NOKIA

UltraSite EDGE BTS GSM/EDGE
Unit Descriptions

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Contents

1 Statutory Information

1.1 CE Marking

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

1.2 FCC Statement

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

2 Technical description of UltraSite EDGE BTS GSM/EDGE units

2.1 Technical description of Base Operations and Interfaces (BOIx) unit of UltraSite EDGE BTS

2.1.1 Function

The BOIx unit is EDGE compatible and handles the control functions that are common among all other units in Nokia UltraSite EDGE BTS. The unit manages the following functions:

- BTS initialisation and self-testing
- configuration
- Operations and Maintenance (O&M) signalling
- software downloads
- main clock functions
- timing functions
- collection and management of external and internal alarms
- delivery of messages to the Base Station Controller (BSC) through the Transmission (VXxx) unit
- cabinet control
- boundary scan for unit-level testing
- flash programming in the production line

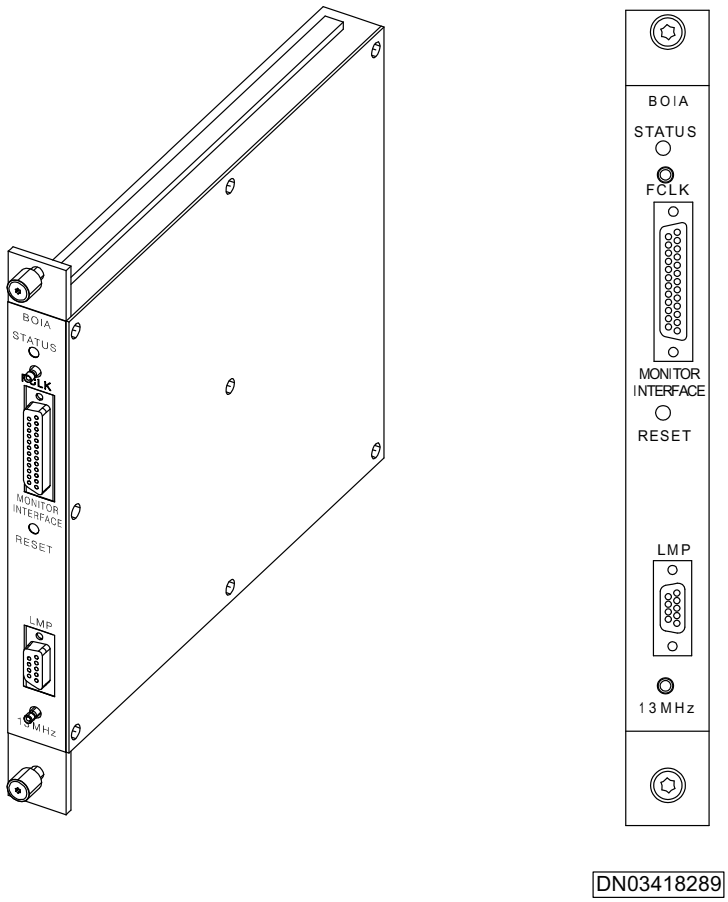


Figure 1. BOIx unit

When the BOIx unit is installed in an outdoor cabinet, it requires a rubber cover for environmental protection.

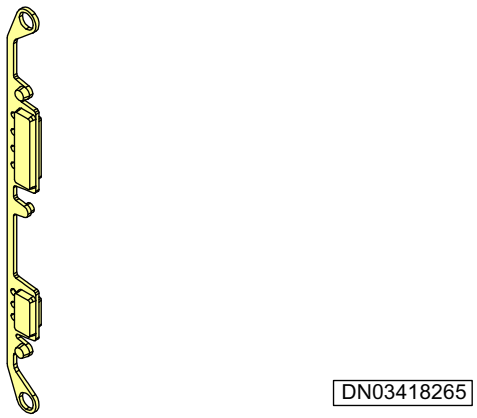


Figure 2. BOIx cover

2.1.2 Operation

The BSC or Nokia BTS Manager downloads software to the Flash memory of the BOIx unit. The BOIx unit downloads BTS software and configuration data to other units in the BTS. The LED on the BOIx unit indicates the status of the board. The BOIx unit receives alarm notifications from other active units and saves configuration information in non-volatile memory. The unit also controls the uplink and downlink cross-connection between the Transceiver Baseband (BB2x) unit and the Transceiver (TSxx) unit. The BOIx unit detects unit alarms and performs recovery actions. In certain situations, the unit resets itself. The BOIx unit generates an accurate reference clock signal for the TSxx unit, BB2x unit, and Remote Tune Combiner (RTxx) unit. The BTS can synchronize its frame clock and number with a member of the Nokia Talk family (with Talk as the clock master) or to another Nokia UltraSite EDGE BTS. The following features are standard with the BOIx unit:

- self-testing
- Local Management Port (LMP) - interface that allows the user to communicate with the main processor and control the BTS through Nokia BTS Manager
- BTS software download - from the BSC (through the Abis interface) or Nokia BTS Manager
- EMI/EMC shielding - for internal electrical components

- High-accuracy reference clock - for timing generation; clock can be adjusted according to the Abis reference
- Overvoltage protection for elecrostatic discharge - the front panel of the BOIx unit is grounded and the power supply lines are protected against damage from accidental cross-connection

2.1.3 Main blocks

The BOIx unit consists of the following functional blocks:

- Unit Controller (UC)
- Master Clock Generator (MCLG)
- D-bus
- Field Programmable Gate Array (FPGA)

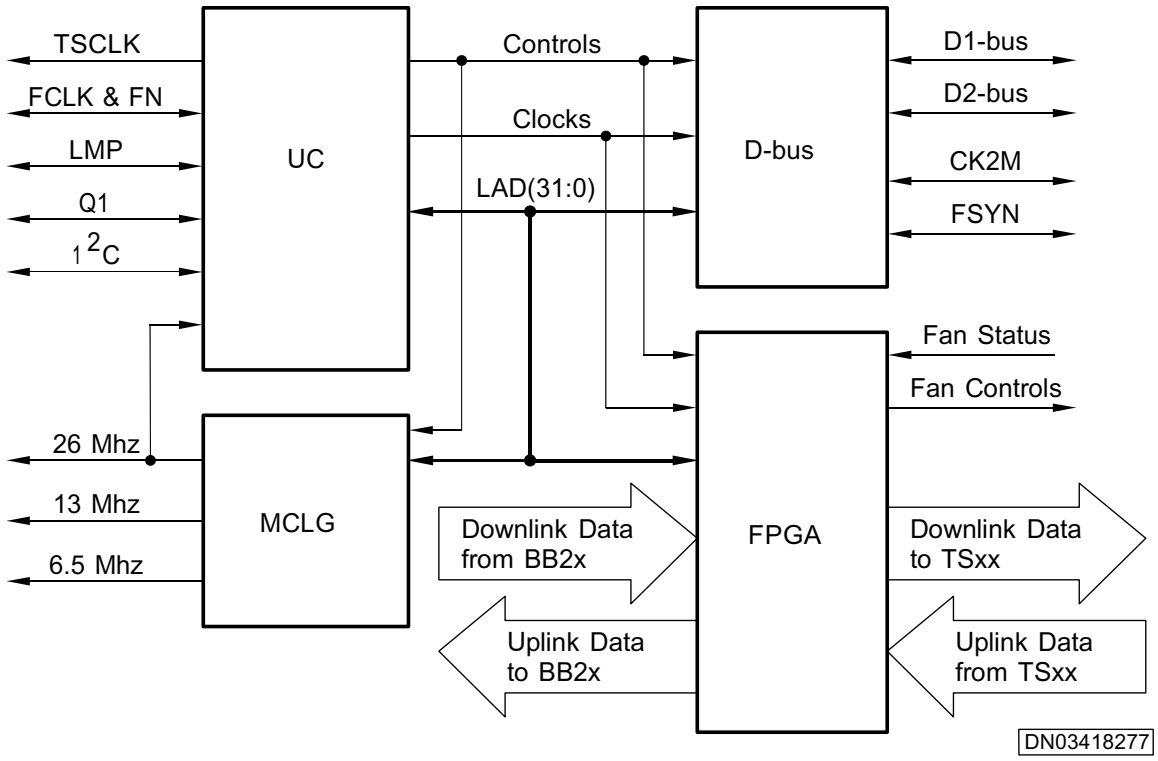


Figure 3. BOIx main blocks

2.2 Interfaces of the Base Operations and Interfaces (BOIx) unit of UltraSite EDGE BTS

Interfaces

Table 1. Connectors

Interface	Reference designator	Connector type
Backplane	X2	10-pin power connector (female)
Front-mounted LMP	X3	D-9 (female)
Front-mounted 13 MHz clock for test equipment	X4	SMB
Front-mounted Frame Clock (FCLK) for test equipment	X5	SMB
Front-mounted Monitor interface for R&D and production	X6	D-25 (female)
Backplane	X7 – X11	30-pin signal connector (female)
Backplane	X12 – X15	30-pin signal connector (female)

Pin configurations

Table 2. LMP pin configurations

Pin	Signal
1	not used
2	LMP_IN
3	LMP_OUT
4	spare
5	GND

Table 2. LMP pin configurations (cont.)

Pin	Signal
6	spare
7	spare
8	spare
9	V3P (Reserved for future use)

Table 3. Monitor interface pin configurations

Pin	Signal
1	MCK2M
2	GND
3	MFSYN
4	MD2_DD
5	V5P
6	BIST_OUT
7	BIST_IN
8	ECOI2CC
9	ECOI2CD
10	MON_EN
11	GND
12	MQ1_DD
13	MQ1_DU
14	TD2_DU
15	MD11_DD
16	MD11_DU
17	MD2_DU

Table 3. Monitor interface pin configurations (cont.)

Pin	Signal
18	DI0 (Reserved for future use)
19	DI1 (Reserved for future use)
20	DI2 (Reserved for future use)
21	DI3 (Reserved for future use)
22	DI4 (Reserved for future use)
23	COI2CC
24	COI2CD
25	GND

2.3 Base Operations and Interfaces (BOIx) unit LEDs for UltraSite EDGE BTS

The front panel of the BOIx has one LED (diffused/high-efficiency type) that indicates the operational status of the unit.

Table 4. LED indications

LED colour	Steady	Flashing
RED	Unit faulty	Not available
YELLOW	No LAPD connection or loss of clock synchronisation (slave)	Configuring
GREEN	Unit is on and operating	Software downloading

2.4 Bias Tee (BPxx) unit

2.4.1 Technical description of Bias Tee (BPxx) unit of UltraSite EDGE BTS

2.4.1.1 Function

A Bias Tee is required to transfer the DC voltage onto the antenna line for use by the Masthead Amplifier (MHA) that is also connected to the antenna line. The BTS TX power is fed through the Bias Tee. For this reason, the Bias Tee provides RF isolation toward the DC voltage supply and DC isolation toward the BTS.

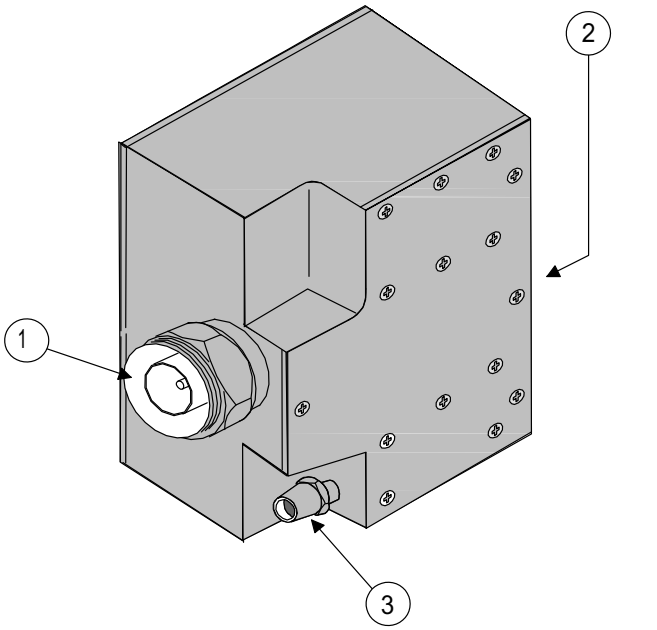
There are two types of Bias Tees:

- BPxV - Bias Tee with Voltage Standing Wave Radio (VSWR) antenna monitoring checks the condition of the antenna line and gives and alarm if the VSWR value exceeds the limit. The BPxV can be used with or without the MNxx unit.
- BPxN - Bias Tee without VSWR antenna monitoring is used solely with the MNxx unit.

Connection of the Bias Tee is at the BTS, directly to the BTS antenna connectors. An antenna box assembly (to enable Bias Tee mounting) is fitted to the top of the BTS. Two assemblies exist: one is for an indoor BTS and one is for an outdoor BTS. Fitted below the top of the BTS is a Bias Tee/BTS interface module that provides the DC connectivity and the alarm connectivity between the Bias Tee and the BTS.

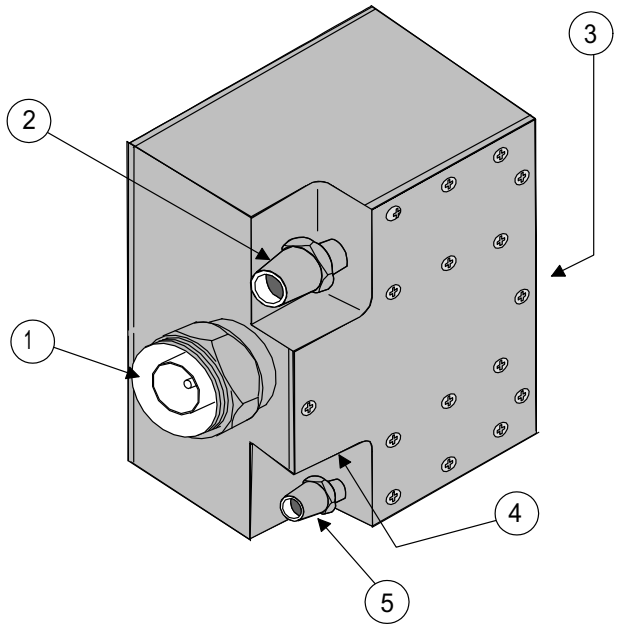
Note

The alarm connectivity is applicable only for VSWR Bias Tees.



1	Connects to BTS
2	Location of Jumper Cable Connector (towards Antenna)
3	DC MHA Connector

Figure 4. Bias Tee without VSWR



1	Connects to BTS
2	Alarm Connector
3	Location of Jumper Cable Connector (towards Antenna)
4	Location of DC No MHA Connector
5	DC MHA Connector

Figure 5. Bias Tee with VSWR

A VSWR Bias Tee (used for each feeder cable) is fitted to the top of the BTS. The Bias Tee can be used either with or without a corresponding MHA unit.

This type of Bias Tee includes the VSWR measurement option to be used together with the BTS. Because the unit can be used without an associated MHA unit, an extra DC power SMB connector (designated 'DC No MHA') is available. The use of the 'DC MHA' SMB connector makes it possible to feed the VSWR circuit into the Bias Tee without sending a DC voltage into the feeder cable. Without this, it is possible that a DC short circuit could result.

VSWR Bias Tee units are used for the low-band of either GSM/EDGE 800/900 or GSM/EDGE 1800/1900.

Note

VSWR Bias Tee (BPDV/BPGV) cannot be installed following a Dual Band Diplex Filter (DU2A) unit. The alarm results and RF power from such installations are not reliable.

2.4.1.2 MAIN blocks

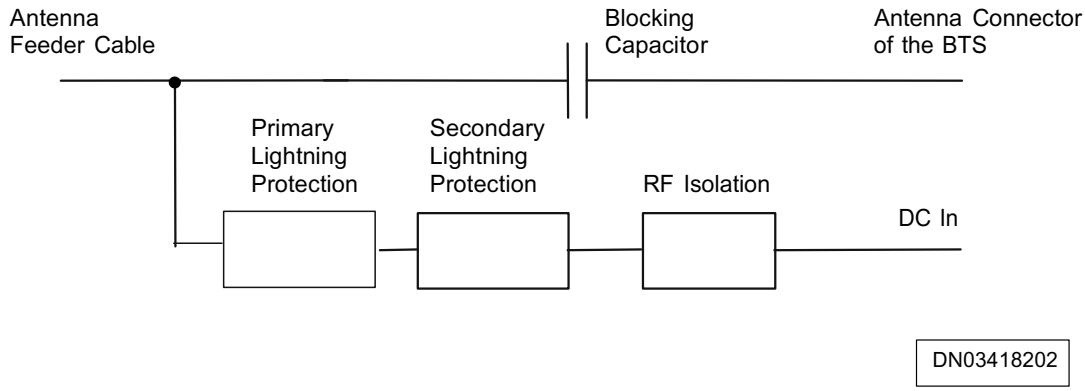


Figure 6. Bias Tee block diagram

2.4.2 Interfaces of the Bias Tee (BPxx) unit of UltraSite EDGE BTS

2.4.2.1 Without VSWR (BPDN, 800/900/1800/1900)

Table 5. Connectors

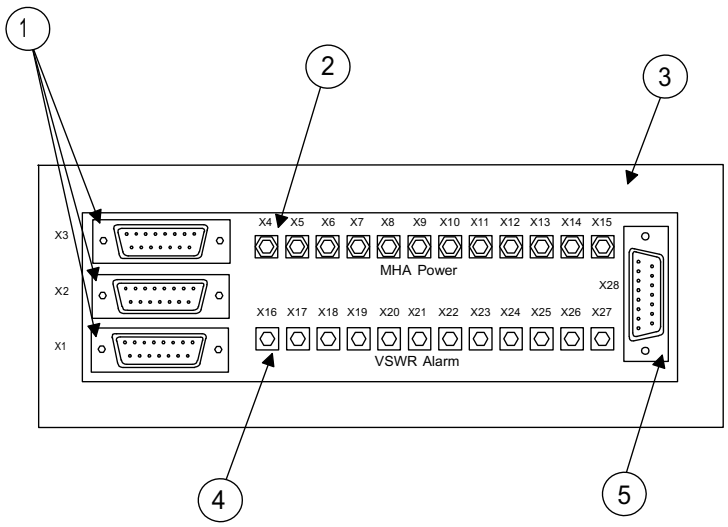
Interface	Connector type
TX/RX	7-16 coaxial socket (male)
RF output	7-16 coaxial socket (female)
DC input (PWS/BOI)	SMB (MHA) through the Bias Tee Interface Module

2.4.2.2 With VSWR (BPGV, 800/900; BPDN, 1800/1900)

Table 6. Connectors

Interface	Connector type
TX/RX	7-16 coaxial socket (male)
RF output	7-16 coaxial socket (female)
DC input (PWS/BOI)	SMB (MHA)
DC input (PWS/BOI)	SMB (without MHA)
Alarm	SMB through the Bias Tee Interface Module

2.4.2.3 Bias Tee Interface Module unit



DN03418195

1	DC Power Input Connectors from BTS ('D' type, 15-pin Male)
2	MHA DC Power Connector (SMB Female x 12)

3	Bias Tee Interface Module
4	VSWR Alarm Connector (SMB Male x 12)
5	VSWR Alarm Connector ('D' type, 15-pin Female)

Figure 7. Bias Tee Interface Module

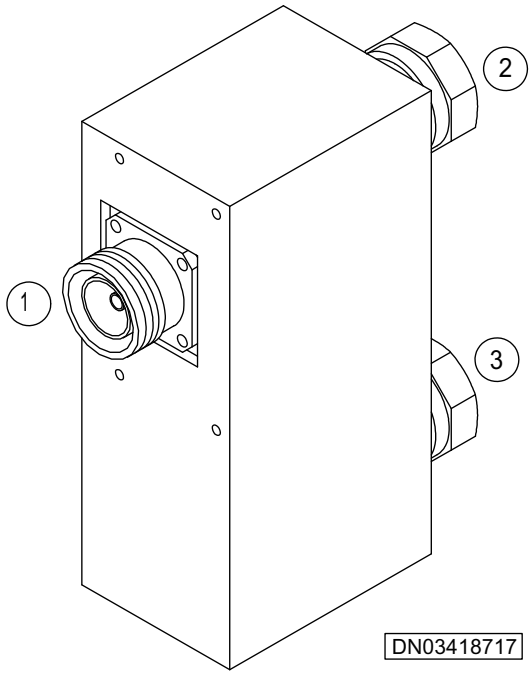
Interface	Reference designator	Connector type	Quantity
DC Power Input	X1 - X3	D-15 (male)	3
MHA DC Power (12V DC)	X4 - X15	SMB (female)	12
VSWR Alarm	X16 - X27	SMB (male)	12
VSWR Alarm	X28	D-15 (female)	1

2.5 Dual Band Diplex Filter (DU2A) unit

2.5.1 Technical description of Dual Band Diplex Filter (DU2A) unit of UltraSite EDGE BTS

2.5.1.1 Function

The Dual Band Diplex Filter Unit (DU2A) either combines signals of different frequencies onto one antenna, or splits an antenna signal into different frequencies. It handles TX and RX signals from the GSM/EDGE 800/900 bands and the GSM/EDGE 1800/1900 bands.



1	Dual band antenna
2	RX/TX GSM 1800/1900 band
3	RX/TX GSM 800/900 band

Figure 8. DU2A unit

Lightning protection

The centre pin of the DU2A unit antenna port is DC grounded. This connection prevents a charge buildup on the antenna and protects th DU2A unit against lightning.

2.5.1.2 Operation

The DU2A unit operates on the following frequency bands:

- GSM/EDGE 800/900 band – 824 to 960 MHz
- GSM/EDGE 1800/1900 band – 1710 to 1990 MHz

The normal operating temperatures for the DU2A unit are -10° C to 65° C (14° F to 149° F). However, the unit can operate in temperatures as low as -33° C (-27.4° F) with degraded RF performance.

2.5.1.3 Main blocks

The main blocks of the DU2A unit are the following passive filter sections:

- GSM/EDGE 800/900 RX/TX filter
- GSM/EDGE 1800/1900 RX/TX filter

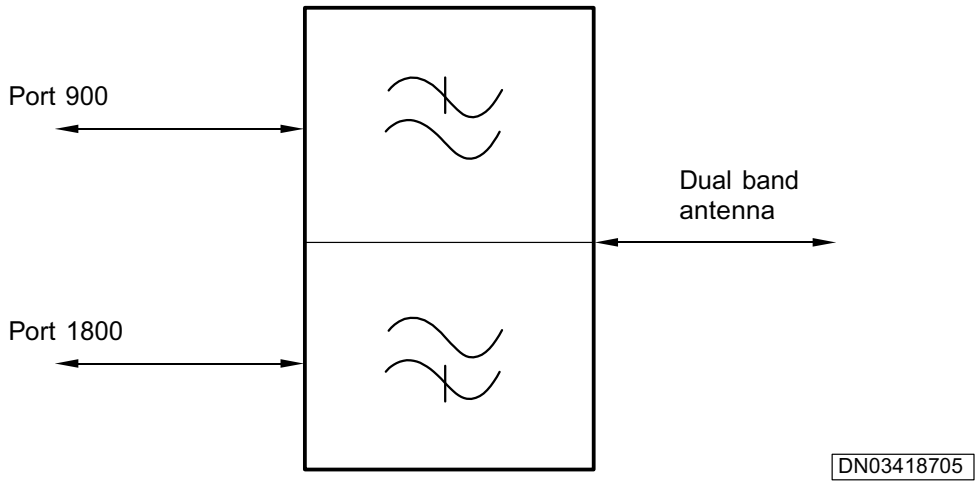


Figure 9. DU2A main blocks

Note

Port 900 is dedicated to the 800/900 bands.

Port 1800 is dedicated to the 1800/1900 bands.

