

NOKIA

Nokia MetroSite EDGE Base Station

Warnings and Cautions

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Summary of Changes

Version 1, 12th November 1999.

Version 2, 2nd June 2000:

- added GSM references to the title and body text
- added EC marking
- changed maximum power in Table 2 to 5W

Version 3, 30th June 2001:

- updated for EDGE

1 About this document

This document details the safety precautions to be followed when working with the Nokia MetroSite EDGE Base Station. The instructions in *Nokia MetroSite EDGE Base Station: Installation* and *Nokia MetroSite EDGE Base Station: Maintenance* must be followed when installing the Nokia MetroSite EDGE Base Station and performing any maintenance on it. Failure to follow these instructions may be dangerous to the installation and maintenance personnel.

1.1 Safety guidelines

The safety guidelines are designed as follows:

- Warnings alert the reader to dangers which may cause loss of life, physical injury or ill health. The symbol denoting a warning is presented below.



WARNING

This is a warning!

- Cautions are used to denote possible damage to equipment but not dangers to personnel. The symbol denoting a caution is presented below.



Caution

This is a caution!

2 Warnings

2.1 Personnel

Installation, commissioning and maintenance measures for any Nokia Base Station (BTS) may be performed only by trained and authorized personnel. The Nokia MetroSite EDGE Base Station must be installed so that only authorized personnel have access to its sensitive parts.



WARNING

Always prevent unauthorized personnel from accessing the Nokia MetroSite EDGE Base Station.

2.2 Dangerous voltage

Potentially lethal voltages are present within this system. For more information on grounding and on the power supply, refer to *Nokia MetroSite EDGE Base Station: Requirements for Installation and Operation*.

The symbol shown in Figure 1 denotes dangerous voltage. The Nokia MetroSite EDGE Base Station is labelled with this symbol.

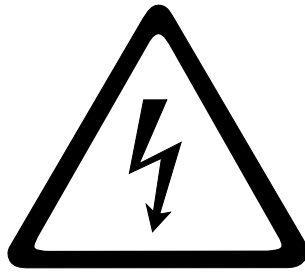


Figure 1. Dangerous voltage symbol



WARNING

Make sure that applicable high voltage safety precautions are taken before attempting to work on the system with the power connected!



WARNING

Potentially lethal voltages can be induced if the equipment is not grounded correctly. Ensure that all ground connections are secure and non-removable!



WARNING

An electrical plug with a ground connection is not sufficient as it can be pulled off. There is a possibility of surge voltage through the transmission lines in the case of lightning.



WARNING

Connect the Nokia MetroSite BTS to the main grounding busbar of the site! Electrical currents from power and communication cables is dangerous.

**WARNING**

Ensure that the ground connection is established before an AC or DC power outlet is connected to the BTS! Ensure that the ground connection is removed only after the AC or DC power outlet is disconnected!

**WARNING**

The power switch of the Nokia MetroSite EDGE Base Station does not disconnect it from the power network (AC/DC). The power switch of the Nokia MetroSite EDGE Base Station power supply unit has two positions: ON and stand-by.

A separate main switch on the site is considered to be the disconnect device for safety and service purposes.

The symbol shown in Figure 2 is used to denote the stand-by position of the power supply unit power switch.

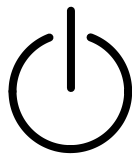


Figure 2. Stand-by symbol on the power supply unit

**WARNING**

Do not rely on the power switch alone to isolate a supply. When switching OFF the Nokia MetroSite EDGE Base Station, make sure that the power supply is completely isolated by setting the power switch to OFF (including the site mains power switch), disconnecting all relevant connectors, and removing all relevant fuses!

**WARNING**

The site mains power switch must be turned OFF before connecting the mains power cable to the Nokia MetroSite EDGE Base Station!

**WARNING**

Do not disconnect the antenna connectors when the Nokia MetroSite EDGE Base Station is powered ON!

When using an external synchronisation source, make sure that the ground for the Nokia MetroSite EDGE Base Station and for the device supplying the synchronisation signal are at the same ground potential. If this is not the case, make sure that the synchronisation cable shield is capacitively grounded at the supply end.

2.3 Weight

**WARNING**

The Nokia MetroSite EDGE Base Station weighs 28 to 40 kg (62 to 88 lb) depending on the number of TRXs. Lifting of the fully equipped BTS requires at least two people.

2.4 High temperatures

The symbol shown in Figure 3 denotes a hot surface. Equipment whose surface reaches high temperatures is labelled with this symbol.



Figure 3. Hot surface symbol



WARNING

During operation, the interior of the Nokia MetroSite EDGE Base Station reaches a temperature of 60° to 70°C (140° to 158°F).

2.5 Toxic hazards

2.5.1 Beryllium oxide

The Nokia MetroSite EDGE Base Station uses beryllium oxide (BeO), which can be harmful to human health.

Beryllium oxide is used in:

- Power amplifiers
- RF transistors (isolator internal load)

The equipment containing BeO carries a Beryllium Oxide label, as shown in Figure 4.

