PICOCELL BTS

System Description

Notice

Summary

This document describes personal communications system using CDMA digital mobile communications technology, STAREX-800 Export Pico-Cell BTS SYSTEM.

Table of Contents

1. General

1.1 Abstract

PICO-CELL BTS(hereinafter called P-BTS), located between MS and BSC in personal communications system using CDMA digital mobile communications technology STAREX-800, controls and maintains calls as to MS.
That is, it leads MS to recognize BTS, downloads necessary data, allocates traffic channel as to call request and makes call path open.
In view of the capacity of BTS, it was designed with 1FA, and BTS can be accommodated up to 48ea as to one BSC.

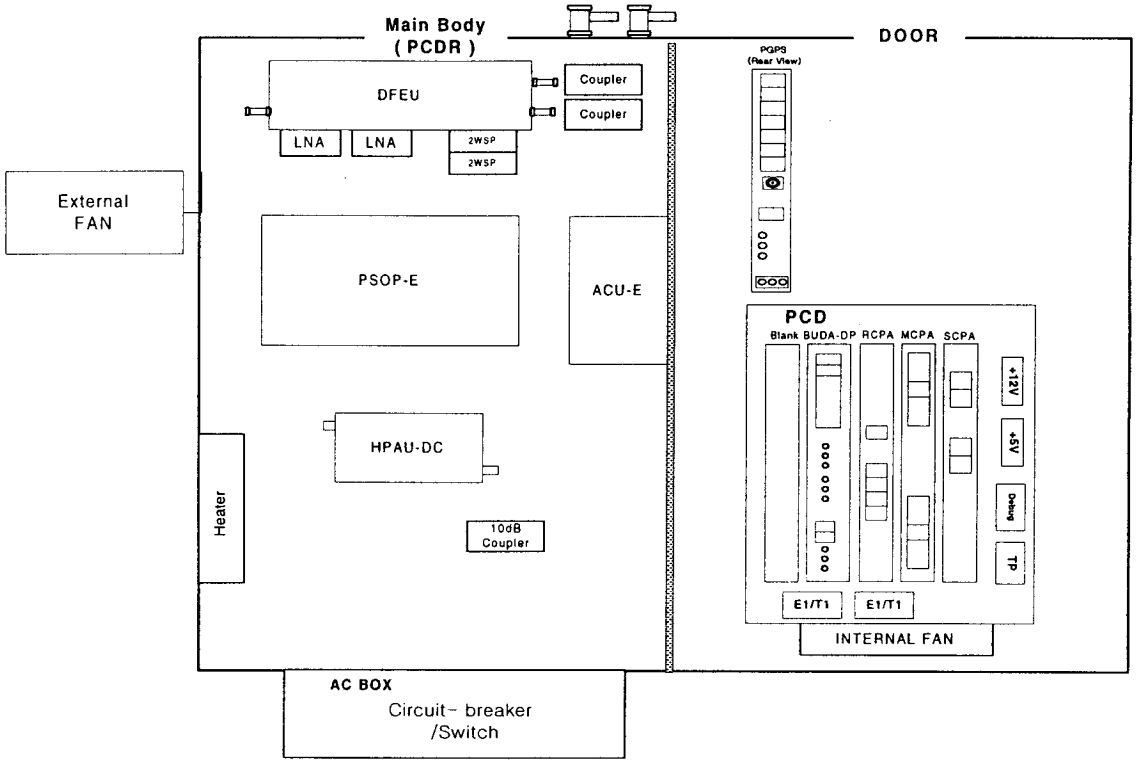
PICO-CELL accommodates all the following functions.

- Call control and call resource management
- Loading function
- Configuration and operational information management function
- Trouble treatment function
- Statistics, overload measurement and control function
- Radio signal processing, radio link test and TPTL
- Packet routing and transmission
- Inventory function
- Remote Control Function

2. Architecture

2.1 H/W Configuration

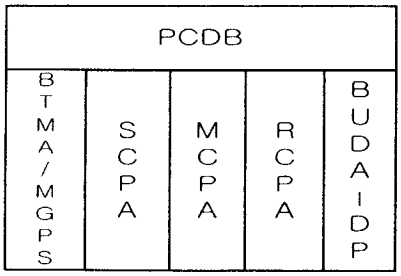
PICO-CELL BTS is composed of 5 blocks, i.e., PCL, rectifier, environment detection unit, Body-Mount Module, AC BOX..
Configuration/mounting diagram and structure of PICO-CELL BTS are as follows:



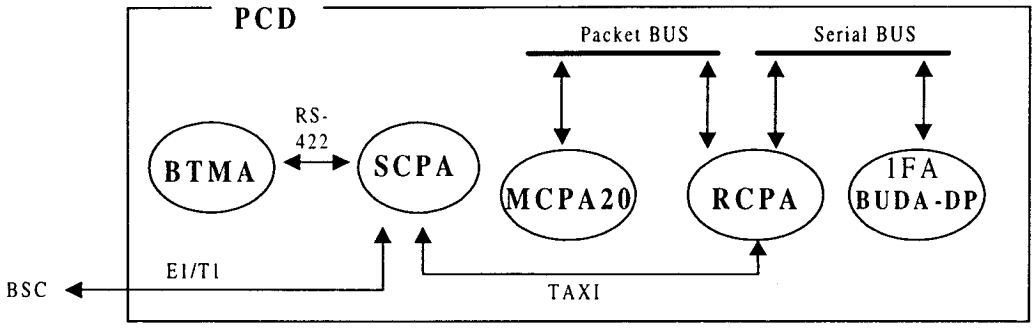
PICO-CELL BTS Configuration and
Mounting Diagram

2.1.1 PCD(Pico-Cell Shelf for DCN)

PCD block is mounted on P-BTS, and executes downloading, call control, maintenance function of BTS including modem function and channel distribution function of CDMA Channel and up/down convert function of RF signal. Besides, H/W configuration diagram and lower module are as follows:



PCD Mounting Diagram



PCD Architecture Diagram

(1) SCPA : As BTS's Master Processor, it executes downloading, call control, maintenance function of BTS.
(2) MCPA : As signal processing area as to CDMA channel, it is in charge of Overhead Channel and Traffic channel.
(3) RCPA : It executes RF device control function, Base-band Digital Combining of forward link.
(4) BUDA-DP : A/D Conversion, frequency conversion and output detection of Tx/Rx signal.
(5) BTMA/MGPS : Reference clock provision, TOD and IPC link function.
(6) PCDB : Back board of PCD

2.1.2 Rectifier (PSOP-P1)

As a device that supplies DC power to each device in the system, internal H/W is composed of a supervisory processor for communications with environment detection unit and the operation and control of rectifier, AC/DC converter that changes AC power into DC power and DC/DC converter.

(1) AC/DC Converter : - It receives input single-phase 220V AC power and outputs DC -48V.
- Upon blackout and AC/DC Fail, it receives DC-48V from Battery and converts it into DC/DC.
(2) DC/DC Converter : It outputs AC/DC Converter and outputs +5V, ±12V, +27V with -48V DC power. Upon AC/DC Fail or blackout, it receives -48V from Battery and outputs +5V/±12V/27V.
(3) Supervisory processor : It was designed to report each state of rectifier to upper one (report via environment detection unit).

2.1.3. Environment detection unit

Environment detection unit (ACU-E) prevents malfunction according to surrounding circumstances and prevents an accident beforehand. It receives input of +27VDC power from rectifier, and detects the temperature of main body, rectifier, door state and the temperature of battery box, and environmental state of door. If there occurred environment not suitable for the operation of the system, it provides alarm generation, power cutoff, etc.

(1) ACU-E : It senses temperature and supervises the body of rectifier and battery.
(2) Inner/External FAN : If sensed temperature exceeds the fixed value for high temperature generation, environment detection unit runs FAN.
(3) HEATER : Upon Coldstart, it makes the temperature inside of the body emit heat until it reaches suitable temperature or makes the inside of the body kept at a fixed temperature.

