Alcatel GSM

Evolium BTS A9100 Hardware Description

BTS Document

Sub-System Description

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Alcatel·Lucent

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Preface

Purpose

The Evolium BTS A9100 Hardware Description describes the cabinets, subracks, modules and cables of the Evolium BTS A9100.

All equipment, features and functions described in this document may not be available on your system.

What's New

In Edition 13

Section *Tower Mounted Amplifier with AGC Support (Section 16.2.2)* was added.

Description improvement in *Transceiver Equipments LEDs (Section 9.2.6)*.

In Edition 12

The following sections were added:

- *Performance Characteristics with AGC GSM 900P Module Functional Variant 'B' (Section 10.4.7.2)*
- *Performance Characteristics with AGC GSM 900P Module Functional Variant 'C' (Section 10.4.7.3)*.

Description improvement for filter attenuation in:

- *ANC Performance Characteristics (Section 10.3.5)*
- *General Performance Characteristics (Section 10.4.7.1)*.

Information about AGX module was removed.

In Edition 11

Section *DAC8/DAC9 (Section 11.6)* was added.

In Edition 10

Description improvement in:

- *Indoor Cabinets (Section 3)*
- *Outdoor Cabinet Interconnection Panel COMI/COME/CODI/CODE (Section 4.3)*
- *Outdoor Cabinet Signal Interfaces (Section 4.4)*.

In Edition 09

The following sections were added:

- *A9100 BTS Indoor (G3) Extension with Twin TRX (Section 2.3)*
- *A9100 BTS Indoor (G4) Extension with Twin TRX (Section 2.4)*
- *Multistandard Base Station Indoor Mixed Configurations Based on Extension with Twin TRX (Section 2.7)*
- *Multistandard Base Station Indoor Mixed Configurations Based on Extension with Twin TRX (Only in MBI5 Cabinet Variant AB) (Section 2.8)*
- *Multistandard Base Station Outdoor Configurations Based on Extension with Twin TRX (Section 2.13)*
- *Multistandard Base Station Outdoor Evolution Mixed Configurations Based on Extension with Twin TRX (Section 2.15)*
- *Outdoor Configurations Based on Extension with Twin TRX (Section 2.11)*.

In Edition 08

Insertion loss in transmit pass band parameter was corrected in *AGC Performance Characteristics (Section 10.4.7)*.

Section *External Battery Cabinet Outdoor Interfaces (Section 5.2.4)* was added.
Description improvement in:

- *LEDs (Section 12.15.2)*
- *PM18 Front View (Section 12.15.5)*.

In Edition 07

Section *TWIN Transceiver Equipment (Section 9.2)* was added.
Description improvement in:

- *LEDs (Section 12.17.2.1)*
- *BCU2 Front Panel (Section 12.17.3)*.

In Edition 06

Description improvement in:

- *LEDs (Section 12.17.2.1)*
- *BCU2 Front Panel (Section 12.17.3)*.

In Edition 05

Section *DCDUE (Section 12.32)* was added.
The following sections were updated for MBOxEDC cabinet variant:

- *Outdoor Cabinets (Section 1.2.1.2)*
- *Available Cabinets and Subracks (Section 1.4.1.1)*
- *Available Cabinet-Mounted Equipment / Modules (Section 1.4.1.2)*
- *Dimensions and Weight of Cabinet-Mounted Equipment (Section 1.4.2)*
- *Outdoor Cabinets General Information (Section 4.1)*

- *Outdoor Cabinet Access and Features (Section 4.2)*
- *Outdoor Cabinet Power Supply and Grounding (Section 4.6)*
- *MBO1/MBO1DC/MBO2/MBO2DC Internal Cables (Section 4.8.1.4)*
- *MBO1/MBO1DC/MBO1T/MBO2/MBO2DC (Section 4.9.1.3)*

Description improvement in *Output Power Parameters (Section 12.15.1.3)*.

Title formatting for *Outdoor Control Board CPT2/MBO1/MBO1DC/MBO1T/MBO1E/MBO2/MBO2DC/ MBO2E/CBO (Section 4.5)*

In Edition 04

The document was updated for A9100 MBS Evolution Outdoor.
The following sections are added:

- *HEX8/HEX9 (Section 11.5)*
- *ACDUE (Section 12.6)*
- *BOMUE (Section 17.1.7)*
- *PM18 (Section 12.15)*

The following sections were updated for MBOxE cabinet variant:

- *Outdoor Cabinets (Section 1.2.1.2)*
- *Available Cabinets and Subracks (Section 1.4.1.1)*
- *Available Cabinet-Mounted Equipment / Modules (Section 1.4.1.2)*
- *Dimensions and Weight of Cabinet-Mounted Equipment (Section 1.4.2)*
- *Outdoor Cabinets General Information (Section 4.1)*
- *Outdoor Cabinet Access and Features (Section 4.2)*
- *Outdoor Cabinet Power Supply and Grounding (Section 4.6)*
- *MBO1/MBO1DC/MBO2/MBO2DC Internal Cables (Section 4.8.1.4)*
- *MBO1/MBO1DC/MBO1T/MBO2/MBO2DC (Section 4.9.1.3)*

In Edition 03

The following sections were added for Geran Antenna Network:

- *AGC (Section 10.4)*
- AGX.

Section *ANC (Section 10.3)* was updated for ANCGP.

In Edition 02

The document was updated with remark that XBCB connector is used for inventory of powered off BTSs at factory level.

Section *Transceiver Equipment (Section 9)* was updated for new power amplifier TEPADHE on TADHE.
The following sections were added for MBO1T cabinet variant:

- *ACMUT (Section 12.8)*

- *LPFMT (Section 12.3)*
- *BOMUT (Section 17.1.8)*

The following sections were updated for MBO1T cabinet variant:

- *Outdoor Cabinets (Section 1.2.1.2)*
- *Available Cabinet-Mounted Equipment / Modules (Section 1.4.1.2)*
- *Dimensions and Weight of Cabinet-Mounted Equipment (Section 1.4.2)*
- *MBO1T (Section 4.1.19)*
- *Outdoor Cabinet Access and Features (Section 4.2)*
- *MBO1T (Section 4.6.5)*
- *MBO1/MBO1DC/MBO2/MBO2DC Internal Cables (Section 4.8.1.4)*
- *MBO1/MBO1DC/MBO1T/MBO2/MBO2DC (Section 4.9.1.3)*

The following sections were updated for CBO cabinet with permanent DC connection:

- *Outdoor Cabinets (Section 1.2.1.2)*
- *Available Cabinet-Mounted Equipment / Modules (Section 1.4.1.2)*
- *Dimensions and Weight of Cabinet-Mounted Equipment (Section 1.4.2)*
- *CBO (Section 4.1.26)*
- *CBO (Section 4.6.8)*
- *CBO (Section 4.9.1.5)*

The following sections were added:

- *Outdoor CBO - 2x2 (Section 2.9.1.5)*
- *Outdoor CBO - 3x1 (Section 2.9.1.9)*
- *HEAT4 (Section 11.9)*
- *DCDU (Section 12.31)*.

Section *External Battery Cabinet Outdoor (Section 5.2)* was updated for new EBCO Design on KNUERR TECORAS basis.

In Edition 01

Improvement of Abis interface description in *Abis Interface (Section 3.1.3.4)*.

Introduction of TRX EDGE+ with RF High Power for GSM 900/1800, *Transceiver Equipment (Section 9)* has been updated due to introduction of TRX EDGE+ with RF High Power for GSM 900/1800.

Update for widen the AC voltage range of PM12 AC/DC converter from 230V+/-15% to 150~280V AC.

Audience

This manual is for:

- Commissioning personnel
- System support engineers
- Training department (for reference use)
- Any other personnel interested in the Evolium BTS A9100 hardware.

Assumed Knowledge

The reader must have a general knowledge of telecommunications systems, terminology and BTS functions.

1 Overview

This Overview gives information needed for project managers and foremen, for the presentation to the customer and site planning.

1.1 Modularity and Common Information

The BTS A9100's modular design allows for omni-directional, sectorized and multiband configurations. Configurations are built from a small range of primary components. This allows BTS installations to be tailored to suit different situations and applications.

The basic building blocks of a BTS A9100 installation are:

- Cabinets for indoor and outdoor installations
- Four types of subrack. SRACDC, ACSR, and ASIB house the AC/DC power modules; STASR houses the telecommunications modules and AC/DC power modules
- A number of telecommunications modules
- Power supply modules
- Modules for temperature control.

Additional cabinet equipment is required, such as fans, power supplies, heat exchangers, optional batteries and cables.

The arrangement of the subracks in the cabinets takes into account the requirements for:

- Thermal cooling, achieved with forced-air cooling
- Minimization of floor space, achieved with back-to-back, back-to-wall or side-to-side cabinet installations
- Ease of access and maintenance, from the front of the cabinets
- Future system expansion.

Configurations	Based on those building blocks all possible BTS A9100 configurations are assembled, see *Configurations - Rack Layouts (Section 2)*.
Operating Temperatures	All BTS A9100 equipment operates in a temperature-controlled environment. The internal temperature of enclosures is regulated with a combination of heaters, heat exchangers and cooling fans, depending on the type of installation required. Environmental conditions, such as the availability of an indoor or outdoor site and climate, are taken into consideration when planning an installation.
Grounding	Grounding of BTS A9100 equipment installations is maintained throughout, via a distributed earthing system which interconnects all metallic parts with the cabinet ground. A cabinet bus bar (or a cableform equivalent) is an important part of this earthing system. The bus bar complies with European standard EN60950 V2. Equipment cabinets must be connected to a suitable external system ground at the installation site.
Units of Measurement	Standard TEP units of measurement are used for BTS A9100 equipment. Metric and imperial equivalents for the TEP units are as follows: ▶ 1 HU = 44.45 mm (1.75 inches) ▶ 1 WU = 5.08 mm (0.20 inches).
Standards	All BTS A9100 equipment complies with the following ETSs: ▶ ETS 300 342-2 EMC for European Digital Cellular Telecommunications Systems ▶ GSM Recommendation for Base Station Equipment 11.21, prETS300.

1.2 Cabinets

1.2.1 Cabinet Overview

The type of cabinet used depends on a number of different items required for a particular installation. Cabinet types and requirements are described below for:

- Indoor cabinets
- Outdoor cabinets
- Configurations
- Indoor power requirements
- Outdoor power requirements
- Cabling.

1.2.1.1 Indoor Cabinets

The available indoor cabinets, and the number of subracks they can contain, are:

- CIMI - two STASRs
- CIDI - two STASRs
- CIMA - five STASRs, or three STASRs and one ASIB
- CIDE - five STASRs, or four STASRs and a battery area for BU41s or BU100s
- MBI3 - three STASRs, or two STASRs and a battery area for BU101s
- MBI5 - five STASRs, or four STASRs and a battery area for BU101s.

1.2.1.2 Outdoor Cabinets

The available outdoor cabinets, and the number of subracks they can contain, are:

- COMI - two STASRs and one SRACDC or ACSR and a battery area for BU41s or BU100s and MV area
- COME - five STASRs and one SRACDC or ACSR and a battery area for BU41s or BU100s and MV area
- CODI - four STASRs and a battery area for BU41s or BU100s and MV area
- CODE - seven STASRs and a battery area for BU41s or BU100s and MV area
- CPT2 - five STASRs and a battery area for BU41s or BU100s
- MBO1 - four STASRs and a battery area for BU41s or BU101s
- MBO1DC - three STASRs and an MW area
- MBO1T - three STASRs and an MW area
- MBO1E - three STASRs, power supplies subrack and an optional area for batteries or microwave
- MBO1EDC - three STASRs and an optional area for microwave
- MBO2 - eight STASRs and a battery area for BU41s or BU101s
- MBO2DC - six STASRs and a MW area
- MBO2E - six STASRs, power supplies subrack and an optional area for batteries or microwave
- MBO2EDC - six STASRs and an optional area for microwave
- CBO - two STASRs with a MW area and optional BATS for the AC variant.

An additional cabinet, COEP, is required when upgrading a COMI to the functionality of a COME, or when upgrading a CODI to the functionality of a CODE.

1.2.1.3 Indoor Power Requirements

The CIMI/CIDI, CIMA/CIDE, and MBI3/MBI5 cabinets are designed to operate from the following external supply voltages:

- CIMI and CIMA DC external supply variant:
  - 0/ -48 VDC
  - 0/ -60 VDC.
- CIMA/CIDE and MBI3/MBI5 AC external supply variant, 230 VAC 1 Ø
  The AC input is converted to 0/ -48 VDC $_{nom.}$ for use within the cabinets. In the event of a mains failure, an optional battery backup unit BU41 or BU100 can be used to provide the DC supply voltage.

For more information about the CIMI/CIDI and CIMA/CIDE, refer to *CIMI/CIDI (Section 3.1)* and *CIMA/CIDE (Section 3.2)*, respectively. For more information about the BU41 and BU100, refer to *BU41 (Section 12.24)* and *BU100 (Section 12.25)* respectively.

1.2.1.4 Outdoor Power Requirements

The COMI/CODI, COME/CODE, CPT2, and MBO1/MBO1E/MBO2/MBO2E cabinets are designed to operate from external AC mains supplies:

- 230 VAC 1Ø
- 400 VAC 3Ø.

The CBO and MBO1T cabinet are designed to operate from external AC mains supplies 230 VAC 1Ø.

The AC input is converted to 0/ -48 $VDC_{nom.}$ for use within the cabinets.

In the event of a mains failure, an optional battery backup unit, BU41 or BU100, can be used to provide the DC supply voltage.

The CBO DC and MBO1DC/MBO2DC cabinets are designed to operate from external DC mains supplies. The 0/ -48 $VDC_{nom.}$ input is distributed for use within the cabinets.

For more information about the COMI/CODI, COME/CODE, CPT2, CBO and MBO1/MBO2, refer to *Outdoor Cabinets (Section 4)*. For more information about the BU41, BU100 and BU101, refer to *BU41 (Section 12.24)*, *BU100 (Section 12.25)* and *BU101 (Section 12.26)* respectively.

1.2.1.5 Cabling

The cable sets supplied with the BTS A9100 fall into the following categories:

- Power
- Abis links
- Internal interconnection.

1.2.2 Cabinet Dimensions and Weight

The following table shows the overall dimensions and the weight of all cabinets.

Cabinet	Height Overall/ Usable	Width Overall/ Usable	Depth	Weight
CIMI/CIDI	920 mm/ 16 HU	600 mm/ 84 WU	450 mm	115 kg fully equipped
CIMA/CIDE	1940 mm/ 38 HU	600 mm/ 84 WU	450 mm	270 kg fully equipped (AC and DC)
COMI/CODI (side compartment)	1500 mm/ 24 HU 24 HU = 17 HU for equipment + 7 HU for battery	1200 mm/ 2 x 84 WU	700 mm	200 kg empty (except for HEX2 and HEAT2)
COME/CODE (compartment 1 and 2) (side compartment)	1500 mm/ 24 HU 24 HU = 17 HU for equipment + 7 HU for batteries	1800 mm/ 3 x 84 WU	700 mm	295 kg empty (except for HEX2 and HEAT2)
COEP	1500 mm/ 24 HU	600 mm/ 84 WU	700 mm	95 kg empty (except for HEX2 and HEAT2)
CPT2	1500 mm/ 24 HU	1200 mm/ 2 x 84 WU	700 mm	380 kg fully equipped w/ o battery
MBI3	1300 mm/ 23 HU	600 mm/ 84 WU	450 mm	170 kg fully equipped (AC and DC)
MBI5	1940 mm/ 38 HU	600 mm/ 84 WU	450 mm	270 kg fully equipped (AC and DC)
MBO1/MBO1DC/MBO1T	1500 mm/ 24 HU	825 mm/ 162 WU	750 mm	95 kg not equipped w/ o battery
MBO1E	1610 mm/26 HU	940 mm/ 185 WU	750 mm	90 kg for empty cabinet
MBO2/MBO2DC	1500 mm/ 24 HU	1500 mm/ 295 WU	750 mm	175 kg not equipped w/ o battery
MBO2E	1610 mm/26 HU	1550 mm/ 305 WU	750 mm	150 kg for empty cabinet
CBO/CBO DC	900 mm/ 18 HU	720 mm/ 84 WU	700 mm	150 kg fully equipped

Table 1: Cabinets, Dimensions and Weight

1.3 Subracks

1.3.1 Overview

The subracks are constructed from two steel-chromate side plates and five metal extrusions which form a frame box. Attached to the frame box are the backplane module and FANU guide rails, and other components such as a ground connector. The subrack is equipped with six integral lugs which enable it to be fixed to the equipment rack with self-tapping screws.

The subracks conform to ETSI standard IEC297-3 for 19 inch telecommunications equipment practice.

The subrack plug-in modules are electrically connected by inserting them into the backplane connectors along plastic guide rails. The connectors have guide-pins which ensure the module and subrack connectors mate together, without risk of bending the connector pins.

The plug-in modules are secured in the subrack with Camloc quarter-turn fasteners.

There are four types of subrack:

- **STASR**
  The STASR is the basic subrack used for all indoor and outdoor applications. It can contain a mixture of telecommunications and power supply plug-in modules. When the subrack contains TREs additional components, the FANU and FACB, are attached to the subrack.
  For more information about the STASR, refer to *Standard Telecommunications Subrack (Section 6)*.
- **SRACDC**
  The SRACDC is an AC power supply subrack for BTS A9100 outdoor configurations. For more information about the SRACDC, refer to *SRACDC (Section 7.1)*.
- **ACSR**
  The ACSR is an AC power supply subrack used for BTS A9100 outdoor configurations. For more information about the ACSR, refer to *ACSR (Section 7.2)*.
- **ASIB**
  The ASIB is only used for indoor applications. For more information about the ASIB, refer to *ASIB (Section 7.3)*.

1.3.2 Subrack Dimensions

The following table shows the overall dimensions of all the subracks. They are the same for STASR, SRACDC, ACSR and ASIB.

Height (TEP/ mm)	Width (TEP/ mm)	Depth (mm)
7 HU/ 311.5 (= 6 HU for modules + 1 HU for fans)	84 WU/ 431.8	304.4

Table 2: Subracks, Dimensions

1.4 Cabinet-Mounted Equipment

1.4.1 Overview of Cabinet-Mounted Equipment

The cabinet-mounted equipment and modules available for the BTS A9100 are listed in the following tables. The tables also provide a reference to the sections that describe each item.

1.4.1.1 Available Cabinets and Subracks

The cabinet and subracks available for the BTS A9100 are listed below.

Mnemonic	Description	Part No.	For More Information...
ACSR	AC Subrack for PM11	3BK 08712	*ACSR (Section 7.2)*
ASIB	AC/DC Subrack Individual Battery	3BK 08676	*ASIB (Section 7.3)*
CIDE	Cabinet Indoor Medi	3BK 25098	*CIMA/CIDE (Section 3.2)*
CIDI	Cabinet Indoor Mini	3BK 25099	*CIMI/CIDI (Section 3.1)*
CIMA	Cabinet Indoor Medi	3BK 07181	*CIMA/CIDE (Section 3.2)*
CIMI	Cabinet Indoor Mini	3BK 07605	*CIMI/CIDI (Section 3.1)*
CODE	Cabinet Outdoor Medi	3BK 25100	*Outdoor Cabinets (Section 4)*
CODI	Cabinet Outdoor Mini	3BK 25101	*Outdoor Cabinets (Section 4)*
COEP	Cabinet Outdoor Expanding Part	3BK 07979	*Outdoor Cabinets (Section 4)*
COME	Cabinet Outdoor Medi	3BK 07606	*Outdoor Cabinets (Section 4)*
COMI	Cabinet Outdoor Mini	3BK 07607	*Outdoor Cabinets (Section 4)*
CPT2	Compact Outdoor, 2 Doors	3BK 25468	*Outdoor Cabinets (Section 4)*
MBI3	Multistandard BTS Indoor, 1 Door	3BK 25964	*Multistandard Base Station Indoor (Section 3.3)*
MBI5	Multistandard BTS Indoor, 2 Doors	3BK 25965	*Multistandard Base Station Indoor (Section 3.3)*
MBO1	Multistandard BTS Outdoor, 1 Door	3BK 25673	*Outdoor Cabinets (Section 4)*
MBO1E/MBO1EDC	Multistandard BTS Evolution Outdoor, 1 Door	3BK 27263	*Outdoor Cabinets (Section 4)*
MBO2	Multistandard BTS Outdoor, 2 Doors	3BK 25675	*Outdoor Cabinets (Section 4)*
MBO2E/MBO2EDC	Multistandard BTS Evolution Outdoor, 2 Doors	3BK 27264	*Outdoor Cabinets (Section 4)*
MBOE	Extension Outdoor Cabinet Multistandard	3BK 25677	*Outdoor Cabinets (Section 4)*
MBOEE/MBOEEDC	Extension Outdoor Evolution Cabinet Multistandard	3BK 27265	*Outdoor Cabinets (Section 4)*
MBO1DC	Multistandard BTS DC Outdoor, 1 Door	3BK 26612	*Outdoor Cabinets (Section 4)*
MBO2DC	Multistandard BTS DC Outdoor, 2 Doors	3BK 26614	*Outdoor Cabinets (Section 4)*
MBOEDC	Extension Outdoor DC Cabinet Multistandard	3BK 26616	*Outdoor Cabinets (Section 4)*

Mnemonic	Description	Part No.	For More Information...
MBO1T	Multistandard BTS Outdoor Tropical, 1 Door	3BK 27138	*Outdoor Cabinets (Section 4)*
SRACDC	AC/DC Subrack Outdoor	3BK 07987	*SRACDC (Section 7.1)*
STASR	Standard Communications Subrack	3BK 07193	*Standard Telecommunications Subrack (Section 6)*
CBO	Compact BTS Outdoor	3BK 26320	*Outdoor Cabinets (Section 4)*
CBO DC	Compact BTS Outdoor DC powered	3BK 27013	*Outdoor Cabinets (Section 4)*

Table 3: Cabinet and Subrack Part Numbers

1.4.1.2 Available Cabinet-Mounted Equipment / Modules

The cabinet-mounted equipment and modules available for the BTS A9100 are listed in the following table.

Mnemonic	Description	Part No.	For More Information...
ABAC	AC Indoor Battery Control Unit	3BK 08673	*ABAC (Section 12.20)*
ACDUE	AC Distribution Unit Evolution	3BK 27266	*ACDUE (Section 12.6)*
ACIB	AC Interface Box	3BK 07989	*ACIB (Section 12.1)*
ACRI	AC Remote Inventory	3BK 07941	*ACRI (Section 13)*
ACMU	AC Switch Unit Multistandard	3BK 25785	*ACMU (Section 12.7)*
ACMUT	AC Distribution Unit Tropical	3BK 27140	*ACMUT (Section 12.8)*
ACSU	AC Switch Unit	3BK 25126	*ACSU (Section 12.9)*
ACUC	AC Connection Unit Compact	3BK 26323	*ACUC (Section 12.10)*
ADAM	Adapter Module	3BK 25025	*ADAM (Section 12.21)*
ADAM2	Adapter Module 2	3BK 25475	*ADAM2 (Section 12.22)*
ADAM4	Adapter Module 4	3BK 25997	*ADAM4 (Section 12.23)*
AFIP	AC Indoor Filter Panel	3BK 08674	*CIMA/CIDE Power Supply and Grounding (Section 3.2.7)*
ANCD	Antenna Network Combined GSM 1800 Module	3BK 08995	*ANC (Section 10.3)*
ANCG	Antenna Network Combined GSM 900 Module	3BK 08993	*ANC (Section 10.3)*
ANCL	Antenna Network Combined GSM 850 Module	3BK 25900	*ANC (Section 10.3)*

Mnemonic	Description	Part No.	For More Information...
ANCP	Antenna Network Combined GSM 1900 Module	3BK 25393	*ANC (Section 10.3)*
ANXD	Antenna Network X GSM 1800 Module	3BK 07241	*ANX (Section 10.1)*
ANXG	Antenna Network X GSM 900 Module	3BK 07232	*ANX (Section 10.1)*
ANXP	Antenna Network GSM 1900 Module	3BK 08459	*ANX (Section 10.1)*
ANYD	Antenna Network Y GSM 1800 Module	3BK 07245	*ANY (Section 10.2)*
ANYG	Antenna Network Y GSM 900 Module	3BK 07237	*ANY (Section 10.2)*
ANYL	Antenna Network Y GSM 850 Module	3BK 25903	*ANY (Section 10.2)*
ANYP	Antenna Network Y GSM 1900 Module	3BK 08465	*ANY (Section 10.2)*
APOD	AC Indoor Power Distribution Panel	3BK 08675	*APOD (Section 12.11)*
BACO	Battery Connection Box	3BK 07988 AA	*BACO (Section 12.18)*
BAC2	Battery Connection Box	3BK 07988 AB	*BAC2 (Section 12.19)*
BATS	Small Battery Unit	3BK 25848	*BATS (Section 12.28)*
BCU1	Battery Control Unit 1	3BK 06784	*BCU1 (Section 12.16)*
BCU2	Battery Control Unit 2	3BK 08714	*BCU2 (Section 12.17)*
BU41	Battery Unit 40 Ah	3BK 08035	*BU41 (Section 12.24)*
BU100	Battery Unit 100 Ah	3BK 08932	*BU100 (Section 12.25)*
BU101	Battery Unit 100 Ah for using in MBO	3BK 25854	*BU101 (Section 12.26)*
DAC8	Direct Air Cooling 8 used in MBOEE	3BK 27794	*DAC8/DAC9 (Section 11.6)*
DAC9	Direct Air Cooling 9 used in MBO1E	3BK 27795	*DAC8/DAC9 (Section 11.6)*
DCDP	DC Distribution Panel	3BK 07990	*DCDP (Section 12.30)*
DCDU	DC Distribution Unit	3BK 27015	*DCDU (Section 12.31)*
DCDUE	DC Distribution Unit Evolution	3BK 27267	*DCDUE (Section 12.32)*
DCMU	DC Connection Unit Multistandard	3BK 26618	*DCMU (Section 12.33)*
DCUC	DC Distribution Unit Compact	3BK 26324	*DCUC (Section 12.34)*
FACB	Fan Control Board	3BK 07202	*Cooling System (Section 11.1)*
FANU	Fan Unit	3BK 07205	*Cooling System (Section 11.1)*

Mnemonic	Description	Part No.	For More Information...
HEAT2	Heating Unit 2	3BK 08075	*HEAT2 (Section 11.7)*
HEAT3	Heating Unit 3	3BK 26343	*HEAT3 (Section 11.8)*
HEATDC	Heating Unit DC	3BK 26619	*HEATDC (Section 11.10)*
HEX2	Heat Exchanger 2	3BK 07978	*HEX2 (Section 11.2)*
HEX3	Heat Exchanger 3 for using in MBOE	3BK 25659	*HEX3/HEX4 (Section 11.3)*
HEX4	Heat Exchanger 4 for using in MBO1	3BK 25660	*HEX3/HEX4 (Section 11.3)*
HEX5	Heat Exchanger 5 for using in CBO	3BK 26325	*HEX5 (Section 11.4)*
HEX8	Heat Exchanger 8 for using in MBOEE	3BK 27148	*HEX8/HEX9 (Section 11.5)*
HEX9	Heat Exchanger 9 for using in MBO1E	3BK 27149	*HEX8/HEX9 (Section 11.5)*
LPFC	Lightning Protection and Filter Unit Compact	3BK 26322	*LPFC (Section 12.2)*
LPFMT	Lightning Protection and Filter Unit Tropical	3BK 27141	*LPFMT (Section 12.3)*
LPFM	Lightning Protection and Filter Unit Multistandard	3BK 25786	*LPFM (Section 12.4)*
LPFU	Lightning Protection and Filter Unit	3BK 25157	*LPFU (Section 12.5)*
PM08	Power Module 800 W	3BK 06783	*PM08 (Section 12.12)*
PM11	Power Module 1100 W	3BK 08713	*PM11 (Section 12.13)*
PM12	Power Module 1200 W	3BK 25024	*PM12 (Section 12.14)*
PM18	Power Module 1800 W	3BK 27198	*PM18 (Section 12.15)*
RIBAT	Remote Inventory Battery	3BK 25134	*RIBAT (Section 12.29)*
SUMA	Station Unit Module Advanced	3BK 08925	*Station Unit Modules (Section 8)*
SUMP	Station Unit Module PCM	3BK 07224	*Station Unit Modules (Section 8)*
TADH	Transceiver Module GSM 1800 High Power	3BK 25373	*Transceiver Equipment (Section 9)*
TAGH	Transceiver Module GSM 900 High Power	3BK 26154	*Transceiver Equipment (Section 9)*
TRAD	Transceiver Module GSM 1800 Medium Power	3BK 08980	*Transceiver Equipment (Section 9)*
TRADE	Transceiver Module GSM 1800 Medium Power Enhanced 8-PSK power	3BK 26526	*Transceiver Equipment (Section 9)*

Mnemonic	Description	Part No.	For More Information...
TRAG	Transceiver Module GSM 900 Medium Power	3BK 08967	*Transceiver Equipment (Section 9)*
TRAGE	Transceiver Module GSM 900 Medium Power Enhanced 8-PSK power	3BK 26525	*Transceiver Equipment (Section 9)*
TRAL	Transceiver Module GSM 850 Medium Power	3BK 25894	*Transceiver Equipment (Section 9)*
TRAP	Transceiver Module GSM 1900 Medium Power	3BK 25825	*Transceiver Equipment (Section 9)*
TRDH	Transceiver Module GSM 1800 High Power	3BK 07723	*Transceiver Equipment (Section 9)*
TRDM	Transceiver Module GSM 1800 Medium Power	3BK 07372	*Transceiver Equipment (Section 9)*
TRGM	Transceiver Module GSM 900 Medium Power	3BK 07206	*Transceiver Equipment (Section 9)*
TRPM	Transceiver Module GSM 1900	3BK 08556	*Transceiver Equipment (Section 9)*

Table 4: Equipment and Module Part Numbers

1.4.1.3 Module Replacement

For detailed information on how to replace modules in the BTS A9100, see the *Evolium BTS A9100/A9110 Corrective Maintenance Handbook*.

1.4.2 Dimensions and Weight of Cabinet-Mounted Equipment

The following table shows the overall dimensions and weight of heavy cabinet-mounted equipment.

Module	Height TEP/ mm	Width TEP/ mm	Depth mm	Weight
ABAC	3 HU/ 128	44 WU/ 223	285	-
ACIB	3 HU/ 128	28 WU/ 141.6	285	-
ACMU	-/172	-/237	127	-
ACMUT	-/172	-/217	125	-
ACRI	3 HU/ 128	6 WU/ 30	285	-
ACUC	-/ 135	-/ 150	146	-
ADAM	-/ 39	42 WU/ 213	280	-

Module	Height TEP/ mm	Width TEP/ mm	Depth mm	Weight
ADAM2	-/ 39	28 WU/ 142	280	-
ADAM4	-/ 39	56 WU/ 284	280	-
ANC	6 HU/ 265	28 WU/ 142	298	-
ANX	6 HU/ 265	31 WU/ 160	298	-
ANY	6 HU/ 265	10 WU/ 52	298	-
APOD	3 HU/ 128	34 WU/ 172	285	-
BACO	3 HU/ 128	50 WU/ 253	285	-
BAC2	6 HU/ 265	14 WU/ 71	285	-
BATS	6 HU/ 265	28 WU/ 142	280	15 kg
BCU1	3 HU/ 128	9 WU/ 45.7	280	-
BCU2	6 HU/ 265	10 WU/ 51	280	-
BU41	-/ 200	-/ 250	200	50 kg
BU100	-/ 234	-/ 250	400	120 kg
BU101	-/ 234	-/ 250	400	120 kg
DCDP	2 HU/ 89	95 WU/ 482.6	152.5	-
DCDU	-/227	-/120	147	-
DCDUE				-
DCMU	-/ 172	-/ 237	125	-
DCUC	-/ 135	-/ 150	146	-
FACB	-/ 95	-/ 55	-	-
FANU	1 HU/ 44	26 WU/ 133	298	-
HEAT	-/ 80	-/ 234.5	140	-
HEAT3	1 HU/ 44	19 WU/ 482	350	-
HEAT4	-/60	-/445	350	-
HEATDC	-/ 101	-/ 170	-/ 145	-
HEX2	-/ 1045	-/ 440	152	24 kg
HEX3	-/ 1150	-/ 450	150	24 kg

Module	Height TEP/ mm	Width TEP/ mm	Depth mm	Weight
HEX4	-/ 1150	-/ 600	150	28 kg
HEX5	-/ 770	-/ 450	130	16 kg
LPFM	-/261	-/181	75	-
LPFMT	-/261	-/181	75	-
LPQD	n/a	n/a	n/a	-
LPQG	n/a	n/a	n/a	-
LPQM	n/a	n/a	n/a	-
LPQP	n/a	n/a	n/a	-
PM08	3 HU/ 128	15 WU/ 76	280	-
PM11	6 HU/ 265	15 WU/ 76	280	-
PM12	-/ 240	14 WU/ 71	280	-
SUMP	6 HU/ 265	10 WU/ 52	298	-
SUMA	6 HU/ 265	10 WU/ 52	298	-
TRE	6 HU/ 265	21 WU/ 106	298	-
	6 HU/ 265	28 WU/ 142	298	-

Table 5: Cabinet-Mounted Equipment, Dimensions and Weight

1.5 Cables

Most BTS A9100 cables are common to both the mini and medi cabinets. The number of standard RF cables that are used varies according to the configuration.

The cabling consists of both:

- Discrete cables, which have the designation CA
- Cable sets, which have the designation CS.

The grouping of certain cables into cable sets can provide advantages in terms of ease of installation or manufacturing.

The BTS A9100 cables are categorized as internal and external cables.

- Internal Cables
  These are the cables and cable sets that are internal to the BTS. They interconnect the various modules and are necessary for all configurations.
- External Cables

  These are the cables that connect the BTS A9100 to:
  - The customer’s 2 Mbit/s PCM distribution board
  - The customer’s 0/ -48 V DC power source and ground point (indoor BTS A9100s)
  - The BTS Terminal
  - Another BTS for clock synchronization.

2 Configurations - Rack Layouts

This chapter shows all possible configurations of the rack layouts for the following BTS types.

2.1 Naming Conventions for the BTS Configurations

In the following sections all possible configurations are listed in figures, sorted by the different types of BTSs.

The naming conventions used for the BTS configurations are listed in the following table.

1x1...4	Means 1 sector with up to 4 TREs
3x1...2	Means 3 sectors with up to 2 TRXs per sector
1x1...2/ 1x1...2	Means Multiband configuration, with 1 sector and up to 2 TREs in Band 1, and 1 sector and up to 2 TREs in Band 2
1x(...2/ ...2)	Means Multiband configuration, with 1 sector and up to 2 TREs in each band

Table 6: Naming Conventions Used for the BTS Configurations

2.2 Indoor Configurations

2.2.1 Indoor Configurations - Standard BTS GSM 900/1800/1900

The following configurations are valid for GSM 900/1800/1900 unless otherwise stated.

2.2.1.1 Indoor MINI - 1x1...4

The following figure shows the rack layouts of the Indoor MINI - 1x1...4 configuration.

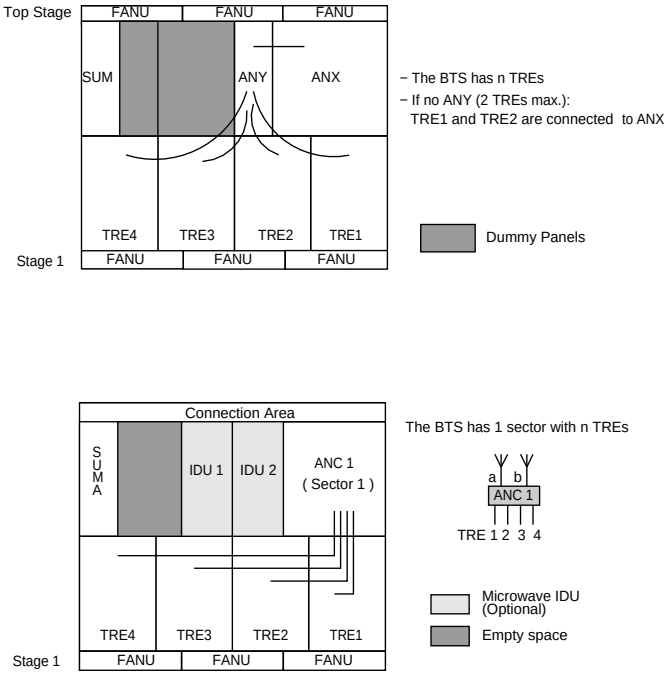


Figure 1: Indoor MINI - 1x1...4 Configuration

2.2.1.2 Indoor MINI - 2x1...2

The following figure shows the rack layouts of the Indoor MINI - 2x1...2 configuration.

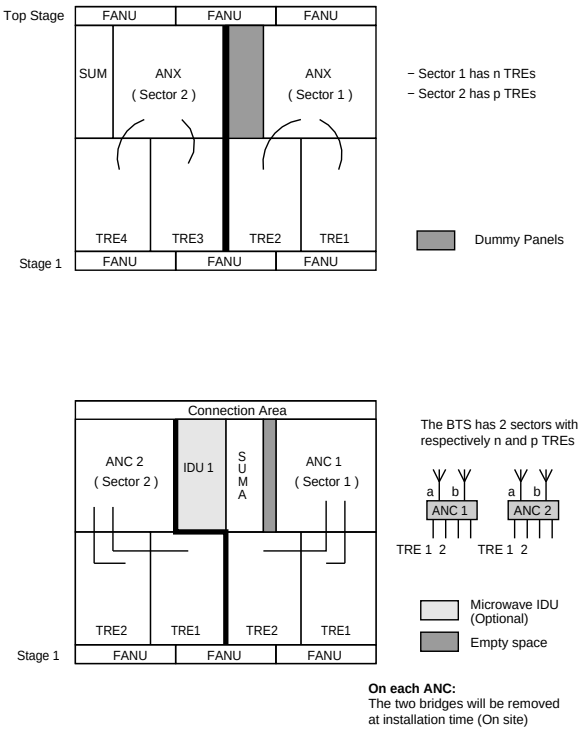


Figure 2: Indoor MINI - 2x1...2 Configuration

2.2.1.3 Indoor MINI - 1x1...3 + 1x1

The following figure shows the rack layout of the Indoor MINI - 1x1...3 + 1x1 configuration.

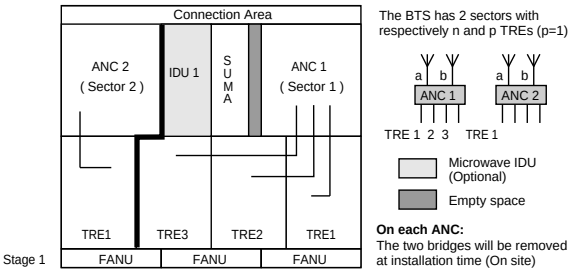


Figure 3: Indoor MINI - 1x1...3 + 1x1 Configuration

2.2.1.4 Indoor MINI - 3x1

The following figure shows the rack layouts of the Indoor MINI - 3x1 configuration.

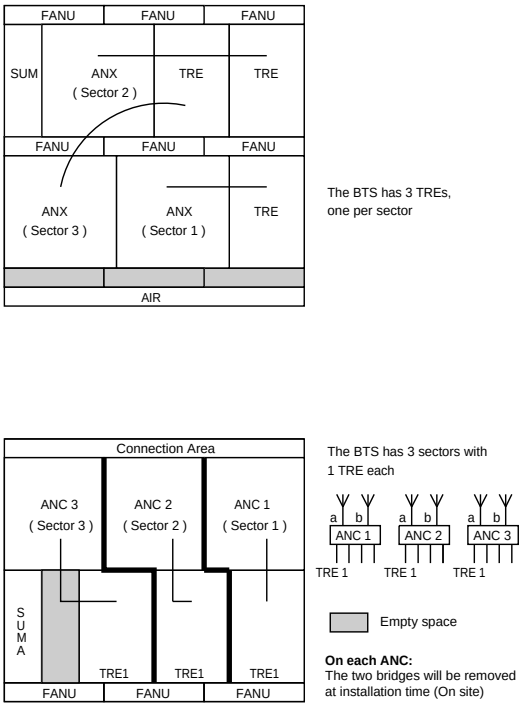


Figure 4: Indoor MINI - 3x1 Configuration

2.2.1.5 Indoor MEDI - 1x1...8

The following figure shows the rack layouts of the Indoor MEDI - 1x1...8 configuration. (The ANX version is only valid for GSM 900/1800).

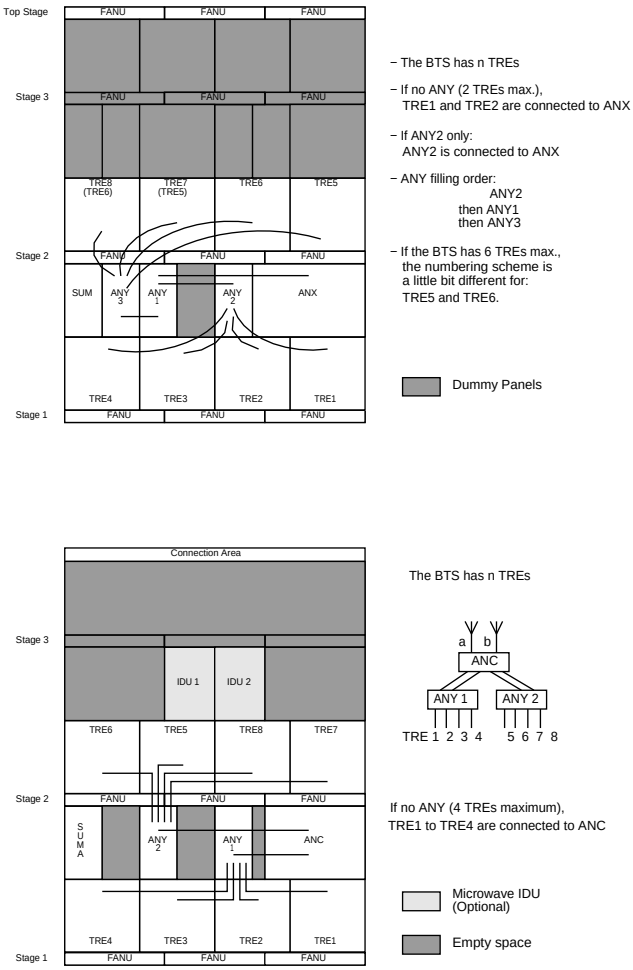


Figure 5: Indoor MEDI - 1x1...8 Configuration

2.2.1.6 Indoor MEDI - 1x2...8 (GSM 1900; ANX version)

The following figure shows the rack layout of the Indoor MEDI - 1x2...8 configuration (GSM 1900; ANX version).

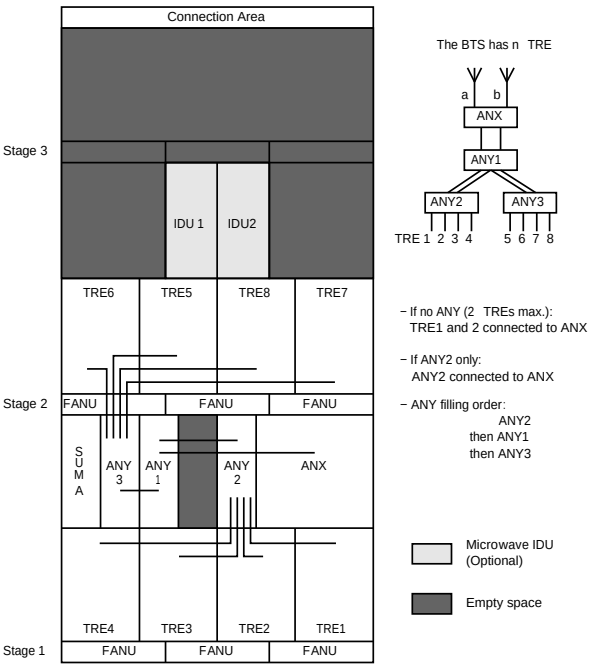


Figure 6: Indoor MEDI - 1x2...8 Configuration (GSM 1900; ANX version)

2.2.1.7 Indoor MEDI - 1x9...12

This configuration is the logical extension of the 1x2...8 configuration with a minimum of nine TREs. The following figure shows the rack layouts of the Indoor MEDI - 1x9...12 configuration.

Note: Restrictions

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x11...12 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 1x10 without restrictions: 45 W at + 45° C.

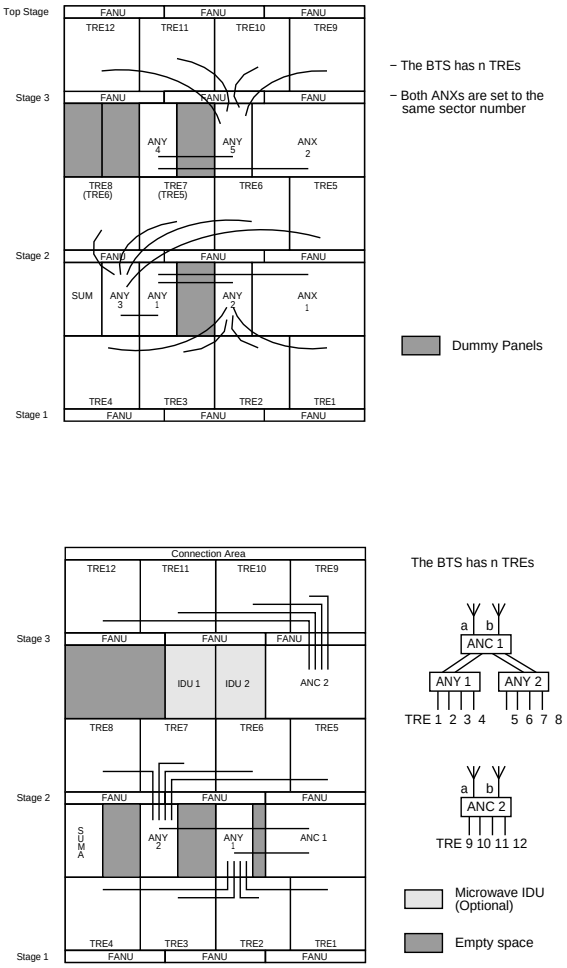


Figure 7: Indoor MEDI - 1x9...12 Configuration

2.2.1.8 Indoor MEDI - 2x1...6

The following figure shows the rack layouts of the Indoor MEDI - 2x1...6 configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 2x1...5 without restrictions: 45 W at + 45° C.

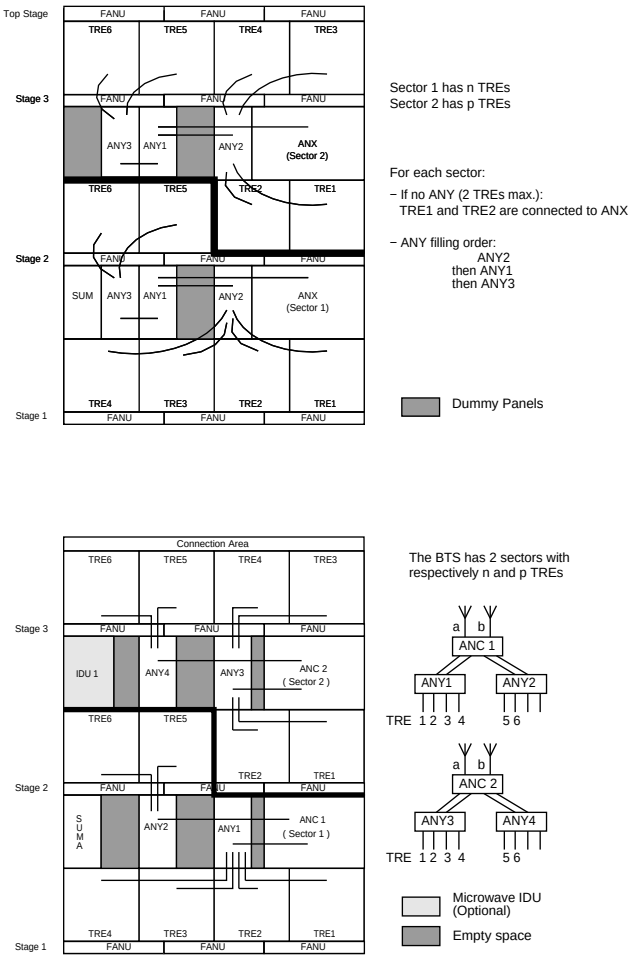


Figure 8: Indoor MEDI - 2x1...6 Configuration

2.2.1.9 Indoor MEDI - 1x1...8 + 1x1...4 (GSM 900/1800)

The following figure shows the rack layout of the Indoor MEDI - 1x1...8 + 1x1...4 configuration.

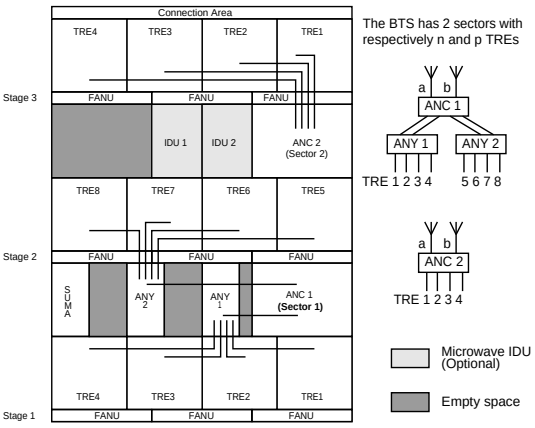


Figure 9: Indoor MEDI - 1x1...8 + 1x1...4 Configuration

2.2.1.10 Indoor MEDI - 3x1...4

The following figure shows the rack layouts of the Indoor MEDI - 3x1...4. (The ANX version is only valid for GSM 900/1800).

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

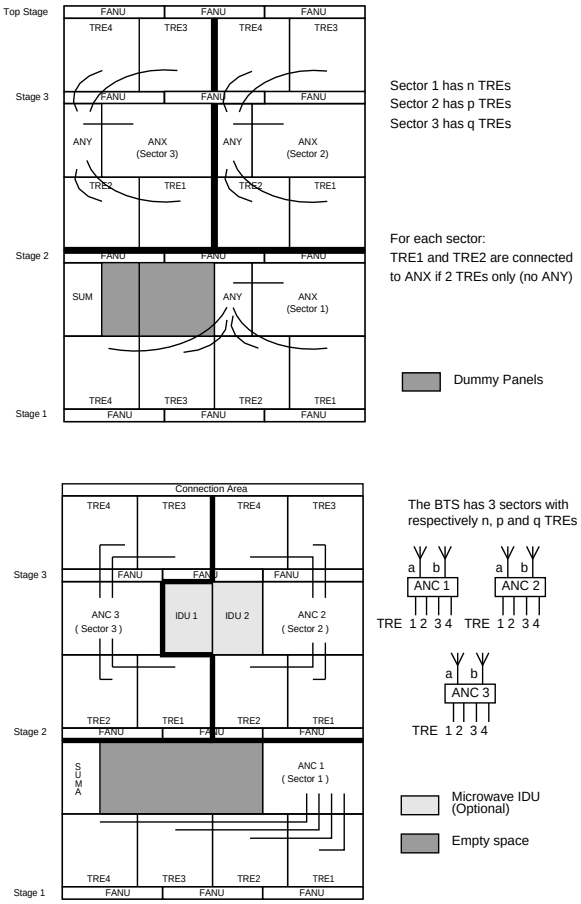


Figure 10: Indoor MEDI - 3x1...4 Configuration

2.2.1.11 Indoor MEDI - 3x1...4 (GSM 1900; ANX version)

The following figure shows the rack layout of the Indoor MEDI - 3x1...4 configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

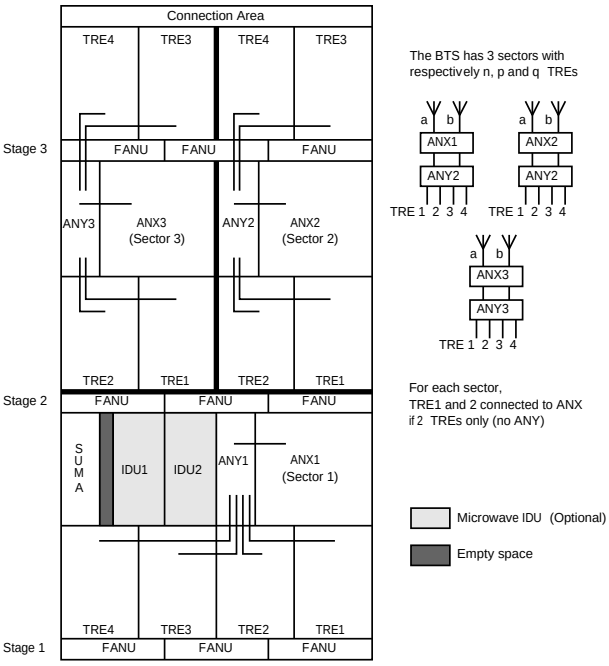


Figure 11: Indoor MEDI - 3x1...4 Configuration (GSM 1900; ANX version)

2.2.2 Indoor Configurations - Low Losses GSM 900/1800/1900

2.2.2.1 Indoor MEDI - 1x3...8 - Low Losses

The following figure shows the rack layouts of the Indoor MEDI - 1x3...8 - Low Losses configuration.

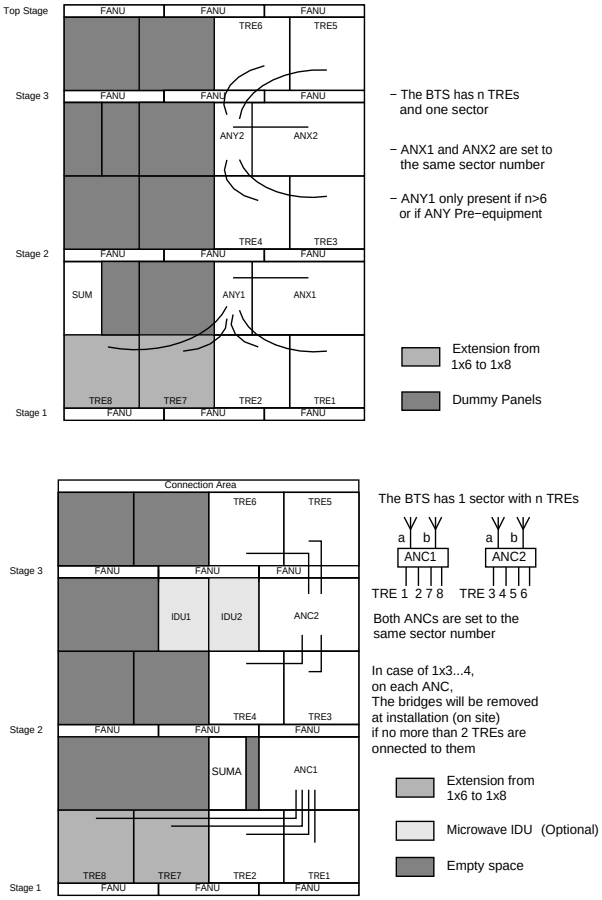


Figure 12: Indoor MEDI - 1x3...8 - Low Losses Configuration

2.2.2.2 Indoor MEDI - 1x9...12 - Low Losses

The following figure shows the rack layout of the Indoor MEDI - 1x9...12 - Low Losses configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x11...12 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 1x1...10 without restrictions: 45 W at + 45° C.

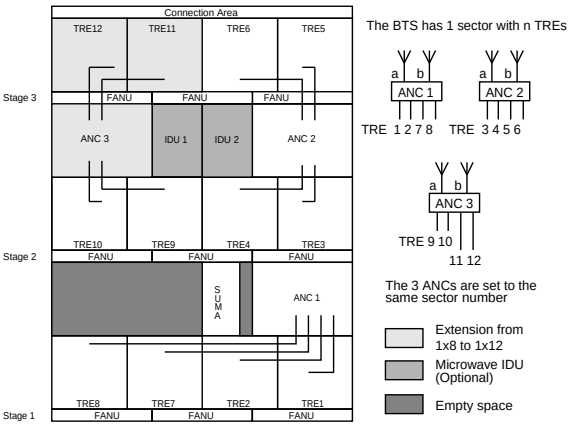


Figure 13: Indoor MEDI - 1x9...12 - Low Losses Configuration

2.2.2.3 Indoor MEDI - 2x1...6 - Low Losses

The following figure shows the rack layout of the Indoor MEDI - 2x1...6 - Low Losses configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 2x1...5 without restrictions: 45 W at + 45° C.

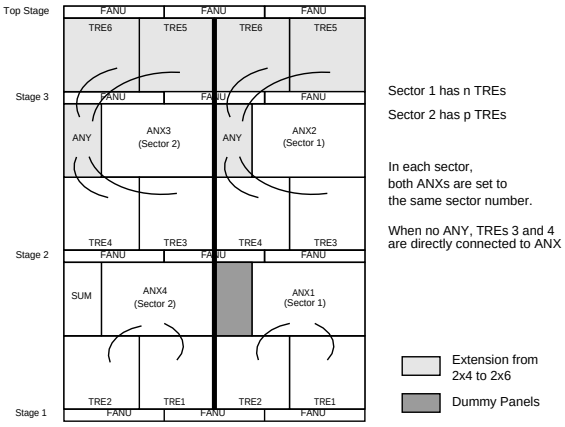


Figure 14: Indoor MEDI - 2x1...6 - Low Losses Configuration

2.2.2.4 Indoor MEDI - 2x3...6 - Low Losses

The following figure shows the rack layout of the Indoor MEDI - 2x3...6 - Low Losses configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 2x3...5 without restrictions: 45 W at + 45° C.

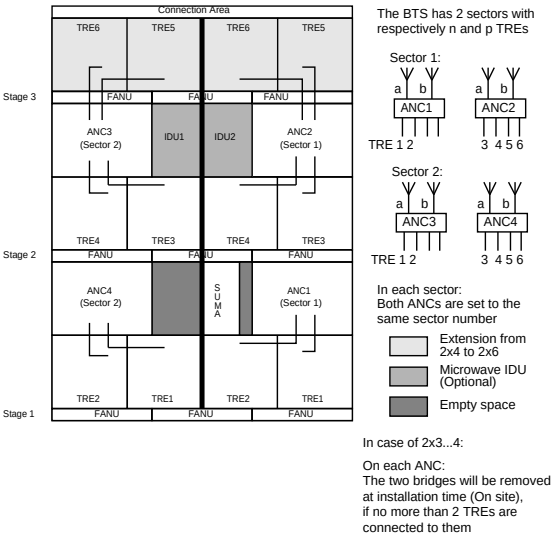


Figure 15: Indoor MEDI - 2x3...6 - Low Losses Configuration

2.2.3 Indoor Configurations - High Power GSM 1800

2.2.3.1 Indoor MINI - 2x1

The following figure shows the rack layout of the Indoor MINI- 2x1- High Power GSM 1800 configuration.

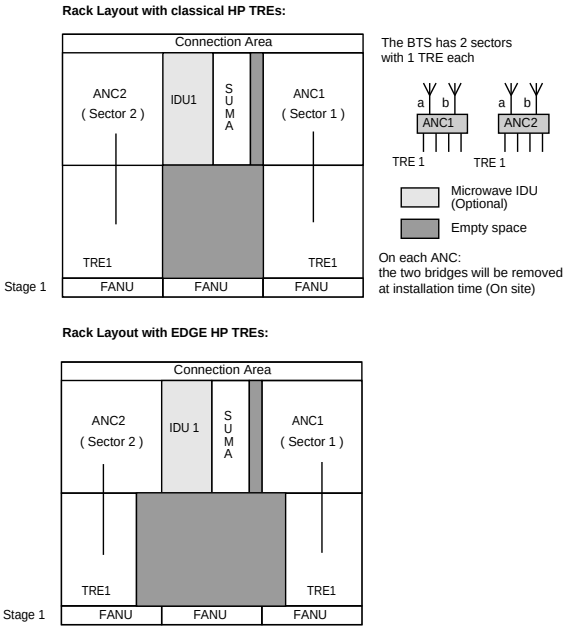


Figure 16: Indoor MINI - 2x1 - High Power GSM 1800 Configuration

2.2.3.2 Indoor MEDI - 1x1...4

The following figure shows the rack layouts of the Indoor MEDI- 1x1...4 - High Power GSM 1800 configuration.

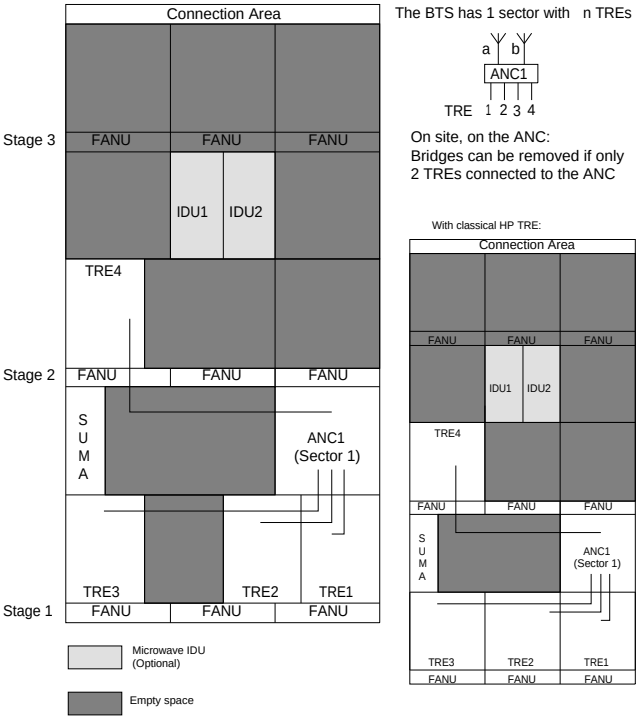


Figure 17: Indoor MEDI - 1x1...4 - High Power GSM 1800 Configuration

2.2.3.3 Indoor MEDI - 2x1...2

This configuration must be considered as a sub-equipment of the 3x1...2 - High Power configuration.

2.2.3.4 Indoor MEDI - 2x1...4

The following figure shows the rack layouts of the Indoor MED I- 2x1...4 - High Power GSM 1800 configuration.

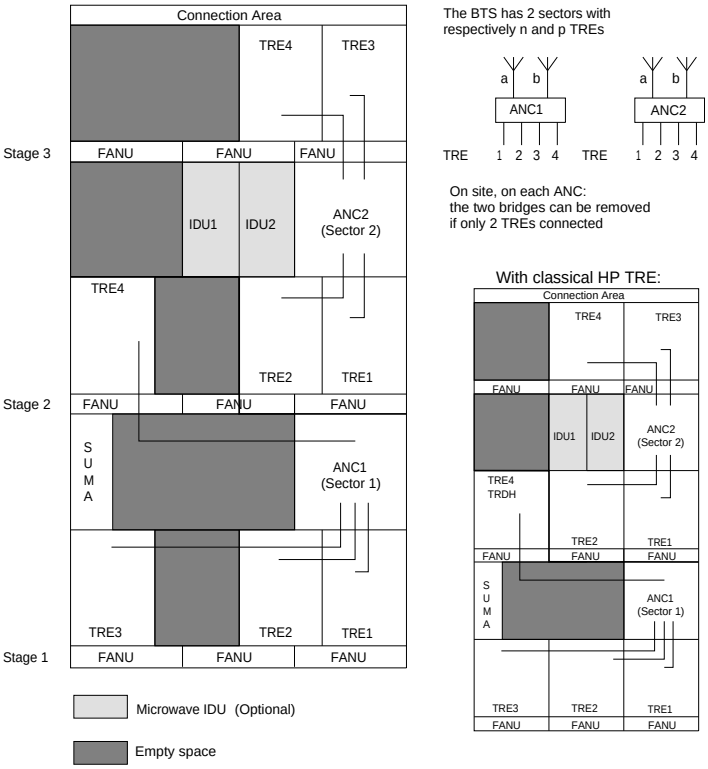


Figure 18: Indoor MEDI - 2x1...4 - High Power GSM 1800 Configuration

2.2.3.5 Indoor MEDI - 3x1...2

The following figure shows the rack layouts of the Indoor MEDI - 3x1...2 - High Power GSM 1800 configuration.



Figure 19: Indoor MEDI - 3x1...2 - High Power GSM 1800 Configuration

2.2.3.6 Indoor MEDI - 3x1...3

The following figure shows the rack layouts of the Indoor MEDI - 3x1...3 - High Power GSM 1800 configuration.

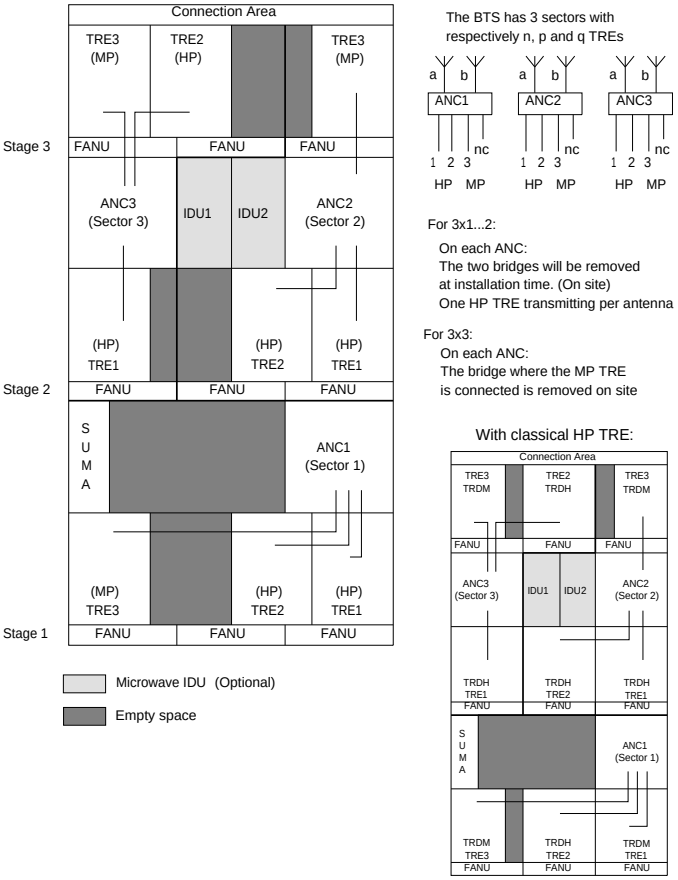


Figure 20: Indoor MEDI - 3x1...3 - High Power GSM 1800 Configuration

2.2.4 Indoor Configurations - Extended Cell GSM 900

Extended cell configurations are based either on REK or on RX TMA use as shown in the following figures.

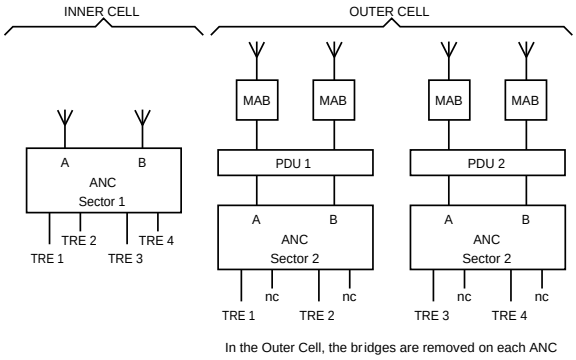


Figure 21: Extended Cell Configuration Based on REK Use

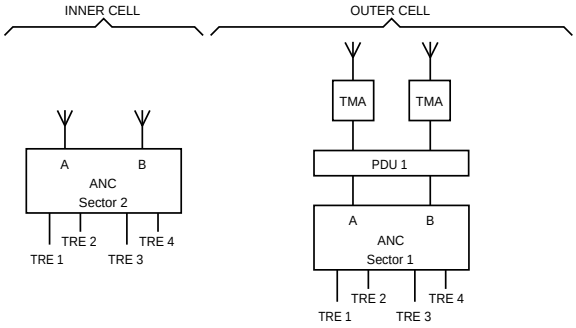


Figure 22: Extended Cell Configuration Based on RX TMA Use

2.2.4.1 Indoor MEDI - Extended Cell Configuration Based on REK

The following figure shows the rack layout of the Indoor MEDI extended cell configuration based on REK use.

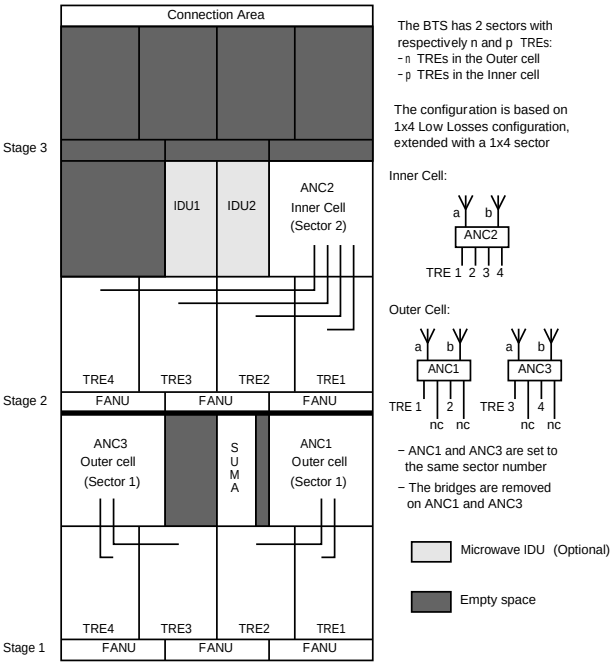


Figure 23: Indoor MEDI - Extended Cell Configuration Based on REK Use

2.2.4.2 Indoor MEDI - Extended Cell Configuration Based on RX TMA Use

The following figure shows the rack layout of the Indoor MEDI extended cell configuration based on RX TMA use.

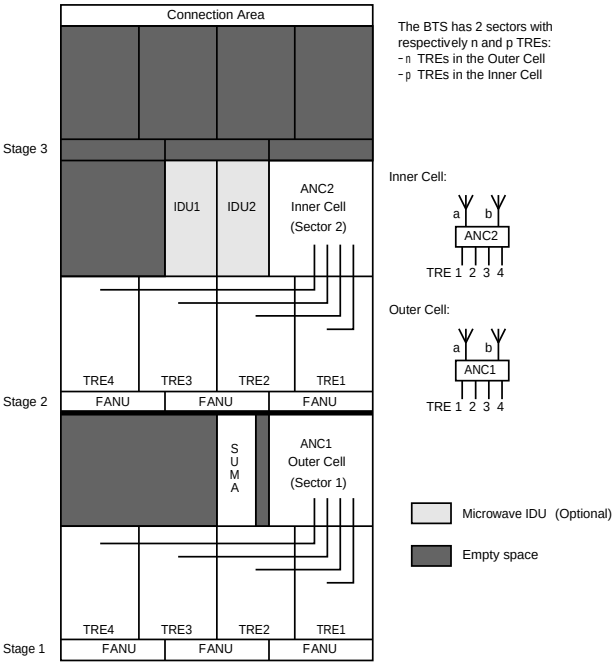


Figure 24: Indoor MEDI - Extended Cell Configuration Based on RX TMA Use

2.2.5 Indoor Configurations - Multiband BTS GSM 900/1800

2.2.5.1 Indoor MINI - 1x1...2/ 1x1...2

The following figure shows the rack layouts of the Indoor MINI - 1x1...2/ 1x1...2 - Multiband BTS configuration.

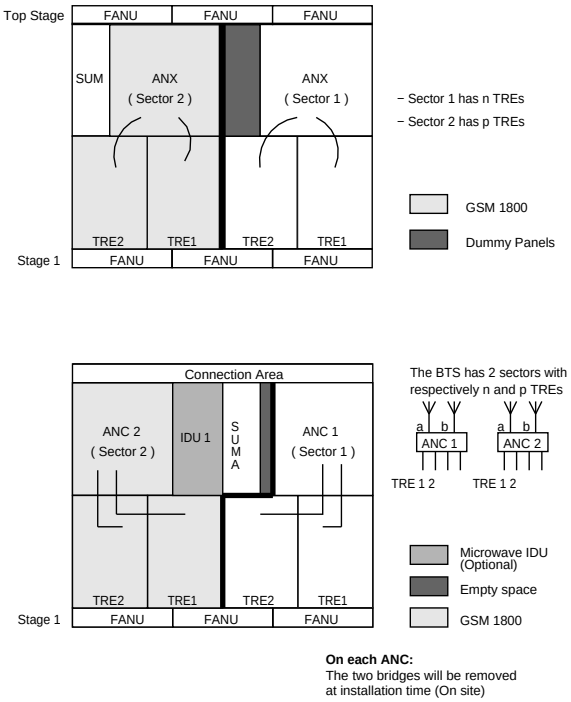


Figure 25: Indoor MINI - 1x1...2/ 1x1...2 - Multiband BTS Configuration

2.2.5.2 Indoor MEDI - 1x1...6/1x1...6

The following figure shows the rack layouts of the Indoor MEDI - 1x1...6/1x1...6 - Multiband BTS configuration.

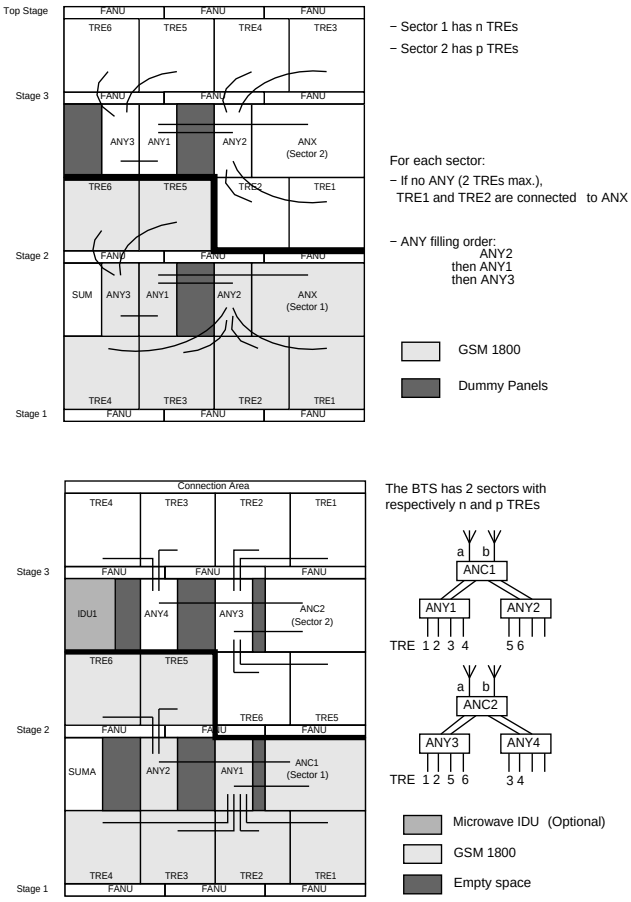


Figure 26: Indoor MEDI - 1x1...6/1x1...6 - Multiband BTS Configuration

2.2.5.3 Indoor MEDI - 1x1...8/1x1...4

The following figure shows the rack layouts of the Indoor MEDI - 1x1...8/1x1...4 - Multiband BTS configuration.

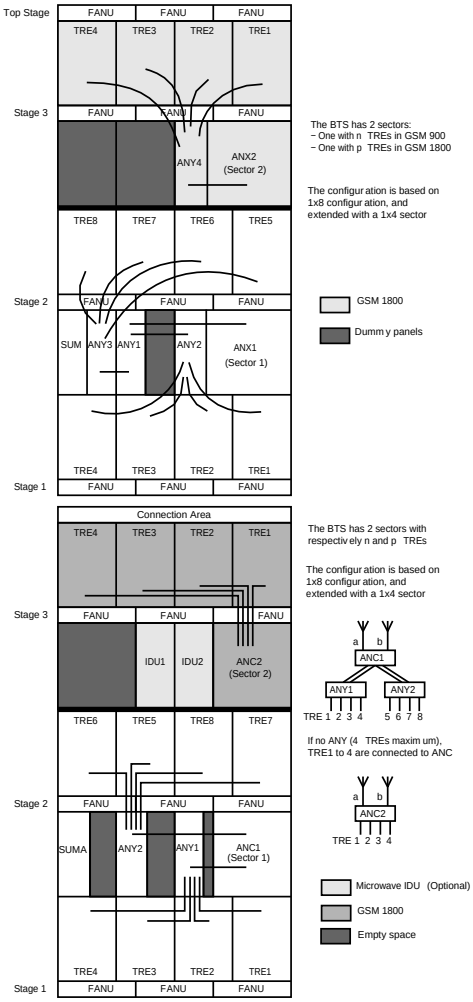


Figure 27: Indoor MEDI - 1x1...8/1x1...4 - Multiband BTS Configuration

2.2.5.4 Indoor MEDI - 1x1...4/1x1...8

The following figure shows the rack layout of the Indoor MEDI - 1x1...4/1x1...8 - Multiband BTS configuration.

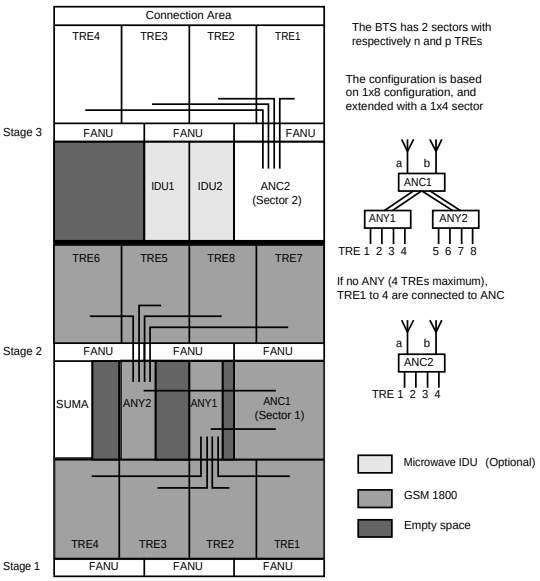


Figure 28: Indoor MEDI - 1x1...4/1x1...8 - Multiband BTS Configuration

2.2.5.5 Indoor MEDI - 1x3...8LL/1x1...4

The following figure shows the rack layouts of the Indoor MEDI - 1x3...8LL/1x1...4 - Multiband BTS configuration.

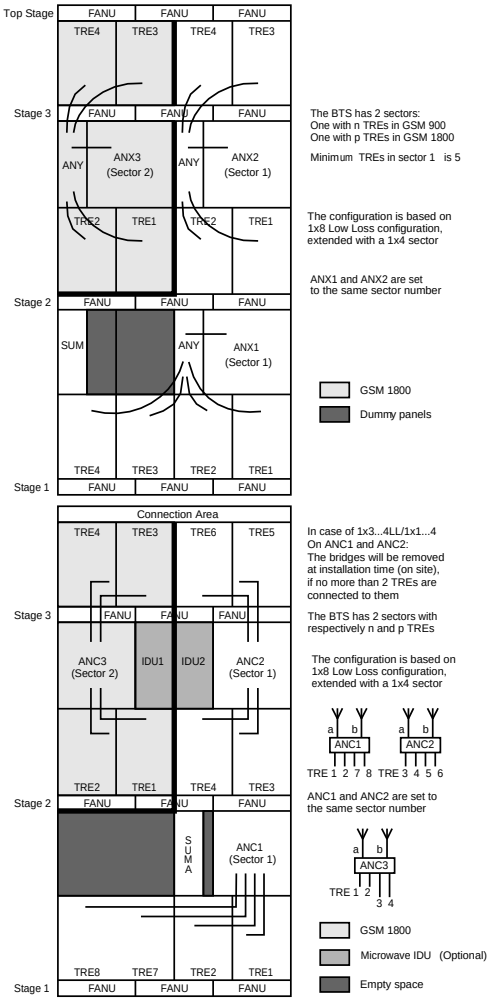


Figure 29: Indoor MEDI - 1x3...8LL/1x1...4 - Multiband BTS Configuration

2.2.5.6 Indoor MEDI - 1x1...4/2x1...4

The following figure shows the rack layouts of the Indoor MEDI - 1x1...4/2x1...4 - Multiband BTS configuration.

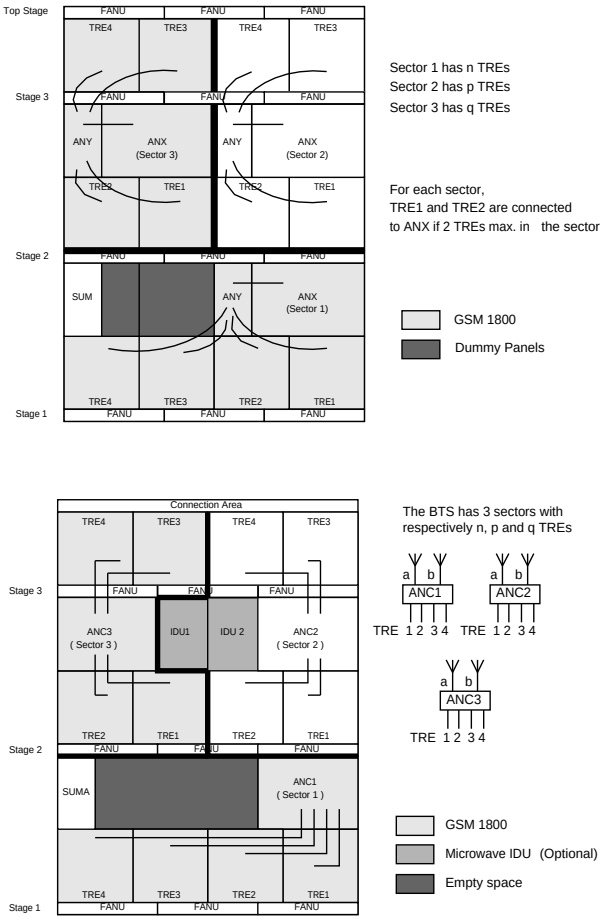


Figure 30: Indoor MEDI - 1x1...4/2x1...4 - Multiband BTS Configuration

2.2.5.7 Indoor MEDI - 2x1...4/1x1...4

The following figure shows the rack layouts of the Indoor MEDI - 2x1...4/1x1...4 - Multiband BTS configuration.

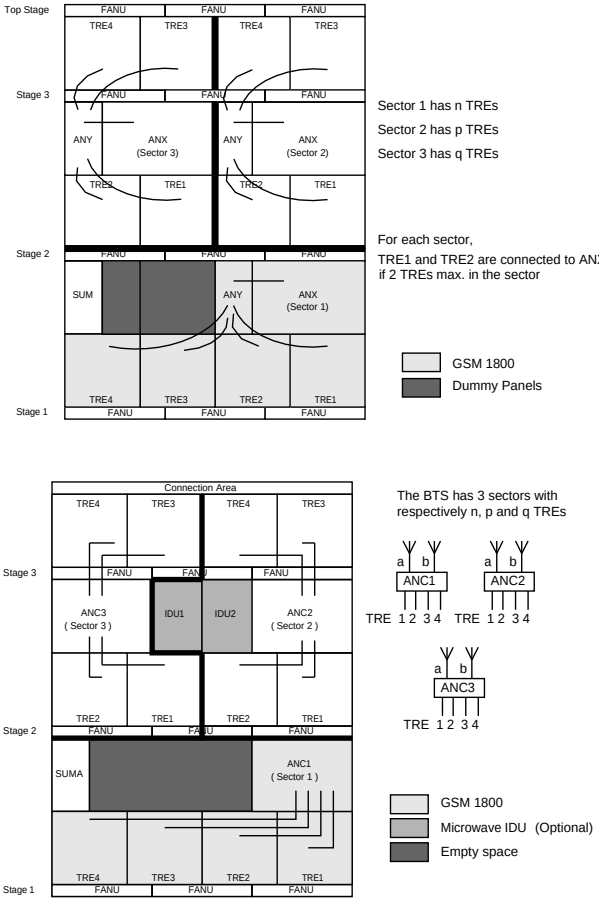


Figure 31: Indoor MEDI - 2x1...4/1x1...4 - Multiband BTS Configuration

2.2.5.8 Indoor MEDI - 1x1...4/...4,...2,...2

The following figure shows the rack layouts of the Indoor MEDI - 1x1...4/...4,...2,...2 - Multiband BTS configuration.

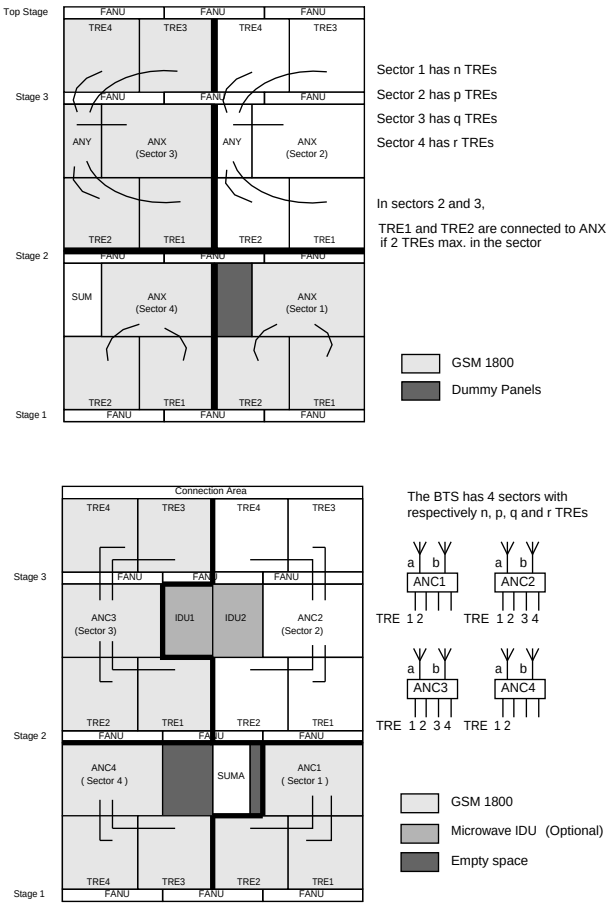


Figure 32: Indoor MEDI - 1x1...4/...4,...2,...2 - Multiband BTS Configuration

2.2.5.9 Indoor MEDI - ...4,...2,...2/1x1...4

The following figure shows the rack layouts of the Indoor MEDI - ...4,...2,...2/1x1...4 - Multiband BTS configuration.

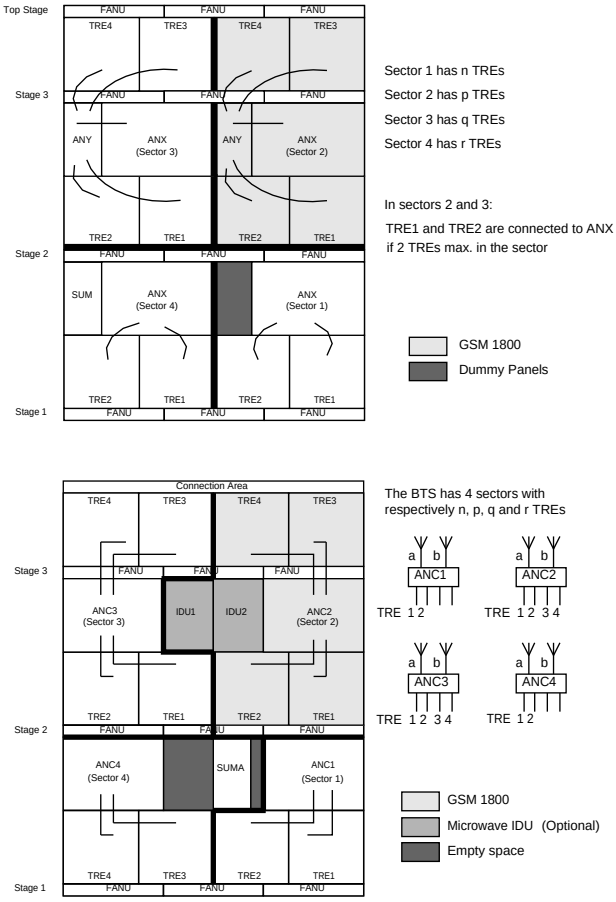


Figure 33: Indoor MEDI - ...4,...2,...2/1x1...4 - Multiband BTS Configuration

2.2.5.10 Indoor MEDI - 2x1...4/2x1...2

The following figure shows the rack layouts of the Indoor MEDI - 2x1...4/2x1...2 - Multiband BTS configuration.

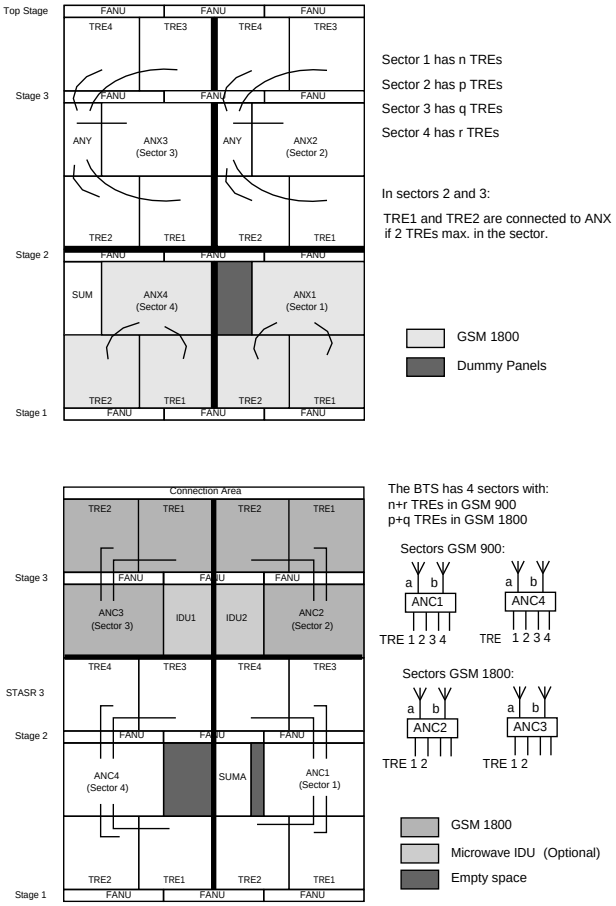


Figure 34: Indoor MEDI - 2x1...4/2x1...2 - Multiband BTS Configuration

2.2.5.11 Indoor MEDI - 2x1...2/2x1...4

The following figure shows the rack layouts of the Indoor MEDI - 2x1...2/2x1...4 - Multiband BTS configuration.

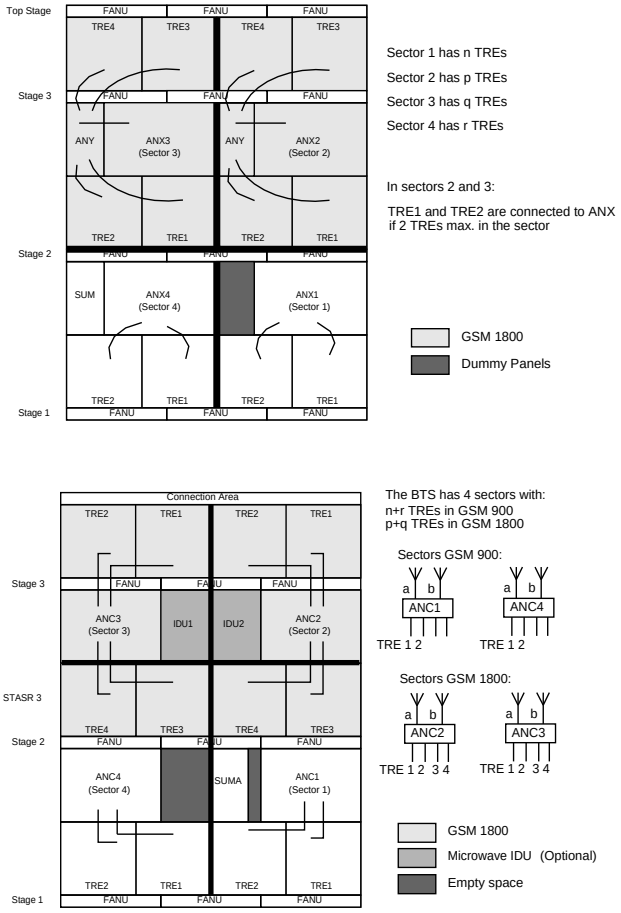


Figure 35: Indoor MEDI - 2x1...2/2x1...4 - Multiband BTS Configuration

2.2.6 Indoor Configurations - Multiband Cells GSM 900/1800

2.2.6.1 Indoor MINI - 1x(...2/...2)

The following figure shows the rack layouts of the Indoor MINI - 1x(...2/...2) - Multiband Cells configuration.

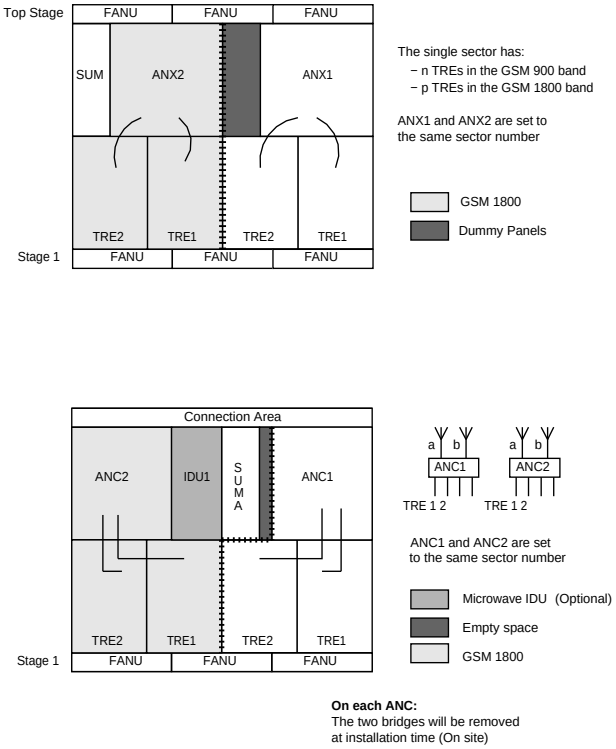


Figure 36: Indoor MINI - 1x(...2/...2) - Multiband Cells Configuration

2.2.6.2 Indoor MEDI - 1x(...6/...6)

The following figure shows the rack layouts of the Indoor MEDI - 1x(...6/...6) - Multiband Cells configuration.

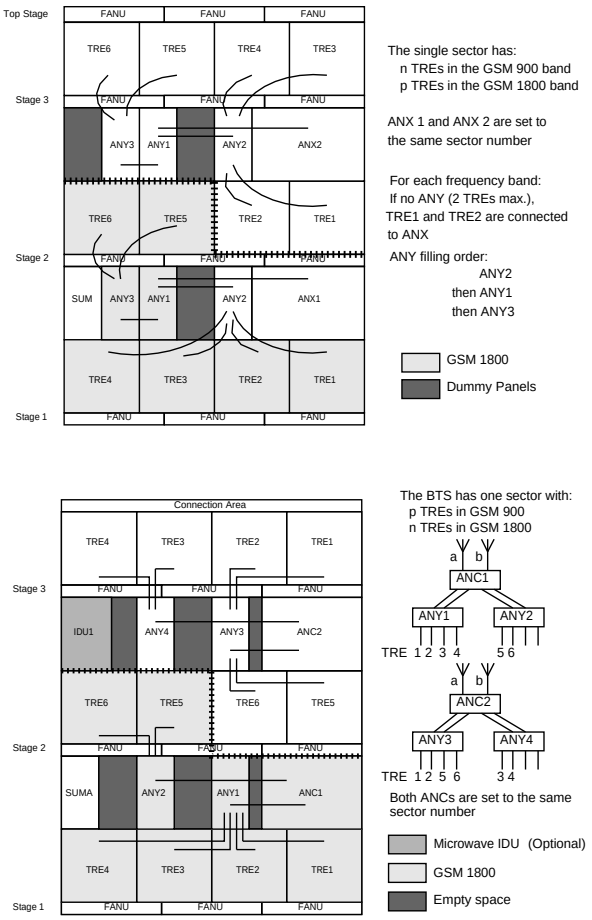


Figure 37: Indoor MEDI - 1x(...6/...6) - Multiband Cells Configuration

2.2.6.3 Indoor MEDI - 2x(...4/...2)

The following figure shows the rack layouts of the Indoor MEDI - 2x(...4/...2) - Multiband Cells configuration.

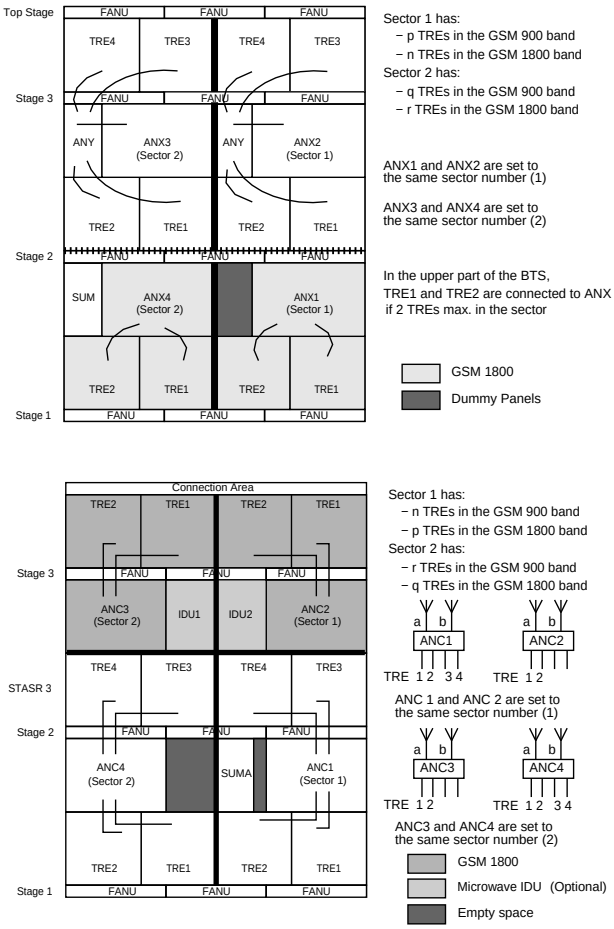


Figure 38: Indoor MEDI - 2x(...4/...2) - Multiband Cells Configuration

2.2.6.4 Indoor MEDI - 2x(...2/...4)

The following figure shows the rack layouts of the Indoor MEDI - 2x(...2/...4) - Multiband Cells configuration.

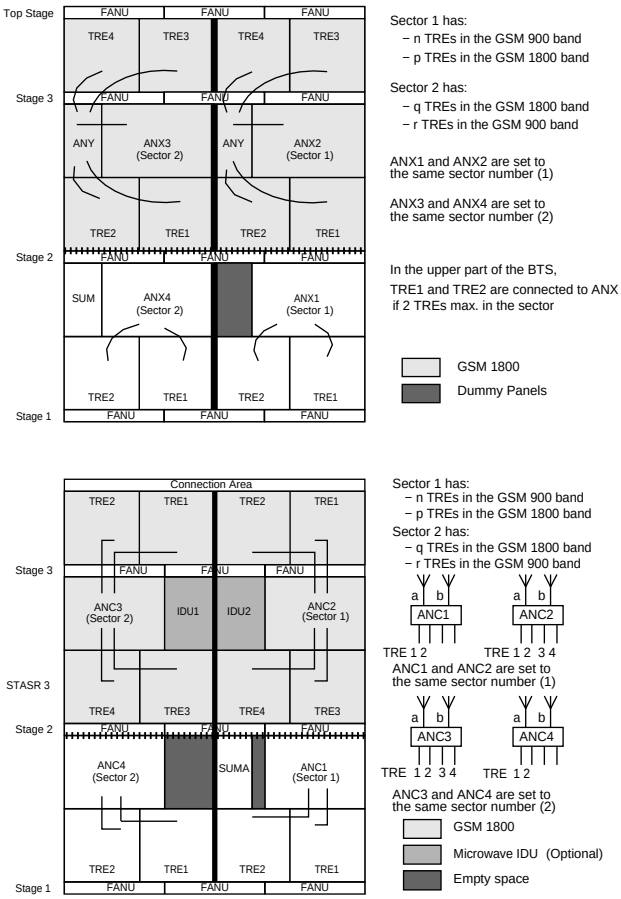


Figure 39: Indoor MEDI - 2x(...2/...4) - Multiband Cells Configuration

2.2.6.5 Indoor MEDI - 1x(...2/...2), 1x(...4/...4)

The following figure shows the rack layouts of the Indoor MEDI - 1x(...2/...2), 1x(...4/...4) - Multiband Cells configuration.

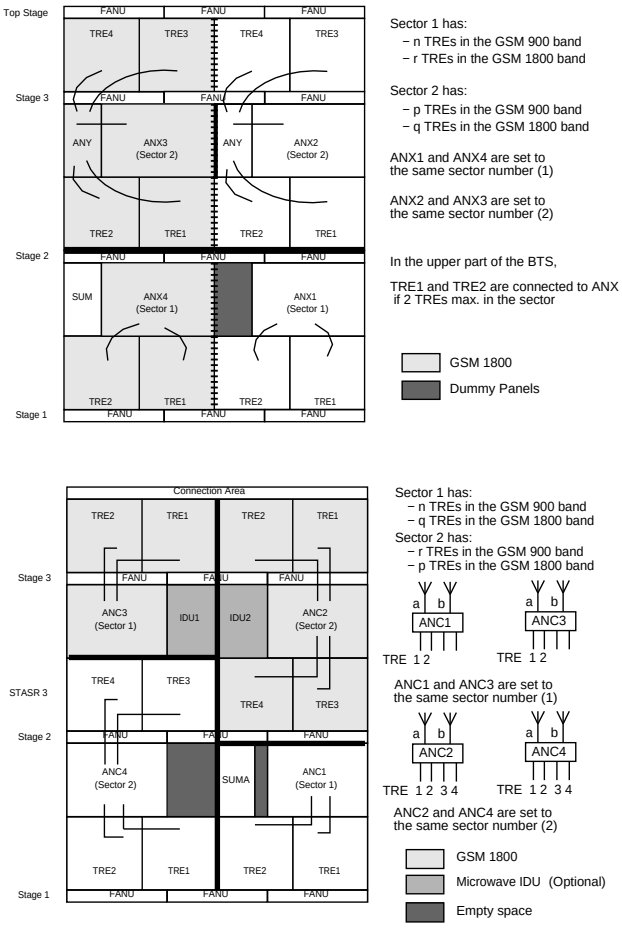


Figure 40: Indoor MEDI - 1x(...2/...2), 1x(...4/...4) - Multiband Cells Configuration

2.2.7 AC Indoor Configurations GSM 900/1800

2.2.7.1 AC Indoor MEDI - 1x1...8

The following figure shows the rack layouts of the AC Indoor MEDI - 1x1...8 configuration.

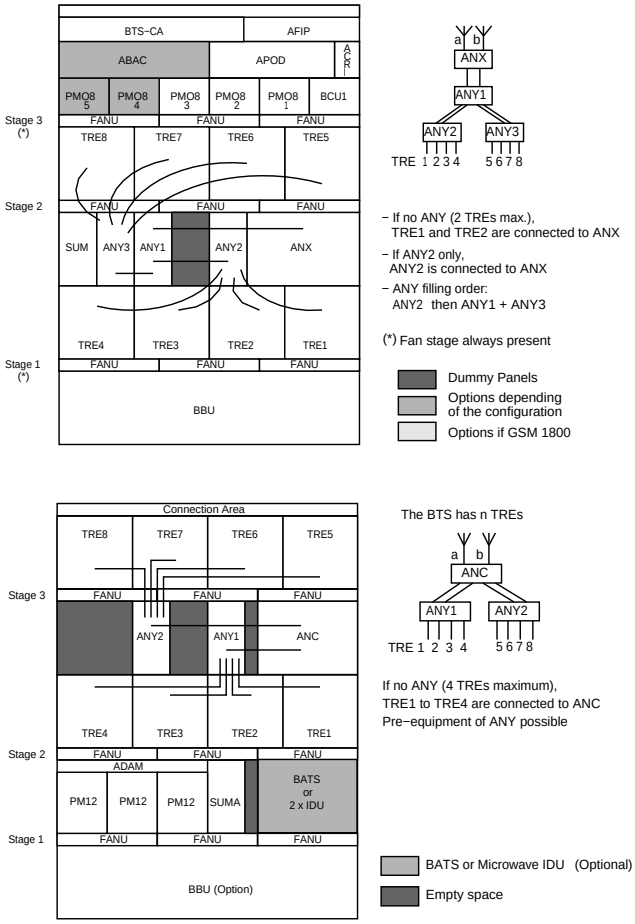


Figure 41: AC Indoor MEDI - 1x1...8 Configuration

2.2.7.2 AC Indoor MEDI - 2x1...2

This configuration must be considered as a sub-equipment of the 3x1...2 configuration (sector 3 is not equipped).

2.2.7.3 AC Indoor MEDI - 3x1...2

The following figure shows the rack layouts of the AC Indoor MEDI - 3x1...2 configuration.

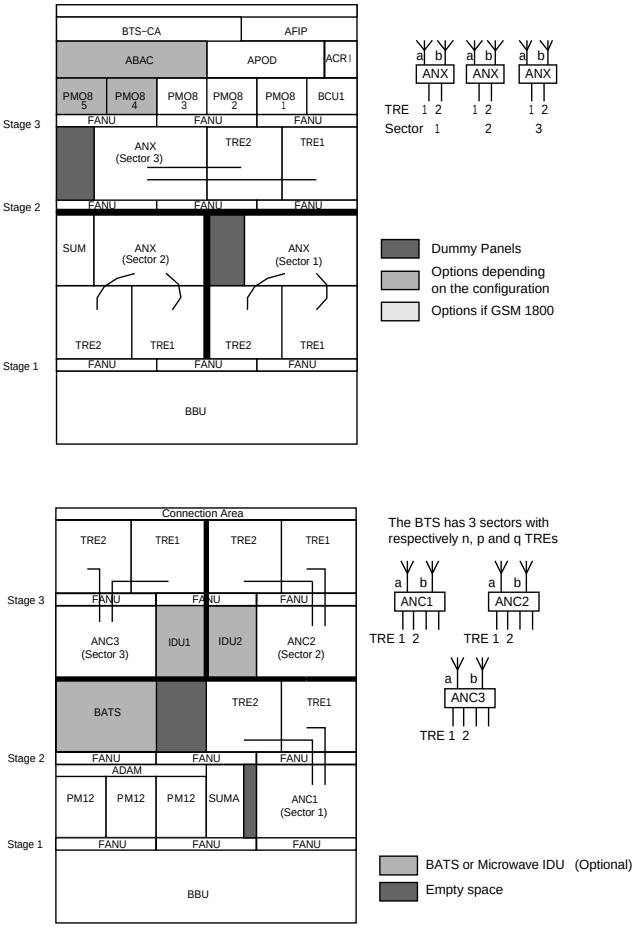


Figure 42: AC Indoor MEDI - 3x1...2 Configuration

2.2.7.4 AC Indoor MEDI - 2x1...6

The following figure shows the rack layout of the AC Indoor MEDI - 2x1...6 configuration.

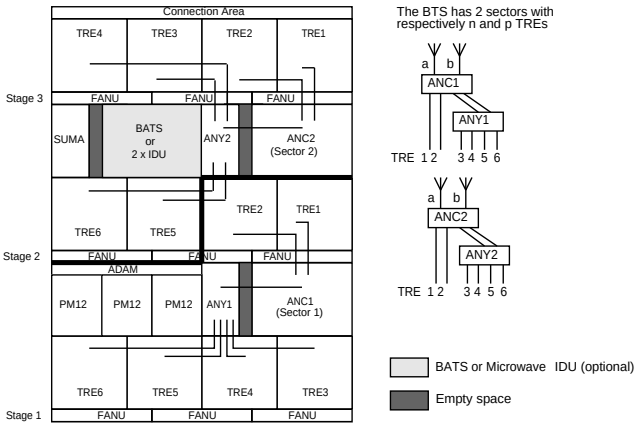


Figure 43: AC Indoor MEDI - 2x1...6 Configuration

2.2.7.5 AC Indoor MEDI - 3x1...4

The following figure shows the rack layout of the AC Indoor MEDI - 3x1...4 configuration.

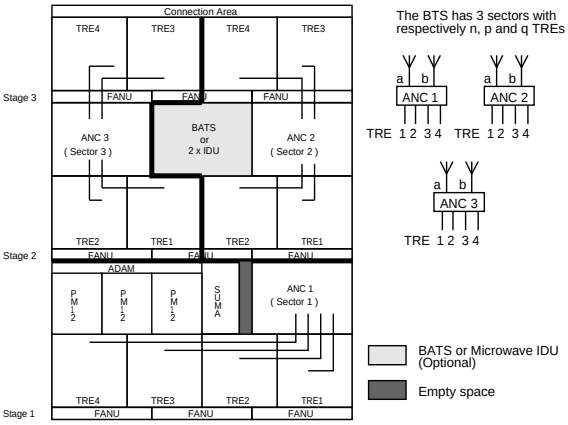


Figure 44: AC Indoor MEDI - 3x1...4 Configuration

2.2.7.6 AC Indoor MEDI - 1x1...8/1x1...4

The following figure shows the rack layout of the AC Indoor MEDI - 1x1...8/1x1...4 Multiband BTS configuration.

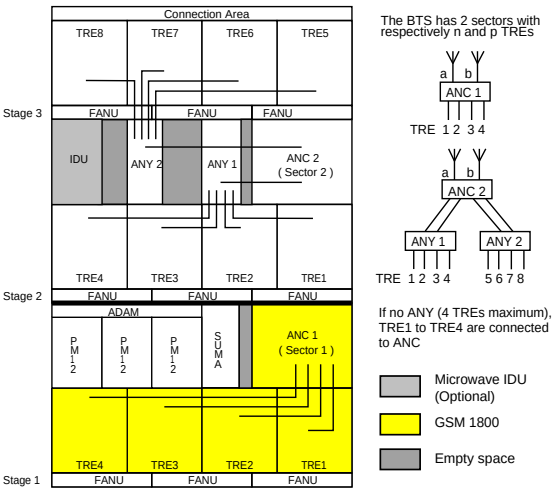


Figure 45: AC Indoor MEDI - 1x1...8/1x1...4 Multiband BTS Configuration

2.2.7.7 DC Power Distribution from an AC Indoor Cabinet

To extend on site the capacities in terms of TREs per sector, the coupling of a DC Indoor cabinet to an AC Indoor cabinet can be envisaged.

A typical case is a 3x6 sectored site with the following hardware: 1x6 AC Indoor MEDI + 2x6 DC Indoor MEDI.

This configuration requires the following actions:

- Add additional AC/DC converters in the AC Indoor cabinet, (3 x AC/DC converters in the case of a standalone AC Indoor cabinet)
- Use of a DC power cable between the two cabinets.

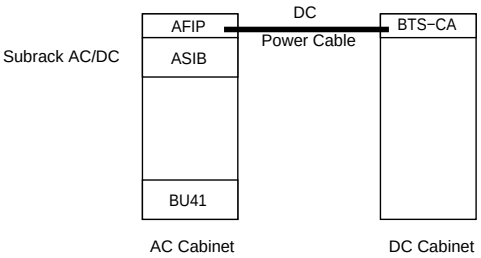


Figure 46: Interconnection between an AC Cabinet and a DC Cabinet

Maximum number of TREs depending on DC Consumption:

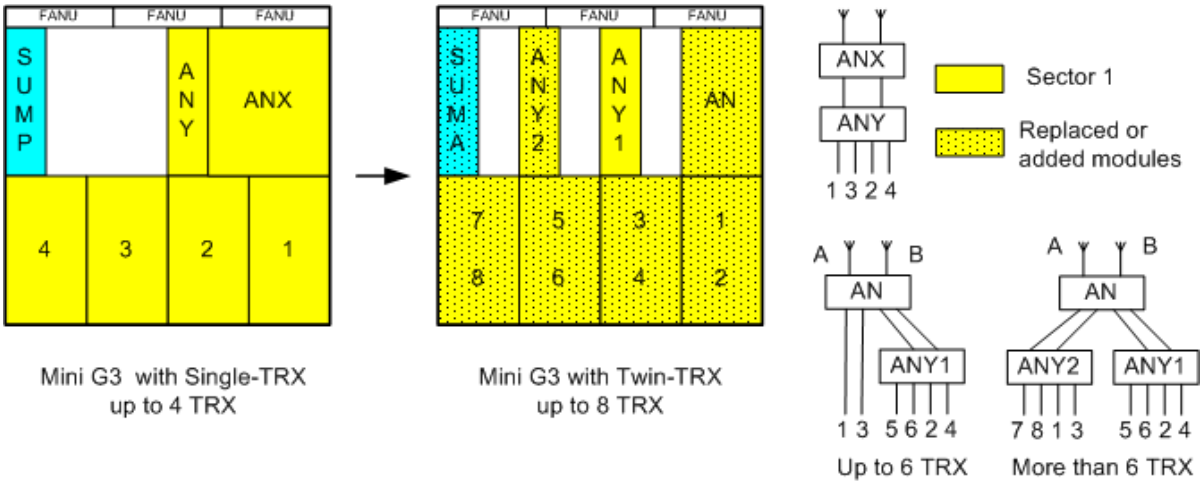
- GSM 900: 3 x PM08 up to eight TREs, 5 x PM08 if more than eight TREs; maximum TREs: 18 (a 3x6 site configuration is possible)
- GSM 1800: 3 x PM08 up to six TREs, 4 x PM08 up to eight TREs, 5 x PM08 if more than eight TREs; maximum TREs: 12 (a 3x6 site configuration is not possible).

2.3 A9100 BTS Indoor (G3) Extension with Twin TRX

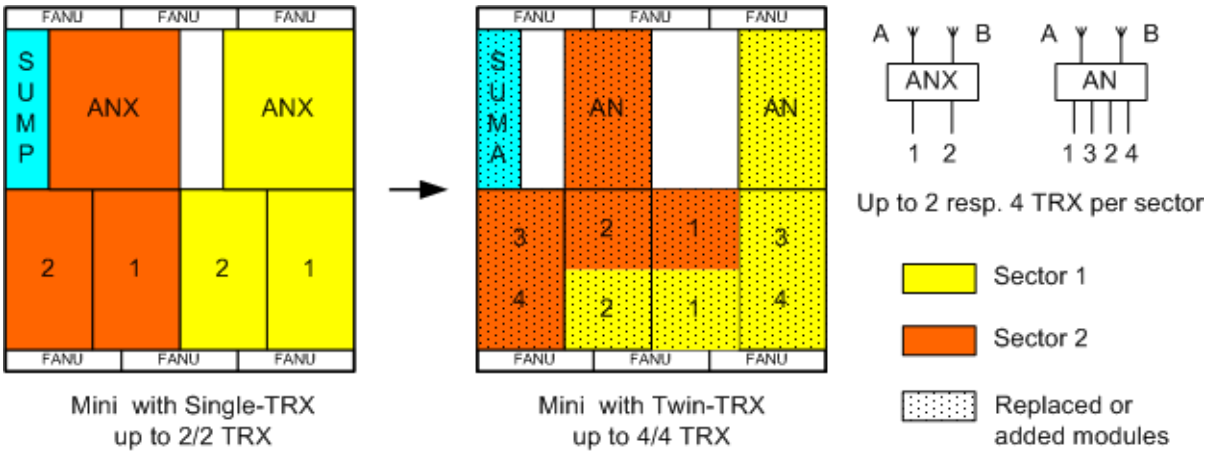
The following table gives the possible configuration extension based on Twin TRX modules.

Cabinet	Number of sectors	AC Carriesrs per sector	DC Carriesrs per sector
		Single TRX -> Twin TRX	**Single TRX -> Twin TRX**
Mini	1	n.a.	*4 -> 8*
	2	n.a.	*2/2 -> 4/4*
	3	n.a.	*1/1/1 -> 2/2/2*
Medi	1	n.a.	*12 -> 16*
	2	n.a.	*6/6 -> 8/8*
	3	n.a.	*4/4/4 -> 6/6/6*

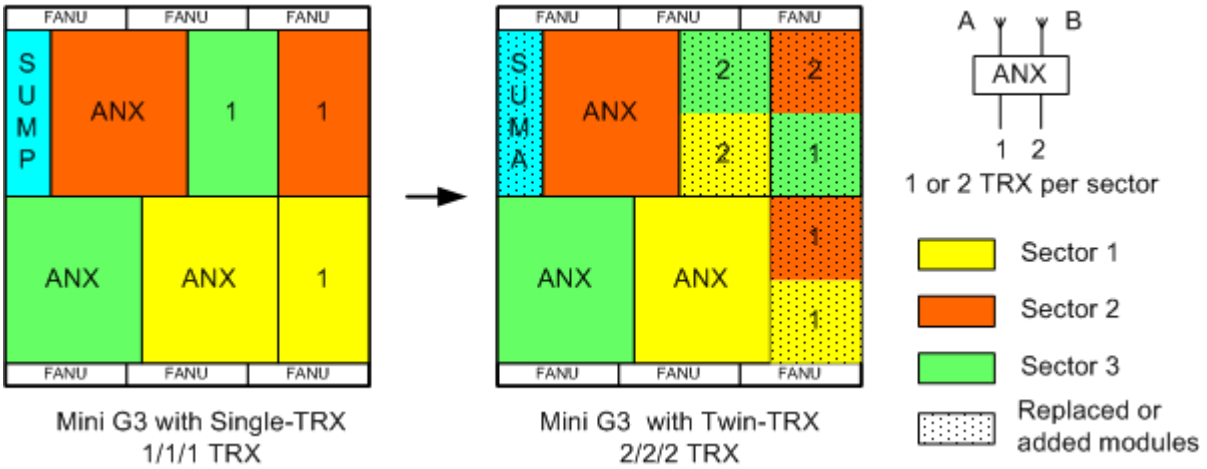
2.3.1 G3 MINI - 1 Sector mixed configuration Single/Twin-TRX



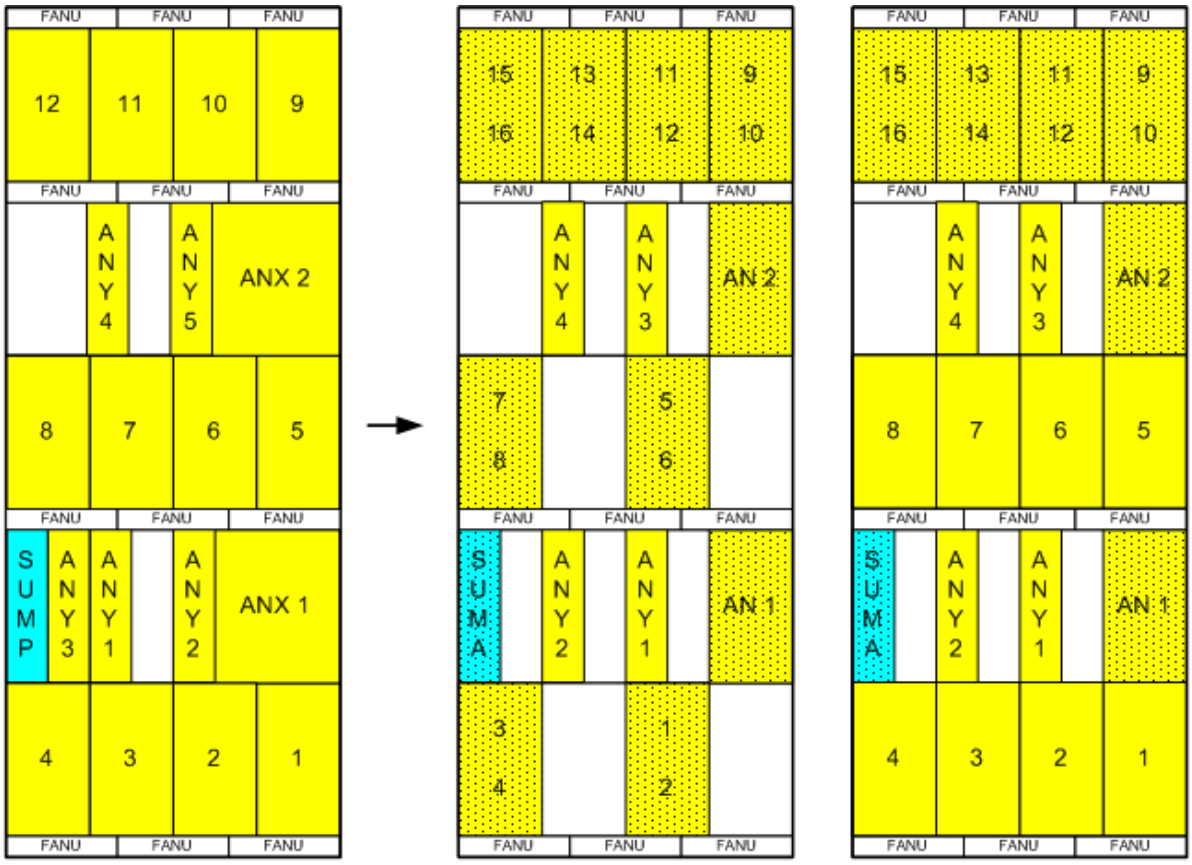
2.3.2 G3 MINI - 2 Sectors mixed configuration Single/Twin-TRX



2.3.3 G3 MINI - 3 Sectors mixed configuration Single/Twin-TRX



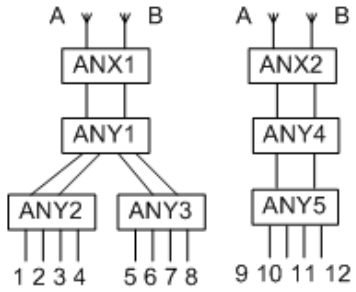
2.3.4 G3 MEDI - 1 Sector mixed configuration Single/Twin-TRX



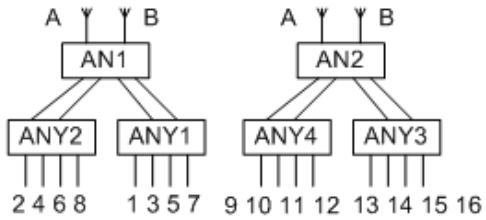
MEDI G3 with Single-TRX
up to 12 TRX

MEDI G3 with Twin-TRX only
up to 16 TRX

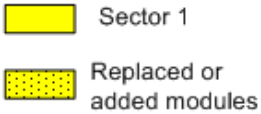
MEDI G3 with mixed Twin-TRX
up to 16 TRX



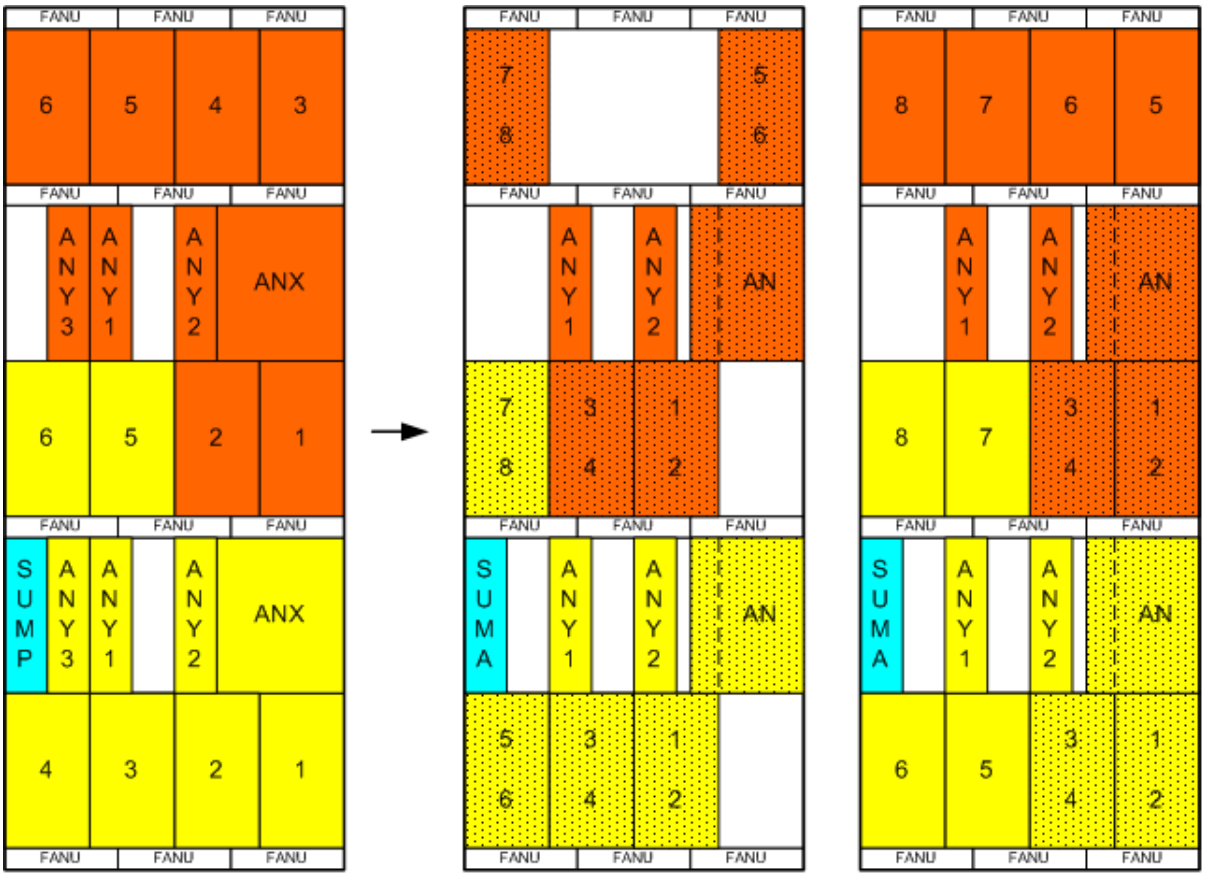
Up to 12 TRX



Up to 16 TRX



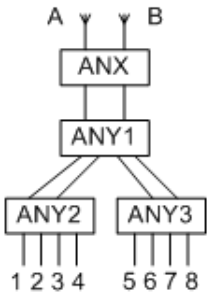
2.3.5 G3 MEDI - 2 Sectors mixed configuration Single/Twin-TRX

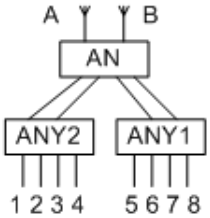


MEDI with Single-TRX
up to 6/6 TRX

MEDI G3 with Twin-TRX only
up to 8/8 TRX

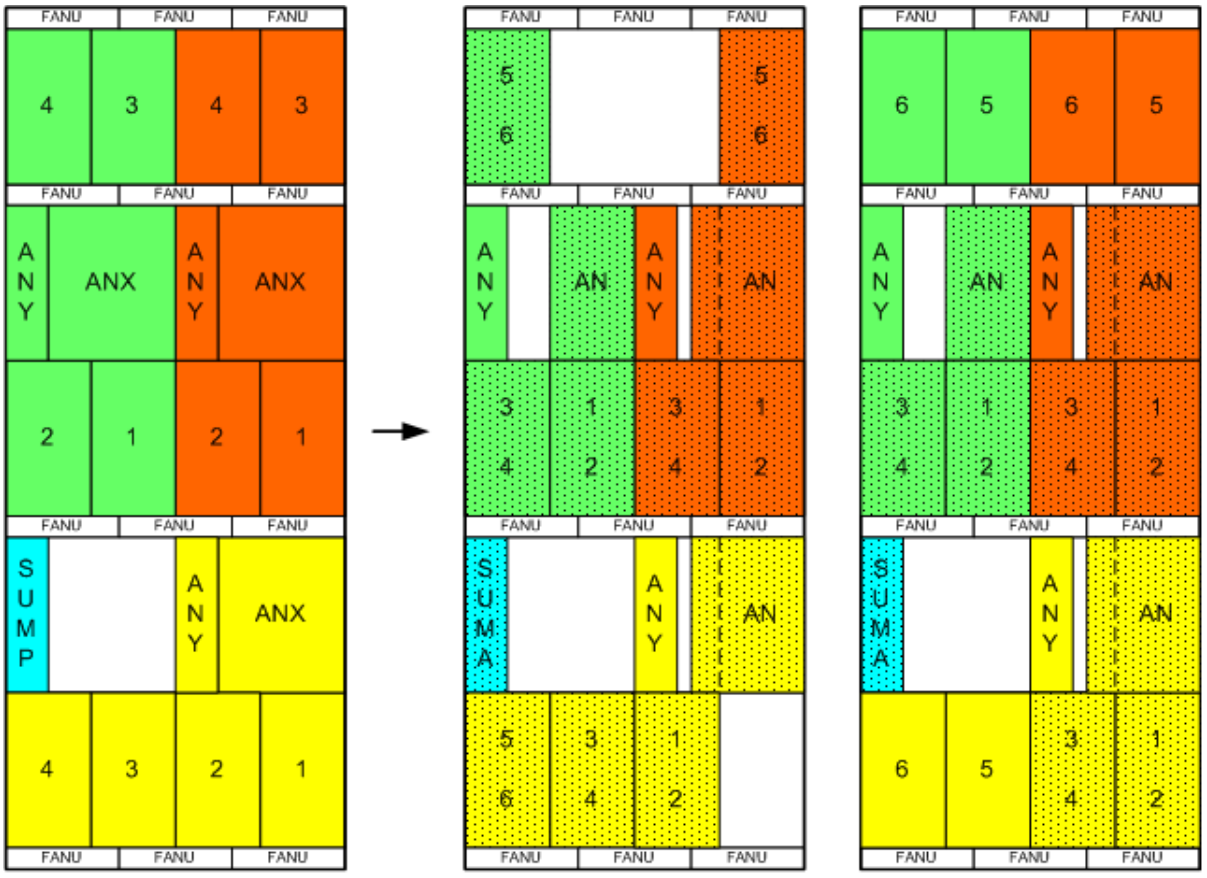
MEDI G3 with mixed Twin-TRX
up to 8/8 TRX

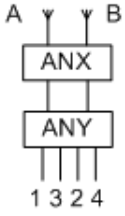


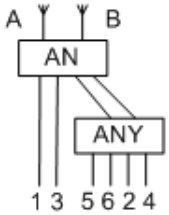




2.3.6 G3 MEDI - 3 Sectors mixed configuration Single/Twin-TRX









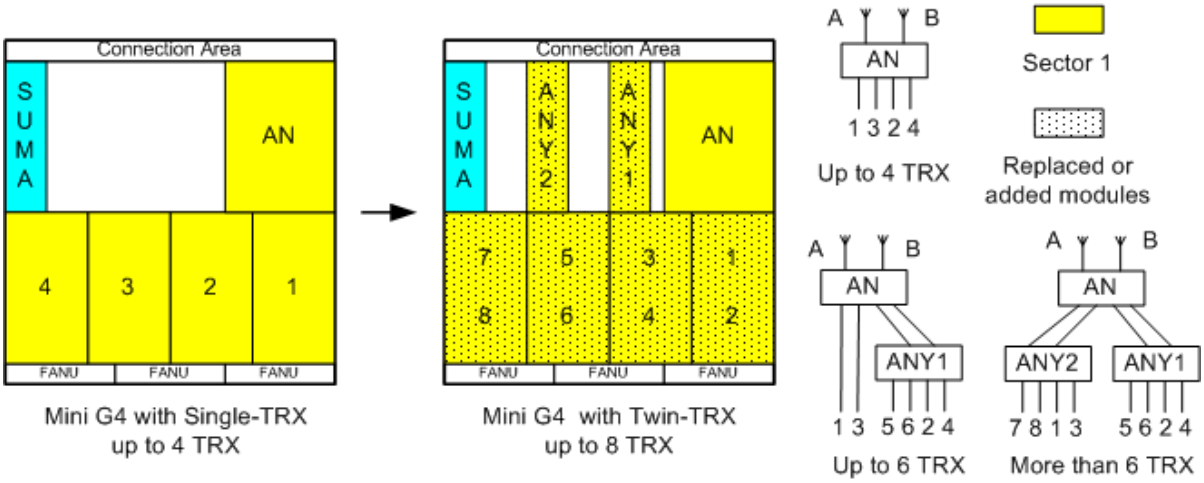
2.4 A9100 BTS Indoor (G4) Extension with Twin TRX

The following table gives the possible configuration extension based on Twin TRX modules.

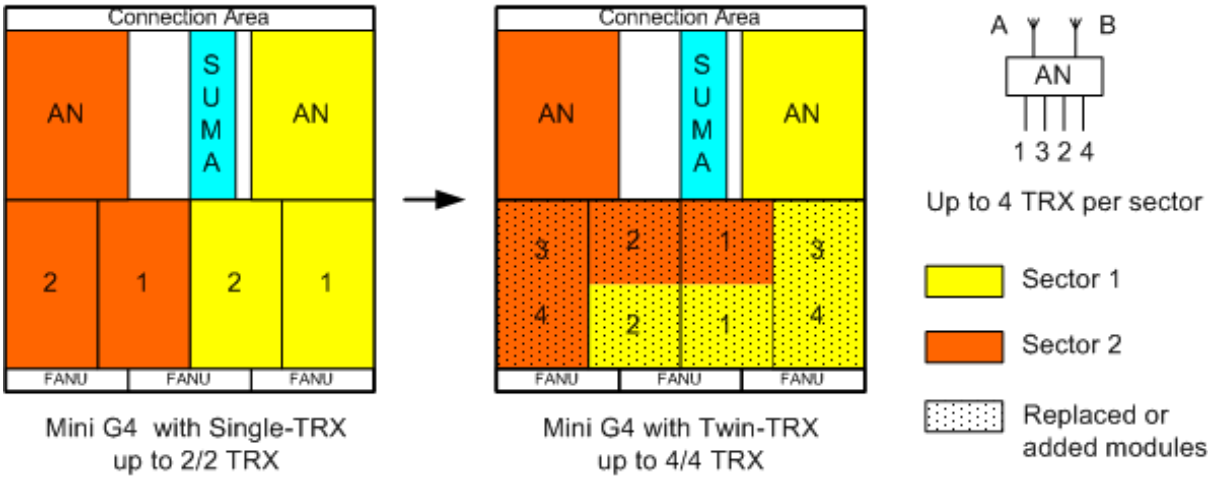
Cabinet	Number of sectiors	AC Carriesrs per sector	DC Carriesrs per sector
		Single TRX -> Twin TRX	**Single TRX -> Twin TRX**
Mini	1	n.a.	*4 -> 8*
	2	n.a.	*2/2 -> 4/4*
	3	n.a.	*1/1/1 -> 2/2/2*
Medi	1	n.a.	*12 -> 16*
	2	*2/2 -> 4/4*	*6/6 -> 8/8*
	3	*2/2/2 (4/4/4) -> 4/6/6(6/6/6)*	*4/4/4 -> 6/6/6*

* : Change of SUMA location

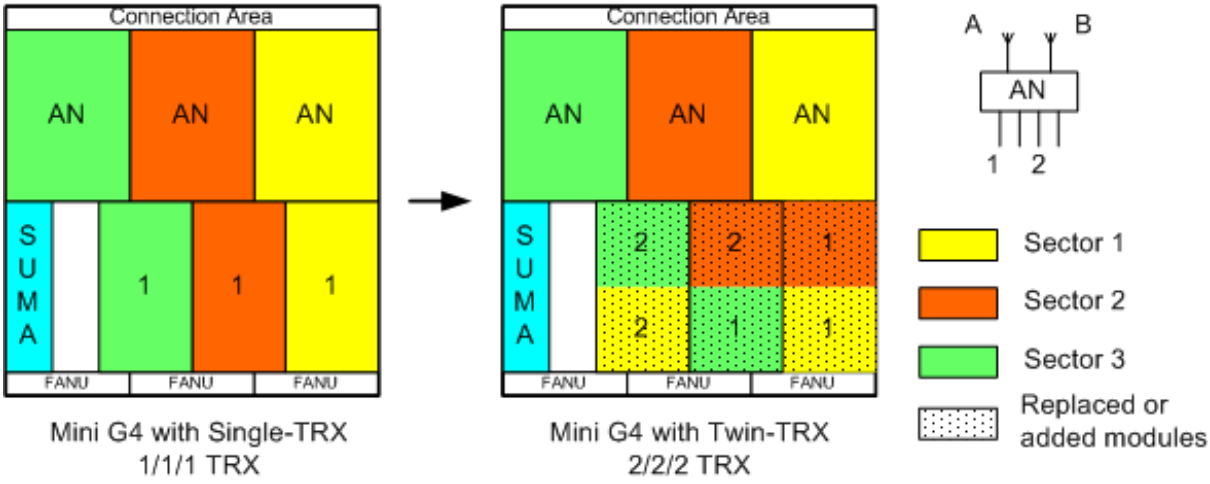
2.4.1 G4 MINI - 1 Sector mixed configuration Single/Twin-TRX



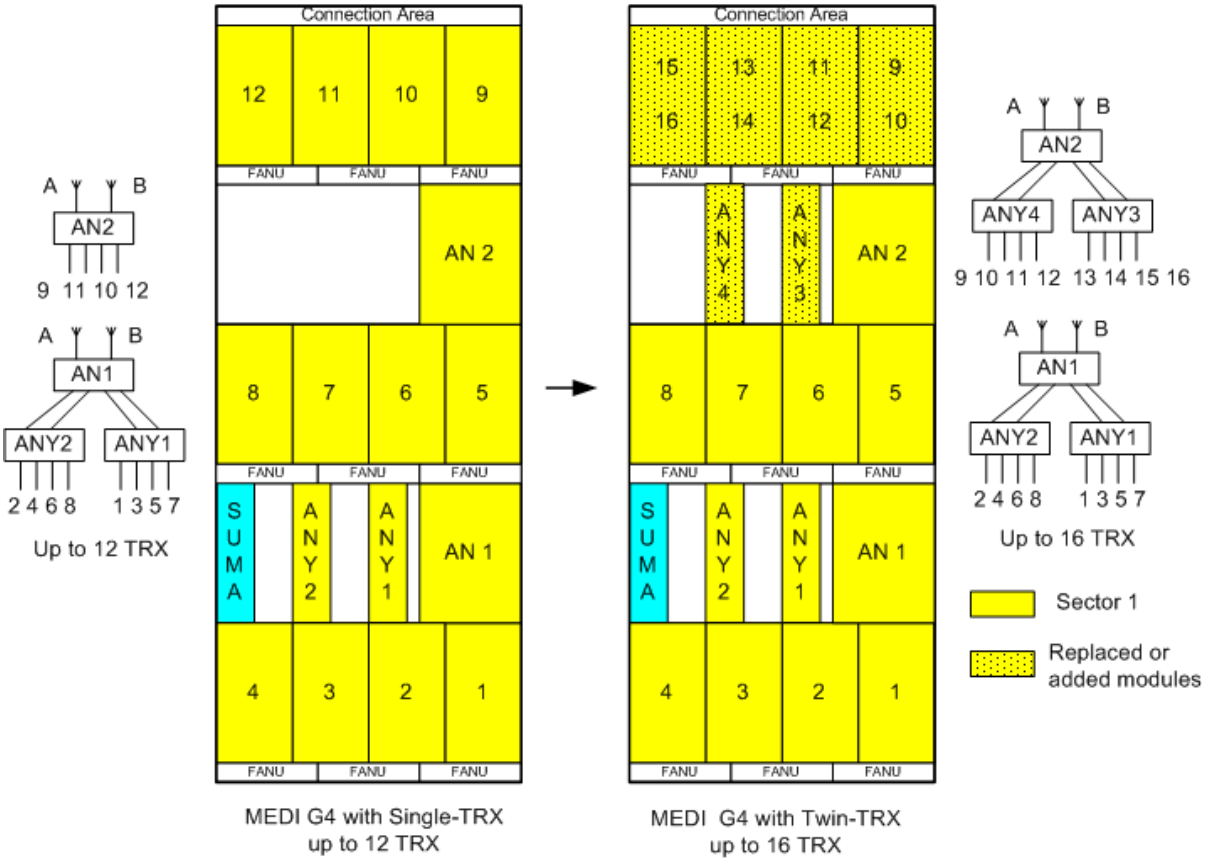
2.4.2 G4 MINI - 2 Sectors mixed configuration Single/Twin-TRX

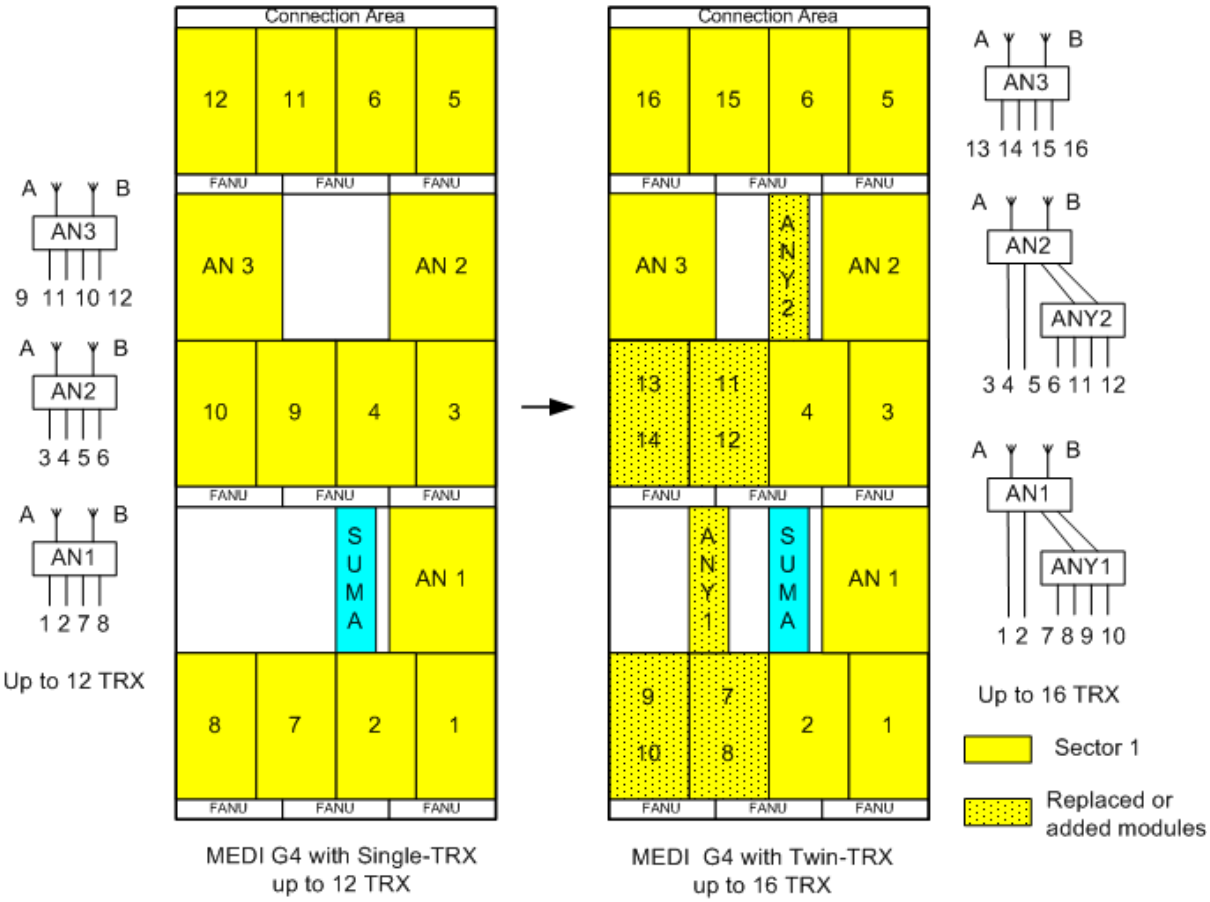


2.4.3 G4 MINI - 3 Sectors mixed configuration Single/Twin-TRX

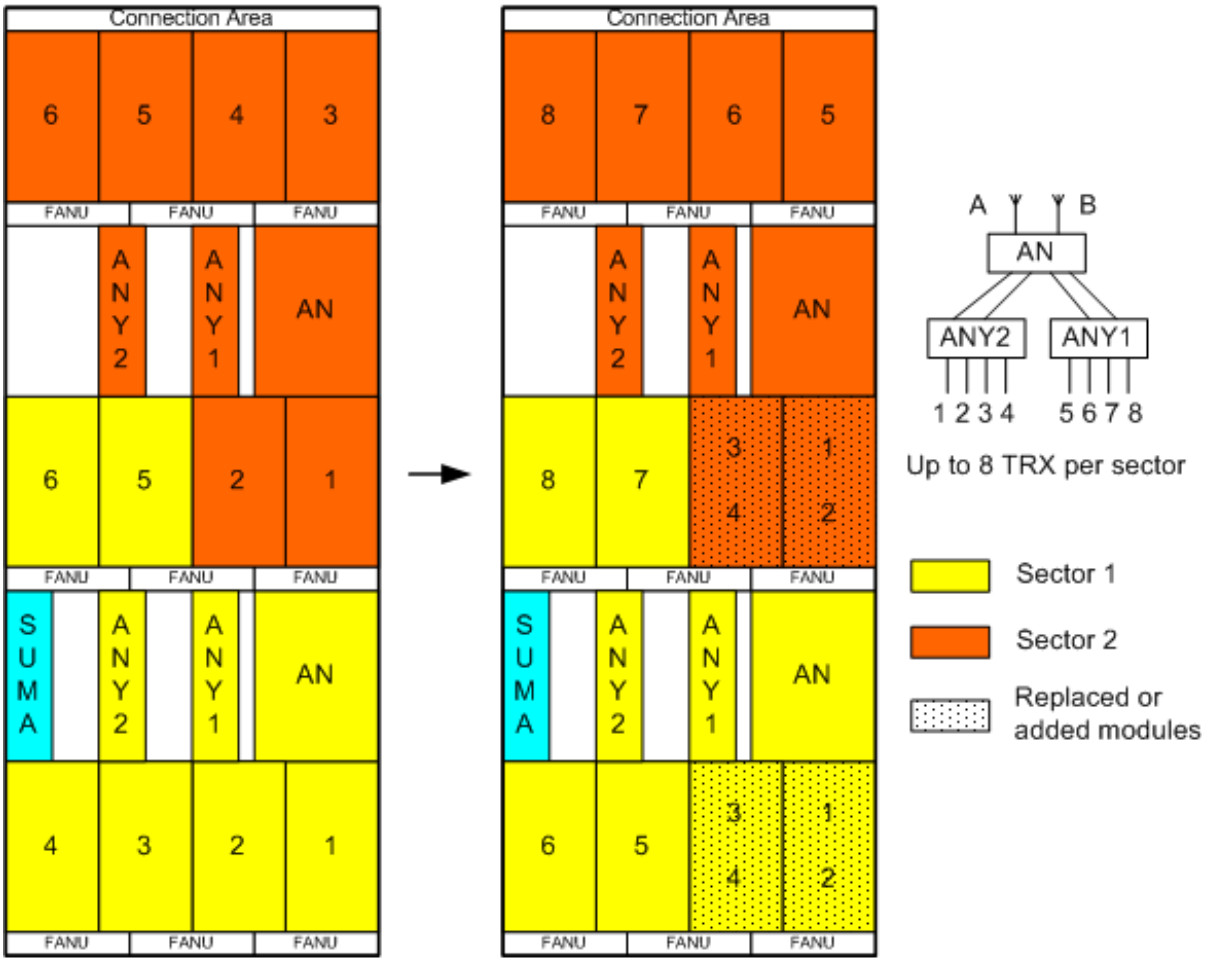


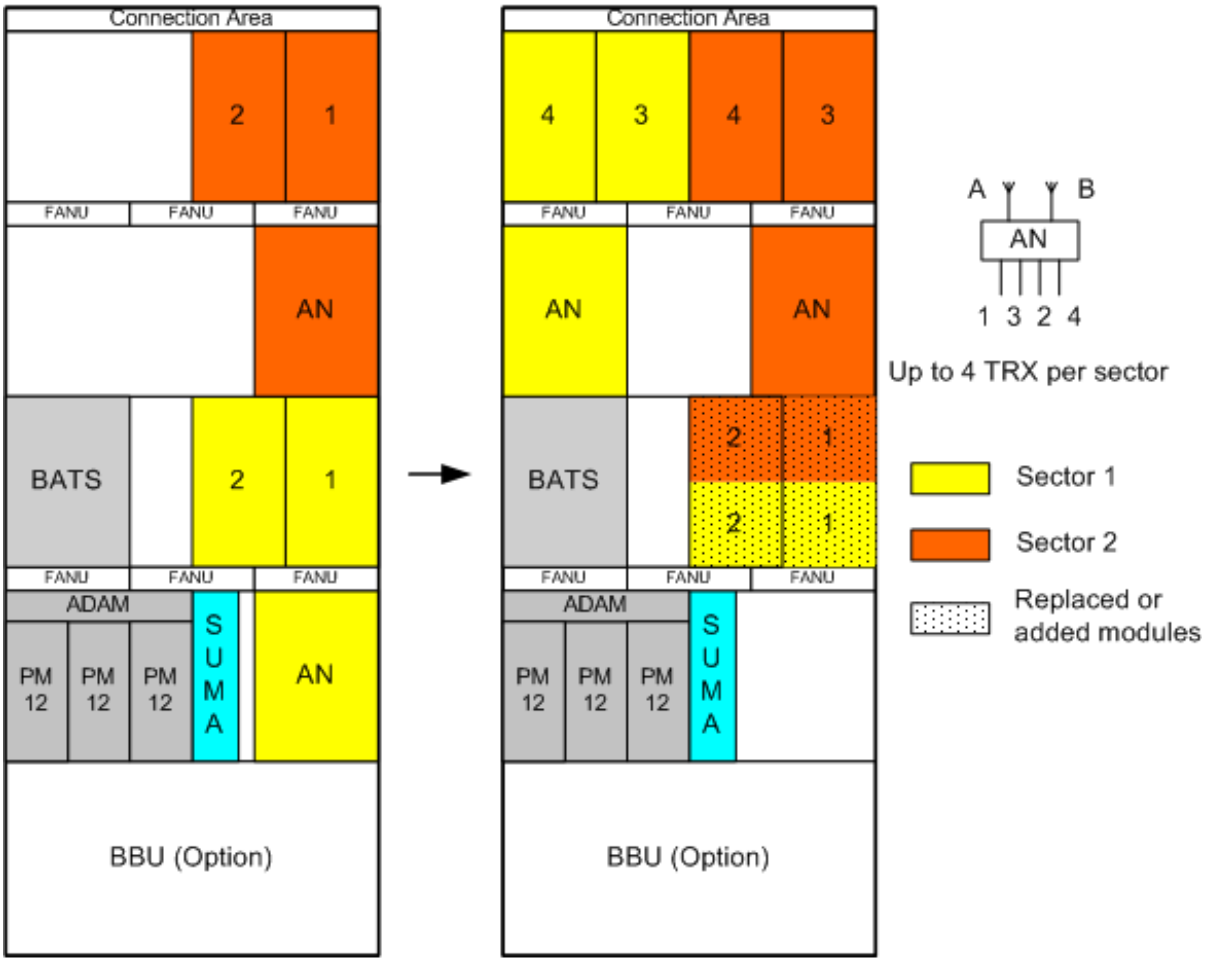
2.4.4 G4 MEDI - 1 Sector mixed configuration Single/Twin-TRX




A B
AN3
9 11 10 12
A B
AN2
3 4 5 6
A B
AN1
1 2 7 8
Up to 12 TRX
Connection Area
12 11 6 5
FANU FANU FANU
AN 3
AN 2
10 9 4 3
FANU FANU FANU
SUMA
AN 1
8 7 2 1
FANU FANU FANU
MEDI G4 with Single-TRX
up to 12 TRX
Connection Area
16 15 6 5
FANU FANU FANU
AN 3
ANY2
AN 2
13 14
11 12
4 3
FANU FANU FANU
ANY1
SUMA
AN 1
9 10
7 8
2 1
FANU FANU FANU
MEDI G4 with Twin-TRX
up to 16 TRX
A B
AN3
13 14 15 16
A B
AN2
ANY2
3 4 5 6 11 12
A B
AN1
ANY1
1 2 7 8 9 10
Up to 16 TRX
Sector 1
Replaced or
added modules

2.4.5 G4 MEDI - 2 Sectors mixed configuration Single/Twin-TRX

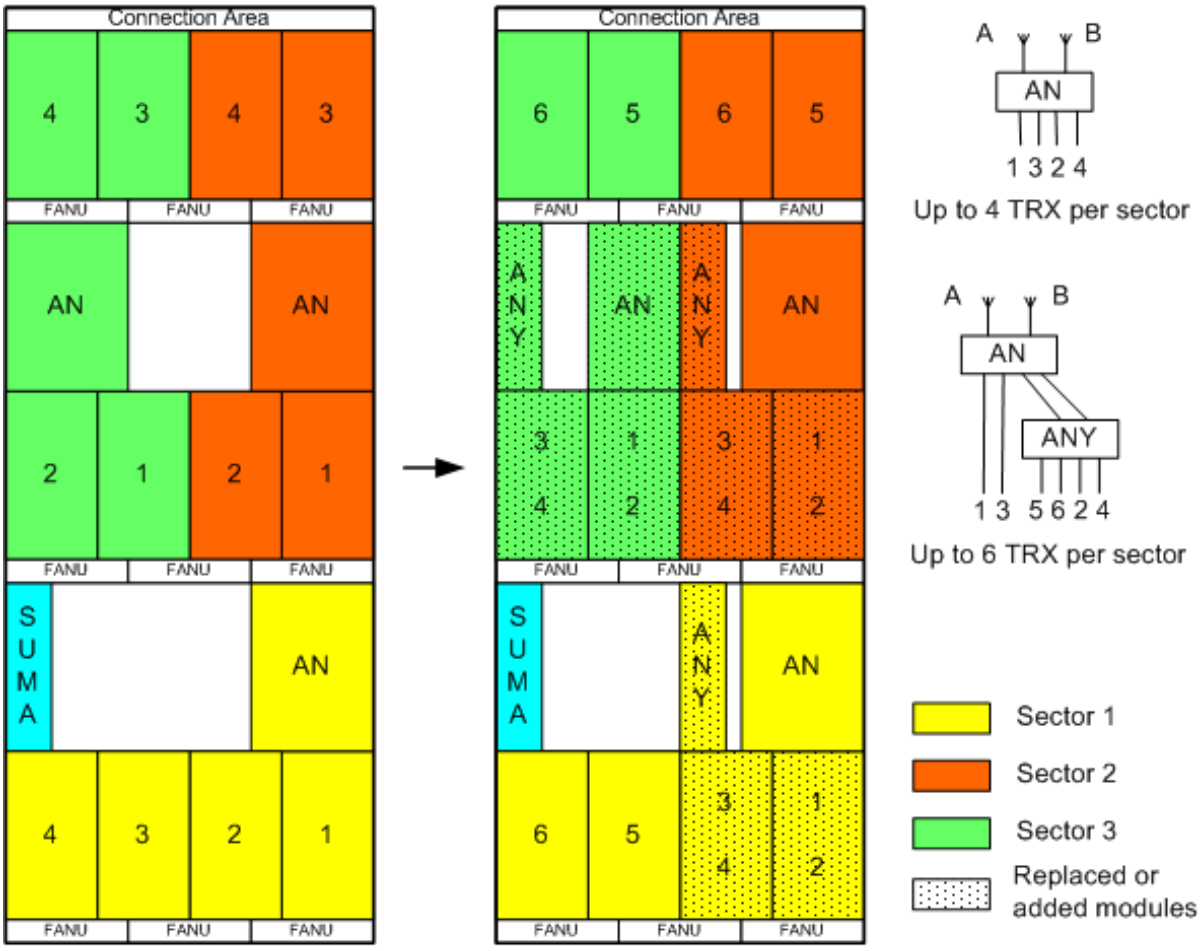




MEDI G4 AC with Single-TRX
up to 2/2 TRX

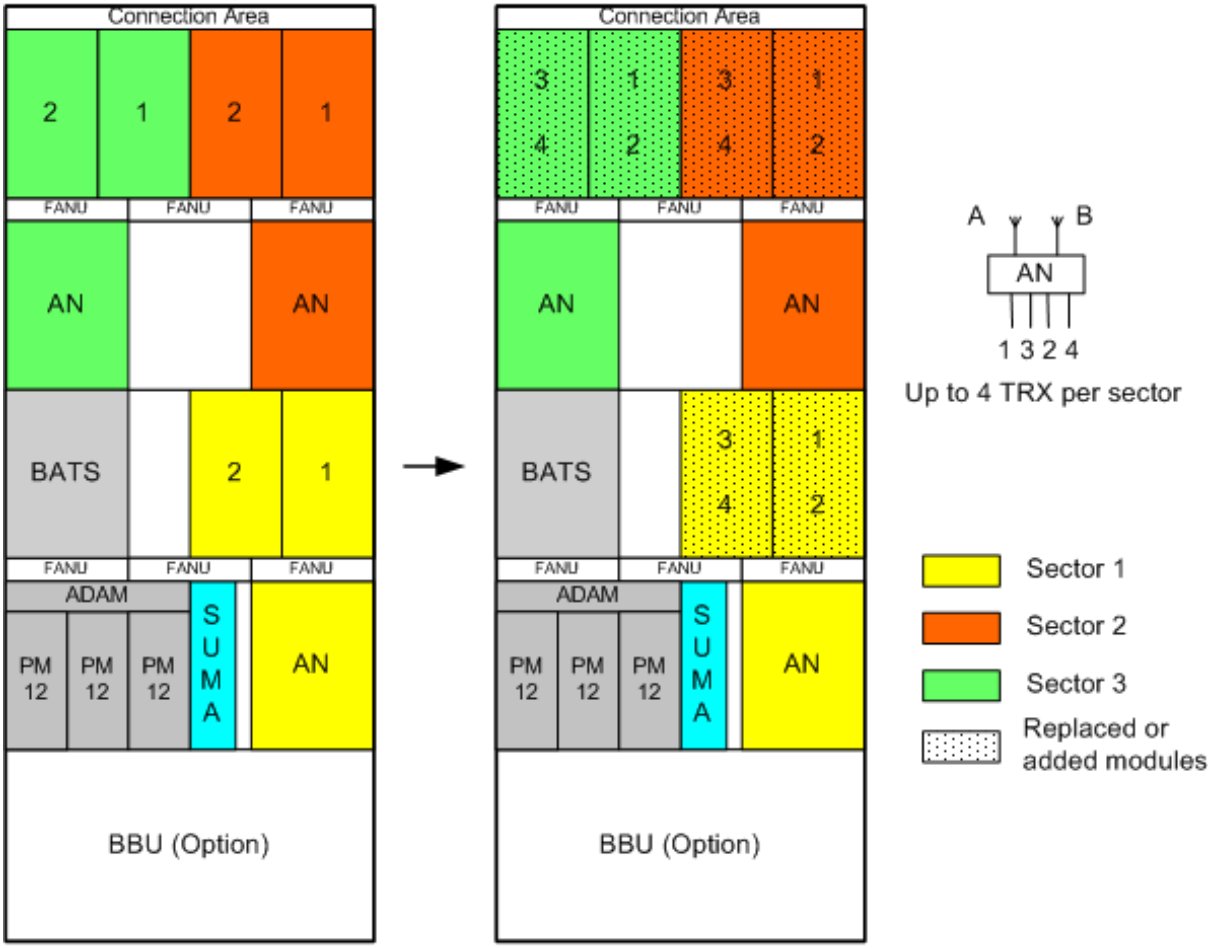
MEDI G4 AC with Twin-TRX
up to 4/4 TRX

2.4.6 G4 MEDI - 3 Sectors mixed configuration Single/Twin-TRX



MEDI G4 with Single-TRX
up to 4/4/4 TRX

MEDI G4 with Twin-TRX
up to 6/6/6 TRX



MEDI G4 AC with Single-TRX
up to 2/2/2 TRX

MEDI G4 AC with Twin-TRX
up to 4/4/4 TRX



MEDI G4 AC with Single-TRX
up to 4/4/4 TRX

MEDI G4 AC with Twin-TRX
up to 4/6/6 TRX

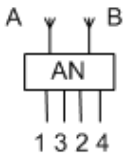
MEDI G4 AC with Twin-TRX
up to 6/6/6 TRX
with SUMA location change

Sector 1

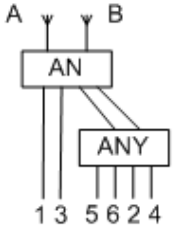
Sector 2

Sector 3

Replaced or
added modules



Up to 4 TRX per sector



Up to 6 TRX per sector

2.5 Multistandard Base Station Indoor Configurations with Single TRX

2.5.1 MBI Configurations - Standard BTS GSM 850/900/1800/1900

The following configurations are valid for GSM 850/900/1800/1900 unless otherwise indicated.

2.5.1.1 MBI3 - 1x1...8 - DC

The following figure shows the rack layout of the MBI3 - 1x1...8 - DC configuration.

Note: **Restrictions**

None. for GSM 850.

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x7...8 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 1x6 without restrictions: 45 W at + 45° C.

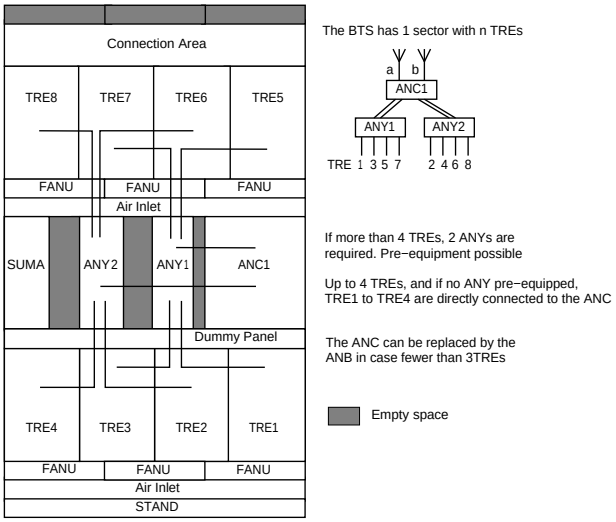


Figure 47: MBI3 - 1x1...8 - DC Configuration

2.5.1.2 MBI3 - 1x1...4 - AC

The following figure shows the rack layout of the MBI3 - 1x1...4 - AC configuration.

Note: **Restrictions**

None. for GSM 850.

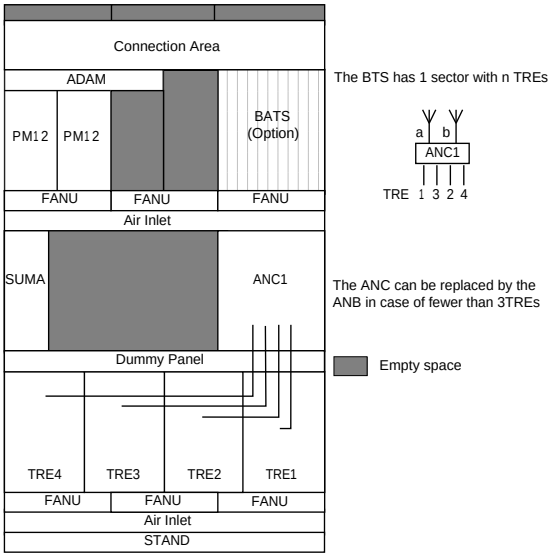


Figure 48: MBI3 - 1x1...4 - AC Configuration

2.5.1.3 MBI3 - 2x1...4 - DC

The following figure shows the rack layout of the MBI3 - 2x1...4 - DC configuration.

Note: **Restrictions**

None. for GSM 850.

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x4 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 2x1...3 without restrictions: 45 W at + 45° C.

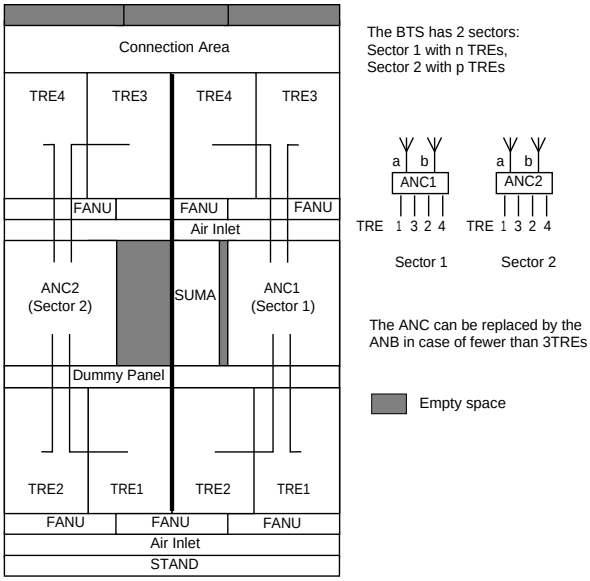


Figure 49: MBI3 - 2x1...4 - DC Configuration

2.5.1.4 MBI3 - 2x1...2 - AC

The following figure shows the rack layout of the MBI3 - 2x1...2 - AC configuration.

Note: **Restrictions**

None. for GSM 850.

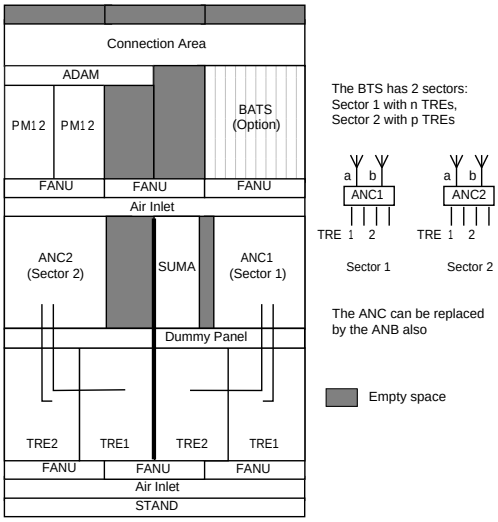


Figure 50: MBI3 - 2x1...2 - AC Configuration

2.5.1.5 MBI3 - 3x1...2 - DC

The following figure shows the rack layout of the MBI3 - 3x1...2 - DC configuration.

Note: **Restrictions**

None. for GSM 850.

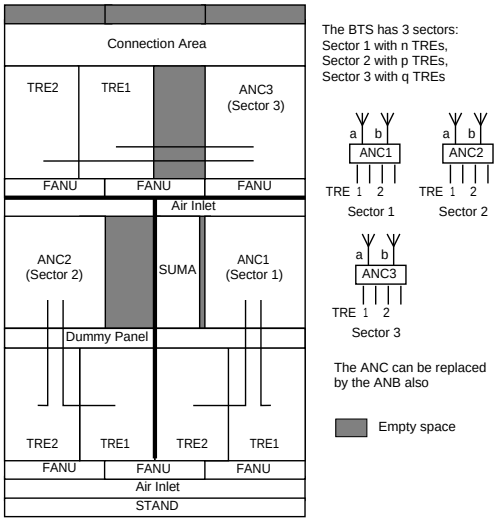


Figure 51: MBI3 - 3x1...2 - DC Configuration

2.5.1.6 MBI3 - 3x1 - AC

The following figure shows the rack layout of the MBI3 - 3x1 - AC configuration.

Note: **Restrictions**

None. for GSM 850.

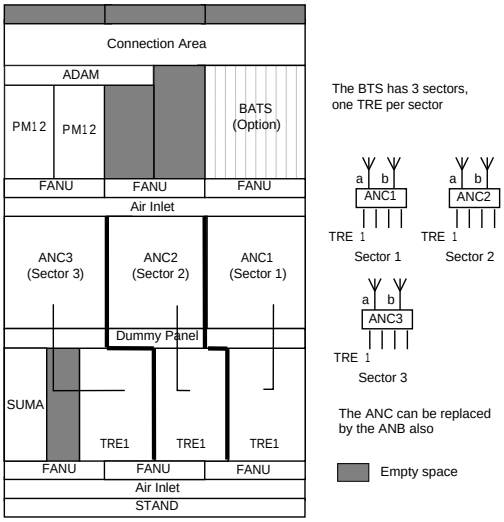


Figure 52: MBI3 - 3x1 - AC Configuration

2.5.1.7 MBI5 - 1x1...8 - AC or DC

The following figure shows the rack layout of the MBI5 - 1x1...8 - AC or DC configuration.

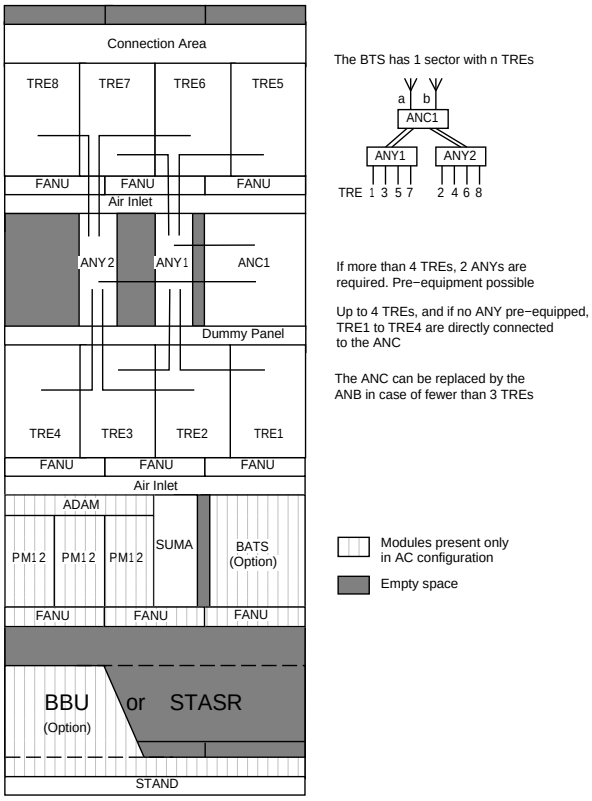


Figure 53: MBI5 - 1x1...8 - AC or DC configuration

2.5.1.8 MBI5 - 1x9...12 (Low Loss) - AC or DC

This configuration is the logical extension of the 1x1...8 configuration with a minimum of nine TREs. The following figure shows the rack layout of the MBI5 - 1x9...12 (Low Loss) - AC or DC configuration.

Note: **Restrictions**

None. for GSM 850.

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x11...12 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 1x10 without restrictions: 45 W at + 45° C.

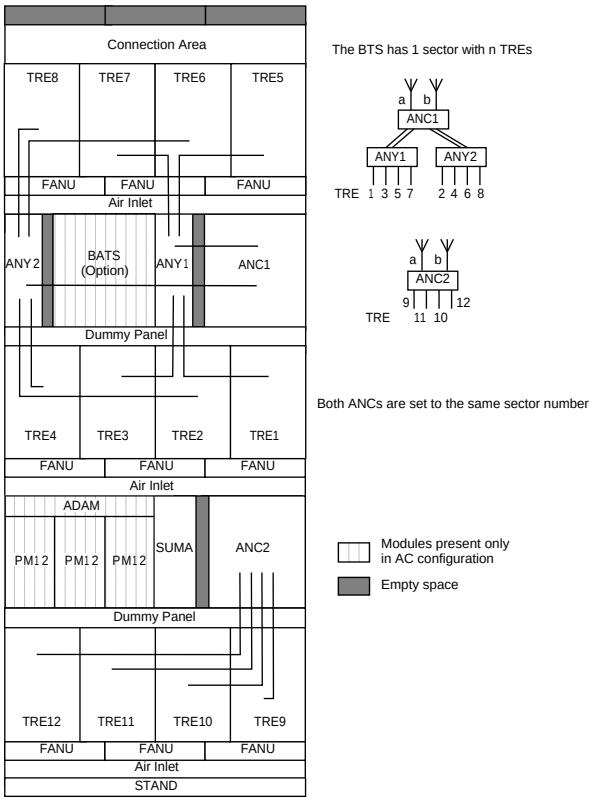


Figure 54: MBI5 - 1x9...12 (Low Loss) - AC or DC Configuration

2.5.1.9 MBI5 - 2x1...4 - AC

The following figure shows the rack layout of the MBI5 - 2x1...4 - AC configuration with BU101.

Note: **Restrictions**

None. for GSM 850.

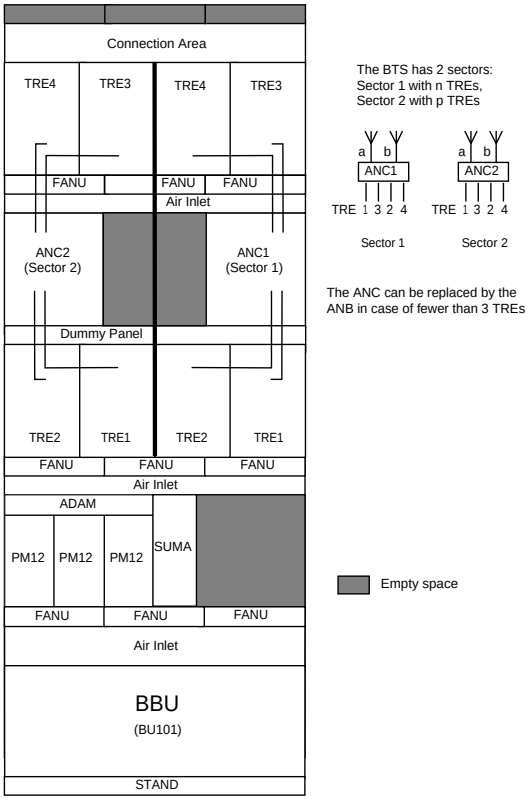


Figure 55: MBI5 - 2x1...4 - AC Configuration with BU101

2.5.1.10 MBI5 - 2x1...6 - AC or DC

The following figure shows the rack layout of the MBI5 - 2x1...6 - AC or DC configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 2x1...5 without restrictions: 45 W at + 45° C.

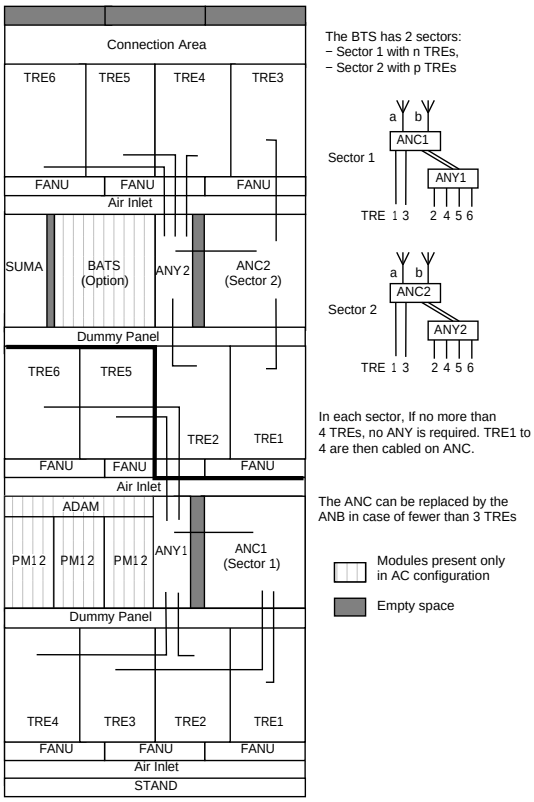


Figure 56: MBI5 - 2x1...6 - AC or DC Configuration

2.5.1.11 MBI5 - 1x1...8 + 1x1...4 - AC or DC

The following figure shows the rack layout of the MBI5 - 1x1...8 + 1x1...4 - AC or DC configuration.

Note: **Restrictions**

None. for GSM 850 and GSM 1900.

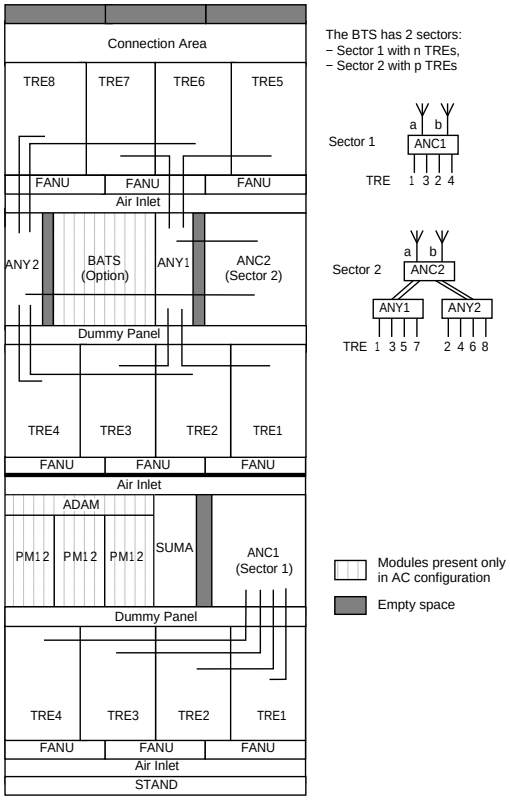


Figure 57: MBI5 - 1x1...8 + 1x1...4 - AC or DC Configuration

2.5.1.12 MBI5 - 3x1...2 - AC

The following figure shows the rack layout of the MBI5 - 3x1...2 - AC configuration with BU101.

Note: **Restrictions**

None. for GSM 850.

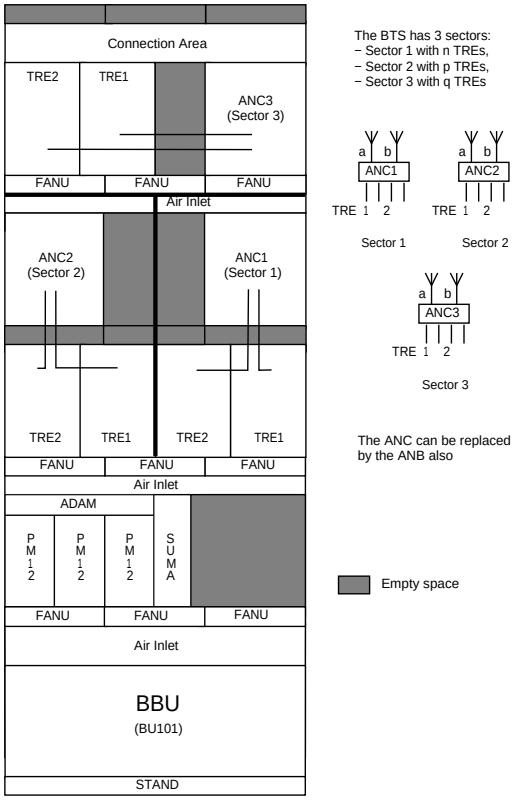


Figure 58: MBI5 - 3x1...2 - AC Configuration with BU101

2.5.1.13 MBI5 - 3x1...4 - AC or DC

The following figure shows the rack layout of the MBI5 - 3x1...4 - AC or DC configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

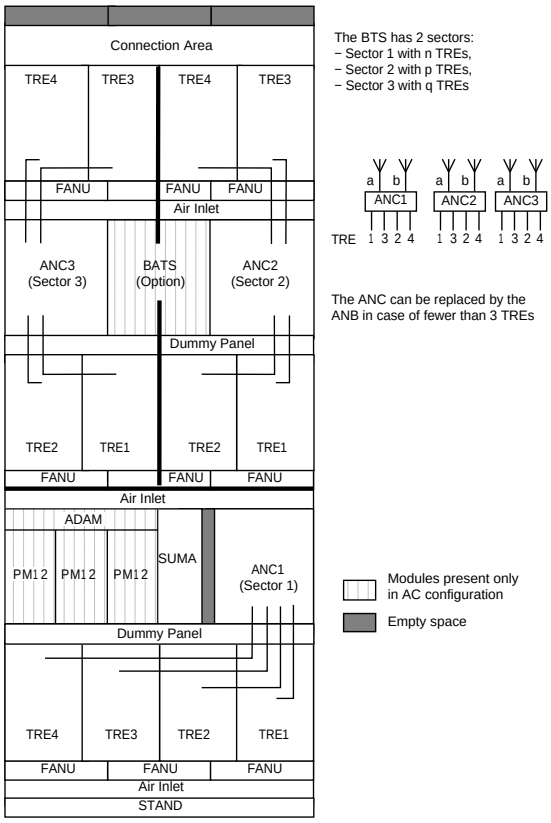


Figure 59: MBI5 - 3x1...4 - AC or DC Configuration

2.5.2 MBI Configurations - Low Losses GSM 900/1800/1900

2.5.2.1 MBI3 - 1x3...4 - Low Losses - AC or DC

The following figure shows the rack layout of the MBI3 - 1x3...4 - Low Losses - AC or DC configuration.

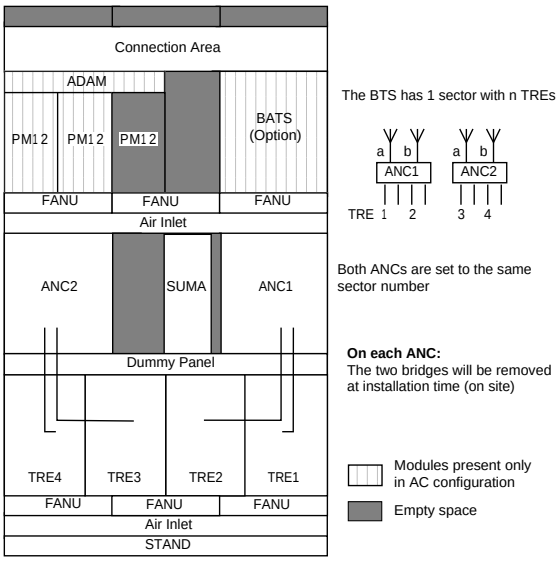


Figure 60: MBI3 - 1x3...4 - Low Losses - AC or DC Configuration

2.5.2.2 MBI5 - 1x3...8 - Low Losses - AC or DC

The following figure shows the rack layout of the MBI5 - 1x3...8 - Low Losses - AC or DC configuration.

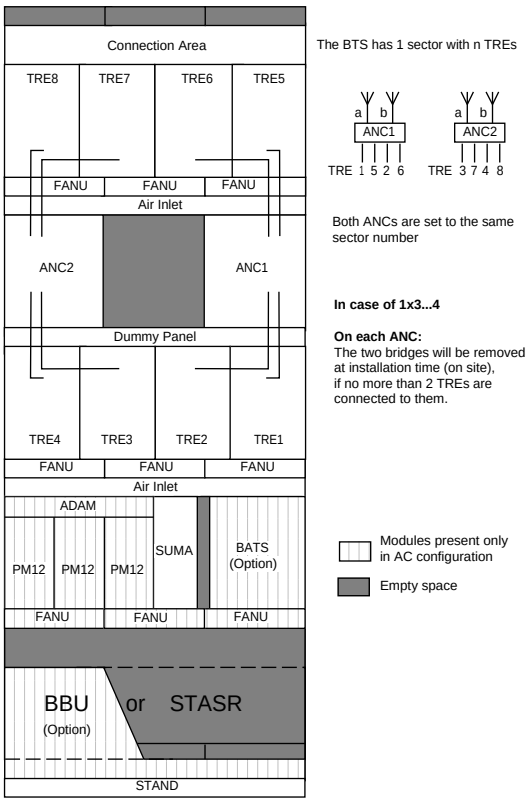


Figure 61: MBI5 - 1x3...8 - Low Losses - AC or DC Configuration

2.5.2.3 MBI5 - 1x9...12 - Low Losses - AC or DC

The following figure shows the rack layout of the MBI5 - 1x9...12 - Low Losses - AC or DC configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x11...12 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 1x1...10 without restrictions: 45 W at + 45° C.

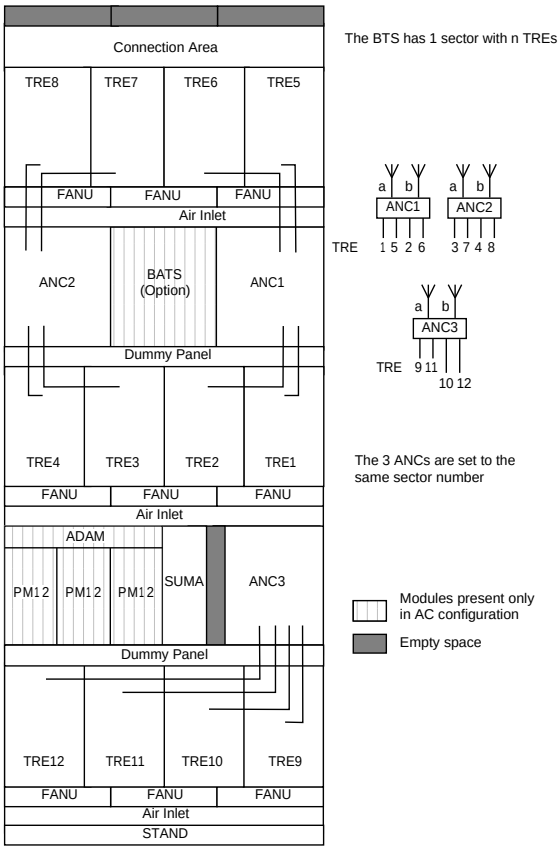


Figure 62: MBI5 - 1x9...12 - Low Losses - AC or DC Configuration

2.5.2.4 MBI5 - 2x3...6 - Low Losses - DC

The following figure shows the rack layout of the MBI5 - 2x3...6 - Low Losses - DC configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 45 W at + 40° C or with 28 W at + 45° C.

Configurations up to 2x3...5 without restrictions: 45 W at + 45° C.

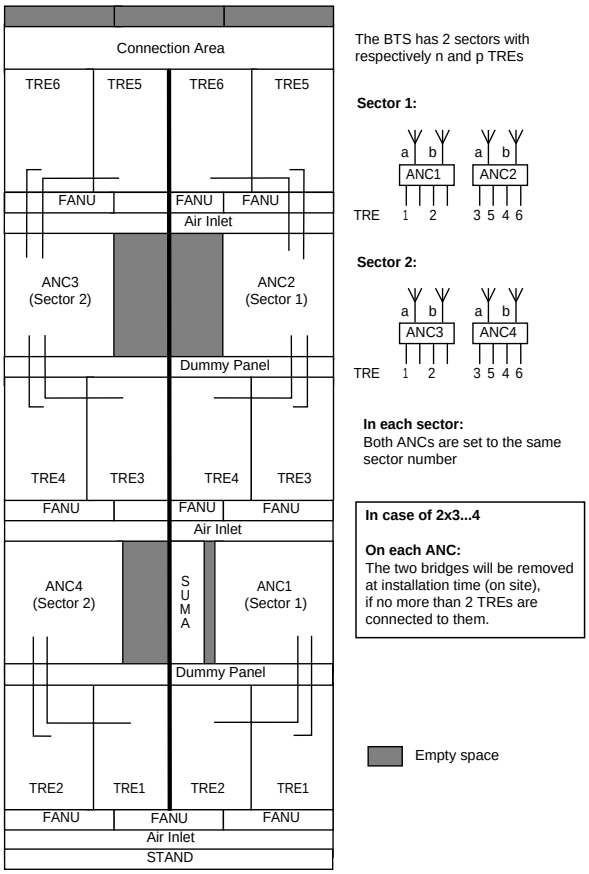


Figure 63: Indoor MEDI - 2x1...6 - Low Losses Configuration

2.5.3 MBI Configurations - High Power GSM 1800

2.5.3.1 MBI3 - 2x1 - High Power - AC or DC

The following figure shows the rack layout of the MBI3 - 2x1- High Power - AC or DC configuration.

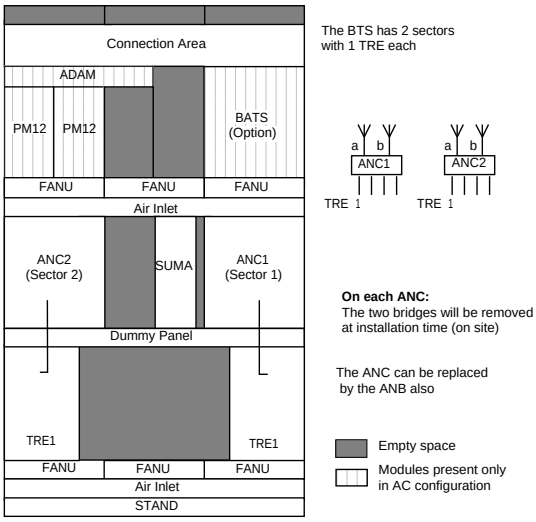


Figure 64: MBI3 - 2x1 - High Power - AC or DC Configuration

2.5.3.2 MBI5 - 1x1...4 - High Power - AC or DC

The following figure shows the rack layout of the MBI5 - 1x1...4 - High Power - AC or DC configuration.

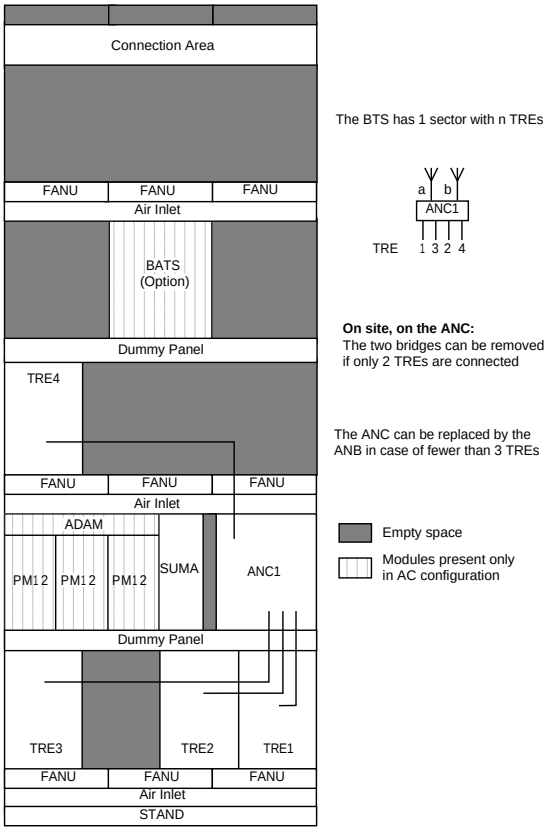


Figure 65: MBI5 - 1x1...4 - High Power - AC or DC Configuration

2.5.3.3 MBI5 - 2x1...4 - High Power - AC or DC

The following figure shows the rack layout of the MBI5 - 2x1...4 - High Power - AC or DC configuration.

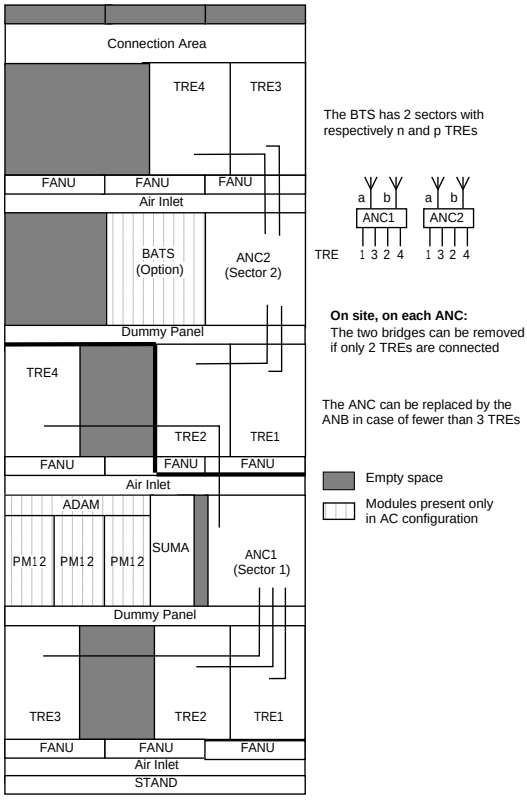


Figure 66: MBI5 - 2x1...4 - High Power - AC or DC Configuration

2.5.3.4 MBI5 - 3x1...3 - High Power - AC or DC

The following figure shows the rack layout of the MBI5 - 3x1...3 - High Power - AC or DC configuration.

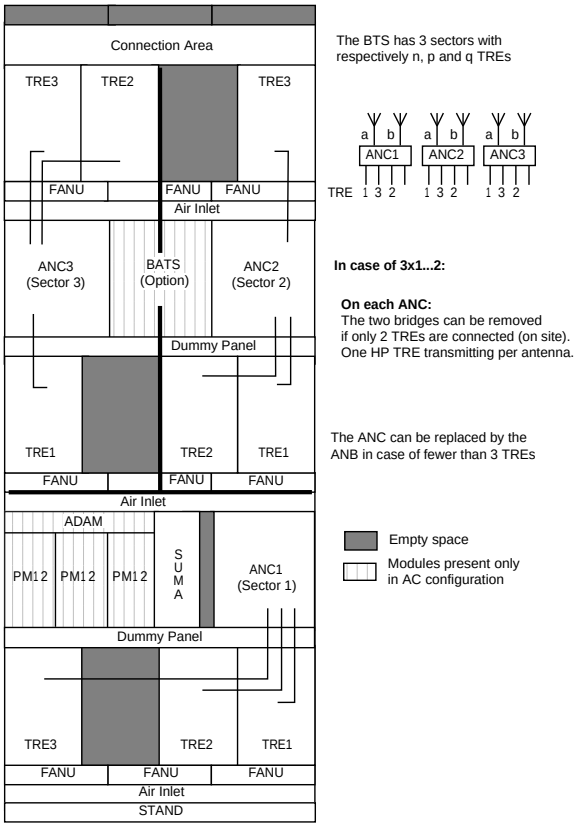


Figure 67: MBI5 - 3x1...3 - High Power - AC or DC Configuration

2.5.3.5 MBI5 - 3x4 - High Power - DC

The MBI5 - 3x4 - High Power - DC configuration is an extension of the 3x2 configuration described earlier. The extension is realized by adding a second BTS cabinet with the following TRE split:

- Cabinet 1: 2x4 HP TREs (the MBI5 3x1...2 is reconfigured to MBI5 2x1...4)
- Cabinet 2: 1x4 HP TREs build on an MBI5 cabinet basis.

2.5.3.6 MBI5 - 3x6 - High Power - DC

The MBI5 - 3x6 - High Power - DC configuration is based on two cabinets with the following TRE split:

- Cabinet 1: 1x6 TREs + 1x3 TREs
- Cabinet 2: 1x6 TREs + 1x3 TREs

These configurations use a mixture of high-power and medium-power TREs.

2.5.4 MBI Configurations - Extended Cell GSM 900

Extended cell configurations are based either on REK or on RX TMA use as shown in the following figures.

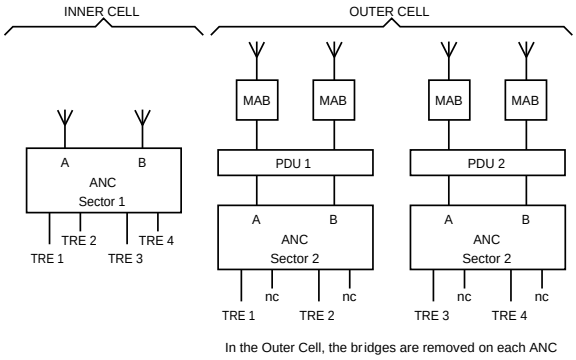


Figure 68: Extended Cell Configuration Based on REK Use

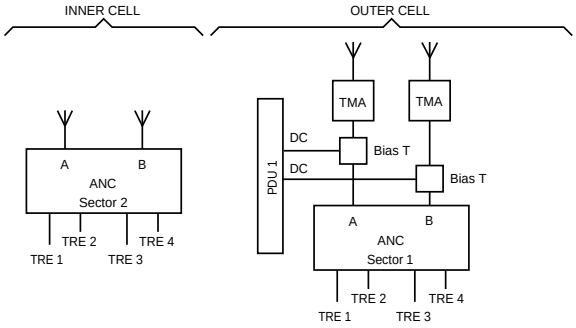


Figure 69: Extended Cell Configuration Based on RX TMA Use

2.5.4.1 MBI5 - Extended Cell Configuration Based on REK

The following figure shows the rack layout of the MBI5 - Extended Cell Configuration Based on REK Use.

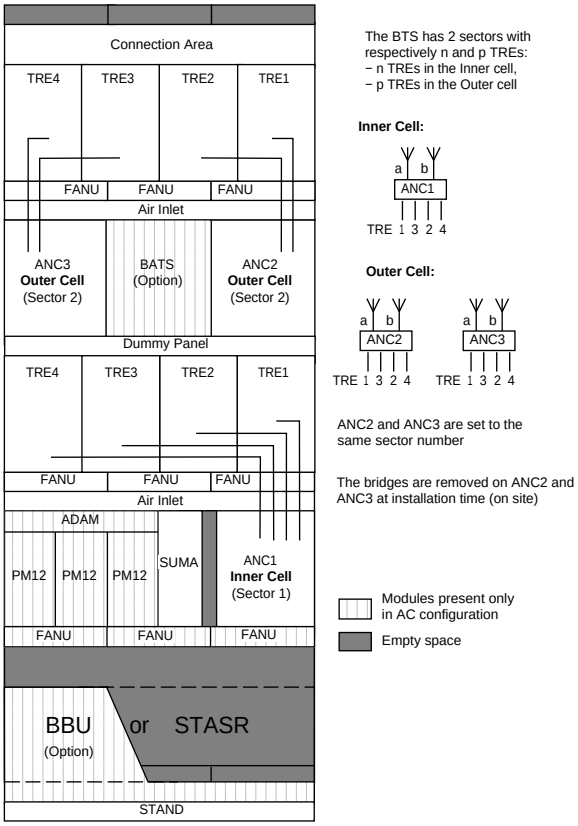


Figure 70: MBI5 - Extended Cell Configuration Based on REK Use

2.5.4.2 MBI5 - Extended Cell Configuration Based on RX TMA Use

The following figure shows the rack layout of the MBI5 - Extended Cell Configuration Based on RX TMA Use.

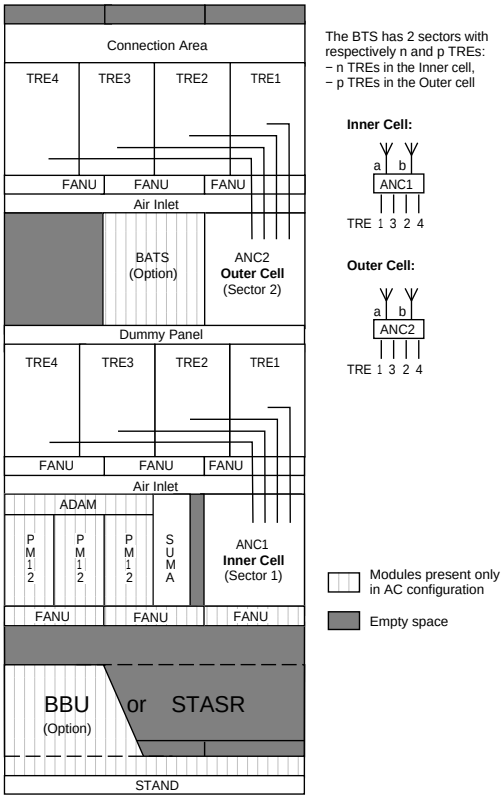


Figure 71: MBI5 - Extended Cell Configuration Based on RX TMA Use

2.5.5 MBI Configurations - Multiband BTS GSM 900/1800 and GSM 900/1900

2.5.5.1 MBI3 - 1x1...4/1x1...4

The following figure shows the rack layout of the MBI3 - 1x1...4/1x1...4 - Multiband BTS configuration.

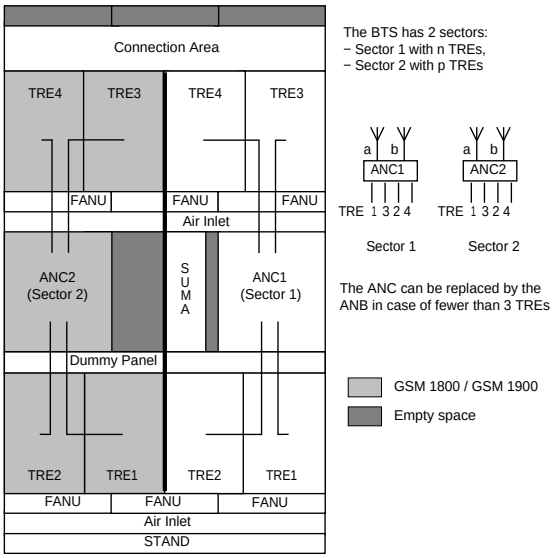


Figure 72: MBI3 - 1x1...4/1x1...4 - Multiband BTS Configuration

2.5.5.2 MBI5 - 1x1...6/1x1...6

The following figure shows the rack layout of the MBI5 - 1x1...6/1x1...6 - Multiband BTS configuration.

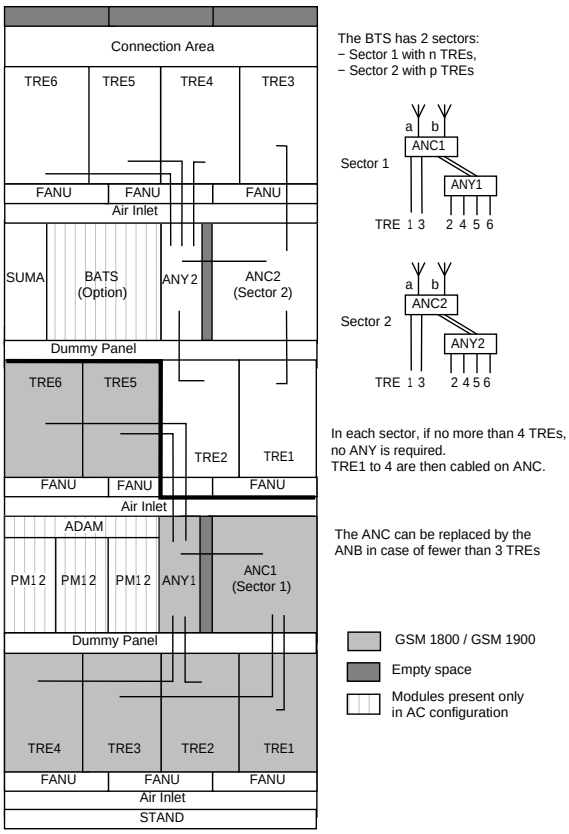


Figure 73: MBI5 - 1x1...6/1x1...6 - Multiband BTS Configuration

2.5.5.3 MBI5 - 1x1...8/1x1...4

The following figure shows the rack layout of the MBI5 - 1x1...8/1x1...4 - Multiband BTS configuration.

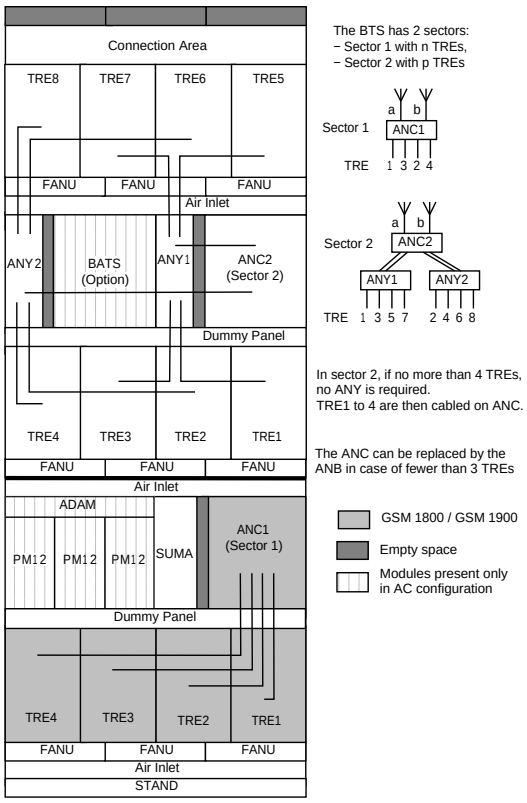


Figure 74: MBI5 - 1x1...8/1x1...4 - Multiband BTS Configuration

2.5.5.4 MBI5 - 1x1...4/1x1...8

The following figure shows the rack layout of the MBI5 - 1x1...4/1x1...8 - Multiband BTS configuration.

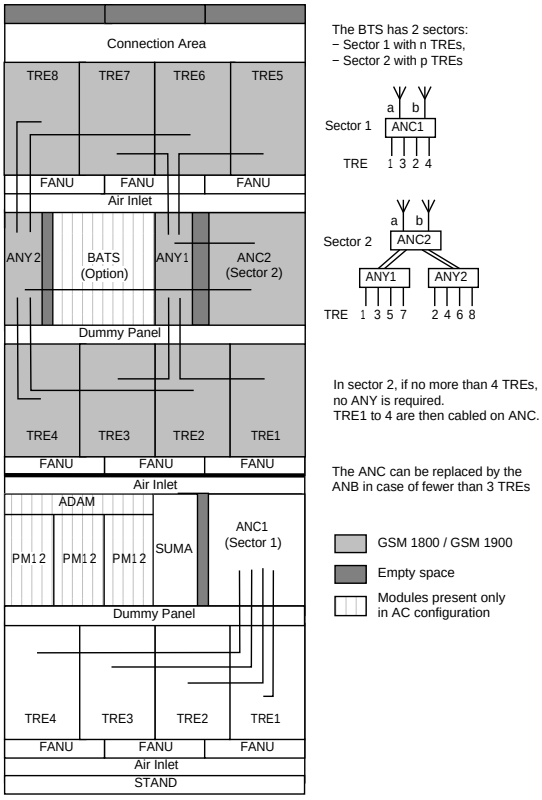


Figure 75: MBI5 - 1x1...4/1x1...8 - Multiband BTS Configuration

2.5.5.5 MBI5 - 1x3...8LL/1x1...4

The following figure shows the rack layout of the MBI5 - 1x3...8LL/1x1...4 - Multiband BTS configuration.

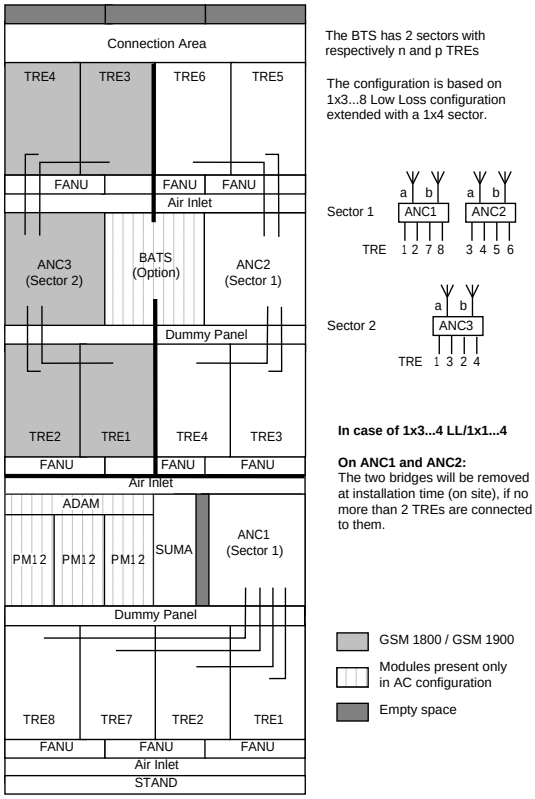


Figure 76: MBI5 - 1x3...8LL/1x1...4 - Multiband BTS Configuration

2.5.5.6 MBI5 - 1x1...4/2x1...4

The following figure shows the rack layout of the Indoor MBI5 - 1x1...4/2x1...4 - Multiband BTS configuration.

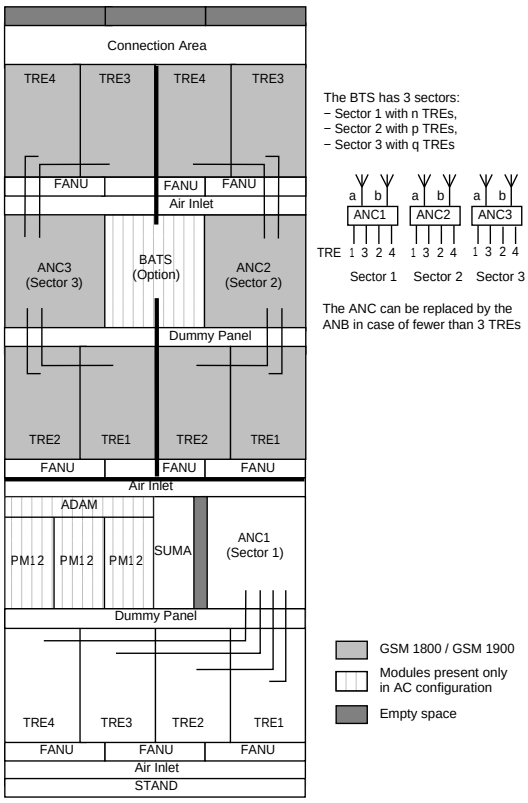


Figure 77: MBI5 - 1x1...4/2x1...4 - Multiband BTS Configuration

2.5.5.7 MBI5 - 2x1...4/1x1...4

The following figure shows the rack layout of the MBI5 - 2x1...4/1x1...4 - Multiband BTS configuration.

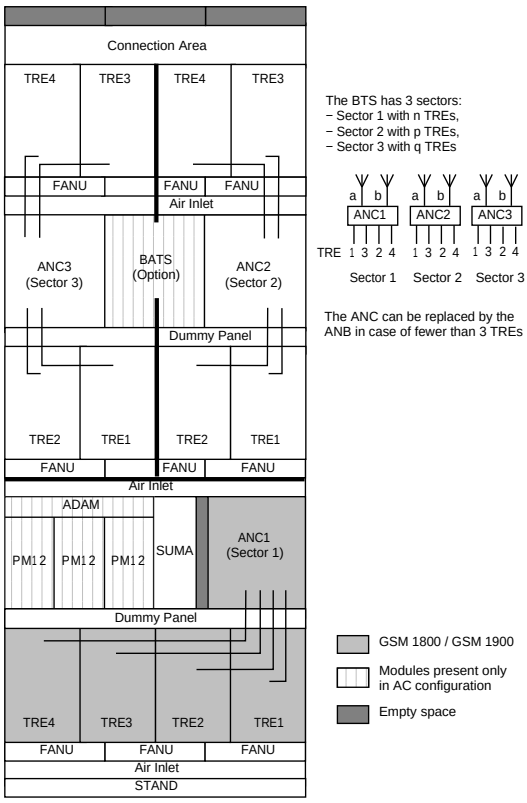


Figure 78: MBI5 - 2x1...4/1x1...4 - Multiband BTS Configuration

2.5.5.8 MBI5 - 1x1...4/...4,...2,...2

The following figure shows the rack layout of the MBI5 - 1x1...4/...4,...2,...2 - Multiband BTS configuration.

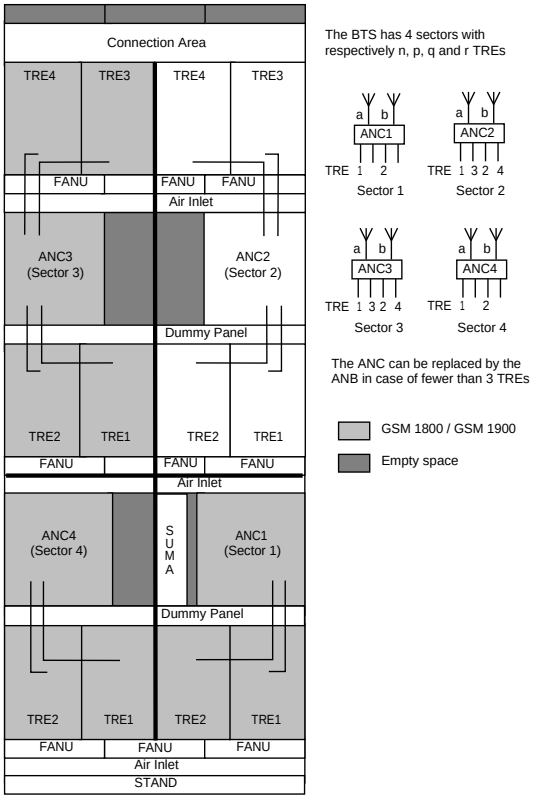


Figure 79: MBI5 - 1x1...4/...4,...2,...2 - Multiband BTS Configuration

2.5.5.9 MBI5 - ...4,...2,...2/1x1...4

The following figure shows the rack layout of the MBI5 - ...4,...2,...2/1x1...4 - Multiband BTS configuration.

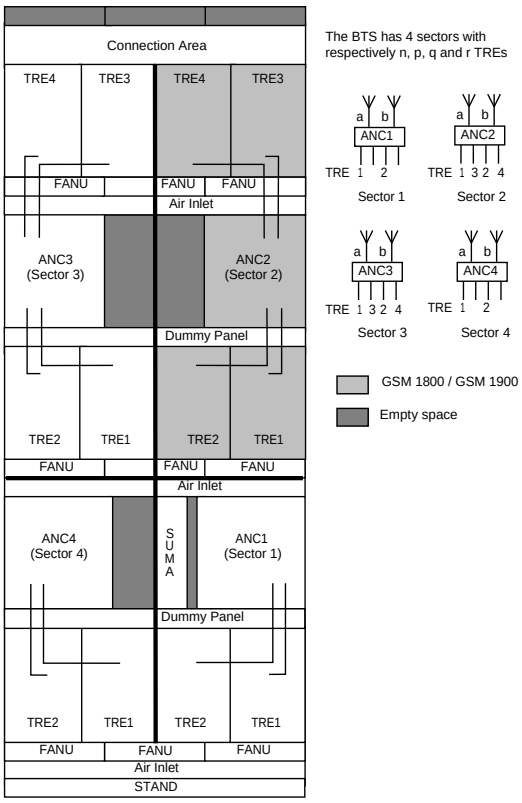


Figure 80: MBI5 - ...4,...2,...2/1x1...4 - Multiband BTS Configuration

2.5.5.10 MBI5 - 2x1...4/2x1...2

The following figure shows the rack layout of the MBI5 - 2x1...4/2x1...2 - Multiband BTS configuration.

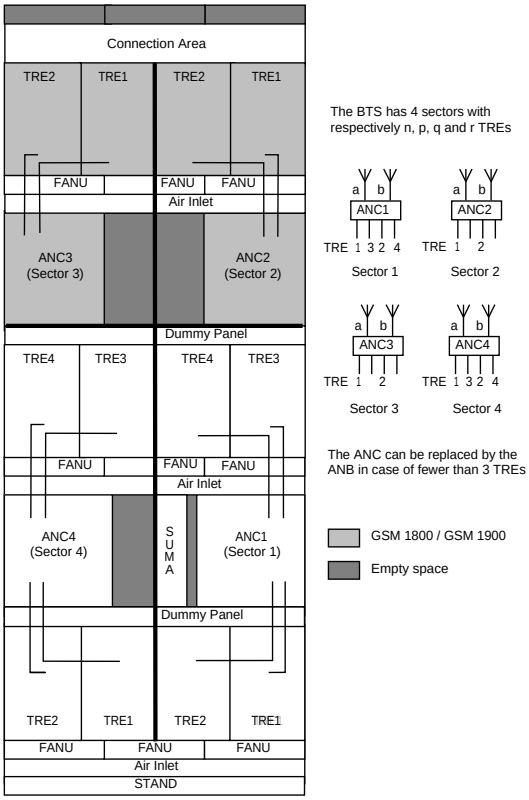


Figure 81: MBI5 - 2x1...4/2x1...2 - Multiband BTS Configuration

2.5.5.11 MBI5 - 2x1...2/2x1...4

The following figure shows the rack layout of the MBI5 - 2x1...2/2x1...4 - Multiband BTS configuration.

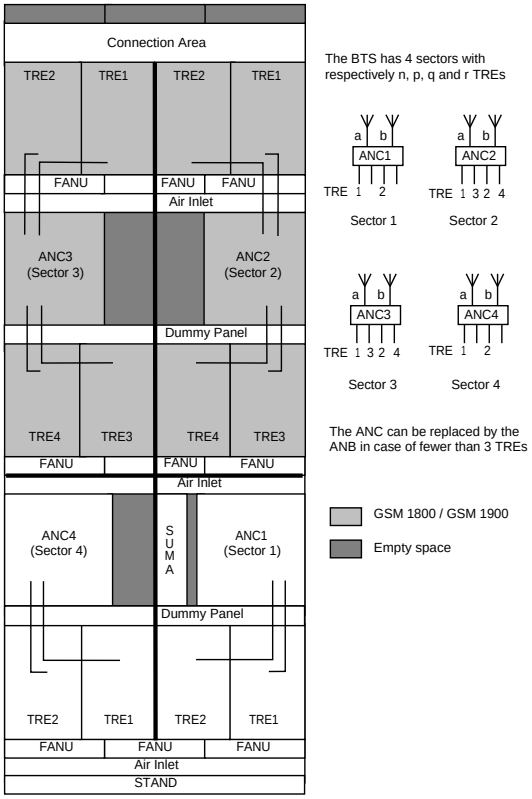


Figure 82: MBI5 - 2x1...2/2x1...4 - Multiband BTS Configuration

2.5.6 MBI Configurations - Multiband Cells GSM 900/1800

2.5.6.1 MBI3 - 1x(...4/...4)

The following figure shows the rack layout of the MBI3 - 1x(...4/...4) - Multiband Cells - DC configuration.

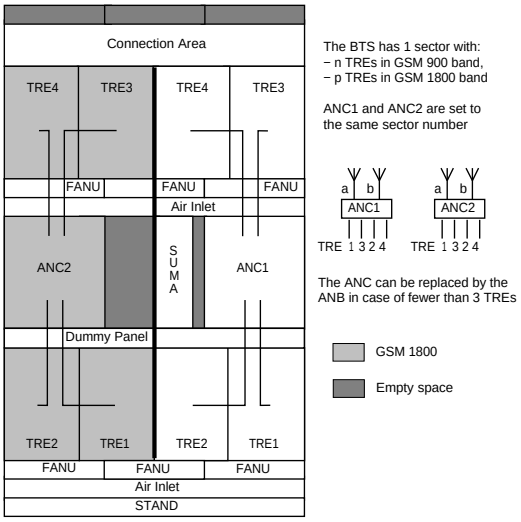


Figure 83: MBI3 - 1x(...4/...4) - Multiband Cells - DC Configuration

2.5.6.2 MBI5 - 1x(...6/...6)

The following figure shows the rack layout of the MBI5 - 1x(...6/...6) - Multiband Cells - AC or DC configuration.

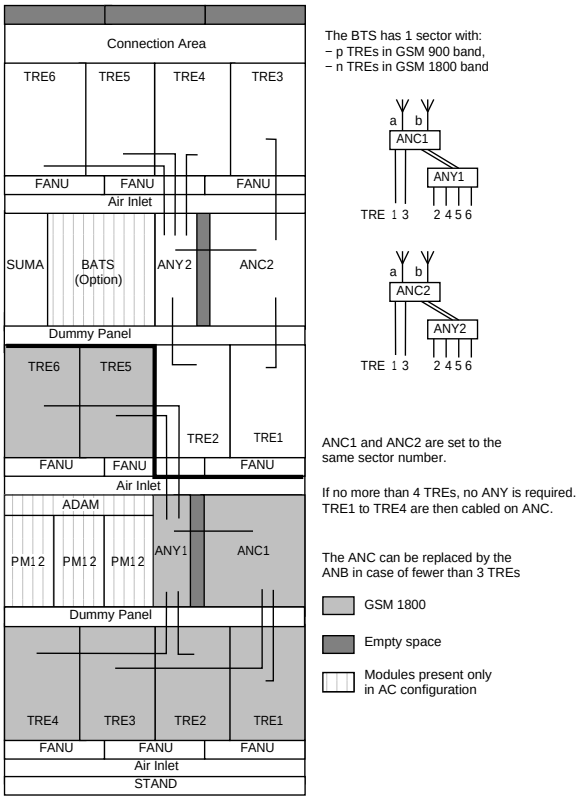


Figure 84: MBI5 - 1x(...6/...6) - Multiband Cells - AC or DC Configuration

2.5.6.3 MBI5 - 1x(...8/...4)

The following figure shows the rack layout of the MBI5 - 1x(...8/...4) - Multiband Cells - AC or DC configuration.

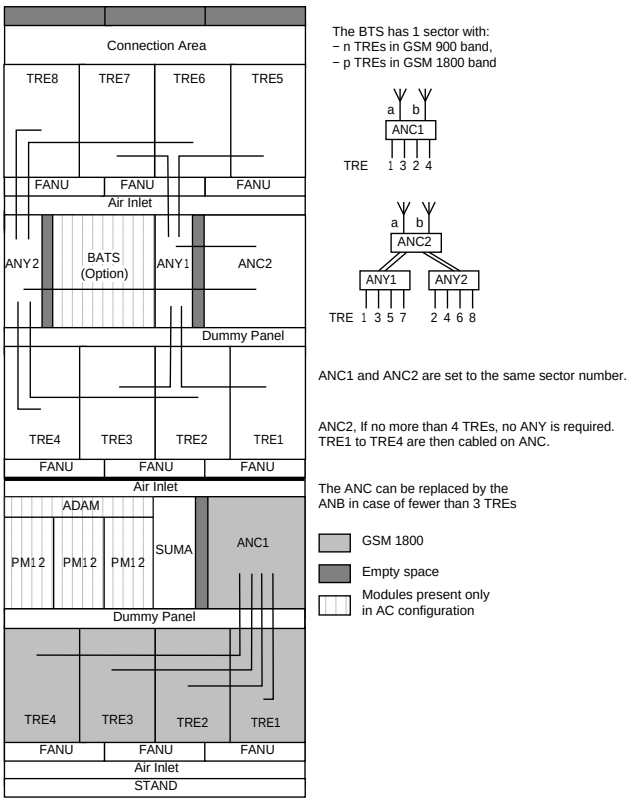


Figure 85: MBI5 - 1x(...8/...4) - Multiband Cells - AC or DC Configuration

2.5.6.4 MBI5 - 1x(...4/...8)

The following figure shows the rack layouts of the MBI5 - 1x(...4/...8) - Multiband Cells - AC or DC configuration.

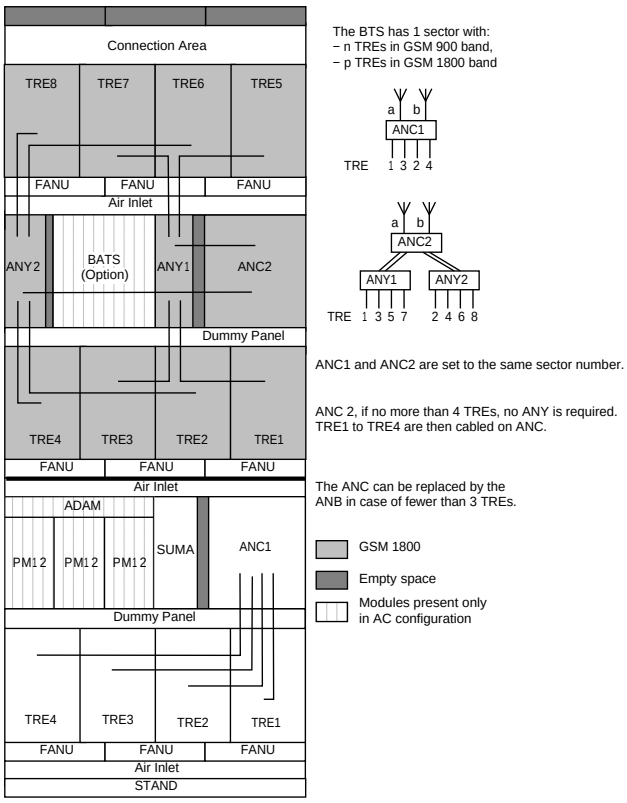


Figure 86: MBI5 - 1x(...4/...8) - Multiband Cells - AC or DC Configuration

2.5.6.5 MBI5 - 2x(...4/...2)

The following figure shows the rack layout of the MBI5 - 2x(...4/...2) - Multiband Cells - DC configuration.

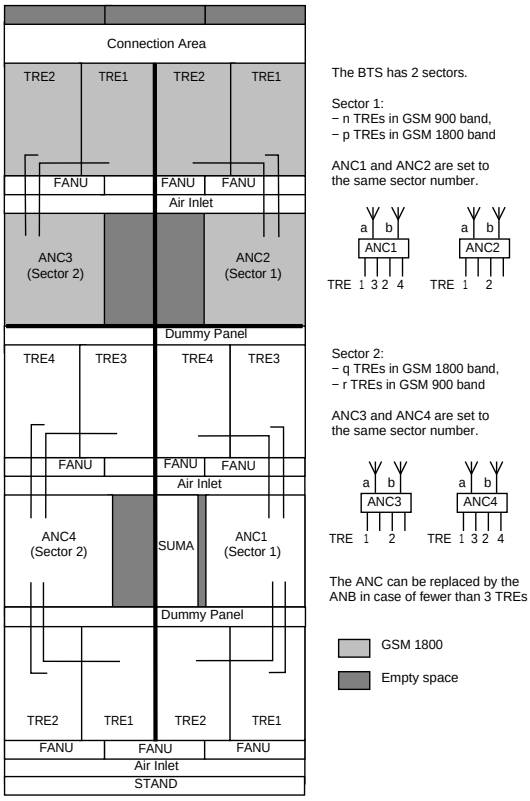


Figure 87: MBI5 - 2x(...4/...2) - Multiband Cells - DC Configuration

2.5.6.6 MBI5 - 2x(...2/...4)

The following figure shows the rack layout of the MBI5 - 2x(...2/...4) - Multiband Cells - DC configuration.

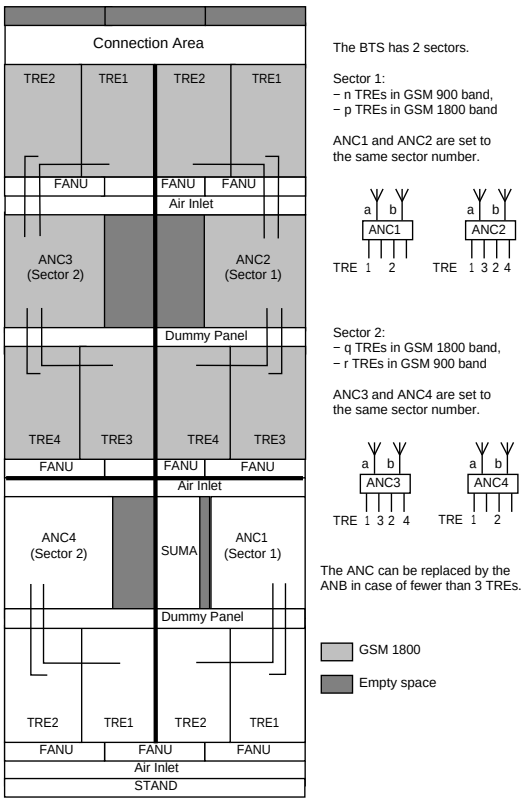


Figure 88: MBI5 - 2x(...2/...4) - Multiband Cells - DC Configuration

2.5.6.7 MBI5 - 1x(...2/...2), 1x(...4/...4)

The following figure shows the rack layout of the MBI5 - 1x(...2/...2), 1x(...4/...4) - Multiband Cells - DC configuration.

