NOKIA

Maintaining UltraSite EDGE BTS

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Contents

1 Statutory information

1.1 CE Marking

Standard	Description
CE 0168 ⓘ	Hereby, Nokia Corporation, declares that this Nokia UltraSite EDGE Base Station is in compliance with the essential requirements and other relevant provisions of Directive: 1999/5/EC.

1.2 FCC Statement

Standard	Description
FCC Statement	Hereby, Nokia Corporation declares that this Nokia UltraSite EDGE Base Station is in compliance with the essential requirements and other relevant provisions of Directive: 1999/5/EC. The product is marked with the CE marking and Notified Body number according to the Directive 1999/5/EC. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The term "IC:" before the radio certification number only signifies that Industry Canada technical specifications were met.

2 Prevent failures

2.1 Overview of preventing failures of UltraSite EDGE BTS

Before you start

Warning

Potentially lethal voltages!

Switch the BTS power OFF from a disconnecting device or circuit breaker before starting the maintenance work whenever the nature of maintenance work causes a risk of electric shocks!

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Steps

1. **Check the specific tools needed for the maintenance task in question. You should always have installation tools, the BTS key, antistatic wrist strap and Nokia Element Manager PC and PC cable with you.**

Note

For installation tools and equipment, see *Tools requirements for UltraSite EDGE BTS*.

2. **Keep the units in their delivery package until installation.**

3. **Perform the required maintenance actions.**

   - *Check the cabinet seal*
   - *Check the Temperature Control System*
   - *Check the hinges*
   - *Check the cable connections*
   - *Check the screws*
   - *Check the dummy panels*
   - *Check the power supplies*
   - *Check the door/roof locks*
   - *Check the LEDs*
   - *Run system tests*

4. **After installation, keep some of the packaging material for sending units to service. Recycle the packaging material.**

5. **Keep a site folder to contain all the required site-specific information.**

   The site folder should include installation, commissioning and integration check lists. Note however, that the exact contents of a site folder is defined by the customer project.

   It is the responsibility of the customer to maintain and archive site-specific documents.

2.2 Checking the UltraSite EDGE BTS cabinet seals

Before you start

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Summary

The cabinet seals (rubber gasket strips) are under the roof and around the door. Inspect them periodically.

Steps

1. **Inspect the seals for dirt, damage or wear.**
2. **Clean the seals with a cloth, if necessary.**
3. **Replace worn or broken seals, if necessary.**

2.3 Checking the UltraSite EDGE BTS Temperature Control System

Before you start

Warning

Potentially lethal voltages!

Switch the BTS power OFF from a disconnecting device or circuit breaker before starting the maintenance work whenever the nature of maintenance work causes a risk of electric shocks!

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Summary

It is necessary to perform a periodic check of the Temperature Control System to maintain proper air circulation and prevent overheating of Nokia UltraSite EDGE BTS.

Steps

1. **Periodically clear the BTS cabinet interior of debris and free all air inlets and outlets of obstructions.**
2. **Remove accumulated dust and debris from unit cooling fins and unit fan blades to ensure adequate heat dissipation.**

3. Replace faulty units, if required.

- *Replacing a GSM/EDGE heater (HETA) unit*
- *Replacing a GSM/EDGE unit cooling fan*
- *Replacing a cabinet cooling fan in UltraSite EDGE BTS*
- *Replacing a WCDMA Heat Exchanger Fan*
- *Replacing a WCDMA unit cooling fan*

2.4 Checking the UltraSite EDGE BTS hinges

Before you start

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Steps

1. Lubricate the hinges with lubricating oil.

2. Check that the hinges work properly.

3. *If* the Outdoor cabinet is operating in temperatures below 0°C (32°F),

   Then

   Lubricate the hinges with a light, non-freezing spray lubricant.

2.5 Checking the UltraSite EDGE BTS cable connections

Before you start

Warning

Potentially lethal voltages!

Switch the BTS power OFF from a disconnecting device or circuit breaker before starting the maintenance work whenever the nature of maintenance work causes a risk of electric shocks!

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Summary

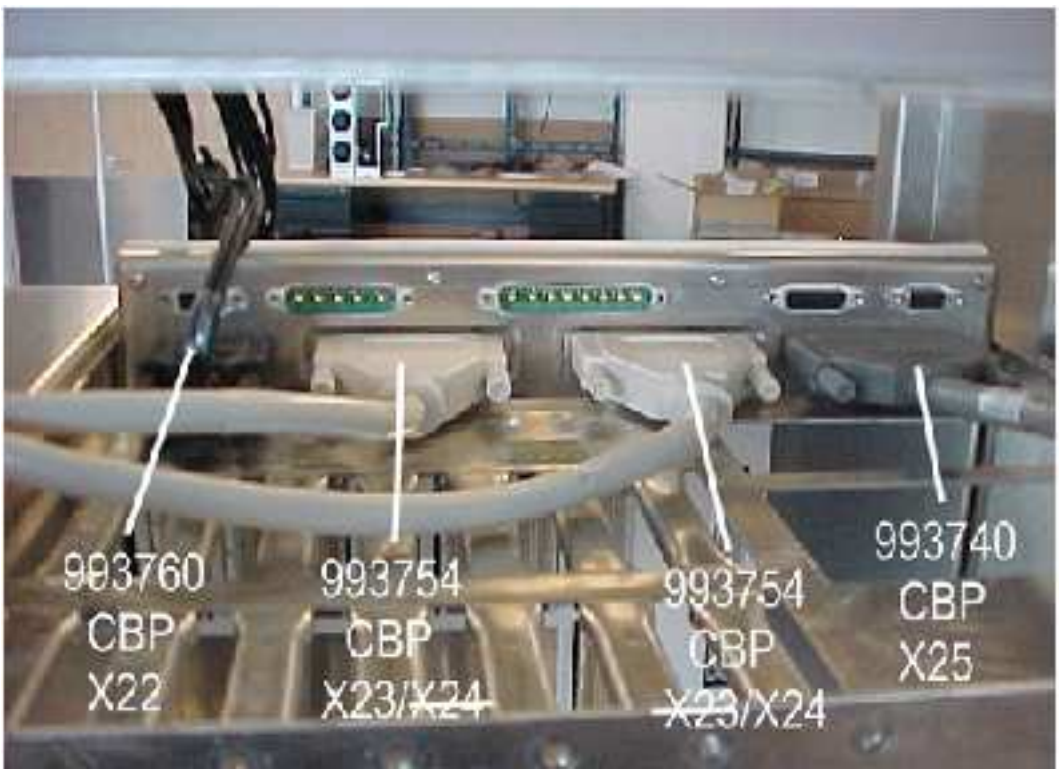


Figure 1. Common backplane bottom row cabling

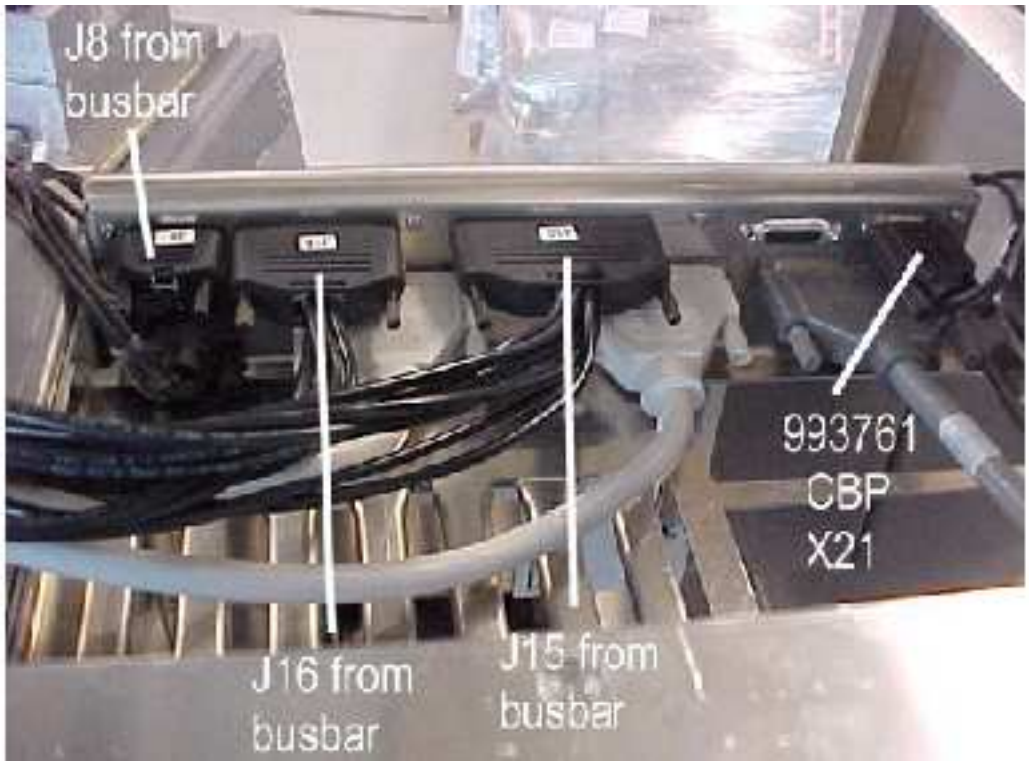


Figure 2. Common backplane upper row cabling

Steps

1. **Perform a visual check of the cables and the cable connections.**

2. **Replace all worn or broken cables.**

   Refer to the table below during cable replacement for the Common backplane (CBP), Rectifier backplane (RFBP), and Interface module (IFM) cable connections.

Table 1. Common backplane/Interface Module connections

Cable Assembly	Description	From	To
993760	Common rack fans (signal/power)	CBP - X22	Fan 1, 2, 3

Table 1. Common backplane/Interface Module connections (cont.)

Cable Assembly	Description	From	To
993761	Common backplane/RFU fan (signal/power)	CBP - X21	Fan 4, 5
993754	Common backplane/Rectifier backplane	CBP - X23/X24	RFBP - X1
993740	Common backplane/ Interface module	CBP - X25	IFM - X5
993828	Interface module/ Bias Tee	IFM - X6	Bias Tee - X28
993741	Rectifier backplane/DVxx/ RTxx	RFBP - X5/X14/ X23	RTxx/DVxx - Power In

2.6 Checking the UltraSite EDGE BTS screws

Before you start

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Steps

1. **Check the tightness of the fixing screws on the front panels of the plug-in units.**

   Torque settings of UltraSite EDGE BTS

2. **Replace all worn or missing screws.**

2.7 Checking the UltraSite EDGE BTS dummy panels

Before you start

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Summary

For cooling and Electromagnetic Compatibility (EMC) to function satisfactorily, empty slots in the UltraSite EDGE BTS should be covered with dummy panels.

Tip

Store any extra dummy panels in case of future changes to the configuration.

Steps

1. **Check that empty slots are covered with dummy panels.**
2. *If* an empty slot is not covered with a dummy panel,

   Then

   Cover the empty slot with a dummy panel.

2.8 Checking the UltraSite EDGE BTS power supply

Before you start

Warning

Potentially lethal voltages!

Switch the BTS power OFF from a disconnecting device or circuit breaker before starting the maintenance work whenever the nature of maintenance work causes a risk of electric shocks!

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Steps

1. **Check the batteries of the Integrated Battery Backup (IBBU) for defects.**

   Possible defects include

   - external damage
   - pressure spots
   - deformities
   - terminal corrosion
   - acid escape

2. *If* any defects described in the previous step are present,

   Then

   Replace the batteries.

3. **Measure battery voltage to check that they are functioning properly.**

4. *If* batteries are not charged,

   Then

   Charge the batteries.

2.9 Checking the UltraSite EDGE BTS door/roof locks

Before you start

Warning

Be careful of the edges of the cabinet when performing any maintenance work. The edges of the cabinet are sharp and may cause personal injury.

Steps

1. **Check the door/roof locks during site visits.**

   Lubricate the door/roof locks, if required.

2. *If* the Outdoor cabinet is operating in temperatures below 0° C (32° F),

   Then

   lubricate each lock with a light, non-freezing, spray lubricant.

   Apply lubricating oil to moving parts of the lock assembly and within the lock cylinder by applying oil to the key and inserting it in the cylinder repeatedly.

2.10 Monitoring transmission unit performance

Purpose

You can view the statistical information of the FXC units in the manager.

Before you start

The equipment view is open.

Steps

1. **Click the transmission unit that you want to monitor**

   Expected outcome

   The corresponding menu opens in the menu bar.

2. **Select Statistics from the menu corresponding to the transmission unit you clicked**

   Expected outcome

   The **Statistics** dialogue opens. Depending on the transmission unit, the dialogue's appearance is different. If it is an FXC E1 or FXC E1/T1 unit, it is as follows.

