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Nokia MetroSite EDGE Base Station

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Summary of changes

Version 1, 12 November 1999.

Version 2, 22 June 2000:

- Added GSM to title and to body text
- Changed max. power to 5 W (Chapter 3.1.2)
- Added 5W TRX options (Chapter 6.3)
- Changed height of BTS (Figure 14, Table 8, and Table 9)
- Changed BBU backup time to 1hr (Chapter 3.5.3)
- Added power alternatives (Table 6). Added HVMF fan to Chapter 6.7
- Expanded Chapter 7 to include 5W TRXs (new Table 7)
- Added 5W TRX BTS power demand in Table 8
- Included 5 W power (Tables 12, 13, and 14)

Version 3 update, 7 March 2001:

- Revised throughout to include EDGE and to remove 1W TRXs. Comments from this document's technical review of 1 February 2001 incorporated.

Version 3 update, July 2002:

- Chaining feature and EGPRS descriptions added.
- 800 MHz TRX, NEBS cover (WCUA), +24 VDC power supply unit added.

1 About this document

This document describes the hardware, software, and functions of the Nokia MetroSite™ EDGE Base Station (BTS), including the 5W GSM TRX and 5W GSM/EDGE TRX variants. Use this document as a reference for the following information:

- Nokia MetroSite EDGE Base Station features
- Nokia MetroSite EDGE Base Station applications
- Nokia MetroSite EDGE Base Station software
- Nokia MetroSite BTS Manager
- Nokia MetroSite EDGE Base Station general function, construction and units
- Nokia MetroSite EDGE Base Station technical data
- Nokia MetroSite EDGE Base Station design standards

Note

Some products referred to in this document, such as Nokia MetroHub™ Transmission Node, Nokia FlexiHopper™ Microwave Radio, and Nokia MetroHopper™ Radio, may not be available in certain markets.

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2 Introduction to the Nokia MetroSite EDGE Base Station

This chapter describes the base station system (BSS) and the Nokia MetroSite EDGE Base Station generally.

2.1 Base station system

In general terms, base stations perform the radio function for the base station system. A base transceiver station (such as a Nokia MetroSite EDGE Base Station) is connected to a transmission node (such as a Nokia MetroHub Transmission Node) or directly to the base station controller (BSC) via the Abis interface and to the mobile stations (MS) via the Air interface (see Figure 1).

The BSC is further connected to the mobile switching centre (MSC) and to the operational support system (OSS).

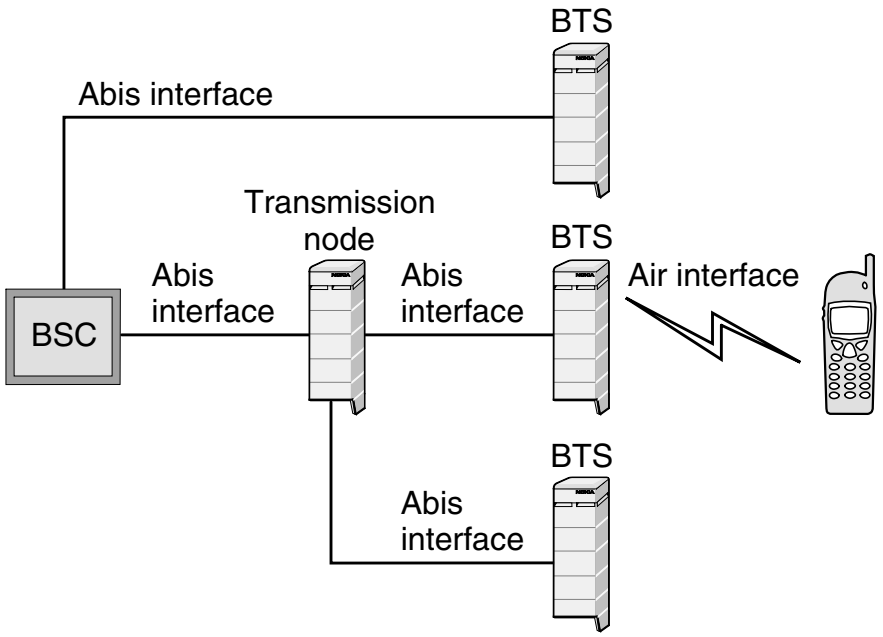

Figure 1. Base station system (BSS)

2.2 Nokia MetroSite EDGE Base Station

The Nokia MetroSite EDGE Base Station is a complete, all-climate base transceiver station. It can be used in GSM 900, 1800 and 1900 and GSM/EDGE 800, 900, 1800 and 1900 systems, or as a dual band GSM 900/1800 or dual band GSM/EDGE 900/1800, 800/1800 or 800/1900 BTS. Both omni and sectored configurations are supported. The small-sized Nokia MetroSite EDGE Base Station cabinet accommodates up to four transceiver units (TRXs).

The Nokia MetroSite EDGE Base Station can be fitted with 5W GSM TRXs or 5W GSM/EDGE TRXs.

Note

The introduction of EDGE requires EDGE capable TRXs. EDGE also requires CX 3.2 software (or later) to be available at the BSC.

Figure 2. Nokia MetroSite - an ideal solution for dense, urban environment

The Nokia MetroSite EDGE Base Station is the core element in the Nokia MetroSite Capacity Solution, which comprises complete sites equipped with BTSs, transmission equipment, and auxiliary equipment. However, the Nokia MetroSite EDGE Base Station can be integrated into other mobile network applications as well.

The optimised RF performance, the versatile installation options, and the flexible radio transmission solution using Nokia MetroHopper Radio for last-kilometre access, allow for a large number of BTSs being installed in a small area. Consequently, the Nokia MetroSite EDGE Base Station is an ideal solution for special hot spots - like downtown areas, sports arenas, shopping centres, underground stations and office buildings - where high capacity is needed.

Note

For more information on the Nokia MetroHopper Radio, see the *Nokia MetroHopper Product Overview*.

In order to ensure a high quality of calls, the Nokia MetroSite EDGE Base Station supports versatile features, such as frequency hopping.

Due to its compact size, low weight, and high level of integration, the Nokia MetroSite EDGE Base Station is fast and easy to install, either indoors or outdoors with minimal preparations. Both wall and pole installations are supported. From the network planning point of view, the Nokia MetroSite EDGE Base Station can be installed at optimal locations. The plug-in construction of the Nokia MetroSite EDGE Base Station also provides great flexibility when, for example, capacity expansion is considered.

In addition to its other versatile and advanced properties, the Nokia MetroSite EDGE Base Station is designed for easy commissioning. This has been achieved by the Nokia MetroSite BTS Manager, which incorporates a commissioning wizard and BTS configuration autodetection.

The Nokia MetroSite EDGE base station’s size and ease of deployment help the operator to reduce site planning and site acquisition costs. The fast start-up and the quick integration into the network enable immediate revenue flow to the operator. Furthermore, the operational costs are low as the BTS management is to a large extent carried out remotely from the OSS.

3 Nokia MetroSite EDGE Base Station features

This chapter describes the technical properties of the Nokia MetroSite EDGE Base Station that contribute to:

- Microcellular capacity
- Network quality
- Data services
- Deployment
- Operation and maintenance

A description of the advanced telecommunication features is also presented here. A detailed description of technical features supported by the Nokia MetroSite EDGE Base Station can be found in the *Feature Descriptions* document delivered in the *Nokia MetroSite Base Station Software Release Binder*. For a list of Nokia MetroSite EDGE Base Station properties, see also Chapter 8 in this document.

3.1 Building capacity with the Nokia MetroSite EDGE Base Station

The features described in this section accommodate the efficient building of capacity such as microcellular, building infill and roadside coverage.

3.1.1 Four TRX BTS with flexible sectoring and dual band operation

One Nokia MetroSite EDGE Base Station incorporates up to four TRXs and thus provides sufficient capacity to handle a large amount of telecommunication traffic. The Nokia MetroSite EDGE Base Station can be sectored very flexibly. Every TRX has its own antenna connector. Every TRX also incorporates a duplex filter, and one antenna therefore handles both transmitting and receiving. Any cell can incorporate up to four TRXs and, on the other hand, every TRX can form a sector of its own within a cell. Consequently, the maximum number of sectors for a stand-alone BTS is four.

The dual band feature enables the operator to configure any sector to operate either on a 900 or 1800 MHz frequency, thus increasing the capacity of the network. With CX 3.2 software, or later, the 800/1800 MHz and 800/1900 MHz dual band frequencies are also possible.

More information on the coverage areas created with different sectoring options can be found in Section 4.1 in this document.

Note

The term “cell” is used in the network management system (NMS) context, referring to the coverage area of transceivers from the same base station.

3.1.2 Chaining of Nokia MetroSite EDGE base stations

Internal bus and Abis chaining are both possible with the Nokia MetroSite EDGE Base Station. For more information on Abis chaining, refer to Section 4.2.

To further increase the capacity expansion possibilities, Nokia MetroSite EDGE base stations can be chained as one BCF object to include up to 12 TRXs. Chaining is done by extending the BTS internal buses through the extension interface on the interface unit. Each BTS is connected to the next BTS in the chain with only one cable (up to five metres). Only one of the BTSs (the master BTS) incorporates a transmission unit (FXC type).

One BTS acts as the master BTS, in which the master TRX of the chain is located. However, each BTS has a dedicated TRX to control the heating and cooling functions. The chained BTSs share the same frame clock (FCLK) and frame number and the sector configuration is therefore not limited by the cabinet boundaries.

The chain can be commissioned in various diversity configurations. For example, a chain with three BTSs could be configured with two sectors and six TRXs per sector.

The Nokia MetroSite EDGE Base Station can also be connected to a Nokia MetroHub Transmission Node. In this case, the BTS cabinet must incorporate a transmission unit.

3.1.3 RF power and sensitivity for microcellular applications

The RF performance of the Nokia MetroSite EDGE Base Station is suitable for microcellular, building infill and roadside coverage applications. The maximum RF power of the Nokia MetroSite EDGE Base Station transmitter is 5 W at the antenna connector. The maximum RF power of the Nokia MetroSite EDGE Base Station in EDGE modulation mode is 3.2 W. The RX sensitivity is better than -106 dBm. The output power and the receiver sensitivity of the Nokia MetroSite EDGE Base Station, together with the use of surrounding buildings to limit the cell size, allow efficient frequency re-use with minimised interference.

The dynamic power level range of the transmitter and the static broadcast control channel (BCCH) power level range are shown in Table 1.

Table 1. Power level ranges for the Nokia MetroSite EDGE Base Station

Property	GMSK modulation	8-PSK modulation
Static power level range (BCCH)	18 dB	10 dB
Total power level range (static + dynamic)	30 dB	16 dB
Step size	2 dB	2 dB

3.1.4 Smooth capacity expansion

As the operator's demand for capacity grows, additional TRXs can be installed to the Nokia MetroSite EDGE Base Station during operation without interrupting the BTS service.

3.2 High network quality

The Nokia MetroSite EDGE Base Station increases the capacity of the network and also maintains the quality of telecommunication traffic. This section describes the features that contribute to the high network quality.

3.2.1 Receiver diversity

Receiver diversity (also known as uplink diversity) is available in the Nokia MetroSite EDGE Base Station when two or more TRXs belong to the same sector.

Multipath propagation of the radio signal may cause local variations of signal strength. Deep fades, particularly when the mobile station is near a cell border, reduce the quality of the received signal. To minimise this effect, a spatial or polarisation receiver diversity can be used, which means that two different paths are used for the received signals.

Antennas are placed physically apart or they employ different polarisation so that correlation between received signals is minimised. It is probable that even if one of the receiver branches suffers from a deep fading drop, the other receives a signal of sufficient quality. The two separate paths are processed in the baseband section of the BTS transceiver, and the pre-detection weighted summing method is used to combine the signals of the two branches.

Diversity can be enabled or disabled from the BSC. When diversity is employed, the BTS must be physically equipped according to the logical sector configuration at the BSC.

3.2.2 Frequency hopping

The Nokia MetroSite EDGE Base Station supports synthesised (RF) frequency hopping when there are at least two TRXs in the same sector.

The most significant property of frequency hopping is that it enables averaging of the interference to RF signal between network users. Frequency hopping can be used to minimise signal quality degradation caused by frequency selective fading, especially for slow moving MSs and narrow band interfering signals.

Synthesised frequency hopping enables each TRX to change frequency on successive time slots, so that a given carrier can hop at several frequencies in quick succession.

It is possible to use either a cyclic or random frequency hopping scheme as defined in GSM 05.02, 05.08 recommendations.

3.2.3 Antenna solution

The MetroSite antenna is a small and unobtrusive dual band antenna designed for microcellular, building infill and roadside coverage. It is a directional two-port antenna with two antenna elements in one casing. This means that two TRXs can be connected to one antenna. The gain of the antenna is 6 dBi and it provides 130° coverage.

Other directional, omnidirectional and cross-polarised antennas can also be used with the Nokia MetroSite EDGE Base Station. Furthermore, distributed antenna systems (DAS), which are primarily used for building fill-in coverage, can be employed.

When the Nokia MetroSite EDGE Base Station itself is installed inside a building, the antennas can be located outdoors. The size of antenna feeders, 1/4” and 3/8”, support the flexibility of installation.

The TRX test includes an antenna cable detection feature which, in most of the cases, verifies whether the cable connection between the TRX and the antenna is free of faults.

3.3 Telecommunication features

The most important telecommunication features supported by the Nokia MetroSite EDGE Base Station software are discussed in this section. The basic features are presented as a list in Section 8.3. A detailed description of all the telecommunication features can be found in the software release documentation.

Half rate speech coding

The use of half rate (HR) speech coding makes it possible to almost double the amount of available traffic channels on the radio path. This is achieved with the existing transmission lines on the Abis interface. Half rate coding enables the use of 8 Kbit/s channels.

Enhanced full rate speech coding

Enhanced full rate (EFR) speech coding improves the voice quality in all channel conditions. The coding is based on improvements made for half rate coding applied to the existing GSM full rate channel coding.

Support for data services

The Nokia MetroSite EDGE Base Station supports a number of features that enable efficient data traffic. The most advanced of those features are dealt with here. See also Section 3.3.1 in this document.

- *High Speed Circuit Switched Data (HSCD)*. This feature provides accelerated data rates for the end-user applications such as browsing the Internet, file transfer and facsimile.
- *14.4 Kbit/s GSM data services* provide accelerated user data rates at 14.4 Kbit/s level. This feature can be combined with HSCSD.
- *Non-transparent and transparent data (9600, 4800, 2400 bit/s)*. Non-transparent means that the data rate can be changed automatically during the call (due to increased traffic, for example). Transparent data uses a fixed data rate throughout the duration of a call.

3.3.1 General Packet Radio Service (GPRS)

GPRS is designed to make the GSM data services more compatible with LAN, WAN, and the Internet. In GPRS, the radio resources are used only when there actually is data to be sent or received. GPRS also provides immediate connectivity and very short set-up for sending a data packet. The throughput is as high as in high speed circuit switched data (HSCSD). The Nokia MetroSite EDGE Base Station supports GPRS coding schemes 1 and 2.

3.3.2 Enhanced General Packet Radio Service (EGPRS)

EGPRS is built on top of GPRS to increase the data rate of GPRS by applying EDGE modulation and increasing the Air interface throughput. The data rate of GPRS is increased up to threefold with EGPRS. The Nokia MetroSite EDGE Base Station supports EGPRS modulation and coding schemes (MCS) 1 to 7.

EGPRS requires EDGE capable TRXs to be fitted in the BTS and CX 3.2 software or later.

3.4 Easy and fast deployment

This section describes the installation and commissioning procedures of the Nokia MetroSite EDGE Base Station. The detailed task-oriented instructions can be found in *Nokia MetroSite EDGE Base Station: Installation* and in *Nokia MetroSite EDGE Base Station: Commissioning*.

3.4.1 Installation

Variety of installation possibilities

Due to its small size, unobtrusive appearance, low weight, and high level of integration, the Nokia MetroSite EDGE Base Station accommodates a variety of new installation possibilities. The extended environmental performance of the Nokia MetroSite EDGE Base Station enables installation indoors and outdoors, even in extreme climatic conditions. Mounting options are available for both wall and pole installations. The Nokia MetroSite EDGE Base Station can also be mounted horizontally on its back. For more information on mounting positions refer to *Nokia MetroSite EDGE Base Station: Requirements for Installation and Operation*.

Delivery and installation procedure

The Nokia MetroSite EDGE Base Station is delivered to the site with the ordered plug-in units pre-installed. Shield units are installed in those unit slots that are not occupied by functional units. The purpose of shield units is to provide protection for the backplane connectors, ensure optimal air flow inside the cabinet, and provide EMC and weather shielding for the BTS.

After unpacking the delivery, some of the units can be removed from the BTS to make it easier to handle. Usually, removing only the TRXs makes the Nokia MetroSite EDGE Base Station light enough to handle.

