RRIC, single or protected).

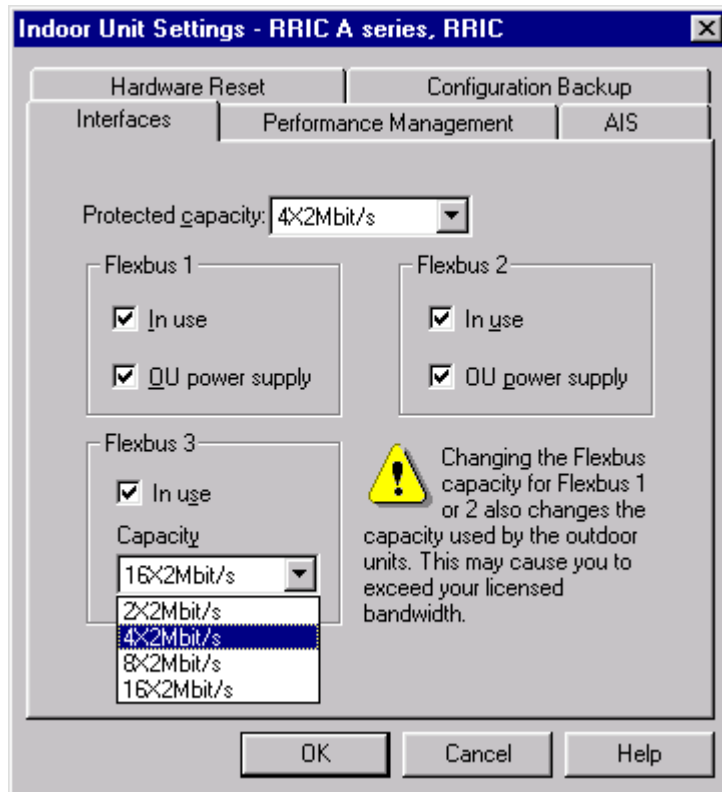


Figure 16. Indoor Unit Settings dialog box (RRIC, protected)

Interfaces

On the **Interfaces** page you can set the Flexbus interface capacity and outdoor unit power supply.

It is not necessary to set the transmission capacity separately for the outdoor unit. When the capacity is set for the Flexbus interface, the OU is automatically configured to this capacity.

To set the Flexbus interface in use, select the **In use** box.

If the Flexbus is not in use, payload is cut and all Flexbus signal alarms deactivated. Statistics and BER measurements are not collected. However, the outdoor unit can still be managed.

To change the Flexbus capacity, select the new capacity from the list.

In protected mode, a capacity common to both protected outdoor units is displayed.



Caution

Changing the Flexbus capacity also changes the capacity of the connected outdoor unit(s). An incorrect value may cause you to exceed your licensed bandwidth and interfere with other links.

Capacity of the outdoor units at the both ends of the hop must be set to the same value.

Note

For RRIC Flexbus 3 is the internal Flexbus which connects the two RRIC cards within the BTS. The Flexbus 3 capacity must be set to the same value in both RRIC units.

To switch the OU power supply on/off, select/clear the **OU Power supply** box.

Hardware reset

On the **Hardware Reset** page you can perform a reset of the indoor unit. This reset is necessary in some cases before settings take effect. This includes the protection settings.

Click **Send the reset command** to reset the indoor unit.

Note

Hardware reset cuts all traffic until the equipment has restarted.

AIS

On the **AIS** page you can select alarm indication signal (AIS) to be sent to 2 Mbit/s interfaces when the bit error rate (BER) exceeds the defined value.

To set the AIS feature, first check the box **AIS to 2M interfaces when BER alarm active**. Configure the alarm using the threshold setting and gating time.

To set the bit error rate threshold at which the BER alarm is activated, select a value from the list (from 10^{-3} to 10^{-7}).

To set the gating time (the time period used for the calculation of the BER), select a value from the list (from 1 to 30 seconds).

Note

If you want optimal performance and changeover switching times in protected modes, do not set the AIS feature on.

Performance management

See Section 3.6.3 for more information on **Performance management**.

Configuration backup

See Section 3.6.3 for more information on **Configuration backup**.

3.6.6 Flexbus plug-in unit settings (FIU 19 and FIU 19E)

To check or change the settings of the Flexbus plug-in unit, select a plug-in unit on the **Select Object** dialog box. A dialog box for the settings opens. Click the tabs to switch between pages.

The dialog box has pages for the **Interfaces**, **Performance management**, and **AIS** settings. The setting options on these pages are the same as described in Section 3.6.5 above.

In single mode, the **Interfaces** page of the dialog box contains only settings for Flexbus 3. The Flexbus 4 interface is only available for use in 1IU protection modes.

3.6.7 Aux data plug-in unit settings (FIU 19 and FIU 19E)

The Aux data plug-in provides two auxiliary data channels which support a variety of data formats and speeds. With one plug-in unit, you can use one Aux fast channel and one Aux slow channel at the same time. The maximum bit rate of these channels depends on the transmission capacity of the signal. In addition, four TTL type programmable I/O channels (software controlled) and/or relay control outputs can be used. Relay controls can be used to turn on equipment rack lights, for example. To a Flexbus, one fast and one slow auxiliary channel can be connected simultaneously.

To check or change the data channel settings of the Aux data plug-in unit, select a plug-in unit on the **Select Object** dialog box. A dialog box for the settings opens. Click the tabs to switch between pages.

See also Section 4.2 on how to program the digital inputs and outputs of the plug-in unit. See *Product Description* for more information on the available auxiliary data channels.

Fast channel

To set the fast auxiliary channel in use, select **In use**. Select the interface mode from the list. Select also the required protocol and interface baud rate.

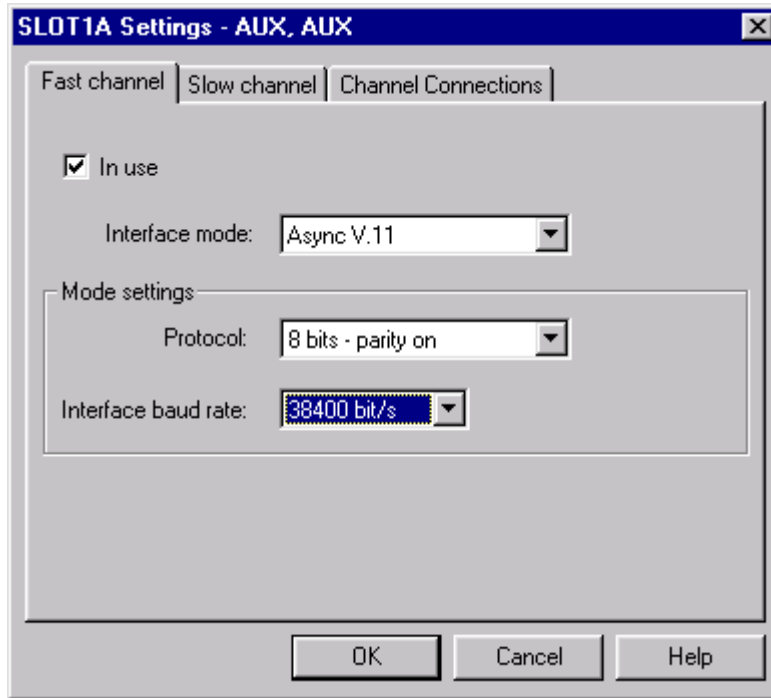


Figure 17. Aux data plug-in fast channel settings



To commission a fast auxiliary channel

1. Select the fast channel settings from Aux plug-in settings:
 - in use
 - interface mode
 - additional interface settings (mode settings).
2. Configure the channel connections.

Connect the fast channel to a Flexbus interface (see Figure 18).

Connecting Async V.11

Pins used:

- AFOUTP (out)
P (positive) at the end of the abbreviation stands for +5 V signal.
- AFOUTN (out)
N (negative) at the end of the abbreviation stands for 0 V signal.
- AFINP (in)
- AFINN (in).

Additional settings: none

Slow channel

To set the slow auxiliary channel in use, select **In use**. Select the interface mode from the list. Select also the required protocol and interface baud rate.

The slow channel settings appear as the fast channel settings given in Figure 17. However, the slow channel supports different data rates and interface modes.



To commission a slow auxiliary channel

1. Select the slow channel settings from Aux plug-in settings:
 - in use
 - interface mode
 - additional interface settings (mode settings).
2. Configure the channel connections.

Connect slow channel to a Flexbus interface (see Figure 18).

Connecting Async V.11

Pins used:

- ASOUTP (out)
- ASOUTN (out)

- ASINP (in)
- ASINN (in).

Additional settings: none

Connecting Async EIA-232

Pins used:

- RXD232 (out)
- TXD232 (in).

Additional settings: none

Channel connections

The channel connections control the routing between the fast and slow channels and the Flexbus that is used to transmit the channel.

To change the channel connections, press the button for the appropriate Flexbus. This creates the connection from the channel to the Flexbus. To remove the connection, either press another button or the same one again.

Note

When several aux data plug-in units are used, only one aux slow channel and one aux fast channel can be connected simultaneously to the same Flexbus.

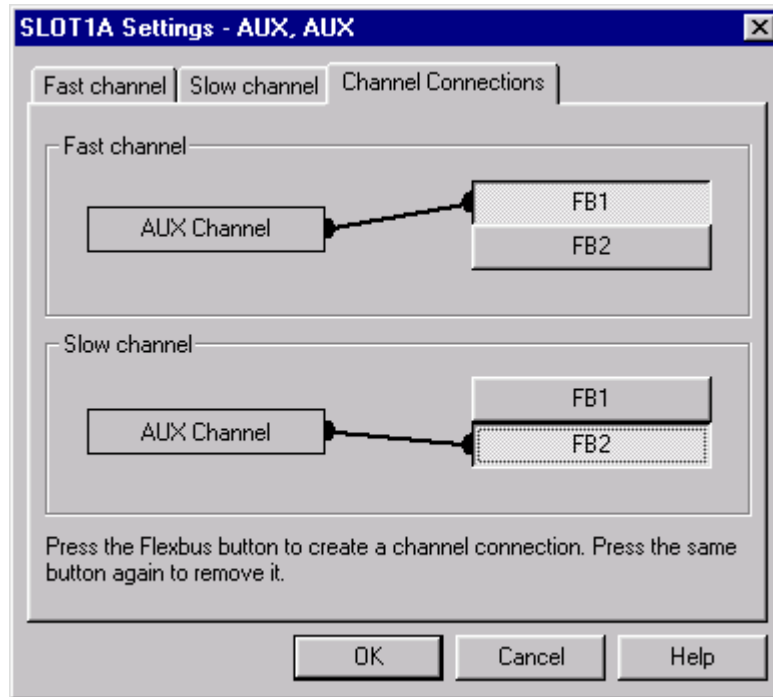


Figure 18. Aux data plug-in channel connection settings

When a fault occurs in the Flexbus interface and the auxiliary data channel is cut, the AIS is connected to both the fast channel and the slow channel.

When AIS is detected in the fast channel interface, the alarm *Alarm signal received* is activated. Note that this alarm is only activated in case of an AIS for the fast channel; it is not supported for the slow channel.

Digital I/O

Refer to Section 4.2.

3.6.8 SNMP settings (FIU 19E)

This section describes how to configure or change SNMP related settings. All Nokia FIU 19E specific SNMP related settings are accessed through the **Configure** → **Network Settings** menu of the Nokia Hopper Manager.

General SNMP settings

To view or change general SNMP settings, select **Configure** → **Network Settings** and select the **SNMP Settings** tab (see Figure 19).

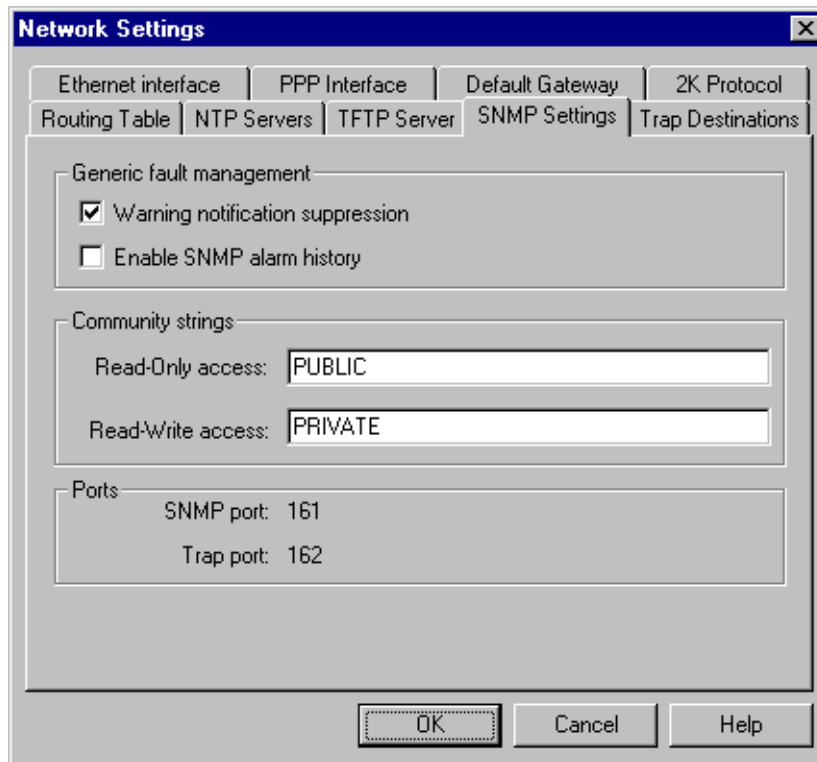


Figure 19. SNMP settings

- Generic fault management
 - Click the first checkbox to activate **Warning notification suppression**. This may be needed in management systems that cannot cope with warning traps never being cleared.
 - Click the second checkbox **Enable SNMP alarm history** to activate the alarm history for SNMP management systems.

Note

The **Enable SNMP alarm history** checkbox should be disabled for other than SNMP network management systems.

- Community strings

Two SNMP community strings can be configured. One string for Read-Only access (such as SNMP Get, Get-Next or Get-Bulk requests) and one for Read-Write access (such as SNMP Set and Get, Get-Next or Get-Bulk requests).

Note

The community strings are case sensitive. Check that you have exactly the same string in all FIU 19E units and in the management system.

- Ports

Used SNMP standard ports for traps and other services that can be read but not modified.

Routing Table

The routing table is used to configure static IP routes in the FIU 19E. An IP route is identified by IP route destination, net mask and the next hop (gateway).

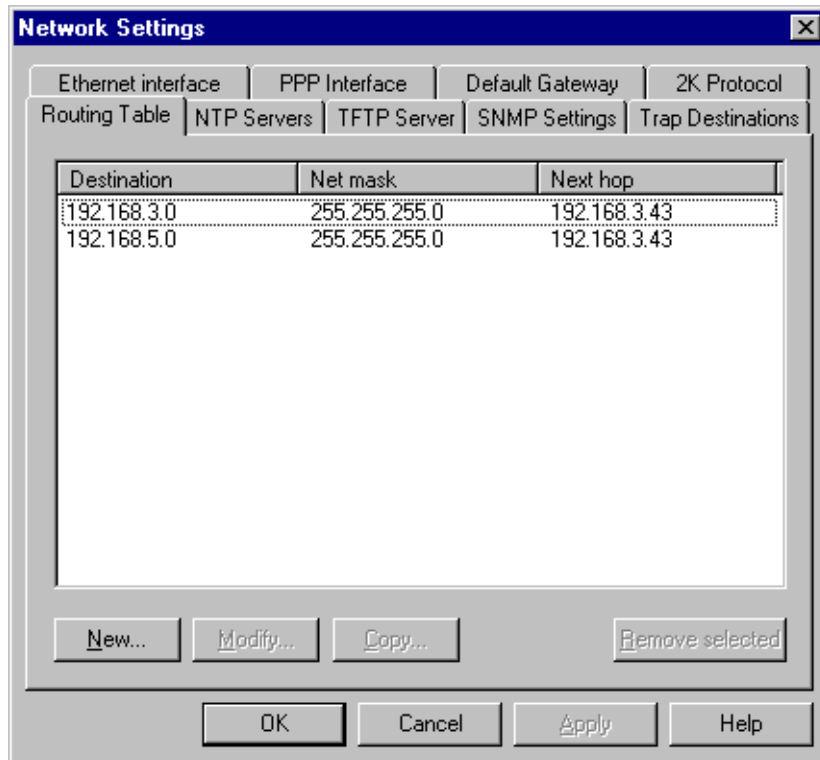


Figure 20. Routing table dialog

Destination	This is the destination of the route.
Net mask	The range of IP addresses handled by the present route.
Next hop	The IP address of the next hop. FIU 19E sends all IP packets handled by the present route to this IP address.

Click the **New** button to create a new static IP route. To modify an existing IP route, select it and click **Modify**. Click **Copy** to create a copy of an existing entry. To remove routing table entries, select the respective entry and click **Remove selected**.

NTP Servers

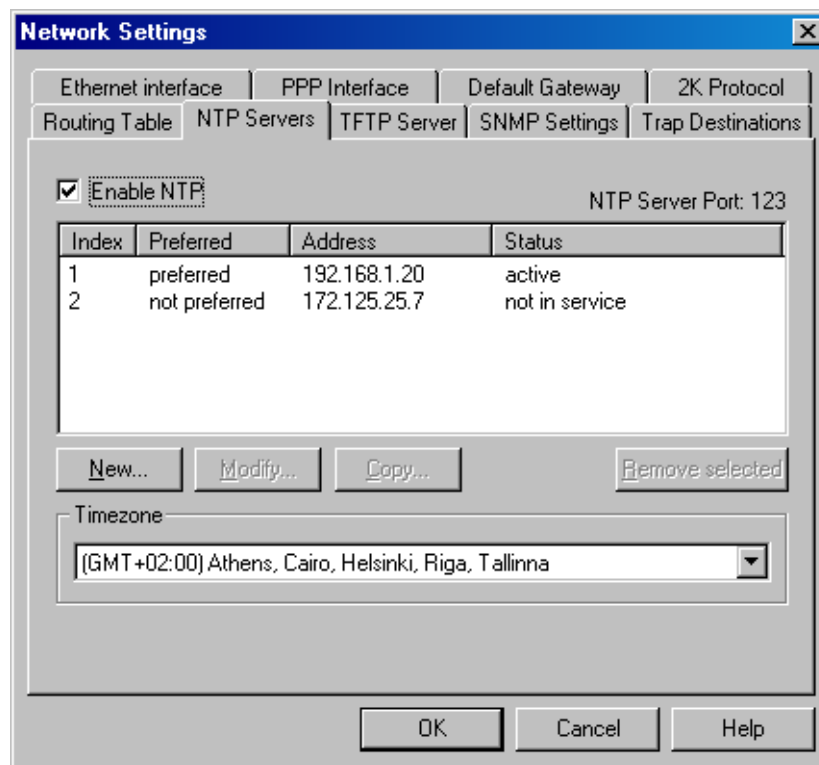


Figure 21. NTP servers dialog

Enable NTP	Enables/disables the NTP functionality of the FIU 19E.
Index	The index of the entry in the NTP server table.
Preferred	Use this setting to prioritise the different NTP server entries. Note that only one table entry can be set to <i>preferred</i> at the same time.
Address	The IP address of the NTP server.
Status	Shows the current status of the NTP server table entry. Can be used to enable, disable and delete an NTP server table entry.
Timezone	Enter the offset in minutes to UTC for the local timezone here.

Click the **New** button to create a new NTP server entry. To modify an existing entry, select the respective entry and click the **Modify** button. To remove an NTP server entry, select the respective entry and click **Remove selected**.

TFTP Servers

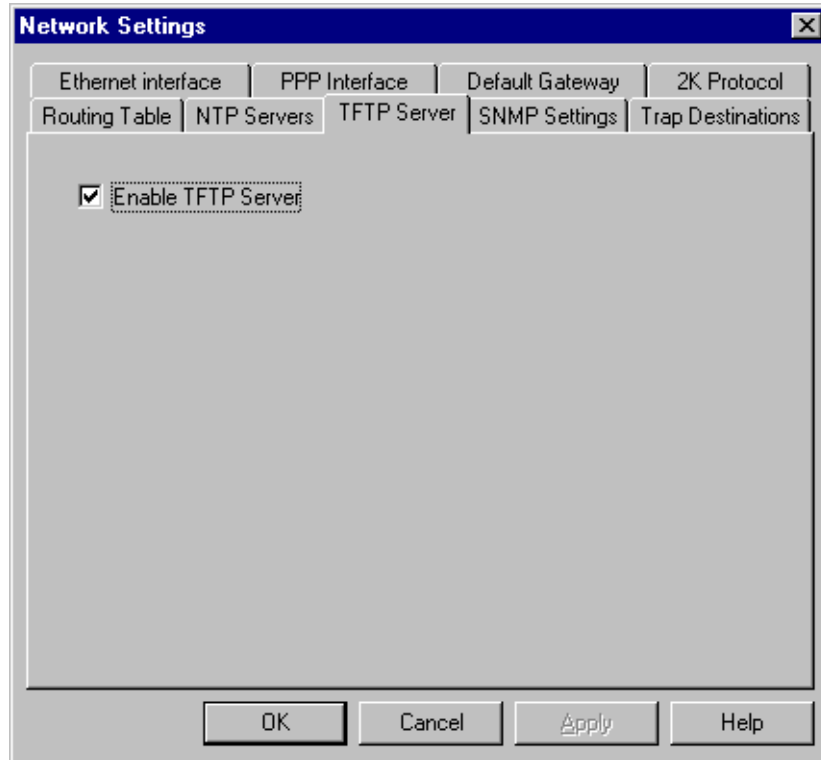


Figure 22. TFTP Server dialog

Check the **Enable TFTP Server** checkbox to enable the TFTP Server functionality of the FIU 19E.

Trap destination settings

To view or setup destinations for SNMP traps, select **Configure** → **Network Settings** and select the **Trap Destinations** tab. You can setup up to five destinations. For a detailed explanation of the trap destinations, refer to the standard *RFC 2021 (RMON2-MIB)*, which is obtained upon request.

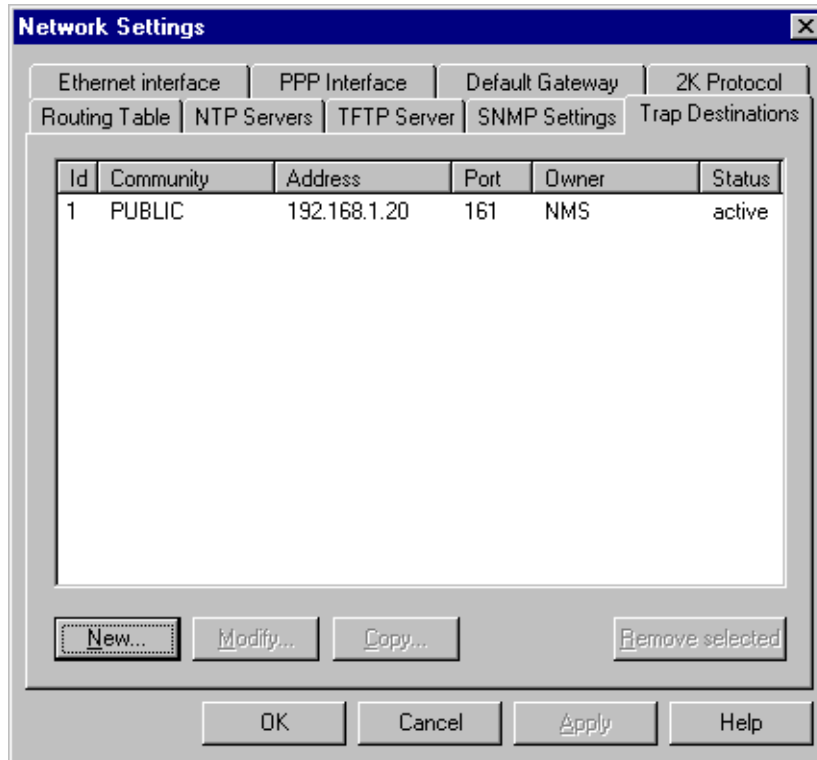


Figure 23. Trap destination settings

To add a new trap destination, click the **New** button. The settings, you need to enter to setup a new entry, are:

Index	Value of the SNMP table index (<i>RMON2 trapDestIndex</i>), is used to identify the table row via SNMP.
Community string	Destination community string is expected by the target management system for incoming traps.
Address	IP address of the target management system.
Port number	Port number for incoming traps in the target management system.
Owner string	String to identify the entity that is assigned to this entry (for example, the management system's name, location or ID).
Status	The status switch allows you to alter the trap destination status from <i>active</i> to <i>not in service</i> , and vice versa. Traps are only sent to <i>active</i> trap destinations, while destinations with <i>not in service</i> status are ignored.

