

Nokia Customer Care

Service Manual

RM-598; RM-604 (Nokia 7230; L3&4)

Mobile Terminal

Part No: (Issue 1)

COMPANY CONFIDENTIAL



Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	12/2009	AP-K	

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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.

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Nokia 7230; L3&4 Service Manual Structure

- 1 General information
- 2 Service Devices and Service Concepts
- 3 BB Troubleshooting and Manual Tuning Guide
- 4 RF Troubleshooting
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Nokia Customer Care

1 — General information

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■ Product selection

RM-598/RM-604 is a WCDMA/GSM handportable phone with a slide form factor. RM-598 supports EGSM 850/900/1800/1900 and WCDMA 850/1900/2100. RM-604 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-598/RM-604 product picture

■ Product features and sales package

Bearers and transport

- GSM/EDGE Class B, Multi slot class 32

- GPRS/EGPRS Class B, Multi slot class 32
- WCDMA 384 kbps uplink/ 384 kbps downlink,
- GSM/EDGE Dual Transfer Mode (DTM) class A, multi slot class 11

Connectivity

- Bluetooth 2.1 with stereo audio profiles
- USB2.0 Full Speed with micro USB interface
- MicroSD memory card - support up to 16 GB
- 3.5 mm Nokia AV Connector
- 2 mm charging connector
- Complementary USB charging

Display

- Large 2.4" QVGA (320 x 240 pixels) TFT main display with 262K colours

Imaging and video

- Integrated 3.2 Megapixel EDOF FULL FOCUS camera with a 4 x digital smooth zoom
- Video recording in QCIF (15 fps) and playing up to VGA
- Video player with H.263, MPEG4, H.264, Real-time streaming, 3GPP streaming

Music

- Music Player for MP3, MP4, AAC, AAC+, eAAC+, WMA, WAV, NB AMR, WB AMR, MIDI
- Ring tones: Video, MP3, AAC, AAC+, eAAC+, WMA and 64 polyphonic ringing tones
- FM RDS stereo radio

Navigation

- Nokia Maps application

Productivity

Context management

- WM DRM \geq 10, OMA DRM 2.0
- Organizer (Calendar + To-Do + Active Notes)
- PC Suite/Ovi Suite
- Active Standby
- Local/remote SyncML data sync
- Web Browser (OSS), XHTML browsing over TCP/IP

Messaging

- Email (native, OZ, Windows Live)
- OMA MMS 1.3 (300 kB MMS size), SMIL 2.0
- Audio Messaging (AMS)
- SMS
- Instant Messaging (IM) (native, Google talk, OZ, Windows Live)
- Social networks

Voice

- Speech codec support for HR, FR, EFR, AMR and AMR WB

Add-on software framework

- Nokia Series 40, 3rd edition
- Java™ MIDP 2.1

Additional features

- Macromedia Flash Lite 3.0
- Reminder light for missed events (IM, SMS, calls, etc.)

Sales package

- Transceiver RM-598/RM-604
- Battery BL-4CT (860 mAh)
- Charger AC-3
- Nokia wired stereo headset WH-102
- MicroSD card 2 GB
- User Guide

■ Product and module list

Module name	Type code	Notes
System/RF module	2XGA	
UI flex	2XHA	

■ Mobile enhancements

Table 1 Audio

Enhancement	Type
Audio Adapter (2.5 to 3.5mm)	AD-52
TTY adapter	HDA-11
Wired headsets	WH-102
	WH-201
	WH-205
	WH-500
	WH-600
	WH-601
	WH-700
	WH-701

Enhancement	Type
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
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

Enhancement	Type
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 860 mAh Li-Ion	BL-4S
Back-up power	DC-11
First aid charger	DC-8
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

Enhancement	Type
Charger adapter (3.5mm to 2mm)	CA-44

■ Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
Transceiver with BL-4CT 860 mAh Li-Ion battery pack	98 x 48 x 14.75	100 (with battery)	64

Battery endurance

Battery	Talk time	Standby time
BL-4CT 860 mAh Li-ion battery pack	Up to 5.33 hours (GSM) Up to 3.66 hours (WCDMA)	Up to 370 hours (GSM) Up to 395 hours (WCDMA)

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 VIII (900), WCDMA II (1900) and WCDMA I (2100)
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

Parameter	Unit
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 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA VIII (900): -50 ... +24 dBm/0.01μW ... 251.2mW
	WCDMA V (850): -50 ... +24 dBm/0.01μW ... 251.2mW
	WCDMA II (1900): -50 ... +24dBm/0.01μW ... 251.2mW
	WCDMA I (2100): -50 ... +24 dBm/0.01μW ... 251.2mW
EDGE output power	EDGE850: +5 ... +29dBm/3.2mW ... 794mW
	EDGE900: +5 ... +29dBm/3.2mW ... 794mW
	EDGE1800: +0 ... +26dBm/1.0mW ... 400mW
	EDGE1900:+0 ... +26dBm/1.0mW ... 400mW
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)

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

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 m² / s³ (0.0558 g²/ 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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2 — Service Devices and Service Concepts

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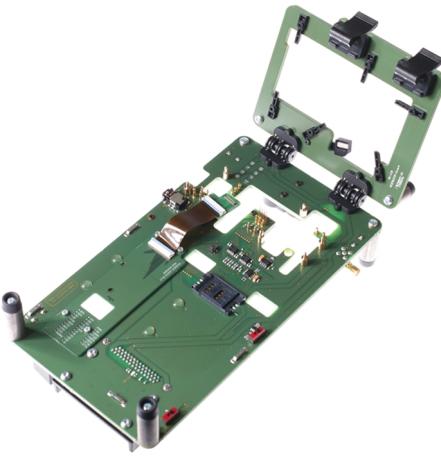
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■ Service devices


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-598; RM-604. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	FS-120	Flash adapter	
	MJ-239	Module jig	<p>MJ-239 is meant for component level troubleshooting.</p> <p>The jig includes an RF interface for GSM and WCDMA. In addition, it has the following features:</p> <ul style="list-style-type: none"> • 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


Rework jigs and stencils



The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-598; RM-604. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.



	RJ-230	Soldering jig	<p>RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.</p>
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General devices

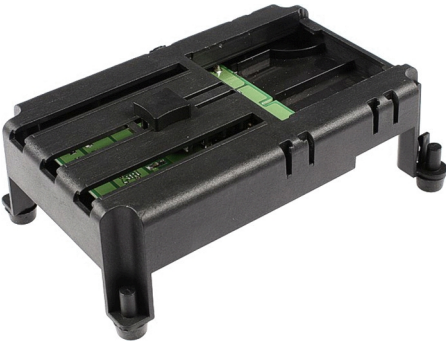
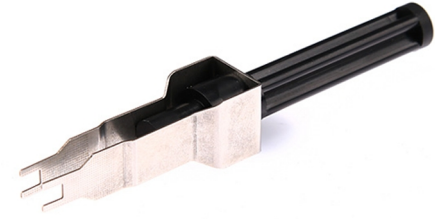
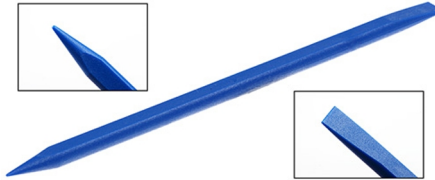

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-598; RM-604. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

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

<p>CU-4</p> 	<p>CU-4</p>	<p>Control unit</p>	<p>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.</p> <p>The unit has the following features:</p> <ul style="list-style-type: none"> • 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 <p>When using CU-4, note the special order of connecting cables and other service equipment:</p> <p>Instructions</p> <ol style="list-style-type: none"> 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.  <p>Note: Phoenix enables CU-4 regulators via USB when it is started.</p> <p>Reconnecting the power supply requires a Phoenix restart.</p>
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	FLS-5	Flash device	
<p>FPS-21</p> 	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.		
	<p>FPS-21 sales package:</p> <ul style="list-style-type: none"> • FPS-21 prommer • AC-35 power supply • CA-31D USB cable <p>FPS-21 interfaces:</p> <p><i>Front</i></p> <ul style="list-style-type: none"> • 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. <p><i>Rear</i></p> <ul style="list-style-type: none"> • 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. <p><i>Inside</i></p> <ul style="list-style-type: none"> • Four SD card memory slots For internal storage memory. <p>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.</p>		




	PK-1	Software protection key	
	SB-6	Bluetooth test and interface box (sales package)	
	SRT-6	Opening tool	
	SS-46	Interface adapter	
			<p>PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle.</p> <p>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.</p> <p>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 .</p> <p>Sales package includes:</p> <ul style="list-style-type: none"> • SB-6 test box • Installation and warranty information <p>SRT-6 is used to open phone covers.</p> <p>Note: The SRT-6 is included in the Nokia Standard Toolkit.</p> <p>SS-46 acts as an interface adapter between the flash adapter and FPS-21.</p>





	SS-62	Generic flash adapter base for BB5	
	<ul style="list-style-type: none"> • generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using galvanic connector or coupler • multiplexing between USB and FBUS media, controlled by VUSB 		
	SS-88	Camera removal tool	
	<p>The camera removal tool SS-88 is used to remove/attach the camera module from/to the socket.</p>		
	SS-93	Opening tool	
	<p>SS-93 is used for opening JAE connectors.</p> <p>Note: The SS-93 is included in Nokia Standard Toolkit.</p>		
	SX-4	Smart card	
	<p>SX-4 is a BB5 security device used to protect critical features in tuning and testing.</p> <p>SX-4 is also needed together with FPS-21 when DCT-4 phones are flashed.</p>		


Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-598; RM-604. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

 <p>CA-101 100cm</p>	CA-101	Micro USB cable	
	<p>The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.</p>		

	CA-158RS	RF tuning cable										
	Product-specific adapter cable for RF tuning.											
	<div><div></div><div>Table 7 Attenuation values</div><table><tr><th>Band</th><th>Attenuation Rx</th></tr><tr><td>GSM 850/900</td><td>0.30 dB</td></tr><tr><td>GSM 1800</td><td>0.38 dB</td></tr><tr><td>GSM 1900</td><td>0.41 dB</td></tr><tr><td>WCDMA I (2 GHz)</td><td>0.45 dB</td></tr></table></div>			Band	Attenuation Rx	GSM 850/900	0.30 dB	GSM 1800	0.38 dB	GSM 1900	0.41 dB	WCDMA I (2 GHz)
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-35S	Power cable										
	CA-35S is a power cable for connecting, for example, the FPS-21 flash prommer to the Point-Of-Sales (POS) flash adapter.											

 <p>CA-89DS 100cm</p> 	CA-89DS	Cable	
<p>Provides VBAT and Flashbus connections to mobile device programming adapters.</p>			
	DAU-9S	MBUS cable	
<p>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.</p> <p>Note: Docking station adapters valid for DCT4 products.</p>			
	PCS-1	Power cable	
<p>The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.</p>			

	XRS-6	RF cable	
	<p>The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.</p> <p>SMA to N-Connector approximately 610 mm.</p> <p>Attenuation for:</p> <ul style="list-style-type: none"> • 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

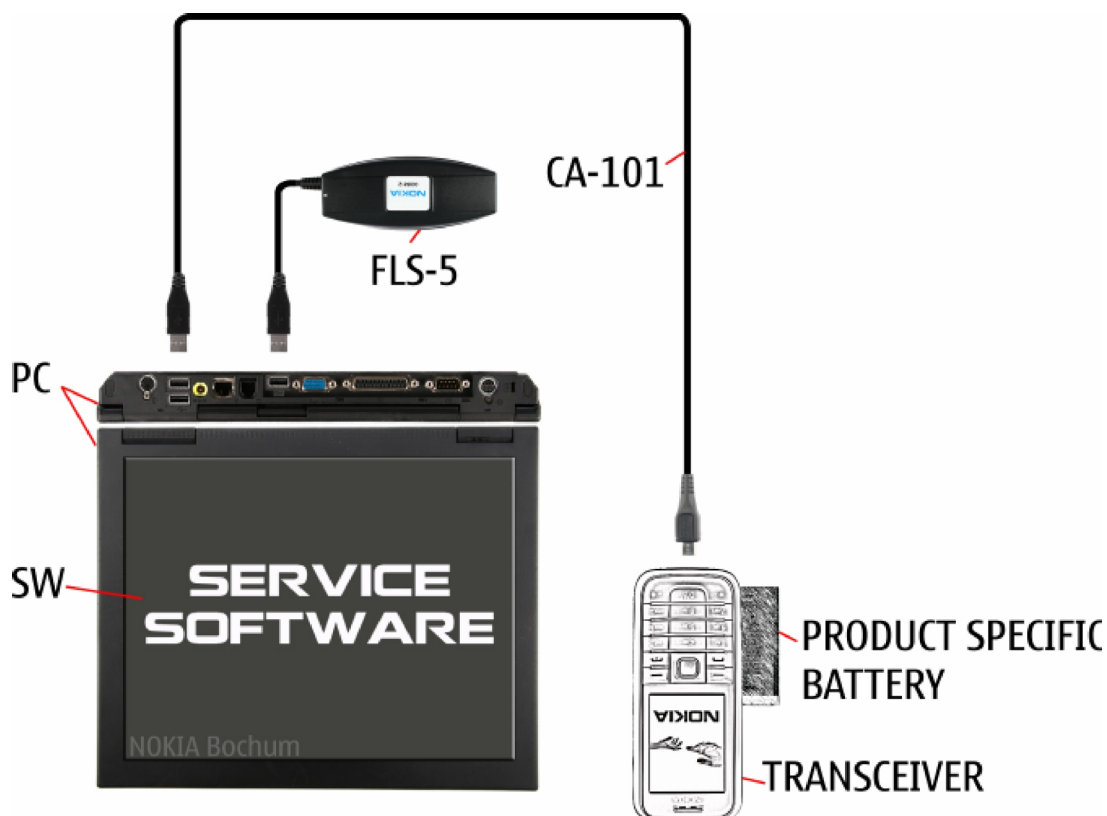


Figure 2 POS flash concept

Type	Description
Product specific tools	
BL-4CT	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software

Type	Description
Cables	
CA-101	Micro USB cable

Flash concept with FPS-21

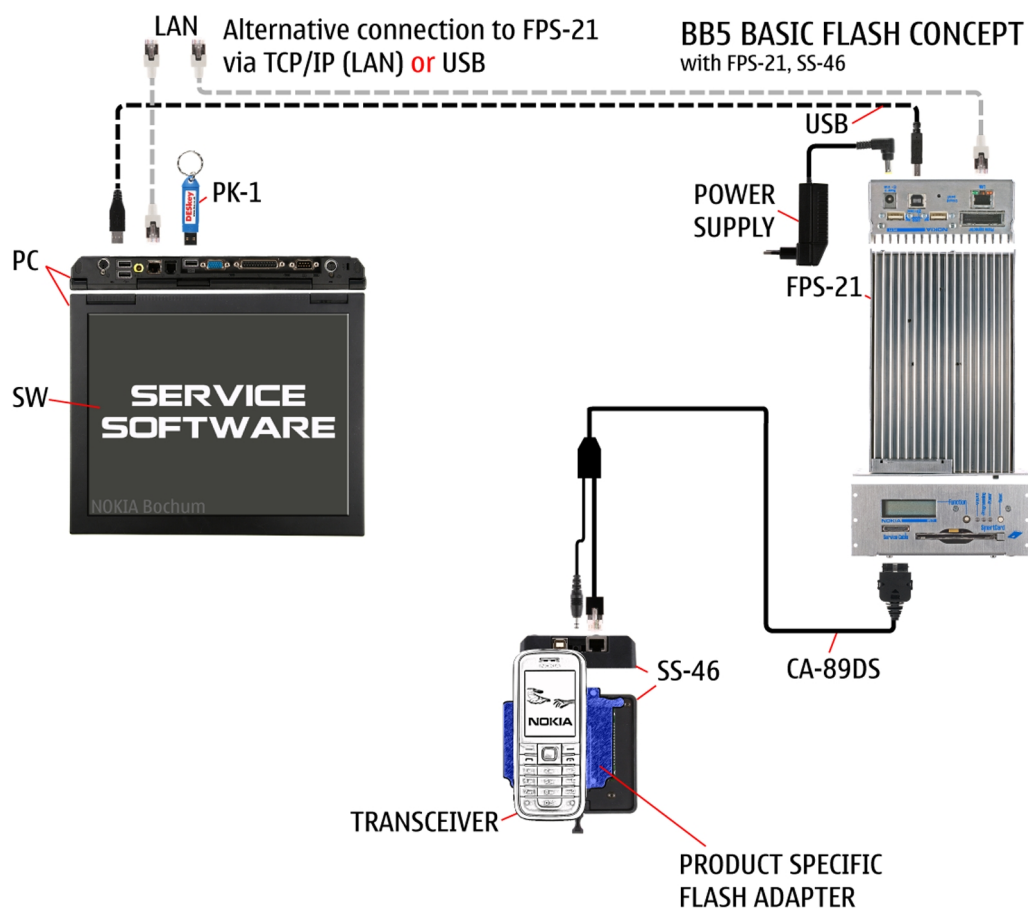


Figure 3 Basic flash concept with FPS-21

Type	Description
Product specific devices	
FS-120	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

