NOKIA

UltraSite EDGE BTS WCDMA Unit Descriptions

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 Technical description of UltraSite EDGE BTS WCDMA units

2.1 Wideband Antenna Filter (WAFA/B) unit

2.1.1 Technical description of Wideband Antenna Filter (WAFA/B) unit of UltraSite EDGE BTS

WAFA filters, amplifies and divides the uplink signals received by the antenna. The gain for the WAFA unit is 18 dB for the uplink signal. WAFA can be used either with or without a Nokia Masthead Amplifier (MHA) (12 dB).

WAFB filters and divides the uplink signal. The attenuation of the WAFB is 9 dB for the uplink signal. WAFB is designed to be used with an MHA (30 dB) provided by other equipment manufacturers.

Also the downlink signal is filtered by the WAFx unit.

The WAFx unit is illustrated in the diagram.

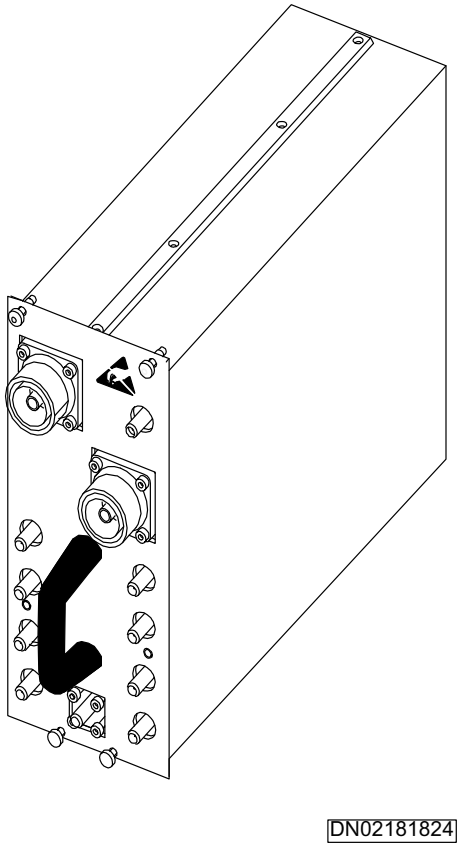


Figure 1. Isometric view of the WAFx unit

2.1.1.1 Operation

The uplink signals received by the antenna are filtered, amplified and divided by the WAFA unit. The WAFB filters and divides the uplink signals and attenuates them by 9 dB. The uplink signals are then transferred via the RX outputs to the inputs of the Transmitter and Receiver Units (WTR).

The WAFA/B units also filter the downlink signal.

The WAFA unit consists of an Interface module and two RX blocks. Both blocks consist of a balanced LNA with four outputs, and either an RX filter or a duplexer RX branch with a monitor output. The downlink signal is filtered in WAF duplexer TX branch.

The WAFB unit consists of an Interface module and two RX blocks which each consist of a divider with four outputs instead of the LNA module.

The hot insert of WAFA/B is possible. Therefore, the unit can be installed or removed without disturbing the power supply of any other plug-in unit.

2.1.1.2 Main functional blocks

The WAFA/B unit consists of the following functional modules:

- Filter module
- 2 LNA modules (WAFA)
- 2 Divider modules (WAFB)
- Interface module

The functional modules of WAFA and WAFB are illustrated in the following diagrams.

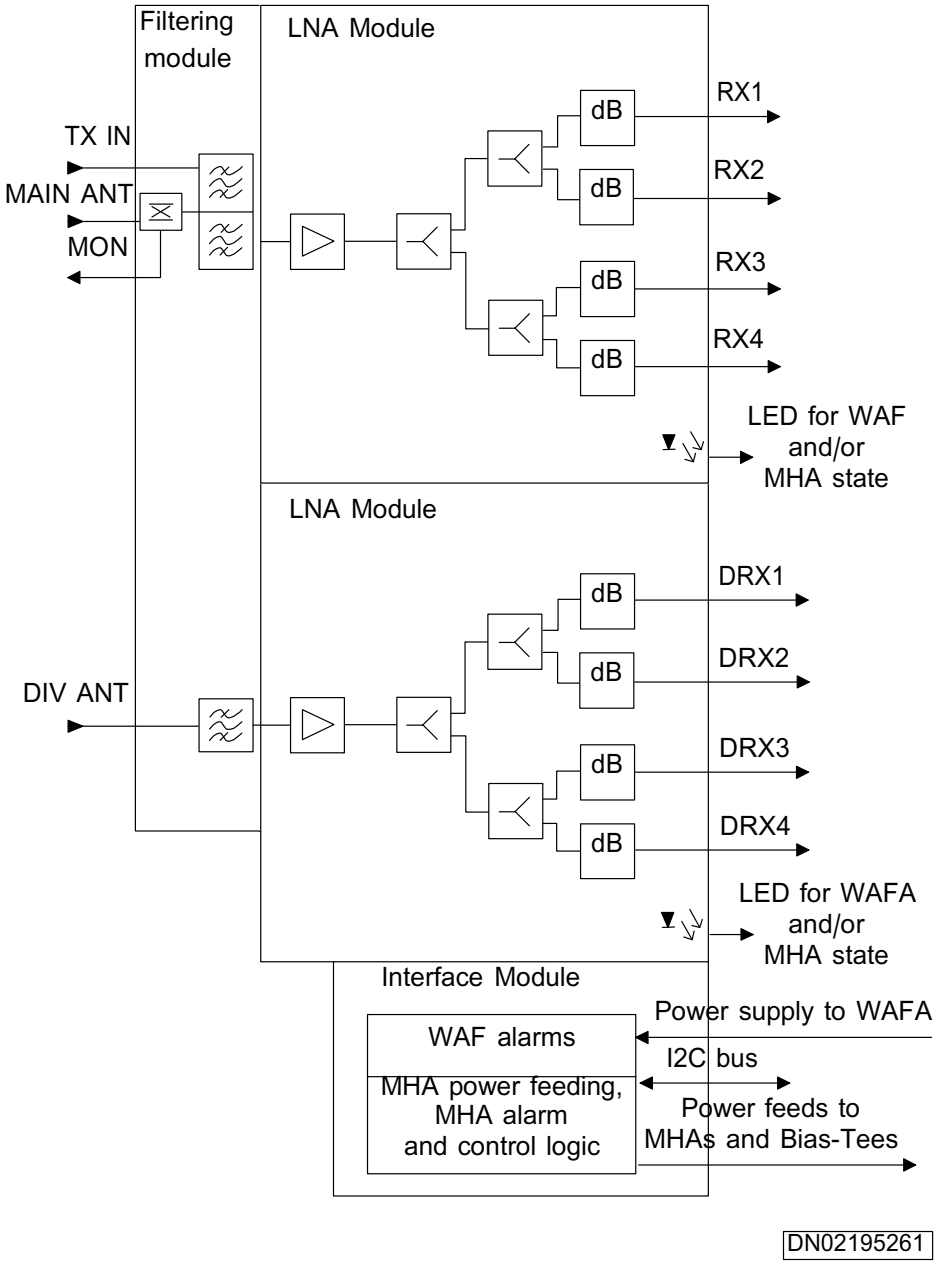


Figure 2. WAFA Unit Functional Blocks

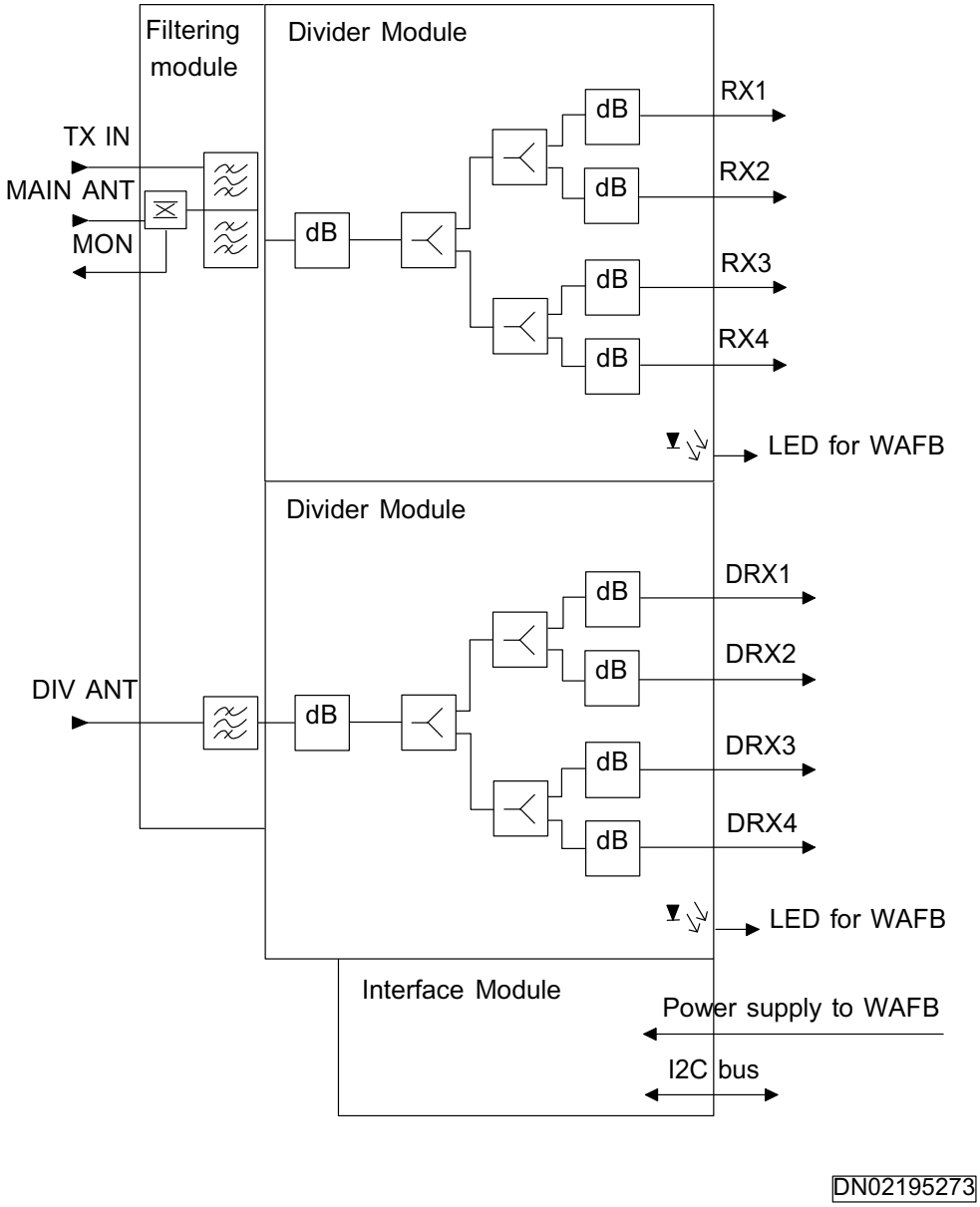


Figure 3. WAFB Unit Functional Blocks

Filter module

There is one filter module in both WAFA and WAFB. The Filter module has two separate filters: an antenna duplexing filter with monitor output and an antenna receiving (RX) filter.

LNA modules (WAFA)

There are two identical LNA modules in every WAFA. The functions of the LNA modules are to:

- Amplify the incoming signals
- Divide the RF signal into four outputs
- Control and monitor bias voltages of the amplifier stages
- Generates LNA alarm
- Manage LEDs

The noise figure of the LNA module is low to guarantee good sensitivity for the receiver; good linearity is important for the overall system performance.

Divider modules (WAFB)

There are two identical divider modules in each WAFB unit. The function of the module is to divide the incoming RX signals into four outputs. The divider module will also display a LED on the front panel indicating the operational status of WAFB unit.

Interface module

There is one Interface module in both WAFA and WAFB. However, the module is slightly different in each unit version.

WAFA

In WAFA the module has two parts: one interface part for the WAFA unit itself and the other part for the current control and detector for the MHA.

The WAFA part of the module provides the power connections, I2C EEPROM (for unit's serial and version numbers) and two I2C I/O expanders for the LNA, MHA and antenna alarms and control signals. WAFA supports only one antenna alarm (on the main branch). The power feeding to the antenna monitoring circuitry in the Bias Tee also goes through the interface module.

WAFA´s MHA current control part has two identical circuits: one for each MHA. The circuit limits the maximum current available for the MHA when necessary to protect the equipment against short circuits. The circuits also monitor the current flow to detect changes in it. The MHA logic is designed to draw more current in case of a fault. The MHA logic has set certain limits for the current and if the current rises above that limit, it is detected in the WAFA which sends an alarm to

the Application Manager Unit (WAM). If the current level rises too high, the WAFA starts to limit the current to MHA. Furthermore, if the alarm still persists, the WAM unit automatically switches off both power control circuits individually. In that case the power feed to MHA is also stopped.

WAFB

In WAFB the module has one interface part which provides the power connections between the Mother Board and the WAFB and an I2C EEPROM for unit´s serial and version numbers.

2.1.2 Interfaces of the Wideband Antenna Filter (WAFx) unit of UltraSite EDGE BTS with WCDMA Upgrade

The WAFx unit is equipped with the following interfaces:

- Front panel connectors
- Back connector

Front panel connectors

The WAFx unit has twelve RF connectors on the front panel of the unit. The connectors, their types and purposes are listed in the table below.

Table 1. RF connectors of WAFx

Connector	Type	Purpose
Ant	7/16 connector, female	Combined TX and RX: TX signals from WAF to antenna and RX signals from antenna or MHA to WAF.
DivAnt	7/16 connector, female	Diversity RX signal from diversity antenna
DRX1 - DRX4 (4 pcs)	SMA connector, female	Output to the Transmitter and Receiver Unit (WTR)
RX1 - RX4 (4 pcs)	SMA connector, female	Output to Transmitter and Receiver Unit (WTR)
TX	N connector, female	TX to antenna via WAF

Table 1. RF connectors of WAFx (cont.)

Connector	Type	Purpose
MON	SMA connector, female	Monitoring output, only for testing purposes

The WAFx front panel is illustrated in the following diagram.

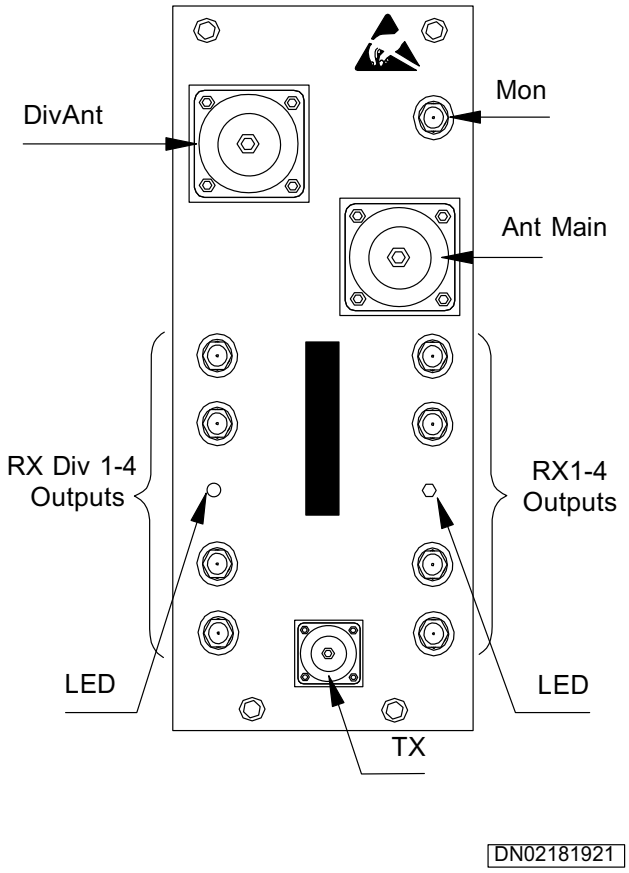


Figure 4. Front panel of the WAFx unit

Back connectors

The WAFx backplane distributes DC voltages to all WAFx units and provides the I2C -bus connection. The WAF unit´s power supply connector, X1, is of 60-pin future bus connector. Connector X1 is illustrated in the following diagram.

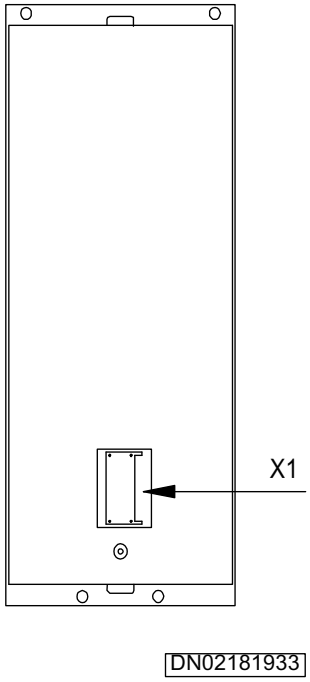


Figure 5. Rear view of the WAFx unit

2.1.3 WAFx Unit LED Indications

Front panel LED

The WAFA unit has two two-colour LEDs on the front panel with three LED status to indicate the operational status of the unit and all fault conditions during operation.

The WAFB unit has two one-colour LEDs on the front panel. The LED light available is stable green to indicate that the unit is operating normally.

Front panel of the WAFx unit is presented in the diagram below.

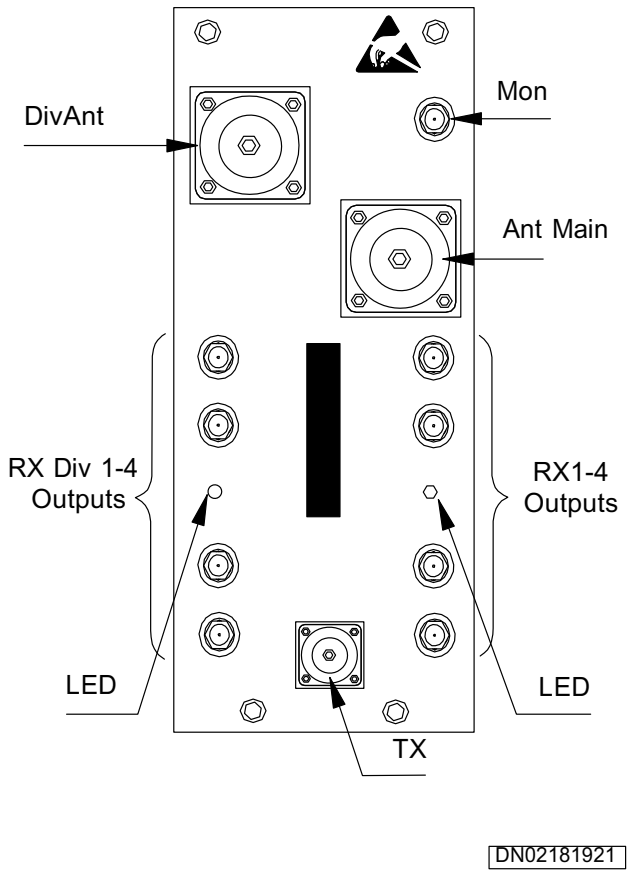


Figure 6. Front Panel of the WAFx unit

The LED indications are listed and explained in the table below.

Table 2. WAFx front panel LED indications

Colour	**WAFA explanation**	**WAFB explanation**
Red	LNA failure or both LNA and MHA failures	N/A
Alternating red and green	MHA failure	N/A

Table 2. WAFx front panel LED indications (cont.)

Colour	WAFA explanation	WAFB explanation
Green	Normal operation, power on	Normal operation, power on

2.2 Wideband Application Manager (WAM) unit

2.2.1 Technical description of Wideband Application Manager (WAM) unit of UltraSite EDGE BTS

The Application Manager Unit (WAM) takes care of the control functions in Nokia WCDMA BTSs, such as BTS initialization, configuration, and O&M functions. The unit also performs transport channel processing, ATM processing, telecom frame protocol handling and logical resource management.

One of the WAM units in the BTS acts as the master O&M unit and the other one as the telecom master unit. If there is only one WAM unit in a BTS, it takes care of both master functions.

The WAM unit is presented in the *Isometric view of the WAM unit* diagram.

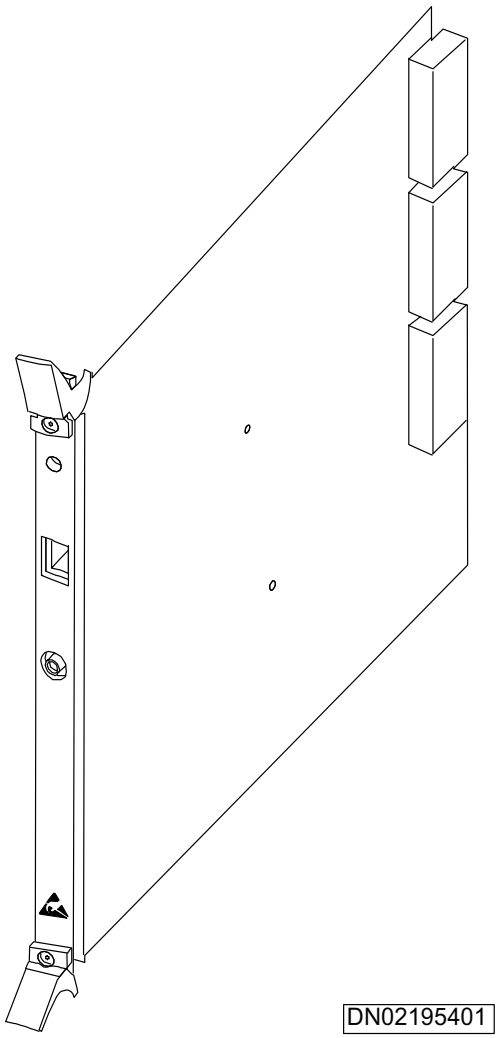


Figure 7. Isometric view of the WAM unit

2.2.1.1 Features

The following features are available with the WAM unit:

- Processes transport channels and terminates all ATM AAL2 / AAL5 signalling and user data traffic from/to RNC over CIF bus
- Forwards transport channel data frames to/from Signal Processor Units (WSP) in the same subrack over DSC bus
- Acts as the O&M controller of the whole BTS by using its interfaces to other BTS units (Ethernet, I 2 C, DSC,CIF)

- Controls BTS frame synchronisation and delivers baseband reference clocks for WSPs
- Downloads DSP SW to WSP units over the DSC bus
- Operates as DSC bus arbiter and I2C bus master (the right-most WAM in the BB subrack)
- Front panel has one 3-colour LED for status and alarm indications
- Front panel BTS Manager local interface, 10 BaseT Ethernet (RJ45)
- Front panel SFN0 (System Frame Number 0) and system frame clock fractional output (SMA) for production testing
- Extensive self tests are run during boot, the WAMcontrols and collects the results of the self tests of other units
- Stores two copies of the BTS SW in its non-volatile flash storage, the update is done locally via the WAM BTS Manager interface or remotely using IP over ATM connection to NMS
- Contains a six port Ethernet Hub (2 ports are spare) for WAM internal and WAM external Ethernet connections

2.2.1.2 Operation

The WAM unit provides the control functions that are common to all UltraSite WCDMA BTS units. The WAM has direct connections to ATM Cross-connect Unit (AXU), System Clock Unit (WSC), Signal Processor Unit (WSP), Transmitter and Receiver Unit (WTR), Power Amplifier Unit (WPA), Input Combiner Unit (WIC), and to Fan and Heater modules.