2.1.3. Body-Mount Module

It amplifies, combines and disconnects BTS Tx/Rx signal and executes RF output control function through the detection and report of Tx signal level. In addition, for the diversity of Rx signal, it uses 2 antennas, performing Tx/Rx duplexing function and, as supplementary functions, the function of measuring VSWR on the antenna side. H/W is composed of main Tx, Rx path and supplementary functions, that is, HPAU-DC that executes amplification to send output from BUDA-DP and DFEU to separate Tx/Rx signal and get rid of signal in addition to required signal.

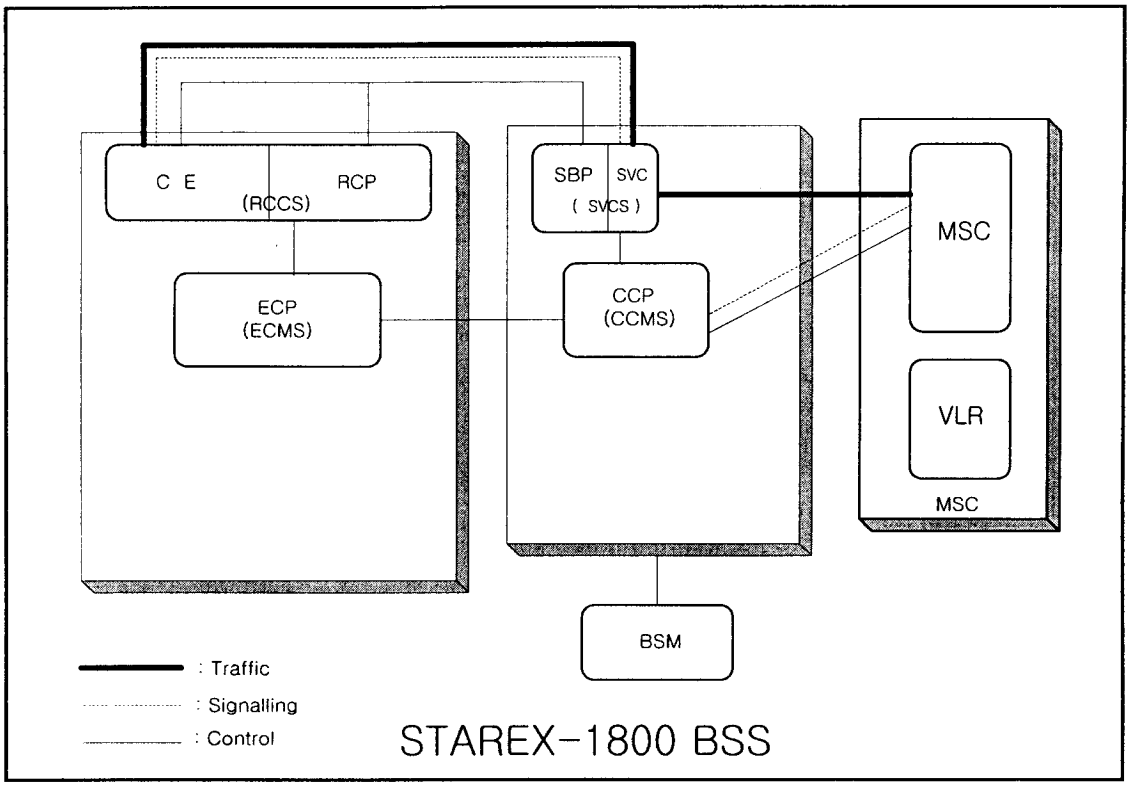
(1) HPAU-DC : Amplification function necessary for the output of Nominal RF Power of Tx signal.
(2) DFEU : It performs amplification of two Rx path signal, removes TX Spurious and provides sampling port of Tx signal.

2.1.4. AC Distribution Box

It is a device that receives commercial power single-phase 220V/380V, supplies it for stable AC power and breaks abnormal power. H/W of the device is made of main breaker that executes the function of distributing power to system rectifier and supplementary devices and the function of opening and closing AC power and auxiliary breaker that supplies power to each supplementary device with power through input common terminal and power supplied from main breaker.

2.2 S/W Configuration

S/W of BTS is composed of ECMS, RCCS.



< BTS and BSC S/W Configuration >

2.2.1 ECMS(Enhanced BTS Call Control & Management) Subsystem

ECMS Subsystem performs mobile call setup and release and the management of resources relating to call. In addition, for operation and maintenance, it executes downloading function, status manageemnt function, configuration and operation information update function, trouble treatment function, remote control function, inventory function, overload control and statistics function.

2.2.2 RCCS(Rf & Channel Control) Subsystem

RCCS Subsystem controls MCPA, BUDA-DP, etc. and executes digital signal processing and call processing as to J-STD-008 CDMA channel.
In addition, it executes channel element downloading function, device status management function, statistics function, etc.
It controls and manages all RF devices such as BUDA-DP Frequency Synthesizer Control, HPAU-DC Enable/Disable, etc. and executes RF power control function such as the measurement of AGC/RSSI Level, Tx Gain Control of entire sector, etc.

3. Functions

3.1 Main functions of BTS

The main function of BTS subsystem is as follows:

1) Call control
Interworking with MS and BSC, it sets up and releases Mobile-to-Land, Land-to-Mobile, Mobile-to-Mobile calls that entered into BTS and supports Softer, Soft, Hard handoff function. In addition, it executes Markov call processing function for setting up test call.

2) Call resource management
It selects channel element resources necessary for call setup by sharing the load, and collects them upon call release. Besides, depending on handoff occurrence frequency of each BTS, it reserves resources exclusive for handoff and supports stable handoff.

3) Downloading
BTS downloads OS and Application Code that it needs by processor from upper processor. Upon downloading of OS and Application Code, if the version is identical, it does not receive loading again and, instead, it is run with them transferred from flash memory which is nonvolatile memory.
This is to get rid of unnecessary loading time and drastically reduce the initialization time of BTS. SCPA, after downloading Application Code, builds and operates database regarding own status, configuration and operation from PLD Data directly transferred from BSM and transfers configuration information necessary for initialization to RCPA.

4) Configuration, status function
For the operation and maintenance of BTS, it executes status management of processor, status management of device, management of configuration information and operation information, etc. SCPA, interworking with RCPA and BSC, BSM, performs operation and maintenance of entire BTS.

5) Trouble, alarm ma management
It manages hardware troubles, i.e., power trouble, processor function trouble, and cable open trouble or software troubles that do not require hardware device for detection. RCPA in BTS detects trouble or alarm of device managed by it, reports it to SCPA, and SCPA reports it to upper processor along with necessary measures. Trouble by hardware is detected through BAMA block in SCPA for management.

6) Test
As for channel element (in particular, Traffic Channel), by periodically testing available resources on-line, it increases reliability of resources.
Depending on the result of the test, it judges whether to continuously use it as call resources. A test at the request of operator is also enabled. CE related tests include one that tests CE's H/W and one that uses BTS Markov Call.

7) Overload control
According to the load of the processor, it is divided into Normal, Minor, Major, Critical, and depending on corresponding grade, it takes necessary measures such as originating call barring, terminating cal barring.