Type	Description
	USB cable

CU-4 flash concept with FPS-21

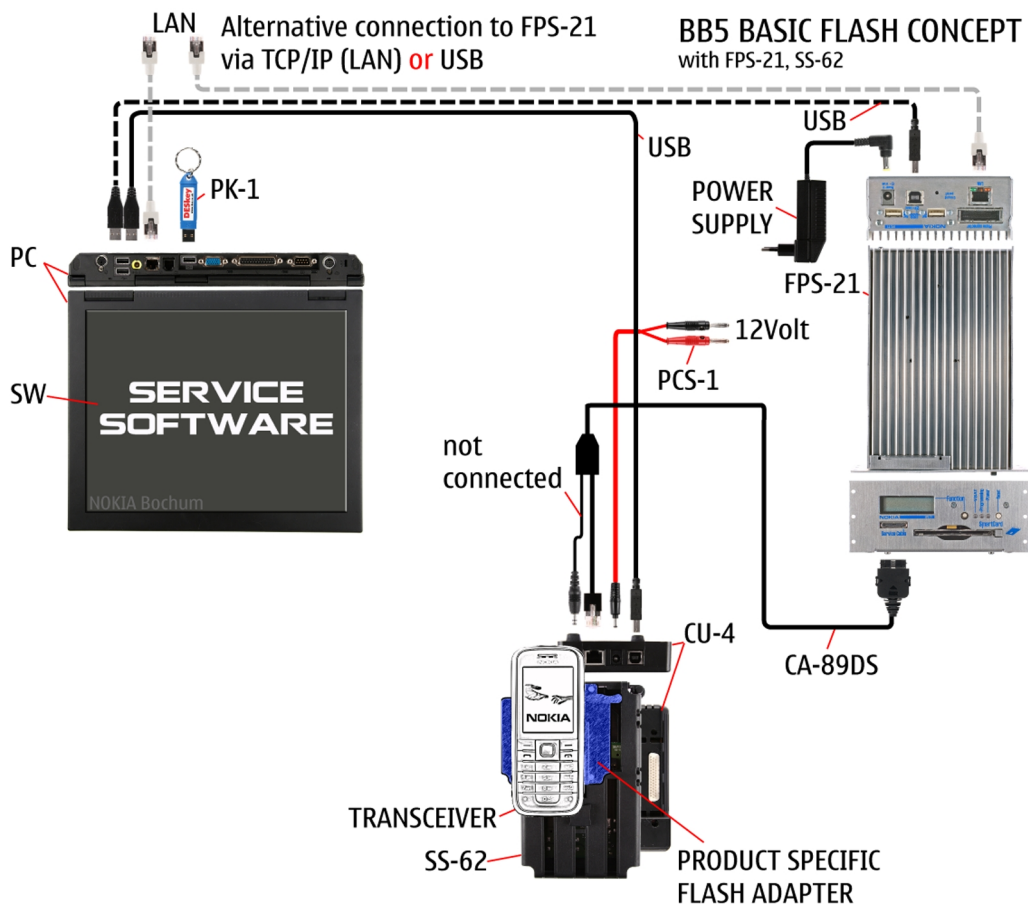


Figure 4 CU-4 flash concept with FPS-21

Type	Description
Product specific devices	
FS-120	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	

Type	Description
PCS-1	Power cable
CA-89DS	Service cable
	Standard USB cable
	USB cable

Module jig service concept

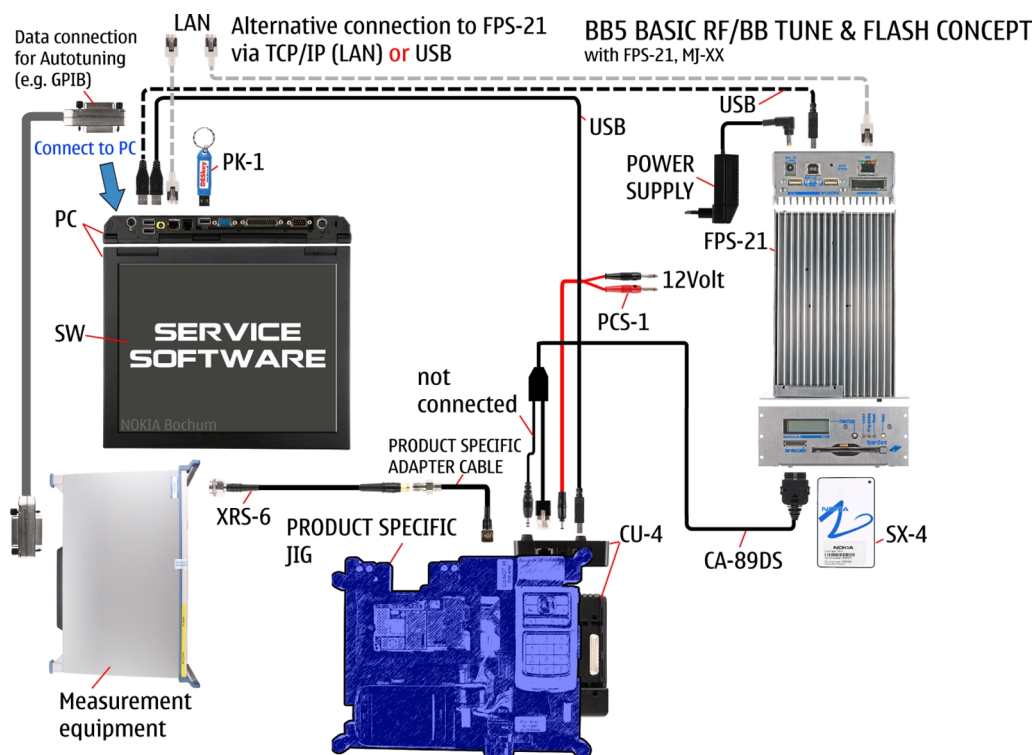


Figure 5 Module jig service concept

Type	Description
Phone specific devices	
MJ-239	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

Type	Description
PCS-1	DC power cable
XRS-6	RF cable
	USB cable
	GPIO control cable

Service concept for RF testing and RF/BB tuning

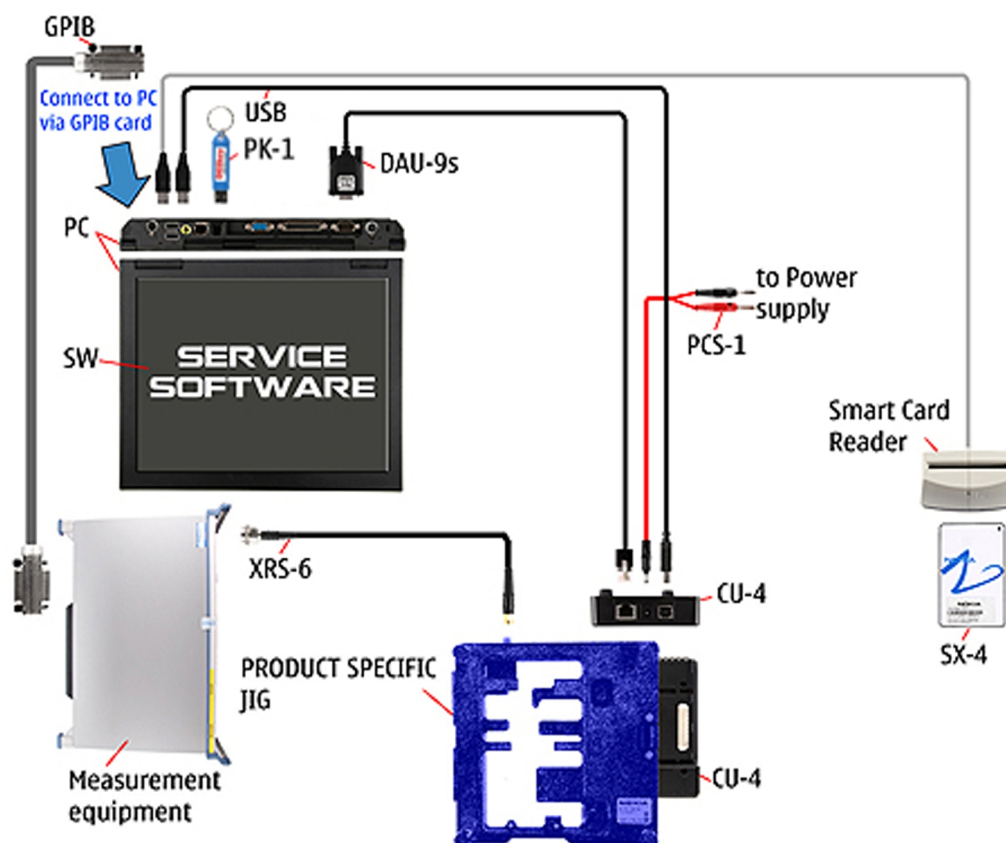


Figure 6 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-239	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

Type	Description
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Bluetooth testing concept with SB-6

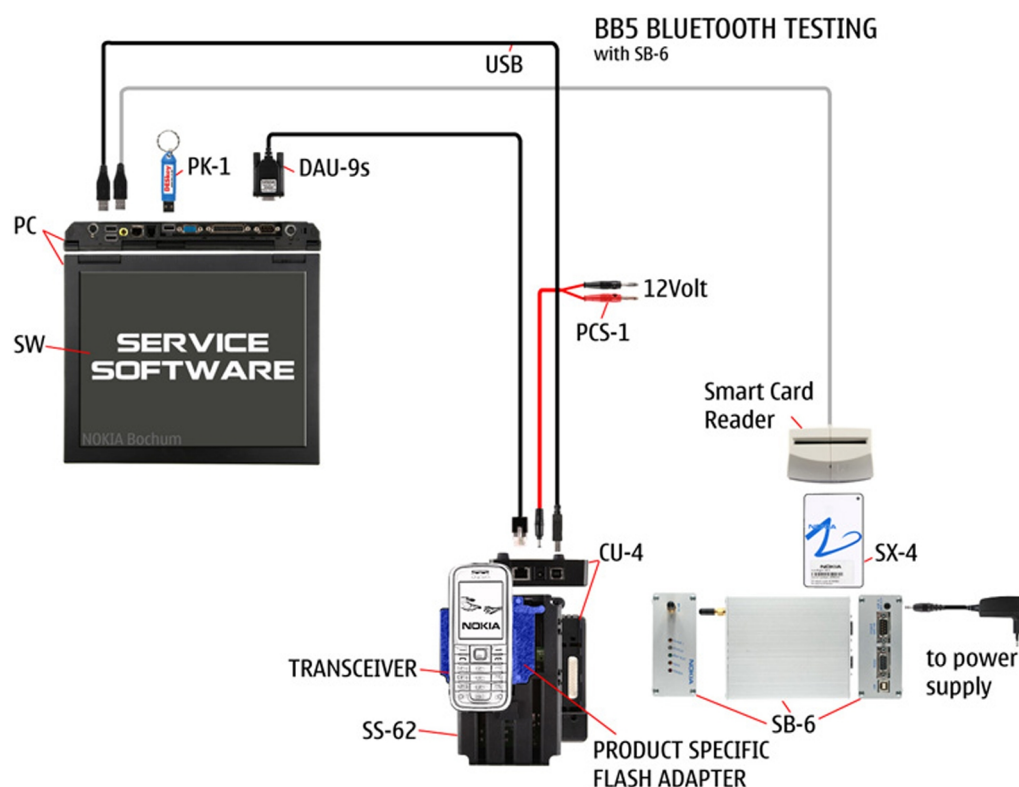


Figure 7 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
FS-120	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

Type	Description
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
	USB cable

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3 — BB Troubleshooting and Manual Tuning Guide

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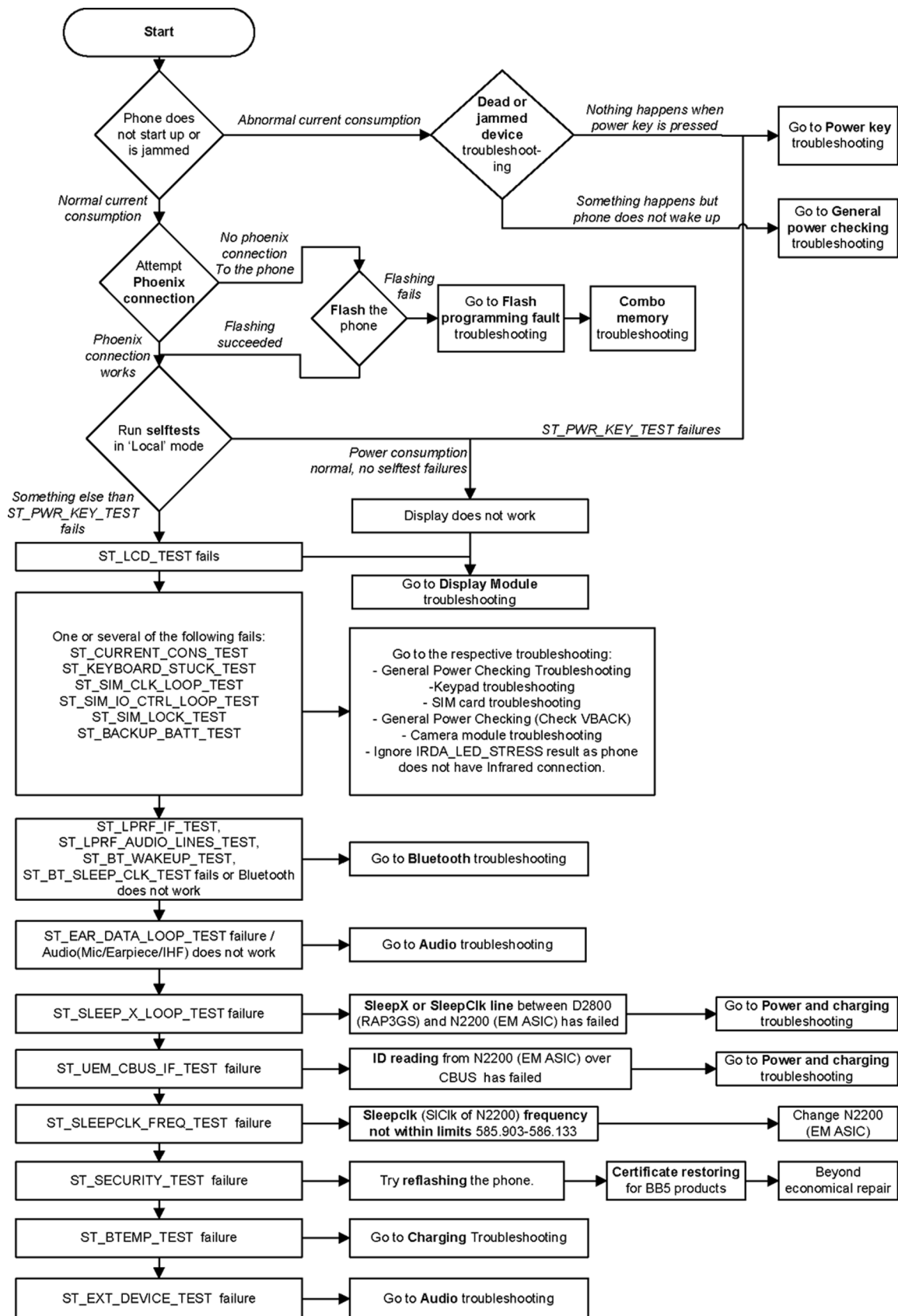
■ Baseband self tests in Phoenix

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*.

