Nokia Customer Care

Service Manual

RM-721; RM-722 (Nokia C2-01)
Mobile Terminal
Part No: (Issue 1)

COMPANY CONFIDENTIAL

NOKIA
Care

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	01/2011	Jeff Zhao	

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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.

- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.

- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.

- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.

- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.

- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.

- Use only approved components as specified in the parts list.

- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.

- Ensure all cables and wires are repositioned correctly.

- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.

- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

Use only approved accessories and batteries. Do not connect incompatible products.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.

- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.

- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.

- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.

- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.

- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.

- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.

- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.

- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Battery information

> **Note:** A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Li-Ion batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77° F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Company policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

Please state:

- Title of the Document + Issue Number/Date of publication
- Latest Amendment Number (if applicable)
- Page(s) and/or Figure(s) in error

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Nokia C2-01 Service Manual Structure

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1 — General information

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◼ Product selection

RM-721/RM-722 is a WCDMA/GSM handportable phone with a slide form factor. RM-722 supports EGSM 850/900/1800/1900 and WCDMA 850/1900/2100. RM-721 supports EGSM 850/900/1800/1900 and WCDMA 900/1900/2100 bands. The device supports GPRS/EGPRS and WCDMA data bearers.

For WCDMA the maximum bit rate is up to 384 kbps for downlink and 384 kbps for uplink with simultaneous CS speech or CS video (max. 64 kbps).

For GPRS/EGPRS networks the device is a Class B EGPRS MSC 32 (5 Rx + 3 Tx, max sum 6), which means a maximum downlink speed of 296 kbps and uplink speed of 177.6 kbps. The device also supports Dual Transfer Mode (DTM) for simultaneous voice and packet data connection in GSM/EDGE networks; simple class A, multi slot class 11, (4 Rx + 3 Tx, max sum 5), downlink speed of 177.6 kbps and uplink speed of 118.4 kbps.

The device is an MMS (Multimedia Messaging Service) enabled multimedia device. The MMS implementation follows the OMA MMS standard release 1.3. The device also supports Bluetooth 2.1 standard with the stereo audio profiles.

The device has a large 2.4'' QVGA (320 x 240 pixels) TFT display with 262K colours. It also has a 3.2 Megapixel EDOF camera with 4 x digital smooth zoom and 3GP video player/recorder.

The device supports the S40 Compact UI and S40 OSS web browser, which brings desktop-like Web browsing experience to mobile devices.

The device also supports MIDP Java 2.1, providing a good platform for compelling 3rd party applications.

Figure 1 RM-721/RM-722 product picture

◼ Product features and sales package

Hardware characteristics

- Bar form factor with NCVM coating (mertal coating)

- 2 ramp up color variants (Warm Silver and Black)
- ITU-T key mat, (5-way) NaviTM key, hard cap keys for call and end keys
- no separate ON/OFF key end key is used
- 2 WCDMA variants:

    850/1900/2100 Ritsa 6.0 (+ Quadband GSM)

    900/1900/2100 Ritsa 6.8 (+ Quadband GSM)
- 3 GPP Rel. 5 (Rel. 6 partly supported)
- Display: 2,0" QVGA 320x240 TFT 262K color display
- 3.2 MPix EDOF camera, 4x digital smooth zooming
- User data memory min. 46Mb plus 15Mb for phonebook
- MicroSD memory card slot (support up to 16GB)
- Combo 128 MB Flash, 64 MB SDRAM
- Speech codec support for HR, FR, EFR, NB-AMR
- SIM support: 3volt, 1.8volt
- BTHFMRDS3.0D
- Vibra: SMD Vibra, type shaft
- Speaker: Malt slim Eva
- Clapton microphone
- Bluetooth v. 2.1 with stereo audio profiles, SIM access profile, audio remote control profile. Easy pairing with other BT device
- RDS Stereo FM Radio (frequency 87.5 - 108.0MHz)
- Type B uUSB connector (without OTG support)
- 2mm charging connector (DC)
- 3.5mm AV connector
- FOTA
- No HAC
- No POC

UI features

- Series 40 SPR 9.1 user interface with Active Idle, Douglas 8 UIS, Contemporary

Applications/Service enablers

- SMS with conversational messaging
- Audio messaging
- NMS 2.0 Nokia e-mail client
- NMS 2.0 Nokia IM client
- Facebook client
- MySpace client
- WAP 2.0
- Java MIDP 2.1
- Applications: Calculator 2, Converter 2, Size converter, Mobile Search Client (Nokia Search v. 2.0) tbd., MyNokia

- Nokia Life Tools 1.6 and V1.7 in later release
- Flickr Image Upload (pre loaded link)
- Music player (Media player)
- Nokia Maps enabling (v. 2.0)supported
- Games (e.g. Bounce II, Brain Champion, SudokuII, Block'd, Tower City Bloxx, Diamond rush)
- Services and games please refer to content sheet

Other key features

- Opera Mini Browser (as default browser)
- Ring tones: MP3, AAC, AAC+, eAAC+, WMA and 64 polyphonic ringing tones
- Media player audio formats: MP3, MP4, AAC, AAC+, eAAC+, WMA, WAV, NB AMR, WB AMR, MIDI
- Media player video formats: H.263, MPEG4, H.264, Real-time straming, 3GPP streaming
- Video recording in QCIF w/ 15fps (QVGA tbd.) and playing up to VGA
- WM DRM ≥ 10, OMA DRM 2.0
- Imaging 09 PhotoViewer and PhotoEditor, animated gallery w/ automatic image orientation
- Downloadable themes, games and screensavers
- Power Organizer with local calendar
- English-Chinese dictionary (China, APAC)
- 2000 phone book entry

Language Support

- Menu Text and Input: Language packs for APAC, China, Europe, Americas and MEA market areas
- Predictive Text Input: For APAC, China, Europe, Americas and MEA

Accessories

(Inbox)
- Battery: BL-5C (1020mAh)
- Chargers: Inbox AC-3 (China: AC-8C w. CA-101)
- Memory cards: no card inbox
- Wired headset: WH-102
- User Guide

(Outbox, plus enhancement list)
- Micro SD card MU-37, 2GB
- USB Data and charging cable, CA-101D
- BT Headset mono, BH-104

■ Product and module list

Module name	Type code	Notes
RM-721	1MJL	
RM-722	1MJK	

■ Mobile enhancements

Table 1 Audio

Enhancement	Type
TTY adapter	HDA-11
Wired headsets	WH-102
	WH-201
	WH-205
	WH-500
	WH-600
	WH-601
	WH-700
	WH-701
Wireless headsets	BH-103
	BH-104
	BH-105
	BH-106
	BH-212
	BH-213
	BH-214
	BH-215
	BH-216
	BH-504
	BH-606
	BH-701
	BH-703
	BH-804
	BH-904
Wireless loopset	LPS-5

Table 2 Car

Enhancement	Type
Auto Navigation	Nokia 500 Auto Navigation
Car kit	CK-7Wi
	CK-100
	CK-300

Enhancement	Type
Holder easy mount	HH-12
	HH-17
Universal holder	CR-39
	CR-82
Wireless plug-in car handsfree	HF-200
	HF-310
	HF-510

Table 3 Data

Enhancement	Type
MicroSD card, 1 GB	MU-22
MicroSD card, 2 GB	MU-37
MicroSD card, 4 GB	MU-41
MicroSD card, 8 GB	MU-43
MicroSD card, 16 GB	MU-44
MicroUSB connectivity adapter cable	CA-101
	CA-101D
	CA-126

Table 4 Music

Enhancement	Type
Mini speakers	MD-8
Wireless music speakers	MD-7W

Table 5 Navigation

Enhancement	Type
Wireless GPS Module	LD-3W
	LD-4W

Table 6 Power

Enhancement	Type
Battery 1020 mAh Li-Ion	BL-5C
Back-up power	DC-11
First aid charger	DC-8

Enhancement	Type
Mobile charger	DC-4
	DC-6
Retractable mobile charger	DC-9
	DC-10
Travel charger	AC-4
	AC-5
	AC-6
	AC-8
	AC-10
USB Charger Adapter Cable	CA-100
	CA-100C
Charger adapter (3.5mm to 2mm)	CA-44

■ Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
Transceiver with BL-5C 1020 mAh Li-Ion battery pack	109.8 x 46.9 x 15.3	89 (without battery)	78.8

Battery endurance

Battery	NMP talk time	NMP standby time	Music play time (headset)
BL-5C 1020 mAh Li-ion battery pack	Up to 8 hours 45 minutes (GSM) Up to 4 hours 30 minutes (WCDMA)	Up to 430 hours (GSM) Up to 450 hours (WCDMA)	Up to 34 hours

Note: Variation in operating times may occur depending on SIM card, network and usage settings, usage style and environments.

Main RF characteristics for GSM 850/900/1800/1900, WCDMA 900/1900/2100 and WCDMA 850/1900/2100 phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA V (850), WCDMA VIII (900), WCDMA II (1900) and WCDMA I (2100)

Parameter	Unit
Rx frequency band	GSM850: 869 - 894 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA VIII (900): 925- 960 MHz
	WCDMA V (850): 869 - 894 MHz
	WCDMA II (1900): 1930-1990MHz
	WCDMA I (2100): 2110 - 2170 MHz
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA VIII (900): 880 - 915 MHz
	WCDMA V (850): 824 - 849 MHz
	WCDMA II (1900): 1850-1910MHz
	WCDMA I (2100): 1920 - 1980 MHz
Output power	GSM850: +5...32.5dBm/3.2mW...1.8W
	GSM900: +5...32.5dBm/3.2mW...1.8W
	GSM1800: +0...29.5dBm/1mW...0.9W
	GSM1900: +0...29.5dBm/1mW...0.9W
	WCDMA VIII (900) [RM-721 only]: -50...+23dBm/ 0.01µW...200mW
	WCDMA V (850) [RM-722 only]: -50...+23dBm/ 0.01µW...200mW
	WCDMA II (1900): -50...+23dBm/0.01µW...200mW
	WCDMA I (2100): -50...+23dBm/0.01µW...200mW
EDGE output power	EDGE850: +5...26.5dBm/3.2mW...447mW
	EDGE900: +5...26.5dBm/3.2mW...447mW
	EDGE1800: +0...25.5dBm/1.0mW...355mW
	EDGE1900: +0...25.5dBm/1.0mW...355mW

Parameter	Unit
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
	WCDMA VIII (900): 152
	WCDMA V (850): 108
	WCDMA II (1900): 289
	WCDMA I (2100): 277
Channel spacing	200 kHz (WCDMA V and II 100/200 kHz)
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA VIII (900): 75
	WCDMA V (850): 75
	WCDMA II (1900): 75
	WCDMA I (2100): 75

Environmental conditions

Temperature conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-10ºC...+55ºC	Specifications fulfilled
Reduced performance	-30ºC...-10ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-30ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

Humidity

Relative humidity range is 5...95%.

The HW module is not protected against water. Condensed or splashed water might cause malfunction. Any submerge of the phone will cause permanent damage. Long-term high humidity, with condensation, will cause permanent damage because of corrosion.

Vibration

The module should withstand the following vibrations:

- 5 - 10 Hz; +10dB / octave
- 10 - 50 Hz; 5.58 m^2 / s^3 (0.0558 g^2/ Hz)
- 50 - 300 Hz; - 10 dB / octave

ESD strength

Conducted discharge is 8 kV (>10 discharges) and air contact 15 kV (>10 discharges).

The standard for electrostatic discharge is IEC 61000-4-2, and this device fulfils level 4 requirements.

RoHS

This device uses RoHS compliant components and lead-free soldering process.

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Nokia Customer Care

2 — Service Devices and Service Concepts

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■ **Service devices**

Product specific devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-721; RM-722. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	FS-160	Flash adapter	
	• FS-160 is equipped with a clip interlock system • provides standardised interface towards Control Unit • multiplexing between USB and FBUS media, controlled by VUSB		
	MJ-312	Module jig	
	MJ-312 is meant for component level troubleshooting. The jig includes an RF interface for GSM and WCDMA. In addition, it has the following features: • Provides mechanical interface with the engine module • Provides galvanic connection to all needed test pads in module • Multiplexing between USB and FBUS media, controlled by Vusb • MMC interface • Duplicated SIM connector • Connector for control unit • Access for AV- and USB connectors		

General devices
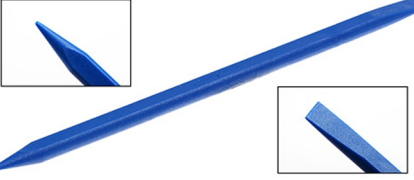
The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-721; RM-722. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	AC-35	Power supply	
	Universal power supply for FPS-21; included in the FPS-21 sales package. Input 100V...230V 50Hz...60Hz, output voltage of 12 V and output current up to 3 A.		

CU-4	CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

1 Connect a service tool (jig, flash adapter) to CU-4.
2 Connect CU-4 to your PC with a USB cable.
3 Connect supply voltage (12 V)
4 Connect an FBUS cable (if necessary).
5 Start Phoenix service software.

Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

	FLS-5	Flash device	
	FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use. **Note:** FLS-5 can be used as an alternative to PK-1.		

FPS-21	FPS-21	Flash prommer	

FPS-21 sales package:

*   FPS-21 prommer
*   AC-35 power supply
*   CA-31D USB cable

FPS-21 interfaces:

Front

*   Service cable connector

    Provides Flashbus, USB and VBAT connections to a mobile device.

*   SmartCard socket

    A SmartCard is needed to allow DCT-4 generation mobile device programming.

Rear

*   DC power input

    For connecting the external power supply (AC-35).

*   Two USB A type ports (USB1/USB3)

    Can be used, for example, for connecting external storage memory devices or mobile devices

*   One USB B type device connector (USB2)

    For connecting a PC.

*   Phone connector

    Service cable connection for connecting Flashbus/FLA.

*   Ethernet RJ45 type socket (LAN)

    For connecting the FPS-21 to LAN.

Inside

*   Four SD card memory slots

    For internal storage memory.

    Note: In order to access the SD memory card slots inside FPS-21, the prommer needs to be opened by removing the front panel, rear panel and heatsink from the prommer body.

	PK-1	Software protection key	
	PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle. PK-1 is meant for use with a PC that does not have a series interface. To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.		
RJ-230	RJ-230	Soldering jig	
	RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.		
	SB-6	Bluetooth test and interface box (sales package)	
	The SB-6 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing . Sales package includes: • SB-6 test box • Installation and warranty information		
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers. **Note:** The SRT-6 is included in the Nokia Standard Toolkit.		
SS-46	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-21.		

	SS-62	Generic flash adapter base for BB5	
	• generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • multiplexing between USB and FBUS media, controlled by VUSB		
	SS-88	Camera removal tool	
	The camera removal tool SS-88 is used to remove/attach the camera module from/to the socket.		
	SS-93	Opening tool	
	SS-93 is used for opening JAE connectors. **Note:** The SS-93 is included in Nokia Standard Toolkit.		
	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-21 when DCT-4 phones are flashed.		

Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-721; RM-722. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	CA-101	Micro USB cable	
	The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.		

| CA-158RS | RF tuning cable | |

Product-specific adapter cable for RF tuning.

- **Table 7 Attenuation values**

Band	Attenuation Rx
GSM 850/900	0.30 dB
GSM 1800	0.38 dB
GSM 1900	0.41 dB
WCDMA I (2 GHz)	0.45 dB

| CA-31D | USB cable | |

The CA-31D USB cable is used to connect FPS-21 to a PC. It is included in the FPS-21 sales package.

| CA-89DS | Cable | |

Provides VBAT and Flashbus connections to mobile device programming adapters.

CA-89DS
100cm

	DAU-9S	MBUS cable	
	The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters. **Note:** Docking station adapters valid for DCT4 products.		
	PCS-1	Power cable	
	The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.		
	XRS-6	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector approximately 610 mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB		

Service concepts

POS (Point of Sale) flash concept
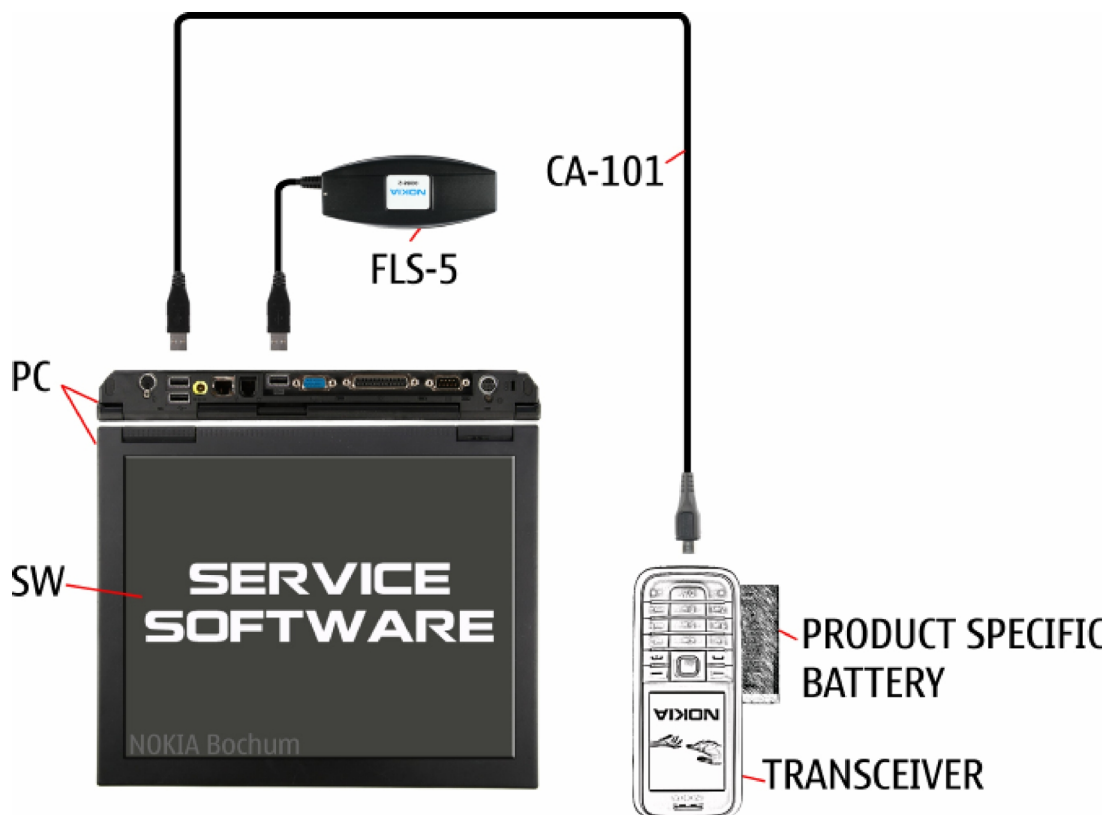
Figure 2 POS flash concept

Type	Description
Product specific tools	
BL-5C	Battery
Other tools	
FLS-5	POS flash dongle
	PC with service software
Cables	
CA-101	Micro USB cable

POS (Point of Sale) flash concept — option 2
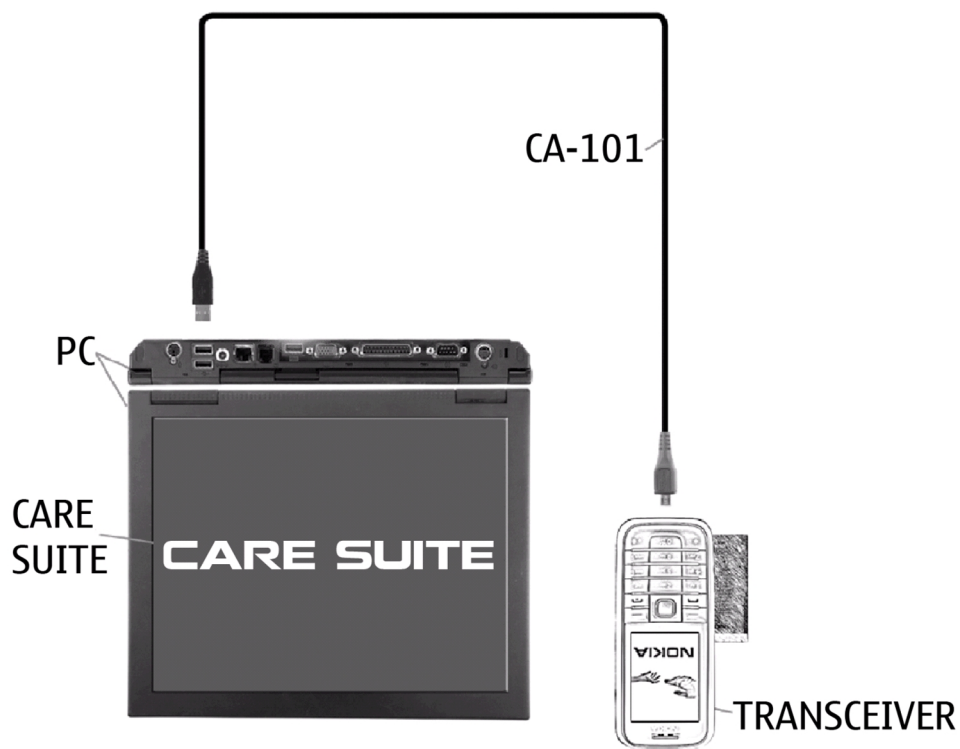
Figure 3 POS flash concept — option 2

Flash concept with FPS-21
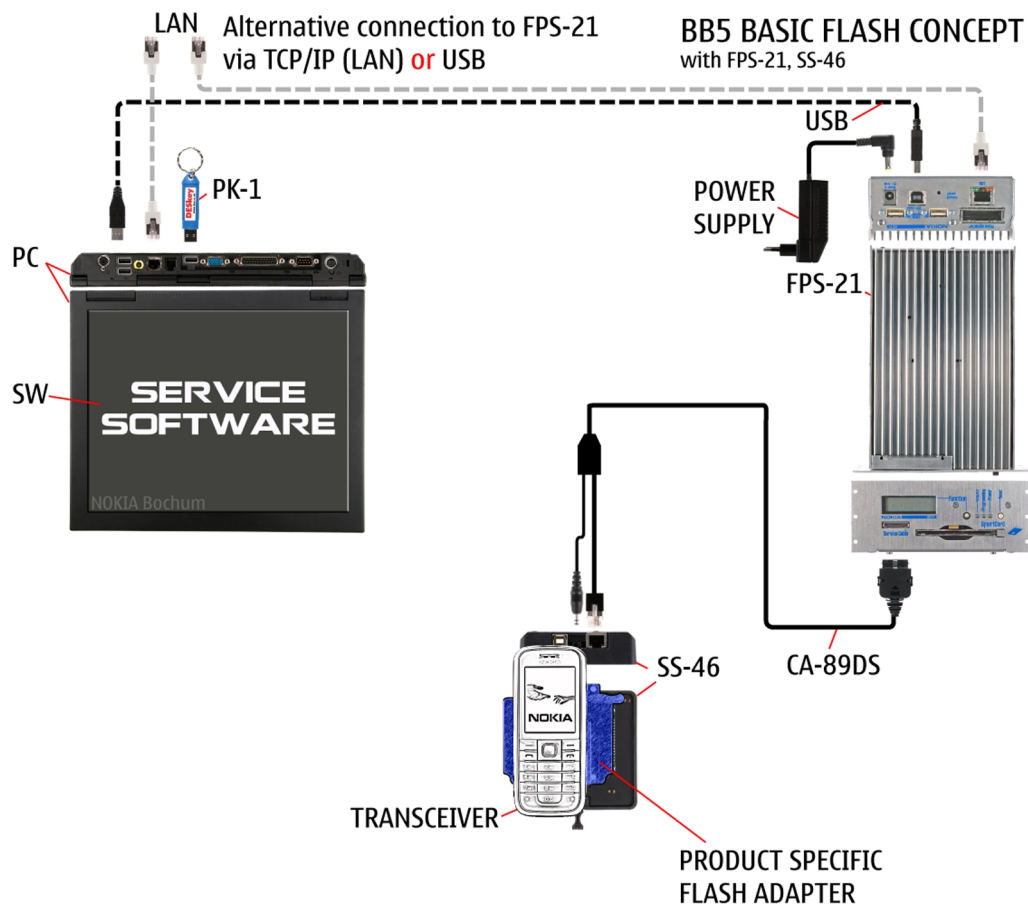
Figure 4 Basic flash concept with FPS-21

Type	Description
Product specific devices	
FS-160	Flash adapter
Other devices	
FPS-21	Flash prommer box
AC-35	Power supply
PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
CA-89DS	Service cable
	USB cable

CU-4 flash concept with FPS-21
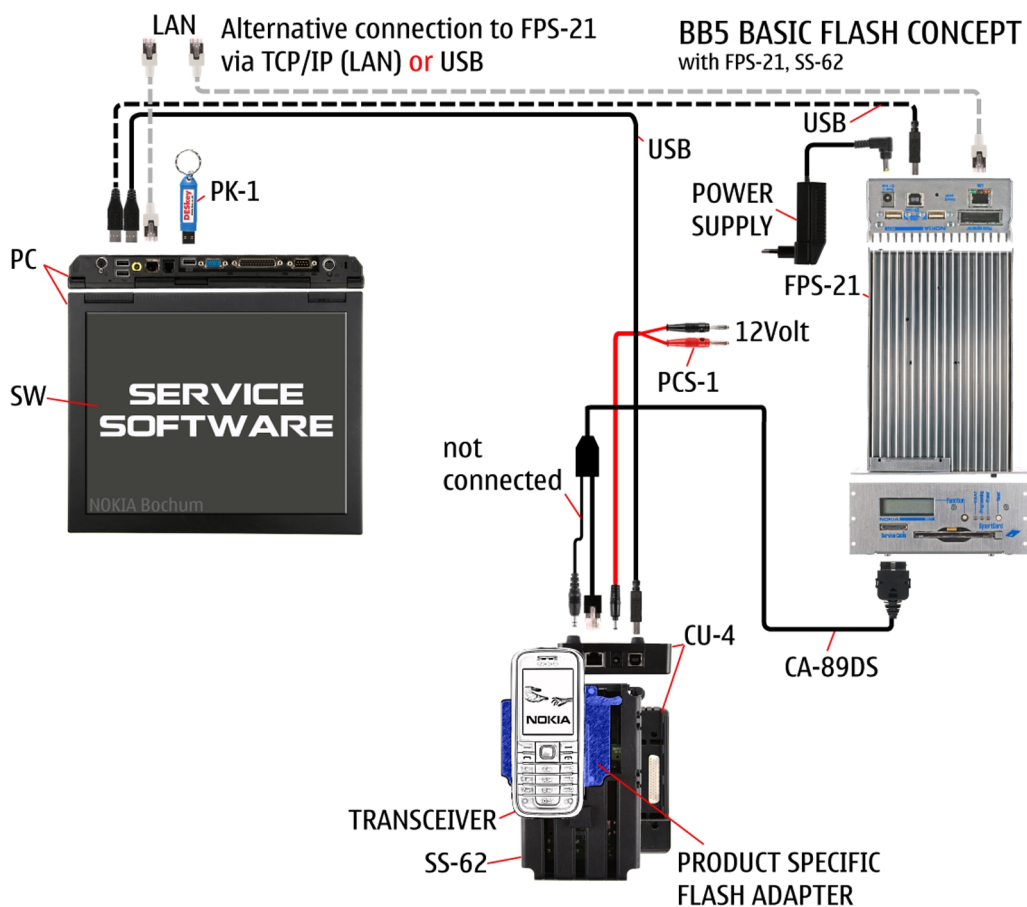
Figure 5 CU-4 flash concept with FPS-21

Type	Description
Product specific devices	
FS-160	Flash adapter
Other devices	
CU-4	Control unit
FPS-21	Flash prommer box
AC-35	Power supply
PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card (for DCT-4 generation mobile device programming)
	PC with Phoenix service software
Cables	
PCS-1	Power cable
CA-89DS	Service cable
	Standard USB cable

Type	Description
	USB cable

Module jig service concept
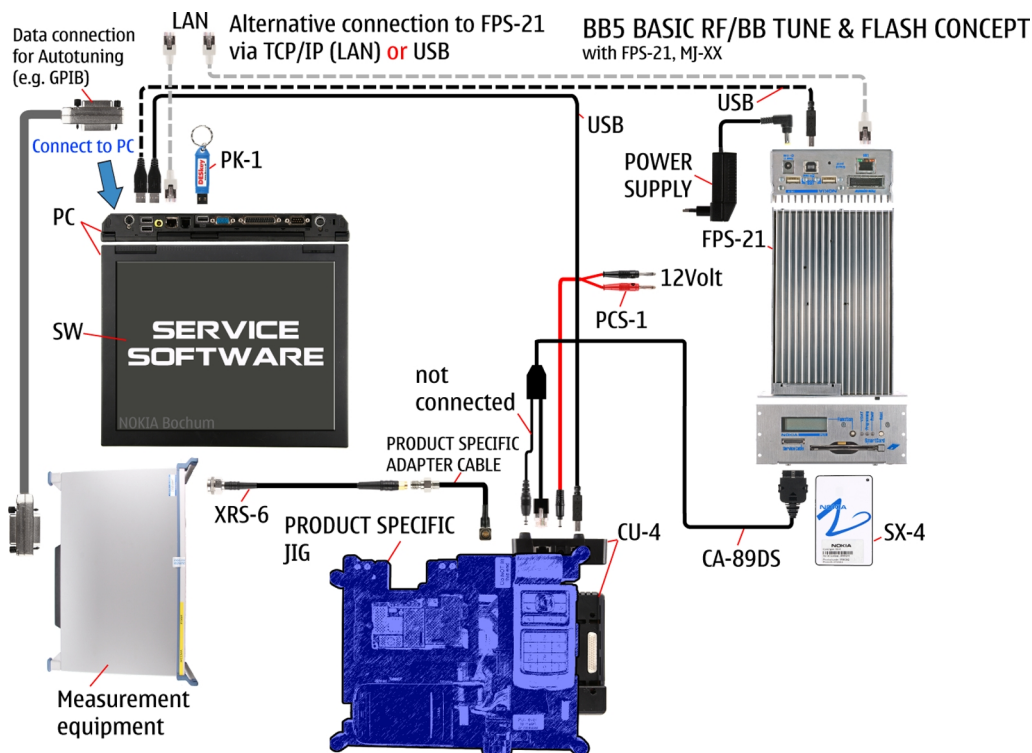
Figure 6 Module jig service concept

Type	Description
Phone specific devices	
MJ-312	Module jig
Other devices	
CU-4	Control unit
FPS-21	Flash prommer box
PK-1	SW security device
SX-4	Smart card
	PC with VPOS and Phoenix service software
	Measurement equipment
Cables	
CA-89DS	Service cable
PCS-1	DC power cable
XRS-6	RF cable
	USB cable

Type	Description
	GPIB control cable

Service concept for RF testing and RF/BB tuning
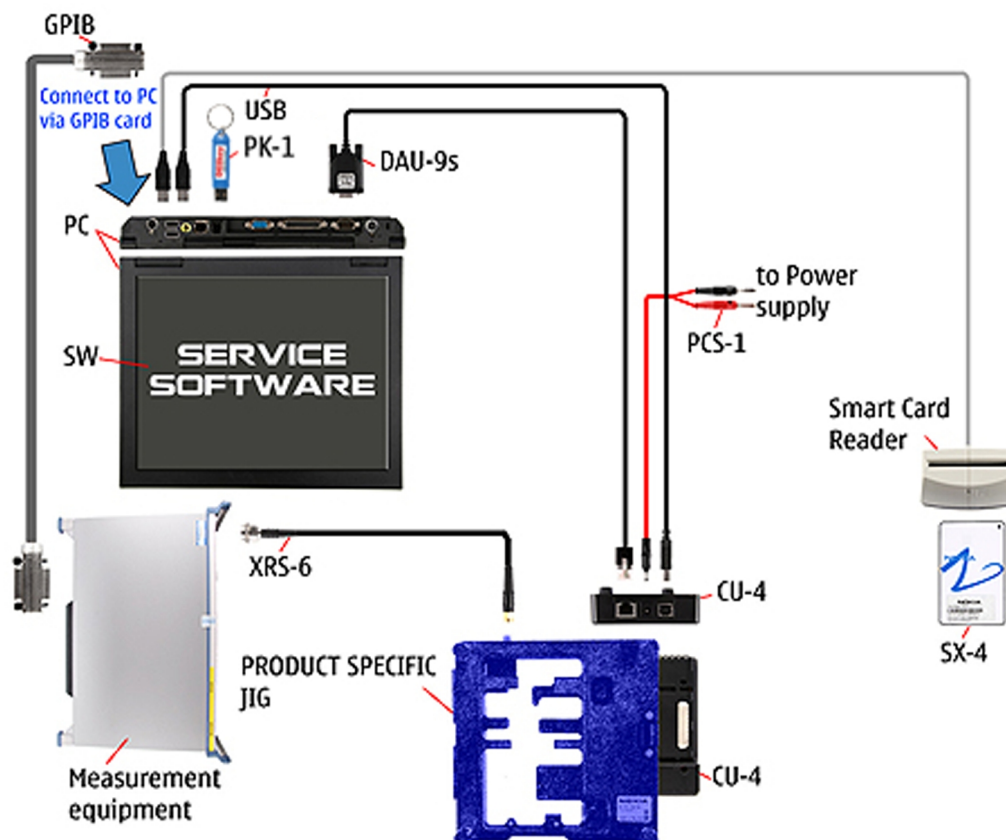
Figure 7 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-312	Module jig
Other devices	
CU-4	Control unit
PK-1	SW security device
SX-4	Smart card
	Measurement equipment
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable

Type	Description
XRS-6	RF cable
	GPIB control cable
	USB cable

Bluetooth testing concept with SB-6
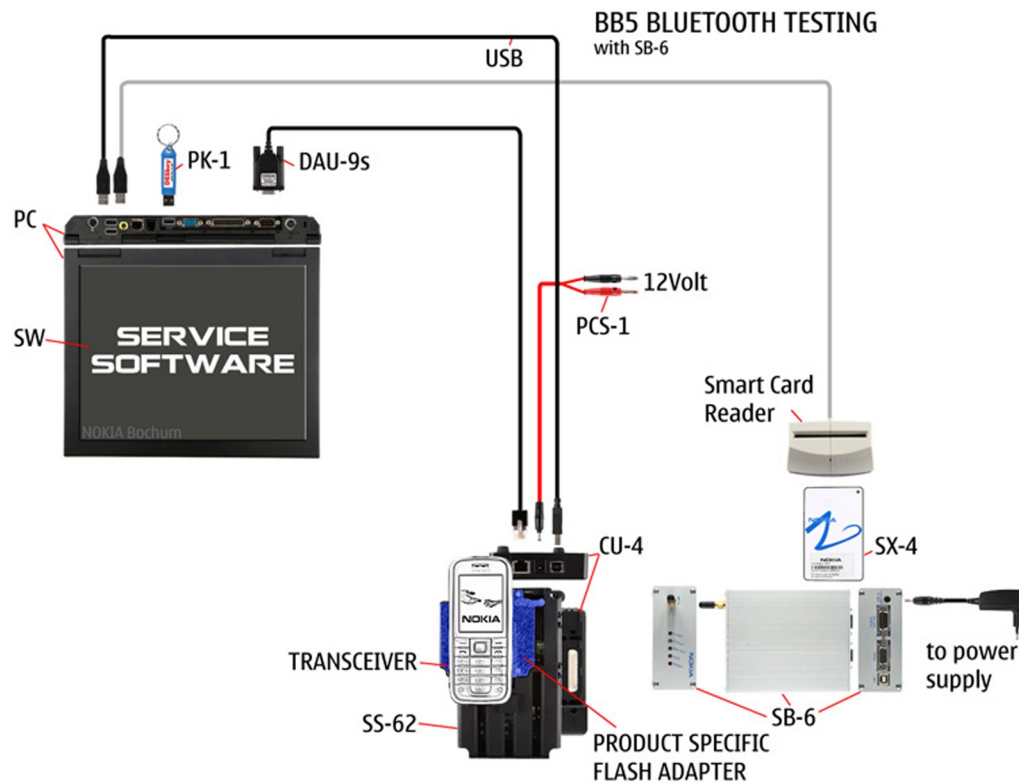
Figure 8 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
FS-160	Flash adapter
Other devices	
CU-4	Control unit
SS-62	Flash adapter base
PK-1	SW security device
SX-4	Smart card
SB-6	Bluetooth test and interface box
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable

