RBS 6102 and 6201

Internal presentation

Gdańsk 05

.2010

RBS 6000 - concept

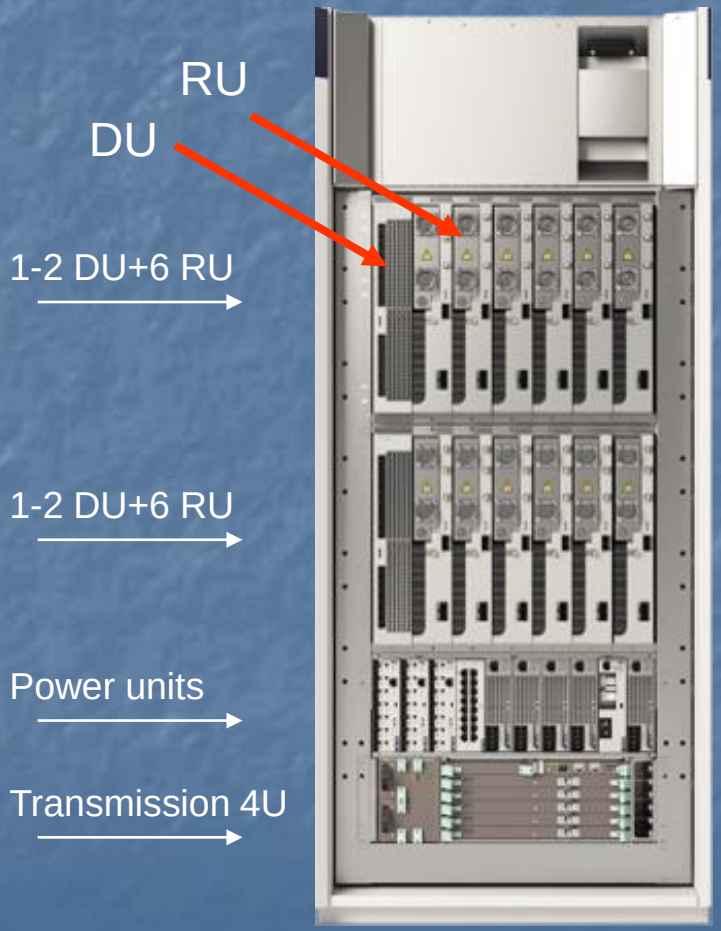
- Cabinet – standard 19” rack
- Common supporting equipment
- Radio Unit
  - GSM/UMTS/LTE
  - Multi standard
  - Single band
- Digital Unit

  In one unit combined:
  - Baseband processing
  - Transmission
  - Internal interfaces
  - Control & Management
  - Single standard
- No back-plane

RBS 6201

Size (H/W/D):
1485 / 600 / 483 mm
Weight:
200kg (fully equiped)
Space:
300 mm abowe
1000 mm at front
Temperature:
+5°C to +40°C
Power supply:
-48VDC, max 6kW (+24VDC and 230 VAC optional)
min 70mm2 cable @ -48VDC
Fuse:
max150A
Earthing:
35mm2
Noise:
62dB(A) @ +20°C
71dB(A) @ +40°C