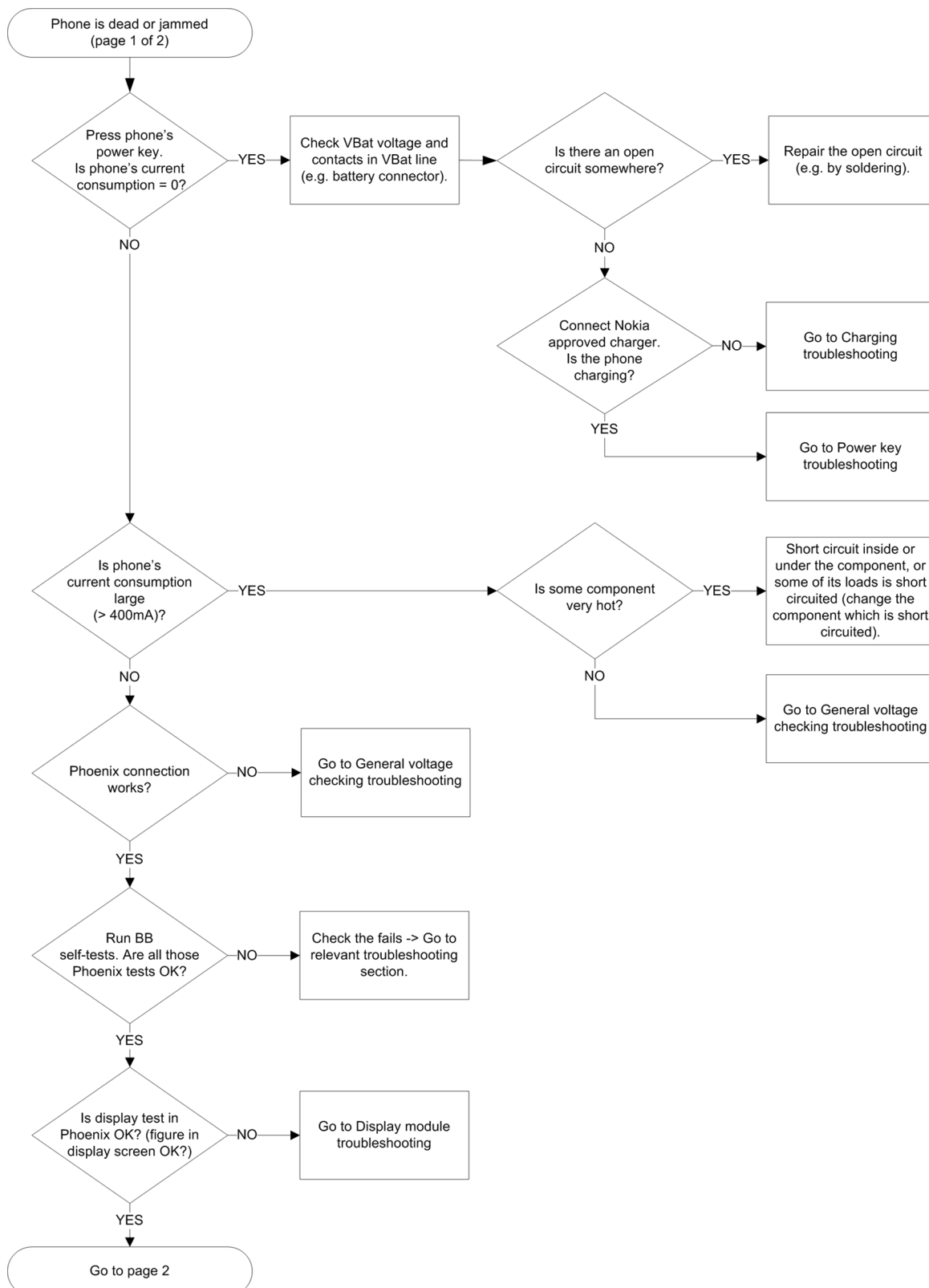
Troubleshooting flow



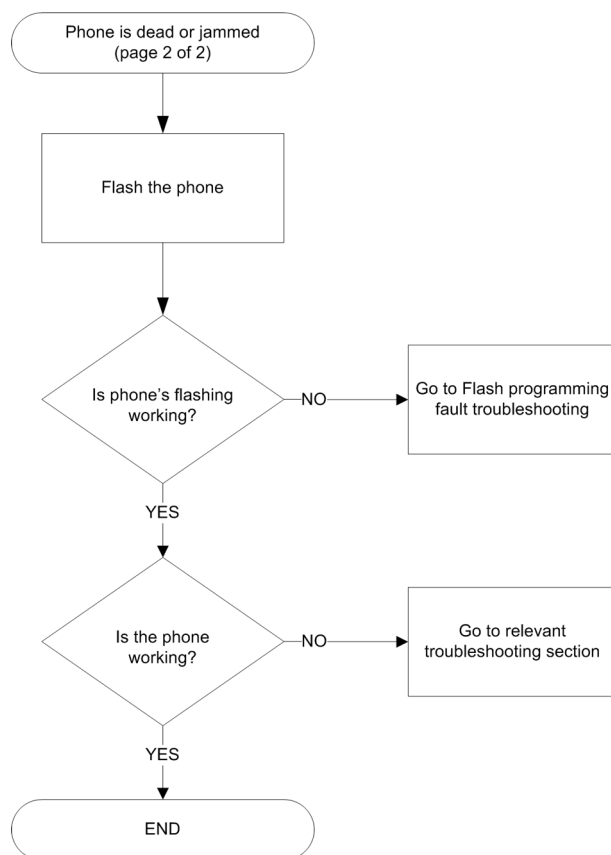
■ Power and charging troubleshooting

Dead or jammed device troubleshooting

Troubleshooting flow - Page 1 of 2

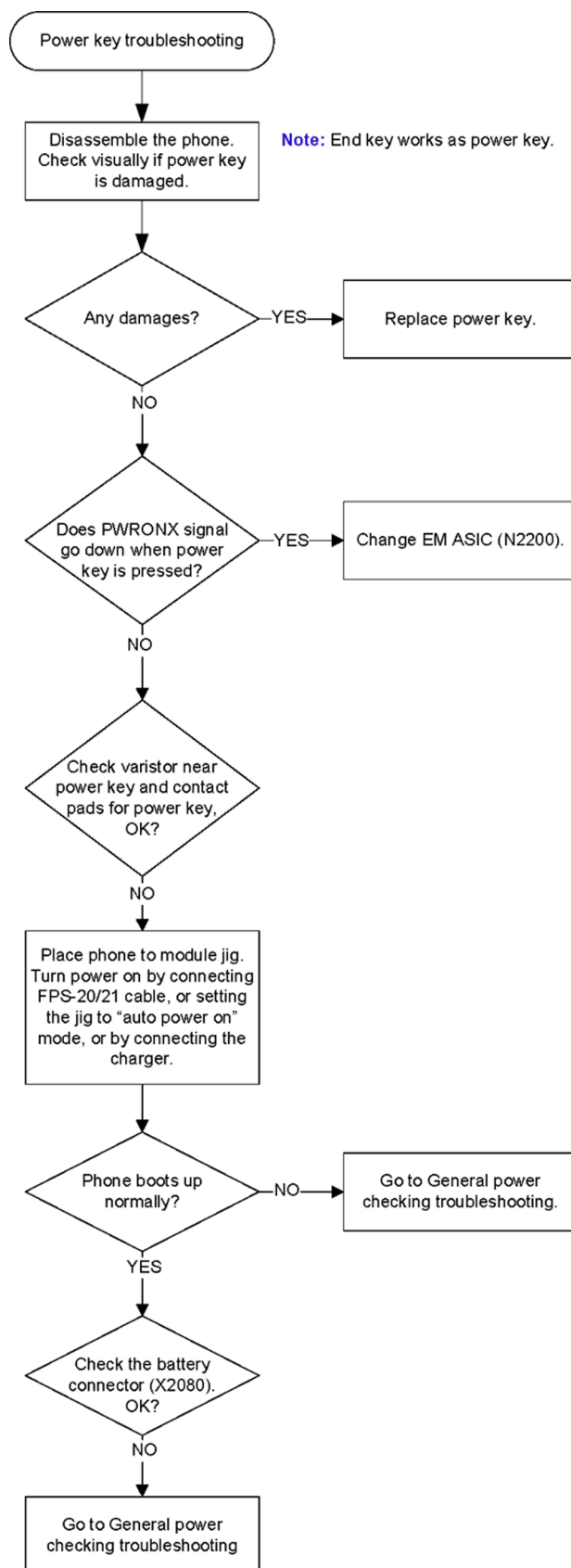


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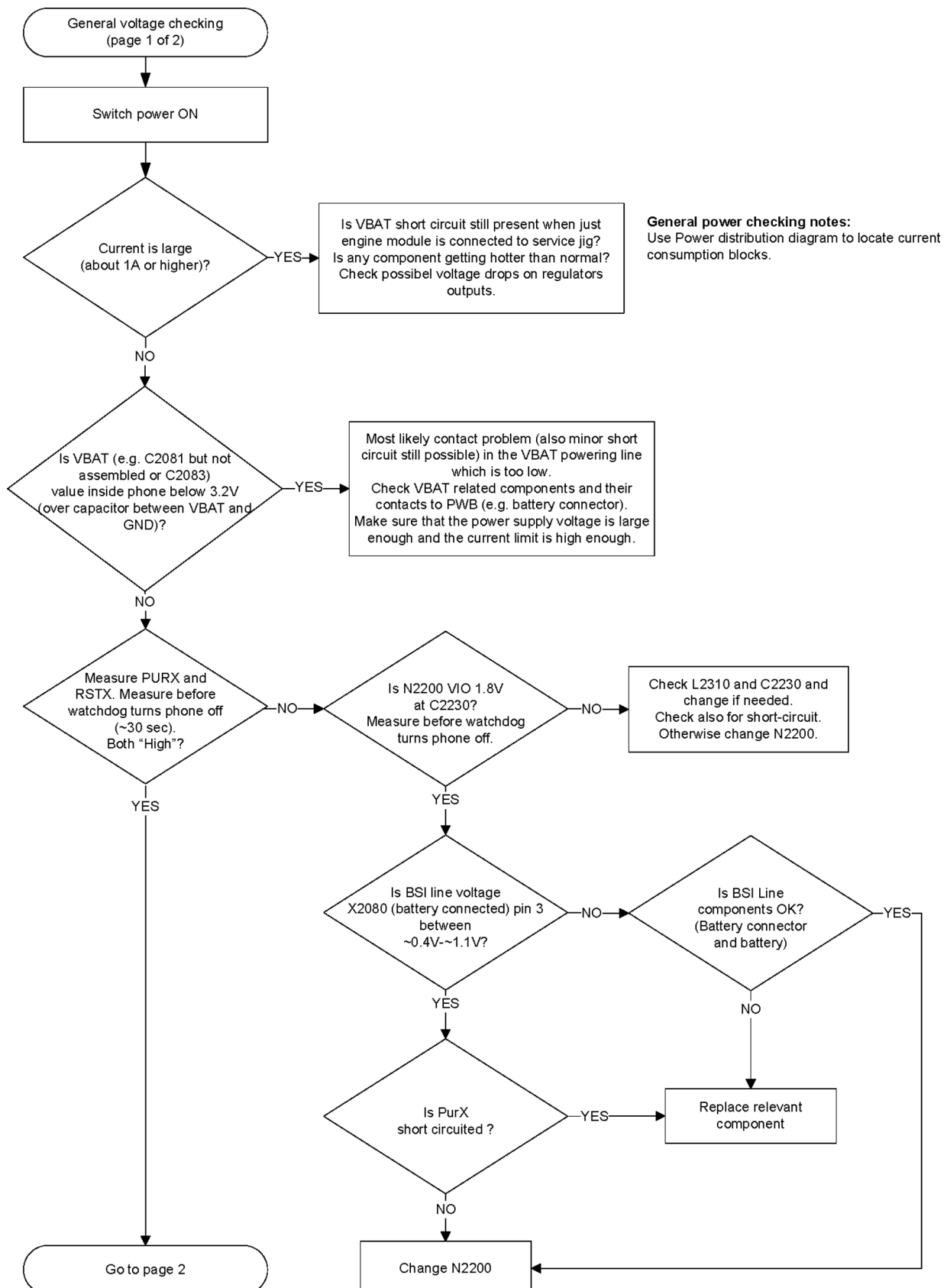
Power key troubleshooting