To modify a configured trap destination, select the entry to be changed and click the **Modify** button. All trap destination settings can be modified in the upcoming window, except the SNMP table index.

To copy trap destination settings to a new entry, click the **Copy** button.

Note

The trap destination index is a unique identifier according to the standard *RFC 2021 (RMON2-MIB)*. Therefore it needs to be modified in the upcoming window.

To remove a complete trap destination entry, select the row and click the **Remove selected** button.

Ethernet interface settings

To view or change general Ethernet Interface settings, select **Configure** → **Network Settings** and select the **Ethernet interface** tab:

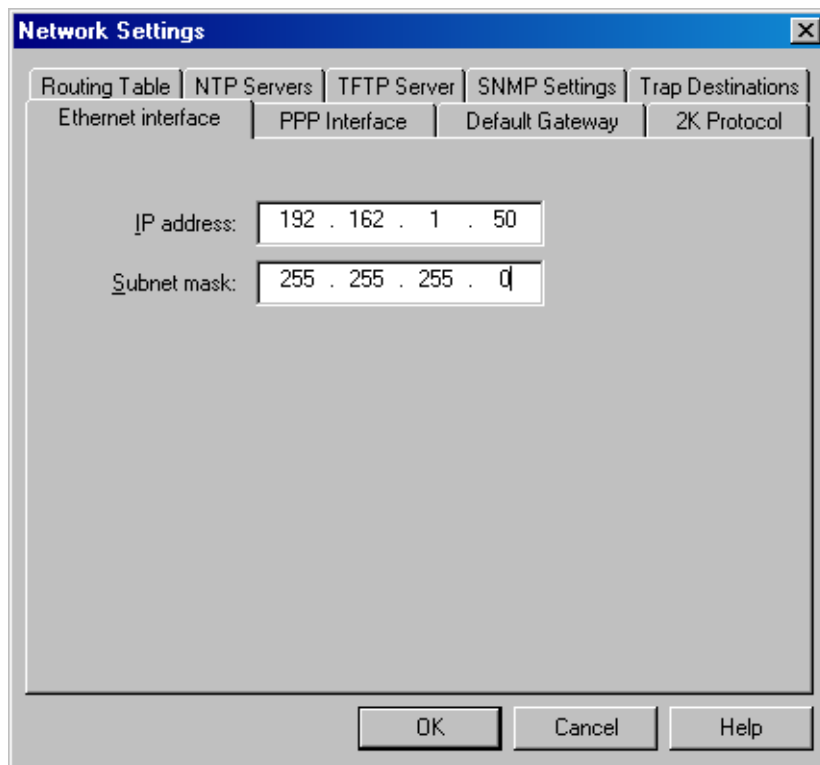


Figure 24. Ethernet interface settings

- IP address
IP address of the FIU 19E
- Subnet mask
Subnet mask of the FIU 19E's Ethernet interface.

Given its own IP address and subnet mask, a host (here the FIU 19E device) can determine if an IP datagram is destined for a host on its own subnet or not.

Default gateway settings

To view or change Default Gateway settings, select **Configure** → **Network Settings** and select the **Default Gateway** tab:

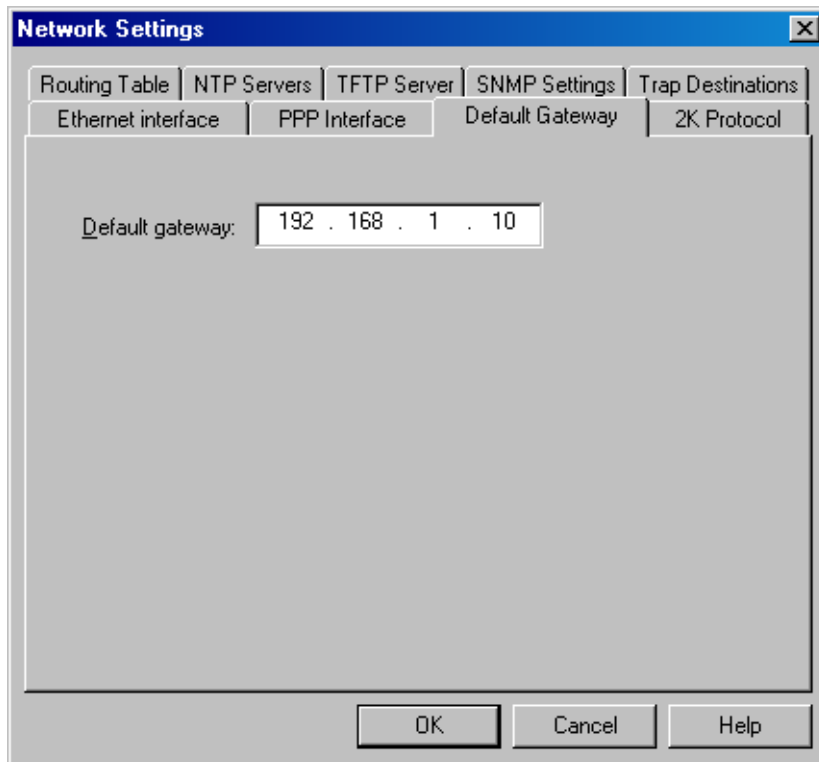


Figure 25. Default gateway settings

- Default gateway
IP address of the FIU 19E's default gateway.

Point-to-Point interface settings

To view or change Point-to-Point Interface settings, select **Configure** → **Network Settings** and select the **PPP Interface** tab (In the PPP interface window, you can configure parameters related to the IP configuration of the Point-to-Point interfaces. The FIU 19E uses PPP links for IP management of other FIU 19E situated at the far-end of FlexiHopper radio links. There can be one PPP link per radio hop):

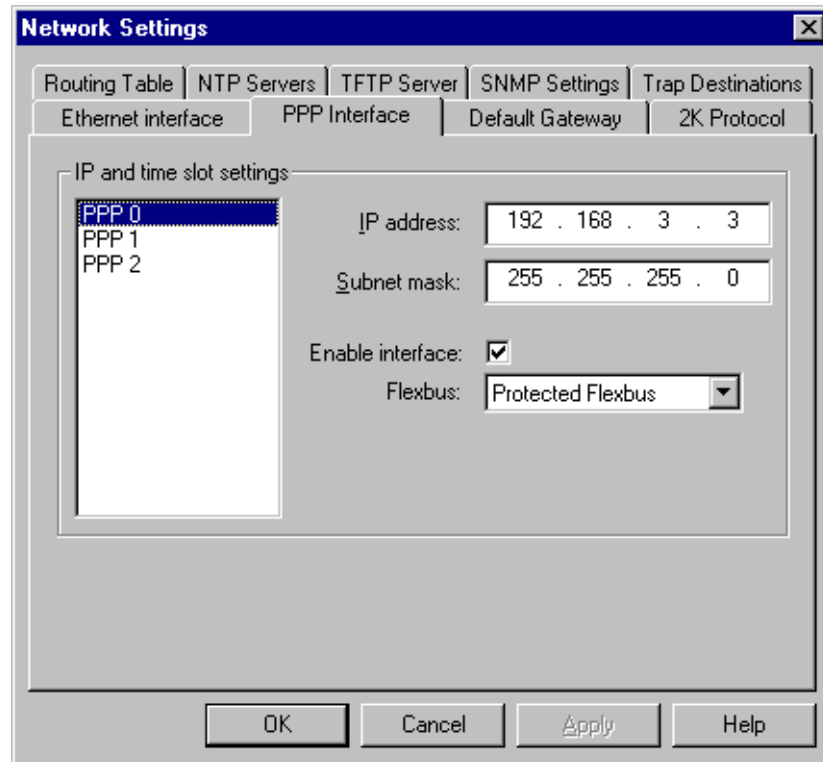


Figure 26. PPP Interface settings

IP address	IP address of the PPP interface.
Subnet mask	Subnet mask of the PPP interface.
Enable interface	Check the box to enable the related PPP link for the microwave radio link. The PPP interfaces can be mapped to Flexbus channels 1 to 3. Each Flexbus channel can be used for one PPP interface.

2K protocol settings

To view or change 2K Protocol settings, select **Configure** → **Network Settings** and select the **2K Protocol** tab (The 2K Protocol is a Nokia proprietary Network Management Protocol via IP data links to connect Nokia Hopper Manager or Management System):

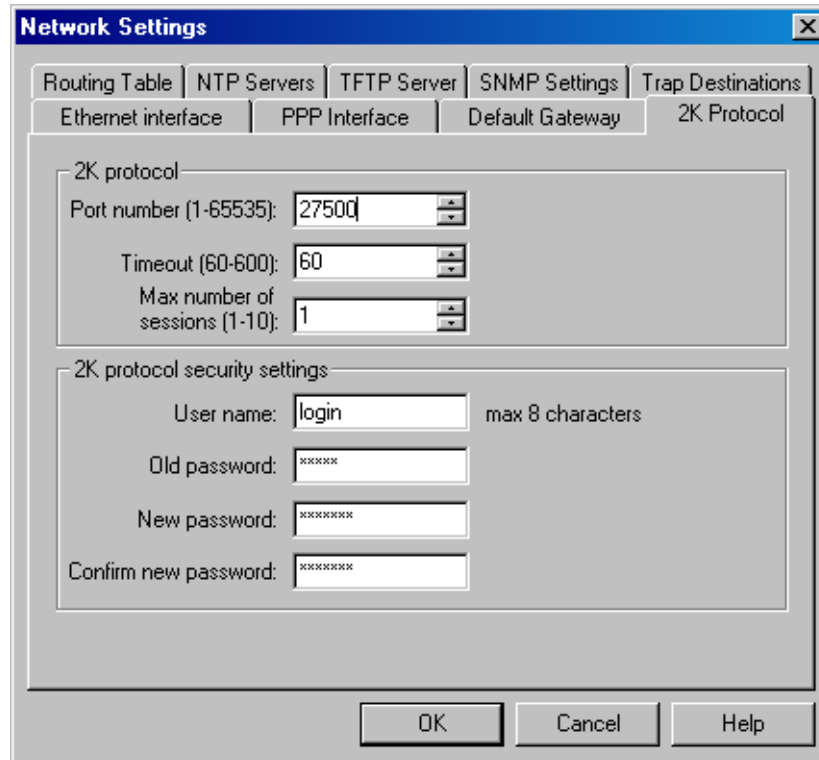


Figure 27. 2K protocol settings

Port number	TCP port number to connect to the FIU 19E via IP. Default value is 27500.
Timeout	TCP port number to connect to the FIU 19E via IP. Default value is 27500.
Max. sessions	Specifies the maximum number of simultaneous sessions connected to the same node. By increasing this number more users can connect to the same node.

Note

When you change the IP address of the node, it can take up to the configured timeout until the current IP socket connections is reestablished.

To view or change 2K protocol security settings, select **Configure** → **Network Settings** and select the **2K Protocol** tab:

User name	Identifying the connecting user. The user name must match with the configured GCS connection tool user name settings of the Nokia Hopper Manager.
Password	Changing current password settings. The password must match the configured GCS connection tool password of the Nokia Hopper Manager. To change the password settings, enter the current password and specify a new password. To verify the new settings you have to confirm the new password before it is activated.

3.6.9 Configuration report

Nokia Hopper Manager provides a configuration report which can be viewed in the **Report View** window.

To get a report of the entire network element configuration, click **Configuration** → **Configuration Report**. When prompted, select the level of detail and the report is displayed. The report can also be printed or exported to a text file.

3.7 Cross-connections (FIU 19 (E))

A cross-connection bank defines how the 2 Mbit/s signals are routed between Flexbus interfaces in a node. FIU 19 (E) can contain up to four cross-connection banks. Only one bank is active at a time and you must make the switch to the other bank manually.

Note

New cross-connection settings do not take effect until they have been sent to the node (**Manage** → **Send**). Also, the **Send** function needs to be selected when removing or modifying an existing cross-connection.

Note

In 2IU+2OU protection, copying a cross-connection setting to a passive unit takes about one minute. During copying, the operation alarm *Operation mode: Fault in change-over function* is active.

3.7.1 Editing cross-connections

There are two methods of editing the cross-connection banks. The first is via a graphical interface, the other by editing a list.

Graphical interface

To open the window, click **Cross-connections** → **View** on the menu. You can toggle between the graphic and list views by checking/unchecking **Cross-connections** → **Graphic view** or the check box on the toolbar.

The window contains one page for each cross-connection bank. The connections themselves are shown as lines between each of the Flexbus connector points. The selected connection is shown in red, the others in black. The selected connection points are also highlighted (Figure 28).

In 1IU+2OU and 2IU+2OU protection modes, common cross-connections for the protected Flexbus interfaces are displayed (Figure 29).

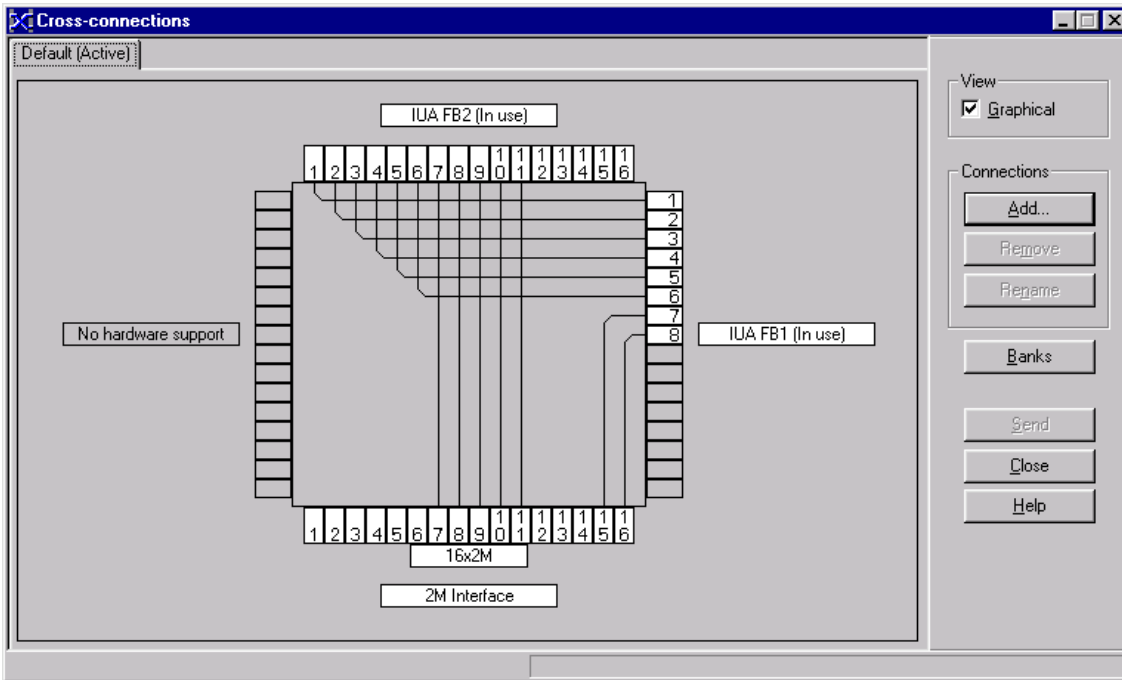


Figure 28. Graphical view of cross-connections

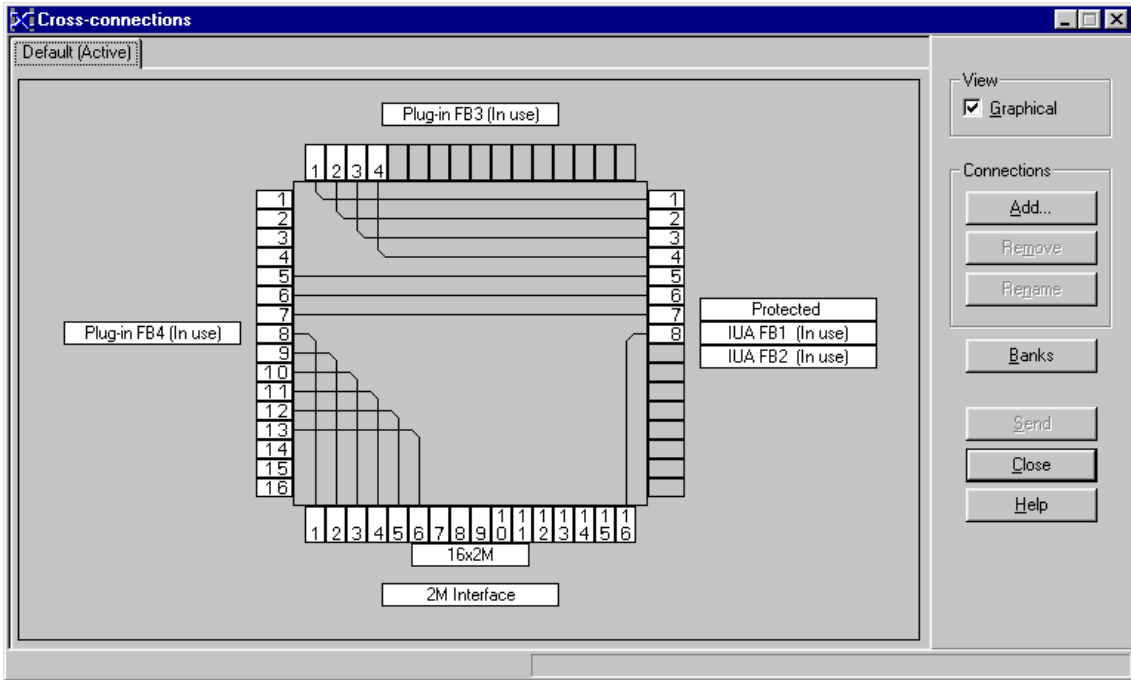


Figure 29. Example of cross-connections in 1IU+2OU protection mode



To create a new connection graphically:

Method one:

1. Click the first connection point so that it is highlighted.
2. Click the second connection point.
3. Click the **Send** button.

The new connection is shown.

Method two:

1. Click **Cross-connections** → **Add Connection** on the menu or from the toolbar. The **Add Connection** dialog box opens.
2. Type in the new cross-connection name.
3. Select the number of cross-connections to add.

4. Pick the two connection points for the start and end of the connection. These points are also first of consecutive cross-connections if multiple connections were chosen.
5. Click the **Send** button.

Note

Before adding a new connection both connection points must be free. Also, when multiple cross-connections are added in the same operation all connections have their name generated automatically.

List interface

As an alternative to using the graphical interface there is also a list based method for editing cross-connections. This can be easier to use if, for example, you do not have a mouse on your computer. For more information, see **Online Help**.

Renaming a cross-connection

Cross-connections can be named when they are added.

To change the name given, select the connection or connections you wish to rename and click **Cross-connections** → **Rename connection** or use the toolbar. This opens the **Edit Connection Name** dialog box.

Deleting a cross-connection

To permanently delete a cross-connection from a bank, select the connection or connections you wish to delete and click **Cross-connections** → **Remove connection**.

Before deleting the cross-connections you are asked if you want to go ahead with the deletion.

3.7.2 Editing cross-connection banks

A Nokia FlexiHopper with FIU 19 (E) network element can contain up to four banks of cross-connections. These banks can be created, copied, activated, renamed, and deleted while in either of the cross-connection windows. To apply any of these actions you have to click the **Send** button.

Click **Cross-connections** → **Banks** to open the **Cross-connection bank management** dialog box, which displays a list containing all the cross-connection banks with their status.

Creating a new bank

To add a new cross-connection bank, click the **Add bank...** button. A dialog appears for naming the bank. After giving the new bank a name it is added to the list.

Copying a bank

To copy one bank into another, click the **Copy bank...** button. This is useful if you want to create another cross-connection bank with only minor differences from the original.

Activating a bank

Click the **Activate bank** button to change the currently active bank of cross-connections in the node to the one which you select from the list.

Renaming a bank label

To change the label of a bank, click the **Rename bank...** button. Each bank name must be unique.

Deleting a bank

To permanently remove a bank from the network element, select the bank you wish to delete from the list and click the **Delete bank** button.

3.8 Cross-connections (RRIC)

Unlike FIU 19, RRIC does not use the Nokia Hopper Manager for making cross-connections. Cross-connections on RRIC are made with the TruMan node manager. For more information on making cross-connections, see the latest *TruMan User's Manual*.

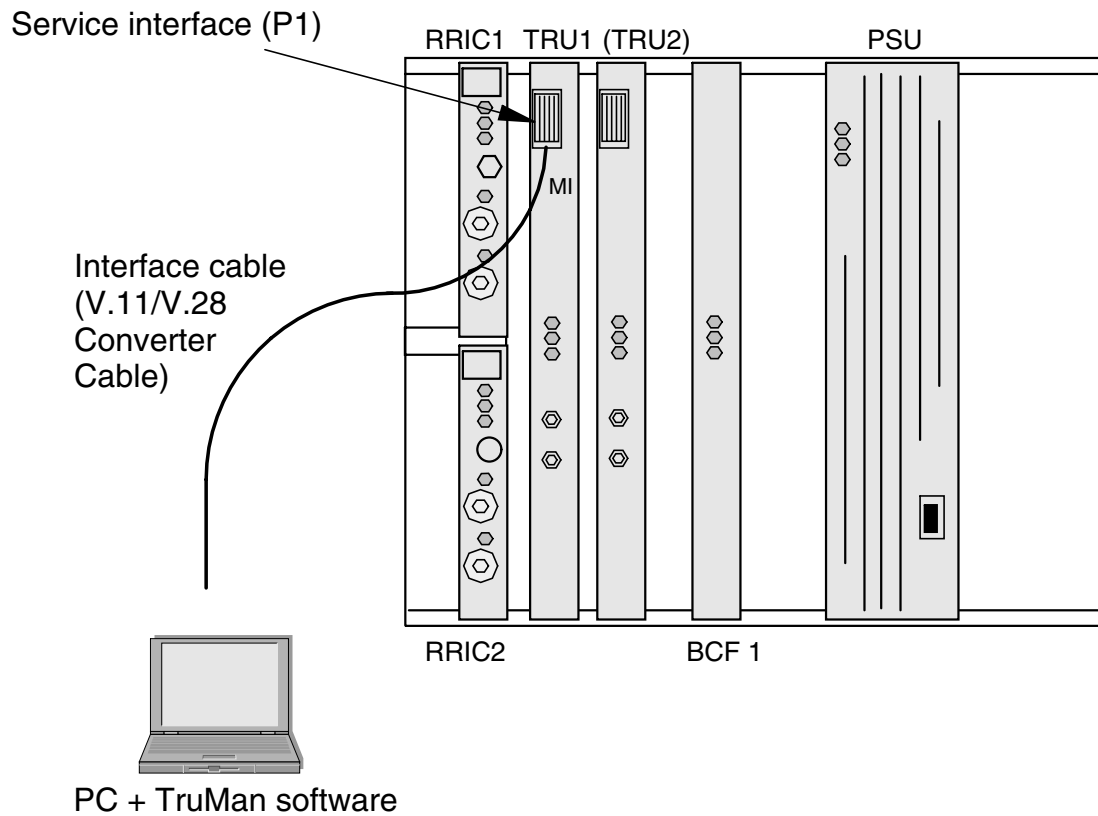


Figure 30. Connecting the interface cable (E62717.01 or E62717.03) to TRU (Nokia Intratalk cabinet as an example)

RRIC cross-connections are defined by cross-connection banks. RRIC can contain up to four cross-connection banks, numbered from 0 to 3. Banks 0 - 2 are freely usable, bank #3 is reserved for the bypass function (see Section 3.8.1).

