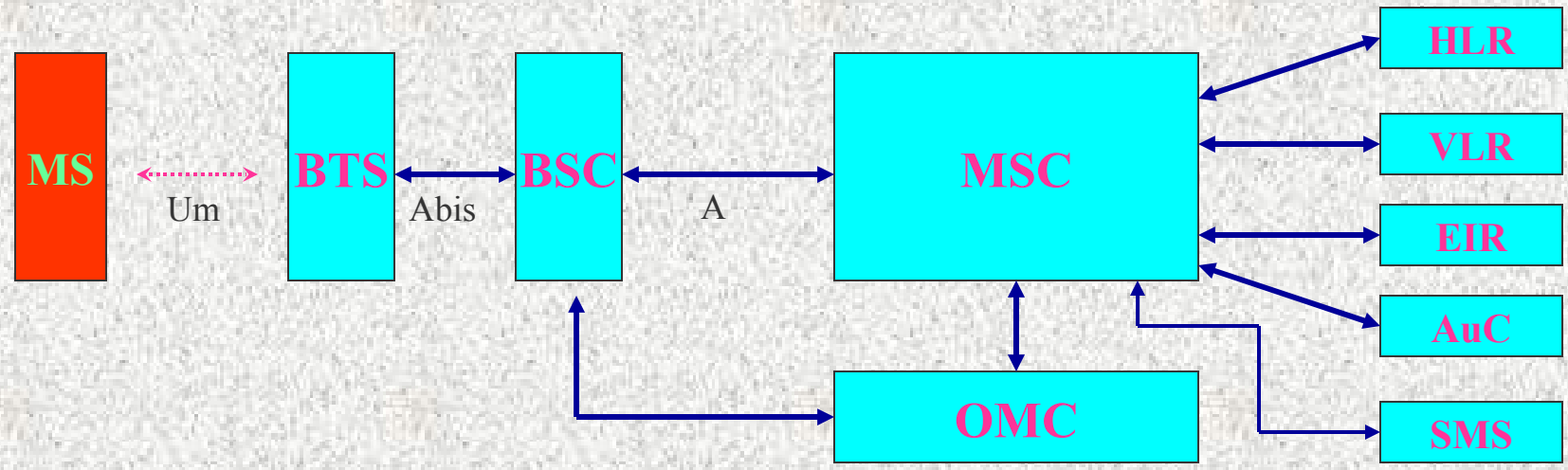
# “EVOLIUM BTS A9100”
# (Alcatel technology)

## Manufactured by

## M/s ITI Mankapur
## &
## M/s ITI Raebareli

# GSM Network Elements




**MS** Mobile Station.
**BTS** Base Transceiver Station
**BSC** Base Station Controller
**MSC** Mobile Services Switching Center.

**HLR** Home Location Register.
**VLR** Visitor Location Register.
**EIR** Equipment Identity Register
**AuC** Authentication Center.
**SMS** Short Message Service.

## 2.1 General characteristics

| G4 BTS – MBI | |
|---|---|
| Definition | |
| Network | GSM 850<br>or GSM 900,<br>or GSM 1800,<br>or GSM 1900,<br>or Multiband 900/1800 & 900/1900. |
| Cabinet | MBI3 or MBI5 |
| Number of sectors | Max. 3 in MBI3 cabinet,<br>Max. 4 in a MBI5 cabinet. |

# EVOLIUM A9100

# INDOOR-BTS

# (MBI5)

# EVOLIUM A9100

# INDOOR-BTS

# (MBI3)

**The BTS A9100's has modular design which allows following configurations:**

- **Omni Configuration,**
- **Sectorized Configuration and**
- **Multi Band Architecture.**

**- Configurations are built from a small primary components.**

## Quality of BTS.(as per Alcatel version)

- Very high radio performances, in particular
  - * Reception sensitivity, -111 dBm,
  - * Improved Output Power, (Standard 45 W),
- Radio (synthesizer) Frequency Hopping,
- Antenna Diversity (as standards option),
- Minimum Service Interruption
- Very High BTS availability
  - Due to Module Reliability
  - Due to System Architecture,
- Optimized software release migration. (Simultaneously stores two software-versions).

## Flexibility of BTS.

- Wide possibilities of extensions and sectorization, within the same cabinet, e.g., the MBO2 cabinet can accommodate up to six sectors with a twelve-TRX total capacity,

- Outdoor BTS modularity provides flexibility for other equipments (Transmission Equipment, Batteries, Microwave, DDF etc.),

- System Architecture and Cabinet for GSM 850, GSM 900, GSM 1800 and GSM 1900 remains the same,

- High modularity,

- Reduced set of modules and a common interface.

**Future Proof BTS.**

- GPRS Ready

- EDGE Ready by "add TRE" operation

- UMTS Ready: the MBI5 and MBO2 outdoor cabinet allow mixed configurations GSM + UMTS.

# EVOLIUM A9100

# INDOOR – BTS

# ( MBI3 )

# RACK & SUBRACK

- Rack Frame (1),
- Connection Shelf (1),
- STASR (3).

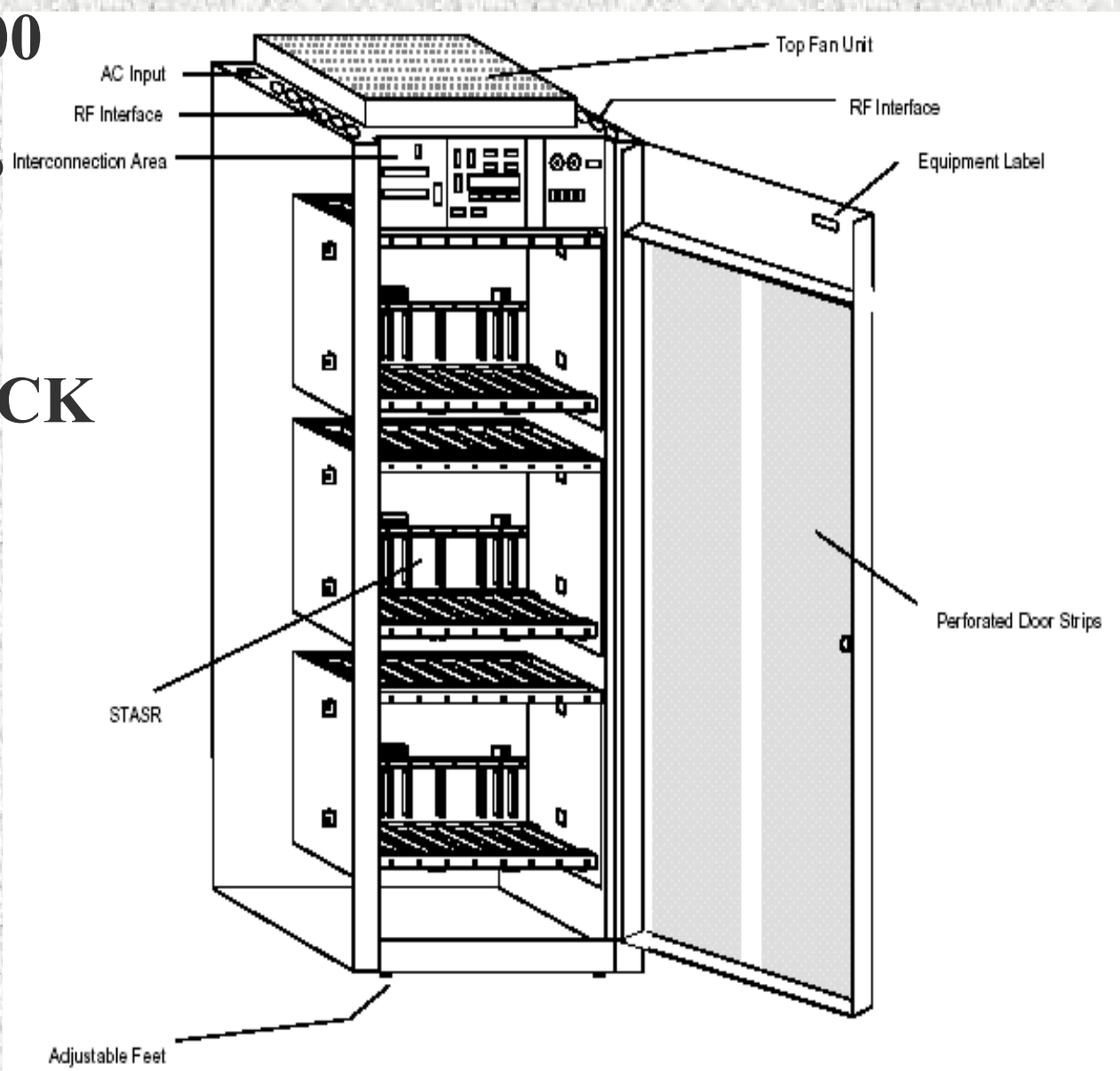



*Figure 196: MBI3 Equipped with Empty Subracks*

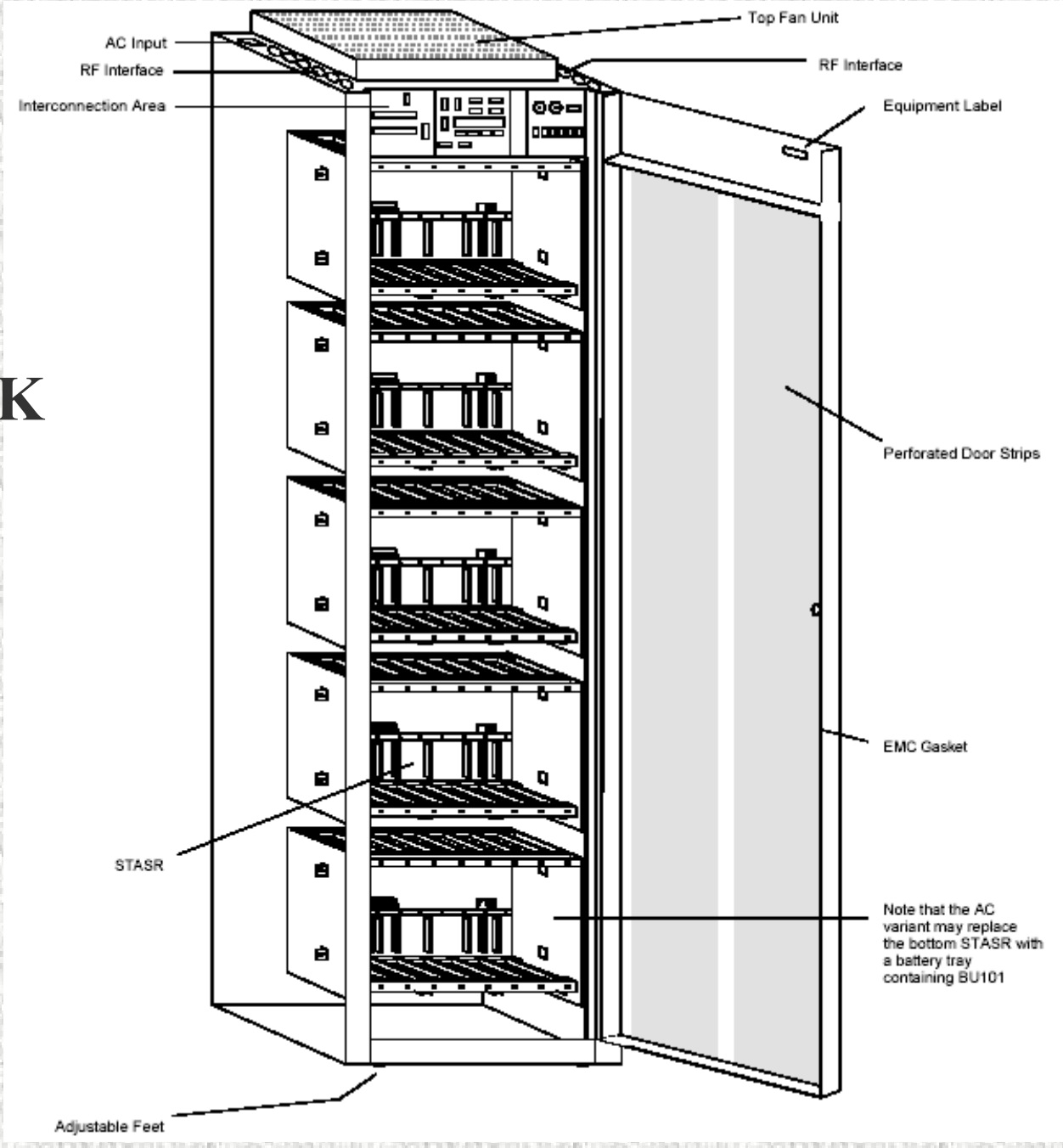
# EVOLIUM A9100

# INDOOR – BTS

# ( MBI5 )

# RACK & SUBRACK

- Rack Frame (1),
- Connection Shelf (1),
- STASR Shelf (5).



**MBI5:** Multistandard Base Station Indoor(5 shelves)

**STASR:** Standard Telecommunication Subrack

## 4. CABINET DESCRIPTION

### 4.1 Indoor cabinets description

Two types of indoor cabinets (also called racks) are available: the MBI3 cabinet, with three sub racks, and the MBI5 cabinet, with five sub-racks.

| External dimensions | MBI3 BTS | MBI5 BTS |
|---|---|---|
| Depth | 45 cm | 45 cm |
| Height | 130 cm | 194 cm |
| Width | 60 cm | 60 cm |
| Max. TRX capacity | 8 TRX | 12 TRX |

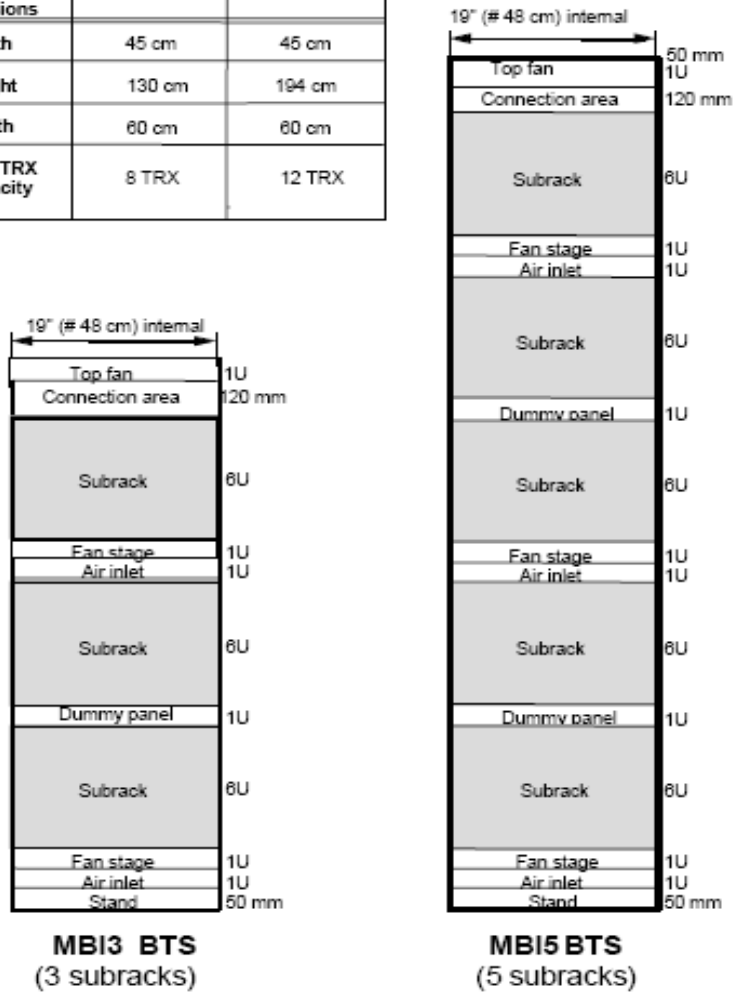



Figure 6: EVOLIUM™ indoor A9100 Base Stations

# STASR Subrack Dimensions

| 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 |

**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).

| Cabinet | Height Overall/Usable | Width Overall/Usable | Depth | Weight |
|---|---|---|---|---|
| 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 | 1500 mm/24 HU | 825 mm/84 WU | 750 mm | 95 kg not equipped w/o battery |
| MBO2/MBO2DC | 1500 mm/24 HU | 1500 mm/2 x 84 WU | 750 mm | 175 kg not equipped w/o battery |

# MBI3/MBI5 Module Positions

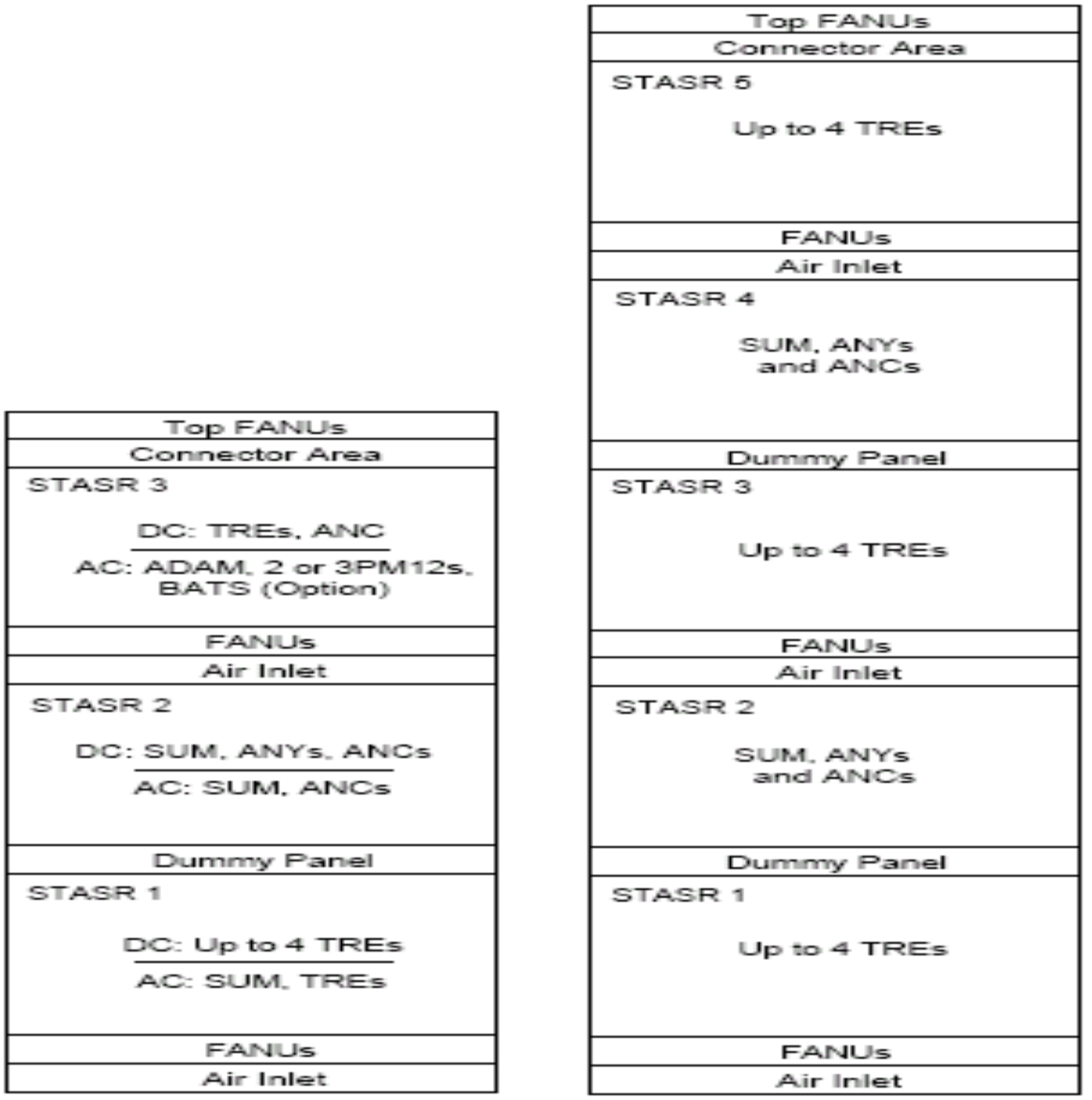



*Figure 195: MBI3/MBI5 Module Positions*

# EVOLIUM A9100 OUTDOOR – BTS (MBO2)

- MBO1 is half of this rack.

# OUTDOOR – BTS

# MBO1

- Battery Unit (BU90),
- Air Con. Unit,
- STASR (3),
- OPTIONAL,
- PM12 (1200W) (2).