The Nokia MetroSite EDGE Base Station is then installed on a wall or a pole. In wall mountings, the packing cardboard can be used as a template for drilling the anchor screw holes to the wall. In pole mountings, an additional pole mounting kit is used to attach the BTS to the installation pole.

After the removed plug-in units are reinstalled, the cabinet ground and power cables are connected. The next step is to connect the diversity cables, transmission cables and antenna cables. Then the BTS is powered up and commissioning is started. Finally, the lock and the cover are installed to the BTS.

3.4.2 Commissioning with the Nokia MetroSite BTS Manager

Nokia MetroSite BTS Manager is a PC-based tool which includes a commissioning wizard that guides the user throughout the whole commissioning process.

Autodetection

The BTS software includes an autodetection feature which identifies the BTS hardware. This reduces the time spent for commissioning as the user does not have to create a separate HW database for the BTS. The system data is replicated to each TRX so that none of the BTS parameters are lost when the units are replaced.

No external measuring devices are needed for BTS commissioning tests.

The task-oriented instructions for each step can be found in *Nokia MetroSite EDGE Base Station: Commissioning* document.

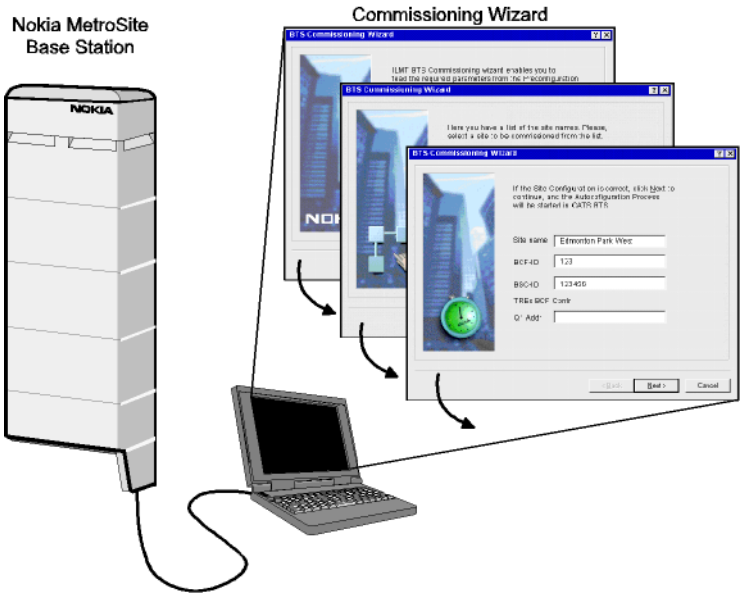

Figure 3. Nokia MetroSite BTS Manager Commissioning Wizard

Manual commissioning

Before the commissioning at the BTS site can be started, the following tasks must be performed:

- The LAPD links must be created at the BSC
- The PCM port at the BSC must be set to active

The commissioning procedure performed on site with the Nokia MetroSite BTS Manager includes the following steps:

- Transmission configuration
- Checking alarms and EACs
- Running the tests
- Creating the BTS commissioning report

In the near future, the use of the Site Configuration File (SCF) will considerably ease the commissioning as most of the parameters can be fed directly from the file, for example, the Abis time slot allocation can be automated.

The Nokia MetroSite BTS Manager automatically produces a commissioning report at the end of the commissioning process.

3.5 Advanced operation and maintenance

The features concerning the operation and maintenance (O&M) of the Nokia MetroSite EDGE Base Station are described in this section.

During operation, the Nokia MetroSite EDGE Base Station is managed remotely from the OSS. Site visits to carry out routine O&M tasks are not usually needed.

3.5.1 Integration of TRX and base control functions (BCF)

One of the TRXs is configured as the master TRX of the BTS. Physically there is no difference between the master TRX and the slave TRXs. In addition to the normal TRX functions, the master TRX handles the BTS operation and maintenance functions. Consequently, there is no need for a dedicated plug-in unit to handle these functions. For more information refer to Section 6.1.2. The O&M signalling and TRX signalling can also be combined into one channel to optimise the use of transmission capacity.

3.5.2 BTS diagnostics, alarms and TRX test

Alarm diagnostics

The Nokia MetroSite EDGE Base Station features a BTS diagnostics system that considerably reduces the number of alarms. Relevant alarm information is easily accessible and understandable. A detailed description of the Nokia MetroSite EDGE Base Station alarms can be found in the software release documentation.

The alarm diagnostics system filters out spurious alarms, reporting only those alarms that directly affect the BTS service level. The alarms are addressed to the unit level, which helps the maintenance engineers locate the faulty unit.

In the case of a mains power failure, the Nokia MetroSite EDGE Base Station provides sufficient backup time for an alarm to be sent to the BSC.

TRX test

The TRX test is a multipurpose test designed for testing the total performance of the intended TRX and Radio Time Slot (RTS). The test can be run locally from the Nokia MetroSite BTS Manager, or remotely from the BSC/OSS when the Abis connection is established. Locally, the TRX test is usually performed during commissioning of the Nokia MetroSite EDGE Base Station.

The TRX test covers all functions between the Abis and Air interfaces: digital and RF parts, antenna cable detection, RX sensitivity, and TX level. The main reason for providing a single multipurpose test is to minimise the total test time; once the time slot is reserved for testing, the test time is used effectively. The test utilises the multifunctional RF loop and it is automatically performed for both RX branches. The test time is approximately 15 seconds. The test can be used as an RF performance supervision test when performed according to a regular schedule from the NMS/2000.

For more information on the TRX test refer to the *Software Release Binder*.

3.5.3 Battery backup with Nokia MetroSite Battery Backup

If additional battery backup is needed, the Nokia MetroSite Battery Backup unit can be used for this purpose. The Nokia MetroSite Battery Backup provides one hour backup time for the Nokia MetroSite EDGE Base Station operating at 400 W. The Nokia MetroSite Battery Backup is an external unit with the same appearance and mounting options as the Nokia MetroSite Base Station itself.

For more information on Nokia MetroSite Battery Backup, refer to *Nokia MetroSite Battery Backup User Manual*.

3.5.4 Temperature control

The Nokia MetroSite EDGE Base Station operates in the ambient temperatures ranging from -40ºC to +50ºC (-40ºF to +122ºF), solar radiation 1120 W/m^2.

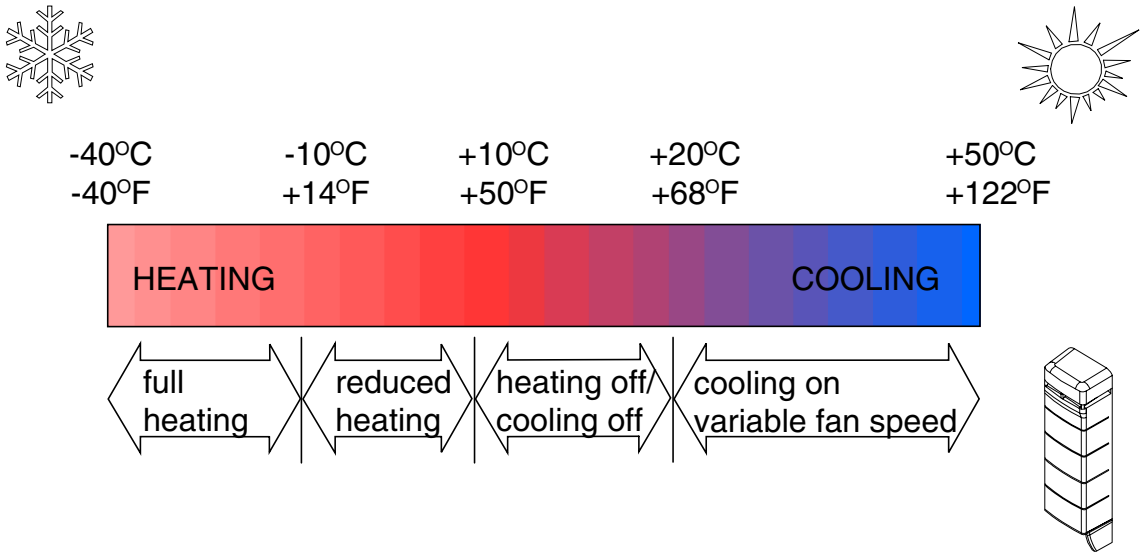

Figure 4. Temperature management diagram

The BTS has a cooling fan and built-in heaters to provide a smooth temperature controlling facility. The BTS software controls the heating and cooling to provide operation conditions which are as stable as possible. Heating and cooling are adjusted gradually to ensure low temperature gradients and noise levels. The temperature is continuously monitored with sensors placed on active units.

The heater elements are located inside the transceiver and transmission units. When the BTS starts up in an extremely cold environment, the units are warmed up to the operation temperature range (-10ºC or +14ºF within each TRX) before the actual BTS operation starts.

The fan unit generates the cooling air flow inside the BTS. The fan unit has 16 speeds, ensuring low temperature gradients and noise levels.

If the temperature of any unit rises too high, due to a broken fan unit or too hot conditions on the site for example, the TRX issues an analysed temperature alarm to the BSC. The master TRX then shuts down the appropriate TRX. Similarly, if the power supply is overheated, the master TRX switches off the power for all units. The power supply switches the power back on when the temperature has returned to the operational range.

During operation, the master TRX starts the heating process if the internal temperature drops below the specified limit.

4 Applications

This chapter describes the typical applications of the Nokia MetroSite EDGE Base Station including the transmission alternatives.

4.1 Building capacity with the Nokia MetroSite EDGE Base Station

The Nokia MetroSite EDGE Base Station can be used for building capacity in areas of heavy telecommunication traffic, such as for building infill, street corners, sports arenas, shopping centres, and underground stations. It can also be used for coverage of gaps in networks, such as for unfriendly terrain or roadside coverage.

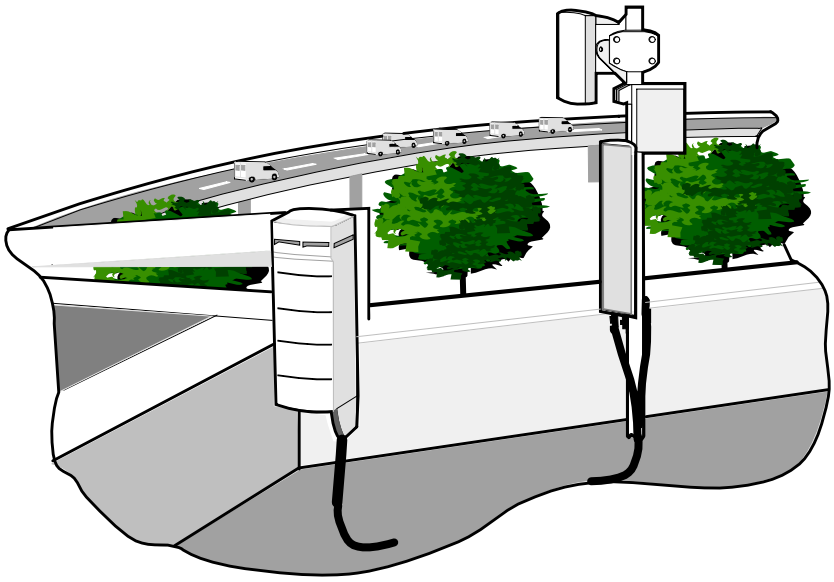

Figure 5. Roadside coverage with the Nokia MetroSite EDGE Base Station

Efficient frequency re-use requires that the size of the coverage area (cell) be limited. Figure 6 shows how the buildings surrounding the Nokia MetroSite EDGE Base Station can be used to limit the cell size and shape in an urban environment.

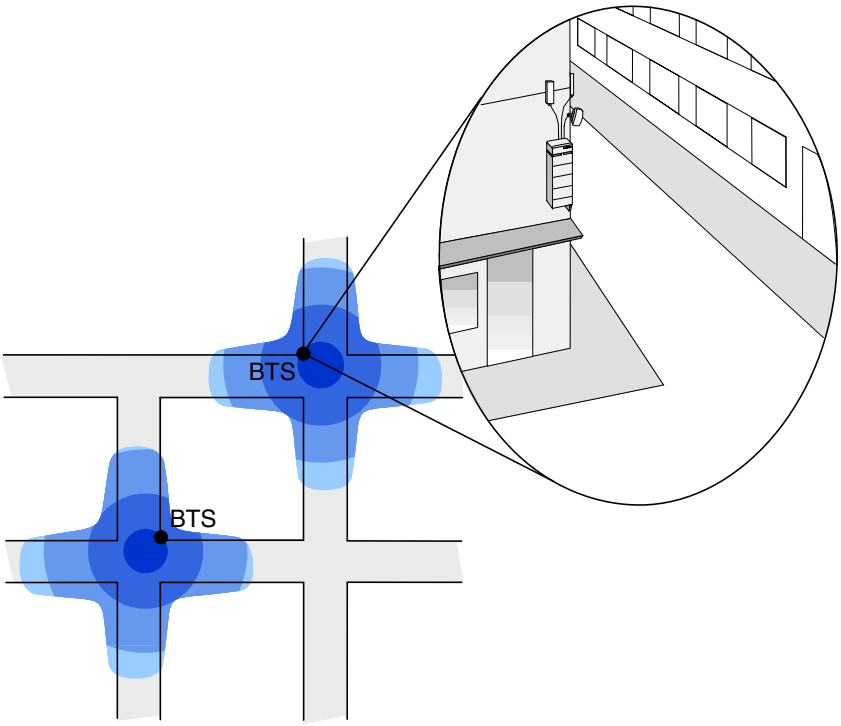

Figure 6. Microcells built with the Nokia MetroSite EDGE Base Station

The Nokia MetroSite EDGE Base Station can be sectored freely. A sector consists of one broadcast control channel (BCCH) TRX and, often, one to three traffic channel (TCH) TRXs. The maximum number of TRXs in one sector is four.

At the BSC, one of the slave TRXs is by default defined as the BCCH TRX. The BCCH TRX the most likely TRX to need replacement and a slave TRX can be replaced without interrupting the BTS operation. If desired, the BCCH can be forced on the master TRX by using the preferred BCCH feature at the BSC.

By using the different sectoring possibilities provided by the Nokia MetroSite EDGE Base Station and by directing the antennas, different types of coverage areas can be created. The actual shape of the coverage areas varies depending on the environment.

TRXs from different sectors can be connected to one antenna. The following examples assume that the MetroSite antenna is used; the diversity applications may differ from the ones presented here if different antenna types are used.

Figure 7 presents a single band (GSM/EDGE 900) BTS which has four TRXs in one sector. The antennas are directed to the same direction; the resulting coverage area comprises four TRXs. In order to employ diversity, it is most feasible to connect the TRXs which share the diversity to different antennas.

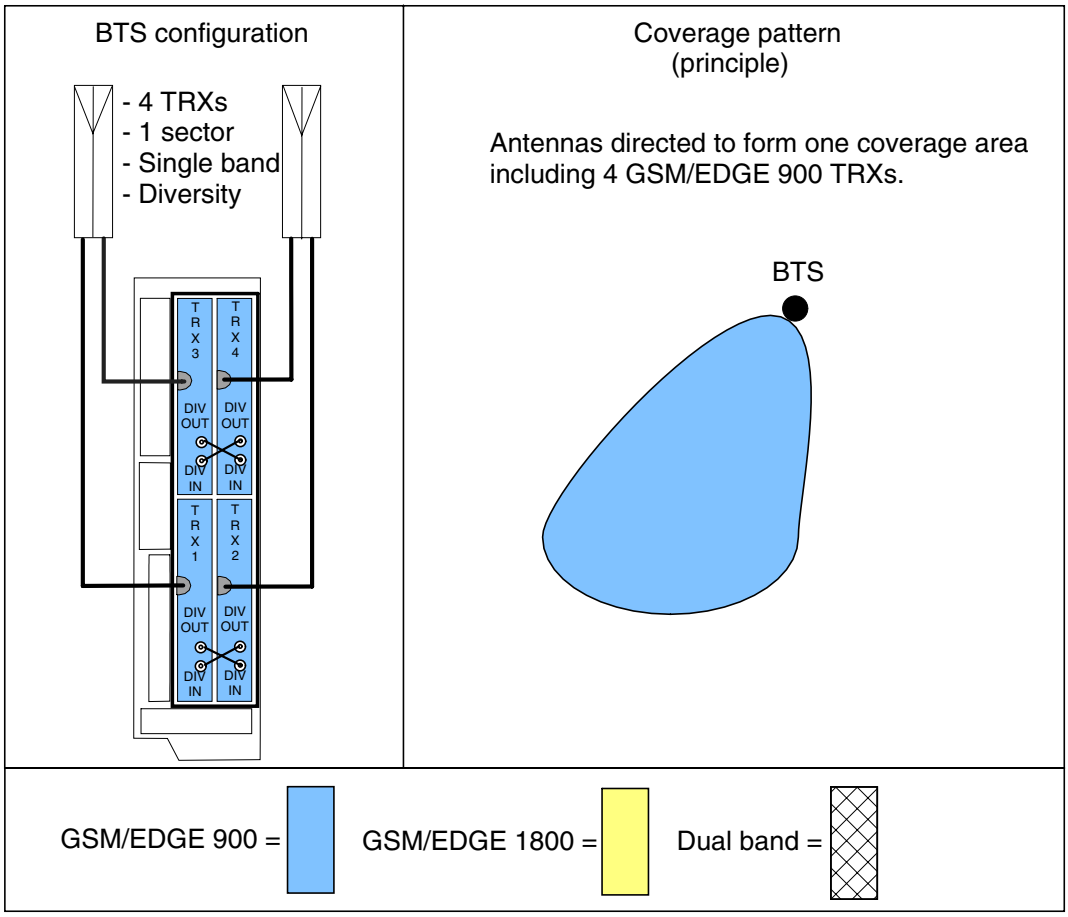

Figure 7. Four TRXs in one sector, single band configuration

With dual band antennas, such as the MetroSite antenna, overlapping GSM/EDGE 900 and GSM/EDGE 1800 coverage areas can be created by connecting TRXs from a GSM/EDGE 900 sector and TRXs from a GSM/EDGE 1800 sector to one antenna.