Troubleshooting flow

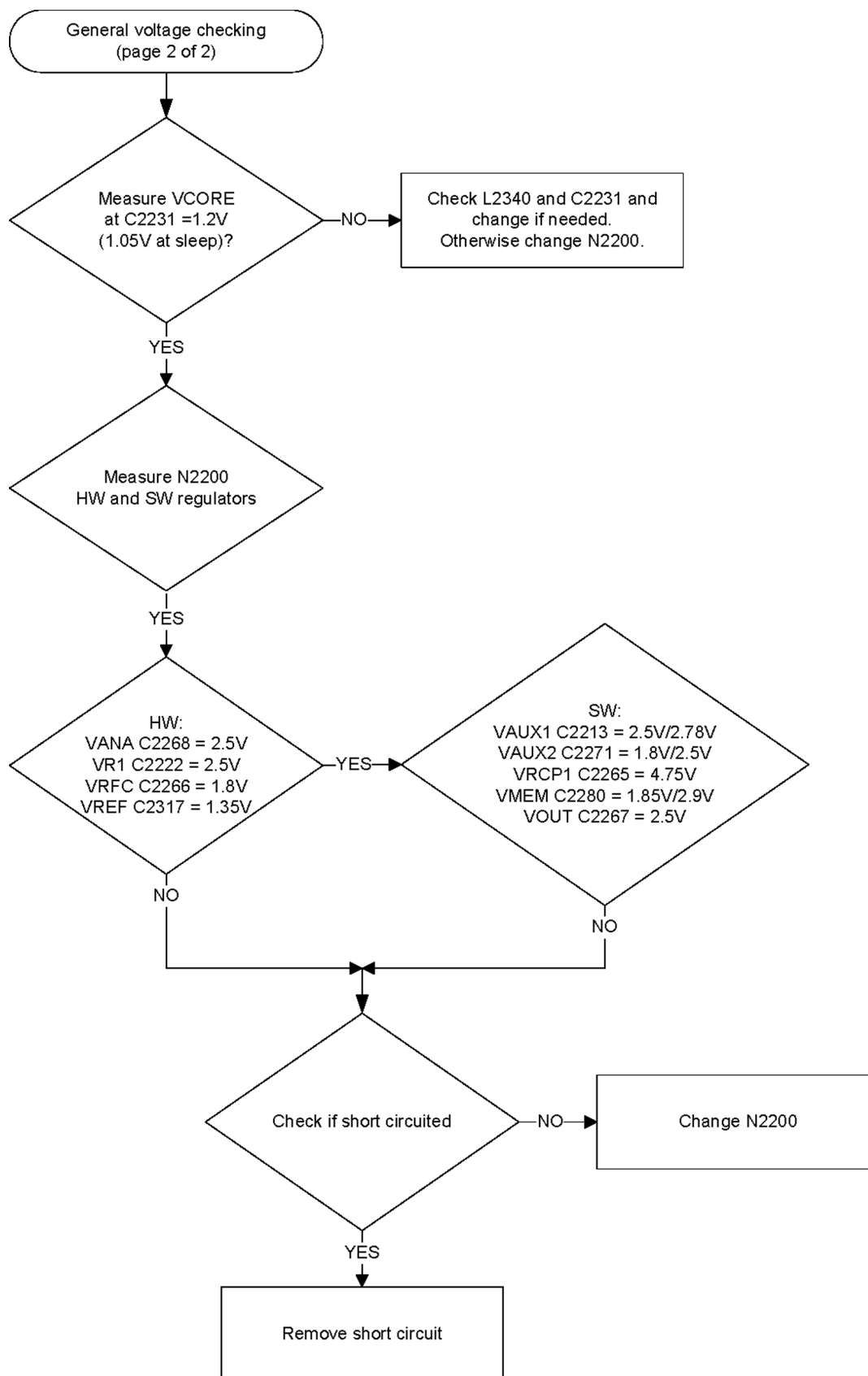


General voltage checking troubleshooting

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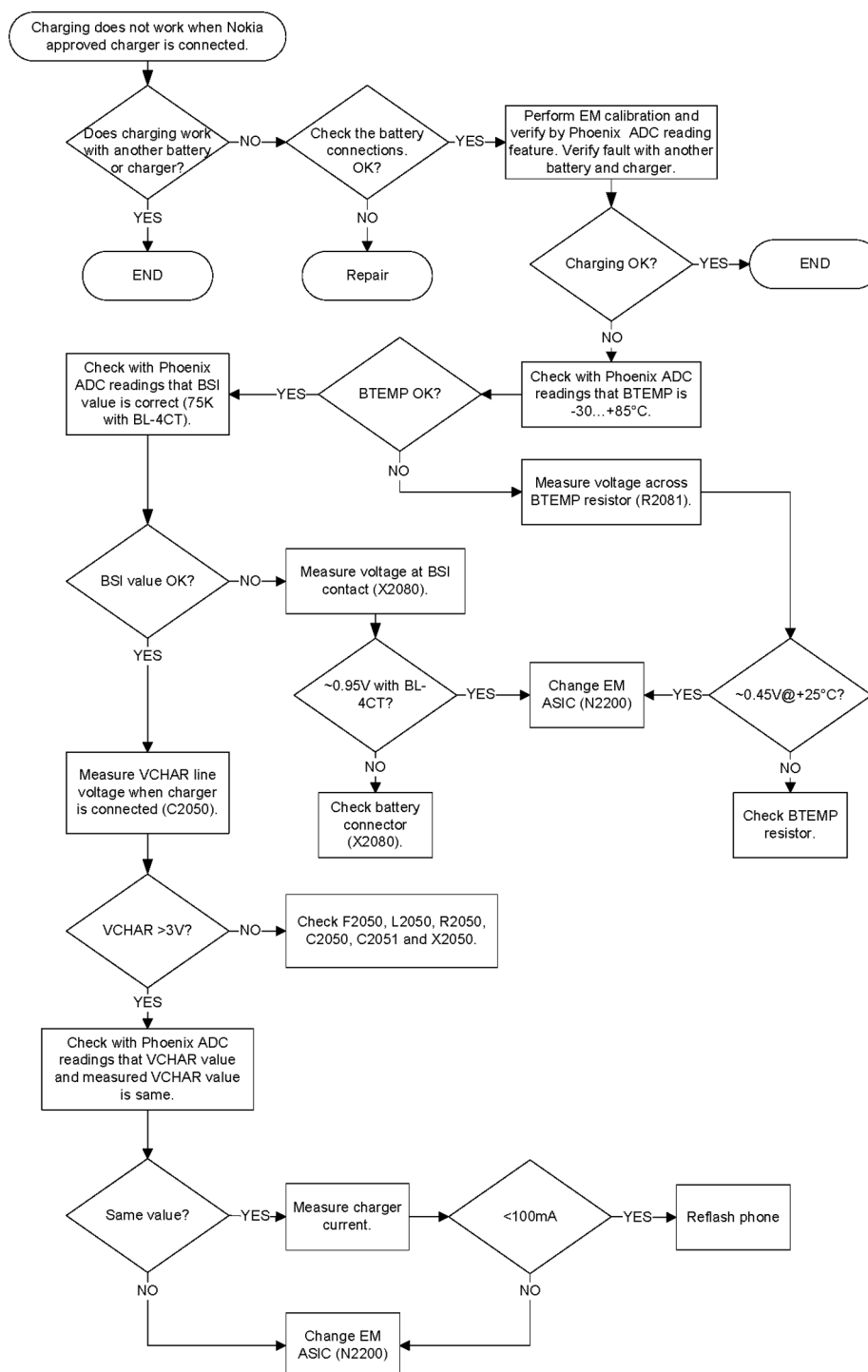
General power checking

Check the following voltages:

Signal Rename	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	Pearl/Gazoo	ON	ON	1.8	Memory, I/Os, display, camera, BTHFMTXRDS3.0	
VBACK	Pearl/Gazoo	ON	ON	2.5	Back-up battery	
VSIM	Pearl/Gazoo	ON	ON	1.8/3.0	SIM card	
VAUX1	Pearl/Gazoo	ON	ON	2.8	Camera, display and hall sensor	
VANA	Pearl/Gazoo	ON	ON	2.5	Camera	
VR1	Pearl/Gazoo	OFF	ON	2.5	Crystal oscillators	
VRFC	Pearl/Gazoo	OFF	ON	1.8	RAP3Gv4 converters	
VRCP1	Pearl/Gazoo			4.75	To RF parts	
VREF	Pearl/Gazoo	ON	ON	1.25	RF reference	
VCORE	Pearl/Gazoo	ON	ON	1.2	RAP3Gv4 digital	Can change due to RAP3Gv4 version & SW
VOUT	Pearl/Gazoo	OFF	OFF	2.5	Video switch	
VMEM	Pearl/Gazoo	OFF	OFF	2.9	microSD	Disabled in sleep

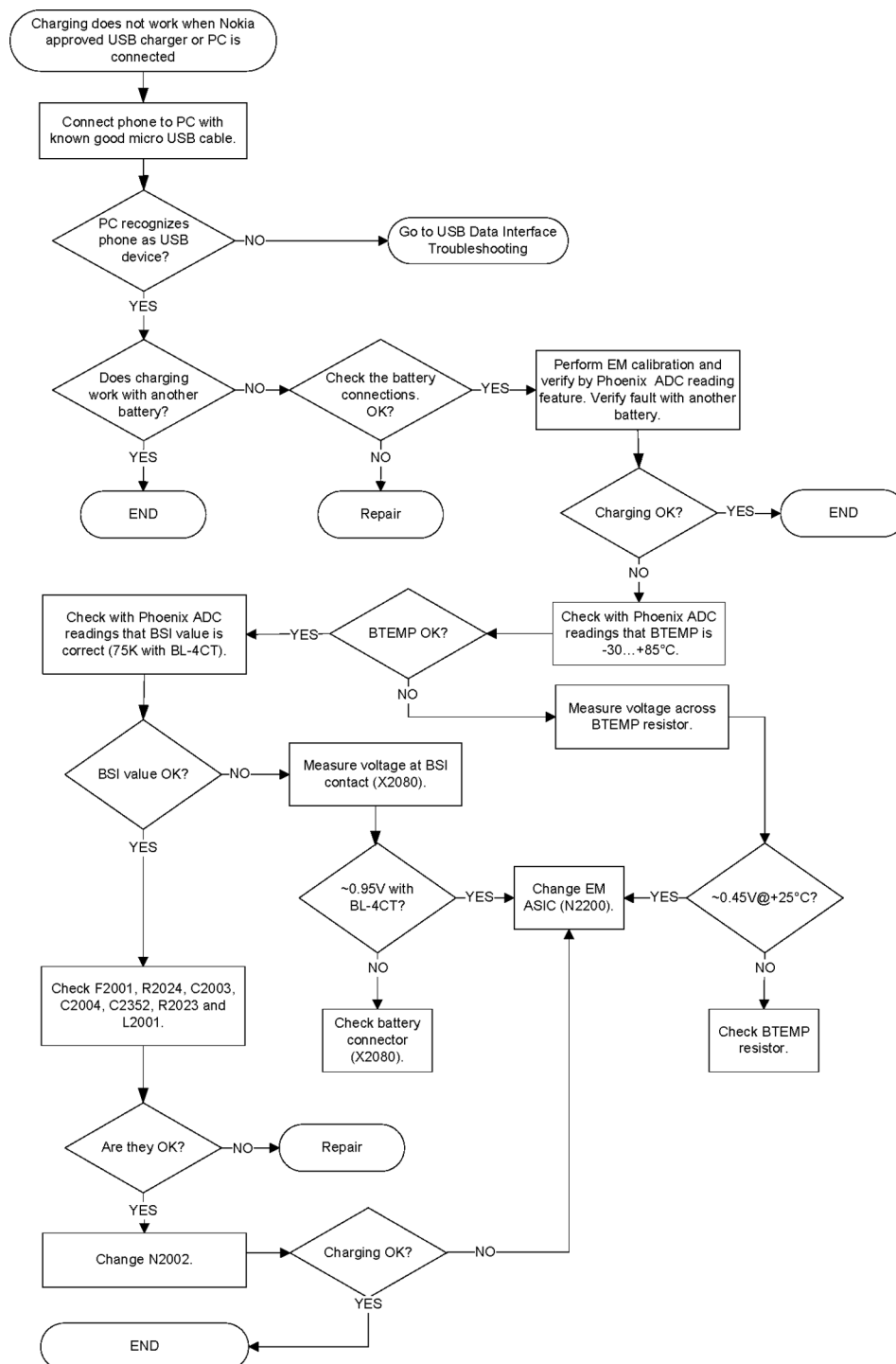
Charging troubleshooting

Troubleshooting flow



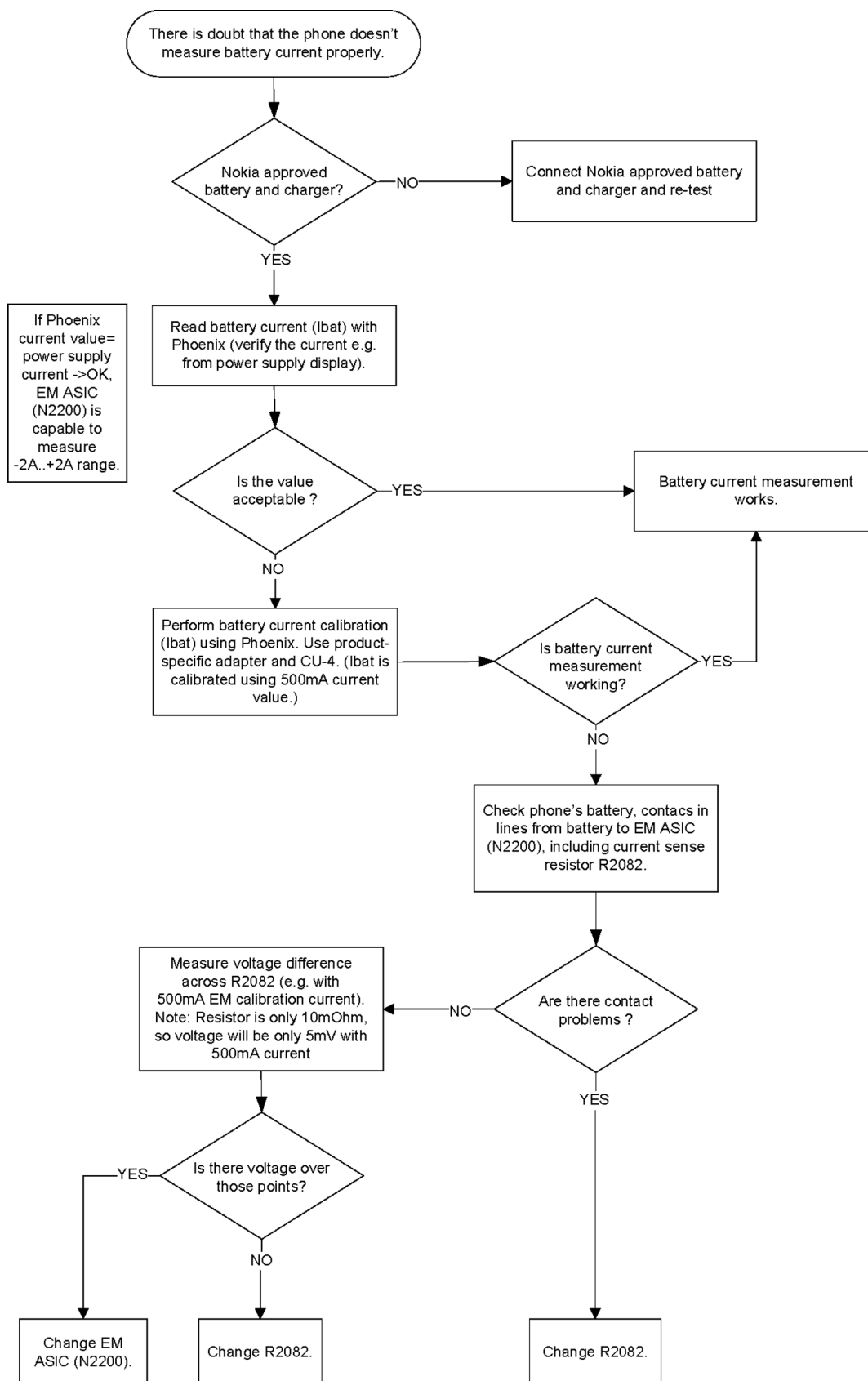
USB charging troubleshooting

Troubleshooting flow



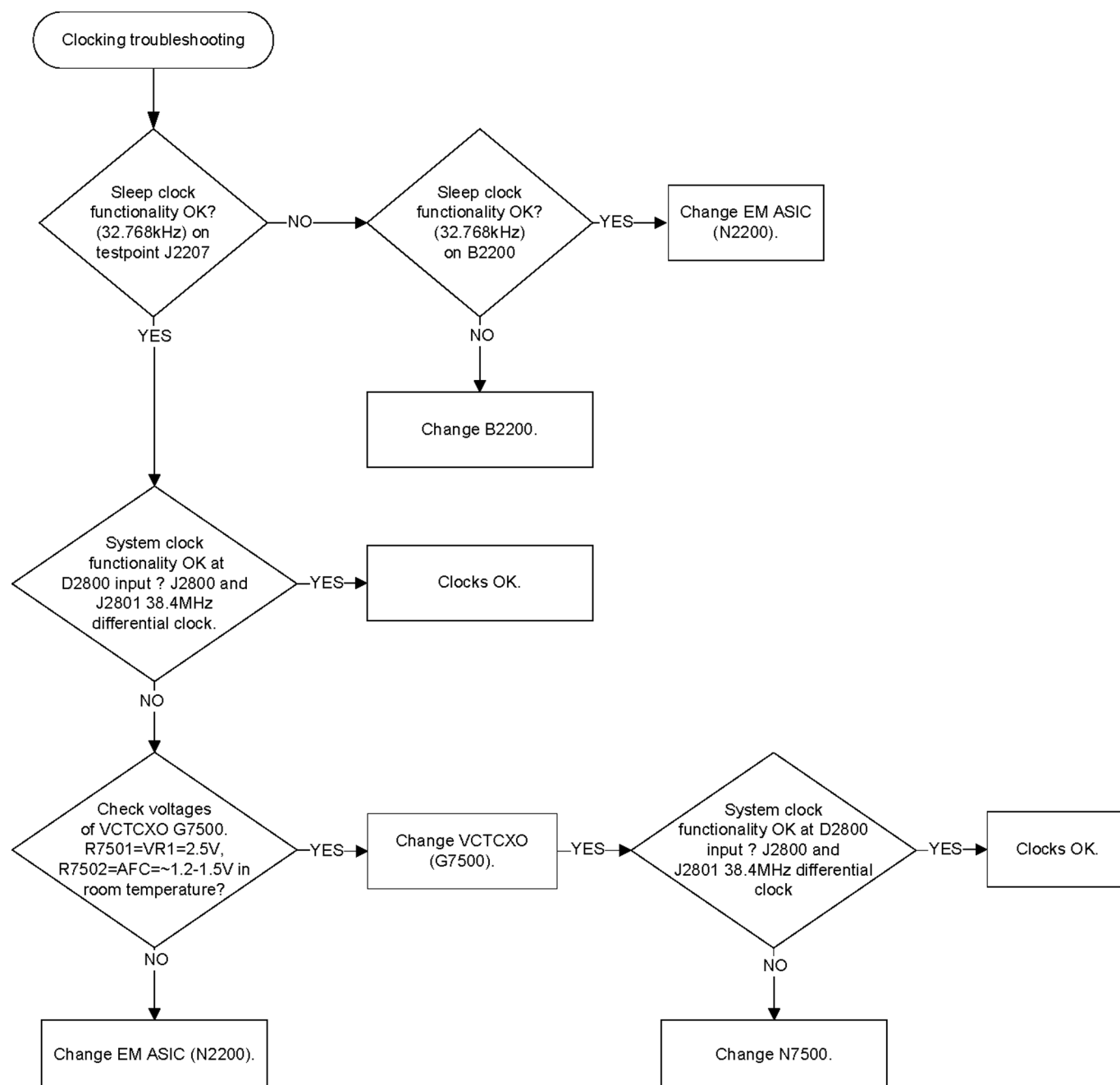
Battery current measuring fault troubleshooting