RBS6201

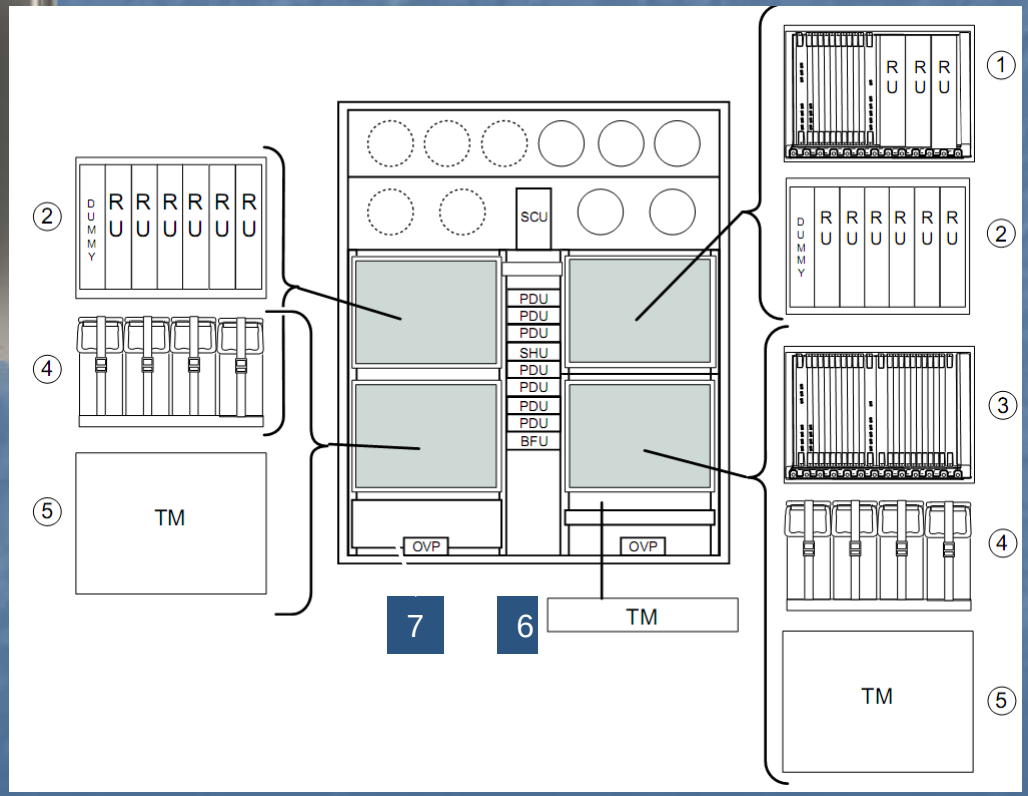


- 12 RU
- 4 DU (DUW takes 2 places)
- The unified building practice enables a huge number of configurations, like;
  - 3x16 GSM TRXes
  - 6x2 WCDMA carriers with TX diversity
  - 3x8 GSM TRXes + 3x4 WCDMA carriers

RBS 6102

Size (H/W/D):
1450 / 1300 / 700 mm
Weight:
330kg (no batteries)
Space:
500 mm above
200mm at back
700 mm at front
Temperature:
-33°C to +45°C
+5°C to +55°C inside cabinet
Power supply:
230VAC and -48VDC, max 6kW
min 5x4m2 cable @ 230VDC
Fuse:
max 3x16A
Earthing:
35mm2
Noise:
62dB(A) @ +20°C
71dB(A) @ +40°C