Cross-connections can be made between the two Flexbus interfaces, between the Flexbus interfaces and the 2M interfaces or between the two RRIC cards. Only one bank is active at a time.

3.8.1 Bypass function

It is also possible to enable a bypass function, which is used if a TRU_x unit failure occurs. In that case the cross-connection bank #3 is activated automatically.

Bypass function can be used on a chaining or branching station. In bypass function the 2M signal which is normally dropped to the 8k cross-connect is routed directly to another Flexbus interface. This way, transmission in the chain continues normally in case of TRUx failure. Only the traffic from the failed TRUx is left out.

Note

The user must take care of editing the cross-connection bank #3 for the bypass purpose, in order for the bank to be activated automatically.

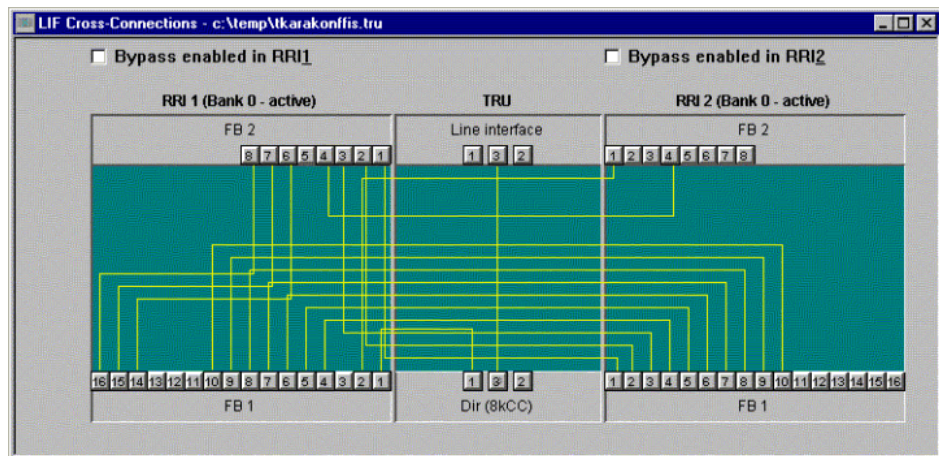


Figure 31. LIF Cross-Connections window of the TruMan Node Manager when there are two RRIC units in the equipment configuration

3.9 Verifying commissioning

3.9.1 Commissioning measurements

Hopper Manager can be used to produce a report that includes a list of the basic settings and information about the network element. You can also take an additional report which contains statistics and commissioning measurement results. However, a report on other items or longer term monitoring of the radio hop must be done manually.



To create a commissioning report:

1. Select **Manage** → **Commissioning Report**.
2. Select the items to be included in the commissioning report. Click **Next**.
3. Select a name for the file and where to save it. Click **Next**.
4. The commissioning report is prepared in approximately 10 minutes. Click **Finish**.

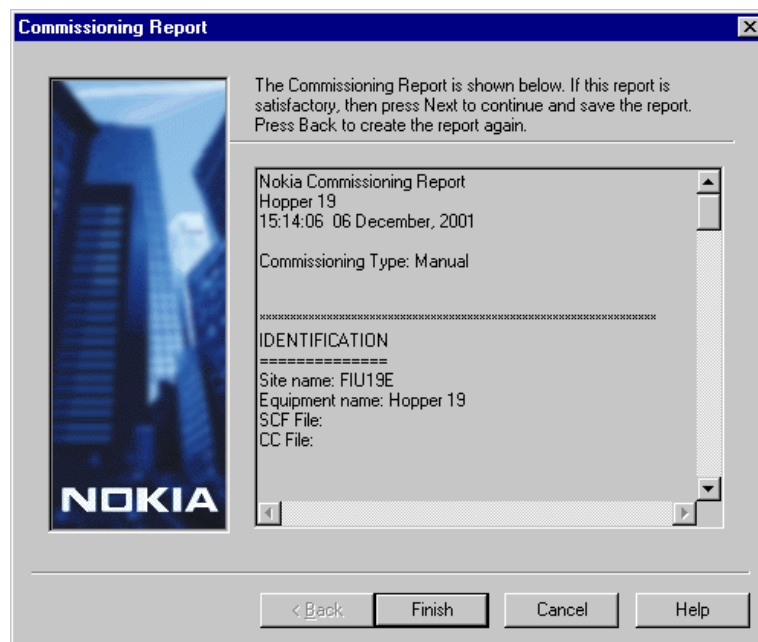


Figure 32. Commissioning report

3.9.2 Measuring the fading margin

Note

Fading margin measurement cuts regular transmission over the radio hop.

To measure the fading margin, click **Configure** → **Settings** and select a FlexiHopper outdoor unit on the **Select Object** dialog box. From the **Radio** dialog box page click the **Fading Margin...** button and the **Measure Fading Margin** dialog box opens. Click **Do Measurement...** and the measurement begins. Result is displayed in a list. Each time a measurement is made it is added to the list so that any changes are easily apparent. The number of results returned depends on the operating mode of the network element. Also note that the Fading Margin value should not be confused with the **ALCQ set point** value used with ALCQ.

For more detailed information on ALCQ functionality, see the *ALCQ and Automatic Fading Margin Measurement in FlexiHopper Microwave Radio* application note that can be obtained upon request.

3.9.3 Monitoring the hop

We recommend that you monitor the hop for at least half an hour after all settings have been made at both ends of the hop. Reset the statistics and the error counters (see Section 3.10 below) and let the hop operate for half an hour (or longer, if desired). After the time has passed, check that the signal quality statistics and the error counters do not show any undesired values (see Section 5.2.).

If the signal quality is OK (unavailability time = 0) and there are no unexpected alarms, the commissioning of the hop is complete. If there occurs any unavailability time during the monitoring, repeat the monitoring.

3.10 Resetting the statistics and error counters

The radio compiles statistics in accordance with the ITU-T recommendation G.826. The statistics should be reset immediately after commissioning. Later on, the statistics should be read and reset at regular intervals (1 month, for example).

The error counters of the indoor unit and the outdoor unit must also be reset immediately after commissioning.

To reset the signal quality statistics and the error counters, click **Maintenance** → **Performance** → **Reset Counters** on the menu.

The use of statistics and error counters is described in more detail in Section 5.2.

4

Managing alarms

A number of different alarms can be generated by a Nokia FlexiHopper network element. Nokia Hopper Manager is able to provide you with the following information about any alarm that has occurred in the node:

- Severity – classification of alarm:
 - Critical (***) = critical alarm is used to indicate a fault situation which requires immediate measures to be taken. A critical alarm indicates possible service degradation.
 - Major (**) = major alarm is used to indicate a fault situation which requires some measures to be taken during normal working hours.
 - Minor (*) = minor alarm is used to indicate a fault situation which does not require any measures to be taken by the user. The alarm is cancelled when the fault situation is over.
 - Warning (W) = warning can be used to give the user information of some event. A warning is not an alarm, and it does not indicate a fault. A warning is not cleared.
- Class – classification by event: A, B, C, or W.
- Time – date and time when the alarm was detected.
- Location – the location (functional element) in the node where the alarm occurred.
- Description – a brief description of the alarm.

Alarm messages are listed in Appendix A.

4.1 Reading and cancelling alarms

All current alarm information is shown in the **Alarm** window. Service indicator LEDs and hop status information can be shown in the equipment view window. These indicators are controlled from **Tools** → **Options** → **Manager Options**.

To open the **Alarms** window, click **Alarms** → **View**. After the window opens, a list of current alarms is shown. To keep this list updated, activate alarm monitoring by clicking **Alarms** → **Monitor**. You can change the time delay for the monitoring in **Tools** → **Options** → **Manager Options** or in **Alarms** → **Window Options**.

You can refresh the alarm information also manually by clicking **Manage** → **Refresh** when the **Current Alarms** window is active or by using the window toolbar.

Note

Avoid setting the alarm monitoring delay to a small value when monitoring a network element remotely. This places a strain on the Q1 bus resources and causes delays for other activities.

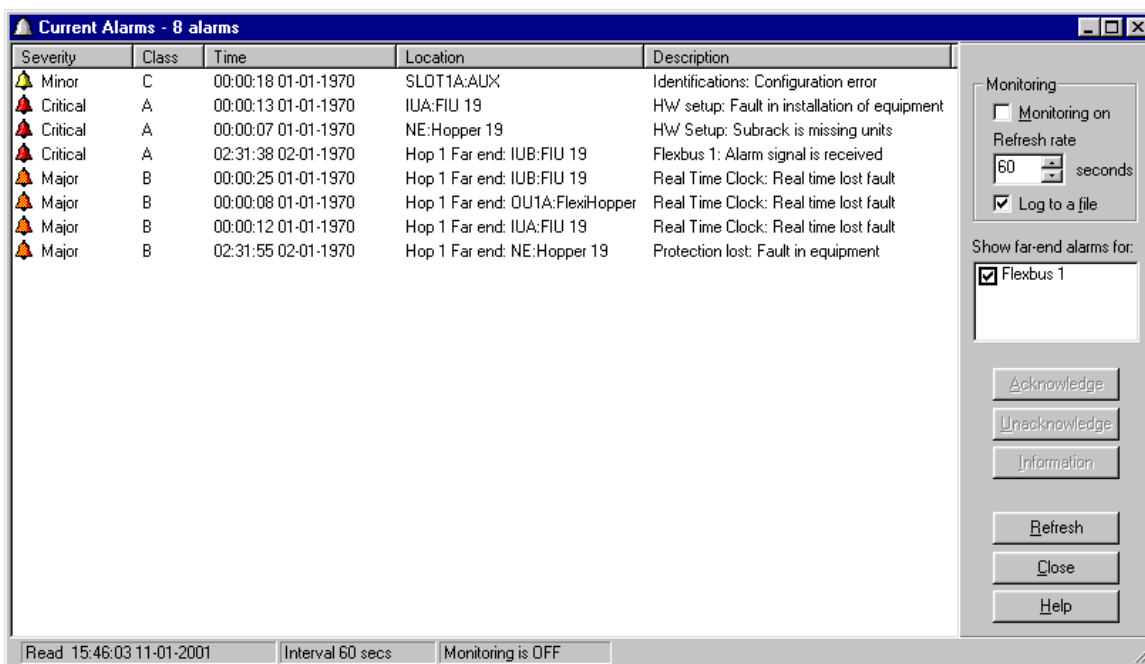


Figure 33. Alarms window

The **Current Alarms** window lists the alarm details as described previously. The alarms are also colour-coded and their state shown symbolically as given in Table .

Table 2. Classification of alarms

Severity	Class	New	Acknowledged	Cleared	Colour
Critical (***)	A				Red
Major (**)	B				Orange
Minor (*)	C				Yellow
Warning (W)	W				Blue

You can sort the alarms by clicking on the column heading in the window. To sort the alarms in reverse order, click a heading twice. By default the alarms are listed by *Time*.

Alarms can be visually acknowledged so that you can easily see which alarms are new and which you have already seen.

To view past alarms which have occurred in the network element, you can open the **Alarm History** window. This window shows a list of past alarms, including those which have been cleared. This window can be opened by clicking **Alarms** → **History**.



To mark an alarm as acknowledged:


1. Select the alarm in the list to be acknowledged.
2. Click **Alarms** → **Acknowledge** on the menu or use the window toolbar.

The symbol for this alarm changes to the bell symbol with the tick in the corner ().




To remove the acknowledgement mark:

1. Select the alarm in the list to be unacknowledged.
2. Click **Alarms** → **Unacknowledge** on the menu or use the window toolbar.

The symbol for the alarm changes back to the bell ()

Note

Alarms which have the bell symbol and a cross () have been cleared from the node.

4.2 Fault settings

Fault settings control the settings for individual alarms in the network element and also the operation of external alarms with the Aux data plug-in unit.

To access the fault settings, click **Alarms** → **Fault settings...** on the menu. Click the tabs to switch between pages.

Using this control it is possible to alter the settings for particular alarms and also to attach an alarm to a PI (Programmable Interface) bit which is used with the Aux data plug-in unit to associate alarms with external events.

The input can be used for raising an alarm when, for example, the cabinet door is opened or for relaying alarms from other vendor's equipment. The output can be used for relaying an alarm to other vendor's equipment. The associated relay control outputs can be used for turning on equipment rack lights, for example.

4.2.1 Alarm settings

From the alarm settings you can change the current state of an alarm to either normal, forced on or forced off. Usually an alarm should be left in the normal state. This allows the alarm to be activated/deactivated as various fault conditions arise in the network element.

In some cases, such as testing, it may be necessary to force an alarm on or off. When an alarm is forced off, it is not activated, even if a fault condition arises which would normally cause that particular alarm. If an alarm is forced on, it is always active.

Programmable Interface (PI) bits are also associated with each alarm. They can be used with the Aux data plug-in unit to connect the FIU 19 (E) to external alarm devices such as display lights. Each alarm can be connected with up to eight PI bits. These bits are then connected to one of the interfaces on the Aux data plug-in. In this way, it is possible to collect alarms into up to eight categories. Each of these PI bits can be connected to activate one particular Aux data plug-in output.

Note that the PI bits are only accessible for indoor unit alarms. The outdoor unit alarms do not support this feature.

To select an alarm to be configured, choose the appropriate functional entity, supervision block (SB), and then the alarm fault code (FC) from the list in the dialog. To change the status of the alarm, click one of the buttons: Normal, Forced on, or Forced off.

To connect the alarm to a PI bit, select the bit(s).

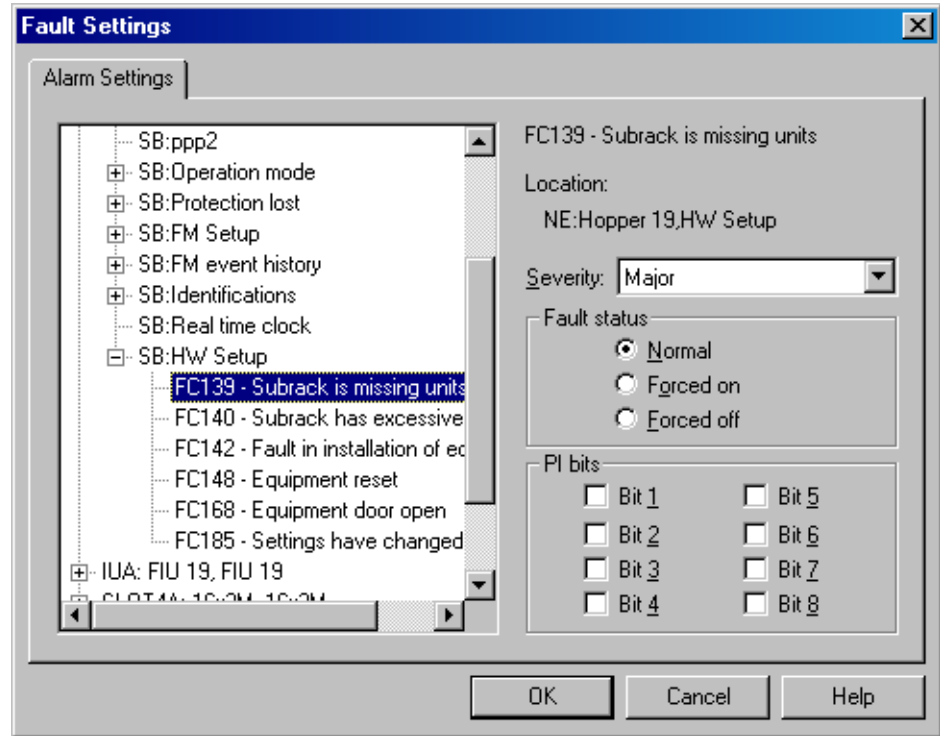


Figure 34. Alarm settings in fault settings dialog box

Note

When using SNMP management, disturbance alarms (<1 second) are sent as warnings.

4.2.2 PI bit cross-connections

The PI (Programmable Interface) bit cross-connections determine which of the Aux data plug-in I/O (input/output) lines are activated when an alarm with that PI bit set becomes active. Because the FIU 19 (E) can support up to three different Aux data plug-in units (in single mode), up to 12 different I/O lines can be available.

Note that only Aux data plug-in I/O lines which are configured as outputs can be used for creating connections with the PI bits.

To create a connection between a PI bit and an I/O line of the Aux data plug-in unit, click on the buttons at the two end points for the connection. To delete a connection, click one of the end points and press the DEL key, or use the pop-up menu.

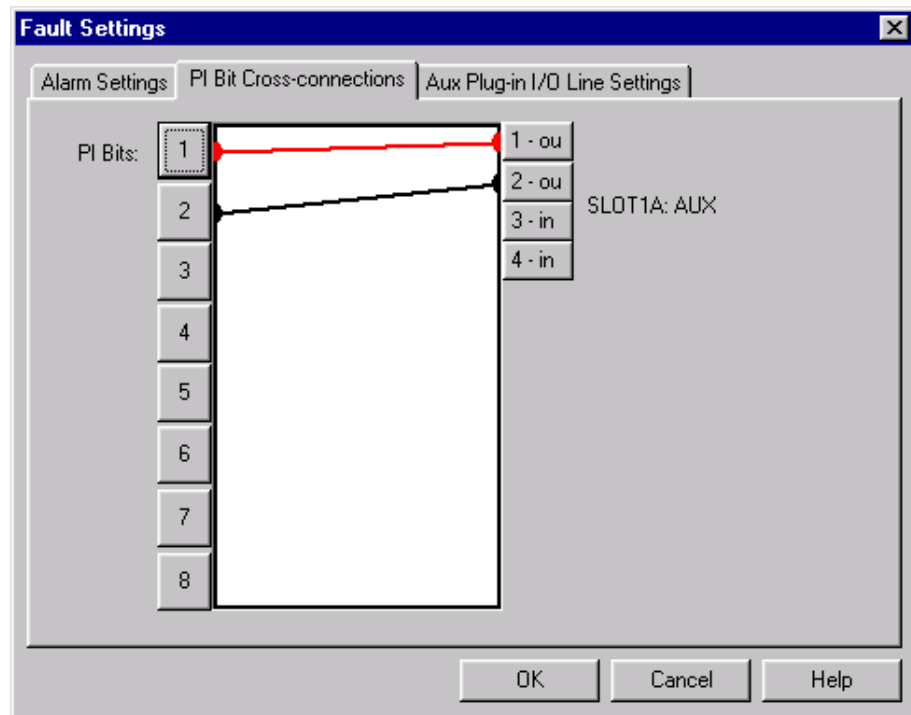


Figure 35. PI bit cross-connections in Fault Settings dialog box

4.2.3 Aux data plug-in I/O line settings

The I/O lines of the Aux data plug-in are used to connect an external device to FIU 19.

For an I/O line to operate, it must be marked as being in use, as well as given a normal state and either an operation mode *input* or *output*.

I/O lines marked as outputs can be used together with the PI bits to connect various alarms to an external device. If an I/O line is marked as an input, it always causes an alarm event in the Aux data plug-in when that I/O line becomes active. The alarm is *Active alarm point* for the particular line.

To set the I/O line configuration, select the appropriate Aux data plug-in unit by pressing the button on the left of the dialog for the Aux data plug-in unit. There is one button for each present Aux data plug-in.

When an Aux data plug-in is selected, the rest of the page displays all the I/O line settings for that plug-in unit. These settings can then be modified as required.

Each I/O line must be configured correctly, which means that it must have a normal and an active state set. The normal state is configured under the *State* and the active under the *Active* setting. There are *High* and *Low* options for each.

Commissioning fault settings with the Aux plug-in unit

The following are examples of how to configure the external alarm interface of the Aux data plug-in unit.

Alarm inputs



To commission the alarm input of the Aux data plug-in unit

1. Open the Fault Settings dialog and select the Aux plug-in I/O Line Settings page.
2. Configure the settings of the selected I/O pin:
 - In use
 - Input operation
 - Input/output polarity active high or low.

The I/O pins are DIO0..3 in TTL level input use.

Note

The alarm appears for example as *SLOT1A:AUX I/O1 Active alarm point*.

Alarm outputs



To commission the alarm output (max 8) of the Aux data plug-in unit

1. Open the Fault Settings dialog and select the Aux plug-in I/O Line Settings page.
2. Configure the settings of the selected I/O pin:

- In use
 - Output operation
 - Input/output polarity active high or low.
3. Select Alarm settings page of the Fault Settings dialog.
 - Select an indoor unit alarm to be followed by the Aux data plug-in output I/O pin.
 - Connect the alarm to a programmable interface (PI) bit.
 4. Select PI Bit Cross-connections page of the Fault Settings dialog. Cross-connect the particular I/O pin to the PI bit.

The I/O pins are DIO0..3 in TTL level input use.



To commission a user controllable output of the Aux data plug-in unit

1. Open the Fault Settings dialog and select the Aux Plug-in I/O Line Settings page.
2. Configure the settings of the selected I/O pin:
 - In use
 - Output operation
 - Input/output polarity active high or low.
3. Select PI Bit Cross-connections page of the Fault Settings dialog. Ensure that the particular I/O pin is not cross-connected to any PI bit.
4. Select Aux Plug-in I/O Line Settings page. Set output state to high or low to control the output state of the particular I/O pin.

The I/O pins are DIO0..3 in TTL level input use.

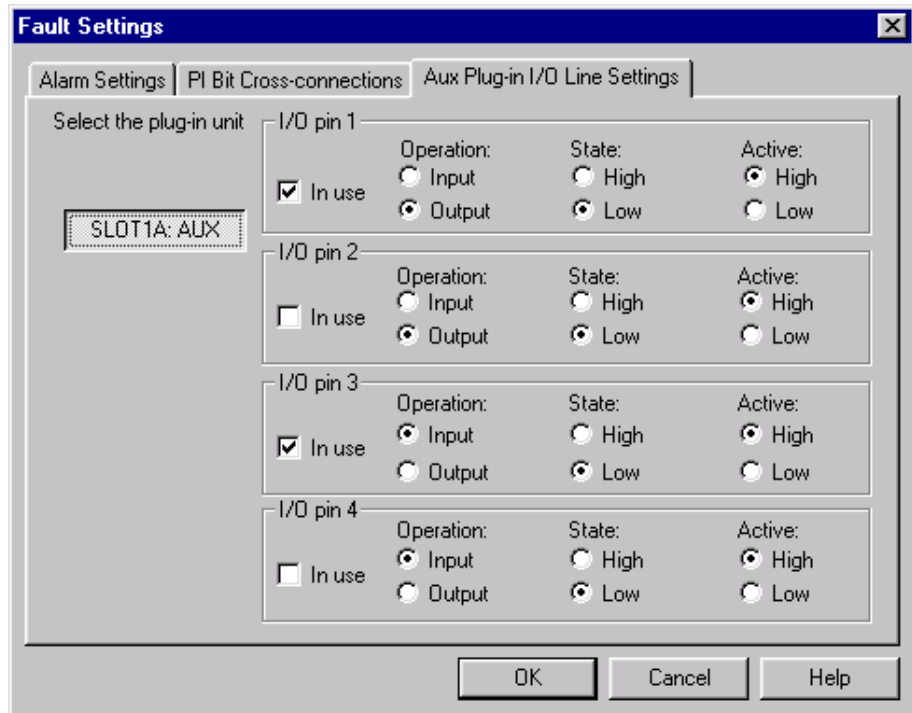


Figure 36. Input/output settings in fault settings dialog box

4.3 Service LEDs

In addition to the alarms which a network element can produce, most functional entities also have LED indicators. These indicators display the current state of the equipment as a quick on-site reference.