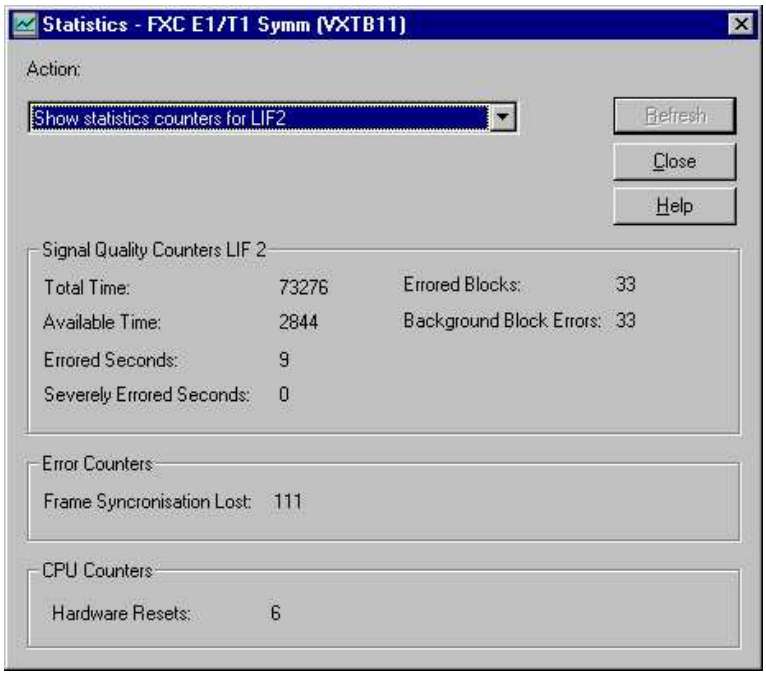


Figure 3. Statistics dialogue for FXC E1(T1)

The following figure shows the **Statistics** dialogue when the transmission unit is FXC RRI.

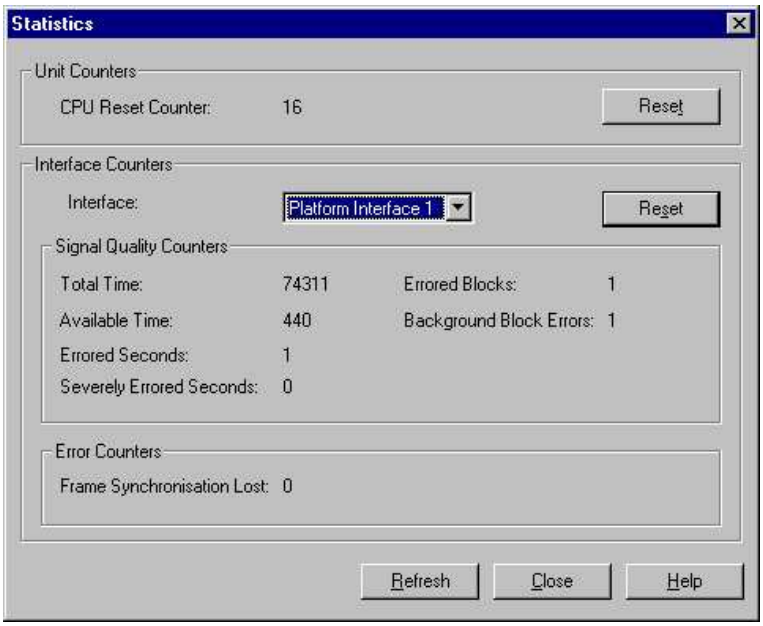


Figure 4. Statistics dialogue for FXC RRI

The **Reset** button is used to reset CPU, interface or error counters.

3. *If* you want to view the statistics history

   Then

   Select Statistics History from the menu bar

   Expected outcome

   The **Statistics History** window opens.

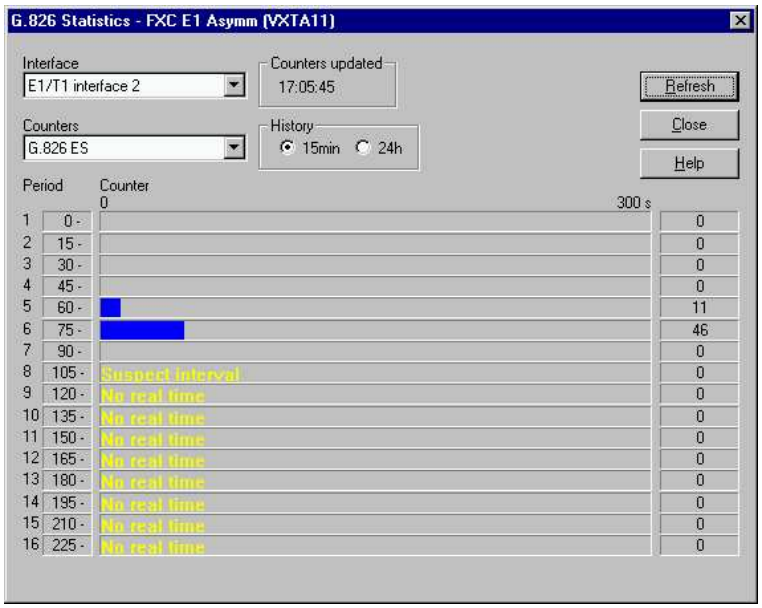


Figure 5. Statistics History for FXC E1/T1

"Suspect interval" in the **Statistics History** window signals that the measurement period was not exactly 15 minutes or 24 hours. This happens when the real time clock in the NE is adjusted more than 10 seconds during the measurement.

By way of example, a measurement interval of 15 minutes 11 seconds, or 24 hours 0 minutes 20 seconds, would result in "Suspect interval" being displayed. A measurement interval of 14 minutes 52 seconds, or 24 hours 0 minutes 8 seconds, would not.

The statistics history is not supported by the FXC RRI unit.

2.11 Monitoring node temperature

Purpose

The temperature information of the node can be viewed in the manager.

Steps

1. **Select Maintenance → Temperature Monitoring**

Expected outcome

The **Temperature Monitoring** window opens.

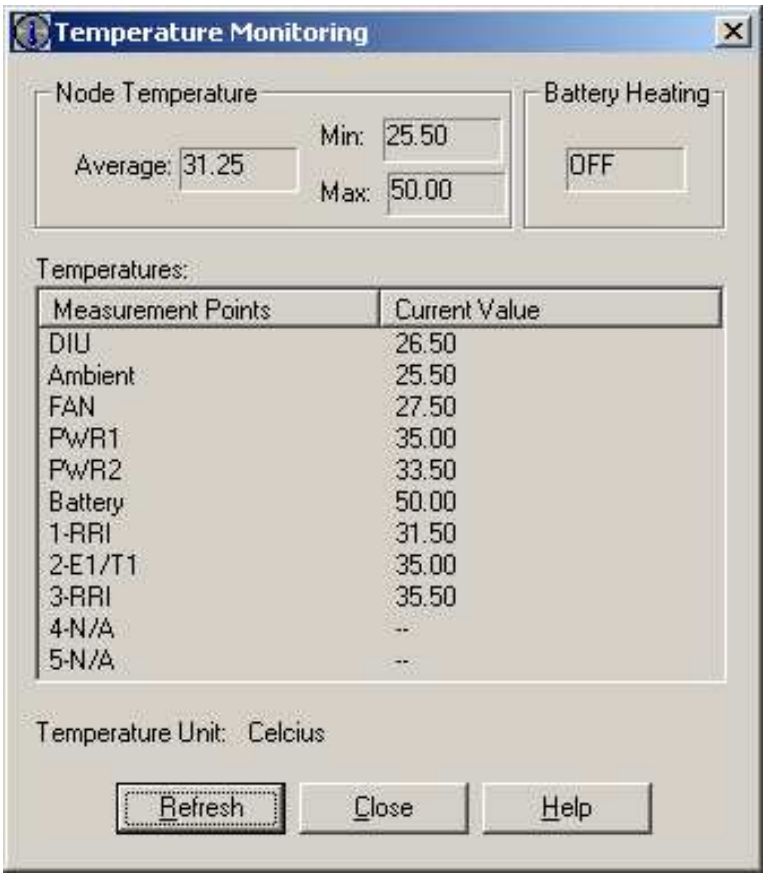


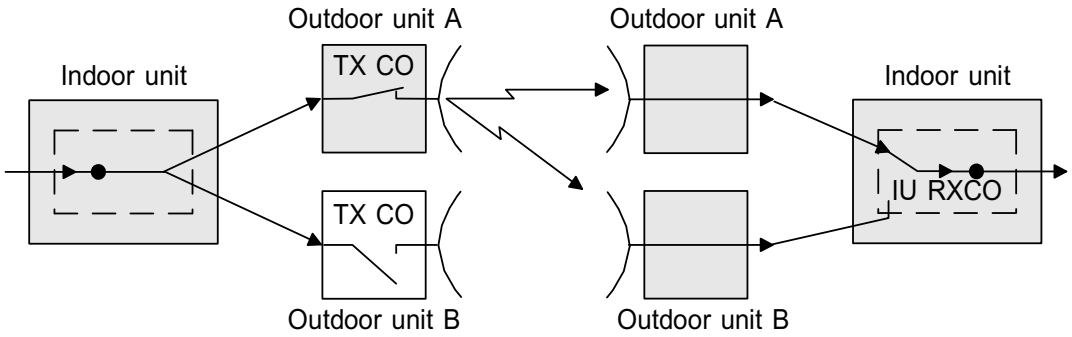
Figure 6. Temperature Monitoring window

2.12 Hot standby

Hot standby (HSB) is a method of equipment redundancy in which two radio transmitters are kept ready (switched on), so that if one fails, the other one immediately picks up where the first one left off.

In single use, the signal is not protected against equipment or propagation faults. In the event of a fault, the connection remains broken until the equipment fault has been repaired or the cause for the propagation fault goes away. Hot standby provides protection against equipment faults.

The supported HSB setup of one FXC RRI indoor unit with two Nokia FlexiHopper outdoor units is shown in the following figure. Active units are shown in grey and passive units in white.



IU RXCO Indoor unit hitless changeover switch (In ASIC)

TX CO Transmitter changeover switch (transmitter mute control)

Figure 7. Nokia FlexiHoppers with FXC RRI, 1IU/2OU HSB (only one direction shown)

In hot standby mode, the transceivers of both radios are on but the transmitter of the protecting radio is in mute state. The changeover criteria are divided in two cases: (OU) receiver changeover and (OU) transmitter changeover. These two are independent of each other.

Outdoor unit transmitter changeover switches (TX CO) are controlled by the processor of the indoor unit. The active outdoor unit is changed if a hardware fault is detected in the unit or if the far-end radio cannot receive the signal. Changeover can also be performed when the reception quality at the far-end degrades.

Possible transmitter faults are:

- Flexbus cable disconnected or broken
- Flexbus power OFF
- Flexbus "in use" setting is turned to OFF
- Flexbus loop to interface or loop to equipment is set active

- Outdoor unit is not capable of transmitting for one or more of the following reasons:
  - Tx lock lost in Flexbus cable interface
  - MWU lock lost
  - Tx power setting off
  - Tx frequency not set
- Both far-end outdoor units have lost the lock to Rx-signal (R-bit is sent from far-end)

Note

Tx changeovers are disabled and the traffic is cut during protected hop fading margin measurement. For more information, see *Fading margin measurement*.

The FXC RRI unit also supports Lazy (OU) transmitter changeover, in addition to the instant (OU) transmitter changeover described above, see *Lazy transmitter changeover*.

Indoor unit Rx changeover switch (IU RXCO) is located in ASIC, and it is hardware controlled. The changeover is based on detected FEC (forward error correction) errors. The Rx changeover is also possible by the control of the indoor unit's processor. In receiver changeover, depending on the received radio signal quality and available receivers, the system tries to minimise the errors in received data by selecting the outdoor unit with the lower bit error rate. When the active receiver gets a serious fault, the receiver changeover is made. During the changeover, bit errors occur and synchronisation is momentarily lost.

Possible serious receiver faults are:

- Flexbus cable disconnected or broken
- Flexbus power OFF
- Flexbus "in use" setting is turned to OFF
- Flexbus loop to interface or loop to equipment is set active
- Flexbus Rx-signal frame lock lost
- Outdoor Unit Rx signal lock lost

After the changeover, the system activates the alarm *128 Fault in equipment* including information about which unit is faulty. Other alarms of the faulty unit show the actual reason for the fault. After the fault has been corrected (for example, the unit has been replaced and commissioned) the system activates HSB protection method and clears the alarms.

If the passive transmitter gets faulty, the system activates the *128 Fault in equipment* alarm and Tx changeover is not possible before the fault is fixed.