Type	Description
PCS-1	DC power cable
	USB cable

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Nokia Customer Care

3 — BB Troubleshooting and Manual Tuning Guide

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Table of Contents

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■ Baseband self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.*

Troubleshooting flow

■ **Power and charging troubleshooting**

Dead or jammed device troubleshooting

Troubleshooting flow - Page 1 of 2

Troubleshooting flow - Page 2 of 2

```
          ┌─────────────────────────┐
          │  Phone is dead or jammed │
          │      (page 2 of 2)       │
          └─────────────────────────┘
                      │
                      ▼
          ┌─────────────────────────┐
          │                         │
          │     Flash the phone     │
          │                         │
          └─────────────────────────┘
                      │
                      ▼
                   ╱     ╲                    ┌──────────────────────┐
                  ╱  Is phone's ╲    NO        │ Go to Flash programming │
                 ╱   flashing    ╲───────────▶│  fault troubleshooting  │
                  ╲  working?    ╱             └──────────────────────┘
                   ╲     ╱
                    YES
                      │
                      ▼
                   ╱     ╲                    ┌──────────────────────┐
                  ╱  Is the  ╲      NO         │     Go to relevant     │
                 ╱   phone    ╲───────────────▶│ troubleshooting section │
                  ╲ working? ╱                 └──────────────────────┘
                   ╲     ╱
                    YES
                      │
                      ▼
          ┌─────────────────────────┐
          │           END           │
          └─────────────────────────┘
```

Power key (End key) troubleshooting

Troubleshooting flow

```
            ┌─────────────────────────┐
            │  Power key (End key)     │
            │     does not work        │
            └────────────┬────────────┘
                         │
            ┌────────────▼────────────┐
            │  Disassemble the phone.  │      Note: End key works as power key.
            │ Check visually if power  │
            │  key (End key) is        │
            │      damaged.            │
            └────────────┬────────────┘
                         │
                    ╱────▼────╲                ┌──────────────────────────┐
                   ╱           ╲     YES        │  Replace keymat and/or    │
                  ╱ Any damages? ╲─────────────▶│  domesheet if necessary.  │
                   ╲           ╱                └──────────────────────────┘
                    ╲────┬────╱
                         │ NO
                    ╱────▼────╲                ┌──────────────────────────┐
                   ╱  Does PWRONX ╲   YES       │  Beyond economical repair. │
                  ╱  signal go down ╲──────────▶└──────────────────────────┘
                  ╲ when power key  ╱
                   ╲ is pressed?   ╱
                    ╲────┬────╱
                         │ NO
                    ╱────▼────╲
                   ╱  Check if   ╲
                  ╱ contact pads for ╲
                  ╲ power/end key are OK. ╱
                   ╲────┬────╱
                         │ NO
            ┌────────────▼────────────┐
            │  Place phone to module   │
            │  jig. Turn power on by   │
            │ connecting FPS-20/21     │
            │ cable, or setting the    │
            │ jig to "auto power on"   │
            │ mode, or by connecting   │
            │     the charger.         │
            └────────────┬────────────┘
                         │
                    ╱────▼────╲                ┌──────────────────────────┐
                   ╱           ╲     NO         │  Go to General power      │
                  ╱ Phone boots up ╲───────────▶│  checking troubleshooting. │
                  ╲  normally?    ╱             └──────────────────────────┘
                   ╲────┬────╱
                         │ YES
                    ╱────▼────╲
                   ╱  Check      ╲
                  ╱ the battery    ╲
                  ╲ connector(X2080).╱
                   ╲    OK?      ╱
                    ╲────┬────╱
                         │ NO
            ┌────────────▼────────────┐
            │  Go to General power     │
            │ checking troubleshooting.│
            └─────────────────────────┘
```

General voltage checking troubleshooting

Troubleshooting flow - Page 1 of 2

```
        ┌─────────────────────────┐
        │  General voltage checking │
        │     (page 1 of 2)       │
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │     Switch power ON      │
        └─────────────────────────┘
                    │
                    ▼
            Current is large          ┌──────────────────────────────────────┐   General power checking notes:
          (about 1A or larger)?  YES→ │ Is VBAT short circuit still present    │   Use Power distribution diagram to locate
                                      │ when just engine module is connected   │   current consumption blocks.
                    │                 │ to service jig?                         │
                   NO                 │ Is any component getting hotter than    │
                    │                 │ normal?                                 │
                    ▼                 │ Check possible voltage drops on         │
                                      │ regulators outputs.                     │
                                      └──────────────────────────────────────┘

              Is VBAT                  ┌──────────────────────────────────────┐
          (e.g. C2081 but not         │ Most likely contact problem (also     │
           assembled or C2083)        │ minor short circuit still possible) in │
           value inside phone   YES→  │ the VBAT powering line which is too    │
           below 3.2V (over          │ low.                                    │
           capacitor between          │ Check VBAT related components and      │
           VBAT and GND)?             │ their contacts to PWB (e.g. battery    │
                                      │ connector).                            │
                    │                 │ Make sure that the power supply        │
                   NO                 │ voltage is large enough and the        │
                    │                 │ current limit is high enough.          │
                    ▼                 └──────────────────────────────────────┘
        ┌─────────────────────────┐
        │     Go to page 2.        │
        └─────────────────────────┘
```

Troubleshooting flow - Page 2 of 2

General voltage checking
(page 2 of 2)

Measure
N2200 HW and SW
regulators

HW:
VR1 C2910 = 2.5 V
VIO C2001 = 1.8 V
VUSB C2002 = 2.8 V

─yes→

SW:
VAUX1 C2481, C2485 = 2.5V/2.78V
VMEM C3200 = 1.85V/2.9V

─NO─

─NO─

Check
if short circuited

─NO→ Beyond economical repair.

YES

Remove short circuit

General power checking

Check the following voltages:

Signal Rename	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	Pearl_J	ON	ON	1.8	Memory, I/Os, display, camera, BTHFMTXRDS3.0	
VBACK	Pearl_J	ON	ON	2.5	Back-up battery	
VSIM	Pearl_J	ON	ON	1.8/3.0	SIM card	
VAUX1	Pearl_J	ON	ON	2.5/2.8	Camera, display and hall sensor	
VANA (VAUX1)	Pearl_J	ON	ON	2.5	Camera	
VR1	Pearl_J	OFF	ON	2.5	Crystal oscillators	
VMEM	Pearl_J	OFF	OFF	2.9	microSD	Disabled in sleep

Charging troubleshooting

Troubleshooting flow
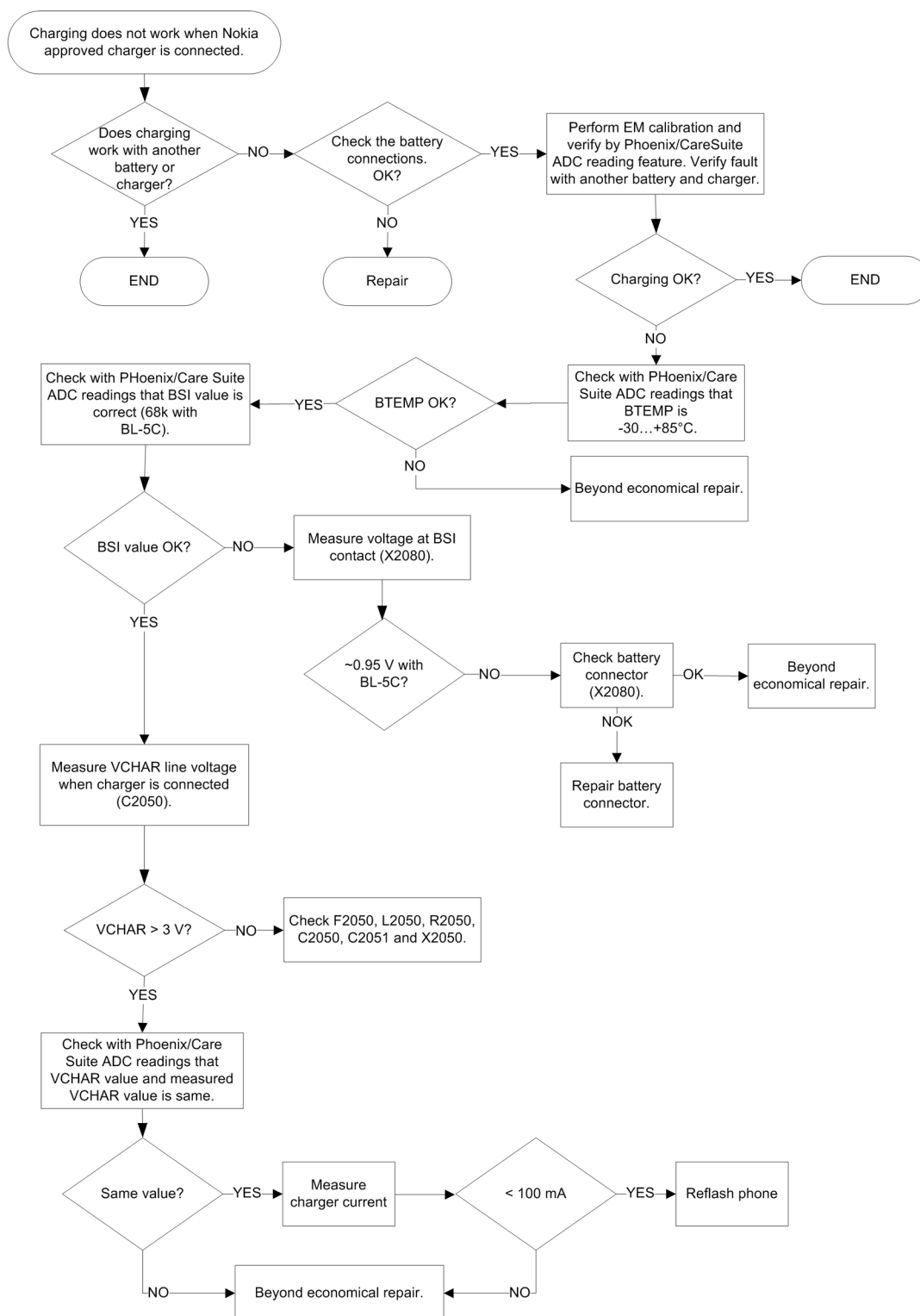
USB charging troubleshooting

Troubleshooting flow
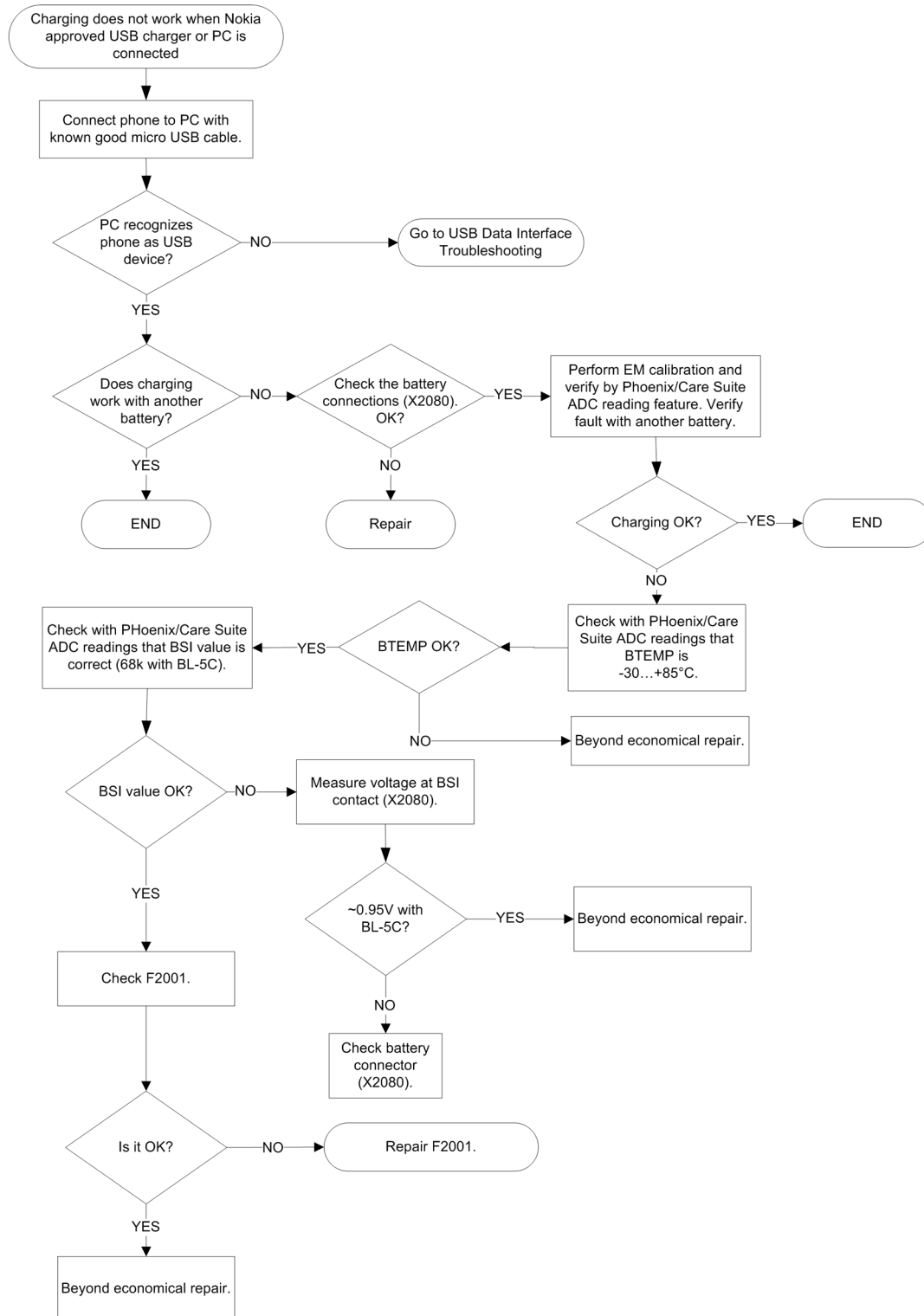
Battery current measuring fault troubleshooting

Troubleshooting flow

NOKIA
Care
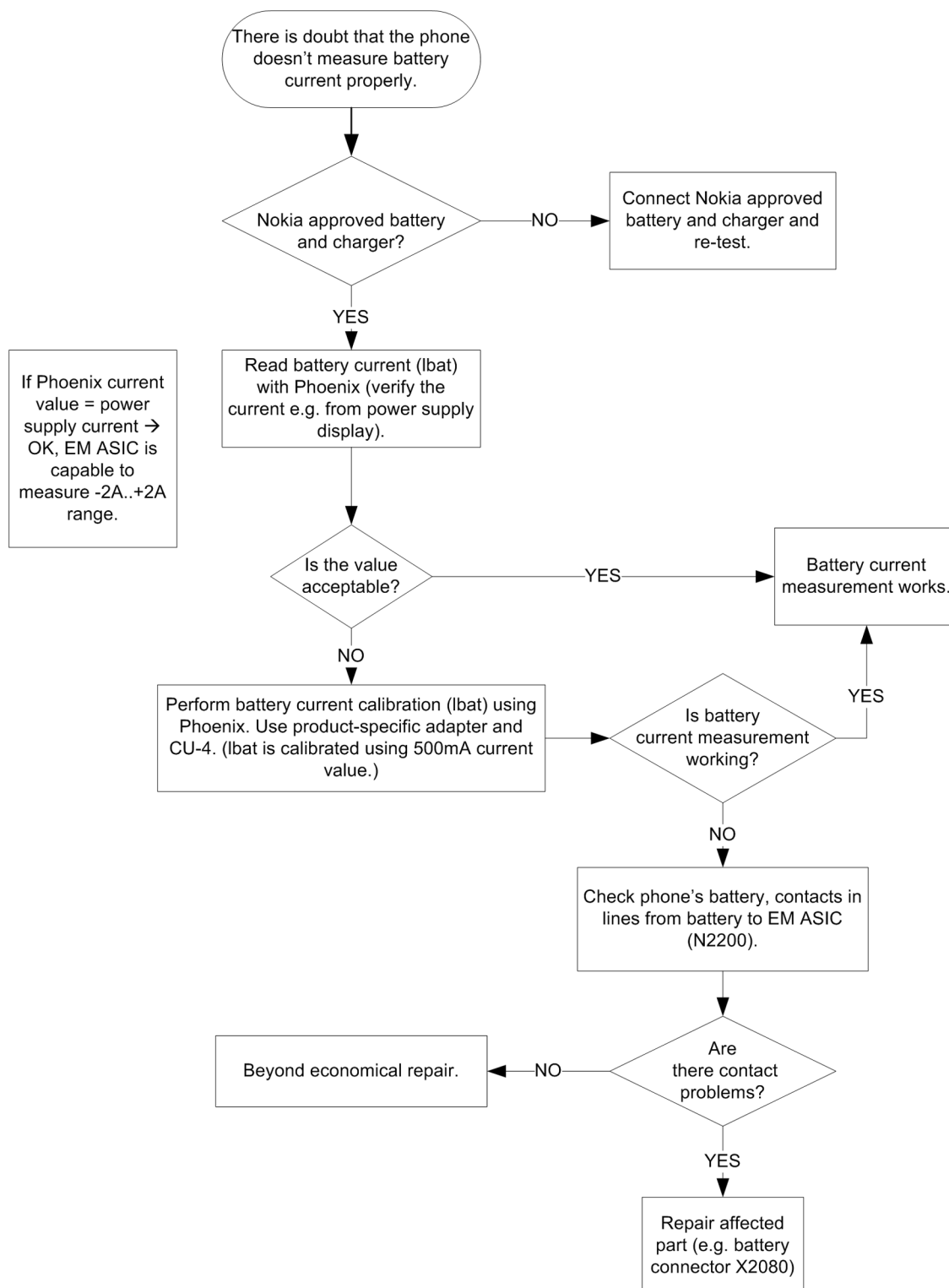
■ **Interface troubleshooting**

Flash programming fault troubleshooting

Troubleshooting flow - Page 1 of 2

```
┌─────────────────────────┐
│  Flash programming      │
│  fault (page 1 of 2).   │
└─────────────────────────┘
             │
             ▼
┌─────────────────────┐
│  Check that SW      │
│  packages are       │──OK──▶  END
│  correct and        │
│  reflash the phone. │
└─────────────────────┘
             │ NOK
             │
```

Comment: Phoenix error codes help to find out in which step flashing fails.

Test flashing through test pattern.

```
┌─────────────────────┐           ┌─────────────────────┐
│  Does the flashing  │──OK──▶    │  Go to "Flash       │
│  procedure start    │           │  programming fault" │
│  at all?            │           │  page 2.            │
└─────────────────────┘           └─────────────────────┘
             │ NOK
             ▼
```

```
                NOK
             USB Flashing
┌─────────────────────┐            ┌──────────────────────┐
│  Measure FBUS line  │──────────▶ │  Measure resistance  │──OK──▶ ┌────────────────┐
│  (Test pattern)     │            │  between:            │        │  Replace       │
│  after start up. Is │            │  USB pin D+          │        │  USB ISP       │
│  FBUS high (1.8V)?  │            │  USB pin D-          │        │  (N2002).      │
└─────────────────────┘            │  >40 ohm             │        └────────────────┘
             │                     └──────────────────────┘
```

```
                NOK
             Flashing via
             production test
             pattern
                          ┌─────────────────────────┐
                          │  Measure internal FBUS  │
                          │  RX line testpad during │──NOK──▶ ┌──────────────────┐
                          │  flashing. See          │         │  Check connections│
                          │  oscilloscope flashing  │         └──────────────────┘
                          │  picture. Signal OK?    │                  │ OK
                          └─────────────────────────┘                  ▼
```

```
   OK      ┌─────────────────────────┐      ┌──────────────┐      ┌────────────────┐
  ◀─OK─    │  Measure internal FBUS  │      │  Beyond      │      │  Measure if    │
           │  TXD line (production   │──NOK─▶│  economical  │◀─NOK─│  short circuit │
           │  test pattern) testpad  │      │  repair.     │      │  between RX    │
           │  during flashing.       │      └──────────────┘      │  and GND       │
           │  1.8V?                  │                            └────────────────┘
           └─────────────────────────┘                                    │ OK
                                                                          ▼
                                                                 ┌────────────────┐
                                                                 │  Restart       │
                                                                 │  flashing      │
                                                                 └────────────────┘
```

See oscilloscope flashing picture.

```
┌─────────────────────┐      ┌──────────────┐
│  Measure BSI pulse  │      │  Beyond      │
│  (X2080) in flash   │──NOK─▶│  economical  │
│  programming start  │      │  repair.     │
│  (2.5V).            │      └──────────────┘
└─────────────────────┘
             │ OK
             ▼
```

See oscilloscope flashing picture.

```
┌─────────────────────┐      ┌──────────────┐
│  Measure FBUS TXD   │      │  Swap main   │
│  line (production   │──NOK─▶│  PWB         │
│  test pattern)      │      └──────────────┘
│  pin 2 after start  │
│  up. FBUS should be │
│  low after being    │
│  high.              │
└─────────────────────┘
             │ OK
             ▼
┌─────────────────────┐
│  Go to page 2       │
└─────────────────────┘
```

```
┌────────────────────────────────────┐
│  [USB connector diagram]           │
│       1 2 3 4 5                     │
│                    1 - VBUS         │
│                    2 - D-           │
│                    3 - D+           │
│                    4 - Not connected│
│                    5 - GND          │
│       Micro-B                       │
│       USB connector                 │
├────────────────────────────────────┤
│  [J2060 diagram]                    │
│   8   7   6   5    1 - MBUS         │
│                    2 - TXD          │
│   J2060            3 - RXD          │
│                    4 - RXD2         │
│                    5 - ENABLE       │
│   4   3   2   1    6 - Not connected│
│                    7 - CLK          │
│       Production test pattern       │
└────────────────────────────────────┘
```

Troubleshooting flow - Page 2 of 2

Figure 9 Flashing pic 1. Take single trig measurement for the rise of the BSI signal

SIM card troubleshooting

Troubleshooting flow
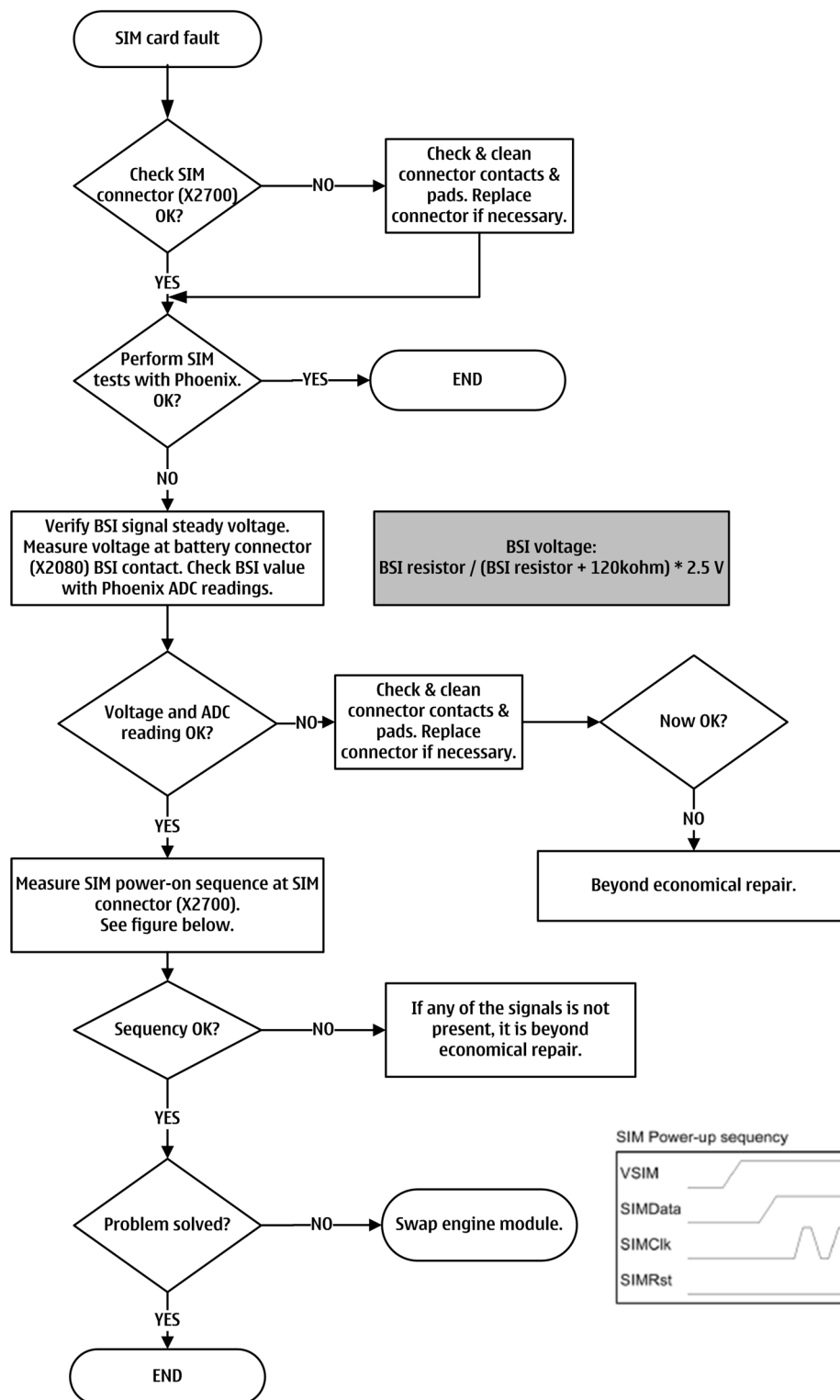
SIM power-on sequence
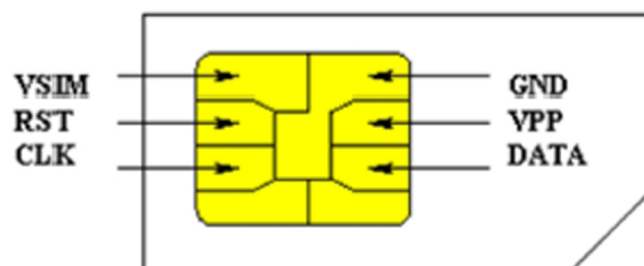
SIM contacts

Fsimclk = 3.8MHz

SIM power-on sequence on X2700.

MicroSD card troubleshooting

Troubleshooting flow

```
         ┌─────────────────────┐
         │  MicroSD card fault  │
         └─────────────────────┘
                    │
                    ▼
         ┌─────────────────────┐
         │   Save a picture to a │
         │  known good MicroSD   │
         │        card.          │
         └─────────────────────┘
                    │
                    ▼
              ╱─────────╲                ┌────────────────────┐            ╭──────────────────╮
            ╱ Save and read ╲──YES──────▶│  No microSD IF failure.│──────▶ │  Format or replace │
            ╲   succeed?    ╱            │ MicroSD card corrupted │         │   microSD card.    │
              ╲─────────╱                │     or damaged.        │         ╰──────────────────╯
                    │                    └────────────────────┘
                   NO
                    │
                    ▼
         ┌─────────────────────────┐
         │  Measure at microSD card │
         │ reader that MMCCIK frequency│
         │ is 400kHz during initialization│
         │        procedure.        │
         └─────────────────────────┘
                    │
                    ▼
              ╱─────────╲            ╭──────────────────────╮         ┌──────────────┐
            ╱    OK?    ╲──NO──────▶ │  Swap engine module.  │──────▶ │    Retest    │◀───┐
              ╲─────────╱            ╰──────────────────────╯         └──────────────┘    │
                    │                                                                     │
                   YES                                                                    │
                    │                                                                     │
                    ▼                                                                     │
              ╱─────────╲            ╭──────────────────╮                                 │
            ╱ MicroSD card ╲──YES──▶ │       END         │                                │
            ╲  working?    ╱         ╰──────────────────╯                                 │
              ╲─────────╱                                                                 │
                    │                                                                     │
                   NO                                                                     │
                    │                                                                     │
                    ▼                                                                     │
         ╭──────────────────────╮                                                        │
         │  Swap engine module.  │────────────────────────────────────────────────────────┘
         ╰──────────────────────╯
```
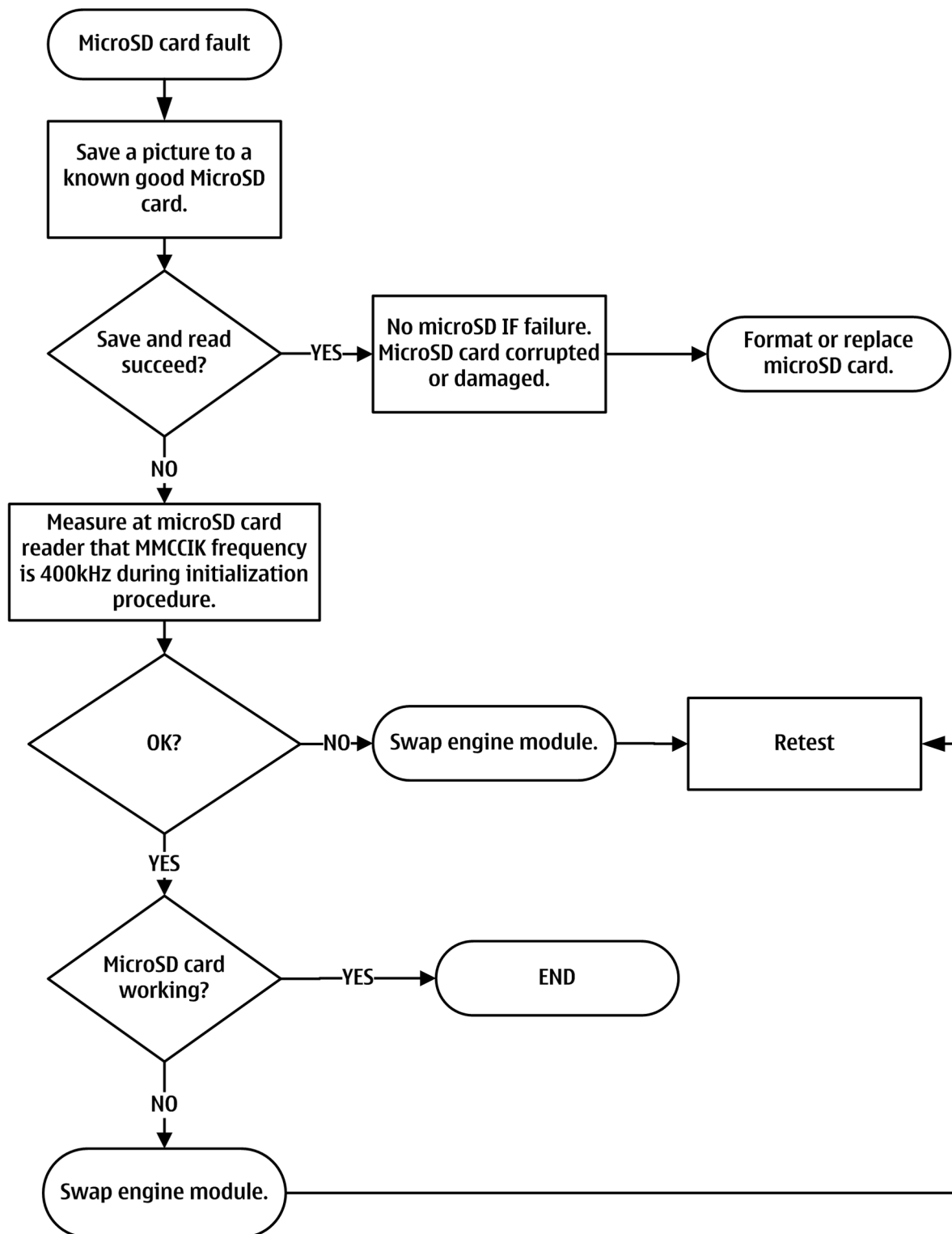
USB data interface troubleshooting

Troubleshooting flow - Page 1 of 2

Troubleshooting flow - Page 2 of 2

```
┌─────────────────┐
│   USB fault     │
│  (page 2 of 2)  │
└─────────────────┘
        │
        ▼
┌─────────────────┐
│   Check R2026   │
└─────────────────┘
        │
        ▼
      ╱OK?╲──YES──►┌──────────────┐
      ╲   ╱        │ Change R2023.│
        │          └──────────────┘
        NO                │
        │                 ▼
        ▼            ╱PC recognizes╲──NO──►┌──────────────┐
┌─────────────────┐ ╲phone as USB  ╱       │ Change N2002.│
│ Beyond          │  ╲  device?   ╱        └──────────────┘
│ economical      │       │                       │
│ repair.         │      YES                       ▼
└─────────────────┘       │                 ╱PC recognizes  ╲──YES──►
                          ▼                 ╲phone as USB     ╱
                    ┌──────────┐            ╲  device?       ╱
                    │   END    │                  │
                    └──────────┘                  NO
                                                  │
                                                  ▼
                                            ┌──────────────┐
                                            │Beyond        │
                                            │economical    │
                                            │repair.       │
                                            └──────────────┘
```
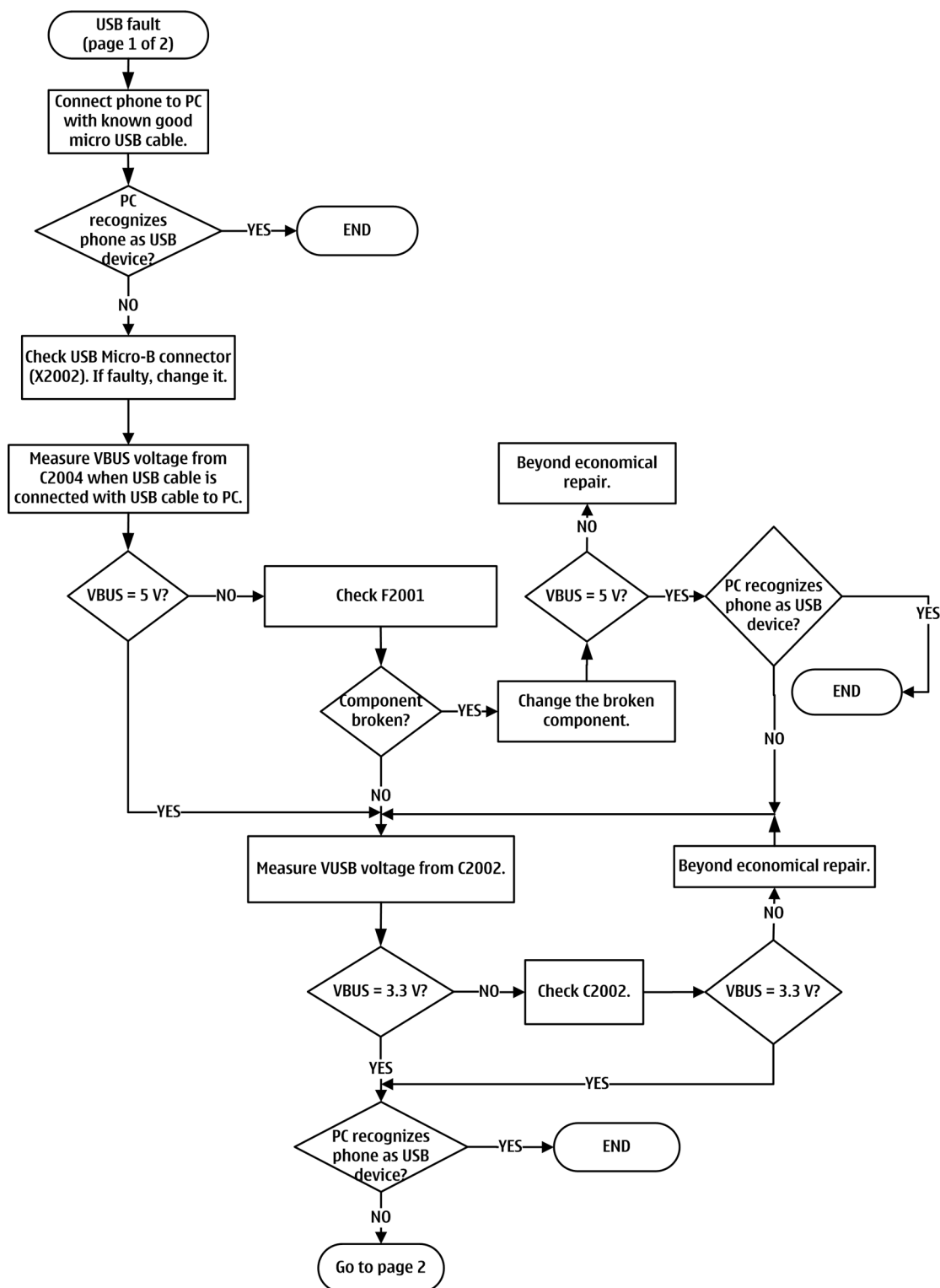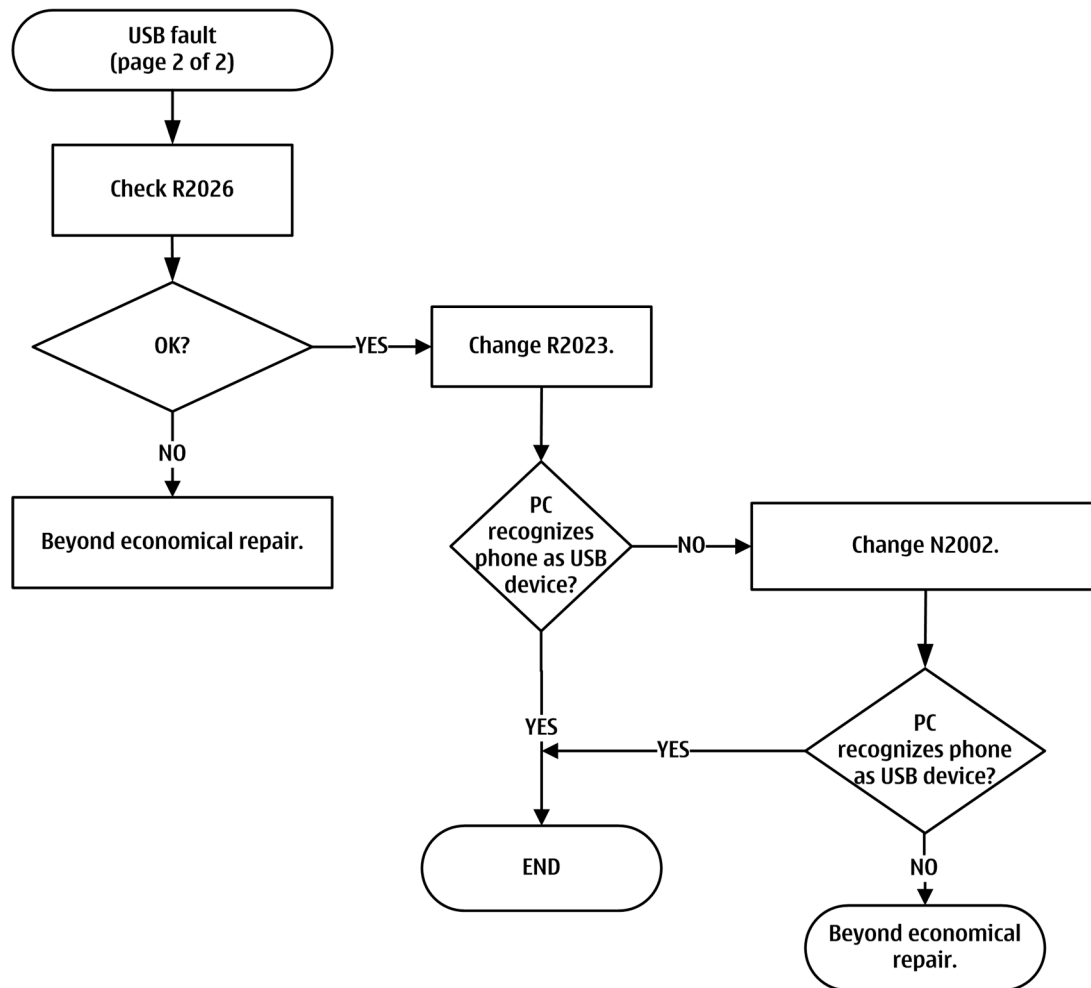
■ **User interface troubleshooting**

Keypad troubleshooting

Context

If one or more keys are stuck, so that the key does not react when a keydome key is pressed, the failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)

If the failure mode is not clear, start with the Keyboard test in Phoenix.

