Theory of operation

Vocabulary

MS = Mobile Station
E-GSM = Enhanced Global System for Mobile communications
GSM = Global System for Mobile communications
HW = Hardware (drivers)
RAM = Random-Access Memory
ROM = Read-Only Memory
SPEC = Specification
SW = Software

PWB = Printed Wire Board
RF = Radio Frequency
BB = BaseBand

Technical Summary

The P7QRHV-1 is a dual-band radio transceiver unit for the E-GSM900 and GSM1900 networks. In E-GSM900 band MS is operating as power class IV providing 15 power levels with highest power level 5. GSM1900 is power class 1 unit providing 16 power levels with highest power level 0.

In the USA, following convention used by all GSM mobile Phones, only the GSM1900 mode Transmission will be active and the GSM900 mode is disabled.

The transceiver is a true 3 Volt transceiver. The transceiver has Full rate (FR) and Enchanced Full Rate (EFR) and Half rate speech (HR) codecs. Half rate is only available in GSM900 Mode.

The transceiver has one PWB structure, which uses ground planes inside PWB as shielding between different modules. A printed flexy circuit provides the main electrical connection between the PWB and peripherals.

The transceiver has full graphic display and microswitch key based user interface.

Tranceiver combines an integral printed antenna, housed in the top of the casing, see photo exhibits, RF circuitry. There is no external antenna connection.

The transceiver has an equalised earliece and OMNI type microphone.

Circuit Description

The ZE4 engine module, as used in the P7QRHV-1 consists one main PWB with BB/RF sub modules housed within shielding cans fitted to both sides of the board. Ground planes inside the PWB are used as shielding between RF/BB and UI sections. The Different modules are interconnected with a printed flexy circuit.

The phone can be connected to accessories via system connector in the base of the phone. This provides the connection for the charger, headset , datacable and optional desk stand.

The RF submodule receives and demodulates radio frequency signals from the base station and transmits modulated RF signals to the base station. It consists of functional submodules Receiver, Frequency Synthesizer and Transmitter.

The Baseband submodule contains audio,control, signal processing and power supply functions.

