Nokia Customer Care
3155/3155i (RM-41), 3152 (RM-61)
Mobile Terminal

Baseband Description and Troubleshooting

Contents **Page**

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Introduction

The 3155/3155i/3152 baseband module is a tri-mode, Code Division Multiple Access (CDMA), dual-band engine and is based on the DCT4.5 standard. The baseband engine includes two major Application Specific Integrated Circuits (ASICs):

- D2200 – Universal Energy Management Enhanced Integrated Circuit (UEME IC), which includes the audio circuits, charge control, and voltage regulators
- D2800 – Main phone processor, which includes system logic for CDMA, two Digital Signal Processors (DSPs), the Main Control Unit (MCU), and the memory

The BL-6C Li-ion battery is used as the main power source and has a nominal capacity of 1070 mAh.

Even though the Bluetooth, Camera, Camera flash, External Display and MMC components are on the ASICs, they are not used in the 3155/3155i/3152 baseband module.

Power Up Sequence

When the mobile terminal is dead or jammed always check the Power Up Sequence of the baseband area. Verify all regulator and reset signals are correct to ensure proper power up of UEMEK and D2800 (see Figure 1).

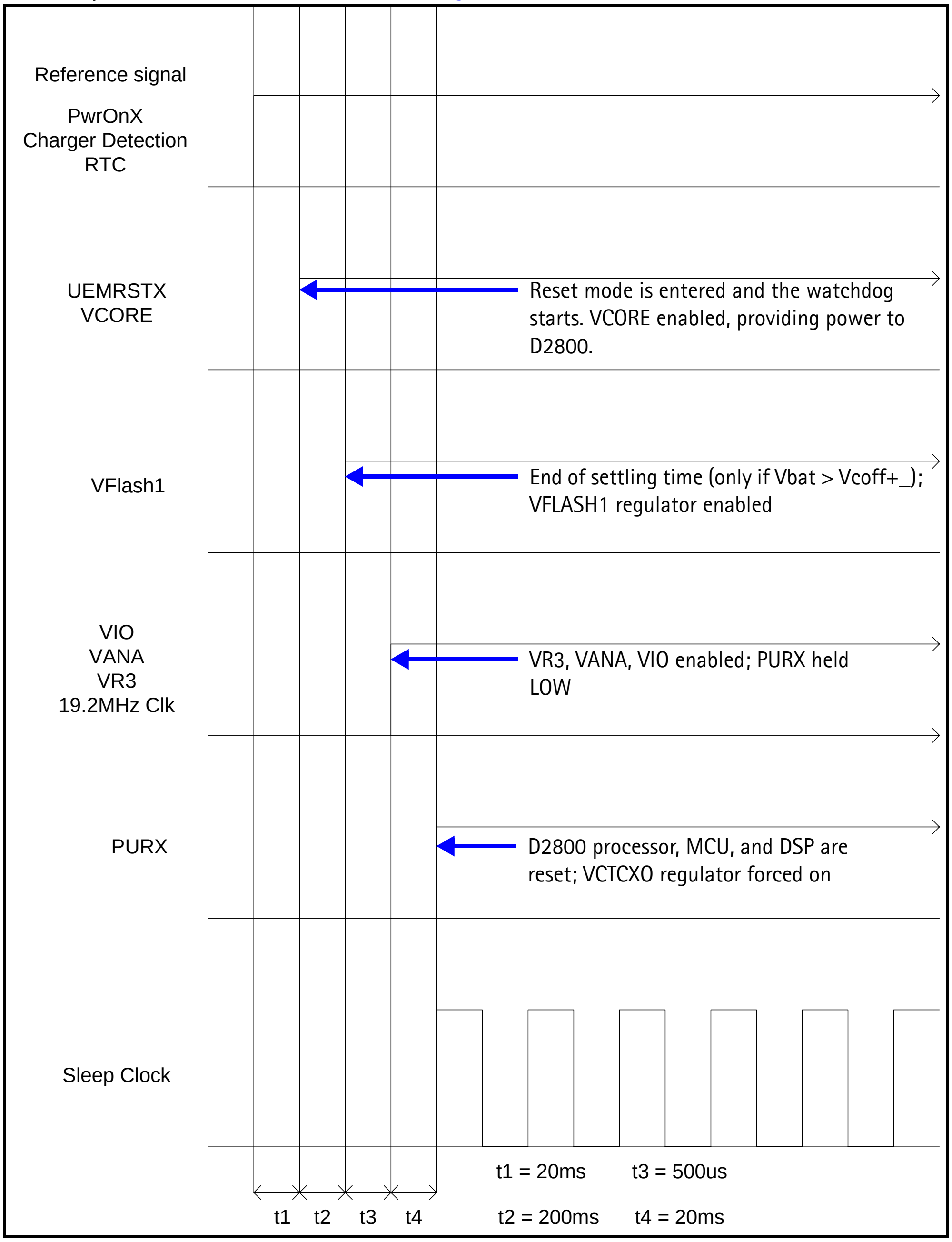

Figure 1: Power-on sequence and timing

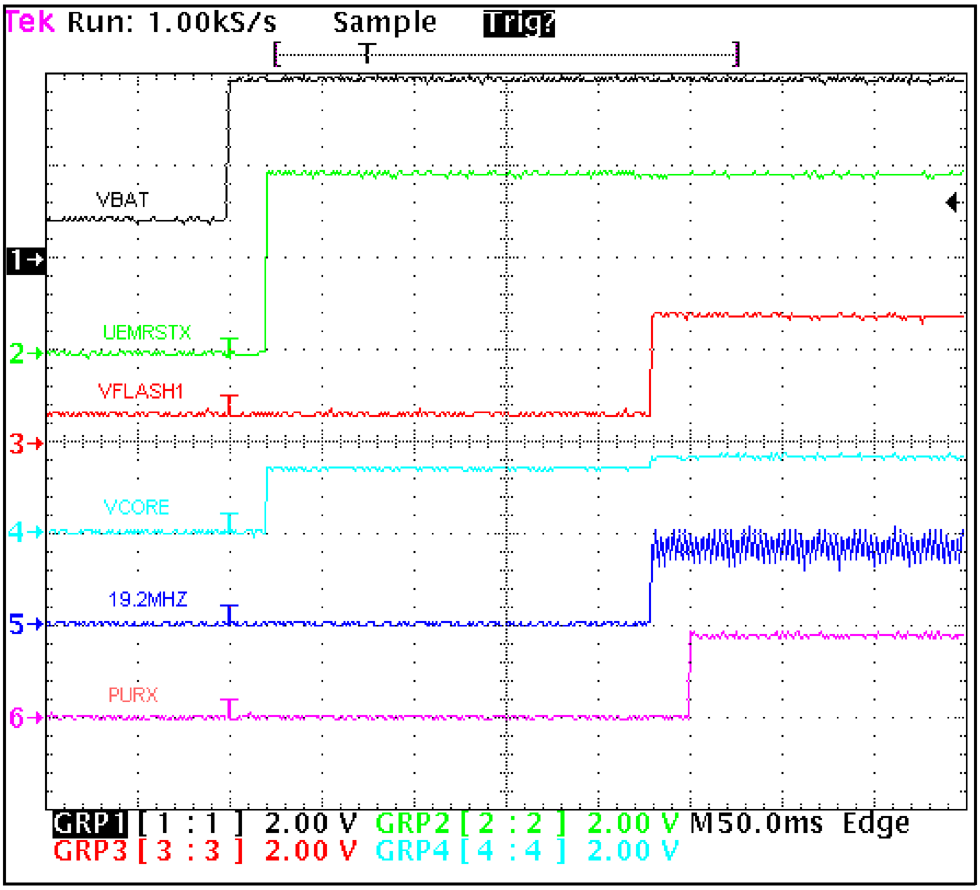

Figure 2: Measured power-on sequence and timing Flash Programming

Flash Programming

Flashing Tool

Flash programming is done through the VPP, FBUSTX, FBUSRX, MBUS, and BSI signals

BSI = Used to indicate to MCU that the prommer is connected and mobile terminal is in flashing mode

MBUS = Used as clock signal for synchronizing the serial communication between the prommer and MCU

FBUSRX = Data to UPP

FBUSTX = Data to prommer

VPP = 0v/ 1.8v/ 12v (read only/normal op. or slow programming/fast programming)

Figure 3 shows the DA-47 flashing tool and Module Jig MJ-57.

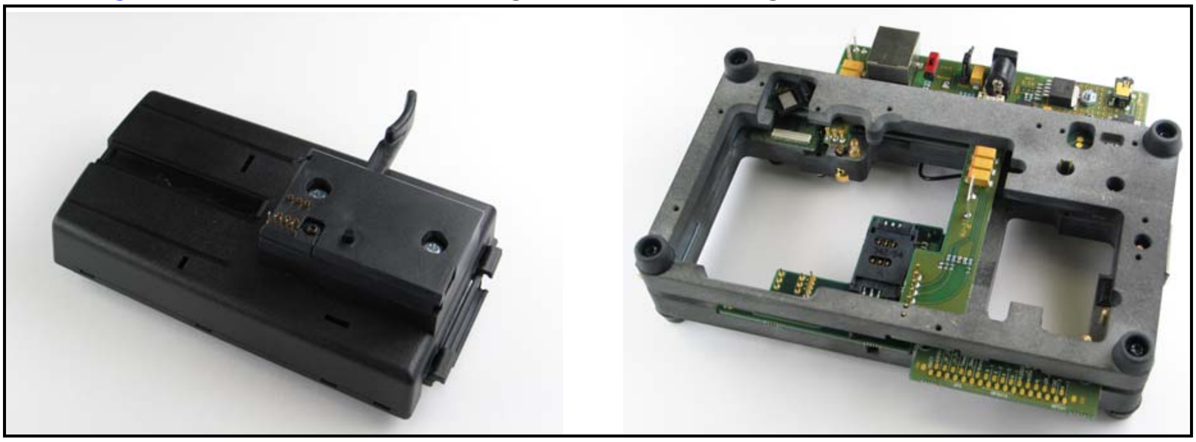

Figure 3: DA-54 Flashing Tool and MJ-57 Module Jig

Flashing Troubleshooting

When troubleshooting flashing problems, first make sure the signals from the FPS-8 to the D2800 processor are functioning properly before replacing any component. Once signals between production test points and the D2200 and the D2800 processor have been checked, verify that the interface between D2800 processor and flash is correct.

While all the signals between D2800 processor and flash are not visible, the available signals will help identify the components that may need to be replaced.

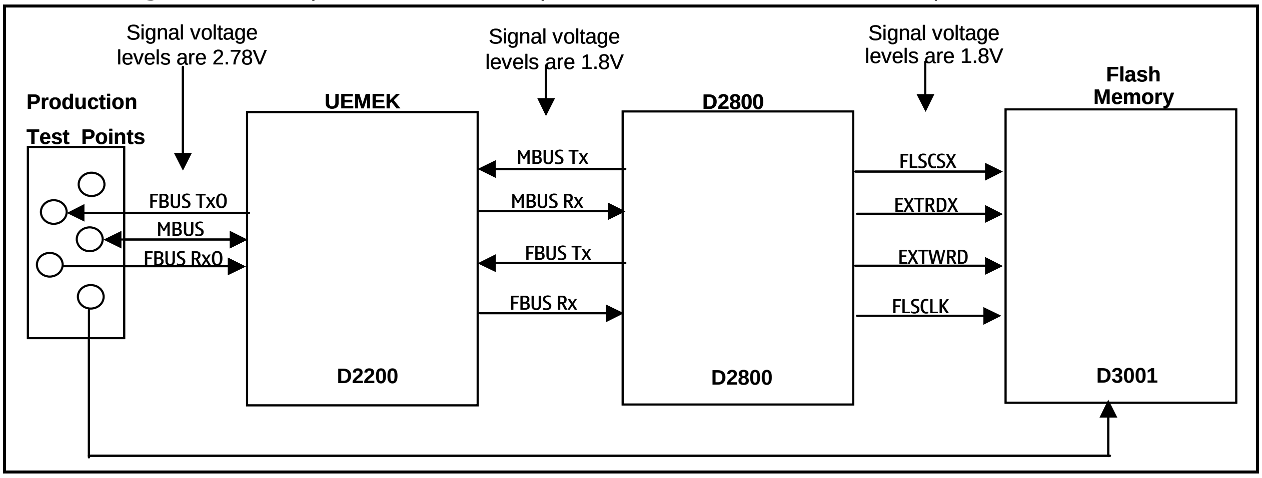

Figure 4: Flashing diagram

When troubleshooting the flashing to diagnose and determine faulty components, check the signals in the following sequence:

- Make sure the signals from the tester are making contact with the production flash pads.
- Use Phoenix External to either program or erase a mobile terminal that is not working. This allows you to monitor the signals form the FPS-8 to the D2800 processor.

- When flashing or erasing the mobile terminal, monitor the MBUSRX and FBUSRX signals from the UEMEK to the D2800 processor for a signal at these points. If either signal does not appear, check the signal at the production test points. If the signal is ok, check the UEMEK. Re-flow or replace the UEMEK.
- Next make sure that the D2800 processor sends information back to the FPS-8 through the FBUSTX signal. If there is no activity at this point re-flow or replace the processor.
- If all points are ok, make sure the FBUSTX signal goes through the UEMEK by measuring the signal at the FBUSTXO at production test points. If there is no signal present, reflow or replace the UEMEK.
- If all signals form the production test points to the UEMEK to the D2800 processor are functioning, it is safe to assume that the UEMEK and D2800 processor are ok.

Continue troubleshooting the D2800 processor as it interfaces with the flash. Verify the available signal interface between the processor and flash as follows:

- Erase or program the mobile terminal to monitor the D2800 processor and flash interface as verified earlier using Phoenix External.
- When programming or erasing the mobile terminal, monitor the FLSCSX, FLSCLK, EXTRDX, and EXTWRX flash signals. If any of these signals has no activity, re-flow or replace the D2800 processor.
- If all signals are ok, re-flow or replace the flash.

If additional troubleshooting is still required to determine why the mobile terminal cannot be flashed, verify all the baseband voltages. In particular, check the VIO since it is one of the regulators that powers the flash chip.

Flashing Phoenix Interface

Run EZ Flash in Phoenix to flash the mobile terminal.

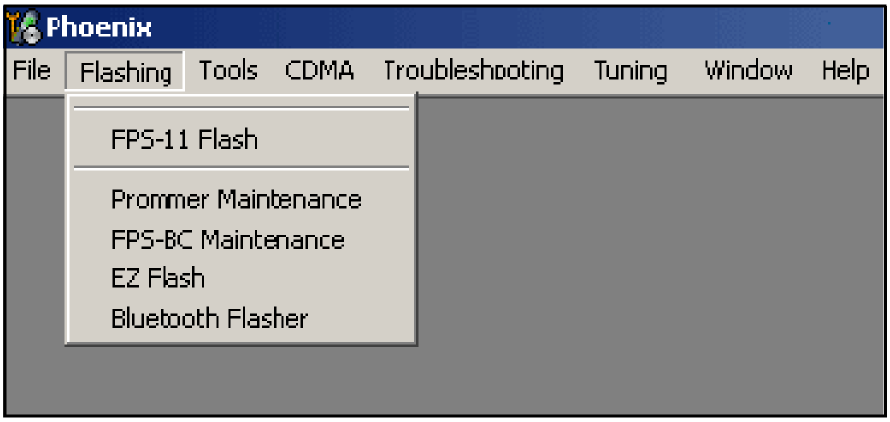

Figure 5: EZ Flash in Phoenix

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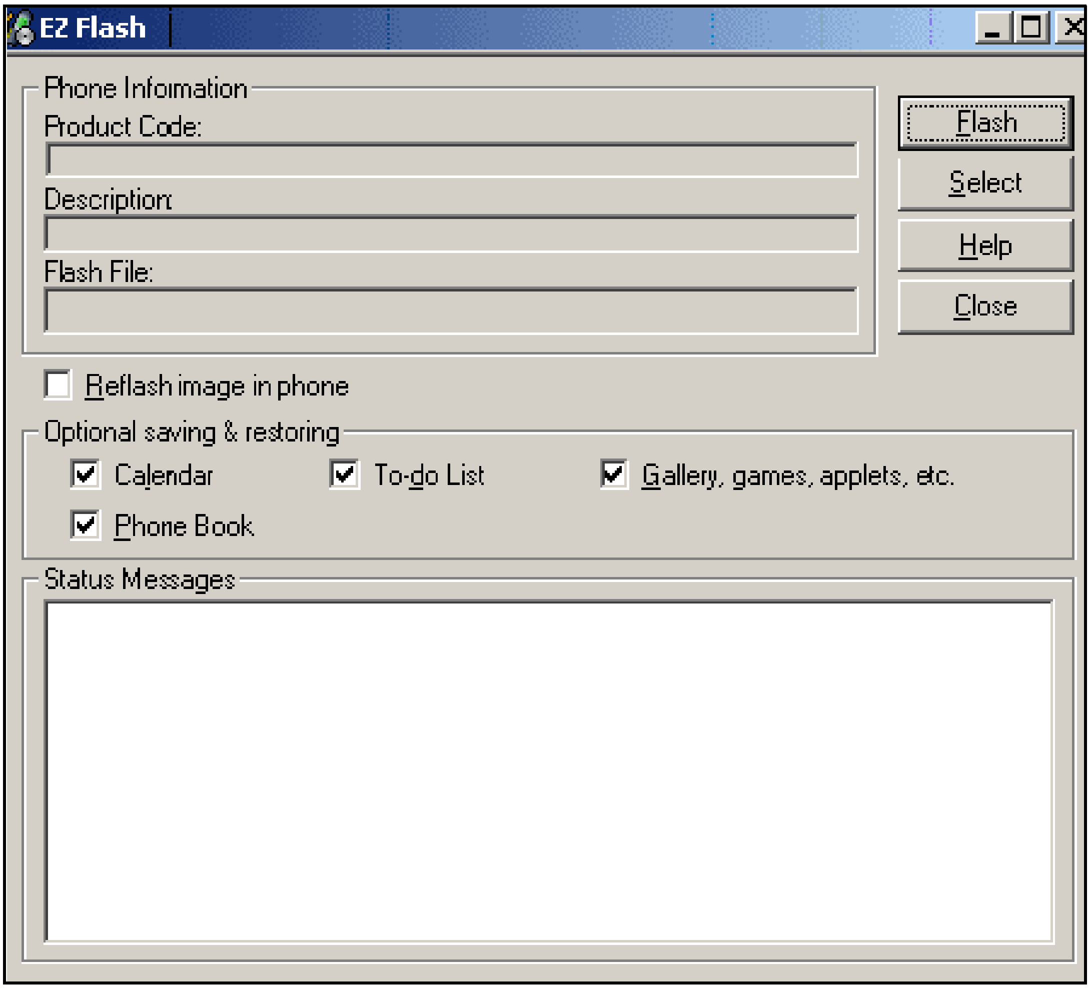


Figure 6: EZ Flash in Phoenix

Audio

How the Audio Works

The baseband supports three microphone inputs and two earpiece outputs. The microphone inputs are MIC1, MIC2, and MIC3:

- MIC1 input is used for the moblie terminal's internal microphone
- MIC2 input is used for headsets (Pop-Port™)
- MIC3 input is used for the Universal Headset

Every microphone input can have either a differential or single-ended AC connection to the UEMEK circuit. In the Nokia 3155/3155i/3152, the internal microphone (MIC1) and external microphone (MIC2) for Pop-Port™ accessory detection are both differential. However, the Universal Headset interface is single-ended. The microphone signals from different sources are connected to separate inputs at the UEMEK. Inputs for the microphone signals are differential types. Also, MICB1 is used for MIC1 and MICB2 is used for MIC2 and MIC3 (Universal Headset).