Note

When an outdoor unit of an HSB protected hop is replaced, the outdoor unit settings of the new outdoor unit should be checked (may be in the default state) with the node manager. The TX-frequency and interleaving settings must be the same in both outdoor units of the HSB protected hop. If the settings are different, the *143 Fault in change over function* alarm is activated. In that case the changeover is still possible, but after the TX-changeover the frequency may be illegal.

Note

Connecting a Flexbus cable to a passive outdoor unit of an operative protected HSB hop may cause a few bit errors to the transmitter and receiver of the active outdoor unit.

2.13 Transmission network protection using loop topology

Introduction

Nokia Loop Protection is considered the most efficient way to protect traffic in a transmission network such as a GSM base station subsystem. In a live telecommunications network it is important to secure the network synchronisation and the centralised network management, in addition to the actual payload traffic, during any period of abnormal circumstances.

For these reasons, Nokia Loop Protection protects

- payload traffic
- network synchronisation
- network management connections.

A transmission loop formed with Nokia elements consists of one loop master and several loop slaves. Usually the loop master is a transmission node whereas the loop slaves can be either transmission nodes, BTSs or a combination of both inside one loop.

The loop principle is that the transmitted signal is always sent in both directions but the received signal must be chosen from only one direction. The loop master sends pilot bits on the basis of which the switching decision is made. Each individually protected slave station needs one pilot bit.

Network synchronisation must also be ensured in a loop network and it follows the loop principle in a similar way. The synchronisation switching takes place independently from the pilot bits by having a master clock bit (MCB) and a loop control bit (LCB).

Each network element decides individually from which direction the signal and the synchronisation will be received, and so it does not require any external or additional supervision for its decision.

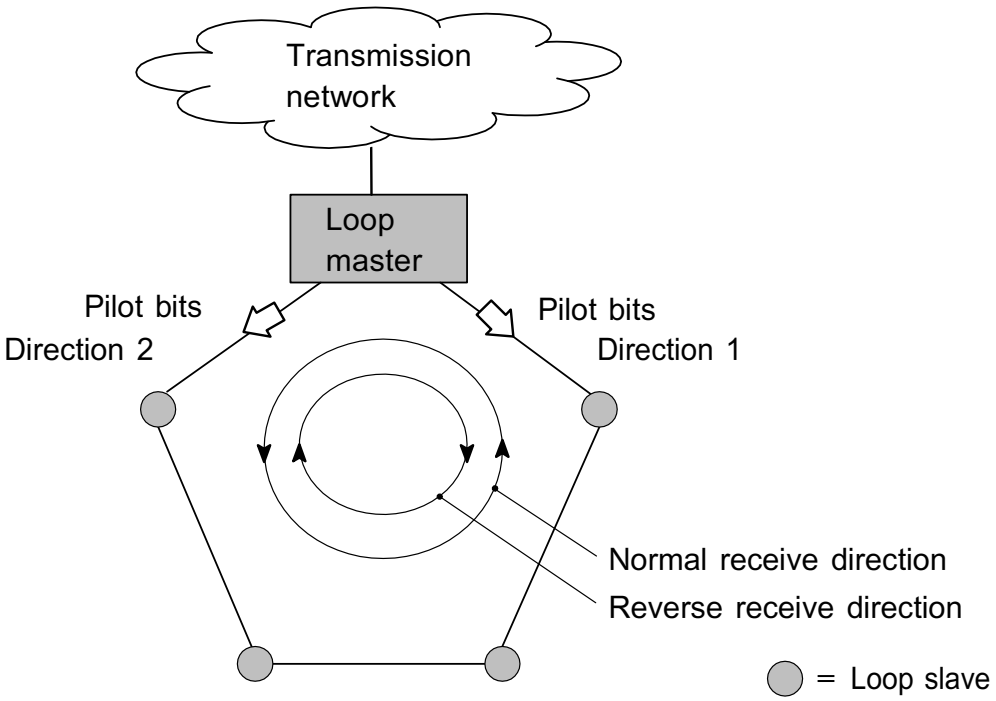


Figure 8. Loop principle

Nokia's way of implementing loop protection is ultimately secure, providing very fast route switching that recovers the transmission connections instantly. Nokia loop protection is embedded and thus very fast. Nokia loop protection protects against failures, such as cable-cut, equipment failure, heavy rain and multipath fading, and against obstacles in the line-of-sight, such as cranes and growing trees.

Compared to an unprotected wireless network, Nokia loop protection increases site availability at least tenfold and prevents end-of-chain availability degradation. Further, it enables significant hop length increases without site availability sacrifices and helps minimise radio link antenna sizes.

Nokia loop protection is an easily activated system feature where Nokia MetroHub and UltraSite BTS can act as a master node. In addition, several Nokia MetroHub nodes, UltraSite base stations, and MetroSite base stations can be looped together.

The protection functionality is compatible with the existing Nokia BSS transmission.

For more information refer to *Nokia PDH Loop Protection in GSM Networks*, which can be obtained from a Nokia representative upon request.

Protecting payload traffic

A pilot bit is a special bit with a preset value (zero), sent among the protected traffic in a known position.

For example, protecting a 2 Mbit/s link requires one bit out of the 2 Mbit/s stream to be reserved for this purpose. Similarly, if the traffic is protected at a partial 2 Mbit/s level, for example, because two different base transceiver stations share one 2 Mbit/s line, one pilot bit is required for each slave station.

The location of the pilot bit is defined in the network plan, and it is often within one of the last time slots of the 2 Mbit/s frame. In principle, the location can be selected freely, but a harmonised practise in the network may be advisable for easy site commissioning and network documentation.

The state of a pilot bit is set to zero at the sending station, which sends identical digital streams (payload and the pilot bit protecting it) in directions 1 and 2 in the loop.

Any failure in the connection between the sending station and the intended destination causes the pilot bit to change from zero to one (based on AIS). The target station, receiving a one instead of a zero then knows that the connection is faulty.

The following figure shows the loop principle between the loop master and one slave. The traffic in the other slave stations is bypassed.

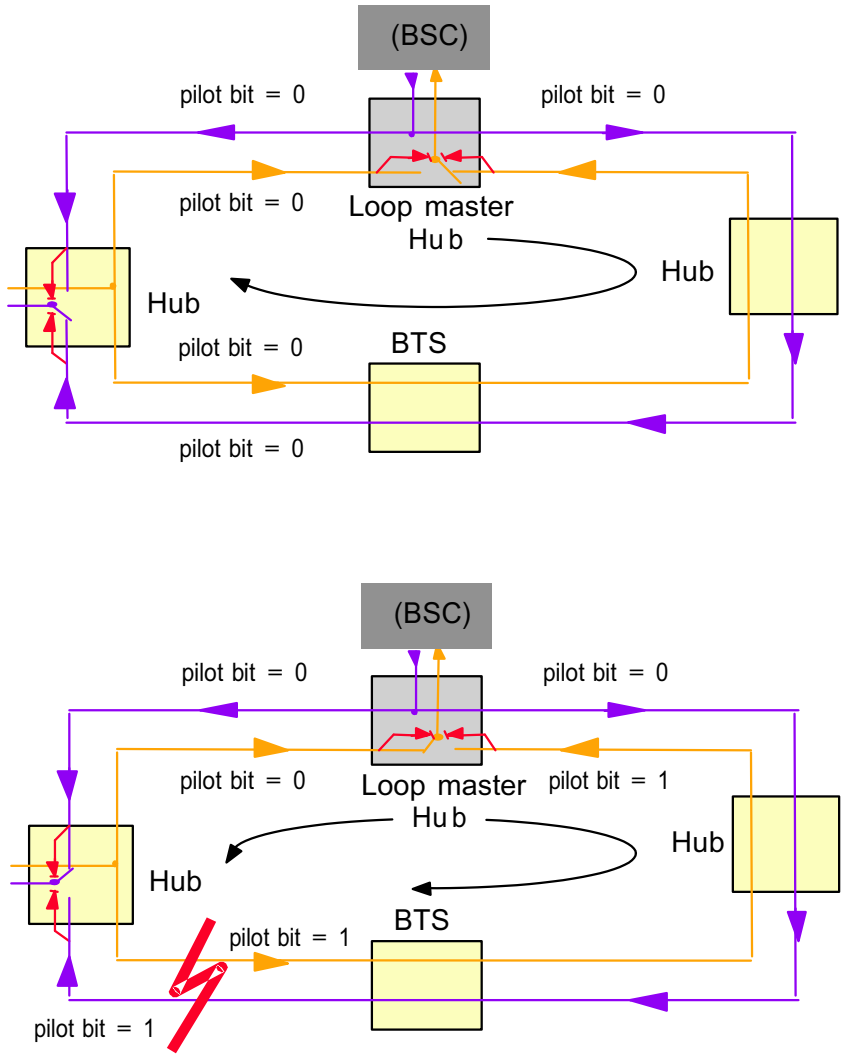


Figure 9. Traffic protection guided by pilot bit monitoring

The pilot bit is sent at the loop master Hub site for all the slave stations as zero with "Uni-directional fixed data" or "Bi-directional Masked" types of cross-connections. By using "Bi-directional Masked," you can reduce the amount of connections from two uni-directional to one bi-directional.

Masking pilot bits

The principle of masking in the loop network is to use the logical "AND" operation with zero, when the result is always zero, and masking with one when the output is the same as the input signal (either unchanged zero or one).

In the example in the following figure, pilot bits are sent to four slave nodes in the loop. The view is from a cross-connection termination point setting.

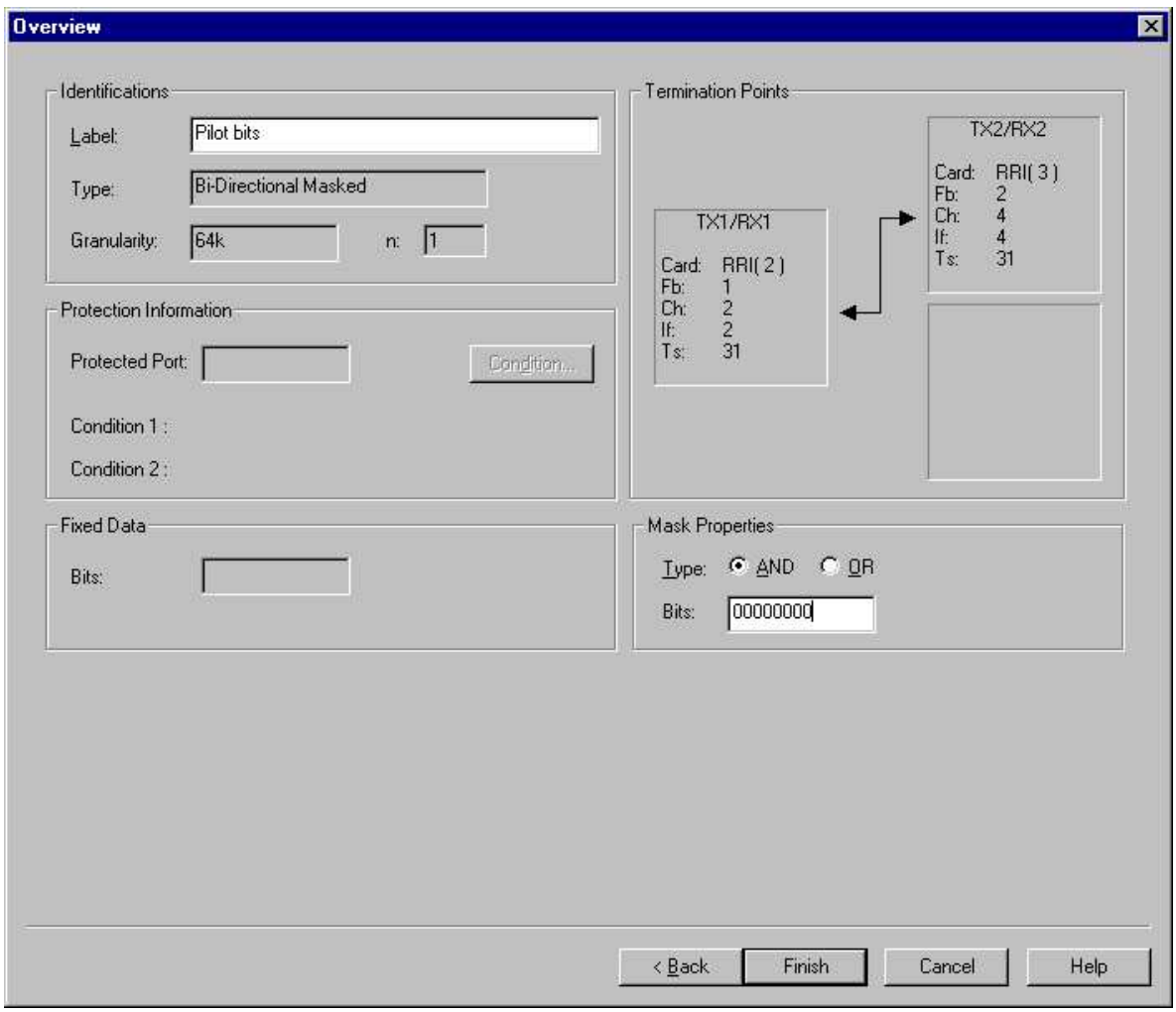


Figure 10. Pilot bit sent from a loop master

In loop slave sites, each node must forward the pilot bits from other slave stations unchanged and send its own pilot bit as zero in both loop directions. This is done with "Bi-directional Masked" type of cross-connection. The following figure presents the pilot bit masking of the second slave node (bit 2) and other pilot bits forwarding in the loop. The view is from a cross-connection termination point setting.