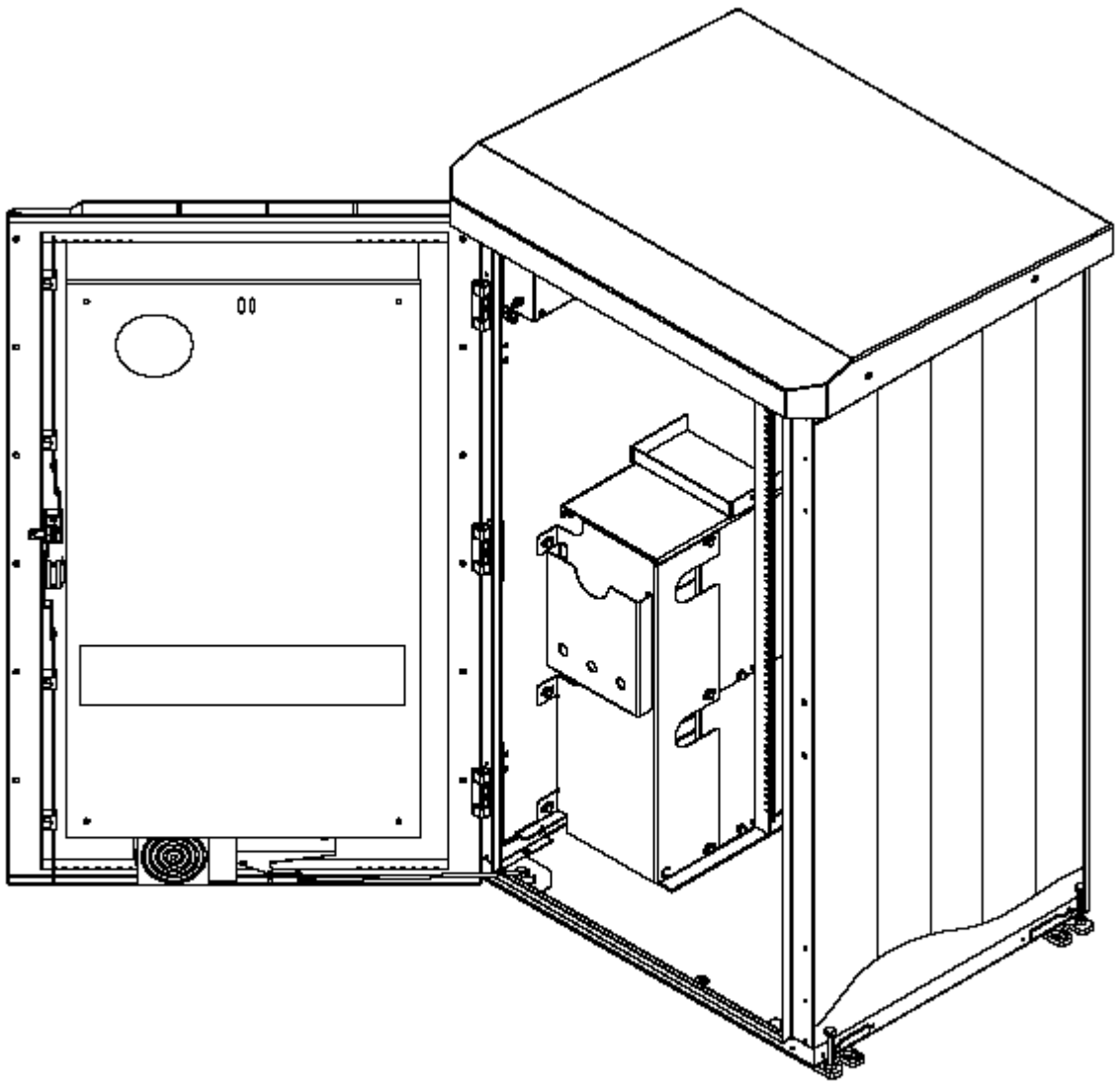


*Figure 220: Multistandard BTS Outdoor Cabinet Construction MBO1/MBO1DC*

# OUTDOOR – BTS MBO2 (MBO1+MBOE)

- Rack Frame (MBO1+MBOE),
- Battery Unit (BU90),
- Heat Exch. Unit,
- STASR (6),
- OPTIONAL,
- PM12 (1200W) (3).

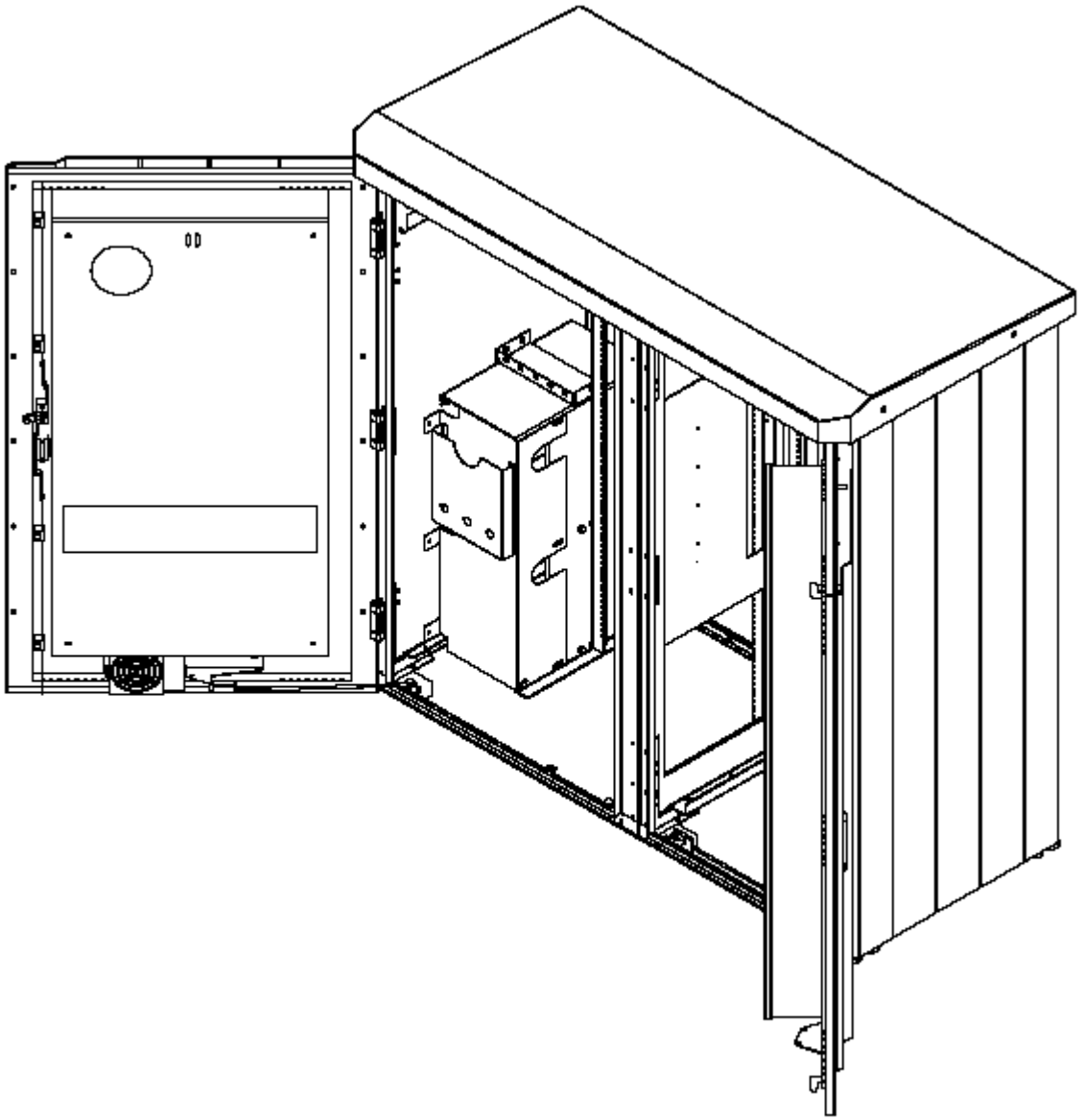


*Figure 221: Multistandard BTS Outdoor Cabinet Construction MBO2/MBO2DC*

# Multi Standard BTS OUTDOOR

| External dimensions | MBO1 BTS | MBO2 BTS |
|---|---|---|
| Depth | 74 cm | 74 cm |
| Height | 149 cm | 149 cm |
| Width | 90 cm | 152 cm |
| Max TRX capacity | 8 TRX | 12 TRX |

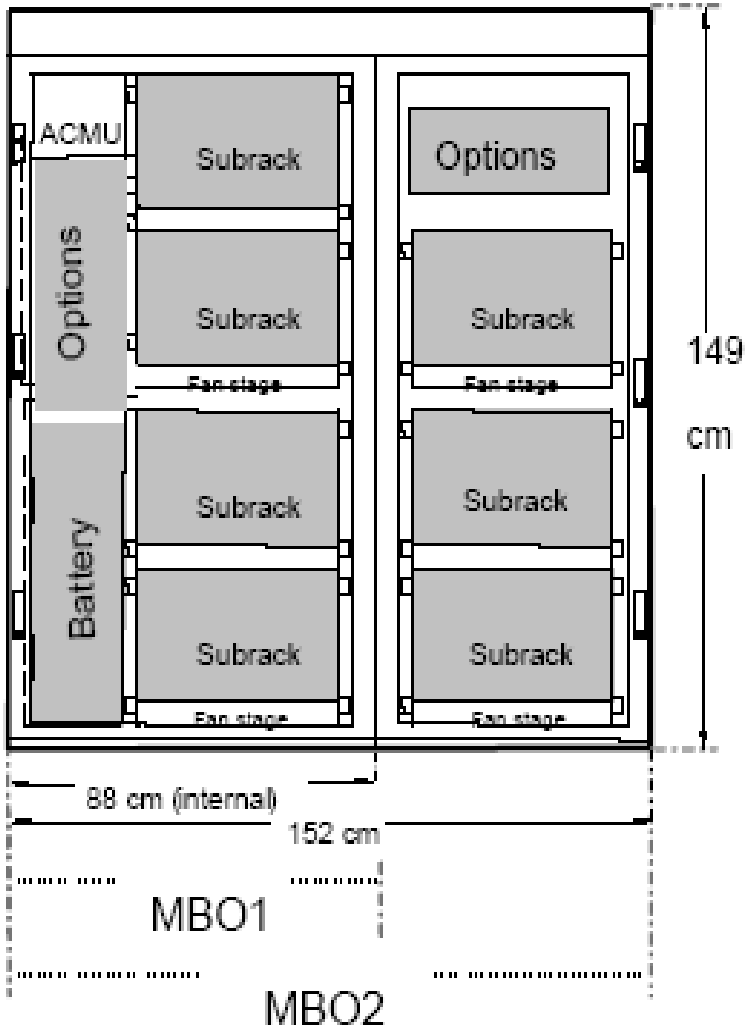
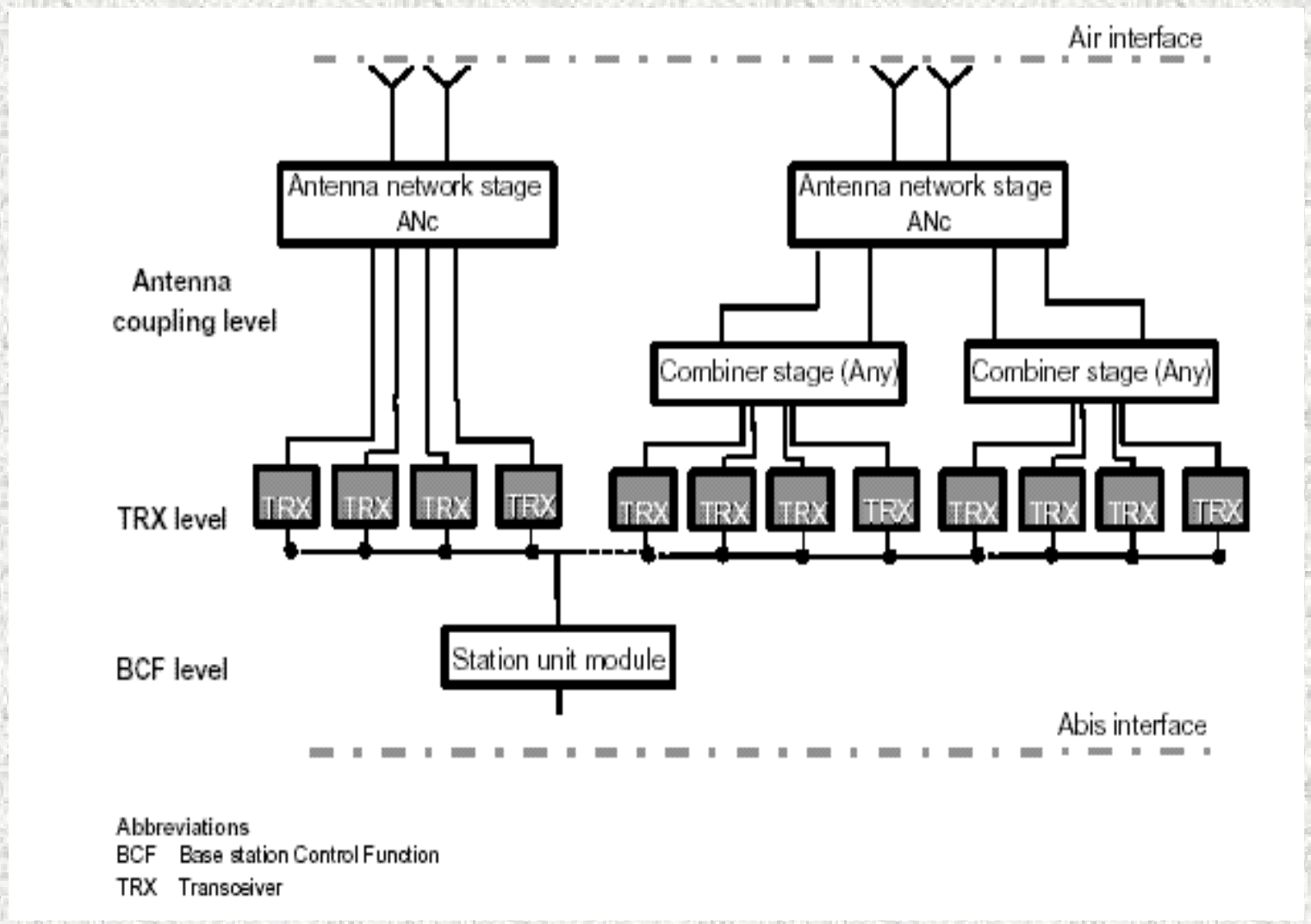



Figure 7: EVOLIUM™ outdoor A9100 Base Station

# BTS A9100 MBI5 MODULES/ CABLES

| S.No | MNEMO | MODULE PROD.CODE | ICS | ED_MOD |
|---|---|---|---|---|
| | | | | |
| 1 | MBI5 | 3BK25965AAAB | 01 | |
| 2 | KMBI5 | 3BK25980AAAB | | 03 |
| 3 | MSCA | 3BK26014AAAB | 01 | 02 |
| 4 | XIBM | 3BK26012AAAB | 02 | 03 |
| 5 | BTSRI5 | 3BK25974AAAA | 02 | 03 |
| 6 | DCBR5 | 3BK25978ABAA | 01 | 03 |
| 7 | MBU5 | 3BK25976AAAA | | |
| 8 | STASR | 3BK07193CAAB | 01 | 01 |
| 9 | TFBP | 3BK07659AAAA | 01 | |
| 10 | FACB | 3BK07202ABAA | 01 | 01 |
| 11 | FANU | 3BK07205AAAA | 01 | |
| 12 | CS04 | 3BK07600AAAA | 01 | 02A |
| 13 | CS05 | 3BK07199CAAB | 02 | 01 |
| 14 | SP2M | 3BK08949AAAA | / | |
| 15 | FC1U | 3BK07601AAAA | 01 | |
| 16 | CS03 | 3BK07599CAAA | 01 | 01 |
| 17 | L50N | 1AB125380002 | | |
| 18 | SUMA | 3BK08925AAAC | 04 | 02 |
| 19 | TRAG | 3BK08967ABAC | 02 | 04 |
| 20 | ANCG | 3BK08992AA | 02 | |