Figure 8 shows schematically the coverage areas created with a BTS that has four sectors (two GSM/EDGE 900 sectors and two GSM/EDGE 1800 sectors) in a (1+1)/(1+1) configuration. In Figure 8 , one GSM/EDGE 900 and one GSM/EDGE 1800 sector are connected to each antenna. The antennas are directed to different directions.

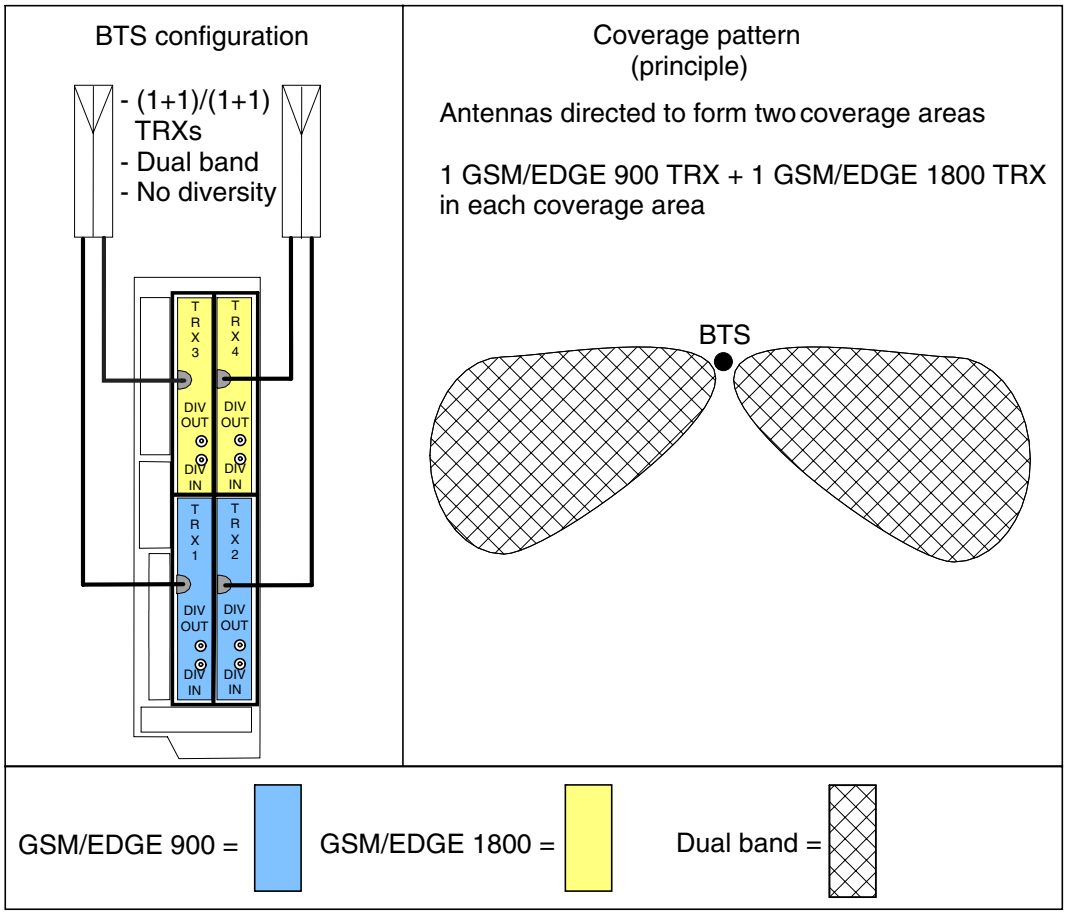

Figure 8. (1+1)/(1+1) dual band configuration

The 2+2 dual band configuration can be used to build one directional dual band coverage area. This configuration has one GSM/EDGE 900 sector which includes two TRXs, and one GSM/EDGE 1800 sector also including two TRXs. One TRX from the GSM/EDGE 900 sector and one TRX from the GSM/EDGE 1800 sector are connected to one antenna. The antennas are directed to the same direction. Consequently, the coverage area comprises four TRXs (two GSM/EDGE 900 and two GSM/EDGE 1800 TRXs). Diversity can also be utilised in this type of configuration. Figure 9 shows schematically the coverage area built in this manner.

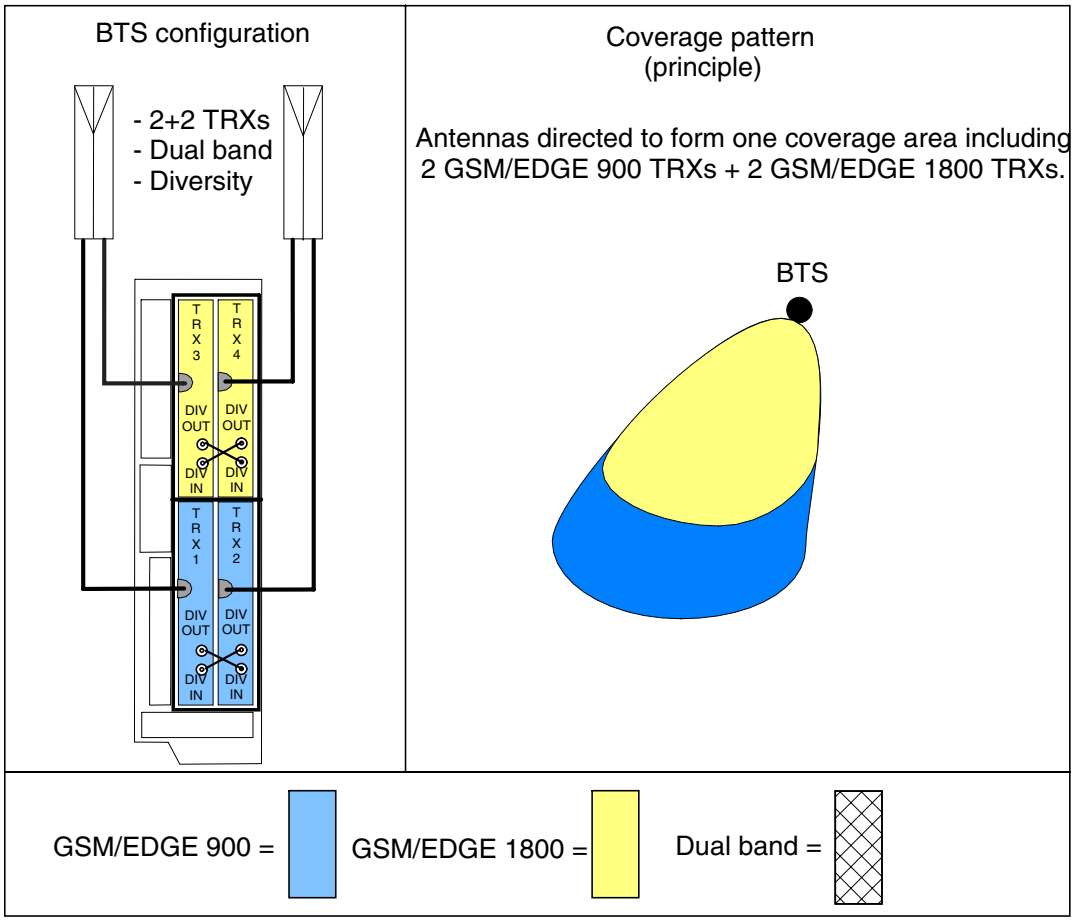

Figure 9. 2+2 dual band configuration

Another way to build overlapping GSM/EDGE 900 and GSM/EDGE 1800 cells, is to direct single band GSM/EDGE 900 and GSM/EDGE 1800 antennas towards the same direction.

The Nokia MetroSite EDGE Base Station can be used to build fill-in coverage in areas that are difficult to reach with conventional base stations. In these cases, it is recommended that high-gain antennas are used.

4.2 Transmission with the Nokia MetroSite EDGE Base Station

This section describes the transmission topologies that can be built by using the transmission unit capacity of the Nokia MetroSite EDGE Base Station. The transmission node that expands the transmission capacity is typically the Nokia MetroHub Transmission Node. For more information on the larger configurations, refer to Nokia MetroHub Transmission Node documentation.

The transmission unit takes care of the transmission between the Nokia MetroSite EDGE Base Station and the BSC through the Abis interface. The transmission media can be either radio link (RRI) or wireline (E1/T1).

The FC RRI and FXC RRI transmission units are used with Nokia MetroHopper radios and/or Nokia FlexiHopper microwave radios. The FC E1/T1, FXC E1 and FXC E1/T1 transmission units are used for wireline transmission.

Note

When EDGE transmission is being used, the FC type transmission units are not recommended because of the high data transfer rates that are possible with EDGE.

The FXC RRI, FXC E1 and FXC E1/T1 transmission units have a cross-connect capability. The bidirectional connection between two interface ports (B2 cross-connection) can be made with 2M, nx64k, 64k, 32k, 16k and 8k granularities. Granularity refers to the number of bits connected into a specific direction in the cross-connection.

The FC RRI and FC E1/T1 transmission units are used in the termination points of the transmission chain. More information on transmission unit alternatives can be found in Chapter 6.

Examples of transmission topologies built with different transmission units are presented in Figure 10. Depending on the type of transmission unit, it is possible to use the following network topologies:

- Chain connection (A and B in Figure 10)
- Star connection (C and D in Figure 10; with the radio transmission alternative, the centre point of the star is always a transmission node)
- Loop connection (E and F in Figure 10)

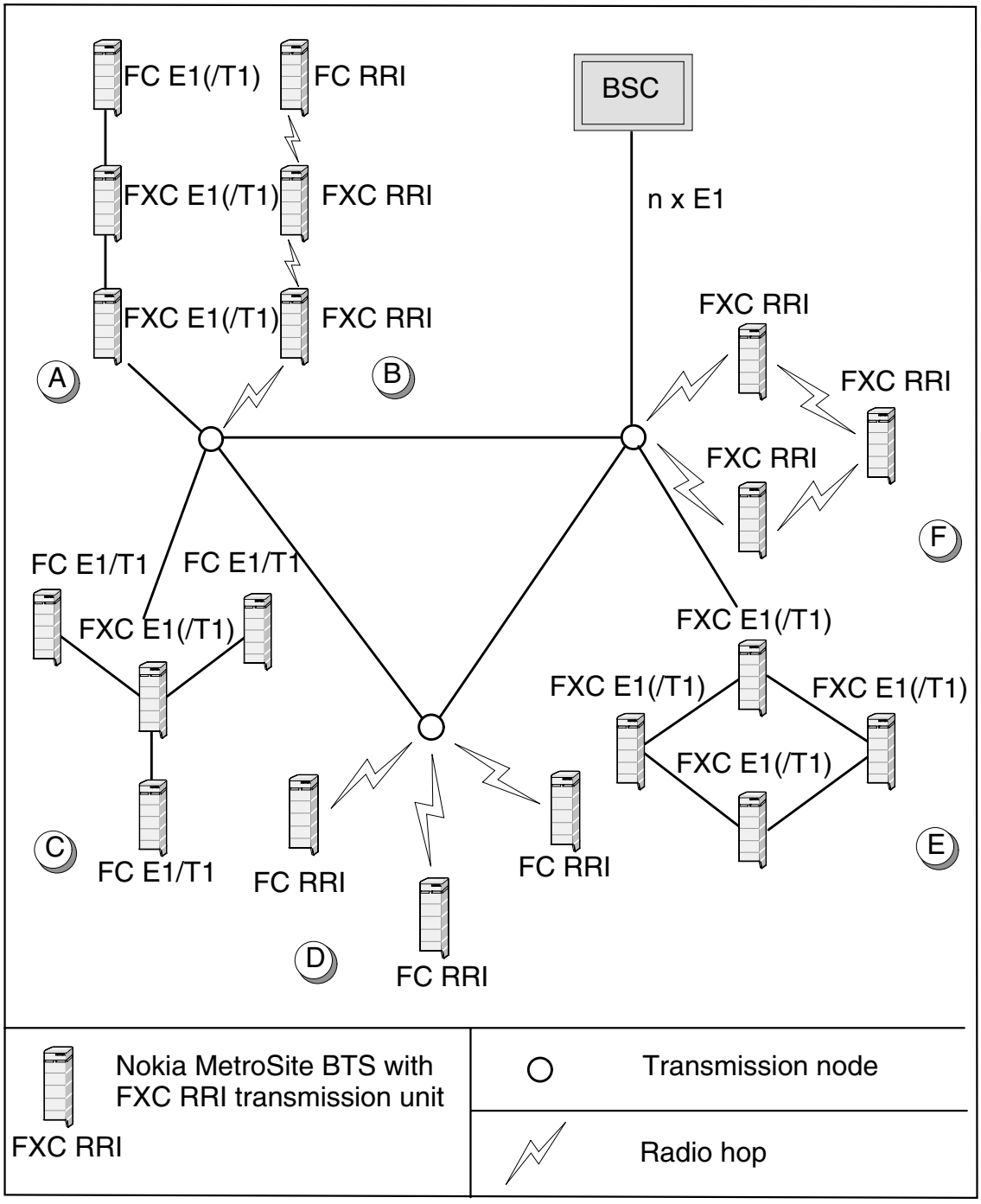

Figure 10. Examples of transmission connections

Furthermore, the Nokia MetroSite EDGE Base Station can be directly connected to the BSC.

The Nokia MetroSite EDGE Base Station supports 16 Kbit/s, 32 Kbit/s and 64 Kbit/s Abis TRX signalling. The O&M signalling speed alternatives are 16 Kbit/s, 32 Kbit/s and 64 Kbit/s. To optimise the use of transmission capacity, combined O&M and TRX signalling is also supported at all these speeds.

Locally, the transmission configuration is managed with the Nokia MetroSite BTS Manager. Information on how to create different transmission configurations can be found in the MetroSite BTS Manager's on-line Help.

Note

Since EDGE can carry higher data rates than GSM, the specification of the transmission unit and its configuration should be of suitably high capacity when using GSM/EDGE TRXs.

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5 Nokia MetroSite EDGE Base Station related software

This chapter describes the Nokia MetroSite EDGE Base Station software (SW) and the Nokia MetroSite BTS Manager software.

Generally, the Nokia MetroSite EDGE Base Station is managed remotely from the OSS via the BSC. The management tasks carried out on site are kept to a minimum. On site, the Nokia MetroSite BTS Manager is used for BTS management.

The Nokia MetroSite EDGE Base Station is delivered to the customer with the SW pre-installed in order to support rapid deployment of the BTS. The Nokia MetroSite EDGE Base Station SW is to a large extent based on the SW for the field-proven Nokia Talk family of base stations and is enhanced with new and improved features. The new, highly embedded Nokia MetroSite EDGE Base Station SW makes it possible to upgrade the BTS on-line without interrupting the BTS operation. Also, the number of alarms sent from the BTS to the BSC is reduced considerably due to the advanced BTS diagnostics system.

The Nokia OSS incorporates a full range of functions from fault, performance, and configuration management to transmission and security management and troubleshooting. For more information, refer to Nokia OSS documentation.

The NMS/2000 SW T13 and BSC SW S10 releases fully support the Nokia MetroSite EDGE Base Station.

5.1 Nokia MetroSite EDGE Base Station software

The Nokia MetroSite EDGE Base Station can store two SW packages in its non-volatile memory. The SW can be loaded to the BTS either locally from the Nokia MetroSite BTS Manager or remotely from the BSC or the NMS/2000. The SW packages are loaded to the non-volatile memory of each TRX.

The BSC updates the BTS SW packages if they are different from the BSC SW. After downloading, new SW is activated by reset and the initialisation takes approximately one minute. The BTS and its units can be reset separately for testing purposes, locally with the Nokia MetroSite BTS Manager and remotely from the BSC or the NMS/2000.