Troubleshooting flow



Clocking troubleshooting

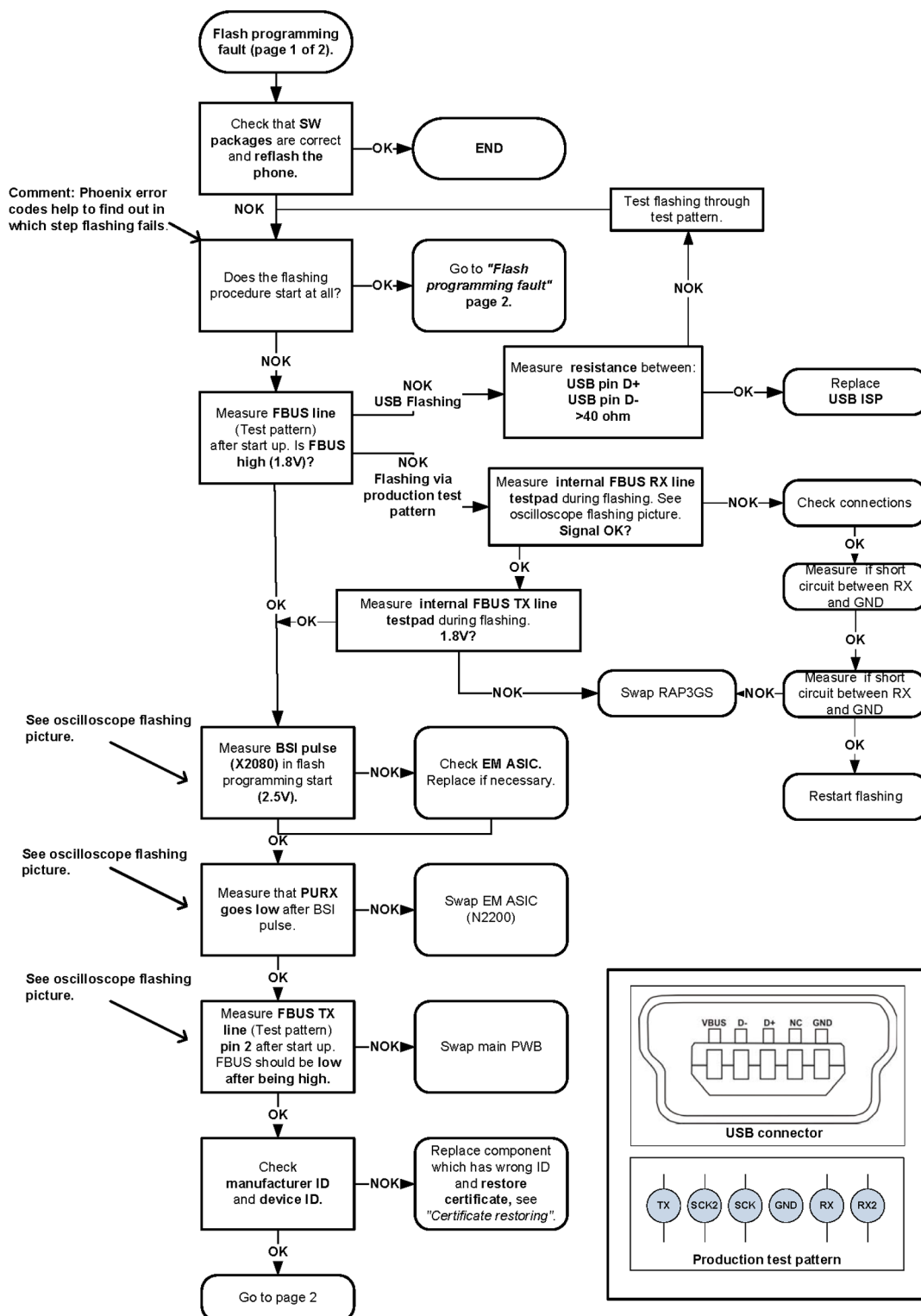
Troubleshooting flow



■ Interface troubleshooting

Flash programming fault troubleshooting

Troubleshooting flow - Page 1 of 2



Troubleshooting flow - Page 2 of 2

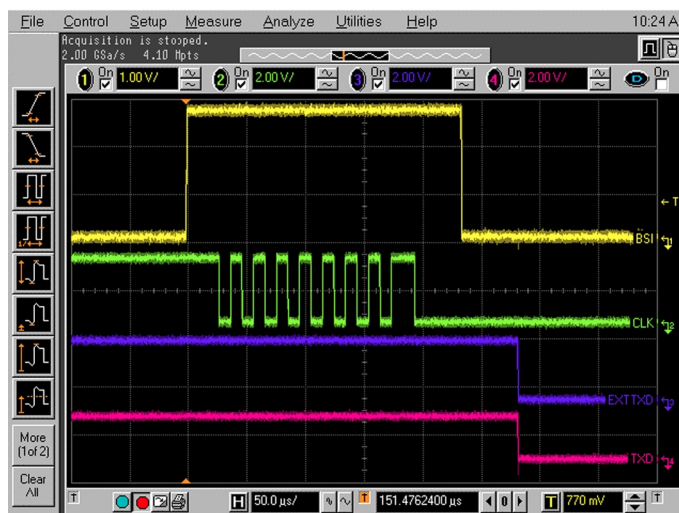
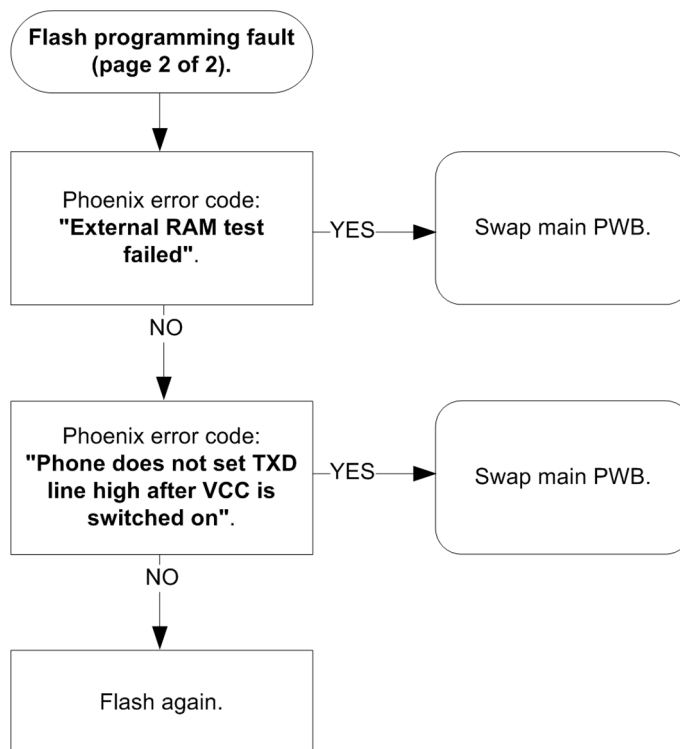


Figure 8 Flashing pic 1. Take single trig measurement for the rise of the BSI signal

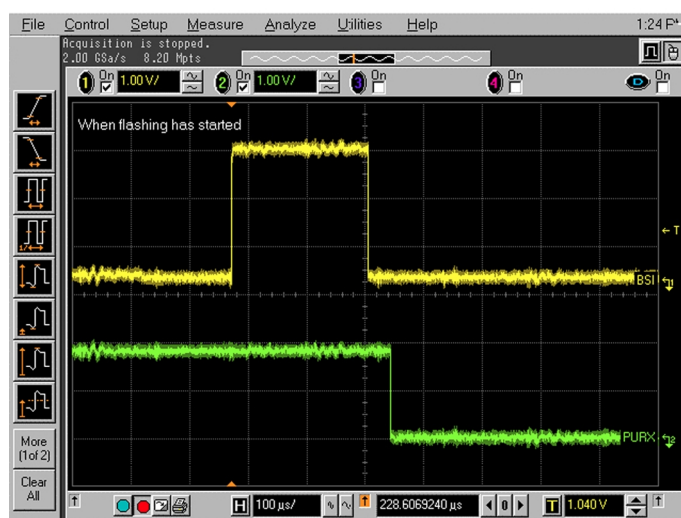
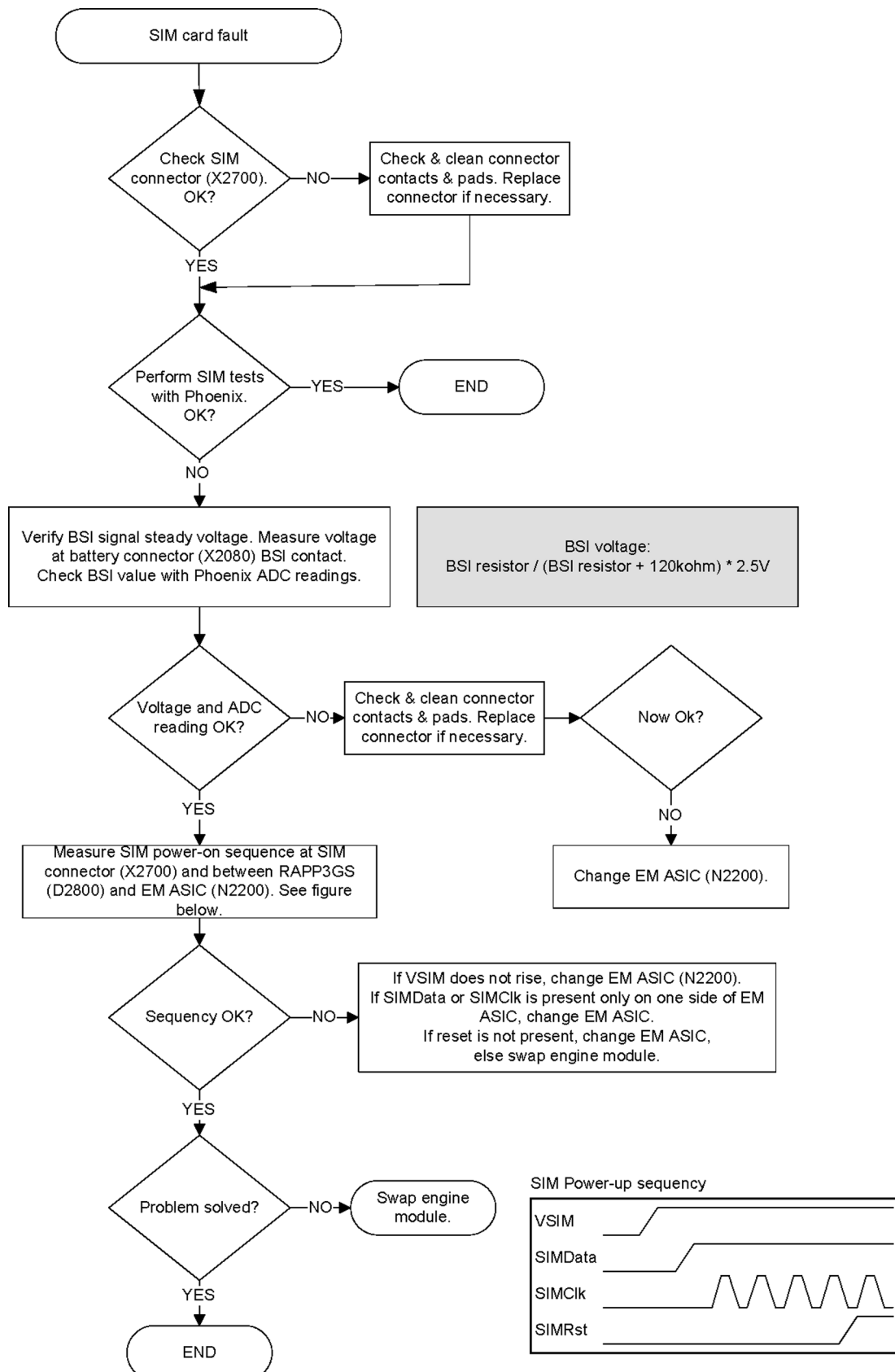


Figure 9 Flashing pic 2. Take single trig measurement for the rise of the BSI signal

SIM card troubleshooting

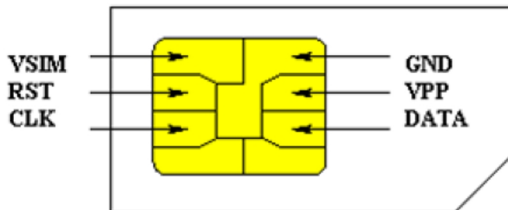
Troubleshooting flow



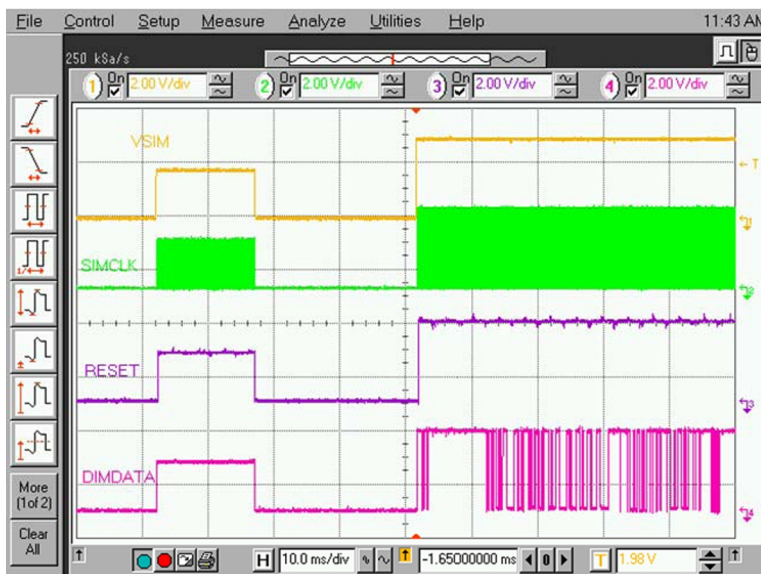
SIM power-on sequence

Testpoints between
RAP3GS and EM ASIC
J2218 = SIMData
J2219 = SIMClk
J2220 = SIMIOC