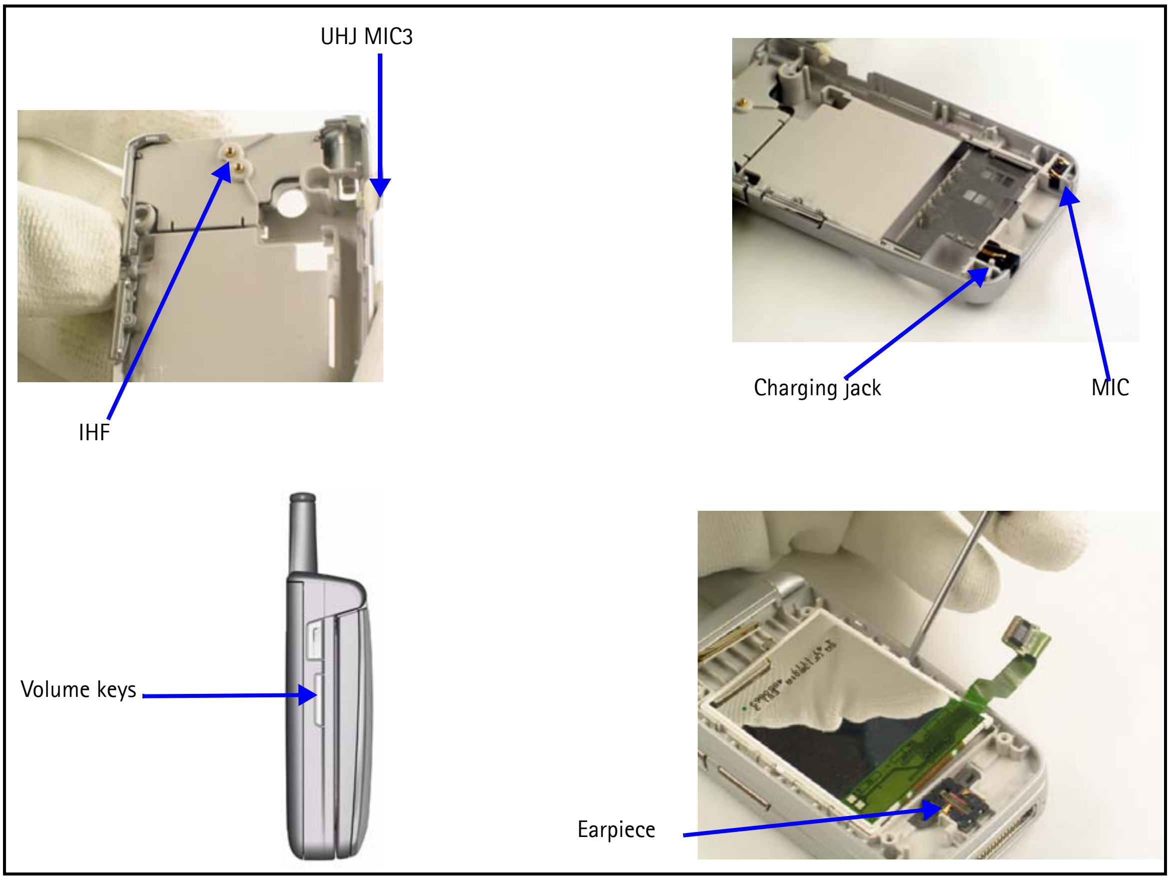


Figure 7: Audio components

Audio Troubleshooting

When troubleshooting the audio, make these common checks (see Figure 8):

- Perform visual inspection of all the ASIPs and the UEMEK.
- Inject 1KHz signal into MiC1 and trace it to the earpiece. Only when using IHF signal will be amplified by a factor of 8.

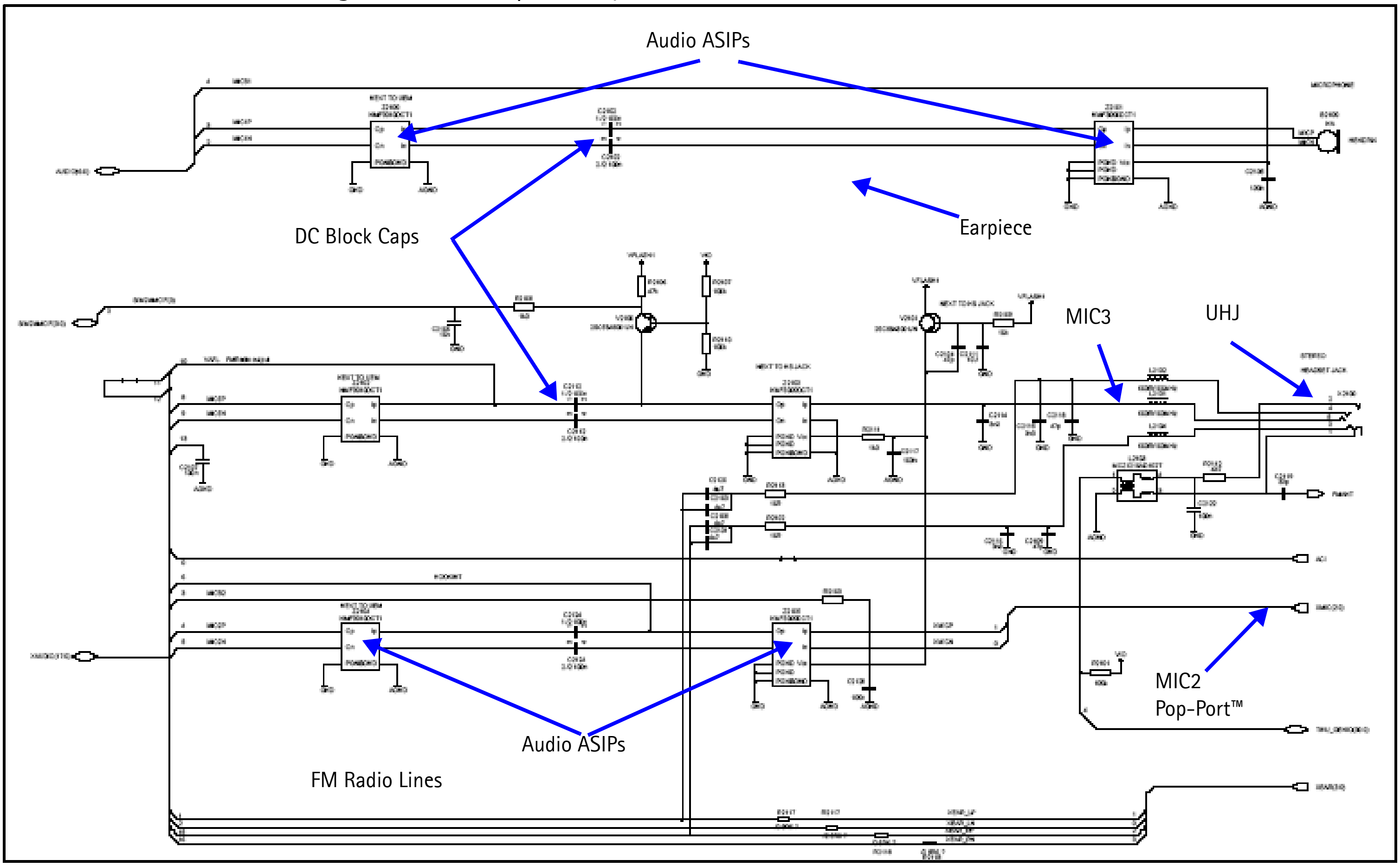


Figure 8: UEMEK Side of Audio Diagram

- Make sure the audio amplifier and solder are ok.
- Make sure the IHF speaker contacts are ok.
- Make sure output is amplified by 8x. If not, check that the gain resistors network is correct.

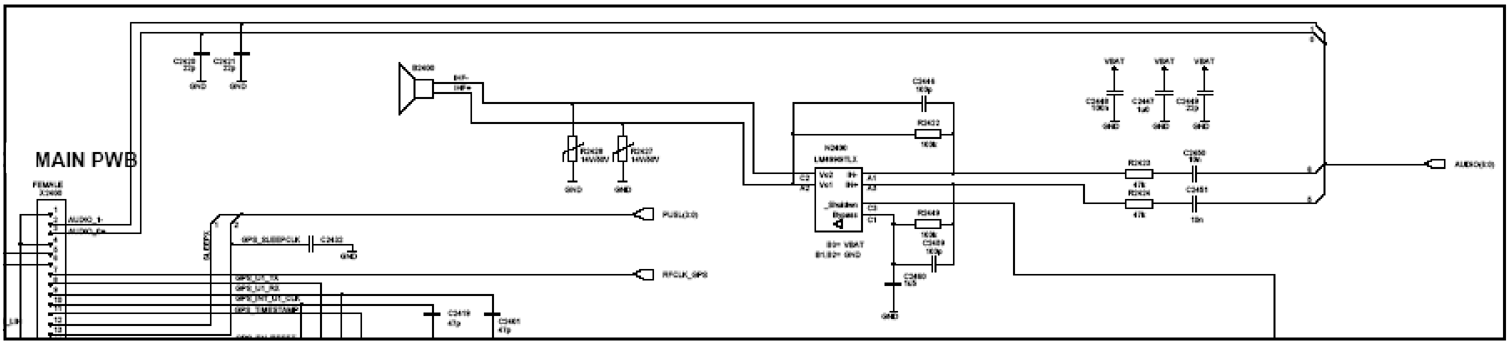


Figure 9: IHF Troubleshooting

Audio Phoenix Interface

Run Audio Test in Phoenix to check the audio functionality.

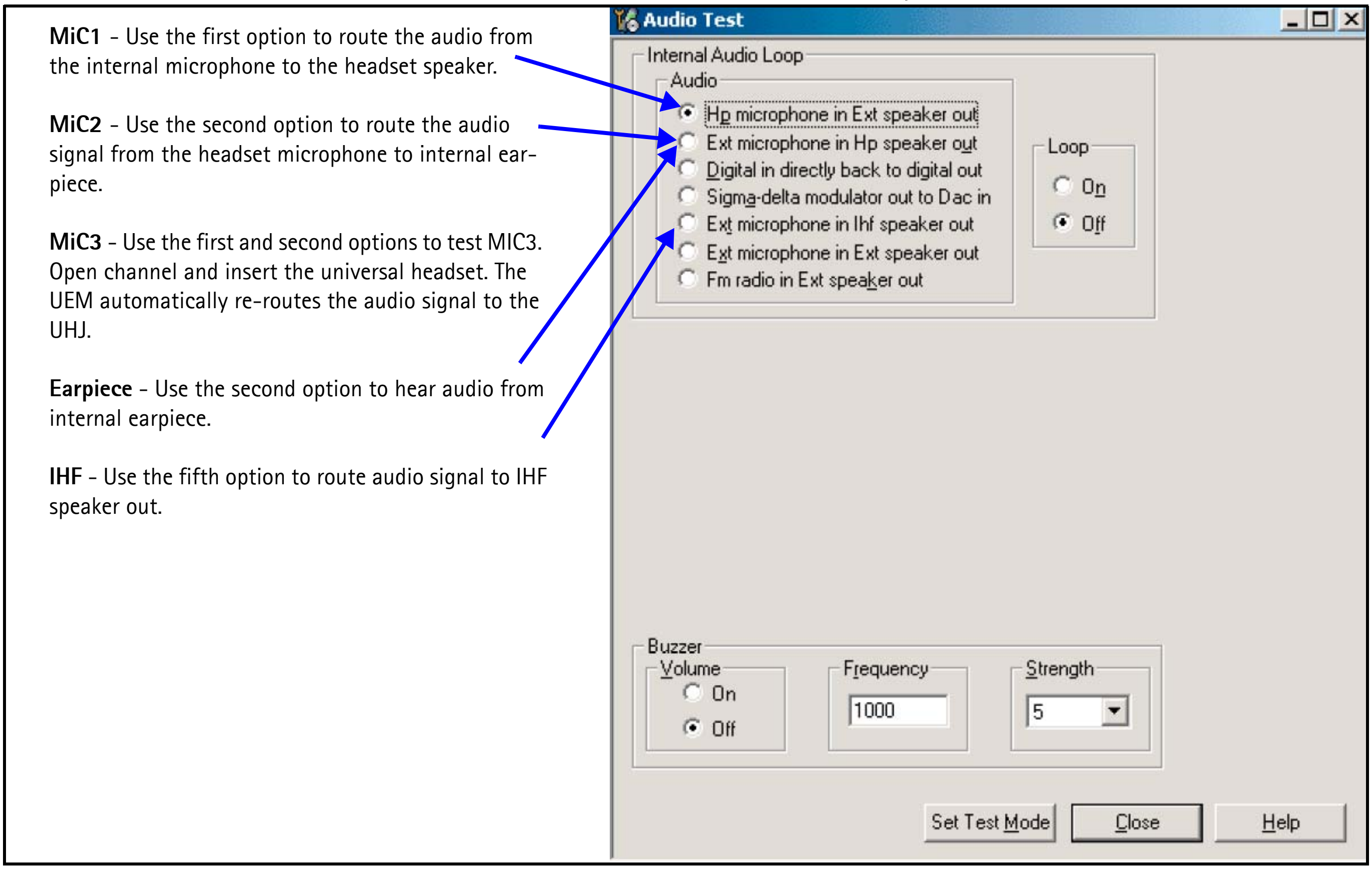


Figure 10: Audio Test in Phoenix

FM Radio

How the FM Radio Works

The D2800 turns on the FM radio and sets the frequency using the CBUS serial interface as the communication channel. A high frequency FM radio signal comes in through RFIN1 Pin to the FM radio chip and gets demodulated into a low frequency signal and is sent to the UEMEK for amplification. The amplified signal then gets routed back either to the universal headset or to the system connector for the stereo headset.

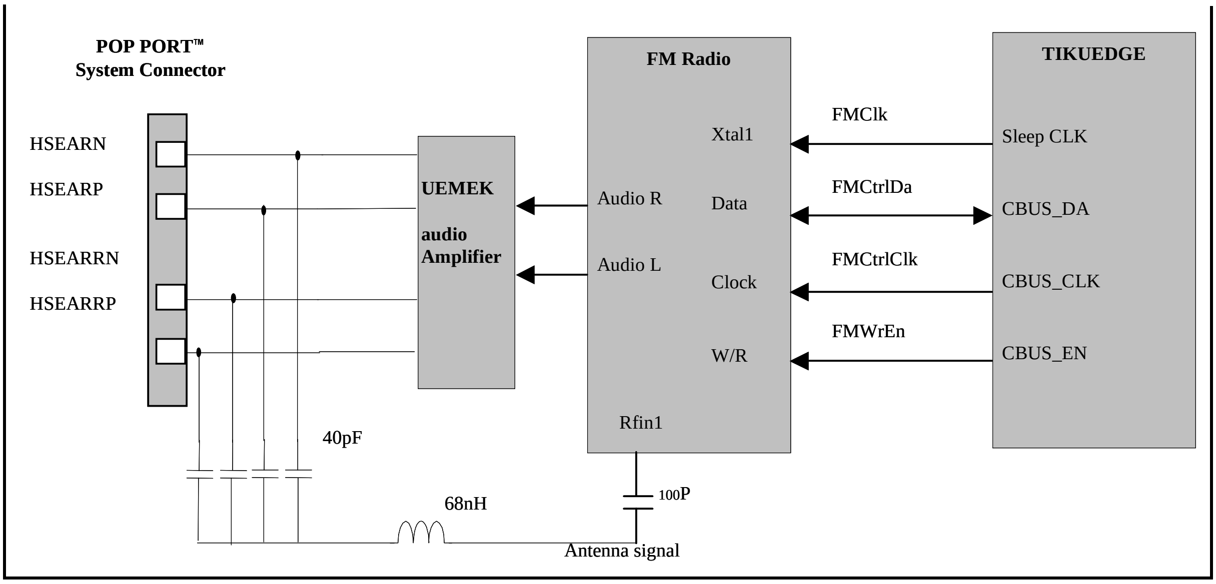


Figure 11: FM Radio (N356), Audio (N150), antenna, and digital interface connections

FM Radio Test

To hear the FM radio, you first connect headset to Pop-Port™ or UHJ ports because the headset is an FM radio antenna. Connect the headset to UHJ port to control the FM radio using Phoenix. If you connect a headset (such as HDS-3) to a Pop-Port™ connector, then you cannot control the mobile terminal because you have already occupied the connection port (Pop-Port™). In this case you have to have jumper wires on the production test points (Fbus Tx/RX,GND).

FM Radio Troubleshooting

When troubleshooting the FM radio, make these common checks (see Figure 12):

- Check Power Supply VIO and VANA
- Check SleepCLK
- Check FMANT
- Check for activity on CBUS
- Check output of FM radio on VAFR and VAFL

- If the audio signal not correct (with 800mv DC-offset), then check FM radio chip for shorts, voids, and misalignments
- If the audio signal is correct (with 800mv DC-offset), then check the UEMEK for shorts, voids, and misalignments
- If the UEMEK and FM Radio Chip is correct, check the system connector

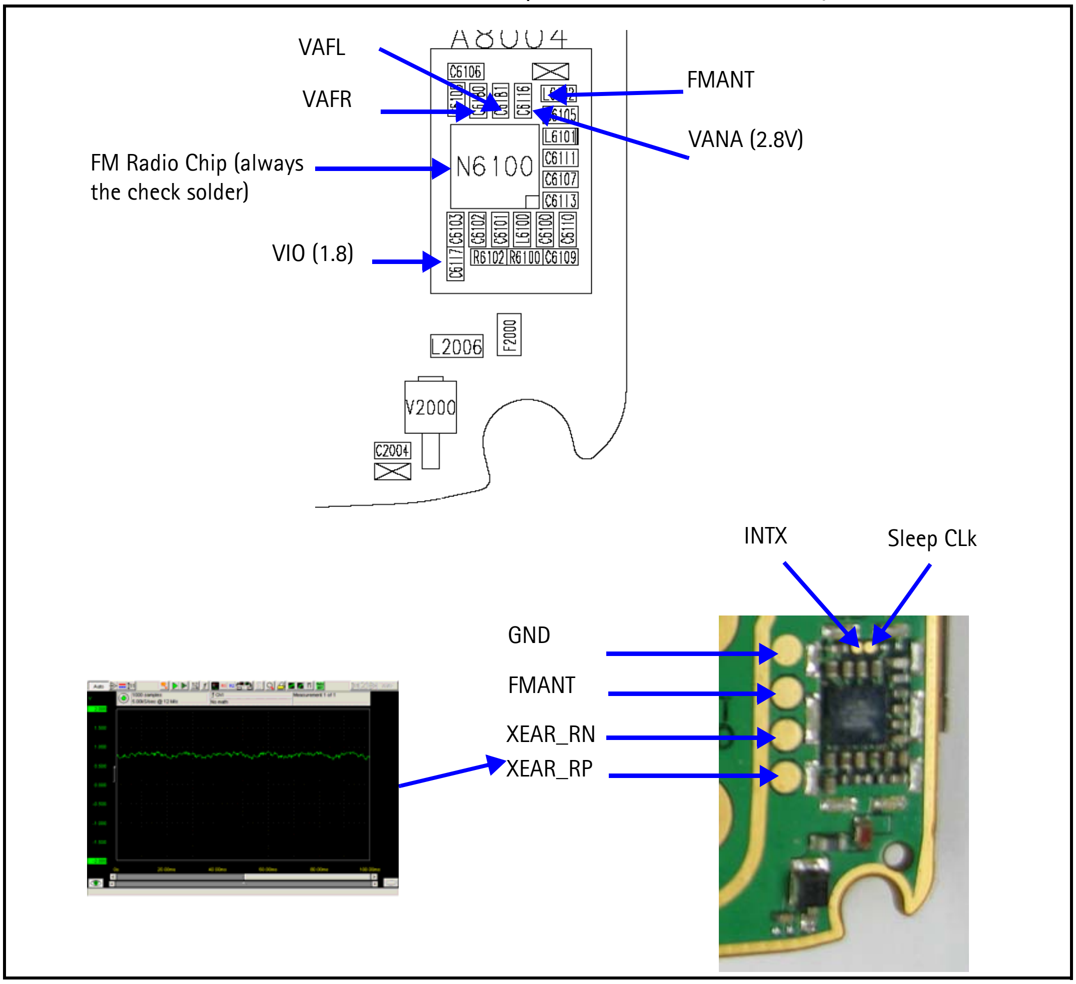


Figure 12: FM Radio Chip and Antenna

FM Radio Phoenix Interface

Checks for the FM radio that can be perform with Phoenix include:

- Verify the FM radio is working by connecting headset to UHJ
- Turn on the FM radio
- Set frequency and volume

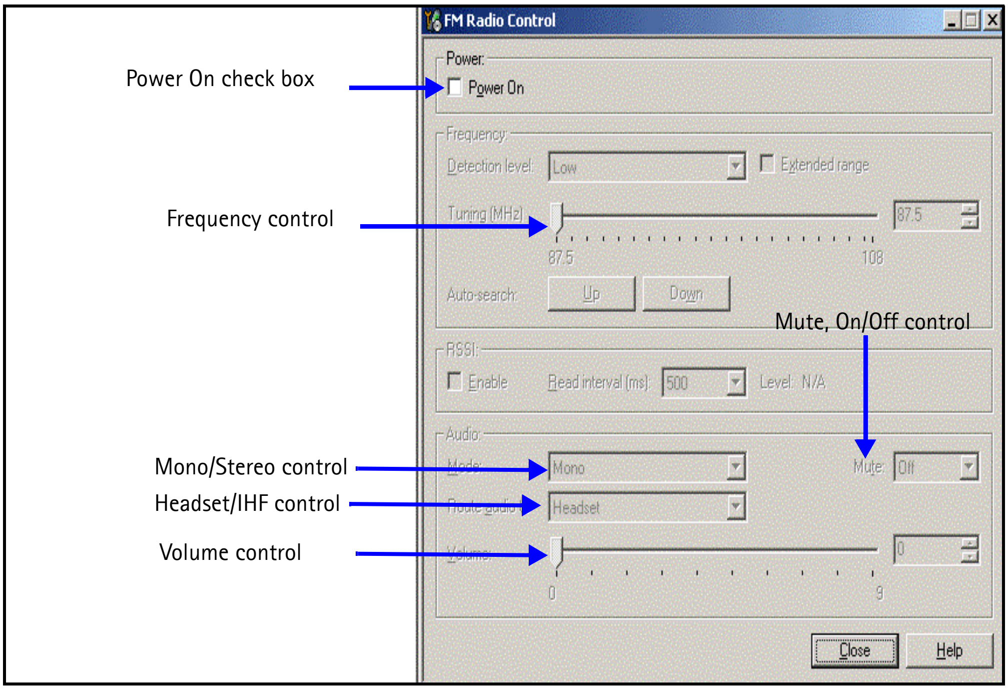


Figure 13: Phoenix FM Radio Control panel

USB (Universal Serial Bus)

How the USB Interface Works

When the mobile terminal is connected to a computer using a DKU-2 data cable, the computer will provide Vbus (5V) to and pull down D+ a,d D – lines. The mobile terminal will respond by pulling the D+ line high. The computer acknowledges and starts transferring data at 12Mbits/sec.

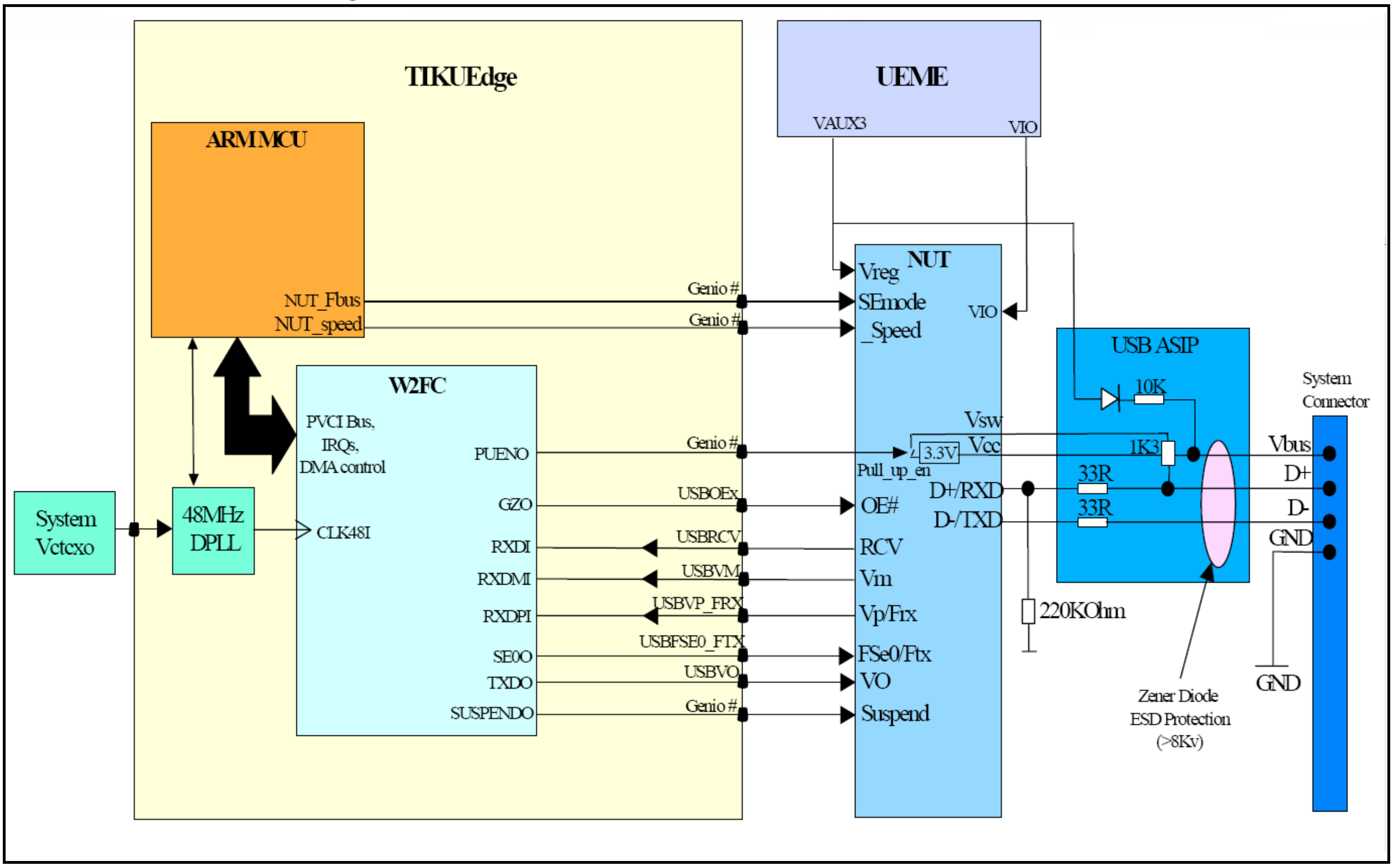


Figure 14: USB interface block diagram

USB Troubleshooting

First connect mobile terminal to the computer using a DKU-2 data cable. Check under device manager if the computer recognizes the mobile terminal as a USB device. If the mobile terminal is recognized, there is no hardware fault and you can stop troubleshooting.

Figure 15: PC Device Manager

When troubleshooting the USB, make these common checks (see Figure 26 and Figure 27):

- Perform a visual inspection on Pop-Port™ connector, ESD Protection, NUT Chip, and caps and Inductors
- Check Vout, Vflash1, and ACI Line. If not correct, check UEMEK under X-ray or change the part.
- Check for activity on the USB D+ and USB D – lines. If there is no activity, check D2800 under X-ray or change the part.

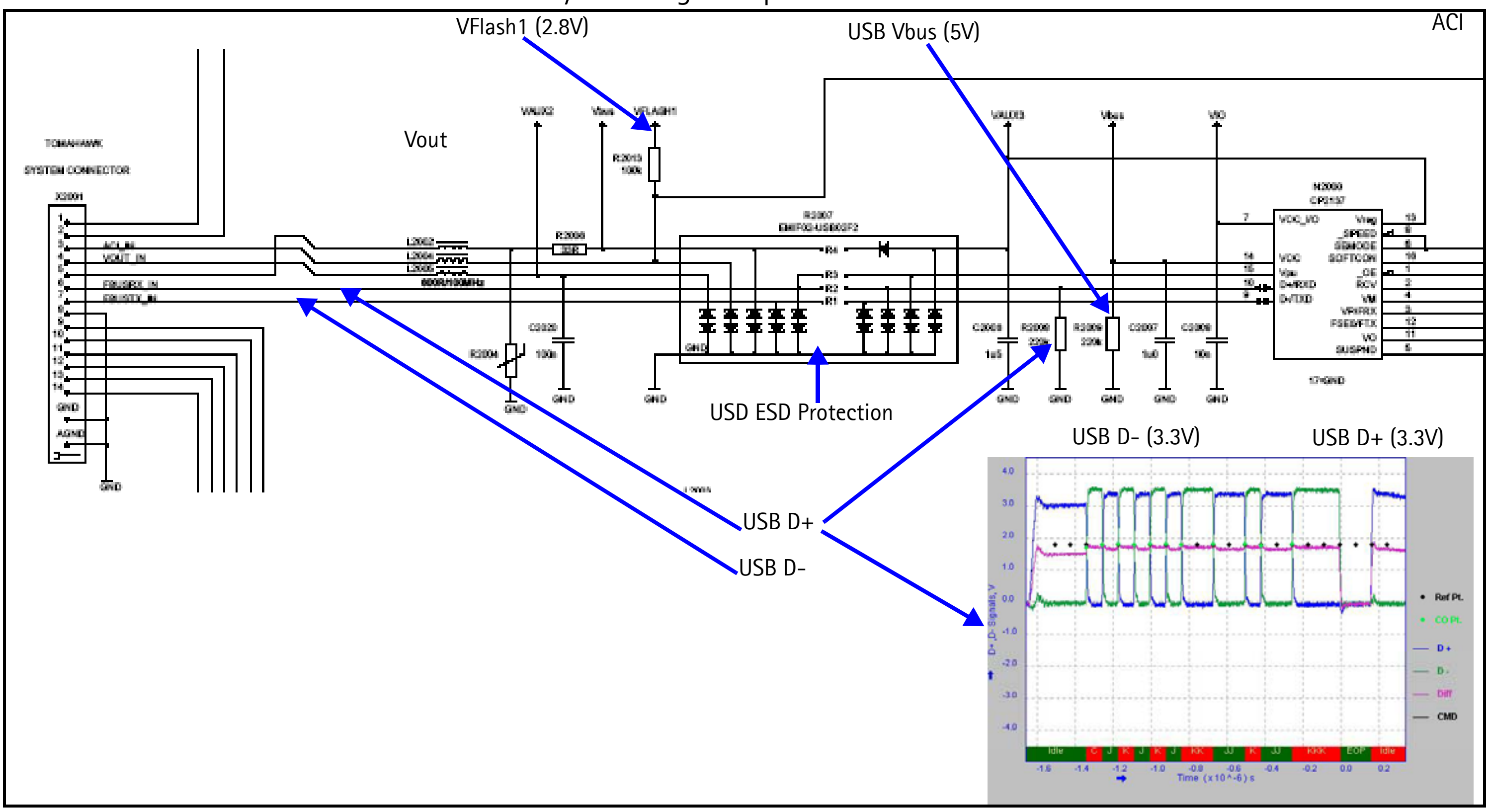


Figure 16: USB Chip and Diagram

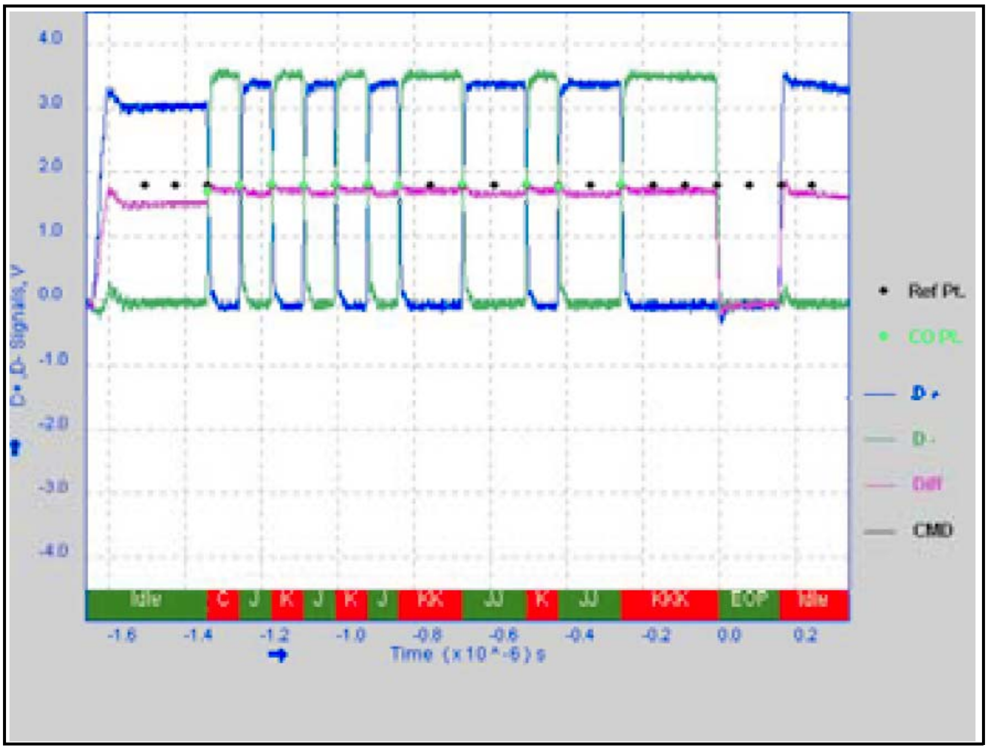


Figure 17: USB Vout

Display

How the Display Works

Nokia 3155/3155i/3152 has a large main display (160 x 130 color depth), controlled by the D2800 engine through a parallel interface. The secondary, black and white display (96 x 68) is controlled by the D2800 engine through a serial interface. The UEMEK powers using VIO and VFlash1.

Figure 18: Nokia 3155/3155i/3152 UI Display

Display Troubleshooting

When troubleshooting the display, make these common checks (see Figure 19):

- Check that the display is connected properly and is making good contact with LCD connector. If no display, replace the LCD.
- Check the power supply VIO and VFlash1. If not correct, check the UEMEK.
- Check the activity on the LCD test points. If no activity, check or replace D2800
- Check the parallel interface (DIF) for the main display
- Check that the DIF CLk is 4.8MHz
- Check the serial interface (LCD) for the secondary display
- Check that the LCD CLk is 2.4MHz

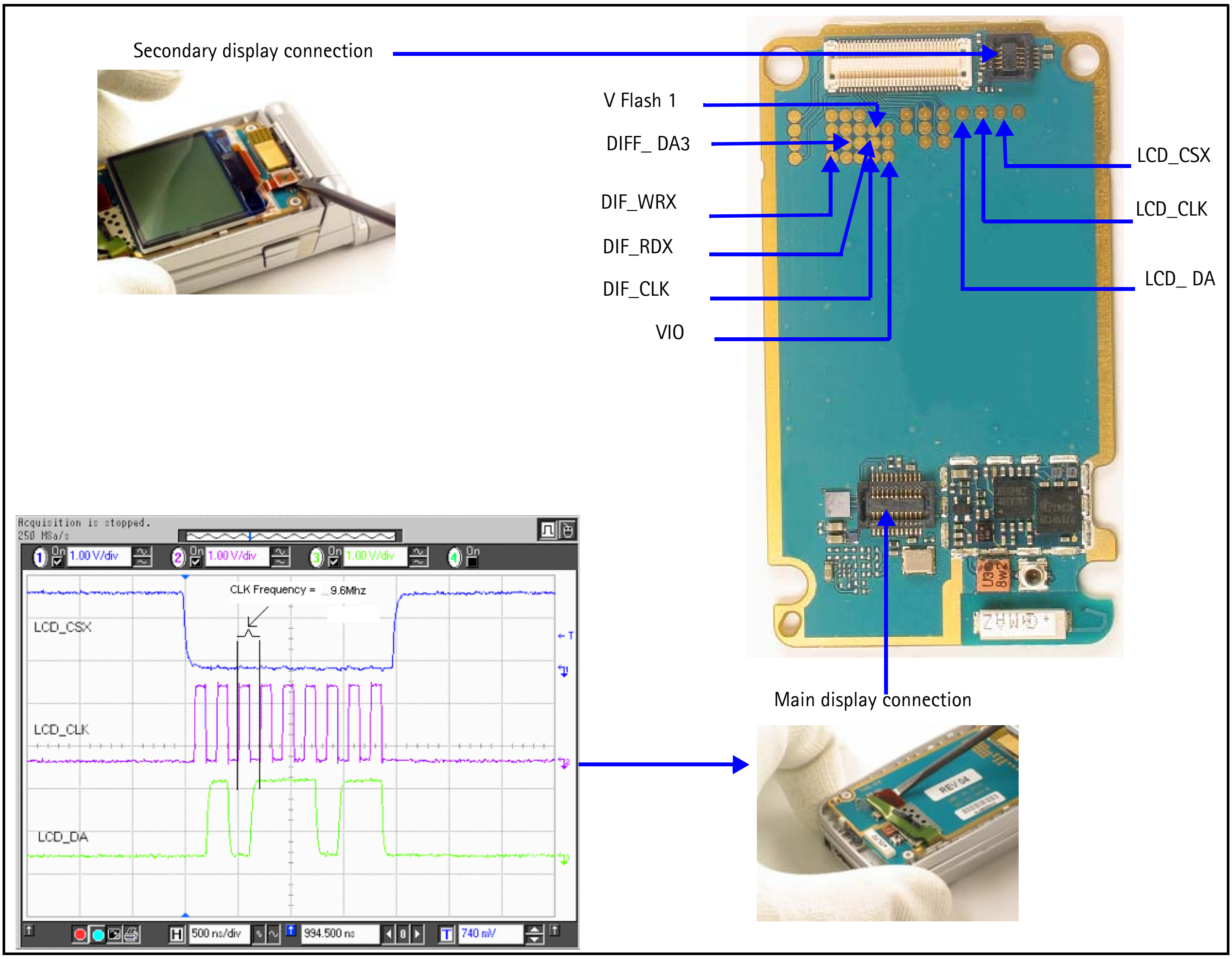


Figure 19: Display Chips and Frequency

Display Backlight Troubleshooting

When troubleshooting the display backlight, make these common checks (see Figure 20):

- Perform visual inspection of LCD connector and LED Driver circuitry
- If the display backlight does not turn on, check VLED +(~12V) for the main display; VLED 2+ for the secondary display and VLED – (~.5V) on display connector for both
- If there, then you can assume the driver is working properly and the LED inside the display might be faulty. Change display.
- Check VLED + and VLED – on Display Driver circuitry
- Check Dlight is enabled high (~4V) for secondary LCD. If not correct, check UEMEK.

- Check Klight is enabled high (~4V) for main LCD and keypad LEDs. If not correct, check UEMEK.
- Check Vbat(~4V) and Vin(~4V) are present on driver inputs. If not, check power supply connection.