Interconnection Diagram

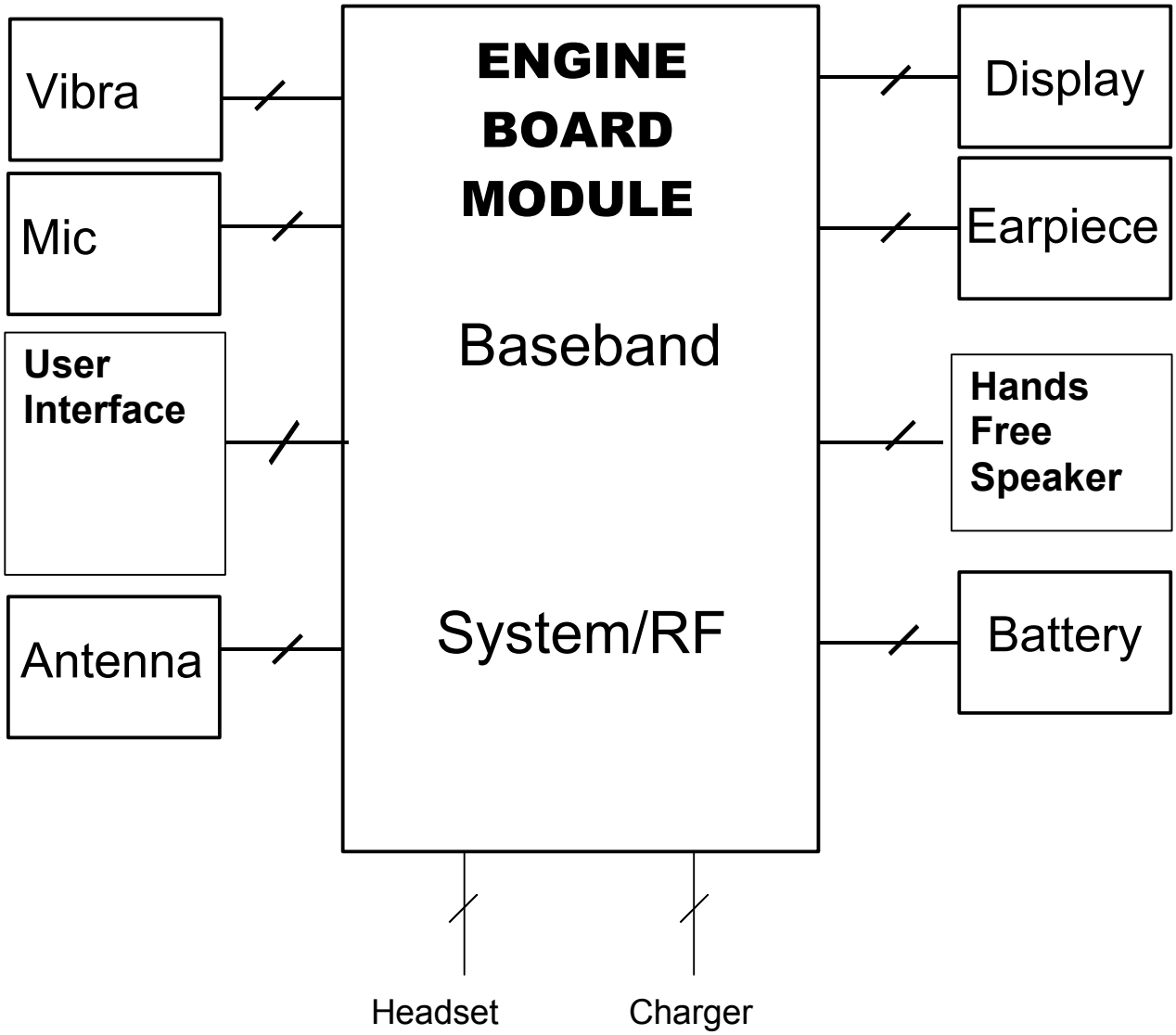


Figure 1. Interconnection

Basic Specifications

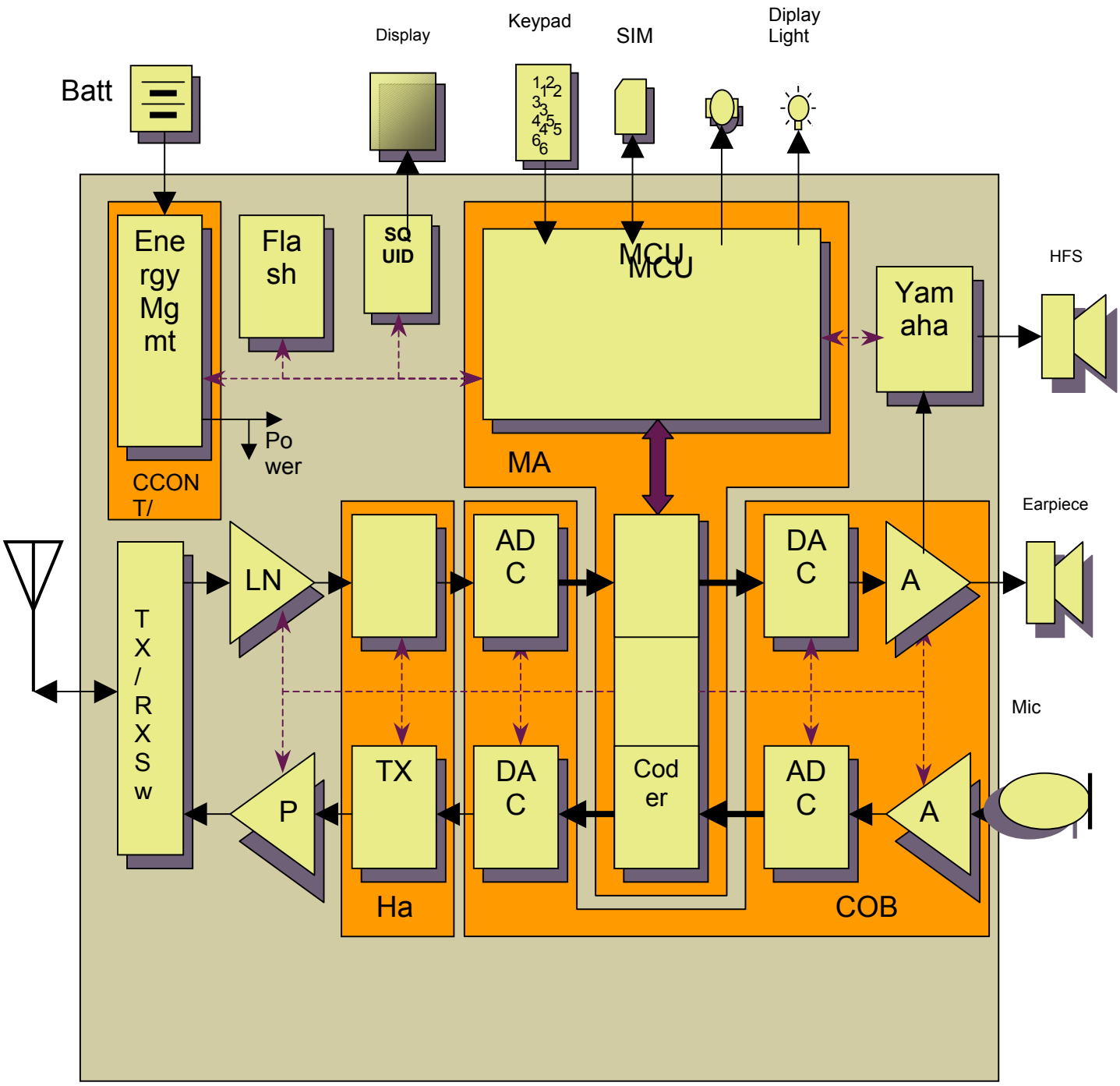
Table 1. Basic Specifications (E-GSM)