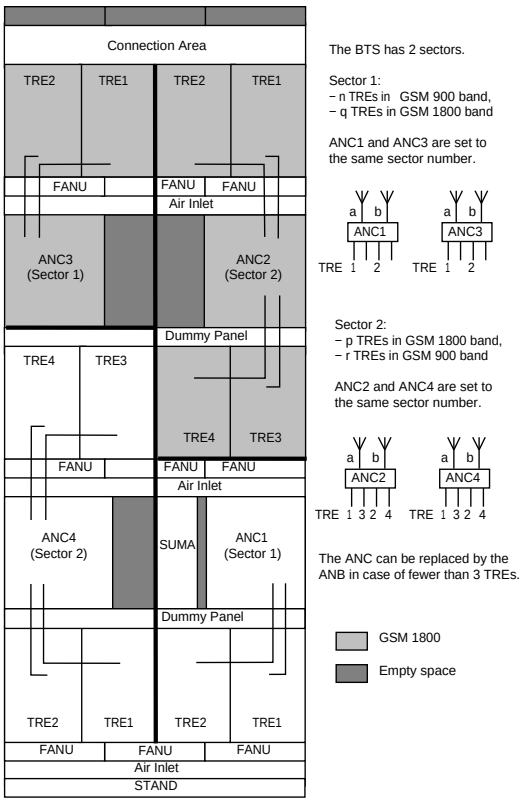
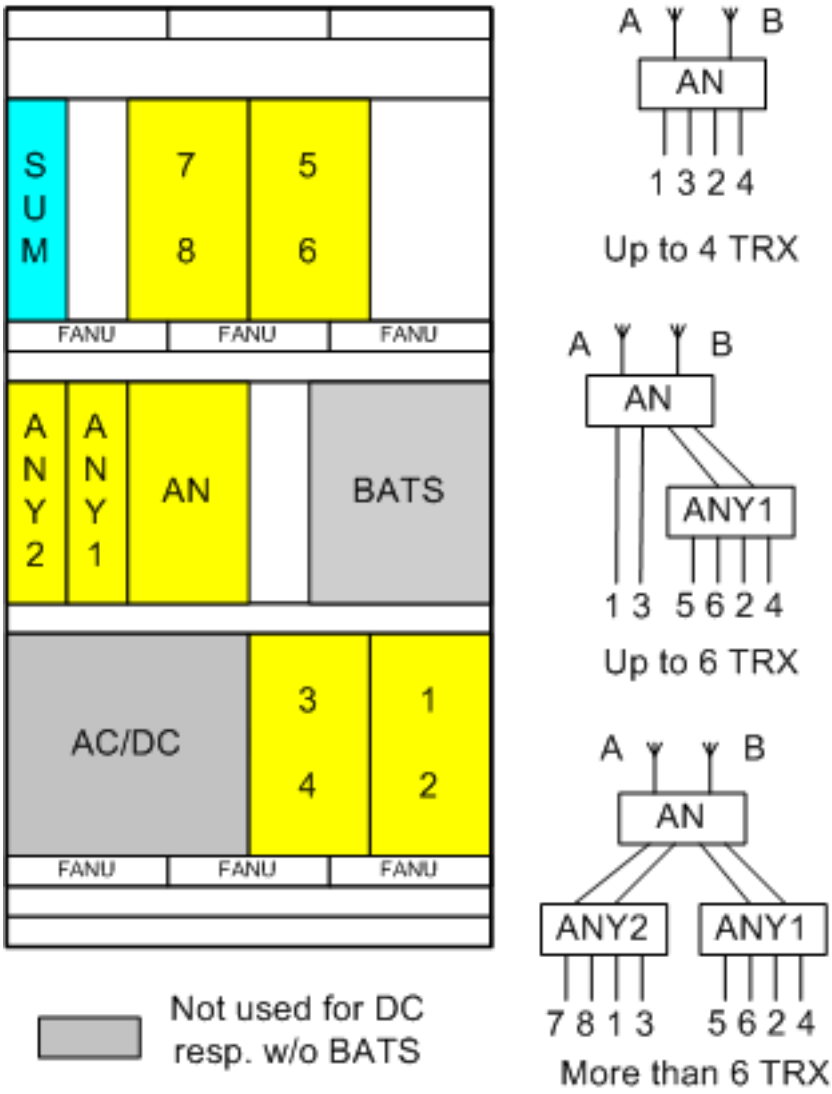


Figure 89: MBI5 - 1x(...2/...2), 1x(...4/...4) - Multiband Cells - DC Configuration

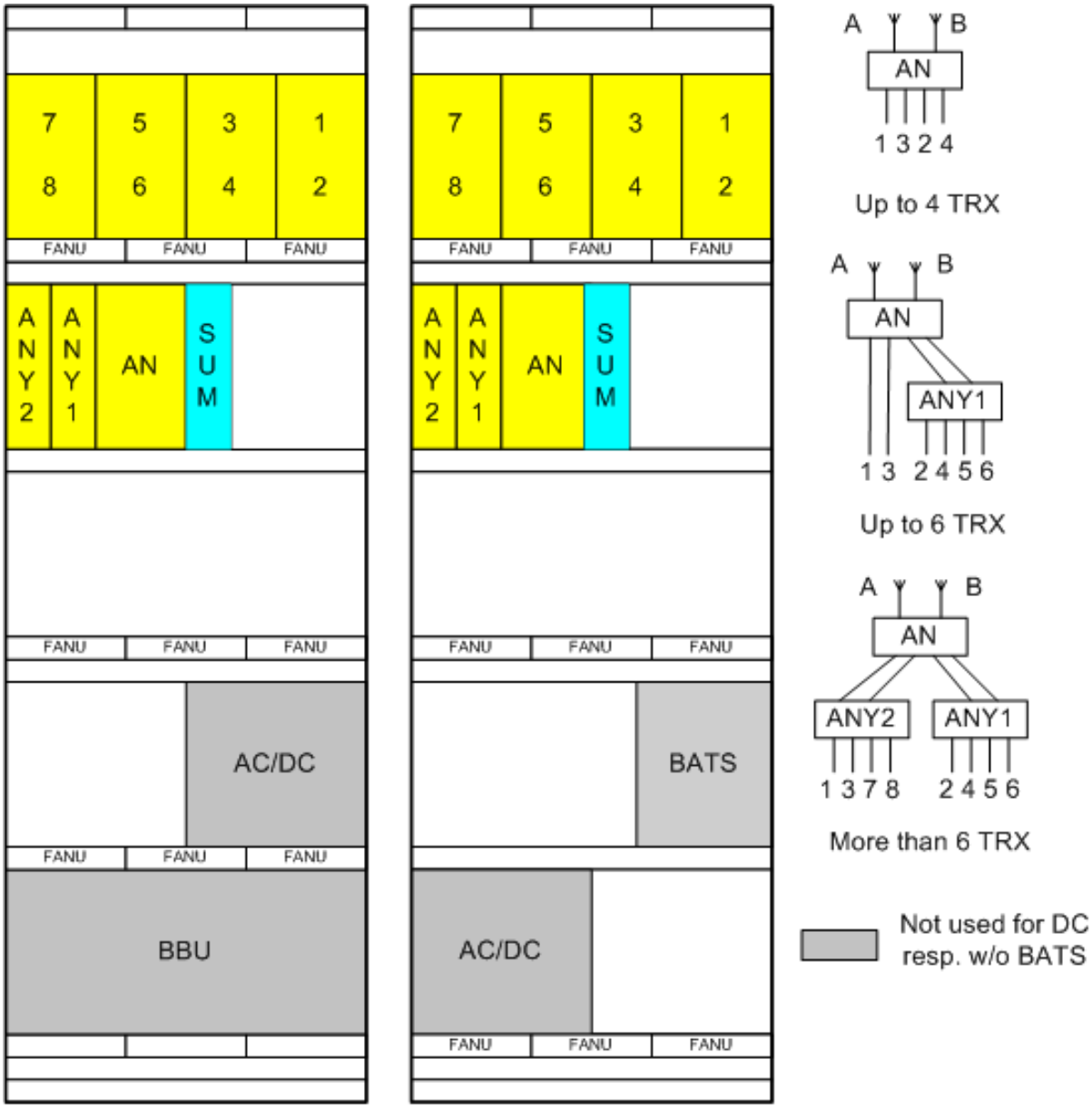
2.6 Multistandard Base Station Indoor Configurations with Twin TRX

2.6.1 Capacity Mode

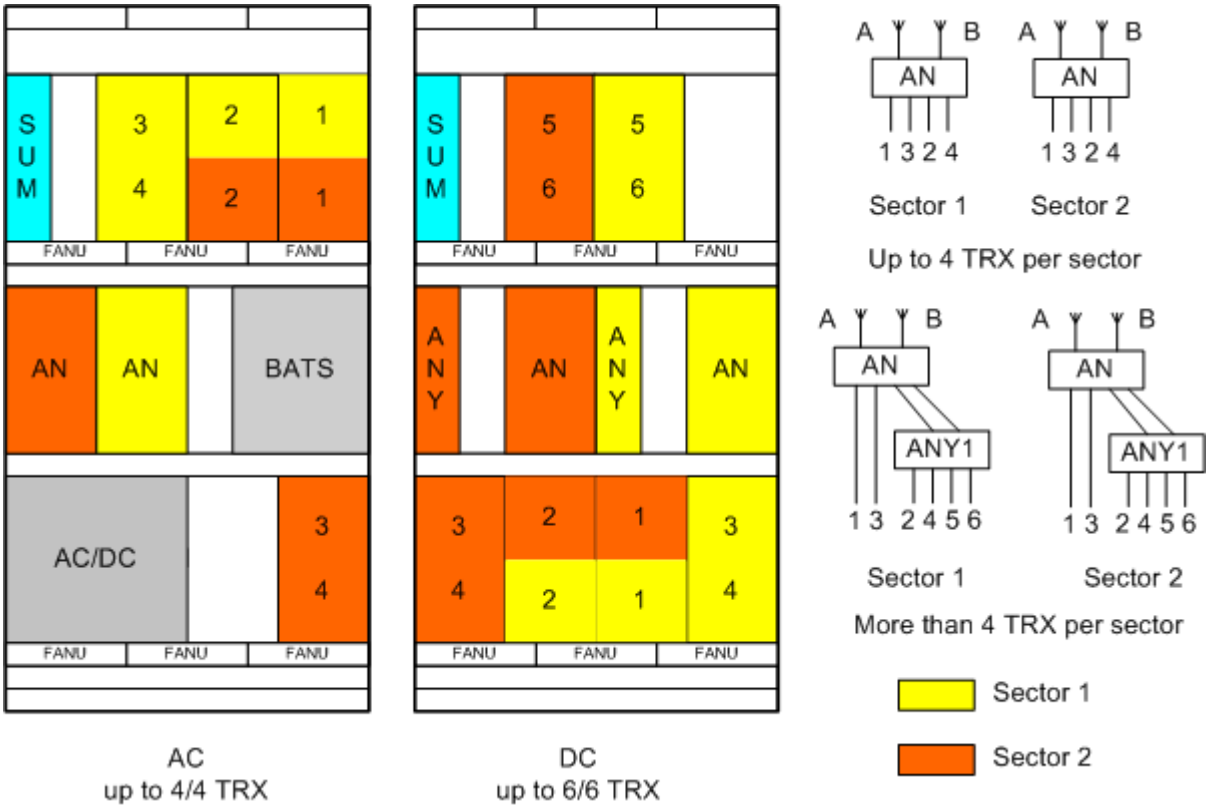
2.6.1.1 MBI3 - 1 Sector with Twin-TRX



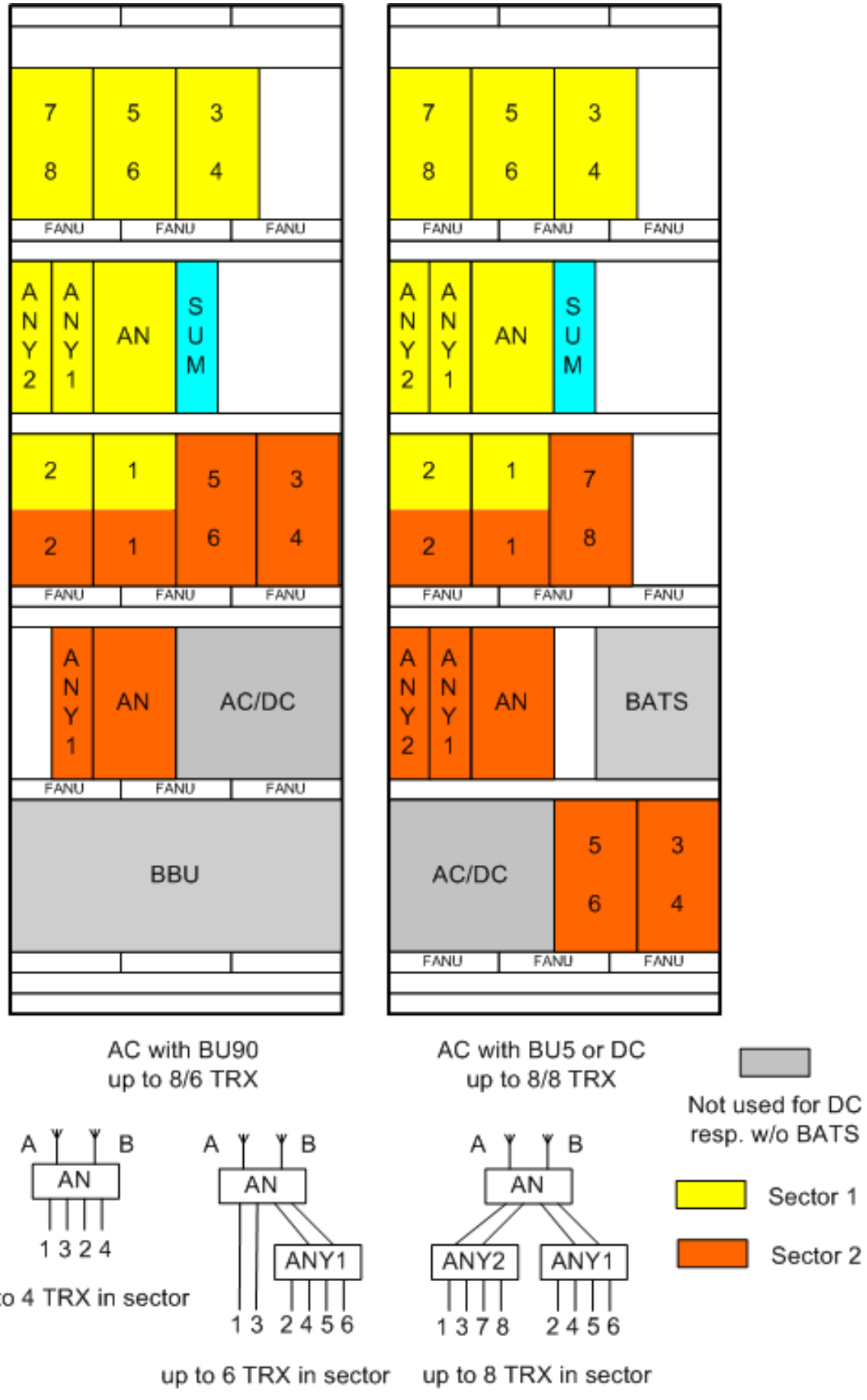
2.6.1.2 MBI5 - 1 Sector with Twin-TRX



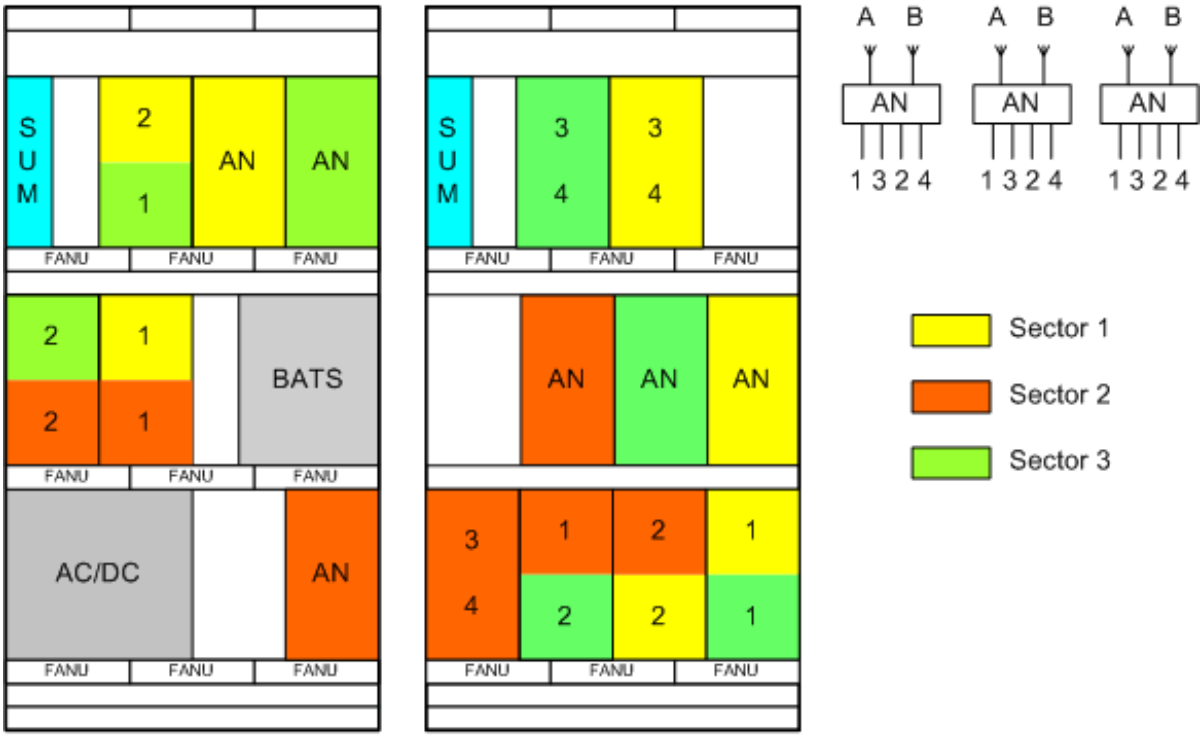
2.6.1.3 MBI3 - 2 Sectors with Twin-TRX



2.6.1.4 MBI5 - 2 Sectors with Twin-TRX



2.6.1.5 MBI3 - 3 Sectors with Twin-TRX

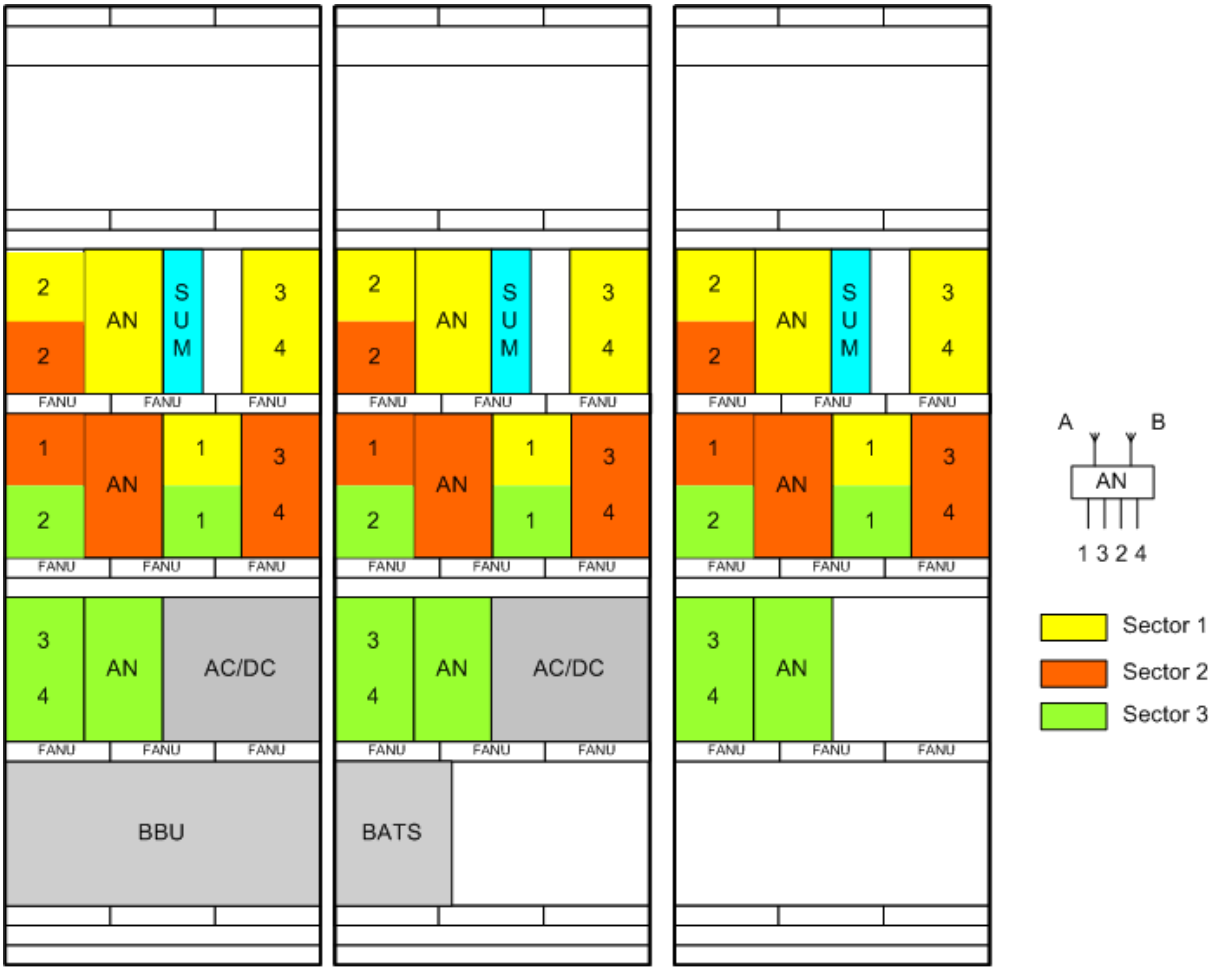


AC
up to 2/2/2 TRX

DC
up to 4/4/4 TRX

2.6.1.6 MBI5 - 3 Sectors with Twin-TRX

Configurations with maximum 4/4/4 TRX.



AC with BU90
up to 4/4/4 TRX

AC with BU5
up to 4/4/4 TRX

DC
up to 4/4/4 TRX

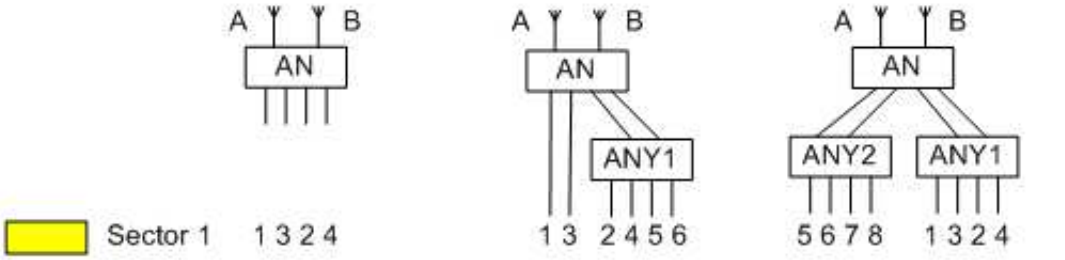
Configurations with intended, respective more than 4/4/4 TRX.



AC with ext. BBU or DC
up to 4/4/4 TRX

AC with ext. BBU
up to 6/6/6 TRX

DC
up to 8/8/8 TRX



up to 4 TRX in sector

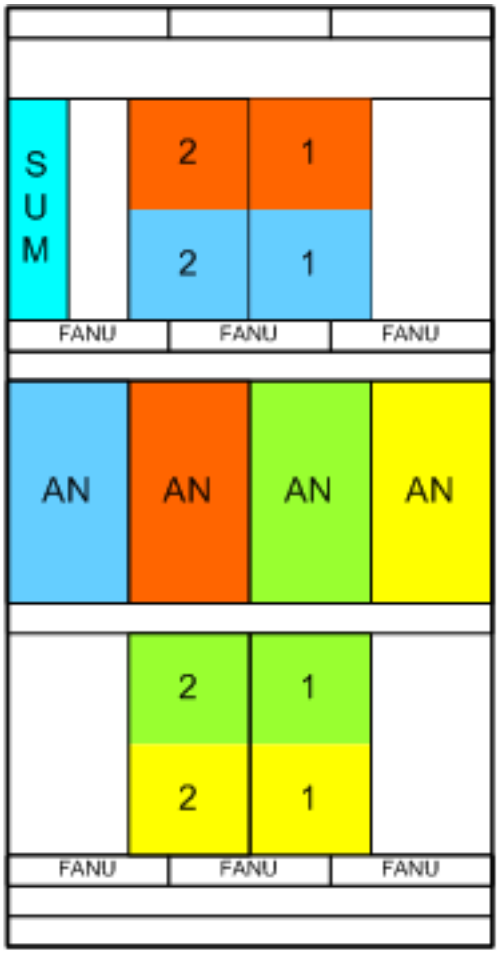
up to 6 TRX in sector

up to 8 TRX in sector

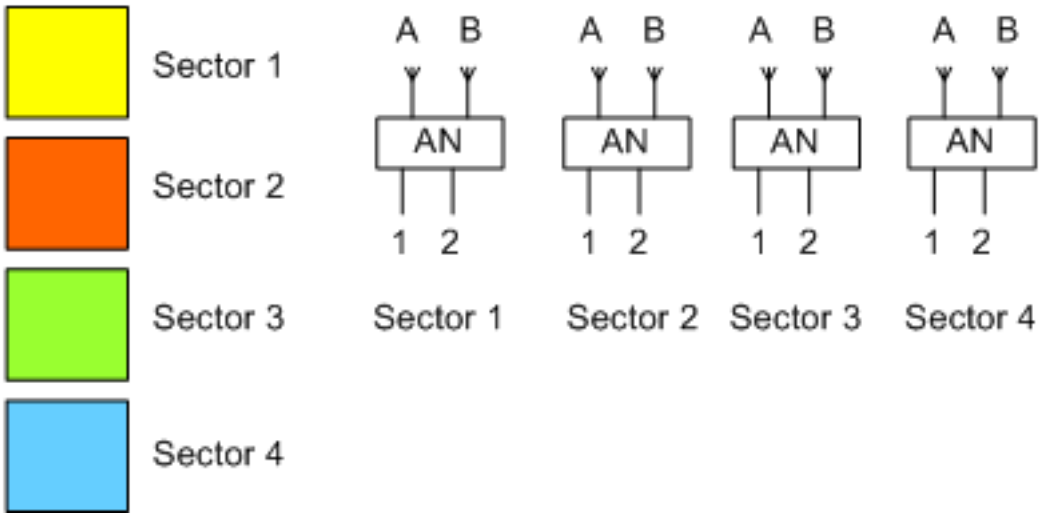
2.6.1.7 MBI3 - 4 Sectors with Twin-TRX



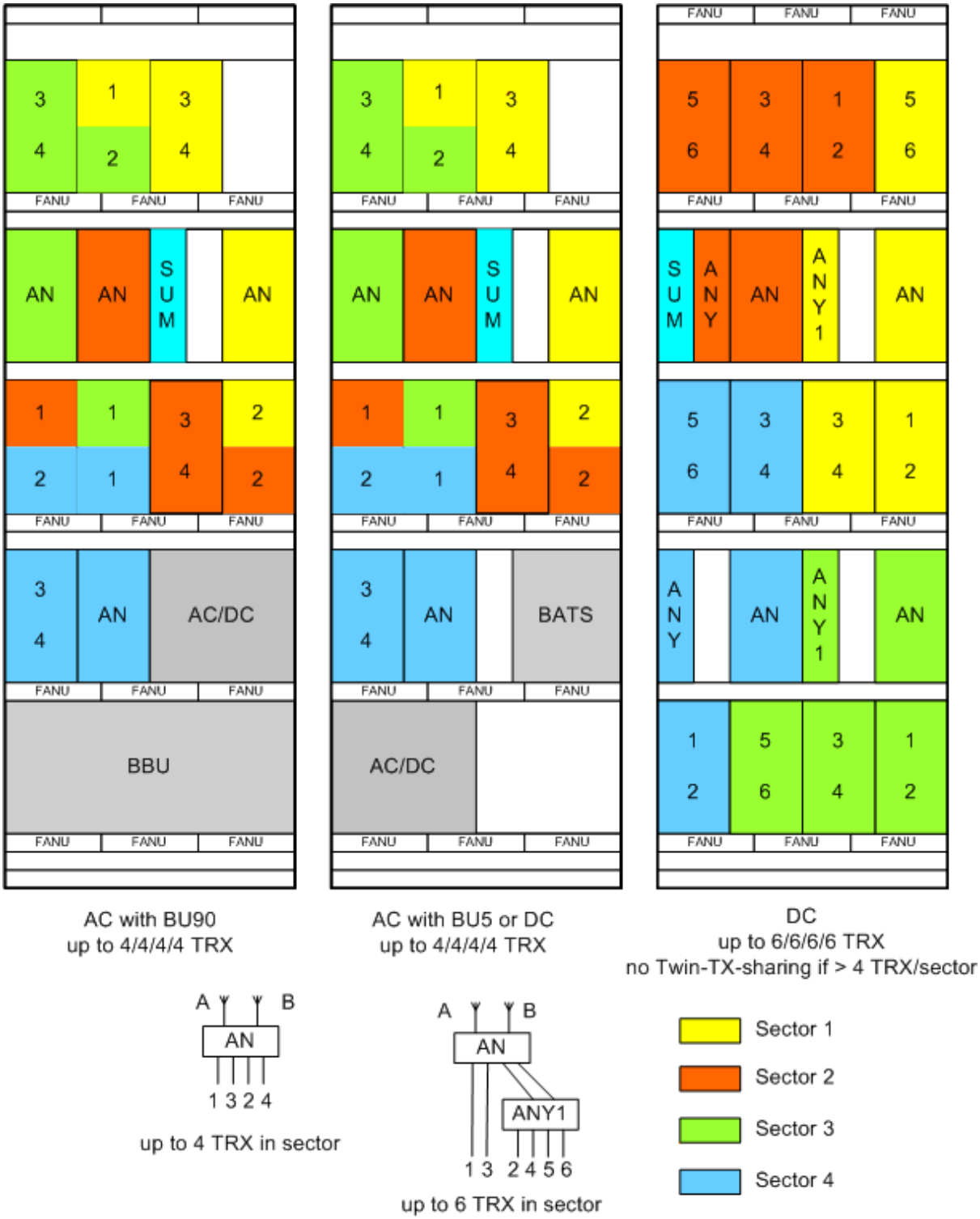
AC
up to 2/2/2/2 TRX



DC
up to 2/2/2/2 TRX

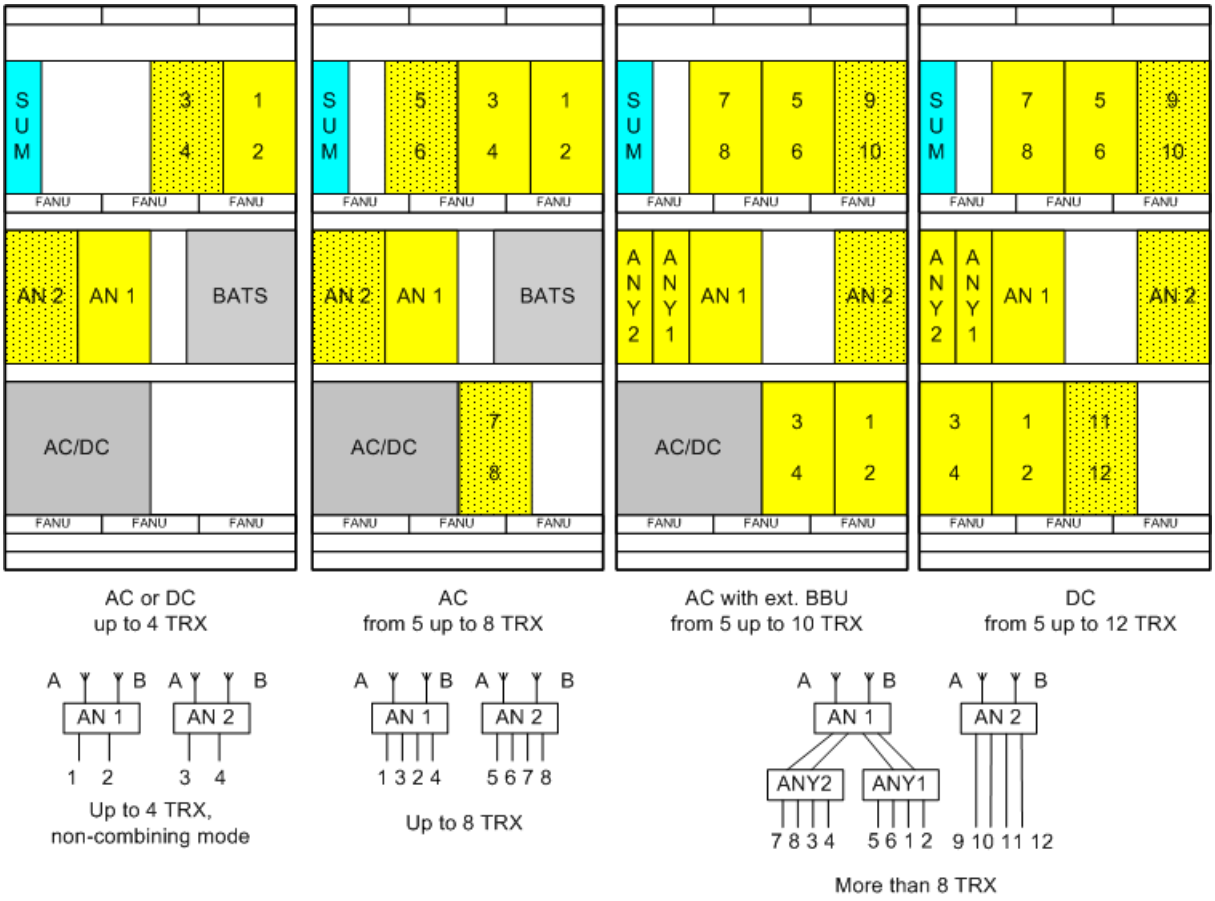


2.6.1.8 MBI5 - 4 Sectors with Twin-TRX



2.6.2 Capacity Mode Low Loss

2.6.2.1 MBI3 - 1 Sector Low Loss with Twin-TRX



2.6.2.2 MBI5 - 1 Sector Low Loss with Twin-TRX

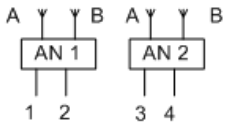


AC with BU90 up to 4 TRX

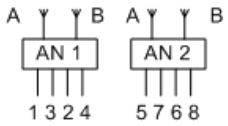
AC with BU5 or DC up to 4 TRX

AC with BU90 up to 8 TRX

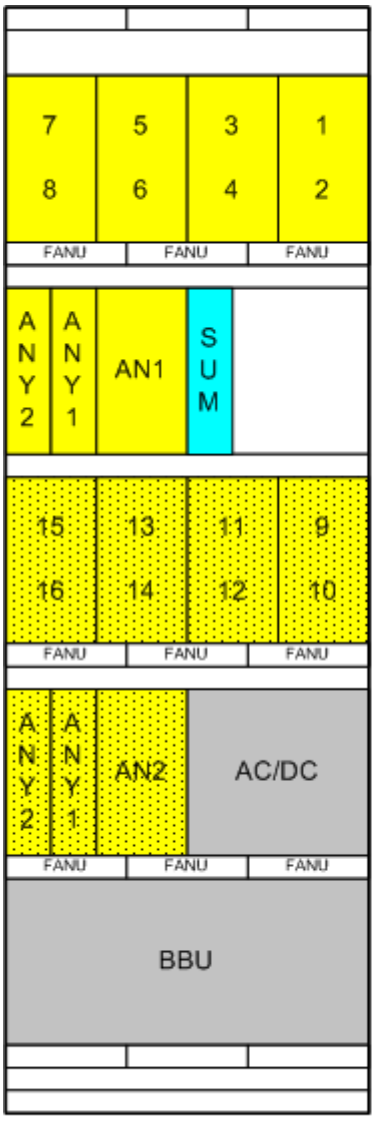
AC with BU5 or DC up to 8 TRX



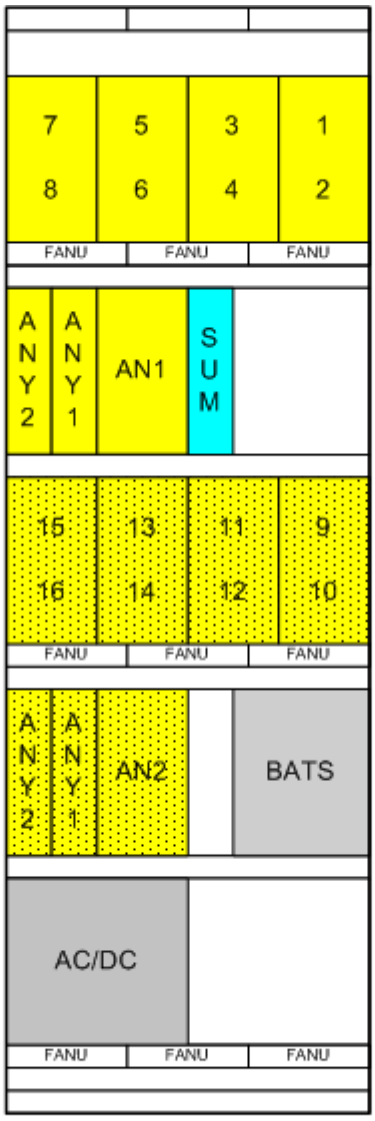
Up to 4 TRX, non-combining mode



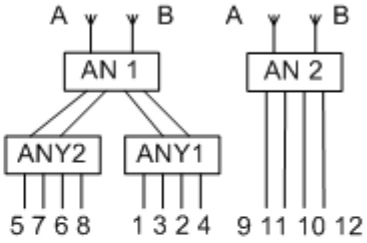
Up to 8 TRX



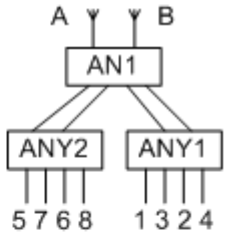
AC with BU90
up to 16 TRX



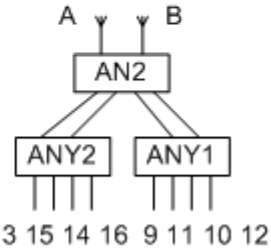
AC with BU5 or DC
up to 16 TRX



From 9 up to 12 TRX

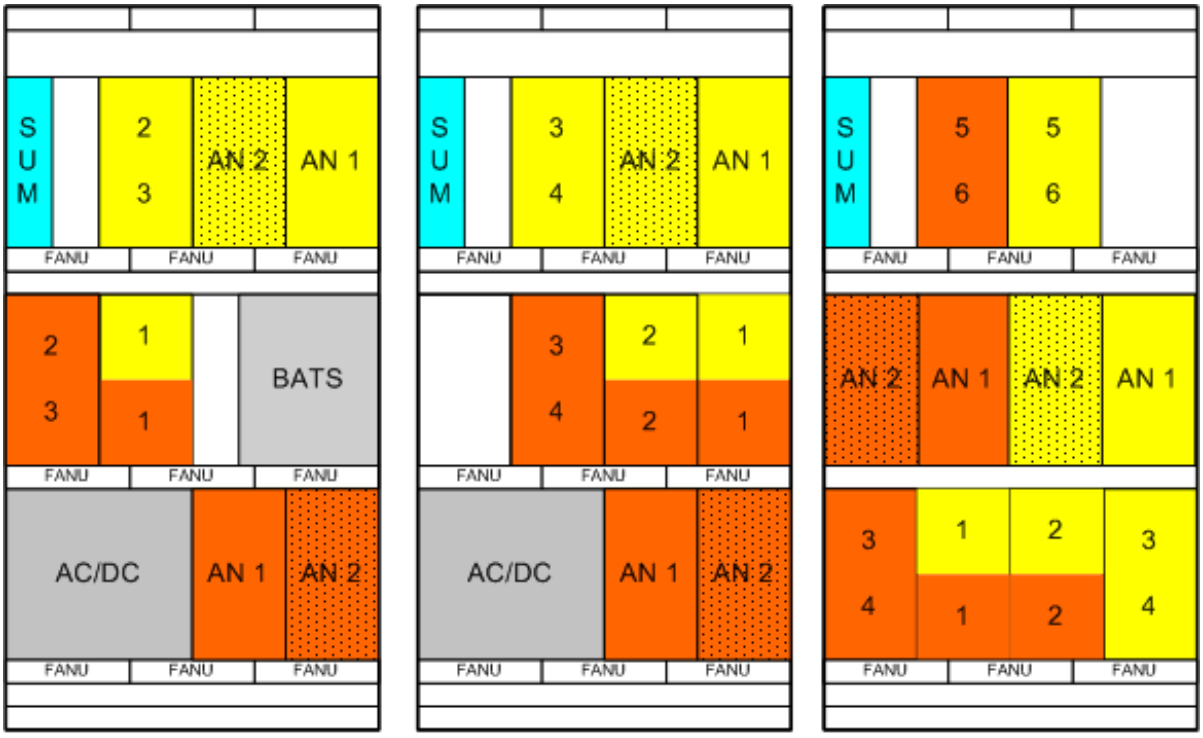


From 13 up to 16 TRX: 1 - 8



From 13 up to 16 TRX: 9 - 16

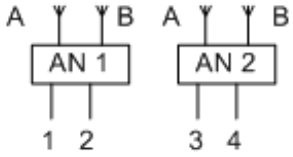
2.6.2.3 MBI3 - 2 Sectors Low Loss with Twin-TRX



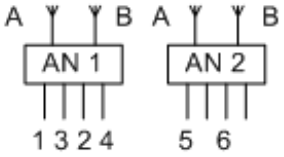
AC with BU5
up to 3/3 TRX

AC
up to 4/4 TRX

DC
up to 6/6 TRX



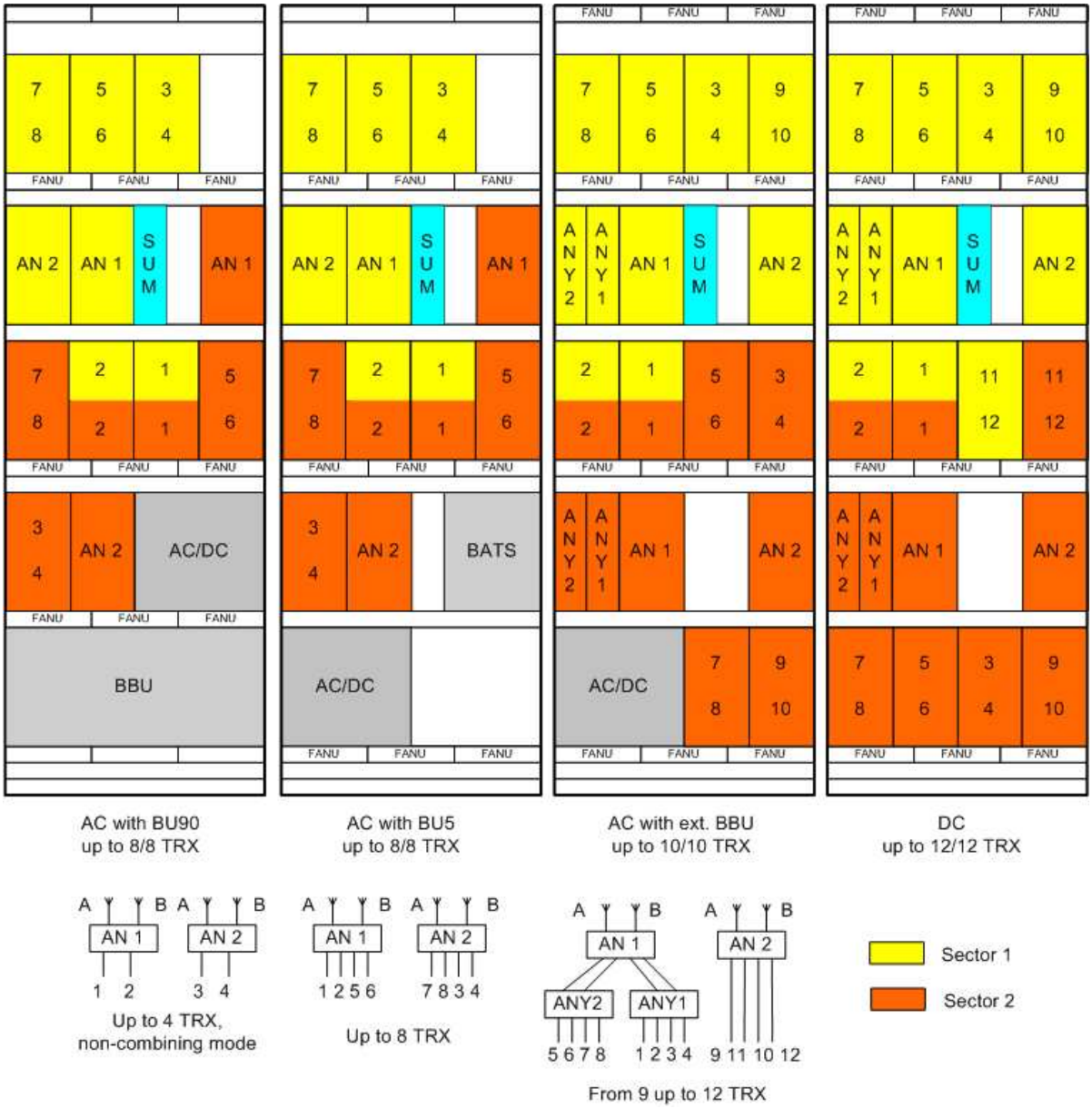
Up to 4 TRX per sector,
non-combining mode



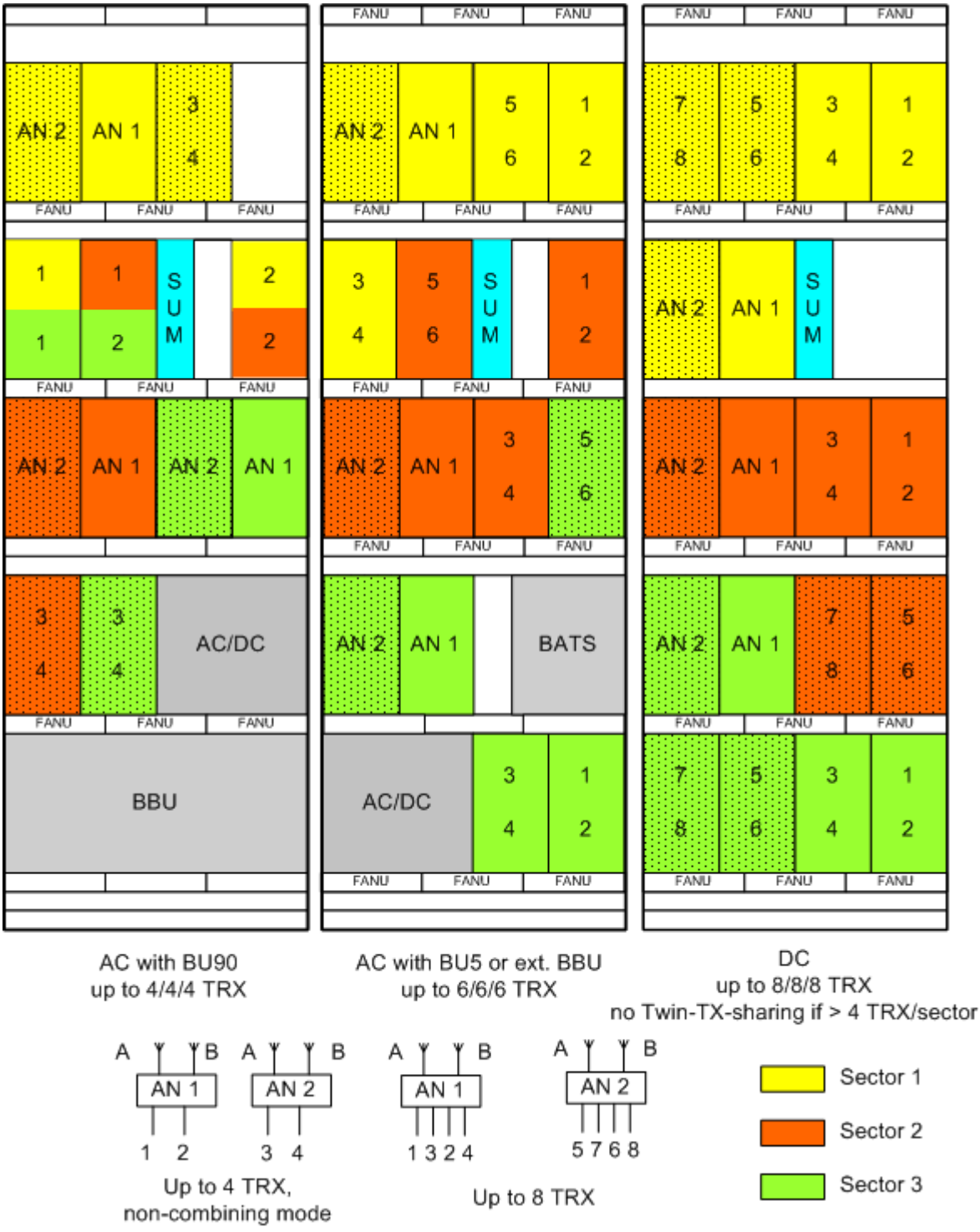
More than 4 TRX per sector



2.6.2.4 MBI5 - 2 Sectors Low Loss with Twin-TRX

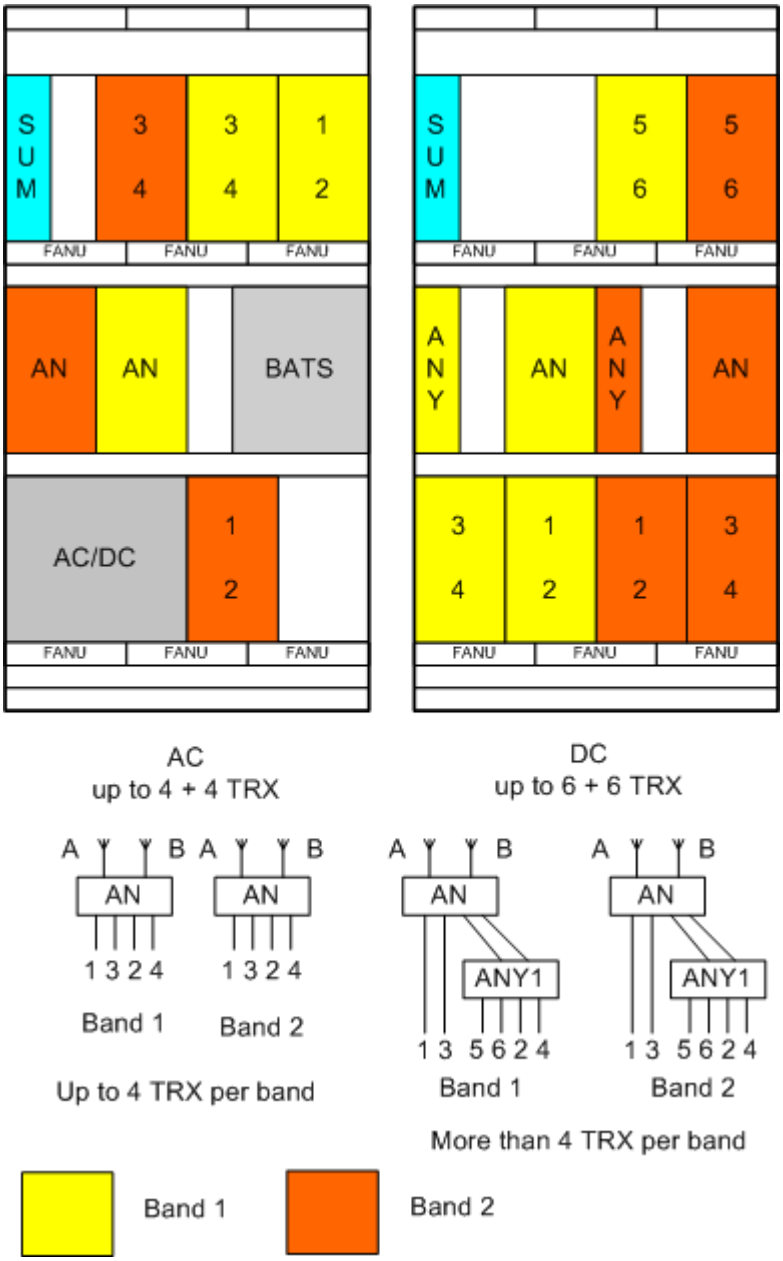


2.6.2.5 MBI5 - 3 Sectors Low Loss with Twin-TRX



2.6.3 Multiband & MB Cell

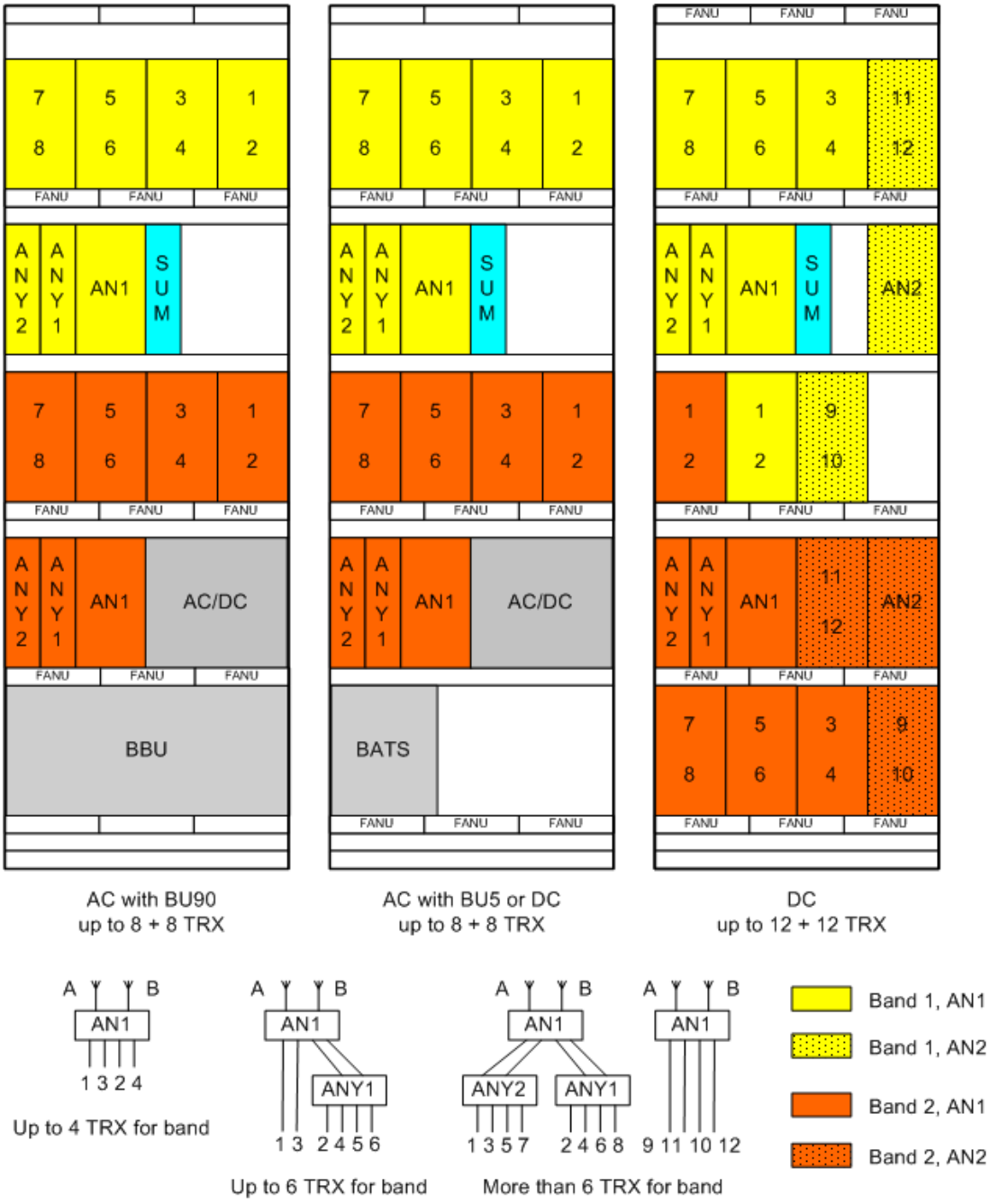
2.6.3.1 MBI3 - Multiband 1 + 1 Sector with Twin-TRX



Multiband BTS: The BTS has 2 sectors with n and p TRX.

Multiband cell: The BTS has one sector with n TRX in 900 MHz and p TRX in 1800 MHz.

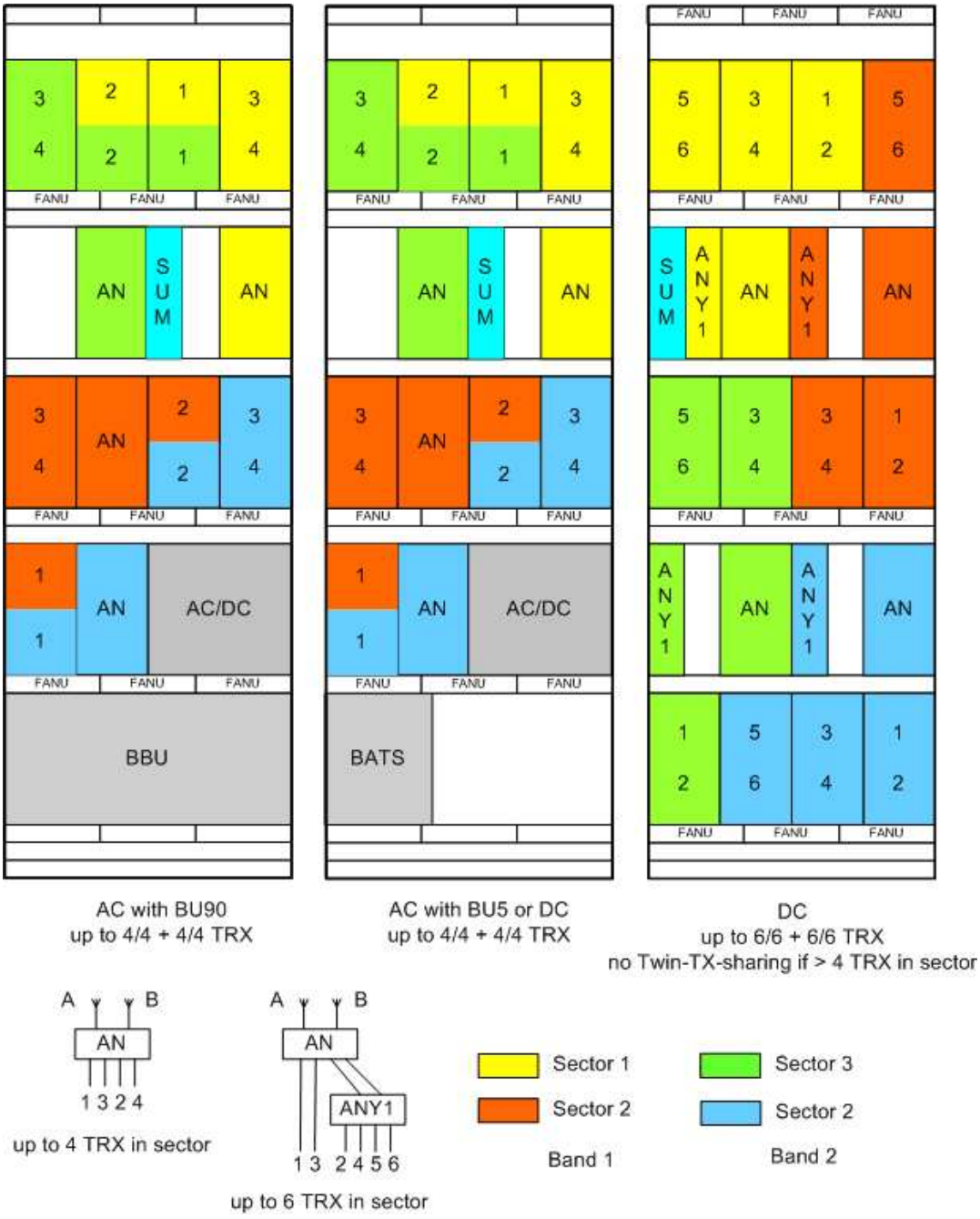
2.6.3.2 MBI5 - Multiband 1 + 1 Sectors with Twin-TRX



Multiband BTS: The BTS has 2 sectors with n and p TRX.

Multiband cell: The BTS has one sector with n TRX in 900 MHz and p TRX in 1800 MHz.

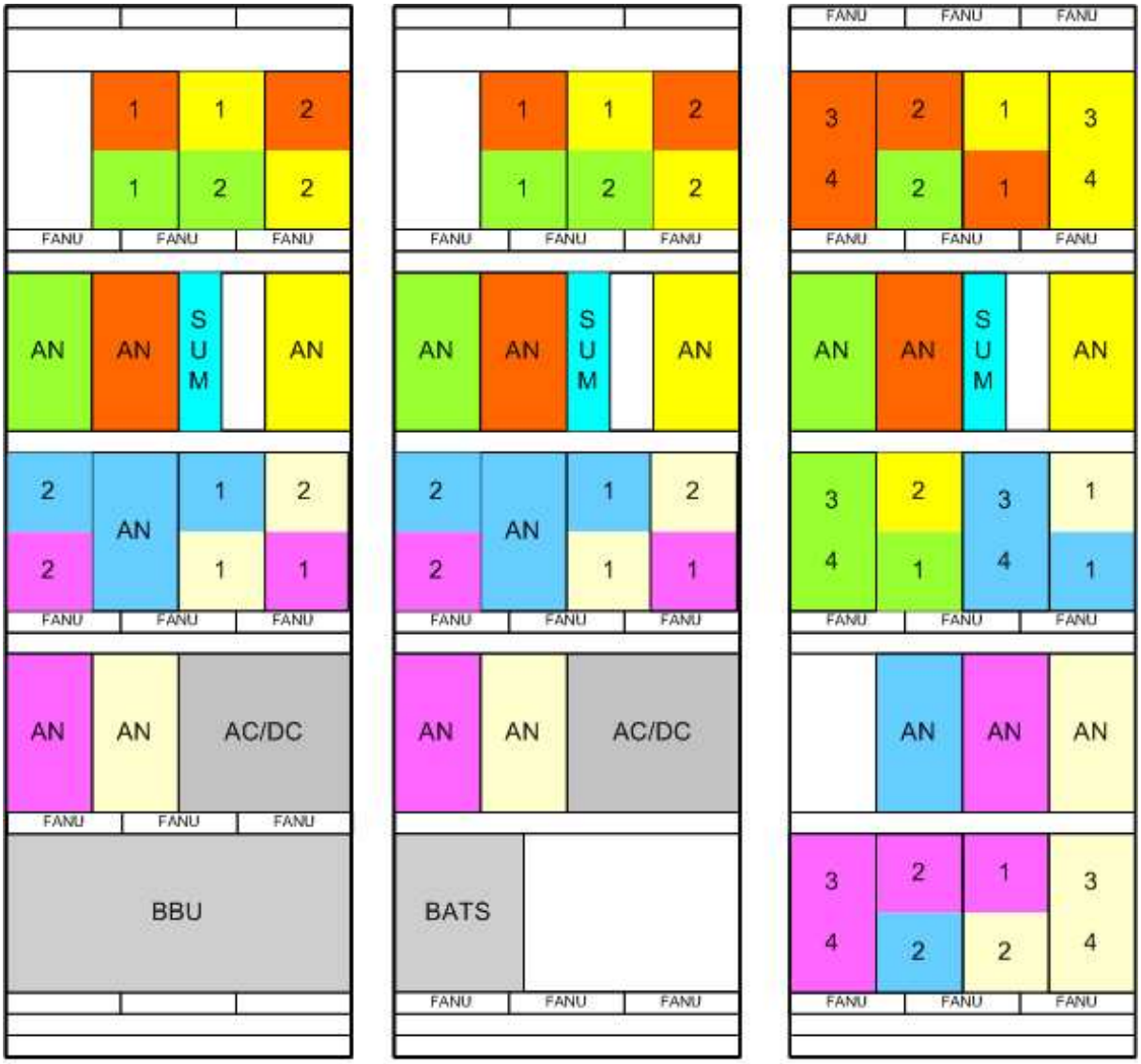
2.6.3.3 MBI5 - Multiband 2 + 2 Sectors with Twin-TRX



Multiband BTS: The BTS has 4 sectors with n and q TRX in 900 MHz plus p and r TRX in 1800 TRX.

Multiband cell: The BTS has 1 sector with n TRX in 900MHz and p TRX in 1800 MHz and 1 sector with q TRX in 900 MHz and r TRX in 1800 TRX.

2.6.3.4 MBI5 - Multiband 3 + 3 Sectors with Twin-TRX

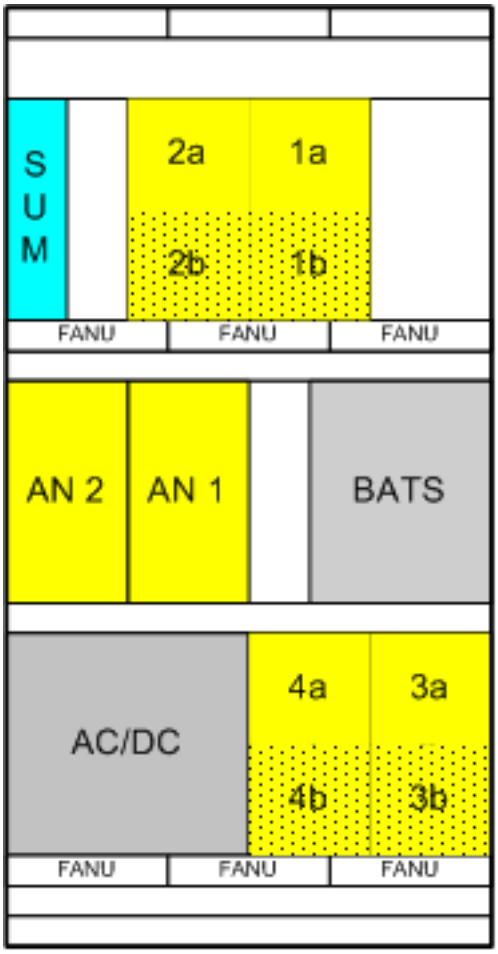


Multiband BTS: The BTS has 6 sectors with n, q, s TRX in 900 MHz and p, r, t TRX in 1800 MHz.

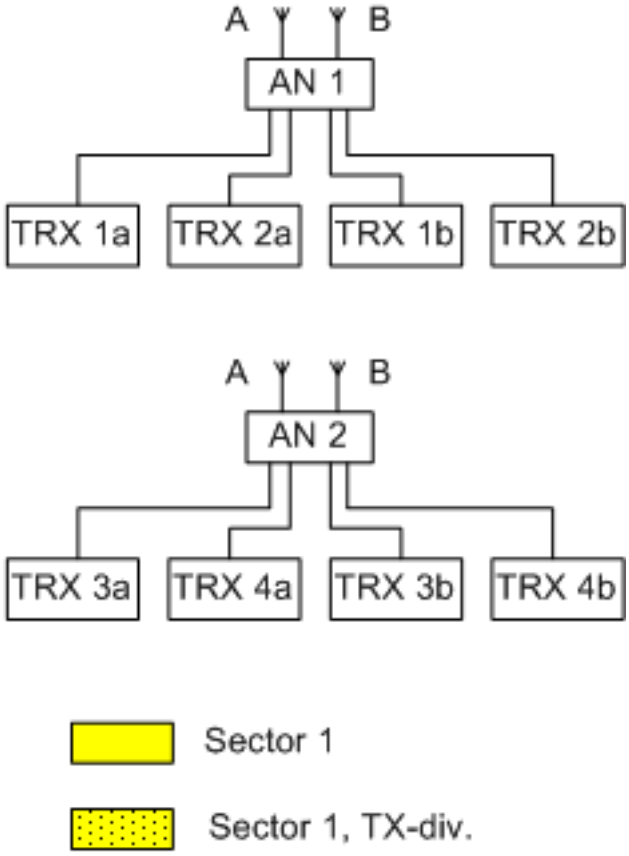
Multiband cell: The BTS has 1 sector with
n TRX in 900 MHz and p TRX in 1800 MHz
plus 1 sector with q TRX in 900 MHz and r TRX in 1800 MHz
plus 1 sector with s TRX in 900 MHz and t TRX in 1800 MHz.

2.6.4 Coverage Mode TxDiv. 2Rx Div.

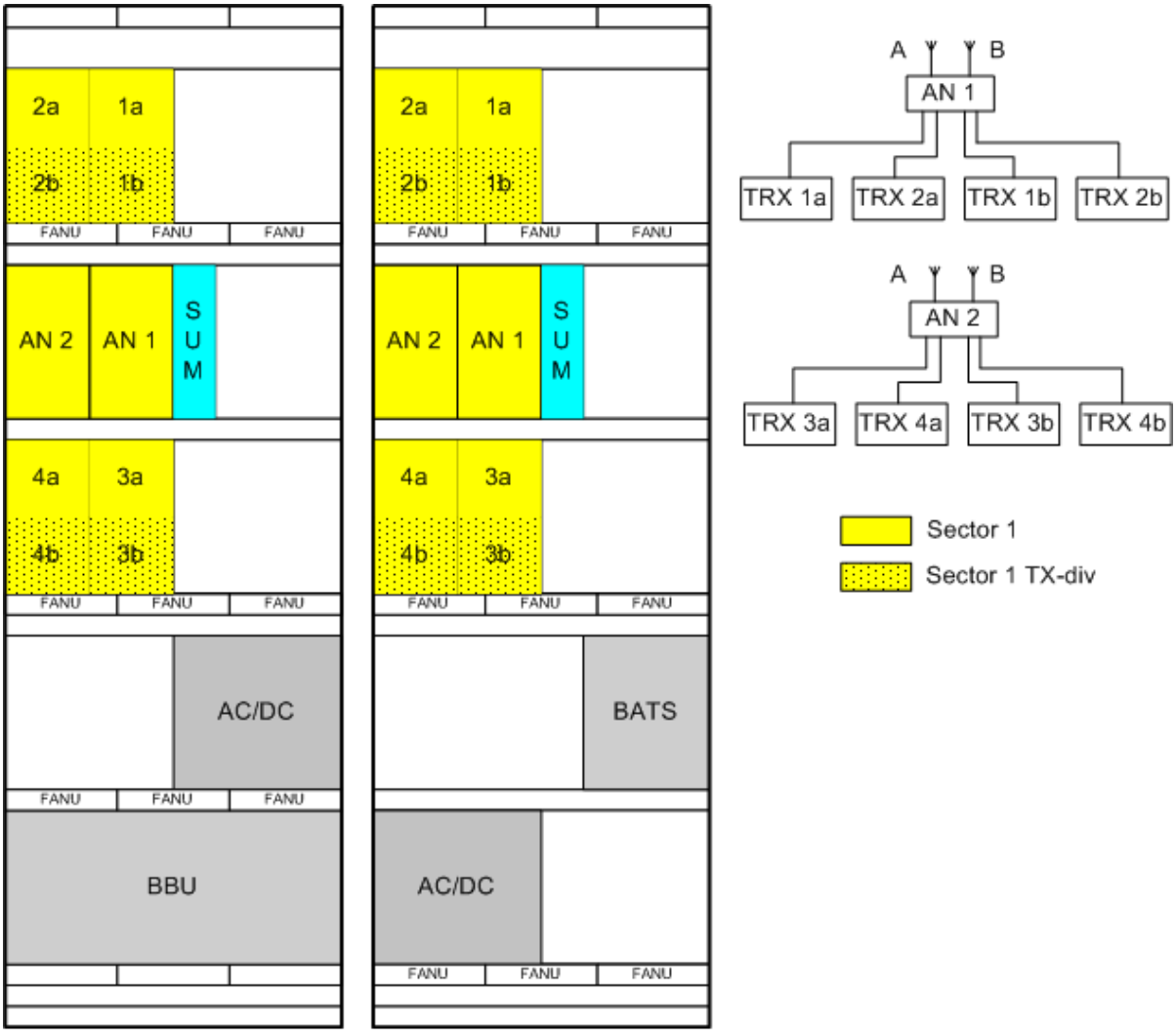
2.6.4.1 MBI3 - 1 Sector TX Diversity 2 RX with Twin-TRX



AC or DC
up to 4 TRX



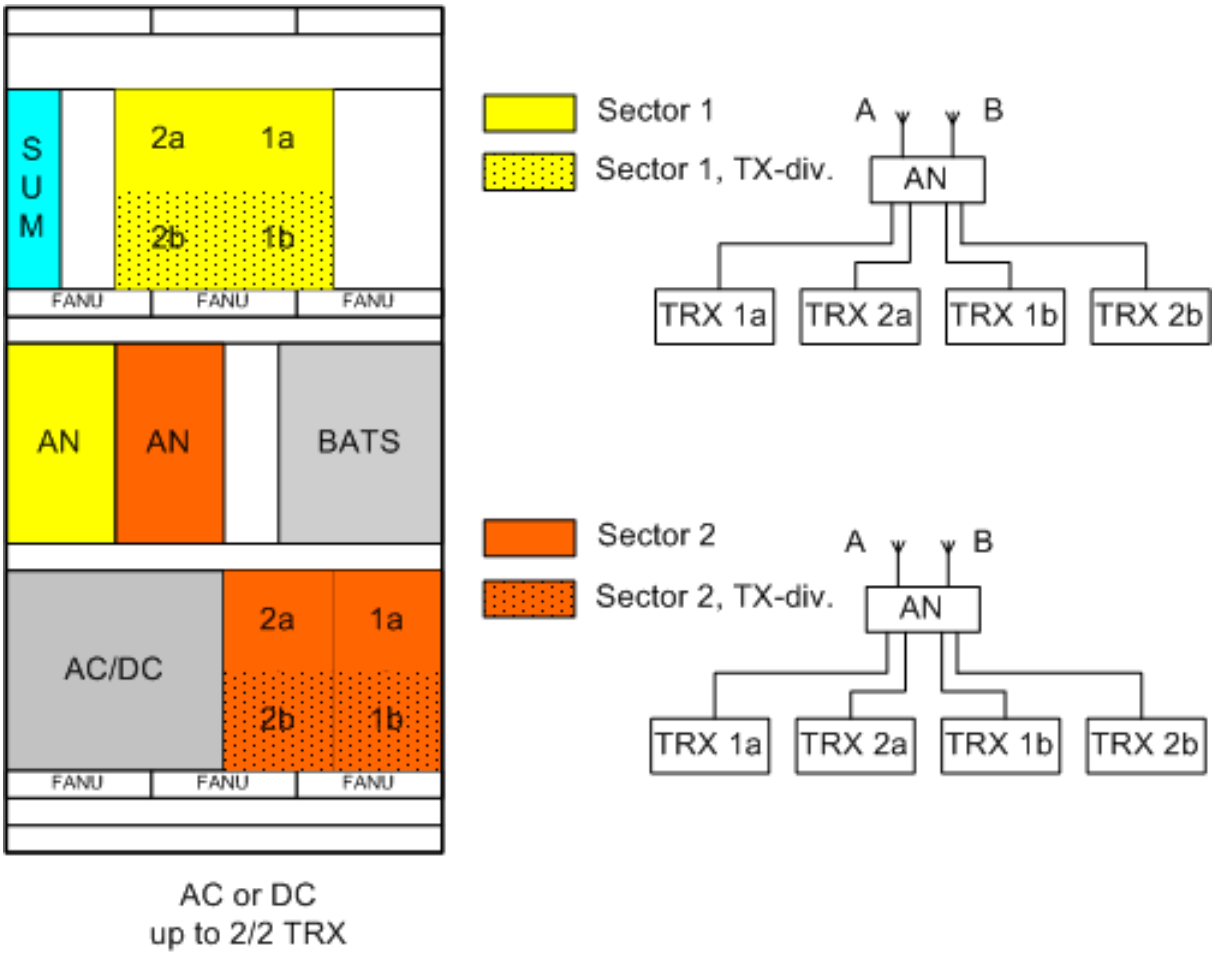
2.6.4.2 MBI5 - 1 Sectors TX Diversity 2 RX with Twin-TRX



AC with BU90
up to 4 TRX

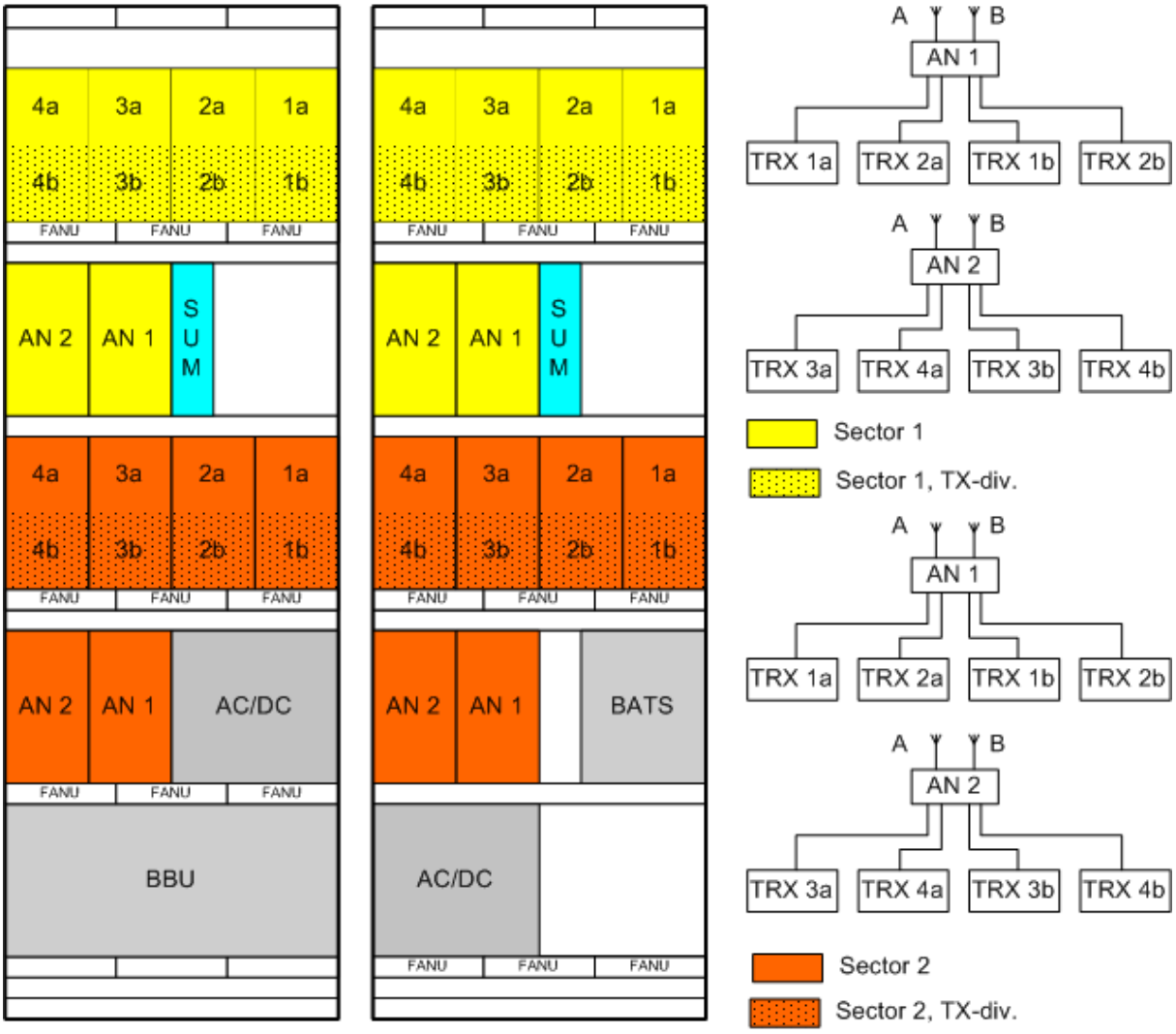
AC with BU5 or DC
up to 4 TRX

2.6.4.3 MBI3 - 2 Sector TX Diversity 2 RX with Twin-TRX



AC or DC
up to 2/2 TRX

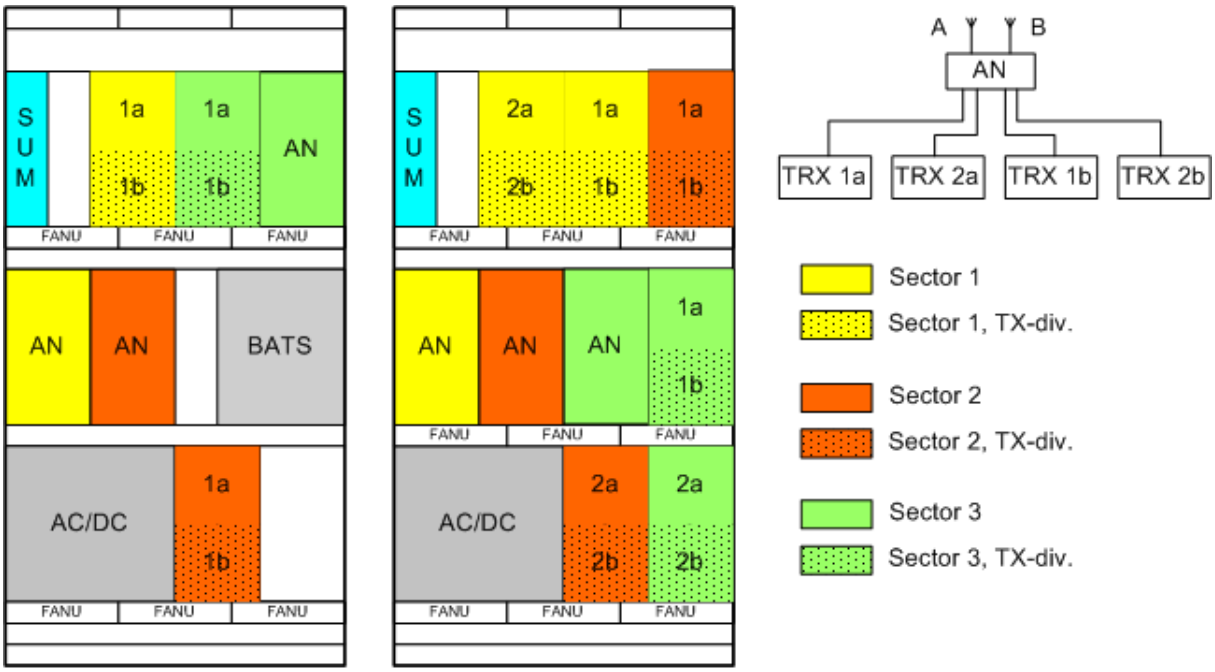
2.6.4.4 MBI5 - 2 Sectors TX Diversity 2 RX with Twin-TRX



AC with BU90
up to 4/4 TRX

AC with BU5 or DC
up to 4/4 TRX

2.6.4.5 MBI3 - 3 Sector TX Diversity 2RX with Twin-TRX



AC
1/1/1 TRX

AC with ext. battery or DC
up to 2/2/2 TRX

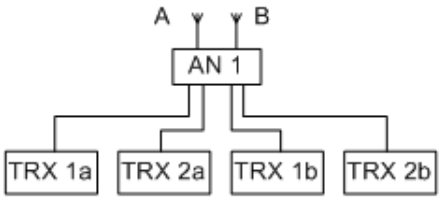
2.6.4.6 MBI5 - 3 Sector TX Diversity 2RX with Twin-TRX

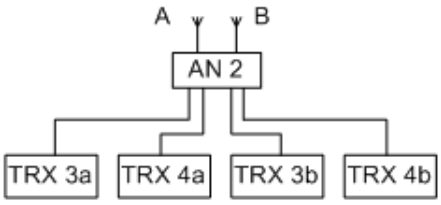


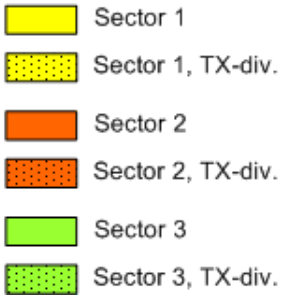
AC with BU90
up to 2/2/2 TRX

AC with BU5
up to 2/2/2 TRX

DC version
up to 4/4/4 TRX

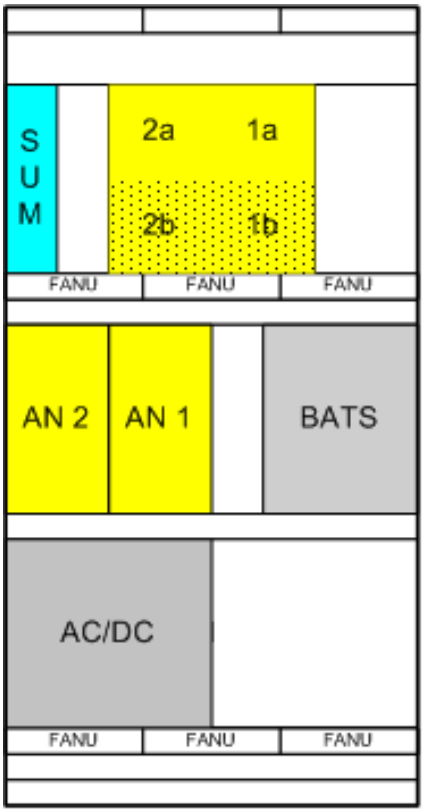




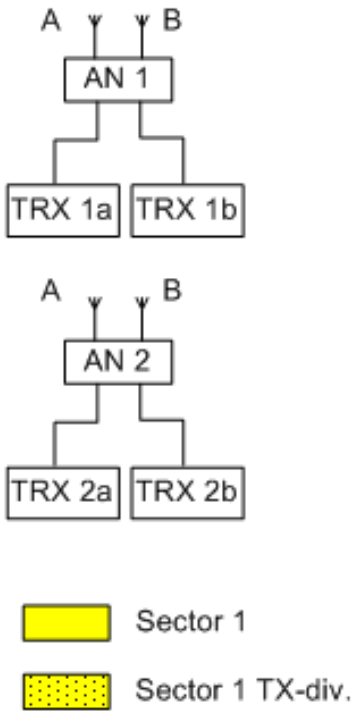


2.6.5 Coverage Mode TxDiv. 2Rx Div. Low Loss

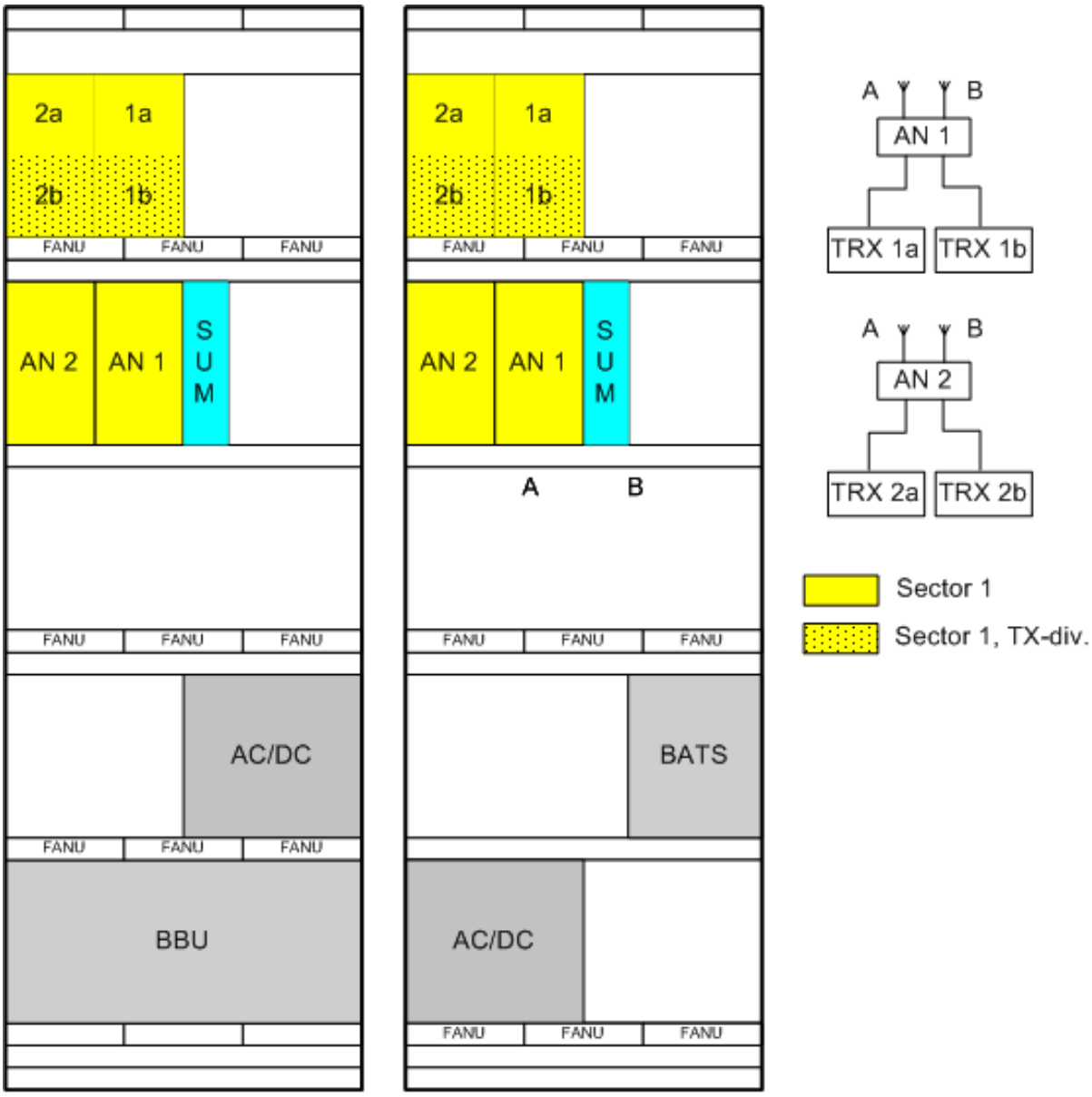
2.6.5.1 MBI3 - 1 Sector TX Diversity Low Loss with Twin-TRX



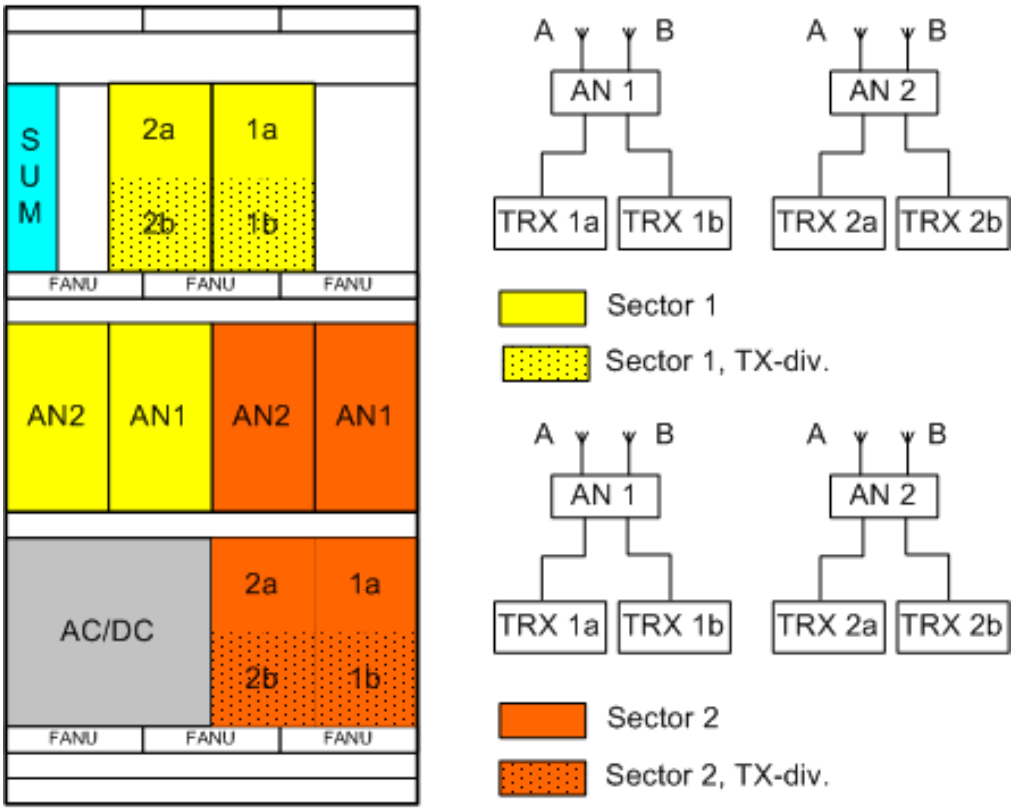
AC or DC
up to 2 TRX



2.6.5.2 MBI5 - 1 Sector TX Diversity Low Loss with Twin-TRX

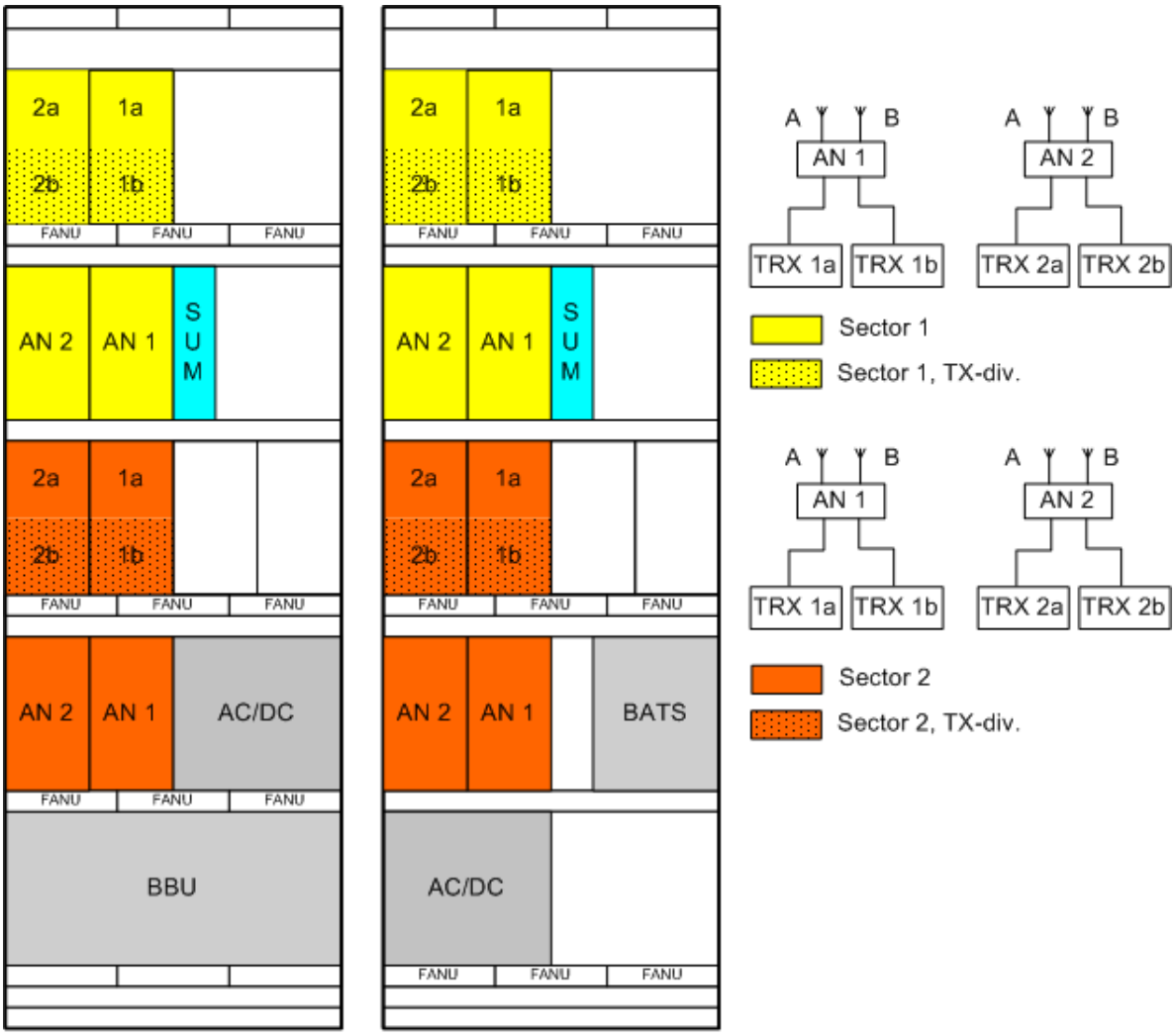


2.6.5.3 MBI3 - 2 Sectors TX Diversity Low Loss with Twin-TRX



AC or DC
up to 2/2 TRX

2.6.5.4 MBI5 - 2 Sectors TX Diversity Low Loss with Twin-TRX



AC with BU90
up to 2/2 TRX

AC with BU5 or DC
up to 2/2 TRX

2.6.5.5 MBI5 - 3 Sectors TX Diversity Low Loss with Twin-TRX

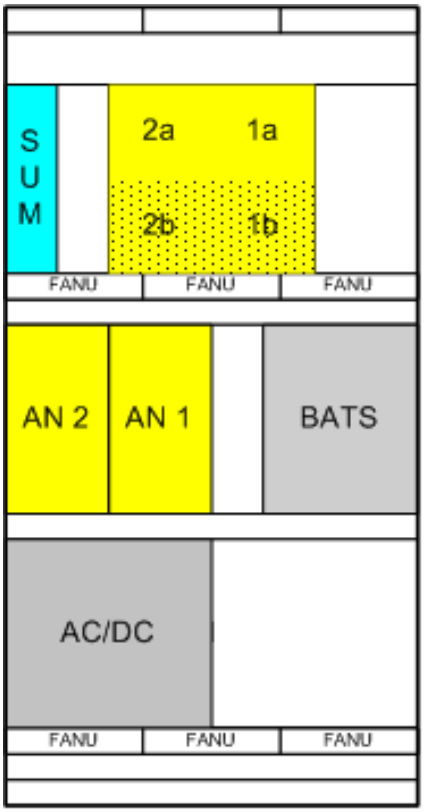


AC with BU90
up to 2/2/2 TRX

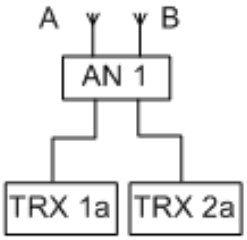
AC with BU5 or DC
up to 2/2/2 TRX

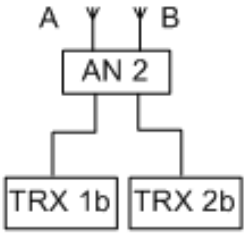
2.6.6 Coverage Mode TxDiv. 4Rx Div. Low Loss

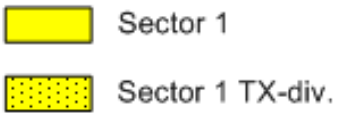
2.6.6.1 MBI3 - 1 Sector TX Diversity 4 RX with Twin-TRX



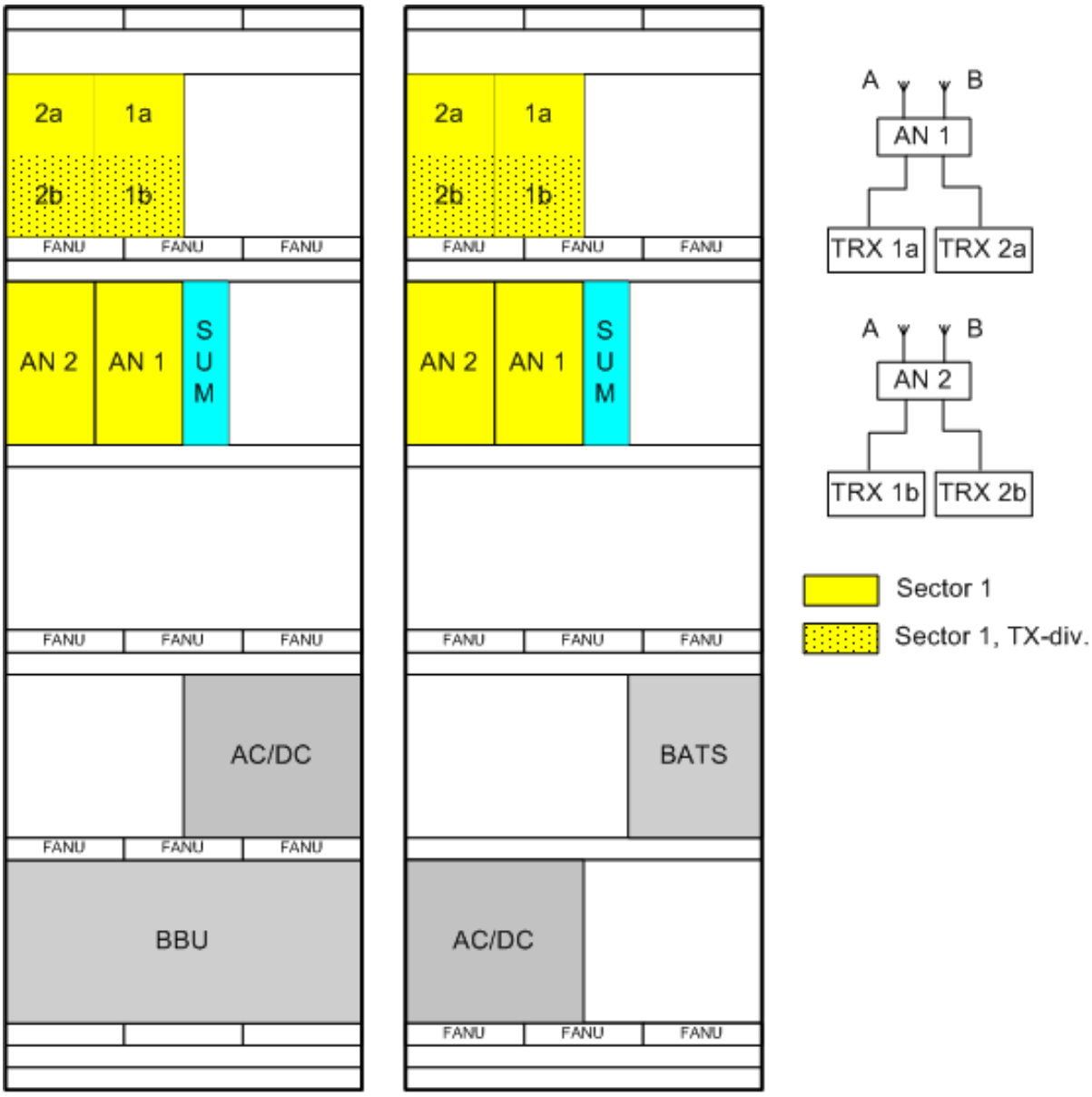
AC or DC
up to 2 TRX



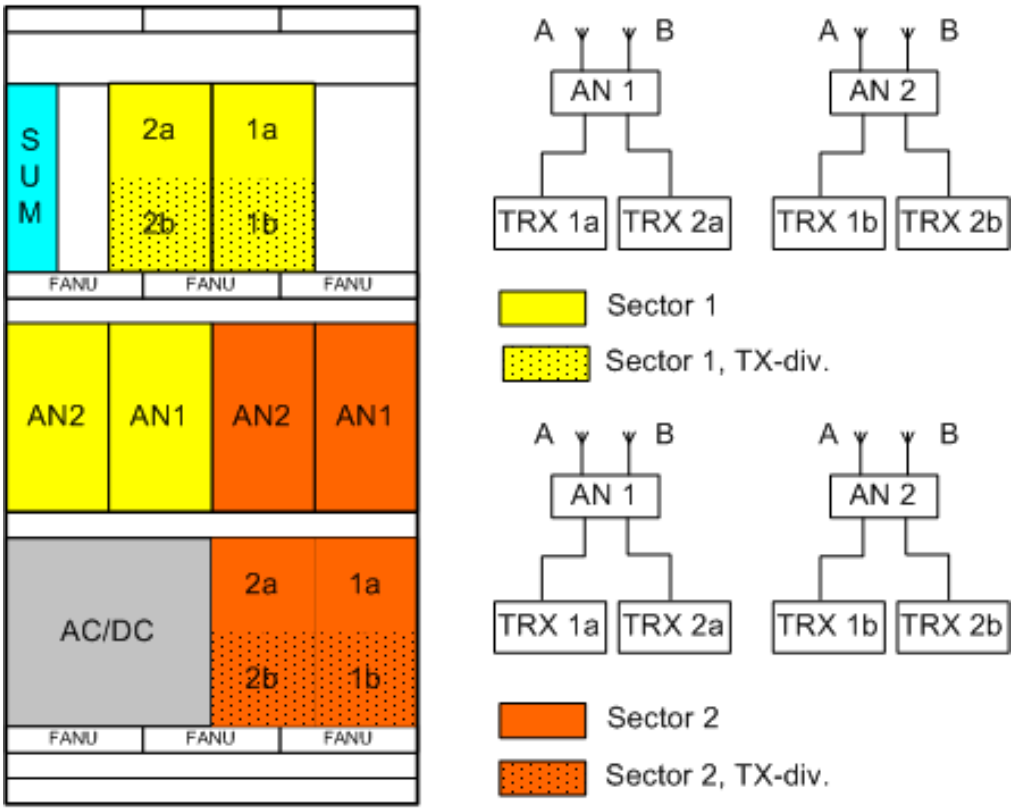




2.6.6.2 MBI5 - 1 Sector TX Diversity 4 RX with Twin-TRX

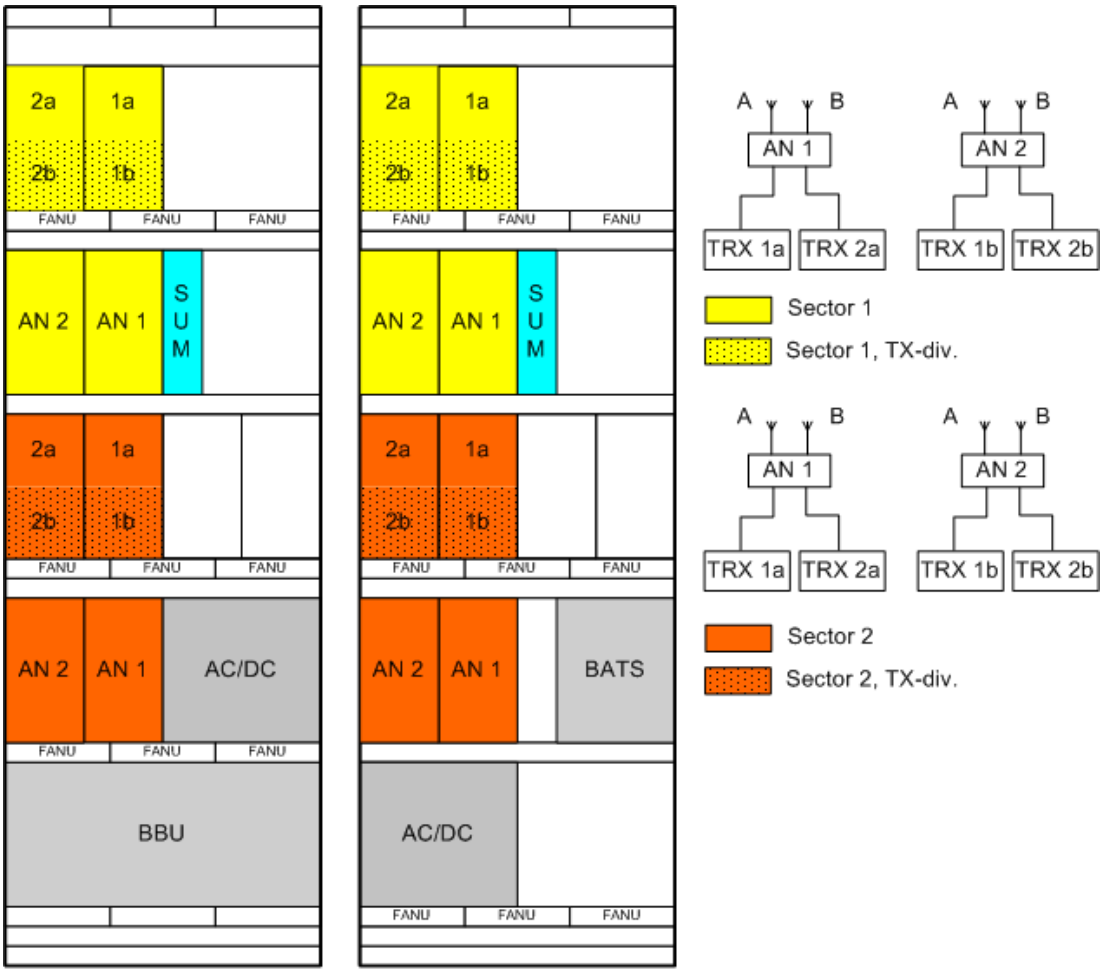


2.6.6.3 MBI3 - 2 Sector TX Diversity 4 RX with Twin-TRX



AC or DC
up to 2/2 TRX

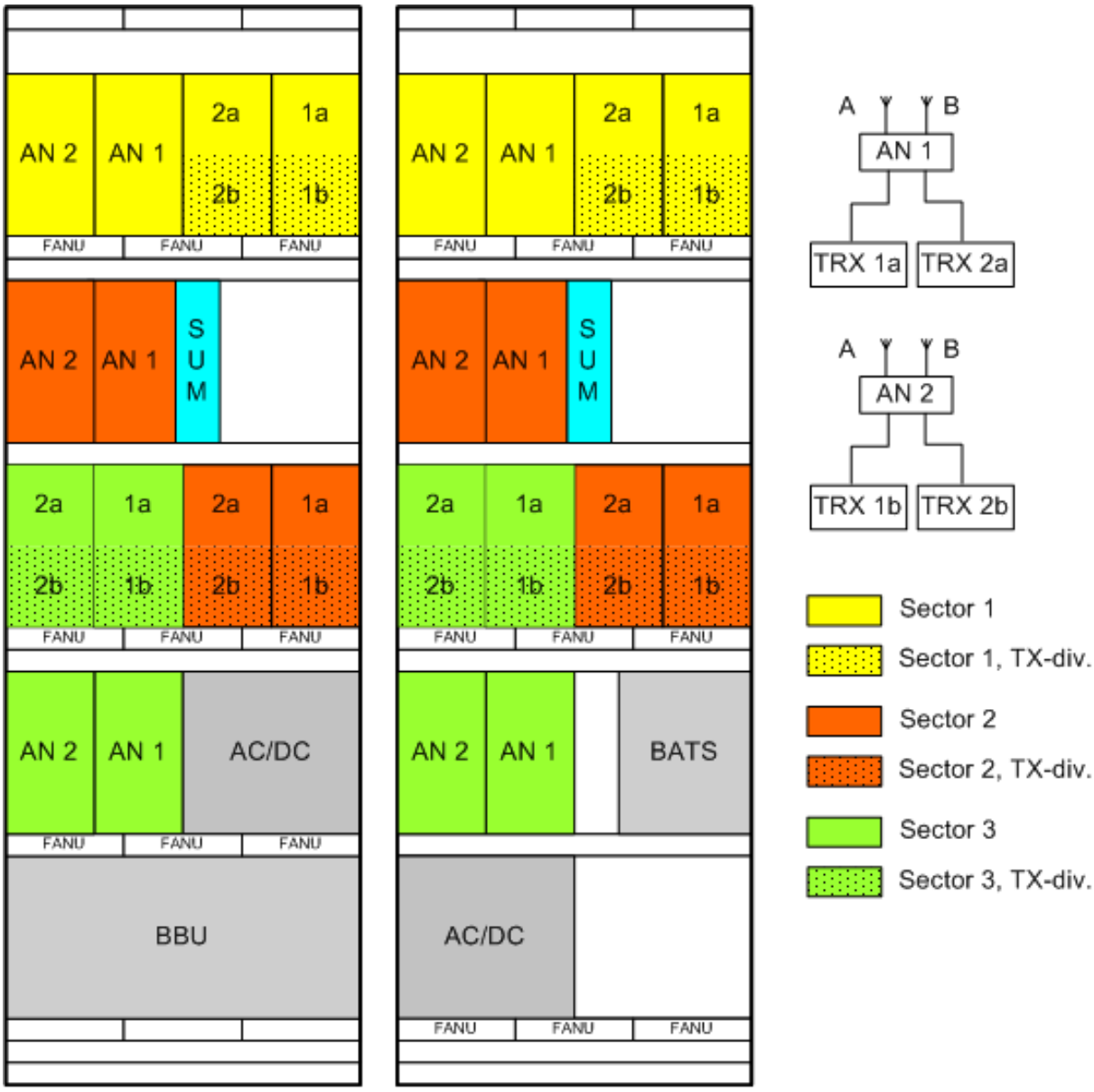
2.6.6.4 MBI5 - 2 Sector TX Diversity 4 RX with Twin-TRX



AC with BU90
up to 2/2 TRX

AC with BU5 or DC
up to 2/2 TRX

2.6.6.5 MBI5 - 3 Sectors TX Diversity 4 RX with Twin-TRX



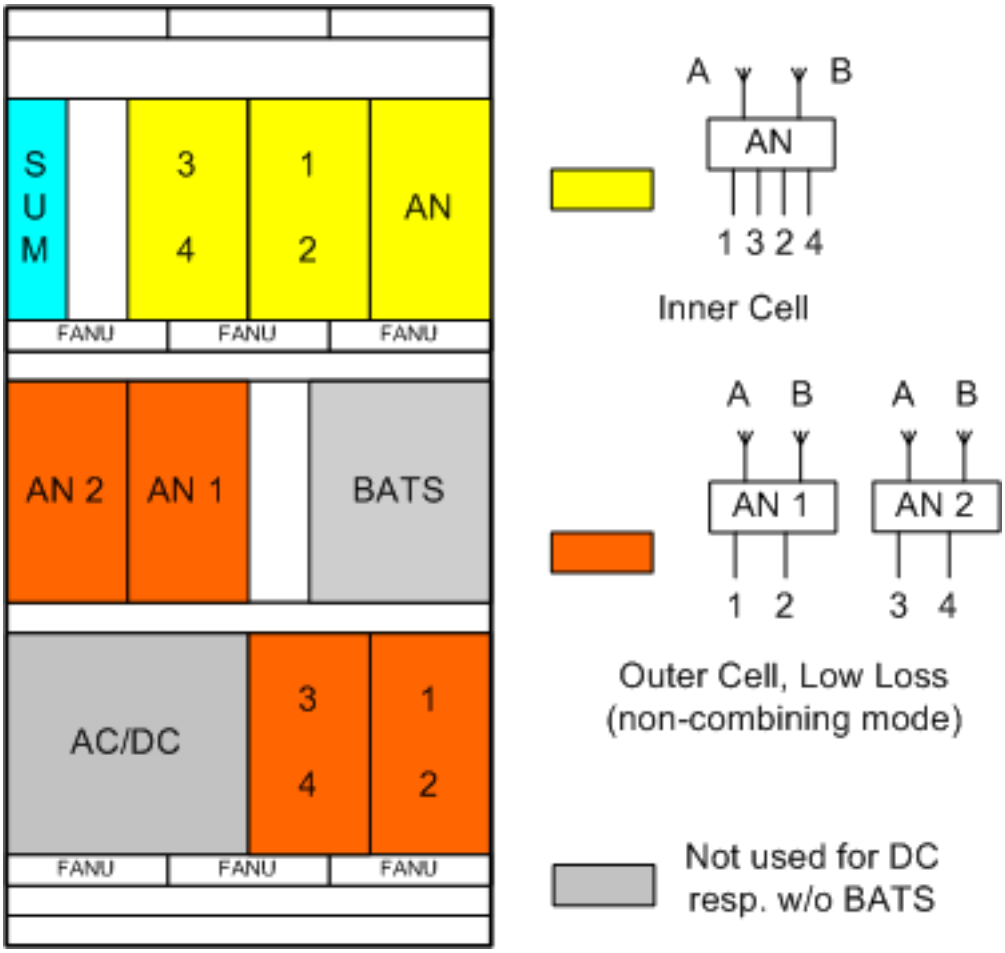
AC with BU90
up to 2/2/2 TRX

AC with BU5 or DC
up to 2/2/2 TRX

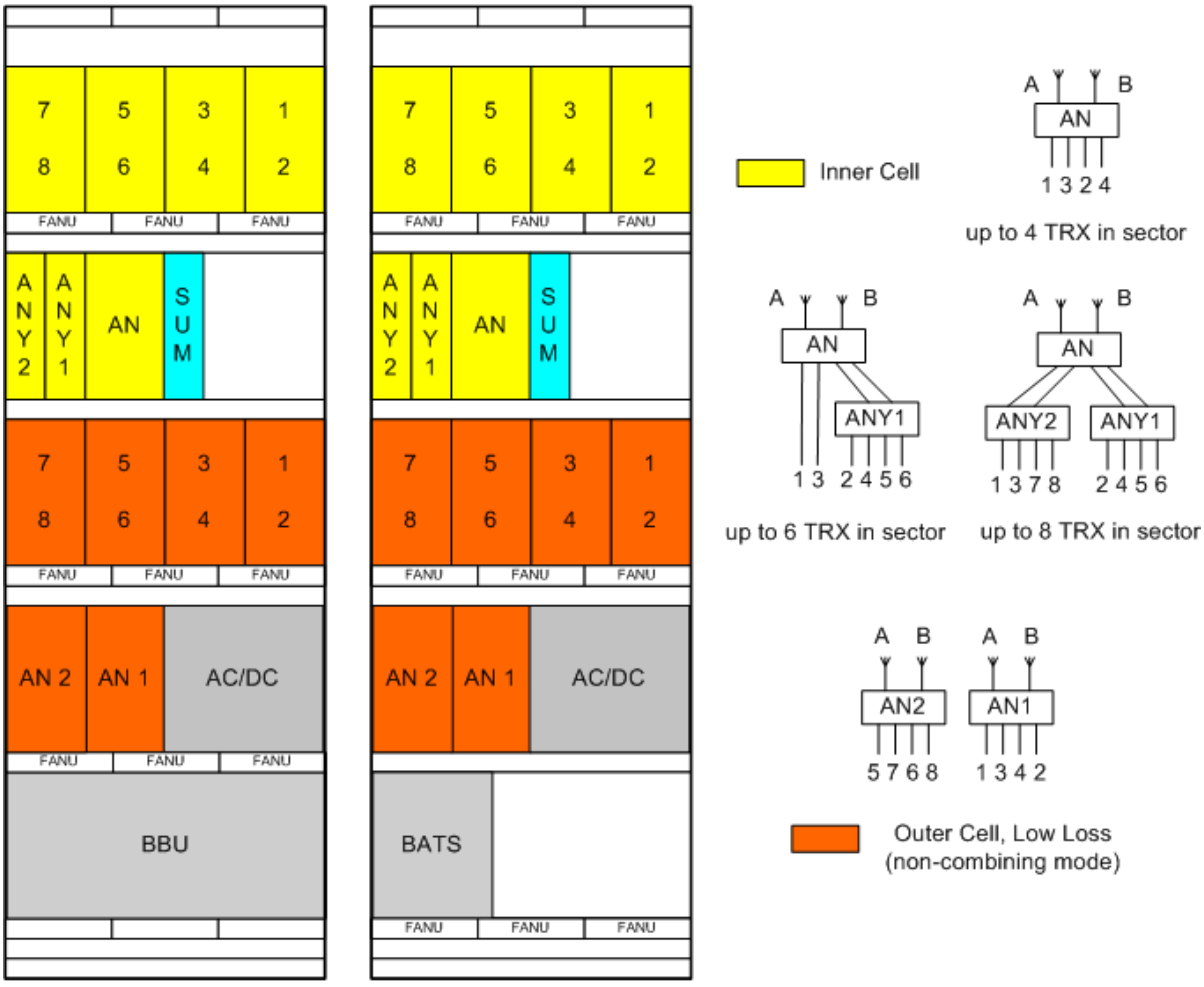
2.6.7 Extended Cell

2.6.7.1 MBI3 - Extended Cell with Twin-TRX

AC or DC configuration, with up to 4 + 4 TRX.


SUM
3
4
1
2
AN
FANU
FANU
FANU
AN 2
AN 1
BATS
AC/DC
3
4
1
2
FANU
FANU
FANU
A
B
AN
1 3 2 4
Inner Cell
A
B
A
B
AN 1
AN 2
1
2
3
4
Outer Cell, Low Loss
(non-combining mode)
Not used for DC
resp. w/o BATS

2.6.7.2 MBI5 - Extended Cell with Twin-TRX

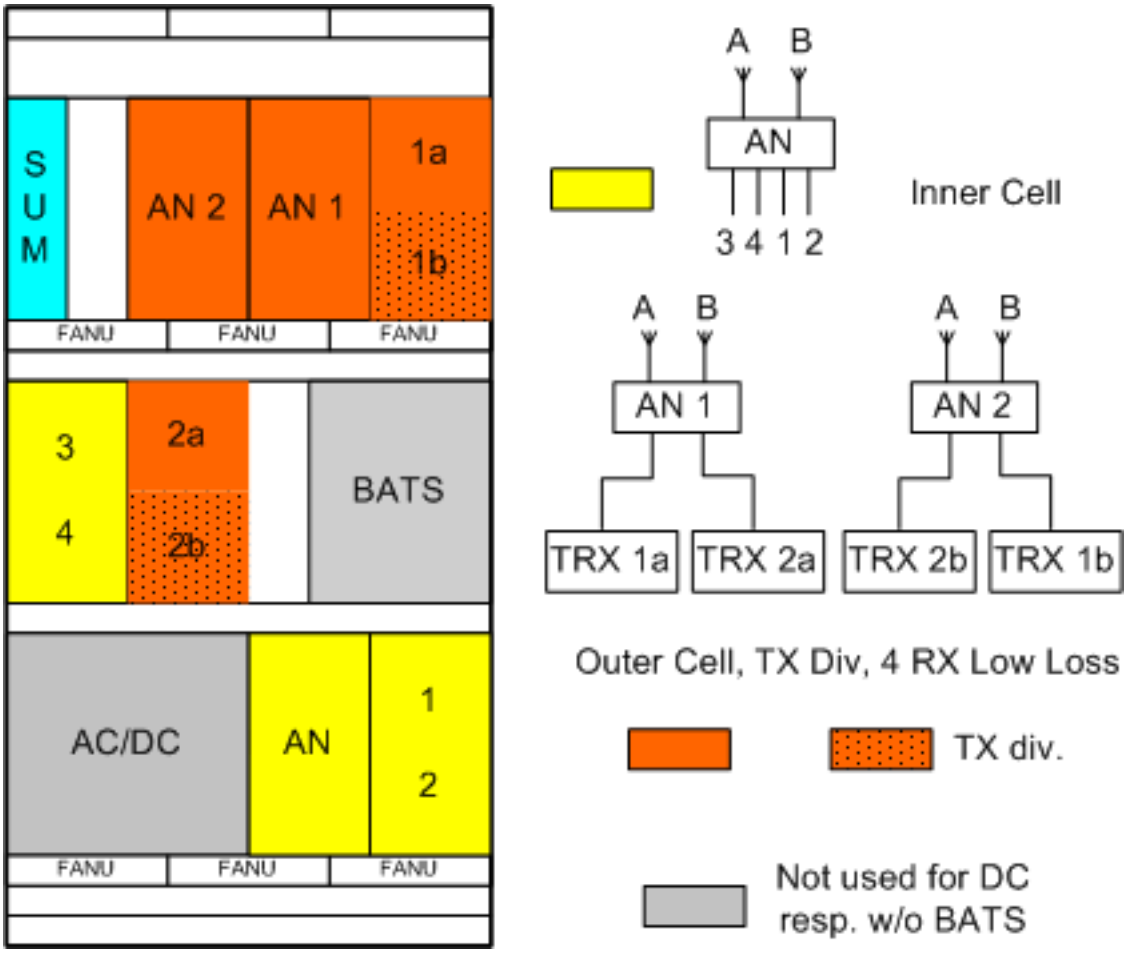


AC with BU90
up to 8 + 8 TRX

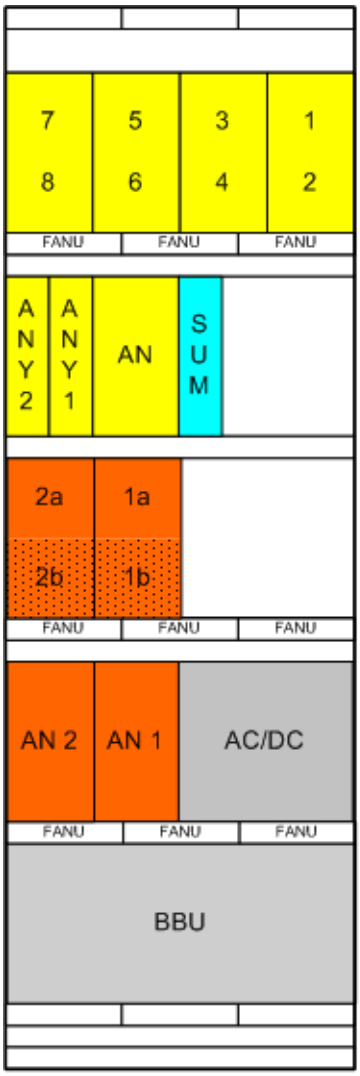
AC with BU5 or DC
up to 8 + 8 TRX

2.6.8 Extended Cell TxDiv, 4RX Div for outer cell

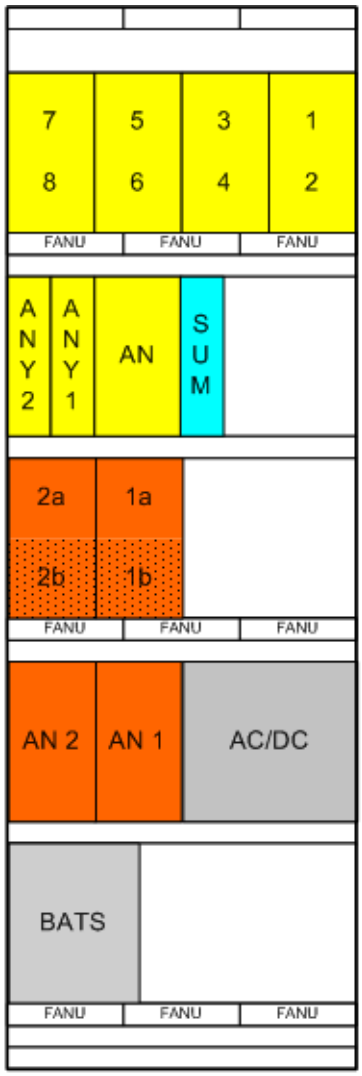
2.6.8.1 MBI3 - Extended Cell TX Diversity 4 RX with Twin-TRX



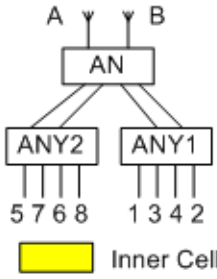
2.6.8.2 MBI5 - Extended Cell TX Diversity 4 RX with Twin-TRX

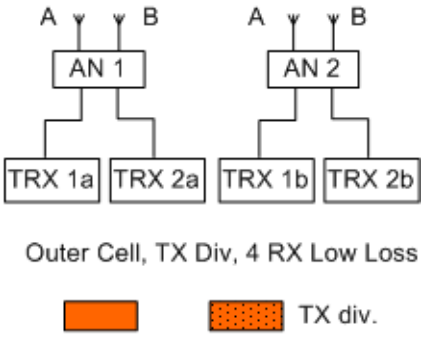


AC with BU90
up to 8 + 2 TRX



AC with BU5 or DC
up to 8 + 2 TRX





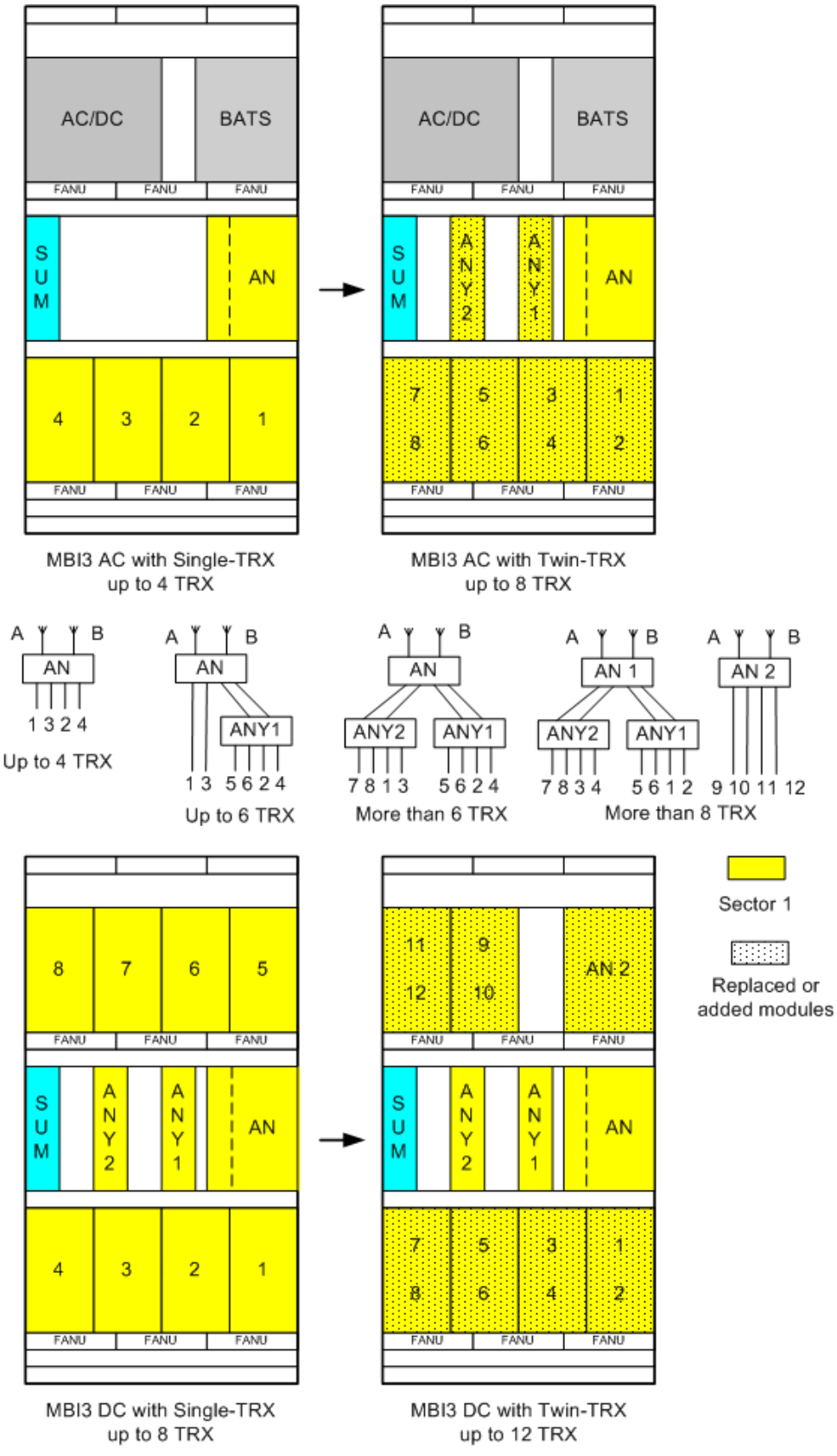
2.7 Multistandard Base Station Indoor Mixed Configurations Based on Extension with Twin TRX

The following table gives the possible configuration extension based on Twin TRX modules.

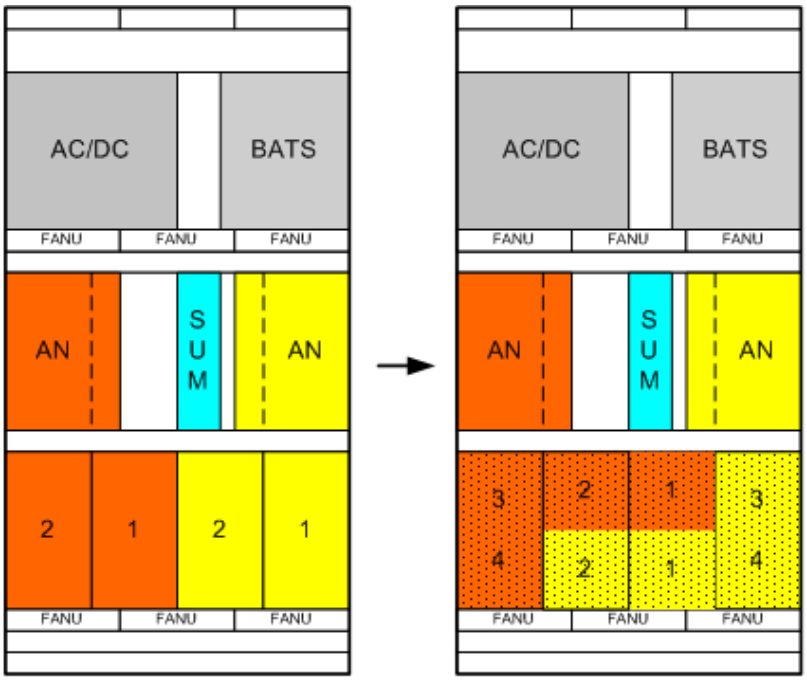
Cabinet	Number of sectiors	AC Carriesrs per sector	DC Carriesrs per sector
		Single TRX -> Twin TRX	**Single TRX -> Twin TRX**
MBI3	1	*4 -> 8*	*8 -> 12*
	2	*2/2 -> 4/4*	*4/4 -> 4/6(6/6*)*
	3	*1/1/1 -> 2/2/2*	*2/2/2 -> 4/4/4*
MBI5	1	n.a.	*12 -> 16*
	2	n.a.	*6/6 -> 8/8*
	3	*4/4/4 -> 4/6/6 (6/6/6*)*	*4/4/4 -> 6/6/6*
Mini	1	n.a.	*4 -> 8*
	2	n.a.	*2/2 -> 4/4*
	3	n.a.	*1/1/1 -> 2/2/2*
Medi	1	n.a.	*12 -> 16*
	2	*2/2 -> 4/4*	*6/6 -> 8/8*
	3	*2/2/2 (4/4/4) -> 4/6/6(6/6/6)*	*4/4/4 -> 6/6/6*

***** : Change of SUMA location

2.7.1 MBI3 - 1 sector mixed configuration Single/Twin-TRX



2.7.2 MBI3 - 2 sectors mixed configuration Single/Twin-TRX



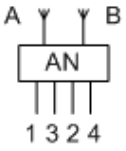
MBI3 AC with Single-TRX
up to 2/2 TRX

MBI3 AC with Twin-TRX
up to 4/4 TRX

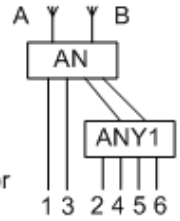
Sector 1

Sector 2

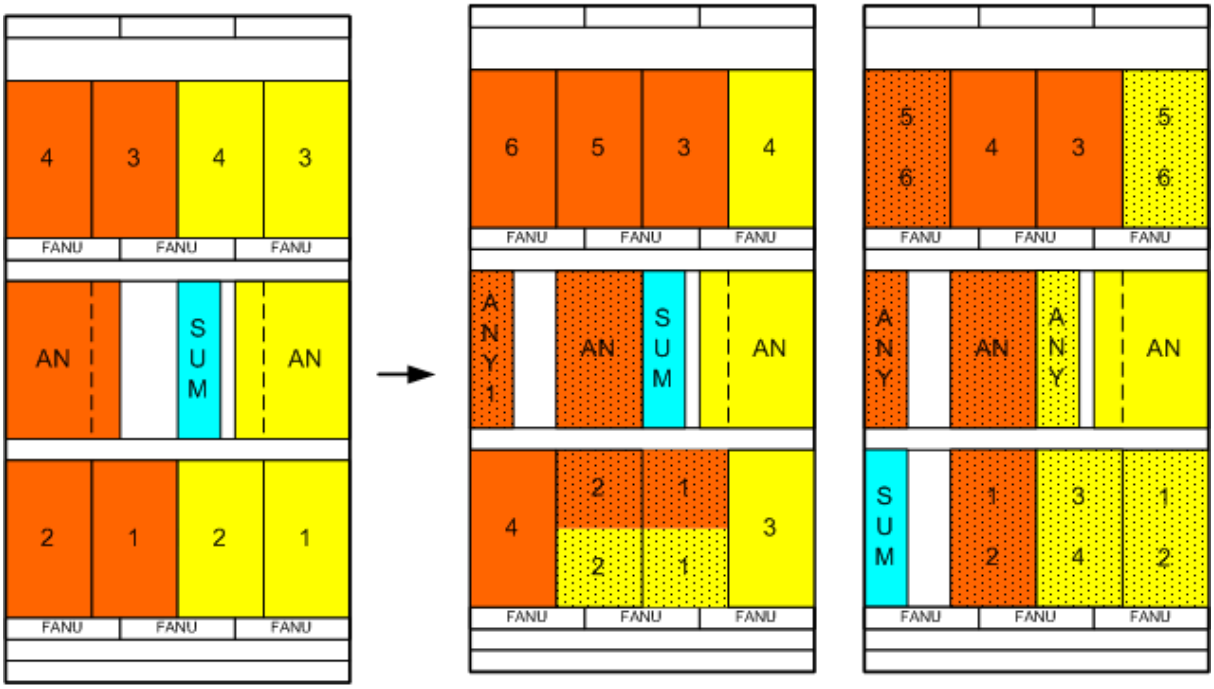
Replaced or
added modules



Up to 4 TRX per sector



Up to 6 TRX per sector

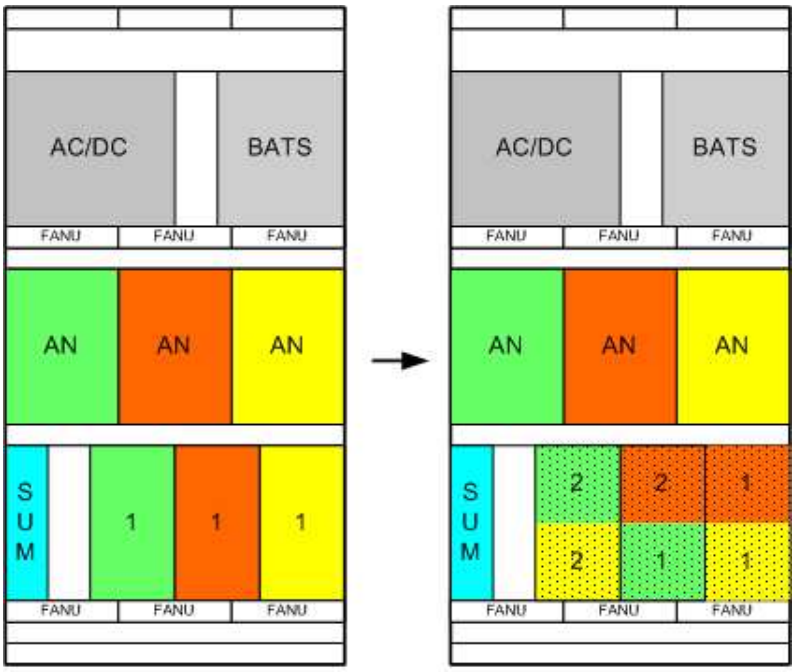


MBI3 DC with Single-TRX
up to 4/4 TRX

MBI3 DC with Twin-TRX
up to 4/6 TRX

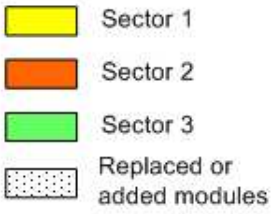
MBI3 DC with Twin-TRX
up to 6/6 TRX
with SUMA location change

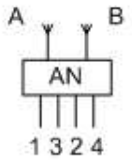
2.7.3 MBI3 - 3 sectors mixed configuration Single/Twin-TRX



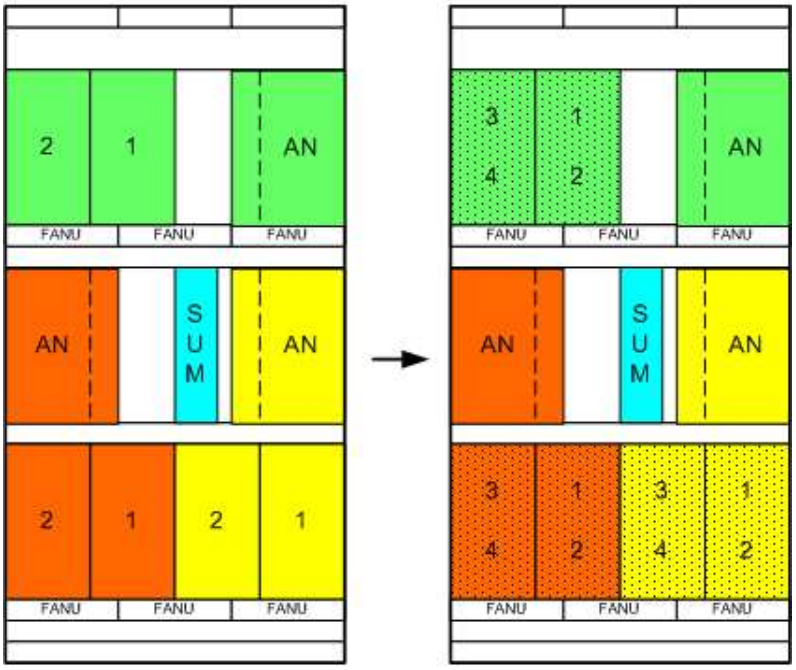
MBI3 AC with Single-TRX
1/1/1 TRX

MBI3 AC with Twin-TRX
up to 2/2/2 TRX





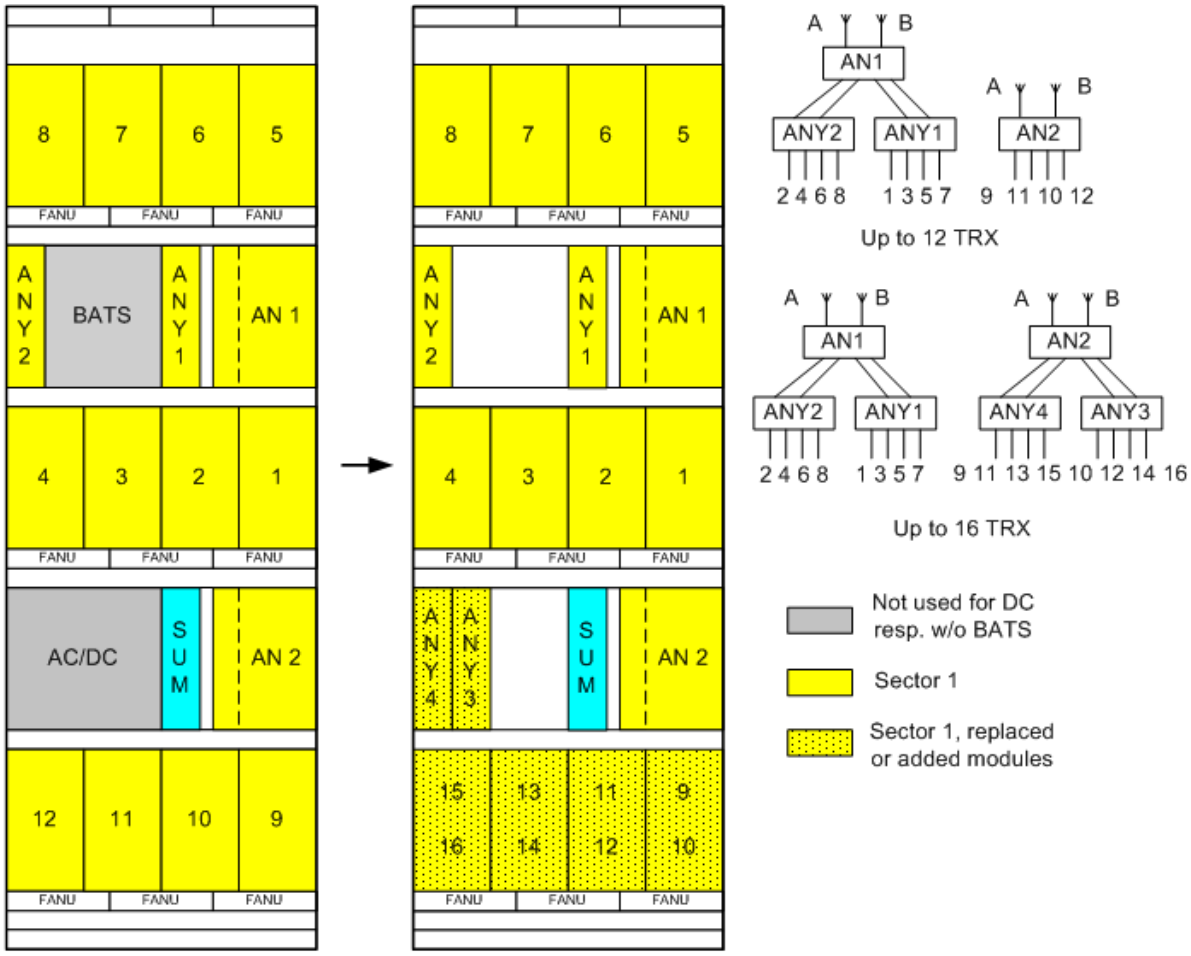
Up to 4 TRX per sector



MBI3 DC with Single-TRX
up to 2/2/2 TRX

MBI3 DC with Twin-TRX
up to 4/4/4 TRX

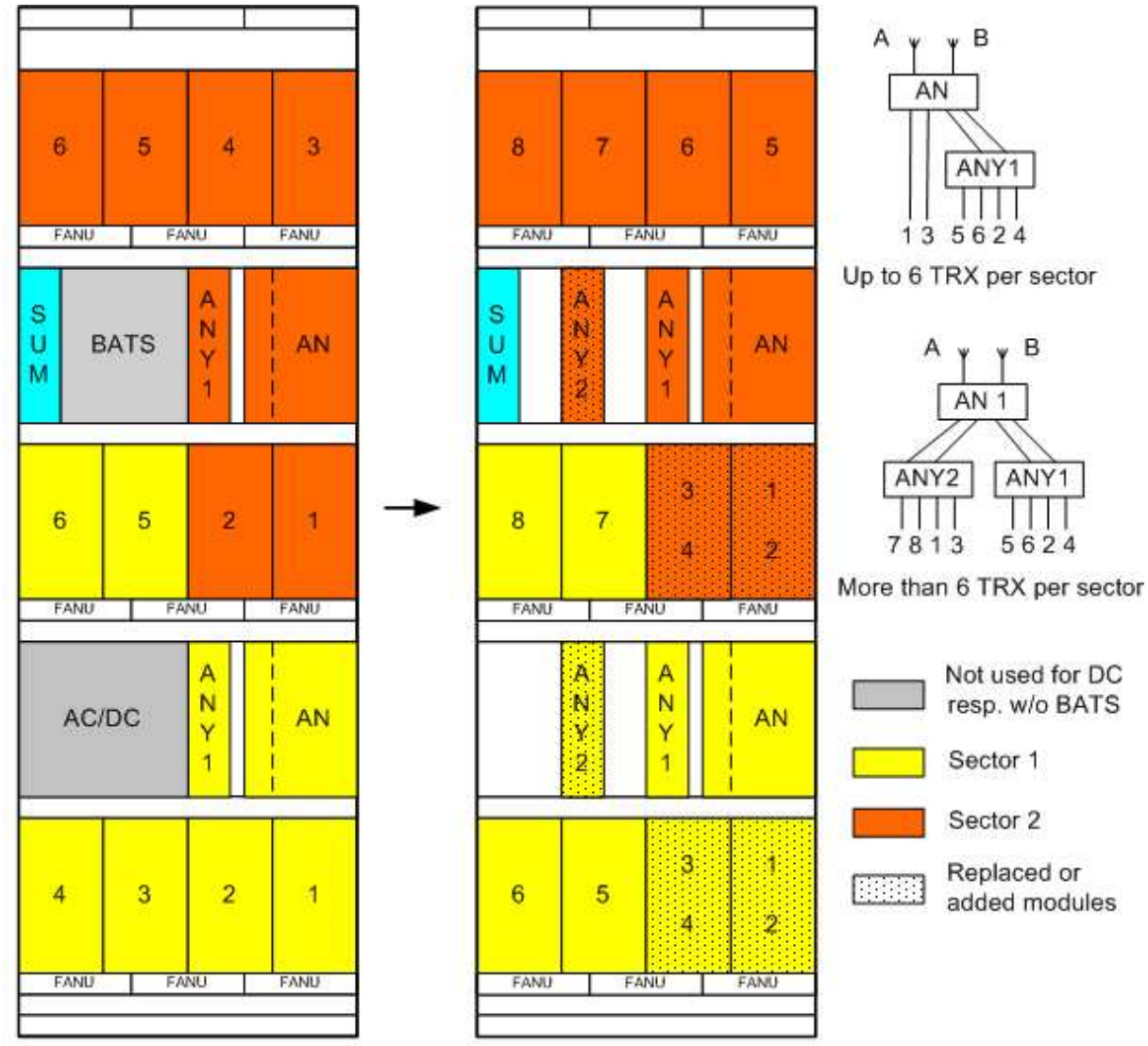
2.7.4 MBI5 - 1 Sector mixed configuration Single/Twin-TRX



MBI5 AC or DC with Single-TRX up to 12 TRX

MBI5 DC with Twin-TRX up to 16 TRX

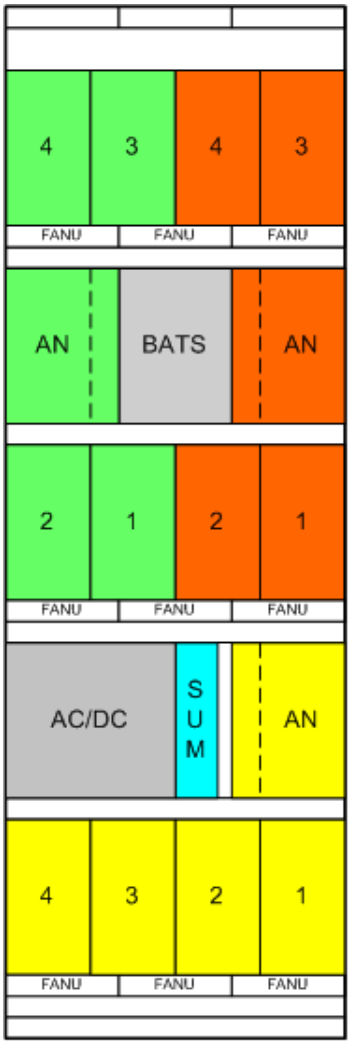
2.7.5 MBI5 - 2 Sectors mixed configuration Single/Twin-TRX

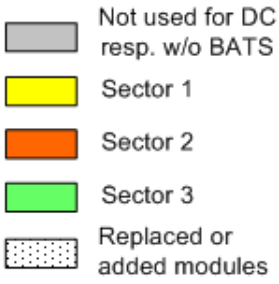


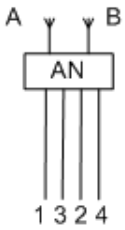
MBI5 AC or DC with Single-TRX up to 6/6 TRX

MBI5 DC with Twin-TRX up to 8/8 TRX

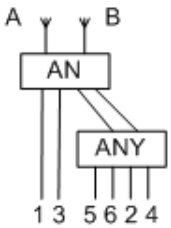
2.7.6 MBI5 - 3 Sectors mixed configuration Single/Twin-TRX





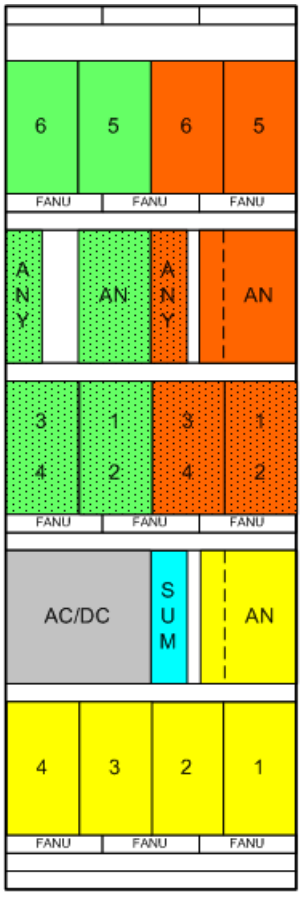


Up to 4 TRX per sector

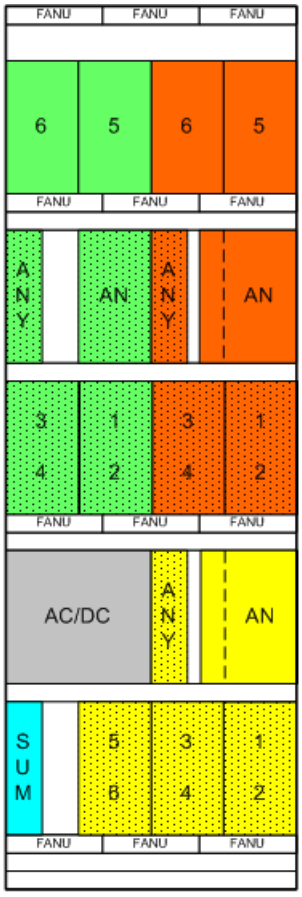


Up to 6 TRX per sector

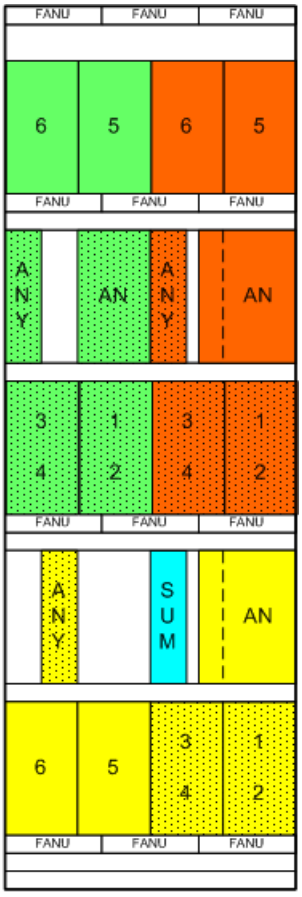
MBI5 AC or DC with Single-TRX
up to 4/4/4 TRX



MBI5 AC w/o BATS
with Twin-TRX
up to 4/6/6 TRX



MBI5 AC with Twin-TRX
up to 6/6/6 TRX
with SUMA location change



MBI5 DC with Twin-TRX
up to 6/6/6 TRX

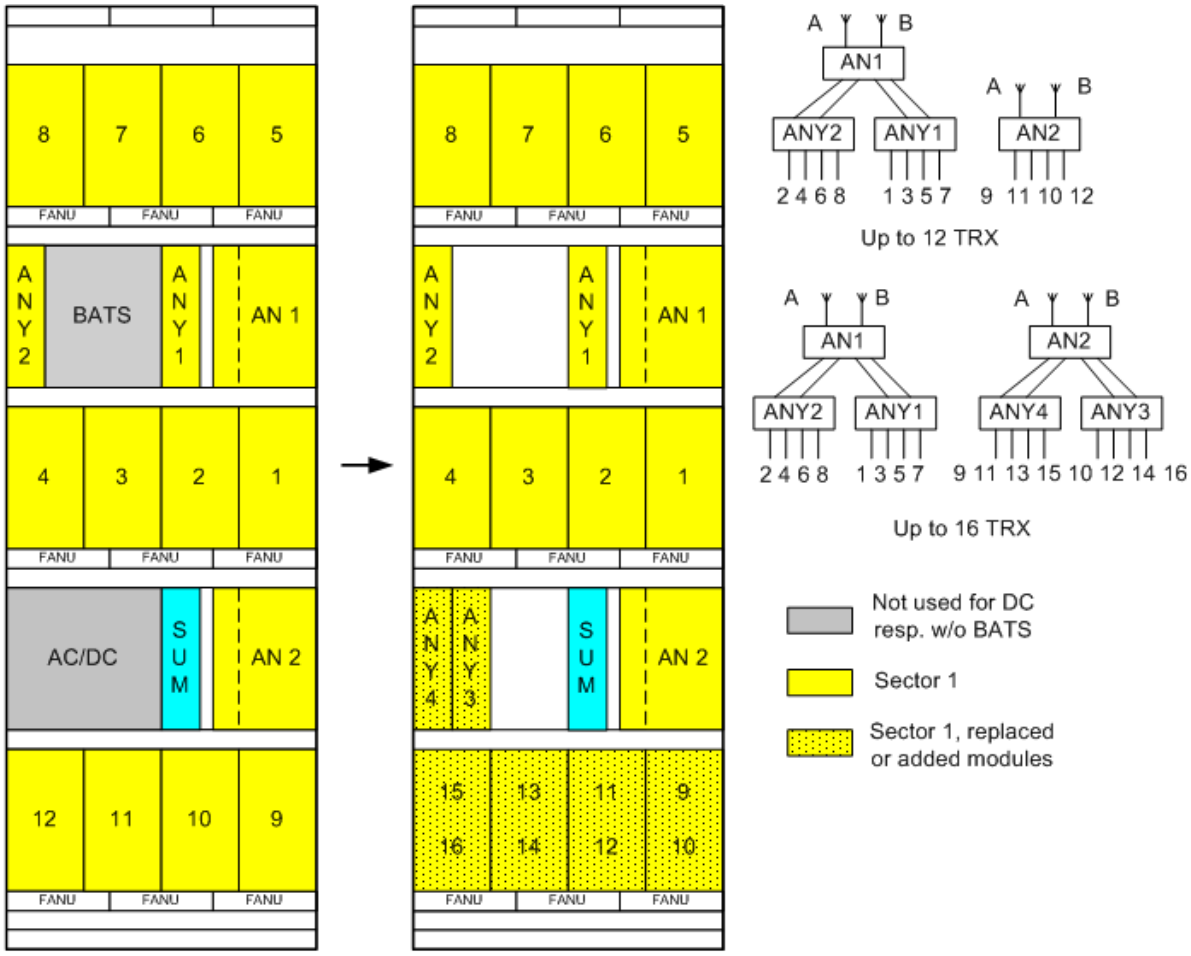
2.8 Multistandard Base Station Indoor Mixed Configurations Based on Extension with Twin TRX (Only in MBI5 Cabinet Variant AB)

The following table gives the possible configuration extension based on Twin TRX modules.

Cabinet	Number of sectiors	AC	DC
		Carriesrs per sector	Carriesrs per sector
		Single TRX -> Twin TRX	Single TRX -> Twin TRX
MBI5 (AB)	1	n.a.	*12 -> 16*
	2	n.a.	*6/6 -> 12/12*
	3	*4/4/4 -> 4/6/6(6/6/6)*	*4/4/4 -> 6/6/6*

***** : Change of SUMA location

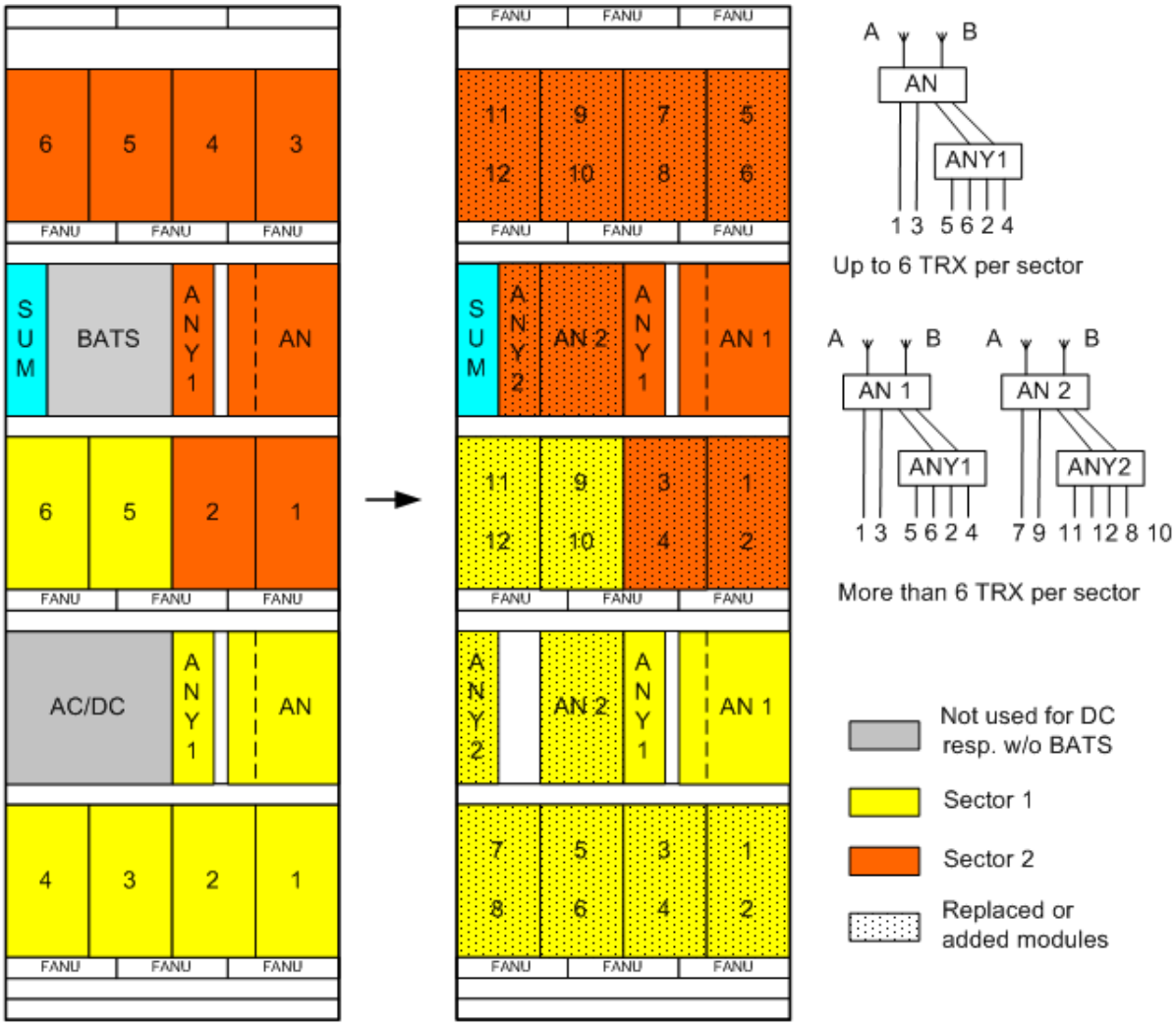
2.8.1 MBI5 AB variant - 1 Sector mixed configuration Single/Twin-TRX



MBI5 AC or DC with Single-TRX up to 12 TRX

MBI5 DC with Twin-TRX up to 16 TRX

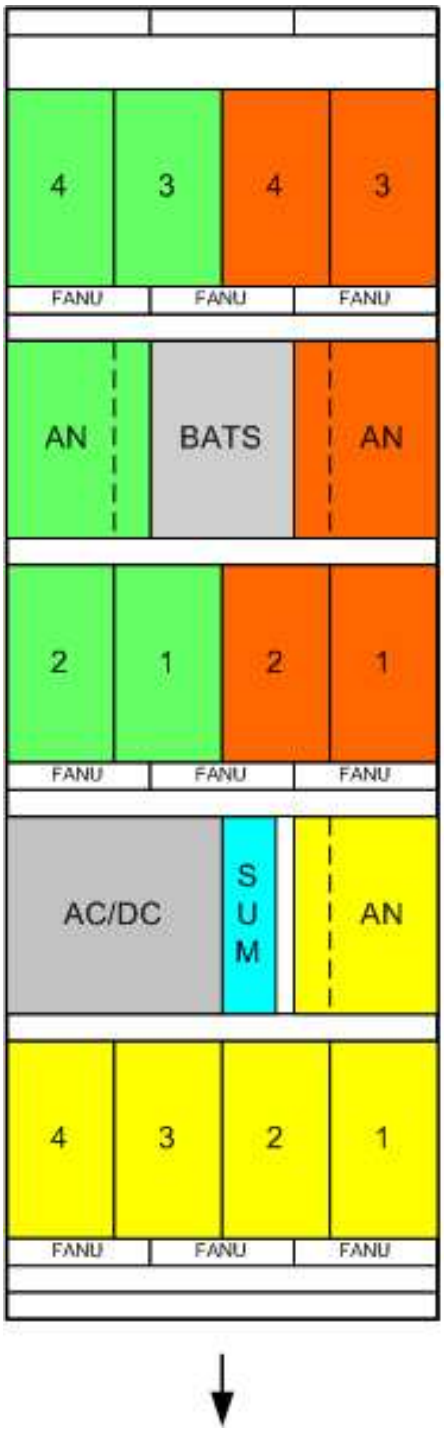
2.8.2 MBI5 AB variant - 2 Sectors mixed configuration Single/Twin-TRX

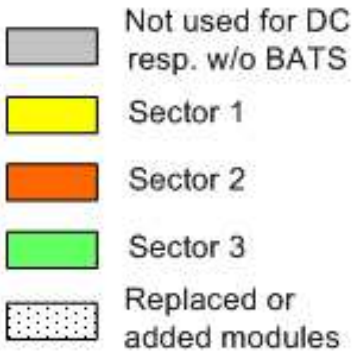


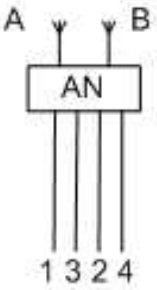
MBI5 AC or DC with Single-TRX up to 6/6 TRX

MBI5 DC with Twin-TRX up to 12/12 TRX

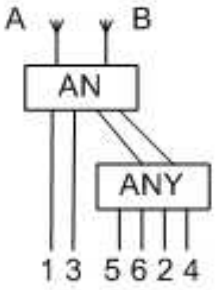
2.8.3 MBI5 AB variant - 3 Sectors mixed configuration Single/Twin-TRX



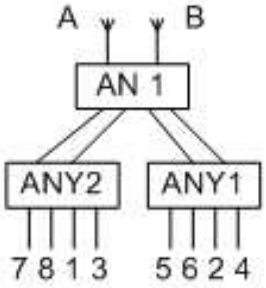




Up to 4 TRX per sector

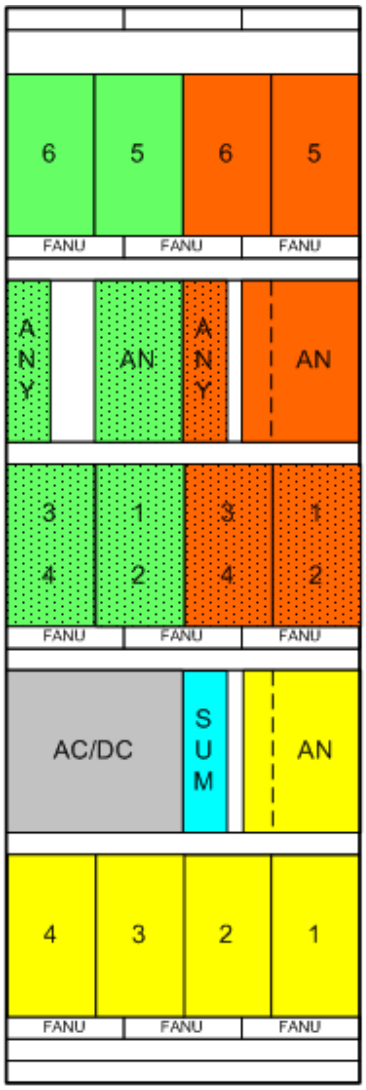


Up to 6 TRX per sector

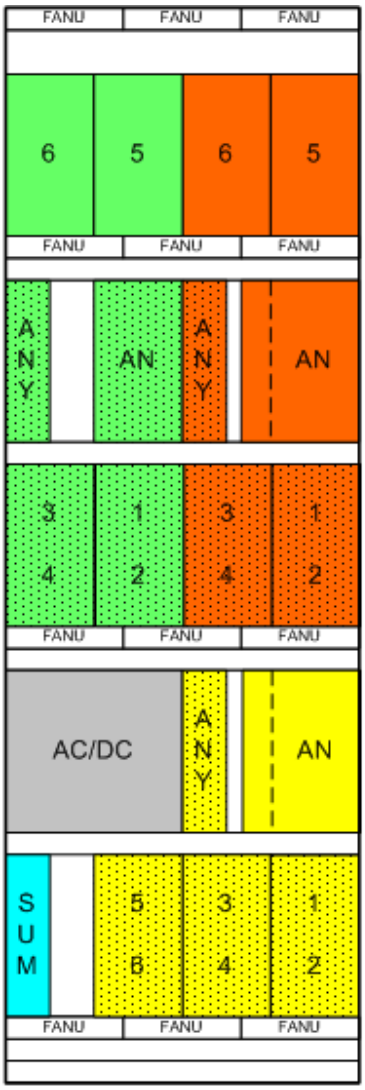


More than 6 TRX per sector

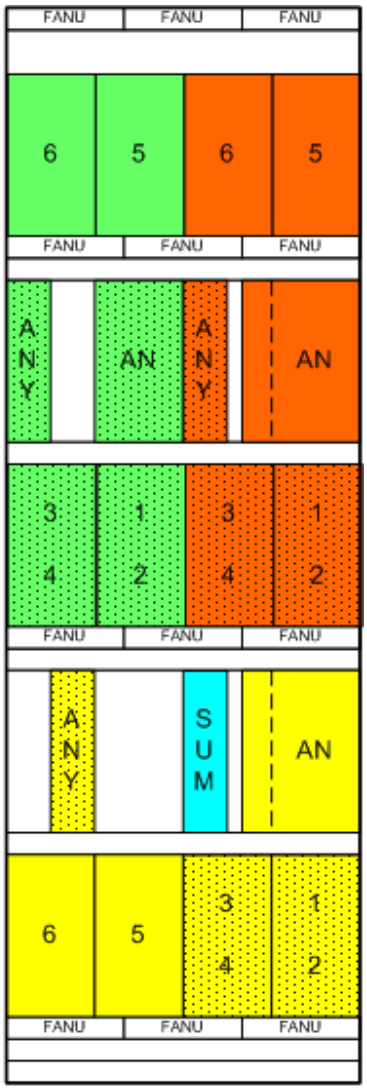
MBI5 AC or DC with Single-TRX
up to 4/4/4 TRX



MBI5 AC w/o BATS
with Twin-TRX
up to 4/6/6 TRX



MBI5 AC with Twin-TRX
up to 6/6/6 TRX
with SUMA location change



MBI5 DC with Twin-TRX
up to 6/6/6 TRX

2.9 Outdoor Configurations with Single TRX

2.9.1 Outdoor Configurations - Standard BTS GSM 900/1800/1900

2.9.1.1 Outdoor CBO - 1x1...2

The following figure shows the rack layouts of the Outdoor CBO - 1x1...2 configuration.

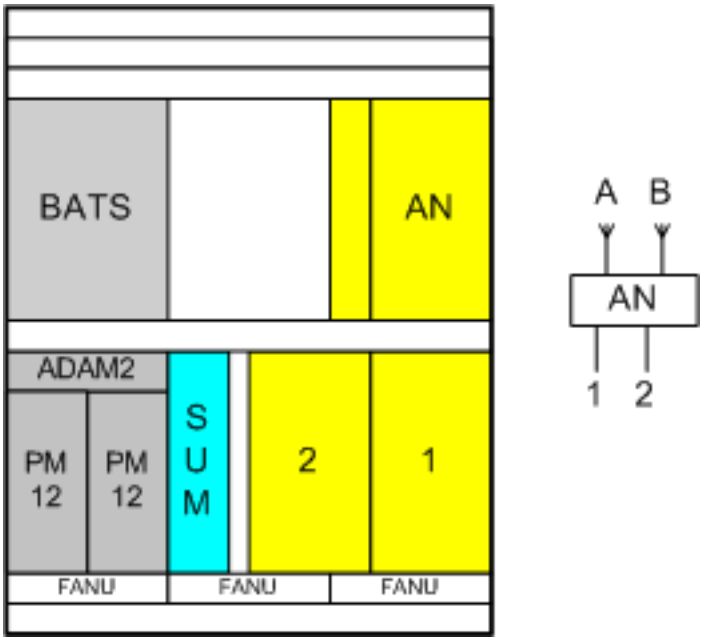


Figure 90: Outdoor CBO - 1x1...2 Configuration

2.9.1.2 Outdoor MINI - 1x1...4

The following figure shows the rack layouts of the Outdoor MINI - 1x1...4 configuration.

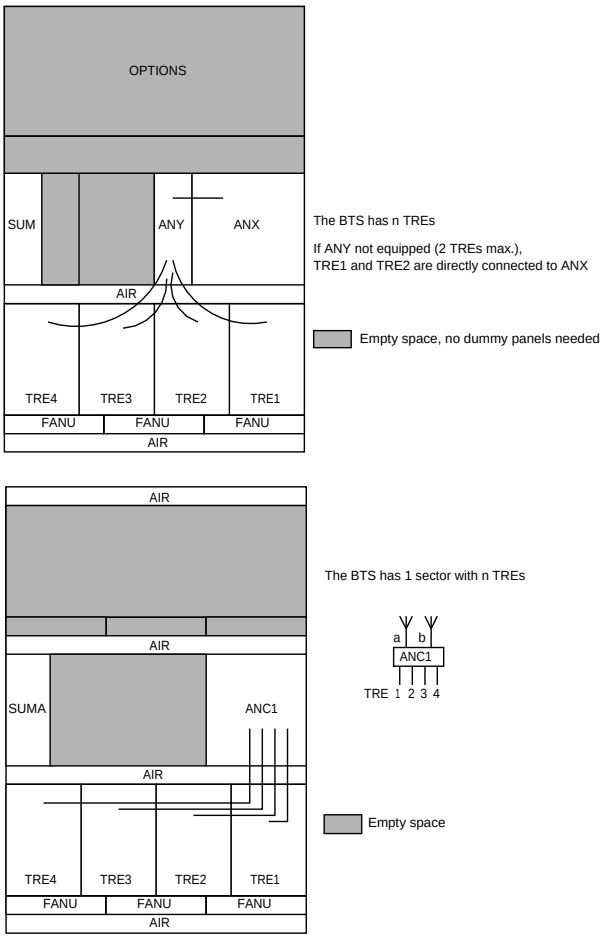


Figure 91: Outdoor MINI - 1x1...4 Configuration

2.9.1.3 Outdoor MINI - 1x1...8

The following figure shows the rack layout of the Outdoor MINI - 1x1...8 configuration.

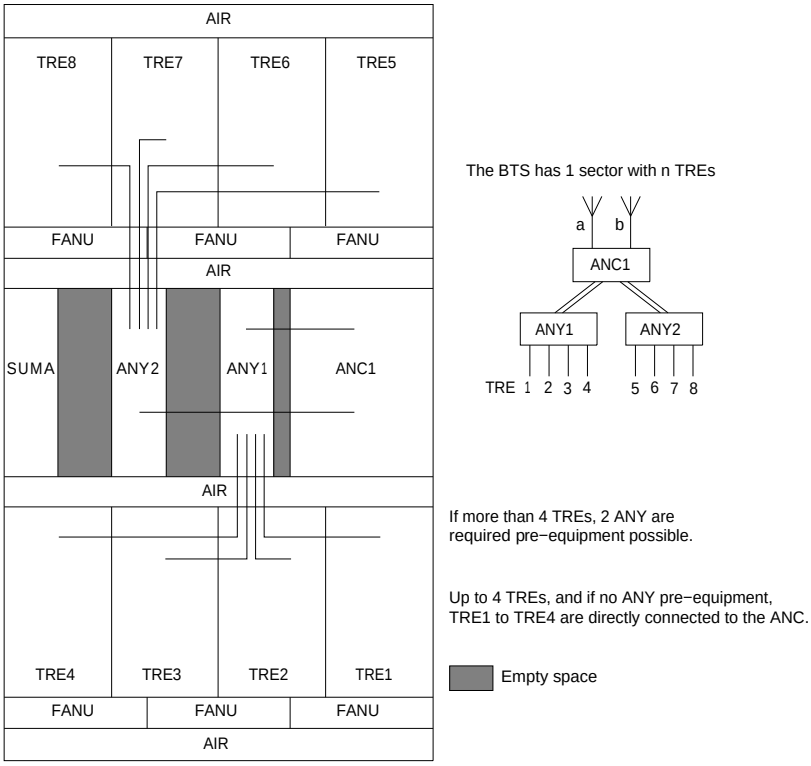


Figure 92: Outdoor MINI - 1x1...8 Configuration

2.9.1.4 Outdoor CBO - 2x1

The following figure shows the rack layouts of the Outdoor CBO - 2x1 configuration.

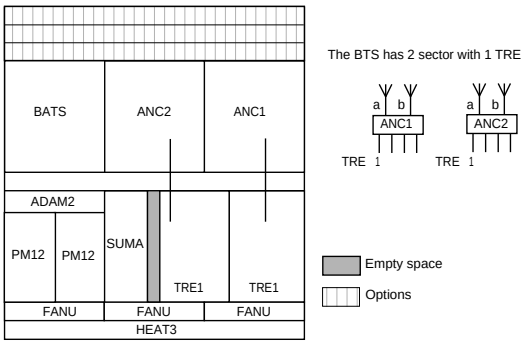


Figure 93: Outdoor CBO - 2x1 Configuration

2.9.1.5 Outdoor CBO - 2x2

The following figure shows the rack layouts of the Outdoor CBO - 2x2 configuration.

This configuration is available only on CBO DC variant.

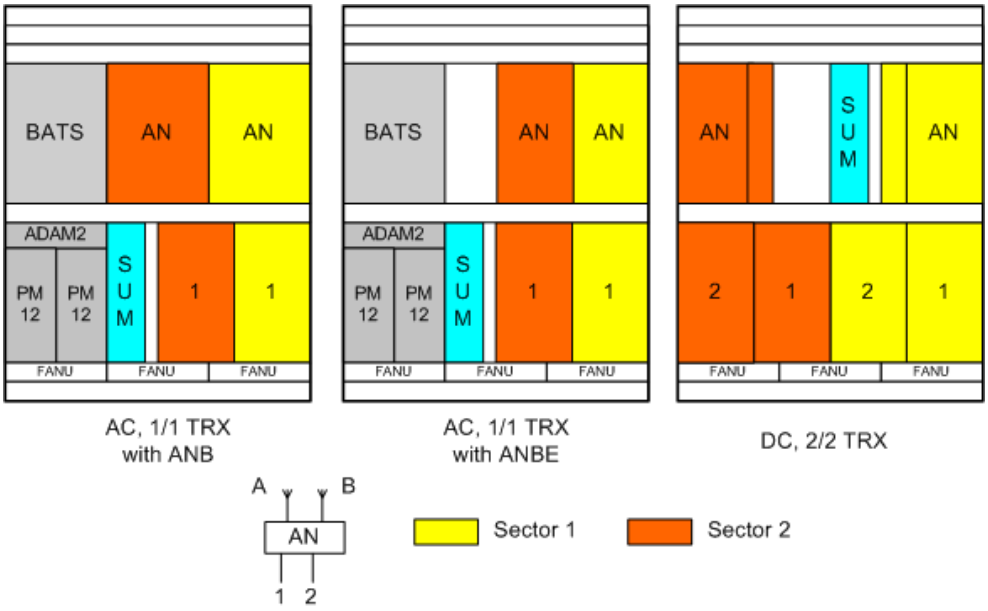


Figure 94: Outdoor CBO - 2x2 Configuration

2.9.1.6 Outdoor MINI - 2x1...2

The following figure shows the rack layouts of the Outdoor MINI - 2x1...2 configuration.

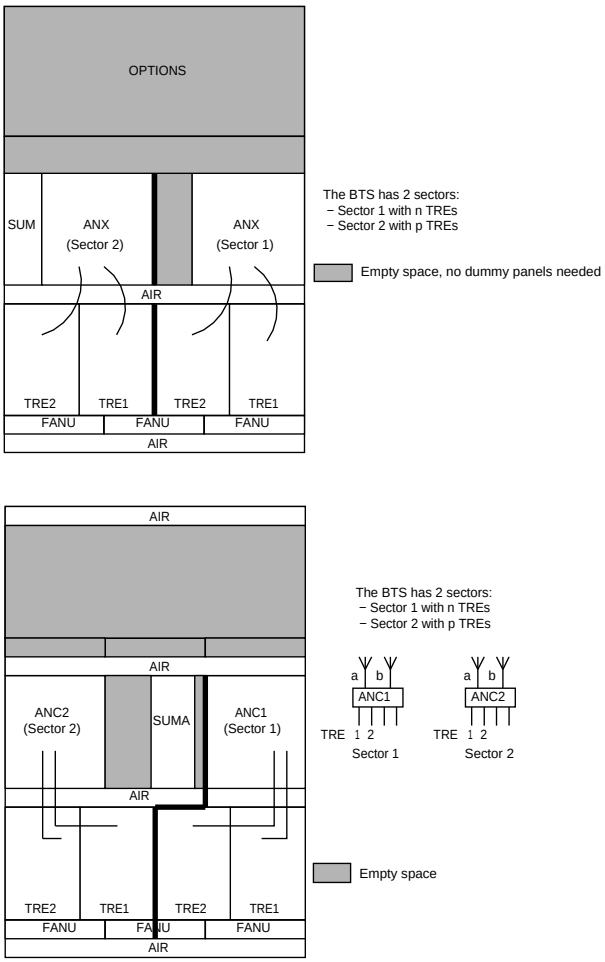


Figure 95: Outdoor MINI - 2x1...2 Configuration

2.9.1.7 Outdoor MINI - 2x1...4

The following figure shows the rack layout of the Outdoor Mini - 2x1...4 configuration.

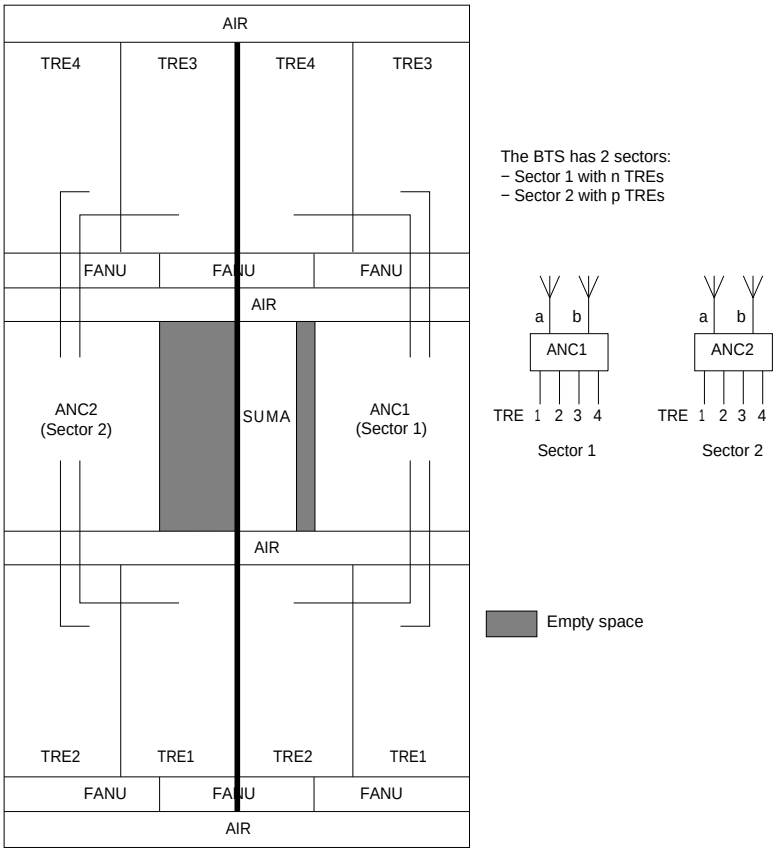


Figure 96: Outdoor MINI - 2x1...4 Configuration

2.9.1.8 Outdoor MINI - 3x1

The following figure shows the rack layout of the Outdoor MINI - 3x1 configuration.

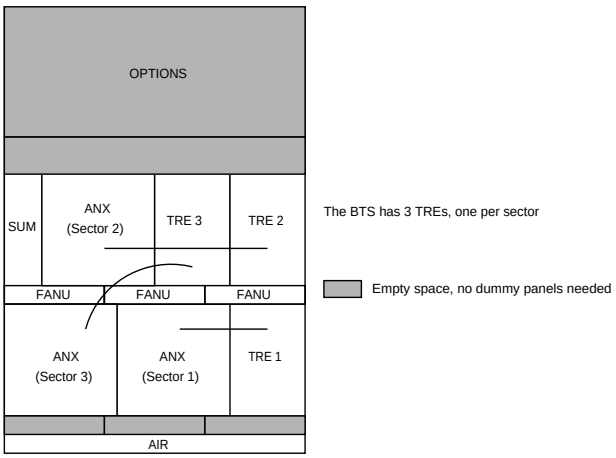


Figure 97: Outdoor MINI - 3x1 Configuration

2.9.1.9 Outdoor CBO - 3x1

The following figure shows the rack layout of the CBO - 3x1 configuration.

This configuration is available only on CBO DC variant.

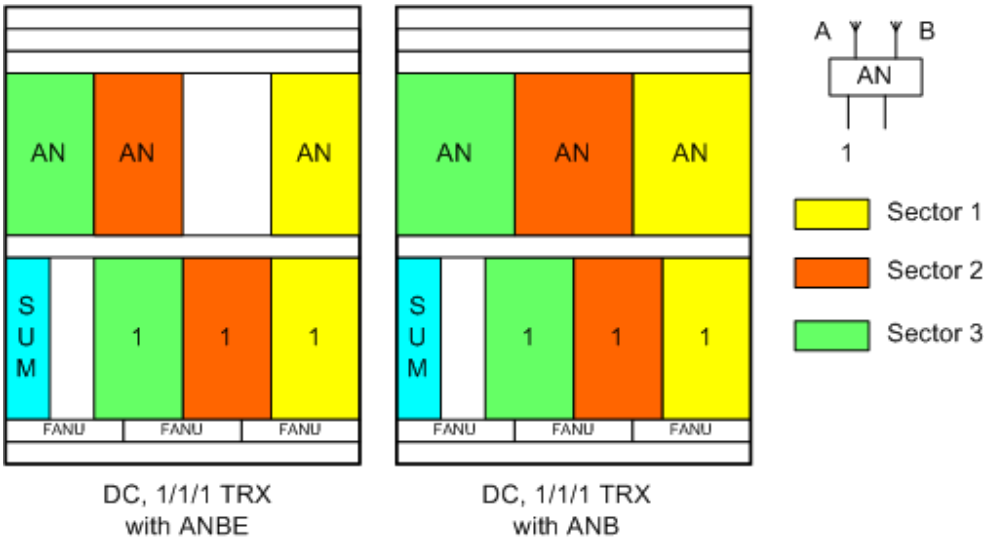


Figure 98: CBO 3x1 Configuration

2.9.1.10 Outdoor MINI - 3x1...2

The following figure shows the rack layout of the Outdoor MINI - 3x1...2 configuration.

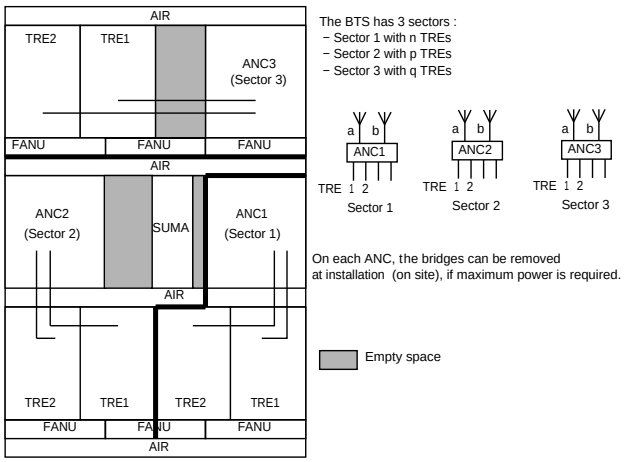


Figure 99: Outdoor MINI - 3x1...2 Configuration

2.9.1.11 Outdoor MINI - 3x1...2 - GSM 1900 (ANX version)

The following figure shows the rack layout of the Outdoor MINI - 3x1...2 - GSM 1900 configuration (ANX version).

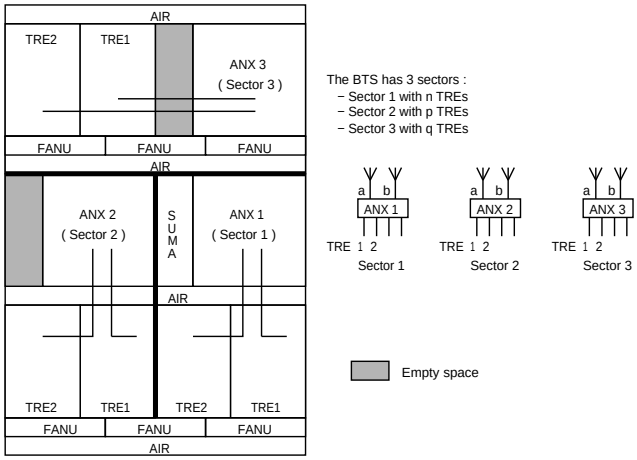


Figure 100: Outdoor MINI - 3x1...2 - GSM 1900 Configuration (ANX version)

2.9.1.12 Outdoor MEDI - 1x1...8

The following figure shows the rack layouts of the Outdoor MEDI - 1x1...8 configuration for GSM 900/1800.

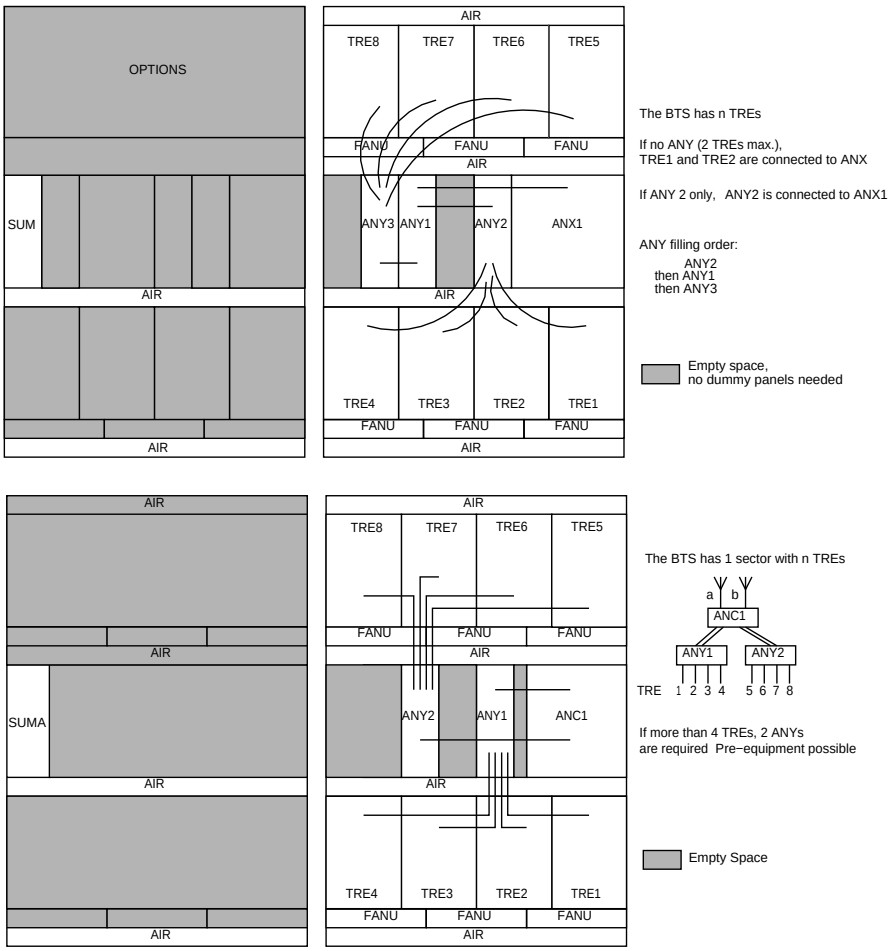


Figure 101: Outdoor MEDI - 1x1...8 Configuration

2.9.1.13 Outdoor MEDI - 1x9...12

The following figure shows the rack layouts of the Outdoor MEDI - 1x9...12 configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x11...12 with 28 W at + 40° C.

Configurations up to 1x1...10 without restrictions: 45 W at + 45° C.

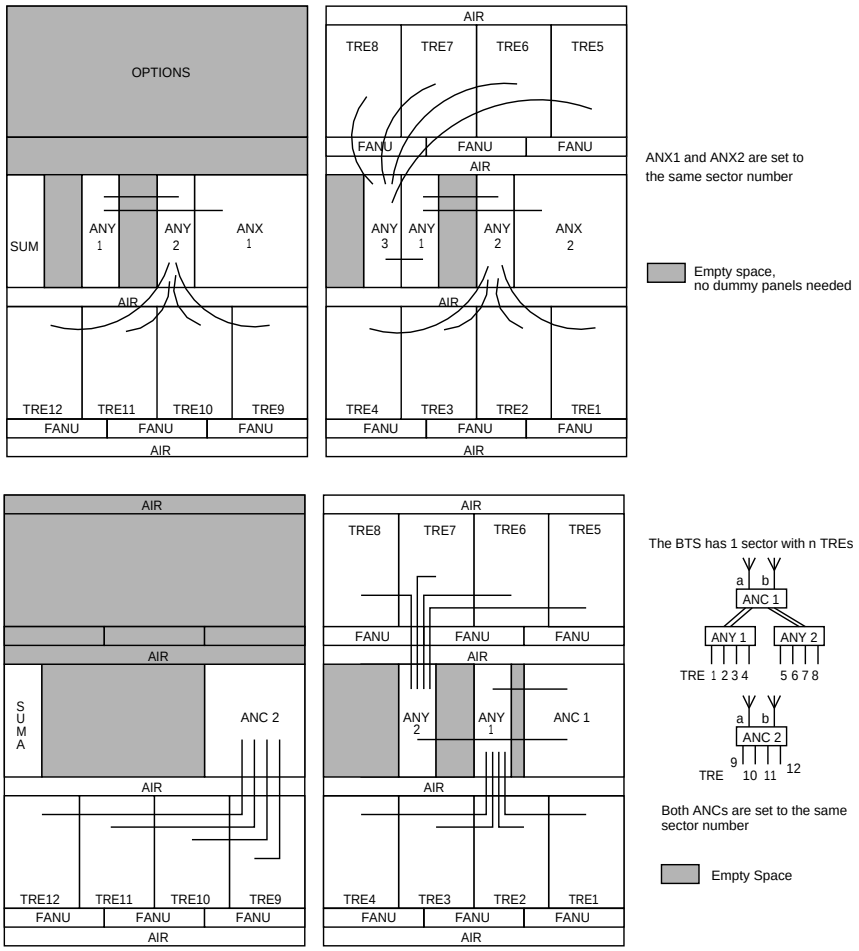


Figure 102: Outdoor MEDI - 1x9...12 Configuration

2.9.1.14 Outdoor CPT2 - 2x1...6

The following figure shows the rack layout of the Outdoor CPT2 - 2x1...6 configuration for GSM 900 and GSM 1800.

Note: **Restrictions**

For the GSM 1800 configuration using TRAD/TRADE TREs, the following restriction has to be considered: 2x5...6 with 45 W at + 40° C.

Configurations up to 2x1...4 without restrictions: 45 W at + 45° C.

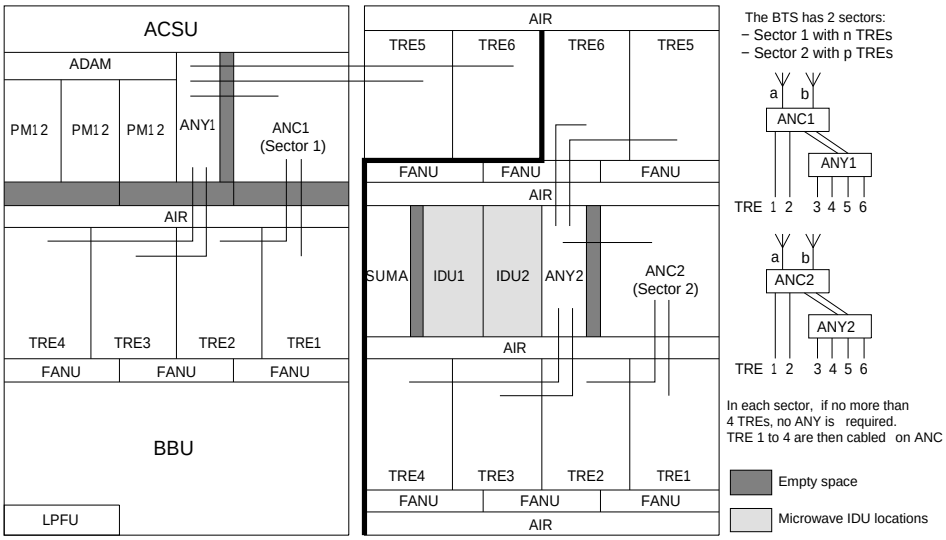


Figure 103: Outdoor CPT2 - 2x1...6 Configuration

2.9.1.15 Outdoor MEDI - 2x1...6

The following figure shows the rack layouts of the Outdoor MEDI - 2x1...6 configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 28 W at + 40° C.

Configurations up to 2x1...5 without restrictions: 45 W at + 45° C.

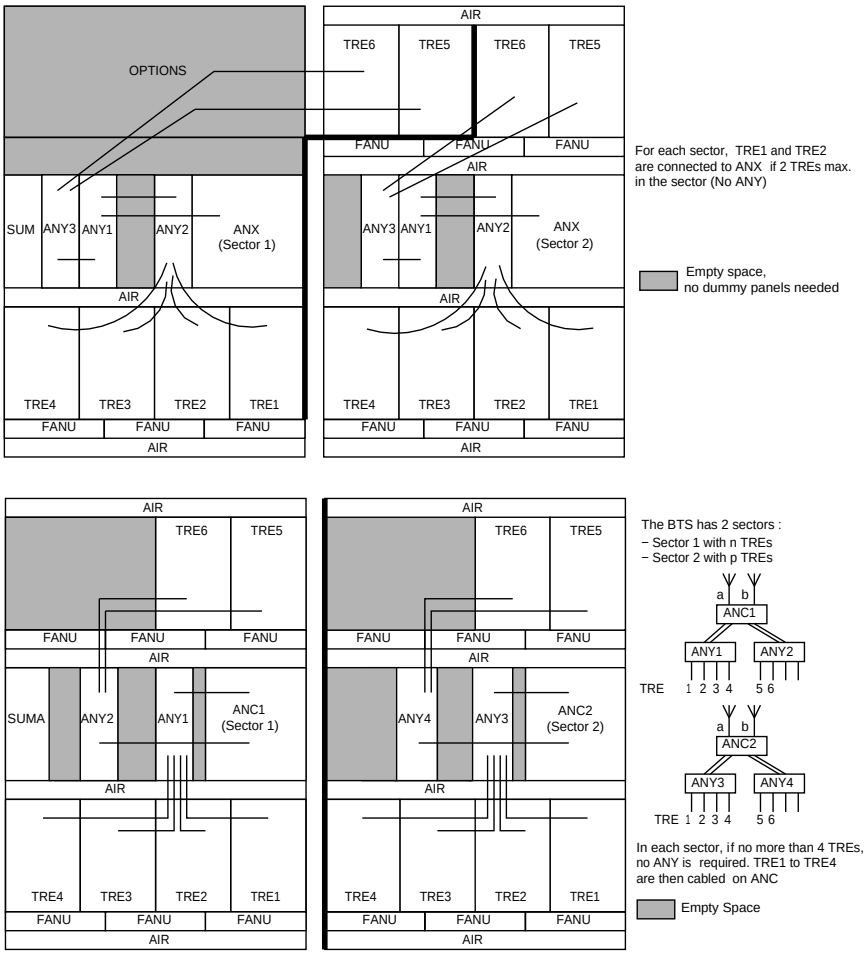


Figure 104: Outdoor MEDI - 2x1...6 Configuration

2.9.1.16 Outdoor CPT2 - 3x1...4

The following figure shows the rack layout of the Outdoor CPT2 - 3x1...4 configuration.

Note: **Restrictions**

For the GSM 1800 configuration using TRAD/TRADE TREs, the following restrictions have to be considered: 3x4 with 45 W at + 40° C.

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 28 W at + 40° C.

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

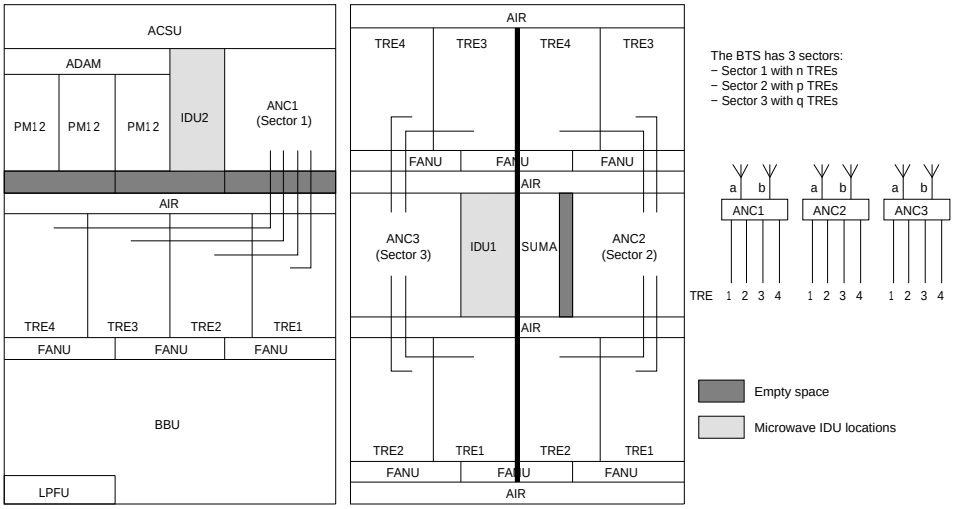


Figure 105: Outdoor CPT2 - 3x1...4 Configuration

2.9.1.17 Outdoor MEDI - 3x1...4

The following figure shows the rack layouts of the Outdoor MEDI - 3x1...4 configuration. (The ANX version is only valid for GSM 900/1800).

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 28 W at + 40° C.

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

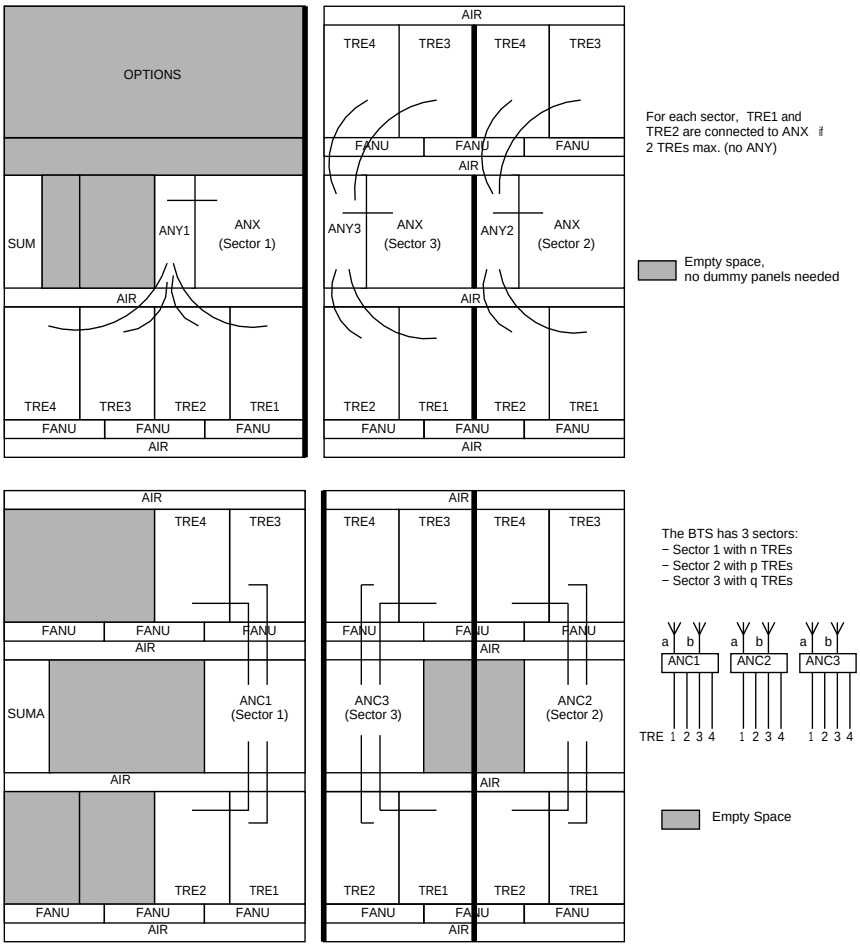


Figure 106: Outdoor MEDI - 3x1...4 Configuration

2.9.1.18 Outdoor MEDI - 3x1...4 GSM 1900

The following figure shows the rack layout of the Outdoor MEDI - 3x1...4 GSM 1900 configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 28 W at + 40° C

Configurations up to 3x1...3 without restrictions: 45 W at + 45° C.

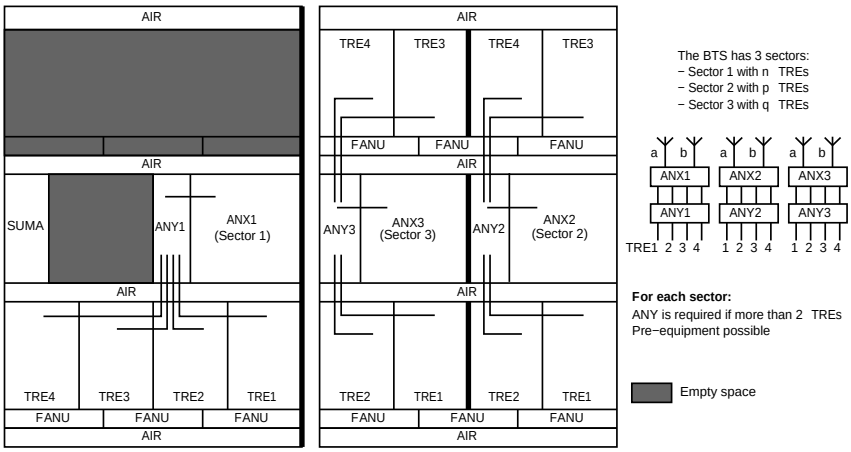


Figure 107: Outdoor MEDI - 3x1...4 GSM 1900 Configuration

2.9.2 Outdoor Configurations - Low Losses GSM 900/1800/1900

2.9.2.1 Outdoor MEDI - 1x3...8 Low Losses

The following figure shows the rack layouts of the Outdoor MEDI - 1x3...8 - Low Losses configuration.

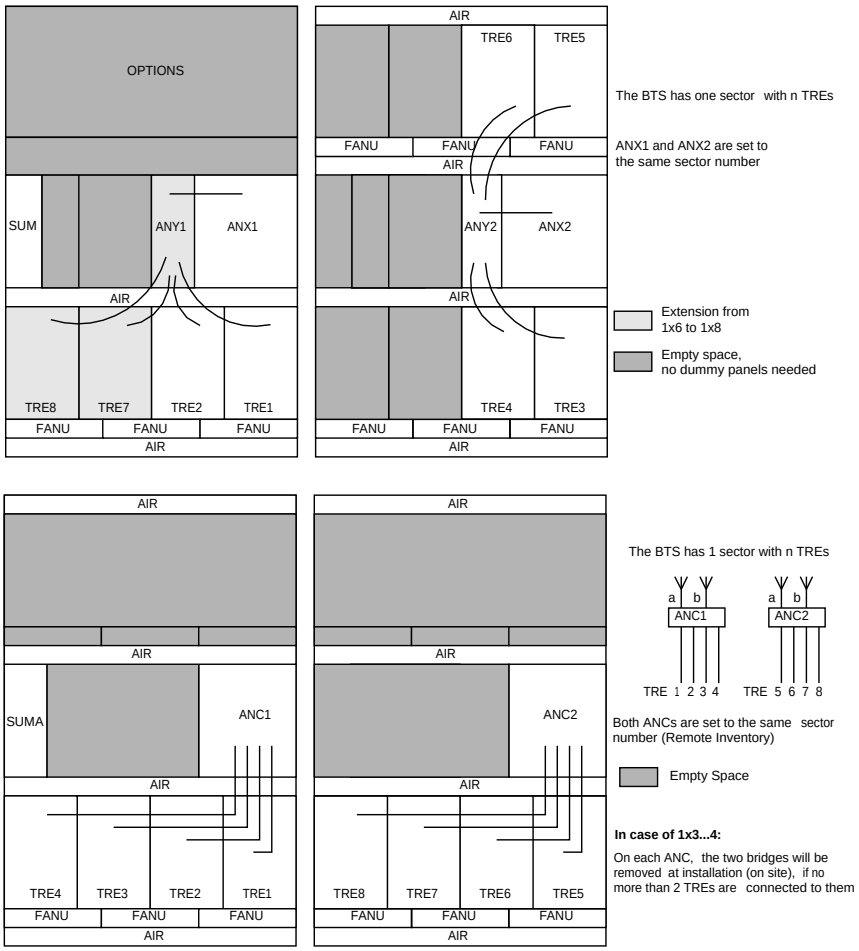


Figure 108: Outdoor MEDI - 1x3...8 - Low Losses Configuration

2.9.2.2 Outdoor MEDI - 1x9...12 Low Losses

The following figure shows the rack layout of the Outdoor MEDI - 1x9...12 - Low Losses configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 1x11...12 with 28 W at + 40° C.

Configurations up to 1x1...10 without restrictions: 45 W at + 45° C.

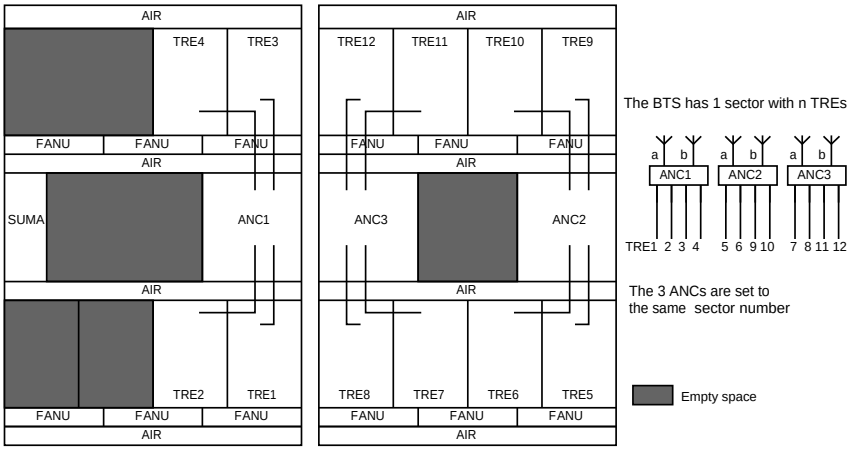


Figure 109: Outdoor MEDI - 1x9...12 - Low Losses Configuration

2.9.2.3 Outdoor MEDI - 2x3...6 Low Losses

The following figure shows the rack layouts of the Outdoor MEDI - 2x3...6 - Low Losses configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 2x6 with 28 W at + 40° C.

Configurations up to 2x3...5 without restrictions: 45 W at + 45° C.

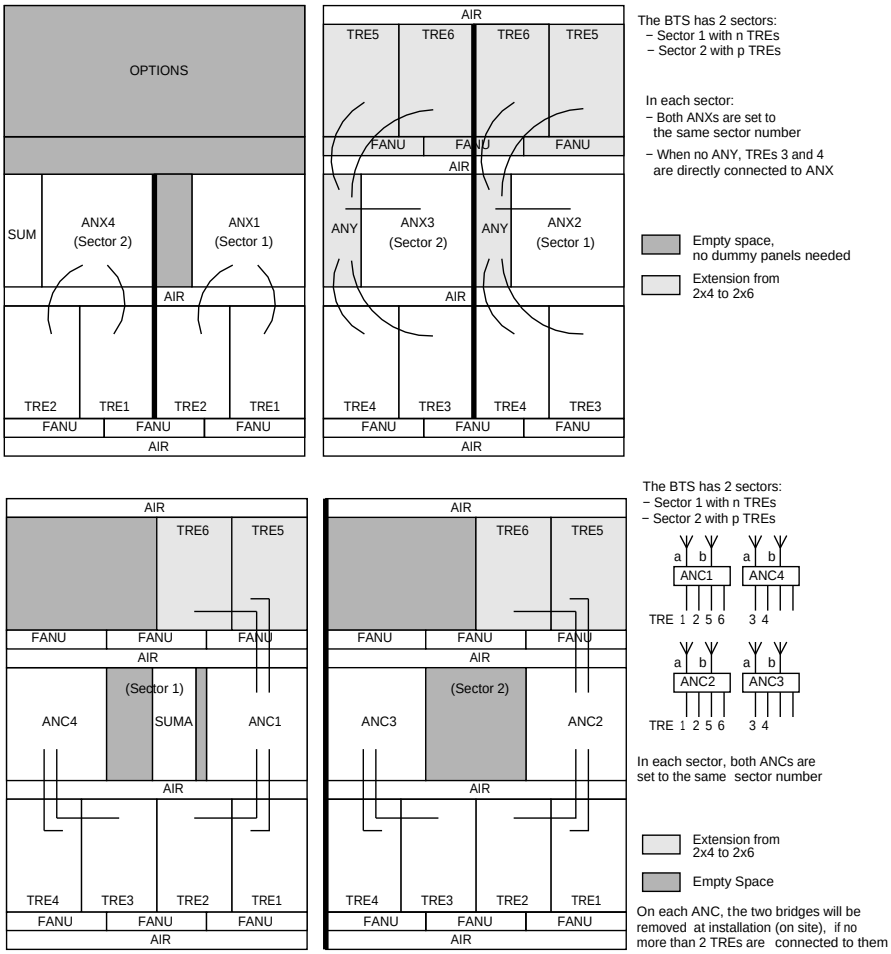


Figure 110: Outdoor MEDI - 2x3...6 - Low Losses Configuration

2.9.2.4 Outdoor MEDI - 3x3...4 Low Losses

The following figure shows the rack layout of the Outdoor MEDI - 3x3...4 - Low Losses configuration.

Note: **Restrictions**

For the GSM 1900 configuration using TRAP TREs, the following restrictions have to be considered: 3x4 with 28 W at + 40° C.

Configuration 3x3 without restrictions: 45 W at + 45° C.

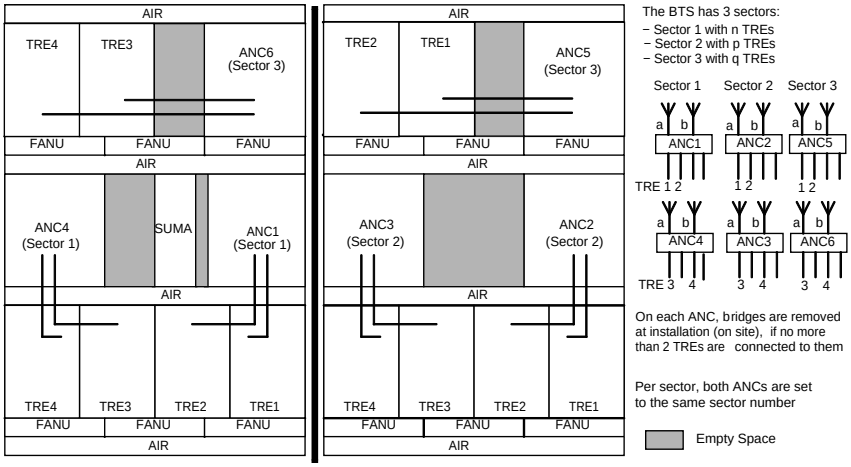


Figure 111: Outdoor MEDI - 3x3...4 - Low Losses Configuration

2.9.3 Outdoor Configurations - High Power GSM 1800

2.9.3.1 Outdoor MINI - 1x1...4

The following figure shows the rack layouts of the Outdoor MINI - 1x1...4 - High Power GSM 1800 configuration.

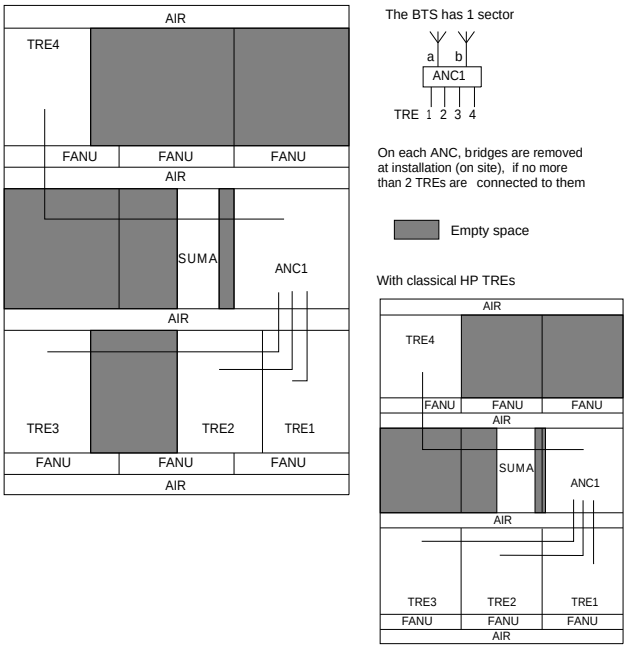


Figure 112: Outdoor MINI - 1x1...4 - High Power GSM 1800 Configuration

2.9.3.2 Outdoor MINI - 2x1

The following figure shows the rack layouts of the Outdoor MINI - 2x1 - High Power GSM 1800 configuration.

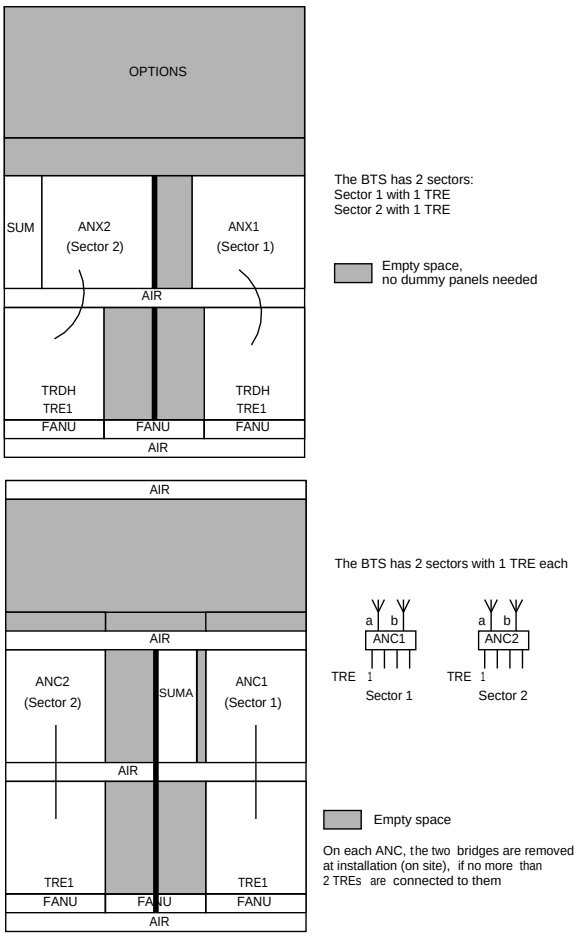


Figure 113: Outdoor MINI - 2x1 - High Power GSM 1800 Configuration

2.9.3.3 Outdoor MINI - 2x1...2

The following figure shows the rack layouts of the Outdoor MINI - 2x1...2 - High Power GSM 1800 configuration.

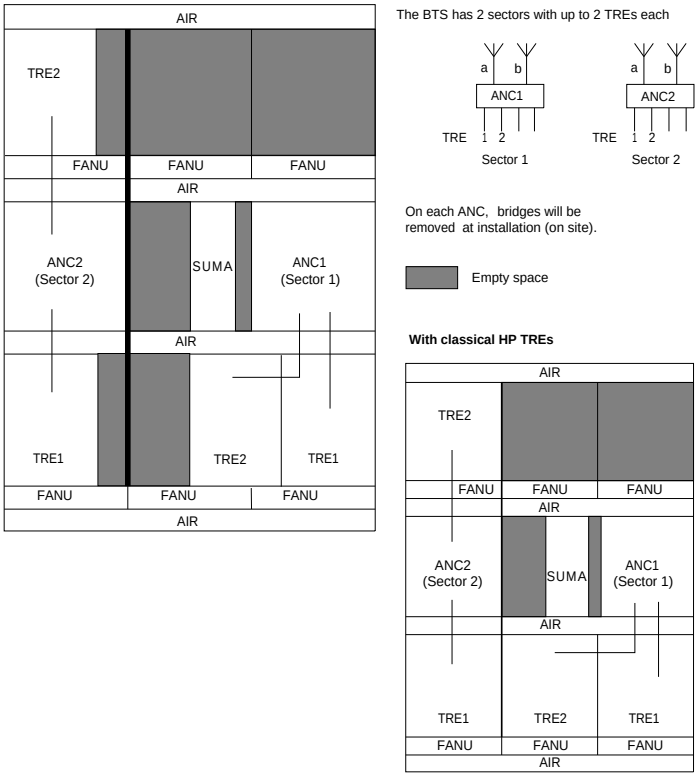


Figure 114: Outdoor MINI - 2x1...2 - High Power GSM 1800 Configuration

2.9.3.4 Outdoor MEDI - 2x1...2

This configuration must be considered as a sub-equipment of the Outdoor MEDI - 3x1...2 - High Power GSM 1800 configuration. Configuration replaced by MINI configuration.

2.9.3.5 Outdoor MEDI - 2x1...4

The following figure shows the rack layouts of the Outdoor MEDI - 2x1...4 - High Power GSM 1800 configuration.

Note: Restrictions

For the GSM 1800 configuration using TADH TREs, the ambient temperature is + 38° C.

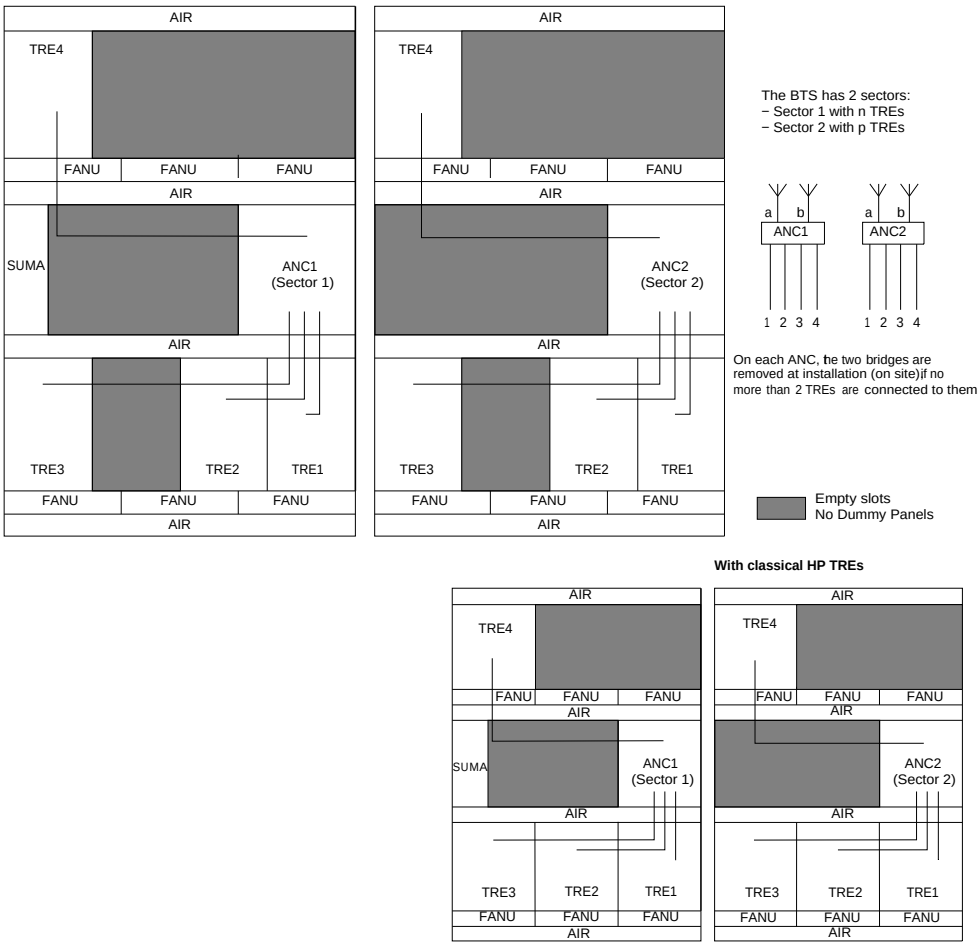


Figure 115: Outdoor MEDI- 2x1...4 - High Power GSM 1800 Configuration

2.9.3.6 Outdoor CPT2 - 3x1...2

The following figure shows the rack layouts of the Outdoor CPT2 - 3x1...2 - High Power GSM 1800 configuration.

Note: **Restrictions**

For the GSM 1800 configuration using TADH TREs, the ambient temperature is + 40° C.



Figure 116: Outdoor CPT2 - 3x1...2 - High Power GSM 1800 Configuration

2.9.3.7 Outdoor MEDI - 3x1...2

The following figure shows the rack layouts of the Outdoor MEDI - 3x1...2 - High Power GSM 1800 configuration.



Figure 117: Outdoor MEDI - 3x1...2 - High Power GSM 1800 Configuration

2.9.3.8 Outdoor MEDI - 3x1...3

The following figure shows the rack layouts of the Outdoor MEDI - 3x1...3 - High Power GSM 1800 configuration. The configuration is based on the 3x1...2 - High Power GSM 1800 configuration, extended with Medium Power TREs.