2.5.2 Interfaces of the Dual Band Diplex Filter (DU2A) unit of UltraSite EDGE BTS

Table 7. RF connectors

Interface	Connector type
Antenna	7/16, flange jack
900	7/16, flange plug, 800/900-band input/ output
1800	7/16, flange plug, 1800/1900-band input/ output

2.6 Dual Variable Gain Duplex Filter (DVxx) unit

2.6.1 Technical description of Dual Variable Gain Duplex Filter (DVxx) unit of UltraSite EDGE BTS

2.6.1.1 Function

The DVxx performs the following primary functions:

- combines transmitted and received signals into one antenna
- amplifies received signals with a variable-gain Low Noise Amplifier (LNA)

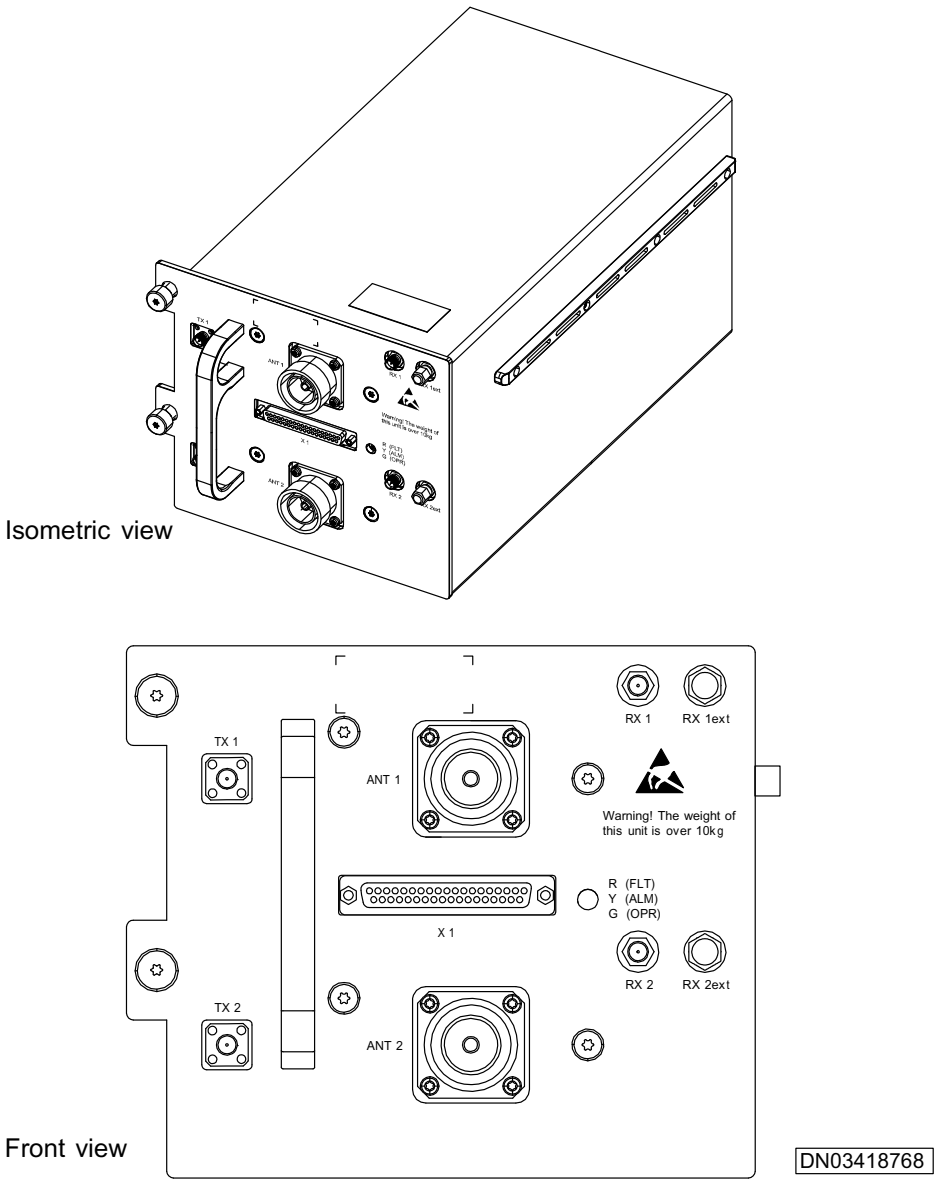


Figure 10. DVxx unit (with terminations on RX 1ext and RX 2ext connectors)

2.6.1.2 Operation

The normal operating temperature for the DVxx unit is -10° C to 65° C (14° F to 149° F). However, the unit can operate in temperatures as low as -33° C (-27.4° F), though with degraded RF performance.

The DVxx alternatives are provided to increase TX/RX separation and to achieve better performance. Full-band options are also available.

Lightning protection

The centre pin of the antenna port on the DVxx unit is DC grounded. This connection prevents a charge buildup on the antenna and protects the unit against lightning.

LNA alarms

Each LNA in the DVxx unit has two alarms (LNA_MINOR and LNA_MAJOR) representing minor and major failures. The LNA_MINOR alarm is activated when a single amplifier in any balanced amplifier stage fails. The LNA_MAJOR alarm is activated when two or more single amplifiers in any balanced amplifier structure fail. LNA_MINOR and LNA_MAJOR alarms are transmitted to the BTS through the I2C-bus. These alarms are also available on four separate pins of the X1 connector on the DVxx unit.

2.6.1.3 Main blocks

The DVxx unit includes two identical duplex filter sections. Each section comprises a duplexer, a variable-gain LNA, and an I^2C-bus I/O buffer block. Each LNA defaults into the high-gain state at startup and can be switched by the operator to the low-gain state through the I^2C-bus using the Site Manager. The operator can also adjust the gain of the low gain path.

The DVxx unit includes an I^2C EEPROM that stores the serial number, information about the insertion loss variation of TX filters and other data.

The I^2C-bus also carries alarm signals to indicate fault conditions for each LNA branch. The signals are relayed to the Base Operations and Interfaces (BOIx) unit, which generates the alarms and sends them on to the user interface.

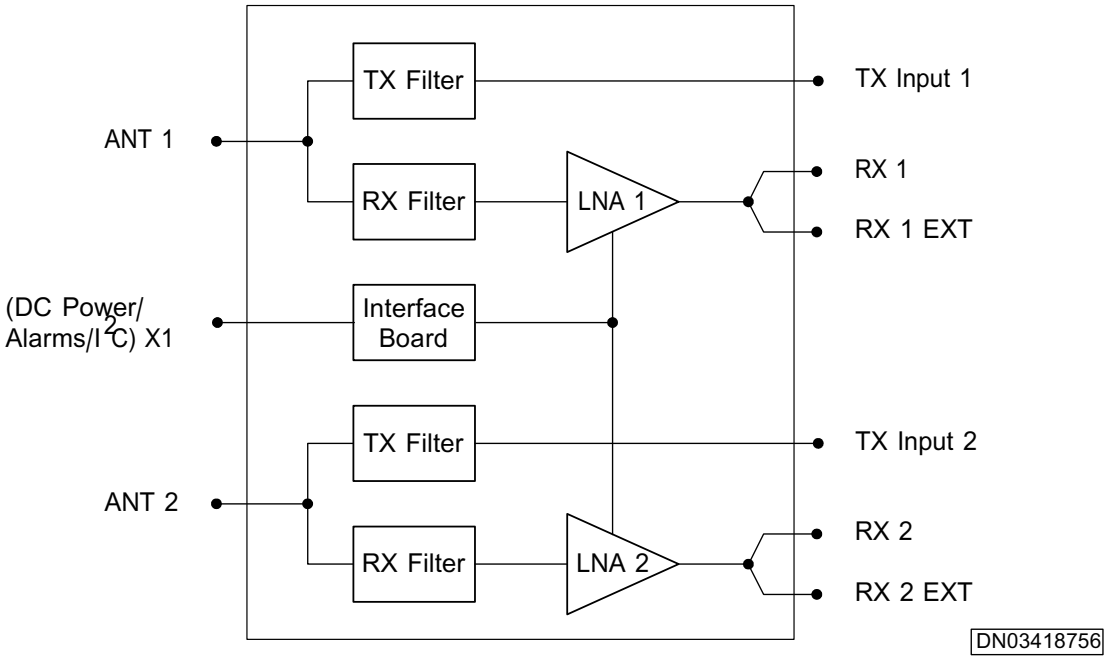


Figure 11. DVxx main blocks

2.6.1.4 I²C-data bus

Functions

The I²C-data bus is a bi-directional, two-wire serial bus that performs the following functions:

- auto detection of the unit
- version and serial number management
- alarm collection
- data storage to the I²C EEPROM
- control of the high-gain and low-gain state of the LNAs
- low-gain LNA adjustment

Signals

The I^2C-data bus is a multipoint bus. Several devices can connect to it through two bus lines:

- serial data line – RFUI2CD
- serial clock line – RFUI2CC

Signals are 5 V Transistor-to-Transistor Logic (TTL) levels with a transfer rate of 100 kbit/s in standard mode.

Circuits

The DVxx unit includes three separate integrated circuits for the I^2C-data bus:

- two I/O devices
- one EEPROM

2.6.2 Interfaces of the Dual Variable Gain Duplex Filter (DVxx) unit of UltraSite EDGE BTS

Table 8. Connectors

Interface	Ref Designator	Connector Type
RF	TX 1, TX 2, RX 1, RX 1ext, RX 2, RX 2ext	SMA (female)
RF	ANT 1, ANT 2	7/16 (female)
DC power, I^2C-data bus, and alarms	X1	D-37 (male)

Table 9. X1 connector pin configurations

Pin	Description	Purpose
1	Reserved	Reserved
2	Reserved	Reserved
3	Reserved	Reserved

Table 9. X1 connector pin configurations (cont.)

Pin	Description	Purpose
4	Reserved	Reserved
5	Reserved	Reserved
6	Reserved	Reserved
7	Reserved	Reserved
8	Reserved	Reserved
9	RFUI2CC	1^2C-data bus clock
10	GND	I^2C Ground
11	RFUI2CD	I^2C-data bus data
12	GND	I^2C Ground
13	UA1	Module addressing
14	UA2	Module addressing
15	LNA 1 Minor	LNA 1 Minor alarm output
16	LNA 1 Major	LNA 1 Major alarm output
17	LNA 2 Minor	LNA 2 Minor alarm output
18	LNA 2 Major	LNA 2 Major alarm output
19	Reserved	Reserved
20	Reserved	Reserved
21	GND	Ground
22	V9P	DC Input
23	GND	Ground
24	V9P	DC Input
25	GND	Ground
26	V9P	DC Input
27	GND	Ground

Table 9. X1 connector pin configurations (cont.)

Pin	Description	Purpose
28	V9N	DC Input
29	GND	Ground
30	V5P	DC Input
31	GND	Ground
32	V5P	DC Input
33	GND	Ground
34	Reserved	Reserved
35	GND	Ground
36	Reserved	Reserved
37	Reserved	Reserved

2.6.3 Dual Variable Gain Duplex Filter (DVxx) unit LEDs for UltraSite EDGE BTS

The front panel on the DVxx unit has one tri-colour LED (diffused/high efficiency type). The LED indicates the operating condition of both LNAs, in either high-gain or low-gain state.

Table 10. LED indications

LED colour	Steady
RED	Unit LNA module major fault, no RX gain available
YELLOW	Unit LNA module minor fault, partial RX gain available
GREEN	LNA is on and operating

2.7 Power Supply (PWSx) unit

2.7.1 Technical description of Power Supply (PWSx) unit of UltraSite EDGE BTS

2.7.1.1 Function

The PWSx unit converts input AC or DC voltage to the DC voltages required for Nokia UltraSite EDGE BTS. The PWSx unit distributes the appropriate voltages through the backplane to the units - except for the optional Heater unit (HETA), which receives its voltages from the AC mains through the AC filter unit. The PWSx unit also supplies power for the MNxx unit.

Nokia UltraSite EDGE BTS can hold one or two AC Power Supply units (PWSA - +230 VAC), three DC Power Supply units (PWSB - -48 VDC), or one or two DC Power Supply units per cabinet (PWSC - +24 VDC). The PWSA and PWSC support full redundancy for as many as six TSxx units. The PWSB supports full redundancy for as many as 12 TSxx units.

The PWSx performs the following functions:

- sends an input alarm to the Base Operations and Interfaces (BOIx) unit when the input voltage is out of range.
- sends an output alarm to the BOIx unit when any output voltages fall below specified limits.
- turns off any output voltages and sends an output alarm to the BOIx unit when any output voltages exceed the specified overvoltage protection limit.
- turns off any output voltages and sends an output alarm to the BOIx unit when the temperature exceeds the specified limit.
- turns off any output voltages and sends an output alarm to the BOIx unit when the input voltage falls outside the specified protection limits.

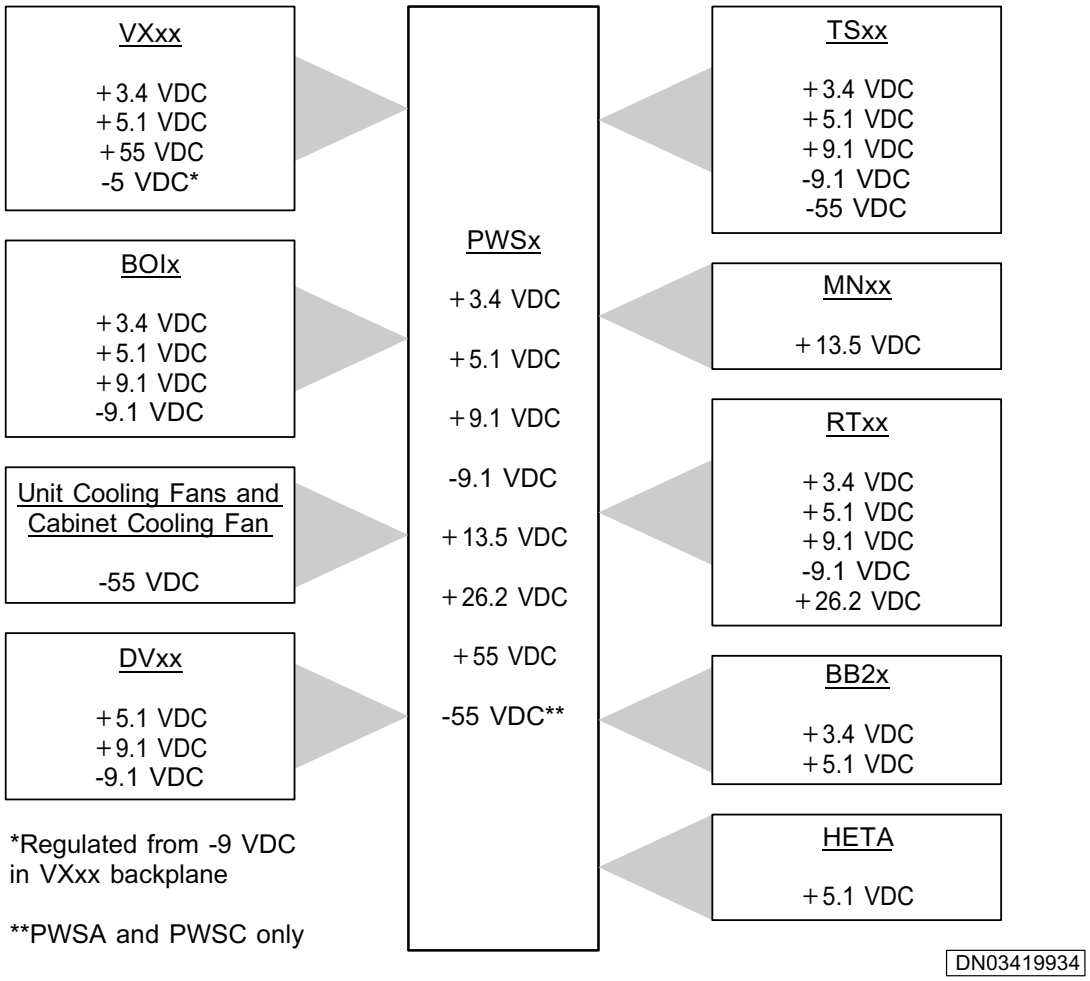


Figure 12. PWSx voltages distributed to units

2.7.1.2 Power supply redundancy

Power supply redundancy is the capability of maintaining full system operation in the event of a single power supply unit failure. Redundancy in UltraSite EDGE BTS depends on the system configuration and the PWSx units installed.

Note

Full redundancy assumes the maximum number of PWSx units are installed.

Table 11. Power supply redundancy

PWSx unit	TSxx units ≤ 6	TSxx units > 6
PWSA	Fully redundant[a]	Not redundant
PWSB	Fully redundant[a]	Fully redundant[1]
PWSC	Fully redundant[a]	Not redundant

[1]Dependent on TSxx slot population configuration.

2.7.1.3 Operation

Operating switch

The operating switch on the front panel of the PWSx unit has two positions: ON and STAND BY.

Thermal protection

The PWSx unit is protected against damage from overtemperature conditions. If the unit temperature exceeds the specified limit, the PWSx unit turns off any output voltages and sends an output alarm to the BOIx unit. It automatically resets when the temperature drops by 15 C and is then within acceptable operating range, or if the input power is cycled. Using the switch will not reset an overtemperature fault.

PWSA

The PWSA unit uses an input voltage of 230 VAC to apply power factor correction and produces the following regulated output voltages for other BTS units:

- +3.4 VDC
- +5.1 VDC
- ±9.1 VDC
- +13.5 VDC
- +26.2 VDC
- ±55 VDC

The -55 VDC output and return are isolated, and the common DC return line is grounded.

If mains power loss occurs, it halts the PWSA output operation for at least 20 milliseconds.

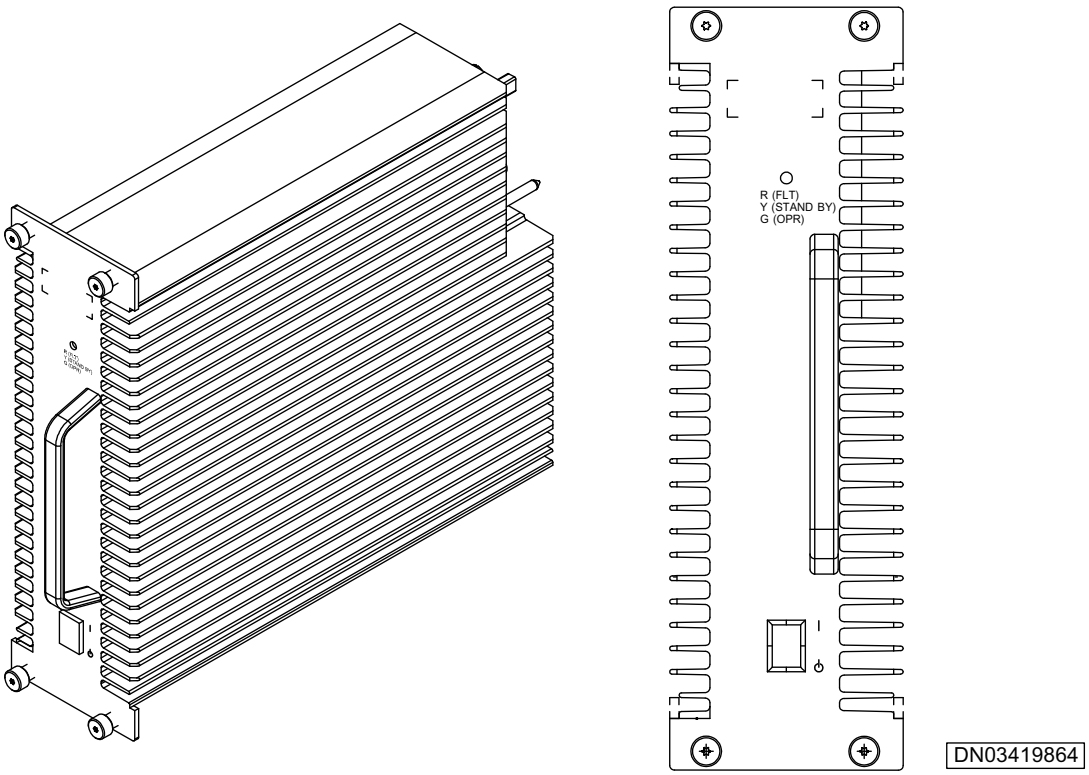


Figure 13. PWSA unit (230 VAC)

PWSB

The PWSB unit uses a floating input voltage of -48 VDC and produces the following regulated output voltages for other BTS units:

- +3.4 VDC
- +5.1 VDC
- ±9.1 VDC
- +13.5 VDC

- +26.2 VDC
- +55 VDC

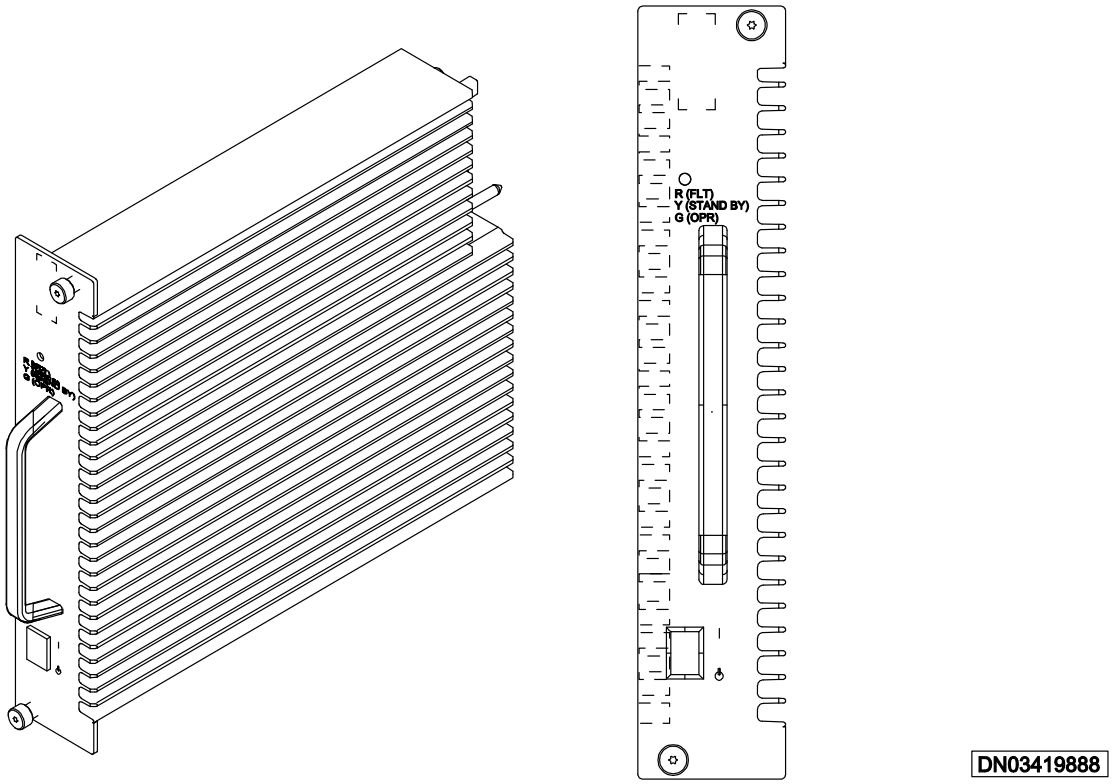


Figure 14. PWSB unit (-48 VDC)

PWSC

The PWSC unit uses a floating input voltage of +24 VDC and produces the following regulated output voltages for other BTS units:

- +3.4 VDC
- +5.1 VDC
- ±9.1 VDC
- +13.5 VDC

- +26.2 VDC
- ±55 VDC

The -55 VDC output and return are isolated, and the common DC return line is grounded.