The BTS start-up procedure has been optimised to shorten the boot-up time. No time-consuming tests are done during the BTS start-up, which contributes to rapid deployment of the BTS and shorter breaks in service after power failures.

Alarms generated by the Nokia MetroSite EDGE Base Station are radically reduced by advanced diagnostics and alarm management. Only the unit level and BTS level alarms are sent to the BSC. Correlation rules and fault diagnostic procedures ensure that the appropriate recovery procedure is activated automatically. The fault diagnostics make it possible to locate a fault to a specific unit of the BTS or to a specific part of the BTS system.

5.2 Nokia MetroSite BTS Manager software

Nokia MetroSite BTS Manager is primarily used to commission the BTS and carry out maintenance tasks locally. BTS sectoring and TRX numbering can be read from the Nokia MetroSite BTS Manager's display. During normal operation the Nokia MetroSite EDGE Base Station is managed remotely from the OSS.

Nokia MetroSite BTS Manager provides a graphical user interface, running in Windows NT, Windows 95, and Windows 98 environments. The Nokia MetroSite BTS Manager provides a commissioning wizard software to ease the process of BTS commissioning. Instructions on how to use the Nokia MetroSite BTS Manager are given in a context-sensitive on-line Help.

The system requirements for the Nokia MetroSite BTS Manager are detailed in Table 27.

Figure 11 shows an example of the Nokia MetroSite BTS Manager desktop with the following windows opened:

1. *Equipment View* in the *Supervision* window
2. *BTS Events* window
3. *Alarms* window

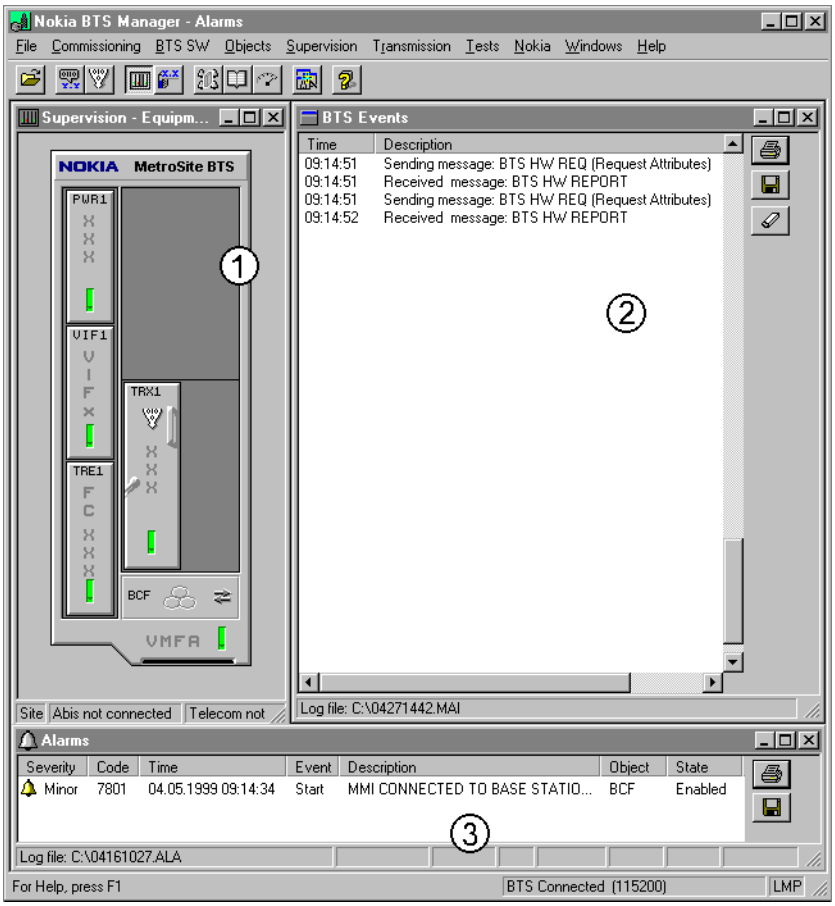


Figure 11. Nokia MetroSite BTS Manager desktop

Note

Nokia MetroSite BTS Manager is part of the Nokia SiteWizard SW package.

5.3 BTS software updates

When the Nokia MetroSite EDGE Base Station software is updated, it can be loaded either locally with the Nokia MetroSite BTS Manager, or remotely from the BSC or the OSS (via the BSC). The transmission unit software is downloaded transparently from the network management system (NMS) or locally with Nokia MetroSite BTS Manager.

The BTS SW is loaded to the master TRX which in turn updates the software in the slave TRXs. When new TRXs are added for more capacity, or when TRXs are replaced for maintenance reasons, the master TRX updates the software in the new slave TRXs if their software version is different from the master TRX SW.

The Nokia MetroSite EDGE Base Station software can be downloaded as a background operation without interrupting the BTS operation. The activation of new software causes a short break in service. However, the activation can be done remotely from the BSC/OSS during the hours of low telecommunication traffic. For more information refer to the *Software Release Binders*.

The Nokia MetroSite EDGE Base Station software updates are delivered to the customer on diskettes which contain the current version of the BTS software. The Nokia MetroSite BTS Manager is delivered on CD-ROM with Nokia SiteWizard.

For more information on Nokia MetroSite EDGE Base Station SW, refer to Nokia MetroSite EDGE Base Station software release documentation.

6 General function, construction and units

This chapter describes the general function, mechanical construction and plug-in units of the Nokia MetroSite EDGE Base Station.

6.1 Nokia MetroSite EDGE Base Station general function

6.1.1 Signalling between network, BTS and MS

The general principle of signalling between the network, the BTS and the Mobile Station (MS) is presented in Figure 12. A more detailed description of the signal flow within the Nokia MetroSite EDGE Base Station is presented in Section 6.3.

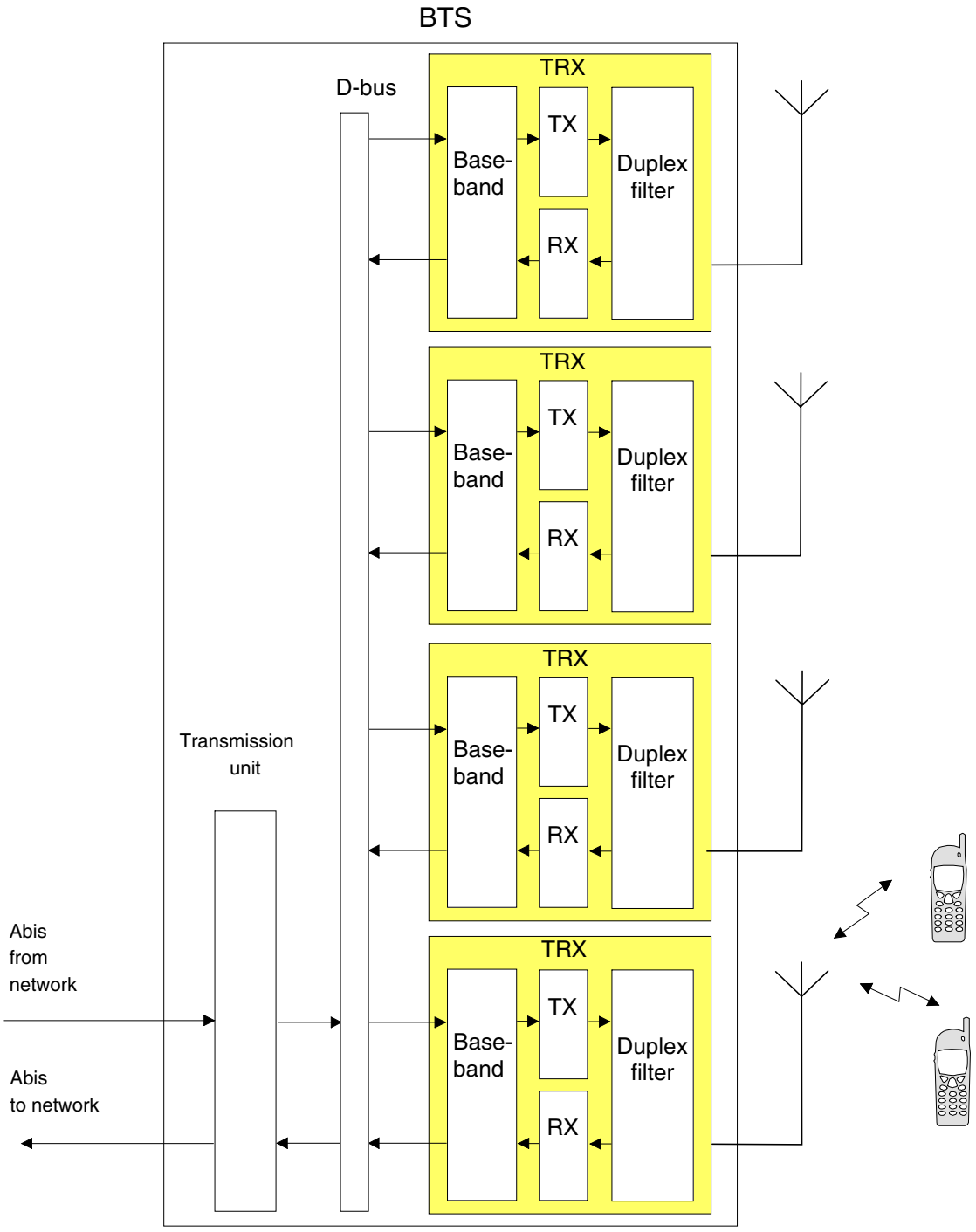


Figure 12. General principle of signalling between network, BTS and mobile station

In the uplink direction, the signal from the MS is picked up by the antennas and then passes through the duplex filter to the RX part of the transceiver unit. In the RX part, the signal is converted to the intermediate frequencies (IF) and filtered. The baseband module performs the digital signal processing and sends the signal via the D-bus to the transmission unit. The transmission unit connects the BTS via the Abis interface to the BSC. The Abis interface can be either a cable or radio link.

In the downlink direction, the signal from the network is submitted via the transmission unit and D-bus to the baseband module for digital signal processing. The transmitter part of the transceiver unit receives the modulated baseband signal from the baseband module, filters the signal to sufficient output spectrum purity, and raises it to the carrier frequency. The signal goes through the duplex filter to the antenna; and the antenna sends the signal via the Air interface to the receiving MS.

6.1.2 Nokia MetroSite EDGE Base Station internal function

A block diagram of the Nokia MetroSite EDGE Base Station is shown in Figure 13.

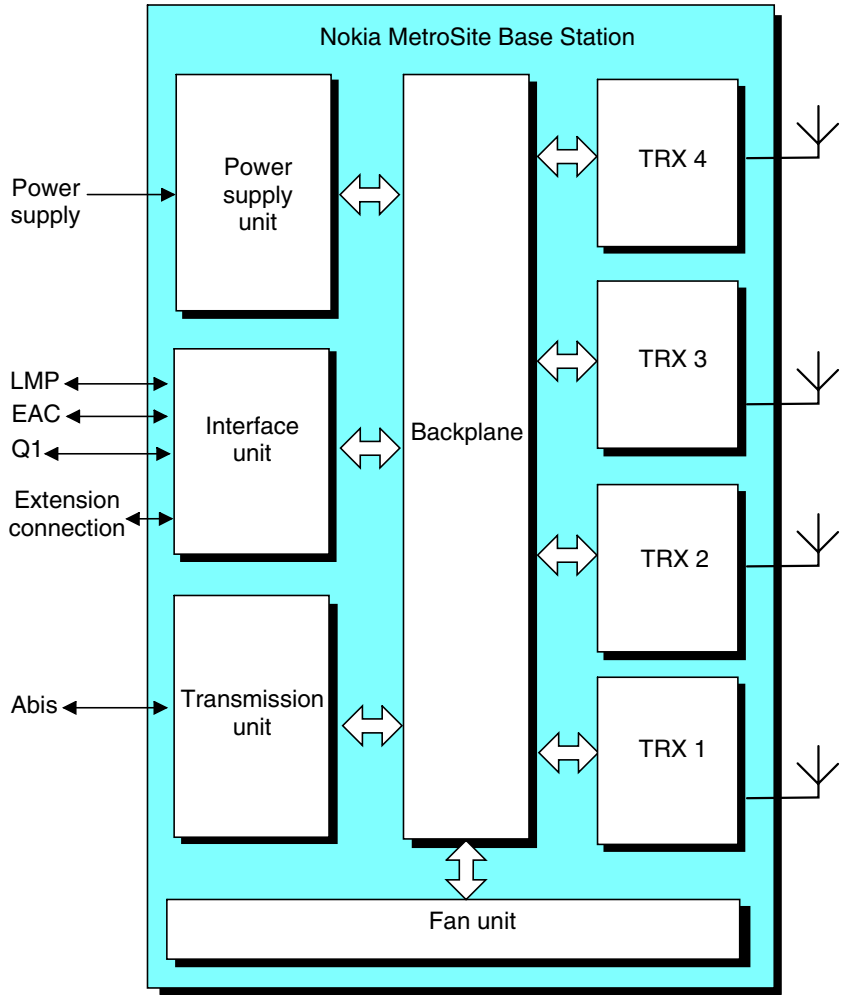


Figure 13. Nokia MetroSite EDGE Base Station block diagram

BTS internal buses

The BTS internal signalling and the signalling between the BTS and the adjacent external equipment is handled by the following buses:

- D1-bus, which handles the data transfer and signalling between the TRX units and the transmission unit.
- D2-bus, which is the main communication channel between the master TRX and slave TRXs. Software downloading is handled through the D2-bus.
- Local Management Bus (LMB), which is used for the BTS and the transmission units' control.

- Q1int-bus, which is used for local transmission management.
- Q1-bus, which is used for external equipment management.
- F-bus, which is used for data transfer and signalling between TRX units.
- I^2C-bus (cabinet management bus), which handles the alarm and control signalling between passive units (all units except for transmission units).

Physically, the buses are located on the BTS backplane.

Base control functions

The Nokia MetroSite EDGE Base Station does not have a separate plug-in unit for base control functions (BCF) because one of the TRXs is configured as the master TRX of the BTS. Currently, the master TRX is always located in TRX slot 1 (the lower left TRX slot, next to the transmission unit and interface unit slots). The following tasks are handled by the master TRX:

- BTS control
- Message delivery to the BSC
- Alarm handling
- Timing functions
- Software downloading
- Self-testing of the BTS

Power distribution

The electrical power (AC or DC) from the external power source is distributed within the Nokia MetroSite EDGE Base Station by the BTS's power supply unit. The power supply unit distributes DC power to the plug-in units. All electrical connections are conveyed via the backplane. For information on the output voltages, refer to Section 6.6.2.

The power supply unit is capable of feeding power to the maximum BTS configuration which includes either two Nokia MetroHopper Radio outdoor units or two Nokia FlexiHopper Microwave Radio outdoor units.

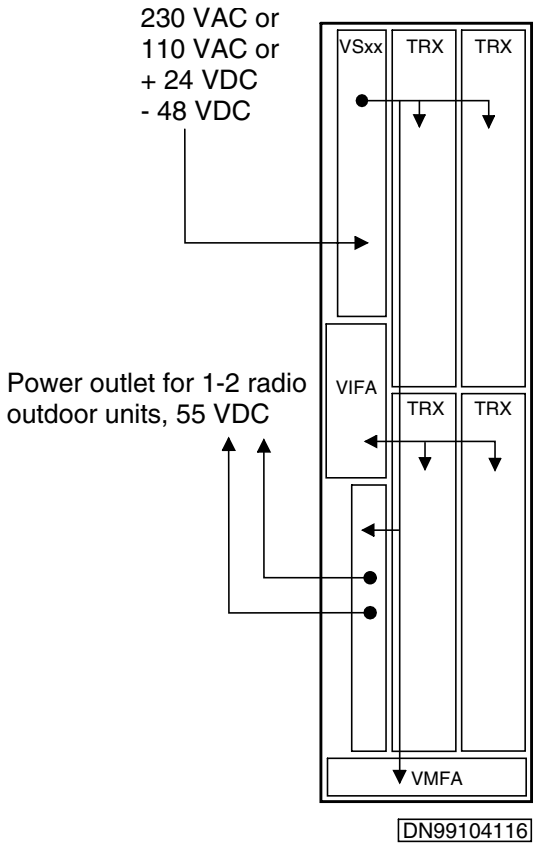


Figure 14. Power distribution in the Nokia MetroSite EDGE Base Station

6.2 Cabinet (HVMC) and cover (HVCU, WCUA)

Similarly to all the other properties of the Nokia MetroSite EDGE Base Station, its construction has been optimised for microcellular, building infill and roadside coverage solutions. The chassis and the units are easy to install and move, and the compact structure provides new installation possibilities.