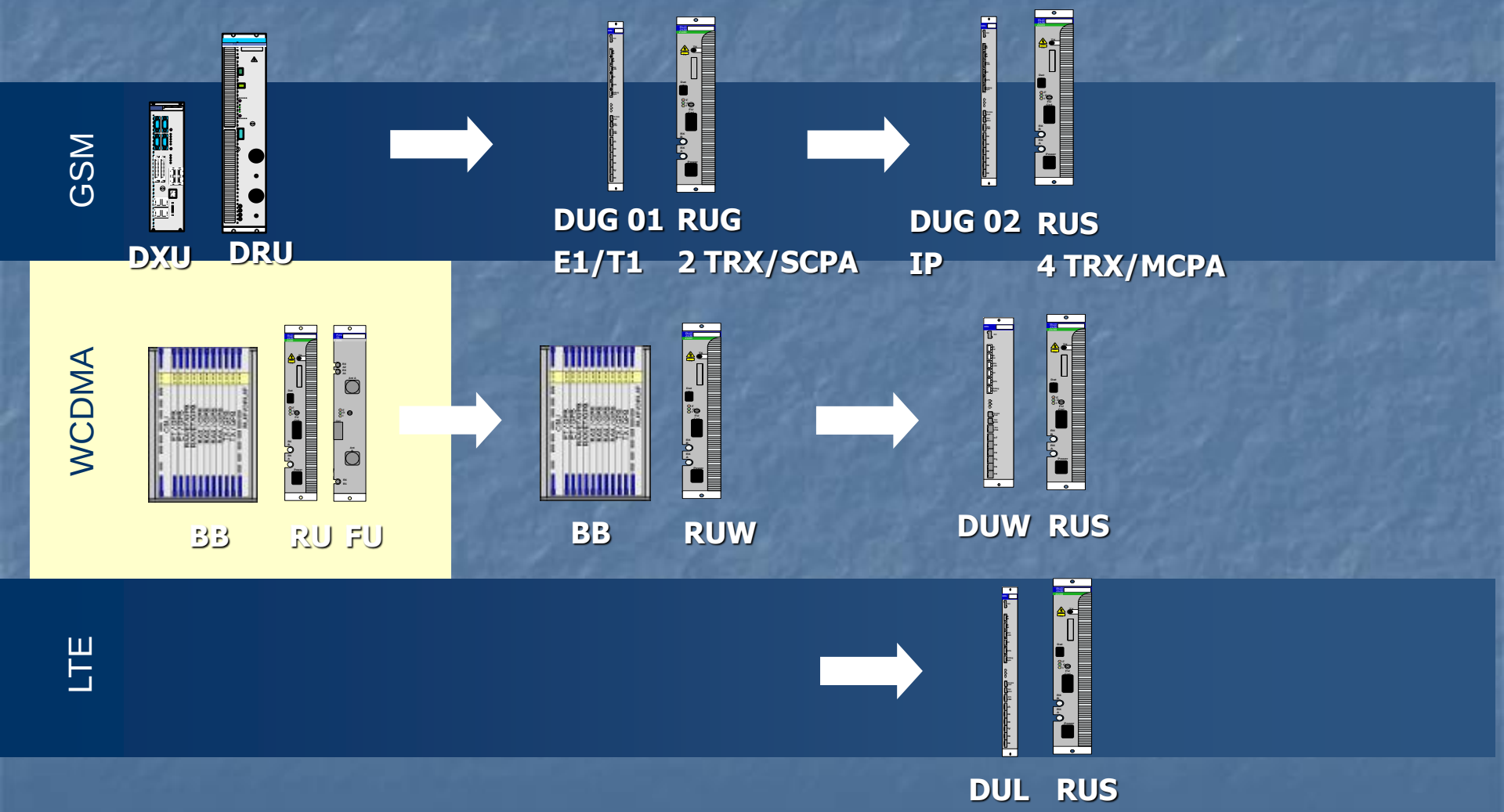
RBS 6102



- 12 RU
- 4 DU (DUW takes 2 places)
- Transmission:
  - 7U (pos. 5)
  - 6U (pos. 6)
  - 3U (pos 7)

RBS 6000 radio modules

– Evolution plan of macro components



RADIO SHELF

The RBS 6000 family uses the following main radio components for GSM, WCDMA and LTE:

- **RU – Radio Unit**
- Transceiver (TRX)
- Transmitter (TX) amplification
- Transmitter/Receiver (TX/RX) duplexing
- TX/RX filtering
- Voltage Standing Wave Ratio (VSWR) support
- **DU – Digital Processing Unit**
- Control processing
- Clock distribution
- Synchronization from transport i/f or GPS
- Baseband processing
- Transport network interface
- RU interconnects
- Site Local Area Network (LAN) and maintenance interface

The radio shelf in RBS 6000 base stations supports a wide variety of RUs and DUs for all main frequency bands and any combination of Radio Frequency (RF) technologies (GSM, WCDMA, or LTE).
Each radio shelf supports up to 6 RUs and a fully configured RBS6102 can house up to 12 RUs.

RADIO UNIT ARCHITECTURE

The RU consists of a filter and a multi-carrier power amplifier. The radio has a 20 MHz bandwidth and up to 60 W of output power, with the latter available in steps of 20 W by hardware activation keys. The antenna system interfaces with a TX/RX port and an RX port. The radio (RUS) can transmit two standards simultaneously. The RU contains co-siting ports, for example, for GSM/WCDMA antenna sharing, and cross-connection that minimizes the number of feeders if more than one RU per sector is used.

The antenna jumper cable that interfaces the RU should have a straight 7/16” connector.

RADIO UNIT FOR GSM

Two GSM variants are offered: one low to mid-capacity (2 TRXs per radio) and one high-capacity version with (4 TRXs per radio).