4.3.1 FIU 19 (E) main LED

A tricolour LED is located on the FIU 19 (E) main connector panel. When FIU 19 (E) is used in single (1+0) mode the LED indicates the following:

Table 3. FIU 19 (E) LED in 1+0 mode

LED	Situation
RED	One or more data lines are not operating correctly. The fault can be in indoor unit itself and/or in one or more outdoor units. The fault can also be in far-end unit(s).
YELLOW	The indoor unit and/or one or more outdoor units have active alarm(s). The data is transmitted in this configuration, but may not be transmitted in other configurations or if another failure occurs. The overall performance capability is reduced. Active alarm(s) can also be in far-end units.
GREEN	Both terminals over this hop are operating normally and no alarms are active. A blinking green LED indicates that there is a connection to the node manager.

When FIU 19 (E) is used in 1+1 protected mode, the LEDs indicate the following:

Table 4. FIU 19 (E) LEDs in 1+1 mode

IU1 LED (Active)	IU2 LED (Passive)	Situation
RED	RED	Data is not transferred. Both protected paths are faulty. IU1 RED LED indicates that data is not transferred. IU2 RED LED indicates that one ore more unit(s) including far-end unit(s), have critical alarm(s) active.
RED	YELLOW	Impossible.
RED	GREEN	Impossible.
YELLOW	RED	Data is transferred, but protection is lost. IU1 YELLOW LED indicates that data is transferred normally, but protection is lost. IU2 RED LED indicates that one ore more unit(s) including far-end unit(s), have critical alarm(s) active.
YELLOW	YELLOW	Impossible.
YELLOW	GREEN	Impossible.

Table 4. FIU 19 (E) LEDs in 1+1 mode (Continued)

IU1 LED (Active)	IU2 LED (Passive)	Situation
GREEN	RED	Impossible.
GREEN	YELLOW	Data is transferred. IU1 GREEN LED indicates that data is transferred normally and protection is enabled. IU2 YELLOW LED indicates that one or more unit(s) including far-end unit(s), have major or minor alarm(s) active.
GREEN	GREEN	All units in this NE are OK.

4.3.2 RRIC main LEDs

Table 5. RRIC LEDs

LED	Situation	
RED	FLT (fault)	One or more data lines are not operating correctly. The fault can be in indoor unit itself and/or in one or more outdoor units. The fault can also be in far-end unit(s).
YELLOW	ALM (alarm)	The indoor unit and/or one or more outdoor units have active alarm(s). The data is transmitted in this configuration, but may not be transmitted in other configurations or if another failure occurs. The overall performance capability is reduced. Active alarm(s) can also be in far-end units.
GREEN	OPR (operation)	Both terminals over this hop are operating normally and no alarms are active. A blinking green LED indicates that there is a connection to the node manager.

4.3.3 Flexbus LED

A green LED is located beside each Flexbus interface. The LED indicates the following:

Table 6. Flexbus LED

LED	Situation
No light	No power feed or Tx signal (but an IU-IU connection may be active).
Blinking GREEN	DC power feed to the outdoor unit active, Tx signal not active.
Continuous GREEN	DC power feed to the outdoor unit and Tx signal active.

4.3.4 Viewing LEDs with the node manager

Nokia Hopper Manager can also display LED indicators in the **Equipment View** window, if required. This option is activated from the **Equipment View**. You can also set the refresh time for LED and other status monitoring. By selecting the Polling option for each far-end in the Equipment View window it is also possible to view the service LEDs for several of the far-end units.

Do not set the refresh rate for these items to a very small value if connecting via the Q1 bus. Polling for these is very resource consuming on the Q1 bus and may cause other applications to slow down or fail. If the connection speed is very low, turn off the status polling. Also turn off the polling during a software download as this also causes delays for the download.

Note

The LED indicators in the **Equipment View** window show the status of each functional entity of the node. They are not the same as the front panel LEDs.

5

Maintaining Nokia FlexiHopper

This chapter describes how to maintain Nokia FlexiHopper microwave radios and how to replace faulty units. The chapter contains information on:

- preventive maintenance
- performance monitoring
- using troubleshooting tools
- replacing or removing equipment.

5.1 Preventive maintenance

Maintenance of the radio includes measurements which do not interfere with the communication. Measurements which do interfere with the communication can also be conducted when the radio is in operation, provided that the measurements are performed at a time when there is no traffic or the traffic can be rerouted. With the Nokia Network Management System, service measurements can be performed centrally for the entire network without having to move physically from station to station. However, any measurements performed with external measuring instruments must be conducted locally.

Record the measurements so that they can be compared with earlier results and used to detect significant changes in the results. Store the measurement records at the location where the measurements are conducted, that is, the records of centralised measurements in the central monitoring room, and the records of external measurements at the equipment station.

The internal signals of the equipment can be directed to the measurement connector (MP) on the indoor unit for measurement with appropriate external instruments. The location and use of the connector is explained in section 5.3.3.

The outdoor unit has a measurement interface for the AGC voltage. The AGC measurement is used when aligning the antenna (see *Outdoor Unit Installation*).

In addition, there are a few other measurements, which are typically conducted continuously in maintenance with the NMS Network Management System but which may also be performed with Hopper Manager:

- bit error ratio
- Rx input level.

5.2 Performance monitoring

The Nokia FlexiHopper network element records information regarding its own performance. This information is accessible from the **Performance** menu of Nokia Hopper Manager.

The performance information is divided into three areas:

- measurements
- error counters
- signal quality statistics.

Each of these is available from the **Maintenance** → **Performance** menu in Nokia Hopper Manager or, in some cases, from the toolbar.

The measurement and error counter windows both display information about the performance of the network element and its current operating condition. The statistics are collected for the signal.

5.2.1 Measurements

The **Measurements** window, which is opened from **Maintenance** → **Performance** → **Measurements**, displays selected information about the network element. This information is in the form of, for example, various voltage or power levels recorded from particular units which make up the network element.

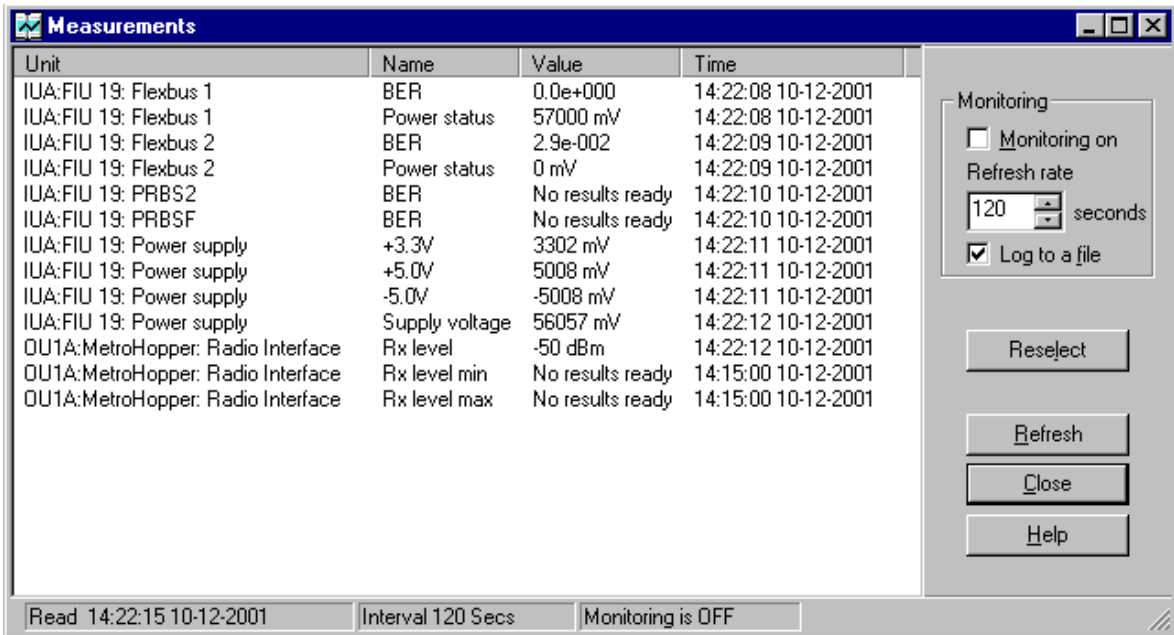


Figure 37. Measurements window

Click the menu command to open the **Select measurement** dialog box in which you can first select the measurements and values that you are interested in. Selecting the unit reads all measurements supported by that unit. Otherwise, select the specific measurements contained under each unit.

Monitoring measurements

These values can be refreshed automatically if the **Maintenance** → **Performance** → **Monitor Measurements** menu command is checked or **Monitoring on** is selected in the toolbar. The refresh period is set in the window toolbar. The values can also be manually refreshed by clicking **Refresh** in the toolbar.

To stop the monitoring, uncheck **Monitor on** in the toolbar. Although monitoring stops, you can update the values at any time with **Refresh**.

If you wish to change the measurements displayed click **Reselect...** . This opens the **Select Measurements** dialog box again so that you can choose new measurements.

5.2.2 Error counters

Error counters in the network element record the number of times that an error has occurred in a particular unit or functional entity. These are events such as *Frame sync lost*.

Click **Maintenance** → **Performance** → **Error Counter** to open the **Error Counters** window.

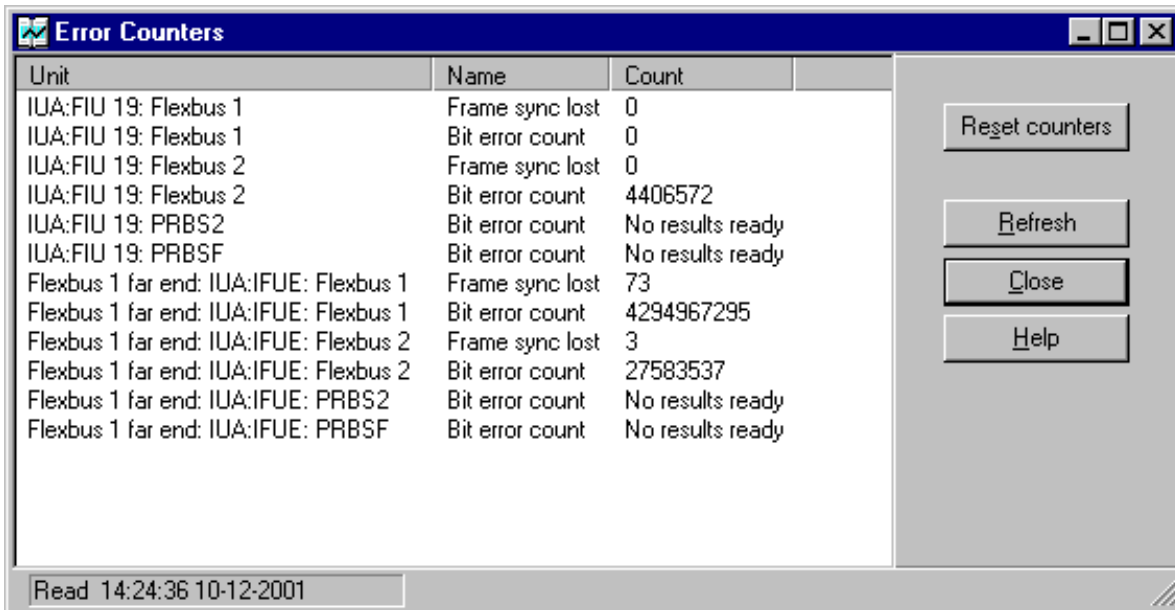


Figure 38. Error counters window

There is no built-in monitoring for this information, but it can be manually refreshed at any time with **Manage** → **Refresh** menu command or the **Refresh** button in the window.

All error counters in the network element can be reset to zero by clicking **Maintenance** → **Performance** → **Reset Counters** on the menu or using the button in the window.

5.2.3 Reading statistics

The statistics the network element records for signal quality are kept to ITU-T recommendation G.826. The values are available as either infinite, or 15-minute and 24-hour histories (last 16 measurements).

The following statistics are recorded:

Table 7. Statistics

ID text	Unit	Description
G.826 TT	seconds	Total Time as specified in G.826
G.826 AT	seconds	Available Time as specified in G.826
G.826 ES	seconds	Errored Seconds as specified in G.826
G.826 SES	seconds	Severely Errored Seconds as specified in G.826 ¹⁾
G.826 BBE	counter	Background Block Errors as specified in G.826
G.826 EB	counter	Errored Blocks as specified in G.826
1) G.826 gives two definitions for SES. In Nokia Q1, the definition of SES as "≥30% errored blocks in one-second period" is adopted.		

To open the **Statistics** window, click **Maintenance** → **Performance** → **View Statistics** on the menu. This opens the **Select Target** dialog box from which you can choose the targets for which the statistics are displayed.

The **Statistics** window is not monitored, but the information can be manually refreshed. It is also possible to reset all the signal quality statistics by clicking **Maintenance** → **Performance** → **Reset Counters** on the menu or using the button in the window.

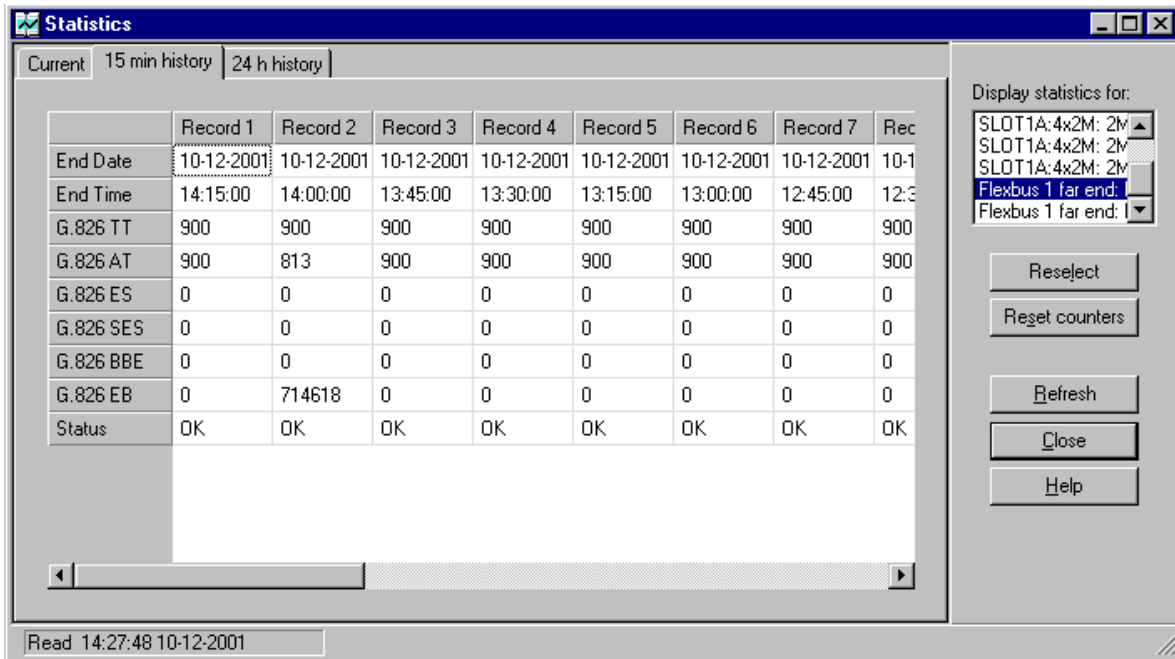


Figure 39. Statistics window

Although several units can be selected from the **Select Target** dialog box only one set of statistics can be displayed at a time. Display statistics for the different targets you initially selected by using the list in the toolbar. To choose new targets, click **Maintenance** → **Performance** → **Reselect...** on the menu or the toolbar.

5.3 Using troubleshooting tools

Each functional entity in a network element contains several controls for pin-pointing faults or problems.

These controls are divided into four areas:

- loopbacks
- forced controls
- measurement interface
- internal tests.

All of these features are affected by the **Control** timeout setting contained in the network element (see Section 3.6.2). The network element is reset to normal functioning after the timeout has been reached. You can also reset the network element to its normal state manually by clicking **Maintenance** → **Tests** → **To Normal State** on the menu or using the toolbar in each window.

Note

When a control has been set, no other settings take effect until the equipment is returned to normal state.

5.3.1 Loopbacks

For testing and diagnostics, there are six integrated loopback tests available. Table 8 below describes the looping possibilities.

Table 8. Loopbacks

Loop type	Description
2M loop to interface	Near-end loop. Loops back the signal in the 2Mbit/s interfaces in the 2M cross-connection block.
BFI* 2M loop to interface	Far-end loop. Loops back the signal in 2Mbit/s interfaces in the cross-connection section. These channels are also connected to a Flexbus.
Flexbus loop to interface	Far-end loop. Loops back the selected Flexbus signal in Flexbus framer and cross-connection block.
Flexbus loop to equipment (FB 1-4)	Near-end loop. Loops back the selected Flexbus signal just prior to the Flexbus interface into the IU-OU cable.
Outdoor unit loop to interface	Far-end loop. Loops the signal back to the radio interface in the outdoor unit. Can be set for a near-end or a far-end outdoor unit.
Outdoor unit loop to equipment	Near-end loop. Loops the signal back to the IU-OU cable in the near-end outdoor unit.
*) BFI = buffer frame interface in FIU 19 and RRIC	

The operation of the various loops can be verified with the help of external BER analyser equipment. Some of the loops can also be verified with an integral PRBS generator/detector.

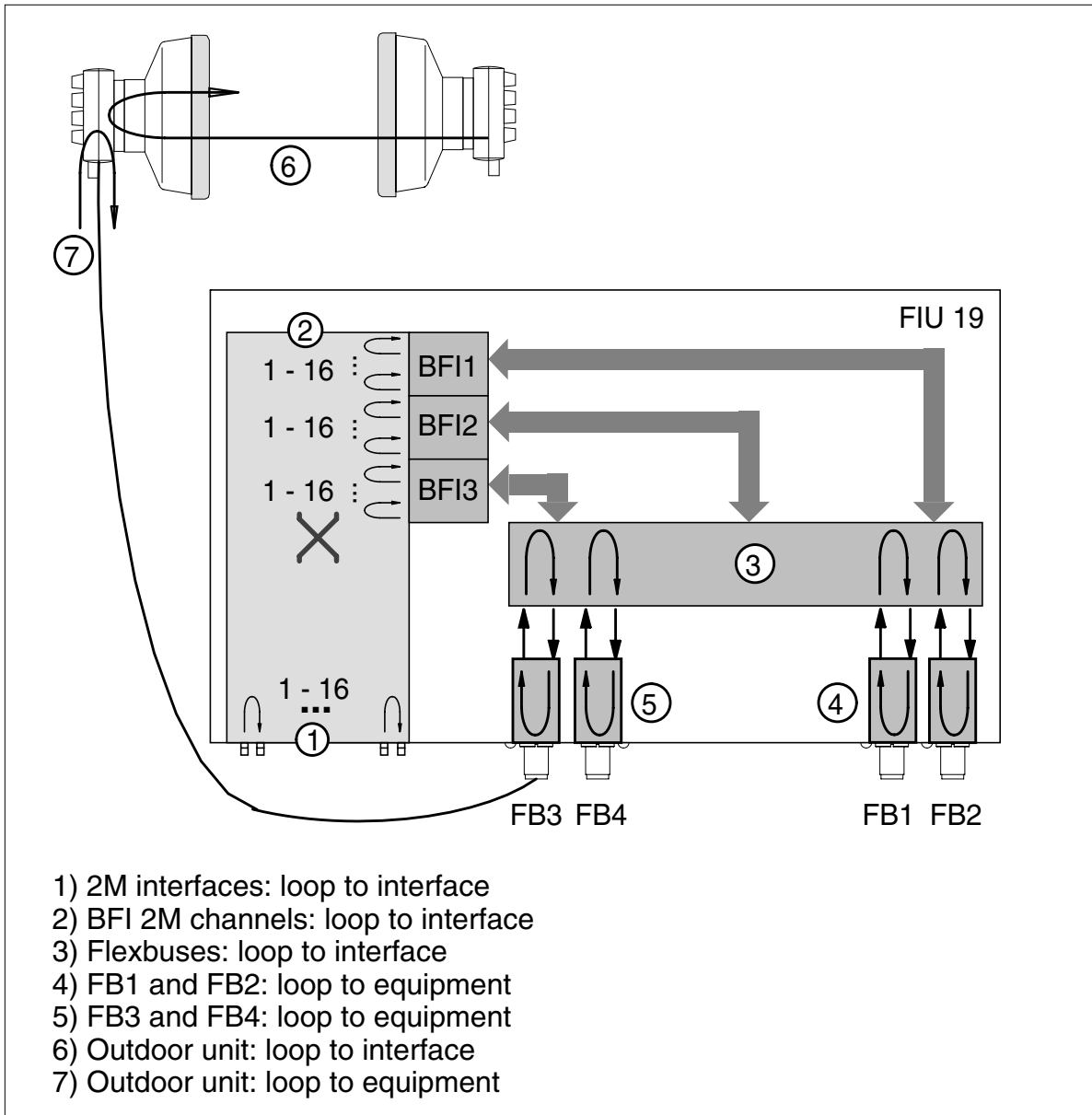


Figure 40. Loopbacks in Nokia FlexiHopper with FIU 19

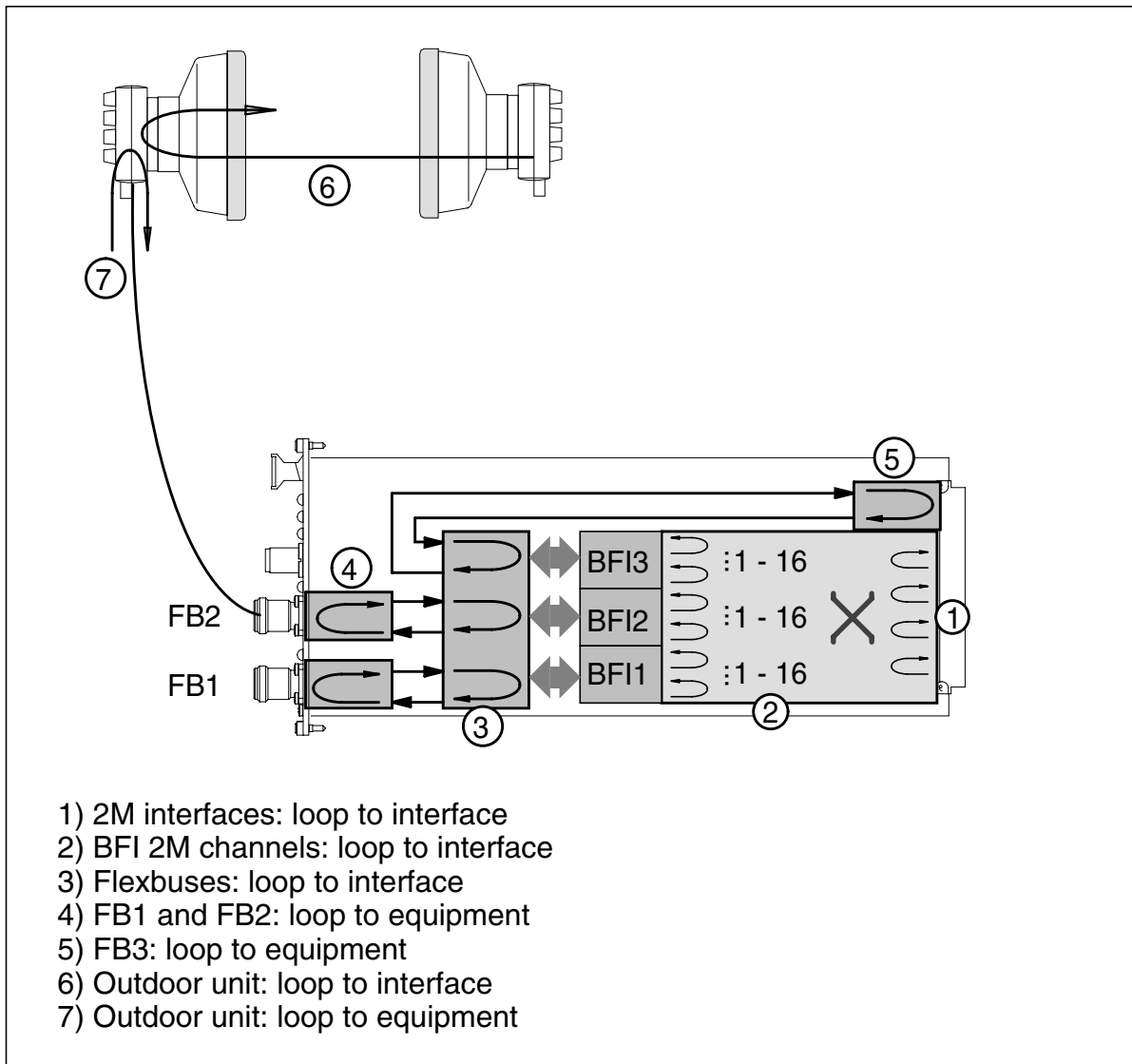


Figure 41. Loopbacks in Nokia FlexiHopper with RRIC

2M loop to interface

This loopback is used for testing the 4x2M plug-in units or 16x2M expansion unit. This loops back the signal in 2Mbit/s interfaces in a 2M cross-connection block. This loop has to be tested with external BER analyser equipment. Figure 38 shows the signal flow on FIU 19 (E) block diagram level.