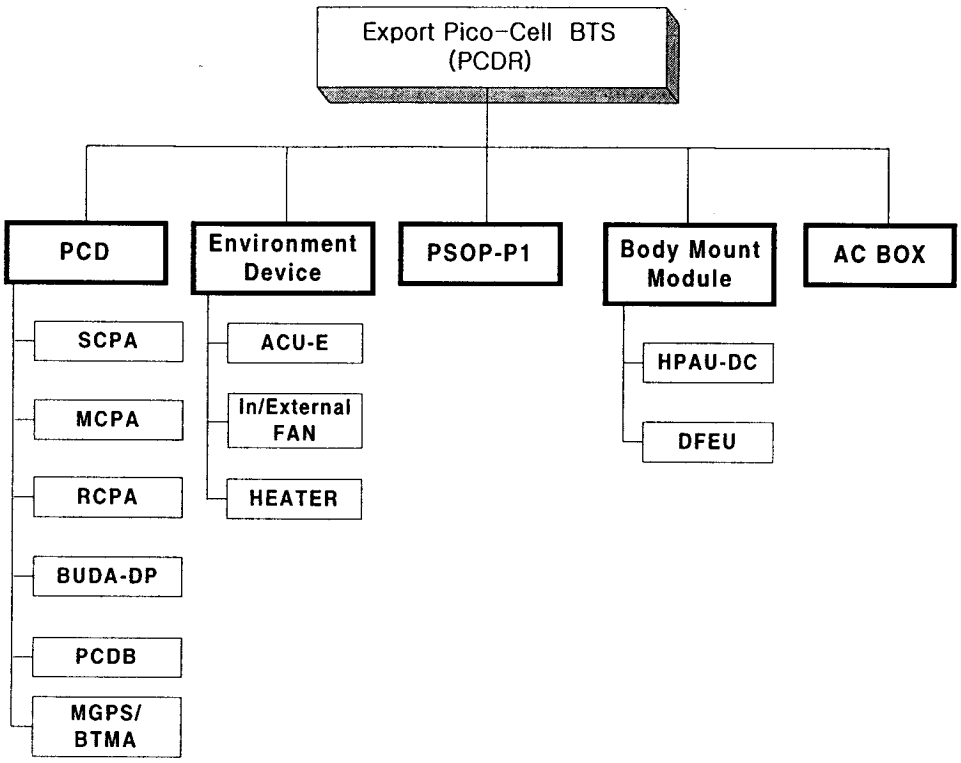
8) Statistics and measurement
It gathers and reports various statistics (cal statistics, process statistics, paging statistics, CE(Channel Element) statistics, BTS performance statistics, CAI(common Air Interface) statistics, etc.). Statistics is basically gathered hourly, reported to BSM, and as occasion demands, it can be measured by inputting the time and cycle that operator wants.

9) Remote Control
It isolates or resets rectifier power, processor or device. When on BSM, operator gave isolation (or Reset) command, SCPA, by receiving it, picks out the subject (BAMA or RCPA) that actually performs isolation (or Reset), and transfers message to corresponding isolation (or Reset) subject for isolation (or Reset).

10) Inventory function
Its purpose is to manage the history of each board. It manages the history of specific board and specific BTS (CN application, repair history, or special notes).

3.2 H/W configuration and function

3.2.1 H/W configuration diagram



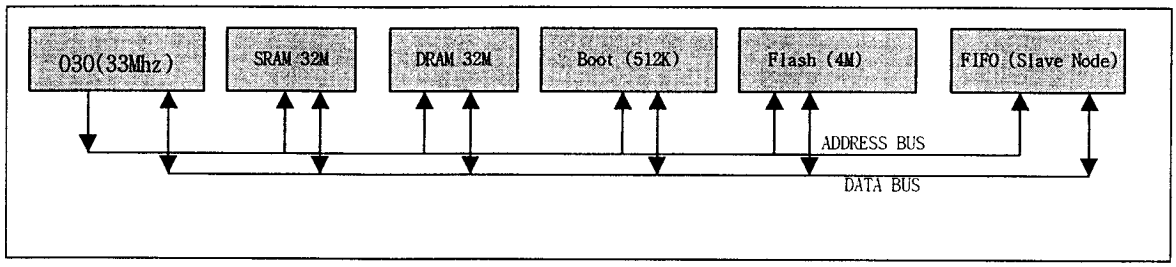
3.2.2 Function by H/W Unit

3.2.2.1 SCPA (System Control Processor Board Assembly)

A. Architecture and function of ECP

1) Function of ECP(Enhanced Control Processor)
As Master Processor of BSC, it manages each board of BTS, takes charge of call control of MS and reports it to upper processor.

2) Configuration of ECP
ECP uses MC68030 of Motorola as processor and is configured by using 32MByte main memory, 128K Booter EPROM, SRAM and 4M Flash. It uses 33Mhz operation clock. And, interface between peripheral and interrupt management and communication port performs the same function as using 2 MFPs by using 1 MFL ASIC. ECP has one slave node of Packet Bus.



<Fig. 2> Configuration of ECP

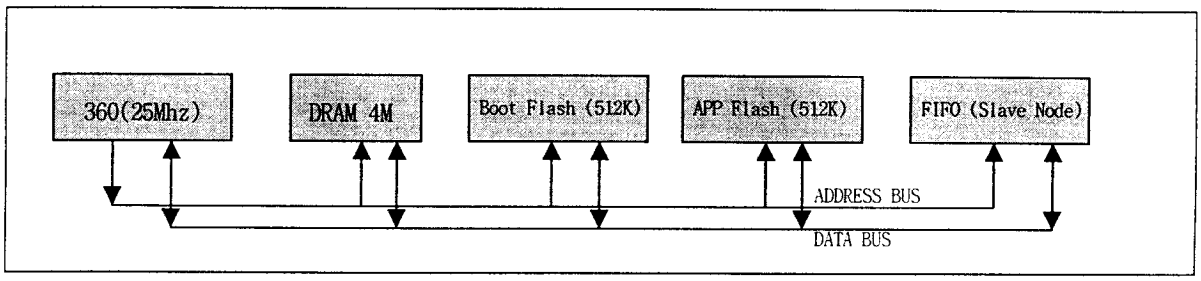
B. Architecture and Function of NMP

1) Function of NMP(Network Master Processor)

NMP has the function of managing the network between upper BSC and BTS. It manages and controls Trunk Line. And, it directly performs alarm gathering function and remote reset function that monitors the state of BTS.

2) Configuration of NMP

NMP uses MC68360 of Motorola and is configured with 4Mbyte main memory. It uses 25Mhz operation clock and has 512Kbyte Booter Flash and Application Flash. NMP has one slave node of Packet Bus, and upon initial Power On, it reads Network Address from EPROM of Back Board and sets Packet Bus. Besides, it manages the state of the node of Packet Bus and manages the state of Trunk.



<Fig. 3> Constitution of NMP

C. Packet BUS

1) Function of Packet Bus

Packet BUS has Full Duplex Tx Mode, and depending on the flow of data, it is called RX Bus, TX Bus, and is 8 bit parallel data bus. RX Bus has check, Move and 5 Nodes and TX Bus has Check, Move Check and 8 Nodes. Each node is composed of TAXI, RS-422, and FIFO. And, it has U-Turn Node between RX Bus and TX Bus.