The Nokia MetroSite EDGE Base Station features a lightweight aluminium chassis with a stainless steel sheet metal backplate, aluminium die-cast guides, and a backplate cover. The Nokia MetroSite EDGE Base Station chassis has a compact plug-in construction covered by a separate two-tone plastic cover (coloured light grey NCS-S-2500-N and grey NCS-S-1500-N). If desired, the cover can be painted so as to better blend into the surrounding environment.

The cover shields the BTS against water, snow or solid foreign objects. The actual ingress protection and EMC shielding are provided by the chassis and the units.

An optional WCUA type cover is available. This cover is made from high impact polycarbonate and when fitted, the Nokia MetroSite EDGE BTS is designed to meet the requirements for National Equipment-Building Standards (NEBS).

The dimensions of the Nokia MetroSite EDGE Base Station are presented in Figure 15.

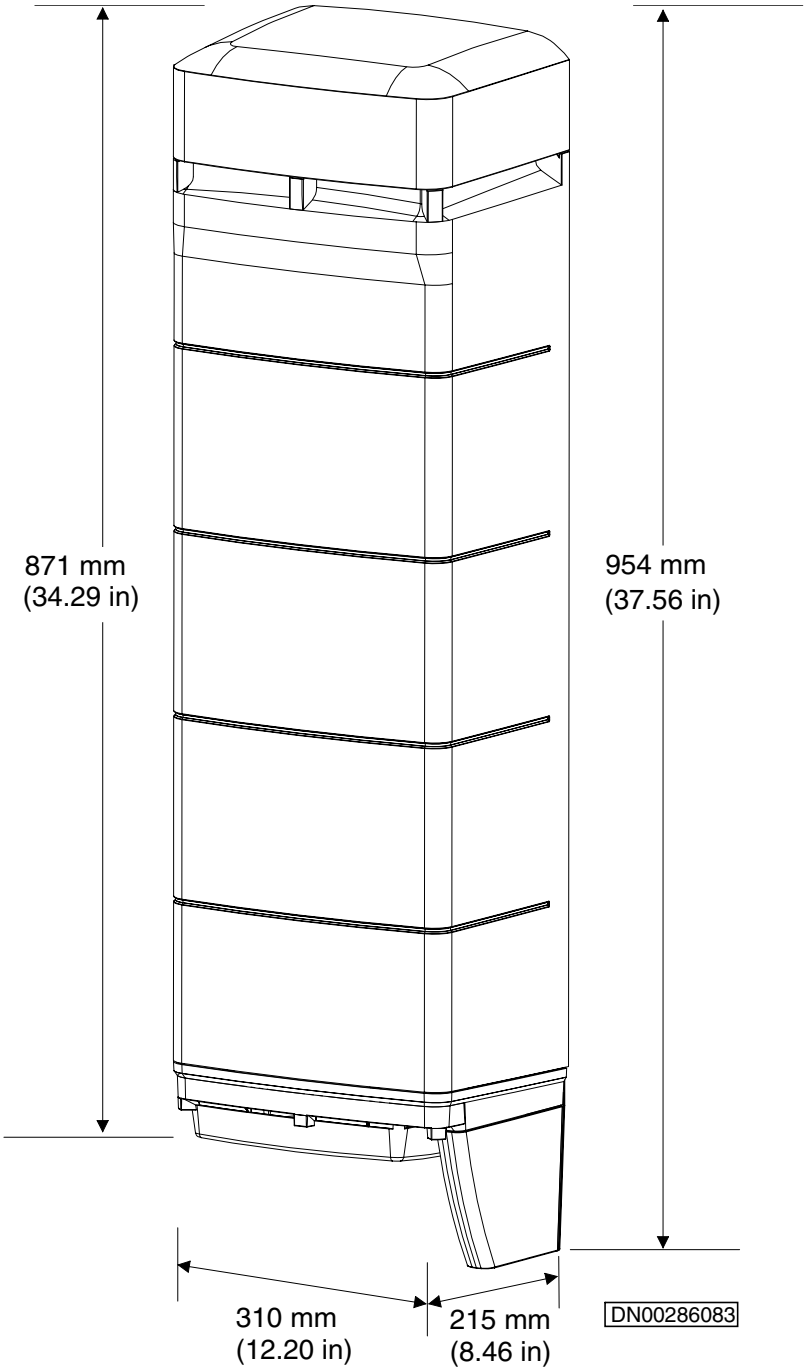


Figure 15. Dimensions of the Nokia MetroSite EDGE Base Station

Plug-in units

The plug-in units are connected to the BTS backplane via the connectors on their back panels. The following plug-in units have been fitted in the cabinet mechanics:

- Up to four TRXs
- Interface unit
- Transmission unit
- Power supply unit
- Fan unit

In the following sections, the Nokia abbreviations for different units are given in the parentheses after the sections' titles.

Note

The LED conditions of the units are presented in *Nokia MetroSite EDGE Base Station: Maintenance*.

Figure 16 shows the arrangement of the units.

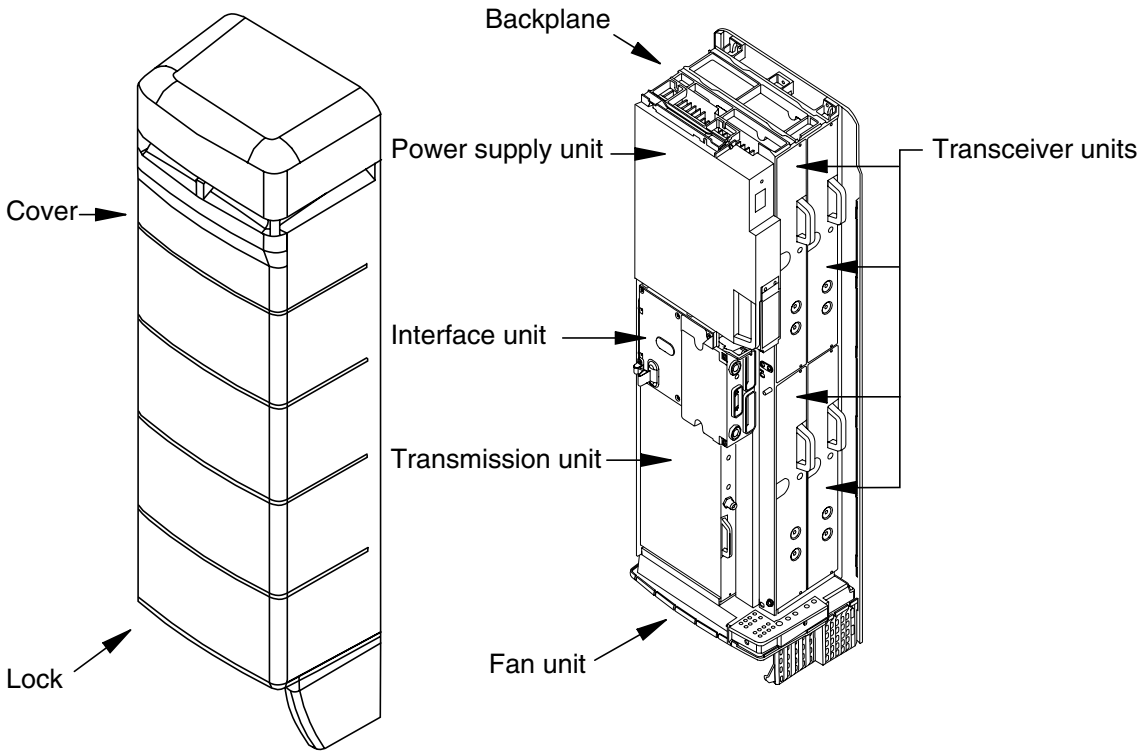


Figure 16. Arrangement of units

6.3 Transceiver unit (HVTxx and WTxx)

The main function of the transceiver unit (TRX) is to provide the analogue and digital signal processing required for handling one carrier, both in the uplink (MS to network) and the downlink (network to MS) direction.

There are 5W (HVTxx) GSM TRX versions available for the 900, 1800, and 1900 MHz frequencies and 5W (WTxx) GSM/EDGE TRX versions available for the 800, 900, 1800, and 1900 MHz frequencies. For a full list of the TRX alternatives, refer to Table 10.

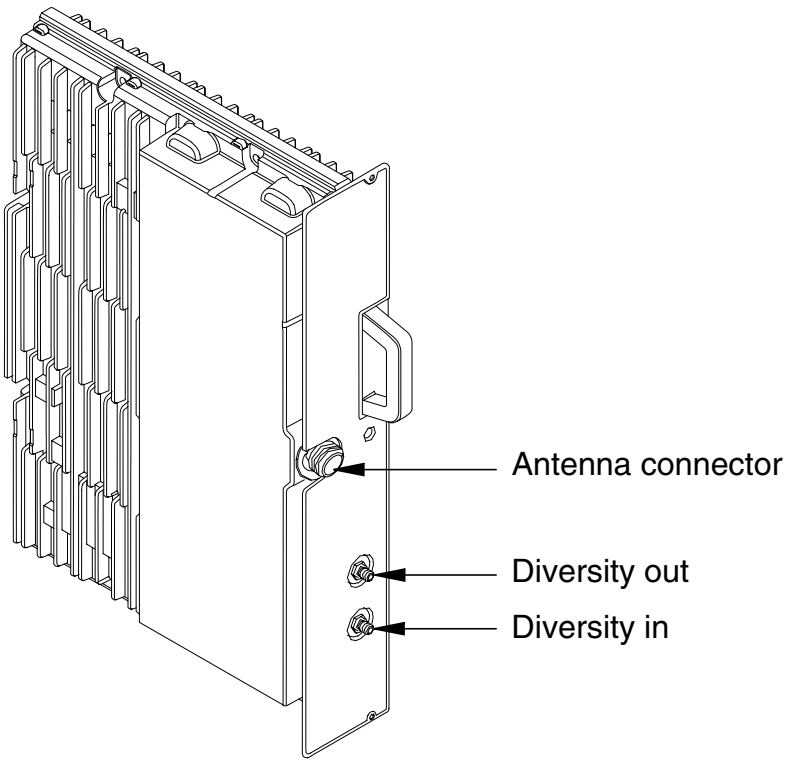


Figure 17. Transceiver unit

The transceiver unit of Nokia MetroSite EDGE Base Station consists of digital and analogue parts and mechanics. The digital functions are in the baseband module whereas the analogue part consists of an RF module and integrated duplex filter.

A block diagram of a Nokia MetroSite TRX is presented in Figure 18.

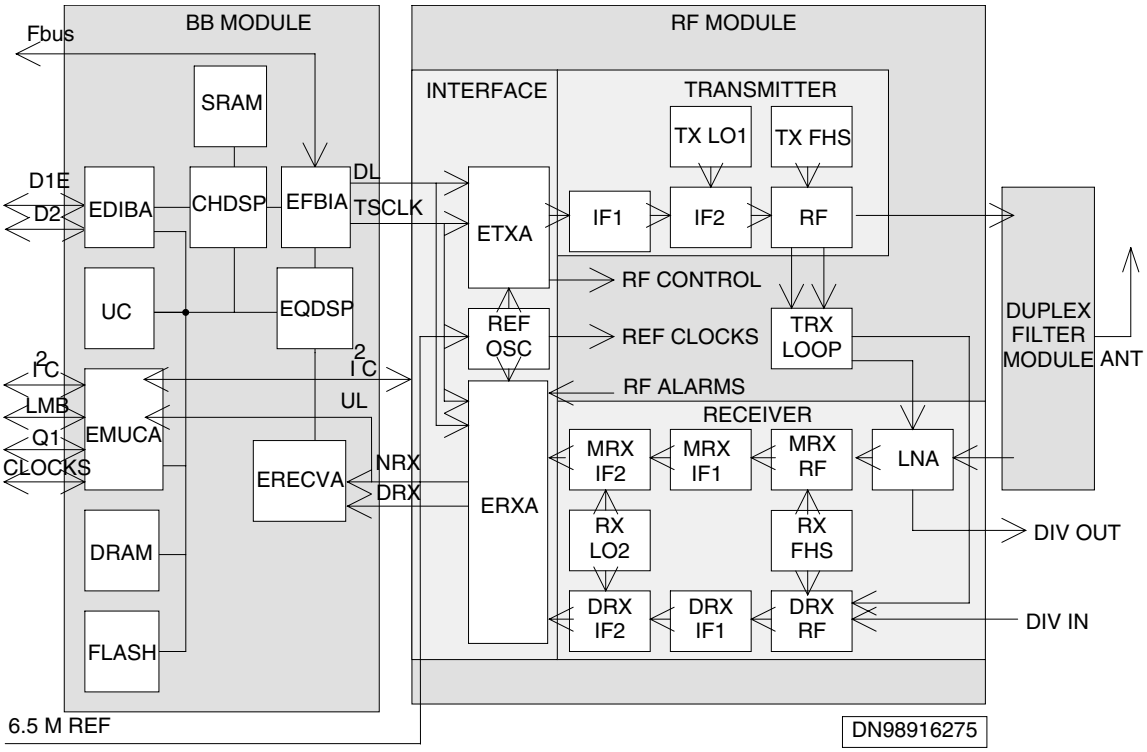


Figure 18. Block diagram of a Nokia MetroSite TRX

One of the TRXs is configured as the master TRX, which manages all the O&M functions of the BTS. In order to optimise the transmitter output power, the antennas are directly connected to the TRXs.

The nominal transmitter output power at the antenna connector is 5 W (37 dBm in GMSK, 35 dBm in 8-PSK). The single branch receiver sensitivity is better than -106.0 dBm for the TCH/FS channel type.

6.3.1 Baseband module

The baseband (BB) module carries out baseband digital signal processing of speech and data channels and manages all signalling for speech connections. It also handles software downloading and timing functions of the GSM/EDGE system.

The block diagram of the baseband module is shown in Figure 19.

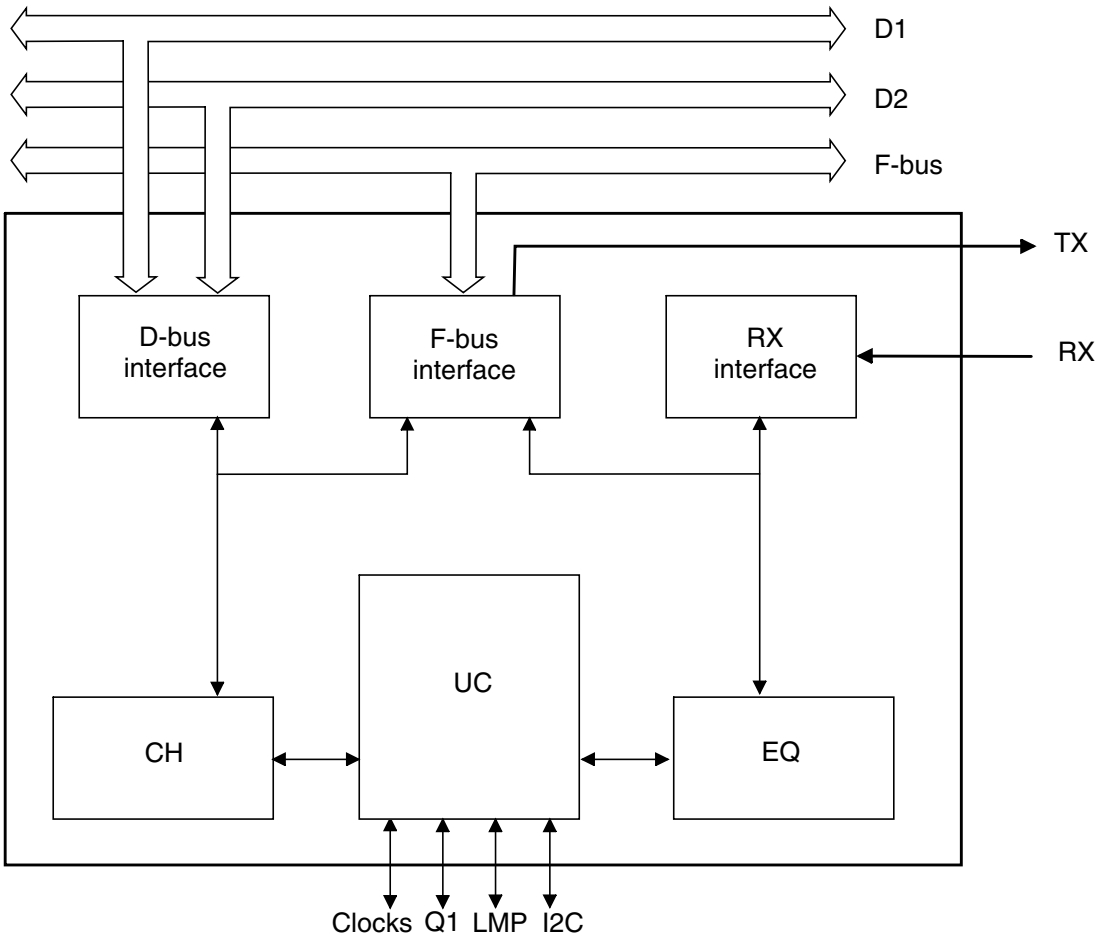


Figure 19. Block diagram of the baseband module

The BB contains the unit controller (UC), two DSPs, four ASICs and memory circuits.