BFI 2M loop to interface

This loopback is used for testing both the near-end and far-end equipment. This loops back the signal in the far-end equipment 2M cross-connection block. This loop includes the far-end Flexbus cable interface and a Flexbus framer/cross-connection. Figure 38 shows the signal flow on indoor unit block diagram level.

Flexbus loop to interface

This loopback is used for testing the near-end and far-end outdoor unit and the Flexbus cable. This loops back the selected Flexbus signal in the Flexbus framer and cross-connection block. This loop includes the far-end Flexbus cable interface. Figure 38 shows the signal flow on indoor unit block diagram level.

Flexbus loop to equipment (FB1–4)

This loopback is used for testing the whole indoor unit from the 2M interface input back to the 2M interface output. This loops back the selected Flexbus signal just prior to the Flexbus interface into the IU-OU cable. Every tributary can be tested separately. A complete loopback test of the indoor unit together with the 4x2M or 16x2M plug-in units is possible with the aid of external BER analyser equipment. This is also the preferred method in troubleshooting. Note that when a 'Flexbus Loop to Equipment' is activated in a selected Flexbus, the connection to the outdoor unit behind that Flexbus is cut. Also, the Flexbus BER measurement, which measures the received signal BER in the Flexbus interface, is stopped. Figure 42 shows the signal flow on indoor unit block diagram level.

Outdoor unit loop to interface

This loopback is used for testing the operation of the radio equipment up to the far-end outdoor unit. This loop loops the signal back to the radio interface in the outdoor unit. The loop includes a near-end indoor unit, an outdoor unit, and a far-end outdoor unit. The loop can be set for a near-end or a far-end outdoor unit. Figures 40 and 41 show the location of the loop.

Outdoor unit loop to equipment

This loopback is used for testing the indoor unit and IU-OU cable. This loop loops the signal back to the IU-OU cable in a near-end outdoor unit. Figures 40 and 41 show the location of the loop.

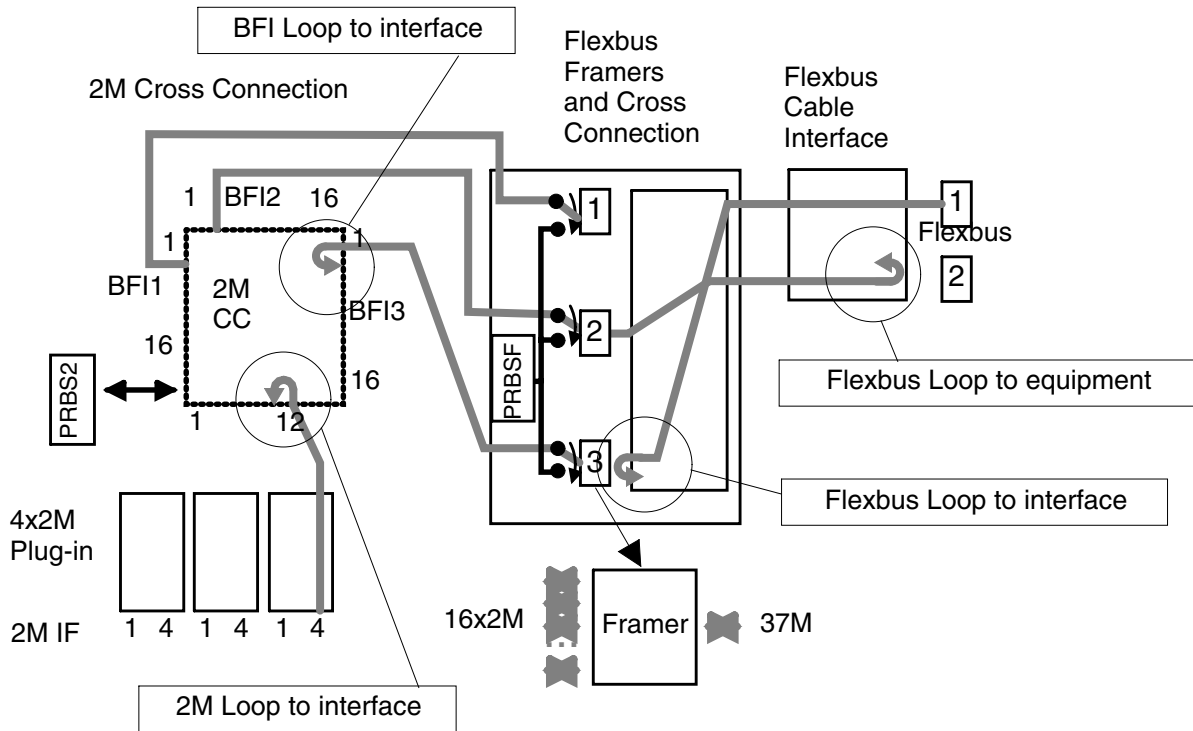


Figure 42. FIU19/ RRIC loopback block diagram

All loopbacks are accessed through Nokia Hopper Manager by clicking **Maintenance** → **Tests** → **Loopbacks...** on the menu.

The loopback status can change without the user changing it, for example, if the timeout has been reached. Because of this, the **Loopback** window has its own private status bar which shows the last time the status of the loopbacks was checked and how long till the next refresh. You can set the refresh value in the **Loopback** window or from **Tools** → **Options** → **Manager Options** and then the **Auto Refresh** tab.

Caution

Setting a Flexbus loop cuts the connection to the outdoor unit until the loop is cancelled or expires. This includes all data and management information. Setting an outdoor unit loop cuts the connection to the outdoor unit until the loop expires.

Use of internal test signals PRBS2 and PRBSF to verify the loop operation

Internal pseudo random bit sequence test signal generators/detectors PRBS2 and PRBSF are provided as an additional tool to verify the loop operations. PRBS2 can also be used for testing the operation over the hop. The locations of the insertion or measurement points of these test signals are shown in Figure 38. The loops and the test signals are separate functions and they must be activated or deactivated separately.

The PRBS2 test can be used, for example, to test one 2Mbit/s channels at a time when the 'Flexbus Loop to Equipment' is activated. In that case, the PRBS test measures the loop operation similarly to an external BER analyser test, but the 2M interface circuits (4x2M and 16x2M plug-in units in an FIU unit's case) are left outside the test.

PRBSF can be used to test the whole Flexbus frame when the 'Flexbus Loop to Equipment' is activated. Due to the insertion or measurement point of this test signal, only the framer, cross-connection, and the Flexbus cable interface circuits are included in this test.

For more information on the PRBS signals, see Section 5.3.2 on forced controls.



Using loopbacks in 1IU+2OU and 2IU+2OU protected modes

Note

Connect always loops to both paths of the protected radio hop. This way, the complete protected radio path is tested (not only one of four possible radio paths).

1. Connect the first loop to a path that the radio is not transmitting (loop to an active transmitter path causes transmitter changeover).
2. Use indoor unit Flexbus loops, for example loops 3, 4 or 5, rather than outdoor unit loops.

This ensures that the AIS is connected to correct untested interfaces. Indoor unit loops can always be removed manually before the control timeout expires.

3. Before connecting new loops, remove old loops and wait at least one minute.

This gives the system time to be stabilised after the test loops so that it can start a new test from a clean point.



To set a loopback point

1. Select the loopback position by clicking one of the tabs.
2. Activate the loopback by double clicking on the loopback title.
3. Send the changes to the node with the command **Manage** → **Send**.

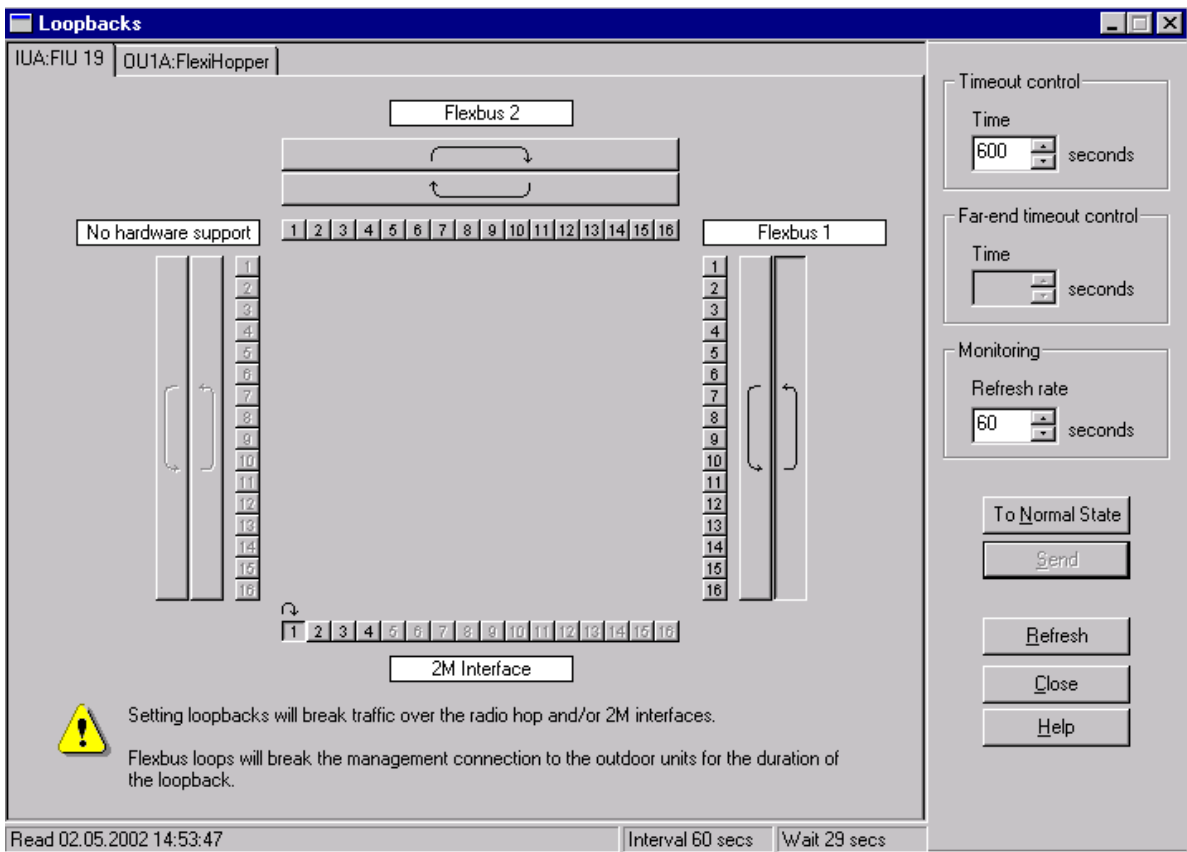


Figure 43. Loopbacks window

5.3.2 Forced controls

Units can contain forced controls which alter the operational state of the network element for a user-definable period of time. These controls affect various parameters, such as power to outdoor units. They are normally used for testing purposes.

To open the **Forced Controls** window click **Maintenance** → **Tests** → **Forced Controls...** The controls are divided into pages depending on the functional entity they apply to, or a general page which applies to the network element.

PRBS (pseudo-random binary sequence) is a two-level signal that has a repetitive sequence, but a random pattern within the sequence. It is used to test the radio link, since it has the basic characteristics of a noise, but in terms of parameters that are easily controlled. One generator in the indoor unit (FIU 19/FIU 19E) sends a PRBS signal, and the other end of the radio link detects this signal.

The forced controls window is used to switch on the PRBS generator, and to specify the used channels (the 2M channels, which are cross-connected in the ASIC to the test generator/detector) for the receiving or transmitting of test signals.

The internal tests window is used to switch on the PRBS test detector to start analysing received test patterns (see Section 5.3.4).

There are two kinds of binary sequences that can be used here:

- PRBS2 pseudo-random binary sequence for 2Mbit/s
- PRBSF pseudo-random binary sequence for Flexbus

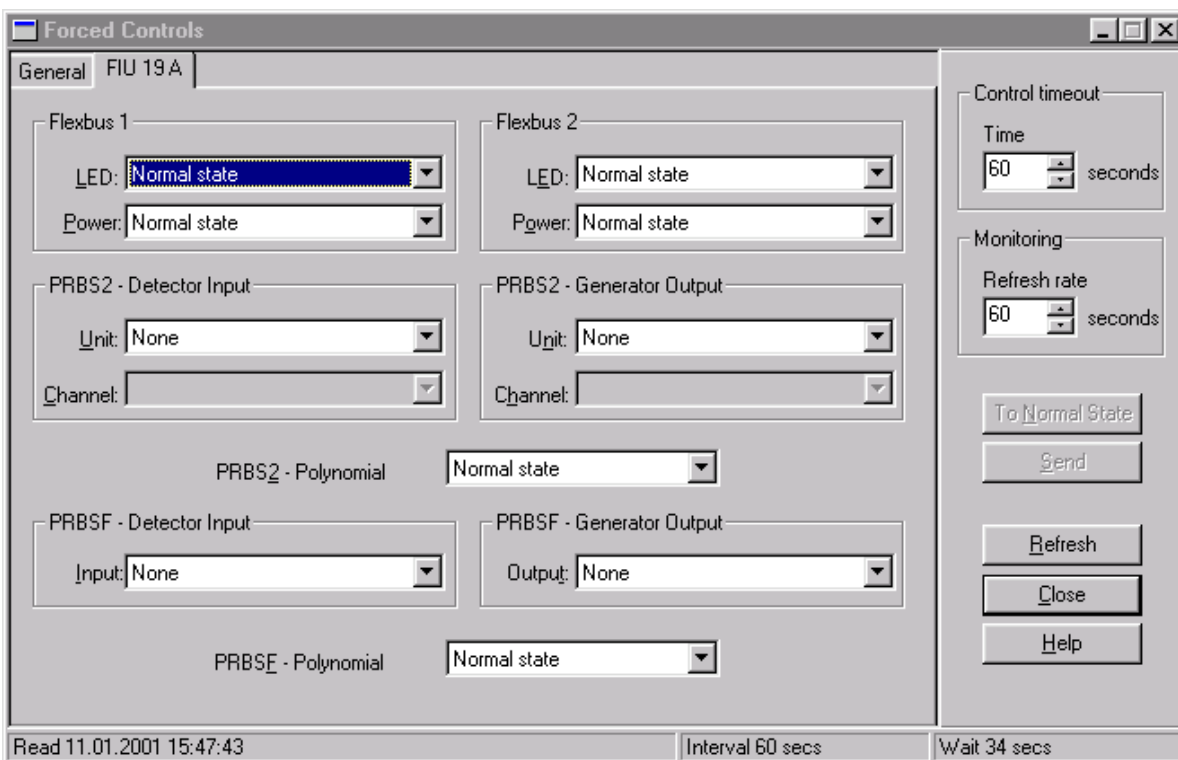


Figure 44. Forced controls window



To test with PRBS:

Before starting you have to reset the counters from **Maintenance** → **Performance** → **Error counters**, and then select **Reset counters**. (For more information about the error counters refer to Chapter 5.2.2.)

1. Set **Detector Input** and **Generator Output**.

- Select Unit: For PRBS2 select 2M interface (way to the 2Mbit plug-in units) or Flexbus 2M channel (direction to the plug-in units). For PRBSF select the used Flexbus.
- Select Channel:
 - If you have selected the 2M interface, then select one 2Mbit interface from one of the 2Mbit plug-in units.
 - If you have selected the Flexbus 2M channel, then select one of the 16 channels of one Flexbus.

2. Select Polynomial (used PRBS bit pattern).

3. Perform PRBS test in **Maintenance** → **Tests** → **Internal tests** window (see Section 5.3.4).

4. View PRBS test results in the **Measurements** window (For more information about monitoring the measurements see Section 5.2.1).

If the BER value in the **Measurements** window is worse than 1E-3, the alarm is activated. The alarm is cleared after one complete measurement with BER value better than 1E-3, or by resetting the error counters. For more information about monitoring the alarms, see Chapter 4.

The controls settings can change without the user changing them, for example, if the time-out has been reached. Because of this, the **Forced Controls** window has its own private status bar which shows the last time the status of the controls was checked and how long till the next refresh. You can set the refresh value in the **Forced Controls** window or from **Tools** → **Options** → **Manager Options** and then the **Auto Refresh** tab.

To set the forced controls in the network element, adjust the required items in the window and click **Manage** → **Send**. This sends all modified values to the network element. To force a refresh of the information in the window, click **Manage** → **Refresh** or use the toolbar in the window.

In addition to forced controls it is possible to test for example loopbacks from **Maintenance** → **Tests** → **Loopbacks** (see Chapter 5.3.1).

5.3.3 Measurement interface

The indoor unit can send one of a variety of signals to its measurement point interface (MP) for analysis. The FIU 19 (E) measurement point is located on the front panel. The RRIC measurement point is located on the printed circuit board.

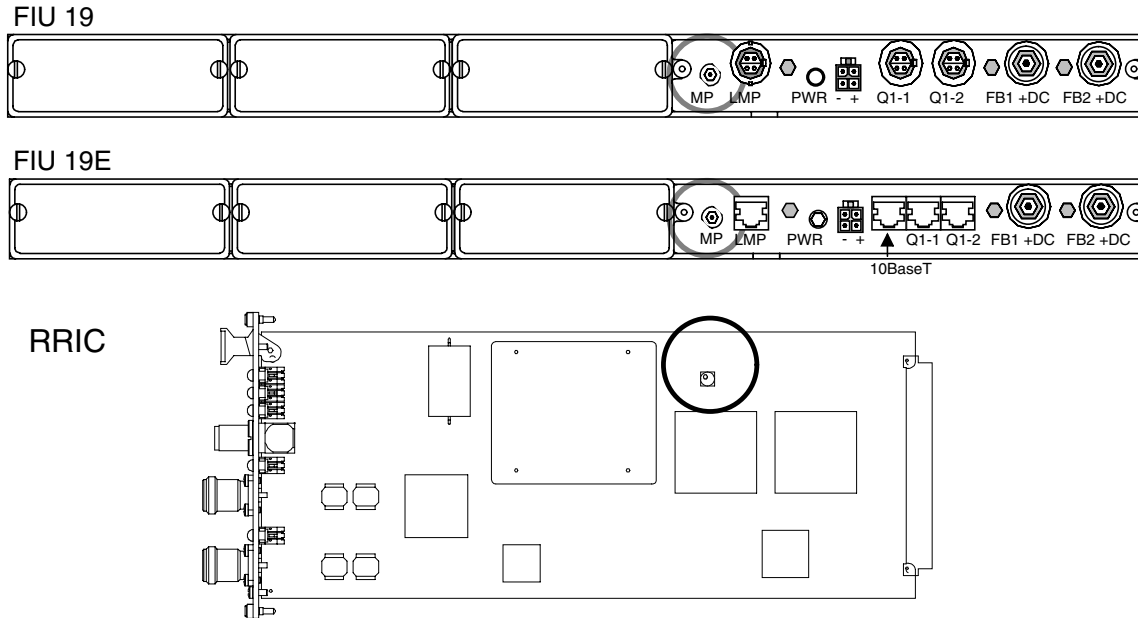


Figure 45. FIU 19, FIU 19E, and RRIC measurement points

The available signals are:

- 2M Tx data
- BFI 2M Rx data (signals in the cross-connection section)
- 2M PRBS (pseudo-random binary sequence)
- 2M AIS (alarm indication signal)
- Flexbus Tx clock
- Flexbus 2M Rx clock.
- 2M Tx clock
- BFI 2M Rx clock

In FIU 19 (E), the measurement point output is 75 Ω G.703.

In RRIC, the measurement point output is 5 V-TTL.

You can select the signal to be sent from the **Measurement Interface** window. To open this window, click **Maintenance** → **Tests** → **Measurement Interface...** The 2 Mbit/s data and clock signals require you to choose a channel also.

To set the measurement point in the indoor unit, adjust the required items in the window and click **Manage** → **Send** or use the toolbar in the window. This sends all modified values to the network element. To force a refresh of the information in the window, click **Refresh**.

5.3.4 Internal tests

There are several unit-specific tests that you can perform on the equipment. These tests include such things as LED function. Some of these tests should only be performed by experienced personnel. To access these tests, click **Maintenance** → **Tests** → **Internal Tests...** on the menu.

This opens the **Internal Tests** window where you can choose the unit-specific test to perform.

When performing the PRBS tests you can select additional timed test, where you have to give the test time in seconds, or infinite test, which runs until you stop it.

Timed test	Measurement result and alarm state is displayed only after complete measurement time is passed.
Infinite test	Measurement result and alarm state are updated every second.

To set the internal tests in the network element, adjust the required items in the window and click **Manage** → **Send** or use the toolbar in the window. This sends all modified values to the network element. To force a refresh of the information in the window, click **Refresh**.

5.4 Replacing or removing equipment

Detailed instructions on removing and installing equipment can be found in the *FIU 19 (E) Indoor Unit Installation*, *RRIC Indoor Unit Installation*, and *Outdoor Unit Installation* parts of this manual. The general work order for the replacement or removal of units follows.



To replace or remove units:

1. Switch the power off.

When an outdoor unit is being removed, set the OU Tx power *off* (see Section 3.6.4). This ensures that the radio will not transmit accidentally in case it is reinstalled. Switch the Flexbus OU power supply off with Nokia Hopper Manager (see Section 3.6.5).

When an FIU 19 (E) indoor unit is being removed, switch the power off at the FIU 19 (E) power switch.

When an RRIC indoor unit is being removed, switch the Flexbus OU power supply off with Nokia Hopper Manager (see Section 3.6.5).

2. Disconnect the cabling and remove the unit(s). Follow the instructions found in the installation part of this manual.
3. Install new unit(s) and connect the cabling (*if applicable*). Follow the instructions found in the installation part of this manual.

Note

Removal or replacement of equipment (excluding FIU 19 plug-in units) cuts traffic.

The following sections detail any special considerations that may apply.

5.4.1 FIU 19 (E) plug-in units

FIU 19 (E) plug-in units can be removed or replaced freely. Refer to *FIU 19 (E) Indoor Unit Installation* for instructions. It is advisable to turn the power off at the FIU 19 (E) power switch before removing and replacing plug-in units.



Caution

When replacing or removing a Flexbus plug-in unit, disconnect the additional power supply before disconnecting the Flexbus cables.



Caution

In 1+1 protection, when installing or removing the 16 x 2M IC plug-in unit the corresponding FIU 19 (E) unit must be turned off.

5.4.2 Removing equipment

When equipment is removed from the network element, some settings must usually be modified. Normally removing equipment causes a *Subrack is missing units* alarm. Click **Configure** → **Send Install All** to read the new equipment structure. Settings of the units can be modified by clicking **Configure** → **Settings...** and selecting the appropriate unit. Cross-connection settings can be modified normally by clicking **Cross-connections** → **View** with FIU 19 (E) or by using TruMan with RRIC.

5.4.3 Replacing the FIU 19 (E) indoor unit

Before replacing the indoor unit, make sure that there is a backup of its configuration, preferably using configuration backup. With the backup, the configuration can be quickly loaded to the new indoor unit. See Section 3.6.3 for more information on configuration backup.



