Flow Chart and technical description

Activa Remote
&
Base Station

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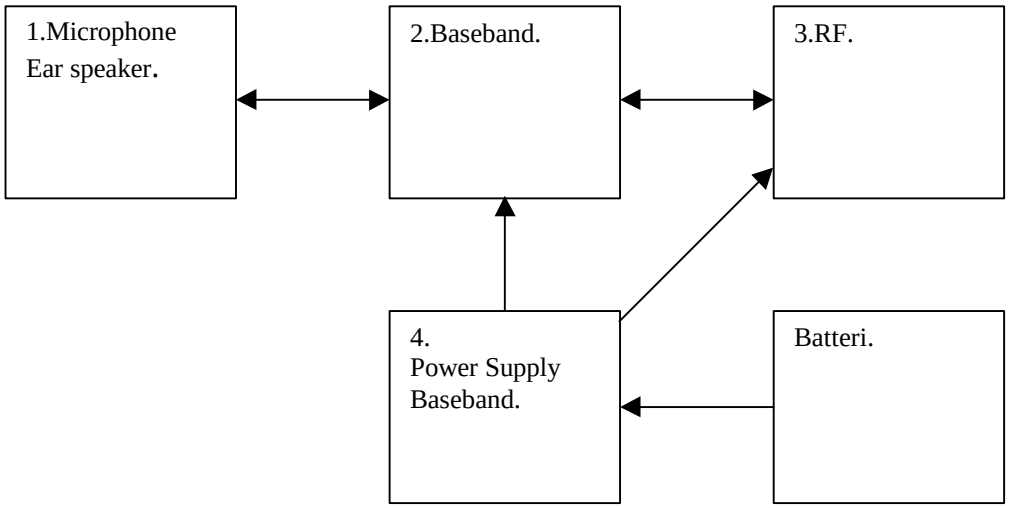
1 Flow chart for the Remote.

This document describes the design of the Base station.



1.1 Headset:

The headset is connected to J5, which is integrated on the PCB.

1.2 Baseband:

Microcontroller.
The micro/burstmode controller IC5, is a device containing both the microcontroller and MARS digital/analog interface.
The clock frequency for the microcontroller is 9.048436 MHz it is possible to tune the crystal with the capacitor diode D1 who is controlled by the microntroller.
The serial interface is bi-directional interface; R16, C38 and D5 protect it for ESD and EMC.

Burst Mode Controller.
The burstmode controller (BMC) inside the microcontroller performs all the time critical control functions and the audio interface to the transducers.
A crystal oscillator controlled by the crystal X1 generates the clock signal. The frequency is nominally 9.048436MHz, but can be tuned by the varicap diode D1, which is controlled from an analog output from the microcontroller.

There are 3 different supply inputs on the BMC, one for the digital circuits (VDD), one for the analog circuits of the RF interface (AVD) and one for the analog part of the codec (AVD2). The two analog supplies have been decoupled separately to reduce the noise levels.
The interface to the transducers (microphone and earspeaker) consists of an audio codec placed internally in the BMC. The microphone in the Activa is an electret type, which requires a supply current. Both speaker output and microphone input is decoupled with 5p6 capacitors. This value is chosen because it has low impedance at 2.4GHz. When the handset is in standby the VREF outputs will be powered down, so that the microphone will consume no power in this mode. The earspeaker is coupled differentially to the loudspeaker outputs LRS+ and LRS-.

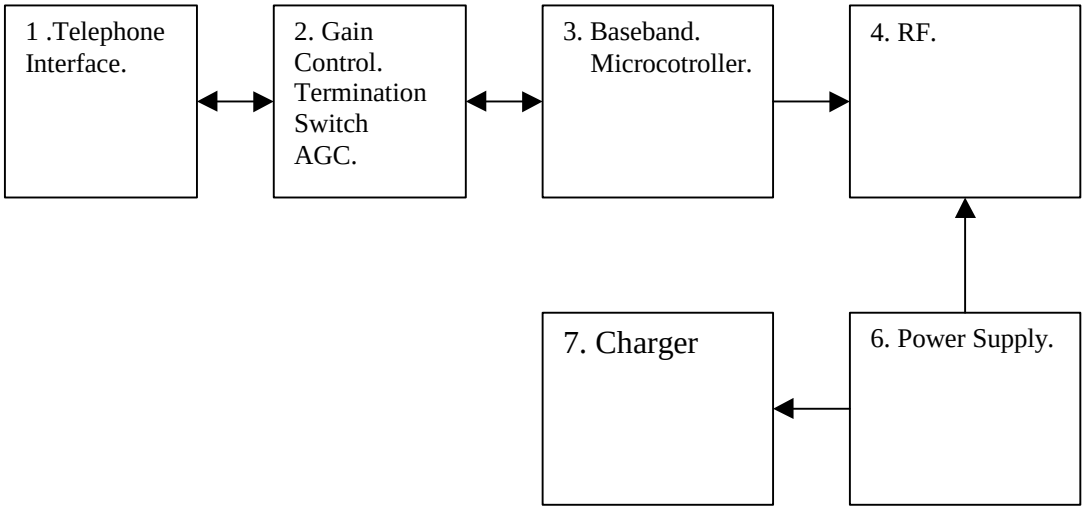
1.3 RF: See "Circuit description for the RF part".