In the downlink direction, the BB reads the TRAU or PCU frames coming from the transmission system via the D1E-bus. The data is then processed to GSM TDMA bit format. Bursts are sent via the downlink serial bus to the RF transmitter.

In the uplink direction, the BB receives a digital I/Q signal from the RF module for both main and diversity branches. The samples are combined, detected, decoded and assembled into TRAU or PCU frames for sending to the Abis connection.

The EMUCA ASIC (Application Specific Integrated Circuit) is a UC interface ASIC. It also handles clock generation and synchronisation, interrupt and alarm handling functions.

The EQDSP is functionally connected to the ERECVA ASIC. This block handles sample receiving from RF, channel equalisation and bit detection functions for both GMSK and 8-PSK.

The interface from the BB to the RF modules is via a serial bus with HDLC protocol, and contains downlink (DL) data and initialisation messages to the RF module. The RF to BB HDLC frame includes I (In Phase) and Q (Quadrature) components of the received signal, and also consists of alarms, timing and status information from the RF module.

The CHDSP is functionally connected to the EFBIA ASIC. This block handles burst transmitting to RF (DL_DATA), channel decoding and encoding, and ciphering and deciphering functions. EFBIA interfaces to the F-bus provide frequency hopping functions.

The BB contains FLASH and RAM memories. FLASH memory is used for the BTS SW and SW backup. There are separate RAM memories for the UC and CHDSP to store programs and data.

6.3.2 RF module

The RF module has four parts, the TX, RX, RF Loop, and digital interface.

The parts of the RF module are shown in Figure 20.

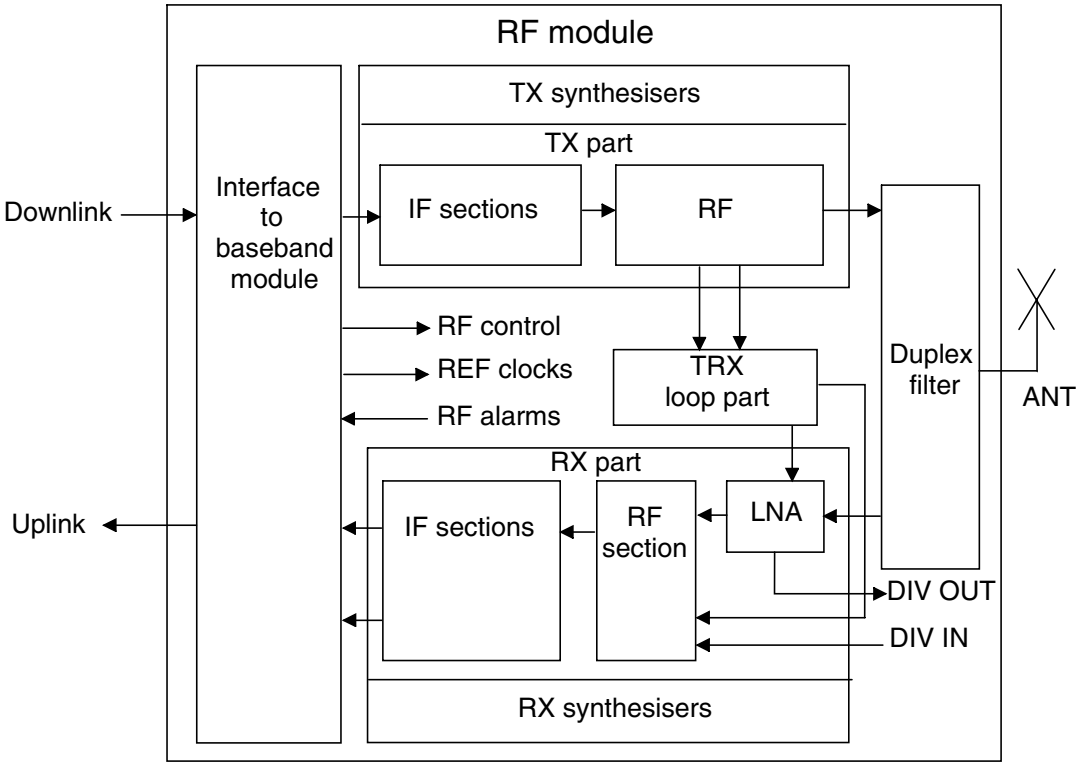


Figure 20. Block diagram of the RF module

Transmitter (TX) part

The transmitter (TX) part includes a Frequency Hopping System (FHS) of its own, two intermediate frequency blocks, an RF block, and a power control block.

In the TX part the modulation source, Gaussian Minimum Shift Keying (GMSK) or 8 Phase Shift Keying (8-PSK), is generated in the Direct Digital Synthesis (DDS) part of the Enhanced Up-converter ASIC (ETXA).

Two stages of up-conversion are used to achieve the carrier frequency. Filters are used within the chain to achieve spectral purity.

The RF module includes a TX FHS phase-locked synthesizer, for either frequency hopping between adjacent time slots or providing a fixed frequency signal in non-hopping mode. The FHS part consists of separate VCO module and PLL circuits. The TX FHS provides the local oscillator signal in the final up-conversion stage of the TX chain.

Receiver (RX) part

The receiver (RX) part includes a common LNA, FHS and the second LO. The RF block, two intermediate frequency blocks and AGC are separate for the main and diversity branches.

The LNA amplifies the signal for the main RX branch and provides diversity output for the other TRX. The diversity input from the other TRX is fed to the first mixer of the diversity branch.

The RX paths convert the input signals from the duplex filtering module by double down-conversion to a final intermediate frequency (IF). Analogue filtering and an on/off type AGC are included in the first IF. The variable gain block in the second stage prevents compression by keeping the signal level within the dynamic range of the output A/D convertor. The signal from the A/D converter is passed to the Enhanced Down-converter ASIC (ERXA), where decimation and channel filtering occur. The main and diversity digital signals are then sent to the BB for DSP processing.

The RF module includes an RX FHS phase-locked synthesizer, for either frequency hopping between adjacent time slots or providing a fixed frequency signal in non-hopping mode. The FHS part consists of separate VCO module and PLL circuits. The RX FHS provides the local oscillator signal in the first down-conversion stage of both RX chains.

The RX part also provides the local oscillator (LO) for the RX IF sections.

RF Loop part

The RF loop part provides transceiver test loop and antenna monitoring facilities. The LED display is also included in this part.

The RF loop converts the TX RF signal down to RX frequency. The down-converted TX signal can be selected as an incident or reflected signal to facilitate antenna monitoring.

The down-converted signal is coupled to the input of the LNA and input to the diversity branch mixer. The three time slot delay and BER test are performed by the DSP SW for both GMSK and 8-PSK.

There is also a reflected power measurement circuit that raises an alarm when the antenna connector is left open at full power.

Digital part

The digital section of the RF module include two ASICs. These interface to the BB and provide control and reference signals to, and alarms from, the analogue functions of the RF module. The Enhanced Up-converter ASIC (EXTA) incorporates a DDS, generating a modulated signal for the TX. The Enhanced Down-converter ASIC (ERXA) performs digital channel filtering and controls AGC.

In addition to the DDS and power control functions, the ETXA provides the controls for all TRX synthesisers. TRX and antenna loop controls are also provided by the ETXA and from the BB via the I^2C bus. Time or state dependent alarms are collected and fed on to the ERXA.

The digital interface includes a PLL part to generate clocks needed for ASICs and FHSs.

Duplex filter part

The passive duplex filter is connected to the RF module and has a single antenna connector. There are also customer specific filter modules available for the 900 MHz frequency band.

Mechanics

The mechanics provide an electrical and environmental shield for the unit. In addition, at higher ambient temperatures it acts as a heat sink, conducting the dissipated heat out of the units, and at lower ambient temperatures it acts as a heater.

6.3.3 External interfaces

The front panel interface connectors are described in Table 2.

Table 2. TRX interface connectors

Connector	Type
Antenna	N (female)
2 x RX diversity (In/Out)	SMA (female)

6.4 Interface unit (VIFA)

The external interfaces of the Nokia MetroSite EDGE Base Station are located on the interface unit. The Local Management Port (LMP) provides the connection to the MetroSite BTS Manager PC. The Nokia Q1 interface is a connection for supervising the Nokia Q1-bus compatible external equipment, such as DMR radios. The extension interface is used as a databus for BTS chaining. Furthermore, the interface unit provides connections for ten customer-definable external alarms and four controls.

The interface unit contains the reference clock source of the BTS that is tuned by the master TRX, based on transmission or external synchronisation interfaces.

The door switch and test interfaces are located at the side of the interface unit.

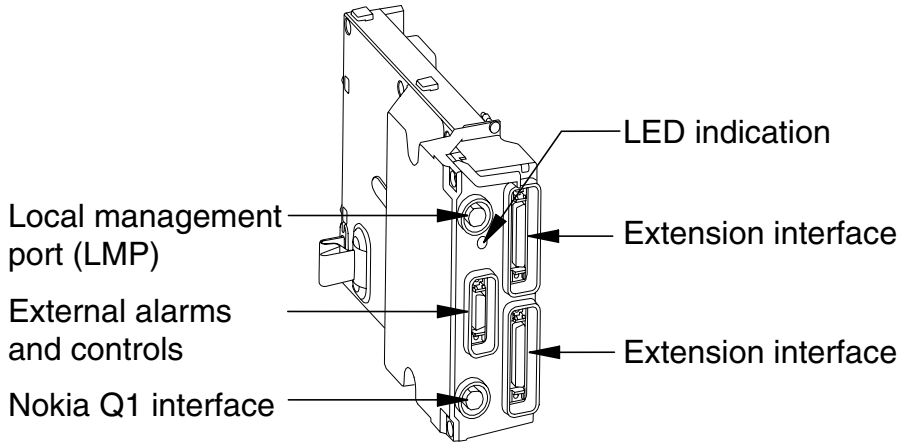


Figure 21. Interface unit of the Nokia MetroSite EDGE Base Station

6.4.1 External interfaces

The interfaces and their connector types are described in this section.

Local Management Port (LMP)

The LMP provides the connection to the MetroSite BTS Manager PC. The connector type for the LMP is BQ, RS-232. Figure 22 and Table 3 present the pin order and configuration for the LMP connector.

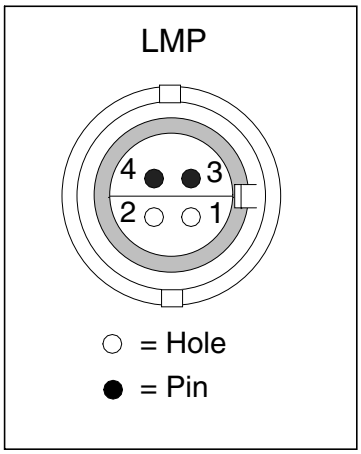


Figure 22. Pin order of the LMP connector

Table 3. Pin configuration of the LMP connector

Pin number	Signal
1	LMP in
2	+5 V
3	LMP out
4	Ground

Nokia Q1 interface

The Nokia Q1 interface provides a connection for supervising the Nokia Q1-bus compatible external equipment, such as DMR radios. The Q1 interface connector type is TQ. Figure 23 and Table 4 present the pin order and configuration for the Q1 connector.

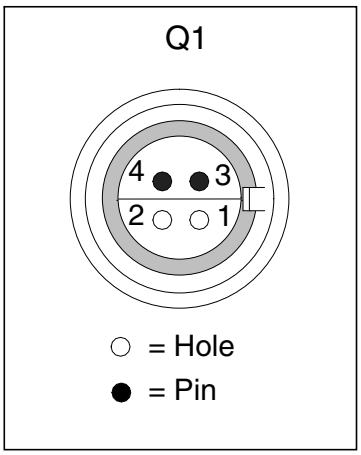


Figure 23. Pin order of the Q1 connector

Table 4. Pin configuration of the Nokia Q1 connector

Pin number	Signal
1	Q1 in+
2	Q1 in-
3	Q1 out+
4	Q1 out-

Extension interface

This 50-pin mini D-type connector is used for BTS chaining and for connecting to the Nokia MetroHub Transmission Node.

External alarms and controls (EAC)

The external alarms and controls connector provides the interface for 10 customer definable external alarm (EA) inputs and 4 control outputs (ECO). The connector type is the 26-pin mini D-type connector (female). Figure 24 and Table 5 present the pin order and configuration of the EAC connector.

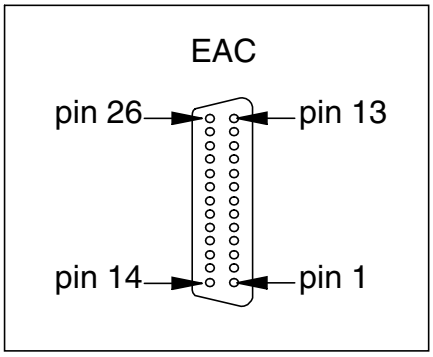


Figure 24. Pin order of the EAC connector

Table 5. Pin configurations of the EAC connector

Pin number	Signal	Pin number	Signal
1	EA1	14	GND
2	EA2	15	GND
3	EA3	16	GND
4	EA4	17	GND
5	EA5	18	GND
6	EA6	19	GND
7	EA7	20	GND
8	EA8	21	GND
9	EA9	22	GND
10	EA10	23	GND

Table 5. Pin configurations of the EAC connector (Continued)

Pin number	Signal	Pin number	Signal
11	ECO1	24	ECO3
12	+3 V	25	ECO4
13	ECO2	26	+5 V

6.5 Transmission unit (VXEA, VXTx, VXRB)

This section provides the technical information on the transmission units used in the Nokia MetroSite EDGE Base Station. The different transmission configurations that can be built with the transmission units described here are presented in Chapter 4. For the transmission interface protocols and standards refer to Section 8.4.5 of this document.

All transmission units can be managed locally with the Nokia SiteWizard software.

6.5.1 Unit alternatives for radio link transmission

The following radio link transmission units are available for the Nokia MetroSite EDGE Base Station:

FXC RRI (VXRB)

- Maximum 16 x 2 Mbit/s capacity
- Support for two microwave radio outdoor units (two TNC connectors)
- Grooming, branching and loop protection support
- Cross-connection at 8 Kbit/s level

FXC RRI transmission units are used with Nokia MetroHopper Radio and Nokia FlexiHopper microwave radio. For more information on the radios and transmission units, refer to *Nokia MetroHopper Radio Product Description* and *Nokia FlexiHopper microwave radio Product Description*. The transmission unit is connected to the Nokia MetroHopper Radio with a single coaxial cable, referred to as Flexbus (FB). For more information on Flexbus, refer to Chapter 8).

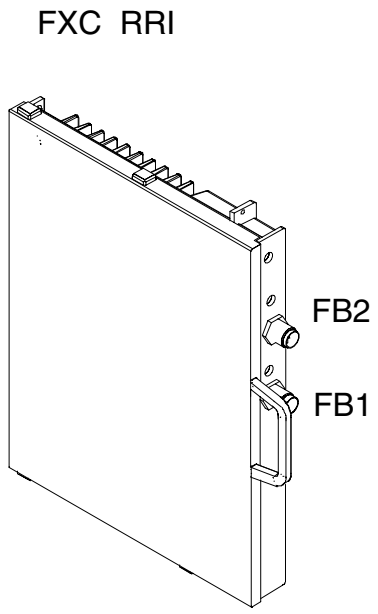


Figure 25. Radio link transmission unit alternatives

6.5.2 Unit alternatives for wireline transmission

The following wireline transmission units are available for the Nokia MetroSite EDGE Base Station:

FC E1/T1 (VXEA)

The FC E1/T1 transmission unit:

- Provides one Abis line interface to the 2 Mbit/s (E1) or 1.5 Mbit/s (T1) transmission line
- Operates as the termination point in a chain or star configuration
- Has no cross-connection capability

On its front panel, the FC E1/T1 has two unbalanced interface connectors (separate TX and RX connectors) for the 75 Ω E1 interface. The TX and RX connectors are connected to each other with a grounding bridge. By removing the grounding bridge, the RX connector's outer conductor can be changed from direct grounding to capacitive grounding.

There is also one balanced connector, which can be configured to be a 120 Ω E1 interface or 100 Ω T1 interface. The balanced connector offers both the TX and RX direction. The pin order and pin configuration of the balanced TQ connector are presented in Figure 26 and in Table 6.