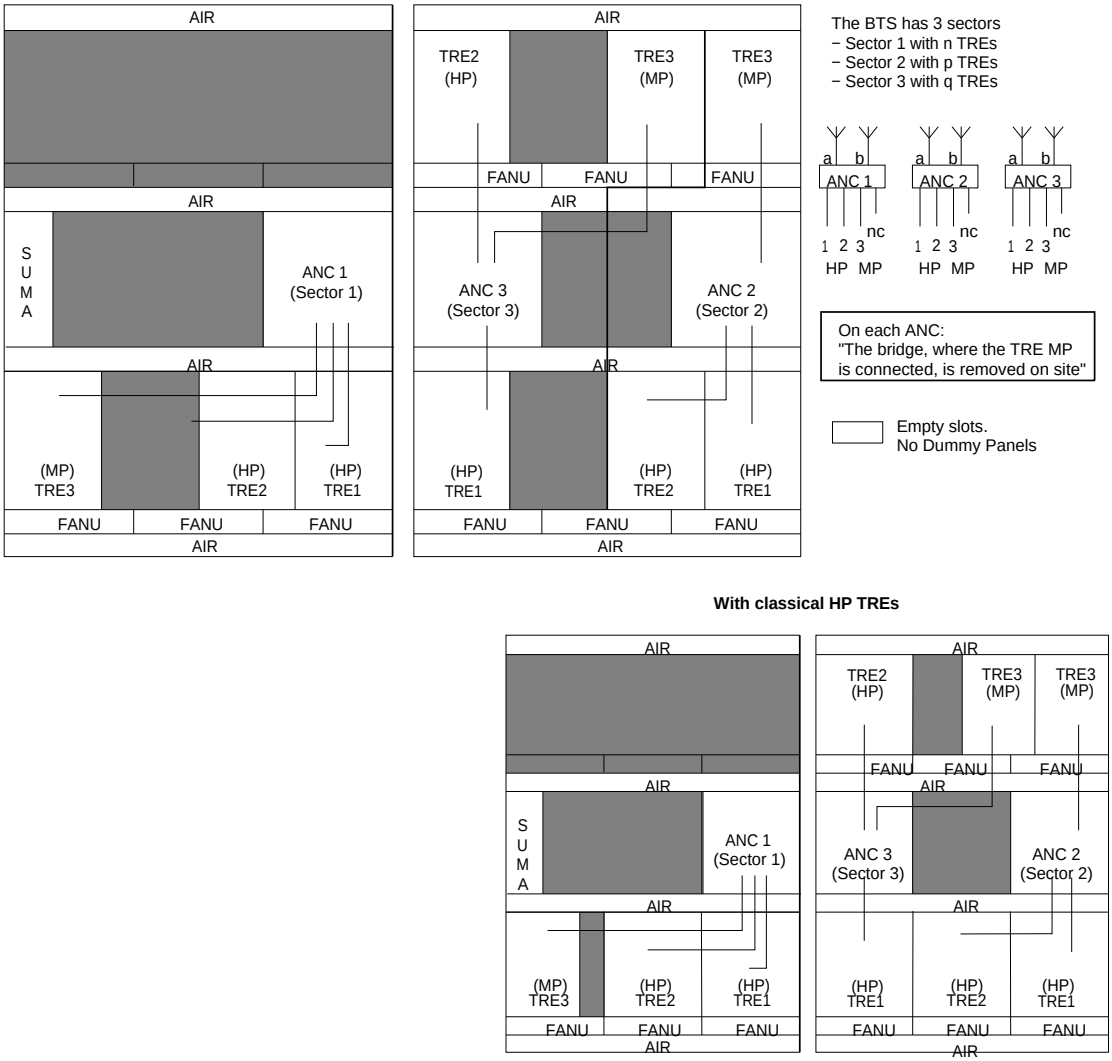


Figure 118: Outdoor MEDI - 3x1...3 - High Power GSM 1800 Configuration

2.9.4 Outdoor Configurations - Multiband BTS GSM 900/1800

2.9.4.1 Outdoor MINI - 1x1...2/1x1...2

The following figure shows the rack layouts of the Outdoor MINI - 1x1...2/1x1...2 - Multiband BTS configuration.

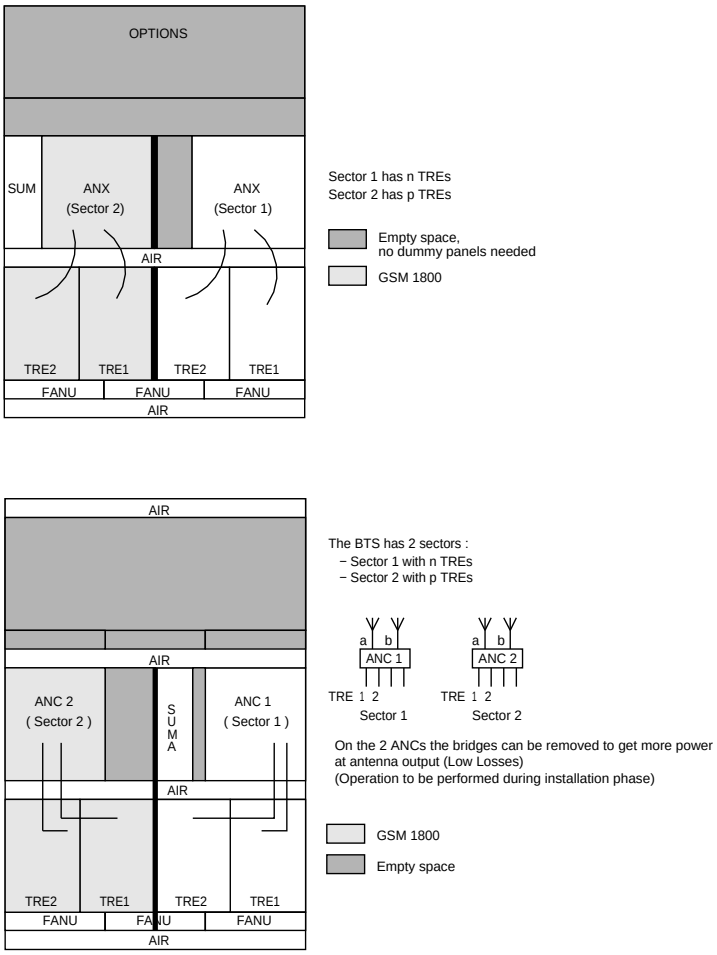


Figure 119: Outdoor MINI - 1x1...2/1x1...2 - Multiband BTS Configuration

2.9.4.2 Outdoor MINI - 1x1...4/1x1...4

The following figure shows the rack layout of the Outdoor MINI - 1x1...4/1x1...4 - Multiband BTS configuration.

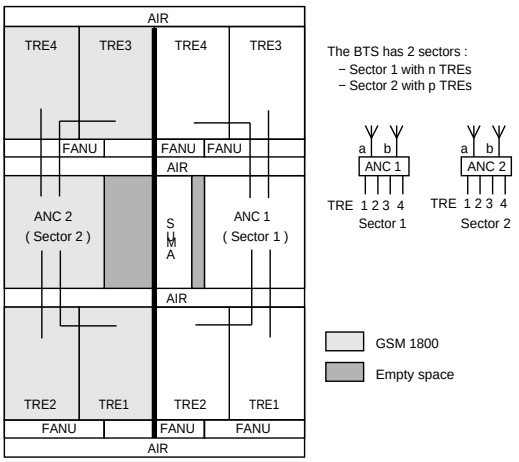


Figure 120: Outdoor MINI - 1x1...4/1x1...4 - Multiband BTS Configuration

2.9.4.3 Outdoor MEDI - 1x1...6/1x1...6

The following figure shows the rack layouts of the Outdoor MEDI - 1x1...6/1x1...6 - Multiband BTS configuration.

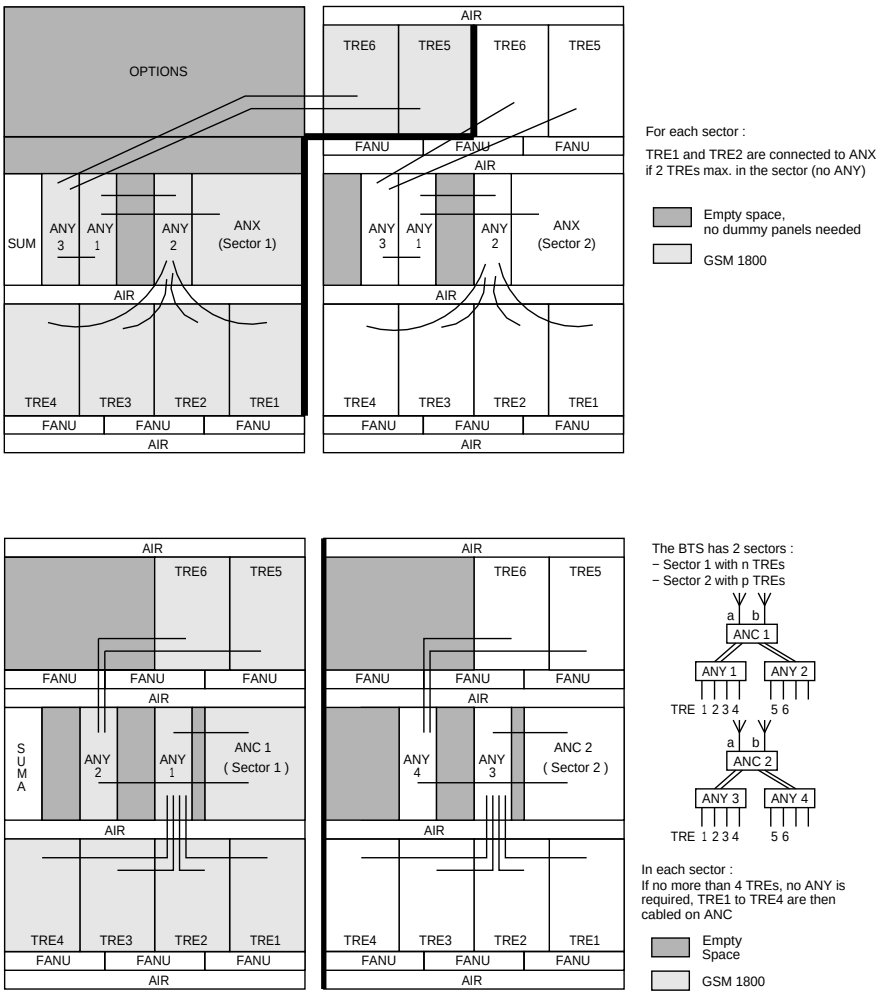


Figure 121: Outdoor MEDI - 1x1...6/1x1...6 - Multiband BTS Configuration

2.9.4.4 Outdoor MEDI - 1x1...4/2x1...4

The following figure shows the rack layouts of the Outdoor MEDI - 1x1...4/2x1...4 - Multiband BTS configuration.

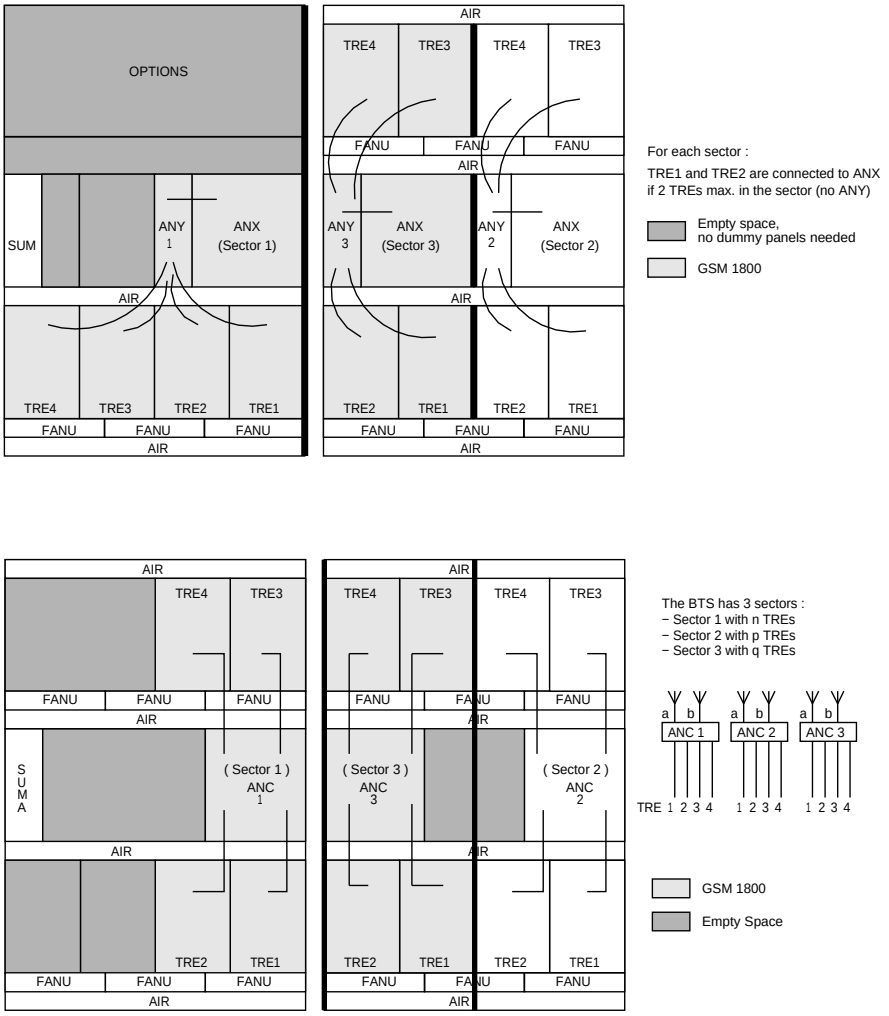


Figure 122: Outdoor MEDI - 1x1...4/2x1...4 - Multiband BTS Configuration

2.9.4.5 Outdoor MEDI - 2x1...4/1x1...4

The following figure shows the rack layouts of the Outdoor MEDI - 2x1...4/1x1...4 - Multiband BTS configuration.

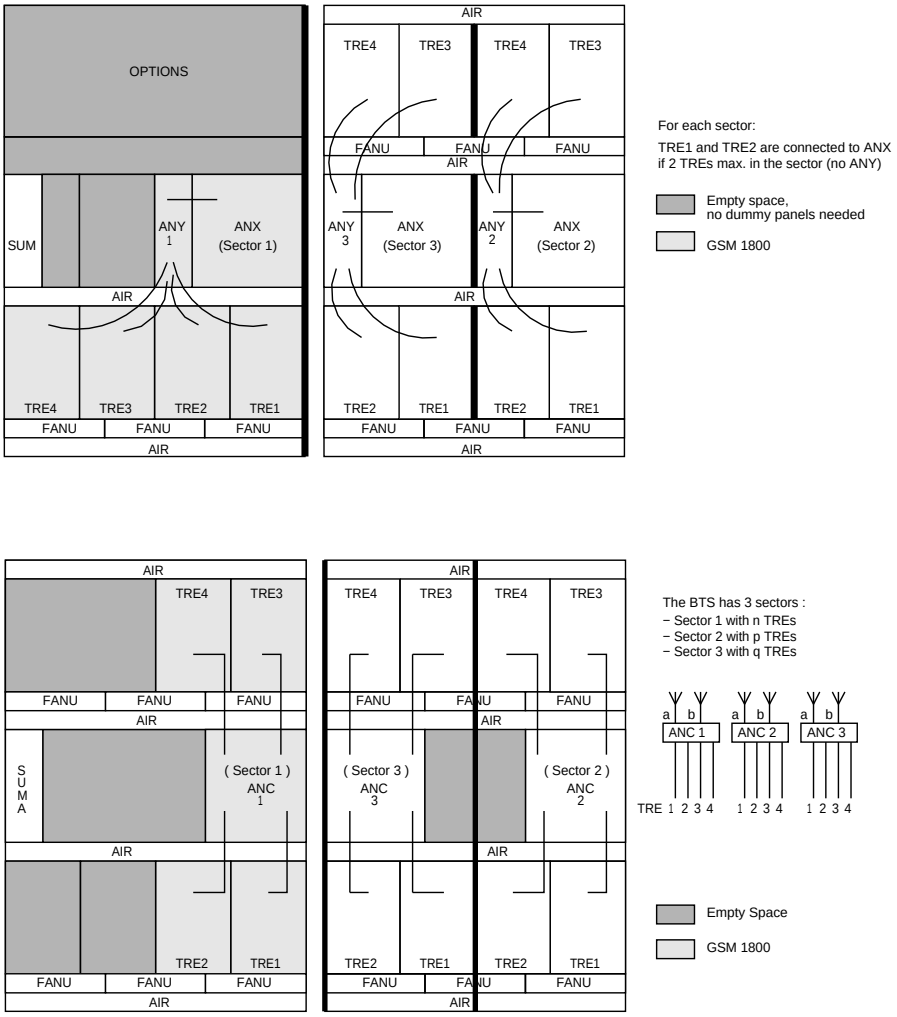


Figure 123: Outdoor MEDI - 2x1...4/1x1...4 - Multiband BTS Configuration

2.9.4.6 Outdoor CPT2 - 2x1...2/2x1...2

The following figure shows the rack layout of the Outdoor CPT2 - 2x1...2/2x1...2 - Multiband BTS configuration.

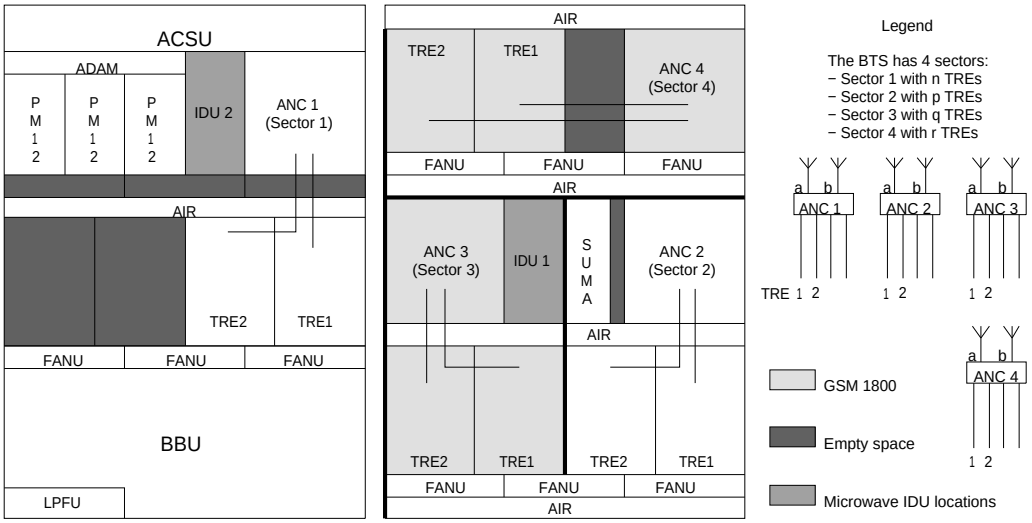


Figure 124: Outdoor CPT2 - 2x1...2/2x1...2 - Multiband BTS Configuration

2.9.4.7 Outdoor MEDI - 1x1...4/...4,...2,...2

The following figure shows the rack layouts of the Outdoor MEDI - 1x1...4/...4,...2,...2 - Multiband BTS configuration.



Figure 125: Outdoor MEDI - 1x1...4/...4,...2,...2 - Multiband BTS Configuration

2.9.4.8 Outdoor MEDI - ...4,...2,...2/1x1...4

The following figure shows the rack layouts of the Outdoor MEDI - ...4,...2,...2/1x1...4 - Multiband BTS configuration.



Figure 126: Outdoor MEDI - ...4,...2,...2/1x1...4 - Multiband BTS Configuration

2.9.4.9 Outdoor MEDI - 2x1...4/2x1...2

The following figure shows the rack layouts of the Outdoor MEDI - 2x1...4/2x1...2 - Multiband BTS configuration.

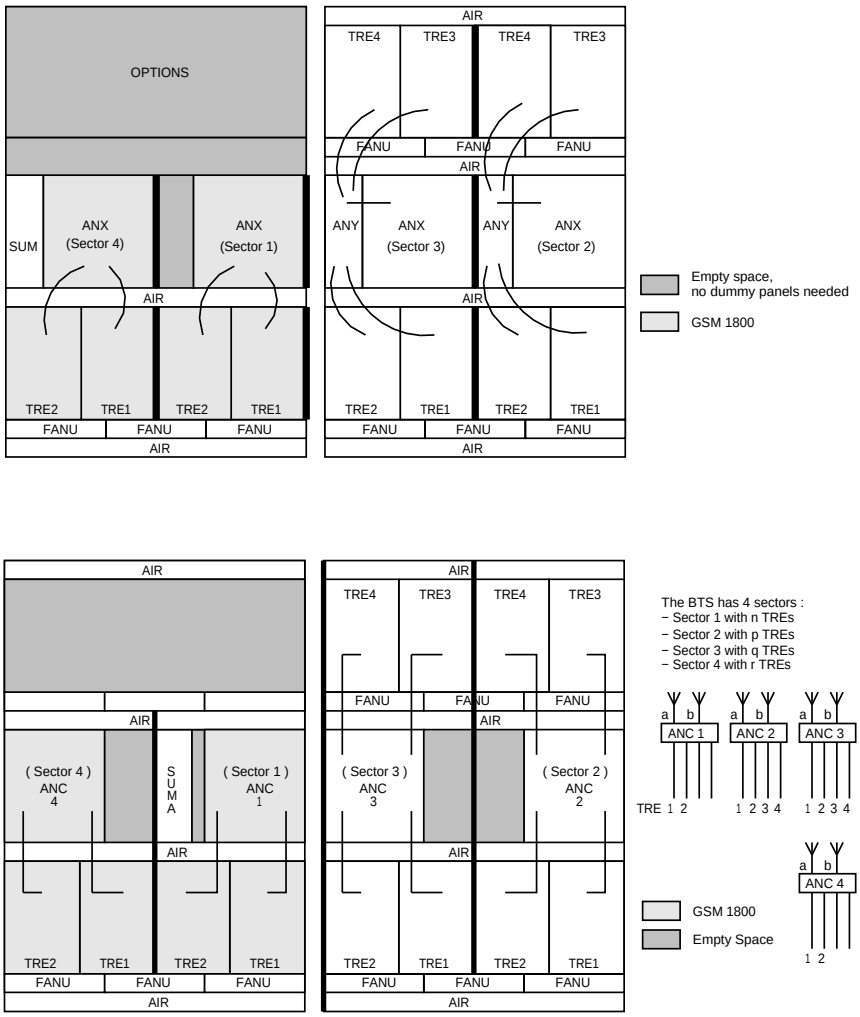


Figure 127: Outdoor MEDI - 2x1...4/2x1...2 - Multiband BTS Configuration

2.9.4.10 Outdoor MEDI - 2x1...2/2x1...4

The following figure shows the rack layouts of the Outdoor MEDI - 2x1...2/2x1...4 - Multiband BTS configuration.

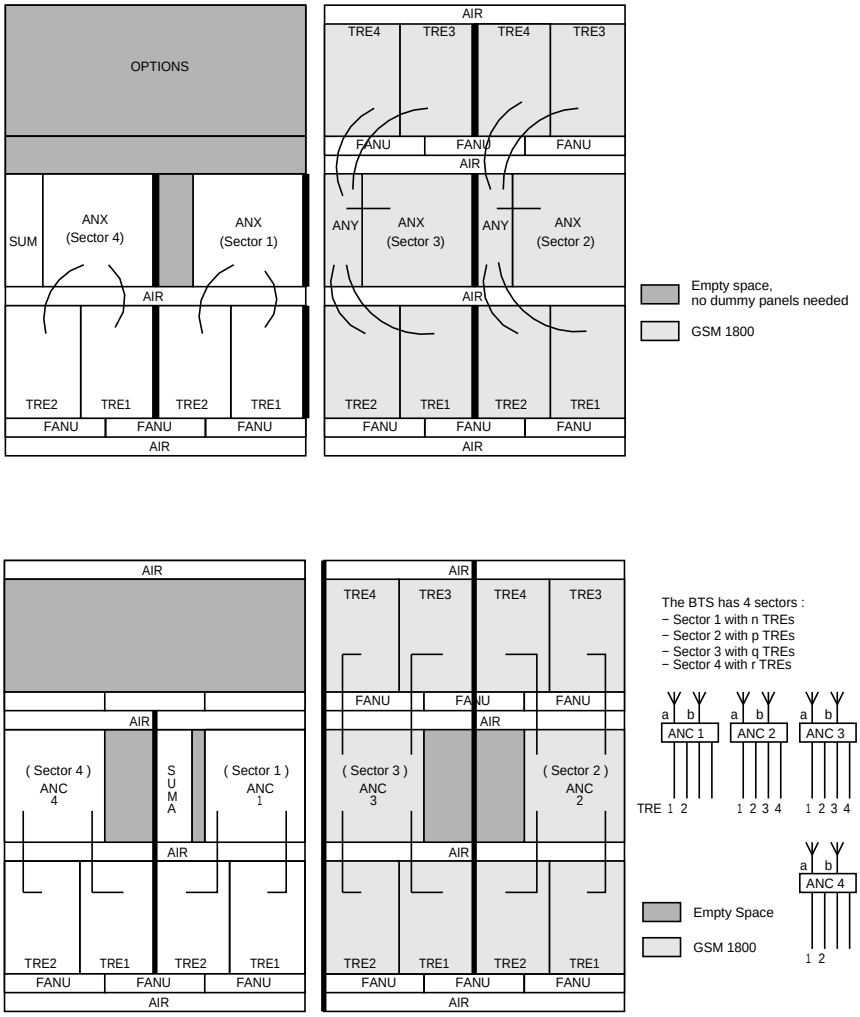


Figure 128: Outdoor MEDI - 2x1...2/2x1...4 - Multiband BTS Configuration

2.9.4.11 Outdoor MEDI - 2x1...3/2x1...3

The following figure shows the rack layout of the Outdoor MEDI - 2x1...3/2x1...3 - Multiband BTS configuration.

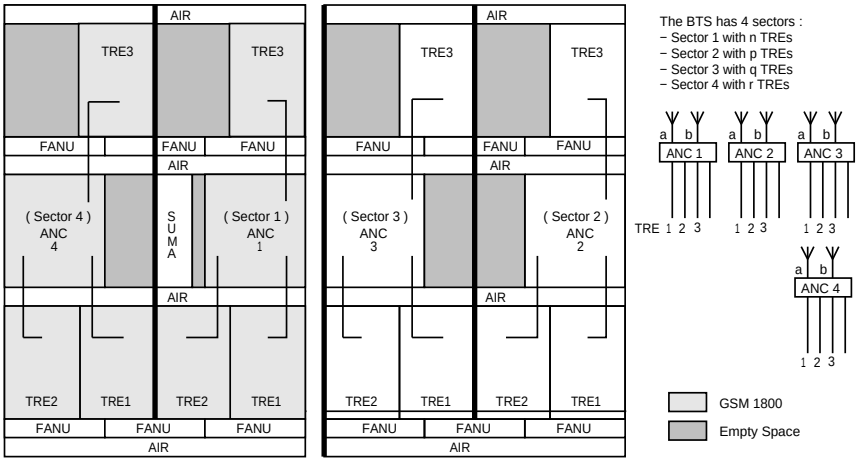


Figure 129: Outdoor MEDI - 2x1...3/2x1...3 - Multiband BTS Configuration

2.9.4.12 Outdoor MEDI - 3x1...2/3x1...2

The following figure shows the rack layout of the Outdoor MEDI - 3x1...2/3x1...2 - Multiband BTS configuration.

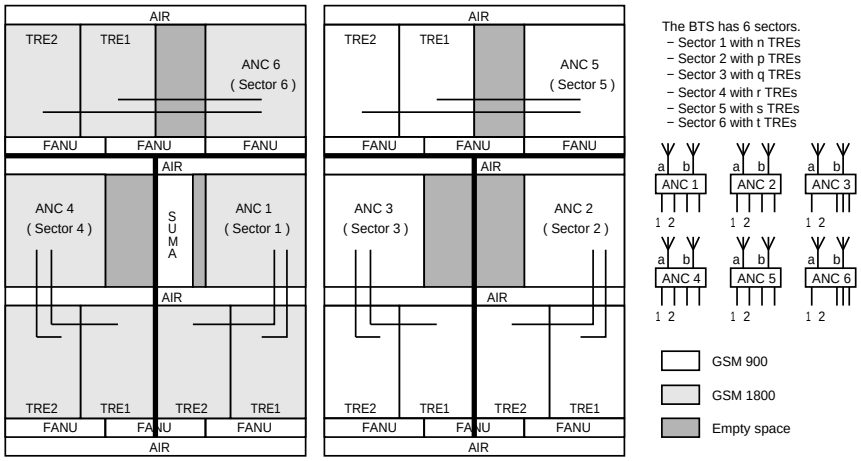


Figure 130: Outdoor MEDI - 3x1...2/3x1...2 - Multiband BTS Configuration

2.9.5 Outdoor Configurations - Multiband Cells GSM 900/1800

2.9.5.1 Outdoor MINI - 1x(...2/...2)

The following figure shows the rack layouts of the Outdoor MINI - 1x(...2/...2) - Multiband Cells configuration.

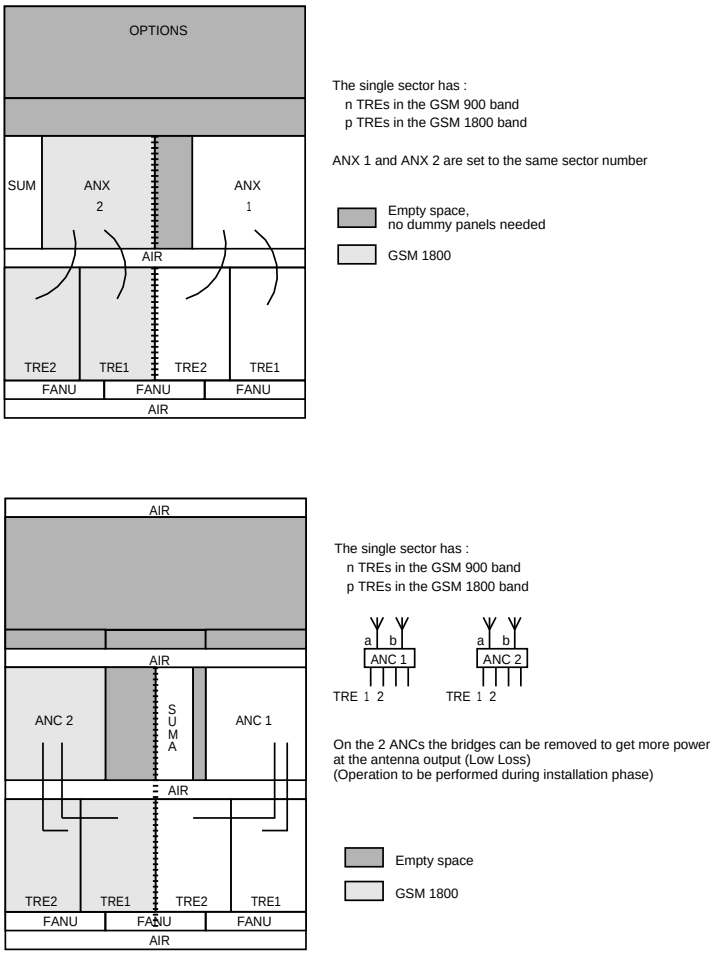


Figure 131: Outdoor MINI - 1x(...2/...2) - Multiband Cells Configuration

2.9.5.2 Outdoor MINI - 1x(...4/...4)

The following figure shows the rack layout of the Outdoor MINI - 1x(...4/...4) - Multiband Cells configuration.

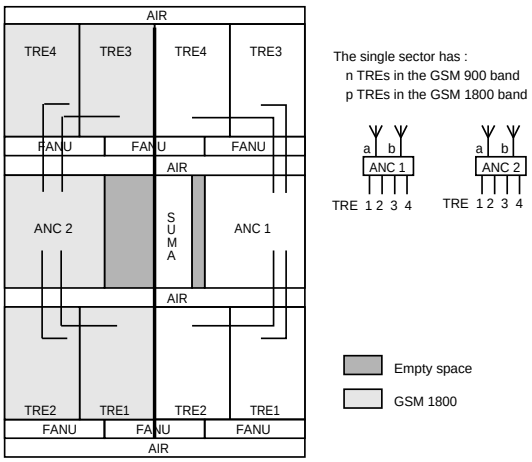


Figure 132: Outdoor MINI - 1x(...4/...4) - Multiband Cells Configuration

2.9.5.3 Outdoor MEDI - 1x(...6/...6)

The following figure shows the rack layouts of the Outdoor MEDI - 1x(...6/...6) - Multiband Cells configuration.

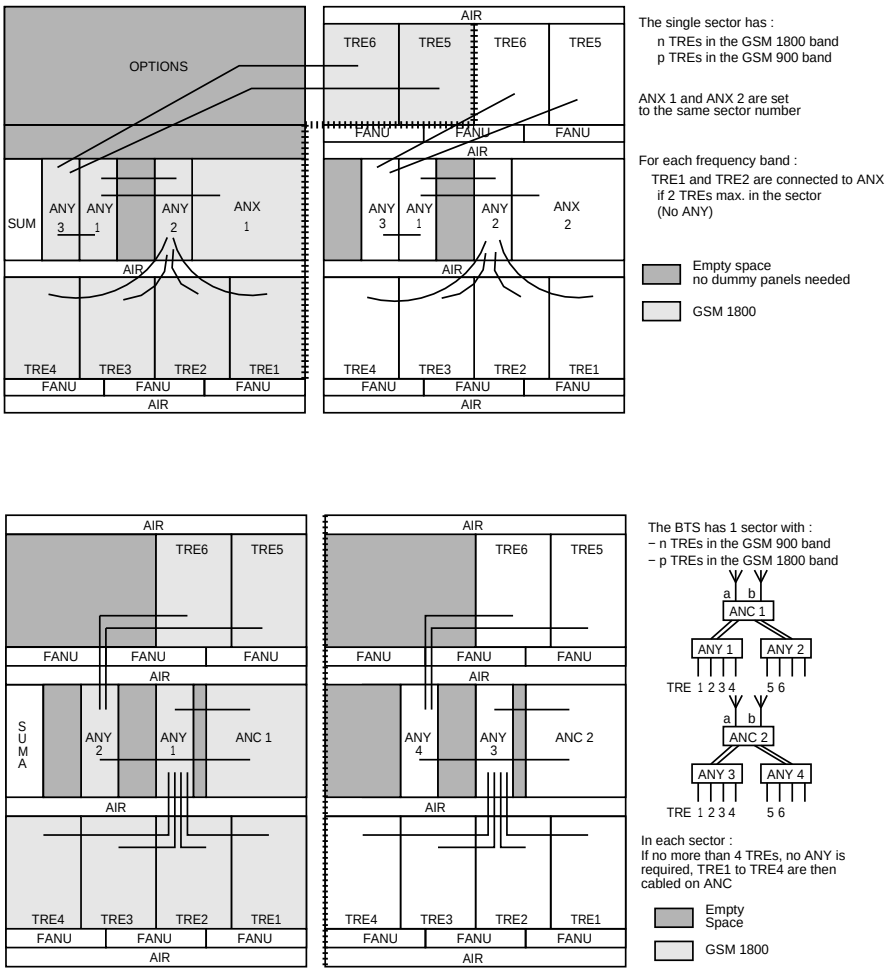


Figure 133: Outdoor MEDI - 1x(...6/...6) - Multiband Cells Configuration

2.9.5.4 Outdoor CPT2 - 2x(...2/...2)

The following figure shows the rack layout of the Outdoor CPT2 - 2x(...2/...2) - Multiband Cells configuration.

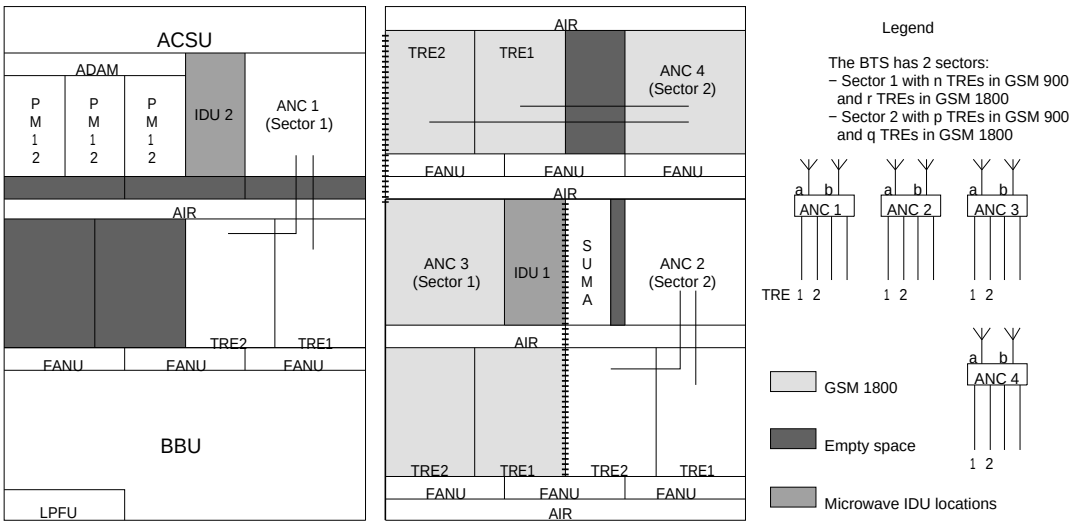


Figure 134: Outdoor CPT2 - 2x(...2/...2) - Multiband Cells Configuration

2.9.5.5 Outdoor MEDI - 2x(...4/...2)

The following figure shows the rack layouts of the Outdoor MEDI - 2x(...4/...2) - Multiband Cells configuration.

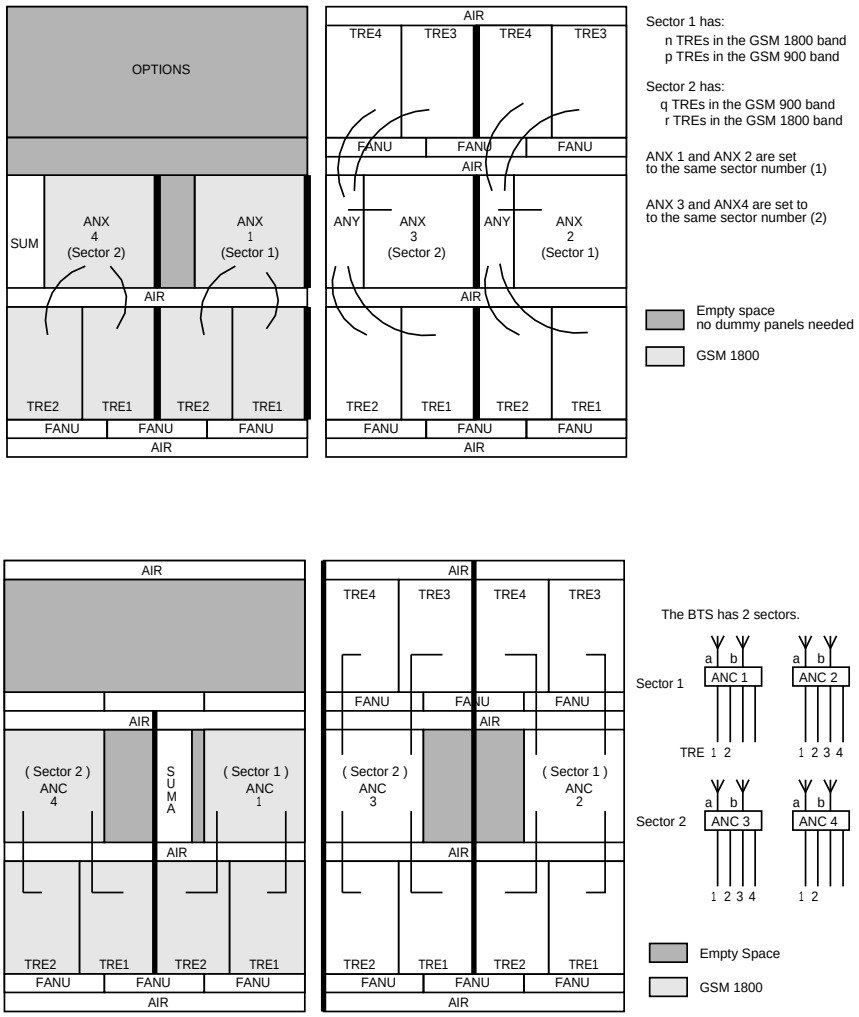


Figure 135: Outdoor MEDI - 2x(...4/...2) - Multiband Cells Configuration

2.9.5.6 Outdoor MEDI - 2x(...2/...4)

The following figure shows the rack layouts of the Outdoor MEDI - 2x(...2/...4) - Multiband Cells configuration.

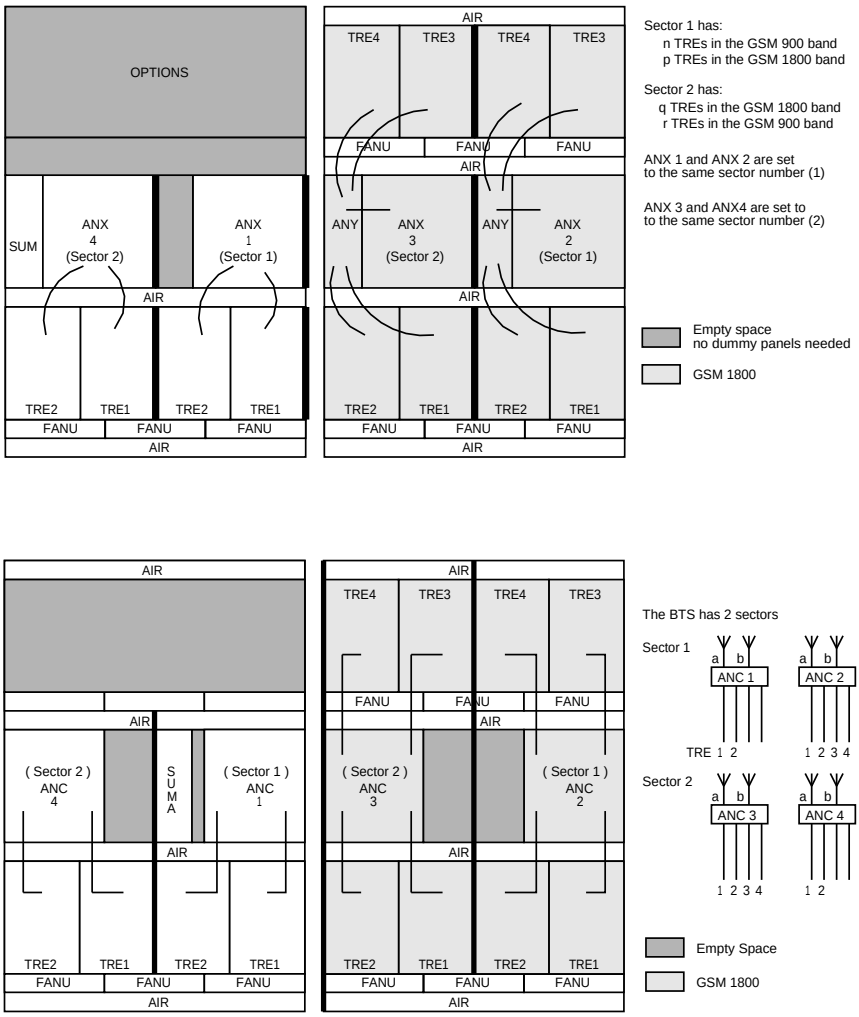


Figure 136: Outdoor MEDI - 2x(...2/...4) - Multiband Cells Configuration

2.9.5.7 Outdoor MEDI - 1x(...2/...2),1x(...4/...4)

The following figure shows the rack layouts of the Outdoor MEDI - 1x(...2/...2),1x(...4/...4) - Multiband Cells configuration.

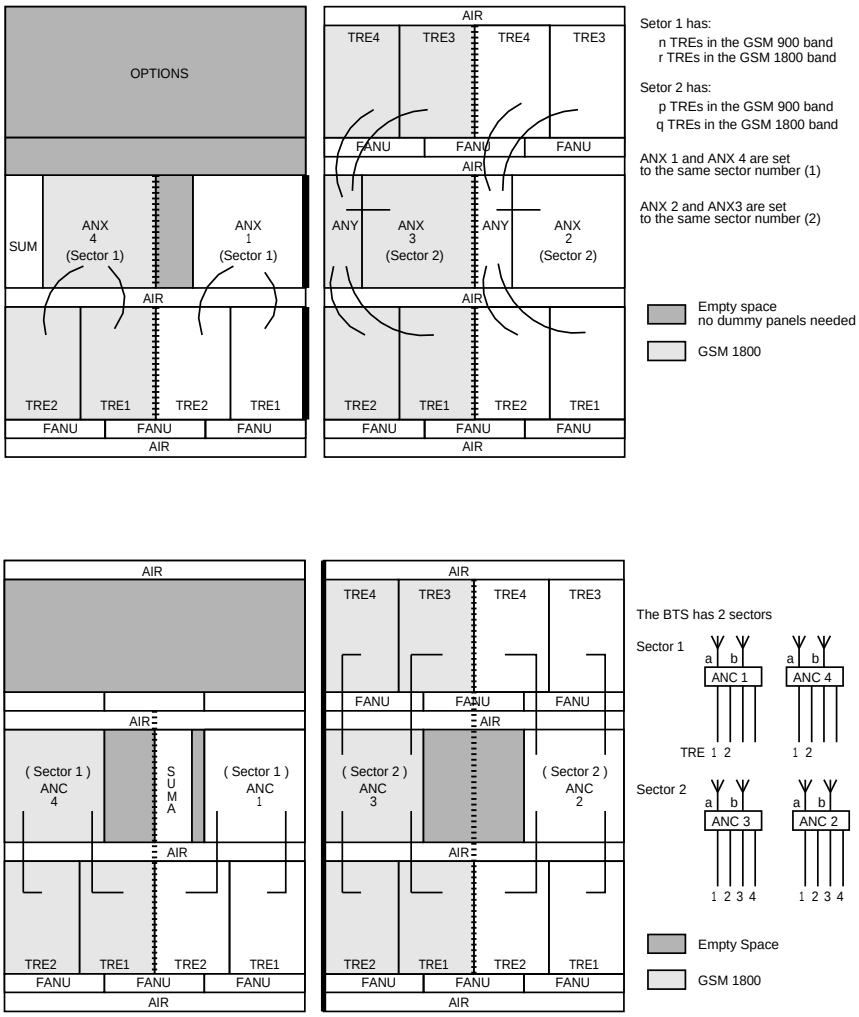


Figure 137: Outdoor MEDI - 1x(...2/...2),1x(...4/...4) - Multiband Cells Configuration

2.9.5.8 Outdoor MEDI - 3x(...2/...2)

The following figure shows the rack layout of the Outdoor MEDI - 3x(...2/...2) - Multiband Cells configuration.

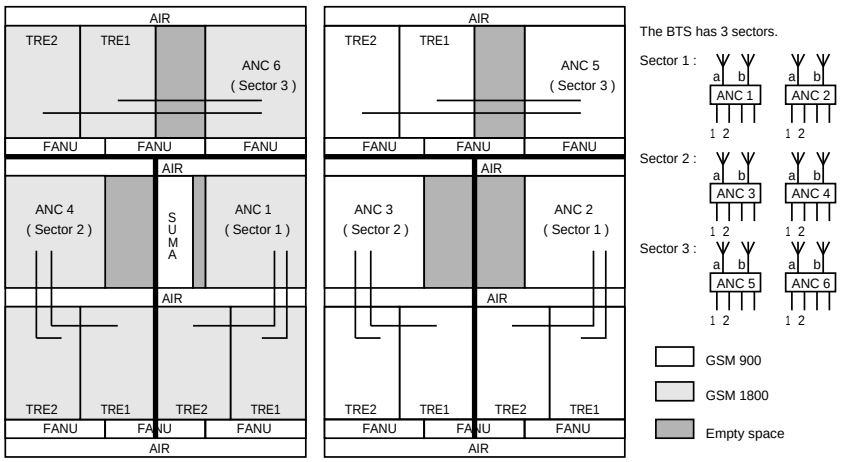


Figure 138: Outdoor MEDI - 3x(...2/...2) - Multiband Cells Configuration

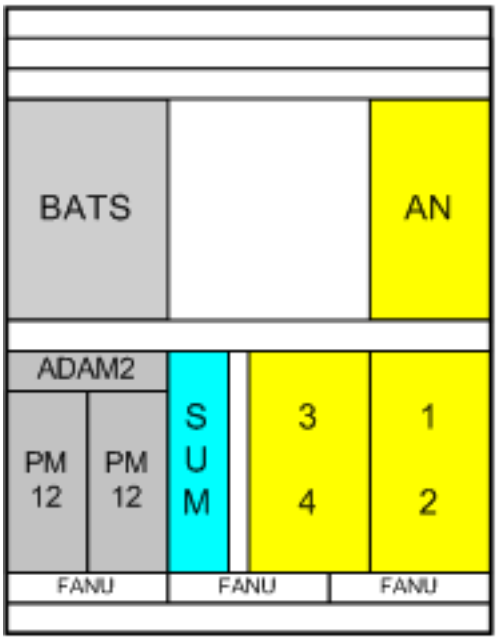
2.10 Outdoor Configurations with Twin TRX

The following table gives the A9100 Compact BTS Outdoor TWIN TRX configurations.

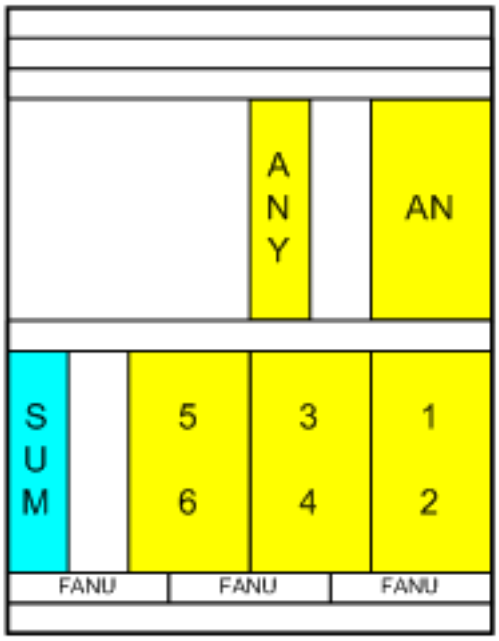
TWIN Mode	Number of sectors	AC with BU5 carriers per sector	AC w/o BU5 carriers per sector	DC carriers per sector
Capacity Mode	1	*4*	*4*	*6*
	2	*2/2*	*2/2*	*3/3 or 4/2*
	3	-	*2/1/1*	*2/2/2*
Capacity Mode Low Loss	1	*4*	*4*	*6*
	2	-	-	*3/3*
Multiband & MB Cell	1	*2 +2*	*2 +2*	*4 + 2*
Coverage Mode TxDiv. 2Rx Div.	1	*2*	*2*	*2*
	2	*1/1*	*1/1*	*1/1*
	3	-	-	*1/1/1*
Coverage Mode TxDiv. 2Rx Div Low Loss	1	*2*	*2*	*2*
Coverage Mode TxDiv. 4Rx Div Low Loss	1	*2*	*2*	*2*

2.10.1 Capacity Mode Configurations

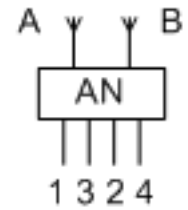
2.10.1.1 CBO - 1 sector with Twin-TRX



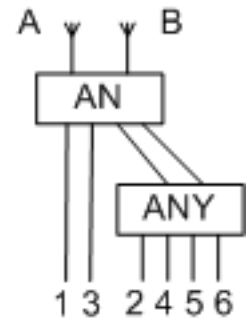
AC, up to 4 TRX



DC, up to 6 TRX

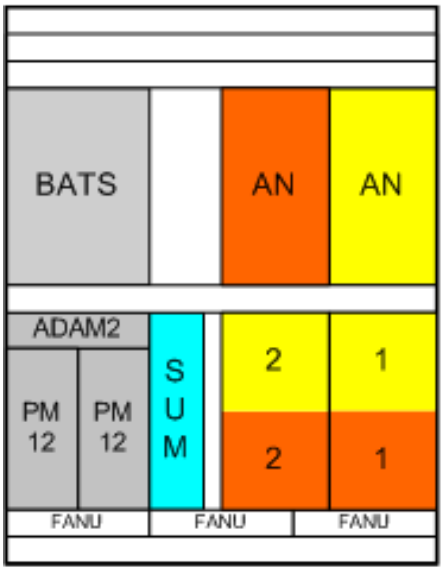


Up to 4 TRX



Up to 6 TRX

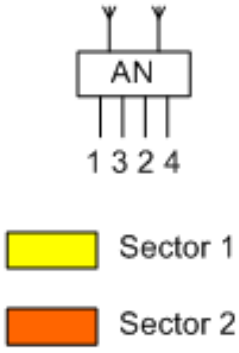
2.10.1.2 CBO - 2 sectors with Twin-TRX



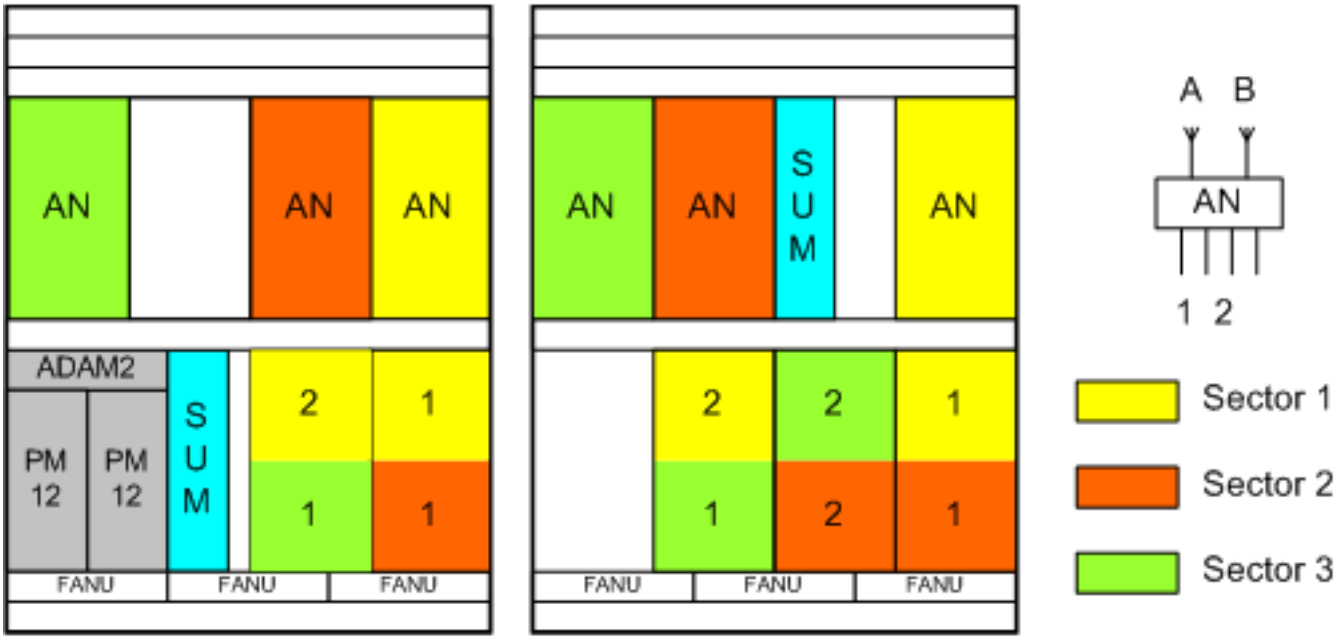
AC, up to 2/2 TRX



DC, up to 4/2 TRX



2.10.1.3 CBO - 3 sectors with Twin-TRX

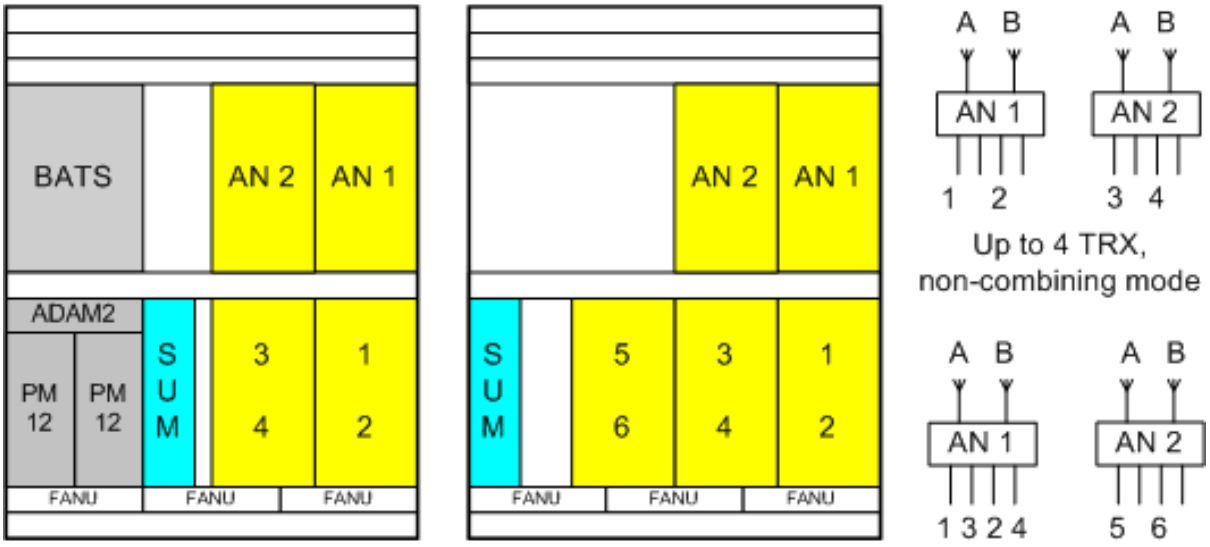


AC w/o BATS, up to 2/1/1 TRX

DC, up to 2/2/2 TRX

2.10.2 Capacity Mode Low Loss Configurations

2.10.2.1 CBO - 1 Sector Low Loss with Twin-TRX

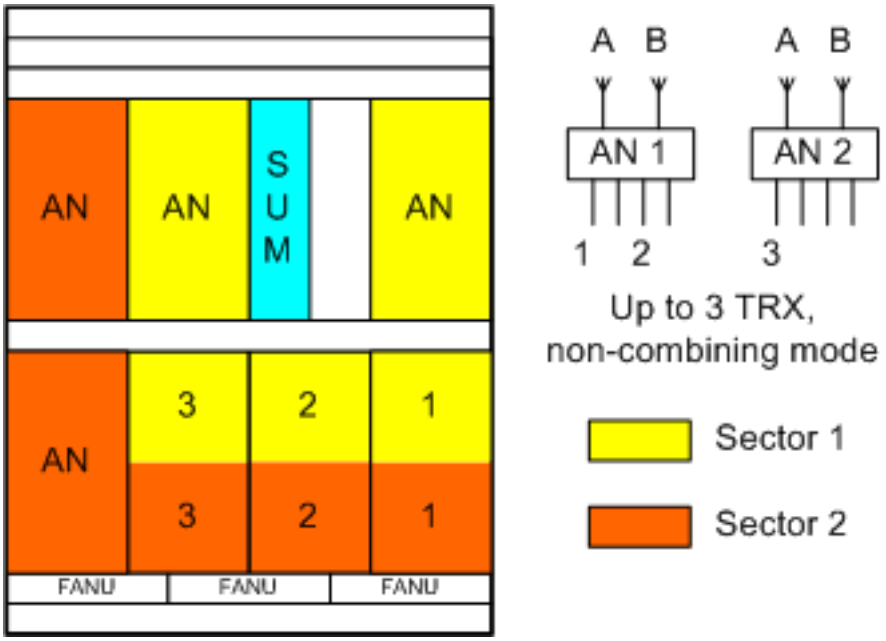


AC, up to 4 TRX

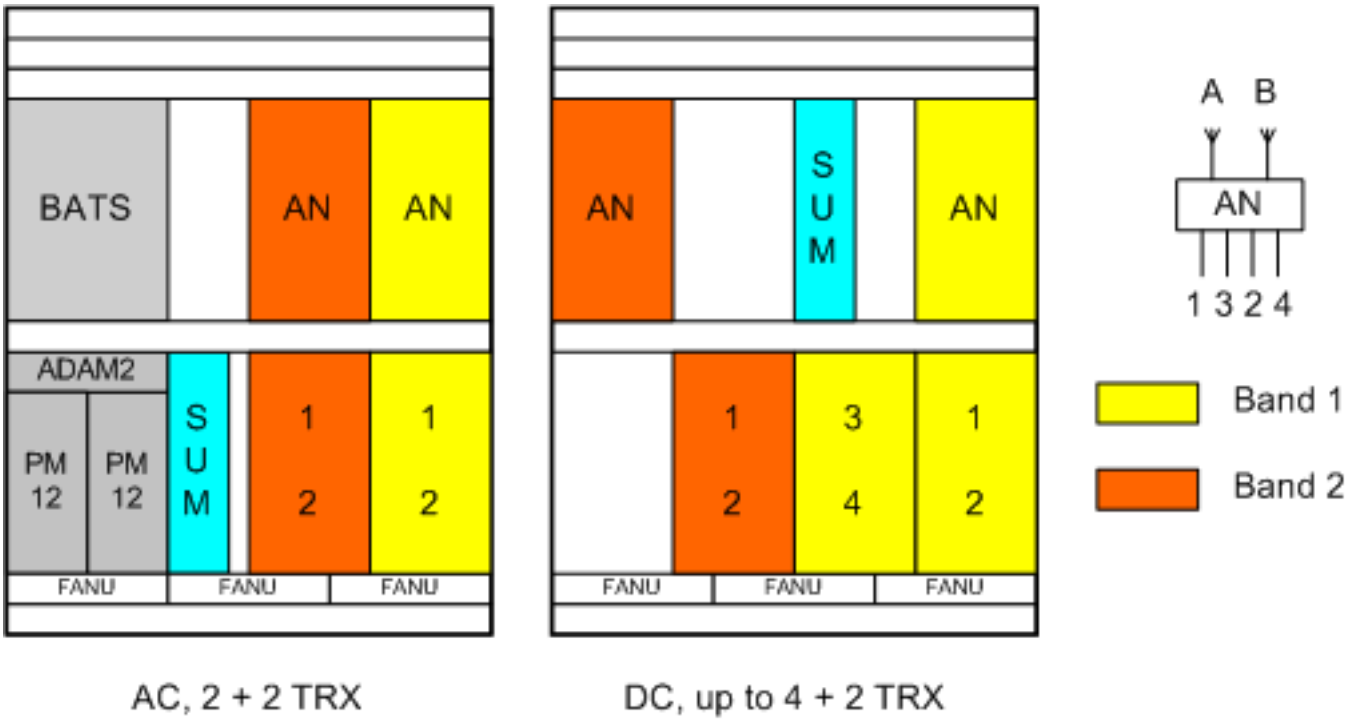
DC, up to 6 TRX

Up to 6 TRX

2.10.2.2 CBO - 2 Sectors Low Loss with Twin-TRX

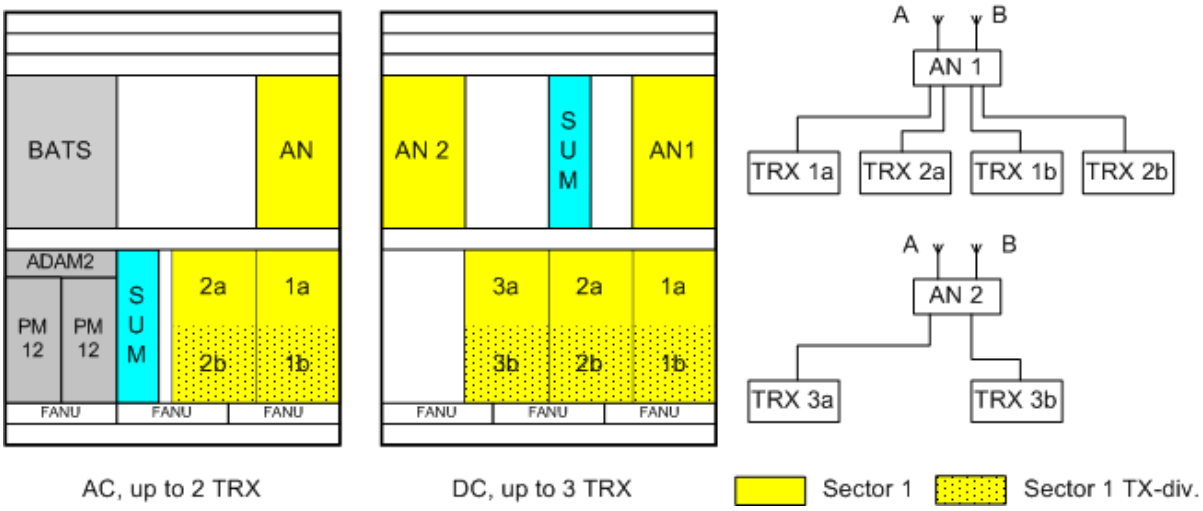


2.10.3 Multiband Configurations - CBO - Multiband 1 + 1 Sector with Twin-TRX

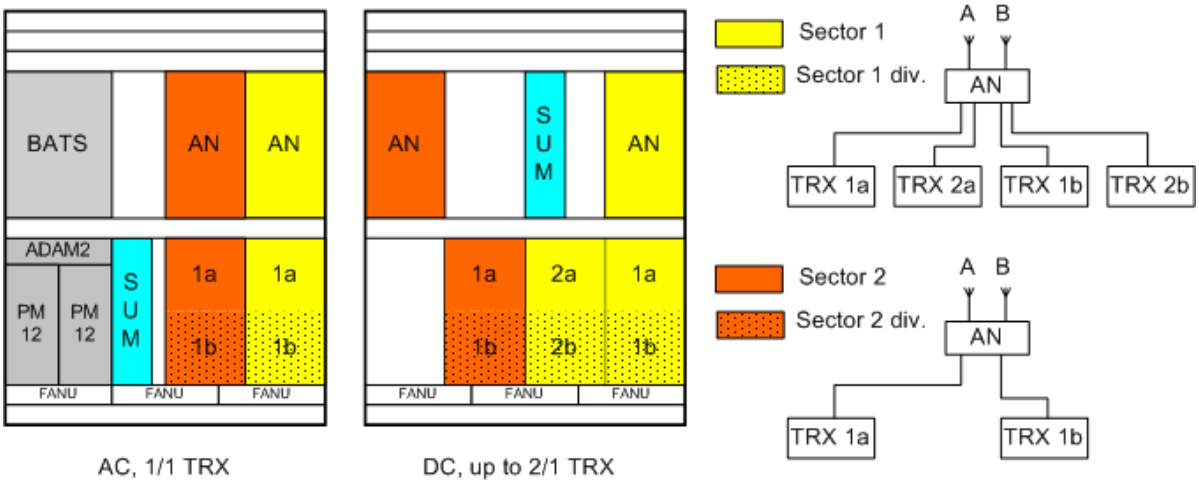


2.10.4 Coverage Mode TX Diversity Configurations

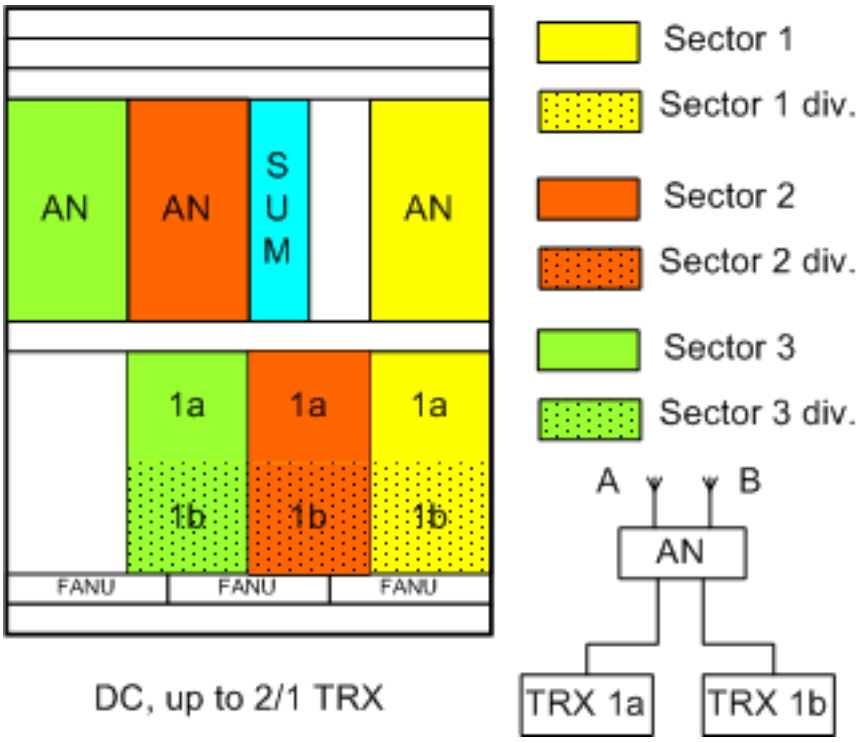
2.10.4.1 CBO - 1 Sector TX Diversity 2RX with Twin-TRX



2.10.4.2 CBO - 2 Sectors TX Diversity 2RX with Twin-TRX

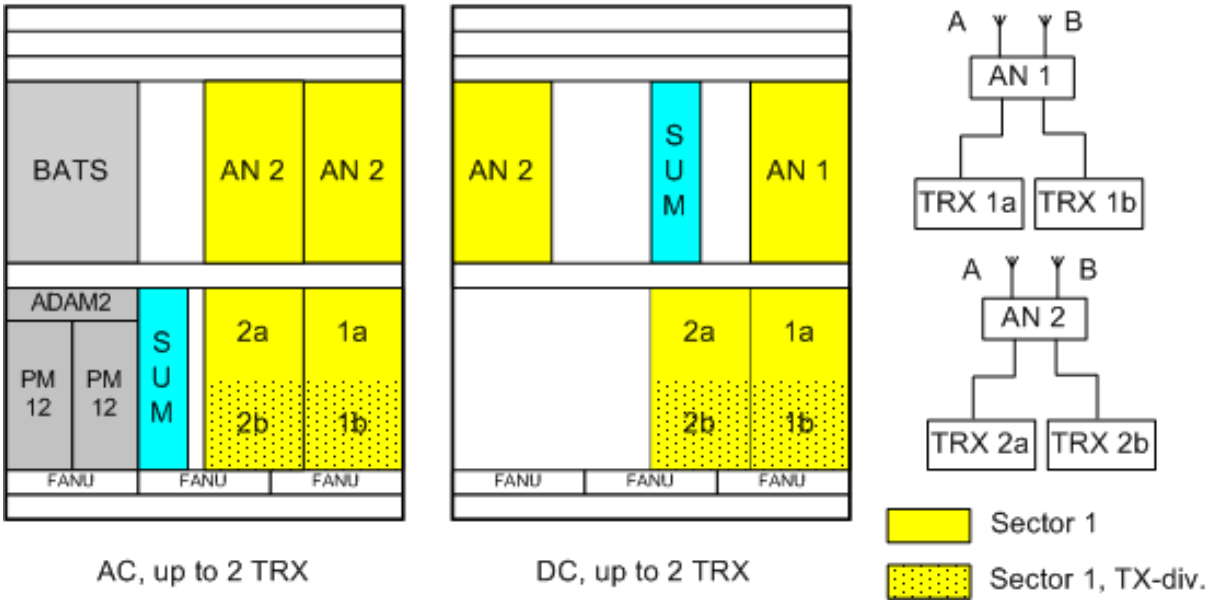


2.10.4.3 CBO - 3 Sectors TX Diversity 2RX with Twin-TRX



DC, up to 2/1 TRX

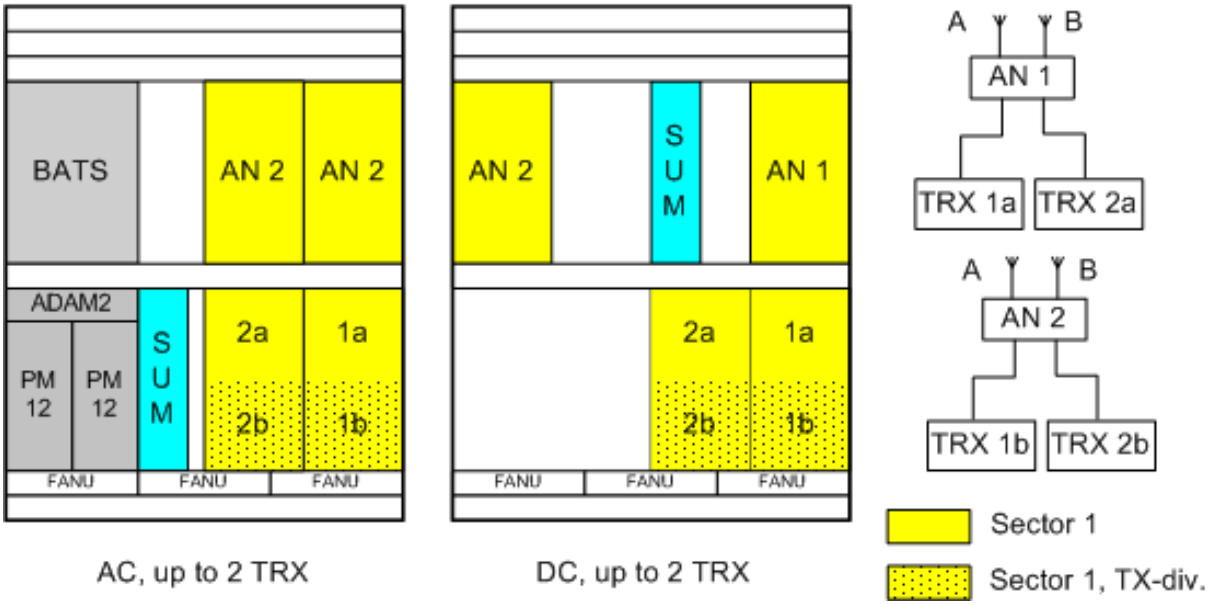
2.10.5 Coverage Mode with TX Diversity Low Loss Configurations - CBO - 1 Sector TX Diversity Low Loss with Twin-TRX



AC, up to 2 TRX

DC, up to 2 TRX

2.10.6 Coverage Mode TX-Diversity 4 RX Configurations - CBO - 1 Sector TX Diversity 4RX with Twin-TRX

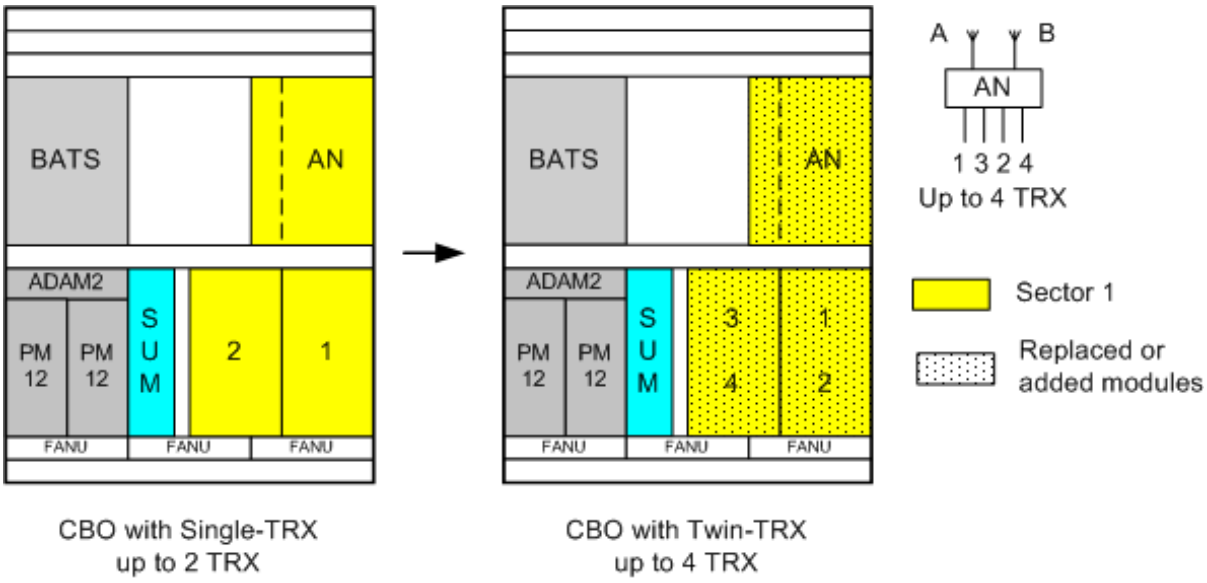


2.11 Outdoor Configurations Based on Extension with Twin TRX

The following table gives the possible configuration extension based on Twin TRX modules.

Cabinet	Number of sectors	Carriesrs per sector
		Single TRX -> Twin TRX
CBO	1	*2 -> 4*
	2	*1/1 -> 2/2*
CBO DC	1	n.a.
	2	*2/2 -> 3/3*
	3	*1/1/1 -> 2/2/2*

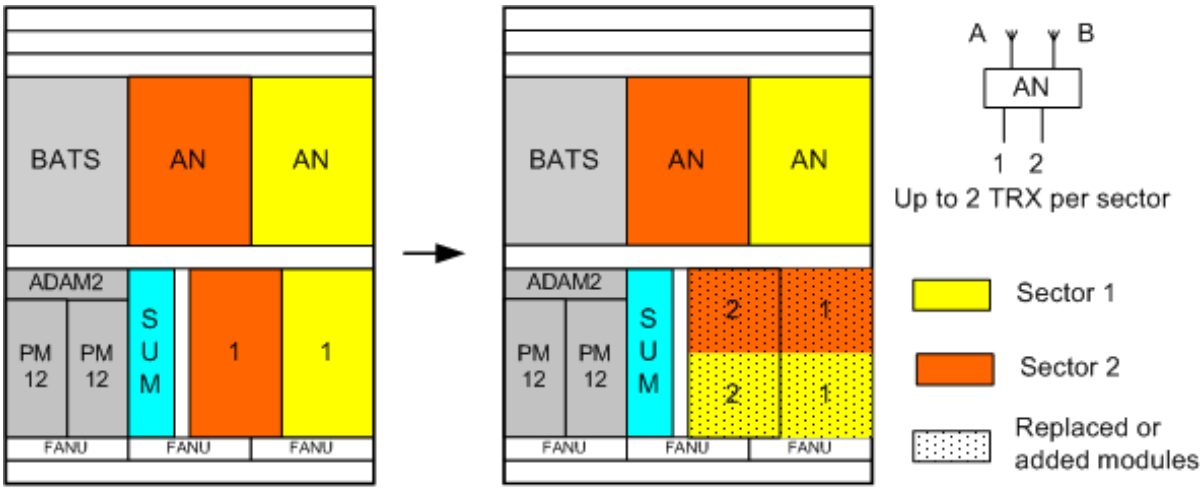
2.11.1 CBO 1 Sector mixed configuration Single/Twin-TRX



CBO with Single-TRX up to 2 TRX

CBO with Twin-TRX up to 4 TRX

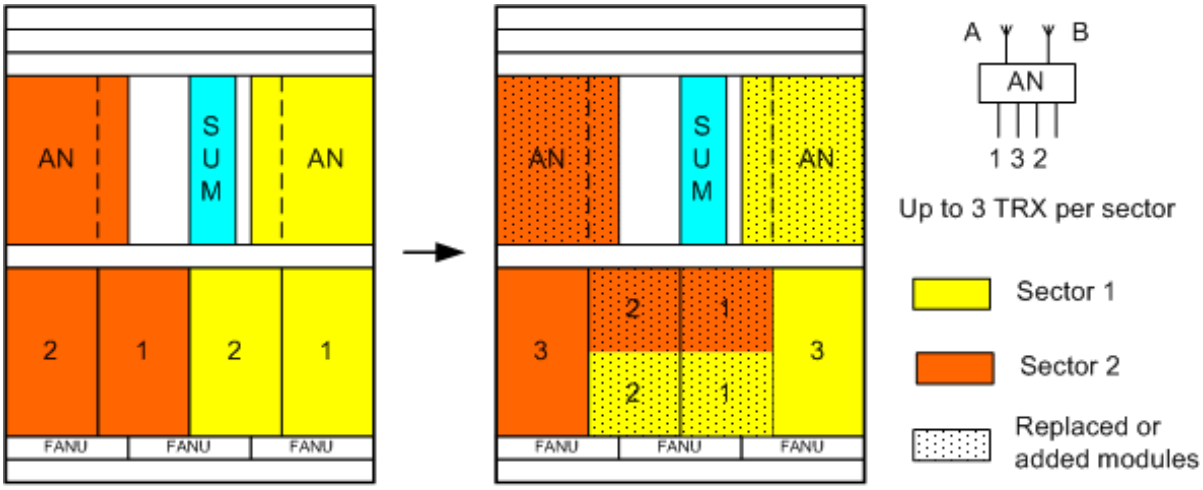
2.11.2 CBO 2 Sectors mixed configuration Single/Twin-TRX



CBO with Single-TRX
1/1 TRX

CBO with Twin-TRX
2/2 TRX

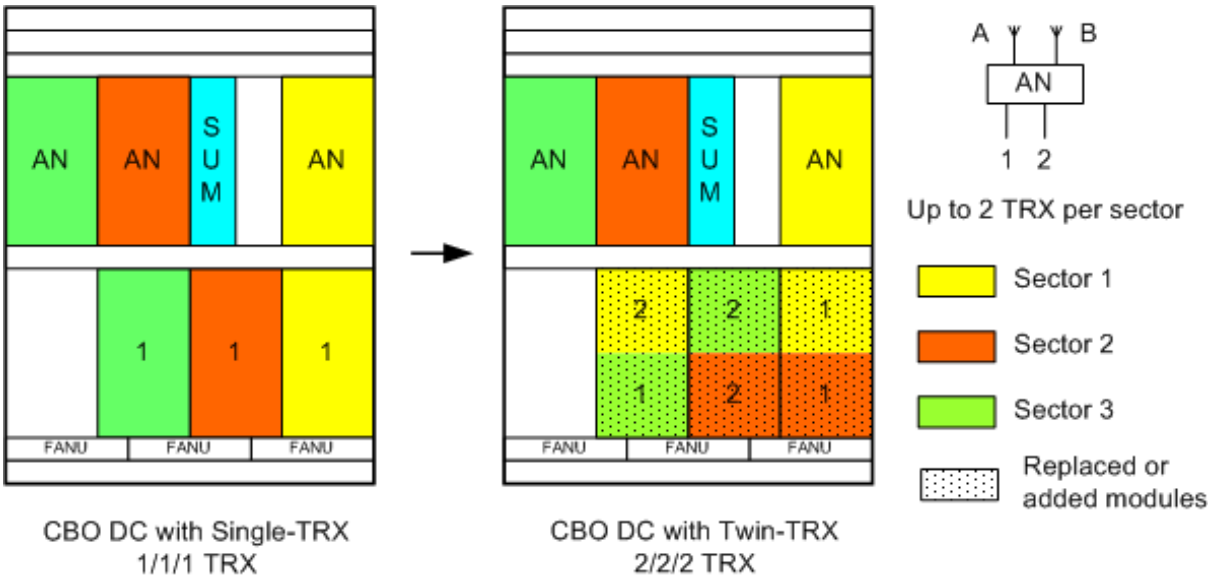
2.11.3 CBO DC 2 Sectors mixed configuration Single/Twin-TRX



CBO DC with Single-TRX
2/2 TRX

CBO DC with Twin-TRX
3/3 TRX

2.11.4 CBO DC 2 Sectors mixed configuration Single/Twin-TRX



CBO DC with Single-TRX
1/1/1 TRX

CBO DC with Twin-TRX
2/2/2 TRX

2.12 Multistandard Base Station Outdoor Configurations

2.12.1 MBO Standard Configurations - GSM 850/900/1800/1900

NOTICE

GSM 850 is not supported by all BSS software releases. If you are in doubt, contact Alcatel support.

2.12.1.1 MBO1 - 1x1...8

The following figure shows the rack layout of the MBO1 - 1x1...8 configuration.

Note: Restrictions

For GSM 1900, the configuration is limited to six TREs.

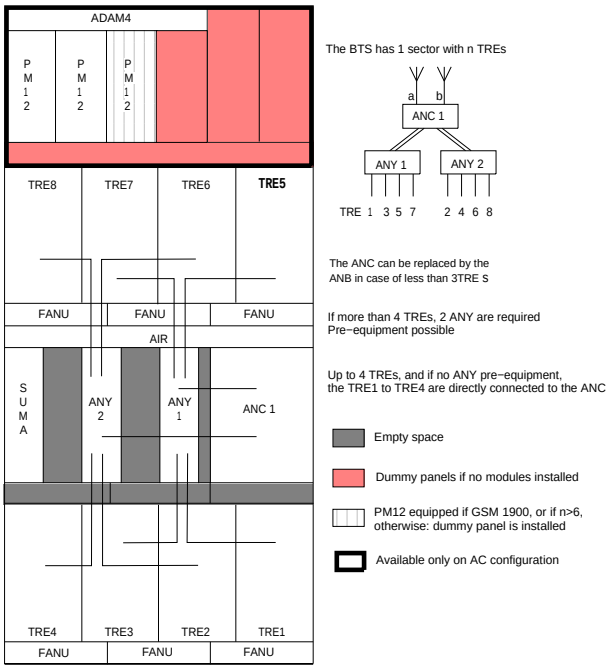


Figure 139: MBO1 - 1x1...8 Configuration

2.12.1.2 MBO1 - 2x1...4

The following figure shows the rack layout of the MBO1 - 2x1...4 configuration.

Note: **Restrictions**

None. for GSM 850.

For GSM 1900, the configuration is limited to six TREs over the two sectors.

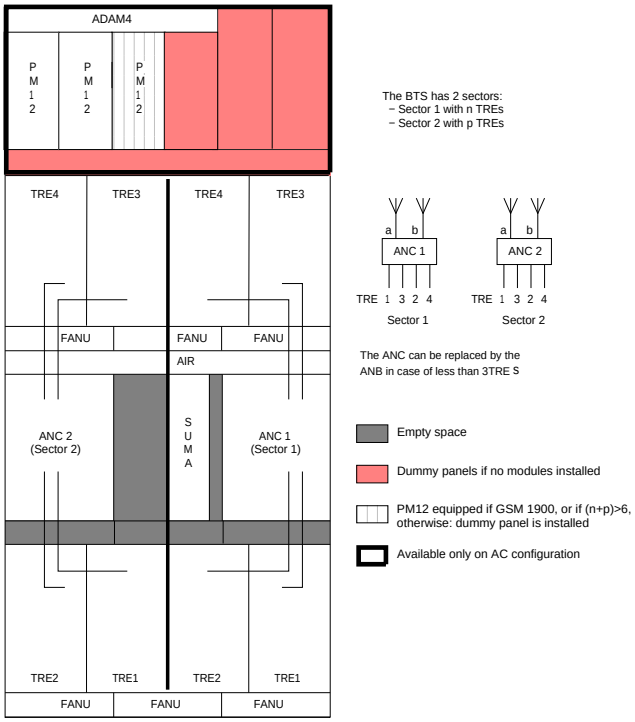


Figure 140: MBO1 - 2x1...4 Configuration

2.12.1.3 MBO1 - 3x1...2

The following figure shows the rack layout of the MBO1 - 3x1...2 configuration.

Note: **Restrictions**

None. for GSM 850.

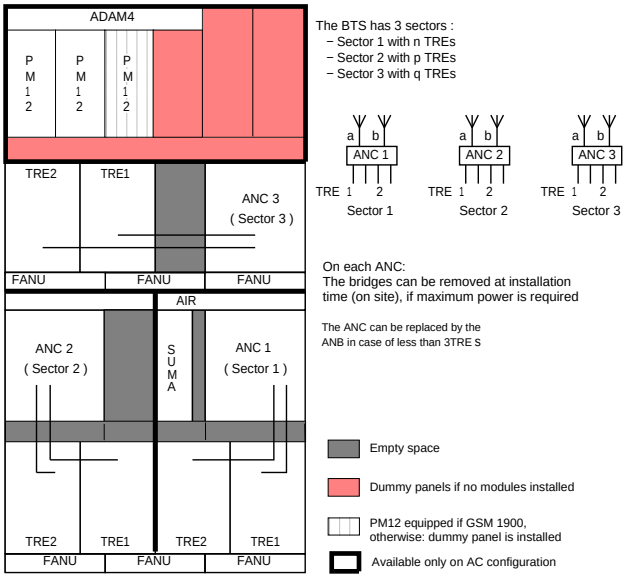


Figure 141: MBO1 - 3x1...2 Configuration

2.12.1.4 MBO2 - 1x9...12

The following figure shows the rack layout of the MBO2 - 1x9...12 configuration.

Note: **Restrictions**

None. for GSM 850.

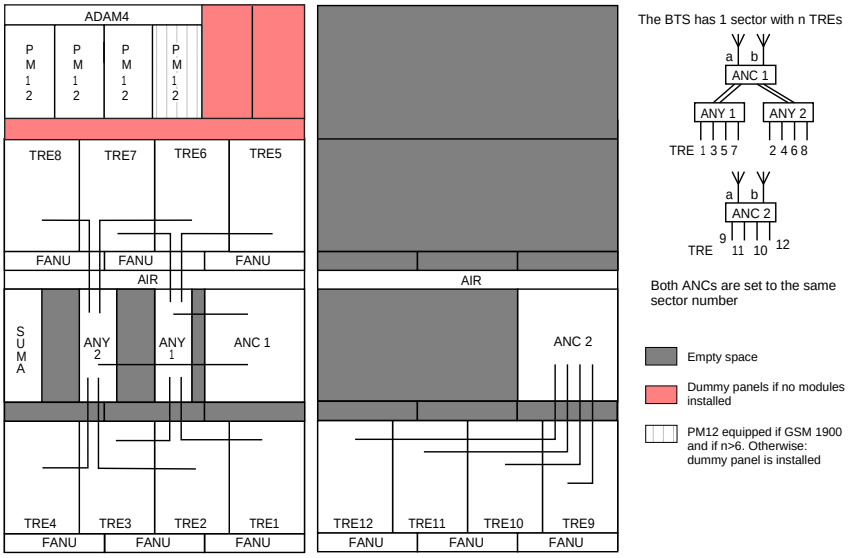


Figure 142: MBO2 - 1x9...12 Configuration

2.12.1.5 MBO2 - 2x1...6

The following figure shows the rack layout of the MBO - 2x1...6 configuration.

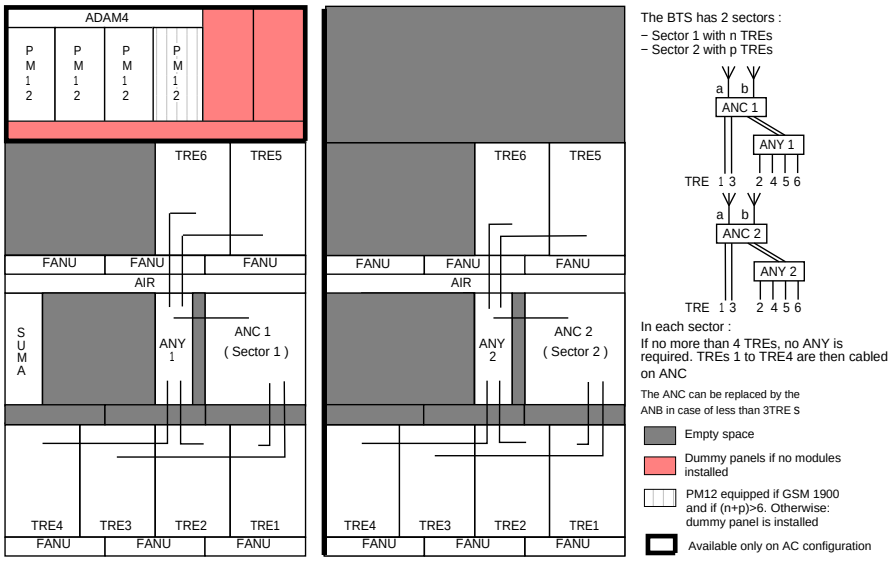


Figure 143: MBO2 - 2x1...6 Configuration

2.12.1.6 MBO2 - 1x1...8 + 1x1...4

The following figure shows the rack layout of the MBO2 - 1x1...8 + 1x1...4 configuration.

Note: **Restrictions**

None. for GSM 850.

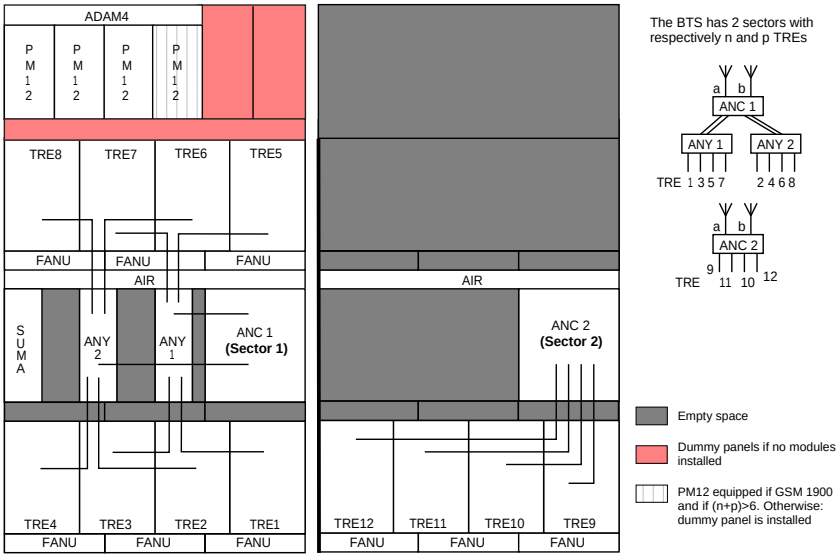


Figure 144: MBO2 - 1x1...8 + 1x1...4 Configuration

2.12.1.7 MBO2 - 3x1...4

The following figure shows the rack layout of the MBO2 - 3x1...4 configuration.

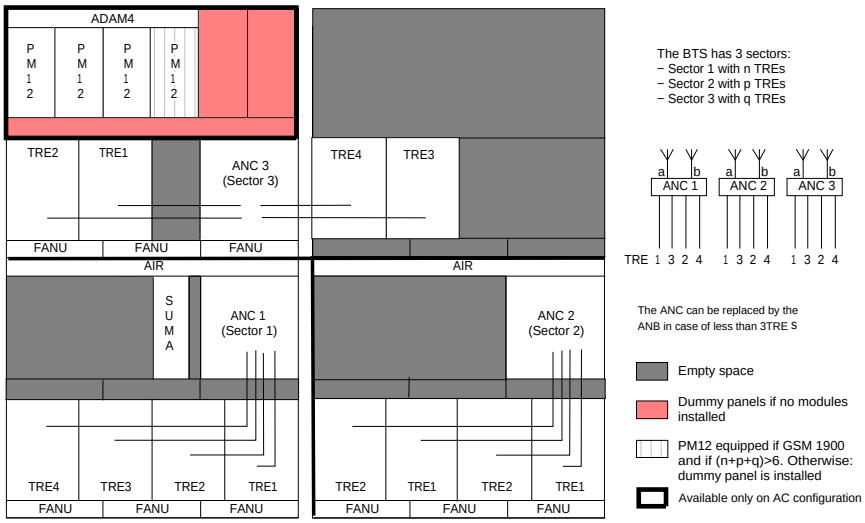


Figure 145: MBO2 - 3x1...4 Configuration

2.12.2 MBO Low Losses Configurations - GSM 900/1800/1900

2.12.2.1 MBO1 - 1x5...8 Low Losses

The following figure shows the rack layout of the MBO1 - 1x5...8 - Low Losses configuration.

Note: **Restrictions**

For GSM 1900, the configuration is limited to six TREs.

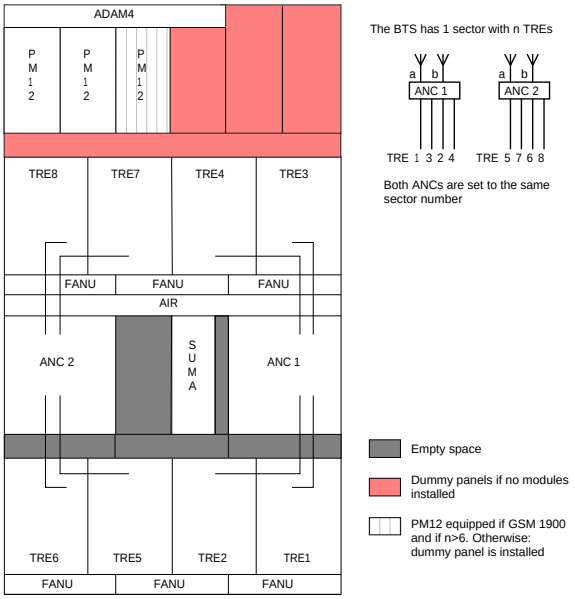


Figure 146: MBO1 - 1x5...8 - Low Losses Configuration

2.12.2.2 MBO2 - 2x3...6 Low Losses

The following figure shows the rack layout of the MBO2 - 2x3...6 - Low Losses configuration.

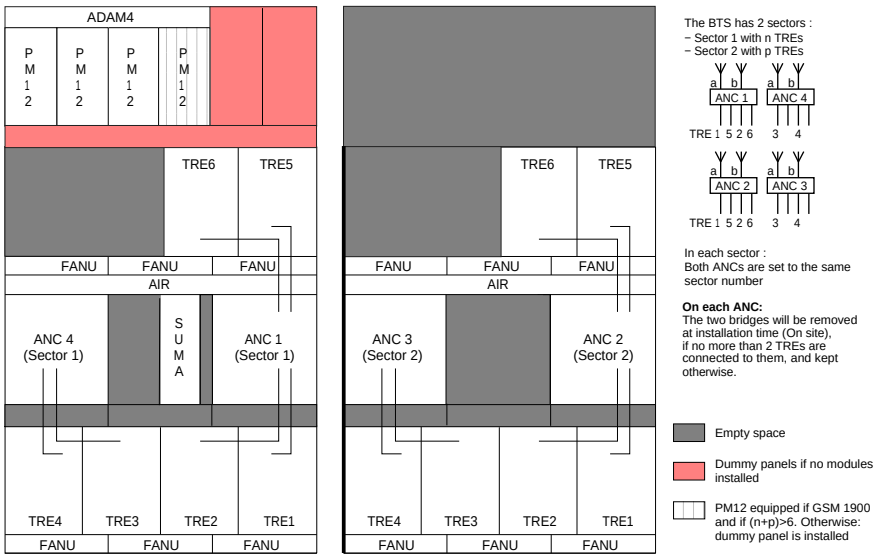


Figure 147: MBO2 - 2x3...6 - Low Losses Configuration

2.12.2.3 MBO2 - 3x3...4 Low Losses

The following figure shows the rack layout of the MBO2 - 3x3...4 - Low Losses configuration.

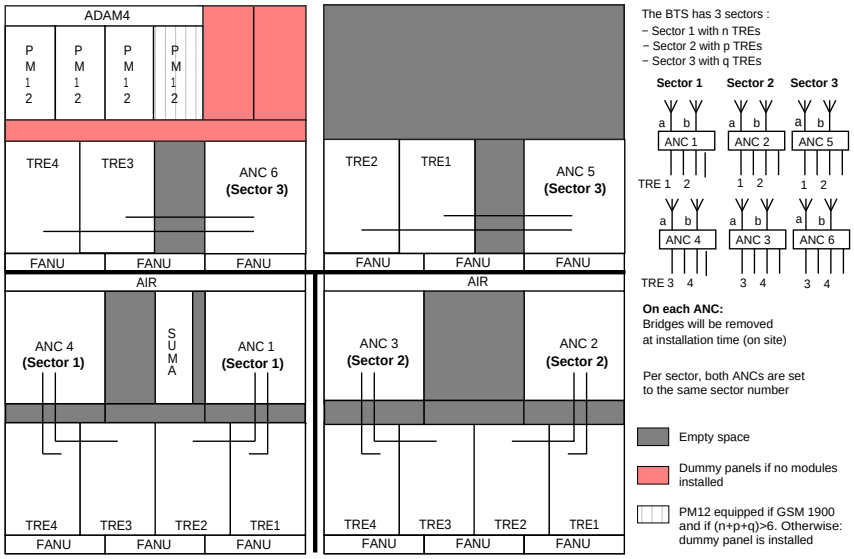


Figure 148: MBO2 - 3x3...4 - Low Losses Configuration

2.12.3 MBO High Power Configurations - GSM 900/1800

2.12.3.1 MBO1 - 1x1...4

The following figure shows the rack layout of the MBO1 - 1x1...4 - High Power GSM 900/1800 configuration.

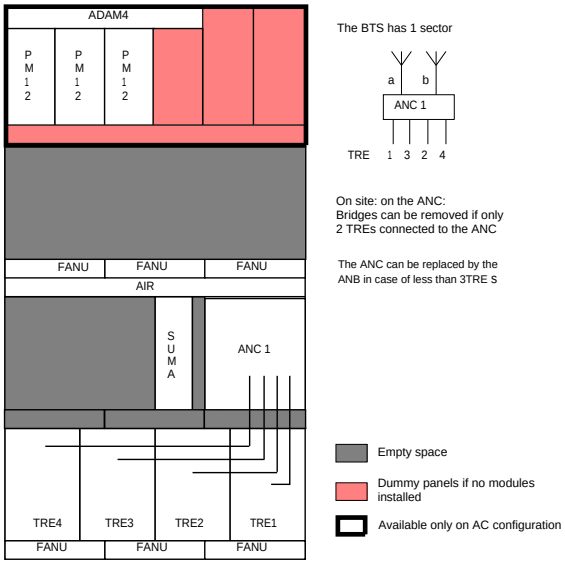


Figure 149: MBO1 - 1x1...4 - High Power GSM 1800 Configuration

2.12.3.2 MBO1 - 2x1...2

The following figure shows the rack layout of the MBO1 - 2x1...2 - High Power GSM 900/1800 configuration.

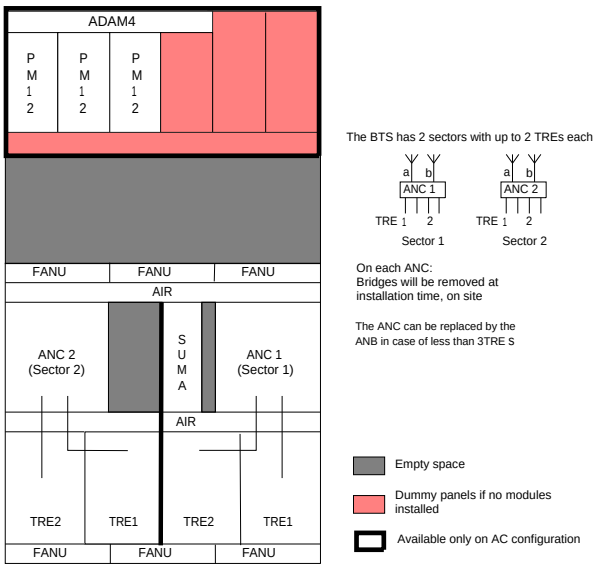


Figure 150: MBO1 - 2x1...2 - High Power GSM 1800 Configuration

2.12.3.3 MBO1 - 3x2

The following figure shows the rack layout of the MBO1 - 3x2 - High Power GSM 900/1800 configuration.

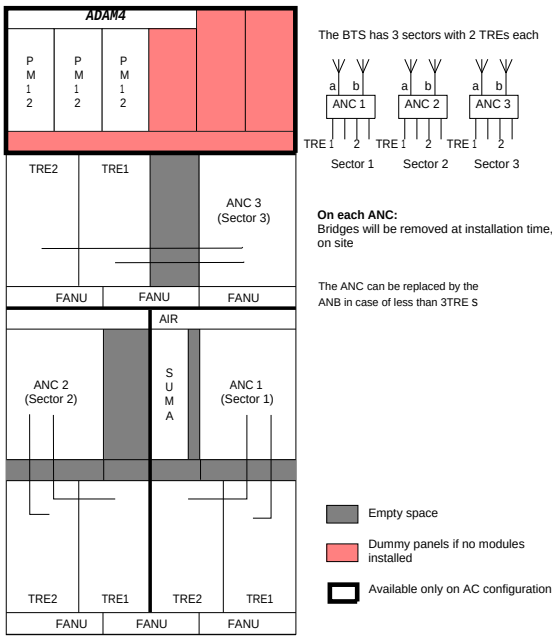


Figure 151: MBO1 - 3x2 - High Power GSM 1800 Configuration

2.12.3.4 MBO2 - 2x1...4

The following figure shows the rack layout of the MBO2 - 2x1...4 - High Power GSM 900/1800 configuration.

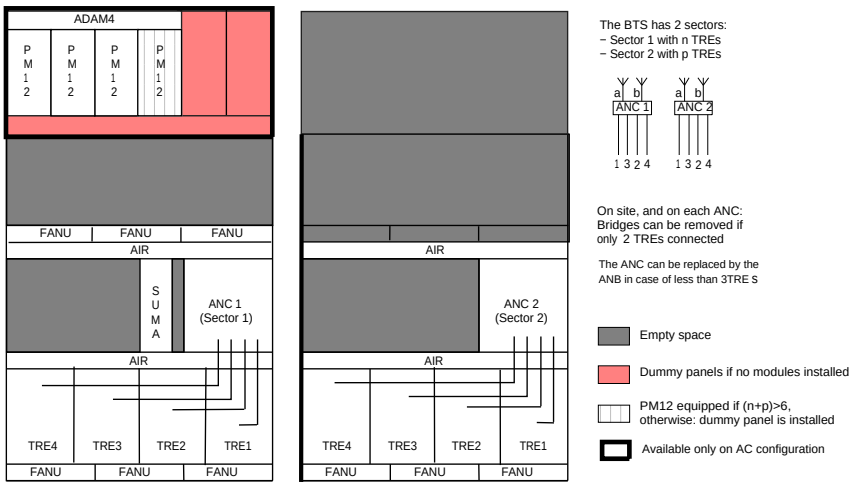


Figure 152: MBO2 - 2x1...4 - High Power GSM 1800 Configuration

2.12.3.5 MBO2 - 3x1...4

The following figure shows the rack layout of the MBO2 - 3x1...4 - High Power GSM 900/1800 configuration.

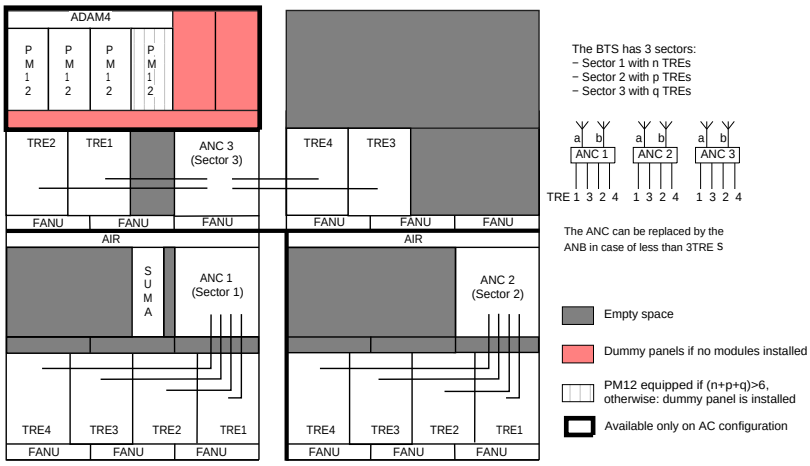


Figure 153: MBO2 - 3x1...4 - High Power GSM 1800 Configuration

2.12.4 MBO Multiband BTS Configurations - GSM 900/1800 and GSM 900/1900

2.12.4.1 MBO1 - 1x1...4/1x1...4

The following figure shows the rack layout of the MBO1 - 1x1...4/1x1...4 - Multiband BTS configuration.

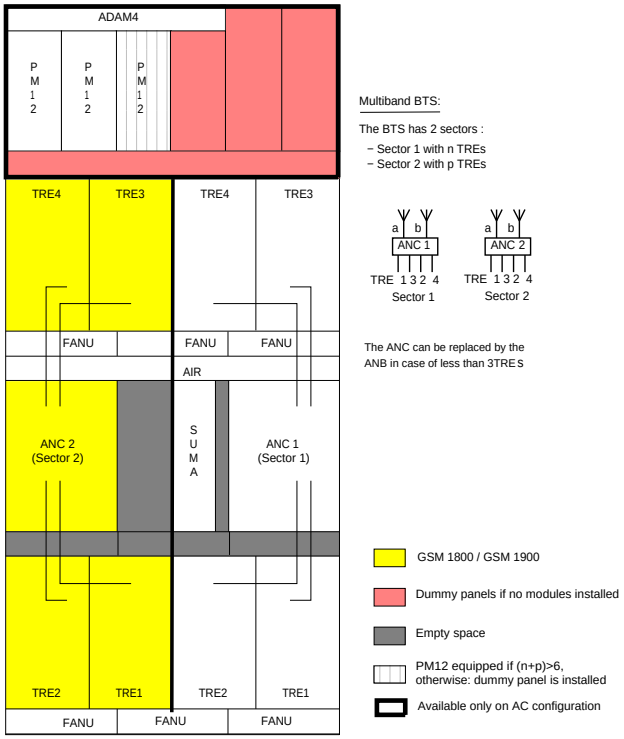


Figure 154: MBO1 - 1x1...4/1x1...4 - Multiband BTS Configuration

2.12.4.2 MBO2 - 1x1...6/1x1...6

The following figure shows the rack layout of the MBO2 - 1x1...6/1x1...6 - Multiband BTS configuration.

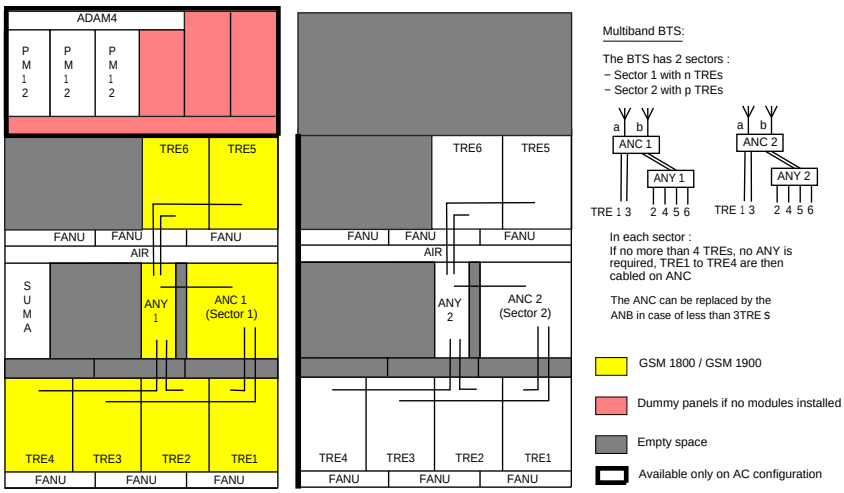


Figure 155: MBO2 - 1x1...6/1x1...6 - Multiband BTS Configuration

2.12.4.3 MBO2 - 1x1...8/1x1...4

The following figure shows the rack layout of the MBO2 - 1x1...8/1x1...4 - Multiband BTS configuration.

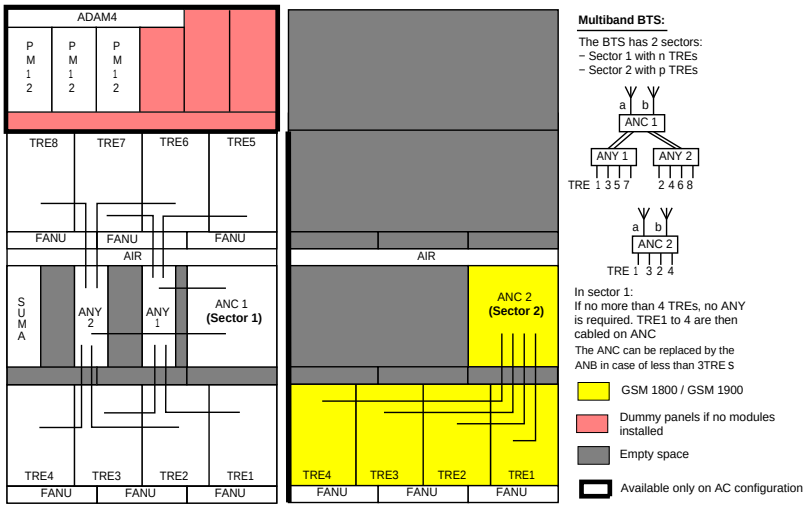


Figure 156: MBO2 - 1x1...8/1x1...4 - Multiband BTS Configuration

2.12.4.4 MBO2 - 1x1...4/1x1...8

The following figure shows the rack layout of the MBO2 - 1x1...4/1x1...8 - Multiband BTS configuration.

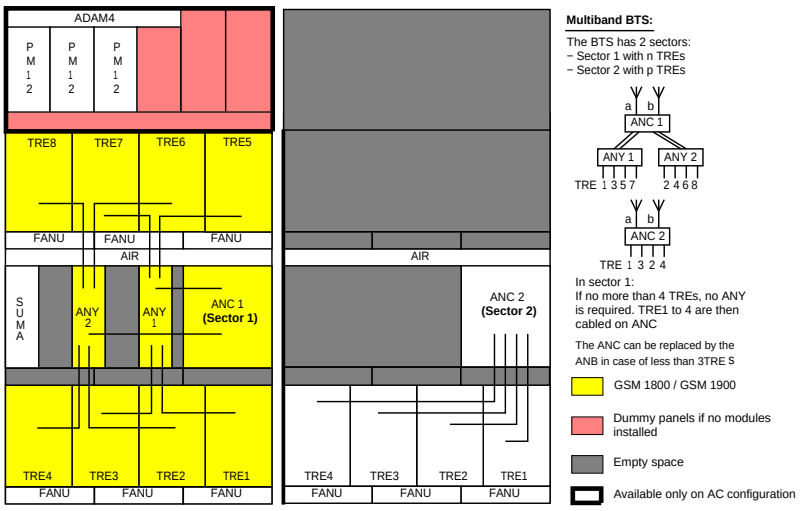


Figure 157: MBO2 - 1x1...4/1x1...8 - Multiband BTS Configuration

2.12.4.5 MBO2 - 1x1...4/2x1...4

The following figure shows the rack layout of the MBO2 - 1x1...4/2x1...4 - Multiband BTS configuration.

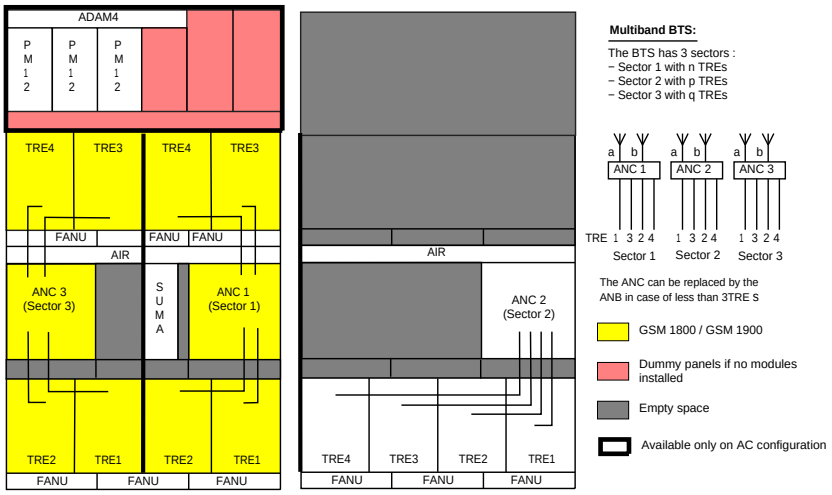


Figure 158: MBO2 - 1x1...4/2x1...4 - Multiband BTS Configuration

2.12.4.6 MBO2 - 2x1...4/1x1...4

The following figure shows the rack layout of the MBO2 - 2x1...4/1x1...4 - Multiband BTS configuration.

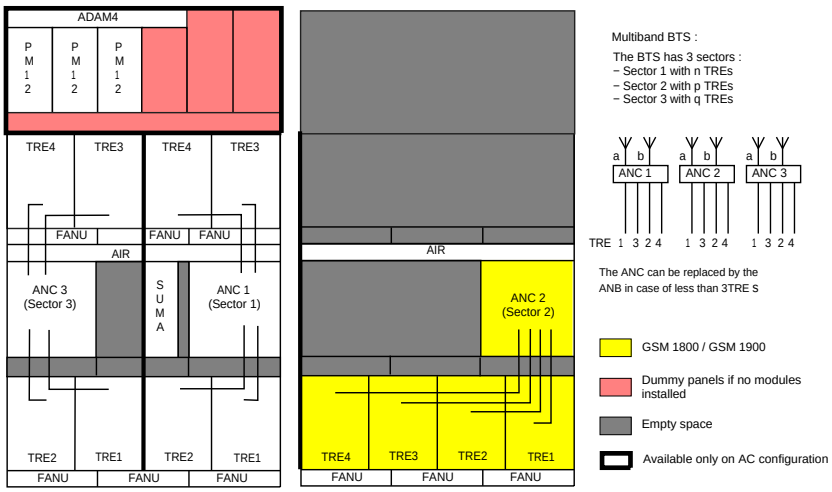


Figure 159: MBO2 - 2x1...4/1x1...4 - Multiband BTS Configuration

2.12.4.7 MBO2 - 1x1...4/...4,...2,...2

The following figure shows the rack layout of the MBO2 - 1x1...4/...4,...2,...2 - Multiband BTS configuration.

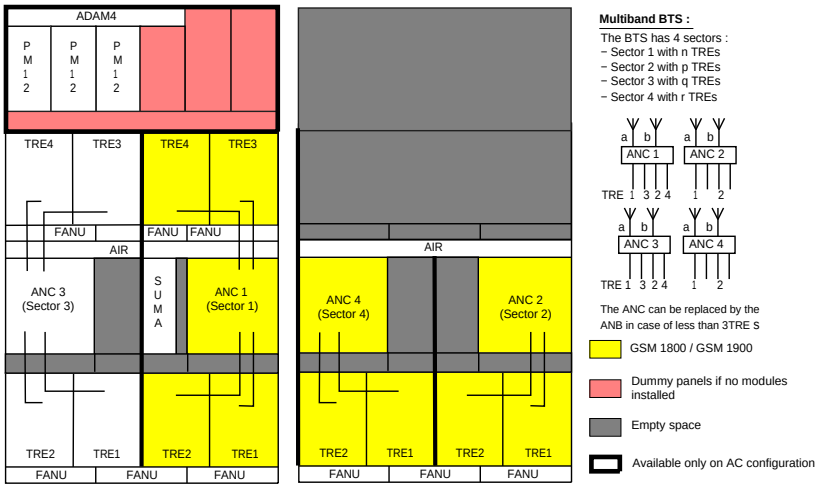


Figure 160: MBO2 - 1x1...4/...4,...2,...2 - Multiband BTS Configuration

2.12.4.8 MBO2 - ...4,...2,...2/1x1...4

The following figure shows the rack layout of the MBO2 - ...4,...2,...2/1x1...4 - Multiband BTS configuration.

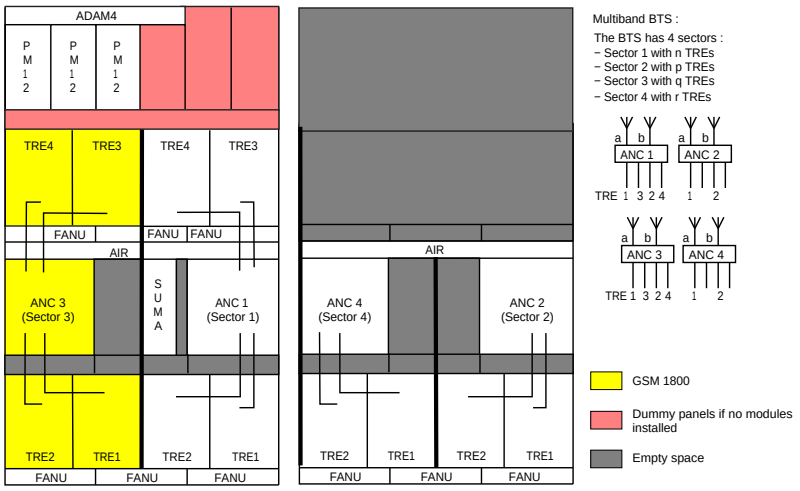


Figure 161: MBO2 - ...4,...2,...2/1x1...4 - Multiband BTS Configuration

2.12.4.9 MBO2 - 2x1...4/2x1...2

The following figure shows the rack layout of the MBO2 - 2x1...4/2x1...2 - Multiband BTS configuration.

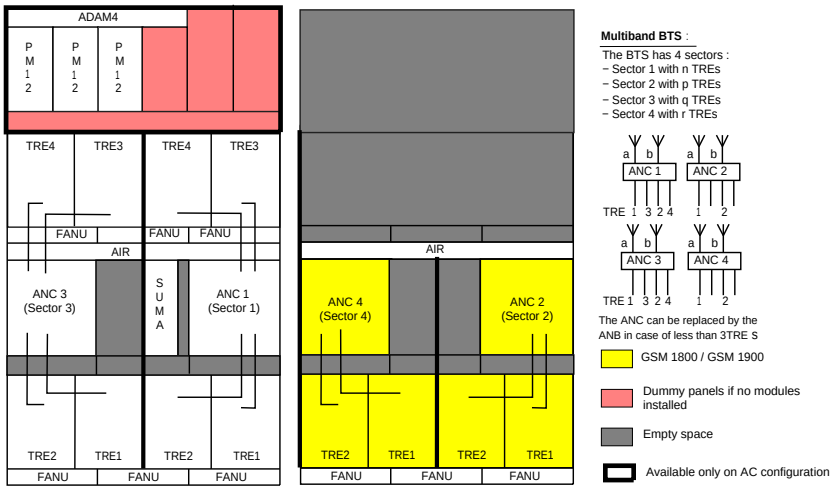


Figure 162: MBO2 - 2x1...4/2x1...2 - Multiband BTS Configuration

2.12.4.10 MBO2 - 2x1...2/2x1...4

The following figure shows the rack layout of the MBO2 - 2x1...2/2x1...4 - Multiband BTS configuration.

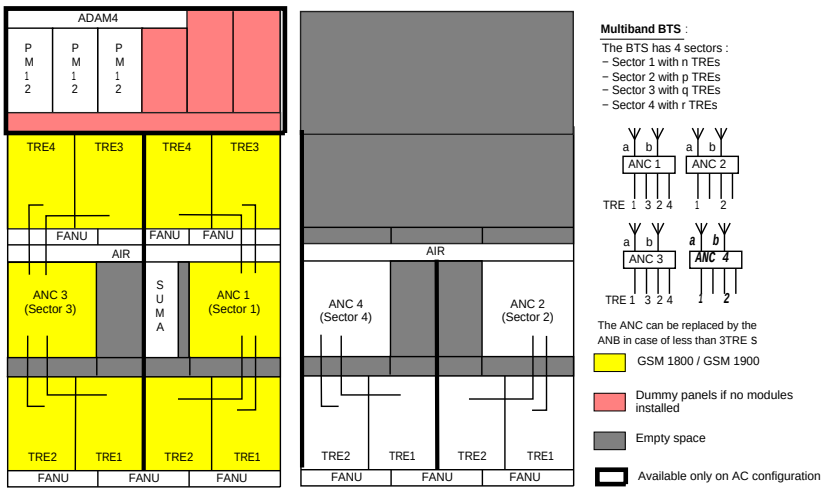


Figure 163: MBO2 - 2x1...2/2x1...4 - Multiband BTS Configuration

2.12.4.11 MBO2 - 2x1...3/2x1...3

The following figure shows the rack layout of the MBO2 - 2x1...3/2x1...3 - Multiband BTS configuration.

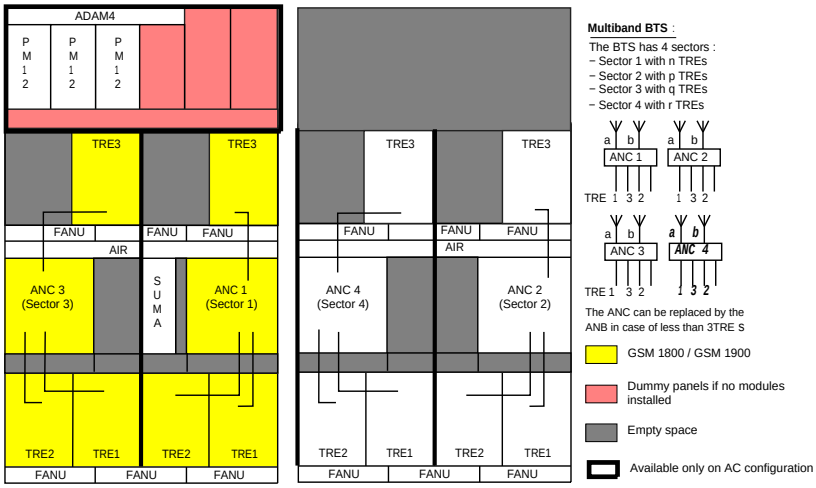


Figure 164: MBO2 - 2x1...3/2x1...3 - Multiband BTS Configuration

2.12.4.12 MBO2 - 3x1...2/3x1...2

The following figure shows the rack layout of the MBO2 - 3x1...2/3x1...2 - Multiband BTS configuration.

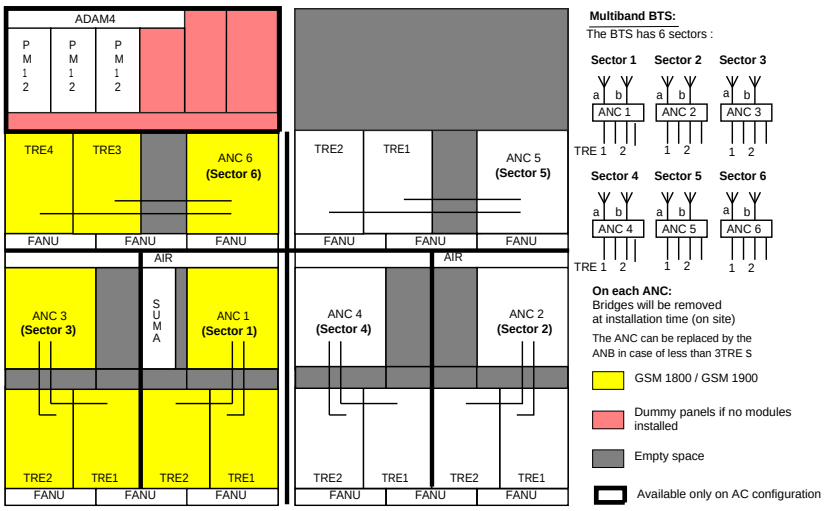


Figure 165: MBO2 - 3x1...2/3x1...2 - Multiband BTS Configuration

2.12.5 MBO Multiband Cells Configurations - GSM 900/1800

2.12.5.1 MBO1 - 1x(...4/...4)

The following figure shows the rack layout of the MBO1 - 1x(...4/...4) - Multiband Cells configuration.

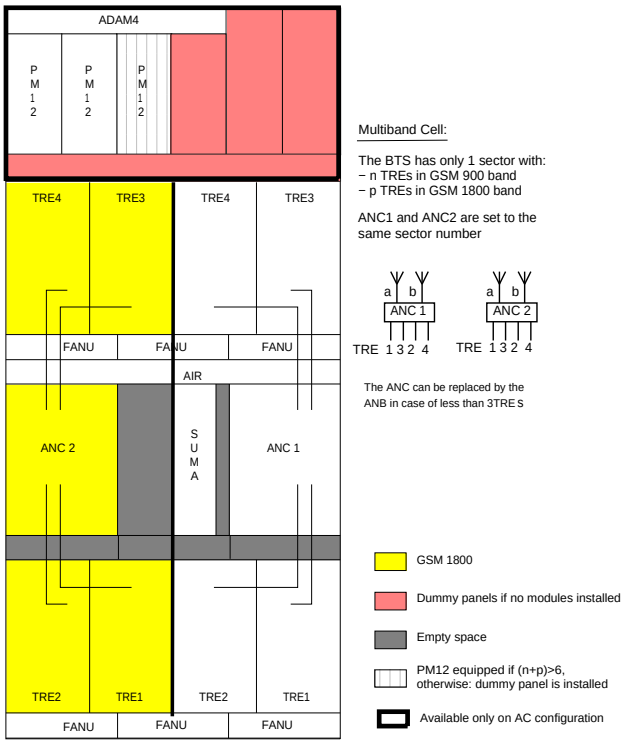


Figure 166: MBO1 - 1x(...4/...4) - Multiband Cells Configuration

2.12.5.2 MBO2 - 1x(...6/...6)

The following figure shows the rack layout of the MBO2 - 1x(...6/...6) - Multiband Cells configuration.

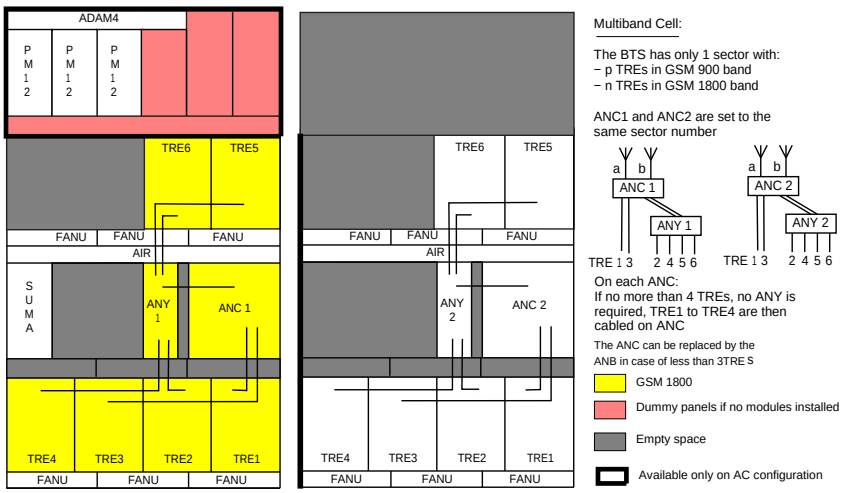


Figure 167: MBO2 - 1x(...6/...6) - Multiband Cells Configuration

2.12.5.3 MBO2 - 1x(...8/...4)

The following figure shows the rack layout of the MBO2 - 1x(...8/...4) - Multiband Cells configuration.

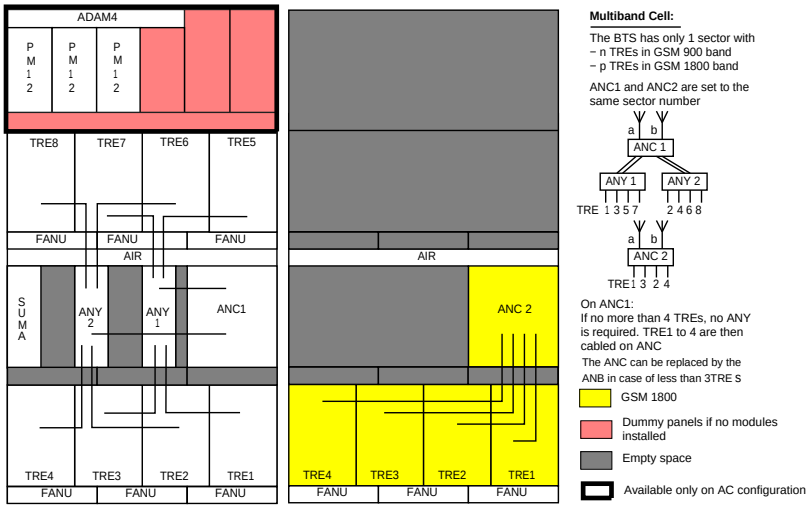


Figure 168: MBO2 - 1x(...8/...4) - Multiband Cells Configuration

2.12.5.4 MBO2 - 1x(...4/...8)

The following figure shows the rack layout of the MBO2 - 1x(...4/...8) - Multiband Cells configuration.

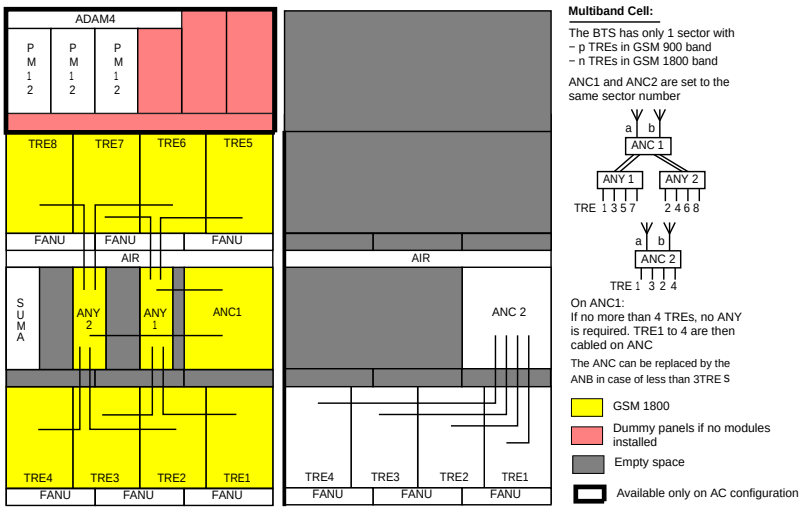


Figure 169: MBO2 - 1x(...4/...8) - Multiband Cells Configuration

2.12.5.5 MBO2 - 2x(...4/...2)

The following figure shows the rack layout of the MBO2 - 2x(...4/...2) - Multiband Cells configuration.

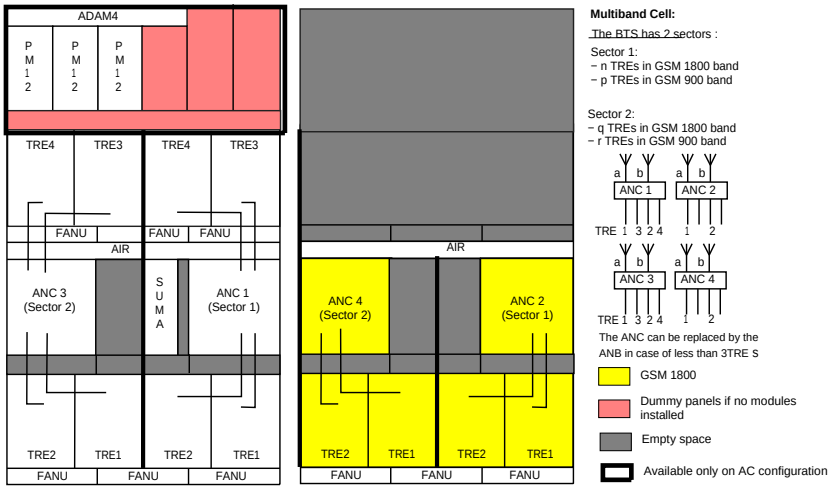


Figure 170: MBO2 - 2x(...4/...2) - Multiband Cells Configuration

2.12.5.6 MBO2 - 2x(...2/...4)

The following figure shows the rack layout of the MBO2 - 2x(...2/...4) - Multiband Cells configuration.

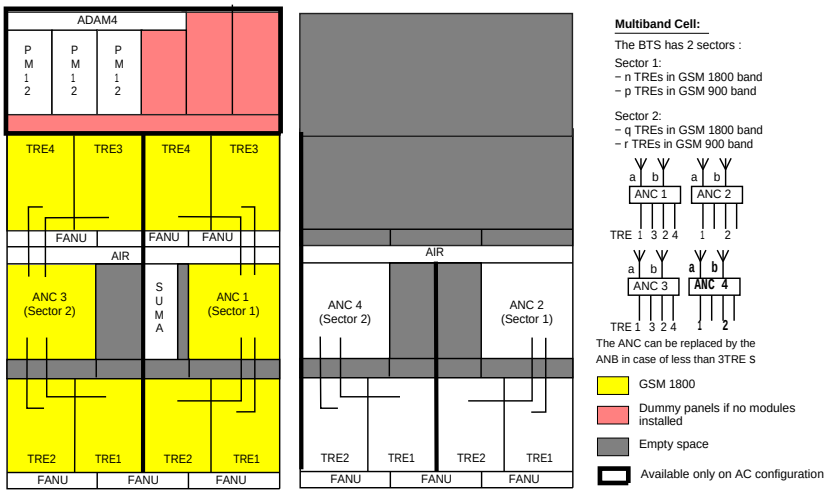


Figure 171: MBO2 - 2x(...2/...4) - Multiband Cells Configuration

2.12.5.7 MBO2 - 2x(...3/...3)

The following figure shows the rack layout of the MBO2 - 2x(...3/...3) - Multiband Cells configuration.

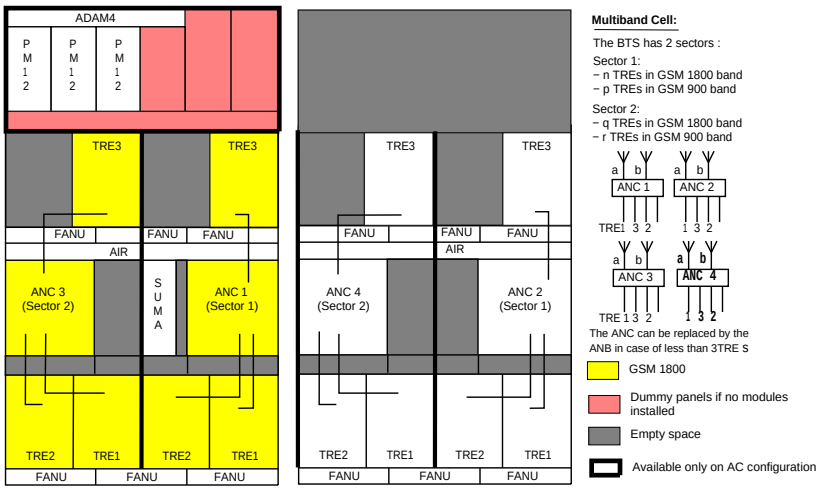


Figure 172: MBO2 - 2x(...3/...3) - Multiband Cells Configuration

2.12.5.8 MBO2 - 1x(...2/...2),1x(...4/...4)

The following figure shows the rack layout of the MBO2 - 1x(...2/...2),1x(...4/...4) - Multiband Cells configuration.

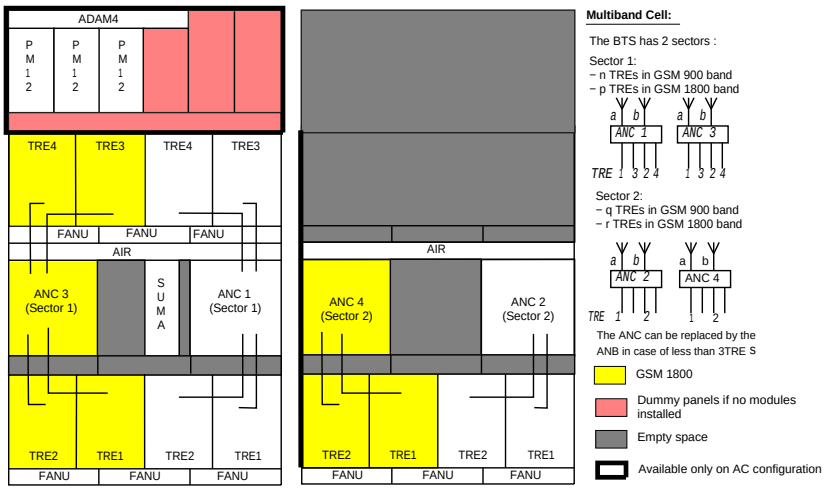


Figure 173: MBO2 - 1x(...2/...2),1x(...4/...4) - Multiband Cells Configuration

2.12.5.9 MBO2 - 3x(...2/...2)

The following figure shows the rack layout of the MBO2 - 3x(...2/...2) - Multiband Cells configuration.

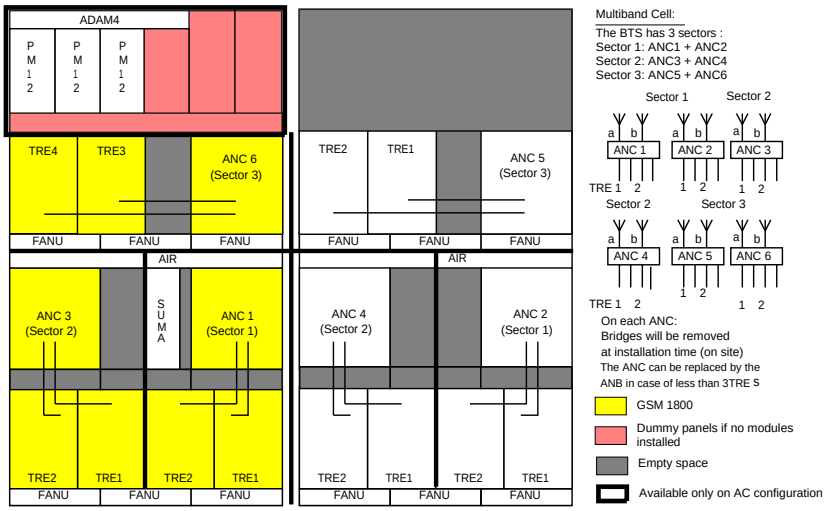


Figure 174: MBO2 - 3x(...2/...2) - Multiband Cells Configuration

2.12.6 MBO Multiband BTS, Multiband Cells Configurations - GSM 850/1800/1900

NOTICE

GSM 850 is not supported by all BSS software releases. If you are in doubt, contact Alcatel support.

2.12.6.1 MBO2 - 3x1/3x1...3

The following figure shows the rack layout of the MBO2 - 3x1/3x1...3 Multiband BTS configuration.

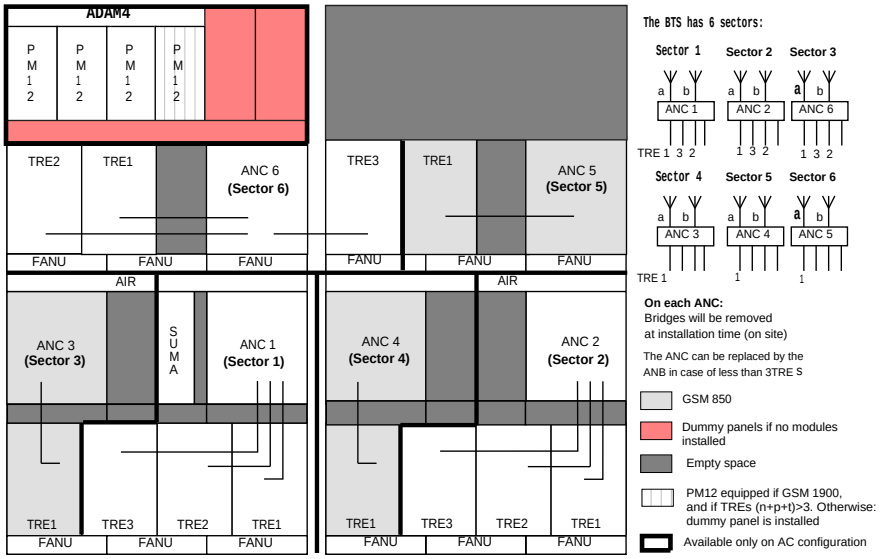


Figure 175: MBO2 - 3x1/3x1...3 Multiband BTS Configuration

2.12.6.2 MBO2 - 3x(1/...3)

The following figure shows the rack layout of the MBO2 - 3x(1/...3) Multiband Cells configuration.

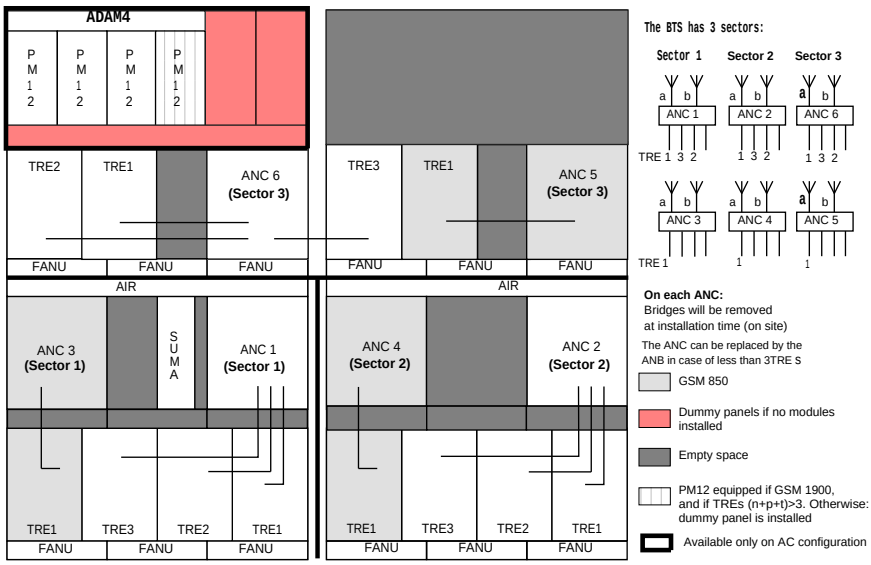


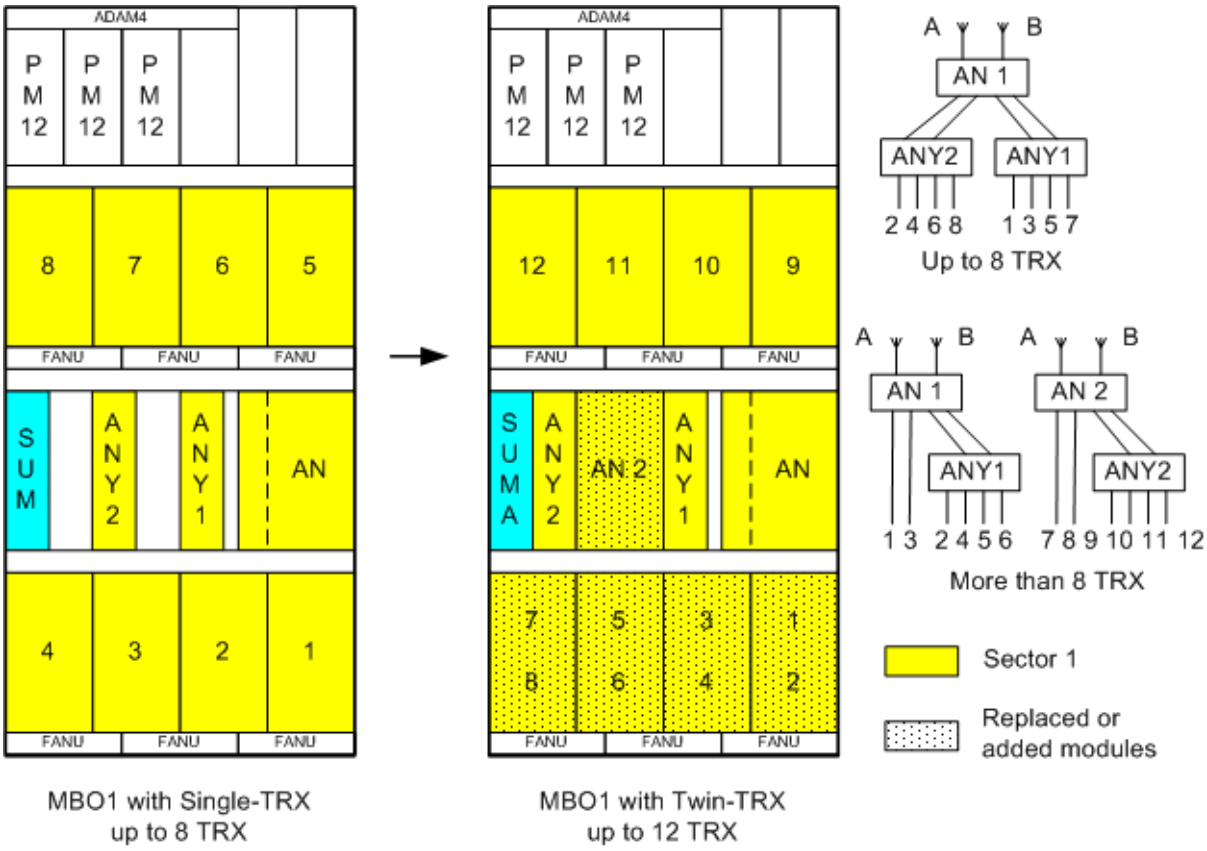
Figure 176: MBO2 - 3x(1/...3) Multiband Cells Configuration

2.13 Multistandard Base Station Outdoor Configurations Based on Extension with Twin TRX

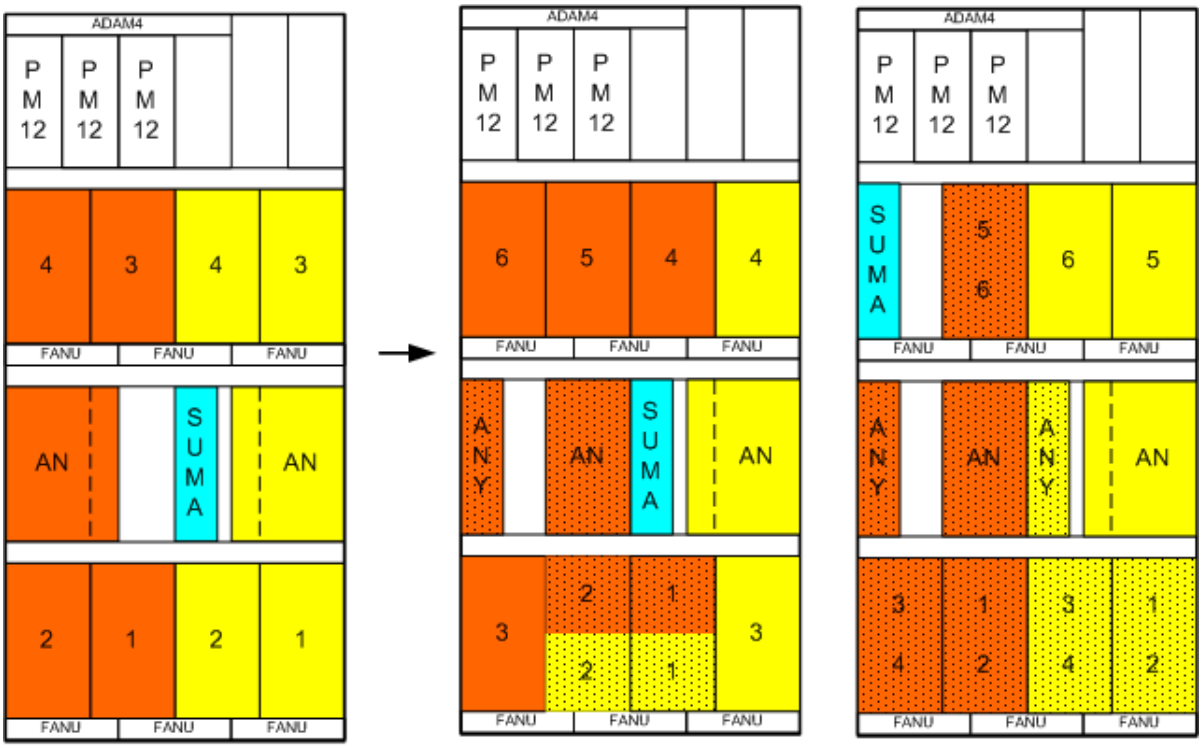
The following table gives the possible configuration extension based on Twin TRX modules.

Cabinet	Number of sectors	Carriesrs per sector
		Single TRX -> Twin TRX
MBO1	1	*8 -> 12*
MBO1T	2	*4/4 ->4/6(6/6*)*
	3	*2/2/2 -> 4/4/4*
MBO2	1	*12 -> 16*
	2	*6/6 -> 8/8*
	3	*4/4/4 -> 6/6/6*

2.13.1 MBO1 - 1 Sector mixed configuration Single/Twin-TRX



2.13.2 MBO1 - 2 Sectors mixed configuration Single/Twin-TRX



MBO1 with Single-TRX
up to 4/4 TRX

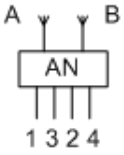
MBO1 with Twin-TRX
up to 4/6 TRX

MBO1 with Twin-TRX
up to 6/6 TRX
with SUMA location change

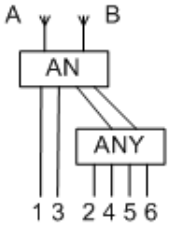
Sector 1

Sector 2

Replaced or
added modules

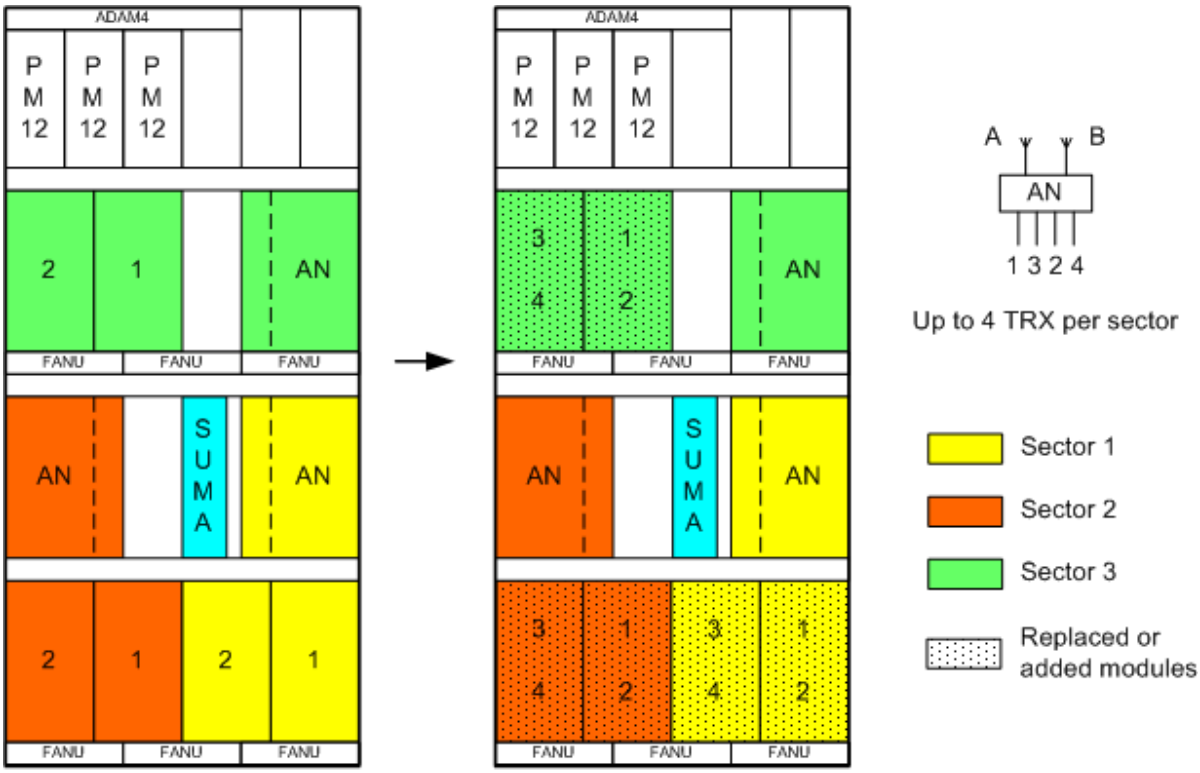


Up to 4 TRX per sector



Up to 6 TRX per sector

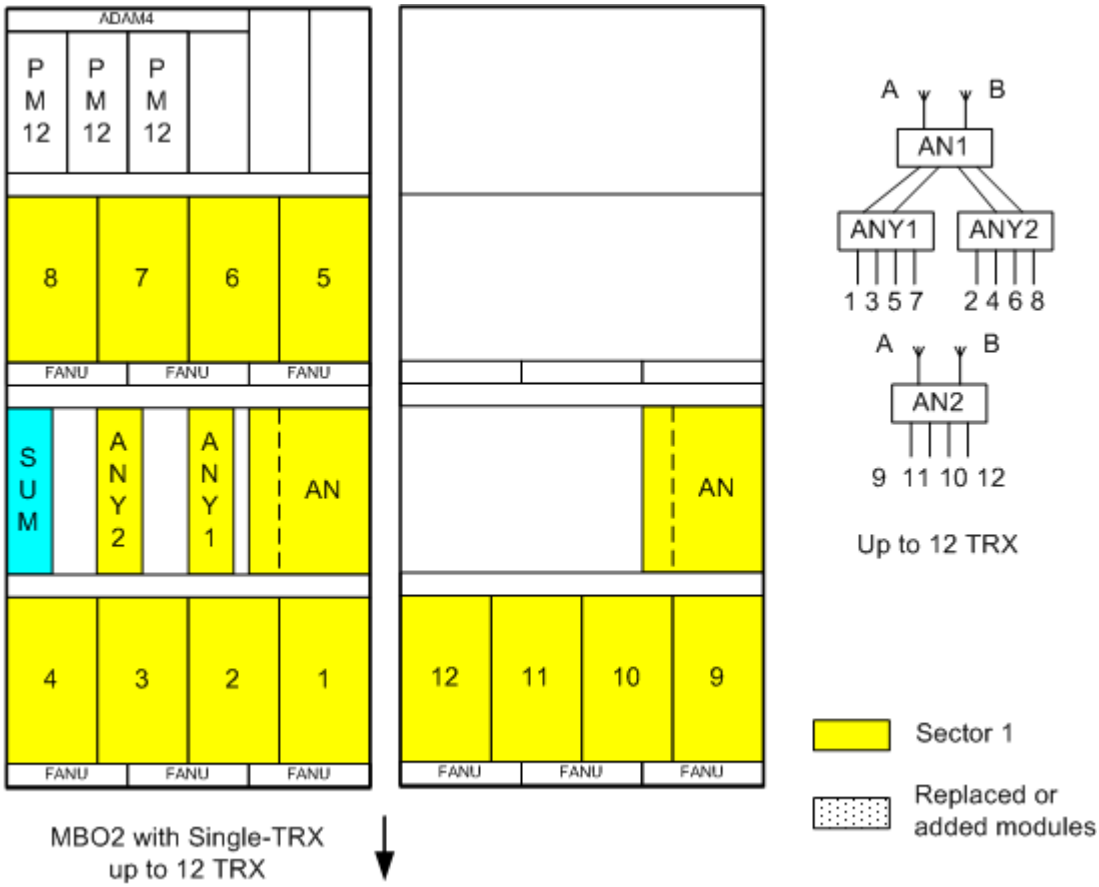
2.13.3 MBO1 - 3 Sectors mixed configuration Single/Twin-TRX



MBO1 with Single-TRX
up to 2/2/2 TRX

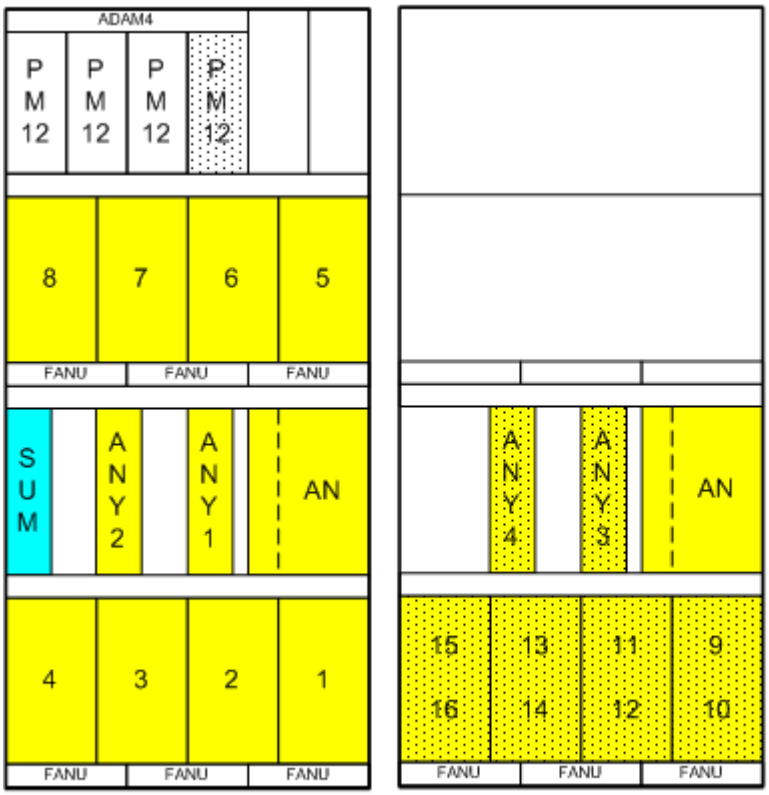
MBO1 with Twin-TRX
up to 4/4/4 TRX

2.13.4 MBO2 - 1 Sector mixed configuration Single/Twin-TRX

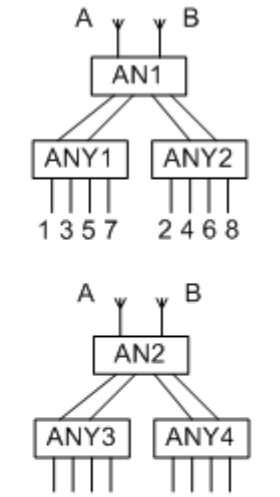


MBO2 with Single-TRX
up to 12 TRX

Up to 12 TRX

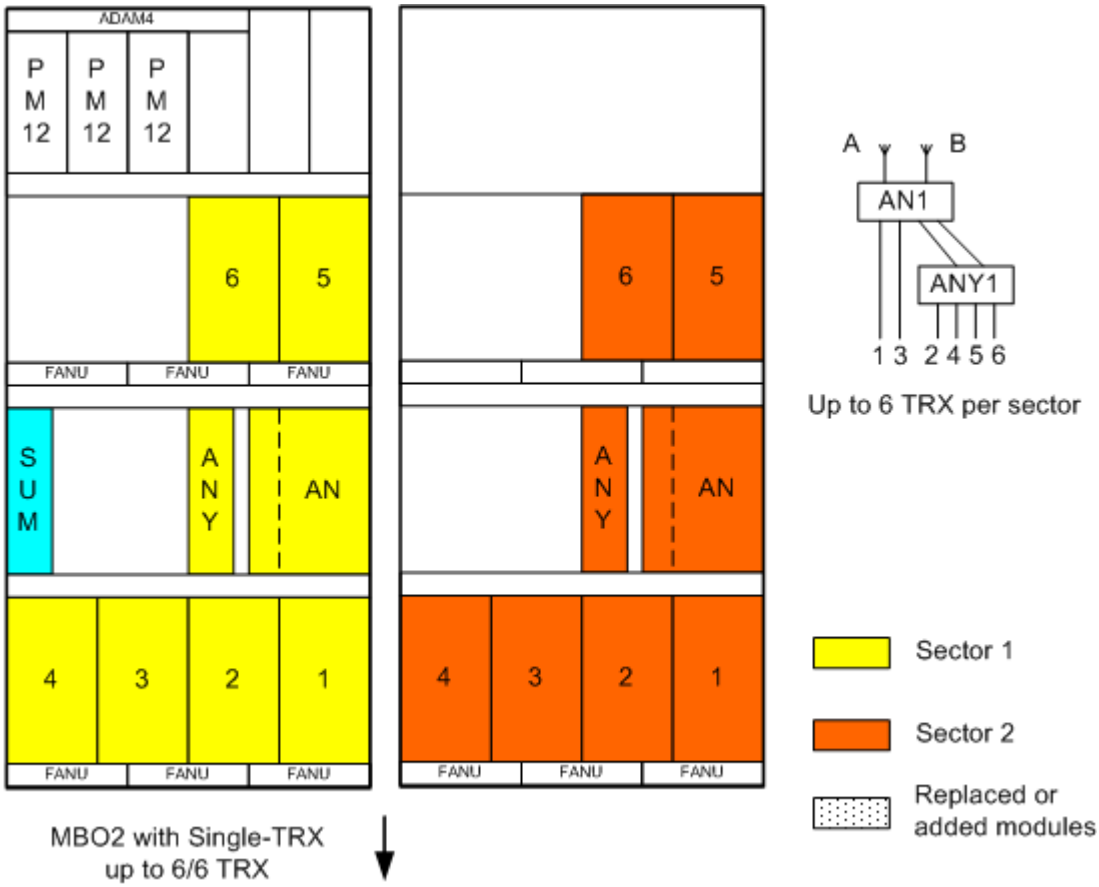


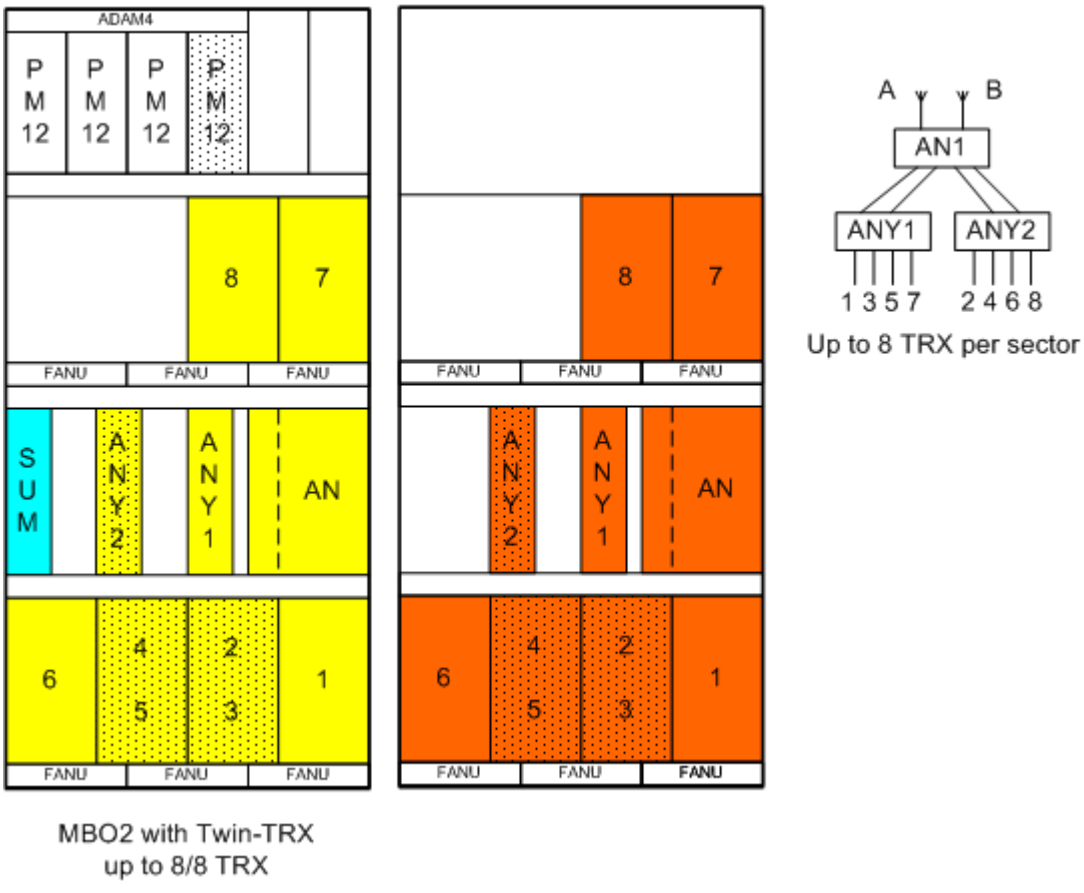
MBO2 with Twin-TRX
up to 16 TRX



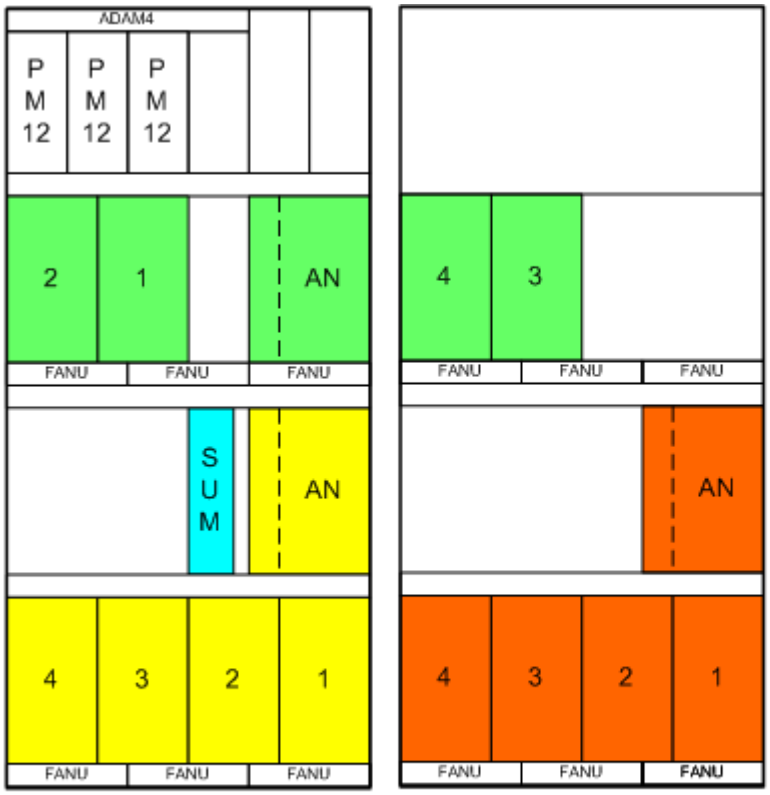
Up to 16 TRX

2.13.5 MBO2 - 2 Sectors mixed configuration Single/Twin-TRX

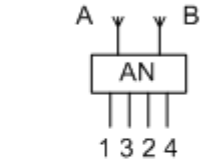




2.13.6 MBO2 - 3 Sectors mixed configuration Single/Twin-TRX



MBO2 with Single-TRX
up to 6/6 TRX

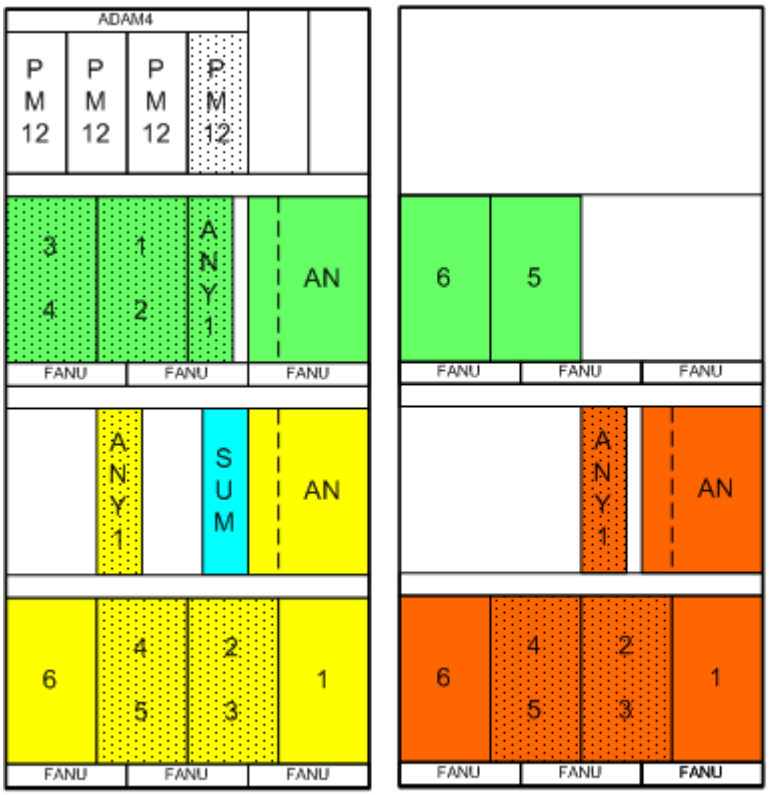


Up to 4 TRX per sector

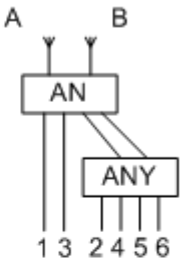
Sector 1

Sector 2

Replaced or
added modules



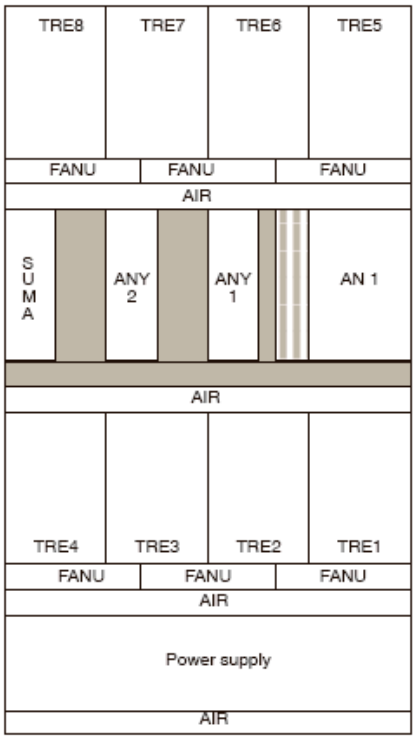
MBO2 with Twin-TRX
up to 8/8 TRX

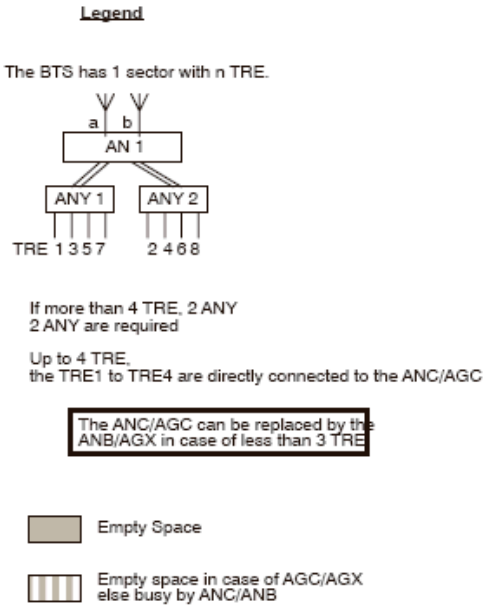


Up to 6 TRX per sector

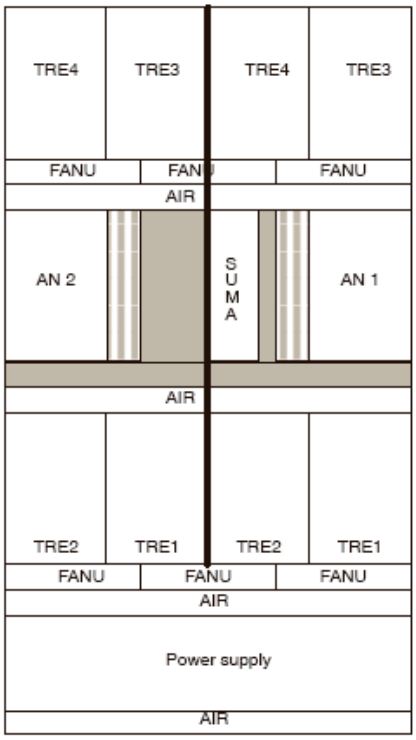
2.14 Multistandard Base Station Outdoor Evolution Configurations with Single TRX

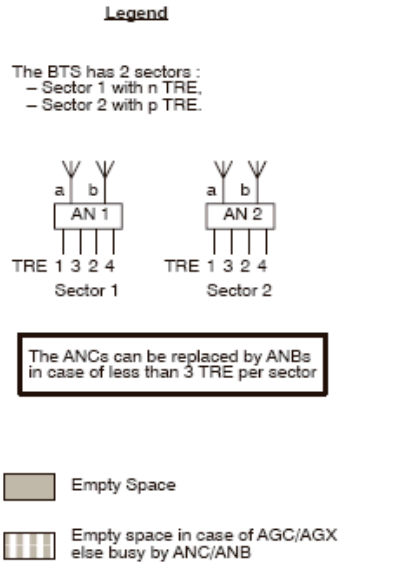
2.14.1 A9100 MBO1E 1 Sector



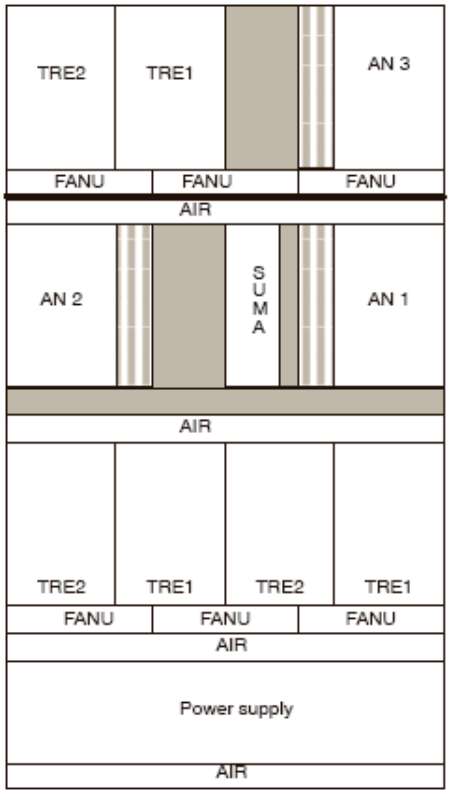


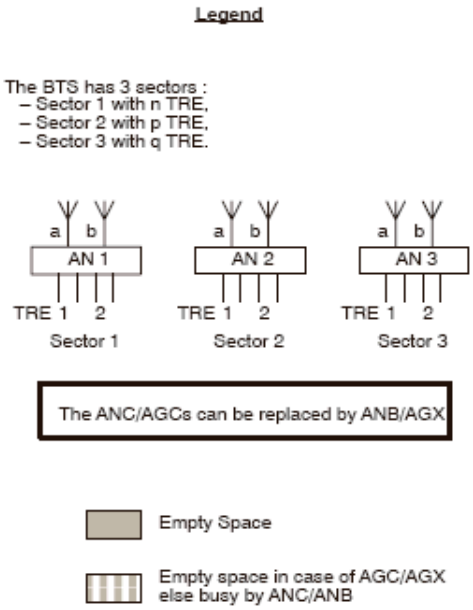
2.14.2 A9100 MBO1E 2 Sectors



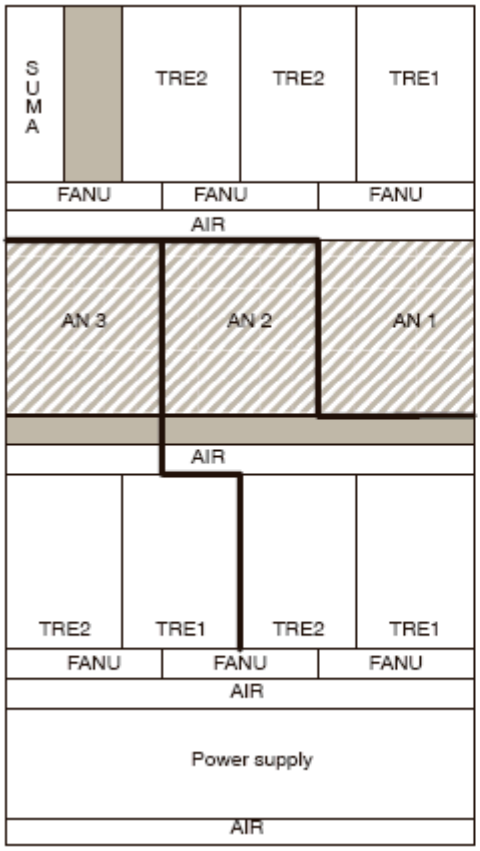


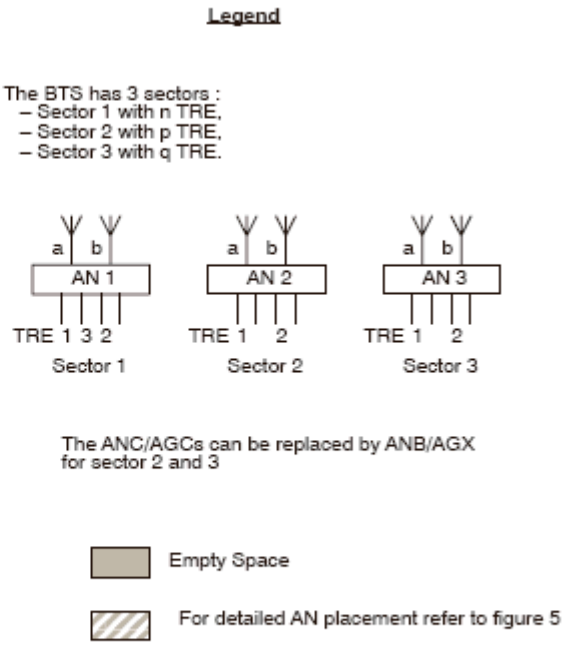
2.14.3 A9100 MBO2E 3 Sectors



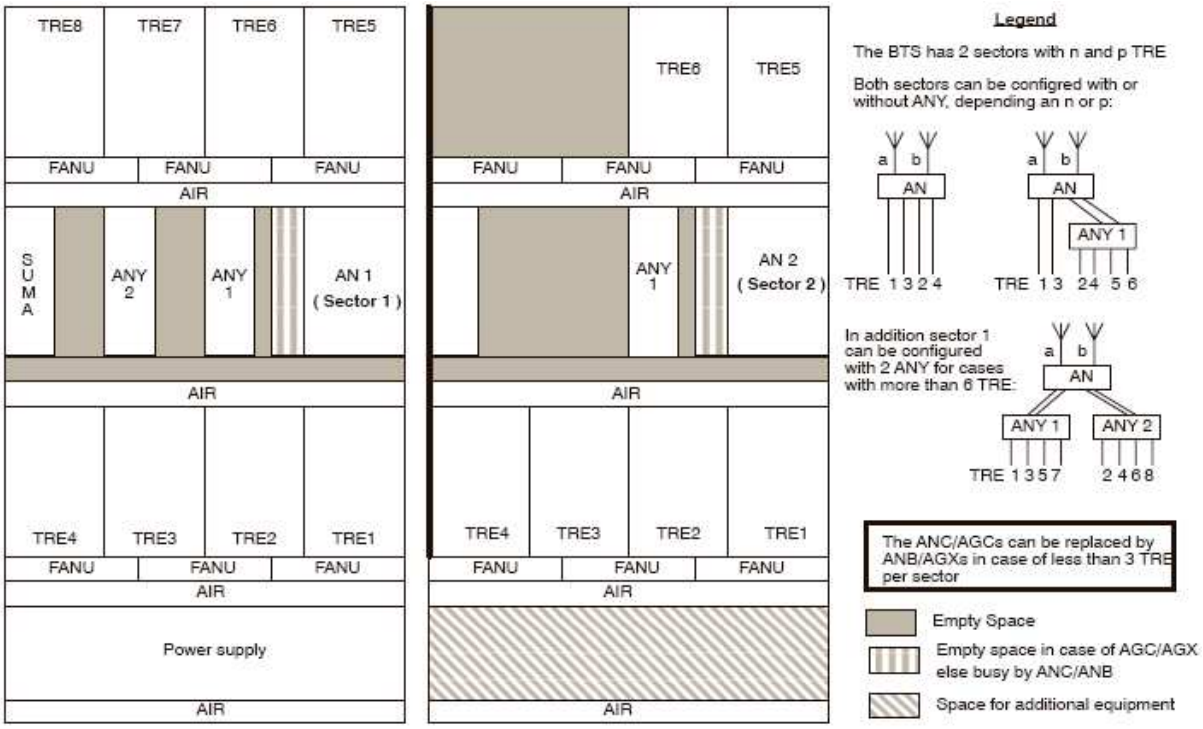


The following figure shows the MBO1E - 3 sectors with 3 TRE in one sector.

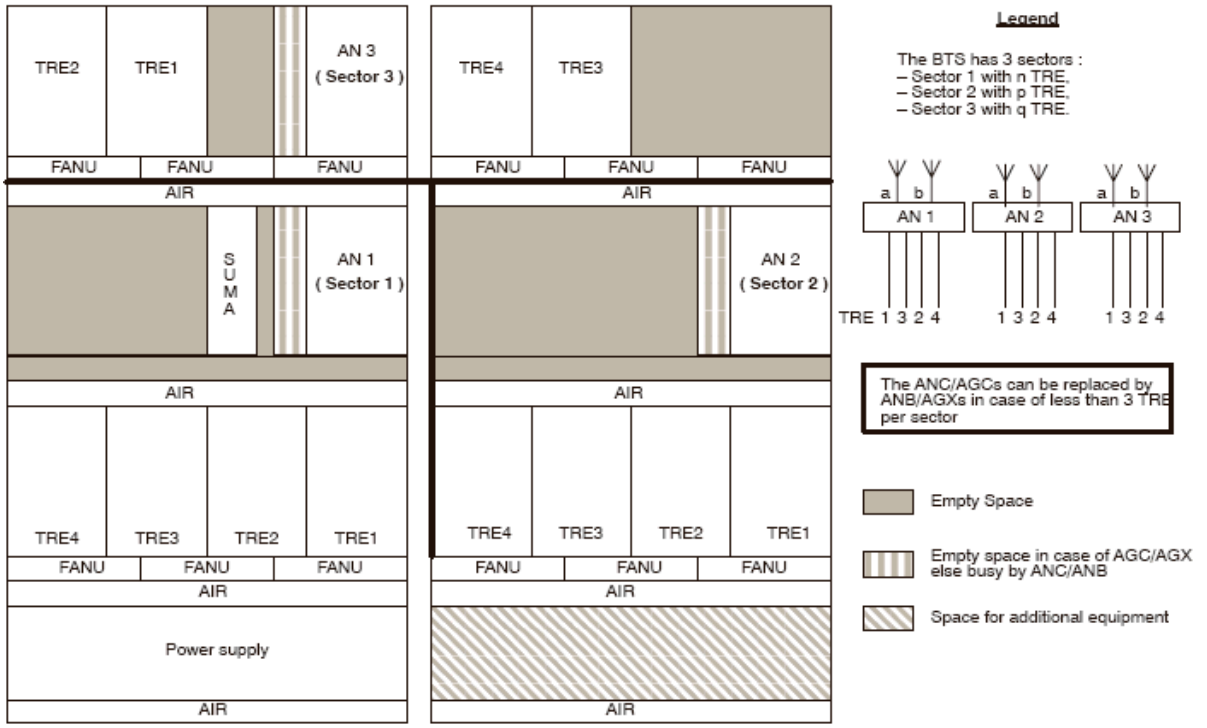




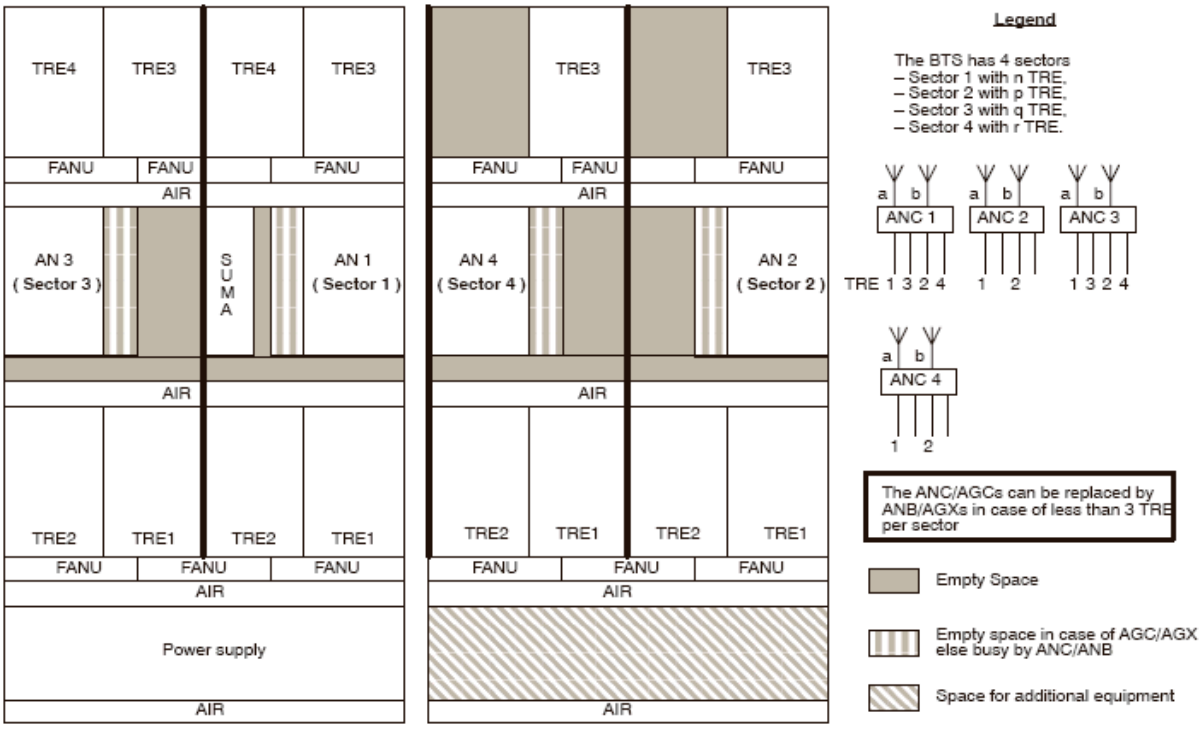
2.14.4 A9100 MBO2E 2 Sectors



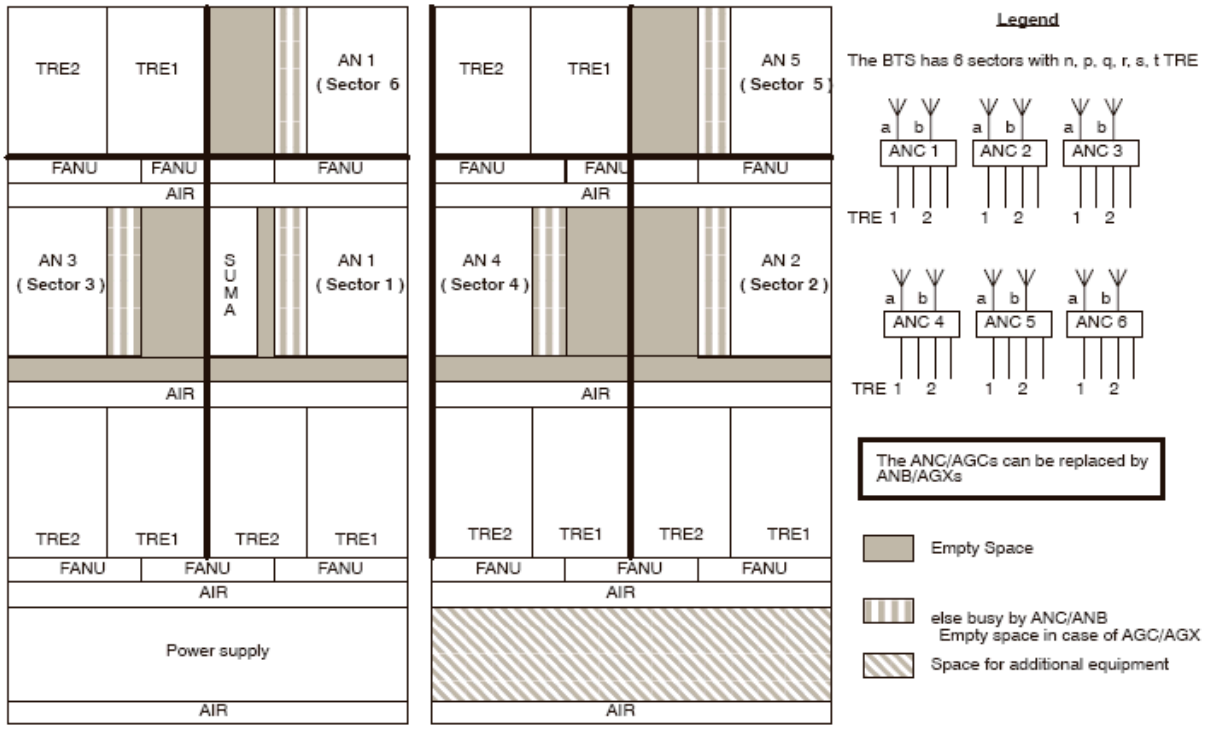
2.14.5 A9100 MBO2E 3 Sectors



2.14.6 A9100 MBO2 4 Sectors



2.14.7 A9100 MBO2 6 Sectors

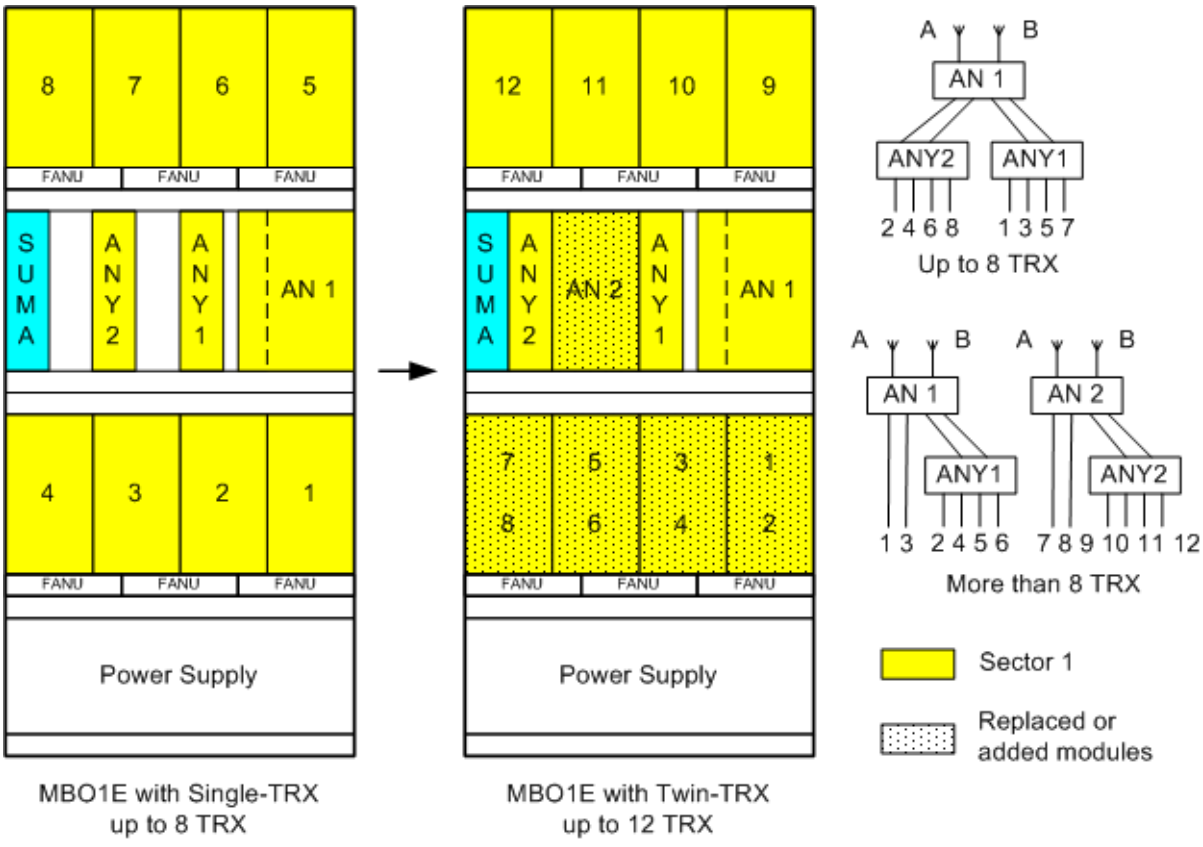


2.15 Multistandard Base Station Outdoor Evolution Mixed Configurations Based on Extension with Twin TRX

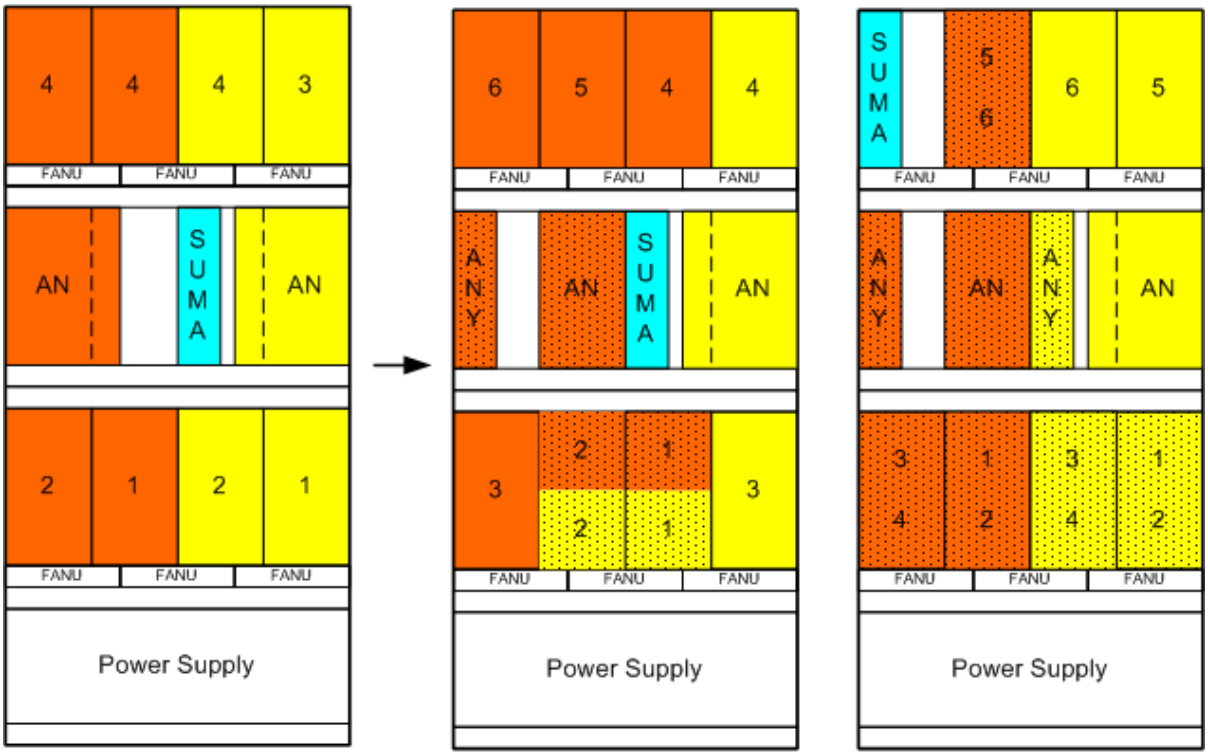
The following table gives the possible configuration extension based on Twin TRX modules.

Cabinet	Number of sectors	Carriesrs per sector
		Single TRX -> Twin TRX
MBO1E	1	*8 -> 12*
	2	*4/4 ->4/6(6/6*)*
	3	*2/2/2 -> 4/4/4*
MBO2E	1	n.a.
	2	*8/6 -> 12/12*
	3	*4/4/4 -> 8/8/8*

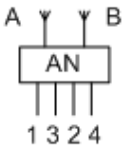
2.15.1 MBO1E - 1 Sector mixed configuration Single/Twin-TRX



2.15.2 MBO1E - 2 Sectors mixed configuration Single/Twin-TRX

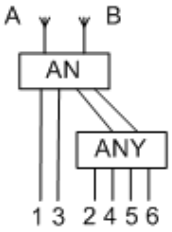


MBO1E with Single-TRX
up to 4/4 TRX



Up to 4 TRX per sector

MBO1E with Twin-TRX
up to 4/6 TRX



Up to 6 TRX per sector

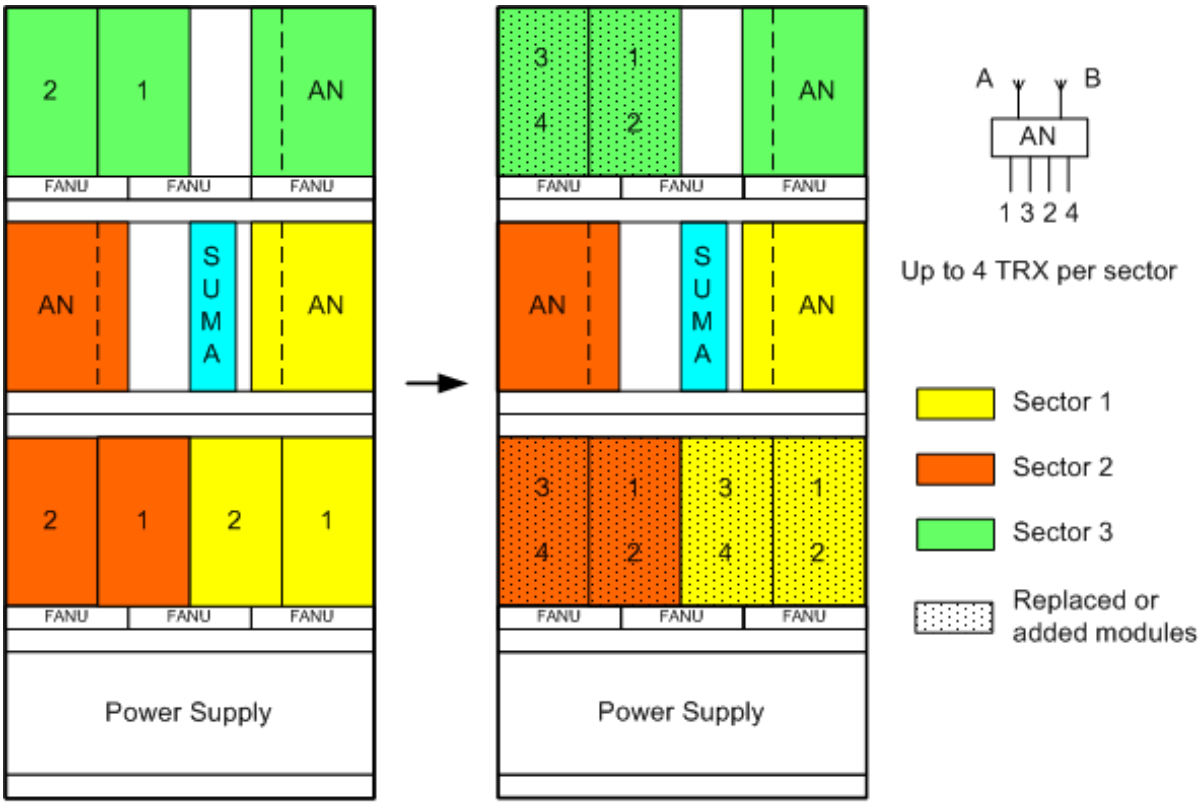
MBO1E with Twin-TRX
up to 6/6 TRX
with SUMA location change

Sector 1

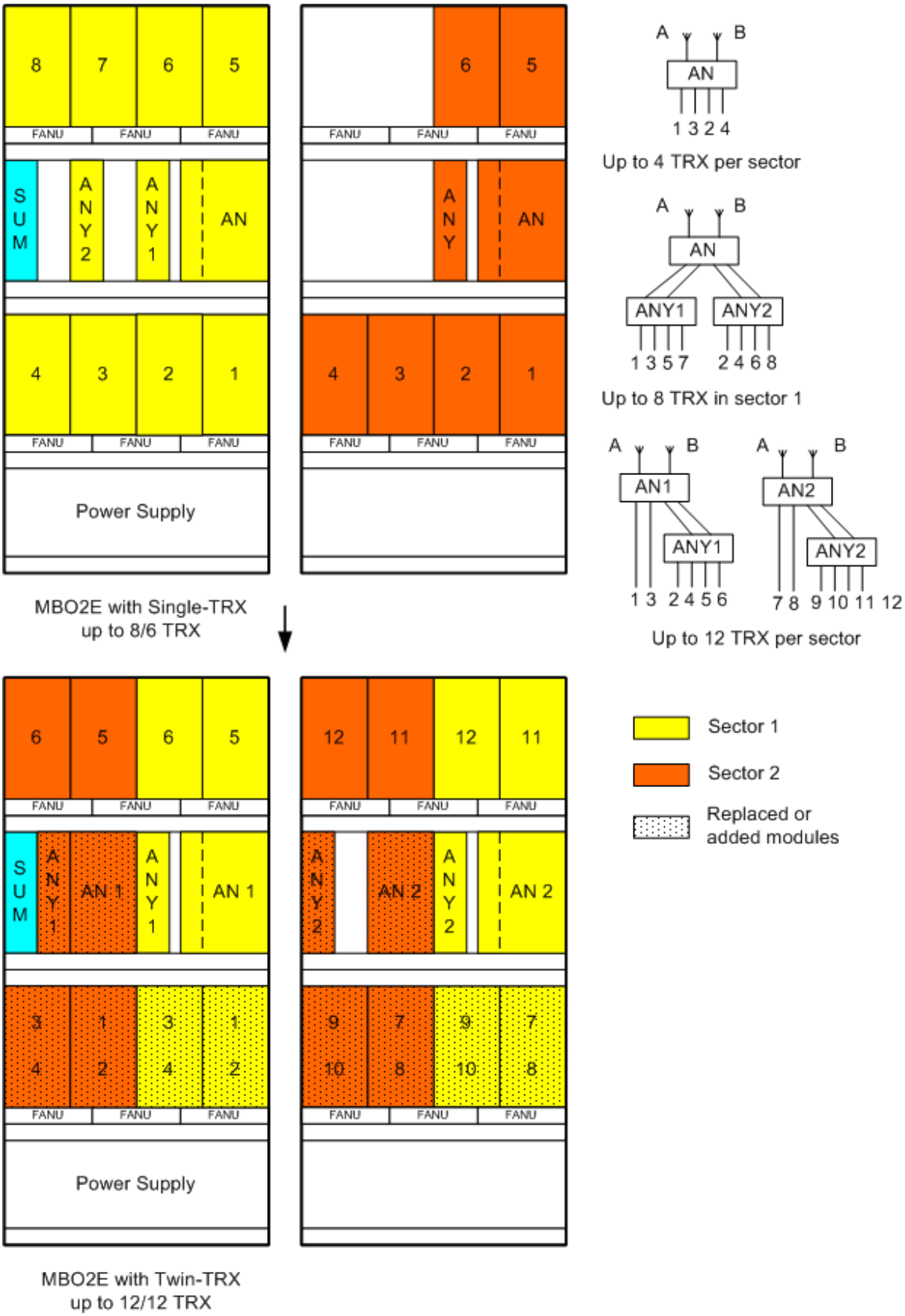
Sector 2

Replaced or
added modules

2.15.3 MBO1E - 3 Sectors mixed configuration Single/Twin-TRX



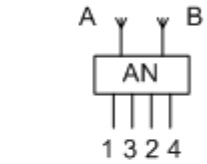
2.15.4 MBO2E - 2 Sectors mixed configuration Single/Twin-TRX



2.15.5 MBO2E - 3 Sectors mixed configuration Single/Twin-TRX



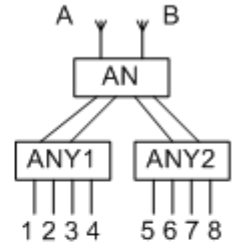
MBO2E with Single-TRX
up to 4/4/4 TRX



Up to 4 TRX per sector



MBO2E with Twin-TRX
up to 8/8/8 TRX



Up to 8 TRX in sector



2.16 Multistandard Base Station Outdoor Evolution Configurations with Twin TRX

2.16.1 Introduction

The following table gives the Twin TRX configurations.

Twin Mode	Number of sectors	MBO1E Carriers per sector	MBO2E Carriers per sector
Capacity Mode	1	*8*	*8*
	2	*6/6*	*8/8*
	3	*4/4/4*	*8/8/8*
	4	*2/2/2/2*	*6/6/6/6*
Capacity Mode Low Loss	1	*12*	*16*
	2	*6/6*	12/12
	3	-	8/8/8
Multiband & Multiband Cell	1	*6 + 6*	*12 + 12*
	2	*2/2 + 2/2*	*6/6 + 6/6*
	3	-	*4/4/4 + 4/4/4*
Coverage Mode TxDiv. 2Rx Div.	1	*4*	*4*
	2	*2/2*	*4/4*
	3	*2/2/2*	*4/4/4*
Coverage Mode TxDiv. 2Rx Div. Low Loss	1	*2*	*2*
	2	*2/2*	*2/2*
	3	-	*2/2/2*
Coverage Mode TxDiv. 4Rx Div.	1	*2*	*2*
	2	*2/2*	*2/2*
	3	-	*2/2/2*

Twin Mode	Number of sectors	MBO1E Carriers per sector	MBO2E Carriers per sector
Extended Cell	1 In, 1 Out	*4+4*	*8+8*
Extended Cell TxDiv, 4RX Div for outer cell	1 In, 1 Out	*4+2*	*8+2*

Table 7: Twin TRX Configurations

2.16.2 Transceiver Module

TRM stands for TRansceiver Module and it can be:

- Twin module (TGT09 TGT18), or
- Single module (TRAG TAGH TRAD TRAP TRAL TADH)

The twin module can operate as:

- One TRM for two TRE, and two TRX in capacity mode
- One TRM for one TRE, and one TRX in Tx Div mode.