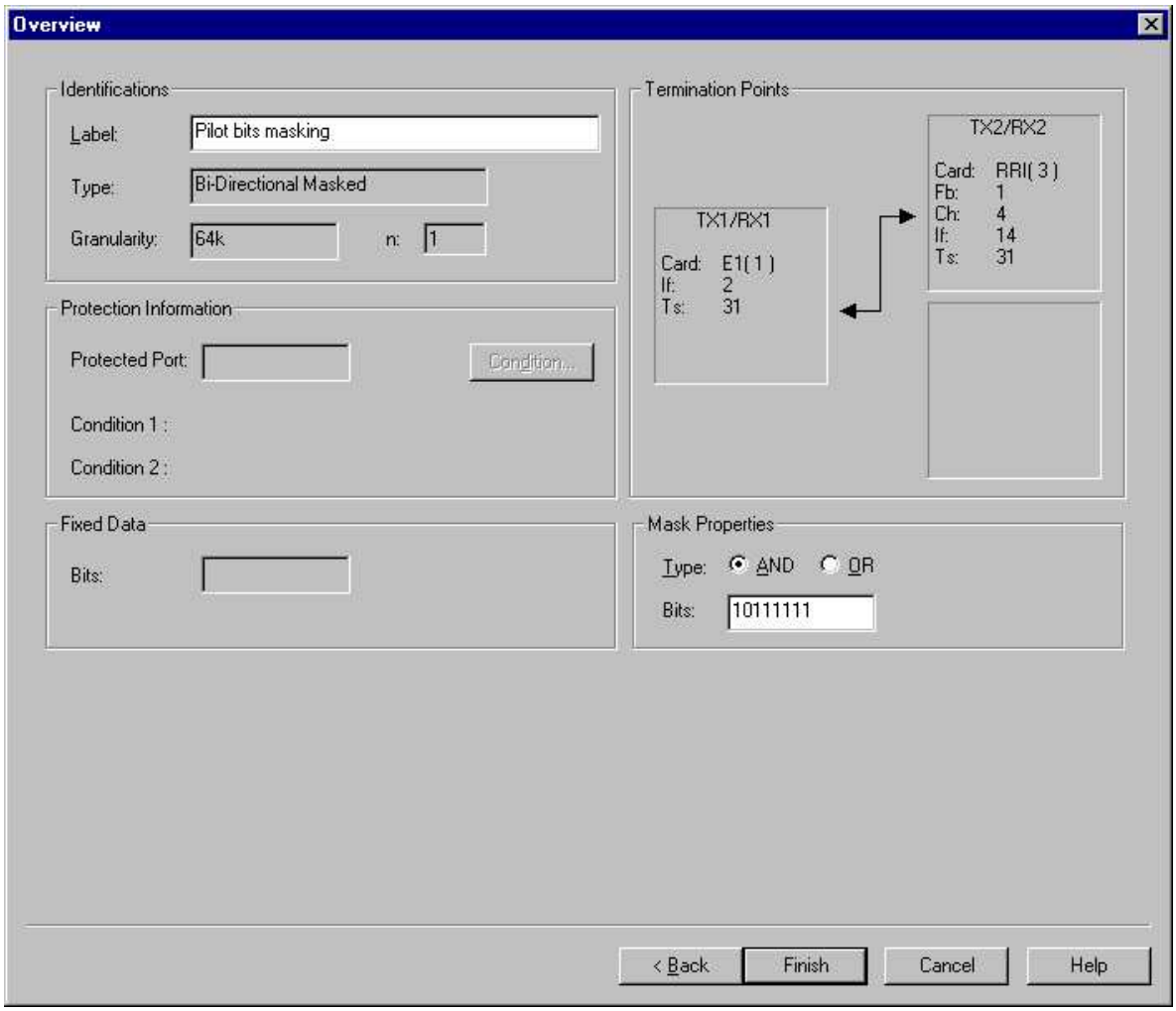


Figure 11. Pilot bit masking in the second loop slave

Nokia Loop Protection can be configured either as *equal switching* or *priority switching*. The difference between these is that in the priority switching the connection returns to the initial route as soon as the problem on that link is solved, whereas with the equal switching the system stays on the chosen link until it gets faulty. The equal switching provides better stability for the connection, and it is therefore the recommended choice for a BSS network.

Protecting network synchronisation

The implementation mechanism for an automatic detection and recovery of missing or looped network synchronisation is based on loop network clock control bits carried within the protected 2 Mbit/s stream:

- one bit for detecting if the incoming signal is synchronised by the original network synchronisation master or not (master clock bit, MCB), and
- one bit for detecting any breaks or loopbacks in the synchronisation chain (Loop Control Bit, LCB).

The loop master sets the MCB and LCB to zero state in both directions. Any station using a certain received signal for synchronisation sends the LCB back as one, and so the counterpart knows that the synchronisation of the incoming stream is inherited in such a way that it must not be used for synchronisation to avoid a loopback or otherwise faulty synchronisation. The same applies to all slaves to make sure the synchronisation remains intact.

Similarly, faulty transmission replaces MCB and LCB with one and affected stations know they are not receiving a valid source signal from that direction.

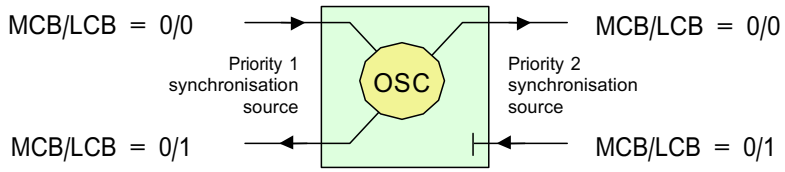


Figure 12. Manipulating synchronisation loop control bit

In the loop master Hub, the MCB/LCB can be sent as zero in both directions of the loop with "Uni-directional fixed data" or "Bi-directional Masked" types of cross-connections, but it is recommended to use Configuration → Synchronisation → Loop Bits setting to define the MCB/LCB bit positions.

Node master-slave detection

The Hub will recognise that it is defined as the master of the loop based on the following information. A synchronisation priority list is always defined first, then the MCB and LCB. The system recognises if the MCB and LCB are in the Synchronisation list and that makes the Hub a slave. If the MCB and LCB bits are not in the list, the node is a master. This detection is automatic. There are a couple of network cases which require the use of real MCB/LCB settings, so this is a better practice for common use.

These cases are, for example:

- Q1 loop termination is done based on the incoming LCB bit status. If the loop master node does not have the definition, the Q1 loop protection is not working.
- The Hub is acting as the master of one loop and the slave of another. The equipment uses loop synchronisation MCB/LCB definition, MCB = incoming MCB bit and LCB = 0 (except towards the interface where the clock is coming, where LCB = 1).
- MCB status is forwarded as received from an upper network element (loop master using chain synchronisation with MCB definition, MCB = incoming MCB bit and LCB = 0).
- Node master running ON internal clock which is not in priority l level (MCB/LCB = 1/0)

The following figure presents the setting of MCB/LCB bits in two directions in different FXC RRI units.

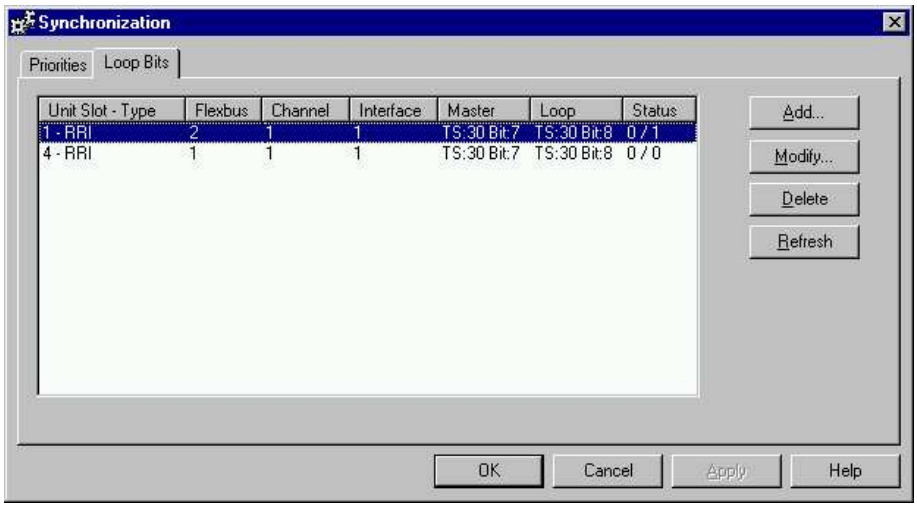


Figure 13. Setting of loop control bits

Note that node synchronisation is always based on priority and will thus return to a higher priority route whenever the problem on that link is solved, of course after certain hysteresis. This does not cause any problem to traffic because the synchronisation is coming from the same loop master.

The location of the MCB and LCB is defined in the network plan. In principle, the location can be selected freely, but a harmonised practise in the network may be advisable for easy site commissioning and network documentation.

Protecting remote network management channel

The Q1 network management channel used to manage Nokia PDH transmission elements is a bus, and therefore must not get looped.

Q1 loop protection is based on switching into a faultless direction when there is a breakage somewhere in transmission. The direction is changed according to an LCB bit (loop control bit which also controls the synchronisation in a loop network).

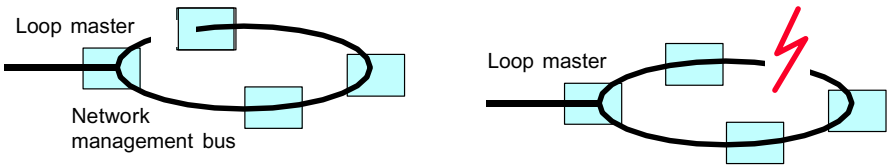


Figure 14. Network management bus circulation prevention

To avoid ringing and simultaneous polling from two directions, the Q1 loop must be terminated at the master node.

To terminate the loop at the master node:

- LCB (from the last slave node) = 0 → no faults in the network → forced termination towards the last slave node
- LCB (from the last slave node) = 1 → fault in the network → forced termination removed

This termination is used when the loop master is a Nokia MetroHub node, UltraSite BTS node, or Nokia DN2. The loop master is configured so that it sends network management channel in just one direction. When a fault occurs in that direction (the loop master detects that from the received LCB), it knows to allow the network management channel propagate in both directions. The Q1 EOC

hybrid switch must be set to "OFF" state towards the "Secondary Port" direction in the loop master. In this case, no additional settings to normal Q1 EOC channel are needed in the slave nodes. This is the recommended way to implement Q1 network management bus protection with Nokia PDH loop protection.

In some cases, when the loop master is an older Nokia BTS integrated transmission unit (TRUx or BIUMD), Q1 protection must be done in the first loop slave on the secondary port side of the loop master. In this case, both the Q1 primary port and the secondary port must be defined for the loop slave. Nokia MetroHub, UltraSite BTS, and MetroSite BTS support Q1 slave protection.

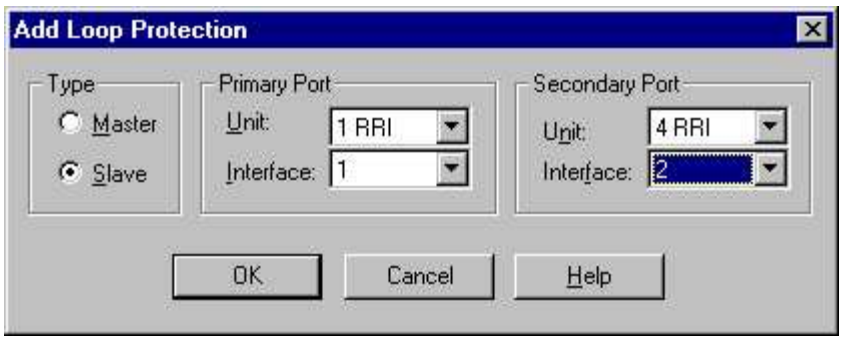


Figure 15. Setting of Q1 protection in the slave (in case of slave protection)

Note

Both the EOC and the MCB/LCB in the secondary port side must be defined in the same 2M interface in order for the Q1 loop protection to work.