Troubleshooting flow

Numerical keypad illumination troubleshooting

Troubleshooting flow

```
┌─────────────────────┐
│  Numerical keypad   │
│ illumination does not│
│   work properly.    │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│ Enable the backlight and│
│  keypad illumination │
│      function.      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│ Measure the voltage on│
│   C2499 to GND.     │
└─────────────────────┘
          │
          ▼
       ◇ Is the voltage ◇ ────NO────►  ┌─────────────────────┐
       ◇    > 12 V?    ◇               │  The problem is     │
                                       │ caused by Pearl_J   │
          │ YES                        │  and components.    │
          ▼                            └─────────────────────┘
┌─────────────────────┐                          │
│ The problem is caused by│                       ▼
│ the keyboard illumination│          ┌─────────────────────┐
│    components.      │               │ Check the voltage on│
└─────────────────────┘               │   C2499 to GND.     │
          │                           └─────────────────────┘
          ▼                              │                │
┌─────────────────────┐                  ▼                ▼
│ Check the placement and│         ◇ Is voltage on ◇  ◇ Is voltage on ◇
│ assembly of V2500, V2502,│       ◇ C2499 to GND ◇   ◇ C2499 to GND ◇
│  R2505 and R2506.   │            ◇    > 12 V?   ◇    ◇   < 12 V?    ◇
└─────────────────────┘                  │ YES             │ YES
          │                              ▼                 ▼
          ▼                       ┌──────────────┐  ┌──────────────┐
┌─────────────────────┐          │Check the display.│ │Beyond economical│
│ If all the components are│      └──────────────┘  │    repair.    │
│ assembled right, check the│                        └──────────────┘
│ polarity of the LEDs V2500│
│    and V2502.       │
└─────────────────────┘
```
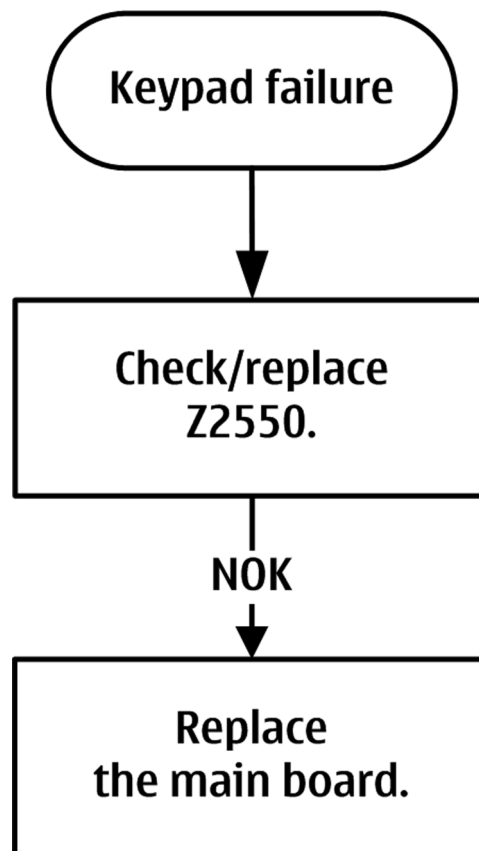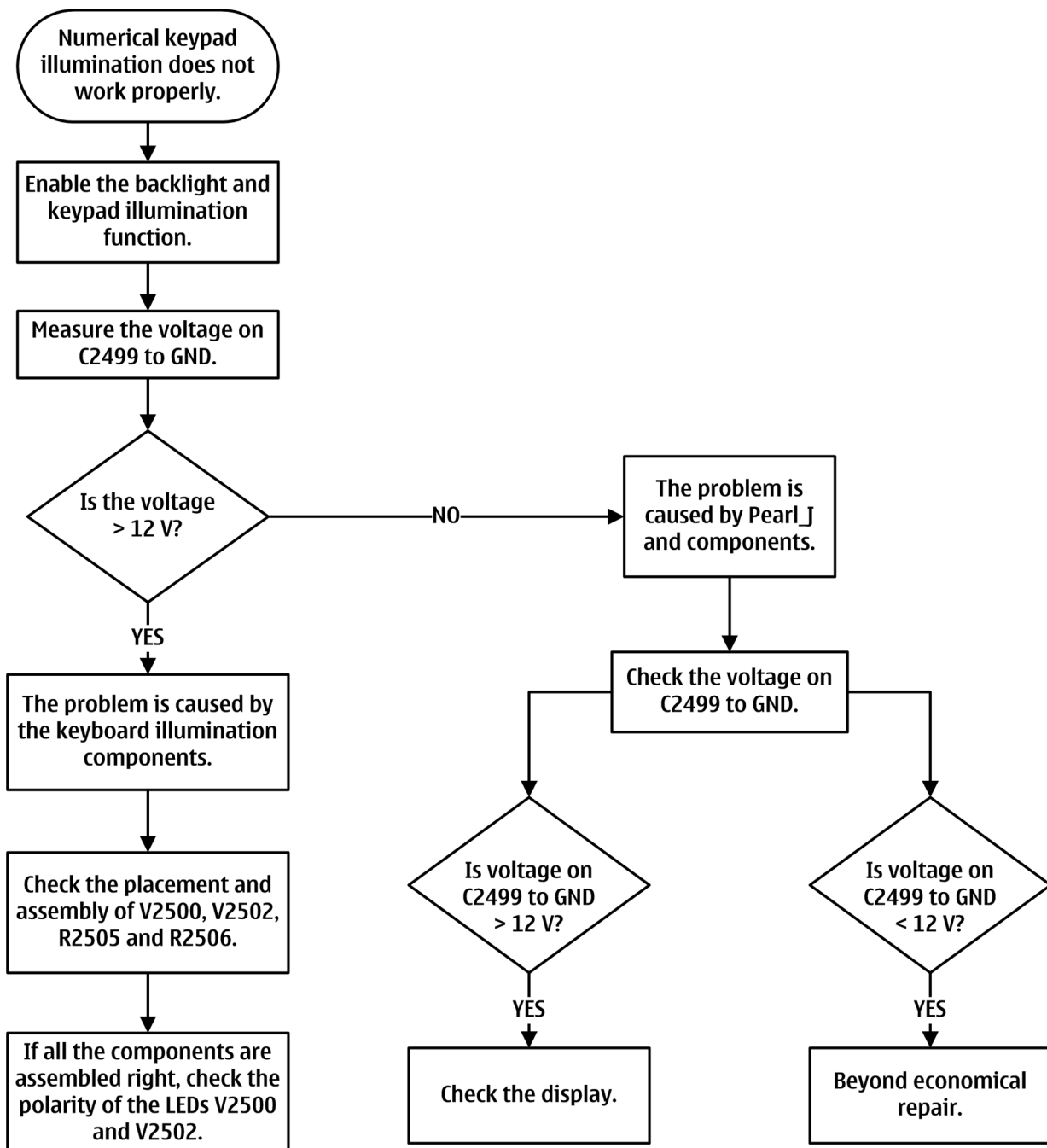
Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a sleep mode when the phone is in the screen saver mode.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 9 Pixel defects

| Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.

2. Check that the cellular engine is working normally.

   i   To check the functionality, connect the phone to a docking station.

   ii Start *Phoenix* service software.

   iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

Display module troubleshooting

Context

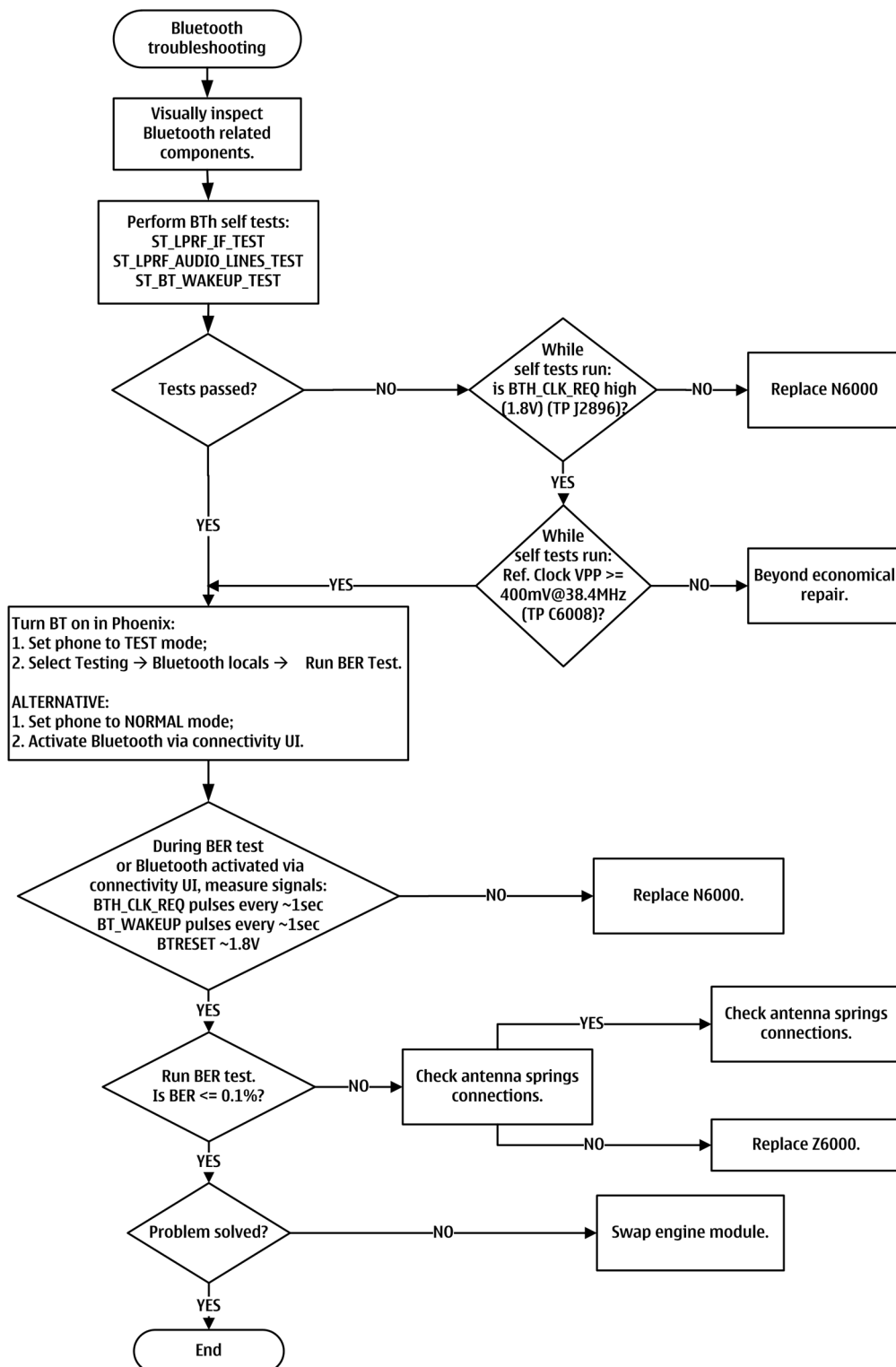Use the display test tool in Phoenix to find the detailed fault mode.

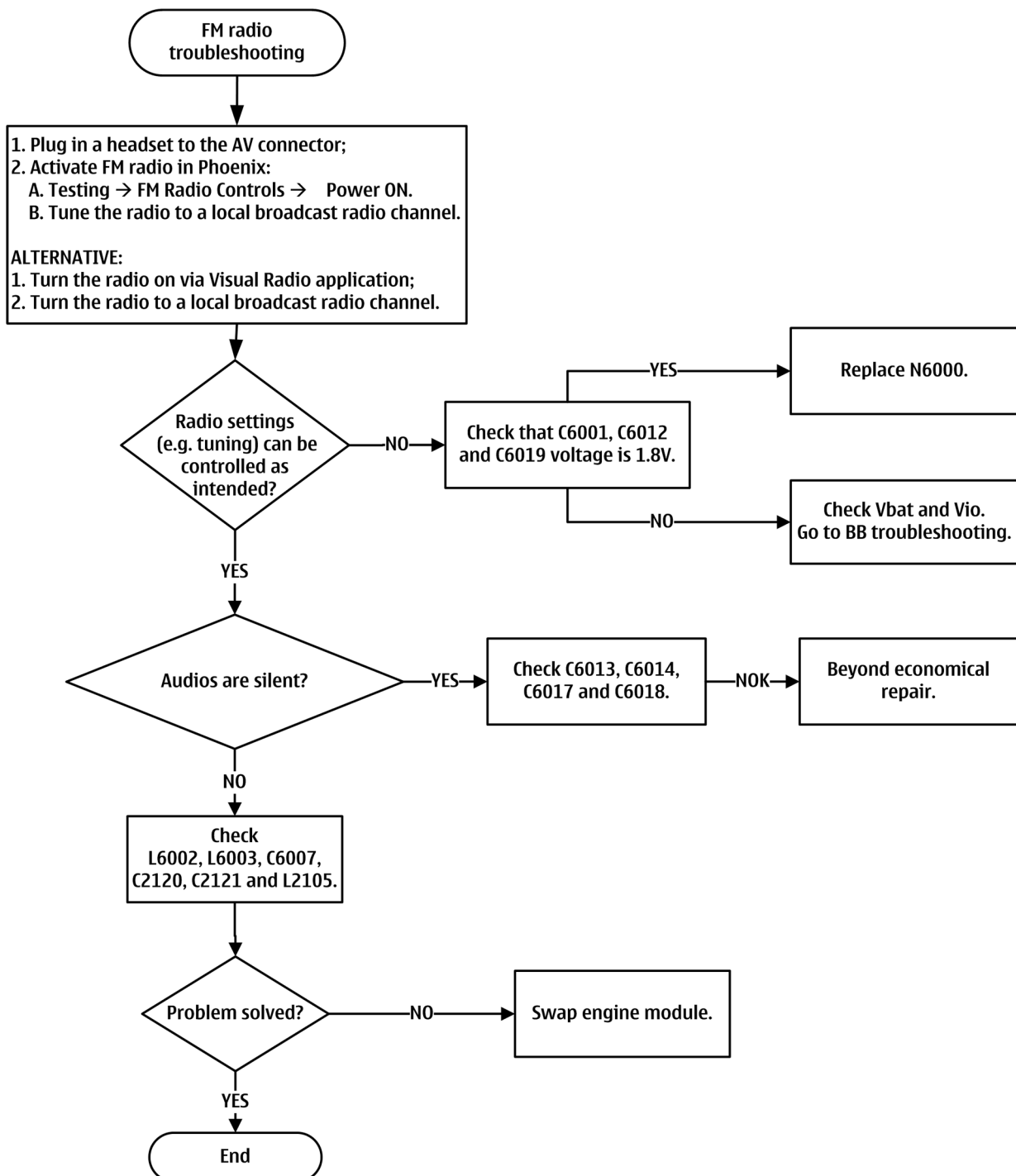### Troubleshooting flow
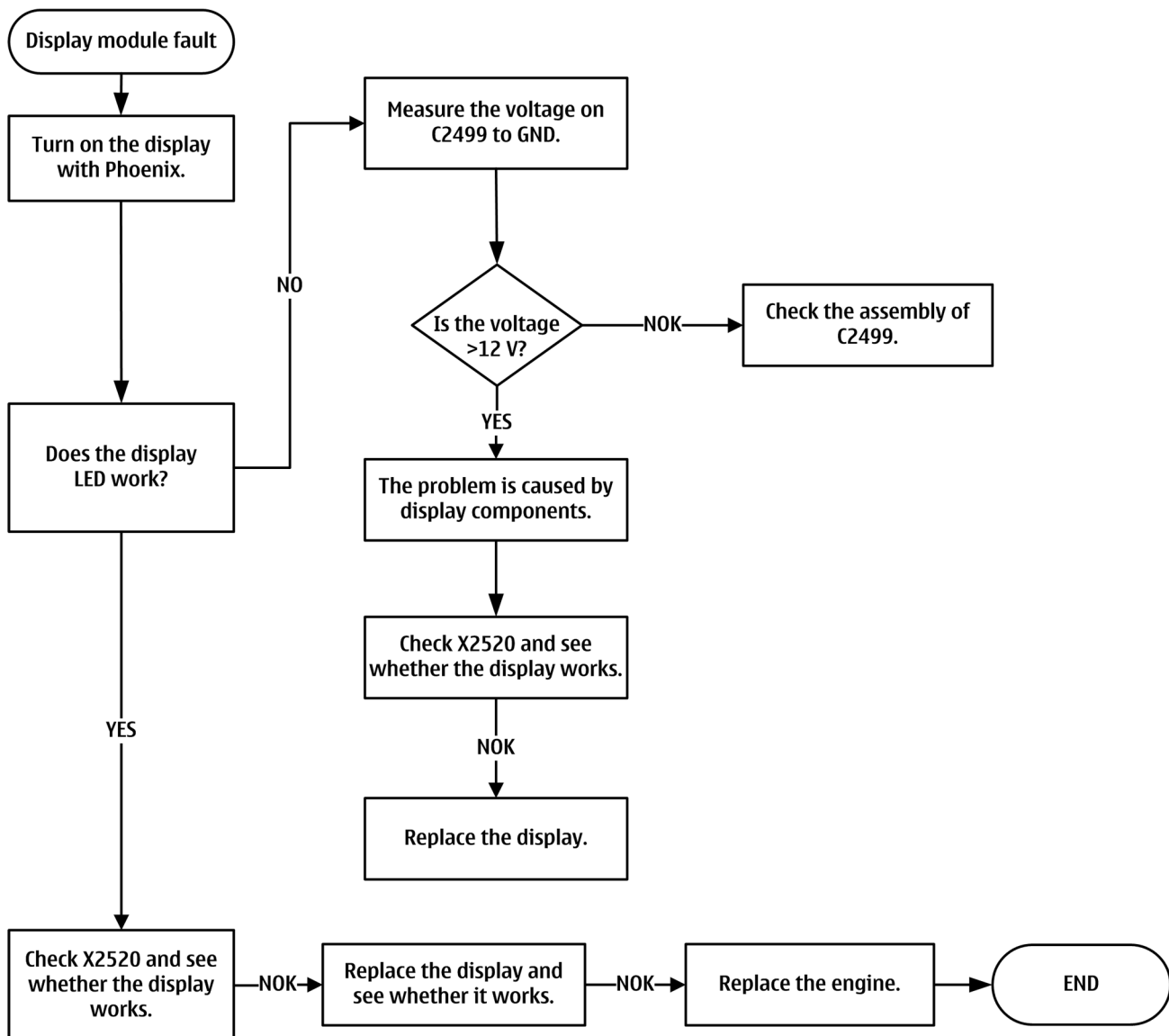
■ **Bluetooth and FM radio troubleshooting**

Bluetooth troubleshooting

Troubleshooting flow

```
                    ╭──────────────────╮
                    │    Bluetooth     │
                    │ troubleshooting  │
                    ╰──────────────────╯
                             │
                             ▼
                    ┌──────────────────┐
                    │ Visually inspect │
                    │ Bluetooth related│
                    │   components.    │
                    └──────────────────┘
                             │
                             ▼
                    ┌──────────────────┐
                    │Perform BTh self tests:│
                    │  ST_LPRF_IF_TEST │
                    │ST_LPRF_AUDIO_LINES_TEST│
                    │ ST_BT_WAKEUP_TEST│
                    └──────────────────┘
                             │
                             ▼
                                              While                              
                    ◇ Tests passed? ◇──NO──▶ self tests run: ──NO──▶ ┌──────────────┐
                                            is BTH_CLK_REQ high       │ Replace N6000│
                                            (1.8V) (TP J2896)?        └──────────────┘
                             │                    │
                            YES                  YES
                             │                    ▼
                             │                   While
                             │              self tests run:
                             ▼         ◇ Ref. Clock VPP >= ◇──NO──▶ ┌──────────────┐
          ┌──────────────────────────┐  YES── 400mV@38.4MHz          │Beyond economical│
          │Turn BT on in Phoenix:    │          (TP C6008)?          │    repair.   │
          │1. Set phone to TEST mode; │                              └──────────────┘
          │2. Select Testing → Bluetooth locals →  Run BER Test.│
          │                          │
          │ALTERNATIVE:              │
          │1. Set phone to NORMAL mode;│
          │2. Activate Bluetooth via connectivity UI.│
          └──────────────────────────┘
                             │
                             ▼
                     During BER test
                  or Bluetooth activated via
                  connectivity UI, measure signals:
              ◇ BTH_CLK_REQ pulses every ~1sec ◇──NO──▶ ┌──────────────┐
                  BT_WAKEUP pulses every ~1sec           │Replace N6000.│
                     BTRESET ~1.8V                       └──────────────┘
                             │
                            YES
                             │                                      ┌──────────────┐
                             ▼                          ──YES──▶    │Check antenna springs│
                                                       │            │  connections.│
                     Run BER test.          ┌──────────────────┐   └──────────────┘
                  ◇ Is BER <= 0.1%? ◇──NO──▶│Check antenna springs│
                                            │   connections.   │   ┌──────────────┐
                             │              └──────────────────┘──NO──▶│Replace Z6000.│
                            YES                                        └──────────────┘
                             │
                             ▼
                  ◇ Problem solved? ◇──NO──▶ ┌──────────────────┐
                             │               │Swap engine module.│
                            YES              └──────────────────┘
                             │
                             ▼
                    ╭──────────────────╮
                    │       End        │
                    ╰──────────────────╯
```

FM radio troubleshooting

Troubleshooting flow

■ Camera module troubleshooting

Taking and evaluating test pictures with main camera

When *taking* a test picture, remember the following:

• Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels

Issue 1

- If the phone is hot, let it rest for a while before taking the picture

- Make sure the optical system is clean

- Use highest possible resolution

- Make sure the light is sufficient (bright office lightning)

- Do not take the picture towards a light source

- Hold the phone as still as possible when taking the picture

- If camera has auto focus: Pictures should be taken both at infinity ~>2m and at macro distance ~10-15 cm in order to verify auto focus functionality

When *evaluating* a test picture, remember the following:

- The center of the picture is sharper than the edges

- The image may be blurred, though it does not show in the viewfinder

- Analyse the picture from your PC monitor, full colour setting is recommended

- If possible, compare with a picture of the same motive taken with a similar Nokia device

- If camera has auto focus: Remember that the white focussing frame which appears when the camera button is pressed halfway down, must turn green for auto focus lock. If the frame turns red, the camera is not focussed!

Camera troubleshooting

Troubleshooting flow
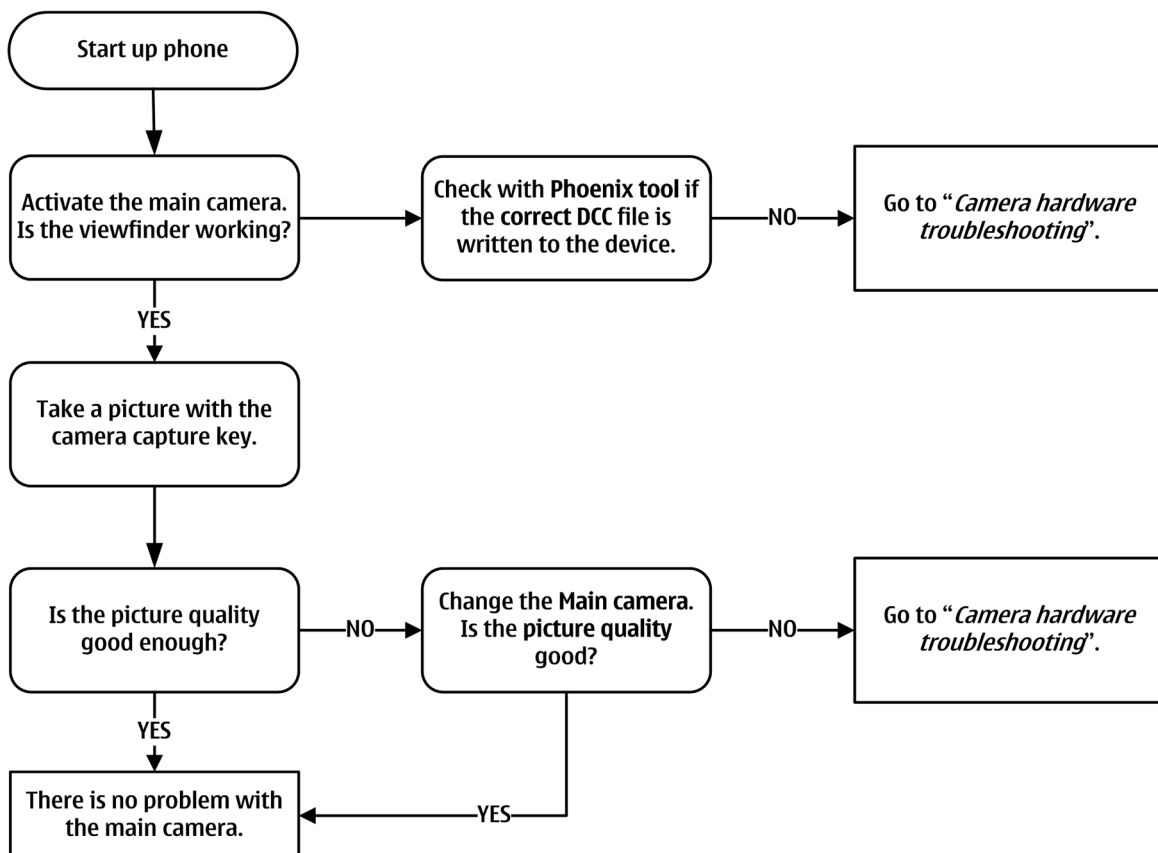
Camera hardware troubleshooting

Troubleshooting flow
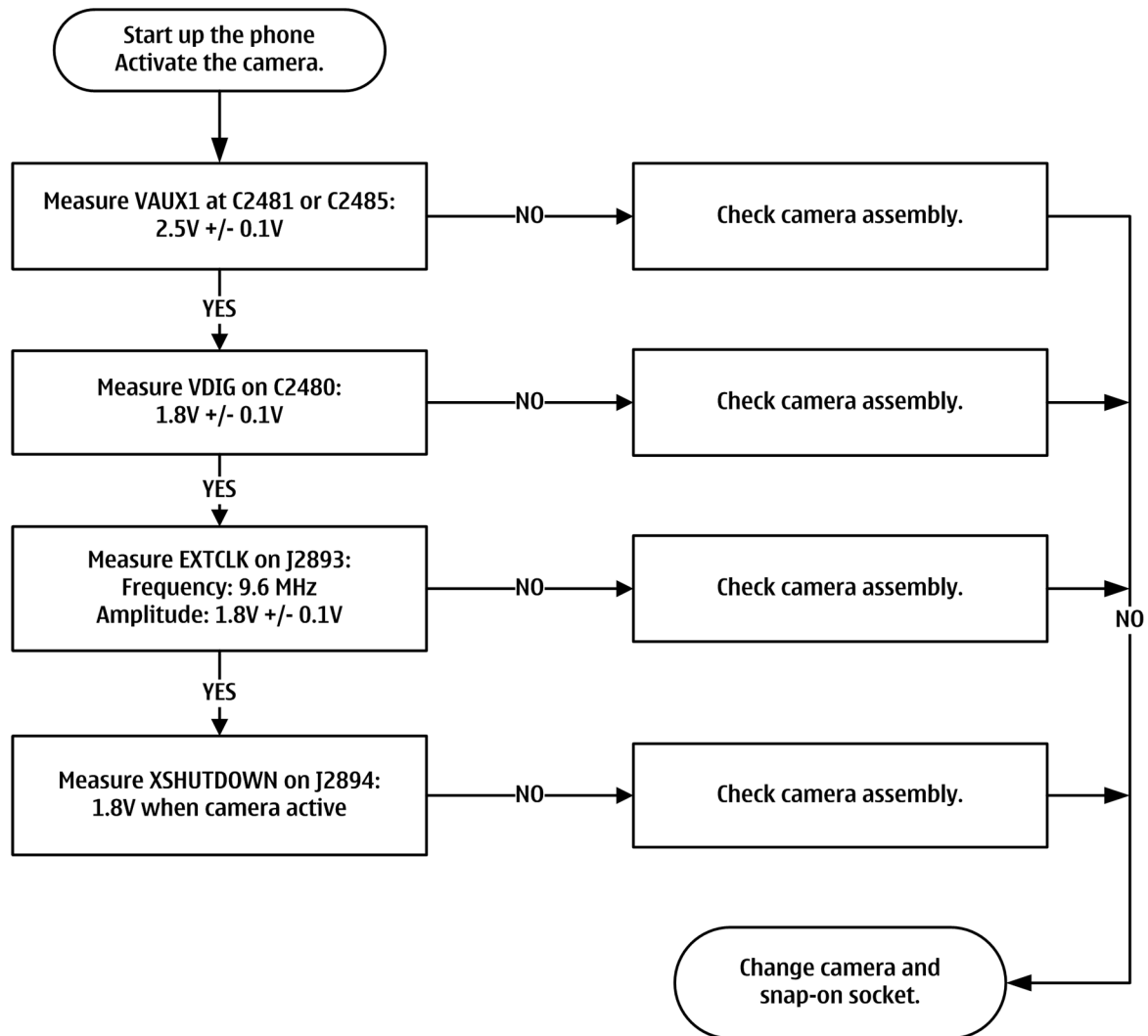
◼ Audio troubleshooting

Audio troubleshooting test instructions

Single-endedl external earpiece and differential internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

• Oscilloscope

- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to internal earpiece
- External microphone to internal handsfree speaker
- Internal microphone to external earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in a table in the following section.

Phoenix audio loop tests and test results

The results presented in this table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB]	Input voltage [mVpp]	Output voltage [mVpp]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R and GND	16.7	100	680	1.2	NA
		HSEAR L and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	10.9	100	353	1.2	NA
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	IHF pads	28.1	100	2540	0	112mA (calc.)