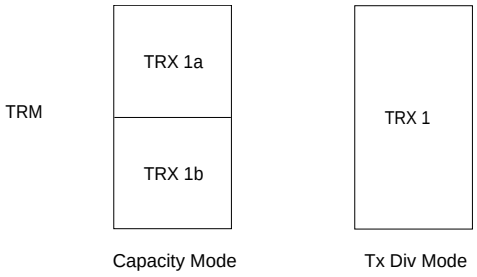
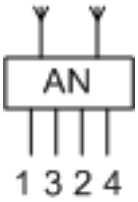


Figure 177: Twin Module Modes

2.16.3 Cabling Information

2.16.3.1 Standard Configuration

The following symbol



is equivalent with

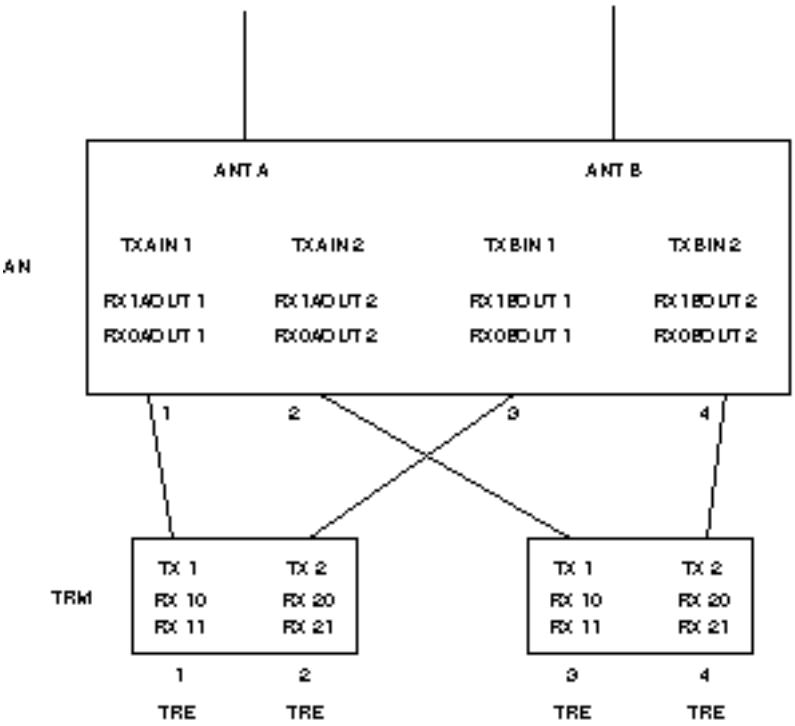


Figure 178: Up to 4 TREs

or

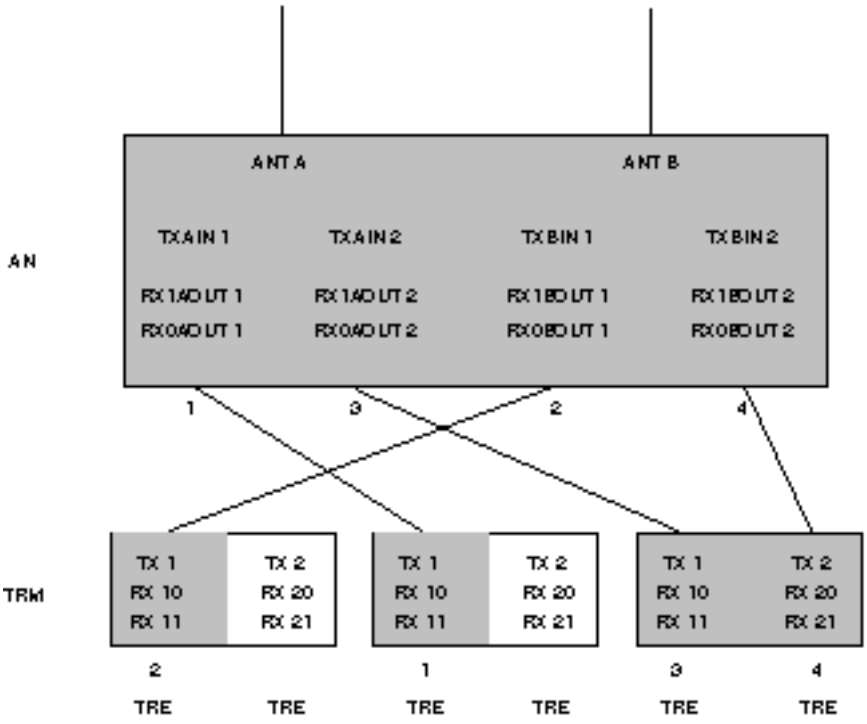
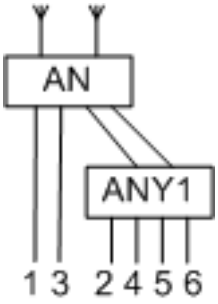


Figure 179: Up to 4 TREs

The following symbol



is equivalent with

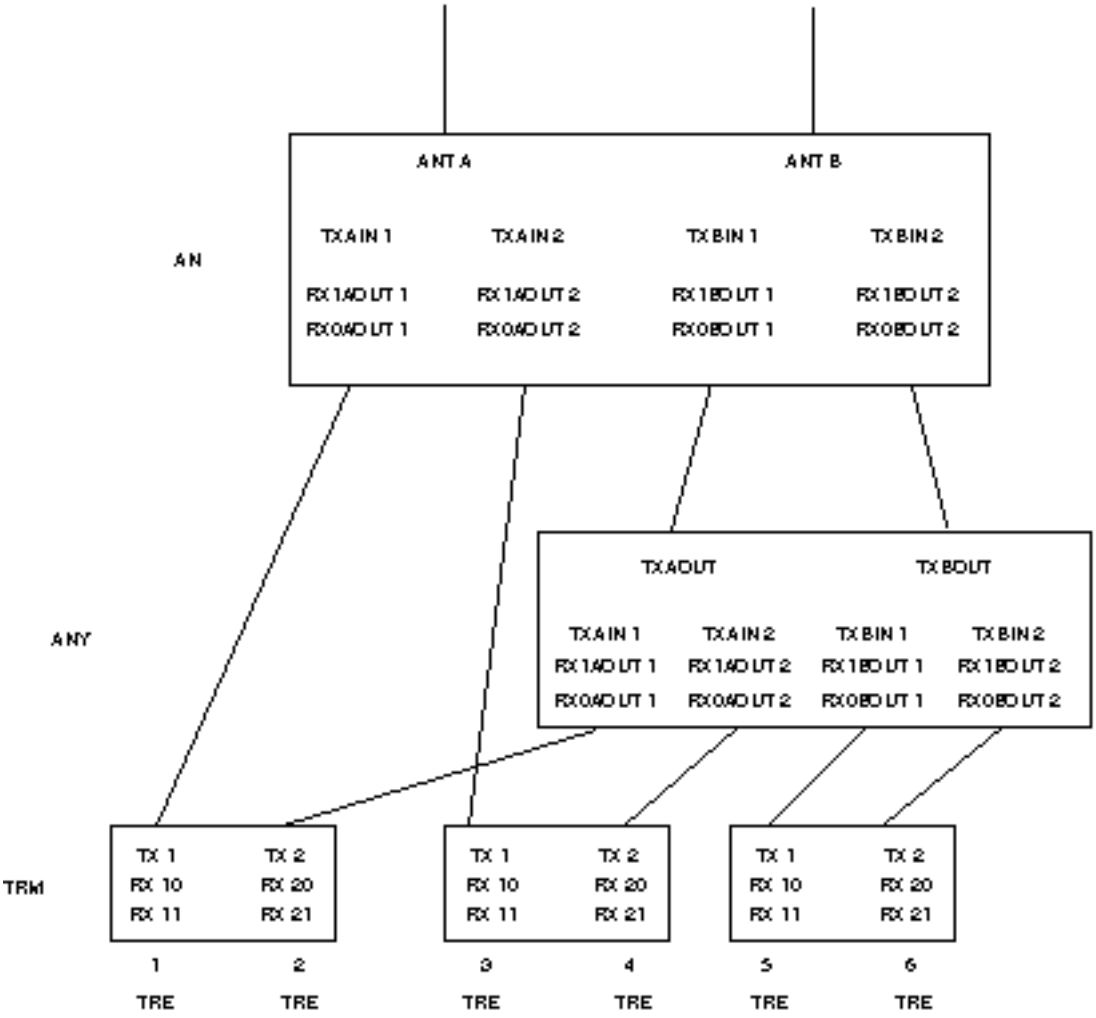
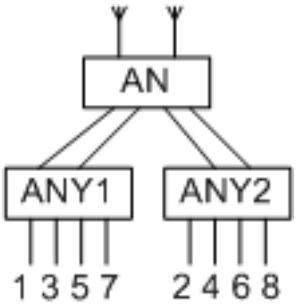


Figure 180: Up to 6 TREs

The following symbol



is equivalent with

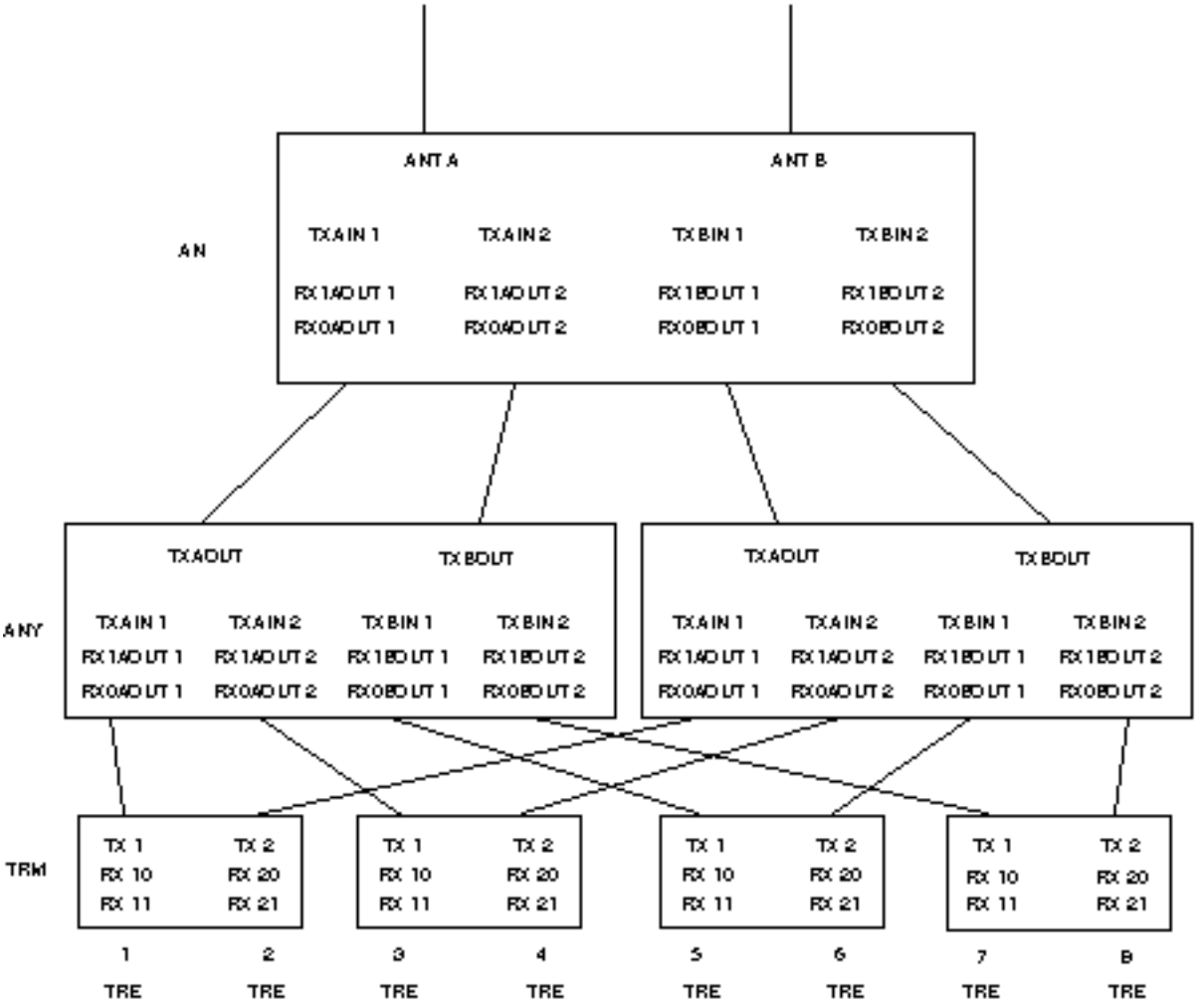
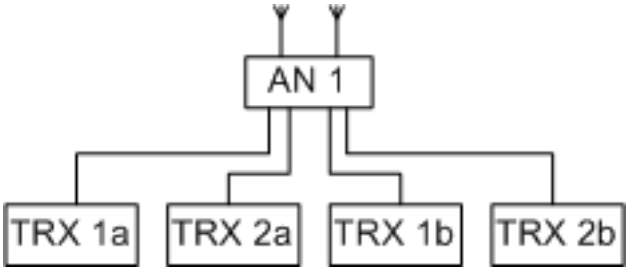


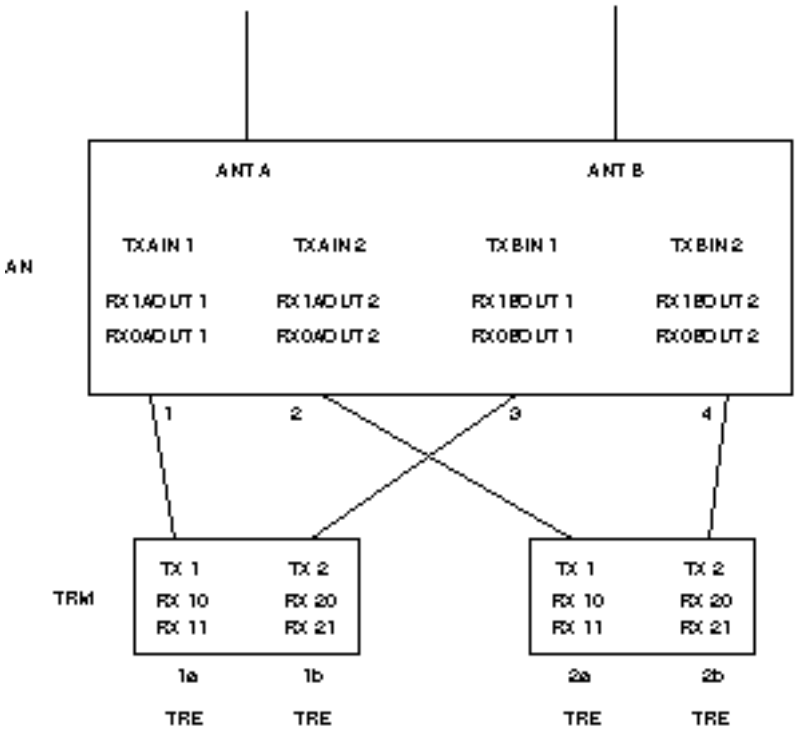
Figure 181: Up to 8 TREs

2.16.3.2 Tx Div 2Rx Div Configurations

The following symbol

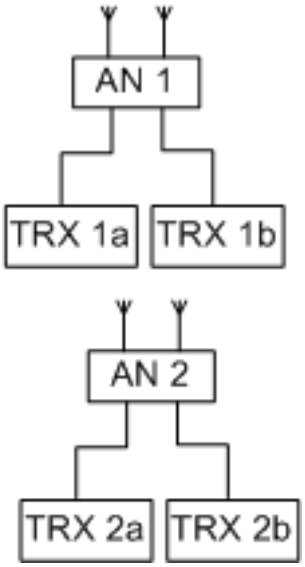


is equivalent with

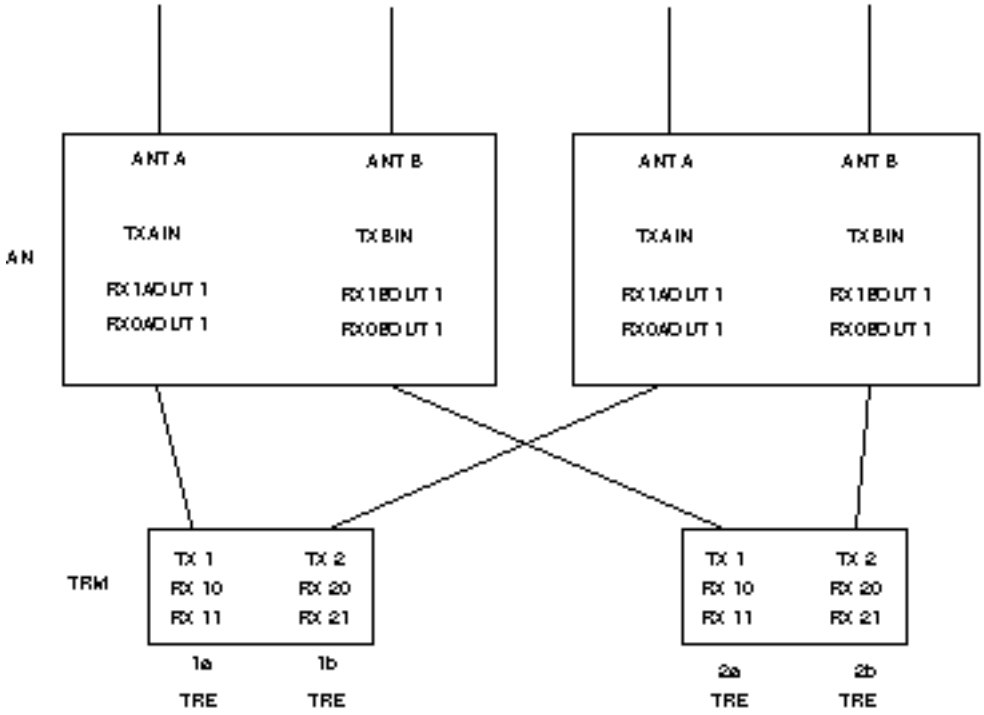


2.16.3.3 Tx Div 4Rx Div Configurations

The following symbol

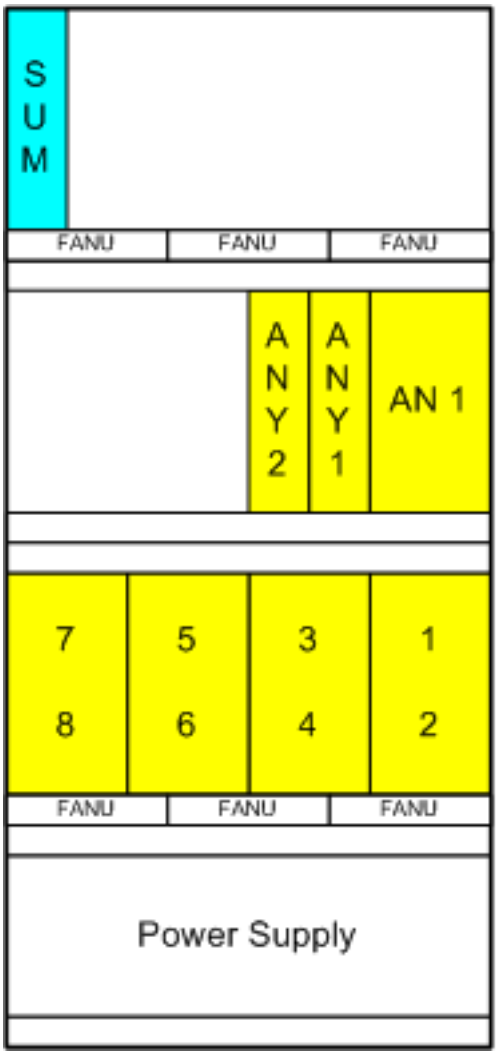


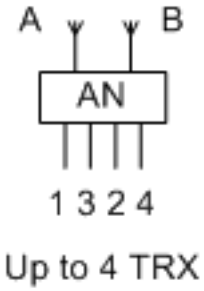
is equivalent with



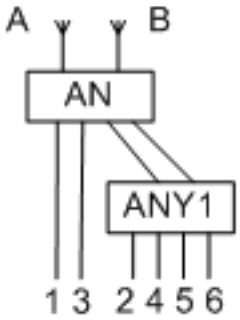
2.16.4 Capacity Mode

2.16.4.1 MBO1E - 1 Sector with Twin-TRX

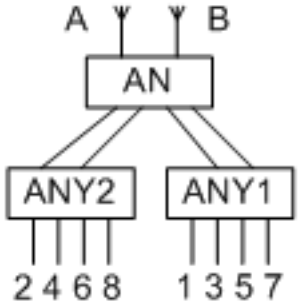




Up to 4 TRX

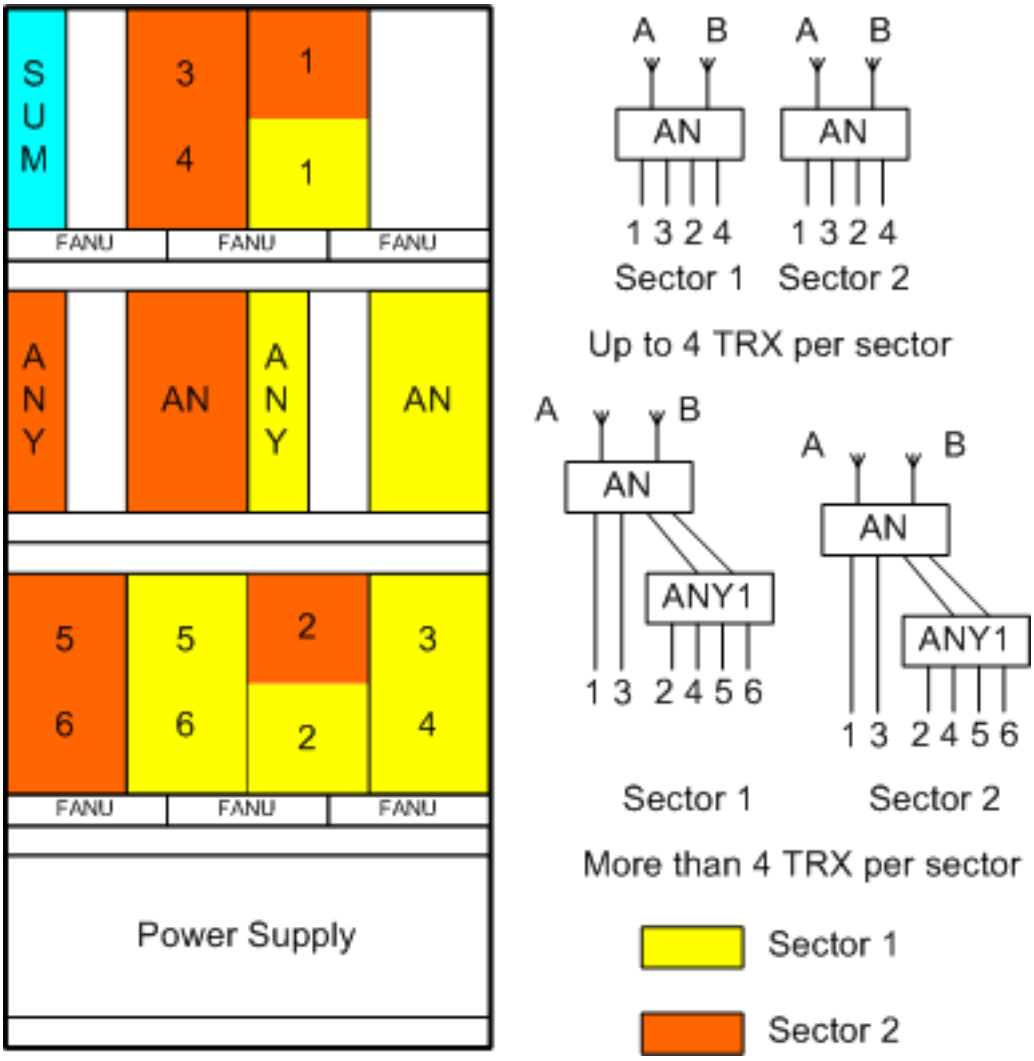


Up to 6 TRX

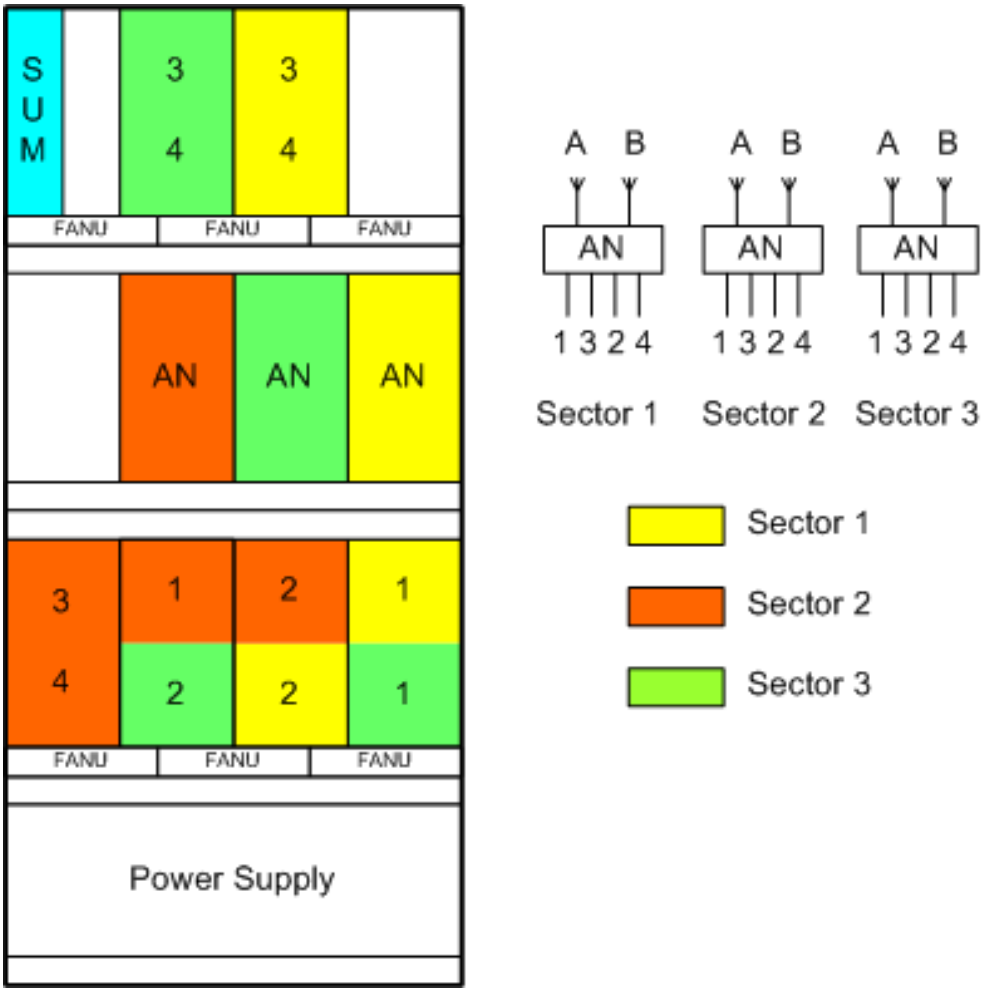


More than 6 TRX

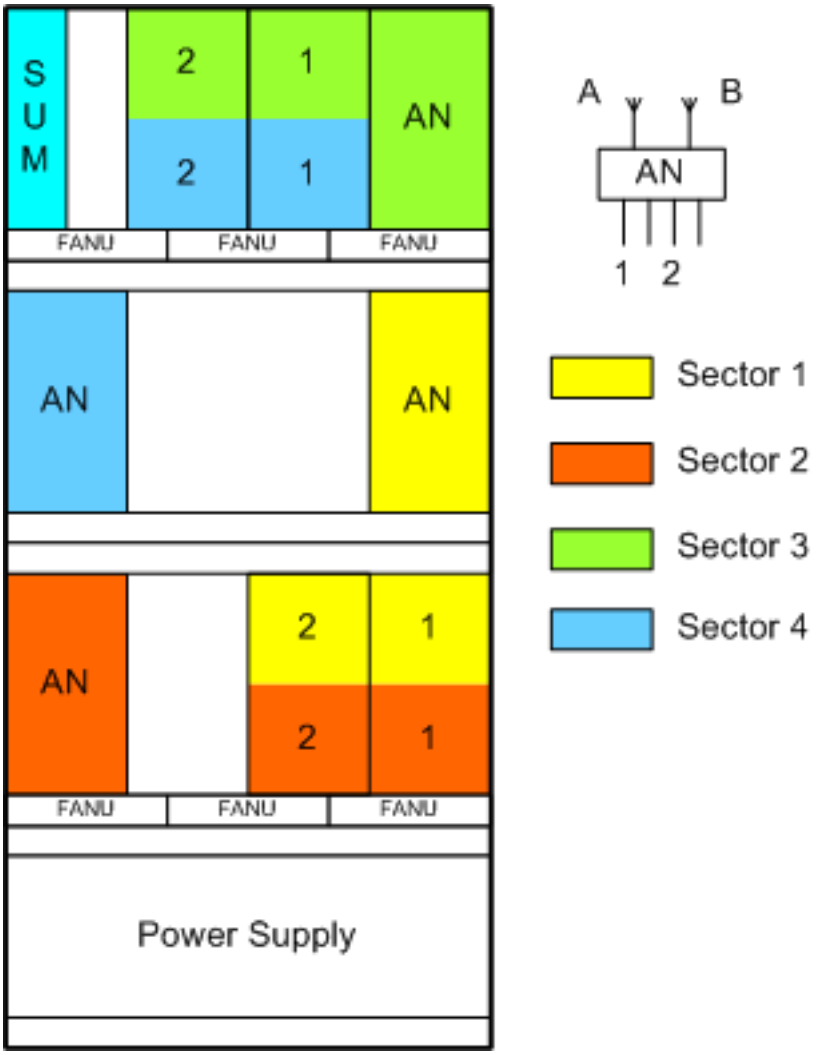
2.16.4.2 MBO1E - 2 Sectors with Twin-TRX



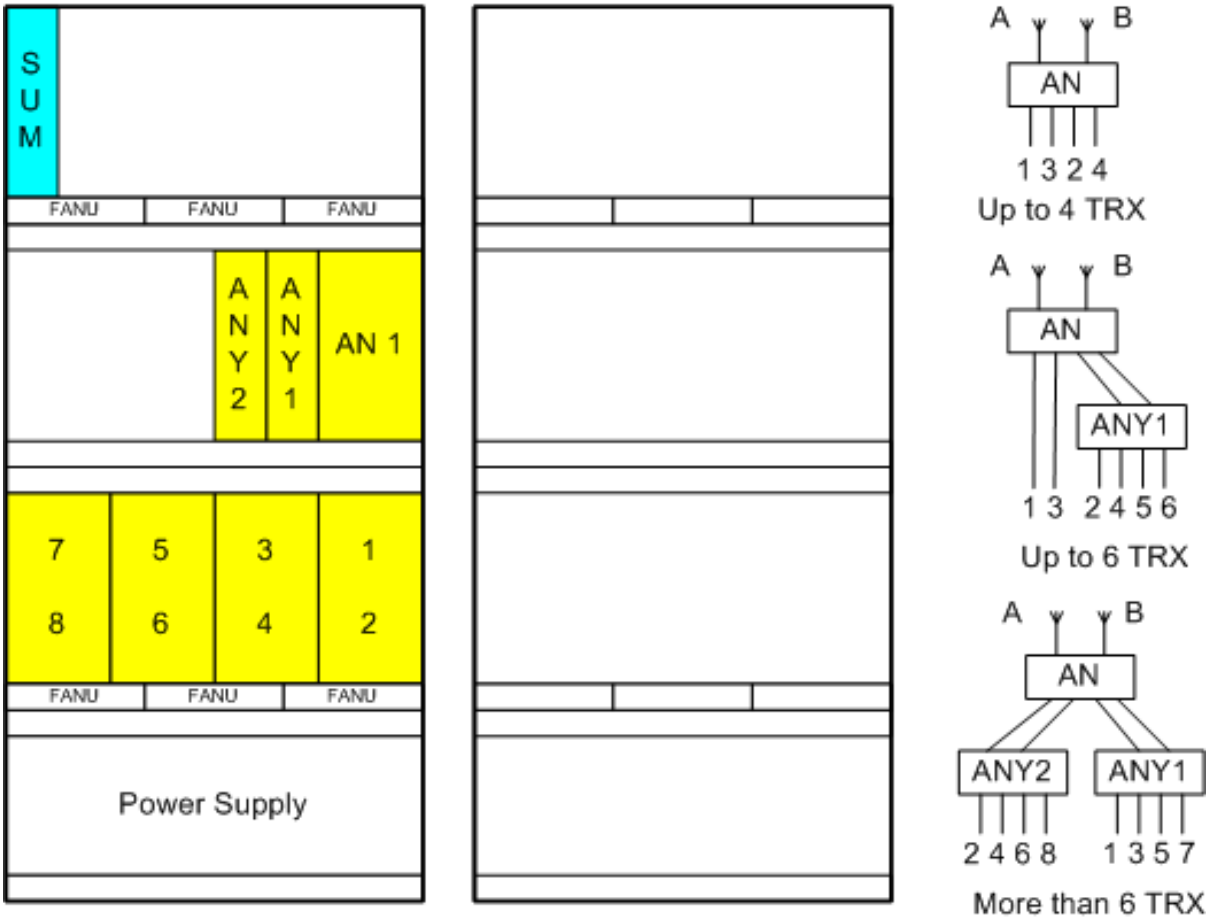
2.16.4.3 MBO1E - 3 Sectors with Twin-TRX



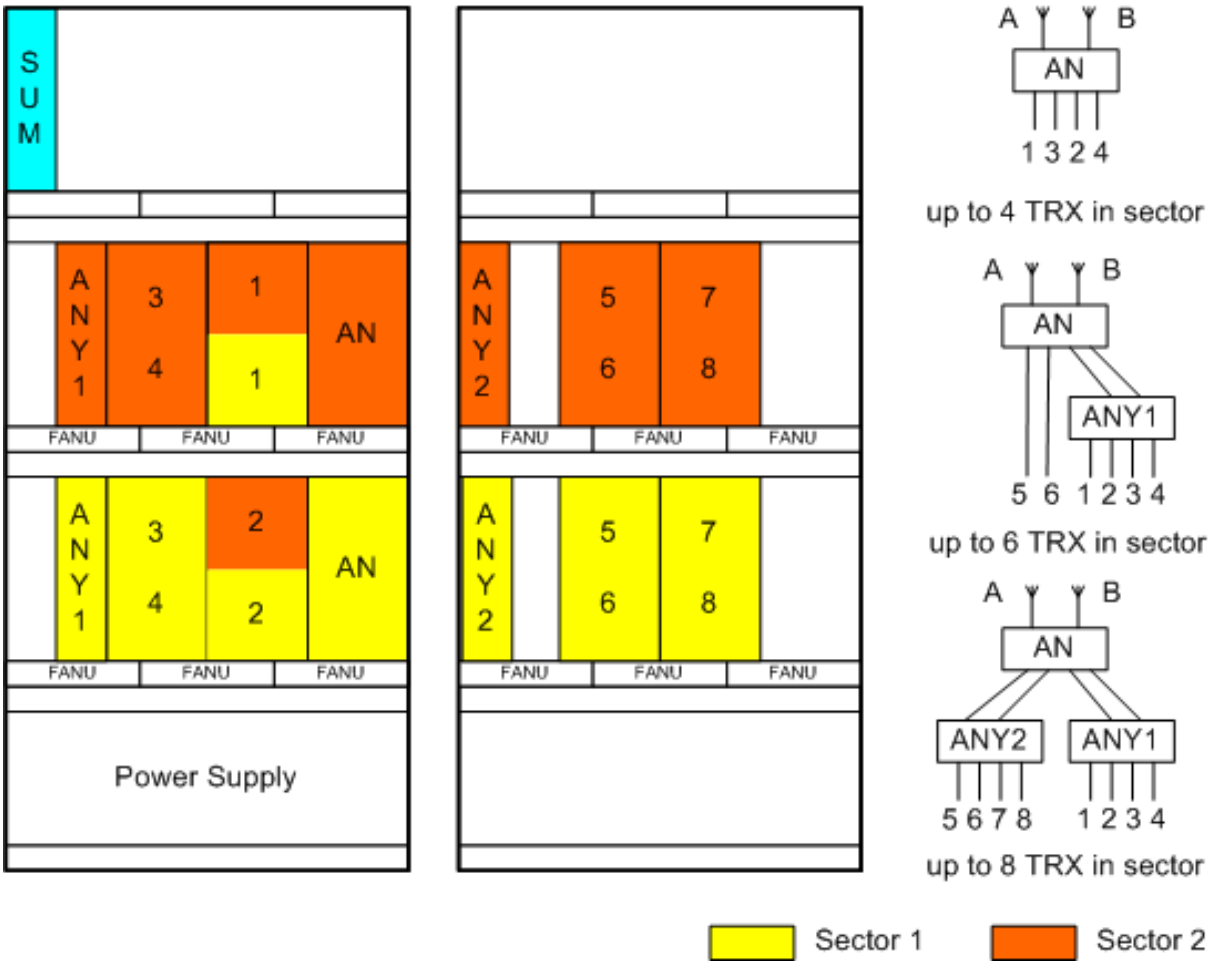
2.16.4.4 MBO1 - 4 Sectors with Twin-TRX



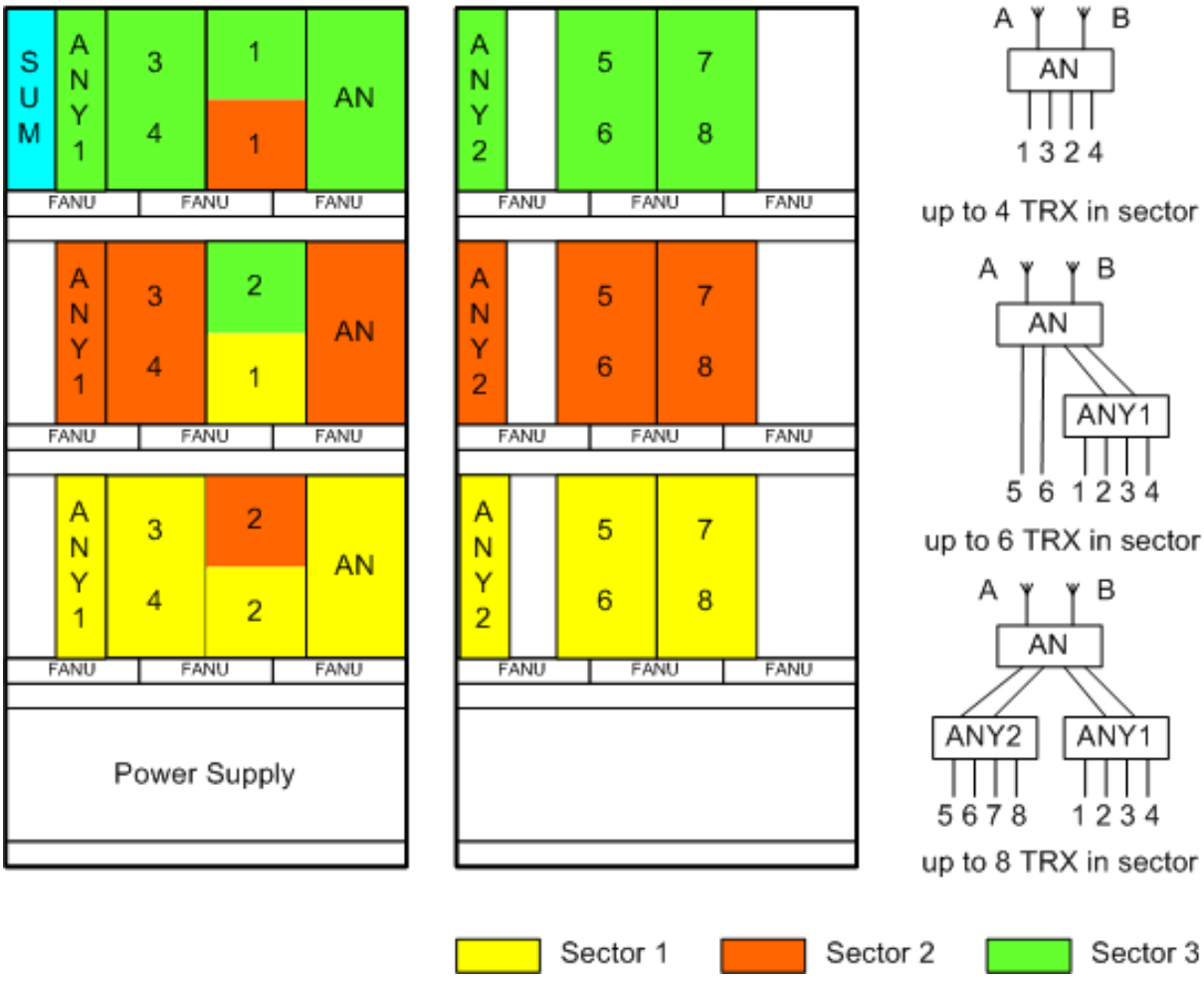
2.16.4.5 MBO2E - 1 Sector with Twin-TRX



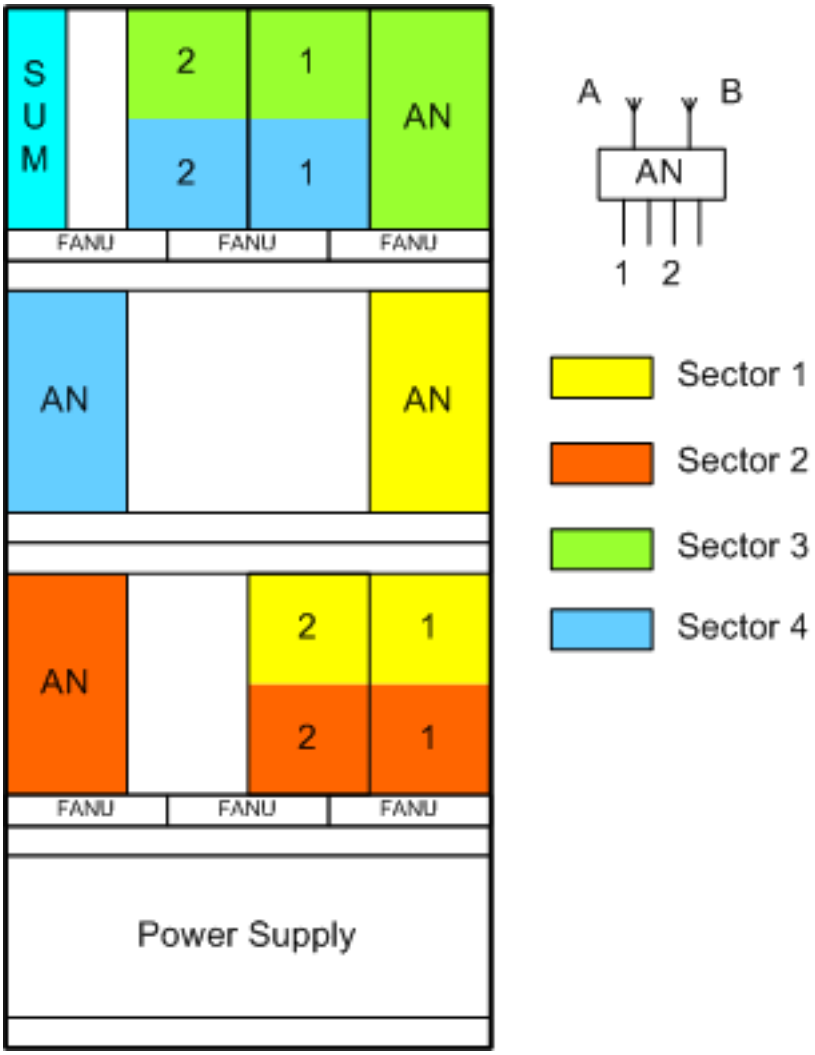
2.16.4.6 MBO2E - 2 Sectors with Twin-TRX



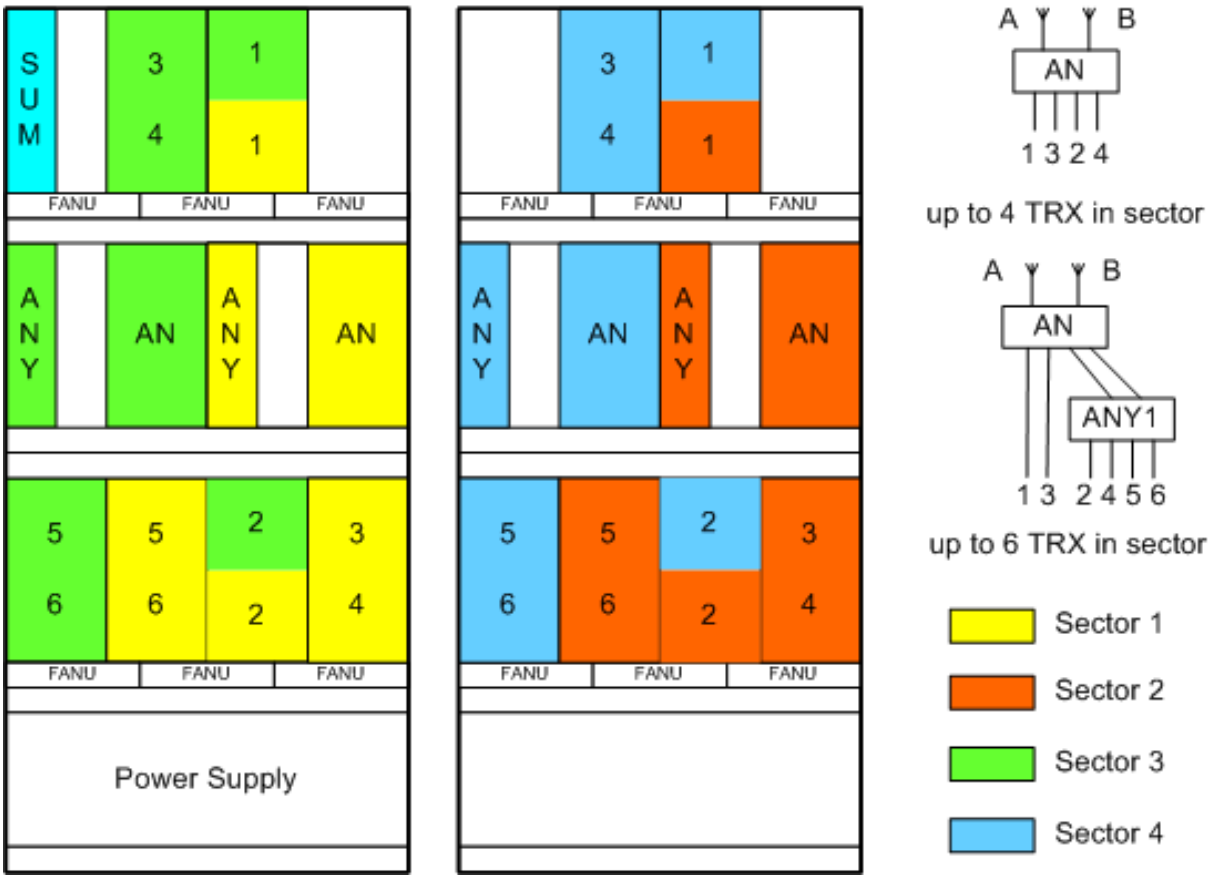
2.16.4.7 MBO2E - 3 Sectors with Twin-TRX



2.16.4.8 MBO1E - 4 Sectors with Twin-TRX

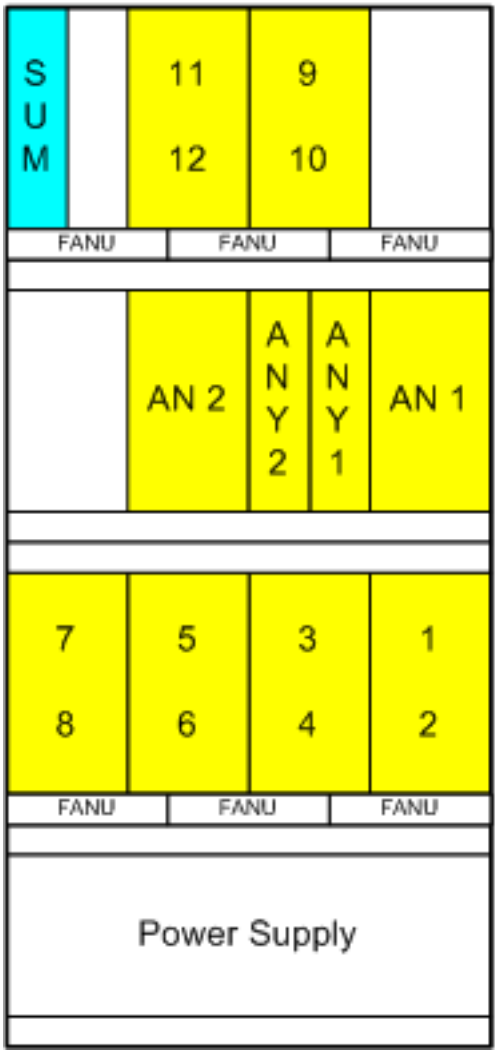


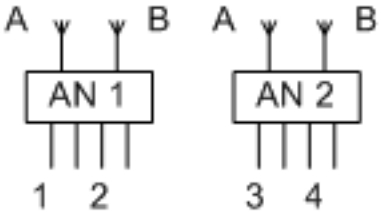
2.16.4.9 MBO2E - 4 Sectors with Twin-TRX



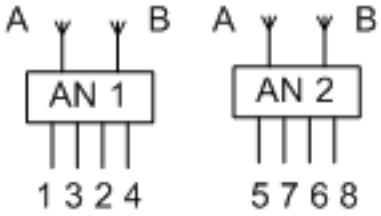
2.16.5 Capacity Mode Low Loss

2.16.5.1 MBO1 - 1 Sector Low Loss with Twin-TRX

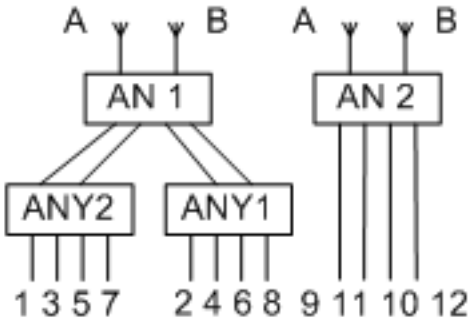




Up to 4 TRX,
non-combining mode

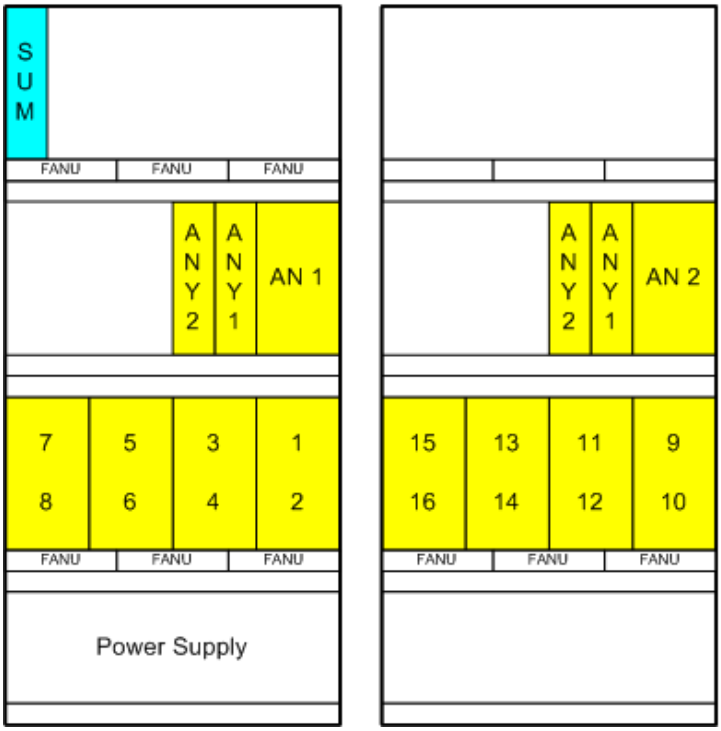


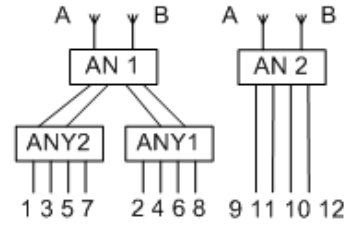
Up to 8 TRX



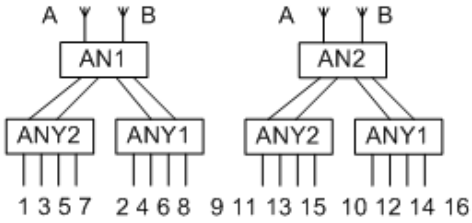
More than 8 TRX

2.16.5.2 MBO2E - 1 Sector Low Loss with Twin-TRX



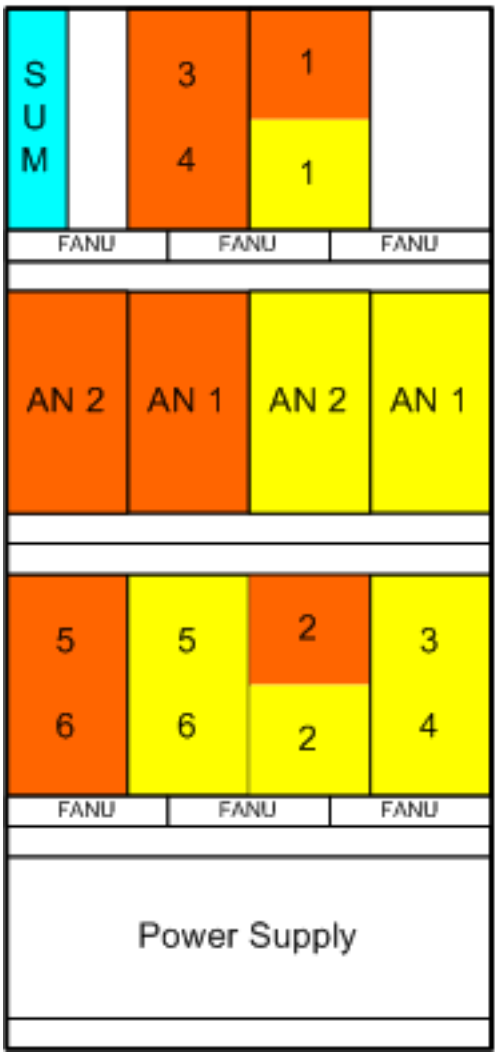


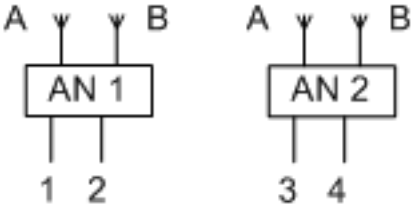
Configurations from 9 to 12 TRX



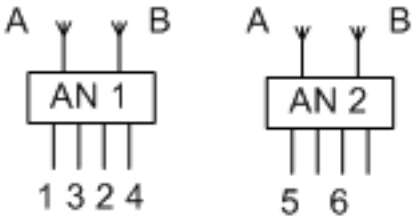
Configurations from 13 to 16 TRX

2.16.5.3 MBO1E - 2 Sectors Low Loss with Twin-TRX





Up to 4 TRX per sector, non-combining mode

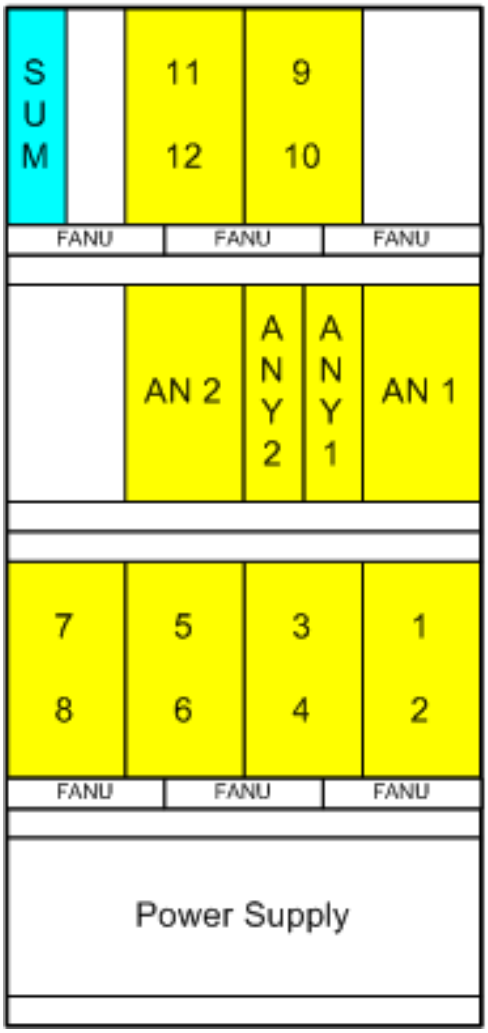


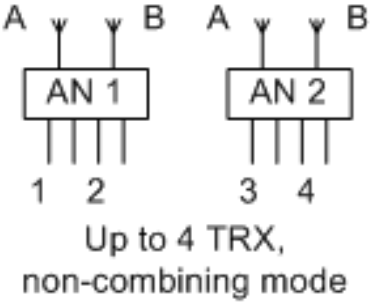
More than 4 TRX per sector

Sector 1

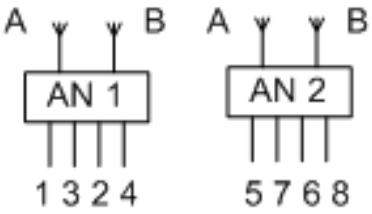
Sector 2

2.16.5.4 MBO2E - 2 Sectors Low Loss with Twin-TRX

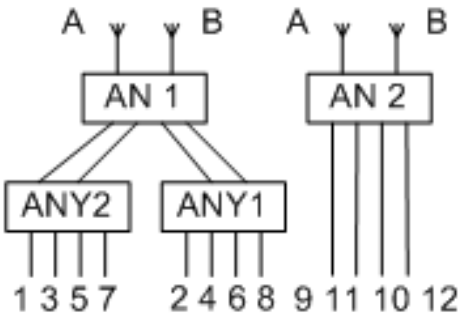




Up to 4 TRX, non-combining mode

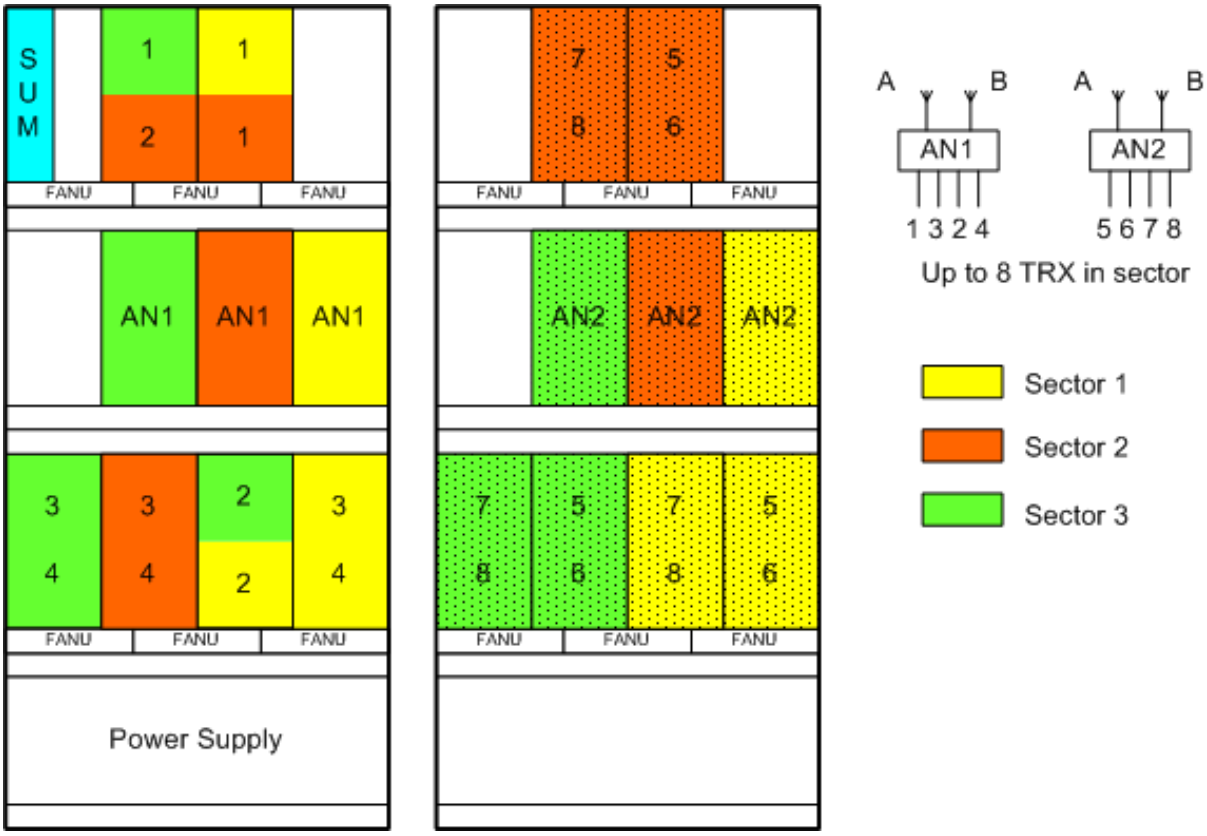


Up to 8 TRX



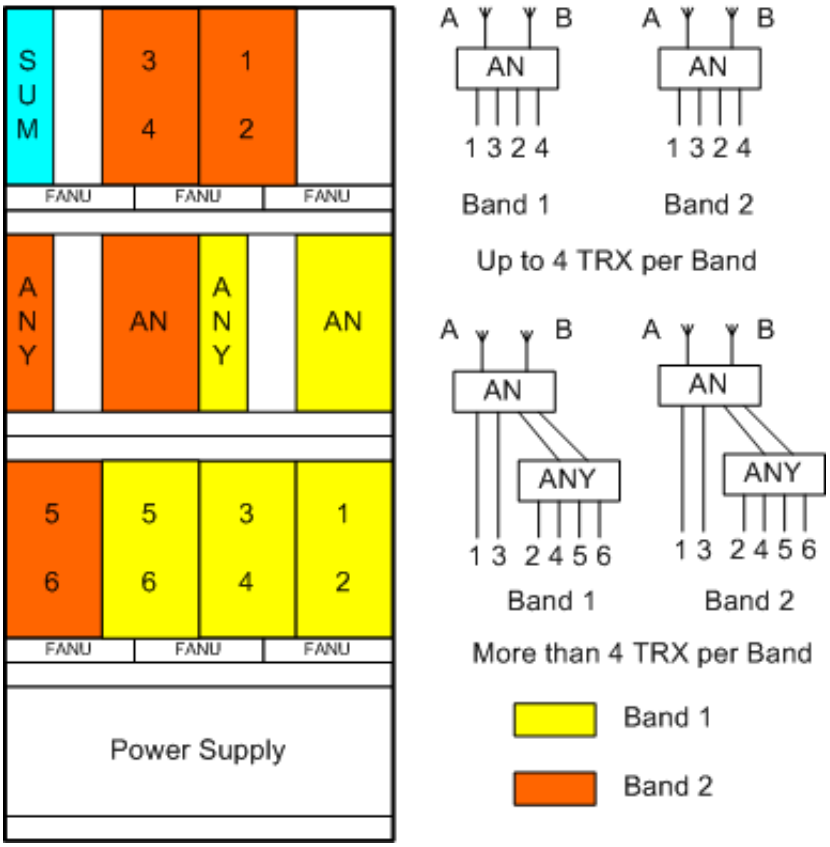
More than 8 TRX

2.16.5.5 MBO2E - 3 Sectors Low Loss with Twin-TRX



2.16.6 Multiband & Multiband Cell

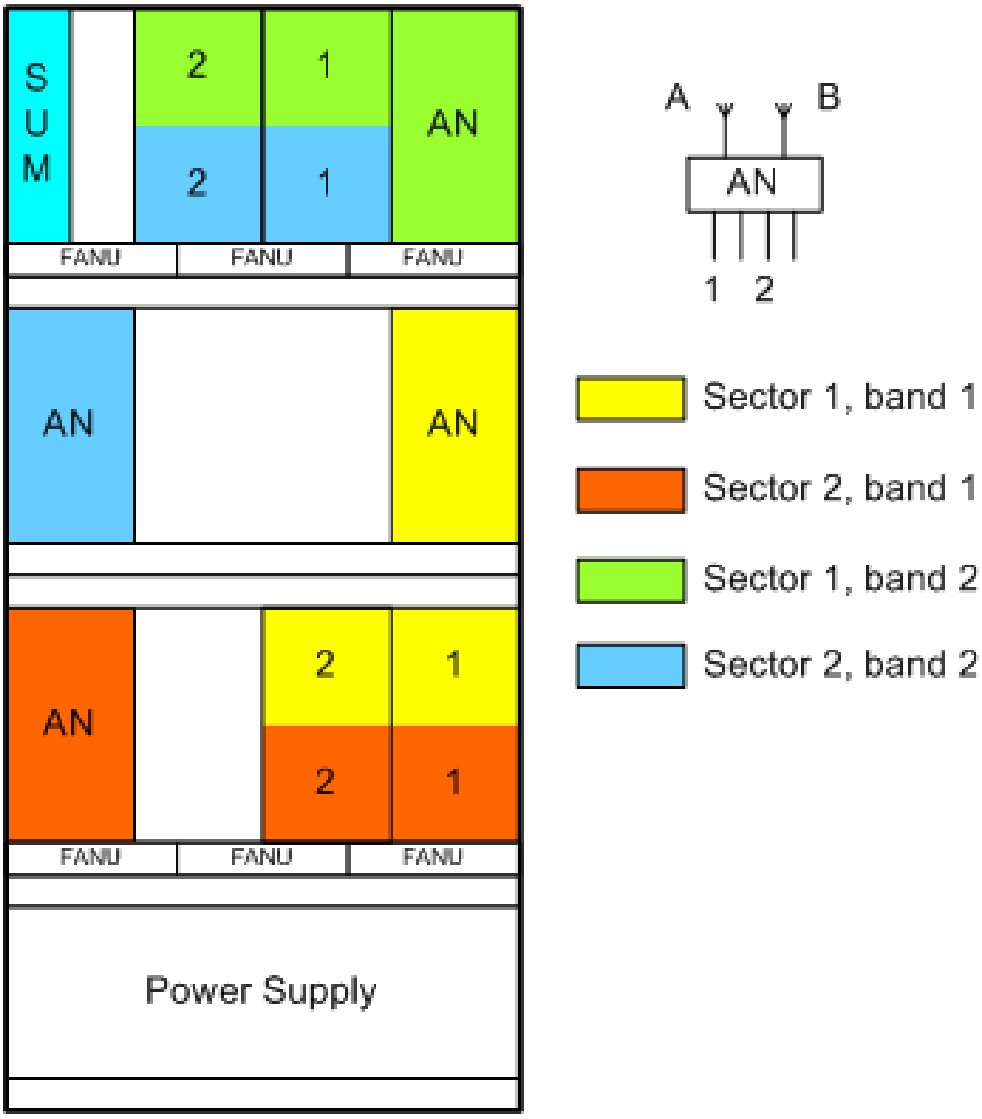
2.16.6.1 MBO1E - Multiband 1 + 1 Sector with Twin-TRX



Multiband BTS: The BTS has 2 sectors with n and p TRX

Multiband Cell: The BTS has 1 sector with n TRX in 900 MHz and p TRX in 1800 MHz

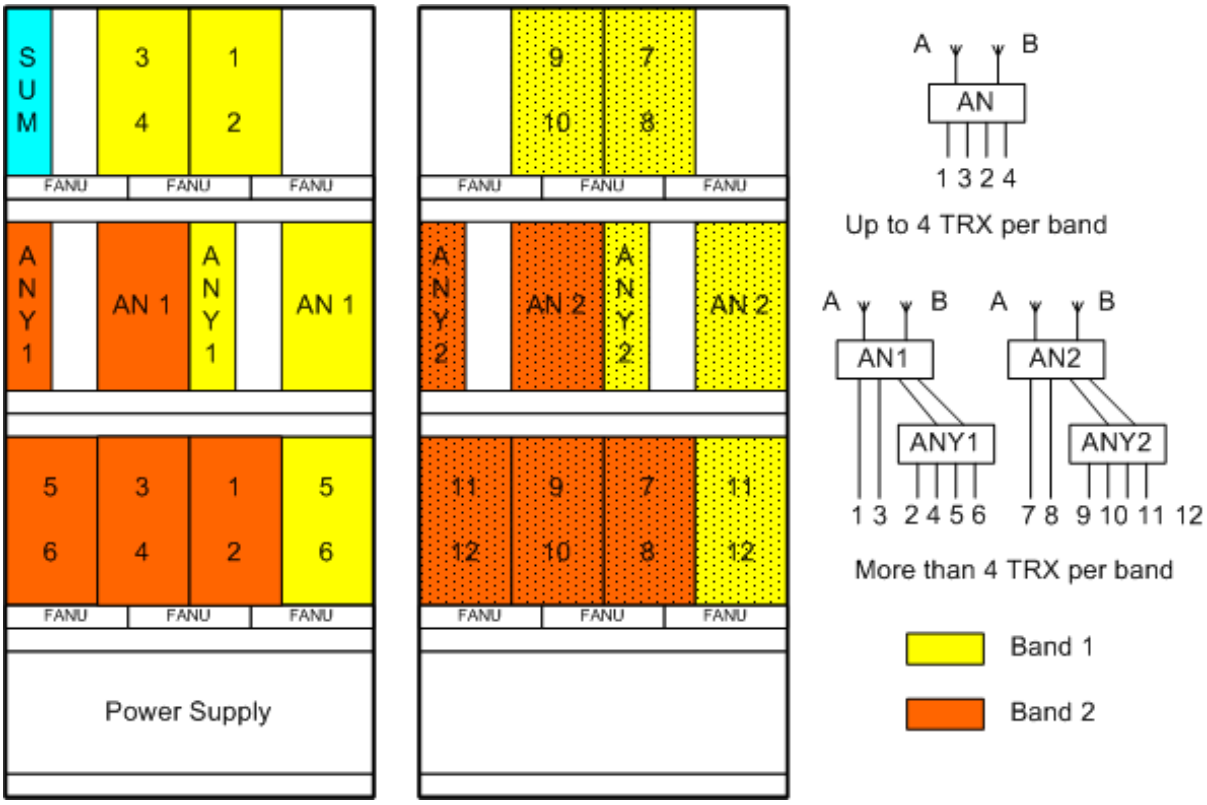
2.16.6.2 MBO1E - Multiband 2 + 2 Sectors with Twin-TRX



Multiband BTS: The BTS has 4 sectors with n and q TRX in 900 MHz plus p and r TRX in 1800 MHz

Multiband Cell: The BTS has 1 sector with n TRX in 900 MHz and p TRX in 1800 MHz and 1 sector with q TRX in 900 MHz and r TRX in 1800 MHz

2.16.6.3 MBO2E - Multiband 1 + 1 Sector with Twin-TRX



Multiband BTS: The BTS has 2 sectors with n and p TRX

Multiband Cell: The BTS has 1 sector with n TRX in 900 MHz and p TRX in 1800 MHz

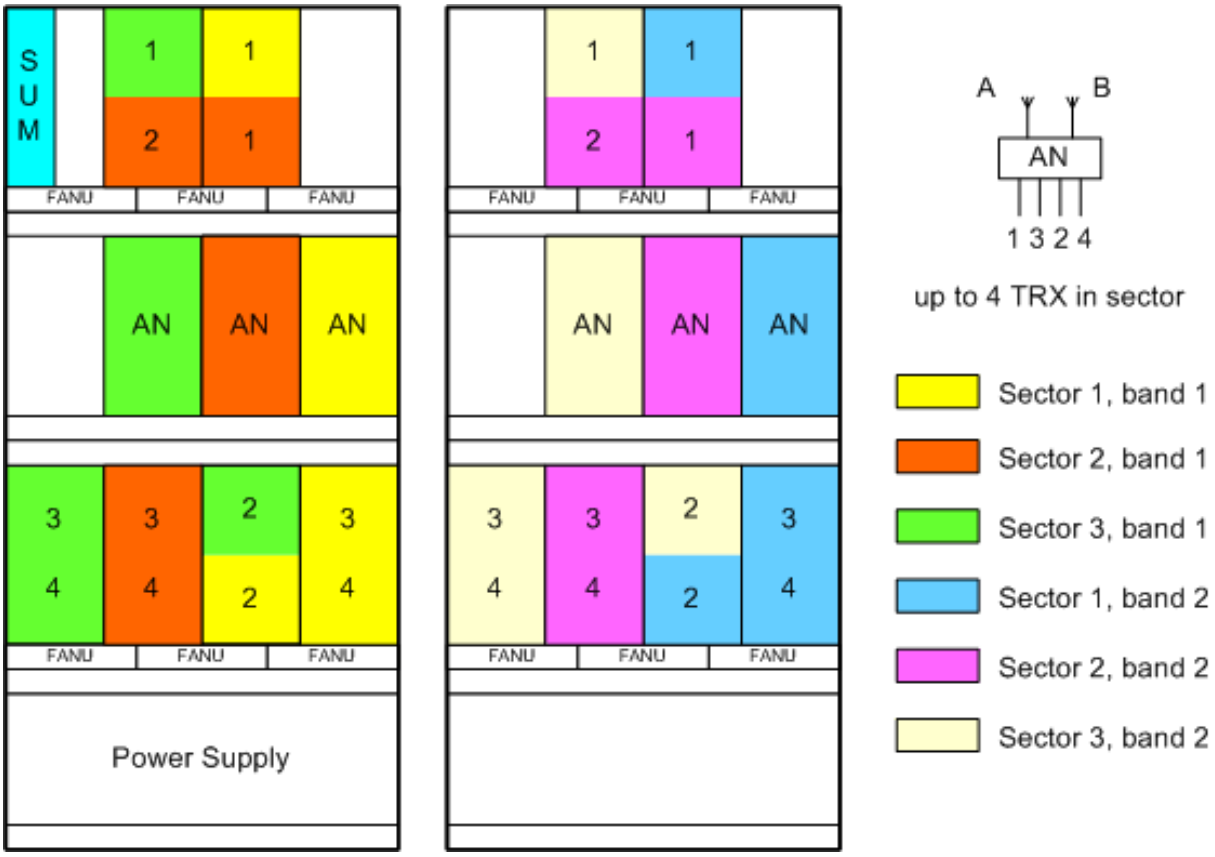
2.16.6.4 MBO2E - Multiband 2 + 2 Sectors with Twin-TRX



Multiband BTS: The BTS has 4 sectors with n and q TRX in 900 MHz plus p and r TRX in 1800 MHz

Multiband Cell: The BTS has 1 sector with n TRX in 900 MHz and p TRX in 1800 MHz and 1 sector with q TRX in 900 MHz and r TRX in 1800 MHz

2.16.6.5 MBO2E - Multiband 3 + 3 Sectors with Twin-TRX

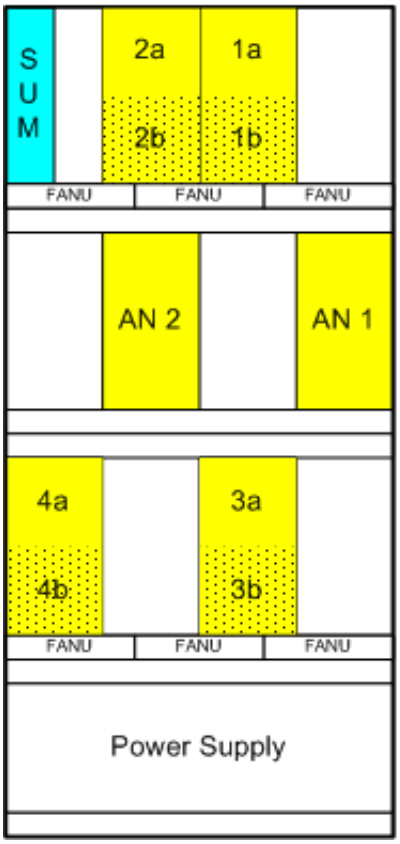


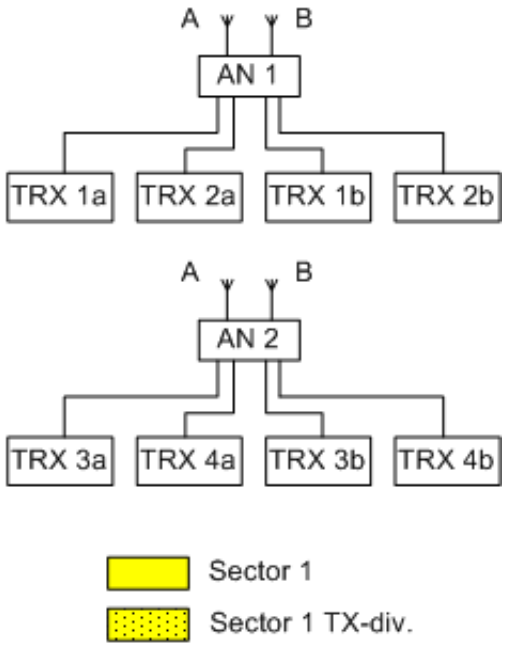
Multiband BTS: The BTS has 6 sectors with n,q,s TRX in 900 MHz plus p,r,t TRX in 1800 MHz

Multiband Cell: The BTS has 1sector with n TRX in 900 MHz and p TRX in 1800 MHz plus 1 sector with q TRX in 900 MHz and r TRX in 1800 MHz plus 1 sector with s TRX in 900 MHz and t TRX in 1800 MHz

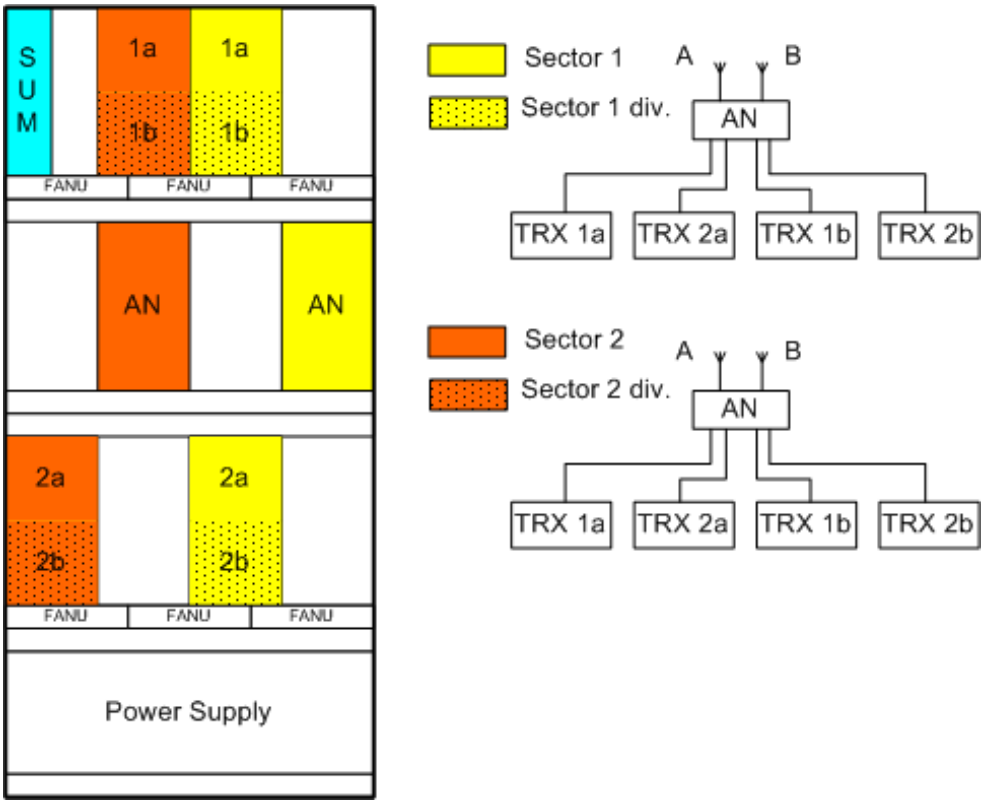
2.16.7 Coverage Mode TxDiv. 2Rx Div.

2.16.7.1 MBO1E - 1 Sector TX Diversity 2RX with Twin-TRX

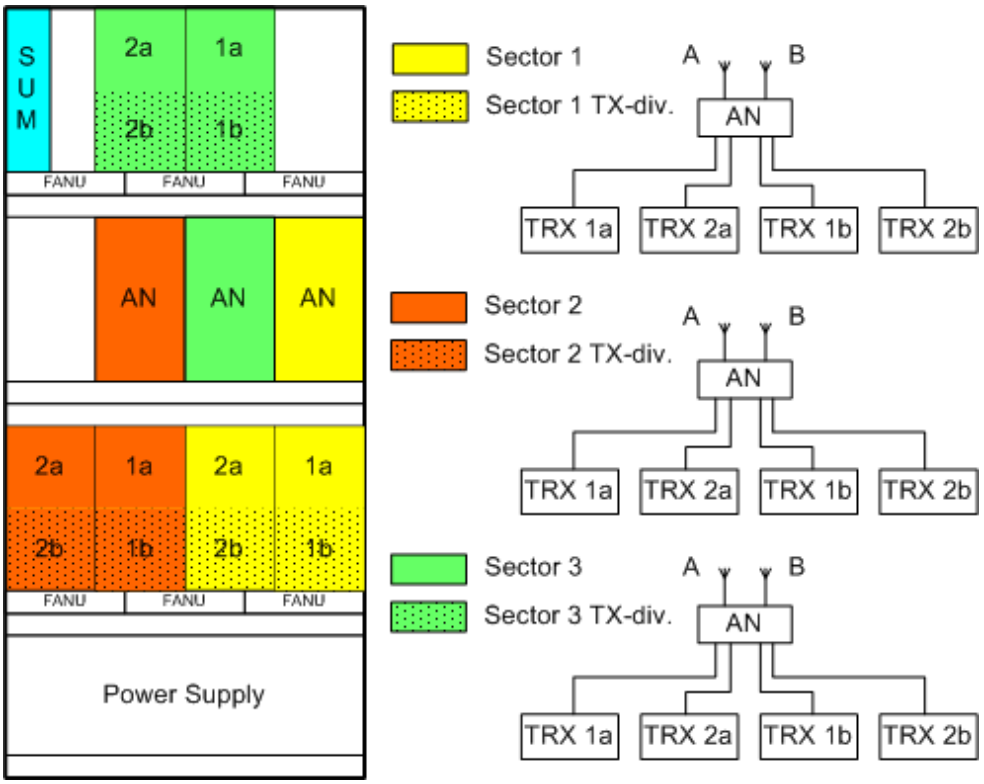




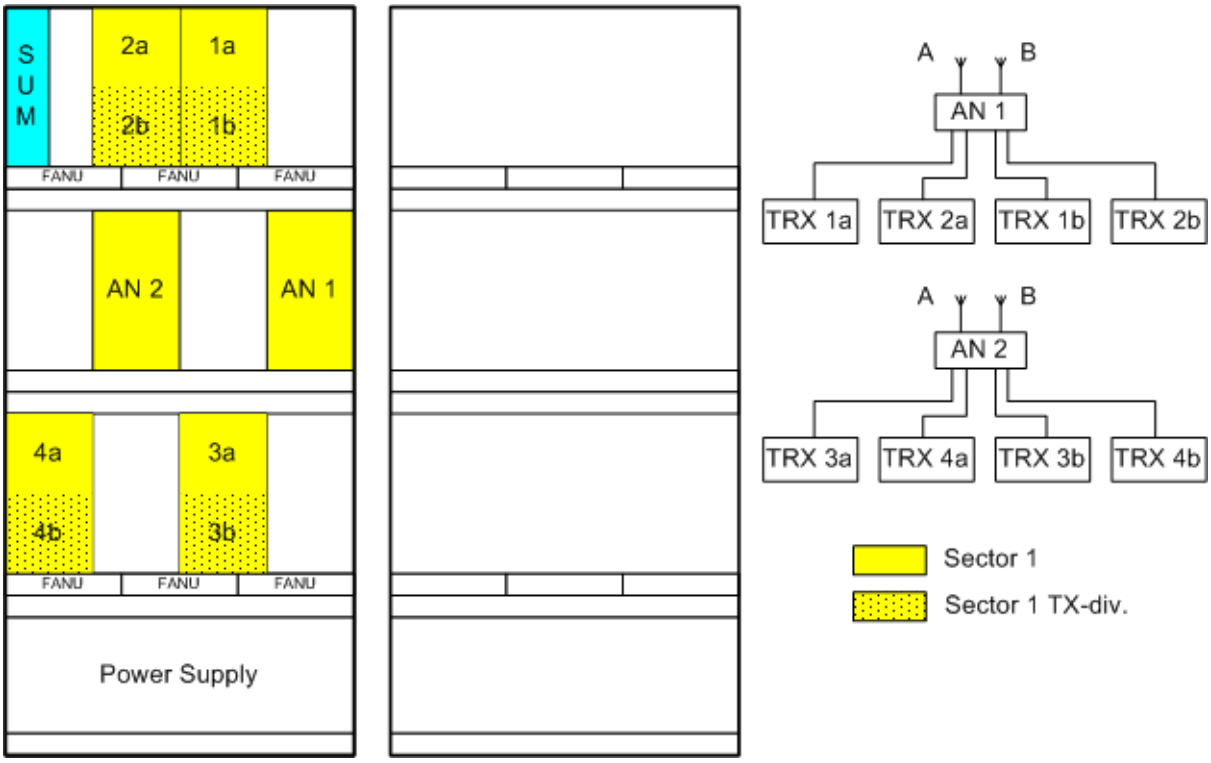
2.16.7.2 MBO1E - Multiband 2 + 2 Sectors with Twin-TRX



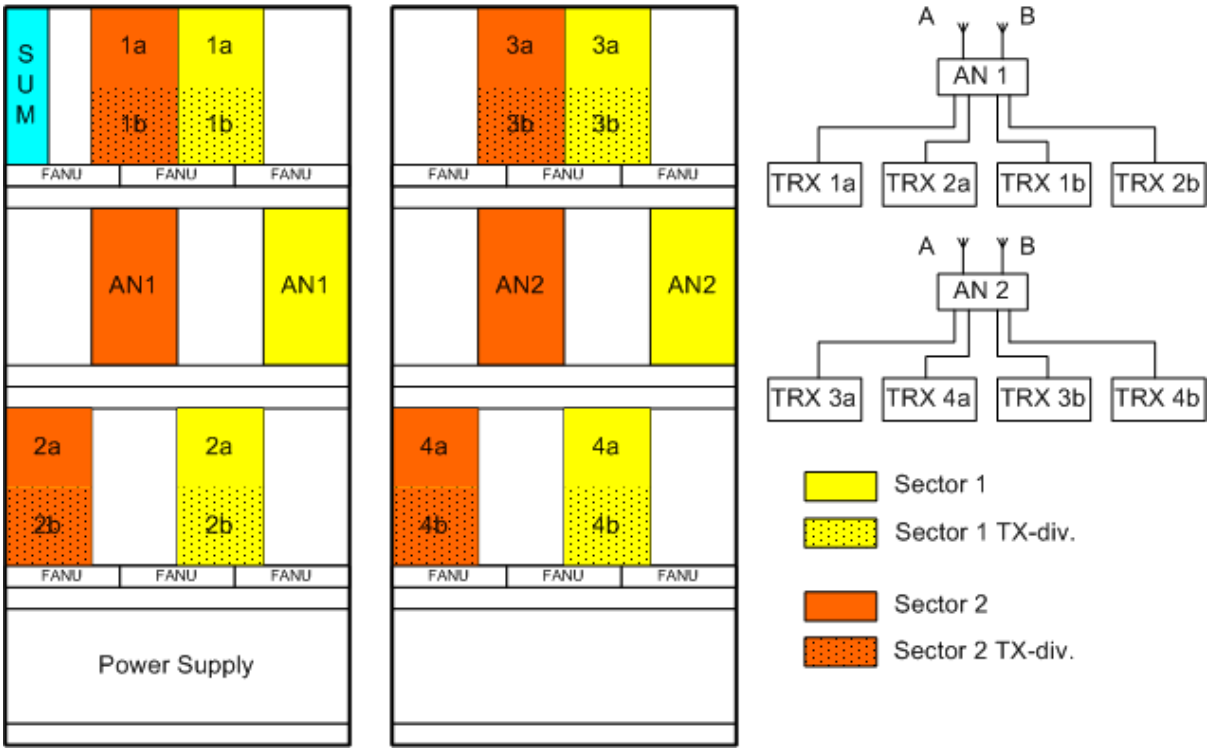
2.16.7.3 MBO1E - 3 Sectors TX Diversity 2RX with Twin-TRX



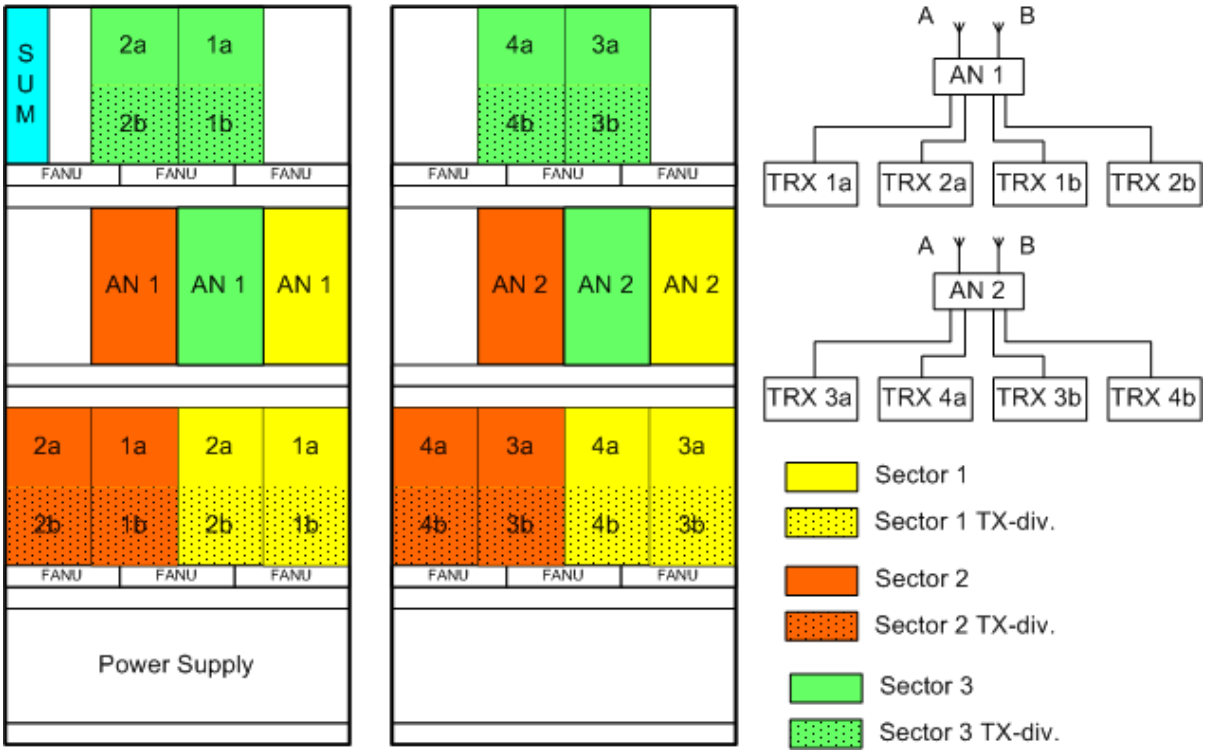
2.16.7.4 MBO2E - 1 Sector TX Diversity 2RX with Twin-TRX



2.16.7.5 MBO2E - 2 Sectors TX Diversity 2RX with Twin-TRX

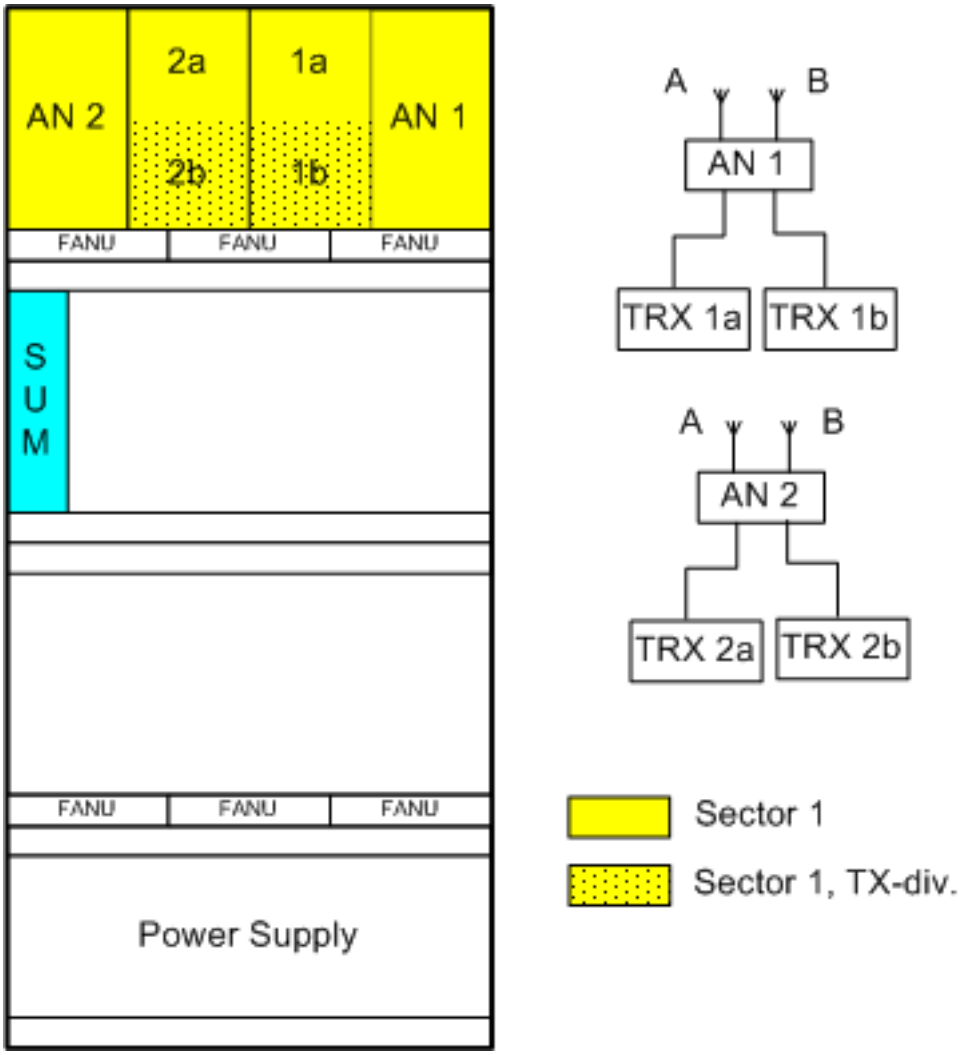


2.16.7.6 MBO2E - 3 Sectors TX Diversity 2RX with Twin-TRX

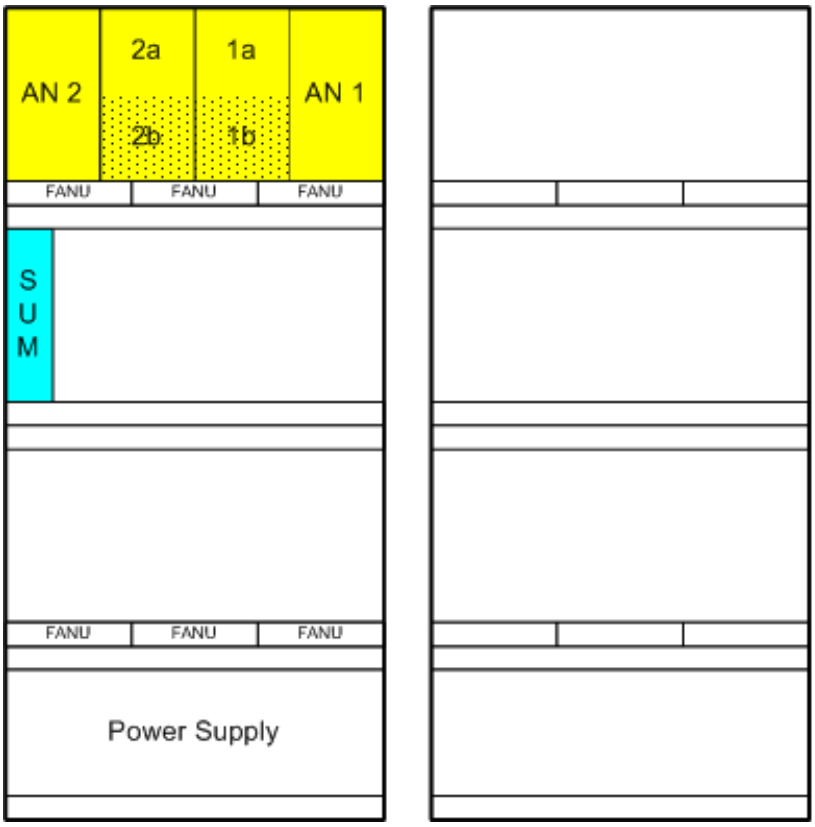


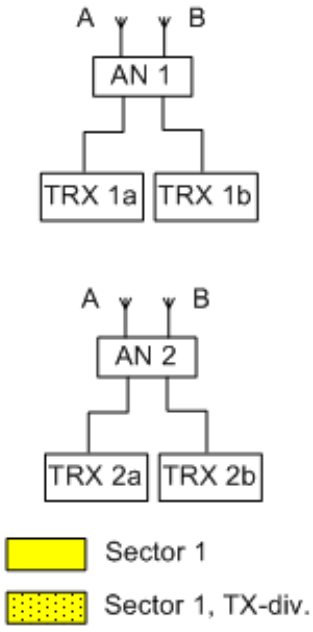
2.16.8 Coverage Mode TxDiv. 2Rx Div. Low Loss

2.16.8.1 MBO1E - 1 Sector TX Diversity Low Loss with Twin-TRX

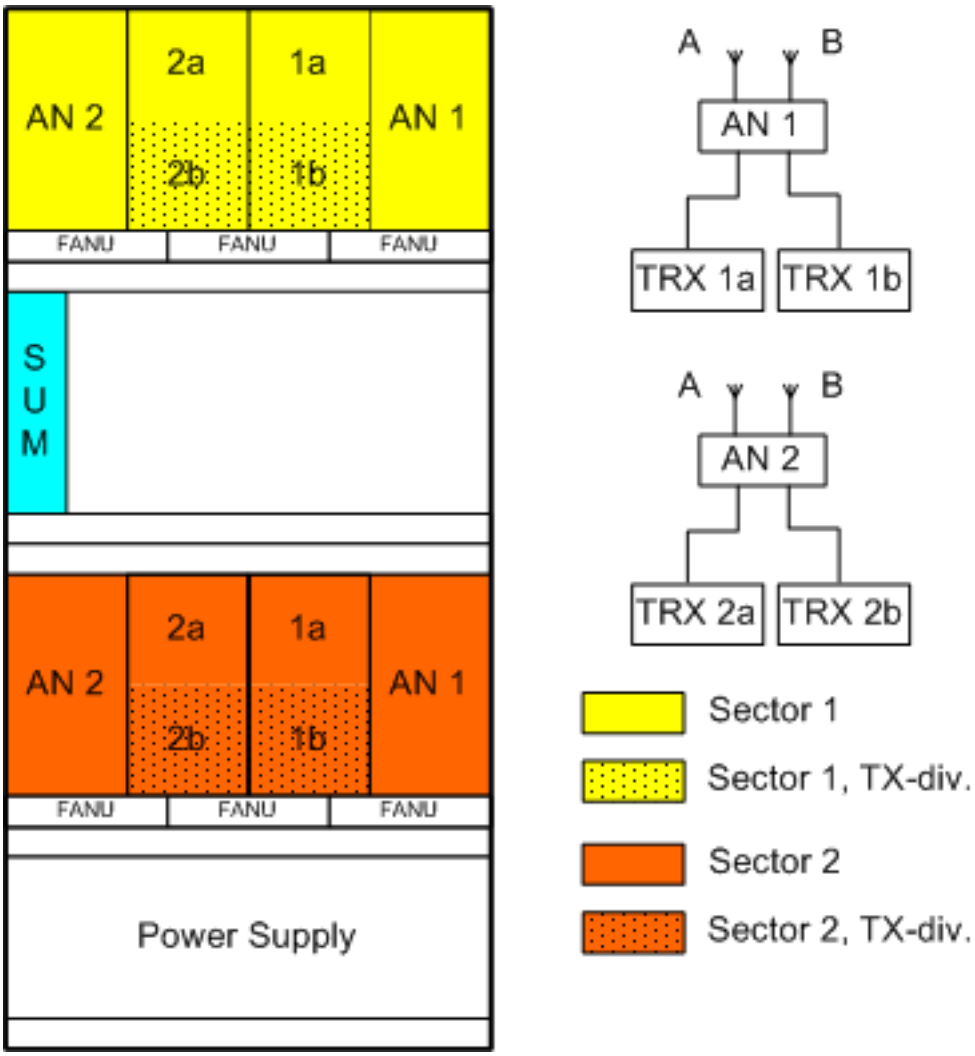


2.16.8.2 MBO2E - 1 Sector TX Diversity Low Loss with Twin-TRX

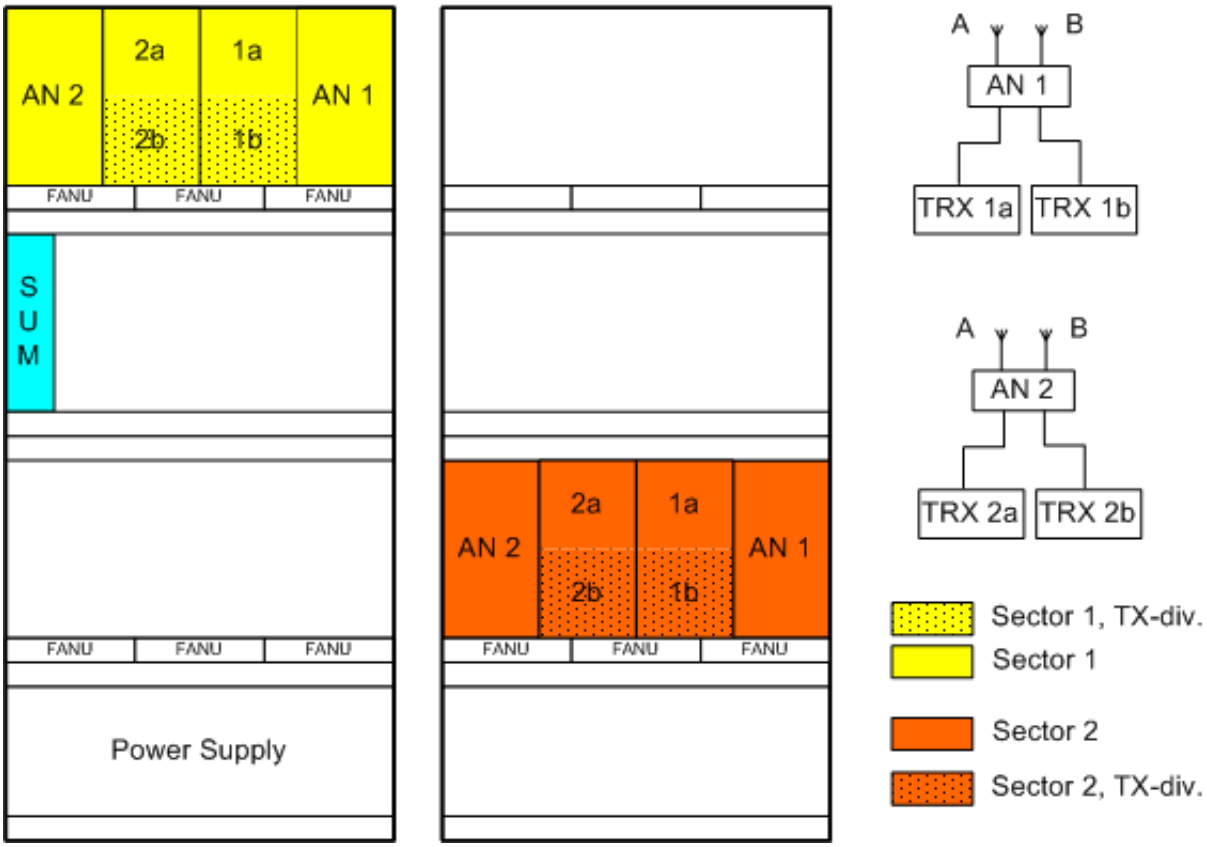




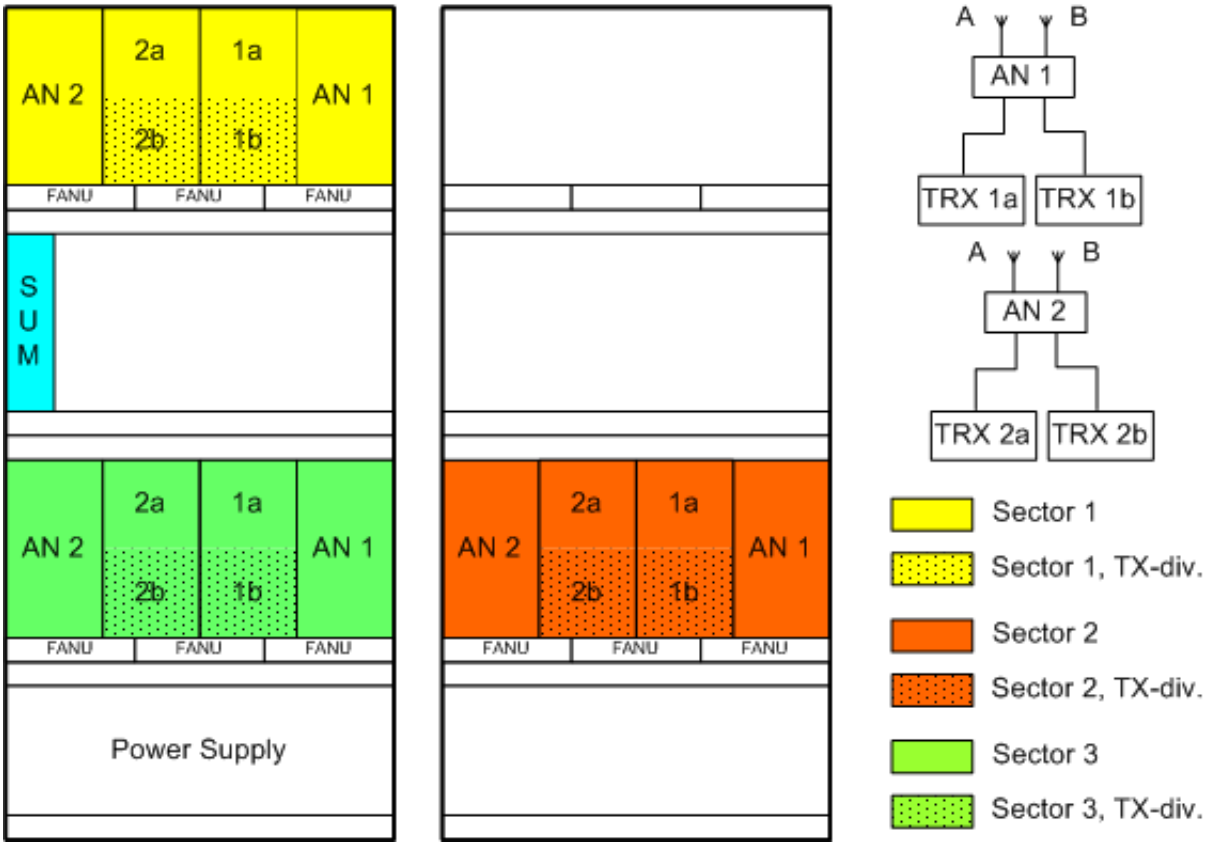
2.16.8.3 MBO1E - 2 Sectors TX Diversity Low Loss with Twin-TRX



2.16.8.4 MBO2E - 2 Sectors TX Diversity Low Loss with Twin-TRX

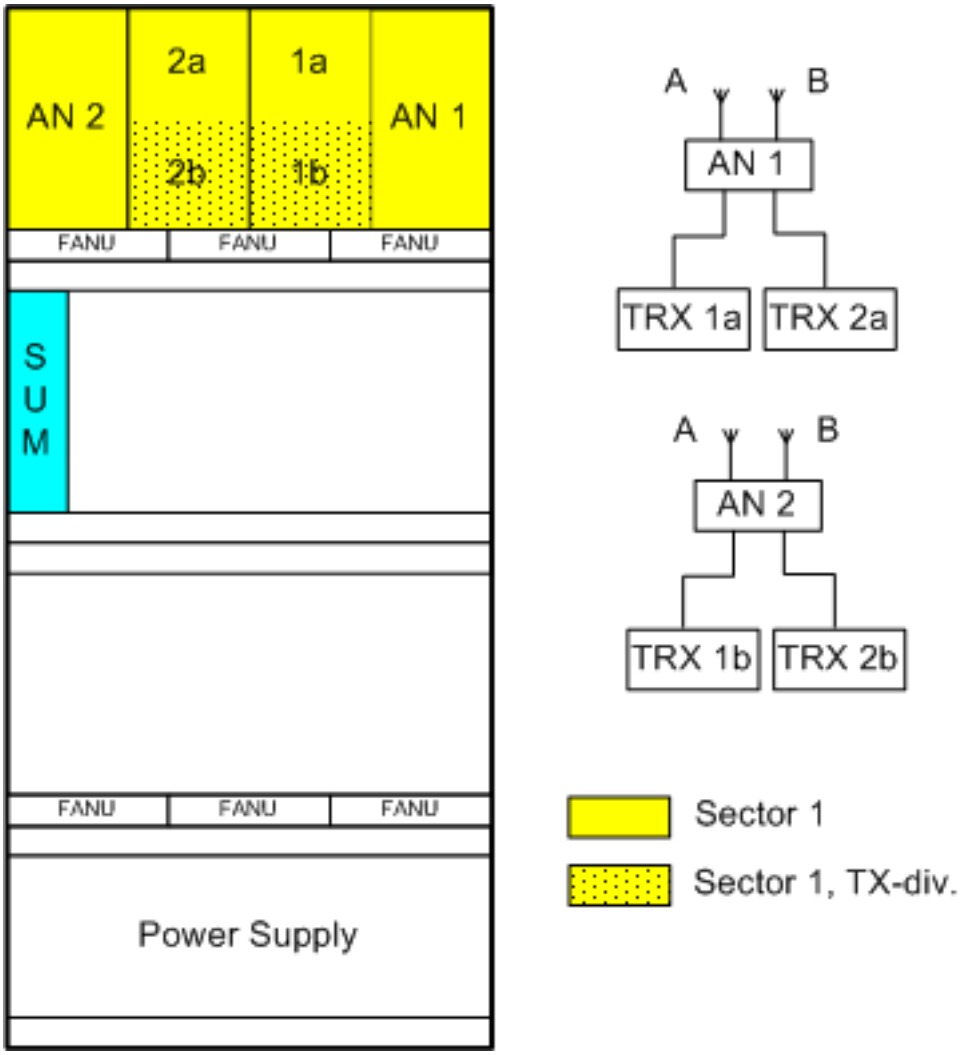


2.16.8.5 MBO2E - 3 Sectors TX Diversity Low Loss with Twin-TRX

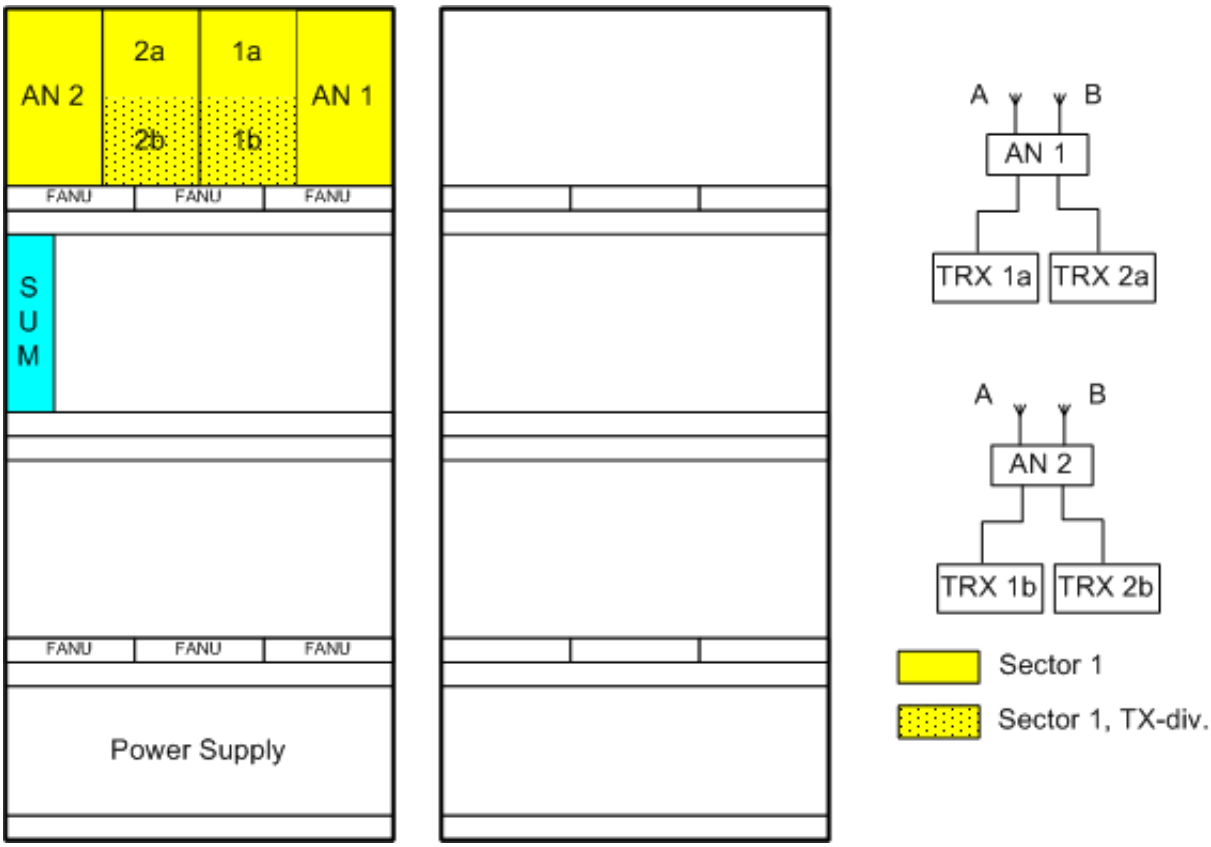


2.16.9 Coverage Mode TxDiv. 4Rx Div.

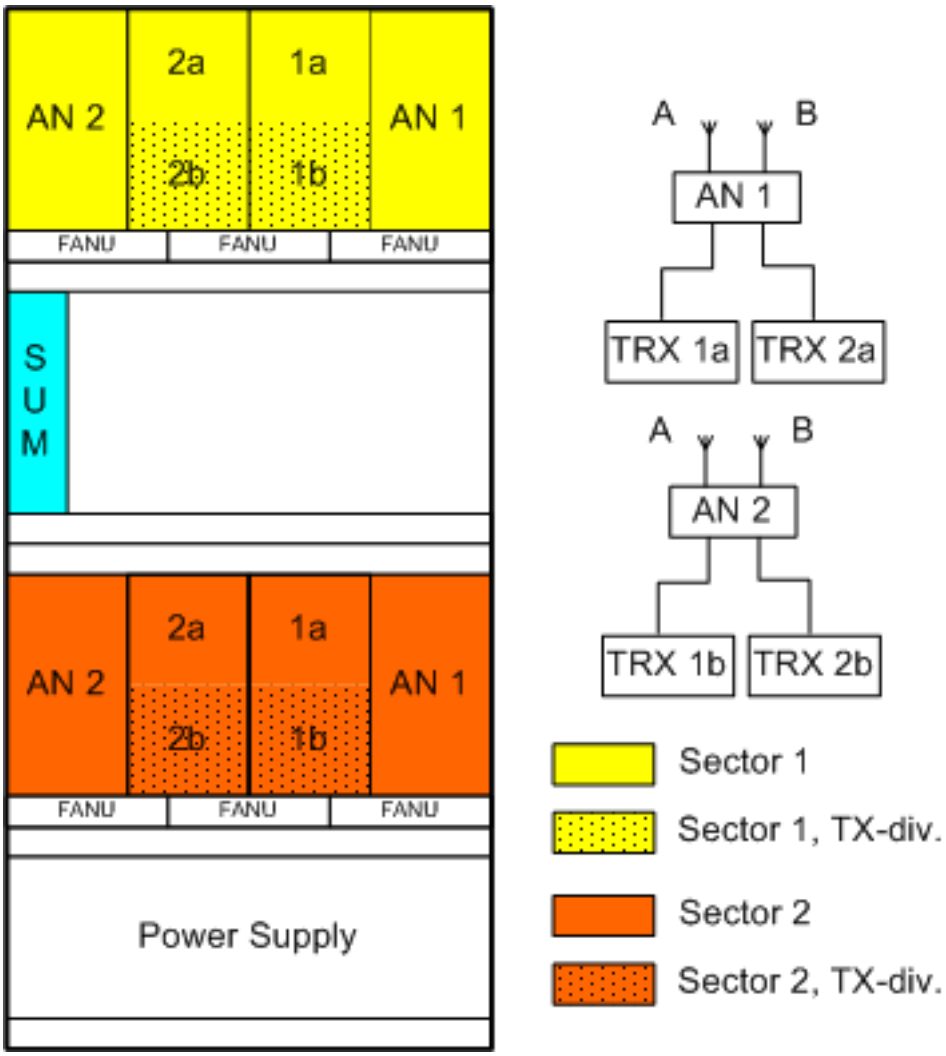
2.16.9.1 MBO1E - 1 Sector TX Diversity 4RX with Twin-TRX



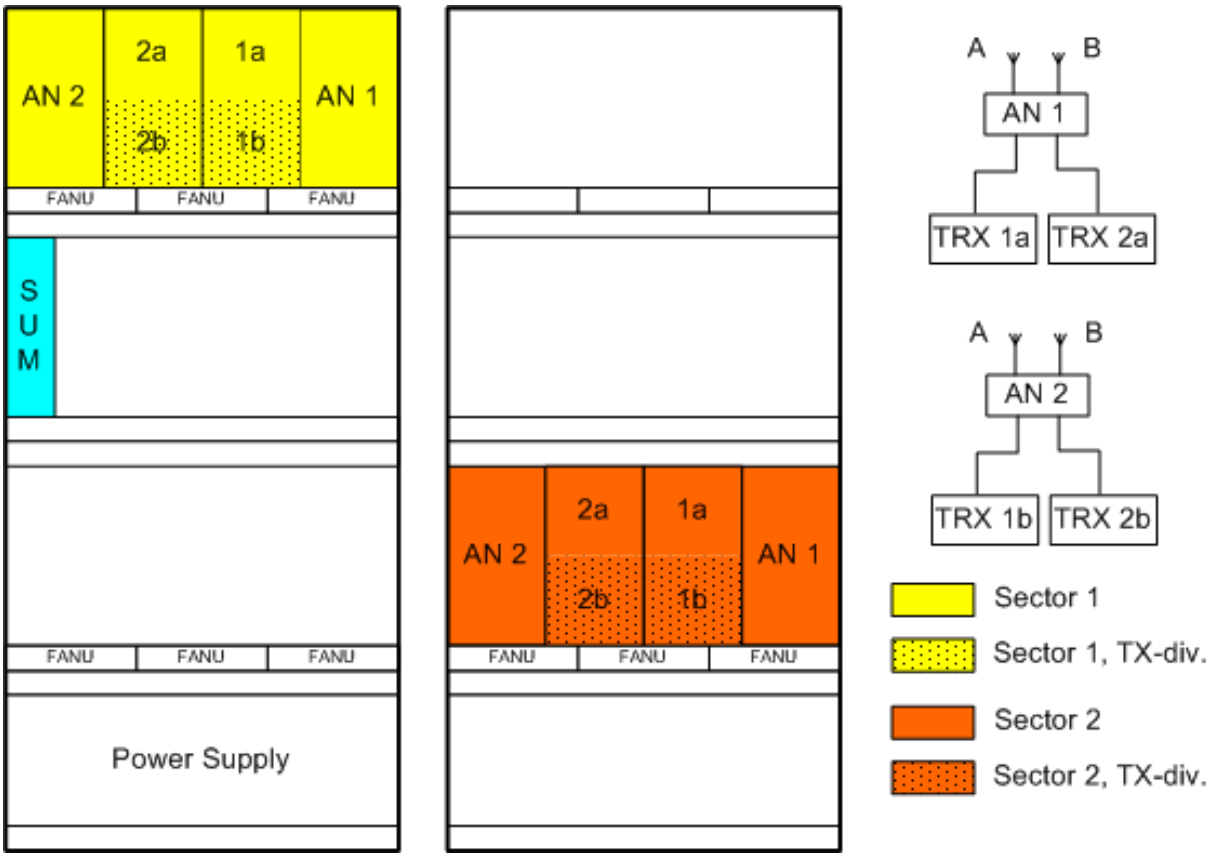
2.16.9.2 MBO2E - 1 Sector TX Diversity 4RX with Twin-TRX



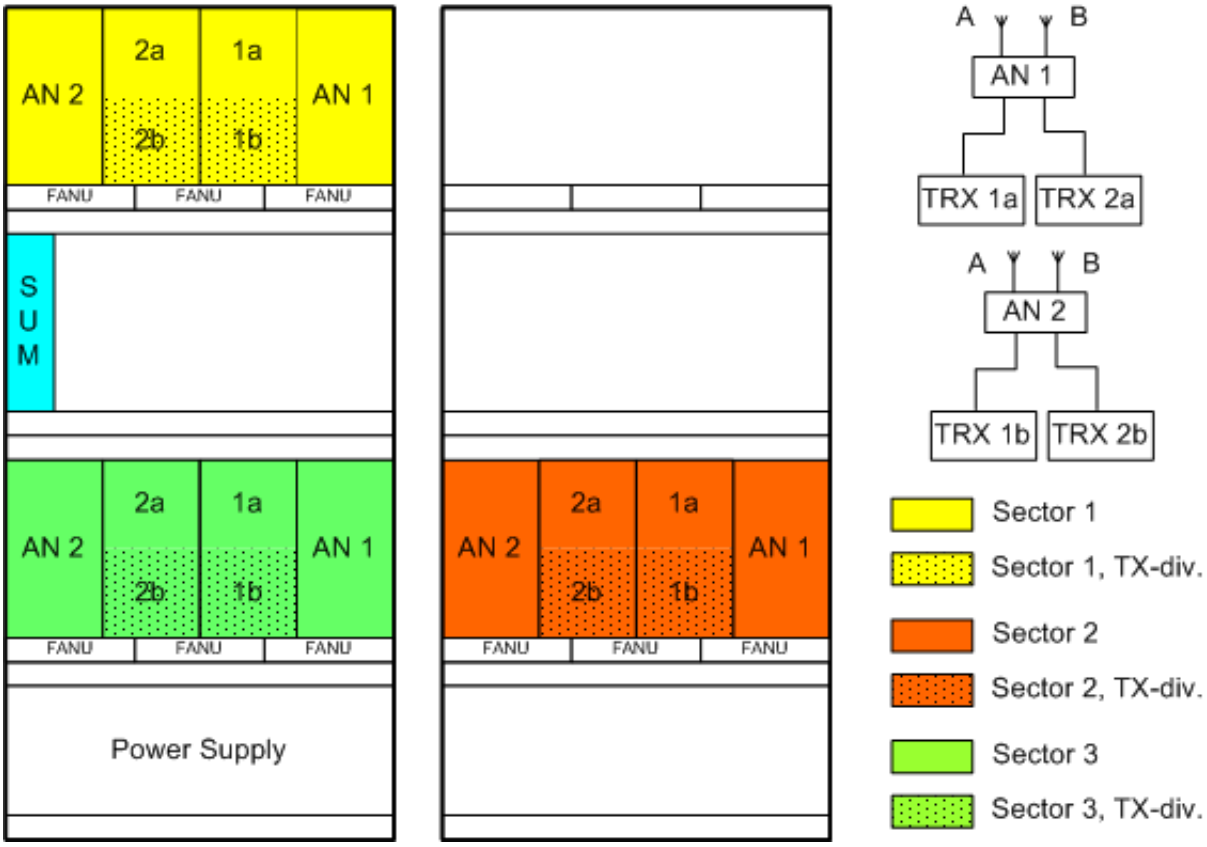
2.16.9.3 MBO1E - 2 Sectors TX Diversity 4RX with Twin-TRX



2.16.9.4 MBO2E - 2 Sectors TX Diversity 4RX with Twin-TRX

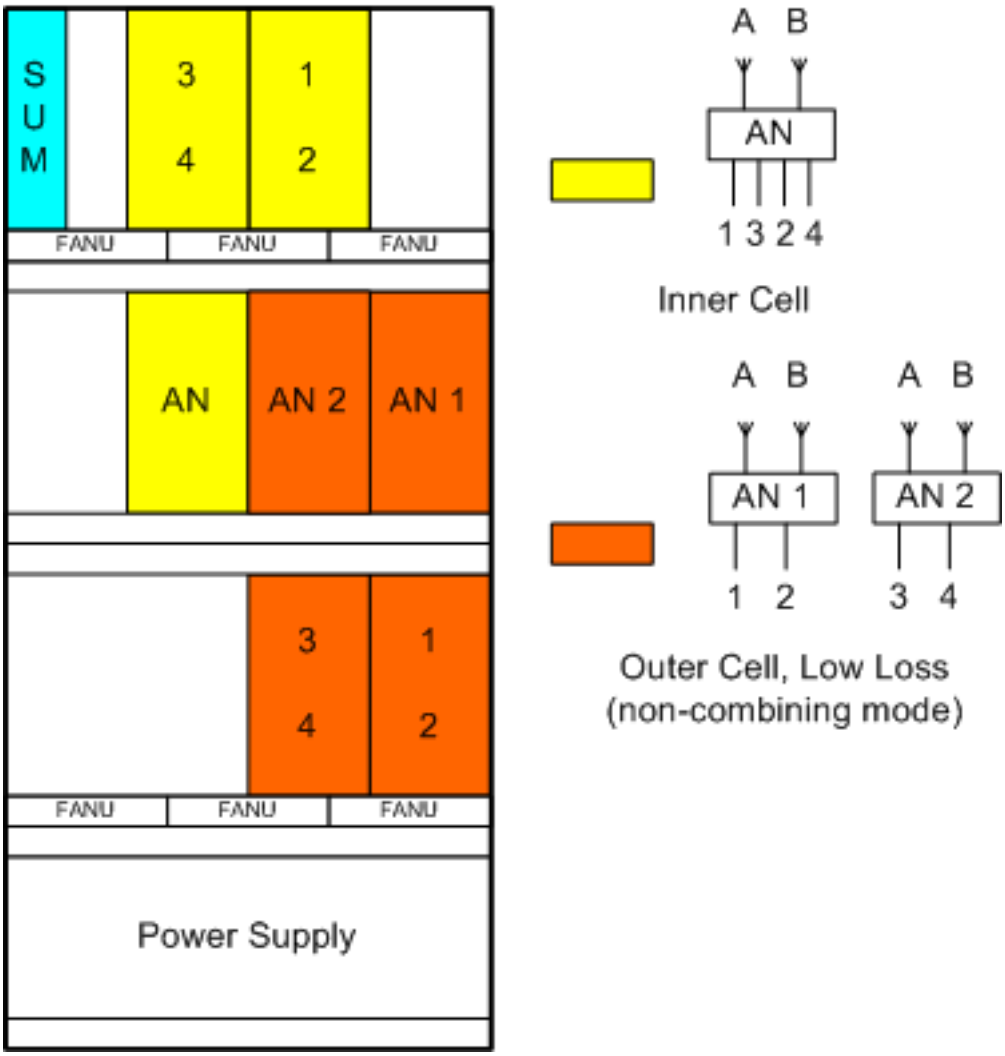


2.16.9.5 MBO2E - 3 Sectors TX Diversity 4RX with Twin-TRX

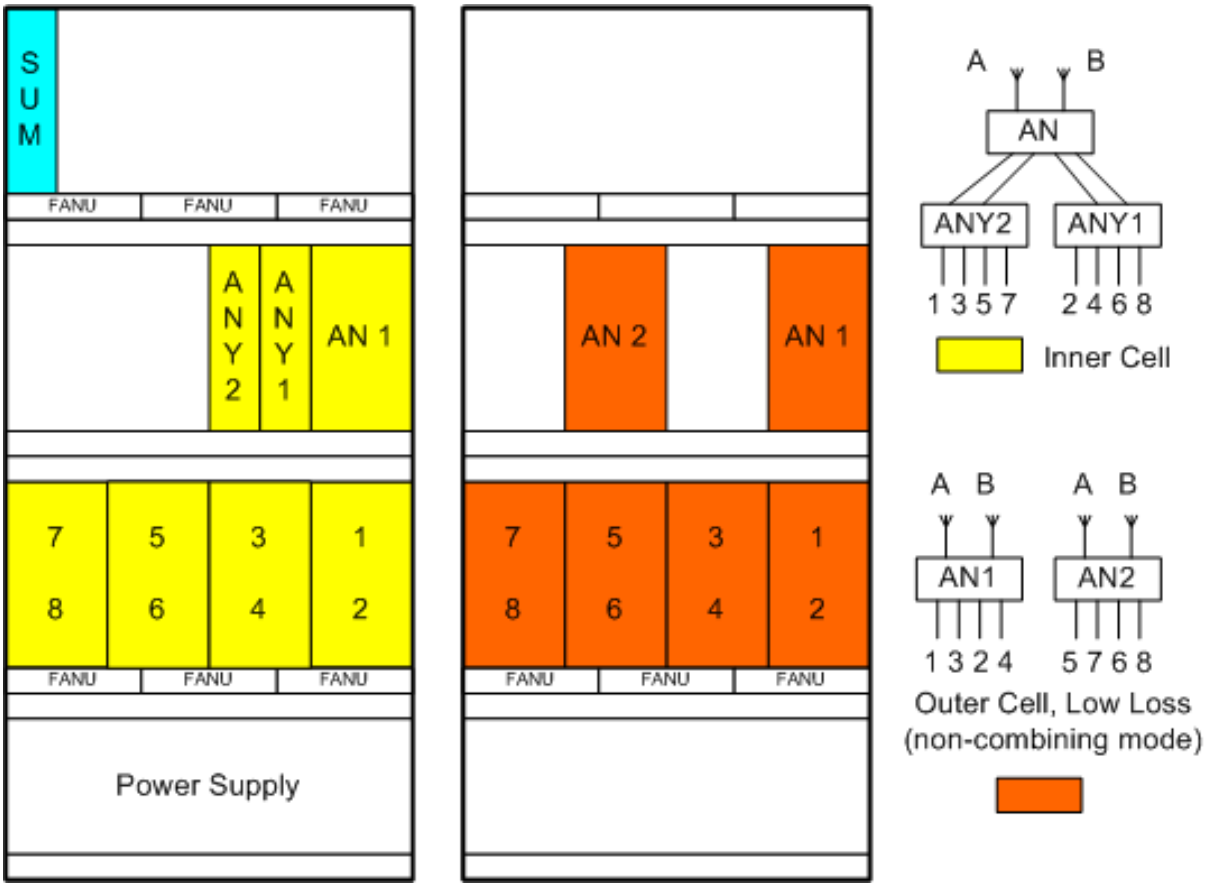


2.16.10 Extended Cell

2.16.10.1 MBO1E - Extended Cell with Twin-TRX

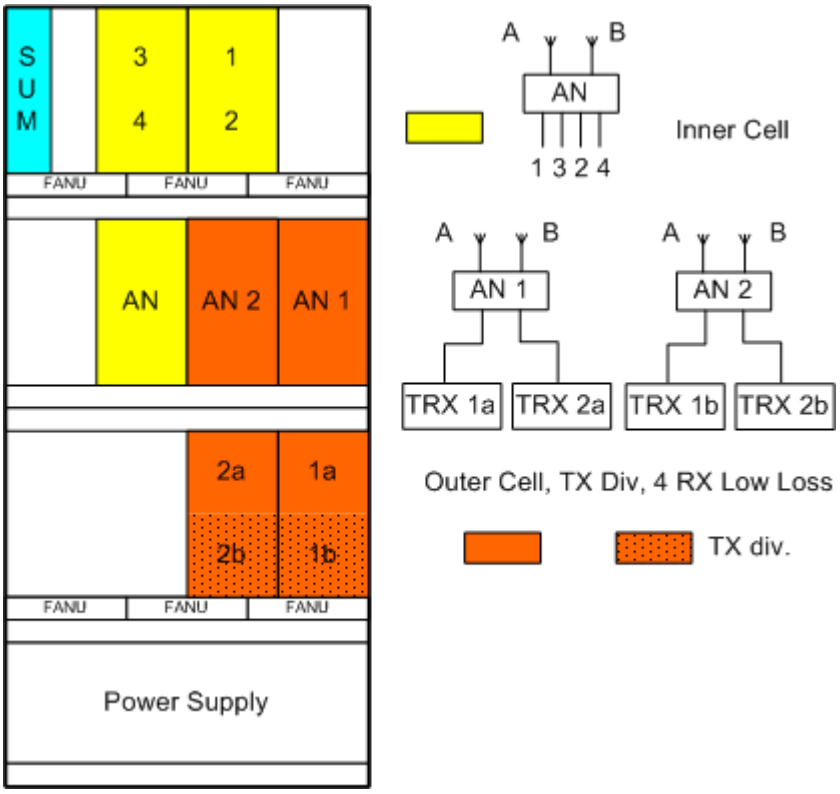


2.16.10.2 MBO2E - Extended Cell with Twin-TRX

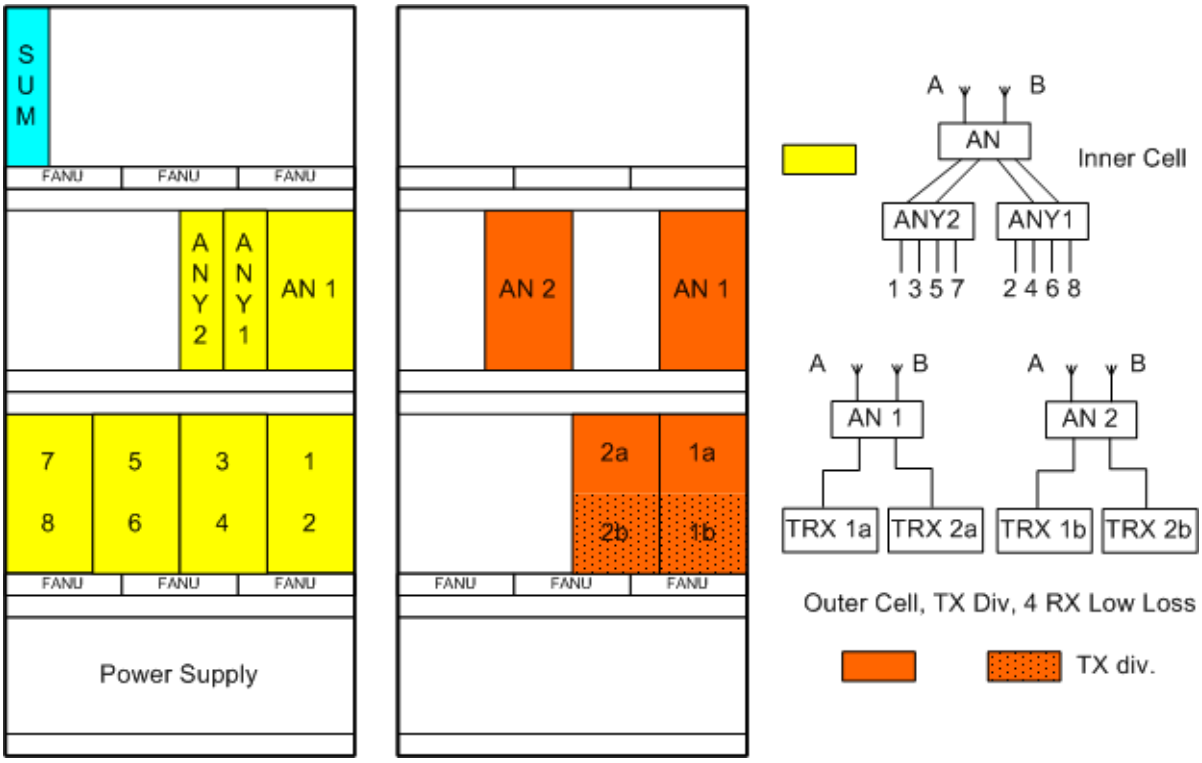


2.16.11 Extended Cell TxDiv, 4RX Div for outer cell

2.16.11.1 MBO1E - Extended Cell TX Diversity 4 RX with Twin-TRX



2.16.11.2 MBO2E - Extended Cell with Twin-TRX



3 Indoor Cabinets

This chapter describes the indoor cabinets used in BTS A9100 configurations.

The descriptions are supported with diagrams and illustrations, where necessary.

3.1 CIMI/CIDI

The CIMI and CIDI are indoor cabinets that support both omnidirectional and sectorized configurations. The following figure shows the position of the main modules.

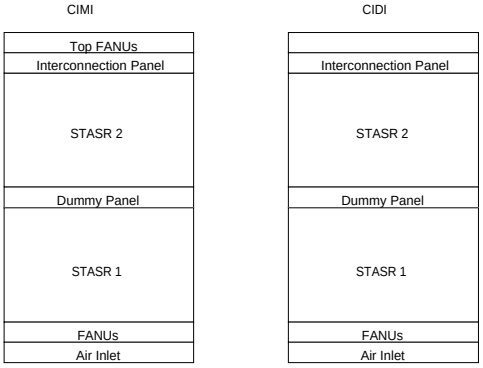


Figure 182: CIMI/CIDI Module Positions

Both cabinets are designed to house two STASRs.

In the CIMI, the upper subrack (STASR2) contains the SUM and may contain TRE and/or AN modules. The lower subrack (STASR1) can contain TRE and/or AN modules.

In the CIDI, the upper subrack (STASR2) can contain the SUM, the microwave equipment and/or AN modules. The lower subrack (STASR1) can contain the SUM and/or TRE modules.

3.1.1 CIMI/CIDI Cabinet Access and Features

The following figure shows the CIMI/CIDI equipped with the interconnection panel and two empty subracks.

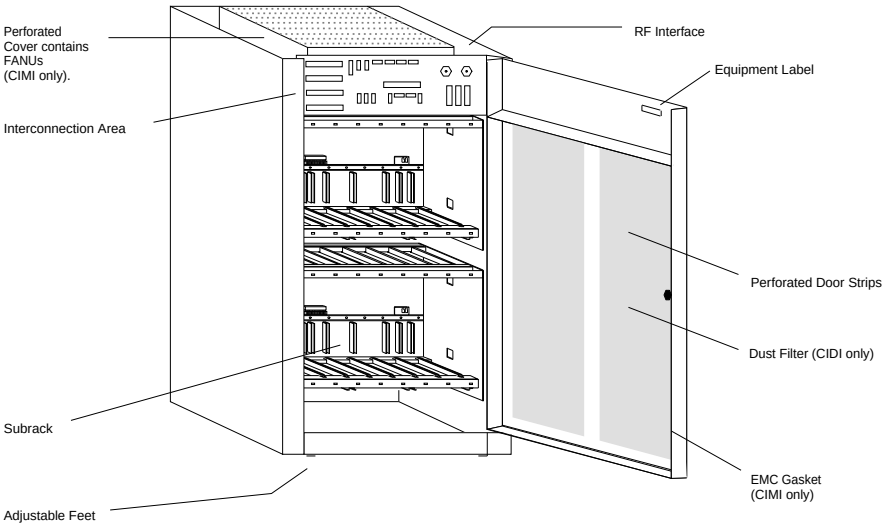


Figure 183: CIMI/CIDI Equipped with Empty Subracks

3.1.1.1 Construction

The CIMI/CIDI is a steel box construction with four adjustable feet, on its underside, to compensate for any unevenness in the floor. The cabinet has no side access; all cable interfaces are accessible from the front or the top of the cabinet.

The structure and dimensions of the mechanical rack and equipment comply with IEC 297 standards.

3.1.1.2 Door

The CIMI/CIDI can be installed in back-to-back or back-to-wall configurations. Access to the subracks and the interconnection panel is via a door at the front of the cabinet. The door is the full height of the cabinet. In the CIMI, the door is fitted with a copper-beryllium gasket to ensure EMC integrity when closed. An optional dust filter can be fitted to the CIDI door. The filter is removable for cleaning.

3.1.1.3 Cables

All external cables, except for the antenna, are connected to the interconnection panel. The external cables include the DC supply and Abis connections. The antenna cabling is connected at the top of the cabinet.

A ribbon cable is used in the cabinet to link the subracks together; see the following figure. In the CIMI, the top end of the cable terminates on the TFBP (refer to *Top Fan Unit (Section 11.1.3)*) for more information). In the CIDI, the cable terminates at the rear connector of the top subrack. The bottom end terminates on the BTSRI board (refer to *Remote Inventory (Section 8.5)* for more information).

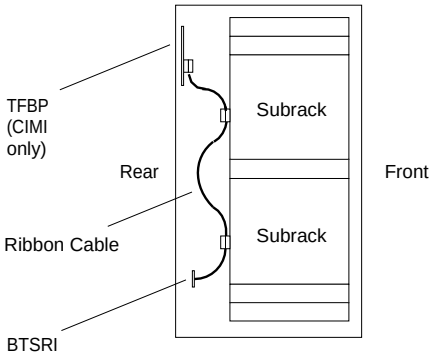
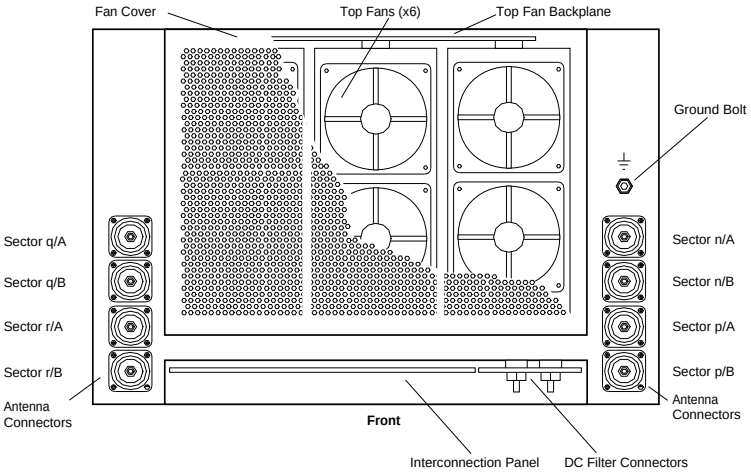


Figure 184: CIMI/CIDI Subracks Interconnection Cable

3.1.1.4 Cabinet Top

The following figure is a top view of the CIMI, showing antenna connectors and the fan cover. The cover is cut away to reveal extractor fans. The fans are installed and removed via the front of the cabinet.

The CIDI cabinet differs in that it requires no top fans and no Top Fan Backplane. The cabinet has a perforated top cover.



Note: Sector n/p/q/r means the sector with n/p/q/r TREs.
A and B are numbering conventions of the antennas.
Antenna connectors are not necessary completely equipped.

Figure 185: CIMI/CIDI Top View

The antennas are connected to RF connectors in a recess at the top of the cabinet. An M8 bolt is also located on the top for connecting the cabinet to ground. Any unequipped holes are fitted with a blanking plate.

3.1.1.5 Cooling

The CIMI is air cooled by fans, both inside the cabinet and at the top. Cool air is drawn-in through perforations on the door and is then forced up, through the subracks, by the internal fans. The warm air is expelled through perforations at the top of the cabinet.

The CIDI is cooled by fans inside the cabinet only, it does not require top fans. Refer to *Temperature Control (Section 11)* for details of the cooling system hardware.

3.1.2 CIMI/CIDI Cabinet Interconnection Panel

All the external electrical interfaces are located on a panel at the top of the cabinet; see the following figure.

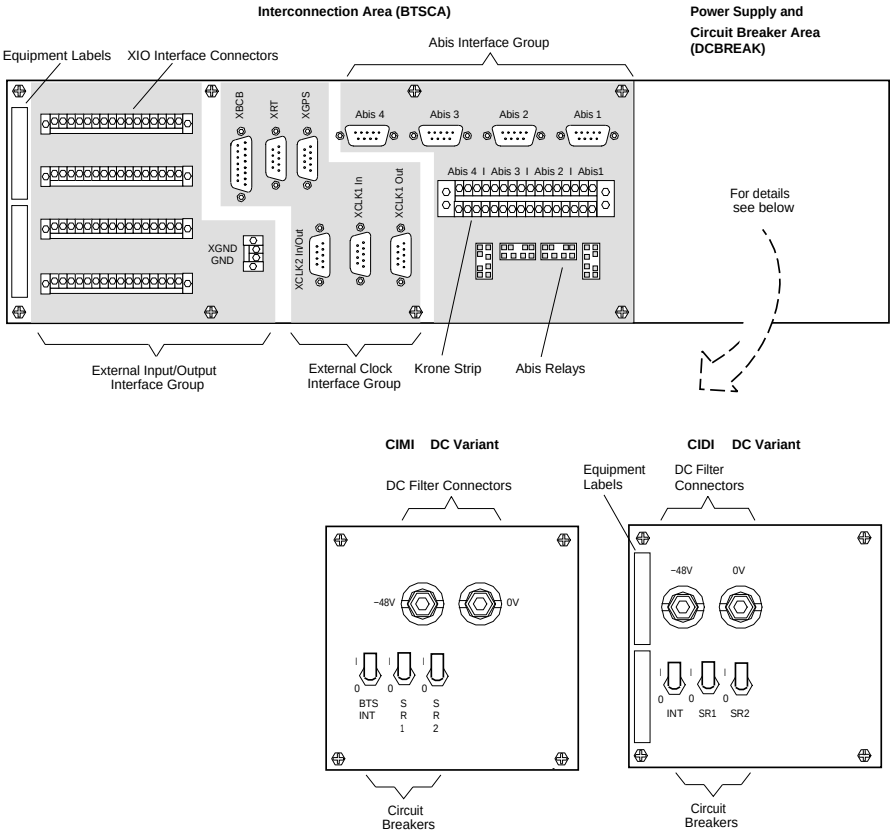


Figure 186: CIMI/CIDI Interconnection Panel

On the left-hand side (see the previous figure) is the interconnection area (BTSCA); the shaded areas identify separate groups of connectors. The power supply input-connectors and circuit breakers are located on the right-hand side. All interfaces are overvoltage protected.

Located behind the interconnection area is an External Input/Output Board. The XIOB is connected to the interconnection area and contains a 24 V DC/DC converter and interface circuitry for external alarms.

The interconnection panel provides interfaces for the:

- XIO, external clock, and Abis signals
- DC supplies.

3.1.3 CIMI/CIDI Signal Interfaces

The CIMI/CIDI have XIO, external clock and Abis signal interfaces. The connectors and functions for each of these interfaces are described, as well as the external alarm inputs.

3.1.3.1 XIO Interface

The XIO connectors allow various external alarm devices to be connected to the BTS A9100. These include smoke and flood detectors, as well as electro-mechanical switches. Crimped or clamp strip contacts can be used on the XIO connectors. The positions of the XIO connectors are shown in Figure *186*.

A detailed view of the XIO connectors is given in the following figure.

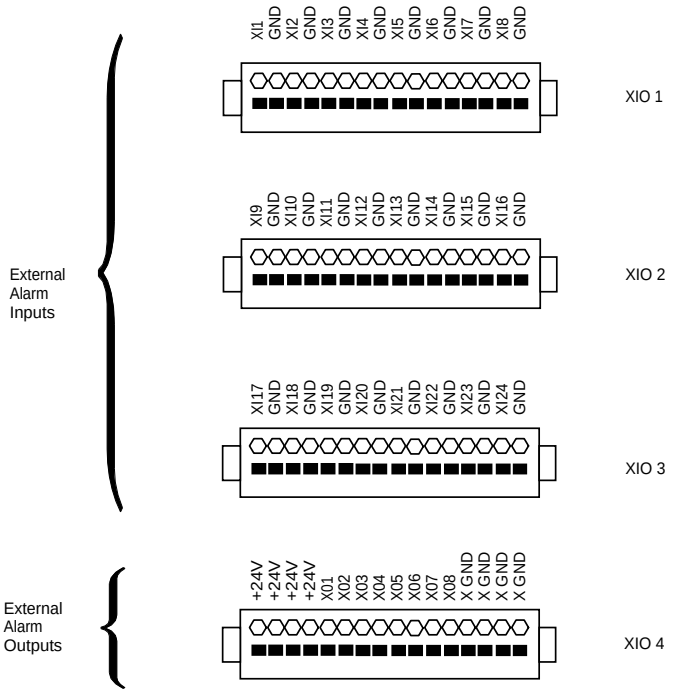


Figure 187: BTS A9100 Indoor XIO Interface Connectors

The XIO connectors are described in functional groups in the following table.

External Alarm Inputs	Connectors XIO 1 to XIO 3 provide an interface for connecting 24 external alarm inputs. Each input alarm is reported to the OMC-R where it is mapped to customer-defined ASCII text. The ASCII text describes the particular alarm. Each alarm input has two adjacent pins associated with it on the XIO connector. If these pins are open-circuit (open loop), an alarm is generated.
External Alarm Outputs	Connector XIO 4 provides an interface for the SUM to control eight external alarm devices. This feature is for future use. The SUM is described in *Station Unit Modules (Section 8)*.
+ 24 VDC Supply	Connector XIO 4 provides a + 24 VDC power source for external alarm devices that require a power supply.
XGND	The XGND connector is used when attaching the external alarm 24 VDC ground to the BTS A9100 ground. If the connector pins are not short-circuited (open loop), the input and output alarms are isolated from the BTS A9100 ground.

Table 8: BTS A9100 Indoor XIO Interface Connectors (Functional Groups)

3.1.3.2 External Alarm Inputs

The following table gives a detailed view of the external alarm inputs.

Alarm Description			Alarm Connection	Alarm Generation
Alarm number	**XIO Input**	**Alarm Class**		
1	1	9	No	Outside
2	2	9	Yes	Outside
3	3	9	No	Outside
4	4	9	No	Outside
5	5	9	No	Outside
6	6	9	No	Outside
7	7	9	No	Outside
8	8	9	Yes	Outside
9	9	9	Yes	Outside
10	10	9	Yes	Outside
11	11	9	Yes	Outside
12	12	9	Yes	Outside
13	13	9	Yes	Outside
14	14	9	Yes	Outside
15	15	9	Yes	Outside
16	16	9	Yes	Outside
17	17	9	Yes	Outside
18	18	9	Yes	Outside
19	19	9	Yes	Outside
20	20	9	Yes	Outside
21	21	9	Yes	Outside
22	22	9	Yes	Outside
23	23	9	Yes	Outside
24	24	9	Yes	Outside

Table 9: BTS A9100 Indoor External Alarm Inputs

3.1.3.3 External Clock Interface

The external clock interface provides connectors for a variety of functions (see Figure *186*). The connectors are described in the following table.

XBCB	The XBCB connector provides an external interface to the BCB. Certain external control functions can be implemented via the XBCB connector: ▶ RI ▶ Power supply status ▶ Battery status ▶ Additional Input/Output signals. The BTS A9100 does not have to be powered up when accessing the Remote Inventory function.
XRT	The XRT connector provides access to the BTS A9100 via an asynchronous serial interface. The signal levels conform to CCITT V.24. This allows a standard terminal to be used for radio supervision and loop-test purposes. The data rate is programmable between 1200 and 115,000 baud. The XRT Interface is controlled by the SUM.
XGPS	The XGPS connector provides an asynchronous serial interface. This controls and supervises an external GPS receiver. The signal levels conform to CCITT V.24. The data rate is programmable between 1200 and 115,000 baud. This interface can also be used to synchronize the BTS A9100 to the GPS receiver. The synchronizing signal conforms to RS-422. The XGPS Interface is controlled by the SUM.
XCLK	The XCLK connectors are used to synchronize the BTS A9100 to another BTS, which can be a G1 BTS, a G2 BTS or a BTS A9100. The signaling interface conforms to RS-422. The XCLK1 In and XCLK1 Out are connected together, pin-to-pin. The XCLK2 In/Out connector provides a bi-directional clock interface. The XCLK Interface is controlled by the SUM.

Table 10: BTS A9100 External Clock Interface Connectors

3.1.3.4 Abis Interface

The Abis Interface provides components for a variety of functions (see Figure *186*). The interface consists of the connectors described in the following table.

Abis Connectors	The Abis Interface connects the BTS A9100 to the BSC. There are four connectors, these are Abis 1, 2, 3 and 4. All the connectors provide 120 Ω and 75 Ω impedances. The impedance is selected by the type of cable connector plugged into the interface. For 120 Ω cable connection the *CA01* cable should be used, for 75 Ω cable connection the *CA02* cable should be used. **Note:** Only Abis 1 and 2 are currently used; Abis 3 and 4 are provided for future use.
Krone Strip Connector	When the Krone connector is used for Abis connection, depending on the cable impedance, the following remarks must be taken into account: ▶ If 120 Ω cables are used the SP2M connector must be removed from the Abis connectors ▶ If 75 Ω cables are used the SP2M connector must be plugged into the Abis connectors. The Krone strip supports an overvoltage protection device and an Abis monitoring device. The overvoltage protection device is a 'make-before-break' type. This means there is no interruption of service during insertion and removal.
Abis Relays	Four relays, one for each Abis Interface, are controlled by the SUM. The relays can be used to: ▶ Perform loop-back tests on the individual Abis Interfaces. ▶ Provide transparent routing of the Abis traffic when the BTS A9100 is powered down or faulty. This ensures that the Abis connection is not broken in multidrop configurations.

Table 11: BTS A9100 Abis Interface Connectors

3.1.4 CIMI/CIDI DC Supplies Interface

The external power supply inputs to the CIMI/CIDI are located at the top of the cabinet (see Figure *186*). The components are listed in the following table.

DC Filters	In CIMI there are two DC filter connectors; one for the 0 V input and one for the -48/-60 VDC input. CIDI requires only a single filter in the -48/-60 VDC line. The 0 V input connector consists of an M8 bolt.
Circuit Breakers	Three hydraulic-magnet type DC circuit breakers protect the CIMI/CIDI equipment from overload. Each subrack power supply is protected by a separate circuit breaker. The XIOB (which includes the interconnection area) and the top fan backplane share the third breaker (see *CIMI/CIDI Power Supply and Grounding (Section 3.1.5)*).

Table 12: CIMI/CIDI, DC Supplies Interface

3.1.5 CIMI/CIDI Power Supply and Grounding

The CIMI/CIDI is powered from a -48/-60 VDC external power source. Power is distributed to the cabinet via:

- One filtered and one unfiltered input connector for CIDI
- Two filtered input connectors for CIMI.

As shown in the figure below.

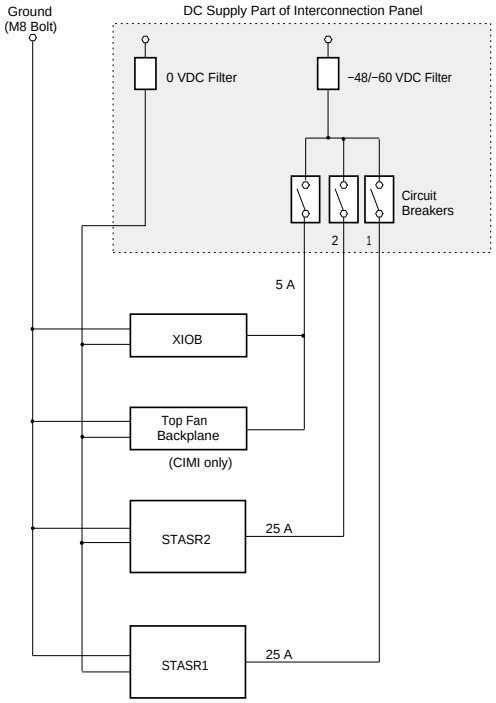


Figure 188: CIMI/CIDI DC Power Interconnections

Each subrack has:

- A filtered input of -48/-60 VDC
- A filtered 0 V return
- A ground connector
- A circuit breaker.

The XIOB and TFBP have the same inputs as the subracks.

The following table shows the rated values for the power components.

Item	Component/Rating
0 and -48/-60 VDC Filters	4 µF capacitors, rated at 75 A.
Circuit Breakers 1 and 2	25 A
Circuit Breaker 3	5 A

Table 13: CIMI/CIDI Power Component Ratings

The CIMI/CIDI is EMC protected at both cabinet and module level. At cabinet level, the CIMI/CIDI is connected to ground via a cable terminated on top of the cabinet with an M8 bolt. At module level, ground continuity is carried to the subracks via the cabinet bus bar. A functionally identical alternative to the cabinet bus bar is used in later models of CIMI. This is a branched cableform. The CIDI uses a bus bar for this purpose.

The bus bar (or cableform) also distributes the DC voltages to the subracks and other CIMI/CIDI equipment.

3.1.6 CIMI/CIDI Cables and Cable Sets

This section lists the cables and cable sets for all BTS A9100 CIMI/CIDI configurations.

For the physical and electrical descriptions of the discrete cables see *Cable Descriptions (Section 17)*.

For some of the cables and cable sets there exist different variants. For the variants used in a specific cabinet refer to its parts list.

3.1.6.1 Internal Cables

The CIMI/CIDI internal cables consist of the discrete cables and cable sets listed in the following table.

Table *15* lists and describes the cables that comprise the cable sets.

Mnemonic	Description	Part Number
BTSRIMI	The BTSRIMI is a flat cable and Printed Circuit Board. It interconnects the subrack backplanes (and the TFBP in case of CIMI). A BTSRI board is permanently attached to one end of the cable.	3BK 07720
BUMI	The BUMI is a branched cableform. It contains cables for the DC power connections to the subracks, XIOB, and top fans.	3BK 07763
CA-ADCO	Cable Assembly - Alarm Disable Connector disables eight alarm inputs. It connects to an XIO connector on the Interconnection Panel.	3BK 07953
CIMI bus bar	The CIMI bus bar is a hardware module used for the DC power connections to the subracks, XIOB, and top fans.	3BK 07763
CS02	Cable Set 02 is an Antenna Network cable set. It connects an ANY to another ANY or to an ANX/ANC.	3BK 07598
CS03	Cable Set 03 is a TRE cable set which connects a TRE to an ANX/ANC or ANY.	3BK 07599
CS04	Cable Set 04 is an Antenna cable set. It connects an ANX/ANC to two antenna cabinet connectors.	3BK 07600
CS05	Cable Set 05 is the BTS Connection Area to SUM cable set. In a CIMI it interconnects the SUM and the Interconnection Panel. The cable set carries the Abis1 and Abis2 Interfaces, and clock and control signals to and from the SUM.	3BK 07199

Table 14: CIMI/CIDI Internal Cables

3.1.6.2 Cable Sets

The cable sets used in the CIMI/CIDE cabinets are described in the table below.

Cable Set	Cable	Description	Part Number	Quantity
CS02	RXRC	The Receiver Radio Frequency Cable connects an ANY RX connector to an ANX or another ANY RX connector.	3BK 07920	2
	TXRC	The Transmitter Radio Frequency Cable connects an ANY TX connector to an ANX or another ANY TX connector.	3BK 07919	1
CS03	RXRC	RXRC connects a TRE RX connector to an ANY, ANX or ANC RX connector.	3BK 07920	2
	TXRC	TXRC connects a TRE TX connector to an ANY, ANX or ANC TX connector.	3BK 07919	1
CS04	ANIC	The Antenna Indoor Cable provides a duplex connection between the ANX/ANC and a cabinet antenna connector.	3BK 07921	2
CS05	CA-ABIS	The Cable Assembly - Abis BTSCA-SUM Cable carries the Abis1 /2 Interfaces from the Interconnection Panel to the SUM.	3BK 07922	1
	CA-BTSCA	The Cable Assembly - BTSCA-SUM Flat Cable carries clock and control signals between the Interconnection Panel and the SUM.	3BK 07923	1

Table 15: CIMI/CIDI Cable Sets

3.1.6.3 External Cables

The CIMI/CIDI external cables consist of discrete cables that are listed and described in the following table.

Mnemonic	Description	Part Number
Antenna Jumper	Antenna jumpers, 1 m/ 2 m/ 3 m / 5 m length, HCF1/ 2, 2 x 7/ 16 straight male connectors. They connect the BTS to the main antenna cables.	3BK 05360
CA01	Cable Assembly 01 is a 120 Ω PCM cable. It provides the Abis1 and Abis2 connections between the BTS A9100 Interconnection Panel and the customer's 2 Mbit/s PCM distribution board.	3BK 07594
	This cable can be replaced by one made on-site to the desired length. The cable used is L907, an 8 pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0004
CA02	Cable Assembly 02 is a 75 Ω PCM cable. It provides the Abis1 and Abis2 connections between the BTS A9100 Interconnection Panel and the customer's 2 Mbit/s PCM distribution board.	3BK 07595
	This cable can be replaced by one made on-site to the desired length. The cable used is Flex3, a multi-coaxial, 2 Mbit/s, 75 Ω PCM cable.	1AC 00110 0011
	A shorting plug, SP2M is used with Flex3, for impedance matching.	3BK 08949
CA-CBTE	The Cable Assembly - Cable BTS Terminal is the BTS Terminal cable. It connects the BTS Terminal to the BTS Terminal connector on the SUM.	3BK 07951
CA-GC35	The Cable Assembly - Ground Cable 35 mm sq. is the cabinet ground cable. It connects to the M8 ground bolt on the cabinet, and to the customer's ground point.	3BK 08031
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq., yellow/green power cable.	1AC 01723 0003
CA-PC2W16	Cable Assembly - Power Cable Two Wires 16 mm sq. is a -48/ 0 VDC cabinet power cable. It connects to the DC connectors on the Interconnection Panel, and to the customer's DC power source.	3BK 08029
	This cable can be replaced by one made on-site to the desired length. The cables used are a 16 mm sq. blue power cable and a 16 mm sq. black power cable.	1AC 00147 0001 (Blue) 1AC 00147 0002 (Black)
CA-PC35BK	Cable Assembly - Power Cable 35 mm sq. Black is a 0 VDC cabinet power cable. It connects to the 0 VDC connector on the Interconnection Panel, and to the customer's 0 VDC power source.	3BK 08030
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. black power cable.	1AC 01723 0001

Mnemonic	Description	Part Number
CA- PC35BL	Cable Assembly - Power Cable 35 mm sq. Blue is a -48 VDC cabinet power cable. It connects to the -48 VDC connector on the Interconnection Panel, and to the customer's -48 VDC power source.	3BK 08032
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. blue power cable.	1AC 01723 0002
External Alarms	This cable can be made on-site to the desired length. The cable used is L907, an 8-pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0001
SCG2/3	Synchronization Cable Generation 2/3 is a clock synchronization cable. It connects a G2 BTS to the BTS A9100.	3BK 08101
SCG3	Synchronization Cable Generation 3 is a clock synchronization cable. It connects a BTS A9100 to another BTS A9100.	3BK 07950
SCM1/3	Synchronization Cable Mark 1/3 is a clock synchronization cable. It connects a G1 BTS Mark1 to the BTS A9100.	3BK 08102
SCM2/3	Synchronization Cable Mark 2/3 is a clock synchronization cable. It connects a G1 BTS Mark2 to the BTS A9100.	3BK 08103

Table 16: CIMI/CIDI External Cables

3.1.7 CIMI/CIDI Data and Control Cabling

The following figure shows the logical interconnections provided by the data and control cables.

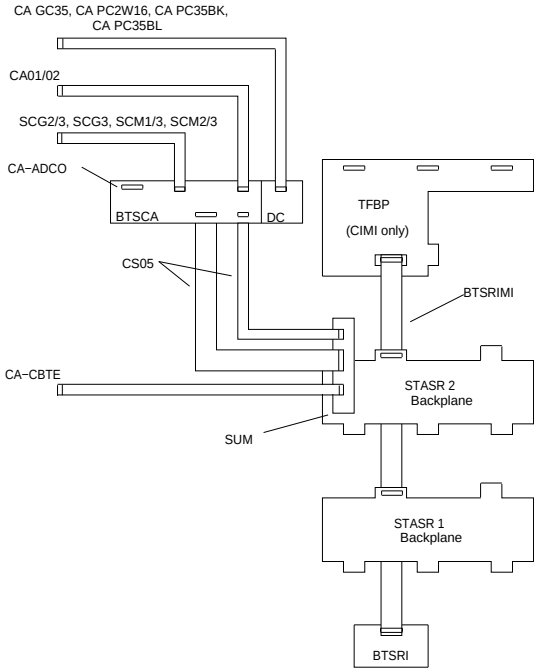


Figure 189: CIMI/CIDI Data and Control Cabling

3.2 CIMA/CIDE

The CIMA/CIDE are indoor cabinets that support both omnidirectional and sectorized configurations. There are two variants, where the allowed configurations are determined by the type of external power supply used by the cabinet:

- DC power supply variant
- AC power supply variant.

The following figure shows the position of the main modules for both variants.

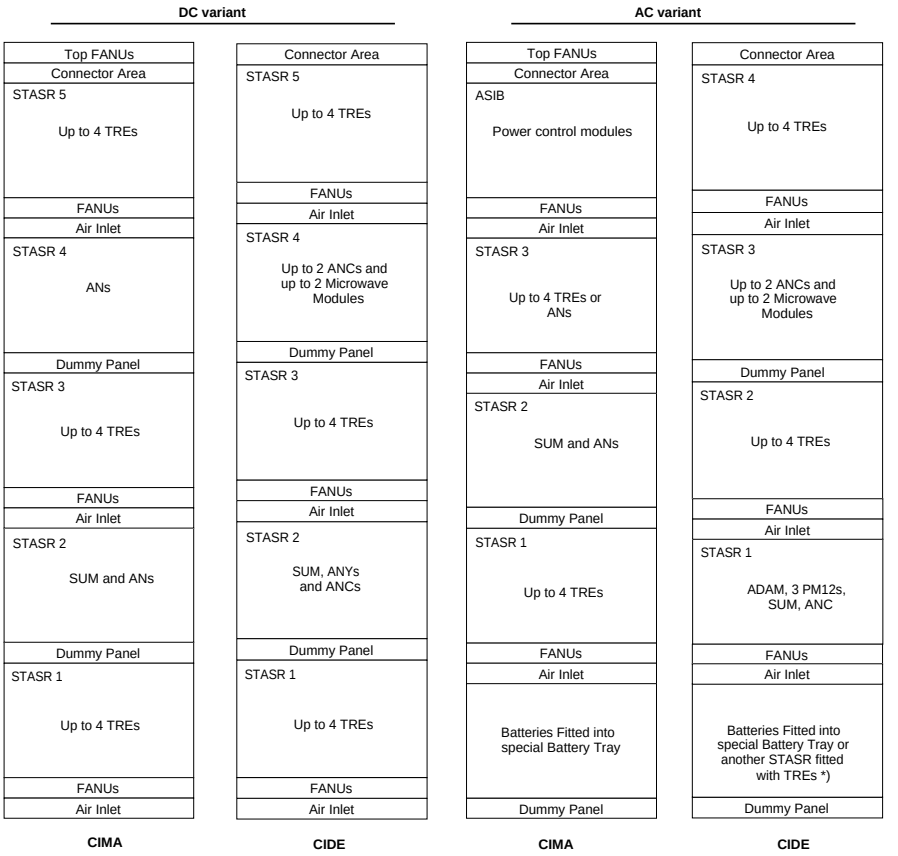


Figure 190: CIMA/CIDE Module Positions

3.2.1 DC Power Supply Variant

The DC variant of the cabinet is designed to house up to five STASRs. The odd-numbered subrack positions (1, 3 and 5) each contain up to four TREs. STASR2 contains the SUM and a mixture of ANX, ANY or ANC modules, as required. STASR4 can contain only a mixture of ANX, ANY or ANC modules, as well as microwave communications modules.

Cooling is provided by FANUs situated at the base of each of the odd-numbered subracks and, in the CIMA, also at the top of the cabinet.

3.2.2 AC Power Supply Variant

The AC variant of the CIMA is designed to house up to three STASRs and an ASIB subrack. The odd-numbered subrack positions (1 and 3) each contain up to four TREs. STASR2 contains the SUM and a mixture of ANX and ANY modules, as required.

The battery tray in the bottom of the cabinet can contain a BU41 or a BU100, in the CIMA, Subrack 4 is an ASIB subrack containing the AC power control modules.

The AC variant of the CIDE uses a backup battery which can be housed internally or externally:

- If an internal battery is used, the CIDE holds four STASRs. STASR1 contains the SUM, three PM12s and the ADAM. STASR2 and 4 each contain up to four TREs. STASR3 contains up to two ANCs, and optionally, up to two microwave communications modules
- If an external battery is used, the CIDE holds five STASRs. The battery tray at the bottom of CIDE is replaced by a STASR which contains up to four additional TREs. In this case FANUs are installed under this STASR.

Cooling is provided by FANUs situated at the base of each of the subracks containing TREs and the power control subrack.

3.2.3 CIMA/CIDE Cabinet Access and Features

The following figure shows the CIMA/CIDE equipped with the interconnection panel and five empty subracks.

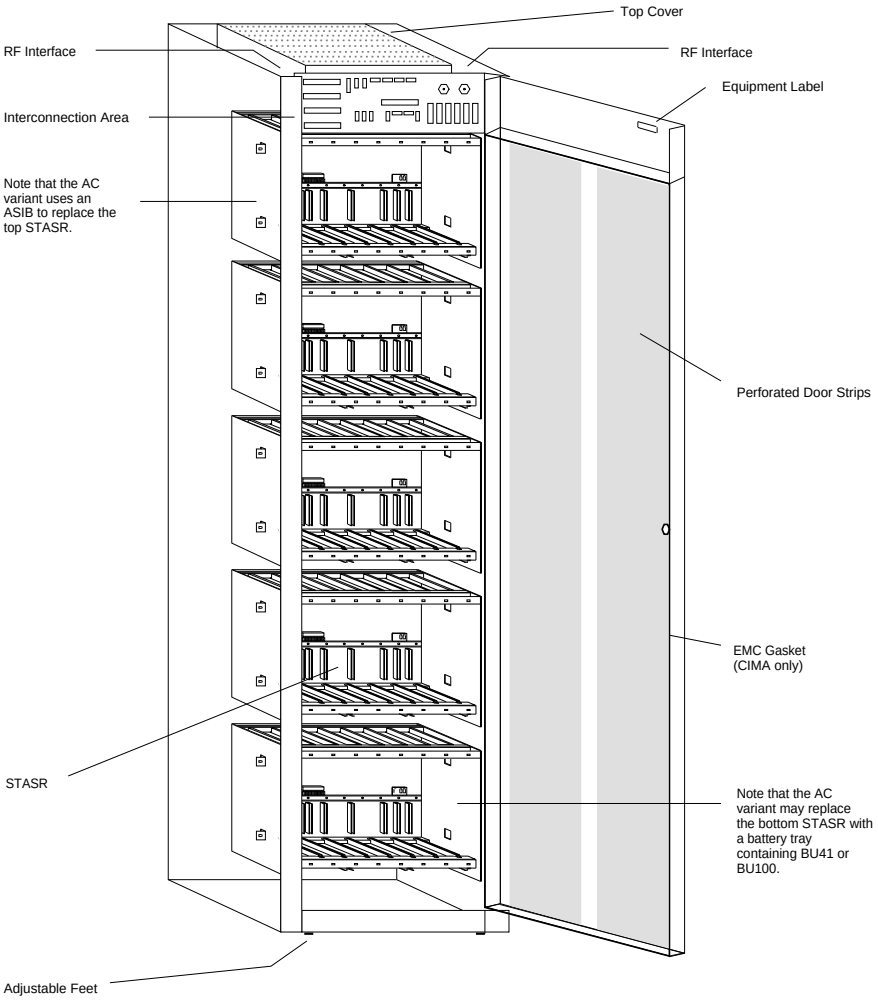


Figure 191: CIMA/CIDE Equipped with Empty Subracks

3.2.3.1 Construction

The CIMA/CIDE is a steel box construction with four adjustable feet, on its underside, to compensate for any unevenness in the floor. The cabinet has no side access; all cable interfaces are accessible from the front or the top of the cabinet.

The structure and dimensions of the mechanical rack and equipment comply with IEC 297 standards.

3.2.3.2 Door

The CIMA/CIDE can be installed in back-to-back or back-to-wall configurations. Access to the subracks and the interconnection panel is via a door at the front of the cabinet. The door is the full height of the cabinet and, in the CIMA, is fitted with a copper-beryllium gasket to ensure EMC integrity when closed.

3.2.3.3 Cables

All external cables, except for the antenna, are connected to the interconnection panel. The external cables include the AC or DC supply and Abis connections. The antenna cabling is connected at the top of the cabinet.

A ribbon cable is used within the cabinet to link the subracks together; see the following figure. The top end of the cable terminates on the TFBP (CIMA only - refer to *Top Fan Unit (Section 11.1.3)* for more information). The bottom end terminates on the BTSRI board (refer to *Remote Inventory (Section 8.5)* for more information). If an internal battery is used in the AC Variant, the ribbon cable also connects to the RIBAT (refer to *RIBAT (Section 12.29)* for more information).

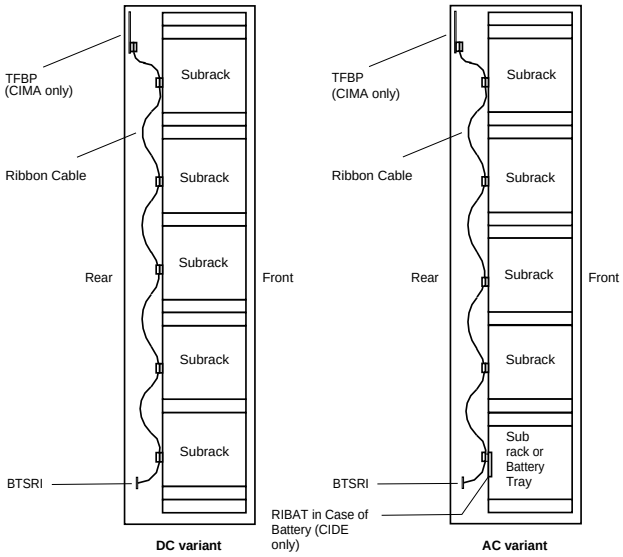
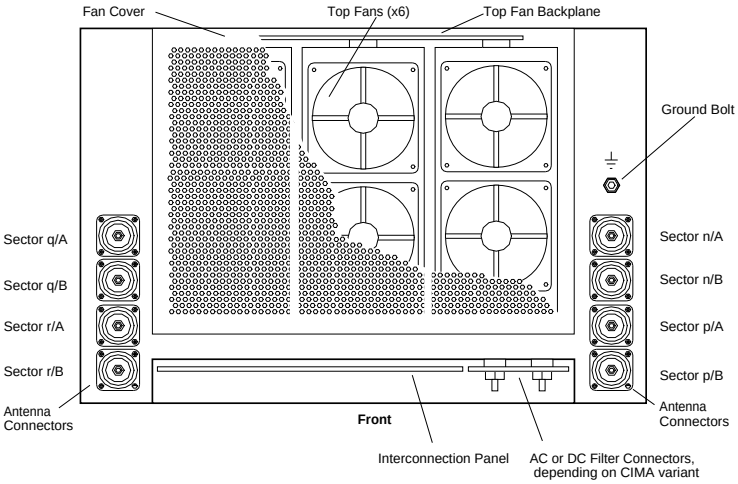


Figure 192: CIMA/CIDE Subracks Interconnection Cable

3.2.3.4 Cabinet Top

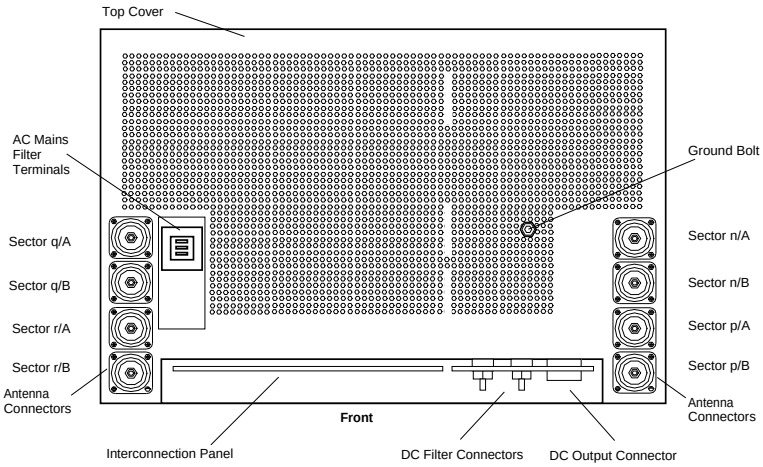
The following figure is a top view of the CIMA, showing antenna connectors and the fan cover. The cover is cut away to reveal extractor fans. The fans are installed and removed via the front of the cabinet.



Note: Sector n/p/q/r means the sector with n/p/q/r TREs.
A and B are numbering conventions of the antennas.
Antenna connectors are not necessary completely equipped.

Figure 193: CIMA Top View

The following figure is a top view of the CIDE. The CIDE has no top fans, just a perforated top cover.



Note: Sector n/p/q/r means the sector with n/p/q/r TREs.
A and B are numbering conventions of the antennas.
Antenna connectors are not necessary completely equipped.

Figure 194: CIDE Top View

The antennae are connected to RF connectors at the top of the cabinet. An M8 bolt is also located on the top for connecting the cabinet to ground. Any unequipped holes are fitted with a blanking plate.

The CIDE AC variant has an AC filter set in the roof plate next to the antenna connectors on the left side. The filter has terminals for connection to a 230 VAC 1Ø supply.

3.2.3.5 Cooling

The CIMA/CIDE is air cooled by fans, inside the cabinet and, in the CIMA, additionally at the top. Cool air is drawn in through perforations on the door and is then forced up, through the subracks, by the internal fans. The warm air is expelled through perforations at the top of the cabinet by the top fans. Refer to *Temperature Control (Section 11)* for details of the cooling system hardware.

3.2.4 CIMA/CIDE Cabinet Interconnection Panel

All the external electrical interfaces are located on a front-facing panel at the top of the cabinet. The following figure shows the details of the CIMA/CIDE DC and AC variants.

The exception is the CIDE AC mains input, which is located in the cabinet roof. AC mains input terminals are part of the AC mains filter. The filter is located next to the antenna connectors, see Figure *194*.

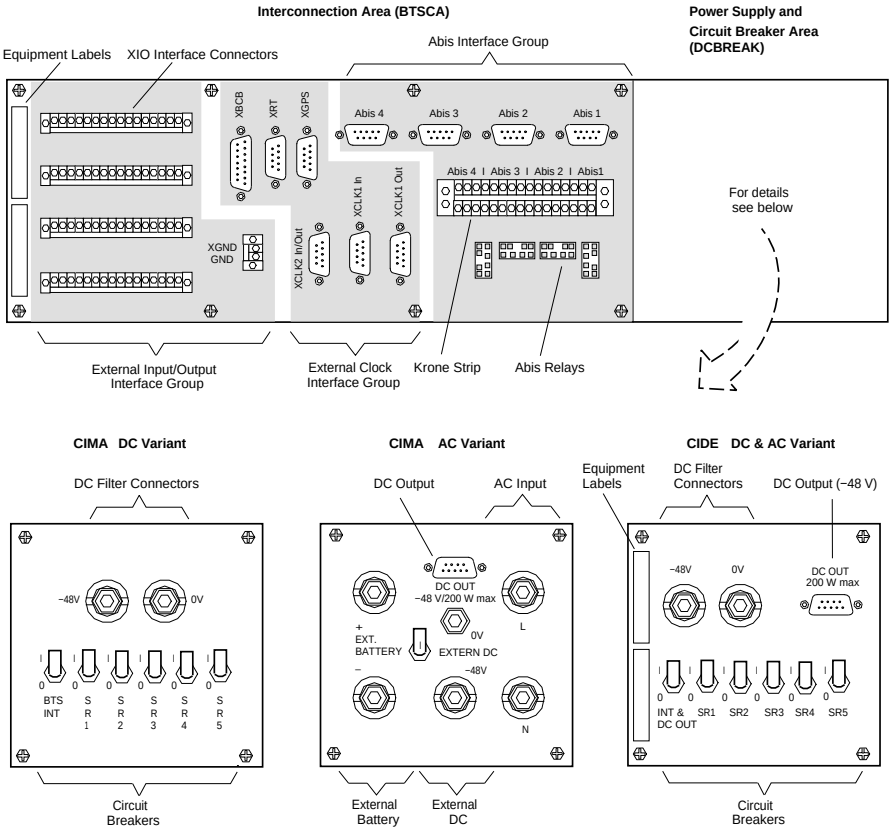


Figure 195: CIMA/CIDE Interconnection Panel, DC and AC Variants

On the left-hand side of the Interconnection Panel (see the previous figure) is the interconnection area; the shaded areas identify separate groups of connectors. The power supply input-connectors and circuit breakers are located on the right-hand side.

Located behind the interconnection area is an XIOB. The XIOB is connected to the interconnection area and contains a 24 V DC/DC converter and interface circuitry for external alarms.

The interconnection panel provides interfaces for:

- XIO, external clock and Abis signals
- External power supplies for both DC and AC variants.

3.2.5 CIMA/CIDE Signal Interfaces

The three CIMA/CIDE signal interfaces are described below.

XIO Interface	The XIO connectors allow various external alarm devices to be connected to the BTS A9100. These include smoke and flood detectors, as well as electro-mechanical switches. Crimped or clamp strip contacts can be used on the XIO connectors. The positions of the XIO connectors are shown in Figure *195*. A detailed view of the XIO connectors is given in Figure *187*. The XIO connectors are described in functional groups in Table *8*. Table *9* gives a detailed view of the eternal alarm inputs.
External Clock Interface	The external clock interface provides connectors for a variety of functions; see Figure *195*. The connectors are described in Table *10*.
Abis Interface	The Abis Interface provides components for a variety of functions; see Figure *195*. The interface consists of the connectors described in Table *11*.

3.2.6 CIMA/CIDE External Power Supply Interfaces

The external power supply interfaces for the CIMA/CIDE AC and DC variants are described below.

3.2.6.1 CIMA DC Variant Interface

The external power supply inputs to the CIMA are located on a panel to the right of the interconnection area; see Figure *195*. The components are listed in the following table.

DC Filters	There are two DC filter connectors; one for the 0 V input and one for the -48/-60 VDC input.
Circuit Breakers	Six hydraulic-magnet type DC circuit breakers protect the CIMA equipment from overload. Each subrack power supply is protected by a separate circuit breaker. The XIOB (which includes the interconnection area) and the top fan backplane share the sixth breaker (see Figure *196*).

Table 17: CIMA, DC Power Supply Interface

3.2.6.2 CIMA AC Variant Interface

The external power supply inputs to the CIMA are located on a panel to the right of the interconnection area; see Figure *195*. The components are listed in the following table.

AC Filter	There is one AC filter connector, for the 230 VAC 1Ø input.
DC Filter	There is one DC filter connector, for the -48/-60 VDC output.
Circuit Breaker	One hydraulic-magnet type DC circuit breaker protects the CIMA equipment from overload. The CIMA power supply system for the AC variant is described in Figure *197*.
DC Output	A 9-pin D-type connector provides -48 VDC supply at 200 W max.

Table 18: CIMA, AC Power Supply Interface

3.2.6.3 CIDE DC and AC Variant Interface

The external power supply inputs to the CIDE are located on top of an AC mains filter fitted in the roof of the cabinet; see Figure *194*. The components are listed in the following table.

AC Filter	There is one AC filter connector, for the 230 VAC 1Ø input.
DC Filters	There are two DC filter connectors; one for the 0 V input and one for the -48/-60 VDC input.
Circuit Breakers	Six hydraulic-magnet type DC circuit breakers protect the CIDE equipment from overload. Each subrack power supply is protected by a separate circuit breaker. See Figures *196* and *198*.
DC Output	A 9-pin D-type connector provides -48 VDC supply at 200 W max. to two optional Microwave Communication Modules.

Table 19: CIDE, DC and AC Power Supply Interface

3.2.7 CIMA/CIDE Power Supply and Grounding

3.2.7.1 CIMA/CIDE DC Variant

The CIMA/CIDE is powered from a -48/-60 VDC external power source. Power is distributed to the cabinet via two filtered input connectors; see the following figure.

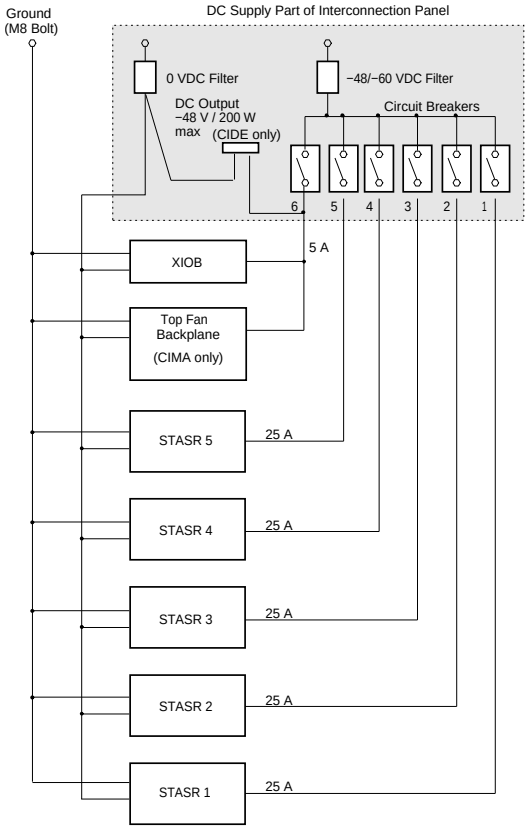


Figure 196: CIMA/CIDE DC Power Interconnections

Each subrack has:

- A filtered input of -48/-60 VDC
- A filtered 0 V return
- A ground connector
- A circuit breaker.

The XIOB and TFBP (CIMA only) have the same inputs as the subracks.

The following table shows the rated values for the power components.

Item	Component/Rating
0 and -48/-60 VDC Filters	4 µF capacitors, rated at 75 A.
Circuit Breakers 1 - 5	25 A
Circuit Breaker 6	5 A

Table 20: CIMA/CIDE Power Component Ratings

The CIMA/CIDE is EMC-protected at both cabinet and module level. At cabinet level, the CIMA/CIDE is connected to ground via a cable terminated on top of the cabinet with an M8 bolt. At module level, ground continuity is carried to the subracks via the cabinet bus bar. In the CIMA, a functionally identical alternative to the cabinet bus bar is used in the AC variant and the later DC variant of CIMA. This is a branched cableform.

The bus bar (or cableform) also distributes the DC voltages to the subracks and other CIMA/CIDE equipment.

3.2.7.2 CIMA AC Variant

The following figure shows the power supply distribution for the CIMA AC variant.

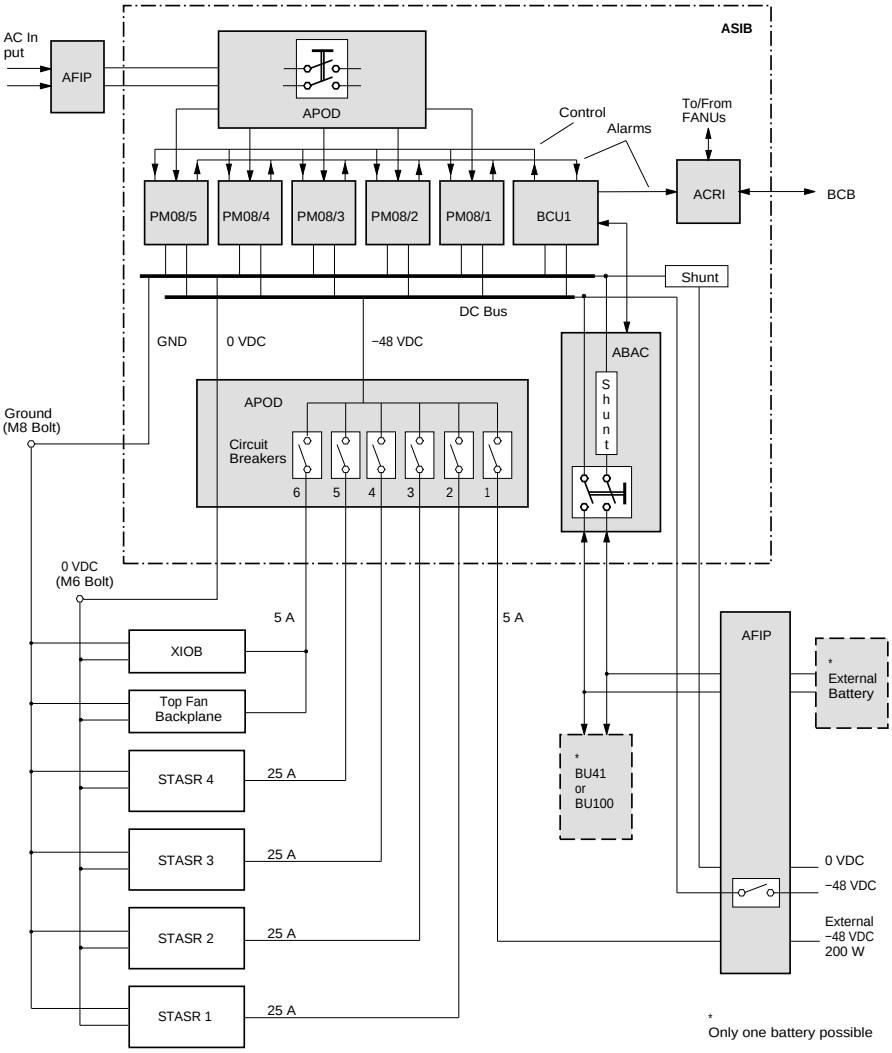


Figure 197: CIMA AC Variant Power Supply System

The AC input is 230 VAC 1Ø. The AC input is connected to the AFIP, where it is filtered and passed to the APOD. The APOD is located in the ASIB and contains an AC circuit breaker used to isolate the AC input supply.

The ASIB contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *APOD (Section 12.11)* and *PM08 (Section 12.12)* for detailed descriptions of the APOD and the PM08s, respectively. Up to five PM08s are used in the CIMA; these are PM08/5 to PM08/1
- Control the output DC voltage level for battery charging and testing. Refer to *BCU1 (Section 12.16)*, *ABAC (Section 12.20)*, *BU41 (Section 12.24)*, *BU100 (Section 12.25)* for detailed descriptions of BCU1 and the ABAC, and the optional items BU41 and BU100, respectively.

The DC supply produced in the ASIB is connected to the remaining modules in the CIMA via the circuit breakers located on the APOD.

The CIMA is EMC-protected at both cabinet and module level. At cabinet level, the CIMA is connected to ground via a cable terminated on top of the cabinet with an M8 bolt. At module level, ground continuity is carried to the subracks via a branched cableform. The cables are terminated with FASTON, Mate-N-Lock and spade connectors.

3.2.7.3 CIDE AC Variant

The following figure shows the power supply distribution for the AC variant. The presence of the battery depends on the power supply option selected:

- CIDE without backup battery
- CIDE with an internal backup battery
- CIDE with an external backup battery.

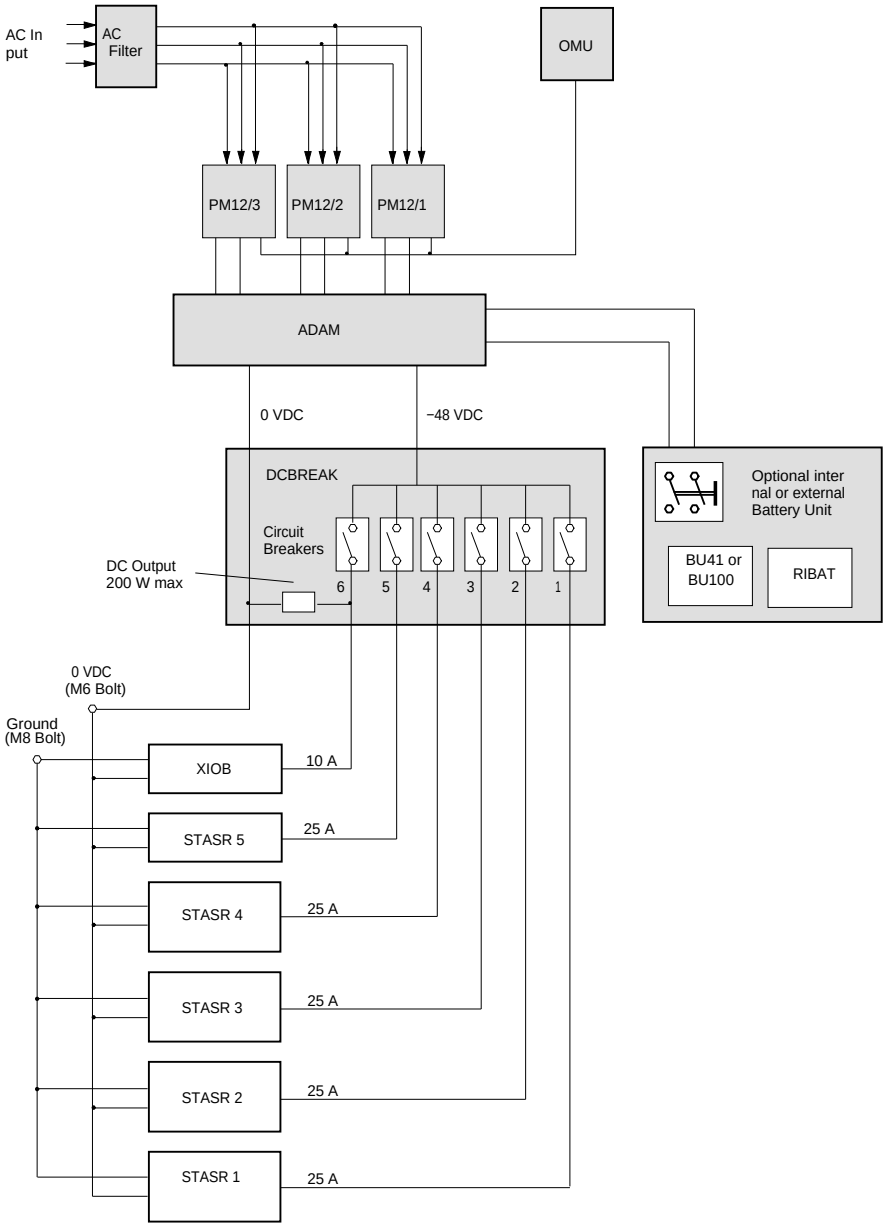


Figure 198: CIDE AC Variant Power Supply System

The AC input is 230 VAC 1Ø. The AC input is connected to the AC Filter, where it is filtered and passed to three PM12s. The mains power connection to each PM12 is via a flying socket.

The three PM12s convert the AC input to 0/ -48 VDC. Refer to *PM12 (Section 12.14)* for a description of the PM12. Up to three PM12s are used in a CIDE; these are PM12/3 to PM12/1.

Control of the output DC voltage level for battery charging and testing is provided by the OMU via the BCB. Charge/discharge current is monitored via a shunt in the ADAM. The ADAM acts as an interface between the PM12s, the batteries and the power distribution inside the BTS. Refer to *ADAM (Section 12.21)* for a detailed description of the ADAM and for a functional description of the power supply system.

DC power is distributed in the BTS via DCBREAK and the bus bar. DCBREAK contains six circuit breakers, five for STASRs 1 - 5, and one for the XIOB.

The CIDE is EMC-protected at both cabinet and module level. At cabinet level, the CIDE is connected to ground via a cable terminated on top of the cabinet with an M8 bolt. At module level, ground continuity is carried to the subracks via a bus bar system. The cables are terminated with FASTON, Mate-N-Lock and spade connectors.

3.2.8 CIMA/CIDE Cables and Cable Sets

This section lists the cables and cable sets for all BTS A9100 CIMA/CIDE configurations.

For the physical and electrical descriptions of the discrete cables, see *Cable Descriptions (Section 17)*.

For some of the cables and cable sets, there exist different variants. For the variants used in a specific cabinet, refer to its parts list.

3.2.8.1 Internal Cables

The CIMA/CIDE internal cables consist of the discrete cables and cable sets.

The following table lists the cables and cable sets, Table *22* lists and describes the cables that comprise the cable sets.

Mnemonic	Description	Part Number
ADABA	ADABA connects the battery via breakers to ADAM. It includes a cable for the battery temperature sensor.	3BK 25146
ADABM	ADABM connects the -48 VDC filter to ADAM or the interconnection area.	3BK 25139
BTSRIMA	The CIMA BTS Remote Inventory Board with Cable for MEDI is a flat cable and a PCB. It interconnects the subrack backplanes and the TFBP. A BTSRI board is permanently attached to one end of the flat cable.	3BK 07720
BUMA	The Cable Assembly Maxi as used in the later variant of CIMA is a branched cableform. It contains cables for the DC power connections to the subracks, XIOB, and top fans.	3BK 07762
CA-ADCO	The CA-ADCO disables eight alarm inputs. It connects to an XIO connector on the Interconnection Panel.	3BK 07953
CIMA bus bar	The CIMA bus bar is a hardware module used for the DC power connections to the subracks, XIOB, and top fans.	3BK 07762
CS02	CS02 is an AN cable set. It connects an ANY to another ANY or to an ANX or ANC.	3BK 07598
CS03	CS03 is a TRE cable set. In a CIMA, it connects a TRE to an ANX or ANY. In a CIDE, it connects a TRE to an ANC.	3BK 07599
CS04	CS04 is an ANT cable set. It connects an ANX or ANC to two antenna cabinet connectors.	3BK 07600
CS05	CS05 is the BTSCA-to-SUM cable set. In a CIMA, it interconnects the SUM and the Interconnection Panel. The cable set carries the Abis1 and Abis2 Interfaces, and clock and control signals to and from the SUM.	3BK 07199
CA-PCAN	CA-PCAN connects the -48 VDC filter (on DCBREAK) to ADAM or to the interconnection area.	3BK 25115
CA-PCAP	CA-PCAP connects the 0 VDC filter (on DCBREAK) to ADAM or to the interconnection area.	3BK 25114

Table 21: CIMA/CIDE Internal Cables

3.2.8.2 Cable Sets

The cable sets used in the CIMA/CIDE cabinets are described in the table below.

Cable Sets	Mnemonic	Description	Part Number	Qty
ADABA	CA-ADABM	CA-ADABM connects -48 VDC from ADAM to the battery breaker.	3BK 25139	1
	CA-ADABP	CA-ADABP connects 0 VDC from ADAM to the battery breaker.	3BK 25138	1
	CA-BABRM	CA-BABRM connects -48 VDC from the battery breaker to the battery interconnection area.	3BK 25141	1
	CA-BABRP	CA-BABRP connects 0 VDC from the battery breaker to the battery interconnection area.	3BK 25140	1
	CA-BSENS	CA-BSENS connects the battery temperature sensor to RIBAT.	3BK 08119	1
CS02	RXRC	The RXRC connects an ANY RX connector to an ANX, ANC or another ANY RX connector.	3BK 07920	2
	TXRC	The TXRC connects an ANY TX connector to an ANX, ANC or another ANY TX connector.	3BK 07919	1
CS03	RXRC	The RXRC connects a TRE RX connector to an ANY, ANX or ANC RX connector.	3BK 07920	2
	TXRC	The TXRC connects a TRE TX connector to an ANY, ANX or ANC TX connector.	3BK 07919	1
CS04	ANIC	The ANIC provides a duplex connection between the ANX or ANC and a cabinet antenna connector.	3BK 07921	2
CS05	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the Interconnection Panel to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the Interconnection Panel and the SUM.	3BK 07923	1

Table 22: CIMA/CIDE Cable Sets

3.2.8.3 External Cables

The CIMA/CIDE external cables consist of discrete cables that are listed and described in the following table.

Mnemonic	Description	Part Number
AC Supply	This AC power supply cable can be made on-site to the desired length. The cable used is a single pair, 4 mm sq. power cable.	1AC 00170 0012
Antenna Jumper	Antenna jumpers, 1 m/ 2 m/ 3 m/ 5 m length, HCF1/ 2, 2 x 7/ 16 straight male connectors. They connect the BTS to the main antenna cables.	3BK 05360
CA01	CA01 is a 120 Ω PCM cable. It provides the Abis1 and Abis2 connections between the BTS A9100 Interconnection Panel and the customer's 2 Mbit/s PCM distribution board.	3BK 07594
	This cable can be replaced by one made on-site to the desired length. The cable used is L907, an 8-pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0004
CA02	CA02 is a 75 Ω PCM cable. It provides the Abis1 and Abis2 connections between the BTS A9100 Interconnection Panel and the customer's 2 Mbit/s PCM distribution board.	3BK 07595
	This cable can be replaced by one made on-site to the desired length. The cable used is Flex3, a multicoaxial, 2 Mbit/s, 75 Ω PCM cable.	1AC 00110 0011
	A shorting plug, SP2M is used with Flex3, for impedance matching.	3BK 08949
CA-CBTE	CA-CBTE is the BTS Terminal cable. It connects the BTS Terminal to the BTS Terminal connector on the SUM.	3BK 07951
CA-GC35	CA-GC35 is the cabinet ground cable. It connects to the M8 ground bolt on the cabinet, and to the customer's ground point.	3BK 08031
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. yellow/green power cable.	1AC 01723 0003
CA-PC2W16	CA PC2W16 is a -48/ 0 VDC cabinet power cable. It connects to the DC connectors on the Interconnection Panel, and to the customer's DC power source.	3BK 08029
	This cable can be replaced by one made on-site to the desired length. The cables used are a 16 mm sq. blue power cable and a 16 mm sq. black power cable.	1AC 00147 0001 (Blue) 1AC 00147 0002 (Black)
CA-PC35BK	CA PC35BK is a 0 VDC cabinet power cable. It connects to the 0 VDC connector on the Interconnection Panel, and to the customer's 0 VDC power source.	3BK 08030
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. black power cable.	1AC 01723 0001
CA -PC35BL	CA PC35BL is a -48 VDC cabinet power cable. It connects to the -48 VDC connector on the Interconnection Panel, and to the customer's -48 VDC power source.	3BK 08032

Mnemonic	Description	Part Number
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. blue power cable.	1AC 01723 0002
External Alarms	This cable can be made on-site to the desired length. The cable used is L907, an 8-pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0001
SCG2/3	SCG2/3 is a clock synchronization cable. It connects a G2 BTS to the BTS A9100.	3BK 08101
SCG3	SCG3 is a clock synchronization cable. It connects a BTS A9100 to another BTS A9100.	3BK 07950
SCM1/3	SCM1/3 is a clock synchronization cable. It connects a G1 BTS Mark 1 to the BTS A9100.	3BK 08102
SCM2/3	SCM2/3 is a clock synchronization cable. It connects a G1 BTS Mark 2 to the BTS A9100.	3BK 08103

Table 23: CIMA/CIDE External Cables

3.2.9 CIMA/CIDE Data and Control Cabling

The following figure shows the logical interconnections provided by the data and control cables.

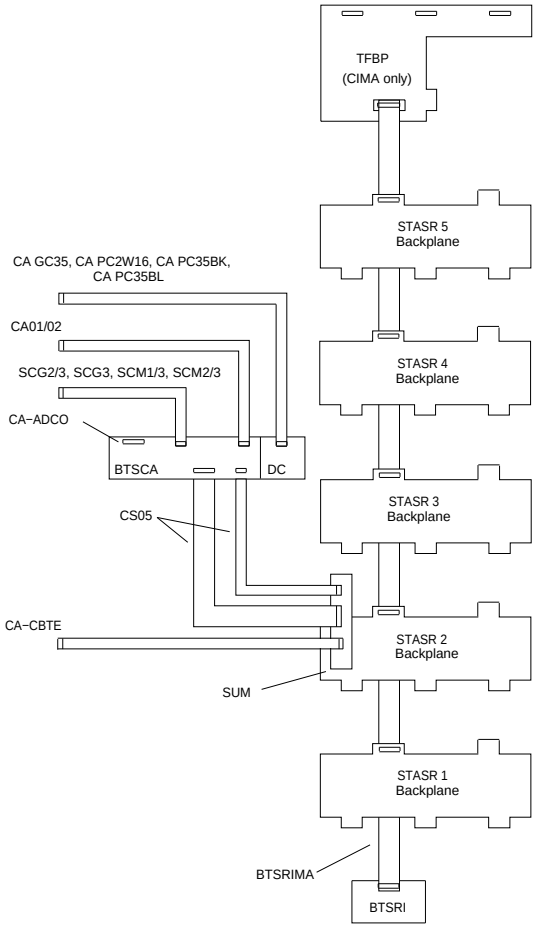


Figure 199: CIMA/CIDE Data and Control Cabling

3.3 Multistandard Base Station Indoor

The MBI3/MBI5 are indoor cabinets that support both omnidirectional and sectorized configurations. There are two variants, where the allowed configurations are determined by the type of external power supply used by the cabinet:

- DC power supply variant
- AC power supply variant.

The following figure shows the position of the main modules for both variants.

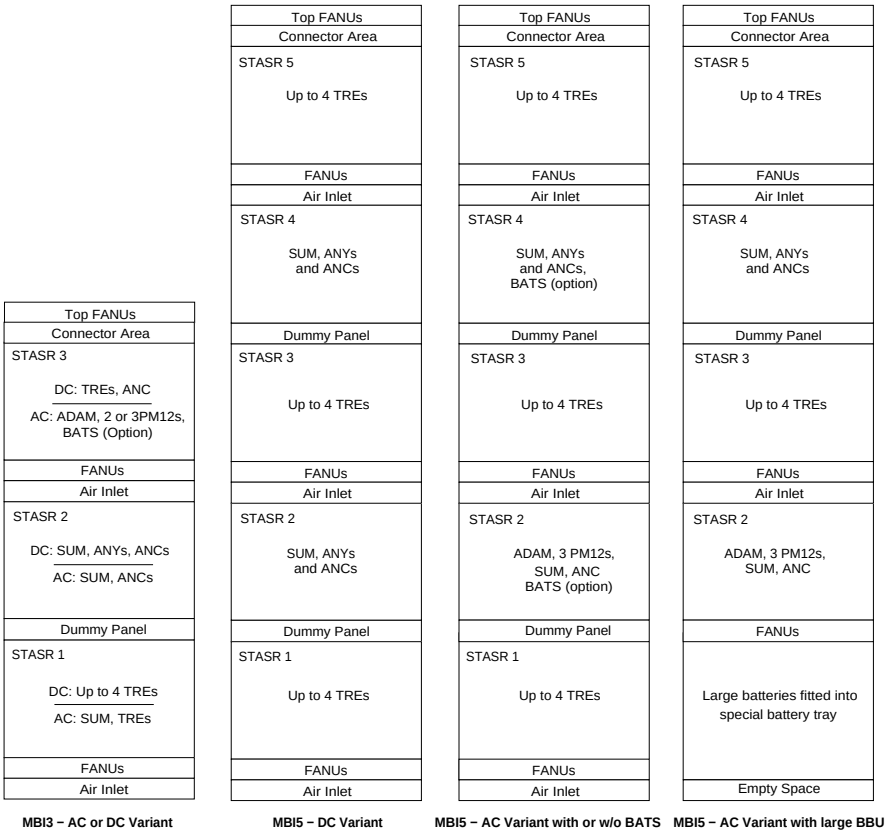


Figure 200: MBI3/MBI5 Module Positions

3.3.1 DC Power Supply Variant

The DC variant of the cabinets is designed to house up to three or five STASRs. The odd-numbered subrack positions each contain up to four TREs. STASR2 contains the SUM and a mixture of ANY and ANC modules, as required. STASR4 can contain only a mixture of ANY or ANC modules, as well as microwave communications modules.

Cooling is provided by FANUs situated at the base of each of the odd-numbered subracks and also at the top of the cabinets.

3.3.2 AC Power Supply Variant

The AC variant of the MBIs uses a backup battery which can be housed internally or externally:

- If an internal battery is used, the MBI3 holds two and the MBI5 holds four STASRs. STASR1 contains the SUM, three PM12s and the ADAM. STASR2 and 4 each contain up to four TREs. STASR3 contains up to two ANCs, and optionally, up to two microwave communications modules
- If an external battery is used, the MBI3 hold three and the MBI5 holds five STASRs. The battery tray at the bottom of the MBI is replaced by a STASR which contains up to four additional TREs. In this case FANUs are installed under this STASR.

Cooling is provided by FANUs situated at the base of each of the subracks containing TREs and the power control subrack.

3.3.3 MBI Cabinet Access and Features

The following figures show the MBI3/MBI5 equipped with the interconnection panel and three or five empty subracks.

3.3.3.1 MBI3 Cabinet

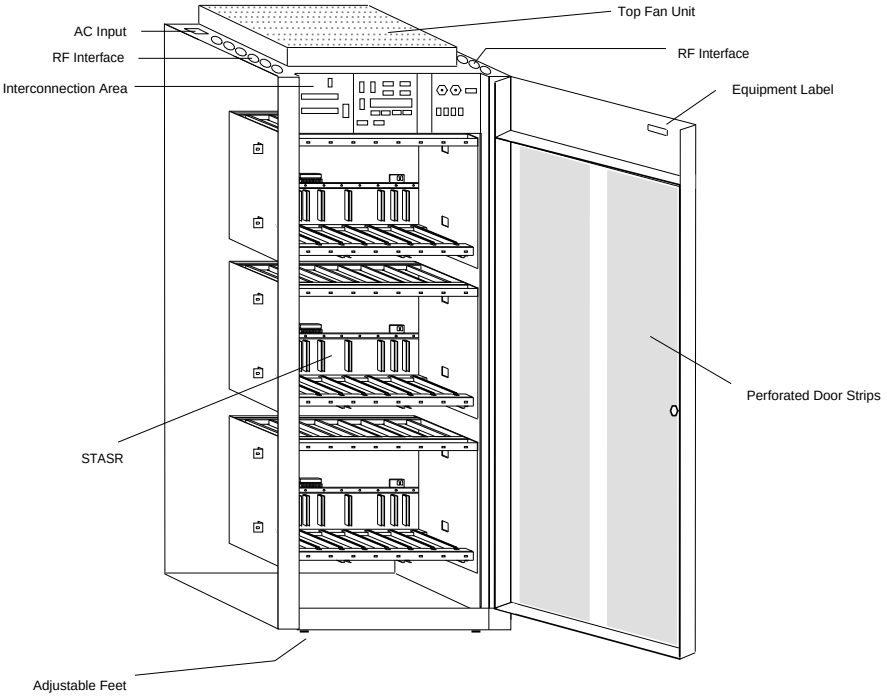


Figure 201: MBI3 Equipped with Empty Subracks

3.3.3.2 MBI5 Cabinet

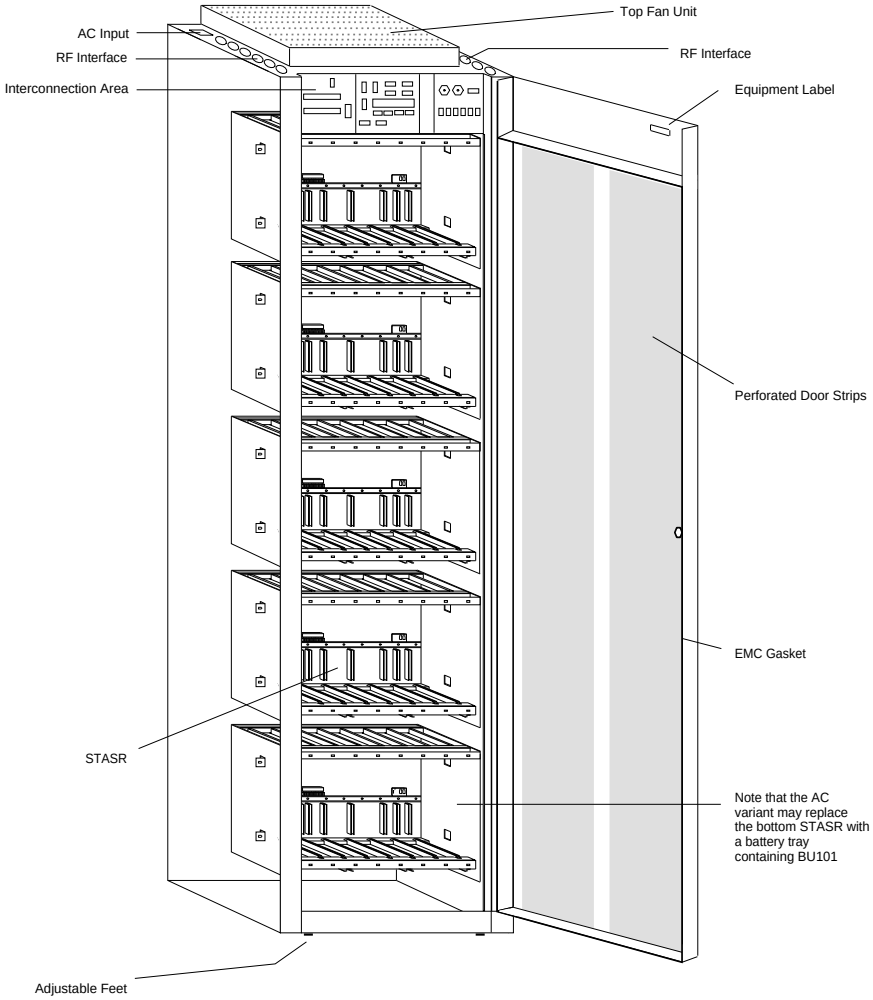


Figure 202: MBI5 Equipped with Empty Subracks

3.3.3.3 Construction

The MBI3/MBI5 are steel box constructions with four adjustable feet on the underside, to compensate for any unevenness in the floor. The cabinets have no side access; all cable interfaces are accessible from the front or the top of the cabinets.

The structure and dimensions of the mechanical rack and equipment comply with IEC 297 standards.

3.3.3.4 Door

The MBI3/MBI5 can be installed in back-to-back or back-to-wall configurations. Access to the subracks and the interconnection panel is via a door at the front of the cabinet. The door is the full height of the cabinet.

3.3.3.5 Cables

All external cables, except for the antenna and AC supply, are connected to the interconnection panel. The external cables include DC supply and Abis connections. The antenna cabling and AC supply are connected at the top of the cabinet.

A ribbon cable is used within the cabinet to link the subracks together; see the following figure. The top end of the cable terminates on the TFBP (refer to *Top Fan Unit (Section 11.1.3)* for more information). The bottom end terminates on the BTSRI board (refer to *Remote Inventory (Section 8.5)* for more information). If an internal battery is used in the AC variant, the ribbon cable also connects to the RIBAT (refer to *RIBAT (Section 12.29)* for more information).

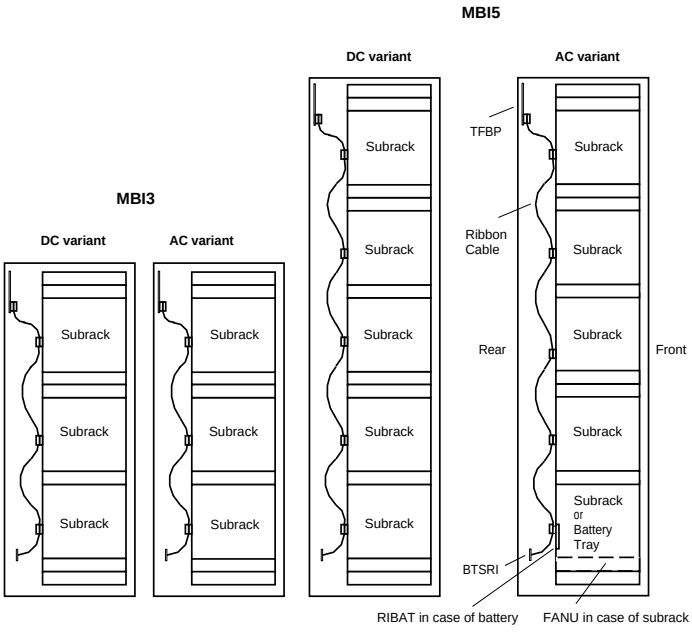


Figure 203: MBI3/MBI5 Subracks Interconnection Cable

3.3.3.6 Cabinet Top

The following figure is a top view of the MBI3/MBI5, showing antenna connectors, AC main filter terminal, fan cover and ground bolt. The cover is cut away to reveal extractor fans. The fans are installed and removed via the front of the cabinet.

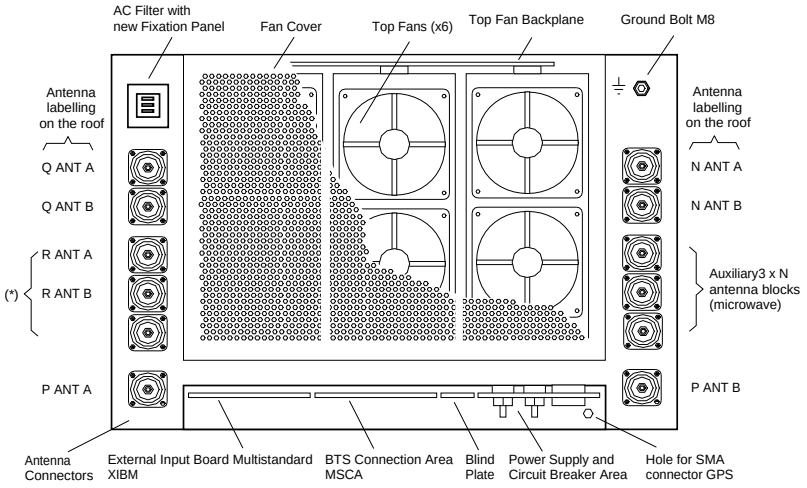


Figure 204: MBI3/MBI5 Top View

The antennas are connected to RF connectors at the top of the cabinet. An M8 bolt is also located on the top for connecting the cabinet to ground. Any unequipped holes are fitted with a blanking plate.

The MBI3/MBI5 AC variant has an AC filter set in the roof plate next to the antenna connectors on the left side. The filter has terminals for connection to a 230 VAC 1Ø supply.

3.3.3.7 Cooling

The MBIs are air cooled by fans, inside the cabinet and additionally at the top. Cool air is drawn in through perforations on the door and is then forced up, through the subracks, by the internal fans. The warm air is expelled through perforations at the top of the cabinet by the top fans. Refer to *Temperature Control (Section 11)* for details of the cooling system hardware.

3.3.4 MBI3/MBI5 Cabinet Interconnection Panels

All the external electrical interfaces are located on front-facing panels at the top of the cabinet. The following figures show the details of the MBI3/MBI5 interconnection panels.

The exception is the AC mains input, which is located in the cabinet roof. AC mains input terminals are part of the AC mains filter. The filter is located next to the antenna connectors, see Figure *204*.

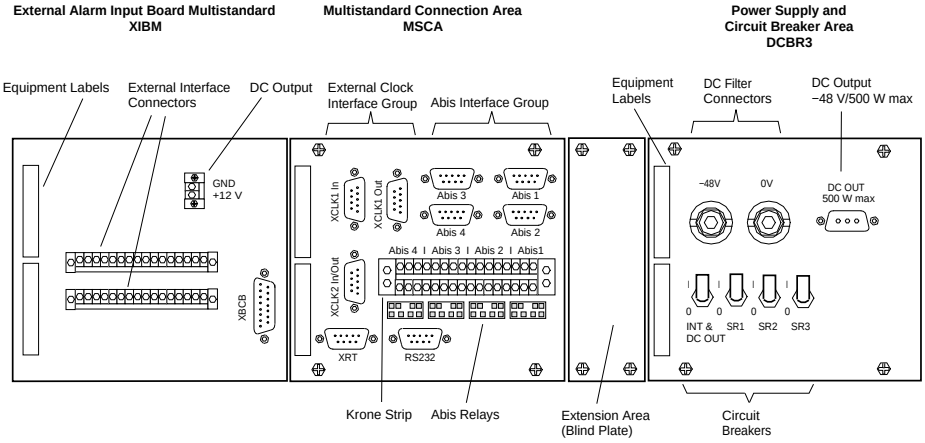


Figure 205: MBI3 Interconnection Panels

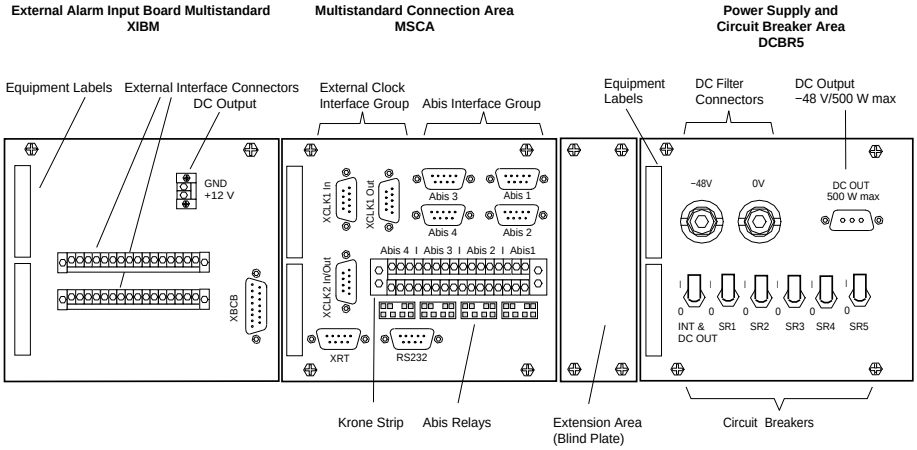


Figure 206: MBI5 Interconnection Panels

On the left-hand side of the interconnection area (see figures above) is the External Alarm Input Board Multistandard XIBM, followed by the Multistandard Interconnection Area MSCA in the middle. An extension area is covered with a blind plate. The power supply input/output connectors and circuit breakers are located on DCBR3/DCBR5 on the right-hand side.

The XIBM contains a 12 V DC/DC converter and interface circuitry for external alarms on the back side of the panel.

The interconnection panels provide interfaces for:

- Signals
  - External alarms
  - External clock
  - Abis.
- DC Power supplies.

3.3.5 MBI Signal Interfaces

The MBI has XIBM, MSCA clock and MSCA Abis signal interfaces. The connectors and functions for each of these interfaces are described below.

3.3.5.1 XIBM Interface Connectors

The XIBM interface connectors are listed in the following table.

External Alarm Interface	'Mini Combicon' connectors XI 1 and XI 2 provide an interface for connecting 16 external alarm inputs. Each input alarm is reported to the OMC-R where it is mapped to customer-defined ASCII text. The ASCII text describes the particular alarm. Each alarm input has two adjacent pins associated with it on the XI connector. If these pins are open-circuit (open loop), an alarm is generated. So every unconnected input alarm is bridged by a short circuit on the plug-in connector. For test purpose, it is possible with software to pull the alarm inputs on active or inactive level in order to check them.
DC Output	The DC Output Connector provides a + 12 VDC power source for external alarm devices that require a power supply. The GND connector is used when attaching the external alarm 12 VDC ground to the BTS A9100 ground. If the connector pins are not short-circuited (open loop), the input and output alarms are isolated from the BTS A9100 ground.
XBCB	The XBCB connector provides an external interface to the internal BCB: ▶ If the BTS is powered, the XBCB can be used to control external devices (e.g., AC/DC power supply, batteries or to provide additional I/O signals) ▶ If the BTS is not powered, the XBCB can be externally powered. Then the direction of the interface is reversed so that it can be used for remote inventory of the whole BTS. This feature is used only at factory level. The signal levels are according to RS-485. An EEPROM is used to store the remote inventory data of the XIBM.

Table 24: XIBM Interface Connectors

The XI connectors allow various external alarm devices to be connected to the BTS A9100. These include smoke and flood detectors, as well as electro-mechanical switches. Crimped or clamp strip contacts can be used on the XI connectors. The positions of the XI connectors are shown in Figures *205* and *206*.

A detailed view of the XI connectors is given in the following figure.

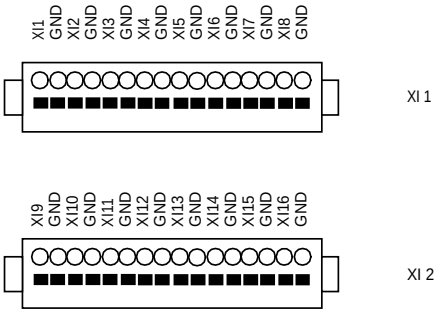


Figure 207: MBI External Alarm Interface Connectors

3.3.5.2 MSCA Clock Interface

The MSCA external clock interface provides connectors for a variety of functions; see Figures *205* and *206*. The connectors are described in the following table.

XRT	The XRT connector provides access to the BTS A9100 via an asynchronous serial interface. The signal levels conform to CCITT V.24. This allows a standard terminal to be used for radio supervision and loop-test purposes. The data rate is programmable between 1200 and 115,000 baud. Only transmit and receive lines are used. Hardware flow control is not implemented. Drivers and control of the XRT interface are located on the SUMA.
RS-232	The RS-232 connector provides an asynchronous serial interface to control and supervise an external GPS receiver or an antenna tilt signal. The signal levels conform to CCITT V.24. The data rate is programmable between 1200 and 115,000 baud. Only transmit and receive lines are used. Hardware flow is not implemented. This interface can also be used to synchronize the BTS A9100 to the GPS receiver or another external clock reference. These signal lines are according to RS-422 Drivers and control of the RS-232 interface are located on the SUMA.
XCLK	The XCLK connectors are used to synchronize the BTS A9100 to another BTS (G1 BTS, G2 BTS, BTS A9100) in time and frequency or vice versa. The signaling interface conforms to RS-422. There are three XCLK connectors: ▶ XCLK1IN: input ▶ XCLK1OUT: output ▶ XCLK2IN/OUT: bi-directional interface. The input XCLK1IN and the output XCLK1OUT are connected together, pin-to-pin. The XCLK2IN/OUT connector provides a bi-directional clock interface. Bus drivers and control logic are located on the SUMA.

Table 25: MSCA External Clock Interface Connectors

3.3.5.3 MSCA Abis Interface

The MSCA Abis Interface provides components for a variety of functions; see Figures *205* and *206*. The interface consists of the connectors described in the following table.

Abis Connectors	The Abis Interface connects the BTS A9100 to the BSC. There are four connectors, these are Abis1 , 2, 3 and 4. All connectors provide 120 Ω and 75 Ω impedances. The impedance is selected by the type of cable connector plugged into the interface. **Note:** Only Abis1 and 2 are currently used; Abis 3 and 4 are provided for future use.
Krone Strip Connector	The Krone strip supports an overvoltage protection device and an Abis monitoring device. The overvoltage protection device is a 'make-before-break' type. This means there is no interruption of service during insertion and removal of the inserts.
Abis Relays	Four relays, one for each Abis Interface, are controlled by the SUMA. The relays can be used to: ▶ Perform loop-back tests on the individual Abis Interfaces ▶ Provide transparent routing of the Abis traffic when the BTS A9100 is powered down or faulty. This ensures that the Abis connection is not broken in multidrop configurations.

Table 26: MSCA Abis Interface Connectors

3.3.6 MBI External Power Supply Interfaces

The external power supply inputs/outputs to/from the MBI3/MBI5 are located on top of the AC mains filter fitted in the roof of the cabinet or on the power supply and circuit breaker area DCBR3/DCBR5, see Figures *201* and *202*. The components are listed in the following table.

AC Filter	There is one AC filter connector, for the 230 VAC 1Ø input.
DC Filters	There are two DC filter connectors; one for the 0 V input and one for the -48/ -60 VDC input.
Circuit Breakers	Four (MBI3) or six (MBI5) hydraulic-magnet type DC circuit breakers protect the MBI equipment from overload. Each subrack power supply is protected by a separate circuit breaker. See Figures *205* and *206*.
DC Output	A 3-pin D-type connector provides -48 VDC supply at 500 W max. to two optional Microwave Communication Modules or external transmission equipment, pylon lightning, etc.

Table 27: MBI, DC and AC Power Supply Interface

3.3.7 MBI Power Supply and Grounding

3.3.7.1 MBI DC Variant

The MBI DC variants are powered from a -48/ -60 VDC external power source. Power is distributed to the cabinet via two filtered input connectors; see the following figures.

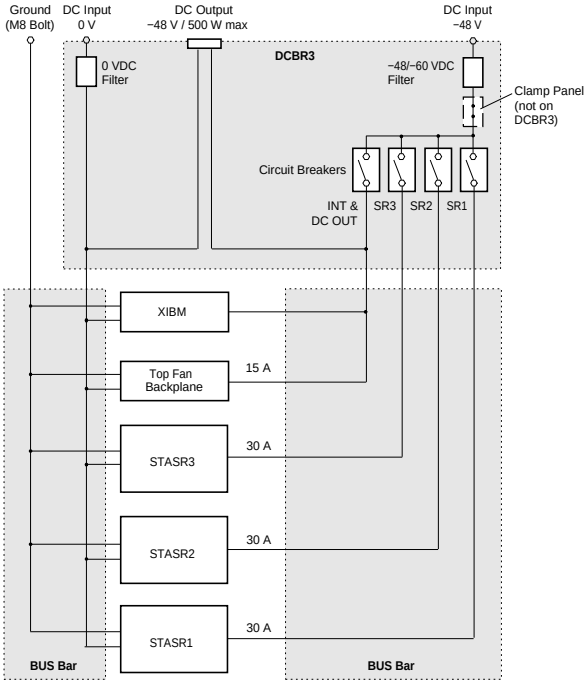


Figure 208: MBI3 DC Power Interconnections

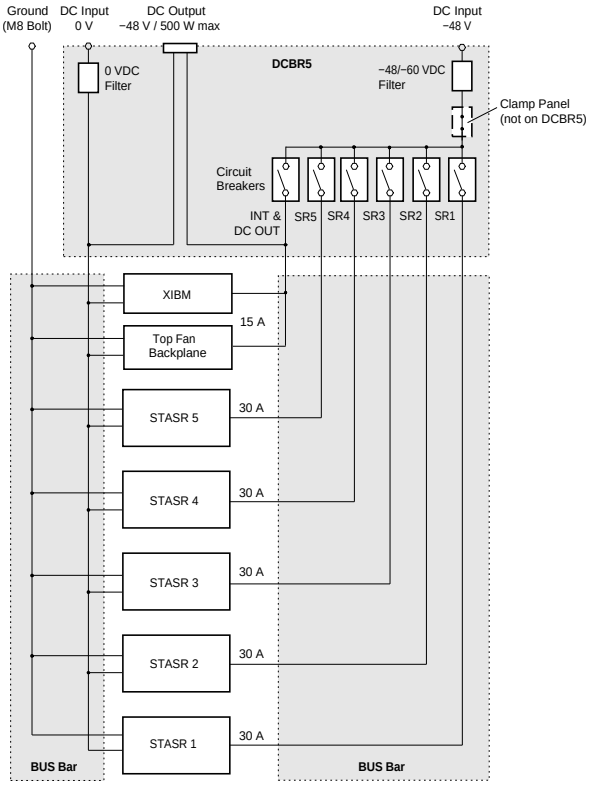


Figure 209: MBI5 DC Power Interconnections

Each subrack has:

- A filtered input of -48/ -60 VDC
- A filtered 0 V return
- A ground connector
- A circuit breaker.

The XIBM and TFBP have the same inputs as the subracks.

The following table shows the rated values for the power components.

Items	Component/Rating
0 and -48/ -60 VDC Filters	4 µF capacitors, rated at 75 A
Circuit Breakers 1 - 3 (MBI3) Circuit Breakers 1 - 5 (MBI5)	30 A
Circuit Breaker 4 (MBI3) Circuit Breaker 6 (MBI5)	15 A

Table 28: MBI Power Component Ratings

The MBIs are EMC-protected at both cabinet and module level. At cabinet level, the MBIs are connected to ground via a cable terminated on top of the cabinet with an M8 bolt. At module level, ground continuity is carried to the subracks via the cabinet bus bar.

The bus bar also distributes the DC voltages to the subracks and other MBI equipment.

3.3.7.2 MBI AC Variant

The following figures show the power supply distribution for the AC variant of MBI5. MBI3 AC variants are similar (only fewer circuit breakers and STASRs), but it is not possible to install a large internal backup battery (no BU101 possible, only BATS). The presence of the battery depends on the power supply option selected:

- MBI without backup battery
- MBI with an internal backup battery
- MBI with an external backup battery.

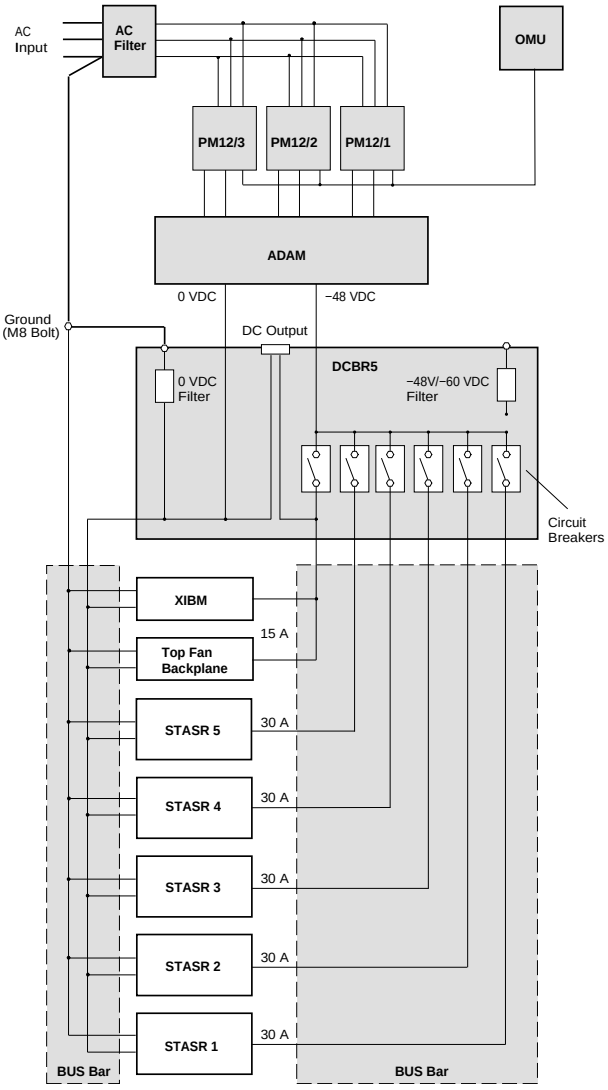


Figure 210: MBI5 AC Variant Power Supply System w/o Battery

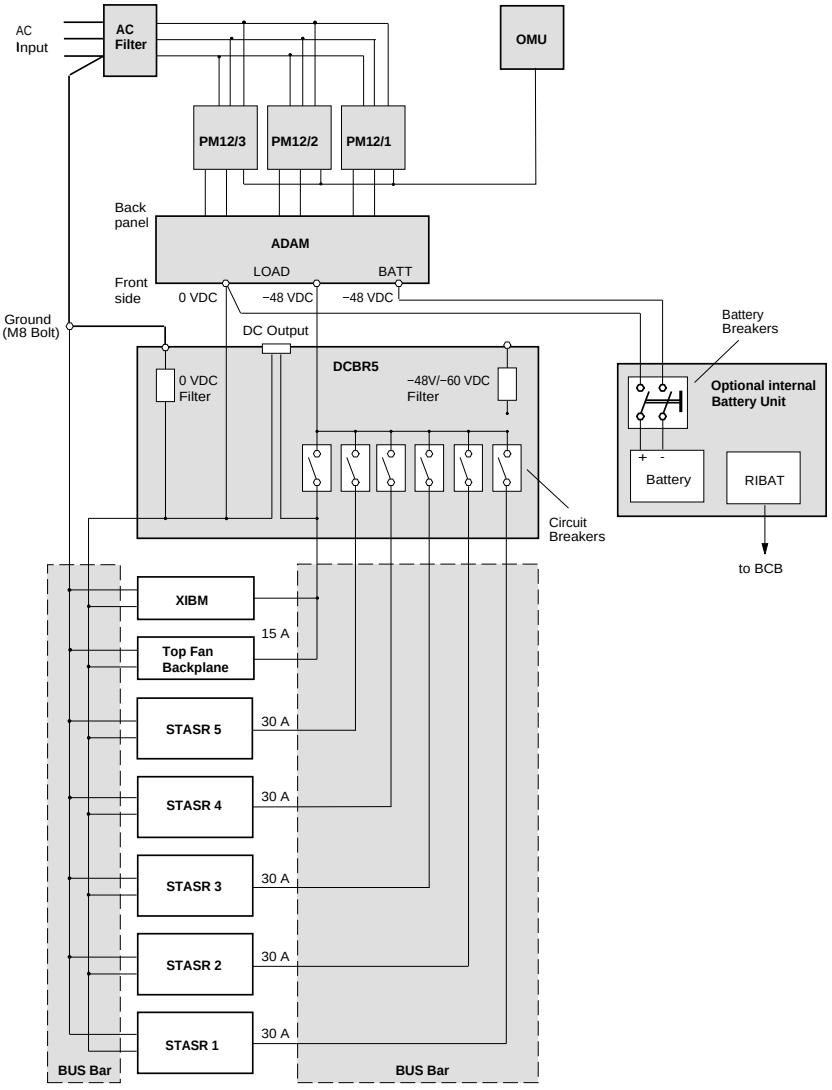


Figure 211: MBI5 AC Variant Power Supply System with Internal Battery

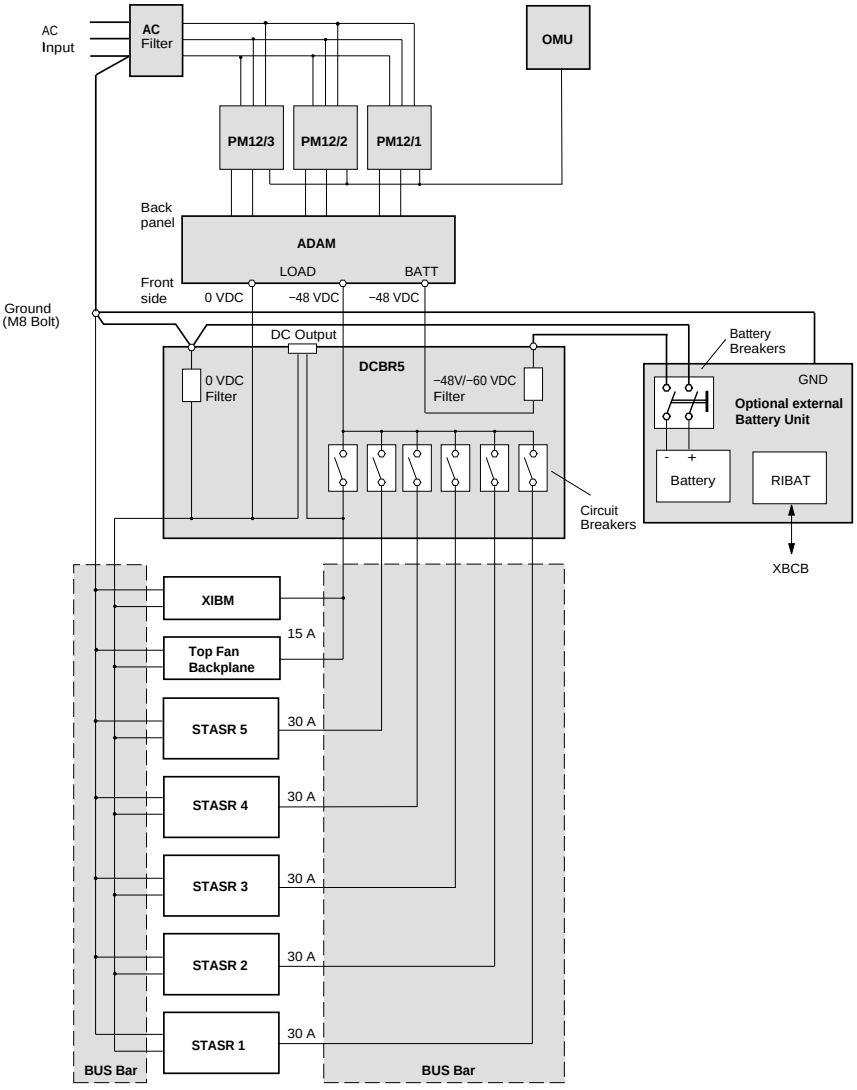


Figure 212: MBI5 AC Variant Power Supply System with External Battery

The AC input is 230 VAC 1Ø. The AC input is connected to the AC filter, where it is filtered and passed to three PM12s. The mains power connection to each PM12 is via a flying socket.

The three PM12s convert the AC input to 0/ -48 VDC. Refer to *PM12 (Section 12.14)* for a description of the PM12. Up to three PM12s are used in a MBI; these are PM12/1 to PM12/3.

Control of the output DC voltage level for battery charging and testing is provided by the OMU via the BCB. Charge/discharge current is monitored via a shunt in the ADAM. The ADAM acts as an interface between PM12s, batteries and power distribution inside the BTS. Refer to *ADAM (Section 12.21)* for a detailed description of the ADAM and for a functional description of the power supply system.

In the MBI3, DC power is distributed in the BTS via the DCBR3 and the bus bar. The DCBR3 contains four circuit breakers, three for STASRs 1 - 3 and one for the XIBM and top fan unit.

In the MBI5, DC power is distributed in the BTS via the DCBR5 and the bus bar. The DCBR5 contains six circuit breakers, five for STASRs 1 - 5 and one for the XIBM and top fan unit.

The MBIs are EMC-protected at both cabinet and module level. At cabinet level, the MBIs are connected to ground via a cable terminated on top of the cabinet with an M8 bolt. At module level, ground continuity is carried to the subracks via a bus bar system. The cables are terminated with FASTON, Mate-N-Lock and spade connectors.

3.3.8 MBI Cables and Cable Sets

This section lists the cables and cable sets for all BTS A9100 MBI configurations.

For the physical and electrical descriptions of the discrete cables see *Cable Descriptions (Section 17)*.

For some of the cables and cable sets, there exist different variants. For the variants used in a specific cabinet, refer to its parts list.

3.3.8.1 Internal Cables

The MBI internal cables consist of the discrete cables and cable sets.

The following table lists the cables and cable sets, Table *30* lists and describes the cables that comprise the cable sets.

Mnemonic	Description	Part Number
ADABA	ADABA connects the battery via breakers to ADAM. It includes a cable for the battery temperature sensor.	3BK 25146
ADABM	ADABM connects the -48 VDC filter to a clamp panel. In combination with CA-PCAN, it connects to the circuit breakers of DCBR3/DCBR5.	3BK 25139
BTSRI3	The BTS Remote Inventory Board with Cable for MBI3 is a flat cable and a PCB. It interconnects the subrack backplanes and the TFBP. A BTSRI board is permanently attached to one end of the flat cable.	3BK 025973
BTSRI5	The BTS Remote Inventory Board with Cable for MBI5 is a flat cable and a PCB. It interconnects the subrack backplanes and the TFBP. A BTSRI board is permanently attached to one end of the flat cable.	3BK 025974
CA-ADCO	The CA-ADCO disables eight alarm inputs. It connects to an XIO connector on the Interconnection Panel.	3BK 07953
CABATS	CABATS connects the small battery unit BATS to ADAM.	3BK 25873
CA-PCAN	CA-PCAN connects the ADAM or the -48 VDC filter (on DCBR3/DCBR5) to the DC breakers on DCBR3/DCBR5.	3BK 25115
CA-PCAP	CA-PCAP connects the 0 VDC filter (on DCBR3/DCBR5) to ADAM.	3BK 25114
CS02	CS02 is an AN cable set. It connects an ANY to another ANY or to an ANC.	3BK 07598
CS03	CS03 is a TRE cable set. It connects a TRE to an ANC.	3BK 07599
CS04	CS04 is an ANT cable set. It connects an ANC to two antenna cabinet connectors.	3BK 07600
CS05	CS05 is the MSCA-to-SUM cable set. It interconnects the SUM and the MSCA. The cable set carries the Abis1 and Abis2 Interfaces, and clock and control signals to and from the SUM.	3BK 07199

Table 29: MBI Internal Cables

3.3.8.2 Cable Sets

The following table describes the cables contained in each MBI cable set.

Cable Sets	Mnemonic	Description	Part Number	Qty
ADABA	CA-ADABM	CA-ADABM connects -48 VDC from ADAM to the battery breaker.	3BK 25139	1
	CA-ADABP	CA-ADABP connects 0 VDC from ADAM to the battery breaker.	3BK 25138	1
	CA-BABRM	CA-BABRM connects -48 VDC from the battery breaker to the battery interconnection area.	3BK 25141	1
	CA-BABRP	CA-BABRP connects 0 VDC from the battery breaker to the battery interconnection area.	3BK 25140	1
	CA-BSENS	CA-BSENS connects the battery temperature sensor to RIBAT.	3BK 08119	1
CS02	RXRC	The RXRC connects an ANY RX connector to an ANC or another ANY RX connector.	3BK 07920	2
	TXRC	The TXRC connects an ANY TX connector to an ANC or another ANY TX connector.	3BK 07919	1
CS03	RXRC	The RXRC connects a TRE RX connector to an ANY or ANC RX connector.	3BK 07920	2
	TXRC	The TXRC connects a TRE TX connector to an ANY or ANC TX connector.	3BK 07919	1
CS04	ANIC	The ANIC provides a duplex connection between the ANC and a cabinet antenna connector.	3BK 07921	2
CS05	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the MSCA to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the MSCA and the SUM.	3BK 07923	1

Table 30: MBI Cable Sets

3.3.8.3 External Cables

The MBI external cables consist of discrete cables that are listed and described in the following table.