Hints for using a loop network

- It is recommended that you use different FXC units for the Protected and Protecting ports of a connection to gain the maximum protection in the hardware reliability sense.
- When 16 x 2 Mbit/s capacity loops are built, each of the three loop directions requires a separate FXC RRI unit.

2.14 Fading margin measurement

Nokia FlexiHopper can execute an automatic fading margin measurement (FMM) during radio relay commissioning. The measured fading margin can be used to verify the quality of radio link network planning. In addition, it can be used for defining a sensible ALCQ Rx-level set-point. The measurement is carried out without the aid of any additional tools or measurement equipment. The automatic fading margin measurement is based on four different measurements: The BER 10-3 threshold signal levels at each capacity and receiver's (capacity dependent) noise floor are measured in Nokia production for each radio. Moreover, the noise floor together with received interference signal level and the normal (maximum) received power level are measured with commissioned radio relay in real environment. Consequently, it is straightforward to calculate the fading margin from these measurement results. More detailed information about fading margin can be found from the *ALCQ and Automatic Fading Margin Measurement in FlexiHopper Microwave Radio Application Note* that can be obtained upon request.

Generally, the fading margin is defined here as a difference between the normal received signal level and the required signal level for 10-3 BER in the actual operation conditions over the commissioned radio hop.

2.15 Lazy transmitter changeover

Lazy transmitter changeover is a protection method against transmitter faults that cannot be detected by the equipment itself, for example, a faulty antenna. The FXC RRI unit sends periodical notifications to the far-end about the radio signal quality. Lazy transmitter changeover is performed, if there are errors in the transmitted data over a specified interval (see lazy changeover timing below) that are caused by the near-end transmitter.

Lazy transmitter changeover is performed when the system experiences bit errors for a longer period. Lazy transmitter changeover is possible only when both transmitters are available. It is based on analyses of the current and past events. System minimises the number of lazy transmitter changeovers, because each time the changeover is made the synchronisation is lost.

Other factors in the lazy transmitter changeover are:

- If one of the outdoor units becomes unavailable, the system makes an instant transmitter changeover and generates the *128 Fault in equipment alarm*.
- If the bit error rate after the changeover is 1000 times higher than before the changeover, the system makes another changeover back to the previous transmitter.

2.15.1 Lazy changeover timing

ITN C2.1 release supports Quality Class 1 Lazy changeover function, which provides the best possible protection against undetectable transmitter faults. It makes the first Tx changeover soon after constant BER is detected in the far-end. Also if far-end BER exceeds 1E-3, the Tx-changeover is done immediately.

The BER value presented in the table below is based on the far-end BER, which is the result of radio's internal process and cannot be measured. The BER value is calculated from the better receiver.

Table 2. Primary and secondary periods of Quality Class 1

Class 1	h:min:s	
BER	Primary period	Secondary period
1E-9	24 days 20:31:24	24 days 20:31:24
1E-8	10:00:00	18:00:00
1E-7	0:30:0	3:00:00
1E-6	0:03:00	0:30:00
1E-5	0:00:30	0:10:00
1E-4	0:00:10	0:05:00
1E-3	0:00:05	0:02:00

2.15.2 Lazy transmitter changeover examples

Example 1

If the BER value stays over the BER level for the time period specified in the quality class for that BER level, a Tx changeover is made.

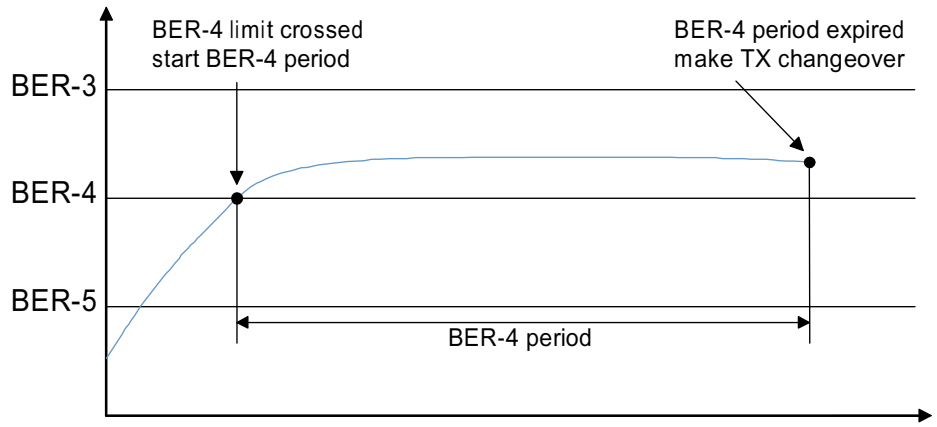


Figure 16. BER stays over the threshold for the primary period

Example 2

If the BER value drops to the previous level, the period timer is continued at the time spent since the level was crossed for the first time.

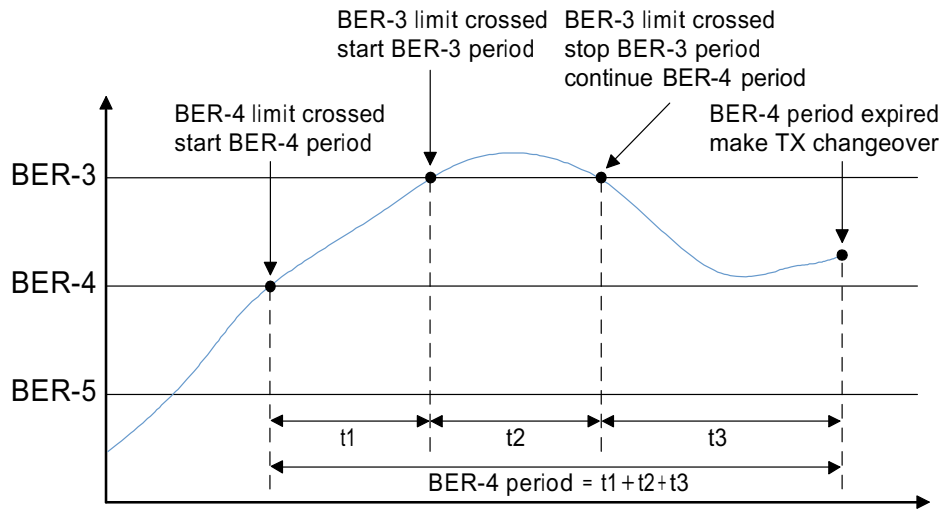


Figure 17. BER drops to the previous level and stays over threshold for the primary period

Example 3

If the BER value drops to the previous level and after that crosses over to the upper level again, the period timer is restarted from zero.

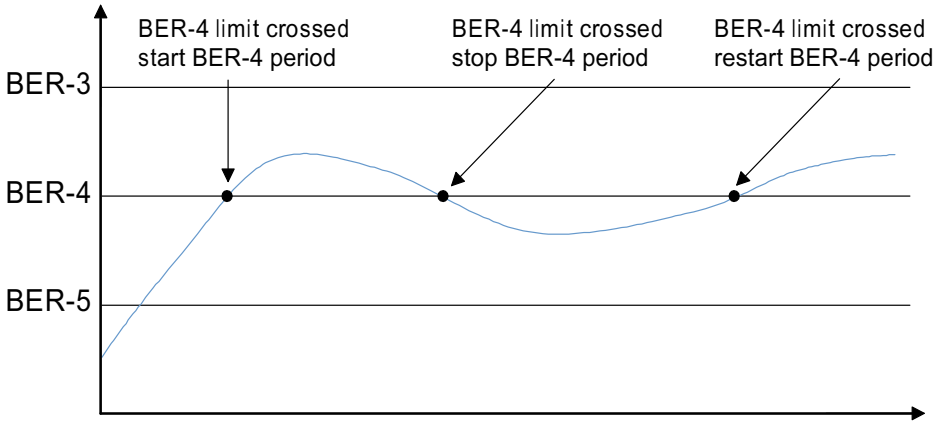


Figure 18. BER drops temporarily under the threshold and the primary period is restared

Example 4

When BER value crosses over to the upper level, but the time period left from the lower BER level is shorter than the new period, the old period is continued.

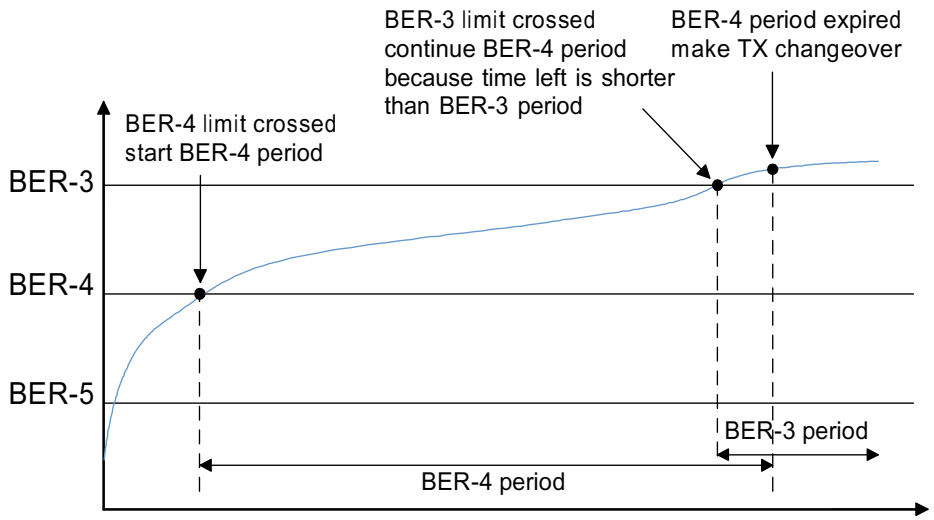


Figure 19. Lower BER primary period is continued

Example 5

If BER is over the threshold after the first changeover, then the secondary period is used for the next changeover.

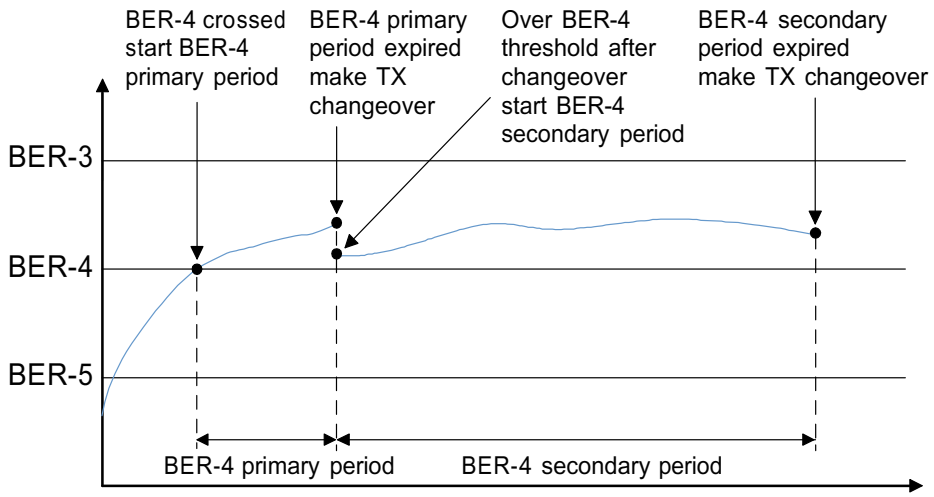


Figure 20. After the first changeover the secondary period is used

3 Checking UltraSite EDGE BTS LEDs

3.1 Checking UltraSite EDGE BTS GSM/EDGE LEDs

3.1.1 Overview of checking UltraSite EDGE BTS GSM/EDGE LEDs

Summary

Every active unit has at least one tri-colour LED indicator. The LEDs on the front of the unit indicate the unit's operational status or the potential fault of a unit in the BTS.

Note

When units are powered on, the LEDs should always be lit. When an LED is not lit, either the unit or the LED may be faulty, or there is no power to the unit.