# A9100 Base Station Architecture (BTS)



# View of Connection Area

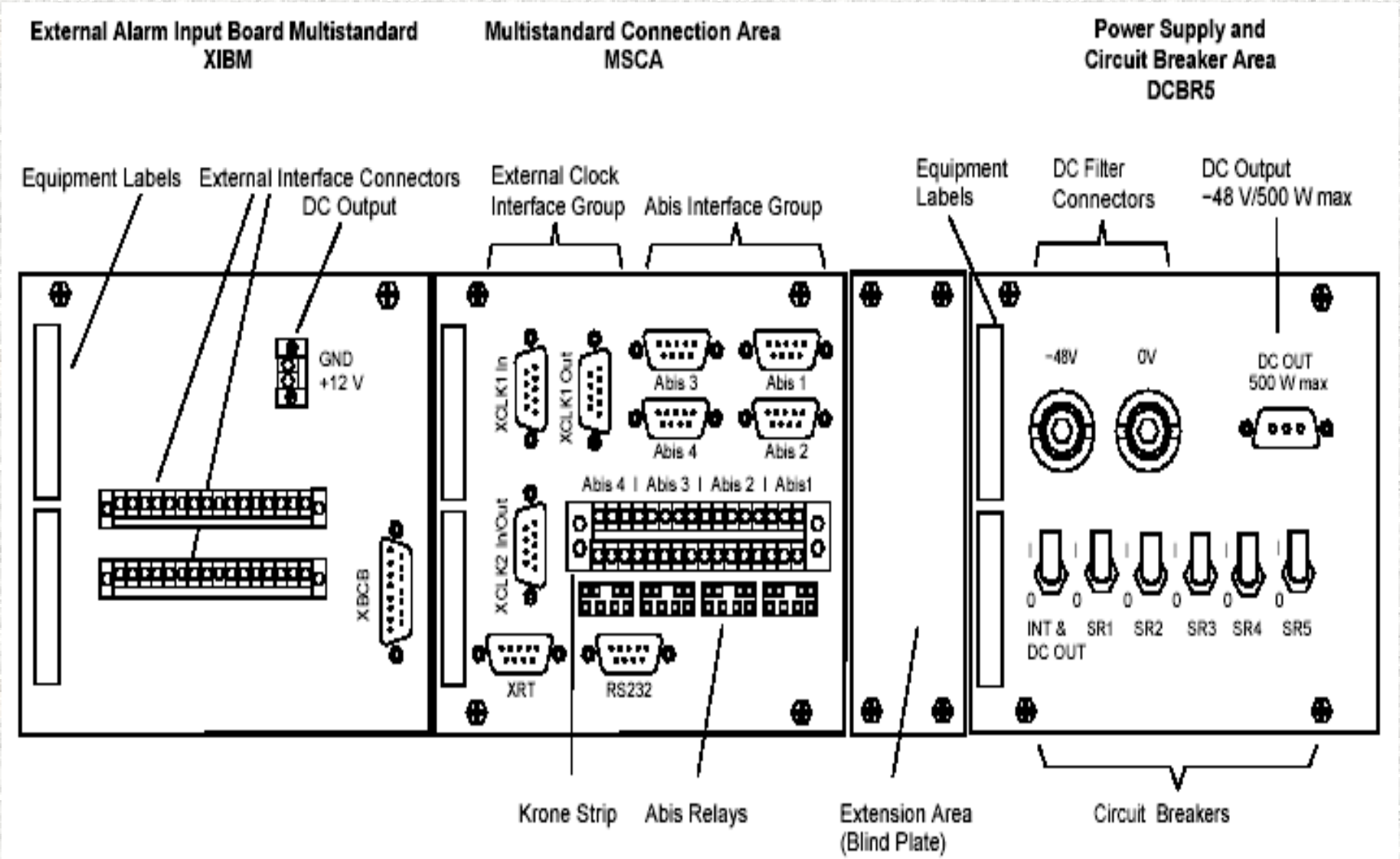
# showing the boards

# XIBM, MSCA and the Breakers

**XIBM** **MSCA** **DCBR5**

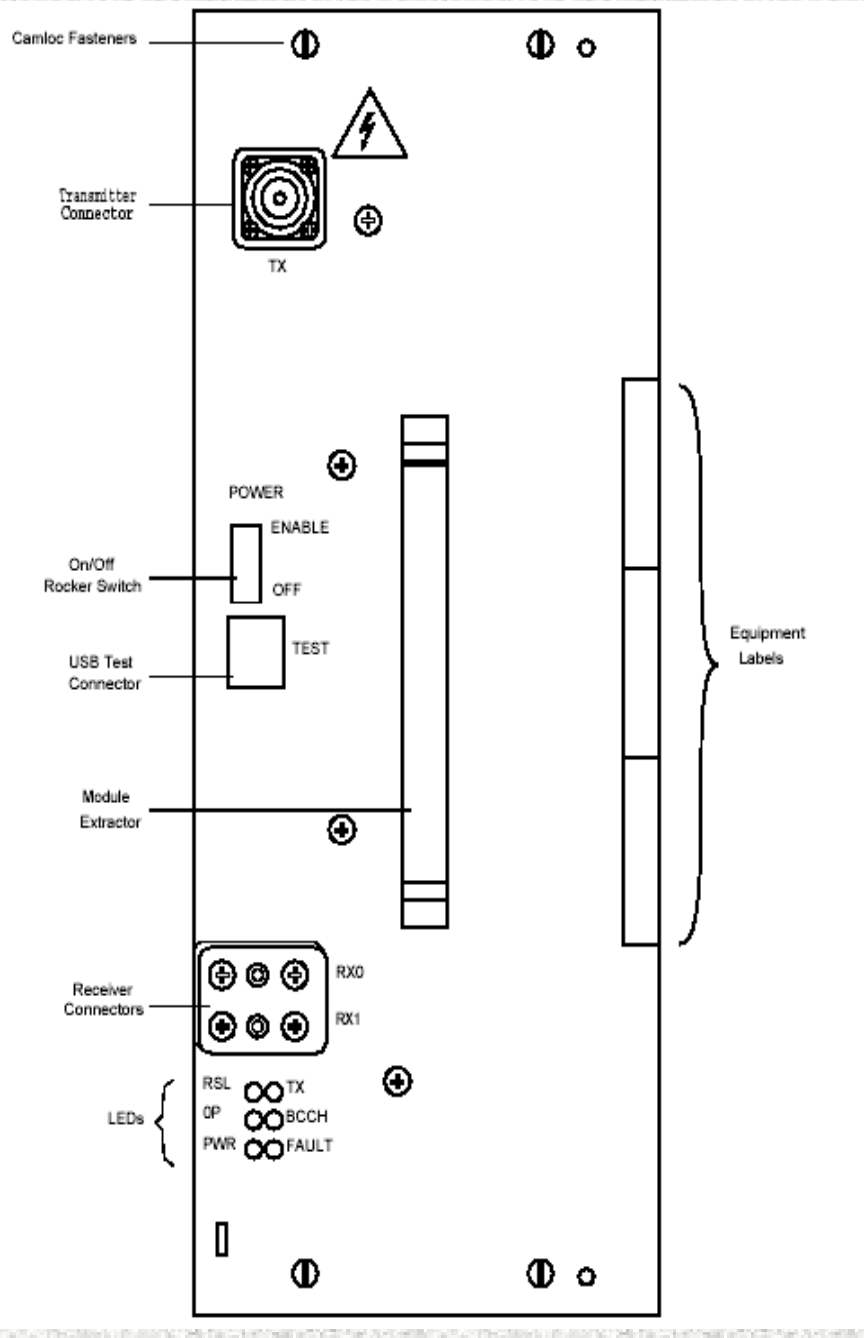
**XIBM:** External Alarm Input Board Multistandard
**MSCA:** Multistandard Connection Area
**DCBR5:** Power Supply & Circuit Breaker Area

# MBI Interconnection Panel



# TRE Front Panel

## (Trans Receive Equipment)

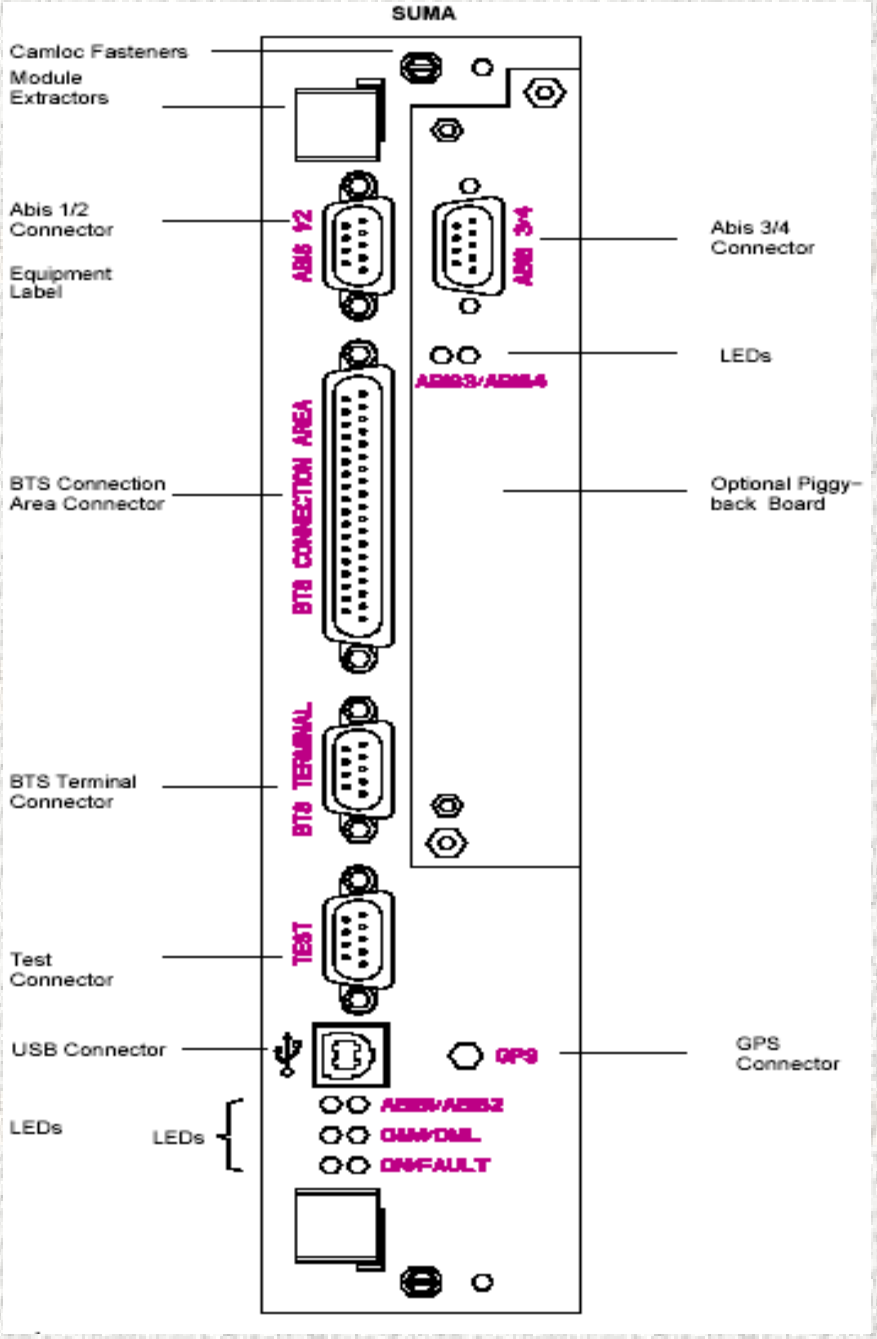


**Transceiver (TRX) level**

The transceiver (TRX) level covers GSM 850, GSM 900, GSM 1800 and GSM 1900 functionalities, including *full rate, half rate, enhanced full rate, antenna diversity, radio frequency hopping (synthesized hopping) and different iphering algorithms*. For each band, these functions are integrated into one single module. Inside each TRX module, an RF loop is implemented. The loop test is performed after downloading the frequencies to the BTS as a supplement to the autotest. The TRX module also handles the Radio Signaling Link (RSL) protocol.

# SUMA Controller Card

**(Station Unit Module Advanced)**



## 2.1.3 Base station Control Function (BCF) level

This level is ensured by the Station Unit Module (SUM), which is the central unit of the BTS. There is only one such module per BTS, whatever the number of sectors and TRXs is; this common control function of the SUM is also called Station Unit Sharing. The main base station control functions performed are as follows:

- Generating the clocks for all other BTS modules; the clocks can be either synchronized to an external clock reference - e.g. A-bis link, GPS or another BTS - or generated in a pure free-run mode by an internal frequency generator.

- Ensuring central BTS Operation & Maintenance (O&M) application,

- Handling the A-bis transmission links (up to two A-bis interfaces),

- Handling Operation and Maintenance Link (OML) and Qmux (transmission equipment supervision) protocols,

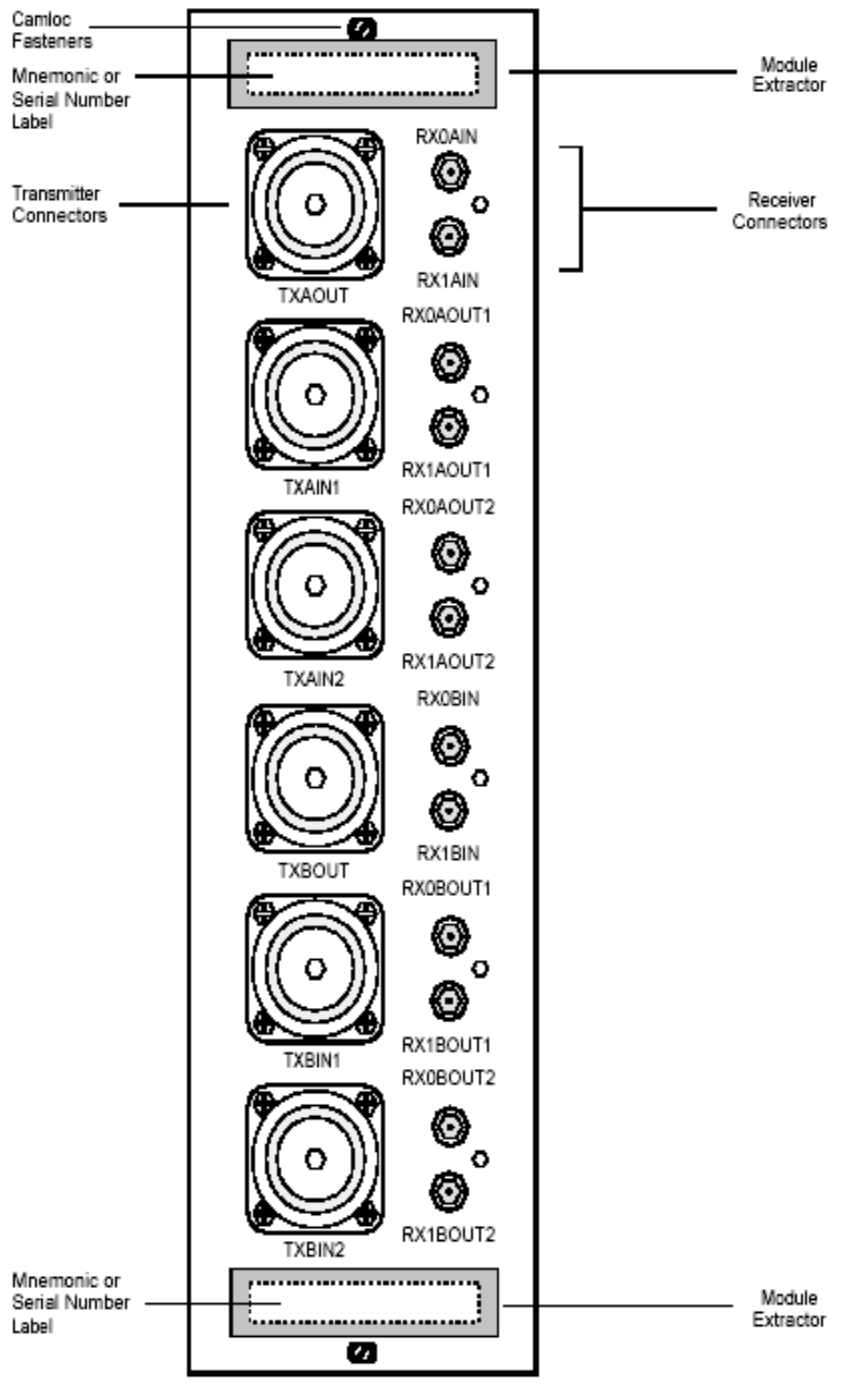
- Controlling the AC/DC function when integrated inside the BTS (Outdoor or Indoor AC configurations),

- Controlling the battery (capacity, voltage, temperature),

- Setting the optimal voltage and current for battery charging.

# ANY Front Panel

**(Twin Wide Band Combiner)**



**The Twin Wide Band Combiner (ANy) module**

The Twin Wide Band Combiner stage (ANy) combines up to four transmitters into two outputs, and distributes the two received signals up to four receivers. This module includes twice the same structure, each structure containing:

- One wide band combiner (WBC), concentrating two transmitter outputs into one

- Two splitters, each one distributing the received signal to two separate outputs providing diversity and non-diversity path. The hybrid Wide-band combining technique is used, since it avoids tuning problems and is more reliable compared to remotely tunable cavities. Moreover it is compatible with the Synthesized Frequency Hopping (SFH) feature.

For standard configurations (for details please refer to dedicated chapter), for which each sector is connected to two antennas (or one cross-polarized antenna), the *Twin Wide Band Combiner* module

(ANy) is only necessary for sectors with five or more TRXs.

# TWIN WIDE BAND COMBINER (ANY)

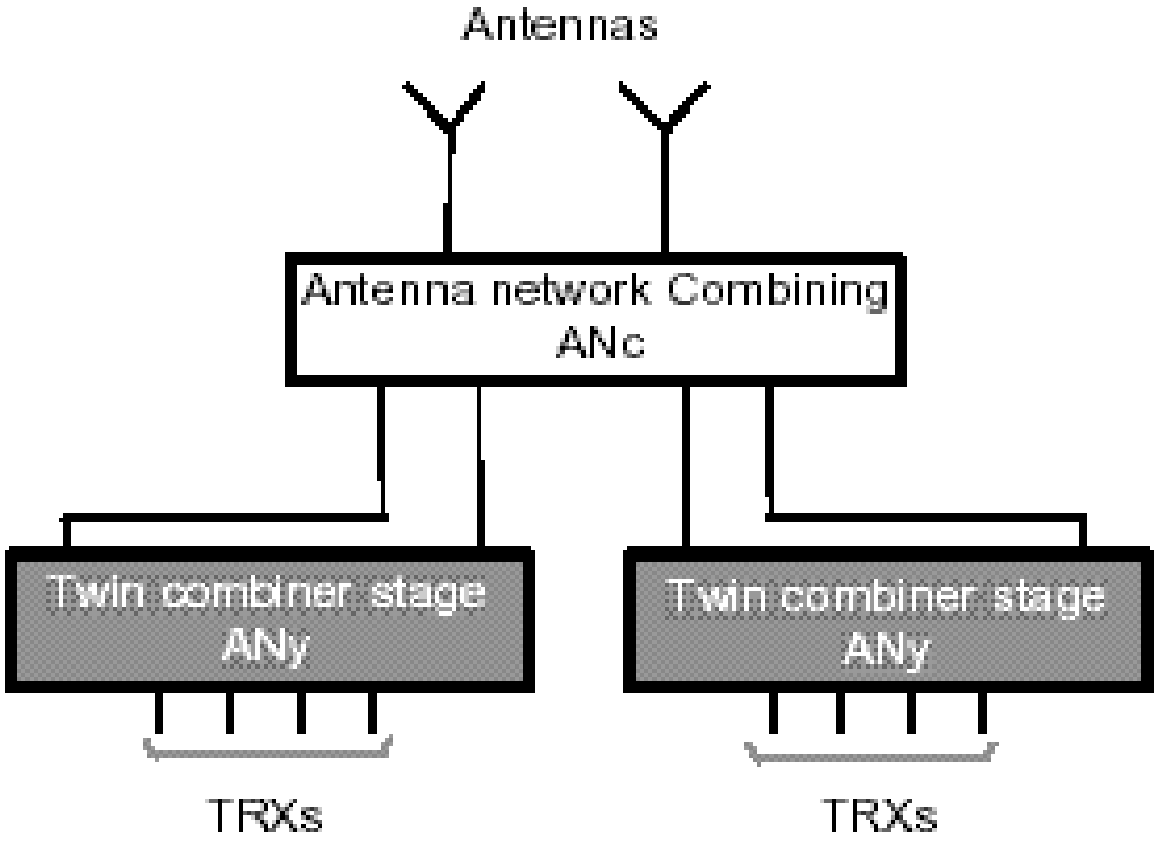



Figure 5: Configuration with 1x8 TRXs

# TWIN WIDE BAND COMBINER (ANY)

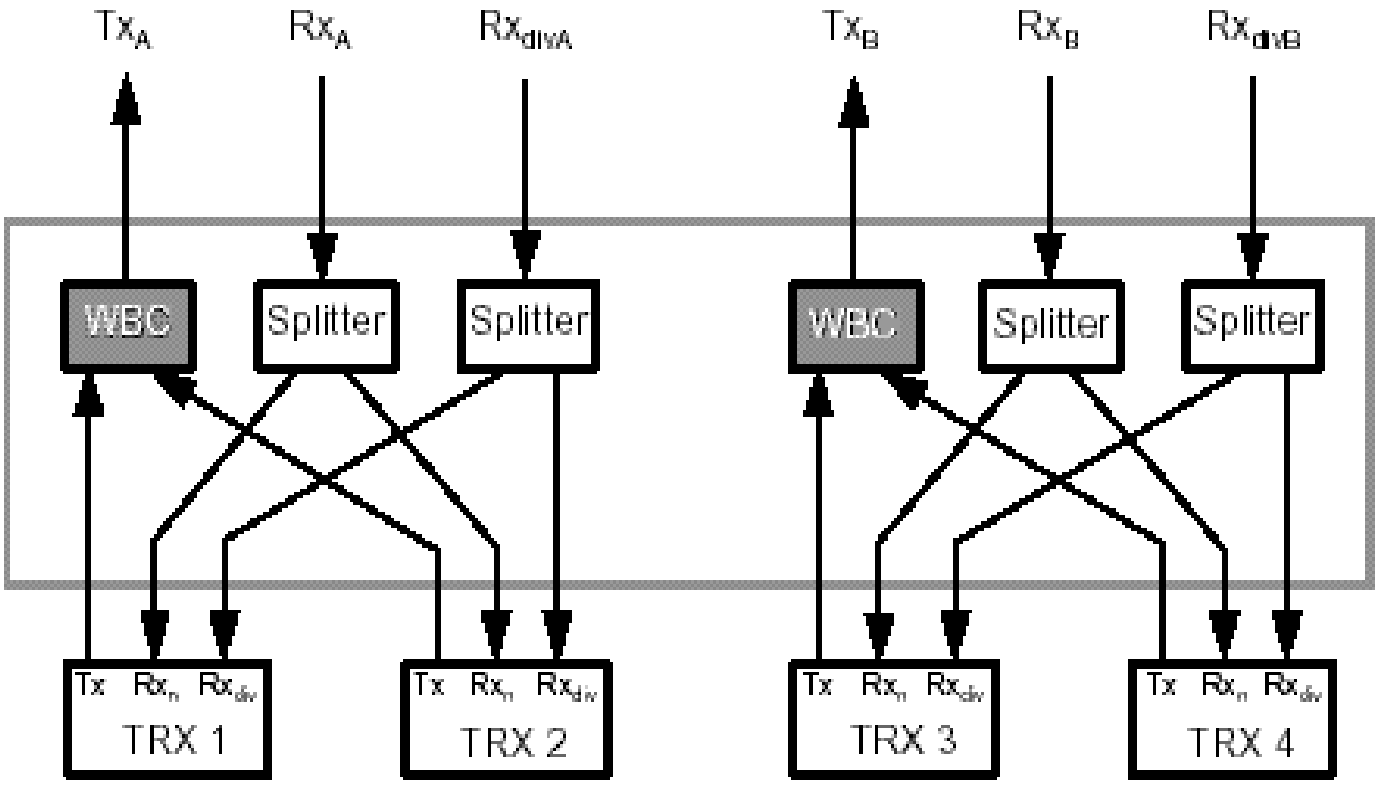
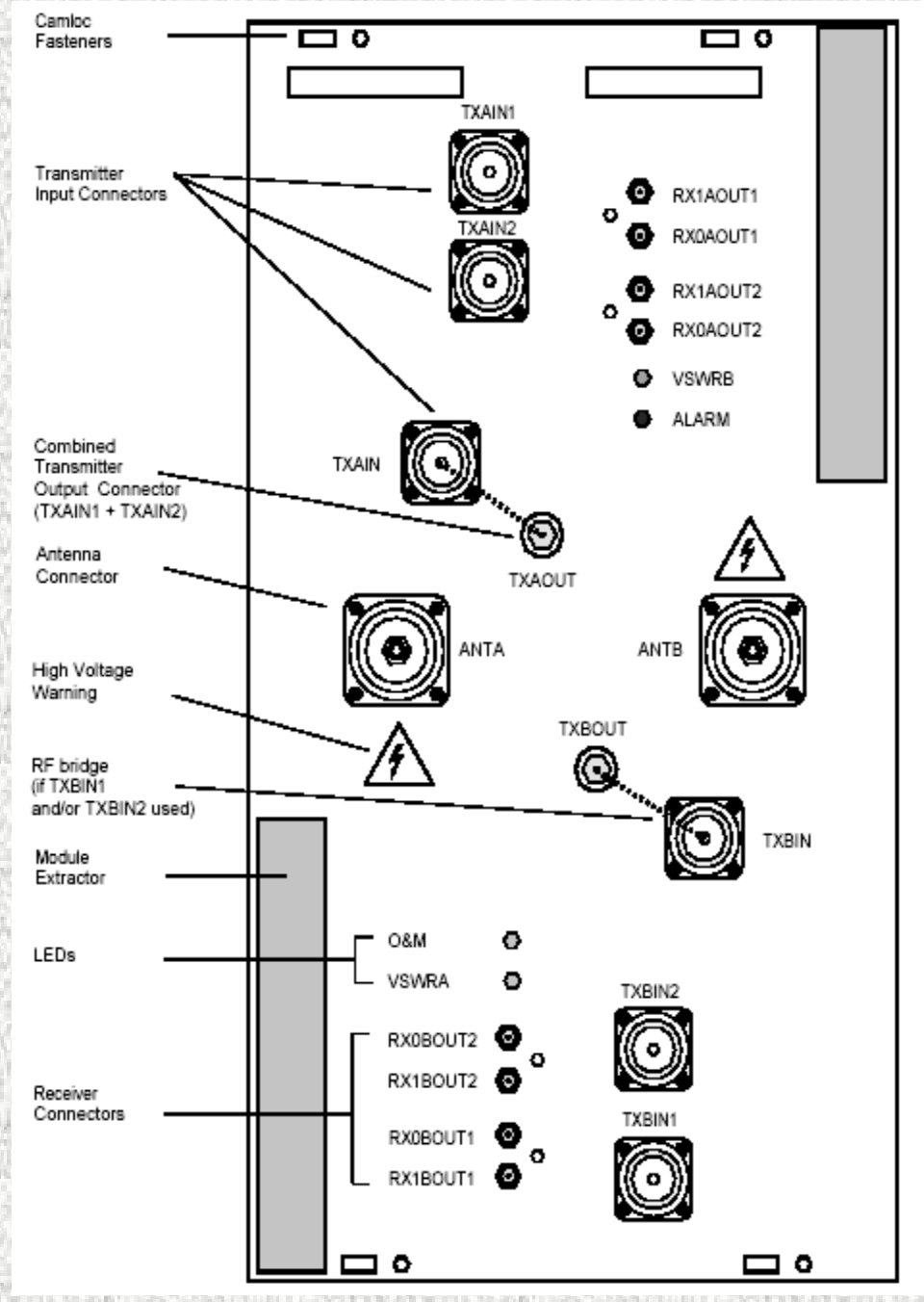