2) Configuration

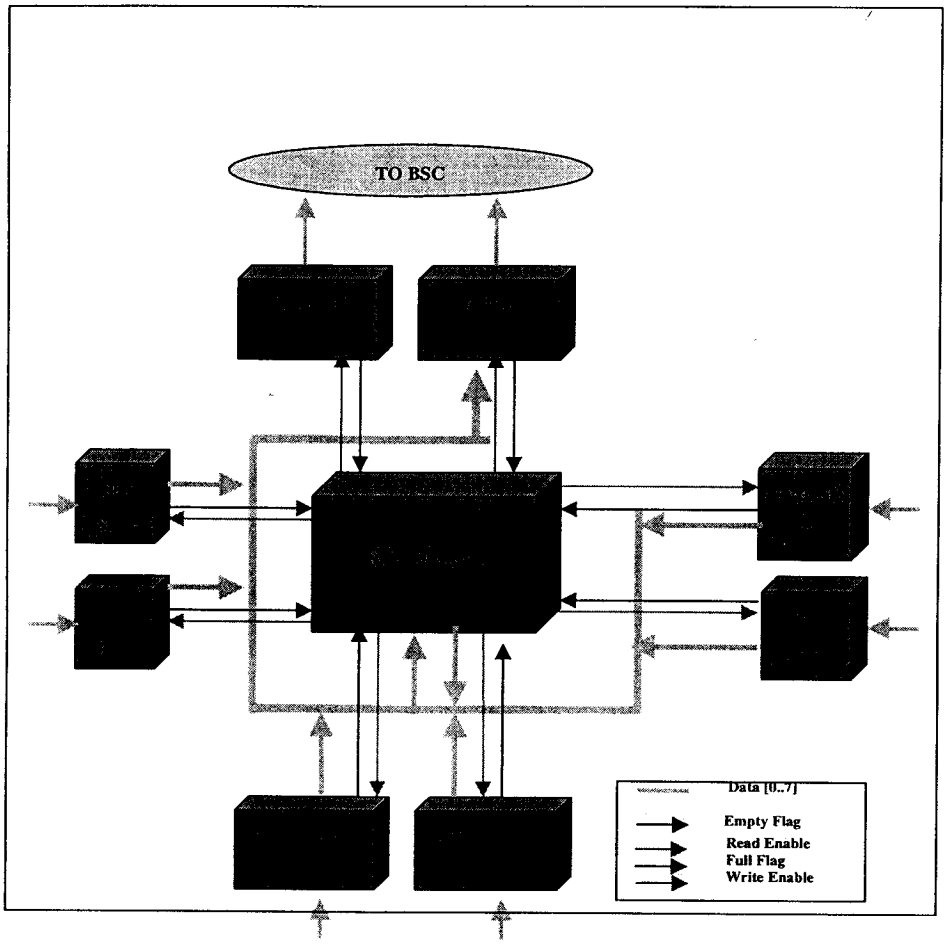
Configuration elements : Bus Master, Bus Slave,

Data Width : 8Bit

Frame Check Method : TAG Method

Node Name	No. of Node		Read CLK	Write CLK	FIFO Size
Trunk	2	HDLC Link			
RCPA	2	TAXI			
BTMA	1	HDLC Link			
030 Slave	1	Data FIFO			
360 Slave	1	Data FIFO			
U-Turn	2	Data FIFO			
Daisy Chain	1	HDLC Link			

TAG1	TAG0	Description
0	0	Frame Start
0	1	Frame Body(Valid)
1	0	Frame End(Even Length)
1	1	Frame Start(Odd Length)



D. Trunk I/F

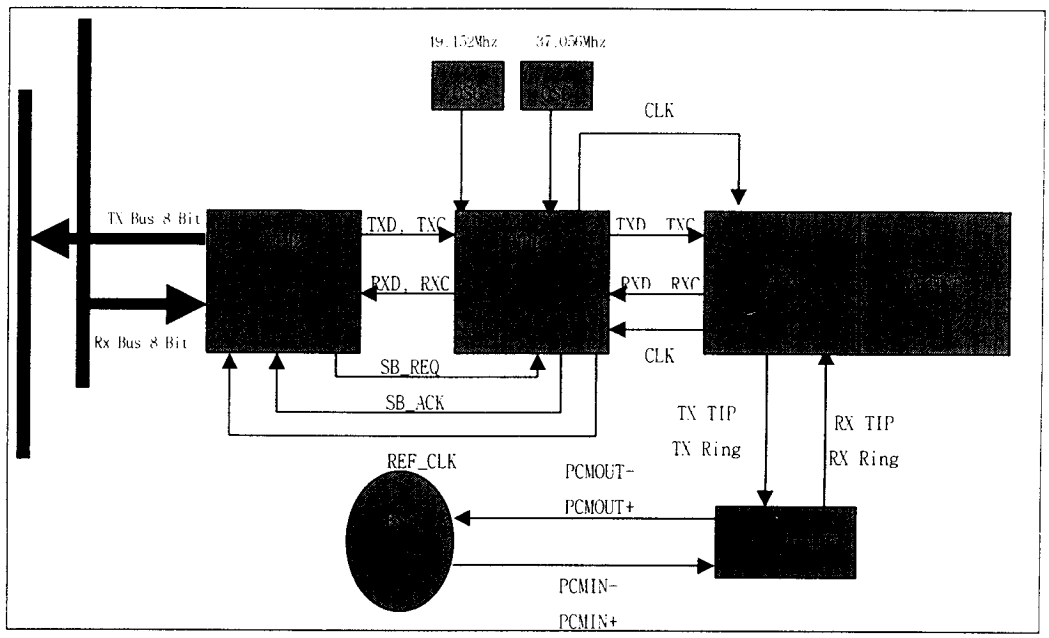
1) Function

It connects BSC with BTS and has the function of maintaining Trunk Line. Depending on operator's request, it can selectively use E1/T1 Mode. It not only has the interface function with higher BSC, but also it has Daisy Function that interfaces lower BTS with higher BSC. It can interface 3 Trunk Lines, uses higher processor and 2 Nodes and one is used for Daisy.

2) Configuration

Tx speed : 1.544Mbps(T1)/2.048Mbps(E1) ± 50ppm
Impedance : 100 Ω(T1) / 120 Ω(E1) ± 10 %
Type of Pseudo Sync Frame
- Normal Sync Frame :
- Block Sync Frame :

Pseudo Sync Frame Tx Cycle : 20msec
No. of Trunk : 2ea
Daisy Chain : 1ea



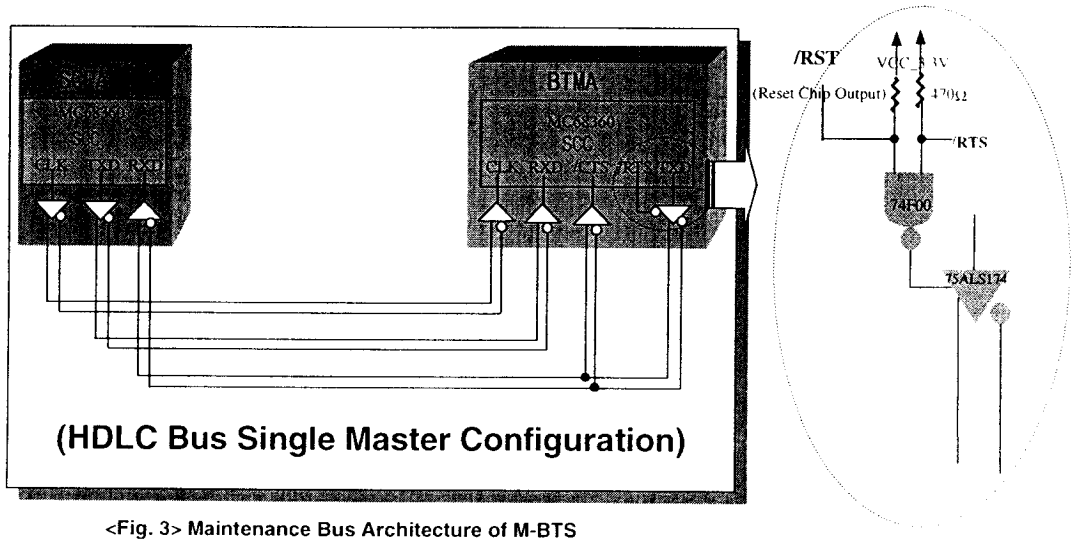
<Fig. 5> Architecture of Trunk I/F

E. Maintenance Bus (M-BUS)

1) Function of M-Bus

SCPA, master of M-Bus, maintains BTS that receives, from Packet Data, the state and error of processor and I/O Device of slaves, reports them to higher processor or handles them by itself.