Table 3. TSxx unit LED indications

LED colour	Steady	Flashing
RED	Fault or alarm	TRX test
YELLOW	Unit is on; transmitter off (no calls at any time slot)	NA
GREEN	Unit is on and transmitting (call and/or BCCH)	NA

Steps

1. **Check UltraSite EDGE BTS GSM/EDGE Transceiver RF unit LEDs**
2. **Check UltraSite EDGE BTS GSM/EDGE Transceiver Baseband unit LEDs**
3. **Check UltraSite EDGE BTS GSM/EDGE Transmission unit LEDs**
4. **Check UltraSite EDGE BTS GSM/EDGE Dual Variable Gain Duplex Filter unit LEDs**
5. **Check UltraSite EDGE BTS GSM/EDGE Base Operations and Interfaces unit LEDs**
6. **Check UltraSite EDGE BTS GSM/EDGE Power Supply unit LEDs**
7. **Check UltraSite EDGE BTS GSM/EDGE Remote Tune Combiner unit LEDs**

3.1.2 Checking UltraSite EDGE BTS GSM/EDGE Transceiver RF (TSxx) unit LEDs

Purpose

The TSxx unit has one tri-colour LED that indicates its status.

Before you start

Ensure that the TSxx unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition..**

   TSxx LEDs

3.1.3 Checking UltraSite EDGE BTS GSM/EDGE Transceiver Baseband (BB2x) unit LEDs

Purpose

) The BB2x unit has two tri-colour LEDs (A&B) that indicate the status of each baseband section. The first indicator shows the status of the first baseband module and the lower indicates that of the second.

Before you start

Ensure that the BB2x unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition.**

   BB2x LEDs

3.1.4 Checking UltraSite EDGE BTS GSM/EDGE Transmission unit LEDs

Purpose

FC and FXC units have one tri-colour LED indicator. This indicator displays the current state of the Transmission unit as a quick on-site reference.

Note

In FXC RRI there are also two green LEDs that display the current state of associated FlexBus interface.

Before you start

Ensure that the transmission unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition.**

   Transmission unit LEDs

3.1.5 Checking UltraSite EDGE BTS GSM/EDGE Dual Variable Gain Duplex Filter (DVxx) unit LEDs

Purpose

The DVxx unit has one tri-colour LED, common for both LNAs, that indicates their status.

Before you start

Ensure that the DVxx unit is powered on.

Steps

1. Find the correct LED indication to determine operating condition.

DVxx LEDs

3.1.6 Checking UltraSite EDGE BTS GSM/EDGE Base Operations and Interfaces (BOIx) unit LEDs

Purpose

The BOIx unit has one tri-colour LED that indicates its status.

Before you start

Ensure that the BOIx unit is powered on.

Steps

1. Find the correct LED indication to determine operating condition.

BOIx LEDs

3.1.7 Checking UltraSite EDGE BTS GSM/EDGE Power Supply (PWSx) unit LEDs

Purpose

The PWSx unit has one tri-colour LED that indicates its status.

Before you start

Ensure that the PWSx unit is powered on.

Steps

1. Find the correct LED indication to determine operating condition.

PWSx LEDs

3.1.8 Checking UltraSite EDGE BTS GSM/EDGE Remote Tune Combiner (RTxx) unit LEDs

Purpose

The RTxx has one tri-colour LED that indicates its status.

Before you start

Ensure that the RTxx unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition.**

   RTxx LEDs

3.2 Checking UltraSite EDGE BTS IBBU LEDs

3.2.1 Overview of checking UltraSite EDGE BTS IBBU LEDs

Summary

Each IBBU unit within UltraSite EDGE BTS have LED indicator to display their operational staus, with the exception of the BATA units. The LED indicators are tri-colour (yellow, red, green) and display various status indications.

Note

When IBBU units are powered on, the LED indicators should always be lit. If and LED indicator is not lit, either the unit or the LED indicator is faulty or there is no power to the unit.

Steps

1. **Check BATA unit LEDs**
2. **Check ADUA and CCUA unit LEDs**

3.2.2 Checking UltraSite EDGE BTS 1300 W Rectifier (BATA) unit LEDs

Before you start

Ensure that the BATA unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition.**

   BATA LEDs

3.2.3 Checking UltraSite EDGE BTS AC/DC Connection (ADUA) and Cabinet Control (CCUA) unit LEDs

Before you start

Ensure that the ADUA unit is powered on and the CCUA is operational.

Steps

1. **Find the correct LED indication to determine operating condition.**

   ADUA/CCUA LEDs

3.3 Checking UltraSite EDGE BTS WCDMA LEDs

3.3.1 Overview of checking UltraSite EDGE BTS WCDMA LEDs

Summary

Each WCDMA unit within UltraSite EDGE BTS has one LED indicator to display its operational status, with the exception of the WAF and WSC units, which have two LED indicators. The LED indicators are tri-colour (yellow, red, green) and display seven status indications.

Note

When WCDMA units are powered on, the LED indicators should always be lit. If an LED indicator is not lit, either the unit or the LED indicator is faulty or there is no power to the unit.

Note

If one of the WSC units in a cabinet is on stand by, its upper LED indicator is not lit. This is an exception to the general LED interpretation and does not indicate that the unit is faulty.

The following units are equipped with LED indicators:

- Transceivers, WTRs
- System clock units, WSCs
- Antenna filters, WAFs
- Power amplifiers, WMPs
- Input combiner, WIC
- Summing and multiplexing unit, WSM
- Application manager, WAM
- Signal processor units, WSP
- ATM cross-connect unit, AXU
- Interface unit, IFU

Steps

1. **Check Transceiver (WTRx) unit LEDs**
2. **Check System Clock (WSCx) unit LEDs**
3. **Check Antenna Filter (WAFx) unit LEDs**
4. **Check common unit LEDs**

   Common units include:

   - Mini-Power Amplifiers (WMPs)
   - Input Combiner (WIC)
   - Summing & Multiplexing unit (WSM)
   - Application Manager (WAM)
   - Signal processor units (WSPs)

- ATM Cross-connect unit (AXU)
- Interface unit (IFU)

3.3.2 Checking UltraSite EDGE BTS WCDMA transceiver (WTRx) unit LEDs

Before you start

Ensure that the WTR unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition.**

   WTRx LEDs

3.3.3 Checking UltraSite EDGE BTS WCDMA System Clock (WSCx) unit LEDs

Before you start

Ensure that the WSC unit is powered on.

WSC units have two LEDs. If one of the WSC units in a cabinet is on standby, its upper LED will not be lit. This does not indicate that the unit is faulty.

Steps

1. **Find the correct LED indication to determine operating condition.**

   WSC LEDs

3.3.4 Checking UltraSite EDGE BTS WCDMA Antenna Filter (WAFx) unit LEDs

Before you start

Ensure that the WAF unit is powered on.

Steps

1. **Find the correct LED indication to determine operating condition.**

   WAF LEDs

3.3.5 Checking UltraSite EDGE BTS WCDMA common unit LEDs

Before you start

Ensure that the WCDMA unit is powered on.

Summary

Each WCDMA common unit within the UltraSite EDGE BTS has one LED indicator to show its operational status. The LED indicators are tri-colour (yellow, red, green) and display seven status indications.

Steps

1. **Find the correct LED indication to determine operating condition.**
   - *WMPA LEDs*
   - *WIC LEDs*
   - *WSM LEDs*
   - *WAM LEDs*
   - *WSP LEDs*
   - *WPS LEDs*
   - *AXU and IFU LEDs*

3.3.6 Running UltraSite EDGE BTS system tests

Summary

To measure the quality and maximum number of calls in a cell, run UltraSite EDGE BTS system tests as they apply to your system. The tests verify the condition of the hardware and help identify appropriate maintenance tasks.

Table 4. Remote testing

System	Action
GSM/EDGE system	Run system tests remotely from the BSC, NMS/2000 or NetAct.
WCDMA system	Run system tests remotely from the RNC or NetAct.

Steps

1. **Run the Abis loop test.**

2. **Run the TRX test.**

3.3.7 Checklist for preventing failures in UltraSite EDGE BTS

Table 5. Checklist for preventing failures

Check	Refer to	Check mark
BTS Manager connection	*Trouble management of UltraSite EDGE BTS*	
Electrical power		
Transmission unit operation		
Transceiver unit operation		
Fan units operation		
WCDMA BTS Manager connection	*Trouble management of UltraSite EDGE BTS with WCDMA upgrade*	
Electrical power to the BTS		
Transmission unit operation		
Wideband transceiver unit (WTR) operation		
Wideband temperature control (WTCx) fan module operation		
Manage BTS alarms	*Trouble management of UltraSite EDGE BTS alarms*	
Identify faulty BTS units	*Identifying faulty units of UltraSite EDGE BTS*	
Reclassification of BTS alarms	*Reclassification of GSM/ EDGE UltraSite EDGE BTS alarms*	
Transmission alarms	*Trouble management of UltraSite EDGE BTS commissioning*	
Commissioning reports		

Table 5. Checklist for preventing failures (cont.)

Check	Refer to	Check mark
Replace BTS units	*Preparing to replace UltraSite EDGE BTS units*	
Transceiver RF unit LEDs	*Overview of checking Ultrasite EDGE BTS LEDs*	
Transceiver Baseband unit LEDs		
Transmission unit LEDs		
Dual Variable Gain Duplex Filter unit LEDs		
Base Operations and Interfaces unit LEDs		
Power Supply unit LEDs		
Remote Tune Combiner unit LEDs		

4 Glossary

4.1 Glossary for UltraSite EDGE BTS

4.1.1 Abbreviations and acronyms

This section lists abbreviations and acronyms used throughout Nokia UltraSite EDGE Solution documentation.

AC	Alternating Current
ACFU	AC Filter Unit
A/D	Analog/Digital
ADC	Analog to Digital Converter
ADUA	AC/DC control and distribution unit for Integrated Battery Backup (IBBU)
AGC	Automatic Gain Control
ALS	Automatic Laser Shutdown
AMR	Adaptive Multi-Rate coding
ANSI	American National Standards Institute
ANT	Antenna connector
ARFN	Absolute Radio Frequency Channel Number
ASIC	Application Specific Integrated Circuit
ATM	Asynchronous Transfer Mode

AWG	American Wire Gauge
AXC	ATM cross-connect
AXU	ATM cross-connect unit
BAPT	Bundesamt für Post und Telekommunikation Telecommunications advisory agency of Federal Republic of Germany
BATx	Rectifier for battery backup
BBAG	12 V battery for Integrated Battery Backup (IBBU)
BB2x	Transceiver Baseband unit • BB2A for GSM • BB2E for GSM/EDGE
BCCH	Broadcast Control Channel
BCF	Base Control Function
BER	Bit Error Ratio The ratio of the number of bit errors to the total number of bits transmitted in a given time interval.
BIST	Built-In Self Test A technique that provides a circuit the capability to carry out an implicit test of itself.
BOIx	Base Operations and Interfaces unit
BPxN	Bias Tee without VSWR monitoring • BPDN for GSM 900/1800/1900 • BPxV Bias Tee with VSWR monitoring • BPGV for GSM 900 • BPDV for GSM 1800/1900
BS	British Standards
BSC	Base Station Controller

BSS	Base Station Subsystem
BTS	Base Transceiver Station (Base Station)
CC	Cross-Connection
CCCH	Common Control Channel
CCITT	Comité Consultatif International Télégraphique et Téléphonique International Telegraph and Telephone Consultative Committee (Telecommunications advisory agency of France)
CCUA	Cabinet Control Unit
CDMA	Code Division Multiple Access A technique in which the radio transmissions using the same frequency band are coded in a way that a signal from a certain transmitter can be received only by certain receivers
CE	Cable Entry; Consumer Electronics; Conformit Européen (European Conformity) CH Channel
CHDSP	Channel Digital Signal Processor
CN	Change Note A short trouble management document in a specified form sent to a customer about a modification in a product
CRC	Cyclic Redundancy Check A method for detecting errors in data transmission.
CRMx	Core Mechanics for Nokia UltraSite EDGE Base Station Indoor and Outdoor cabinet • CRMA for Indoor and Outdoor cabinets • CRMB for Site Support cabinets • CRMC for Midi Indoor and Outdoor cabinets
CSC	Customer Services Centre
D/A	Digital/Analog

DC	Direct Current
DCS	Digital Cellular System
DDS	Direct Digital Synthesis The frequency synthesis in which logic and memory are used to digitally construct the desired output signal, and a digital-to-analogue converter is used.
DL	(Downlink) The direction of transmission in which the BTS is the transmitting facility and the mobile station is the receiving facility.
DIP	Dual In-line Package
DRAM	Dynamic Random Access Memory
DRX	Discontinuous Reception
DSP	Digital Signal Processor
DTX	Discontinuous Transmission
DU2A	Dual Band Diplex Filter unit for GSM 900/1800
DVxx	Dual Variable Gain Duplex Filter unit • DVTB for GSM/EDGE 800 • DVTC for GSM/EDGE 800 co-siting • DVGA for GSM/EDGE 900 • DVHA for GSM/EDGE 900 customer-specific H band • DVJA for GSM/EDGE 900 customer-specific J band • DVDC for GSM/EDGE 1800 • DVDA for GSM/EDGE 1800 A band • DVDB for GSM/EDGE 1800 B band • DVPA for GSM/EDGE 1900
E1	European Digital Transmission Format Standard (2.048 Mbit/s)
EAC	External Alarms and Controsl