Figure 4: The twin Wide Band Combiner module (ANy)

# ANC Front Panel

**(Antenna Network Combiner)**



# ANC Architecture

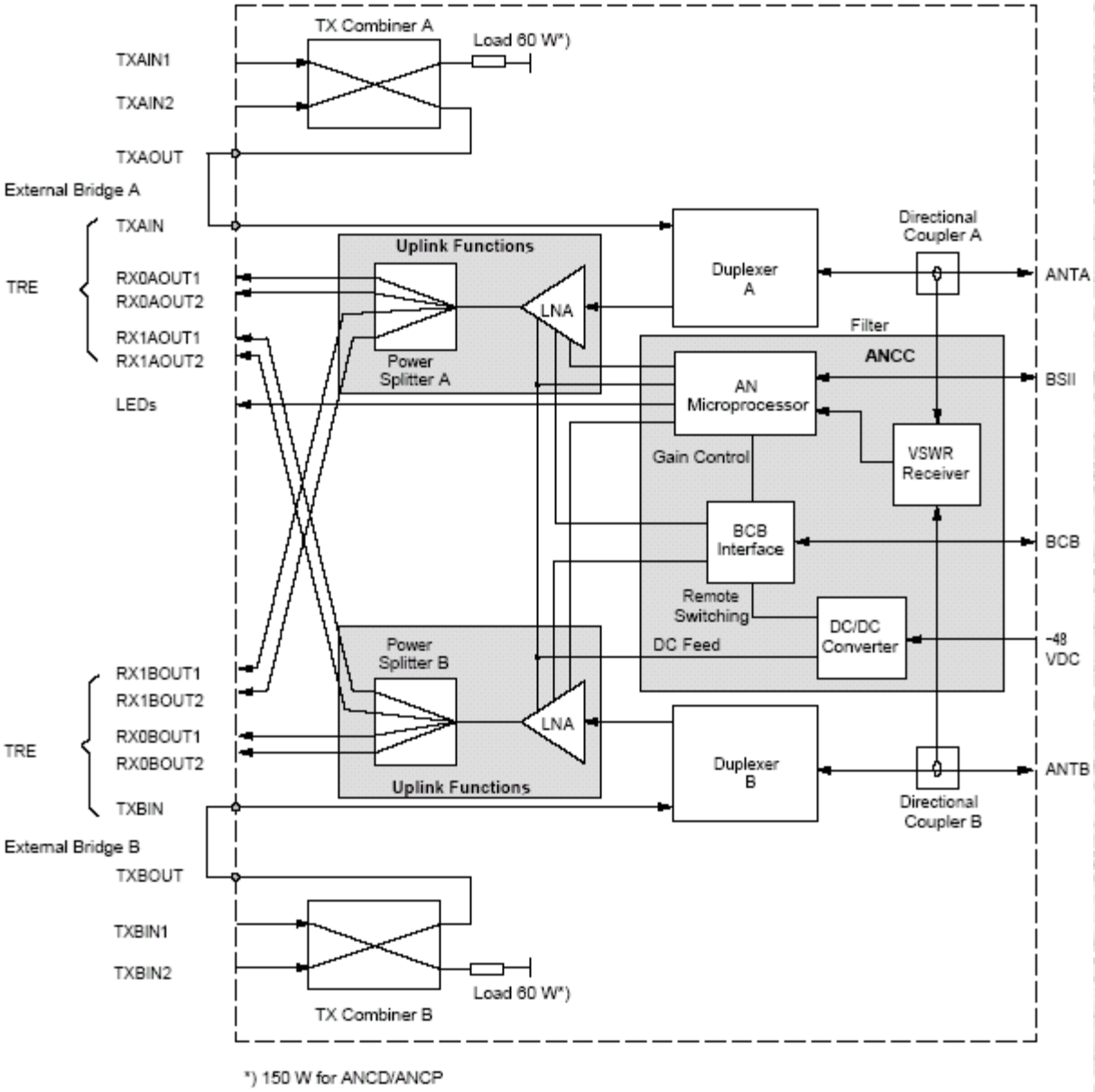



*Figure 298: ANC Architecture*

# Antenna Coupling Level.

The antenna coupling level is the stage between the antennas and the TRX level; it handles the combining functions as well as the interface with the antennas. A single module called Antenna Network Combiner (ANc) performs these functions for up to 4 TRXs. For configurations of higher capacity, a Combiner stage can be added. Thanks to the ANc flexibility and this modular building, the antenna coupling level can be adapted to a wide range of requirements (reduction of attenuation losses, minimization of the number of antennas…).

The general functions performed at this level are:

- Duplexing transmit and receive paths onto common antennas;

- Feeding the received signals from the antenna to the receiver front end, where the signals are amplified and distributed to the different receivers (Low Noise Amplifier (LNA) and power splitter functions);

- Providing filtering for the transmit and the receive paths;

- Combining, if necessary, output signals of different transmitters and connecting them to the antenna(s);

- Supervising antennas VSWR (Voltage Standing Wave Ratio).

**The Antenna Network Combiner (ANc) module**

The Antenna Network combiner module (ANc) connects up to four transmit signals to two antennas, and distributes the received signals from each antenna to up to four receivers (for the normal and the diversity reception). This module includes twice the same structure, each structure containing:

- One duplexer allowing a single antenna to be used for the transmission and reception of both downlink and uplink channels- hence minimizing the number of antenna

- A frequency selective VSWR meter to monitor antenna feeder and antenna

- One LNA amplifying the receive RF signal, and giving good VSWR values, noise compression and good reliability

- Two splitter levels distributing the received signal to two or four separate outputs so that each output receive the signal from its dedicated antenna and from the second one (diversity)

- One Wide Band Combiner (WBC), concentrating two transmitter outputs into one, only for configurations with more than two TRX.

Each sector is equipped with at least one such stage, which features very high sensitivity reception, low attenuation, and minimum inter-modulation products.

The ANc can be manually configured (on site) in two modes depending on the number of TRX in the sector:

- The No-combining mode for configuration up to 2 TRX, for which the Wide Band Combiner is not needed therefore bypassed.

- The Combining mode for configuration from 3 up to 4 TRX, for which the Wide Band combiner is not bypassed.

Each sector is equipped with at least one such stage, which features very high sensitivity reception, low attenuation, and minimum inter-modulation products.

The ANc can be manually configured (on site) in two modes depending on the number of TRX in the sector

- The No-combining mode for configuration up to 2 TRX, for which the Wide Band Combiner is not needed therefore bypassed.

- The Combining mode for configuration from 3 up to 4 TRX, for which the Wide Band combiner is not bypassed.

# Antenna Network Combiner (ANC)

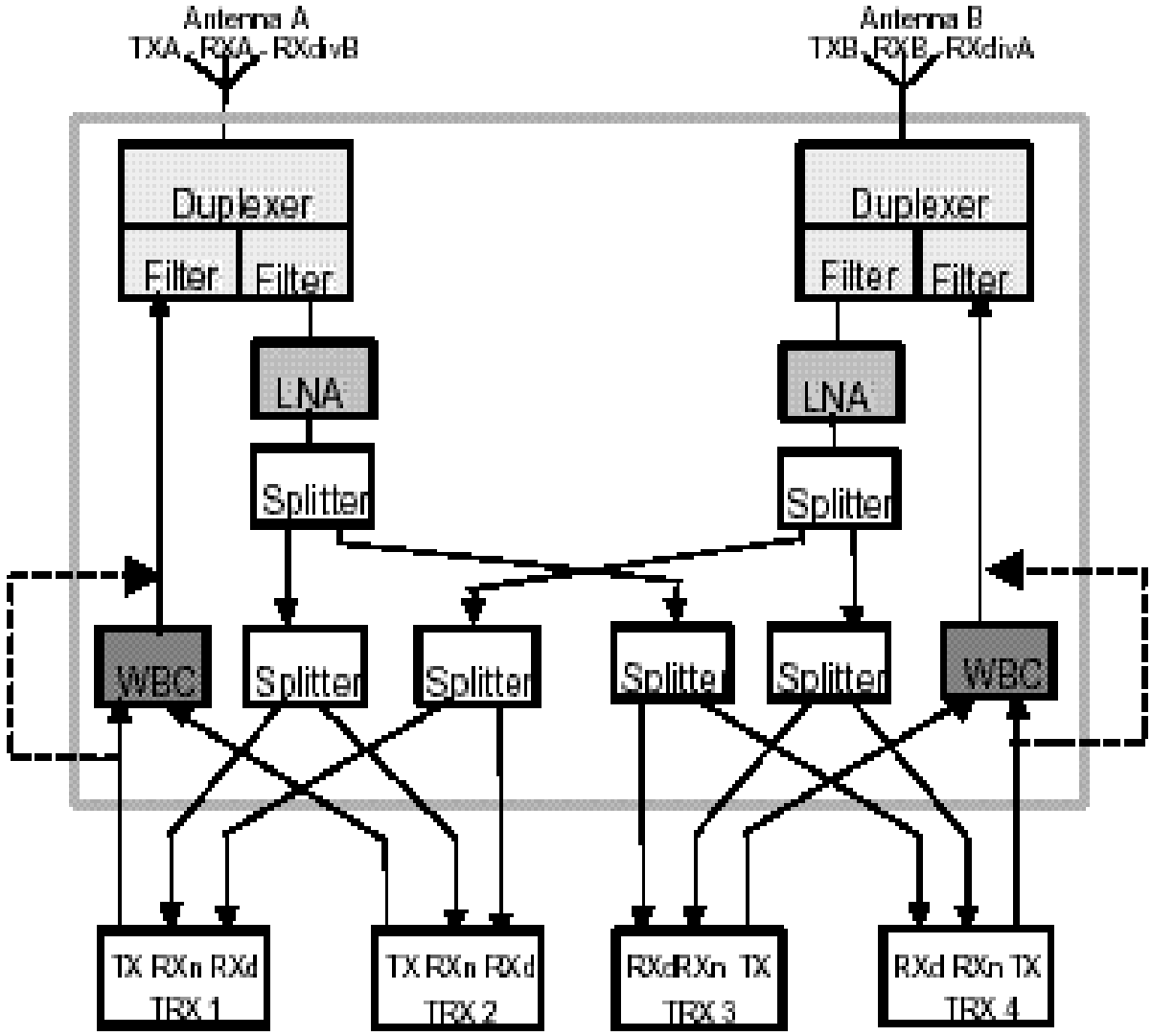



Figure 3: The Antenna network Combiner (ANc)- Combining mode

# Weight of Physical Modules

## 5.10 Weight of modules and configurations

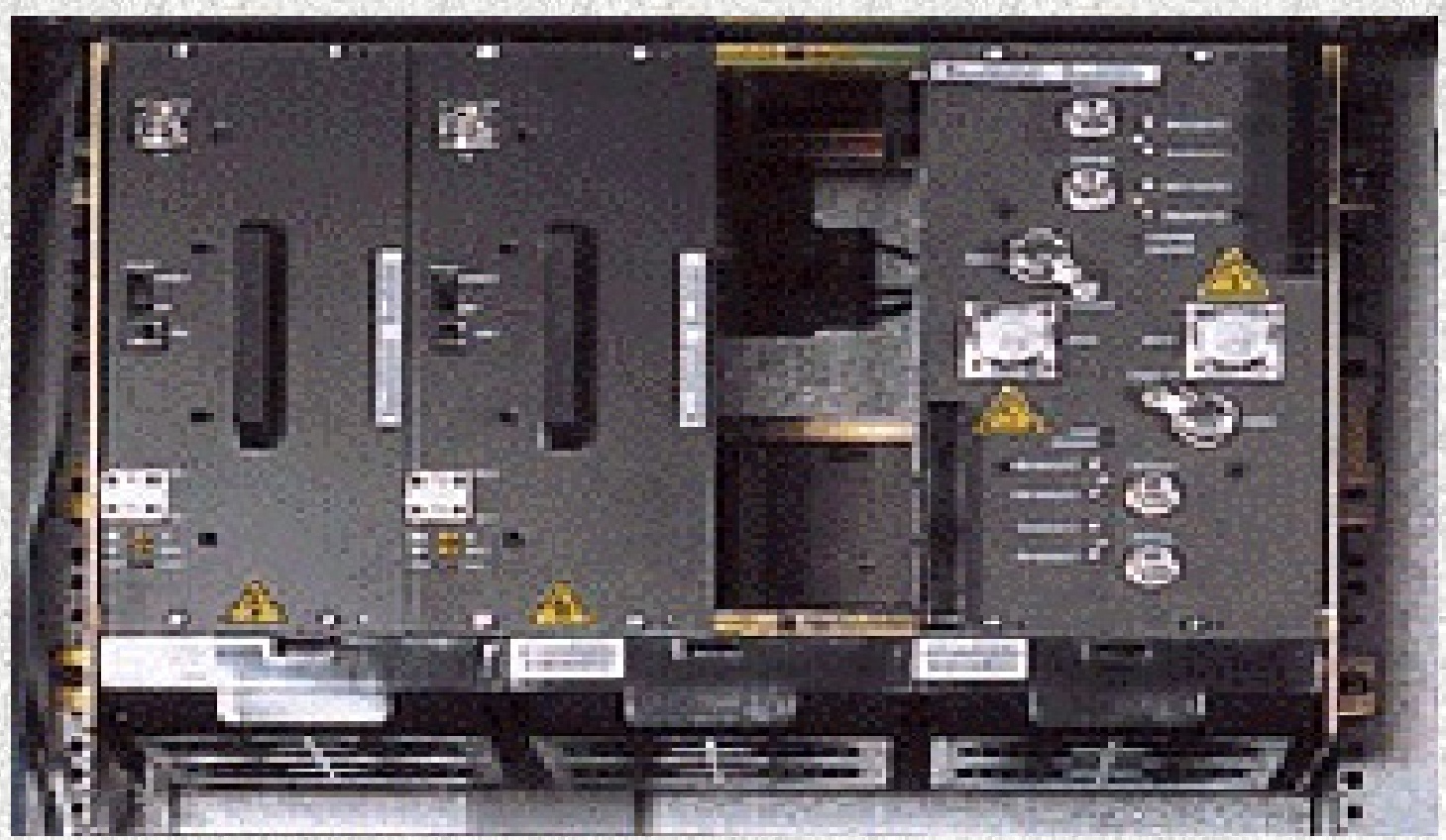
The following table gives the weight of main BTS modules; modules of which the weight is negligible and/or the number is the same whatever the configuration are not listed (their weight is included in that of cabinet or of other modules); also, weight of options such are microwaves are not listed:

| Module | Weight (Kg) |
|---|---|
| TRX | 7.2 |
| ANc | 8.5 |
| ANy | 3.5 |
| CBO cabinet | 104 |
| MBO1 cabinet | 188 |
| MBO2 cabinet | 316 |
| MBI3 DC cabinet | 86 |
| MBI3 AC cabinet | 97 |
| MBI5 DC cabinet | 131 |
| MBI5 AC cabinet | 142 |
| BU5 | 15 |
| BU90 | 140 |

These weights allow to estimate the weight of any configuration; as an example, the weight of MBI and MBO 3x4 are:

| | | Unit | Qty | Total (Kg) |
|---|---|---|---|---|
| **MBO2 3x4 TRX-BU90** | | | | **567.6** |
| | MBO2 cabinet | 316 | 1 | 316 |
| | TRX | 7.2 | 12 | 86.4 |
| | ANc | 8.5 | 3 | 25.5 |
| | BU90 | 140 | 1 | 140 |
| **MBI5 AC 3x4 TRX-BU5** | | | | **393.9** |
| | MBI5 AC cabinet | 142 | 1 | 142 |
| | TRX | 7.2 | 12 | 86.4 |
| | ANc | 8.5 | 3 | 25.5 |
| | BU5 | 15 | 1 | 140 |