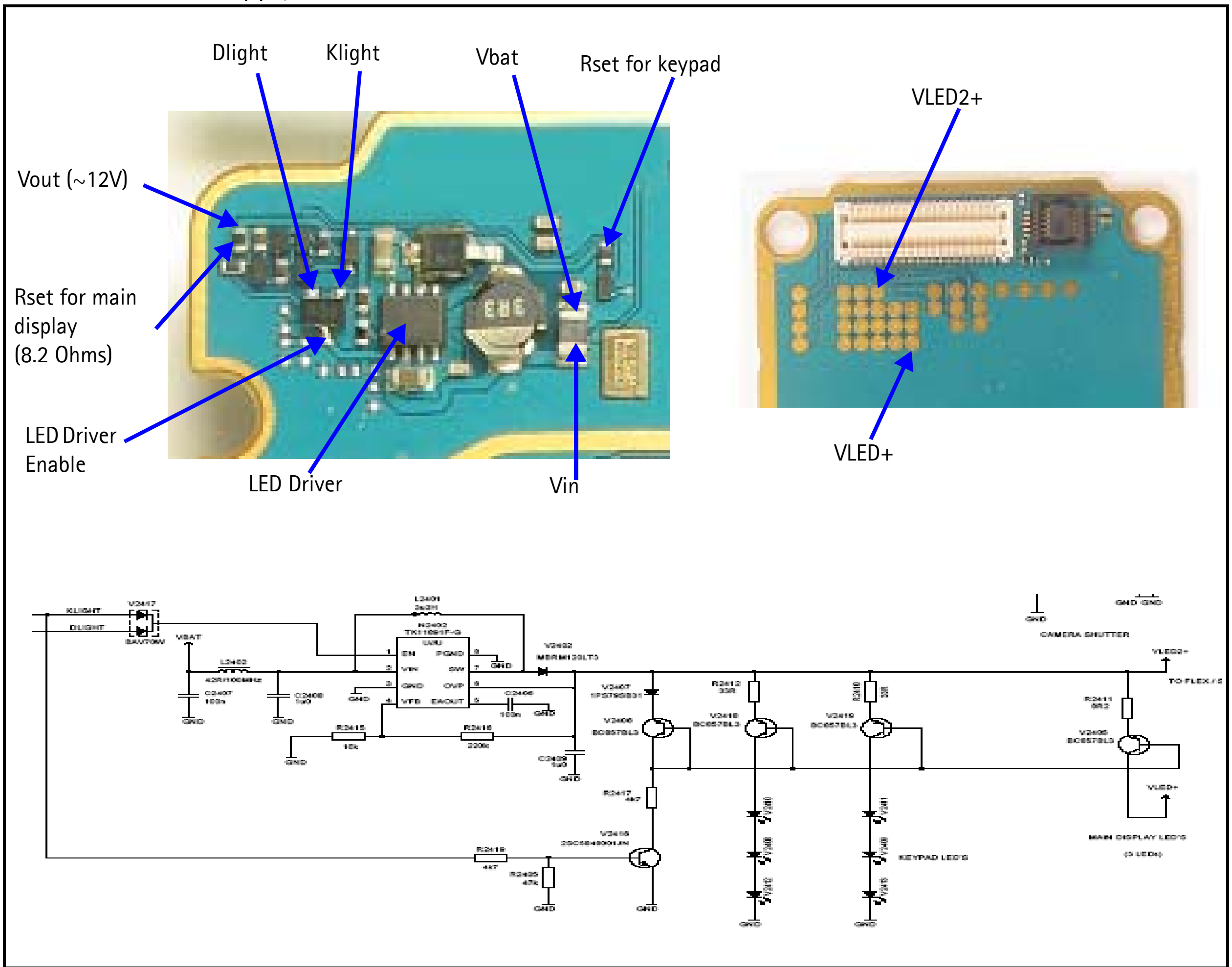


Figure 20: Display Backlight Chip and Diagram

Display Phoenix Interface

Run the Display Test and Display Tune in Phoenix to check the display.

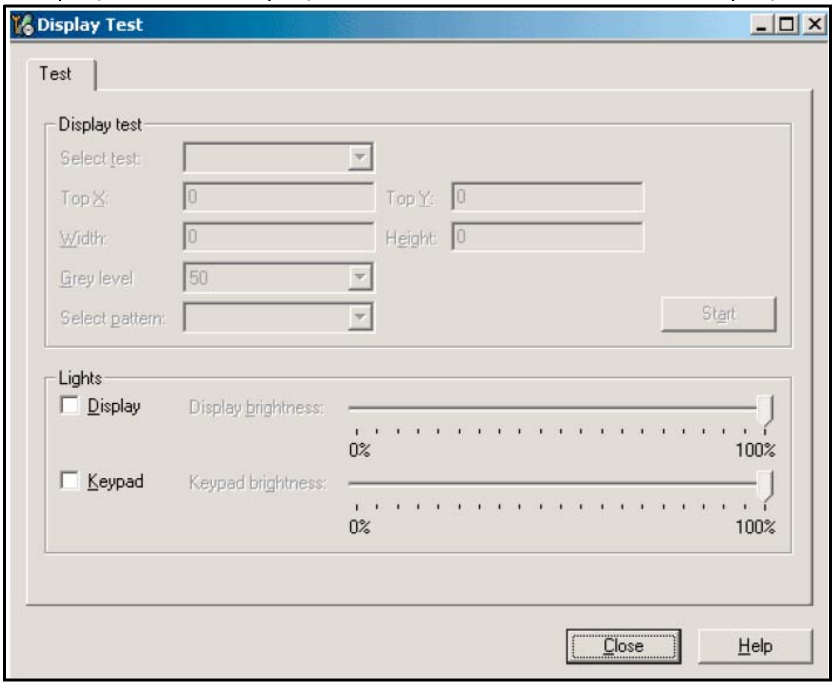


Figure 21: Phoenix Display Test option

Keypad Backlight

How the Keypad Backlight Works

Klight coming out of UEMEK controls the keypad backlight LEDs. Klight enables the LED driver, which is a constant voltage supply for all the keypad LED in series. The current is set for all the branches by Rset which in this case is 33k Ohms and equates to 10mA through each LED.

Figure 22: Keypad Backlight Diagram

Keypad Backlight Troubleshooting

When troubleshooting keypad backlight, make these common checks (see Figure 23 and Figure 24):

- Perform visual inspection of all the components including LEDs
- Check Vbat to make sure the driver has power
- Check Klight to make sure driver is enabled by the UEMEK. If not correct, check the UEMEK.
- If lights are too dim or too bright, check Rset. Rset controls the current going through the LEDs.
- Check Vout to make sure LEDs are getting power. If still not working, change LED. Make sure LED orientation is correct.

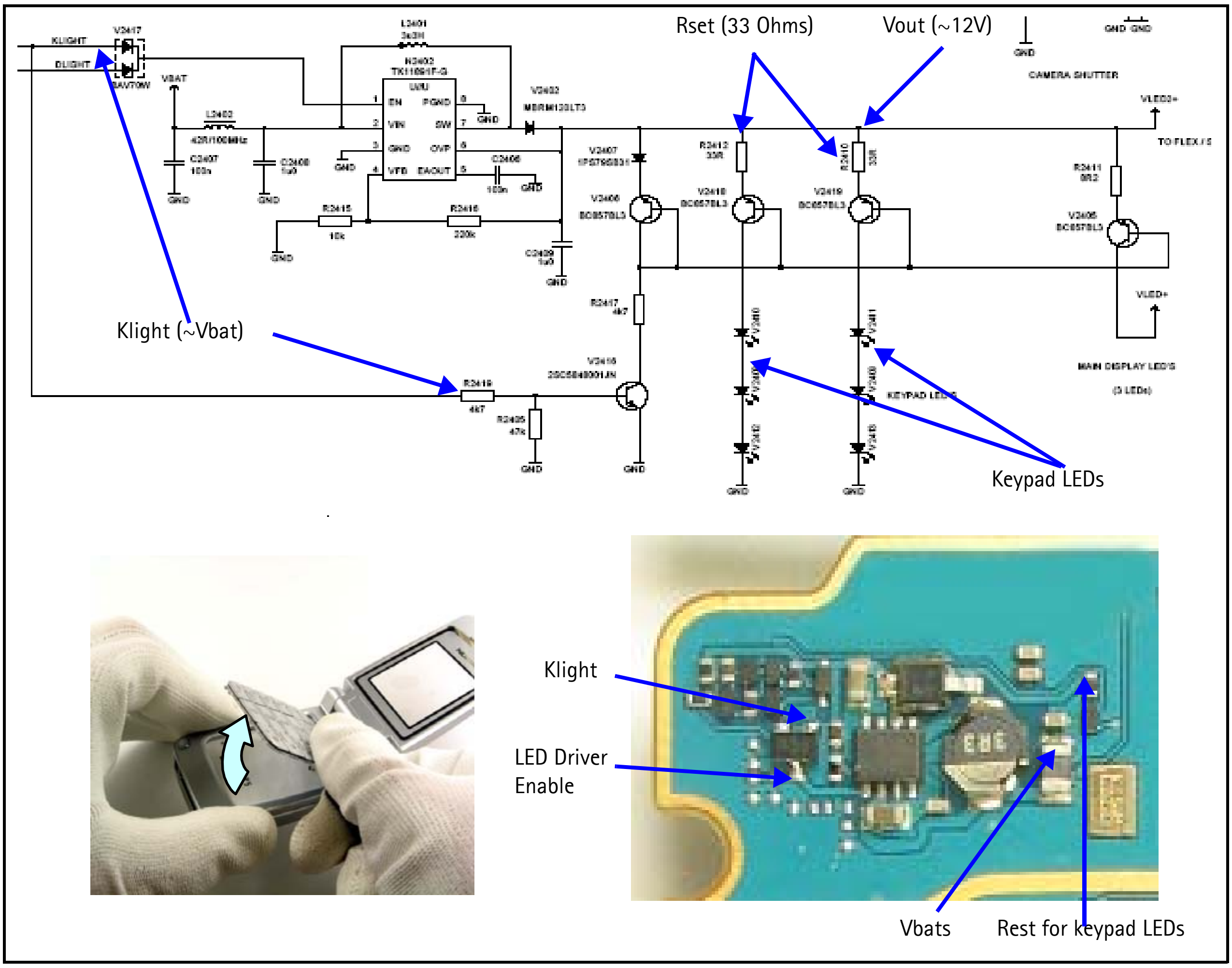


Figure 23: Keypad Backlight Chip and Diagram

Keypad Backlight Display Phoenix Interface

Run the Display Test in Phoenix to check the keypad backlight.

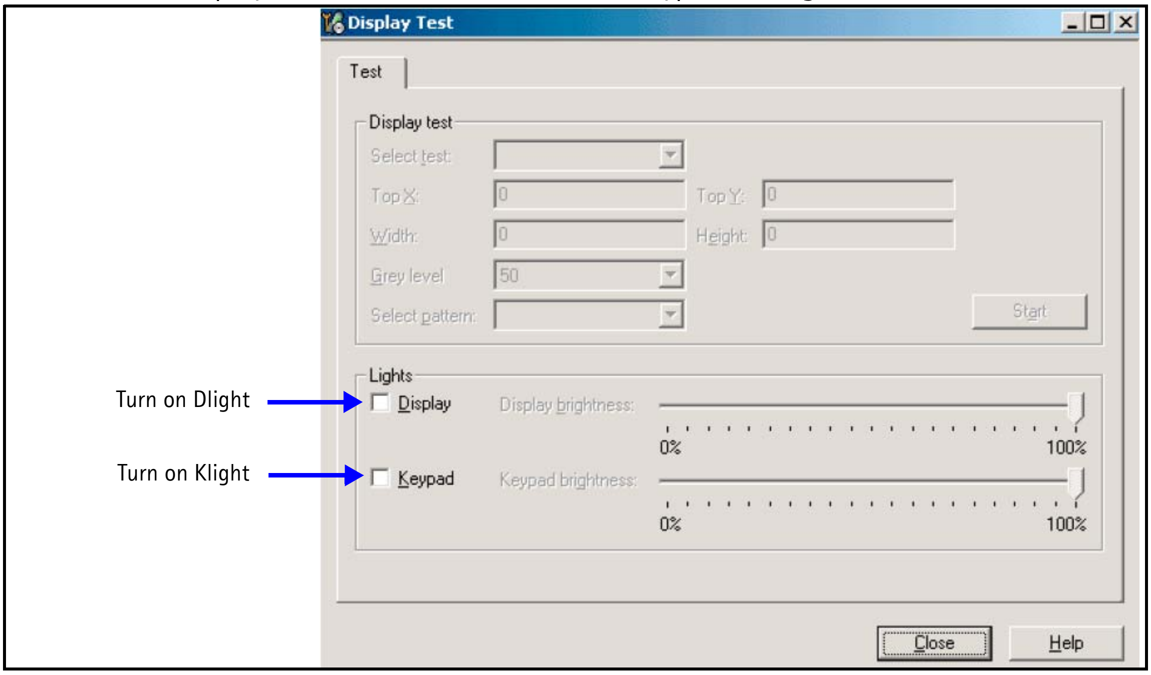


Figure 24: Phoenix Display Test option

GPS

How GPS Works

This is for emergency 911 GPS service only. When you dial 911, the GPS turns on by using Vcore_Lin and VIO from UEMEK. GPS communicates with the D2800 using the UART interface. This turns on the BB chip and the RF chip. They synchronize with the mobile terminal using the 19.2Mhz clock. The mobile terminal locates the closest satellite and downloads the location coordinates to send them to the Emergency desk.

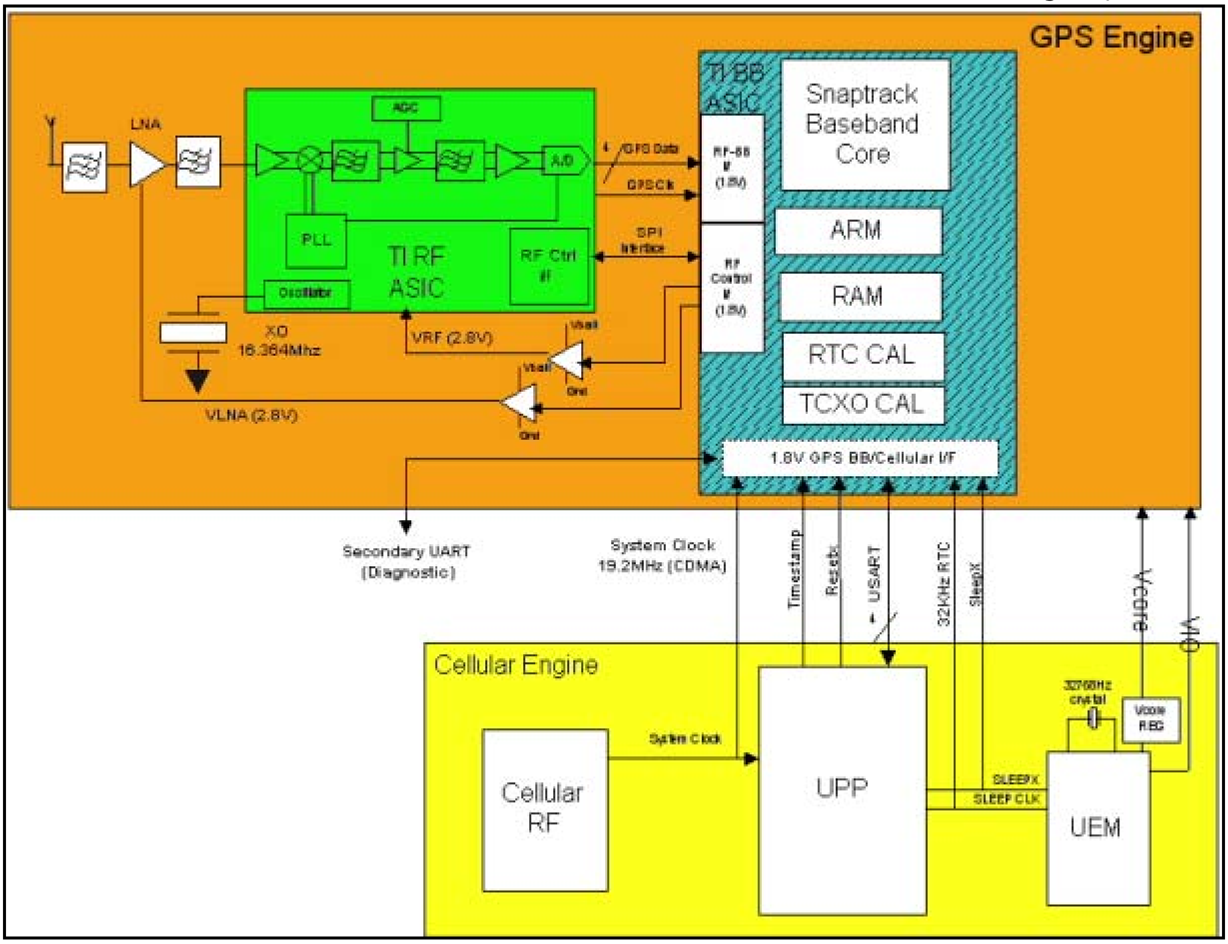


Figure 25: GPS Block Diagram

GPS Troubleshooting

When troubleshooting GPS, make these common checks (see Figure 26 and Figure 27):

- Check the Power Vcore and VIO
- Check that GPS_RF_CLk = 19.2Mhz
- Check the GPS_EN_Reset
- Check that Sleep_CLK = 32.768kHz
- Check that VRF_GPS = 2.78
- Check that the GPS clock = 16.384Mhz