EC	European Community
EDGE	Enhanced Data rates for Global Evolution
EEC	European Economic Community
EEPROM	Electronically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMP	Electromagnetic Pulse
EN	European Norm
EQDSP	Equaliser Digital Signal Processor
ESD	Electrostatic Discharge
ET	Exchange Terminal
ETSI	European Telecommunications Standards Institute
Ext.	External
FACCH	Fast Associated Control Channel
FACH	Forward Access Channel
FCC	Federal Communications Commission The United States federal agency responsible for the regulation of interstate and international communications by radio, television, wire, satellite, and cable.
FC E1/T1	Wireline transmission unit (75 [ohm] E1, 120 [ohm] E1, or 100 [ohm] T1) of Nokia UltraSite EDGE Base Station without cross-connection capability.
FCLK	Frame Clock
FET	Field Effect Transistor
FHS	Frequency Hopping Synthesiser

FIFP	Forwarded Intermediate Frequency Power
FIKA	+24 VDC Installation Kit
FPGA	Field Programmable Gate Array
FXC E1	Wireline transmission unit (75 [ohm] E1) with four line interfaces to the 2 Mbit/s (E1) transmission line; cross-connection capability at 8 kbit/s level.
FXC E1/T1	Wireline transmission unit (120 [ohm] E1 or 100 [ohm] T1) with four line interfaces to the 2 Mbit/s (E1) or 1.5 Mbit/s (T1) transmission line; cross-connection capability at 8 kbit/s level.
FXC RRI	Radio link transmission unit (radio indoor unit) with cross-connection capability at 8 kbit/s level. Used with MetroHopper Radio and FlexiHopper Microwave Radio.
Gb	Interface between RNC and SGSN
GMSK	Gaussian Minimum Shift Keying
GND	Ground; Grounding (protective earthing). See Grounding and PE.
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications • GSM 800 GSM 800 MHz frequency band • GSM 900 GSM 900 MHz frequency band • GSM 1800 GSM 1800 MHz frequency band • GSM 1900 GSM 1900 MHz frequency band
GUI	Graphical User Interface
HDLC	High-level Data Link Control
HETA	Base station cabinet heater
HO	Handover

	The action of switching a call in progress from one radio channel to another, to secure the continuity of the established call
HSCSD	High-Speed Circuit Switched Data
HV	High Voltage
HW	Hardware Specfically, electronic equipment supporting data transmission and processing tasks, and the electrical and mechanical devices related to their operation
IAKx	Indoor Application Kit for Nokia UltraSite EDGE Base Station • IAKA for UltraSite Indoor cabinet • IAKC for UltraSite Midi Indoor cabinet
IBBU	Integrated Battery Backup
IC	Integrated Cell
ICE	Intelligent Coverage Enhancement
ID	Identification; Identifier IE Information Element The basic unit of a transaction capabilities application part (TCAP) message.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IF	Intermediate Frequency
IFM	Interface Module
IFU	Interface unit
ILKA	Indoor Lock Kit
ILMT	Integrated Local Management Tool

IMA	Inverse Multiplexed ATM
IP	Ingress Protection
IRPA	International Radiation Protection Association
ISDN	Integrated Services Digital Network
ISHO	Inter-system handover The handover from one system to another.
ISO	International Organization for Standardization
ITU	International Telecommunication Union
L2	AC Phase 2
L3	AC Phase 3
Iu	The interconnection point between the RNC and the Core Network
Iub	Interface between the RNC and node B
Iubis	Interface between the RNC and the BTS
Iur	The logical interface for the interconnection of two radio network controller (RNC) components of the UMTS terrestrial radio access network (UTRAN) system
JIS	Japanese Industrial Standard
LAN	Local Area Network A data transmission network covering a small area.
LAPD	Link Access Protocol on D-channel between the BSC and BTS
LED	Light Emitting Diode
LMB	Local Management Bus
LMP	Local Management Port

LNA	Low-Noise Amplifier
LO	Local Oscillator
LTE	Line Terminal Equipment
LV	Low Voltage
LVD	Low Voltage Disconnect
LVDS	Low Voltage Differential Signalling
LVTTL	Low Voltage Transistor Transistor Logic
M2xA	2-way Receiver Multicoupler unit • M2LA for GSM/EDGE 800/900 • M2HA for GSM/EDGE 1800/1900 • M6xA 6-way Receiver Multicoupler unit • M6LA for GSM/EDGE 800/900 • M6HA for GSM/EDGE 1800/1900
MAC	Medium Access Control function, handles the channel allocation and multiplexing, that is, the use of physical layer functions.
MCLG	Master Clock Generator
MDF	Main Distribution Frame
MHA	Masthead Amplifier
MMI	Man-Machine Interface
MML	Man-Machine Language A text-based command language with a standardised structure, designed to facilitate direct user control of a system.
MNxx	Masthead Amplifier specific to Nokia UltraSite EDGE Base Station • MNGA for GSM/EDGE 800/900 • MNDA for GSM/EDGE 1800 A band • MNDB for GSM/EDGE 1800 B band

- MNPA for GSM/EDGE 1900 A band
- MNPB for GSM/EDGE 1900 B band
- MNPC for GSM/EDGE 1900 C band

MPT — Ministry of Posts and Telecommunications

Telecommunications regulatory agency of Great Britain.

MS — Mobile Station

User equipment which uses a radio connection, and which can be used in motion or at unspecified points. This is usually a mobile phone.

MSC — Mobile Switching Centre

The mobile network element which performs the switching functions in its area of operation, and controls cooperation with other networks.

MTBF — Mean Time Between Failure

NCRP — National Council on Radiation Protection and Measurements

NCU — Node Control Unit

NEBS — Network Equipment Building Systems

NED — Nokia Electronic Documentation

NMS — Network Management System

O&M — Operation and Maintenance

OAKB — Cable entry kit for BTS co-siting

OAKx — Outdoor Application Kit for Nokia UltraSite EDGE Base Station

- OAKA for UltraSite Outdoor cabinet
- OAKC for UltraSite Midi Outdoor cabinet
- OAKD for UltraSite Midi Outdoor to Talk-family Co-siting

OBKA — Outdoor Bridge Kit

OCXO	Oven Controlled Crystal Oscillator An oscillator in which the crystal and critical circuits are temperature-controlled by an oven.
OEKA	Outdoor (cable) Entry Kit
OFKA	Outdoor Air Filter Kit
OFKC	MIDI Outdoor Air Filter Kit
OMU	Operation and Maintenance Unit
OMUSIG	OMU Signalling
OVP	Over-Voltage Protection
PC	Personal Computer
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PE	Protective earthing (grounding) See GND and Grounding.
PFC	Power Factor Correction
PLL	Phase-Locked Loop
Point-to-point	Transmission between two fixed points
PSM	Power System Management
PWM	Pulse Width Modulation
PWSx	AC/DC Power Supply unit • PWSA for 230 VAC input • PWSB for -48 VDC input • PWSC for +24 VDC input
Q1	Nokia proprietary transmission management protocol

RACH	Random Access Channel
RAKE	A receiver capable of receiving and combining multipath signals
RAM	Random Access Memory
RAN	Radio Access Network A third generation network that provides mobile access to a number of core networks of both mobile and fixed origin.
RCD	Residual Current Device
RF	Radio Frequency
RFF	Radio Frequency Fingerprinting
RIFP	Reflected Intermediate Frequency Power
RLE	Radio Link Equipment
RNC	Radio Network Controller The network element in a radio access network which is in charge of the use and the integrity of radio resources.
ROM	Read Only Memory
RRI	Radio Relay Interface
RSSI	Received Signal Strength Indicator
RTC	Remote Tune Combining
RTxx	Remote Tune Combiner • RTGA for GSM/EDGE 900 • RTHA for GSM/EDGE 900 H band • RTJA for GSM/EDGE 900 J band • RTDC for GSM/EDGE 1800 • RTDA for GSM/EDGE 1800 A band • RTDB for GSM/EDGE 1800 B band • RTPA for GSM/EDGE 1900

RTN	Return
RX	Receiver; Receive
SCF	Site Configuration File
SCT	Site Configuration Tool
SDCCH	Stand-alone Dedicated Control Channel
SDH	Synchronous Digital Hierarchy
SMB	Sub-Miniature B Connector
SMS	Short Message Service
SSS	Site Support System
STM	Synchronous Transport Module
STM-1	Synchronous Transport Module (155 Mbit/s)
SW	Software
Sync	Synchronization The process of adjusting corresponding significant instances of signals, in order to obtain the desired phase relationship between these instances.
T1	North American Digital Transmission Format Standard (1.544 Mbit/s)
TC	Transcoder
TCH	Traffic Channel The logical radio channel that is assigned to a base transceiver station and is primarily intended for conversation.
TCP/IP	Transport Control Protocol/Internet Protocol
TCS	Temperature Control System
TDMA	Time Division Multiple Access

TE	Terminal Equipment Equipment that provides the functions necessary for user operation of the access protocols.
TMS	Transmission Management System The network system for managing equipment settings, and for centralised retrieval of statistics and alarm information from transmission equipment connected to the system.
TS	Time Slot A cyclic time interval that can be recognised and given a unique definition.
TRE	Transmission Equipment
TRX	Transceiver
TRXSIG	TRX Signalling
TS	Time Slot
TSxx	Transceiver (RF unit), specific to Nokia UltraSite EDGE Base Station • TSTB for GSM/EDGE 800 • TSGA for GSM 900 • TSGB for GSM/EDGE 900 • TSDA for GSM 1800 • TSDB for GSM/EDGE 1800 • TSPA for GSM 1900 • TSPB for GSM/EDGE 1900
TTL	Transistor Transistor Logic
TX	Transmitter; Transmit
UC	Unit Controller
UI	User Interface
UL	Underwriters Laboratories

UL (Uplink) The direction of transmission in which the mobile station is the transmitting facility and the BTS is the receiving facility.

- 2-way uplink diversity - The function by which a BTS uses two antennas and two receivers simultaneously on a single channel to obtain improved overall BTS receiver sensitivity in an environment that is subject to random multipath fading.
- 4-way uplink diversity - The function by which a BTS uses four antennas and four receivers simultaneously on a single channel to obtain improved overall BTS receiver sensitivity in an environment that is subject to random multipath fading.

UMTS Universal Mobile Telecommunications System

UTRAN / UMTS
Terrestrial Radio Access Network

A radio access network (RAN) consisting of radio network controllers (RNCs) and base transceiver stations (BTSs). It is located between the Iu interface and the wideband code division multiple access (WCDMA) radio interface.

UPS Uninterruptible Power Supply

VC Virtual Channel

VCO Voltage Controlled Oscillator

An oscillator for which a change in tuning voltage results in a predetermined change in output frequency.

VLL Line-to-Line Voltage

VP Virtual Path

The unidirectional transport of ATM cells belonging to virtual channels that are associated by a common identifier value.

VPCI Virtual Path Connection Identifier

An identifier which identifies the virtual path connection between two B-ISDN ATM exchanges, or between a B-ISDN ATM exchange and a B-ISDN user.

VPI — Virtual Path Identifier

An identifier which identifies a group of virtual channel links at a given reference point that share the same virtual path connection.

VSWR — Voltage Standing Wave Ratio

The ratio of maximum to minimum voltage in the standing wave pattern that appears along a transmission line. It is used as a measure of impedance mismatch between the transmission line and its load.

VXxx — Transmission unit, specific to Nokia UltraSite EDGE Base Station

- VXEA for FC E1/T1
- VXRA for FC RRI
- VXRB for FXC RRI
- VXTA for FXC E1
- VXTB for FXC E1/T1

WAF — Wideband Antenna Filter unit

WAM

Wideband Application Manager unit

WBC — Wideband Combining unit

WCC — Wideband Cabinet Core

WCDMA — Wide band Code Division Multiple Access

A spread spectrum CDMA technique used to increase the capacity and coverage of wireless communication networks.