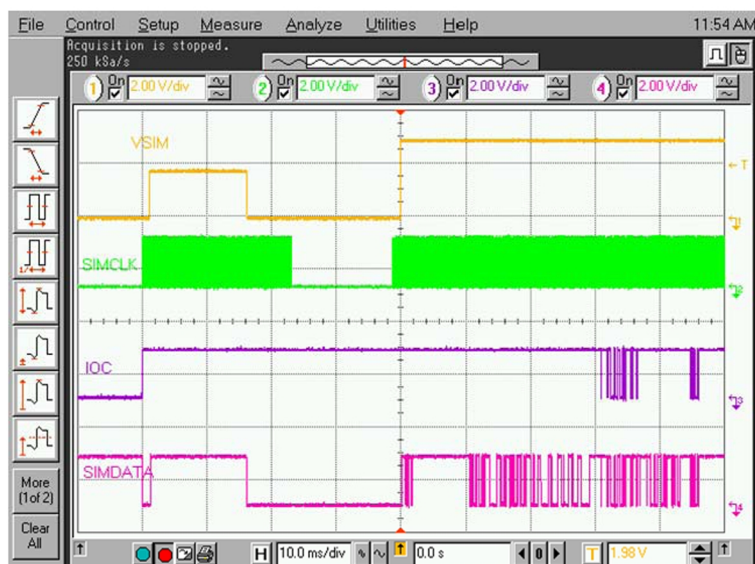
Fsimclk = 3.8MHz



SIM contacts



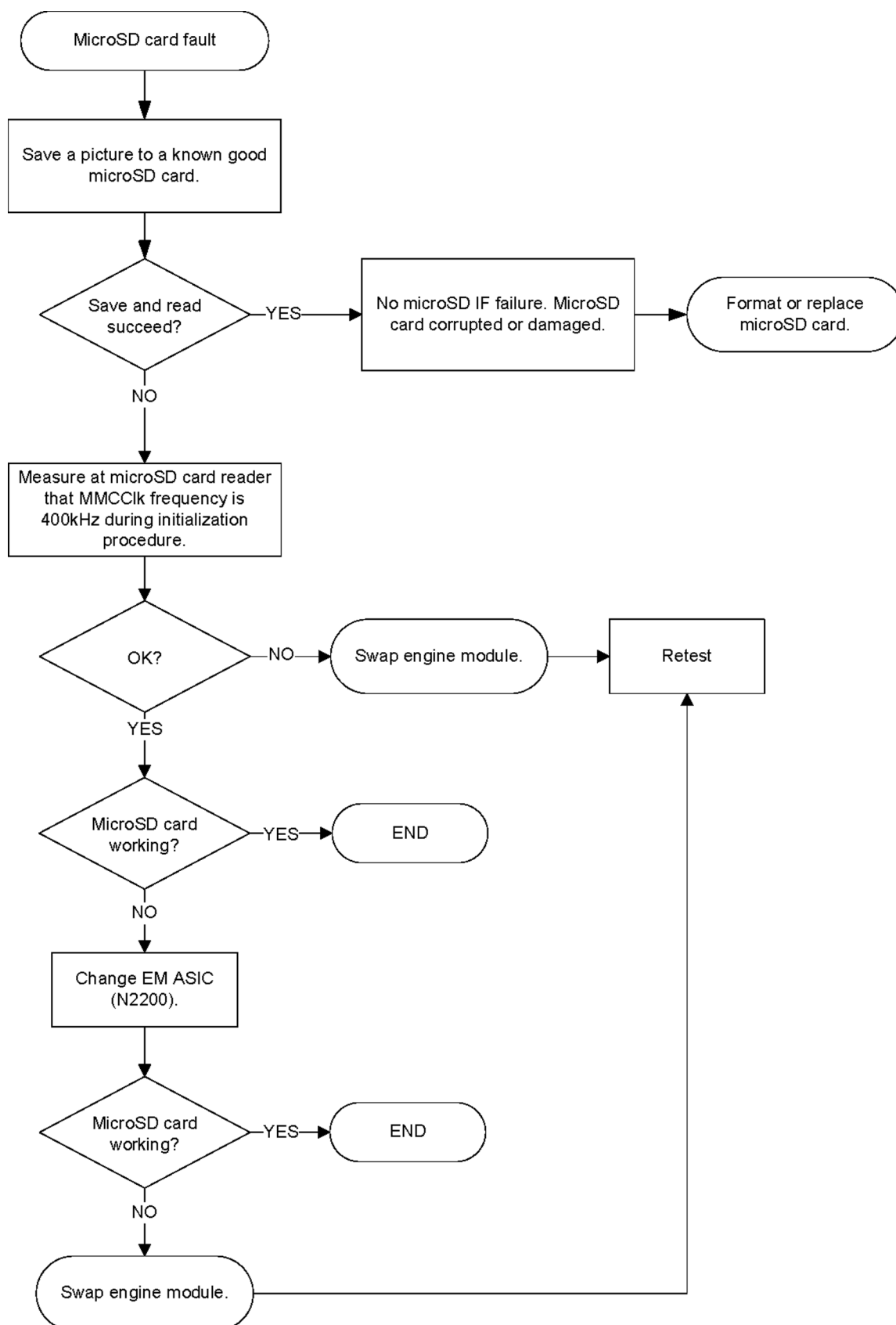
SIM power-on sequence on X2700.



SIM power-on sequence between RAP3GS and EM ASIC.