Mnemonic	Description	Part Number
AC Supply	This AC power supply cable can be made on-site to the desired length. The cable used is a single-pair, 4 mm sq. power cable.	1AC 00170 0012
Antenna Jumper	Antenna jumpers, 1 m/ 2 m/ 3 m/ 5 m length, HCF1/ 2, 2 x 7/ 16 straight male connectors. They connect the BTS to the main antenna cables.	3BK 05360
CA01	CA01 is a 120 Ω PCM cable. It provides the Abis1 and Abis2 connections between the BTS A9100 Interconnection Panel MSCA and the customer's 2 Mbit/s PCM distribution board.	3BK 07594
	This cable can be replaced by one made on-site to the desired length. The cable used is L907, an 8-pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0004
CA02	CA02 is a 75 Ω PCM cable. It provides the Abis1 and Abis2 connections between the BTS A9100 Interconnection Panel MSCA and the customer's 2 Mbit/s PCM distribution board.	3BK 07595
	This cable can be replaced by one made on-site to the desired length. The cable used is Flex3, a multicoaxial, 2 Mbit/s, 75 Ω PCM cable.	1AC 00110 0011
	A shorting plug, SP2M is used with Flex3, for impedance matching.	3BK 08949
CA-CBTE	CA-CBTE is the BTS Terminal cable. It connects the BTS Terminal to the BTS Terminal connector on the SUM.	3BK 07951
CA-GC35	CA-GC35 is the cabinet ground cable. It connects to the M8 ground bolt on the cabinet, and to the customer's ground point.	3BK 08031
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. yellow/green power cable.	1AC 01723 0003
CA-PC2W16	CA PC2W16 is a -48/ 0 VDC cabinet power cable. It connects the DC connectors on the DCBR3/DCBR5 and the customer's DC power source.	3BK 08029
	This cable can be replaced by one made on-site to the desired length. The cables used are a 16 mm sq. blue power cable and a 16 mm sq. black power cable.	1AC 00147 0001 (Blue) 1AC 00147 0002 (Black)
CA-PC35BK	CA PC35BK is a 0 VDC cabinet power cable. It connects the 0 VDC connector on the DCBR3/DCBR5 and the customer's 0 VDC power source.	3BK 08030
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. black power cable.	1AC 01723 0001
CA -PC35BL	CA PC35BL is a -48 VDC cabinet power cable. It connects the -48 VDC connector on the DCBR3/DCBR5 and the customer's -48 VDC power source.	3BK 08032
	This cable can be replaced by one made on-site to the desired length. The cable used is a 35 mm sq. blue power cable.	1AC 01723 0002

Mnemonic	Description	Part Number
External Alarms	This cable can be made on-site to the desired length. The cable used is L907, an 8-pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0001
SCG2/3	SCG2/3 is a clock synchronization cable. It connects a G2 BTS to the BTS A9100.	3BK 08101
SCG3	SCG3 is a clock synchronization cable. It connects a BTS A9100 to another BTS A9100.	3BK 07950
SCM1/3	SCM1/3 is a clock synchronization cable. It connects a G1 BTS Mark 1 to the BTS A9100.	3BK 08102
SCM2/3	SCM2/3 is a clock synchronization cable. It connects a G1 BTS Mark 2 to the BTS A9100.	3BK 08103

Table 31: MBI External Cables

3.3.9 MBI Data and Control Cabling

The following figures show the logical interconnections provided by data and control cables.

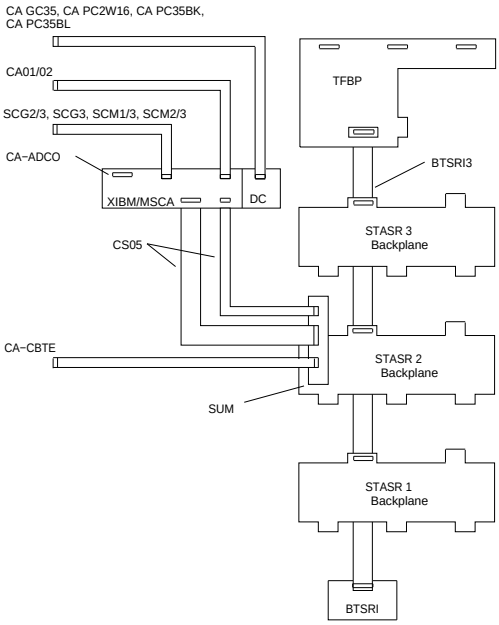


Figure 213: MBI3 Data and Control Cabling

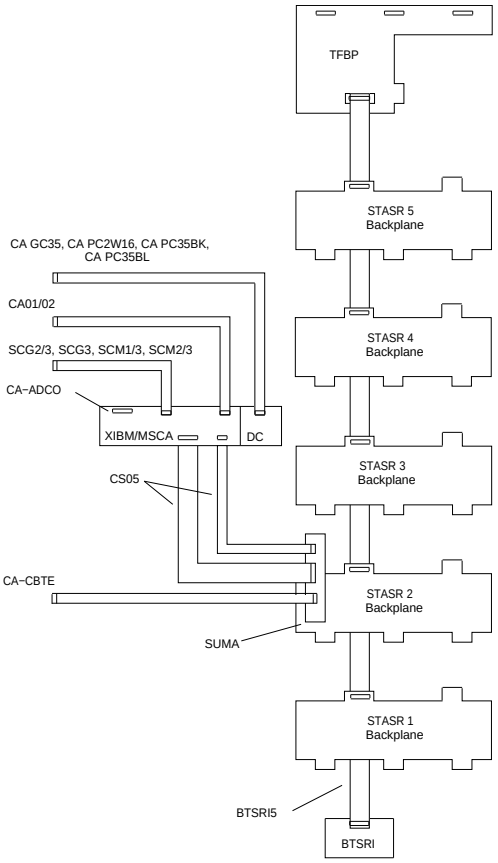


Figure 214: MBI5 Data and Control Cabling

4 Outdoor Cabinets

This chapter describes the outdoor cabinets used in BTS A9100 configurations.

The sections are supported with diagrams and illustrations if necessary.

4.1 Outdoor Cabinets General Information

There are four classes of outdoor cabinets available to house the BTS A9100 equipment:

- COME/CODE - three-door outdoor cabinet
- COMI/CODI/CPT2/MBO2/MBO2E/MBO2EDC - two-door outdoor cabinet
- COEP/MBOE/MBOEDC/MBOEEDC - one-door outdoor extension cabinet
- MBO1/MBO1DC/MBO1T/MBO1E/MBO1EDC - one-door outdoor cabinet
- CBO - one-door outdoor cabinet.

The COEP is designed to allow the extension in the field of a COMI to a COME and a CODI to a CODE. The MBOE/MBOEE is designed to extend an MBO1/MBO1E to an MBO2/MBO2E. The MBOEDC/MBOEEDC is designed to extend an MBO1DC/MBO2EDC to an MBO2DC/MBO2EDC.

All outdoor cabinets support both omnidirectional and sectorized configurations. The following figures show the possible positions of the main modules. The positions of the modules in the subracks are configuration dependent; for more information, refer to *Configurations - Rack Layouts (Section 2)*.

COME/COMI/CODE/CODI/CPT2 cabinets have two or three compartments:

- Side compartment
- BTS compartment 1
- BTS compartment 2.

MBO1/MBO1E/MBO2/MBO2E cabinets have one or two compartments:

- MBO1/MBO1E
- MBOE/MBOEE.

MBO1DC/MBO1EDC/MBO2DC/MBO2EDC cabinets have one or two compartments:

- MBO1DC/MBO1EDC
- MBOEDC/MBOEEDC.

The MBO1T and CBO cabinets have one compartment.

4.1.1 COME/COMI/COEP with Modules

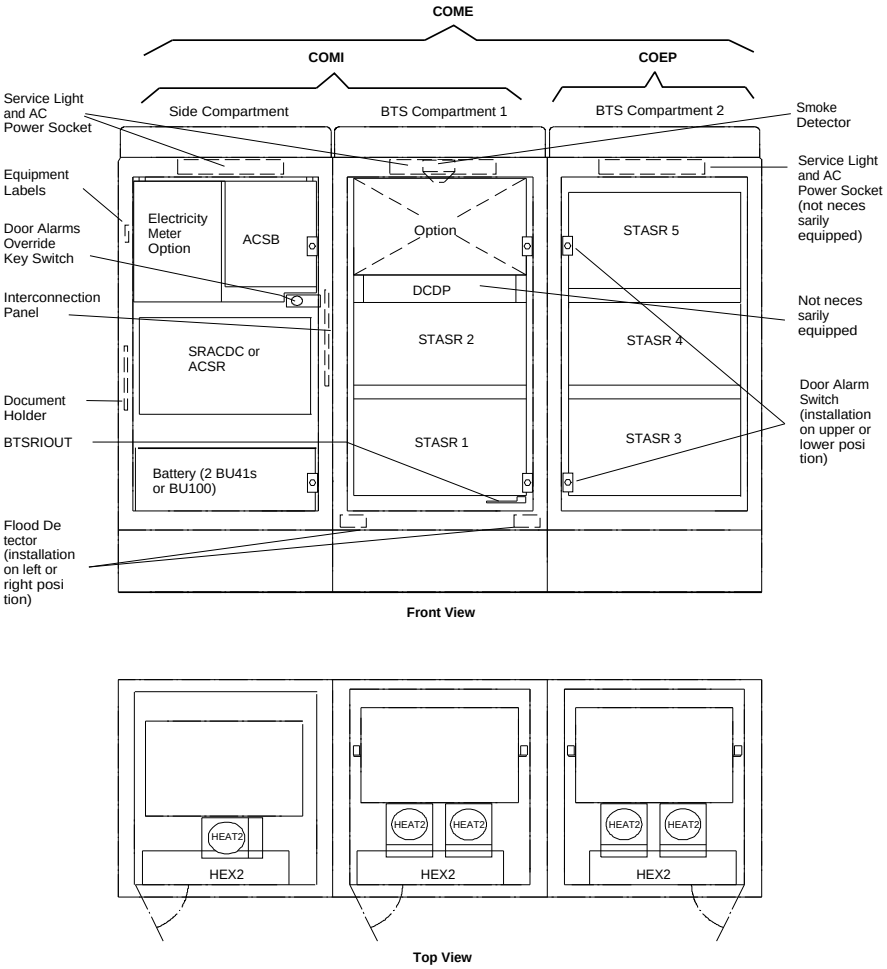


Figure 215: COME/COMI/COEP Module Positions

4.1.2 CODE/CODI/COEP with Modules

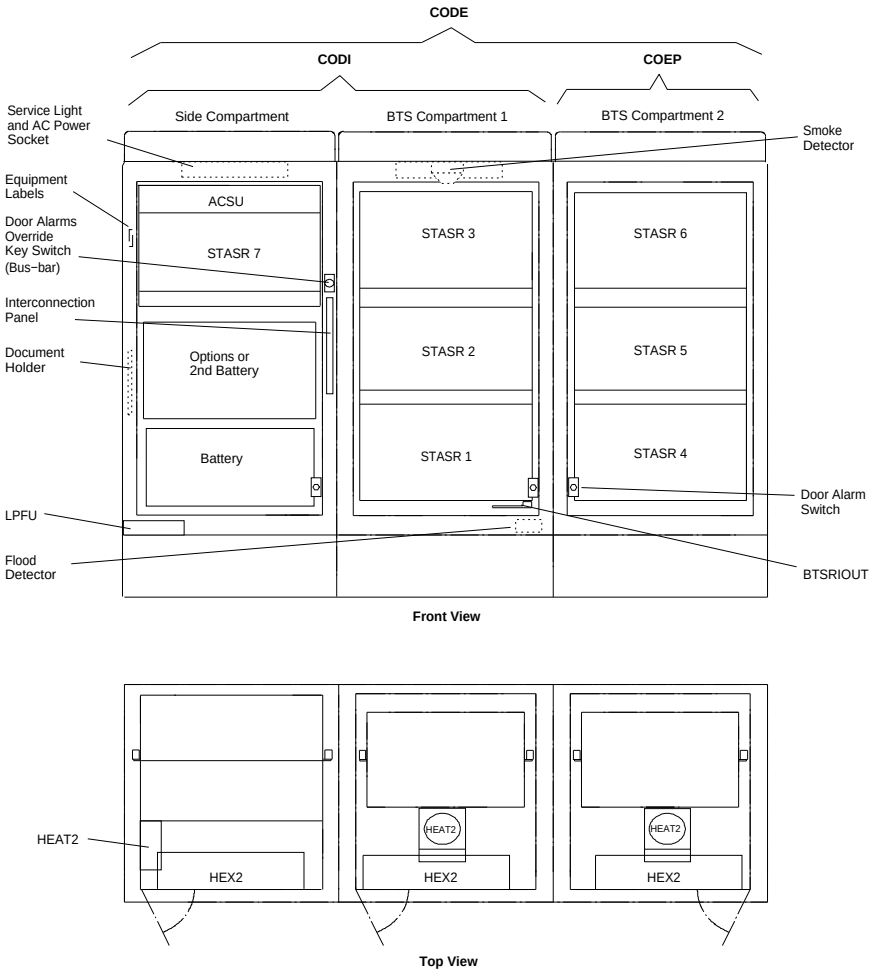


Figure 216: CODE/CODI/COEP Module Positions

4.1.3 CPT2 with Modules

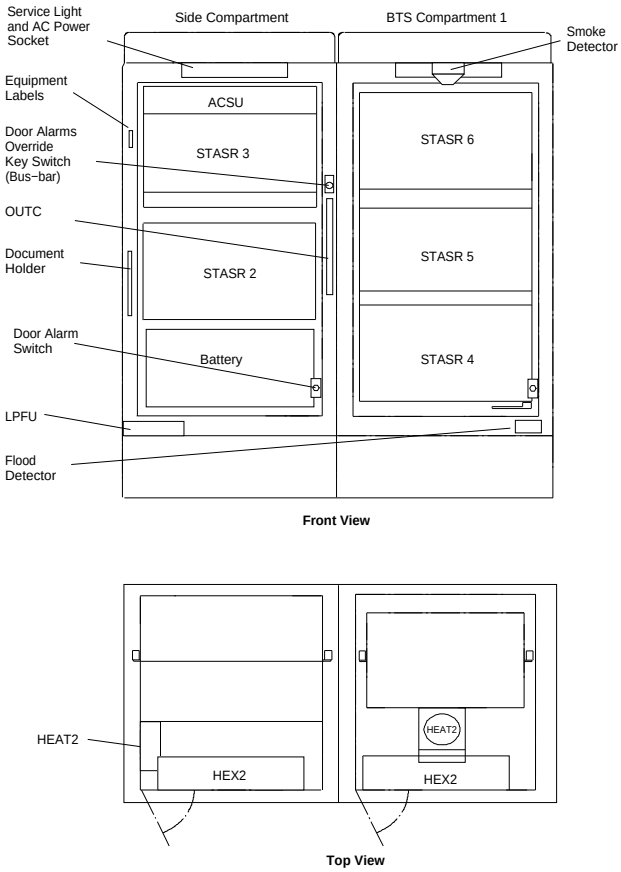


Figure 217: CPT2 Module Positions

4.1.4 MBO1 with Modules

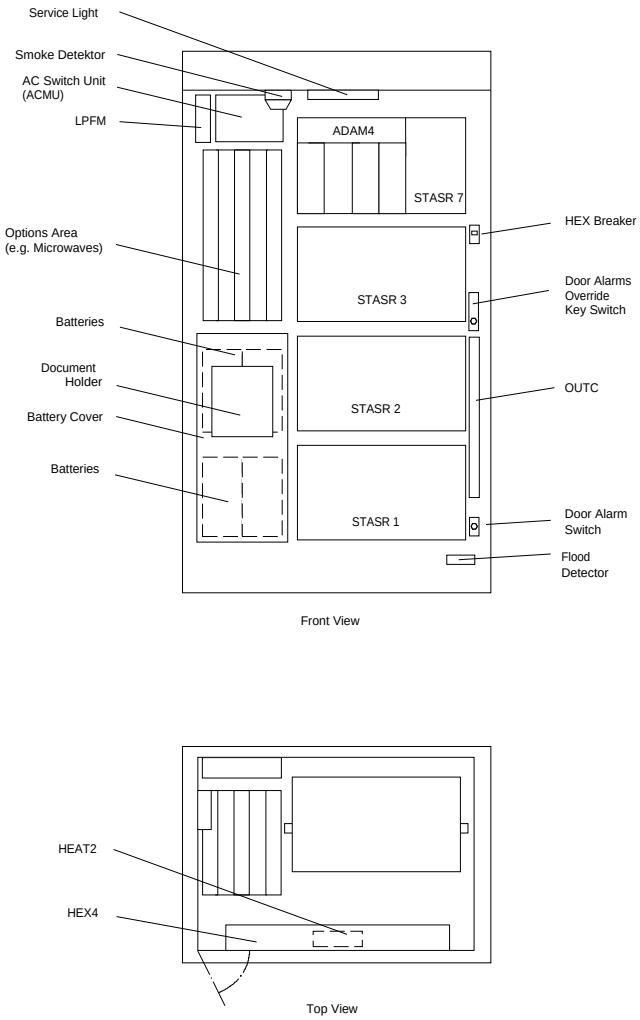


Figure 218: MBO1 Module Positions

4.1.5 MBO1DC with Modules

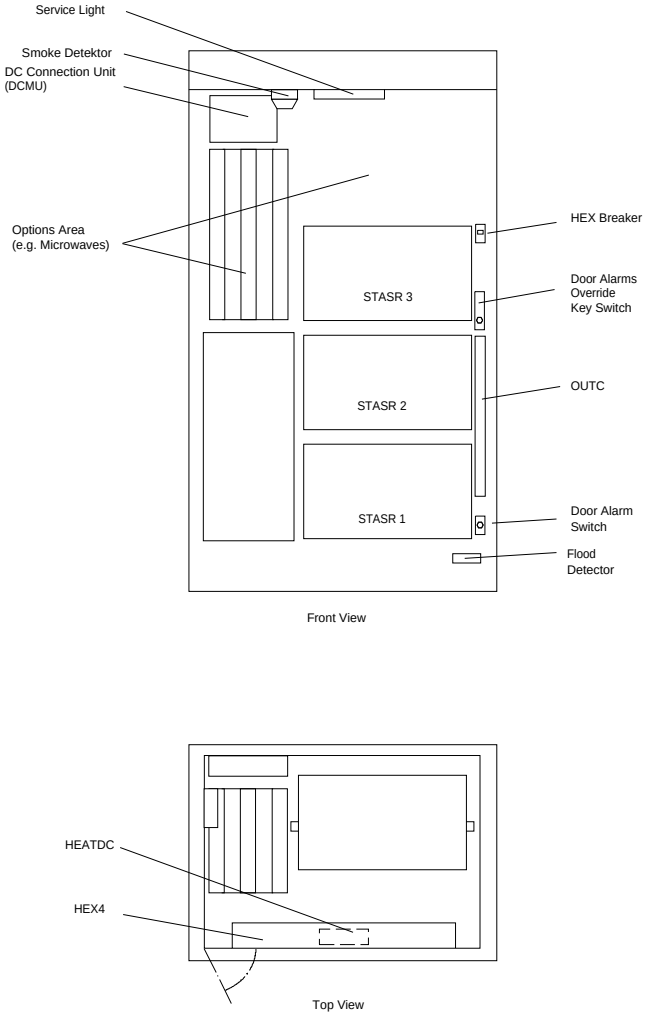


Figure 219: MBO1DC Module Positions

4.1.6 MBO1E with Modules

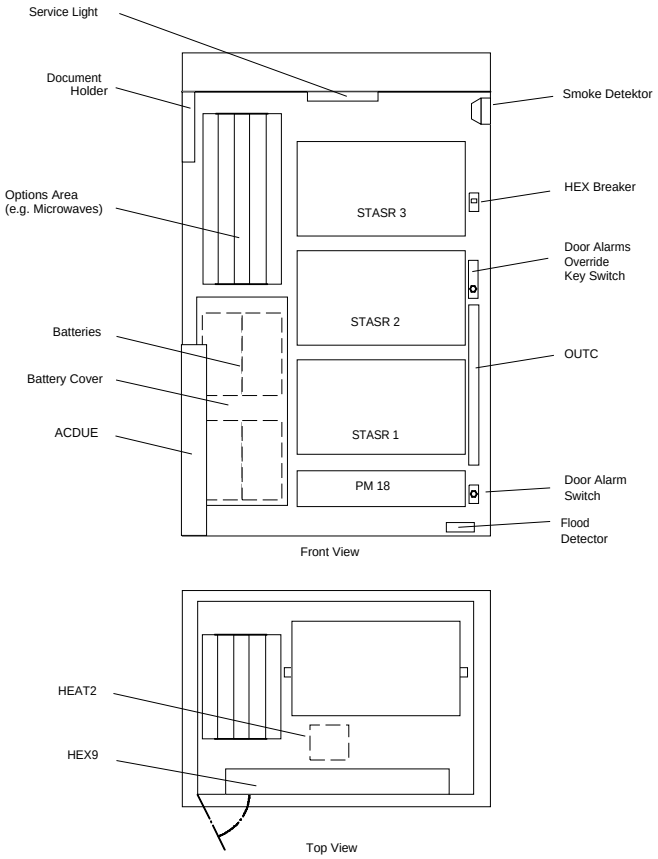


Figure 220: MBO1E Module Positions

4.1.7 MBO1EDC with Modules

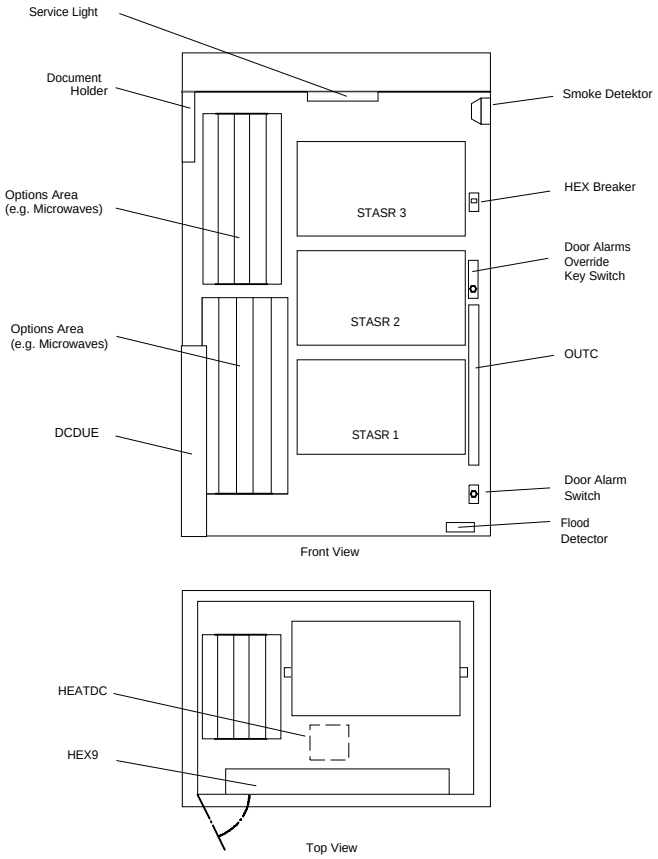


Figure 221: MBO1EDC Module Positions

4.1.8 MBO1T with Modules

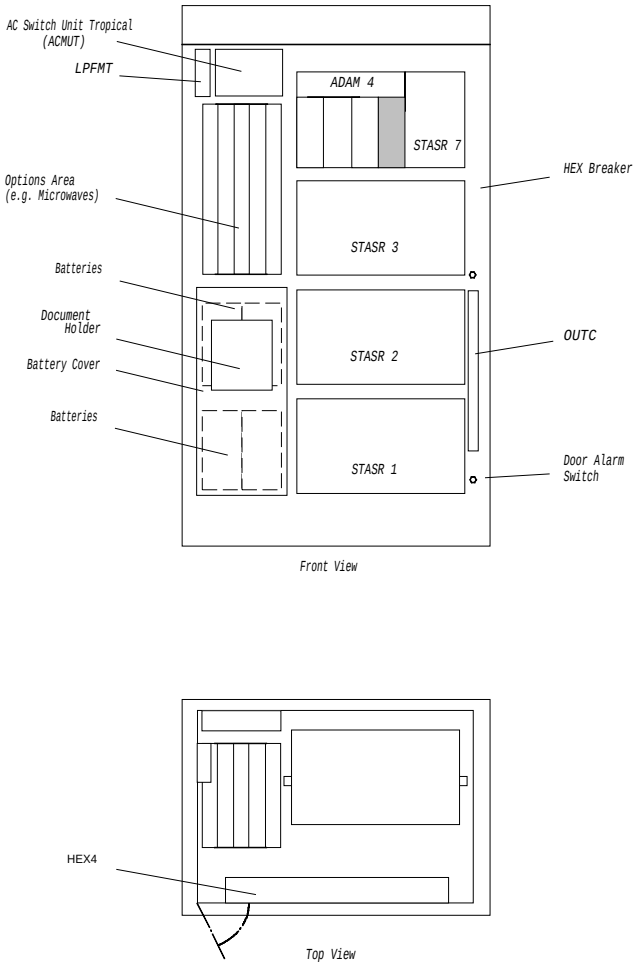


Figure 222: MBO1T Module Positions

4.1.9 MBO2 with Modules

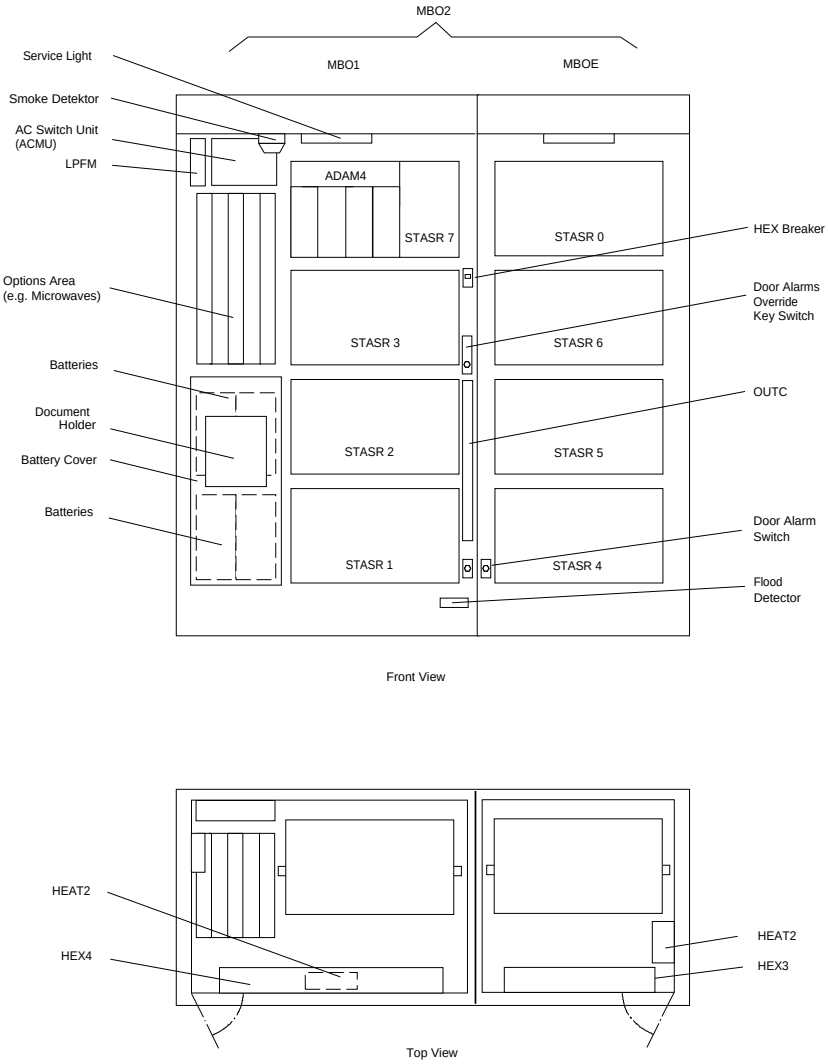


Figure 223: MBO2 Module Positions

4.1.10 MBO2E with Modules

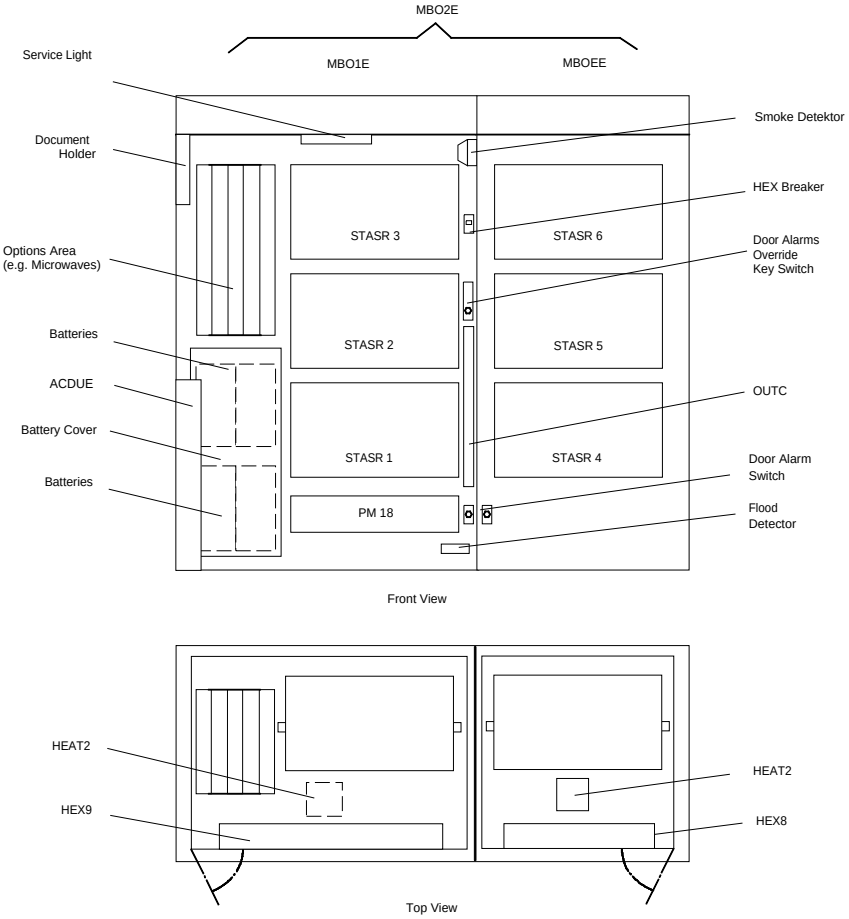


Figure 224: MBO2E Module Positions

4.1.11 MBO2DC with Modules

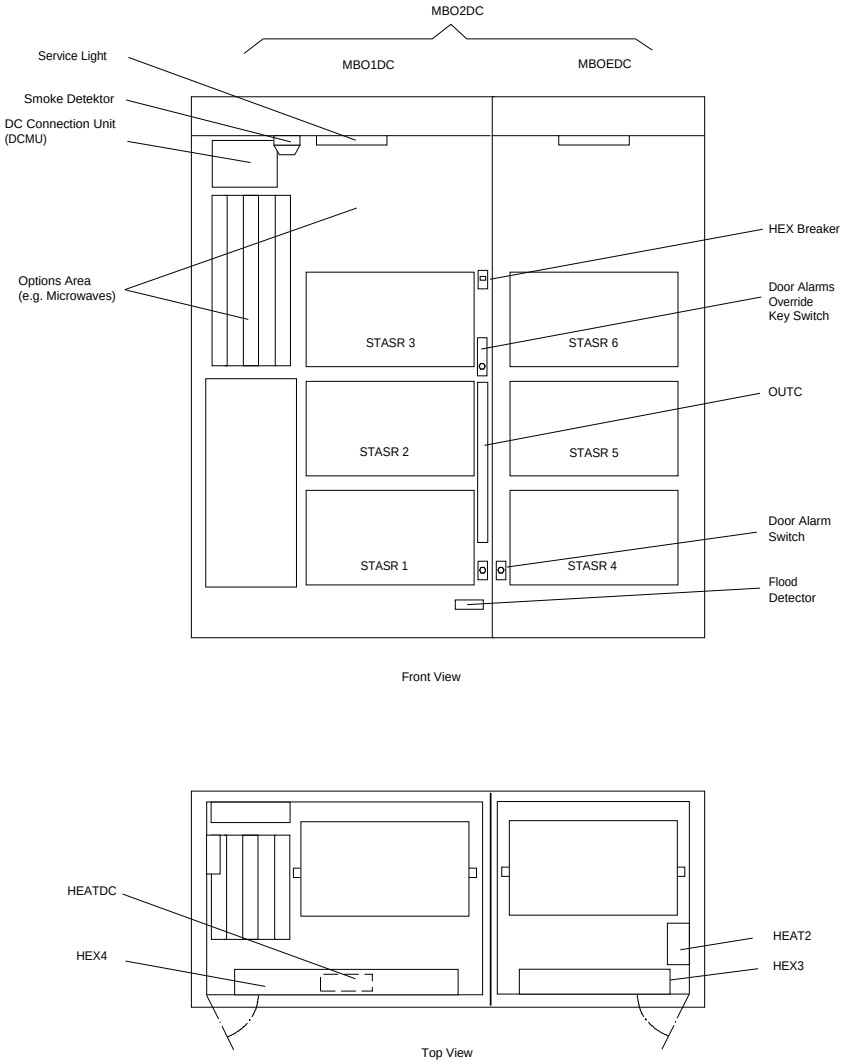


Figure 225: MBO2DC Module Positions

4.1.12 MBO2EDC with Modules

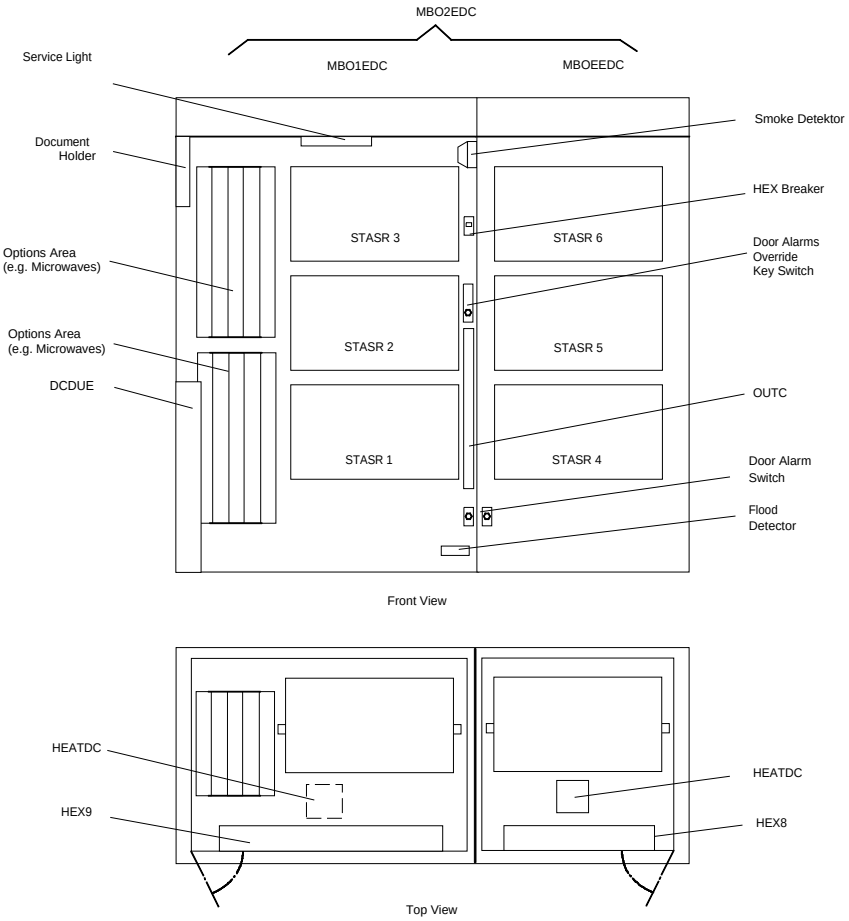


Figure 226: MBO2EDC Module Positions

4.1.13 COBO with Modules

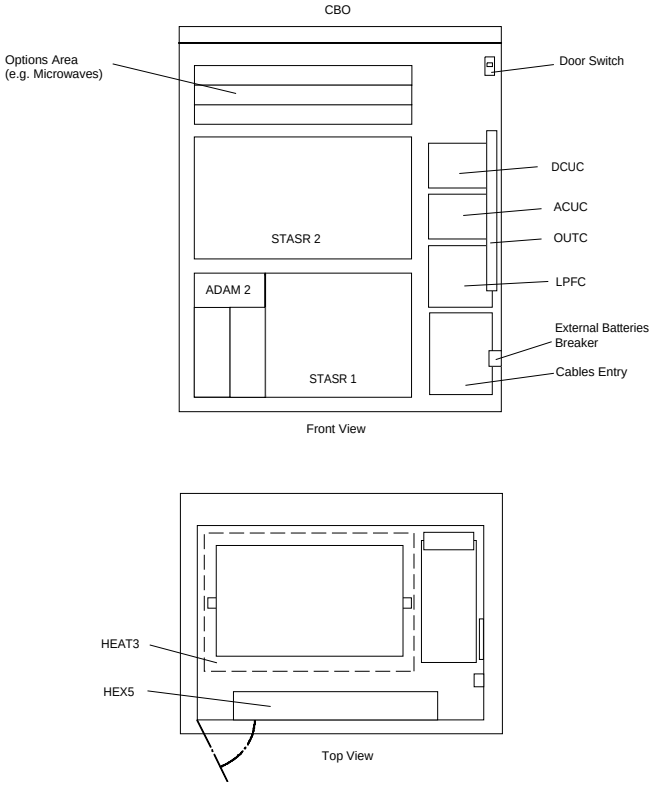


Figure 227: CBO Module Positions

4.1.14 Side Compartment

The side compartment is designed to house AC/DC power equipment and provide an external cables connection point. All external cables, except RF cables, enter the side compartment. The layout of the Side Compartment differs for COME/COMI and CODE/CODI/CPT2 versions.

4.1.14.1 COME/COMI

At the top of the compartment is room for an optional electricity meter. An ACSB provides AC distribution and circuit breakers for the incoming AC mains supply. The ACSB also provides lightning protection for the AC supply lines.

The SRACDC or ACSR houses the modules that convert the AC mains supply into a 0/-48 VDC supply.

Between the side compartment and BTS compartment 1 is the Interconnection Panel. This provides connectors for DC supplies, and for the external Abis, alarm and clock cables.

4.1.14.2 CODE/CODI

AC mains power is applied to the LPFU located at the bottom of the side compartment. The LPFU provides lightning protection for the AC supply lines and HF filtering for the incoming AC supply. At the top of the side compartment is the ACSU which provides AC distribution. The ACSU contains AC circuit breakers and a thermostat with the associated power relays.

Directly underneath the ACSU a STASR contains the ADAM and three PM12s. There is also provision for optional microwave equipment.

Above the batteries on the floor, an additional BU41 or BU100 can be fitted.

Between the side compartment and BTS compartment 1 is the Interconnection Panel. This provides connectors for DC supplies, and for the external Abis, alarm and clock cables.

4.1.14.3 CPT2

AC mains power is applied to the LPFU located at the bottom of the side compartment. The LPFU provides lightning protection for the AC supply lines and HF filtering for the incoming AC supply. At the top of the side compartment is the ACSU which provides AC distribution. The ACSU contains AC circuit breakers and a thermostat with the associated power relays.

Directly underneath the ACSU a STASR contains the ADAM and three PM12s.

Directly above the batteries a STASR contains up to four TREs and three FANUs.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI, RIBAT and COAR functions and provides connectors for DC supplies, temperature sensor, and for the external Abis, alarm and clock cables.

4.1.14.4 Common Features

Other equipment items include:

- BOSU for power distribution. In the CODE, circuit breakers are provided in the BOSU for isolating the DC supply from the XIOB, HEX2, STASR7 and the Power Distribution Units
- HEAT2 on the floor in the COME and on the lower left side panel in the CODE/CPT2
- Two optional BU41s or one BU100 on the floor in the COME. The CODE has one BU41 or one BU100 on the floor; and an additional BU41 or BU100 can be fitted above (as an option)
- Document holder on the side panel
- Equipment labels on the side panel
- HEX2 on the inside of the door
- Door alarm switch on the side frame
- Door alarm override key switch on the side frame (COME/COMI) or on the bus-bar (CODE/CODI/CPT2)
- Service light, AC power socket at the top.

4.1.15 BTS Compartment 1

The equipment contained in compartment 1 in the COME/COMI and CODE/CODI/CPT2 cabinets is described below.

COME/COMI	A COME/COMI BTS compartment 1 holds two STASRs. The lower subrack (STASR1) contains up to four TREs and three FANUs. The upper subrack (STASR2) holds the SUM and a mixture of ANX or ANY modules, as required.
CODE/CODI/CPT2	A CODE/CODI/CPT2 BTS Compartment 1 holds three STASRs. The top and bottom subracks contain up to four TREs and three FANUs each. The middle subrack holds the SUM and a mixture of ANC and ANY modules as required.

In addition, all BTS compartment 1s have the following common equipment:

- Up to two HEAT2s on the floor for COME/COMI, one HEAT2 for CODE/CODI/CPT2
- HEX2 on the inside of the door
- Door alarm switch on the side frame
- Flood detector on the floor
- RF lightning protectors in the floor
- Smoke detector on the ceiling
- Service light and an AC power socket at the top.

The method used for DC supply isolation depends on the compartment type:

- For the COME/COMI, there are two possibilities:
  - The DCDP above the upper subrack. Circuit breakers are provided for isolating the DC supply from the STASRs, HEX2s, XIOB and optional microwave link equipment. The optional equipment is housed above the DCDP
  - Circuit breakers are provided in the BOBU for isolating the DC supply from the STASRs, HEX2s, XIOB and optional microwave link equipment. The optional equipment is housed above the upper subrack (STASR2).
- In the CODE/CODI/CPT2, circuit breakers are provided in the BOBU for isolating the DC supply from the STASRs and HEXxs.

4.1.16 BTS Compartment 2

BTS compartment 2 holds three STASRs. The upper and lower subracks each contain up to four TREs and three FANUs. The middle subrack contains a mixture of ANX, ANY or ANC modules, as required.

Other equipment includes:

- For COME, up to two HEAT2s on the floor; one HEAT2 for CODE
- HEX2 on the inside of the door
- Door alarm switch on the side frame
- RF lightning protectors in the floor
- Service light and an AC power socket at the top (not necessarily equipped).

4.1.17 MBO1

MBO1 is designed to house AC/DC power equipment. All external cables enter the MBO1 at roof top.

AC mains power is applied to the LPFM located at the left upper side of the MBO1 compartment. The LPFM provides lightning protection for the AC supply lines and HF filtering for the incoming AC supply. At the left upper back side of the compartment is the ACMU which provides AC distribution. The ACMU contains AC circuit breakers and a thermostat with the associated power relays.

Underneath the ACMU optional modules (e.g., microwaves) are installed.

The batteries (BU101) are located directly underneath these optional modules. There is a specific battery box which contains two batteries in an upper and two batteries in a lower block. All batteries are connected in series.

To the right of the batteries and the optional modules, a rack frame is installed which contains four STASRs. The top STASR (STASR7) contains ADAM4 and two, three or four PM12s.

STASR1 (bottom) contains up to four TREs and three FANUs. STASR2 above contains a mixture of SUMA, ANY and ANC modules as required. STASR3 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI, RIBAT and COAR functions and provides connectors for DC supplies, temperature sensor, and for the external Abis, alarm and clock cables.

Other equipment includes:

- BOMU for power and alarm distribution in MBO1/MBOE. Circuit breakers are provided in the BOMU for isolating the DC supply from the XIOB, HEX3/HEX4, STASRs and the Power Distribution Units
- HEX4 on the inside of the door
- HEAT2 at the back of the front door underneath HEX4
- Document holder in the cover of the battery box
- Equipment labels on the side panel
- Door alarm switch on the side frame
- Door alarm override key switch (part of BOMU)
- Service light, AC power socket, and smoke detector at the top
- Flood detector on the floor.

4.1.18 MBO1DC

MBO1DC is designed to house DC power equipment. All external cables enter the MBO1DC at roof top.

DC mains power is applied to the DCMU located at the left upper side of the MBO1DC compartment. The DCMU provides DC distribution inside the cabinets. It contains DC circuit breakers and a thermostat with the associated power relays.

Underneath the DCMU optional modules (e.g., microwaves) are installed.

Directly underneath these optional modules is an empty area.

To the right of the empty area and the optional modules, a rack frame is installed which contains three STASRs.

STASR1 (bottom) contains up to four TREs and three FANUs. STASR2 above contains a mixture of SUMA, ANY and ANC modules as required. STASR3 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI and COAR functions and provides connectors for DC supplies, temperature sensor plug SENSP, and for the external Abis, alarm and clock cables.

Other equipment includes:

- BOMU for power and alarm distribution in MBO1DC/MBOEDC. Circuit breakers are provided in the BOMU for isolating the DC supply from the XIOB, HEX3/HEX4, STASRs and the Power Distribution Units
- HEX4 on the inside of the door
- HEATDC at the back of the front door underneath HEX4
- Equipment labels on the side panel
- Door alarm switch on the side frame
- Door alarm override key switch (part of BOMU)
- Service light DC and smoke detector at the top
- Flood detector on the floor.

4.1.19 MBO1T

MBO1T is designed to house AC/DC power equipment. All external cables enter the MBO1T at roof top.

AC mains power is applied to the LPFMT located at the left upper side of the MBO1T compartment. The LPFMT provides lightning protection for the AC supply line and HF filtering for the incoming AC supply. At the left upper back side of the compartment is the ACMUT which provides AC distribution. The ACMUT contains an AC circuit breaker.

Underneath the ACMUT optional modules (e.g., microwaves) are installed.

The batteries (BU101) are located directly underneath these optional modules. There is a specific battery box which contains two batteries in an upper and two batteries in a lower block. All batteries are connected in series.

To the right of the batteries and the optional modules, a rack frame is installed which contains four STASRs. The top STASR (STASR7) contains ADAM4 and two or three PM12s.

STASR1 (bottom) contains up to four TREs and three FANUs. STASR2 above contains a mixture of SUMA, ANY and ANC modules as required. STASR3 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI, RIBAT and COAR functions and provides connectors for DC supplies, temperature sensor, and for the external Abis, alarm and clock cables.

Other equipment includes:

- BOMUT for power and alarm distribution in MBO1T. Circuit breakers are provided in the BOMUT for isolating the DC supply from the XIOB, HEX4, STASRs and one Power Distribution Units
- HEX4 on the inside of the door
- Document holder in the cover of the battery box
- Equipment labels on the side panel
- Door alarm switch on the right bottom side.

4.1.20 MBO1E

MBOE1 is designed to house AC/DC power equipment. All external cables enter the MBO1E at bottom plate.

AC mains power is applied to the ACDUE located at the left lower side of the MBO1E compartment. The ACDUE provides lightning protection for the AC supply lines and HF filtering for the incoming AC supply. The ACDUE provides also AC distribution, AC circuit breakers and a thermostat with the associated power relays.

Behind the ACDUE optional modules (e.g., microwaves) or batteries are installed.

There is a specific battery box which contains two batteries in an upper and two batteries in a lower block. All batteries are connected in series. A secong battery branch can be installed on top of the first one.

To the right of the batteries and the optional modules, a rack frame is installed which contains three STASRs and the power supply subrack.

STASR1 (bottom) contains up to four TREs and three FANUs. STASR2 above contains a mixture of SUMA, ANY and ANC modules as required. STASR3 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI, RIBAT and COAR functions and provides connectors for DC supplies, temperature sensor, and for the external Abis, alarm and clock cables.

Other equipment includes:

- BOMUE for power and alarm distribution in MBO1E/MBOEE. Circuit breakers are provided in the BOMUE for isolating the DC supply from the XIOB, HEX8/HEX9 or DAC8/DAC9, STASRs and the Power Distribution Unit
- HEX9/DAC9 on the inside of the door
- HEAT2 on the bottom plate of MBO1E rack
- Document holder in the cover of the battery box
- Equipment labels on the side panel
- Door alarm switch on the side frame
- Door alarm override key switch (part of BOMUE)
- Service light, AC power socket, and smoke detector at the top
- Flood detector on the floor.

4.1.21 MBO1EDC

MBO1EDC is designed to house DC power equipment. All external cables enter the MBO1EDC at bottom of the rack.

DC mains power is applied to the DCDUE located at the left lower side of the MBO1EDC compartment. The DCDUE provides DC distribution inside the cabinets. It contains DC circuit breakers and a thermostat with the associated power relays.

Behind DCDUE optional modules (e.g., microwaves) can be installed.

To the right of the empty area and the optional modules, a rack frame is installed which contains three STASRs.

STASR1 (bottom) contains up to four TREs and three FANUs. STASR2 above contains a mixture of SUMA, ANY and ANC modules as required. STASR3 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI and COAR functions and provides connectors for DC supplies, temperature sensor plug SENSP, and for the external Abis, alarm and clock cables.

Other equipment includes:

- BOMUE for power and alarm distribution in MBO1EDC/MBOEEDC. Circuit breakers are provided in the BOMUE for isolating the DC supply from the XIOB, HEX8/HEX9, STASRs and the Power Distribution Unit
- HEX9 on the inside of the door
- HEATDC on the bottom plate of MBO1EDC rack
- Equipment labels on the side panel
- Door alarm switch on the side frame
- Door alarm override key switch (part of BOMUE)
- Service light DC and smoke detector at the top
- Flood detector on the floor.

4.1.22 MBOE

An MBOE holds four STASRs. The top subrack (STASR0) can be used for optional 19” units. The bottom subrack (STASR4) contains up to four TREs and three FANUs each. STASR5 above contains a mixture of ANC and ANY modules as required. STASR6 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

Other equipment includes:

- HEX3 on the inside of the door
- HEAT2 at the bottom on the right side frame
- Door alarm switch on the side frame
- RF lightning protectors in the roof
- Service light and an AC power socket at the top.

4.1.23 MBOEDC

An MBOE holds three STASRs. STASR0 use was cancelled. In the free space above STASR6, optional 19“ equipment can be fitted. The bottom subrack (STASR4) contains up to four TREs and three FANUs each. STASR5 above contains a mixture of ANC and ANY modules as required. STASR6 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

Other equipment includes:

- HEX3 on the inside of the door
- HEATDC at the bottom on the right side frame
- Door alarm switch on the side frame
- RF lightning protectors in the roof
- Service light at the top.

4.1.24 MBOEE

An MBOEE holds three STASRs and optional equipment. The bottom subrack (STASR4) contains up to four TREs and three FANUs each. STASR5 above contains a mixture of ANC and ANY modules as required. STASR6 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

Other equipment includes:

- HEX8/DAC8 on the inside of the door
- HEAT2 on the bottom plate on MBOEE
- Door alarm switch on the side frame
- RF lightning protectors in the bottom plate.

4.1.25 MBOEEDC

An MBOEE holds three STASRs and optional equipment. The bottom subrack (STASR4) contains up to four TREs and three FANUs each. STASR5 above contains a mixture of ANC and ANY modules as required. STASR6 above contains up to four TREs or a mixture of TREs and an ANC and three FANUs each.

Other equipment includes:

- HEX8 on the inside of the door
- HEATDC at the bottom on the right side frame
- Door alarm switch on the side frame
- RF lightning protectors in the bottom plate
- Service light at the top.

4.1.26 CBO

4.1.26.1 CBO AC Variant

CBO is designed to house two TREs with up to two ANCs and an optional BATS module. Above the STASRs, up to three 19” units can be installed. All external cables enter the CBO at the right side of the cabinet where the cables entry is located.

AC mains power is applied to the LPFC located above the cable entry of the CBO cabinet. The LPFC provides lightning protection for the AC supply lines and HF filtering for the incoming AC supply. Above the LPFC is the ACUC which provides AC distribution. The ACUC contains AC circuit breakers, a thermostat and an AC power socket.

The DCUC, which provides DC distribution, is located above the ACUC.

At the top of the rack space is foreseen for options installation. A maximum of three MW units can be installed.

The bottom STASR (STASR1) contains the ADAM2, two PM12s, SUMA and up to two TREs and three FANUs. STASR2 above contains the BATS and up to two ANC modules.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI, RIBAT and COAR functions, temperature sensor, and for the external Abis, alarm and clock cables.

Other equipment includes:

- HEX5 on the inside of the door
- HEAT3 under the STASR1
- Equipment labels on the side panel
- Door alarm switch on the side frame
- Degasing filtered holes are foreseen at the top and the bottom of the cabinet
- Two holes are foreseen at the bottom of the door for water outlet from HEX5.

4.1.26.2 CBO DC Variant

CBO is designed to house four TREs with up to three ANBs. When three ANBs are used only three TREs can be equipped. Above the STASRs, up to three 19” units can be installed. All external cables enter the CBO at the right side of the cabinet where the cables entry is located.

DC mains power is applied to the DC filter located at the cable entry of the CBO cabinet.

The DCUC, which provides DC distribution, is located above the cables entry.

At the top of the rack space is foreseen for options installation. A maximum of three MW units can be installed.

The bottom STASR (STASR1) contains the SUMA and up to three TREs, or up to four TREs and three FANUs. STASR2 above contains the SUMA and up to two ANBs or up to three ANB modules.

At the right side of the compartment is the Outdoor Control Board (OUTC). It contains the XIOB, BTSRI, RIBAT and COAR functions, temperature sensor, and for the external Abis, alarm and clock cables.

Other equipment includes:

- HEX5 on the inside of the door
- HEAT4 under the STASR1
- Equipment labels on the side panel
- Door alarm switch on the side frame
- Two holes are foreseen at the bottom of the door for water outlet from HEX5.

4.2 Outdoor Cabinet Access and Features

The following figures show the BTS A9100 outdoor cabinets without subracks.

4.2.1 COME/COMI/CODI/CODE Cabinet Access

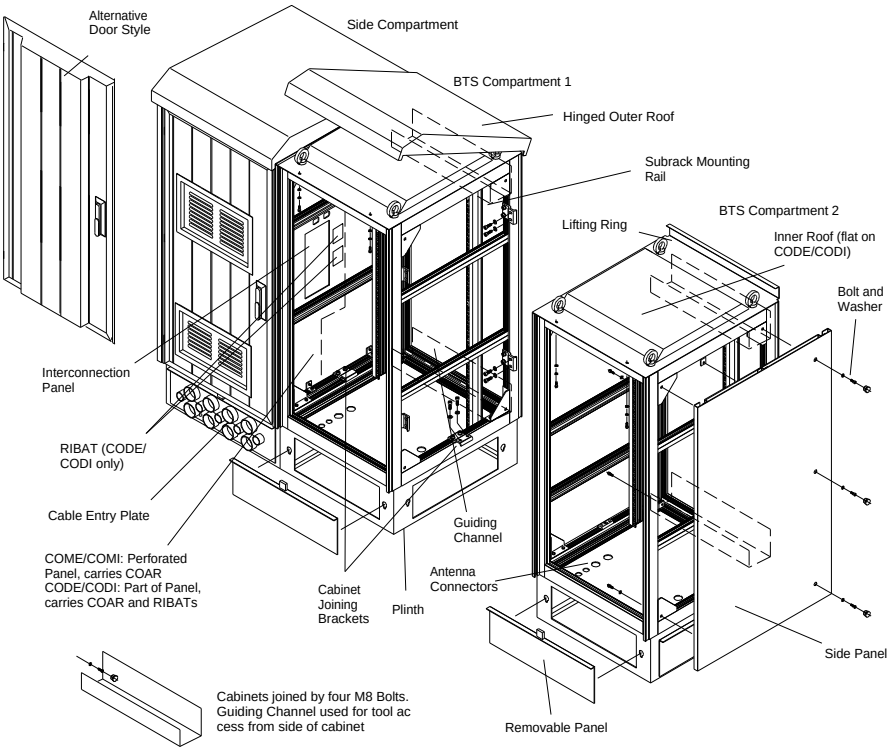


Figure 228: BTS A9100 Outdoor Cabinet Construction

4.2.2 CPT2 Cabinet Access

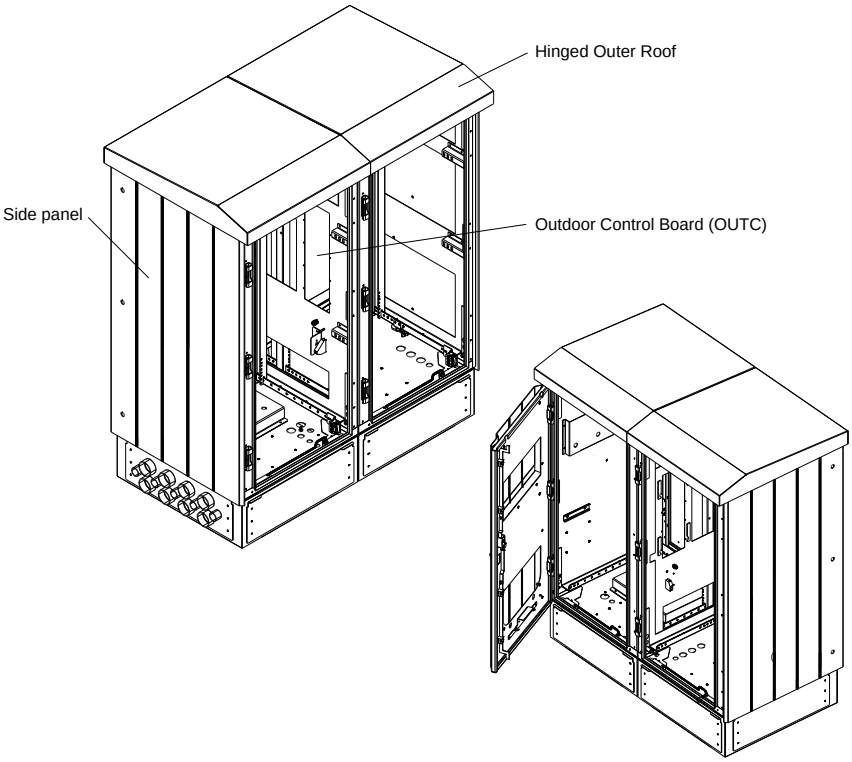


Figure 229: BTS A9100 Outdoor Cabinet Construction CPT2

4.2.3 MBO1/MBO1DC/MBO1T/MBO1E Cabinet Access

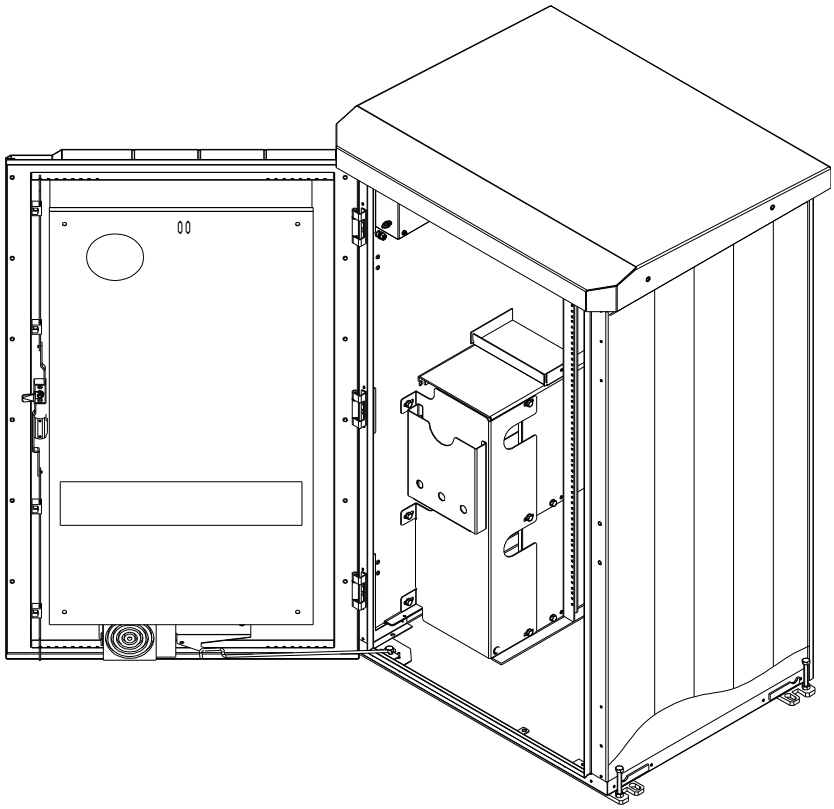


Figure 230: Multistandard BTS Outdoor Cabinet Construction MBO1/MBO1DC/MBO1T

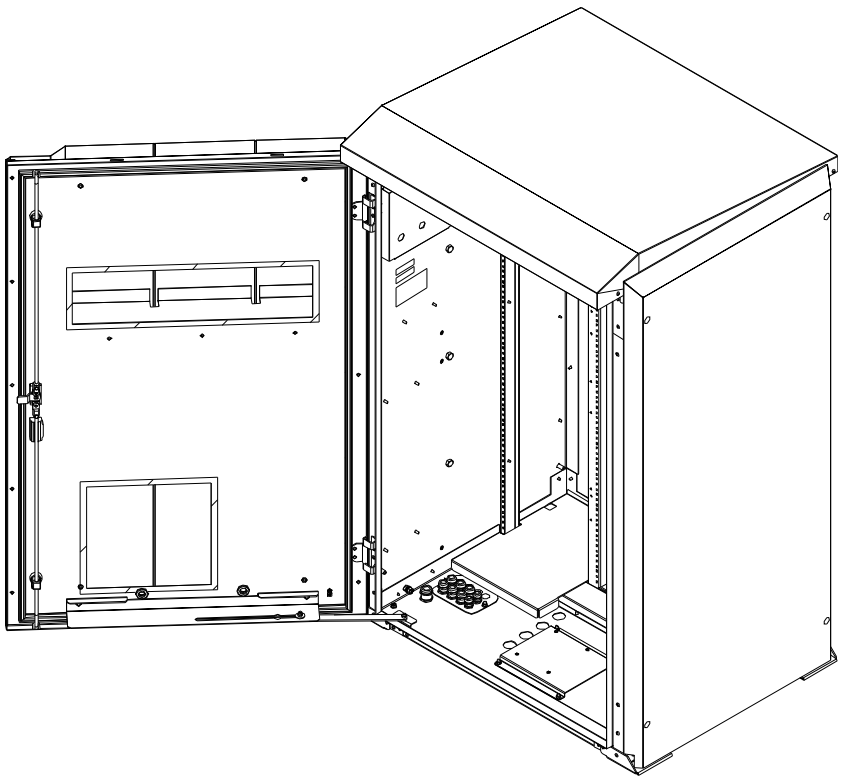


Figure 231: Multistandard BTS Evolution Outdoor Cabinet Construction MBO1E

4.2.4 MBO2/MBO2DC/MBO2E Cabinet Access

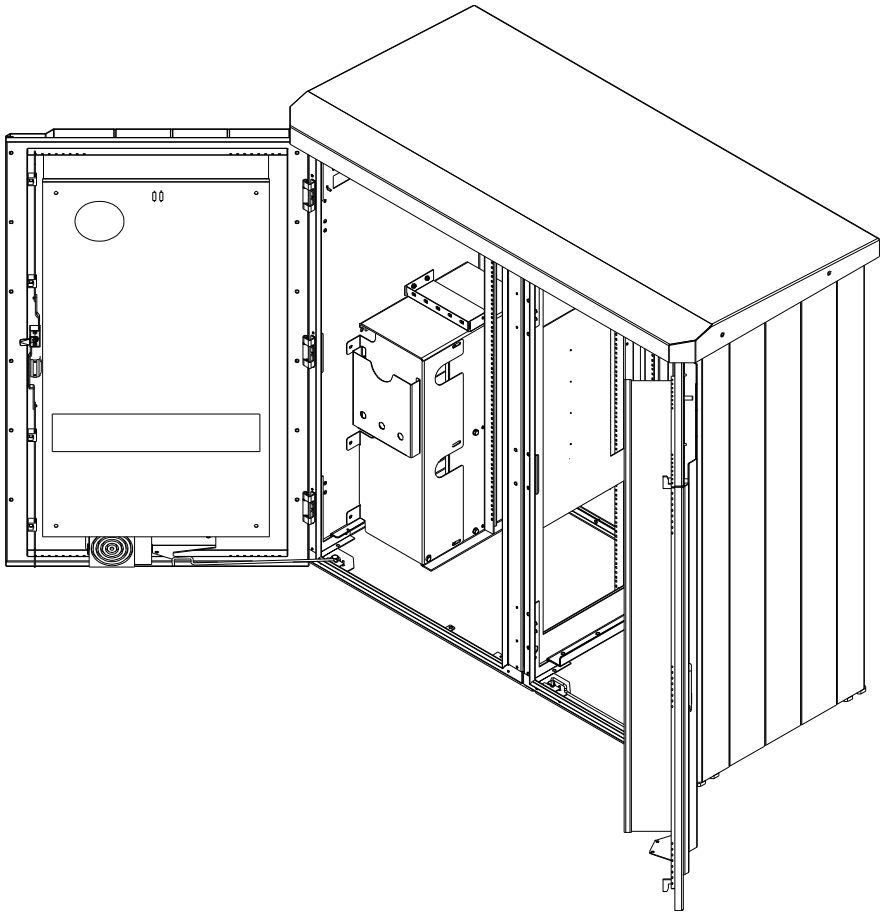


Figure 232: Multistandard BTS Outdoor Cabinet Construction MBO2/MBO2DC

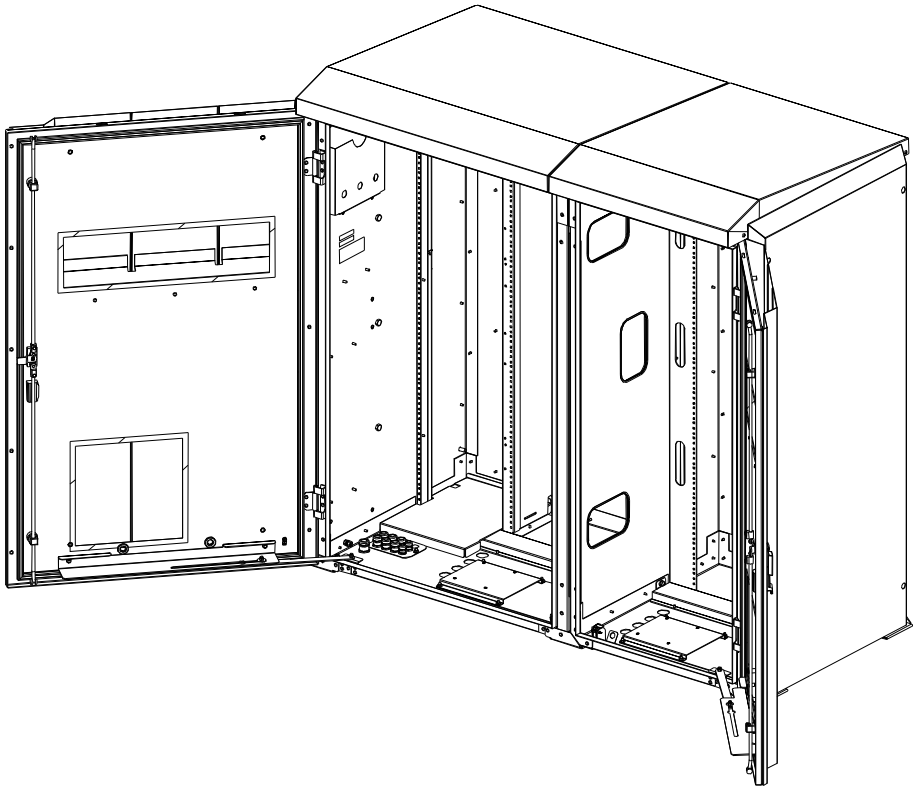


Figure 233: Multistandard BTS Evolution Outdoor Cabinet Construction MBO2E

4.2.5 CBO Cabinet Access

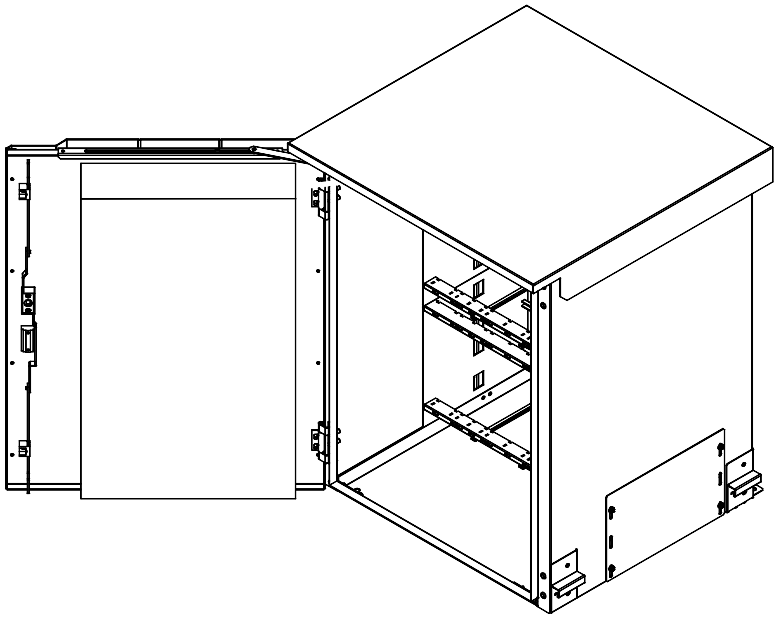


Figure 234: Compact BTS Outdoor Construction CBO

4.2.6 Outdoor Cabinet Features

The main design features of the outdoor cabinets are listed below:

- Cabinet extensibility on site
- Cabinet dismountable on site for easier manual transportation
- Front access to BTS equipment only
- Side walls removable - thus extended cabinet without partition wall inside
- Easy removable roof, socle panels (except for MBO1/MBO2/CBO) and heat exchanger
- Double-skinned wall (except for CBO) and roof
- Cooling by air/air heat exchanger (generic)
- Environmental- and EMC-protected.

4.2.6.1 Construction

Each BTS A9100 compartment consists of a box-shaped frame bolted to a plinth. Other components are added to this basic construction, as required. Two or three compartments are bolted together. The method of joining the cabinets is different for each variant. One COME/COMI variant uses joining brackets fixed to the sides and bottom of the cabinet frame. Another COME/COMI variant and CODE/CODI/CPT2/MBO1/MBO1DC/MBO1T/MBO1E/MBO2/MBO2DC/MBO2E use four M8 bolts in the corners of the cabinet with guiding channels at the rear of the cabinet to help locate the fixing tool and bolts.

The COME/COMI side compartment and BTS Compartment 1 are separated by perforated panels which prevents RF interference from entering the side compartment. Similar panels are used in CODE/CODI/CPT2/MBO1/MBO2 but only as a structural element and support for COAR and RIBATs (CODE/CODI) or OUTC (CPT2/MBO1/MBO1DC/MBO1E/MBO2/MBO2DC/MBO2E). The space between BTS Compartments 1 and 2 is open.

Each compartment has a separate rear panel. In the COME/CODE, the side compartment and BTS Compartment 2 each have a side panel. In the COMI/CODI/CPT2, the side compartment and BTS Compartment 1 each have a side panel. In the MBO1/MBO1DC/MBO1T, the compartment has two side panels. In the MBO2/MBO2DC, MBO1/MBO1DC and MBOE/MBOEDC have a side panel each.

4.2.6.2 Roof

The outer roof of each compartment can be raised at the front and unhinged at the rear for removal. This reveals an inner roof (flat on CODE/CODI/CPT2/MBOx/MBOxDC/MBOxE) and four lifting rings. Each outer roof must be removed, in turn, from right to left.

On MBOx/MBOxDC roofs, a label warns to lift the top cover with care in windy conditions.

4.2.6.3 Door

All the BTS A9100 cabinets can be installed in back-to-back or back-to-wall configurations. Access to each compartment is via a door at the front. The door provides both an environmental and EMC seal when closed. Mounted on the inside of the door is a HEXx. Above (COME/COMI/CBO) or under (CODE/CODI/CPT2/MBO1/MBO1DC/MBO1E/MBO2/MBO2DC/MBO2E) the HEXx is a latch mechanism for keeping the door open during maintenance.

Each door contains a door lock opened by a key. Each door presses an electronic switch. All door switches are serially connected. In the side compartment or MBO1/MBO1DC/MBO1E compartment, there is another mounted electronic switch, the so-called door alarm override switch, which uses the same key as the side compartment or MBO/MBODC compartment door lock. It ensures that non-authorized opening of the doors leads to an alarm.

Not less than 0.8 m free space must be left in front of the cabinet doors, and 0.1 or 0.2 m at the side and back.

4.2.6.4 Subracks

The subracks are secured to two vertical mounting rails. The rails are positioned on the left and right sides of each compartment.

Refer to *Standard Telecommunications Subrack (Section 6)* and *AC Power Subracks (Section 7)* for detailed information on STASR, SRACDC, and ACSR, respectively.

4.2.6.5 External Cable Entry

All external cables, including antenna cables, enter the cabinet via the cable entry plate or from below the plinth. The plate can be fitted to the front or left side of the side compartment plinth. The outward-facing sides of the plinths are covered by removable panels.

For the MBO1/MBO1DC/MBO1T/MBO2/MBO2DC, the side panel has a variable notch on the bottom or top so that all external cables can be passed through. If the external cables come directly from the BTS socket, the notch is not needed and can be closed. There is a space between the side panel and internal rack construction to take in the cables. The cables are fixed at the side of the internal rack and led to the top where they enter the cabinet.

For the CBO, the cables entry has an adjustable cover plate that must be removed so that the cables can be passed through it.

4.2.6.6 Internal Interconnections

Internal power and signal connections between the side compartment and BTS compartment 1 are made via the interconnection panel or the outdoor control board (CPT2). Internal signal connections between MBO1 and MBOE are made via the outdoor control board. The interconnection panel also contains a PCB. Refer to *Outdoor Cabinet Interconnection Panel COMI/COME/CODI/CODE (Section 4.3)* for detailed information on the interconnection panel. The outdoor control board performs the functions of four boards: the COAR, XIOB, BTSRI, and RIBAT. Refer to *Outdoor Cabinet Signal Interfaces (Section 4.4)* for detailed information.

BTS compartments 1 and 2 have RF connectors fitted to the floor. These are for antenna cabling.

4.2.6.7 STASR Ribbon Cable

In the COME/CODE only, a ribbon cable is used in the cabinet to link the STASRs together. The ribbon cable is in two parts, joined by the BTSRIOUT board between them. One cable part connects to the subracks in BTS compartment 1, and the other to the subracks in BTS compartment 2. Refer to *Remote Inventory (Section 8.5)* for information on the Remote Inventory function.

4.2.6.8 Heating and Cooling

Heating is provided by HEAT2/HEAT3/HEATDC if the internal air temperature is below 10° C. Above this temperature, module cooling is provided by FANUs. If the temperature increases above 20° C, the HEXxs switch on. As the temperature rises further, the HEXx fan speed increases. HEXxs transfer heat from the cabinet interior to the outside air environment.

Refer to *HEX2 (Section 11.2)*, *HEX3/HEX4 (Section 11.3)*, *HEX5 (Section 11.4)*, *HEX8/HEX9 (Section 11.5)*, *HEAT2 (Section 11.7)*, *HEAT3 (Section 11.8)* and *HEATDC (Section 11.10)* for detailed information.

4.2.6.9 Cabinet Installation

All the BTS A9100 cabinets can be installed in back-to-back or back-to-wall configurations. Access to the subracks and the interconnection panel is via a door at the front of the cabinet.

Not less than 0.8 m free space must be left in front of the cabinet doors.

4.2.6.10 Additional Outdoor Cabinet Features

The outdoor cabinets include the following additional features.

4.2.6.11 Adjustable Feet

Adjustable feet are provided in each corner of the compartment (MBO1/MBO1DC/MBO2/MBO2DC) or compartment plinth for levelling the cabinet.

4.2.6.12 Wind Load

The cabinet is designed to withstand a wind load of 180 km/h.

4.2.6.13 Smoke Detector

An optical smoke detector is fitted to the inner roof plate of the MBO1, on the right side wall of MBO1E or BTS compartment 1 (COME/COMI/CODE/CODI/CPT2). In case of smoke inside the BTS, an alarm is raised.

4.2.6.14 Flood Detector

A flood detector is fitted to the bottom plate of the MBO1 or BTS compartment 1 (COME/COMI/CODE/CODI/CPT2). If water enters the BTS above the bottom plate, an alarm is raised.

4.2.6.15 Service Light/AC Power Socket

In each compartment a service light with an integral 230 VAC power socket is fitted (not necessarily equipped in BTS compartment 2). If needed, the service light can be switched on by the service staff.

4.2.6.16 Document Holder

At the left side wall inside of the side compartment and MBO1E a document box is mounted to store A4 documents. In MBO1 the document holder is fitted on the cover of the battery box.

4.2.6.17 Extensibility

The BTS cabinet COMI can be extended on site to COME by adding an additional BTS cabinet COEP at the right hand side. The same applies to extend a CODI to a CODE by adding a COEP. An MBO1/MBO1DC/MBO1E/MBO1EDC cabinet can be extended on site to MBO2/MBO2DC/MBO2E/MBO2EDC by adding an MBOE/MBOEDC/MBOEE/MBOEEDC. MBO1T cabinet is not extendible.

4.3 Outdoor Cabinet Interconnection Panel COMI/COME/CODI/CODE

All the power and signal connections between the side compartment and BTS compartment 1 are made via the interconnection panel for COME/COMI/CODE/CODI (via OUTC for CPT2). The following figure shows the details when viewed from the side compartment.

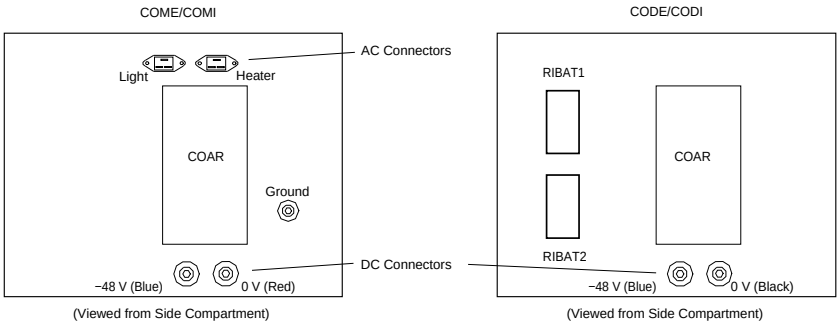


Figure 235: BTS A9100 Outdoor, Interconnection Panel

The interconnection panel carries the components listed in the following table.

Components		COME/ COMI	CODE/ CODI
Two filter connectors to provide 230 VAC power for HEAT2, service light and AC power socket in BTS compartment 1.		X	-
0/ -48 V power distribution	Two filters with M6 bolt connectors for DC power distribution by the DCDP or One filter with one M6 bolt connector (-48 VDC) and one M6 bolt (0 VDC) for DC power distribution by the BOBU.	X	-
	One Feed through terminal HDFKV25 (-48 VDC) and one M6 bolt (0 VDC) for DC power distribution.	-	X
M8 ground bolt.		X	-
Connectors for RIBAT1 and RIBAT2.		-	X
Status and control signals via the COAR.		X	X

Table 32: BTS A9100 Outdoor, Interconnection Panel Components

4.3.1 Interconnection Panel - COME/COMI COAR Front View

The following figure shows the COME/COMI COAR, viewed from the side compartment.

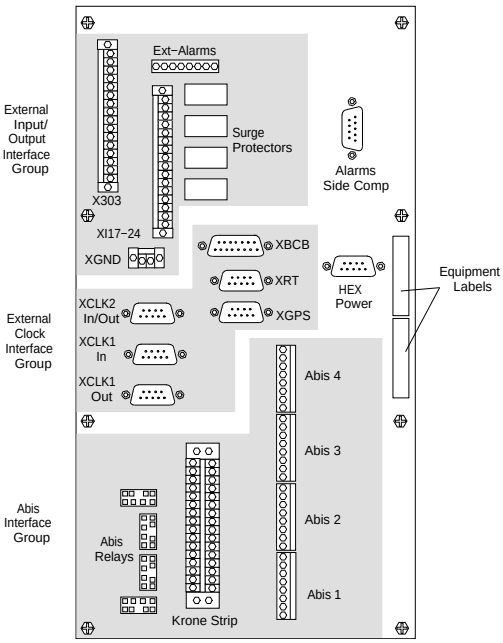


Figure 236: COME/COMI COAR Front View

The shaded areas in the above figure identify separate external interface groups. All these interfaces are overvoltage protected.

4.3.2 Interconnection Panel - CODE/CODI COAR Front View

The following figure shows the front view of the CODE/CODI COAR.

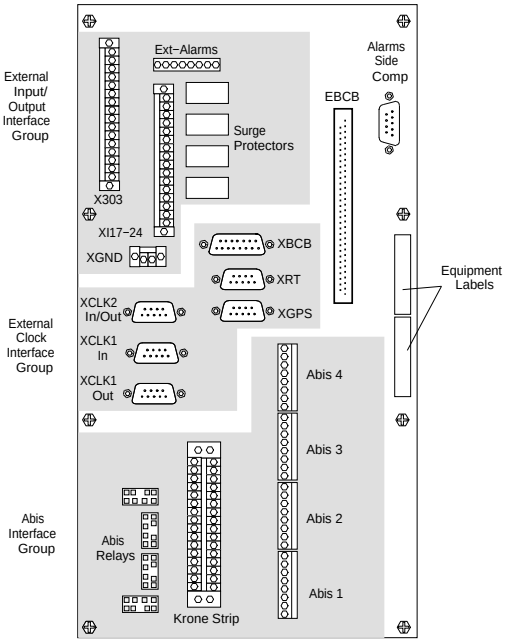


Figure 237: CODE/CODI COAR Front View

4.3.3 Interconnection Panel - BTS A9100 Outdoor Rear View

The following figure shows the rear view of the COME/COMI and CODE/CODI COAR.

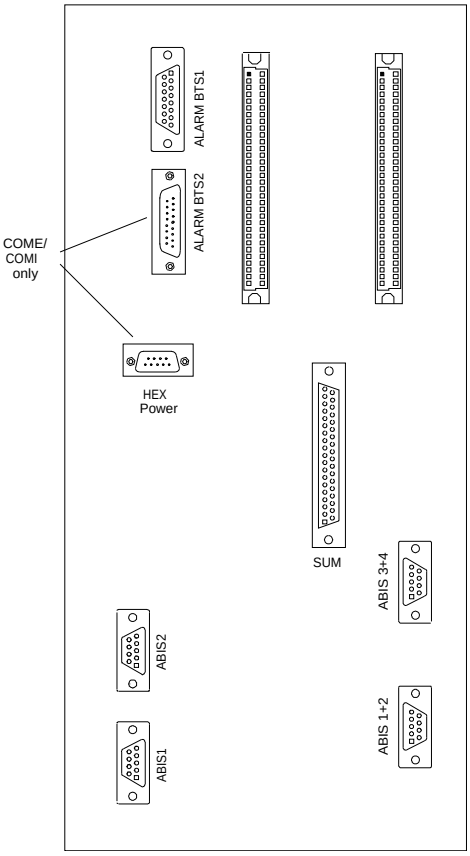


Figure 238: BTS A9100 Outdoor COAR Rear View

Located behind the COAR (BTS compartment 1 side) is the XIOB. The XIOB is connected to the COAR and contains a 24 V DC/DC converter and interface circuitry for external alarms.

The COAR provides interfaces for:

- XIO
- External clock
- Abis
- Miscellaneous connections.

4.4 Outdoor Cabinet Signal Interfaces

The outdoor cabinet has XIO, external clock and Abis signal interfaces. It also has a miscellaneous connections interface. The connectors and functions for each of these interfaces are described below.

4.4.1 XIO

The XIO connectors allow various alarm devices to be connected to the BTS A9100. These include smoke and flood detectors, as well as electro-mechanical switches. Crimped or clamp strip contacts can be used on the XIO connectors. The positions of the XIO connectors are shown in Figures *236*, *237* and *239*.

The XIO interface connectors are described in the following table.

External Alarm Inputs	The Ext-Alarms connector provides an interface for three external alarms. These are alarms that are external to the cabinet (for example, an antenna lamp failure alarm) and the inputs are protected by surge arresters. The three external alarms are part of a group of 16 alarms which includes the pre-wired smoke detector, door switches, etc. The 16 alarms are reported to the OMC-R via the SUM. At the OMC-R, the alarms are mapped to predefined and customer-defined ASCII text. The ASCII text describes the particular alarm. Each external alarm input has two adjacent pins associated with it on the Ext-Alarms connector. If these pins are open-circuit (open loop), an alarm is generated.
Additional Alarm Inputs	Connector XI17-24 provides an interface for connecting eight additional non-BTS alarm inputs. Each additional alarm is reported to the OMC-R via the SUM. At the OMC-R, the additional alarms are mapped to customer-defined ASCII text. The ASCII text describes the particular alarm. Each additional alarm input has two adjacent pins associated with it on the XI17-24 connector. If these pins are open circuit (open loop), an alarm is generated.
External Alarm Outputs	Connector X300 provides an interface for the SUM to control eight external alarm devices. This feature is for future use. The SUM is described in *Station Unit Modules (Section 8)*.
+ 24 VDC Supply	Connector X303 provides a + 24 VDC power source for external alarm devices that require a power supply.
+ 5 VDC Supply	Connector X112 provides a + 5 VDC power source for RIBAT.
XGND	The XGND connector is used when referencing the external alarm 24 VDC ground to the BTS A9100 ground. If the connector pins are not short-circuited (open loop), the input and output alarms are isolated from the BTS A9100 ground.

Table 33: BTS A9100 Outdoor Interface Connectors

4.4.1.1 Pre-Wired Internal Alarms

The following table shows a list of the pre-wired internal alarms. These alarms are not configurable.

Pre-wired Internal Alarm	Side Compartment	BTS Compartment 1	BTS Compartment 2
Door alarm*	X	X	X
Door alarm over-ride	X	-	-
Smoke detector alarm	X***	X	-
Float detector alarm	X***	X	-
Heat exchange. alarm*	X **	X	X

Table 34: BTS A9100 Outdoor Pre-wired Internal Alarms

* These alarms are serially linked and reported as only one alarm in case of multi-failure.

** When equipped (more than six TREs).

*** For MBO1/MBO1DC/MBO2/MBO2DC only.

4.4.1.2 Ext-Alarms Connector

The following table shows the pin assignment of the Ext-Alarms connector. The inputs of the Ext-alarms connector are protected by surge arrestors and are configurable.

Pin	Description
1	GND (braid earthing clamp)
2	ALM 1 (GND)
3	ALM 1 (ext. alarm no 10)
4	ALM 2 (GND)
5	ALM 2 (ext. alarm no 13)
6	ALM 3 (GND)
7	ALM 3 (ext. alarm no 14)
8	GND (braid earthing clamp)

Table 35: BTS A9100 Outdoor Ext-Alarms Connector

4.4.1.3 External Alarm Inputs

To enhance the capabilities of the BTS A9100 outdoor in terms of coverage, the REK feature may be used (not for CPT2). The REK is composed of two modules, a Masthead Amplification Box and a Power Distribution Unit, but only Power Distribution Unit ensures the alarm interface with the BTS. Up to seven alarms can be reported to the BTS (taking into account that the maximum configuration is six TREs, and that in an outdoor BTS only eight external alarms are available for that purpose).

The BTS A9100 outdoor can handle up to 24 external alarms but 8 inputs are not realized so not usable. The remaining 16 external alarms are used as follows:

- 5 external alarms are connected to internal sensors, not configurable
- 3 external alarms have protected inputs on dedicated connector and are configurable
- 8 external alarms on dedicated connector, configurable.

The following table gives detailed view of the external alarm inputs.

Alarm Description

Alarm Number	XIO Input	Alarm Class	Alarm Connection	Alarm Generation
1	1	9	Not used	-
2	2	9	Not used	-
3	3	9	Yes	Inside
4	4	9	Yes	Inside
5	5	9	Yes	Inside
6	6	9	Yes	Inside
7	7	9	Yes	Inside
8	8	9	Not used	-
9	9	9	Not used	-
10	10	9	Yes	Outside
11	11	9	Not used	-
12	12	9	Not used	-
13	13	9	Yes	Outside
14	14	9	Yes	Outside
15	15	9	Not used	-
16	16	9	Not used	-
17	17	9	Yes	Inside (*)

Alarm Description				
Alarm Number	**XIO Input**	**Alarm Class**	**Alarm Connection**	**Alarm Generation**
18	18	9	Yes	Inside (*)
19	19	9	Yes	Inside (*)
20	20	9	Yes	Inside (*)
21	21	9	Yes	Inside (*)
22	22	9	Yes	Inside (*)
23	23	9	Yes	Inside (*)
24	24	9	Yes	Inside

Table 36: BTS A9100 Outdoor External Alarm Inputs

(*) Provisions for REK: Masthead Amplification Box and Power Distribution Unit alarms (not for CPT2).

4.4.2 External Clock Interface

The external clock interface provides connectors for a variety of functions; see Figures *236*, *237* and *239*. The connectors are described in Table *10*.

4.4.3 Abis Interface

The Abis Interface provides components for a variety of functions; see Figures *COME/COMI COAR Front View (236)*, *CODE/CODI COAR Front View (237)* and *OUTC, Front View (239)*. The interface consists of the connectors described in Table *BTS A9100 Abis Interface Connectors (11)*.

4.4.4 Miscellaneous Connections Interface

Connectors are provided for the side compartment, see the following table.

Alarms	This includes the door alarm switch and the HEXx alarm.
HEX2 (COME/COMI only)	This is the 0/ -48 VDC power supply from the DCDP or BOBU (depending on COME/COMI variant).

Table 37: BTS A9100 Outdoor Miscellaneous Connections Interface

4.5 Outdoor Control Board CPT2/MBO1/MBO1DC/MBO1T/MBO1E/MBO2/MBO2DC/ MBO2E/CBO

The Outdoor Control Board (OUTC) performs the functions of the following four separate boards:

- COAR
- XIOB
- BTSRI
- RIBAT

The figure below shows the front part of the OUTC.

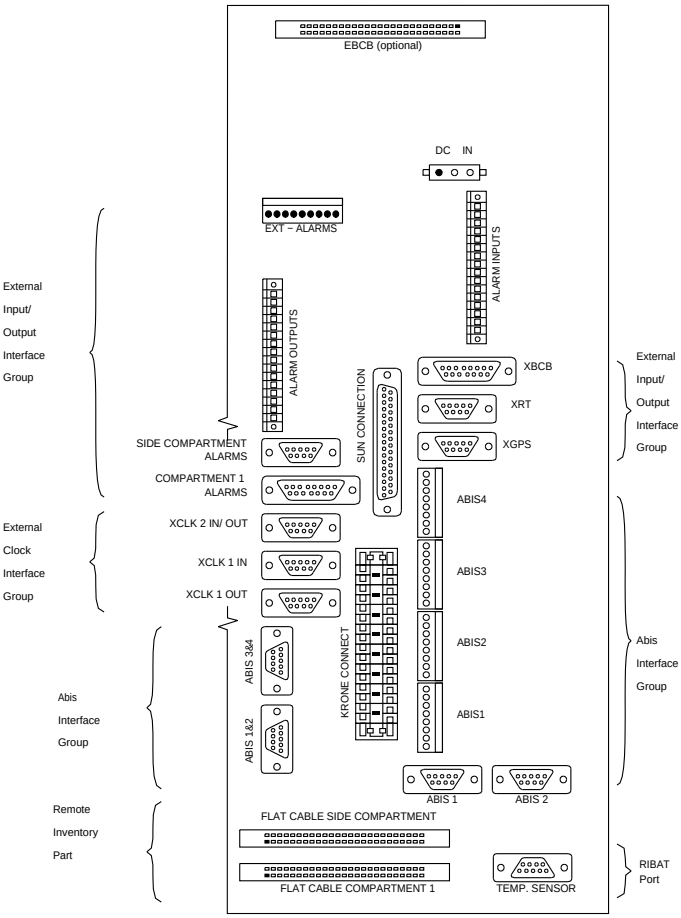


Figure 239: OUTC, Front View

All the functions of these four boards are kept except for the following:

- The output voltage provided on the external output connector is 12 V instead of 24 V. The current per output is limited to 50 mA instead of 100 mA.
- No galvanic isolation between external inputs/outputs and the BTS.
- The 'Power Architecture' of the OUTC is different from that of the earlier boards (see the following figure). Each part of the board is powered by the power supply of the OUTC, even the BTSRI, RIBAT and BCB parts of the XIOB. On the earlier boards, these parts are only supplied via the BCB_VCC.

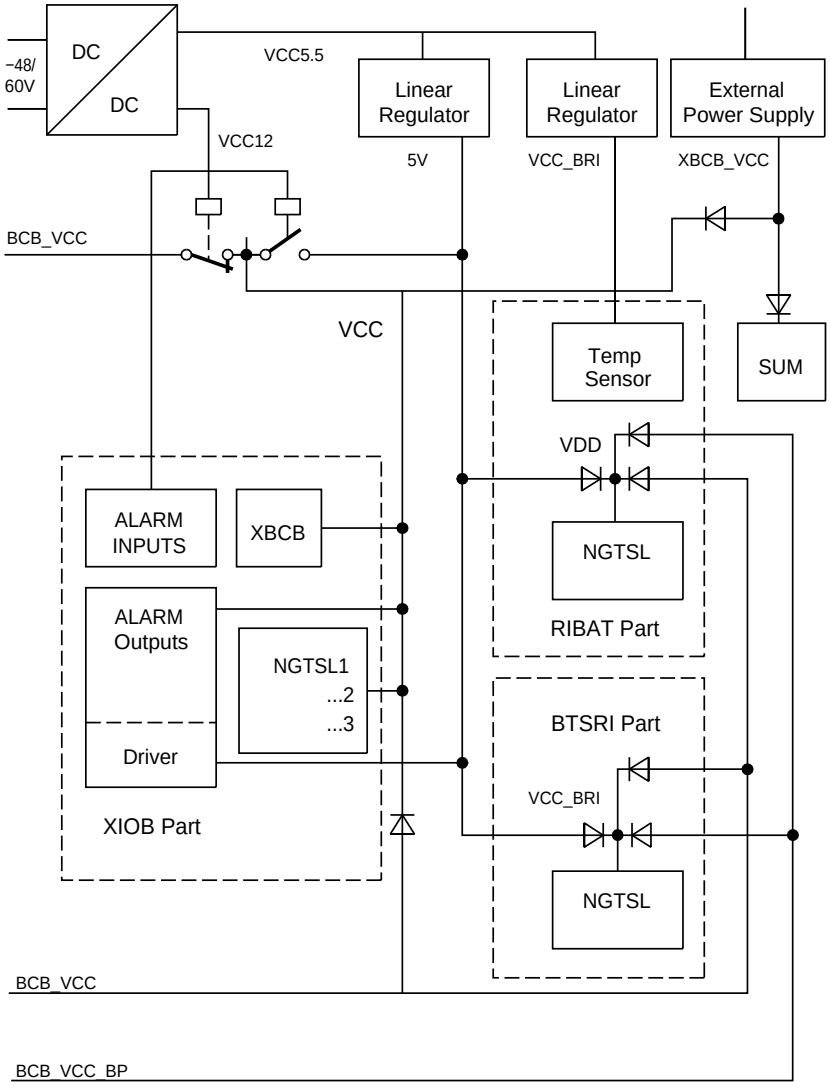


Figure 240: OUTC, Power Architecture

4.5.1 Connection Area (COAR)

The Connection Area is part of the OUTC. It provides external BTS interfaces which are grouped in three different functional parts:

- Abis
- External Clock Interface
- External Inputs/Outputs.

4.5.1.1 Abis

The Abis part provides the external interfaces for four separate Abis links (Abis 1 ... Abis 4). The interface consists of the connectors described in *BTS A9100 Abis Interface Connectors (11)*.

The KRONE Strip Connector also provides the possibility to monitor the Abis links. Therefore the overvoltage insert has to be pulled out and has to be replaced by a special monitor insert.

The interconnection between the SUMA and the OUTC consists of the following cables:

Abis 1, 2 cable	The Abis cable is a four pair, RF shielded cable. It is a 120 Ω cable which is used if the external Abis cables have 120 Ω or 75 Ω. The needed impedance conversion is realized on the OUTC itself.
Abis 3, 4 cable	The Abis cable is a four pair, RF shielded cable. It is a 120 Ω cable which is used if the external Abis cables have 120 Ω or 75 Ω. The needed impedance conversion is realized on the OUTC itself.
OUTC-SUM cable	The OUTC-SUM cable is a flat cable with 37 wires. It is equipped on the SUMA side with a Sub-D connector of 37-pins/male, on the OUTC side with a Sub-D connector of 37-pins/female.

Table 38: Interconnection OUTC - SUMA

4.5.1.2 External Clock Interface

The external clock interface provides connectors for a variety of functions. The connectors are described in Table *BTS A9100 External Clock Interface Connectors (10)*.

4.5.1.3 External Inputs/Outputs

The external Input/Output part of the OUTC provides the interfaces for 16 BTS alarm inputs and eight alarm outputs. 'Open' alarm inputs are interpreted by the BTS as 'alarm on'. Therefore any unconnected input alarm has to be bridged by a short circuit on the plug-in connector.

The following table described the external inputs/outputs.

On-board Connectors	These are two 'Mini Combicon' connectors, one Sub-D 9 and one Sub-D 15 connector (to connect five internal BTS alarms, e.g., heat exchanger, door, fire, key, water) and one connector with screws for special protected alarm inputs (three alarms). One of the two 'Mini Combicon' connectors provides eight alarm inputs; the other one provides the alarm outputs and + 12 VDC voltage.
Plug in Connectors	The insert in these connectors have either clamp strip contacts or crimp contacts. The version with a clamp strip is used for customer with no common interface where no pre-equipped cable can be used. The version with crimp contacts is the solution if the customer has a common interface and pre-equipped cables can be used. Every unconnected input alarm has to be bridged by a short circuit on the plug-in connector.
Alarm Disable Connector	The alarm disable insert consists of a connector with crimp contacts which provides the short circuits for eight alarm inputs. It is inserted in the alarm input connectors which are not connected by an external alarm cable to suppress alarms based on open inputs.
Overvoltage Protection	The OUTC additionally provides surge arrestors for three alarms to protect the circuitry of these inputs. These are on the 'EXT-ALARMS' connector for external alarm numbers 10, 13, and 14. Alarms 17 to 24 are not protected by special transient or overvoltage components but these inputs have to withstand a 1.2/ 50 1500 V wave. The alarm outputs are protected by bi-directional suppressor diodes.

Table 39: External Inputs/Outputs

4.5.2 BTSRI

The BTS Remote Inventory part of the OUTC is used to store basic information about a BTS in non-volatile memory.

Flat cables from compartment 1 and side compartment or MBO1/MBO2 are connected to the BTSRI.

The mounting position of the flat cables are located on the bottom of the OUTC (see Figure *239*).

The following figure shows the block diagram of the BTSRI.

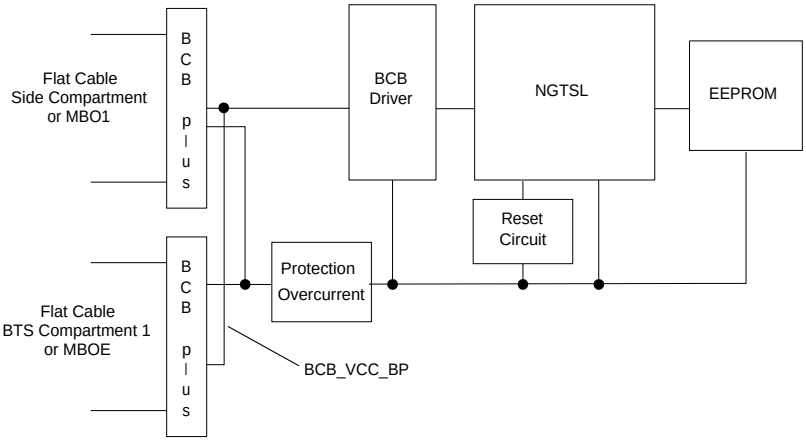


Figure 241: Block Diagram of BTSRI

The heart of the BTSRI is an NGTSL-ASIC. An EEPROM is used as memory (256 x 16 bits). A reset circuit (MAX 811) is used to reset the ASIC at power on.

The BTSRI is either powered via the flat cable (BCB_VCC_BP, provided by the SUMA) or via the power supply of the OUTC board. An overcurrent protection protects the BCB_VCC_BP line.

The access to this board can be established via the BCB bus. There are two possibilities to establish a link to the BTSRI:

- If the BTS is in traffic, the SUM can use the BCB bus as the interface to the BTSRI
- If the BTS is unpowered, the BTSRI can be accessed by an external tool via the XBCB- (and BCB-) bus. Then the external tool provides the necessary power supply. This feature is used only at factory level.

The subrack number is coded on the flat cable with holes. Five wires are reserved on the cable for that purpose. Up to six subracks can be coded which corresponds to the large outdoor configuration.

4.5.3 XIOB

The External Alarm Input and Output Board (XIOB) is used as the interface between the external environment and the BTS. The board provides 16 BTS alarm inputs and eight alarm outputs. These alarms are described in the tables *BTS A9100 Outdoor Interface Connectors (33)* to *BTS A9100 Outdoor External Alarm Inputs (36)*. The XIOB functions are integrated in the OUTC.

The following figure shows the block diagram of the XIOB.

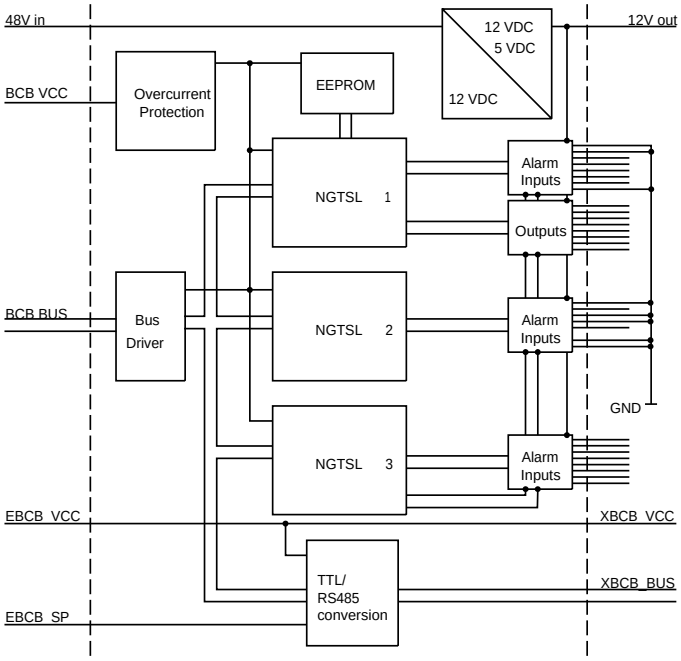


Figure 242: Block Diagram of the XIOB

Three NGTSLs are used; each NGTSL handles eight alarm inputs. The first NGTSL also controls eight outputs and the EEPROM, which is used to store the remote inventory data of the XIOB. The third NGTSL can be used to pull the alarm inputs to the active or inactive status for test purposes. It is possible to pull the alarm inputs with software on active or inactive level in order to check them. Alarm test 0 pulls all inputs to the inactive status and alarm test 1 pulls all inputs to the active status.

The alarm inputs use comparators to detect an alarm. Open alarm inputs are regarded as active. A current of approximately 1 mA flows from the alarm input to ground if the alarm input is pulled to ground. An alarm line must stay longer than 1 ms in the active status in order to be detected as active.

The alarm outputs use Darlington transistor arrays with open collectors.

No galvanic isolation is provided between inputs/outputs to the BTS. One common ground (GND) is used within the BTS including inputs and outputs.

The DC/DC converter is switched on if the BCB_VCC (powered by the SUMA) is available. An overcurrent protection protects the BCB_VCC line. A 12 VDC power supply is used to supply input and output circuitry. This power supply can be used to supply relays that can be switched with the outputs.

An XBCB interface provides access to the internal base station control bus (BCB):

- If the BTS is powered, then the interface can be used to control external devices
- If the BTS is unpowered, the XBCB can be powered externally. Then the direction of the interface is changed so that it can be used for remote inventory of the BTS. This feature is used only at factory level.

The signal levels are according to RS-485. An ABTE 16246 is used as the internal BCB driver.

4.5.4 RIBAT

The RIBAT board is part of the battery, but physically integrated in the OUTC. Its task is to measure the battery temperature and to provide the OMU with the temperature value and the battery Remote Inventory information which includes the information of the battery type. Knowledge of the temperature value is necessary for charging. The board contains a BCB interface to transfer the information.

The RIBAT is supplied from the BTS not from the batteries. The power consumption is about 30 mA. The operating temperature range of the board is 0° C to 70° C.

The connection and addressing differs for different configurations. The following figure shows the RIBAT block diagram.

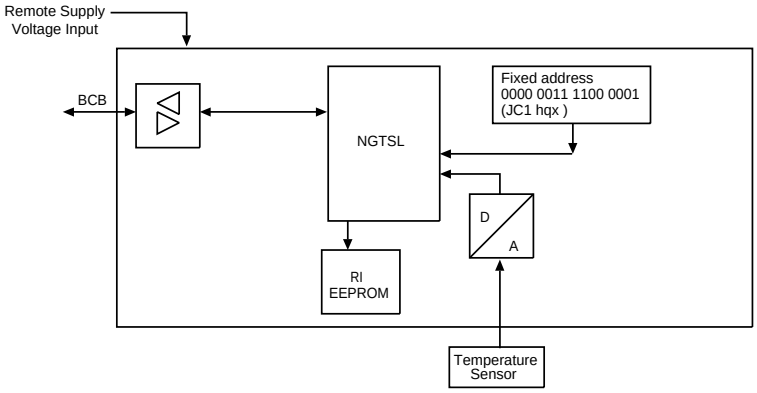


Figure 243: RIBAT Block Diagram

The board consists of an NGTSL which is the terminal for the ISL data link, the Remote Inventory EEPROM including the Remote Inventory information, and the analog part for temperature measuring.

The analog part includes signal conditioning and an ADC to digitize the temperature value. An external PT100 temperature sensor is connected to the analog part. The ADC outputs are connected directly to the NGTSL alarm inputs.

Power supply is provided remotely either via the BCB_VCC_BP or the internal power supply of the OUTC.

The internal battery of the outdoor BTS is located inside a side compartment. The RIBAT is connected to the BCB via a flat band cable coming from the backplane.

The battery temperature range which can be measured is between -10° C and 70° C. This range is extended against the operating temperature range of the batteries (0° C to 50° C) and the minimum operating temperature range of the RIBAT to submit high or low temperature alarms. The measurement resolution is 0.5° C. Values below -10° C means a short cut at the temperature sensor. Values above 70° C means a not-connected or interrupted sensor.

4.6 Outdoor Cabinet Power Supply and Grounding

There are different power supply systems for the COME/COMI, CODE/CODI/CPT2/MBO1/MBO2 and MBO1DC/MBO2DC. These are described in the following sections.

4.6.1 COME/COMI

For the COME/COMI there exist two different power supply systems, one based on PM08s with BCU1 and another one based on PM11s with BCU2.

Certain elements are common for both variants.

The AC input is connected to the ACSB via the optional electricity meter. The ACSB contains lightning overvoltage protectors, input supply fuses, and circuit breakers for AC power distribution. The AC input can be 230 VAC 1Ø or 415 VAC 3Ø. The switched outputs from the ACSB are 230 VAC 1Ø.

These are used for:

- HEAT2s
- Service light and AC power sockets
- SRACDC or ACSR.

The COME/COMI is grounded by connecting an external ground cable to an M8 bolt fitted to the side compartment plinth. From there, separate ground straps are used to ground the major equipment modules in each compartment.

4.6.1.1 COME/COMI Power Supply with PM08s and BCU1

The COME/COMI power supply system with PM08s and BCU1 is shown in the following figure.

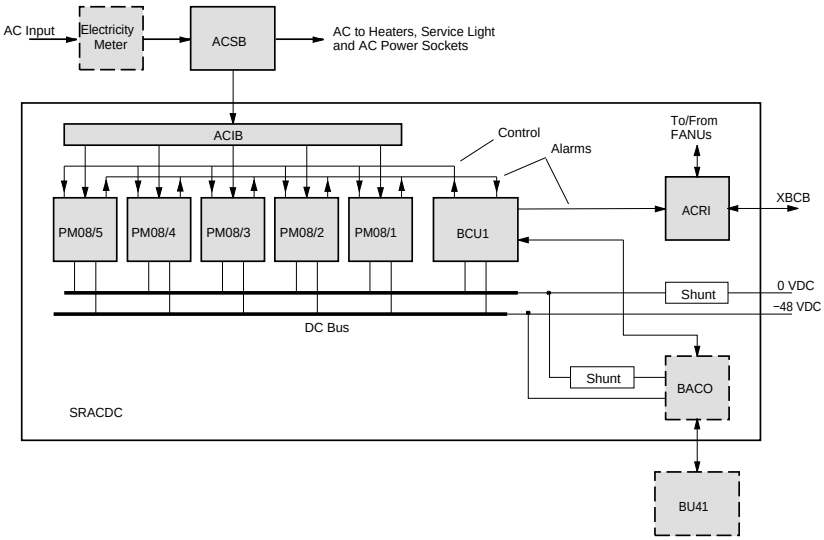


Figure 244: COME/COMI AC/DC Power Supply System with PM08s and BCU1

The SRACDC contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *ACIB (Section 12.1)* and *PM08 (Section 12.12)* for detailed descriptions of the ACIB and the PM08s, respectively. Three PM08s are used in the COMI; five PM08s are used in the COME.
- Control the output DC voltage level for battery charging and testing. Refer to *BCU1 (Section 12.16)*, *BACO (Section 12.18)* and *BU41 (Section 12.24)* for detailed descriptions of the BCU1, and the optional BACO and BU41, respectively.

The DC supply produced in the SRACDC is connected to the DCDP via the interconnection panel. Refer to *DCDP (Section 12.30)* for a detailed description of the DCDP.

4.6.1.2 COME/COMI Power Supply with PM11s and BCU2

The COME/COMI power supply system with PM11s and BCU2 is shown in the following figure.

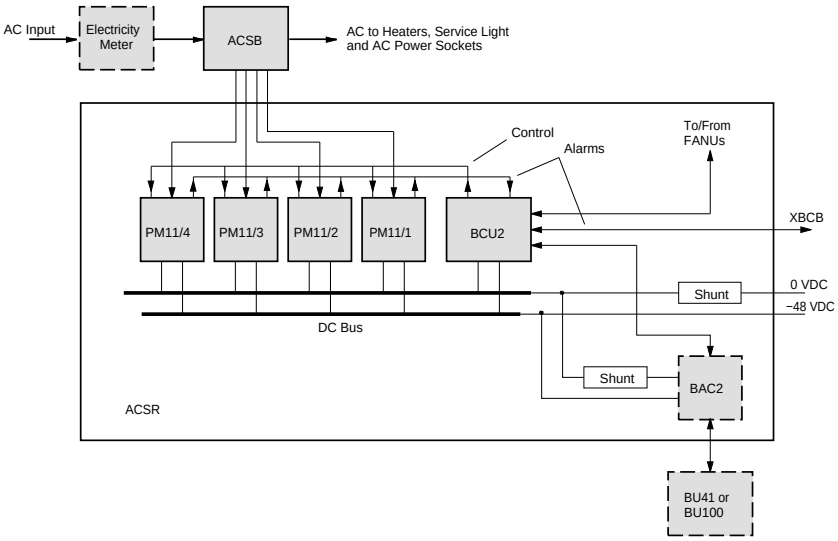


Figure 245: COME/COMI AC/DC Power Supply System with PM11s and BCU2

The ACSR contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *PM11 (Section 12.13)* for a detailed description of the PM11s. Three PM11s are used in the COMI; four PM11s are used in the COME
- Control the output DC voltage level for battery charging and testing. Refer to *BCU2 (Section 12.17)*, *BAC2 (Section 12.19)*, *BU41 (Section 12.24)*, and *BU100 (Section 12.25)* for detailed descriptions of the BCU2, and the optional BAC2 and BU41 or BU100, respectively.

The DC supply produced in the ACSR is connected to the BOBU via the interconnection panel.

The ACSB used in combination with PM11s is slightly different from the ACSB used in combination with PM08s. In Figure *245* the ACSB distributes the AC input directly to the PM11s and the ACSB executes the functions normally performed by the ACIB.

4.6.2 CODE/CODI/CPT2

The CODE/CODI/CPT2 power supply system differs from that of COME/COMI because it is completely integrated in the BTS. The system control functions are performed by the OMU which is part of the SUMA.

The following figures show the power supply system for the CODE/CODI/CPT2.

AC mains power is applied to the LPFU located at the bottom of the side compartment. The LPFU provides overvoltage lightning protection for the AC supply lines and HF filtering for the incoming AC supply (for a detailed description of the LPFU, refer to *LPFU (Section 12.5)*). The AC input can be 230 VAC 1Ø or 400 VAC 3 Ø.

AC power is then passed to the ACSU located at the top of the side compartment. The ACSU provides AC distribution via seven AC circuit breakers.

The switched outputs from the ACSU are used for:

- Two or three PM12s
- HEAT2s and optional air conditioning
- Service Light and AC power sockets.

For a detailed description of the ACSU, refer to *ACSU (Section 12.9)*.

The CODE/CODI/CPT2 are grounded by connecting an external ground cable to an M8 bolt fitted to the side compartment plinth. From there, separate ground straps are used to ground the major equipment modules in each compartment.

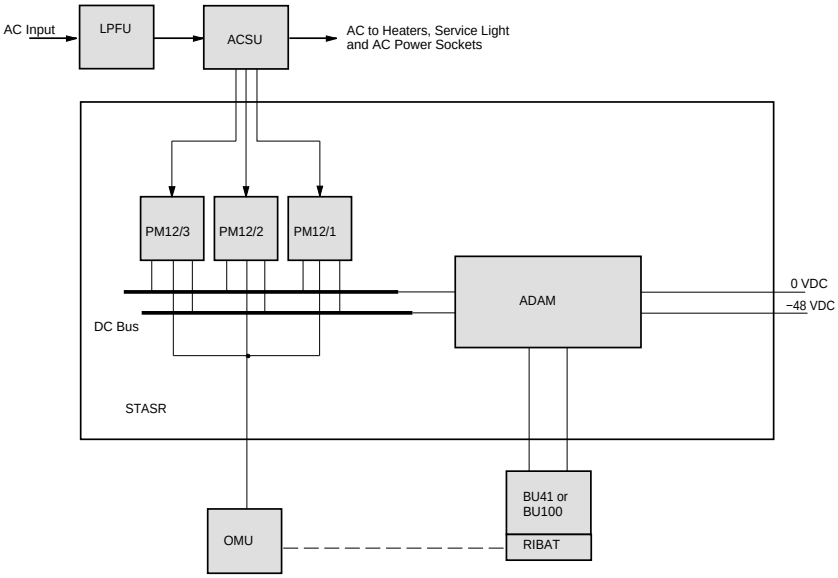


Figure 246: CODE/CODI/CPT2 AC/DC Power Supply System

The STASR contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *PM12 (Section 12.14)* for a detailed description of the PM12s. Three PM12s are used in the CODE/CODI/CPT2. The operation of the PM12s is controlled by software running in the OMU
- Sense the output DC voltage level for battery charging and testing. The sense data is passed to the OMU. Refer to *ADAM (Section 12.21)*, *BU41 (Section 12.24)* and *BU100 (Section 12.25)* for detailed descriptions of ADAM and the batteries BU41, BU100 and BU101.

The DC supply produced in the STASR is connected to the BOSU and BOBU via the interconnection panel.

A specific installation set can be used to connect the DC power of the bus bar via external cable entry to external loads like transmission equipment, pylon lightning, etc...

4.6.3 MBO1/MBO2

The MBO1/MBO2 power supply system differs from that of COME/COMI because it is completely integrated in the BTS. The system control functions are performed by the OMU which is part of the SUMA.

The following figure shows the power supply systems for MBO1 and MBO2.

AC mains power is applied to the LPFM located at the upper side of the MBO1 compartment. The LPFM provides overvoltage lightning protection for the AC supply lines and HF filtering for the incoming AC supply (for a detailed description of the LPFM, refer to *LPFM (Section 12.4)*). The AC input can be 230 VAC 1Ø or 400 VAC 3 Ø.

AC power is then passed to the ACMU located at the top of the MBO1 compartment. The ACMU provides AC distribution via five AC circuit breakers.

The switched outputs from the ACMU are used for:

- Two to four PM12s in combination with ADAM4
- HEAT2s and optional air conditioning
- Service Light and AC power sockets.

For a detailed description of the ACMU, refer to *ACMU (Section 12.7)*.

The MBO1/MBOE are grounded by connecting an external ground cable to an M8 bolt fitted to the left upper side of the MBO1 (near LPFM). From there, separate ground straps are used to ground the major equipment modules in each compartment.

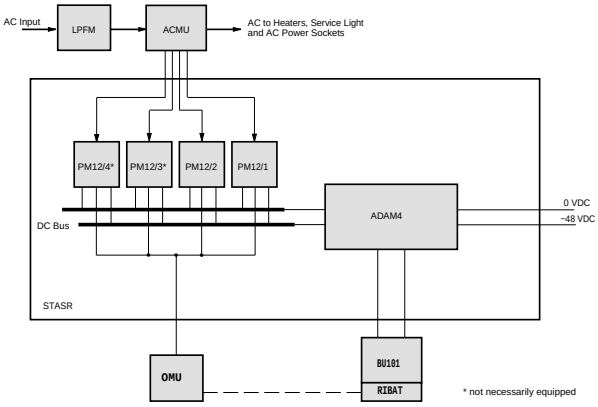


Figure 247: MBO1/MBO2 AC/DC Power Supply System

The STASR contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *PM12 (Section 12.14)* for a detailed description of the PM12s. Two or three PM12s are used in the MBO1; three or four PM12s are used in the MBO2. The operation of the PM12s is controlled by software running in the OMU
- Sense the output DC voltage level for battery charging and testing. The sense data is passed to the OMU. Refer to *ADAM4 (Section 12.23)* and *BU101 (Section 12.26)* for detailed descriptions of ADAM4 and the BU101 battery.

The DC supply produced in the STASR is connected to the BOMU via ADAM4.

A specific installation set can be used to connect the DC power of the bus bar via external cable entry to external loads like transmission equipment, pylon lightning, etc...

4.6.4 MBO1DC/MBO2DC

The MBO1DC/MBO2DC power supply system differs from that of COME/COMI because it is completely integrated in the BTS. The system control functions are performed by the OMU which is part of the SUMA.

The following figure shows the power supply systems for MBO1 and MBO2.

DC mains power is applied to the DC In filters located at the upper side of the MBO1DC compartment.

DC power is then passed to the DCMU located at the top of the MBO1DC compartment. The DCMU provides DC distribution via four DC circuit breakers.

The switched outputs from the DCMU are used for:

- BTS compartments
- HEATDCs and optional air conditioning
- Service Light.

For a detailed description of the DCMU, refer to *DCMU (Section 12.33)*.

The MBO1DC/MBOEDC are grounded by connecting an external ground cable to an M8 bolt fitted to the left upper side of the MBO1DC. From there, separate ground straps are used to ground the major equipment modules in each compartment.

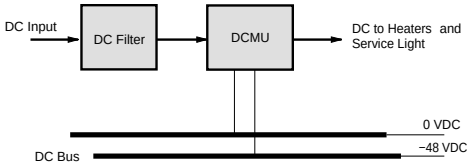


Figure 248: MBO1DC/MBO2DC Power Supply System

The DC supply is connected to the BOMU via the DCMU.

A specific installation set can be used to connect the DC power of the bus bar via external cable entry to external loads like transmission equipment, pylon lightning, etc...

4.6.5 MBO1T

MBO1T is derived from MBO1 by reducing the used equipment.

The following figure shows the power supply systems for MBO1T.

AC mains power is applied to the LPFMT located at the upper side of the MBO1T compartment. The LPFMT provides overvoltage lightning protection for the AC supply line and HF filtering for the incoming AC supply (for a detailed description of the LPFMT, refer to *LPFMT (Section 12.3)*). The AC input is 230 VAC 1Ø.

AC power is then passed to the ACMUT located at the top of the MBO1T1 compartment. The ACMUT provides AC distribution via one AC circuit breaker.

The switched outputs from the ACMUT are used for two to three PM12s in combination with ADAM4.

For a detailed description of the ACMUT, refer to *ACMUT (Section 12.8)*.

The MBO1T is grounded by connecting an external ground cable to an M8 bolt fitted to the left upper side of the MBO1T (near LPFMT). From there, separate ground straps are used to ground the major equipment modules in each compartment.

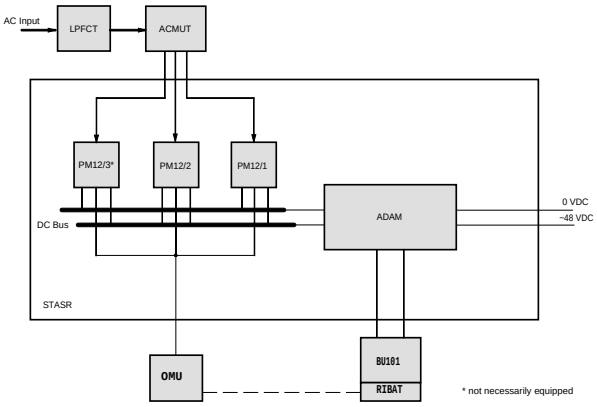


Figure 249: MBO1T AC/DC Power Supply System

The STASR contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *PM12 (Section 12.14)* for a detailed description of the PM12s. Two or three PM12s are used in the MBO1T. The operation of the PM12s is controlled by software running in the OMU
- Sense the output DC voltage level for battery charging and testing. The sense data is passed to the OMU. Refer to *ADAM (Section 12.21)* and *BU101 (Section 12.26)* for detailed descriptions of ADAM and the BU101 battery.

The DC supply produced in the PM12 and is connected to the BOMUT via ADAM4.

A specific installation set can be used to connect the DC power of the bus bar via external cable entry to external loads like transmission equipment, pylon lightning, etc...

4.6.6 MBO1E/MBO2E

The following figure shows the power supply systems for MBO1E and MBO2E.

AC mains power is applied to the ACDUE located at the lower side of the MBO1E compartment (for a detailed description of the ACDUE, refer to *ACDUE (Section 12.6)*). The AC input can be 230 VAC 1Ø or 400 VAC 3 Ø.

AC power is then passed to the switching block located at the middle part of ACDUE. The switching block provides AC distribution via five AC circuit breakers.

The switched outputs are used for:

- One to three PM18 rectifiers supervised by PM18 controller
- HEAT2s
- Service Light and AC power socket.

The MBO1E/MBOEE are grounded by connecting an external ground cable to an M8 bolt fitted to the left lower side of the MBO1E (near the front left fixing point). From there, separate ground straps are used to ground the major equipment modules in each compartment.

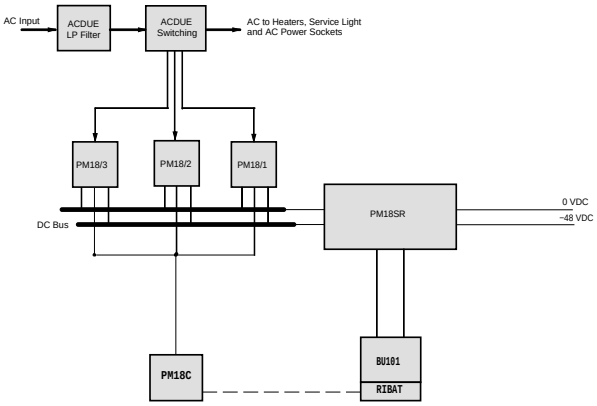


Figure 250: MBO1E/MBO2E AC/DC Power Supply System

The PM18SR contains the modules that:

- Convert the AC input to 0/ -48 VDC. Refer to *PM18 (Section 12.15)* for a detailed description of the PM18s. One or two PM18s are used in the MBO1E; two or three PM18s are used in the MBO2E. The operation of the PM18s is controlled by the PM18 controller
- Sense the output DC voltage level for battery charging and testing. The sense data is passed to the controller. Refer to *PM18 (Section 12.15)* and *BU101 (Section 12.26)* for detailed descriptions of PM18 and the BU101 battery.

The DC supply produced in the PM18 power supply subrack and is connected to the BOMUE.

A specific installation set can be used to connect the DC power of the bus bar via external cable entry to external loads like transmission equipment, pylon lightning, etc...

4.6.7 MBO1EDC/MBO2EDC

The MBO1EDC/MBO2EDC power supply system is completely integrated in the BTS. The system control functions are performed by the OMU which is part of the SUMA.

The following figure shows the power supply systems for MBO1EDC and MBO2DC.

DC mains power is applied to the DC In clamps located in the DCDUE at the lower side of the MBO1EDC compartment.

DC power is then passed to the DC In filter located at the bottom of the MBO1EDC compartment. The DCDUE provides DC distribution via four DC circuit breakers.

The switched outputs from the DCMU are used for:

- BTS compartments
- Service Light
- HEATDCs and optional air conditioning.

For a detailed description of the DCDUE, refer to *DCDUE (Section 12.32)*.

The MBO1EDC/MBOEEDC are grounded by connecting an external ground cable to an M8 bolt fitted to the left lower side of the MBO1EDC. From there, separate ground straps are used to ground the major equipment modules in each compartment.

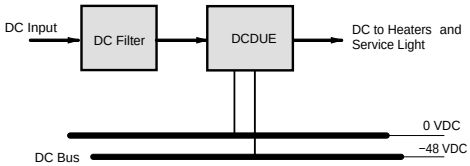


Figure 251: MBO1EDC/MBO2EDC Power Supply System

The DC supply is connected to the BOMUE via the DCDUE.

A specific installation set can be used to connect the DC power of the bus bar via external cable entry to external loads like transmission equipment, pylon lightning, etc...

4.6.8 CBO

4.6.8.1 CBO AC Variant

The CBO power supply system is completely integrated in the BTS. The system control functions are performed by the OMU which is part of the SUMA.

The following figure shows the power supply system for the CBO.

AC mains power is applied to the LPFC located above the cables entry compartment. The LPFC provides overvoltage lightning protection for the AC supply lines and HF filtering for the incoming AC supply (for a detailed description of the LPFC, refer to *LPFC (Section 12.2)*). The AC input is 230 VAC 1Ø.

AC power is then passed to the ACUC located above the LPFC. The ACUC provides AC distribution via two AC circuit breakers.

The switched outputs from the ACUC are used for:

- Two PM12s in combination with ADAM2
- HEAT3
- AC power socket.

For a detailed description of the ACUC, refer to *ACUC (Section 12.10)*.

The CBO is grounded by connecting an external ground cable to an M8 socket fitted to the right upper side of the cables entry. From there, separate ground straps are used to ground all equipment modules.

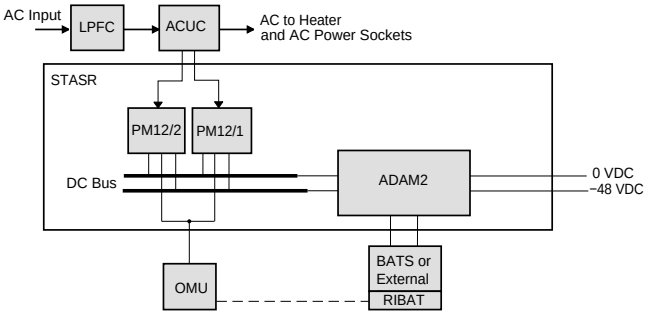


Figure 252: CBO AC Variant Power Supply System

The STASR contains the modules that:

- Convert the AC input to 0/-48 VDC. Refer to *PM12 (Section 12.14)* for a detailed description of the PM12s. Two PM12s are used in the CBO. The operation of the PM12s is controlled by software running in the OMU.
- Sense the output DC voltage level for battery charging and testing. The sense data is passed to the OMU. Refer to *ADAM2 (Section 12.22)* and *BATS (Section 12.28)* for detailed descriptions of ADAM2 and the BATS battery.

The DC supply produced in the PM12 is connected to the DCUC via ADAM2. Refer to *DCUC (Section 12.34)* for a detailed description of DCUC.

4.6.8.2 CBO DC Variant

The CBO DC variant DC power supply distribution differs from that of CBO AC variant.

The following figure shows the power supply distribution for CBO DC variant.

DC mains power is applied to the DC In filter located above the cables entry compartment.

DC power is then passed to the DCDU located at the top of the CBO DC compartment. The DCDU provides DC distribution via five DC circuit breakers.

The switched outputs from the DCDU are used for:

- BTS compartments
- Optional equipments
- Heater HEAT4
- Heat exchanger HEX5.

For a detailed description of the DCDU, refer to *DCDU (Section 12.31)*.

The CBO DC varinat is grounded by connecting an external ground cable to an M8 bolt fitted to the left upper side of the MBO1DC. From there, separate ground straps are used to ground the major equipment modules in each compartment.

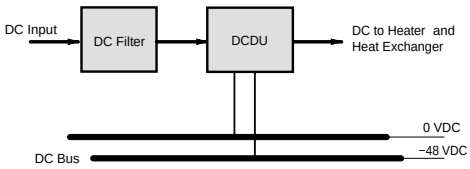


Figure 253: CBO DC Variant Power Supply System

4.6.9 Temperature Control

How the temperature is controlled in the different cabinets is described in the following sections.

4.6.9.1 COMI, COME, CODI, CODE, MBO, MBOxE

The ACSB/ACSU/ACMU contain a relay which is controlled by a thermostat. When the temperature is above -20° C, the AC supply is connected to the AC/DC converters.

If the temperature is below -20° C when the BTS A9100 is first switched on, there is no AC supply to the AC/DC converters. This means that the 0/ -48 VDC supply is not available and the BTS A9100 cannot operate. AC power is available only on the HEAT2 to warm-up the cabinet.

When the HEAT2 raise the internal cabinet temperature above -20° C, the power relay is activated and the AC supplies are passed to the AC/DC converters. The HEAT2 prevents the internal cabinet temperature from dropping below 0° C.

When the internal cabinet temperature rises above 0° C, the SUM switches on the telecommunications modules and the BTS A9100 becomes operational.

4.6.9.2 CBO

For CBO AC variant with the ACUC, a permanent connection is maintained up to -33° C. When switched on at minus temperature, both the HEAT3 and AC/DC are powered in time in order to warm up the cabinet to above 0° C.

When the internal cabinet temperature rises above 0° C, the SUM switches on the telecommunications modules and the BTS A9100 becomes operational. The HEAT3 prevents the internal cabinet temperature from dropping below 0° C.

4.6.9.3 CBO DC

For CBO DC variant with theDCUC, a permanent connection is maintained up to -33° C. When switched on at minus temperature, both the HEAT4 and DC are powered in time in order to warm up the cabinet to above 0° C.

When the internal cabinet temperature rises above 0° C, the SUM switches on the telecommunications modules and the BTS A9100 becomes operational. The HEAT4 prevents the internal cabinet temperature from dropping below 0° C.

4.6.9.4 MBO1T

As MBO1T is designed to be used in tropical areas only cooling facilities are implemented by HEX4 unit.

4.6.9.5 MBODC/MBOxEDC

With the DCMU/DCDUE, a permanent connection is maintained up to -33° C. When switched on at minus temperature, the HEATDC is powered in order to warm up the cabinet to above 0° C.

When the internal cabinet temperature rises above 0° C, the SUM switches on the telecommunications modules and the BTS A9100 becomes operational. The HEATDC prevents the internal cabinet temperature from dropping below 0° C.

4.7 Outdoor Cabinet Lightning Protection

Protection against the effects of lightning strikes is provided for external cables, see the following table.

External Cable	Lightning Protection
AC Mains Supply	Two types of lightning protectors can be fitted: ▶ Medium stage protectors (DIN VDE 0675-6, Class C) are installed in the ACSB for supply lines L1, L2, L3 and N ▶ Coarse protectors (DIN VDE 0675-6, Class B) are installed externally if the cabinet is sited in exposed locations. Such locations are, for example, building tops and open fields.
Abis Interface	Medium-stage spark gap overvoltage protection is provided by the Krone strip on the COAR or OUTC.
Three External Alarms	Combined medium stage and fine overvoltage protection is provided by the COAR or OUTC surge protectors. Additional external coarse protection is unnecessary.
Antenna Connectors	Quarter wave (λ/4) lightning protectors are fitted at the bottom of BTS compartment 1 and 2. For detailed information on the lightning protectors, refer to *Antenna Connector Lightning Protectors (Section 14)*.

Table 40: BTS A9100 Outdoor Lightning Protection

4.8 Outdoor Cabinet Cables and Cable Sets

This section lists the cables and cable sets for all BTS A9100 outdoor configurations.

4.8.1 Internal Cables

The BTS A9100 outdoor internal cables consist of the discrete cables and cable sets listed in the tables *COMI/COME/COEP Outdoor Internal Cables (41)* to *CPT2 Outdoor Internal Cables (43)*.

Table *BTS A9100 Outdoor Cable Sets (46)* lists and describes the cables that comprise the cable sets.

For the physical and electrical descriptions of the discrete cables, see *Cable Descriptions (Section 17)*.

For some of the cables and cable sets there exist different variants. For the variants used in a specific cabinet refer to its accompanying cable list.

4.8.1.1 COMI/COME/COEP Internal Cables

			COME	
Mnemonic	**Description**	**Part Number**	**COMI**	**COEP**
BTSRIOUT	BTSRIOUT is a flat cable which is permanently attached to a BTSRI board. It interconnects the BTS compartment 1 STASR backplanes and the BTSRI.	3BK 08126	X	-
CA-ACSC	CA-ACSC gathers alarms from the side compartment. This consists of the key switch, door switch and HEX2 alarms. The cable connects to the Alarms Side Comp connector on the COAR.	3BK 08078	X	-
CA-ADCO	CA-ADCO disables eight alarm inputs. It connects to the XI17 - 24 connector on the COAR.	3BK 07953	X	-
CA-APC2	CA-APC2 gathers BTS compartment 1 alarms from the door switch, smoke detector, flood detector and HEX2.	3BK 08215	X	-
CA-ASMC	CA-ASMC is an AC power cable. It connects 230 VAC from the ACSB to the ACIB.	3BK 08807	X	-

			COME	
Mnemonic	**Description**	**Part Number**	**COMI**	**COEP**
CA-ONCCx	CA-ONCCx carries: ▶ 0/ -48 VDC from the bus bar ▶ TX/RX from the Connection Area ▶ Abis 1/2 Interfaces from the SUM. The cable connects to the customer equipment in BTS compartment 1.	-	X	-
CA-OSCP1	CA-OSCP1 short circuits the HEX2 P1 connector of CA-ACSC. This suppresses the side compartment HEX2 alarm. The side compartment HEX2 is only fitted in the COME when there are more than six TREs.	3BK 08095	X	-
CA-OSCP2	CA-OSCP2 short circuits the Alarms BTS2 connector on the COAR. This suppresses the BTS compartment 2 HEX2 and door switch alarms. BTS compartment 2 is part of COME.	3BK 08096	X	-
CS02	CS02 is an AN cable set. It connects an ANY to another ANY or to an ANX/ANC.	3BK 07598	X	X
CS03	CS03 is a TRE cable set. It connects a TRE to an ANX/ANC or an ANY.	3BK 07599	X	X
CS07	CS07 is an ANT cable set. It connects an ANX/ANC to two antenna cabinet connectors.	3BK 07964	X	X
CS08	CS08 is the customer equipment cable set. It connects a BTS to the microwave equipment and other customer equipment.	3BK 08036	X	-
CS09	CS09 is a BTS compartment 1 basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX2 and XIOB ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals.	3BK 08037	X	-

			COME	
Mnemonic	**Description**	**Part Number**	**COMI**	**COEP**
CS10	CS10 is an optional cable set. It provides the 0/ -48 VDC supply for the side compartment HEX2. The side compartment HEX2 is only fitted in the COME when there are more than six TREs.	3BK 08042	-	X
CS11	CS11 is the BTS compartment 2 basic cable set. It contains cables for: ▶ DC power connections to the STASRs and HEX2 ▶ Signal connections between the STASRs.	3BK 08040	-	X
CS12	CS12 is a TRE cable set. It connects a TRE to ANY.	3BK 08041	X	-

Table 41: COMI/COME/COEP Outdoor Internal Cables

4.8.1.2 CODI/CODE/COEP Internal Cables

			CODE	
Mnemonic	**Description**	**Part Number**	**CODI**	**COEP**
BATCO	BATCO connects the battery via breakers to the interconnection area. It includes a cable for the battery temperature sensor.	3BK 25156	X	-
BTSRIOUT	BTSRIOUT is a flat cable which is permanently attached to a BTSRI board. It interconnects the BTS compartment 1 STASR backplanes and the BTSRI.	3BK 08126	X	-
CA-ADCO	CA-ADCO disables eight alarm inputs. It connects to the XI17 - 24 connector on the COAR.	3BK 07953	X	-
CA-ONCCx	CA-ONCCx carries: ▶ 0/ -48 VDC from the bus bar ▶ TX/RX from the Connection Area ▶ Abis 1/2 Interfaces from the SUM. The cable connects to the customer equipment in BTS compartment 1.	-	X	-
CS03	CS03 is a TRE cable set. It connects a TRE to an ANX/ANC or an ANY.	3BK 07599	X	X
CS07	CS07 is an ANT cable set. It connects an ANX/ANC to two antenna cabinet connectors.	3BK 07964	X	X
CS08	CS08 is the customer equipment cable set. It connects a BTS to the microwave equipment and other customer equipment.	3BK 08036	X	-
CS11	CS11 is the BTS compartment 2 basic cable set. It contains cables for: ▶ DC power connections to the STASRs and HEX2 ▶ Signal connections between the STASRs.	3BK 08040	-	X

			CODE	
Mnemonic	**Description**	**Part Number**	**CODI**	**COEP**
CS15	CS15 is a BTS compartment 1 basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX2 and XIOB ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals.	3BK 08719	X	-
CS16	CS16 is a side compartment basic cable set. It contains cables for: ▶ DC power connections to the HEX2 ▶ Signal connections to the SUM. This includes control and alarm signals.	3BK 08775	X	-

Table 42: CODI/CODE/COEP Outdoor Internal Cables

4.8.1.3 CPT2 Internal Cables

Mnemonic	Description	Part Number
BATCO Version AA	BATCO AA connects the battery via breakers to the interconnection area. It includes a cable for the battery temperature sensor.	3BK 25156
CS03	CS03 is a TRE cable set. It connects a TRE to an ANC or an ANY.	3BK 07599
CS07	CS07 is an ANT cable set. It connects an ANC to two antenna cabinet connectors.	3BK 07964
CS15	CS15 is a BTS compartment 1 basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX2 and OUTC ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals.	3BK 08719
CS16	CS16 is a side compartment basic cable set. It contains cables for: ▶ DC power connections to the HEX2 ▶ Signal connections to the SUM. This includes control and alarm signals.	3BK 08775

Table 43: CPT2 Outdoor Internal Cables

4.8.1.4 MBO1/MBO1DC/MBO2/MBO2DC Internal Cables

Mnemonic	Description	Part Number	MBO1	MBO2
BATCO Version BA	BATCO BA connects the battery via breakers to the interconnection area. It includes a cable for the battery temperature sensor.	3BK 25156	X	X
CM01	CM01 is an MBO1 basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX4 and OUTC ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals ▶ Remote inventory data.	3BK 25818	X	X
CMO1E	CM01E is an MBO1E basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX9/DAC9 and OUTC ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals ▶ Remote inventory data.	3BK 27268	X	X
CM02	CM02 is an MBOE compartment basic cable set. It contains cables for: ▶ DC power connections and alarms to the HEX3 ▶ DC power connections to the STASRs ▶ Remote inventory data.	3BK 25819	-	X
CM02E	CM02E is an MBOEE compartment basic cable set. It contains cables for: ▶ DC power connections and alarms to the HEX8/DAC8 ▶ DC power connections to the STASRs ▶ Remote inventory data.	3BK 27269	-	X

Mnemonic	Description	Part Number	MBO1	MBO2
CMO11*	CM011 is an MBO1DC basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX4 and OUTC ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals ▶ SENSP ▶ Remote inventory data.	3BK 26621	X	X
CMO1T**	CMO1T is an MBO1T basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX4 and OUTC ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals ▶ Remote inventory data.	3BK 27142	X	-
CS03	CS03 is a TRE cable set. It connects a TRE to an ANC or an ANY.	3BK 07599	X	X
CS07	CS07 is an ANT cable set. It connects an ANC to two antenna cabinet connectors.	3BK 07964	X	X

***** : Available only for MBODC

****** : Available only for MBO1T

Table 44: MBO1/MBO1DC/MBO1T/MBO2/MBO2DC Outdoor Internal Cables

4.8.1.5 CBO Internal Cables

Mnemonic	Description	Part Number
CBOA	CBOA is an CBO basic cable set. It contains cables for: ▶ DC power connections to the STASRs, HEX5 and OUTC ▶ Signal connections to the SUM. This includes the Abis1 and Abis2 Interfaces, clock, control and alarm signals ▶ Remote inventory data.	3BK 26346
BATSC	BATSC connects the battery to the ADAM board and the 0 V bolt.	3BK 26354

Mnemonic	Description	Part Number
CS03	CS03 is a TRE cable set. It connects a TRE to an ANC or an ANY.	3BK 07599
CS26	CS26 is an ANT cable set. It connects an ANC to two antenna cabinet connectors.	3BK 26351

Table 45: CBO Outdoor Internal Cables

4.8.1.6 BTS A9100 Outdoor Internal Cable Sets

Cable Sets	Mnemonic	Description	Part Number	Quantity
BATCO Version AA	CA-BABRM	CA-BABRM connects -48 VDC from the battery to the battery breaker.	3BK 25141	1
	CA-BABRP	CA-BABRP connects 0 VDC from the battery to the battery breakers.	3BK 25140	1
	CA-BRCM	CA-BRCM connects -48 VDC from the battery breaker to the battery interconnection area.	3BK 25246	1
	CA-BRCP	CA-BRCP connects 0 VDC from the battery breaker to battery interconnection area.	3BK 25245	1
	CA-BSENS	CA-BSENS connects the battery temperature sensor to RIBAT or OUTC.	3BK 08119	1
BATCO Version AB	CA-CBRM	CA-CBRM connects -48 VDC from the battery to the battery breaker.	3BK 25868	1
	CA-CBRP	CA-CBRP connects 0 VDC from the battery to the battery breakers.	3BK 25869	1
	CA-BRCM	CA-BRCM connects -48 VDC from the battery breaker to the battery interconnection area.	3BK 25246	1
	CA-BRCP	CA-BRCP connects 0 VDC from the battery breaker to battery interconnection area.	3BK 25245	1
	CA-BSENS	CA-BSENS connects the battery temperature sensor to RIBAT or OUTC.	3BK 08119	1
BATSC	CA-PDCP	CA-PDCP connects the 0 VDC from the battery to the ground bolt.	3BK 25231	1
	CA-ADACM	CA-ADACM connects the -48 VDC from the battery to the ADAM2 board.	3BK 25248	1
CM01	BOMU	Bus bar Outdoor Multistandard Unit. Carries AC and DC power supplies to the STASRs, XIOB, HEX3/ HEX4, HEAT2, service lights, customer and microwave equipment. Transfers alarms from the HEX3/ HEX4, smoke detector, flood detector, and door switches to the OUTC.	3BK 25672	1
	CA-RIMO1	Remote Inventory Multistandard Out cable. RIMO1 transfers remote inventory data of MBO1 modules to OUTC.	3BK 25822	1
	CA-Ground	CA-Ground is a cabinet ground cable. It connects LPFM to a ground bolt.	3BK 25182	1

Cable Sets	Mnemonic	Description	Part Number	Quantity
	CA-BRCP	CA-BRCP connects 0 VDC from the battery breaker to battery interconnection area.	3BK 25245	1
	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the COAR (OUTC) to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the COAR (OUTC) and the SUM.	3BK 07923	1
CMO1T	CA-RIMO1	Remote Inventory Multistandard Out cable. RIMO1 transfers remote inventory data of MBO1 modules to OUTC.	3BK 25822	1
	CA-Ground	CA-Ground is a cabinet ground cable. It connects LPFM to a ground bolt.	3BK 25182	1
	CA-BRCP	CA-BRCP connects 0 VDC from the battery breaker to battery interconnection area.	3BK 25245	1
	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the COAR (OUTC) to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the COAR (OUTC) and the SUM.	3BK 07923	1
	CA-OSCP4	The CA-OSCP4 short circuits the Alarms BTS2 connector on the OUTC. This suppresses the MBO2 HEX3 and door switch alarms.	3BK 272003	1
CM01E	CA-RIC1	Remote Inventory Multistandard Evolution Out cable. RIC1 transfers remote inventory data of MBO1E modules to OUTC.	3BK 27319	1
	CA-XBCBPS	CA-XBCBPS carries alarm and Remote Inventory information from the PM18C to the OUTC.	3BK 27318	1
	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the COAR (OUTC) to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the COAR (OUTC) and the SUM.	3BK 07923	1
CM02	CA-PCOS	Power cable outdoor for upper subracks (MBO2).	3BK 08809 AA	2
	CA-PCOS	Power cable outdoor for bottom subrack (MBO2).	3BK 08809 BA	1
	CA-HOAP	HEX outdoor alarm and power cable. The CA-HOAP connects HEX3 and BOMU transferring DC power and alarms.	3BK 25820	1

Cable Sets	Mnemonic	Description	Part Number	Quantity
	CA-RIMO2	Remote Inventory Multistandard Out cable. CA-RIMO2 transfers remote inventory data of MBO2 modules to OUTC.	3BK 25823	1
CM02E	CA-PCOS	Power cable outdoor for upper subracks (MBO2E).	3BK 08809 BB	3
	CA-HOAP	HEX outdoor alarm and power cable. The CA-HOAP connects HEX3 and BOMU transferring DC power and alarms.	3BK 25820	1
	CA-RIC2	Remote Inventory Multistandard Out Evolution cable. CA-RIC2 transfers remote inventory data of MBO2E modules to OUTC.	3BK 27320	1
CMO11	BOMU	Bus bar Outdoor Multistandard Unit. BOBU carries DC power supplies to the STASRs, XIOB, HEX3/ HEX4, HEATDC, service lights, customer and microwave equipment. BOBU transfers alarms from the HEX3/ HEX4, smoke detector, flood detector, and door switches to the OUTC.	3BK 25672	1
	CA-RIMO1	Remote Inventory Multistandard Out cable. RIMO1 transfers remote inventory data of MBO1DC modules to OUTC.	3BK 25822	1
	CA-SENSP	Temperature sensor plug.	3BK 26147	1
	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the COAR (OUTC) to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the COAR (OUTC) and the SUM.	3BK 07923	1
CS02	RXRC	RXRC connects an ANY RX connector to an ANX/ANC or another ANY RX connector.	3BK 07920	2
	TXRC	TXRC connects an ANY TX connector to an ANX/ANC or another ANY TX connector.	3BK 07919	1
CS03	RXRC	RXRC connects a TRE RX connector to an ANY or ANX/ANC RX connector.	3BK 07920	2
	TXRC	TXRC connects a TRE TX connector to an ANY or ANX/ANC TX connector.	3BK 07919	1
CS07	ANOC	ANOC provides a duplex connection between the ANX/ANC and a cabinet antenna connector.	3BK 07965	2

Cable Sets	Mnemonic	Description	Part Number	Quantity
CS08 Variant BA	CA-DFUX	CA-DFUX carries the Abis1 /2 Interfaces to the SUM.	3BK 08503	1
CS08 Variant CA	CA-GCMW	CA-GCMW is a cabinet ground cable. It connects the microwave equipment to ground.	3BK 07934	1
	CA-MXBP	CA-MXBP carries 0/ -48 VDC from the bus bar. The cable connects to the microwave equipment in BTS compartment 1.	3BK 08886	1
	CA-RFMW	CA-RFMW carries the TX/RX to the bottom plate of the BTS.	3BK 07931	1
CS08 Variant BB	CA-2MMC2	CA-2MMC2 carries the Abis1 /2 Interfaces to the SUM.	3BK 08289	1
	CA-GCMW	CA-GCMW is a cabinet ground cable. It connects the microwave equipment to ground.	3BK 07934	1
	CA-MLBP	CA-MLBP carries 0/ -48 VDC from the bus bar. The cable connects to the microwave equipment in BTS compartment 1.	3BK 08887	1
	CA-RFMW	CA-RFMW carries the TX/RX to the bottom plate of the BTS.	3BK 07931	1
CS09	CA-ABIS	CA-ABIS carries the Abis1 /2 Interfaces from the COAR to the SUM.	3BK 07922	1
	CA-BTSCA	CA-BTSCA carries clock and control signals between the COAR and the SUM.	3BK 07923	1
	CA-H2PC1	H2PC1 carries 0/ -48 VDC from the DCDP. The cable connects to the BTS compartment 1 HEX2.	3BK 08077	1
	CA-OSPC	CA-OSPC carries 0/ -48 VDC from the DCDP to an STASR.	3BK 08079	2
	CA-XBCBO	CA-XBCBO carries alarm and Remote Inventory information from the ACRI to the COAR.	3BK 08205	1
	CA-XIOPC	CA-XIOPC carries 0/ -48 VDC from the DCDP to the XIOB.	3BK 08087	1
CS10	CA-H2PC2	Cable Assembly - HEX2 Power Cable 2 carries 0/ -48 VDC from the DCDP. The cable connects to the COAR.	3BK 08092	1
	CA-H2PC3	Cable Assembly - HEX2 Power Cable 3 carries 0/ -48 VDC from the HEX Power connector on the COAR. The cable connects to the side compartment HEX2.	3BK 08093	1

Cable Sets	Mnemonic	Description	Part Number	Quantity
CS11 Variant AA	CA12	Cable Assembly 12 is a flat cable that interconnects the BTS compartment 2 STASR backplanes and the BTSRIOUT.	3BK 08086	1
	CA-ACB2	Cable Assembly - Alarm Cable BTS2 gathers alarms from BTS compartment 2. This consists of the door switch and HEX2 alarms. The cable connects to the Alarms BTS2 connector on the COAR.	3BK 08091	1
	CA-H2PC1	CA-H2PC1 carries 0/ -48 VDC from the DCDP. The cable connects to the BTS compartment 2 HEX2.	3BK 08077	1
	CA-OSPC	CA-OSPC carries 0/ -48 VDC from the DCDP to an STASR.	3BK 08079	1 of AA, 2 of AB
CS11 Variant BA	CA12	CA12 is a flat cable that interconnects the BTS compartment 2 STASR backplanes and the BTSRIOUT.	3BK 08086	1
	CA-OHAC	CA-OHAC carries: ▶ 0/ -48 VDC from the BOBU ▶ Alarms to the BOBU. The cable connects to the BTS compartment 2 HEX2.	3BK 08810	1
	CA-PCOS	Cable Assembly - Power Cable Outdoor Subrack carries 0/ -48 VDC from the BOBU to the STASR.	3BK 08809	3
CS12	RXRC	The RXRC connects a TRE RX connector to an ANY connector.	3BK 07920	2
	TXRC	The TXRC connects a TRE TX connector to an ANY connector.	3BK 07919	1
CS15 Variant CA	BOBU	BOBU carries AC and DC power supplies to the STASRs, XIOB, HEX2, HEAT, service lights, customer and microwave equipment. BOBU transfers alarms from the HEX2, smoke detector, flood detector, and door switches to the COAR.	3BK 08742	1
	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the COAR to the SUM.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the COAR and the SUM.	3BK 07923	1

Cable Sets	Mnemonic	Description	Part Number	Quantity
	CA-OHAC	CA-OHAC carries: ▶ 0/ -48 VDC from the BOBU ▶ Alarms to the BOBU. The cable connects to the BTS compartment 1 HEX2.	3BK 08810	1
CS15 Variant DA	BOBU	BOBU carries AC and DC power supplies to the STASRs, XIOB, HEX2, HEAT, service lights, customer and microwave equipment. BOBU transfers alarms from the HEX2, smoke detector, flood detector, and door switches to the OUTC.	3BK 08742	1
	CA-RICPT2	The CA-RICPT2 is a flat cable which is permanently attached to the OUTC board. It interconnects the BTS compartment 1 STASR backplanes and the OUTC.	3BK 25538	1
	CA-OHAC	CA-OHAC carries: ▶ 0/ -48 VDC from the BOBU ▶ Alarms to the BOBU. The cable connects to the BTS compartment 1 (CPT2) HEX2.	3BK 08810	1
CS16 Variant AA	BOSU	BOSU carries AC and DC power supplies to the HEX2, HEAT, service lights, and ASCB/ACSU. BOSU transfers alarms from the HEX2, key and door switch to the COAR.	3BK 08741	1
	CA-Ground1	CA-Ground1 is a cabinet ground cable. It connects the ACSB to a ground bolt.	3BK 08118	1
	CA-Ground2	CA-Ground2 is a cabinet ground cable. It connects between two ground bolts.	3BK 08117	1
	CA-OHAC	CA-OHAC carries: ▶ 0/ -48 VDC from the BOBU ▶ Alarms to the BOBU. The cable connects to the BTS compartment 1 HEX2.	3BK 08810	1
	CA-XBCBO	CA-XBCBO carries alarm and Remote Inventory information from the BCU2 to the COAR.	3BK 08205	1

Cable Sets	Mnemonic	Description	Part Number	Quantity
CS16 Variant CA	BOSU	BOSU carries AC and DC power supplies to the HEX2, HEAT, service lights, and ACSB/ACSU. BOSU transfers alarms from the HEX2, key and door switch to the COAR.	3BK 08741	1
	CA-CSTR	CA-CSTR connects the COAR with RIBAT 1, RIBAT 2 and STASR7.	3BK 25178	1
	CA-Ground	CA-Ground is a cabinet ground cable. It connects the LPFU grounding bolt to the bottom plate.	3BK 25182	1
	CA-OHAC	CA-OHAC carries: ▶ 0/ -48 VDC from the BOBU ▶ Alarms to the BOBU. The cable connects to the BTS compartment 1 HEX2.	3BK 08810	1
	CA-PDCM	CA-PDCM carries -48 VDC from ADAM to the side wall interconnection area.	3BK 25232	1
	CA-PDCP	CA-PDCP carries 0 VDC from ADAM to the side wall interconnection area.	3BK 25231	1
	CA-ADACM	CA-ADACM carries -48 VDC from ADAM to the battery interconnection area.	3BK 25248	1
	CA-ADACP	CA-ADACP carries 0 VDC from ADAM to the battery interconnection area.	3BK 25247	1
CS16 Variant DA	BOSU	BOSU carries AC and DC power supplies to the HEX2, HEAT, service lights, and ACSU. BOSU transfers alarms from the HEX2, key and door switch to the OUTC.	3BK 08741	1
	CA-Ground	CA-Ground is a cabinet ground cable. It connects the LPFU grounding bolt to the bottom plate.	3BK 25182	1
	CA-RICPT1	The CA-RICPT1 is a flat cable which is permanently attached to the OUTC board. It interconnects the side compartment STASR backplanes and the OUTC.	3BK 25537	1
	CA-OHAC	CA-OHAC carries: ▶ 0/ -48 VDC from the BOBU ▶ Alarms to the BOBU The cable connects to the BTS compartment 1 HEX2.	3BK 08810	1

Cable Sets	Mnemonic	Description	Part Number	Quantity
	CA-PDCM	CA-PDCM carries -48 VDC from ADAM/ADAM2 to the side wall interconnection area.	3BK 25232	1
	CA-PDCP	CA-PDCP carries 0 VDC from ADAM/ADAM2 to the side wall interconnection area.	3BK 25231	1
	CA-ADACM	CA-ADACM carries -48 VDC from ADAM/ADAM2 to the battery interconnection area.	3BK 25248	1
	CA-ADACP	CA-ADACP carries 0 VDC from ADAM/ADAM2 to the battery interconnection area.	3BK 25247	1
	CA-ABIS	The CA-ABIS carries the Abis1 /2 Interfaces from the OUTC to the SUMA.	3BK 07922	1
	CA-BTSCA	The CA-BTSCA carries clock and control signals between the OUTC and the SUMA.	3BK 07923	1
CS25	ANCO	ANCO provides a duplex connection between the ANX/ANC and a cabinet antenna connector.	3BK26151	2
CS26	ANLC	ANLC provides a duplex connection between the ANX/ANC and a cabinet antenna connector.	3BK 26349	2
CS27	ANCO	ANCO provides a duplex connection between the ANX/ANC and a cabinet antenna connector.	3BK26151	2

Table 46: BTS A9100 Outdoor Cable Sets

4.8.2 External Cables

The BTS A9100 outdoor external cables consist of the discrete cables listed in the following table. They belong to COME/COMI and CODE/CODI. There are no COEP external cables, because COEP is used to extend COMI to COME and CODI to CODE.

Mnemonic	Description	Part Number
AC Supply	This cable can be made on-site to the desired length. The cable used is a five-core, 6 mm sq. power cable.	1AC 00468 0003
Antenna Jumper	Antenna jumpers, 1 m/ 2 m/ 3 m/ 5 m length, HCF1/ 2, 2 x 7/ 16 straight male connectors. They connect the BTS to the main antenna cables.	3BK 05360
	This cable can be replaced by one made on-site to the desired length. The cable used is L907, an 8-pair, shielded, 2 Mbit/s, 120 Ω PCM cable.	1AC 01328 0004
	This cable can be replaced by one made on site to the desired length. The cable used is Flex3, a multicoaxial, 2 Mbit/s, 75 Ω PCM cable.	1AC 00110 0011
CA-CBTE	CA-CBTE is the BTS Terminal cable. It connects the BTS Terminal to the BTS Terminal connector on the SUM.	3BK 07951
CA-GC35	CA-GC35 is the cabinet ground cable. It connects to the M8 ground bolt on the side compartment floor, and to the customer’s ground point.	3BK 08031
	This cable can be replaced by one made on-site to the desired length. The cable used is a 50 mm sq. yellow/green power cable.	1AC 00465 0003
OCC23	OCC23 is a clock synchronization cable. It connects a G2 BTS to the BTS A9100.	3BK 08303
OCC33	OCC33 is a clock synchronization cable. It connects a BTS A9100 to another BTS A9100.	3BK 08304

Table 47: BTS A9100 Outdoor External Cables List

4.9 Outdoor Cabinet Cabling

The various types of cabling used in outdoor cabinets is described in the following sections. This includes DC power and alarm cabling, as well as data and control cabling. The cabling descriptions are group by outdoor cabinet types.

4.9.1 Outdoor Cabinet DC Power and Alarm Cabling

The DC power and alarm cabling for the COME/COMI/CODE/CODI, CPT2, MBO1/MBO1DC/MBO2/MBO2DC, and CBO cabinets are described separately. The descriptions are supported by diagrams.

4.9.1.1 COME/COMI/CODE/CODI

There are two variants of cable sets used to distribute DC power and alarms within the BTS A9100 outdoor cabinets:

- One variant is used for COME/COMI AXXX
- One variant is used for COME/COMI BXXX and CODE/CODI.

The following figure shows the cables that carry DC power and alarms within the COME/COMI AXXX.

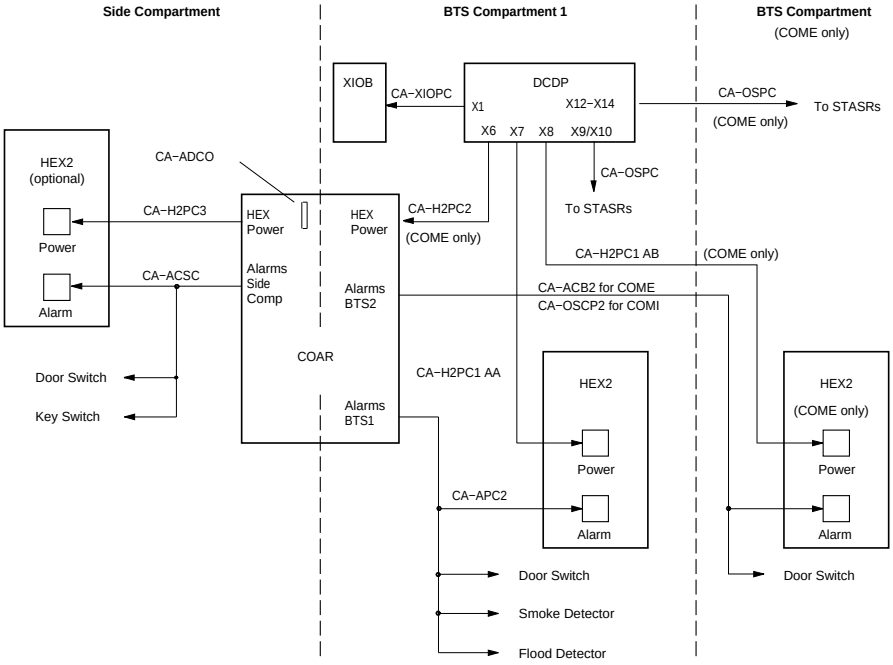


Figure 254: COME/COMI AXXX, DC Power and Alarm Cabling

The following figure shows the cables and bus bars that carry DC power and alarms within the COME/COMI BXXX and CODE/CODI. Note that, although the bus bars carry AC power, this is not shown in the following figure.

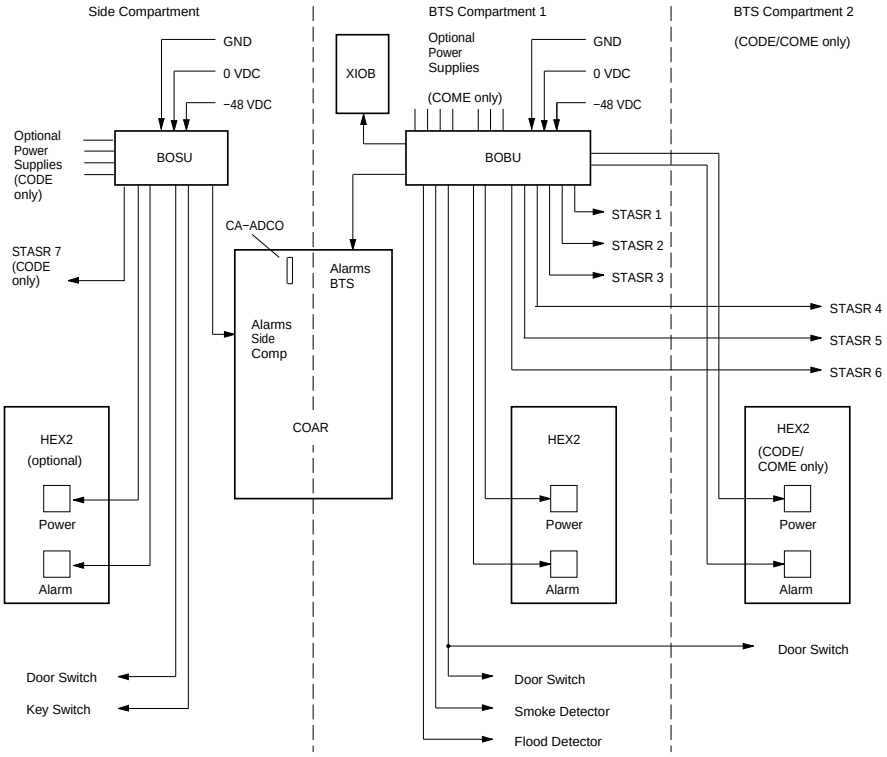


Figure 255: COME/COMI BXXX and CODE/CODI, DC Power and Alarm Cabling

4.9.1.2 CPT2

The following figure shows the cables and bus bars that carry DC power and alarms within the CPT2. Note that, although the bus bars carry AC power, this is not shown in the figures.

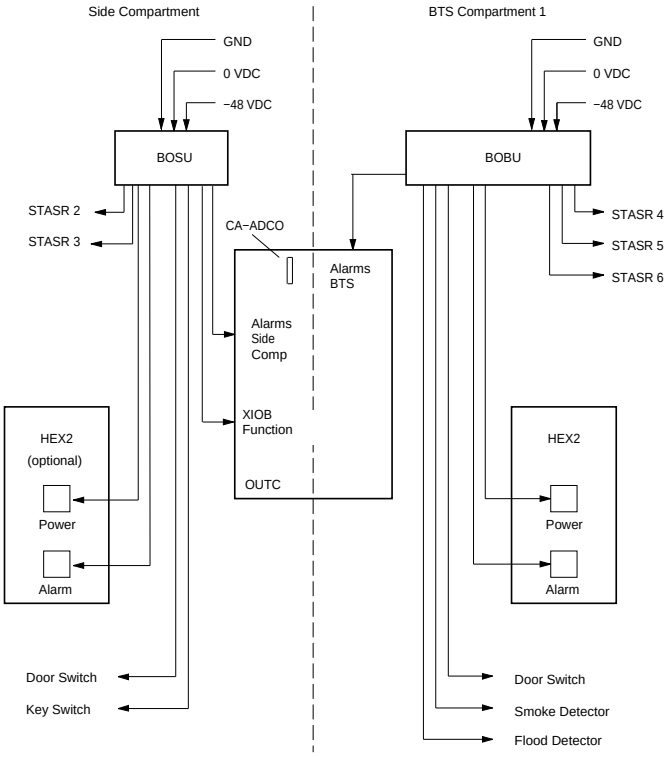


Figure 256: CPT2 DC Power and Alarm Cabling

4.9.1.3 MBO1/MBO1DC/MBO1T/MBO2/MBO2DC

The following figure show the cables and bus bars that carry DC power and alarms within the MBO1/MBO1DC/MBO1T/MBO1E and MBO2/MBO2DC/MBO2E.

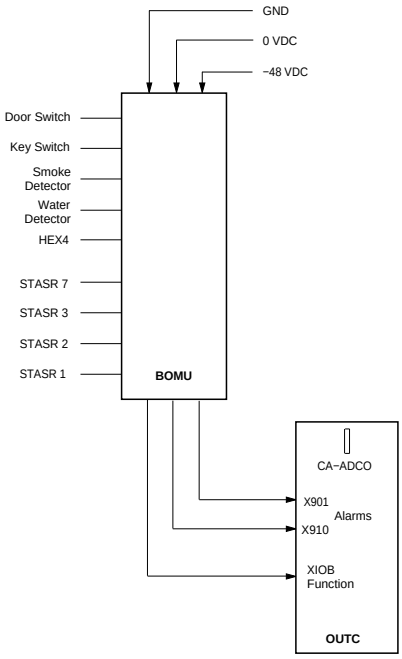


Figure 257: MBO1/MBO1DC DC Power and Alarm Cabling

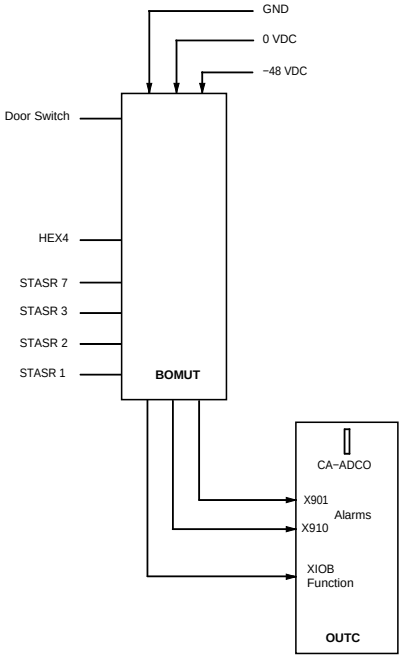


Figure 258: MBO1T DC Power and Alarm Cabling

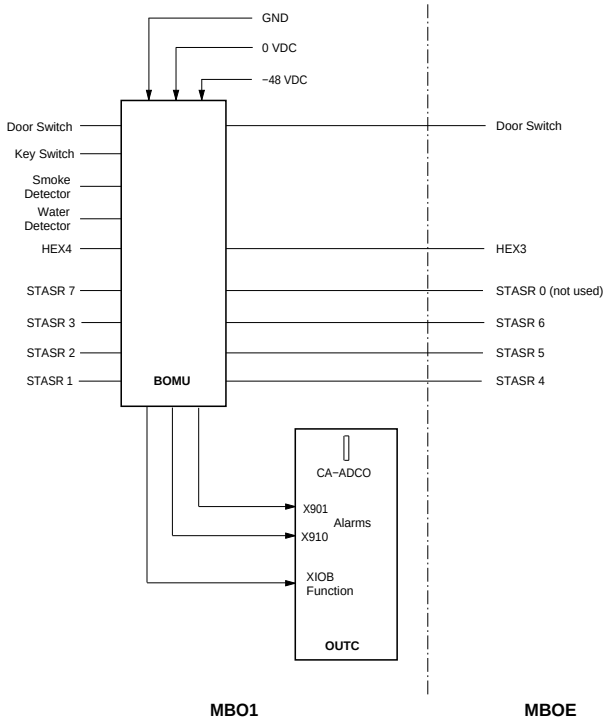


Figure 259: MBO2/MBO2DC DC Power and Alarm Cabling

4.9.1.4 MBO1E/MBO1EDC/MBO2E/MBO2EDC

The following figure show the cables and bus bars that carry DC power and alarms within the MBO1E/MBO1EDC and MBO2E/MBO2EDC.

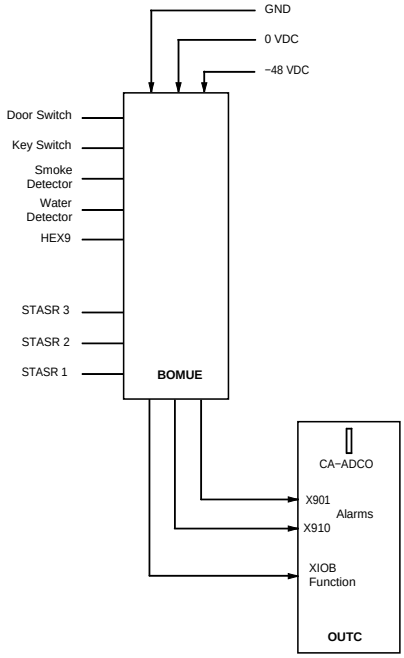


Figure 260: MBO1E/MBO1EDC Power and Alarm Cabling

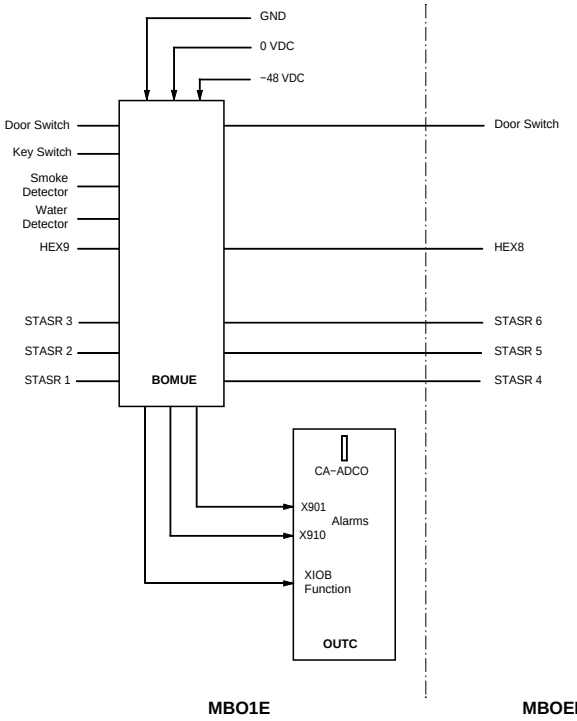


Figure 261: MBO2E/MBO2EDC Power and Alarm Cabling

4.9.1.5 CBO

CBO AC Variant

The following figure shows the cables that carry DC power and alarms within the CBO AC variant. Note that, although the bus bars carry AC power, this are not shown in the figures.

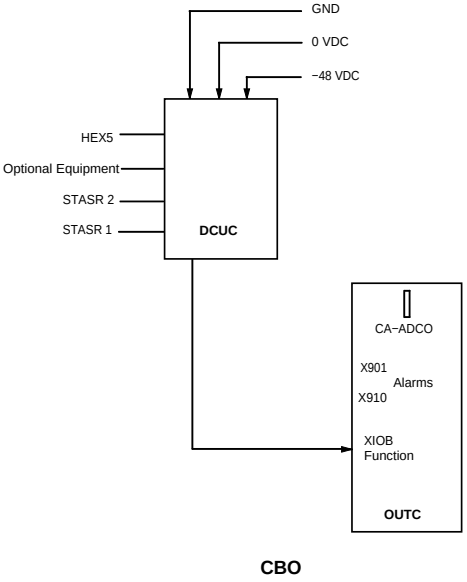


Figure 262: CBO DC Power and Alarm Cabling

CBO DC Variant

The following figure shows the cables that carry DC power and alarms within the CBO AC variant.

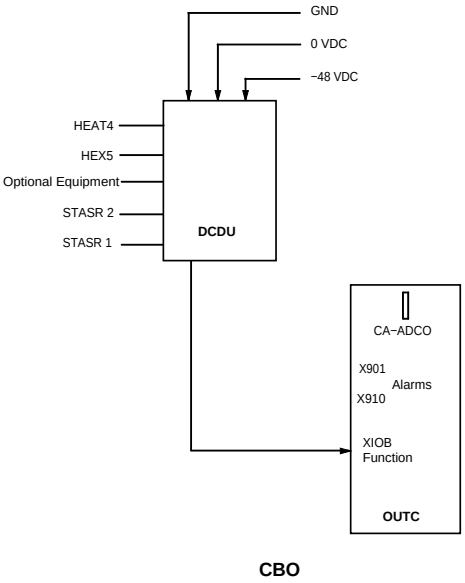


Figure 263: CBO DC Power and Alarm Cabling

4.9.2 Outdoor Cabinet Data and Control Cabling

The following sections described the data and control cabling used in the different types of outdoor cabinets.

4.9.2.1 COME/COMI

The following figure shows the logical interconnections provided by the data and control cables for the COME/COMI.

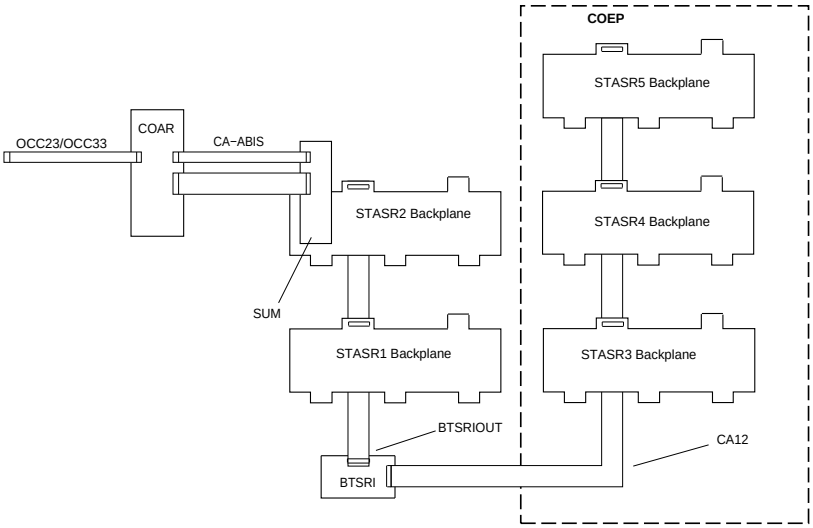


Figure 264: COME/COMI Data and Control Cabling

4.9.2.2 CODE/CODI

The following figure shows the logical interconnections provided by the data and control cables for the CODE/CODI.

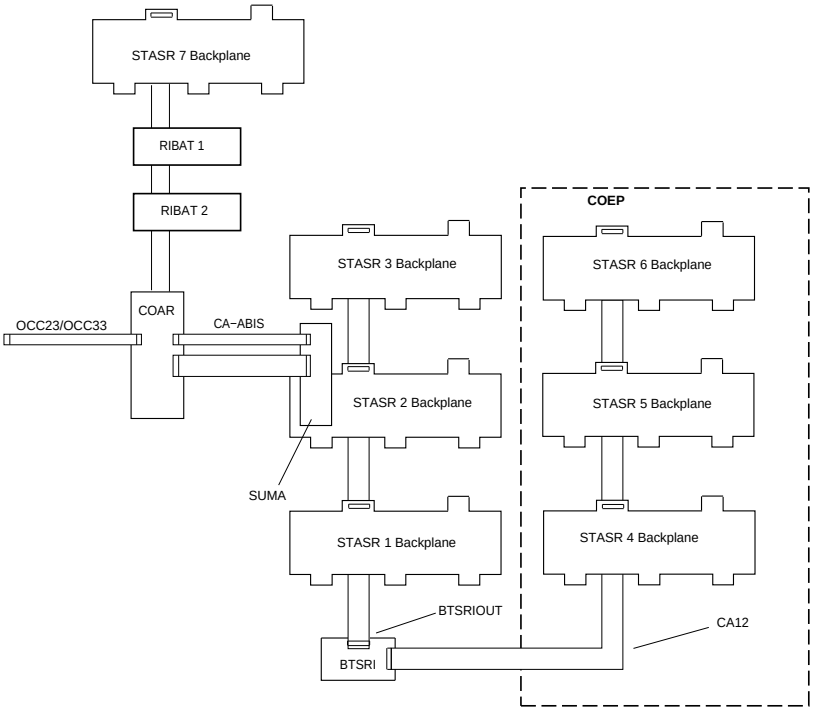


Figure 265: CODE/CODI Data and Control Cabling

4.9.2.3 CPT2

The following figures show the logical interconnections provided by the data and control cables for the CPT2.

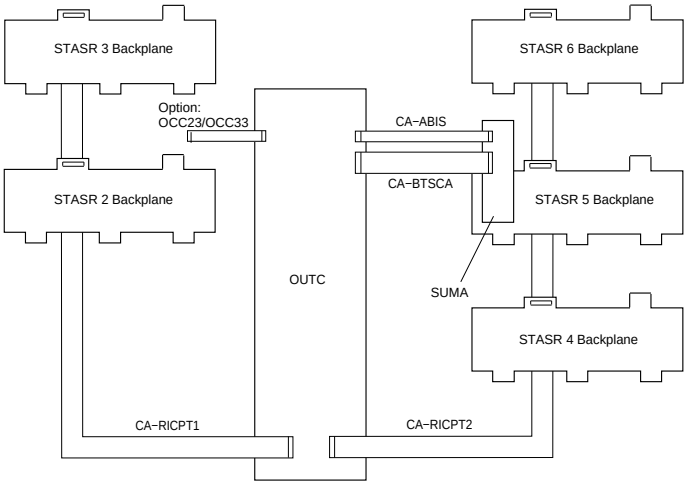


Figure 266: CPT2 Data and Control Cabling

4.9.2.4 MBO1/MBO2

The following figures show the logical interconnections provided by the data and control cables for the MBO1/MBO1DC/MBO1T/MBO2/MBO2DC. The STASR7 is equipped only in MBO1 and MBO2.

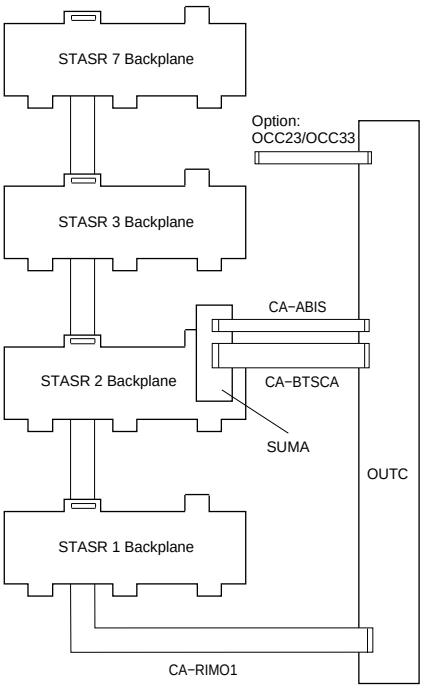


Figure 267: MBO1/MBO1DC/MBO1T Data and Control Cabling

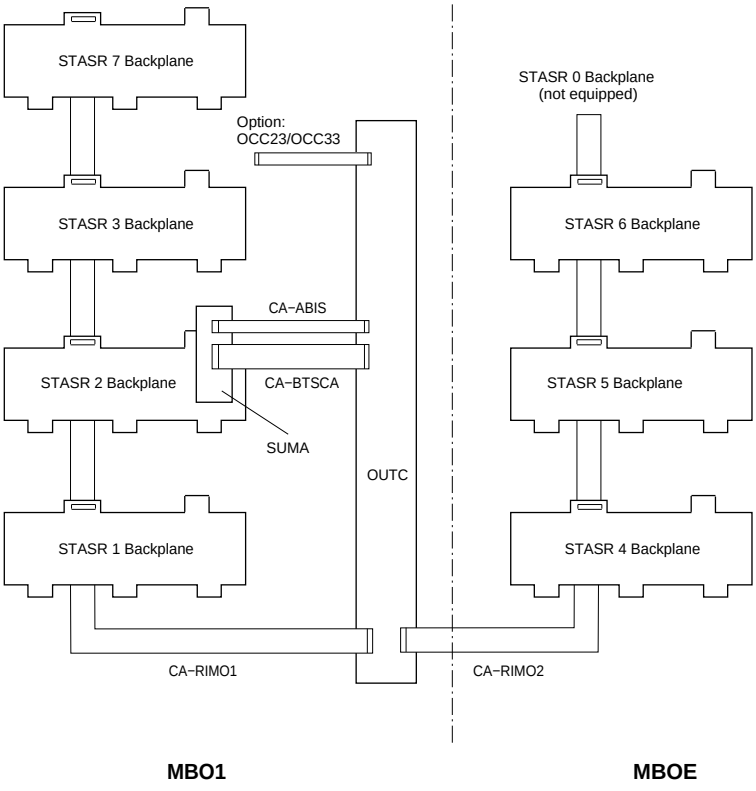


Figure 268: MBO2/MBO2DC Data and Control Cabling

4.9.2.5 MBO1E/MBO2E

The following figures show the logical interconnections provided by the data and control cables for the MBO1E/MBO1EDC/MMBO2E/MBO2EDC. The PM18SR is equipped only in MBO1E and MBO2E AC variants.

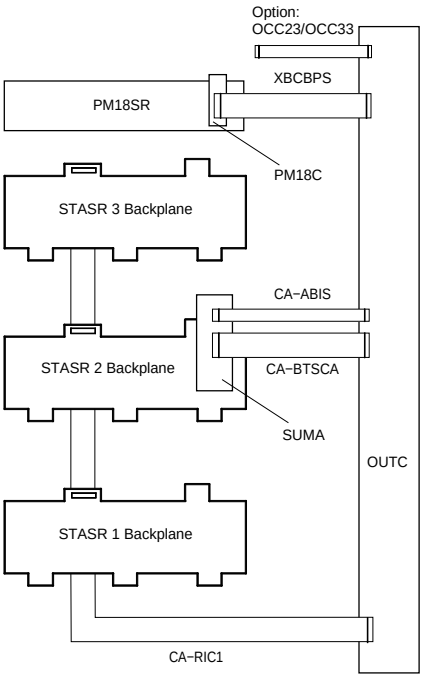


Figure 269: MBO1E Data and Control Cabling

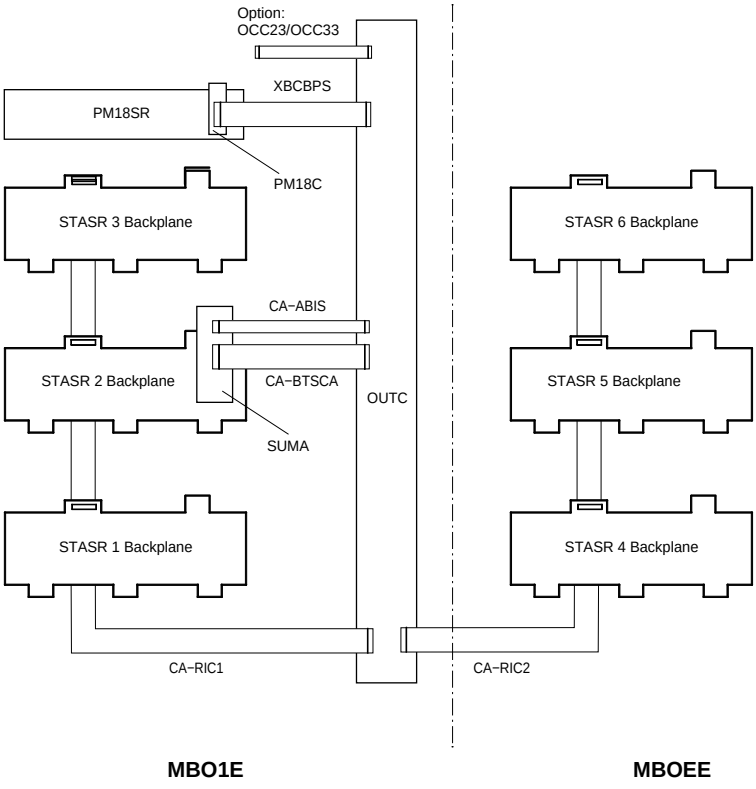


Figure 270: MBO2E Data and Control Cabling

4.9.2.6 CBO

The following figure shows the logical interconnections provided by the data and control cables for the CBO.

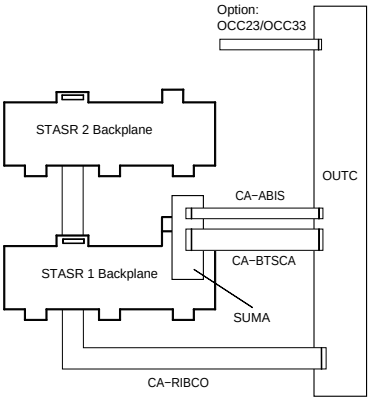


Figure 271: CBO Data and Control Cabling

5 External Battery Cabinets

The sections describe mechanical design of battery cabinets and cabling between the battery cabinets and the BTS.

5.1 External Indoor Battery Cabinet

The external indoor battery cabinet is used to house a large backup battery. In this case it is not allowed to use a BTS configuration with an internal battery in parallel. As required up to three battery units (48 V) can be installed inside the cabinet.

The following figures show block diagrams illustrating the principle. If battery units are connected to different BTSs, each battery unit is connected with separate DC connectors and can be switched on/off by a separate circuit switch (block diagram 1). Battery units can also be connected in parallel. Then DC output connectors of BTS1 are used. DC battery voltage can be switched on/off by using the common circuit switch.

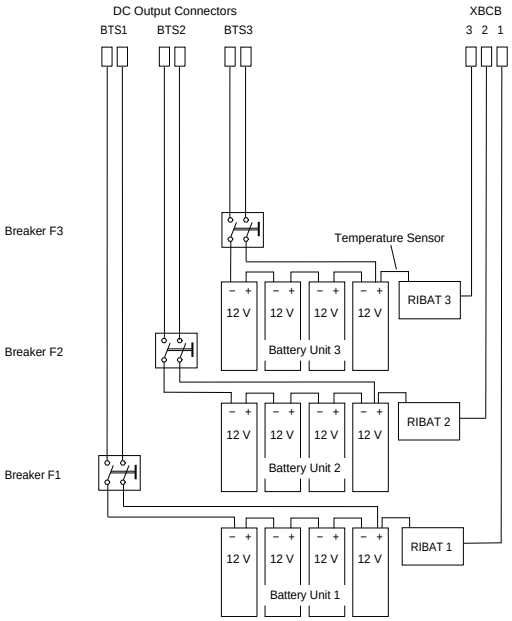


Figure 272: External Indoor Battery Cabinet, Block Diagram 3x1 Battery Units

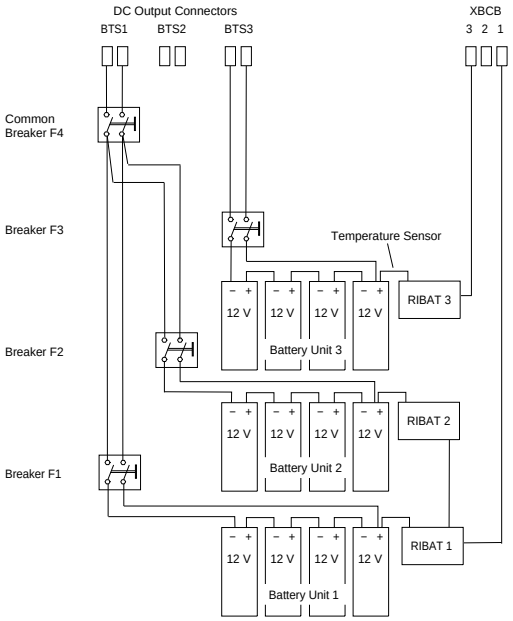


Figure 273: External Indoor Battery Cabinet, Block Diagram 1x2 + 1x1 Battery Units

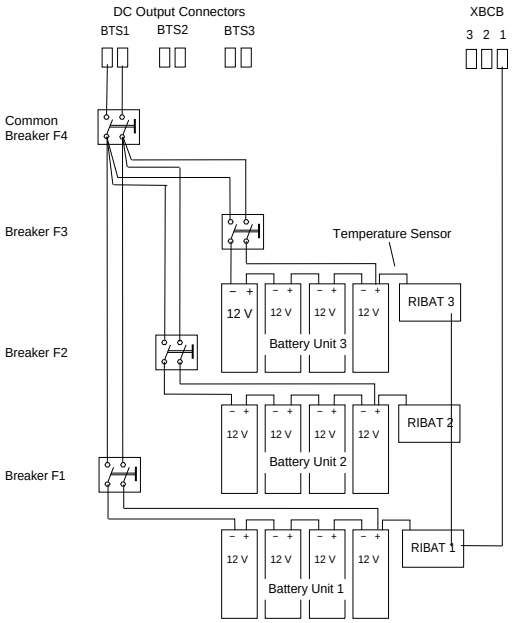


Figure 274: External Indoor Battery Cabinet, Block Diagram 1x3 Battery Units

5.1.1 Mechanical Design

The external indoor battery is built by using the housing of the MBI3 cabinet (see *MBI Cabinet Access and Features (Section 3.3.3)*). For environmental conditions and electromagnetic compatibility, see *Environment (Section 18)*.

The following figure shows that the battery units are mounted in three shelves, one unit per shelf. Each unit consists of four separate battery blocks (12 V) connected in line. Battery units can be connected to separate circuit switches (placed at the left side of each unit) and separate connectors (placed at the connection area at the top) for different BTSs. Battery units can also be connected in parallel with a common circuit switch (connection area at the top) and a common connector for one BTS.

Adjustable brackets are at both sides of each shelf for positioning of the battery unit. The distance between battery blocks is maintained by means of spacers supplied with the battery.

Battery units are covered with a small cover plate to secure the batteries.

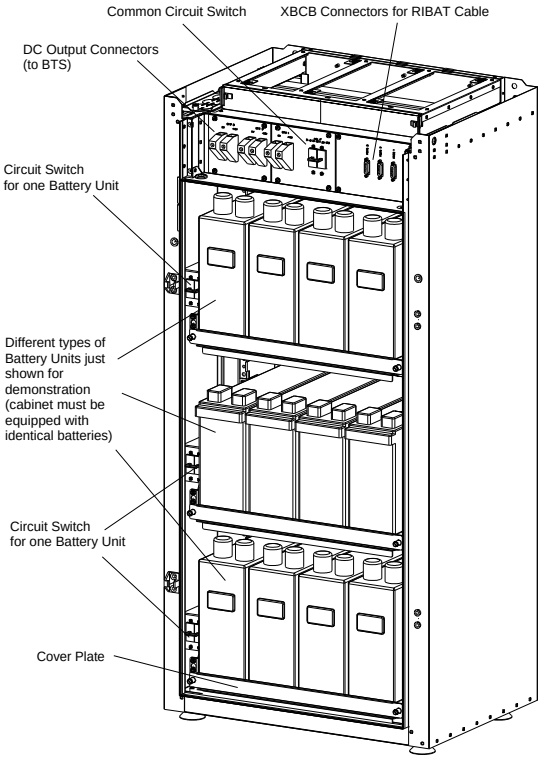


Figure 275: External Indoor Battery Cabinet

One battery terminal of each unit is connected with a temperature sensor, which monitors the battery temperature. The output from the sensor is used by the SUMA to regulate the charging voltage and thus prevent battery overheating. First this sensor information is collected and stored in RIBAT boards, which are placed behind each battery unit at the rear side of the shelves. RIBAT boards are powered by a BTS via RIBAT cable(s).

RIBAT boards (for more information see *RIBAT (Section 12.29)*) are connected with the XBCB connectors placed at the connection area on the top. If battery units are connected in parallel, corresponding RIBAT boards are also connected together producing a common result of monitoring.

RIBAT and DC battery cables are connected to the BTS(s) passing through the battery cabinet on the top.

5.1.2 External Battery

The battery type used in the external indoor battery cabinet is BU101. This type is also used in indoor and outdoor BTSs and external outdoor battery cabinets.

A detailed description, including charging, discharging and storage parameters, is given in *BU101 (Section 12.26)*. Battery blocks of one unit are installed in line (contrary to the installation in an MBO cabinet) as shown in the following figure.

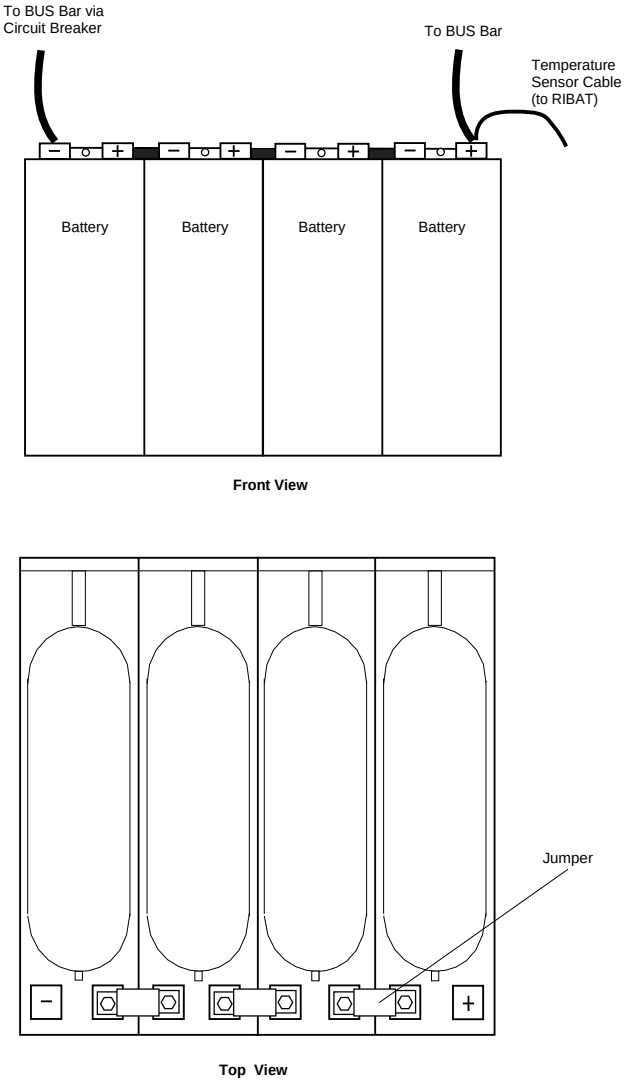


Figure 276: External Indoor Battery Unit

5.1.3 Battery Cabinet External Cabling

There are following cables used for connection of an external battery cabinet indoor with a BTS and ground:

- CA-PCEBP, 3BK 25259 AAAA, Power Cable external Battery 0 V
- CA-PCEBM, 3BK 25260 AAAA, Power Cable external Battery -48 V
- CA-GND, 3BK 25349 AAAA, Ground Cable for external Battery
- CA-RIBEB, 3BK 25258 AAAA, RIBAT Cable for external indoor Battery.

Mechanical design of cables can be found in *External Cables (Section 17.2)*.

5.2 External Battery Cabinet Outdoor

The external battery cabinet outdoor battery cabinet is used to house a large backup battery. In this case it is not allowed to use a BTS configuration with an internal battery in parallel. As required, up to three battery units (48 V) can be installed inside the cabinet.

The following figure shows a block diagram illustrating the principle. All battery units are connected in parallel via two bus bars. Each battery branch can be switched on/off separately by a single pole circuit switch. Complete DC battery voltage can be switched on/off by using the common circuit switch. Connection to the BTS is made via terminal blocks.

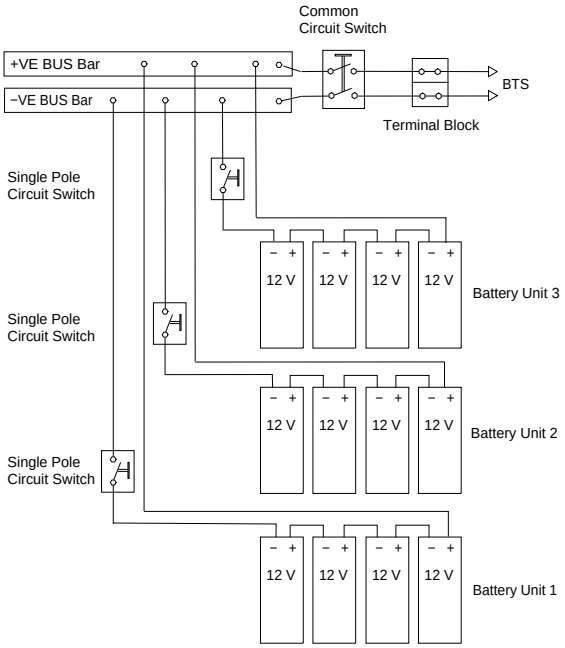


Figure 277: External Outdoor Battery Cabinet, Block Diagram

5.2.1 Mechanical Design

5.2.1.1 Dimensions and Weight

The external outdoor battery cabinet has the following dimensions and weight.

Cabinet Version	3BK 26004 AAAA	3BK 26004 AAAB
Total Height	1500 mm	1312 mm
Width	700 mm	680 mm
Depth	800 mm	830 mm

Table 48: Dimensions

Cabinet pre-equipped with ACU but without batteries.	< 180 kg
Cabinet with three battery units.	< 600 kg

Table 49: Weight

5.2.1.2 Cabinet

The external outdoor battery cabinet consists of a box-shaped frame bolted to a plinth. Four clearance long holes in the bottom (one in each edge) allow to fix the cabinet to the fundament using M12 anchor bolts. Other components are added to this basic construction. The cabinet has foam-insulated walls and roof.

The following figures show the internal arrangement of the different variants of cabinets. The battery units are mounted in three shelves, one unit per shelf. Each unit consists of four separate battery blocks (12 V) connected in line. The minus line of each battery unit is connected to a separate single-pole circuit switch placed at the DC breaker box above the battery floors in cabinet version 3BK 26004 AAAA and at the AC/DC distribution box in cabinet verion 3BK 26004 AAAB. From that circuit switch the minus line is connected to a bus bar. Plus lines of all battery units are connected to another bus bar. Both bus bars are connected with a double pole main circuit switch (placed at the DC breaker box) and then with terminal blocks placed at the bottom of the right side wall for further connection to BTS. An exhausting tube for each battery unit is connected to the roof or bottom plate.

Adjustable brackets are at both sides of each shelf to position the battery unit. The distance between battery blocks is maintained by means of spacers supplied with the battery.

Battery units are covered in front with a small cover plate to secure the batteries.

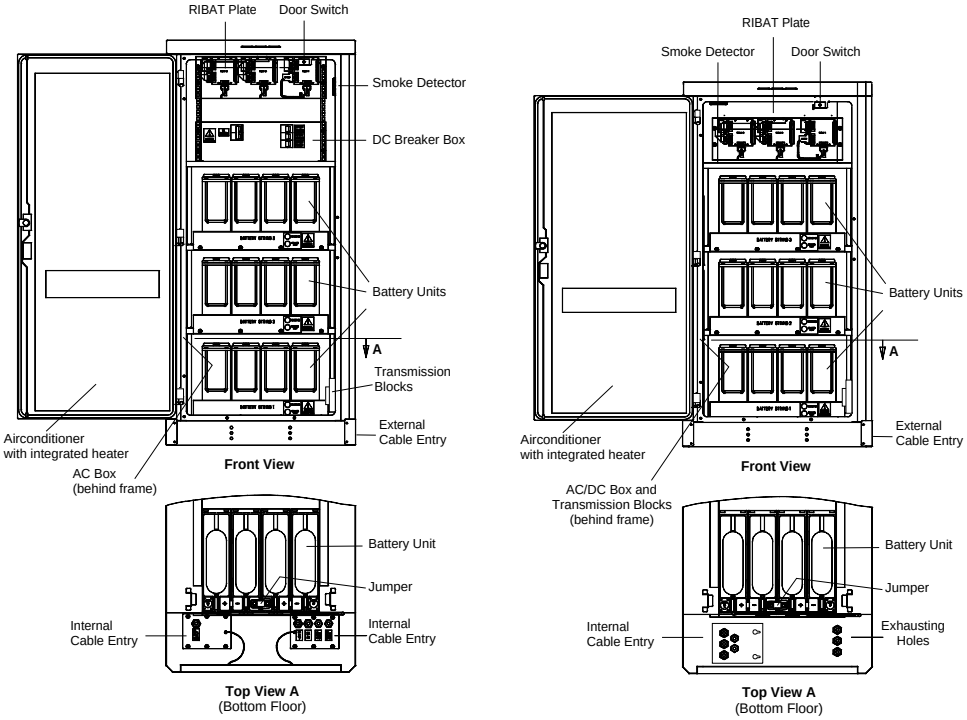


Figure 278: External Battery Cabinet Outdoor Variant 3BK 26004 AAAA (Left) and 3BK 26004 AAAB (Right)

Main (+) battery terminal of each unit is connected to a temperature sensor, which monitors the battery temperature. The output from the sensor is used by the SUMA to regulate the charging voltage and thus to prevent battery overheating. This sensor information is collected and stored in RIBAT boards, which are placed above the DC breaker box.

RIBAT boards (for more information see *RIBAT (Section 12.29)*) are powered by the BTS via the CA-RIBEO cable.

5.2.1.3 Door

Access to the external outdoor battery cabinet is via a door at the front. The door provides both an environmental seal and EMI protection when closed. Mounted on the inside of the door is an air conditioner with an integrated heater.

Above the air conditioner is a latch mechanism for keeping the door open during maintenance. Restrainers allow fixing the door open at 90° and 135°.

The door has a 3-point latching system with a Eurocylinder barrel located centrally, opened by a key.

The door presses an electronic switch. This switch causes an alarm, if the door is open. The switch can be switched off during maintenance.

5.2.1.4 Cable Entry and Terminals

AC, DC, RIBAT (CA-RIBEO) and Alarm cables enter the cabinet via the cable entry plate at the bottom of back, the left or right side wall. Internally, cables are passed through cable glands at the ground floor. For cabinet version 3BK 26004 AAAA the cables are connected to the DC and alarm terminals (placed at the right inner side wall), the AC distribution box (placed at the left inner side wall), or to the first RIBAT board. For cabinet version 3BK 26004 AAAB the cables are connected to the AC/DC power connection box (placed at the left inner side wall) or to the first RIBAT board.

The AC distribution box is shown in the figure *279* for cabinet version 3BK 26004 AAAA (left) and for cabinet version 3BK 26004 AAAB (right). It contains an 1-pole AC main switch (L), a residual current breaker (RCB) for the service light and socket, and a switch for the air conditioner and integrated heater.

Lightning protectors for AC leads (L, N) are placed at the right and wired to the earthing strip.

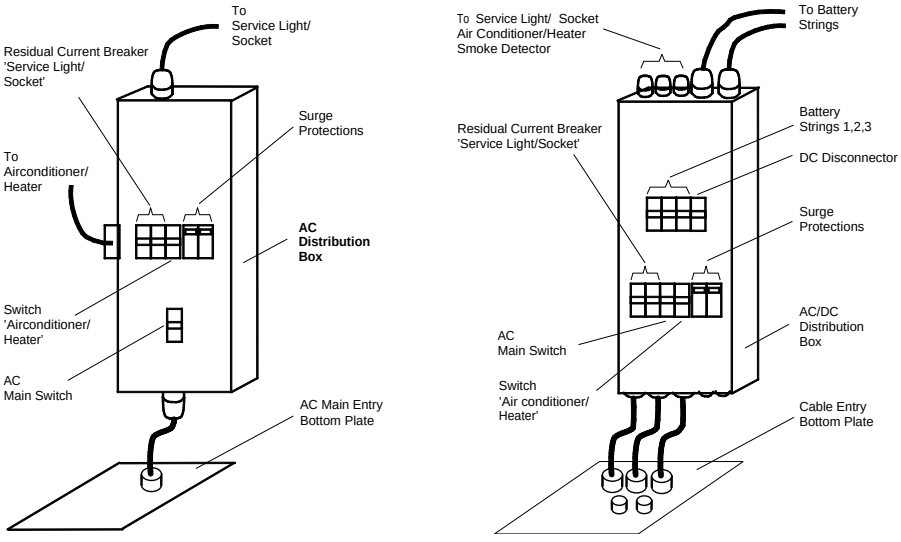


Figure 279: AC Distribution Box for Cabinet Version 3BK 26004 AAAA (Left) and 3BK 26004 AAAB (Right)

5.2.1.5 Environmental Conditions

The external battery cabinet equipment housings provide the necessary environmental and safety protection according to the standard ETS 300 019 -1-4 class 4.1, for outdoor equipment.

The minimum ambient temperature is -33° C, exceptional ambient temperature is up to +50° C. Shock and vibration according to class 4M3; earthquake according to Bellcore 3.

Storage conditions are according to ETS 300 019-1-1 class 1.2.

Transportation conditions (packed) are either according to ETS 300 019-1-2 class 2.3 (public transportation, cabinet without batteries fitted) or to ETS 300 019-1-2 class 2.2 (careful transportation, cabinet with battery fitted). Transport and crane lifting with batteries is possible.

5.2.1.6 Electromagnetic Compatibility

Conducted emission on AC (air conditioner/heater) are according to EN 55022 class B.

Harmonic current emissions on AC lines are according to EN 61000-3-2.

5.2.2 External Battery

The battery type used in the external outdoor battery cabinet is BU101. This type is also used in indoor and outdoor BTSs and internal indoor battery cabinet.

A detailed description, including charging, discharging and storage parameters, is given in *BU101 (Section 12.26)*. Battery blocks of one unit are installed in line (contrary to the installation in the MBO cabinet) as shown in the following figure.

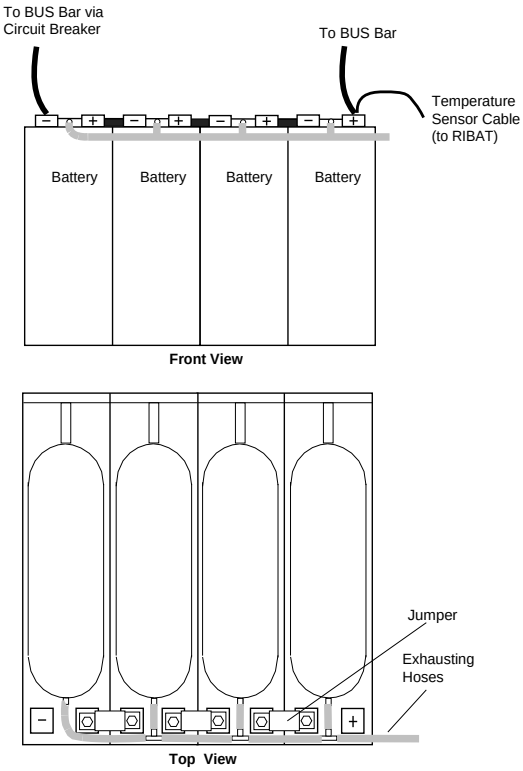


Figure 280: External Outdoor Battery Unit

5.2.3 Auxiliary Equipment

The auxiliary equipment installed in the external battery cabinets is described below.

5.2.3.1 Air Conditioner

The air conditioner is used to maintain the temperature of the battery in range of about 20 - 25° C at ambient temperature up to 45° C, solar load included.

The air conditioner is fixed to the door via 2x5 M5 studs placed on the door. The unit is supplied by 230 VAC; cooling capacity is 350 W.

The following figure shows the internal and external air paths.

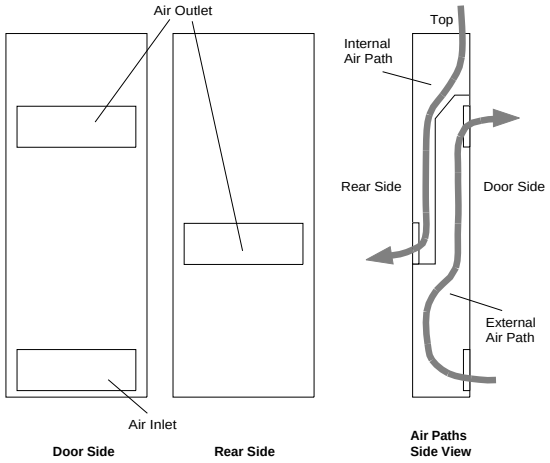


Figure 281: Air Conditioner Unit, Air Paths

The internal warmer air is taken into the internal fan at the top of the unit and is forced through the evaporator coil and supplied back to the bottom of the cabinet. The heater element is located in front of the fan intake area.

The external cooler air is taken into the external fan positioned in the bottom of the unit and is forced through the coil and exhausted back to the external environment at the top.

Supervision of the air conditioner produces one sum alarm if the unit fails. The alarm line is wired to signal terminals for further connection to BTS.

5.2.3.2 Heater

The heater is used for a warm-up period from -33° C and to maintain temperature inside the cabinet above 10° C. The heater is integrated in the air conditioner. The heater element (1 kW) is located in the upper internal part of the air conditioner just before the internal fan intake.

The heater is controlled by a control board and is supplied by 230 VDC. For protection, two thermal switches are placed close to the heater elements. Both have a setting of 40° C for cut off and 25° C for resetting.

5.2.3.3 Overcurrent Protections

The breakers for the AC lines are fitted in a box in the left side wall of the cabinet:

Breaker	Type	Description
1x 1-pole	C16 A MCB in L line	Incoming mains line
1x 2-pole	6A/ 30 mA RCB in L and N lines	Interior light and service socket
1x 1-pole	C10 A MVB in L line	Air conditioner and heater

Table 50: Overcurrent Protection AC Lines

The breakers for the DC lines are fitted in the distribution box at the top of the cabinet:

Breaker	Type	Description
1x 2-pole	80 A MCB fast acting in 0 V and -48 V main DC lines	Main DC Outgoing
3x 1-pole	80 A MCB in -48 V line	Separate battery branch
1x 1-pole	2 A fuse or MCB in 12 V line	Smoke detector
Note: The 0 V lead (+ pole of battery) is connected to PE inside of BTS.		
Note: The 0 V and -48 V main DC lines can also be switched off/on by a 2-pole circuit switch inside the BTS.		

Table 51: Overcurrent Protection DC Lines

5.2.3.4 Lightning Protection

Lightning protection is equipped for AC lines only. It is fitted in the left side wall of the cabinet close to cable entry and wired to the earthing strip. There are medium stage protectors (category c) for L and N leads.

5.2.3.5 Door Switch

The cabinet is equipped with an electromechanical door switch. If the door is opened, an alarm is raised and sent to the BTS. The alarm line is wired to signal terminals. The alarm can be cancelled manually if an open door is required for maintenance operations etc...

5.2.3.6 Smoke Detector

An optical smoke detector is fitted on the top of the right inner side wall of the cabinet. In case of smoke inside the cabinet, an alarm is raised and sent to the BTS. The smoke detector is powered by + 12 VDC provided from the BTS. Alarm and DC power lines are wired to signal terminals.

5.2.3.7 Service Light and AC Power Socket

A service light and integral 230 VAC power socket are fitted at the top of the cabinet, both protected by one common 6 A MCB.

5.2.3.8 RIBAT

The RIBAT is a printed circuit board for remote inventory and temperature supervision of the battery. Up to three RIBAT boards (one for each battery unit) can be fitted in one cabinet. The boards are placed on a 19” panel and fitted above the distribution box on the top. Each RIBAT reports the supervision result at a dedicated address (for more information, see *RIBAT (Section 12.29)*). RIBAT boards are powered by + 5 VDC provided from the BTS. RIBATs are connected to the XBCB bus in the BTS via the CA-RIBEO cable.

5.2.3.9 Document Holder

The document holder is attached to the inner side of the door or side wall to store A4 documents.

5.2.4 External Battery Cabinet Outdoor Interfaces

5.2.4.1 A9100 MBS Outdoor Interfaces

The following intrerfaces are available for A9100 MBS Outdoor and older BTS cabinets:

- AC 230V
  TN-S, TN-C, TT power systems are used, 3- or 5-wire (L,N,PE). Voltage range is -150 - 280 V AC and overvoltage protection class II installed in each BTS cabinet
- External DC 48V (charging voltage)
  AC/DC rectifiers PM12 are designed for permanent connection to DC load and backup battery (DC bus)
  - Nominal voltage: -48V DC (0V pole connected to PE in BTS cabinet)
  - Voltage range Ufloat: -52.5 to –57V temperature regulated
  - 2-wire system (floating) connection to external battery.

  Voltage setting

  Cell voltage at 20°C (battery manufacturer’s recommendation) can be set by means of Local Terminal in a commissioning mode
  - Cell voltage range 2.20V to 2.35V in step 0.01V
  - Default setting 2.29 V/cell.

  Charge current limitation

  Maximum charge current can be set by means of Local Terminal in a commissioning mode:
  - Limitation range: 0A to 15.5A in step 0.5A
  - Default setting: 8A.

  Boost charge
  Not applicable.
  Temperature regulation
  See XBCB Interface.
  Overvoltage protection
  DC bus is not overvoltage protected. It is strongly requested to route DC wires between BTS cabinet and external battery in a metallic cable tray connected to site common bonding network (CBN).
  DC wiring

Maximum length of wires 10 m Wire cross section must be chosen to be in line with (in general 16 or 25 mm^2):

- Maximum allowed DC voltage drop 2V
- Used MCB 70A inside BTS cabinet
- Wire load capability.

- XBCB
  Needed for temperature regulation of charging voltage. XBCB is an external connection to BTS Control Bus with BTS specific requirements. Next to external battery PBA RIBAT 3BK 25133 AAAA must be placed.

  The RIBAT connections are:

  - Temperature sensor
  - XBCB cable to BTS
  - RIBAT termination.

- Alarm
  Optional interface used when an external equipment has to be supervised by BTS OMC (e.g. door of ext. enclosure, cooling equipment, smoke detector etc., if any).
  Up to three external alarm inputs can be connected using dedicated overvoltage protected terminals inside of BTS.

  External alarm interface characteristics:

  - Electromechanical contacts or optocoupler, floating
  - Normal closed - alarm loop conductive in normal status (no alarm).

- Grounding
  All collocated equipment, antenna pole and feeders, BTS cabinet, external equipment, cable trays, must be properly connected to the site common bonding network (CBN) in shortest possible way.

5.2.4.2 A9100 MBS Evolution Outdoor Interfaces

The following intrerfaces are available for A9100 MBS Evolution Outdoor cabinet:

- AC 230V
  TN-S, TN-C, TT power systems are used, 3- or 5-wire (L,N,PE). Voltage range is -150 - 280 V AC and overvoltage protection class II installed in each BTS cabinet.

- External DC 48V (charging voltage)
  AC/DC rectifiers PM18 used in MBO Evolution cabinet are designed for permanent connection to DC load and backup battery.

  - Nominal voltage- 48V DC (0V pole connected to PE in BTS cabinet)
  - Voltage range Ufloat = -52.5 to -57V temperature regulated
  - 2-wire system (floating) connection to external battery.

  Voltage setting

  Cell voltage at 20°C (battery manufacturer's recommendation) can be set by means of Local Terminal in a commissioning mode.

  - Cell voltage range 2.20V to 2.35V in step 0.01V

- Default setting 2.29 V/cell.

Charge current limitation
Maximum charge current can be set by means of Local Terminal in a commissioning mode.
Limitation range 1A to 31A in step of 1A.
Default setting 8A.
Boost charge
Boost charge mode (charging with elevated voltage) can be selected by means of Local Terminal in a commissioning mode. Boost charge returns to float charge mode automatically after 5h time period or on demand by appropriate selection in Local Terminal in a commissioning mode.
Temperature regulation
PM18 temperture sensor must be connected to external battery. Connection to PM18 is done by means of an extension cord. For routing the extension cord same rules apply as for DC wires.
Overvoltage protection
DC bus is not overvoltage protected. It is strongly requested to route DC wires between BTS cabinet and external battery in a metallic cable tray connected to site common bonding network (CBN).
DC wiring

Maximum length of wires 10 m. Wire cross section must be chosen to be in line with (in general 16 or 25 mm^2):

- Maximum allowed DC voltage drop 2V
- Used MCB 80A inside PM18
- Wire load capability.

- XBCB
  Not applicable.

- Alarm
  Optional interface used when an external equipment has to be supervised by BTS OMC (e.g. door of ext. enclosure, cooling equipment, smoke detector etc., if any).
  Up to three external alarm inputs can be connected using dedicated overvoltage protected terminals inside of BTS.

  External alarm interface characteristics:

  - Electromechanical contacts or optocoupler, floating
  - Normal closed - alarm loop conductive in normal status (no alarm).

- Grounding
  All collocated equipment, antenna pole and feeders, BTS cabinet, external equipment, cable trays, must be properly connected to the site common bonding network (CBN) in shortest possible way.

5.2.4.3 External Battery Cabinet Cabling

There following cables are used to connect an external outdoor battery cabinet with a BTS and ground:

- PC05B5, 3BK 25561 AAAA, AC Power Cable, 3x2.5 mm² in 100 m roll
- PC25BL1D, 3BK 25995 AAAA, Power Cable (-48 V), 1x25 mm² blue in 100 m roll
- PC25B1D, 3BK 08963 BAAA, Power Cable (0 V), 1x25 mm² black in 100 m roll
- PC50YG1D, 3BK 08961 BAAA, Ground Cable, 50 mm² green/yellow in 100 m roll
- CA12058, 3BK 08965 AAAA, Alarm Cable, L907, 4 quads, 120 Ohms in 100 m roll
- CA-RIBEO, 3BK 26138 AAAA, RIBAT Cable external Battery outdoor.

All external cables listed above are fixed installation cables connected to terminals at both sides. Cable lengths depend on the local distance between the battery cabinet and the BTS.

The CA-RIBEO cable is connected to the first RIBAT board at the battery cabinet side. At the BTS side, the cable is connected to the OUTC board via an XBCB connector. The mechanical design of the CA-RIBEO cable/connector is found in *External Cables (Section 17.2)*.

6 Standard Telecommunications Subrack

The sections are supported with diagrams and illustrations, where necessary. An illustration of the subrack is also included.

6.1 STASR General Information

The STASR is the standard telecommunications subrack for all BTS A9100 configurations. The number of subracks used, and the types of plug-in modules fitted into the subracks, is configuration dependent.

Each STASR plug-in module has a unique number which identifies its position within the cabinet.

The number consists of:

- Subrack number - coded on the subrack interconnecting ribbon cable
- Slot position within subrack - coded on the subrack backplane PCB.

The possible plug-in modules can be:

- TRE
- SUMA/SUMP
- Antenna Network modules: ANC, ANX, ANY
- Power Supply equipment: ADAM, ADAM4, PM12
- Microwave modules.

6.2 STASR Mechanical Characteristics

The following figure shows the STASR with no modules fitted.

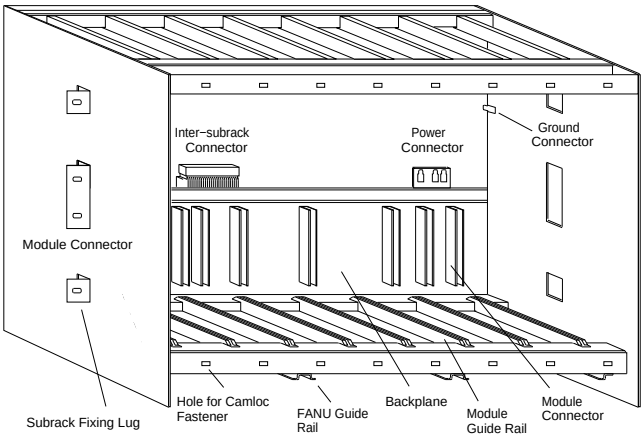


Figure 282: STASR Construction

For common information and dimensions refer to *Subracks (Section 1.3)*.

The STASR has an integral backplane, which provides the electrical and signaling interface for the modules. The backplane has nine connectors for the plug-in modules and three for the FANUs. An inter-subrack cable connector at the top of the backplane is provided for multiple subrack configurations. The power connection consists of three FASTON connectors.

Refer to the *STASR Electrical Description (Section 6.3)* for a description of the subrack backplane.

6.3 STASR Electrical Description

The STASR is described below in terms of power supplies and grounding, the backplane, and connectors and cables.

6.3.1 Power Supplies and Grounding

The STASR receives its -48/ -60 VDC supply from the cabinet DC distribution panel, via the cabinet bus bar. Each module fitted within the STASR has its own on-board DC/DC converter, except the ANY which is a passive RF module.

Ground continuity, between the subrack and the equipment rack, is ensured by using earth linking straps. The straps are attached to the equipment rack bus bar at one end and terminated on the subrack with a FASTON connector. The subrack is also fixed to the equipment rack with conductive self-tapping screws.

6.3.2 Backplane

The backplane is a multi-layer PCB. It distributes the -48/ -60 VDC, to power the subrack equipment, and the digital signals between the various plug-in modules. The following figure shows a front view of the backplane and the positions of the various connectors.

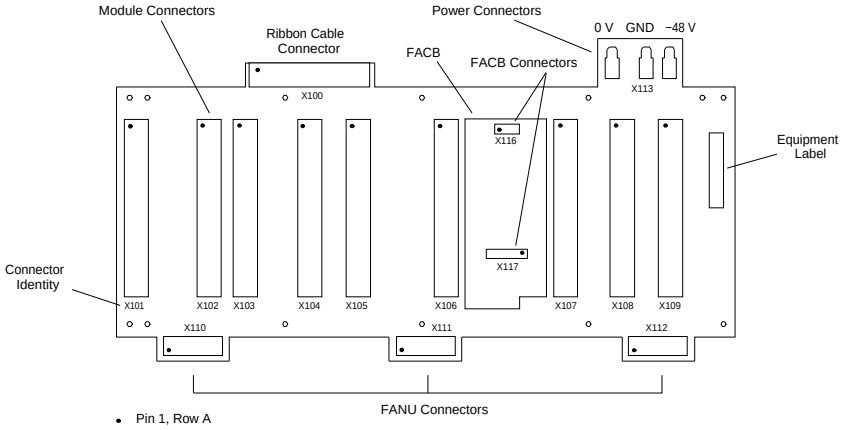


Figure 283: STASR Backplane Connector Layout, Front View

6.3.3 Connectors and Cables

The following table lists and describes the STASR cables and connectors. For connector locations, see Figure *283*.

Name	Quantity	Type and Description
Module Connectors	9	Millipacs Type 1.
FACB Connectors	2	2 x 6-pin male Header type connector. 2 x 16-pin male Header type connector. The FACB connectors are linked to the FANU connectors via the backplane printed wiring.
FANU Connectors	3	Type R 1/3 30-M connectors. Three FANU connectors are positioned at the bottom of the subrack backplane (see Figure *283*).
Ribbon Cable	1	C 64 M (DIN 41612) connector. The cable is used to interconnect multiple subracks (see Figure *CIMI/CIDI Subracks Interconnection Cable (184)* and Figure *192*). It is pre-equipped with the correct number of connectors for the number of subracks deployed.
Power Cable	1	Three-core twin and earth, terminated with a three-in-one FASTON connector.

Table 52: STASR Connectors and Cables

The following table lists the module connectors and the associated modules. The ✓ symbol shows that the particular connector is a possible plug-in position for the associated module.

Connector	SUMA	SUMP	ANC	ANX	ANY	TRE	TRE HP	IDU
X101	✓	✓	-	-	✓	✓	✓	✓
X102	-	-	-	-	✓	-	-	-
X103	-	-	✓	-	-	-	-	✓
X104	-	-	-	✓	✓	✓	-	-
X105	-	-	-	-	-	-	✓	✓
X106	✓	-	✓	-	✓	✓	-	✓
X107	-	-	-	-	-	-	✓	✓
X108	-	-	-	✓	✓	✓	-	-
X109	-	-	✓	-	-	-	-	✓

Table 53: STASR Module Connectors and Associated Modules

7 AC Power Subracks

The sections are supported with diagrams and illustrations, where necessary. An illustration of each subrack is also included.

7.1 SRACDC

The SRACDC is the power subrack used for all BTS A9100 outdoor configurations with the PM08 power supply modules. It contains plug-in modules which convert the AC mains supply into a 48 VDC supply. The plug-in modules are fitted in predefined slots within the subrack.

SRACDC contains the following modules:

- ACIB
- ACRI
- BACO
- BCU1
- Up to five PM08s
- FANUs.

7.1.1 SRACDC Mechanical Characteristics

The following figure shows the SRACDC subrack with no modules fitted.

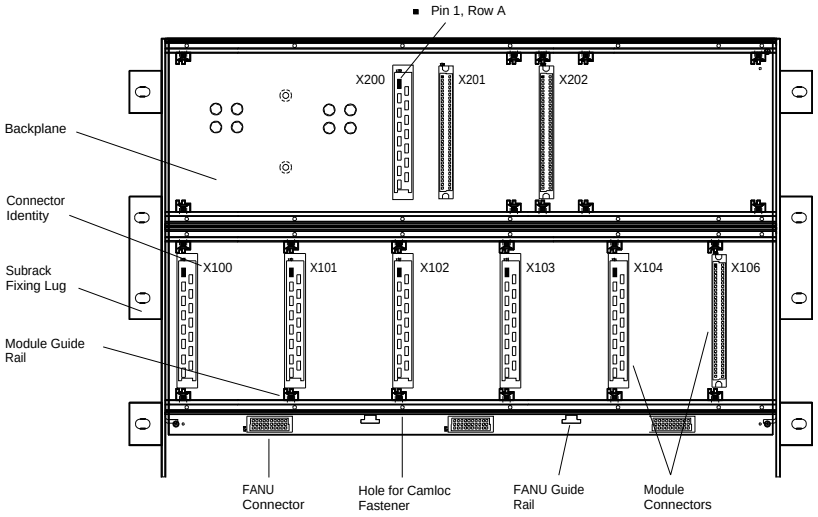


Figure 284: SRACDC Subrack Front View

For common information and dimensions refer to *Subracks (Section 1.3)*.

The SRACDC has an integral backplane, which provides the electrical and signaling interface for the modules. The backplane contains nine connectors for the plug-in modules and three for the FANUs.

7.1.2 SRACDC Subrack Layout

Modules are fitted at the predefined positions shown in the following figure.

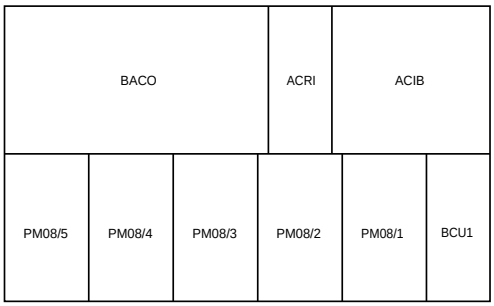


Figure 285: SRACDC Module Positions

There are five PM08 slots. The PM08s are identified by numbers in the range 1 to 5, as shown.

7.1.3 SRACDC Electrical Description

The SRACDC is described below in terms of power supplies and grounding, the backplane, and connectors and cables.

7.1.3.1 Power Supplies and Grounding

The SRACDC power supply system subrack is fixed to the equipment rack with conductive self-tapping screws. Ground continuity is maintained by the metal fittings and securing brackets.

The SRACDC is isolated from the AC supply voltage. The 230 VAC supply from the ACSB connects directly to the AC IN connector on the front of ACIB (see the following figure). From there it connects to the front of the PM08s where it is converted to 0/ -48 VDC.

The DC is connected to the SRACDC backplane for distribution to:

- BACO for charging the optional batteries
- DCDP for further distribution to the STASR subracks, XIOB and HEX2s.

7.1.3.2 Backplane

The SRACDC backplane distributes the 0/ -48 VDC to the subrack equipment that requires it. Two power cables carry the DC power to the equipment external to the SRACDC. The following figure shows a rear view of the backplane and the positions of the various connectors.