1.4 Power supply baseband:

Because the Activa is powered by 1 cell, a step-up converter is needed. This is done by IC1 this is an integrated circuit that contains all what is needed for a step-up converter, only an external coil is needed. R9 and R22 set the output voltage (3.7V). The 3.7V power is supplied to the RF part and the baseband controller IC5. This device contains a low drop regulator, only an external PnP transistor is needed (T2). The regulated output voltage from the regulator IC5 is 2.85V. When the input voltage is below a threshold voltage determined by IC1 the switch regulator will be turned off, resulting in a current consumption of less than 5uA to protect the batteries against deep discharge. R1 and C4 generate the reset pulse delay.

2 Flow chart for the Base station.

This document describes the design of the Base station.



2.1 Telephone interface:

The signal from the telephone is connected to J2 and the receiver is connected to J3. With the two relays RL1 and RL2 is possible to route the signal from J2 to J3 or from J2 to the analog interface.

2.2 Gain control, Termination switch:

The in/out signals from the telephone interface goes to the switch S1, where it is possible to switch between 7 different configuration of the wiring in the telephone. S3 switches the MARS system on and off.
T5 is an insulation transformer. The output from the transformer is supplied to the input of the burstmode controller and the differential amplifier IC8A. The output from the

Amplifier is rectified and the DC is filtered by C66. R47 and R41 give the time constant of the charging and decharging of C66. IC8B is used as a buffer. The DC signal, which is a function of the AC input signal, is supplied to an AD converter in the microcontroller. Inside the burstmode controller is an input attenuator that has 15 steps of 2-dB attenuation. The attenuation is controlled by the microcontroller as a function of the level of the DC signal; this gives an AGC function so the output signal level is constant to the portable part. If the input signals suddenly drops more than 20dB, the AGC function is stopped, so regulation only is made is there is an input signal.
The differential output signal from the burstmode controller is supplied to the resistor network R58, R59, R55, R56 and R120. With the switch S2 is it possible adjust the TX gain, which gives 8 steps. T6 and T7 is a push pull output buffer, so it is possible to source signal to low impedance.
Inside the burtsmode controller there is a 15 step / 1dB step attenuator. The TX gain switch S2 gives a code depending on the position of S2. This controls the attenuator, so the TX gain can be adjusted over a range of 50dB.

2.3 Baseband, Microcontroller:

Microcontroller.
The microcontroller IC3 is configured to run in "Memory Expansion Mode" where the external ROM controls the processor. If a processor with internal ROM is used, the processor is used in the "micro controller mode". The "start up" mode is determined by R19 and R20. The clock frequency for the microcontroller comes from the burstmode controller. During and shortly after reset the clock frequency will be 1.1311MHz. During normal operation the clock frequency will be 4.5242MHz. The circuits needed for selecting the flashprom and the burstmode controller is built into the processor.

Burst Mode Controller.
The Burst Mode Controller (BMC) IC 1 performs all the time critical control functions as well as the audio interface to the audiointerface.
A crystal oscillator controlled by the crystal X1 generates the clock signal. The frequency is nominally 9.048436MHz, but it can be fine-tuned by means of the varactor diode D2 controlled from an analog output from the micro controller. There are more clocks outputs from the BMC. UCLK is the clock output to the microcontroller. CLK1M is a 1.0054MHz clock output, which not is used in the base station. CLK100 is not used in the construction but connected to a test point. CLK100 is an 89.17Hz clock signal that is synchronized to the MARS frame, so it is useful for synchronizing e.g. an oscilloscope. RFCLK is a 9.048436MHz clock output for the PLL in the RF module. It is only active during the PLL lock period.

There are 3 different supply inputs on the BMC, one for the digital circuits (VDD), one for the analog circuits of the RF interface (AVD) and one for the analog part of the codec (AVD2). The two analog supplies have been decoupled separately to reduce the noise levels.
The interface to the audio interfaces consists of the codec placed internally in the burtstmode controller and some passive components used to decouple for the low frequency and the RF noise.

2.4 RF: See "Circuit description for the RF part".

2.5 Power supply:

The power supply for the base band part consists of two low drop regulators. The discrete voltage regulator (T13) delivers an output voltage of 4V. This supply is used to supply the RF module. The voltage regulator IC9 delivers an output voltage of 3,3V at Vcc. It supplies the digital and the analogue circuits of the base band, as well as some parts of the RF module. The regulator IC9 contains a comparator and a voltage reference; this is used to make a power up reset, where C74 and R60 give the timing of the reset pulse

2.6 Charger:

There are 2(1) charger(s), which are identical so only one is explained. The charger is a 2-step charger, one for low current charging and a high current (250mA) constant current charger controlled by the microcontroller. The low current charger is made with a voltage drop resistor R29, R30. The battery voltage is measured with an A/D converter in the microcontroller. When the portable part is placed in the base, the output voltage from the charger drops, this is detected by the microcontroller activating the charging algorithm and turning the charging indicator on.
T9, T19, T2, R36, R35, R26, R27 and R28 are coupled as a constant current generator, controlled by T10 and the microcontroller. The battery voltage measured by the microcontroller by R73, R74 and C37. D13 is a protection diode. With R76 and R88 it is possible to measure the temperature of the battery during charging.