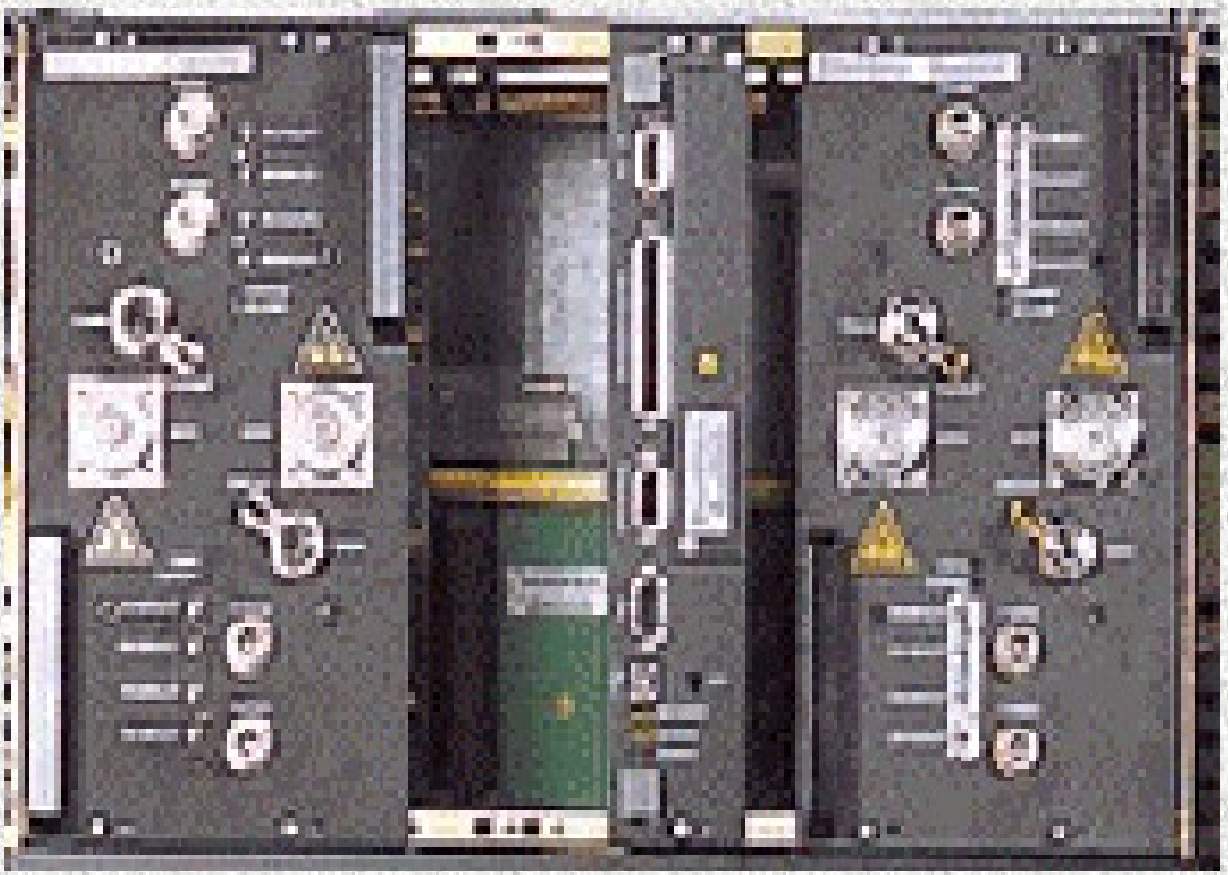
# STASR Shelf showing 2 TRE's & 1 ANC



**TRE:** Trans Receive Equipment

**ANC:** Antenna Network Combiner( upto 4 TRE's )

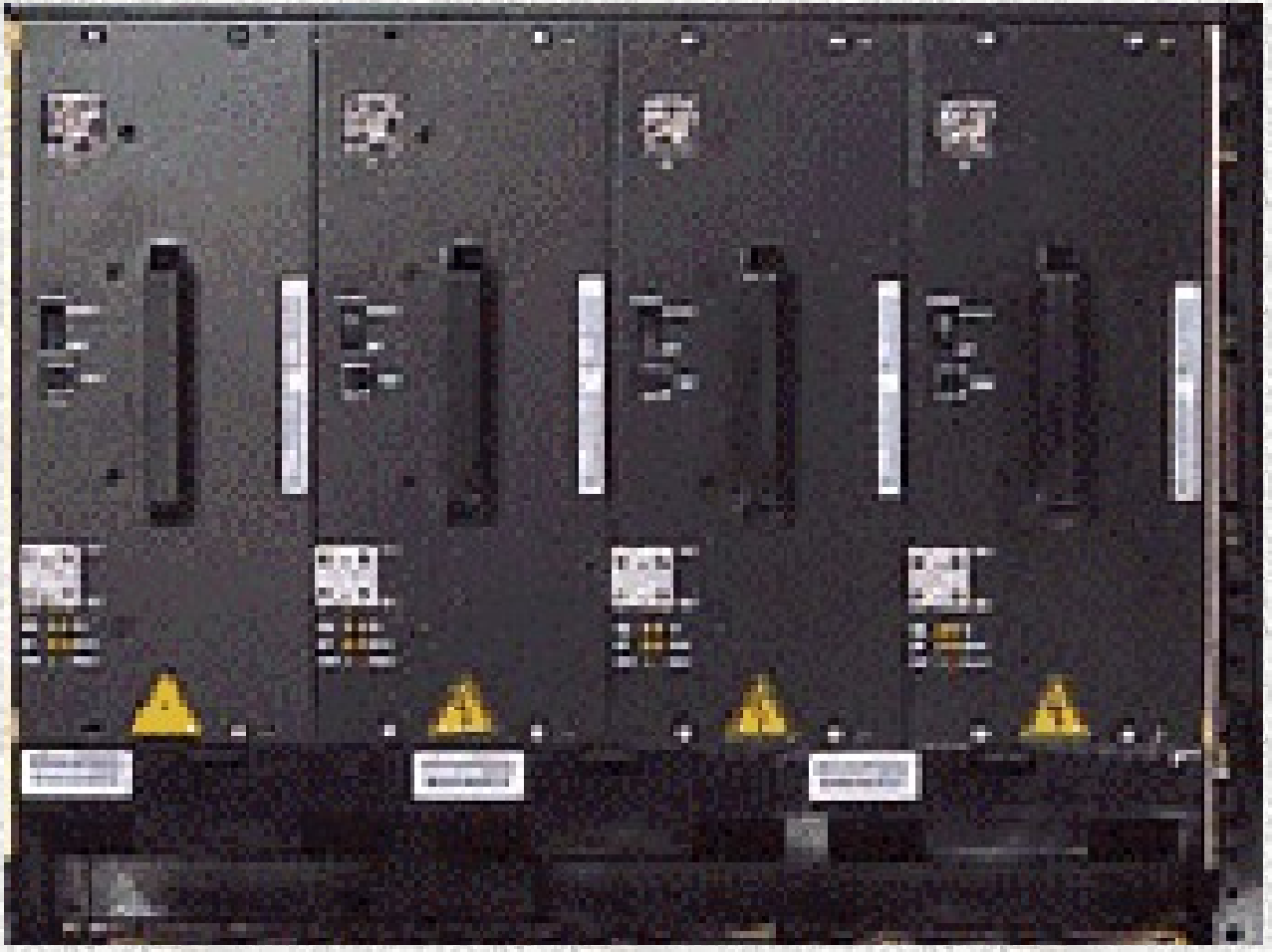
# STASR Shelf showing SUMA and 2 ANC's



**SUMA:** Station Unit Module Advanced (Controller Board)

ANC: Antenna Network Combiner (upto 4 TRE's).

# STASR Shelf showing 4 TREs

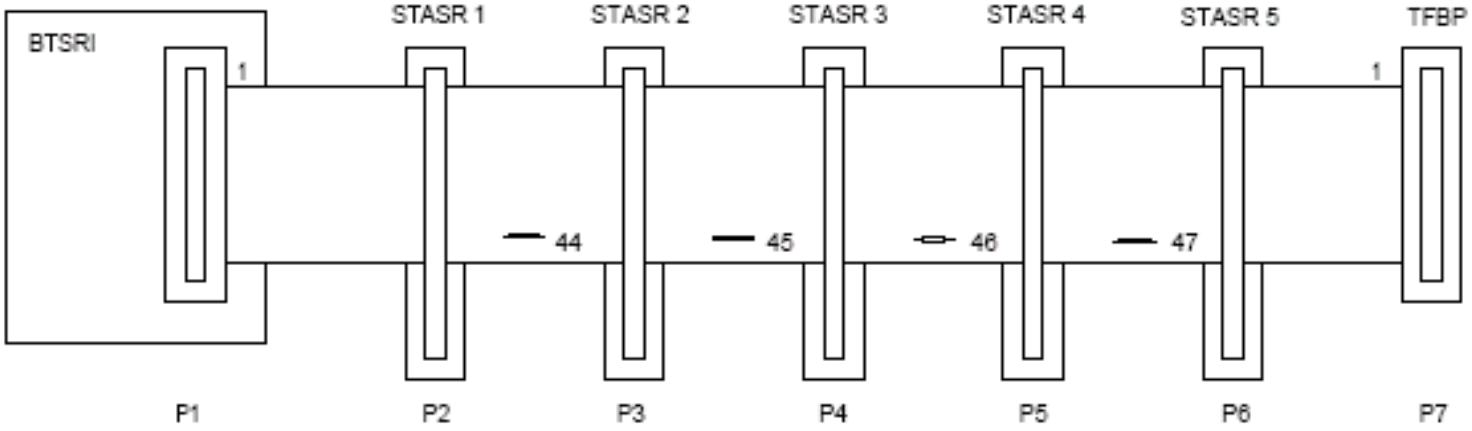


**TRE:** Trans Receive Equipment

# BTSRI5

## 17.1.9 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 456: BTSRI5 Connections*

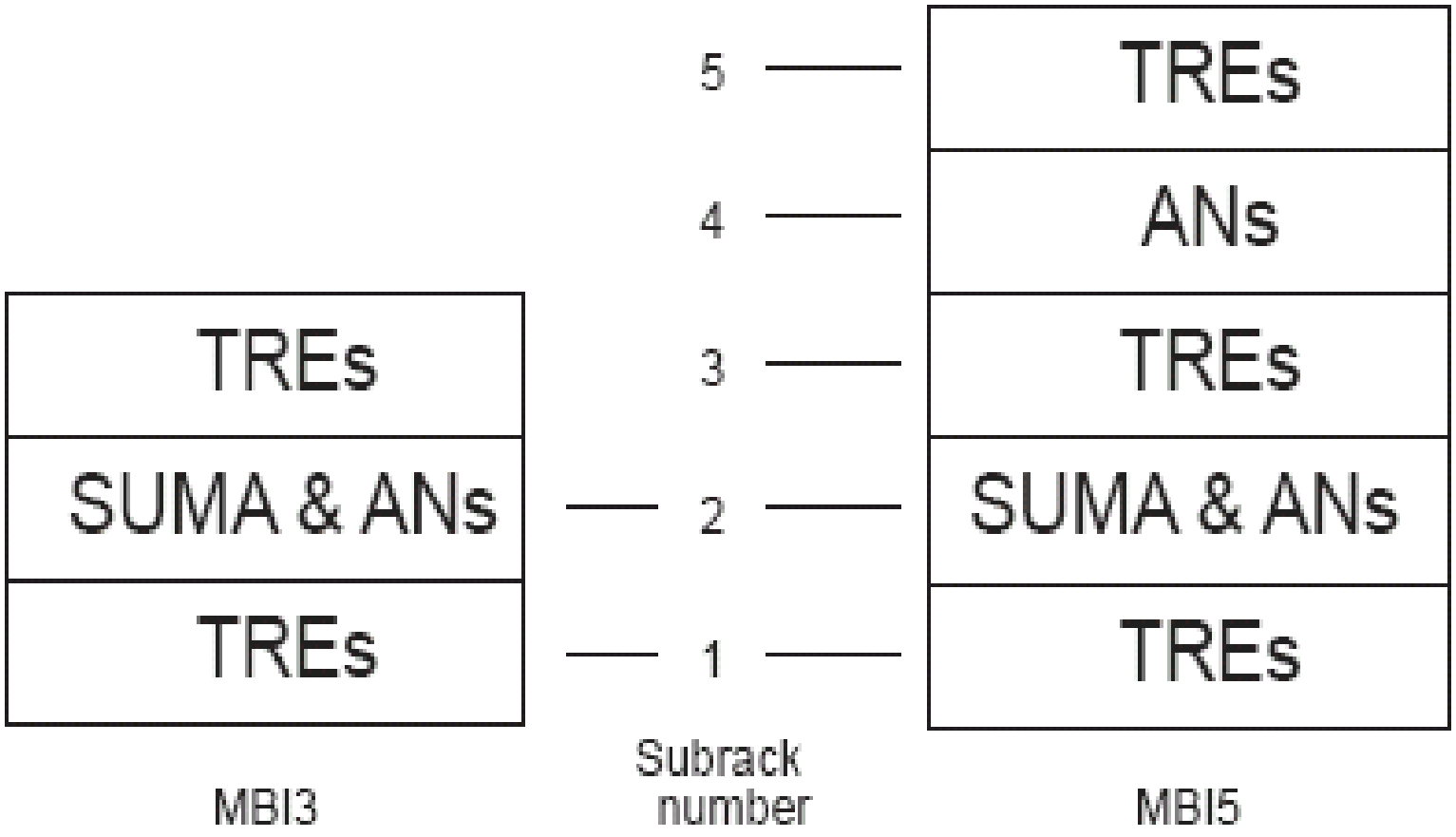
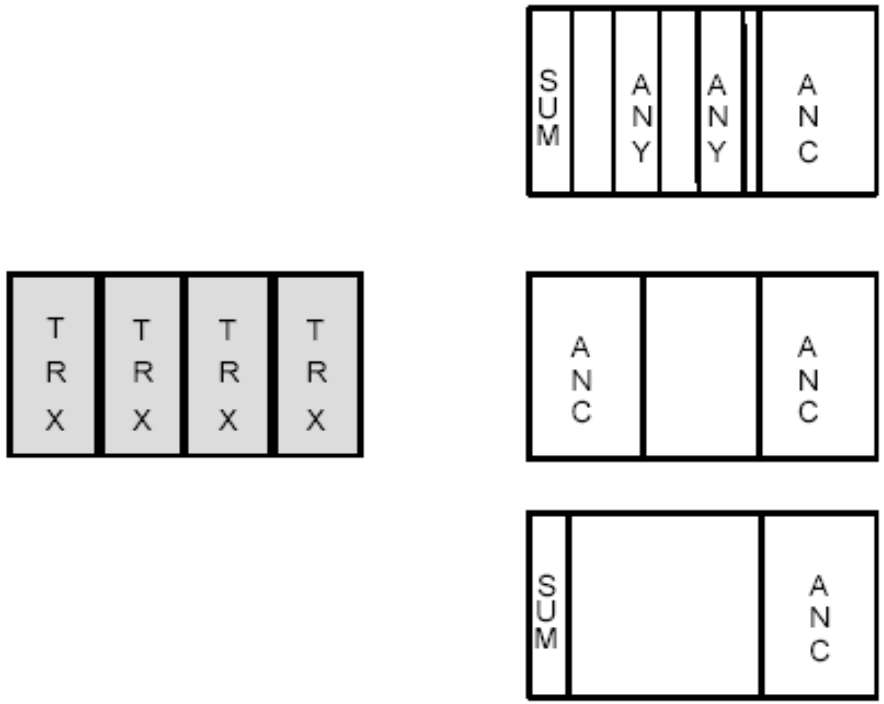



Figure 1. Subracks equipment in MBI racks

# SUB-RACK CONFIGURATION

Different sub-rack organizations are given in figure below. The following widths hold true for the different modules (taken L for one sub-rack):

| | | Legend |
|---|---|---|
| SUM | L / 8 | SUM |
| Antenna Network Combining | L / 3 | ANC |
| Twin WBC stage | L / 8 | ANY |
| TRX | L / 4 | TRX |



## 4.3 Sub-rack and modules organization

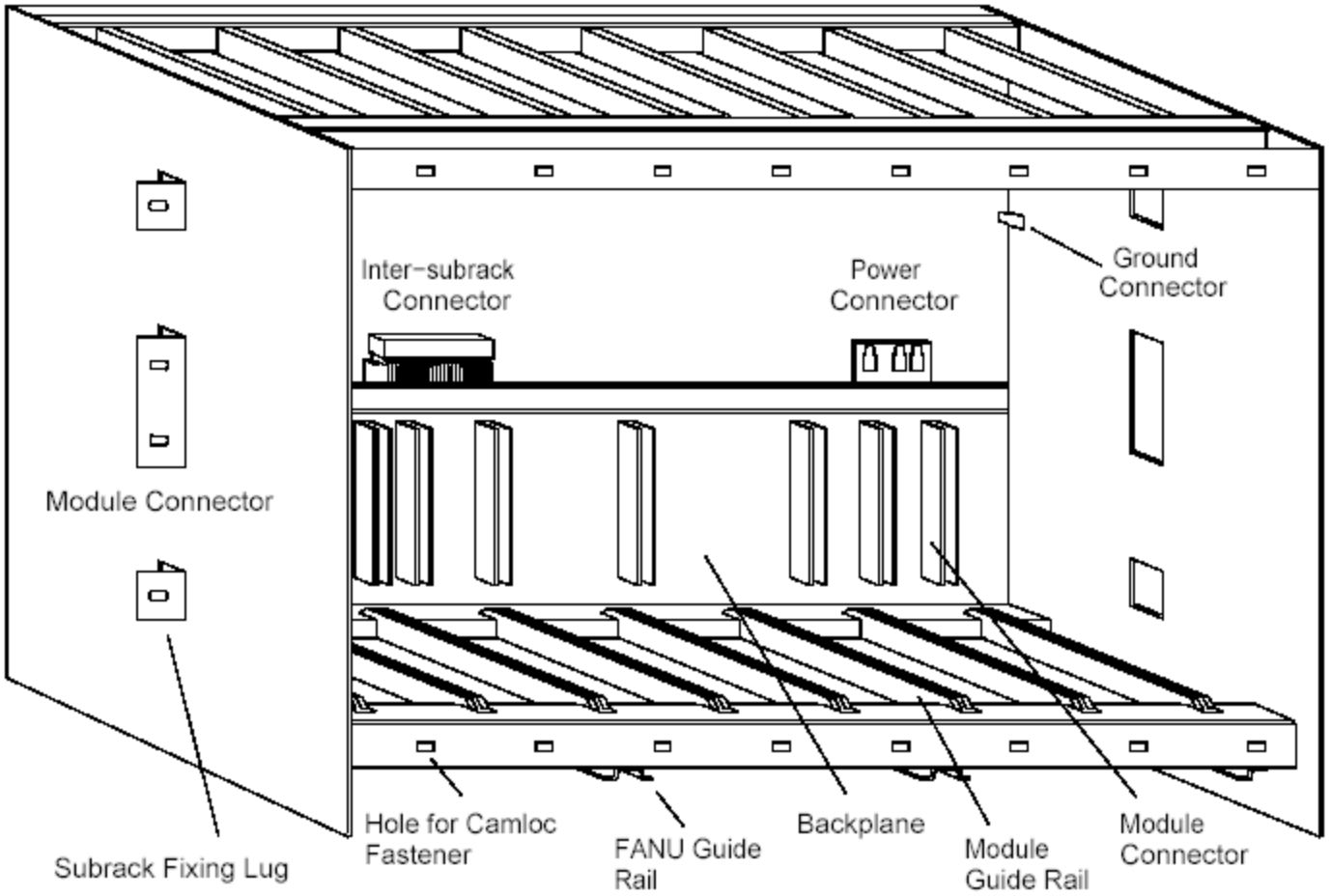
The following figure gives an example of indoor and outdoor 3*4 configuration:


**Outdoor MBO2 3x4** **Indoor MBI5 3x4**

Figure 8: Sub-rack organization - configurations examples

# STASR Shelf

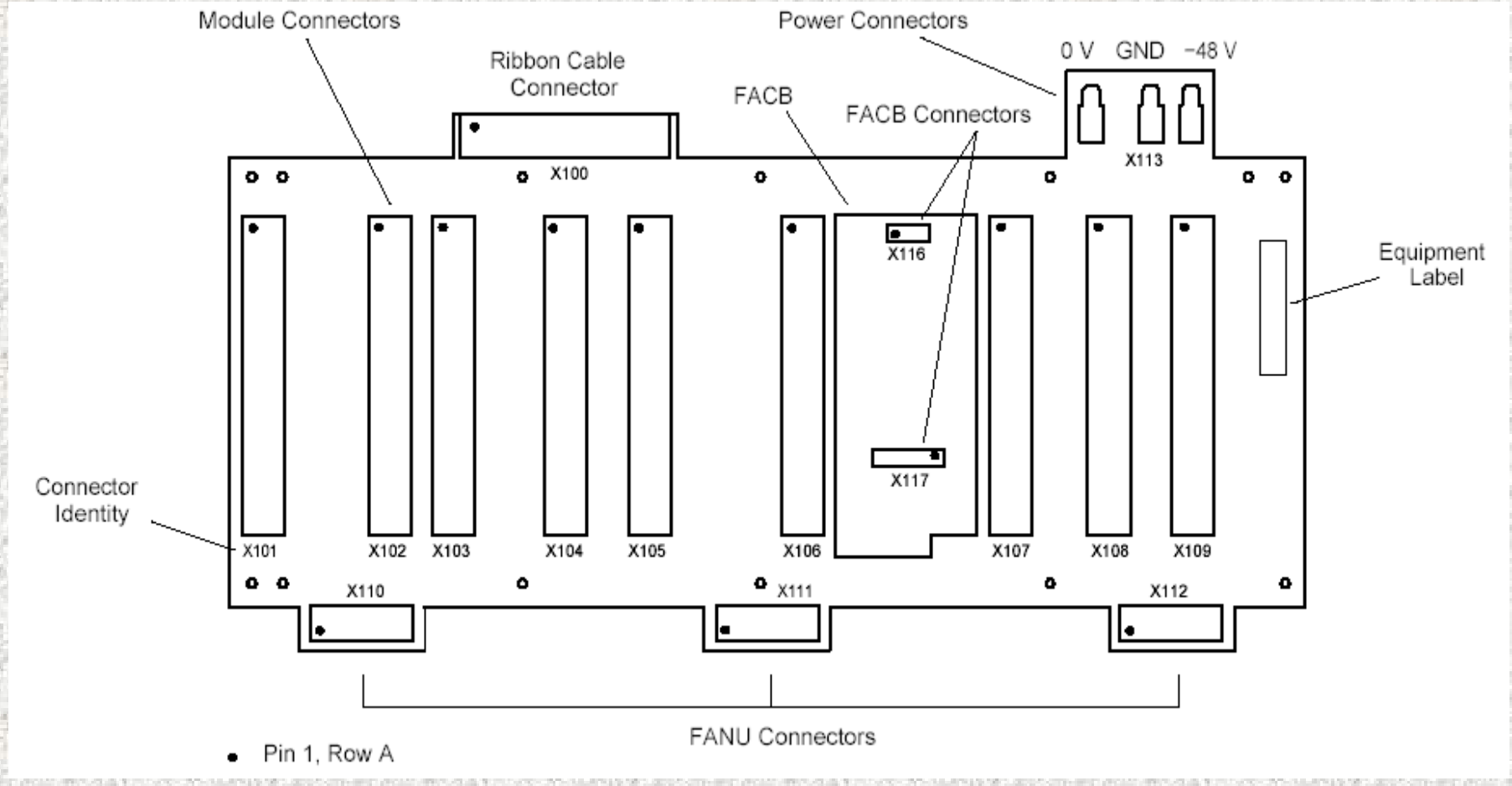
The following figure shows the STASR with no modules fitted.