Caution

Switch the power off at the FIU 19 (E) power switch and disconnect the IU power supply before replacing a faulty FIU 19 (E) indoor unit.



Replacing an FIU 19 (E) unit in 1+1 protected mode

When FIU 19 (E) is used in 1+1 (2IU+2OU) protected mode and an FIU 19 main unit has become faulty, replace the unit in the following order:

1. Switch the power of the faulty unit *off*.
2. Remove the faulty unit.
3. Check that the power of the new FIU 19 (E) main unit is *off*. Install the new unit and connect the cabling.
4. Switch the power of the new unit *on*.

Wait approximately 60 seconds and use the **Refresh** function in Nokia Hopper Manager until the new unit appears into the **Equipment View**.

5. Use configuration backup to restore the settings. See Section 3.6.3 for more information on configuration backup.

5.4.4 Replacing the RRIC indoor unit

Before replacing the indoor unit, make sure that there is a backup of its configuration, preferably using configuration backup. With the backup, the configuration can be quickly loaded to the new indoor unit. See Section 3.6.3 for more information on configuration backup.

5.4.5 Replacing the outdoor unit or the antenna



Caution

Switch the TX power off and then the Flexbus OU power supply off before replacing faulty outdoor units or antennas (see Section 3.6.5).

Before replacing the outdoor unit, make sure that the spare OU is of the correct frequency subband.

If the replacement of the outdoor unit is done carefully, the antenna alignment is not affected.

Replacement of the antenna should not affect its alignment, but we recommend that you check the alignment after replacing the antenna.

Before replacing the outdoor unit, make sure there is a backup of its configuration, preferably using configuration backup. See Section 3.6.3 for more information on configuration backup.

6

Upgrading

This chapter describes how to upgrade or alter a Nokia FlexiHopper configuration. The chapter contains information on:

- software upgrading
- changing capacity
- adding equipment.

6.1 Software upgrading

The software configuration of a network element is managed through the **Software** window of Nokia Hopper Manager. The window shows the details of the software packages installed in the network element.

To access the **Software** window, click **Maintenance** → **Software** → **View**.

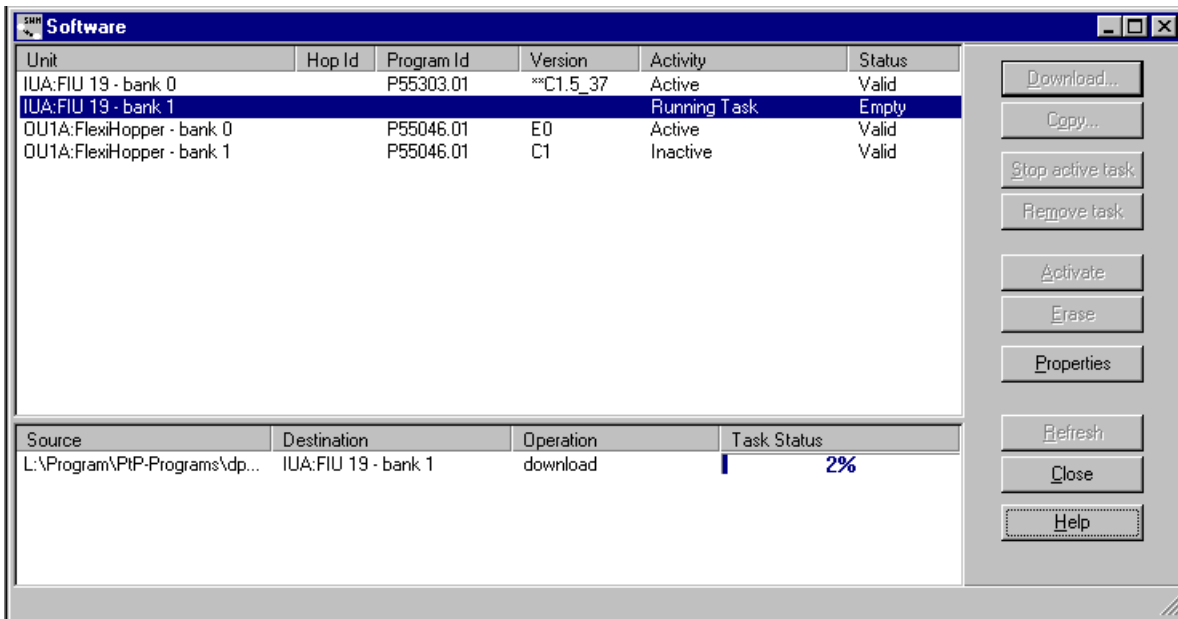


Figure 46. Software window

To support the software upgrade process, each functional entity (hardware unit) in the network element contains two or more software slots. Each slot can contain a software package, but only one of these slots may be active at a time. Software which is in the active state is the currently running software in the unit. In the most common situation, one slot contains the active software while others are either empty or inactive.

New software can only be downloaded into one of the non-active slots. Once the download is completed it must be activated so it can be used. This causes a reset of the functional entity which interrupts traffic.

Software upgrade via TFTP

With FIU 19E as the indoor unit, software download is also possible using trivial file transfer protocol (TFTP). FIU 19E acts as the TFTP server that can receive software binary files sent by a TFTP client.

TFTP timeout recommendations:

- Retransmit timeout 60 seconds
- General timeout 120 seconds

TFTP transfer is always performed into the inactive software bank. Specify one of the following destinations in the node: IUA, IUB, OU 1A, OU 2A, etc.

Note

The **Enable TFTP Server Flag** box has to be checked to use the TFTP functionality (**Configure** → **Network Settings** → **TFTP Server**).

Nokia Hopper Manager can perform several actions on each software unit in the network element. These are:

- Show properties of the software.
- Change the software user label.
- Erase the software.
- Activate the software.
- Erase the pending state of the software.
- Download a software file to a unit.
- Validate the software file on the unit.
- Print the software configuration.

Note

If you activate the software, the traffic is cut.

Further information is given in the **Status** and **Activity** fields. The **Activity** field shows whether the software is currently active, inactive or waiting to become active. The **Status** shows whether the software is present and if it is valid.



To install a new software package in a functional entity:

1. Select the software unit from the list in the **Software** window.
2. Download the new software.
3. Check that the downloaded software is now in a *Valid* state.

4. If not, manually validate it with **Maintenance** → **Software** → **Validate Unit** command on the menu or use the toolbar in the window. If it is still not successful, go back to step 1.
5. Activate the software package by clicking **Maintenance** → **Software** → **Activate Unit** on the menu or use the toolbar in the window.

When the software is activated, the functional entity resets automatically and the new software begins running.

The download process can take some time depending on the speed of the connection to the unit. You can select the connection speed in **Network Element Settings** dialog box (see Section 3.6.2) according to the type of equipment you are using. Typically, the download process takes up to 20 minutes using the fastest baud rate (115 kbit/s) and approximately two hours using the rate 9600 bit/s.

When the download is complete the functional entity attempts to validate the new software. If this process does not succeed, it is possible to retry the validation of the software manually from the menu of the **Software** window. The validation process checks the new software for errors which may have occurred during the download.

Software download does not cause a traffic interruption, but it slows down the management connection to the node. Traffic is cut briefly when new software is activated and the respective functional entity is reset.

6.2 Changing capacity

6.2.1 Transmission capacity

Transmission capacity of the outdoor unit can be changed using Nokia Hopper Manager. No hardware changes are necessary. Any capacity from 2 x 2 Mbit/s to 16 x 2 Mbit/s can be selected. See Section 3.6.5.



Caution

The capacity must be set according to the licence given by the local authorities.

6.2.2 Add/drop capacity

Add/drop capacity of the FIU 19 (E) indoor unit can be changed by adding or removing plug-in units or expansion unit. See Section 6.3 below.

Add/drop capacity of the RRIC indoor unit to the TRUx base station transmission unit is always 4 x 2 Mbit/s.

6.3 Adding equipment

Detailed instructions on installing new equipment can be found in the installation documents contained in this manual.

When new equipment is added to the network element, some settings must usually be modified. Normally adding equipment causes a *Subrack has excessive units* alarm. Click **Configure** → **Send Install All** to read the new equipment structure. Settings of the new units can be modified by clicking **Configure** → **Settings...** and selecting the appropriate unit. Cross-connection settings can be modified normally by clicking **Cross-connections** → **View**.

6.3.1 FIU 19 (E) plug-in units

Flexbus and 4 x 2M interface plug-in units can be purchased separately and installed to free plug-in unit slots. Refer to *FIU 19 (E) Indoor Unit Installation* for instructions on how to install new plug-in units.

6.3.2 FIU 19 (E) expansion unit

The FIU 19 (E) 16 x 2M expansion unit (EXU) can be purchased separately as an upgrade. The upgrade kit includes mounting brackets, 1+0 backplane, and an EXU.

Make sure there is enough rack space to install the EXU. The main unit and EXU (1+0) assembly requires 2 U of space (unit height of 1.5 U + air gap of 0.5 U).

Note

This upgrade cuts traffic for the duration of the upgrade work.



To upgrade FIU 19 (E) to 16 x 2M capacity:

1. Switch the power off at the FIU 19 (E) power switch.
2. Disconnect the cabling and remove the main unit from the rack.
3. Remove all 4 x 2M plug-in units from the main unit.

4. Remove old mounting brackets.
5. Follow instructions on installing FIU 19 (E) with expansion unit in the *FIU 19 (E) Indoor Unit Installation* part of this manual.
6. Connect the cabling.
7. Use Nokia Hopper Manager to make the new settings.

6.3.3 Upgrading to 1IU+2OU protected mode (FIU 19 (E) and RRIC)

A single use terminal can be upgraded to 1IU+2OU protected mode by adding another outdoor unit.

Install the protecting OU as described in the *Outdoor Unit Installation* part of this manual. Use Nokia Hopper Manager to set the unit to 1IU+2OU mode and the required protection mode. Other setting changes are most likely required as well.

If you are upgrading to 1-antenna HSB protection, remove first the existing outdoor unit. Then do as follows:

- With the 7-15 GHz radios, install the coupler and connect the waveguide to the antenna on the existing alignment unit.
- With the 18 - 38 GHz radios, install the coupler on the existing alignment unit.

See *Outdoor Unit Installation* for more information.

Note

Upgrade to 1-antenna HSB cuts traffic for the duration of the upgrade work. Upgrade to other 1IU+2OU protection modes causes a short break as the new settings are made and the indoor unit is reset (see Section 3.6.2).

6.3.4 Upgrading to 2IU+2OU protected mode (FIU 19 (E))

Upgrade kits are available to upgrade FIU 19 with 4 - 12 x 2M capacity or FIU 19 with 16 x 2M capacity (with EXU) to 2IU+2OU (1+1) protected mode. These kits contain mounting brackets, 1+1 backplane, and the appropriate FIU 19 units.

Make sure there is enough rack space to install the 1+1 protected mode units. The assembly requires 2 U of space and potentially also an air gap of 1 U (as described in the *FIU 19 (E) Indoor Unit Installation* part of this manual).

Note

This upgrade cuts traffic for the duration of the upgrade work.

Note

If the node has access to an IP-based DCN via 10baseT Ethernet, then the Ethernet interfaces of both indoor units have to be connected to the LAN. It is recommended to use a Hub for setting up these cable connections.

**To upgrade Nokia FlexiHopper with FIU 19 (E) to 2IU+2OU protected mode:**

1. Switch the power off at the FIU 19 (E) power switch.
2. Disconnect the cabling and remove the previous configuration.
3. If upgrading from FIU 19 (E) with 4 - 12 x 2M capacity, remove any 4 x 2M plug-in units.
4. Remove old FIU 19 (E) mounting brackets.
5. Follow instructions on installing FIU 19 (E) in 1+1 protected mode in the *FIU 19 (E) Indoor Unit Installation* part of this manual.
6. If upgrading from single use, install the protecting OU as described in the *Outdoor Unit Installation* part of this manual.
7. Connect the cabling.
8. Follow instructions in Section 3.2.2 to make the new settings.

Appendix A. Alarm list

This appendix lists all the possible alarms (with their fault codes) that a Nokia FlexiHopper with FIU 19 (E) or RRIC network element can give. The alarms are classified by functional entity (FE), and further by the supervision block (SB) giving the alarm.

The alarm tables give the following information:

- The alarm name is shown on the first row of the table.
- **Severity** shows the severity class of the alarm as it appears in the node manager.
- **SB type** shows the supervision block giving the alarm.
- **Fault code** shows the fault code (in decimal).
- **Consequence** and **Meaning** give information related to the alarm.
- **Instructions** guides you in how to find the actual reason for the alarm and how to correct it.
- **Cancelling** gives information on how to cancel the alarm.

A.1 FIU 19 (E) alarms

A.1.1 Functional entity: NE/FE0

Connection or settings have changed	
Severity: Warning	SB 1: FM setup SB 2: HW setup SB 3: Identifications SB 4: Protected hop
Fault code: 185	Consequence 1, 3 and 4: Consequence 2: Sets or clears <i>Subrack is missing units</i> or <i>Subrack has excessive units</i> alarms

Connection or settings have changed	
Meaning 1: Fault management settings have changed Meaning 2: New unit(s) added, removed or replaced in the system. Meaning 3: Identifications changed Meaning 4: G.826 settings have changed	
Instructions 1, 3 and 4: N/A Instructions 2: Refresh Hopper Manager's equipment view.	
Cancelling 1 - 4: Warning resets automatically	

Subrack is missing units	
Severity: Critical	SB: HW setup
Fault code: 139	Consequence: Possibly some signal quality alarms
Meaning: Unit removed or missing from the system	
Instructions: Hopper Manager troubleshooting information displays which unit is missing. Possible causes are: faulty unit, faulty cable, or power off.	
Cancelling: Alarm is cancelled after the unit is back on the system or <i>Install all</i> command given	

Subrack has excessive units	
Severity: Major	SB: HW setup
Fault code: 140	Consequence:
Meaning: New unit(s) added to the system, but not installed to configuration	
Instructions: After plugging in new units, use <i>Install</i> or <i>Install all</i> command in Hopper Manager	
Cancelling: Alarm is cancelled in max. 30 seconds after the <i>Install</i> command	

Fault in installation of equipment	
Severity: Critical	SB 1: Operation mode SB 2: HW setup
Fault code: 142	Consequence:
Meaning 1: Settings do not match the HW configuration: <ol style="list-style-type: none"> 1. Plug-in unit in an illegal slot 2. Plug-in unit mismatch (e.g. 4x2M and 16x2M at the same time) Meaning 2: Unit replaced with another type of unit	
Instructions 1: If the unit is upgraded to 16x2M, remove all 4x2 plug-in cards first Instructions 2: <ol style="list-style-type: none"> 1. Give <i>Uninstall</i> and then <i>Install</i> command with Hopper Manager to replace the unit 2. Install the correct unit back to the system 	
Cancelling 1: Remove the conflicting plug-in card Note: Some plug-in cards in illegal slots require unit reset after the plug-in card is removed Cancelling 2: Warning resets automatically	

Equipment reset	
Severity: Warning	SB: HW setup
Fault code: 148	Consequence:
Meaning: Unit is starting up after power-on or reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:

Database full	
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Equipment door open	
Severity: Minor	SB:HW setup
Fault code: 168	Consequence:
Meaning: Notification NMS: Nokia Hopper Manager is connected to this unit.	
Instructions: This feature may be needed in some customer specific applications. The feature will be default, not active. To activate when connected to FIU 19 (E) by Hopper Manager check 'Enable node manager connection' in Manager Options → Communication.	
Cancelling: Uncheck 'Enable node manager connection notification' in Manager Options→ Communication. The alarm is cancelled after 2 minutes.	

Configuration error	
Severity: Minor	SB: Identifications
Fault code: 186	Consequence:

Configuration error	
Meaning: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. NE family type string 2. NE type string 3. NE product code string 4. NE product version string 5. NE serial number string 6. NE user's manual product code string 7. NE user's manual product version string 	
Instructions: Contact manufacturer	
Cancelling: N/A	

Fault in change-over function	
Severity: Critical	SB: Operation mode
Fault code: 143	Consequence:
Meaning: <ol style="list-style-type: none"> 1. OU configuration incompatible with protection mode (e.g. Tx frequency not the same in both radios in HSB mode) 2. Incompatible OU software for the used operation mode 3. IU protection modes are different 4. IU configurations are different 	
Instructions: <ol style="list-style-type: none"> 1. Restore configuration backup of OU or correct settings 2. Download new software to OU 3. Follow commissioning procedure 4. Restore configuration backup of IU or correct settings 	
Cancelling: N/A	

Fault in equipment	
Severity: Major	SB: Protection lost
Fault code: 128	Consequence:
Meaning: Protection lost, but data still being transmitted. Possible causes: <ol style="list-style-type: none"> 1. OU transmitter error 2. OU receiver error 3. IU TX oscillator error 4. IU hardware register error 5. Spare IU missing or not operational 6. 4x2M plug-in unit missing 7. 16x2M EXU missing 8. IU cannot lock to the flexbus signal 	
Instructions: <ol style="list-style-type: none"> 1. Check other faults of the faulty unit to find the actual reason 2. Replace the faulty unit 	
Cancelling: N/A	

Error rate > 1 E-3	
Severity: Critical	SB: Protected hop
Fault code: 99	Consequence:
Meaning: Received signal BER over limit	
Instructions: N/A	
Cancelling: Cancelled when BER is under limit	

Error rate > 1 E-4, Error rate > 1 E-5, Error rate > 1 E-6	
Severity: Major	SB: Protected hop
Fault codes: 100, 101, 102	Consequence:
Meaning: Received signal BER over limit	
Instructions: N/A	
Cancelling: Cancelled when BER is under limit	

15 min G826 ES threshold crossed	
Severity: Minor	SB: Protected hop
Fault code: 256	Consequence:
Meaning: 15 min G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled when the signal has been good enough for a 15 minutes' period. (ES less than the reset threshold.)	

15 min G826 SES threshold crossed	
Severity: Major	SB: Protected hop
Fault code: 257	Consequence:
Meaning: 15 min G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled when the signal has been good enough for a 15 minutes' period. (SES less than the reset threshold.)	

15 min G826 BBE threshold crossed	
Severity: Minor	SB: Protected hop
Fault code: 258	Consequence:
Meaning: 15 min G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled when the signal has been good enough for a 15 minutes' period. (BBE less than the reset threshold.)	

24 h G826 ES threshold crossed	
Severity: Warning	SB: Protected hop
Fault code: 259	Consequence:

24 h G826 ES threshold crossed	
Meaning: 24 h G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G286 SES threshold crossed	
Severity: Warning	SB: Protected hop
Fault code: 260	Consequence:
Meaning: 24 h G286 SES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 BBE threshold crossed	
Severity: Warning	SB: Protected hop
Fault code: 261	Consequence:
Meaning: 24 h G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Unavailability	
Severity: Critical	SB: Protected hop
Fault code: 262	Consequence:
Meaning: G.826 settings have changed	
Instructions: N/A	
Cancelling: Cancelled when the amount of errored blocks has been less than 30% for 10 consecutive seconds.	

Statistics reset	
Severity: Warning	SB: Protected hop
Fault code: 263	Consequence:
Meaning: G.826 error counters (current measurement) are reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

Forced control on	
Severity: Critical	SB: Operation mode
Fault code: 141	Consequence:
Meaning: 1. Automatic fading margin measurement on 2. Forced controls on OU TX 3. Forced controls on OU RX 4. Forced controls on IU	
Instructions: N/A	
Cancelling: Alarm is cancelled after AFMM finished or forced controls removed	

A.1.2 Functional entity: FIU 19 (E)

Fault in power supply	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Power supply
Fault code: 0	Consequence:
Meaning 1: Flexbus OU power supply fault. Possible reasons: 1. Failure in power supply 2. Short circuit in the Flexbus cable Meaning 2: Power supply voltage is below or above the limit. See measurements.	
Instructions: N/A	
Cancelling : N/A	

Loop to interface	
Severity: Major	SB 1: BFI (1-3) channel (1-16) SB 2: Flexbus (1-2)
Fault code: 21	Consequence:
Meaning 1: 2M signal looped back to Flexbus Meaning 2: Flexbus interface loop is active (Rx signal is looped back to Tx direction)	
Instructions: N/A	
Cancelling: Cancelled when the loop is removed	

Loop to equipment	
Severity: Major	SB: Flexbus (1-2)
Fault code: 22	Consequence:
Meaning: Flexbus equipment loop is active	
Instructions: N/A	
Cancelling: Cancelled when the loop is removed	

Test Mode Active	
Severity: Major	SB 1: Flexbus (1-2) SB 2: LED SB 3: Clock monitor
Fault code: 23	Consequence:
Meaning 1: Flexbus LED state is forced. Meaning 2: Alarm LED state is forced. Meaning 3: Tx oscillator calibration active.	
Instructions: N/A	
Cancelling 1 -2: Cancelled when forced control is removed Cancelling 3: Cancelled after Tx calibration finished.	