Measurement data
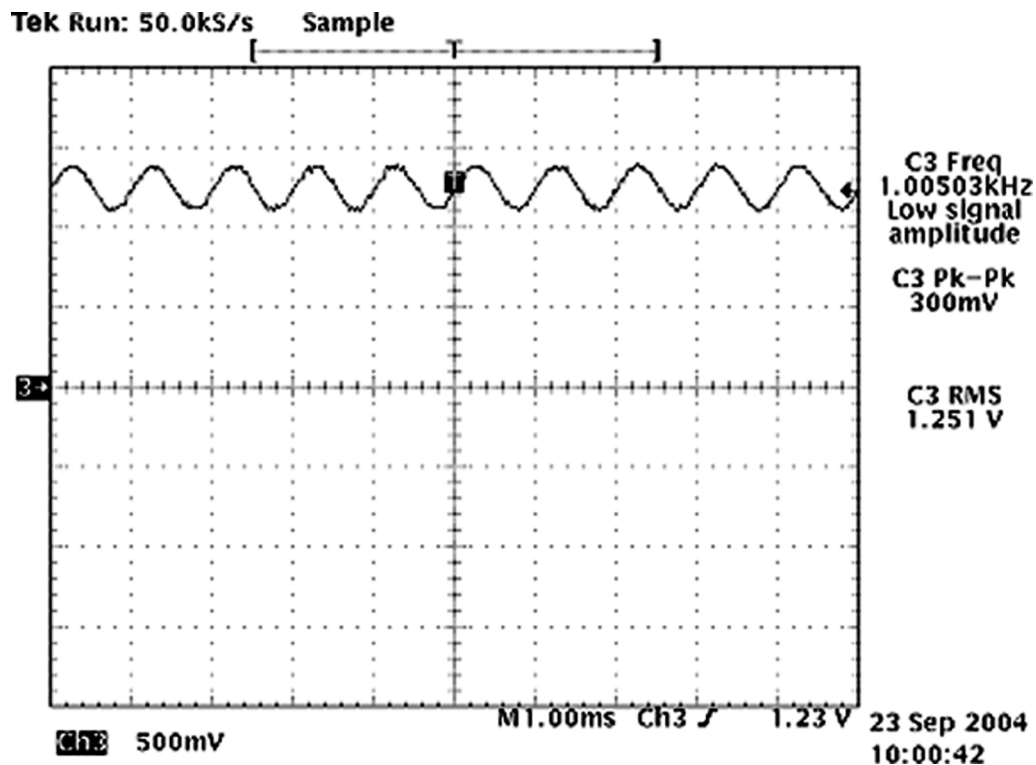
Figure 10 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.
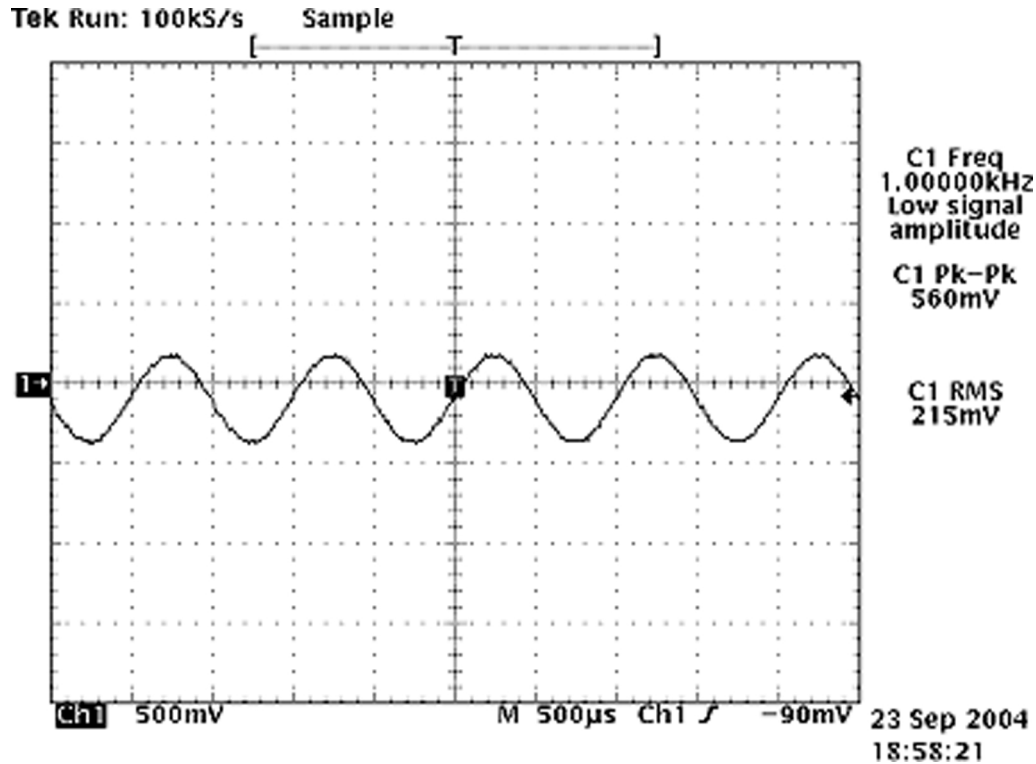
If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

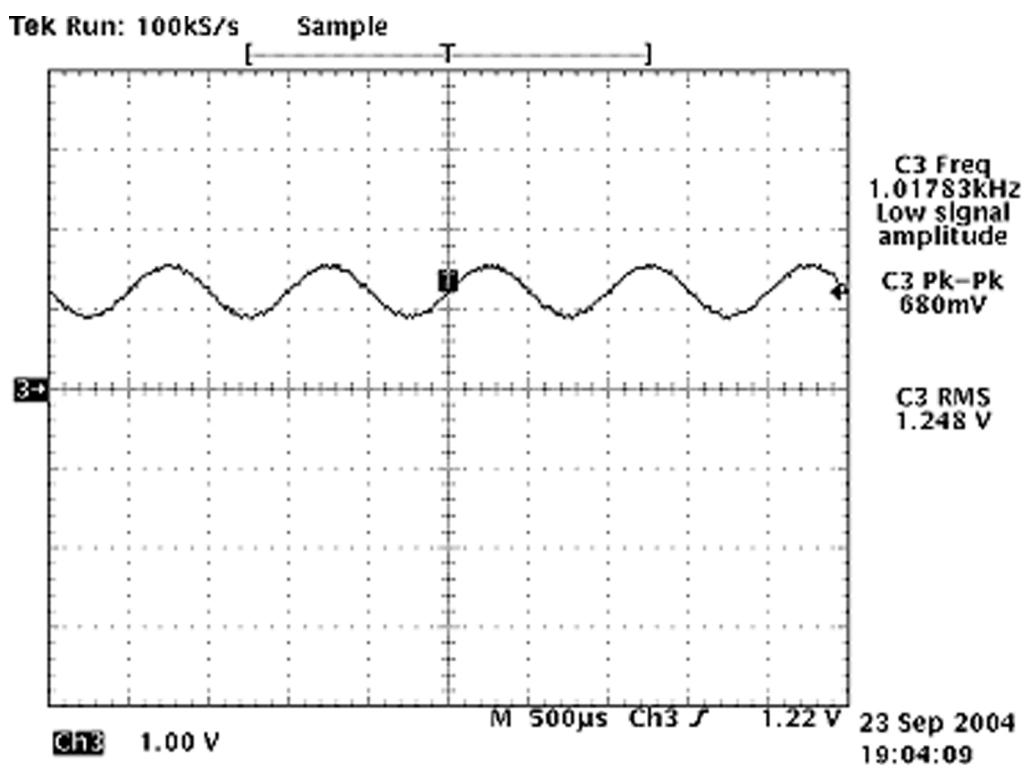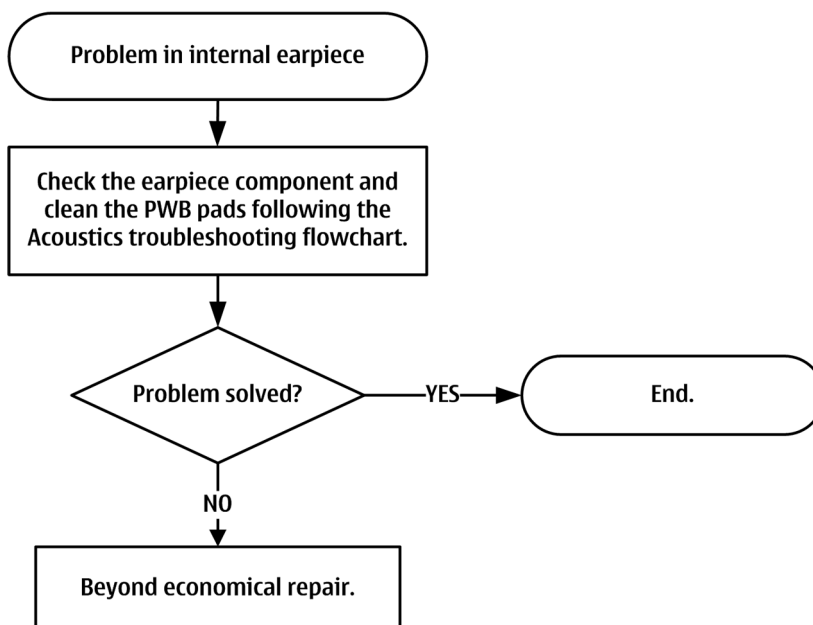**Figure 11 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.**

Figure 12 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

Internal earpiece troubleshooting

Troubleshooting flow

Internal microphone troubleshooting

Troubleshooting flow

```
        ╭──────────────────────────────╮
        │ Problem in internal microphone│
        ╰──────────────────────────────╯
                      │
                      ▼
        ┌──────────────────────────────┐
        │   Set Phoenix audio routing to│
        │         HP_in_Ext_out         │
        │             mode.             │
        └──────────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────────┐
        │   Check the Clapton microphone.│
        │  Change if necessary and retest.│
        └──────────────────────────────┘
                      │
                      ▼
              ◇ Problem solved? ◇──────────────────────────── YES
                      │
                     NO
                      │
                      ▼
  ┌──────────────────────────────┐         ┌──────────────────────────────┐
  │ Check L2130, L2131 and R2120. │─If faulty→│  Beyond economical repair.   │
  └──────────────────────────────┘         └──────────────────────────────┘
                      │
                      ▼
              ◇ Problem solved? ◇────────── YES
                      │
                     NO
                      │
                      ▼
  ┌──────────────────────────────┐         ╭──────────────────────────────╮
  │  Beyond economical repair.   │         │      Problem solved.         │◄──
  └──────────────────────────────┘         ╰──────────────────────────────╯
```
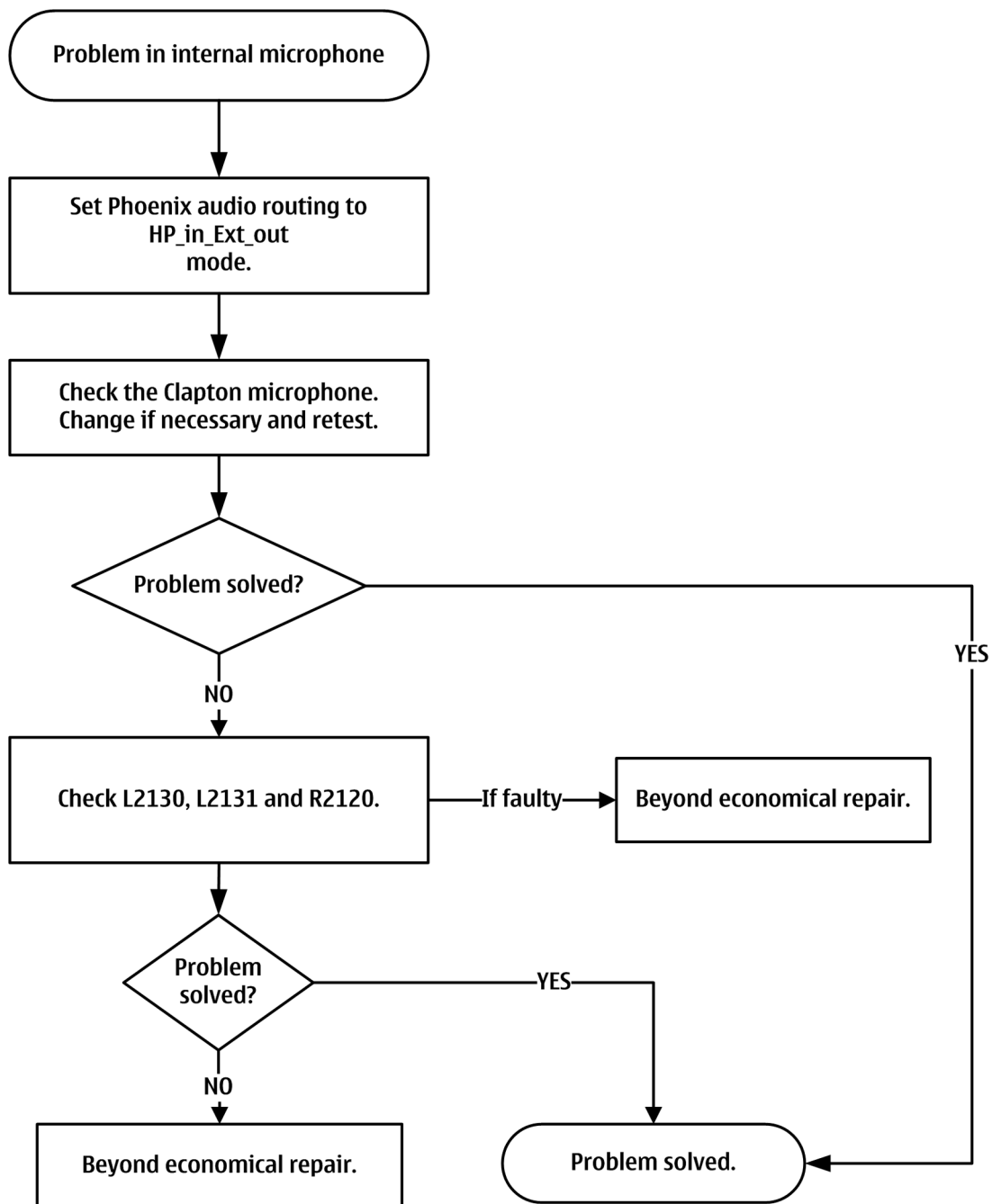
Internal handsfree (IHF) troubleshooting

Troubleshooting flow

Problem in internal handsfree (IHF) speaker

↓

Check the speaker module and clean the PWB pads following the Acoustics troubleshooting flowchart.

↓

Problem solved? — YES →

NO ↓

Check the signal path between EM ASIC and speaker pads.
Check L2102 and L2103.

↓

Problem solved? — YES →

NO ↓

Beyond economical repair.   Problem solved.

External earpiece troubleshooting

Troubleshooting flow

```
┌─────────────────────────────┐
│ Problem in external earpiece │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Set Phoenix audio routing to │
│ HP_in_Ext_out mode and activate│
│ related audio paths if necessary.│
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Check and clean the AV connector│
│ contacts. Replace the AV connector if│
│ necessary.                   │
└─────────────────────────────┘
              │
              ▼
        ◇ Problem solved? ◇ ──────────────────────────────┐
              │ NO                                          │
              ▼                                             │
   ◇ Can you hear      ◇  ──NO──►┌──────────────────┐      │
   ◇ your own voice in ◇         │ Check the audio path│    │
   ◇ the headset and DC◇         │ between EM ASIC and AV│  │
   ◇ level is 1.35V?   ◇         │ connector. Check L2106 and│ │
                                  │ L2132.            │      │
                                  └──────────────────┘      │
                                          │                  │
              │ YES              ◇ Levels OK? ◇ ──NO──►┌──────────────┐
              │                           │            │ Beyond economical│
              │◄────────YES───────────────┘            │ repair.       │
              ▼                                          └──────────────┘
   ◇ Does audio    ◇ ──NO──►┌──────────────────────────┐
   ◇ work during a ◇         │ Beyond economical repair. │
   ◇ call?         ◇         └──────────────────────────┘
              │ YES                                    YES
              ▼                                         │
┌─────────────────────────────┐◄──────────────────────┘
│     Problem solved.          │
└─────────────────────────────┘
```

External microphone troubleshooting

Troubleshooting flow

```
                    ┌──────────────────────────────┐
                    │ Problem in external microphone │
                    └──────────────┬───────────────┘
                                   │
                                   ▼
                    ┌──────────────────────────────┐
                    │  Set Phoenix audio routing to │
                    │  Ext_in_HP_out mode and activate │
                    │  related audio paths if necessary. │
                    └──────────────┬───────────────┘
                                   │
                                   ▼
                    ┌──────────────────────────────┐
                    │  Check and clean the AV connector. │
                    │  Replace the AV connector if │
                    │  necessary. │
                    └──────────────┬───────────────┘
                                   │
                                   ▼
                          ◇ Problem solved? ◇──────────────────────────────────┐
                                   │                                           │
                                   NO                                          │
                                   ▼                                           │
                    ┌──────────────────────────────┐                          │
                    │  Measure DC-voltage from the XMICP │                     │
                    │  pad against GND. │                                      │
                    └──────────────┬───────────────┘                          │
                                   │                                           │
                                   ▼                                           │
                          ◇ Is the bias voltage 2.1V ◇───────────┐             │
                          ◇ measured from XMICP ◇                │             │
                          ◇ (J2106)? ◇                           NO            │
                                   │                             │             │
                                   YES                           │             │
                                   ▼                             │             │
                    ┌──────────────────────────────┐             │            YES
                    │  Check the signal path activating │         │            │
                    │  Ext_in_HP_out mode and activate │          │            │
                    │  related audio paths if necessary. │        │            │
                    └──────────────┬───────────────┘             │             │
                                   │                             │             │
                                   ▼                             │             │
                          ◇ Can you hear ◇──NO──┐   ┌────────────▼──────────┐  │
                          ◇ your own voice from ◇    │ Beyond economical repair. │ │
                          ◇ the headset? ◇           └───────────▲───────────┘  │
                                   │                             │              │
                                   YES                           │              │
                                   ▼                             │              │
                          ◇ Does audio ◇──NO───────────────────┘               │
                          ◇ work during a ◇                                     │
                          ◇ call? ◇                                             │
                                   │                                            │
                                   YES                                          │
                                   ▼◄───────────────────────────────────────────┘
                    ┌──────────────────────────────┐
                    │       Problem solved. │
                    └──────────────────────────────┘
```

Acoustics troubleshooting

Introduction to acoustics troubleshooting

Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by the speaker. The acoustics of the phone include three basic systems: earpiece, integrated handsfree (IHF) and a Clapton microphone.

The sound reproduced from the earpiece readiates through a single hole on the front cover (A-cover). The sound reproduced from the IHF speaker radiates from the sound holes located on the bottom part of the phone.

For a correct functionality of the phone, all sound holes must be always open. When the phone is used, care must be taken not to close any of those holes with a hand or fingers. The phone should be dry and clean, and no objects must be located in such a way that they close any of the holes.

Earpiece troubleshooting

Troubleshooting flow

```
                    ┌─────────────────────────┐
                    │   Problem in earpiece    │
                    └─────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │   Check that earpiece hole is open. │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │        Disassemble A-cover.         │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │  Check earpiece spring condition and│
              │    earpiece dc-resistance (32 Ohm)  │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │   Check that the window is positioned│
              │    properly for sufficient sealing  │
              │    effect, and check that gasket next│
              │      to earpiece is sufficient.     │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │ Check that nothing is affecting the │
              │  dust protection material by looking│
              │      through earpiece outlet.       │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │ Check that nothing is affecting the │
              │      rear side of the earpiece.     │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │ Check that pad layout is not damaged│
              │       or affected by corrosion.     │
              └───────────────────────────────────┘
                                 │
                                 ▼
              ┌───────────────────────────────────┐
              │ Check that the component is working │
              │  correctly and is well assembled in │
              │            its place.               │
              └───────────────────────────────────┘
                                 │
                                 ▼
                            ◇ Is everything OK? ◇──NO──┐
                                 │                     ▼
                                YES            ┌────────────────┐
                                 │             │ Repair problem.│
                                 │             └────────────────┘
                                 ▼◄──────────────────┘
              ┌───────────────────────────────────┐
              │        Go to Audio flowchart.       │
              └───────────────────────────────────┘
```

IHF troubleshooting

Troubleshooting flow

```
                    ╭─────────────────────╮
                    │   Problem in IHF    │
                    ╰─────────────────────╯
                              │
                              ▼
                ┌─────────────────────────────┐
                │  Check that IHF holes are open. │
                └─────────────────────────────┘
                              │
                              ▼
            ┌───────────────────────────────────┐
            │ Remove the battery cover, A-Cover and │
            │ B-cover and disassemble the antenna   │
            │    assembly from the B-cover.         │
            └───────────────────────────────────┘
                              │
                              ▼
                ┌─────────────────────────────┐
                │            Check            │
                │    IHF dc-resistance (8 Ohm).   │
                └─────────────────────────────┘
                              │
                              ▼
            ┌───────────────────────────────────┐
            │  Check that the spring contacts of  │
            │      the IHF are not damaged or     │
            │  corroded and that the contact pads │
            │  on the PWB are also not corroded.  │
            └───────────────────────────────────┘
                              │
                              ▼
            ┌───────────────────────────────────┐
            │  Check that nothing is inside the IHF │
            │        front and rear cavity.       │
            └───────────────────────────────────┘
                              │
                              ▼
            ┌───────────────────────────────────┐
            │  Check that nothing is affecting the │
            │      dust protection material.      │
            └───────────────────────────────────┘
                              │
                              ▼
            ┌───────────────────────────────────┐
            │   Check that the component is       │
            │   working correctly and is well     │
            │     assembled in its place.         │
            └───────────────────────────────────┘
                              │
                              ▼
                          ◇ Is ◇
                       everything ───NO───┐
                          OK?             │
                           │              ▼
                          YES     ┌──────────────────┐
                           │      │  Repair problem.  │
                           │      └──────────────────┘
                           │              │
                           ▼◄─────────────┘
                ┌─────────────────────────────┐
                │     Go to Audio flowchart.    │
                └─────────────────────────────┘
```

NOKIA
Care

Microphone troubleshooting

Troubleshooting flow

Vibra troubleshooting

Troubleshooting flow

Problem in vibra

Activate Phoenix vibra control.

Check the vibra (M2100) on the Main Board.

Problem Solved?

NO

Check the signal path by activating vibra.

Vibra rotates?

NO → Check L2124, L2125, C2108, C2150 and C2151. → Vibra rotates?

NO

YES

YES

Does vibra work during incoming call (when set on)?

NO → Beyond economical repair.

YES

YES

Problem solved.
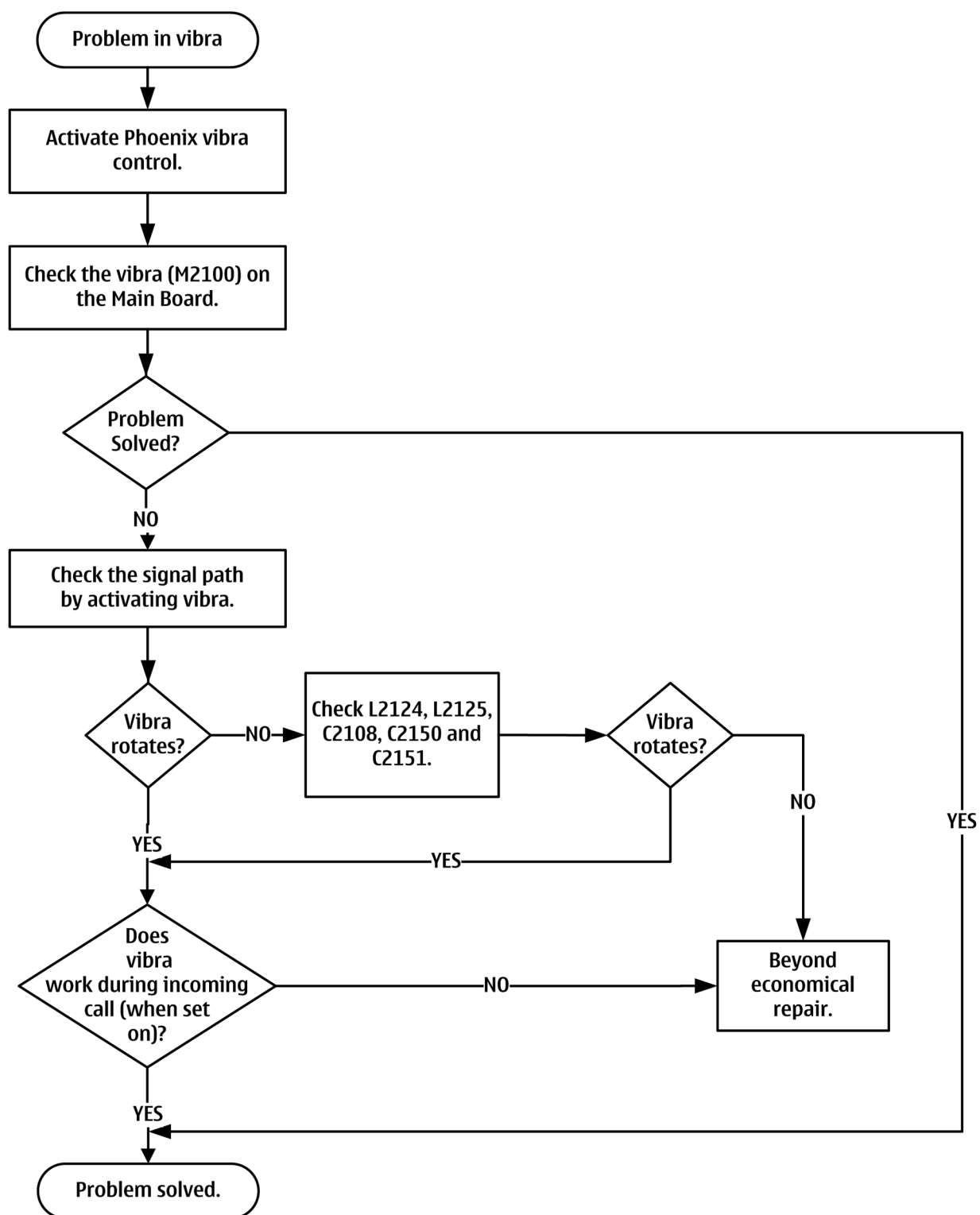
■ **Tucson troubleshooting**

Requirements

- Latest Phoenix Service Software
- "Tucson add on" package if one has been released between complete Phoenix releases
- FPS-10 or 21 Flash prommer updated with latest flash update package
- - Latest product specific data package, supporting for the variants you want to change the phones to. Certificate restoring without flashing does not require data packages to be installed
- SX-4 or SX-4T Smart Card, which has been registered for Tucson use in Nokia Online Security Device Master, and for which local Nokia Care has granted Tucson user rights
- BB 5.0 models:SS-46 with phone specific flash adapter connected to flash prommer
- DCT-4 models:JBV-1 with phone specific flash adapter connected to flash prommer
- Active online connection to internet, please refer to Technical Bulletins for IP addresses

Terms in Tucson

Certificate restore BB 5 and IMEI rebuild

When certificate restoring for BB 5 products or IMEI rebuild for DCT-4 products is performed, existing data from Nokia System is programmed in the phone. The phone will be in the same condition as it was when it left the factory for the first time.

If "Product Code Change" has been SUCCESSFULLY performed with Tucson after the phone left the factory, it will be restored back to the variant it was made into during Product Code change event.

It is recommended to perform "Restore" function without selecting "Flash Product" – option to avoid possible SW downgrade which causes the phone to die.

Product code change with Tucson connection

When Product Code change with Tucson is successfully performed, phone variant will be changed. Data for the new variant is extracted from Nokia System, and programmed in the phone.

After successful change, phone specific information in Nokia systems will match the new variant, and it can be used for e.g. certificate restoring. If you perform several product code changes, Nokia system will always be up to date with the latest successful event.

Failed / incomplete actions will not change the phone specific information in Nokia systems.

This function can be performed with or without flashing the phone with correct software, selection can be made by checking / unchecking the tick box on Phoenix UI.

Options for product code change

"van2var" is Tucson operation which you can change open (i.e. not Sim Locked) terminal to another variant, possibly creating a Sim Locked terminal. It only allows you to change to another open terminal or to locked one, but not back. Variant itself is any variation of terminal (some may be as simple as cover color, language, operator customization etc). Variants are either open or locked to some operator.

"var2var" is Tucson operation which allows you to create any compatible variant regardless what the source is or whether it is locked or not. You can for example take operator locked phones and create unlocked vanilla terminals out of them. Only few have this permission and it also requires use of SX-4T type Smart Card.

BB 5 downgrade

If BB 5 generation product is programmed with older software than already exists in the phone, it will become "dead". This happens if programming is done without Tucson connection.

When product code change with TUCSON is performed, it is possible to "downgrade" BB 5 product software to lower version. This is also valid for some of the latest DCT-4 models.

Software downgrade depends on the installed product specific data package and its product SW version. Phoenix will compare the product SW version to the SW versions it finds installed on you PC. If older SW for the new variant is found and needed, downgrade will be allowed during Tucson product code change event.

This function always requires the "Flash" option to be selected on Phoenix UI.

This function is ONLY possible in association with "Product Code Change" – function! If you try to downgrade SW during BB5 certificate restoring phone will become dead.

Please note that SW downgrade is not possible for all BB5 models, only those which support Data Package 2 concept.

Please note that product code must be changed during downgrade, procedure will fail if you try to downgrade SW version to older one and use the same product code as phone already has.

Information in Nokia online warranty check

Nokia Online follows the information in Nokia System. Please note that after product code change it takes approximately one working day for the new information to be updated to NOL.

In case you receive errors, please check phone information from NOL based on IMEI number.

PIN codes

4 Digit PIN for DCT-4 Flash

• Use "Smart Card Activator" – UI in Phoenix to request it from Nokia by email

• You have 3 attempts to enter this PIN correctly

• If you enter PIN incorrectly or forget it, you need to request it from Nokia again by using "Smart Card Activator" – UI in Phoenix

5 Digit TUCSON PIN for SX-4 use

• You will get PIN by email, when your smart card has been approved for Tucson use

• There is no limit to how many times this PIN can be entered incorrectly, but you are not allowed to use Tucson either.

• You are requested to change your password periodically

• If you enter Pin incorrectly you need to reactivate your Smart card for Tucson use

• If you forget the PIN you must re register the Smart Card from the start

6 Digit Smart Card PIN for SX-4T use

• You will get PIN by email, when your SX-4T smart card has been registered for Tucson use.

• You have 3 attempts to enter this PIN correctly

• If you enter PIN incorrectly the Smart Card becomes unusable and you need to request a new one

• If you forget the PIN you can request it from Nokia

Certificate restore BB5

• Connect phone and scan product, read phone information to check communication with phone.

• Open *Tools –> Menu*.

• Provide Tucson Password and PIN code which have been delivered to you by email. Please note that characters are case sensitive
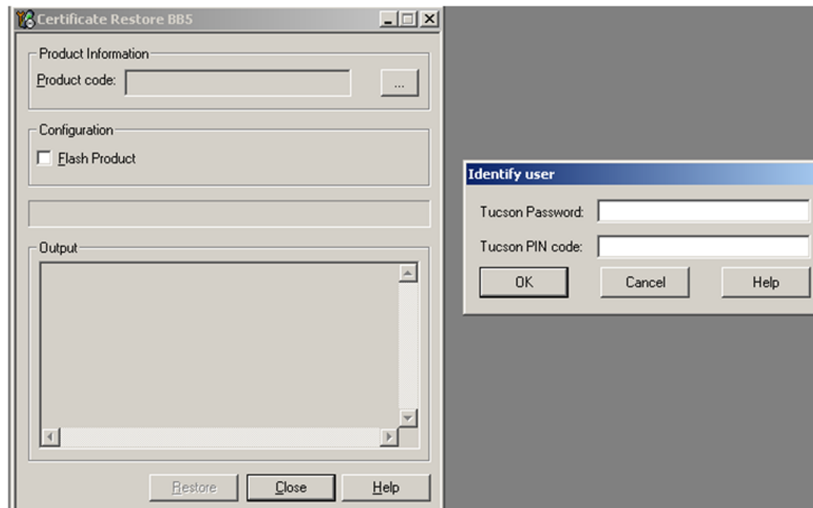
- Select OK, Phoenix will read product information from phone.

Product code shown on the UI does not matter, because during restoring it will be replaced by the product code which is the latest one stored in Nokia system.

It is recommended to perform "Restore" function without selecting "Flash Product" – option to avoid possible SW downgrade which causes the phone to die.
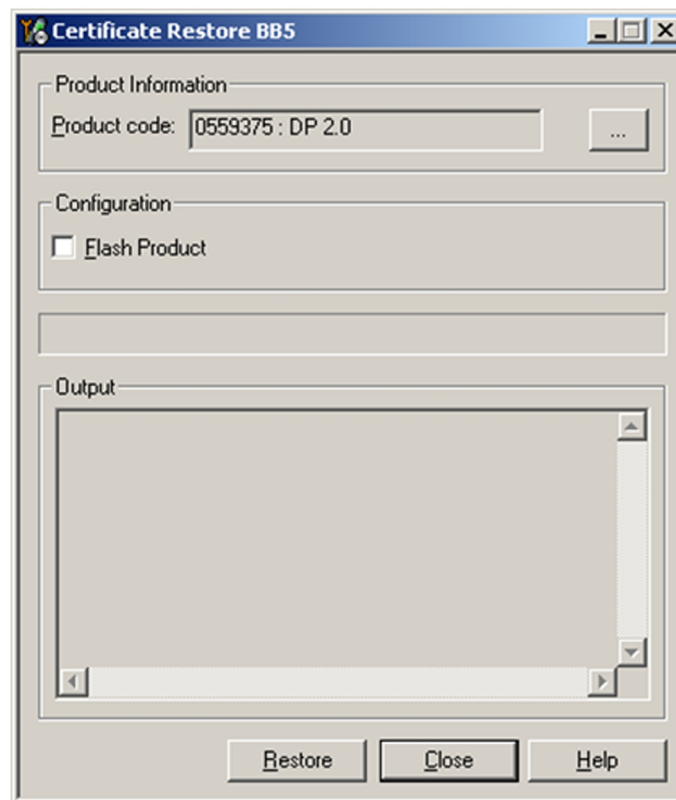
Information from phone and Smart Card are read and connection to Tucson server is established.
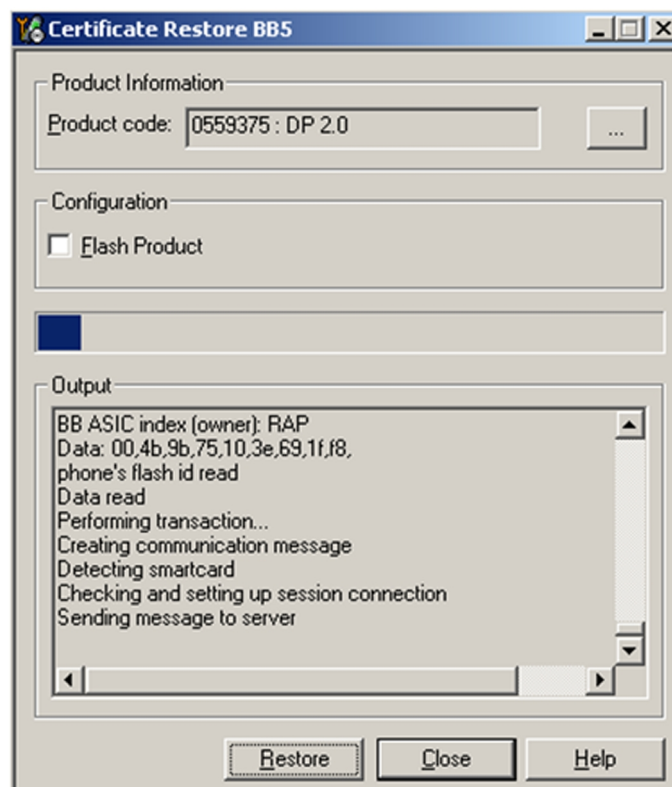
Information from Nokia system is retrieved and programmed in the phone
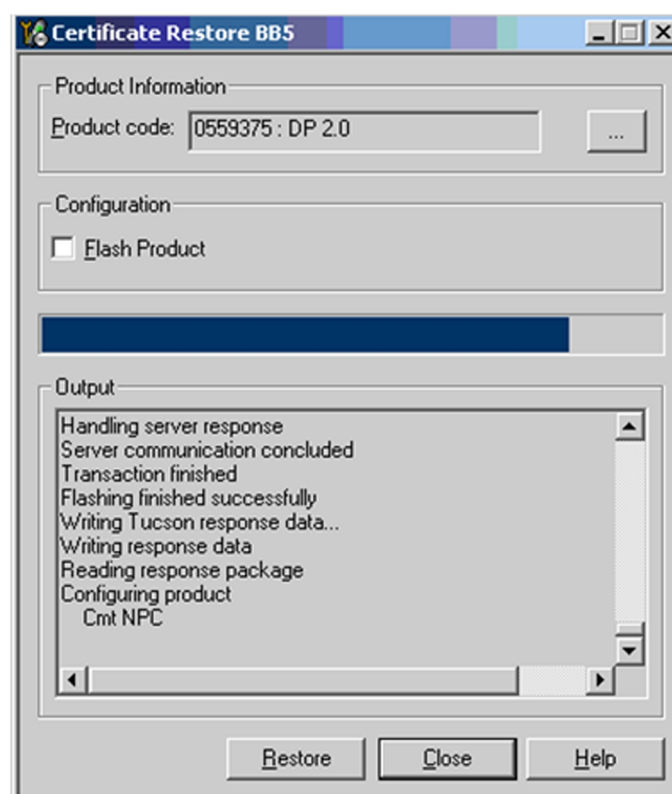
After programming confirmation about successful event is sent to Nokia system.
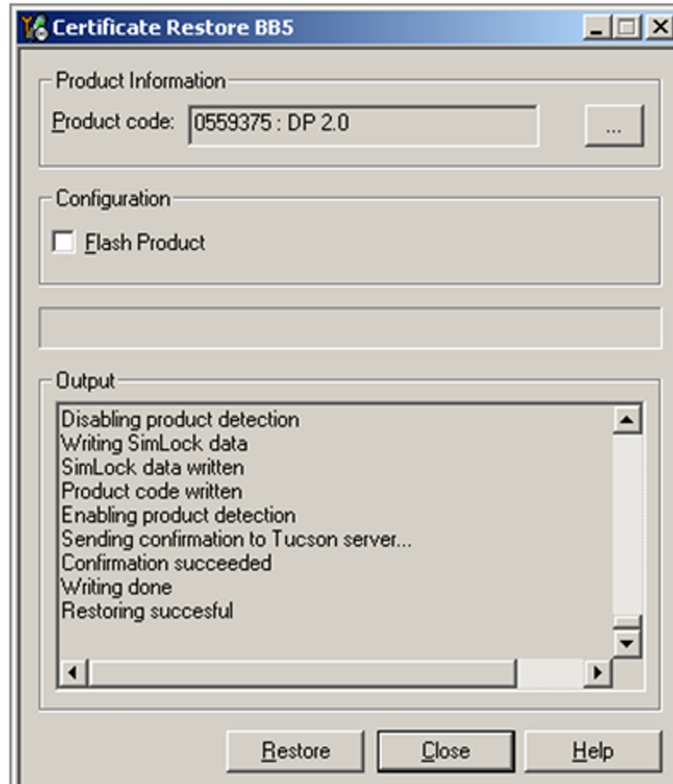
Product code change BB5

- Connect phone and scan product, read phone information to check communication with phone.