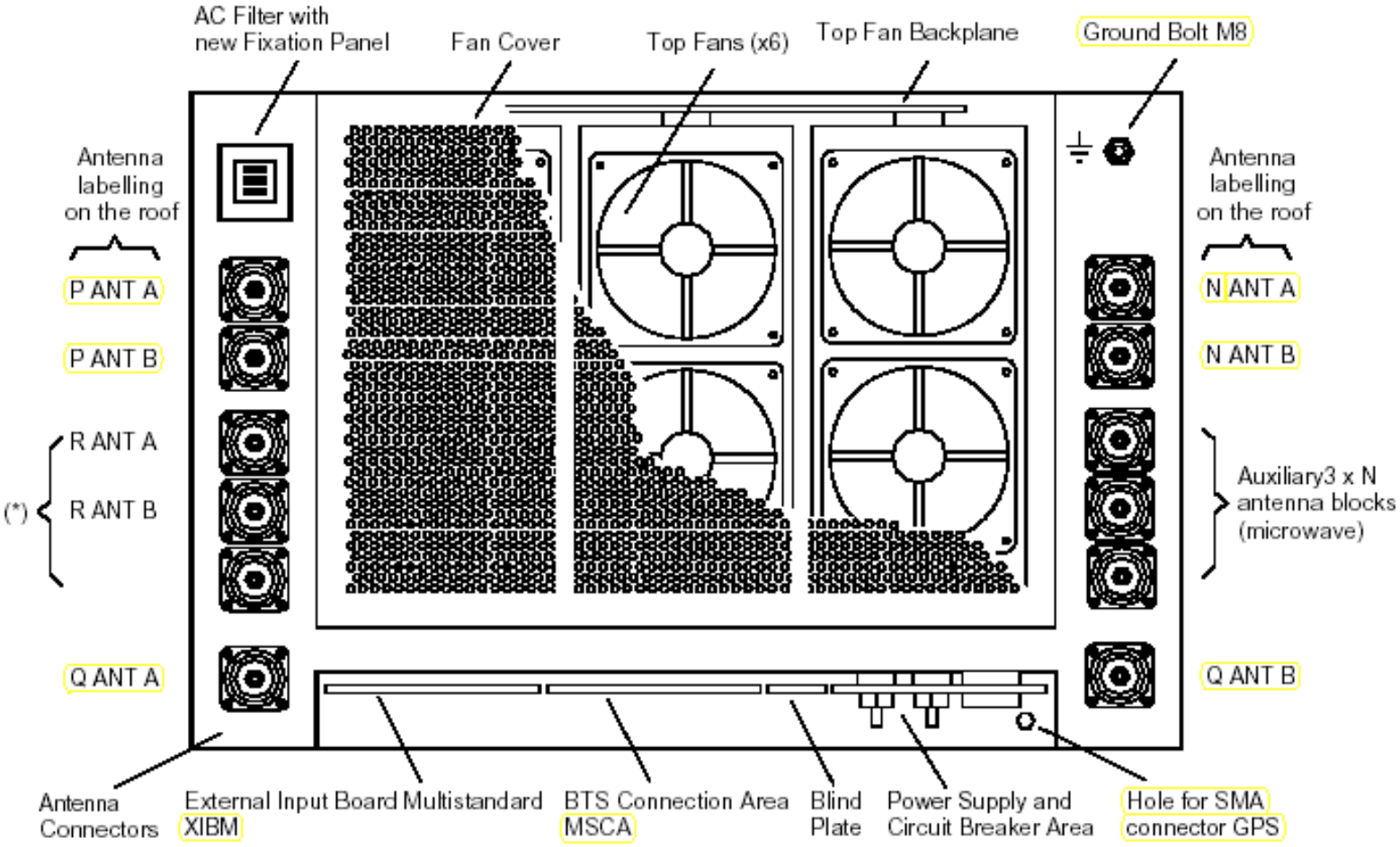

**STASR:** Standard Telecommunication Sub-rack

# STASR BACK-PLANE

## Connector Layout Front View



# MBI Rack Top View

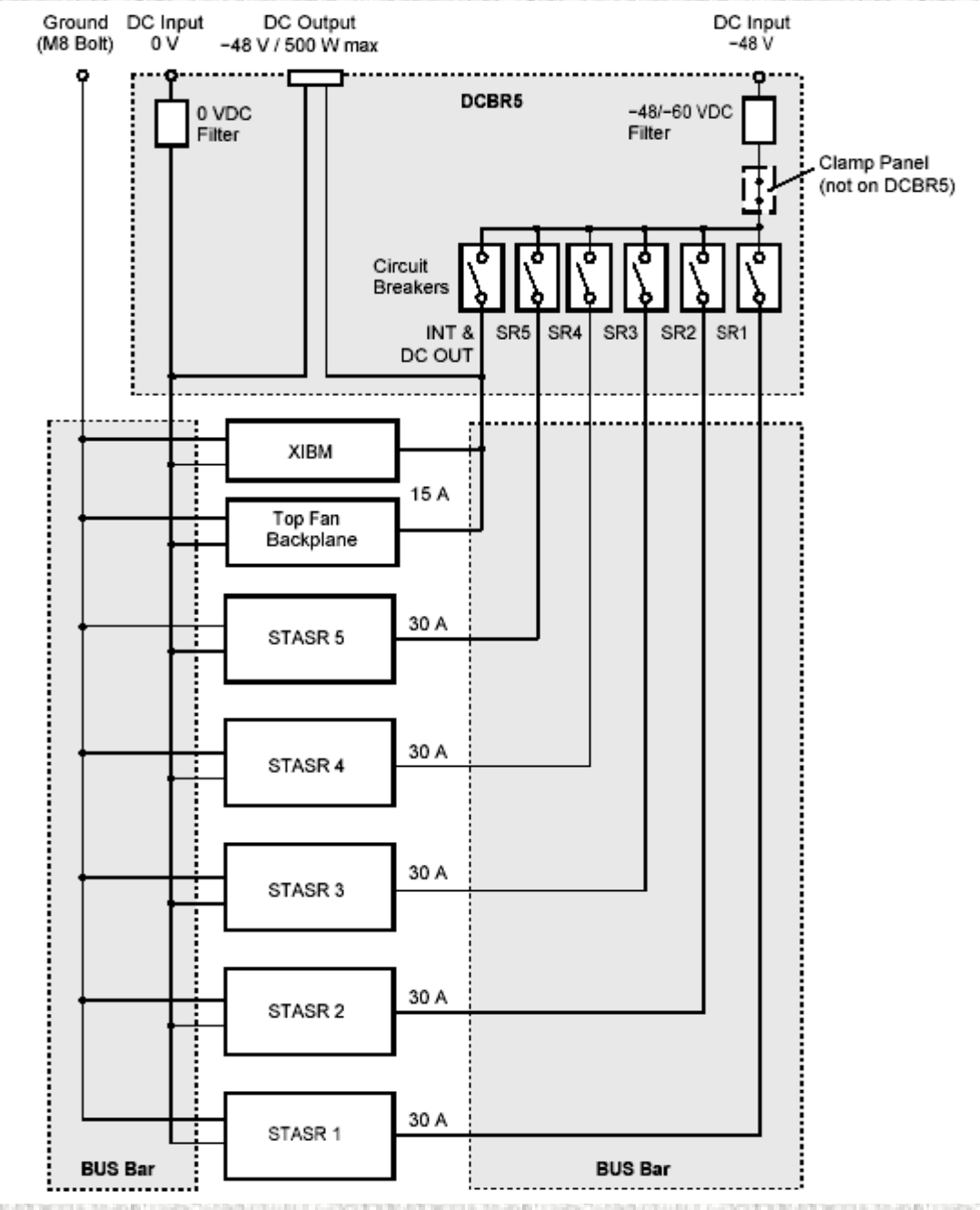



(*) Auxiliary 3 x 7/16 antenna blocks

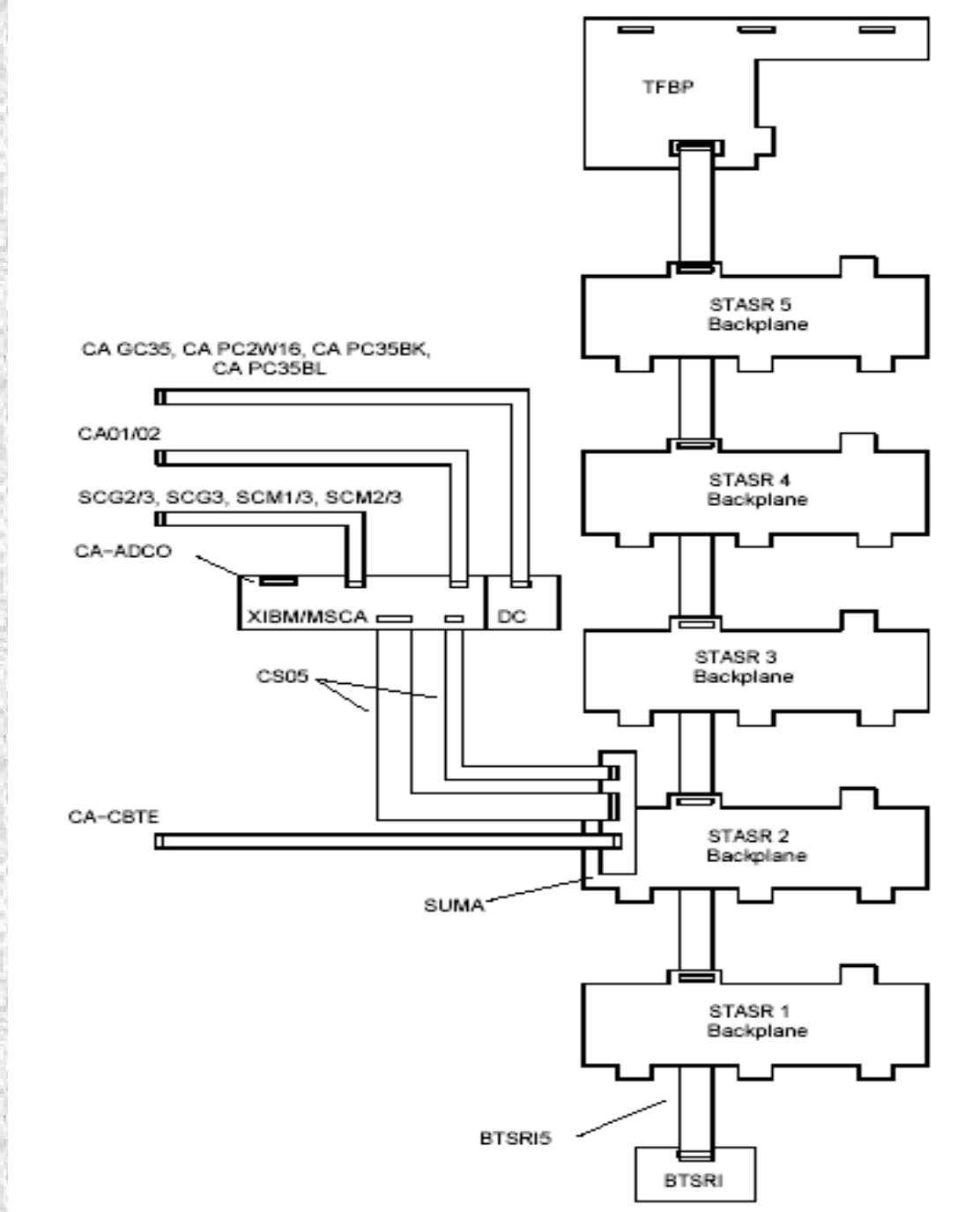
Note: Antenna connectors are not necessary completely equipped.

*Figure 199: MBI3/MBI5 Top View*

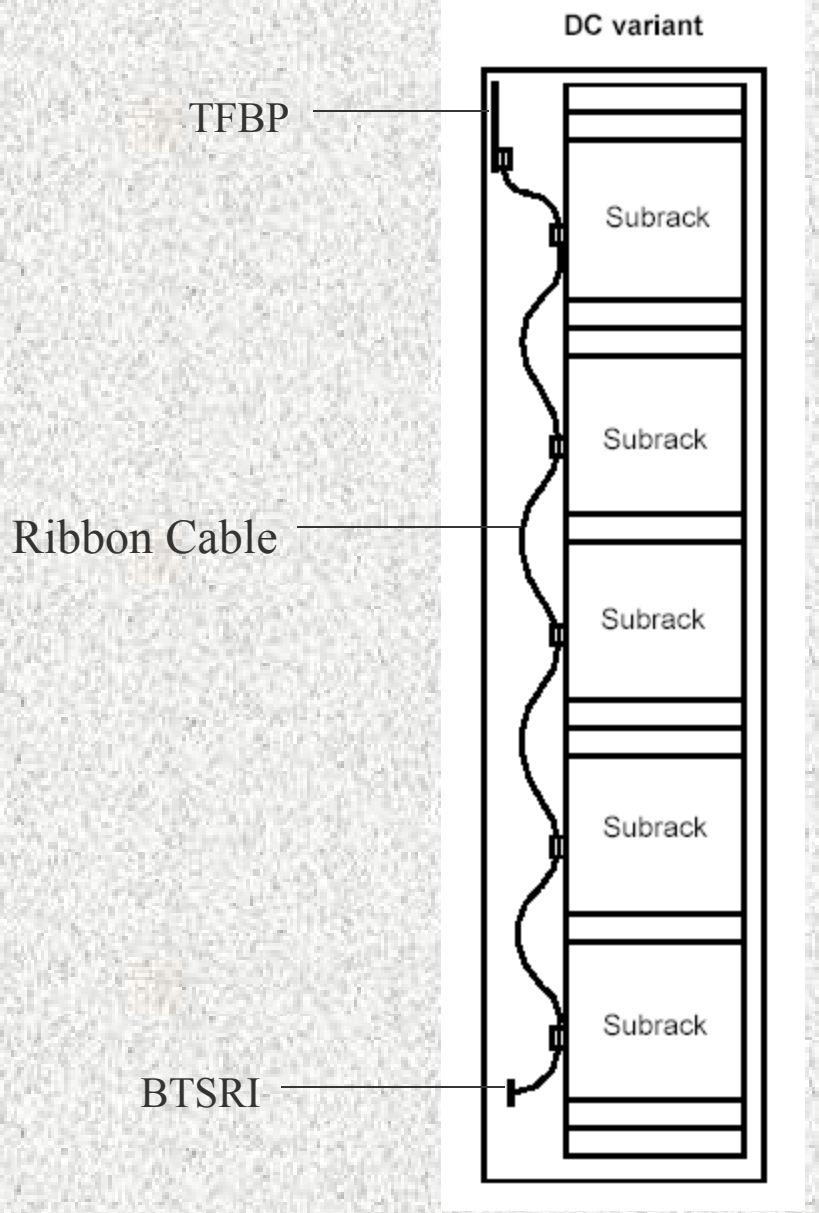
# MBI5 DC Power Interconnections



# MBI5 Data and Control Cabling



# MBI5 Subracks Interconnection cabling



# Naming Conventions for the BTS Configurations

| | |
|---|---|
| **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*

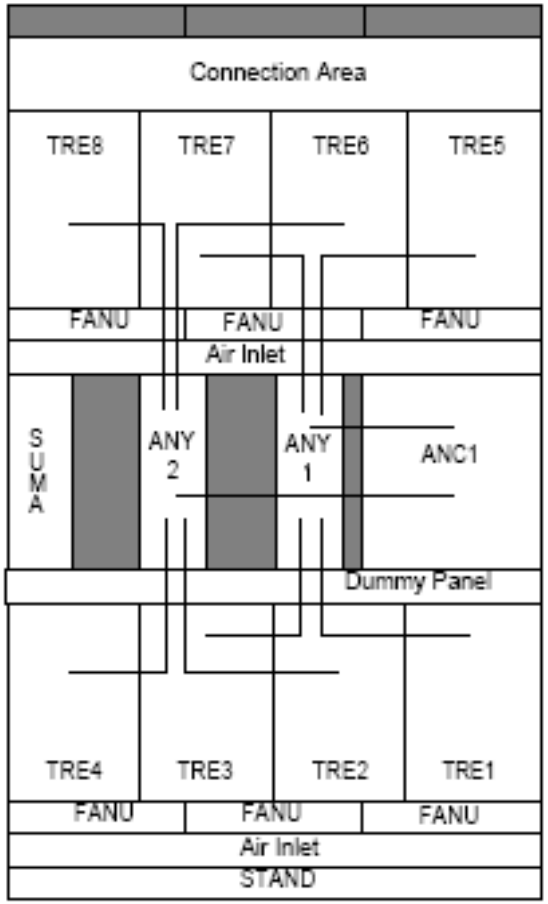
# CONFIGURATION NOMENCLATURE

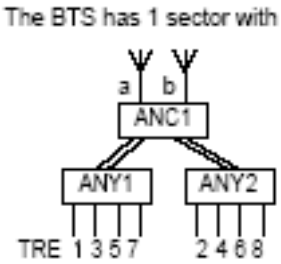
## Different type of Configurations

**BTS-9100-IND-MBI5-1N, 1P, 1Q TRX900 (MBI5 1,1,1G)**
**BTS-9100-IND-MBI5-2N, 2P, 2Q TRX900 (MBI5 2,2,2G)**
**BTS-9100-IND-MBI5-3N, 3P, 3Q TRX900 (MBI5 3,3,3G)**
**BTS-9100-IND-MBI5-4N, 4P, 4Q TRX900 (MBI5 4,4,4G)**
**BTS-9100-IND-MBI3-4N, 0P, 0Q TRX900 (MBI3 4,0,0G)**

**BTS-9100-OUT-MBO2-1N, 1P, 0Q TRX900-2HU-BU90 (MBO2-1, 1G)**
**BTS-9100-OUT-MBO2-2N, 2P, 0Q TRX900-2HU-BU90 (MBO2-2, 2G)**
**BTS-9100-OUT-MBO2-1N, 1P, 1Q TRX900-2HU-BU90 (MBO2-1, 1, 1G)**
**BTS-9100-OUT-MBO2-1N, 1P, 1Q TRX1800-2HU-BU90 (MBO2-1, 1, 1D)**