The low-to-mid capacity radio (RUG) consists of two GSM TRXs, one hybrid combiner, two duplex filters, and two bias injectors.The radio supports 2×40 W uncombined or 2×20 W combined configurations. Up to six RUs can be installed in one radio shelf, enabling up to 12 TRXs per radio shelf or 24 TRXs in an enclosure with two radio shelves. The low to mid capacity radio also supports supreme coverage mode by use of Transmitter Coherent Combining (TCC), which provides an increased cell radius for the downlink. The result is 6 dB higher signal output power compared with the combined version. To compensate the uplink when TCC is used, 4-way RX diversity can be configured.

The high-capacity radio (RUS) consists of four GSM TRXs and a 60 W Multi-carrier Power Amplifier (MCPA). High-capacity GSM radio configurations such as 3×8 to 3×12 requires only 2 antenna branches per sector when the MCPA version is used.

A mixed mode of low-to-mid and high capacity RUs can be used for a coverage/capacity RBS site.

RADIO UNIT FOR WCDMA

The RU for WCDMA (RUW and RUS) is an evolution of the current RU/FU concept, which combines the previously separate RU and Filter Unit (FU) in one unit. The radio supports 60 W of output power with a bandwidth of 20 MHz. Each unit is capable of handling four cell carriers in both downlink and uplink. Multiple radio units can be combined to create various single- or dual-band configurations with 1–6 sectors and 1–4 carriers.

With two units per sector the radio is prepared to support MIMO, transmitter diversity, and 4-way RX diversity. It also supports 3GPP/AISG-compatible TMA/ ASC/RET Interface Unit.

RADIO UNIT FOR LTE

The RU for LTE (RUL and RUS) supports 60 W output power with a bandwidth of 20 MHz. Multiple radio units can be combined into different radio configurations from 1–6 sectors and up to 20 MHz for single or dual band configurations.

With two units per sector the radio is prepared to support MIMO, transmitter diversity, and 4-way RX diversity. It also supports 3GPP/AISG-compatible TMA/ASC/RIU.

MULTI STANDARD RADIO (RUS)

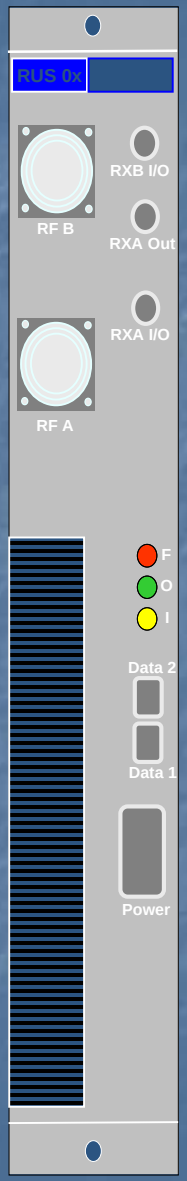
The RUS supports 60W output power for any standard with a bandwidth of 20MHz.

HW supports for two technologies simultaneously.

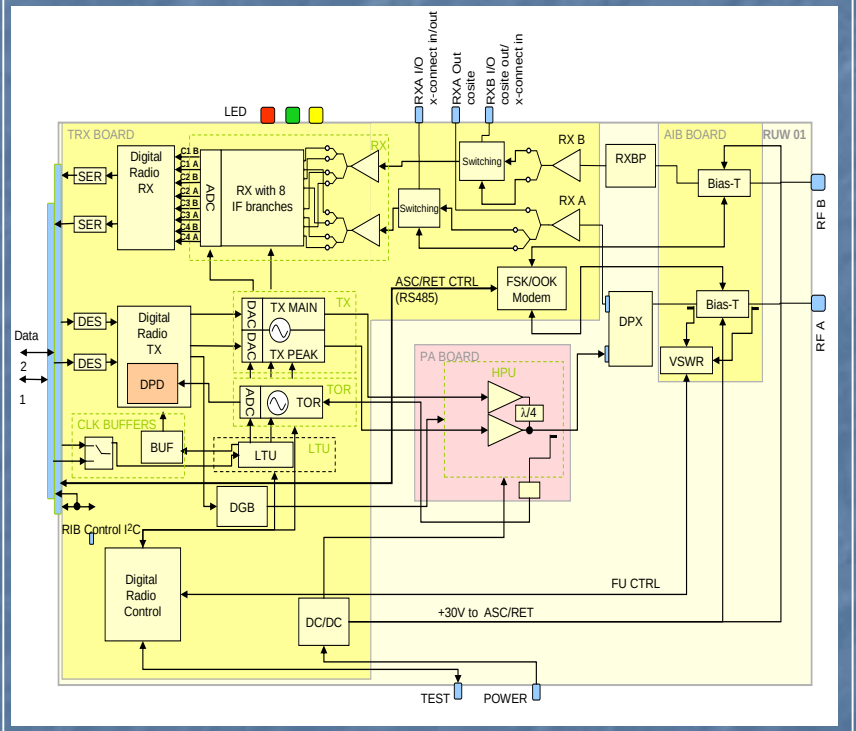
Each unit is capable of handling four cell carriers in both downlink and uplink. Multiple RU can be combined to create various single- or dual-band configurations with 1–6 sectors and 1–4 carriers.