- Open "*Tools*" –> "*Product Code Change*" -> *Menu*

- Provide Tucson Password and PIN code which have been delivered to you by email. Please note that characters are case sensitive
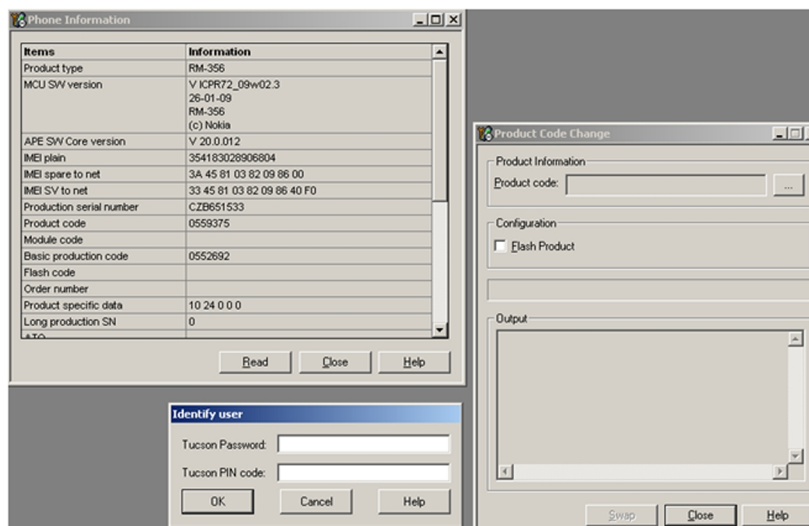
- Select product code of new variant from list.

If product code you want is not shown, please install correct data package including the variant.

- Select "*OK*" and "*SWAP*".
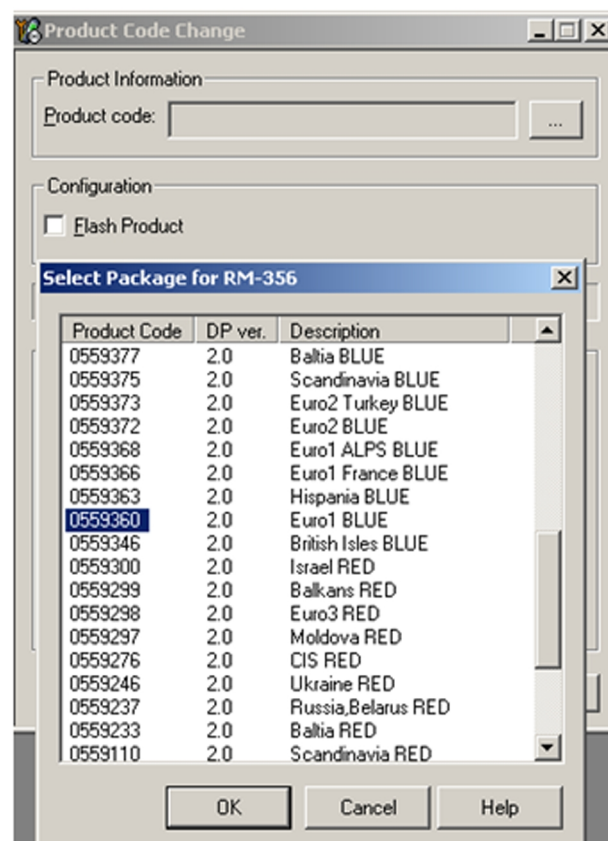
Information from phone is read and connection to Tucson server is established.
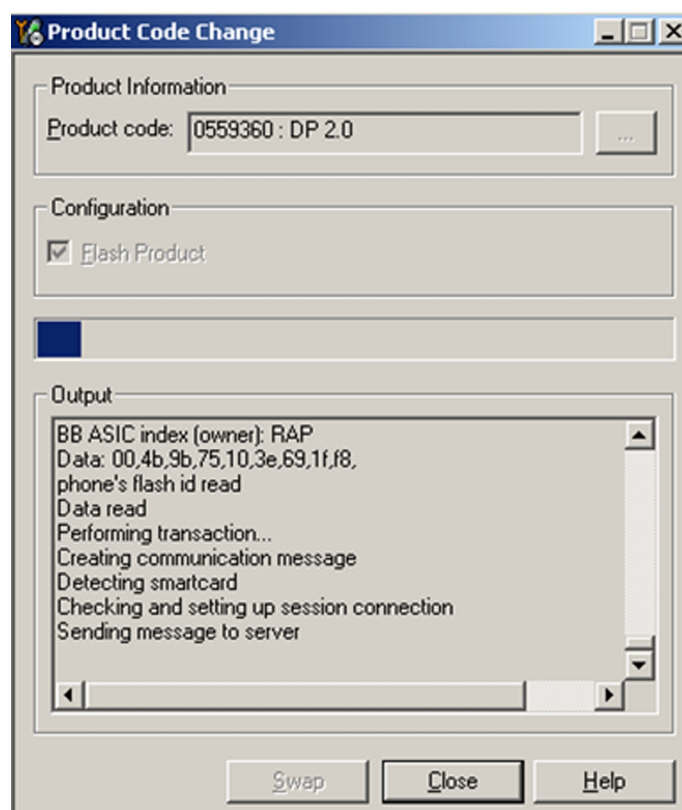
If "Flash Product" – option was selected, phone SW is programmed.
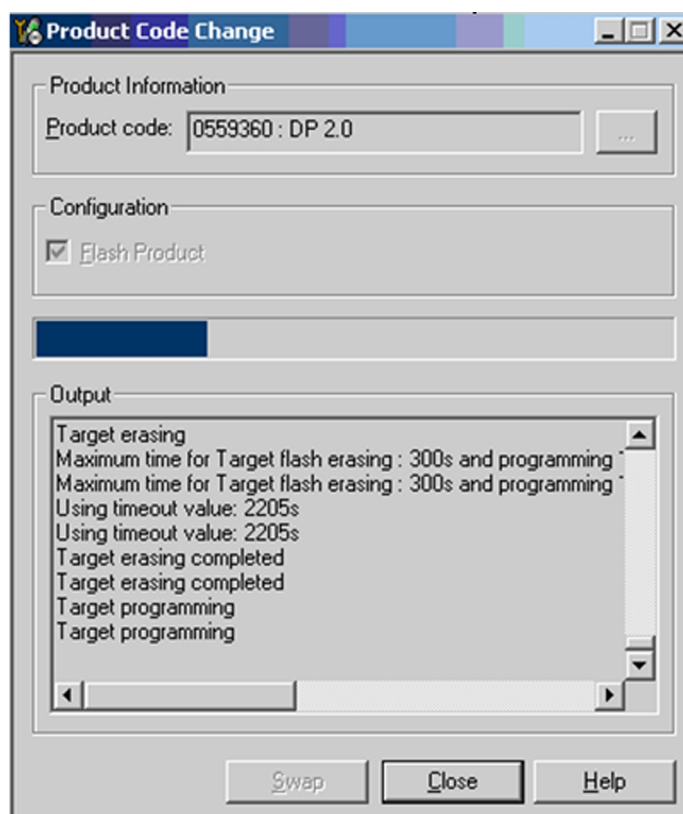
New data retrieved from Nokia system is programmed in the phone.
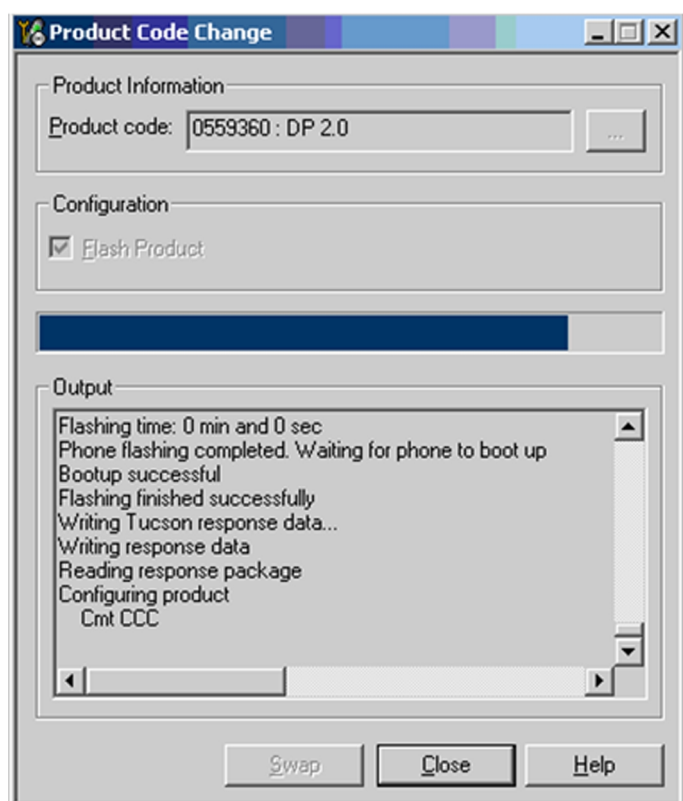
Confirmation about successful event is sent to Nokia system.
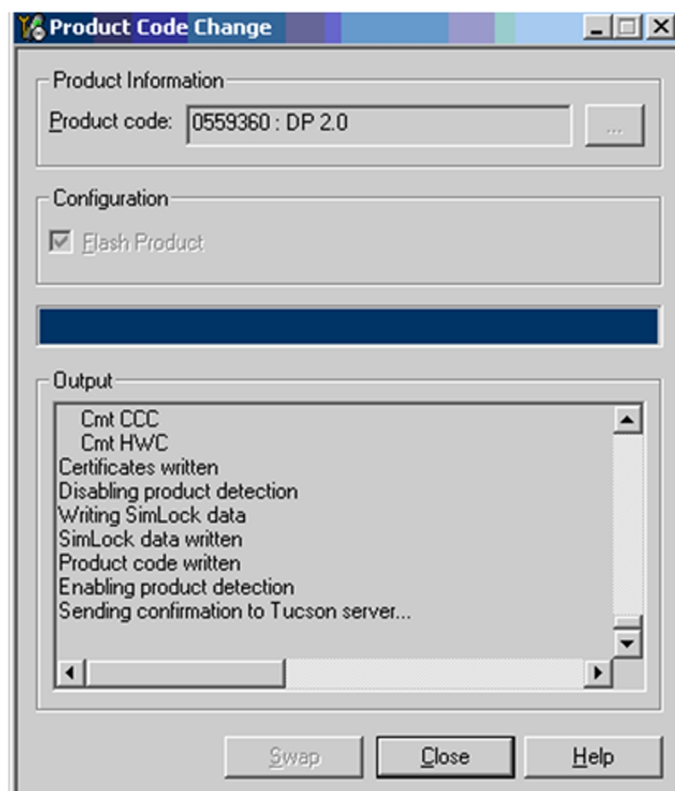
Phone has now been changed to another variant.

If there is need to restore the data, this information will be sent back to phone.

Warranty information in NOL will show the current information in about 24 hours
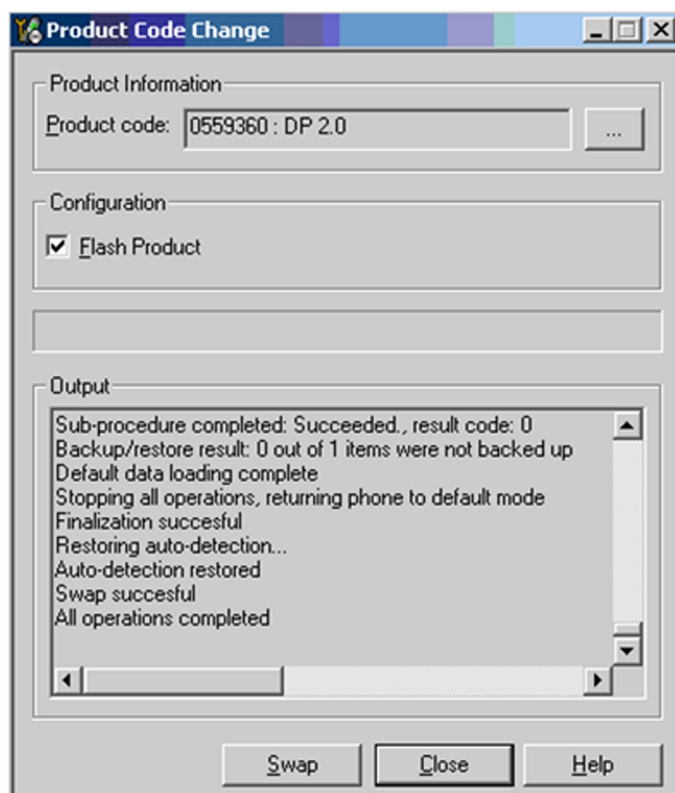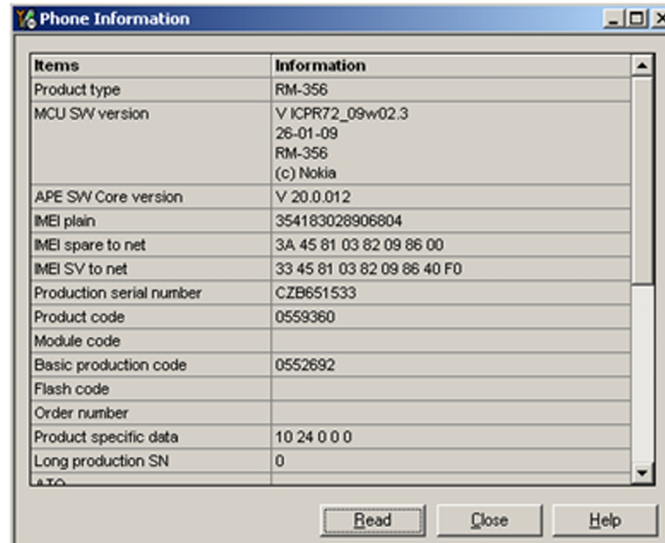
IMEI/ESN rebuild DCT-4

- Supply power to JBV-1 Docking station from an external power supply. Higher voltage is needed so that phone is forced in correct mode during procedure.

- Connect phone and scan product, read phone information to check communication with phone.

- Open *Tools –> IMEI / ESN Rebuild DCT-4 –> Menu*.

- Provide Tucson Password and PIN code which have been delivered to you by email. Please note that characters are case sensitive
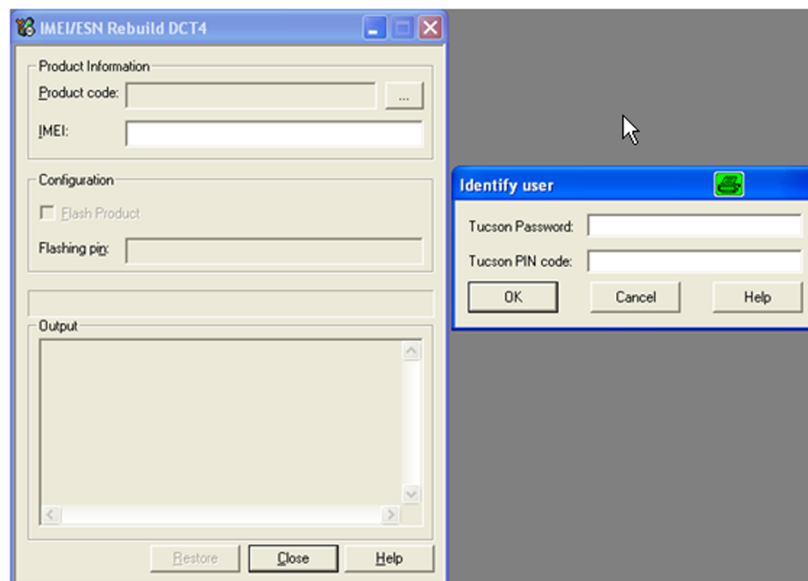
Product code shown on the UI does not matter, because during restoring it will be replaced by the product code which is the latest one stored in Nokia system.

Do not select the "Flash Product" – option!
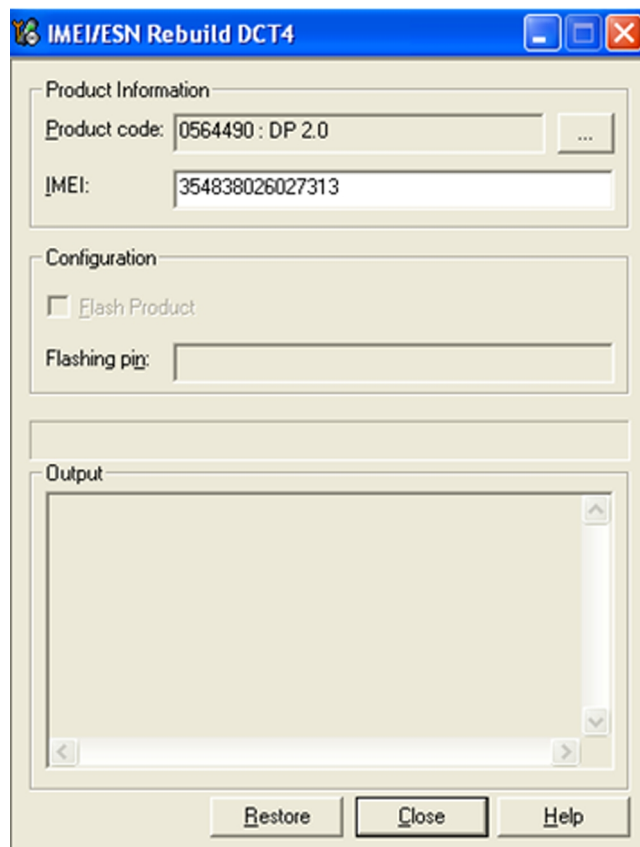
Information from phone is read and connection to Tucson server is established.

Information from Nokia system is retrieved and programmed in the phone.

Confirmation about successful event is sent to Nokia system.
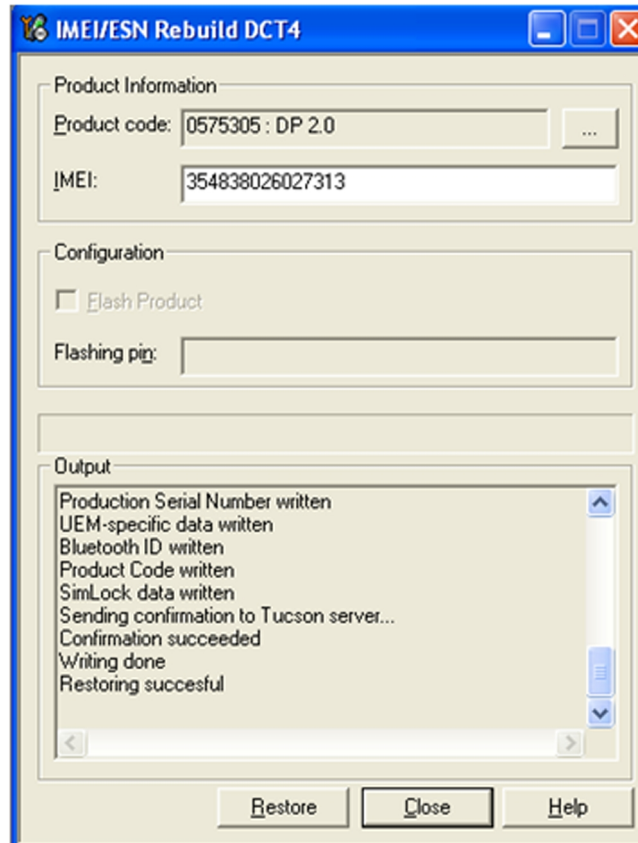
Product code change DCT-4

- Supply power to JBV-1 Docking station from an external power supply. Higher voltage is needed so that phone is forced in correct mode during procedure.

- Connect phone and scan product, read phone information to check communication with phone.

- Open *Tools –> Product Code Change DCT-4 –> Menu*.

- Provide Tucson Password and PIN code which have been delivered to you by email. Please note that characters are case sensitive.

- Do not select the "Flash Product" – option!
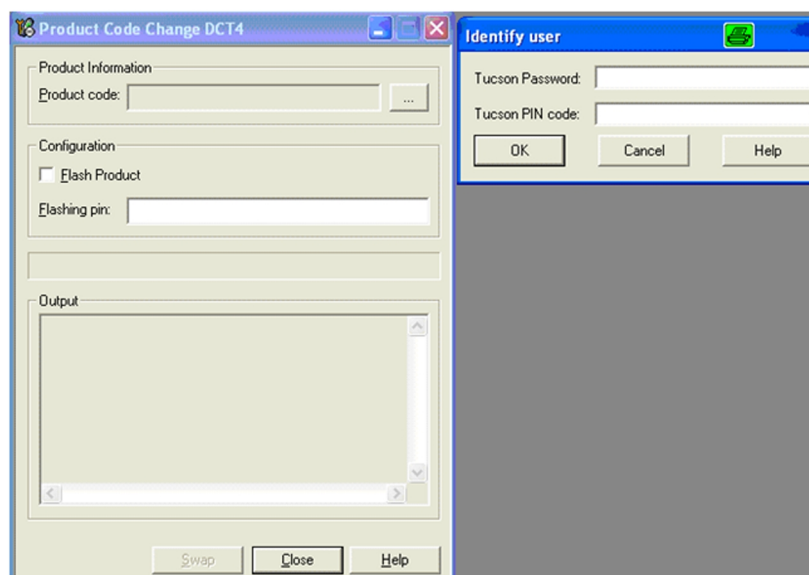
- Select product code of new variant from list.

If product code you want is not shown, please install correct data package including the variant.

- Select "*OK*" and "*SWAP*".

Information from phone is read and connection to Tucson server is established.

Information from Nokia system is retrieved and programmed in the phone.

Confirmation about successful event is sent to Nokia system.

Phone has now been changed to another variant.

If there is need to restore the data, this information will be sent back to phone.

Warranty information in NOL will show the current information in about 24 hours.
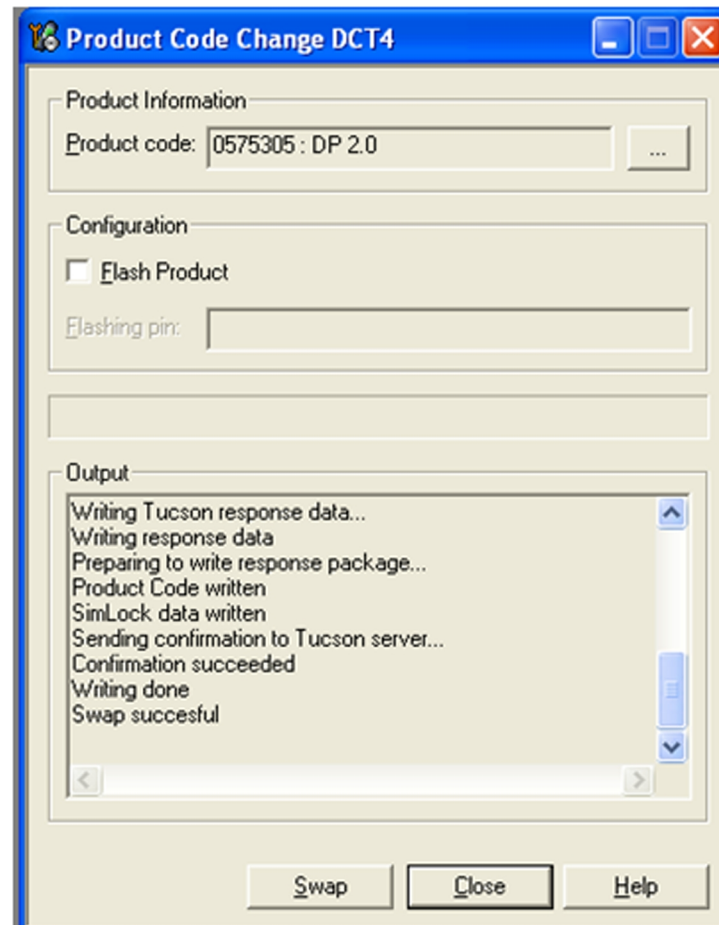
Use of SX-4T smart card in product code change

Operations with SX-4T type smart card are exactly the same as with SX-4.

The only difference is an extra 6 digit PIN code which is required to complete variant changes concerning SIM locked variants (variant to variant changes).

You will be requested to enter this PIN when connection to Tucson server has been established and system detects that you are trying to modify a locked variant.
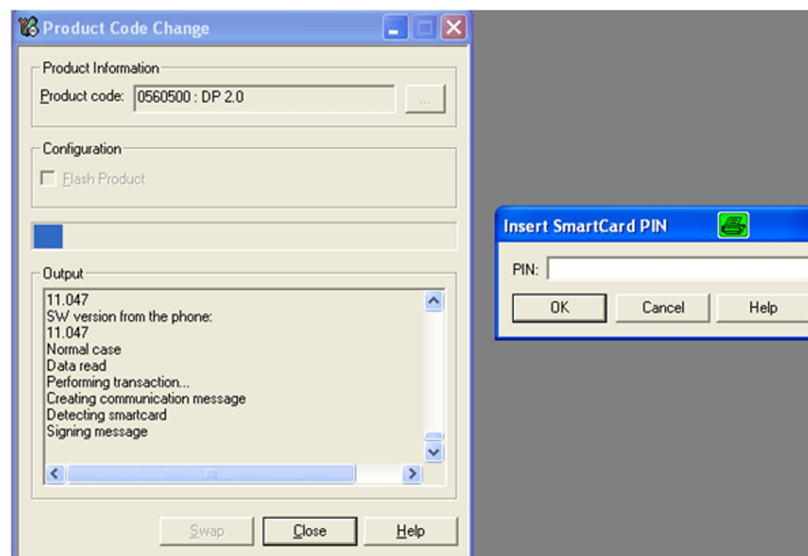
Flash pin for DCT-4

- Flash PIN is needed for programming the DCT-4 generation products.
- It can be acquired from Tucson system.
- Open *Tools* –>" *Smart Card Activator*" menu.
- Provide Tucson Password and PIN code which have been delivered to you by email. Please note that characters are case sensitive.
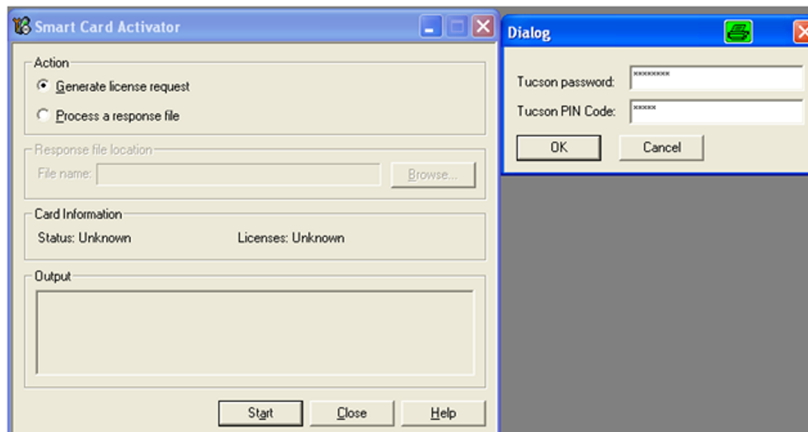
- Select "Generate License Request" and "Start".
- Request will be sent to Tucson system, you will receive response with file attachment via email.
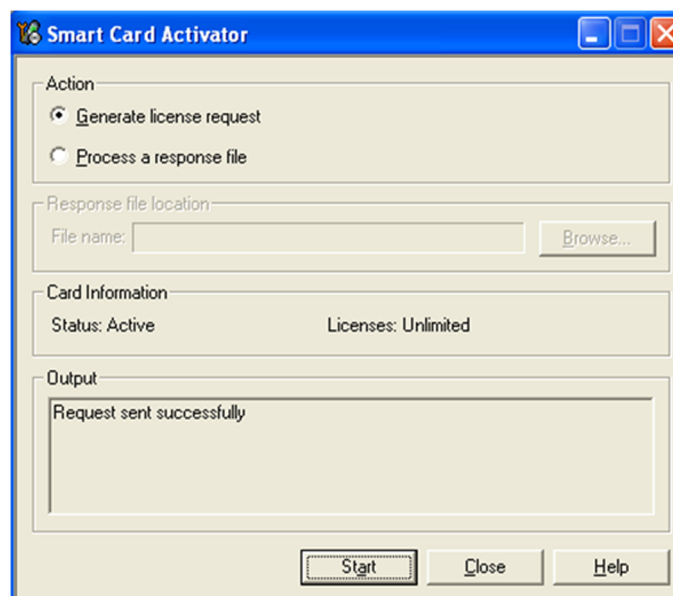
- When you receive response file by email, please save it to a file on your PC
- Open " *Tools*" – " *Smart Card Activator*" – menu
- Provide Tucson Password and PIN code which have been delivered to you by email. Please note that characters are case sensitive
- Select " *Process License Request*".
- Browse to the location where you have saved the response file and select " *Open*".
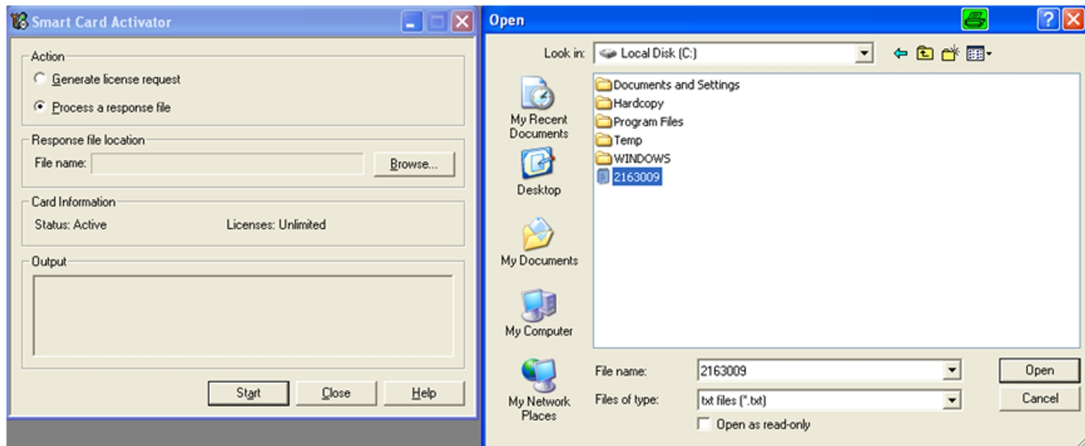
You will see the PIN Code on the UI, and it is also written in the response file.
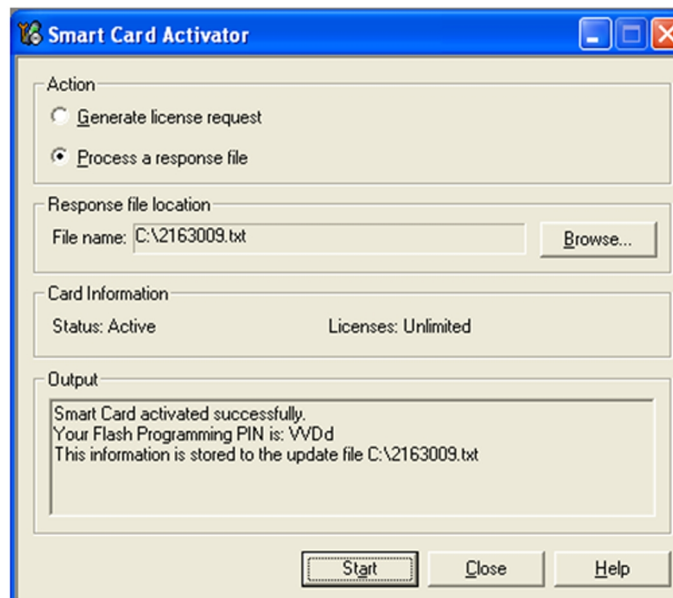
When programming DCT-4 generation phones, you must enter the PIN code to "*Options*" – UI in "*Firmware Update*" – menu.
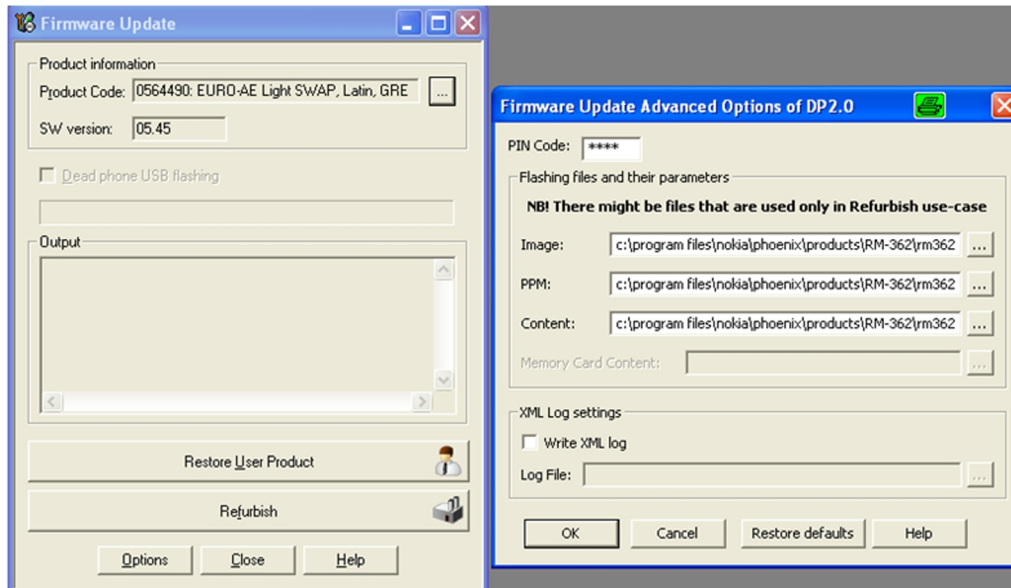
Troubleshooting

*
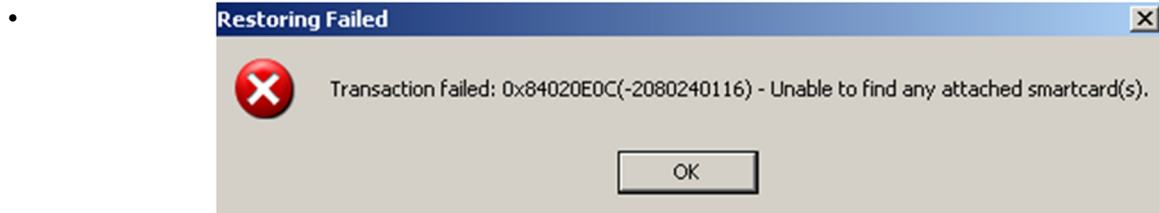
Please check that the Smart Card you use is properly connected to the flash prommer.