The WAM detects unit alarms and performs recovery actions.

Power control includes hot insert logic, 2.5V / 3A serial regulator, voltage supervisor for 3.3V and 2.5V voltages and power on main reset control.

2.2.1.3 Main blocks

The WAM unit includes the following functional blocks:

- CTRL
- ATM
- DSC

The *Functional blocks of the WAM unit* diagram shows the functional blocks of the WAM unit.

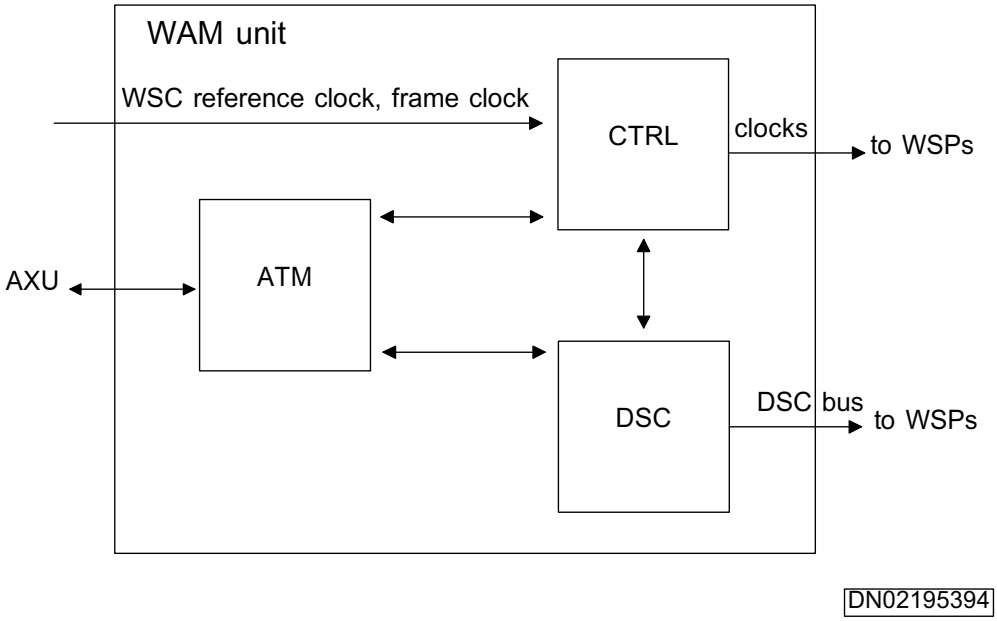


Figure 8. Functional blocks of the WAM unit

CTRL

The CTRL block consists of CTRL_MCU block, clocks and local power control.

The CTRL_MCU performs all the O&M and telecom signalling functions. This block communicates with the WSPs in the same subrack via the DSC bus. The O&M communication between the WAM units in separate subracks is done via the CIF buses using IP over ATM protocol.

ATM

The ATM block consists of ATM HOST, ATM MCUs and ATM IF.

The ATM block provides the interface to the AXU units, the active and the redundant, with two 155.52 Mbit/s connections, called CIF bus. This block manages all ATM and frame protocol processing concerning both the user plane data (payload data) and the control plane data (signalling data). Data over Iub from/to RNC is processed and forwarded to/from the WSP units. ATMAAL2 and AAL5 connections are terminated in this block. ATM block communicates with the CTRL block over CD bus and Ethernet. WAMcommunicates with WSP units via DSC bus.

DSC

The DSC block consists of DSC AIF bus with the bus transceivers and buffers, and DSC ASIC.

The DSC block provides the interface to the DSC bus located on the baseband subrack backplane. Internally this block has connections to both CTRL and ATM block. That is the so called DSC AIF interface of WAM. DSC bus connects two WAMunits and six WSP units. The WSP unit has a different DSC AIF interface. In the subrack the right-most (front view) WAM unit acts as the DSC arbiter unit which is always required in a functional baseband subrack. The second WAM in the subrack is used to increase the user plane processing capacity and it is the normal DSC bus node as all WSP units are. DSC bus addressing covers the following:

- Subrack level addressing (BSA, Bus System Address)
- Backplane level addressing (BNA, Bus node Address)
- Unit internal addressing (SNA, Subnode Address)

2.2.1.4 Power and clocks

The right-most WAMunit delivers baseband clocks and system frame number for the WSP units. The WSC unit provides reference clock input (61.44 MHz) for the WAM. Bus clocks are driven separately for each DSC bus unit. The AXU unit provides the 19.44 MHz reference clock for the 155.53 Mbit/s CIF connection. All other clocks are WAM´s internal clocks.

The WAM operation voltage is 3.3V DC. For Hot Insert support also 10 V DC control voltage is required. All other voltages are WAM´s internal voltages and are generated locally.

2.2.2 Interfaces of the WAM unit of UltraSite EDGE BTS with WCDMA Upgrade

The WAM unit is equipped with the following interfaces:

- X4 Ethernet RJ45 on the front panel
- X6 SFN0, SMA type connector on the front panel
- Back connectors X1, X2, X21, X22 and X3

Front panel connectors

There are two connectors on the front panel of the WAM unit; X4 and X6. The connectors, their type and purpose are described in the table below.

Table 3. Front panel connectors of WAM

Connector	Type	Purpose
X4	RJ45 Ethernet connector	For BTS Manager
X6	SMA connector SFN0	For production tester synchronisation

The front panel connectors are illustrated in the following diagram.

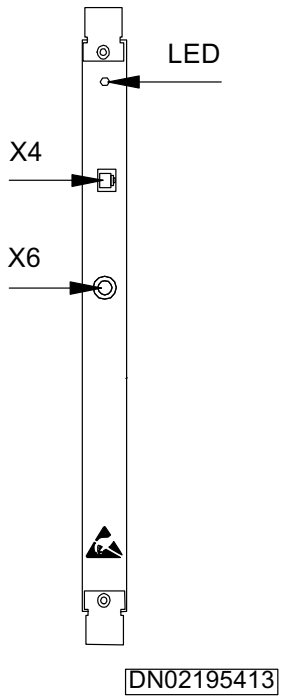


Figure 9. Front panel of the WAM unit

Back connectors

There are five HDM connectors in BB subrack backplane; X1, X2, X21, X22 and X3. The connectors, their type and purpose are listed in the table below.

Table 4. Back connectors of WAM

Connector	Type	Purpose
X1	HDM 144	For DSC bus
X2	HDM 72 -pin (6 x 12) power connector and 2 x HDM 3 -pin Hot Insert power connector	For power supply and hot insert
X21	HDM 3 -pin	For hot insert
X22	HDM 3 -pin	For hot insert
X3	HDM 144	For CIF, I 2 C and Ethernet busses, and for clock delivery to WSP units

The back connectors are shown in the following diagram.

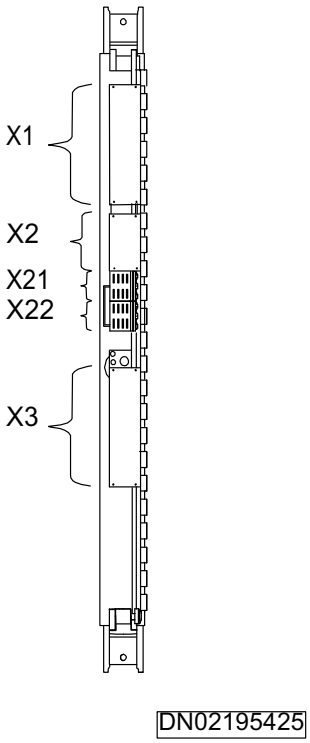


Figure 10. Rear view of the WAM unit

2.2.3 WAM Unit LED Indications

Front panel LED

The WAM unit has one tri-colour LED on the front panel. It indicates the operational status of the unit and all fault conditions during operation.

The LED indications of the WAM unit are described in the table below.

Table 5. WAM front panel LED indications

Colour	Explanation
Red	WAM fault or major alarm or reset
Red, blinking	Minor alarm
Yellow-red, blinking	Check-sum error detected and recovered
Yellow	Transmission blocked for maintenance purposes, or frame clock not detected
Yellow, blinking	Software download or configuration ongoing
Green	Normal operation, power on
Green, blinking	Local maintenance access (unit operational), unit receiving parameters or downloading SW during operation

See the diagram below for LED location.

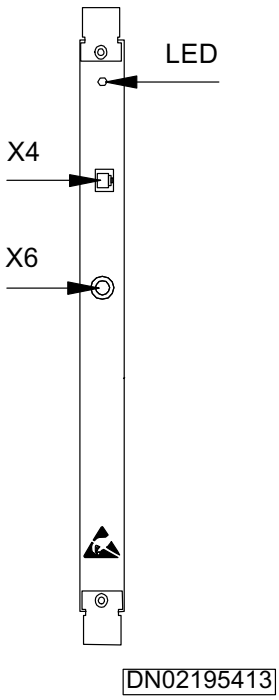


Figure 11. Front panel of the WAM unit

2.3 Wideband Input Combiner (WICA) unit

2.3.1 Technical description of Wideband Input Combiner (WICA) unit of UltraSite EDGE BTS

The Input Combiner Unit (WICA) consists of two separate sections: an RF module and an Ethernet Hub module.

One cabinet is equipped with 1 to 3 WICx units, depending on the configuration of the BTS.

The WICA unit is shown in the *Isometric view of the WICA unit* diagram.

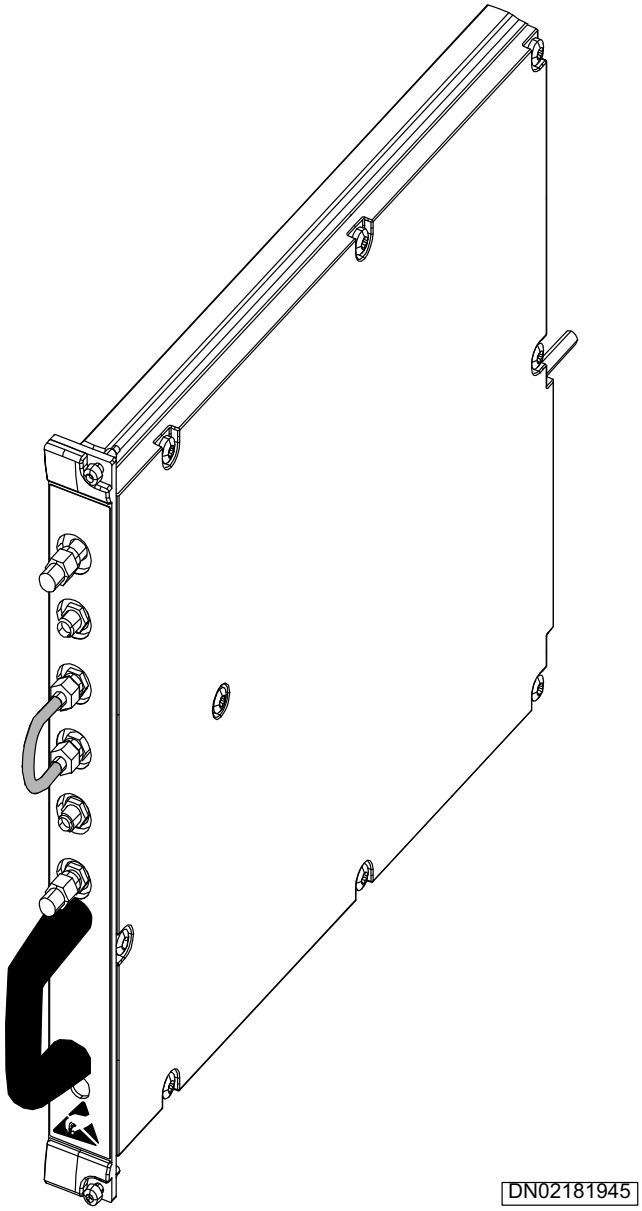


Figure 12. Isometric view of the WICA unit

2.3.1.1 Operation

The RF module of the WICA unit connects RF output signals from two Transmitter and Receiver Units (WTR) to the inputs of two Power Amplifier Units (WPA).

The Ethernet Hub module connects the Application Managers (WAMs), WTRs and WPAs in a sector together. The module is controlled by a WAM unit via the ACI bus.

The front panel of the WICA unit is equipped with a LED to indicate different operational conditions.

The unit can be replaced without switching off DC voltages in the sub-rack.

2.3.1.2 Main blocks

The WICA consists of two modules:

- RF module
- Hub module

The modules are illustrated in *The block diagram of the WICA unit*.

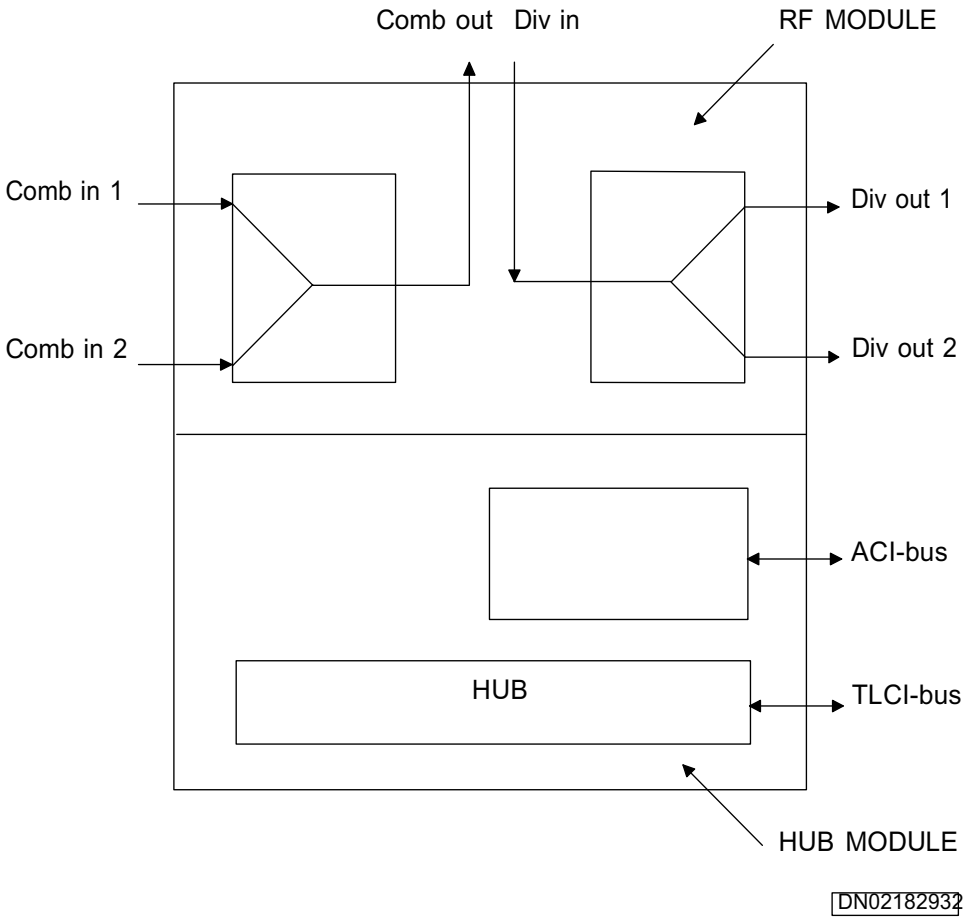


Figure 13. The block diagram of the WICA unit

RF module

The RF module consists of a 2-way combiner and a 2-way divider. Both the combiner and the divider can be used as an attenuator branch, with one port terminated. The combiner and divider circuits are the same design, and both can be used as combiner circuits.

The RF module:

- Divides one WTR signal for two WPAs
- Combines two WTR signals for one WPA

- Combines signals from two WTRs and then divides summed signal for two WPAs
- Uses two branches of equal attenuation for connecting single signals from two WTRs directly to two separate WPAs

Hub module

The Hub module connects the WAMs, WTRs and WPAs in a sector together. The BTS sectors have each one Hub module and the sectors themselves are connected to each other. Normally there are no connections between other sector HUBs, but if there is failure in a WAM unit, connection will be established between two or tree sectors.

The Hub module has a Hub control and system support block and a 10Base-T block. The module also has a voltage supervisor.

The Hub module:

- Supports functions of repeating Hub for 10Base-T Ethernet which repeats Hub for TLCI bus
- Has six permanently active ports
- Has two ports that can be configured via ACI bus either active or passive

The Hub module has an I 2 C bus interface and an EEPROM integrated circuit for serial number and unit version number information. This function is controlled by the WAM unit.

2.3.2 WICx Unit Interfaces

The WICx is equipped with the following interfaces:

- RF connectors on the front panel
- Back connector

Front panel connectors

There are six RF interfaces on the front panel of the WICx unit. The RF connectors are SMA, straight female type.

The connectors are illustrated in the following diagram.

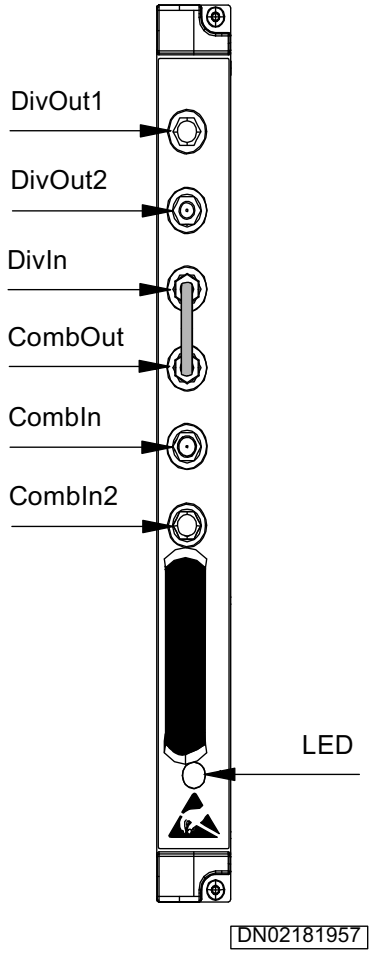


Figure 14. The WICx front panel

Back connectors

The backplane of the WICx unit has two connectors; one female 96-pin signal connector and one female 8-pin power connector. The connectors and their purposes are presented in more detail in the table below.

Table 6. Back connectors of the WICx unit

Connector	Type	Purpose
Connector for signals	96-pin right-angle female (4x24) connector	For signals

Table 6. Back connectors of the WICx unit (cont.)

Connector	Type	Purpose
Connector for power	8-pin right-angle female power connector	For input power

The back connectors of the WICx unit are shown in the following diagram.

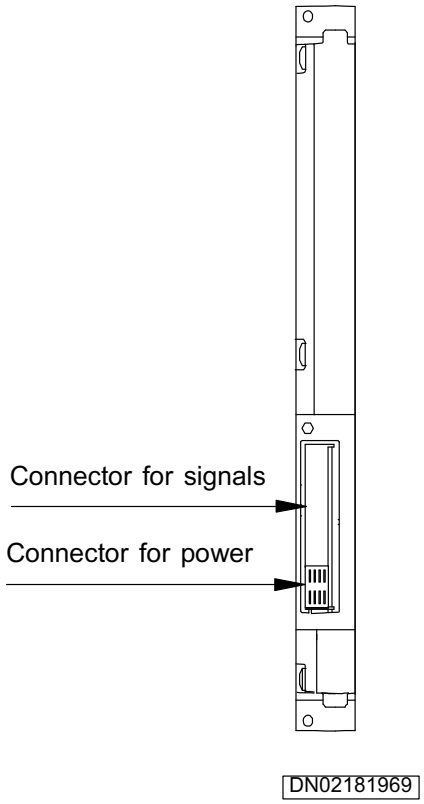


Figure 15. Rear view of the WICx unit

2.3.3 WICx Unit LED Indications

Front panel LED

The front panel LED is located on the Hub module board. The front panel of the WICx unit is illustrated in the diagram below.

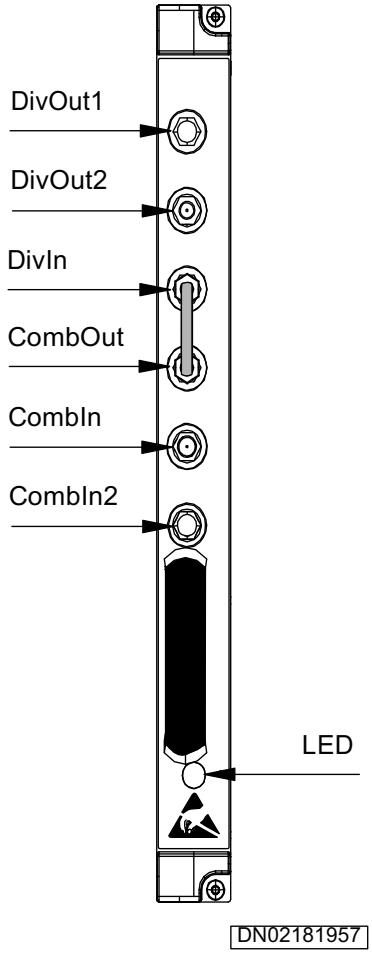


Figure 16. The WICx front panel

The LED light indicates the operational status of the Hub module as described in the table below.