Note

The location of the handle, LED, and switch varies with the version of the unit.

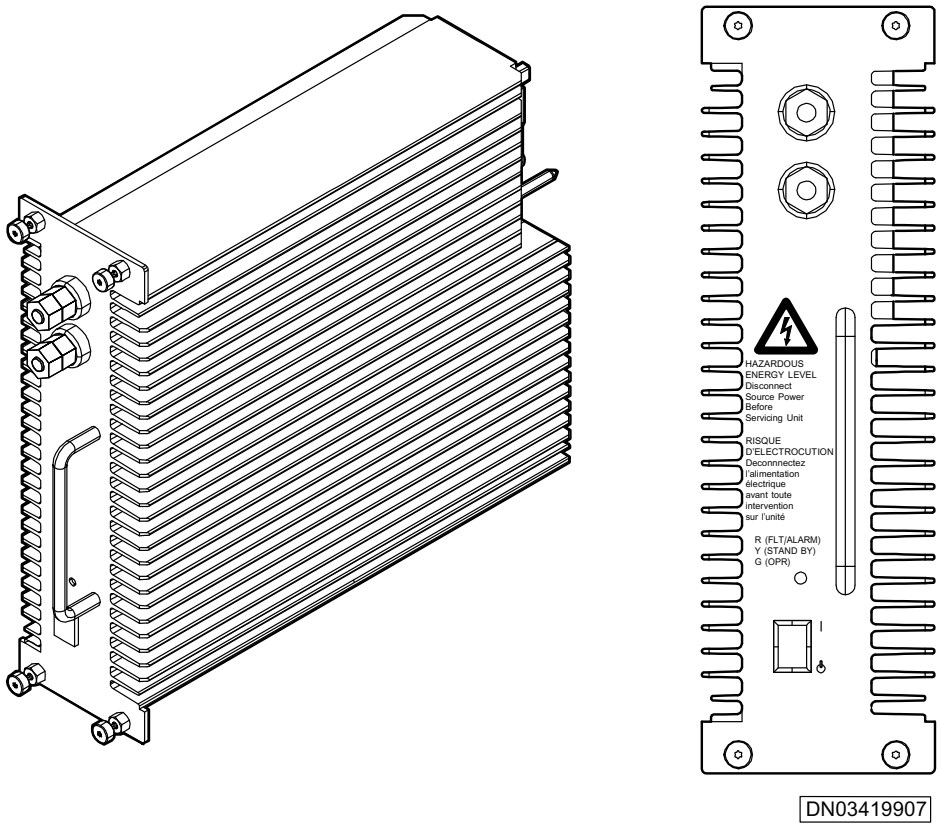


Figure 15. PWSC unit (+24 VDC)

Overvoltage protection

The power output on the TWSx unit is protected against overvoltage. Cycling the power or using the switch resets the overvoltage protection logic.

2.7.1.4 Main blocks

Power input block

PWSA

The power input block on the PWSA unit includes the following components:

- input circuit (mains filter, inrush current limiter, and rectifier)
- Power Factor Correction (PFC) preregulator

The input voltage is applied to the input circuit. The PFC preregulator converts the input voltage to a stabilised intermediate voltage for the power switcher block, improving the power factor.

PWSB and PWSC

The power input block on the PWSB and PWSC units includes the following components:

- input circuit
- step-up converter

The input circuit filters the input voltage and limits the inrush current. The stepup converter converts the filtered input voltage to a stabilised intermediate voltage for the power switcher block.

Power switcher block

The power switcher block includes switched-mode circuits that convert the intermediate voltage to the output voltage.

Control block

The control block includes the input and output control circuits that monitor and control the PWSx unit operation. The control block handles the following functions:

- overvoltage and undervoltage protection
- overcurrent protection
- temperature protection
- unit synchronisation
- front-panel LED control
- I^2C data received from the BOIx unit

If the BTS includes a Masthead Amplifier (MNxx) unit, the control block also:

- monitors and controls the output voltage to the MNxx unit
- reports the current consumption of the MNxx unit through the I^2C-bus, if requested

2.7.2 Interfaces of the Power Supply (PWSx) unit of UltraSite EDGE BTS

The power connector on the back of the PWSx unit consists of the following interfaces and connections:

- I2C-bus (between the BOIx and PWSx units) for alarms, remote-control signals, temperature, and measurement of the MNxx unit current
- remote-control interface from the optional Heater (HETA) unit for cold starts
- power and control-signal input and output

Note

The PWSC power input is located on the front panel of the unit.

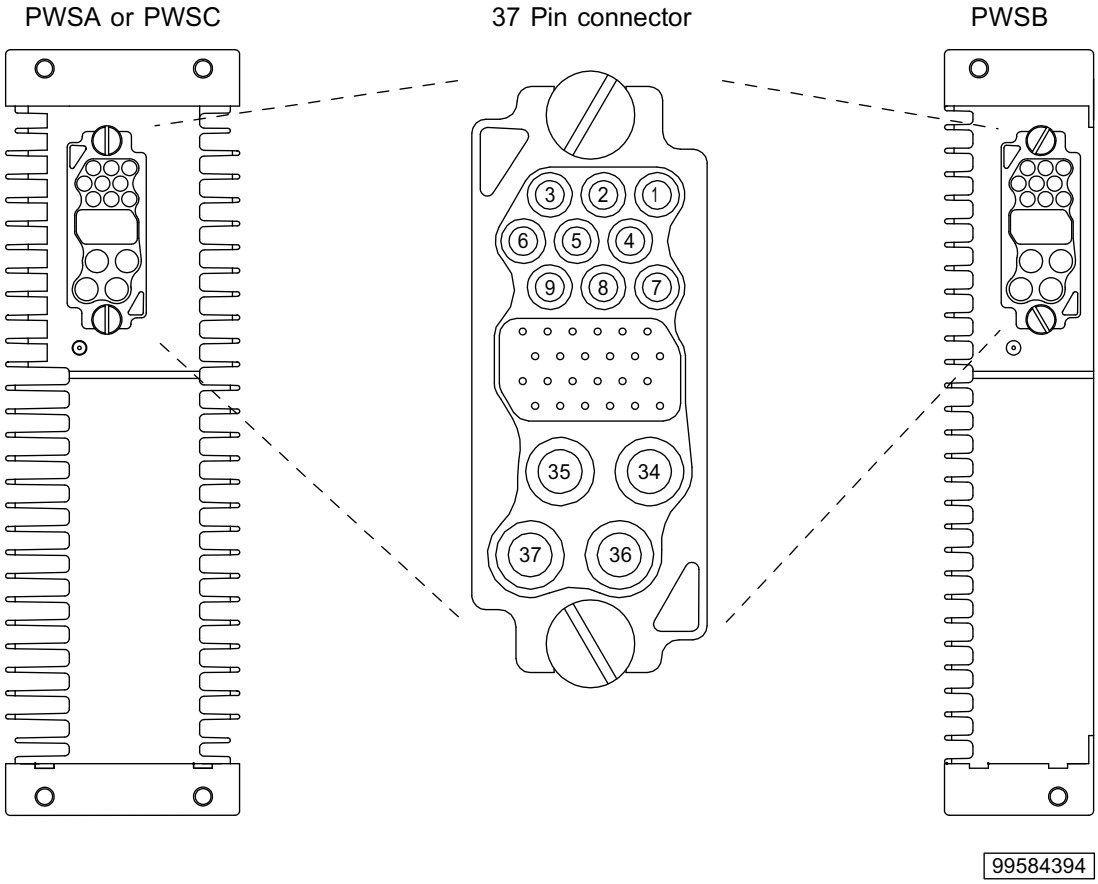


Figure 16. PWSx power connector

Note

Pins 10 though 33 are identified in the same desending right-to-left order as those identified by number in *PWSx power connector*.

Table 12. PWSx pin configurations

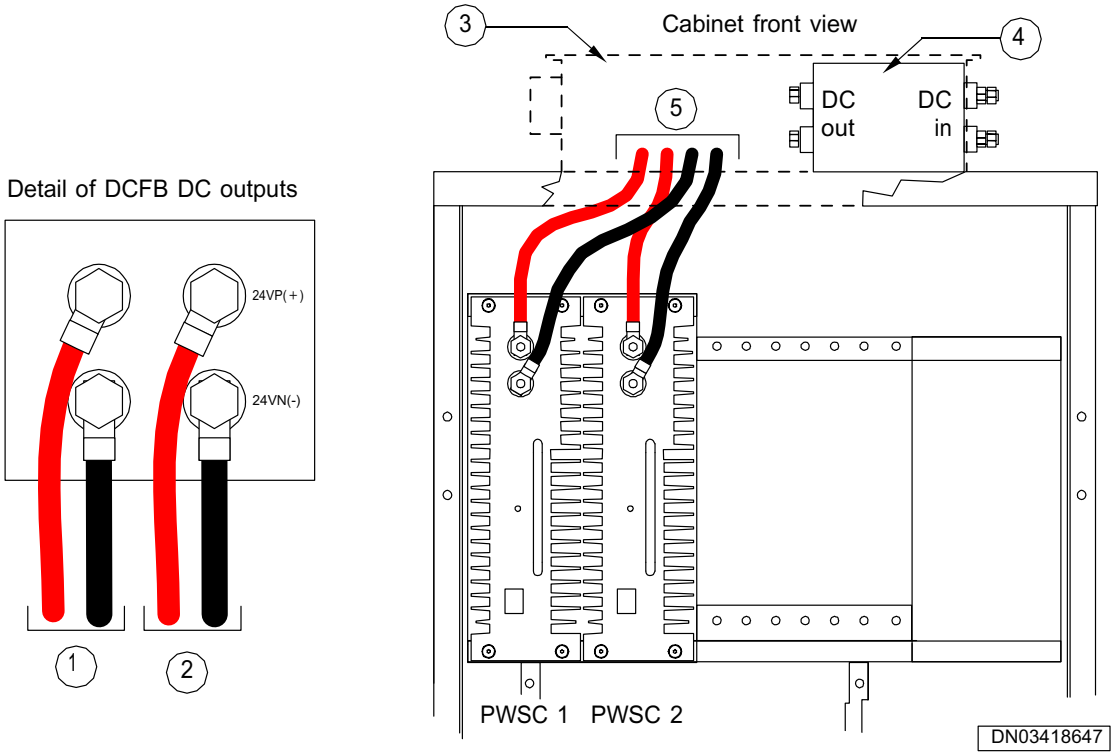
Pin	Name	Description
1	GNDIN	Earth/Safety Ground
2	Earth/Safety Ground	AC Power Conductor 1 (PWSA only)
3	ACIN2	AC Power Conductor 2 (PWSA only)
4	V55P	+55 VDC VXR
5	V9P	+9 VDC
6	V9P	+9 VDC
7	V5P	+5 VDC
8	V3P	+3 VDC
9	V3P	+3 VDC
10	MHA01B	Masthead Amplifier
11	MHA02B	Masthead Amplifier
12	MHA03B	Masthead Amplifier
13	MHA04B	Masthead Amplifier
14	MHA05B	Masthead Amplifier
15	MHA06B	Masthead Amplifier
16	MHA07B	Masthead Amplifier
17	MHA08B	Masthead Amplifier
18	MHA09B	Masthead Amplifier
19	MHA10B	Masthead Amplifier
20	MHA11B	Masthead Amplifier
21	MHA12B	Masthead Amplifier
22	COI2CD	I2C Serial Clock

Table 12. PWSx pin configurations (cont.)

Pin	Name	Description
23	CO12CC	I2C Serial Clock
24	UA1	I2C Unit Address bit 0
25	UA2	I2C Unit Address bit 1
26	RLC	Remote latch clear
27	L5V	+5 VDC Logic signal
28	UI1	PWSx Unit 2 installed
29	UI2	PWSx Unit 3 installed
30	PWR_AL	Input Power Low Alarm (PWSA only)
31	RCTL	Remote Control Signal
32	V9N	-9 VDC
33	V26P	+26 VDC
34	V48RTN	DC Power - (output on PWSA and PWSC, input on PWSB)
35	V48N	DC Power - (output on PWSA and PWSC, input on PWSB)
36	CGND	Common Ground
37	CGND	Common Ground

The input power terminals for the PWSC are located on the front unit. These terminals connect the PWSC unit to the DCFB unit. The input power terminals are M8-threaded studs, or alternately, M8-threaded inserts. The appropriate mounting hardware (hex-nuts or hex-head bolts and washers) are included with the unit. Do not exceed the following torque limits:

- Hex-nuts – 10 Nm
- Hex-bolts – 10 Nm



1	PWSC 1
2	PWSC 2
3	Antenna box
4	DCFB
5	To DCFB/DC out

Figure 17. PWSC input power terminals

2.7.3 Power Supply (PWSx) unit LEDs for UltraSite EDGE BTS

A tri-colour LED indicator on the front panel of the Power Supply (PWSx) unit displays operating conditions. The operating switch has two positions (ON and STAND BY).

Table 13. LED indications

LED colour	Steady
RED	• Unit faulty, major alarm, or short circuit in one of Nokia UltraSite EDGE BTS units • Output voltage is off because of a detected PWSx over temperature • Input voltage out of range
YELLOW	• Output voltage off, power supply unit switch in ON position, BTS in cold-start mode • Power shutdown signal sent from the BSC, NMS/2000 or NetAct • Input voltage OK, switch on the power supply unit in STAND BY position
GREEN	Unit is on and operating

2.8 Receiver Multicoupler (MxxA) unit

2.8.1 Technical description of Receiver Multicoupler (MxxA) unit of UltraSite EDGE BTS

2.8.1.1 Function

The multicoupler units split Received (RX) and Diversity-Received (DRX) signals and distribute them to the Transceiver (TSxx) units.

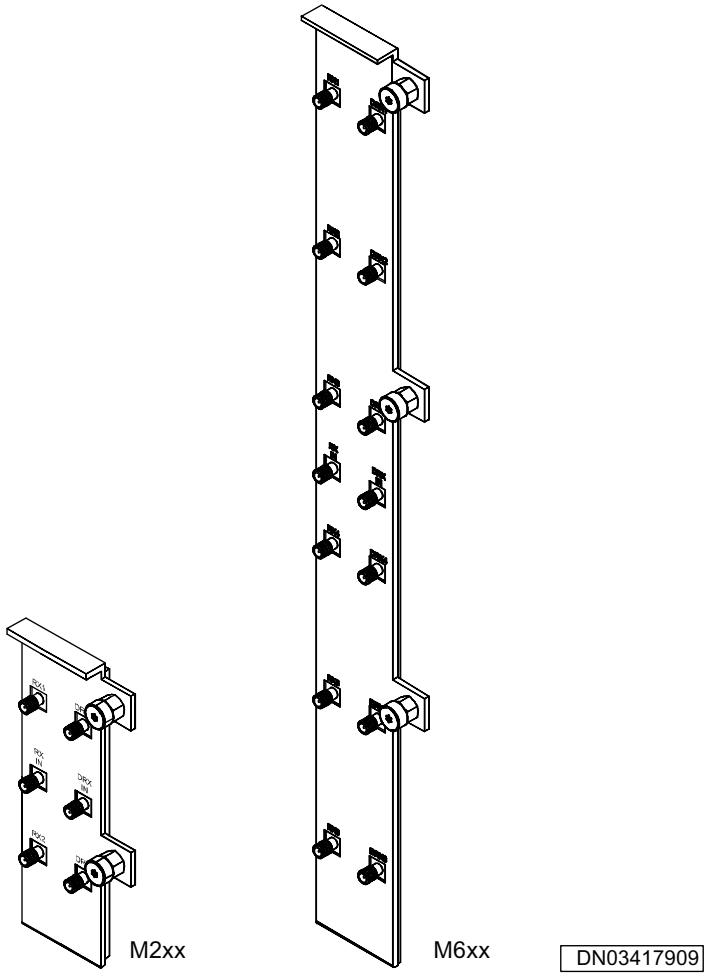


Figure 18. 2-way (M2xA) and 6-way (M6xA) Receiver Multicoupler units

2.8.1.2 Operation

M2xA

The M2xA unit receives signals from the DVxx unit or the RTxx unit. The M2xA unit divides the signals into two outputs for the RX path and two outputs for the DRX path. The outputs feed the receivers of two TSxx units, and a BTS can accommodate a maximum of six M2xA units. The unit is used in most wideband combining or combining by-pass configurations.

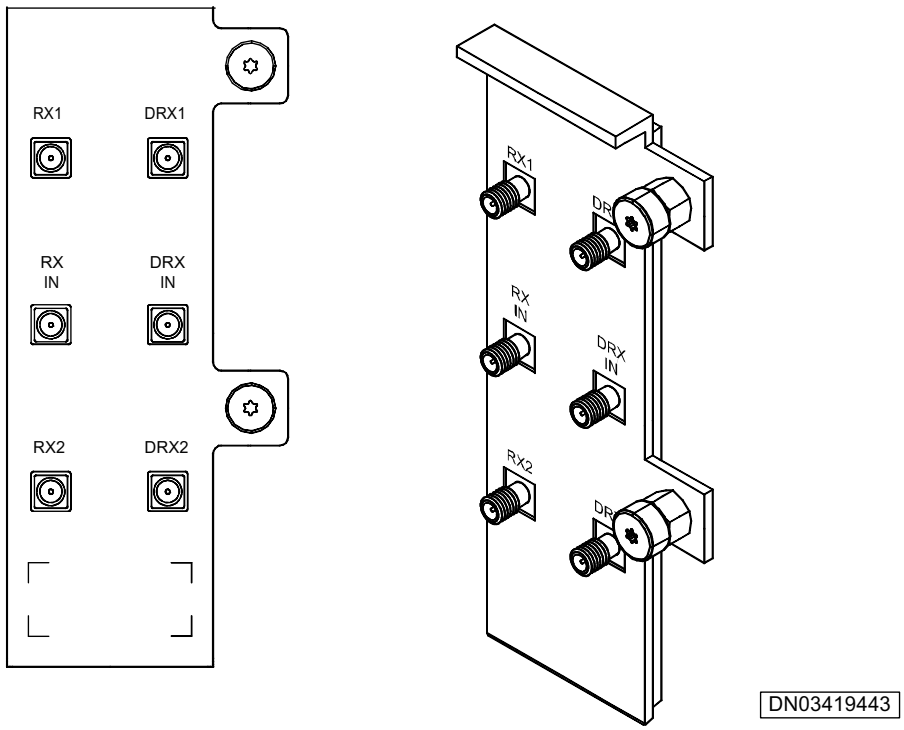


Figure 19. M2xA unit

M6xA

The M6xA unit receives signals from the DVxx unit or the RTxx unit. The M6xA unit divides the signals into six outputs for the RX path and six outputs for the DRX path. The outputs feed the receivers of six TSxx units, and a BTS can accommodate a maximum of two M6xA units. The unit is used most in conjunction with Remote Tune Combining.

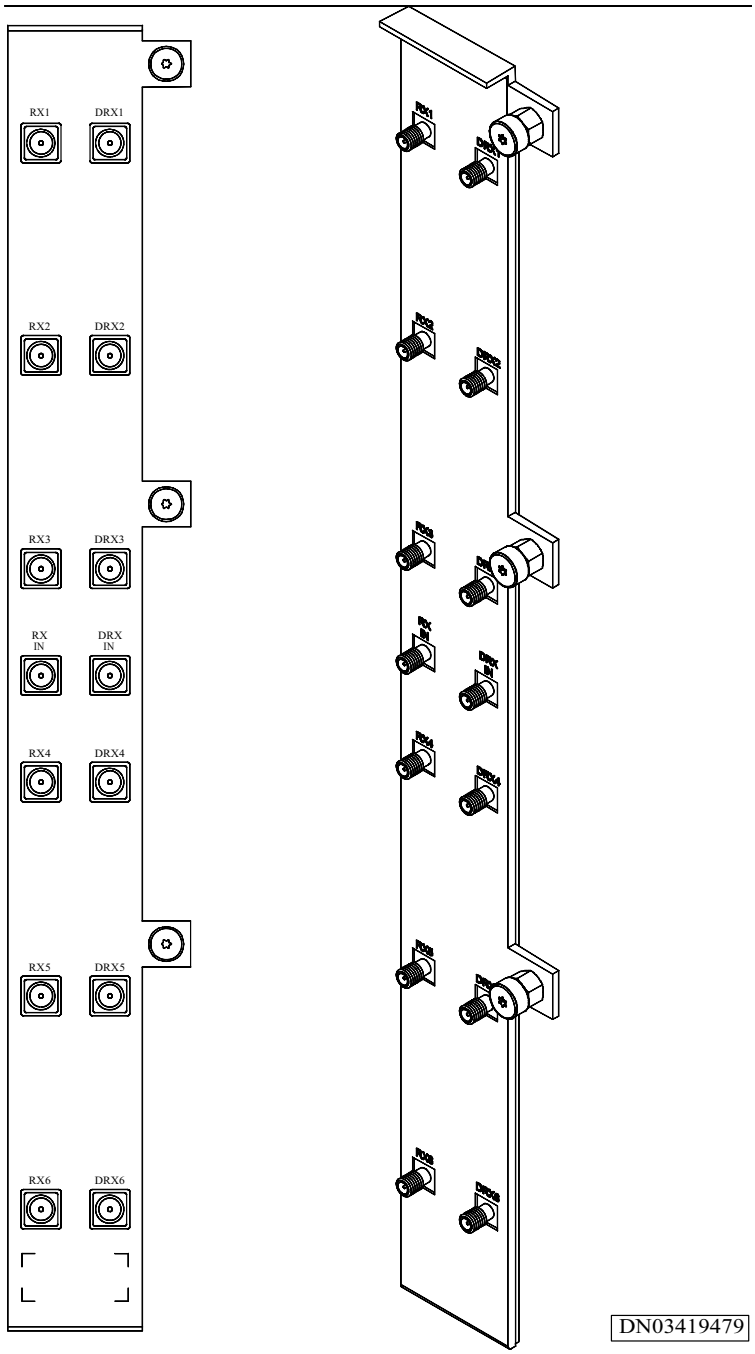


Figure 20. M6xA unit

2.8.1.3 MAIN blocks

M2xA blocks

The blocks of the M2xA unit provide the following outputs:

- Two RX – RX 1 and RX 2
- Two DRX – DRX 1 and DRX 2

Note

An unused RX output on the M2xA unit requires 50 Ω termination.

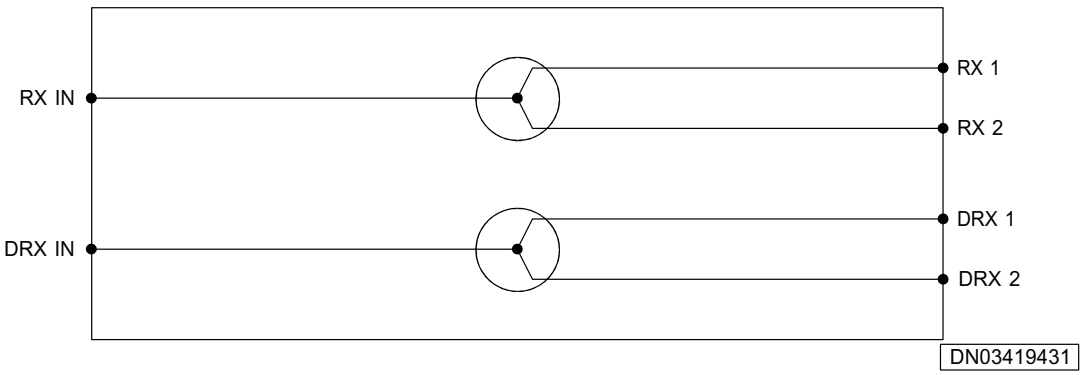


Figure 21. M2xA main blocks

M6xA blocks

The blocks of the M6xA unit provide the following outputs:

- Six RX – RX 1 to RX 6
- Six DRX – DRX 1 to DRX 6

Note

An unused RX output on the M6xA unit requires 50 Ω termination.