WCH — Wideband Cabinet Heater

WCxA — Wideband Combiner, specific to Nokia UltraSite EDGE Base Station

- WCGA for GSM/EDGE 800/900
- WCDA for GSM/EDGE 1800
- WCPA for GSM/EDGE 1900

WEK	Wideband Extension Kit
WFA	Wideband Fan
WHX	Wideband Heat Exchanger
WIC	Wideband Input Combiner
WIK	Wideband Indoor Kit
WOC	Wideband Output Combiner
WOK	Wideband Outdoor Kit
WPA	Wideband Power Amplifier unit
WPS	Wideband Power Supply unit
WSC	Wideband System Clock
WSM	Wideband Summing and Multiplexing unit
WSP	Wideband Signal Processor unit
WTR	Wideband Transmitter and Receiver

4.1.2 Terms

This section provides definitions for terms used throughout Nokia UltraSite Solution documentation.

Abis Interface
: Interface between a Base Transceiver Station (BTS) and the Base Station Controller (BSC) and between two BTSs.

Absolute radio frequency channel number
: See absolute radio frequency number.

Absolute radio frequency number; absolute radio frequency channel number; ARFN; ARFCN
: Radio frequency used in connection with, for example, mobile originating and terminating test calls.

Adaptive multi-rate speech codec; AMR speech codec; AMR codec; AMR
: Speech codec which adapts its operation optimally according to the prevailing channel conditions.

Air Interface — Interface between MS and BTS.

Alarm — Announcement given to the operating personnel about abnormal functioning of the system or about a failure, or an indication of the degradation of the service level or reliability.

Alarm Status — Classification of the severity of an alarm, such as Critical, Major, Minor, and Information.

Alternating current; AC
A periodic current having a mean value zero.

Analogue-to-digital converter; Analog-to-digital converter /US/; A/D converter; ADC
A device which converts an analogue input signal to a digital output signal carrying equivalent information.

Application-specific integrated circuit; custom circuit; custom IC; ASIC
Integrated circuit which is designed for a specific application and a specific customer and which is not available to other customers.

ATM connection control; connection control; CC
Function that keeps track of connection resources and based on those handles the operations related to different kind of cross-connections.

ATM inverse multiplexing
See inverse multiplexing for ATM.

Backplane — Connector board at the back of Nokia UltraSite cabinets to which plug-in units are directly connected. See also BATA backplane and RFU backplane.

Base station — See base transceiver station.

Base station controller; BSC
Network element in the public land mobile network (PLMN) for controlling one or more base transceiver stations (BTS) in the call set-up functions, in signalling, in the use of radio channels and in various maintenance tasks.

Base station system; BSS
System of base stations (BSs) and base station controllers which is viewed by the mobile services switching centre (MSC) through a single interface.

Base transceiver station; base station; BTS; BS
: Network element in a mobile network responsible for radio transmission and reception to or from the mobile station.

BATA backplane
: Additional backplane required in a Site Support cabinet when using 12 rectifiers.

Bias Tee
: Unit that provides DC power for an associated MHA unit.

Cabinet Control Unit
: Module of the ADUA or ADUB that manages battery control, climatic control, alarm reporting, and serial and version number reporting for the IBBU or Nokia UltraSite Support cabinet. The CCU connects to the BOIx with Q1-bus.

Cell
: Coverage area of a given BTS where transmission is acceptably received.

Cell breathing
: Variation of the cell coverage area; depends on the interference and power requirements.

Cellular Network
: Two or more base stations connected together to provide an area of coverage for Mobile Stations (MS).

CENELEC
: Comité European de Normalisation ELECtrotechnique. European Committee for Electrotechnical Standardization.

Chain Connection
: Transmission solution in which the BTSs are interconnected through a chain, and the first BTS in the chain is connected to the BSC. See Loop Connection, Multidrop Connection, and Star Connection.

Chip
: Signal element.

Chip rate
: Number of chips transmitted in one second.

Commissioning
: Tasks performed to enable the BTS to be connected to the network. Includes operational tests and configuring of the transmission equipment.

Coverage Area
: See Cell.

Cross-connection
: Connection between input and output ports of a network element.

Cross-connection bank
: Information base that defines the cross-connections of a network element. The network element contains two or more banks, one of which is always active.

Custom circuit
: See application-specific integrated circuit.

Custom IC
: See application-specific integrated circuit.

D-bus
: Bus used for traffic communication between the transmission units and BB2x units (D1-bus) and for internal O&M communication with the BOIx, BB2x, and RTxx units (D2-bus).

Despreading
: The received wideband signal is modulated with the spreading code to get a narrowband signal after the multipath propagation in spread spectrum systems.

Digital signal processor; DSP
: A processor designed for signal handling, resembling an ordinary microprocessor.

Discontinuous reception; DRX
: Means of saving battery power (for example in hand-portable units) by periodically and automatically switching the mobile station receiver on and off.

Discontinuous transmission; DTX
: Feature which enables saving battery power (for example in hand-portable units) and reducing interference by automatically switching the transmitter off when no speech or data are to be sent.

Downlink Diversity
: See Frequency Hopping.

Earthing
: See Grounding.

F-bus
: Frequency Hopping bus. See Frequency Hopping.

Finger; rake finger; RAKE finger
: Receiver unit that despreads one multipath signal.

Four-way uplink diversity; 4-way uplink diversity
: Function by which a base transceiver station (BTS) uses four antennas and four receivers simultaneously on a single channel to obtain improved overall BTS receiver sensitivity in an environment that is subject to random multipath fading.

Forward link
: See downlink.

Flash memory
: Nonvolatile, electronically writable memory, similar to EEPROM in function, but which must be erased in blocks.

Flexbus
: Bidirectional coaxial cable that carries up to 16 x 2 Mbit/s signals and power between transmission equipment, such as a radio outdoor and indoor unit.

Frequency-change oscillator
: See local oscillator.

Frequency Hopping
: Function in which a BTS swaps two transmitters on a single channel to obtain improved overall MS receiver sensitivity in a system that is subject to random fading.

Gain
: Signal amplification, expressed in dBi—decibels over a theoretic, isotropic, and uniformly radiating antenna.

Grounding
: Protecting the equipment and the users against lightning and surges through the external connections.

I^2C-bus
: Integrated Inter Cell communication bus used for polling, autodetection, version and serial number management, temperature polling, and alarm collection in units without a microprocessor.

Handover
: The handover occurs between two cells; the signal goes through one base station or base station sector at a time.

Human-machine interface; man-machine interface; HMI; MMI
: A subsystem or function which provides user interface functions in a man-machine language.

Installation
: Tasks performed to enable the BTS to be mounted at the site.

Integration
: Tasks performed to make the BTS functional in the cellular network. Includes making test calls.

Inter-frequency handover
: Handover where the new carrier frequency is different from the current one.

Inter-system handover
: Handover from one system to another, e.g. between a 3rd generation system and GSM.

Inverse multiplexing for ATM; ATM inverse multiplexing; inverse multiplexing; IMA
: The transmission method in which ATM cells in a cell stream are divided across several physical E1 links on a cell-by-cell basis, and then reassembled at the receiving end without affecting the original cell order.

Loop connection
: Transmission solution in which BTSs are interconnected in a loop. For example, the first and last BTSs are connected to the BSC. See Chain Connection, Multidrop Connection, and Star Connection.

Macrocellular
: Application that covers large areas with a cell radius of 1 to 10 km (0.6 to 6 miles). The coverage area is achieved when the antenna is installed high and off the ground.

Maximum ratio combining
: A signal combining technique in which each signal is multiplied by a weight factor that is proportional to the signal amplitude: the strong signals are further amplified, while the weak signals are attenuated.

Microcellular
: Application that typically covers areas with a cell radius of 100 m to 1 km (327 feet to 0.6 miles). The antennas are installed below rooftop level.

Microwave radio
: Radio equipment for establishing an aligned and fixed radio connection between two points.

Midi
: Indoor or Outdoor cabinet with up to six TRXs.

Multidrop Connection
: Transmission solution in which one or more BTS chains are connected to one BTS that is connected to the BSC. See Chain Connection, Loop Connection, and Star Connection.

Network Element

Any equipment that can be managed, monitored, or controlled in a telecommunications network.

Network Topology

Method of transmission between the cells of a network. Examples of transmission solutions are chain, loop, multidrop, and star connections.

Node Manager

A feature of Power System Management (PSM), the Node Manager software called PSMMan is used to control network elements, or nodes, of the Site Support System.

Nokia FlexiHopper

Nokia family of Flexbus-compatible microwave radios for the 13, 15, 18, 23, 26, and 38 GHz frequency bands, in which the radio transmission capacity can be selected using software. The radio transmission capacity of Nokia FlexiHopper can be 2 x 2, 4 x 2, 8 x 2, or 16 x 2 Mbit/s.

Nokia FlexiHopper outdoor unit can be used with different indoor units: FIU 19, RRIC, FC RRI, and FXC RRI.

Nokia Hopper Manager

PC software application used for controlling and monitoring Nokia FlexiHopper and Nokia MetroHopper radios connected to FIU19 or RRIC indoor units.

Nokia MetroHopper

Nokia Flexbus-compatible radio for the 58 GHz frequency band that does not require coordinated frequency planning. The main use of Nokia MetroHopper is to provide 4 x 2 Mbit/s, point-to-point wireless access for Nokia MetroSite BTS and Nokia MetroHub.

Nokia MetroHopper outdoor unit can be used with different indoor units: FIU 19, RRIC, FC RRI, and FXC RRI.

Nokia MetroHub

Nokia’s compact transmission node with cross-connection and grooming functions, such as FXC RRI. Nokia MetroHub contains up to five transmission units.

Nokia MetroSite GSM BTS

Nokia’s compact four-TRX GSM base station for Nokia MetroSite capacity solution. Nokia MetroSite GSM BTS can contain one transmission unit.

Nokia Q1 Connection Tool
: Program that makes connection and node definitions for identifying objects on a Nokia Q1 managed network. See Q1.

Nokia UltraSite
: Multimedia coverage and capacity macrocellular base station.

Omnidirectional Cell
: Cell with a 360× sector; also known as standard cell.

Operator
: Telecommunications company running telecommunications services in a specific geographical area.

PCM time slot
: 1.5 Mbit/s PCM circuit is divided into twenty-four 64 kbit/s time slots.

  2 Mbit/s PCM circuit is divided into thirty-two 64 kbit/s time slots.

Peltier elements
: Elements that absorb or emit heat when an electric current passes across a junction between two materials. Used for heating and cooling IP20 protection class equipment.

Point-to-point
: Transmission between two fixed points.

Q1-bus
: Bus in Nokia UltraSite EDGE BTS, used for local transmission management (Q1int) and for extending the management to external equipment.

Radio interface; air interface; AI
: The interface between the mobile station (MS) and the radio equipment in the network. This is defined by functional characteristics, common radio (physical) interconnection characteristics, and other characteristics as appropriate.

Radio Relay
: Microwave radio unit that replaces a fixed cable with a microwave radio link in the Abis Interface.

Rectifier
: Device for converting alternating current to direct current. See BATx.

RFU backplane
: Backplane in Nokia UltraSite EDGE BTS cabinet to which RF units are attached.

Sectored BTS Site
: A site with multiple cells positioned to supply the desired radiation.

Sectored Cell — A cell with a conical coverage area achieved by means of a directional aerial.

Single Sector — A part of the BTS's physical equipment that serves a single cell in the network radio topology.

Site — Location where telecommunication equipment has been installed. For example, a site can contain a base station and transmission equipment with an equipment shelter and antenna tower.

Several network elements can be located at a site.

Soft handover — Handover where the signal goes through two base stations or base station sectors at a time.

Softer handover — Handover where the signal goes through two sectors in one base station area at a time.

Software Package — Software collection consisting of the components of the BTS operating system.

Spreading — A process in which the signal is modulated with the pseudo noise code to get a wideband signal for multipath propagation in spread spectrum systems.

Spreading code — A code that is used to despread a signal in spread spectrum communications.

Star Connection — Transmission solution in which three branches with one BTS in each are connected to a common node. See Chain Connection, Loop Connection, and Multidrop Connection.

Synchronisation (Sync) — Process of adjusting the corresponding significant instances of signals (between adjacent and serving cells) to obtain the desired phase relationship between these instances.

Uplink — Direction of transmission in which the mobile station is the transmitting facility and the BTS is the receiving facility.

Uplink Diversity

2-way uplink diversity – Function in which a BTS uses two antennas and two receivers simultaneously on a single channel to obtain improved overall BTS receiver sensitivity in an environment that is subject to random multipath fading.

4-way uplink diversity – Function in which a BTS uses four antennas and four receivers simultaneously on a single channel to obtain improved overall BTS receiver sensitivity in an environment that is subject to random multipath fading.

See Frequency Hopping.

Related Topics

Monitoring transmission unit performance

Descriptions

Performance management

Hot standby

Instructions

Setting Nokia FlexiHopper and Nokia FlexiHopper Plus settings

Reference

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Fading margin measurement

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Overview of checking UltraSite EDGE BTS IBBU LEDs