- Run Test Mode 1 on Phoenix
- Check USART activity

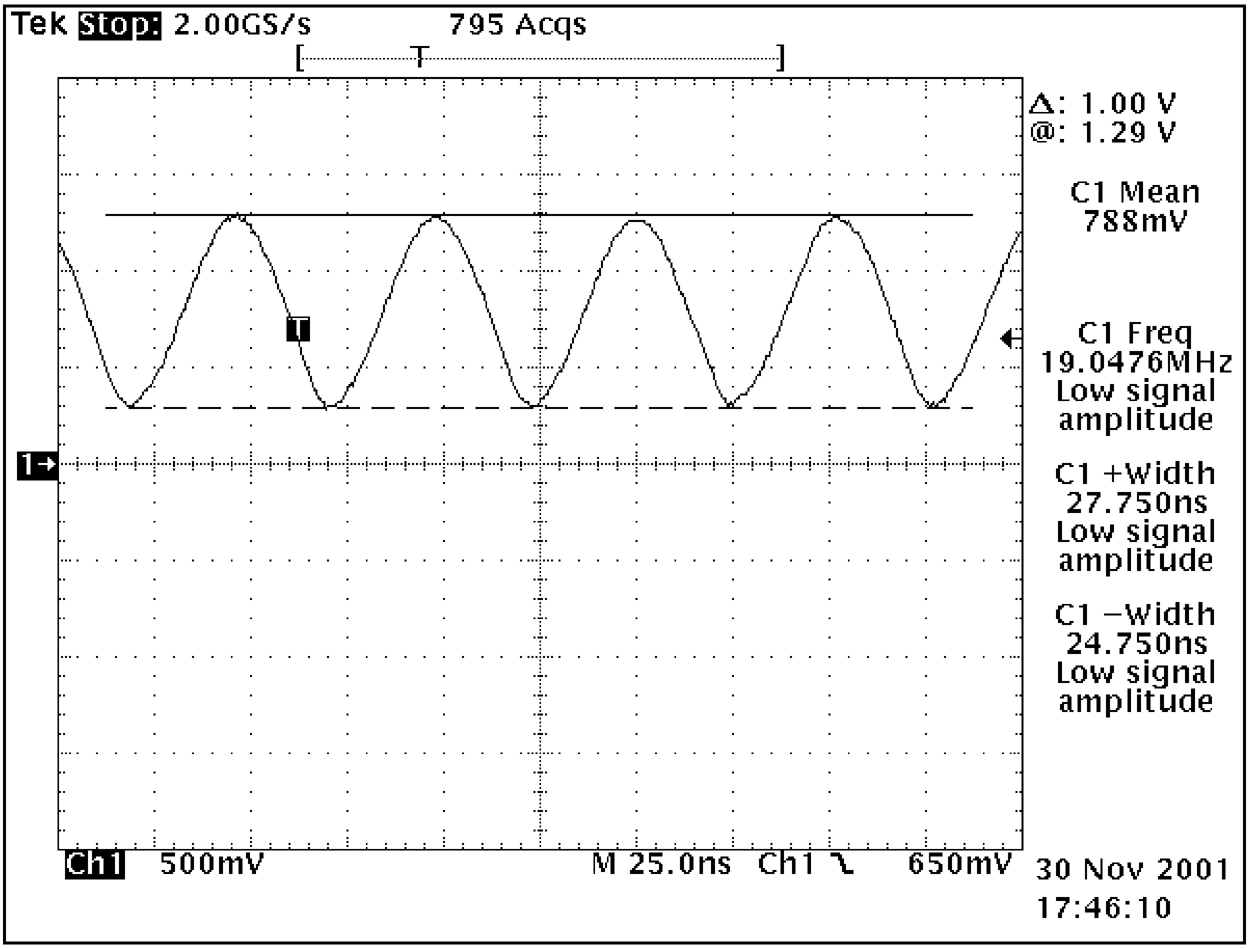


Figure 26: GPS Power VCore or VIO

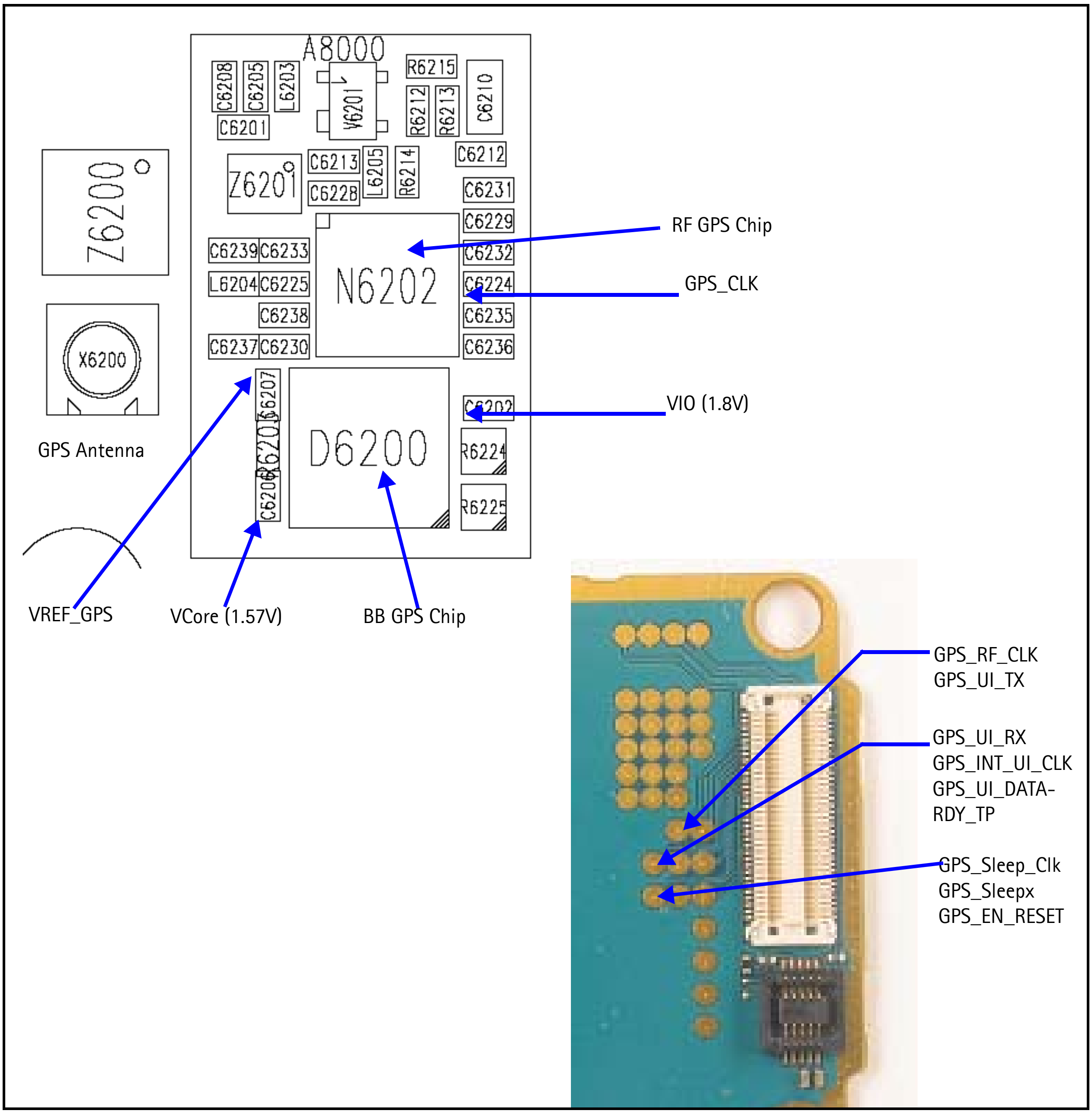


Figure 27: GPS Chip

GPS Phoenix Interface

Run the GPS Quick Test in Phoenix to check the GPS BB.

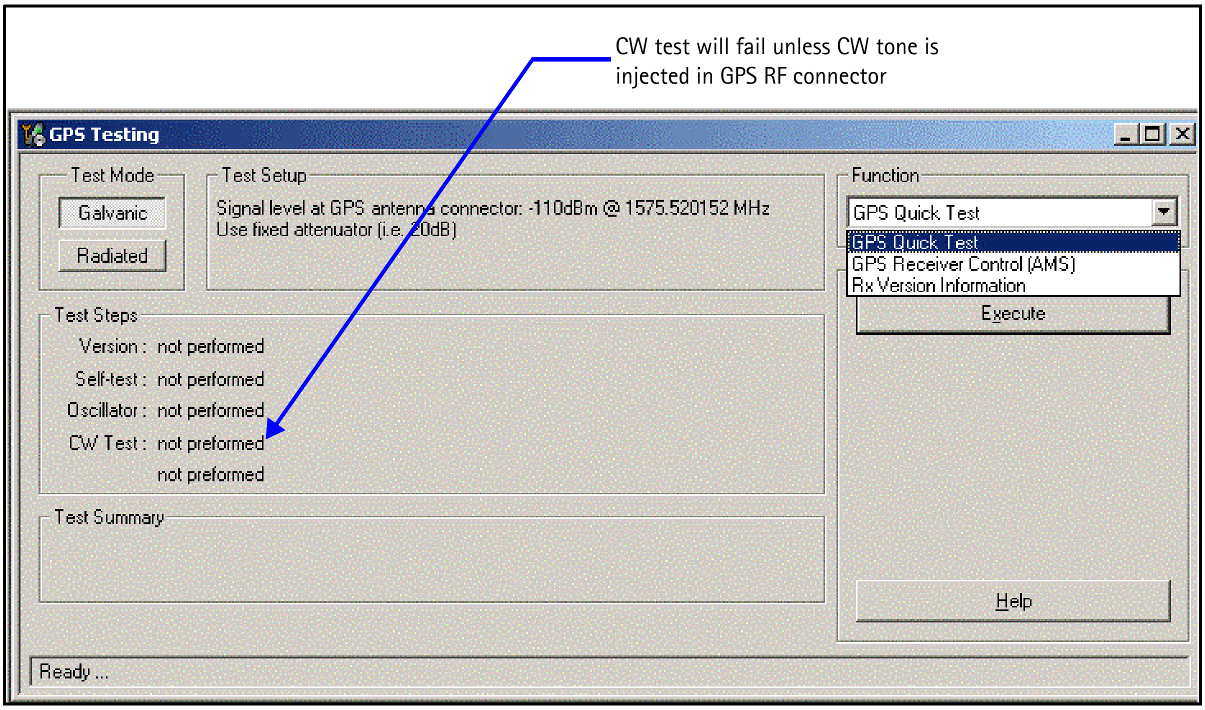


Figure 28: Phoenix GPS Testing option

UIM Card

How the UIM Card Works

The Nokia 3155/3155i/3152 supports two types of UIM cards that work at 1.8V and 3.0V. When the mobile terminal is switched on with a UIM card, the D2800 sends a 1.8V signal to the UIM card and waits for the UIM card's response and identification. After a wait period, if there is no answer from the UIM card, the mobile terminal will send another signal at 1.8V. In this case UEMEK acts as a level shifter and raises the signal to 3.0V. If there is still no response, the mobile terminal will not allow access. If there is a response, then the mobile terminal powers up.

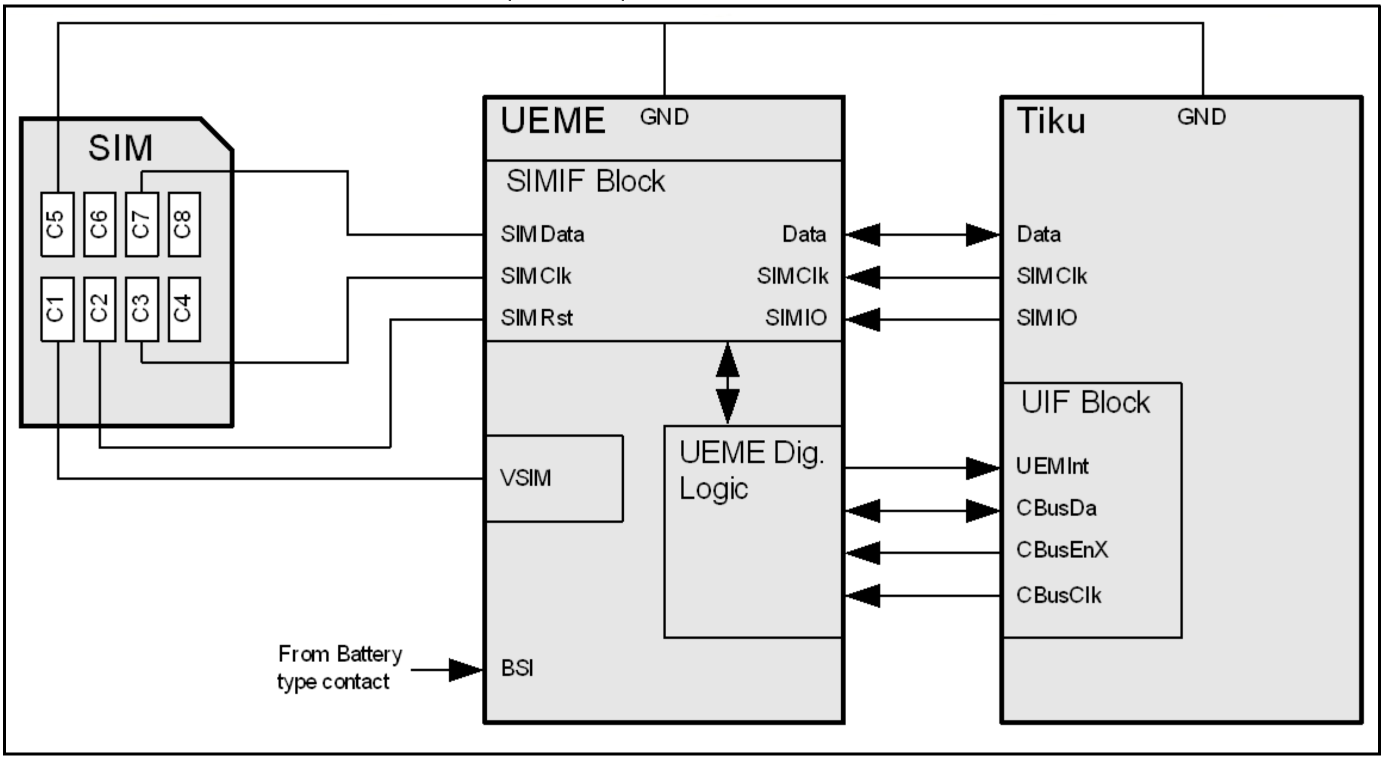


Figure 29: UIM Card Block Diagram

UIM Card Troubleshooting

When troubleshooting UIM cards, make these common checks (see Figure 30 and Figure 31):

- Check Vsim 1.8V or 3.0V. Vsim comes from UEMEK and goes through the SIM ESD protection chip. Check for bad or damaged solder joints. Replace chips if necessary.

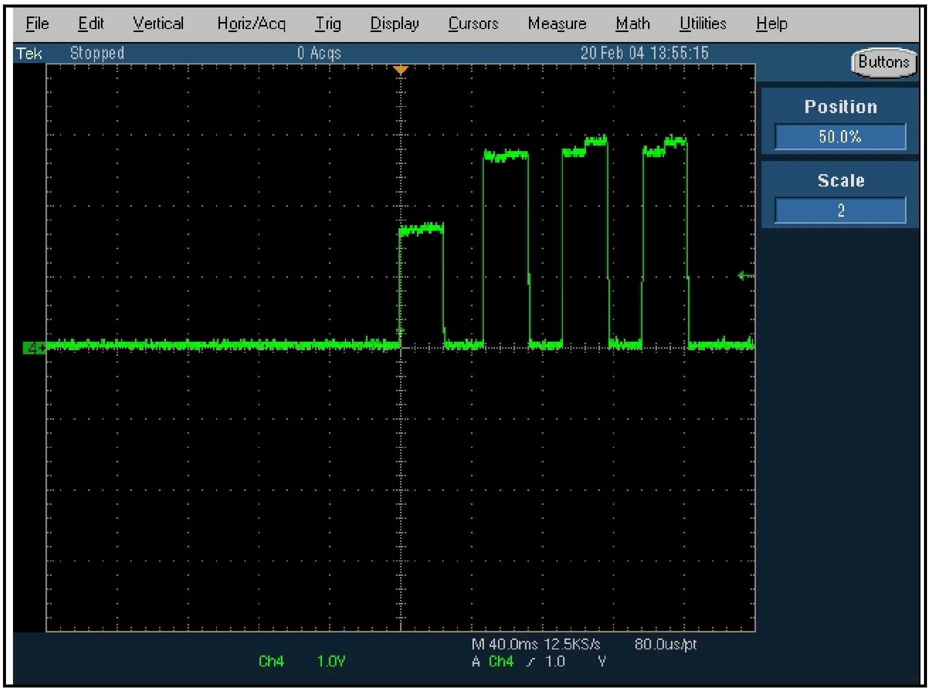


Figure 30: Vsim check

- Check detection sequence

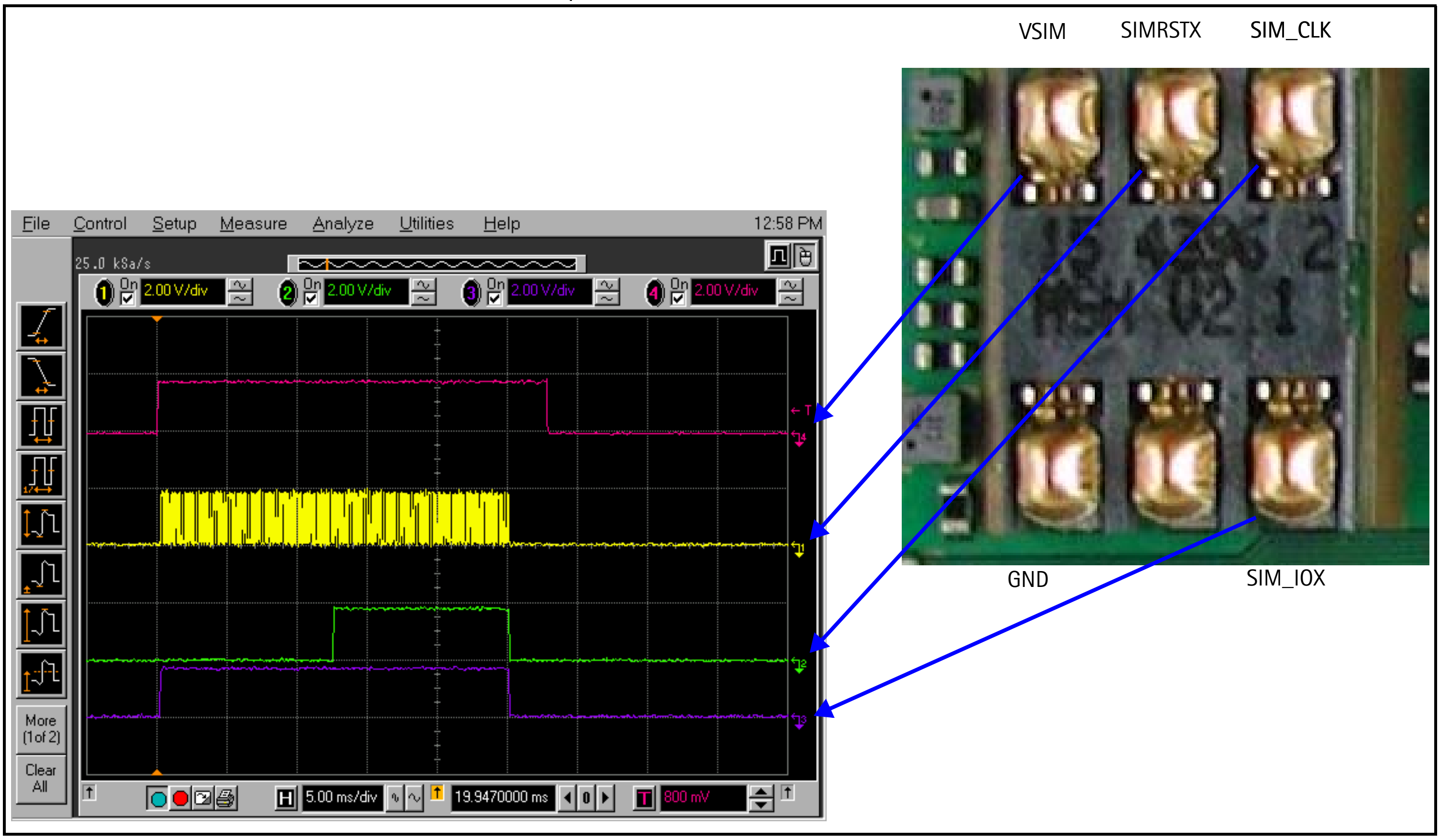


Figure 31: Detection sequence

- Verify communication signals

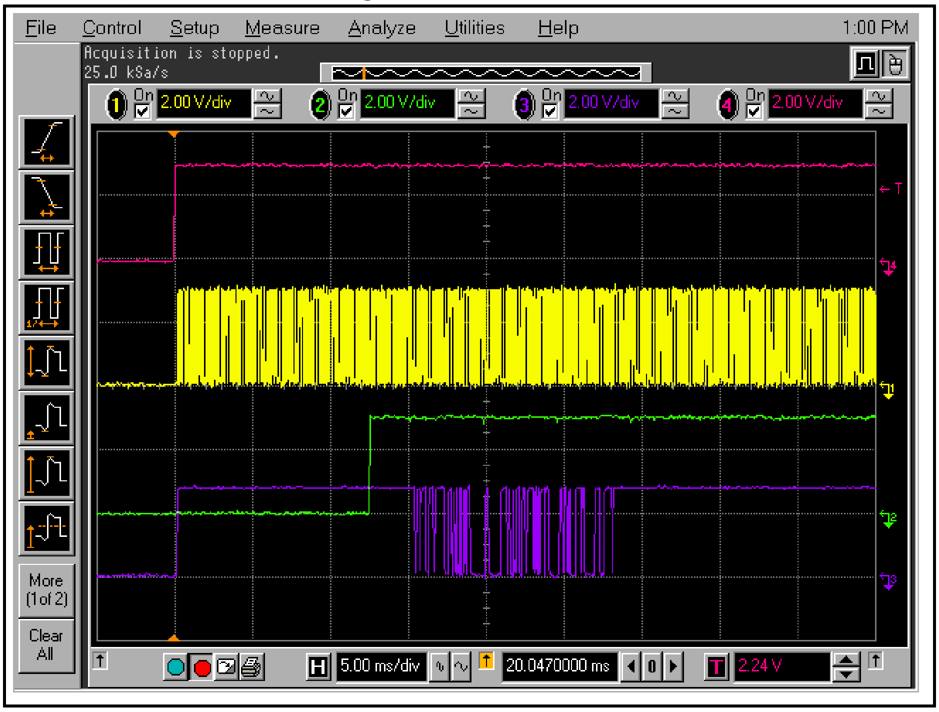


Figure 32: Commuication signals

- If no signals are present: (1) check contacts on Sim connector are correct, (2) check ESD chips are correct, and (3) check the UEMEK is correct. Replace damaged parts if necessary.