Table 7. LED indications for Hub´s operational status

Colour	**Explanation**
Red	Reset
Green	The Hub module is operational

2.4 Wideband Output Combiner (WOCA) unit

2.4.1 Technical description of Wideband Output Combiner (WOCx) unit of UltraSite EDGE BTS

The Wideband Output Combiner combines output signals from two Power Amplifiers (WPAs) to one Antenna Filter (WAF) in a Nokia UltraSite WCDMA BTS.

The WOCx unit consists of a 2-way wideband cable combiner.

Two versions of the WOC unit are available:

- The WOCA unit is for use in the Nokia UltraSite WCDMA BTS Supreme Indoor and Nokia UltraSite WCDMA BTS Optima Indoor.
- The WOCC unit is for use in the Nokia UltraSite WCDMA BTS Optima Compact Outdoor.

The *WOCA unit* diagram shows the WOCA unit.

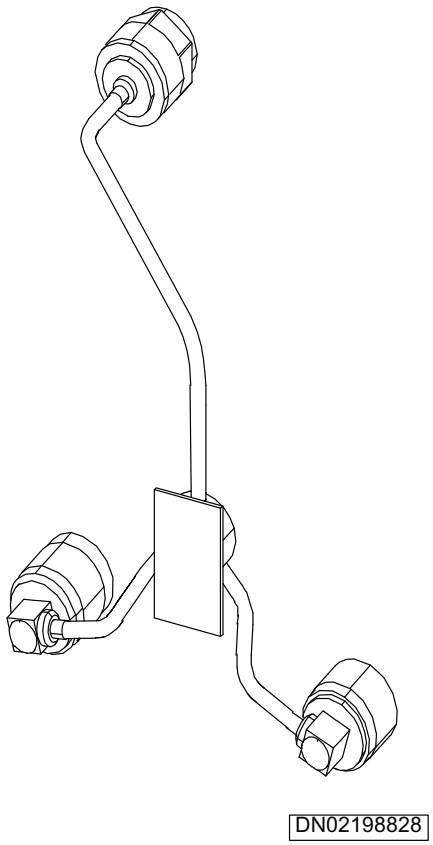


Figure 17. WOCA unit

The *WOCC unit* diagram shows the WOCC unit.

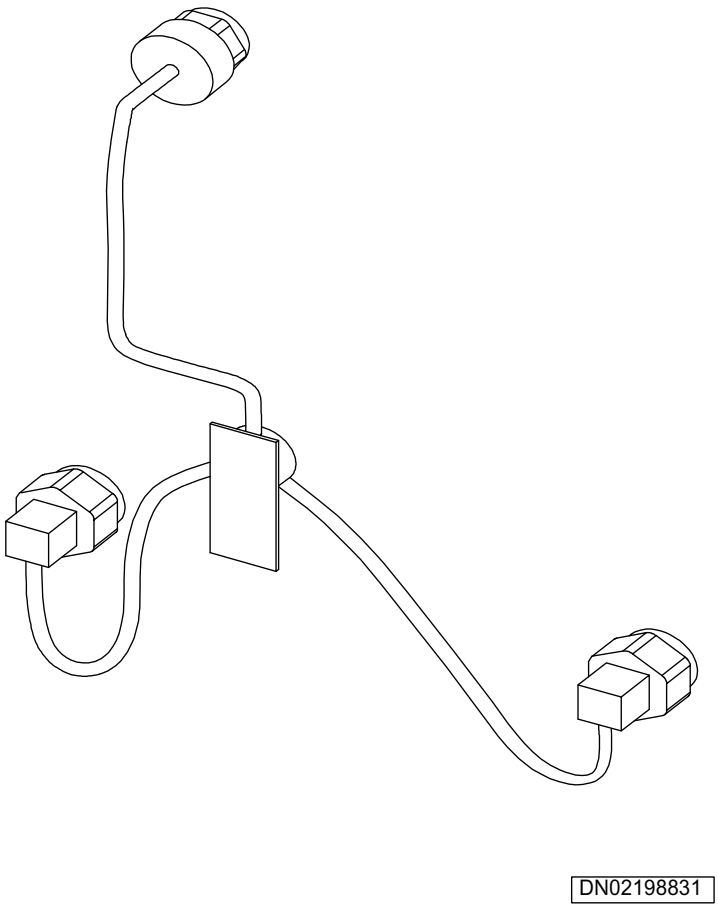


Figure 18. WOCC unit

The weight of the WOCx unit is max. 300 g.

2.4.1.1 Operation

The WOCx combines output signals from two parallel WPAs to one WAF with minimum insertion loss. The frequency range for the WOCx unit is 2110 - 2170 MHz.

The installation of the WOCx unit requires that two WPAs are installed side by side to the cabinet.

The WOCx unit should be handled with utmost caution. The installation of the unit requires that the output connector to the WAF unit is connected first and then the input connectors to the WPA units. The WOCx unit is fully operational after it has been installed to the BTS.

If either of the WPAs connected to the WOCx unit has to be changed, the whole WOCx unit needs to be removed from the BTS first.

Note

For information on installing, removing, and replacing the Wideband Output Combiner (WOCx) unit, see the WCDMA product documentation.

2.4.1.2 Main blocks

The WOCx unit consists of three coaxial cables, a summing device and three N-type connectors.

2.4.2 WOCx Unit Interfaces

The WOCx unit has three N-type male connectors. The connectors, their type and purpose are described in the table below.

Table 8. The connectors of the WOCx unit

Interface name	Connector	Purpose
TX1 in	N male	Connects WOCx to 1st WPA TX_out connector
TX2 in	N male	Connects WOCx to 2nd WPA TX_out connector
TX out	N male	Connects WOCx to WAF TX connector

The TX in and TX out interfaces of the WOCx unit are illustrated in the diagram below.

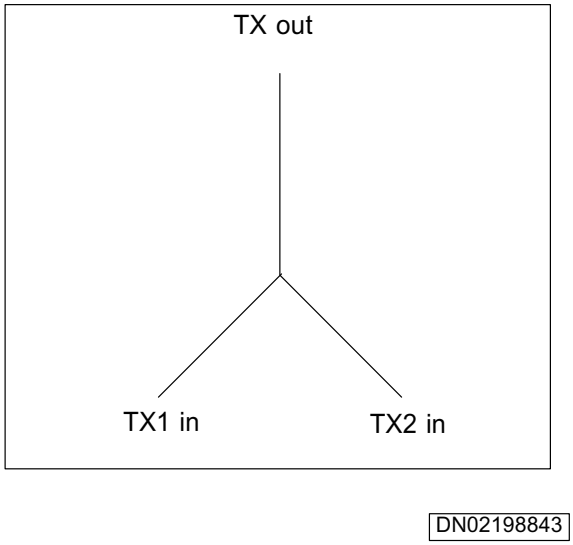


Figure 19. Interfaces of the WOCx unit

2.5 Wideband Mini Power Amplifier (WMPA) unit

2.5.1 Technical description of the Wideband Mini Power Amplifier (WMPA) unit of UltraSite EDGE BTS

2.5.1.1 Function

The main function of the Mini Power Amplifier Unit (WMPA) is to amplify the input signal from one WTR (Wideband Transmitter and Receiver). The WMPA uses feedforward linearisation technology to achieve high quality WCDMA (Wideband Code Division Multiple Access) signals in the triple-mode UltraSite EDGE BTS. The WMPA is protected against overvoltage and short circuits.

One cabinet can include up to three WMPA units.

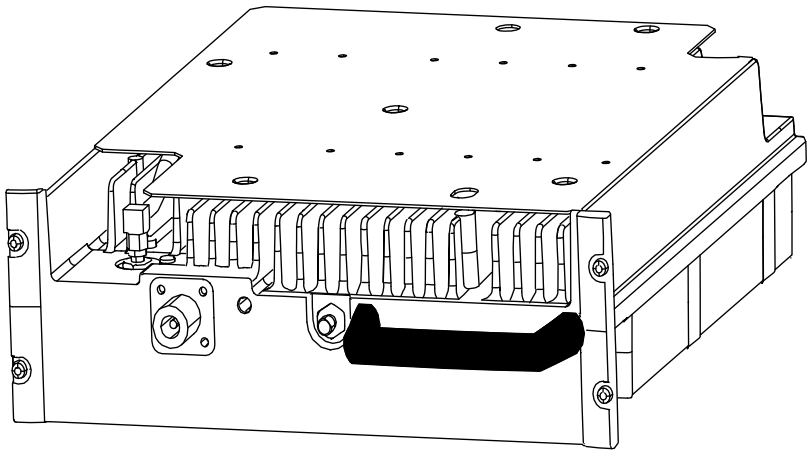


Figure 20. Isometric view of the WMPA unit

2.5.1.2 Operation

Operational characteristics

The WMPA unit provides linear amplification for one to two WCDMA carriers with a constant power gain of 33.8 dB. The amplifier can support, with certain restrictions, up to two carriers in a 20 MHz frequency slot within a 60 Mhz band.

The average output power of the WMPA unit is 12 W.

The Application Manager Unit (WAM) controls the operation of the WMPA units. The WMPA communicates with the WAM unit via TLCI-bus by sending alarm and measurement information and receiving control information from the WAM. The TLCI-bus interface is arranged via a rear signal connector (X4100).

Operational states

The WMPA unit has two operational states: *Stand-by* and *Operational.*

Table 9. Operational states of the WMPA unit

State	Description
Stand-by	• The default start-up state • Corresponds to the PSU stand-by state: power is supplied only to the digital controller in the WMPA unit. No configuration has been performed.
Operational	• Unit has been initialized and configured. • The unit is fully operational.

2.5.1.3 MAIN blocks

The WMPA unit includes the following main functional modules:

- Combined Board Module (COM)
- Feedforward RF Module (FRF)

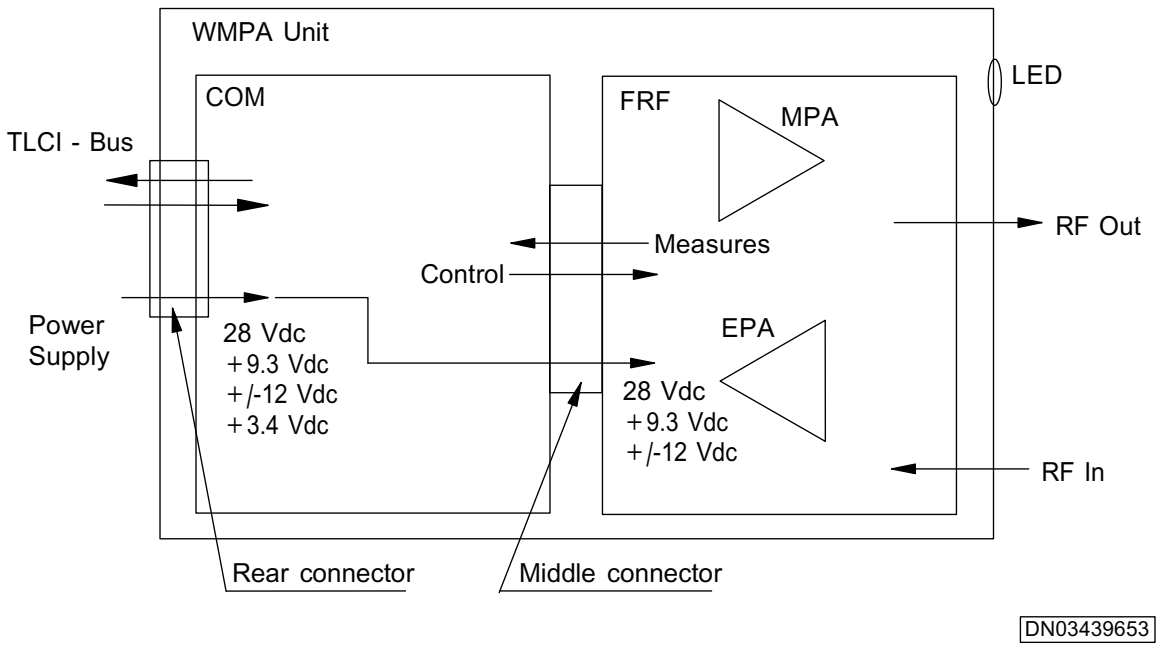


Figure 21. Functional modules of the WMPA unit

Combined Board Module (COM)

The COM module includes a CTRL_MCU block, clocks, local power control, down conversion sections, synthesizers and an output signal detector. The CTRL_MCU block performs units O&M (Operation and Maintenance) and telecom signalling functions. It communicates with the WAM via the DSC bus.

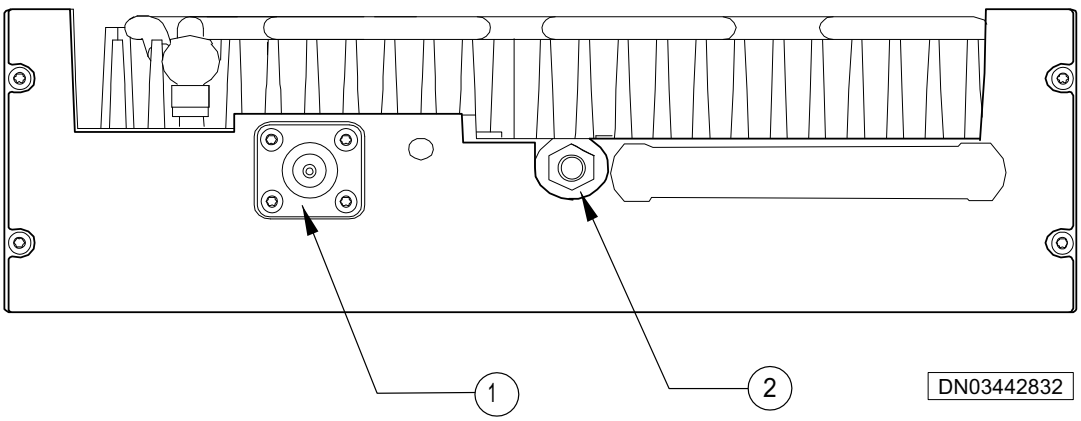
Feedforward RF Module (FRF)

The FRF module includes the following blocks:

- Main Power Amplifier (MPA)
- Error Power Amplifier (EPA)
- Loops, Adjusters and Couplers (LAC)

The function of the MPA is to amplify the WCDMA signal. Unwanted distortion products are generated in the process, and the EPA is used to cancel these distortions. The LAC is used to connect the MPA and EPA together in a feedforward configuration and to provide amplitude and phase adjustment for the RF signals fed into the EPA and MPA.

2.5.2 Interfaces of the Mini Power Amplifier (WMPA) unit of UltraSite EDGE BTS with WCDMA Upgrade

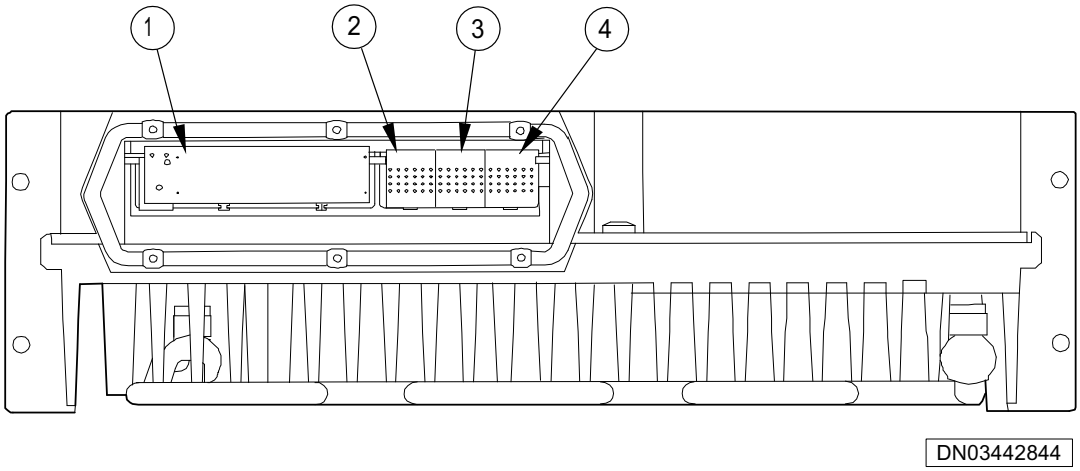


1	RF Out
2	RF In

Figure 22. Front panel of the WMPA unit

Table 10. WMPA front panel connectors

Interface	Purpose	Connector type
RF Out	For RF output signal from WMPA to WAF	N-type (female)
RF In	For RF input signal from WTR	SMA (female)



1	X4100
2	X4102
3	X4103
4	X4104

Figure 23. Rear view of the WMPA unit

Table 11. Rear panel connectors

Interface	Purpose	Connector type
X4100	Provides supply voltages (+12V, +12V, 9V), grounding, hot insert detection, unit ID detection, Ethernet connection	144-pin signal
X4102 - X4104	Provides supply voltages (3.4V, 9V, 28V) and grounding	Supply voltage

2.5.3 Mini Power Amplifier (WMPA) unit LEDs for UltraSite EDGE BTS with WCDMA Upgrade

The WMPA unit has one tri-colour LED indicator on the front panel that displays the operational status of the unit and all fault conditions during operation.

Table 12. LED indicators

LED Colour	Steady	Flashing
RED	Unit self-test on startup or reset (LED appears red for a very brief moment - a second or less) Or Major alarm	Minor alarm
YELLOW	Unit on & waiting (unit should be in this state for 10 seconds or less)	Software download or configuration ongoing (unit non-operational)
GREEN	Unit On & working	Local maintenance access (unit operational) or Unit receiving parameters while in operation or Software downloading from the WAM or from the Network during operation

2.6 Wideband Power Supply (WPSA/B) unit

2.6.1 Technical description of Power Supply (WPSA/B) unit of UltraSite EDGE BTS

WPSA

The WPSA is a 1200 W AC power supply unit, and the unit efficiency is minimum 82%. Up to 3 operating units can be used per cabinet. Redundant power is provided as follows when at least two WPSs are installed into the BTS:

- DC power to the System Clock (WSC), the ATM Cross-connect Unit (AXU), Interface (IFU) units, Location Measurement Unit (LMU) and fans

The WPSA uses nominal 230 V AC single phase input or between phases 200 - 240 V AC input voltage. The input may vary between 180 and 264 V AC. The unit does not operate with lower voltages 0 - 180 V AC or higher voltages 264 - 300 V AC, but these voltages do not damage the unit. When normal operating voltages are restored, the unit automatically restarts.

With 3 WPSAs installed installed, the BTS can accept either single phase or 3 phase input voltage.

The unit applies power factor correction and produces the following regulated voltages, for output to various units:

- +1.55 V DC
- +1.86 V DC
- +3.4 V DC
- +3.4 V DC Red
- +10 V DC
- +12.1 V DC Red
- -12.1 V DC
- -55 V DC Red

WPSB

The WPSB is a 620 W DC power supply unit, and the unit efficiency is minimum 80%. Up to 3 units can be used per cabinet. Redundant power supply is provided as follows when at least two WPSs are installed into the BTS:

- DC power to the System Clock (WSC) units

The nominal operating range is between 40.5 and 57 V DC, but the unit will operate down to 39.5 V at its input terminals. The unit does not operate with lower voltages 0 - 39.5 V DC or higher voltages 57 - 60 V DC, but these voltages do not damage the unit. When normal operating voltages are restored, the unit automatically restarts.

The output voltages are:

- +1.55V
- +1.86V
- +3.4V
- +3.4V Red
- +10V
- +12.1V Red
- -12.1V

The *WPSx unit* diagram shows the WPSx unit.

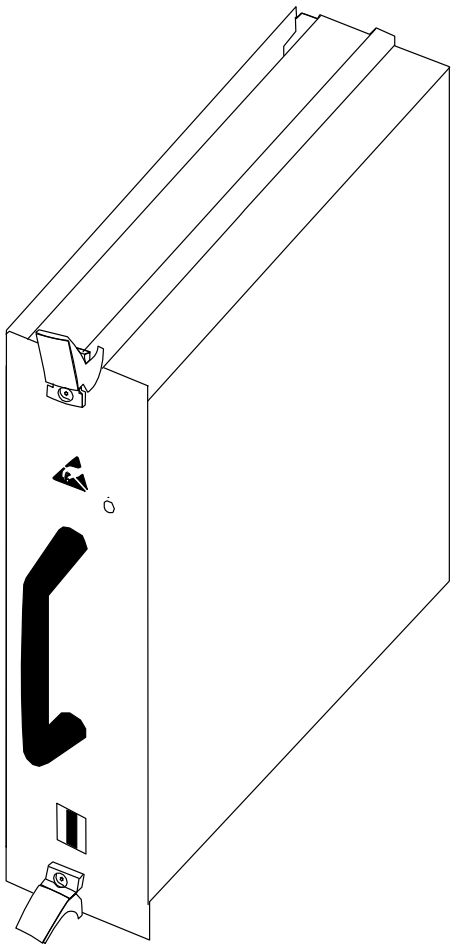


Figure 24. WPSx unit

2.6.1.1 Operation

The WPSA/B unit provides power for the BTS plug-in units. It converts input power into isolated output voltages.

The WPSA/B also:

- Monitors the output voltages and currents and sends an output alarm to the Application Manager Unit (WAM) if any of the output voltages falls below the specified limit
- Monitors the output voltages; disconnects power supply from all outputs and sends an output alarm to the WAM unit if any of the output voltages exceeds the specified overvoltage protection limit
- Measures the temperature inside the WPSx unit
- Delivers temperature information to the WAM unit and receives remote control signals from it via the I2C bus.

Both WPSA and WPSB units are capable of operating in an ambient air temperature ranging from -33C to +66C. The WPSA/B is fully compliant with the specification from –10° C to +66°C and all outputs shall contiue to operate without loss of service from –33° C to -10°C. In Cold Start situations the heater unit (WCH) does not allow the WPSx units to be switched on until the temperature is -10C.

The WPSA/B shall not suffer damage due to elevated temperatures. If the unit turns off due to high temperatures, it must restart before the unit measured temperature has reached 70°C minimum. Fan cooling to the WPSs is provided by the BTS cabinet.