With two units per sector the radio is prepared to support MIMO, transmitter diversity, and 4-way RX diversity. It also supports 3GPP/AISG-compatible TMA/ASC/RIU.

RUS building block



Block diagram



Functions

Multi standard radio including. clipping, PA, UL/DL filtering, ASC/TMA/RET support

Capacity/Performance

Power Class 60W @ ARP
GSM: 1-4 carriers UL/DL with diversity
WCDMA: 1-4 carriers UL/DL with diversity
LTE: 20 MHz
60W total power DL
Full operating BW, 20 MHz IBW
All frequency bands except 700 MHz

Metrics

Power consumption (W)	400 W
Power dissipation (W)	310 W
Hotspots	Yes
Airflow	Front to Back
Max airflow	27 g/s
Min pressure drop	90 Pa
Temperature range	5℃ to +55℃
Size (HxWxD)	8U x 62mm x 280mm
Weight	<6,5 kg

Replaces all radio and filter units for all standards!

DIGITAL UNIT FOR GSM

The Digital Unit GSM (DUG) can control up to 12 GSM carriers.

If more than 12 TRXs are required, then an additional DUG can be installed in the radio shelf and synchronized with other DUGs in the cabinet using TG Sync.

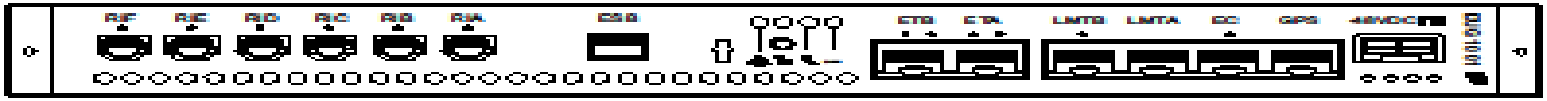
The DUG comes in two variants, DUG10 supports RUG whereas DUG20 supports RUS and RRUS.

The DUG supports the cross-connection of individual time slots to specific TRXs and extracts the synchronization information from the PCM link to generate a timing reference for the RBS.

The DUG supports:

- E1/T1 transport interface
- Baseband processing (DUG20)
- LAPD concentration / multiplexing
- Abis optimization
- Multi-drop (cascading)
- Synchronized radio network, through an external GPS signal
- Transceiver Group (TG) synchronization
- Site LAN

To handle IP, a combination with optional equipment such as SIU, MINI-LINK or OMS is recommended



The DU has the following functions:

-Timing function

-Loadable software (from Flash Card)

-TMA-CM

-Radio interface

-Transmission handling

-External Synchronization

-Feeder Loss Detection

DU Interfaces

DU Interfaces :

- Power –48 V DC
- GPS RJ-45GPS interface including GPS power
- EC RJ-45 Enclosure Control, EC-bus common
- LMTA RJ-45 Local Management Terminal A
- LMTB RJ-45 Site LAN and Local Management Terminal B
- ETA RJ-45 E1/T1 port
- ETBRJ-45 E1/T1 port
- Button - Switch DU mode between Remote and Maintenance
- ESB HSIO - for synchronization to other GSM base stations
- RIA–F Y-link Radio Interface A–F including TMA power

DIGITAL UNIT FOR WCDMA - DUW

The Digital Unit WCDMA (DUW) is available in three variants, to match different capacity demands. The DUW contains the baseband, control, and switching, as well as the Iub and Mub interfaces.