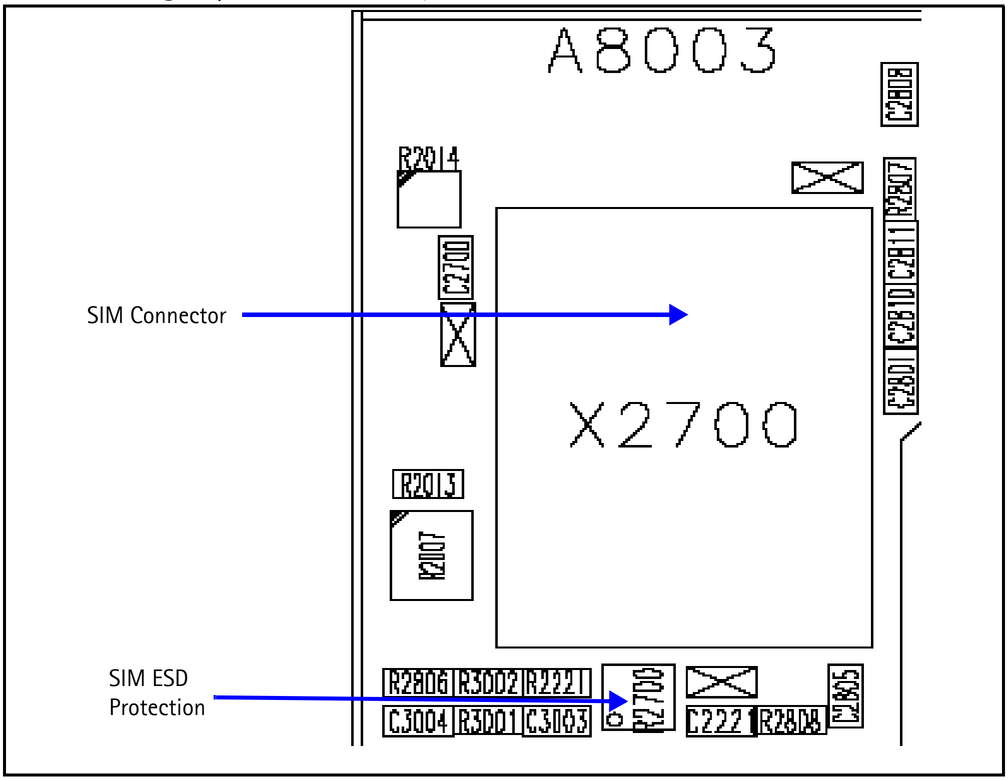


Figure 33: Vsim check

UIM Card Phoenix Interface

Run the SIM-Lock Status in Phoenix to test a SIM (or UIM) card.

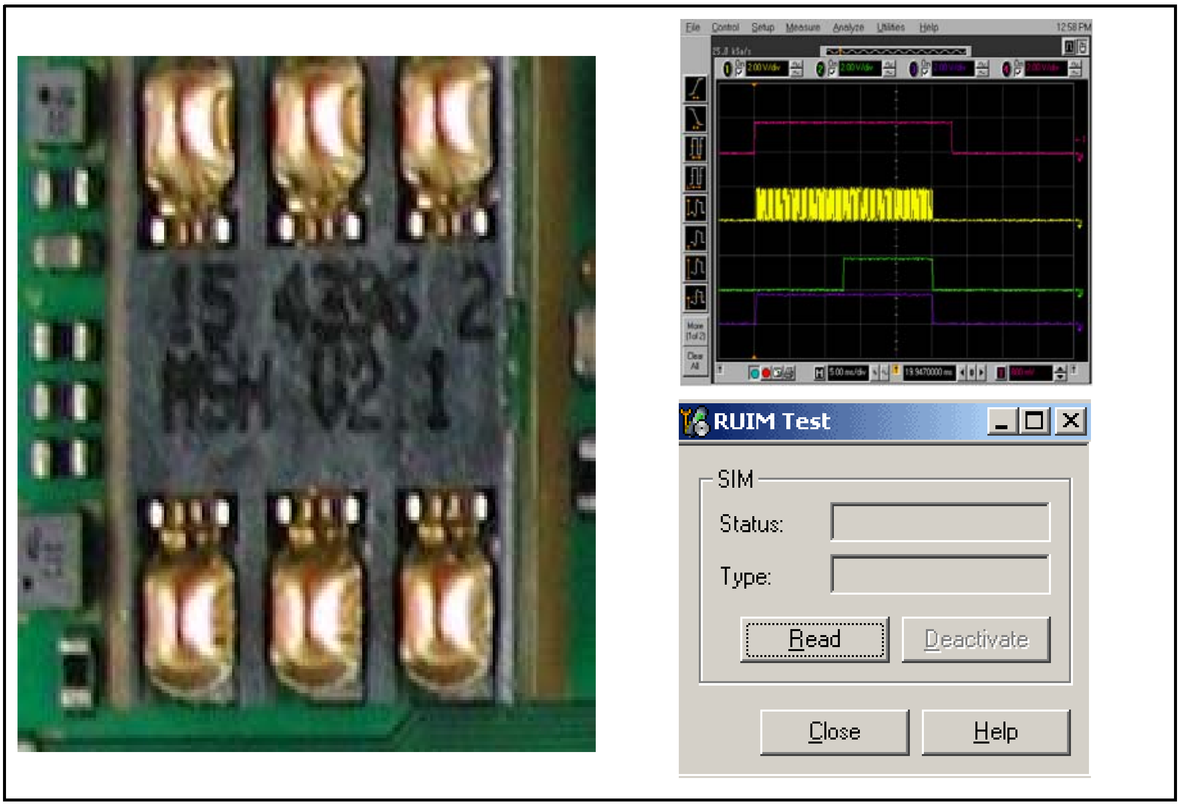


Figure 34: Phoenix SIM Testing options

System Connector

Figure 35 provides a mapping for the system connetor. The 3155/3155i/3152 supports Pop-Port™ and Universal Headset accessories, differential and single-ended, respectively. Detection of the Pop-Port™ accessories is done through the ACI signal where the Universal Headset is detected on TIKU_GenIO (4).

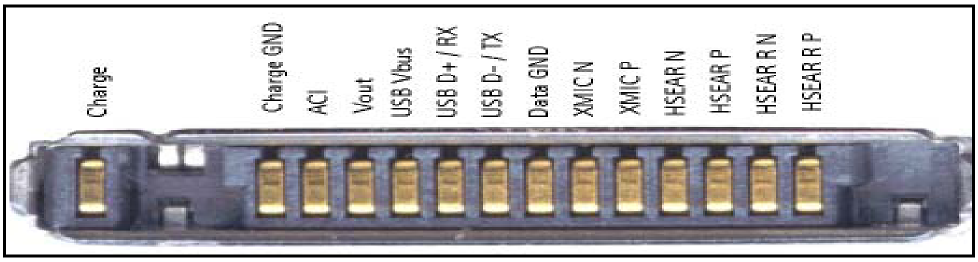


Figure 35: System Connector

The pin out on the Pop-Port™ connector is as follows:

- Charger
- Charger GND
- ACI
- Vout
- USB Vbus
- USB D+ / Fbus Rx
- USB D- / Fbus Tx
- Data GND
- XMic N
- XMic P
- HSear N
- HSear P
- HSear R N
- HSear R P

Accessory Detection

Figure 36 displays how the mobile terminal detects accessories. Dummy accessories pull down to GND ACI Line. Smart accessories pull down ACI line with a 56K Ohm resistor allowing communication between accessory and UEMEK.

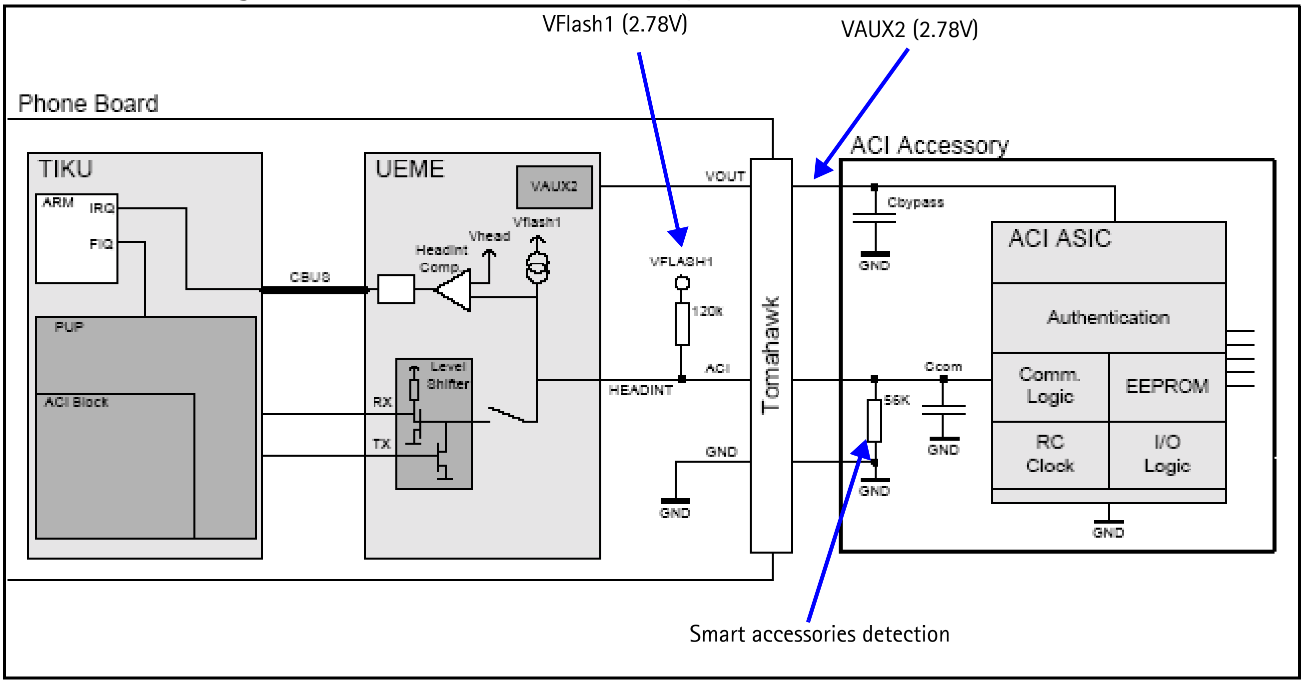


Figure 36: Accessory Detection Diagram

Battery (Lynx) Interface Circuit

Figure 37 illustrates the battery interface circuit. The BSI voltage level for different power-up modes:

- normal mode - 1.23V
- for the test mode - 170MV
- local mode - 90MV

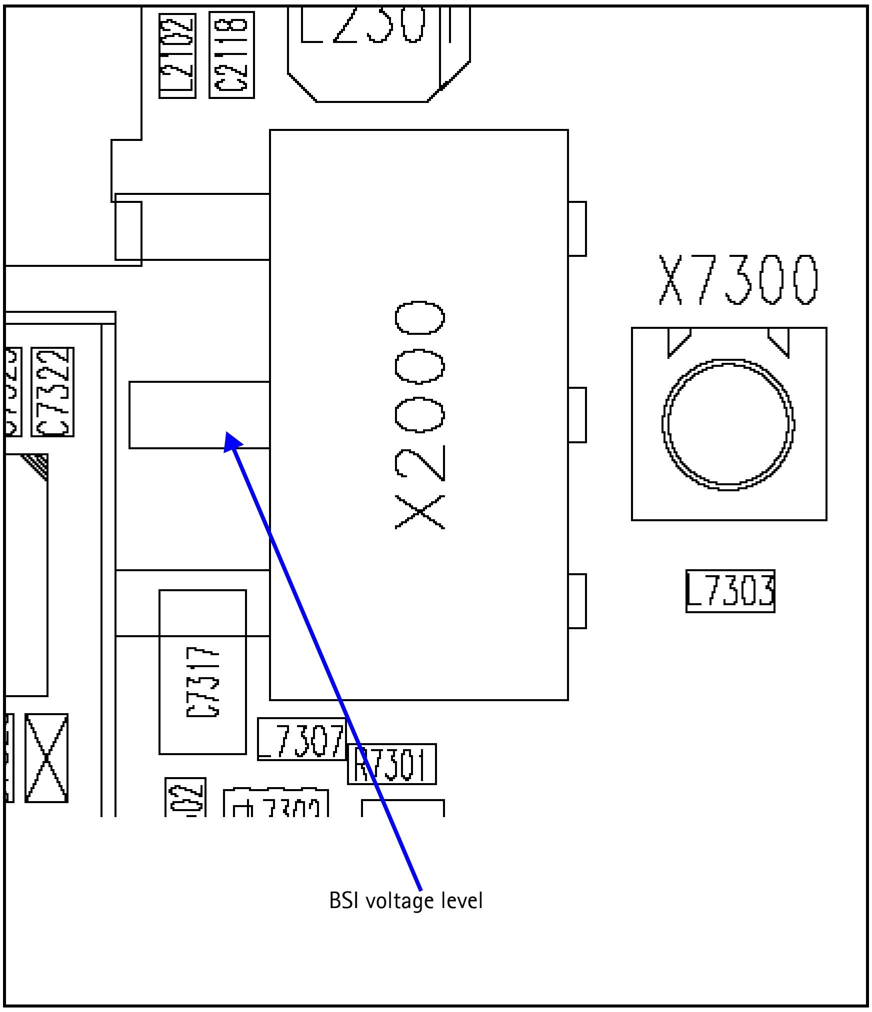


Figure 37: Battery Interface Circuit

Charging

When troubleshooting battery charging, make these common checks (see Figure 38, Figure 39 and Figure 40):

- Does the battery bar scroll?

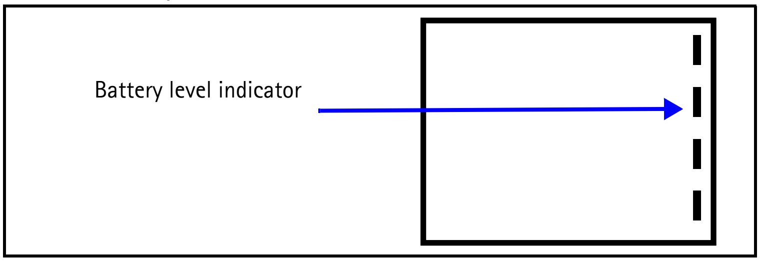


Figure 38: Battery indicator bar

- Measure voltage at V2000. Is it >3VDC?

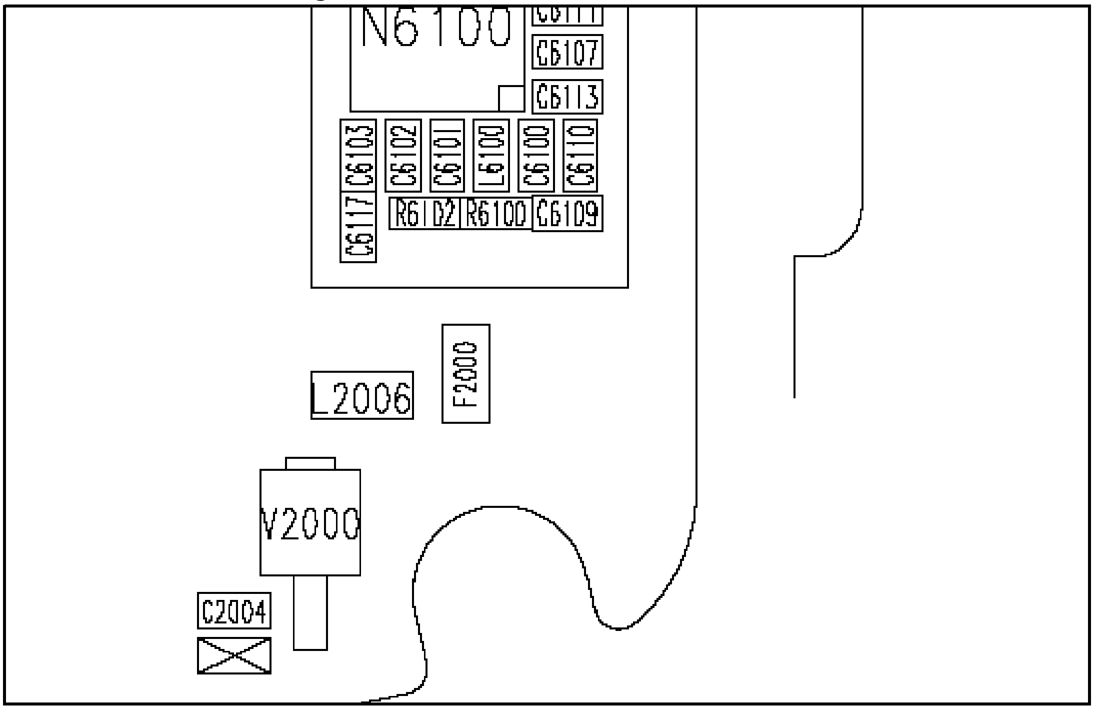


Figure 39: Charging layout

- Measure BTEMP at V2000. Is it ~25*C? If not, replace the UEME.

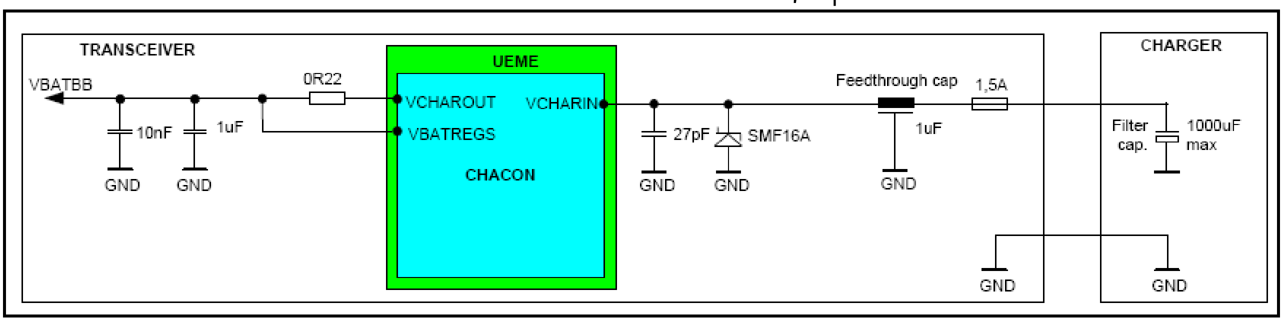


Figure 40: Charging diagram

- Remove the fuse at F2000 and measure the current. Is it ~850mA ? If not, replace the UEME.

Common Problems

The following section has a list of common problems, along with some standard checks.

No Communication During Flash

- Make sure there is a good connection between flash adaptor and the mobile terminal
- The mobile terminal has to be powered by prommer (FPS-8)
- Check the Baseband regulators VR3, VIO, VCORE, VFLASH1
- The mobile terminal will not able to flash without 19.2Mhz clock into UPP
- Check BSI, MBUS, FBUSRx, FBUSTx, PURX, SLEEPX for bad solder joints between UEM and UPP
- Check the Flash bus signal and VPP voltage level

No Communication During Alignment

- Check all connections between test fixture, cables and the mobile terminal
- Make sure the mobile terminal is in Local Mode. If not, check BSI signal level
- Make sure the mobile terminal is programmed/flashed

Failed Self Test/Calibrate

- Make sure the mobile terminal is in local mode
- Make sure power supply provides enough current (usually approximately 500mA and 2A for tuning)
- Use the troubleshooting guide's flow chart to verify the failed circuit
- Check the signals and voltage levels as described in the troubleshooting guide

Mobile Terminal Not Powering Up

Refers to when no power causes the mobile terminal to not able to flash, not to get into local mode and similar problems.