Parameter	E-GSM900
Cellular system	E-GSM 900
TX frequency band	880,2 ... 914,8 MHz
RX frequency band	925,2 ... 959,8 MHz
Duplex spacing	45 MHz
Number of RF channels	174
Channel spacing	200 kHz
Power class	4
Power levels	15
Method of frequency synthesis	Digital phase locked loop UHF 3520 ... 3980 MHz
Frequency control	26 MHz VCTCXO: AFC used
Receiver type	Direct conversion
Modulator type	GMSK

Table 2. Basic Specifications (PCS band)

Parameter	GSM1900
Cellular system	GSM 1900
TX frequency band	1850,2 ... 1909,8 MHz
RX frequency band	1930,2 ... 1989,8 MHz
Duplex spacing	80 MHz
Number of RF channels	299
Channel spacing	200 kHz
Power class	1
Power levels	16
Method of frequency synthesis	Digital phase locked loop UHF 3520 ... 3980 MHz
Frequency control	26 MHz VCTCXO: AFC used
Receiver type	Direct conversion
Modulator type	GMSK

Functional Block Diagram



Technical Specifications

Modes of Operation

P7QRHV-1 operates in normal,cellular mode and a local mode for service:

- Normal mode, the phone is controlled by Cellular System SW and partly by basestation
- Local mode, used by Production and After Sales.

Normal Mode

In Normal mode, the phone performs all the tasks to place and release calls. Also charging and communication between accessories and phone are done during this mode by Operating System SW. Signaling and handover functions are supported by basestation.

Power off

In the power-off mode only CCONT is active. Power-off mode can be left by pushing the ⏻-key, connecting charger to the phone, real time clock interrupt.

Idle / standby

The phone is in SERV-state listening to the network and waiting for the page.

Call

The phone call is going on and during most of the time all RF- and BB-parts are on. Separate parts are turned off when they are not needed in order to save power.

Local Mode

Local mode is used for testing purposes by Product Development, Production and After Sales. The Cellular Software is stopped (no signalling to base station), and the phone is controlled by MBUS/FBUS messages by the controlling PC.