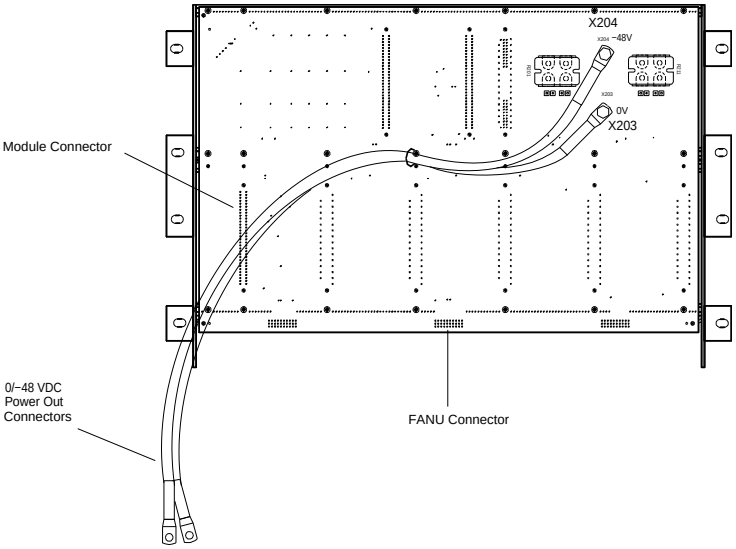


Figure 286: SRACDC Backplane Connector Layout Rear View

7.1.3.3 Connectors and Cables

The following table lists and describes the SRACDC subrack cables and connectors. For connector locations, see Figures *SRACDC Subrack Front View (284)* and *SRACDC Backplane Connector Layout Rear View (286)*.

Name	Quantity	Type and Description
Module Connectors	6	H15-F (DIN 41612). The connectors are used by the PM08s and the BACO.
Module Connectors	3	R64-M-a-c (DIN 41612). The connectors are used by the ACRI, BACO and BCU1.
FANU Connectors	3	Type R 1/3 30-M connectors. Three FANU connectors are positioned at the bottom of the subrack backplane (see Figure *286*).
Ribbon Cable	1	C 64 M (DIN 41612) connector. The cable is used to interconnect multiple subracks. It is pre-equipped with the correct number of connectors for the number of subracks deployed.
Power Cables	2	60 A power terminals M5 x 8. The cables carry the 0/-48 VDC to the interconnection panel.

Table 54: SRACDC Connectors and Cables

7.2 ACSR

The ACSR is the power subrack used for BTS A9100 outdoor configurations with PM11 power supply modules. ACSR contains plug-in modules which convert the AC mains supply into a 48 VDC supply. The plug-in modules are fitted in predefined slots within the subrack.

ACSR contains the following modules:

- BAC2
- BCU2
- Up to four PM11s
- FANUs.

7.2.1 ACSR Mechanical Characteristics

The following figure shows the ACSR subrack with no modules fitted.

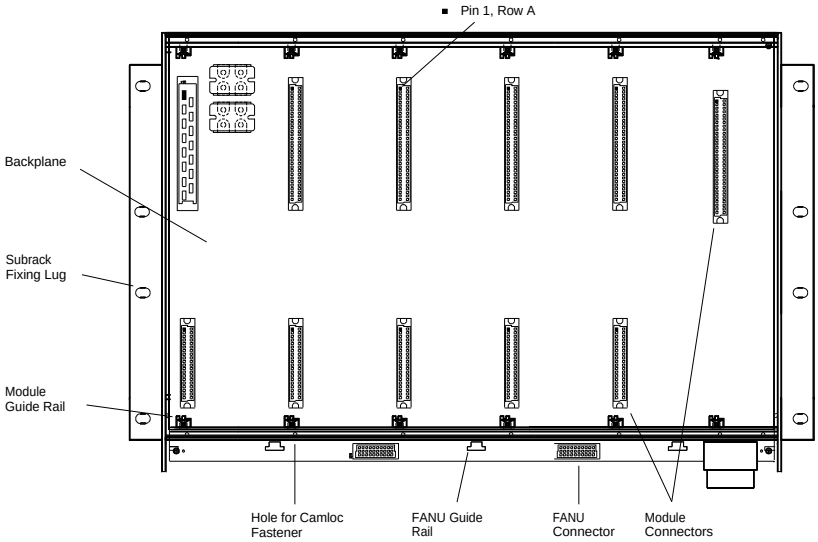


Figure 287: ACSR Subrack Front View

For common information and dimensions refer to *Subracks (Section 1.3)*.

The ACSR has an integral backplane, which provides the electrical and signaling interface for the modules. The backplane contains six connectors for the plug-in modules and two for the FANUs.

7.2.2 ACSR Subrack Layout

Modules are fitted at the predefined positions shown in the following figure.

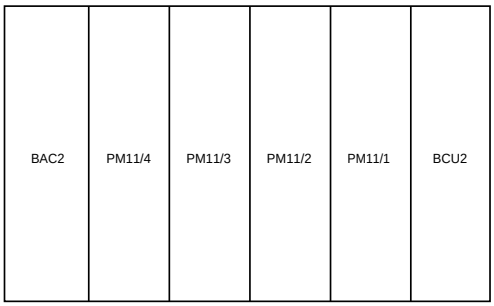


Figure 288: ACSR Module Positions

There are four PM11 slots. The PM11s are identified by numbers in the range 1 to 4, as shown.

7.2.3 ACSR Electrical Description

The ACSR is described below in terms of power supplies and grounding, the backplane, and connectors and cables.

7.2.3.1 Power Supplies and Grounding

The ACSR power supply system subrack is fixed to the equipment rack with conductive self-tapping screws. Ground continuity is maintained by the metal fittings and securing brackets.

The ACSR is connected to the AC supply voltage. The 230 VAC supply from the ACSB connects to the ACSR backplane. From there it connects to the PM11s where it is converted to 0/ -48 VDC.

The DC is connected to the ACSR backplane for distribution to:

- BAC2 for charging the optional batteries
- BOBU for further distribution to the STASR subracks, XIOB and HEX2s.

7.2.3.2 Backplane

The ACSR backplane distributes the 230 VAC supply from the ACSB to the PM11s. The backplane also distributes the 0/ -48 VDC to the subrack equipment that requires it.

One five-wire power cable carries the AC power from the ACSB to the backplane. Two power cables carry the DC power to the equipment external to the ACSR. The following figure shows a rear view of the backplane and the positions of the various connectors.

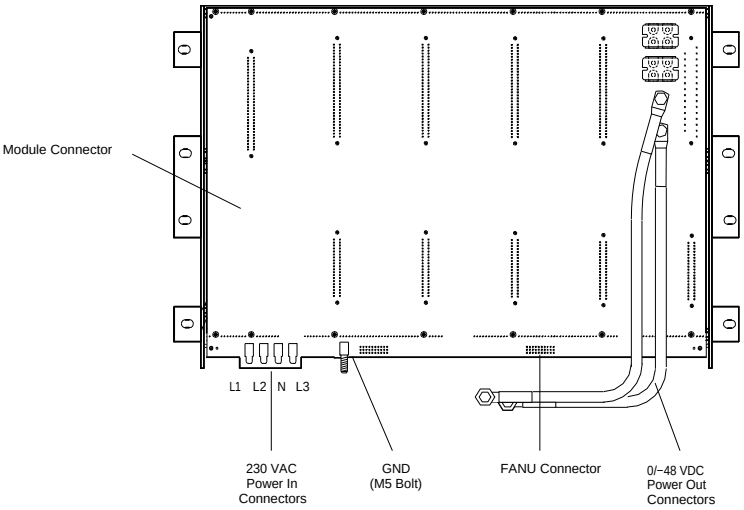


Figure 289: ACSR Backplane Connector Layout Rear View

7.2.3.3 Connectors and Cables

The following table lists and describes the ACSR subrack cables and connectors. For connector locations, see Figures *ACSR Subrack Front View (287)* and *ACSR Backplane Connector Layout Rear View (289)*.

Name	Quantity	Type and Description
Module Connectors	5	H15-F (DIN 41612). The connectors are used by the PM11s and BAC2.
Module Connectors	1	R64-M-a-c (DIN 41612). The connector is used by BCU2.
FANU Connectors	2	Type R 1/3 30-M connectors. Two FANU connectors are positioned at the bottom of the subrack backplane (see Figure *289*).
Ribbon Cable	1	C 64 M (DIN 41612) connector. The cable is used to interconnect multiple subracks. It is pre-equipped with the correct number of connectors for the number of subracks deployed.
AC Power Cables	1	Four FASTON connectors and one M5 x 8 terminal. The cables carry the 230 VAC (L1, L2, L3, N, and GND) from the ACSB.
DC Power Cables	2	60 A power terminals M5 x 8. The cables carry the 0/ -48 VDC to the interconnection panel.

Table 55: ACSR Connectors and Cables

7.3 ASIB

The ASIB is the power subrack for the BTS A9100 indoor configurations powered from an AC mains supply. It contains plug-in modules which convert the AC mains supply into a 48 VDC supply. The plug-in modules are fitted in predefined slots within the subrack.

7.3.1 ASIB Mechanical Characteristics

The following figure shows the ASIB subrack with no modules fitted.

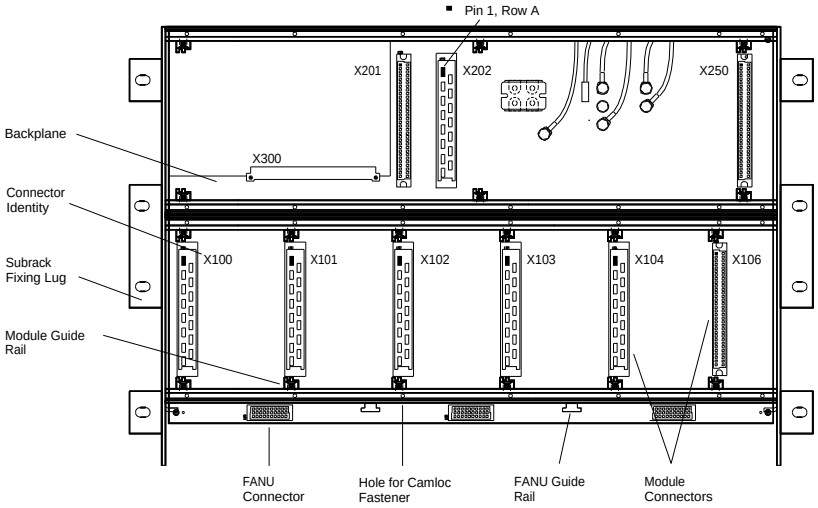


Figure 290: ASIB Front View

For common information and dimensions, refer to *Subracks (Section 1.3)*.

The ASIB has an integral backplane, which provides the electrical and signaling interface for the modules. The backplane has nine connectors for the plug-in modules and three for the FANUs.

7.3.2 ASIB Layout

Modules are fitted at the predefined positions shown in the following figure.

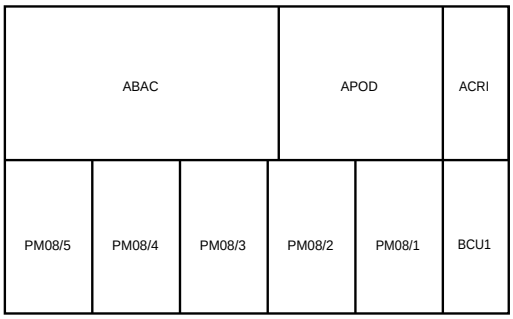


Figure 291: ASIB Module Positions

There are five PM08 slots. The PM08s are identified by numbers in the range 1 to 5, as shown.

7.3.3 ASIB Electrical Description

The ASIB is described below in terms of power supplies and grounding, the backplane, and connectors and cables.

7.3.3.1 Power Supplies and Grounding

The ASIB is isolated from the AC supply voltage. The 230 VAC supply from the AFIP connects via the backplane to the APOD. From there it connects to the front of the PM08s where it is converted to 0/ -48 VDC.

The DC is connected to the ASIB backplane for distribution to:

- ABAC for charging the optional batteries
- Cabinet cable trunk for further distribution to the STASR subracks.

The subrack is fixed to the equipment rack with conductive M6 screws. Ground continuity is maintained by the metal fittings and securing brackets.

7.3.3.2 Backplane

The backplane distributes the 0/ -48 VDC to the subrack equipment that requires it. Four power cables carry DC power to the equipment external to the ASIB. The following figure shows a rear view of the backplane and the positions of the various connectors.

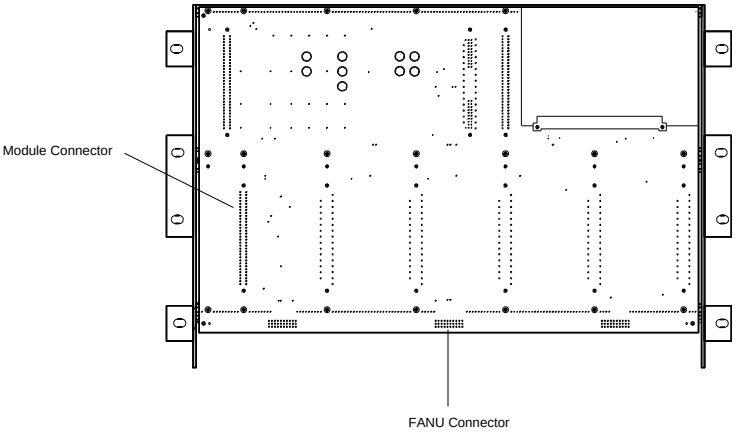


Figure 292: ASIB Backplane Connector Layout Rear View

7.3.3.3 Connectors and Cables

The following table lists and describes the ASIB subrack cables and connectors. For connector locations, see Figures *ASIB Front View (290)* and *ASIB Backplane Connector Layout Rear View (292)*.

Name	Quantity	Type and Description
Module Connectors	6	H15-F (DIN 41612). The connectors are used by the PM08s and the ABAC.
Module Connectors	3	R64-M-a-c (DIN 41612). The connectors are used by the ACRI, ABAC and BCU1.
FANU Connectors	3	Type R 1/3 30-M connectors. Three FANU connectors are positioned at the bottom of the subrack backplane (see Figure *292*).
Ribbon Cable	1	C 64 M (DIN 41612) connector. The cable is used to interconnect multiple subracks. It is pre-equipped with the correct number of connectors for the number of subracks deployed.
Power Cables	4	60 A power terminals M5 x 8. The cables carry the 0/ -48 VDC to the interconnection panel.

Table 56: ASIB Connectors and Cables

8 Station Unit Modules

The sections are supported with diagrams, where necessary, showing the functional blocks and their interfaces.

A drawing of the physical appearance of the module is also included, showing LED indicators, connectors and controls.

8.1 Introduction to Station Unit Modules

The SUMP/SUMA provides the central management and control of all the BTS A9100 modules.

It is responsible for the following functional areas:

- Digital transmission
- Timing and clock generation
- Management of the BTS internal digital interfaces
- O and M functions
- RI
- Control of the AC/DC converters and check of the batteries (SUMA only).

The following figure gives an overview of all the interfaces connected to the SUMP/SUMA.

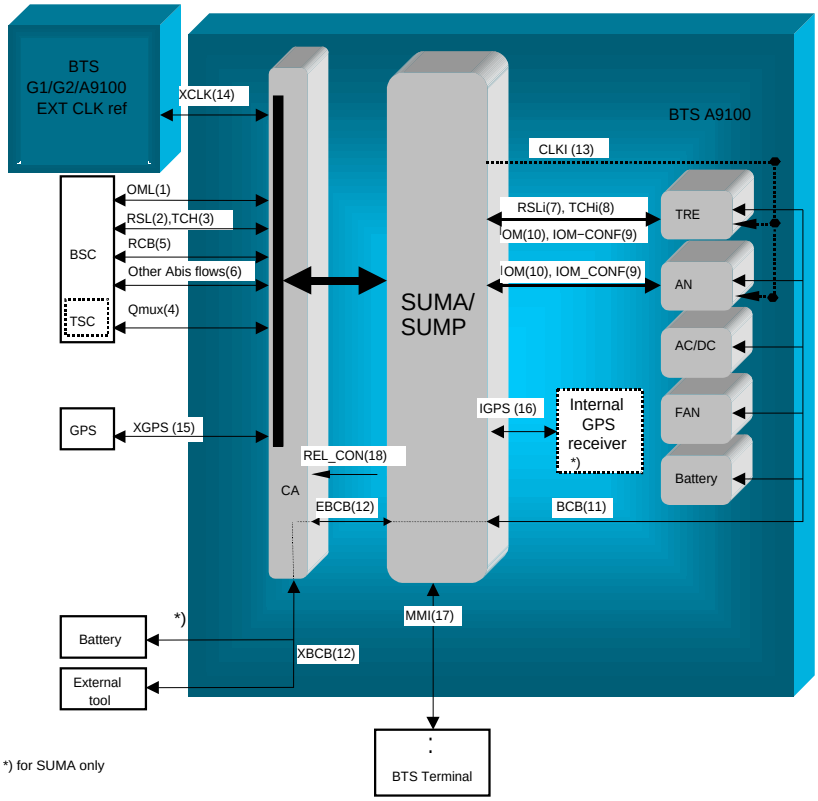


Figure 293: The SUMP/SUMA in its Environment

The following table provides information relative to the links mentioned in the figure above. All external links connected to the CA in Figure *293* are routed through the CA to the SUMA/SUMP.

Note: The AN, ANX, ANY, ANC modules are connected to the BCB, but only the ANX and ANC are connected to IOM and IOM_CONF.

Link	1	Comment
OML	L	The link carries O and M messages between the BSC and BTS. The link is routed by the SUMP/SUMA from/to Abis to/from BSII.
RSL	L	These links are transparently routed by the SUMP/SUMA from/to Abis
TCH	L	To/from the BSII.
Qmux	L	This link is used for the remote transmission O and M between the TSC and the Transmission part of the BTS.
RCB	L	This link is used to control the ring functions between the BIEs by managing F, S, R, FEA, AIS bits.
Other Abis flows	L	All the other flows carried by the Abis are transparently routed in Abis ring or drop through the SUMP/SUMA.
RSLi	L	The Radio signaling Link is for TRE telecom function.
TCHi	L	The Traffic Channel is for TRE telecom function.
IOM_CONF	L	It is used to broadcast the IOM configuration by the SUMP/SUMA.
IOM	L	This link carries O and M messages exchanged between the SUMP/SUMA and other BTS modules connected on the IOM. These links are used for BTS internal O and M between SUMP/SUMA and other BTS equipment.
BCB	P	The link is connected to other BTS modules and allows the BTS Remote Inventory supported by SUMP/SUMA.
XBCB (EBCB)	P	The link is connected to the external tool for Remote Inventory. XBCB is changed into EBCB in between SUMP/SUMA and CA. When the SUMP/SUMA is powered off, the BTS module Remote Inventory information is reported to the external tool through the EBCB. This feature is used only at factory level. When the SUMP/SUMA is powered on, the alarms from XIOB are reported to SUMP/SUMA through the EBCB.
CLKI	P	This link distributes BTS internal synchronizing signals to TRE and AN.
XCLK	P	The link carries BTS external clock synchronization signals for either the master or slave configuration.
XGPS	P	These flows are used in order to communicate with the GPS system. It is External GPS when the GPS system is outside the BTS and Internal GPS when it is plugged inside the SUMP/SUMA. These flows carry the supervision interface of the GPS system (Configuration, Fault).
IGPS	P	These flows carry the GPS CLK reference.

Link	1	Comment
MMI	L	This link is connected to a PC used as a BTS Terminal which includes the local BTS O and M application. it includes: ▶ The download of software for SUMP/SUMA and other BTS downloadable modules ▶ The BTS commissioning tests ▶ The O and M commands for the Transmission part of the SUMP/SUMA ▶ The O and M commands for the Clock part of the SUMP/SUMA (for OCXO calibration and OCXO tuning).
REL_CON	P	This relay command flow is used to control Abis relays. This flow has its own physical interface.

Table 57: SUMP/SUMA Interfaces

[1] This column indicates for each link if it is a logical link (L) or a physical link (P).

The following figure shows the functional block diagram of the SUMP/SUMA.

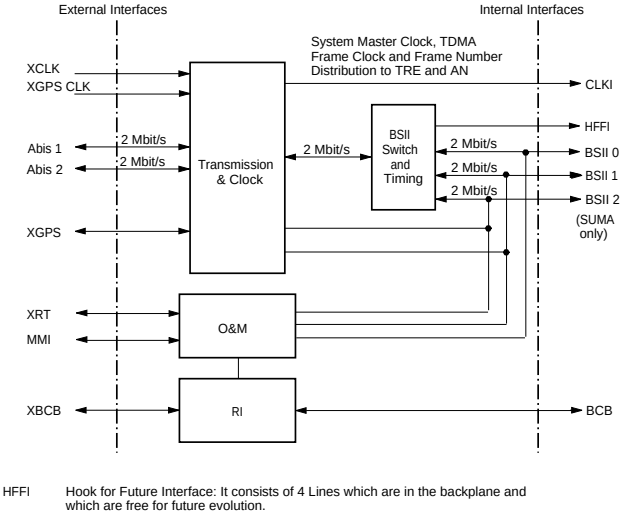


Figure 294: SUMP/SUMA Basic Architecture

The SUMP/SUMA provides a switchable 2 Mbit/s duplex connection between the Abis Interface and the BSII. The BSII is used to transfer TCH information to the TRE module, and O and M information to the OMU/SUM microprocessor. SUMA has an additional BSII 2 interface. This is used exclusively to carry TCH information.

The SUMP/SUMA comprises the following functional blocks:

- Transmission and Clock
- BSII
- OMU
- RI.

The SUMP uses two microprocessors, the SUMA only one to run the software/firmware for the O and M and Transmission and Clock functions.

8.2 Transmission and Clock Functions

The SUMP/SUMA Transmission and Clock functions provide:

- Clock selection and generation
- Two 2 Mbit/s interfaces to the BSC, via a PCM link.

The following figure shows the Transmission and Clock architecture.

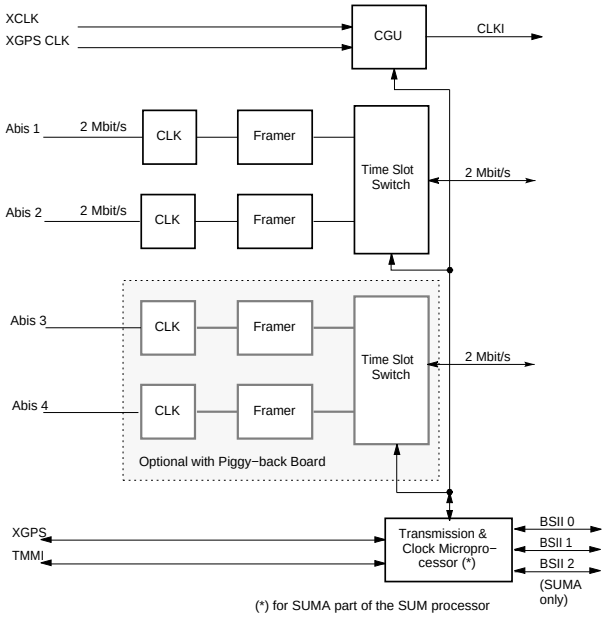


Figure 295: SUMP/SUMA Transmission and Clock Architecture

The principal functional components and interfaces of the Transmission and Clock are as follows:

- Abis Interface
- Transmission and Clock microprocessor
- CGU
- Q1 link.

8.2.1 Abis Interface

The Abis Interface is the digital interface to the BSC. The SUMP/SUMA provides two G.703 Abis Interfaces.

They support the following communications links:

- TCH, which carries speech and/or data
- OML, which uses a LAPD protocol
- RSL, which carries signaling data for the telecommunications functions
- Q1 Link, which carries transmission management data.

Relays, mounted on the cabinet interconnection panel, are used to route the Abis links transparently if the SUMP/SUMA is switched off.

The Abis Interface consists of the functional entities shown in the following table.

Clock Recovery	The Clock circuit recovers timing from the PCM link.
Framer Device	The Framer is responsible for: - Insertion of frame/multiframe synchronization patterns - Monitoring frame and multiframe synchronization - HDB3 coding/decoding for PCM - AIS detection - Frame and CRC error detection. The Framer can be configured for CRC by the Transmission and Clock/SUM microprocessor, via the Time Slot Switch.
Time Slot Switch	The Time Slot Switch is responsible for mapping the 64 kbit/s time slots onto the TCH. The switch is configured by the Transmission and Clock/SUM microprocessor.
Loop-back Relays	Relays on the SUMP/SUMA provide a loop-back on the Abis Interface for testing the Abis links.

Table 58: SUMP/SUMA, Abis Interface Functional Entities

Two additional Abis Interfaces can be implemented with a ’Piggy-back’ board (SUMA only). This is an optional feature of the BTS A9100.

8.2.2 Transmission and Clock Microprocessor

In case of SUMA the Transmission and Clock functions run on the only SUM microprocessor.

The Transmission and Clock microprocessor controls the transmission and clock functions on the SUMP/SUMA. It consists of a QUICC (SUMP) or PowerQUICC (SUMA), with access to the RAM and to the EEPROM.

The external signal connected to the microprocessor is the XGPS, for controlling a GPS receiver.

8.2.3 Station Unit Module Clock Generation Unit

The functions of the clock generation unit consist of the:

- Generation of the GSM clock by an internal OCXO for TRE and AN modules in the BTS
- Possibility to synchronize the OCXO:
  - On an external clock reference coming from (Slave synchronization - Slave BTS) another BTS (G1, G2, BTS A9100)
  - On the Abis clock (PCM synchronization - Master BTS)
  - On the GPS CLOCK receiver (GPS synchronization - Master BTS)
  - No synchronization (OCXO in free run mode) (OCXO free running - Master BTS).
- Generation of both frame clock and frame number for TRE and AN modules in the BTS:
  - For the Master BTS, it is a local generation
  - For Slave BTS, both frame clock and frame number are aligned on those provided by the Master BTS.
- Distribution through the CLKI of GSM clock, frame clock and frame number
- OCXO calibration (which is done on time in the factory and consists of the measurement of the OCXO curve and is stored in the SUM EEPROM)
- OCXO tuning (which consists of the change of the OCXO tuning value)
- Possibility to synchronize other BTSs (G1 BTS, G2 BTS, BTS A9100).

NOTICE

In the case of 'OCXO free running', an on-site periodic electronic tuning is necessary. (For further information, refer to the *Evolium BTS A9100/A9110 Corrective Maintenance Handbook*).
Regarding 'GPS synchronization', the SUMA hardware is ready to have a GPS receiver plugged in.
'GPS synchronization' concerns frequency synchronization and time synchronization (so that all BTSs have the same Frame Number).

8.2.4 Q1 Link

The Q1 link is a logical link routed via the Abis Interface, the Time Slot Switch, the BSII switch and the BSII to the OandM functions. The OandM functions are performed remotely by the BSC TSC, via the Q1 link, or locally via a BTS Terminal.

All BTS A9100 transmission equipment have Q1 addresses, which identify them to the TSC. The transmission equipment is supervised by the TSC using the Q1 protocol.

The TSC, or a local BTS Terminal, can interrogate the SUMP/SUMA for the following data:

- Performance measurement
- Alarms
- Abis clock source
- Loop request
- Firmware version
- Hardware version.

The Q1 link is also used for software downloads, for configuration purposes.

8.3 Base Station Internal Interface

The BSII is an internal digital interface to the TRE module.

The BSII bus consists of three 2 Mbit/s full duplex links:

- BSII 0
- BSII 1
- BSII 2.

The BSII basically consists of the following two functional components:

- **BSII PLL**
  The BSII PLL is logically a part of the CGU. It locks the BSII CLK to a fixed frequency of 2.048 MHz. The clock is then distributed to the Transmission and Clock/SUM microprocessor, and an NGISL device. Distribution is via the SUMP/SUMA Glue Logic.
  The NGISL device is an ASIC, providing an internal serial link to the Remote Inventory EEPROM. It also performs serial-to-parallel conversion, to allow the OMU microprocessor access to the EEPROM.
- **BSII Switch**

  The BSII switch performs the following functions:

  - Distribution of the system clock, TDMA frame clock and FN
  - 64 kbit/s time slot mapping
  - Q1 message routing.

  The BSII switch is implemented with a CPLD, which is a part of the Glue Logic. Its main function is to select between BSII 0, BSII 1 and BSII 2, which are the internal interfaces for O and M data distribution and uplink and downlink TCH.
  The data is multiplexed, via line drivers, onto the internal interfaces under control of the Transmission and Clock/SUM microprocessor. The Glue logic monitors the status of the BSII PLL via a lock detect signal. The drivers are disabled if the PLL is not locked to the BSII clock.

8.4 Operations and Maintenance Functions

The O and M functions include:

- Starting the BTS A9100
- Configuring the BTS A9100, under control of the BSC
- Executing maintenance commands
- Filtering and correlating faults
- Reporting, and acting on, the status of the modules
- Controlling the PM12s, depending on the battery status (SUMA only).

The OMU/SUM microprocessor performs the following O and M functions:

- Configuration management
- Fault management
- Performance management
- Configuration and supervision of the BSII
- Routing MMI messages to the Transmission and Clock microprocessor (SUMP only)
- Test facilities.

The O and M architecture is shown in the following figure. It consists of the following functional entities:

- OMU microprocessor for SUMP and for SUMA as part of the SUM processor
- SDRAM
- Flash EEPROM
- NGISL ASIC
- Glue logic.

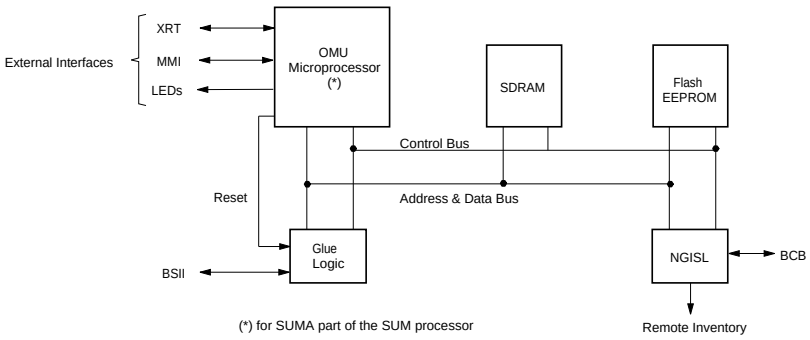


Figure 296: SUMP/SUMA, O and M Architecture

8.4.1 BTS Control Bus

Most of the internal control functions are managed via the BCB. The BCB also interfaces to an EEPROM which holds inventory information on the BTS A9100 modules.

The BCB is used for the following functions:

- Accessing the RI
- Detecting module insertion/extraction
- Collecting alarm/data
- Controlling the battery and PM12s (SUMA only).

The BCB is also used for:

- Remote bit setting
  Remote bit setting consists of setting memory bits to control, disable or reset certain hardware. There are eight such BCB bits available, one of which is reserved for power supply control
- Boundary scanning
  Boundary scanning allows remote access to a particular module, via a boundary scan path. This facility can be used to reprogram the module's initialization sequence. For example, by downloading fresh data to an on-board Flash EEPROM.

8.4.2 OMU Microprocessor

In the SUMA, the O and M functions only run on the SUM processor.

The OMU microprocessor controls the O and M functions on the SUMP.

It is a Power QUICC device, with access to the following memory devices:

- SDRAM, organized as 32 bits wide and accessible in 8, 16 or 32 bit words
- Flash EPROM providing memory that is 32 bits wide.

The external signals connected to the microprocessor are:

- MMI - for connecting a BTS terminal
- XRT - for radio supervision and loop tests.

8.4.3 Glue Logic

Glue logic, implemented as a PLA, supports the CPU and connects the various functional blocks together.

8.5 Remote Inventory

The Remote Inventory is related to an Alcatel standard. It consists of storing in non-volatile memory the basic information related to a module from the hardware (and possibly software) point of view. This information is available out of the module even for unpowered modules.

The range of information goes from module manufacturing (serial number, manufacturing and repair history, ...) to module design (part number, hardware capability, firmware release...).

One part of the Remote Inventory is mandatory, while another is optional.

Access to the inventory information is 'remote' because it is managed externally to the module.

However, this access can be requested from different levels:

- Module access
  Inventory of the unplugged (and so unpowered) modules through a dedicated module connector
- Internal BTS access
  Inventory of all BTS modules from a central node internal to the BTS (SUMP/SUMA). Only the SUMP/SUMA has to be powered.
- External BTS access
  Inventory of all BTS modules from a central node external to the BTS (XBCB-connected tool). It is used at factory level when the complete BTS is unpowered (including the SUMP/SUMA).

For both internal and external BTS accesses, the BCB is used.

8.6 Station Unit Module Power Supply

The SUMP is powered by two identical DC/DC converters. The DC/DC converters work in parallel to provide all the voltages required by the SUMP circuitry. This parallel mode of operation provides redundancy. If one DC/DC converter fails, the other is capable of supplying all the necessary SUMP voltages.

The SUMA is powered by a single, highly reliable DC/DC converter.

The SUMP/SUMA DC/DC converters' input/output voltages are shown in the following table.

Voltage	Value
V_{in}	-38.4 VDC min.
	-72 VDC max.
	-48 VDC to -60 VDC nom.
$V_{out\ SUMP}$	+ 3.3 VDC ±3 %
	+ 5.1 VDC ±3 %
	+ 12 VDC ±10 %
$V_{out\ SUMA}$	+ 3.3 VDC ±2 %
	+ 5.1 VDC ±2 %

Table 59: SUMP/SUMA Input/Output Voltages

Normal operation of V_{out} is unaffected by temperature fluctuations in the range -10^{o} C to 70^{o} C.

The power supply also has the elements described below.

Fuse	The inputs of the power supply are protected by an on-board fuse, located on the SUMP/SUMA board.
Protection	The SUMP/SUMA power supply circuitry is protected against short circuit and accidental polarity inversion on its inputs.
Grounding	Ground continuity for the module is achieved with ground pins on the subrack backplane which connect to the bus bar ground.

8.7 Station Unit Module LEDs

There are eight LEDs on the SUMP front panel or six LEDs on the SUMA front panel, which provide a visual indication of the operational status of the SUMP/SUMA module (see Figure *297*). The following table describes each LED and provides a definition of the various operational states.

LED	Color	Status	Description	SUMP	SUMA
OML	Yellow		Status of the OML.	X	X
		On	Link connected.		
		Blinking	Connecting link.		
		Off	Link disconnected.		
ABIS 1	Yellow		Status of Abis1 for Transmission and Clock.	X	X
		On	Abis 1 serviceable.		
		Blinking	Failure detected on Abis1 .		
		Off	Not configured or not used.		
O and M	Yellow		O and M status for the OMU.	X	X
		On	Operational.		
		Blinking	In a transient state, before reaching the operational state.		
		Off	Not used.		
ABIS 2	Yellow		Status of Abis2 for Transmission and Clock.	X	X
		On	Abis 2 serviceable.		
		Blinking	Failure detected on Abis2 .		
		Off	Not configured or not used.		
OMU (for SUMP)	Red		OMU alarm status.	X	X
FAULT (for SUMA)		On	Fatal alarm or module is unserviceable.		
		Blinking	Non-fatal alarm.		
		Off	No alarm.		

LED	Color	Status	Description	SUMP	SUMA
Trans FAULT			Transmission and Clock alarm status.	X	-
		On	Fatal alarm or module is unserviceable.		
		Blinking	Non-fatal alarm.		
		Off	No alarms.		
PS1 (for SUMP)	Green		Converter 1 status.	X	X
ON (for SUMA)		On	Converter 1 serviceable.		
		Off	Converter 1 faulty.		
PS2	Green (SUMP only)		Converter 2 status.	X	-
		On	Converter 2 serviceable.		
		Off	Converter 2 faulty.		
ABIS 3	Yellow		Status of Abis 3 for Transmission and Clock.	-	(X)
		On	Abis 3 serviceable.		
		Blinking	Failure detected on Abis 3.		
		Off	Not configured or not used.		
ABIS 4	Yellow		Status of Abis 4 for Transmission and Clock.	-	(X)
		On	Abis 4 serviceable.		
		Blinking	Failure detected on Abis 4.		
		Off	Not configured or not used.		

Table 60: SUMP/SUMA LED Descriptions

(X) Optional, if piggy-back board is connected on the SUMA board.

Note: During a reset of the OMU microprocessor, all the red and yellow LEDs are lit for approximately 100 ms. This is a test of the LEDs to make sure they are all working.

8.8 Station Unit Module Front Panel

The following figure shows the SUMP and SUMA front panels.

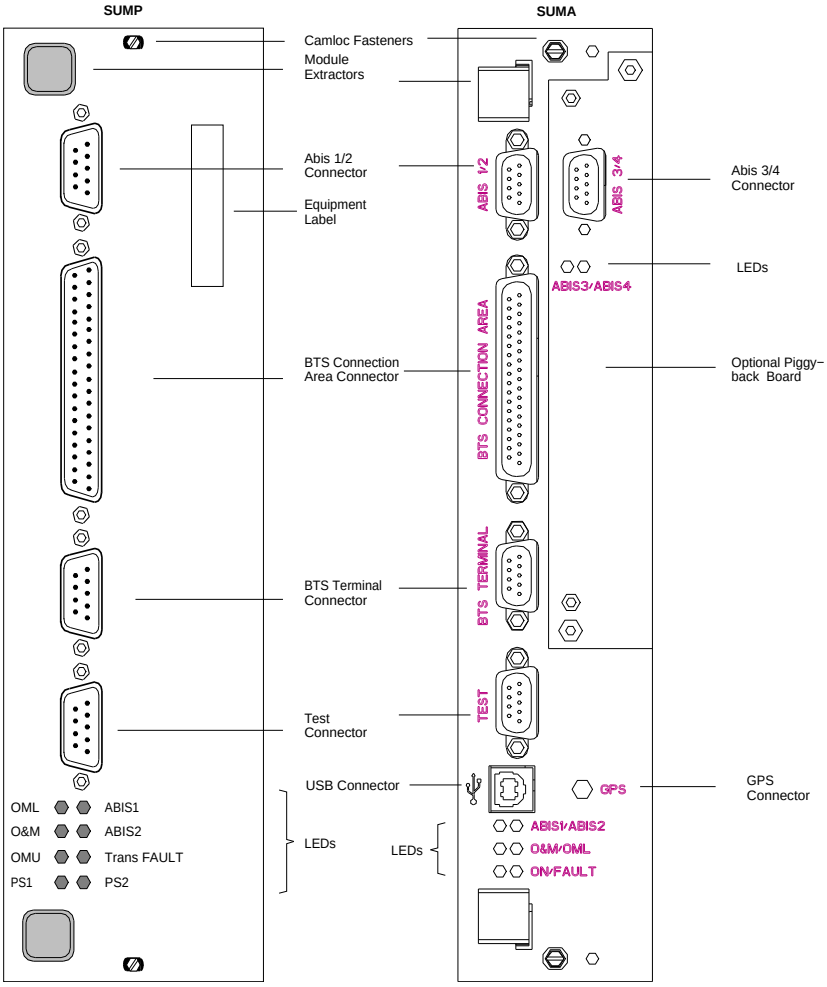


Figure 297: SUMP/SUMA Front Panel

The following table describes the SUMP/SUMA front panel connectors.

Connector	Type	Description	SUMP	SUMA
Abis 1/2	9-pin Sub-D female	Provides two Abis Interfaces. The connector is pre-equipped for both 75 Ω and 120 Ω impedance cables. The impedance is selected by the type of cable connector used. Two more Abis Interfaces are possible with a piggy-back board.	X	X
Abis 3/4	9-pin Sub-D female	Provides two Abis Interfaces on SUMA piggy-back board. The connector is pre-equipped for both 75 Ω and 120 Ω impedance cables. The impedance is selected by the type of cable connector used.	-	X
BTS Connection Area	37-pin Sub-D female	Provides the following digital interfaces: ▶ XBCB ▶ XRT ▶ XGPS ▶ XGPS CLKX ▶ CLK1 ▶ Abis relay control.	X	X
BTS Terminal	9-pin Sub-D female	For connecting a computer terminal. It provides a V.24 asynchronous serial interface, which can be used for local maintenance and configuration purposes. Presence of a terminal is automatically detected.	X	X
BTS Terminal	USB port	For connecting a computer terminal. It provides a high-speed serial interface, which can be used for local maintenance and configuration purposes. Either the V.24 interface or the USB interface can be connected to a BTS Terminal, but not both. Presence of a terminal is automatically detected.	-	X
Test	9-pin Sub-D male	Provides remote access to the OMU and Transmission and Clock microprocessors (in case of SUMP) and to the SUM processor (in case of SUMA) for factory test purposes.	X	X
GPS	SMA female	Provides a synchronization output from an optional on-board GPS receiver.	-	X

Table 61: SUMP/SUMA Front Panel Connectors

9 Transceiver Equipment

The sections are supported with diagrams showing the functional blocks and their interfaces.

A drawing of the physical appearance of the module is also included, showing LED indicators, connectors and controls.

9.1 Single Transceiver Equipment

9.1.1 Introduction to Transceiver Equipment

The TRE combines digital baseband and analog RF functions in one module.

The architecture is split into three functional blocks:

- Digital part TRED
- Analog part TREA with the power amplifier TEPAxx (for TADH/TAGH/TRAD/TRADE/TRAG/TRAGE/TAGHE/TRAL/TRAP), TEPADHE (for TADHE) or TREPAxx (for TRDH, TRDM, TRGM, TRPM)
- Power supply TREP (for TRDH, TRDM, TRGM, TRPM), TREPS (for TRAG/TRAD), or TREPSH (for TADH/TRADE/TADHE/TAGH/TRAGE/TAGHE/TRAL/TRAP).

In the TADH/TRADE/TADHE/TAGH/TRAGE/TAGHE/TRAD/TRAG/TRAL/TRAP TRE variants TRED and TREA are implemented in one submodule (TREDAx).

The TRE basic architecture is shown in the following figure.

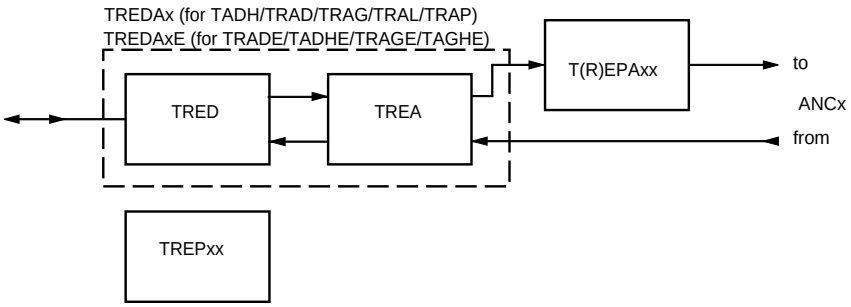


Figure 298: TRE Basic Architecture

The TRE performs the digital functions interface to the SUM and the analog functions interface to the AN module. The TRE contains its own integrated power supply.

The following types of TRE modules are available for the different BTS A9100 variants:

- TADH, TRE high power module for GSM 1800
- TAGH, TRE high power module for GSM 900
- TRAD, TRE medium power module for GSM 1800
- TRADE, TRE module medium power for GSM 1800, enhanced 8-PSK power
- TADHE, TRE high power module for GSM 1800 GMSK and 8-PSK
- TRAG, TRE medium power module for GSM 900
- TRAGE, TRE module medium power for GSM 900, enhanced 8-PSK power
- TAGHE, TRE high power module for GSM 900 GMSK and 8-PSK
- TRAL, TRE medium power module for GSM 850
- TRAP, TRE medium power module for GSM 1900
- TRDH, TRE high power module for GSM 1800
- TRDM, TRE medium power module for GSM 1800
- TRGM, TRE medium power module for GSM 900
- TRPM, TRE medium power module for GSM 1900.

NOTICE

GSM 850 is not supported by all BSS software releases. If you are in doubt, contact Alcatel support.

9.1.2 Digital Functions

The following figures show a block diagram of the TRED hardware architecture. They show the functional blocks, relative to each other, and the interfaces to the TRED. The shaded areas identify separate functional blocks, which are implemented on the same hardware device.

9.1.2.1 TRED Architecture of TRDH, TRDM, TRGM, TRPM

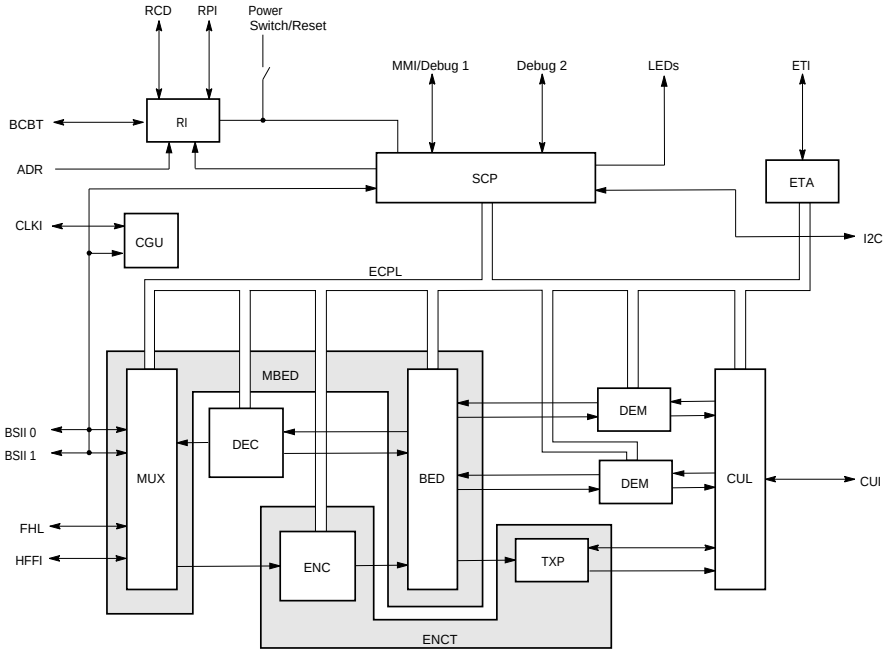


Figure 299: TRED Architecture (TRDH, TRDM, TRGM, TRPM)

The TRED (TRDH, TRDM, TRGM, TRPM) consists of the following functional entities (refer to the figure above):

- Entity Control Parallel Link (ECPL)
- signaling and Control Processor (SCP)
- Decoder (DEC)
- Demodulator (DEM)
- Multiplexer, Baseband, Encryption and Decryption (MBED)
- Encoder and Transmitter Processor (ENCT)
- Carrier Unit Logic (CUL)
- Clock Generation Unit (CGU)
- External Test Adapter (ETA)
- Remote Inventory (RI).

9.1.2.2 TRED Architecture of TADH, TAGH, TRAD, TRADE, TADHE, TRAG, TRAGE, TAGHE, TRAL, TRAP

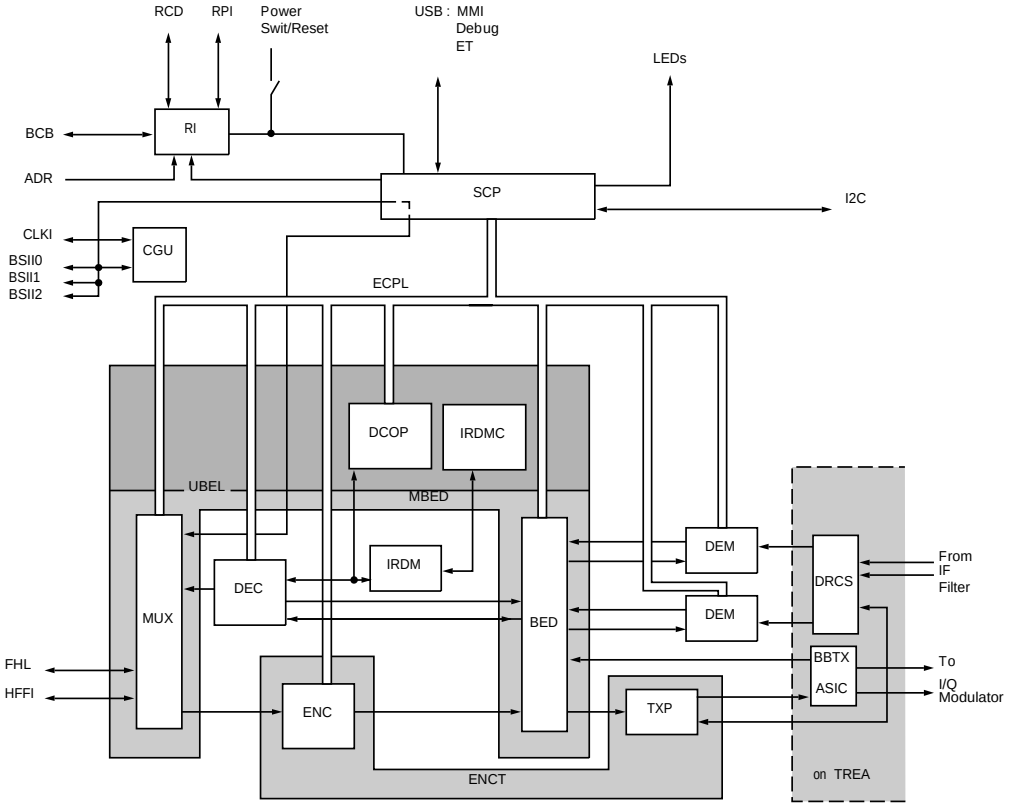


Figure 300: TRED Architecture (TADH, TAGH, TRAD, TRADE, TADHE,TRAG, TRAGE, TAGHE, TRAL, TRAP)

The TRED (TADH, TAGH, TRAD, TADHE, TRADE, TRAG, TRAGE, TAGHE, TRAL, TRAP) consists of the following functional entities (refer to the figure above):

- ECPL
- SCP
- DEC
- DEM
- Incremental Redundancy Data Memory (IRDM)
- MBED, part of the UBEL
- Decoder Co-processor (DCOP), part of the UBEL
- IRDM Controller (IRDMC), part of the UBEL
- United Baseband Logic (UBEL), containing the MBED, DCOP, and IRDMC
- ENCT
- CGU
- RI
- Baseband ASIC for Transmitter (BBTX), located on the TREA
- Diversity Receiver Chip Set (DRCS), located on the TREA.

9.1.2.3 TRED System Interfaces

The TRED provides a number of system interfaces. The following table briefly describes each of them (see also Figures *299* and *300*).

ADR	Module address: provides a unique address to each module in the BTS. Used to set BCB physical BCB terminal address and BSII HDLC address.
BCB	Base station control bus: used for Remote Inventory (RI) read write and for controlling and supervision of the power supply.
CLKI	Clock interface: used to distribute the Evolium BTS A9100 master clock and the frame clock multiplexed on the same line with the frame number in a serial format.
BSII	Base station internal interface: transfers all TCH-related data (traffic and signaling) and internal O and M data. TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP: three links, TRDH/TRDM/TRGM/TRPM: two links.
HFFI	Hook for future interface, is a spare interface and can be used for future extensions.
FHL	Frequency hopping link: used for downlink baseband frequency hopping.
RCD	Remote cabling detection: detects DC voltage variations on the TREA receiver inputs.
RPI	Remote power interface: consists of: - Power lines for TRED and TREA DC supply - On/off control of the power supply - Alarm handling for the TREP/TREPS/TREPSH DC input and DC output signals.

MMI/ Debug 1	Debug interface: for TRE (development and validation only).
Debug 2	Debug interface: for TRE (development and validation only).
PSwitch/ Reset	Manual front panel power switch: disables the TREP/TREPS/TREPSH for TRE maintenance (security function for actions on RF cables). Also used to generate the push button reset (PB_SRST) with fast off/on sequence.
LEDs	Front panel LED control.
ETI	Used to trace the ECPL, or access it with a test tool.
I2C	Interface to the TREA EEPROM which stores the calibration and adjustment data.
CUI	Transfers uplink and downlink TCH data, and configuration/control data between TRED and TREA.
USB	Universal serial bus as known from the personal computer domain. It is used to channel the tool interfaces ET/ISA, MMI, ALFS and Debug which are all targets for communication with a PC.

Table 62: TRED Interface Descriptions

9.1.2.4 Entity Control Parallel Link

The ECPL is the main internal control bus. It provides a parallel interface between the SCP and the other functional blocks in the TRED.

9.1.2.5 Signaling and Control Processor

The SCP performs Layer 2 and Layer 3 central processing for signaling and O and M functions. Layer 2 performs O and M functions using LAPD protocols. Layer 3 performs general traffic management functions for the Air Interface.

The SCP consists of a Power QUICC device, supported by SDRAM and Flash Memory. The following figure shows a block diagram of the SCP and its peripheral memory and logic devices.

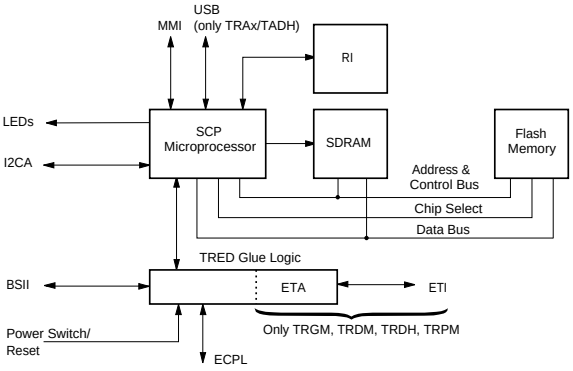


Figure 301: TRED, SCP Functional Blocks

9.1.2.6 Decoder

The decoder performs uplink channel decoding, and interfaces the TRAU frames to the BSII. The hardware consists of a DSP and an SRAM.

The functions performed by the decoder are:

- Soft-decision bit combining for antenna diversity (TRDH, TRDM, TRGM, TRPM)
- Decryption and decryption process control
- On the terrestrial link side:
  - Rate adaptation
  - TRAU frame adaptation.
- On the radio channel side:
  - Channel decoding
  - Speech, data and signal de-interleaving.
- Measurements preprocessing
- In-band control of the demodulator.

Block Diagram

The following figure shows a functional block diagram of the decoder.

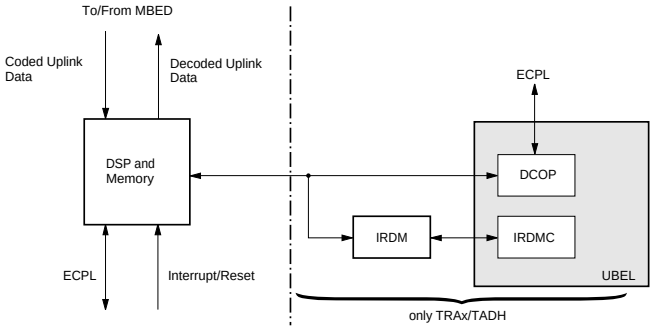


Figure 302: TRED, Decoder

Decoder DSP

The decoder consists of a DSP and its associated SRAM.

The input to the decoder consists of a serial interface. The interface carries clock, frame signals and the demodulated data from eight RF time slots. The DSP decodes and transmits eight full-rate or enhanced full-rate (or 16 half-rate) TCHs to the BSII, via the MBED. Each full-rate channel can be replaced by a GPRS channel.

The ECPL interface is used mostly for booting code during resets. The interrupt/reset interface sets the boot mode, and later provides frame and time slot interrupts.

9.1.2.7 Incremental Redundancy Data Memory

The IRDM is required by the EGPRS feature to store demodulated packet data blocks for incremental redundancy function.

9.1.2.8 IRDM Controller

Hardware and access control function for the IRDM. The IRDMC function is implemented in the UBEL FPGA.

9.1.2.9 Decoder Co-processor

The DCOP is a slave of the DEC used to enhance signal processing functions which are more efficiently implemented in a FPGA than in a DSP. The introduction of the DCOP is linked to the EGPRS feature. The DCOP function is implemented in the UBEL FPGA.

9.1.2.10 Demodulator

The demodulator demodulates the uplink channels.

The functions performed are:

- Antenna diversity combining (TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP)
- Radio link measurements on a burst basis
- Using control information provided by the decoder:
  - Preprocessing
  - Channel demodulation
  - Equalization of the received signals.
- DC offset compensation.

Block Diagram

The following figure shows a functional block diagram of the demodulator.

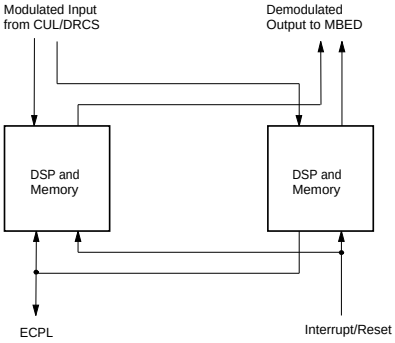


Figure 303: TRED Demodulator

Demodulator DSPs

The demodulator consists of two DSPs, each of which has its own SRAM.

The inputs to the demodulator consist of two serial interfaces. The interfaces carry clock, frame signals and the data from eight RF time slots. Each DSP demodulates eight full-rate or enhanced full-rate (or 16 half-rate) TCHs for one antenna path.

It demodulates either access or normal bursts (TRDH, TRDM, TRGM, TRPM). It combines and demodulates either access or normal burst for both antenna paths (TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP).

The ECPL interface is used almost exclusively for booting code during resets. The interrupt/reset interface sets the boot mode, and later provides frame and time slot interrupts.

9.1.2.11 Multiplexer, Baseband, Encryption and Decryption

The MBED functions are combined in a single FPGA.

The functions performed by the MBED are:

- Multiplexing of baseband data
- Baseband encryption
- Baseband decryption
- Interfacing digital processing functions on the TCH.

The following figure shows a functional block diagram of the MBED.

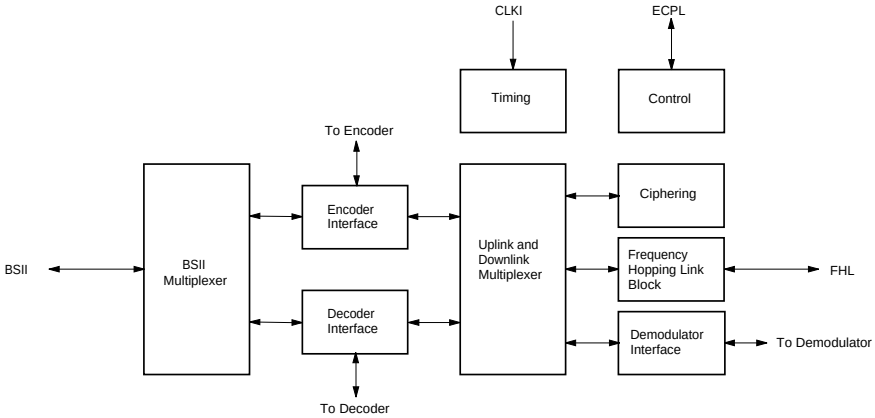


Figure 304: TRED, Multiplexer, Baseband, Encryption and Decryption

	The following table gives a short description of each block.
Control	The Control block is the main controlling function of the MBED. It contains several status and control registers that are updated via the ECPL interface.
Timing	The Timing block is connected to CLKI which carries the master clock, frame clock and frame number. The main role of the timing block is to: ▶ Provide clocks for the DSPs ▶ Retrieve the frame number and transfer it to the ECPL.
Ciphering	The Ciphering block performs pattern generation according to the configuration information, that is: ▶ A5 type ▶ Encryption/decryption key ▶ Frame number. The configuration information is sent in band from the encoder/decoder. This means that it is possible to change the A5 algorithm and key on a call-by-call basis.
BSII Multiplexer	The BSII Multiplexer selects between the BSII links for the uplink and downlink directions. The selection of the correct bits to be sent downlink, and the insertion of bits at the correct position in uplink, is done by the DSPs.
Uplink and Downlink Multiplexer	The Uplink Multiplexer handles two data flows: ▶ Data from the decoder. Additionally, the uplink cipher key is forwarded to the ciphering block ▶ TCH data from the demodulator is forwarded to the decoder. The deciphering bits coming from the ciphering block are added to this data stream. The Downlink Multiplexer splits the data stream coming from the encoder: ▶ In-band signaling from the TXP is forwarded to the demodulator, together with the ARFCN ▶ The downlink ciphering key is extracted and forwarded to the ciphering block. The ciphering bits from the ciphering block are sent back to the ENCT ▶ The FHL data stream is forwarded to the FHL Interface.
Frequency Hopping Link Block	The Frequency Hopping Link Block provides the interface to the FHL. If the FHL is configured and used, the data is sent to, and received from, the FHL. If the FHL is not configured, the downlink data is forwarded to the TXP.
Demodulator Interface	The Demodulator Interface provides clock and frame signals for the demodulator DSPs.
Decoder Interface	The Decoder Interface provides the connection to and from the decoder. It also provides clock and frame signals to the decoder DSP.
Encoder Interface	The Encoder Interface provides the connection to and from the encoder and TXP. It also provides clock and frame signals to the encoder DSP.

Table 63: TRE, MBED Functional Entities

9.1.2.12 Encoder and Transmitter

The ENCT receives the downlink TRAU frames from the BSII, performs channel encoding on them and transmits them to the TREA block. The hardware consists of a DSP and an SRAM.

The functions performed by the ENCT are:

- On the terrestrial link side:
  - Rate adaptation
  - TRAU frames management
  - Transcoder time alignment.
- On the radio channel side:
  - Channel coding
  - Speech, data and signaling interleaving.
- Radio frequency hopping law computation for downlink and uplink
- TREA control, including transmitter and receiver parts
- FHL interface management if baseband hopping
- Encryption and encryption process control.

The following figure shows a functional block diagram of the ENCT.

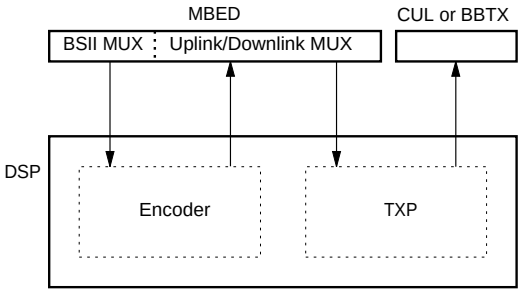


Figure 305: TRED, ENCT Functional Block

Encoder The Encoder encodes the data for eight full-rate or enhanced full-rate (or 16 half-rate) TCHs. Each full-rate channel can be replaced by a GPRS channel. This data is received from the MBED. The encoded data, ciphering configuration and the frequency number for the RF transmission, are sent to the MBED.

TXP The MBED sends the encoded data to the TXP for transmission on the Air Interface. It also sends the cipher bits coming from the ciphering block. The TXP processes the data and extracts all additional information coming from the Encoder or FHL. The resulting data stream is sent to the CUL or BBTX.

9.1.2.13 Carrier Unit Logic

For TRDH, TRDM, TRGM, TRPM only, the CUL adapts the ENCT DSP signals to provide the various data and control lines required for the TREA. The CUL consists of an FPGA and some external drivers and registers.

9.1.2.14 Clock Generation Unit

The CGU consists of two PLLs: one for the BSII clock and one for the CLKI clock. It also provides an internal clock distribution function.

9.1.2.15 External Test Adapter

For TRDH, TRDM, TRGM, TRPM only, the ETA device contains its own internal logic and drivers which enables external test equipment to be connected to the ECPL.

9.1.2.16 TRE Remote Inventory

Remote Inventory is used to store information about the TRE module (part number, name, serial number, etc.). It consists of an EEPROM which is connected to the BCB ASIC. The stored information is read via the BCB.

9.1.2.17 Baseband Transmitter Module

For TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP only, the BBTX adapts ENCT DSP signals to provide various data and control lines required for the TREA.

The BBTX consists of a mixed signal ASIC.

9.1.2.18 Diversity Receiver Chip Set

For TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP only: DRCS performs IF A/D conversion and digital filtering and decimation for both antenna paths.

9.1.3 Analog Functions

The TRE analog part performs the analog functions within the TRE.

These functions are split between the two functional parts:

- TRE analog part TREA
- TRE power amplifier TREPAxx or TEPAxx.

For GSM 1900, the TRE analog part is called TREAP.

Depending on the frequency for the TRE power amplifier, there are different variants available:

- TEPAD for GSM 1800, medium power
- TEPADE for GSM 1800, medium power, enhanced 8-PSK power
- TEPADH for GSM 1800, high power
- TEPADHE for GSM 1800, high power GMSK and 8-PSK
- TEPAG for GSM 900, medium power
- TEPAGE for GSM 900, medium/high power, enhanced 8-PSK power
- TEPAGH for GSM 900, high power
- TEPAL for GSM 850, medium power
- TEPAP for GSM 1900, medium power
- TREPAGM for GSM 900, medium power
- TREPADM for GSM 1800, medium power
- TREPAPM for GSM 1900, medium power
- TREPADH for GSM 1800, high power.

9.1.3.1 Analog Architecture -TRDH, TRDM, TRGM, TRPM

The following figure shows a block diagram of the TRE analog part hardware architecture for the TRDH, TRDM, TRGM, and TRPM. It shows the functional blocks and the interfaces to the TRED. The shaded areas define the TREA and TEPAxx (or TREPAxx) parts.

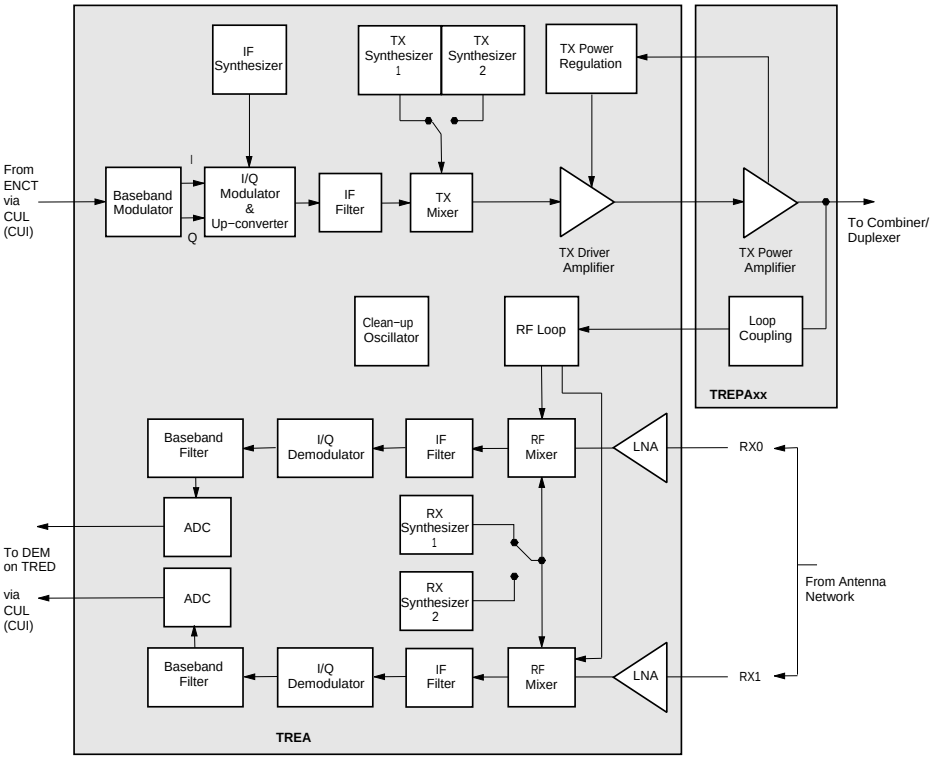


Figure 306: TRE Analog Part Architecture (TRDH, TRDM, TRGM, TRPM)

9.1.3.2 Analog Architecture -TADH, TAGH, TRAD, TRAG, TRAL, TRAP

The following figure shows a block diagram of the TRE analog part hardware architecture for the TADH, TAGH, TRAD, TRAG, TRAL, and TRAP. It shows the functional blocks and the interfaces to the TRED. The shaded areas define the TREA and TEPAxx (or TREPAxx) parts.

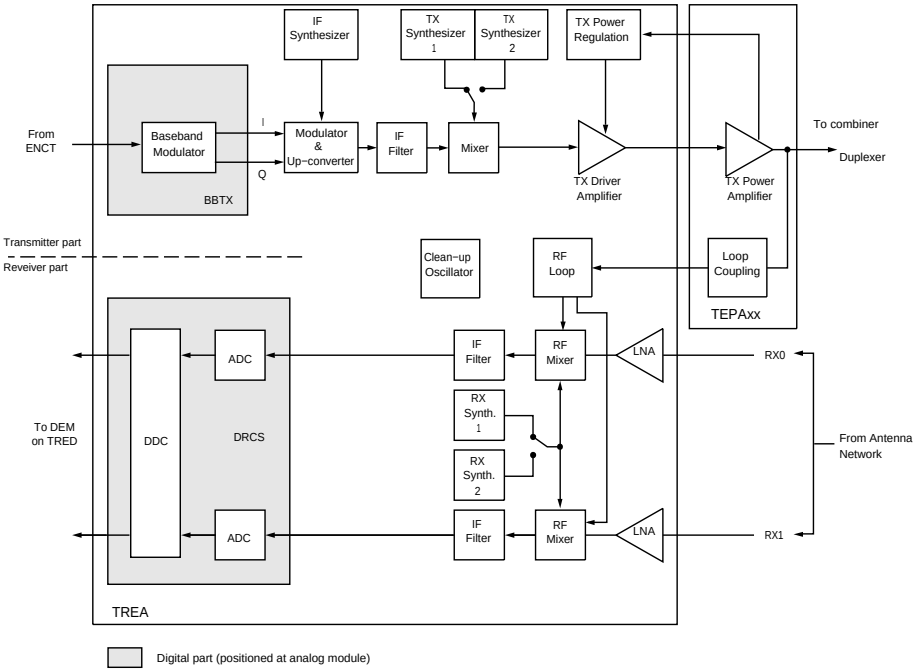


Figure 307: TRE Analog Part Architecture (TADH, TAGH, TRAD, TRAG, TRAL, TRAP)

9.1.3.3 Analog Architecture - TRAGE, TAGHE, TRADE, TADHE

The following figure shows a block diagram of the TRE analog part hardware architecture for the TRADE/TADHE/TRAGE/TAGHE. It shows the functional blocks and the interfaces to the TRED. The shaded area defines the digital part positioned on the analog module.

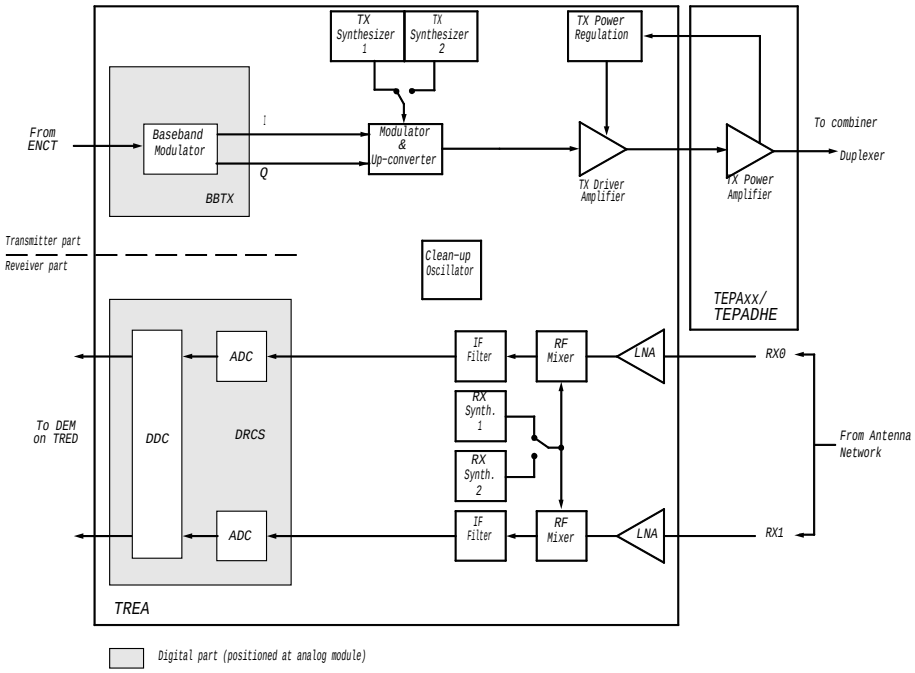


Figure 308: TRE Analog Part Architecture (TRAGE/TAGHE/TRADE/TADHE)

9.1.3.4 TRE Analog Functional Entities

The following table gives a short description of each of the TRE analog functional entities.

Baseband Modulator	The baseband modulator transforms the incoming digital data stream into two baseband signals: I and Q. These baseband signals are fed to the up-converter. The modulation is GSMK modulation or EDGE*. * for TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP
I/Q Modulator and Up-converter	The I/Q baseband signals are fed to the up-converter. Then they are transformed into the IF frequency band (211 MHz). For TRAGE/TAGHE/TRADE/TADHE the I/Q baseband signals are directly transformed into the RF frequency band.
Transmitter Amplifiers	The TX amplification stages are physically split between the TREA and TEPAxx (or TREPAxx) sections (see Figure *306*, Figure*307* or Figure *308*). The stages comprise the following three components: ▶ TX Driver Amplifier The TX Driver Amplifier stage is located on the TREA. It consists of a preamplifier, power control circuitry, and a main amplifier. An isolator provides output impedance matching and protection for a low voltage FET on the output ▶ Power Regulation The Power Regulation stage is located on the TREA. It consists of a control path and a multiplexing detection path. An EEPROM is used to store data for calibrating the transmitter output power. The control path consists of a 12-bit DAC. The detection path consists of a 12-bit ADC and a low-pass filter. (For TADH/TAGH/TRAD/TRADE/TADHE/TRAG/TRAGE/TAGHE/TRAL/TRAP it is implemented on the BBTX). ▶ TX Power Amplifier. The TX Power Amplifier is located on the TEPAxx (or TREPAxx) part of the module. It provides the final amplification stage for the transmit RF signal, from the TREA. It feeds the amplified RF signal to the AN module, as required.
Clean-up Oscillator	The Clean-up Oscillator provides spectrally pure reference clocks required for synchronization of the transmitters, receivers and synthesizers.
Transmitter Hopping Synthesizers	The Transmitter Hopping Synthesizers generate the RF frequencies for the transmitter. There are two hopping synthesizers working in parallel. While one synthesizer is active, the other selects the next transmission frequency.

Receivers	Two receivers are physically located on the TREA. The main functions of the receivers for TRGM, TRDM, TRDH, TRPM are: ▶ Low noise amplification ▶ Down conversion ▶ IF filtering ▶ IQ demodulation ▶ Baseband filtering ▶ Baseband digitizing. The main functions of the receivers for TADH, TAGH, TRAD, TRADE, TADHE, TRAG, TRAGE, TAGHE, TRAL, TRAP are: ▶ Low noise amplification ▶ Down conversion ▶ IF filtering ▶ IF sampling ▶ Digital I/Q demodulation ▶ Digital Baseband filtering ▶ Digital Decimation.
Receiver Synthesizers	The Receiver Hopping Synthesizers generate the RF frequencies for the receiver. There are two hopping synthesizers working in parallel. While one synthesizer is active, the other selects the next receive frequency.
RF Loop	The RF Loop provides an analog test loop between the transmitter and receivers. It performs analog self-tests, mainly for start-up test purposes. The RF Loop circuitry generates a frequency of 45 MHz (GSM 850/GSM 900), 95 MHz (GSM 1800), or 80 MHz (GSM 1900) and converts the transmitter output signals to the receiver frequency. The RF Loop functionality is physically split between the: ▶ TREA, which contains the RF loop itself ▶ TEPAxx (or TREPAxx), which contains the RF loop coupling function (see Figure *306* and Figure *307*). The RF Loop is removed in case of TRAGE/TAGHE/TRADE/TADHE (see Figure *308*).

Table 64: TRE Analog Part Functional Entities

9.1.4 TRE Power Supply

The TREP, TREPS, TREPSH are on-board power supplies, providing all the necessary voltages and currents for the TRE analog and digital functions.

In the case of medium-power TREs, the power supply consists of one DC/DC converter. For high-power TREs, the power supply contains an additional DC/DC converter which provides a + 26 V supply for the high-power analog circuits.

9.1.4.1 Voltages

For normal operational requirements, the DC input voltage V_{in} can be any value between -38.4 VDC and -72 VDC. If the input is too low, the power supply switches off automatically. When the input voltage is restored, the power supply switches back on. If the input voltage falls below -38.4 VDC, the output is maintained within the specified values, until the TRE power supply switches off.

The following table provides the TRE power supply output voltage parameters.

Output Voltage	Tolerance	Min. Value	Max. Value	TRE Version (1)	TRE Version (2)	TRE Version (3)
+ 3.3 V	±3 %	3.2 V	3.4 V	X	X	X
+ 5.1 V	±3 %	4.95 V	5.25 V	X	-	
-5.1 V	±3 %	-4.95 V	-5.25 V	-	X	
+ 5.3 V	±3 %	5.14 V	5.46 V	-	X	X
+ 12 V	±3 %	11.64 V	12.36 V	X	-	
-12 V	±5 %	-11.4 V	-12.6 V	X	-	
+ 26 V	±2 %	25.48 V	26.52 V	X	X	X

(1): TRDH, TRDM, TRGM, TRPM

(2): TADH, TAGH, TRAD, TRAG, TRAL, TRAP

(3): TRAGE, TAGHE, TRADE, TADHE

Table 65: Output Voltage Parameters

9.1.4.2 Fuse

The TRE power supply input is protected by a fuse with a high-breaking capacity (15 A).

9.1.4.3 ON/OFF Switch

The TRE module is equipped with an on/off power switch. It is a rocker type switch, fitted slightly below the front panel's profile to prevent accidental switching.

9.1.4.4 Remote Switching

The TREPS can be remotely switched on and off by the OMU, via the BCB. This feature is implemented on the module with an optically isolated on/off switch.

9.1.4.5 Low Voltage Alarms

If an output voltage falls below a preset threshold value, an alarm is raised. The following table gives the minimum and maximum threshold values. The values are measured across the output connector pins.

Output Voltage	Threshold Min.	Threshold Max.	TRE Version (1)	TRE Version (2)	TRE Version (3)
+ 3.3 V	2.7 V	3.0 V	X	X	X
+ 5.1 V	4.2 V	4.6 V	X	-	
-5.1 V	-4.2 V	-4.6 V	-	X	
+ 5.3 V	4.4 V	4.8 V	-	X	X
+ 12 V	10.0 V	11.0 V	X	-	
-12 V	-10.0 V	-11.0 V	X	-	
+ 26 V	22.0 V	24.0 V	X	X	X

(1): TRDH, TRDM, TRGM, TRPM

(2): TADH, TAGH, TRAD, TRAG, TRAL, TRAP

(3): TRAGE, TAGHE, TRADE, TADHE

Table 66: Low Voltage Alarm Thresholds

9.1.5 Transceiver Equipment LEDs

There are eight LEDs (TRDH, TRDM, TRGM, TRPM) or six LEDs (TADH, TAGH, TRAD, TRADE, TADHE, TRAG, TRAGE, TAGHE, TRAL, TRAP) on the front panel, which provide a visual indication of the operational status of the TRE module (see Figures *309* and *310*). The following table describes each LED their various operational states.

LED	Color	Status	Description	TRE Version (1)	TRE Version (2)
RSL	Yellow		RSL connection status	X	X
		On	Link connected	-	-
		Blinking	Connecting link	-	-
		Off	Link disconnected	-	-
TX	Yellow		Transmission status (not BCCH)	X	X
		On	Transmitting on SDCCH, CBCH or TCH	-	-
		Blinking	Emitting (normal operation)	-	-
		Off	Not transmitting	-	-
OP	Yellow		TRE operational status	X	X
		On	Fully operational	-	-
		Blinking	Initializing	-	-
		Off	Not operational	-	-
BCCH	Yellow		BCCH transmission status	X	X
		On	Transmitting	-	-
		Off	Not transmitting	-	-
FAULT	Red		Alarm status (1): two LEDs connected in parallel (2): one LED	X	X
		On	Fatal alarm	-	-
		Blinking	Non-fatal alarm	-	-
		Off	No alarm	-	-
5 V POWER	Green		Status of the + 5 V power supply	X	
		On	+ 5 V present	-	-

LED	Color	Status	Description	TRE Version (1)	TRE Version (2)
		Off	+ 5 V faulty	-	-
3.3 V POWER	Green		Status of the + 3.3 V power supply	X	-
		On	+ 3.3 V present	-	-
		Off	+ 3.3 V faulty	-	-
PWR	Green		Status of the TRE power supply output voltages	-	X
		On	Output voltages present	-	-
		Off	Output voltages faulty	-	-

(1): TRDH, TRDM, TRGM, TRPM

(2): TADH, TAGH, TRAD, TRADE, TADHE, TRAG, TRAGE, TAGHE, TRAL, TRAP

Table 67: TRE LED Descriptions

9.1.6 Transceiver Equipment Front Panel

The following figures show the TRE front panels.

9.1.6.1 Front Panel - TRDH, TRDM, TRGM, and TRPM

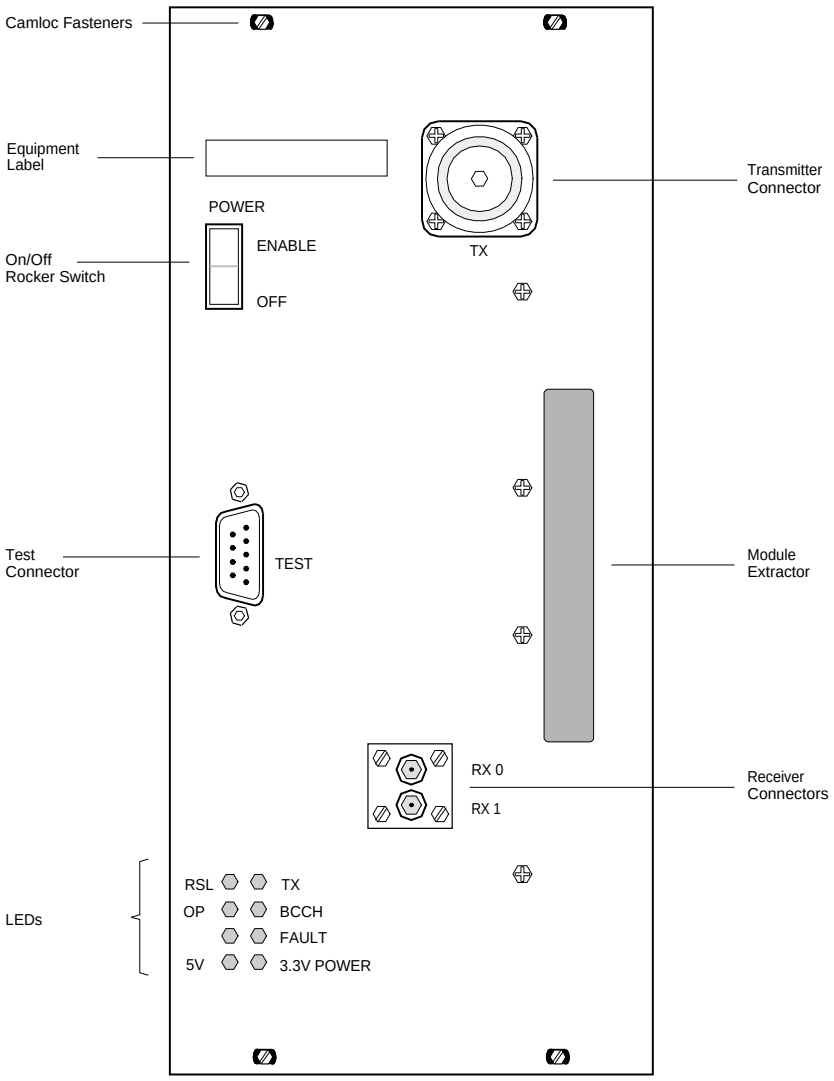


Figure 309: TRE Front Panel (TRDH, TRDM, TRGM, TRPM)

9.1.6.2 Front Panel - TADH, TAGH, TRAD, TRADE, TADHE, TRAG, TRAGE, TAGHE, TRAL, and TRAP

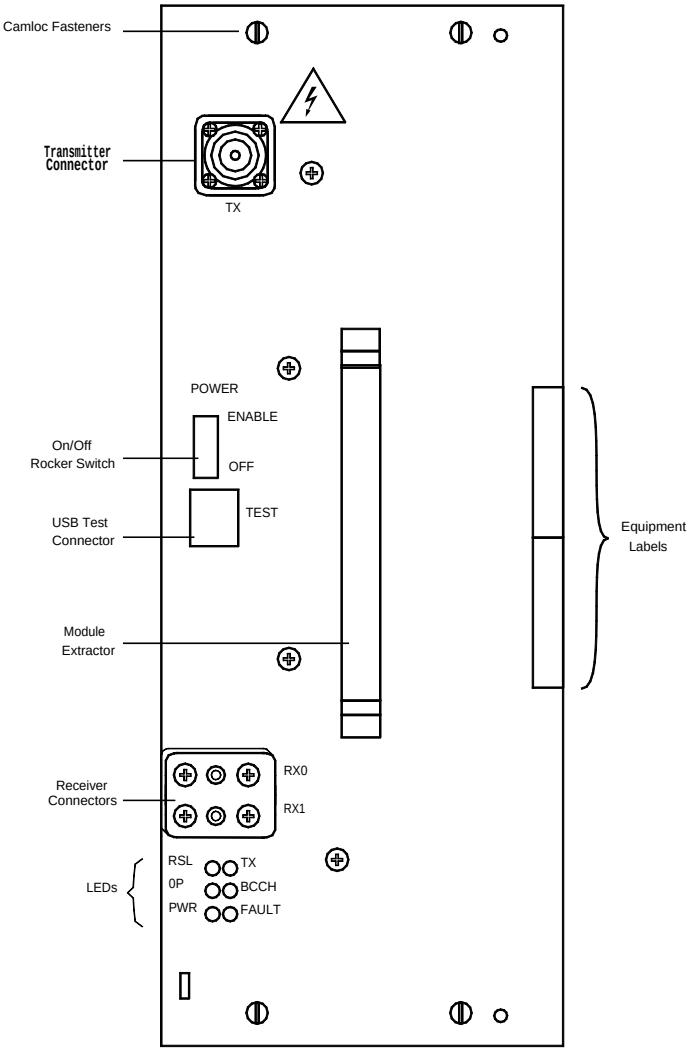


Figure 310: TRE Front Panel (TADH, TAGH, TRAD, TRADE, TADHE, TRAG, TRAGE, TAGHE, TRAL, TRAP)

9.1.6.3 Connectors

The following table describes the TRE front panel connectors.

Connector	Description
Test	Provides an interface to the TRE for factory test purposes.

Connector	Description
TX	Provides the transmit RF Interface to the AN module.
RX 0, RX 1	Provides two receive RF Interfaces from the AN module.

Table 68: TRE Front Panel Connectors

9.2 TWIN Transceiver Equipment

9.2.1 Introduction to TWIN TRA

The TWIN TRA combines digital baseband and analog RF functions in one module.

The architecture is split into three functional blocks:

- Digital part TRA-D
- Analog part TRA-A with two power amplifiers TGPA
- Power supply TGPS.

The TRA-D and TRA-A are implemented in one submodule TGDA.

The TWIN TRA basic architecture is shown in the following figure.

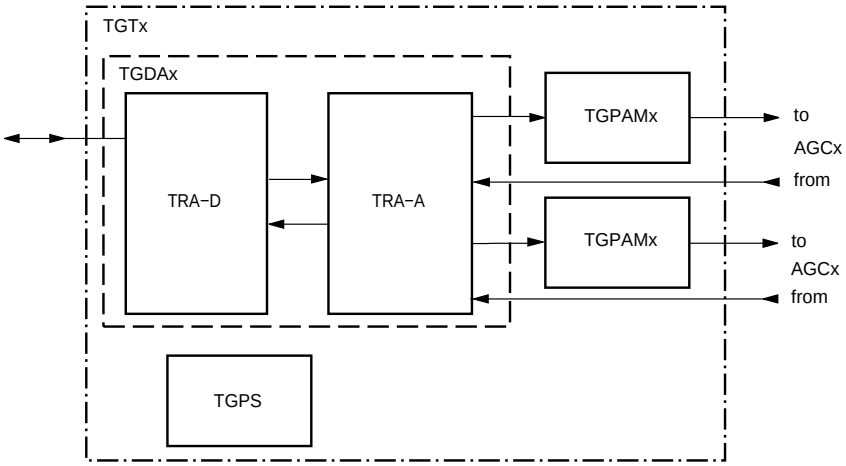


Figure 311: TWIN TRA Basic Architecture

The TWIN TRA performs the digital functions interface to the SUM and the analog functions interface to the AN module. The TWIN TRA contains its own integrated power supply.

The following types of TWIN TRA modules are available for the different BTS A9100 variants:

- TGT09, TWIN TRA medium power module for GSM 900
- TGT18, TWIN TRA medium power module for GSM 1800

9.2.2 Digital Functions

9.2.2.1 TRA-D Architecture

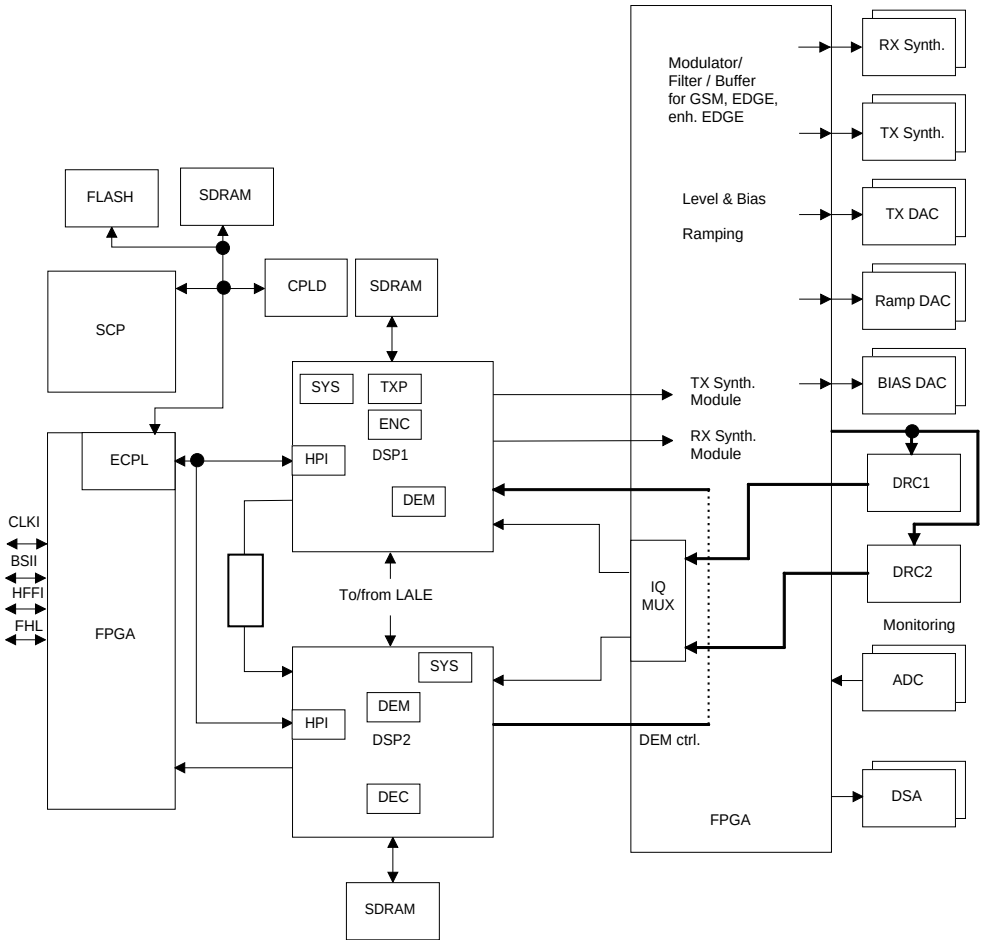


Figure 312: TRA-D Architecture

The TRA-D consists of the following functional entities:

- Signalling and Control Processor (SCP)
- Digital Signal Processor 1 (DSP1)
- Digital Signal Processor 2 (DSP2)
- Field Programable GateArray (FPGA)
- Flash Memory
- SDRAM
- Glue Logic (CPLD)
- Diversity Receiver Chip (DRC).

9.2.2.2 TRA-D System Interfaces

Interface	Description
BCB	Base station control bus: used for Remote Inventory (RI) read write and for controlling and supervision of the power supply.
ADR	Module address: provides a unique address to each module in the BTS. Used to set BCB physical BCB terminal address and BSII HDLC address.
RCD	Remote cabling detection: detects DC voltage variations on the TRA-A receiver inputs.
BSII	Base station internal interface: transfers all TCH-related data (traffic and signaling) and internal O&M data.
FHL	Frequency hopping link: used for downlink baseband frequency hopping.
HFFI	Hook for future interface, is a spare interface and can be used for future extensions.
CLKI	Clock interface: used to distribute the Evolium BTS A9100 master clock and the frame clock multiplexed on the same line with the frame number in a serial format.
TDTI	Proprietary interface used as debug and test interface.
MMI	Debug interface: for TGTx (development and validation only).
RPI	Remote power interface: consists of: ▶ Power lines for TGD-A DC supply TGPS ▶ ON/OFF control of the power supply ▶ Alarm handling for the TGPS DC input and DC output signals.
LEDs	Front panel LED control.
PSwitch/ Reset	Manual front panel power switch: disables the TGPS for TRA maintenance (security function for actions on RF cables). Also used to generate the push button reset (PB_SRST) with fast OFF/ON sequence.

Table 69: TRED Interface Descriptions

9.2.2.3 Signalling and Control Processor

The SCP is responsible for the basic initialisation including the boot of the DSPs and signalling processing. It communicates with the O&M and performs the needed actions.

9.2.2.4 Digital Signal Processor 1

The DSP1 performs the telecom Layer 1 functions of the TXP, ENC and DEM.

9.2.2.5 Digital Signal Processor 2

The DSP1 performs the telecom Layer 1 functions of the DEC and DEM.

9.2.2.6 Field Programable Gate Array

The FPGA integrates the following functions:

- **TX Data Module**
  Buffer, modulator tables, filter, gain and offset adjust.
- **Ramping Module**
  Ramping control interface to ramping DAC.
- **Level and BIAS Module**
  BIAC control interface to BIAS DAC.
- **Power Switch Module**
  Switches power supply with exact timing.
- **TX Synthesizer Module**
  Interface to TX synthesizers.
- **RX Synthesizer Module**
  Interface to RX synthesizers.
- **GTA Module**
  Interface to GTA's.
- **Monitoring Module**
  Receives monitoring data. Perform demultiplexing and storing of the monitoring data in corresponding registers.

9.2.2.7 Flash Memory

Flash Memory is used to store the TWIN TRA origin software and the software packages.

9.2.2.8 SDRAM

SDRAM dedicated working memory for SCP and DSP.

9.2.2.9 CPLD

Contains the necessary glue logic for the SCP.

9.2.2.10 DRC

Diversity Receiver Chip integrates the interface between the digital and analog baseband part in receive direction.

9.2.3 Analog Functions

9.2.3.1 TGTx Analog Architecture

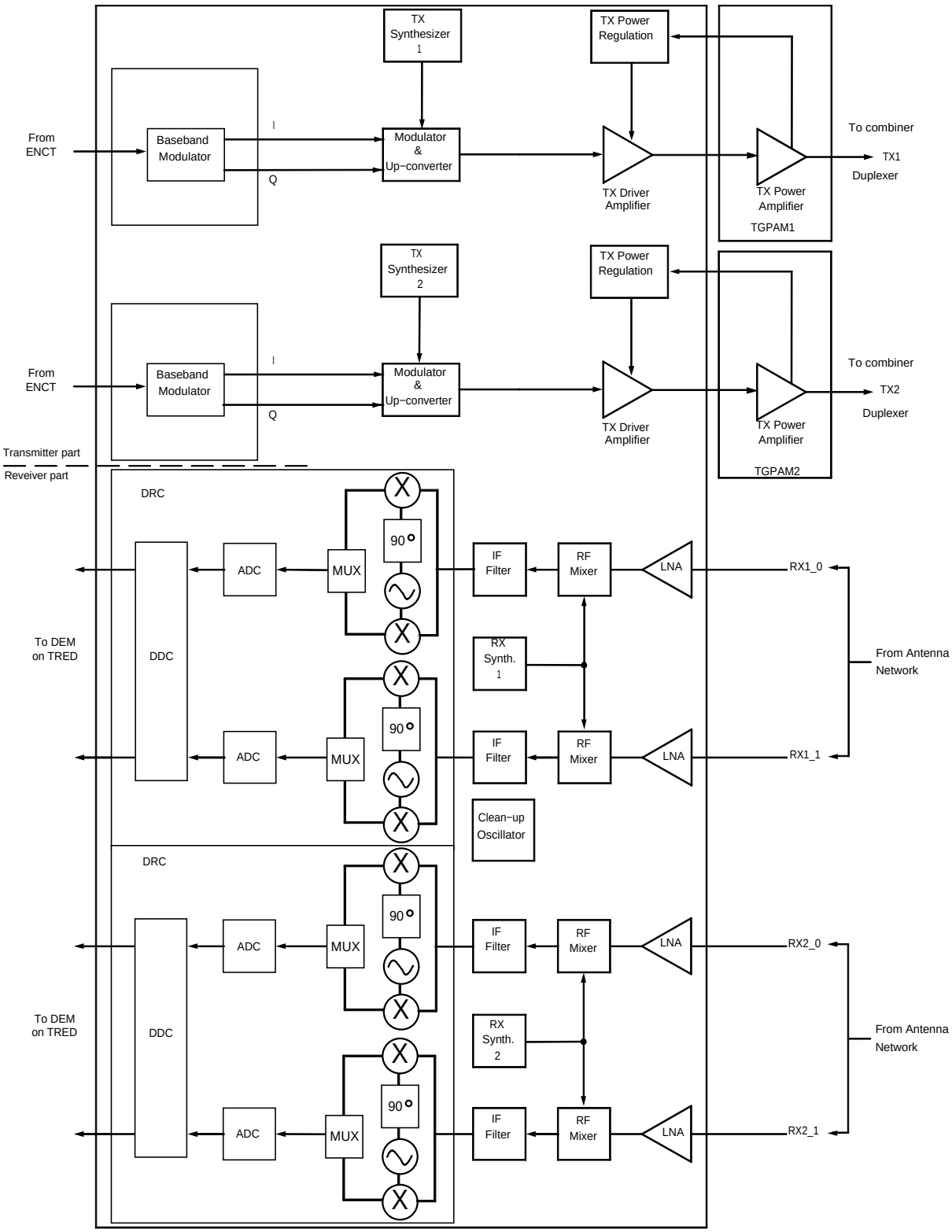


Figure 313: TGTx Analog Architecture

9.2.3.2 TGTx Analog Functional Entities

The following table gives a short description of each of the TWIN TRA analog functional entities.

Baseband Modulator	The baseband modulator transforms the incoming digital data stream into two baseband signals: I and Q. These baseband signals are fed to the up-converter. The modulation is GSMK modulation or EDGE.
I/Q Modulator and Up-converter	The I/Q baseband signals are fed to the up-converter. Then they are transformed into the RF frequency band.
Transmitter Amplifiers	The TX amplification stages are physically split between the TGDAx and TGPAMx sections (see Figure *313*). The stages comprise the following three components: ▶ TX Driver Amplifier The TX Driver Amplifier stage is located on the TGDAx. It consists of a preamplifier, power control circuitry, and a main amplifier. ▶ Power Regulation The Power Regulation stage is located on the TGDAx. It consists of a control path and a multiplexing detection path. An Flash is used to store data for calibrating the transmitter output power. ▶ TX Power Amplifier. The TX Power Amplifier is located on the TGPAMx part of the module. It provides the final amplification stage for the transmit RF signal, from the TGDAx. It feeds the amplified RF signal to the AN module, as required.
Clean-up Oscillator	The Clean-up Oscillator provides spectrally pure reference clocks required for synchronization of the transmitters, receivers and synthesizers.
Transmitter Fast Hopping Synthesizers	The Transmitter Fast Hopping Synthesizers generate the RF frequencies for the transmitter.

Receivers	The main functions of the receivers are: ▶ Low noise amplification ▶ Down conversion ▶ IF filtering ▶ BB sampling ▶ Digital I/Q demodulation ▶ Digital Baseband filtering ▶ Digital Decimation.
Receiver Synthesizers	The Receiver Fast Hopping Synthesizers generate the RF frequencies for the receiver.

Table 70: TWIN TRA Analog Part Functional Entities

9.2.4 TWIN TRA Power Supply

The TGPS is an on-board power supply, providing all the necessary voltages and currents for the TWIN TRA analog and digital functions.

9.2.4.1 Voltages

For normal operational requirements, the DC input voltage V_{in} can be any value between -38.4 VDC and -72 VDC. If the input is too low, the power supply switches OFF automatically. When the input voltage is restored, the power supply switches back ON. If the input voltage falls below -38.4 VDC, the output is maintained within the specified values, until the TRA power supply switches off.

The following table provides the TRA power supply output voltage parameters.

Output Voltage	Tolerance	Min. Value	Max. Value
+ 1.2 V	±3 %	+ 1.164 V	+ 1.236 V
+ 3.3 V	±3 %	+ 3.2 V	+ 3.4 V
+ 5.3 V	±3 %	+ 5.14 V	+ 5.46 V
+ 6.5 V	±2 %	+ 6.37 V	+ 6.63 V
+ 24 V	±2 %	+ 23.52 V	+ 24.48 V
+.30 V	±2 %	+ 29.4 V	+ 30.6 V

Table 71: Output Voltage Parameters

9.2.4.2 Fuse

The TWIN TRA power supply input is protected by a fuse with a high-breaking capacity (25 A).

9.2.4.3 ON/OFF Switch

The TWIN TRA module is equipped with an ON/OFF power switch. It is a rocker type switch, fitted slightly below the front panel's profile to prevent accidental switching.

9.2.4.4 Remote Switching

The TGPS can be remotely switched ON and OFF by the OMU, via the BCB. This feature is implemented on the module with an optically isolated ON/OFF switch.

9.2.4.5 Low Voltage Alarms

If an output voltage falls below a preset threshold value, an alarm is raised. The following table gives the minimum and maximum threshold values. The values are measured across the output connector pins.

Output Voltage	Treshold Min.	Treshold Max.
+ 1.2 V	+ 0.984 V	+ 1.116 V
+ 3.3 V	+ 2.7 V	+ 3.0 V
+ 5.3 V	+ 4.4 V	+ 4.8 V
+ 6.5 V	+ 5.3 V	+ 6.0 V
+ 24 V	+ 20.4 V	+ 22.3 V
+30 V	+ 25.5 V	+ 27.9 V

Table 72: Low Voltage Alarm Thresholds

9.2.5 Transceiver Equipments Front Panel

The following figures show the TWIN TRA front panel.

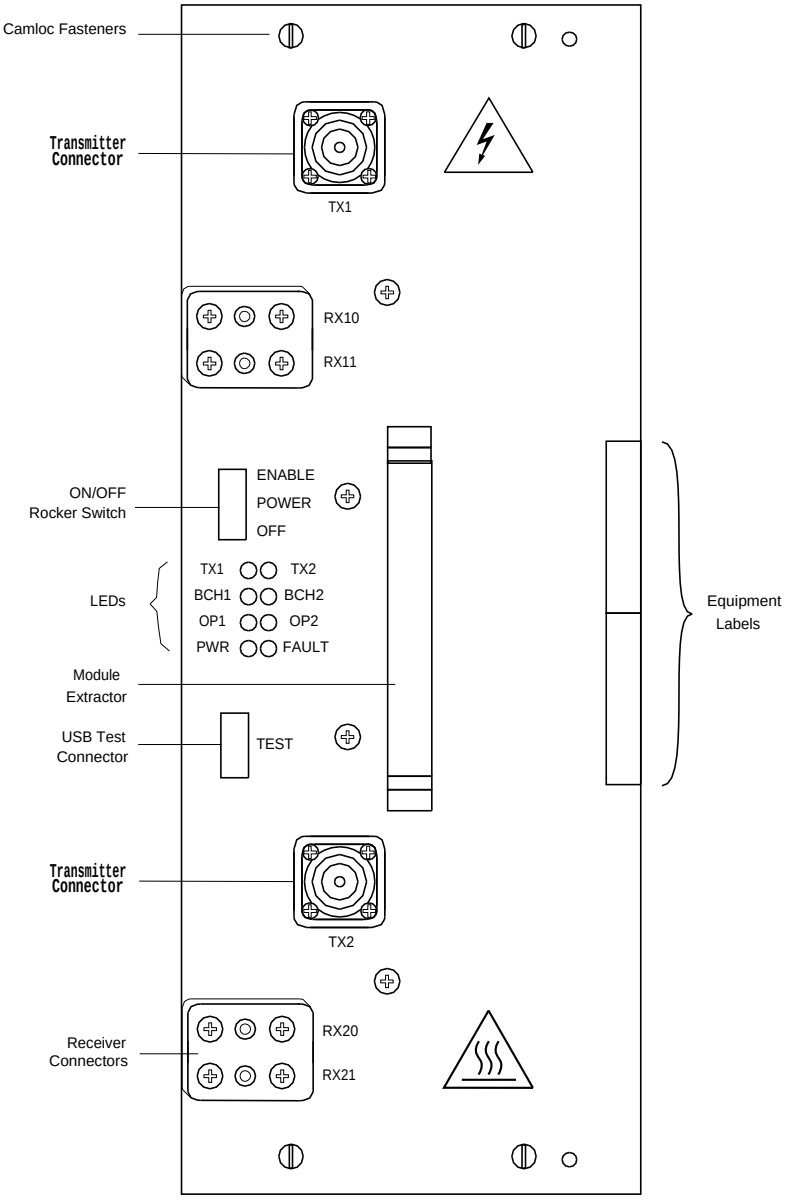


Figure 314: TWIN TRA Front Panel

9.2.6 Transceiver Equipments LEDs

There are 8 LEDs on the front panel, which provide a visual indication of the operational status of the TWIN TRA module (see Figure *314*).

The green “Power” and the red “FAULT” LED are common for both TRX.

For the yellow LEDs, each column represents one TRX.

The following table describes the LEDs and their various operational states.

LED	Color	Status	Description
TX1, TX2	Yellow		Transmission status (not BCCH)
		ON	At least one dedicated channel is activated on the TRX (x) (CS-traffic onTCH or signalling on SDCCH)
		Blinking	No dedicated channel (TCH/SDCCH) is activated on the TRX (x), but the TRX (x) may be emitting Dummy Bursts or GPRS-bursts
		OFF	The TRX (x) is not emitting RF for TCH
OP1, OP2	Yellow		TRE operational status
		ON	The TRX (x) is fully operational with telecom parameters
		Blinking Normal	The TRX (x) has received the Configure Request, configuration is ongoing
		Blinking Fast	The TRX (x) is O&M operational with RSL established, waiting for Telecom-configuration
		OFF	Not operational
BCH1, BCH2	Yellow		BCCH transmission status
		ON	The TRX (x) is configured as BCCH-TRX and emitting the BCCH
		OFF	The TRX (x) is configured as TCH-TRX
PWR	Green		Status of the TRE power supply output voltages
		ON	The module is powered ON
		OFF	The module is powered OFF
FAULT	Red		Alarm status
		ON	The TRA has entered the ‘Out-of-order’ state
		Blinking	At least one non-fatal alarm is active
		OFF	All alarms are ‘OFF’, the ‘Alarms-in-force-lists’ (AIFL) of both TRX are empty

Table 73: TWIN TRA LED Descriptions

9.2.7 Transceiver Equipments Connectors

The following table describes the TWIN TRA front panel connectors.

Connector	Description
Test	Provides an interface to the TRE for factory test purposes.
TX1, TX2	Provide two transmit RF Interface to the AN module.
RX10, RX20	Provide two receive RF Interfaces from the AN module via the normal path.
RX11, RX21	Provide two receive RF Interfaces from the AN module via the antenna diversity path.

Table 74: TWIN TRA Front Panel Connectors

10 Antenna Networks

The sections are supported with diagrams where necessary, showing the functional blocks and their interfaces.

Drawings of the physical appearance of the modules are also included, showing LED indicators, connectors and controls.

10.1 ANX

The ANX provides the intermediate RF stage between the TREs and the antenna. The following figure shows the basic architecture.

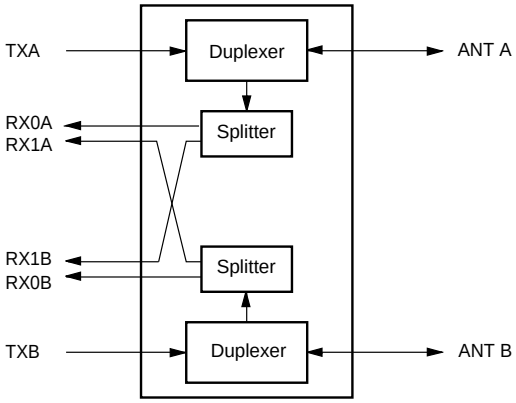


Figure 315: ANX Basic Architecture

On the downlink, the ANX connects two TRE transmitters to two antennas. On the uplink, it splits the received signals and passes them to the TRE receivers.

The following types of ANX modules are available for the different BTS A9100 variants:

- ANXG, ANX module for GSM 900
- ANXD, ANX module for GSM 1800
- ANXP, ANX module for GSM 1900.

The following figure shows the ANX in more detail. The shaded areas identify the uplink functions.

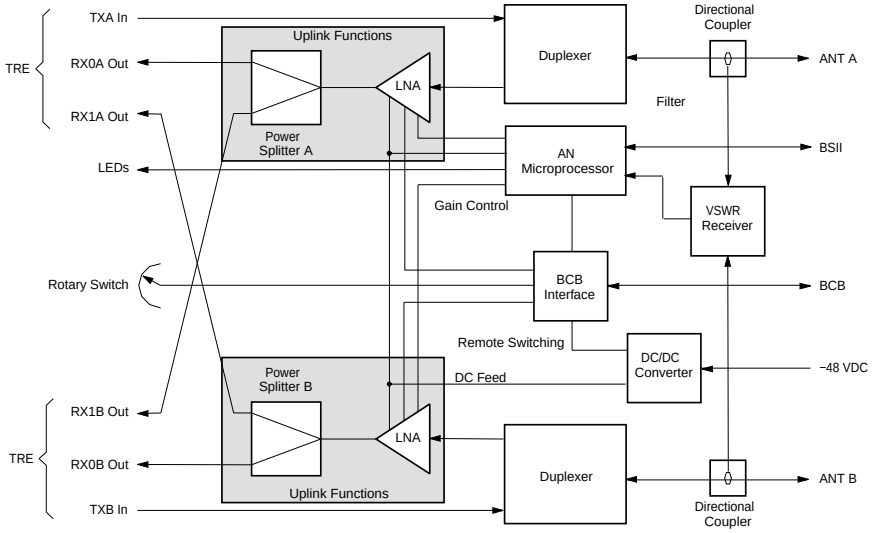


Figure 316: ANX Architecture

The duplexers provide coupling of the transmitted and received signals, allowing a single antenna to be used for both downlink and uplink channels.

The ANX also allows the return loss of the transmitted signals to be measured, at the antenna connector, using VSWR techniques.

The uplink channel comprises amplifiers, with remotely-adjustable gain control, remote DC feed and power splitters.

10.1.1 AN Downlink Functions

The downlink functions are performed by the components shown in the following table.

Downlink Component	Description	No. of Components			
		ANX	ANC	ANB	AGC
Combiner	The combiner is used to connect two TX inputs to the single antenna. Connection between the combiner output TX..OUT and the input to the duplexer TX..IN is made by a link on the front panel of the AN.	-	2	-	2
Duplexer	The duplexer provides the coupling function for the transmitted and received RF signals. The duplexer provides a bi-directional signal path. Thus a single antenna can be used for the transmission and reception of both downlink and uplink channels. The downlink path functions of the duplexer are provided by a transmit filter, which: ▶ Provides a transmitter path to the antenna ▶ Suppresses unwanted emissions outside the downlink band, especially emissions that fall into the uplink band ▶ Prevents downlink signals from blocking the receiver ▶ Prevents noise or spurious emissions in the downlink signal from causing interference in the receive band.	2	2	2	2
Directional Coupler	The antenna directional coupler comprises a dual directional coupler. It monitors the VSWR forward and reflected power at the antenna connector. These values are used to measure the return loss of the antenna (refer also to *Antenna Network Controller (Section 10.1.4)* for a description of the VSWR receiver).	2	2	2	2
Bias T	The interface provides the DC supply for the optional Tower Mounte Amplifier	-	-	-	2

Table 75: ANX/ANC/AGC/ANB, Downlink Components

10.1.2 AN Uplink Functions

The uplink functions are performed by the components shown in the following table.

Uplink Component	Description	No. of Components			
		ANX	ANC	ANB	AGC
Duplexer	The duplexer provides the coupling function for the transmitted and received RF signals. The duplexer provides a bi-directional signal path. Thus a single antenna can be used for the transmission and reception of both downlink and uplink channels. The uplink path functions of the duplexer are provided by a receive filter, which: ▶ Provides an RF path from the antenna to the receiver ▶ Suppresses unwanted signals outside the uplink band ▶ Prevents downlink signals from entering the receiver.	2	2	2	2
LNA	The LNA amplifies the received RF signals. The LNA consists of a balanced amplifier configuration, designed to provide good VSWR values, noise compression and good reliability. The LNA contains a digital step-attenuator for controlling the overall gain of the antenna network. The attenuator compensates for any losses in the connecting cables, for example, when an ANY module is used.	2	2	2	2
Remote DC Feed	The remote DC feed is used for feeding a + 5 V TTL signal to the receiver output ports. This is used to provide an indication of the status of the antenna cable connections.	1	1	1	1
Power Splitter	A power splitter distributes the received signals to two separate outputs. It also supports the correct grouping of the connectors, which simplifies the external cable interconnections for the BTS A9100 modules.	2	2	2	2

Table 76: ANX/ANC/AGC/ANB, Uplink Components

10.1.3 BTS Control Bus Interface

The BCB Interface is located on the backplane. It interfaces the data and control signals to the BCB as listed in the following table.

Signal	Description
RI	The Remote Inventory stores data such as the RIT name, module type, frequency band, diversity and duplexer type.
Power Supply Control	The BCB Interface supports remote on/off switching of the DC/DC converters. They are switched with an optically-isolated switch on the power supply.
DC Line Supervision	The BCB Interface delivers a TTL level signal which is used by the remote DC feed. A circuit in the TRE detects the signal and feeds back a status message to the BCB (refer to *AN Uplink Functions (Section 10.1.2)* for information about the remote DC feed).
Rotary Switch	The BCB Interface is connected to a rotary switch on the ANX front panel. The switch position is associated with the antenna sector, in sectorized configurations. The switch position is read via coded address lines.

Table 77: ANX/ANC/AGC/ANB, BCB Interface

10.1.4 Antenna Network Controller

The ANCON is responsible for maintaining the operation of the ANX.

Its principal functions are:

- Setting the LNA gain for the assigned TREA receiver
- Supervising LNA alarms
- Measuring antenna VSWR
- Reporting VSWR alarms
- Selecting the antenna sector
- Detecting RF cabling status
- RI, via the BCB Interface
- Remote power on/off, via the BCB Interface
- Status display, via front panel LEDs.

The following figure shows the ANCON architecture. The shaded areas represent hardware shared by different functions.

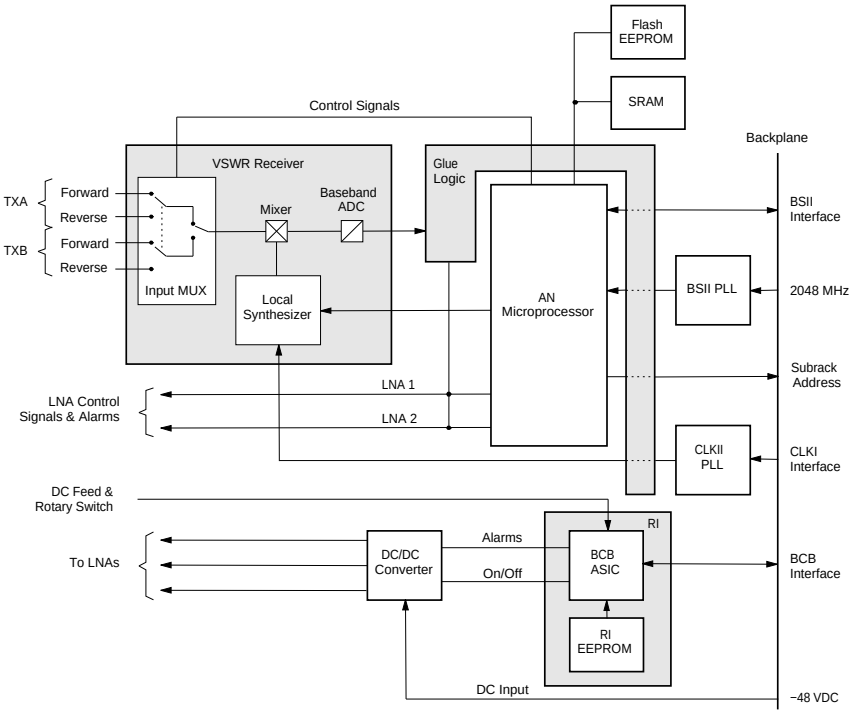


Figure 317: ANCON Architecture

The ANCON functional entities are described in the sections below.

10.1.4.1 VSWR Receiver

The VSWR receiver is a selective VSWR meter which measures the forward and reflected (reverse) power of the transmitters. The VSWR is measured at the output of the duplexer couplers, and fed to an RF MUX in the receiver (see Figure *317*).

The VSWR receiver consists of:

- Local synthesizer
- Input MUX.

A local synthesizer generates a signal which is used to compare the baseband frequency with the ARFCN. The local synthesizer is set to the ARFCN frequency by the AN microprocessor.

The input MUX provides the RF inputs to the VSWR receiver. It provides a selective input of the forward and reverse power from transmitters A and B. The input MUX operates under the control of the AN microprocessor.

10.1.4.2 BSII Frame Clock PLL

The BSII frame clock PLL recovers the BSII frame clock from the backplane. The clock outputs are used for BSII communications, the AN microprocessor and the PLL lock-detect signal.

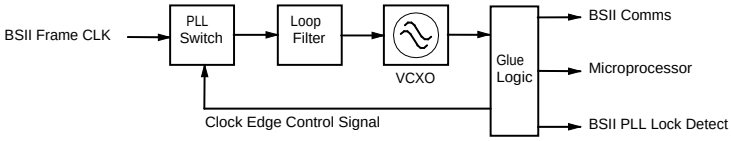


Figure 318: ANCON, BSII Frame Clock PLL

10.1.4.3 CLKII Clock PLL

The CLKII clock PLL recovers the BSII master clock from the backplane. The clock outputs are used for the local synthesizer reference clock, the 'start conversion' signal for the baseband ADC and the CLKII lock-detect signal.

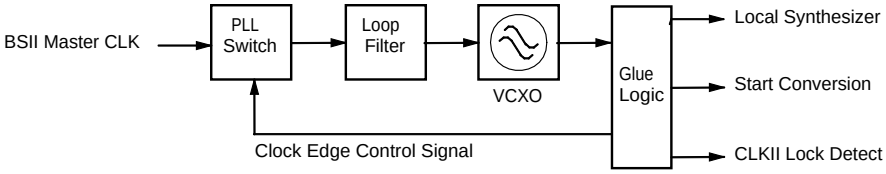


Figure 319: ANCON, CLKII Clock PLL

10.1.4.4 AN Microprocessor

The AN microprocessor performs LNA alarm supervision and gain setting, and control of the status LEDs. It also provides an interface to the baseband ADC in the VSWR receiver (see Figure *317*).

The microprocessor compares the ADC output with known VSWR values. If the VSWR exceeds predefined thresholds, an alarm is raised (refer to Table *ANX LED Descriptions (80)*). If the reflected power is very high, the transmitters are shut down to avoid possible damage to equipment. High reflected power can be caused by, for example, a break in the antenna coupling.

The AN microprocessor hardware consists of a QUICC microprocessor supported by two memory devices, a Flash EEPROM and an SRAM.

10.1.4.5 Glue Logic

Glue logic consists of a number of registers, implemented on a single CPLD device. It also converts 5 V TTL signals to 3.3 V, required by the Power QUICC microprocessor.

The Glue logic maintains the following interfaces and/or functions:

- AN microprocessor to the BSII
- Board/module address register
- Baseband ADC
- LNA error register
- LNA gain adjustment register.

The Glue logic also controls the BSII frame clock PLL and the CLKII master clock PLL with a clock edge control signal (see Figure *318* and Figure *319*).

10.1.4.6 Remote Inventory

Remote Inventory is used to store information about the ANX module (part number, name, serial number, etc.). It consists of an EEPROM which is connected to the BCB ASIC. The stored information is read via the BCB Interface.

10.1.5 AN Power Supply

The ANPS is a DC/DC converter, providing all the necessary voltages for the ANX/ANC components.

10.1.5.1 Voltages

The following table provides ANPS input/output voltage parameters.

Voltage	Value
V_{in}	-38.4 VDC $_{min.}$
	-72 VDC $_{max.}$
	-48 VDC to -60 VDC $_{nom.}$
V_{out}	+ 5.1 VDC ±3 %
	+ 12 VDC ±3 %

Table 78: ANPS Input/Output Voltage Parameters

Normal operation of V_{out} is unaffected by temperature fluctuations in the range -10^{o} C to 70^{o} C.

10.1.5.2 Fuse

The input of the ANPS is protected by a fuse with a high-breaking capacity (15 A).

10.1.5.3 Protection

The ANPS circuitry is protected against short circuit and accidental polarity inversion on its inputs.

10.1.5.4 Grounding

Ground continuity for the module is achieved with ground pins on the subrack backplane which connect to the bus bar ground.

10.1.5.5 Remote Switching

The ANPS can be remotely switched on and off by the OMU, via the BCB. This feature is implemented on the module with an optically isolated on/off switch.

10.1.5.6 Low Voltage Alarms

Alarms are raised if the voltage level is too low. The following table provides the low voltage threshold tolerances for ANPS alarms.

Voltage	Threshold Min.	Threshold Max.
Vin	30.4 V	38.4 V
5.1 V	4.2 V	4.6 V
12 V	10.0 V	11.0 V

Table 79: ANPS Alarm Thresholds

10.1.6 ANX LEDs and Alarms

This section provides information on the ANX's LEDs and Alarms.

10.1.6.1 LEDs

There are eight LEDs on the front panel, which provide a visual indication of the operational status of the ANX module. The following table describes each LED and their various operational states.

LED	Color	Status	Description
VSWR A	Yellow		VSWR status of Antenna 1.
		On	Good VSWR.
		Slow Blinking	Threshold 1 reached.
		Fast Blinking	Threshold 2 reached.
		Off	VSWR not supervised.
VSWR B	Yellow		VSWR status of Antenna 2.
		On	Good VSWR.
		Slow Blinking	Threshold 1 reached.
		Fast Blinking	Threshold 2 reached.
		Off	VSWR not supervised.
O and M	Yellow	-	O and M status.
		On	IOM link operational.
		Off	IOM link not established.
ALARM	Red	-	Alarm status (both LEDs are connected in parallel)
		On	IOM link operational
		Blinking	Non-urgent alarm.
		Off	IOM link not established.
5 V	Green	-	Status of + 5 V power supply.
		On	+ 5 V present.
		Off	+ 5 V faulty.
12 V	Green	-	Status of + 12 V power supply.
		On	+ 12 V present.
		Off	+ 12 V faulty.

Table 80: ANX LED Descriptions

10.1.6.2 Alarms

The ANX detects the alarm conditions shown in the following table.

VSWR	The AN microprocessor can raise four alarms when VSWR values exceed certain preset thresholds. The values are downloaded from the OMU software. There is a non-urgent and an urgent alarm for each antenna.
Amplifier	There are two amplifier alarms for each LNA. One indicates degraded amplifier performance, and the other a total failure. A total failure is regarded as performance that is below a usable output.
DC line supervision	The remote + 5 V TTL DC feed signal is used for supervision of the RF cabling continuity. A circuit in the TREA receiver detects the signal and a message is fed back, via the BCB.

Table 81: ANX/ANC/AGC/ANB Alarm Conditions

10.1.7 ANX Performance Characteristics

The performance characteristics of the ANXs/ANCs are shown in the following table.

Parameter	GSM 900	GSM 1800	GSM 1900
Transmit band.	925 - 960 MHz	1805 - 1880 MHz	1930 - 1990 MHz
Receive band.	880 - 915 MHz	1710 - 1785 MHz	1850 - 1910 MHz
Power for each transmitter channel input.	45 W maximum	63 W maximum	45 W maximum
Number of channels.	174	374	299
Bandwidth for each channel.	200 kHz	200 kHz	200 kHz
Return loss at receive port.	> 18 dB	> 18 dB	> 18 dB
Return loss at transmit port.	> 18 dB	> 18 dB	> 18 dB
Return loss at antenna port.	> 18 dB [1)]	> 18 dB	> 18 dB
Return loss at coupler port.	> 18 dB	≥ 18 dB	≥ 18 dB
Group delay distortion in transmit band.	≤100 ns	≤ 100 ns	≤ 100 ns
Isolation between receive port and antenna port.	>30 dB	>30 dB	> 30 dB
Isolation between receive ports.	22 dB	22 dB	> 22 dB
Isolation between transmit ports (A to B/ 1 to 2).	>50 dB/ 22 dB	>50 dB/ 22 dB	>50 dB/ 22 dB
Insertion loss in transmit pass band.	0.3 - 1.6 dB	< 0.3 - 1.6 dB	< 0.3 - 1.6 dB
Intermodulation products at antenna port with 2x 20 W signals at one transmit port and 50 Ω on receive port in receive band.	<-103 dBm	<-103 dBm	<-103 dBm
Intermodulation products at antenna port with 2x 20 W signals at one transmit port and 50 Ω on receive port in transmit band.	<-75 dBc	<-75 dBc	<-75 dBc
RF input impedance.	50 Ω	50 Ω	50 Ω
RF output impedance.	50 Ω	50 Ω	50 Ω
1) For ANX with bridge: >16 dB.			

Table 82: ANX Performance Characteristics

10.1.8 ANX Front Panel

The following figure shows the layout and O and M features of the ANX's front panel.

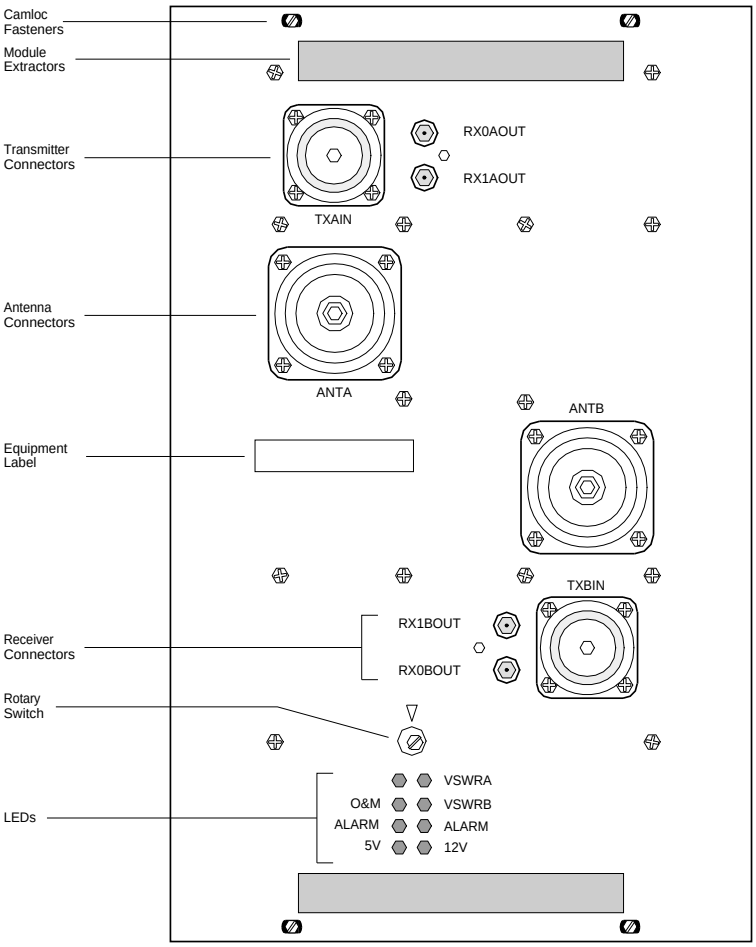


Figure 320: ANX Front Panel

The ANX has two transmitter input connectors and four receiver output connectors on its front panel. Therefore, one ANX module can be interfaced to two TRE modules, or an ANY module if used.

The following table describes the ANX front panel connectors.

Connector	Description
TXAIN TXBIN	Provides the RF transmitter interfaces from two TRE modules, or an ANY module if used.
RX0AOUT RX1AOUT	Provides the RF receiver interfaces between antenna A and the first TRE receiver connectors RX0 and RX1, or an ANY module if used.
RX0BOUT RX1BOUT	Provides the RF receiver interfaces between antenna B and the second TRE receiver connectors RX0 and RX1, or an ANY module if used.
ANTA ANTB	Provides the RF interface to/ from two antennas, A and B.

Table 83: ANX Front Panel Connectors

10.2 ANY

The ANY is a passive RF module, having neither a controller nor a power supply. It is an optional RF distribution device, which is used to expand the capacity of the ANX/ANC. Therefore, it is basically an extension unit to the ANX/ANC module.

The following types of ANY modules are available for the different BTS A9100 variants:

- ANYD, ANY module for GSM 1800
- ANYDH, ANY module for GSM 1800 high power
- ANYG, ANY module for GSM 900
- ANYGH, ANY module for GSM 900 high power
- ANYL, ANY module for GSM 850
- ANYP, ANY module for GSM 1900.

NOTICE

GSM 850 is not supported by all BSS software releases. If you are in doubt, contact Alcatel support.

The following figure shows the logical position of the ANY in relation to the TREs and the ANX. The signal paths are also indicated.

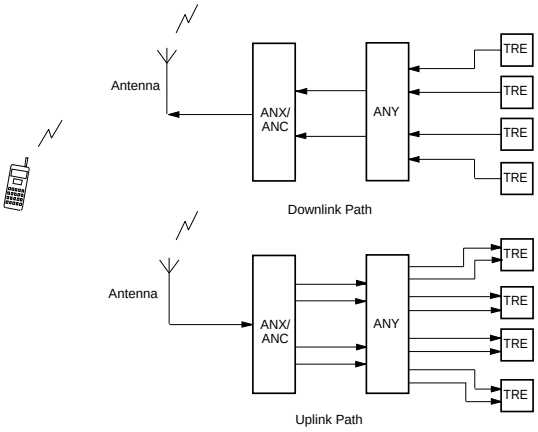


Figure 321: ANY Relationships

The ANY performs functions for both the:

- Downlink path
  The RF signals coming from the TREs enter the ANY at four TX connectors on the front panel. They are combined in pairs by RF combiners and fed to two TX output connectors. The ANY performs a 4:2 reduction of the TRE transmitter outputs. The two concentrated outputs are coupled to the ANX/ANC inputs, via external RF cables.
- Uplink path.
  Each of the four RF signals from the ANX/ANC passes through a 1:2 RF splitter. These signals are distributed in four groups to the TREs, via external RF cables. Each group provides a path for antenna diversity and non-diversity.

10.2.1 ANY Functions

The following figure shows the method of combining the transmitter outputs and distributing the receiver inputs.

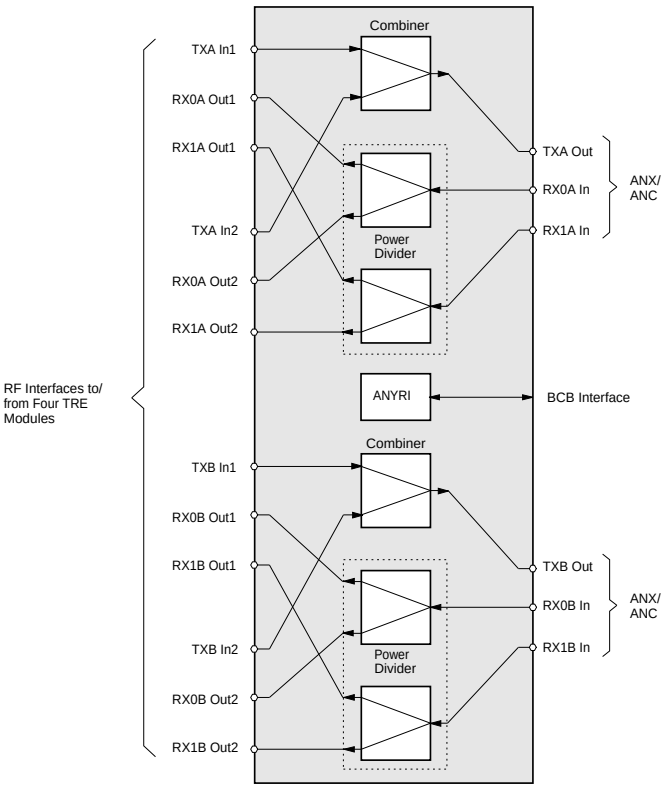


Figure 322: ANY Architecture

The ANY consists of the functional entities shown in the following table.

Combiner	The Combiner consists of two hybrid devices. Each device concentrates two transmitter outputs into one, thus halving the number of antennas required. The combiner takes the TX outputs from four TREs, via external cabling, and feeds them to the TXIN connectors on the ANX/ANC.
Power Dividers	The Power Dividers split and distribute the received RF signals, from the ANX module, to four outputs. The outputs are connected, via external cabling, to the inputs of the TRE module. There are two Power Dividers in each ANY module, each consisting of two splitters, providing diversity and non-diversity paths.
BCB Interface	The BCB interface is located on the subrack backplane. It interfaces the following ANYRI data to the BCB Bus: ▶ Inventory ▶ Subrack position of the ANY ▶ Subrack number.
ANY Remote Inventory	The ANYRI is specifically designed to hold Remote Inventory data for the ANY module. It is functionally and physically separate from the RF part of the ANY. The ANYRI consists of three components: ▶ BCB Interface driver ▶ BCB ASIC ▶ Serial EEPROM. The inventory data, which is held in a serial EEPROM, is transferred via the BCB ASIC and the BCB Interface. The ANYRI components are powered from a DC supply, which is present on the backplane.

Table 84: ANY, Functional Entities

10.2.2 ANY Performance Characteristics

The performance characteristics of the ANY are shown in the following table.

Parameter	GSM 850	GSM 900	GSM 1800	GSM 1900
Transmit band.	869 - 894 MHz	925 - 960 MHz	1805 - 1880 MHz	1930 - 1990 MHz
Receive band.	824 - 849 MHz	880 - 915 MHz	1710 - 1785 MHz	1850 - 1910 MHz
Power for each transmitter channel input for: Medium power ANY - ANYx.	45 W maximum	45 W maximum	45 W maximum	45 W maximum
High power ANY - ANYHx.	-	63 W maximum	63 W maximum	-
Number of channels.	124	174	374	299
Bandwidth for each channel.	200 kHz	200 kHz	200 kHz	200 kHz
Insertion loss at transmit band.	3.3 ± 0.2 dB	3.3 ± 0.2 dB	3.3 ± 0.2 dB	3.3 ± 0.2 dB
Insertion loss at receive band.	3.3 ± 0.2 dB	3.3 ± 0.2 dB	3.3 ± 0.2 dB	3.3 ± 0.2 dB
Return loss at receive port.	> 21 dB	> 21 dB	> 21 dB	> 21 dB
Return loss at transmit port.	> 21 dB	> 21 dB	> 21 dB	> 21 dB
Isolation between transmit and receive ports.	> 85 dB	> 90 dB	≤ 90 dB	≤ 90 dB
Isolation between receive output ports of same coupler.	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Isolation between receive ports of different networks.	> 50 dB	> 50 dB	> 50 dB	> 50 dB
Isolation between transmit input ports of same network.	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Isolation between transmit input ports of different networks.	> 50 dB	> 50 dB	> 50 dB	> 50 dB
Intermodulation products at antenna port with 2 x 40 W (2 x 30 W for GSM 1800 and GSM 1900) signals at one transmit port and 50 Ω on receive port in receive band.	< -108 dBm	< -108 dBm	< -108 dBm	< -108 dBm

Parameter	GSM 850	GSM 900	GSM 1800	GSM 1900
Intermodulation products at antenna port with 2 x 40 W (2 x 30 W for GSM 1800 and GSM 1900) signals at one transmit port and 50 Ω on receive port in transmit band.	< -75 dBc	< -75 dBc	< - 75 dBc	< - 75 dBc
RF input impedance.	50 Ω	50 Ω	50 Ω	50 Ω
RF output impedance.	50 Ω	50 Ω	50 Ω	50 Ω

Table 85: ANY Performance Characteristics

10.2.3 ANY Front Panel

The following figure shows the layout of the ANY front panel.

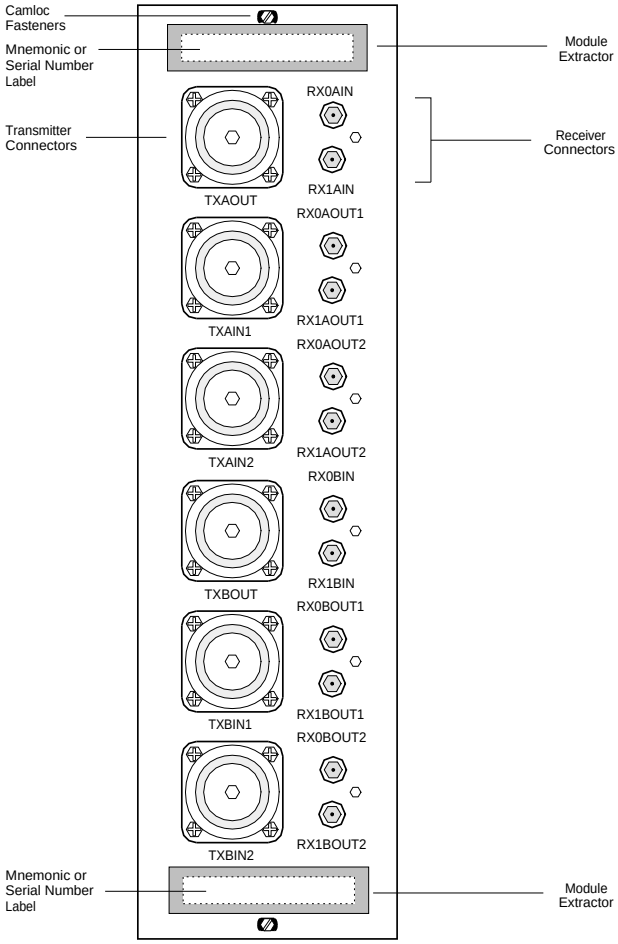


Figure 323: ANY Front Panel

10.2.3.1 Transmitter Connectors

The ANY has four transmitter input connectors and two transmitter output connectors on its front panel.

The following table describes the ANY transmitter connectors.

Connector	Description
TXAOUT TXBOUT	Provide two RF interfaces to the transmitter inputs of an ANX/ANC module.
TXAIN1, TXAIN2 TXBIN1, TXBIN2	Provide four RF interfaces from four TRE transmitter outputs.

Table 86: ANY Transmitter Connectors

10.2.3.2 Receiver Connectors

The ANY has four receiver input connectors and eight receiver output connectors on its front panel.

The following table describes the ANY receiver connectors.

Connector	Description
RX0AIN RX1AIN	Provide two RF receiver interfaces from the ANX/ANC receiver outputs RX0AOUT and RX1AOUT.
RX0BIN RX1BIN	Provide two RF receiver interfaces from the ANX/ANC receiver outputs RX0BOUT and RX1BOUT.
RX0AOUT1, RX1AOUT1 RX0AOUT2, RX1AOUT2 RX0BOUT1, RX1BOUT1 RX0BOUT2, RX1BOUT2	Each pair of connectors provide two RF receiver interfaces to the TRE receiver inputs RX0 and RX1.

Table 87: ANY Receiver Connectors

10.3 ANC

The ANC provides the intermediate RF stage between the TREs and the antenna.

Its tasks are to:

- Combine the output signals of up to four transmitters and to connect them to up to two antennas
- Feed the received signals from the antenna to the radio front end, where the signals are amplified and distributed to up to eight receivers
- Allow simultaneous transmission and receiving on antennas (duplexer)
- Provide filtering for the TX- and RX-path
- Supervise the VSWR of the antennas.

10.3.1 ANC Basic Architecture

The following figure shows the basic architecture.

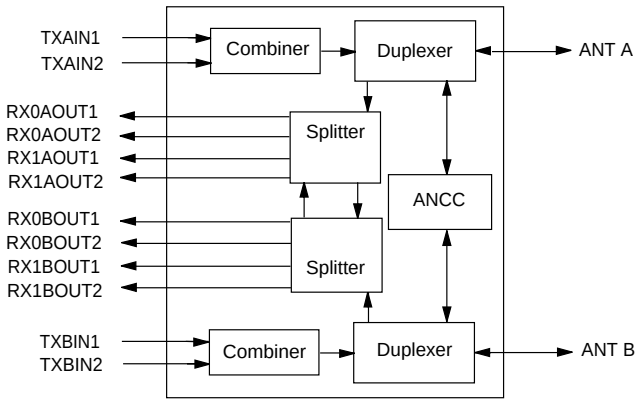


Figure 324: ANC Basic Architecture

10.3.2 ANC Detailed Architecture

The following figure shows the ANC in more detail.

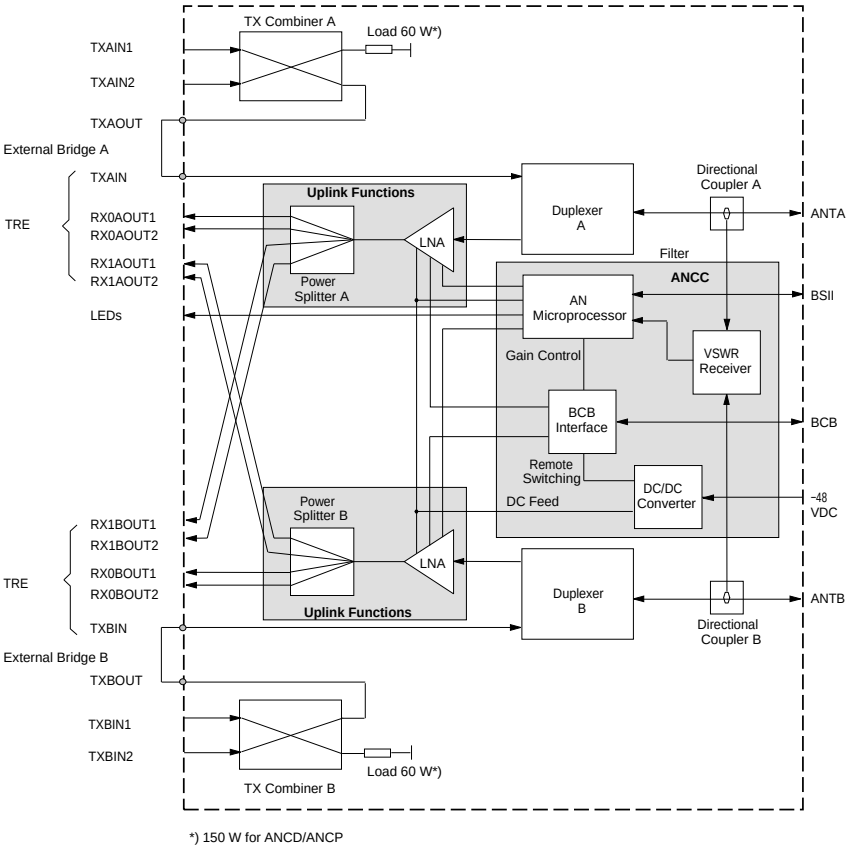


Figure 325: ANC Architecture

10.3.3 ANC Description

On the downlink, the ANC connects two TRE transmitters to two antennas. On the uplink, it splits the received signals and passes them to the TRE receivers.

The following types of ANC modules are available for the different BTS A9100 variants:

- ANCD, ANC module for GSM 1800
- ANCG, ANC module for GSM 900
- ANCGP, ANC module for PGSM 900
- ANCL, ANC module for GSM 850
- ANCP, ANC module for GSM 1900.

NOTICE

GSM 850 is not supported by all BSS software releases. If you are in doubt, contact Alcatel support.

If one transmitter is used in each branch A and B, the RF signals pass the duplexers before feeding the antennas.

If two transmitters are used in a branch, the coupler will be used in front of the duplexer. This coupler is connected by an RF cable bridge.

The duplexers provide coupling of the transmitted and received signals, allowing a single antenna to be used for both downlink and uplink channels.

The ANC also allows the return loss of the transmitted signals to be measured, at the antenna connector, using VSWR techniques.

The uplink channel comprises amplifiers, with remotely-adjustable gain control, remote DC feed and power splitters.

The ANC functions; interface, controller and power supply are given below.

Downlink Functions	The downlink functions are performed by the components shown in Table *ANX/ANC/AGC/ANB, Downlink Components (75)*.
Uplink Functions	The uplink functions are performed by the components shown in Table *ANX/ANC/AGC/ANB, Uplink Components (76)*.
BTS Control Bus Interface	The BCB Interface is located on the backplane. It interfaces the data and control signals to the BCB as listed in Table *ANX/ANC/AGC/ANB, BCB Interface (77)*.
Antenna Network Controller	From a functional point of view the ANCC is the same as the ANCON used in the ANX (but without the DC/DC converter). Therefore for a description of the ANCC, see *Antenna Network Controller (Section 10.1.4)*.
Power Supply	As part of the ANCC there is a DC/DC converter, providing all the necessary voltages for the ANC components. As the DC/DC is functionally the same as the one used in the ANX, refer to *AN Power Supply (Section 10.1.5)* for its description.

10.3.4 ANC LEDs and Alarms

This section provides information on the ANC's LEDs and Alarms.

10.3.4.1 LEDs

There are four LEDs on the front panel, which provide a visual indication of the operational status of the ANC module. The following table describes each LED and defines their various operational states.

LED	Color	Status	Description
VSWR A	Yellow		VSWR status of Antenna 2
		On	VSWR OK
		Slow Blinking	Low threshold reached
		Fast Blinking	High threshold reached
		Off	VSWR not supervised
VSWR B	Yellow		VSWR status of Antenna 1
		On	VSWR OK
		Slow Blinking	Low threshold reached
		Fast Blinking	High threshold reached
		Off	VSWR not supervised
O and M	Yellow/ Red		O and M status
		Yellow On	ANC is in O and M operational mode
		Red On	Not used. (Only active during startup LED test in case of LNA cabling error)
		Off	ANC is not operational
ALARM	Yellow/ Red		Alarm status
		Yellow On	Normal situation (FS/SW running, no alarms present, module is powered)
		Red Blinking	Non-fatal alarm present
		Off	No Power presence or LED failure
		Red On	Fatal alarm for the module or module in out-of-order state

Table 88: ANC/ANB LED Descriptions

10.3.4.2 Alarms

The ANC detects the alarm conditions shown in Table *ANX/ANC/AGC/ANB Alarm Conditions (81)*.

10.3.5 ANC Performance Characteristics

The performance characteristics of the ANCs are shown in the following table.

Parameter	GSM 850 [1]	GSM 900	GSM 1800	GSM 1900
Transmit band.	869 - 894 MHz	925 - 960 MHz 935 - 960 MHz [4]	1805 - 1880 MHz	1930 - 1990 MHz
Receive band.	824 - 849 MHz	880 - 915 MHz 890 - 915 MHz [4]	1710 - 1785 MHz	1850 - 1910 MHz
Power for each transmitter channel input.	63 W maximum	63 W maximum	63 W maximum	63 W maximum
Number of channels.	124	174	374	299
Bandwidth for each channel.	200 kHz	200 kHz	200 kHz	200 kHz
Return loss at receive port.	> 16 dB	> 16 dB	> 16 dB	> 16 dB
Return loss at transmit port.	> 16 dB [2]	> 16 dB	> 16 dB	> 16 dB
Return loss at antenna port.	> 18 dB	> 18 dB [3]	> 18 dB	> 18 dB
Return loss at coupler port.	> 18 dB	> 18 dB	≥ 18 dB	≥ 18 dB
Group delay distortion in transmit band.	≤100 ns	≤100 ns	≤ 100 ns	≤ 100 ns
Isolation between receive port and antenna port.	>30 dB	>30 dB	>30 dB	> 30 dB
Isolation between receive ports.	>20 dB	22 dB	22 dB	> 22 dB
Isolation between transmit ports (A to B/ 1 to 2).	>50 dB/ 22 dB	>50 dB/ 22 dB	>50 dB/ 22 dB	>50 dB/ 22 dB
Insertion loss in transmit pass band without combiner.	0.3 - 1.6 dB	0.3 - 1.6 dB	< 0.3 - 1.6 dB	< 0.3 - 1.6 dB
Insertion loss in transmit pass band with combiner.	3.4 - 5.3 dB	3.4 - 5.3 dB	3.4 - 5.2 dB	3.4 - 5.2 dB
Intermodulation products at antenna port with 2x 20 W signals at one transmit port and 50 Ω on receive port in receive band.	<-101 dBm	<-103 dBm	<-103 dBm	<-103 dBm
Intermodulation products at antenna port with 2x 20 W signals at one transmit port and 50 Ω on receive port in transmit band.	-75 dBc	<-75 dBc	<-75 dBc	<-75 dBc
RF input impedance.	50 Ω	50 Ω	50 Ω	50 Ω

Parameter	GSM 850 [1)]	GSM 900	GSM 1800	GSM 1900
RF output impedance.	50 Ω	50 Ω	50 Ω	50 Ω

1) Valid for ANCL only.

2) For ANC with bridge: >18 dB.

3) For ANC with bridge: >16 dB.

4) For ANCGP

Table 89: ANC Performance Characteristics

10.3.6 ANC Front Panel

The following figures show the layout and O and M features of the three versions of the ANC front panel.

10.3.6.1 ANC Front Panel - Version 1

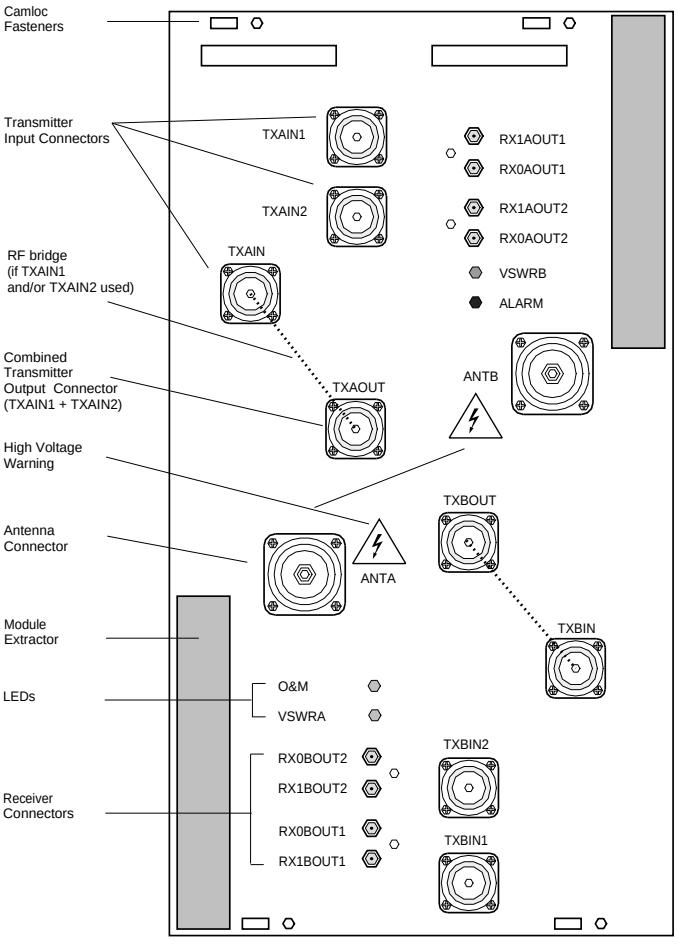


Figure 326: ANC Front Panel Version 1

10.3.6.2 ANC Front Panel - Version 2

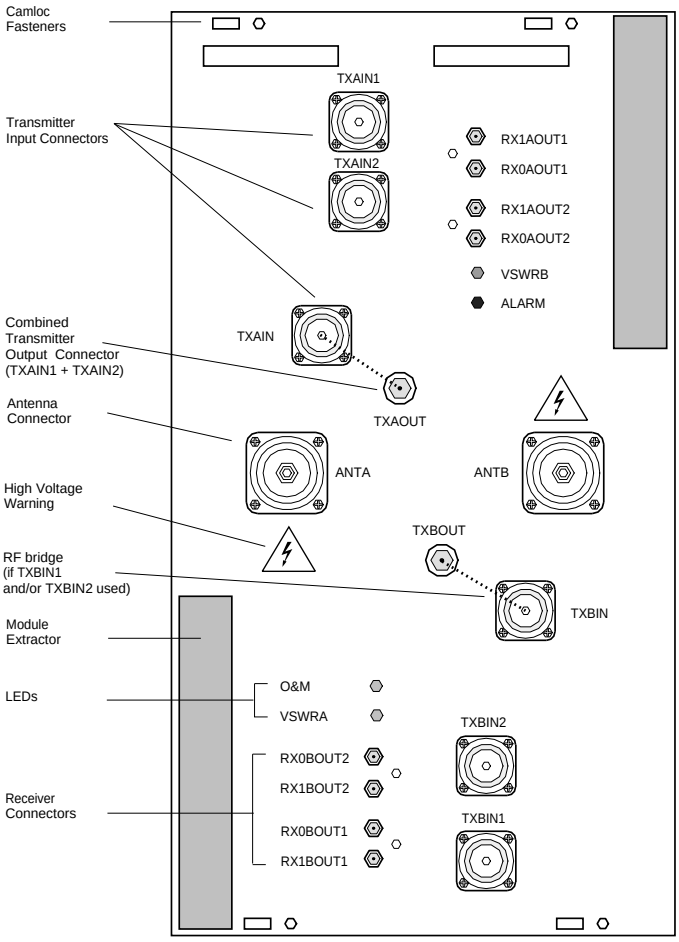


Figure 327: ANC Front Panel Version 2

10.3.6.3 ANC Front Panel - Version 3

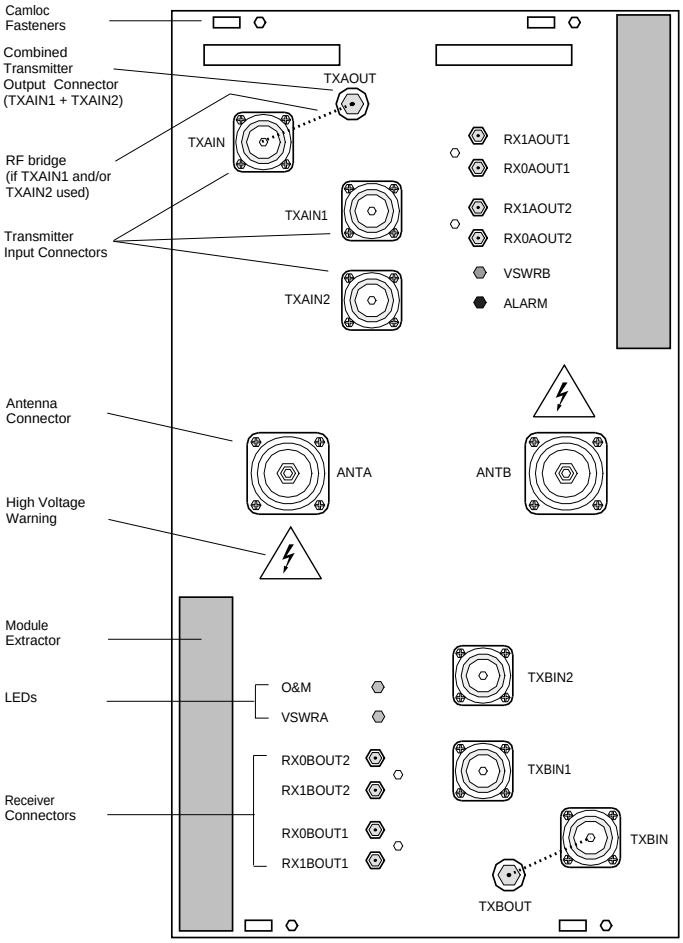


Figure 328: ANC Front Panel Version 3

10.3.6.4 Connectors

The ANC has four transmitter input connectors and eight receiver output connectors on its front panel. Therefore, one ANC module can be interfaced to four TRE modules or two ANY modules, if used.

The following table describes the ANC front panel connectors.

Connector	Description
TXAIN1, TXAIN2 TXBIN1, TXBIN2	Provide the RF transmitter interfaces from four TRE modules, or two ANY modules if used.
TXAIN, TXAOUT	A bridge between both connectors provides the interface between two combined RF transmitter signals and the duplexer of branch A.
TXBIN, TXBOUT	A bridge between both connectors provides the interface between two combined RF transmitter signals and the duplexer of branch B.
RX0AOUT1 RX1AOUT1	Provide the RF receiver interfaces between antenna A and the first TRE receiver connectors RX0 and RX1, or a first ANY module if used.
RX0AOUT2 RX1AOUT2	Provide the RF receiver interfaces between antenna A and the second TRE receiver connectors RX0 and RX1, or a first ANY module if used.
RX0BOUT1 RX1BOUT1	Provide the RF receiver interfaces between antenna B and the third TRE receiver connectors RX0 and RX1, or a second ANY module if used.
RX0BOUT2 RX1BOUT2	Provide the RF receiver interfaces between antenna B and the fourth TRE receiver connectors RX0 and RX1, or a second ANY module if used.
ANTA ANTB	Provide the RF interface to/ from two antennas, A and B.

Table 90: ANC Front Panel Connectors

The front panel connector types are described in the following table.

	ANC Version 1	ANC Versions 2 and 3
ANTA, ANTB	7/ 16	7/ 16
TXAOUT, TXBOUT	N female	SMA female
All other TXnn	N female	N female
All RXnn	SMB	SMB

Table 91: ANC, Front Panel Connector Types

10.4 AGC

The AGC provides the intermediate RF stage between the TREs and the antenna.

Its functions are to:

- Combine the output signals of up to four transmitters and to connect them to up to two antennas
- Feed the received signals from the antenna to the radio front end, where the signals are amplified and distributed to up to eight receivers
- Allow simultaneous transmission and receiving on antennas (duplexer)
- Provide filtering for the TX- and RX-path
- Supervise the VSWR of the antennas.

10.4.1 AGC Basic Architecture

The following figure shows the basic architecture.

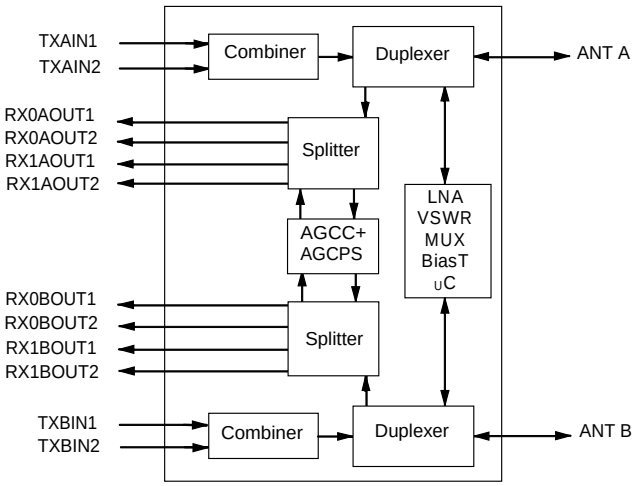


Figure 329: AGC Basic Architecture

10.4.2 AGC Detailed Architecture

The following figure shows the AGC in more detail.

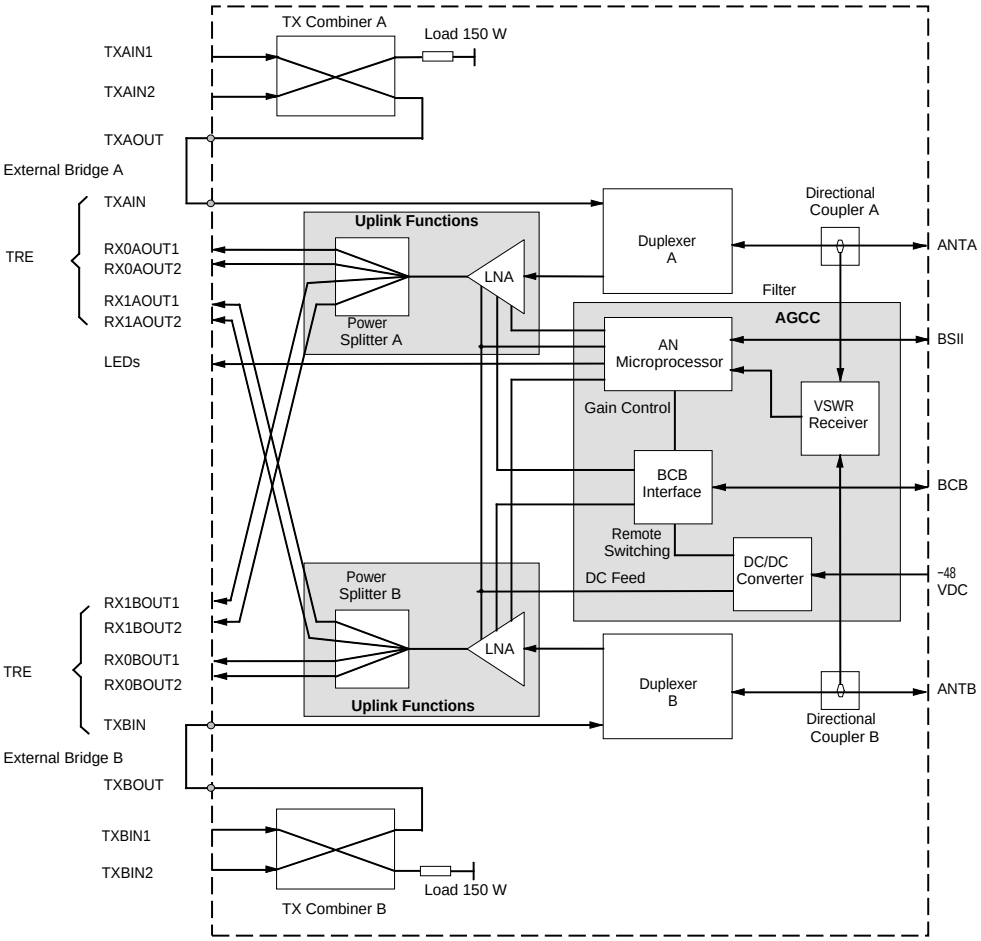


Figure 330: AGC Architecture

10.4.3 AGC Description

On the downlink, the AGC connects four TRE transmitters to two antennas. On the uplink, it splits the received signals and passes them to the TRE receivers.

The following types of AGC modules are available for the different BTS A9100 variants:

- AGC18, AGC module for GSM 1800
- AGC9E, AGC module for GSM 900.

If one transmitter is used in each branch A and B, the RF signals pass the duplexers before feeding the antennas.

If two transmitters are used in a branch, the coupler will be used in front of the duplexer. This coupler is connected by an RF cable bridge.

The duplexers provide coupling of the transmitted and received signals, allowing a single antenna to be used for both downlink and uplink channels.

The AGC also allows the return loss of the transmitted signals to be measured, at the antenna connector, using VSWR techniques.

The uplink channel comprises amplifiers, with remotely-adjustable gain control, remote DC feed and power splitters.

The AGC functions, interface, controller and power supply are given below.

Downlink Functions	The downlink functions are performed by the components shown in Table *ANX/ANC/AGC/ANB, Downlink Components (75)*.
Uplink Functions	The uplink functions are performed by the components shown in Table *ANX/ANC/AGC/ANB, Uplink Components (76)*.
BTS Control Bus Interface	The BCB Interface is located on the backplane. It interfaces the data and control signals to the BCB as listed in Table *ANX/ANC/AGC/ANB, BCB Interface (77)*.
Antenna Network Controller	From a functional point of view the AGCC is the same as the ANCON used in the ANX (but without the DC/DC converter). Therefore for a description of the AGCC, see *Antenna Network Controller (Section 10.1.4)*.
Power Supply	As part of the AGCC there is a DC/DC converter, providing all the necessary voltages for the AGC components. Refer to *AGC Power Supply (Section 10.4.5)* for its description.

10.4.4 Antenna Network Geran Combiner Controller

The AGCC is responsible for maintaining the operation of the AGC.

Its principal functions are:

- Setting the LNA gain for the assigned TREA receiver
- Supervising LNA alarms
- Measuring antenna VSWR
- Reporting VSWR alarms
- Selecting the antenna sector
- Detecting RF cabling status
- RI, via the BCB Interface
- Remote power on/off, via the BCB Interface
- Status display, via front panel LEDs.
- Measurement of the antenna output power
- Reporting the antenna output power
- Tower mounted amplifier (TMA) current supervision.

The following figure shows the AGCC architecture.

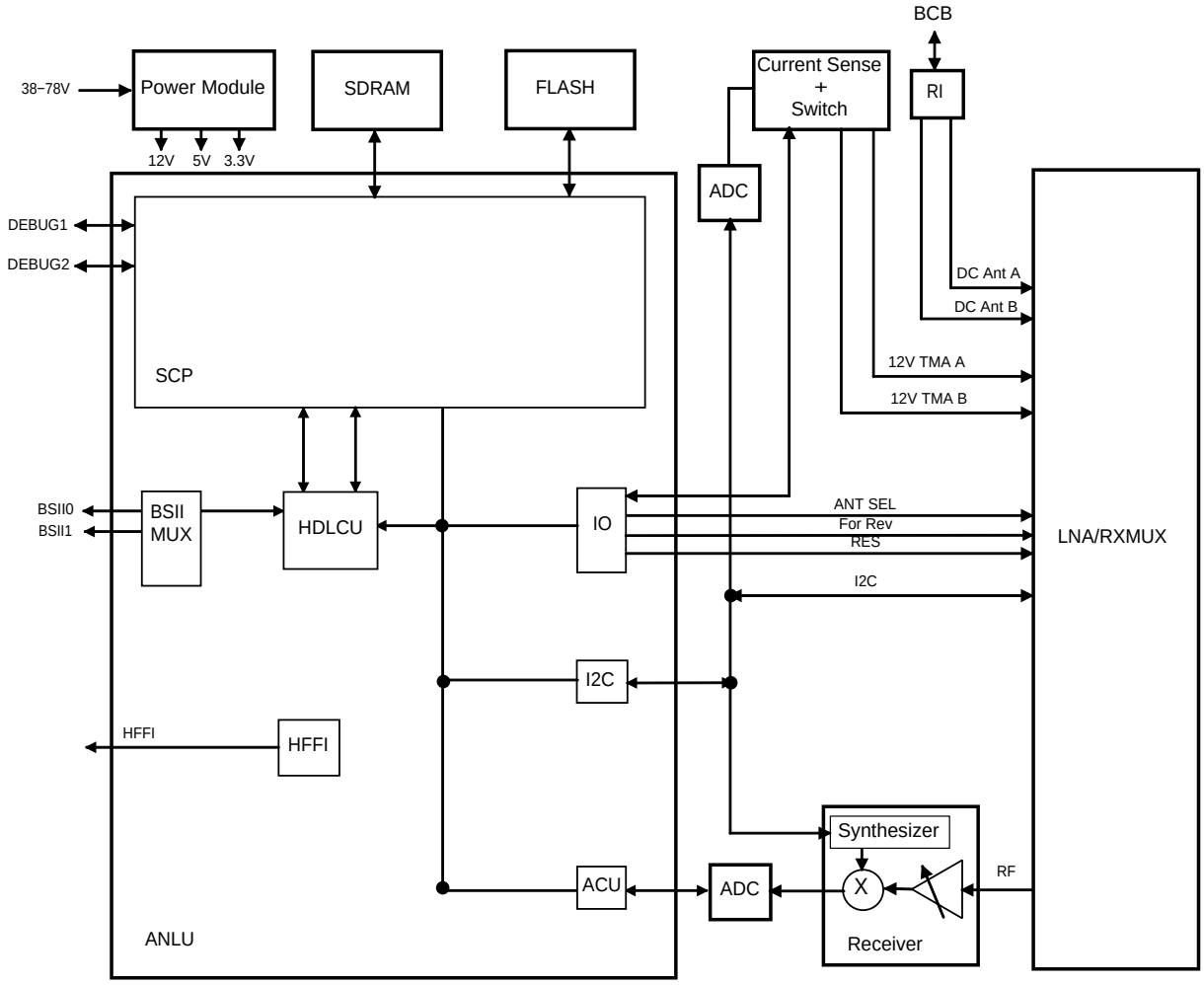


Figure 331: AGCC Architecture

The AGCC interfaces provides the following interfaces:

- On backpanel connector
  - BCB
  - BSII
  - CLKI
  - DEBUG1
  - DEBUG2.
- On LNA/RXMUX connector
  - LNAC
  - RCD
  - RF
  - TMAFD.

The AGCC functional entities are described in the following sections.

10.4.4.1 VSWR Receiver

The VSWR receiver is a selective VSWR meter which measures the forward and reflected (reverse) power of the transmitters. The VSWR is measured at the output of the duplexer couplers, and fed to an RF MUX in the receiver (see Figure *331*).

The VSWR receiver consists of:

- Local synthesizer
- Input MUX.

A local synthesizer generates a signal which is used to compare the baseband frequency with the ARFCN. The local synthesizer is set to the ARFCN frequency by the AN microprocessor.

The input MUX provides the RF inputs to the VSWR receiver. It provides a selective input of the forward and reverse power from transmitters A and B. The input MUX operates under the control of the AN microprocessor.

10.4.4.2 BSII Frame Clock PLL

The BSII frame clock PLL recovers the BSII frame clock from the backplane. The clock outputs are used for BSII communications, the AN microprocessor and the PLL lock-detect signal.

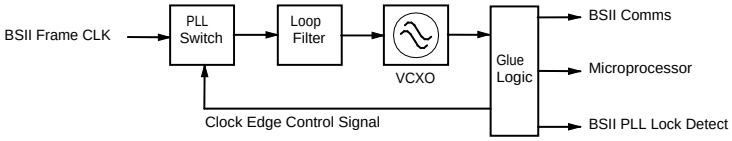


Figure 332: AGCC, BSII Frame Clock PLL

10.4.4.3 CLKII Clock PLL

The CLKII clock PLL recovers the BSII master clock from the backplane. The clock outputs are used for the local synthesizer reference clock, the 'start conversion' signal for the baseband ADC and the CLKII lock-detect signal.

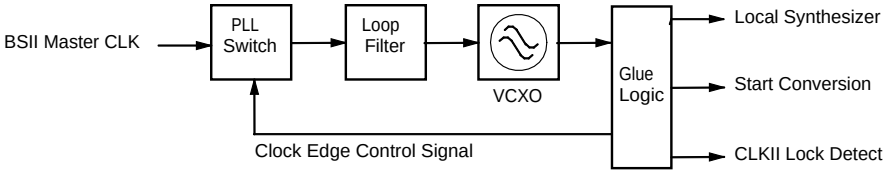


Figure 333: AGCC, CLKII Clock PLL

10.4.4.4 Signal Control Processor

The SCP performs LNA alarm supervision and gain setting, and control of the status LEDs. It also provides an interface to the baseband ADC in the VSWR receiver (see Figure *331*).

The microprocessor compares the ADC output with known VSWR values. If the VSWR exceeds predefined thresholds, an alarm is raised (refer to Table *AGC LEDs and Alarms (Section 10.4.6)*). If the reflected power is very high, the transmitters are shut down to avoid possible damage to equipment. High reflected power can be caused by, for example, a break in the antenna coupling.

The SCP hardware consists of a microprocessor supported by two memory devices, a Flash EEPROM and an SDRAM.

10.4.4.5 Antenna Network Logic Unit

The Antenna Network Logic Unit (ANLU) contains the follwing blocks:

- Clock and Reset Control Unit (CRCU)
- MicroBlaze Systeem
- HDLC Unit
- BSII Multiplexer
- HFFI Unit
- Register Unit
- I2C Unit
- Analog Control CIrcuit (ACU).

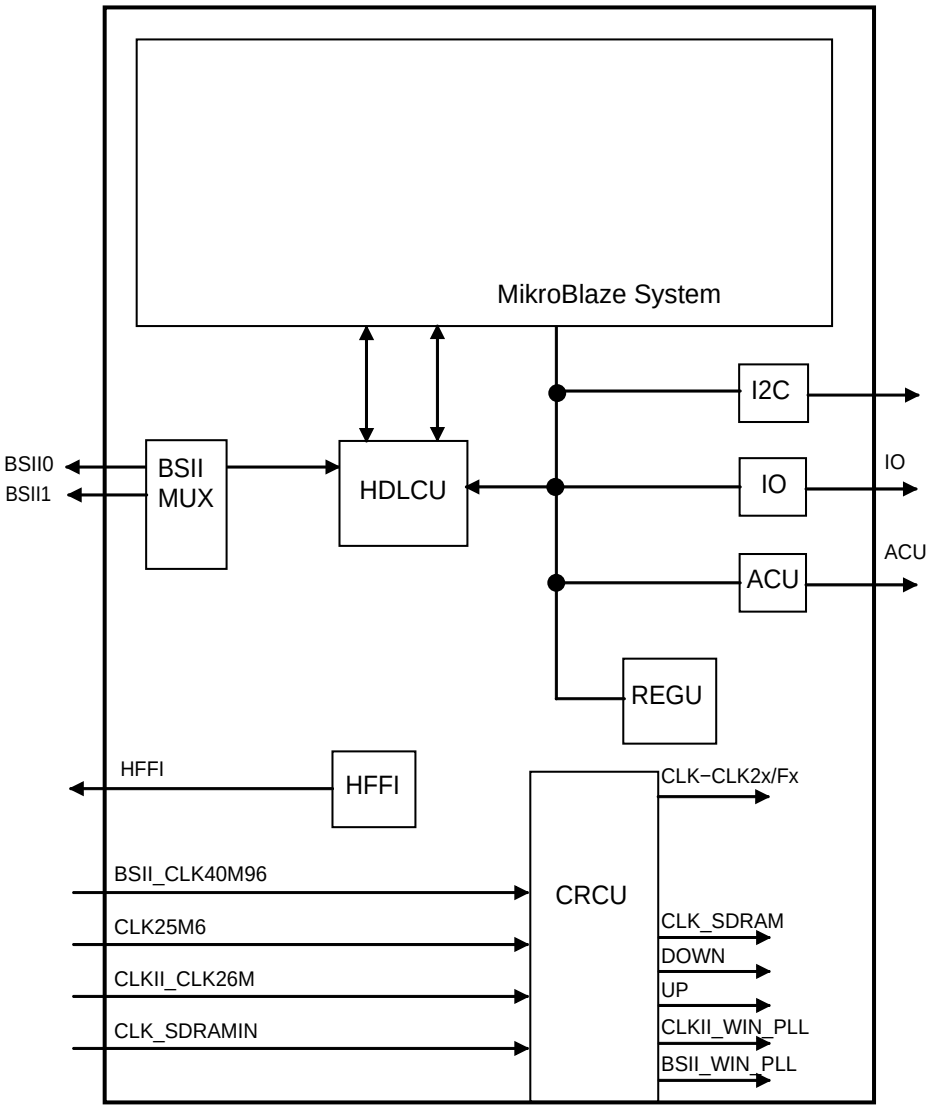


Figure 334: ANLU Architecture

10.4.4.6 Receiver

The front-end receiver is realized by one device, which includes a direct conversion QPSK demodulator, the PLL and synthesizer. The downconverter can handle receive frequency in the GSM, DCS or PCS band. Control data will be entered by means of an I2C interface.

The RF signal from the LNA board is fed directly into the downconverter. The I/Q baseband output signal of the downconverter is sampled and converted using a dual sigma-delta ADC. The data output is serial at a word rate of 270.83kHz for each I and Q. The ADC is interfaced by the Analog Control Unit (ACU),

10.4.4.7 TMA Feeding and Current Supervision

The power for the two TMA will be switched on and off by means of an ANLU GPIO signal and a MOSFET. The current supervision is done with an Overcurrent Protection Circuit, which includes a current sense amplifier, a comparator and an internal voltage reference.

The current sense amplifier output is converted by a 10 bit ADC and the SCP can read the actual current value via the I2C bus. Additional the current sense IC has a comparator with a latched output. It gives an over current alarm if the current is higher than 300mA. This latched alarm signal is used to switch off the 12V directly by hardware to prevent a DC/DC converter shot down.

10.4.4.8 BCB and RI

The main functions are:

- ISL, provides access via BCN on the ISL interface to RI ASIC
- RI EEPROM, is a serial EEPROM that stores information about AGCC module
- RPI, Remote Power Interface controls the AGCC power supply and supervises the signals of input and output voltages
- RCD, Radio Cabling Detection allows an automatic uplink RF cabling detection and supervision
- BCB_Vdd, BCB bus powered if DC/DC converter is off or self powered if DC/DC converter is on
- ADR, Physical address from backpanel for RI ASIC address setting and for SCP BSII address setting.

10.4.4.9 Glue Logic

Glue logic consists of a number of registers, implemented on a single CPLD device. It also converts 5 V TTL signals to 3.3 V, required by the microprocessor.

The Glue logic maintains the following interfaces and/or functions:

- AN microprocessor to the BSII
- Board/module address register
- Baseband ADC
- LNA error register
- LNA gain adjustment register.

The Glue logic also controls the BSII frame clock PLL and the CLKII master clock PLL with a clock edge control signal (see Figure *332* and Figure *333*).

10.4.4.10 Remote Inventory

Remote Inventory is used to store information about the AGC module (part number, name, serial number, etc.). It consists of an EEPROM which is connected to the BCB ASIC. The stored information is read via the BCB Interface.

10.4.5 AGC Power Supply

The AGCPS is a DC/DC converter, providing all the necessary voltages for the AGC components.

10.4.5.1 Voltages

The following table provides AGCPS input/output voltage parameters.

Voltage	Value
V_{in}	-38.4 VDC $_{min.}$
	-72 VDC $_{max.}$
	-48 VDC to -60 VDC $_{nom.}$
V_{out}	+3.3 VDC ±3 %
	+ 5.1 VDC ±3 %
	+ 12 VDC ±3 %

Table 92: AGCPS Input/Output Voltage Parameters

Normal operation of V_{out} is unaffected by temperature fluctuations in the range 0^{o} C to 70^{o} C.

10.4.5.2 Fuse

The input of the AGCPS is protected by a fuse with a high-breaking capacity.

10.4.5.3 Protection

The AGCPS circuitry is protected against short circuit and accidental polarity inversion on its inputs.

10.4.5.4 Grounding

Ground continuity for the module is achieved with ground pins on the subrack backplane which connect to the bus bar ground.

10.4.5.5 Remote Switching

The AGCPS can be remotely switched on and off by the OMU, via the BCB. This feature is implemented on the module with an optically isolated on/off switch.

10.4.5.6 Low Voltage Alarms

Alarms are raised if the voltage level is too low. The following table provides the low voltage threshold tolerances for AGCPS alarms.

Voltage	Threshold Min.	Threshold Max.
Vin	30.4 V	38.4 V
3.3 V	2.7 V	3.0 V
5.1 V	4.2 V	4.6 V
12 V	10.0 V	11.0 V

Table 93: AGCPS Alarm Thresholds

10.4.6 AGC LEDs and Alarms

This section provides information on the AGC's LEDs and Alarms.

10.4.6.1 LEDs

There are two LEDs on the front panel, which provide a visual indication of the operational status of the AGC module. The following table describes each LED and defines their various operational states.

LED	Color	Status	Description
ON	Green		Power status
		On	Module is switched on
		Off	Module is switched off
OM / ALARM	Yellow/ Red		Alarm status
		Yellow On	OM operational status (normal operation)
		Yellow Blinking	Not defined
		Red Blinking	Not defined
		Red On	LNA, TMA or VSWR alarm on port A or B

Table 94: AGC LED Descriptions

10.4.6.2 Alarms

The AGC detects the alarm conditions shown in Table *ANX/ANC/AGC/ANB Alarm Conditions (81)*.

10.4.7 AGC Performance Characteristics

10.4.7.1 General Performance Characteristics

The performance characteristics of the AGCs are shown in the following table.

Parameter	GSM 900 P	GSM 900 E	GSM 1800
Transmit band.	935 - 960 MHz	925 - 960 MHz	1805 - 1880 MHz
Receive band.	890 - 915 MHz	880 - 915 MHz	1710 - 1785 MHz
Power for each transmitter channel input.	80 W maximum	80 W maximum	80 W maximum
Number of channels.	124	174	374
Bandwidth for each channel.	200 kHz	200 kHz	200 kHz
Return loss at receive port.	> 16 dB	> 16 dB	> 16 dB
Return loss at transmit port.	> 16 dB	> 16 dB	> 16 dB
Return loss at antenna port.	> 18 dB	> 18 dB	> 18 dB
Group delay distortion in transmit band.	≤100 ns	≤100 ns	≤ 100 ns
Isolation between receive port and antenna port.	>30 dB	>30 dB	>30 dB
Isolation between receive ports.	>20 dB	>20 dB	>20 dB
Isolation between transmit ports (A to B/ 1 to 2).	>50 dB/ 22 dB	>50 dB/ 22 dB	>50 dB/ 22 dB
Insertion loss in transmit pass band without combiner.	0.3 - 1.6 dB	0.3 - 1.6 dB	0.3 - 1.6 dB
Insertion loss in transmit pass band with combiner.	3.4 - 5.3 dB	3.4 - 5.3 dB	3.4 - 5.2 dB
Intermodulation products at antenna port with 2x 28 W signals at one transmit port and 50 Ω on receive port in receive band.	<-100 dBm	<-100 dBm	<-100 dBm
Intermodulation products at antenna port with 2x 28 W signals at one transmit port and 50 Ω on receive port in transmit band.	<-36 dBm	<-36 dBm	<-36 dBm
RF input impedance.	50 Ω	50 Ω	50 Ω
RF output impedance.	50 Ω	50 Ω	50 Ω

Table 95: AGC Performance Characteristics

TX to RX isolation:

TXAIN -> RX1AOUT1 / RX1AOUT2 / RX1BOUT1 / RX1BOUT2

TXBIN -> RX0AOUT1 / RX0AOUT2 / RX0BOUT1 / RX0BOUT2

No.	Start Freq (MHz)	Stop Freq (MHz)	Atten (dB) with RX gain	Atten (dB) without RX gain
A14	890	915	> 64	> 79

ANTA -> RX1AOUT1 / RX1AOUT2 / RX1BOUT1 / RX1BOUT2

ANTB -> RX0AOUT1 / RX0AOUT2 / RX0BOUT1 / RX0BOUT2

No.	Start Freq (MHz)	Stop Freq (MHz)	Attenuation (dBc)
A20 (Out of band rejection)	816	880	> 30
A21 (RX passband)	890	915	LNA Passband gain

10.4.7.2 Performance Characteristics with AGC GSM 900P Module Functional Variant 'B'

Compared to general perfomrance characteristics, the variant 'B' has the following specific values:

TX to RX isolation:

TXAIN -> RX1AOUT1 / RX1AOUT2 / RX1BOUT1 / RX1BOUT2

TXBIN -> RX0AOUT1 / RX0AOUT2 / RX0BOUT1 / RX0BOUT2

No.	Start Freq (MHz)	Stop Freq (MHz)	Atten (dB) with RX gain	Atten (dB) without RX gain
A14	896	915	> 64	> 79

ANTA -> RX1AOUT1 / RX1AOUT2 / RX1BOUT1 / RX1BOUT2

ANTB -> RX0AOUT1 / RX0AOUT2 / RX0BOUT1 / RX0BOUT2

No.	Start Freq (MHz)	Stop Freq (MHz)	Attenuation (dBc)
A20 (Out of band rejection)	816	888	> 30
A21 (RX passband)	896	915	LNA Passband gain

10.4.7.3 Performance Characteristics with AGC GSM 900P Module Functional Variant 'C'

Compared to general perfomrance characteristics, the variant 'C' has the following specific values:

TX to RX isolation:

TXAIN -> RX1AOUT1 / RX1AOUT2 / RX1BOUT1 / RX1BOUT2

TXBIN -> RX0AOUT1 / RX0AOUT2 / RX0BOUT1 / RX0BOUT2

No.	Start Freq (MHz)	Stop Freq (MHz)	Atten (dB) with RX gain	Atten (dB) without RX gain
A14	902	915	> 64	> 79

ANTA -> RX1AOUT1 / RX1AOUT2 / RX1BOUT1 / RX1BOUT2

ANTB -> RX0AOUT1 / RX0AOUT2 / RX0BOUT1 / RX0BOUT2

No.	Start Freq (MHz)	Stop Freq (MHz)	Attenuation (dBc)
A20 (Out of band rejection)	816	888	> 50
A21 (RX passband)	902	915	LNA Passband gain

10.4.8 AGC Front Panel

The following figures show the layout and O& M features of the three versions of the AGC front panel.

10.4.8.1 AGC Front Panel - Version 1

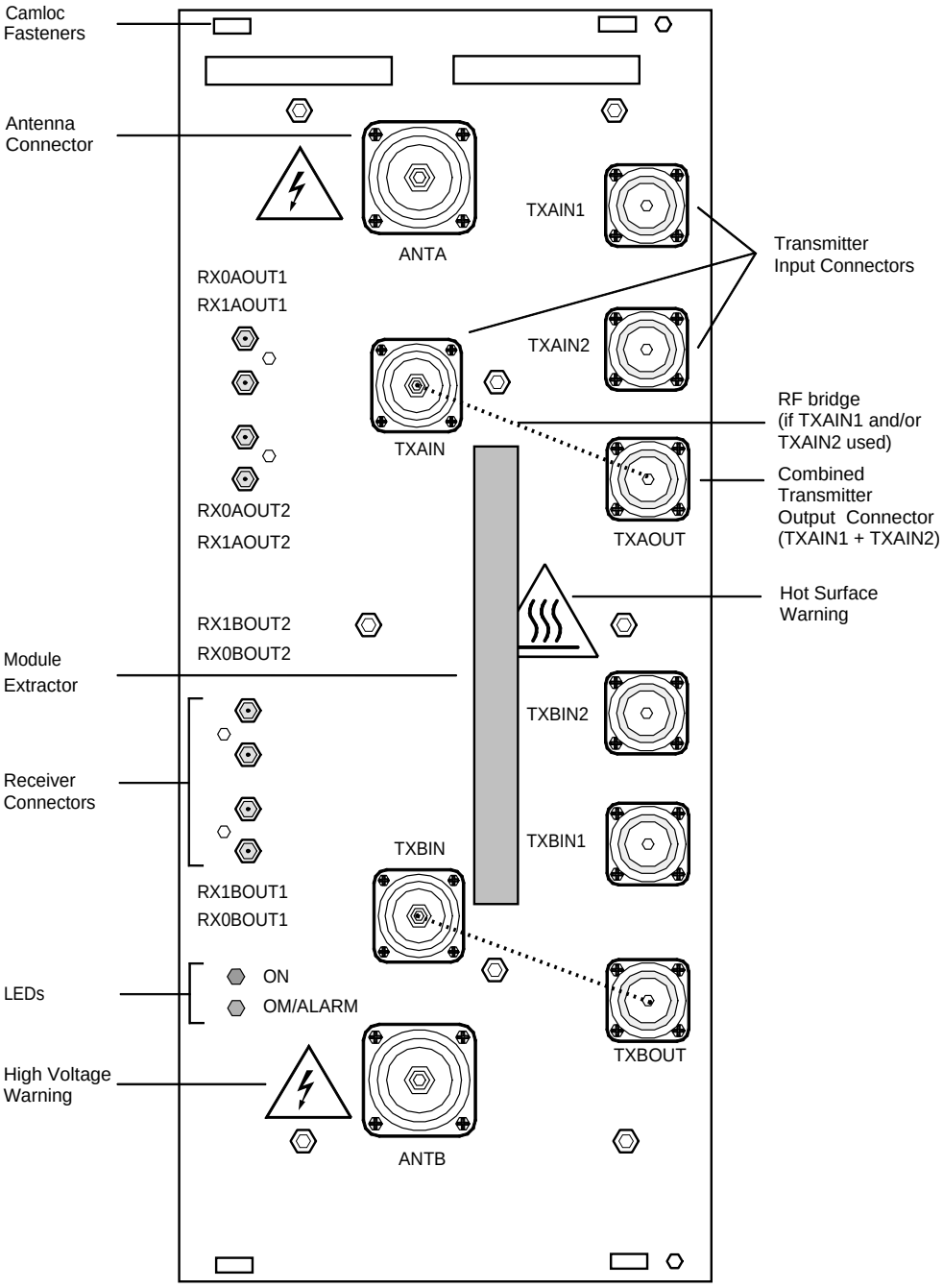


Figure 335: AGC Front Panel - Version 1

10.4.8.2 AGC Front Panel - Version 2

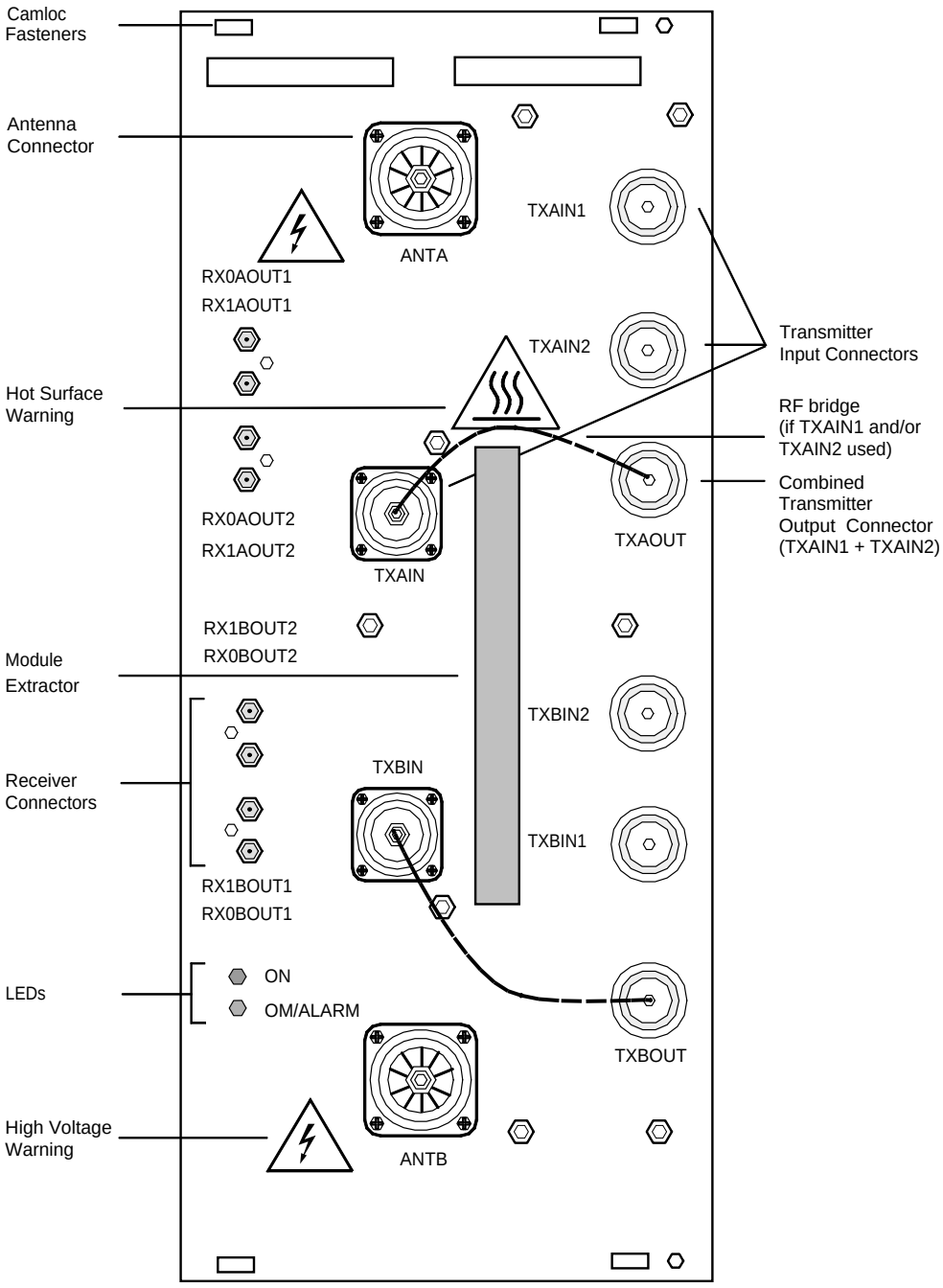


Figure 336: AGC Front Panel - Version 2

10.4.8.3 Connectors

The AGC has four transmitter input connectors and eight receiver output connectors on its front panel. Therefore, one AGC module can be interfaced to four TRE modules or two ANY modules, if used.

The following table describes the AGC front panel connectors.

Connector	Description
TXAIN1, TXAIN2 TXBIN1, TXBIN2	Provide the RF transmitter interfaces from four TRE modules, or two ANY modules if used.
TXAIN, TXAOUT	A bridge between both connectors provides the interface between two combined RF transmitter signals and the duplexer of branch A.
TXBIN, TXBOUT	A bridge between both connectors provides the interface between two combined RF transmitter signals and the duplexer of branch B.
RX0AOUT1 RX1AOUT1	Provide the RF receiver interfaces between antenna A and the first TRE receiver connectors RX0 and RX1, or a first ANY module if used.
RX0AOUT2 RX1AOUT2	Provide the RF receiver interfaces between antenna A and the second TRE receiver connectors RX0 and RX1, or a first ANY module if used.
RX0BOUT1 RX1BOUT1	Provide the RF receiver interfaces between antenna B and the third TRE receiver connectors RX0 and RX1, or a second ANY module if used.
RX0BOUT2 RX1BOUT2	Provide the RF receiver interfaces between antenna B and the fourth TRE receiver connectors RX0 and RX1, or a second ANY module if used.
ANTA ANTB	Provide the RF interface to/ from two antennas, A and B.

Table 96: AGC Front Panel Connectors

The front panel connector types are described in the following table.

Connector	Type
ANTA, ANTB	7/ 16 female
TXAOUT, TXBOUT	N female or SnapN
All other TXnn	N female or SnapN
All RXnn	SMB male

Table 97: AGC, Front Panel Connector Types

10.5 ANB

The ANB provides the intermediate RF stage between the TREs and the antenna.

Its tasks are to:

- Combine the output signals of up to two transmitters and to connect them to up to two antennas
- Feed the received signals from the antenna to the radio front end, where the signals are amplified and distributed to up to eight receivers
- Allow simultaneous transmission and receiving on antennas (duplexer)
- Provide filtering for the TX- and RX-path
- Supervise the VSWR of the antennas.

10.5.1 ANB Basic Architecture

The following figure shows the basic architecture.

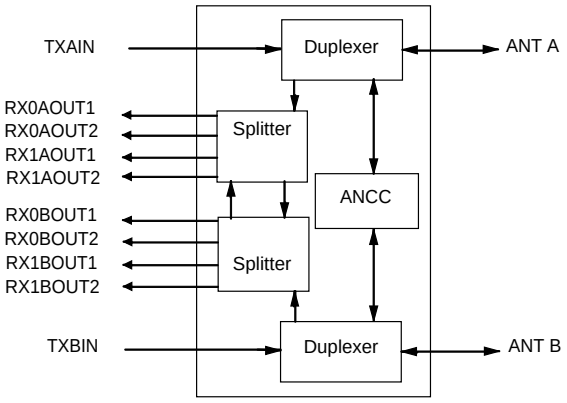


Figure 337: ANB Basic Architecture

10.5.2 ANB Detailed Architecture

The following figure shows the ANB in more detail.

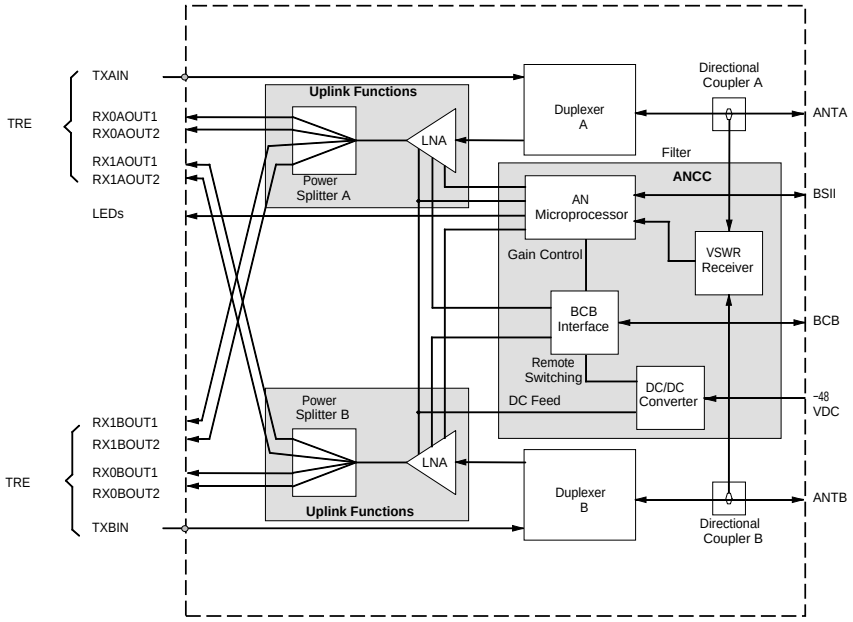


Figure 338: ANB Architecture

10.5.3 ANB Description

On the downlink, the ANB connects two TRE transmitters to two antennas. On the uplink, it splits the received signals and passes them to the TRE receivers.

The following types of ANB modules are available for the different BTS A9100 variants:

- ANBD, ANB module for GSM 1800
- ANBG, ANB module for GSM 900.

In each branch A and B, the RF signals pass the duplexers before feeding the antennas.

The duplexers provide coupling of the transmitted and received signals, allowing a single antenna to be used for both downlink and uplink channels.

The ANB also allows the return loss of the transmitted signals to be measured, at the antenna connector, using VSWR techniques.

The uplink channel comprises amplifiers, with remotely-adjustable gain control, remote DC feed and power splitters.

The table below describes the downlink and uplink functions, the interface, the controller and the power supply for the ANB.

Downlink Functions	The downlink functions are performed by the components shown in Table *ANX/ANC/AGC/ANB, Downlink Components (75)*.
Uplink Functions	The uplink functions are performed by the components shown in Table *ANX/ANC/AGC/ANB, Uplink Components (76)*.
BTS Control Bus Interface	The BCB Interface is located on the backplane. It interfaces the data and control signals to the BCB as listed in Table *ANX/ANC/AGC/ANB, BCB Interface (77)*.
Antenna Network Controller	From a functional point of view the ANCC is the same as the ANCON used in the ANX (but without the DC/DC converter). There,fore for the description of the ANCC, see *Antenna Network Controller (Section 10.1.4)*.
Power Supply	As part of the ANCC there is a DC/DC converter, providing all the necessary voltages for the ANB components. As the DC/DC is functionally the same as the one used in the ANX refer to *AN Power Supply (Section 10.1.5)* for its description.

10.5.4 ANB LEDs and Alarms

This section provides information on the ANB's LEDs and Alarms.

There are four LEDs on the front panel, which provide a visual indication of the operational status of the ANB module. As the LEDs functionality is the same as in ANC refer to *ANC/ANB LED Descriptions* for its description.

The ANB detects the alarm conditions shown in Table *ANX/ANC/AGC/ANB Alarm Conditions (81)*.

10.5.5 ANB Performance Characteristics

The performance characteristics of the ANBs are shown in the following table.

Parameter	**GSM 900**	**GSM 1800**
Transmit band.	925 - 960 MHz	1805 - 1880 MHz
Receive band.	880 - 915 MHz	1710 - 1785 MHz
Power for each transmitter channel input.	63 W maximum	63 W maximum
Number of channels.	174	374
Bandwidth for each channel.	200 kHz	200 kHz
Return loss at receive port.	> 16 dB	> 16 dB
Return loss at transmit port.	> 16 dB	> 16 dB
Return loss at antenna port.	> 16 dB [1)]	> 16 dB
Return loss at coupler port.	> 18 dB	≥ 18 dB
Group delay distortion in transmit band.	≤100 ns	≤ 100 ns
Isolation between receive port and antenna port.	>30 dB	>30 dB
Isolation between receive ports.	>20 dB	>20 dB
Isolation between transmit ports (A to B/ 1 to 2).	>50 dB/ 22 dB	>50 dB/ 22 dB
Insertion loss in transmit pass band.	0.3 - 1.6 dB	< 0.3 - 1.6 dB
Intermodulation products at antenna port with 2x 20 W signals at one transmit port and 50 Ω on receive port in receive band.	<-101 dBm	<-101 dBm
Intermodulation products at antenna port with 2x 20 W signals at one transmit port and 50 Ω on receive port in transmit band.	<-75 dBc	<-75 dBc
RF input impedance.	50 Ω	50 Ω
RF output impedance.	50 Ω	50 Ω

1) For ANB with bridge: >16 dB.

Table 98: ANB Performance Characteristics

10.5.6 ANB Front Panel

The following figures show the layout and O and M features of the two versions of the ANB front panel.

10.5.6.1 ANB Front Panel - Version 1

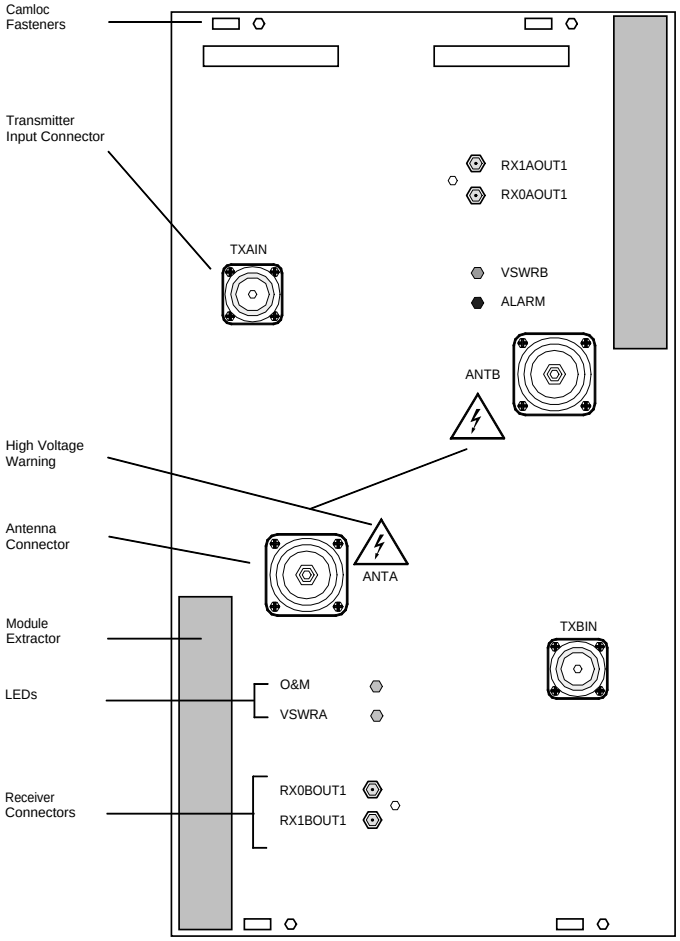


Figure 339: ANB Front Panel Version 1

10.5.6.2 ANB Front Panel - Version 2

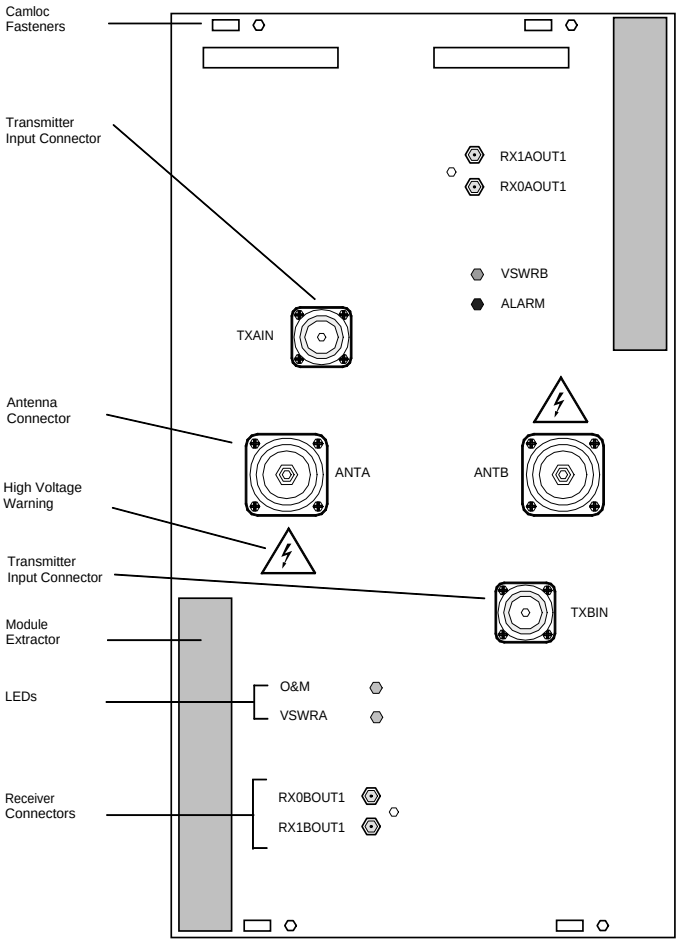


Figure 340: ANB Front Panel Version 2

10.5.6.3 Connectors

The ANB has two transmitter input connectors and four receiver output connectors on its front panel. Therefore, one ANB module can be interfaced to two TRE modules or two ANY modules, if used.

The following table describes the ANB front panel connectors.

Connector	Description
TXAIN TXBIN	Provide the RF transmitter interfaces from two TRE modules or two ANY modules, if used.
RX0AOUT1 RX1AOUT1	Provide the RF receiver interfaces between antenna A and the first TRE receiver connectors RX0 and RX1.
RX0AOUT2 RX1AOUT2	Provide the RF receiver interfaces between antenna A and the second TRE receiver connectors RX0 and RX1.
RX0BOUT1 RX1BOUT1	Provide the RF receiver interfaces between antenna B and the third TRE receiver connectors RX0 and RX1.
RX0BOUT2 RX1BOUT2	Provide the RF receiver interfaces between antenna B and the fourth TRE receiver connectors RX0 and RX1.
ANTA ANTB	Provide the RF interface to/ from two antennas, A and B.

Table 99: ANB Front Panel Connectors

The front panel connector types are described in the following table.

ANTA, ANTB	7/ 16
TXAIN, TXBIN	N female
All RXnnOUT	SMB male

Table 100: ANB, Front Panel Connector Types

10.6 GSM/UMTS Co-Siting

GSM cabinets and UMTS cabinets can be installed at the same site. Normally all antenna feeder cables between antennas (A and B) and BTSs have to be installed separately for GSM and UMTS as shown in the following figure.

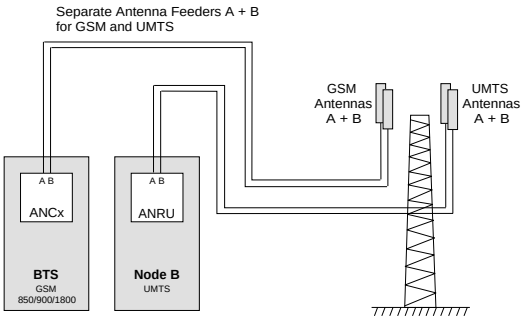


Figure 341: GSM/UMTS Co-Siting

With the help of diplexer filters at both ends of the feeder cables, the GSM (850/900/1800) band and the UMTS band can be decoupled in order to use the same feeder cable for both services. The following figure shows the principle.

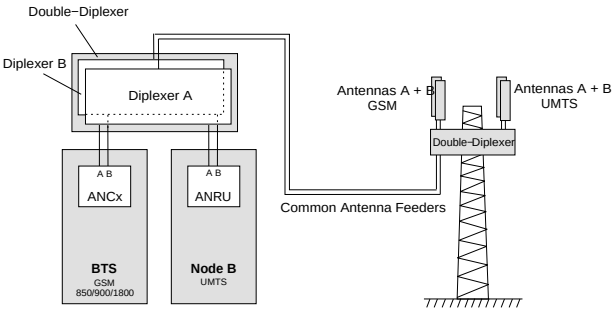


Figure 342: GSM/UMTS Co-Siting with Diplexers and Common Feeders

10.6.1 Diplexer Functional Description

The following figure shows the block diagram of the diplexer. The base station feeder cable of the GSM and UMTS part is connected to the according BTS port of the diplexer. The signal passes the bandpath filter of the diplexer and is available at the antenna connector.

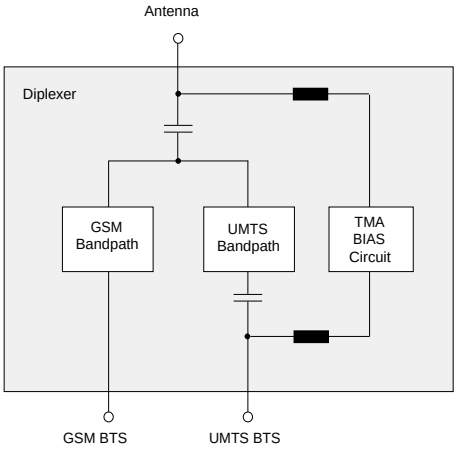


Figure 343: Diplexer, Block Diagram

The insertion losses of the filters are as low as possible to achieve the best noise figures in the uplink and low attenuation in the TX downlink.

GSM and UMTS bandpath filters provide following features:

- Suppression of spurious and noise signals from the transmitter(s) out of band
- Suppression of intermodulation product(s)
- Rejection of harmonics of the transmitter(s)
- Isolation of the UMTS branch (GSM part) or GSM branch (UMTS part).

The following table shows the out-of-band attenuations of the diplexer filters.

Filter	Frequency (MHz)	Attenuation	Remark
GSM 850 GSM 900 GSM 1800	1920 - 2170	>60 dB	UMTS Band
UMTS	824 - 960	>60 dB	GSM 850 Band GSM 900 Band
UMTS	1710 - 1880	>60 dB	GSM 1800 Band

Table 101: Diplexer Filters Out-of-Band Attenuations

The UMTS branch is additionally equipped with a Tower Mounted Amplifier (TMA) BIAS circuit. This BIAS circuit allows the DC power supply (12 VDC) of a TMA using the RF feeder cable. The appropriate power distribution unit (PDU) is part of the ANRU module.

The GSM part of the diplexer is decoupled from the UMTS BIAS circuit part. If both branches (GSM and UMTS) are equipped with a tower mounted amplifier, this external diplexer cannot be used. Then all necessary equipment of a TMA (inclusive of feeders) has to be installed twice.

10.6.2 Diplexer Mechanical Design

The external diplexers are designed for indoor and outdoor applications. They are fully purchased items. Therefore mechanical design, dimensions and weight depend on the selected manufacturer and cannot be described here in detail. Moreover there are additional differences in dimensions between GSM 850/900/UMTS and GSM 1800/UMTS diplexers, depending on the frequencies used.

The following figure shows a GSM 1800 (DCS)/UMTS double-diplexer (for antennas A and B) as an example.

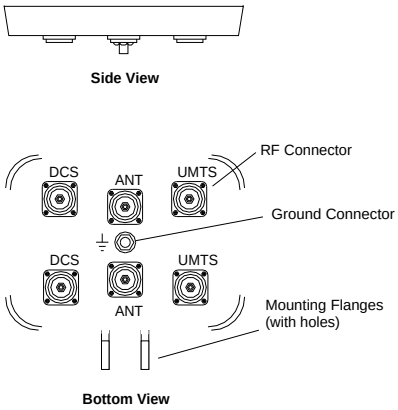


Figure 344: Diplexer, Mechanical Design (Example)

The diplexer has six RF connectors (7/16 female) for connecting GSM BTS, UMTS BTS and antennas. A ground connector is available to connect the diplexer to ground. Two mounting flanges are used to fix the diplexer to immobile equipment near the BTSs.

10.6.3 Environmental Conditions

The external diplexer housings provide the necessary environmental and safety protection according to the standard ETS 300 019 -1-4 class 4.1E.

The minimum ambient temperature is -45° C, humidity up to 100 % at + 38° C. Earthquake is according to ETS 300 019 -2-3.

10.6.4 EMC Requirements

The EMC requirements are derived from ETS 300 342-3/phase 2, TS 25.104 and EN 55022.

11 Temperature Control

The sections are supported with diagrams, if necessary. Illustrations of the FANU and FACB are also included.

11.1 Cooling System

The BTS A9100 is equipped with a forced-air cooling system. Depending on the BTS A9100 variant the cooling system may consist of up to three RITs; see the following figure.

The three RITs are:

- FANU
- FACB
- TFBP.

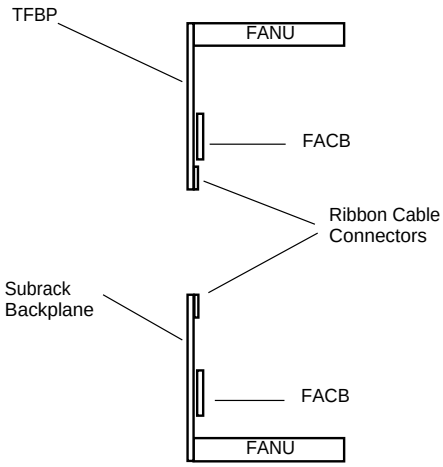


Figure 345: Cooling System Components

A FANU consists of a moulded-plastic frame containing two fan blowers (see Figure *347*). The FANU is connected to the TFBP or subrack backplane.

Three FANUs are controlled by one FACB. The FACB monitors the fans and provides power and digital speed control of the FANUs. The FACB is fitted on a TFBP or a subrack backplane, as required.

A special case exists where two FANUs are fitted as a pair below the ACSR used in BTS A9100 outdoor configurations. These two FANUs are controlled by the BCU2 contained in the ACSR. The BCU2 monitors the fans and provides power and digital speed control of the FANUs.

A feature of the cooling system is its ability to control the front and back rows of fans, independently of each other (see Figure *348*). This enables the temperature inside the cabinet to be regulated more precisely. It also extends the life of the fans and keeps noise levels to a minimum.

11.1.1 Fan Units

The FANUs are usually installed in groups of three. The exception is where they are fitted as a pair below the ACSR used in variant 2 of the BTS A9100 outdoor configurations.

The FANUs are normally situated below the subracks containing TREs. Additional FANUs can be installed at the top of the equipment rack; see the following figure.

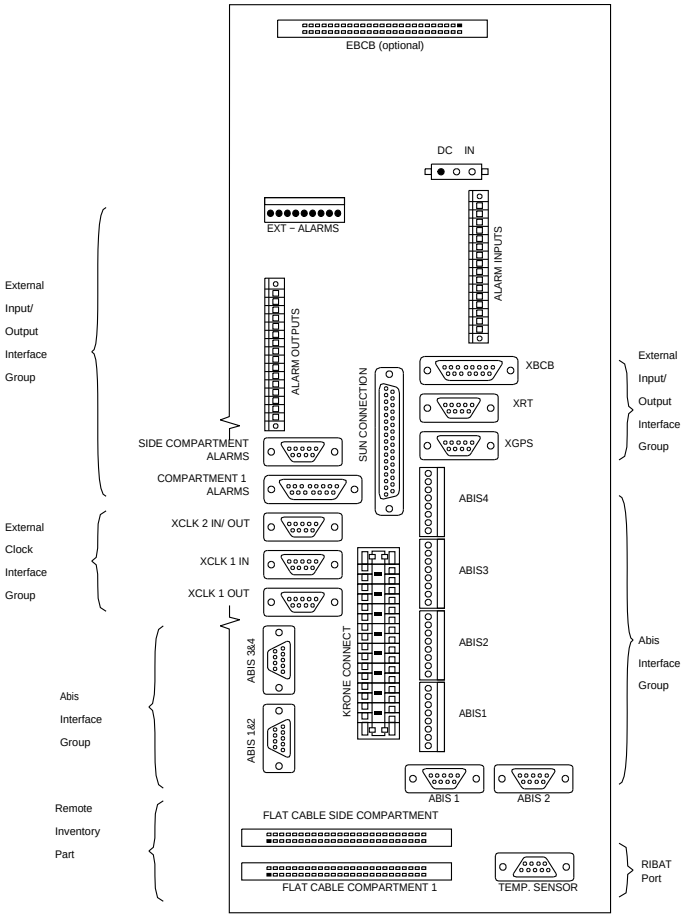


Figure 346: Subrack Air Circulation

The fan blowers are driven by electronically-commutated motors. These are protected against reverse polarity and blocking due to an obstruction in the fan blades.

Air is taken from the front of the cabinet and forced through the subracks. The fans force the air in an upwards direction to dissipate the heat generated by the subrack modules (mainly the TREs). The FANUs at the top of the rack assist air flow by pulling the air through the rack and expelling it through grills at the top of the cabinet.

Dummy panels are used to fill the FANU positions that are not equipped (indoor racks). These provide an air outlet at the back of the subrack.

11.1.1.1 FANU Appearance

The FANU consists of a moulded-plastic frame for mounting the two fan blowers. The fan blowers are manufactured from fiberglass reinforced plastic. They are fixed in the moulded-plastic frame with a simple snap-in mechanism.

The FANUs are inserted in guide rails, at the bottom of the subrack, and locked in position with a latch. The electrical connection is achieved with a connector, fitted to the rear of the FANU, which plugs-in to the subrack backplane. The following figure shows a three-dimensional image of the FANU.

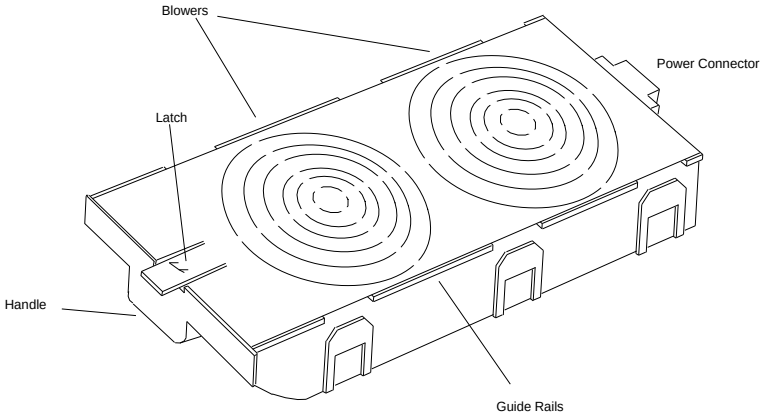


Figure 347: FANU

11.1.1.2 Fan Blower Operational Parameters

The following table lists the operational parameters for the fan blowers.

Parameter	Description
Type:	PAPST 4318/2, version 113
Max. air flow:	170 m^3/ h
Acoustic noise:	<45 dB
Operating voltage:	20 VDC to 40 VDC

Table 102: Fan Blower Unit Operating Parameters

11.1.2 Fan Control

The principal function of the FACB is to control the fan speed of the front and back rows of fans, independently of each other. Each FACB controls three FANUs.

The BCU2 performs the functions of the FACB in the special case of a pair of FANUs fitted below the ACSR used in variant 2 of the BTS A9100 outdoor configurations.

The FACB has the following functionality:

- Performs control and supervision of the fans
- Detects the fan module and its date of manufacture
- Supplies power to the fans
- Provides an interface to the BCB.

The following figure shows the FACB architecture in block diagram form.

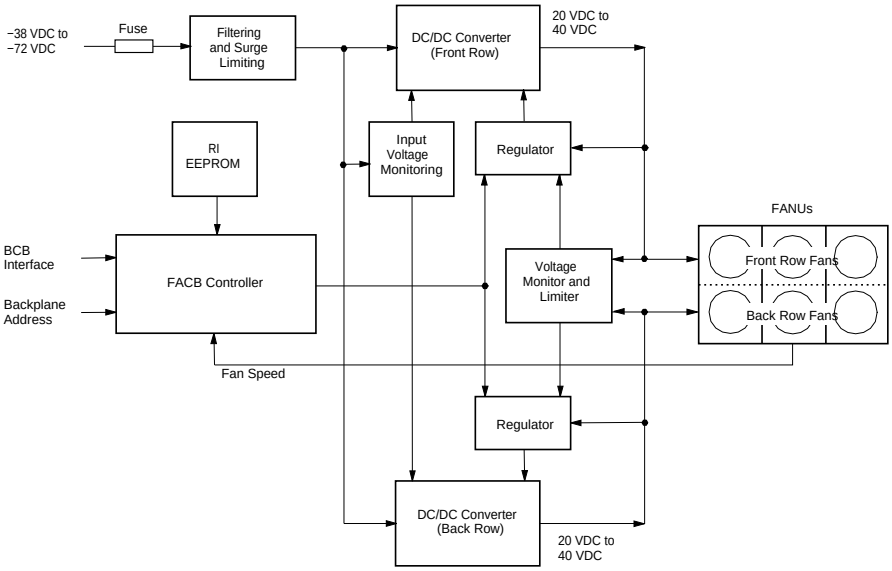


Figure 348: FACB Architecture

The FACB activates the fans within the temperature range: -40° C to + 70° C. However, at very low temperatures, in the range -40° C to -10° C, the fans operate without digital speed control.

11.1.2.1 FACE Functional Entities

The FACB consists of the functional entities described in the following table.

FACB Controller	The controller is responsible for the following interfaces: ▶ I/O for the BCB ▶ Backplane address ▶ Date of FANU manufacture ▶ Fan speed control output ▶ Remote on/off switching ▶ RI EEPROM.
BCB Interface	All OMU messages, such as fan alarms, are communicated via the BCB interface. The BCB also provides an interface to the Remote Inventory EEPROM, via the FACB controller.
RI EEPROM	The Remote Inventory EEPROM stores information about the FACB.
Power Supply	The FANU power supply consist of two on-board DC/DC converters. These provide power independently for the front and back rows of fans. The DC/DC converters operate on an input voltage in the range -38 VDC to -72 VDC. This is converted to a variable output in the range + 20 VDC to + 40 VDC. The input to the FACB DC/DC converters is protected from accidental reverse polarity, transient voltages and surges.
Fan Speed Control	The output of the DC/DC converters is monitored and dynamically regulated by the FACB controller PWM techniques. A square wave output signal from the fans indicates rotational speed of the fans. The PWM signal is used to control the fan speed.

Table 103: FACB Functional Entities

11.1.2.2 Fuse

The input of the FACB is protected by a fuse with a high breaking capacity (3.5 A).

11.1.2.3 Date Coding

Three pins on the FANU connector are hard-wired to provide a fixed code for the year of manufacture. The code is read from the FACB controller.

11.1.2.4 Remote Switching

The front and back row DC/DC converters can be remotely switched on and off, independently of each other. The fan speeds for each row can also be adjusted. This function is implemented by the OMU, via the BCB Interface to the FACB.

11.1.2.5 FACB Appearance

The FACB is a small PCB which is fitted to the STASR backplane between the third and fourth module connectors (see Figure *283*).

The following figure shows the layout of the FACB; only the principle components are marked. The layout is shown so that the FACB can be easily identified.

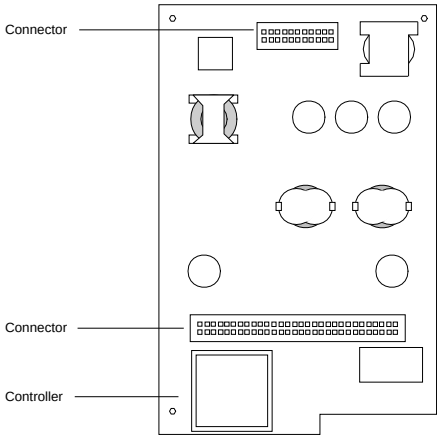


Figure 349: FACB Component Layout

11.1.2.6 Alarms

Two independent fan alarms, for the front and back rows, can be raised under the control of the FACB. An alarm is raised when a fan-related output voltage is out of tolerance. The following table lists the voltage threshold-tolerances before an alarm is raised.

Voltage	Threshold Min.	Threshold Max.
U_{Front}	13 V	20 V
U_{Back}	13 V	20 V

Table 104: Alarm Threshold Voltages

11.1.3 Top Fan Unit

In some BTS A9100 variants, additional FANUs at the top of the cabinet assist the air circulation. They are connected to the TFBP, which provides the electrical and signaling interface between the FANUs and the FACB. The TFBP is mounted at the top of the cabinet, on the rear wall. It is powered from a -48/ -60 VDC external power source, via the cabinet bus bar.

The following figure shows the TFBP connector layout.

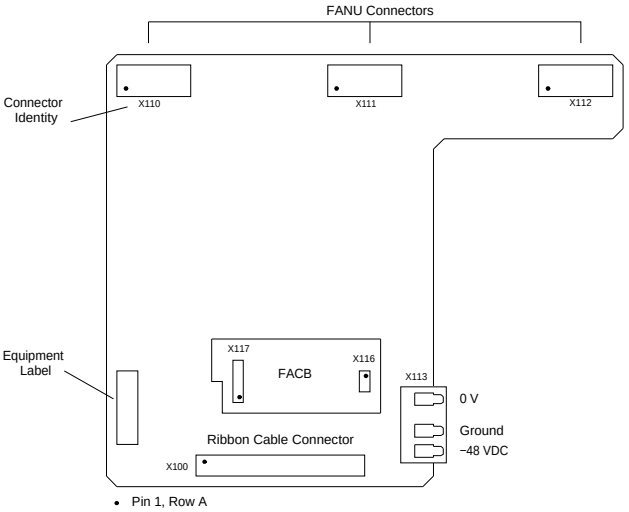


Figure 350: TFBP Connector Layout

The following table lists and describes the TFBP connectors.

Connector	Type	Description
X110, X111, X112	R 1/3, male	FANU Connectors
X116 X117	2 x 6-pin Header, male 2 x 16-pin Header, male	The FACB connectors are linked to the FANU connectors via the TFBP printed wiring.
X100	C 64 M DIN 41612, male	Ribbon Cable
X113	3 x FASTON	Power

Table 105: TFBP Connectors

11.2 HEX2

HEX2 is used in outdoor BTS A9100 versions. It maintains the correct air environment within the cabinets. The airflow within the cabinets is isolated from the outside environment.

HEX2 is mounted on the inside of the compartment door. It cools the internal air by transferring heat to the outside environment. The following figure shows the main components of HEX2.