Please try another card / prommer combination.

*
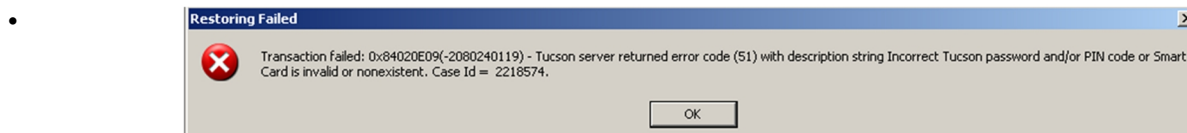
Please retry and check that your password and PIN are correct.

Please check that the Smart card you are using has been registered to NOL Security Device Master.

*
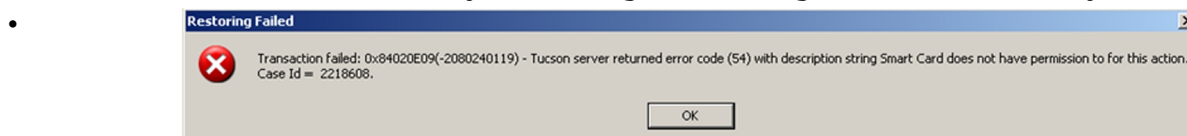
Please check that the Smart card you are using has been approved for Tucson use.

When card has been approved you should have received confirmation by email from local Nokia care. Please check with local Nokia care support if needed.

*
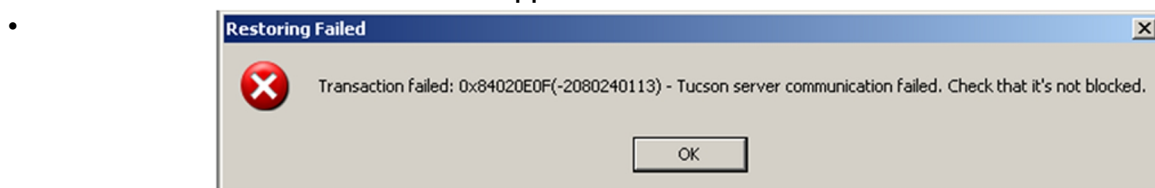
Please check that your internet connection works.

Open browser and see if you can open any internet page normally.

Check that your firewall settings allow PC / Phoenix to reach Tucson server.

Restart PC and Phoenix.

-
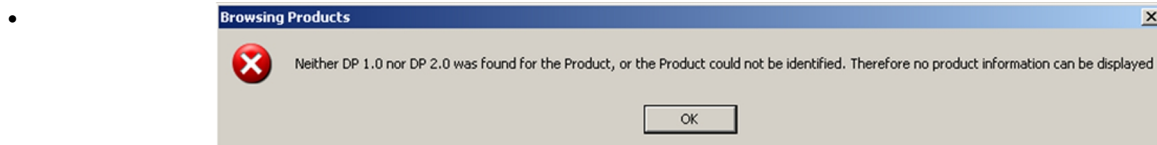
Please check that data package supporting the product code is installed.
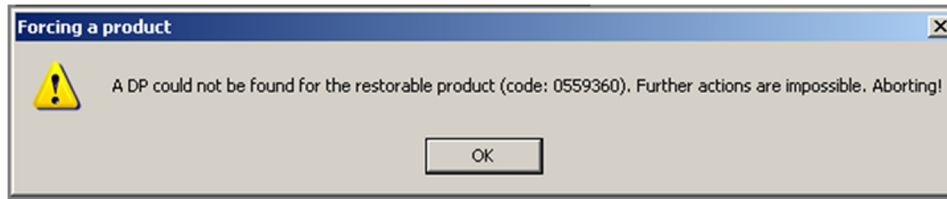
Please check that data package supporting the product code is installed.
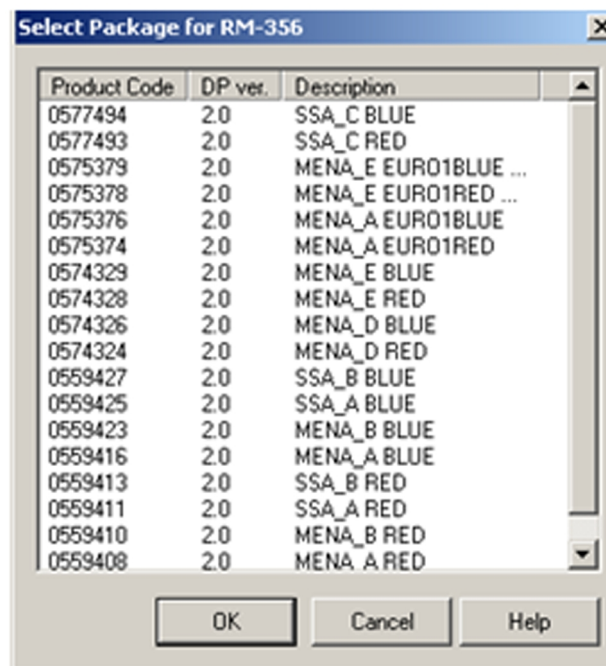
IF YOU CAN NOT SEE THE PRODUCT CODE YOU WANT TO CHANGE THE PRODUCT INTO.

Please check that data package supporting the product code is installed.

-
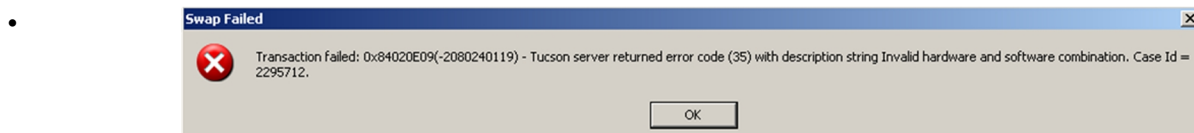
During product code change involving product SW downgrade Tucson system checks for all HW and SW combinations which have been made in Factory.

If Tucson procedure fails because of the invalid HW/SW combination, the combination is not possible. This can not be changed in any way. The HW your phone has not been manufactured with SW.

The HW information is coming from Nokia system, editing the HW version with Phoenix does not help in this case.

The only thing that can be done is to try to use the phone for another variant where the HW / SW combination is allowed.

Please note that phone SW may have been updated offline without Tucson connection.

Always check that you have the latest data package supporting the new product code installed, because the latest data packages always include the latest / highest suitable HW / SW combinations. If you have old DP´s installed, system may interpret the case as downgrade and prevent it even if combination with newer product SW would be possible.

If you have access to the SWAP data packages including the lowest possible software, you can try to create a SWAP phone first and then try to change the variant to some custom transceiver code.

-
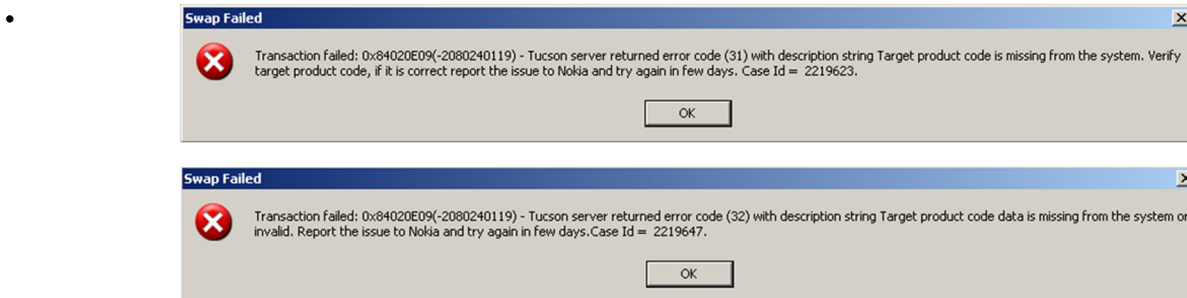
Original or new Product Code is missing from system.

Please wait for a few working days and retry.

Failed attempt will trigger data recovery in Nokia systems, data will be restored but it takes some time.

Please also check that the product code can be found from an official data package.

If problem is not solved after some working days, please report issue to Nokia.

-
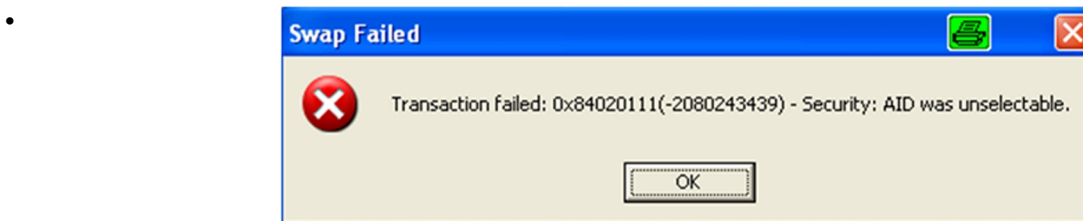
The Smart Card you are using is not authorized to perform this operation.

Please use SX-4T Smart Card for this procedure.

-
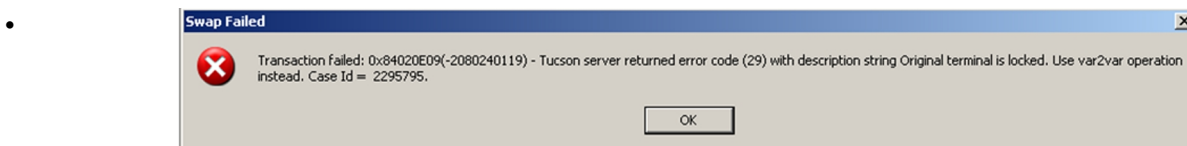
Data in system indicates that the phone should be SIM Locked.

Please try to use the Certificate Restore operation.

It is not possible to process the phone further unless successful Certificate Restore operation is done, and the data in phone matches the data in Tucson system.

After successful Certificate Restore operation SX-4T type card needs to be used to process the phone further. This is valid if you want to change the variant into another locked variant, or some unlocked variant.

You can always check the SIM lock status by using the "SIM Lock Status" – menu in Phoenix

-
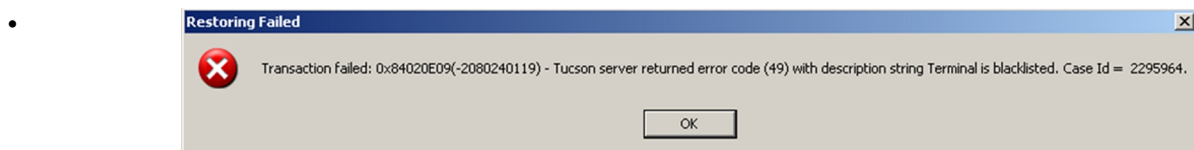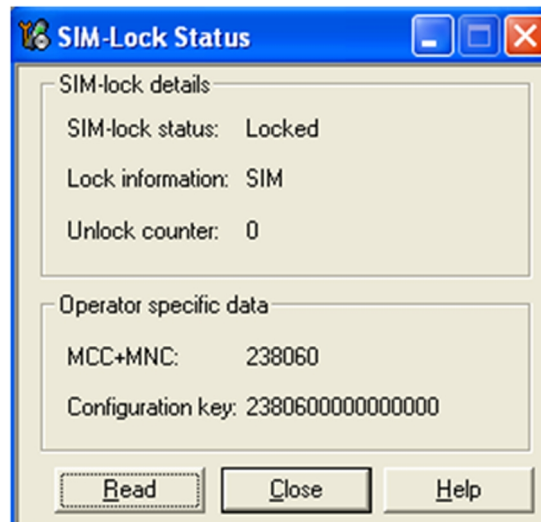
Phone is not supported in Tucson system, because it has been reported as scrapped or it has been blacklisted due to some other reason. Further actions are not possible.

-
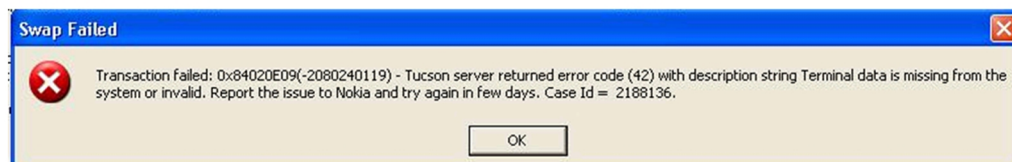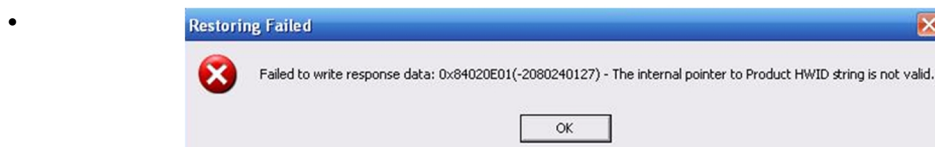
Phone specific data missing from system.

Examples shown above are for missing HW version, other variation of this error can be related to SIM Lock or a certificates.

Missing data is automatically retrieved and corrected within one working week.

Please wait for one working week.

-
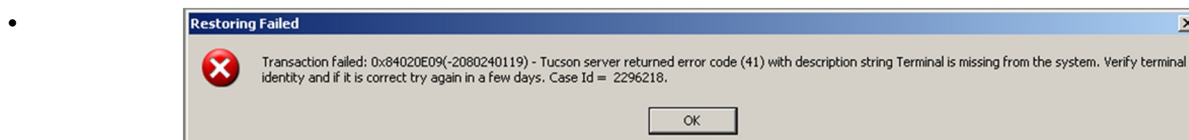
Please report issue to Nokia.

Common things to be checked in case of problems

Please check that communication between phone and Phoenix works

- Check connection manager for correct connection type

- Check communication between Phoenix and prommer by using "Prommer Maintenance" - menu. If prommer SW version is read successfully, communication is OK

- Check communication to phone by using "Product Information" – menu. If phone information is read successfully, communication is OK

- Check tools and cables

- Restart Phoenix and / or PC you are using, reset prommer and recreate connection

Check that your internet connection is working

- Try to browse any web page in internet, like http://www.nokia.com/ . If not, check that the settings on your PC allow web access. Try restarting PC.

Check that the data package on your PC includes support for the product code you try to restore or change the product code into.

- Open "Firmware Update" – menu and see if the product code you need is visible. If not, install DP supporting the product code

If you experience problems with "Flash" – option selected

- Try to run the same procedure without "Flash" – option selected

- If procedure is OK without "Flash" – option, please try to flash the product SW separately by using "Firmware Update" – menu

- If flashing fails, are you getting the same errors at same phase of the process as you get when you try restore or product code change with flash option selected?

If "Product Code Change" fails

- Check the status of phone from NOL "Warranty Check". Does the information in NOL match the current status of phone? Please note that it may have been processed offline without Tucson connection.

- If Product code change fails, always try the restore – procedure first so information in phone will match the information in Nokia system, and then try to change the product code.

If you experience problems with DCT-4 models when using the FPS-21 Flash Prommer, please try FPS-10 instead.

Some phone software versions request SIM Lock data to be written in wrong format. In this case you should use a special _tcsclient.dll_ - version, which writes the data in correct format. Please see technical bulletin documents for details.

Error reporting to Nokia

If you are not able to solve problems locally, a case can be escalated to local Nokia care or by using the GENIUS tool directly.

Following information should be attached to the Genius case:

- Service Software versions used (Phoenix, prommer SW)

- Product software version. If version change (upgrade old -> new or downgrade new-> old) is involved, both software versions are needed

- Data package version

- Variant version / product code. In case of variant change both old and new product codes are needed

- Connection method to phone, tools used (prommer, cables, adapters)

- Screenshot of error with TUCSON LOG ID

- Screenshot of "Phone information" UI

- IMEI number and date of event

- If log files are needed, they will be requested. If DLog tool is available, it is recommended to attach the logs in the case
- Brief step by step description about how the error can be reproduced
- Serial number of SX-4 or SX-4T smart card used

If you are requested to wait for some days, please do so. The system will try to recover any missing information, and most phones will pass after some working days. If phone still does not pass after 4-5 working days, it is OK to escalate the case to Nokia. Most phones will pass if you wait.

If the problem can not be solved, and you escalate the case to Nokia, please keep the problematic phones available for further tests. You may be required to try again or return the problematic phone(s) to Nokia.

If you escalate a case, please do not report problems concerning different phones or phone types under the same issue if the case is sent back to you. The case should always concern the same phones and types which originally had the problem. For example, if you escalate a case for RM-159 models and certain IMEI numbers, please do not escalate the case back with problems concerning other IMEI numbers or phone types. Please create new cases. Common problem is that the content and problems in the case change, which makes the troubleshooting very difficult as the original problem and phones in question change into something completely different.

Tucson Log ID is very important information. Based on the Error ID it is possible to trace the problem in system.

■ Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).

2. Start *Phoenix* service software.

3. Choose **File → Scan Product.**

4. Choose **Tuning → Energy Management Calibration.**

5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.

6. Check that the **CU-4 used** check box is checked.

7. Select the item(s) to be calibrated.

    Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

    The calibration of the selected item(s) is carried out automatically.

    The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-14	14
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2450	2800
VBAT Gain	15000	21900
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.

10. To end the procedure, close the *Energy Management Calibration* window.

4 — RF Troubleshooting

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Table of Contents

List of Figures

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■ General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- VAPAUS RFIC (N7500)
- TX FEM (N7520)
- WCDMA PA (N7540)
- Aura DC/DC converter (N7560)

Discrete components

In addition to the key components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by *visual inspection*.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

> **Note:** In-circuit measurements should be evaluated carefully.

Measuring equipment

All measurements should be done using:

- Module jig MJ-312
- Flash adapter FS-160
- Control unit CU-4/Interface adapter SS-46
- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10MOhm/8pF.
- A radio communication tester including RF generator and spectrum analyser, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyser and a RF generator can be used. However, some tests in this guide are not possible to perform if this solution is chosen).

> **Note:** A mobile phone WCDMA transmitter should never be tested with full TX power (only if it is possible to perform the measurement in a good RF-shielded room). Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.

> **Note:** All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

Level of repair

The scope of this guideline is to verify functionality of the cellular RF block without removing RF shield.

Instructions for finding the faulty component are provided in some cases, but the whole engine PWB (system module) still needs to be swapped, even when a single component is faulty.

■ Auto tuning

Introduction to auto tuning

This phone can be tuned automatically.

Auto tune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/XP) with GPIB card
- PK-1/PDK-1 service dongle
- Power supply
- Product specific module jig
- Cables: RF cable XRF-1, USB cable, GPIB cable and DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter or one device including all.
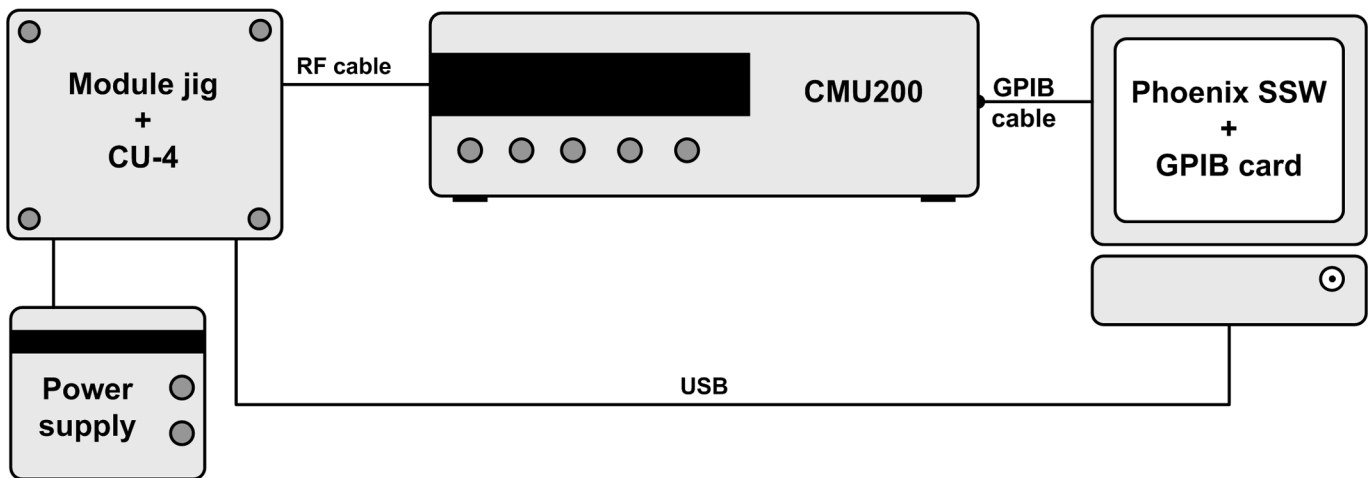
Figure 13 Auto tuning concept with CMU200

Auto tuning procedure

Prerequisites

Install the phone-specific data package, e.g. *Nokia_firmware_RM721/RM722_DP20_3.471__sw-1.00.exe*.

The data package defines the phone-specific settings.

Steps

1. Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.
2. Go to loss settings by selecting **Tuning (Alt_U)** → **SET LOSS** from the menu.
3. Set the loss between CMU200 and the phone. (Total loss = cable + jig)
4. Go to auto tuning by selecting **Tuning (Alt_U)** → **Auto-tune (Alt_A)** from the menu.
5. Start auto tuning by clicking the **Tune** button.

■ Self test troubleshooting
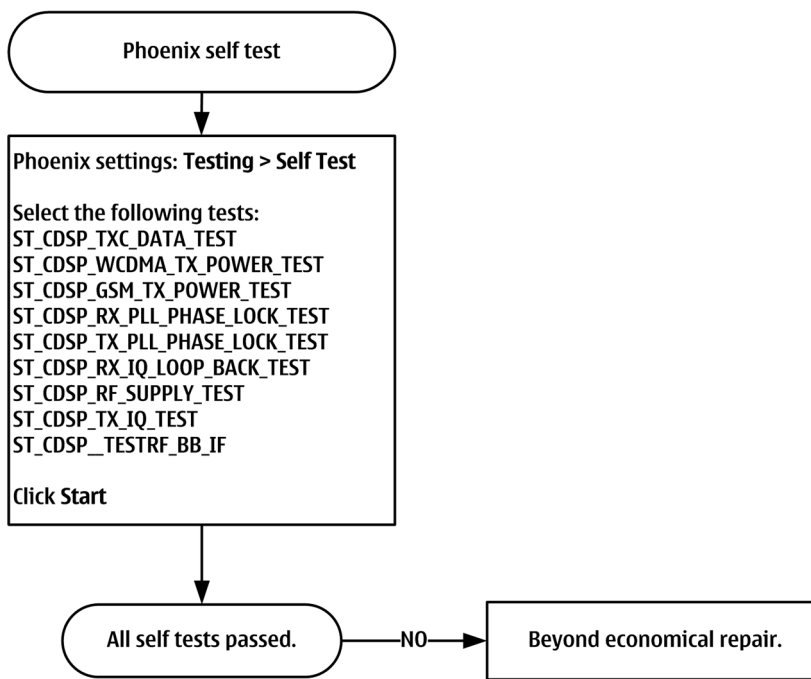
Phoenix self test troubleshooting

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting* in Chapter 3, BB Troubleshooting and Manual Tuning Guide.

> **Note:** Self tests are recommended to be made when phone is in jig and a 50Ω load connected to the RF connector. Otherwise power tests may fail depending on antenna load.

Troubleshooting flow

```
        ┌─────────────────────────┐
        │    Phoenix self test    │
        └─────────────────────────┘
                    │
                    ▼
┌──────────────────────────────────────────┐
│ Phoenix settings: Testing > Self Test     │
│                                            │
│ Select the following tests:                │
│ ST_CDSP_TXC_DATA_TEST                      │
│ ST_CDSP_WCDMA_TX_POWER_TEST                │
│ ST_CDSP_GSM_TX_POWER_TEST                  │
│ ST_CDSP_RX_PLL_PHASE_LOCK_TEST             │
│ ST_CDSP_TX_PLL_PHASE_LOCK_TEST             │
│ ST_CDSP_RX_IQ_LOOP_BACK_TEST               │
│ ST_CDSP_RF_SUPPLY_TEST                     │
│ ST_CDSP_TX_IQ_TEST                         │
│ ST_CDSP__TESTRF_BB_IF                      │
│                                            │
│ Click Start                                │
└──────────────────────────────────────────┘
                    │
                    ▼
        ┌─────────────────────┐      ┌───────────────────────────┐
        │ All self tests passed. │──NO──▶│ Beyond economical repair. │
        └─────────────────────┘      └───────────────────────────┘
```

◼ **Receiver troubleshooting**

Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see section GSM RX chain activation for manual measurements/ GSM RSSI measurement (page 4–7) . For a similar test in WCDMA mode, see section WCDMA RSSI measurement (page 4–11) .

GSM RX chain activation for manual measurements/GSM RSSI measurement

Prerequisites

Make the following settings in signal generator and Phoenix service software:

Setting	GSM850	GSM900	GSM1800	GSM1900
Phoenix Channel	190	37	700	661
Signal generator to antenna connector	881.46771MHz (67.71kHz offset) at -60dBm	942.46771MHz (67.71kHz offset) at -60dBm	1842.86771MHz (67.71kHz offset) at -60dBm	1960.06771MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix by selecting **Testing** → **GSM** → **RSSI reading** .
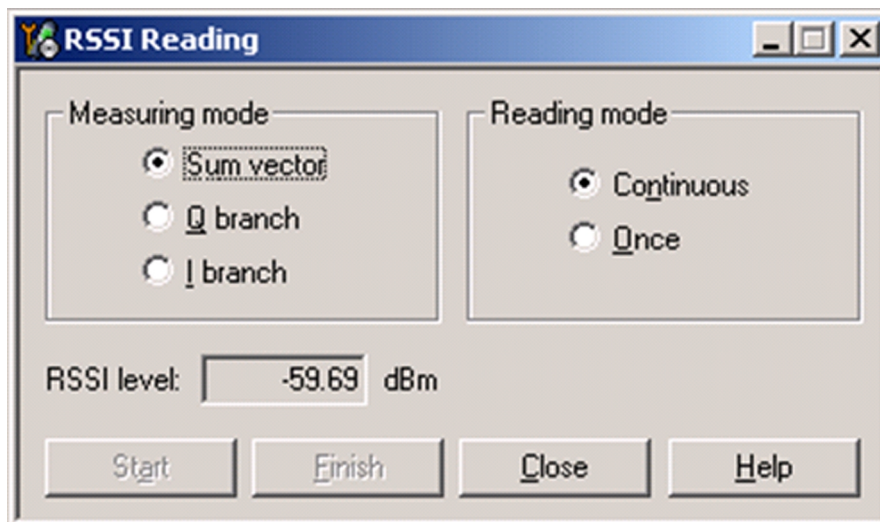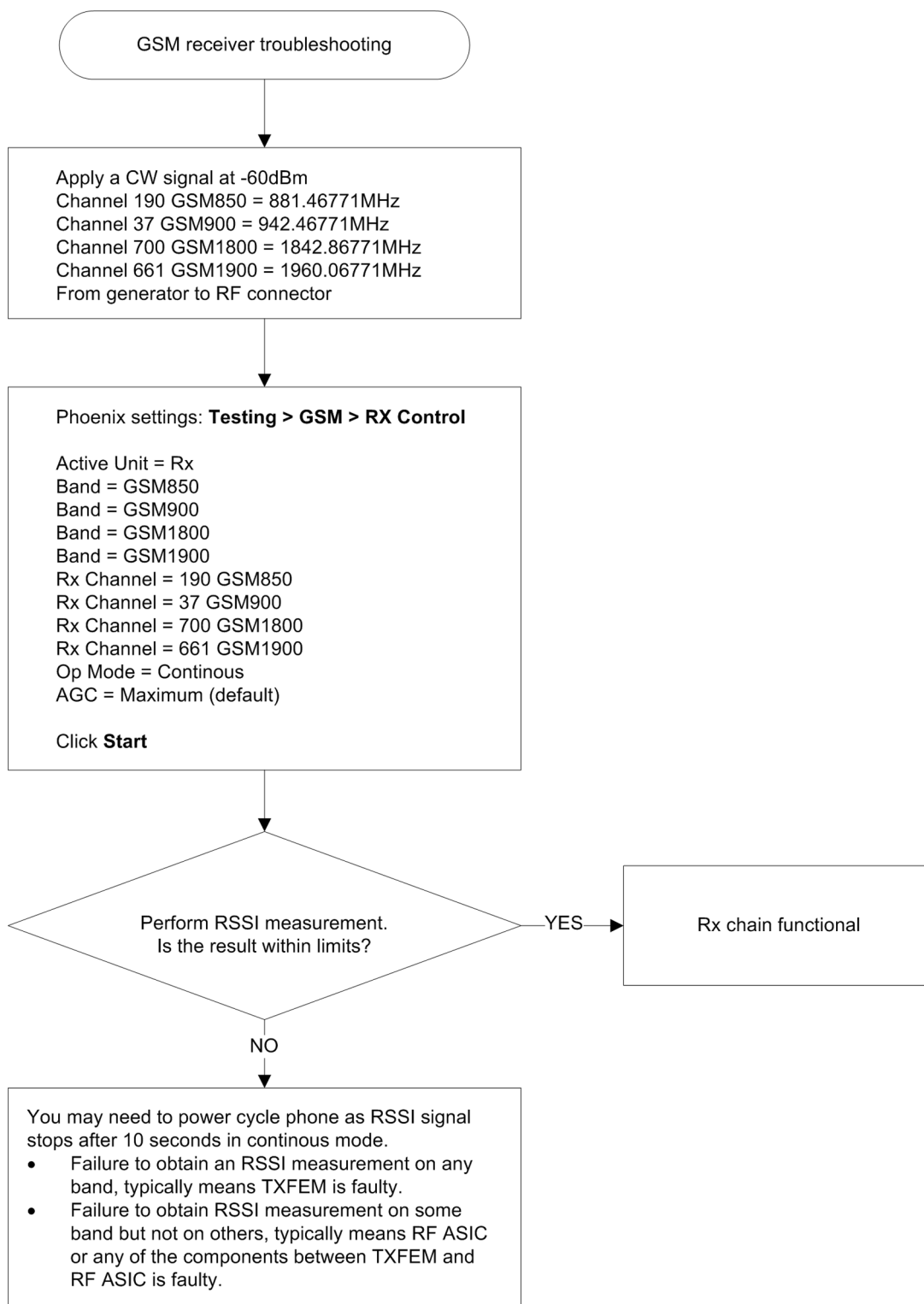

Figure 14 Phoenix RSSI Reading window

Results

The reading should reflect the level of the signal generator (minus losses) ±5dB.

When varying the level in the range -30 to -102dBm the reading should then follow within ±5dB.

GSM receiver troubleshooting flowchart

Troubleshooting flow

GSM receiver troubleshooting

↓

Apply a CW signal at -60dBm
Channel 190 GSM850 = 881.46771MHz
Channel 37 GSM900 = 942.46771MHz
Channel 700 GSM1800 = 1842.86771MHz
Channel 661 GSM1900 = 1960.06771MHz
From generator to RF connector

↓

Phoenix settings: **Testing > GSM > RX Control**

Active Unit = Rx
Band = GSM850
Band = GSM900
Band = GSM1800
Band = GSM1900
Rx Channel = 190 GSM850
Rx Channel = 37 GSM900
Rx Channel = 700 GSM1800
Rx Channel = 661 GSM1900
Op Mode = Continous
AGC = Maximum (default)

Click **Start**

↓

Perform RSSI measurement.
Is the result within limits? —YES→ Rx chain functional

NO
↓

You may need to power cycle phone as RSSI signal
stops after 10 seconds in continous mode.
- Failure to obtain an RSSI measurement on any
  band, typically means TXFEM is faulty.
- Failure to obtain RSSI measurement on some
  band but not on others, typically means RF ASIC
  or any of the components between TXFEM and
  RF ASIC is faulty.

WCDMA RX chain activation for manual measurement

Steps

1. In Phoenix, select **Testing → WCDMA → Rx Control** . The Phoenix Rx Control window opens.
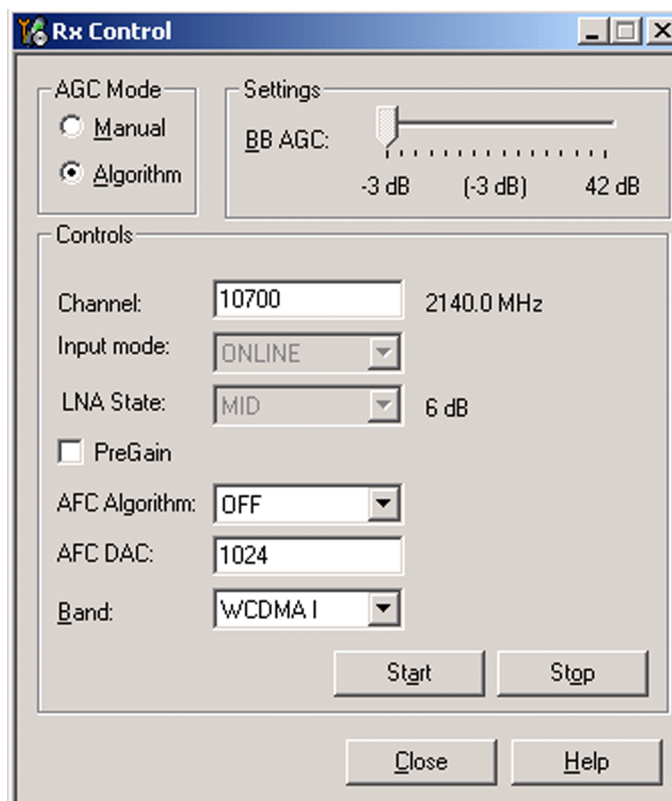
Figure 15 Phoenix Rx Control window with sample settings (WCDMA band I)

2. Make settings for the band to be tested according to the following table:

Band to be tested	Phoenix Channel	Signal generator to antenna connector
WCDMA I	10700	2141 MHz
WCDMA II	9800	1960 MHz
WCDMA V	4408	881.6 MHz
WCDMA VIII	3013	943.6 MHz

3. Make the following general settings (the same values for all bands):

Setting	Value
AGC Mode	Algorithm
AFC Algorithm	OFF
AFC DAC	1024

4. Click **Start** to activate the settings.

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If the settings are changed later on (for example, change of channel) you have to click **Stop** and **Start** again.

> **Note:** Clicking **Stop** also disables TX control if it was active.

WCDMA RSSI measurement

Prerequisites

WCDMA RX must be activated before RSSI can be measured. For instructions, please refer to WCDMA RX chain activation for manual measurement (page 4–10) .

Connect signal generator to RF connector and use appropriate frequency for each channel.