Test generator on	
Severity: Major	SB 1: PRBS2 SB 2: PRBSF
Fault code: 25	Consequence:
Meaning 1: Internal 2 Mbit/s test generator on Meaning 2: Internal test generator for Flexbuses and aux channels is on	
Instructions: N/A	
Cancelling: Cancelled when forced control removed	

Loss of incoming signal	
Severity: Critical	SB: Flexbus (1-2)
Fault code: 48	Consequence:
Meaning: 1. Flexbus Rx clock is missing 2. Flexbus Rx clock oscillator faulty	
Instructions: N/A	
Cancelling: N/A	

Alarm signal is received	
Severity: Critical	SB: Flexbus (1-2)
Fault code: 64	Consequence:
Meaning: Flexbus Rx signal contains a pseudo frame, generated in the OU (OU not locked to Rx signal). Typically OU Rx signal is missing or faulty.	
Instructions: N/A	
Cancelling: N/A	

Loss of frame alignment	
Severity: Critical	SB: Flexbus (1-2)
Fault code: 81	Consequence:
Meaning: 1. Flexbus received signal faulty or errored 2. Fault in the Flexbus cable interface	
Instructions: N/A	
Cancelling: N/A	

Error rate > 1 E-3	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: PRBS2 SB 3: PRBSF
Fault code: 99	Consequence:
Meaning 1: Received signal BER over limit. Possible reasons: 1. Signal from the radio path is attenuated 2. Hardware fault in the Flexbus cable or interface Meaning 2 -3: Internal test receives BER over alarm limit	
Instructions: N/A	
Cancelling 1: Cancelled when BER under limit Cancelling 2: Cancelled when PRBS2 error counter is reset Cancelling 3: Cancelled when PRBSF error counter is reset	

Error rate > 1 E-4, Error rate > 1 E-5, Error rate > 1 E-6	
Severity: Major	SB 1: Flexbus (1-2) SB 2: PRBS2 SB 3: PRBSF
Fault code: 100, 101, 102	Consequence:
Meaning 1: Received signal BER over limit. Possible reasons: 1. Signal from the radio path is attenuated 2. Hardware fault in the Flexbus cable or interface Meaning 2: Internal test receives BER over alarm limit Meaning 3: Internal test receives BER over alarm limit	
Instructions: N/A	
Cancelling 1: Cancelled when BER under limit Cancelling 2: Cancelled when PRBS2 error counter is reset Cancelling 3: Cancelled when PRBSF error counter is reset	

Buffer overflow (or underflow)	
Severity: Critical	SB: BFI (1-3) channel (1-16)
Fault code: 113	Consequence:
Meaning: Bit rate of received 2M signal is not within the limits	
Instructions: N/A	
Cancelling: N/A	

Fault in equipment	
Severity: Major	SB: SW setup
Fault code: 128	Consequence:
Meaning: File system error	
Instructions: Replace the unit	
Cancelling: N/A	

Fault in oscillator	
Severity: Critical	SB: Clock monitor
Fault code: 137	Consequence:
Meaning: Internal oscillator faulty	
Instructions: N/A	
Cancelling: N/A	

Forced control on	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Measurement point
Fault code: 141	Consequence:
Meaning 1: OU power supply forced on or off with the control menu, while the setting value may be different. Meaning 2: Signal connected to measurement point	
Instructions: N/A	
Cancelling: Cancelled when forced control is removed	

Fault in installation of equipment	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: HW setup
Fault code: 142	Consequence:
Meaning 1: Flexbus not set in use, but OU (or IU) is connected to it Meaning 2: Incompatible unit	
Instructions 1: When Flexbus and radio are commissioned set <i>In use</i> to <i>ON</i> . Instructions 2: Check Hopper Manager troubleshooting instructions which unit <ul style="list-style-type: none"> • if HW module, replace module or fill in missing identifications • if SW incompatibility, download new software 	
Cancelling 1: Cancelled when <i>In use</i> is <i>ON</i> Cancelling 2: Cancelled after the situation is corrected and the indoor unit restarted	

Operating error	
Severity: Critical	SB: SW setup
Fault code: 144	Consequence:
Meaning: 1. File system error 2. Internal SW error	
Instructions: Replace the unit	
Cancelling: N/A	

Equipment reset	
Severity: Warning	SB: HW setup
Fault code: 148	Consequence:
Meaning: Unit is starting up after power-on or reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:
Meaning: Overflow in event history	
Instructions: Alarm history is flushed by NMS alarm polling When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port. When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP). If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.	
Cancelling: Warning resets automatically	

Real time lost fault	
Severity: Major	SB type: Real time clock
Fault code: 165	Consequence:
Meaning: Real Time Clock (RTC) not set after reset	
Instructions: 1. Set RTC with Hopper Manager 2. RTC is set by NMS	
Cancelling: Cancelled when RTC is set	

Far-end alarm	
Severity: Major	SB: Flexbus (1-2)
Fault code: 179	Consequence:
Meaning: Traffic broken in one direction. Possible reasons: 1. Far-end IU is not receiving data transmitted from this end, but this end is receiving data transmitted from far-end 2. Far-end is not transmitting useful data because it has loop to equipment active	
Instructions: N/A	
Cancelling: Cancelled when data transmission functions in both directions	

Real time updated	
Severity: Warning	SB: Real time clock
Fault code: 184	Consequence:
Meaning: Updated RTC difference more than 5 s	
Instructions: N/A	
Cancelling: Warning resets automatically	

Connection or settings have changed	
Severity: Warning	SB 1: Flexbus (1-2) SB 2: FM setup SB 3: Identifications
Fault code: 185	Consequence:
Meaning 1: G.826 settings have changed Meaning 2: Fault management settings have changed Meaning 3: Identifications changed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB 1: Identifications SB 2: SW setup
Fault code: 186	Consequence:
Meaning 1: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. FE type string 2. FE product code string 3. FE product version string 4. FE serial number string 5. FE user's manual product code string 6. FE user's manual product version string 7. Tx-clock calibration missing or illegal Meaning 2: <ol style="list-style-type: none"> 1. No backup available. 2. Backup available for this unit, needs activation. 	
Instructions: N/A	
Cancelling: N/A	

15 min G826 ES threshold crossed	
Severity: Minor	SB: Flexbus (1-2)
Fault code: 256	Consequence:
Meaning: 15 min G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled after the signal has been good enough for a 15 minute time period (ES less than reset threshold)	

15 min G826 SES threshold crossed	
Severity: Major	SB: Flexbus (1-2)
Fault code: 257	Consequence:
Meaning: 15 min G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled after the signal has been good enough for a 15 minute time period (SES less than reset threshold)	

15 min G826 BBE threshold crossed	
Severity: Minor	SB: Flexbus (1-2)
Fault code: 258	Consequence:
Meaning: 15 min G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled after the signal has been good enough for a 15 minute time period (BBE less than reset threshold)	

24 h G826 ES threshold crossed	
Severity: Warning	SB: Flexbus (1-2)
Fault code: 259	Consequence:

24 h G826 ES threshold crossed	
Meaning: 24 h G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 SES threshold crossed	
Severity: Warning	SB: Flexbus (1-2)
Fault code: 260	Consequence:
Meaning: 24 h G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 BBE threshold crossed	
Severity: Warning	SB: Flexbus (1-2)
Fault code: 261	Consequence:
Meaning: 24 h G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Unavailability	
Severity: Critical	SB: Flexbus (1-2)
Fault code: 262	Consequence:
Meaning: Amount of errored blocks has been more than 30% for at least 10 consecutive seconds.	
Instructions: N/A	
Cancelling: Cancelled when the amount of errored blocks has been less than 30% for 10 consecutive seconds	

Statistics reset	
Severity: Warning	SB: Flexbus (1-2)
Fault code: 263	Consequence:
Meaning: G.826 error counters (current measurement) are reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

A.1.3 Functional entity: 4 x 2M plug-in unit, 16 x 2M expansion unit

Loop to interface	
Severity: Major	SB: 2M interface (1-4, 1-16)
Fault code: 21	Consequence:
Meaning: 2M signal looped back to interface	
Instructions: N/A	
Cancelling: N/A	

Loss of incoming signal	
Severity: Critical	SB: 2M interface (1-4, 1-16)
Fault code: 48	Consequence:
Meaning: No incoming signal in 2M interface	
Instructions: If two 2M outputs are connected together, alarms are usually produced for all other interfaces of the same plug-in card. Read alarm history with Hopper Manager to see which interface is not generating alarms and thus is not properly connected.	
Cancelling: N/A	

AIS 2M	
Severity: Major	SB: 2M interface (1-4, 1-16)
Fault code: 66	Consequence:
Meaning: Alarm signal incoming in 2M interface	
Instructions: N/A	
Cancelling: N/A	

Buffer overflow (or underflow)	
Severity: Critical	SB: 2M interface (1-4, 1-6)
Fault code: 113	Consequence:
Meaning: Incoming signal in 2M interface is corrupted or its bit rate is out of limit	
Instructions: N/A	
Cancelling: N/A	

Fault in unit	
Severity: Critical	SB: Driver
Fault code: 150	Consequence:
Meaning: Fault in 2M line driver	
Instructions: N/A	
Cancelling: N/A	

Connection or settings have changed	
Severity: Warning	SB 1: FM setup SB 2: Identifications
Fault code: 185	Consequence:

Connection or settings have changed	
Meaning 1: Fault management settings have changed Meaning 2: Identifications changed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB: Identifications
Fault code: 186	Consequence:
Meaning: One or more of the following identifications missing: 1. FE type string 2. FE product code string 3. FE product version string 4. FE serial number string 5. FE user's manual product code string 6. FE user's manual product version string	
Instructions: Contact manufacturer	
Cancelling: N/A	

Fault in unit	
Severity: Critical	SB: Driver
Fault code: 150	Consequence:
Meaning: Fault in 2M line driver	
Instructions: N/A	
Cancelling: N/A	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:

Database full	
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

A.1.4 Functional entity: Flexbus plug-in unit

Fault in power supply	
Severity: Critical	SB: Flexbus (3)
Fault code: 0	Consequence:
Meaning: OU power supply fault	
Instructions: N/A	
Cancelling: N/A	

Loop to interface	
Severity: Major	SB: Flexbus (3)
Fault code: 21	Consequence:
Meaning: Flexbus interface loop is active (Rx signal is looped back to Tx direction).	
Instructions: N/A	
Cancelling: Cancelled when loop is removed	

Loop to equipment	
Severity: Major	SB: Flexbus (3)
Fault code: 22	Consequence:
Meaning: Flexbus equipment loop is active	
Instructions: N/A	
Cancelling: Cancelled when loop is removed	

Test mode active	
Severity: Major	SB: Flexbus (3)
Fault code: 23	Consequence:
Meaning: Flexbus LED state is forced	
Instructions: N/A	
Cancelling: Cancelled when forced control removed	

Loss of incoming signal	
Severity: Critical	SB: Flexbus (3)
Fault code: 48	Consequence:
Meaning:	
<ol style="list-style-type: none"> 1. Flexbus received clock is missing 2. Flexbus Rx clock oscillator faulty 	
Instructions: N/A	
Cancelling: N/A	

Alarm signal is received	
Severity: Critical	SB: Flexbus (3)
Fault code: 64	Consequence:

Alarm signal is received	
Meaning: Flexbus received signal contains a pseudo frame, generated in the OU (OU not locked to Rx signal). Typically OU received signal is missing or faulty.	
Instructions: N/A	
Cancelling: N/A	

Loss of frame alignment	
Severity: Critical	SB: Flexbus (3)
Fault code: 81	Consequence:
Meaning: 1. Flexbus received signal faulty or errored 2. Fault in the Flexbus cable interface	
Instructions: N/A	
Cancelling: N/A	

Error rate > 1 E-3	
Severity: Critical	SB: Flexbus (3)
Fault code: 99	Consequence:
Meaning: Received signal BER over limit. Possible reasons: 1. Signal from the radio path is attenuated 2. Hardware fault in the Flexbus cable of interface	
Instructions: N/A	
Cancelling: Cancelled when BER under limit	

Error rate > 1 E-4, Error rate > 1 E-5, Error rate > 1 E-6	
Severity: Major	SB: Flexbus (3)
Fault codes: 100, 101, 102	Consequence:

Error rate > 1 E-4, Error rate > 1 E-5, Error rate > 1 E-6	
Meaning: Received signal BER over limit. Possible reasons:	
<ol style="list-style-type: none"> 1. Signal from the radio path is attenuated 2. Hardware fault in the Flexbus cable of interface 	
Instructions: N/A	
Cancelling: Cancelled when BER under limit	

Forced control on	
Severity: Critical	SB: Flexbus (3)
Fault code: 141	Consequence:
Meaning: OU power supply forced on or off with control menu, while the setting value may be different	
Instructions: N/A	
Cancelling: Cancelled when forced control removed	

Fault in installation of equipment	
Severity: Critical	SB: Flexbus (3)
Fault code: 142	Consequence:
Meaning: Flexbus is not set in use, but OU (or IU) is connected to it	
Instructions: When Flexbus and radio are commissioned, set <i>In use</i> to <i>ON</i>	
Cancelling: Cancelled when <i>In use</i> is <i>ON</i>	

Database full	
Severity: Warning	SB: Flexbus (3)
Fault code: 162	Consequence:

Database full	
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Far-end alarm	
Severity: Major	SB: Flexbus (3)
Fault code: 179	Consequence:
<p>Meaning: Traffic broken in one direction. Possible reasons:</p> <ol style="list-style-type: none"> 1. Far-end IU is not receiving data transmitted from this end, but this end is receiving data transmitted from far-end 2. Far-end is not transmitting useful data because it has loop to equipment active 	
Instructions: N/A	
Cancelling: N/A	

Connection or settings have changed	
Severity: Warning	SB1: Flexbus (3) SB 2: FM setup SB 3: Identifications
Fault code: 185	Consequence:
<p>Meaning 1: G.826 settings have changed</p> <p>Meaning 2: Fault management settings have changed</p> <p>Meaning 3: Identifications changed</p>	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB: Identifications
Fault code: 186	Consequence:
Meaning: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. FE type string 2. FE product code string 3. FE product version string 4. FE serial number string 5. FE user's manual product code string 6. FE user's manual product version string 7. Tx-clock calibration missing or illegal 	
Instructions: Contact manufacturer	
Cancelling: N/A	

15 min G826 ES threshold crossed	
Severity: Minor	SB: Flexbus (3)
Fault code: 256	Consequence:
Meaning: 15 min G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Cancelled after a 15 minutes' period of the signal being good enough. (ES less than the reset threshold.)	

15 min G826 SES threshold crossed	
Severity: Major	SB: Flexbus (3)
Fault code: 257	Consequence:
Meaning: 15 min G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Cancelled after a 15 minutes' period of the signal being good enough. (SES less than the reset threshold.)	

15 min G826 BBE threshold crossed	
Severity: Minor	SB: Flexbus (3)
Fault code: 258	Consequence:
Meaning: 15 min G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Cancelled after a 15 minutes' period of the signal being good enough. (BBE less than the reset threshold.)	

24 h G826 ES threshold crossed	
Severity: Warning	SB: Flexbus (3)
Fault code: 259	Consequence:
Meaning: 24 h G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 SES threshold crossed	
Severity: Warning	SB: Flexbus (3)
Fault code: 260	Consequence:
Meaning: 24 h G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 BBE threshold crossed	
Severity: Warning	SB: Flexbus (3)
Fault code: 261	Consequence:
Meaning: 24 h G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Unavailability	
Severity: Critical	SB: Flexbus (3)
Fault code: 262	Consequence:
Meaning: Amount of errored blocks has been more than 30% for at least 10 consecutive seconds.	
Instructions: N/A	
Cancelling: Cancelled when the amount of errored blocks has been less than 30% for 10 consecutive seconds	

Statistics reset	
Severity: Warning	SB: Flexbus (3)
Fault code: 263	Consequence:
Meaning: G.826 error counters (current measurement) are reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

A.1.5 Functional entity: EXU

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Connection or settings have changed	
Severity: Warning	SB 1: FM setup SB 2: Identifications
Fault code: 185	Consequence :
Meaning 1: Fault management settings have changed Meaning 2: Identifications changed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB: Identifications
Fault code: 186	Consequence:
Meaning: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. FE type string 2. FE product code string 3. FE product version string 4. FE serial number string 5. FE user's manual product code string 6. FE user's manual product version string 	
Instructions: Contact manufacturer	
Cancelling: N/A	

A.1.6 Functional entity: Aux data plug-in unit

Alarm signal received	
Severity: Major	SB: AUX fast
Fault code: 64	Consequence:
Meaning: Alarm indication signal received to the AUX interface.	
Instructions: N/A	
Cancelling: N/A	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Connection or settings have changed	
Severity: Warning	SB 1: FM setup SB 2: Identifications
Fault code: 185	Consequence:
<p>Meaning 1:</p> <p>Meaning 2: Identifications changed</p>	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB: Identifications
Fault code: 186	Consequence:
Meaning: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. FE type string 2. FE product code string 3. FE product version string 4. FE serial number string 5. FE user's manual product code string 6. FE user's manual product version string 	
Instructions: Contact manufacturer	
Cancelling: N/A	

Active alarm point	
Severity: Major	SB: General I/O (0-3)
Fault code: 240	Consequence:
Meaning: Alarm in input	
Instructions: N/A	
Cancelling: N/A	

A.2 RRIC alarms

A.2.1 Functional entity: NE/FE0

Error rate > 1 E-3	
Severity: Critical	SB: Protected hop
Fault code: 99	Consequence:
Meaning: Received signal BER over limit	
Instructions: N/A	
Cancelling: Cancelled when BER is under limit	

Error rate > 1 E-4, Error rate > 1 E-5, Error rate > 1 E-6	
Severity: Major	SB: Protected hop
Fault codes: 100, 101, 102	Consequence:
Meaning: Received signal BER over limit	
Instructions: N/A	
Cancelling: Cancelled when BER is under limit	

Fault in equipment	
Severity: Major	SB 1: Protection lost SB 2: TRUA
Fault code: 128	Consequence:
Meaning 1: Protection lost, but data still being transmitted. Possible causes: 1. OU transmitter error 2. OU receiver error 3. IU TX oscillator error 4. IU hardware register error Meaning 2: Bypass	
Instructions 1: 1. Check other faults of the faulty unit to find the actual reason 2. Replace the faulty unit Instructions 2: N/A	
Cancelling: N/A	

Subrack is missing units	
Severity: Critical	SB: HW setup
Fault code: 139	Consequence: Possibly some signal quality alarms
Meaning: Unit removed or missing from the system	
Instructions: Hopper Manager troubleshooting information displays which unit is missing. Possible causes are: faulty unit, faulty cable, or power off.	
Cancelling: Alarm is cancelled after the unit is back in the system or <i>Install all</i> command is given	

Subrack has excessive units	
Severity: Major	SB: HW setup
Fault code: 140	Consequence:
Meaning: New unit(s) added to the system, but not installed to configuration	
Instructions: After plugging in new units, use <i>Install</i> or <i>Install All</i> command in Hopper Manager.	
Cancelling: Alarm is cancelled in max. 30 seconds after the <i>Install</i> command	

Forced control on	
Severity: Critical	SB: Operation mode
Fault code: 141	Consequence:
Meaning: 1. Automatic fading margin measurement on 2. Forced controls on OU TX 3. Forced controls on OU RX 4. Forced controls on IU	
Instructions: N/A	
Cancelling: Alarm is cancelled after AFMM finished or forced controls removed	

Fault in installation of equipment	
Severity: Warning	SB 1: HW setup SB 2: Operation mode
Fault code: 142	Consequence:
Meaning 1: Unit replaced with another type of unit in the system Meaning 2: Settings do not match the HW configuration	
Instructions 1: 1. Give <i>Uninstall</i> and then <i>Install</i> command with the Hopper Manager to replace the unit 2. Install the correct unit back into the system Instructions 2:	
Cancelling 1: Warning resets automatically Cancelling 2: N/A	

Fault in change-over function	
Severity: Critical	SB: Operation mode
Fault code: 143	Consequence:
Meaning: 1. OU setting incompatible with protection mode (e.g. Tx-frequency not the same in both radios in HSB mode) 2. Incompatible OU software for used operation mode	
Instructions: 1. Restore configuration backup of OU or set correct settings 2. Download new software to OU	
Cancelling: N/A	

Equipment reset	
Severity: Warning	SB: HW setup
Fault code: 148	Consequence:
Meaning: Unit is starting up after power-on reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:

Database full	
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Far-end alarm	
Severity: Major	SB: Flexbus (1-2)
Fault code: 179	Consequence:
<p>Meaning: Traffic broken in one direction. Possible reasons:</p> <ol style="list-style-type: none"> 1. Far-end IU is not receiving data transmitted from this end, but this end is receiving data transmitted from far-end 2. Far-end is not transmitting useful data because it has loop to equipment active 	
Instructions: N/A	
Cancelling: Cancelled when data transmission functions in both directions	

Connection or settings have changed	
Severity: Warning	SB 1: FM setup SB 2: HW setup SB 3: Identifications SB 4: Protected hop
Fault code: 185	Consequence 1, 3 and 4: Consequence 2: Sets or clears <i>Subrack is missing units</i> or <i>Subrack has excessive units</i> alarms

Connection or settings have changed	
Meaning 1: Fault management settings have changed Meaning 2: New unit(s) added, removed or replaced in the system. Meaning 3: Identifications changed Meaning 4: G.826 settings have changed	
Instructions 1, 3 and 4: N/A Instructions 2: Refresh Hopper Manager's equipment view.	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB: Identifications
Fault code: 186	Consequence:
Meaning: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. NE family type string 2. NE type string 3. NE product code string 4. NE product version string 5. NE serial number string 6. NE user's manual product code string 7. NE user's manual product version string 	
Instructions: Contact manufacturer	
Cancelling: N/A	

15 min G826 ES threshold crossed	
Severity: Minor	SB: Protected hop
Fault code: 256	Consequence:
Meaning: 15 min G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled when the signal has been good enough for a 15 minutes' period. (ES less than the reset threshold.)	

15 min G826 SES threshold crossed	
Severity: Major	SB: Protected hop
Fault code: 257	Consequence:
Meaning: 15 min G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled when the signal has been good enough for a 15 minutes' period. (SES less than the reset threshold.)	

15 min G826 BBE threshold crossed	
Severity: Minor	SB: Protected hop
Fault code: 258	Consequence:
Meaning: 15 min G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled when the signal has been good enough for a 15 minutes' period. (BBE less than the reset threshold.)	

24 h G826 ES threshold crossed	
Severity: Warning	SB: Protected hop
Fault code: 259	Consequence:
Meaning: 24 h G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G286 SES threshold crossed	
Severity: Warning	SB: Protected hop
Fault code: 260	Consequence:
Meaning: 24 h G286 SES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 BBE threshold crossed	
Severity: Warning	SB: Protected hop
Fault code: 261	Consequence:
Meaning: 24 h G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Unavailability	
Severity: Critical	SB: Protected hop
Fault code: 262	Consequence:
Meaning: G.826 settings have changed	
Instructions: N/A	
Cancelling: Cancelled when the amount of errored blocks has been less than 30% for 10 consecutive seconds.	

Statistics reset	
Severity: Warning	SB: Protected hop
Fault code: 263	Consequence:
Meaning: G.826 error counters (current measurement) are reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

A.2.2 Functional entity: RRIC

Fault in power supply	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Power supply
Fault code: 0	Consequence:
Meaning 1: Flexbus OU power supply fault. Possible reasons: 1. Failure in power supply 2. Short circuit in the Flexbus cable Meaning 2: Power supply voltage is below or above the limit. See measurements.	
Instructions: N/A	
Cancelling: N/A	

Blocked from use	
Severity: Major	SB: CC bank
Fault code: 20	Consequence:
Meaning: as in DTRU	
Instructions: N/A	
Cancelling: N/A	

Loop to interface	
Severity: Major	SB 1: 2M (1-4) SB 2: BFI channel SB 3: Flexbus (1-2)
Fault code: 21	Consequence:
Meaning 1: 2M signal looped back to interface Meaning 2: 2M signal looped back to Flexbus Meaning 3: Flexbus interface loop is active (Rx signal is looped back to Tx direction)	
Instructions: N/A	
Cancelling: Cancelled when loop is removed	

Loop to equipment	
Severity: Major	SB: Flexbus (1-2)
Fault code: 22	Consequence:
Meaning: FB signal looped back to equipment	
Instructions: N/A	
Cancelling: Cancelled when loop is removed	

Test mode active	
Severity: Major	SB 1: Flexbus (1-2) SB 2: LED
Fault code: 23	Consequence:
Meaning 1: Flexbus LED state is forced. Meaning 2: Alarm LED state is forced	
Instructions: N/A	
Cancelling: Cancelled when forced control is removed	

Test generator on	
Severity: Major	SB 1: PRBS2 SB 2: PRBSF
Fault code: 25	Consequence:
Meaning 1: Internal 2 Mbit/s test generator on Meaning 2: Internal test generator for Flexbuses and aux channels is on	
Instructions: N/A	
Cancelling: Cancelled when forced control removed	

Loss of incoming signal	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 48	Consequence:
Meaning 1: 1. Flexbus Rx clock is missing 2. Flexbus Rx clock oscillator faulty Meaning 2: 1. Flexbus Rx clock is missing 2. Flexbus Rx clock oscillator faulty	
Instructions: N/A	
Cancelling: N/A	

No incoming line signal	
Severity: Critical	SB: 2M (1-4)
Fault code: 61	Consequence:
Meaning: No incoming signal in 2M interface	
Instructions: N/A	
Cancelling: N/A	

Alarm signal is received	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 64	Consequence:
Meaning 1: Flexbus received signal contains a pseudo frame, generated in the OU (OU not locked to Rx signal). Typically OU received signal is missing or faulty Meaning 2: N/A	
Instructions: N/A	
Cancelling: N/A	

AIS 2M	
Severity: Major	SB 1: 2M (1-4)
Fault code: 66	Consequence:
Meaning: Alarm signal incoming in 2M interface	
Instructions: N/A	
Cancelling: N/A	

Loss of frame alignment	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 81	Consequence:
Meaning: 1. Flexbus received signal faulty or errored 2. Fault in the Flexbus cable interface	
Instructions: N/A	
Cancelling: N/A	

Error rate > 1 E-3	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Flexbus (3) SB 3: PRBS2 SB 4: PRBSF
Fault code: 99	Consequence:

Error rate > 1 E-3	
Meaning 1: Received signal BER over limit. Possible reasons: <ol style="list-style-type: none"> 1. Signal from the radio path is attenuated 2. Hardware fault in the Flexbus cable or interface Meaning 2: Received signal BER over limit. Possible hardware fault in Flexbus interface Meaning 3 - 4: Internal test receives BER over limit	
Instructions: N/A	
Cancelling 1 - 2: Cancelled when BER under limit Cancelling 3: Cancelled when PRBS2 error counter is reset Cancelling 4: Cancelled when PRBSF error counter is reset	