# BTS-9100-MBI3-8N,0P,0QG (MBI3 8,0,0G)




If more than 4 TREs, 2 ANYs are required. Pre-equipment possible

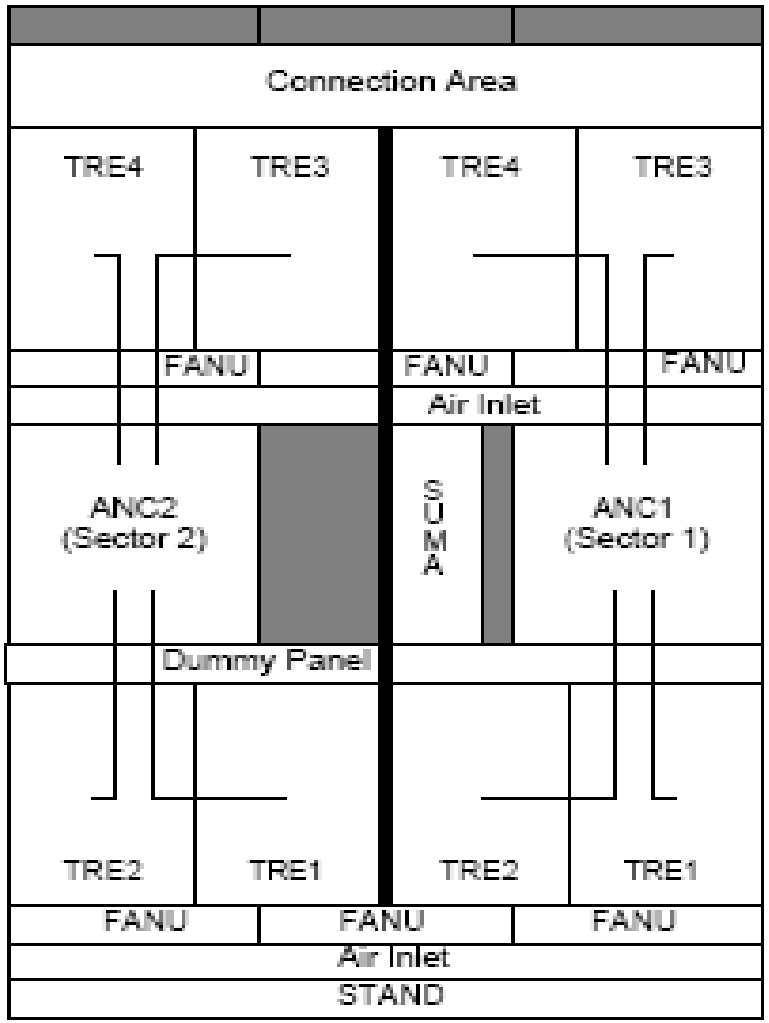
Up to 4 TREs, and if no ANY pre-equippec the TRE1 to TRE4 are directly connected to the ANC

The ANC can be replaced by the ANB in case of less than 3TREs

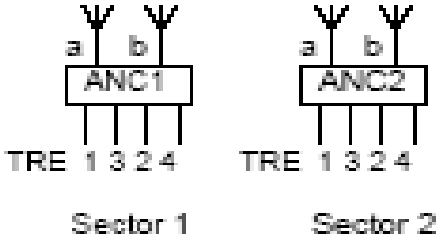
Empty space

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

# BTS-9100-MBI3-4N,4P,0QG (MBI3 4,4,0G)




The BTS has 2 sectors:
- Sector 1 with n TREs,
- Sector 2 with p TREs

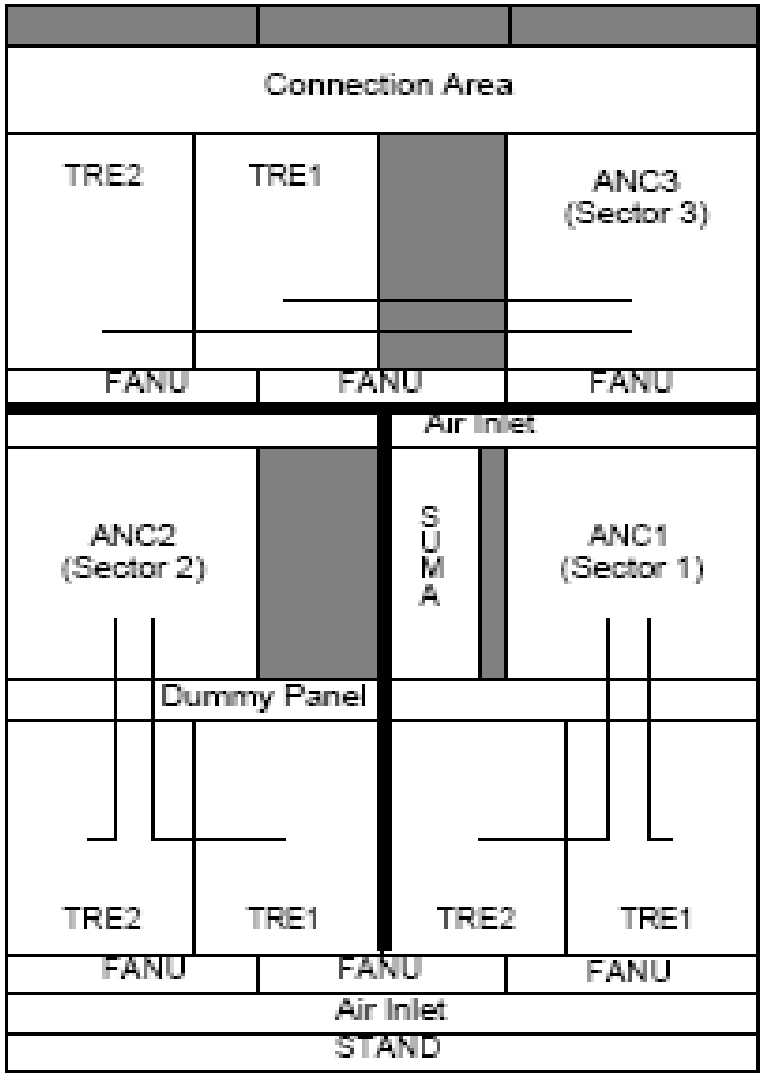



The ANC can be replaced by the ANB in case of less than 3TREs

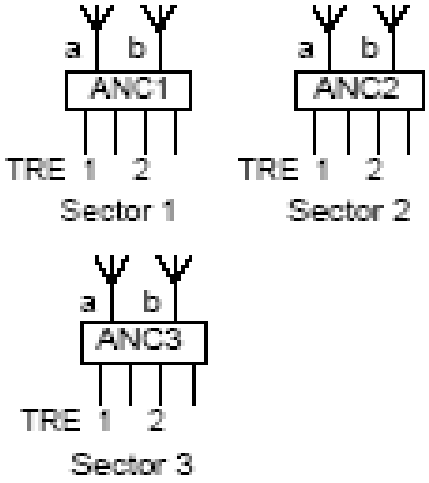
Empty space

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

# BTS-9100-MBI3-2N,2P,2QG (MBI3 2,2,2G)




The BTS has 3 sectors:
- Sector 1 with n TREs,
- Sector 2 with p TREs,
- Sector 3 with q TREs

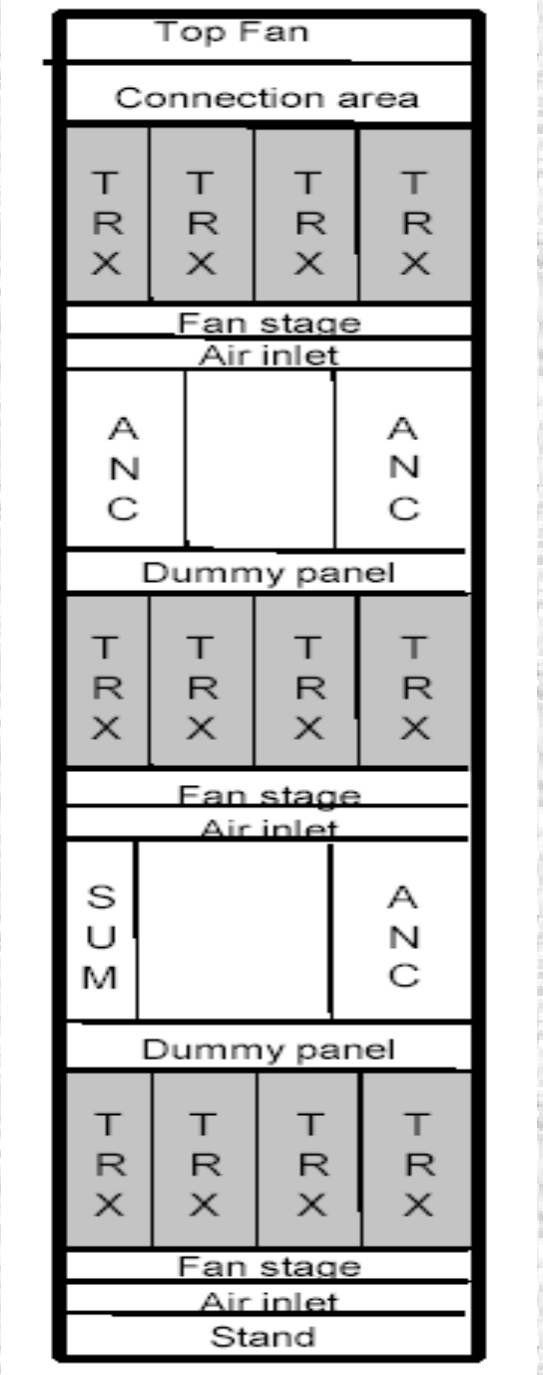



The ANC can be replaced by the ANB also

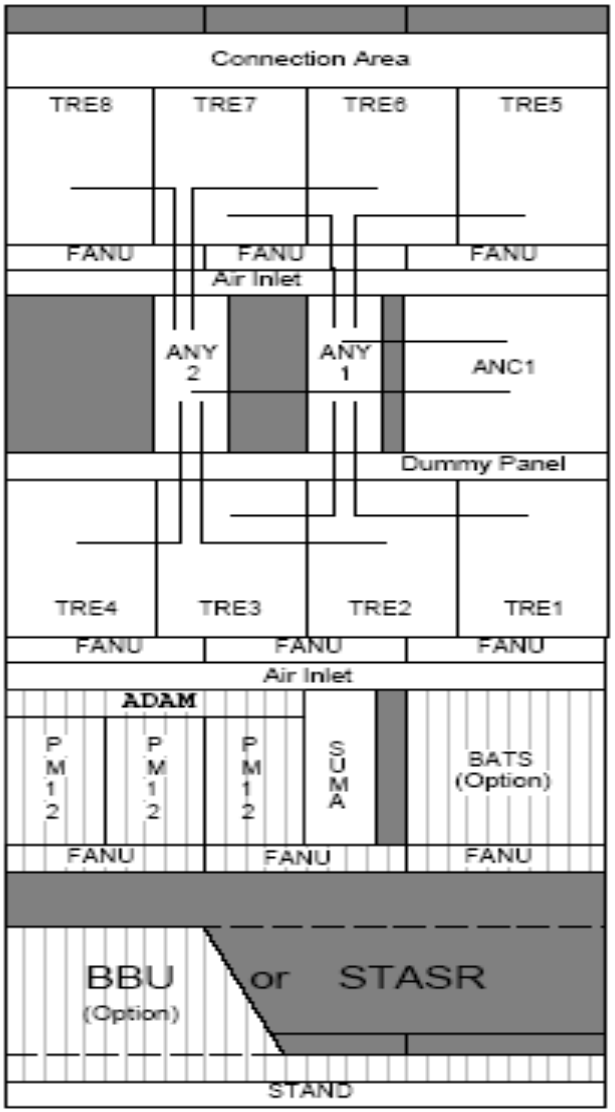
Empty space

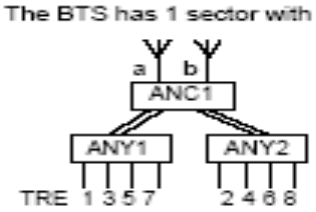
*Figure 51: MBI3 - 3x1...2 - DC Configuration*

# MBI5 with 4,4,4 Configuration



# BTS-9100-MBI5-8N,0P,0QG (MBI5 8,0,0G)




If more than 4 TREs, 2 ANYs are required. Pre-equipment possible

Up to 4 TREs, and if no ANY pre-equipped the TRE1 to TRE4 are directly connected to the ANC

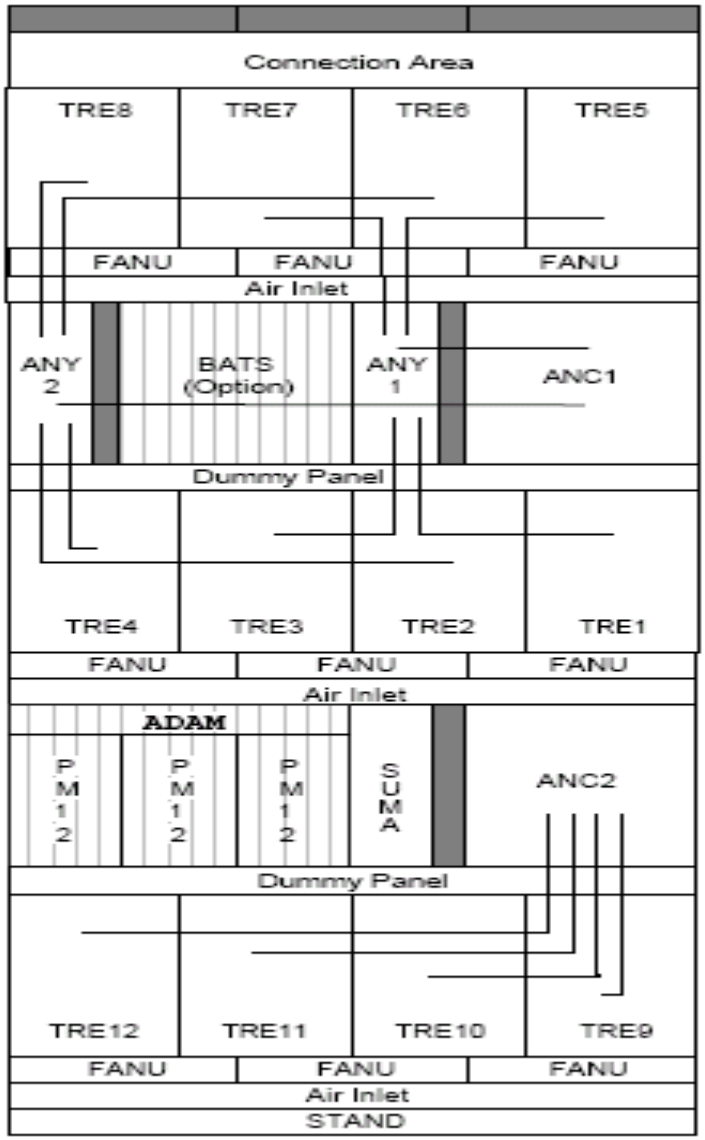
The ANC can be replaced by the ANB in case of less than 3TREs

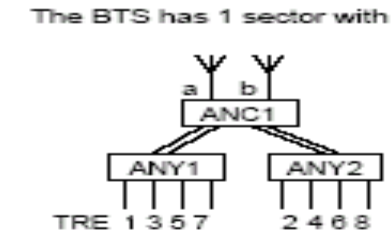
Modules present only in AC configuration

Empty space

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

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



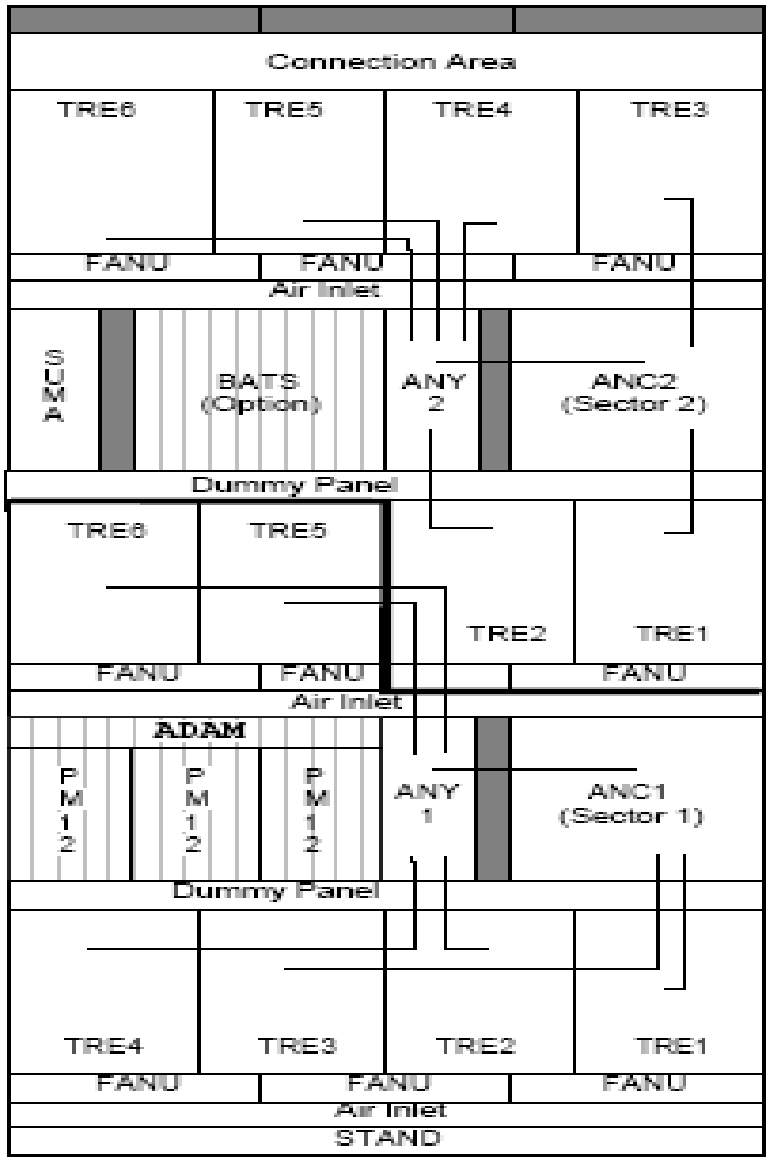

Both ANCs are set to the same sector number

Modules present only in AC configuration

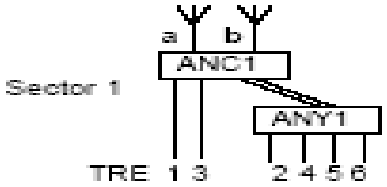
Empty space

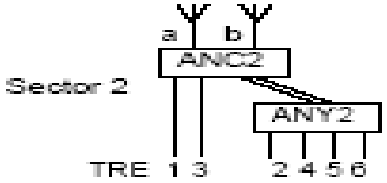
*Figure 54: MBI5 - 1x9...12 (Low Loss) - AC or DC Configuration*

# BTS-9100-MBI5-6N,6P,0QG (MBI5 6,6,0G)




The BTS has 2 sectors:
- Sector 1 with n TREs,
- Sector 2 with p TREs




In each sector:
If no more than 4 TREs, no ANY is required. TRE1 to 4 are then cabled on ANC.