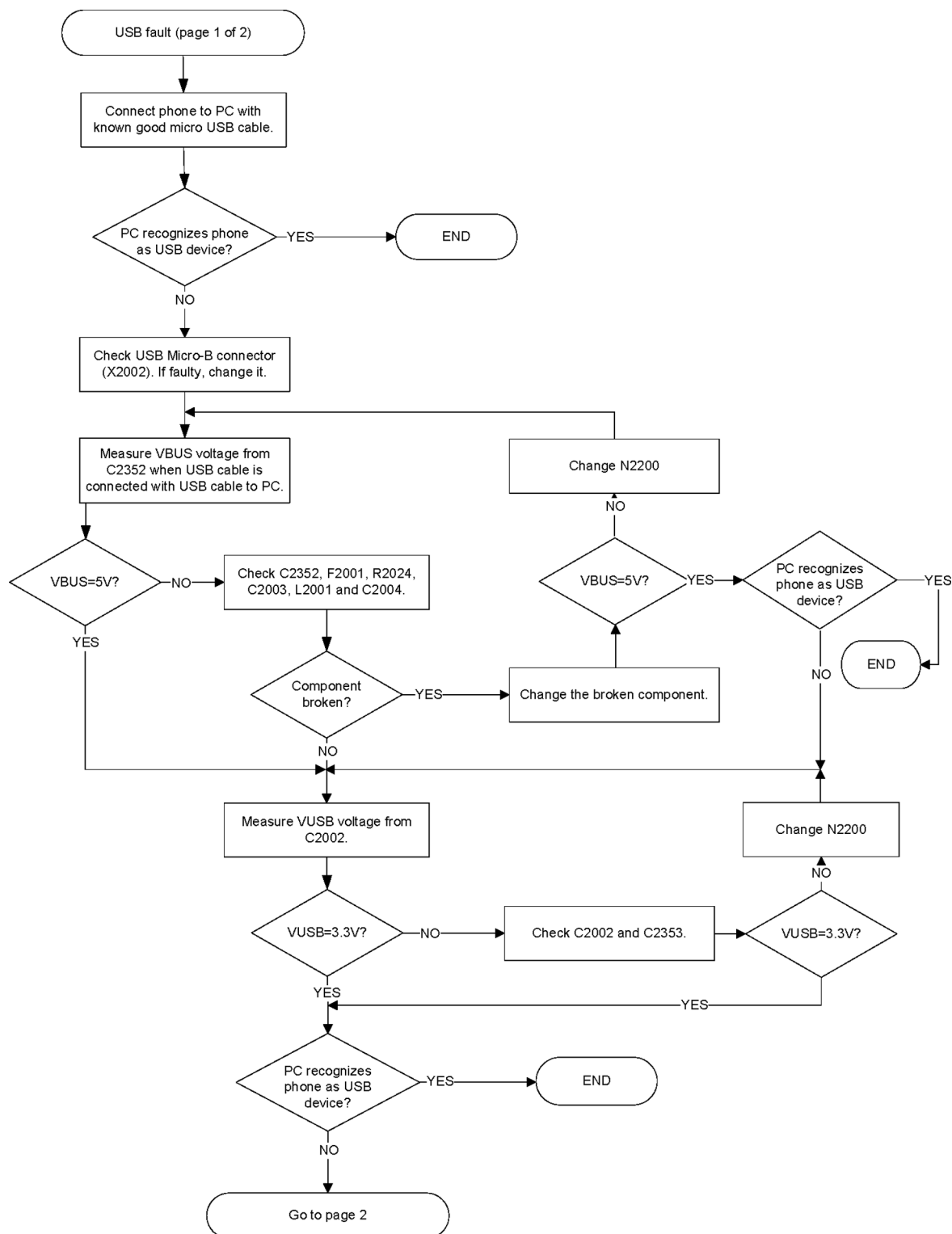
MicroSD card troubleshooting

Troubleshooting flow

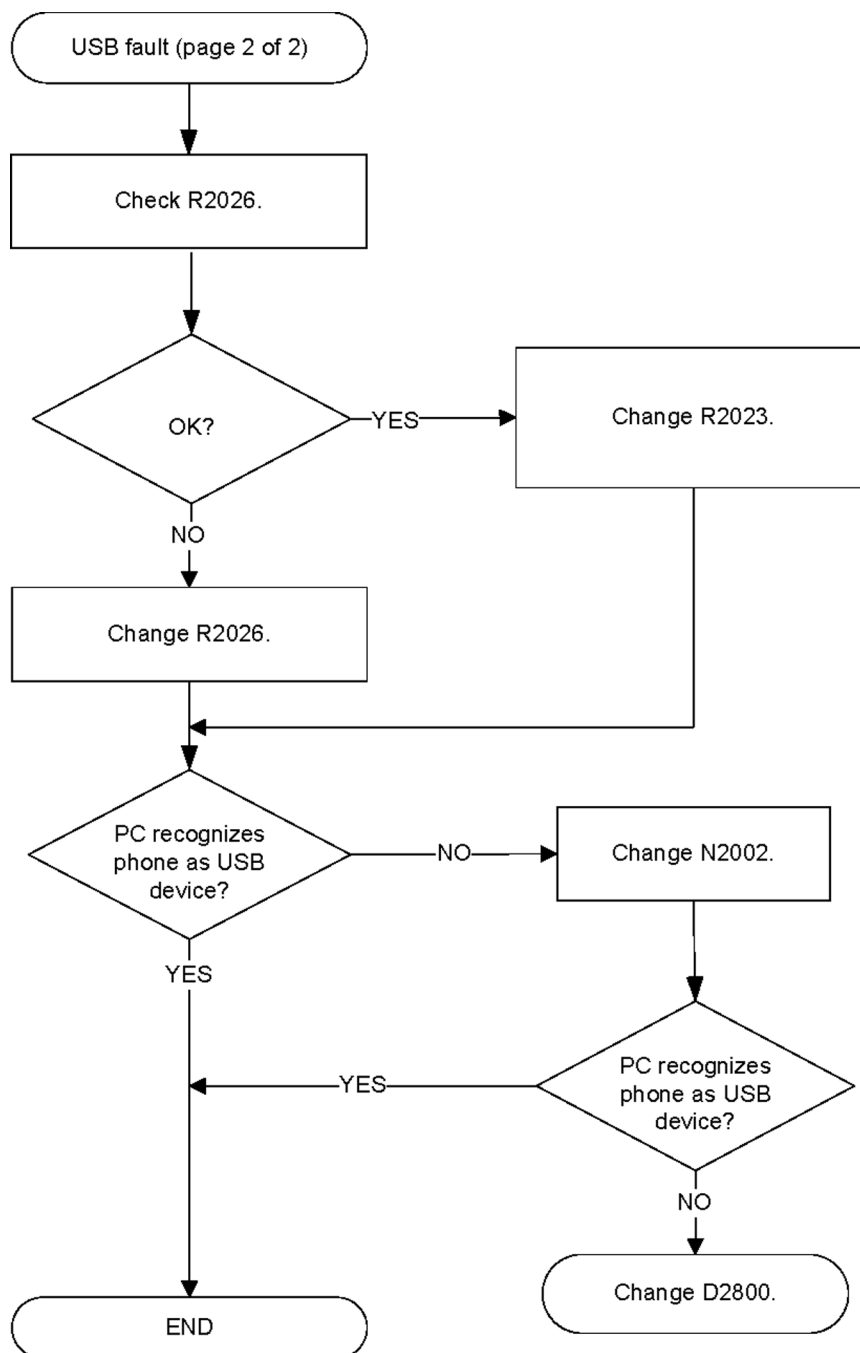


USB data interface troubleshooting

Troubleshooting flow - Page 1 of 2



Troubleshooting flow - Page 2 of 2



■ User interface troubleshooting

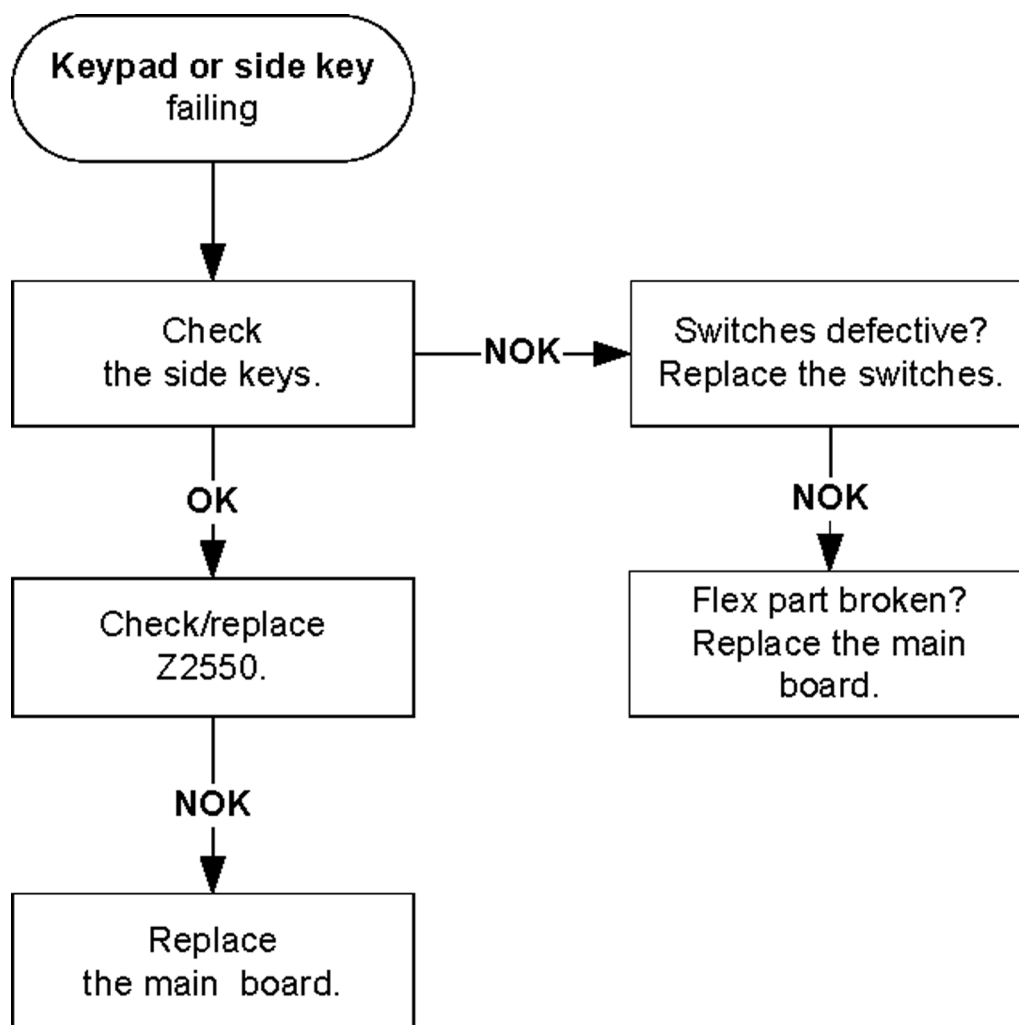
Keypad and side key troubleshooting

Context

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

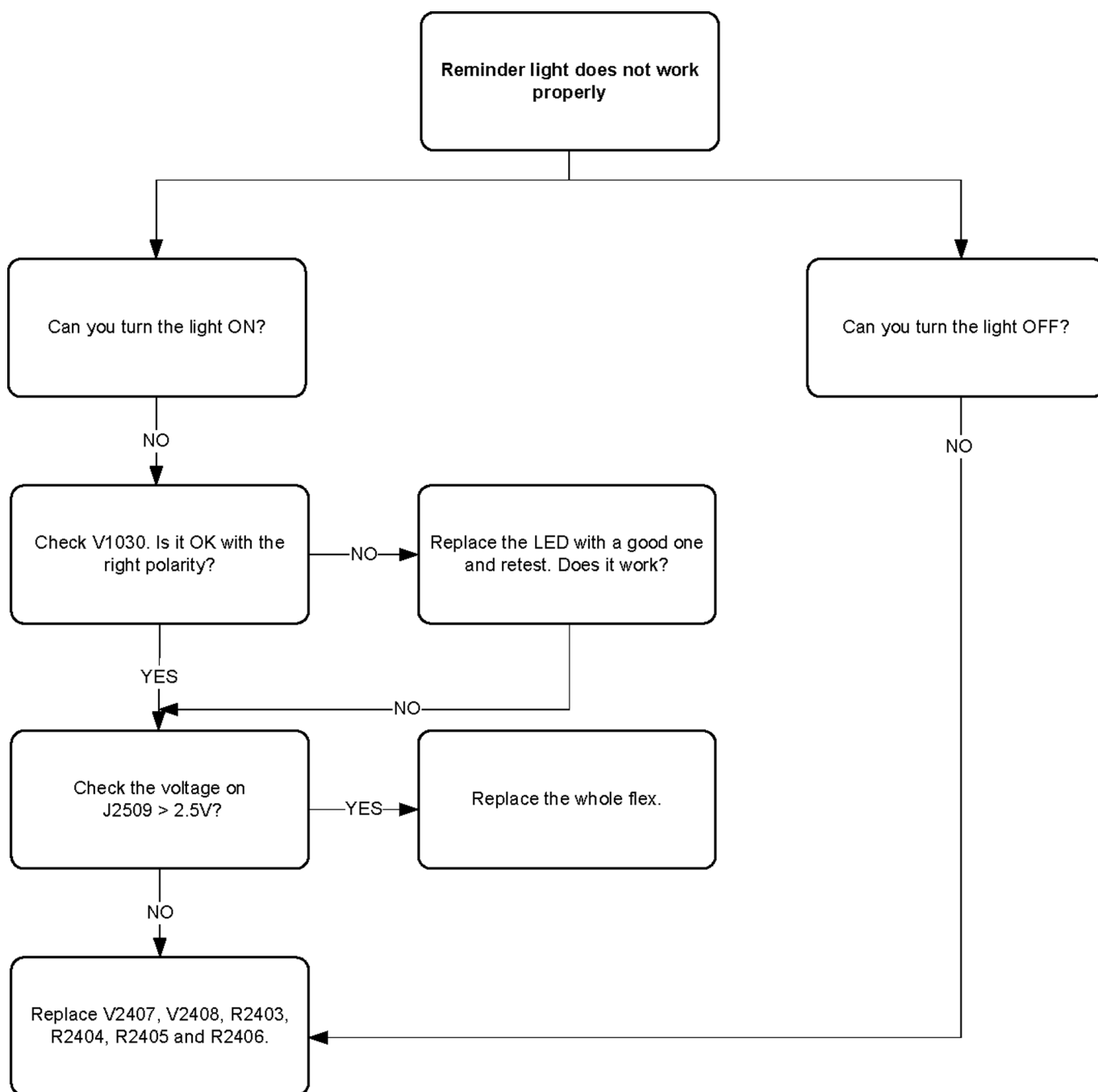
If the failure mode is not clear, start with the Keyboard test in Phoenix.

Troubleshooting flow



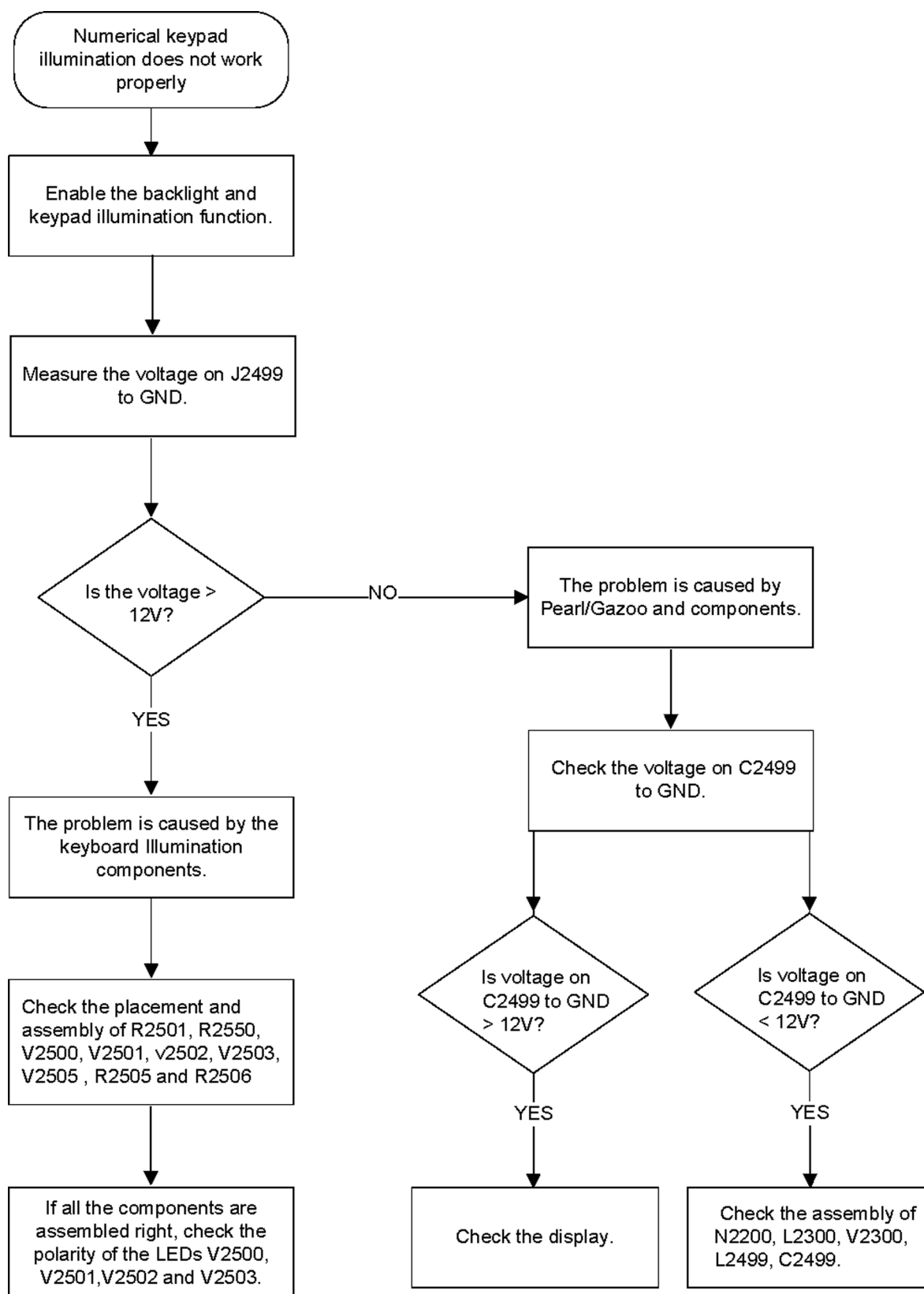
Reminder light troubleshooting

Troubleshooting flow



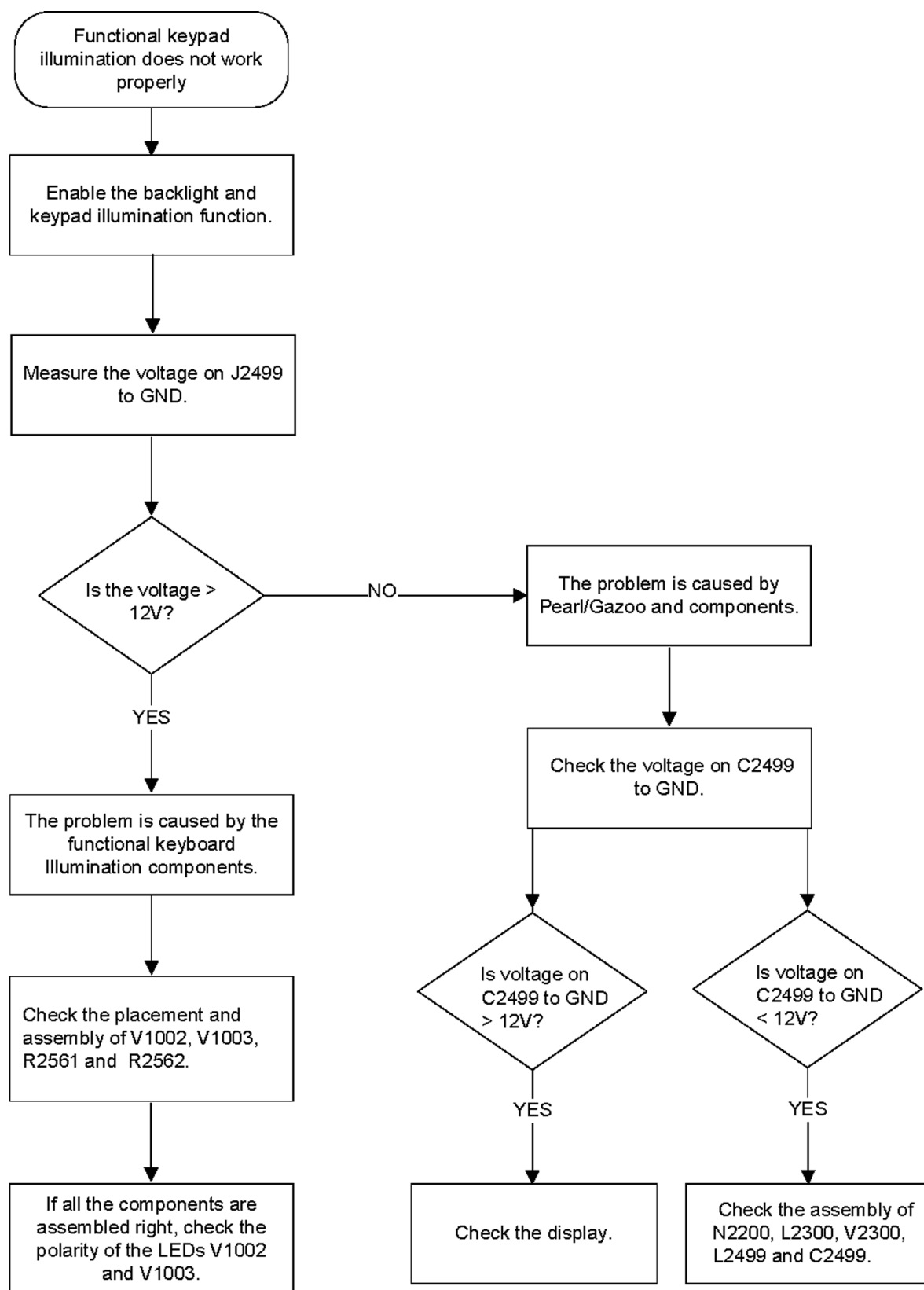
Numerical keypad illumination troubleshooting

Troubleshooting flow



Functional keypad illumination troubleshooting

Troubleshooting flow



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

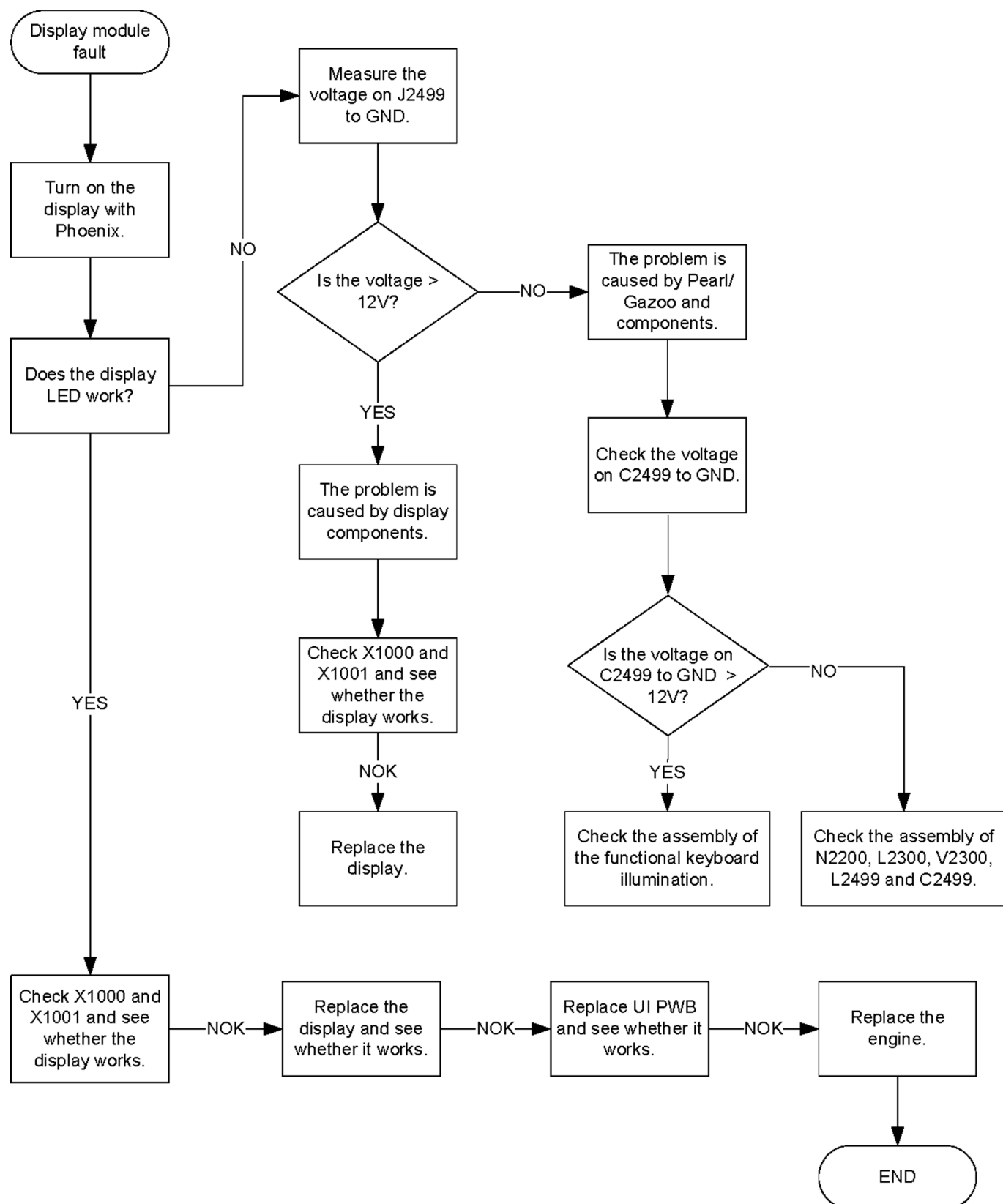
1. Verify with a working display that the fault is not on the display module itself.
The display module cannot be repaired.
2. Check that the cellular engine is working normally.
 - i To check the functionality, connect the phone to a docking station.
 - ii Start *Phoenix* service software.
 - iii Read 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