Baseband resources are pooled in the DUW and the number of Channel Elements (CE) and high-speed data capacity can be optimized to fit operator requirements for user type and number of services.

The baseband capacity is pooled independently of sectors and frequencies, and up to two baseband pools can exist (two DUW units) in the same node.

The RBS 6000 family software platform provides generic support for the application software and includes an execution platform with operating system, ATM and IP transport, and O&M infrastructure.

The DUW stabilizes the clock signal extracted from the transport network connection or optional external GPS equipment and uses it to synchronize the RBS.

The DUW provides:

- ATM connectivity
- Fast or Gigabit Ethernet (100/1000 Base-T)
- Channelized STM-1

DUW

Marking	Connector	Description	Optical
RI A - RI F	3 x SFP	Radio Interface x 3 Internal interface between DU and RU External interface between DU and RRU	Yes
TN B	RJ45	Transmission, Ethernet External interface, electrical	No
IDL	HSIO	Inter DU Link Internal interface, DU to DU	No
TN A	SFP	Transmission, Ethernet External interface, optical	No
LMT B	RJ45	Site LAN External interface	No
LMT A	RJ45	Console Internal interface	Yes
EC A	RJ45	EC Bus Internal interface	No
GPS	Modular 10P	GPS External interface	No
PWR	Power	-48 V DC Power	No

Available boards

Control Base Unit

The Control Base Unit (CBU) is the central control unit of the RBS. It handles several control functions and provides for the most common transport network connectivity requirements. The CBU also contains power distribution and filtering.

Transmitter Boards

The baseband Transmitter Board (TXB) is fully HSDPA capable and available with different HSDPA (code) and R99 Channel Element (CE) capacities.

The TXB consists of the baseband TX part, taking care of the following cell splitting, channel combining, encoding, modulation and spreading as well as handling transport channels.

Number of units: 1-2

Random Access and Receiver Boards

The baseband Random Access and Receiver Board (RAXB) consists of the baseband RX part and handles cell ccombination for softer handover, decoding, RAKE receiving, searching as well as dedicated and random access transport channels.

Number of units: 1-6

RUIF

The RUIF is a device board unit used for communication between the Radio Units (RU) and the Baseband (BB) digital subrack. It is directly connected to both the Asynchronous Transfer Mode (ATM) backplane and the BB, while point-to-point cables connect the unit to the RUs. Communication includes control data, clock signals, and gamma data.

Exchange Terminal Boards

The Exchange Terminal Boards (ETBs) provide additional, or other types of, transport network connection ports. The use of ETBs is optional since the CBU already provides 4 E1/T1-ports.

It is possible to equip the cabinet with transmission options such as: E1/J1/T1, E3/J3/T3, STM-1 (channelised and non-channelised) and Ethernet.

Support Control Unit

- SCU board contains internal and external fans groups and external alarms.
- Control of fan speed and fan status
- Interface for smoke detector, external alarms, cabinet lamp, door-switch, external temperature sensor, and heaters
- Generate cold-start signal
- Cabinet memory
- Transient protected EC bus ports for external connections

Support Auxiliary Unit

SAU unit is a common external alarm unit that is part of the site equipment.
It is an alarm supervision unit that can be placed either inside an outdoor RBS or outside an indoor RBS. The SAU is connected to the Support Control Unit (SCU) through an EC-bus cable, it supports control and monitoring of external alarms from external equipment

Support Hub Unit

The SHU has the following functions:

- Providing connection field for EC bus communication between the Control Base Unit (CBU)/Digital Unit (DU) and other units
- Distributing signals for the Cold-Start and Priority Load functions

LICENSING

The LKF is made for a specific node. The default fingerprint value is the backplane identity of the BB subrack, that is, the backplane serial number – CBU version.

