# KIRK 4040 Handset 2.4 GHz
## (PP5N 2G4)



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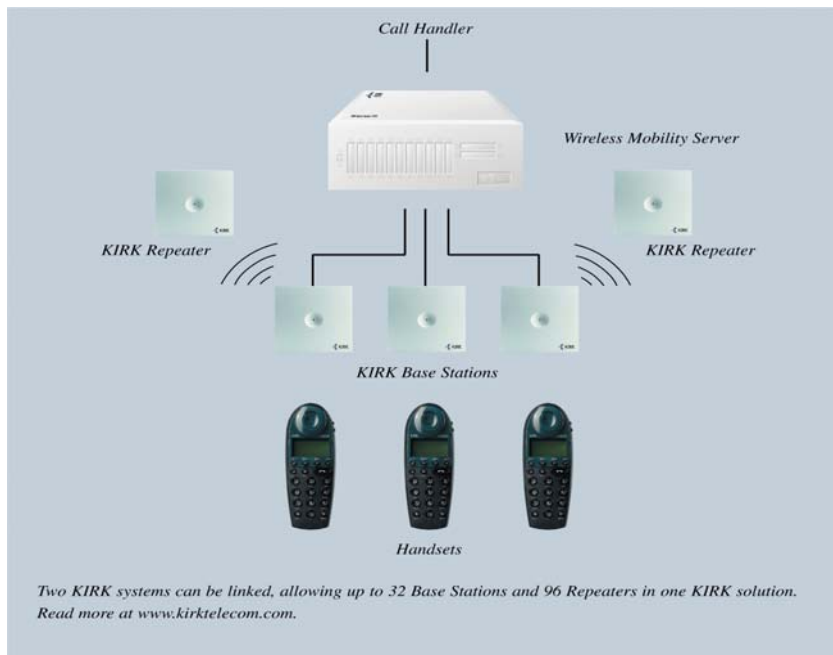| **KIRK** <br> telecom | ED | 001 | DATE | 04-07-2005 | SIGN | HBR | | Page 2 of 6 |
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# 1  Introduction

The KIRK 4040 handset is a robust, well designed and full feature handset. It meets demands for easy mobility and is built for long-term dependability in harsh environments. In order to meet industry standards, the KIRK 4040 is IP54 classified, which means that it is dust-protected and protected against splashing water.

## Main Features

- Graphic display
- Alarm key - ready for alarm application
- CLIP (10 caller-ID presentations)
- Internal/external ring pattern
- Volume control
- LED indication of incoming and unanswered calls
- Telephone book with room for 80 numbers
- Auto Login - roaming between 10 different systems
- Silent mode (mute all sounds)
- Redial function (the last 10 numbers)
- Programming pause
- Key lock
- Auto key lock
- 9 different ringer tone and adjustable ringer volume
- Ringer tone in headset
- Microphone mute
- Headset jack
- Loud speaking/Hands free
- Vibrator
- Automatic Off-Hook (B-answer)
- 6 menu languages (UK, DE, FR, IT, ES, NL)
- Possibility for 1 customer specific language
- SMS function (Supported on KIRK systems only), stores 14 messages of 72 characters each
- Editing possibilities for start-up text
- R-key for transfer and special services
- IP 54 classification: Dust protected/Splashing water
- Speech/stand by time > 16/150 hours
- Temperature compensated charging
- Weight incl. battery: 130g
- Size (LxWxH): 148x50x28mm

More functions and features can be found on the data sheet. The KIRK 4040 is designed for office, personal security and hospital segments. Segments that require a full featured communication unit with the possibility for alarm applications, and the same time a unit that is fully resistant in harsh environments.



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## 2   General circuit description

This chapter describes the general functionality of the KIRK 4040 handset (PP5N 2G4) cordless phone.

The device is a DECT based handset (portable part) operating in the 2.4 GHz ISM band on 79 RF-channels and 9 timeslots in duplex mode. The handset is improved by implementing extra features to combat the interference at 2.4 GHz ISM band.

The device is acting according to the DECT standard EN 300 175-2 and EN 300 175-3 with changes according to FCC part 15, subpart C.