- Check the baseband regulators – VR3, VIO, VFLASH1, VCORE dc/dc, PURX
- Check VCTCXO 19.2MHz signal at UPP input
- Check power-up sequence
- Check the Flash IC, flash bus signals, and voltage level

Shut Down After 32 Seconds

- Check for the absence of 32KHz SleepCLK
- Check for incorrect SleepX and PURX signal levels
- Check if ESN number is corrupted

No Audio

- Check for bad contacts or damaged earpiece
- Check for bad connections at mic
- Check for broken or bad solder joint of passive components
- Verify the audio signal paths using BaseBand "audio test" component with Phoenix as described in the troubleshooting guide

Key Pads Malfunction

- Check for protective film left on back of the key dome if a new one was installed
- Check for corrosion on both the key pads and key dome
- Check if flash software was corrupted
- Check for bad joint from UPP to Interface
- Check for pins shorted on or bad on Z300

No LCD Display

- Check for bad connections
- Check for a cracked or damaged display
- Probe test points as described in the troubleshooting guide for missing for incorrect signal level

Phoenix Tools

Baseband menu items in Phoenix Guide.

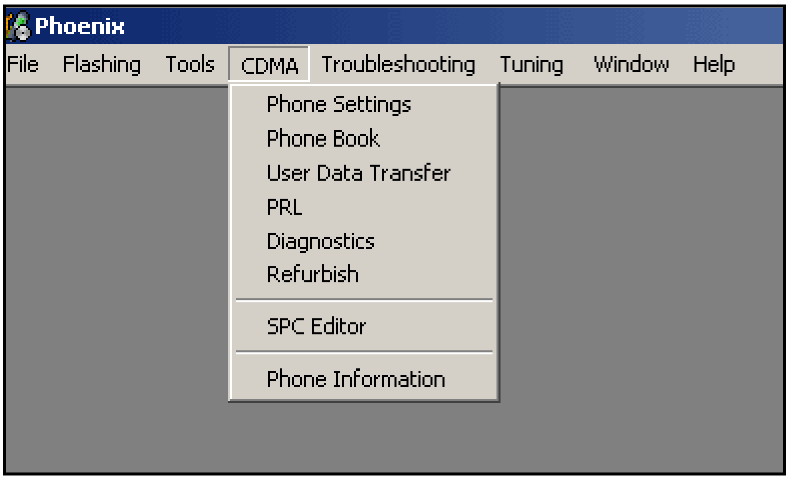


Figure 41: CDMA menu in Phoenix

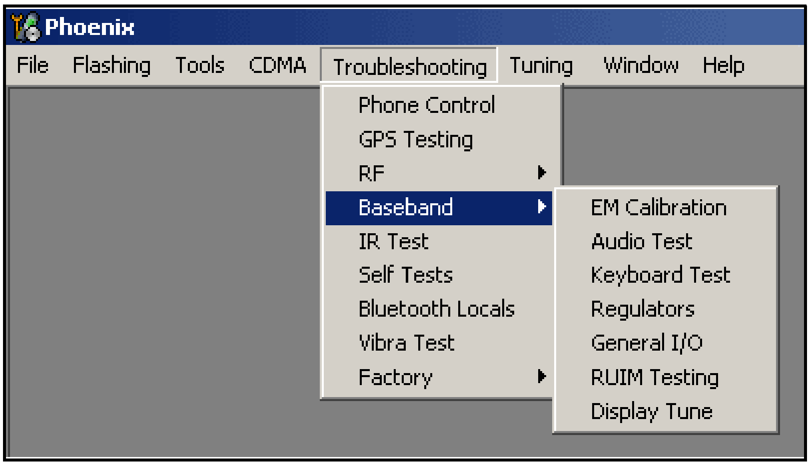


Figure 42: Baseband Troubleshooting menu in Phoenix

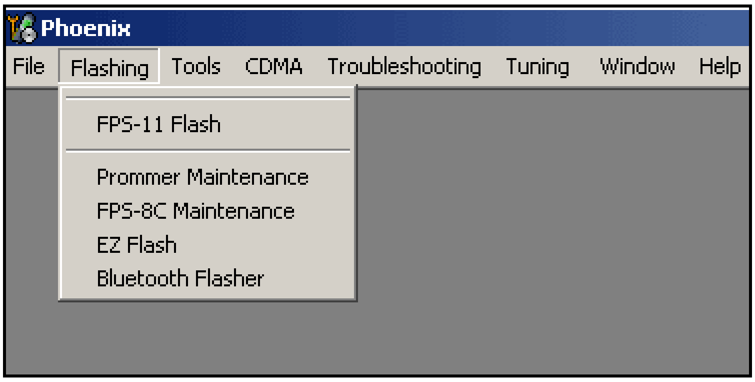


Figure 43: Flashing menu in Phoenix

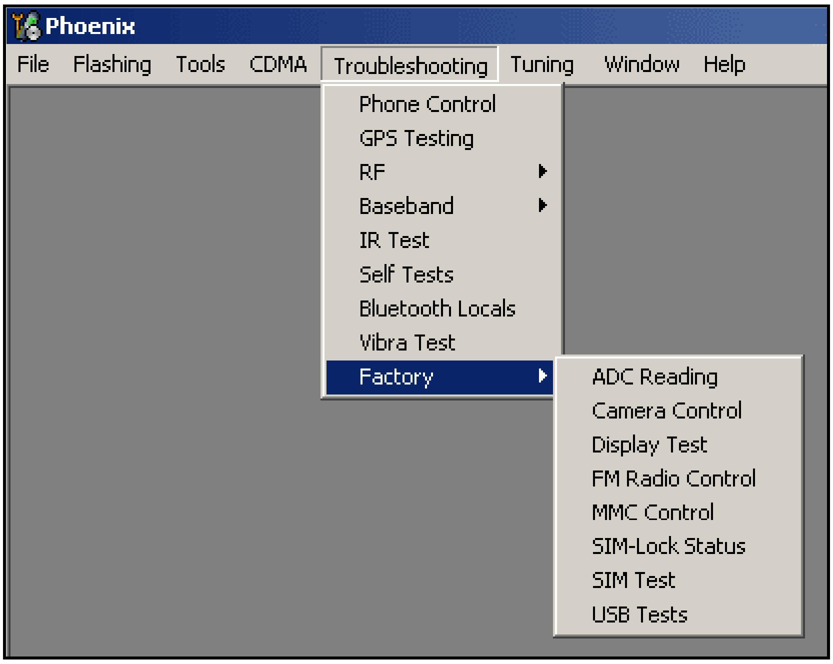