WPSA/B is equipped with a power indicator LED to indicate different operational conditions. The unit also has an operating switch on the front panel. For more information, see chapters *WPSx unit LED indications* and *WPSA/B unit interfaces*.

The overvoltage protection logic is reset by switching the unit off.

2.6.1.2 Main blocks

The WPSA/B consists of three functional blocks:

- Power input block
- Power switcher block
- Control block

The block diagrams for WPSA and WPSB units are shown in the *WPSA Functional Blocks* and *WPSB Functional Blocks* diagrams.

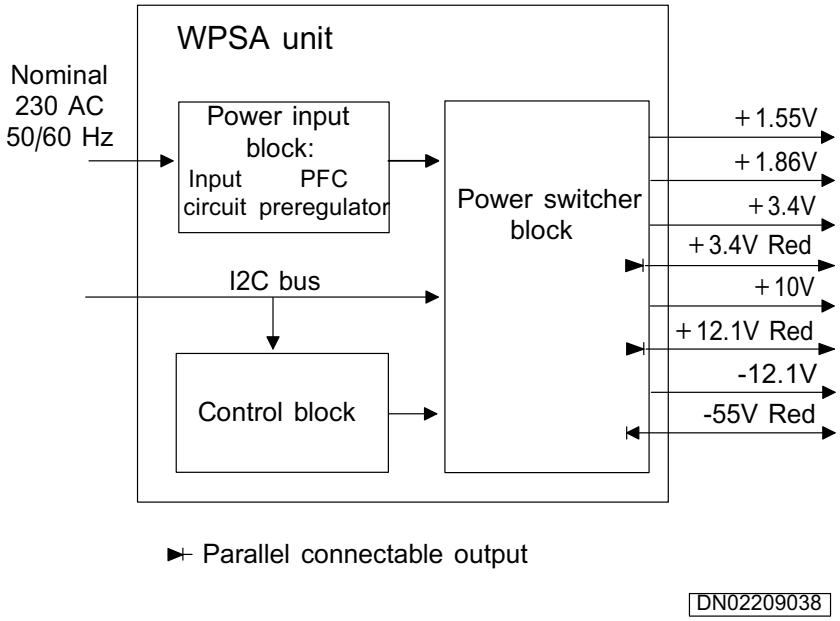


Figure 25. WPSA Functional Blocks

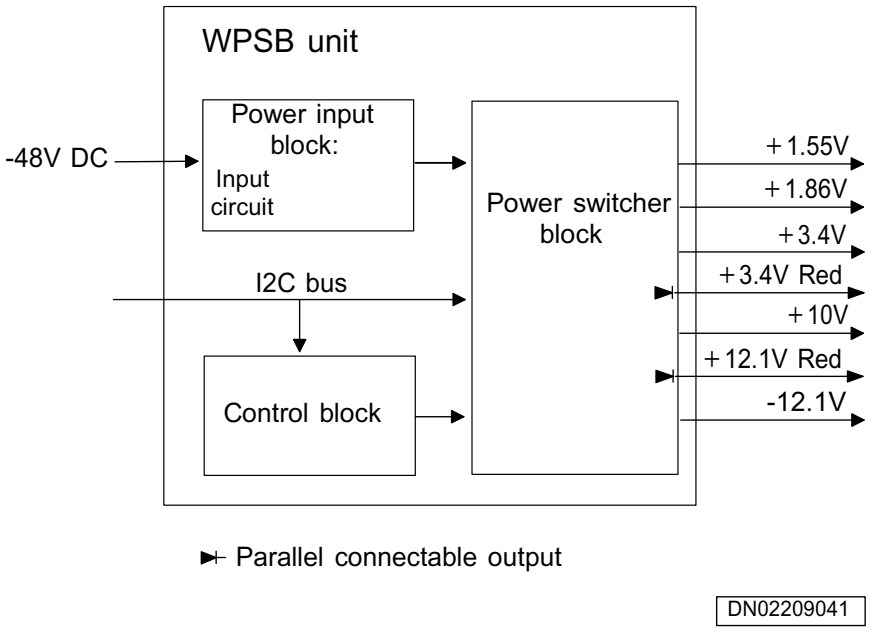


Figure 26. WPSB Functional Blocks

Power input block

WPSA

The WPSA power input block consists of an input circuit and a Power Factor Correction (PFC) preregulator. The input voltage is first fed through the input circuit that consists of a mains filter, an inrush current limiter and a rectifier. To improve the power factor, the input voltage is then fed through the PFC preregulator which converts the rectified input voltage to a stabilized intermediate DC voltage for the power switcher block.

The power input block also includes a DC/DC converter providing operating voltage for the control block.

WPSB

The WPSB power input block consists of an input circuit. The input circuit filters the input voltage and limits the inrush current. The switcher block then converts the filtered input voltage into a stabilized intermediate voltage.

Power switcher block

The power switcher block consists of switched-mode circuits which convert the intermediate voltage into the isolated DC output voltages.

Control block

The control block is a house keeping supply, and consists of an input control circuit and an output control circuit which monitor and control the operation of the power supply. The control block takes care of the over and undervoltage protection, overcurrent protection, overheat protection, alarm signal generation, and the unit front panel LED control. It also processes the cold start signal, HCRTL, from thermostat.

2.6.2 WPSA/B Unit Interfaces

The WPSA/B unit is equipped with the following interfaces:

- An operating switch on the front panel
- Power connectors on the rear panel

Front panel operating switch

The operating switch is located on the front panel of the WPSA/B unit. It has two states: ON when the unit is operating and STANDBY when the unit is in standby mode. With this power switch on STANDBY mode, the output of the unit can be disabled. The switch is designed so that the unit cannot be accidentally switched on.

Note

When using the DC/DC Power Supply unit with the site support system, be sure to turn off the main power switch of the BTS (in the side of the site support system) before performing any servicing or replacement of the ATM Cross-connect Unit (AXU), Interface Unit (IFU), fans, heater, or input filter. This is the only way to turn off all supply voltages. When using DC power supply, the Standby switch does not turn off the 48/55V, which comes from the site support system.

The operating switch is illustrated in the diagram below.

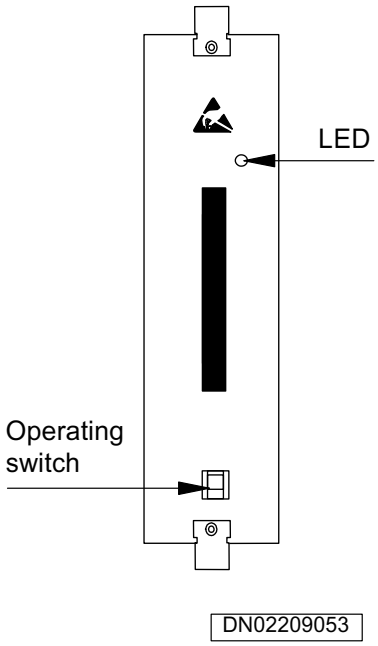


Figure 27. WPSA/B front panel

Back connectors

The WPSA/B back connectors provide connections for the power input and output, control signal input and output, and alarm signal output.

Table 13. Power connectors of WPSA/B unit

Connector	WPSA	WPSB
X1	GND	GND
X2	DC output	DC output
X3	DC output	DC input/output
X4	AC input	-

The rear panels connectors of WPSA and WPSB units are illustrated in the diagram below.

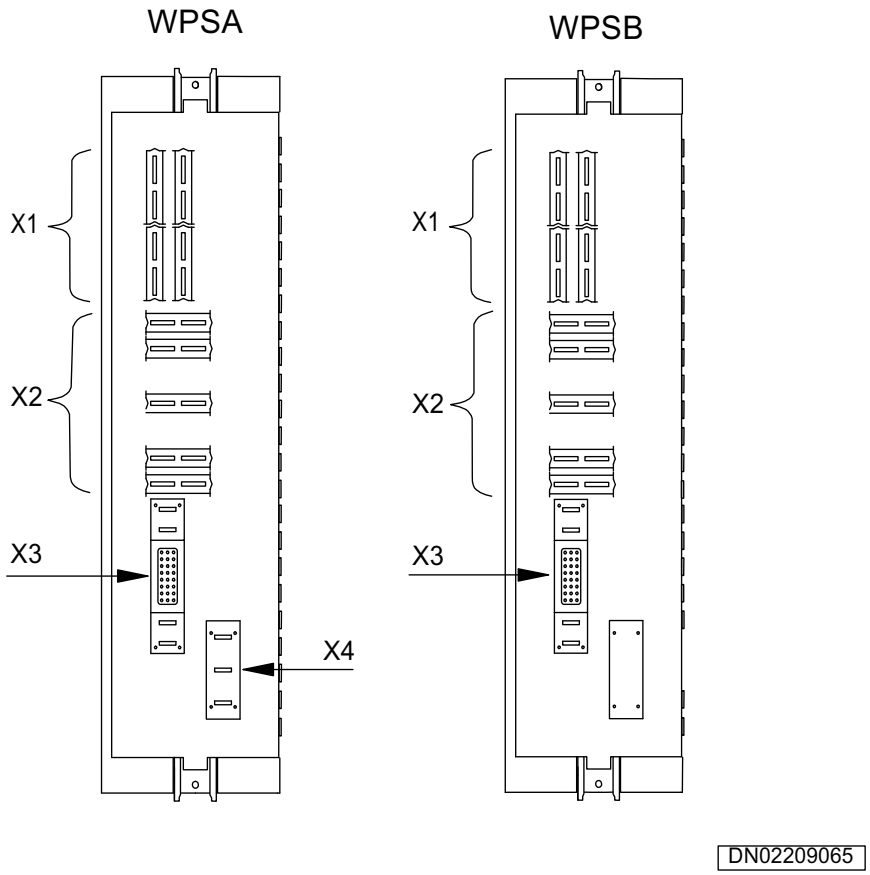


Figure 28. Rear panels of the WPSA and WPSB units

The pins and signals of the WPSA and WPSB X3 connector are defined in the table below.

Table 14. WPSA and WPSB X3 connector pin signal configuration

Pin	Signal	Pin	Signal	Pin	Signal
17.	Gnd	9.	Gnd	1.	Gnd
18.	+3.4 V sen	10.	+1.86 V sen	2.	+1.55 V sen
19.	Gnd	11.	Gnd sen	3.	Gnd

Table 14. WPSA and WPSB X3 connector pin signal configuration (cont.)

Pin	Signal	Pin	Signal	Pin	Signal
20.	+12.1 V Red	12.	+12.1 V Red	4.	+12.1 V Red
21.	-12.1 V	13.	-12.1 V	5.	-12.1 V
22.	+3.4 V Red	14.	+3.4 V Red	6.	+3.4 V Red
23.	Gnd	15.	SA2	7.	HCTRL
24.	I2CClk	16.	I2Cdata	8.	Gnd

2.6.3 Wideband Power Supply (WPSx) unit LEDs for UltraSite EDGE BTS with WCDMA Upgrade

A tri-colour LED on the WPSx unit's front panel indicates the operational status of the unit.

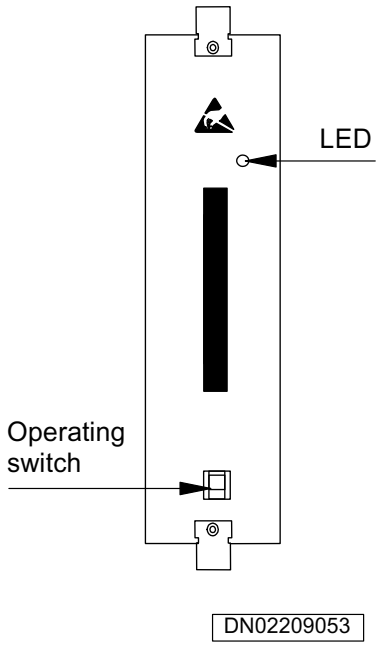


Figure 29. Front panel of the WPSx unit

Table 15. WPSx front panel LED indications

Colour	Explanation
Red	Fault or Major alarm
Red, blinking	Minor alarm
Yellow	Switch in Standby or during remote shutdown by HCTRL
Green	Normal operation, power on

2.7 Wideband System Clock (WSCA) unit

2.7.1 Technical description of Wideband System Clock (WSCA) unit of UltraSite EDGE BTS

The System Clock Unit (WSCA) performs synchronization functions and reference clock functions.

Nokia UltraSite Indoor and Outdoor WCDMA BTSs can be chained to a configuration so that one master clock system (WSC+WCI) and up to three slave clock systems can be used.

The WSCA unit diagram shows the isometric view of the unit.

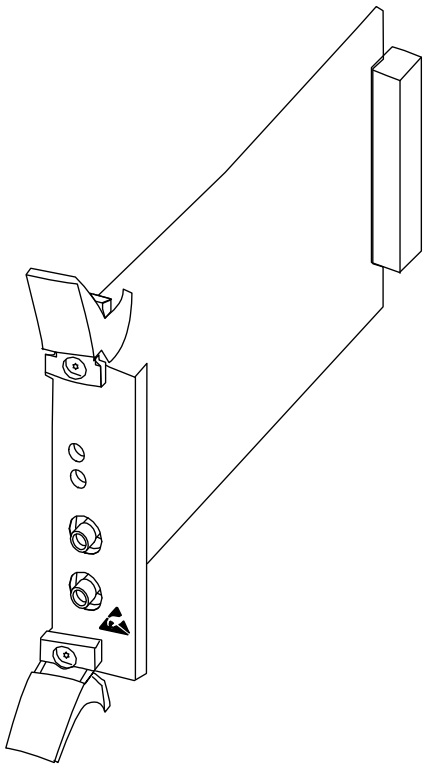


Figure 30. The WSCA unit

2.7.1.1 Operation

There are one or two WSCA units in a base station. If both WCSs are installed, one of them is an active master WSCA and the other one a passive redundant WSCA. If the master WSCA fails to operate, the back-up WSCA is activated and it can perform all the same functions as the master unit. Both WSCAs are connected to a Wideband Clock Interface (WCI) module which provides a clock and synchronisation signal interface to other BS units through the transmission backplane.

The WSCAs and the WCI are mounted to a sub-frame which has the size of a BB unit. The WCI module is firmly attached to the backplane. The WSCAs are located one on top of the other and they are visible on the front panel.

The hot insert of the WSCA unit is possible without damaging other BTS units surrounding it or the WSCA unit itself.

The WSCA unit generates the following clocks:

- Test frame clock
- Measurement device reference clock
- Frequency synthesizer reference clocks
- Sampling clocks for the A/D and D/A converters

The WSCA unit also provides frequency references for base band processing and for secondary BTS cabinets. The WSCA unit uses an internal OXCO (Oven Controlled Crystal Oscillator) as a source clock which is synchronised to the external reference extracted from the Iub.

The WSCA/WCI clock distribution in BTS cabinet chaining is illustrated in the *Clock distribution in cabinet chaining* diagram.

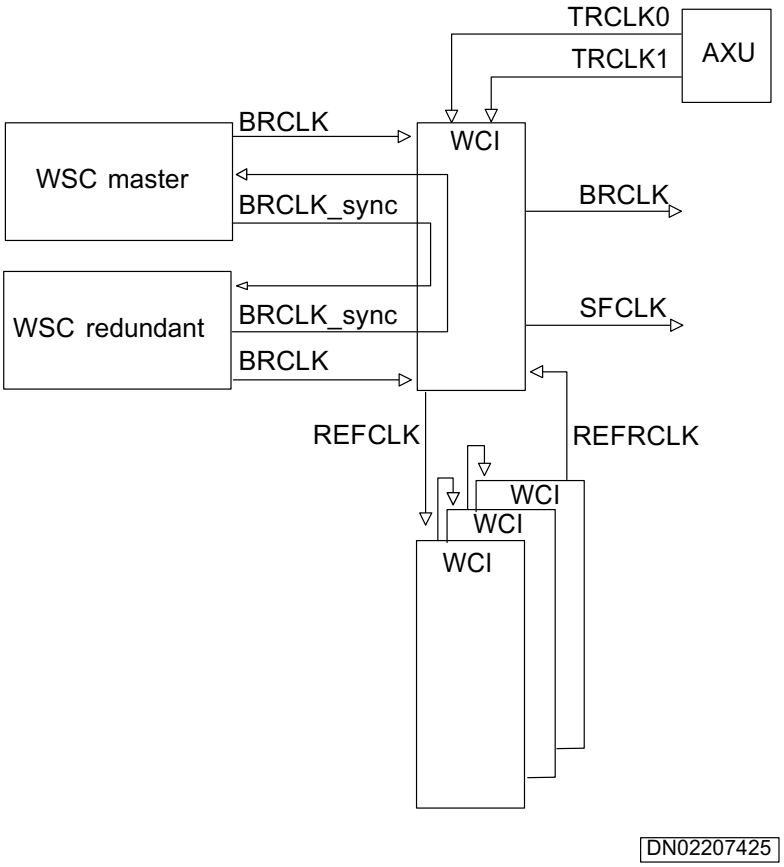


Figure 31. Clock distribution in cabinet chaining

Synchronisation messages, both at local and network levels, as well as other control and O&M messages are forwarded to/from the Application Manager Unit (WAM). The synchronization signals are distributed to individual units in the BTS by WCI either via the WAM units or directly.

The following clocks are used:

- TRCLK, transmission derived clock, 2,048 MHz, from Iub to the WSCA unit
- BRCLK, baseband reference clock, 61.44 MHz from the WSCA unit via WCI module to the WAM, WSM and WTR units
- REFCLK, synchronization clock output for the next BTS cabinet, 30.72 MHz
- REFRCLK, synchronization clock input from the previous BTS cabinet, 30.72 MHz
- SFCLK, system frame clock 100Hz, from the unit front panel for testing purposes
- TESTCLK, 10MHz, from the front panel as measurement device reference

---

Note

The WCI can generate a SFCLK from the 61.44 MHz. The WAM unit sends this signal to Signal Processor Units (WSP) together with BRCLK signal.

The WSCA unit operates with +3.3V DC and +12V DC.

2.7.1.2 Main blocks

The WSCA unit consists of 5 main functional blocks:

- Clock signal generation block
- Control and I/O block
- Iub synchronisation block
- Power input block.
- Master & redundant WSCA synchronisation block

The main functional blocks of the WSCA unit and WCI module are illustrated in the *WCI module and functional blocks of the WSCA unit* diagram.

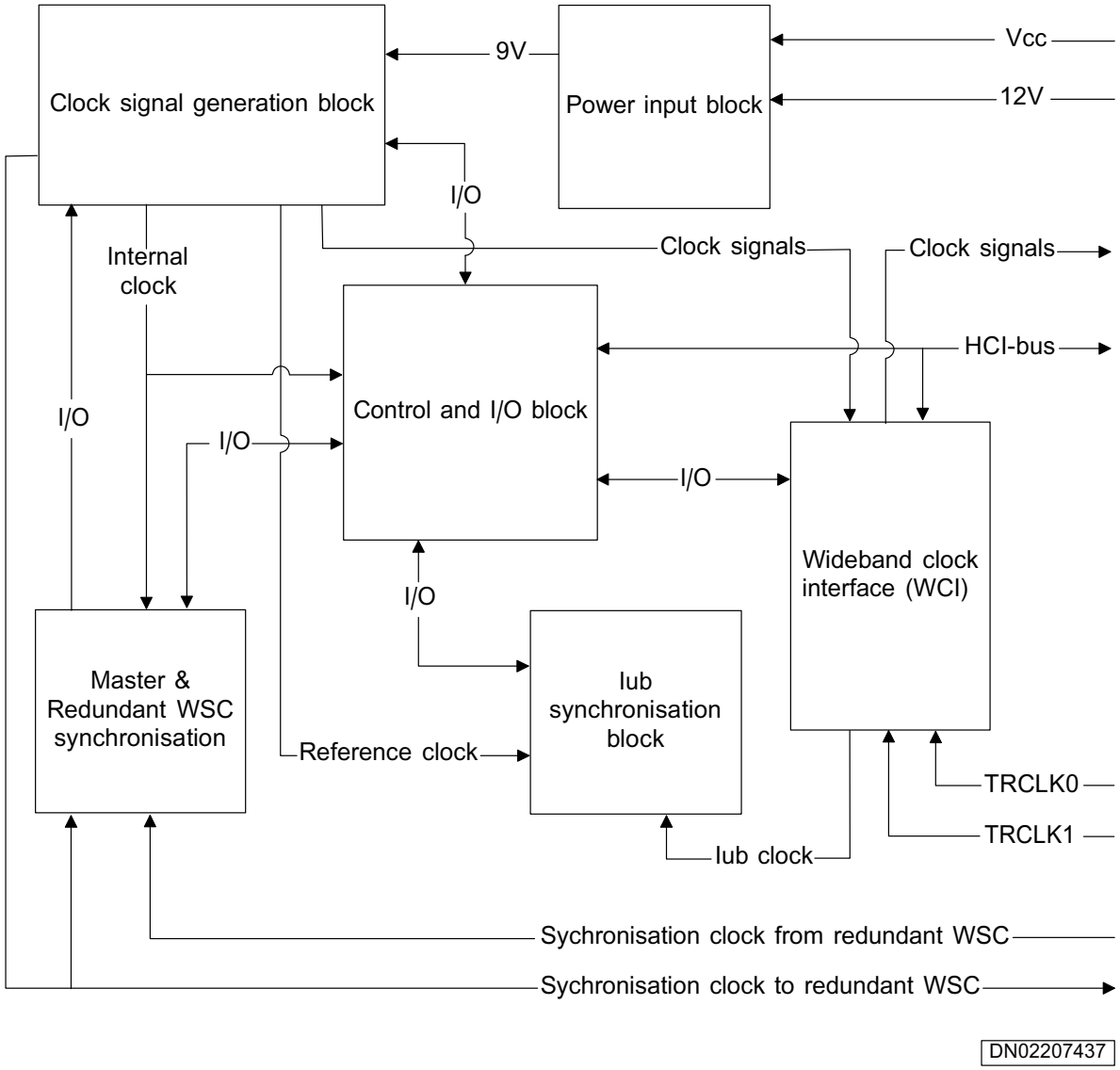


Figure 32. WCI module and functional blocks of the WSCA unit

Clock signal generation block

The WSCA unit contains an Oven Controlled Crystal Oscillator OCXO which provides the source clock for all clock signals which are distributed by the WSCA unit. The clock signals are generated by FPGA which divides them directly from the OCXO main frequency input or synchronises external clock sources to the OCXO frequency.