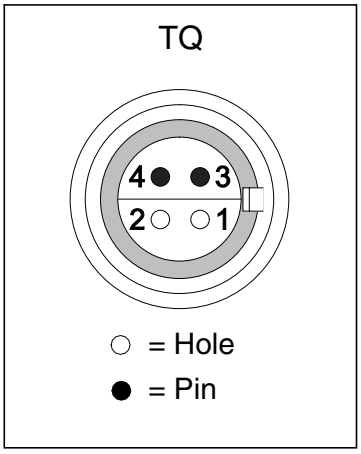


Figure 26. Pin order of a balanced TQ connector

Table 6. Pin configuration of a balanced TQ connector

Pin number	Signal
1	RX+
2	RX-
3	TX+
4	TX-

FXC E1 (VXTA)

In addition to digital speech data, the FXC E1 transmission unit can also transfer operating and maintenance information to other equipment in the network.

The FXC E1 offers the following main features:

- Four Abis line interfaces to the 2 Mbit/s (E1) transmission line
- Grooming, branching and loop protection support
- 8 Kbit/s level cross-connection functions between the four Abis line interfaces and the D-bus
- Nokia Q1 E2E traffic routing model, which allows easy transmission network planning

The front panel of the FXC E1 has four pairs of unbalanced BT-43 interface connectors (separate TX and RX connectors) for the 75 Ω E1 interface. The TX and RX connectors are connected to each other with a grounding bridge. By removing the grounding bridge, the RX connector's outer conductor can be changed from direct grounding to capacitive grounding.

For more information on the FXC E1 transmission unit, refer to *Nokia MetroHub Product Description*.

FXC E1/T1 (VXTB):

In addition to digital speech data, the FXC E1/T1 transmission unit can also transfer operating and maintenance information to other equipment in the network.

FXC E1/T1 offers the following main features:

- Four Abis line interfaces to the 2 Mbit/s (E1) or 1.5 Mbit/s (T1) transmission line
- Grooming, branching and loop protection support
- 8 Kbit/s level cross-connection functions between the four Abis line interfaces and the D-bus
- Nokia Q1 E2E traffic routing model, which allows easy transmission network planning

The front panel of FXC E1/T1 has four balanced TQ connectors (for pin order and configuration see Figure 26 and Table 6). The connectors offer both TX and RX direction. Each line interface can be independently configured to be a 120 Ω E1 interface or 100 Ω T1 interface, which enables using the balanced FXC E1/T1 unit as an E1/T1-converter.

For more information on the FXC E1/T1 transmission unit, refer to the *Nokia MetroHub Transmission Node Product Description*.

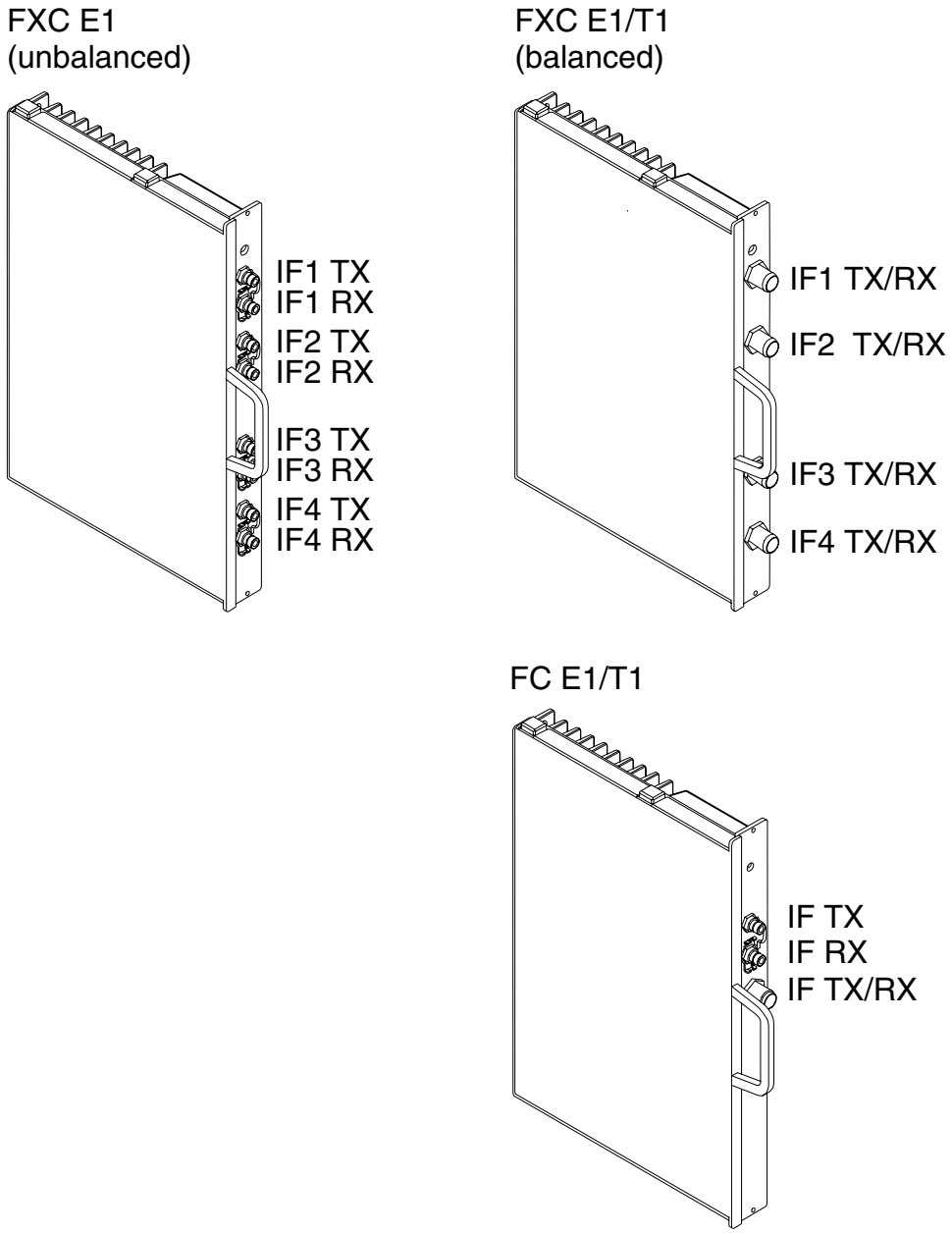


Figure 27. Wireline transmission unit alternatives

6.6 Power supply unit (HVSx)

The purpose of the power supply unit is to convert the incoming AC or DC supply voltages into the appropriate DC output voltages. The power is distributed to the units of the Nokia MetroSite EDGE Base Station and to radio outdoor units (if used) via the backplane. DC power supplies are reverse polarity protected.

In the case of mains power failure, the AC power supply unit provides a backup time of 130 ms during which the alarm can be sent. The alarm signal appears when the input voltage drops below the specified limit. The limit is dependent on the power supply unit type.

6.6.1 Power supply unit alternatives

The power supply units alternatives available for the Nokia MetroSite EDGE Base Station are listed in Table 7.

Table 7. Power supply unit alternatives

Input voltage	PSU type
230 VAC	HVSA
110 VAC	HVSB
-48 VDC	HVSD
+24 VDC	HVSC (available for the 800 and 1900 MHz BTS)

6.6.2 Output voltages

The output voltages from the power supply unit are the following:

- +3.4 VDC, +5.1 VDC, -5.1 VDC, +9.1 VDC, -9.1 VDC, +26.2 VDC and +55 VDC
- 24 VDC for fan unit

When the fan unit is not in use, the same output voltage feeds power to the heater. The output voltage to the fan unit and heating is controlled by the I^2C-bus. The heating voltage is controlled in five steps ranging from 0 VDC (no heating) to 24 VDC (full heating), the intermediate voltages being 7.2 VDC, 10.9 VDC and 14.7 VDC.

DC power supplies are reverse polarity protected.

6.6.3 Connector types

All alternative power supply units have the same physical appearance. The power input connector types, however, are different. The power supply unit and the three connector types are shown in Figure 28.

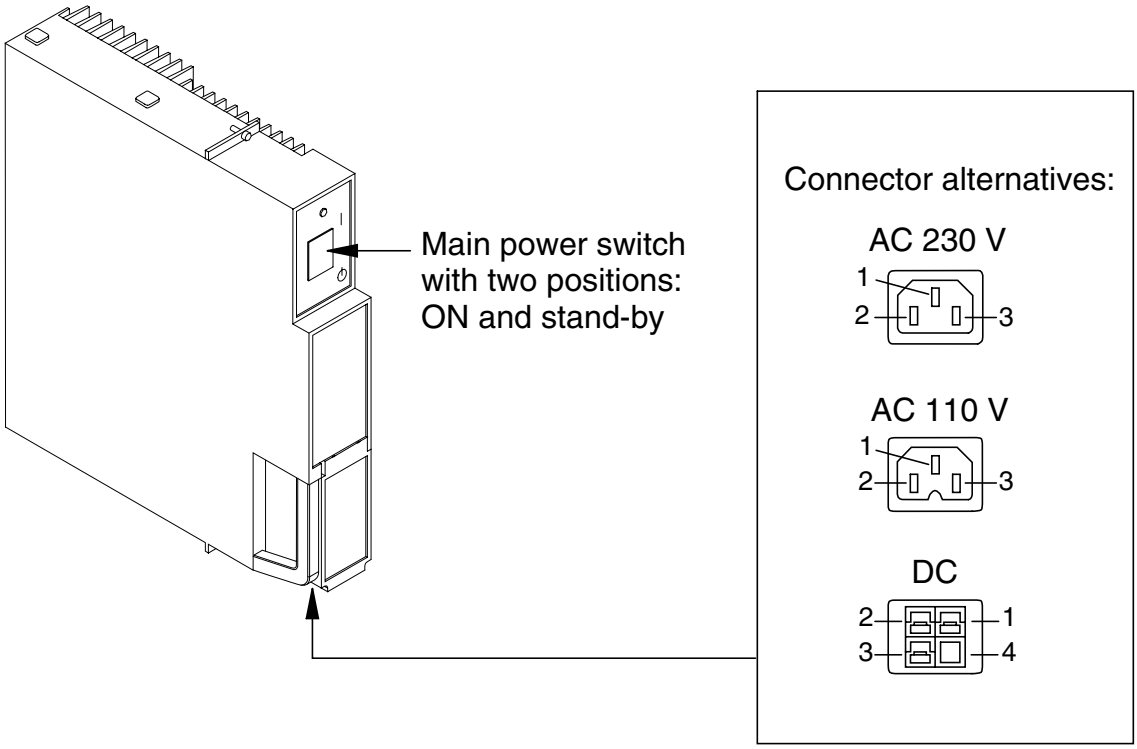


Figure 28. Power supply unit

The connector type of each power supply alternative is presented in Table 8.

Table 8. Power supply connector types

Power supply type	Connector type	Pin configuration
230 VAC	IEC 320 (male)	1 = Ground (E) 2 = Neutral (N) 3 = Live (L)
110 VAC	IEC 320 (male) with a notch	1 = Ground (E) 2 = Live 2 (L2) 3 = Live 1 (L1)
-48 VDC	Anderson Power pole	1 = Ground 2 = Positive input, +36 to +60 VDC, permitted fluctuation ±20% (or positive input 0 V) 3 = Negative input, 0 V (or negative input -36 to -60 VDC, permitted fluctuation ±20%) 4 = spacer
+24 VDC	Anderson Power pole	1 = Ground 2 = Positive input, 0 V (or +20 to +28 VDC, permitted fluctuation ±20%) 3 = Negative input, -20 to -28 VDC, permitted fluctuation ±20% (or negative input 0 V) 4 = spacer

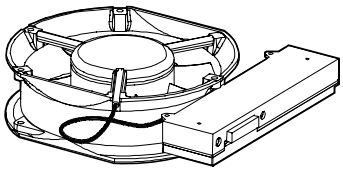
6.7 Fan unit (HVMF)

The fan unit is located at the bottom of the cabinet. The master TRX controls the fan unit via I^2C-bus according to temperature information from other units. The cooling is performed by adjusting the rotation speed of the fan. The adjustable speed also minimises the noise generated by the fan unit. The fan unit has 16 speeds.

One cooling fan unit is available, applicable for all MetroSite TRX variants. The fan details are given in Table 9 and is shown in Figure 29.

Table 9. Cooling fans details

Fan type	Cooling fan capacity	Notes
HVMF	120 m^3/hr (4238 ft^3/hr)	For all MetroSite BTS TRXs



HVMF

Figure 29. Fan unit

7 Unit alternatives and other delivery items

This chapter details the unit alternatives for Nokia MetroSite EDGE Base Stations.

Table 10. Transceiver unit alternatives

Input power	Frequency band	Unit type	Notes
5 W	GSM 900	HVTGA	Standard filter
5 W	GSM 900	HVTGH	Customer specific filter
5 W	GSM 900	HVTGJ	Customer specific filter
5 W	GSM 1800	HVTDA	Standard filter
5 W	GSM 1900	HVTPA	Standard filter
5 W	GSM/EDGE 800	WTFA	Standard filter
5 W	GSM/EDGE 900	WTGA	Standard filter
5 W	GSM/EDGE 900	WTGH	Customer specific filter
5 W	GSM/EDGE 900	WTGJ	Customer specific filter
5 W	GSM/EDGE 1800	WTDA	Standard filter
5 W	GSM/EDGE 1900	WTPA	Standard filter

Table 11. Nokia MetroSite EDGE Base Station unit alternatives and other delivery items

Unit/Item	Alternatives	Nokia abbreviations
Transmission unit	FXC RRI FC E1/T1 FXC E1 75 Ω FXC E1/T1 120/100 Ω	VXRB VXEA VXTA VXTB
Power supply unit	AC 230 V AC 110 V DC -48 V DC +24 V	HVSA HVSB HVSD HVSC
Interface unit	-	VIFA
Fan unit	-	HVMF
Cover unit	Standard NEBS cover	HVCU WCUA
Nokia MetroSite BTS Manager	-	-
Customer documents	Nokia MetroSite EDGE Base Station Product Overview Nokia MetroSite EDGE Base Station User Manual	-
Options	Pole mounting kit	-

Prefabricated LMP, EAC, power (AC and DC), Flexbus, Extension and Q1 cables for the Nokia MetroSite EDGE Base Station can also be ordered from Nokia.

8 Technical specifications

The purpose of this chapter is to provide all the necessary technical data for the Nokia MetroSite EDGE Base Station.

Table 12. Common technical data

Property	Value	Note
Height	871 mm (34.3 in)	954 mm (37.56 in) including the cables cover
Width	310 mm (12.20 in)	-
Depth	215 mm (8.46 in)	-
Weight	Maximum 40 kg (88.18 lb) with four TRXs	Approximately 18 kg (39.68 lb) without TRXs. Heaviest single part is 8 kg (17.66 lb).
Low temperature limit	- 40°C (-40°F)	-
High temperature limit	+ 50°C (122°F)	-
Ingress protection class	IP55 UL50-3R	Protection class of units within cabinet
Acoustic noise	55 dBA typical 61 dBA maximum	(Sound power)
Nominal input voltage (external supply voltage)	230 VAC 110 VAC -48 VDC +24 VDC	- - (-36 to -60 VDC) (+20 to +28 VDC)
Permitted operating voltage fluctuation	184 VAC - 276 VAC 85 VAC - 145 VAC -28 VDC - -72 VDC +20 VDC - +28 VDC	(44 Hz - 65 Hz) (44 Hz - 65 Hz)

Table 12. Common technical data (Continued)

Property	Value	Note
Typical power demand	300 W 340 W	5W GSM TRXs 5W GSM/EDGE TRXs • Four TRXs • FC E1/T1 • No heating
Maximum power demand	420 W 630 W	5W GSM TRXs 5W GSM/EDGE TRXs • 1900 MHz TRXs • Four TRXs • FXC RRI • 2 FlexiHoppers • Worst case heating scenario
Cooling fan capacity	120 m^3/hr (4238 ft^3/hr)	-

Table 13. Specific technical data for the 5W GSM 900 TRX

Property	Value	Note
TX frequency range	A: 925 - 960 MHz H: 943 - 960 MHz J: 935 - 960 MHz	Extended GSM H and J are customer specific filters
RX frequency range	A: 880 - 915 MHz H: 897.5 - 915 MHz J: 890.1 - 915 MHz	H and J with improved isolation between TX and RX bands
Channel spacing	200 KHz	-
Available radio channels	174	-
TX output power at antenna connector, nominal	37 dBm	± 2dB at 20°C (68°F), ± 2.5dB at extreme temperatures
Dynamic power range	30 dB (15 x 2 dB steps)	-

Table 13. Specific technical data for the 5W GSM 900 TRX (Continued)

Property	Value	Note
Static RX sensitivity	-108.0 dBm -106.0 dBm	Nominal Minimum
RX diversity	Yes	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 14. Specific technical data for the 5W GSM 1800 TRX

Property	Value	Note
TX frequency range	1805 - 1880 MHz	-
RX frequency range	1710 - 1785 MHz	-
Channel spacing	200 KHz	-
Available radio channels	374	-
TX output power at antenna connector, nominal	37 dBm	± 2 dB at 20°C (68°F), ± 2.5 dB at extreme temperatures
Dynamic power control	30 dB (15 x 2 dB steps)	-
Static RX sensitivity	-108.0 dBm -106.0 dBm	Nominal Minimum
RX diversity	Yes	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 15. Specific technical data for the 5W GSM 1900 TRX