Error rate > 1 E-4, Error rate > 1 E-5, Error rate > 1 E-6	
Severity: Major	SB 1: Flexbus (1-2) SB 2: Flexbus (3) SB 3: PRBS2 SB 4: PRBSF
Fault code: 100, 101, 102	Consequence:
Meaning 1: Received signal BER over limit. Possible reasons: <ol style="list-style-type: none"> 1. Signal from the radio path is attenuated 2. Hardware fault in the Flexbus cable or interface Meaning 2: Received signal over BER limit. Possible hardware fault in Flexbus interface Meaning 3 - 4: Internal test receives BER over limit	
Instructions: N/A	
Cancelling 1 - 2: Cancelled when BER under limit Cancelling 3: Cancelled when PRBS2 error counter is reset Cancelling 4: Cancelled when PRBSF error counter is reset	

Buffer overflow (or underflow)	
Severity: Critical	SB 1: 2M (1-4) SB 2: BFI channel
Fault code: 113	Consequence:

Buffer overflow (or underflow)	
Meaning 1: Incoming signal in 2M interface is corrupted or its bit rate is not within the limits Meaning 2: Bit rate of received 2M signal is out of limit	
Instructions: N/A	
Cancelling 1: N/A	

Fault in oscillator	
Severity: Critical	SB: Clock monitor
Fault code: 137	Consequence:
Meaning: Internal oscillator faulty	
Instructions: N/A	
Cancelling: N/A	

Forced control on	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Measurement point
Fault code: 141	Consequence:
Meaning 1: OU power supply forced on or off with control menu, while the setting value may be different Meaning 2: Signal connected to measurement point.	
Instructions: N/A	
Cancelling: Cancelled when forced control is removed	

Fault in installation of equipment	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: HW setup
Fault code: 142	Consequence:

Fault in installation of equipment	
Meaning 1: Flexbus not set in use, but OU (or IU) is connected to it Meaning 2: Incompatible unit	
Instructions 1: When Flexbus and radio are commissioned, set <i>In use</i> to <i>ON</i> Instructions 2: Check Hopper Manager troubleshooting instructions for the concerned unit <ul style="list-style-type: none"> • if HW module, replace module or fill in missing identifications • if SW incompatibility, download new software 	
Cancelling 1: Cancelled when <i>In use</i> is <i>ON</i> Cancelling 2: Warning resets automatically	

Operating error	
Severity: Critical	SB: SW setup
Fault code: 144	Consequence:
Meaning: SW error / File system error	
Instructions: N/A	
Cancelling: N/A	

Equipment reset	
Severity: Warning	SB: HW setup
Fault code: 148	Consequence:
Meaning: Unit is started up after power-on or reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:

Database full	
Meaning: Overflow in event history	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Real time lost fault	
Severity: Major	SB: Real time clock
Fault code: 165	Consequence:
Meaning: RTC not set after reset	
<p>Instructions:</p> <ol style="list-style-type: none"> 1. Set RTC with Hopper Manager 2. RTC is set by NMS 	
Cancelling: Cancelled when RTC is set	

Far-end alarm	
Severity: Major	SB 1: Flexbus (1–2) SB 2: Flexbus (3)
Fault code: 179	Consequence:
<p>Meaning: Traffic is broken in one direction. Possible reasons:</p> <ol style="list-style-type: none"> 1. Far-end IU not receiving data transmitted from this end, but this end is receiving data transmitted from far-end 2. Far-end is not transmitting useful data because it has loop to equipment active 	
Instructions: N/A	
Cancelling: Cancelled when data transmission functions in both directions	

Real time updated	
Severity: Warning	SB: Real time clock
Fault code: 184	Consequence:
Meaning: Updated RTC difference more than 500 ms	
Instructions: N/A	
Cancelling: Warning resets automatically	

Connection or settings have changed	
Severity: Warning	SB 1: Flexbus (1-2) SB 2: Flexbus (3) SB 3: FM setup SB 4: Identifications
Fault code: 185	Consequence:
Meaning 1: G.826 settings have changed Meaning 2: G.826 settings have changed Meaning 3: Fault management settings changed Meaning 4: Identifications changed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB 1: Identifications SB 2: SW setup
Fault code: 186	Consequence:
Meaning 1: Identification(s) missing Meaning 2: 1. No backup available. 2. Backup available for this unit, needs activation.	
Instructions 1: The unit is faulty. Replace the faulty RRIC and send it to the manufacturer. Instructions 2: N/A	
Cancelling: N/A	

15 min G826 ES threshold crossed	
Severity: Minor	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 256	Consequence:
Meaning: 15 min G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled after the signal has been good enough for a 15 minute time period (ES less than reset threshold)	

15 min G826 SES threshold crossed	
Severity: Major	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 257	Consequence:
Meaning: 15 min G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled after the signal has been good enough for a 15 minute time period (SES less than reset threshold)	

15 min G826 BBE threshold crossed	
Severity: Minor	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 258	Consequence:
Meaning: 15 min G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Alarm is cancelled after the signal has been good enough for a 15 minute time period (BBE less than reset threshold)	

24 h G826 ES threshold crossed	
Severity: Warning	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 259	Consequence:
Meaning: 24 h G826 ES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 SES threshold crossed	
Severity: Warning	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 260	Consequence:
Meaning: 24 h G826 SES threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

24 h G826 BBE threshold crossed	
Severity: Warning	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 261	Consequence 1:
Meaning: 24 h G826 BBE threshold crossed	
Instructions: N/A	
Cancelling: Warning resets automatically	

Unavailability	
Severity: Critical	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 262	Consequence:

Unavailability
Meaning: Amount of errored blocks has been more than 30% for at least 10 consecutive seconds.
Instructions: N/A
Cancelling: Cancelled when the amount of errored blocks has been less than 30% for 10 consecutive seconds

Statistics reset	
Severity: Warning	SB 1: Flexbus (1-2) SB 2: Flexbus (3)
Fault code: 263	Consequence:
Meaning: G.286 error counters (current measurement) are reset	
Instructions: N/A	
Cancelling: Warning resets automatically	

A.3 Nokia FlexiHopper outdoor unit alarms

A.3.1 Functional entity: FlexiHopper

Fault in power supply	
Severity: Critical	SB: Radio interface
Fault code: 0	Consequence:
Meaning: 1. +3.3 V supply voltage is out of range 2. +5.25 V supply voltage is out of range 3. +27.5 V supply voltage is out of range 4. +6.5 V supply voltage is out of range 5. -5.0 V supply voltage is out of range	
Instructions: The outdoor unit is faulty. Replace the faulty OU and send it to the manufacturer.	
Cancelling: N/A	

Loop to interface	
Severity: Major	SB: Radio interface
Fault code: 21	Consequence:
Meaning: Far-end loopback is on.	
Instructions: Wait for the control timeout to expire or restart the outdoor unit. The control timeout can be defined by the user.	
Cancelling: N/A	

Loop to equipment	
Severity: Major	SB: Radio interface
Fault code: 22	Consequence:
Meaning: Near-end loopback is active.	
Instructions: Cancel the loopback.	
Cancelling: N/A	

No outgoing radio signal	
Severity: Critical	SB: Radio interface
Fault code: 45	Consequence:

No outgoing radio signal	
<p>Meaning:</p> <ol style="list-style-type: none"> 1. Transmit power has been set off 2. Transmit frequency setting is missing 3. Transmitter frame lock is lost 4. MW phaselock is lost 	
<p>Instructions:</p> <ol style="list-style-type: none"> 1. Set the Tx power on 2. Set the Tx frequency 3. In the normal operation this alarm is activated during the changing of capacity and it is automatically cancelled when the capacity has been successfully changed. If the alarm persists, the connection to the outdoor unit has been lost (the outdoor unit is faulty). Replace the faulty OU and send it to the manufacturer 4. Set the Tx frequency. If this does not help, the outdoor unit is faulty. Replace the faulty OU and send it to the manufacturer 	
Cancelling: N/A	

Incoming signal level incorrect	
Severity: Critical	SB type: Radio interface
Fault code: 59	Consequence:
Meaning: Received signal level is low.	
<p>Instructions: The cause for this alarm is that the Rx signal level is below the alarm limit. The alarm limit can be defined by the user.</p> <p>Check the following points:</p> <ul style="list-style-type: none"> • Rx signal level • Tx power level in the far-end OU • Tx frequencies in the far-end and near-end OUs • antenna alignment in the far-end and near-end OUs • line-of-sight (obstacles etc.). 	
Cancelling: N/A	

No incoming radio signal	
Severity: Critical	SB: Radio interface
Fault code: 60	Consequence:
Meaning: 1. Rx framelock is lost 2. MW phaselock is lost 3. IF phaselock is lost	
Instructions: 1. If the signal level is sufficient, check that the capacity and Tx frequency are correct 2. Set the Tx frequency. If this does not help, the outdoor unit is faulty. Replace the faulty OU and send it to the manufacturer 3. The outdoor unit is faulty. Replace the faulty OU and send it to the manufacturer	
Cancelling: N/A	

Excessive error rate	
Severity: Critical	SB: Radio interface
Fault code: 96	Consequence:
Meaning: Bit error rate is high.	
Instructions: <ul style="list-style-type: none"> • Check that the Rx signal level is sufficient • Check that the interleaving setting is the same as in the far-end radio The alarm limit can be defined by the user. The default value for the limit is BER = 10 ⁻⁶ .	
Cancelling: N/A	

Fault in equipment	
Severity: Major	SB: SW setup
Fault code: 128	Consequence:
Meaning: 1. FS checksum error 2. FS writing/erasing error	
Instructions: The outdoor unit is faulty. Replace the faulty outdoor unit and send it to the manufacturer.	
Cancelling: N/A	

Forced control on	
Severity: Critical	SB: Radio interface
Fault code: 141	Consequence:
Meaning: 1. Fading margin measurement is ongoing 2. Transmit power has been set off.	
Instructions: 1. Wait until the fading margin measurement is finished. 2. Set the Tx power on.	
Cancelling: N/A	

Fault in installation of equipment	
Severity: Critical	SB type: HW setup
Fault code: 142	Consequence:
Meaning: 1. Compatibility problem with fixed hardware module CIPSU 2. Compatibility problem with fixed hardware module MODEM 3. Compatibility problem with fixed hardware module IFU.	
Instructions: 1. - 3. Software version is incorrect. Contact your local Nokia representative for getting the correct software version.	
Cancelling: N/A	

Equipment reset	
Severity: Warning	SB: HW setup
Fault code: 148	Consequence:
Meaning: Equipment has been reset.	
Instructions: N/A	
Cancelling: Warning resets automatically	

Fault in unit	
Severity: Critical	SB: Radio interface
Fault code: 150	Consequence:
<p>Meaning:</p> <ol style="list-style-type: none"> 1. Temperature is out of range 2. MWU power amplifier voltage is out of range 3. MWU medium power amplifier voltage is out of range 4. IF-PLL database is missing 5. Subband conflict between modem and MWU 6. Intermediate frequency conflict between IFU and MWU 7. Incorrect duplex frequency for subband 8. Band database is missing 9. Band database line is missing. 	
<p>Instructions:</p> <ol style="list-style-type: none"> 1. Verify that the outside temperature is within the range defined in the technical specifications. 2. - 9. The outdoor unit is faulty. Replace the faulty OU and send it to the manufacturer. 	
Cancelling:	

Database full	
Severity: Warning	SB: Event history
Fault code: 162	Consequence:
<p>Meaning: Overflow in event history</p>	
<p>Instructions:</p> <p>Alarm history is flushed by NMS alarm polling</p> <p>When SNMP or (new) Nokia Q1 alarm polling is used, the alarm poller is flushing used port's alarm history. FIU 19 (E) software flushes LMP port's alarm history to avoid Database full when history is read through LMP port.</p> <p>When (old) Q1 alarm polling is used, the network master never flushes the alarm history. When FIU 19 (E) receives an alarm polling (Get Fault Condition) command, it flushes alarm history for all ports (usually one or more Q1Ps and one LMP).</p> <p>If Old Q1 Support mode (Use old style fault handler setting) is enabled, FIU 19 (E) software regularly flushes alarm histories of all ports.</p>	
Cancelling: Warning resets automatically	

Real time lost fault	
Severity: Major	SB: Real time clock
Fault code: 165	Consequence:
Meaning: Real time clock is not set.	
Instructions: Set the real time clock. The real time clock is lost when the power is switched off.	
Cancelling: N/A	

Far-end alarm	
Severity: Major	SB: Radio interface
Fault code: 179	Consequence:
<p>Meaning:</p> <ol style="list-style-type: none"> 1. Loop to equipment loopback is set in the far-end outdoor unit 2. Loop to interface loopback is set in the far-end outdoor unit 	
<p>Instructions:</p> <ol style="list-style-type: none"> 1. Cancel the loopback at the far-end 2. Wait for the control timeout to expire at the far-end or restart the far-end outdoor unit. The far-end control timeout can be defined by the user. 	
Cancelling: N/A	

Real time updated	
Severity: Warning	SB: Real time clock
Fault code: 184	Consequence:
Meaning: Real time clock time difference has been over 5 s and it has been automatically updated.	
Instructions: N/A	
Cancelling: Warning resets automatically	

Connection or settings have changed	
Severity: Warning	SB 1: FM setup SB 2: Identifications
Fault code: 185	Consequence:
Meaning 1: Unit alarm settings have been changed by the user. Meaning 2: Q1 identifications have been changed by the user.	
Instructions: N/A	
Cancelling: Warning resets automatically	

Configuration error	
Severity: Minor	SB 1: Identifications SB 2: SW setup
Fault code: 186	Consequence:
Meaning 1: One or more of the following identifications missing: <ol style="list-style-type: none"> 1. FE type string 2. FE product code string 3. FE product version string 4. FE serial number string 5. FE user's manual product code string 6. FE user's manual product version string 7. Tx-clock calibration missing or illegal Meaning 2: <ol style="list-style-type: none"> 1. No backup available for this unit. 2. Backup is available and needs activation. 	
Instructions 1: The outdoor unit is faulty. Replace the faulty OU and send it to the manufacturer. Instructions 2: <ol style="list-style-type: none"> 1. Make the backup. 2. Activate the backup, if desired. 	
Cancelling: N/A	

Appendix B. Examples of commissioning

B.1 Commissioning an FIU 19 chaining station

In this example a chaining station is being commissioned. The network element is composed of one FIU 19 indoor unit with 4 x 2M interfaces and two FlexiHopper 38A outdoor units. Far-end stations have similar setups with FlexiHopper 38A' outdoor units. The setup is presented in Figure 47. For clarity, only the other far-end (*Far-end 1*) is drawn.

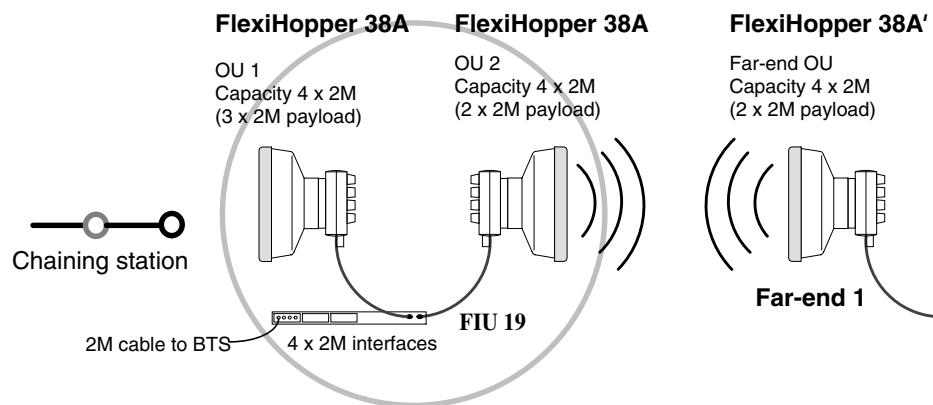


Figure 47. Station configuration example

Before commissioning, the radios have been installed in the mast and all the cables have been connected. The indoor unit has been connected to a power source. Far-end units have similarly been installed, and the radio at *Far-end 1* has been commissioned and is transmitting.

The following information, as determined by transmission planning, is at hand when starting the commissioning:

- Tx frequencies for the radios: *OU1 = 37 194 500 kHz; OU2 = 37 320 500 kHz*
- Maximum Tx power for the radios: *OU1 = 10.0 dBm, ALCQ on; OU2 = 11.0 dBm, ALCQ on*
- Interleaving settings: *OU1 = four-depth interleaving; OU2 = four-depth interleaving*
- Station type and protection equipment: *Chaining, Single*

- Flexbus capacities = OU transmit capacities: $FB1(OU1) = 4 \times 2 \text{ Mbit/s}$; $FB2(OU2) = 4 \times 2 \text{ Mbit/s}$
- Equipment address and baud rate of the Q1 and LMP ports: *Q1 port: group address 4051, NE address 316, baud rate 9600 bit/s. LMP: baud rate 115200 bit/s*
- Routing of the Q1 bus: *Q1-1, Q1-2 On; Processor; Flexbus; FB1; FB2*
- Cross-connection of channels: *Two 2 Mbit/s signals are repeated through this station. One 2 Mbit/s signal is added to the traffic going out from OU1.*
- Calculated Rx-levels for both hops.



To commission this setup:

1. Switch the power on (see Section 3.3).
2. Connect the PC to the LMP of the indoor unit (see Section 2.2) and start Nokia Hopper Manager (see Section 2.3.1)
3. Connect to the network element (see Section 2.5) and run commissioning wizard (see Section 3.4). The manager reads the installed equipment configuration.
4. Fill in the basic settings in the wizard as they are presented to you (see Section 3.4).
 1. Give the site information.
 2. Set station type and protection mode.
 3. Set Flexbus (outdoor unit) capacities.
 4. Set Q1 and LMP port baud rates and addresses.
 5. Set Q1 branching bridges (Figure 48).

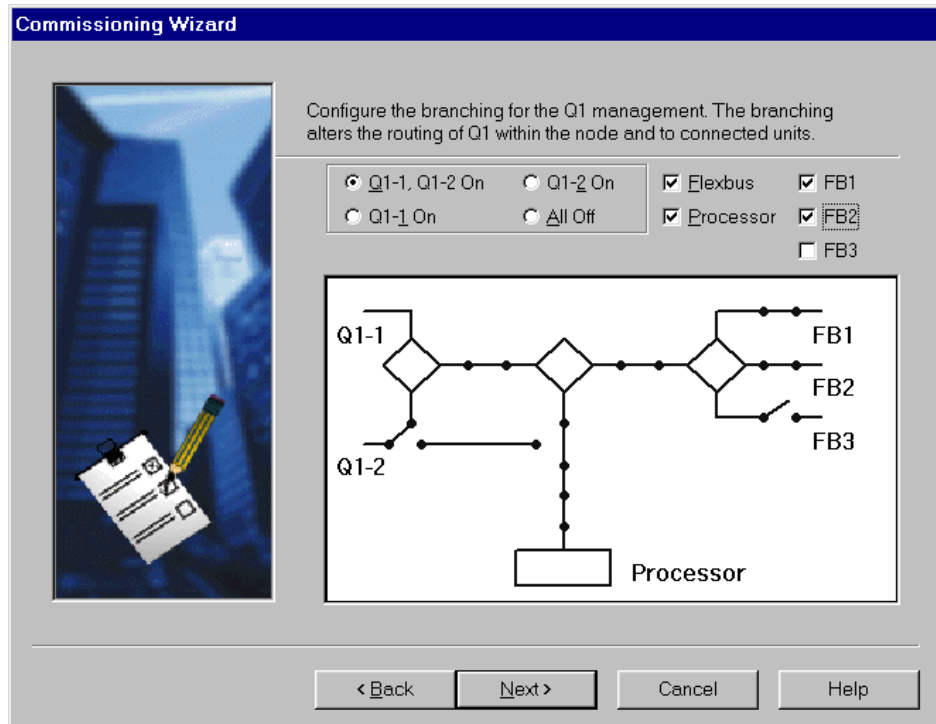


Figure 48. Example of the Q1 branching bridge settings

6. Set the transmit frequency and maximum transmit power. The settings are made for both outdoor units separately.
7. The manager now displays all made settings.
8. Set installation info and the node clock.

Note

As the radio at *Far-end 1* is already commissioned and transmitting, OU 2 can now be fine-aligned. Note also, that as OU 1 is now transmitting in the correct frequency, the commissioning of the next station in the chain can be started. In the most desirable situation there is a crew working at the both ends of a hop when it is being commissioned. Then problems with antenna alignment, for example, can be fixed more easily.

5. Fine-align the OU 2 antenna (see Section 3.5). Verify that the Rx-input level determined by the transmission planning is met. This can be done by clicking **Maintenance** → **Performance** → **Measurements**. Acceptable deviation is ±3 dB.

6. Make the cross-connections with the manager (see Section 3.7).

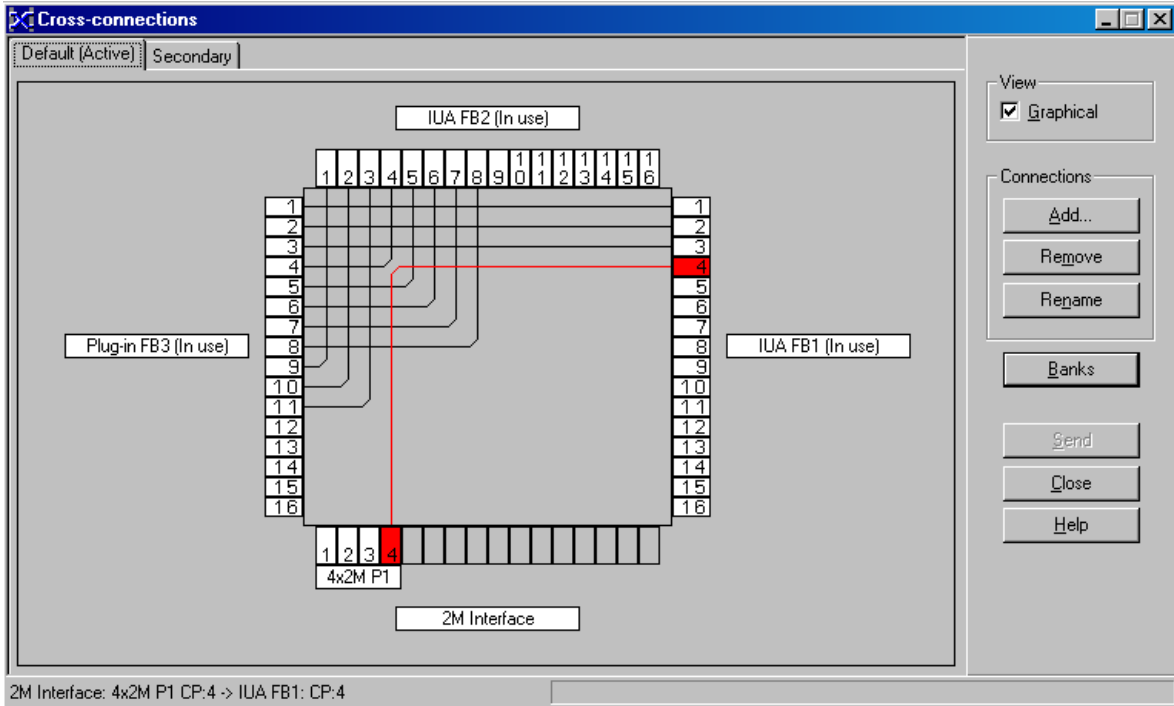


Figure 49. Example of cross-connections

7. Measure the fading margin to *Far-end 1* (see Section 3.9).
8. Make any additional settings. In this case, set the interleaving to four-depth mode in both radios (see Section 3.6.4) and set ALCQ on. Make also any performance management and configuration backup settings.
9. Reset the statistics and the error counters (see Section 3.10).
10. Monitor the hop to *Far-end 1* for half an hour. Record any alarms if they occur.
11. If the signal quality is OK (unavailability time = 0) and there are no unexpected alarms, the commissioning is finished. At this point:
 1. Save a copy of the node to a file.
 2. Export the alarm log to a file.
 3. Export the measurement log to a file.
 4. Export the statistics to a file.

5. Close the connection to the node.

If there is any unavailability time during the monitoring, repeat the monitoring.