Steps

1. In Phoenix select **Testing** → **WCDMA** → **RX Power measurement** . The Rx Power Measurement window opens.
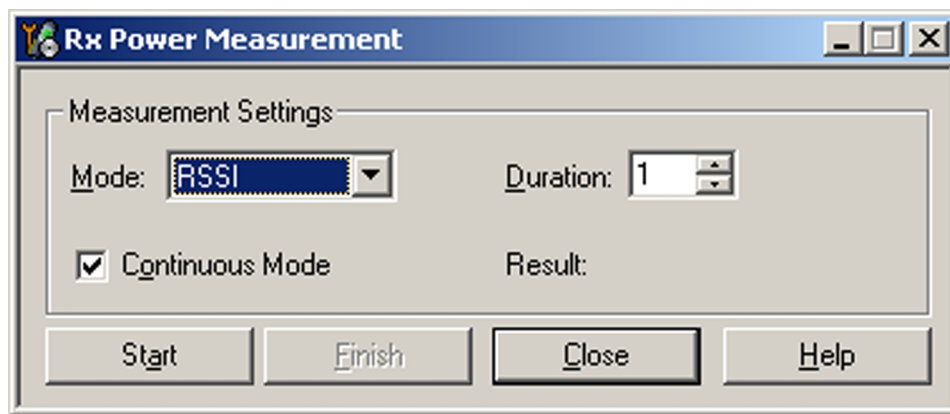
Figure 16 Phoenix Rx Power Measurement window

2. In the RX Power measurement window, select:

   • Mode: RSSI

   • Continuous mode

3. Click **Start** to perform the measurement.

> **Note:** WCDMA RSSI measurement is accurate only with WCDMA modulated signal.

WCDMA receiver troubleshooting flowchart

Troubleshooting flow

```
        ╭──────────────────────────────╮
        │ WCMA receiver troubleshooting │
        ╰──────────────────────────────╯
                      │
                      ▼
  ┌────────────────────────────────────────┐
  │ Apply a CW signal at -60dBm             │
  │ WCDMA I     2141 MHz                     │
  │ WCDMA II    1960 MHz                     │
  │ WCDMA V     881.6 MHz                    │
  │ WCDMA VIII 943.6 MHz                     │
  │ From generator to RF connector           │
  └────────────────────────────────────────┘
                      │
                      ▼
  ┌────────────────────────────────────────┐
  │ Phoenix settings: Testing > WCDMA > Rx Control │
  │                                          │
  │ AGC mode = Algorithm                     │
  │ Rx Channel = 10700 WCDMA I               │
  │ Rx Channel = 9800  WCDMA II              │
  │ Rx Channel = 4408  WCDMA V               │
  │ Rx Channel = 3013 WCDMA VIII             │
  │ AFC Algorithm = OFF                      │
  │ AFC DAC = 1024                           │
  │ AGC = Maximum (default)                  │
  │                                          │
  │ Click Start                              │
  └────────────────────────────────────────┘
                      │
                      ▼
```

Perform RSSI measurement. Result within limits? — YES → Rx chain functional

NO
↓

You may need to power cycle phone as RSSI signal stops after 10 seconds in continous mode.
- Failure to obtain an RSSI measurement on any band, typically means TXFEM is faulty.
- Failure to obtain an RSSI measurement on some band but not on others, typically means RF ASIC or any of the components between TXFEM and RF ASIC is faulty.

■ **Transmitter troubleshooting**

Introduction to transmitter (TX) troubleshooting

Please note the following before performing transmitter tests:

• TX troubleshooting requires TX operation.

• Do not transmit on frequencies that are in use!

• The transmitter can be controlled in local mode for diagnostic purposes.

• The most useful Phoenix tool for GSM transmitter testing is "RF Control"; in WCDMA transmitter testing the best tool is "TX Control".

• Remember that re-tuning is not a fix! Phones are tuned correctly in production.

• The TX path for GSM and WCDMA are using the same filters in some bands. Please refer to RF component reference (page 4– 0   ) for details.

> **Note:** Never activate the GSM or WCDMA transmitter without a proper antenna load. Always connect a 50Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2W dummy load); otherwise the GSM or WCDMA Power amplifier (PA) may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.

2. In Phoenix, select **Testing** → **GSM** → **Rf Controls** . The RF Controls window opens.
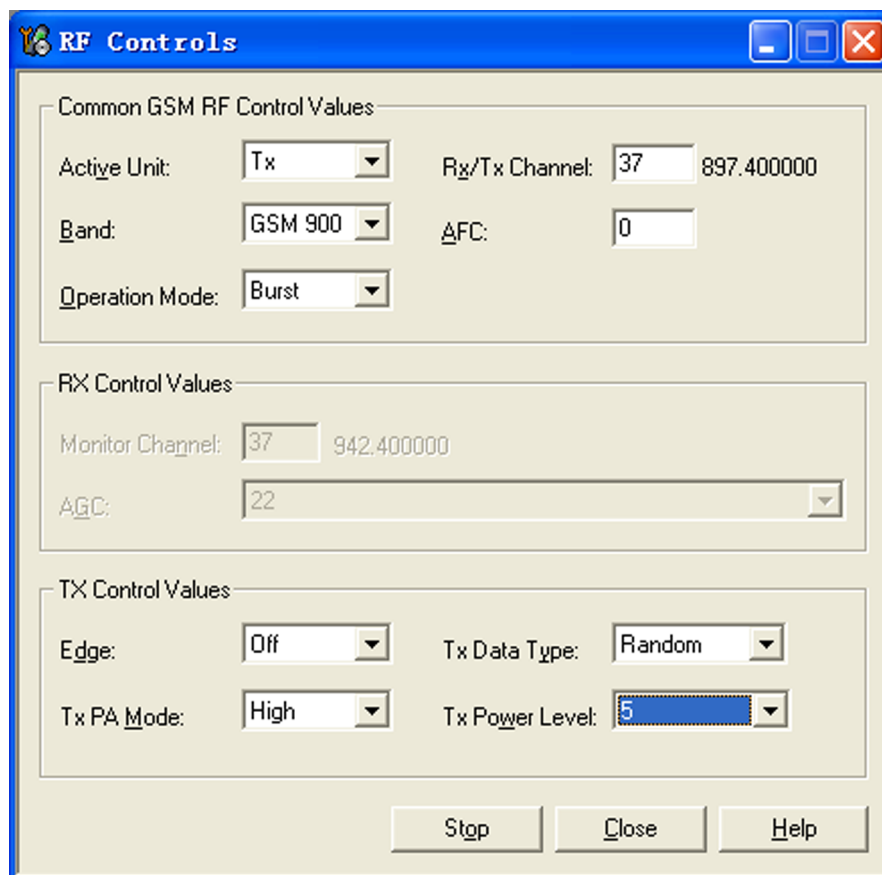
Figure 17 Phoenix RF Controls window

3. Make the following settings:

Setting	Value
Active Unit	Tx
Rx/Tx Channel	37
Band	GSM 900
AFC	0
Operation Mode	Burst
Edge	Off
Tx Data Type	Random
Tx PA Mode	High
Tx Power Level	5

4. Check the basic TX parameters, using a communication analyser (e.g. CMU200).

- Power
- Phase error
- Modulation
- Switching spectrum
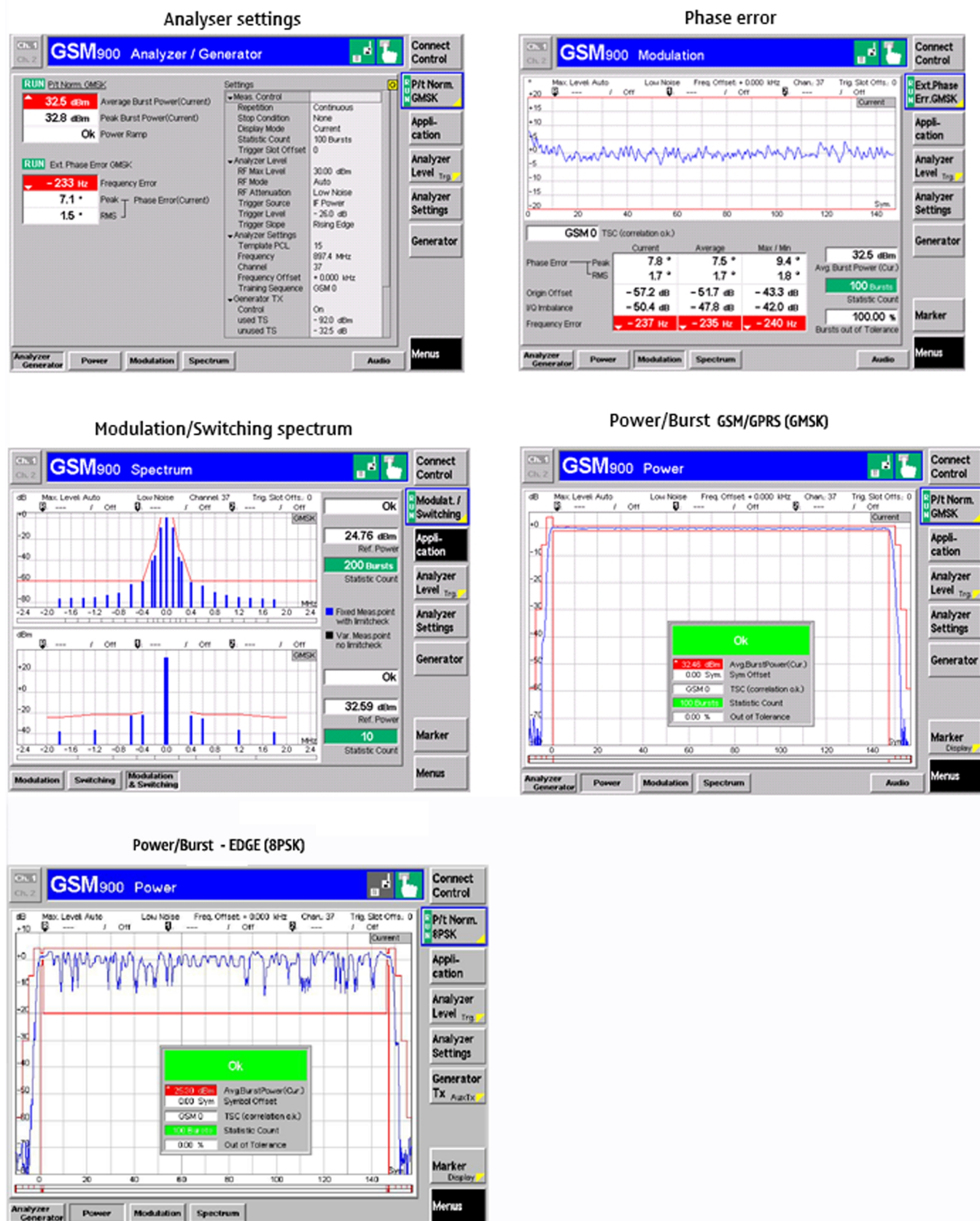
Figure 18 Typical readings

5. Change the power level in RF controls window and make sure the power reading follows accordingly.

Next actions

You can troubleshoot the GSM transmitter for each GSM band separately, one band at a time. If you want to troubleshoot GSM850, GSM1800 or GSM1900, change the band in the RF controls window and set the communication analyser accordingly.

GSM transmitter troubleshooting flowchart

Troubleshooting flow

```
            ╭──────────────────────────────╮
            │ GSM transmitter troubleshooting │
            ╰──────────────────────────────╯
                          │
                          ▼
    ┌────────────────────────────────────────────┐
    │ Phoenix Settings: Testing > GSM > Tx Control │
    │                                              │
    │ Band = GSM850                                │
    │ Band = GSM900                                │
    │ Band = GSM1800                               │
    │ Band = GSM1900                               │
    │ Active Unit = Tx                             │
    │ Op Mode = Burst                              │
    │ Tx Channel = 190 GSM850                      │
    │ Tx Channel = 37 GSM900                       │
    │ Tx Channel = 700 GSM1800                     │
    │ Tx Channel = 661 GSM1900                     │
    │ Edge = Off                                   │
    │ Tx Data Type = Random                        │
    │ Power level = 5 for GSM850/GSM900            │
    │ Power level = 0 for GSM1800/1900             │
    │                                              │
    │ Click Start                                  │
    └────────────────────────────────────────────┘
                          │
                          ▼
    ┌────────────────────────────────────────────┐
    │   Check output signal level from RF connector. │
    │              +32.5 dBM (+/- 2dB)              │
    │               GSM850 836.6MHz                 │
    │               GSM900 897.4MHz                 │
    │              +29.5 dBm (+/- 2dB)              │
    │              GSM1800 1747.8MHz                │
    │              GSM1900 1880.0MHz                │
    └────────────────────────────────────────────┘
                          │
                          ▼
              ◇ Output signal level OK? ◇ ──YES──▶ ┌──────────┐
                          │                         │  Tx OK.  │
                         YES                        └──────────┘
                          │
                          ▼
    ┌────────────────────────────────────────────┐
    │         TXFEM or components between          │
    │          TXFEM and RF ASIC faulty.           │
    └────────────────────────────────────────────┘
```

WCDMA transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing** → **WCDMA** → **Tx control** . The Tx Control window opens.
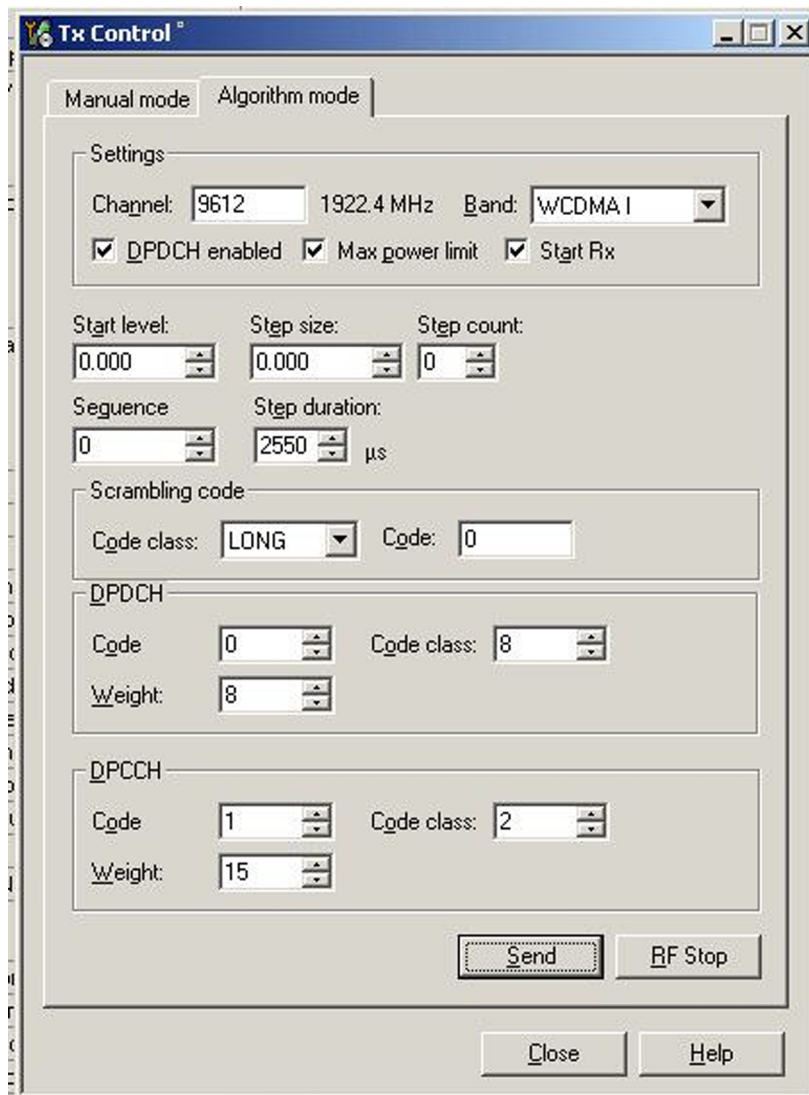
Figure 19 Phoenix WCDMA Tx control window

3. Make settings for the band to be tested, according to the following table:

Band	Channel
WCDMA I	9750
WCDMA II	9400
WCDMA V	4183
WCDMA VIII	2788

4. Make the following general settings (the same values for all bands). Note that Max power limit is not checked by default.

Setting	Value
DPDCH enabled	Checked
Max power limit	Checked
Start Rx	Checked
Start level	0
Step size	0
Step count	0
Sequency	0
Step duration	2550
Code class	LONG
Code	16
DPDCH code	0
Weight	8
Code class	8
DPCCH code	1
Weight	15
Code class	2

Note: Use the **Start level** option to set the TX power level.

5. Click **Send** to enable the settings and activate TX.

   If settings are changed (eg. new channel selected), you have to click **RF Stop** and **Send** again.

6. Check the basic TX parameters using a communication analyser (e.g. CMU200).

Power
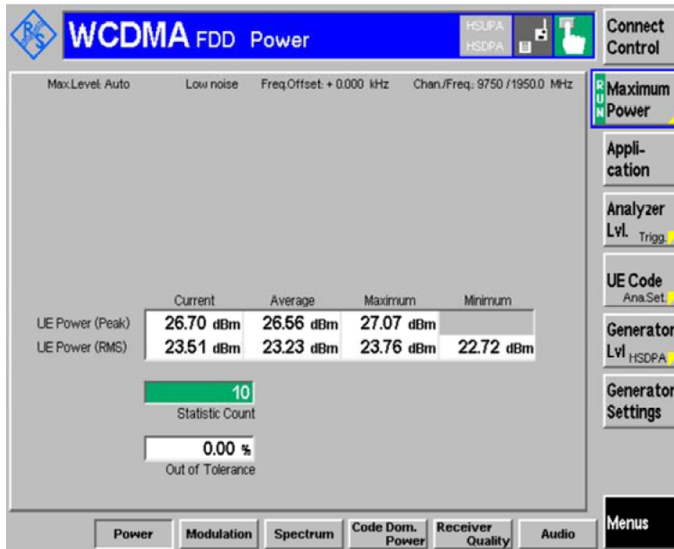
Spectrum - Emission Mask
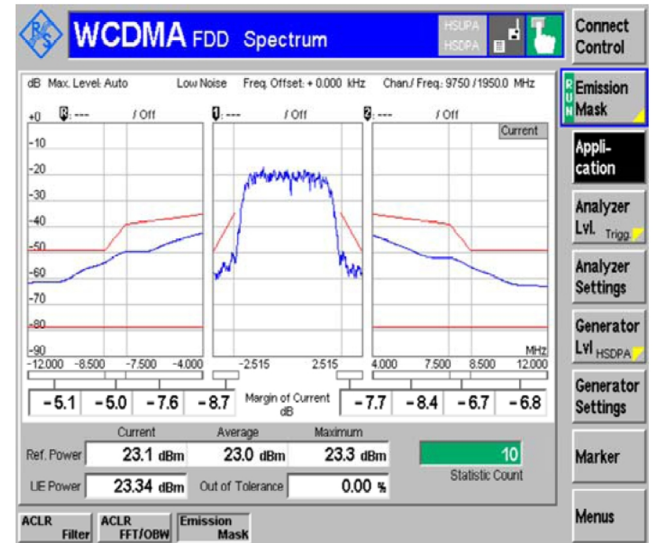
Spectrum - ACLR (FFT/OBW)
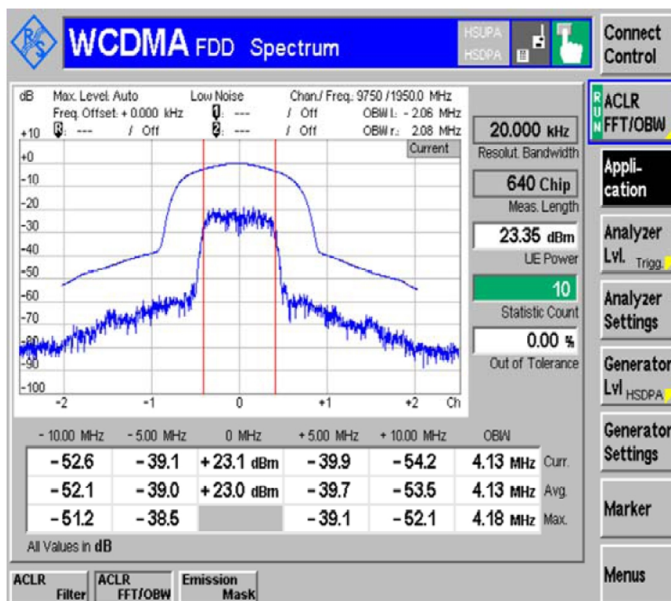
Spectrum - ACLR (Filter)
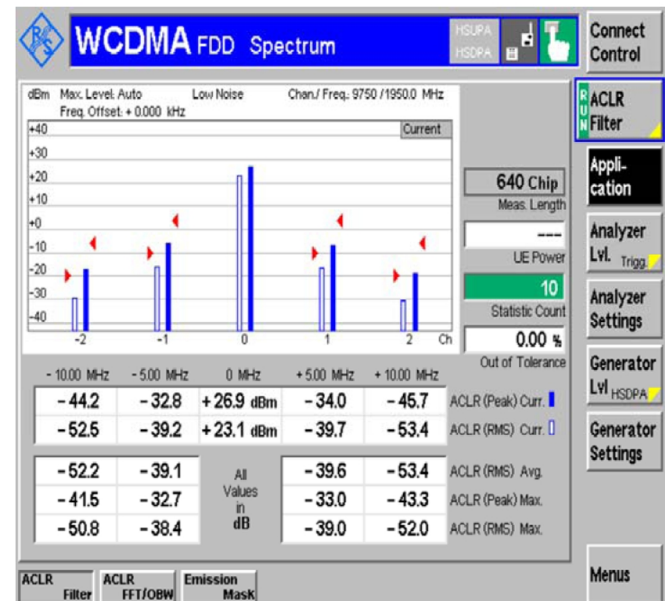
Figure 20 Typical readings

WCDMA transmitter troubleshooting flowchart

Troubleshooting flow

WCDMA transmitter troubleshooting

Connect spectrum analyzer to RF connector
Phoenix settings: **Testing > WCDMA > Tx Control**

Algorithm Mode
Tx Channel = 9750 WCDMA I
Tx Channel = 9400 WCDMA II
Tx Channel = 4183 WCDMA V
Tx Channel = 2788 WCDMA VIII

Click **Start**

Check output signal from RF connector:
SPAN = 20MHz
Center freq. = 1950 MHz WCDMA I
Center freq. = 1800 MHz WCDMA II
Center freq. = 836.6 MHz WCDMA V
Center freq. = 897.6 MHz WCDMA VIII
Level = 23 dBm (+/- 3dBm)
RBW = 5MHz

Output signal OK? — YES → Tx OK.

NO

Check components between
RF ASIC and TXFEM.
OK? — YES → WCDMA PA is faulty.

NO

Component between RF ASIC and TXFEM is faulty.

■ Antenna

Antenna overview

The phone has two antennas, a main antenna and a BT antenna. Their placement in the phone can be seen in the following figure:

The main antenna consists of an antenna carrier with an adhesive. This is called Cellular Antenna Module. The Cellular Antenna Module also acts as top of an IHF chamber, which is built together with the B-Cover. For acoustical sealing of the IHF chamber a sealing is glued on the bottom side of the Cellular Antenna Module. The Cellular Antenna Module is snapped in the B-Cover and the IHF speaker is in between the Cellular Antenna Module and the B-Cover.

Main antenna functionality

The main antenna consists of two radiators which cover different frequency ranges. One radiator covers the range 824 MHz to 960 MHz, the low band, and the other radiator the ranges 1710 MHz to 1990 MHz as well as 2110 MHz to 2170 MHz, the high bands.

Both radiators are matched monopoles, the matching network consists of components, which are soldered on the antenna flex and are located on the bottom side of the assembled antenna module.

There are three pads close to the matching network. They act as contact areas for the C-Clips on the PWB. The outer ones are ground, and the middle area is the antenna feed, as shown in the above figure.

The main antenna functionality must also be checked by a GoNoGo test as described in Technical Bulletin TB 214.

Antenna troubleshooting

Main antenna

Check that the GND and feed pads take proper contact to the C-Clips on the main PWB. Also check visually that all the matching components are soldered properly. In case of damage, the whole antenna module needs to be replaced.

If only low band or high band is working properly, it may indicate a faulty matching network. Defects in the solderings or breaks in the wiring of matching should be seen. In this case, also the engine PWB must be replaced.

Bluetooth antenna

Check that the spring clip takes proper contact to the gold plated contact area on the PWB. Also check that the spring clip fits well in the Bluetooth antenna and has a proper contact to the wire in the PWB. In case of damage, the whole B-cover needs to be replaced.

Nokia Customer Care

5 — System Module

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Table of Contents

■ Introduction

Phone description

RAP3Gv4 is the main digital baseband ASIC in the device. It contains functionality for both WCDMA and GSM EDGE. The cellular baseband is constructed around Radio Application Processor (RAP3GS2v4) and mixed signal ASIC PEARL_J. RAP3GS2v4 is used as a single chip solution, which means that all UI components are connected to RAP3GS2v4.

N2200 is the main audio and energy management controller for the phone. The mixed-signal functionality is in one mixed-signal ASIC. N2200 includes blocks for charger control, SMPS power supplies for VCORE, VIO and LEDs, linear regulators for RF and BB supplies, level shifter functions, A/D converters, audio and RTC.

Bluetooth and FM radio are physically integrated in one single ASIC.

Key components

Function	Description	Item ref
Main board	2MJK/2MJL	
Energy management ASIC	PEARL_J	N2200
RF ASIC	Vapaus	N7500
Processor	RAP3GS2v4	D2800
PA GSM	Front end module (FEM), quad band	N7520
PA WCDMA	Triple band PA	N7540
Oscillators	VCTCXO	G7500
Memory	1 Gbit M3/ DDR SDRAM 512 Mbit combo (stacked with RAP)	D3000
FM radio	BTHFMRDS3.0 module	N6000
Bluetooth	BTHFMRDS3.0 module	N6000
Slide switch	Hall IC switch/position sensor	N2460
Battery	BL-5C	
Battery connector	Lynx interface	X2080
MicroUSB connector	For data and charging	X2002
MicroSD connector		X3200
SIM connector		X2700
Microphone		B2104
IHF speaker		B2121
Earpiece		B1000
Vibra		M2100
Camera		
USB transceiver		N2002

Key component placement

Display connector
X2520

Keypad LEDs
V2500/2502

AV-connector **uSD-connector** **SIM connector** **Lynx Battery**
X2100 **X3200** **X2700** **connector**
X2080

Camera

Backup **Vibra** **USB** **USB** **BT/FM** **BB** **RF**
battery **M2100** **connector** **transceiver** **components** **components** **components**
G2200 **X2002** **N2002**

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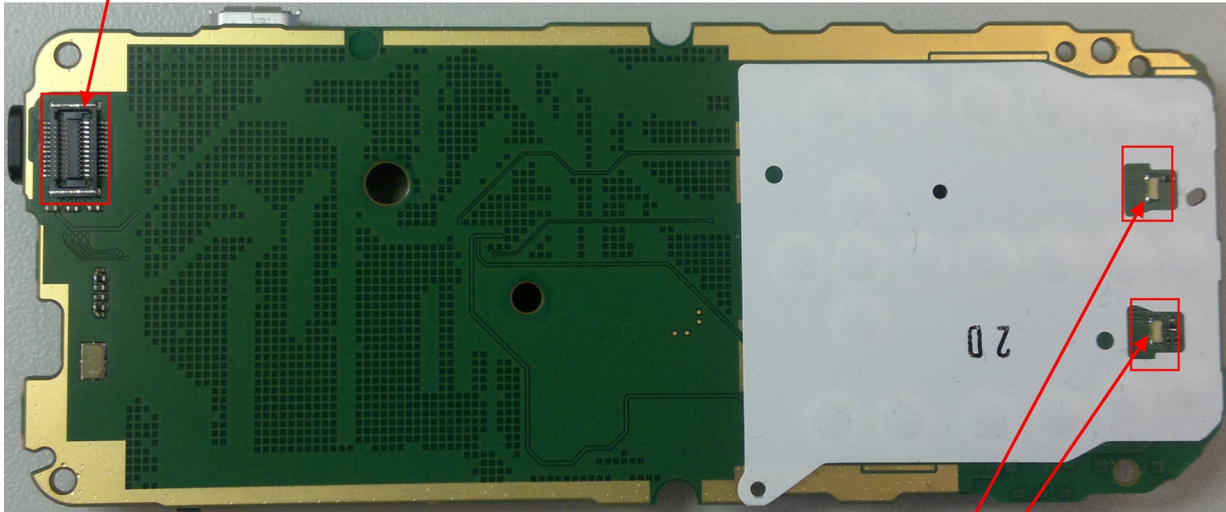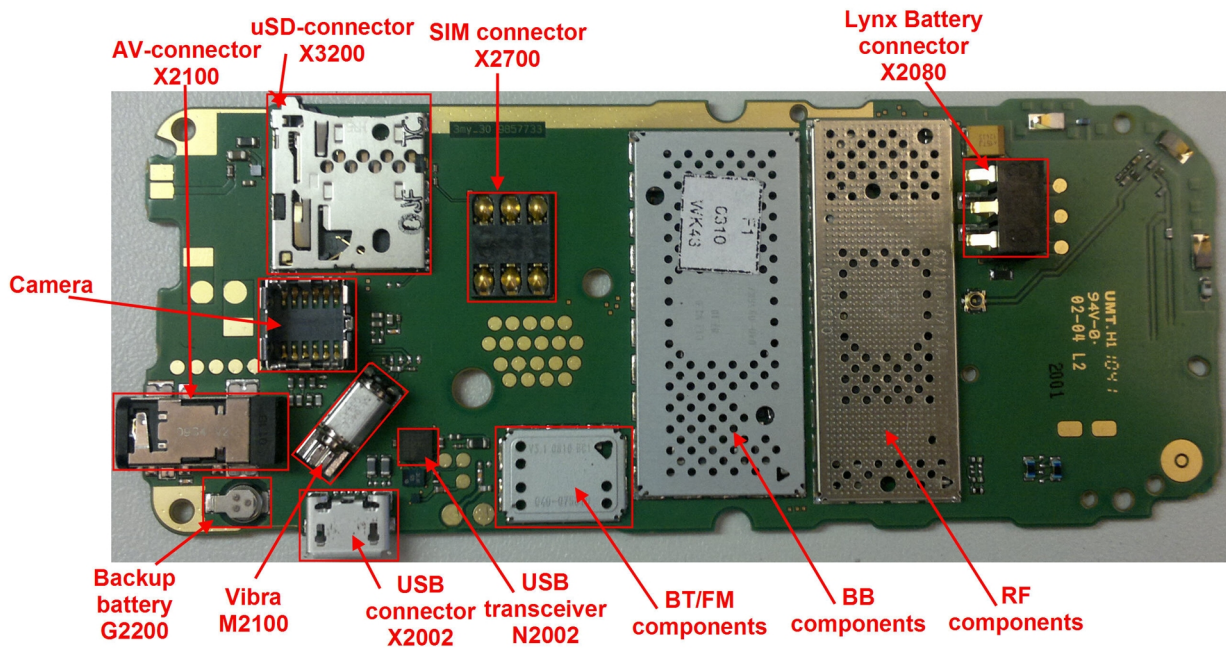
System module block diagram
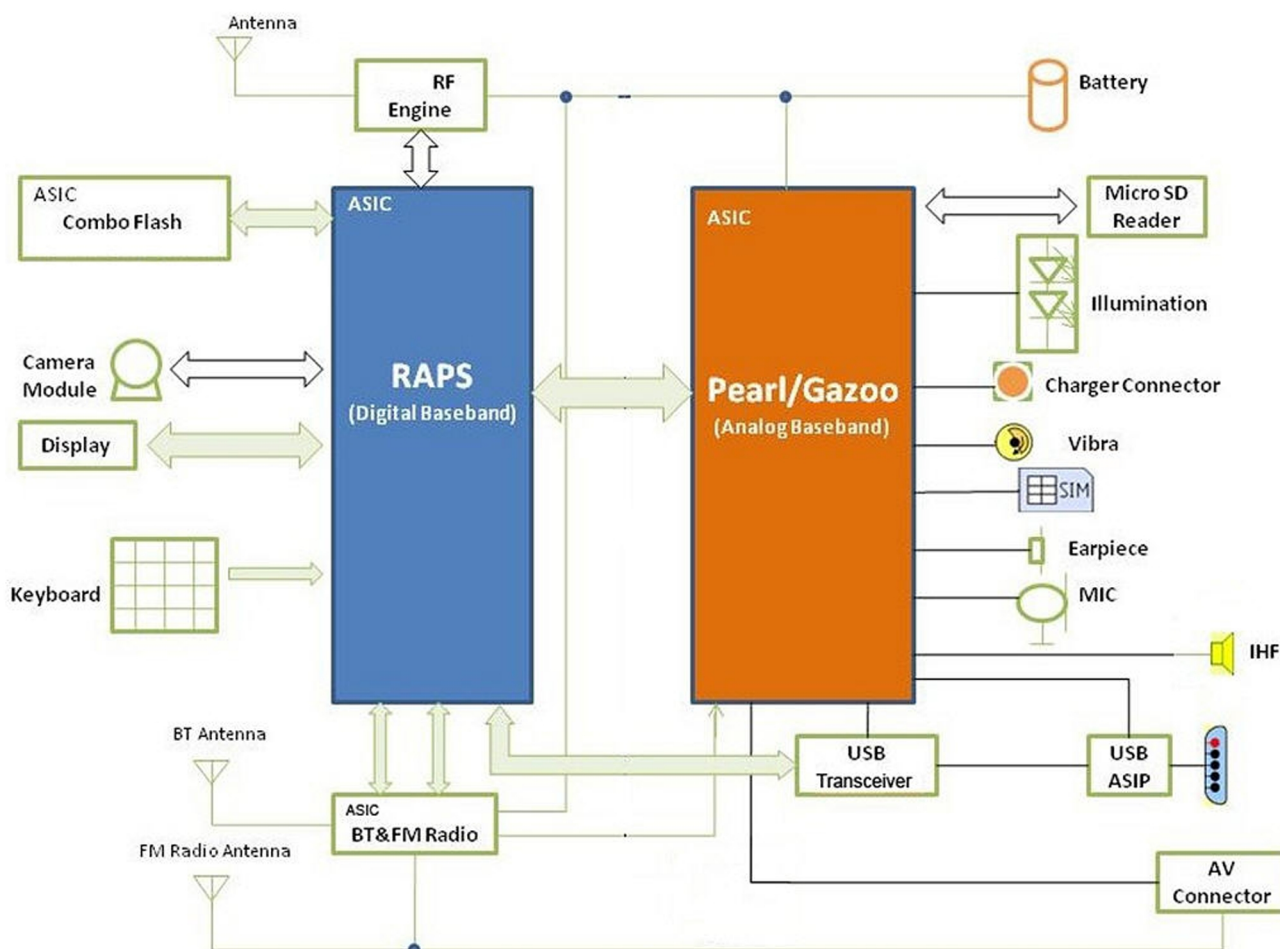
Board and module connections
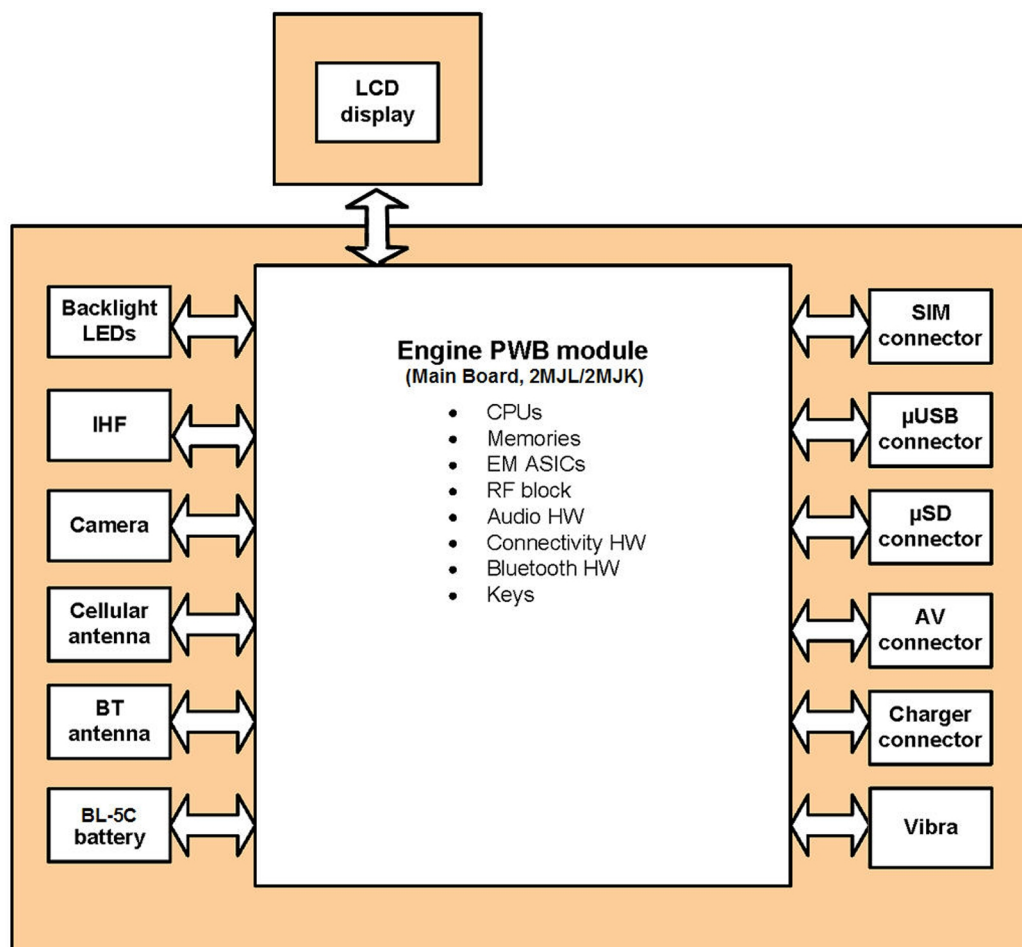
◼ Energy management

Battery and charging

BL-5C battery

The phone is powered by a 3-pole BL-5C 1020 mAh battery. The three poles are named VBAT, BSI and GND where the BSI line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor.
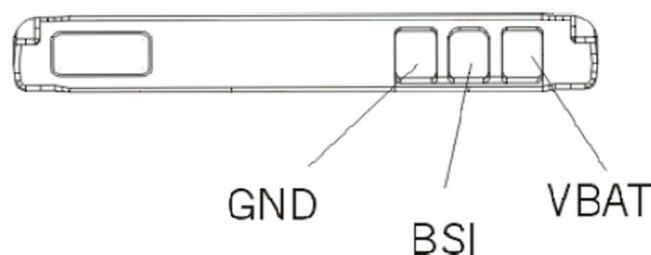
Figure 21 Battery pin order

Battery connector

The battery connector is a spring connector. It has three springs;

- BSI (Battery size indicator)
- GND (Ground)
- VBAT (Battery voltage)

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

Charging

This phone is charged through a separate charger connector.