2) Architecture of M-Bus



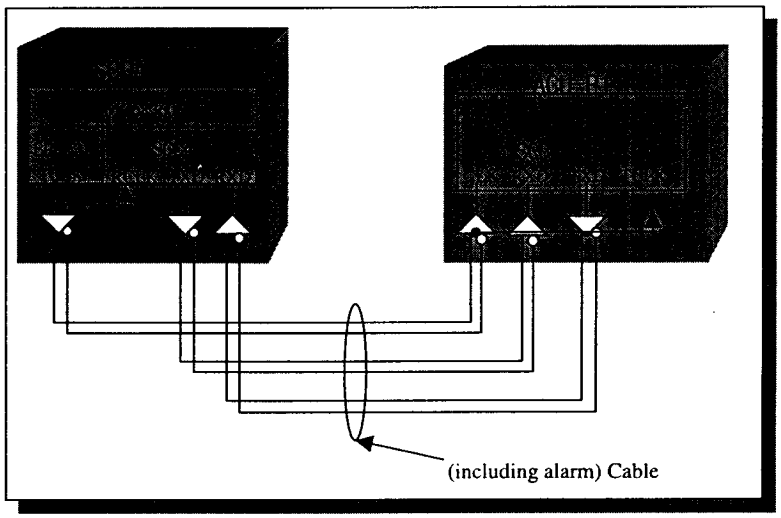
<Fig. 3> Maintenance Bus Architecture of M-BTS

F. ACP-E Communications

1) ACP-E communications

It sets environment parameter (temperature, humidity, threshold) with ACP-E(Environment Detection Unit) and RS-422/LGIC-HDLC or reads environment parameter (temperature, humidity) and reports it to BSM, and Alarm is only gathered with H/W Alarm.

2) Architecture of ACP-E communications



<Fig. 8> Architecture of ACU-E Communication

3) Operation of ACP-E communications

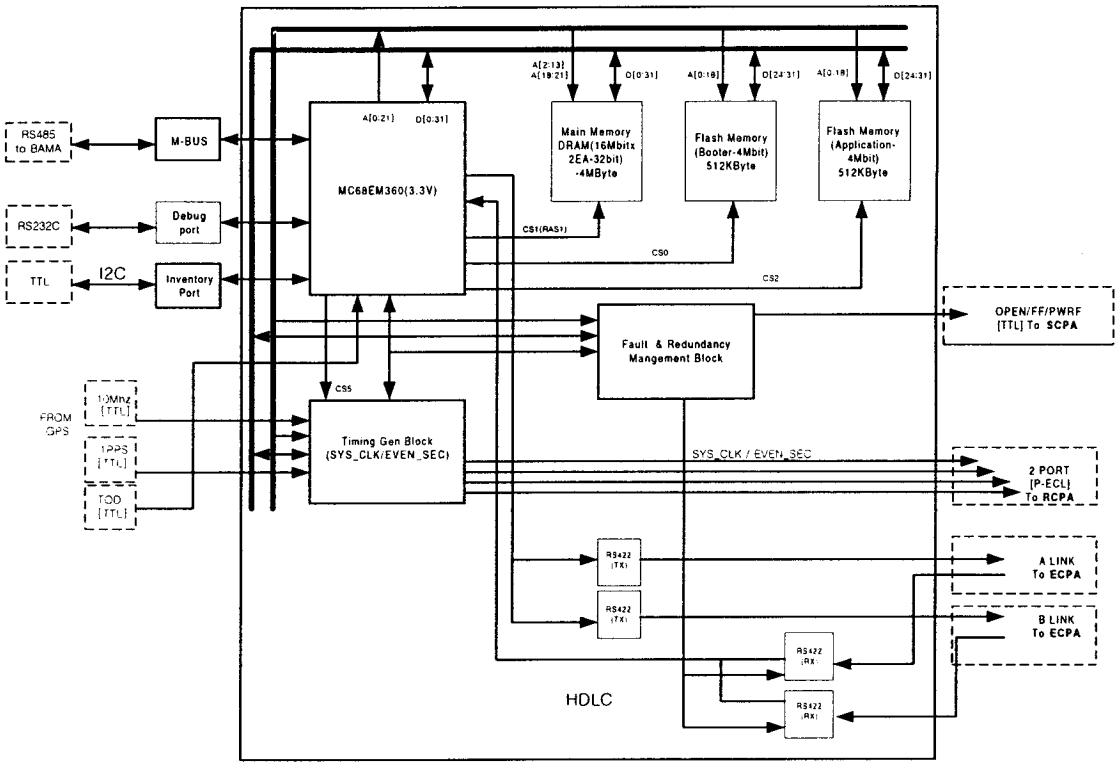
SCPA and ACP-E Communication is made with RS-422/LGIC-HDLC, and SCPA sends TXCLK(1MHZ) and TX Data to ACP-E and ACPU sends and receives data by adjusting synchronization to TX CLK sent by SCPA. Even when SCPA receives DATA, it adjusts synchronization to TX CLK as in the above figure.

Although not indicated in <Fig. 8>, Loop Back Path exists to check own function of SCPA to check the state of up to RS-422 Driver Edge.

3.2.2.2 BTMA/MGPS (BTS Timing Reference Block)

BTMA/MGPS is equipped to P-BTS, and is composed of MGPS made of BTMA and GPS engine, Power supply, OCXO, and Controller that provide synchronization and clock as to BTS by using TOD and synchronization signal provided from MGPS receiver.

(1) BTMA (BTS Timing Management circuit board Assembly)
BTMA receives 10MHZ(TTL), 1PPS(TTL) and TOD(Time of Day) from MGPS and TOD broadcasts it by using IPC link. Signals between MGPS and BTMA are all connected through backplane, and BTMA uses on-board power supply.
Block diagram and main function of BTMA are as follows:



BTMA Block Diagram

Main Function

- Clock Generation
  - SYS_CLOCK/EVEN_SEC
  - p-ECL Interface
- GPS interface
  - TOD / Control / Alarm / 1PPS / 10MHZ
  - TTL Interface
- MBUS interface
  - Power On/Off
  - RS485 Interface
- IPC

- Interface using NIM2 ASIC
- RS422 Serial Interface

Interface
Interface between BTMA and MGPS is as follows:

- Clock Interface : Providing 1PPS, 10Mhz (from MGPS)
- TOD, Control TTL Interface : Provided to BTMA through back plane.
- Alarm Interface : It receives GPS related H/W Alarm(Open / Power fail / Function fail) from MGPS And provides it to BAMA block.

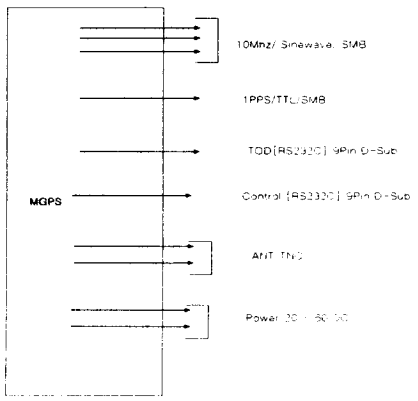
(2) MGPS(Micro BTS's Global Positioning System)
MGPS provides 10Mhz(TTL), 1PPS(TTL) and TOD(Time of Day - TTL) to BTMA.
All signals between MGPS and BTMA are connected through backplane, and uses its own on-board power supply.
Block diagram and main function of MGPS are as follows:

MGPS provides the following function by using time information received from GPS satellite.

- 10Mhz, 1PPS, TOD Generation
- Control port, Alarm Interface
- Redundancy Control
- Fault supervision

MGPS has External Interface inputted and outputted by using backplane and internal interface by using connection between MGPS and BTMA.