The ANC can be replaced by the ANB in case of less than 3TREs

Modules present only in AC configuration

Empty space

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

# BTS-9100-MBI5-4N,8P,0QG (MBI5 4,8,0G)

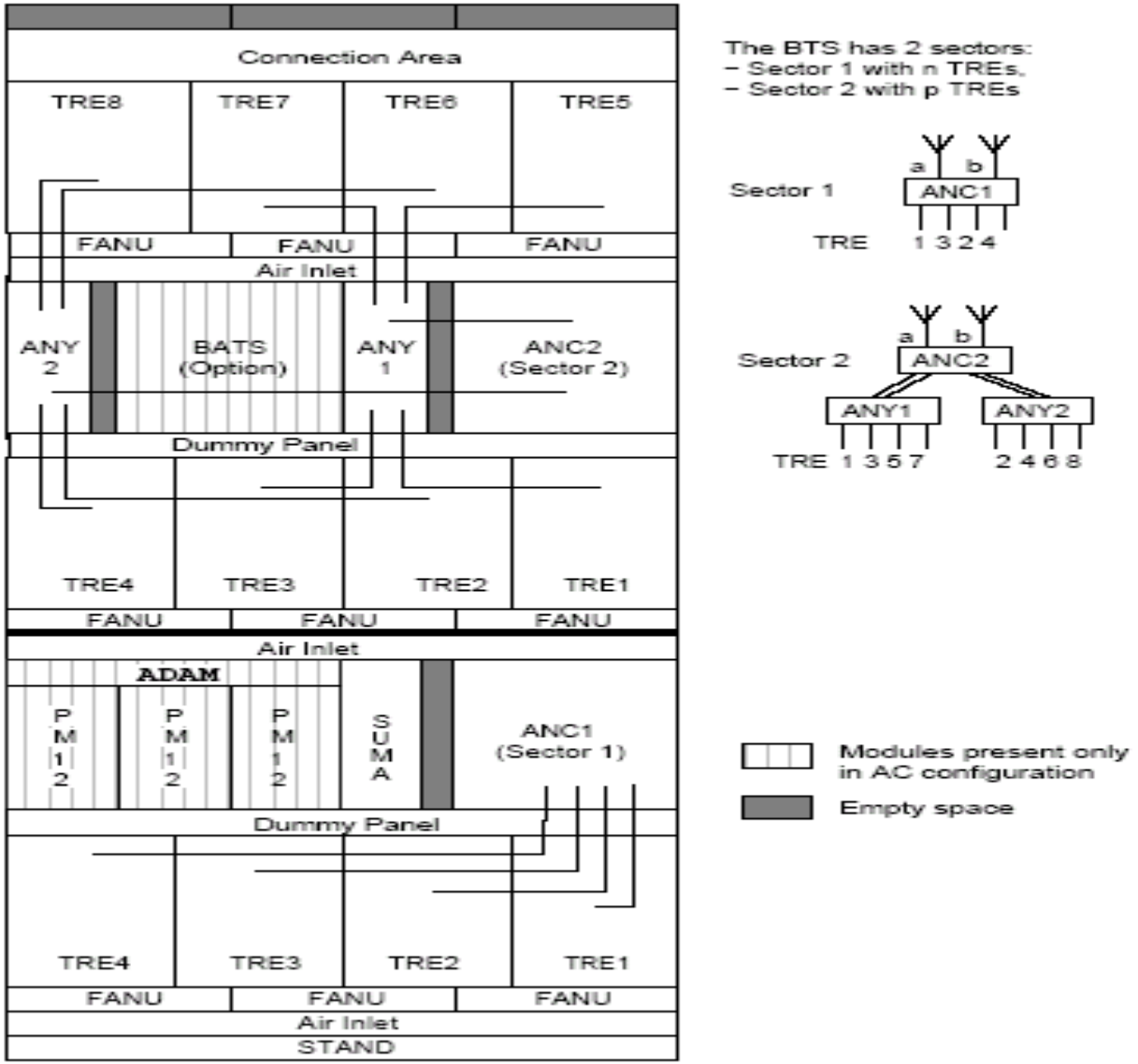



*Figure 57: MBI5 - 1x1...8 + 1x1...4 - AC or DC Configuration*

# BTS-9100-MBI5-4N,4P,4QG (MBI5 4,4,4G)

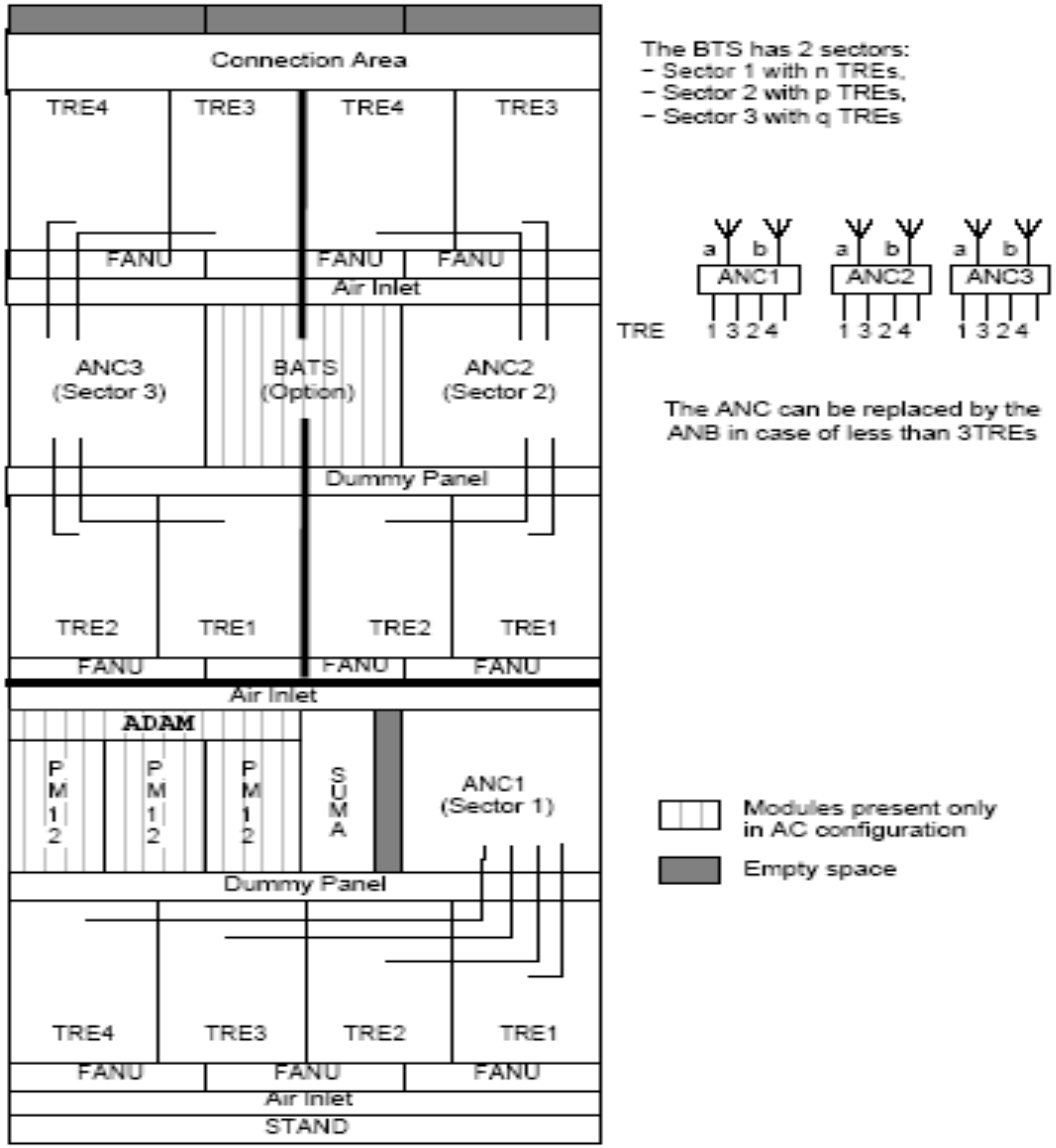
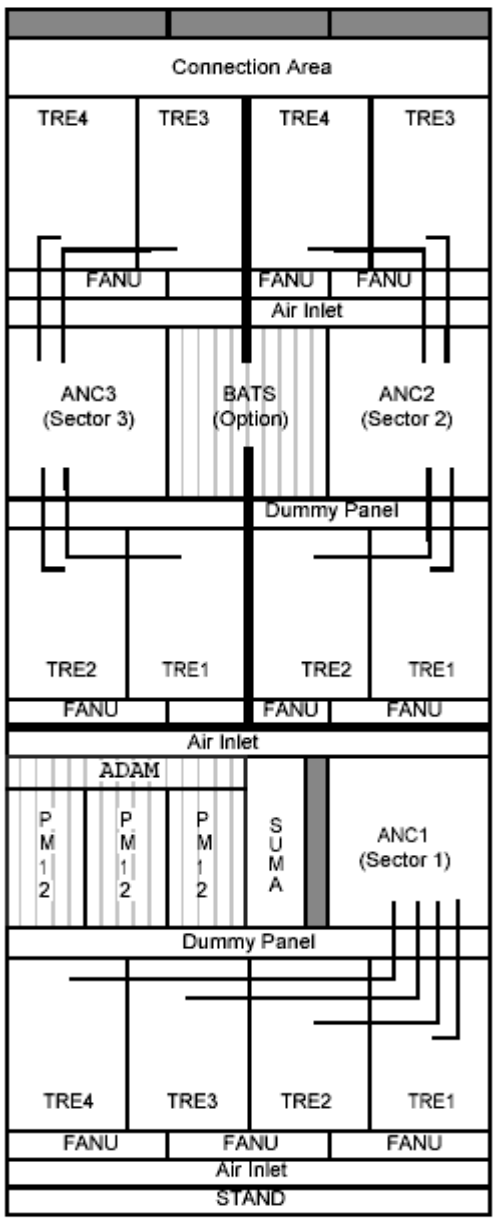


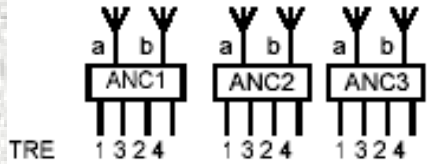

*Figure 59: MBI5 - 3x1...4 - AC or DC Configuration*

# BTS-9100-MBI5-4N,4P,4QG (MBI5 4,4,4G)

Note:
Cards ADAM, PM12, and BATS(Opt) are used in AC version.




The BTS has 3 sectors:
- Sector 1 with n TREs,
- Sector 2 with p TREs,
- Sector 3 with q TREs

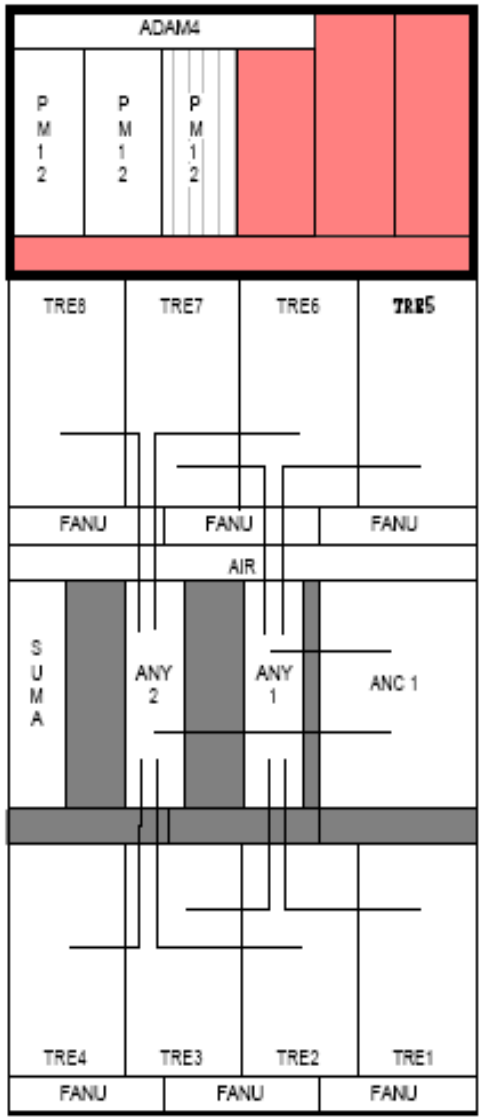


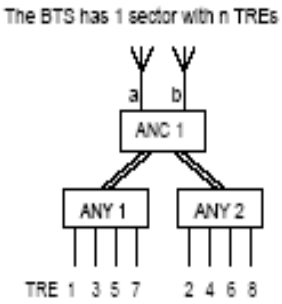

The ANC can be replaced by the ANB in case of less than 3TREs

Modules present only in AC configuration

Empty space

# BTS-9100-MBO1-8N,0P,0QG-HU (MBO1 8,0,0G-HU)




The ANC can be replaced by the ANB in case of less than 3TRE 5

If more than 4 TREs, 2 ANY are required
Pre-equipment possible

Up to 4 TREs, and if no ANY pre-equipment, the TRE1 to TRE4 are directly connected to the ANC

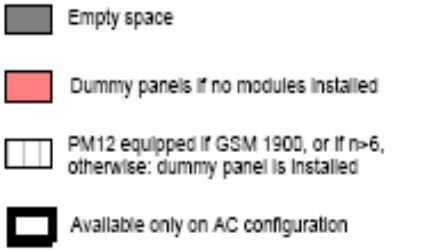
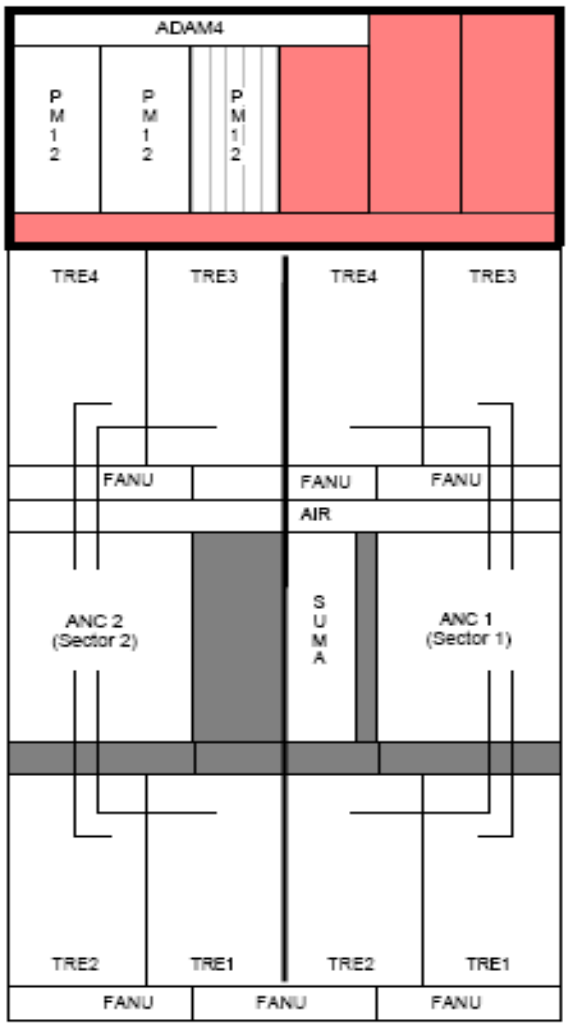
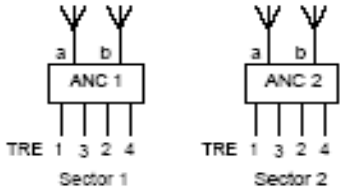



*Figure 139: MBO1 - 1x1...8 Configuration*

# BTS-9100-MBO1-4N,4P,0QG-HU (MBO1 4,4,0G-HU)




The BTS has 2 sectors:
- Sector 1 with n TREs
- Sector 2 with p TREs




The ANC can be replaced by the ANB in case of less than 3TRE S

Empty space

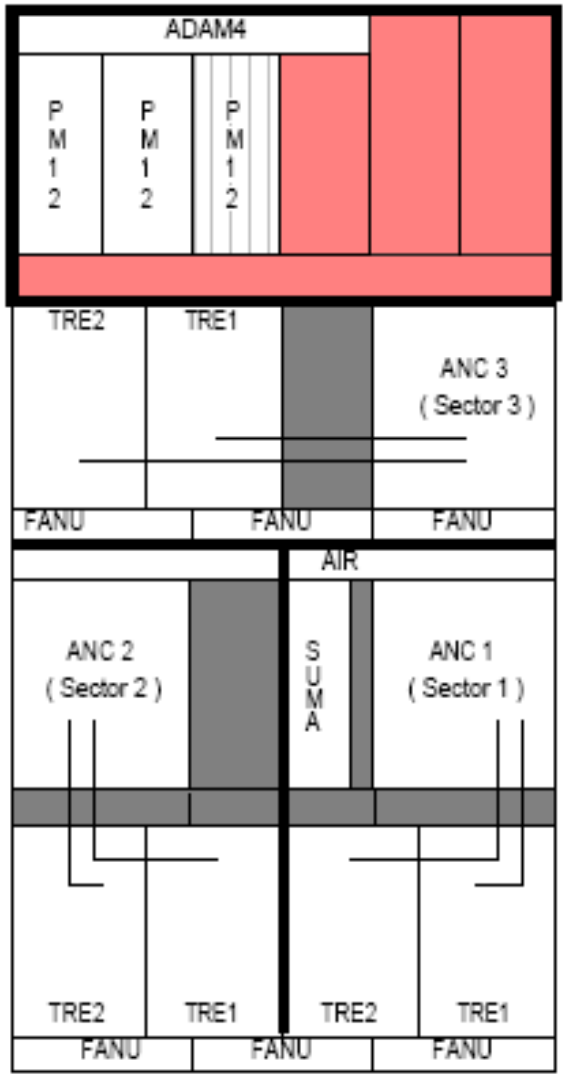
Dummy panels if no modules installed

PM12 equipped if GSM 1900, or if (n+p)>6, otherwise: dummy panel is installed

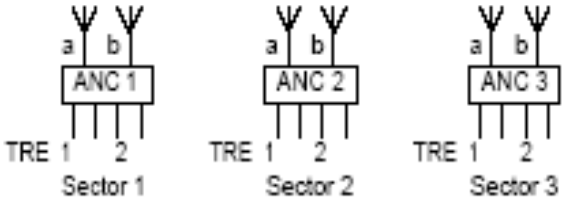
Available only on AC configuration

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

# BTS-9100-MBO1-2N,2P,2QG-HU (MBO1 2,2,2G-HU)




The BTS has 3 sectors :
- Sector 1 with n TREs
- Sector 2 with p TREs
- Sector 3 with q TREs




On each ANC:
The bridges can be removed at installation time (on site), if maximum power is required

The ANC can be replaced by the ANB in case of less than 3TRE S

Empty space

Dummy panels if no modules installed

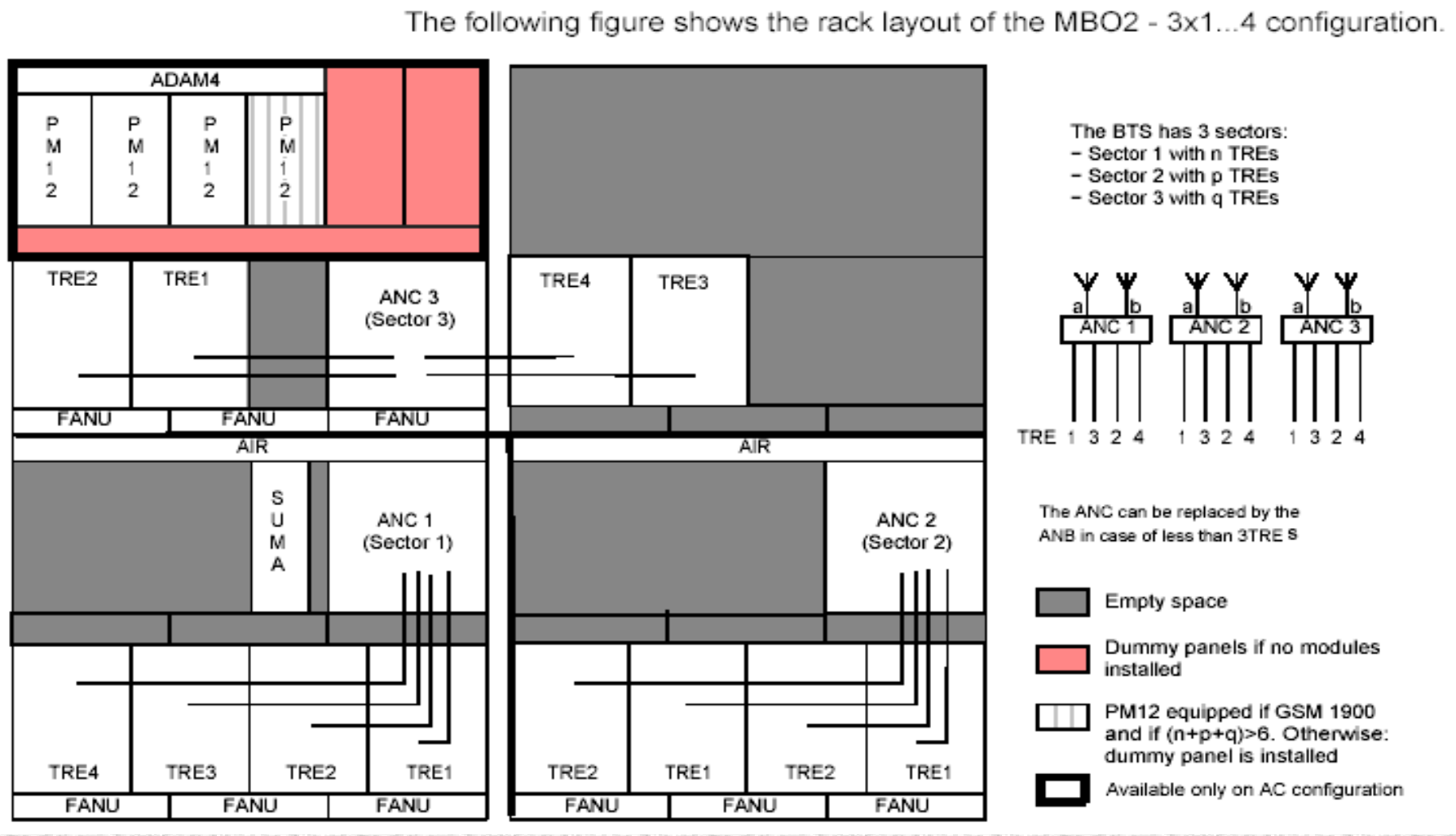
PM12 equipped if GSM 1900, otherwise: dummy panel is installed

Available only on AC configuration

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

# OUTDOOR – BTS

## BTS-9100-OUT-MBO2-4N, 4P, 4Q TRX900-2HU-BU90 (MBO2-4, 4,4G)




**MBO2:** Multistandard Base Station Outdoor

## Present status of the Product with BSNL QA

-Indoor BTS MBI model with upto GPRS,EDGE compatibility only has been offered till date.

-The BTS offered is for GSM 900 only.

-TSEC is yet to be issued due to want of some GR non compliances

-At present only despatch clearance were issued and no Ics were issued for want of TSEC.

-Out door BTS has not been offered yet for TSEC.

END.