Control and I/O block

The WSCAs are controlled by the WAM unit via I2C -bus. The WAM acts as I2C -master and controls WSCA´s FPGA registers, temperature sensor and EEPROM. The WAM unit adjusts and saves the DAC word at specified intervals to remove possible jitter so that OCXO will produce 61.44 MHz. The WAM also masters WSCA unit´s initialisation and configuration, controls the BS alarm status checking and its own failure handling together with O&M.

The control block determines the transmission reference: internal OCXO or BTS external signal.

Iub synchronisation block

OCXO of the active WSCA is synchronised to IUB clock (2.048MHz) reference provided by the ATM Cross-connect Unit (AXU). The synchronisation is based on the phase difference between sequential samples towards IUB reference. The samples are taken and analysed by O&M SW which provides tuning information to the WSCA unit, and therefore, long term stability can be achieved.

If a redundant AXU is installed to a base station, the WCI module has two reference clocks available: TRCLK0 and TRCLK1. The active AXU informs the WCI module which clock should be used. If neither of the references are active, the TRCLK alarm is activated.

Wideband clock interface (WCI)

The WCI module is attached to the transmission backplane and it provides an interface to other units and base stations. The WCI module provides system clock for BB processing and reference clock for secondary BS cabinets if the base stations are chained as master / slave configuration. The WCI detects possible clock source failures and performs a changeover to the redundant WSCA unit automatically or manually by O&M.

Power input block

The WSCA unit has a regulator which provides +9V as OCXO supplies from +12V input which comes from the transmission backplane via the WCI.

The hot insert feature provides smooth supply voltage switch for the WSCA unit while it is inserted to the powered BTS.

Master & redundant WSCA synchronisation block

If there are two WSCAs in a BTS, they are automatically synchronised with each other. The redundant WSCA is synchronised to the master WSCA which is the active unit by default when the BTS is powered. This ensures continuous BRCLK clock signal distribution to other BS units even if one of the WSCAs fails to operate.

2.7.2 WSCA Unit Interfaces

The WSCA unit is equipped with the following interfaces:

- Test clock connectors on the front panel
- Back connectors

Front panel connectors

There are two SMA connectors on the front panel of the WSCA unit. Detailed information concerning the connectors are listed in the table below.

Table 16. Front panel connectors of the WSCA unit

Connector	Description	Type
X203; TEST_SFCLK	100Hz clock (LVTTL)	Frame clock output for testing purposes
X202; TESTCLK	10 Mhz clock (LVTTL)	Reference clock output for test equipment

The WSCA front panel is illustrated in the diagram below.

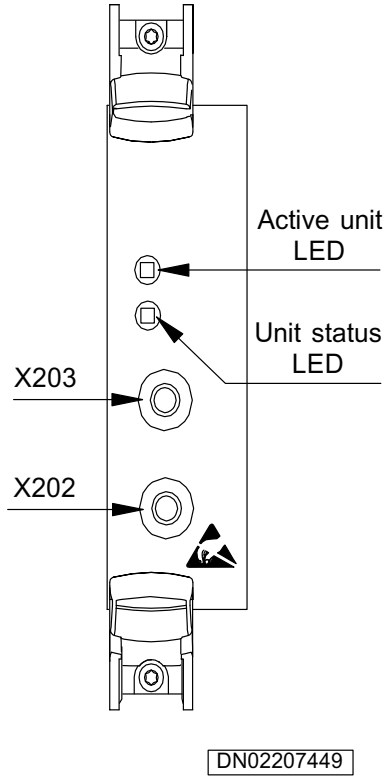


Figure 33. WSCA Front Panel

Back connectors

The WSCA back connectors provide connections for input power, clock and control connections.

The back connectors, their type and purpose are described in the table below.

Table 17. The back connectors of the WSCA unit

Connector	Type	Purpose
X200	96-pin right angled connector, layout 4x24 rows	For input power and signals
X201	24-pin right angled connector, layout 4x2 rows	For hot insert

The back connectors of the WSCA unit are shown in the diagram below.

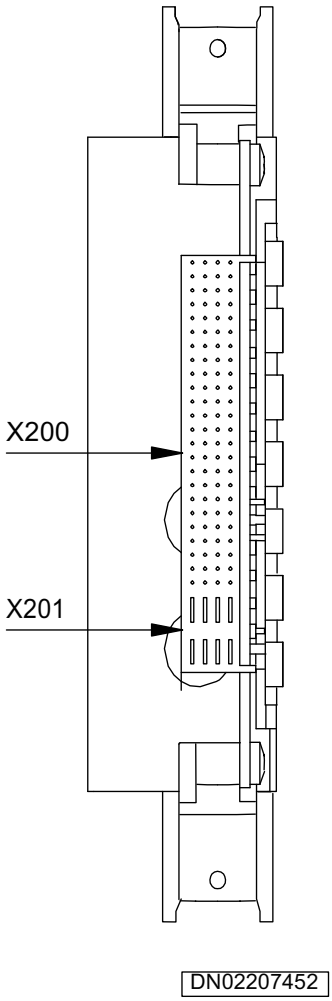


Figure 34. Rear view of the WSCA unit

2.7.3 WSCA Unit LED Indications

Front panel LEDs

There are two LED indicators on the WSCA front panel: one for the unit status to indicate any faults in the operation of the WSCA and the other to indicate which of the two WSCAs is active. The function of the LEDs is described in the tables below.

Table 18. The WSCA unit status LED indications

Colour	Explanation
Red	Fault / OCXO warm alarm
Red, blinking	Active / non-active WSCA synchronisation or OCXO tuning maximum or minimum limit exceeded
Yellow	OCXO warm up
Green	Normal Operation, power on

Table 19. Active WSCA unit LED indications

Colour	Explanation
Green	The WSCA unit is active
No light on	The WSCA unit is not active

See the diagram below for LED locations.

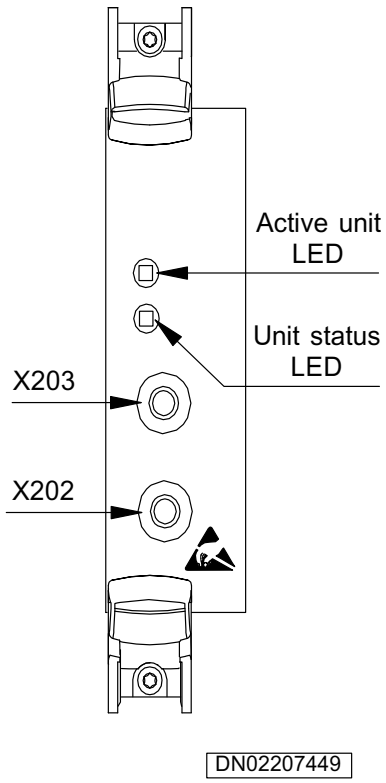


Figure 35. Front panel of the WSCA unit

2.8 Wideband Summing and Multiplexing (WSMA) unit

2.8.1 Technical description of Summing and Multiplexing (WSMA) unit of UltraSite EDGE BTS

The Summing and Multiplexing Unit (WSMA) routes and distributes digital bit streams between Transmitter and Receiver (WTR) and Signal Processor Units (WSP).

In downlink direction, the unit receives spreaded downlink signals from six WSPs. In the case of softer handover, it receives signals also from up to two neighbouring sectors. After the final summing, the unit forwards the composite signals to the WTR unit for transmission.

In uplink direction, the WSMA unit distributes the received signals from its own sector and from its two neighbouring sectors to all six WSPs.

The Application Manager Unit (WAM) controls the WSMA and the System Clock Unit (WSC) provides the WSMA clock signal.

In Nokia UltraSite WCDMA BTS Supreme Indoor up to 3 WSMA units can be installed in a single cabinet, one per each BB section. In Nokia UltraSite WCDMA BTS Optima Compact Outdoor with RF extension up to 3 units can be used. In Nokia UltraSite WCDMABTS Optima Compact Outdoor with IBBU up to 2 units can be used. In triple-mode Nokia UltraSite EDGE Base Station one WSMA unit can be used.

Isometric view of the WSMA unit diagram shows the WSMA unit.

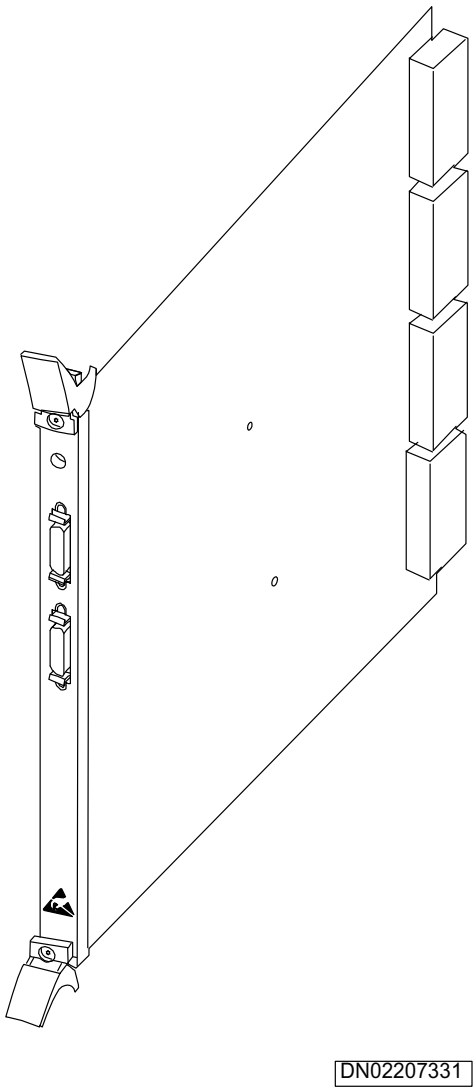


Figure 36. Isometric view of the WSMA unit

2.8.1.1 Operation

The WSMA unit distributes signals between WTRs and WSPs. The TX block receives signals from the WSP unit and forwards them to the WTRs. The RX block receives signals from the WTR unit and forwards them to the WSPs.

The WSC unit provides the reference clock BRCLK 61.44MHz and SFCLK for the WSMA unit which sends them forward to the WAM unit.

The WAM unit detects the WSMA via SCI-bus by reading the serial and version numbers and the ID from EEPROM. The WAM also uploads the configuration data for the WSMA units.

The WSMA is equipped with a LED to indicate different operation conditions (see *WSMx unit LED indication*).

The hot insert of the WSMA unit is possible. If any of the WSMA, WSP or WTR units is inserted (hot insert) or removed from the BTS, the WAM updates that to the WSMA units.

The WSMA unit can be reset remotely via SCI-bus.

2.8.1.2 Main blocks

The WSMA unit consists of the following functional blocks:

- TX block
- RX block
- SCI bus (I2tC)

See *The functional modules of the WSMA unit* diagram.

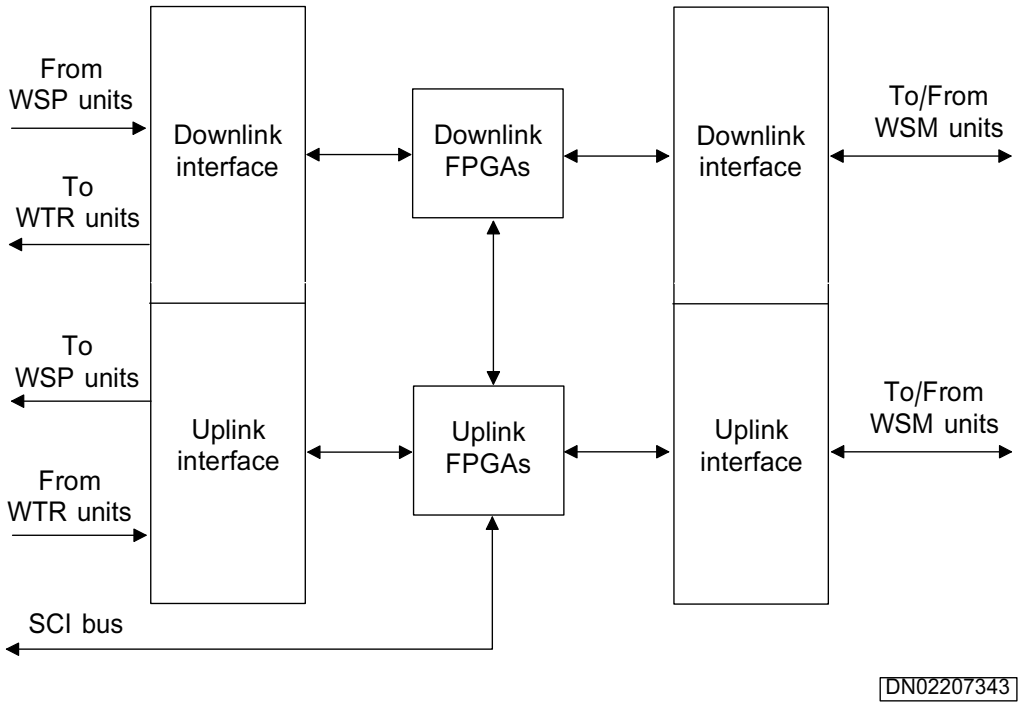


Figure 37. The functional modules of the WSMA unit

TX block

Spreaded TX samples processed by the WSP unit are transmitted to the WSMA unit. The WSMA can take input data from up to six WSPs simultaneously. The TX block of the WSMA unit synchronises and sums up the data it receives from the WSP units in the same subrack. The unit sends the resulting sum to the WSMA units in other subracks for softer handover operation.

The TX block forms the signal sent to the WTR units both from the data received from the WSP units in the same subrack and from the data sent by other WSMA units.

The TX block also checks the parity of the received buses and controls the accuracy of the bus format.

RX block

To receive direction, the RX block of the WSMunit routes the data from the WTR units to all WSPs. The switching logic routes the data to the WSP units depending on the HW configuration. The RX block also checks the parity and synchronisation of all incoming buses.

SCI bus

The WSMA unit communicates with the WAM unit via I2C protocol. The WAM unit sends the configuration information to the WSMA unit and receives the status information and alarms from the WSMA unit.

2.8.2 WSMA Unit Interfaces

The WSMA unit is equipped with the following interfaces:

- Two TX / RX connectors, mini D ribbon (MDR) on the front panel
- Six back connectors for buses, clocks and voltage input

Front panel connectors

The WSMA unit´s front panel has two connectors, X36000 (L) and X36001 (R). The connectors, their type and purpose are listed in the table below.

Table 20. WSMA Front Panel Connectors

Connector	Type	Purpose
X36000 (L)	MDR 26-pole connector	Signals from WSMxs in other sectors to the WSMx unit
X36001 (R)	MDR 26-pole connector	Signals from the WSMx unit to WSMxs in other sectors

The front panel connectors of the WSMA unit are illustrated in the diagram below.

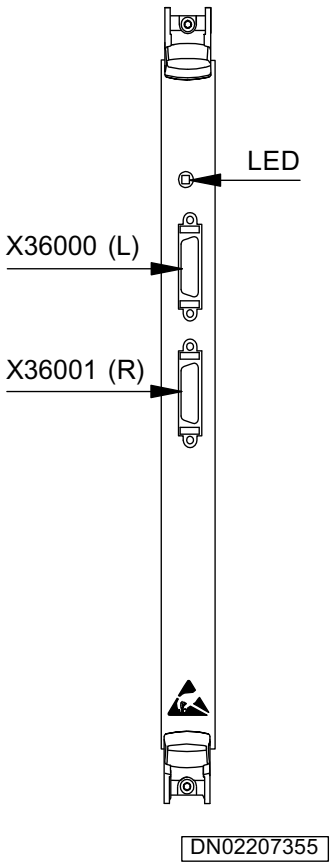


Figure 38. WSMA front panel

If there are two or three WSMA units in one cabinet, the units can be connected together with front panel connectors to allow data transmission between separate subracks. In such a case, the cable is connected to the L connector in one WSMA unit and to the R connector of the WSMA unit in the other subrack.

Back connectors

The backplane of the WSMA unit has two power connectors and four HDM series connectors which provide interfaces to the WSP units, WTR units, clocks and I2C -bus.

The back connectors and their types are listed in the table below.

Table 21. The back connectors of the WSMA unit

Connector	Type	Purpose
X200	HDM 72	Signals from/to WTR units, and clock signals
X201	HDM 144	Signals from/to WSP units
X202	Hot insert power connector	For Hot Insert
X203	Hot insert power connector	For Hot Insert
X300	HDM 144	Signals from/to WSP units
X301	HDM 144	Signals from/to WSP units

The back connectors are shown in the diagram below.

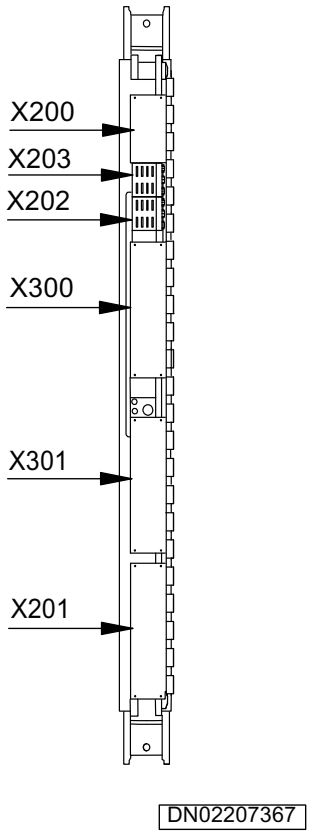


Figure 39. Rear view of the WSMA unit

2.8.3 WSMx unit LED indications

Front panel LED

A tri-colour LED on the front panel of the WSMx unit indicates the operational status of the unit.

The LED indications are listed and explained in the table below.

Table 22. WSMx front panel LED indications

Colour	Explanation
Red	Faults in received data or reset.

Table 22. WSMx front panel LED indications (cont.)

Colour	Explanation
Yellow	Unit waiting (e.g. after power up).
Green	Normal operation, power on
Green, blinking	Configuring

See the diagram below for LED location.

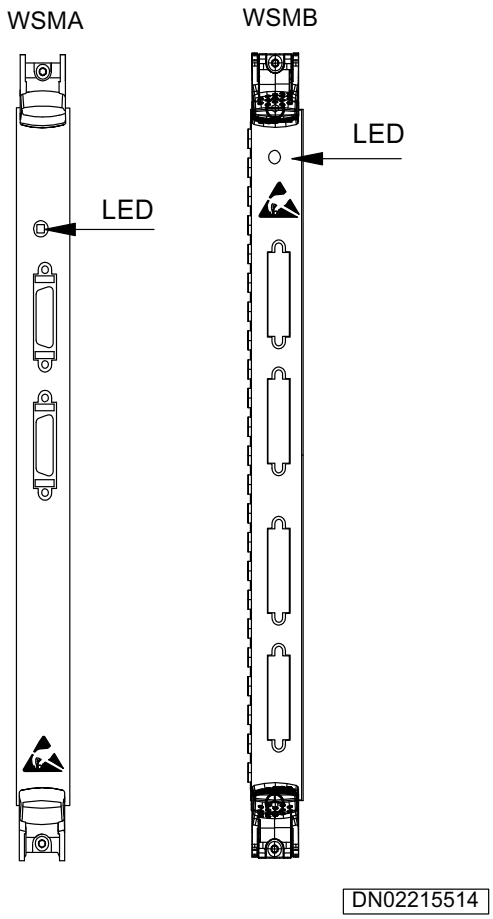


Figure 40. Front panel LED location in WSMA and WSMB

2.9 Wideband Signal Processor (WSPA) unit

2.9.1 Technical description of Signal Processor (WSPA) unit of UltraSite EDGE BTS

The Signal Processor Unit (WSPA) performs RX and TX code channel processing, coding, decoding and fast closed loop power control. The unit supports both convolutional coding and Turbo coding.

The unit processes RX data sample signals from up to twelve receiver chains (Number of chains = number of carriers x number of antennas). The WSPA receives the antenna signals from the Summing and Multiplexing Unit (WSM). There are six RX -buses per each WSPA unit and every RX -bus contains data from two RX-chains.

The WSPA also generates TX data samples for up to twelve TX chains (Number of chains = number of carriers x number of antennas). The spreaded TX data from the channel blocks of the WSPA unit is directed either to every TX antenna or to a subset of TX antennas (the WSMs take care of the summing operation towards the TX antennas).

Every WSPA unit provides 32 code channels. The number of used uplink and downlink code channels may vary; in softer hand over, more code channels are needed in downlink than in uplink direction as RACH reception needs code channel processing only in uplink.

In Nokia UltraSite WCDMA BTS Supreme Indoor up to 6 operating WSPA units can be used per Baseband subrack, while up to 18 units can be installed in a single cabinet. In Nokia UltraSite WCDMA BTS Optima Compact Outdoor up to 6 units can be used per Baseband subrack, and up to 12 units per cabinet. In Nokia MetroSite WCDMA BTS up to two units can be used. In triple-mode Nokia UltraSite EDGE Base Station up to 5 WSPA units can be used.

The WSPx unit diagram shows the WSPx unit.