- External Interface
  - 10Mhz(sine wave-50 ohm-SMB) --- 3 port
  - 1PPS(TTL,50 ohm-SMB) --- 1 port
  - TOD(RS232C-9 pin D-sub) --- 1 port
  - Control(RS232C-9 pin D-sub) --- 1 port
  - ANT(TNC Female) --- 2 port
  - PWR --- 2 port
- Internal Interface
  - 10Mhz(TTL-50 ohm) ---- 2 port
  - 1PPS(TTL,50 ohm) --- 2 port
  - TOD(TTL,50 ohm) --- 1 port
  - Control(TTL,50 ohm) --- 1 port



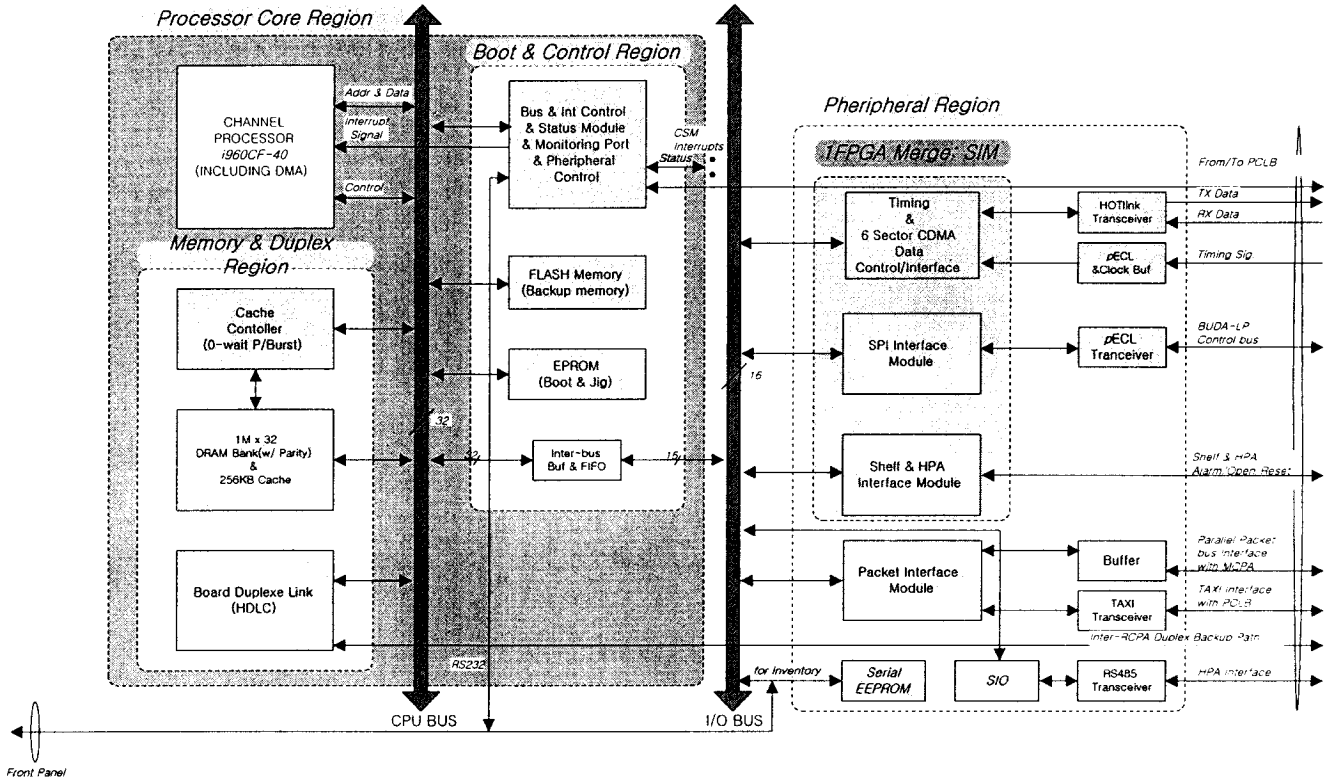
PGPS Block Diagram

3.2.2.3 RCPA(Radio & Channel Processing board Assembly)

RCPA plays a role in Base-band Digital Combining of forward link, Parity Check and Generation of reverse link, Timing and reference frequency distribution of Digital Shelf and RF Device Control.

RCPA has Core Control Module(CCM) that interfaces with CPU(i960) and is composed of ESCC in charge of Monitor Interface through RS-232, Memory Controller in control of Memory, HDLC in charge of board duplication, and Peripheral Controller in charge of interface of Peripheral Device in the Board. 6 CSM(Cell Site Modem) ASICs or ECM ASIC Control that correspond to each CDMA Code Channel are related.

Block diagram and main function of RCPA are as follows:



RCPA Block Diagram

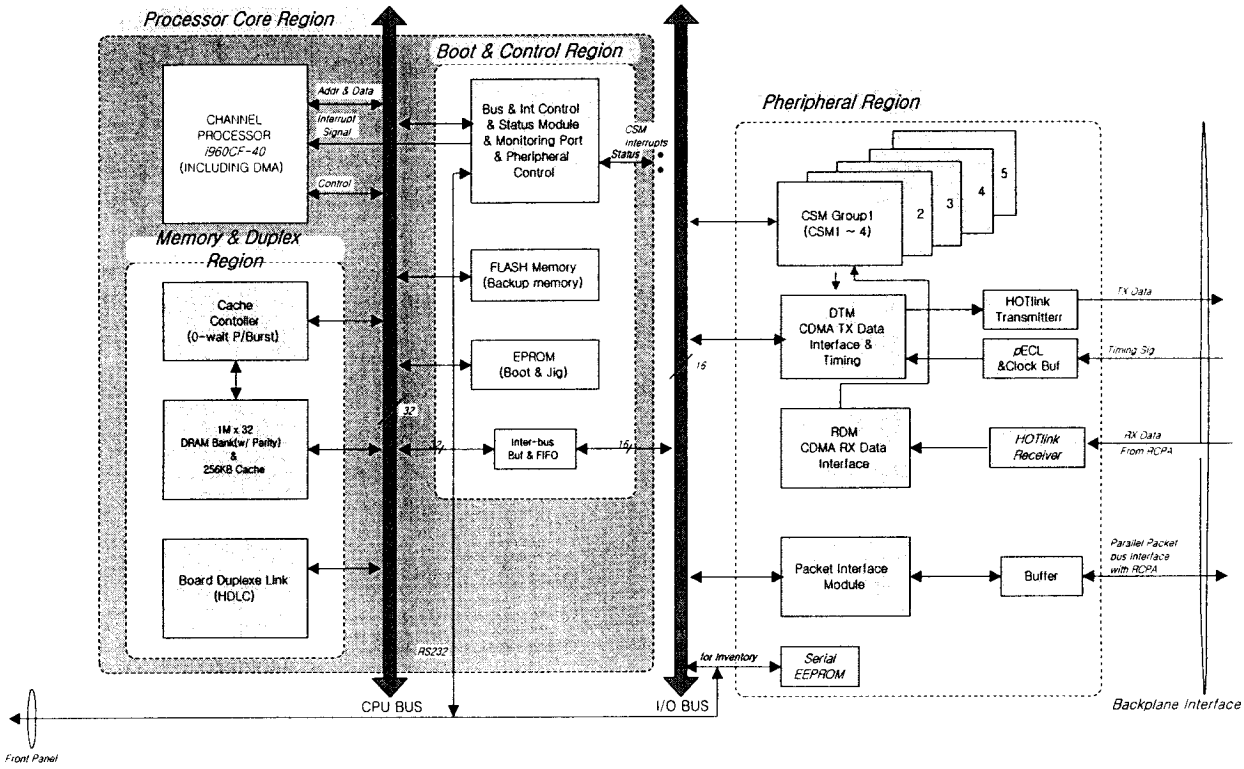
- Core Control Module (CCM)
  - Interrupt Control
  - DMA Control
  - Timer
  - Control port
- ESCC
  - RS-232 Monitor Interface
- Memory Controller
  - Dram, Cache RAM, Tag RAM Control
  - Cache Mode Control between Cache RAM and DRAM
  - Flash Memory Control
- HDLC
  - NIM2- Board Duplex

- Peripheral Controller
  - CSM(Cell Site Modem) ASIC or ECM ASIC – Modem Chip
  - CDM - CDMA Date interface Control
  - SDM – Self states Detecting Module (Open/Fail)
  - Packet Interface with PIM - MCPA
  - STM – System Timing
  - HPA – SIO HPA Interface
  - SIM – BUDA, PACA function Interface

3.2.2.4. MCPA(Multi-Channel Processing board Assembly)

MCPA is in charge of overhead channel (Pilot, Sync, Paging, Access channel) and a maximum of 20 Traffic Channels of CDMA code channels, and MCPA has Core Control Module(CCM) that interfaces with CPU(i960), composed of ESCC in charge of Monitor Interface through RS-232, Memory Controller in control of Memory, and Peripheral Controller in charge of the interface of Peripheral Device in the board. 20 CSM(Cell Site Modem) ASICs or ECM ASIC Control that correspond to each CDMA Code Channel are related.