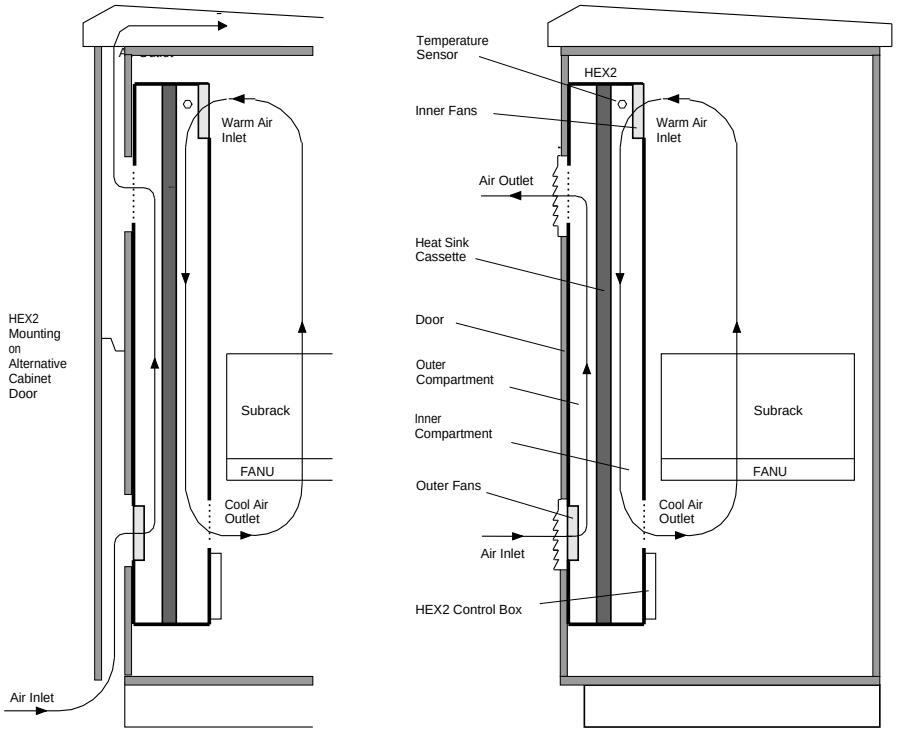


Figure 351: HEX2 Main Components

HEX2 is a box which is divided into inner and outer compartments by a heat sink cassette. Warm air from inside the cabinet is drawn into the inner compartment by the inner fans. It is then blown past the heat sink cassette and returned to the cabinet as cool air.

The heat gathered in the heat sink cassette is transferred to the outside environment by the air stream in the outer compartment. The outside air is drawn into the outer compartment by the outer fans.

The fan controller is contained in a control box. When the internal temperature reaches 20° C, the inner fans switch on and operate at minimum speed. When the internal temperature reaches 30° C, the outer fans switch on and also operate at minimum speed. As the temperature rises further, fan speed increases for both the inner and outer fans.

If the temperature sensor fails or is disconnected, all fans operate at maximum speed and an alarm is raised.

11.2.1 LED(s)

There are three versions of HEX2, two with only one LED and another one with four LEDs, where the reason for the alarm is shown in more detail (but only on the module itself):

- Versions with one LED (versions ADAC, ADCA)
  There is one LED on the front of the control box. It illuminates when there is an alarm
- Version with four LEDs (version ADBA)

  There are the following four LEDs on the module:
  - High/Low Temp: Temperature sensor failure, inside temperature above 70° C or below -60° C
  - Heater: Heater failure (not used; not correlated to HEAT2)
  - Ext. Fan: External fan failure
  - Int. Fan: Internal fan failure.

  But the alarm raised by HEX2 is only an accumulative alarm.

11.2.2 Alarms

HEX2 raises an alarm when:

- A fan fails
- The temperature sensor is disconnected
- The controller is faulty
- The internal temperature reaches 70° C.

11.2.3 Appearance

The following figure shows the front and the two possible rear views of HEX2.

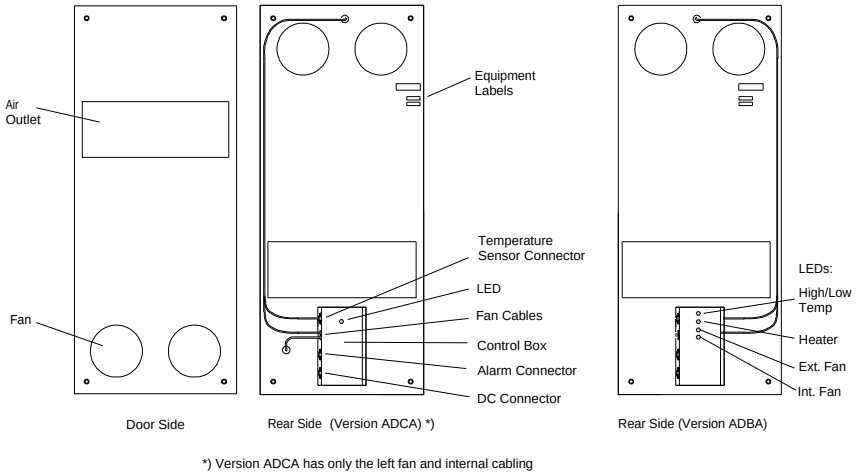


Figure 352: HEX2 Appearance

11.2.4 Connectors

The following table describes the HEX2 control box connectors.

Connector	Type	Description
DC Connector	9-pin Sub-D male	48 VDC power in.
Alarm Connector	9-pin Sub-D female	Alarm out.

Table 106: HEX2 Front Panel Connectors

11.3 HEX3/HEX4

HEX3 and HEX4 are used in Multistandard BTS outdoor versions. They maintain the correct air environment within the cabinets. Fresh air cooling is not allowed in the outdoor BTSs. Therefore the airflow within the cabinets is isolated from the outside environment.

HEX4 is mounted on the inside of the MBO1 door, HEX3 is mounted on the inside of the MBOE door. They cool the internal air by transferring heat to the outside environment. The following figure shows the main components of HEX3 and HEX4.

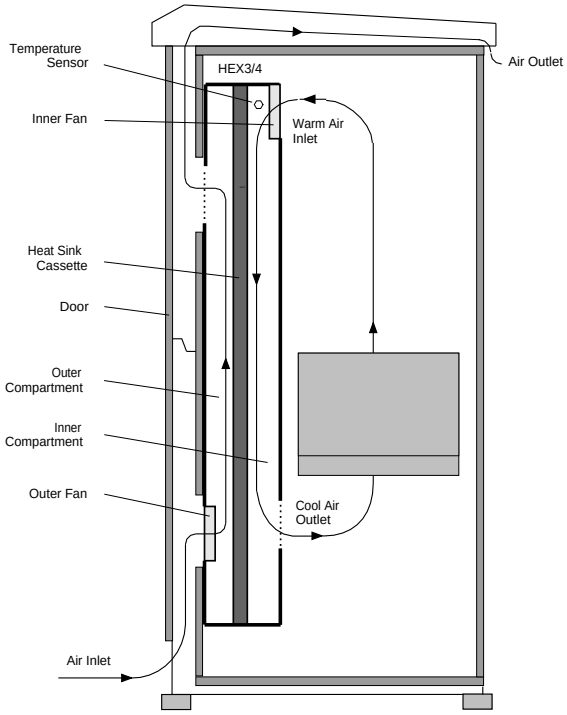


Figure 353: HEX3/HEX4 Main Components

HEX3 and HEX4 are boxes which are divided into inner and outer circuits by a heat sink cassette (core). The core consists of thermal conductive material allowing heat exchange between both circuits. The air is circulated by one blower in each circuit. Warm air from inside the cabinet is drawn into the inner compartment by the inner fan. It is then blown past the heat sink cassette and returned to the cabinet as cool air.

The heat gathered in the heat sink cassette is transferred to the outside environment by the air stream in the outer compartment. The outside air is drawn into the outer compartment by the outer fan.

11.3.1 Blower Rotation Control

The temperature-controlled regulation of blower rotation is contained in a control unit which is assembled inside an inner circuit. The inner and outer blower are independent of each other. The control of blowers is an internal function of the heat exchanger.

When the internal temperature reaches 20° C, the inner fans switch on and operate at minimum speed. When the internal temperature reaches 30° C, the outer fans switch on and also operate at minimum speed. As the temperature rises further, fan speed increases for both the inner and outer fans.

After switch-on, the blower speed accelerates continuously up to the maximum specified rotation. Then the speed is regulated down to the specified ramp.

11.3.2 Temperature Sensor

The temperature sensor is mounted in the heat exchanger at the air inlet of the inner circuit.

Failure of the temperature sensor (e.g., sensor disconnected or short circuited) causes the following response:

- All blowers are rotating at full specified speed
- Alarm occurs, red LED is lit.

The response can be delayed up to 5 seconds after the failure occurs.

11.3.3 Alarm

There is one alarm output per heat exchanger. An alarm is raised when:

- At least one blower fails
- Temperature sensor/plug disconnected or short circuited
- The controller is faulty
- Temperature exceeds 70° C
- Temperature drops below -60° C (sensor failure).

The response can be delayed up to 5 seconds after the failure occurs.

11.3.4 LED

An alarm indication is implemented by means of a visible red LED located on the lid (inner circuit side).

The red LED is lit in case of an alarm.

11.3.5 Test Port

The test port allows the connection of an external temperature simulator (variable resistor) setting a temperature value to check the blower operation depending on the temperature.

11.3.6 Appearance

The following figure shows the front and the rear views of the HEX3/HEX4. Note that the HEX3 and HEX4 only differ in width and weight.

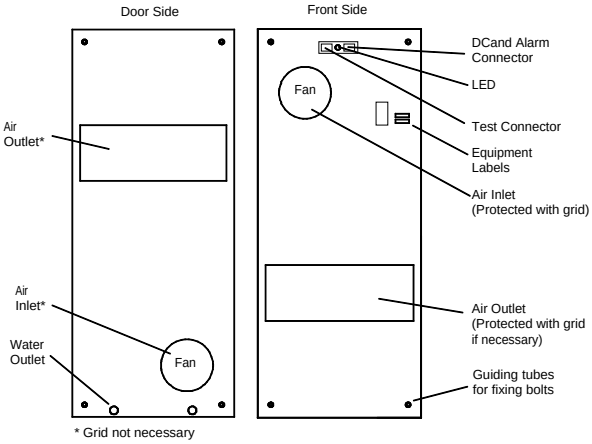


Figure 354: HEX3/HEX4 Appearance

11.3.7 Connectors

The following table describes the HEX3/HEX4 connectors.

Connector	Type	Description
DC and Alarm Connector	9-pin Sub-D male	48 VDC power in (fuse T6.3 A) Alarm out.
Test Connector	9-pin Sub-D female	Connection of external temperature simulator.

Table 107: HEX3/HEX4 Connectors

11.3.8 Mechanical Parameters

The following table lists the mechanical parameters of the HEX3/HEX4.

Parameter	HEX3	HEX4
Height (mm)	1150	1150
Width (mm)	450	600
Depth (mm)	150	150
Weight (kg)	24	28

Table 108: HEX3/HEX4 Mechanical Parameters

11.4 HEX5

HEX5 is used in Compact BTS Outdoor (CBO) versions. It maintains the correct air environment within the cabinets. Fresh air cooling is not allowed in the outdoor BTSs. Therefore the air flow within the cabinets is isolated from the outside environment.

HEX5 is mounted on the inside of the CBO door. It cools the internal air by transferring heat to the outside environment. The following figure shows the main components of HEX5.

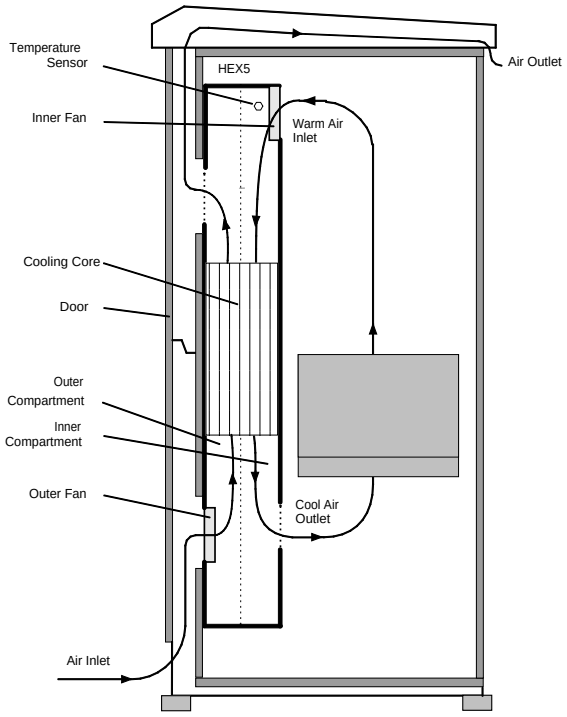


Figure 355: HEX5 Main Components

HEX5 is a box which is divided into inner and outer circuits by a heat sink cassette (core). The core consists of thermal conductive material allowing heat exchange between both circuits. The air is circulated by one blower in each circuit. Warm air from inside the cabinet is drawn into the inner compartment by the inner fan. It is then blown past the heat sink cassette and returned to the cabinet as cool air.

The heat gathered in the heat sink cassette is transferred to the outside environment by the air stream in the outer compartment. The outside air is drawn into the outer compartment by the outer fan.

11.4.1 Blower Rotation Control

The temperature-controlled regulation of blower rotation is contained within a control unit which is assembled inside the inner circuit. The inner and outer blower are independent of each other. The control of the blowers is an internal function of the heat exchanger.

When the internal temperature reaches 20° C, the inner fans switch on and operate at minimum speed. When the internal temperature reaches 30° C, the outer fans switch on and also operate at minimum speed. As the temperature rises further, fan speed increases for both the inner and outer fans.

After switch-on, the blower speed accelerates continuously up to the maximum specified rotation. Then the speed is regulated down to the specified ramp.

11.4.2 Temperature Sensor

The temperature sensor is mounted in the heat exchanger at the air inlet of inner circuit.

Failure of the temperature sensor (e.g., sensor disconnected or short circuited) causes the following response:

- All blowers are rotating at full specified speed
- Alarm occurs, red LED is lit flashing.

The response can be delayed up to 15 seconds. after the failure occurs.

11.4.3 Alarm

There is one alarm output per heat exchanger. An alarm is raised when:

- At least one blower fails
- Temperature sensor/plug disconnected or short circuited
- The controller is faulty
- Temperature exceeds 70° C
- Temperature drops below -60° C (sensor failure).

The response can be delayed up to 15 seconds. after the failure occurs.

11.4.4 LED

An alarm indication is implemented by means of a visible red LED located on the lid (inner circuit side):

- The red LED is lit flashing in case of a temperature/temperature sensor alarm
- The red LED is lit continuously in case of a fan alarm.

11.4.5 Test Port

The test port allows the connection of an external temperature simulator (variable resistor) setting a temperature value to check the blower operation depending on the temperature.

11.4.6 Appearance

The following figure shows the front and the rear views of HEX5.

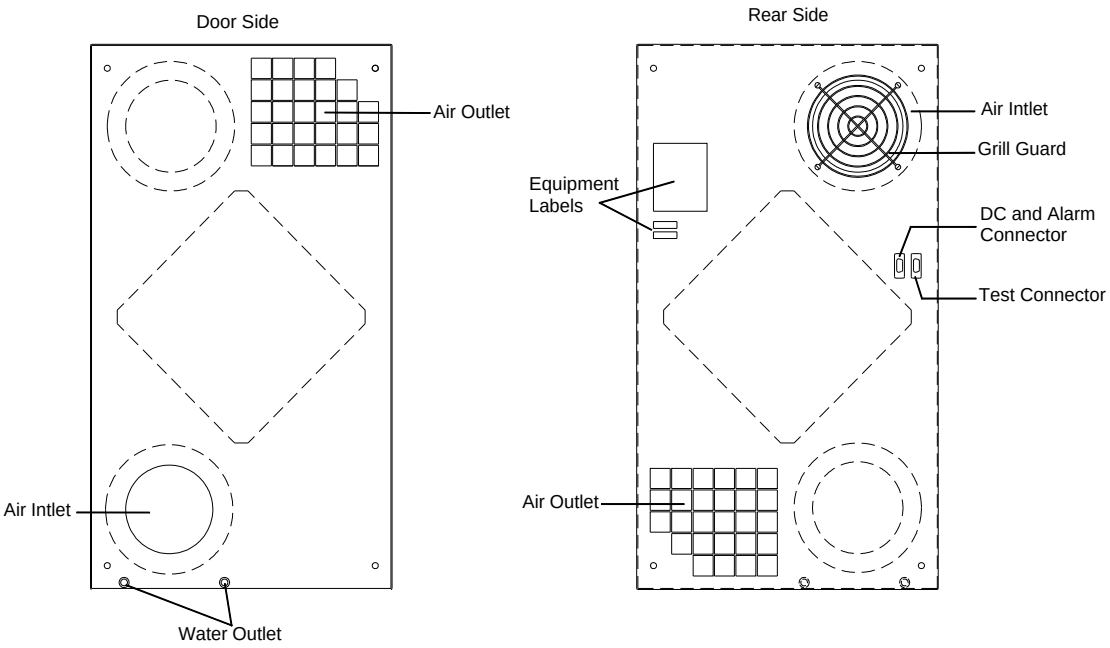


Figure 356: HEX5 Appearance

11.4.7 Connectors

The following table describes the HEX5 connectors.

Connector	Type	Description
DC and Alarm Connector	9-pin Sub-D male	48 VDC power in (fuse T6.3 A) Alarm out.
Test Connector	9-pin Sub-D female	Connection of external temperature simulator.

Table 109: HEX5 Connectors

11.4.8 Mechanical Parameters

The following table lists the mechanical parameters of the HEX5.

Parameter	HEX5
Height (mm)	800
Width (mm)	450
Depth (mm)	130
Weight (kg)	13

Table 110: HEX5 Mechanical Parameters

11.5 HEX8/HEX9

HEX8 and HEX9 are used in Multistandard BTS Evolution outdoor versions. They maintain the correct air environment within the cabinets. Fresh air cooling is not allowed in the outdoor BTSs. Therefore the airflow within the cabinets is isolated from the outside environment.

HEX9 is mounted on the inside of the MBO1E door, HEX8 is mounted on the inside of the MBOEE door. They cool the internal air by transferring heat to the outside environment. The following figure shows the main components of HEX8 and HEX9.

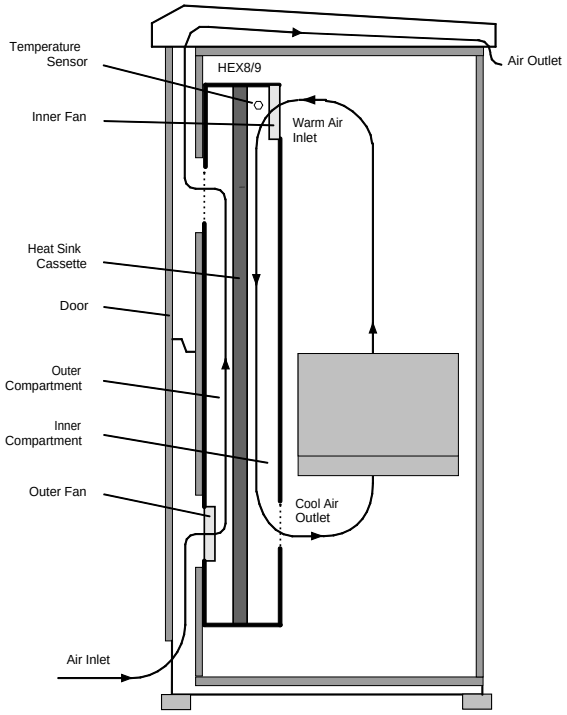


Figure 357: HEX8/HEX9 Main Components

HEX8 and HEX9 are boxes which are divided into inner and outer circuits by a heat sink cassette (core). The core consists of thermal conductive material allowing heat exchange between both circuits. The air is circulated by one blower in each circuit. Warm air from inside the cabinet is drawn into the inner compartment by the inner fan. It is then blown past the heat sink cassette and returned to the cabinet as cool air.

The heat gathered in the heat sink cassette is transferred to the outside environment by the air stream in the outer compartment. The outside air is drawn into the outer compartment by the outer fan.

11.5.1 Blower Rotation Control

The temperature-controlled regulation of blower rotation is contained in a control unit which is assembled inside an inner circuit. The inner and outer blower are independent of each other. The control of blowers is an internal function of the heat exchanger.

When the internal temperature reaches 20° C, the inner fans switch on and operate at minimum speed. When the internal temperature reaches 30° C, the outer fans switch on and also operate at minimum speed. As the temperature rises further, fan speed increases for both the inner and outer fans.

After switch-on, the blower speed accelerates continuously up to the maximum specified rotation. Then the speed is regulated down to the specified ramp.

11.5.2 Temperature Sensor

The temperature sensor is mounted in the heat exchanger at the air inlet of the inner circuit.

Failure of the temperature sensor (e.g., sensor disconnected or short circuited) causes the following response:

- All blowers are rotating at full specified speed
- Alarm occurs, red LED is lit.

The response can be delayed up to 5 seconds after the failure occurs.

11.5.3 Alarm

There is one alarm output per heat exchanger. An alarm is raised when:

- At least one blower fails
- Temperature sensor/plug disconnected or short circuited
- The controller is faulty
- Temperature exceeds 70° C
- Temperature drops below -60° C (sensor failure).

The response can be delayed up to 5 seconds after the failure occurs.

11.5.4 LED

An alarm indication is implemented by means of a visible red LED located on the lid (inner circuit side).

The red LED is lit in case of an alarm.

11.5.5 Test Port

The test port allows the connection of an external temperature simulator (variable resistor) setting a temperature value to check the blower operation depending on the temperature.

11.5.6 Appearance

The following figure shows the front and the rear views of the HEX8/HEX9. Note that the HEX8 and HEX9 only differ in width and weight.

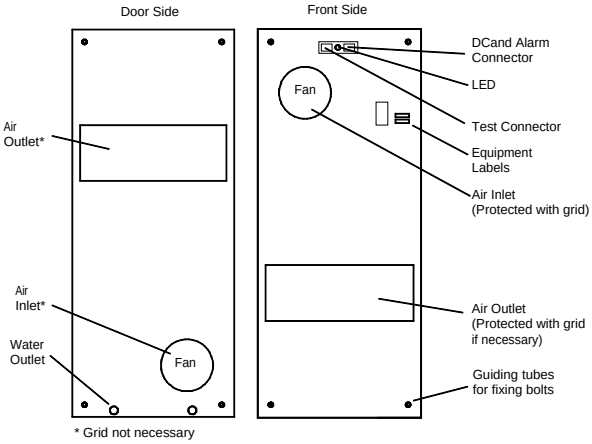


Figure 358: HEX8/HEX9 Appearance

11.5.7 Connectors

The following table describes the HEX8/HEX9 connectors.

Connector	Type	Description
DC and Alarm Connector	9-pin Sub-D male	48 VDC power in (fuse T6.3 A) Alarm out.
Test Connector	9-pin Sub-D female	Connection of external temperature simulator.

Table 111: HEX8/HEX9 Connectors

11.5.8 Mechanical Parameters

The following table lists the mechanical parameters of the HEX3/HEX4.

Parameter	HEX8	HEX9
Height (mm)	1250	1250
Width (mm)	450	600
Depth (mm)	150	150
Weight (kg)	24	28

Table 112: HEX8/HEX9 Mechanical Parameters

11.6 DAC8/DAC9

DAC8 and DAC9 are used in Multistandard BTS Evolution outdoor versions. They maintain the correct air environment within the cabinets using fresh air cooling.

DAC9 is mounted on the inside of the MBO1E door, DAC8 is mounted on the inside of the MBOEE door. They cool the internal air by transferring heat to the outside environment. The following figure shows the main components of DAC8 and DAC9.

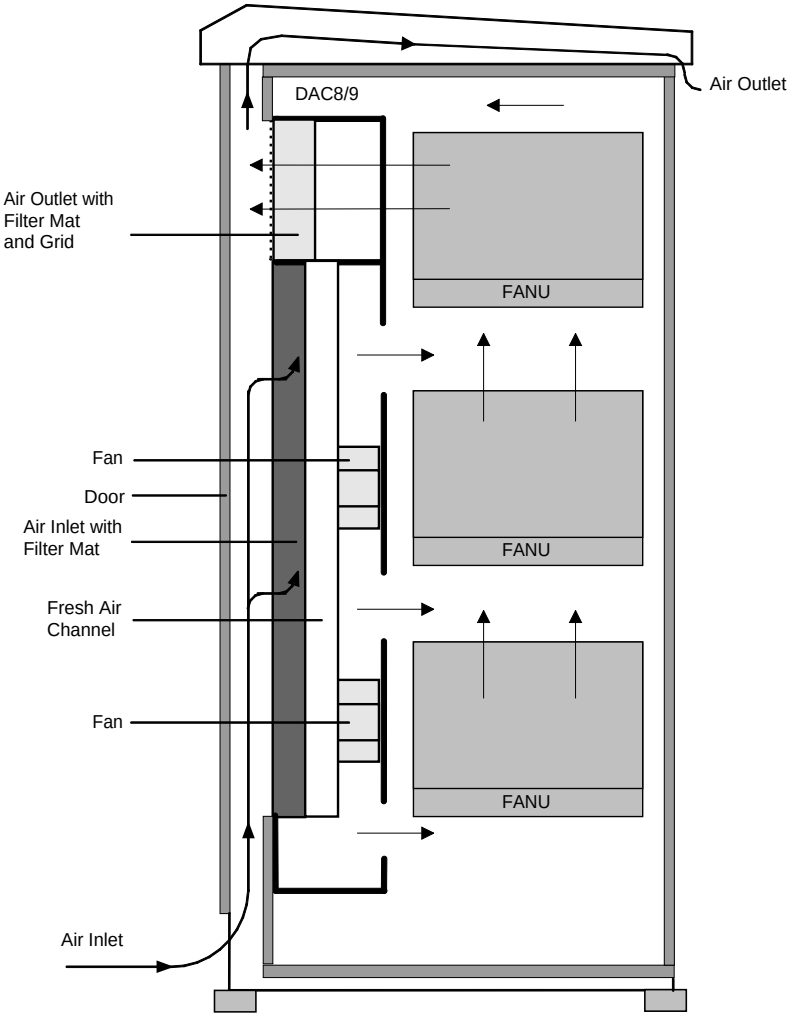


Figure 359: DAC8/DAC9 Main Components

The DAC8 and DAC9 consists of metal boxes with an air inlet and an air outlet in the front side as shown in Figure *359*. In these cut-outs filter mats are mounted.

Compared to HEX system, where the air inside of the cabinet is separated from ambient air, the DAC system uses fresh air to cool the equipment inside of the cabinet.

The ambient air is drawn by fans through the hydrophobic filter mat and blown into the BTS through cut-outs directly below the subracks. There it arises to the top of the BTS and leaves it by the air outlet. The air outlet is protected against intrusion of water and insects by a filter mat and an additional fly screen.

11.6.1 Blower Rotation Control

The temperature-controlled regulation of blower rotation is contained in a control unit which is assembled inside an inner circuit. The control of blowers is an internal function of the direct air cooling module.

When the internal temperature reaches 30° C, the fans switch ON and operate at 1500 rpm speed. When the internal temperature reaches 35° C and is below 55 ° C the fan speed increases linearly up to 2500 rpm. As the temperature rises further, fan speed increases up to maximum speed of 2900 rpm.

11.6.2 Temperature Sensor

The temperature sensor is mounted on the controller PBA.

Failure of the temperature sensor (e.g., sensor disconnected or short circuited) causes the following response:

- All blowers are rotating at full specified speed
- Alarm occurs, red LED is lit.

The response can be delayed up to 15 seconds after the failure occurs.

11.6.3 Filter Mats

The inlet filter is a cassette consisting of a frame mounted on the door containing a filter mat. The filter mat is made of hydrophobic material but not gas proof.

The outlet fleece filter mat is additional protected by a fly screen.

11.6.4 Alarm

There is one alarm output per cooling unit. An alarm is raised when:

- At least one blower fails
- Temperature sensor/plug disconnected or short circuited
- The controller is faulty
- Temperature exceeds 70° C
- Temperature drops below -60° C (sensor failure).

The response can be delayed up to 15 seconds after the failure occurs.

11.6.5 LED

An alarm indication is implemented by means of a visible red LED located on the lid (inner circuit side).

The red LED is lit in case of an alarm.

11.6.6 Test Port

The test port allows the connection of an external temperature simulator (variable resistor) setting a temperature value to check the blower operation depending on the temperature.

11.6.7 RS232

The RS232 port allows the connection of an external terminal to readout the fan speed..

11.6.8 Appearance

The following figure shows the front and the rear views of the DAC8/DAC9. Note that the DAC8 and HEX9 only differ in width and weight.

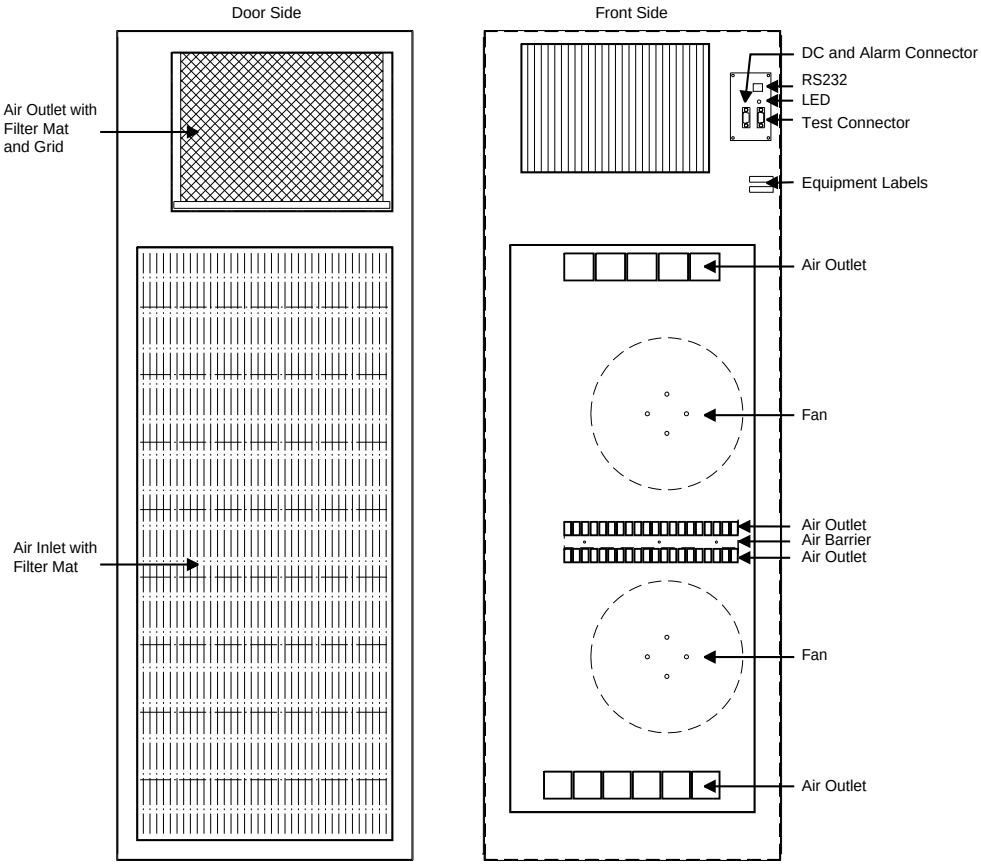


Figure 360: DAC8/DAC9 Appearance

11.6.9 Connectors

The following table describes the DAC8/DAC9 connectors.

Connector	Type	Description
DC and Alarm Connector	9-pin Sub-D male	48 VDC power in (fuse T6.3 A) Alarm out.
Temperature and Test Connector	9-pin Sub-D female	Connection of external temperature simulator.
RS232	RJ45	For readout the fan speed.

Table 113: DAC8/DAC9 Connectors

11.6.10 Mechanical Parameters

The following table lists the mechanical parameters of the DAC8/DAC9.

Parameter	DAC8	DAC9
Height (mm)	1229	1229
Width (mm)	449	600
Depth (mm)	150	150
Weight (kg)	18	22

Table 114: DAC8/DAC9 Mechanical Parameters

11.7 HEAT2

HEAT2 is an electrical air heater used in outdoor BTS A9100 versions. It switches on automatically when the internal air temperature falls below a predefined value.

HEAT2 is an electro-mechanical assembly fitted to the floor, the side wall or beneath the HEX4 (MBO1) of each compartment in the outdoor BTS A9100. The following figure shows the circuit schematic.

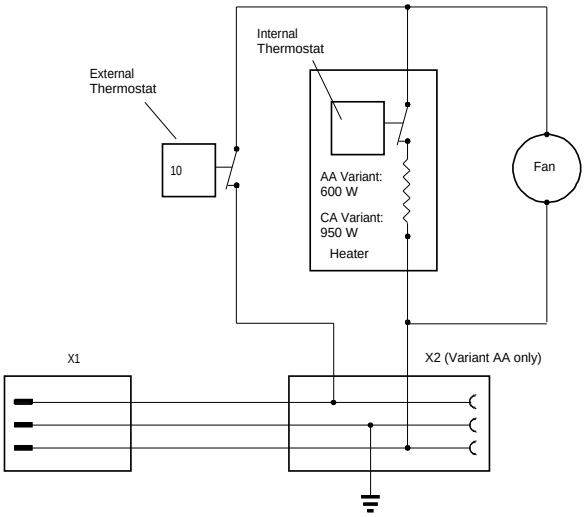


Figure 361: HEAT2 Circuit Schematic

The 230 VAC supply enters HEAT2 at connector X1. From there it is routed to the heater and fan (via connector X2 in case of variant AA). If, in case of variant AA, another HEAT2 is fitted, its AC supply is provided by the socket which is part of connector X2.

The external thermostat closes a switch when the temperature is below 10° C. The switch completes the circuit for the AC supply to the heater and fan. The fan blows air through the heating elements of the heater.

The heater is protected by an internal thermostat. If the temperature of the heater assembly exceeds 90° C, the thermostat within the heater assembly opens a switch. This breaks the AC circuit to the heater elements.

11.7.1 Appearance

The HEAT2 has two variants: variant AA and variant CA. Each variant is shown separately.

11.7.1.1 Variant AA

The following figure shows the side and top views of HEAT2 variant AA.

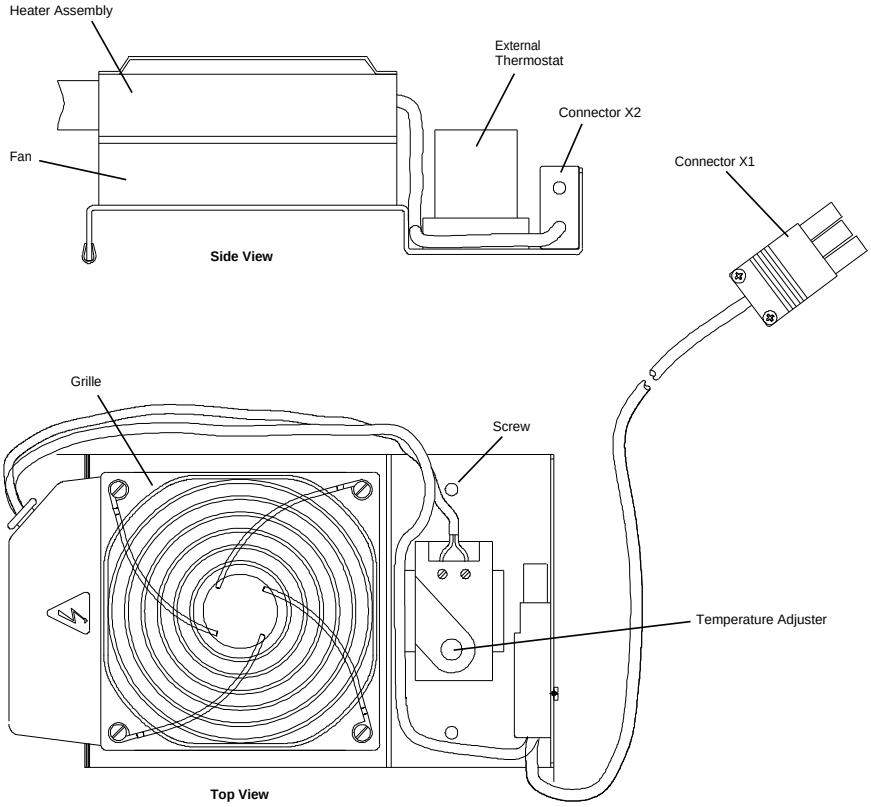


Figure 362: HEAT2 Variant AA Appearance

11.7.1.2 Variant CA

The following figure shows the side and top view of HEAT2 variant CA.

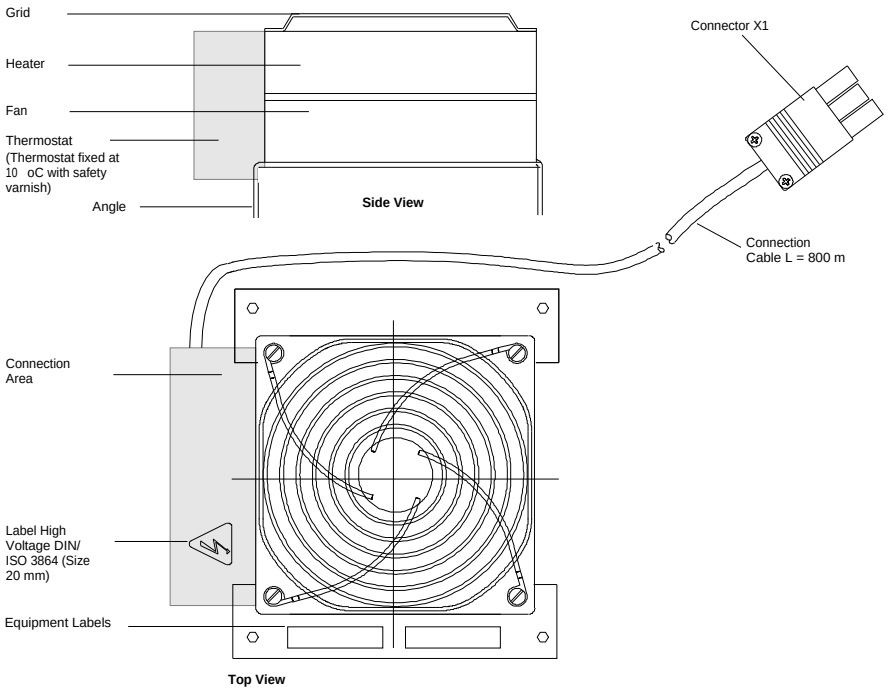


Figure 363: HEAT2 Variant CA

11.7.2 Connectors

The following table describes the HEAT2 connectors.

Connector	Description
X1	Provides the 230 VAC input.
X2 (Variant AA only)	Provides the 230 VAC source for a second, optional HEAT2.

Table 115: HEAT2 Connectors

11.8 HEAT3

HEAT3 is an electrical air heater used in outdoor BTS Compact versions. It switches on automatically when the internal air temperature falls below a predefined value.

HEAT3 is an electrical assembly fitted between the bottom plate of the Compact BTS Outdoor and the lowest subrack. The following figure shows the circuit schematic.

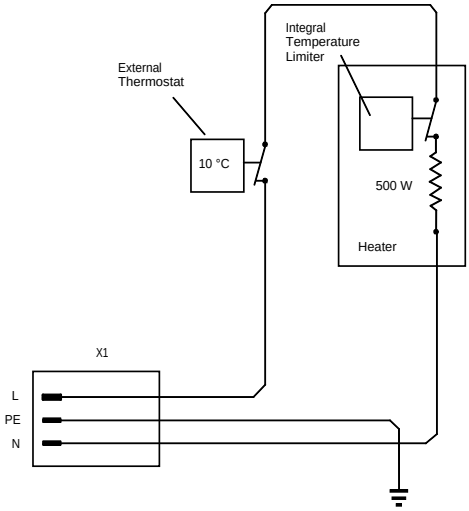


Figure 364: HEAT3 Circuit Schematic

The 230 VAC supply enters HEAT3 at connector X1.

The external thermostat closes a switch when the temperature is below 10° C. The switch completes the circuit for the AC supply to the heater.

The heater is protected by an internal thermostat. If the temperature of the heater assembly exceeds 70° C, the thermostat within the heater assembly opens a switch. This breaks the AC circuit to the heater elements.

11.8.1 Appearance

The following figure shows the side and top views of HEAT3.

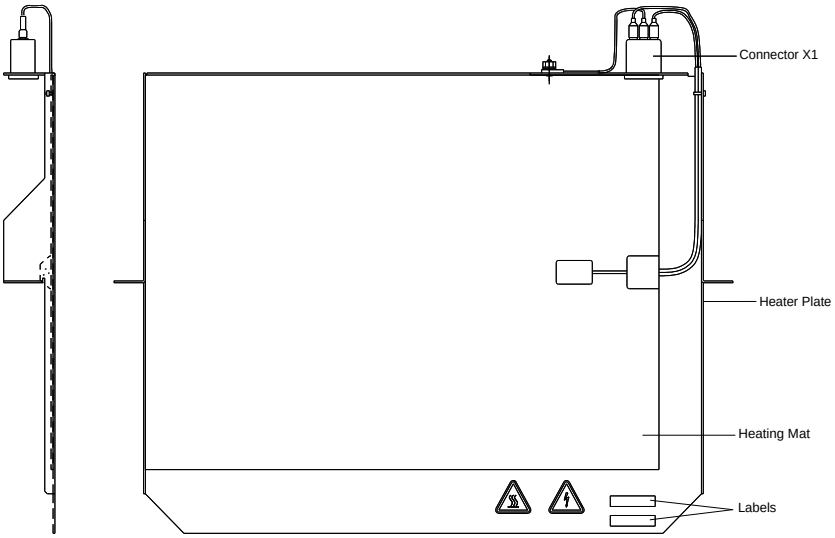


Figure 365: HEAT3 Appearance

11.8.2 Connectors

The following table describes the HEAT3 connectors.

Connector	Description
X1	Provides the 230 VAC input.

Table 116: HEAT3 Connectors

11.9 HEAT4

HEAT4 is an electrical air heater used in outdoor BTS Compact versions. It switches on automatically when the internal air temperature falls below a predefined value.

HEAT4 is an electrical assembly fitted between the bottom plate of the Compact BTS Outdoor and the lowest subrack. The following figure shows the circuit schematic.

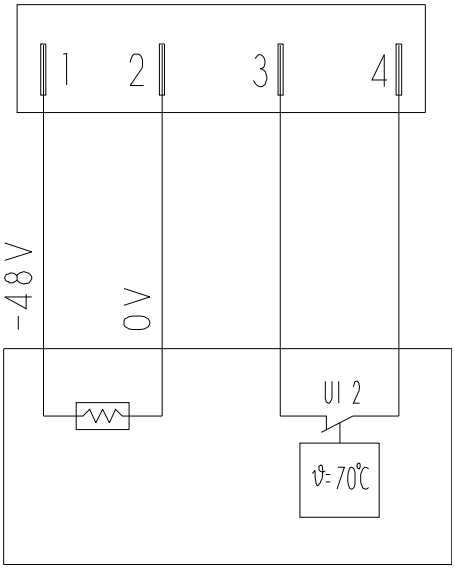


Figure 366: HEAT4 Circuit Schematic

The -48 VDC supply enters HEAT4 at power connector.

The external thermostat closes a switch when the temperature is below 10° C. The switch completes the circuit for the DC supply to the heater.

The heater is protected by an internal thermostat. If the temperature of the heater assembly exceeds 70° C, the thermostat within the heater assembly opens a switch. This breaks the DC circuit to the heater elements.

11.9.1 Appearance

The following figure shows the side and top views of HEAT4.

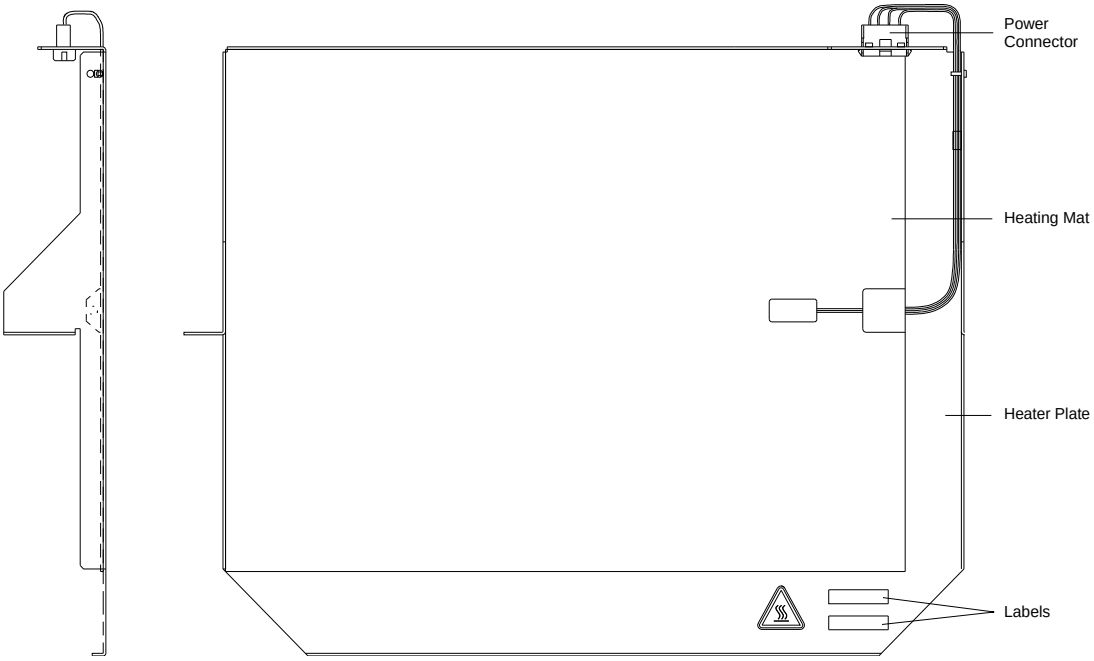


Figure 367: HEAT4 Appearance

11.9.2 Connectors

The following table describes the HEAT4 connectors.

Connector	Description
Power connector	Provides the -48 VDC input.

Table 117: HEAT4 Connectors

11.10 HEATDC

HEAT DC is an electrical air heater used in DC A9100 MBS GSM outdoor versions. It switches on automatically when the internal air temperature falls below + 10° C.

HEAT DC is an electro-mechanical assembly fitted to the side wall or beneath the HEX4 (MBO1) of each compartment in the DC A9100 MBS GSM outdoor. The following figure shows the circuit schematic.

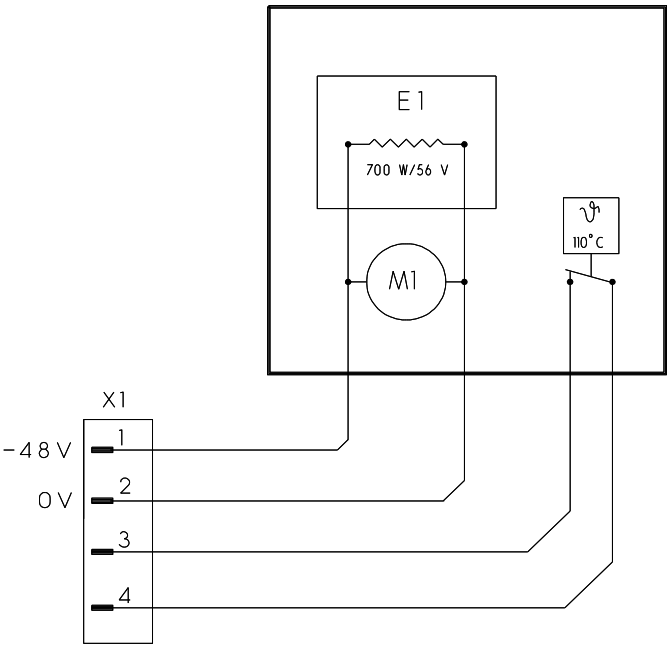


Figure 368: HEAT DC Circuit Schematic

The - 48 VDC supply enters HEAT2 at connector X1. From there it is routed to the heater and fan.

The external thermostat closes a switch when the temperature is below 10° C. The switch completes the circuit for the DC supply to the heater and fan. The fan blows air through the heating elements of the heater.

The heater is protected by an internal temperature limiter in case of fan failure. If the temperature of the heater assembly exceeds 110° C, the temperature limiter opens a switch. This breaks the DC circuit to the heater elements.

11.10.1 Appearance

The following figure shows the side and top views of HEATDC.

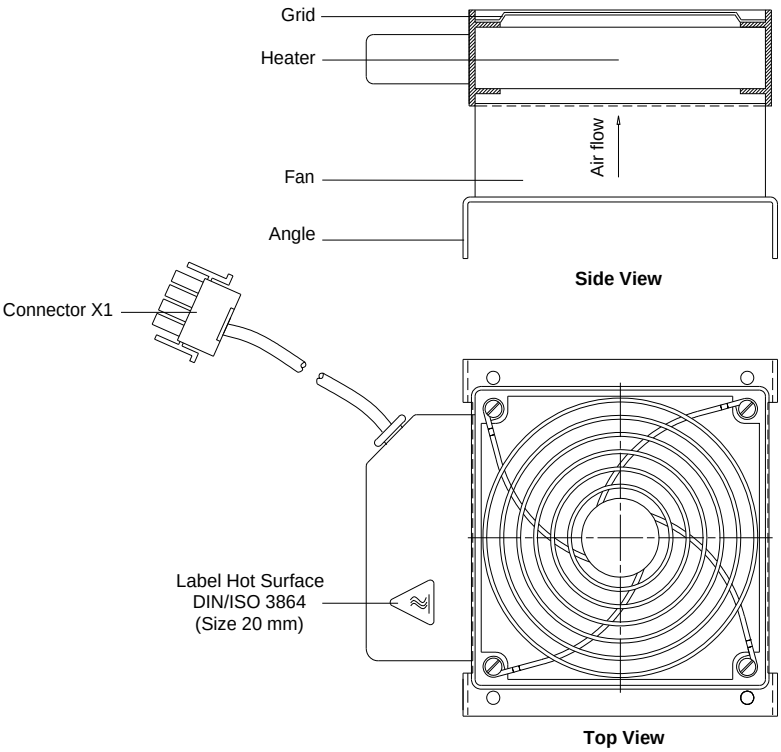


Figure 369: HEATDC Appearance

11.10.2 Connectors

The following table describes the HEATDC connectors.

Connector	Description
X1	Provides the - 48 VDC input.

Table 118: HEATDC Connectors

12 Power Supplies and Distribution

The sections are supported with diagrams, where necessary, showing the functional blocks and their interfaces.

A drawing of the physical appearance of the module is also included, showing the connectors and controls.

12.1 ACIB

The ACIB is used in outdoor BTS A9100 versions. It distributes its AC input to five output connectors. The five output connectors provide the AC power source for the PM08s.

The ACIB is housed in the SRACDC. It distributes 230 VAC to the five PM08s. If the temperature in the ACIB falls below a predefined level, the AC supply to the PM08s is automatically switched off. The following figure shows the circuit schematic.

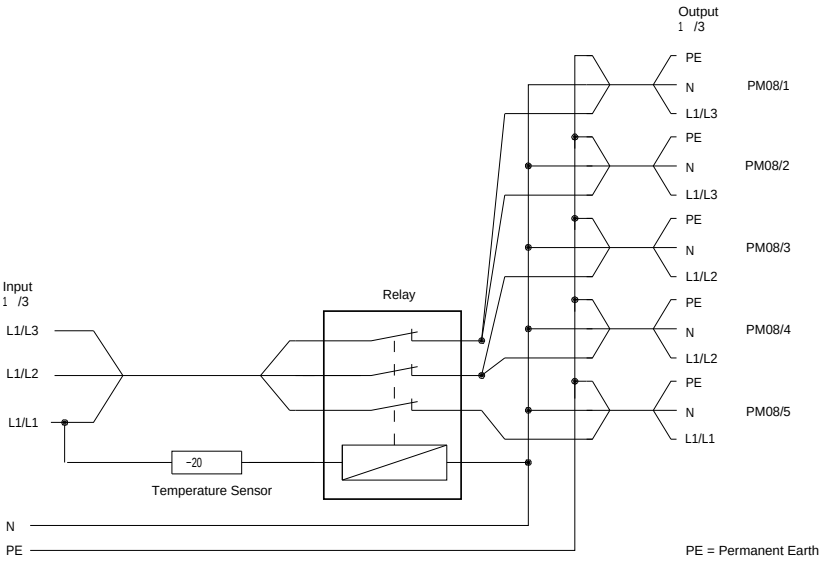


Figure 370: ACIB Circuit Schematic

The ACIB input connector is connected to the ACSB where provision is made for 1Ø or 3Ø operation.

If the cabinet AC supply is:

- 230 VAC 1Ø - each of the three live wires in the input connector receives the same, single phase L1. The PM08s connected to the output connectors also receive the phase L1.
- 400 VAC 3Ø - each of the three live wires in the input connector receives a different phase, L1, L2 or L3. The PM08s connected to the output connectors share the L1, L2 and L3 phases, as shown in the above figure.

The AC input is connected to the five AC outputs via a relay which is controlled by a temperature sensor. When the temperature is above -20° C, the AC input is connected to the five AC output connectors.

If the temperature is below -20° C when the BTS A9100 is first switched on, there is no AC supply to the PM08s. This means that the 0/ -48 VDC supply is not available and the BTS A9100 cannot operate. However, AC power is available to the HEAT2s.

When the HEAT2s raise the internal cabinet temperature above -20° C, the relay is activated and the DC supplies are produced. The HEAT2s prevent the internal cabinet temperature from falling to -20° C thereafter.

When the internal cabinet temperature rises above 0° C, the SUMP switches on the telecommunications modules and the BTS A9100 becomes operational.

12.1.1 Front Panel

The following figure shows the front panel of the ACIB.

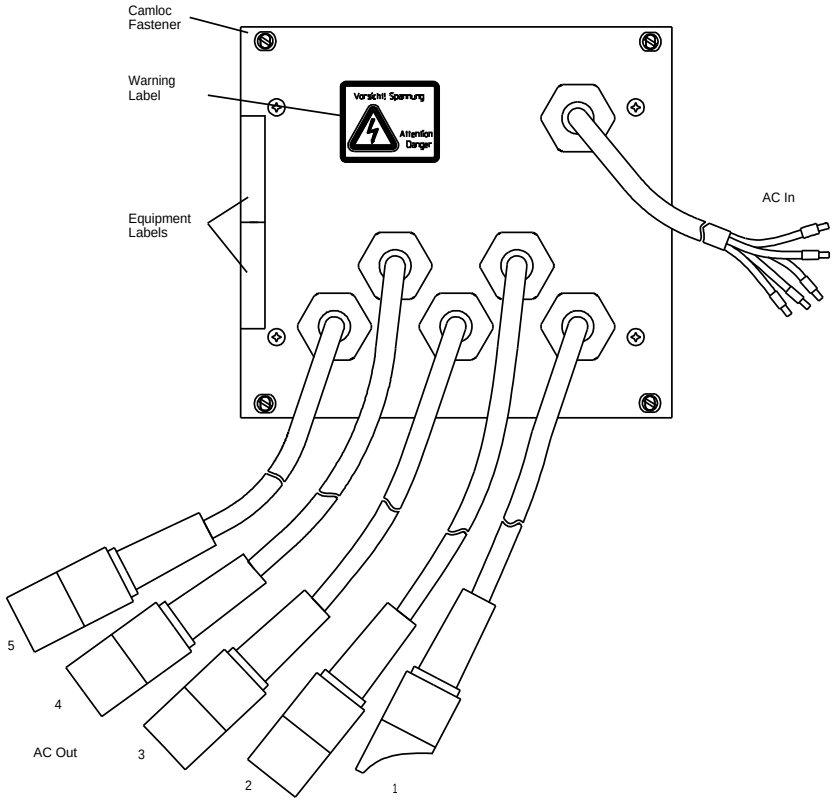


Figure 371: ACIB Front Panel

12.1.2 Connectors

The following table describes the ACIB front panel connectors.

Connector	Description
AC In	Provides a 230 VAC 1Ø or 400 VAC 3Ø input.
AC Out 1- 5	Provides 230 VAC 1Ø outputs for the five PM08s.

Table 119: ACIB Front Panel Connectors

12.2 LPFC

The LPFC is used in Compact BTS Outdoor cabinets.

Its functions are:

- Connection of AC mains to the BTS
- Lightning protection of the AC mains In
- Line filtering.

The following figure shows the block diagram of the LPFC.

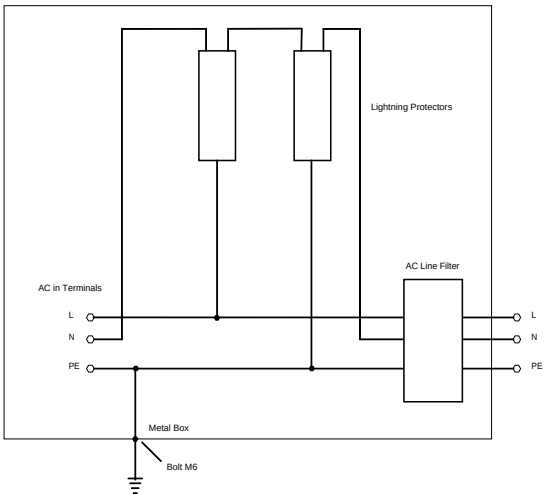


Figure 372: LPFC Block Diagram

The multistandard BTS outdoor cabinet is supplied with 230 VAC 1 Ø.

The LPFC is mounted above the cables entry compartment. The cover of the LPFC has a window which allows checking the lightning protection modules without removing the cover.

The following figure shows the LPFC top view.

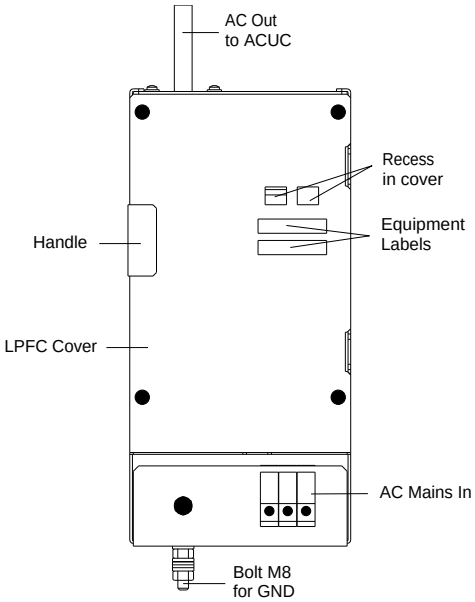


Figure 373: LPFC Top View

12.3 LPFMT

The LPFMT is used in multistandard BTS outdoor tropical cabinets.

Its functions are:

- Connection of AC mains to the BTS
- Lightning protection of the AC mains In
- Line filtering.

The following figure shows the block diagram of the LPFMT.

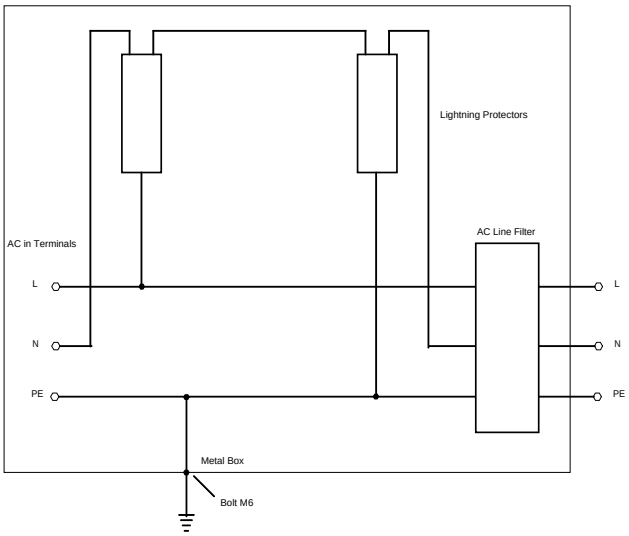


Figure 374: LPFMT Block Diagram

The multistandard BTS outdoor cabinet is supplied with 230 VAC 1phase.

The LPFMT is mounted on the left upper side of the MBO1T cabinet. The cover of the LPFMT has a window which allows checking the lightning protection modules without removing the cover.

The following figure shows the LPFMT top view.

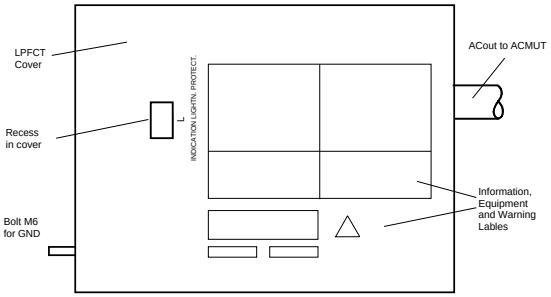


Figure 375: LPFMT Top View

12.4 LPFM

The LPFM is used in multistandard BTS outdoor cabinets.

Its functions are:

- Connection of AC mains to the BTS
- Lightning protection of the AC mains In
- Line filtering.

The following figure shows the block diagram of the LPFM.

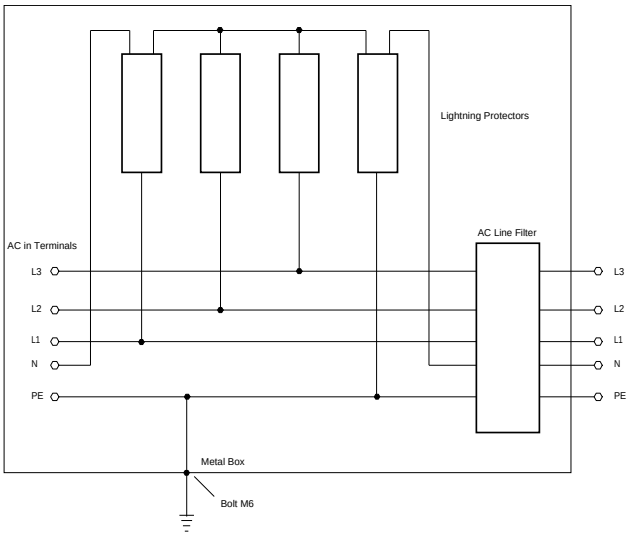


Figure 376: LPFM Block Diagram

The multistandard BTS outdoor cabinet can be supplied with 230 VAC 1 Ø or 400 VAC 3Ø.

If the cabinet AC supply is:

- 230 VAC 1 Ø - the three AC In terminals are connected by a bridge, i.e., each of the three live wires receives the same, single phase L1.

- 400 VAC 3 Ø - each of the three live wires at the AC In terminals receives a different phase, L1, L2 or L3.

The LPFM is mounted on the left upper side of the MBO1 cabinet. The cover of the LPFM has a window which allows checking the lightning protection modules without removing the cover.

The following figure shows the LPFM top view.

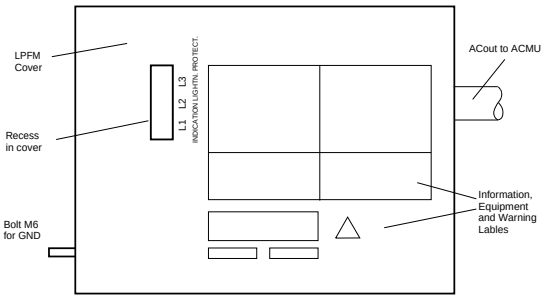


Figure 377: LPFM Top View

12.5 LPFU

The LPFU is used in outdoor BTS A9100 configurations.

Its functions are:

- Connection of AC mains to the BTS
- Lightning protection of the AC mains In
- Line filtering.

The following figure shows the block diagram of version AA (three phases).

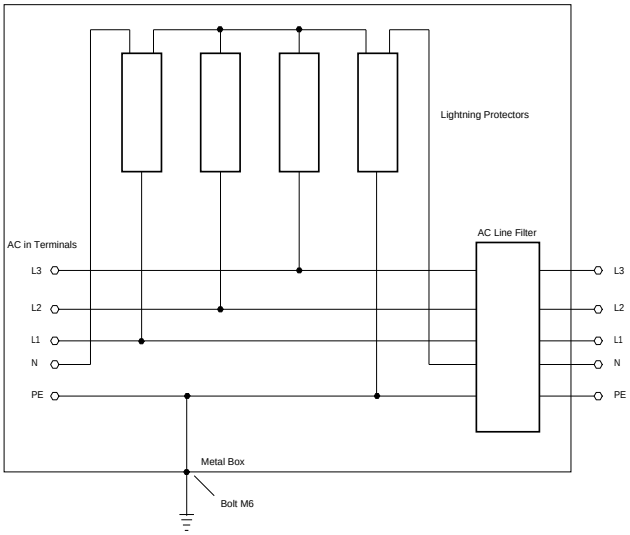


Figure 378: LPFU Version AA, Block Diagram

The outdoor BTS can be supplied with 230 VAC 1 Ø or 400 VAC 3Ø.

If the cabinet AC supply is:

- 230 VAC 1 Ø - the three AC In terminals are connected by a bridge, i.e., each of the three live wires receives the same, single phase L1
- 400 VAC 3 Ø - each of the three live wires at the AC In terminals receives a different phase, L1, L2 or L3.

The following figure shows the LPFU top view with its cover removed.

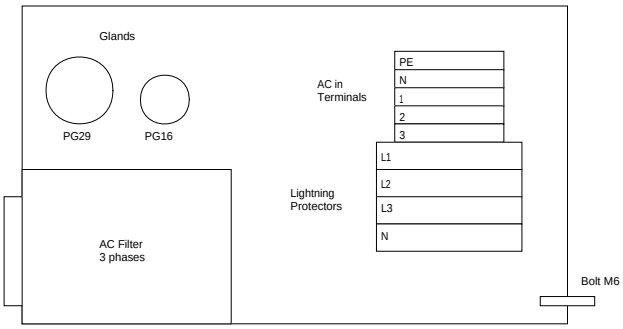


Figure 379: LPFU Version AA, Top View (with Cover Removed)

12.6 ACDUE

The AC Distribution Unit is used for MBO1E cabinets.

The ACDUE contains:

- AC cable access in bottom inside the Filter/OVP part
- 3-phase input (L1, L2, L3, N, PE)
- AC line filtering
- Surge protectors
- Overcurrent protection devices
- Thermostat.

The ACDUE box is divided in two parts:

- Filter and OVP function in bottom
- AC-distribution and MCB above.

12.6.1 Technical Charateristics

Parameter	ACDUE
Line filtering, rated current	3 x 12 A
Line filtering, leakage current	Max. 4 mA/phase at 230 V
Line filteri damping	30 db at 1 MHz, 70 dB at 10 MHz to 1 GHz
Overcurrent protection devices	4 x 16 A (3 for rectifiers, 1 for heaters) 1 x 10 A (for light and service socket)
AC power switch thermostat	Closed at temperature above -20° C, open below -20° C, hysteresis max. 10 K

12.6.2 ACDUE Views

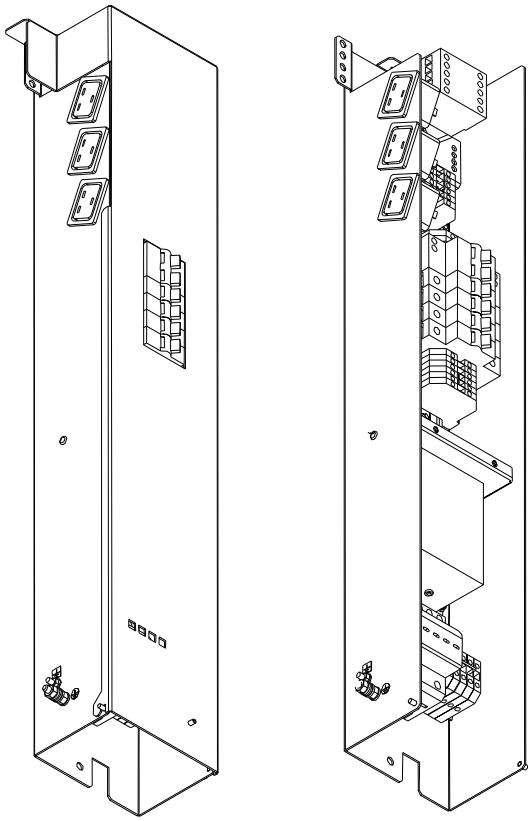


Figure 380: ACDUE Views

12.7 ACMU

The ACMU is used in multistandard BTS outdoor configurations.

Its functions are:

- Distribution of the AC input to AC/DC converters, heaters/air conditioning and Service Lights (with AC power sockets)
- Switching the AC lines to the connected modules by using circuit breakers.

The following figure shows the block diagram.

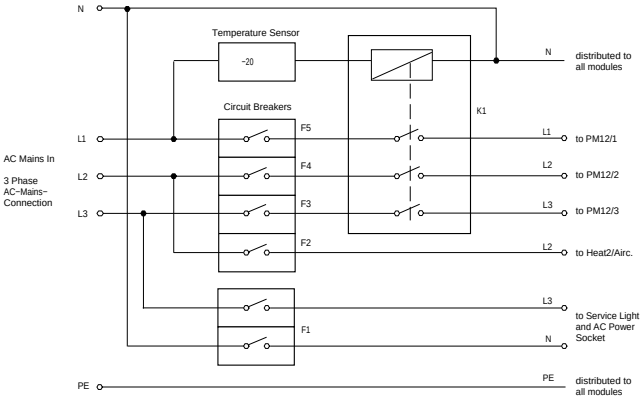


Figure 381: ACMU Block Diagram

The AC input controlled by circuit breakers is connected to the three AC/DC converters via a relay which is controlled by a temperature sensor. When the temperature is above -20° C, the AC input is connected to the three AC output connectors.

If the temperature is below -20° C when the BTS A9100 is first switched on, there is no AC Supply to the PM12s. This means that the 0/ -48 V supply is not available and the BTS A9100 cannot operate. However, AC power is available to the HEAT2.

When the HEAT2s raise the internal cabinet temperature above -20° C, the relay is activated and the DC supplies are produced. The HEAT2s prevent the internal cabinet temperature from falling to -20° C thereafter.

When the internal cabinet temperature rises above 0° C, the SUMA switches on the telecommunications modules and the BTS A9100 become operational.

The following figure shows the ACMU front panel.

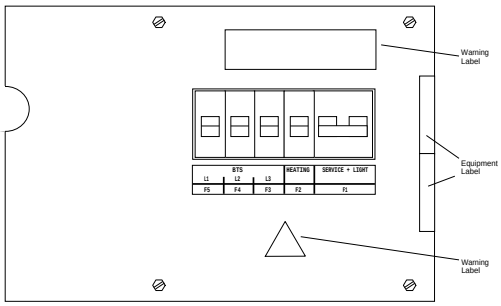


Figure 382: ACMU Front Panel

12.8 ACMUT

The ACMUT is used in multistandard BTS outdoor tropical configurations.

Its functions are:

- Distribution of the AC input to AC/DC converters and air conditioning
- Switching the AC line to the connected modules by using circuit breakers.

The following figure shows the block diagram.

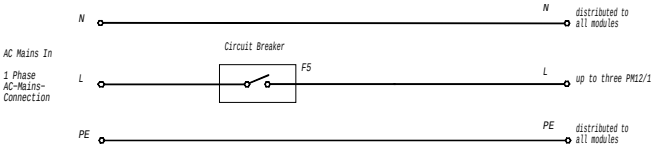


Figure 383: ACMUT Block Diagram

The AC input controlled by circuit breakers is connected to the three AC/DC converters.

The following figure shows the ACMUT front panel.

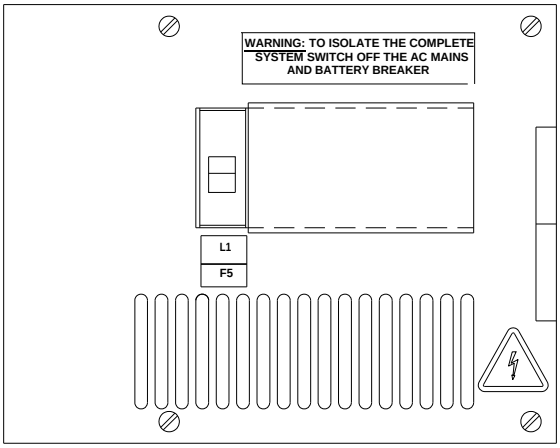


Figure 384: ACMUT Front Panel

12.9 ACSU

The ACSU is used in outdoor BTS A9100 configurations.

Its functions are:

- Distribution of the AC input to AC/DC converters, heaters/air conditioning and Service Lights (with AC power sockets)
- Switching the AC lines to the connected modules by using circuit breakers.

The following figure shows the block diagram for CODI/CODE/CPT2.

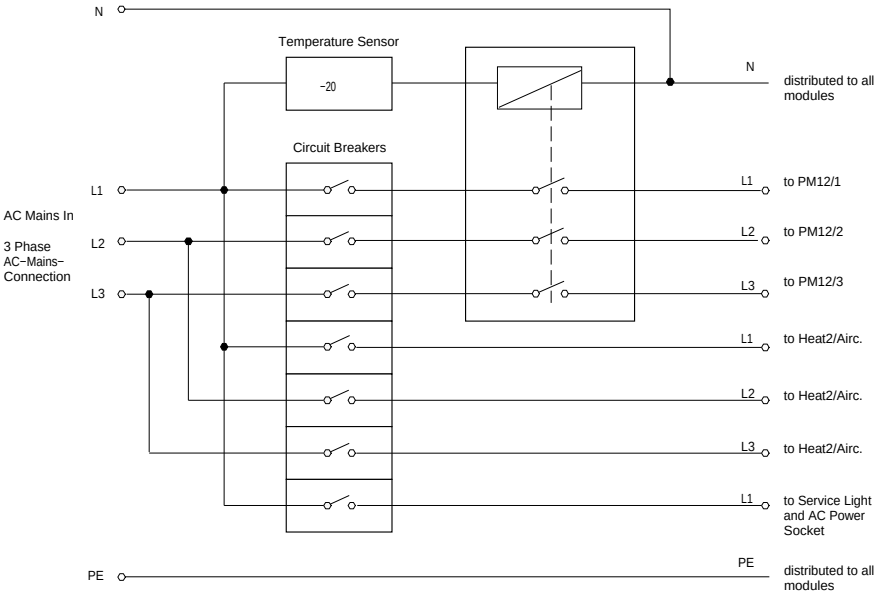


Figure 385: CODI/CODE/CPT2, ASCU Block Diagram

The AC input controlled by circuit breakers is connected to the three AC/DC converters via a relay which is controlled by a temperature sensor. When the temperature is above -20° C, the AC input is connected to the two or three AC output connectors.

If the temperature is below -20° C when the BTS A9100 is first switched on, there is no AC Supply to the PM12s. This means that the 0/ -48 V supply is not available and the BTS A9100 cannot operate. However, AC power is available to the HEAT2.

When the HEAT2s raise the internal cabinet temperature above -20° C, the relay is activated and the DC supplies are produced. The HEAT2s prevent the internal cabinet temperature from falling to -20° C thereafter.

When the internal cabinet temperature rises above 0° C, the SUMA switches on the telecommunications modules and the BTS A9100 become operational.

The following figure shows the ACSU front panel of CODI/CODE/CPT2.

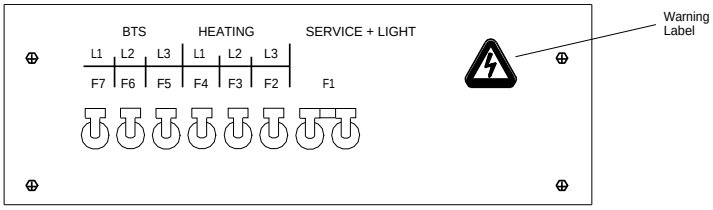


Figure 386: ACSU Front Panel CODI/CODE/CPT2

12.10 ACUC

The ACUC is used in Compact BTS Outdoor (CBO) configurations.

Its functions are:

- Distribution of the AC input to AC/DC converters, heaters/air conditioning and AC power socket
- Switching the AC lines to the connected modules by using circuit breakers.

The following figure shows the block diagram.

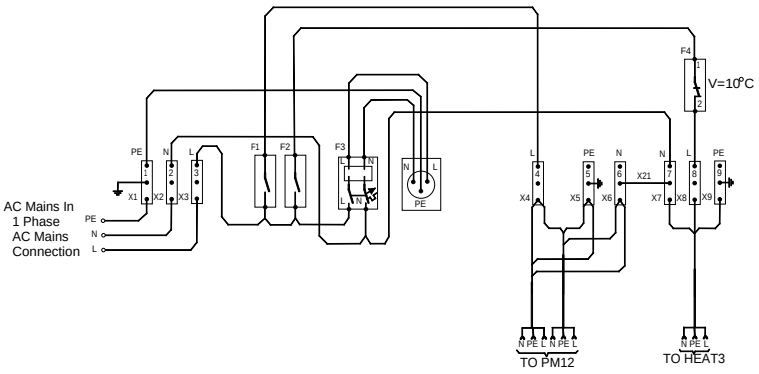


Figure 387: ACUC Block Diagram

The AC input controlled by circuit breakers is connected to the two AC/DC converters. From -33° C the AC power is applied to the PM12 modules, FAN units and to HEAT3.

When the internal cabinet temperature rises above 0° C, the SUMA switches on the telecommunications modules and the CBO become operational.

When the internal cabinet temperature rises above 10° C, the HEAT3 is switched off.

The following figure shows the ACUC front panel.

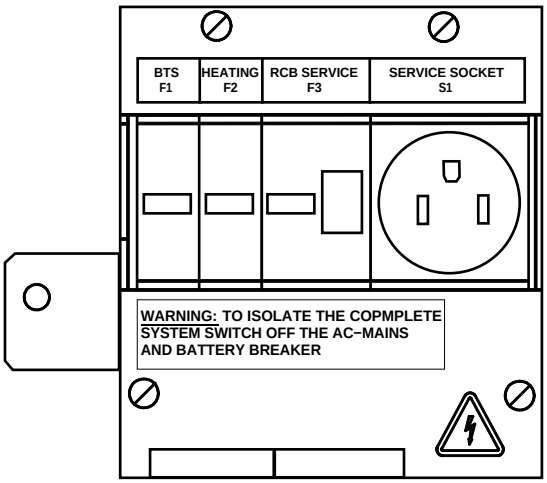


Figure 388: ACUC Front Panel

12.11 APOD

The APOD is used in indoor BTS A9100 versions that use an AC power supply. It distributes its AC input to five output connectors. The five output connectors provide the AC power source for the PM08s. The DC output from the PM08s is then distributed to the subracks and other equipment by the APOD.

The APOD is housed in the ASIB. It distributes 230 VAC to the five PM08s. The DC supply produced by the PM08s is connected to the remaining modules in the cabinet via the circuit breakers located on the APOD, as shown in the following figure.

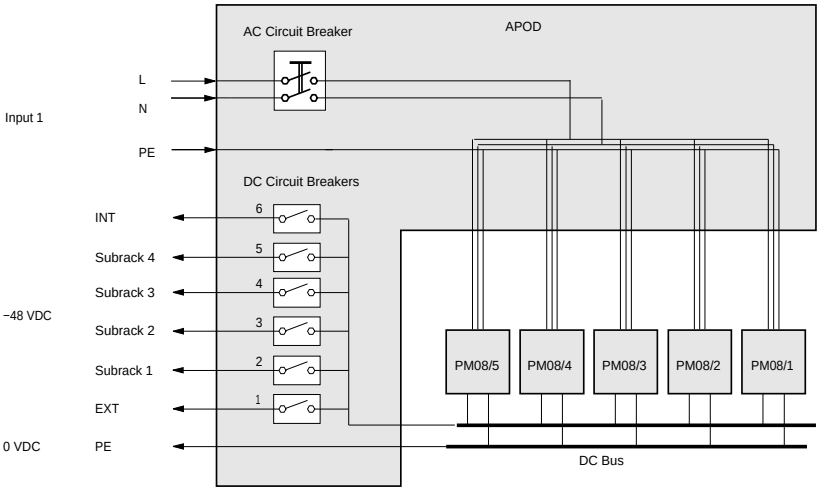


Figure 389: APOD Circuit Schematic

12.11.1 Front Panel

The following figure shows the front panel of the APOD.

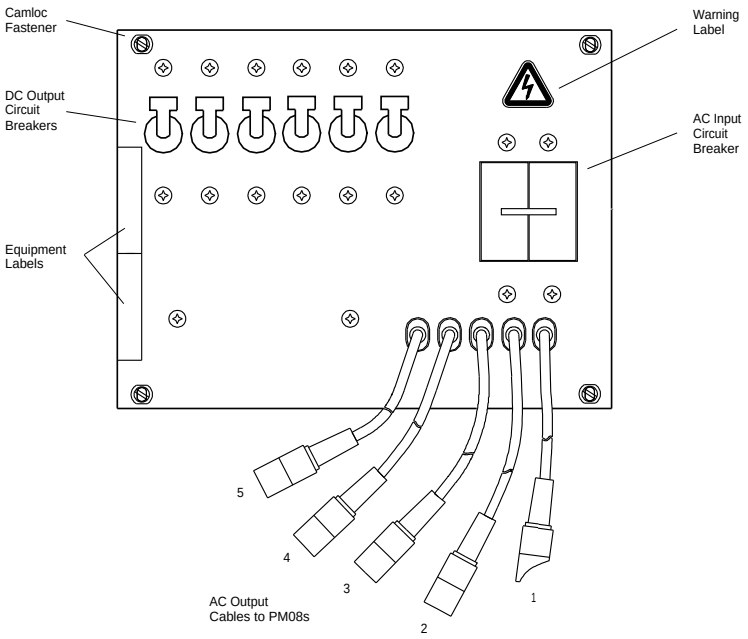


Figure 390: APOD Front Panel

12.11.2 Connectors

The following table describes the APOD front panel connectors.

Connector	Description
AC Input	AC Input Circuit Breaker.
INT, SR1, SR2, SR3, SR4, EXT	DC Output Circuit Breakers.
AC Out 1- 5	Provides 230 VAC 1Ø outputs for the five PM08s.

Table 120: APOD Front Panel Connectors

12.12 PM08

PM08 is used in outdoor BTS A9100 versions. It converts the AC input voltage to provide DC power for the cabinet equipment.

12.12.1 PM08 Functional Description

PM08 is housed in the SRACDC. It is an 800 W AC/DC power supply module which converts 230 VAC to 0/ -48 VDC $_{nom.}$ Five PM08s (PM08/1 - PM08/5) are fitted in parallel to provide n + 1 redundancy, with load sharing. The following figure shows the arrangement.

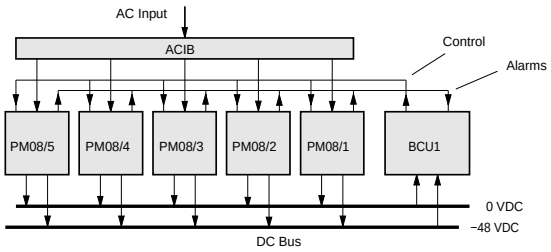


Figure 391: PM08 Load-Sharing

The BCU1 performs the functions listed in the following table for the PM08s.

Control	PM08 outputs are connected to the SRACDC backplane DC Bus and monitored by BCU1. When the output voltage changes because of a changed load, the PM08s automatically compensate for the change. BCU1 controls the overall output voltage of the PM08s. The nominal -48 V output is typically -54.5 V at 20° C. During battery charging, BCU1 changes the output voltage within the range -52 V to -57 V. During battery testing, the output voltage can be reduced to -44 V. The DC Bus provides DC power to the DCDP and the BU41, via the BACO.
Alarm Collection	The PM08 raises alarms for both Mains power failure and power module failure. The alarm is collected by the BCU1. For more information on alarms, refer to *PM08 Electrical Characteristics (Section 12.12.2)*.

Table 121: BCU1 Functions for PM08

12.12.2 PM08 Electrical Characteristics

The electrical characteristics for the PM08 are described in terms of input and output voltages, fuses, output current and protection and alarms.

12.12.2.1 Input Voltage

The following table shows the PM08 input voltage parameters.

Input	Parameter
Input voltage	220 VAC to 230 VAC (±15 %)
Frequency	47 Hz to 63 Hz
Number of phases	Single phase

Table 122: PM08 Input Voltage Parameters

Note: The PM08 can be operated at 110 VAC if the output power is limited to 500 W.

12.12.2.2 Fuses

Both the live and neutral inputs of the PM08 are protected by fast acting 10 A fuses. The fuses are accessed by removing protective caps on the module's front panel.

12.12.2.3 Output Voltage

The following table shows the PM08 output voltage parameters.

Output	Parameter
Nominal output voltage at 20^{o} C.	-54.5 VDC
Output voltage range.	-50 VDC to -58 VDC
Line regulation.	U_{in} ±15 %
Dynamic load regulation.	5 % of output voltage
Static load regulation.	0.2 %
Dynamic response.	2 ms
Voltage ripple.	< 400 mV p-p

Table 123: PM08 Output Voltage Parameters

Note: If the BCU1 fails or is not fitted, the PM08 produces an output of -52 VDC (±0.25 V). If batteries are not fitted, the default voltage is produced at all times.

12.12.2.4 Output Current

The following table shows the PM08 output current parameters.

Output	Parameter
Nominal I_{out} at -54.6 VDC	15 A
Minimum I_{out}	0 A
Maximum I_{out}	19 A
Current limitation (I_{max}).	16 A to 19 A
Derating.	3 % of I_{out} (at > 60 ^{o}C)
Shared load current.	<10 % of I_{out} (of single module).

Table 124: PM08 Output Current Parameters

12.12.2.5 Protection and Alarms

The PM08's internal protection feature raises an alarm and shuts down the PM08 for:

- Mains power failure
- Under voltage: output voltage below -40.5 VDC
- Over voltage: output voltage exceeds -60 VDC
- Over current: output voltage at 0 V (short circuit)
- Over temperature: PM08 heat sink temperature in range + 85° C to + 100° C.

12.12.3 PM08 Front Panel

The following figure shows the front panel of the PM08.

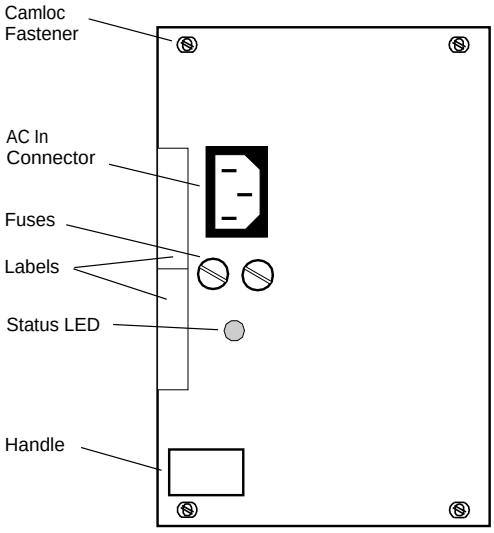


Figure 392: PM08 Front Panel

12.12.3.1 PM08 LEDs

The PM08 has a single LED on its front panel. The type of LED fitted depends on the part number of the PM08. The following table shows the PM08 part numbers and associated LED states.

PM08 Part Number	LED State	Description
3BK 06783 BAAA	Green	Normal operating conditions.
	Off	Fault.
3BK 06783 BBAA	Green	Normal operating conditions.
	Orange	Power limitation mode (maximum power of 800 W reached).
	Red	Fault.

Table 125: PM08 LED States

12.12.3.2 Connectors

The only PM08 front panel connector is AC In, an IEC 320 connector for coded conditions, where the 230 VAC input cable from the ACIB is plugged in.

12.13 PM11

The PM11 is used in outdoor BTS A9100 versions where the ACSR is employed. PM11 converts the AC input voltage to provide DC power for the cabinet equipment.

12.13.1 PM11 Functional Description

The PM11 is housed in the ACSR. It is an 1100 W AC/DC power supply module which converts 230 VAC to 0/ -48 VDC $_{nom.}$ Four PM11s (PM11/1 - PM11/4) are fitted in parallel to provide n + 1 redundancy, with load sharing. The following figure shows the arrangement.

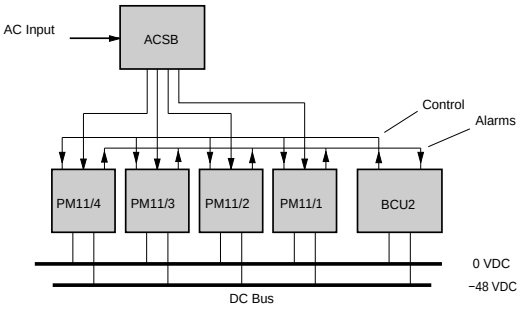


Figure 393: PM11 Load-Sharing

The BCU2 performs the functions listed in the following table for the PM11s.

Control	PM11 outputs are connected to the ACSR backplane DC Bus and monitored by the BCU2. When the output voltage changes because of a changed load, the PM11s automatically compensate for the change. The BCU2 controls the overall output voltage of the PM11s. The nominal -48 V output is typically -54.5 V at 20° C. During battery charging, the BCU2 changes the output voltage within the range -52 V to -57 V. During battery testing, the output voltage can be reduced to -44 V. The DC Bus provides DC power to the BOBU and the BU41 or BU100, via the BAC2.
Alarm Collection	The PM11 raises alarms for both Mains power failure and power module failure. The alarm is collected by the BCU2. For more information on alarms, refer to *PM11 Electrical Characteristics (Section 12.13.2)*.

Table 126: BCU2 Functions for PM11

12.13.2 PM11 Electrical Characteristics

The electrical characteristics of the PM11 are described in terms of input and output voltages, fuses, output current, and protection and alarms.

12.13.2.1 Input Voltage

The following table shows the PM11 input voltage parameters.

Input	Parameter
Input voltage	220 VAC to 230 VAC (±15 %)
Frequency	47 Hz to 63 Hz
Number of phases	Single phase

Table 127: PM11 Input Voltage Parameters

Note: The PM11 can be operated at 110 VAC if the output power is limited to 500 W.

12.13.2.2 Fuses

Both the live and neutral inputs of the PM11 are protected by fast acting 10 A fuses. The fuses are accessed by removing protective caps on the module's front panel.

12.13.2.3 Output Voltage

The following table shows the PM11 output voltage parameters.

Output	Parameter
Nominal output voltage at 20^{o} C.	-54.6 VDC
Output voltage range.	-50 VDC to -57 VDC
Line regulation.	U_{in} ±15 %
Dynamic load regulation.	5 % of output voltage
Static load regulation.	0.2 %
Dynamic response.	2 ms
Voltage ripple.	< 400 mV p-p

Table 128: PM11 Output Voltage Parameters

Note: If the BCU2 fails or is not fitted, the PM11 produces an output of -52 VDC (±0.25 V). If batteries are not fitted, the default voltage is produced at all times.

12.13.2.4 Output Current

The following table shows the PM11 output current parameters.

Output	Parameter
Nominal I_{out} at -54.6 VDC	20 A
Minimum I_{out}	0 A
Maximum I_{out}	24 A
Current limitation (I_{max})	21 A to 24 A
Derating	3 % of I_{out} (at > 60 ^{o}C)
Shared load current	<10 % of I_{out} (of single module)

Table 129: PM11 Output Current Parameters

12.13.2.5 Protection and Alarms

The PM11's internal protection feature raises an alarm and shuts down the PM11 for:

- Mains power failure
- Under voltage: output voltage below -40.5 VDC
- Over voltage: output voltage exceeds -60 VDC
- Over current: output voltage at 0 V (short circuit)
- Over temperature: PM11 heat sink temperature in range + 85° C to + 100° C.

12.13.3 PM11 Front Panel

The following figure shows the front panel of the PM11.

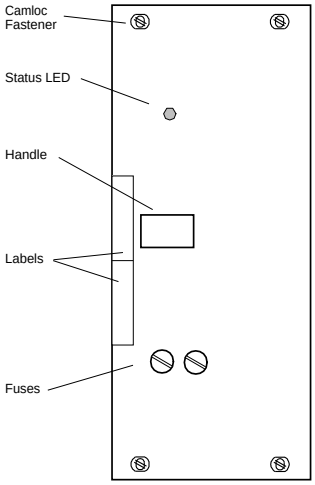


Figure 394: PM11 Front Panel

12.13.4 PM11 LED

The PM11 has a single LED on its front panel. The following table shows the LED states.

LED State	Description
Green	Normal operating conditions.
Off	Fault.

Table 130: PM11 LED States

12.14 PM12

The PM12 converts the AC input voltage to provide DC power for the cabinet equipment. The PM12 is used in indoor and outdoor BTS A9100 versions where the SUMA is employed.

12.14.1 PM12 Functional Description

Up to three PM12s and an ADAM or up to four PM12s and an ADAM4 are put together in one-half or two-thirds of a STASR (see Figure *408* or *414*). The ADAM/ADAM4 is connected to the DC distribution of the BTS. Each PM12 is controlled from the OMU (part of SUMA) via the BCB. Batteries fitted to a BTS have a temperature sensor which is controlled by the RIBAT (see *RIBAT (Section 12.29)*) or the OUTC (see *Outdoor Control Board CPT2/MBO1/MBO1DC/MBO1T/MBO1E/MBO2/MBO2DC/ MBO2E/CBO (Section 4.5)*. The OMU reads the stored battery size/charge current and the temperature out of the RIBAT or OUTC and sets the PM12s according to these values.

PM12 is an AC/DC power supply module which converts 230 VAC to 0/-48 VDC nom. The output power of the PM12 module depends on the input voltage range and temperature range as listed in the following table.

Output Power	Input Voltage	Temperature
900W*	150V...187V	-25°C...70°C
1200W	187V...264V	-25°C...70°C
900W*	264V...280V	-25°C...70°C
100W	150V...280V	-40°C...-25°C

***** : Available only on PM12 module version 3BK25024 ABxx

Table 131: PM12 Output Power Values

Two to four PM12s (PM12/1 - PM12/4) are fitted in parallel with load sharing (see Figure *246* or *MBO1/MBO2 AC/DC Power Supply System (247)*) controlled by a local sharing bus.

The OMU performs the functions listed in the following table for the PM12s.

Control	PM12 outputs are connected via ADAM/ADAM4 to the STASR backplane DC Bus and monitored by the OMU. When the output voltage changes because of a changed load, the PM12s automatically compensate for the change. OMU controls the overall output voltage of the PM12s. Default output voltage without OMU control is 52.2V. Depending on battery cell voltage set in RIBAT/OUTC, OMU sets the output voltage of PM12 in range 52.2-57V. The DC Bus provides DC power to the: ▶ BOBU/BOMU/BOSU ▶ BU41, BU100 or BU101, via the ADAM/ADAM4.
Alarm Collection	The PM12 raises alarms for both Mains power failure and power module failure. The alarm is collected by the OMU. For more information on alarms, refer to *PM12 Electrical Characteristics (Section 12.14.2)*.

Table 132: OMU Functions for PM12

12.14.2 PM12 Electrical Characteristics

The electrical characteristics of the PM12 are described in terms of input and output voltage, fuses, output current, and protections and alarms.

12.14.2.1 Input Voltage

The following table shows the PM12 input voltage parameters.

Input	Parameter
Nominal input voltage	230/ 240 VAC
Input voltage range	187 VAC to 264 VAC
Frequency	47 Hz to 63 Hz
Number of phases	Single phase

Table 133: PM12 Input Voltage Parameters

12.14.2.2 Fuses

Both the live and neutral inputs of the PM12 are protected by fast acting 10 A fuses. The fuses are accessed by removing the cover of the module.

12.14.2.3 Output Voltage

The following table shows the PM12 output voltage parameters.

Output	Parameter
Nominal output voltage at 20^{o} C	-54.5 VDC (in case of U_{cell}=2.27V)
Output voltage range	-50 VDC to -57 VDC
Line regulation	U_{in} ±15 %
Dynamic load regulation	5 % of output voltage
Static load regulation	0.2 %
Dynamic response	2 ms
Voltage ripple	< 400 mV p-p

Table 134: PM12 Output Voltage Parameters

12.14.2.4 Output Current

The following table shows the PM12 output current parameters.

Output	Parameter
Nominal I_{out} at -54.6 VDC	20 A
Minimum I_{out}	0 A
Maximum I_{out}	24 A
Current limitation (I_{max})	21 A to 24 A
Derating	3 % of I_{out} (at > 60° C)
Shared load current	<10 % of I_{out} (of single module)

Table 135: PM12 Output Current Parameters

12.14.2.5 Protection and Alarms

The PM12's internal protection feature raises an alarm and shuts down the PM12 for:

- Mains power failure
- Under voltage: output voltage below -40.5 VDC
- Over voltage: output voltage exceeds -60 VDC
- Over current: output voltage at 0 V (short circuit)
- Over temperature: PM12 heat sink temperature in range + 85° C to + 100° C.

12.14.3 PM12 Front Panel

The following figure shows the front panel of the PM12.

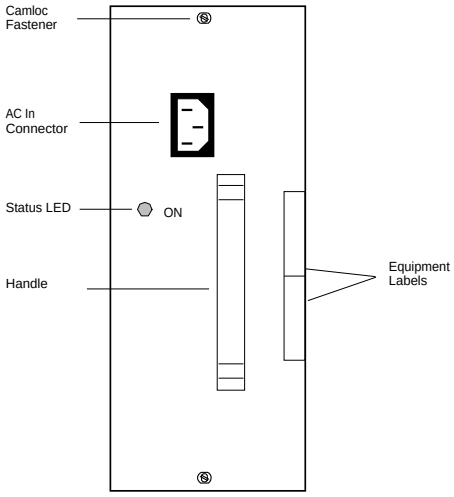


Figure 395: PM12 Front Panel

12.14.4 PM12 LED

The PM12 has a single LED on its front panel. The following table shows the LED states.

LED State	Description
Green	Normal operating conditions.
Off	Fault.

Table 136: PM12 LED States

12.15 PM18

The PM18 converts the AC input voltage to provide DC power for the cabinet equipment. PM18 are used in outdoor BTS or MBS.

The consists of the subrack PM18SR which contains a control unit PM18C, up to 3 rectifier PM18R and a temperature sensor.

Each rectifier has an output power of 1800 W. The PM18C controls the the power modules and handles the alarm reporting to the SUMU via XBCB and RS232. The battery management is done by the PM18C internally of the power supply without any control functions of the SUMA.

12.15.1 Performance Characteristics

12.15.1.1 Input Voltage Parameters

The following table shows the PM18 input voltage parameters.

Input	PM18
Nominal input voltage	230 VAC
Input voltage range	150 VAC to 280 VAC
Frequency	47 Hz to 63 Hz
Number of phases	Single or three phase

12.15.1.2 Output Voltage Parameters

The following table shows the PM18 output voltage parameters.

Output	PM18
Nominal output voltage at 20^{o} C	-52.5 VDC … -54VDC
Output voltage range	-42 … -57 VDC
Line regulation	+/-10 %
Dynamic load regulation	+/-10 %
Dynamic response	50 ms
Voltage ripple	< 200 mV p-p

12.15.1.3 Output Power Parameters

The following table shows the PM18 output power parameters.

Output	PM18 per module
Nominal output voltage U_N	52.5 - 54 V
Output voltage range U_R	48 - 57 V
Nominal power at U_R	1800 W
Maximum I_{out}	40 A (limitation mode)
Output power de-rating	2 % of I_{out}/ K (at > 55°C)

12.15.2 LEDs

12.15.2.1 PM18SR

The PM18SR from Cherokee has a single LED on it.

LED	Color	State	Description
LVD (Low Voltage Disconnection)	Green	ON	Battery connected
		OFF	Battery not connected

12.15.2.2 PM18C LEDs

The PM18C from Cherokee has a single LED on its front panel.

The following table shows the LED states for the Cherokee PM18C.

LED	Color	State	Description
ON	Green	ON	Normal operational conditions. Monitoring OK
		Blinking	Monitoring start-up
		OFF	Monitoring fail

The PM18C from H+S has two LEDs on its front panel.

The following table shows the LED states for the H+S PM18C.

LED	Color	Status	Description
ON	Green	ON	Normal operational conditions
		OFF	Module not operational

LED	Color	Status	Description
Alarm	Red	ON	Fault
		OFF	Normal operational conditions

12.15.2.3 PM18R LEDs

The Cherokee PM18R has four LEDs on its front panel.

The following table shows the LED states.

LED	Color	State	Description
AC OK	Green	ON	AC voltage OK
		OFF	Module not operational
DC OK	Green	ON	DC voltage OK
		OFF	Module not operational
OVP	Red	ON	Output overvoltage
		OFF	Normal operational conditions
OTP	Red	ON	Excessive temperature
		OFF	Normal operational conditions

The H+S PM18R has two LEDs on its front panel.

The following table shows the LED states.

LED	Color	State	Description
ON	Green	ON	Normal operational conditions
		OFF	Module not operational
Fault	Red	ON	Fault
		OFF	Normal operational conditions

12.15.3 Fuses

Both the live and neutral inputs of the PM18 are protected by fuses.

PM	Fuses
PM18	12.5 A, medium delay

The fuses are accessed by removing the protective caps on the module's front panel.

12.15.4 Protection and Alarms

The PM's internal protection feature raises an alarm and shuts down the PM for the following reasons:

- Mains power failure
- Under-voltage: Output voltage below -40.5 VDC
- Over-voltage: Output voltage exceeds -60 VDC
- Over-current: Output voltage at 0 V (short circuit)
- Over-temperature: PM12 heat sink temperature in the range of +85°C to +100°C.

12.15.5 PM18 Front View

The PM18 consists of the subrack PM18SR, which contains a control unit PM18C, up to 3 rectifiers PM18R and a temperature sensor.

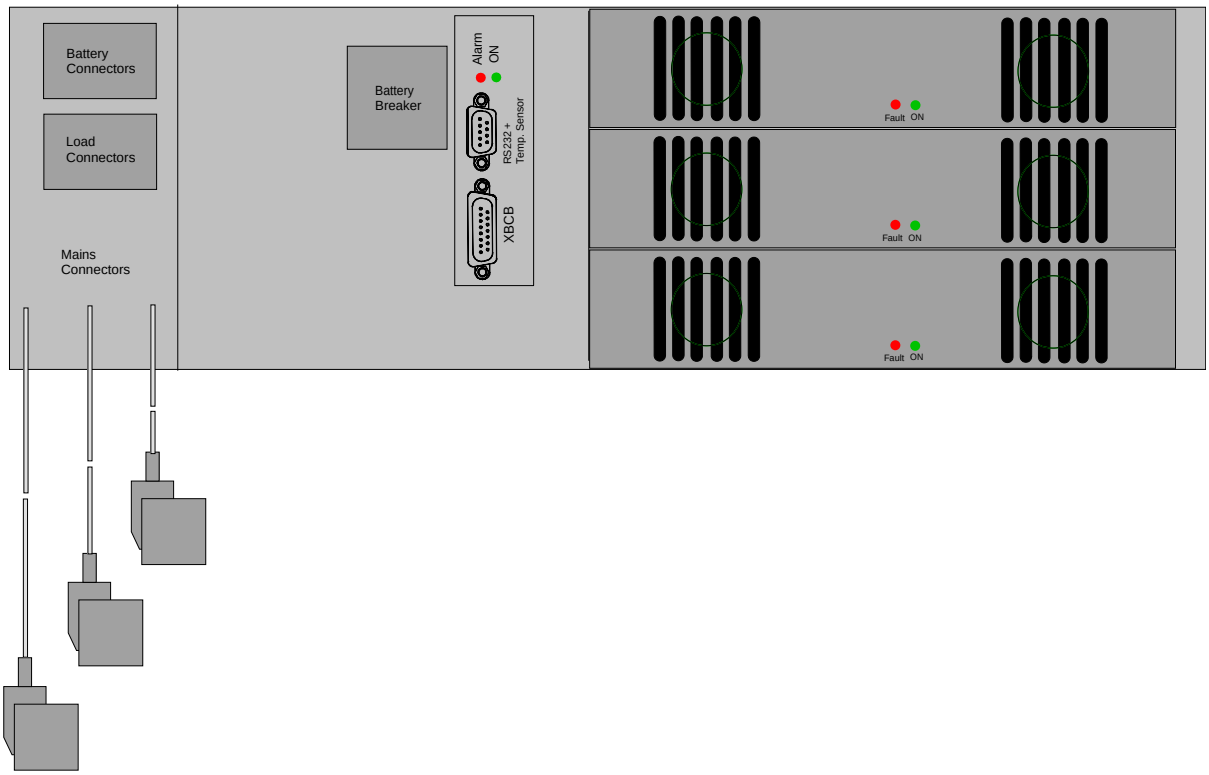


Figure 396: PM18 H+S Front View

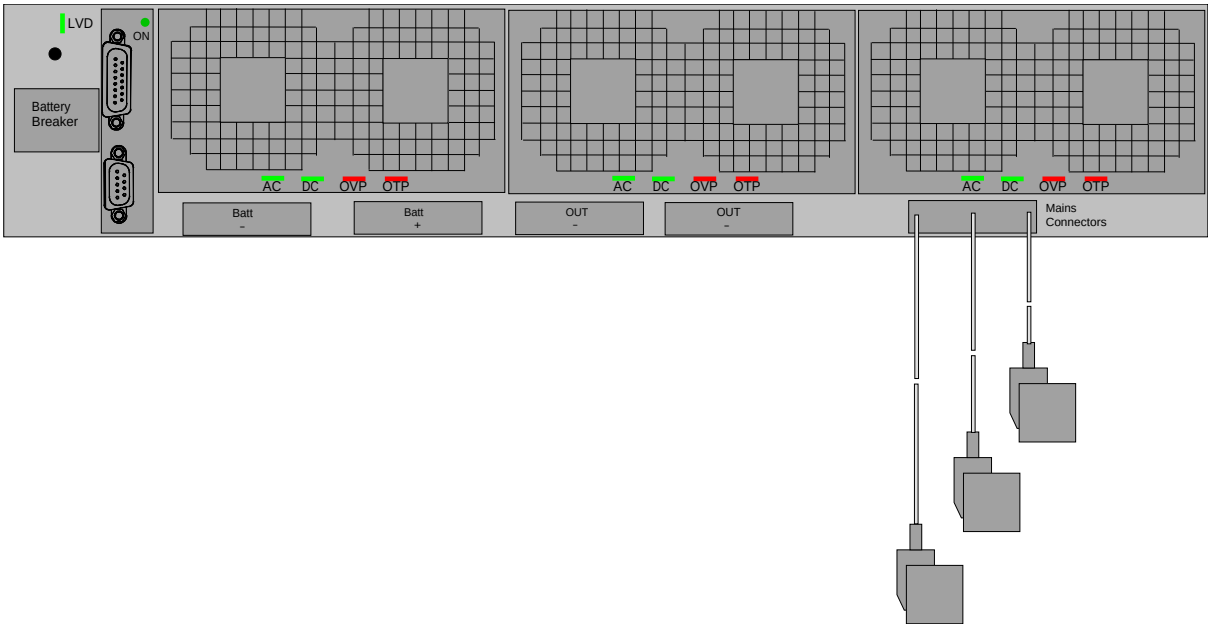


Figure 397: PM18 Cherokee Front View

12.15.6 Weight

PM	Weight
PM18 Rectifier	3 kg / module
PM18 Subrack H+S	5 kg
PM18 Subrack Cherokee	7,5 kg

12.16 BCU1

The BCU1 is used in outdoor BTS A9100 versions. It controls the DC output voltage and battery operation.

12.16.1 BCU1 Functional Description

The BCU1 is housed in the SRACDC. It performs control functions for the batteries and some of the modules within the SRACDC. The following figure shows the arrangement. For simplicity, only two of the five PM08s are shown.

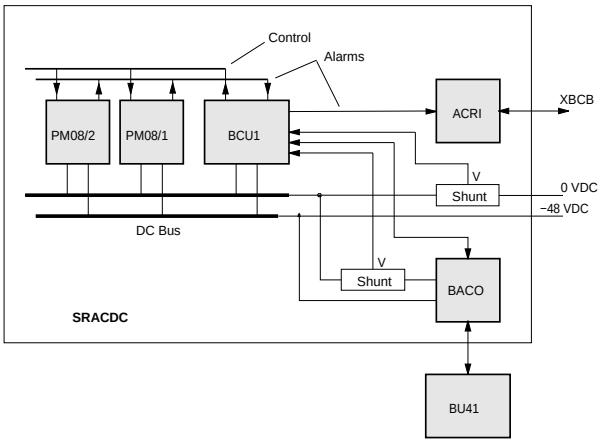


Figure 398: BCU1 Interconnections

The BCU1 connects to the PM08s, ACRI and BACO via the SRACDC backplane. The voltages across the shunt resistors provide the BCU1 with a measurement of the currents drawn. BU41 contains up to two battery groups which are referred to as branches. Each branch provides -48 VDC.

The functions performed are:

- PM08 control
- Alarm supervision
- Battery management.

12.16.1.1 PM08 Control

The BCU1 controls the PM08 output voltage and collects any alarms that are produced. For more information on the PM08, refer to *PM08 (Section 12.12)*.

12.16.1.2 Alarm Supervision

The BCU1 collects alarms and reports them to the ACRI.

The alarms are:

- AC power failure
- PM08 failure
- Battery malfunction
- BCU1 fault.

For more details of the alarm information, refer to *BCU1 LEDs, LCD, Alarms and Buttons (Section 12.16.2)*.

12.16.1.3 Battery Management

The BCU1 provides the battery management functions described in the following table.

Deep Discharge Protection	During normal operation, a trickle charge current ensures that the batteries remain fully charged. When an AC mains failure occurs, the batteries supply DC power to the BTS A9100. This discharges the batteries causing their output voltage to fall. If the output voltage falls below -42 VDC (±0.5 V), the BCU1/BCU2 disconnects the batteries by deactivating relays in the BACO/BAC2. This prevents deep discharge of the batteries which shortens their life.
Charging Current Regulation	When charging the batteries, BCU1/BCU2 regulates the charging current so that battery life is not shortened. Charging current is adjusted by changing the PM08/PM11 output voltages. Charging current regulation: - Limits the maximum charging current, depending on battery type and the number of battery branches. For more details of the charging current limits, refer to *BU41 (Section 12.24)* and *BU100 (Section 12.25)*. - Adjusts the charging current to avoid overheating the batteries. A temperature sensor, fitted to one battery branch, is connected to BCU1 via the BACO. The charging voltage, at an ambient temperature of 20^{o} C, is typically -54.6 VDC. If the temperature sensor fails, or is not fitted, the PM08/PM11 output voltage is set to -52 VDC.

Table 137: BCU1/BCU2 Battery Management Functions

12.16.2 BCU1 LEDs, LCD, Alarms and Buttons

The different LEDs, the LCD, alarms, buttons and the special menu for the BCU1 are described separately below.

12.16.2.1 LEDs

The following table describes the front panel LEDs.

LED	Color	State	Description
On	Green	On	Normal state - BCU1 internal reference voltage is available.
		Off	BCU1 faulty.
Bat.	Red	On	Battery backup in operation (battery discharging) or battery malfunction.
		Off	Normal state.
Test	Yellow	On	n/a
		Off	Normal state.

Table 138: BCU1 LED Descriptions

12.16.2.2 LCD

The BCU1 has an LCD on its front panel (see Figure *399*). Information is viewed using the front panel Function and Status buttons to scroll through several display options.

The LCD provides two rows of alphanumeric information where each row consists of eight characters. The first row displays a message and the second row displays associated parameters or choices.

12.16.2.3 Alarms

The BCU1 collects alarms and reports them to the ACRI. The alarms are described in the following table.

Alarm Type	Description
BCU1 Fault	The internal reference voltage used by the BCU1 has failed.
PM08 Failure	The alarm information specifies the identity number of the failed module and the number of modules fitted.
AC Failure	The AC mains supply has failed or been switched off.
Battery Malfunction	The identity number of the battery branch that failed is reported. A battery malfunction occurs if: ▶ The battery was automatically disconnected because of a malfunction during charging ▶ Deep discharge protection occurred.

Table 139: BCU1 Alarms

12.16.2.4 Function Button

Using the Function button, the following information can be displayed:

- PM08s output voltage (Uload)
- Battery voltage (Ubatt)
- Output current (Iload)
- Battery current (Ibatt), where:
  - + = charging
  - - = discharging.
- Battery temperature.

12.16.2.5 Status Button

Using the Status button, the following information can be displayed:

- Alarm type, where the character:
  - V represents BCU1 failure
  - R represents a rectifier (PM08) failure
  - M represents an AC mains failure
  - B represents a battery malfunction.
- Status of the PM08s, represented by a five-character sequence. Each character position represents a physical PM08 slot position, where:
  - N - slot not occupied
  - F - PM08 failed
  - Y - PM08 serviceable.
- Battery type and number of battery branches.

12.16.2.6 Special Menu

The special menu is activated by pressing the Function and Status buttons simultaneously, for five seconds. Selections in the special menu are then made using the Function and Status buttons individually.

Using the special menu, the following tasks can be performed:

- Set battery type
- Set number of branches in use.

Refer to the *Evolium BTS A9100/A9110 Corrective Maintenance Handbook* for details of how to use the special menu facility.

12.16.3 BCU1 Front Panel

The following figure shows the front panel of the BCU1.

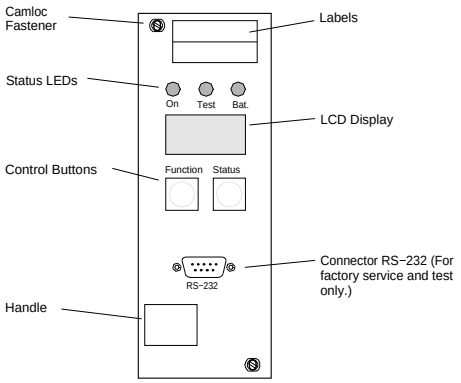


Figure 399: BCU1 Front Panel

12.17 BCU2

The BCU2 is used in outdoor BTS A9100 versions where the ACSR is employed. It:

- Controls the DC output voltage and battery operation
- Collects alarms from the ACSR modules
- Controls the ACSR FANUs
- Provides the interface to the BTS Remote Inventory function.

12.17.1 BCU2 Functional Description

The BCU2 is housed in the ACSR. It performs control functions for the batteries and some of the modules within the ACSR. The following figure shows the arrangement. For simplicity, only two of the four PM11s are shown.

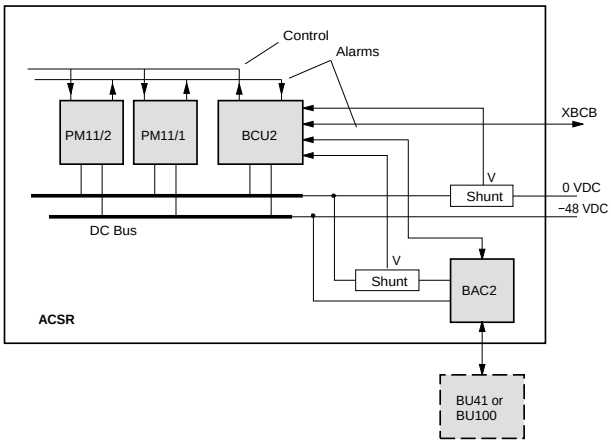


Figure 400: BCU2 Interconnections

BCU2 connects to the PM11s and BAC2 via the ACSR backplane. The voltages across the shunt resistors provide BCU2 with a measurement of the currents drawn. BU41 contains up to two battery groups and BU100 contains one battery group. These battery groups are referred to as branches. Each branch provides -48 VDC.

The functions performed are:

- PM11 control
- Alarm supervision
- Battery management
- ACRI system functions.

12.17.1.1 PM11 Control

The BCU2 controls the PM11 output voltage and collects any alarms that are produced. For more information on the PM11, refer to *PM11 (Section 12.13)*.

12.17.1.2 Alarm Supervision

The BCU2 collects alarms and reports them to the OMU on the SUMP.

The alarms are:

- AC power failure
- PM11 failure
- Battery malfunction
- BCU2 fault.

For more details of the alarm information, refer to *BCU2 LEDs, LCD, Alarms and Buttons (Section 12.17.2)*.

12.17.1.3 Battery Management

The BCU2 provides the battery management functions described in Table *BCU1/BCU2 Battery Management Functions (137)*.

12.17.1.4 ACRI System Functions

The ACRI system implemented on the BCU2 consists of the functions listed in the following table.

ANPS	The BCU2 contains an ANPS which converts the -48 VDC input supply to the DC voltages required by the other components. For more information on the ANPS, refer to *AN Power Supply (Section 10.1.5)*.
Modified FACB	The BCU2 contains a modified FACB which reports fan faults and controls the two FANUs that cool the ACSR modules. For more information on the FACB and FANUs, refer to *Fan Control (Section 11.1.2)*.

XBCB	The BCU2 contains a BCB ASIC that transfers information to the OMU in the SUMP via the XBCB. This consists of: ▶ Alarms from modified FACB ▶ Alarms internal to the BCU2 ▶ Alarms from the battery and PM11s ▶ Remote Inventory information.
RI	The BCU2 contains a Remote Inventory that is used to store information about the module (part number, name, serial number, etc.). It consists of an EEPROM which is connected to the BCB ASIC.

Table 140: BCU2, ACRI System Functions

12.17.2 BCU2 LEDs, LCD, Alarms and Buttons

The different LEDs, the LCD, alarms, buttons and the special menu for the BCU2 are described separately below.

12.17.2.1 LEDs

The following table describes the front panel LEDs.

LED	Color	State	Description
On	Green	ON	Normal state - BCU2 internal reference voltage is available.
		OFF	BCU2 faulty.
Bat.	Red	ON	Battery backup in operation (battery discharging) or battery malfunction.
		OFF	Normal state.
Test	Yellow	ON	n/a
		OFF	Normal state.
Power ON		ON	When XBCB bus is connected and OK and internal power supply (48V/5V converter) is operational.
		OFF	Otherwise.

Table 141: BCU2 LED Description

12.17.2.2 LCD

The BCU2 has an LCD on its front panel (see Figure *401*). Information is viewed using the front panel Function and Status buttons to scroll through several display options.

The LCD provides one row of alphanumeric information where the row consists of eight characters.

12.17.2.3 Alarms

The BCU2 collects alarms and reports them to the OMU on the SUMP. The alarms are described in the following table.

Alarm Type	Description
BCU2 Fault	The internal reference voltage used by the BCU2 has failed.
PM11 Failure	The alarm information specifies the identity number of the failed module and the number of modules fitted.
AC Failure	The AC mains supply has failed or been switched off.

Alarm Type	Description
Fan Status	The status of the two FANUs located below the ACSR.
Battery Malfunction	The identity number of the battery branch that failed is reported. A battery malfunction occurs if: ▶ The battery was automatically disconnected because of a malfunction during charging ▶ Deep discharge protection occurred.

Table 142: BCU2 Alarms

12.17.2.4 Function Button

Using the Function button, the following information can be displayed:

- PM11s output voltage (Uload)
- Battery voltage (Ubatt)
- Output current (Iload)
- Battery current (Ibatt), where:
  - + = charging
  - - = discharging.
- Battery temperature.

12.17.2.5 Status Button

Using the Status button, the following information can be displayed:

- Alarm type, where the character:
  - V represents BCU2 failure
  - R represents a rectifier (PM11) failure
  - M represents an AC mains failure
  - B represents a battery malfunction.
- Status of the PM11s, represented by a four-character sequence. Each character position represents a physical PM11 slot position, where:
  - N - slot not occupied
  - F - PM11 failed.
  - Y - PM11 serviceable.
- Battery type and number of battery branches.

12.17.2.6 Special Menu

The special menu is activated by pressing the Function and Status buttons simultaneously, for five seconds. Selections in the special menu are then made using the Function and Status buttons individually.

Using the special menu, the following tasks can be performed:

- Set battery type
- Set number of branches in use.

Refer to the *Evolium BTS A9100/A9110 Corrective Maintenance Handbook* for details of how to use the special menu facility.

12.17.3 BCU2 Front Panel

The following figure shows the front panel of the BCU2.

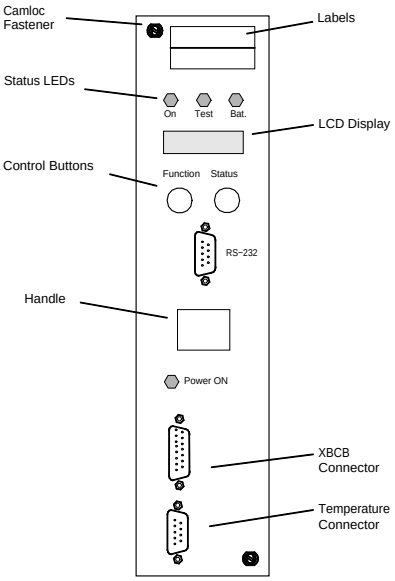


Figure 401: BCU2 Front Panel

12.17.4 Connectors

The following table describes the BCU2 front panel connectors.

Connector	Description
Temperature	For connection of temperature sensor from BU41 or BU100.
XBCB	Provides a: ▶ + 5 VDC signal to enable ANPS ▶ Serial interface for the transfer of alarms and Remote Inventory information to the OMU.

Table 143: BCU2 Front Panel Connectors

12.18 BACO

The BACO is used in outdoor BTS A9100 versions. It interconnects the batteries and the DC outputs of the PM08s.

The BACO contains:

- Circuit breakers for manual isolation of the batteries
- Relays for automatic isolation of the batteries, controlled by the BCU1.

The BACO is housed in the SRACDC. It interconnects up to two battery branches to the SRACDC backplane DC bus. The battery branches must be of the same type and capacity. The following figure shows the circuit schematic.

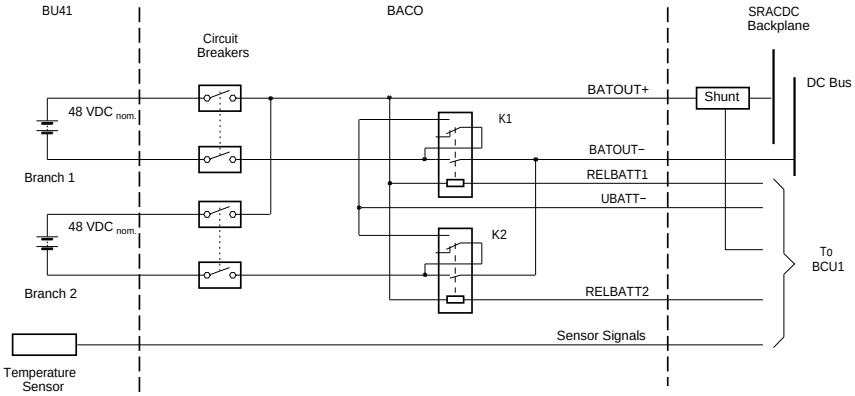


Figure 402: BACO Circuit Schematic

Circuit breakers are provided for manual isolation of the batteries during battery maintenance. When in use, the circuit breakers trip automatically when the current drawn exceeds 60 A.

During an AC mains failure, BU41 provides battery power to the DC bus via relays K1 and K2, and a shunt resistor. If the battery discharge becomes excessive, BCU1 deactivates the relays to isolate the batteries. Relays K1 and K2 are controlled by the signals RELBATT1 and RELBATT2, respectively. During battery charging and discharging, the relays operate simultaneously. During battery testing, they operate independently.

12.18.1 Front Panel

The following figure shows the front panel of the BACO.

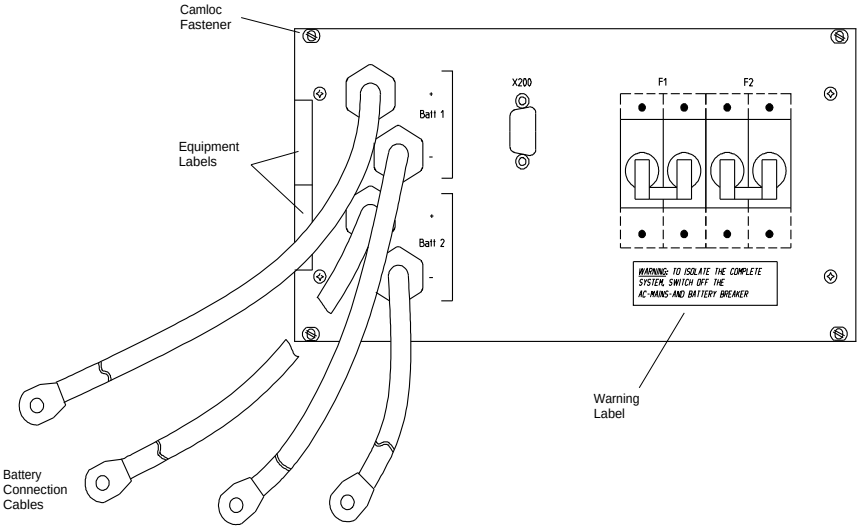


Figure 403: BACO Front Panel

12.18.2 Connectors

The following table describes the BACO connectors.

Connector	Description
X200	Connects battery temperature sensor signals to SRACDC backplane.
Battery Connectors	Connects to battery terminals. There are two cables for each branch.

Table 144: BACO Front Panel Connectors

12.19 BAC2

The BAC2 is used in outdoor BTS A9100 versions. It interconnects the batteries and the DC outputs of the PM08s or PM11s.

The BAC2 contains:

- Circuit breakers for manual isolation of the batteries
- Relays for automatic isolation of the batteries, controlled by the BCU2.

The BAC2 is housed in the ACSR. It interconnects up to two battery branches to the ACSR backplane DC bus. The battery branches must be of the same type and capacity. The following figure shows the circuit schematic.

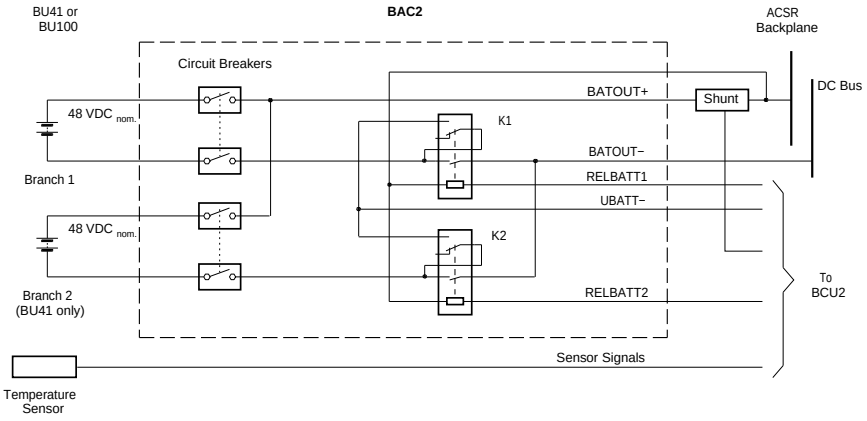


Figure 404: BAC2 Circuit Schematic

Circuit breakers are provided for manual isolation of the batteries during battery maintenance. When in use, the circuit breakers trip automatically when the current drawn exceeds 60 A.

During an AC mains failure, BU41 or BU100 provides battery power to the DC bus via relays K1 and K2, and a shunt resistor. If the battery discharge becomes excessive, BCU2 deactivates the relays to isolate the batteries. Relays K1 and K2 are controlled by the signals RELBATT1 and RELBATT2, respectively. During battery charging and discharging, the relays operate simultaneously. During battery testing, they operate independently.

12.19.1 Front Panel

The following figure shows the front panel of the BAC2.

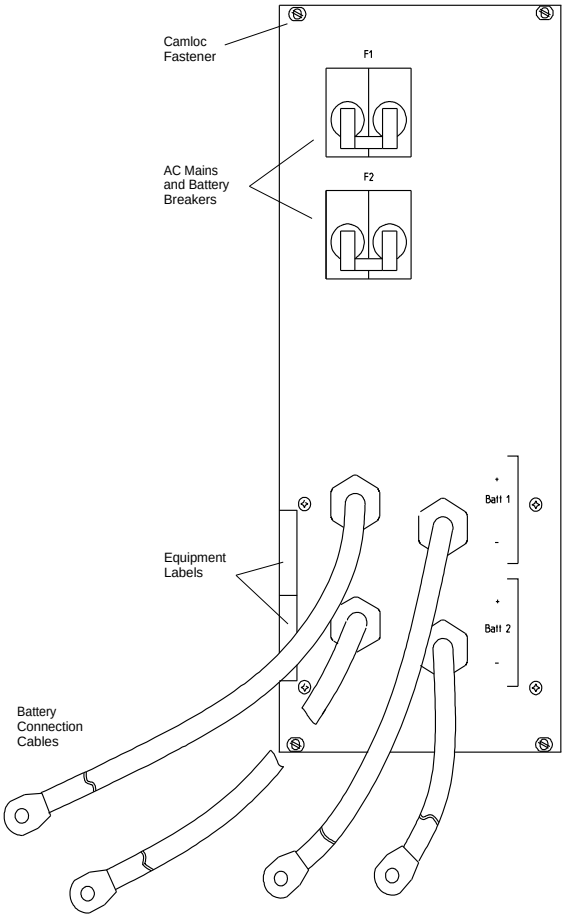


Figure 405: BAC2 Front Panel

12.19.2 Connectors

The following table describes the BAC2 connectors.

Connector	Description
Battery Connectors	Connects to battery terminals. There are two cables for each branch.

Table 145: BAC2 Front Panel Connectors

12.20 ABAC

The ABAC is used in indoor BTS A9100 versions that use an AC power supply. It interconnects the batteries and the DC outputs of the PM08s.

The ABAC contains:

- Circuit breakers for manual isolation of the battery
- Relays for automatic isolation of the battery, controlled by the BCU1.

The ABAC is housed in the ASIB. It interconnects a maximum of one battery branch to the ASIB backplane DC bus. The battery branch can be BU41 or BU100. The following figure shows the circuit schematic.

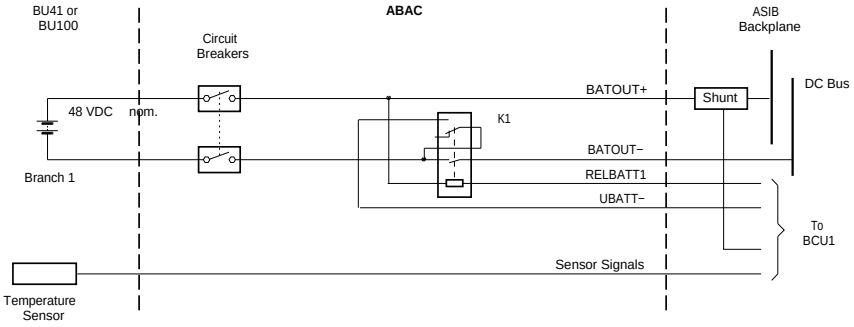


Figure 406: ABAC Circuit Schematic

Circuit breakers are provided for manual isolation of the battery branch during battery maintenance. When in use, the circuit breakers trip automatically when the current drawn exceeds 60 A.

During an AC mains failure, BU41 or BU100 provides battery power to the DC bus via relay K1, and a shunt resistor. If the battery discharge becomes excessive, the BCU1 deactivates the relay to isolate the battery branch. Relay K1 is controlled by the signal RELBATT1.

12.20.1 Front Panel

The following figure shows the front panel of the ABAC.

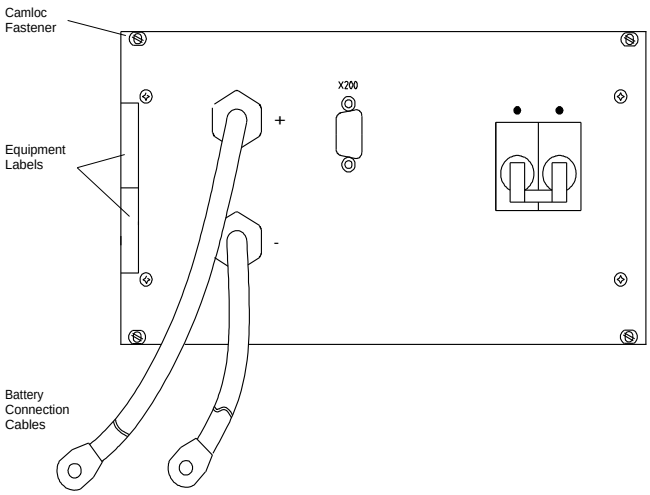


Figure 407: ABAC Front Panel

12.20.2 Connectors

The following table describes the ABAC connectors.

Connector	Description
X200	Connects battery temperature sensor signals to the ASIB backplane.
Battery Connectors	Connects to battery terminals. There are two cables only (one branch).

Table 146: ABAC Front Panel Connectors

12.21 ADAM

ADAM is used in the AC/DC power supply of BTS A9100 configurations as the interface between the PM12s, the batteries and the power distribution inside the BTS.

ADAM consists of:

- An air permeable metal frame, mounted in one-half of a STASR above the PM12s (see the following figure)
- A small backpanel with the connectors for three PM12s and a terminal for the wiring of the BTS.

In addition, the ADAM contains on its backpanel:

- The relay for battery protection
- The relay control
- A shunt for measuring the battery current.

The following figure shows the position of ADAM in the STASR.

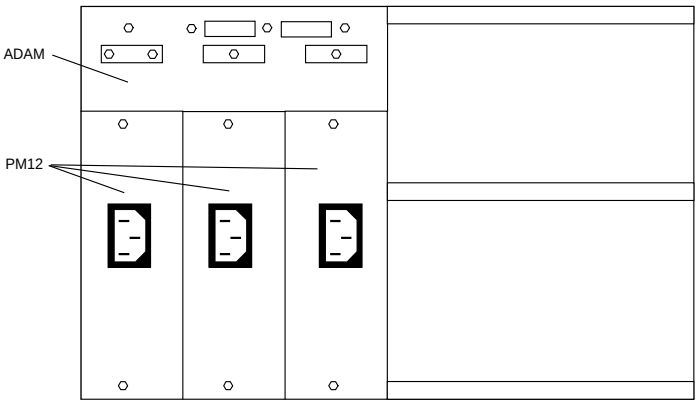


Figure 408: ADAM, Position in the STASR

12.21.1 Block Diagram

The following figure shows the block diagram.

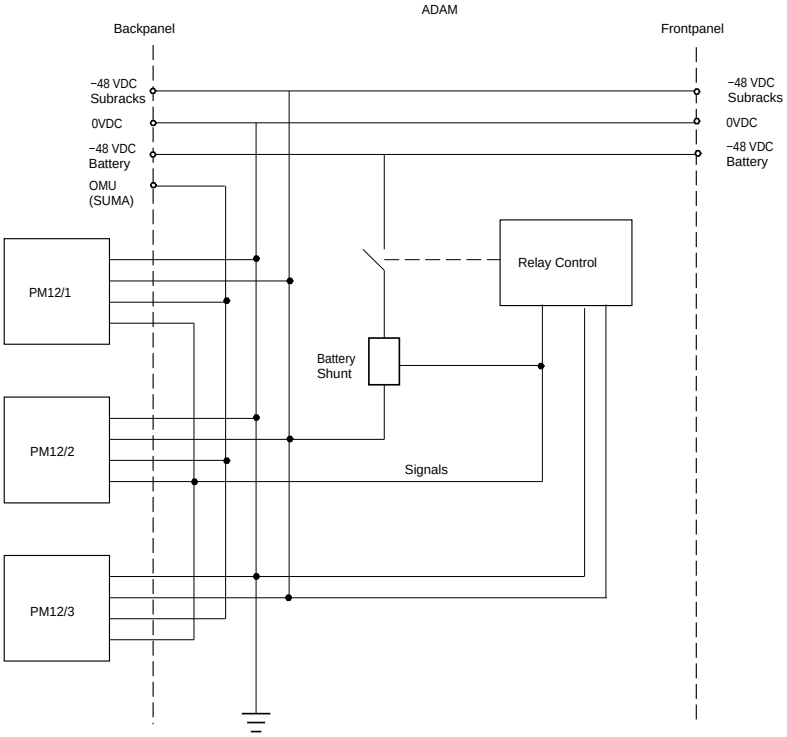


Figure 409: ADAM Block Diagram

The relay protects the battery in case of discharging. If the voltage reaches the lower limit, the relay separates the -48 VDC line of the battery. The relay has its own control circuit, so it works independently of the OMU.

12.21.2 Appearance

The following figure shows the front side view of ADAM.

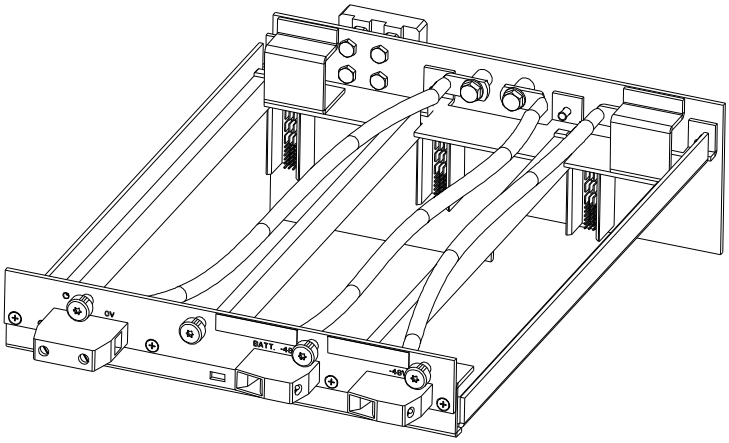


Figure 410: ADAM Front Side View

12.21.3 Connectors

On the backpanel there are three connectors for the PM12s. Each of them contains two blocks with 4x2 high current contacts (one block for 0 VDC and one for -48 VDC) and a 24-pin block for the control signals.

On the front panel there are the terminals for the DC supply of the subracks (via BOBU/BOMU/BOSU) and the back-up battery.

12.22 ADAM2

ADAM2 is used in the AC/DC power supply of Compact BTS Outdoor configurations as the interface between the PM12s, the batteries and the power distribution inside the BTS.

ADAM2 consists of:

- An air permeable metal frame, mounted in one-third of a STASR above the PM12s (see the following figure)
- A small backpanel with the connectors for two PM12s and terminal for the wiring of the BTS.

In addition, the ADAM2 contains on its backpanel:

- The relay for battery protection
- The relay control
- A shunt for measuring the battery current.

The following figure shows the position of ADAM2 in the STASR.

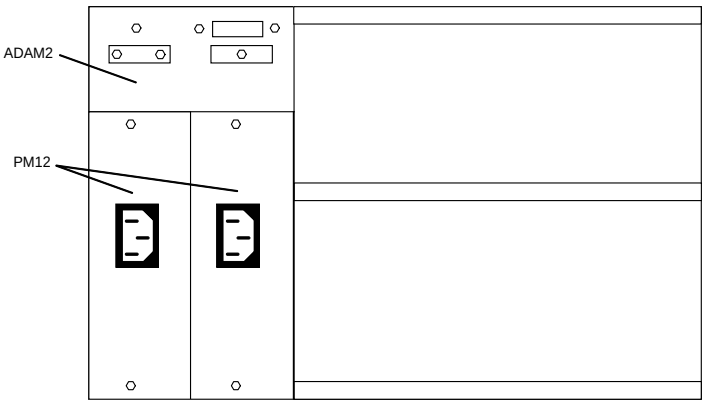


Figure 411: ADAM2, Position in the STASR

12.22.1 Block Diagram

The following figure shows the block diagram.

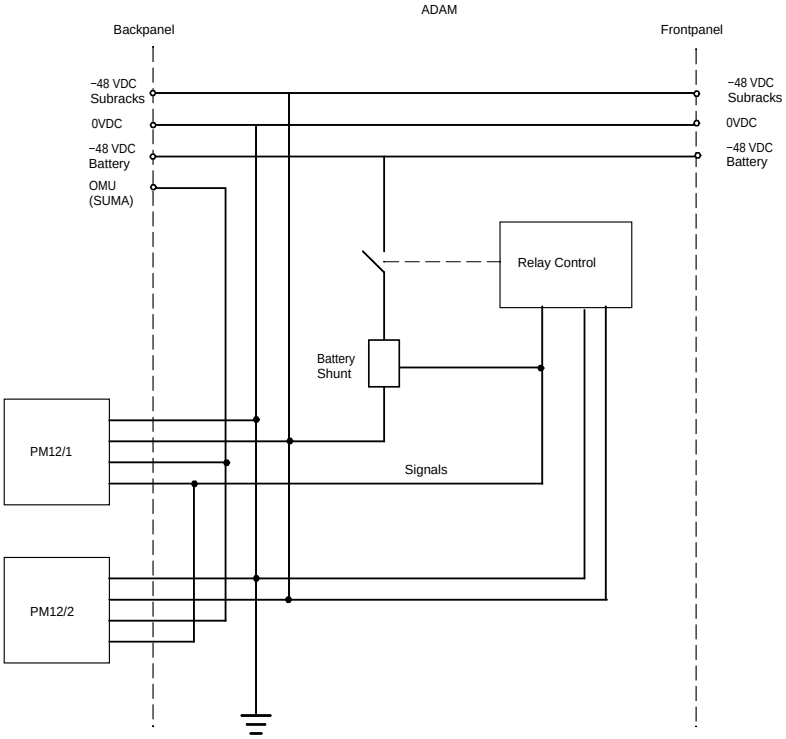


Figure 412: ADAM2 Block Diagram

The relay protects the battery in case of discharging. If the voltage reaches the lower limit (42 V), the relay separates the DC line of the battery. The relay has its own control circuit, so it works independently of the OMU.

12.22.2 Appearance

The following figure shows the front side view of ADAM2.

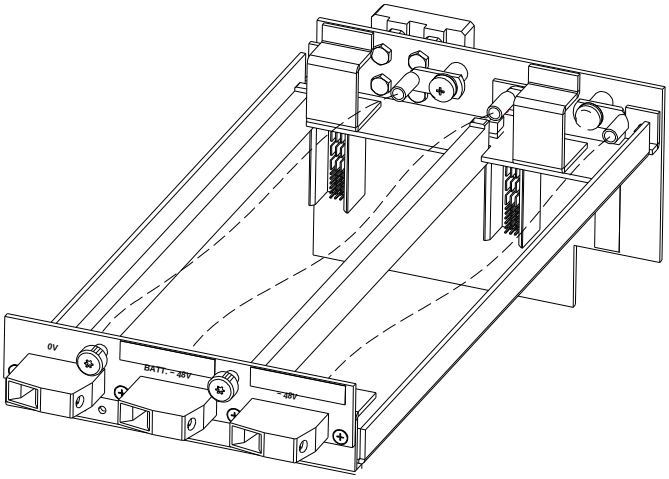


Figure 413: ADAM2 Front Side View

12.22.3 Connectors

On the backpanel there are two connectors for the PM12s. Each of them contains two blocks with 4x2 high current contacts (one block for 0 VDC and one for -48 VDC) and a 24-pin block for the control signals.

On the front panel there are the terminals for the DC supply of the subracks (via DCUC) and the back-up battery.

12.23 ADAM4

ADAM4 is used in the AC/DC power supply of BTS A9100 MBO1/MBO2 configurations as the interface between the PM12s, the batteries and the power distribution inside the BTS. ADAM4 is installed in combination with two to four PM12s. If less than four PM12s are installed, the empty PM12 slot is covered by a dummy panel.

ADAM4 consists of:

- An air permeable metal frame, mounted in two third of a STASR above the PM12s (see the following figure)
- A small backpanel with the connectors for four PM12s and terminal for the wiring of the BTS.

In addition, ADAM4 contains on its backpanel:

- The relay for battery protection
- The relay control
- A shunt for measuring the battery current.

The following figure shows the position of ADAM4 in the STASR.

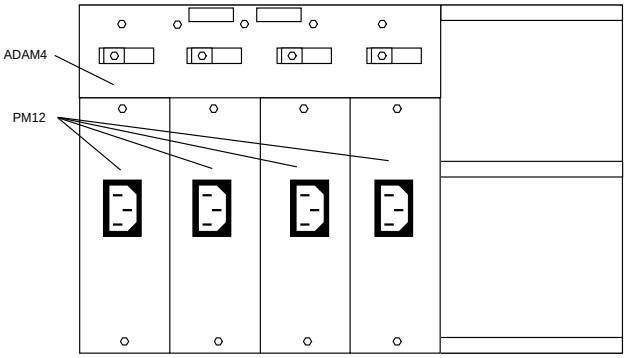


Figure 414: ADAM4 Position in the STASR

12.23.1 Block Diagram

The following figure shows the block diagram.

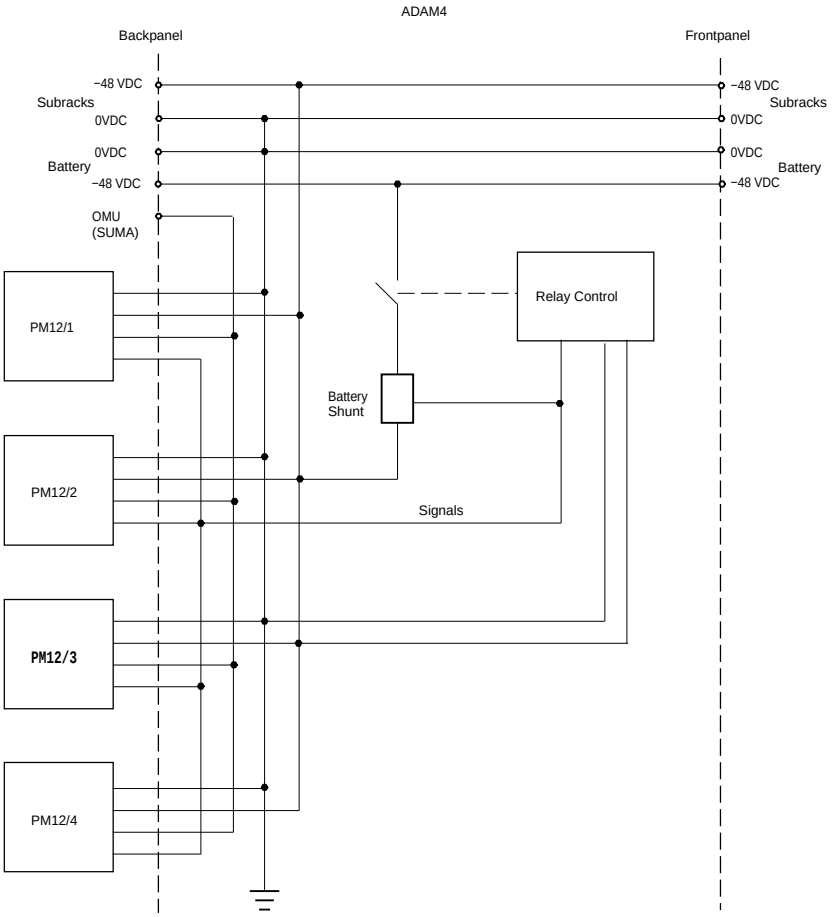


Figure 415: ADAM4 Block Diagram

The relay protects the battery in case of discharging. If the voltage reaches the lower limit, the relay separates the -48 VDC line of the battery. The relay has its own control circuit, so it works independently of the OMU.

12.23.2 Appearance

The following figure shows the front side view of ADAM4.

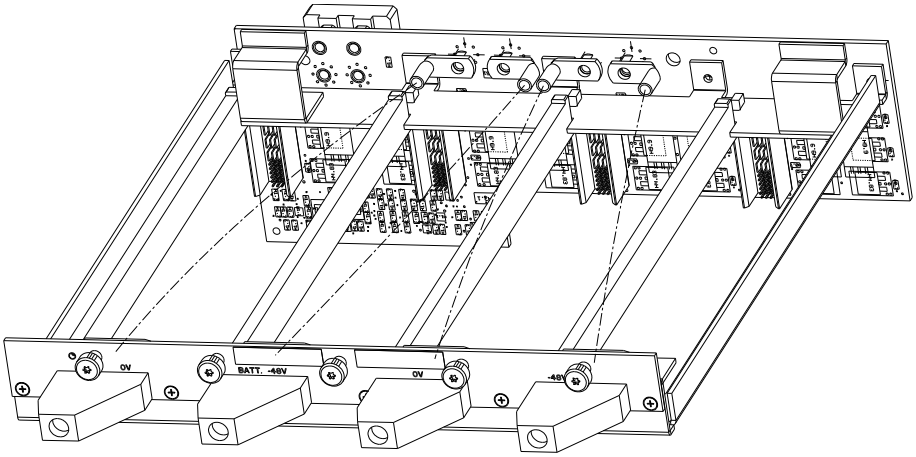


Figure 416: ADAM4 Front Side View

12.23.3 Connectors

On the backpanel there are two connectors for the PM12s. Each of them contains two blocks with 4x2 high current contacts (one block for 0 VDC and one for -48 VDC) and a 24-pin block for the control signals.

On the front panel there are the terminals for the DC supply of the subracks (via BOMU) and the back-up battery.

12.24 BU41

The BU41 is an optional feature used in outdoor BTS A9100 versions. It provides an emergency DC power source for use in the event of a mains supply failure.

The principal components of BU41 are four high performance, sealed, lead-acid batteries that conform to the DIN 43539 standard. They connect in series to provide a 48 VDC $_{nom.}$ power source, referred to as a branch. Optionally, a second branch of four sealed lead-acid batteries can be fitted to double the backup period. Each battery branch is independently connected to the BACO or BAC2. Note however, that only one battery branch can be connected to an ABAC or ADAM.

When two battery branches are used, both branches must consist of batteries of the same type and capacity. This is required because the charging and testing circuits assume both branches are the same.

Connected to one of the battery terminals is a temperature sensor. This monitors the battery temperature. The output from the sensor is used by the BCU1/SUMA to regulate the charging voltage and thus prevent battery overheating.

Each battery branch is fitted with venting tubes. The venting tubes discharge to the external environment the gasses produced during battery charging.

12.24.1 Charging

The BU41 charging characteristics conform to the DIN 41773 (float charging) standard.

The following table shows the battery type and the charging current limit for the number of battery branches in use.

Battery Type	One Branch	Two Branches
40 Ah	6 A	12 A

Table 147: BU41 Battery Type and Charging Current Limit

The following table shows the recommended charging voltage versus battery temperature.

Temperature	Voltage Per Cell	Total Voltage (± 1%)
0° C	2.3773	57.05
5° C	2.3484	56.36
10° C	2.3215	55.72
15° C	2.2966	55.12
20° C	2.2737	54.57
25° C	2.2528	54.07
30° C	2.2339	53.61
35° C	2.2170	53.21
40° C	2.2021	52.85
45° C	2.1892	52.54
50° C	2.1783	52.29

Table 148: BU41 Charging Voltage Versus Battery Temperature

Note: Avoid excessive battery gas leakage by not exceeding a charging voltage of 2.35 V per cell (56.40 V total) at 20° C.

12.24.2 Discharging and Storage

Discharging below 1.75 V per cell (42 V total) can damage the batteries.

Batteries may be stored without recharging only for a restricted time. Therefore manufacturers instructions (delivered with the product) must be followed.

12.24.3 Front and Top View

The following figure shows the front and top views of BU41.

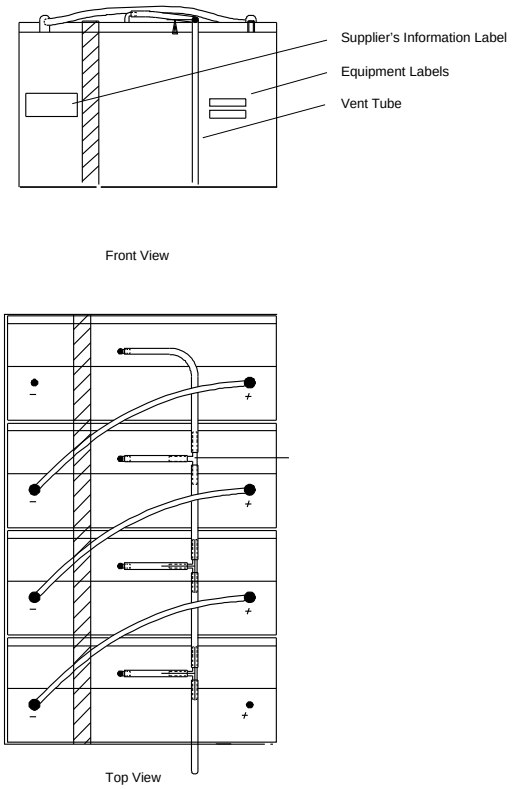


Figure 417: BU41 Front and Top Views

12.24.4 BU41 Mounted in MBO

The MBO offers a specific battery box. The batteries are arranged as shown in the following figure. The battery box is covered with a plate to secure the batteries.

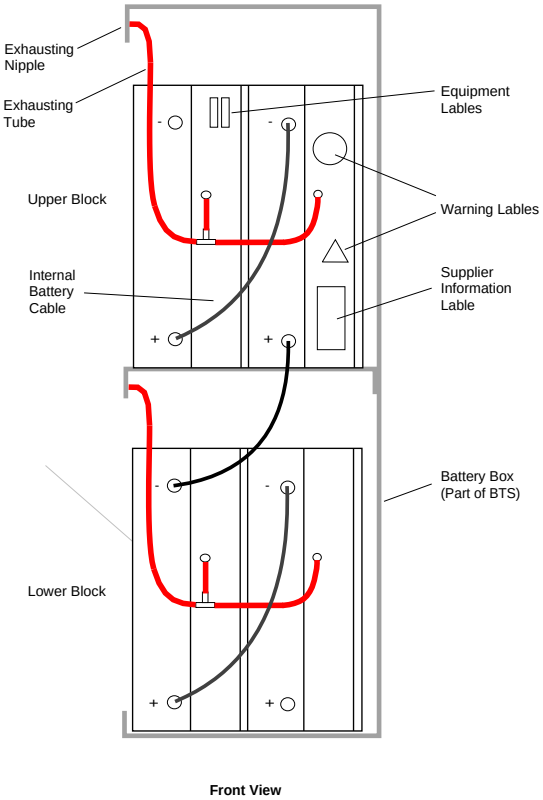


Figure 418: BU41 in MBO - Front View

12.25 BU100

The BU100 is an optional feature used in all outdoor BTS A9100 versions and in indoor versions that use an AC power supply. It provides an emergency DC power source for use in the event of a mains supply failure.

The principal components of the BU100 are four high performance, sealed, lead-acid batteries that conform to the DIN 43539 standard. They connect in series to provide a 48 VDC $_{nom.}$ power source, referred to as a branch. The battery branch is connected to the BACO, BAC2, ABAC or ADAM as appropriate.

Connected to one of the battery terminals is a temperature sensor. This monitors the battery temperature. The output from the sensor is used by the BCU1, BCU2 or SUMA to regulate the charging voltage and thus prevent battery overheating.

The battery branch is fitted with venting tubes. The venting tubes discharge the gasses produced during battery charging to the external environment.

12.25.1 Charging

The BU100 charging characteristics conform to the DIN 41773 (float charging) standard.

The following table shows the battery type and the charging current limit.

Battery Type	Limit
100 Ah	12 A

Table 149: BU100 Battery Type and Charging Current Limit

The following table shows the recommended charging voltage versus battery temperature.

Temperature	Voltage Per Cell	Total Voltage (± 1%)
0° C	2.3773	57.05
5° C	2.3484	56.36
10° C	2.3215	55.72
15° C	2.2966	55.12
20° C	2.2737	54.57
25° C	2.2528	54.07
30° C	2.2339	53.61
35° C	2.2170	53.21
40° C	2.2021	52.85
45° C	2.1892	52.54
50° C	2.1783	52.29

Table 150: BU100 Charging Voltage Versus Battery Temperature

Note: Avoid excessive battery gas leakage by not exceeding a charging voltage of 2.35 V per cell (56.40 V total) at 20° C.

12.25.2 Discharging and Storage

Discharging below 1.75 V per cell (42 V total) can damage the batteries.

Batteries may be stored without recharging only for a restricted time. Therefore manufacturers instructions (delivered with the product) must be followed.

12.25.3 Front and Top View

The following figure shows the front and top views of BU100.

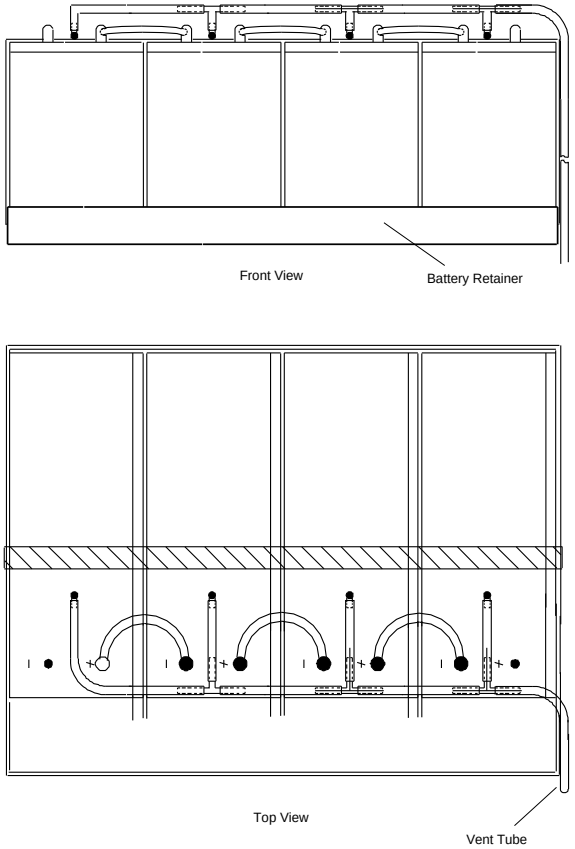


Figure 419: BU100 Front and Top Views

12.26 BU101

The BU101 is an optional feature used in Multistandard Outdoor BTS Cabinets. It provides an emergency DC power source for use in the event of a mains supply failure.

The principal components of the BU101 are four high performance, sealed, lead-acid batteries that conform to the DIN 43539 standard. They are connected in series to provide a 48 VDC $_{nom.}$ power source, referred to as a branch. The battery branch is connected to ADAM or ADAM4.

Connected to one of the battery terminals is a temperature sensor. This monitors the battery temperature. The output from the sensor is used by the SUMA to regulate the charging voltage and thus prevent battery overheating.

The battery branch is fitted with venting tubes. The venting tubes discharge the gases produced during battery charging to the external environment.

12.26.1 Charging

The BU101 charging characteristics conform to the IEC 896-2 standard.

The following table shows the battery type and the charging current limit.

Battery Type	Limit
100 Ah	12 A

Table 151: BU101 Battery Type and Charging Current Limit

The following table shows the recommended charging voltage versus battery temperature.

Temperature	Voltage Per Cell	Total Voltage (± 1%)
0° C	2.3773	57.05
5° C	2.3484	56.36
10° C	2.3215	55.72
15° C	2.2966	55.12
20° C	2.2737	54.57
25° C	2.2528	54.07
30° C	2.2339	53.61
35° C	2.2170	53.21
40° C	2.2021	52.85
45° C	2.1892	52.54
50° C	2.1783	52.29

Table 152: BU101 Charging Voltage Versus Battery Temperature

Note: Avoid excessive battery gas leakage by not exceeding a charging voltage of 2.35 V per cell (56.40 V total) at 20° C.

12.26.2 Discharging and Storage

Discharging below 1.75 V per cell (42 V total) can damage the batteries.

Batteries may be stored without recharging only for a restricted time. Therefore manufacturers instructions (delivered with the product) must be followed.

12.26.3 Front and Top View

The following figure shows the front and top view of the BU101. The battery box is covered with a plate to secure the batteries.

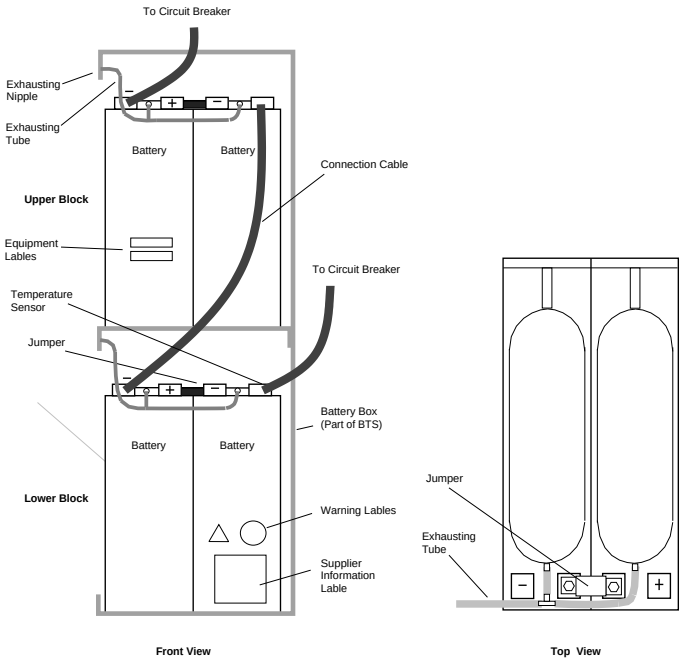


Figure 420: BU101 Front and Top View

12.27 BU102

The BU102 is an optional feature used in External Battery Cabinets Outdoor. It provides an emergency DC power source for use in the event of a mains supply failure.

The principal components of the BU102 are four high performance, sealed, gel batteries. They are connected in series to provide a 48 VDC $_{nom.}$ power source, referred to as a branch. The battery branch is connected to ADAM4 in a BTS cabinet.

A temperature sensor is connected to one of the 0 V battery terminal. This monitors the battery temperature. The output from the sensor is used by the SUMA to regulate the charging voltage and thus prevent battery overheating.

The battery branch is fitted with venting tubes. The venting tubes divert the gases produced during battery charging to the external environment.

12.27.1 Charging

The BU102 charging characteristics conform to the IEC 896-2 standard.

The following table shows the battery type and the charging current limit.

Battery Type	Limit
90 Ah	8 A for one battery branch 16 A for more than one battery branch

Table 153: BU102 Battery Type and Charging Current Limit

The following table shows the charging voltage versus battery temperature in case of default setting 2.29 V/ cell.

Temperature	Voltage Per Cell	Total Voltage (± 1%)
0° C	2.38	57.125
5° C	2.3587	56.616
10° C	2.3370	56.1
15° C	2.3162	55.59
20° C	2.295	55.08
25° C	2.2737	54.57
30° C	2.2525	54.06
35° C	2.2312	53.55
40° C	2.21	53.04

Table 154: BU102 Charging Voltage Versus Battery Temperature

12.27.2 Discharging and Storage

Discharging is interrupted at 1.75 V per cell (42 V total) in order to avoid damaging the batteries.

Batteries may be stored without recharging only for a restricted time. Therefore manufacturers instructions (delivered with the product) must be followed.

12.27.3 Front and Top View

The following figure shows the front and top view of BU102. The battery box is covered with a plate to secure the batteries.

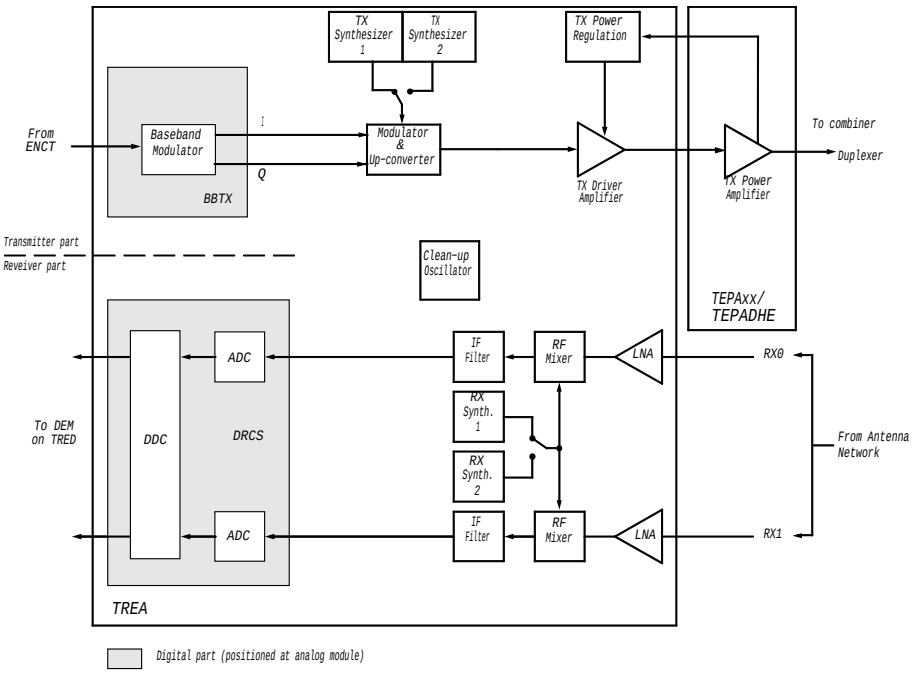


Figure 421: BU102 Front and Top View

12.28 BATS

The small battery BATS is a plug-in unit for the subrack STASR with a width of 28 TE. It is used in indoor cabinets. It provides an emergency DC power source for use in the event of a mains supply failure. It contains:

- A block of four batteries
- Printed board RIBATs
- Temperature sensor
- Battery breaker.

The following figure shows the block diagram.

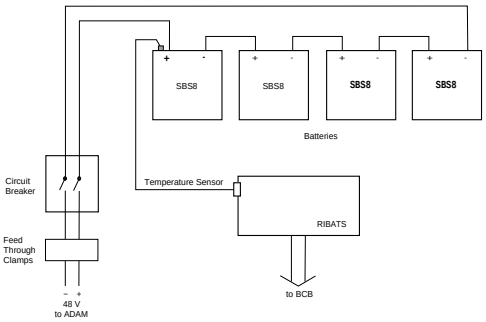


Figure 422: BATS Block Diagram

12.28.1 Batteries

The batteries are connected in series and have nominal 48 V and a capacity of 8 Ah. A BATS can be plugged in any unused subrack position.

The principal components of BATS are four high performance, sealed, lead-acid batteries that conform to the IEC 896-2 standard. They are connected in series to provide a 48 VDC $_{nom.}$ power source, referred to as a branch. The DC clamps of the module are connected to the battery clamps on the front side of ADAM.

12.28.2 Charging

The BATS charging characteristics conform to the DIN 41773 (float charging) standard.

The following table shows the battery type and the charging current limit.

Battery Type	Charging Current Limit
8 Ah	2 A

Table 155: BATS Battery Type and Charging Current Limit

The following table shows the recommended charging voltage versus battery temperature.

Temperature	Voltage Per Cell	Total Voltage (± 1%)
0° C	2.3773	57.05
5° C	2.3484	56.36
10° C	2.3215	55.72
15° C	2.2966	55.12
20° C	2.2737	54.57
25° C	2.2528	54.07
30° C	2.2339	53.61
35° C	2.2170	53.21
40° C	2.2021	52.85
45° C	2.1892	52.54
50° C	2.1783	52.29

Table 156: BATS Charging Voltage Versus Battery Temperature

Note: In order to avoid excessive battery gas leakage from the battery, the charging voltage must not exceed 2.35 V per cell (56.40 V total) at 20° C.

12.28.3 Discharging and Storage

Discharging below 1.75 V per cell (42 V total) can damage the batteries.

Batteries may be stored without recharging only for a restricted time. Therefore manufacturers instructions (delivered with the product) must be followed. Storage of discharged batteries is not allowed.

12.28.4 RIBATS

The RIBATS is a small PCB mounted on the BATS frame. It collects the value of the temperature sensor and transfers this information to the OMU via the BCB. It is directly connected to a backplane connector of the STASR. The RIBATS is supplied from the BTS via the BCB, not from the batteries.

12.28.5 Temperature Sensor

Connected to one of the battery terminals is a temperature sensor. This monitors the battery temperature. The output from the sensor is used by the SUMA to regulate the charging voltage and thus prevent battery overheating.

12.28.6 Battery Breaker

A battery breaker is mounted on the front side of BATS: 2 x 60 A, 80 V. The battery breaker disconnects the connection between the batteries and ADAM.

12.28.7 Front and Top View

The following figure shows the front view of the BATS.

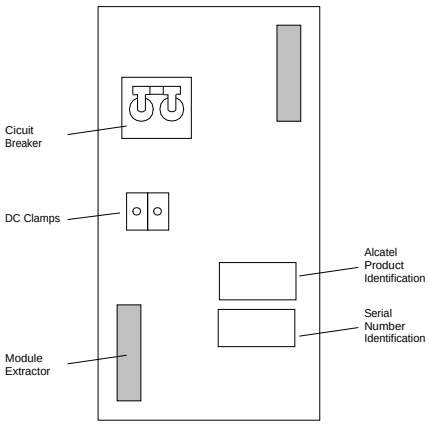


Figure 423: BATS Front View

12.29 RIBAT

The RIBAT board is part of the battery. Its task is to measure the battery temperature and to provide the OMU with the temperature value and the battery Remote Inventory information which includes the information for the battery type. Knowledge of the temperature value is necessary for charging. The board contains a BCB interface to transfer the information. Dependenting on the configuration, different interfaces are used: the BCB/EBCB, XBCB.

The RIBAT is supplied from the BTS, not from the batteries. The power consumption is about 100 mA.

12.29.1 Block Diagram

The connection and addressing differs for different configurations. The following figure shows the RIBAT block diagram.

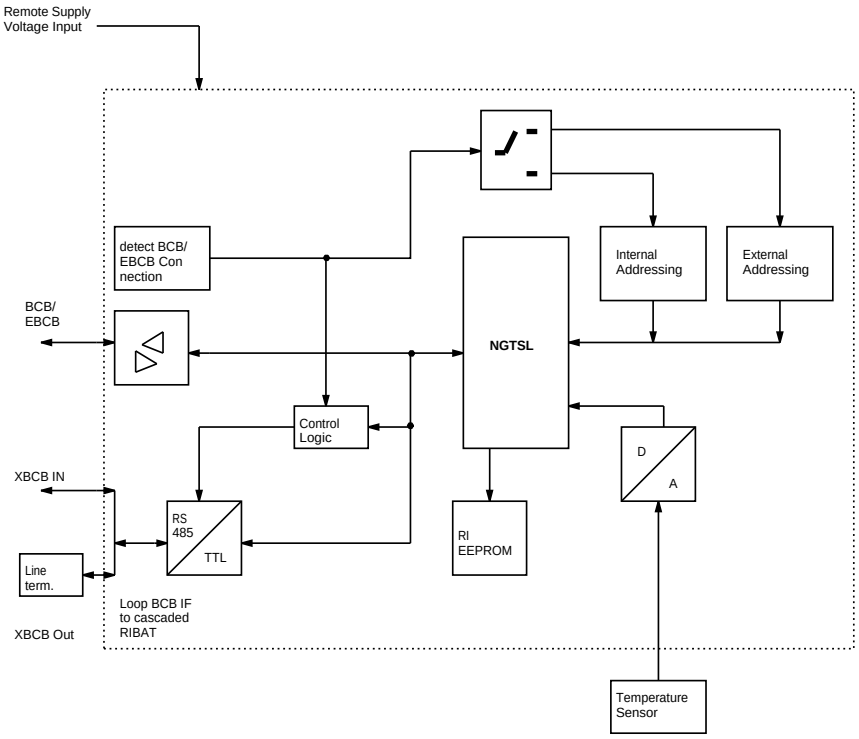


Figure 424: RIBAT Block Diagram

12.29.2 Functional Description

The board consists of:

- An NGTSL; which is the terminal for the ISL data link
- The Remote Inventory EEPROM including the Remote Inventory information
- The analog part for temperature measuring
- Address switching
- the BCB/EBCB, XBCB interfaces.

In order to differ between internal or external addressing and internal or external connection, the BCB/EBCB connection is detected. The BCB/EBCB connection is true if the battery is located inside the BTS cabinet. In this case, addressing is switched to internal and the XBCB interface is disabled by the control logic. If the addressing is switched to external, the XBCB interface is active. If there is no other terminal or RIBAT connected to XBCB Out, it has to be terminated with a line termination plug.

The analog part includes signal conditioning and an ADC to digitize the temperature value. An external PT100 temperature sensor is connected to the analog part. The ADC outputs are connected directly to the NGTSL alarm inputs.

Power supply is provided remotely either from inside the BTS or via the XBCB connection.

The internal battery of the outdoor BTS is located inside a side compartment. For this, the EBCB is fed to the side compartment. The RIBAT is connected to the EBCB via a flat band cable like it is done with a backplane. In this case addressing is switched to internal and the battery gets subrack number 0 (due to wire cutting on the flat band cable). Two cascaded batteries are possible by using different slot numbers (slot 1, slot 2) to address them. One wire of the flat band cable is used for this.

The battery temperature range which can be measured is between -10° C and 70° C. This range is extended against the operating temperature range of the batteries (0° C to 50° C) and the minimum operating temperature range of the RIBAT to submit high or low temperature alarms. The measurement resolution is 0.5° C. Values below -10° C mean a short cut at the temperature sensor. Values above 70° C mean a not-connected or interrupted sensor.

12.29.3 Appearance

The RIBAT is a small board with a C96 connector for the flat band cable, a Sub-D 9 connector for the temperature sensor and two Sub-D 15 connectors for the XBCB input and output. The top view is shown in the following figure.

The temperature sensor is mounted on one pole of the batteries to give a good thermal contact.

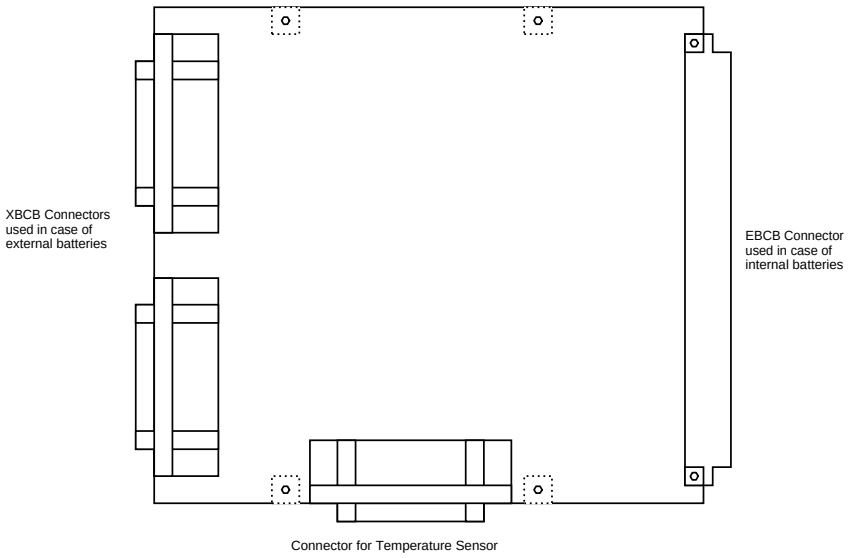


Figure 425: RIBAT Top View

12.29.4 XBCB Bus Termination

Because the XBCB is an RS-485 bus, it has to be terminated at the end of the line. At the BTS side this is already done on the COAR. At the RIBAT side, this is done by a termination plug. The termination plug consists of an 15-pin Sub-D male connector and a small PCB (50 mm x 30 mm) with termination and pull up/pull down resistors on it.

The plug is connected to the XBCB Out at the RIBAT. In case of cascaded RIBATs, the plug is connected to the remaining XBCB Out.

12.30 DCDP

The DCDP is used in outdoor BTS A9100 versions. It distributes -48 VDC to the equipment modules. Each DC output is over-current protected by its own circuit breaker. The circuit breakers are reset manually.

The DCDP is housed in BTS compartment 1 above the top STASR. The following figure shows the circuit schematic.

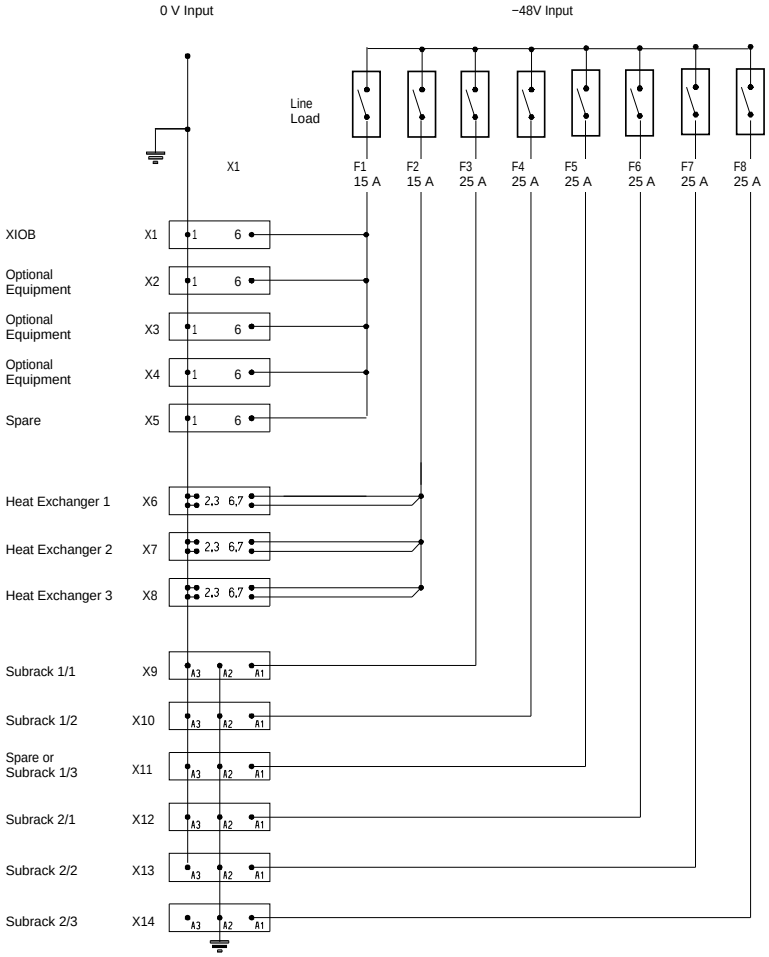


Figure 426: DCDP Circuit Schematic

The DCDP 0/ -48 VDC input supply is distributed to the front panel output connectors, via six circuit breakers.

The circuit breaker trip currents are:

- 15 A for F1, which supplies the connectors for the XIOB and optional equipment (such as microwave or termination of network line equipment)
- 15 A for F2, which supplies the connectors for the heat exchangers
- 25 A for F3 - F8, which supply the connectors for the STASRs.

The 0 VDC input is grounded in the DCDP and connected to each output connector.

12.30.1 Front and Top View

The following figure shows the front and top views of the DCDP.

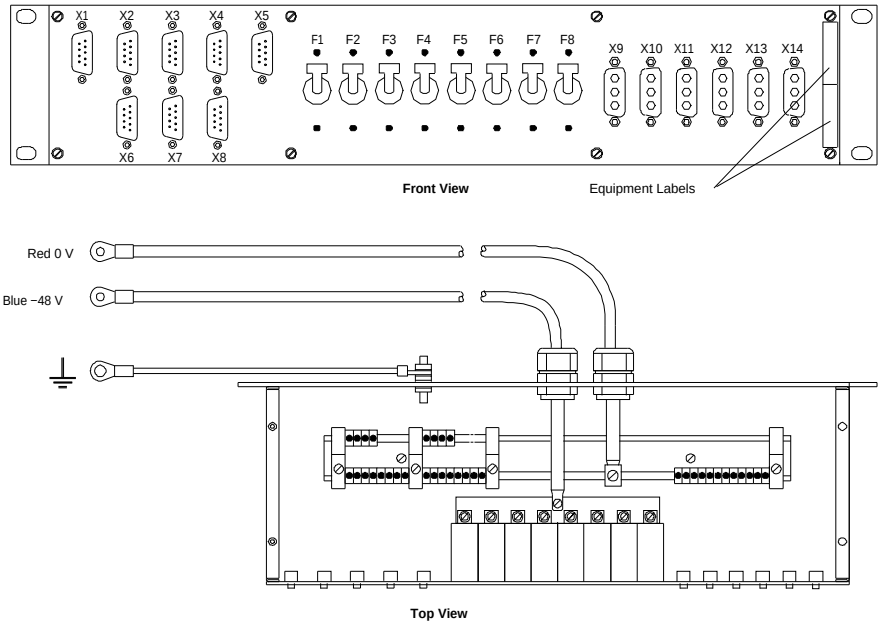


Figure 427: DCDP Front and Top View

12.30.2 Front Panel Connectors

The following table describes the DCDP front panel connectors.

Connector	Description
X1	Provides 0/ -48 VDC for the XIOB.
X2 - X4	Provides 0/ -48 VDC for the microwave equipment, if fitted.
X5	Spare.
X6 - X8	Provides 0/ -48 VDC for the heat exchanger controllers.
X9 - X14	Provides 0/ -48 VDC for the STASRs.

Table 157: DCDP Front Panel Connectors

12.30.3 Rear Panel Connectors

The following table describes the DCDP rear panel connectors.

Connector	Description
-48 V IN	Provides the -48 VDC input.
0 V IN	Provides the 0 VDC input.
Ground	Provides the ground connection for the unit.

Table 158: DCDP Rear Panel Connectors

12.31 DCDU

The DCDU is used in Compact BTS Outdoor DC versions. It distributes -48 VDC to the equipment modules. Each DC output is over-current protected by its own circuit breaker. The circuit breakers are reset manually.

The DCUC is housed in the BTS compartment above the cable entry. The following figure shows the circuit schematic.

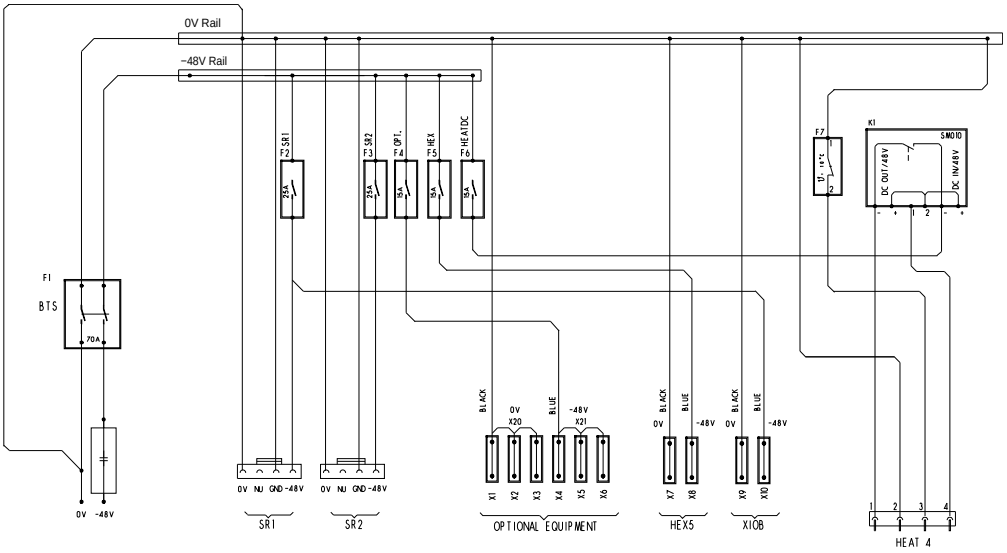


Figure 428: DCDU Circuit Schematic

The DCDU 0/ -48 VDC input supply is distributed to the front panel output connectors, via six circuit breakers.

The circuit breaker trip currents are:

- 70 A for F1, which supplies the complete BTS and is the main breaker
- 25 A for F2 and F3, which supply the connectors for the STASRs.
- 15 A for F4, which supplies the connectors for the XIOB and optional equipment (such as microwave or termination of network lines equipment)
- 15 A for F5, which supplies the connectors for the heat exchangers
- 15 A for F6, which supplies the connectors for the heater.

The 0 VDC input is grounded in the DCUC and connected to each output connector.

12.31.1 Front and Side View

The following figures show the front and side views of the DCDU.

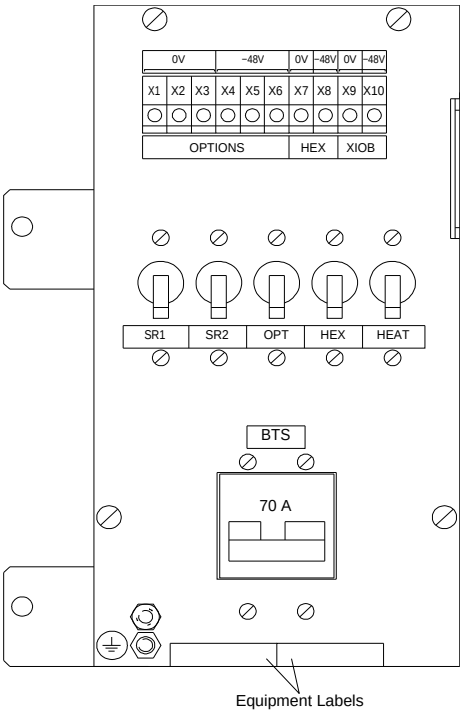


Figure 429: DCDU Front View

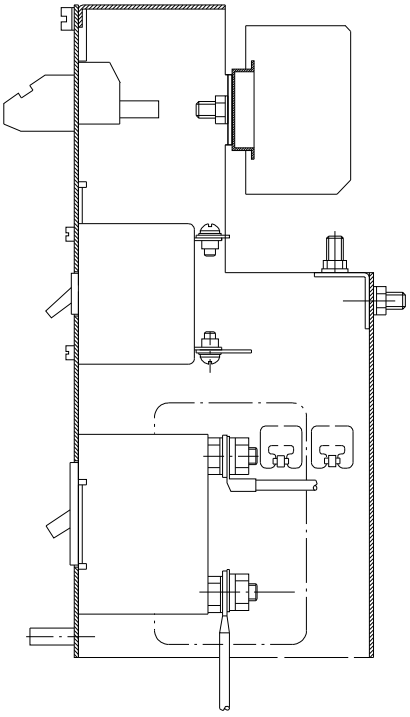


Figure 430: DCDU Side View

12.31.2 Front Panel Connectors

The following table describes the DCDU front panel connectors.

Connector	Description
X1 - X3	Provides 0 VDC for the optional equipment.
X4 - X6	Provides -48 VDC for the optional equipment.
X7, X8	Provides 0/ -48 VDC for the Heat Exchanger.
X9, X10	Provides 0/ -48 VDC for the XIOB.

Table 159: DCDU Front Panel Connectors

12.32 DCDUE

The DCDUE is used in DC A9100 MBS GSM Evolution Outdoor versions. It distributes -48 VDC to the equipment modules. Each DC output is over-current protected by its own circuit breaker. The circuit breakers are reset manually.

The DCDUE is housed in the left side of the BTS compartment. The following figure shows the circuit schematic.

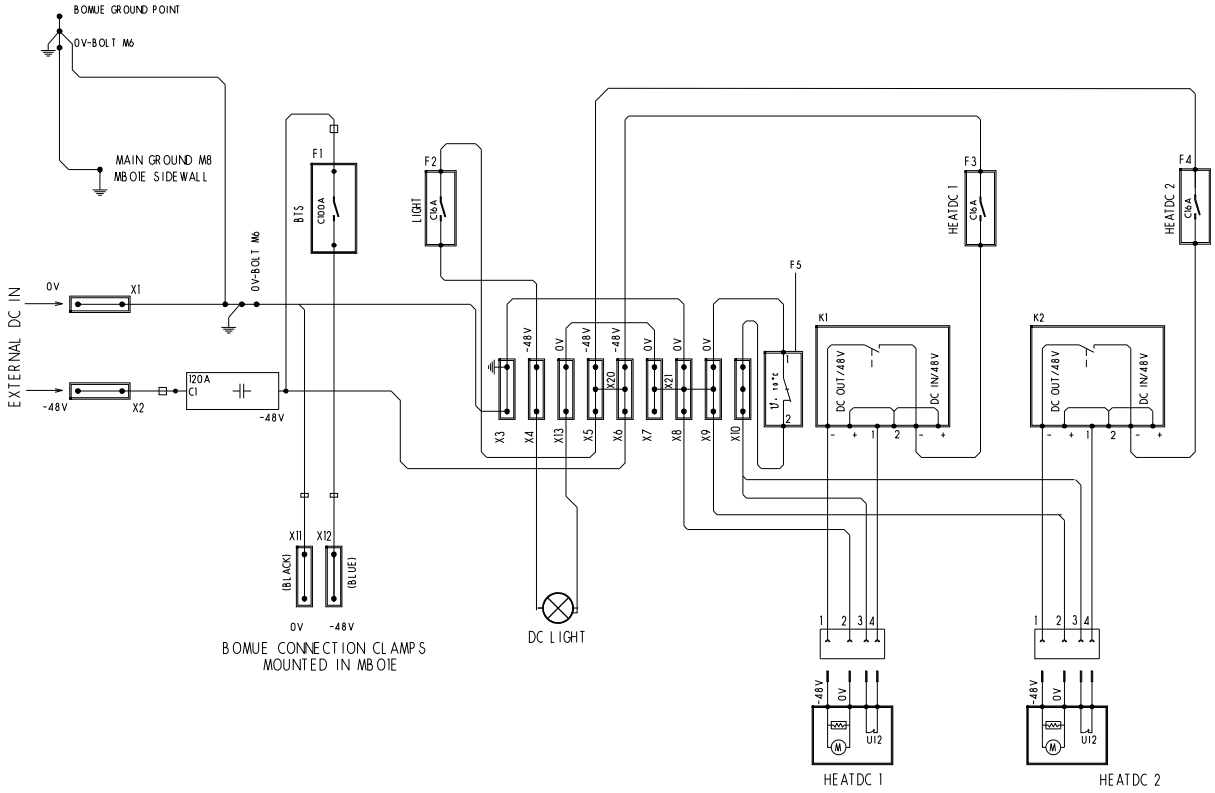


Figure 431: DCDUE Circuit Schematic

The DCDUE 0/ -48 VDC input supply is distributed to the front panel output connectors, via four circuit breakers.

The circuit breaker trip currents are:

- 100 A for F1, which supplies the complete BTS
- 15 A for F2, which supplies the Service Light
- 15 A for F3 and F4, which supply the heaters.

The following figure shows the front and side views of the DCDUE.

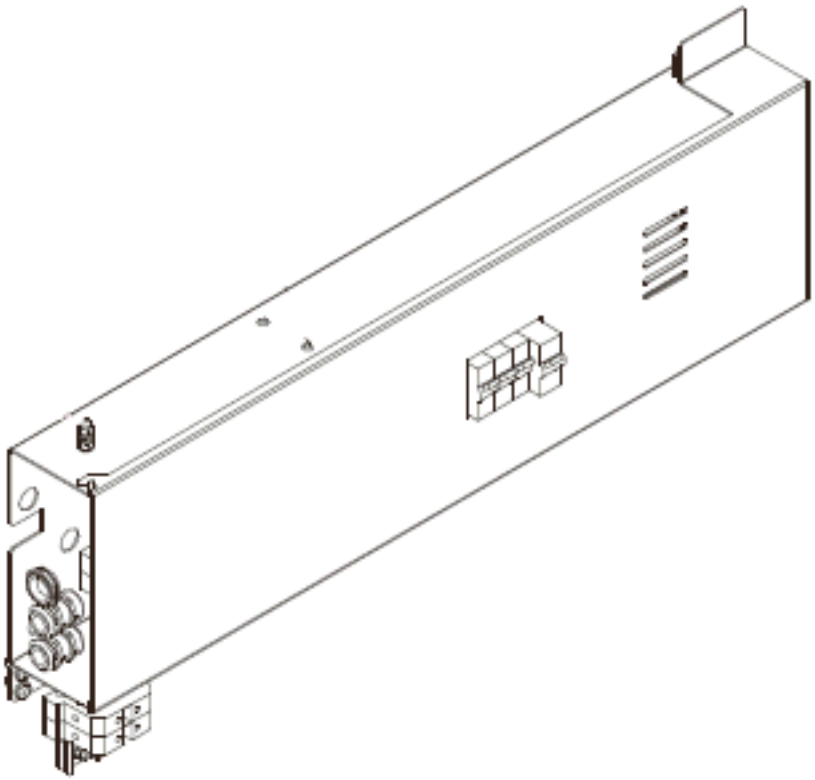


Figure 432: DCDUE Front and Side View

12.33 DCMU

The DCMU is used in DC A9100 MBS GSM Outdoor versions. It distributes -48 VDC to the equipment modules. Each DC output is over-current protected by its own circuit breaker. The circuit breakers are reset manually.

The DCMU is housed in the left side of the BTS compartment. The following figure shows the circuit schematic.

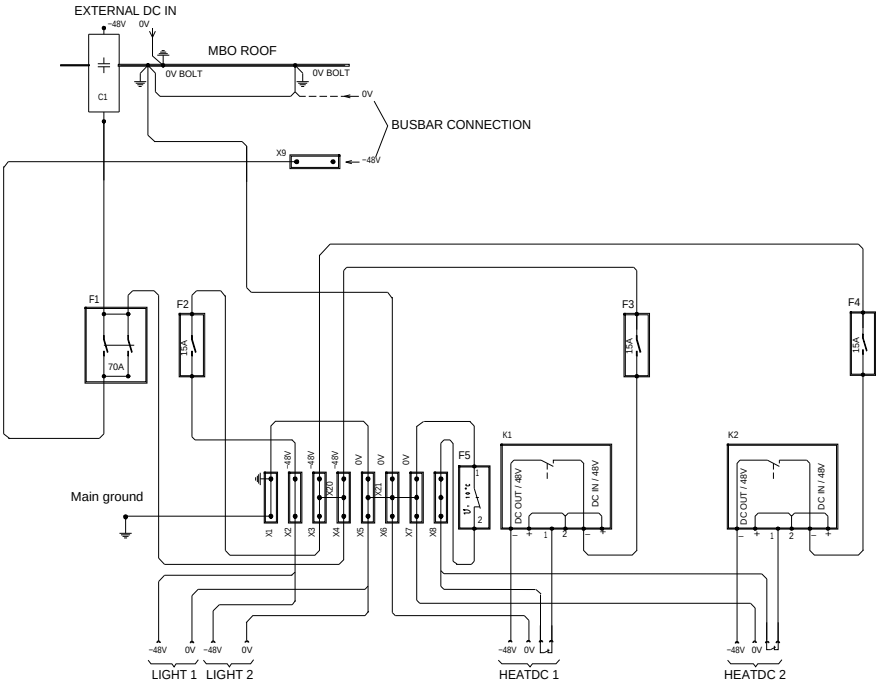


Figure 433: DCMU Circuit Schematic

The DCMU 0/ -48 VDC input supply is distributed to the front panel output connectors, via four circuit breakers.

The circuit breaker trip currents are:

- 75 A for F1, which supplies the complete BTS
- 15 A for F2, which supplies the Service Light
- 15 A for F3 and F4, which supply the heat exchangers.

The following figure shows the front and side views of the DCMU.

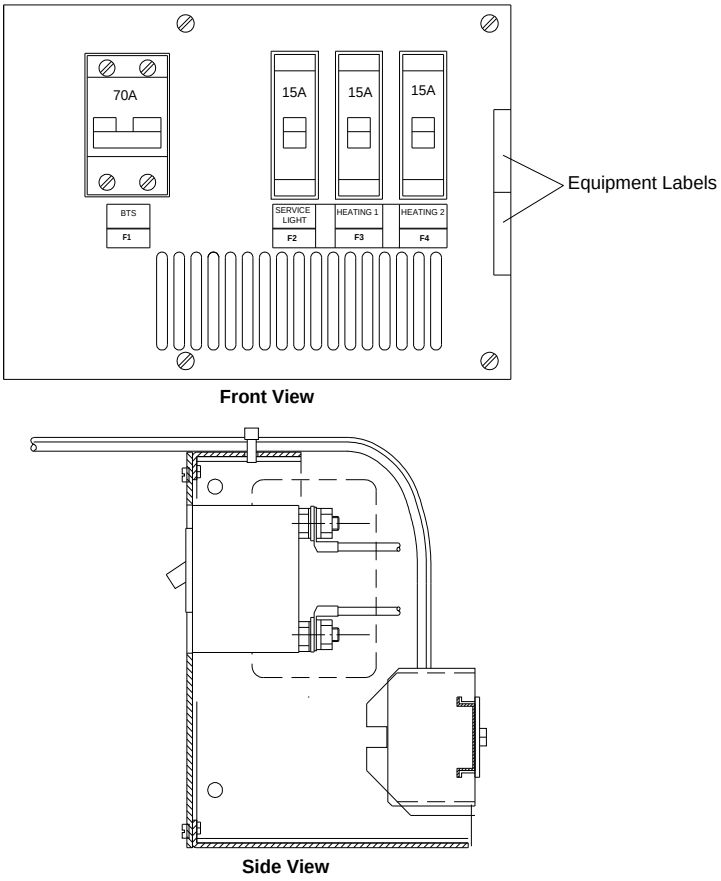


Figure 434: DCMU Front and Side View

12.34 DCUC

The DCUC is used in Compact BTS Outdoor versions. It distributes -48 VDC to the equipment modules. Each DC output is over-current protected by its own circuit breaker. The circuit breakers are reset manually.

The DCUC is housed in the BTS compartment above the ACUC. The following figure shows the circuit schematic.

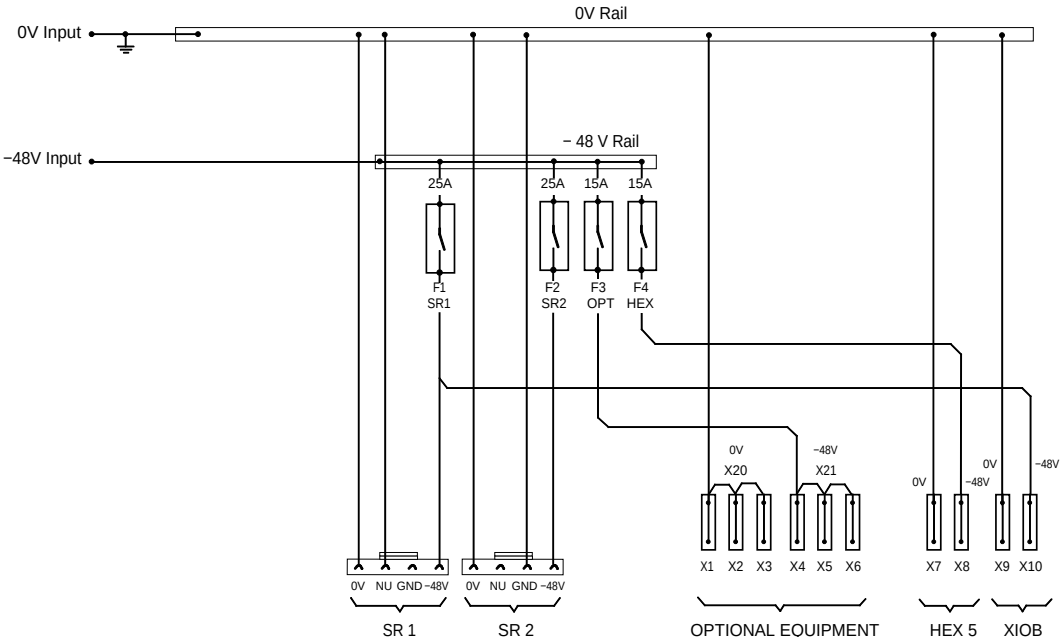


Figure 435: DCUC Circuit Schematic

The DCUC 0/ -48 VDC input supply is distributed to the front panel output connectors, via four circuit breakers.

The circuit breaker trip currents are:

- 25 A for F1 and F2, which supply the connectors for the STASRs.
- 15 A for F3, which supplies the connectors for the XIOB and optional equipment (such as microwave or termination of network lines equipment)
- 15 A for F4, which supplies the connectors for the heat exchangers

The 0 VDC input is grounded in the DCUC and connected to each output connector.

12.34.1 Front and Side View

The following figure shows the front and side views of the DCUC.

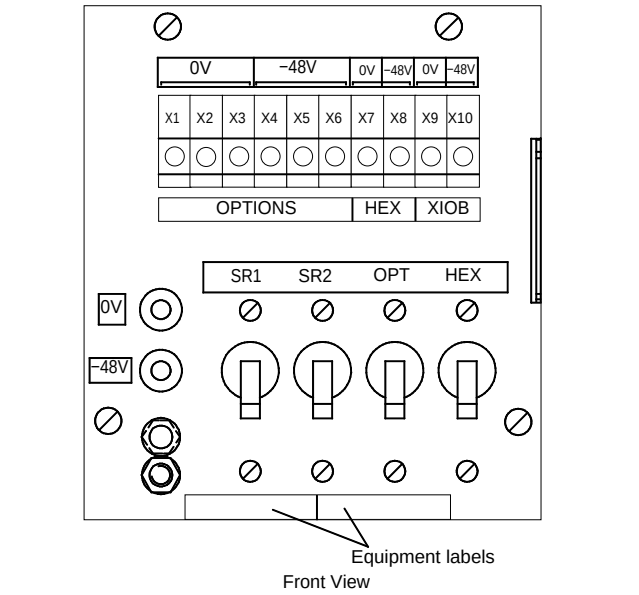


Figure 436: DCUC Front and Side View

12.34.2 Front Panel Connectors

The following table describes the DCUC front panel connectors.

Connector	Description
X1 - X3	Provides 0 VDC for the optional equipment.
X4 - X6	Provides -48 VDC for the optional equipment.
X7, X8	Provides 0/ -48 VDC for the Heat Exchanger.
X9, X10	Provides 0/ -48 VDC for the XIOB.

Table 160: DCUC Front Panel Connectors

13 ACRI

The sections are supported with diagrams, where necessary, showing the functional blocks and their interfaces.

A drawing of the physical appearance of the module is also included, showing the connectors and controls.

13.1 ACRI Functional Description

The ACRI is used in indoor and outdoor BTS A9100 versions. There are two functionally identical variants. The sole difference is that the indoor variant has the BCB interface available on the backplane connector.

The ACRI:

- Collects alarms from the SRACDC modules
- Controls the SRACDC FANUs.

The ACRI is housed in the SRACDC. The following figure shows the functional block diagram.

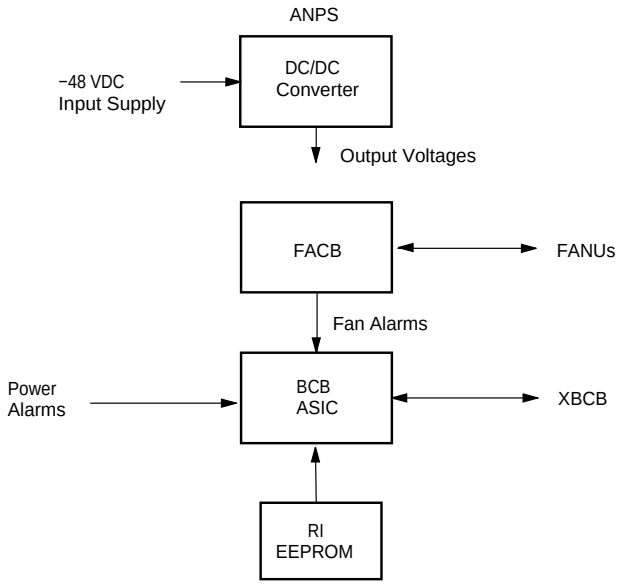


Figure 437: ACRI Block Diagram

The ACRI consists of the functional entities described in the following table.

ANPS	The ANPS which the -48 VDC input supply to the DC voltages required by the other components. For more information on the ANPS, refer to *AN Power Supply (Section 10.1.5)*.
FACB	The FACB reports fan faults and controls the FANUs that cool the SRACDC modules. For more information on the FANUs and FACB, refer to *Fan Units (Section 11.1.1)* and *Fan Control (Section 11.1.2)*, respectively.
XBCB	The way in which the BCB ASIC transfers information to the OMU in the SUMP depends on the ACRI variant. For the indoor variant, the information is transferred via the BCB, available on the backplane. For the outdoor variant, the information is transferred via the XBCB connector on the front panel. This information consists of: ▶ Alarms from the FACB ▶ Alarms from the battery, PM08s and BCU1 ▶ Remote Inventory information.
RI	The Remote Inventory is used to store information about the module (part number, name, serial number, etc.). It consists of an EEPROM which is connected to the BCB ASIC.

Table 161: ACRI Functional Entities

13.2 ACRI LEDs and Alarms

The two LEDs on the front panel are connected in parallel. They indicate the state of the + 5 VDC output of the ANPS.

The alarm information consists of:

- Fan status
- Number of PM08s fitted
- Number of PM08s that are serviceable
- Battery malfunction
- BCU1 failure.

13.3 ACRI Front Panel

The following figure shows the front panel of the ACRI.

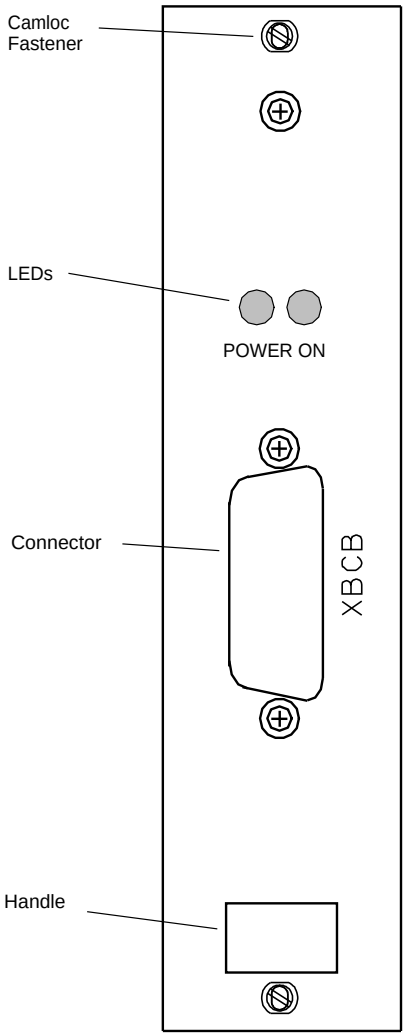


Figure 438: ACRI Front Panel

The ACRI XBCB connector provides a:

- + 5 VDC signal to enable ANPS
- Serial interface for the transfer of alarms and Remote Inventory information to the OMU.

14 Antenna Connector Lightning Protectors

The sections are supported with diagrams, where necessary, showing the functional blocks and their interfaces.

A drawing of the physical appearance of the modules is also included which shows the connectors.

14.1 Lightning Protector Functional Description

Antenna connector lightning protectors are used in outdoor BTS A9100 versions. They protect the RF inputs and outputs from the effects of nearby or direct lightning strikes.

The lightning protectors are described in the sections:

- Operating principles
- Types.

14.1.1 Operating Principles

Lightning strikes and induced pulses have characteristics which are very different from the desired RF signals transmitted and received by the BTS A9100. These differences allow a lightning strike to be suppressed.

The BTS A9100 lightning protectors are based on a 'quarter-wavelength shorting stub'. This has the effect of passing all operational RF signals, but effectively shorting any lightning voltage spikes to the cabinet's chassis ground.

The protectors can be used in both the transmit and receive signal paths. They are installed to form part of the cabinet's external RF connections.

14.1.2 Types

Even though the LPQG, LPQD, LPQP, and LPQM types can have different suppliers, the product numbers are always identical. The following table lists the product numbers.

Type	Variant Product Numbers
LPQG	3BK 05817 AAAA
LPQD	3BK 05818 AAAA
LPQP	3BK 08691 AAAA
LPQM	3BK 25444 AAAA

Table 162: Antenna Connector Lightning Protector Types and Variants

The AAAA variants are functionally identical, differing only in dimensions and appearance.

14.1.3 Lightning Power Spectrum

Quarter-wave stub lightning protectors remove lightning current on a frequency selection basis.

The following figure shows the power spectrum of a typical lightning strike.

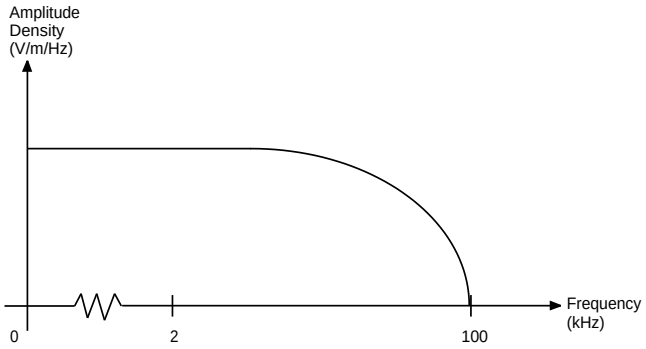


Figure 439: Lightning Strike Power Spectrum

As lightning has a power spectrum with very little energy above 100 kHz, a band-pass protection filter can be used. This passes the frequencies of interest (which are much above 100 kHz), yet rejects the low frequencies generated by lightning. The antenna connector lightning protectors perform this function using the quarter-wavelength shorting stub.

14.1.4 Quarter-Wave Stub

The quarter-wave stub is a coaxial line exactly one quarter-wavelength long. One end is connected to the through path and the other end is simply shorted.

The following figure shows the equivalent circuit of the antenna connector lightning protectors.

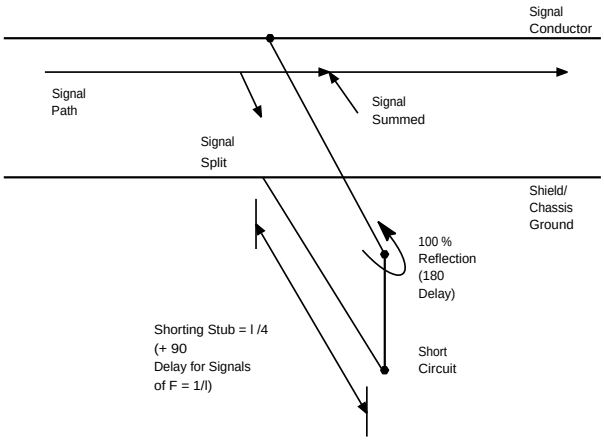


Figure 440: Antenna Connector Lightning Protectors Equivalent Circuit

During normal operation, the RF transmission signal arrives at the input of the shorting stub, where it is split.

One part travels along the matched quarter-wavelength stub, thus changing its phase by 90°. At the short, the signal is reflected and hence shifted by a further 180°. It then travels back along the stub and is again shifted by 90° by the time it reaches the junction.

The other part continues along the straight-through path. The reflected and straight-through signals are therefore exactly one cycle out of phase at the junction.

The signals are summed at the junction. Apart from negligible jitter, the resulting signal is identical to the original signal.

In contrast to the high frequency transmission signals, the much lower frequency lightning spectrum is not matched to the stub. Its components are, effectively, shorted to ground (as they are shifted completely out of phase by the short). At the same time, they have a negligible shift when travelling down the stub.

14.2 Lightning Protector Electrical Characteristics

The following table shows the electrical characteristics. The lightning protectors have little effect on system performance during normal operation.

Characteristic	LPQG	LPQD	LPQP	LPQM
Usable frequency range:	870 - 970 MHz	1700 - 1900 MHz	1800 - 2000 MHz	870 - 970 MHz and 1700 - 2200 MHz
Insertion loss:	≤ 0.1 dB	≤0.1 dB	≤0.1 dB	≤0.1 dB
VSWR:	≤ 1.1	≤1.1	≤1.1	≤1.1
Impedance:	50 Ω	50 Ω	50 Ω	50 Ω

Table 163: Lightning Protector Electrical Characteristics

14.3 Lightning Protector Appearance

Lightning protectors can be designed with an internal filter or with a shorting stub (depending on the manufacturer). The following figure shows the appearance of the antenna connector lightning protector with shorting stub.

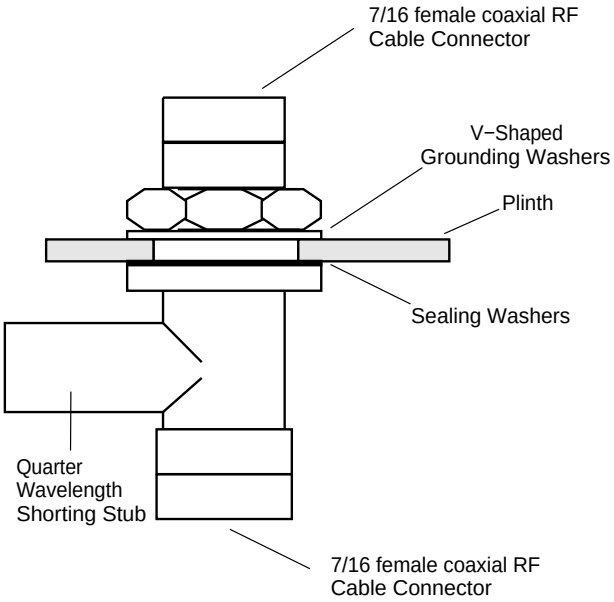


Figure 441: Lightning Protector Appearance with Shorting Stub

The protectors are mounted in the plinth at the bottom of the cabinet. Each protector consists of a coaxial through-connection with the protection mechanism located below the plinth.

15 Range Extension Kit

This chapter describes the range extension kit (REK) which is aimed at enhancing the capabilities of the Evolium BTS A9100 in terms of coverage.

The REK is designed to compensate the feeder losses which significantly impact the density of sites to be implemented over the service area of GSM networks.

15.1 Introduction to REK

The basic advantage of the REK is to enhance the capabilities of the Evolium BTS A9100 in terms of coverage by increasing the size of the cell, which significantly impacts the density of sites to be implemented over the service area of GSM networks. Other advantages are range extension of road cell, compensation of the eventual error of site location by radio network planning and compensation of RF performance impairment due to antenna feeder and ANx losses.

The REK can be used with a wide variety of Evolium BTS A9100 indoor and outdoor configurations in GSM 900 with a coupling constraint of maximum one TRX/TRE to each antenna. Cross-polarized antennas can still be used respecting this constraint. For practical reasons, configurations are limited to a maximum of six TREs per BTS site, assuming a 3x2 configuration.

The REK is designed to minimize BTS and system impacts. The BTS has no knowledge of the REK's presence and is not involved in its configuration. Configuration of the REK is reduced to manual attenuator setting at installation. Supervision is minimal. It only involves external alarms to the BTS and there is no recovery mechanism. The system impact concerns the handling of these new external alarms at the OMC-R level.

The REK is composed of two modules:

- A Masthead Amplification Box, to be installed close to the antenna, featuring power amplification downlink and low noise amplification uplink, along with proper supervision means
- A Power Distribution Unit, to be installed in the BTS cabinet or close to the BTS, providing DC power for the purpose of remotely feeding the masthead amplification module through the antenna feeder and collecting the alarm signals.

15.2 Overall Description

15.2.1 Architecture

The following figure shows a two TRX configuration.

The equipment has three sections:

- The Masthead Amplification Box. Each MAB provides bi-directional amplification for one antenna port. The antennas are not part of the MAB. The use of two separate antennas or one cross-polar antenna (decoupling >25 dB) is possible
- The feeder cables. Up to 11 dB of loss is supported allowing 1/2” cables with up to 100 m length if used as an extension for a standard Evolium BTS A9100. The DC feed and supervision of the masthead equipment is also done via the feeder cables
- The Power Distribution Unit. This module provides the interface towards the BTS. The power supply for the masthead equipment and the alarm handling is provided by this module. This module is located beside the BTS rack for indoor applications and inside the cabinet for outdoor configurations.

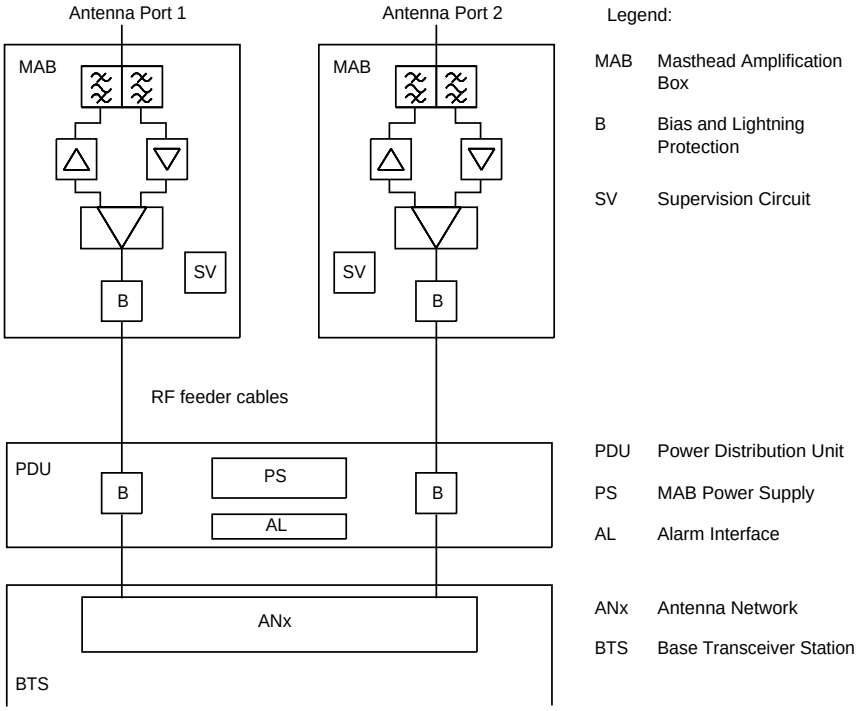


Figure 442: REK Architecture

15.2.2 Configurations

The REK is usable in site configurations featuring one antenna per TRX, and therefore well adapted for the implementation of air combining.

The technical constraints are: no TX coupling in the BTS (no ANY in the configuration), respectively the sectors, which means only one TRE transmitting on each antenna. (On the ANC, the included combiner will be disabled by removal of the two bridges and the TREs connected directly to the duplexers).

The different possible site configurations are shown separately below.

15.2.2.1 With One TRE

The following figure shows a one-cell configuration using the REK.

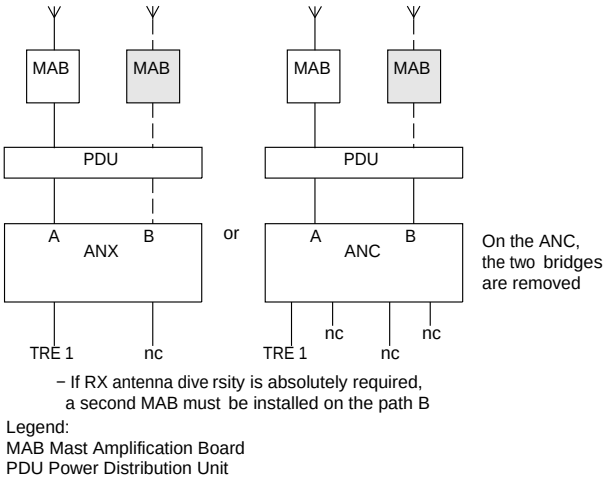


Figure 443: Cell with One TRE

If RX antenna diversity is absolutely required, a second MAB must be installed on path B.

15.2.2.2 With Two TREs and RX Antenna Diversity

The figure below shows the configuration for one cell with two TREs and RX antenna diversity.

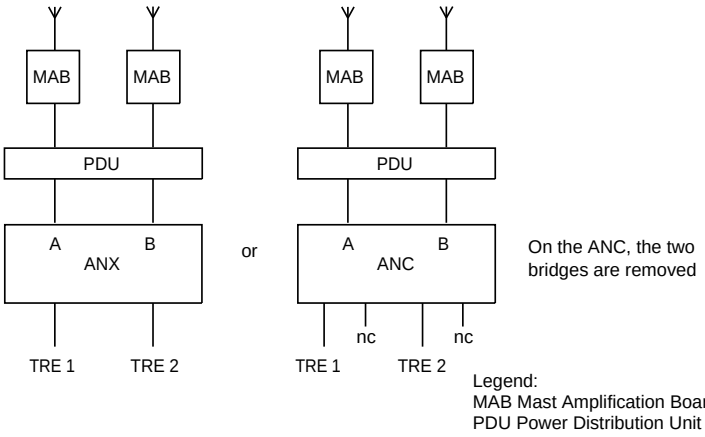


Figure 444: Cell with two TREs and RX Antenna Diversity Active

15.2.2.3 3x1 without RX Antenna Diversity, with ANX

As shown in Figures*443* and *444* above, one MAB is required per TRE. However, one PDU can supply two MABs (two TREs connected) These two TREs do not need to belong to the same sector. Thus a 3x1 configuration requires only two PDUs if there is no RX antenna diversity.

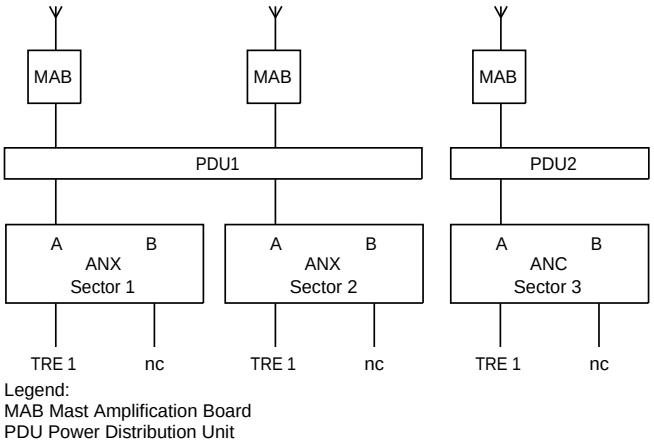
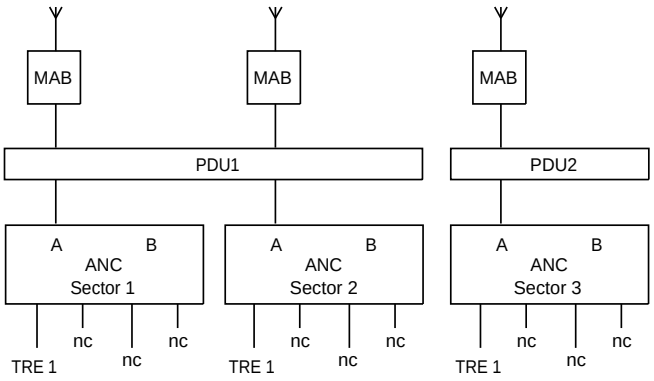


Figure 445: 3x1 Configuration without RX Antenna Diversity - ANX Variant

15.2.2.4 3x1 without RX Antenna Diversity, with ANC

A 3x1 configuration without RX antenna diversity using the ANC is shown in the following figure.



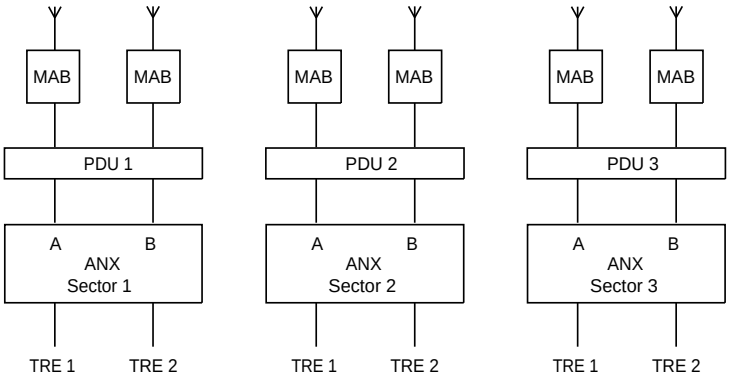
On each ANC, the two bridges are removed

Legend:
MAB Mast Amplification Board
PDU Power Distribution Unit

Figure 446: 3x1 Configuration without RX Antenna Diversity - ANC Variant

15.2.2.5 3x2 with ANX

The following figure shows a 3x2 configuration using the ANX.

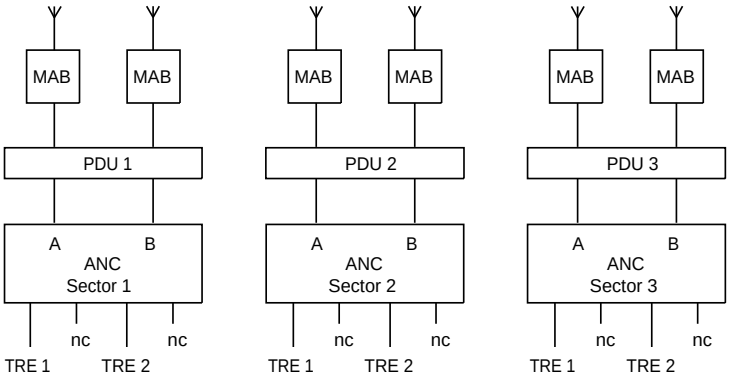


Legend:
MAB Mast Amplification Board
PDU Power Distribution Unit

Figure 447: 3x2 Configuration - ANX Variant

15.2.2.6 3x2 with ANC

The figure below shows a 3x2 configuration using the ANC.



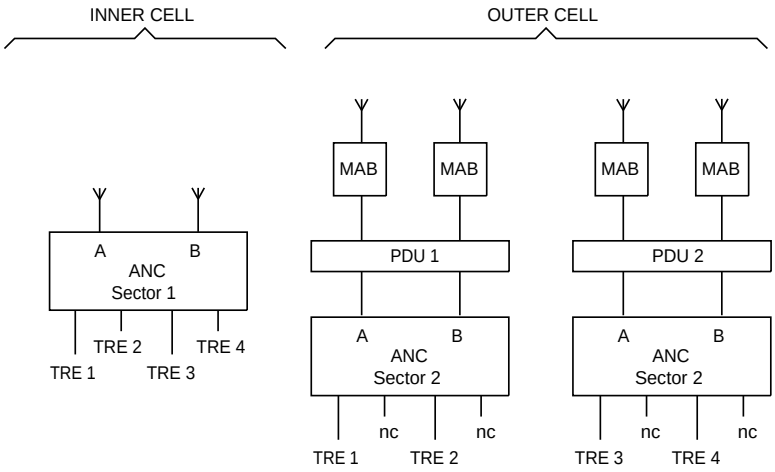
On each ANC, the two bridges are removed

Legend:
MAB Mast Amplification Board
PDU Power Distribution Unit

Figure 448: 3x2 Configuration - ANC Variant

15.2.2.7 Extended Cell Configuration

The extended cell configuration is composed of one Inner Cell with up to four TREs, and one Outer Cell with up to four TREs. The REK is used in the Outer Cell.

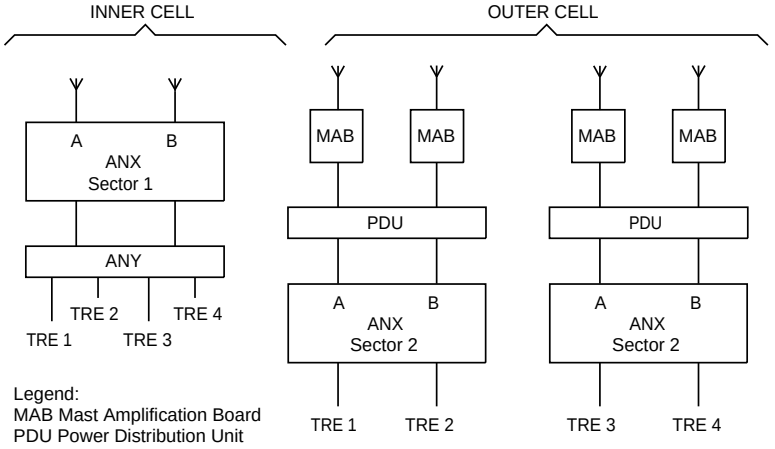


In the Outer Cell, the bridges are removed on each ANC

Legend:
MAB Mast Amplification Board
PDU Power Distribution Unit

Figure 449: Extended Cell Based on ANC (and SUMA) Installation

In case of an Evolium BTS 9100 equipped with ANX and SUMP, the SUMP has to be replaced by a SUMA.



Legend:
MAB Mast Amplification Board
PDU Power Distribution Unit

Figure 450: Extended Cell Based on ANX (and SUMA) Installation

15.2.2.8 BTS Configurations

Due to limited DC power distribution in outdoor cabinets which can accept no more than three PDUs and external alarm limitation, the configurations are limited to a maximum of six TREs per BTS.

In addition, no multiband configuration is foreseen.

Considering these limitations, the following configurations are possible.