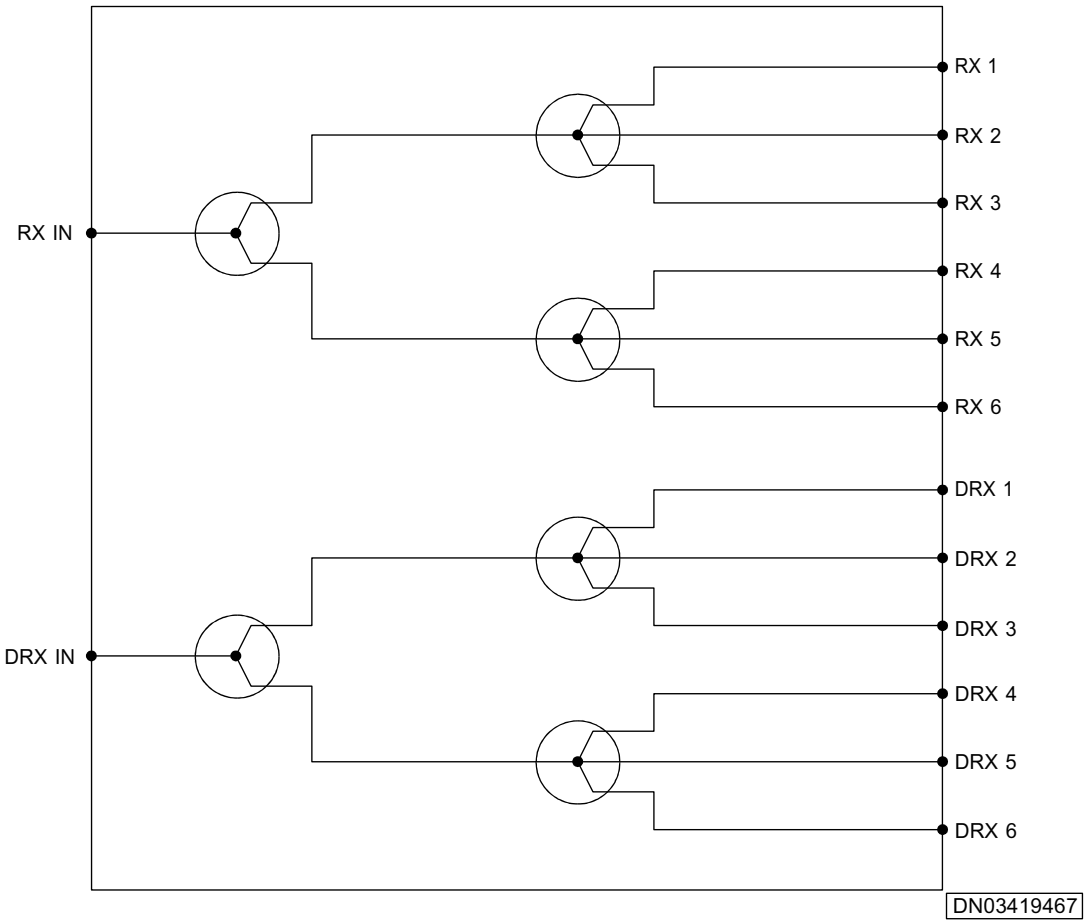


Figure 22. M6xA main blocks

2.8.2 Interfaces of the Receiver Multicoupler (M2xA and M6xA) unit of UltraSite EDGE BTS

2.8.2.1 M2xA interfaces

Table 14. Connectors

Interface	Purpose	Connector type	Quantity
RX IN	Input from DVxx unit or RTxx unit	SMA (female)	1
DRX IN	Input from DVxx unit or RTxx unit	SMA (female)	1
RX 1 and RX 2	Outputs to main RX of TSxx unit	SMA (female)	2
DRX 1 and DRX 2	Outputs to diversity RX of TSxx unit	SMA (female)	2

2.8.2.2 M6xA interfaces

Table 15. Connectors

Interface	Purpose	Connector type	Quantity
RX IN	Input from DVxx unit or RTxx unit	SMA (female)	1
DRX IN	Input from DVxx unit or RTxx unit	SMA (female)	1
RX 1 and RX 6	Outputs to main RX of TSxx unit	SMA (female)	6
DRX 1 and DRX 6	Outputs to diversity RX of TSxx unit	SMA (female)	6

2.9 Remote Tune Combiner (RTxx) unit

2.9.1 Technical description of Remote Tune Combiner (RTxx) unit of UltraSite EDGE BTS

2.9.1.1 Function

The RTxx unit is EDGE compatible and performs the following primary functions:

- combines up to six Transceiver (TSxx) units into a single BTS antenna
- provides duplex filtering to connect transmitted and received signals into one antenna
- provides RX filtering and amplification for the main and diversity branches

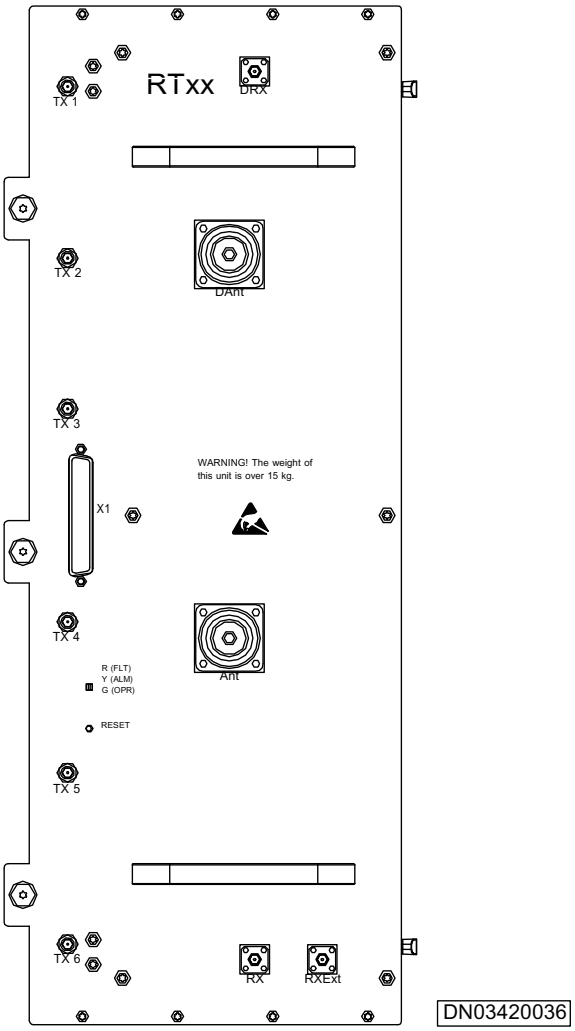


Figure 23. RTxx unit

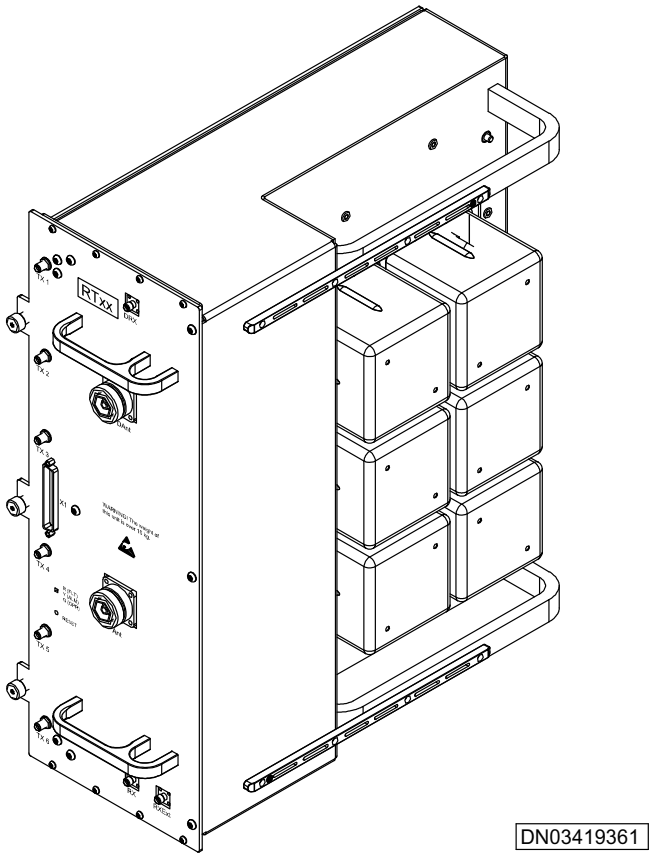


Figure 24. Isometric view of the RTxx unit

2.9.1.2 Operation

During BTS set-up, the BOIx unit commands the TSxx unit to send a dummy burst, modulated RF carrier signal at the frequency to which the combiner filter will be tuned. The BOIx unit sends a configuration message to the RTxx unit, and the RTxx unit starts to tune the combiner filters.

The power of the RF carrier signal forwarded to the combiner filter and reflected from it is measured. The signals are compared, and the centre frequency of the combiner filter is adjusted so that the reflecting power level from the filter is as low as possible.

Tuning is performed for each combiner filter. Tuning is then repeated, starting with the first combiner filter. The second tuning corrects the mutual effect of the combiner filters. The RTxx unit is ready for use.

The RTxx unit checks the condition of the combiner filters regularly and fine tunes the filters only if the forwarding power exists. The software of the RTxx is downloaded from the BOIx unit through the D2-bus. The software is first loaded to the DRAM of the controller. If the software is correct, it is loaded to Flash memory and is ready for use. The operational temperature range for the RTxx unit is -10° C to +65° C (+14° F to 149° F).

Overvoltage protection

The RTxx unit checks the condition of the combiner filters regularly and fine tunes the filters only if the forwarding power exists. The software of the RTxx is downloaded from the BOIx unit through the D2-bus. The software is first loaded to the DRAM of the controller. If the software is correct, it is loaded to Flash memory and is ready for use. The operational temperature range for the RTxx unit is -10° C to +65° C (+14° F to 149° F).

2.9.1.3 Main modules

The RTxx unit consists of the following main modules:

- selector
- combiner
- filter
- controller

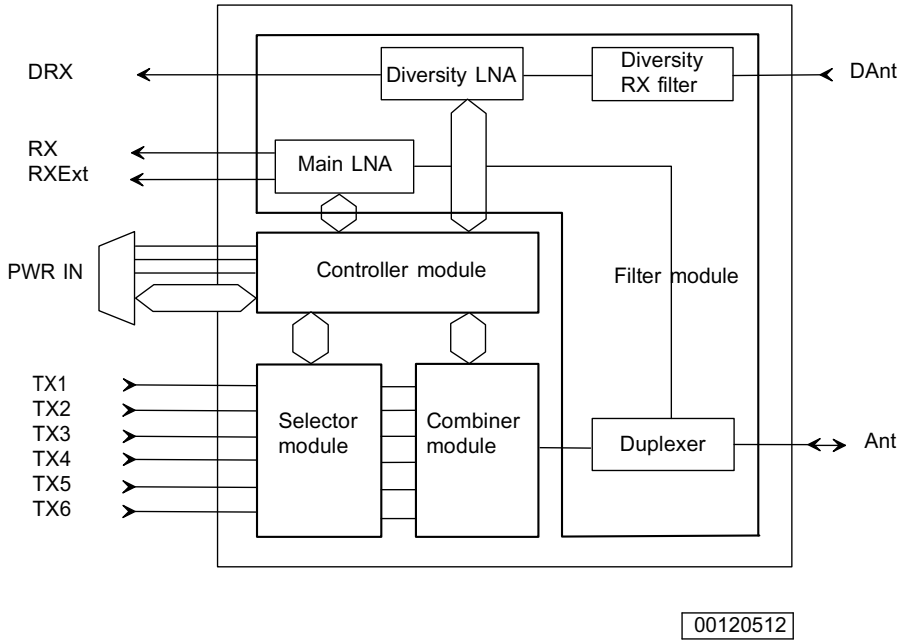


Figure 25. RTxx main modules

Selector

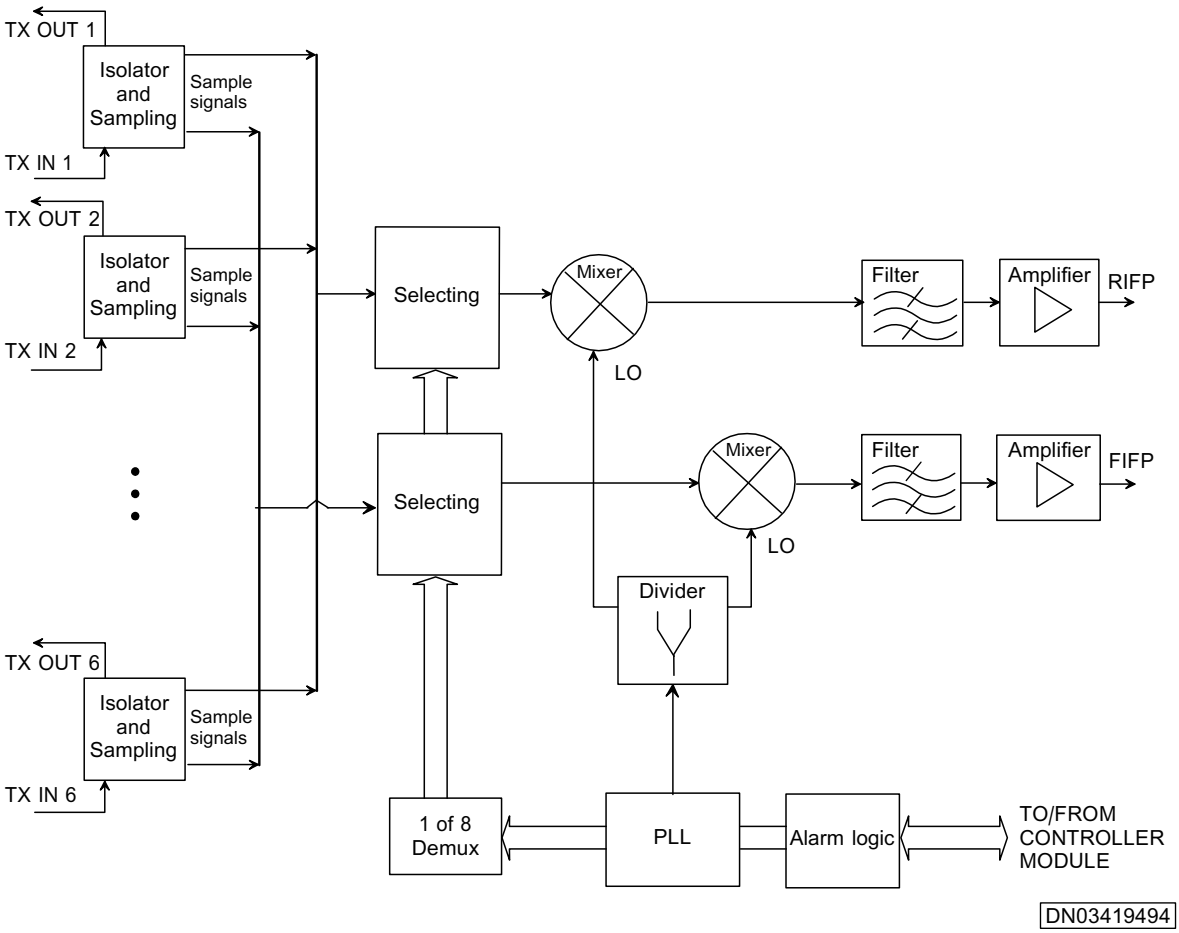


Figure 26. Main functional blocks of the selector module

The selector module provides the controller module with power samples that are proportional to the reflecting and forwarding power.

The TX signals go first to the selector module. The selector module then creates a sample of every forwarding power signal. After this sampling, the selector module directs the TX signals to the combiner module.

The selector module also creates samples of every reflected TX signal that comes from the combiner module. After this sampling, reflected power is directed to the high-power terminator.

The RTxx unit requires Fowarded Intermediate Frequency Power (FIFP) and Reflected Intermediate Frequency Power (RIFP) signals for tuning. The selector module mixes Local Oscillator (LO) and sample signals to create FIFP and RIFP signals and directs these signals to the controller module.

LO signal is generated in the PLL block of the selector module. The selector module also prevents reflected power flow toward the TSxx unit.

Combiner

The main function of the combiner module is to merge the modulated TX signals from the TSxx units through the following components:

- narrow bandpass filters
- single coaxial line using the summing network

The combiner module also provides RF isolation between the TSxx units.

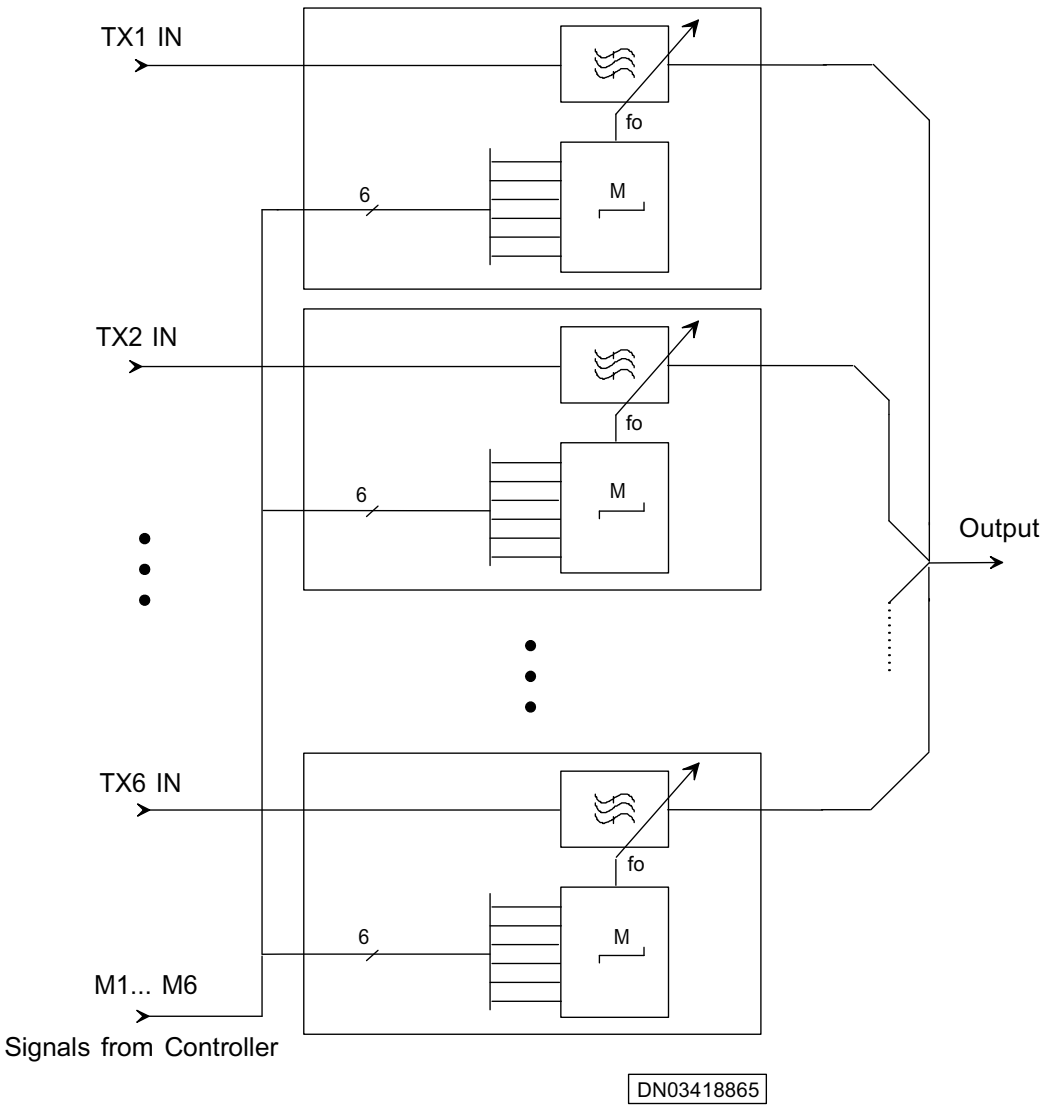


Figure 27. Functional blocks of combiner module

The carriers from the selector module are connected to the combiner filters. These filters are individually tuned to the carrier frequencies. The stepper motors, which receive control signals (M) from the controller, tune the centre frequencies of the combiner filters.

The combiner filters have narrow bandwidth and low insertion loss. The narrow bandwidth of the filters provides frequency-dependent attenuation between the filter input and output. This makes it possible to combine the outputs with a reasonably low insertion loss. Together with the filter module, the combiner filters provide the high attenuation required in the RX band.

The outputs of the combiner filters are connected to a single coaxial line using the summing network.

Filter

The main function of the filter module is to connect the TX branch and the main RX branch to the same BTS antenna with minimum insertion loss and high stopband attenuation, which in turn eliminates the need for a separate duplexer unit. Another important function of the filter module is to connect the RX diversity branch to the BTS diversity antenna.

The filter module includes two LNAs with adaptive gain state feature: high gain and low gain. The controller software adjusts the low-gain state, whereas the high-gain state remains constant.

The filter module has two functional blocks: main and diversity. The main block consists of a duplexer and adaptive LNA with two outputs. The diversity block consists of an RX diversity filter and adaptive LNA with one output. Gain of the LNAs can be switched between the high-gain or low-gain state by the controller module. If a Masthead Amplifier (MHA) is used, the LNAs must be set to the low-gain state.

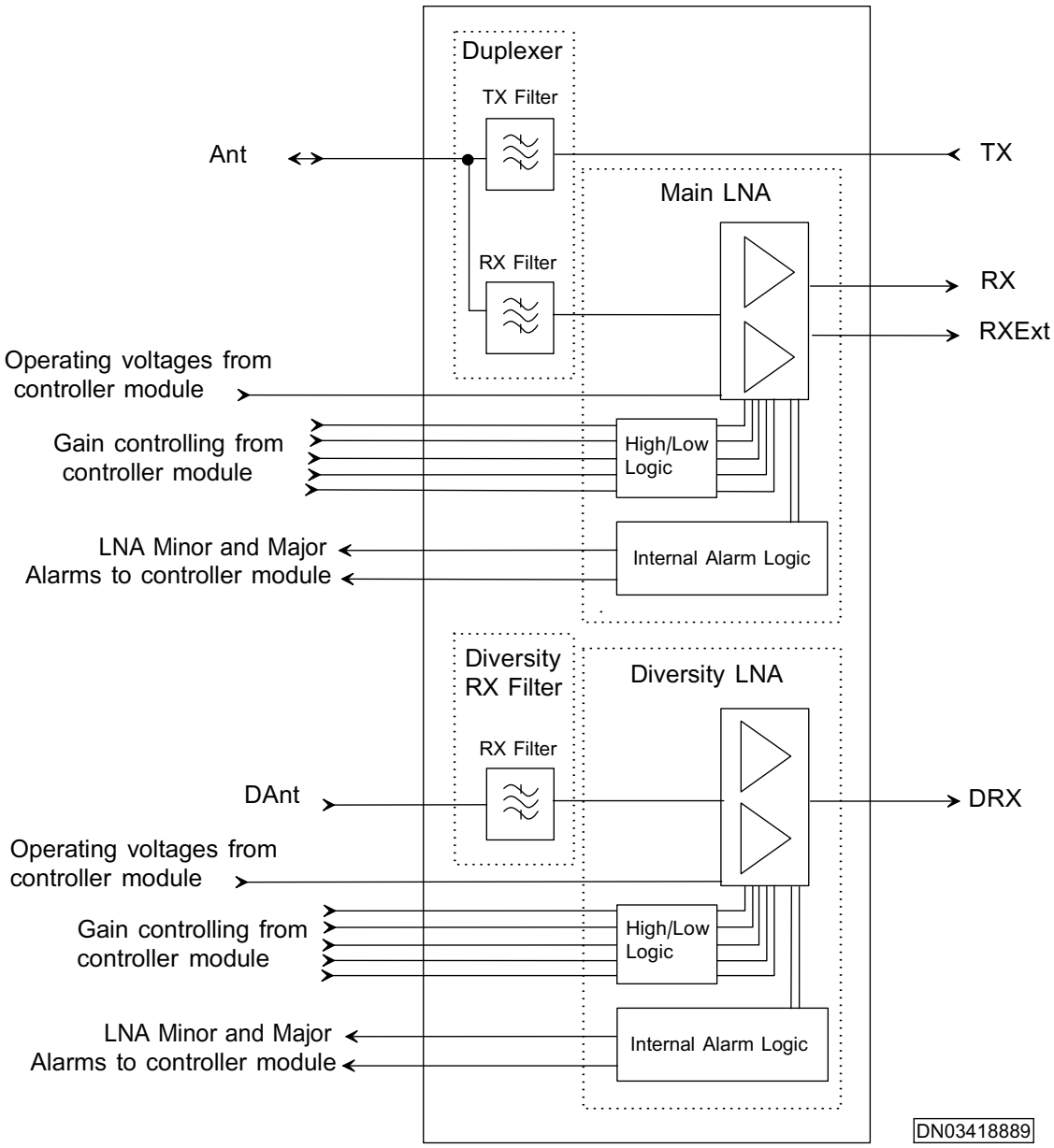


Figure 28. Functional blocks of filter module

Duplex filter

The combined TX carriers from the combiner module are connected to the BTS antenna through the TX bandpass filter. The passband of the filter covers the whole TX band with minimum insertion loss. The filter provides the high stopband attenuation that is required to limit the level of spurious frequencies and intermodulation products in the RX band.