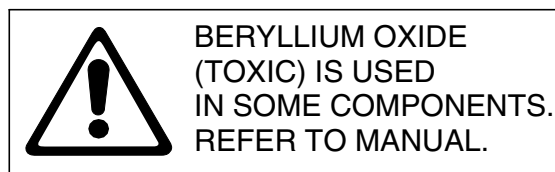


Figure 4. Beryllium Oxide label

**WARNING**

Personnel who handle, use or dispose of components containing BeO should be aware of its nature and of the necessary safety precautions. Beryllium oxide is released into the air if the components containing it are damaged.

**WARNING**

The sub assemblies or components in units containing BeO must not under any circumstances be subjected to mechanical strain that might damage the components and thereby release beryllium oxide into the air.

**WARNING**

The components containing BeO must never be thrown out with general or domestic waste. Dispose of the equipment in the manner appropriate to chemical or special waste, and according to the local regulations!

2.6 Electromagnetic fields and RF power

The Nokia MetroSite EDGE Base Station generates electromagnetic radiation. This can exceed safety levels very close to the antennas. Personnel must observe the general guidelines presented in Section 2.6.1, and apply the minimum distance calculation formula presented in Section 2.6.2.

2.6.1 General guidelines

**WARNING**

This equipment generates electromagnetic radiation which can exceed safety levels when a person is working in very close proximity to the antennas. Observe the minimum distance precautions shown in Table 1 when working in close proximity to antennas operating at full power!

**WARNING**

Do not install the Nokia MetroSite EDGE Base Station or its antennas in areas where there is a potential risk for interference with inadequately shielded medical equipment, such as life supporting devices, hearing aids or other electrically or magnetically sensitive devices!

**WARNING**

When installing the Nokia MetroSite EDGE Base Station or its antennas, the emission of other antennas nearby must be known beforehand so that ambient emissions can be managed properly.

2.6.2 Formula for minimum safety distances

This section presents the formula for calculating the minimum safety distances using the specifications of the particular antenna.

$$r_{\min} = \sqrt{\frac{N \cdot 10^{\frac{(G-L)}{10}} \cdot P}{4 \pi S}}$$

Equation 1. Formula for calculating minimum safety distance (r_{\min})

Equation 1 refers to the following factors:

- G is the antenna gain (in dB) compared to isotropically radiating antenna
- P is the power delivered to the antenna (W)
- L is the total loss (in dB) between the transmitter and the antenna input
- N is the number of transmitters combined to the antenna
- S is the maximum allowed power density in air (W/m^2)

2.6.3 Safety distance calculation examples

Table 1 describes how the minimum distances for controlled and uncontrolled environments have been calculated.

Table 1. Description for distance calculations in controlled and uncontrolled environments

Limit	Description
Minimum Distance in Controlled Environments*	The minimum distances are calculated using the reference levels for power density as presented in the CENELEC prestandard; $f/40 \text{ W/m}^2$, in the frequency range 400 to 2000 MHz, averaged over any 6 min. time interval. This is in agreement with other guidelines (IEEE/ANSI, IRPA, NCRP, FCC) or stricter.
Minimum Distance in Uncontrolled Environments*	The minimum distances are calculated using the reference levels for power density as presented in the CENELEC prestandard; $f/200 \text{ W/m}^2$, in the frequency range 400 to 2000 MHz, averaged over any 6 min. time interval. This is in agreement with other guidelines (IEEE/ANSI, IRPA, NCRP, FCC) or stricter.
* Controlled environments refer to locations where there is exposure to persons aware of the potential exposure. Uncontrolled environments refer to locations where there is exposure to persons not aware of the potential exposure and who have no control over it.	

Using the formula for minimum safety distances and the appropriate information for each factor, safety distances can be calculated as in the following calculations (Table 2) for a particular environment.

Table 2. Safety distance calculation example

Factor	Unit	GSM/E DGE 900	GSM/E DGE 1800	GSM/ED GE 1900
Frequency	f [MHz]	900	1800	1900
Maximum TX power	P_{out} [W]	5	5	5
Minimum losses: cable	L [dB]	1	1	1
Maximum antenna gain (dependent on user choices)	G [dB]	10	10	10
* CENELEC prestandard ENV50166-2				

Table 2. Safety distance calculation example (Continued)

Factor	Unit	GSM/E DGE 900	GSM/E DGE 1800	GSM/ED GE 1900
Maximum number of TRXs/antenna (dependent on user choices)	N	2	2	2
Power Density / Controlled environment*	S [W/m ²]	22.50	45	47.5
Power Density / Uncontrolled environment*	S [W/m ²]	4.5	9	9.5
Safety distance / Controlled environment	r _{min} [m]	0.3 m	0.2 m	0.2 m (0.66 ft)
Safety distance / Uncontrolled environment	r _{min} [m]	0.6 m	0.4 m	0.4 m (1.32 ft)
* CENELEC prestandard ENV50166-2				

3 Cautions

3.1 Handling the BTS

3.1.1 Storage and transportation



Caution

During storage and transportation, the Nokia MetroSite EDGE Base Station must remain in its original package in order to:

- avoid mechanical damage
 - maintain traceability
 - protect the units against static electricity
-



Caution

Handle the Nokia MetroSite EDGE Base Station with care. Do not drop the base station or the package containing it.