Block diagram and main function of MCPA are as follows:



MCPA Block Diagram

Main configuration of MCPA is as follows:

- Core Control Module (CCM)
  - Interrupt Control
  - DMA Control
  - Timer
  - Control port

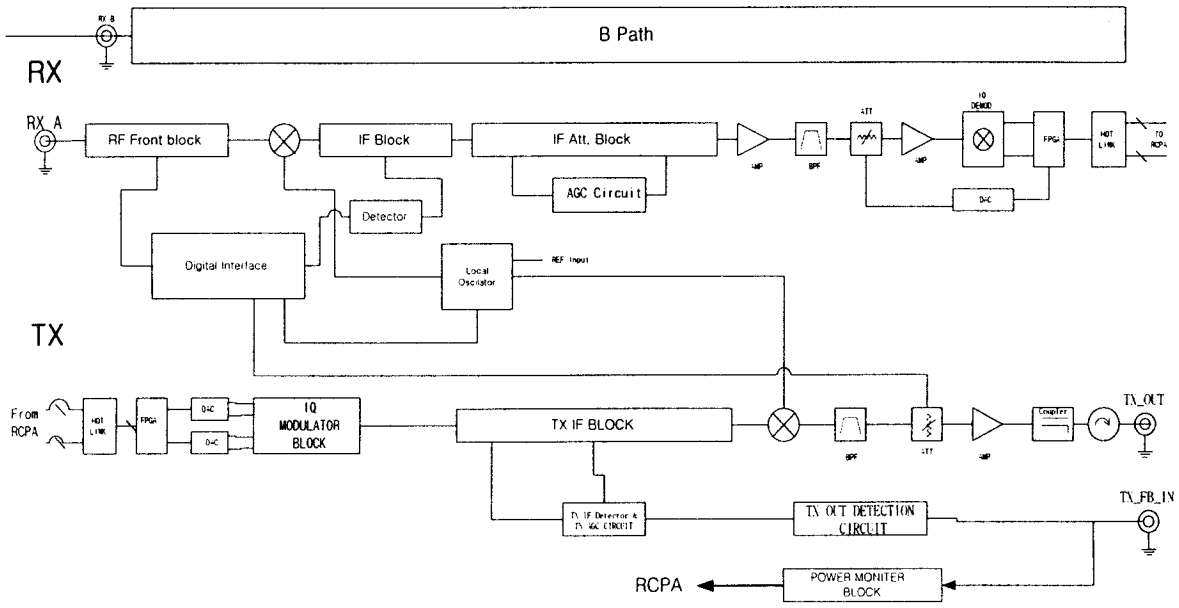
- ESCC
  - RS-232 Monitor Interface

- Memory Controller
  - Dram , Cache RAM, Tag RAM Control
  - Cache Mode Control between Cache RAM and DRAM
  - Flash Memory Control

- Peripheral Controller
  - CSM(Cell Site Modem) ASIC or ECM ASIC
  - DTM - Timing & CDMA Date interface Control
  - PIM - Packet Interface with RCPA

3.2.2.5. BUDA-DP (Base station sector conversion & Up/Down converter Assembly)

BUDA is largely divided into common part, Tx Path, and Rx Path. Block diagram and main function of BUDA are as follows:



BUDA-DP Block Diagram

Main function of Tx/Rx

- Frequency UP Conversion Function that makes baseband signal into IF/ RF signal
- RF signal output adjustment function by Gain Contro.
- Tx AGC(Automatic Gain Control) function: Function of regularly maintaining the gain of sending end so that the output of sending end is regular
- Rx AGC(Automatic Gain Control) function
- RSSI(Received Signal Strength Indication) Monitor function
- IQ Demodulator function

- Tx output measurement function

A. Transceiver function (Baseband Up Down Conversion Function)

BUDA-DP can be divided into Tx/Rx block for explanation. Tx part, by using HOT Link from RCPA, is subject to A/D conversion at BUDD(Buda Digital Daughter board) and is, with analog signal, modulated into IF signal from IQ modulator. This signal is given frequency up conversion at RF block and transmitted to HPA.

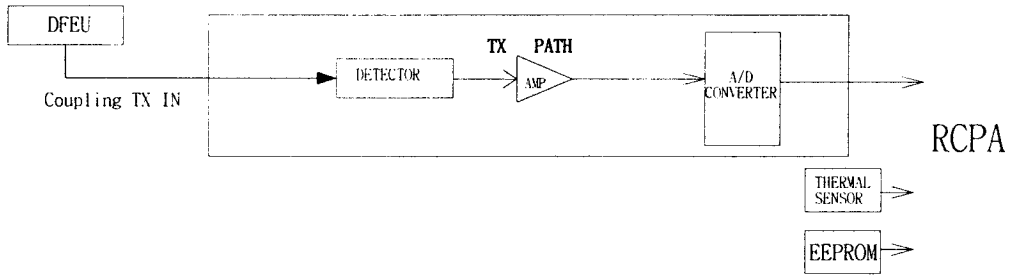
Receiving end amplifies, with low noise, signal inputted from DFEU(Pico-cell Front End Unit) at RF block, and after frequency conversion into medium frequency, it makes D/A Conversion of signals that were inputted to IQ Demodulator block, transmitted to BUDD and converted into baseband for transmission of signals to RCPA and MCPA. In addition, status report of BUDA and PLL synthesizer frequency setting are processed by RCPA and digital interface block.

B. Power Monitor & Control Function

Power measurement function, with BUDA-DP of 1FA/Omni built-in, converts final output signal of Tx path into received signal strength indication (RSSI) voltage to provide the function of monitoring the change in final Tx output level. The main function is as follows:

- Tx output reading
- Temperature reading

PLL Synthesizer part generates local signal to receive Control Signal of Decoding Circuit make Frequency Down Conversion of RF signal into IF signal. Monitor module reports the current temperature of the board to RCPA. It receives final Tx output signal from Front End, converts it into IF signal, separates signals only wanted and reports RSSI voltage of wanted signal to RCPA.



PWR Monitering BLOCK

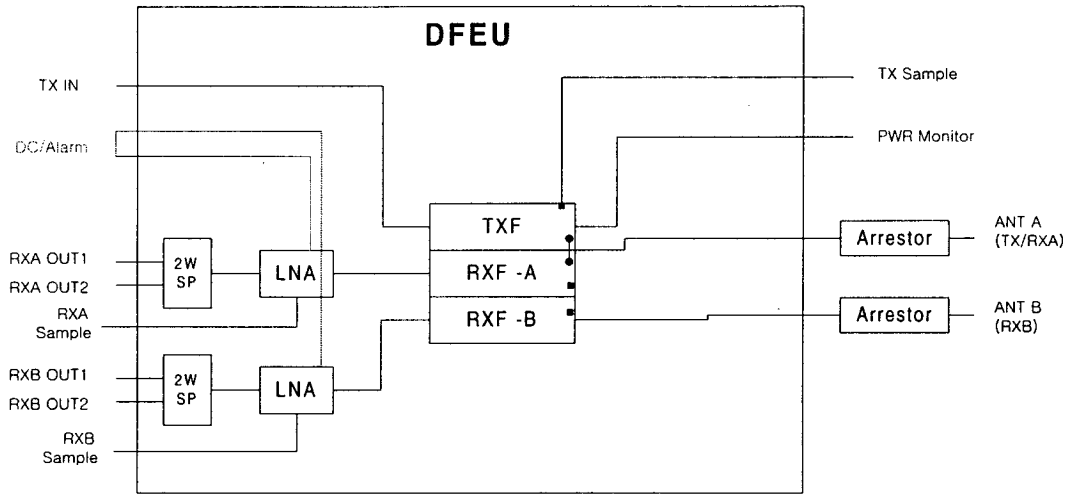
3.2.2.6 HPAU-DC(High Power Amplifier unit – Export DCN Picocell BTS)

HPAU-DC is equipped to PICO-CELL, and one HPAU-DC is needed per 1FA.
Interface with RCPA uses RS-485 Protocol by Multi-Drop method. Other H/W alarm signal uses TTL level. HPAU-DC receives, from RCPA, Enable/Disable, Status Request, Version Request command for execution, and upon status request command, it reports the state of HPAU-DC. By using remote control signal sent from RCPA, it can restart HPAU-DC. HPAU-DC receives restart command from RCPA for restart.