Charging is controlled by energy management, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Complementary USB charging is supported as well, in case the phone is connected to a PC or to a dedicated USB charger.

Normal and extreme voltages

Energy management is mainly carried out in the ASIC PEARL_J. These circuits contain a number of regulators.

In the table below normal and extreme voltages are shown when a BL-5C battery is used.

Table 11 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	4.0	
Lower extreme voltage	3.145	
Higher extreme voltage (fast charging)	4.23	
HW Shutdown Voltages		
Vmstr+	2.1 ± 0.1	Off to on
Vmstr-	1.9 ± 0.1	On to off
SW Shutdown Voltages		
Sw shutdown	3.106	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	2.9 ± 0.1	Off to on
Vcoff-	2.6 ± 0.1	On to off

Power key and system power-up

When the battery is placed in the phone the power key circuits are energized. When the power key is pressed, the system boots up (if an adequate battery voltage is present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). The power key is connected to EM ASIC N2200 (PEARL_J) via PWRONX signal.

Modes of operation

Mode	Description
NO_SUPPLY	(Dead) mode means that the main battery is not present or its voltage is too low (below N2200 PEARL_J master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2200 PEARL_J master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

Clocking scheme

In BB5.0, two main clocks are provided to the system: 38.4MHz RF clock produced by the RF section and 32.768kHz sleep clock produced by EM ASIC N2200 with an external crystal.

32 k Sleep Clock is always powered on after startup. Sleep clock is used by RAP for low-power operation.

SMPS Clk is 3.2 MHz clock line from RAP to EM ASIC N2200. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

RF CLK Ext is 38.4 RF CLK Ext from Vapaus ASIC. It is buffered in the RF part and distributed to BTHFMTXRDS.

■ Connectivity

MicroUSB interface

The micro USB (Universal Serial Bus) provides a wired connectivity between a PC and peripheral devices. It is a differential serial bus. USB 2.0 is supported with full speed (12 Mbps).

Hot swap is supported, which means that USB devices may be plugged in/out at any time.

This phone is equipped with a μUSB connector (B type) which accepts CA-101 or an appropriate 3rd party data cable to establish a USB connection.
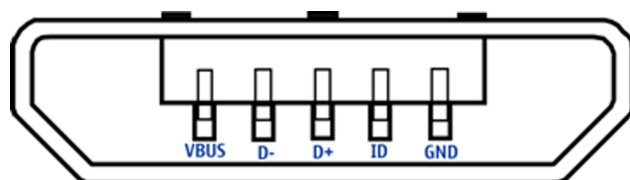
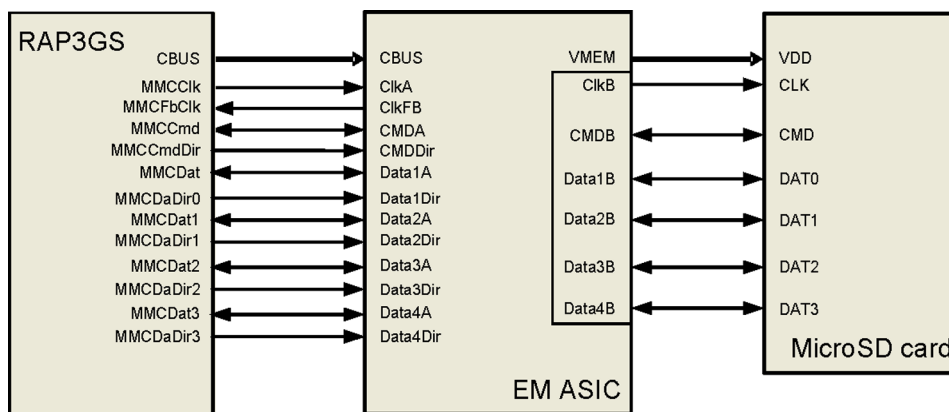| Pin number	Signal name
1	VBUS
2	D-
3	D+
4	ID
5	Gnd
Shell	Gnd

Figure 22 MicroUSB connector

SIM interface

The phone has a SIM (Subscriber Identification Module) interface including a SIM connector. The connector is only accessible when the battery is removed.

The interface is located into two ASICs; RAP3GS2v4 contains most of the interface functionality and MS ASIC takes care of card power up/down, card detect, ATR counting and level shifting functions.

Figure 23 SIM interface

The SIM interface supports 1.2V, 1.8V and 3V technology smart cards.

MicroSD card interface

The microSD card is connected to the engine through the level shifter in Pearl/Gazoo to adapt the 1.8V I/O IF of the RAP3GS2v4.x to the 3V IF of the SD IF.

The microSD card can only be removed or inserted when the battery is removed.

Figure 24 MicroSD card interface

USB interface

The phone has an interface for USB (Universal Serial Bus) and it supports device mode. Device mode means that the mobile terminal can be a USB device for a USB host such as PC.
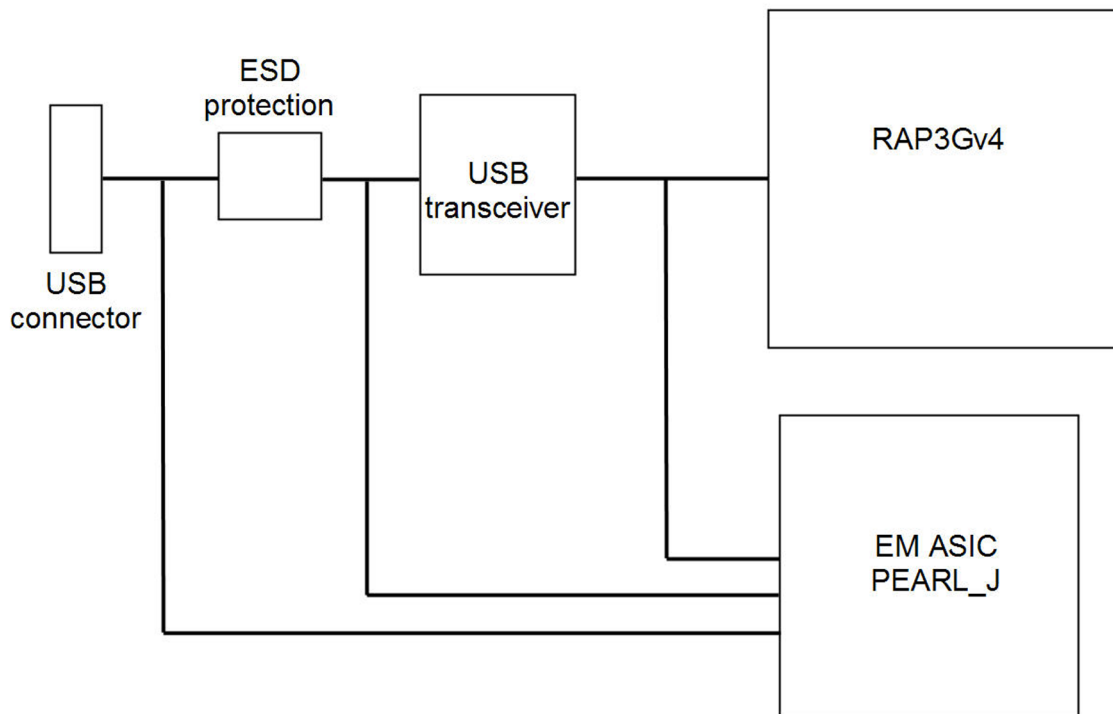
Figure 25 USB interface

The phone supports full speed (12 Mb/s) in device mode.

Charger interface

The charger interface is a 2 mm Dynamo charger plug. Older chargers with a 3.5 mm plug are supported via the charger adapter cable CA-44.

Charging is controlled by PEARL_J (N2200). Additional external components are needed for EMC purposes, reverse polarity and transient protection of the input to the baseband module.
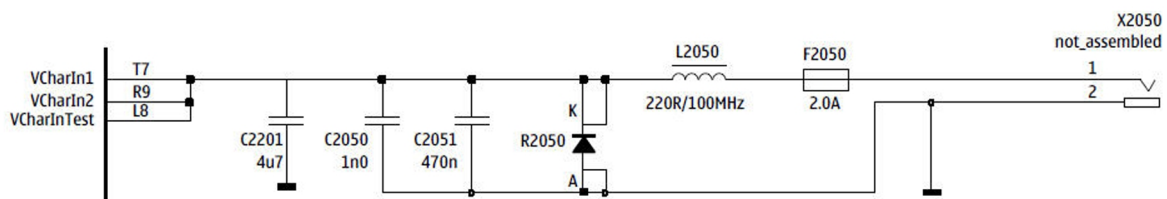
Figure 26 Charger interface

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit (the phone) and one or more slave units (e.g. a wireless headset). Data and control interface for a low power RF module is provided by the module.

The Bluetooth is physically integrated with the FM radio into one single module. From a functional point of view they, however, have nothing in common.
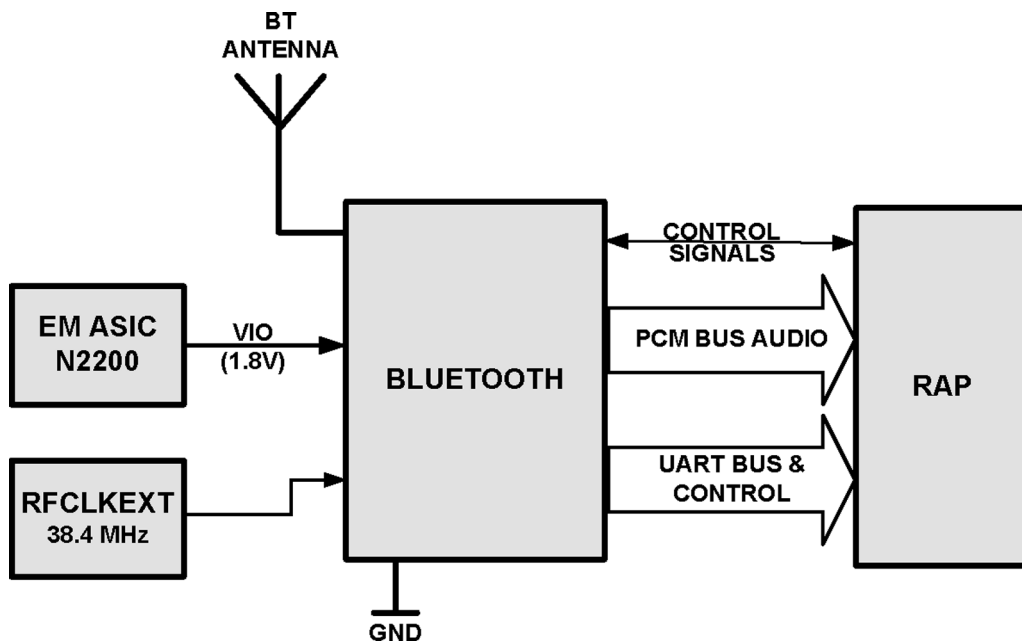
Figure 27 Bluetooth interface

The Bluetooth has a separate built in antenna and is powered by VBAT and the regulated voltage VIO. For audio applications the Bluetooth has a PCM data bus. In addition a UART (universal asynchronous receiver/ transmitter) is used for data communication and controls.

FM radio

The FM radio is physically integrated with the Bluetooth into one single module. From a functional point of view they, however, have nothing in common.
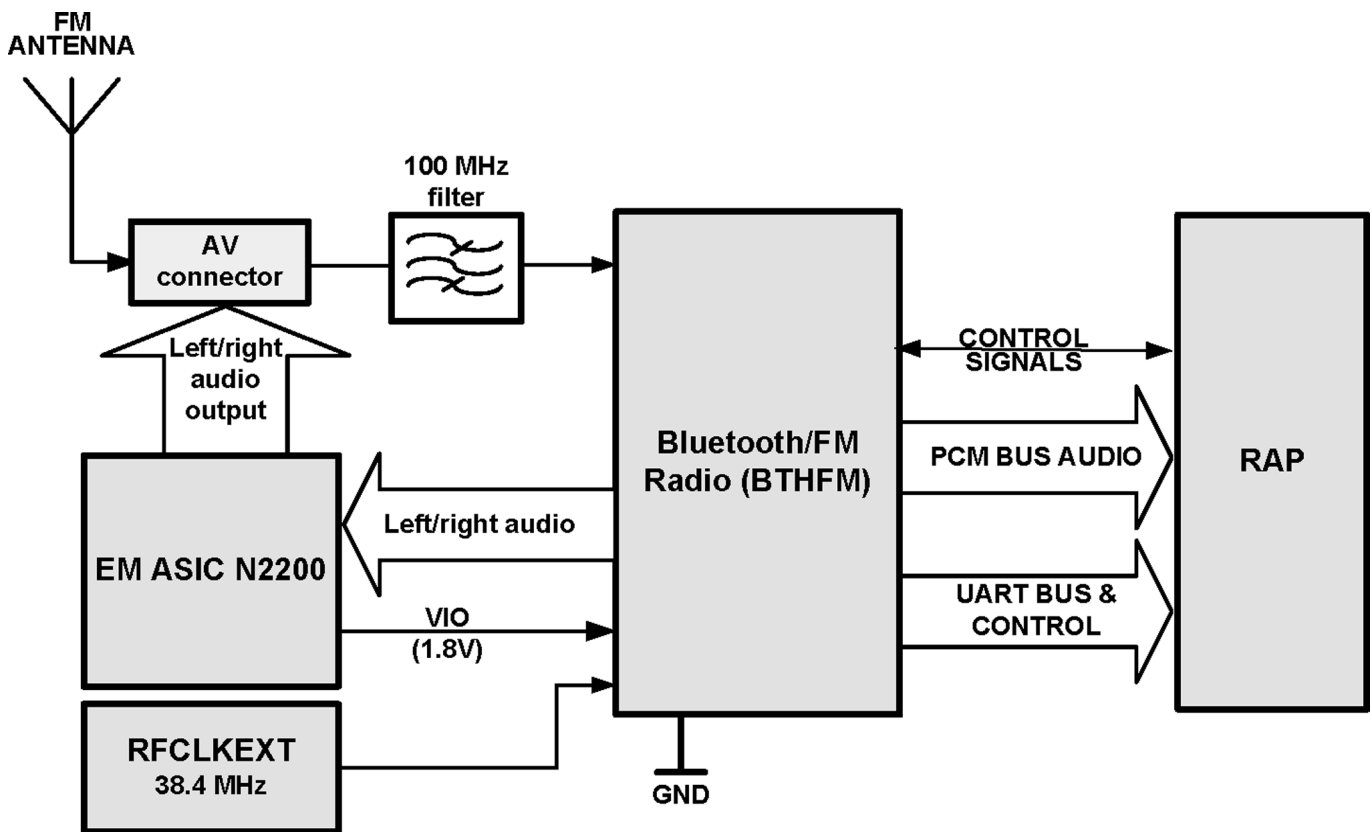
Figure 28 FM interface

The FM radio is an integrated circuit, controlled by MCU software through a serial bus interface. The wires of the headset are used as poles of the antenna, and no other antenna is needed for FM radio reception.

■ User interface

Display module

Display module

The display module consists of a large 2.0" QVGA (320 x 240 pixels) TFT display with 262K colours.

The interconnection between the display module and RAP engine is implemented with a 25-pin board-to-board connector. The display module is equipped with a driver with bi-directional 8-bit parallel interfaces.
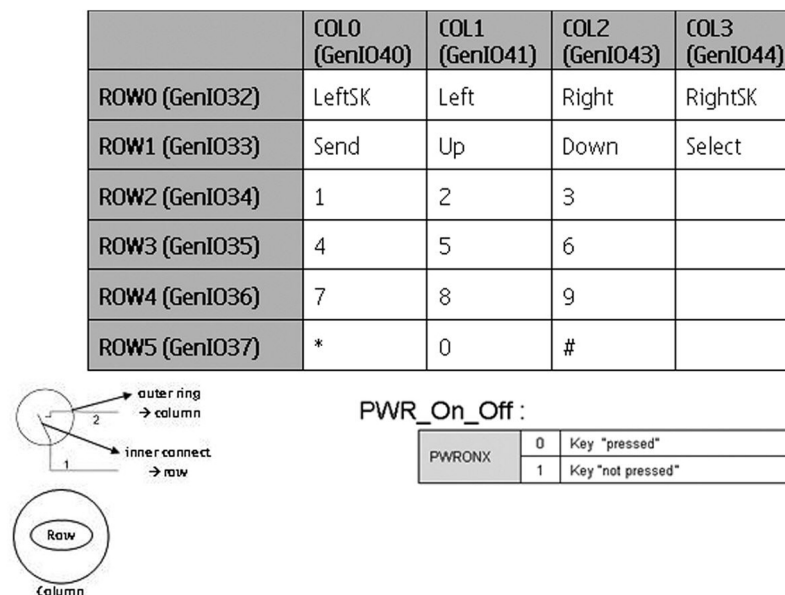
Keyboard interface

	COL0 (GenIO40)	COL1 (GenIO41)	COL2 (GenIO43)	COL3 (GenIO44)
ROW0 (GenIO32)	LeftSK	Left	Right	RightSK
ROW1 (GenIO33)	Send	Up	Down	Select
ROW2 (GenIO34)	1	2	3	
ROW3 (GenIO35)	4	5	6	
ROW4 (GenIO36)	7	8	9	
ROW5 (GenIO37)	*	0	#	

PWR_On_Off :

PWRONX	0	Key "pressed"
	1	Key "not pressed"

outer ring → column
inner connect → row

Row
Column

Figure 29 Keypad matrix

Backlight and illumination

The illumination has four main areas: numeric keypad (2 x white LEDs), display backlight (2 x white LEDs). The display backlight is powered by the integrated DC/DC converter of the PEARL_J IC.

In the VLED+ line of the Pearl a "VLED disconnect switch" is integrated. This avoids that the VLED line is at VBAT level even in switched off state (which can cause electro migration problems).
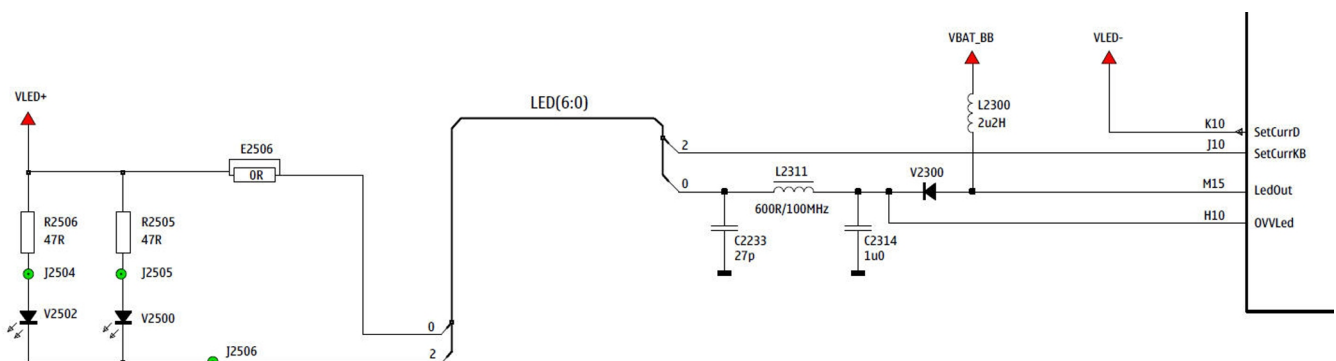

Figure 30 Backlight and illumination concept

■ Camera concept

Camera interface

The camera module is a EDOF 3.2 Mpix. The camera is connected directly to the baseband, no hardware accelerator is used. Processing of the image is done by phone processor using NIPS (Nokia Imaging Perfection System) algorithms.

The CCI-bus (Camera Command Interface) is an I2C-compatible interface that is used bidirectional to transfer commands from BB to the camera and to get information of the camera register settings from the camera to BB.

The CCP-bus (Compact Camera Port) is a unidirectional interface that is used to transfer the image data from the camera to BB. It is a high speed differential interface. The camera is equipped with CCP class2 interface, i.e. up to 650 Mbit/s. The device baseband supports CCP class0 (specified up to 208 MHz) but limits the frequency to 160 MHz. So clock/data-signaling is used in the device.
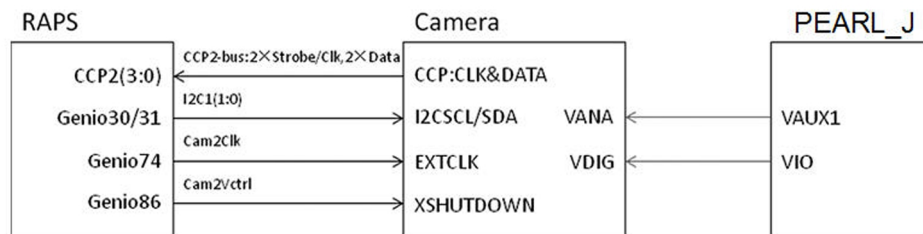

Figure 38 Camera concept

Figure 31 Camera concept

Audio concept

Audio concept

The functional core of the audio hardware is built around two ASICs; Energy management ASIC N2200 and digital ASIC D2800.

N2200 provides an interface for the transducers and the AV connector.

There are three audio transducers:

• one earpiece

• one IHF speaker

• one Clapton microphone

N2200 also provides an output for the vibra motor.

All external audio accessories are connected to the specific AV connector.

The following block diagram illustrates the audio interface of the phone:
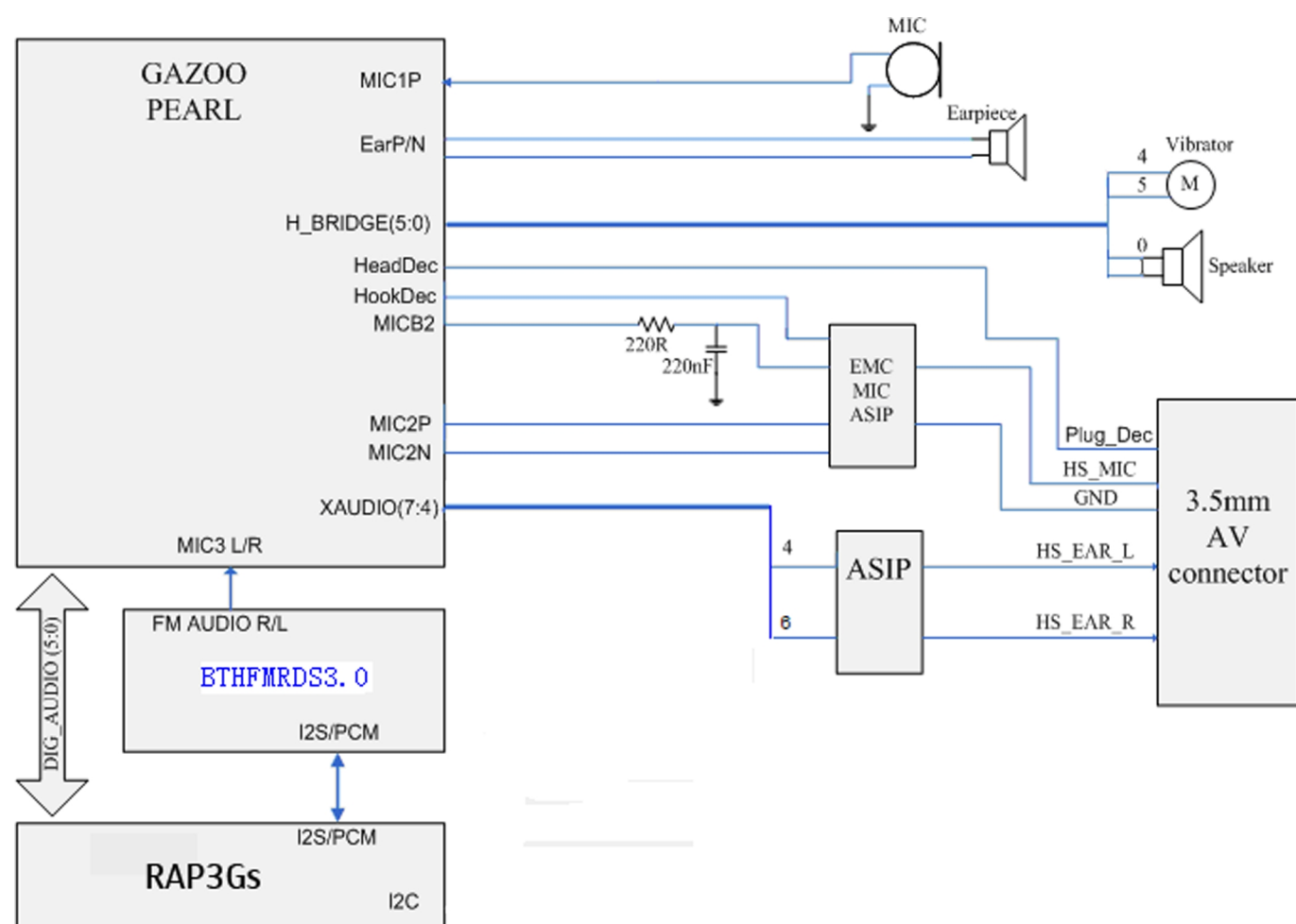
Figure 32 Audio block diagram

Internal audio

The internal audio components are used in these modes:

	Hand portable (HP) mode	Internal hands free (IHF) mode
Microphone	X	X
Earpiece	X	
Speaker		X

Internal microphone

The Clapton microphone is located in the antenna module. The MIC1P connects directly to the EM ASIC N2200.
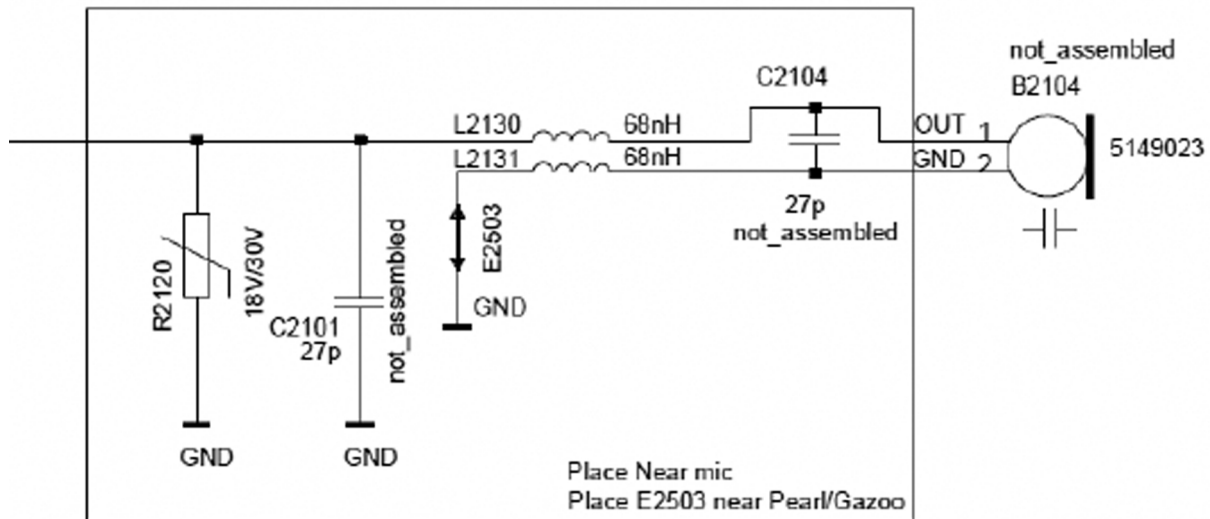
Figure 33 Internal microphone

Internal earpiece

The internal earpiece (B1000) is located in the B-cover. The earpiece is directly driven by the internal ear amplifiers of the PEARL_J (N2200) and no additional amplifier is needed
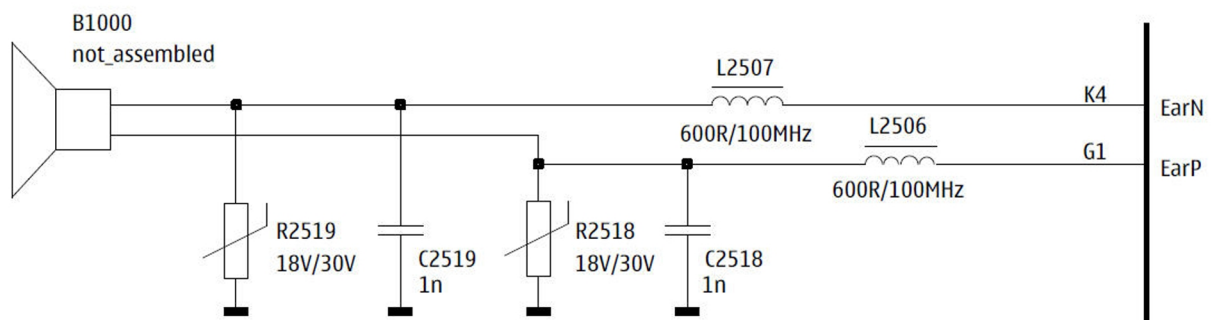

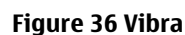**Figure 34 Internal earpiece**

IHF speaker

The IHF speaker (B2121) is located at the bottom side of the main board. No additional amplifier is used.

External microphone

An external microphone can be connected to the device via the 3.5 mm AV connector (X2100) located at the bottom side of the main board.

Figure 35 AV connector

External earpiece

An external earpiece can be connected to the device via the 3.5 mm AV connector (X2100) located at the top side of the phone.

The external earpiece is directly driven by the internal amplifier of PEARL_J. There are no external amplifiers.

Vibra

The vibra (M2100) is a mounted SMD located at the bottom side of the main board. It is supplied directly from the PEARL_J vibra outputs.

Figure 36 Vibra

AV connector

The 3.5mm AV connector consists of mono or stereo audio output, mono audio input and optional features like control data over microphone line.

A connected male connector is detected on pin 6 (PLUG_DET).

Accessories are detected as basic headset (no ECI) or as intelligent ECI communication devices.

> **Note:** Only use an approved cable for connecting to the AV connector (e.g. headset HS-47).
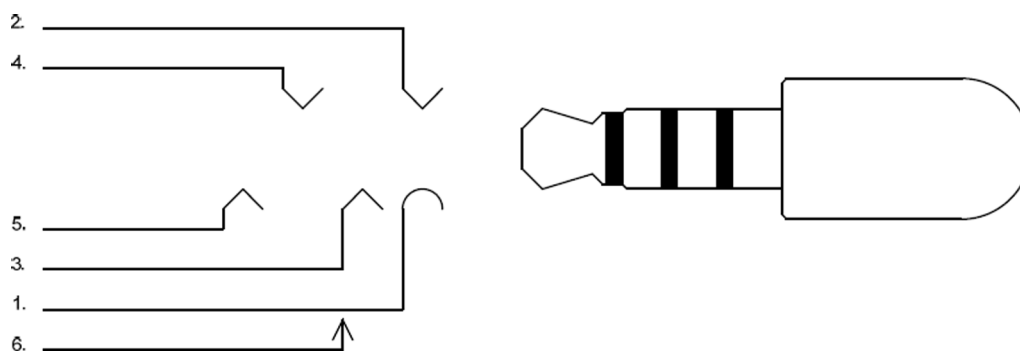
Figure 37 AV connector pin layout

Table 12 AV connector pins

Pin	Signal name	Direction	Description
1, 2	HS_ GND	-	Ground contacts
3	HS_MIC	Input	Multiplexed microphone audio and control data/muxed: MIC2P and ACI
4	HS_EAR_R	Output	Audio output (XEAR_R)
5	HS_EAR_L	Output	Audio output (XEAR_L)
6	PLUG_DET	Input	Terminal internal connection, plug detection

■ Combo memory

The die stacked combo memory module POP2 (1Gbit M3/ DDR SDRAM 512 Mbit) is assembled on the top of RAP3GS2v4, and located at the bottom side of the main board. RAP3GS2v4 has pads on the top of it, where POP2 is soldered. These components cannot be replaced. The engine module must be replaced.

■ RF description

Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (e.g. to the earpiece).

The receiver functions are implemented in the RF ASIC.

Signals with different frequencies take different paths, therefore being handled by different components. The principle of GSM and WCDMA is the same.

Transmitter (TX)

The digital baseband signal (e.g. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwith of the system in use (e.g. GSM900).

The transmitter functions are implemented in the RF ASIC.

Even though the GSM and WCDMA signals are sent via different components, the principle of the transmission is the same.

Nokia Customer Care

Glossary

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A/D-converter	Analogue-to-digital converter
ACI	Accessory Control Interface
ADC	Analogue-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BA	Board Assembly
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic (type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2, UEME and Zocus
CCP	Compact Camera Port
CDMA	Code division multiple access
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSD	Circuit-switched data
CSR	Cambridge silicon radio
CSTN	Colour Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analogue converter
DAC	Digital-to-analogue converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo

DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FM	Frequency Modulation
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HSDPA	High-speed downlink packet access
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity

IR	Infrared
IrDA	Infrared Data Association
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MP3	Compressed audio file format developed by Moving Picture Experts Group
MTP	Multipoint-to-point connection
NFC	Near field communication
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PCM	Pulse Code Modulation
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board

PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RDS	Radio Data Service
RF	Radio Frequency
RF PopPort ™	Reduced function PopPort ™ interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card
RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC

USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
VF	View Finder
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WCDMA	Wideband code division multiple access
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

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