Figure 44: Troubleshooting Factory menu in Phoenix

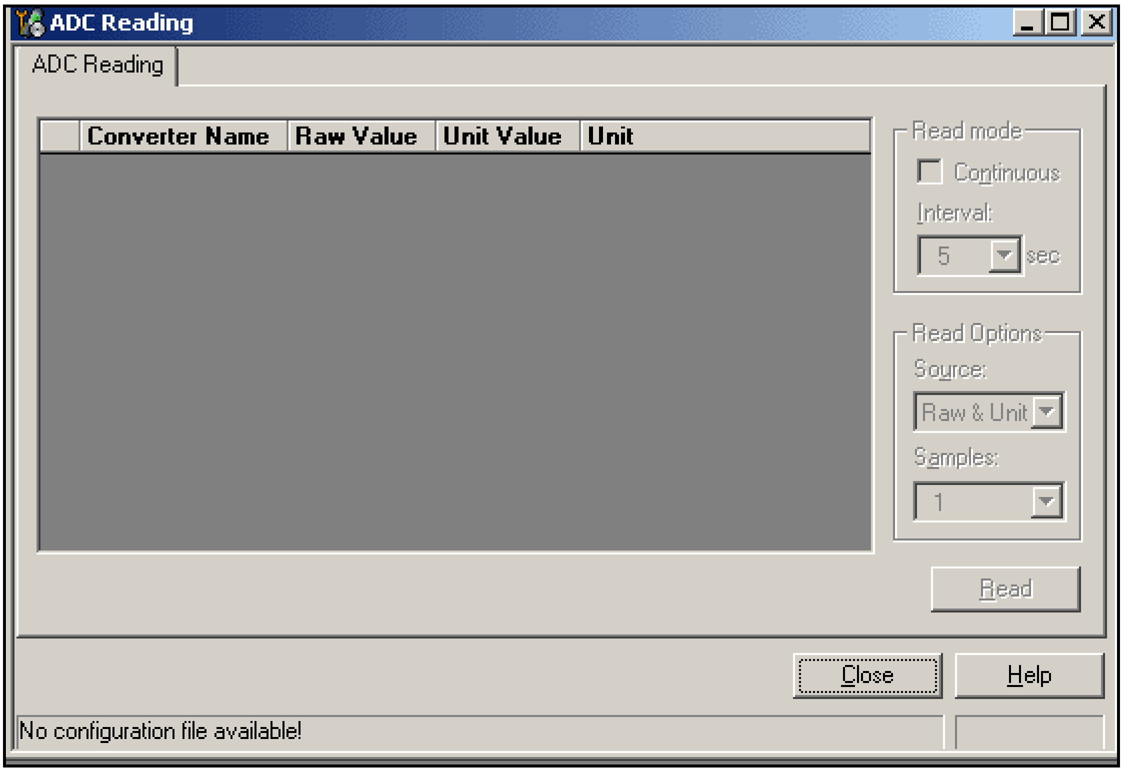


Figure 45: ADC menu in Phoenix

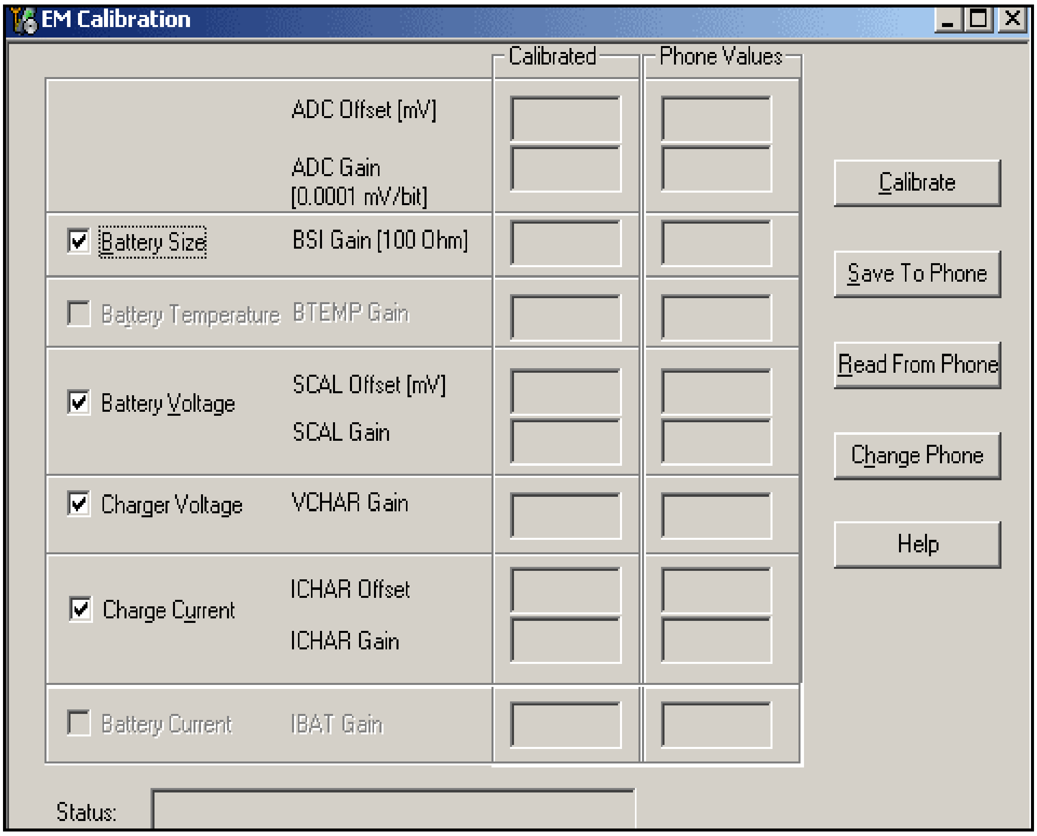


Figure 46: EM Calibration menu in Phoenix

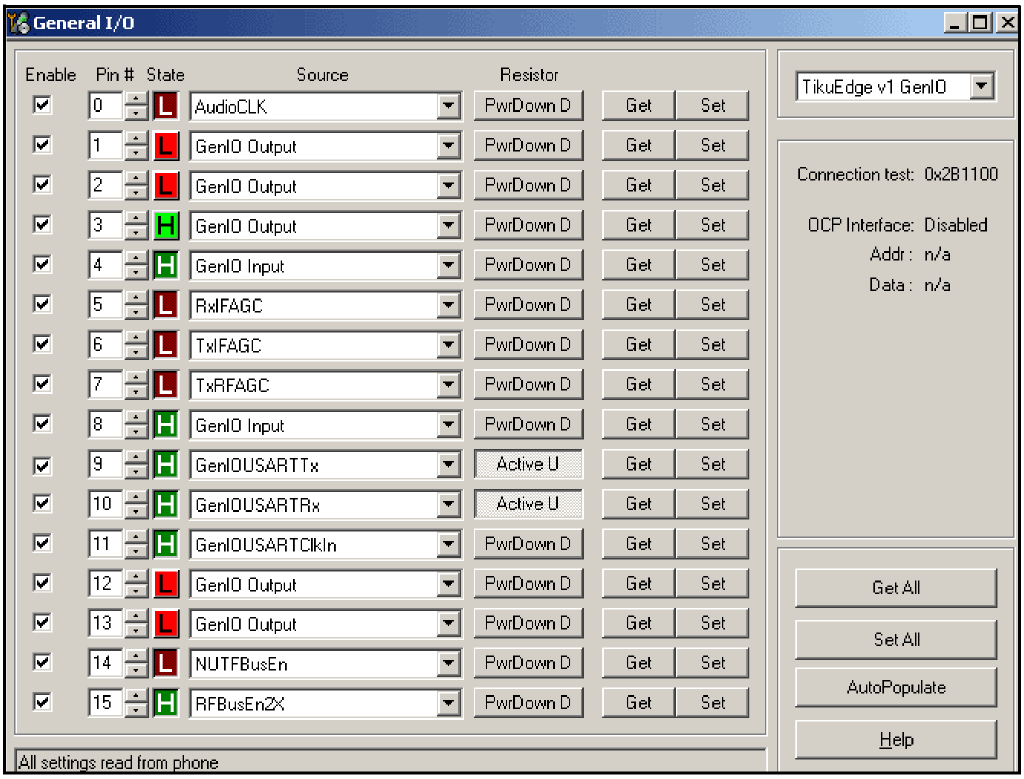


Figure 47: General IO and GPIO menu in Phoenix

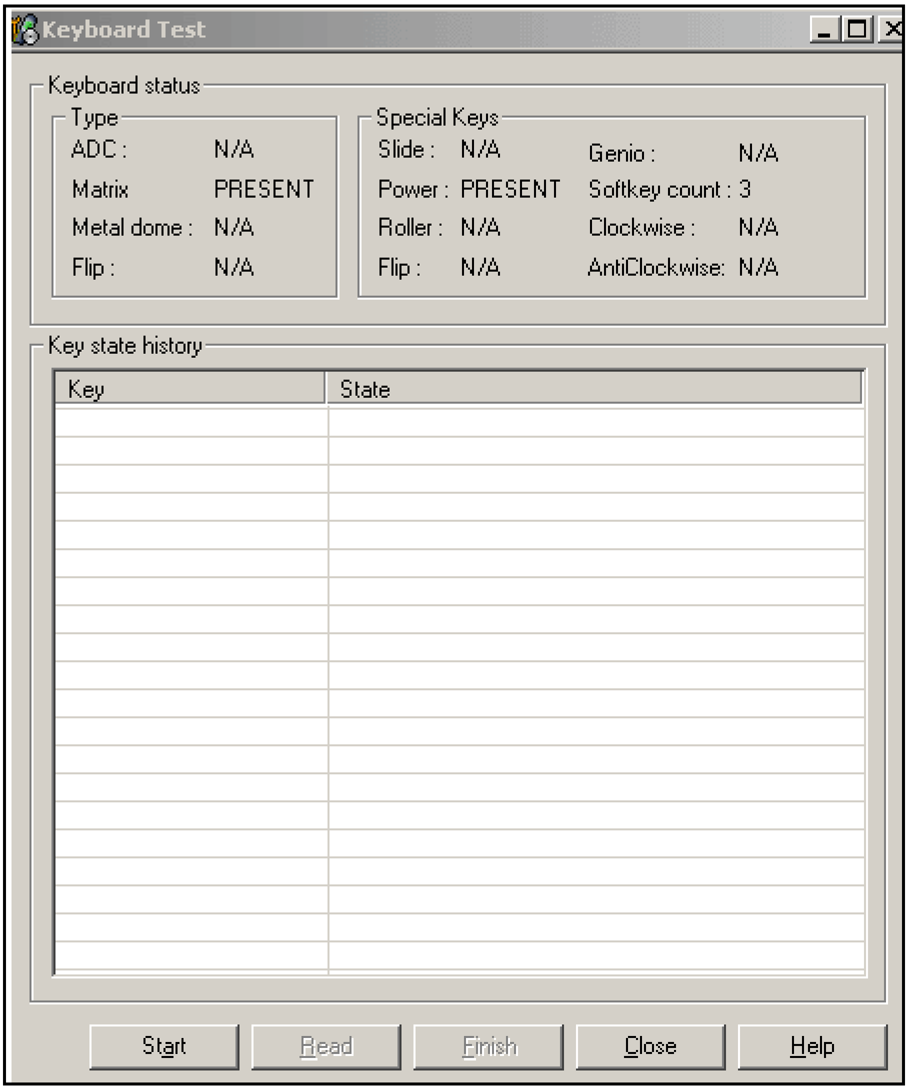


Figure 48: Keyboard Test menu in Phoenix

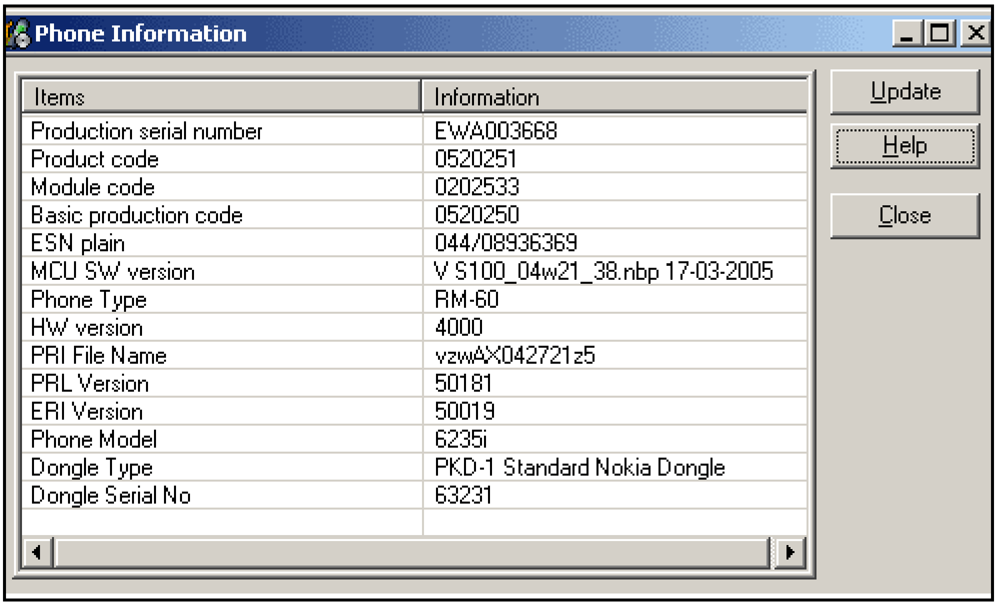


Figure 49: Phone Information menu in Phoenix

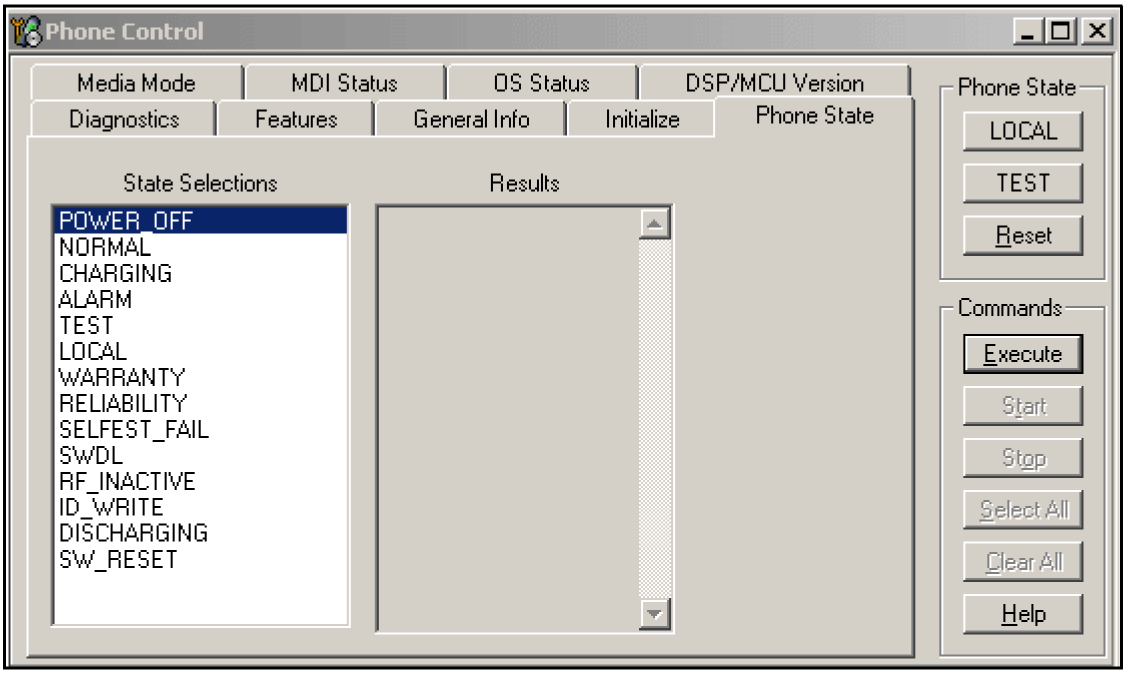


Figure 50: Phone Control menu in Phoenix

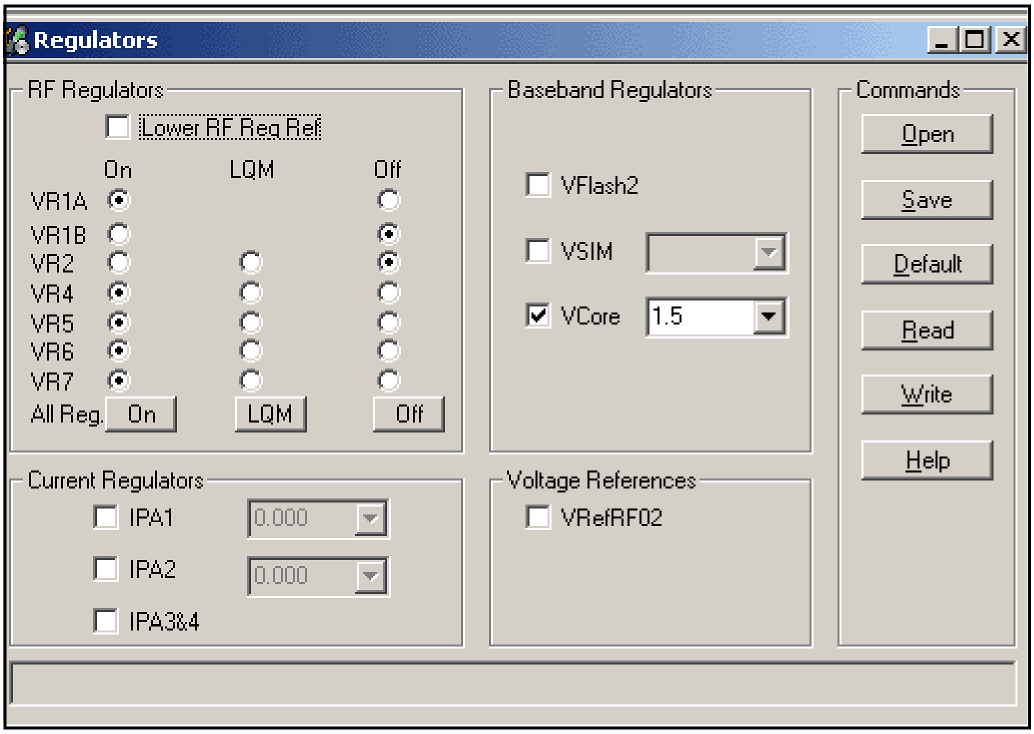


Figure 51: Regulator Control menu in Phoenix

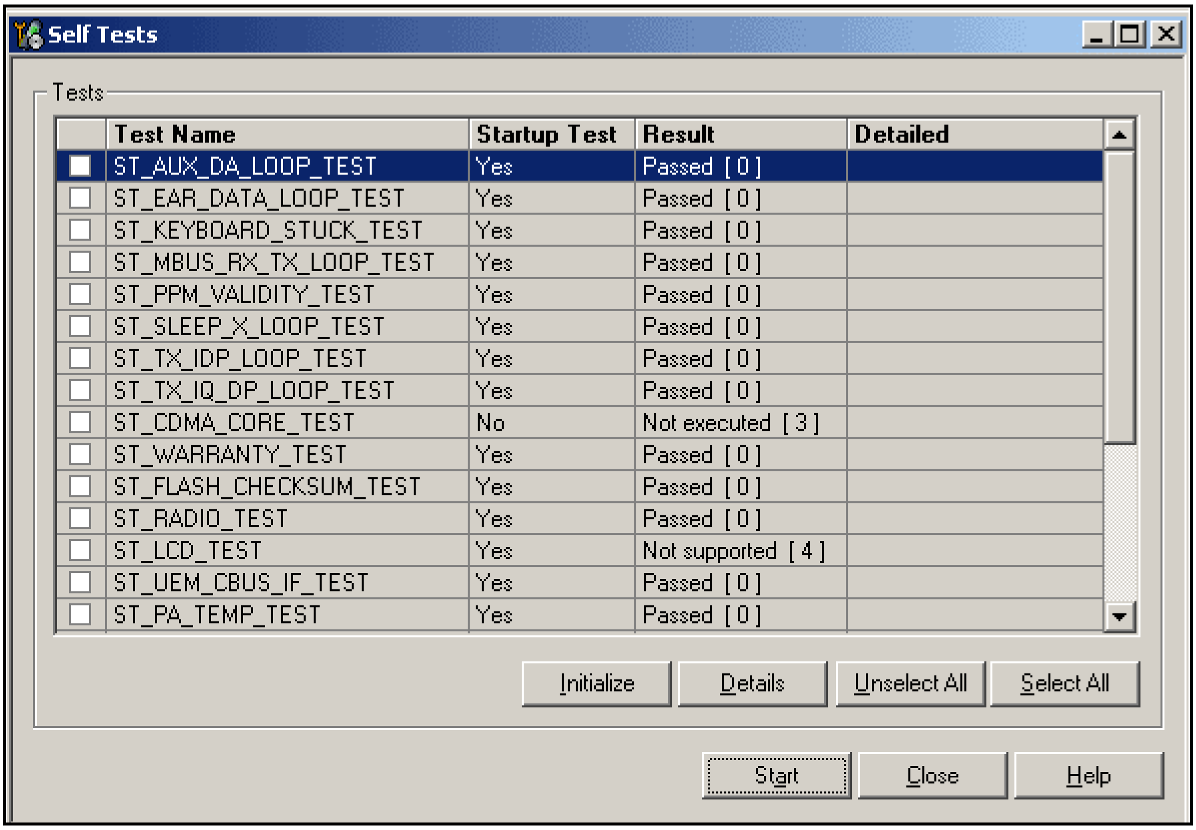
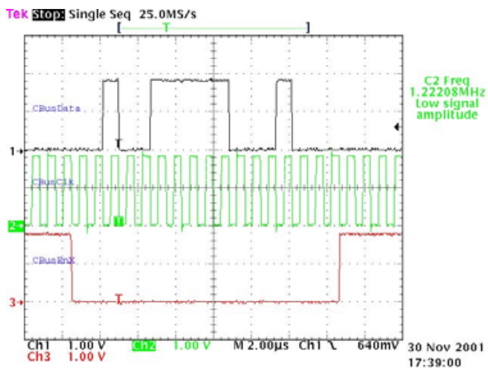


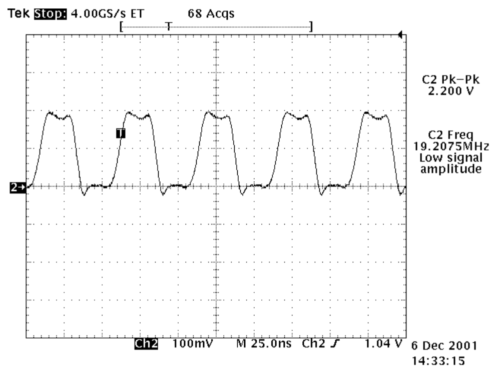
Figure 52: Self-test menu in Phoenix

Reference

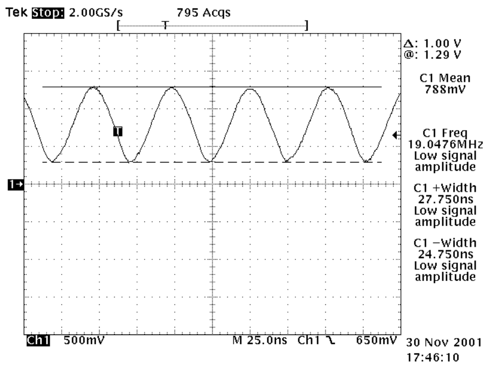
Signal references



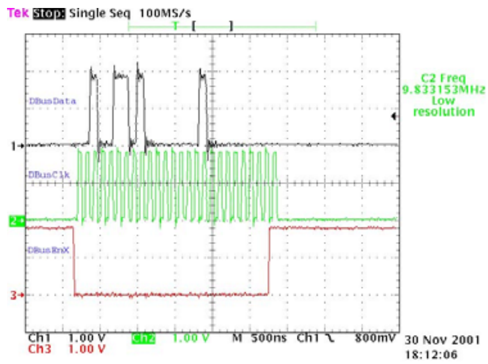
System Clock 19.2 MHz



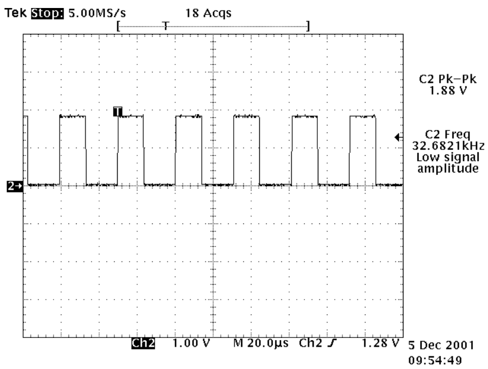
RFconv Clock 19.2 MHz



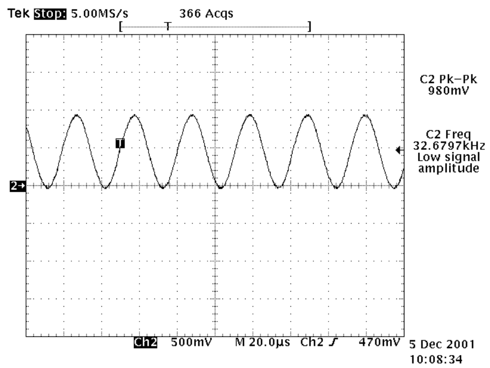
C BOS Interface



D BOS Interface



Digital Sleep Clock 32 KHz



Analog Sleep Clock 32 KHz

Figure 53: Signal References

Main PWB Overview
Test point map – bottom

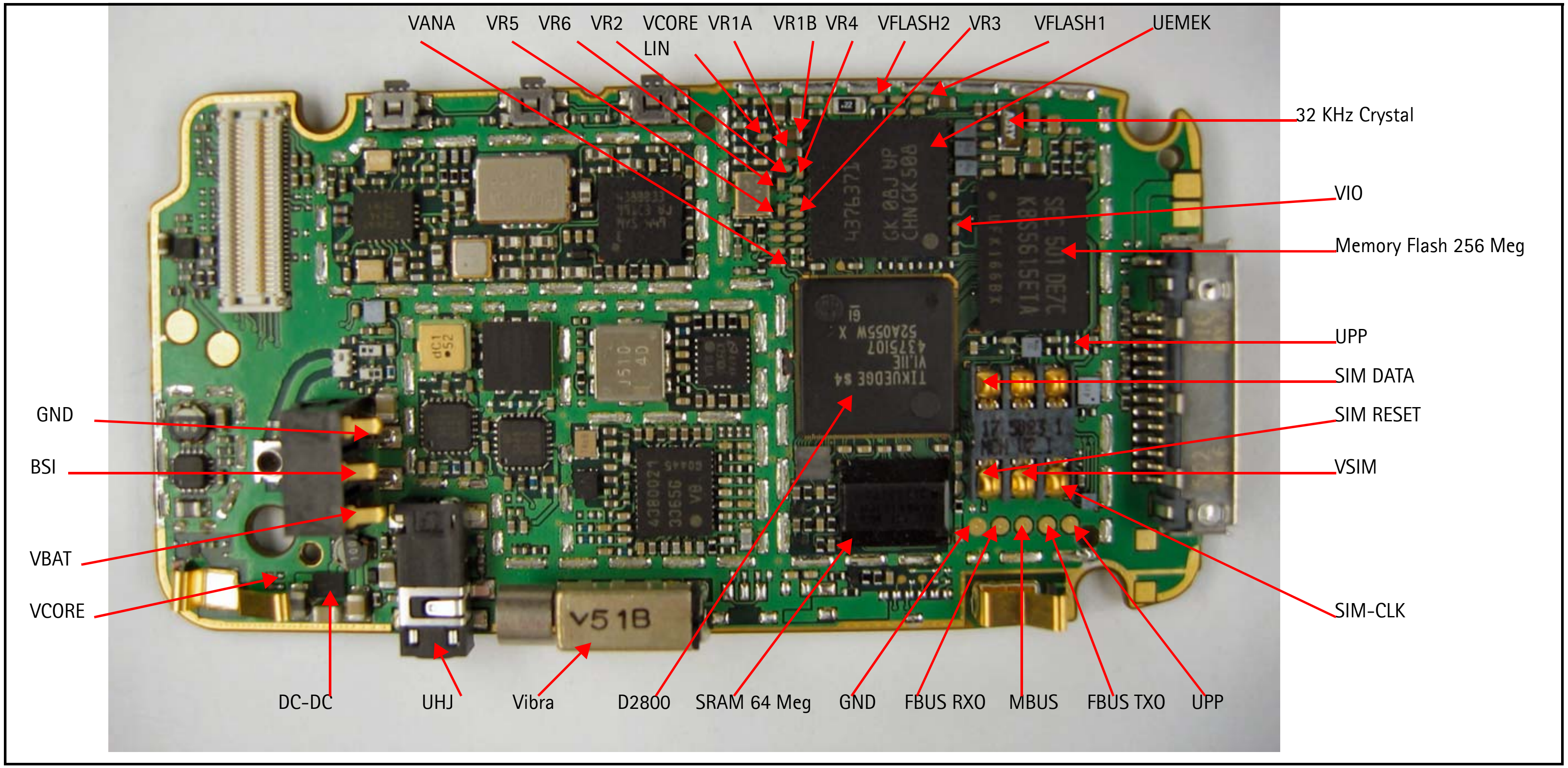


Figure 54: test points – bottom

Test point map – top

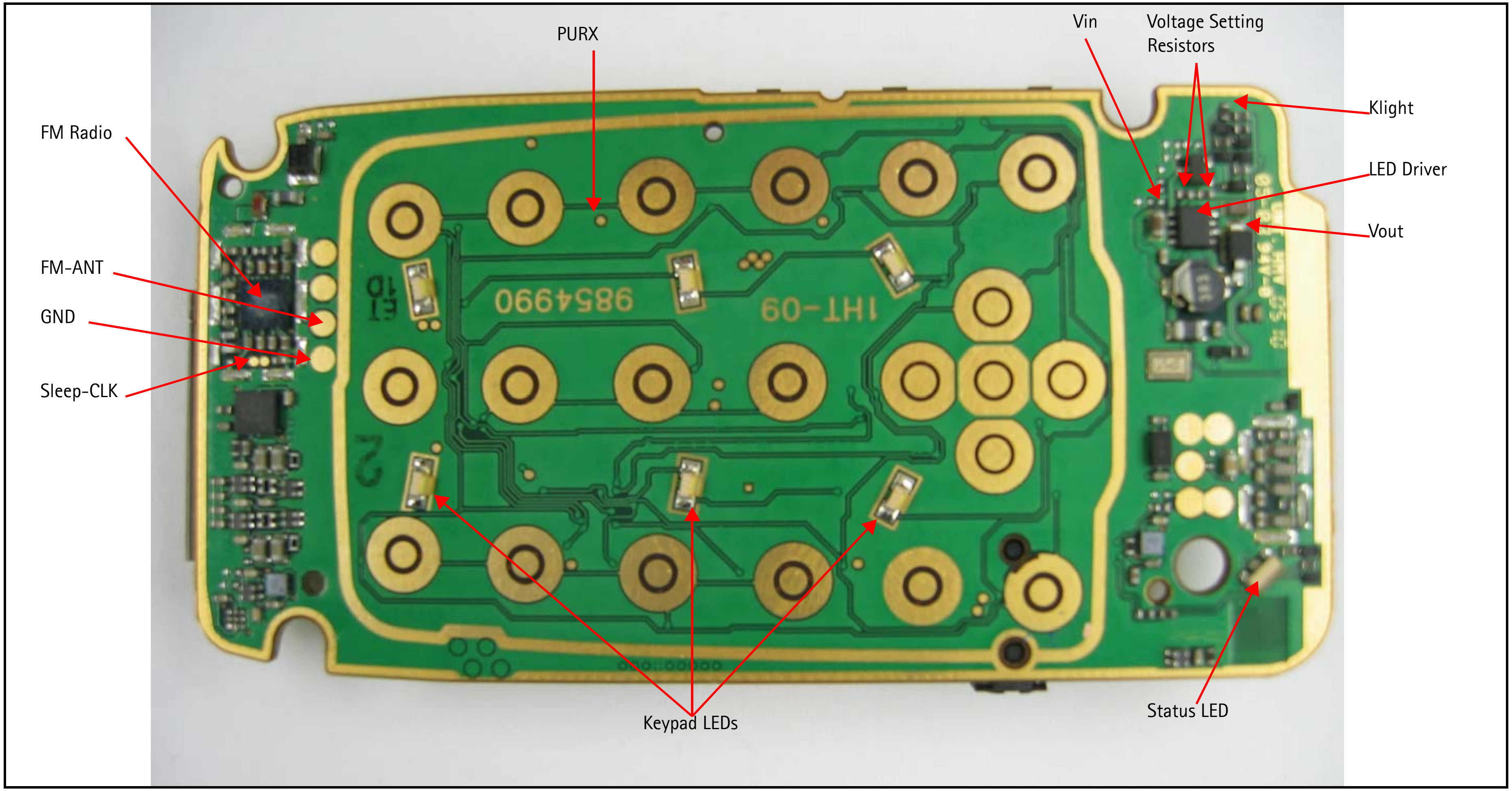


Figure 55: test points – top

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