The system is named MARS 2.4 GHz and is described in the enclosed document "MARS 2.4 GHZ frequency hopping and Dual slot diversity description".
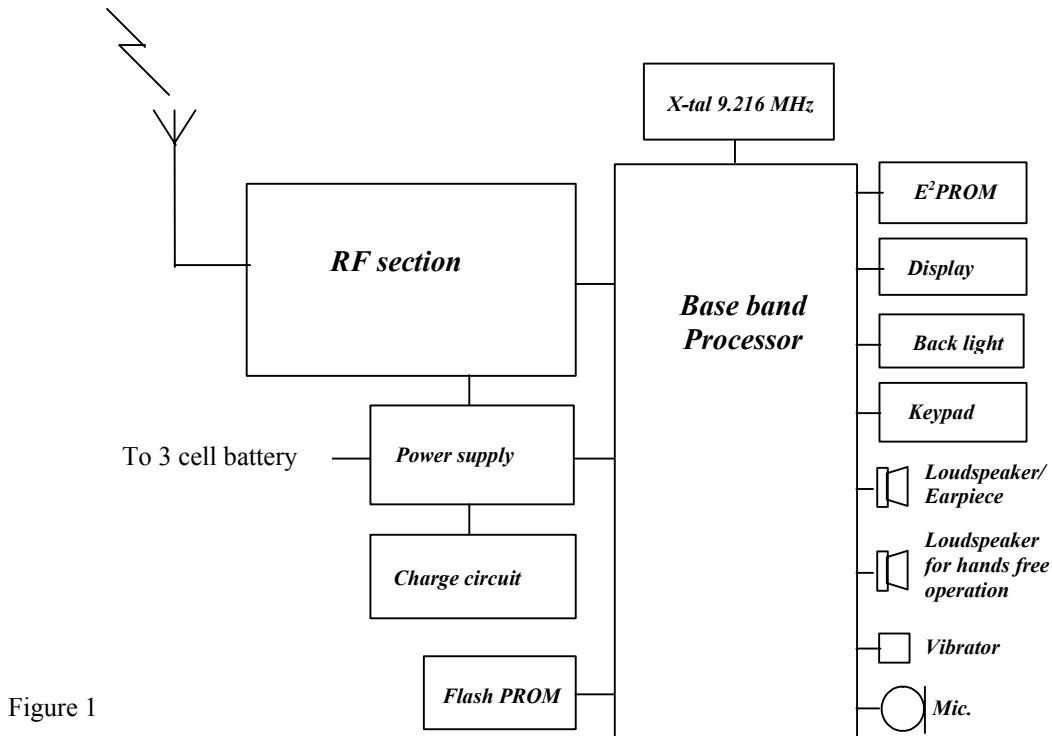
Figure 1

Figure 1 shows the block diagram of the handset.

The handset consists of one PCB containing the RF- and base band section. The RF-section consists mainly of a DCT radio transceiver and a power amplifier. The base band section consists of a base band processor, Flash PROM, $E^2$PROM, display with back light, loudspeakers /earpiece, vibrator, microphone and  power supply with charge circuit.

# 3 Base band section

The circuits in the base band section are described in this chapter.

## Base Band Processor SC14428

The base band processor SC14428 is a dedicated CMOS chip from National Semiconductor optimized to handle all audio, signals and data processing needed within a DECT handset.
The SC14428 contains of a 16 bit Codec, a four channel ADPCM trans-coder, an analogue Front-end and a crystal oscillator for generating the clock signals for internal use and for the RF section.
The SC14428 contains of a microprocessor that controls the user interface and the radio interface. It also handles the audio processing.
The SC14428 contains of interfaces to flash program memory, microphone and loudspeaker / earpiece.
The external memory is a 4Mbit Flash PROM.
The crystal oscillator frequency is internally trimmed. The nominal frequency is 9.216 MHz.
The transducer's interface to the microphone and the loudspeaker / earpiece consists of the internal codec, and external passive components to decouple the low frequency and the RF noise.

## E$^2$PROM

The E$^2$PROM contains of different forms of data divided into the following categories:
- Fixed data, values fixed during development.
- Production adjustment variables.
- User data e.g. number registration data and ID storage.

The E$^2$PROM used in the handset is a 128kbit.

## Flash PROM

The external memory is a 4Mbit Flash PROM from SST (silicon storage technology Inc.).

## Display/backlight

The display is a custom designed LCD-module. It is a 5x8 dot matrix display with 3x12 characters and 5 icons. The display is controlled by the microcontroller via a serial interface The LCD driver contains an internal oscillator.
The handset has backlight for the LCD. The backlight is made by light diodes on the PCB. It is activated from the base band processor.

## Keyboard

The keyboard is organized as a 5x5 matrix, with 5 outputs from the microcontroller and 5 inputs. The inputs are internally pulled up in the SC14428 to ensure the inputs will be high when no key is activated.

## Microphone, loudspeaker / earpiece and vibrator

The microphone is an electrete type that requires a supply current. This is delivered from the base band processor. The earpiece is coupled differentially to the loudspeaker outputs of the base band processor. An extra loudspeaker is used for hands free operation. Vibrator is integrated in the plastic with connectors to the PCB.

## Power Supply

The base band processor has two built in power supplies, a 1.8V and a 2.6V, used for the base band and the RF section. Beside these a 3V low drop regulator IC3 is used for supplying the display.

## Charge Circuit

The charge circuit is designed to operate with an external constant current charger placed in the Charger. An ADC internal in the base band processor is used to monitor the battery voltage. This function is used for controlling the battery charging, for low battery indication to the user and for protecting the batteries against deep discharge.