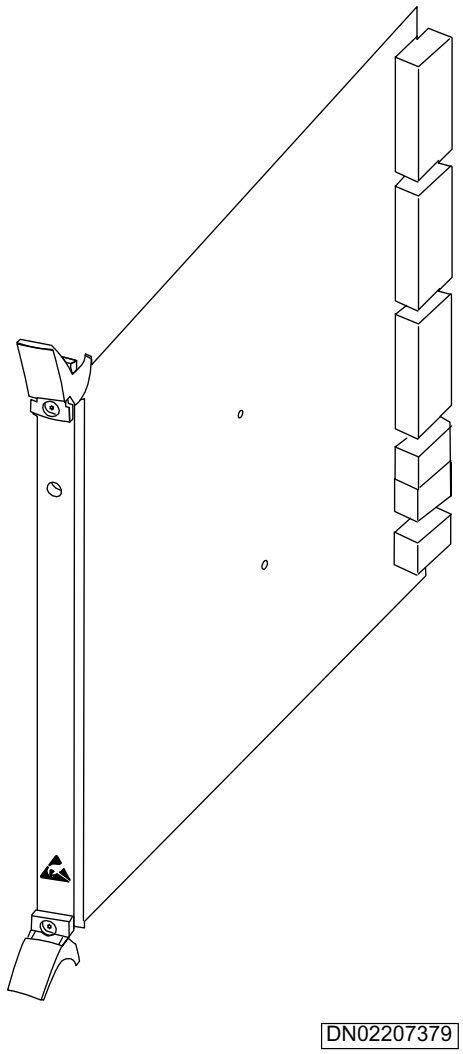


Figure 41. The WSPx unit

2.9.1.1 Operation

The WSPA unit has an uplink and a downlink. The unit takes care of several functions in both ends. The functions are listed below.

The uplink performs the following functions:

- RAKE receiving
- Physical channel decoding

- Transport channel decoding
- Deinterleaving
- Rate matching
- CRC calculation (cyclic redundancy check)

The downlink performs the following functions:

- Encoding
- Spectrum spreading
- Modulation
- Interleaving
- Rate matching
- CRC checking
- TPC (transmit power control)

The main functions of the WSPA unit are illustrated in *The main functions of the WSPA unit* diagram.

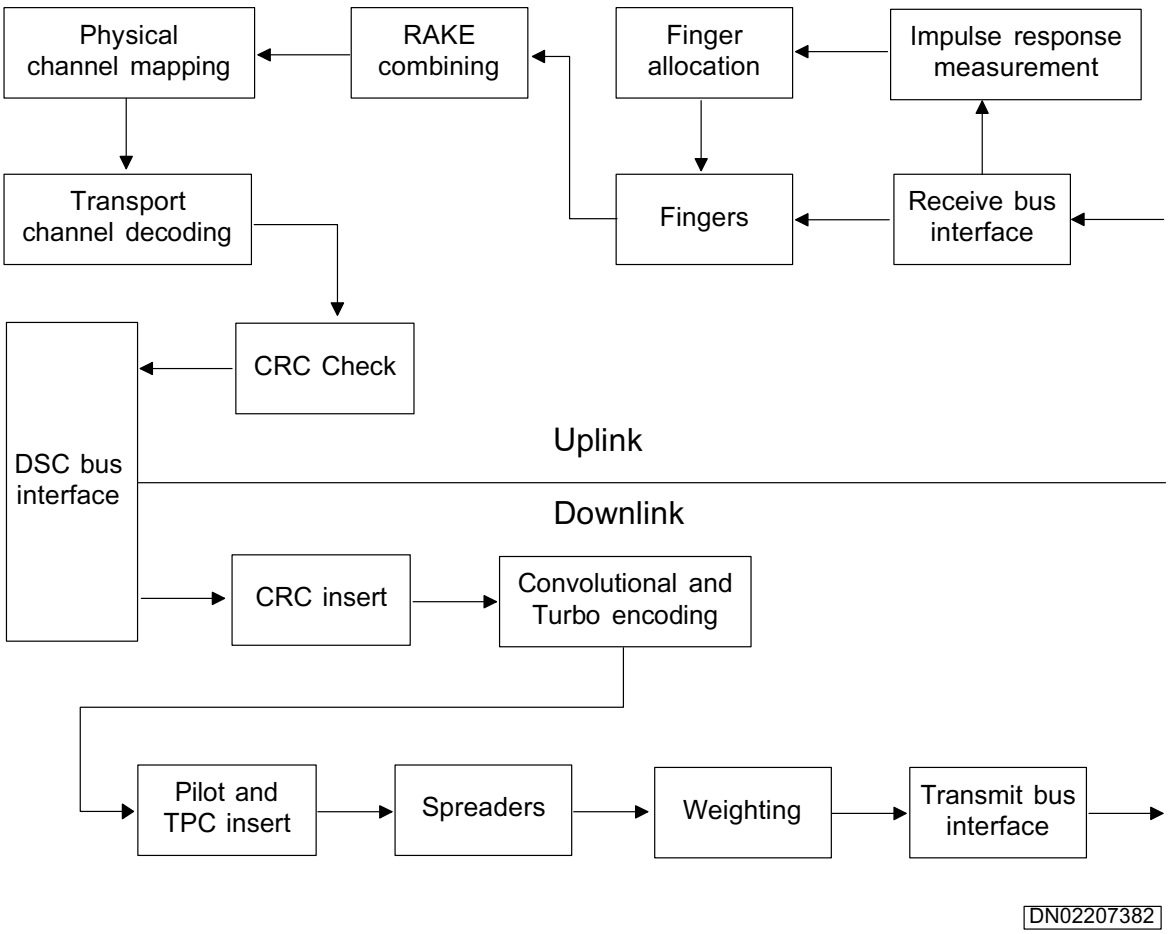


Figure 42. The main functions of the WSPA unit

The WSPA unit has four external clocks available:

- BRCLK 61.44MHz master clock delivered by the WSC unit via the Application Manager Unit (WAM)
- SSFCLK 100Hz delivered by the WSC unit via the WAM unit. This clock is used to give the frame start information to ASICs.
- SFN; system frame number is delivered by the WAM unit
- 33 MHz DSC bus clock

The WSPA unit communicates with the WAM unit via the DSC-bus and OCI-bus. See the *MCU interface* chapter below.

The WSPA unit is equipped with a LED indicator on the front panel to indicate different operational conditions.

Power control for the WSPA unit includes hot insert logic, voltage supervisor for each voltage (1.5V, 1.8V and 3.3V) and power on main reset control.

The reset logic keeps the WSPA unit in a reset state for a short moment after the voltages have been raised up to the required level.

The reset logic controls the voltage levels. If any of the voltages drop below the required level, reset will appear to certain circuits and an alarm will be sent to O&M

2.9.1.2 Main blocks

The WSPA unit consists of the following functional blocks:

- Channel block: Codec (4 pcs)
- RAKE receiver (4 pcs)
- MCU interface

Channel block (codec)

There are four channel blocks in the WSPA unit. Each block contains the following items: one codec DSP, one SWS ASIC (including spreaders), and one TVD ASIC (including Viterbi and Turbo).

A channel block performs the following functions:

- Channel encoding: convolutional or Turbo coding
- Decoding (+ Viterbi and Turbo)
- Interleaving / deinterleaving
- Rate matching
- CRC checking / calculation
- Modulation
- Spreading
- Scrambling
- TPC (transmit power control)

Encoding takes place in the SWS ASIC and in the CODEC DSP. Main functions of the encoding are spreading, weighting and summing data, interruptions and TPC insertion. SWS ASIC is connected to RAKE, DSP, and other SWS ASICs.

Every WSPA unit contains four channel blocks, and therefore, four encoding blocks can be allocated to the downlink.

Decoding takes place in the TVD ASIC and in the CODEC DSP. The decoding includes physical channel mapping, transport channel decoding and CRC checking.

The DSPs are connected to the DSC bus which is used as a data bus between the WSPA and WAM units within one subrack.

The spreaders send spreaded and summed data to the WSM unit which sends downlink data to the WTR unit.

RAKE receiver

There are four RAKE blocks on the WSPA unit. Each RAKE has two IRAD ASICs and one RAKE DSP. The DSP is connected to the WAM unit via DSC ASIC.

Each RAKE block includes four finger banks which have each eight RAKE fingers: four for the main antenna and four for the diversity antenna. Each finger bank is time-multiplexed for two users.

The RAKE block receives uplink data from the WTR unit. The RAKE performs, for example, the following functions:

- Impulse response measurements
- Channel estimation
- Receiver fingers allocation
- Descrambling in fingers
- Despreading in fingers
- Maximum ration combining (MRC)
- Code tracking
- Closed loop power control
- Signal to interference ratio (SIR) estimation

MCU interface

The WSPA unit communicates with the WAM unit via the DSC-bus and MCU interface (OCI-bus). The interfaces include one DSC ASIC, a LED control, a temperature sensor, electrical serial number information, operation time register, HW -identification, and AIF bus transceivers.

The MCU controls all DSPs via AIF bus. DSC-bus takes care of uplink and downlink data traffic and alarm signalling between the WAM unit and the WSPA unit.

2.9.2 Interfaces of the Wideband Signal Processor (WSPx) unit of UltraSite EDGE BTS with WCDMA Upgrade

The WSPx unit is equipped with the following interfaces:

- Back connectors

Back connectors

The WSPx rear panel has six connectors which provide interfaces to other units and to power input.

The table below describes the connectors, their types, and purposes.

Table 23. The back connectors of the WSPx unit.

Connector	Type	Purpose
Network interface connector	Female pihr with guide right angle	From/to DSC bus to/from WSPx unit
Power connector	Female pihr with guide right angle	Power input
RF interface connector	Female pihr with guide right angle	Interface to/from the WSM unit
Power connector	Metric connector / 4-row right-angle power receptacle	Power input
Power connector	Metric connector / 4-row right-angle power receptacle	Power input

Table 23. The back connectors of the WSPx unit. (cont.)

Connector	Type	Purpose
Power connector	Metric connector / 4-row right-angle power receptacle	Power input

The WSPx back connectors are shown in the diagram below.

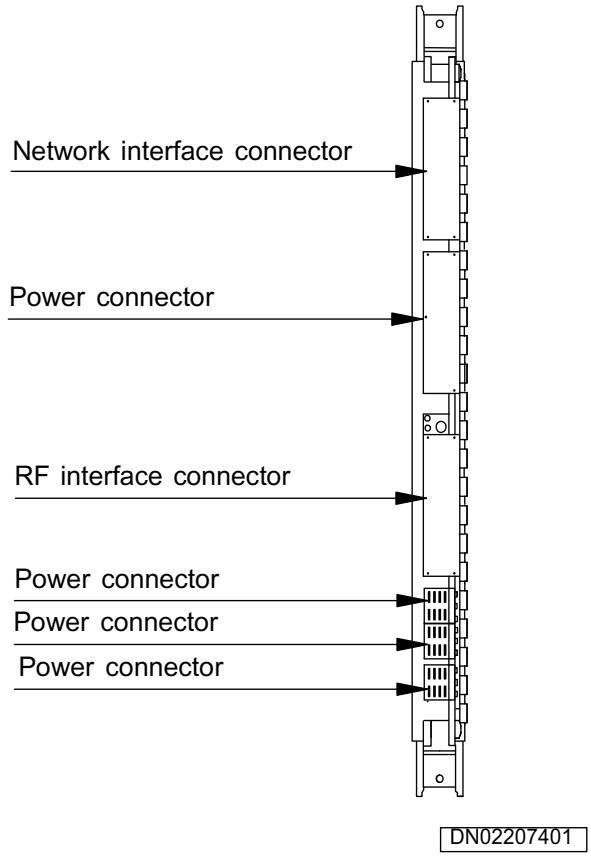


Figure 43. Rear view of the WSPx unit

2.9.3 WSPx Unit LED Indications

Front panel LED

A tri-colour LED on the WSPx unit´s front panel indicates the operational status of the unit.

The LED indications are listed and explained in the table below.

Table 24. WSPx front panel LED indications

Colour	Explanation
Red	Faulty unit
Red, blinking	Minor alarm
Yellow	Transmission blocked for maintenance purposes
Yellow, blinking	Stand-by after start-up, SW downloading / configuration
Green	Normal operation, power on

See the diagram below for LED location.

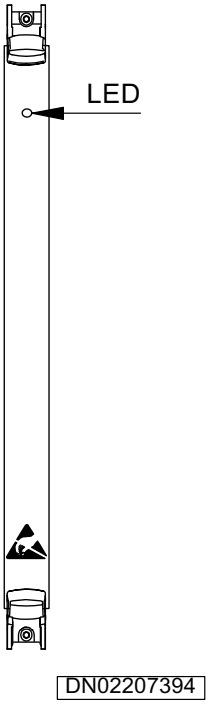


Figure 44. Front panel of the WSPx unit

2.10 Wideband Transmitter and Receiver (WTRx) unit

2.10.1 Technical description of Wideband Transmitter and Receiver (WTRA) unit of UltraSite EDGE BTS

In downlink direction, the WTRA unit receives digital data from the Signal Processing Unit (WSP) via the Summing and Multiplexing Unit (WSM). The WTRA performs modulation and upconversion of the transmitted carrier which is amplified by the Power Amplifier Unit (WPA).

In uplink direction, the WTRA performs channel selection and downconversion for the selected carrier (with diversity reception). The received signal is digitised and transmitted to the WSP via WSM.

In Nokia UltraSite WCDMA Base Stations up to 6 WTRA units can be installed into a single cabinet. In Nokia MetroSite WCDMA BTS up to one unit can be used. In Triple-mode Nokia UltraSite EDGE Base Station up to 3 units can be used per cabinet.

The WTRA units are connected to the WTR section backplane which provides an interface to TX and RX sample buses, clocks, Ethernet bus, and power supply.

The *Isometric view of the WTRA unit* diagram shows the WTRA unit.

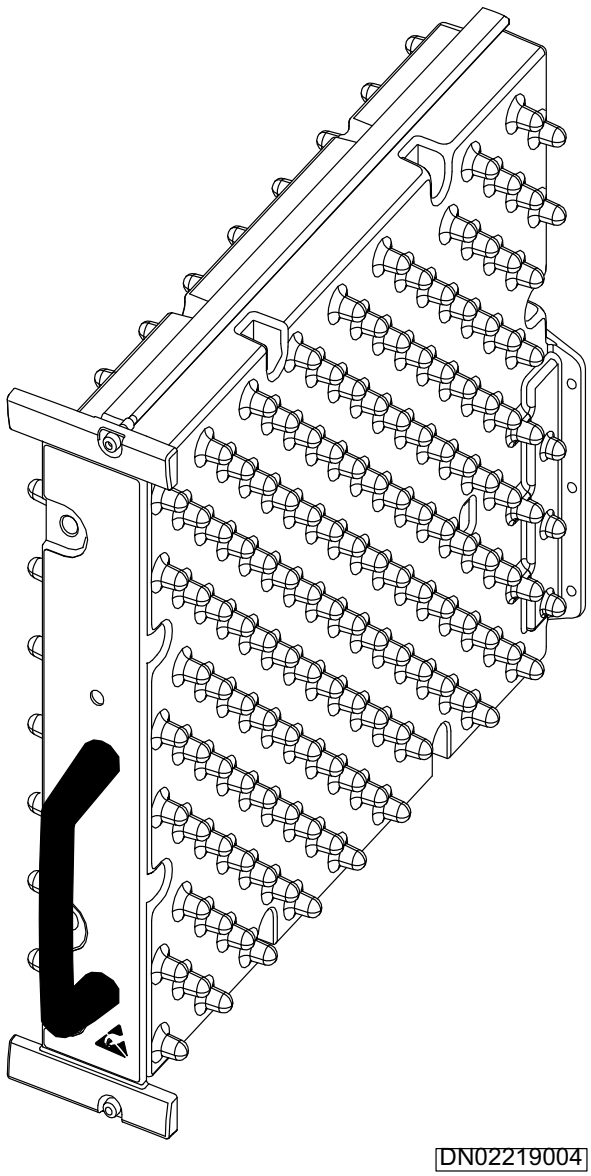


Figure 45. Isometric view of the WTRA unit

2.10.1.1 Operation

When the WTRA unit is plugged into an active BTS cabinet, the unit is automatically powered and the external inputs to the unit via the backplane are available. When the unit is powered, the unit initialisation process starts automatically.

The WTRA consists of two functional blocks: the digital board and the RF board. The digital board manages the WTRA digital signal manipulation and transmitter D/A conversion. The RF board manages WTRA analog signal manipulation and receiver A/D conversion.

The main features of the WTRA unit are:

- Two receivers (RX1 and RX2) and one transmitter
- RX band 1920-1980 MHz and TX band 2110-2170 MHz (duplex separation of 190 MHz)
- Full digital implementation from BB to the lowest IF in both RX and TX
- Digital IF sampling with 61.44 MHz clock
- Internal VCXO for high quality clock reference

The System Clock Unit (WSC) provides the system clock signal to the WTRA unit. The internal 61.44 MHz VCXO clock signal is referenced to the system clock signal and used to time ASICs, AD and DA converters. It is also used as the synthesizer reference.

The WTRA unit communicates with the Application Manager Unit (WAM) which controls its operation.

The temperature level inside the WTRA unit is monitored by a sensor located in the digital board. The sensor is controlled by the control processor which reports the temperature level to the WAM unit.

The WTRA unit is equipped with a tri-colour LED on the front panel to indicate different operational statuses. The LED is located in the WTRA digital board and is controlled by the control processor.

Hot insert of the WTRA unit is possible without any damage to the unit itself or to the units surrounding it.

2.10.1.2 Main blocks

The WTRA consists of the following functional blocks:

- Digital board
- RF board

The functional blocks of the WTRA unit are illustrated in the *Block diagram of the WTRA unit*.

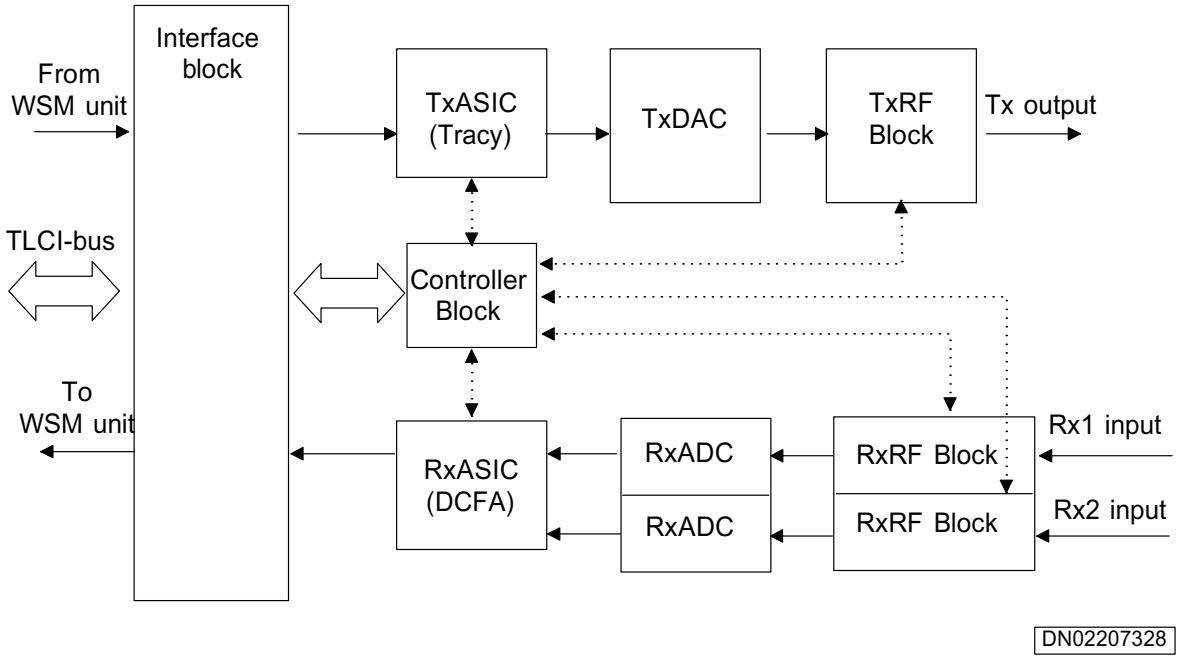


Figure 46. Block diagram of the WTRA unit

Digital board

The main parts of the WTRA digital board are a control processor and two ASICs: a receiver Down-Conversion and Filtering ASIC (DCFA) and a transmitter filtering and quadrature modulator ASIC (TRACY).

The processor controls all functions in the WTRA unit, including the operation of the ASICs. It also communicates with the WAM unit via Ethernet bus.

In the receive side, two ADCs in the RF module make the AD conversion and send the buffered digital outputs to the DCFA. The ASIC demodulates and filters the data and forwards it to the WSM unit.

In the transmission side, the TRACY ASIC receives data from the WSM unit. TRACY filters and modulates the data and routes it to a TxDAC which converts it from digital to analog form. The output of the TxDAC is buffered and routed to the RF module.

The WTRA Digital Board functions include also:

- I/Q modulation and demodulation
- Channel filtering
- TX power measurements
- RX power measurements
- DDS of TX and RX signals
- Generation of control signals for the RF board
- Alarm handling for the RF board

The WTRA unit backplane connectors for external inputs, such as power supply, reference clock and control functions (via Ethernet bus), are located on the digital board. From the digital board the power supply and clock are delivered also to the RF board.

The digital board of the WTRA unit requires +3.3 V, +1.86 V, and +10 V supply voltages. The voltages +10 V and -12 V are delivered through the digital board to the RF board.

RF board

The functional blocks of the RF board are a transmitter (TX), two identical receivers (RX1 and RX2), synthesizers, and a test loop.

The WTRA RF board functions include:

- Frequency conversion
- Filtering and amplification of TX and RX signals

The WTRA RF board VCXO uses the clock signal from the BS WSC unit as a reference clock. The WSC signal is delivered to the VCXO through the WTRA digital board. The VCXO synthesizer output is used as a reference clock for the other RF board synthesizers.

The RF board uses +10 V and -12 V power supplies which are delivered through the digital board.

Transmitter (TX)

The transmitter structure consists of two up-conversions. The transmitter module consists of a TX IF block, TX RF block and a power amplifier block.

The TX block of the WTRA RF board converts the WCDMA coded 15.2 MHz input signal coming from the digital board to the transmit frequency at the desired RF output power level. The output signal is forwarded to the Power Amplifier Unit (WPA) which filters and amplifies it.

The TX block uses internally regulated +5 V and +8 V supply voltages.

Receiver (RX)

The WTRA unit consists of two identical receivers: one for the main branch (RX1) and one for the diversity branch (RX2).

The receiver structure consists of two down-conversions. Each receiver branch consists of an RF LNA block, RF mixer block, two IF blocks and an AD conversion block.