3.2.2.7 DFEU (Pico-Cell Front-End for DCN Block)

DFEU is composed of Duplexer or Rx BPF(Band Pass Filter), Tx BPF(BAND Pass Filter), Tx Channel Filter, LNA(Low Noise Amplifier), Directional Coupler and Splitter. Main function and block diagram of DFEU are as follows:

- Rx BPF(Band Pass Filter) of Duplexer filters Rx signal of necessary band only.
- Low Noise Amplifier (LNA) amplifies Rx signal to appropriate signal and then supplies Rx signal to Rx terminal of BUDA by FA.
- It transfers the state of LNA to SCPA.



< DFEU Block Diagram>

3.2.2.8. AC Distribution Box

AC input power was so composed as to selectively adopt single-phase 2-wire 220V and 3-phase 4-wire 380V supplied from commercial power.
Rated capacity of P-BTS is AC 220V, 18A, 60Hz, 4000W, and it maximizes electronic wave shielding effect due to AC power through EMI Noise Filter at the input part of the distribution box.

(1) Configuration

The distribution box is composed of 1ea of main breaker in charge of breaking the input of commercial power and 6ea of auxiliary breakers for the supply of power to other auxiliary devices such as 3ea of Surge Protector with protective function as to surge input, a rectifier for the supply of P-BTS power, etc. And, ground terminal and power common terminal are additionally comprised of.

(2) Specifications
-Breaker : Type → MCB C60N

Item		Ampere (A)	Voltage(V)	Impact withstanding voltage	Breaking capacity	Number of bipolar
Main breaker	Distribution box	63 A	220/380 V	6 KV	6 KA	1
Auxiliary breaker	Rectifier	40 A	220 V	6 KV	6 KA	1

	Navigation light	20 A	220 V	6 KV	6 KA	1
	Supplementary device	10 A	220 V	6 KV	6 KA	1

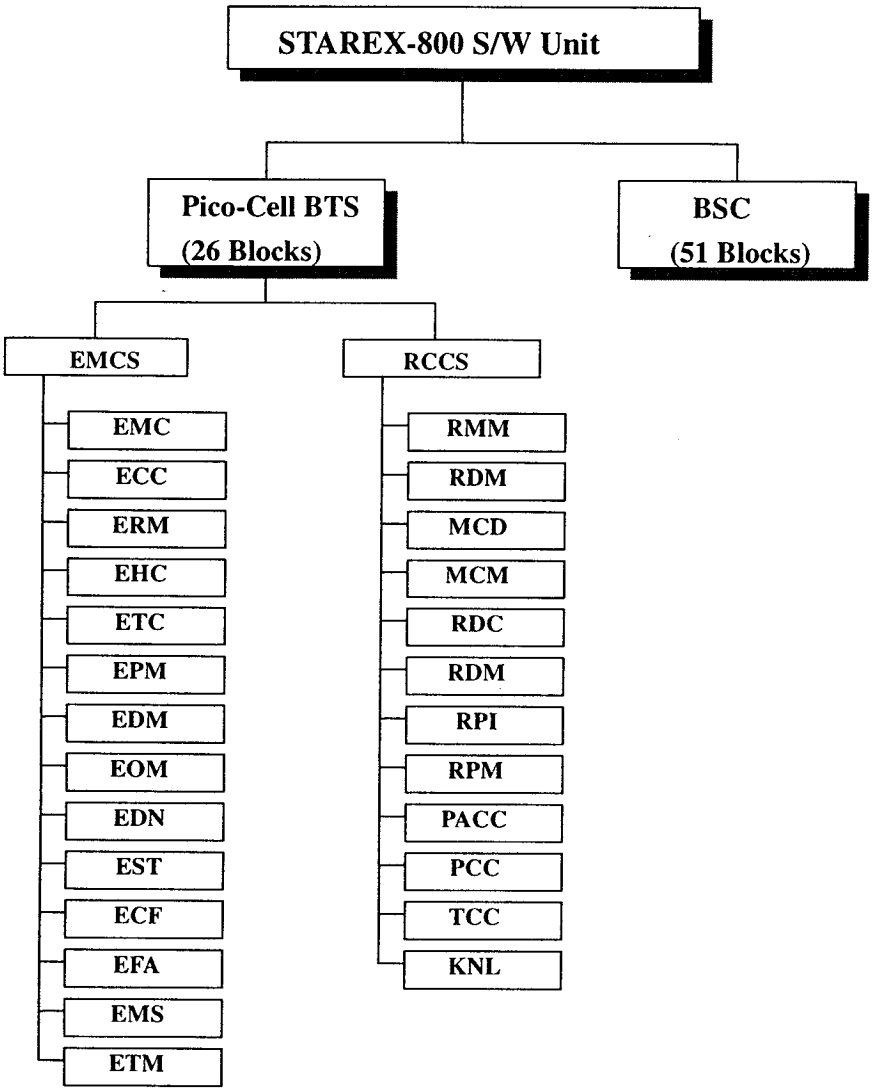
-Surge Protector : Type → FLT 60-400

Item	Voltage used	Impact withstanding voltage	Insulation resistance	Breaking capacity
Lightning Current Arrester	440V 50/60Hz	2.9 KV (+25%/-45%)	> 10MΩ	100KA

(3) Operation principals and operation

The distribution box supplies commercial power single-phase 220V inputted through Noise Filter and 3 lines are inputted, i.e., 2 power lines and 1 ground line. One of the power line is connected to the main breaker and the other is connected to input common terminal and Ground Line is connected to Ground Terminal.
Main breaker performs the function of making and breaking commercial power and the function of distributing power to system rectifier and incidental device and power through main breaker is parallel connected to protector for preventing surge and auxiliary breaker that is connected to rectifier, fluorescent light, outlet, etc. to supply AC power
Auxiliary breaker performs the function of making and breaking power inputted to rectifier, etc. and with power supplied from main breaker and power through input common terminal, it supplies power to each incidental device.

3.3 S/W Configuration Diagram



4. Abbreviations

PCDC : PicoCell for DCN Cabinet
PCDB : PicoCell for DCN Backboard
SCPA : System Control Processor board Assembly
BAMA : BTS Alarm collection & Maintenance board Assembly
LICD : Line Interface Control Daughter board
BTMA : BTS Timing Management Unit.
MGPS : Micro BTS's Global Positioning System
MCPA : Multi-Channel Processing board Assembly
RCPA : Radio & Channel Processing board Assembly
BUDA-DP : Base station sector conversion & Up/Down converter Assembly – DCN PicoCell
PACA : Power Adjust and Control Assembly.
HPAU-DC : HPA Unit – Export DCN Picocell BTS
ACU-E : Access Control Unit – Export DCN Picocell BTS
DFEU : Pico-Cell BTS Front End Unit
PSOP-E : Power Supply for DCN Pico-cell BTS