3.1.2 Weight



Caution

Persons in charge of the transportation and installation of the Nokia MetroSite EDGE Base Station must note that a fully equipped Nokia MetroSite base station weighs 28 to 40 kg (62 to 88 lb).

3.1.3 Heat management



Caution

During operation, the interior of the Nokia MetroSite EDGE Base Station may reach high temperatures (60° to 70°C).

The power supply unit of the Nokia MetroSite EDGE Base Station carries a hot surface label, as shown in Figure 5.



Figure 5. Hot surface label

3.1.4 Grounding

The Nokia MetroSite EDGE Base Station may receive damaging over voltages through the antenna equipment, communication cables or power supply lines.



Caution

Sufficient protective grounding is required. An electrical power plug with ground connection is not sufficient: the grounding of the Nokia MetroSite EDGE Base Station must be based on a fixed grounding cable.

3.1.5 Electro-static discharge protection



Caution

Always wear a close-fitting antistatic wrist strap around your uncovered wrist when handling the Nokia MetroSite EDGE Base Station!

The Nokia MetroSite EDGE Base Station contains electro-static sensitive devices, which means that they may be permanently damaged by electro-static discharges encountered in routine handling, testing and transportation. The Nokia MetroSite EDGE Base Station is labelled with an electro-static sensitive device symbol as shown in Figure 6.

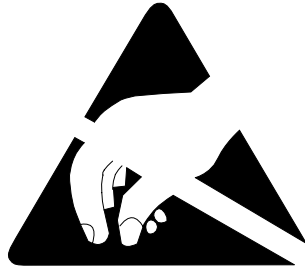


Figure 6. Electro-static sensitive device label

Electro-static discharges are caused by direct contact or by an electro-static field. If a charged body approaches an electrically conducting surface, the acquired potential is discharged. An equalizing current can then flow in the associated circuitry and generate permanently damaging voltages by induction. The human body should be grounded at the same potential as the component or equipment being handled. A wrist strap creates an equipotential electrical connection between the object and the human.

The Nokia MetroSite EDGE Base Station has a grounding point (ESD stud) to which a wrist strap must be connected. The wrist strap should be used and connected to the ESD stud as shown in Figure 7.

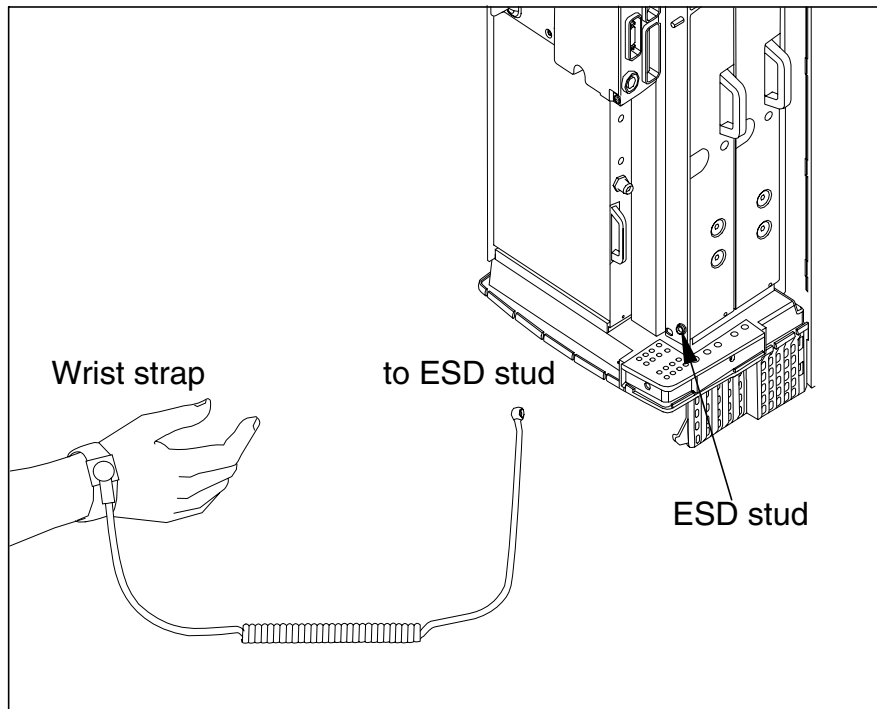


Figure 7. Using the antistatic wrist strap

3.2 BTS power supply

3.2.1 AC and DC connectors



Caution

Ensure the correct polarity. Incorrect polarity causes damage to the equipment.



Caution

The Nokia MetroSite BTS power switch does not disconnect the base station from the power network (AC or DC). The separate main switch on the site is considered to be the power disconnect device for safety and service purposes.

**Caution**

Do not connect AC or DC power until you have verified that the line voltage is correct!

3.2.2**Grounding of AC power supply units**

**Caution**

Ensure that the Nokia MetroSite EDGE Base Station is connected to a grounded power outlet!

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