The RX block of the WTRA RF board converts the received RF signal, coming from the antenna through the WAF unit, into a digital signal to be passed on to the WTRA digital board DCFA ASIC for channel filtering and IQ-demodulation.

The purpose of the WTRA RF Board RX module is to convert the received RF signal (1920...1980 MHz), coming from the antenna through the WAF unit, into a digital signal to be passed on to the WTRA digital board DCFA ASIC for channel filtering and IQ-demodulation.

The RX module consists of two identical receiver chains: the main and diversity branch (RX1 and RX2). The down-conversion is done via two intermediate frequencies: 1st IF 190 MHz and 2nd IF 16.2 MHz. AD conversion is done in the 2nd IF frequency. Before connecting the received signal to the ADC, the signal is fed through an automatic gain controller circuit to adjust the received power level if it exceeds the ADC dynamic range.

The AGC circuit consists of attenuators located in the RF and 2nd IF frequencies. The AGC attenuator control is automatic and based on the received wideband power measured in the DCFA ASIC before channel filtering.

Synthesizers

The WTRA RF board synthesizer module consists of a VCXO, a common RF synthesizer for the TX and RX blocks, RX IF, TX IF, and loop synthesizers.

The VCXO gets its reference clock 61.44 MHz from the WSC unit via the WTRA digital board. The VCXO locks the output signal to the external reference clock and delivers a stable reference clock to all synthesizers, AD and DA converters, and to the ASICS.

The synthesizer module delivers high performance RF and IF local oscillator signals to the TX, RX, and Loop modules. The synthesizers are optimised for minimum phase noise.

Loop

The loop module of the WTRA RF board consists of a down conversion mixer and a digitally controllable attenuator.

The RF loop enables the verification of the WTRA unit RF functionality by looping the signal between the WTRA RF output and input. The RF loop converts a fraction of the WTRA unit TX output signal power into RX frequency via directional couplers, attenuates the signal to the desired receive power level and inserts the signal to both RX inputs of the WTRA unit.

2.10.2 WTRx Unit Interfaces

The WTRx unit is equipped with the following interfaces:

- RF connectors on the front panel
- Back connectors

Front panel connectors of the WTRA unit

There are three RF interfaces on the front panel of the WTRA unit: TX, RX1 and RX2.

The connectors, their type, and purpose are described in the table below.

Table 25. The front panel connectors of the WTRA unit.

Connector	Type	Purpose
TX	SMA female connector	For TX output
RX1	SMA female connector	For RX input: signals from WAF (main branch)
RX2	SMA female connector	For RX input: signals from WAF (diversity branch)

The WTRA front panel is illustrated in the diagram below.

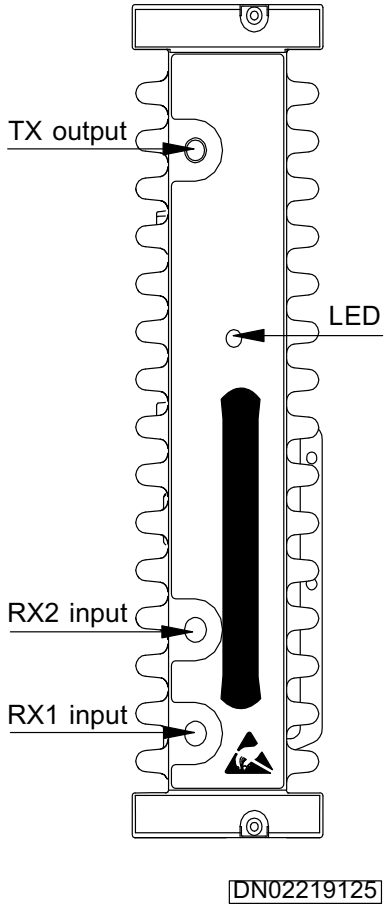


Figure 47. Front panel of the WTRA unit

Front panel connectors of the WTRB/C unit

There are seven RF interfaces on the front panel of the WTRB/C unit: TX1, TX2, SUM TX, RX1M, RX1D, RX2M and RX2D.

The connectors, their type, and purpose are described in the table below.

Table 26. The front panel connectors of the WTRB/C unit.

Connector	Type	Purpose
TX1	SMA female connector	For TX output

Table 26. The front panel connectors of the WTRB/C unit. (cont.)

Connector	Type	Purpose
SUM TX	SMA female connector	For TX output, two TX branches combined
TX2	SMA female connector	For TX output
RX1M	SMA female connector	For RX input, main branch
RX1D	SMA female connector	For RX input, diversity branch
RX2M	SMA female connector	For RX input, main branch
RX2D	SMA female connector	For RX input, diversity branch

The WTRB/C front panel is illustrated in the diagram below.

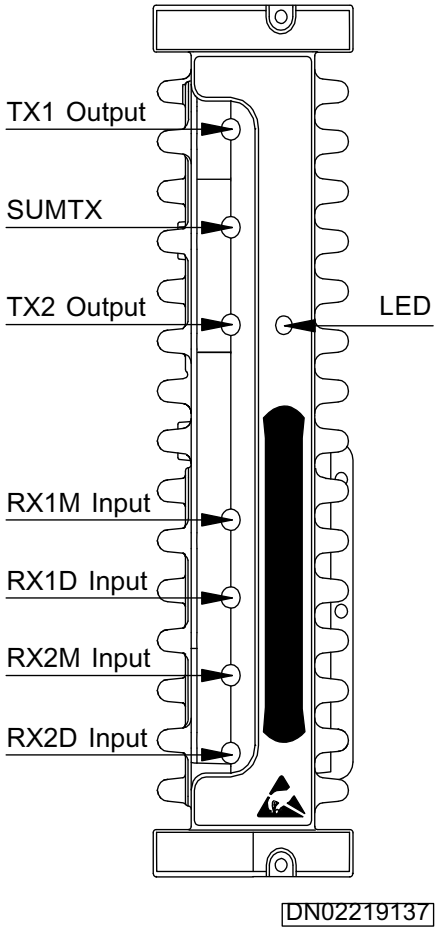


Figure 48. Front panel of the WTRB/C unit

Back connectors

The WTRx unit has three back connectors which provide interfaces to other units, clocks, signals, and power supply.

The back connectors, their type and purpose are described in the table below.

Table 27. Back connectors of the WTRx unit.

Connector	Type	Purpose
X1	144 -pin (6x24) right angle female 2 mm Metric connector	For power supply and signals
X2	8 -pin (2x4) right angle female 2 mm Metric power connector	For hot insert
X3	8 -pin (2x4) right angle female 2 mm Metric power connector	For hot insert

The back connectors are shown in the diagram below.

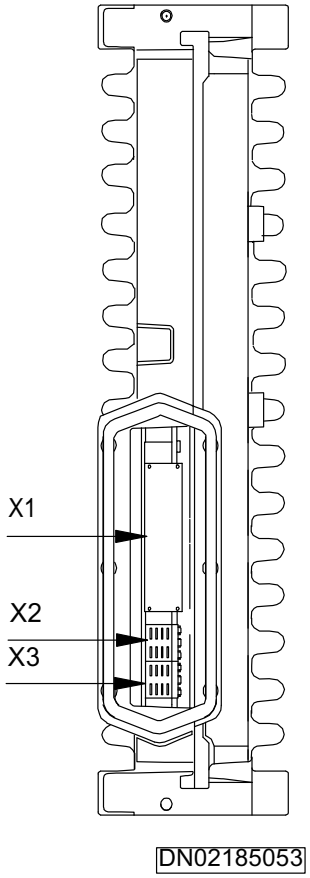


Figure 49. Rear view of the WTRx unit

2.10.3 WTRx unit LED indications

Front panel LED

A tri-colour LED on the WTRx unit´s front panel indicates the operational status of the unit.

The LED indications are listed and explained in the table below.

Table 28. WTRx front panel LED indications

Colour	**Explanation**
Red	Faulty unit
Red, blinking	Minor alarm
Yellow	Unit waiting / RF transmission blocked for maintenance purposes
Yellow, blinking	SW downloading / configuration
Green	Normal operation, power on

The LED location on the front panel of the WTRA unit is displayed in the diagram below.

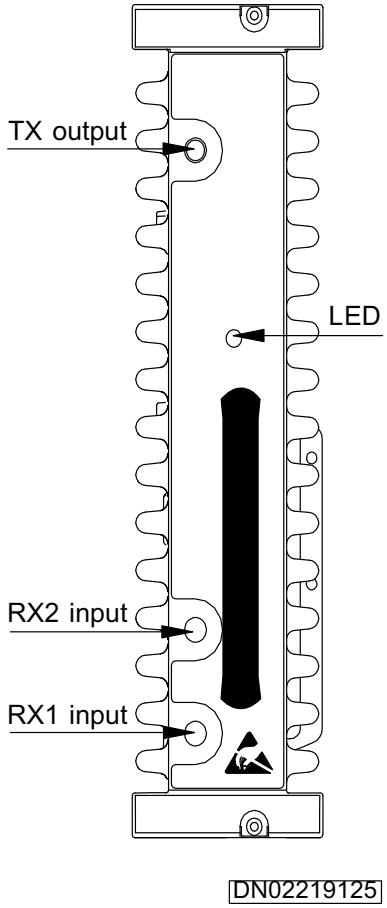


Figure 50. Front panel of the WTRA unit

The led location on the front panel of the WTRB unit is displayed in the diagram below.

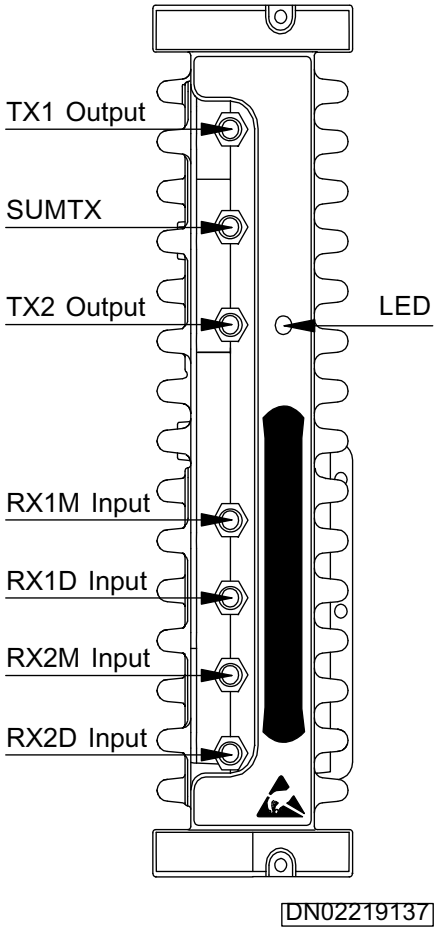


Figure 51. Front panel of the WTRB unit

2.11 ATM Cross-connect (AXU) unit

2.11.1 Technical description of AXC - ATM cross-connect (AXU) unit of UltraSite EDGE BTS

2.11.1.1 Function

The AXU unit includes the following functional blocks:

- Control Unit
- Clock Distribution Circuit
- ATM Switch Fabric
- AAM (in AXUB)
- Backplane Bus Adaptation
- DC/DC Converter

2.11.1.2 MAIN blocks

Control Unit

- The Control Unit consists of the Microcontroller and other necessary circuitry. It is compiled on a module that is the same in each AXC unit. The module type is generic and meets all the requirements of each AXC unit.
- The Microcontroller runs all unit control software on the AXC.
- The Control Unit also features an IP router. It provides a routing path for remote BTS management and local management of the BTS through the LMP of the AXC. You can also manage other BTSs through the IP router. In addition the Control Unit features a Q1 management support function that can be used to manage Q1 network elements remotely. The Q1 network elements can be connected to the Q1 management support function by a cable connected to the Q1 interface at the front panel of the AXU or through operation channels (EOC) embedded in some transmission signals. The Q1 management support function can be connected through the backplane to AXC-embedded Q1 network elements (IFUE).

Clock Distribution Circuit

- The Clock Distribution Circuit provides a reference clock for all IFUs and the WSC.
- The reference clock can either be recovered from a physical interface or received from an external timing source or internal reference source. The internal clock is used if no external reference is available. In this case the AXC does not provide a reference clock for the BTS, but the BTS's WSC provides the clock for the BTS. The AXU features two dedicated interfaces for external timing source input.

ATM Switch Fabric

The ATM Switch Fabric performs all ATM layer functions of the AXC:

- Virtual Path and Virtual Channel cross-connection functionality for ATM cells between a certain number of IFUs and WAMs
- header translation functionality for ATM connections
- traffic management functions like policing or traffic shaping
- O&M functionality (operations, administration and maintenance)

The total switching capacity of the block is 1.2 Gbit/s.

AAM (in AXUB)

If the AAL type 2 module (AAM) on AXUB unit is taken into operation, it multiplexes or demultiplexes AAL type 2 connections between the WAMs and RNC into one or several VCCs.

Backplane Bus Adaptation

The Backplane Bus Adaptation provides serial payload backplane connections between the IFUs and the AXU by means of a bus, as well as the AXU and the WAMs.

DC/DC Converter

The DC/DC Converter transforms the input voltage of –48 V fed through the backplane to the voltages required at unit level.

- The ATM cross-connect unit (AXU) is the master unit of the AXC node. It controls the node within the Nokia WCDMA BTS. It cross-connects ATM traffic within the BTS, and connects the BTS to other BTSs or to the Nokia Radio Network Controller (RNC). The AXU unit is always installed in the first slot of the AXC.
- There are two AXU units available: AXUA and AXUB. AXUB provides the BTS AAL2 multiplexing feature. It is enabled by the ATM Adaptation Module (AAM) of the AXUB unit.

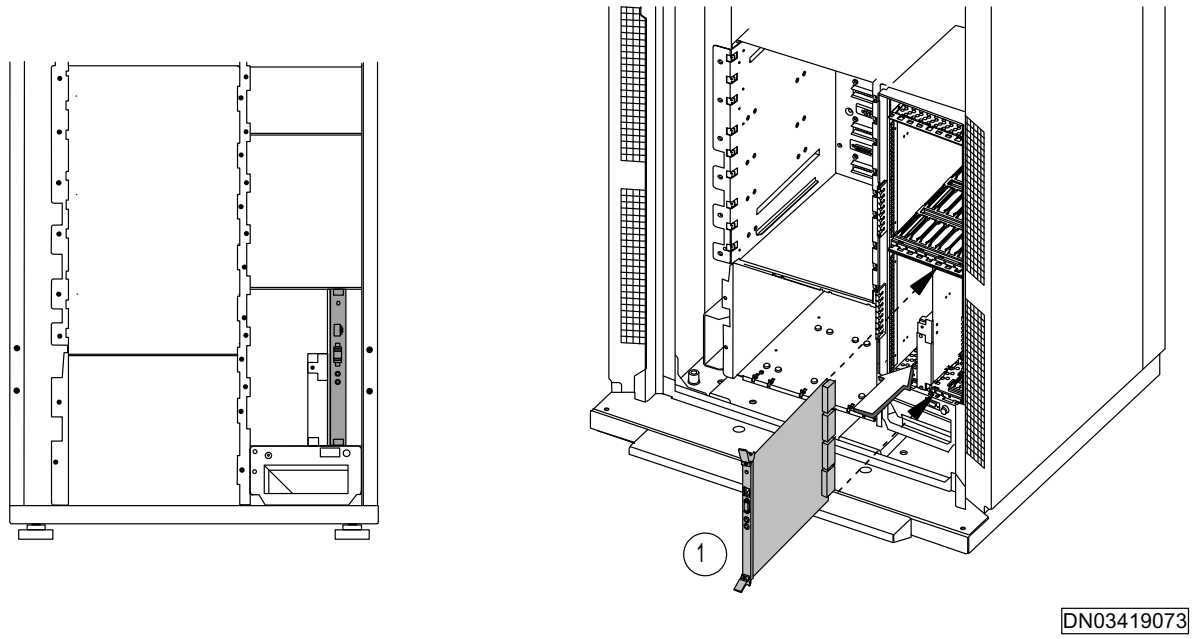


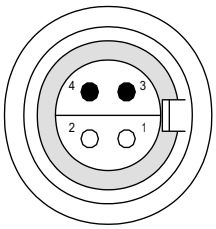
Figure 52. Installing the AXU Unit

2.11.2 Interfaces of the AXC - ATM Cross Connect Unit (AXU) of UltraSite EDGE BTS

AXUA and AXUB interfaces

Interface	Connector
Local Management Port (LMP)	10baseT crossed Ethernet interface, RJ-45 connector Ethernet standards IEEE 802.3 and ANSI 8802.3, RFC 1483 (routed)
Q1 management port	V.11 interface, D-sub 9 connector
External reference clock interface 1 (ERC 1)	TQ connector (symmetrical), 110 Ω 64 kHz + 8 kHz (AMI with 8 kHz bipolar violation)

Interface	Connector
External reference clock interface 2 (ERC 2)	Coaxial BT-43 connector, 75 Ω 1.544 MHz, 2.048 MHz, 2 Mbit/s



1 Clock input -
2 Clock input +
3 nc
4 nc

Figure 53. ERC1 symmetrical interface

Local management port pinout (RJ-45 connector)

Pin	Signal	Explanation
1	TD+	Transmitted data +
2	TD-	Transmitted data -
3	RD+	Received data +
4	nc	Not used by 10baseT
5	nc	Not used by 10baseT
6	nc	Not used by 10baseT
7	nc	Not used by 10baseT
8	RD-	Received data -
9	nc	Not used by 10baseT

Nokia Q1 management interface pinout

Pin	Signal	Explanation
1	Q1_OUT_N	Transmitted data -
2	nc	Not connected

Pin	Signal	Explanation
3	GND	Ground
4	GND	Ground
5	Q1_IN_N	Received data -
6	Q1_OUT_P	Transmitted data +
7	nc	Not connected
8	nc	Not connected
9	Q1_IN_P	Received data +

2.11.3 AXC - ATM Cross Connect (AXU) unit LEDs for UltraSite EDGE BTS

The LEDs of the Nokia AXC-ATM cross-connect unit (AXU) and Interface Units IFUA/IFUD, IFUB, IFUC and IFUE are presented in the following.

Front panel LEDs

Each of the Nokia AXC units has a 3-colour status LED located on the front panel. These indicators display the current state of the equipment. The LEDs indicate the following:

Table 29. LED indications (O/A/F1)

LED Colour	Explanation
Stable RED	Major or critical alarm or Unit disabled
Blinking RED	Minor alarm
Stable YELLOW	Unit starting up
Stable GREEN	Normal operation, power on
Blinking GREEN	Software download from LMT or network during operation

IFUE LEDs

The Interface Unit IFUE has two 3-colour status LEDs on the front panel indicating the operational status of the unit: O/A/F1 and O/A/F2 (O/A/F signifies Operation/Alarm/Fail). The O/A/F1 LED indicates the operational status of the ATM part and the O/A/F2 LED indicates the operational status of the Flexbus part of the IFUE. In addition, each of the three Flexbus interfaces has a status LED of its own (DC on).

- O/A/F1 (ATM part)
- O/A/F2 (Flexbus part)
- DC on (Flexbus 1)
- DC on (Flexbus 2)
- DC on (Flexbus 3)

The following table shows the indications of the *O/A/F2* multi-colour LED for the Flexbus part.

Table 30. IFUE O/A/F2 LED indications

LED Colour	**Status**
GREEN	The unit functions well, no alarms.
YELLOW	Alarms with low priority occur, e.g. “the node clock is not set”
RED	Some errors occur, e.g. “LOS of FB1” or “2M interface 3: Buffer overflow”

The following table shows the indications of the DC on Flexbus LEDs.

Table 31. IFUE Status of “DC on” LED indications

Indication	**Status**
Off	Normal status, no remote power feeding.
Blinking	Try to find an Outdoor Unit (OU), remote power feeding is temporarily on.

Table 31. IFUE Status of “DC on” LED indications (cont.)

Indication	Status
On	OU found and remote power feeding is on.

DC-PIU LEDs

The classification of the station alarms of the DC-PIU is described in the table below. When there are no incoming station alarms the DC-PIU is not lit.

Table 32. Classification of station alarm

Severity	Class	Colour
Critical, major	A	Red
Minor	B	Yellow
Reminder (disabled A or B alarm)	D	Green

2.12 Interface (IFUA/IFUD) unit

2.12.1 Technical description of Interface (IFUA/IFUD) unit of UltraSite EDGE BTS

2.12.1.1 Function

The IFUA is the interface unit for the symmetrical E1, JT1 or T1 connections. The IFUD is the interface unit for the coaxial E1 connections.

IFUA and IFUD interface units support Inverse Multiplexing for ATM (IMA). The units enable distribution of ATM connections across up to 8 E1/JT1/T1 links in an IMA group.

Each of the eight interfaces of the IFUs can be configured to operate either as ATM over E1/JT1/T1 (IFUA) or E1 (IFUD), or as ATM over fractional E1/JT1/T1 (IFUA) or E1 (IFUD). In the fractional E1/JT1/T1 links, the timeslots that are unused by ATM traffic can be filled with TDM traffic by external 64 kbit/s cross-connects (Nokia Talk Family BTS, Nokia MetroHub and Nokia UltraSite GSM/EDGE BTS).

The interface units IFUA and IFUD can be installed in Nokia UltraSite WCDMA Base Stations, Nokia MetroSite WCDMA Base Station and Triple-mode Nokia UltraSite EDGE Base Station.