Rack	Configuration Type	Indoor	Outdoor	ANX	ANC	Rack Layout Type	Notes
MINI	1x1...2	X	X	X	X	1x1...4	**(1)**
MINI	2x1	X	X	X	X	2x1...2	
MINI	2x2	X	X	X	X	2x1...2	
MINI	3x1	X	X	X	X	3x1	
MEDI	1x4 Low Loss	X	X	X	X	2x1...4 Low Loss	**(1)**
MEDI	3x.2	X	X	X	X	3x1...4	**(1)**
MEDI	Extended Cell 1x1...4, 1x1...4 Low Loss	X		X	X	1x1...4 + 1x1...4 Low Loss	**(2)**

Table 164: BTS Configurations with REK

(1) These BTS configurations are without TX coupling: no ANY.

(2) In the 1x1...4 Low Loss part, the two bridges of each ANC are removed.

For rack layouts see *Configurations - Rack Layouts (Section 2)*.

15.3 Masthead Amplification Box

The Masthead Amplification Box for GSM 900 (part number 3BK 08848 AAAA) is a bi-directional amplifier for one antenna port. It is designed for outdoor installation on a tubular mounted support below the antenna.

The Masthead Amplification Box architecture is shown in the following figure.

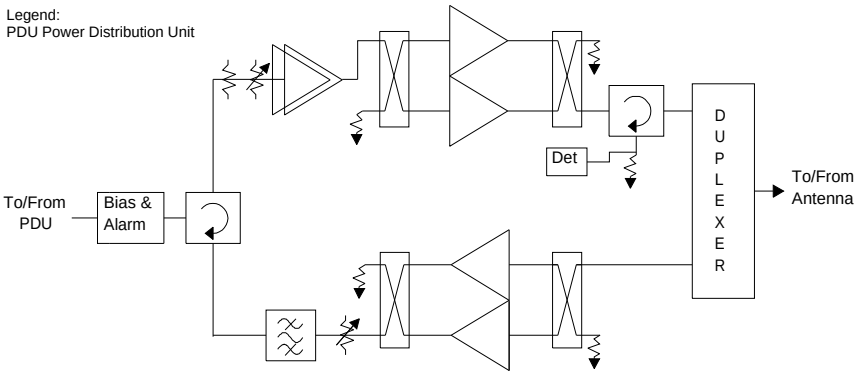


Figure 451: Block Diagram of the Bi-directional Amplifier

The bi-directional amplifier is composed of:

- A circulator at the BTS input
- A power amplifier in the Tx path
- A low noise amplifier in the Rx path
- A duplexer at the antenna output
- A reflected power detector at the output of the power amplifier
- A Bias T and a lightning protection module
- A power regulation (DC voltage regulators for the Tx and Rx amplifiers), not represented in figure above
- Alarm circuitry, collecting alarms (from DC regulators, Tx and Rx amplifiers), not represented in figure above
- Two switches for adjusting the gains of the Tx and Rx paths (independent from each other), not represented in figure above.

15.3.1 Transmit Power Amplifier and Required Attenuators

The required output power (transmit) of the masthead equipment (including output filter) is 44.5 dBm (28 W). To adapt the amplifier to the different BTS types and antenna cable losses, an attenuator in front of the amplifier is needed.

Because of the high input power in the standard Evolium BTS A9100, this attenuator is split into a fixed part (8 dB) and a variable part (range 0...15.5 dB).

The fixed attenuator is built to limit the signal level at the output of the variable attenuator to maximum 2.5 W (34 dBm). The variable attenuator is digital and can be manually adjusted in steps of 0.5 dB depending on BTS type and cable losses (see the following figure). The variable attenuator supports an input power in the range of 21.65 to 32.75 dBm and is dimensioned for up to 34 dBm (i.e., 2.5 W) to allow some margin.

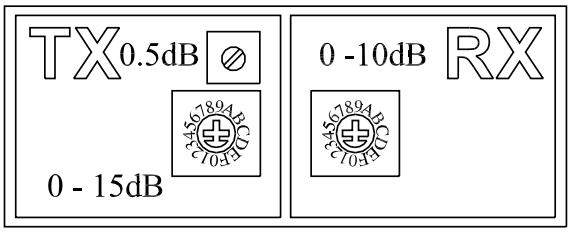


Figure 452: RX and TX Attenuation Setting

The amplifier itself is composed of one class A and two class AB stages. The output stage is a quadrature to improve the reliability and manufacturability of the design.

An isolator is added on the output for protection from operation in a high output VSWR as well as reverse intermodulation performance. The insertion loss is 0.35 dB.

The gain is maintained within ±1.5 dB tolerance by employing passive temperature compensation on the amplifier input. This maintains the gain within the required tolerance over the whole range of frequency, temperature, power supply and input power variations, so there is no control loop on the amplifier gain.

The amplifier can be damaged, if the maximum input power is >41 dBm. A thermal protection/shut-down circuitry is incorporated in order to prevent the amplifier from damage in case of a too high temperature inside the Masthead Amplification Box enclosure.

A DC regulator is introduced to avoid gain fluctuations of the power amplifier, because the amplifier is DC-fed via the feeder cable which introduces up to 3 V of voltage drop (depending on the cable length and DC current).

15.3.2 Receive Amplifier

As shown in Figure *451*, the receiver amplifier is a balanced two-stage design. Each arm of the balanced amplifier contains two standard LNAs (the first stage is GaAs and the second stage is bipolar for GSM 900). The maximum overall gain measured from the antenna input to the output of the Masthead Amplification Box is 16 dB for GSM 900. The noise figure remains below 2.5 dB (for temperatures up to 50° C.

Temperature compensation is provided through a passive temperature variable attenuator on the amplifier output. Its insertion loss is 2 dB. A DC voltage regulator is also included to minimize the LNA gain variations due to input voltage fluctuations.

The receive amplifier includes a manually settable attenuator at its output, which allows decreasing the gain by 10 dB in steps of 1 dB in order to adapt for the different cable lengths (see Figure *452*). It is a digital attenuator, controlled by a manual rotary switch. Its insertion loss is 2 dB in GSM 900. A bandpass filter is added to ensure adequate rejection of the transmit band signal coming into the receive amplifier input. Its insertion loss is 1.5 dB.

Since the receive amplifier involves two low noise amplifiers in parallel, any single LNA failure will only produce a 6 dB decrease of the amplifier gain.

15.3.3 Output Duplexer

The masthead output duplexer is located at the antenna port of the masthead box. It has to prevent the Rx path from being interfered by the own Tx signals and to suppress the Tx noise in the Rx band. A further function is the attenuation of Tx harmonics if necessary.

In order to achieve a low level of intermodulation (-110 dB) at the output of the low noise amplifier, the Tx/Rx isolation is 80 dB. The duplexer has a Tx insertion loss of 1.1 dB for GSM 900. The Rx insertion loss is 1.2 dB for GSM 900.

15.3.4 Input Splitter

The masthead input splitter routes the Tx signal coming from the antenna cable to the Tx power amplifier and the output signal of the LNA to the antenna cable. As shown in Figure *451* it is implemented with a circulator. Together with the Masthead Amplification Box output duplexer, it prevents the masthead equipment from self-oscillating.

Another function of the input splitter is to prevent the Masthead Amplification Box receive amplifier from generating intermodulation by reversely injected Tx signals. Its insertion loss in Tx is 0.35 dB and in Rx is 0.3 dB.

15.3.5 RF Specifications

The RF specifications of the Masthead Amplification Box are summarized in the following table.

Parameter	Requirement
Transmit Path	
Frequency range	925 - 960 MHz
Impedance	50 Ω
Input VSWR	<1.5 at the input of the masthead amplification box
Output power	44.5 dBm ±1.5 dB
Gain variation	Max ± 1.5 dB versus frequency, temperature and input power ranges
Variable attenuator	Tunable from 0...15.5 dB in steps of 0.5 dB
Max input level for attenuator setting 0 dB	≤41 dBm
Receive Path	
Frequency range	880 - 915 MHz
Impedance	50 Ω
Input, Output VSWR	<1.5
Gain in Rx path	16 dB ±1 dB for -10 to + 40° C 16 dB ±1.5 dB for -40 to + 60° C
Attenuator setting at output	0...10 dB in steps of 1 dB
Output duplexer	
Tx bandpass	925 - 960 MHz
Rx Bandpass	880 - 915 MHz
Tx/Rx isolation in Tx and Rx band	70 dB minimum

Table 165: RF Specifications of the Masthead Amplification Box

15.3.6 Supervision Circuits and Alarm Interface

Two alarms per TRX function are provided by the Masthead Amplification Box, one fatal and one non fatal. The fatal alarm is raised in case of a fatal failure (e.g., power amplifier out of order). The non-fatal alarm is raised in case of a non-fatal failure (e.g., acceptable performance degradation). The signaling of the alarms from the MAB to the PDU is done via the corresponding antenna cable, using low frequency signals that are coupled onto the RF coaxial lines via the Bias tee and lightning protection module. An alarm is active if its corresponding frequency is present.

The fatal alarm is activated by:

- High reflected power at the power amplifier output
- High current draw by the power amplifier
- Low input voltage to the power amplifier
- High temperature.

The non-fatal alarm is activated by:

- Low bias current on the transistors in the receive amplifier (in one or both arms of the balanced amplifier)
- High bias current on the transistors in the receive amplifier (in one or both arms of the balanced amplifier).

15.3.7 Bias Circuit and Lightning Protection

For each antenna cable this circuit is located at both ends, i.e., inside the MAB and inside the PDU. The bias circuit is used for remote DC feeding and alarm signaling of the masthead box. It is the first circuit at the input of the MAB on the feeder cable side, so that the DC signal is extracted before any RF function is performed in the MAB.

Its insertion loss in Tx is 0.5 dB and includes a lightning protector.

15.3.8 Mechanical Characteristics

The overall dimensions of the MAB are 38 x 32 x 27 cm (see the following figure). The weight is maximum 19 kg.

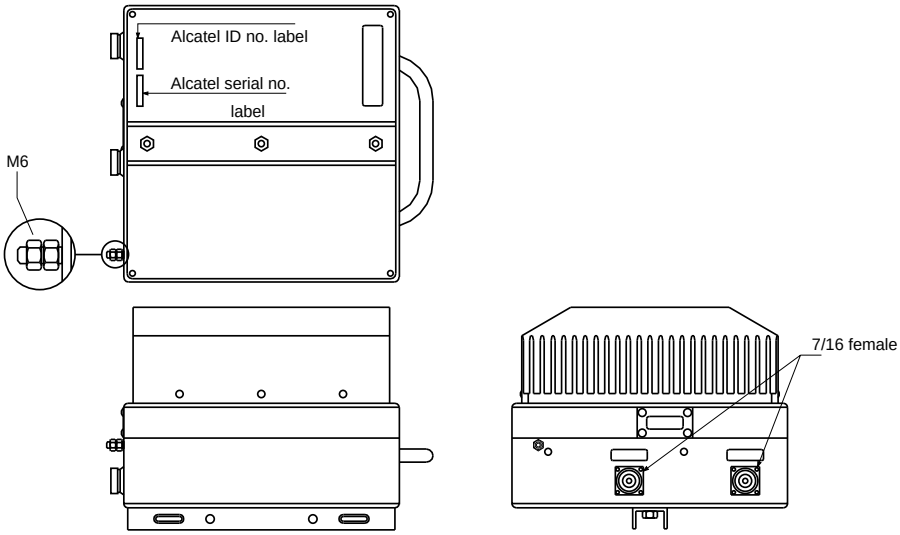


Figure 453: Masthead Amplification Box

The enclosure is constructed from aluminium pieces. The back side is so formed that it can be easily mounted onto the tower. The front side is covered with fins which provide cooling.

The receive components are mounted in the back half since they do not dissipate much heat. The transmit amplifier and DC power regulation are mounted in the front half.

The two halves of the enclosure are bolted together with an environmental seal between them. All RF connectors are placed on the bottom side of the enclosure. Access for gain adjustment is provided on the bottom side via a removable cover.

The RF connector type is 7/ 16 female on both sides of the MAB (towards the PDU and towards the antenna). The MAB is fitted with a M6 threaded rod for grounding via a yellow/green 16 mm ^{2} ground cable (in the installation kit).

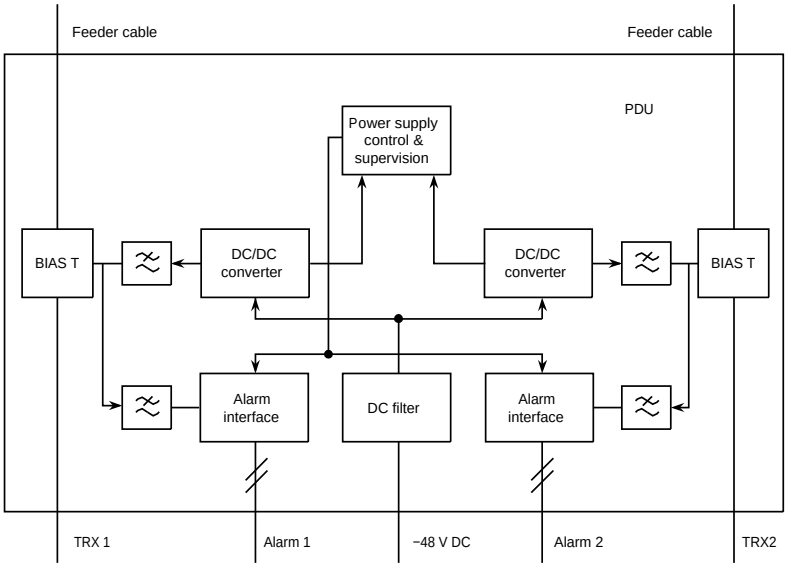
15.4 Power Distribution Unit

The Power Distribution Unit (part number 3BK 08850 ABAA) provides power supply and alarm interface for two Masthead Amplification Boxes. It is located at the BTS site, either wall-mounted close to the BTS in the case of an indoor site or integrated inside the BTS cabinet in the case of an outdoor BTS.

The primary voltage of the Power Distribution Unit is -48 VDC. The secondary voltages are 33.7 VDC and are fed to the two Masthead Amplification Boxes via Bias tees which are integrated parts of the module. The Bias tees also provide the lightning protection at the BTS end of the feeder cable.

The Power Distribution Unit includes two separate DC/DC converters, each providing one Masthead Amplification Box with DC power. The power consumption for the Power Distribution Unit is 600 W at a power dissipation of 115 W.

The Power Distribution Unit architecture is shown in the following figure.



Legend:
PDU Power Distribution Unit

Figure 454: Power Distribution Unit Block Diagram

15.4.1 Supervision and Alarm Interfaces

The two alarm interfaces located in the Power Distribution Unit collect the alarms corresponding to each TRX and coming from the corresponding Masthead Amplification Box (extraction in the Bias T, DC reject filtering and detection of the alarm low frequency) or from the corresponding DC/DC converter through the power supply control and supervision circuit.

The Masthead Amplification Box alarm signals consist of low frequency signals that are extracted from the feeder cables via the Bias T and after DC cut filtering. An alarm is active if its corresponding frequency is present. The Power Distribution Unit itself has only one alarm corresponding to a DC/DC converter failure, which is fatal. The list of alarm causes and corresponding actions is summarized in the following table.

Alarm Cause	Fatal	Non Fatal	Action
High reflected power at the power amplifier output.	X	-	DC power shut down in Power Distribution Unit.
High current draw by the power amplifier.	X	-	DC power shut down in Power Distribution Unit.
Low input voltage to the power amplifier.	X	-	None.
High temperature in the power amplifier.	X	-	Power shut down in PA at Masthead Amplification Box level, no action on the LNA. Automatic recovery for both power and alarm signal below a defined temperature level.
High and low bias current on the transistors in the receive amplifier.	-	X	None.
DC/DC converter failure.	X	-	None.

Table 166: List of Alarms

The alarm interfaces provide an external alarm interface towards the BTS (one logical signal per alarm).

The Power Distribution Unit collects the fatal and non-fatal alarms for each TRX and groups the two non-fatal alarms together using an OR function, resulting in three external alarms at the output of the alarm interfaces:

- Fatal alarm TRX1
- Fatal alarm TRX2
- Non-fatal alarm TRX1 or TRX2.

When several PDUs are used in the same BTS, the non-fatal alarms of the different PDUs are grouped in a single alarm in order to reduce the number of alarms. This is accomplished by alarm circuitry in the PDU which allows the connection of those alarms in parallel by an alarm combining cable.

15.4.2 LEDs

LEDs are provided on the front panel of the Power Distribution Unit to indicate the status and the alarms. The following table describes each LED and provides a definition of their various operational states.

LED	Meaning	Color	LED On	LED Off	LED Flashing
TRX 1 MAB	Fatal alarm	Red	Alarm on	Alarm off	-
TRX 1 MAB	Non-fatal alarm	Red	-	Alarm off	Alarm on
TRX 2 MAB	Fatal alarm	Red	Alarm on	Alarm off	-
TRX 2 MAB	Non-fatal alarm	Red	-	Alarm off	Alarm on
TRX 1 DCDC	DC/DC Converter failure	Red	Alarm on	Alarm off	-
TRX 2 DCDC	DC/DC Converter failure	Red	Alarm on	Alarm off	-
DC INPUT STATUS	DC Input status	Green	DC input OK	No DC input	-

Table 167: LEDs of Power Distribution Unit

15.4.3 Reset Buttons

If the power cable is connected to the PDU before complete installation has been carried out, one or more red LEDs can be activated. In this case, resetting the PDU is required. Resetting is carried out by pressing the 'TRX 1 RESET' and 'TRX 2 RESET' buttons.

15.4.4 Bias Circuit and Lightning Protection

There is one Bias T per feeder cable. It is used to DC feed the corresponding Masthead Amplification Box and to extract the alarms from the Masthead Amplification Box. It includes a lightning protector which performances are as specified in IEC 1000-4-5 level 4. This lightning protector is sufficient to protect the BTS. No other lightning protector can be installed between the PDU and the MAB, in order to avoid cutting the DC feed.

15.4.5 Mechanical Characteristics

The dimensions of the Power Distribution Unit are a height of 3U, a depth of 280 mm and a width of 28 TE (see the following figure).

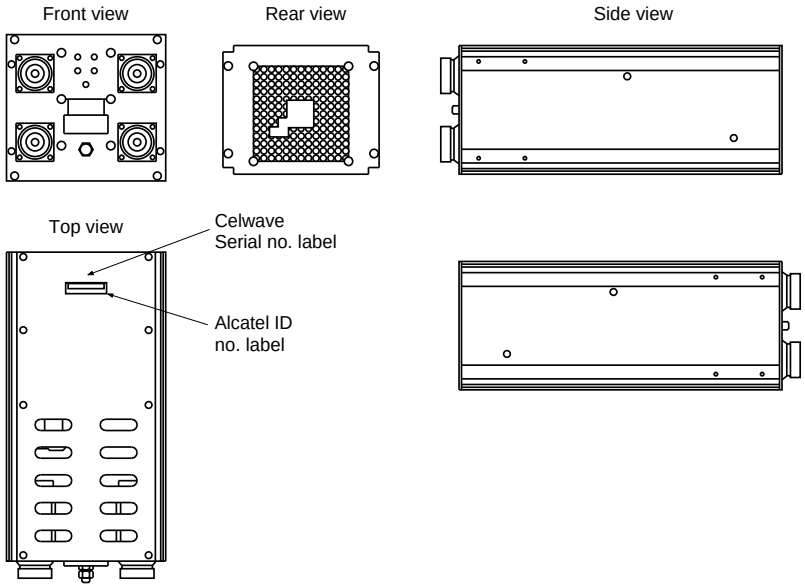
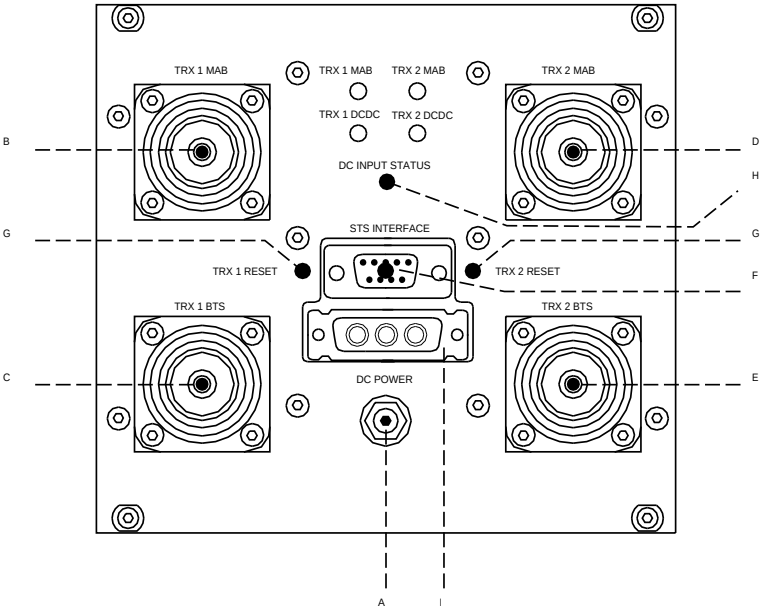


Figure 455: Drawing of Power Distribution Unit

All connections are located on the front panel (see the following figure).



Legend:

A – ground rod, diam 8 mm

B – TRX 1 MAB female 7/16 connector

C – TRX 1 BTS female 7/16 connector

D – T RX 2 MAB female 7/16 connector

E – TRX 2 BTS female 7/16 connector

F – alarm SubD male 9 pin connector

G – reset button

H – DC status LED – green

I – DC supply SubD male 3 pin high power connector

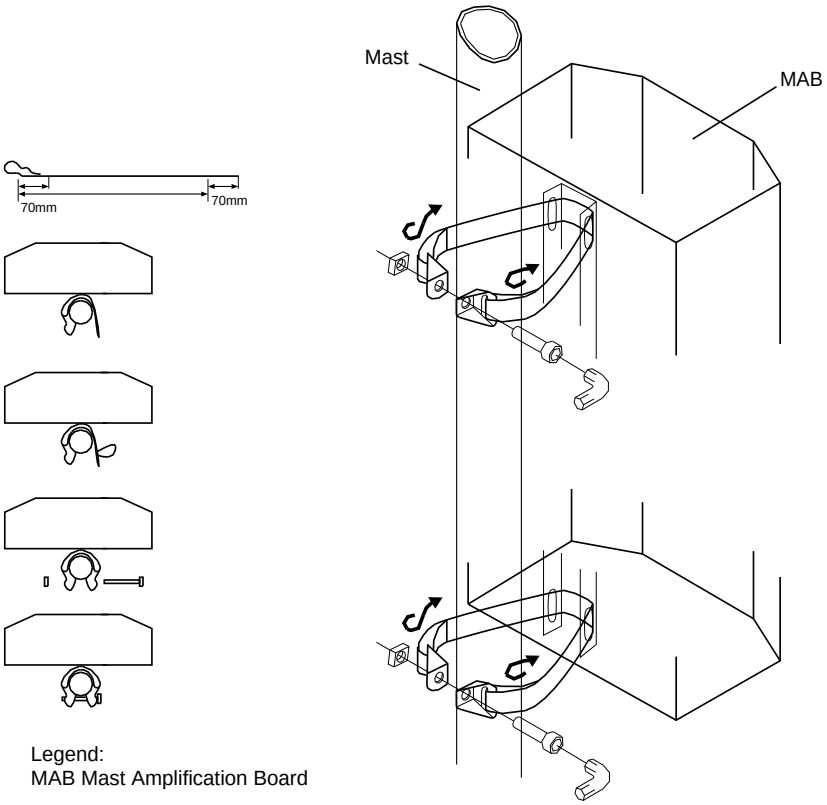
Figure 456: Power Distribution Unit Front Panel

The RF connectors are of 7/ 16 female type on ANx and feeder sides of the PDU. The PDU is fitted with a M6 threaded rod for grounding via a yellow/green 16 mm ^{2} ground cable (in the installation kit).

15.5 REK Installation

15.5.1 Masthead Amplification Box Installation

The MAB is fixed on the same vertical tubular support (∅ 40 to ∅ 200 mm) as the antenna using mounting hardware (two hose clamp steel bands and two hose clamp lock sets) as close as possible to the antenna. The MAB is mounted vertically on the pole with the connectors pointing downwards. The following figure shows the installation of MAB on the pole.



Legend:
MAB Mast Amplification Board

Figure 457: MAB Installation on the Pole

15.5.2 Power Distribution Unit Installation

The PDUs are fitted in a subrack and the subrack is fixed on the wall or in a 19” rack. This is a standard 3U high, 19” subrack with front fixation which can carry up to three PDUs. The following figure shows the installation of a PDU inside an Evolium BTS A9100 outdoor or in a 19” rack for an indoor site. Figure *459* shows the installation of a PDU for an indoor site on the wall (with brackets). The first PDU is to the left in the PDU subrack.

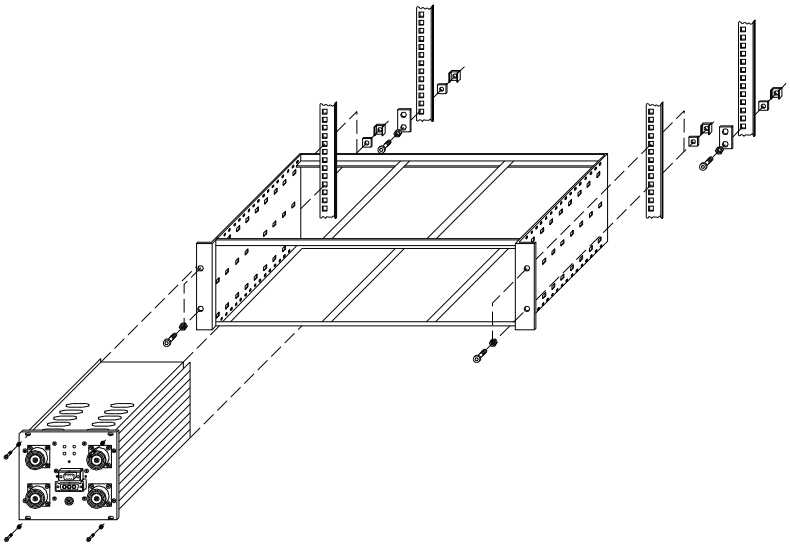


Figure 458: Installation of PDU in an Evolium BTS A9100 Outdoor or in 19” Rack for Indoor

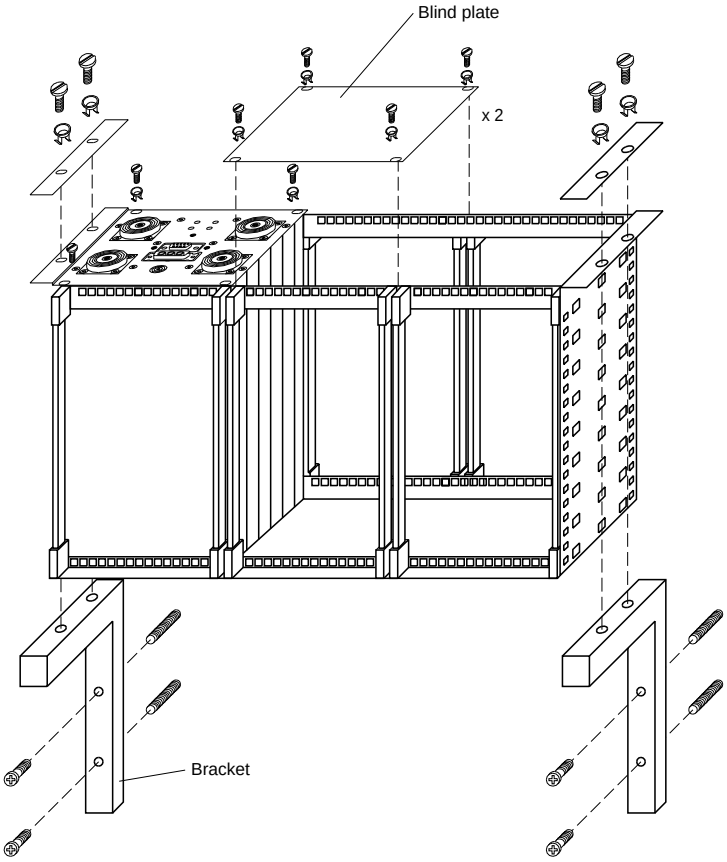


Figure 459: Wall Installation of PDU for Indoor Site

15.6 REK Cabling

15.6.1 Cabling Overview

Depending on the installation, the distance between the BTS, PDU, and MAB can be variable. Thus RF jumper cables have been defined to cover this flexibility.

15.6.1.1 Indoor Cabling Overview

The following figure shows an indoor cabling overview of the Evolium BTS A9100.

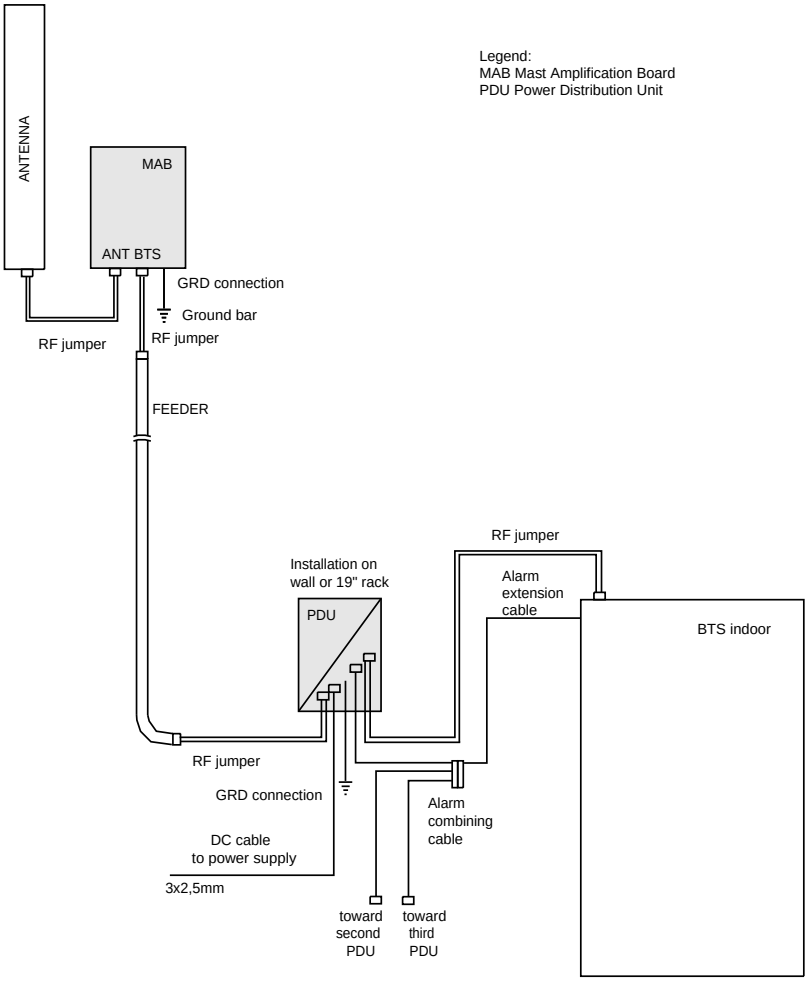


Figure 460: Evolium BTS A9100 Indoor Cabling Overview

15.6.1.2 Outdoor Cabling Overview

The following figure shows an outdoor cabling overview of the Evolium BTS A9100.

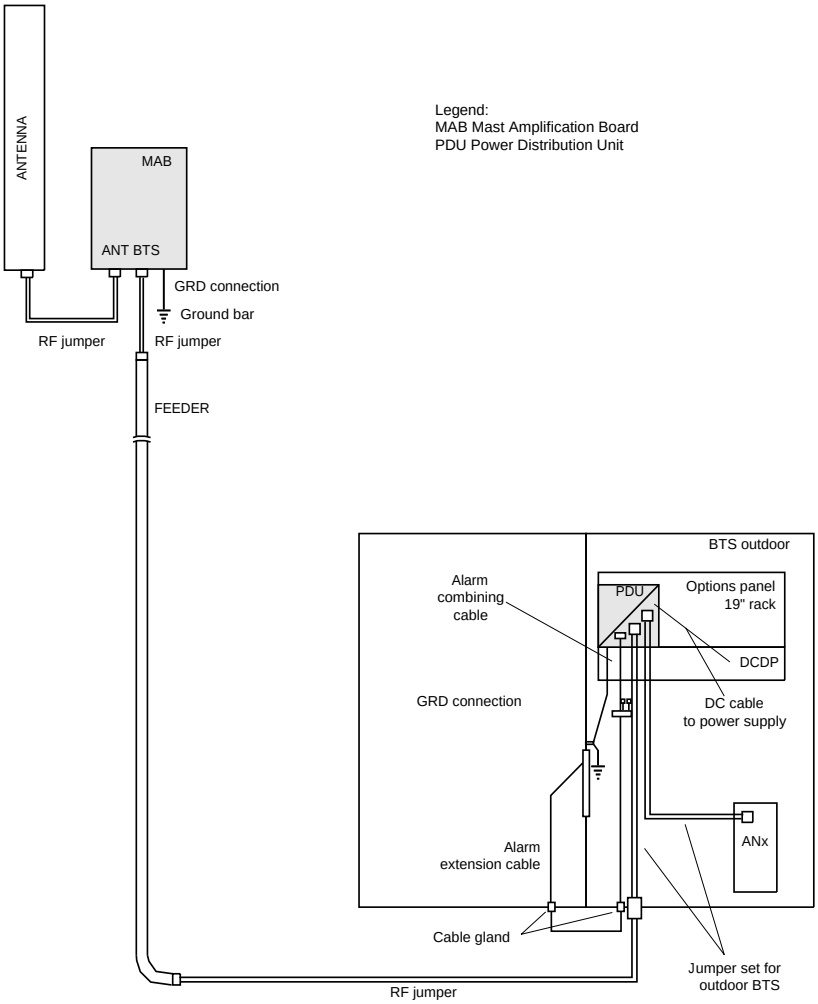


Figure 461: Evolium BTS A9100 Outdoor Cabling Overview

The following sections describe the cabling of the MAB and PDU for indoor and outdoor versions in more details.

15.6.2 Masthead Amplification Box Cabling

The following figure shows the cabling of the MAB in detail. There are two 7/ 16 female connectors marked BTS and ANT on the lower side downward. The ANT connector is connected to the antenna by an RF jumper. The BTS connector is connected to the transmission/reception coaxial cable going down to the BTS (Power Distribution Unit) by an RF jumper. The connectors on the jumpers are sealed at both ends. The ground cable is connected to the M6 rod of Masthead Amplification Box and to the ground or copper bar on the other side.

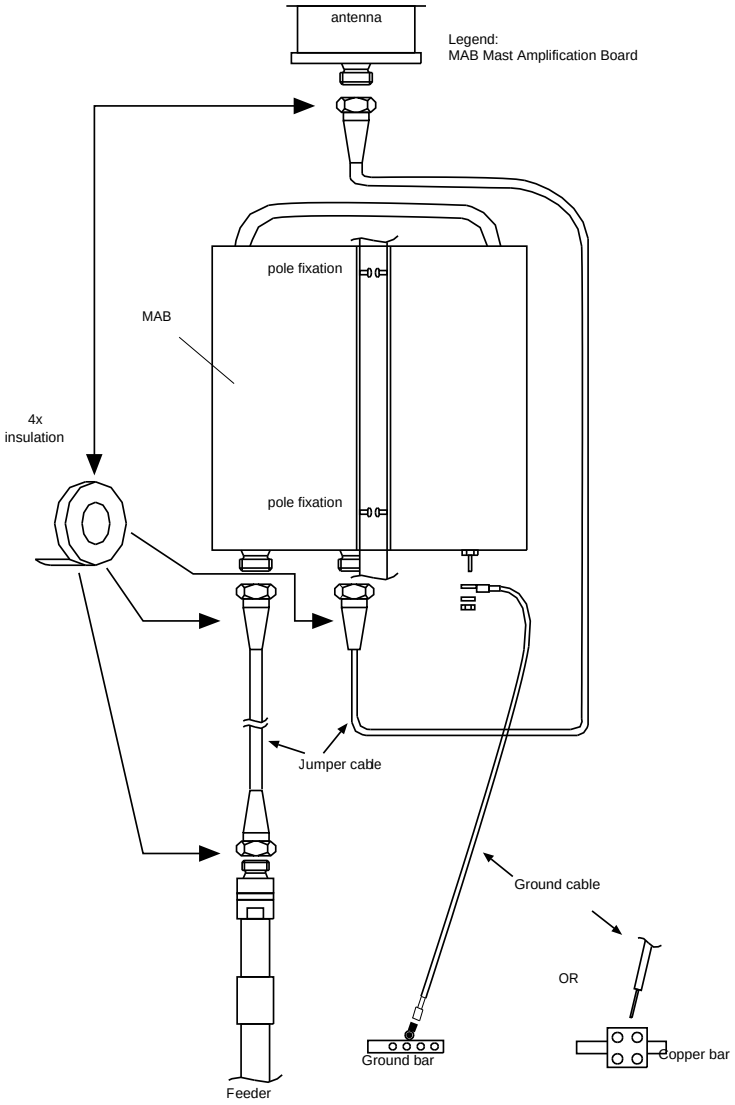


Figure 462: Cabling of Masthead Amplification Box

15.6.3 PDU Cabling in Indoor BTS

The following figure shows the cabling of the PDU in an indoor Evolium BTS A9100 in detail. Between the PDU and MABs, classical RF jumpers are used without lightning protectors in the form of quarter wave stubs or attenuators. Lightning protectors at the feeder entry in the shelter (necessary for operation without the REK) are suppressed, because they cut the DC power supply to the MAB. The PDU itself contains lightning protectors.

The 'TRX 1 MAB' 7/ 16 female connector is connected to the antenna feeder line with an RF jumper. The 'TRX 1 BTS' 7/ 16 female connector is connected to the antenna output of the Evolium BTS A9100 with an RF jumper.

When a second MAB is connected to the same PDU, these connections are done to 'TRX 2 MAB' and 'TRX 2 BTS'.

The ground cable is connected to the M6 rod of the MAB and to the ground or copper bar on the other side.

The alarm cable has two parts. The alarm combining cable can be connected to three PDUs with three Sub-D 9 pin female connectors at the 'BTS Interface'. The 15-pin connector on the other end is connected to the alarm extension cable. The other end of the alarm extension cable is connected to the alarm interface of the Evolium BTS A9100.

Connection to a DC power supply is via a 10 m cable 3x2.5 mm ^{2} with tips on one end and a Sub-D connector 3-pin (high current) at the PDU end. The output of the -48 VDC power supply is protected by a 15 A fuse.

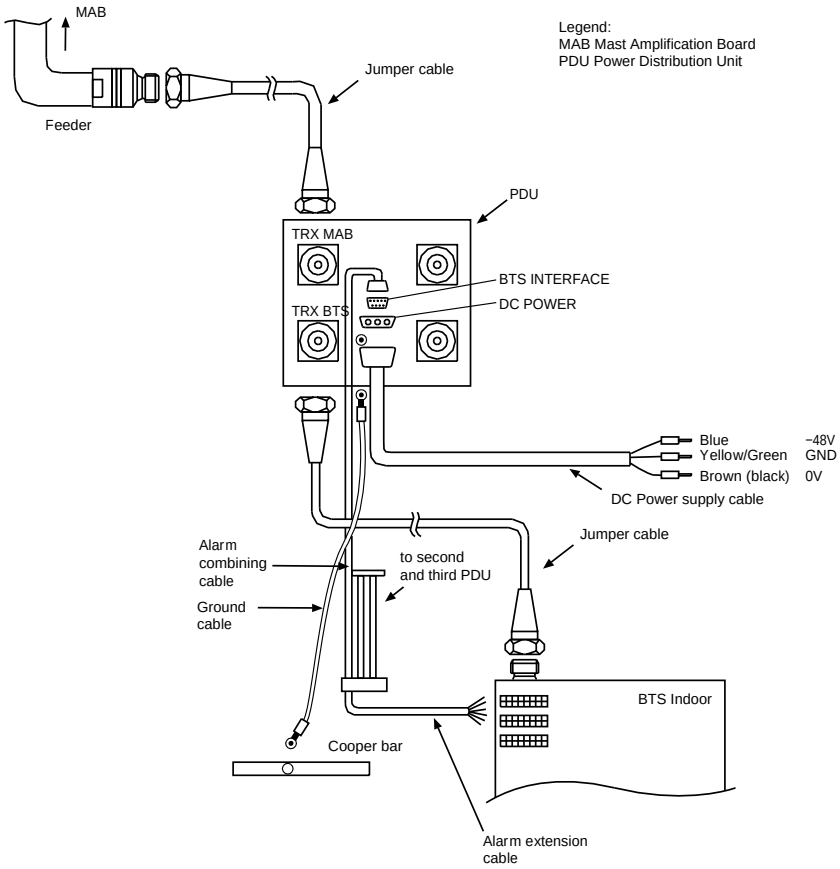


Figure 463: PDU Cabling for Indoor Evolium BTS A9100

15.6.4 PDU Cabling in Outdoor BTS

The following figures show the cabling of the PDU in the outdoor Evolium BTS A9100 in detail. The versions just differ in connecting the DC power supply.

Lightning protectors at the feeder entry in the shelter (necessary for operation without the REK) are removed, because they cut the DC power supply to the MAB. The PDU itself contains lightning protectors.

The ’TRX 1 MAB’ 7/ 16 female connector is connected to an RF jumper. The RF jumper is connected to the 7/ 16 coaxial socket fitted at the bottom of the Evolium BTS A9100. The ’TRX 1 BTS’ 7/ 16 female connector is connected with the ANx of the Evolium BTS A9100 with an RF jumper.

When a second MAB is connected to the same PDU, these connections are done to the ’TRX 2 MAB’ and ’TRX 2 BTS’.

The ground cable is connected to the M6 rod of the PDU and the FASTON connector in the middle compartment.

The alarm cable has two parts. The alarm combining cable can be connected to three PDUs with three Sub-D 9-pin female connectors at the ’BTS Interface’. The 15-pin connector on the other end is connected to the alarm extension cable. The other end of the alarm extension cable is connected to the alarm interface of the Evolium BTS A9100. For outdoor BTS, the alarm cable has to go to the left compartment, crossing two times the bottom of the BTS by cable glands.

For outdoor Evolium BTS A9100 equipped with a DC bus bar, the DC power supply cable is connected to this bus bar (see the following figure). If there is no bus bar, the PDU is connected to the DCDP panel at the high current outputs via a specific DC cable (see Figure *465*). This cable has two branches to supply the racks with the TREs and the relevant PDU. In this way, PDU1 is connected with DCDP X9, PDU2 with DCDP X12, and PDU3 with DCDP X14.

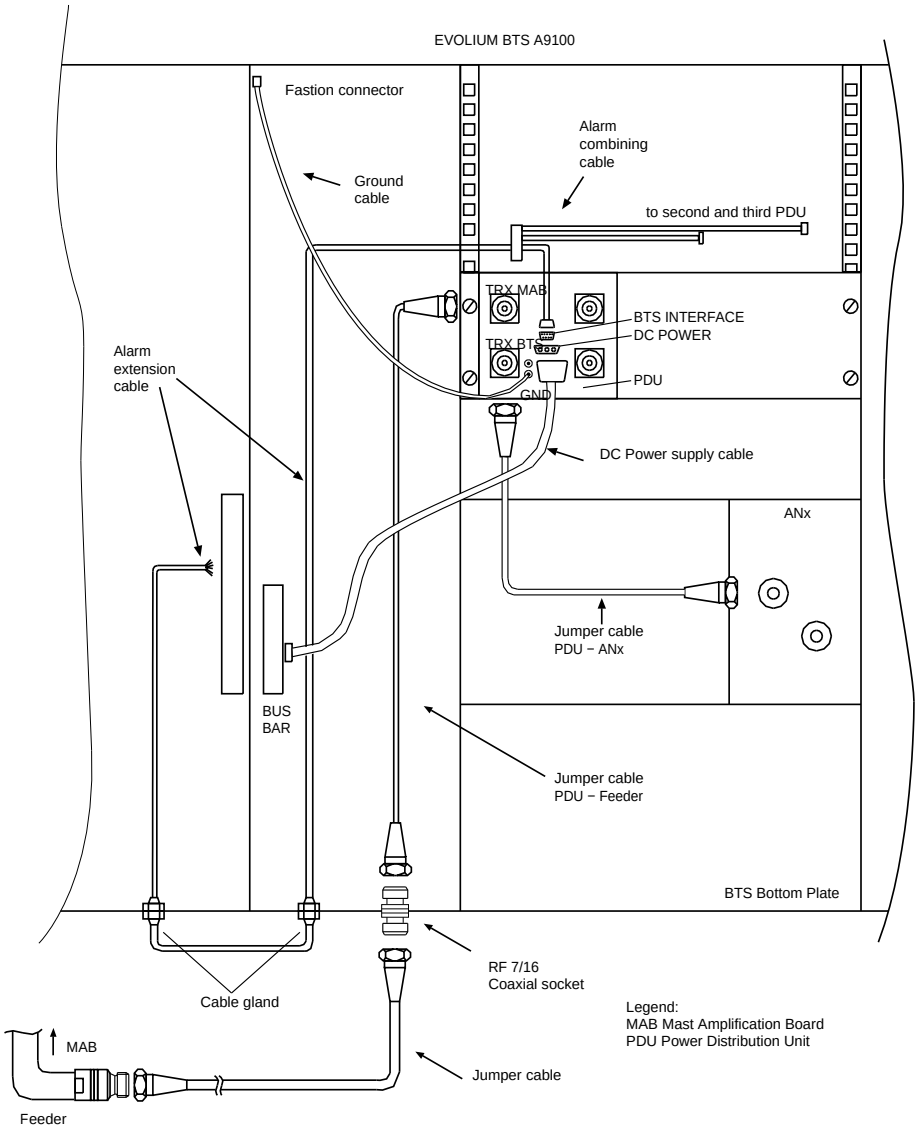


Figure 464: PDU Cabling for Outdoor Evolium BTS A9100 with DC Bus Bar

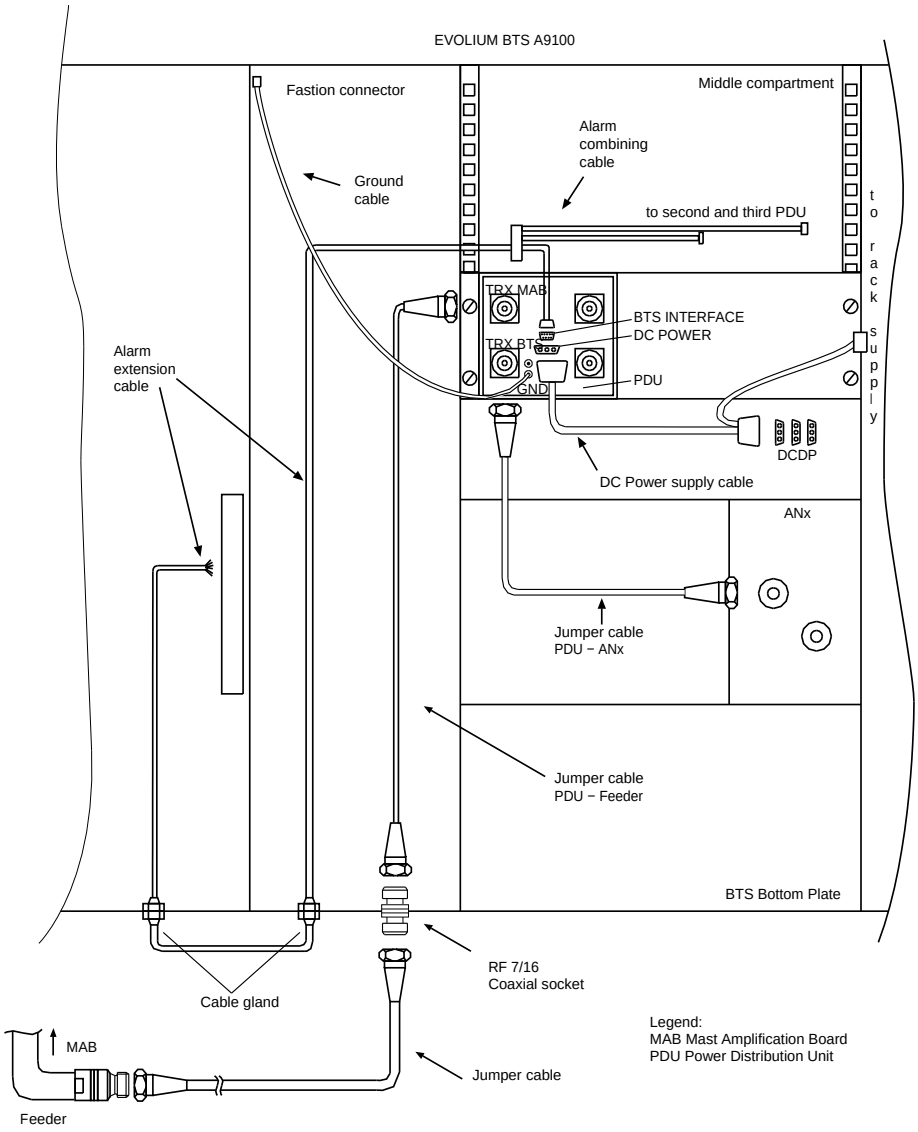


Figure 465: PDU Cabling for Outdoor Evolium BTS A9100 without DC Bus Bar

15.7 REK Cables

15.7.1 Ground Cable

The ground cables for the MAB and the indoor PDU (part number 3BK 08824 AAAA) and the outdoor PDU (part number 3BK 07934 AAAA) installation are shown in the following figures.

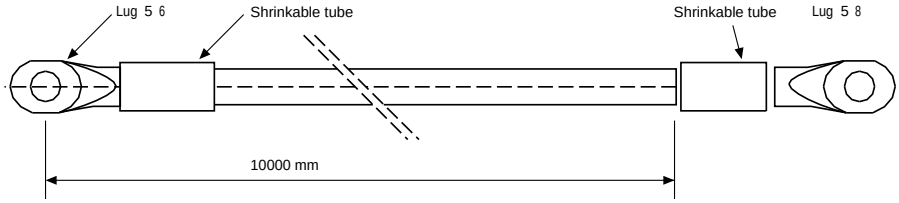


Figure 466: Ground Cable for MAB and Indoor PDU

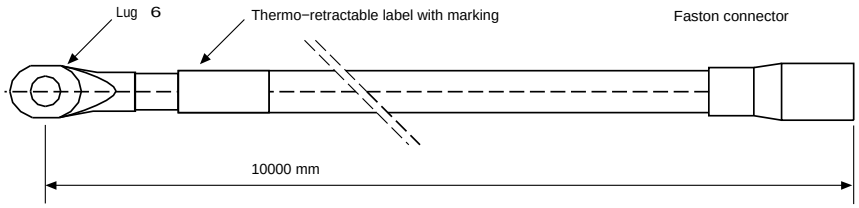
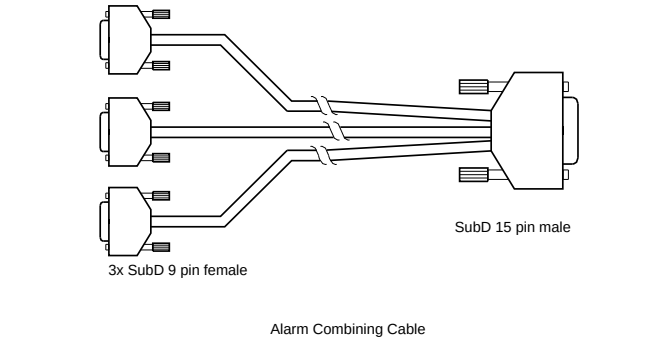


Figure 467: Ground Cable for Outdoor PDU

15.7.2 Alarm Cable

The alarm cable has two parts: the alarm combining cable, 0.6 m (part number 3BK 08819 AAAA) and the alarm extension cable indoor, 8 m (part number 3BK 08818 AAAA) or the alarm extension cable outdoor, 2 m (part number 3BK 08915 AAAA) as shown in the following figure.



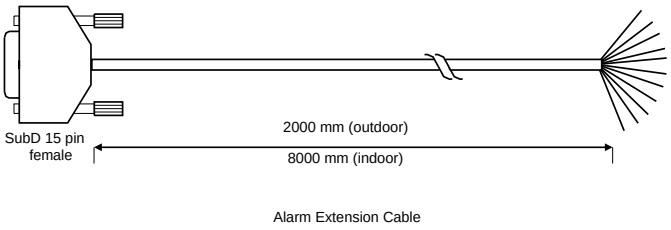


Figure 468: Alarm Combining/Extension Cable

15.7.3 DC Power Supply Cable

The DC power supply cable for indoor Power Distribution Unit installation (part number 3BK 08916 AAAA) is shown in the following figure.

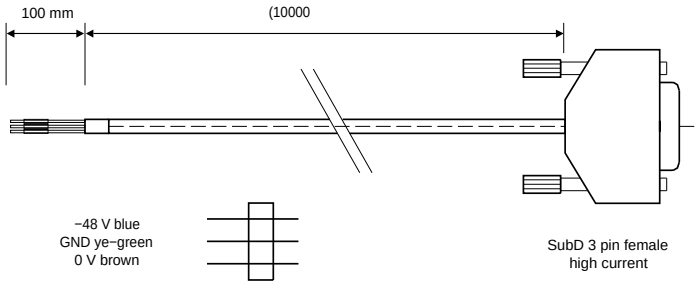


Figure 469: DC Power Supply Cable for Indoor Power Distribution Unit

The DC power supply cable for PDU installation in outdoor Evolium BTS A9100 with a DC power supply bus bar (part number 3BK 08919 AAAA) is shown in the following figure. The DC power supply cable for PDU installation in outdoor Evolium BTS A9100 without a DC power supply bus bar (part number 3BK 08918 AAAA) is shown in Figure *471*.

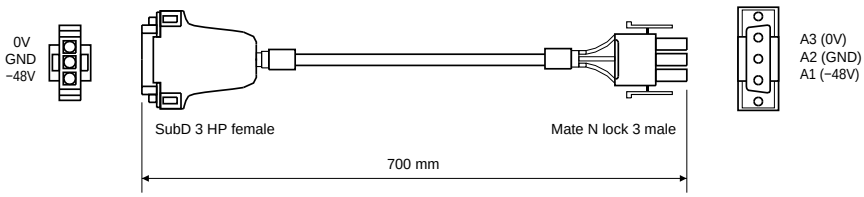


Figure 470: DC Power Supply Cable for PDU in Outdoor Evolium BTS A9100 with Power Supply Bus Bar

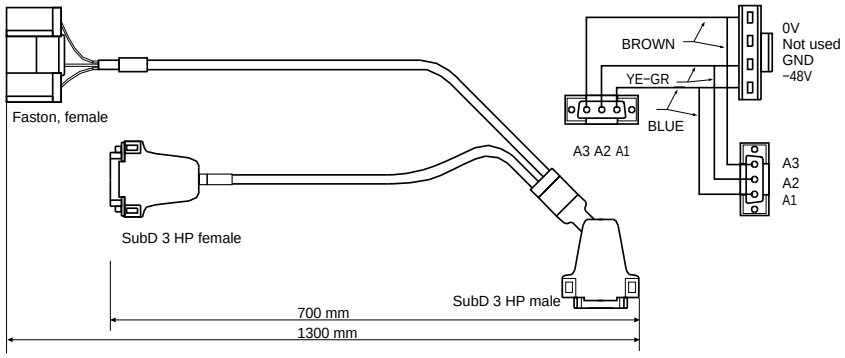


Figure 471: DC Power Supply Cable for PDU in Outdoor Evolium BTS A9100 without Power Supply Bus Bar

15.7.4 Jumper Cable

For indoor installation of the REK, there are four jumper cables (MAB/Power Distribution Unit) available with a length of 1 m (part number 3BK 05360 BAAA), 2 m (part number 3BK 05360 CAAA), 3 m (part number 3BK 05360 DAAA), and 5 m (part number 3BK 05360 ELAA).

MAB jumper cables are identical for indoor and outdoor Evolium BTS A9100. For outdoor installation of the REK, there are two different jumper cables for the PDU: RF cable PDU - ANx (part number 3BK 07965 AAAA) and RF cable PDU - feeder (part number 3BK 07965 ABAA).

The following figure shows the jumper cable.

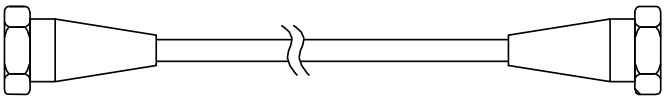


Figure 472: Jumper Cable

16 Tower-Mounted Amplifier

The TMA is designed to compensate the feeder losses which significantly impact the density of sites to be implemented over the service area of GSM networks.

16.1 Introduction to TMA

A significant part of the benefits brought by the outstanding sensitivity of the Evolium BTS A9100 can be lost if the losses incurred by signals along the feeder cable between the receiving antenna and the antenna coupling module (ANxx) are too high. In fact, the noise factor of the system is degraded by an amount depending on the feeder loss.

The basic idea of tower-mounted amplification is to implement a low-noise amplifier as close as possible to the antenna (see figure below), so as to compensate for all losses incurred by received signals. The TMA solution can be used in GSM 900 or GSM 1800 indoor and outdoor configurations.

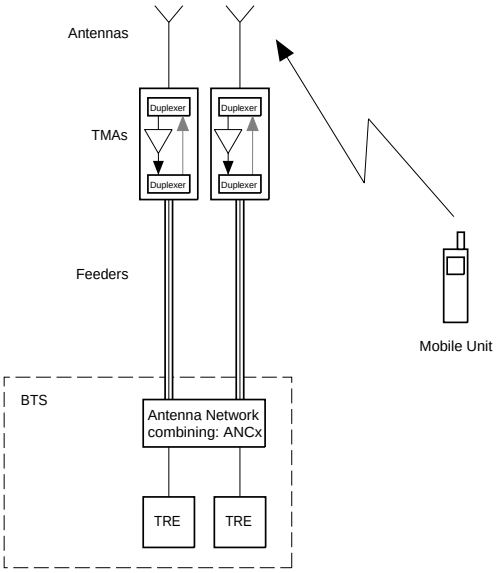


Figure 473: Principles of Tower-Mounted Amplification

Tower-mounted amplification appears as an efficient sensitivity enhancement technique. However, both uplink and downlink power budgets must be considered for the calculation of the coverage ranges. The smallest available path loss determines the range. In that respect, tower-mounted amplification can be beneficial in those cases where system performance is limited by a weaker uplink budget.

On the other hand, in a balanced uplink/downlink situation, the introduction of tower-mounted amplification can be an efficient means to reduce the output power level of all mobile stations. The uplink power control mechanism provided at each base station will force all mobiles to reduce their emission level.

Two benefits can be obtained in that case:

- Lower output favorably impacts the standby time of every mobile station
- Lower output power contributes to minimizing the electromagnetic pollution within the service area.

In summary, the decision to exploit tower-mounted amplification can be influenced by system design considerations but also result from the application of the Operator's internal policy.

The counterpart of getting better sensitivity by means of a tower-mounted amplifier is the risk of degrading the blocking and intermodulation characteristics of the base station if the value of the amplification gain greatly exceeds the value of the feeder losses. The attention of Operators is drawn to the fact that, in such a case, the site equipment might not fully comply with ETSI requirements settled in GSM rec 05.05.

The TMA can be used with a wide variety of Evolium BTS A9100 indoor and outdoor configurations in GSM 900, GSM 1800 or GSM 1900 with a coupling constraint of a of one TRX/TRE maximum to each antenna. Cross-polarized antennas can still be used respecting this constraint. For practical reasons, configurations are limited to a maximum of six TREs per BTS site assuming a 3x2 configuration.

The TMA is designed to minimize BTS and system impacts. The BTS has no knowledge of the TMA presence and is not involved in its configuration. Supervision is minimal. It only involves external alarms to the BTS and there is no recovery mechanism. The system impact concerns the handling of these new external alarms at the OMC-R level.

16.2 Architecture

For TMA usage two solutions are available:

- Tower Mounted Amplifier with external solution
- Tower Mounted Amplifier with AGC support.

16.2.1 Tower Mounted Amplifier with External Solution

The TMA with external solution is basically composed of three modules (see figure below):

- A Tower-Mounted Amplifier (TMA), installed close to the antenna, featuring the transmit signal bypassed to the antenna and the receive signal amplified by a low-noise amplifier
- A Bias T module, used to insert the DC voltage in the RF antenna cable to feed the TMA. The Bias T module is suited for GSM 900, GSM 1800, and GSM 1900
- A Power Distribution Unit (PDU), installed in the BTS cabinet or close to the BTS, providing DC power to remotely feed the masthead amplification module through the antenna feeder and collect the alarm signals.

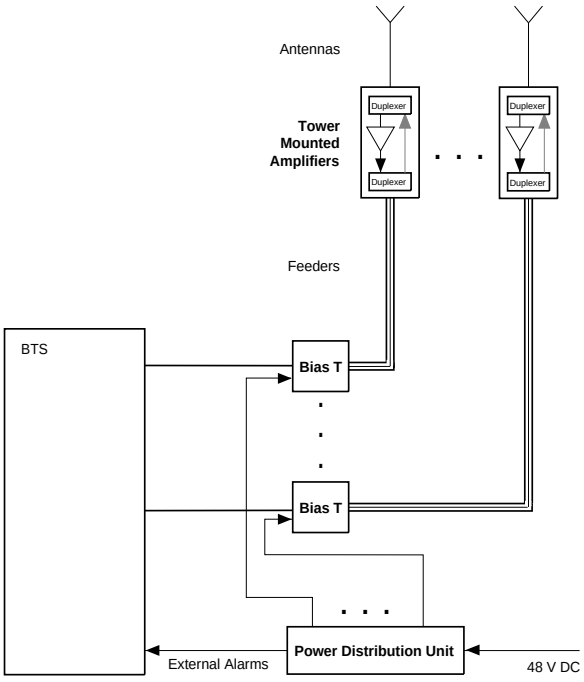


Figure 474: TMA with External Solution Architecture

The PDU is designed to supply and to monitor up to six TMAs (typical BTS configuration of 3x2 TRXs/TREs), independently of their frequency band (i.e., the same PDU equipment can be used with the TMA of GSM 900, GSM 1800, and GSM 1900. In fact, the PDU has no frequency notation).

For indoor BTS installations, the PDU can be installed on the wall or in a separate transmission cabinet (if available) and be powered by the BTS power supply. For outdoor BTS configurations, it is possible to install the PDU inside the BTS cabinet. The PDU is also powered by the BTS power supply.

16.2.2 Tower Mounted Amplifier with AGC Support

The TMA withAGC support is basically composed of two modules (see figure below):

- A Tower-Mounted Amplifier (TMA), installed close to the antenna, featuring the transmit signal bypassed to the antenna and the receive signal amplified by a low-noise amplifier
- An Antenna Network module (AGC) containing the Bias T module used to insert the DC voltage in the RF antenna cable to feed the TMA and the power supply providing the DC power to remotely feed the masthead amplification module through the antenna feeder.

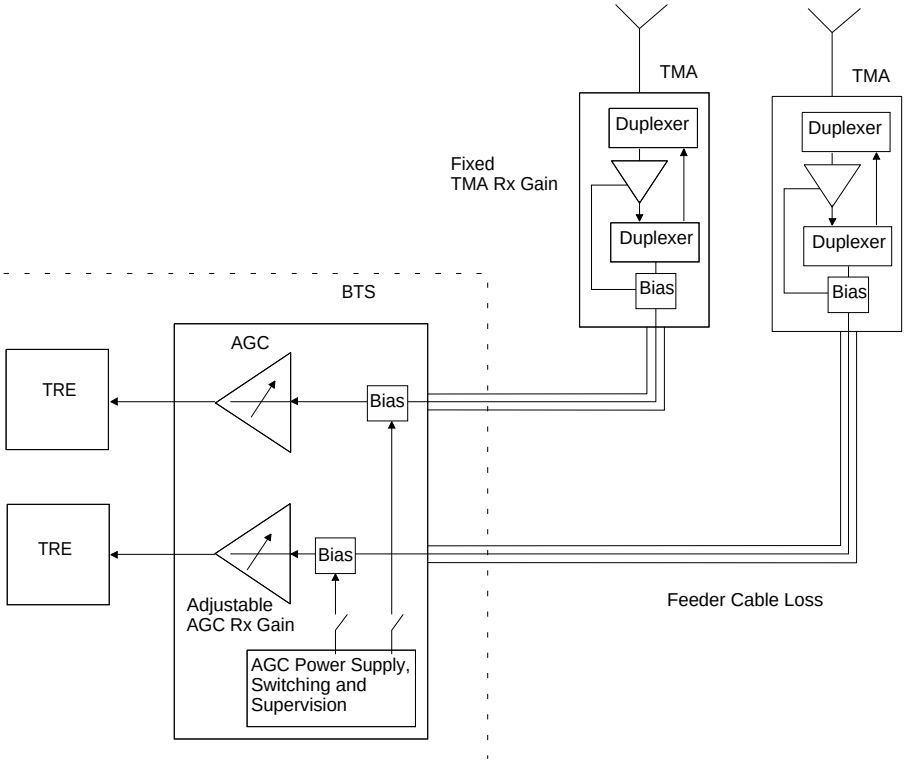


Figure 475: TMA with AGC Support Architecture

16.3 Tower-Mounted Amplifier

The tower-mounted amplifier is available for GSM 900, GSM 1800 and GSM 1900, as shown in the following table.

	Part number
GSM 900	3BK 08451 AAAA
GSM 1800	3BK 08497 AAAA
	3BK 08497 BAAA
	3BK 08497 CAAA
	3BK 08497 DAAB
GSM 1900	3BK 08498 AAAA
	3BK 08498 BAAA

Table 168: TMA Part Numbers

16.3.1 Appearance

The tower-mounted amplifier includes a low noise amplifier for the receive path and a double duplexer TX/RX for one antenna port. It is designed for outdoor installation on a tubular mounted support below the antenna. Amplifiers for GSM 900 and GSM 1800/ GSM 1900 are offered by different manufacturers. Therefore, the appearance of TMAs can differ, as shown in the following figures as an example.

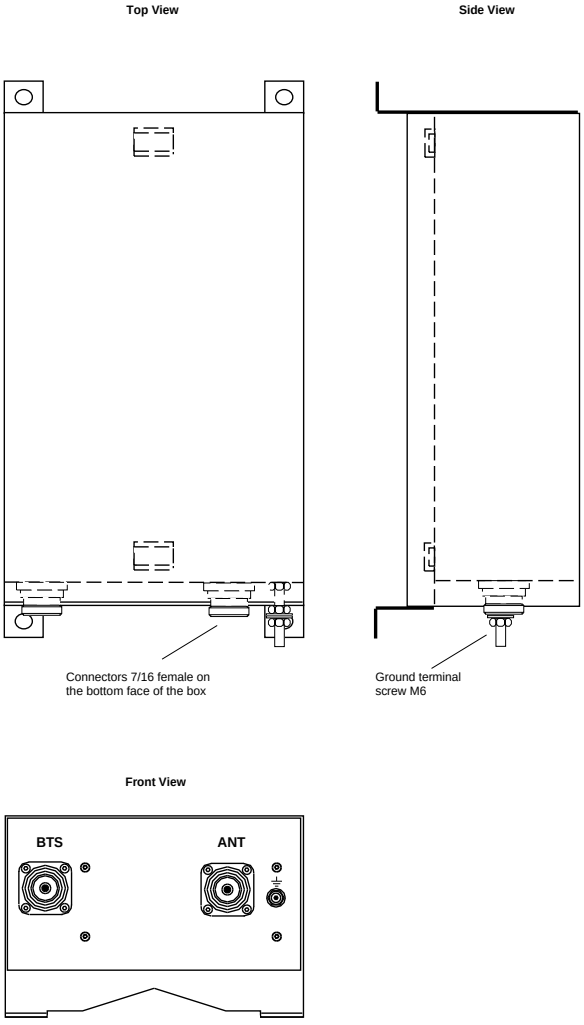


Figure 476: Tower-Mounted Amplifier for GSM 900

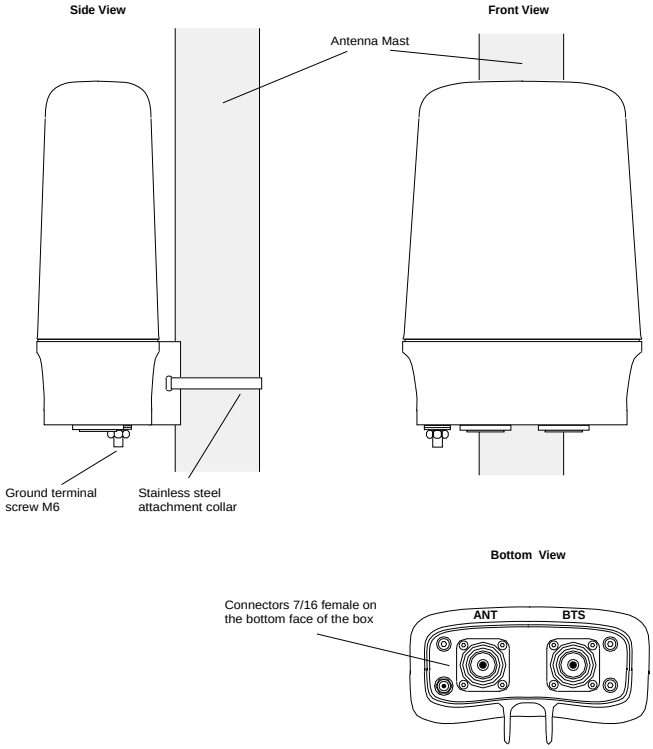


Figure 477: Tower-Mounted Amplifier for GSM 1800/ GSM 1900

16.3.2 Frequency Range

The RX and TX frequency ranges of the tower-mounted amplifiers are summarized in the following table.

Parameter	GSM 900	GSM 1800	GSM 1900
Frequency range RX	925 - 960 MHz	1710 - 1785 MHz	1850 - 1910 MHz
Frequency range TX	880 - 915 MHz	1805 - 1880 MHz	1930 - 1990 MHz

Table 169: Frequency Ranges of the Tower-Mounted Amplifiers

Other RF specifications depend on which TMA version of a specific manufacturer is used, the current position of the BTS, the TMA, and the antenna on site and the corresponding cable lengths.

16.3.3 Mechanical Characteristics

The overall dimensions and weights of the examples shown above are listed in the following table.

Parameter	GSM 900	GSM 1800	GSM 1900
Dimensions	357.5 x 168 x 112 mm	265 x 158 x 95 mm	265 x 158 x 95 mm
Weight	6 kg	2.5 kg	2.5 kg

Table 170: Tower-Mounted Amplifiers, Weight and Dimensions

The back side of the tower-mounted amplifier is so formed that it can be easily attached on the same vertical tubular support as the antenna using one (GSM 1800/ GSM 1900) or two (GSM 900) stainless steel attachment collars provided as close as possible to the antenna.

The equipment is guaranteed to be watertight when the equipment is installed with the connectors downwards and the two coaxial cables (jumpers) connected to the equipment. The connectors on the jumpers are insulated at both ends, i.e., one at the antenna connector, two at the tower-mounted amplifier, and one at the feeder head.

There are two 7/ 16 female connectors marked BTS and ANT on the front (lower side down). The antenna connector is connected to the antenna by an RF jumper. The BTS connector is connected to the transmission/reception coaxial cable going down to the BTS by an RF jumper.

The tower-mounted amplifier is fitted with an M6 threaded rod for grounding via a black 16 mm² ground cable (in the installation kit) connected to the pylon or building ground, depending on the installation.

16.4 Power Distribution Unit

The Power Distribution Unit (wall installation: part number 3BK 08456 AAAA, 19” installation: part number 3BK 08456 ABAA) provides power supply and an alarm interface for up to six tower-mounted amplifiers. It is located at the BTS site, either wall-mounted close to the BTS in an indoor site or integrated inside the BTS cabinet in an outdoor BTS.

The primary voltage of the Power Distribution Unit is -48 VDC. The secondary voltages are + 12 VDC and are fed to the six tower-mounted amplifiers via Bias tees which are not integrated parts of the module. The BTS is informed by an alarm indication if there is a defective DC/DC converter, a malfunction of the tower-mounted amplifier, or an connection error of the various parts of cables and equipment.

The Power Distribution Unit includes three separate DC/DC converters each providing two tower-mounted amplifiers with DC power. The power consumption for the Power Distribution Unit is 30 W.

16.4.1 Appearance

The Power Distribution Units are shown in the following figures.

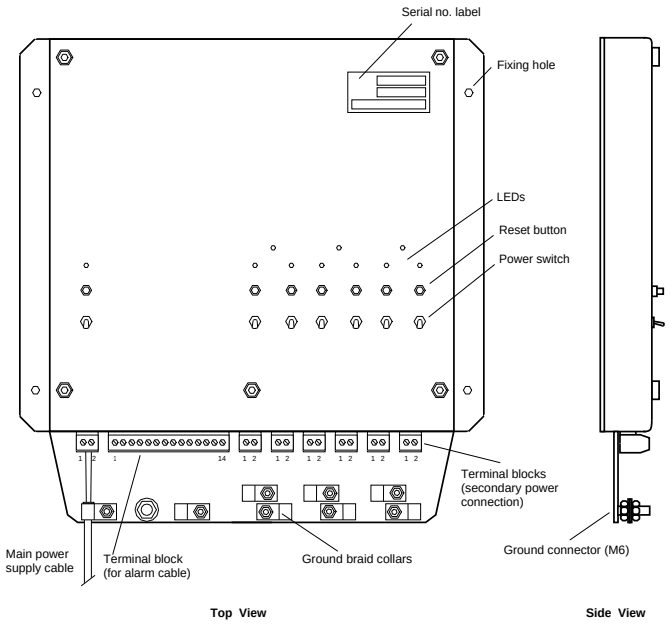


Figure 478: Power Distribution Unit, Wall Version for BTS Indoor

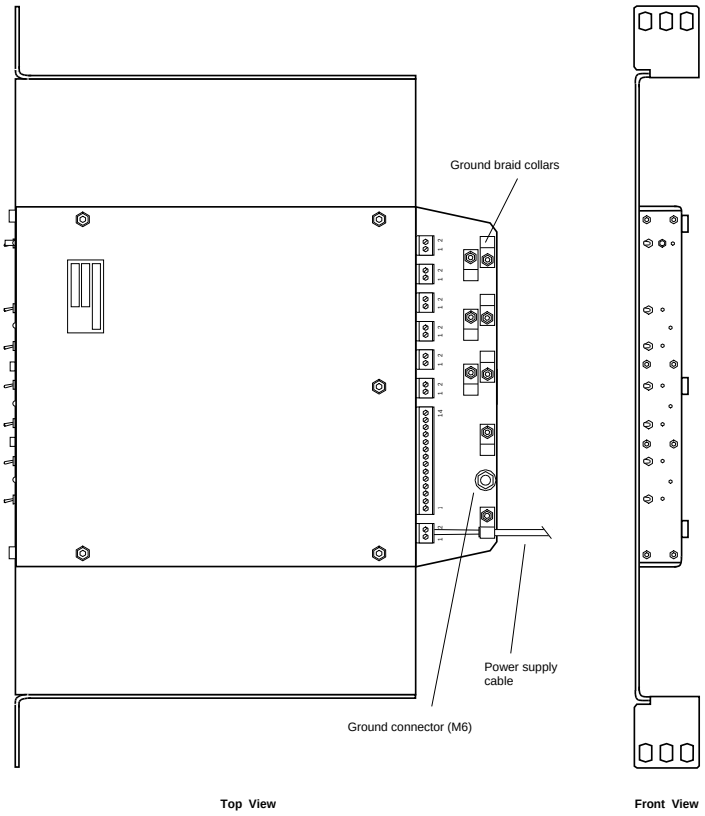


Figure 479: Power Distribution Unit, 19" Version for BTS Outdoor

16.4.2 Switches and LEDs

There is a main power switch used to switch the main power on or off. The corresponding orange LED indicates the presence of -48 V primary voltage. Three green LEDs indicate the presence of the secondary voltage for two channels each (1 + 2, 3 + 4, 5 + 6). The output channels can be separately switched on/off. A corresponding red LED indicates the presence of + 12 VDC secondary voltage.

16.4.3 Reset Button

Each channel has a separate reset button. If pressed for at least two seconds, the concerned red LED goes out. The PDU is also fitted with a main reset button to reset all channels used in a single action.

16.4.4 Switching On

Before switching on the power supply at the PDU input, all switches have to be in the OFF position (all LEDs are also OFF). When the main power is switched on, the orange LED 'main power' indicates the presence of primary voltage, while the three green LEDs indicate that the secondary power for all separate channels is available.

The six red LEDs (for channel 1 to channel 6) indicate when the tower-mounted amplifier alarms come on. After switching on the separate channel switches and pressing the reset buttons, the corresponding tower-mounted amplifiers are supplied and the red LEDs are OFF.

16.4.5 PDU LEDs

LEDs are provided on the top (wall installation) or on the side (19" installation) of the Power Distribution Unit to indicate the status and the alarms. The following table describes each LED and provides a definition of their operational states.

LED	Color	LED On	LED Off
-48 VDC	Orange	Main power available	No main power available
POWER TMA 1 and 2	Green	Secondary power available	DC/DC converter is faulty (alarm)
POWER TMA 3 and 4	Green	Secondary power available	DC/DC converter is faulty (alarm)
POWER TMA 5 and 6	Green	Secondary power available	DC/DC converter is faulty (alarm)
TMA 1 to TMA 6	Red	TMA malfunction or connection errors (alarm)	No fault

Table 171: Power Distribution Unit LEDs

16.5 Bias T

The Bias T unit (part number 3BK 08453 ABAA or 3BK 08454 ABAA) is a power supply injector to transport the + 12 VDC power supply energy to the tower-mounted amplifier through the coaxial cable between the antenna and the BTS.

The injector is designed for indoor and outdoor installation between the BTS and the coaxial transmission-reception cable.

Two Bias T versions are available:

- Bias T for indoor BTS-RF connectors 7/ 16 male/ side TMA; female/ side BTS
- Bias T for outdoor BTS-RF connectors 7/ 16 female/ side TMA; male/ side BTS.

The outdoor version is normally combined with a 90° bend. Both indoor and outdoor versions are combined with a surge arrestor.

The Bias T units are shown in the following figures.

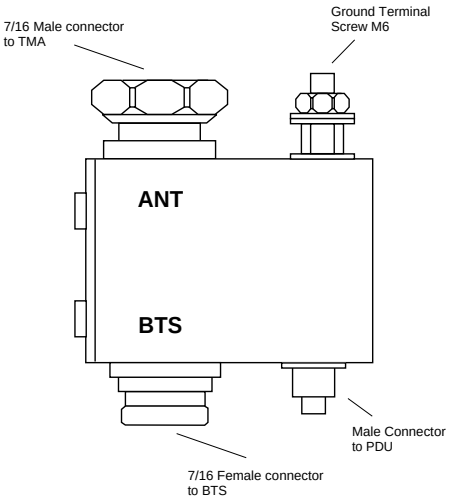


Figure 480: Bias T, Indoor Version

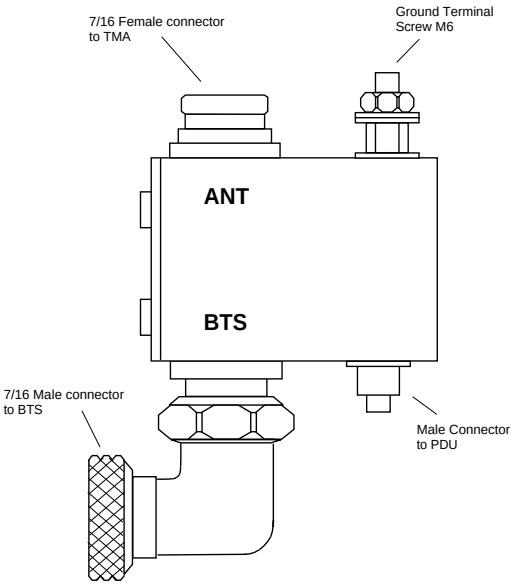


Figure 481: Bias T, Outdoor Version

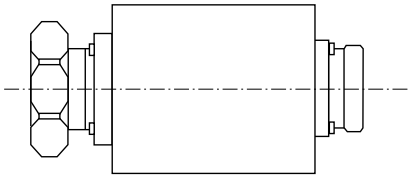


Figure 482: Surge Arrestor

16.6 Installation

16.6.1 Indoor Installation

Depending on the installation, the distance between the BTS, the Power Distribution Unit, and the Tower-Mounted Amplifier can be variable. Thus RF jumper cables have been defined to cover this flexibility. The PDU and Bias T are installed outside the BTS.

The following figure shows an indoor installation.

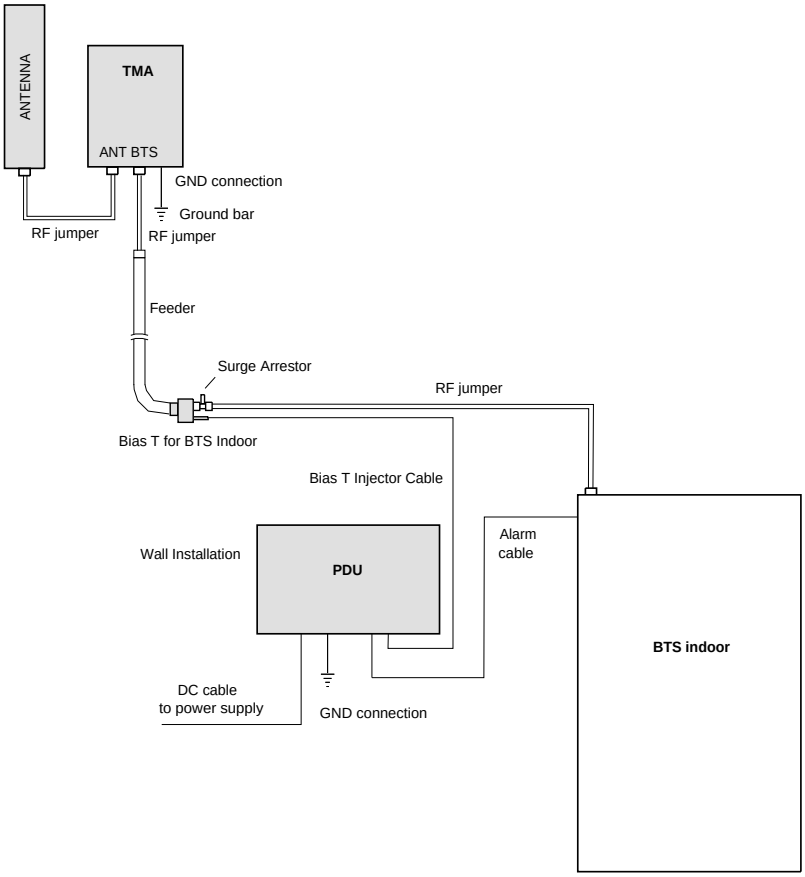


Figure 483: Indoor Installation

16.6.2 Outdoor Installation

Contrary to indoor installation, in an outdoor installation the PDU and Bias T are installed inside the BTS. The PDU has a 19” version which is installed in a subrack. The Bias T, including 90° bend and surge arrestor, are installed in the bottom or top of the cabinet.

The following figures show the principle outdoor installations for BTS versions with a Bias T installation on the bottom.

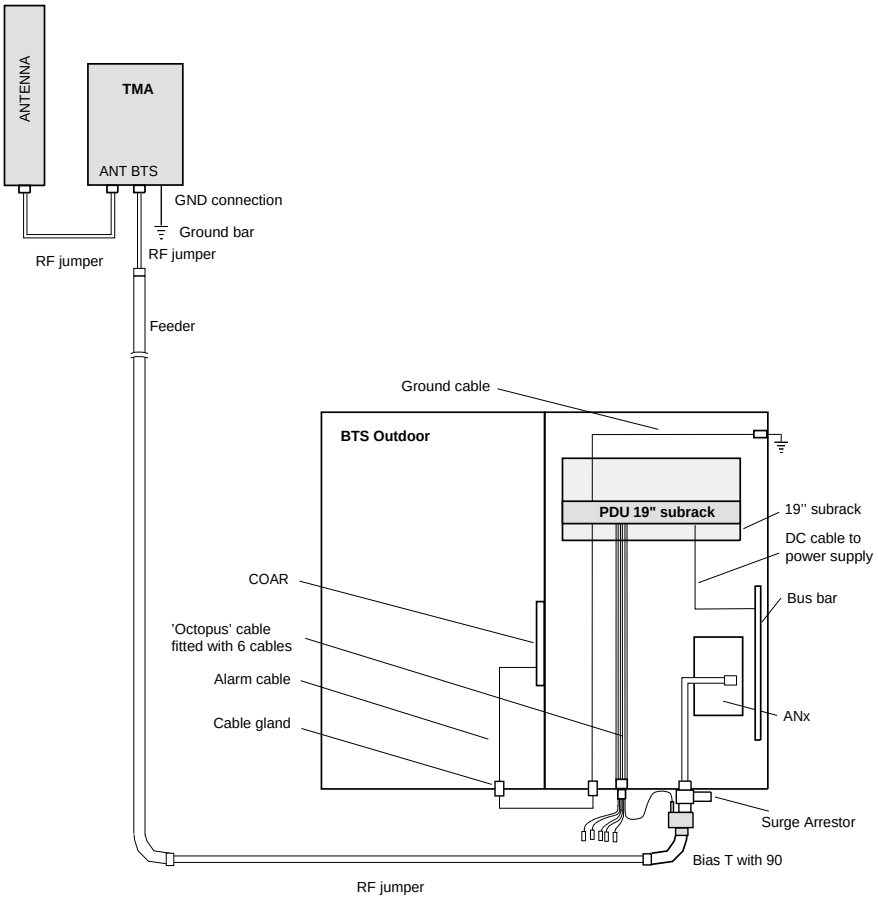


Figure 484: Principle Outdoor Installation for Evolium A9100 BTS

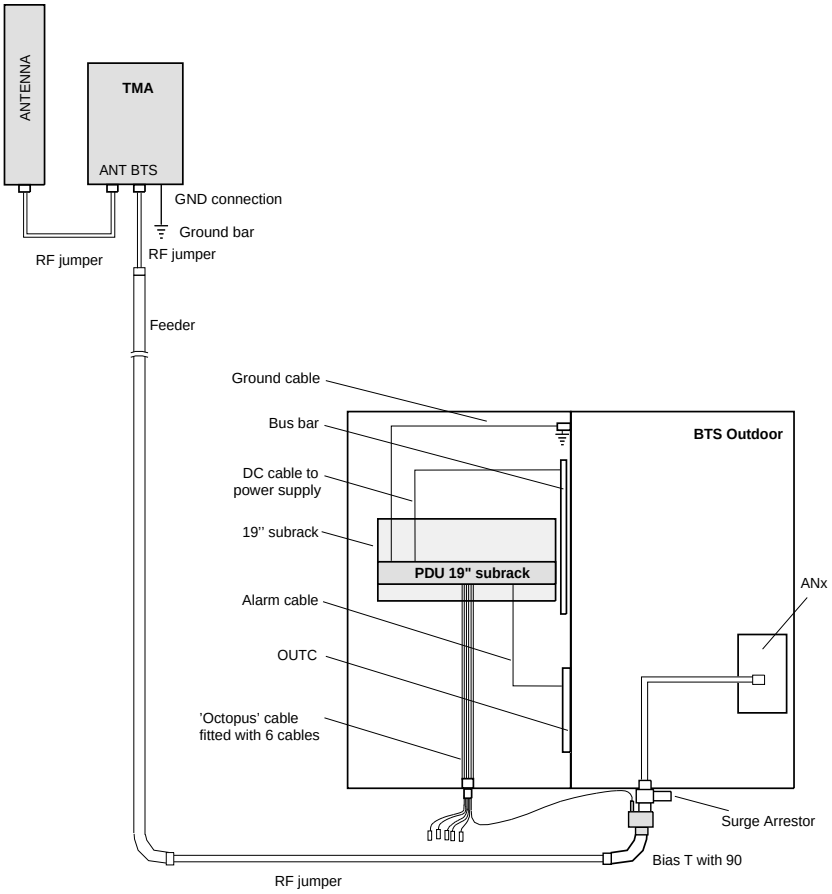


Figure 485: Principle Outdoor Installation for Evolium A9100 BTS Evolution

16.7 TMA Cables

16.7.1 Indoor/Outdoor BTS Cables

Cables for both indoor and outdoor BTS installation of the TMA are described.

16.7.1.1 TMA Ground Cable

The TMA ground cable (part number 3BK 08452 ABAA) is shown in the following figure.

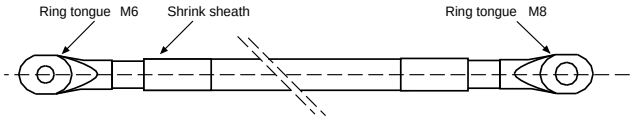


Figure 486: Ground Cable for Tower-Mounted Amplifier

16.7.1.2 Jumper Cable

For indoor and outdoor installation of the tower-mounted amplifier, there are several jumper cables with different cable lengths (part numbers 3BK 05360 xxxx or 3BK 07965 xxxx). Variant 'xxxx' represents cable lengths.

The following figure shows the jumper cable.

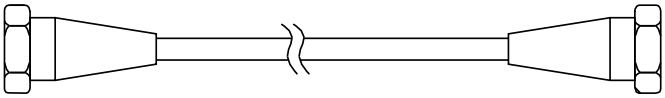


Figure 487: Jumper Cable

16.7.2 Indoor BTS Cables

The Bias T cable and the cable set used for indoor BTS installations are described in the following sections.

16.7.2.1 Bias T Cable

The Bias T cable (part number 3BK 25482 AAAA) is shown in the following figure.

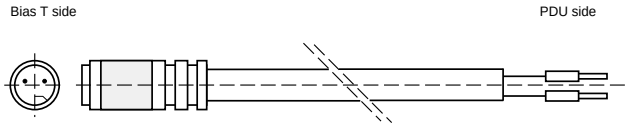


Figure 488: Bias T Cable

16.7.2.2 Indoor Cable Set

For indoor installation there is a specific cable set (part number 3BK 25484 AAAA) containing a ground cable, a DC power supply cable, and an alarm cable. All cables are shown in the following figures.

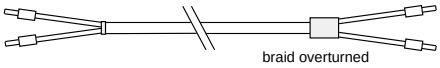


Figure 489: Indoor DC Cable

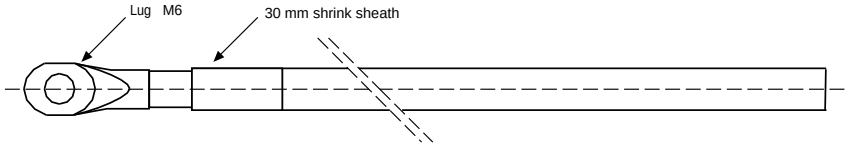


Figure 490: Indoor Ground Cable

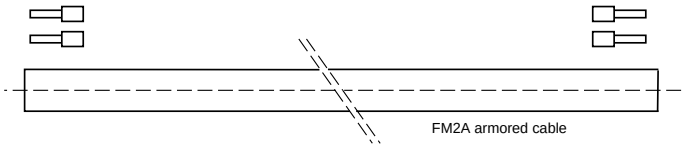


Figure 491: Indoor Alarm Cable

16.7.3 Outdoor BTS Cables

The cable and cable set used for outdoor BTS installations are described in the following sections.

16.7.3.1 Octopus Cable

The ’Octopus’ cable (part number 3BK 25483 AAAA) is fitted with six cables and is shown in the following figure.

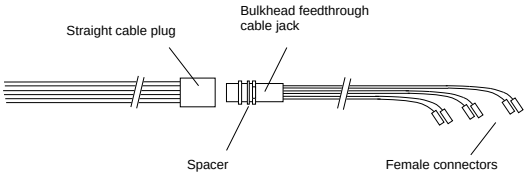


Figure 492: ’Octopus’ Cable

16.7.3.2 Outdoor Cable Set

For outdoor installation there is a specific cable set (part number 3BK 25485 AAAA) containing a ground cable, a DC power supply cable, and an alarm cable. All cables are shown in the following figures.

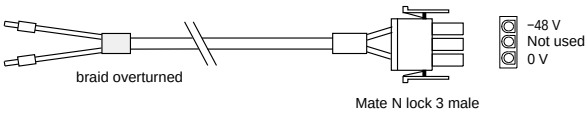


Figure 493: Outdoor DC Cable

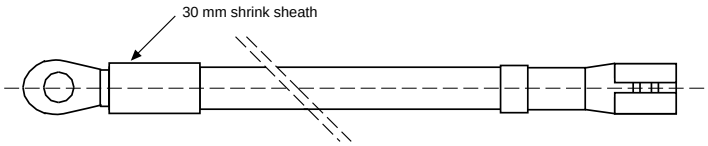


Figure 494: Outdoor Ground Cable

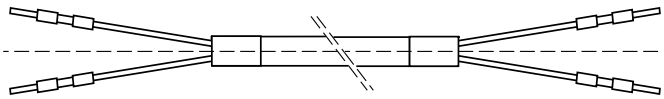


Figure 495: Outdoor Alarm Cable

17 Cable Descriptions

This chapter describes the internal and external cables.

Where appropriate, the pin-to-pin interconnections between cable connectors are illustrated in diagrams.

17.1 Internal Cables

The physical and electrical characteristics for the indoor and outdoor internal cables are given in the following sections.

17.1.1 ANCO

The ANCO (part number 3BK 26151) connections are shown in the following figure.

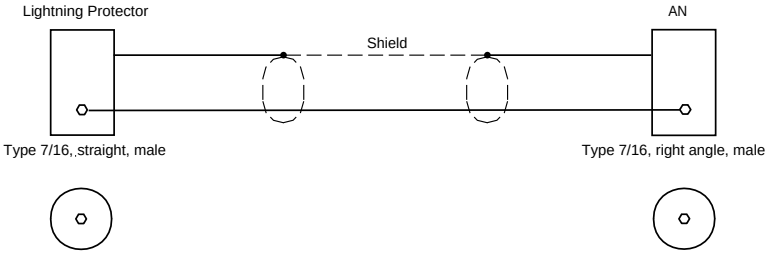


Figure 496: ANCO Connections

17.1.2 ANIC

The ANIC (part number 3BK 07921) connections are shown in the following figure.

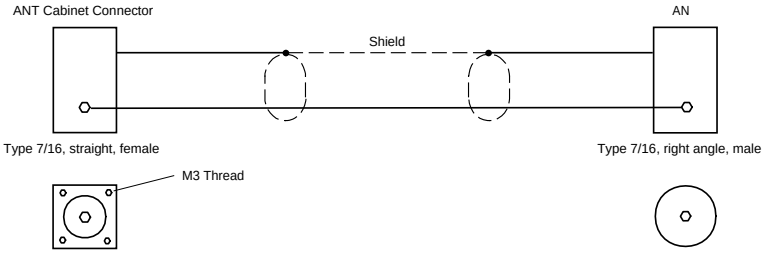


Figure 497: ANIC Connections

17.1.3 ANLC

The ANLC (part number 3BK 26349) connections are shown in the following figure.

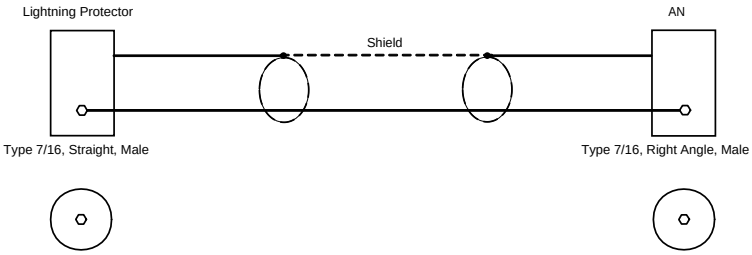


Figure 498: ANLC Connections

17.1.4 ANOC

The ANOC (part number 3BK 07965) connections are shown in the following figure.

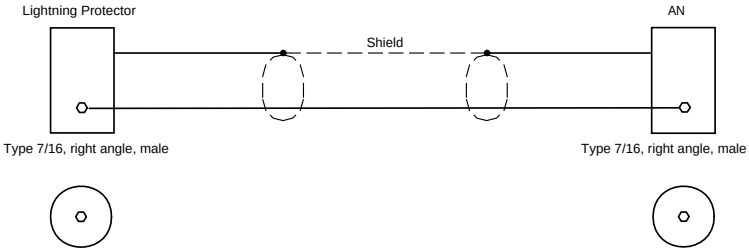


Figure 499: ANOC Connections

17.1.5 BOBU

Both Variant AA and Variant CA of the BOBU are described.

17.1.5.1 Variant AA Appearance

The front and side views of the BOBU (part number 3BK08742) Variant AA are shown in the following figure.

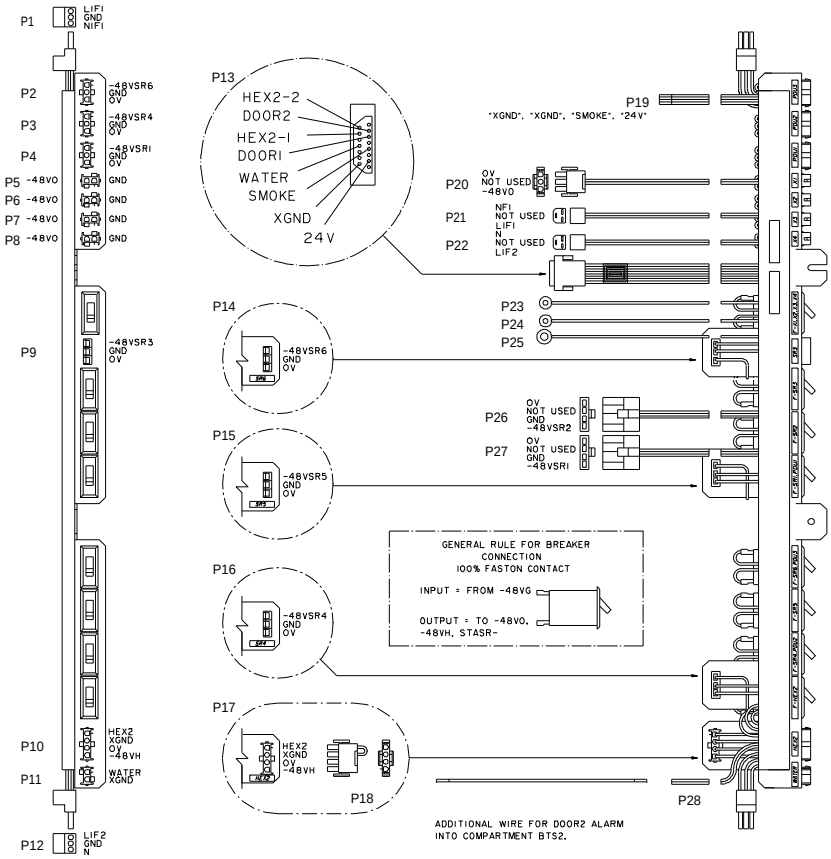


Figure 500: BOBU Variant AA Appearance

17.1.5.2 Variant AA Circuit Schematic

The BOBU Variant AA connections are shown in the following figure.

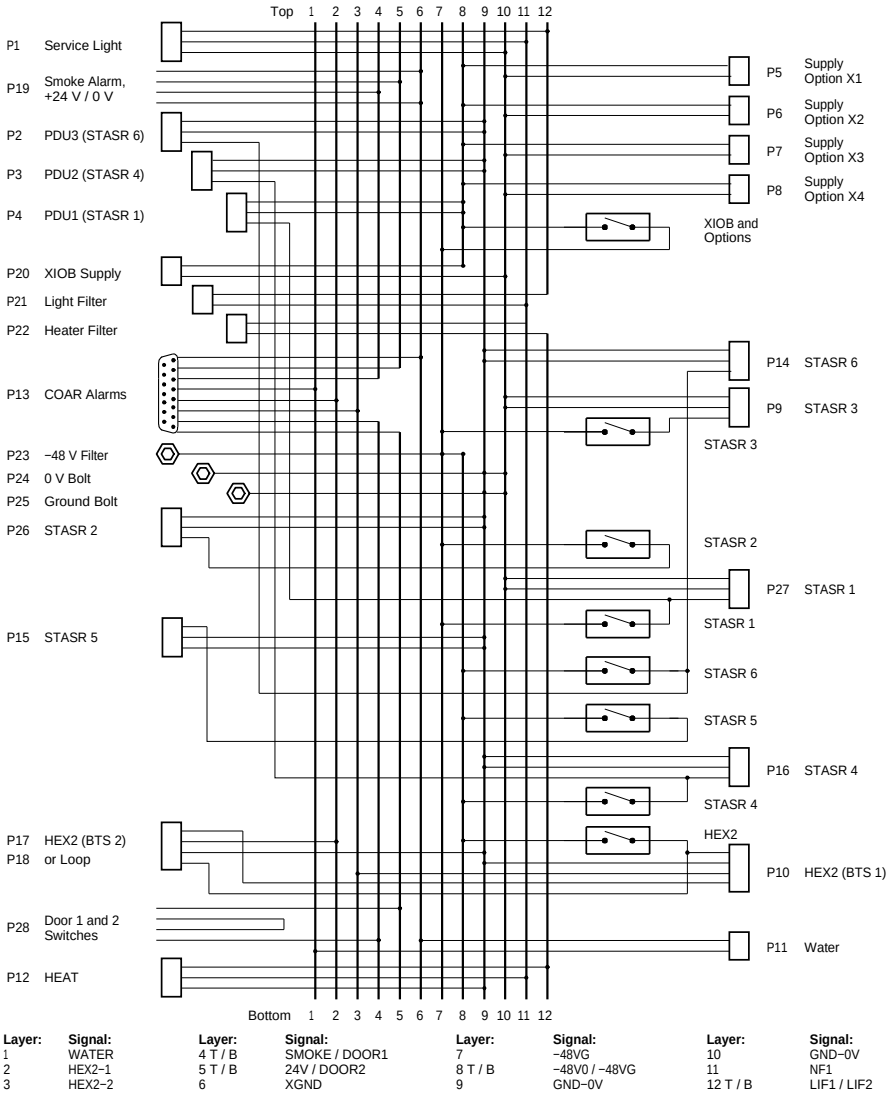


Figure 501: BOBU Variant AA Circuit Schematic

17.1.5.3 Variant AA Connectors

The connectors of the BOBU are shown in the following table.

Connector	Type
P1, P12	Wieland GST 1813 S, male with female contacts.
P2, P3, P4	Mate-N-Lock, female with female contacts.
P5, P6, P7, P8, P11	Mate-N-Lock, female with female contacts.
P9, P14, P15, P16	Anderson Powerpole, unisex.
P10, P17	Mate-N-Lock, female with female contacts.
P13	9-pin Sub-D, female.
P18	Mate-N-Lock, male with male contacts.
P19	DIN wire ferrules 2.5 mm^2
P20, P28	Mate-N-Lock, male with female contacts.
P21, P22	FASTON 6.3, female contacts.
P23, P24	Lug, ring, crimp, 6 mm.
P25	Lug, ring, crimp, 8 mm.
P26	Triple FASTON, male with female contacts.
P27	Triple FASTON, female with female contacts.

Table 172: BOBU Variant AA Connectors

17.1.5.4 Variant CA Appearance

The front and side views of the BOBU (part number 3BK 08742) Variant CA are shown in the following figure.

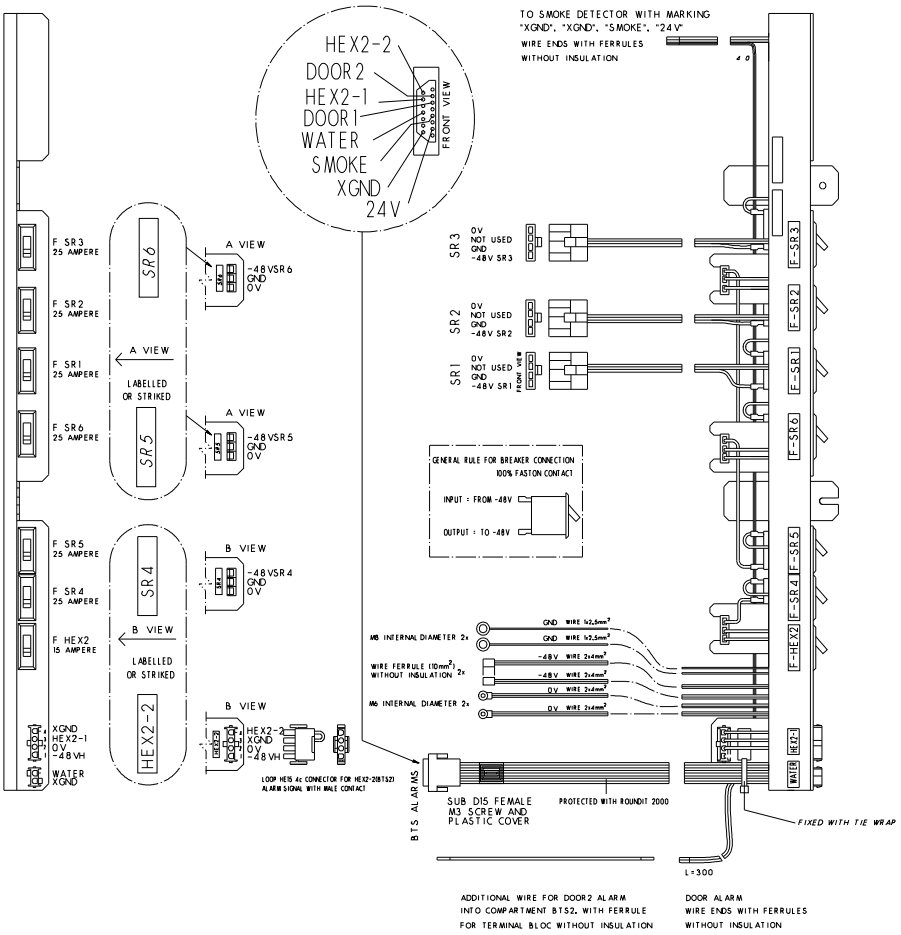


Figure 502: BOBU Variant CA Appearance

17.1.5.5 Variant CA Circuit Schematic

The BOBU Variant CA connections are shown in the following figure.

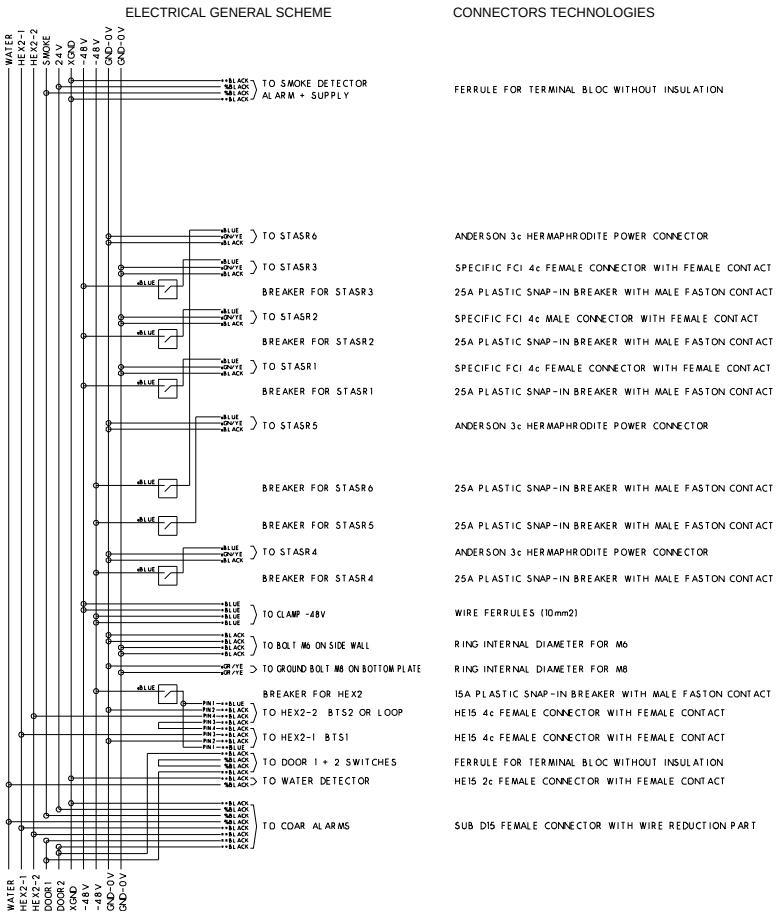


Figure 503: BOBU Variant CA Circuit Schematic

17.1.6 BOMU

Diagrams illustrate both the BOMU's appearance and its circuit schematics.

17.1.6.1 Appearance

The front and side views of the BOMU (part number 3BK 25672) are shown in the following figure.

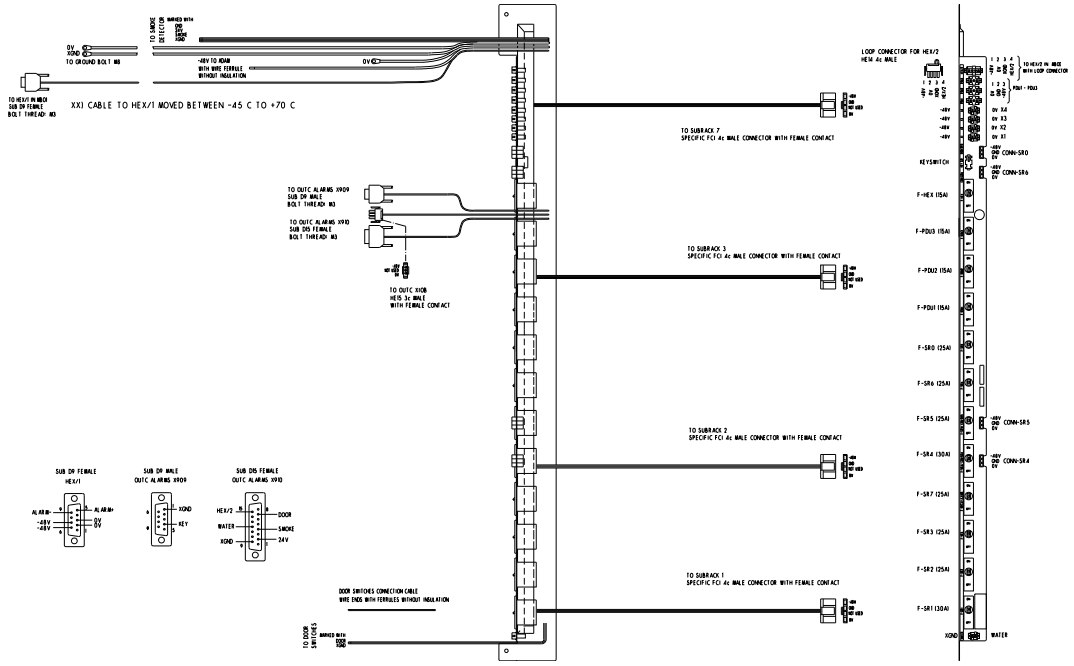


Figure 504: BOMU Appearance

17.1.6.2 Circuit Schematic

The BOMU connections are shown in the following figure.

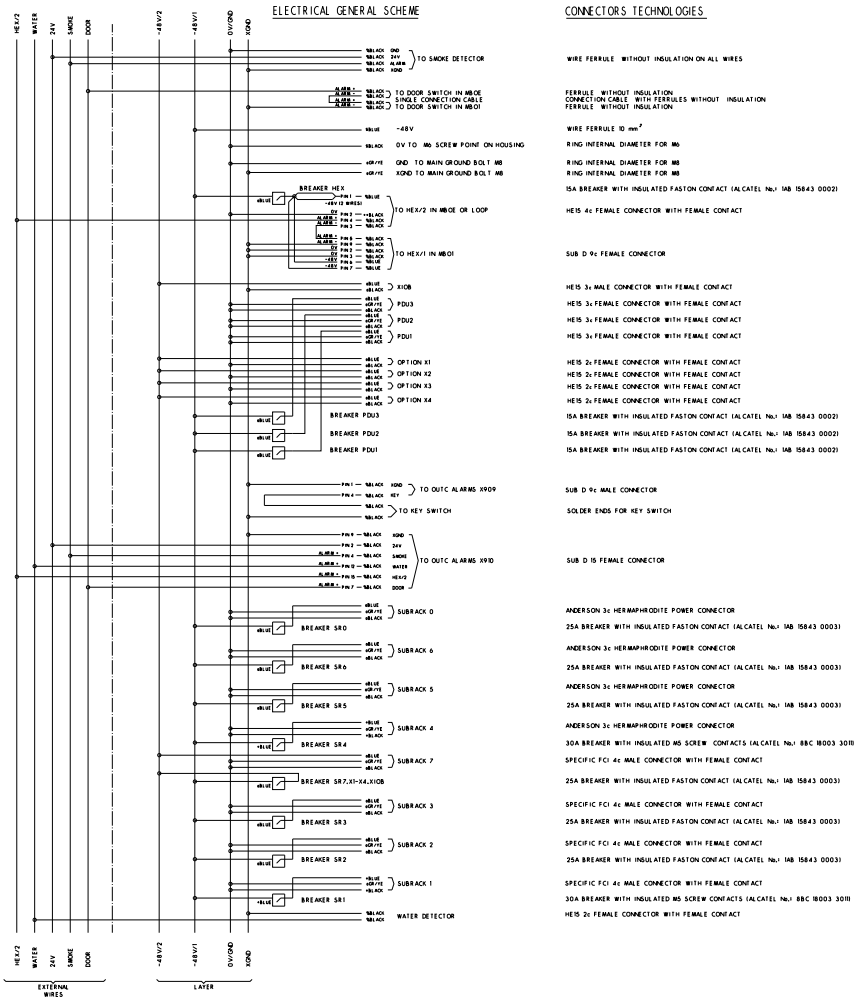


Figure 505: BOMU Circuit Schematic

17.1.7 BOMUE

Diagrams illustrate both the BOMU's appearance and its circuit schematics.

17.1.7.1 Appearance

The front and side views of the BOMUE (part number 3BK 27262) are shown in the following figure.

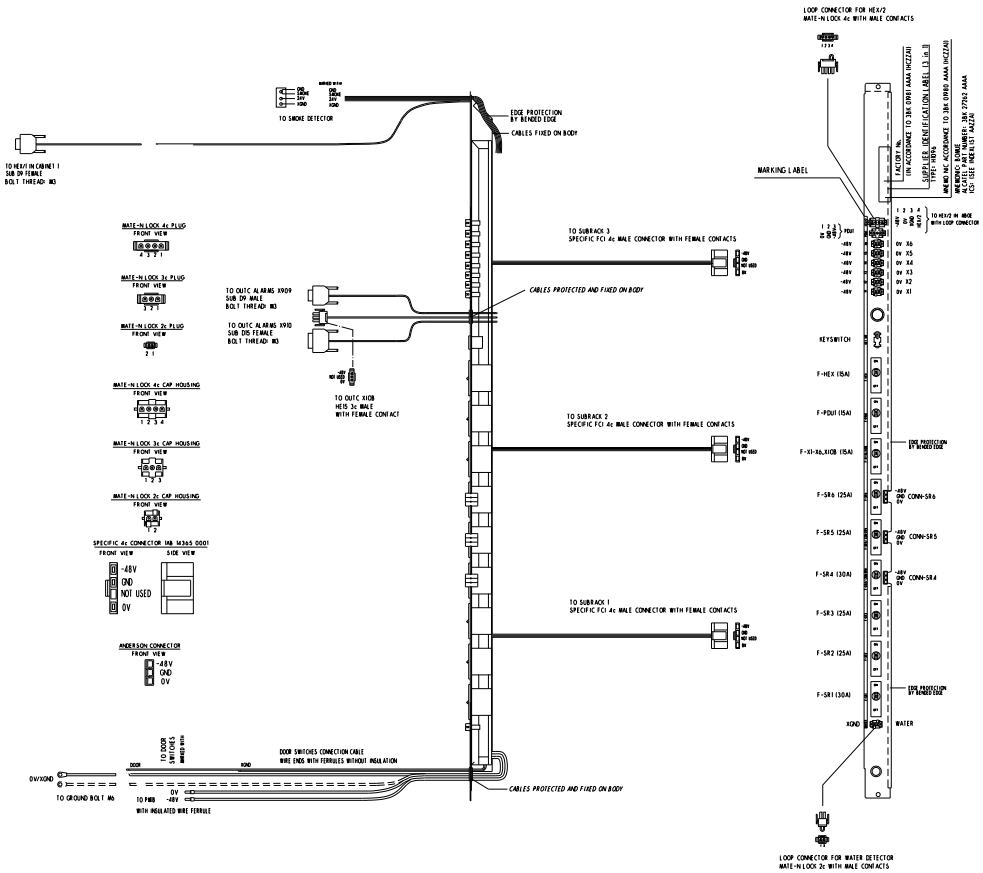


Figure 506: BOMUE Appearance

17.1.7.2 Circuit Schematic

The BOMUE connections are shown in the following figure.

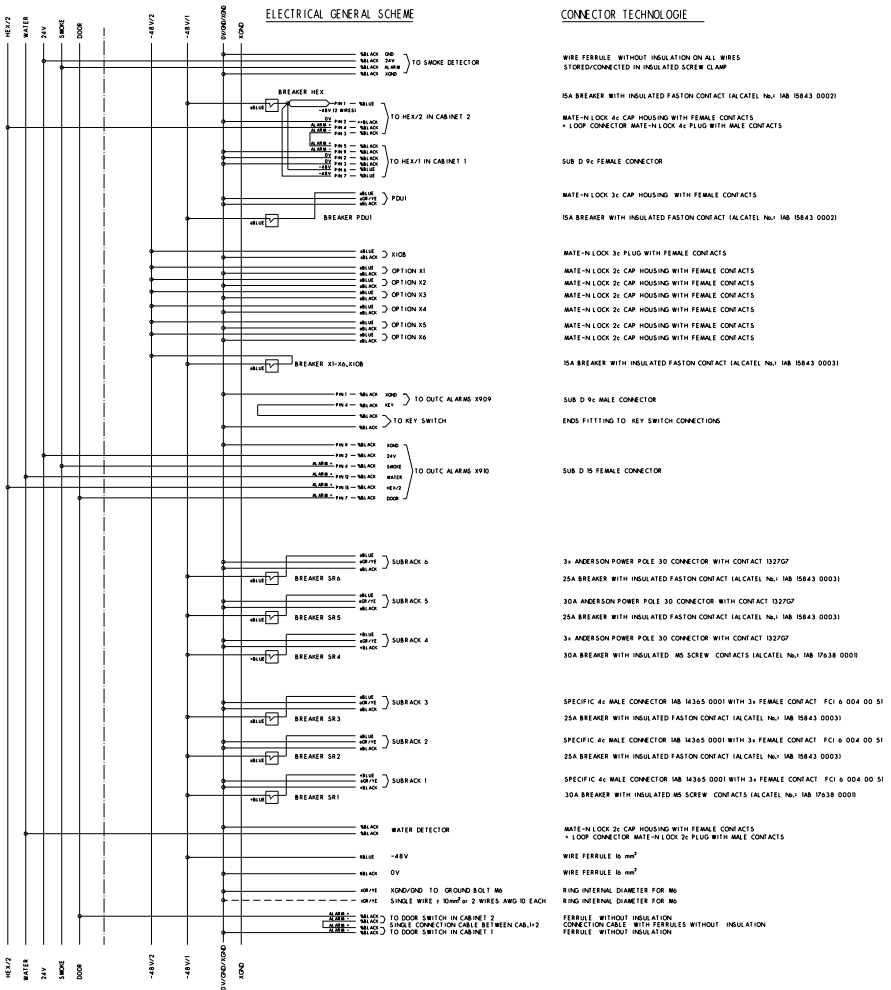


Figure 507: BOMUE Circuit Schematic

17.1.8 BOMUT

Diagrams illustrate both the BOMUT's appearance and its circuit schematics.

17.1.8.1 Appearance

The front and side views of the BOMUT (part number 3BK 27143) are shown in the following figure.

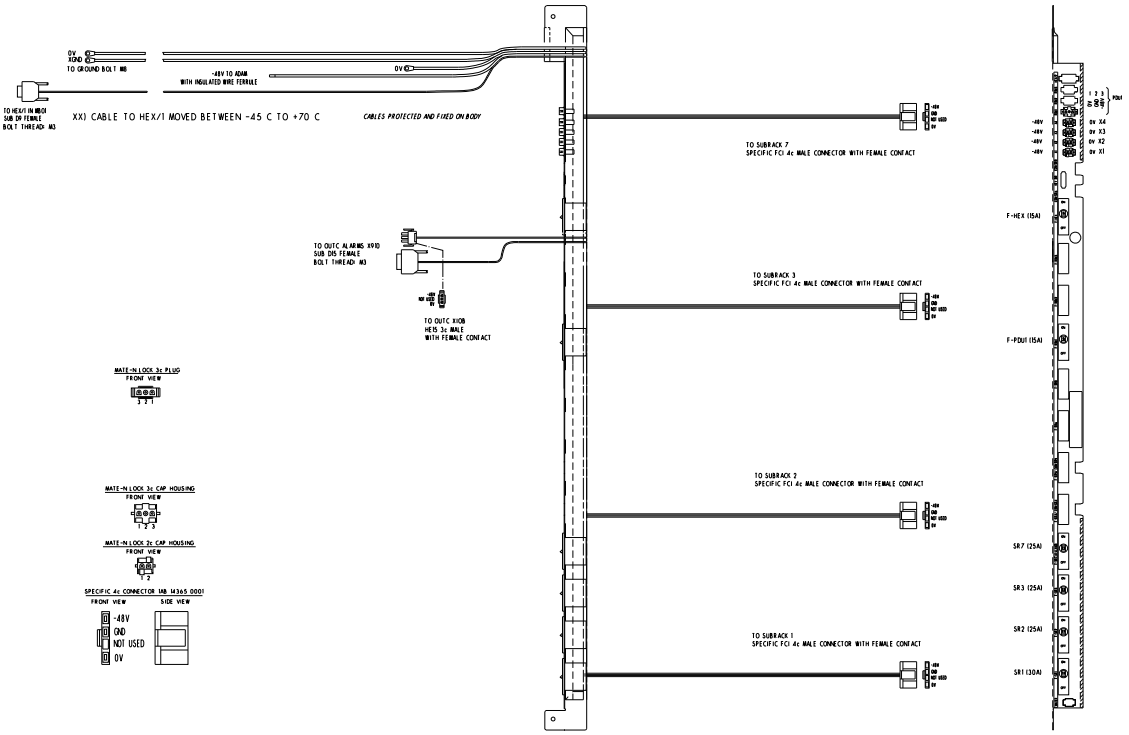


Figure 508: BOMUT Appearance

17.1.8.2 Circuit Schematic

The BOMUT connections are shown in the following figure.

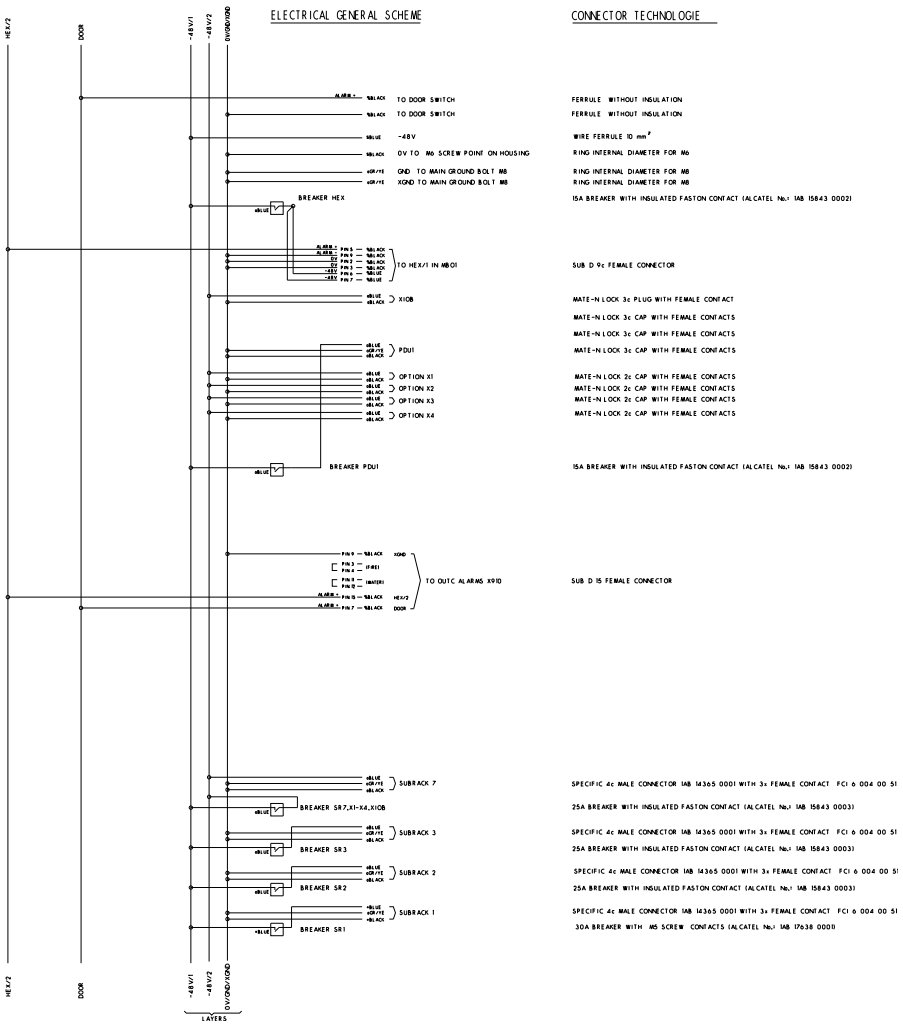


Figure 509: BOMUT Circuit Schematic

17.1.9 BOSU

The BOSU variants, AA and CA, are described in terms of appearance and connections.

17.1.9.1 Variant AA Appearance

The front and side views of the BOSU (part number 3BK 08741) Variant AA are shown in the following figure.

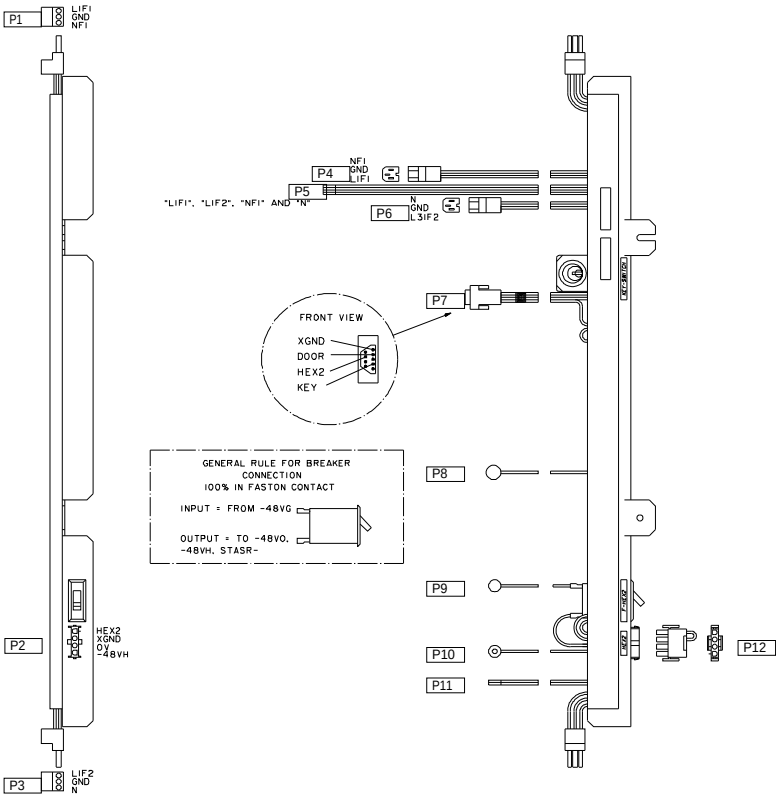
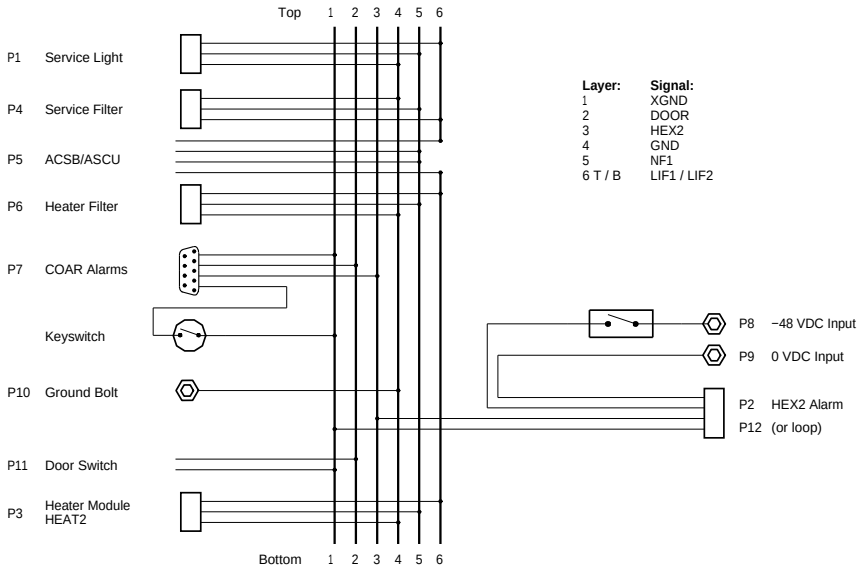


Figure 510: BOSU Variant AA Appearance

17.1.9.2 Variant AA Circuit Schematic

The BOSU Variant AA connections are shown in the following figure.



P1, P3:	Wieland GST 1813 S, male with female contacts
P2:	Tripple Faston, female with female contacts
P4:, P6:	Anderson Powerpole, unisex
P5, P11:	DIN wire ferrules 2.5 mm
P7:	9−pin Sub−D female
P8:	Lug, ring, crimp, 8 mm
P9, P10:	Lug, ring, crimp, 6 mm
P12:	Matenlock, male with male contacts

Figure 511: BOSU Variant AA Circuit Schematic

17.1.9.3 Variant CA Appearance

The front and side views of the BOSU (part number 3BK 08741) Variant CA are in the following figure.

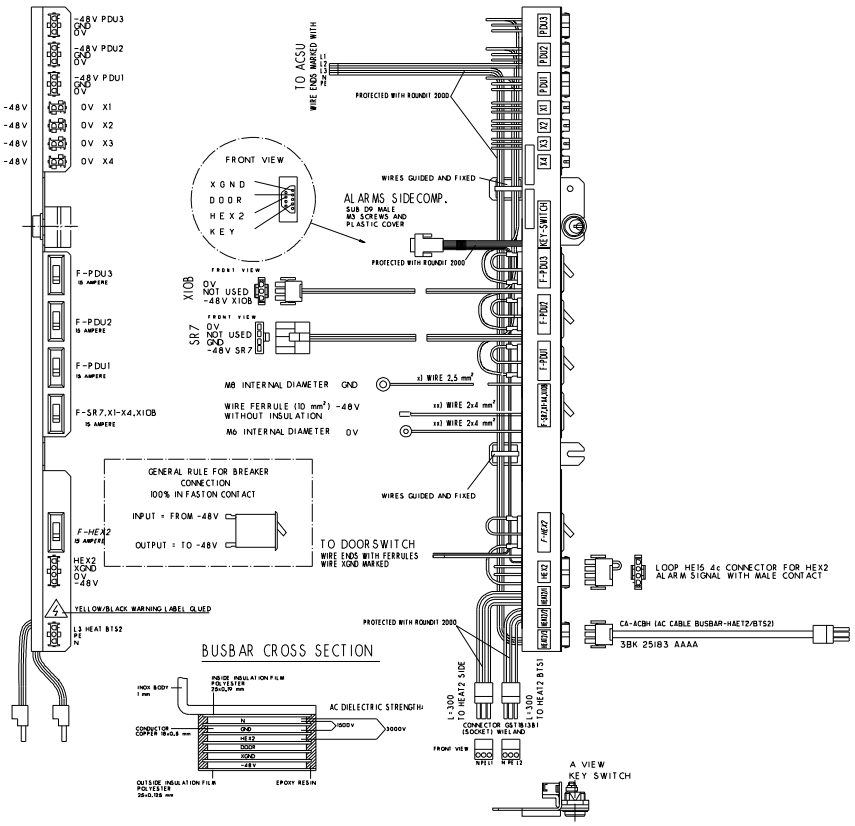


Figure 512: BOSU Variant CA Appearance

17.1.9.4 Variant CA Circuit Schematic

The BOSU Variant CA connections are shown in the following figure.

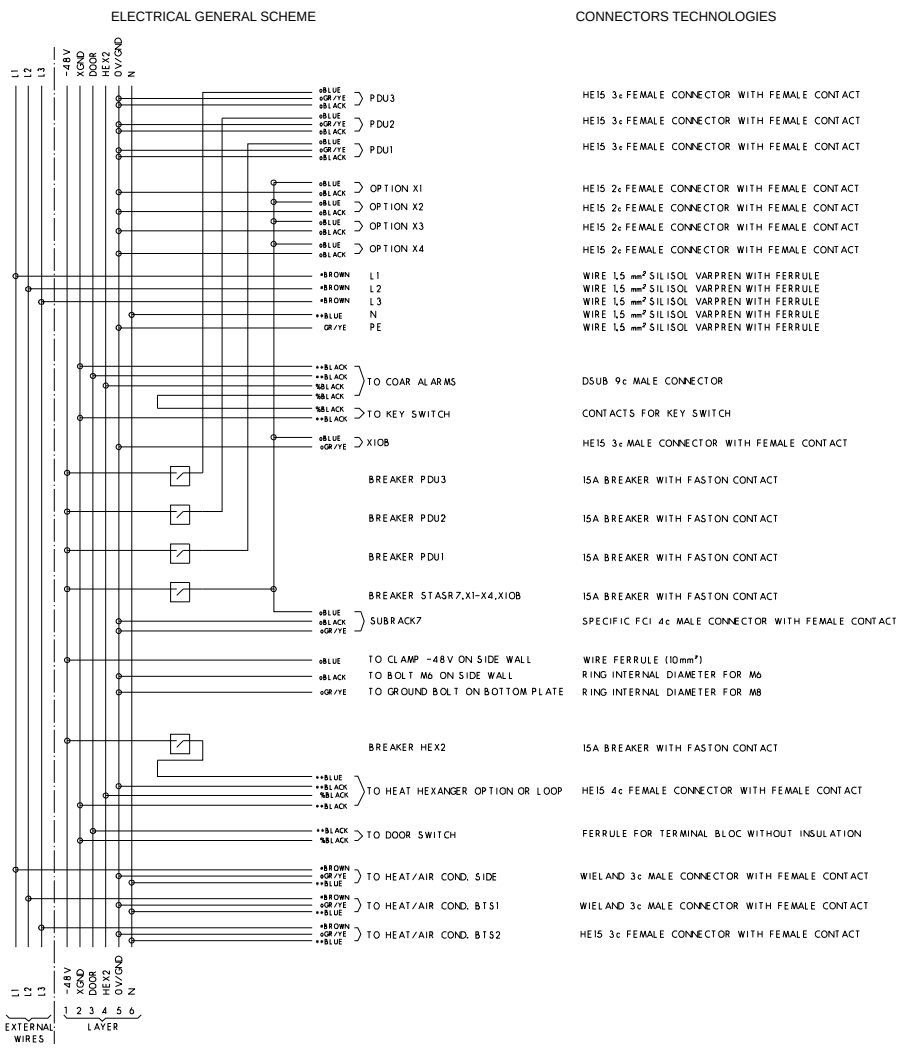
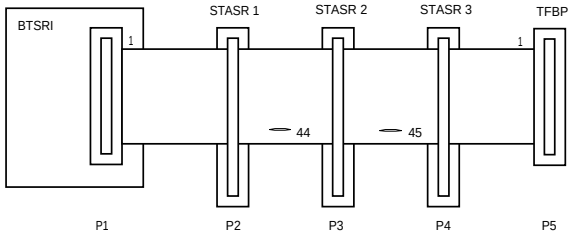


Figure 513: BOSU Variant CA Circuit Schematic

17.1.10 BTSRI3

The connections for the BTSRI3I (part number 3BK 25973) are shown in the following figure.



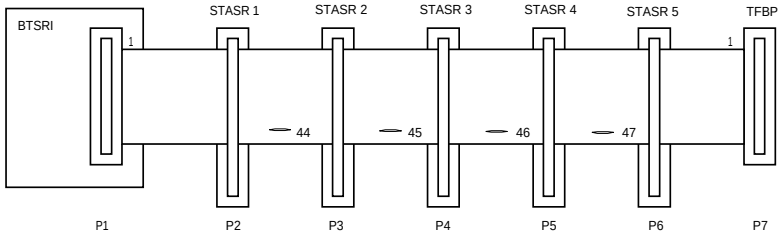
Break in wire for coding purposes

P1:	Non−removable, self cutting, 50 pins
P2 − P4:	DIN 41612, 64 pins, rows A and C only, female
P5:	Flat cable connector, 50 pins, female

Figure 514: BTSRI3 Connections

17.1.11 BTSRI5

The connections for the BTSRI5 (part number 3BK 25974) are shown in the following figure.



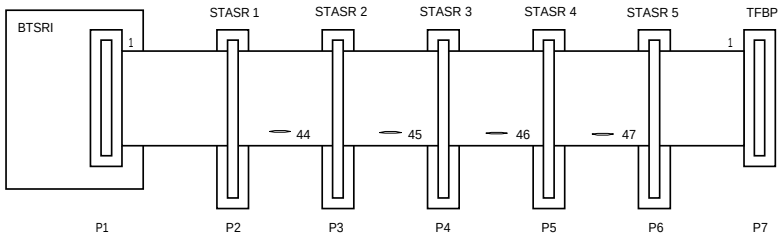
Break in wire for coding purposes

P1:	Non−removable, self cutting, 50 pins
P2 − P6:	DIN 41612, 64 pins, rows A and C only, female
P7:	Flat cable connector, 50 pins, female

Figure 515: BTSRI5 Connections

17.1.12 BTSRIMA

The connections for the BTSRIMA (part number 3BK 07720) are shown in the following figure.



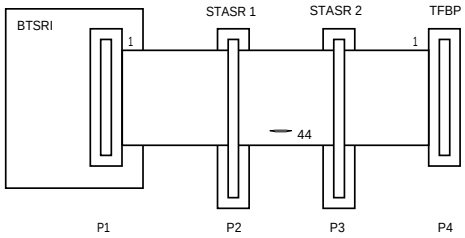
Break in wire for coding purposes

P1:	Non−removable, self cutting, 50 pins
P2 − P6:	DIN 41612, 64 pins, rows A and C only, female
P7:	Flat cable connector, 50 pins, female

Figure 516: BTSRIMA Connections

17.1.13 BTSRIMI

The connections for the BTSRIMI (part number 3BK 07720) are shown in the following figure.



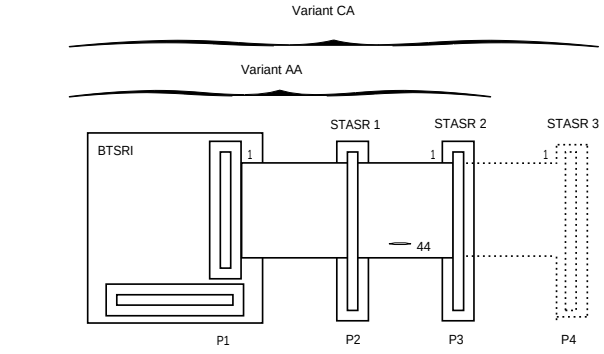
Break in wire for coding purposes

P1:	Non−removable, self cutting, 50 pins
P2, P3:	DIN 41612, 64 pins, rows A and C only, female
P4:	Flat cable connector, 50 pins, female

Figure 517: BTSRIMI Connections

17.1.14 BTSRIOUT

The connections for the BTSRIOUT (part number 3BK 08126) are shown in the following figure.



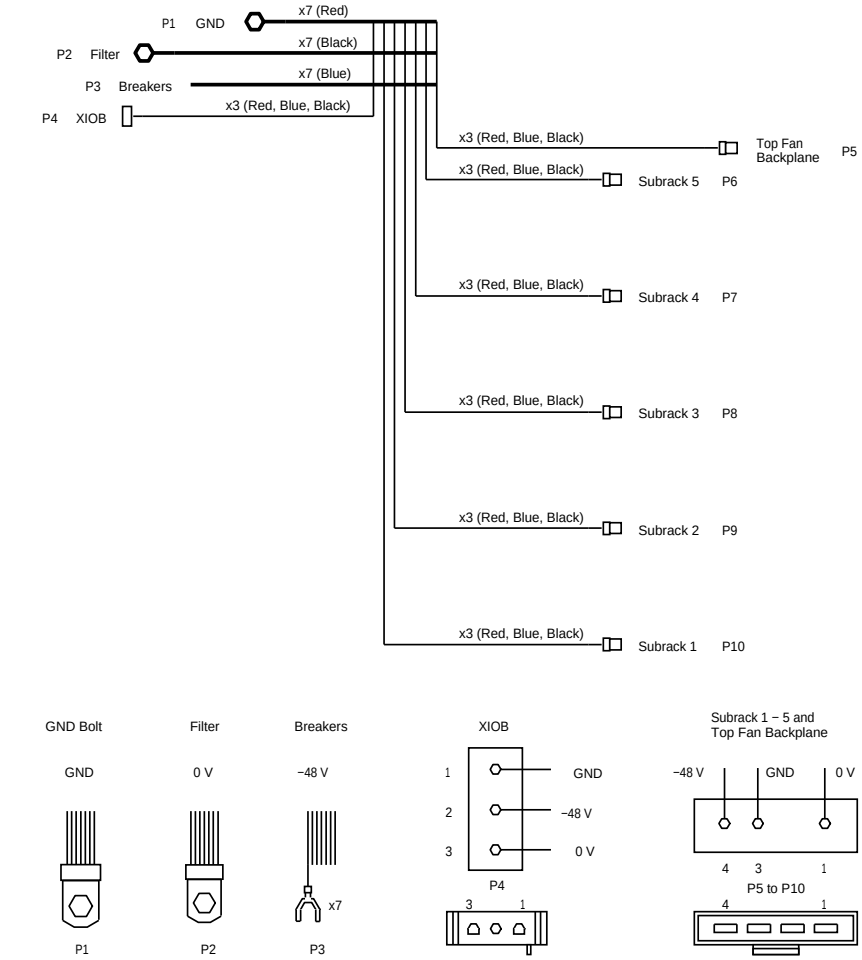
Break in wire for coding purposes

P1: Non−removable, self cutting, 50 pins
P2, P3, P4: DIN 41612, 64 pins, rows A and C only, female

Figure 518: BTSRIOUT Connections

17.1.15 BUMA

The BUMA (part number 3BK 07762) cableform connections are shown in the following figure.

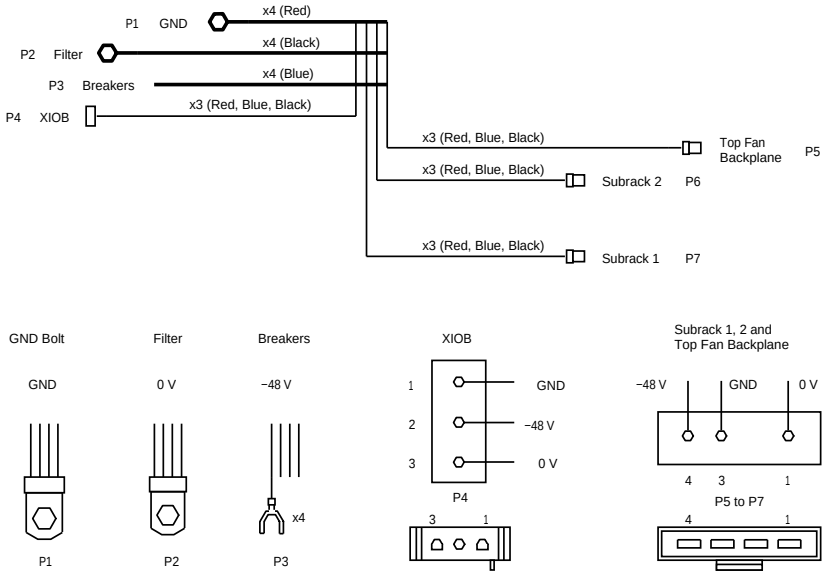


P1: Spade, male, M8 hole
P2: Spade, male, M6 hole
P3: Spade, male, open tongue, M5
P4: Matenlock, female
P5 − P10: Triple Faston, female

Figure 519: BUMA Connections

17.1.16 BUMI

The BUMI (part number 3BK 07763) cableform connections are shown in the following figure.



P1: Spade, male, M8 hole
P2: Spade, male, M6 hole
P3: Spade, male, open tongue, M5
P4: Matenlock, female
P5 – P7: Triple Faston, female

Figure 520: BUMI Connections

17.1.17 CA12

The connections for the CA12 (part number 3BK 08086) are shown in the following figure.

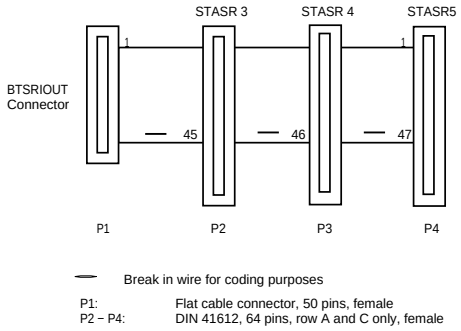


Figure 521: CA12 Connections

17.1.18 CA-2MMC2

The CA-2MMC2 (part number 3BK 08289) connections are shown in the following figure.

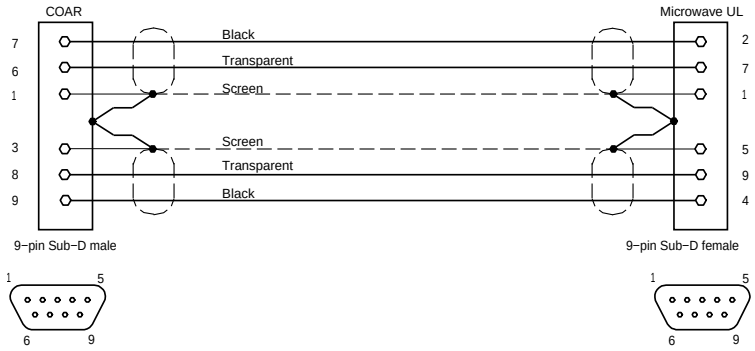


Figure 522: CA-2MMC2 Connections

17.1.19 CA-ABIS

The CA-ABIS (part number 3BK 07922) connections are shown in the following figure.

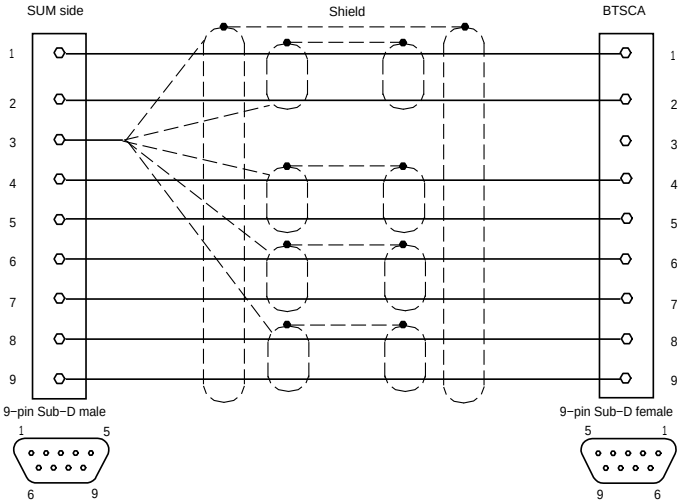


Figure 523: CA-ABIS Connections

17.1.20 CA-ACB2

The CA-ACB2 (part number 3BK 08091) cable connections are shown in the following figure.

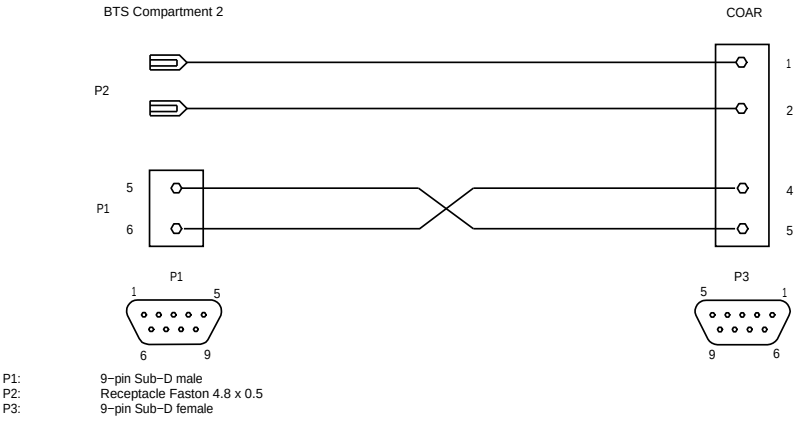


Figure 524: CA-ACB2 Connections

17.1.21 CA-ACSC

The CA-ACSC (part number 3BK 08078) cable connections are shown in the following figure.

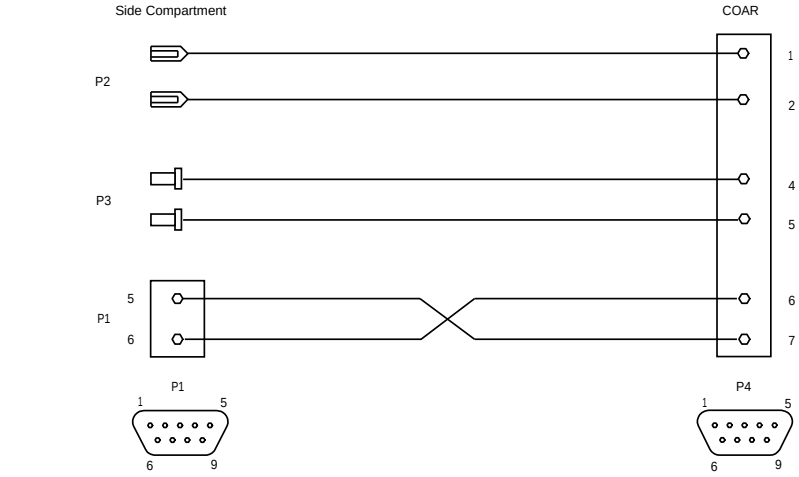


Figure 525: CA-ACSC Connections

17.1.22 CA-ADABM, CA-ADABP

The CA-ADABM (part number 3BK 25139) connections and the CA-ADABP (part number 3BK 25138) connections are shown in the following figure.

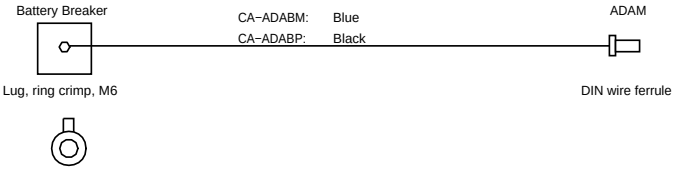


Figure 526: CA-ADABM, CA-ADABP Connections

17.1.23 CA-ADACM, CA-ADACP

The CA-ADACM (part number 3BK 25248) connections and the CA -ADACP (part number 3BK 25247) connections are shown in the following figure.

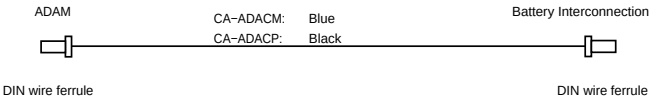


Figure 527: CA-ADACM, CA-ADACP Connections

17.1.24 CA-ADCO

The CA-ADCO (part number 3BK 07953) cable connections are shown in the following figure.

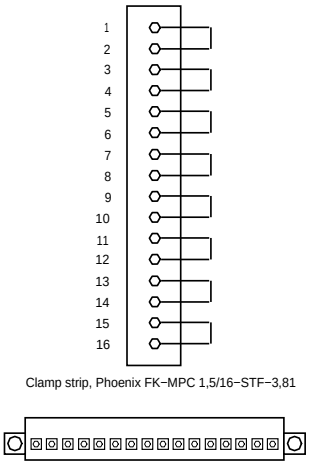


Figure 528: CA-ADCO Connections

17.1.25 CA-ALPC

The CA-ALPC (part number 3BK 26348) cable connections are shown in the following figure.

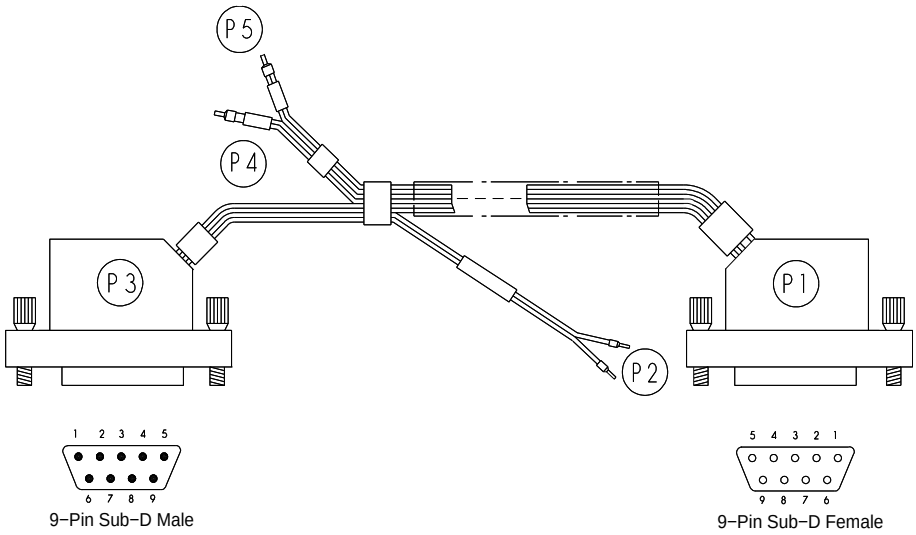
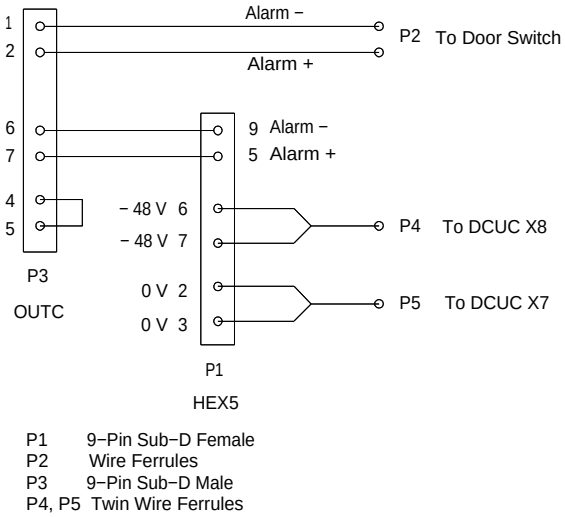


Figure 529: CA-ALPC Appearance

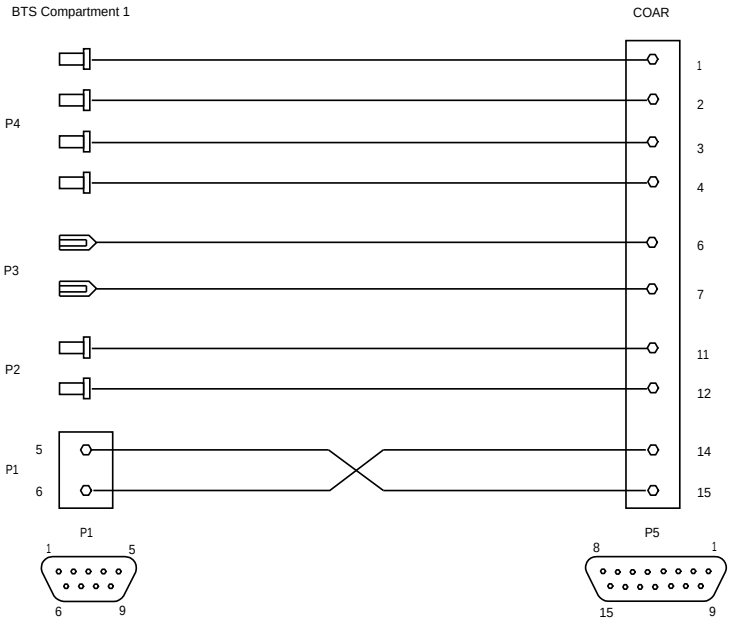


P1 9−Pin Sub−D Female
P2 Wire Ferrules
P3 9−Pin Sub−D Male
P4, P5 Twin Wire Ferrules

Figure 530: CA-ALPC Circuit Schematic

17.1.26 CA-APC2

The CA-APC2 (part number 3BK 08215) cable connections are shown in the following figure.



P1: 9−pin Sub−D male
P2, P4: DIN wire ferrules
P3: Receptagle Faston 4.8x0.5
P5: 9−pin Sub−D female

Figure 531: CA-APC2 Connections

17.1.27 CA-ASMC

The CA-ASMC (part number 3BK 08807) connections are shown in the following figure.

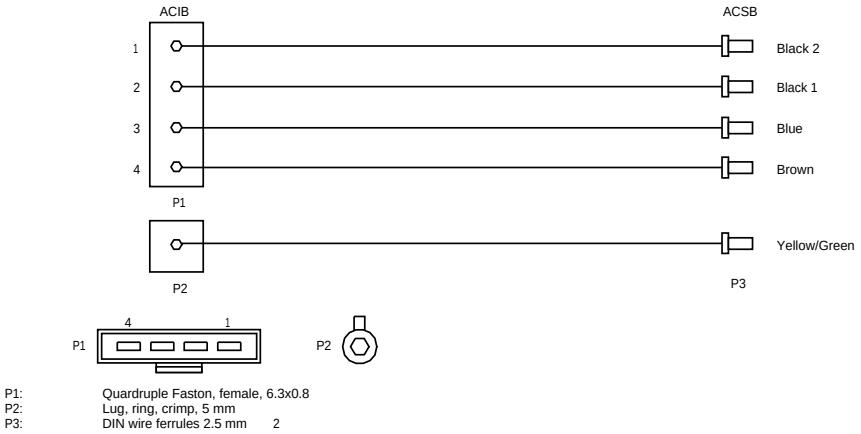


Figure 532: CA-ASMC Connections

17.1.28 CA-BABRM, CA-BABRP

The CA-BABRM (part number 3BK 25141) connections and the CA-BABRP (part number 2BK 25140) connections are shown in the following figure.

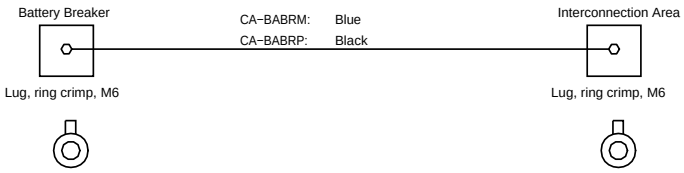


Figure 533: CA-BABRM, CA-BABRP Connections

17.1.29 CA-BRCM, CA-BRCP

The CA-BRCM (part number 3BK 25246) connections and the CA-BRCP (part number 3BK 25245) connections are shown in the following figure.

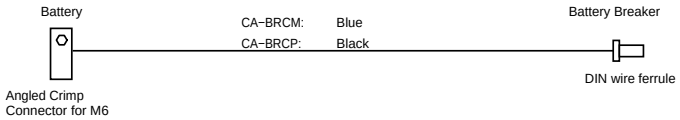


Figure 534: CA-BRCM, CA-BRCP Connections

17.1.30 CA-BTSCA

The CA-BTSCA (part number 3BK 07923) connections are shown in the following figure.

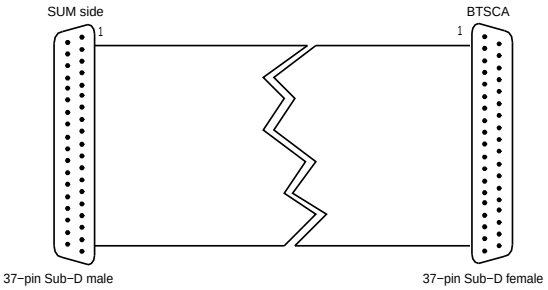


Figure 535: CA-BTSCA Connections

17.1.31 CA-CSTR

The connections for the CA-CSTR (part number 3BK 25178) are shown in the following figure.

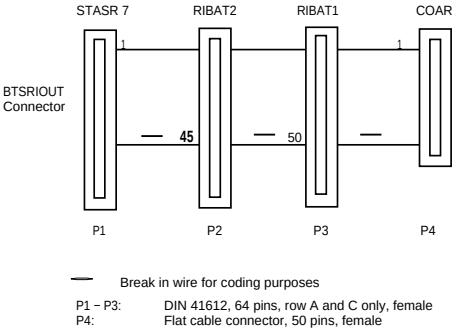


Figure 536: CA-CSTR Connections

17.1.32 CA-DFUX

The CA-DFUX (part number 3BK 08503) cable connections are shown in the following figure.

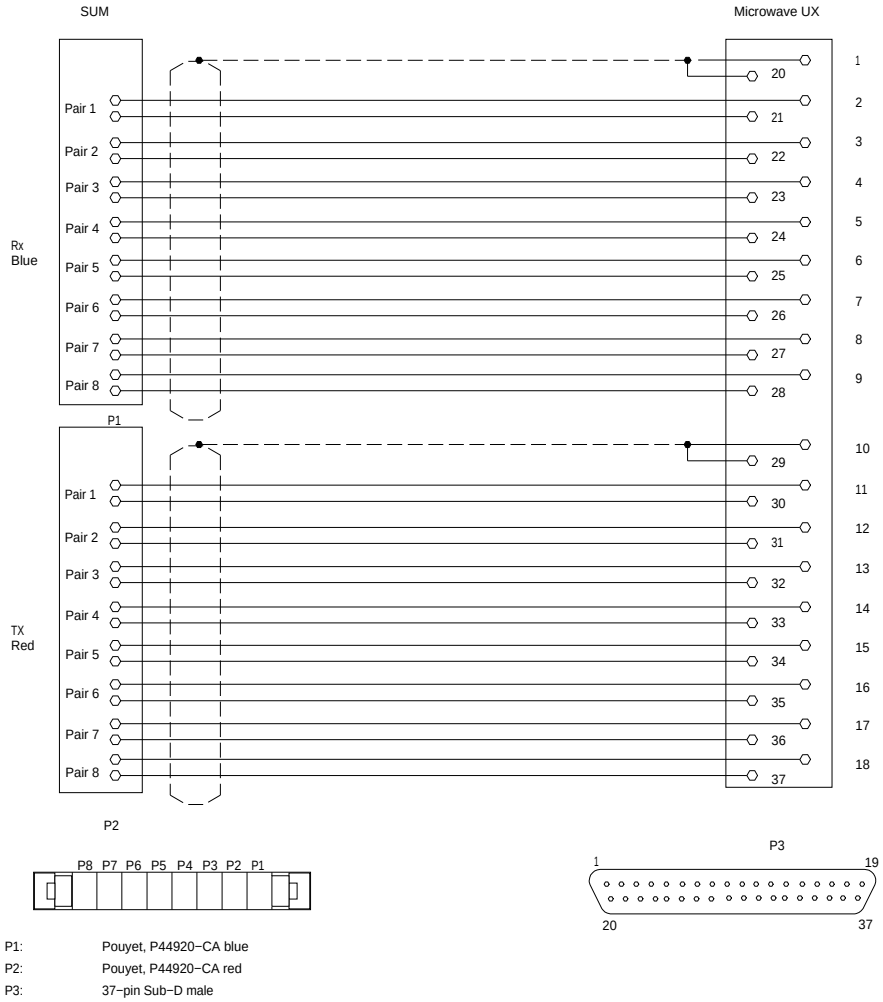


Figure 537: CA-DFUX Connections

17.1.33 CA-GCMW

The CA-GCMW (part number 3BK 07934) connections are shown in the following figure.

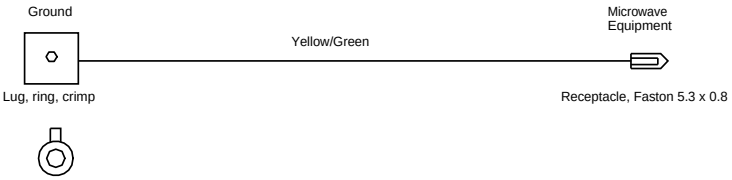


Figure 538: CA-GCMW Connections

17.1.34 CA-Ground

The CA-Ground (part number 3BK 25182) connections are shown in the following figure.

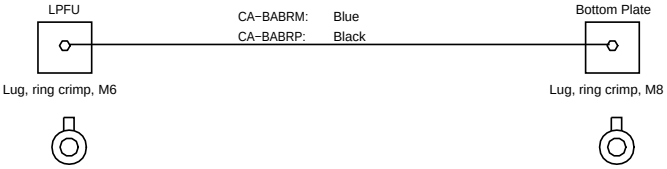


Figure 539: CA-Ground Connections

17.1.35 CA-Ground1

The CA-Ground1 (part number 3BK 08118) connections are shown in the following figure.



Figure 540: CA-Ground1 Connections

17.1.36 CA-Ground2

The CA-Ground2 (part number 3BK 08177) connections are shown in the following figure.

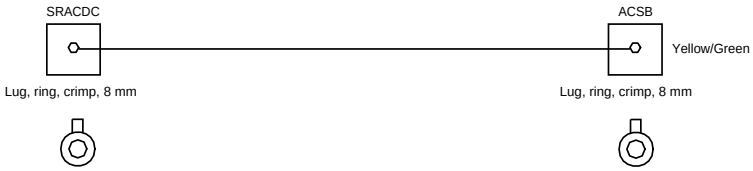


Figure 541: CA-Ground2 Connections

17.1.37 CA-H2PC1

The CA-H2PC1 (part number 3BK 08077) connections are shown in the following figure.

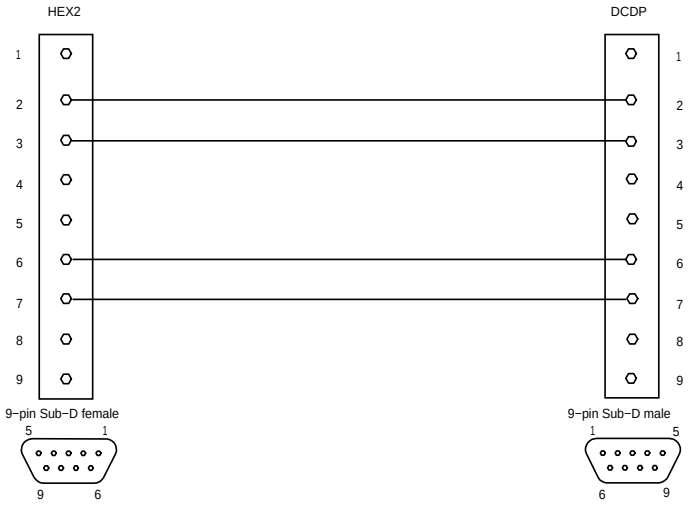


Figure 542: CA-H2PC1 Connections

17.1.38 CA-H2PC2

The CA-H2PC2 (part number 08092) connections are shown in the following figure.

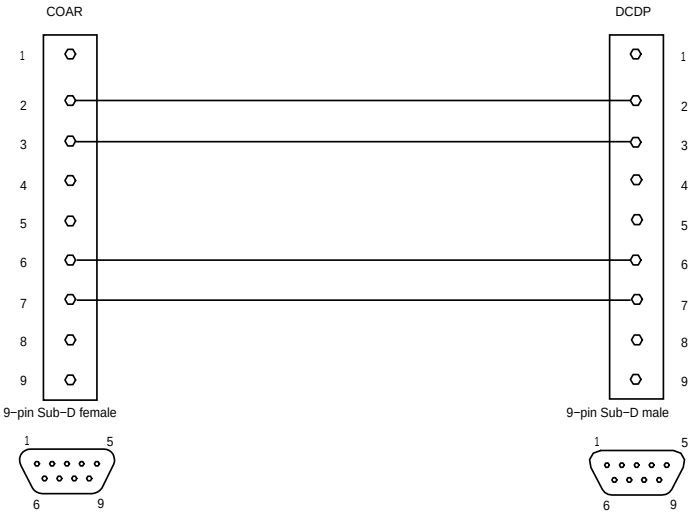


Figure 543: CA-H2PC2 Connections

17.1.39 CA-H2PC3

The CA-H2PC3 (part number 3BK 08093) connections are shown in the following figure.

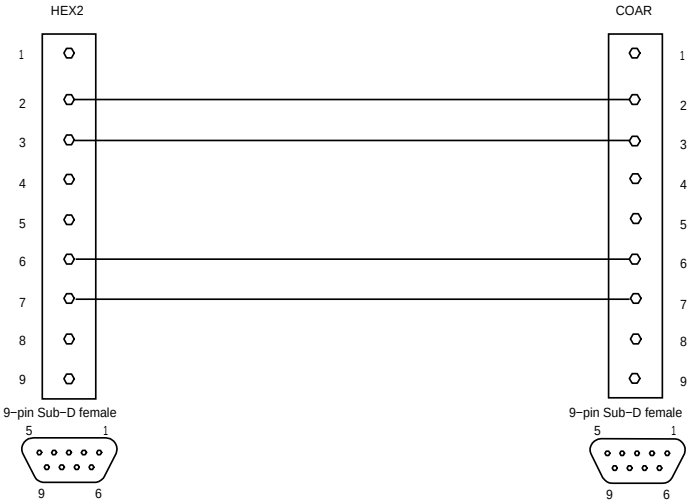


Figure 544: CA-H2PC3 Connections

17.1.40 CA-HOAP

The CA-HOAP (part number 3BK 25820) connections are shown in the following figure.

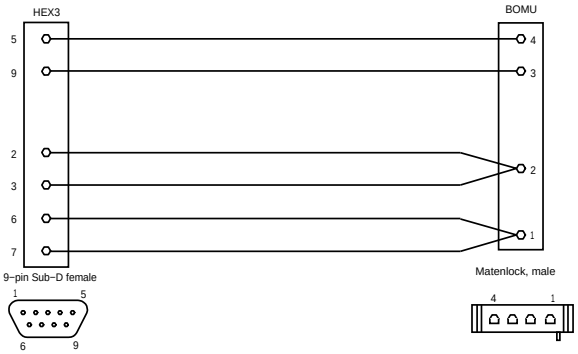


Figure 545: CA-HOAP Connections

17.1.41 CA-MLBP

The CA-MLBP (part number 3BK 08886) connections are shown in the following figure.

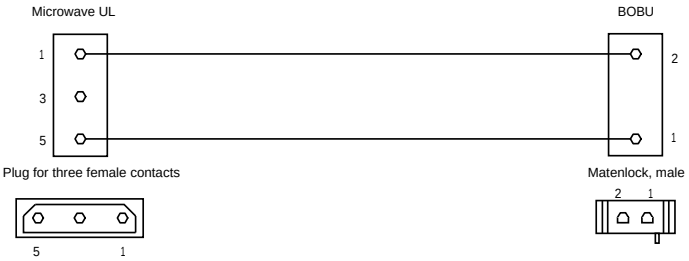


Figure 546: CA-MLBP Connections

17.1.42 CA-MXBP

The CA-MXBP (part number 3BK 08886) connections are shown in the following figure.

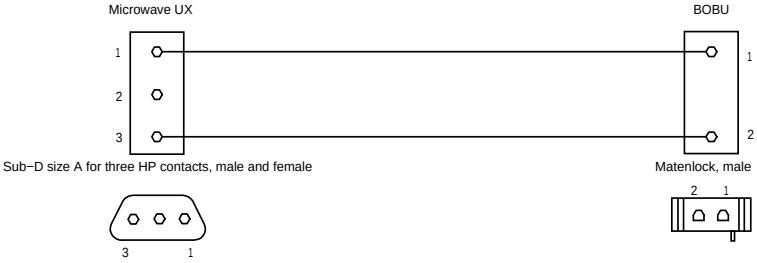


Figure 547: CA-MXBP Connections

17.1.43 CA-OHAC

The CA-OHAC (part number 3BK 08810) connections are shown in the following figure.

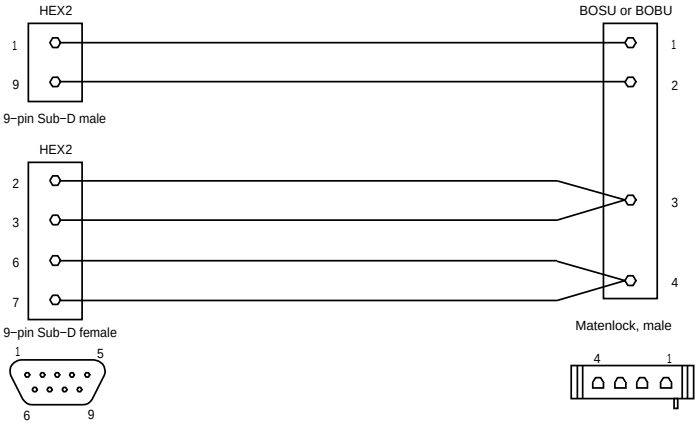


Figure 548: CA-OHAC Connections

17.1.44 CA-ONCCx

The CA-ONCCx cable has three connection types. Each type is illustrated in a separate diagram.

17.1.44.1 Type 1 Connections

The CA-ONCCx type 1 connections are shown in the following figure.

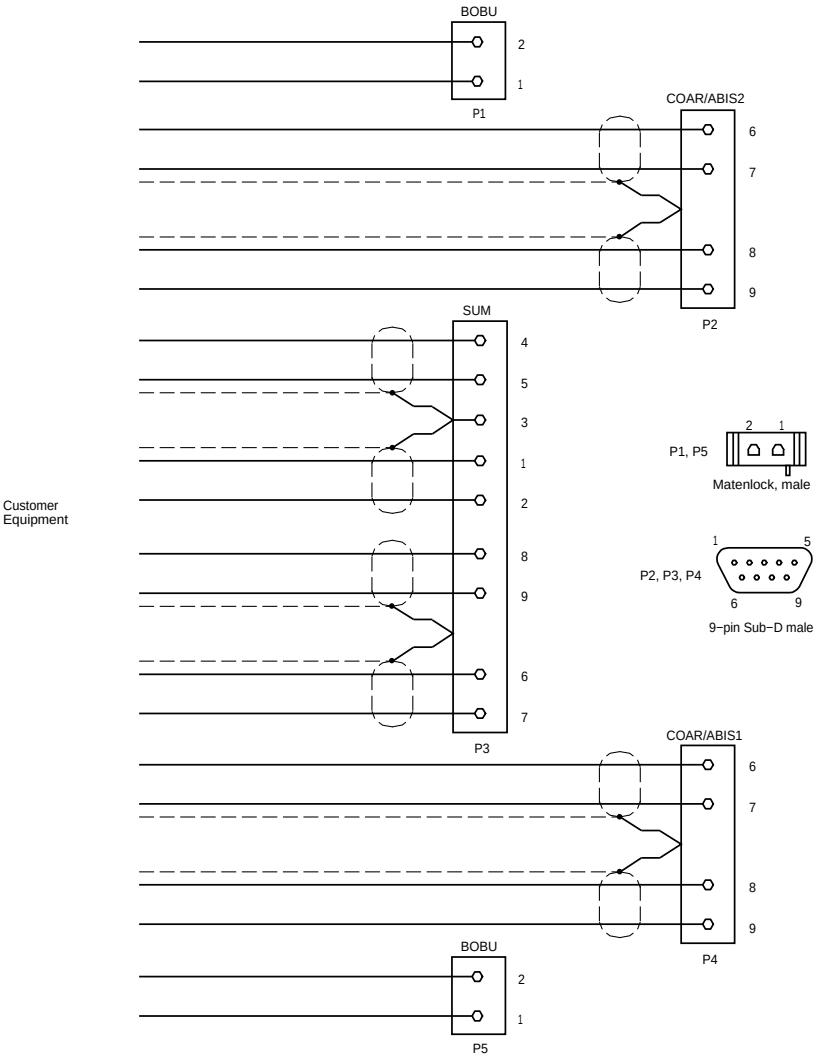


Figure 549: CA-ONCCx Type 1 Connections

17.1.44.2 Type 2 Connections

The CA-ONCCx type 2 connections are shown in the following figure.

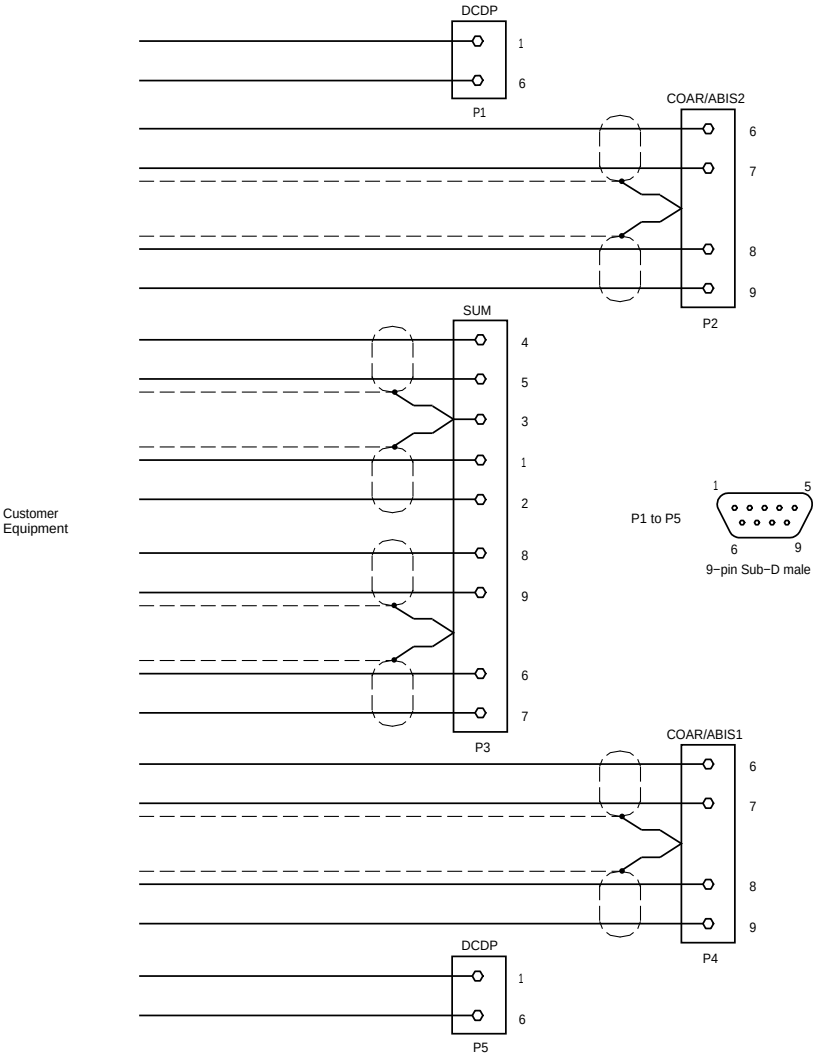


Figure 550: CA-ONCCx Type 2 Connections

17.1.44.3 Type 3 Connections

The CA-ONCCx type 3 connections are shown in the following figure.

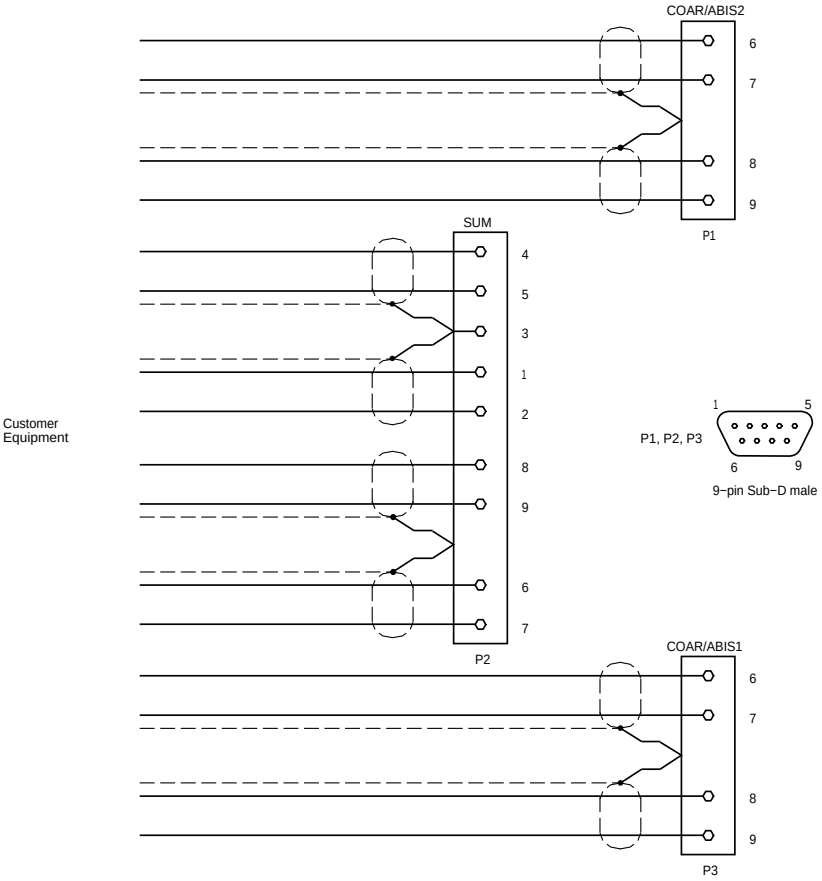


Figure 551: CA-ONCCx Type 3 Connections

17.1.45 CA-OSCP1

The CA-OSCP1 (part number 3BK 08095) cable connections are shown in the following figure.

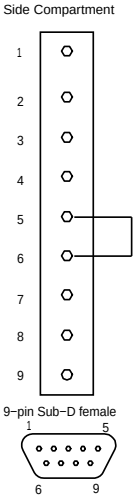


Figure 552: CA-OSCP1 Connections

17.1.46 CA-OSCP2

The CA-OSCP2 (part number 3BK 08096) cable connections are shown in the following figure.

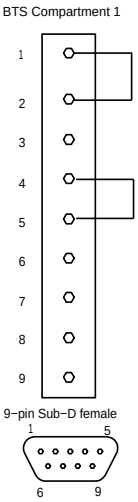


Figure 553: CA-OSCP2 Connections

17.1.47 CA-OSCP3

The CA-OSCP3 (part number 3BK 25548) cable connections are shown in the following figure.

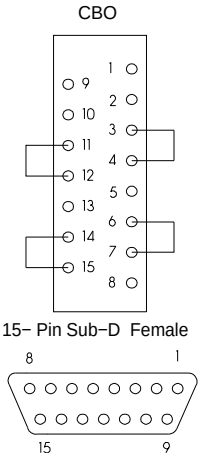


Figure 554: CA-OSCP3 Connections

17.1.48 CA-OSPC

The CA-OSPC (part number 3BK 08079) connections are shown in the following figure.

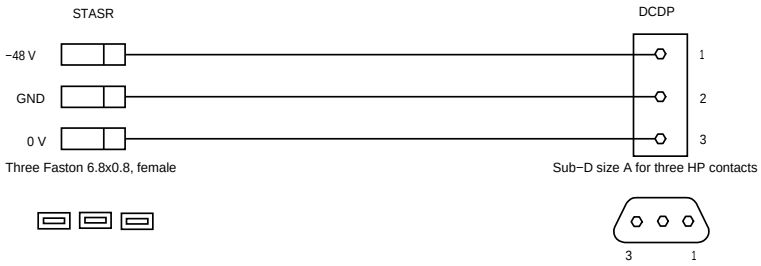


Figure 555: CA-OSPC Connections

17.1.49 CA-PCAN, CA-PCAP

The CA-PCAN (part number 3BK 25115) and the CA-PCAP (part number 3BK 25114) connections are shown in the following figure.

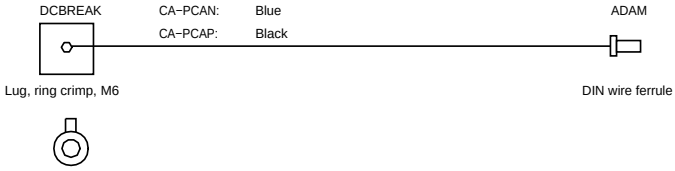


Figure 556: CA-PCAN, CA-PCAP Connections

17.1.50 CA-PCOS

The CA-PCOS (part number 3BK 08809) connections are shown in the following figure.

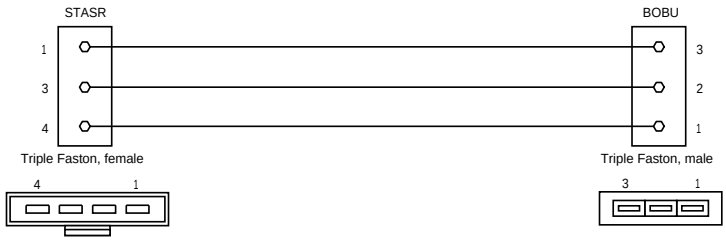


Figure 557: CA-PCOS Connections

17.1.51 CA-PDCM, CA-PDCP

The CA-PDCM (part number 3BK 25232) connections and the CA-PDCP (part number 3BK 25231) connections are shown in the following figure.

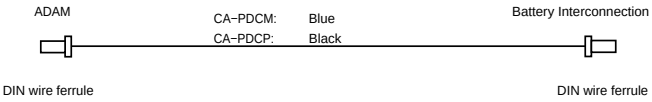


Figure 558: CA-PDCM, CA-PDCP Connections

17.1.52 CA-RFMW

The CA-RFMW (part number 3BK 07931) connections are shown in the following figure.

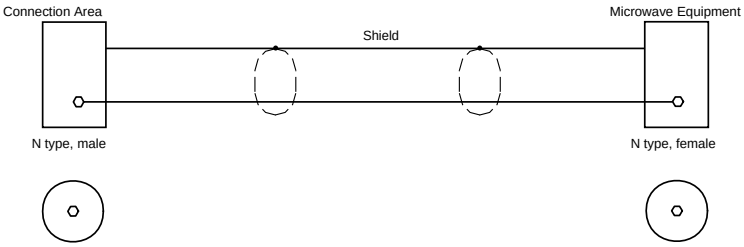
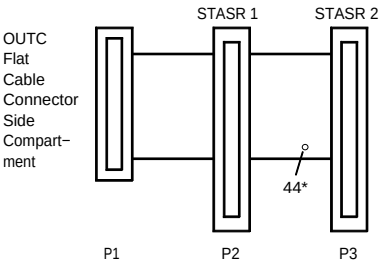


Figure 559: CA-RFMW Connections

17.1.53 CA-RIBCO

The connections for the CA-RIBCO (part number 3BK 26347) are shown in the following figure.

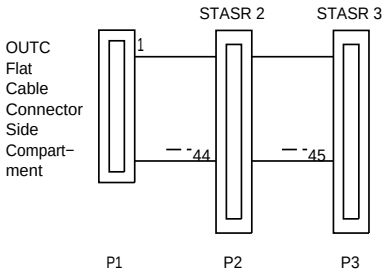


* :	Break wire for coding purposes
P1 :	Flat cable connector, 50 pins, female
P2/P3 :	DIN 41612, 64 pins, row A and only, female

Figure 560: CA-RIBCO Connections

17.1.54 CA-RICPT1

The connections for the CA-RICPT1 (part number 3BK 25537) are shown in the following figure.

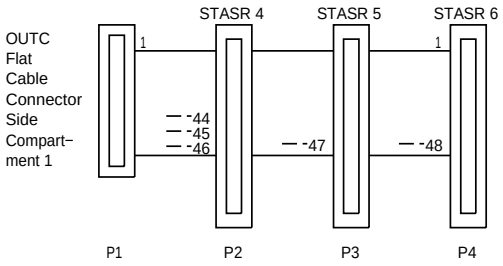


— -	Break wire for coding purposes
P1 :	Flat cable connector, 50 pins, female
P2/P3 :	DIN 41612, 64 pins, row A and C only, female

Figure 561: CA-RICPT1 Connections

17.1.55 CA-RICPT2

The connections for the CA-RICPT2 (part number 3BK 25538) are shown in the following figure.

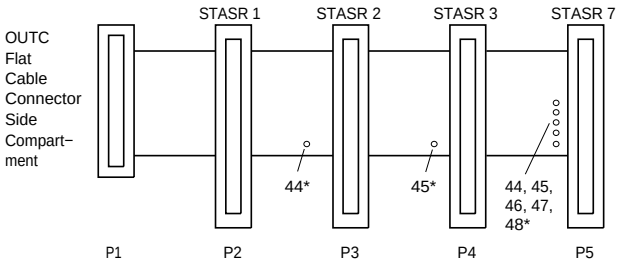


— -	Break wire for coding purposes
P1 :	Flat cable connector, 50 pins, female
P2/P4 :	DIN 41612, 64 pins, row A and only, female

Figure 562: CA-RICPT2 Connections

17.1.56 CA-RIMO1

The connections for the CA-RIMO1 (part number 3BK 25822) are shown in the following figure.

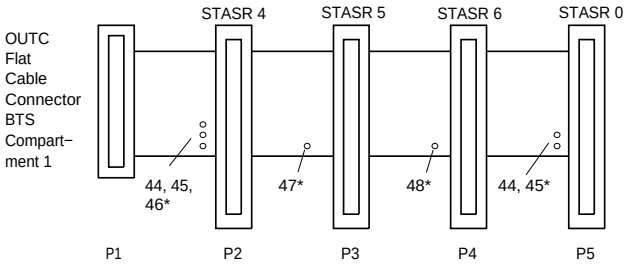


* : Break wire for coding purposes
P1 : Flat cable connector, 50 pins, female
P2/P5 : DIN 41612, 64 pins, row A and only, female

Figure 563: CA-RIMO1 Connections

17.1.57 CA-RIMO2

The connections for the CA-RIMO2 (part number 3BK 25823) are shown in the following figure.



* : Break wire for coding purposes
P1 : Flat cable connector, 50 pins, female
P2/P5 : DIN 41612, 64 pins, row A and only, female

Figure 564: CA-RIMO2 Connections

17.1.58 CA-SENSP

The CA-SENSP (part number 3BK 26147) connections are shown in the following figure.

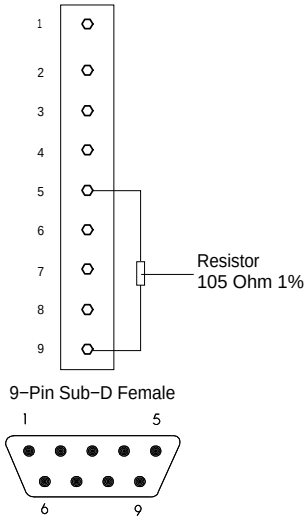


Figure 565: CA-SENSP Connections

17.1.59 CA-XBCBO

The CA-XBCBO (part number 3BK 08205) connections are shown in the following figure.

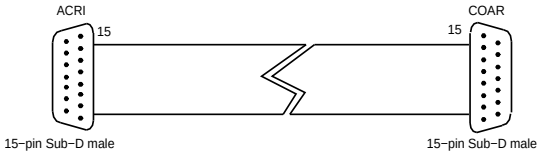


Figure 566: CA-XBCBO Connections

17.1.60 CA-XIOC

The CA-XIOC (part number 3BK 26353) connections are shown in the following figure.

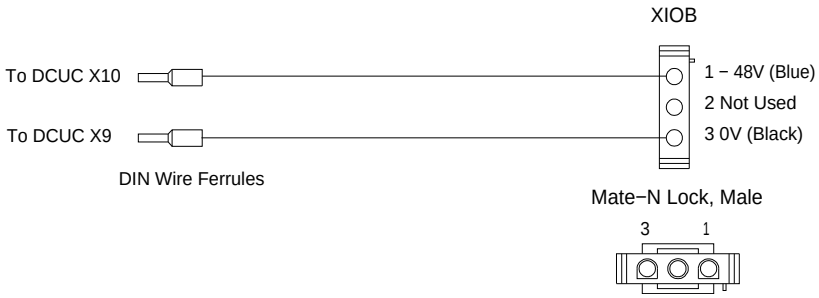


Figure 567: CA-XIOC Connections

17.1.61 CA-XIOPC

The CA-XIOPC (part number 3BK 08087) connections are shown in the following figure.

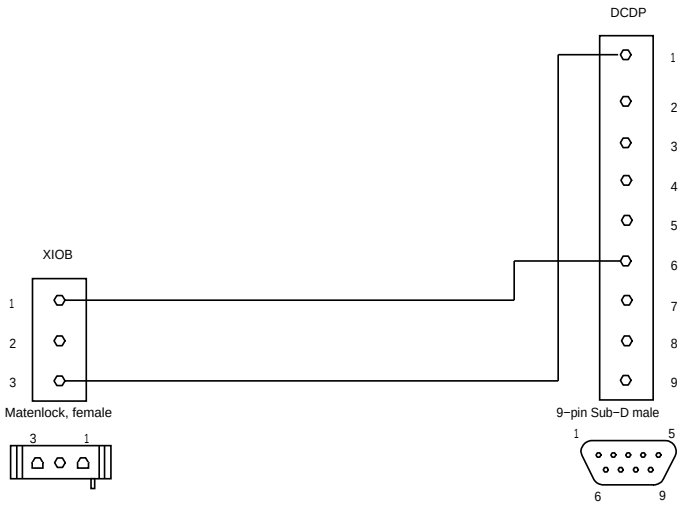


Figure 568: CA-XIOPC Connections

17.1.62 CIMA Bus Bar

The CIMA (part number 3BK 07762) bus bar connections are shown in the following figure.

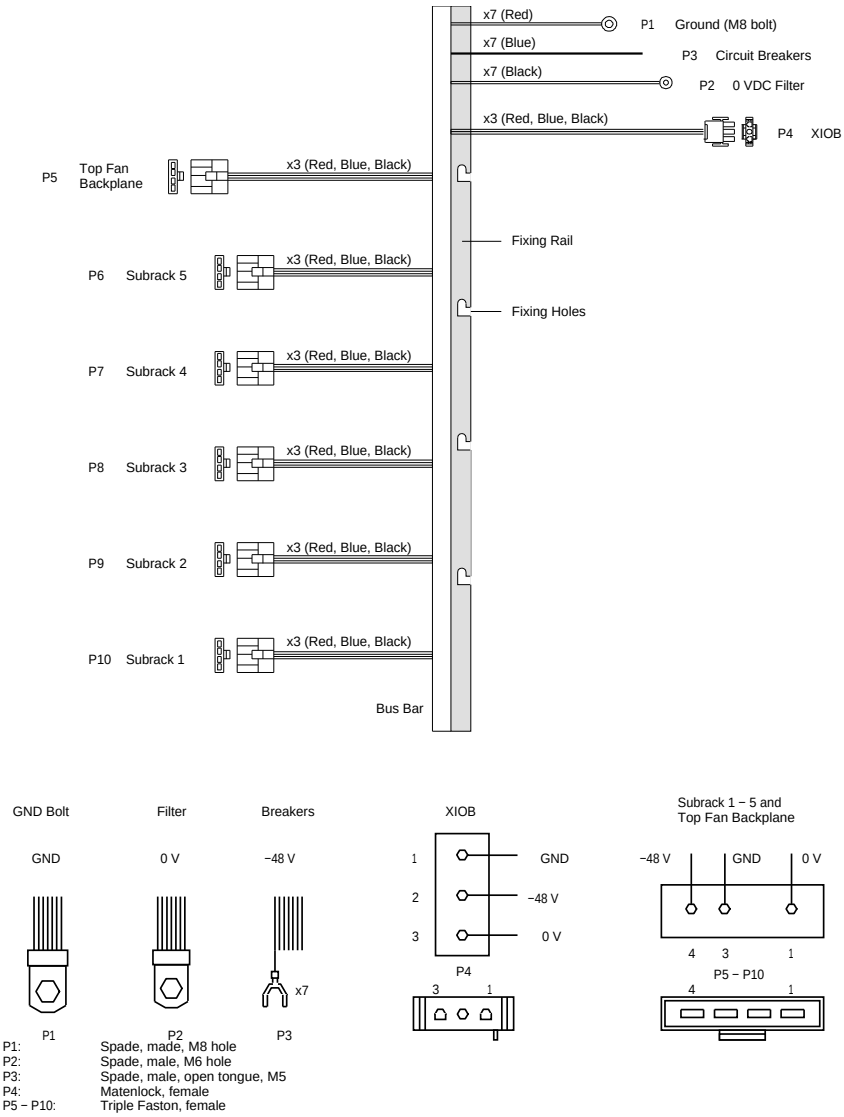


Figure 569: CIMA Bus Bar Connections

17.1.63 CIMI Bus Bar

The CIMI (part number 3BK 07763) bus bar connections are shown in the following figure.

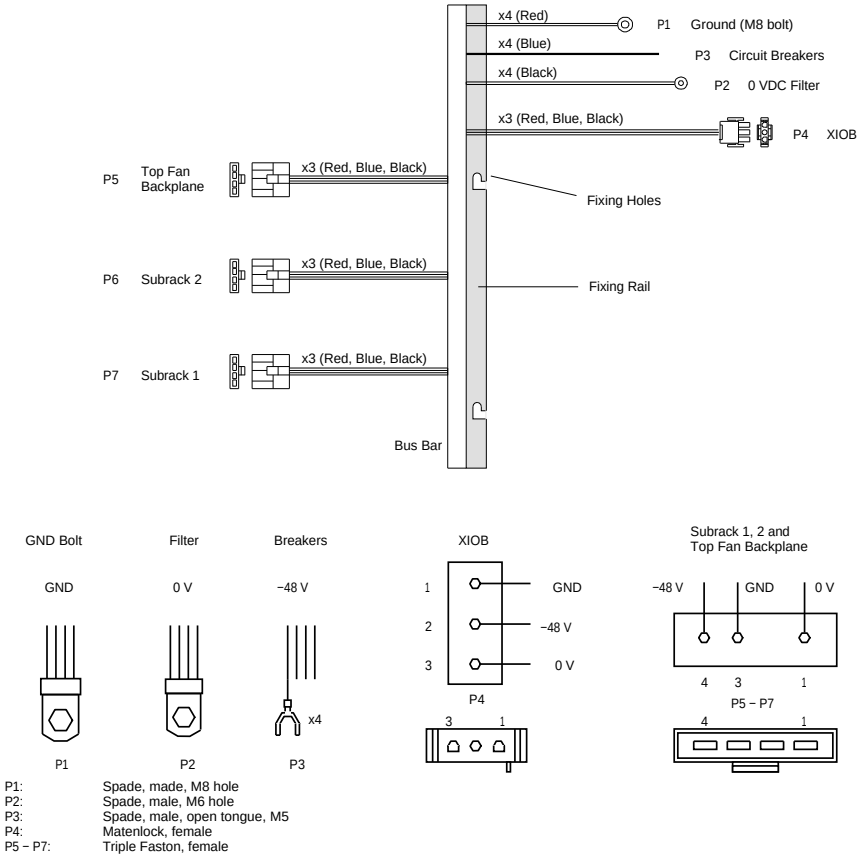
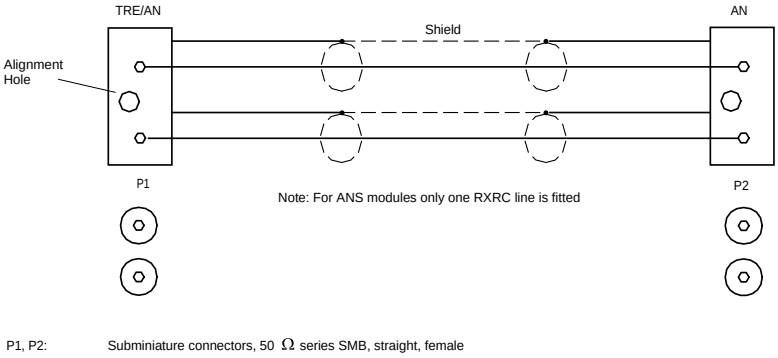


Figure 570: CIMI Bus Bar Connections

17.1.64 RXRC

The RXRC (part number 3BK 07920) connections are shown in the following figure.



P1, P2: Subminiature connectors, 50 Ω series SMB, straight, female

Figure 571: RXRC Connections

17.1.65 TXRC

The TXRC (part number 3BK 07919) connections are shown in the following figure.

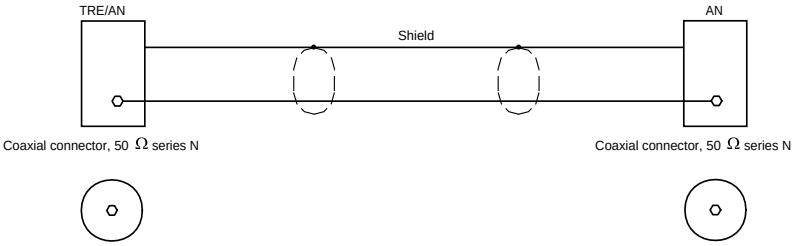


Figure 572: TXRC Connections

17.2 External Cables

The physical and electrical characteristics for the indoor and outdoor external cables are given in the following sections.

17.2.1 CA01

The CA01 (part number 3BK 07594) Abis cable connections are shown in the following figure.

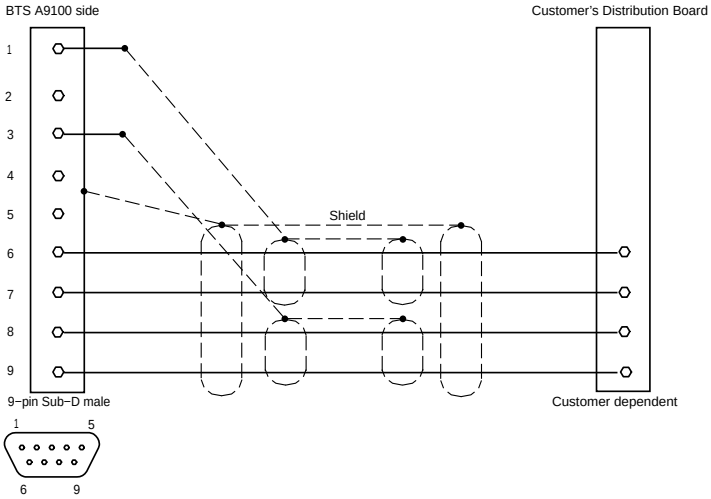


Figure 573: CA01 Connections

17.2.2 CA02

The CA02 (part number 3BK 07595) Abis cable connections are shown in the following figure.

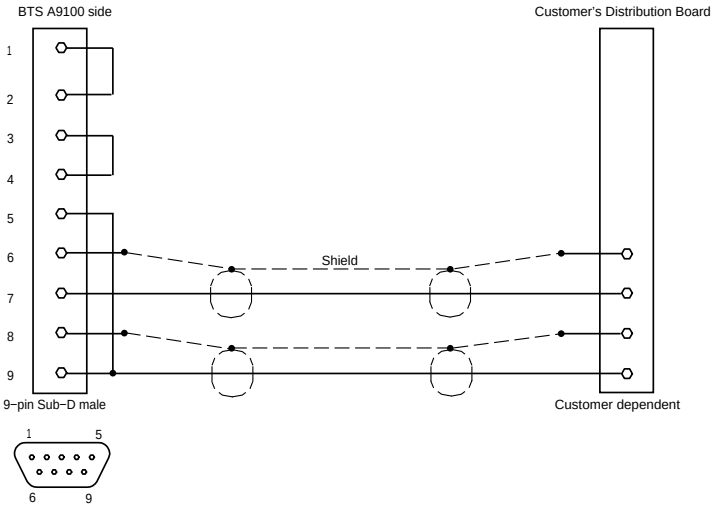


Figure 574: CA02 Connections

17.2.3 CA03

The CA03 (part number 3BK 07596) Abis cable connections are shown in the following figure.

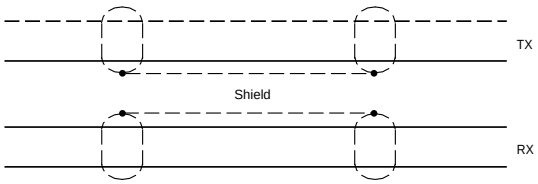


Figure 575: CA03 Connections

17.2.4 CA04

The CA04 (part number 3BK 07597) Abis cable connections are shown in the following figure.

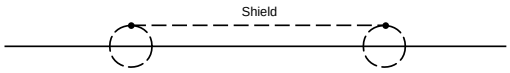


Figure 576: CA04 Connections

17.2.5 CA-CBTE

The CA-CBTE (part number 3BK 07951) cable connections are shown in the following figure.

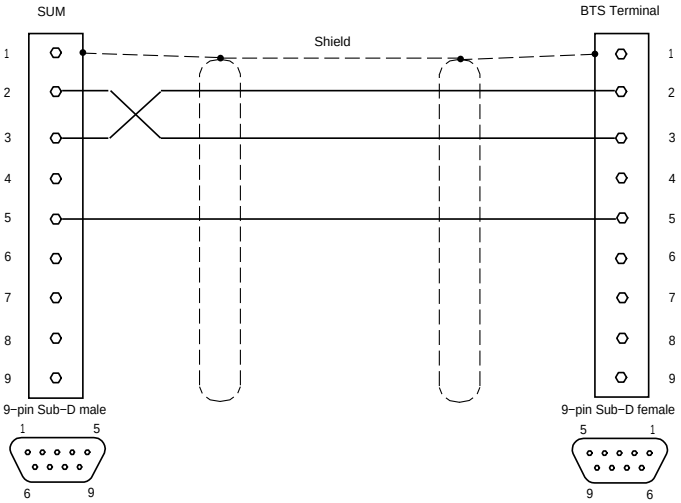


Figure 577: CA-CBTE Connections

17.2.6 CA-GC35

The CA-GC35 (part number 3BK 08031) cable connections are shown in the following figure.

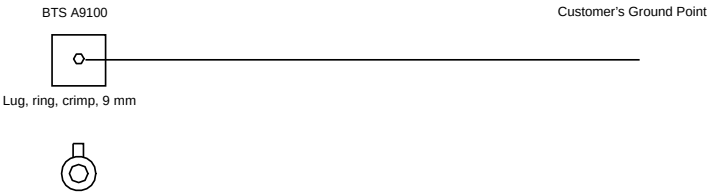


Figure 578: CA-GC35 Connections

17.2.7 CA-GND

The CA-GND (part number 3BK 25349) cable connection is shown in the following figure.

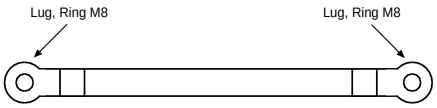


Figure 579: CA-GND Connection

17.2.8 CA-PC2W16

The CA-PC2W16 (part number 3BK 08029) cable connections are shown in the following figure.

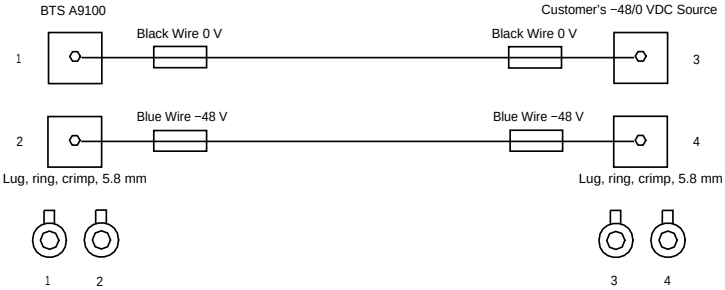


Figure 580: CA-PC2W16 Connections

17.2.9 CA-PC35BK

The CA-PC35BL (part number 3BK 08032) cable connections are shown in the following figure.



Figure 581: CA-PC35BK Connections

17.2.10 CA-PC35BL

The CA-PC35BL (part number 3BK 08032) cable connections are shown in the following figure.

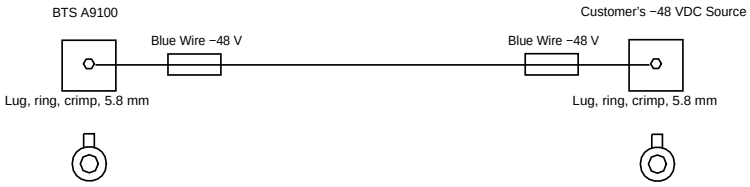


Figure 582: CA-PC35BL Connections

17.2.11 CA-PCEBM

The CA-PCEBM (part number 3BK 25260) cable connection is shown in the following figure.

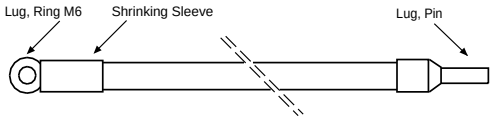


Figure 583: CA-PCEBM Connection

17.2.12 CA-PCEBP

The CA-PCEBP (part number 3BK 25259) cable connection is shown in the following figure.

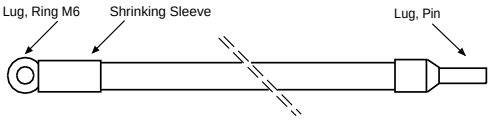


Figure 584: CA-PCEBP Connection

17.2.13 CA-RIBEB

The CA-RIBEB (part number 3BK 25258) cable connections are shown in the following figure.

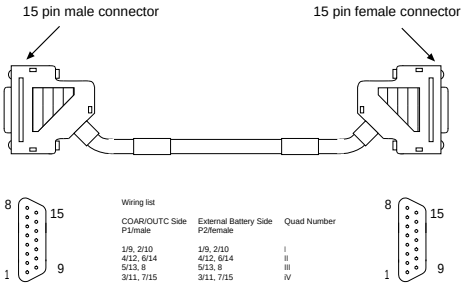


Figure 585: CA-RIBEB Connections

17.2.14 CA-RIBEO

The CA-RIBEO (part number 3BK 26138) cable connections are shown in the following figure.

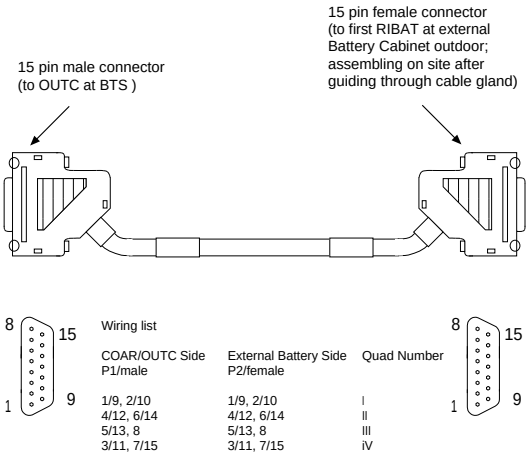


Figure 586: CA-RIBEO Connections

17.2.15 OCC23

The OCC23 (part number 3BK 08303) cable connections are shown in the following figure.

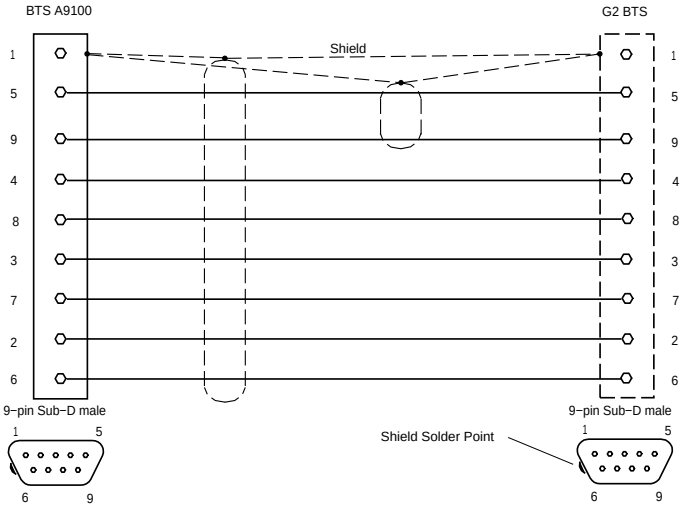


Figure 587: OCC23 Connections

17.2.16 OCC33

The OCC33 (part number 3BK 08304) cable connections are shown in the following figure.

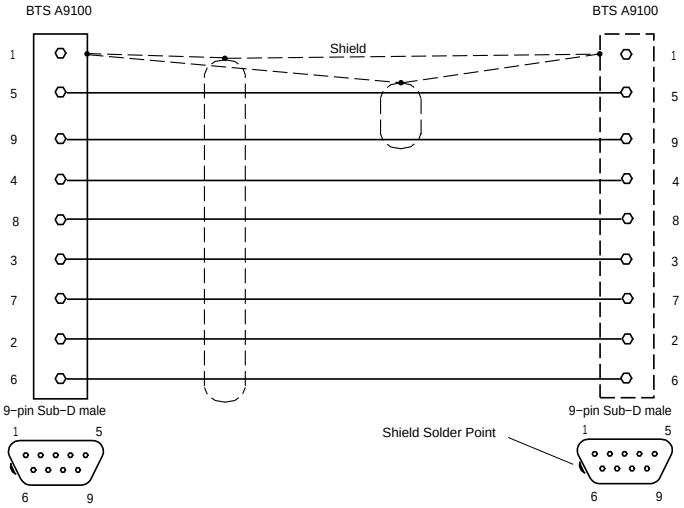


Figure 588: OCC33 Connections

17.2.17 SCG2/3

The SCG2/3 (part number 3BK 08101) cable connections are shown in the following figure.

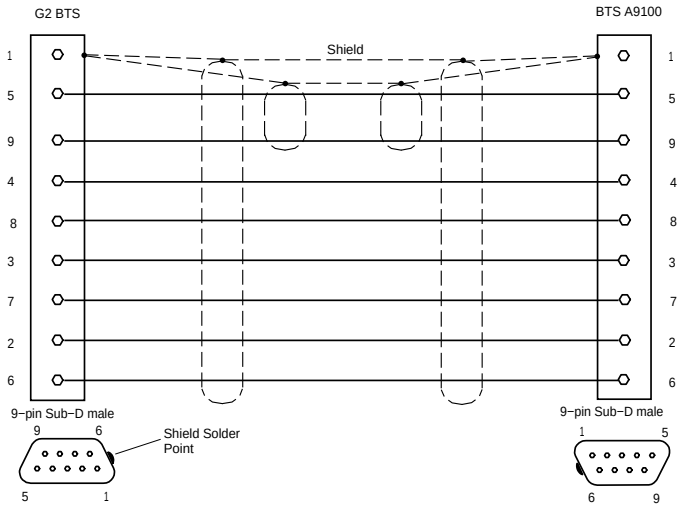


Figure 589: SCG2/3 Connections

17.2.18 SCG3

The SCG3 (part number 3BK 07950) cable connections are shown in the following figure.

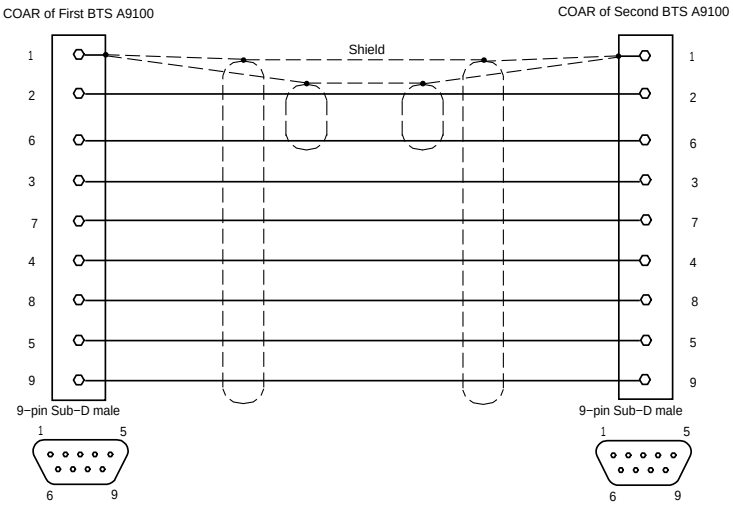
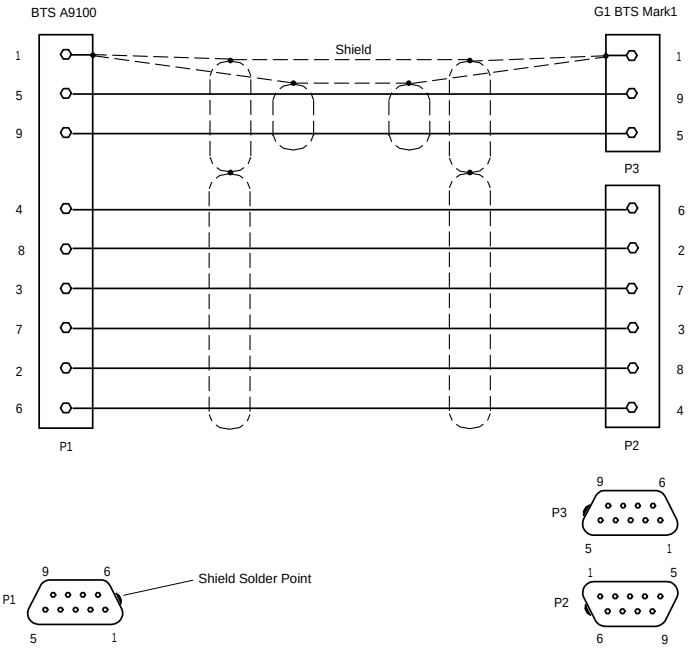


Figure 590: SCG3 Connections

17.2.19 SCM1/3

The SCM1/3 (part number 3BK 08102) cable connections are shown in the following figure.



P1, P2, P3: 9−pin Sub−D male

Figure 591: SCM1/3 Connections

17.2.20 SCM2/3

The SCM2/3 (part number 3BK 08103) cable connections are shown in the following figure.

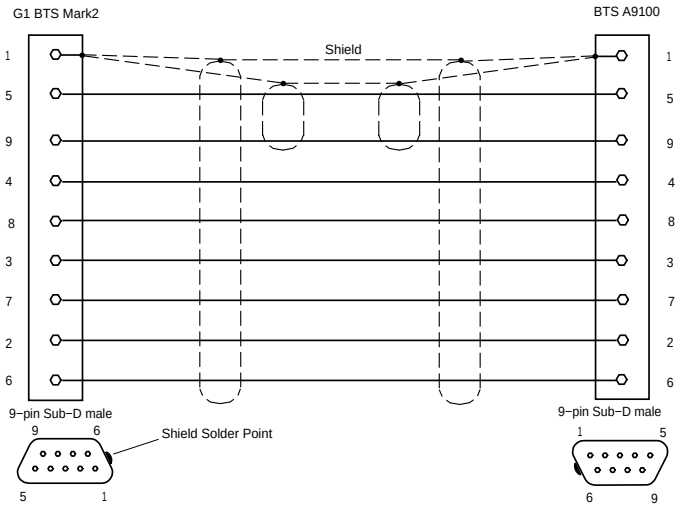


Figure 592: SCM2/3 Connections

18 Environment

The sections are supported with data tables, where necessary. References to the relevant European and International standards are also given, when appropriate.

18.1 Indoor Climatic and Mechanical Conditions

This section describes the climatic and mechanical conditions required for the safe and efficient operation of indoor BTS A9100 equipment.

It includes information on the following:

- Environmental requirements
- Operational conditions
- Transportation conditions
- Storage conditions.

18.1.1 Environmental Requirements

The BTS A9100 equipment housings provide the necessary environmental and safety protection according to the standard ETS 300 019, for indoor equipment.

18.1.2 Operational Conditions

Operational conditions are specified in accordance with Class 3.1E, ETS 300 019-1-3, as shown in the following table.

Type	Condition	Limit
Climatic	Low temperature	-5° C
	High temperature	+45° C
	Low relative humidity	5 %
	High relative humidity	90 %
	Low absolute humidity	1 g/ m^3
	High absolute humidity	25 g/ m^3
	Rate of change of temperature	0.5° C/ min
	Low air pressure	70 kPa
	High air pressure	106 kPa
Mechanical	Displacement amplitude in Frequency Range 2-9 Hz	0.3 mm p-p
(Vibration)	Acceleration amplitude in Frequency Range 9-200 Hz	0.1 m/ s^2
Shock	-	40 m/ s^2

Table 173: Environmental Conditions for Indoor Operation

18.1.3 Transportation Conditions

Transportation conditions are specified in accordance with Class2.2, ETS 300 019 -1-2, as shown in the following table.

Type	Condition	Limit
Climatic	Low temperature	-40° C
	High temperature	+70° C
	High relative humidity	95 %
	High absolute humidity	60 g/ m^3
	Low air pressure	70 kPa
Mechanical	Displacement amplitude (frequency 2- 9 Hz)	3.5 mm
	Acceleration amplitude (frequency 9-200 Hz)	10 m/ s^2
	Acceleration amplitude (frequency 200-500 Hz)	15 m/ s^2
	Free Fall	100 mm
	Steady State Acceleration	20 m/ s^2
	Static Load	5 kPa

Table 174: Environmental Conditions for Transportation

18.1.4 Storage Conditions

Storage conditions are specified in accordance with Class 1.2, ETS 300 019-1 -1, as shown in the following table.

Type	Condition	Limit
Climatic	Low temperature	-25° C
	High temperature	+55° C
	Low relative humidity	10 %
	High relative humidity	100 %
	Low absolute humidity	0.5 g/ m^3
	High absolute humidity	29 g/ m^3
	Low air pressure	70 kPa
	High air pressure	106 kPa
Mechanical	Displacement amplitude (frequency 2 - 9 Hz)	1.5 mm
	Acceleration amplitude (frequency 9 - 200 Hz)	5 m/ s^2
	Steady State Acceleration	40 m/ s^2
	Static Load	5 kPa

Table 175: Environmental Conditions for Storage

18.2 Outdoor Climatic and Mechanical Conditions

This section describes the climatic and mechanical conditions required for the safe and efficient operation of outdoor BTS A9100 equipment.

It includes information on the following:

- Environmental requirements
- Operational conditions
- Transportation conditions
- Storage conditions.

18.2.1 Environmental Requirements

The BTS A9100 equipment housings provide the necessary environmental and safety protection according to the standard ETS 300 019, for outdoor equipment.

18.2.2 Operational Conditions

Operational conditions are specified in accordance with Class 4.1E, ETS 300 019-1 -4, as shown in the following table.

Type	Condition	Limit
Climatic	Low temperature	-45° C
	High temperature	+45° C
	Low relative humidity	8 %
	High relative humidity	100 %
	Low absolute humidity	0.26 g/ m^3
	High absolute humidity	30 g/ m^3
	Rate of change of temperature	0.5° C/ min
	Low air pressure	70 kPa
	High air pressure	106 kPa
Mechanical	Displacement amplitude in Frequency Range 2-9 Hz	1.5 mm p-p
(Vibration)	Acceleration amplitude in Frequency Range 9-200 Hz	5 m/ s^2
Shock	-	70 m/ s^2

Table 176: Environmental Conditions for Outdoor Operation

18.2.3 Transportation Conditions

Transportation conditions are specified in accordance with Class2.2, ETS 300 019 -1-2, as shown in the following table.

Type	Condition	Limit
Climatic	Low temperature	-40° C
	High temperature	+70° C
	High relative humidity	95 %
	High absolute humidity	60 g/ m^3
	Low air pressure	70 kPa
Mechanical	Displacement amplitude (frequency 2 - 9 Hz)	3.5 mm
	Acceleration amplitude (frequency 9-200 Hz)	10 m/ s^2
	Acceleration amplitude (frequency 200-500 Hz)	15 m/ s^2
	Free Fall	100 mm
	Steady State Acceleration	20 m/ s^2
	Static Load	5 kPa

Table 177: Environmental Conditions for Transportation

18.2.4 Storage Conditions

Storage conditions are specified in accordance with Class 1.2, ETS 300 019-1 -1, as shown in the following table.

Type	Condition	Limit
Climatic	Low temperature	-25° C
	High temperature	+55° C
	Low relative humidity	10 %
	High relative humidity	100 %
	Low absolute humidity	0.5 g/ m^3
	High absolute humidity	29 g/ m^3
	Low air pressure	70 kPa
	High air pressure	106 kPa
Mechanical	Displacement amplitude (frequency 2 - 9 Hz)	1.5 mm
	Acceleration amplitude (frequency 9 - 200 Hz)	5 m/ s^2
	Steady State Acceleration	40 m/ s^2
	Static Load	5 kPa

Table 178: Environmental Conditions for Storage

18.3 Electromagnetic Compatibility

This section describes the EMC compatibility of BTS A9100 equipment.

It provides information on the following:

- EMC immunity
- Transient bursts
- Spurious emissions.

BTS A9100 equipment complies with the following EMC standards:

- European Directive 89/336/EEC
- ETS 300 342 Part 2, and Draft ETSI EN 300 342 Part 2.

18.3.1 EMC Immunity

This section contains information on EMC immunity. EMC immunity ensures the normal operation of BTS A9100 equipment when subjected to the conditions specified in the following table.

Parameter	Standard
Electrostatic Discharge	IEC 1000-4-2: Levels 2 and 3.
RF Common Mode	IEC 1000-4-6: 3 Vrms 150 kHz to 80 MHz.
Radiated Fields	IEC 1000-4-3: 3 V/ m, 80 MHz to 1 GHz (+ 1.8 GHz excepted reception band).
Transient Pulse Immunity	IEC 1000-4-4: Levels 2 and 3 (see Table *Permitted Transient Bursts (180)*). ETS 300 342-2.
Surges (on AC lines)	IEC 1000-4-5: level 500 V at differential mode; level 1 kV at common mode. Note that all outdoor Evolium™ BTS A9100 external lines have better surge protection characteristics than that defined in IEC 1000-4-5.

Table 179: EMC Immunity

18.3.2 Transient Bursts

The following table shows the IEC 1000-4-4 Levels 2 and 3 transient voltage bursts. These are the voltage bursts that the different types of lines can withstand without causing permanent defects to the equipment.

Peak Amplitude	Level	Line Type
±2000 V	3	AC power lines
±1000 V	2	DC power lines
±500 V	2	Signal lines (including RF)

Table 180: Permitted Transient Bursts

Note: The amplitudes shown in the above table must not exceed 50 ns duration or have a rise time of less than 5 ns.

18.3.3 Spurious Emissions

Potential EMC emissions of BTS A9100 equipment (unintentionally produced) are shown in the following table.

Type	Standard	Frequency Range
Conducted Emissions on Power Lines:	EN 55022 Class B (AC powered BTS) EN 55022 Class A (DC powered BTS)	150 kHz - 30 MHz
Radiated Emissions from Enclosure:	GSM 11.21	30 MHz - 4 GHz

Table 181: EMC Emissions

18.4 Acoustic Noise

This section describes the acoustic noise parameters which apply to BTS A9100 equipment. The acoustic noise generated by the equipment is measured according to ISO 7779 and ISO 9296. Noise limits for the measurements are in accordance with GSM 11.22 and ETS 300 753, respectively.

18.5 Safety Requirements

Safety standards cover protection against:

- Electric shock
- Skin burns
- Radio frequency radiation hazards
- Fire hazards
- Mechanical hazards
- Energy hazards
- Chemical hazards.

The indoor and outdoor BTS are compliant with the following safety standards:

- **Indoor BTS**
  EN60215 - Safety Requirements for Radio Transmitting Equipment
  EN60950 - Safety of Information Technology Equipment.
- **Outdoor BTS**
  EN60215 - Safety Requirements for Radio Transmitting Equipment
  EN60950 - Safety of Information Technology Equipment
  EN41003 - Safety Requirements for Apparatus for Connection to Telecommunications Networks
  ISO 3864 - Safety Colors and Safety Signs.