The main RX signal from the BTS antenna is connected to the RX bandpass filter. The filter and adaptive LNA provide an amplified RX signal to the Receiver Multicoupler unit. The passband of the filter covers the whole RX band, and the stopband of the filter effectively rejects the spurious frequencies from the antenna and TX branch.

RX diversity filter

The diversity RX signal from the BTS antenna is connected to the RX diversity bandpass filter. The filter and adaptive LNA provide an amplified RX signal to the Receiver Multicoupler unit. The passband of the filter covers the whole RX band, and the stopband of the filter effectively rejects the spurious frequencies from the antenna.

Controller

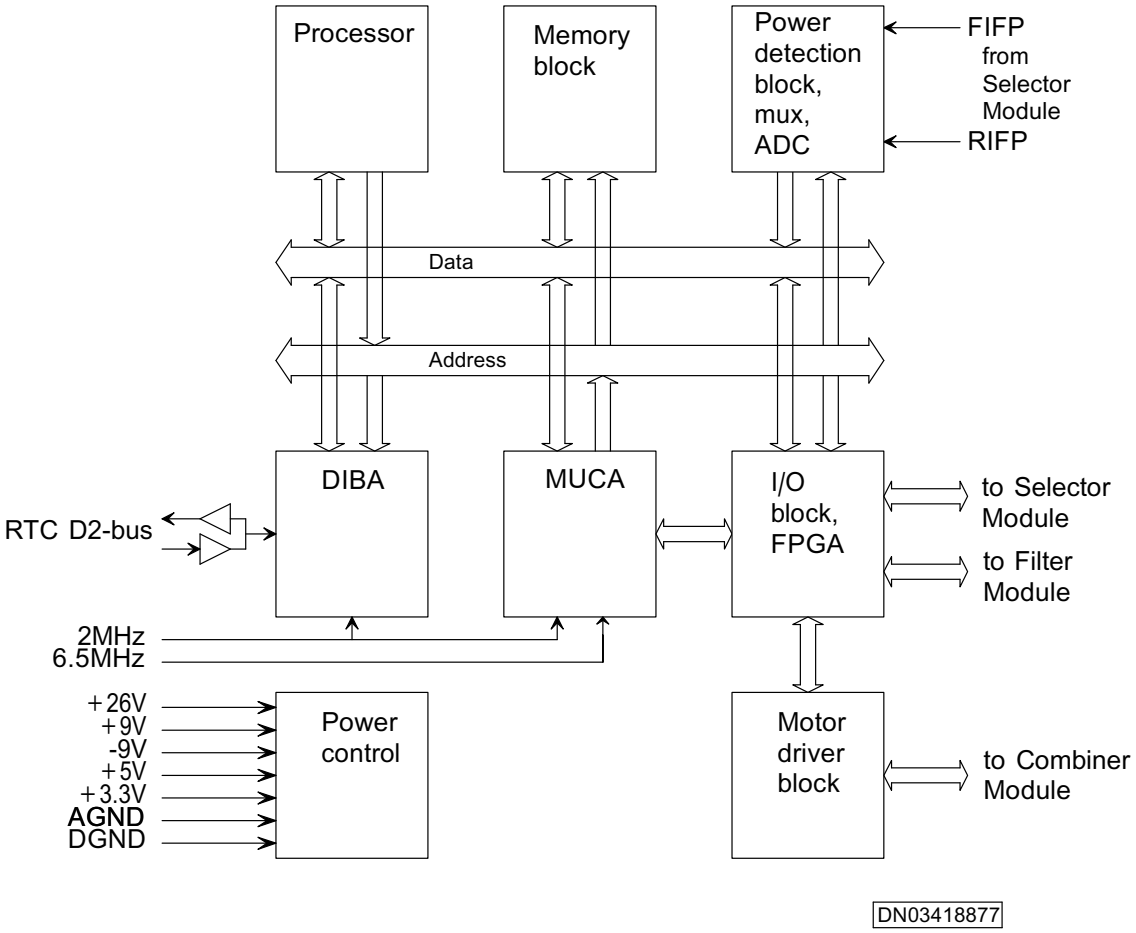


Figure 29. Functional blocks of controller module

The main purpose of the controller module is to control and monitor the function of the RTxx unit. It also handles communication between the RTxx and BOIx units through the RTC D2-bus. The RTxx unit sends status information to the BOIx unit. The BOIx updates the controller software when necessary.

The controller module also tunes the cavities of the RTxx unit to the desired frequencies. The selector module gathers samples from the forwarded and reflected power, and the power detection block on the controller module collects the samples. The UC (Unit Controller) processes the sample information to form the correct commands for the motor drivers. The UC sends the commands to the motor controller block that drives the stepper motors, so that the cavities are tuned to the correct frequencies.

The controller module manages the alarms from the filter and selector modules and the controller module itself. The controller module also monitors the temperature of the RTxx unit.

The controller module receives and manages the 3.3 V operating voltages from the RFU backplane through the flexible cable and supplies operating voltages to the connected modules.

2.9.2 Interfaces of the Remote Tune Combiner (RTxx) unit of UltraSite EDGE BTS

Table 16. Connectors

Interface	Purpose	Connector type
Ant	Combined TX signals from the RTxx to the BTS and main RX signals from the BTS to the TSxx	7/16 (female)
DAnt	Diversity RX signal from the diversity antenna	7/16 (female)
DRX	Output to the Receiver Multicoupler	SMA connector (female)
RX	Output to the Receiver Multicoupler	RX
RXExt	Output to the Receiver Multicoupler	SMA connector female)
TX1 to TX6	RTxx input connector for TSxx transmitters	SMA connector female)
X1	D-37, D-sub (male)	D-37, D-sub (male)

Table 17. Pin configurations

Pin configurations	Signal	Used by
1	RTxx	RTxx
2	D2DUN	RTxx
3	D2DDP	RTxx

Table 17. Pin configurations (cont.)

Pin configurations	Signal	Used by
4	D2DDN	RTxx
5	CK2MP	RTxx
6	CK2MN	RTxx
7	CK6M5P	RTxx
8	CK6M5N	RTxx
9		DVxx
10	GND	RTxx
11		DVxx
12	GND	RTxx
13		DVxx
14		DVxx
15	RXD	R&D testing
16	GND	R&D testing
17	TXD	R&D testing
18	GND	R&D testing
19	RTCUA	RTxx
20	V26P	RTxx
21	GND	RTxx
22	V9P	RTxx
23	GND	RTxx
24	V9P	RTxx
25	GND	RTxx
26	V9P	RTxx
27	GND	RTxx

Table 17. Pin configurations (cont.)

Pin configurations	Signal	Used by
28	V9P	RTxx
29	GND	RTxx
30	V5P	RTxx
31	GND	RTxx
32	V5P	RTxx
33	GND	RTxx
34	V5P	RTxx
35	GND	RTxx
36	V3P	RTxx
37	GND	RTxx

Table 18. Signal descriptions

Signal	Level	Description
CK2MN	LVDS	D2-bus 2MHz clock, negative
CK2MP	LVDS	D2-bus 2MHz clock, positive
CK6M5N	LVDS	6.5 MHz Reference Clock for selector module, negative slope
CK6M5P	LVDS	6.5 MHz Reference Clock for selector module, positive slope
D2DDN	LVDS	D2 downlink data, negative
D2 downlink data, negative	LVDS	D2 downlink data, positive
D2DUN	LVDS	D2 uplink data, negative

Table 18. Signal descriptions (cont.)

Signal	Level	Description
D2 uplink data, negative	LVDS	D2 uplink data, positive
GND	0 V	Ground
RTCUA	LVTTL	RTxx unit address bit
RXD	RS-232	R and D testing
TXD	RS-232	R and D testing
V3P	+3.3 VDC	Digital supply voltage
V5P	+5 VDC	Digital supply voltage
V9N	-9 VDC	Digital supply voltage
V9P	+9 VDC	Digital supply voltage
V26P	+26 VDC	Digital supply voltage

2.9.3 Remote Tune Combiner (RTxx) unit LEDs for UltraSite EDGE BTS

A tri-colour LED on the front of the RTxx unit indicates operating conditions.

Table 19. LED indications

LED colour	Steady	Flashing
RED	Fault or alarm, all six cavities faulty	One or more faulty cavities
YELLOW	Power is on, and unit is waiting	Configuring ongoing
GREEN	Unit is on and operating	Software downloading

2.10 Temperature Control System

2.10.1 Technical description of Temperature Control System (TCS) of UltraSite EDGE BTS

This section describes the operation and functional blocks of the TCS (Temperature Control System). The TCS includes the following hardware elements:

- Unit cooling fans - included in the cabinet core mechanics (Indoor and Outdoor BTS)
- Cabinet cooling fan - included in the Outdoor BTS
- HETA (BTS cabinet heater) unit - optional in the Outdoor BTS. AC filter unit and associated AC cabling must be installed if optional HETA unit is used. It also cannot be installed to IBBU cabinet.

The main purpose of the TCS is to monitor and control the internal temperature of the BTS cabinet. The TCS uses integrated control software in the BOIx (Base Operations and Interfaces) unit and unit temperature sensors to monitor the temperature. Using these measurements, the TCS adjusts the speed of the fans and turns the HETA on or off, if installed. The alarm-handling software in the BOIx unit also uses these measurements to generate temperature alarms.

The TCS also monitors the rotation speed of the unit cooling fans and the cabinet cooling fan.

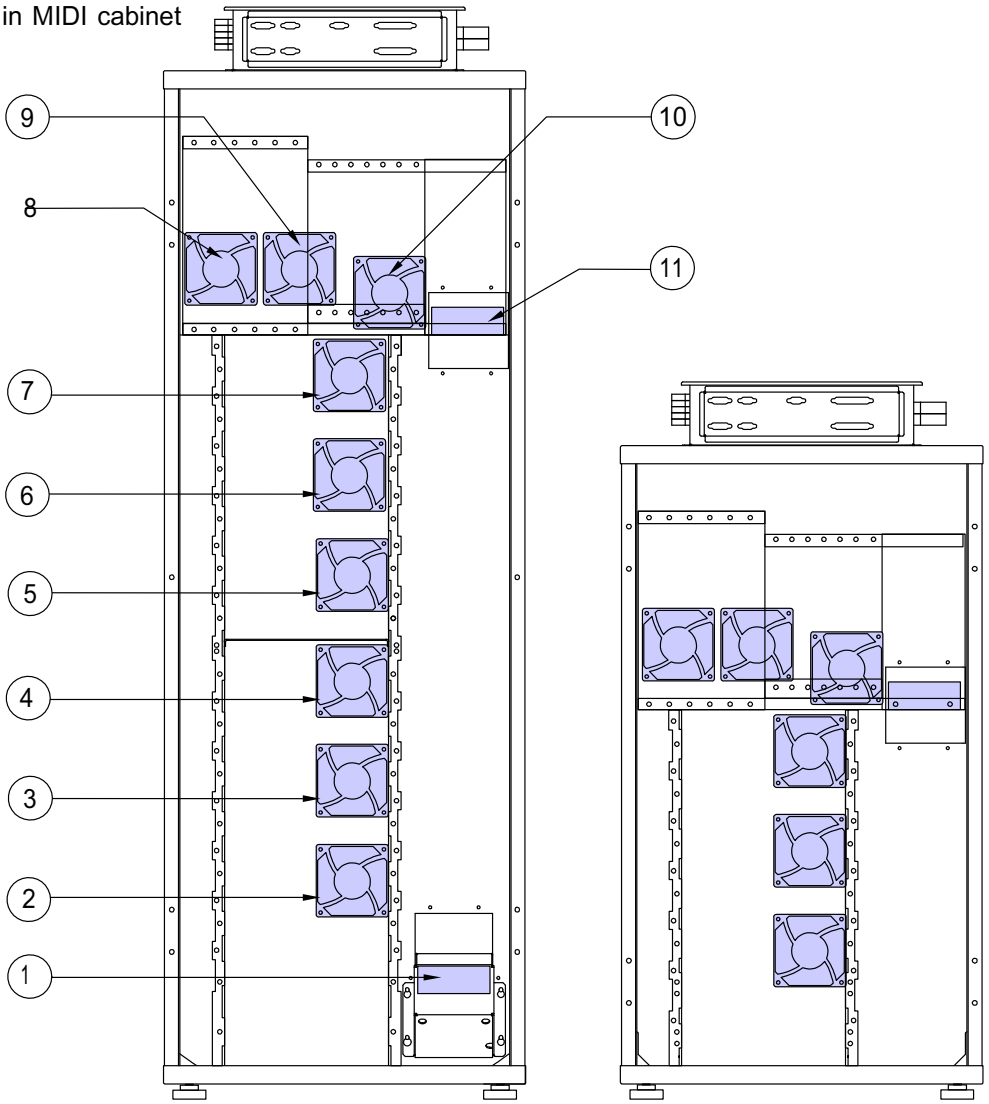
2.10.1.1 Operation

Unit cooling fans

The unit cooling fans cool the various units inside the BTS cabinet. The fans have reverse polarity, blocked rotor protection and automatic restart capability. Their normal operating temperature is from -33° C to 70° C (-27.4° F to 158° F).

The TCS software in the BOIx unit controls and monitors fan function and speed. If fan speed degrades significantly, the reduced fan speed alarm notifies the operator before failure occurs. When failure occurs, the fan broken alarm is sent. Each fan's airflow varies according to the temperatures of the individual units in the fan's general area.

*Same location in MIDI cabinet



DN03419607

UltraSite cabinet core

UltraSite MIDI cabinet core

1	RF Filter fan 2, horizontal mount (not used in IBBU configurations)
2	TSxx/IBBU fan 6
3	TSxx/IBBU fan 5
4	TSxx/IBBU fan 4

5	TSxx fan 3*
6	TSxx fan 2*
7	TSxx fan 1*
8	Power fan, 1*
9	Power fan, 2*
10	Common units fan*
11	RF Filter fan 1, horizontal mount*

Figure 30. Names and locations of unit cooling fans

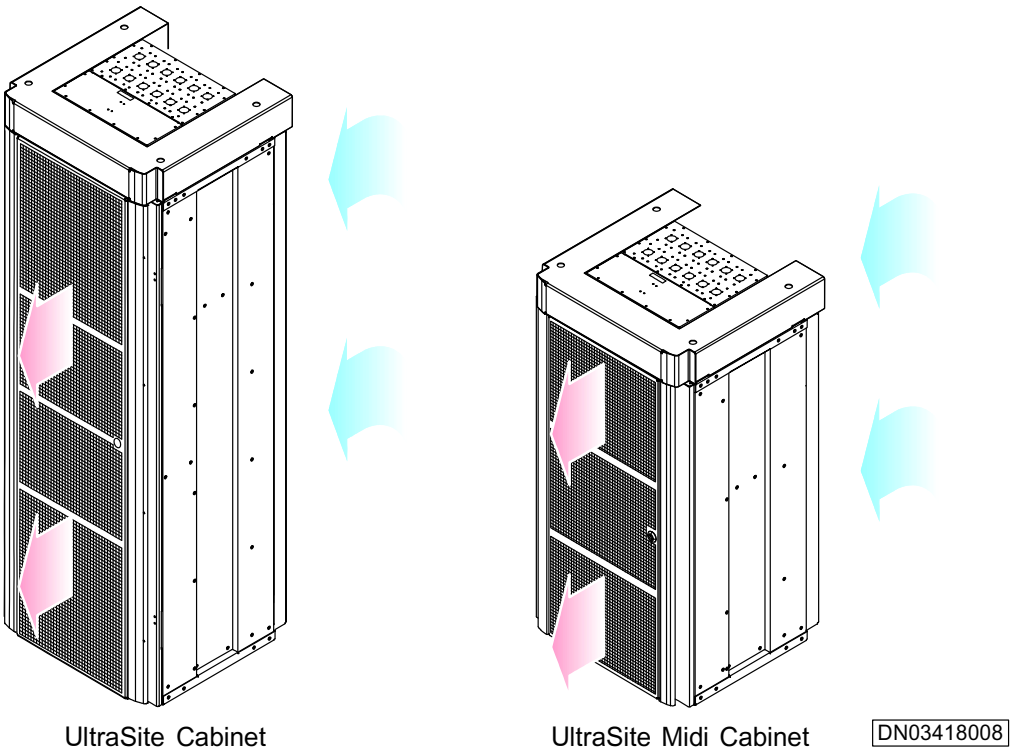
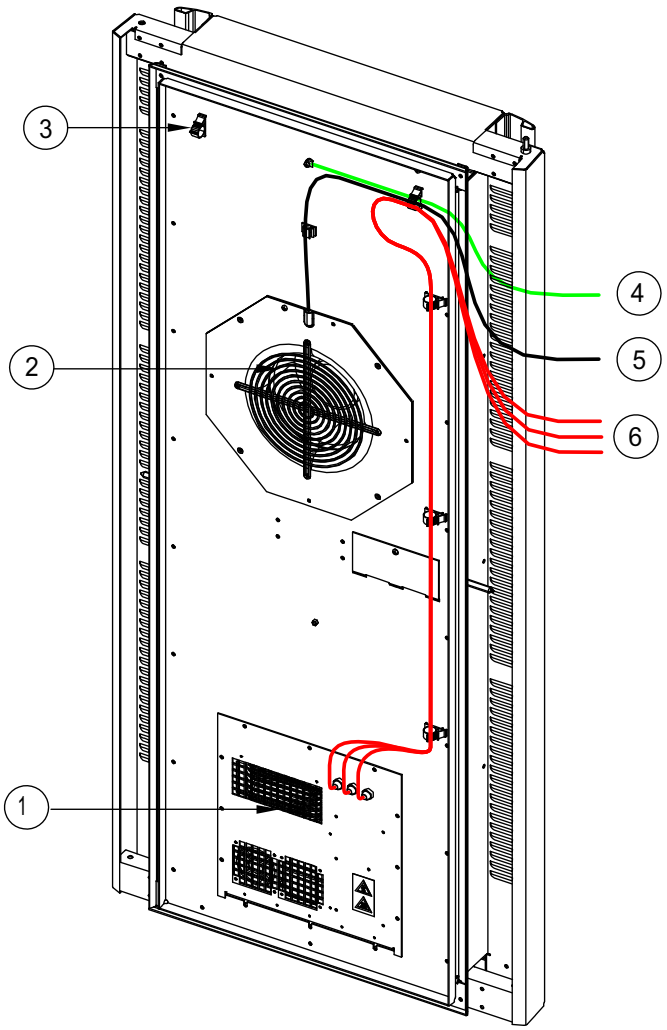


Figure 31. Airflow of unit cooling fans in IAKA and IAKC

Cabinet cooling fan

The cabinet cooling fan is included in the OAKx (Outdoor Application Kit). This fan draws cool air in and exhausts warm air from the BTS cabinet. The normal operating temperature of the fan is from -33° C to 70° C (-27.4° F to 158° F).

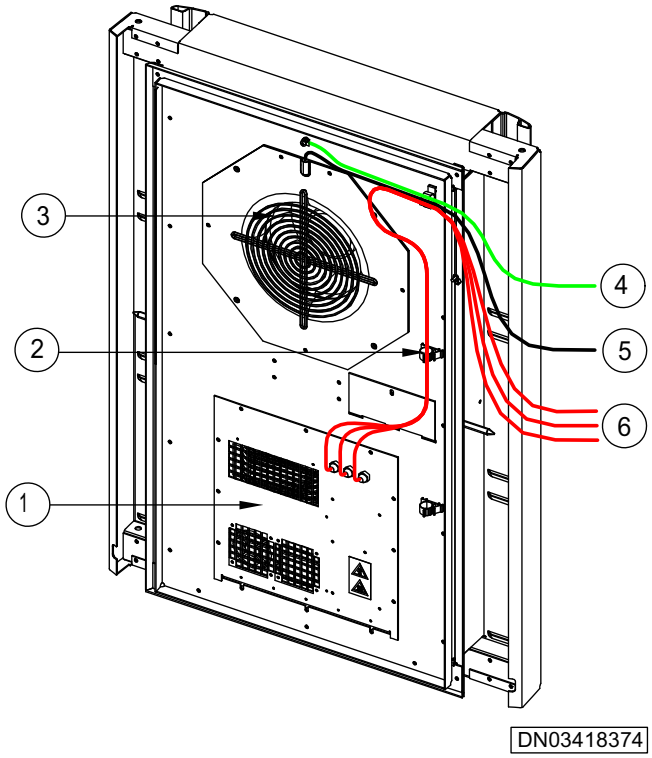
The TCS software in the BOIx unit controls the functions and speed of the cabinet cooling fan. The airflow varies according to the temperature inside the cabinet.