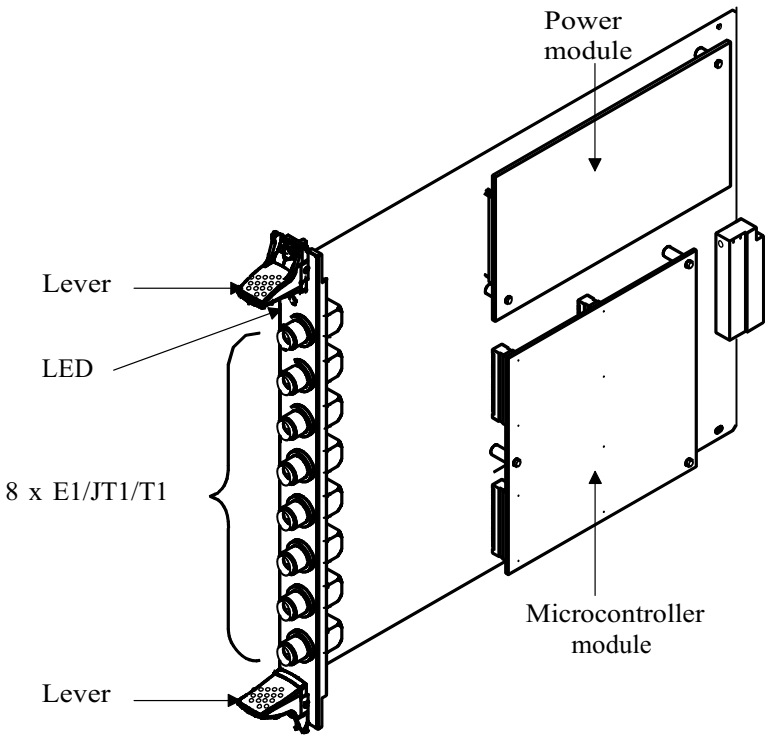


Figure 54. IFUA unit

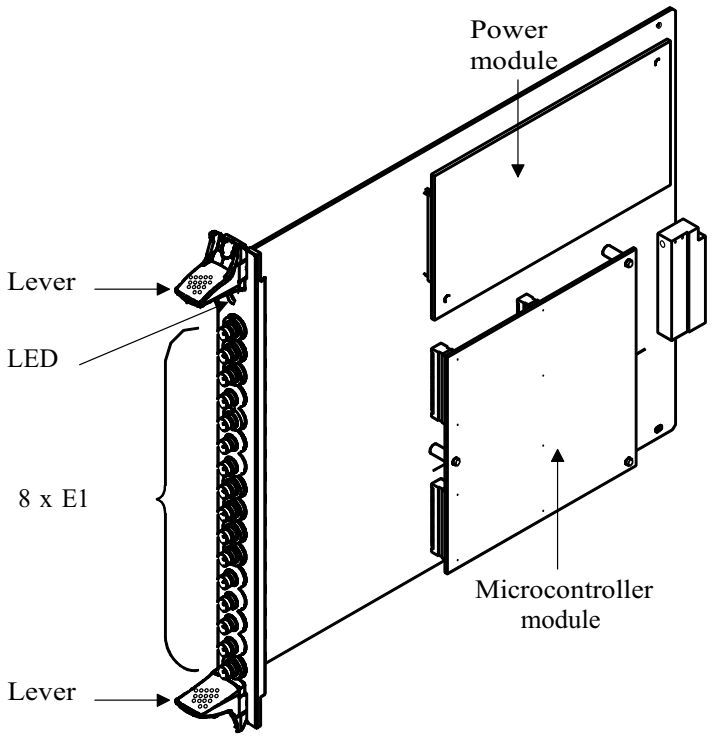


Figure 55. IFUD unit

2.12.1.2 MAIN blocks

The IFUA/D units include the following functional blocks:

- Line Interface Overvoltage Protection
- Clock Recovery
- E1/JT1/T1–ATM Interworking, CES Interworking
- IMA
- Backplane Bus Adaptation
- Control Unit
- DC/DC Converter

Figures *The functional blocks of the IFUA unit* and *The functional blocks of the IFUD unit* show the block diagrams of the IFUA and IFUD units.

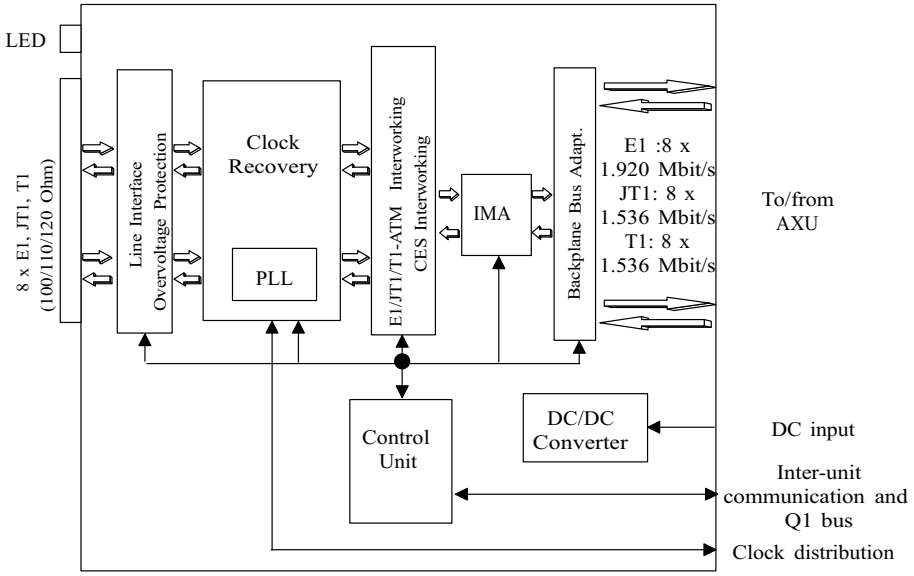


Figure 56. The functional blocks of the IFUA unit

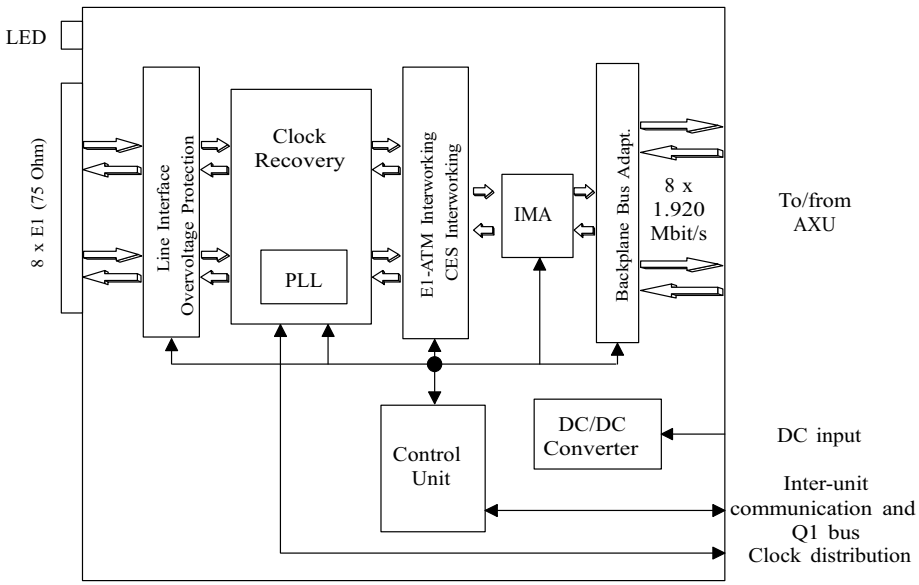


Figure 57. The functional blocks of the IFUD unit

Line Interface, Overvoltage Protection

The Line Interface, Overvoltage Protection consists of 8 physical interfaces that can be either symmetrical TQ connectors (8 x 100/110/120 Ω) or coaxial BT–43 connectors (16 x 75 Ω).

The block provides appropriate overvoltage protection. It contains framing for the different line interface rates and provides electrical parameters.

Clock Recovery

The Clock Recovery recovers the clock signal from the incoming data stream and passes it to the E1/JT1/T1–ATM Interworking together with the sampled data signal. Via the backplane the recovered clock signal is transferred to the Clock Distribution Circuit of the AXU.

The block consists of a clock and a data recovery circuit working at either 1.544 Mbit/s or 2.048 Mbit/s.

The PLL recovers the clock signal from the common reference clock provided by the Clock Distribution Circuit of the AXU.

E1/JT1/T1–ATM Interworking, CES Interworking

The E1/JT1/T1–ATM Interworking supports the mapping of ATM cells from/into PDH frames. Thus it forms the interface between ATM and TDM.

Each of the interfaces can be configured to operate as ATM over E1, JT1 or T1 or as ATM over fractional E1, JT1 or T1.

CES Interworking supports the mapping of TDM traffic into ATM cells. IFUA/D supports both unstructured and structured CES.

IMA

The IMA implements Inverse Multiplexing for ATM (IMA) that uses a cell based multiplexing technique for mapping a single high-capacity ATM stream into multiple lower-capacity PDH streams for transmission over independent links.

The IFUA/D supports 1 to 4 IMA groups with 1 to 8 E1/JT1/T1 links per IMA group.

Backplane Bus Adaptation

The Backplane Bus Adaptation provides serial payload backplane connections between the IFUs and the AXU by means of a bus.

Control Unit

The Control Unit consists of the Microcontroller and other necessary circuitry. It is compiled on a module that is the same in each AXC unit. The module type is so generic that it meets all the requirements of each AXC unit.

The Microcontroller runs all unit control software on the AXC.

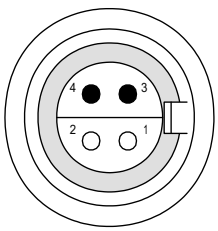
DC/DC Converter

The DC/DC Converter converts the input voltage of –48V fed through the backplane of the unit to the voltages required at unit level.

2.12.2 Interfaces of the IFUA unit of UltraSite EDGE BTS

Table 33. Interfaces of IFUA unit

Interface	Connector
E1/JT1/T1 interfaces	TQ connector (symmetrical), 120/110/100 Ω ITU-T G.703/ G.704 TTC JT-G.703/ TTC JT-G.704 ANSI T1.403/T1.102 af-phy-0130.000 (fractional E1/JT1) af-phy-0064.000 (E1 Physical Interface Specification) af-phy-0086.001 (Inverse Multiplexing for ATM (IMA); V1.0, V1.1) af-vtoa-00780.000 (CES)



1	RxR
2	RxT
3	TxR
4	TxT

Figure 58. IFUA symmetrical interface

- Rx/TxR (receive/transmit signal ("ring"))
- RX/TxT (receive/transmit signal ("tip"))

2.12.3 Interfaces of the IFUD unit of UltraSite EDGE BTS

Interface	Connector
E1 interfaces	Coaxial BT–43 connector, 75 Ω ITU-T G.703 ITU-T G.704 af-phy-0130.000 (fractional E1) af-phy-0064.000 (E1 Physical Interface Specification) f-phy-0086.001 (Inverse Multiplexing for ATM (IMA); V1.0, V1.1) af-vtoa 0078.000 (CES)

2.12.4 Technical description of Interface (IFUE) unit of UltraSite EDGE BTS

2.12.4.1 Function

The IFUE provides an interconnection to Nokia FlexiHopper and MetroHopper radios, and to Nokia GSM/EDGE base stations. This is implemented with three Flexbus interfaces which have a maximum capacity of 16 x 2.048 Mbit/s each. They also provide power to the outdoor microwave radio units.

IFUE includes a PDH cross-connect facility between the 3 Flexbus interfaces as well as the Flexbus interfaces and the E1-ATM interworking.

IFUE supports also IMA by enabling distribution of ATM connections across up to 8 E1 channels in an IMA group. Note that due to differential delay in an IMA group, it is recommended that all E1 channels of an IMA group share the same Flexbus link.

Nokia FlexiHopper microwave radio outdoor units connected to Flexbus interfaces 1 and 2 can be configured to protect each other (Hot Stand-by). Flexbus interface 3 is an unprotected interface that can only be operated with one single Nokia MetroHopper or Nokia FlexiHopper.

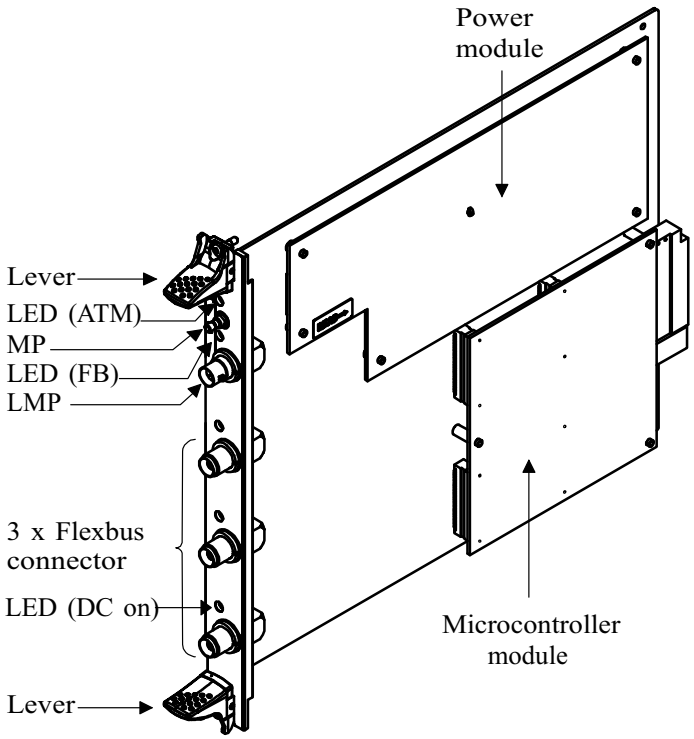


Figure 59. IFUE unit

The IFUE interface unit has the following features:

- 3 flexbus interfaces each carrying up to 16 x E1
- interconnection to Nokia PDH radio transmission equipment (FlexiHopper or MetroHopper)
- Inverse Multiplexing for ATM (IMA)
- remote power feeding to 3 Flexbus interfaces
- interconnection to other Nokia Flexbus indoor units (IFUE, FIU19, RRIC, FXC RRI)
- Q1 Embedded Operation Channel (EOC)
- 16 x E1 add-drop capacity
- 2 Mbit/s cross-connection functionality
- Hot Stand-by for Flexbus 1 and Flexbus 2

2.12.4.2 MAIN blocks

The IFUE unit has two main blocks: Flexbus part and ATM part. The Flexbus part can map a maximum of 16 x E1 channels into 3 Flexbus interfaces, that is it provides an add-drop capacity of 16 E1 channels. The other E1 channels of a Flexbus link can be cross-connected to another Flexbus link. The ATM part implements the interface between the 16 E1 channels and ATM cell-based interface to the AXUs.

The IFUE unit includes the following functional blocks:

- Flexbus Framer
- FB-E1 Deframing, 2 M Cross-Connect
- E1–ATM Interworking, CES Interworking
- IMA
- Backplane Bus Adaptation
- Control Unit FB/ATM
- DC/DC Converter

Figure *The functional blocks of the IFUE unit* shows the functional blocks of the IFUE unit.

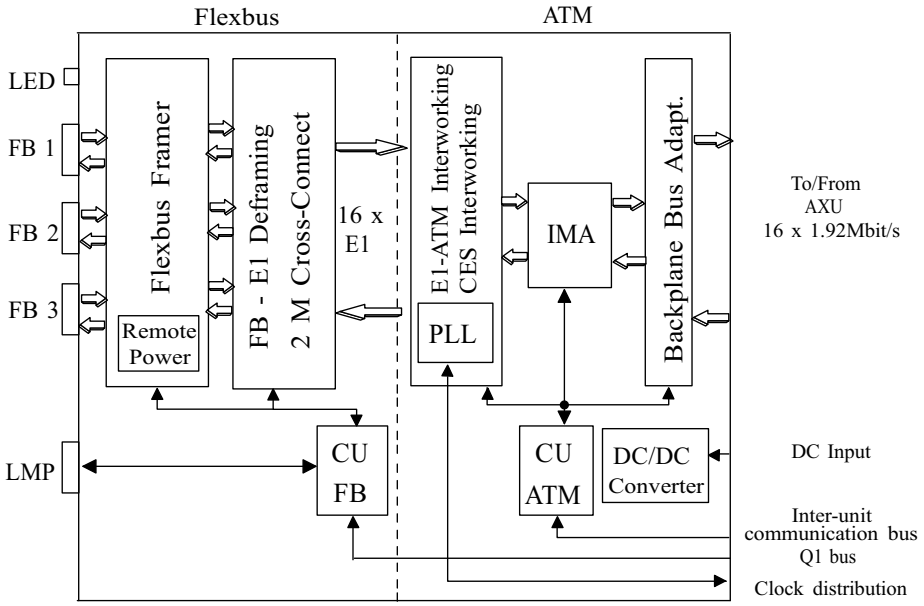


Figure 60. The functional blocks of the IFUE unit

2.12.5 Interfaces of the IFUE unit of UltraSite EDGE BTS

Interfaces of the IFUE unit of UltraSite EDGE BTS

Interface	Connector
Flexbus interfaces 1-3 FB1, FB2, FB3	TNC-connector 50 Ω (female) af-phy-0064.000 (E1 Physical Interface Specification) af-phy-0086.001 (Inverse Multiplexing for ATM (IMA); V1.1) at-vtoa-0078.000 (CES)

Flexbus cable requirements

Property	Value
Cable type	Coaxial cable, double shielded or semi-rigid

Property	Value
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)

NOTE: Over-voltage protection and cable equalizer are integral parts of the Flexbus interface. Primary over-voltage protection is a 90 V gas-arrester. External gas-arresters can be used as well.

Recommended cable types

RG-223	Maximum length 140 m
RG-214	Maximum length 300 m

3 Glossary

3.1 Glossary for UltraSite EDGE BTS

3.1.1 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

3.1.2 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

Technical description of Wideband Antenna Filter (WAFA/B) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Antenna Filter (WAFA/B) unit

Removing a Wideband Antenna Filter (WAFA/B) unit

Replacing a Wideband Antenna Filter (WAFA/B) unit

Reference

Technical data for Wideband Antenna Filter (WAFA/B) unit

Wideband Antenna Filter (WAFA/B) unit alternatives

Interfaces of the Wideband Antenna Filter (WAFA/B) unit

Technical description of Wideband Application Manager (WAM) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Application Manager (WAM) unit

Removing a Wideband Application Manager (WAM) unit

Replacing a Wideband Application Manager (WAM) unit

Reference

Technical data for Wideband Application Manager (WAM) unit

Interfaces of the Wideband Application Manager (WAM) unit

Wideband Application Manager (WAM) unit LEDs

Technical description of Wideband Input Combiner (WICA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Input Combiner (WICA) unit

Removing a Wideband Input Combiner (WICA) unit

Replacing a Wideband Input Combiner (WICA) unit

Reference

Technical data for the Wideband Input Combiner (WICA) unit

Interfaces of Wideband Input Combiner (WICA) unit

Technical description of Wideband Output Combiner (WOCx) unit of UltraSite EDGE BTS

Reference

Technical data for the Wideband Output Combiner (WOCx) unit

Wideband Output Combiner (WOCx) unit alternatives

Interfaces of the Wideband Output Combiner (WOCx) unit

Technical description of the Wideband Mini Power Amplifier (WMPA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Mini Power Amplifier (WMPA) unit

Removing a Wideband Mini Power Amplifier (WMPA)

Replacing a Wideband Mini Power Amplifier (WMPA) unit

Reference

Technical data for the Wideband Mini Power Amplifier (WMPA) unit

Interfaces of the Wideband Mini Power Amplifier (WMPA) unit

Wideband Mini Power Amplifier (WMPA) unit LEDs

Technical description of Power Supply (WPSA/B) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Power Supply (WPSA/B) unit

Replacing a Wideband Power Supply (WPSA/B) unit

Reference

Technical data for the Wideband Power Supply (WPSA/B) unit

Interfaces of the Wideband Power Supply (WPSA/B) unit

Wideband Power Supply (WPSA/B) unit LEDs

Technical description of Wideband System Clock (WSCA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband System Clock (WSCA) unit

Removing a Wideband System Clock (WSCA) unit

Replacing a Wideband System Clock (WSCA) unit

Reference

Technical data for Wideband System Clock (WSCA) unit

Interfaces for the Wideband System Clock (WSCA) unit

Wideband System Clock (WSCA) unit LEDs

Technical description of Summing and Multiplexing (WSMA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Summing and Multiplexing (WSMA) unit

Removing a Wideband Summing and Multiplexing (WSMA) unit

Replacing a Wideband Summing and Multiplexing (WSMA) unit

Reference

Technical data for the Wideband Summing and Multiplexing (WSMA) unit

Interfaces for the Wideband Summing and Multiplexing (WSMA) unit

Wideband Summing and Multiplexing (WSMA) unit LEDs

Technical description of Signal Processor (WSPA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Signal Processor (WSPA) unit

Removing a Wideband Signal Processor (WSPA) unit

Replacing a Wideband Signal Processor (WSPA) unit

Reference

Technical data for the Wideband Signal Processor (WSPA) unit

Interfaces for the Wideband Signal Processor (WSPA) unit

Technical description of Wideband Transmitter and Receiver (WTRA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Transmitter and Receiver (WTRA) unit

Removing a Wideband Transmitter and Receiver (WTRA) unit

Replacing a Wideband Transmitter and Receiver (WTRA) unit

Reference

Technical data for the Wideband Transmitter and Receiver (WTRA) unit

Interfaces for the Wideband Transmitter and Receiver (WTRA) unit

Wideband Transmitter and Receiver (WTRA) unit LEDs

Technical description of AXC - ATM cross-connect (AXU) unit of UltraSite EDGE BTS

Instructions

Installing a AXC - ATM cross-connect (AXU) unit

Removing a AXC - ATM cross-connect (AXU) unit

Replacing a AXC - ATM cross-connect (AXU) unit

Reference

Technical data for the AXC - ATM cross-connect (AXU) unit

Interfaces of the AXC - ATM cross-connect (AXU) unit

AXC - ATM cross-connect (AXU) unit LEDs

Technical description of Interface (IFUA/IFUD) unit of UltraSite EDGE BTS

Instructions

Installing an Interface (IFUx) unit

Removing an Interface (IFUx) unit

Replacing an Interface (IFUx) unit

Reference

Technical data for Interface (IFUx) unit

Interface (IFUx) unit alternatives

Interfaces for the Interface (IFUA) unit

Interfaces for the Interface (IFUD) unit

Technical description of Interface (IFUE) unit of UltraSite EDGE BTS

Instructions

Installing an Interface (IFUx) unit

Removing an Interface (IFUx) unit

Replacing an Interface (IFUx) unit

Reference

Technical data for the Interface (IFUE) unit

Interface (IFUx) unit alternatives

Technical data for the Interface (IFUx) unit

Interfaces for the Interface (IFUxE) unit