In an RBS with Digital Unit WCDMA (DUW), there is no baseband backplane. Therefore, the RBS initial node identity is created upon initial startup of the node in the factory. This is the fingerprint that is defined as the **serial number on the active** core Main Processor (MP) and a time stamp. This identity is distributed and stored on several Plug In Units (PIUs) in the node. This makes sure that the identity can be reconstructed even if one of the PIUs is replaced.

Example of the External_hw script

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE Site SYSTEM "SiteEquipment.dtd">
<!--Site Equipment Configuration-->
<Site>
  <Format revision="R" />
  <OptionalEquipmentConfiguration configureXalm="NO" configureSau="NO"
     configurePowerSupply="NO" configureBatteryBackup="NO"/>
  <SiteLocationConfiguration siteName="Warszawa1" logicalName="Warszawa1">
    <SectorData sectorNumber="1" latitude="145237" latHemisphere="NORTH"
     longitude="5142555" geoDatum="WGS84" beamDirection="000" height="2000" />
    <SectorData sectorNumber="2" latitude="145237" latHemisphere="NORTH"
     longitude="5142555" geoDatum="WGS84" beamDirection="140" height="1900" />
    <SectorData sectorNumber="3" latitude="145237" latHemisphere="NORTH"
     longitude="5142555" geoDatum="WGS84" beamDirection="260" height="1900" />
  </SiteLocationConfiguration>
  <SectorCapabilitySettings>
<SectorCapability sectorNumber="1" radioBuildingBlock="RRB02B" numberOfCarriers="1" />
<SectorCapability sectorNumber="2" radioBuildingBlock="RRB02B" numberOfCarriers="1" />
<SectorCapability sectorNumber="3" radioBuildingBlock="RRB02B" numberOfCarriers="1" />
</SectorCapabilitySettings>
  <SectorEquipmentConfiguration>
    <TmaConfiguration>
      <TmaSector sectorNumber="1" tmaType="NONE" typeOfRet="RETU"/>
      <TmaSector sectorNumber="2" tmaType="NONE" typeOfRet="RETU"/>
      <TmaSector sectorNumber="3" tmaType="NONE" typeOfRet="RETU"/>
    </TmaConfiguration>
```

```
<AntennaConfiguration>
    <AntennaSector sectorNumber="1" band="1" antennaType="7" mechanicalTilt="0"
    electricalTilt="20" dlFeederAttenuationBranchA="?"
    ulFeederAttenuationBranchA="?"dlFeederDelayBranchA="?"
    ulFeederDelayBranchA="?" dlFeederAttenuationBranchB="?"
    ulFeederAttenuationBranchB="?" dlFeederDelayBranchB="?"
    ulFeederDelayBranchB="?" fqBandHighEdgeBranchA="21700"
    fqBandLowEdgeBranchA="21600" fqBandHighEdgeBranchB="21700"
    fqBandLowEdgeBranchB="21600" />

    <AntennaSector sectorNumber="2" band="1" antennaType="7" mechanicalTilt="0"
    electricalTilt="20" dlFeederAttenuationBranchA="?" ulFeederAttenuationBranchA="?"
    dlFeederDelayBranchA="?" ulFeederDelayBranchA="?"
    dlFeederAttenuationBranchB="?" ulFeederAttenuationBranchB="?"
    dlFeederDelayBranchB="?" ulFeederDelayBranchB="?"
    fqBandHighEdgeBranchA="21700" fqBandLowEdgeBranchA="21600"
    fqBandHighEdgeBranchB="21700" fqBandLowEdgeBranchB="21600" />

    <AntennaSector sectorNumber="3" band="1" antennaType="7" mechanicalTilt="0"
    electricalTilt="20" dlFeederAttenuationBranchA="?" ulFeederAttenuationBranchA="?"
    dlFeederDelayBranchA="?" ulFeederDelayBranchA="?"
    dlFeederAttenuationBranchB="?" ulFeederAttenuationBranchB="?"
    dlFeederDelayBranchB="?" ulFeederDelayBranchB="?"
    fqBandHighEdgeBranchA="21700" fqBandLowEdgeBranchA="21600"
    fqBandHighEdgeBranchB="21700" fqBandLowEdgeBranchB="21600" />
```