DN03418362

1Optional heater unit2Cabinet fan (CAFA)3Cable clamp, six places4Door ground strap5Wiring to CAFA power and control6Wiring to HETA power and control

Figure 32. Cabinet cooling fan and optional HETA in OAKx cabinet door



1	Optional heater unit (HETA)
2	Cable clamp, three places
3	Cabinet fan (CAFA)
4	Door ground strap
5	Wiring to CAFA power and control
6	Wiring to HETA power and control

Figure 33. Cabinet cooling fan and optional HETA in OAKC cabinet door

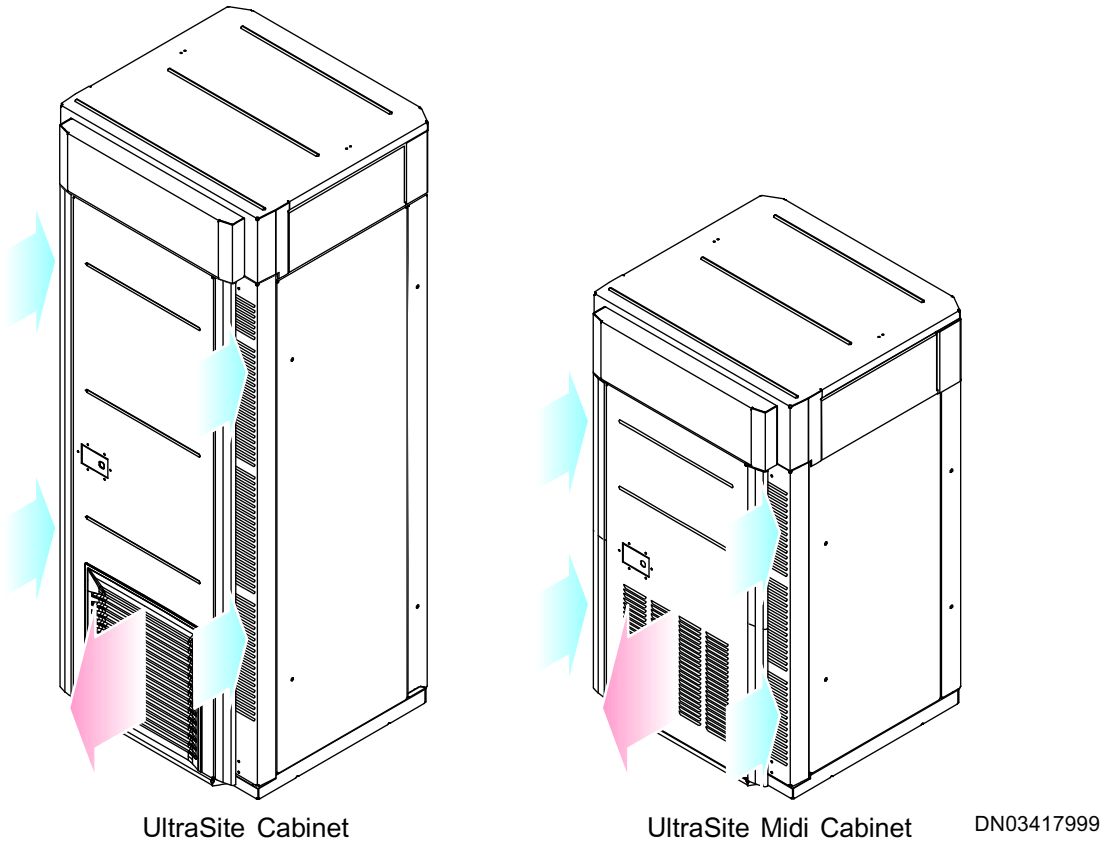


Figure 34. Airflow of cabinet and unit cooling fans in OAKx and OAKC

HETA

The HETA is available as an option for the OAKx only. The HETA is required for BTS operation at ambient temperatures below -10° C (14° F). Its minimum operating temperature is -33° C (-27.4° F).

Note

The HETA unit needs AC filter unit and associated AC cabling to operate. If installed to a BTS working of DC, that cabinet would also need AC power cables as well as DC. It cannot be installed to IBBU cabinet.

The HETA is installed in the cabinet door and has the following functions:

- raise the internal BTS temperature when it falls below -5° C (23° F) during normal operation
- protect the BTS during cold-start operation

The HETA reports its status and potential alarms to the BOIx unit, which detects the HETA during the auto-detection procedure. The HETA interfaces with the BOIx and power supply (PWSx) units through the common backplane.

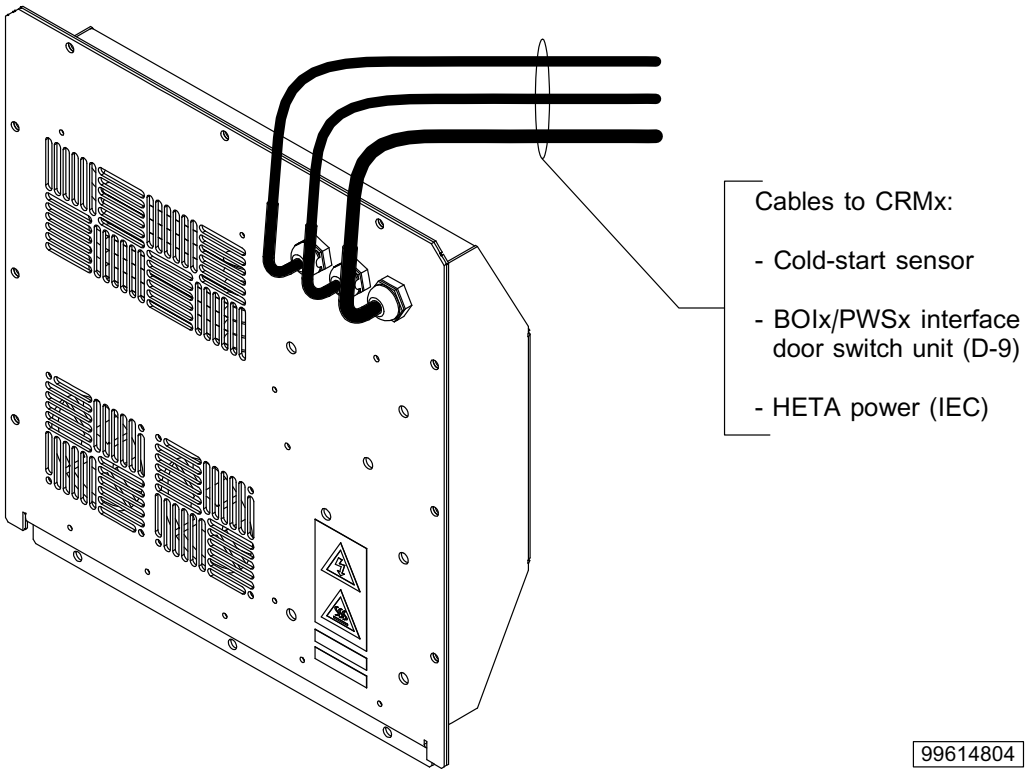


Figure 35. Optional HETA

Normal operation

During normal BTS operation (ambient temperature from -33° C to 50° C, or -27.4° F to 122° F), the BOIx unit controls the HETA according to the temperatures of the individual units. If any unit temperature falls below -5° C (23° F), the BOIx unit enables the HETA. After the HETA raises the unit's temperature above 5° C (41° F), the BOIx unit disables the HETA.

Cold-start operation

The cold-start controller circuit on the HETA protects the BTS during startup when the cabinet temperature falls below -10° C (14° F). The controller circuit has a sensor that measures the temperature inside the cabinet. When the temperature at startup is below -10° C (14° F), the cold-start controller prevents the enabling of the PWSx unit outputs and enables the HETA, which is used to raise the cabinet temperature to the minimum operating level within four hours. When the cabinet temperature reaches -5° C (23° F), the cold-start controller enables the PWSx unit outputs. Once the BTS is online, the TCS software assumes responsibility for the cabinet temperature.

Fan control during startup

When the BTS is powered on (before the TCS software has started), the FPGA (Field Programmable Gate Array) software in the BOIx unit uses a default speed to control the cabinet and unit fans directly connected to the BOIx unit. The TSxx microcontroller software controls the TSxx fans at a default speed.

Note

The TSxx unit fan speeds can vary, because the PWM (Pulse Width Modulation) signals received from the two TSxx that control each fan may be out of phase (until TCS software takes over).

The TCS software starts and takes control of the fan speeds when the BOIx unit reaches a *Supervisory* state, which requires an Abis or BTS Manager connection.

2.10.1.2 Fan control during reset

During an OMU (Operation and Maintenance Unit) reset, the unit fans directly connected to the BOIx unit rotate at the default speed. The TSxx unit fans maintain their speed until the BOIx unit software starts, because the TSxx hardware and software are not reset.

During a site reset, the unit fans directly connected to the BOIx and TSxx unit fans rotate at the default speed until the BTS software starts.

2.10.1.3 Main blocks

Unit cooling fans

The manufacturers of the unit cooling fans supply the fan components. Each fan includes a PWM input for control and a tachometer output for monitoring speed.

Cabinet cooling fan

The manufacturers of the cabinet cooling fan supply the fan components. The fan includes a PWM input for control and a tachometer output for monitoring speed.

HETA

The HETA includes the following functional blocks:

- heating element
- relay
- fan
- temperature sensor and cable
- cold-start controller circuit
- internal power supply for the cold-start controller circuit, with a power board and a cable for connection to the AC filter module
- interface with the BOIx and PWSx units, consisting of an interface circuit and cable

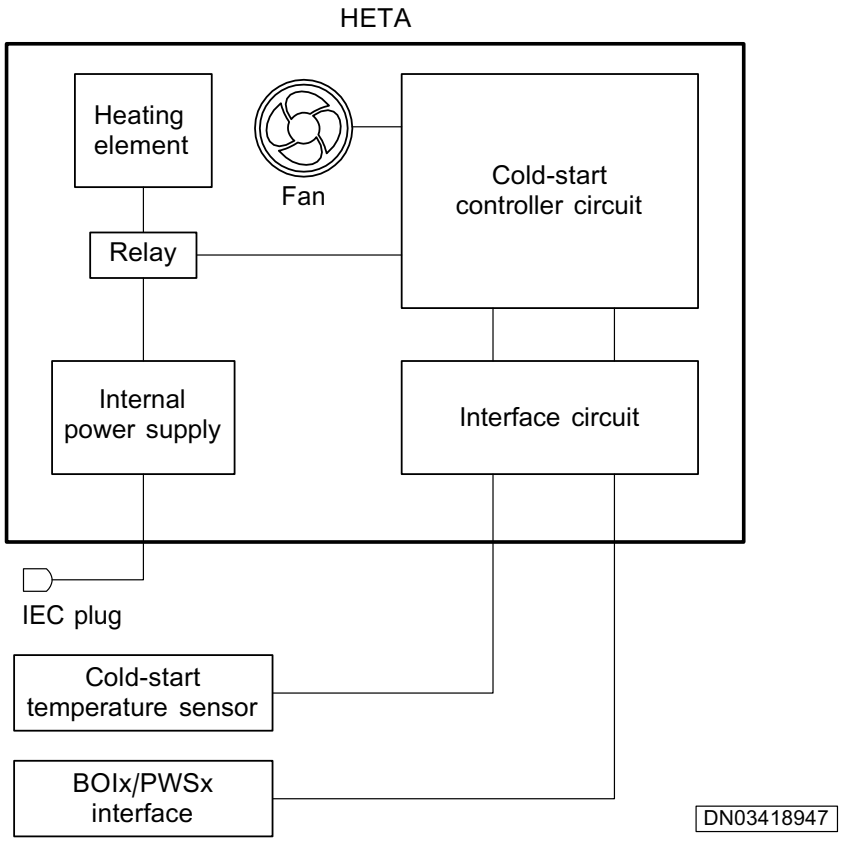


Figure 36. HETA functional blocks

2.10.2 Interfaces of the Temperature Control System of UltraSite EDGE BTS

2.10.2.1 Fans

Unit cooling fans

The unit cooling fans have the following interfaces:

- fan control
- fan status
- 48 VDC power

Cabinet cooling fan

The cabinet cooling fan has the following interfaces:

- fan control
- fan status
- 48 VDC power

Table 20. Interface wires and pin configurations

Pin	Wire
1	V48RTN (+ pole of input voltage)
3	3 V48N (- pole of input voltage)
6	FANST (RPM info)
8	FANCTRL (PWM)

2.10.2.2 HETA

The HETA has the following interfaces:

- AC power
- control and status
- cold-start sensor

AC power interface

The AC power cable has an IEC male latching/locking connector. The secondary side of the AC/DC converter is grounded to the HETA case.

Control and status interface

The HETA interfaces with the BOIx and PWSx units through the common backplane. This interface routes control and status signals to and from the appropriate units. The HETA control cable runs from the HETA to the common backplane. The connector type is D-9 male.

Table 21. Pin configurations

Pin	Signal	Pin	Signal
1	Pin	2	GND
3	V5P	4	NA
5	V5P	6	HETA_CTRL
7	HETA_AD	8	RCTL
9	GND		

2.11 Transceiver Baseband (BB2x) unit

2.11.1 Technical description of Transceiver Baseband (BB2x) unit of UltraSite EDGE BTS

2.11.1.1 Function

The BB2x unit is a digital signal processing board, consisting of two independent baseband modules. Each module functions independently for its own TSxx unit. The BB2x unit also controls frequency hopping.

Externally all the units are alike except for the model number on the face of each. Internally, the major difference is the additional EDGE capability provided by the BB2E and BB2Funits. BB2A units can only be used with GSM (TSxA) transceiver units. The BB2E and BB2F may be used with or can replace the BB2A and supports GSM (TSxA) and GSM/EDGE (TSxB) transceiver units. EDGE operation is only possible when BB2E or BB2F units are used in conjunction with TSxB transceiver units.

The front panel of the BB2x unit is grounded to handle electrostatic discharges.

The BB2x units of Nokia UltraSite EDGE Base Station have the following main functions:

- Process digital speech and data channels signals
- Manage all speech function signalling

- Uses software downloaded from the Base Operations and Interfaces (BOIx) unit
- Sets internal timing according to clock references from the BOIx unit
- Supports synthesised radio frequency (RF) and baseband (BB) frequencyhopping

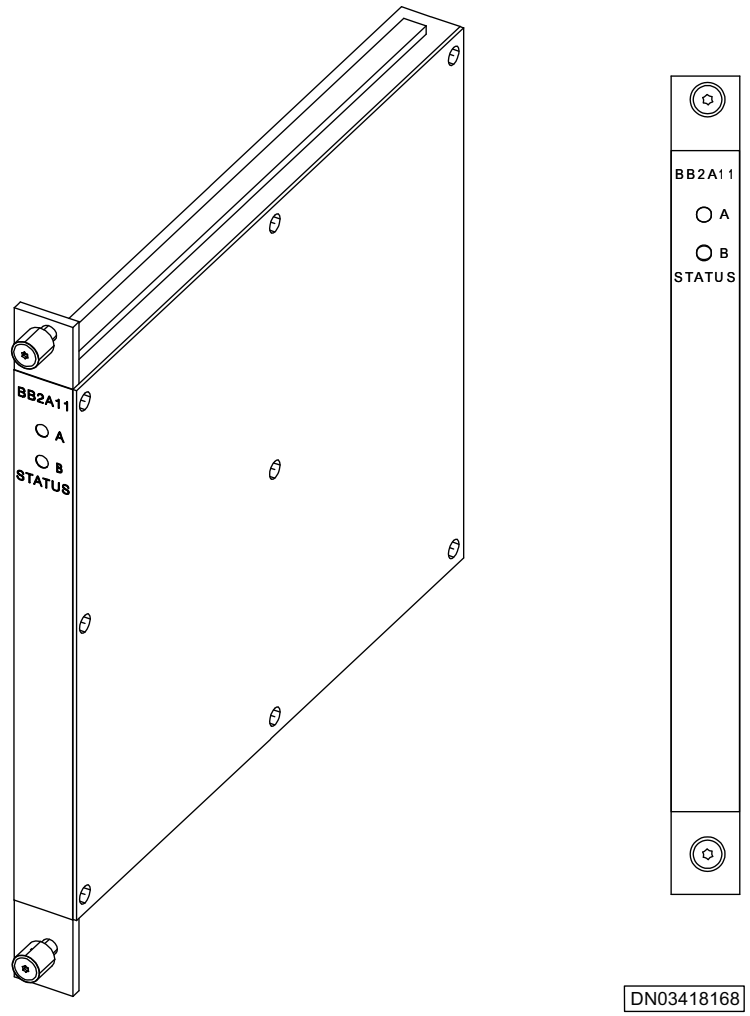


Figure 37. BB2x unit

2.11.1.2 Operation

The BB2x units are functionally located between the Abis interface and the BTS RF modules. The BB2x processes uplink and downlink information from/to the TSxx. The uplink is from the mobile station (MS) to the Base Transceiver Station (BTS) with the downlink in the reverse direction.

The BB2x units communicate with the following units:

- Base Operations and Interfaces (BOIx)
- Transceiver (TSxx)
- Transmission (DTRUx)

  These units send and/or receive signals via the uplink and downlink paths.

Downlink signal processing

BB2x unit

In the downlink path, the BSC sends a signal through the Abis interface to the DTRUx unit, which passes the signal to the BB2x unit. The BB2x unit encodes the signal and reformats it as a GSM/EDGE TDMA burst. The BB2x unit then sends the signal to the TSxx unit.

The TSxx unit modulates and amplifies the signal and sends it to the RF filter units. From those units, the signal goes to the antenna, which passes the signal over the Air interface to the Mobile Station (MS).

Uplink Signal Processing

BB2A

In the uplink path, the TSxx unit samples the signal and sends the information, plus High-Level Data Link Coded (HDLC) status and alarm messages, to the BB2A. The BB2x unit then sends the processed signal to the DTRUx unit, which passes the signal through the Abis interface to the Base Station Controller (BSC). The BB2A combines normal (NRX) and diversity (DRX) data on to the NRX line.

BB2E and BB2F

Uplink signal processing includes basic BB2A unit capabilities plus normal (NRX) and diversity (DRX) branch uplink interfaces in EDGE mode. While in EDGE mode, the BB2E and BB2F units use NRX for main RX data and the DRX line for diversity RX data.

Downlink signal processing

BB2x unit

In the downlink path, the BSC sends a signal through the Abis interface to the DTRUx unit, which passes the signal to the BB2x unit. The BB2x unit encodes the signal and reformats it as a GSM/EDGE TDMA burst. The BB2x unit then sends the signal to the TSxx unit.

The TSxx unit modulates and amplifies the signal and sends it to the RF filter units. From those units, the signal goes to the antenna, which passes the signal over the Air interface to the Mobile Station (MS).

2.11.1.3 Main blocks

The BB2x units are self contained and consist of two separate baseband sections. Each section is further divided into five functional blocks.

The BB2x unit has two independent baseband sections. Each section communicates with the TRX module of one TSxx unit. Typically, one BB2x unit processes signals to/from two TSxx units, each with eight receive/transmit logical channels. The channel usage varies according to configuration.

Each BB section consists of the following functional blocks:

- Uplink/Downlink interface
- D-bus interface
- Control block
- Digital Signal Processor (DSP) block
- F-bus interface

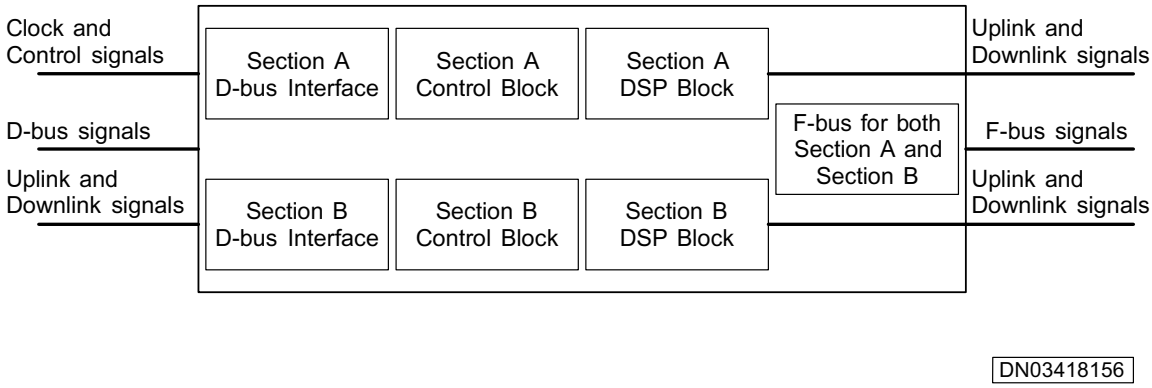


Figure 38. BB2x main blocks

Uplink/downlink interface

The uplink/downlink interface consists of communication pathways between the BTS and MS. Baseband data is converted for transmission and during reception. The interface also handles synthesiser control, clock distribution from the baseband section, alarm functions, and TRX loop control.

BB2x downlink

In the downlink direction (BTS to MS), the BB2x unit sends transmission, initialisation, and synthesiser-control data (to TSxx) through a serial point-topoint line using HDLC protocol.

BB2x uplink

In the uplink direction (MS to BTS), the BB2x unit receives the following data:

- I (In Phase) and Q (Quadrature) components of the normal and diversity branch data samples
- RF alarms and status information through a serial point-to-point line

D-bus interface

The D-bus interface synchronises the signals transmitted and received through the D-bus. The D-bus interface also synchronises data between the D-bus and Unit Controller (UC) processor and between the D-bus and Channel Digital Signal Processor (CHDSP).

The D-bus consists of the following buses:

- D1-bus, which transfers traffic and signalling data among the BB2x, DTRUx, and BOIx units
- D2-bus, which transfers internal O and M communications (including software downloads) among the BOIx, BB2x, and Remote Tune Combiner (RTxx) units

Control block

The Control block handles the following functions:

- clock generation and synchronisation
- DSP interrupt signals
- alarm management

The Control block contains the UC processor, which runs the BTS software.

Digital Signal Processor

Each DSP block has an Equaliser DSP (EQDSP) and a Channel DSP (CHDSP).

Equaliser DSP

The EQDSP handles the following functions:

- sample reception from RF
- bit detection
- channel equalisation
- demodulation

Channel DSP

The CHDSP handles the following functions:

- sample transmission to RF
- channel decoding and encoding
- ciphering and deciphering
- demodulation

F-bus interface

The frequency-hopping bus (F-bus) between the BB2x units is used for baseband hopping (moving TX and RX bursts between the BB2x units).

Frequency-hopping is only allowed between sets of the same hopping group configurations in GMSK mode. For example, TSxA and TSxB units cannot be used in the same hopping group, but can be used in different hopping groups on the same bus.

When a mixture of BB2As and BB2Es are used in the BTS, then Baseband-hopping is only allowed between sets of the same hopping group configurations in GMSK mode. For example, TSxA and TSxB units cannot be used in the same hopping group, but can be used in different hopping groups on the same bus.

When a mixture of (BB2As and/or BB2Es) and BB2Fs are used in the Base Station Cabinet, then Baseband hopping can be configured with both TSxAs and TSxBs in the same Baseband hopping group when the BB2F drives the TSxB.

2.11.2 Interfaces of the Transceiver Baseband (BB2x) unit of UltraSite EDGE BTS

The BB2x unit has connectors for power and interface-signal inputs and outputs.

2.11.2.1 BB2A interfaces

Table 22. Connectors

Interface	Purpose	Type
X0210 X0220 X0230 X0240	Four connectors stacked to form one 120-pin female connector	30-pin (female)

Table 22. Connectors (cont.)

Interface	Purpose	Type
X0204	One piece connector used in place of four piece stacked connector	120-pin (female)
X1	Power connector	10-pin (female)

2.11.2.2 BB2E and BB2F interfaces

Table 23. Connectors

Interface	Purpose	Type
X0204	One piece connector used in place of four piece stacked connector	120-pin (female)
X0202	Power connector	10-pin (female)

2.11.3 Transceiver Baseband (BB2x) unit LEDs for UltraSite EDGE BTS

The BB2x unit has two tri-colour LEDs (A and B) on the front panel. Each LED indicates the operating condition of one baseband section. The upper LED indicates status of the first baseband section and the lower LED indicates that of the second.

Table 24. LED indications

LED colour	Steady	Flashing
RED	Fault or alarm	TRX test running
YELLOW	No Abis LAPD link	Configuring
GREEN	Unit is on and operating	Software downloading

2.12 Transceiver (TSxx) unit

2.12.1 Technical description of Transceiver (TSxx) unit of UltraSite EDGE BTS

The TSxx unit performs RF modulation/demodulation and amplification for one RF carrier. The TSxx handles uplink signals from the Mobile Station (MS) to the BTS and downlink signals from the BTS to the MS. The TSxA unit provides GSM functionality only, while the TSxB unit provides both GSM and EDGE functionality. UltraSite EDGE BTS can use TSxA and TSxB units within the same cabinet.