# 4  RF Section

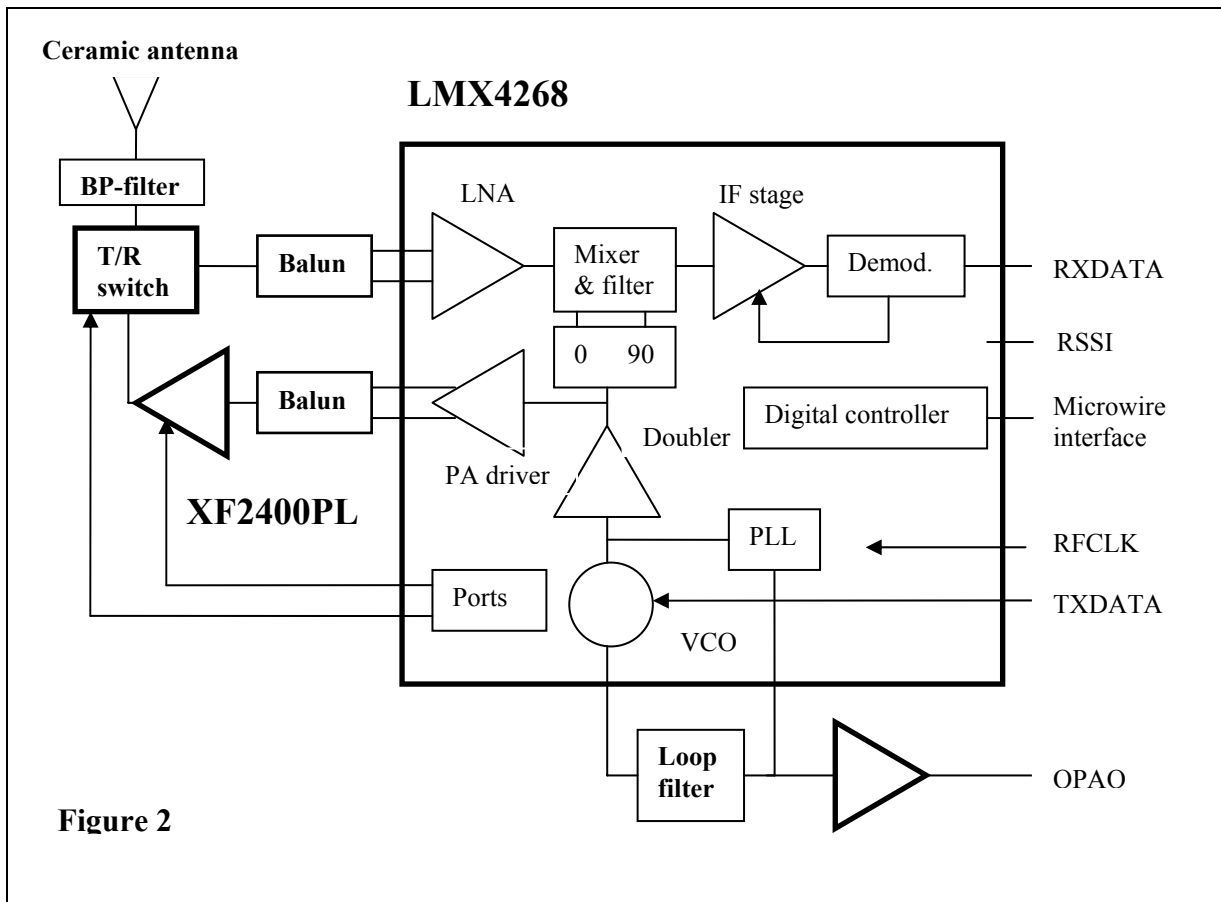This chapter describes the circuits in the RF section.



**Figure 2**

Figure 2 shows the block diagram of the RF-section in the handset.

The RF-section consists of the highly integrated CMOS DCT transceiver LMX 4268 from National semiconductor, Power amplifier technology from MURATA, ceramic antenna design from FRACTUS, T/R switch from NEC, loop-filter design and BP-filter/matching network as a part of the PCB layout. Fast PLL lock facilities are applied by an Op-amp. circuit. The design is shielded by to metal cans.

## DECT transceiver LMX 4268

The LMX 4268 is a radio transceiver integrated circuit optimized for the Digital Enhanced Cordless Telecommunications (DECT) system. It is designed to perform the complete receiver function in a receiver without requiring an external SAW filter at IF. Furthermore, the device includes a PLL and a VCO used for performing both transmitting and receiving functions. The device is designed to operate the frequency synthesizer in an open loop configuration both during transmitting and receiving.

The operation of LMX4268 can be divided into three distinct operations; set-up of the desired functionality, locking the frequency synthesizer and performing the desired transmitting or receiving function. All functions are controlled by programming the Microwire interface on the device. Logic output ports programmed by the microwire interface are used to control the power amplifier and T/R switch.

## Power amplifier XF2400PL

The power amplifier XP2400PL from Murata is designed for cordless applications.
The amplifier has features for power ramping and for control of the output power level.
The matching network at the input and output terminals of the amplifier together with the front-end filter performs proper rejection of harmonics from the hole transmitter chain.