```
</AntennaConfiguration>
    <InitiateSectorsConfiguration>
      <InitiatedSector sectorNumber="1" antennaSupervisionBranchA="0„ antennaSupervisionBranchB="0" />
      <InitiatedSector sectorNumber="2" antennaSupervisionBranchA="0" antennaSupervisionBranchB="0" />
      <InitiatedSector sectorNumber="3" antennaSupervisionBranchA="0" antennaSupervisionBranchB="0" />
    </InitiateSectorsConfiguration>
    <LocalCellConfiguration>
      <Sector sectorNumber="1"> <Cell cellNumber="1" cellIdentity="30881" cellRange="35000"
numberOfTxBranches="1" hsCodeResourceId="0" /> </Sector>
      <Sector sectorNumber="2"> <Cell cellNumber="1" cellIdentity="30882" cellRange="35000"
numberOfTxBranches="1" hsCodeResourceId="0" /> </Sector>
      <Sector sectorNumber="3"> <Cell cellNumber="1" cellIdentity="30883" cellRange="35000"
numberOfTxBranches="1" hsCodeResourceId="0" /> </Sector>


    </LocalCellConfiguration>
  </SectorEquipmentConfiguration>
  <HsdpaSettings steeredHsAllocation="FALSE">
    <HsdpaSlot slot="8" numHsCodeResources="1" />
  </HsdpaSettings>
  <EulSettings>
    <EulSlot slot="8" numEulResources="1" />
  </EulSettings>
</Site>
```

Example of the O&M script

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE SiteBasic SYSTEM "OamAccess.dtd">
<!--OAM Access Configuration-->
<SiteBasic>
  <Format revision="E" />
  <ConfigureOAMAccess>
  <IPoverEthernet ethernetIpAddress="172.27.96.52"
ethernetSubnetMask="255.255.255.248" />
    <EthernetSwitch etxSlot="1A1-2" vlan="TRUE">
      <VlanMembership action="ADD_MODIFY" vid="32" egressUntag="FALSE" />
      <EthernetSwitchPort administrativeState="UNLOCKED" portNo="2"
systemPort="FALSE" untaggedIngressVid="33" untaggedIngressPriority="5">
        <VlanMembership action="ADD_MODIFY" vid="33" egressUntag="TRUE" />
      </EthernetSwitchPort>
      <EthernetSwitchPort administrativeState="UNLOCKED" portNo="3"
systemPort="FALSE" untaggedIngressVid="33" untaggedIngressPriority="5">
        <VlanMembership action="ADD_MODIFY" vid="33" egressUntag="TRUE" />
      </EthernetSwitchPort>
      <EthernetSwitchPort administrativeState="UNLOCKED" portNo="6"
systemPort="TRUE" untaggedIngressVid="1" untaggedIngressPriority="5">
        <VlanMembership action="ADD_MODIFY" vid="33" egressUntag="FALSE" />
        <VlanMembership action="ADD_MODIFY" vid="32" egressUntag="FALSE" />
      </EthernetSwitchPort>
```

```
</EthernetSwitch>
    <IPoverGigabitEthernet etIPSynchSlot="1A1-2"
     syncIpAddress="172.27.66.52" syncSubnetMask="255.255.255.248"
     defaultRouter0="172.27.66.49" syncVid="32">
      <IpSyncRef ntpServerIpAddress="172.27.65.4" />
      <IpSyncRef ntpServerIpAddress="172.27.65.5" />
    </IPoverGigabitEthernet>
    <Servers isDefaultDomainName="YES"
     defaultDomainName="9010AU.3g.digi.com"
     dnsServerIpAddress="172.28.61.34"
     documentServerWebAddress="172.28.61.34"
     primaryNtpServerIpAddress="172.28.61.34"
     primaryNtpServiceActive="YES"
     secondaryNtpServerIpAddress="172.28.61.35"
     secondaryNtpServiceActive="YES" localTimeZone="CTT"
     daylightSavingTime="NO" singleLogonServer="" />
    <StaticRouting>
      <Route routeIpAddress="0.0.0.0" routeSubnetMask="0.0.0.0"
     hopIpAddress="172.27.96.49" routeMetric="50" redistribute="NO" />
    </StaticRouting>
  </ConfigureOAMAccess>
</SiteBasic>
```

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