Overvoltage protection

The power supply lines for the TSxx unit are protected with fuses. TSxB units also provide reverse voltage protection on the -48 VDC lines.

Some of the components in the PA module of the TSxx units may contain Beryllium Oxide (BeO).

Warning

BeO does not present a health hazard, provided that the components containing BeO are not damaged. Persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions.

TSxA and TSxB modules

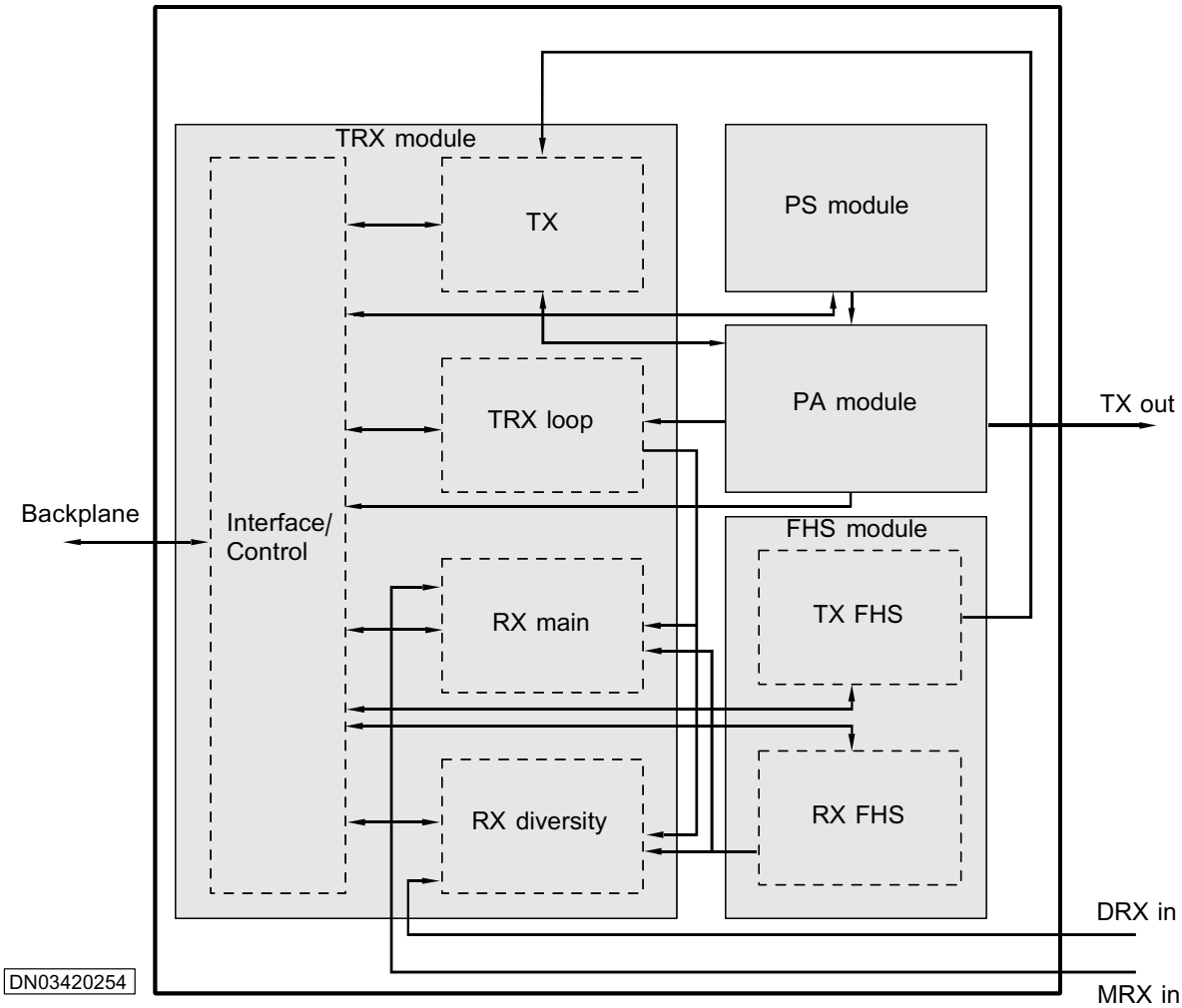


Figure 39. TSxx main modules

For frequency bands available in TSxx, see *Transceiver unit alternatives for UltraSite EDGE BTS*

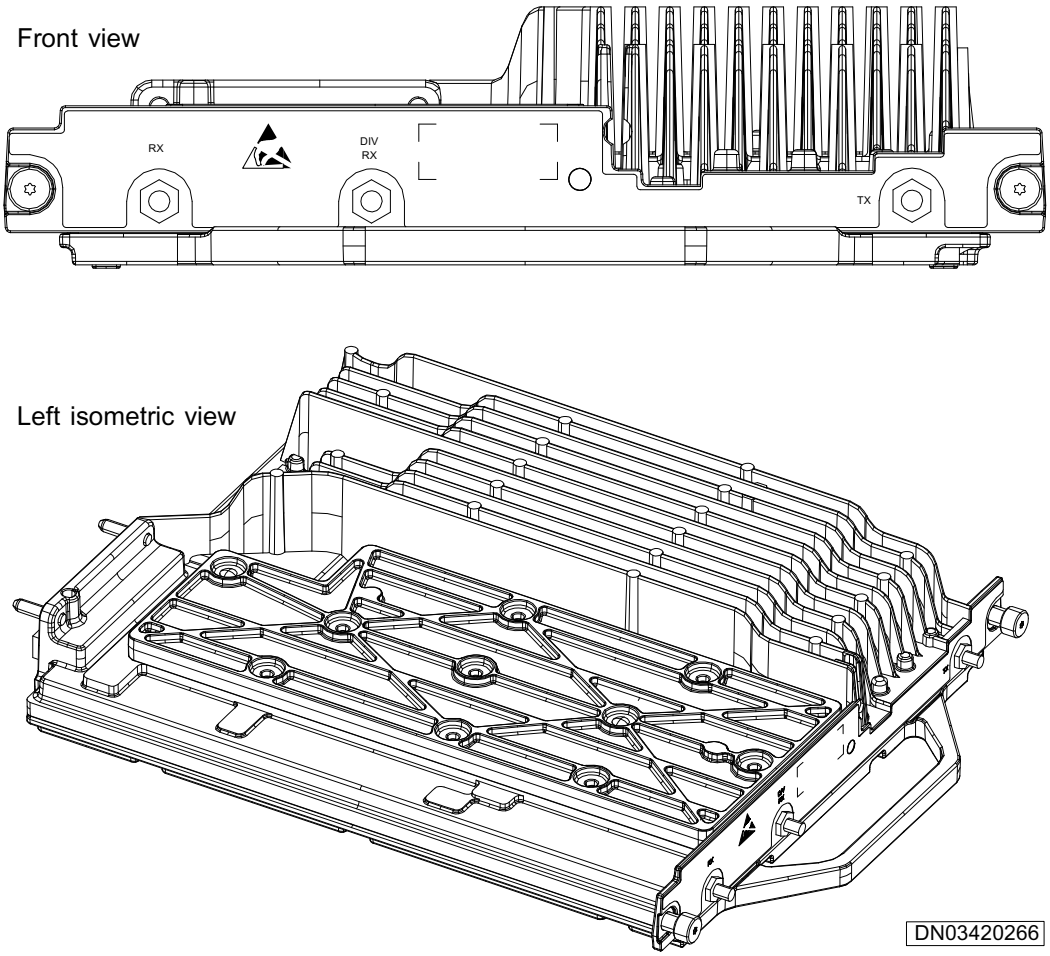


Figure 40. TSxx units

2.12.1.1 TRX module

The TRX module provides the main RF functions for UltraSite EDGE BTS. The TRX module has the following functional sections:

- Interface/Control
- Transmitter (TX)
- Main Receiver (MRx)

- Diversity Receiver (DRx)
- TRX loop

These functional sections communicate with the Transceiver Baseband (BB2x) and Base Operations and Interfaces (BOIx) units through the backplane. The functional sections process the following signals:

- data signals between the TSxx and BB2x units
- initialisation and control signals from the BB2x unit to the TSxx unit
- status and alarm signals from the TSxx unit to the BB2x unit

The TRX module includes two Application Specific Integrated Circuits (ASICs). The ASICs interface to the BB2x through the backplane and provide control and reference signals to, and alarms from, the analogue functions. One of the ASICs incorporates Direct Digital Synthesis (DDS), generating a GMSK/8-PSK signal for the transmitter.

Interface/Control section

The Interface/Control section converts the baseband (BB) data stream to GMSK/8-PSK modulation for the Transmitter section. It also converts the analogue RX signal from the main and diversity branches to the baseband data stream. The Interface/Control section controls all synthesizers and the TRX loop. It also handles clock distribution from the BB2x unit as well as alarm functions.

Transmitter (TX)

The intermediate frequency (IF) sections in the transmitter provide amplification and filtering prior to the signal being raised to the RF carrier frequency. Thereafter, the RF section amplifies the signal to the desired output signal amplitude. Filters are used to achieve spectral purity. The RF output signal is sampled and detected for output power control.

The TSxx unit supports 16 power levels for GMSK and 10 power levels for 8-PSK. The power steps are 2 dB, with a maximum range of 30 dB. Power levels from 0 to 7 are static.

Receiver (MRx/DRx)

The RF section of the receiver converts the carrier frequency signal to the IF frequency.

The IF sections of the receiver perform channel filtering to prevent interfering frequencies from distorting the signal. The IF sections also provide automatic gain control.

TRX loop

The TRX loop supports self-testing of the TSxx unit. The tests are carried out by converting the frequency of the TX signal to the RX band. The signal is coupled from the TX output, and a low-level signal is routed back through the RX path. The signal is routed to main and diverse Rx branches.

2.12.1.2 Frequency Hopping Synthesizer module

The Frequency Hopping Synthesizer (FHS) module consists of separate synthesizer blocks; the RX block and the TX block.

- The RX block serves as the first local oscillator in the receiver.
- The TX block serves as the second local oscillator in the transmitter.

Both the RX and the TX blocks have two Phased-Locked Loop (PLL) circuits. Each circuit includes a PLL, an amplification chain, and a switching network. The output buffer is common for both circuits. Each circuit has appropriate voltage supply regulation. Both blocks work according to the Ping-Pong principle; the output frequency is taken alternately from the two PLLs.

Frequency-hopping is only allowed between sets of the same hopping group configurations in GMSK mode. Frequency-hopping in EDGE mode is only allowed between matching BB2E/TSxB equipped hopping groups.

2.12.1.3 Power Amplifier module

The Power Amplifier (PA) module amplifies the GMSK/8-PSK modulated signal from the TRX module to the appropriate level and provides a detected sample of the RF output for the Power Control function on the TRX module.

2.12.1.4 Power Supply module

The Power Supply (PS) module consists of a commercial DC/DC converter, input and output filters, and connectors. The PS module of the unit converts the -48 VDC supply voltage to 26.2 VDC required by the PA module.

2.12.2 Interfaces of the Transceiver (TSxx) unit of UltraSite EDGE BTS

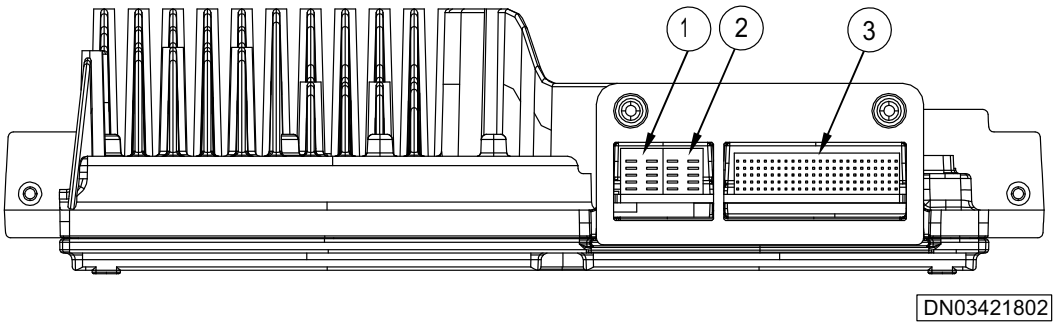
2.12.2.1 Front interfaces

Table 25. Connectors

Connector	Description	Type
RX	Receiver, main branch	SMA
DIV RX	Receiver, diversity branch	SMA
TX	Transmitter	SMA

2.12.2.2 Back interfaces

The TSxx unit has three connectors on the back of the TRX unit: X6, X7, and X100.



1	X7
2	X6
3	X100

Figure 41. TSxx back connectors

X6 connector

Table 26. X6 interface signals

Signal	Description	Pin count	Level	I/O
V48RTN	Power supply return	18	N/A	N/A
FANST	Fan status +	3	PWM	I
Not connected		9	N/A	N/A

Table 27. X6 pin configurations

Pin	Signal	Pin	Signal	Pin	Signal
A1	V48RTN	A3	V48RTN	A5	Not connected
B1	V48RTN	B3	V48RTN	B5	Not connected
C1	V48RTN	C3	V48RTN	C5	Not connected
D1	V48RTN	D3	V48RTN	D5	V48RTN
E1	V48RTN	E3	V48RTN	E5	FANST
A2	V48RTN	A4	Not connected	A6	Not connected
B2	V48RTN	B4	Not connected	B6	Not connected
C2	V48RTN	C4	Not connected	C6	Not connected
D2	V48RTN	D4	V48RTN	D6	V48RTN
E2	V48RTN	E4	FANST	E6	FANST

X7 connector

Table 28. X7 interface signals

Signal	Description	Pin count	Level	I/O
V48N	-48 VDC supply	18	N/A	N/A
FANCTRL	Fan control +	3	PWM	O
Not connected		9	N/A	N/A

Table 29. X7 pin configuration

Pin	Signal	Pin	Signal	Pin	Signal
A1	V48N	A3	V48N	A5	V48N
B1	Not connected	B3	Not connected	B5	V48N
C1	Not connected	C3	Not connected	C5	V48N
D1	Not connected	D3	Not connected	D5	V48N
E1	FANCTRL	E3	FANCTRL	E5	V48N
A2	V48N	A4	V48N	A6	V48N
B2	Not connected	B4	V48N	B6	V48N
C2	Not connected	C4	V48N	C6	V48N
D2	Not connected	D4	V48N	D6	V48N
E2	FANCTRL	E4	V48N	E6	V48N

X100 connector

Older versions of TSxA use a single X100 connector. Current versions of TSxA and all TSxB units use four side by side connectors in place of the single X100 connector. The stacked connector pins carry identical signals. The four connectors and their pin designations are described in the following table.

Table 30. X100 four-connector pin definition

Connector pins	TSxA & TSxB
A1-E6	X97
A7-E12	X98
A13-E18	X99
A19-E24	X100

Table 31. X100 interface signals

Signal	Description	Pin count	Level	I/O
DLP, DLN	Downlink bus, differential	2	LVDS	I
CK6M5P, CK6M5N	6.5 MHz clock signal, differential	2	RS-485	I
TSCLKP, TSCLKN	Time slot clock, differential	2	RS-485	I
V3P	3.3 V supply voltage, digital	2		I
GND	Ground	73		
TI2CD	I^2C serial data – internal to TSxx, BTxx	1	TTL	I/O
TI2CC	I^2C serial clock – internal to TSxx, BTxx	1	TTL	I

Table 31. X100 interface signals (cont.)

Signal	Description	Pin count	Level	I/O
RFUI2CD	I^2C serial data to DVxx	1	TTL	I/O
RFUI2CC	I^2C serial clock to DVxx	1	TTL	I
EXT_IN2	External input 2, 6.8 k Ω pull up to 3.3 V	1	LVTTL	I
CLK_DIS	Disable clock signals of boundary-scan components, active low	1	LVTTL	I
RF_RESET	Hardware reset of TSxx, active low (not used)	1	LVTTL	I
RF_TMS	Mode select, boundary scan	1	LVTTL	I
RF_TCK	Clock, boundary scan	1	LVTTL	I
RF_TDI	Data in, boundary scan	1	LVTTL	I
RF_TDO	Data out, boundary scan	1	LVTTL	O
RF_TRST	Boundary-scan reset, active low	1	LVTTL	I
ADCSYNC_-OUT	ADC_SYNC to output	1	TTL	O
V5P	+5 V DC power, digital	3		I
V9P	+9 V DC power, analogue	4		I

Table 31. X100 interface signals (cont.)

Signal	Description	Pin count	Level	I/O
V9N	-9 V DC power, analogue	2		I
BI2CC (not connected)	I^2C serial clock	1		N/A
BI2CD (not connected)	I^2C serial data	1		N/A
BOOSTER_-REF (not connected)	ADC Sync	1		N/A
UL_NRXP, UL_NRXN	Main and diversity RX branch data, alarms, status, and control from TSxx to BB2x through BOIx, differential	2	LVDS	O
DRXP, DRXN	Diversity RX data, (EDGE support), differential	2	LVDS	O
PSEN	µcontroller Program Store Enable output	1	TTL	O
_EA	µcontroller External Access input	1	TTL	I
RXD	µcontroller Serial Input port	1	TTL	I
TXD	µcontroller Serial Output port	1	TTL	O
ALE	µcontroller Address Latch Enable	1	TTL	O

Table 31. X100 interface signals (cont.)

Signal	Description	Pin count	Level	I/O
_EW	µcontroller Enable Watchdog Timer	1	TTL	I
PSEN_PROG	µcontroller In-circuit Programming signal	1	TTL	I

Note

The Level specifications are used to determine the standard by which each interface signal is transmitted. The following abbreviations are derived from telecom standards:

- LVDS – Low Voltage Differential Signalling.
- RS-485 – Recommended Standard for a balanced interface.
- TTL – Transistor Transistor Logic.
- LVTTL – Low Voltage Transistor Transistor Logic.

Table 32. X100 pin configuration for A1-A24

Pin	Signal
A1	GND
A2	ADCSYNC_IN (not used)
A3	TI2CD
A4	TI2CC
A5	BI2CC (not used)
A6	BI2CD (not connected)
A7	RFUI2CC

Table 32. X100 pin configuration for A1-A24 (cont.)

Pin	Signal
A8	RFUI2CD
A9	TXD
A10	ALE
A11	GND
A12	GND
A13	GND
A14	GND
A15	GND
A16	GND
A17	TSCLKP
A18	GND
A19	TSCLKN
A20	GND
A21	PSEN
A22	_EA
A23	GND
A24	GND

Table 33. X100 pin configuration for B1-B24

B1	V5P
B2	GND
B3	V9P
B4	GND
B5	DRXP (EDGE support)

Table 33. X100 pin configuration for B1-B24 (cont.)

B6	GND
B7	DRXN
B8	GND
B9	_EW
B10	RXD
B11	GND
B12	GND
B13	GND
B14	ADCSYNC_OUT
B15	GND
B16	GND
B17	GND
B18	GND
B19	GND
B20	GND
B21	GND
B22	GND
B23	GND
B24	GND

Table 34. X100 pin configuration for C1-C24

C1	PSEN_POG (not used)
C2	GND
C3	GND
C4	GND

Table 34. X100 pin configuration for C1-C24 (cont.)

C5	GND
C6	GND
C7	V9P
C8	GND
C9	GND
C10	RF_REST
C11	RF_TDI
C12	GND
C13	GND
C14	GND
C15	GND
C16	GND
C17	DLN
C18	GND
C19	UL_NRXN
C20	GND
C21	GND
C22	GND
C23	GND
C24	GND

Table 35. X100 pin configuration for D1-D24

D1	V9N
D2	GND
D3	V3P

Table 35. X100 pin configuration for D1-D24 (cont.)

D4	GND
D5	V5P
D6	GND
D7	V9P
D8	GND
D9	GND
D10	RF_TRST
D11	RF_TCK
D12	GND
D13	GND
D14	V3P
D15	GND
D16	EXT_IN2
D17	GND
D18	CLK_DIS
D19	GND
D20	GND
D21	CK6M5N
D22	GND
D23	CK6M5P
D24	GND

Table 36. X100 pin configuration for E1-E24

E1	V9N
E2	GND

Table 36. X100 pin configuration for E1-E24 (cont.)

E3	V3P
E4	GND
E5	V5P
E6	GND
E7	V9P
E8	GND
E9	GND
E10	RF_TDO
E11	RF_TMS
E12	GND
E13	GND
E14	GND
E15	GND
E16	GND
E17	DLP
E18	GND
E19	UL_NRXP
E20	GND
E21	GND
E22	GND
E23	GND
E24	GND

2.12.3 Transceiver (TSxx) unit LEDs for UltraSite EDGE BTS

The TSxx unit has one tri-colour LED on the front panel that indicates its operating conditions.

Table 37. LED indications

LED colour	Steady	Flashing
Red	Fault or alarm	TRX test
Yellow	Unit is on; transmitter off (no calls at any time slot)	N/A
Green	Unit is on and transmitting (call and/or BCCH)	N/A

2.13 Wideband Combiner (WCxA) unit

2.13.1 Technical description of Wideband Combiner (WCxA) unit of UltraSite EDGE BTS

Main blocks

2.13.1.1 Function

The WCxA unit(s) can combine transmit (TX) signals from two or four Transceiver (TSxx) units; then feeds the combined signal to the antenna through the TX port of the Dual Variable Gain Duplex Filter (DVxx) unit.

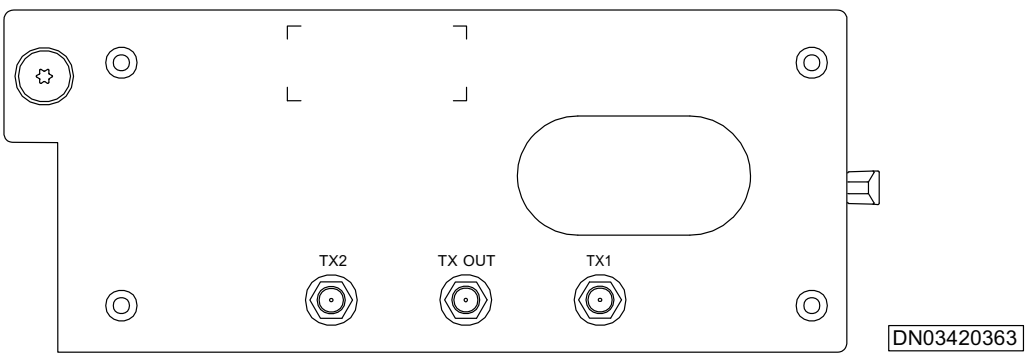


Figure 42. WCxA front panel

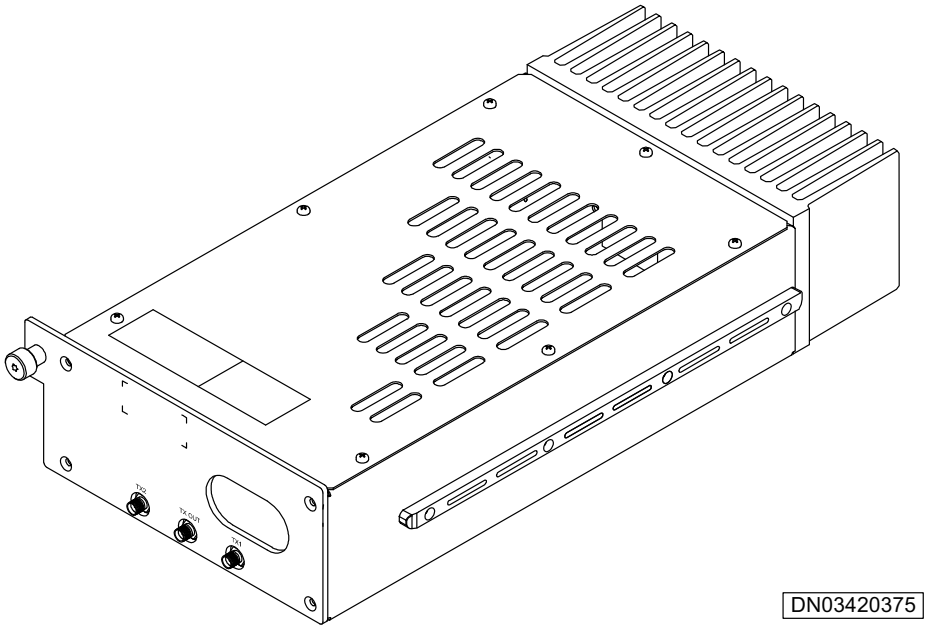


Figure 43. WCxA isometric view

2.13.1.2 Operation

Nokia UltraSite EDGE BTS supports two Wideband Combining options:

- 2-way Wideband Combining
- 4-way Wideband Combining

With 2-way Wideband Combining, the WCxA unit combines the transmit (TX) signals from two Transceiver (TSxx) units and feeds the combined signal to the antenna through the TX port of the Dual Variable Gain Duplex Filter (DVxx) unit.