Property	Value	Note
TX frequency range	1930 - 1990 MHz	-
RX frequency range	1850 - 1910 MHz	-
Channel spacing	200 KHz	-
Available radio channels	293 (298)	Five blocked channels. More options available for certain markets in the future.
TX output power at antenna connector, nominal	37 dBm	± 2 dB at 20°C (68°F), ± 2.5 dB at extreme temperatures
Dynamic power control	30 dB (15 x 2 dB steps)	-
Static RX sensitivity	-108.0 dBm -106.0 dBm	Nominal Minimum
RX diversity	-	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 16. Specific technical data for the 5W GSM/EDGE 800 TRX

Property	Value	Note
TX frequency range	A: 869 - 894 MHz	-
RX frequency range	824 - 829 MHz	-
Channel spacing	200 KHz	-
Available radio channels	119	Four blocked channels

Table 16. Specific technical data for the 5W GSM/EDGE 800 TRX

Property	Value	Note
TX output power at antenna connector, nominal	37 dBm (GMSK) 35 dBm (8-PSK)	± 2 dB at 20°C (68°F), ± 2.5 dB at extreme temperatures
Dynamic power range	Static power level range (BCCH): • 18 dB (GMSK) • 10 dB (8-PSK) Total (static + dynamic) power level range: • 30 dB (GMSK) • 16 dB (8-PSK) Step size: 2 dB	-
Static RX sensitivity	-108.0 dBm (GMSK) -106.0 dBm (GMSK)	Nominal Minimum
RX diversity	Yes	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 17. Specific technical data for the 5W GSM/EDGE 900 TRX

Property	Value	Note
TX frequency range	A: 925 - 960 MHz H: 943 - 960 MHz J: 935 - 960 MHz	Extended GSM H and J are customer specific filters
RX frequency range	A: 880 - 915 MHz H: 898 - 915 MHz J: 890 - 915 MHz	H and J with improved isolation between TX and RX bands
Channel spacing	200 KHz	-
Available radio channels	174	-

Table 17. Specific technical data for the 5W GSM/EDGE 900 TRX

Property	Value	Note
TX output power at antenna connector, nominal	37 dBm (GMSK) 35 dBm (8-PSK)	± 2 dB at 20°C (68°F), ± 2.5 dB at extreme temperatures
Dynamic power range	Static power level range (BCCH): • 18 dB (GMSK) • 10 dB (8-PSK) Total (static + dynamic) power level range: • 30 dB (GMSK) • 16 dB (8-PSK) Step size: 2 dB	-
Static RX sensitivity	-108.0 dBm (GMSK) -106.0 dBm (GMSK)	Nominal Minimum
RX diversity	Yes	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 18. Specific technical data for the 5W GSM/EDGE 1800 TRX

Property	Value	Note
TX frequency range	A: 1805 - 1880	-
RX frequency range	A: 1710 - 1785 MHz	-
Channel spacing	200 KHz	-
Available radio channels	374	-
TX output power at antenna connector, nominal	37 dBm (GMSK) 35 dBm (8-PSK)	± 2 dB at 20°C (68°F), ± 2.5 dB at extreme temperatures

Table 18. Specific technical data for the 5W GSM/EDGE 1800 TRX

Property	Value	Note
Dynamic power control	Static power level range (BCCH): • 18 dB (GMSK) • 10 dB (8-PSK) Total (static + dynamic) power level range: • 30 dB (GMSK) • 16 dB (8-PSK) Step size: 2 dB	-
Static RX sensitivity	-108.0 dBm (GMSK) -106.0 dBm (GMSK)	Nominal Minimum
RX diversity	Yes	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 19. Specific technical data for the 5W GSM/EDGE 1900 TRX

Property	Value	Note
TX frequency range	A: 1930 - 1990 MHz	-
RX frequency range	A: 1850 - 1910 MHz	-
Channel spacing	200 KHz	-
Available radio channels	293 (298)	Five blocked channels. More options available for certain markets in the future.
TX output power at antenna connector, nominal	37 dBm (GMSK) 35 dBm (8-PSK)	± 2 dB at 20°C (68°F), ± 2.5 dB at extreme temperatures

Table 19. Specific technical data for the 5W GSM/EDGE 1900 TRX

Property	Value	Note
Dynamic power control	Static power level range (BCCH): • 18 dB (GMSK) • 10 dB (8-PSK) Total (static + dynamic) power level range: • 30 dB (GMSK) • 16 dB (8-PSK) Step size: 2 dB	-
Static RX sensitivity	-108.0 dBm (GMSK) -106.0 dBm (GMSK)	Nominal Minimum
RX diversity	-	With two or more TRXs in one sector
Isolation requirement for antenna or external combiner equipment	Minimum 25 dB	-

Table 20. HW interfaces of Nokia MetroSite EDGE Base Station

Interface	Number	Connector type/note
Antenna connectors	1 to 4	N-type (female), one for each TRX
RX diversity connectors	2 to 8	SMA (female), two for each TRX
AC supply 230 V	1	IEC 320 (male)
AC supply 110 V	1	IEC 320 (male), with a notch
DC supply -48 V	1	Anderson Power Pole
DC supply -24 V	1	Anderson Power Pole
Grounding	1	Cable clamp
External alarms and controls	1	10 alarm inputs, 26-pin mini D-type (female) 4 control outputs
Extension connectors	2	Out/In: 50-pin mini D-type (female)
13 MHz clock interface	1	MCX (female)

Table 20. HW interfaces of Nokia MetroSite EDGE Base Station (Continued)

Interface	Number	Connector type/note
Frame clock	1	MCX (female)
Q1 interface	1	TQ
Local management port (LMP)	1	BQ, RS-232

Table 21. Transmission interfaces of Nokia MetroSite EDGE Base Station

Interface	Number	Connector type/note
FC RRI	1	TNC (50 Ω), Flexbus connection to outdoor unit
FXC RRI	2	TNC (50 Ω), Flexbus connection to outdoor unit
FC E1/T1	2 1	BT43 (75 Ω) TQ (120/100 Ω)
FXC E1 (75 Ω)	8	BT43
FXC E1/T1 (120/100 Ω)	4	TQ

Table 22. Flexbus cable characteristics

Property	Value
Cable type	Coaxial cable, double shielded or semi-rigid (recommended types RG-223, RG-214)
Characteristic impedance	50 ± 2 Ω
DC resistance	< 4.6 Ω (sum of inner and outer conductor)
Data attenuation	< 9.0 dB at 19 MHz
Flexbus signals	DC power supply Bidirectional data (37 Mbit/s, NRZ code, 1.4 V pulse amplitude)
Length	Maximum 140 m for RG-223 Maximum 300 m for RG-214

8.1 Dimensions and weights of plug-in units

This section presents the dimensions and weights of the plug-in units.

8.1.1 Transceiver unit

Table 23. Dimensions and weight of the TRX

Dimension	Value
Height	314 mm 12.4 in
Width	61 mm 2.4 in
Depth	233 mm 9.2 in
Weight	4.5 kg 9.9 lb

8.1.2 Interface unit

Table 24. Dimensions and weight of the interface unit

Dimension	Value
Height	58 mm 2.3 in
Width	152 mm 6.0 in
Depth	200 mm 7.9 in
Weight	1 kg 2.2 lb

8.1.3 Transmission unit

Table 25. Dimensions and weight of the transmission unit

Dimension	Value
Height	254 mm 10 in
Width	28 mm 1.10 in
Depth	164 mm 6.5 in
Weight	1.35 kg 3 lb

8.1.4 Power supply unit

Table 26. Dimensions and weight of the power supply unit

Dimension	Value
Height	245 mm 9.7 in
Width	60 mm 2.4 in
Depth	268 mm 10.6 in
Weight	< 4 kg (depending on type) < 8.8 lb

8.2 System requirements for Nokia MetroSite BTS Manager

System requirements for Nokia MetroSite BTS Manager are detailed in Table 27.

Table 27. System requirements for Nokia MetroSite BTS Manager

Computer	Intel Pentium based IBM-compatible PC
Operating system	Microsoft Windows NT 4.0 (with service pack 4) Microsoft Windows 95 (or Microsoft Windows 98) with service pack 1
System memory (minimum)	Microsoft Windows NT 4.0: • 32 MB RAM Microsoft Windows 95 or 98: • 16 MB RAM
Monitor	SVGA, min 800x600 resolution
Minimum disk space	40 MB
Accessories	CD-ROM drive Windows compatible mouse or pointing device Windows compatible printer (optional) Cable (PC - BTS)

8.3 Basic telecommunication features

The Nokia MetroSite EDGE Base Station supports the following basic telecommunication features:

- DRX, discontinuous reception
- DTX, discontinuous transmission
- Handover and power control algorithms
- Stand-alone Dedicated Control Handover (SDCH)
- Interference band selection based on MS power
- Logical channel configurations (based on GSM/DCS recommendation 05.02.)
- Full Rate Speech
- Ciphering (support for A5/0,1,2)
- FACCH emergency call set-up

8.4 International recommendations

This section lists the recommendations referred to in the designing of the Nokia MetroSite EDGE Base Station.

8.4.1 Common standards

Table 28 lists the common standards referred to in the designing of the Nokia MetroSite EDGE Base Station.

Table 28. Common standards

Standard	Description
ETSI GSM 05.05/11.20/11.21/11.22/11.23	Standard for base station equipment
T1.713-2000	Personal Communications Services, PCS 1900 Specifications
TIA/EIA PN-3777	EMC specific

8.4.2 Electrical standards

The tables of this section list the electrical standards referred to in the designing of the Nokia MetroSite EDGE Base Station.

Table 29. Input voltage standards

Standard	Description
ETS 300 132-1:1996	Equipment Engineering Power Supply Interface at the input to Telecommunications Equipment Interface Operated by Alternating Current (AC)
ETS 300 132-2:1996	Power Supply Interface at the input to telecommunications equipment interface operated by direct current (DC)
GSM 11.20	Standard for base station equipment
ETS 300 253, 1995	Earthing and bonding of telecommunication equipment in telecommunication centres

Table 30. Electrical safety standards

Standard	Description
EN 60950: 1992 A1: 1992 A2: 1993 A3: 1995 A4: 1996 IEC 950: 1991 A1: 1992 A2: 1993 A3: 1995 A4: 1996	Safety of Information Technology Equipment, including Electrical Business Equipment + Amendments A1, A2, A3 and A4
UL1950: 1995, 3rd edition	Standard for Safety of Information Technology Equipment, including Electrical Business Equipment
FCC Part 68	Rules for Registration of Telephone Equipment PART 68: 1995
EN 60215:1988 IEC 215: 1987 BS 3192	Safety requirements for radio transmitting equipment

Table 31. Product specific EMC standards

Standard	Description
ETS 300 342 2, 1994	Radio Equipment and Systems (RES); Electro-Magnetic Compatibility (EMC) for European digital cellular telecommunications system (GSM 900 and DCS 1800 MHz) Part 2: Base station and ancillary equipment
d-ETS 300 342-3:1997	Radio Equipment and Systems (RES); Electro-Magnetic Compatibility (EMC) for European digital cellular telecommunications system Part 3: Base station and ancillary equipment and repeaters meeting, Phase 2, GSM requirements

Table 31. Product specific EMC standards (Continued)

Standard	Description
ETSI GSM 11.20 ETSI GSM 11.21	Standard for base station equipment Standard for base station equipment
ANSI T1.713-2000	Personal Communications Services; PCS 1900 Specifications
TIA/EIA PN-3777	EMC specific

Table 32. Basic EMC standards based on d-ETS 300 342-3:1997

Standard	Description
ETSI GSM 11.21	Standard for base station equipment
EN 55022, class B, 1994 (IEC/CISPR 22, 1993) EN 55022/A1:1995	Limits and methods of measurement of radio interference characteristics of information technology equipment
EN 61000-4-2: 1995 IEC 1000-4-2: 1995	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test: Basic EMC publication
EN 61000-4-3: 1995 IEC 1000-4-3: 1995	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 3: Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4: 1995 IEC-1000-4-4: 1995	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test: Basic EMC publication
EN 61000-4-5: 1995 IEC-1000-4-5: 1995	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 5: Surge immunity test
EN 61000-4-6: 1996 IEC 1000-4-6: 1996	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
IEC 1000-4-11: 1994 EN 61000-4-11: 1994	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity tests

Table 33. Additional EMC standards

Standard	Description
FCC Part 15 FCC Part 24	FCC Rules for Radio Equipment Devices Personal Communication Services
IEC 1000-3-2, EN 60555-2 BS 5406 Part 2	Electromagnetic Compatibility (EMC) Part 3: Limits - Section 2: Limits for harmonic current emission (equipment input current ≤16 A per phase)
IEC 1000-3-3: 1994 EN 61000-3-3: 1995 EN 60555-3: BS 5406	Electromagnetic Compatibility (EMC) Part 3: Limits - Section 3: Limitation of voltage fluctuation and flicker in low-voltage supply systems for equipment with rated current ≤16 A
IEC 1000-4-8: 1993	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 8: Power frequency magnetic field immunity test: Basic EMC publication
IEC 1000-4-9: 1993	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques Section 9: Pulse magnetic field immunity test: Basic EMC publication

8.4.3 Environment

The environmental standards referred to in the designing of Nokia MetroSite EDGE Base Station are described in this section.

Table 34. Environmental standards

Standard	Description
ETS 300 019-1-1:1992	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-1: Classification of environmental conditions: Storage
ETS 300 019-2-1:1994	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 2-1: Specification of environmental tests: Storage
ETS 300 019-1-2:1992	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-2: Classification of environmental conditions: Transportation
ETS 300 019-2-2:1994	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 2-2: Specification of environmental tests: Transportation
ETS 300 019-1-4:1992	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1-4: Classification of environmental conditions: Stationary use at non-weather protected locations
ETS 300 019-2-4:1994	Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 2-2: Specification of environmental tests: Stationary use at non-weather protected locations

8.4.4 Mechanical standards

The mechanical standards referred to in the designing of the Nokia MetroSite EDGE Base Station are described in this section.

Table 35. Mechanical standards

Standard	Description
EN 60659 BS 5490	Degree of Protection Provided by Enclosures (IP Code)
ISO 3744, 1988	Acoustics determination of sound power levels of noise sources: Engineering methods for special reverberation test rooms
ETS 300 753	Acoustic noise emitted by telecommunications equipment
IEC 68-2-57: 1989	Environmental Testing Part 2: Test Methods Ff: Vibration Time-history Method.
GR-63-CORE:1995	Network Equipment-Building System (NEBS): Physical Protection
GR-487-CORE	Corrosion Resistance - Temperature Cycling/High Humidity

Note

The Nokia MetroSite EDGE BTS is designed to meet GR-63-CORE (NEBS) and GR-487-CORE only when fitted with the WCUA type cover (high impact polycarbonate).

8.4.5 Base station interface equipment - related recommendations and standards

The standards and recommendations related to base station interface equipment are described in this section.

Table 36. Flexbus interface

Standard	Description
ITU-T G.704 (10/94)	Synchronous frame structures used at primary and secondary hierarchical levels
ITU-T G.706 (1991)	Frame alignment and cyclic redundancy check (CGC) procedures relating to basic frame structures defined in Recommendation G.704

Table 36. Flexbus interface (Continued)

Standard	Description
ITU-T G.823 (03/93)	The control of jitter and wander within digital networks which are based on the 2048 Kbit/s hierarchy
ITU-T G.826 (08/96)	Error performance parameters and objectives for international, constant bit rate digital paths at or above primary rate
ITU-T G.921	Digital sections based on the 2048 Kbit/s hierarchy

Table 37. 2048 Kbit/s E1 interface

Standard	Description
CCITT (Blue Book): • G.703 • G.704 • G.706 • G.711 • G.732 • G.736 • G.826 • G.823 • I.460	 • Digital Interface Characteristics • Functional Interface Characteristics • CRC Multiframe Structure • PCM Coding Law • Primary PCM Multiplexer • Synchronous 2 Mbit/s Digital Multiplexer • Jitter and Wander • Performance Parameters • Multiplexing, Rate Adaption
GSM: • 03.50 • 08.51 • 08.54 • 08.52	 • Transmission Planning Aspects • BSC-BTS Interface, General Aspects • BSC-BTS Interface Principles • BSC BTS Interface Layer 1, Structure of Physical Circuits

Table 38. 1544 Kbit/s T1 interface

Standard	Description
ANSI T1.403 and T1.102 ANSI T1.403	Digital Interface Characteristics Functional Interface Characteristics PCM Coding Law Primary PCM Multiplexer Synchronous 2 Mbit/s Digital Multiplexer Performance Parameters
AT&T TR 62411	Jitter and Wander Multiplexing, Rate Adaptation

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