With 4-way Wideband Combining, the TX signals from four TSxx units are combined using three WCxA units in the following manner. The first WCxA unit combines the TX signals from two of the four TSxx units. The second WCxA unit combines the TX signals from the other two TSxx units. The third WCxA unit combines the two combined signals; then feeds the combined signal to the antenna through the TX port of the DVxx unit.

The normal range for operational temperatures is -10° C to 65° C (14° F to 149° F). However, the WCxA unit can operate in temperatures as low as -33° C (-27.4° F) with degraded RF performance.

2.13.1.3 Main blocks

The WCxA unit contains the following components:

- one 2-way combiner
- two isolators
- one 50 Ω termination
- one heatsink for thermal dissipation

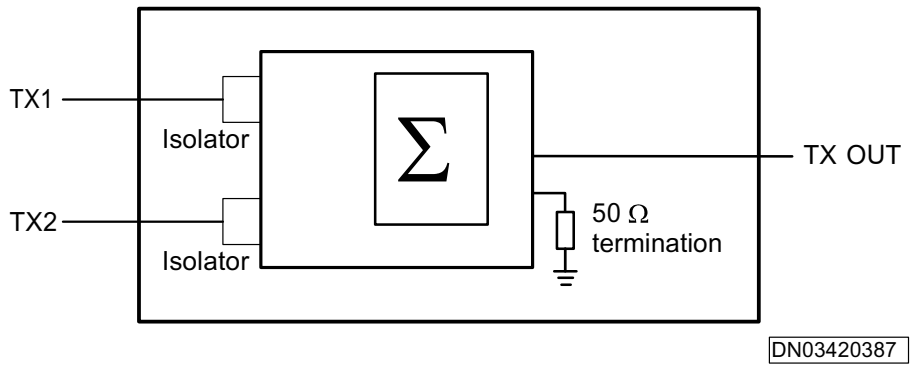
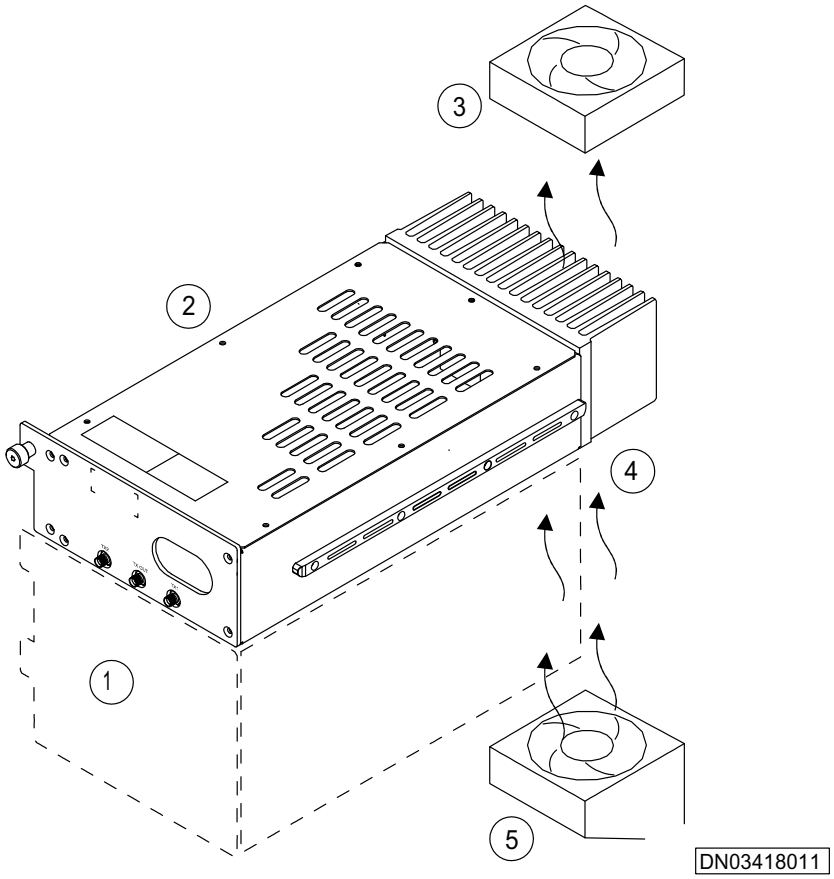


Figure 44. WCxA main blocks

The heatsink fins on the WCxA unit extend past the DVxx unit where most of the cooling occurs. Two unit cooling fans create an upward airflow through the fins at a velocity of approximately 1.1 m/s.



1	Duplexer unit
2	Wideband combiner
3	Top RF filter Unit Cooling Fan
4	Airflow
5	Bottom RF filter Unit Cooling Fan

Figure 45. Airflow through WCxA heatsink fins

2.13.2 Interfaces of the Wideband Combiner (WCxA) unit of UltraSite EDGE BTS

Table 38. Connectors

Interface	Purpose	Connector type
TX1	Receives input signal from TX connector on TSxx unit	SMA (female)
TX2	Receives input signal from TX connector on TSxx unit	SMA (female)
TX OUT	TX output	SMA (female_

2.14 Transmission (VXxx) unit

2.14.1 Technical description of Transmission (FC E1/T1) unit of UltraSite EDGE BTS

Features

The main features of the FC E1/T1 transmission unit are:

- one Abis line interface to the 2 Mbit/s (E1) or 1.5 Mbit/s (T1) transmission line
- operation as the termination point in a chain or star configuration
- balanced interface that can be configured to E1 or T1 mode
- interface statistics gathered in compliance with ITU-T G.826 and ANSI T1.403 Recommendations
- handling of timeslot 0 at 2 Mbit/s interfaces. The 2 Mbit/s E1 frame/ multiframe structure complies with ITU-T G.704/706 Recommendations
- transmitting and receiving functions at the 2 Mbit/s interfaces (HDB3 line coding, clock recovery, AIS detection etc.) and at the 1.5 Mbit/s interfaces (B8ZS line coding, clock recovery, AIS detection etc.)

- easy management of settings and transmission configurations both remotely and locally, using the Nokia Q1 management protocol. The management is carried out using a Nokia NMS-compatible node manager software.
- multiple Q1 management connections can be simultaneously active

---

Note

To meet the BTS Air interface accuracy requirement ±0.05 ppm (set by ETSI), the Abis interface must meet the long-term accuracy of ±0.015 ppm. This kind of accuracy is attained if the network master clock (PRC) fulfills the ITU-T recommendation G.811 and the synchronisation of the network is correct. The maximum jitter/wander of the Abis interface is specified in the ITU-T recommendation G.823.

MAIN blocks

FC E1/T1 units are encased plug-in units constructed on a printed circuit board. The unit connects to other units in the base station cabinet via its backplane connectors, so it does not require any additional cabling except the line interface cables.

The state of the incoming line signal is monitored in the transmission unit. If the line signal switches into an error state, the unit indicates the fault.

2.14.2 Technical description of Transmission (FXC E1 and FXC E1/T1) unit of UltraSite EDGE BTS

FXC E1 and FXC E1/T1 transmission units provide the transmission functionality, including cross-connections, for various Nokia transmission solutions. The units can be applied as a single-unit transmission equipment or a multi-unit cross-connect node.

For more information about FXC E1 and FXC E1/T1 transmission units and cross-connections, refer to the *Nokia MetroHub Transmission Node* documentation set.

Features

Following are the main features of the FXC E1 and FXC E1/T1 transmission units.

- The FXC E1 unit has:
  - four pairs of unbalanced 75 ohm (Tx and Rx) connectors (type BT-43) with each pair forming a transmission interface
  - four 2 Mbit/s (E1) A-bis interfaces to the multidrop 2 Mbit/s transmission line (one for each pair of connectors)
  - 75 ohm connectors that are connected with a grounding bridge

---

Note

If the grounding bridge is removed, the grounding of the Rx connectors' outer conductor changes from direct grounding to capacitive grounding.

- The FXC E1/T1 unit has:
  - an interface that can be independently configured as a 120 ohm E1 interface or a 100 ohm T1 interface
  - four balanced TQ connectors (Tx and Rx in the same connector)
  - four 1.5 Mbit/s (T1) A-bis interfaces to the multidrop 1.5 Mbit/s transmission line (only in FXC E1/T1)
- Both support:
  - several cross-connection types, in addition to cross-connections with the following granularities: 8k, 16k, 32k, 64k, n x 64k and 2M
  - grooming, branching, and loop protection
  - ability to operate as a loop network master or slave
  - interface statistics gathered in compliance with ITU-T G.826 and ANSI T1.403 Recommendations
  - handling of timeslot 0 at 2 Mbit/s interfaces. The 2 Mbit/s E1 frame/multiframe structure complies with ITU-T G.704/706 Recommendations
  - transmitting and receiving functions at the 2 Mbit/s interfaces (HDB3 line coding, clock recovery, AIS detection etc.) and at the 1.5 Mbit/s interfaces (B8ZS line coding, clock recovery, AIS detection etc.)
  - Fourth Rx connector that can be used as a synchronisation interface for an externally provided 2048 kHz clock signal. Software settings determine whether this connector is used or not.
  - easy management of settings and transmission configurations both remotely and locally, using the Nokia Q1 management protocol. The management is carried out using a Nokia NMS-compatible node manager software

- multiple Q1 management connections that can be active simultaneously
- advanced testing features: the transmission unit's internal tests can be started through the node manager
- Nokia Q1 End-to-End traffic routing model that allows easy transmission network planning
- a tri-colour status LED that can emit green, yellow, and red

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Note

To meet the BTS Air interface accuracy requirement ±0.05 ppm (set by ETSI), the Abis interface must meet the long-term accuracy of ±0.015 ppm. This kind of accuracy is attained if the network master clock (PRC) fulfills the ITU-T recommendation G.811 and the synchronisation of the network is correct. The maximum jitter/wander of the Abis interface is specified in the ITU-T recommendation G.823.

Another possibility is that the source for BTS master clock reference is an external 2.048 MHz clock signal. In that case the FXC unit is configured so that the fourth interface is not used for 2.048 Mbit/s traffic, but as a 2.048 MHz synchronisation input. The Abis accuracy requirement above applies also for the FXC synchronisation input interface.

MAIN blocks

The FXC E1 and FXC E1/T1 units are encased plug-in units constructed on a printed circuit board. The unit connects to other units in its environment via its backplane connectors, so it does not require any additional cabling except the line interface cables.

In the functional block diagram the unit is divided into the platform and the application part. The former takes care of the cross-connections and the interfacing to other transmission units. The latter part interfaces to other network elements.

2.14.3 Technical description of FXC RRI Transmission (FXC RRI) unit of UltraSite EDGE BTS

FXC RRI transmission unit features the cross-connection function, allowing the traffic to be groomed so that transmission paths are fully utilised. Full utilisation reduces transmission costs.

For more information about the FXC RRI transmission unit and cross-connections, refer to the *Nokia MetroHub Transmission Node* documentation set.

Features

The main features of the FXC RRI transmission unit are:

- two Flexbus interfaces, which give support for two radio outdoor units or any other network elements with Flexbus interfaces
- a separate short circuit protection in both Flexbus interfaces. This ensures that a short circuit in either of the interfaces does not affect the other Flexbus interface.
- support of one operating mode, single use.
- capacity bypassing possibility at 2M level from one Flexbus interface to another
- up to 16 x 2 Mbit/s add/drop capacity (platform interfaces)

Note

If the total Flexbus interface traffic in one FXC RRI exceeds 16 x 2 Mbit/s, the surplus traffic has to be bypassed. In such a scenario, time slot 0 is not regenerated.

- cross-connections with the following granularities: 8k, 16k, 32k, 64k, n x 64k, and 2M.
- support for several cross-connection types
- grooming, branching and loop protection support
- ability to operate as a loop network master or slave
- interface statistics collected in compliance with ITU-T G.826
- easy management of settings and transmission configurations both remotely and locally, using the Nokia Q1 management protocol. The management is carried out using a Nokia NMS compatible node manager software
- advanced testing features: the transmission unit's internal tests and loopbacks can be started using the node manager

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Note

To meet the BTS Air interface accuracy requirement ±0.05 ppm (set by ETSI), the Abis interface must meet the long-term accuracy of ±0.015 ppm. This kind of accuracy is attained if the network master clock (PRC) fulfills the ITU-T recommendation G.811 and the synchronisation of the network is correct. The maximum jitter/wander of the Abis interface is specified in the ITU-T recommendation G.823.

Another possibility is that the source for BTS master clock reference is an external 2.048 MHz clock signal. In that case the FXC unit is configured so that the fourth interface is not used for 2.048 Mbit/s traffic, but as a 2.048 MHz synchronisation input. The Abis accuracy requirement above applies also for the FXC synchronisation input interface.

MAIN blocks

FXC RRI units are encased plug-in units constructed on a printed circuit board. The unit connects to other units in the base station or transmission node cabinet via its backplane connectors. It can be connected to a radio outdoor unit or another Flexbus compatible network element through the Flexbus interfaces.

In the block diagram, FXC RRI is divided into the backplane and the application part. The backplane takes care of the cross-connections and the interfacing to other transmission units within a node. The application part interfaces either to radios or other RRI-units.

Flexbus interfaces

The Flexbus interfaces handle the communication between the FXC RRI and the radio or another indoor unit.

- radio power feed (55 VDC)
- separate short circuit protection for both radios
- overvoltage protection

A connection made between a Flexbus channel and a platform interface is a blocking connection. This means that the whole 2 Mbit/s frame is reserved for the connection even if only part of it, say, one time slot, is used.

2M cross-connect

The operator defines the traffic routes in the network elements by using the cross-connection functions available in the network elements. Thus, traffic routing means managing the cross-connections in the network elements.

- cross-connection of data signals at 2 Mbit/s granularity
- data rate adaption between 2M line interfaces and Flexbus interfaces
- capacity bypassing from one Flexbus interface to another
- alarm indication signal (AIS) detection
- elastic buffers for signal justification/dejustification
- clock regeneration

2M framer / deframer

- 16 x 2M framer/deframer
- 2M line termination

2.14.4 Interfaces of the Transmission (VXxx) units of UltraSite EDGE BTS

2.14.4.1 FXC RR1

Table 39. Connectors

Interface	Connector type
Flexbus interfaces 1 and 2 (FB 1, FB 2): up to 16 x 2 Mbit/s	TNC connectors, 50 Ω
Local Management Port, LMP	BQ connector in the BTS or the transmission node

2.14.4.2 FXC E1 and FXC E1/T1

Table 40. Connectors

Interface	Connector type
E1: 2 Mbit/s (G.703, G.704)	E1 only: BT43 female, 75 Ω

Table 40. Connectors (cont.)

Interface	Connector type
E1: 2 Mbit/s T1: 1.5 Mbit/s (T1.403, T1.102)	E1: TQ100/120 Ω T1: TQ100/120 Ω

Synchronisation interface

There is no specific synchronisation interface in any FXC unit. Any free interface input can be used as a synchronisation interface by connecting the synchronisation signal in proper format (E1 or T1) to it and configuring FXC correspondingly. The Rx-connector of line interface 4 can be used as a synchronisation interface for externally provided 2048 kHz or 1544 kHz (in FXCE1/T1 only) clock signals. The usage of this connector is selected by software.

2.14.4.3 FC E1/T1

Table 41. Connectors

Interface	Connector type
E1: 2 Mbit/s (G.703, G.704) T1: 1.5 Mbit/s (T1.403, T1.102)	E1: TQ 100/120 Ω or BT43 female, 75 Ω E1 only T1: TQ 100/120 Ω

2.14.5 Transmission (VXxx) unit LEDs for UltraSite EDGE BTS

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

Table 42. LED indications

LED colour	Static	Slow flashing	Fast flashing
GREEN	Operation	Upon Master's command[1]; no alarms active	Software is downloading
YELLOW	Major or minor alarm active	Upon Master's command; major or minor alarm(s) active	Software is downloading
RED	Critical alarm active	Upon Master's command; critical alarms active	Software is downloading

[1]When the Q1 Master unit sends the Functional Entity Indication Command (3 kHz)

Note

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

Table 43. LED indications on FXC RRI

LED colour	Situation
No light	No power feed or Tx signal
Flashing GREEN	DC power feed to the outdoor unit active; Tx signal inactive
Steady GREEN	DC power feed to the outdoor unit and Tx signal active

2.14.6 Flexbus DC LEDs on FXC RRI unit for UltraSite EDGE BTS

Table 44. Flexbus DC LEDs on FXC RRI

LED colour	Situation
No light	No power feed or Tx signal
Flashing GREEN	DC power feed to the outdoor unit active, Tx signal not active
Steady GREEN	DC power feed to the outdoor unit and Tx signal active

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 Base Operations and Interfaces (BOIx) unit of UltraSite EDGE BTS

Instructions

Installing the Base Operations and Interfaces (BOIx) unit

Removing the Base Operations and Interfaces (BOIx) unit

Reference

Technical data for the Base Operations and Interfaces (BOIx) unit

Interfaces of the Base Operations and Interfaces (BOIx) unit

Base Operations and Interfaces (BOIx) unit LEDs

Technical description of Bias Tee (BPxx) unit of UltraSite EDGE BTS

Instructions

Installing a Bias Tee (BPxx) unit

Removing a Bias Tee (BPxx) unit

Replacing a Bias Tee (BPxx) unit

Reference

Technical data for the Bias Tee (BPxx) unit

Bias Tee unit alternatives

Interfaces of the Bias Tee (BPxx) unit

Technical description of Dual Band Diplex Filter (DU2A) unit of UltraSite EDGE BTS

Instructions

Installing the Dual Band Diplex Filter (DU2A) unit

Removing a Dual Band Diplex Filter (DU2A) unit

Replacing a Dual Band Diplex Filter (DU2A) unit

Reference

Technical data for the Dual Band Diplex Filter (DU2A) unit

Interfaces of the Dual Band Diplex Filter (DU2A) unit

Technical description of Dual Variable Gain Duplex Filter (DVxx) unit of UltraSite EDGE BTS

Instructions

Installing a Dual Variable Gain Duplex Filter (DVxx) unit

Removing a Dual Variable Gain Duplex Filter (DVxx) unit

Replacing a Dual Variable Gain Duplex Filter (DVxx) unit

References

Technical data for the Dual Variable Gain Duplex Filter unit

Dual Variable Gain Duplex Filter (DVxx) unit alternatives

Interfaces of the Dual Variable Gain Duplex Filter (DVxx) unit

Dual Variable Gain Duplex Filter (DVxx) unit LEDs

Technical description of Power Supply (PWSx) unit of UltraSite EDGE BTS

Instructions

Installing a Power Supply (PWSx) unit

Removing a Power Supply (PWSx) unit

Replacing a Power Supply (PWSx) unit

Reference

Technical data for the Power Supply (PWSx) units

Power Supply (PSWx) unit alternatives

Interfaces of the Power Supply (PWSx) unit

Power Supply (PWSx) unit LEDs

Technical description of Receiver Multicoupler (MxxA) unit of UltraSite EDGE BTS

Instructions

Installing a Receiver Multicoupler (M2xA or M6xA) unit

Removing a M2xA or M6xA unit

Replacing a Receiver Multicoupler (M2xA or M6xA) unit

Reference

Technical data for Receiver Multicoupler (M2xA or M6xA) unit

Receiver Multicoupler (M2xA or M6xA) unit alternatives

Interfaces of the Receiver Multicoupler (M2xA or M6xA) unit

Technical description of Remote Tune Combiner (RTxx) unit of UltraSite EDGE BTS

Instructions

Installing a Remote Tune Combiner (RTxx) unit

Removing a Remote Tune Combiner (RTxx) unit

Replacing a Remote Tune Combiner (RTxx) unit

Reference

Technical data for the Remote Tune Combiner unit

Remote Tune Combiner (RTxx) unit alternatives

Interfaces for the Remote Tune Combiner (RTxx) unit

Remote Tune Combiner (RTxx) unit LEDs

Technical description of Temperature Control System (TCS) of UltraSite EDGE BTS

Reference

Technical data for the Temperature Control System (TCS)

Interfaces of the Temperature Control System (TCS)

Technical description of Transceiver Baseband (BB2x) unit of UltraSite EDGE BTS

Instructions

Installing a Transceiver Baseband (BB2) unit

Removing a Transceiver Baseband (BB2) unit

Replacing a Transceiver Baseband (BB2) unit

Reference

Technical data for the Transceiver Baseband (BB2x) unit

Transceiver Baseband (BB2x) unit alternatives

Interfaces of the Transceiver Baseband (BB2x) unit

Transceiver Baseband (BB2x) unit LEDs

Technical description of Transceiver (TSxx) unit of UltraSite EDGE BTS

Instructions

Installing a Transceiver (TSxx) unit

Removing a Transceiver (TSxx) unit

Replacing a Transceiver (TSxx) unit

Reference

Technical data for the Transceiver (TSxx) unit

Transceiver (TSxx) unit alternatives

Interfaces of the Transceiver (TSxx) unit

Transceiver (TSxx) unit LEDs

Technical description of Wideband Combiner (WCxA) unit of UltraSite EDGE BTS

Instructions

Installing a Wideband Combiner (WCxA) unit

Removing a Wideband Combiner (WCxA) unit

Replacing a Wideband Combiner (WCxA) unit

Reference

Technical data for the Wideband Combiner unit

Wideband Combiner (WCxA) unit alternatives

Interfaces of Wideband Combiner (WCxA) unit

Technical description of Transmission (FC E1/T1) unit of UltraSite EDGE BTS

Instructions

Installing a Transmission unit

Removing a Transmission unit

Replacing a Transmission unit

Reference

Technical data for the Transmission units

Transmission unit alternatives

Interfaces of the Transmission units

Transmission unit LEDs

Technical description of Transmission (FXC E1 and FXC E1/T1) unit of UltraSite EDGE BTS

Instructions

Installing a Transmission unit

Removing a Transmission unit

Replacing a Transmission unit

Reference

Technical data for the Transmission units

Transmission unit alternatives

Interfaces of the Transmission units

Transmission unit LEDs

BTS transmission capacity signal types

Technical description of FXC RRI Transmission (FXC RRI) unit of UltraSite EDGE BTS

Instructions

Installing a Transmission unit

Removing a Transmission unit

Replacing a Transmission unit

Reference

Technical data for the Transmission units

Transmission unit alternatives for UltraSite EDGE BTS

Interfaces of the FXC RRI Transmission unit of UltraSite EDGE BTS

Transmission unit LEDs

BTS transmission capacity signal types