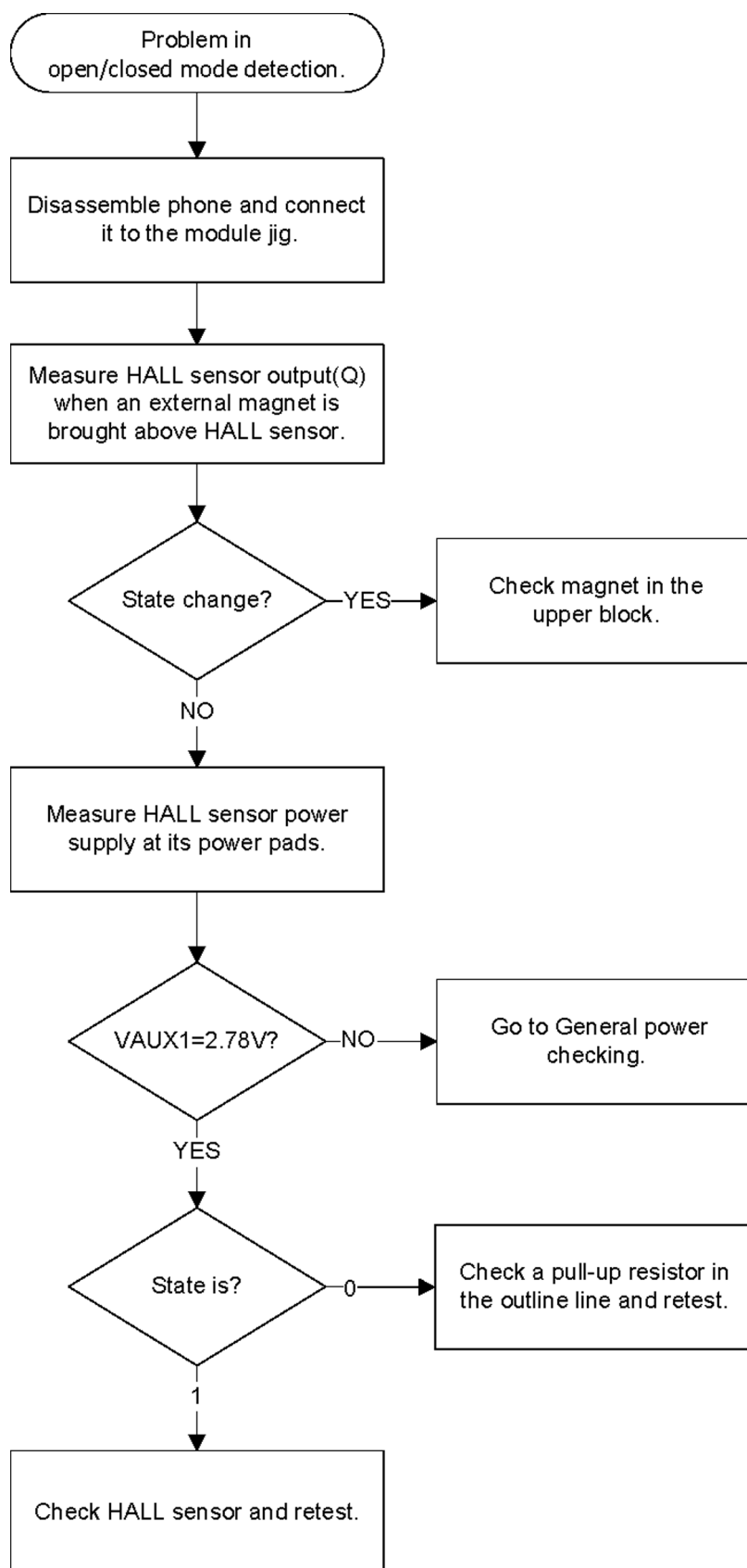
Use the display test tool in *Phoenix* to find the detailed fault mode.

Troubleshooting flow



Hall sensor troubleshooting

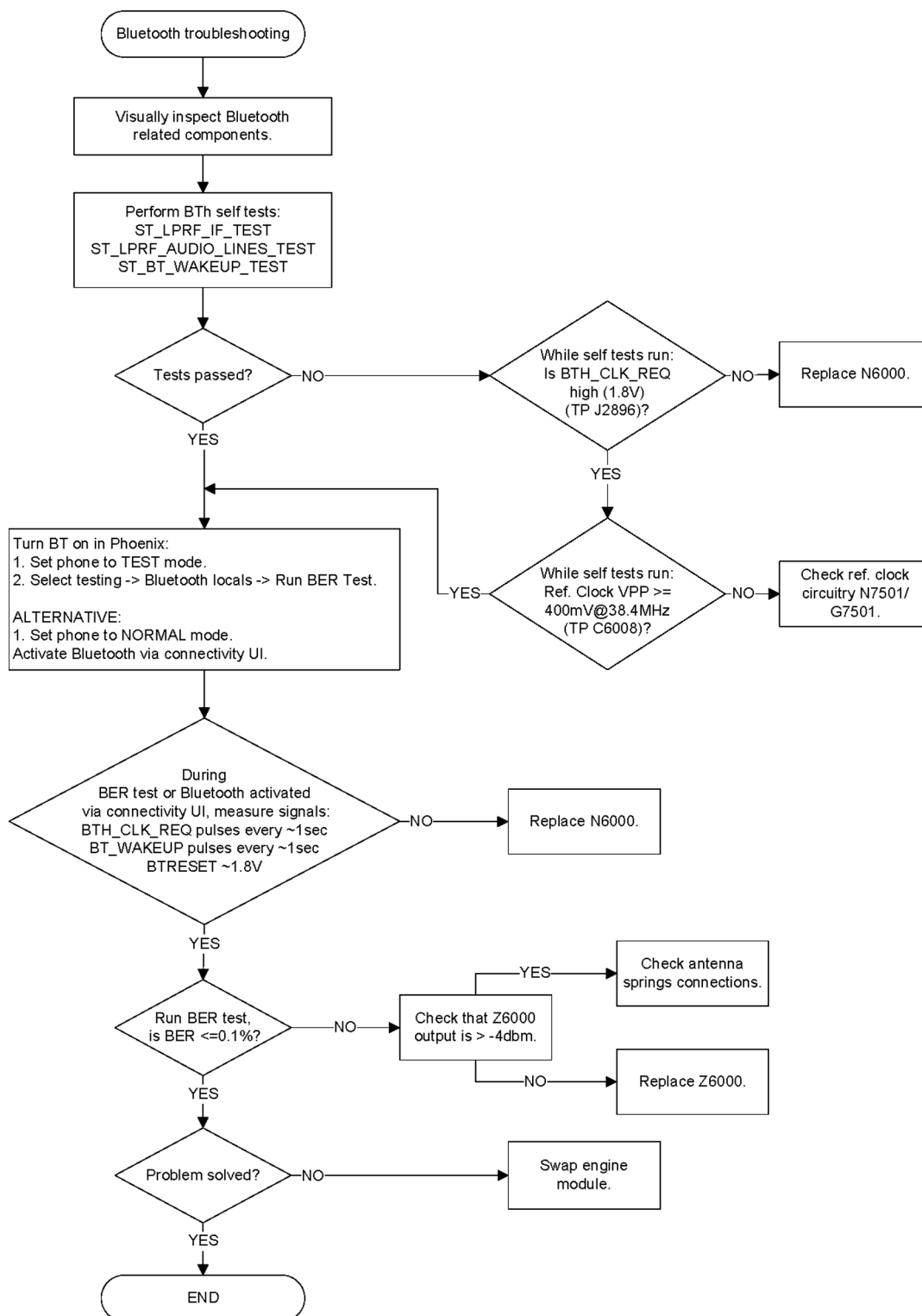
Troubleshooting flow



Bluetooth and FM radio troubleshooting

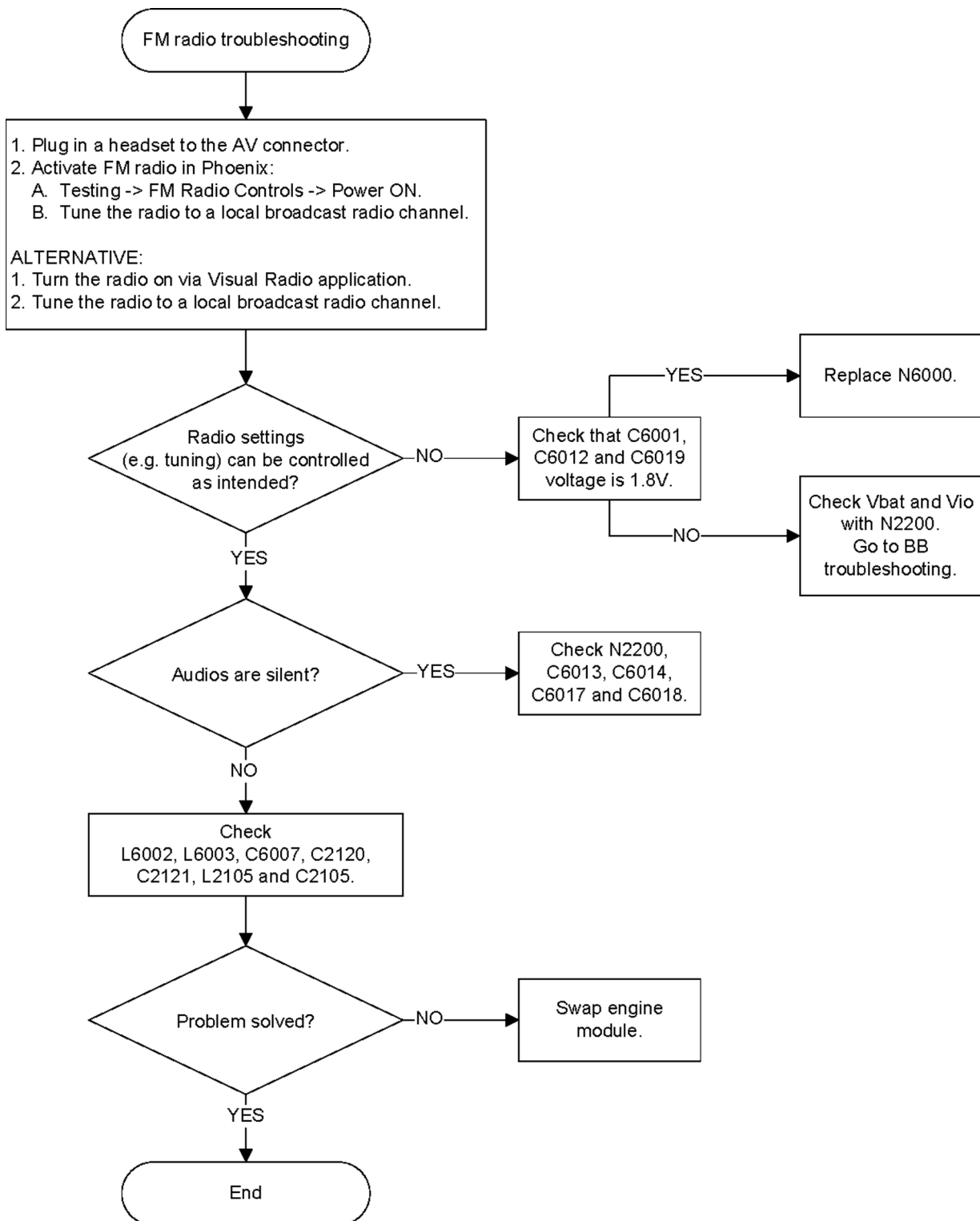
Bluetooth troubleshooting

Troubleshooting flow



FM radio troubleshooting

Troubleshooting flow



■ Camera module troubleshooting

Taking and evaluating test pictures with main camera

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

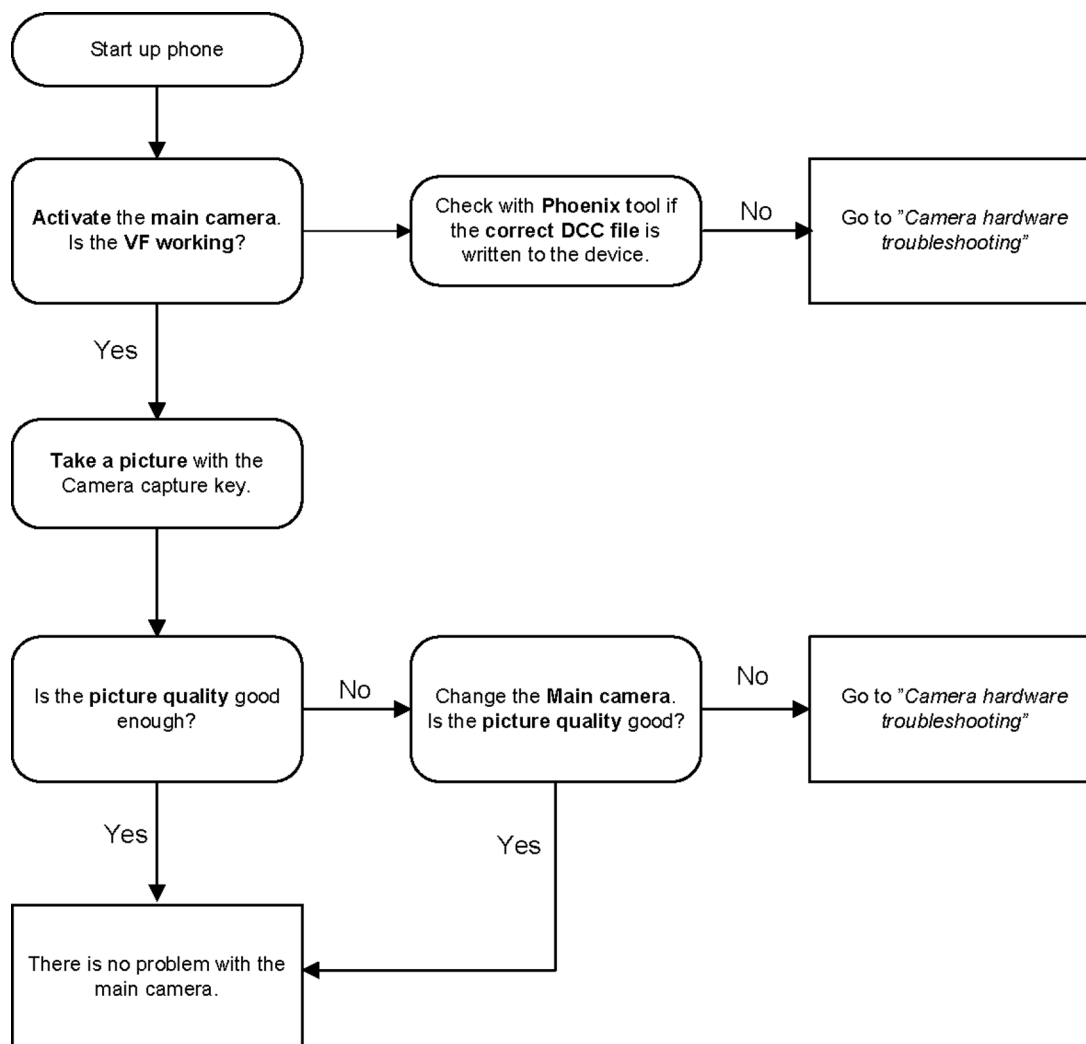
- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is sufficient (bright office lightning)
- 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 $\sim >2\text{m}$ and at macro distance $\sim 10\text{-}15\text{ cm}$ 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!

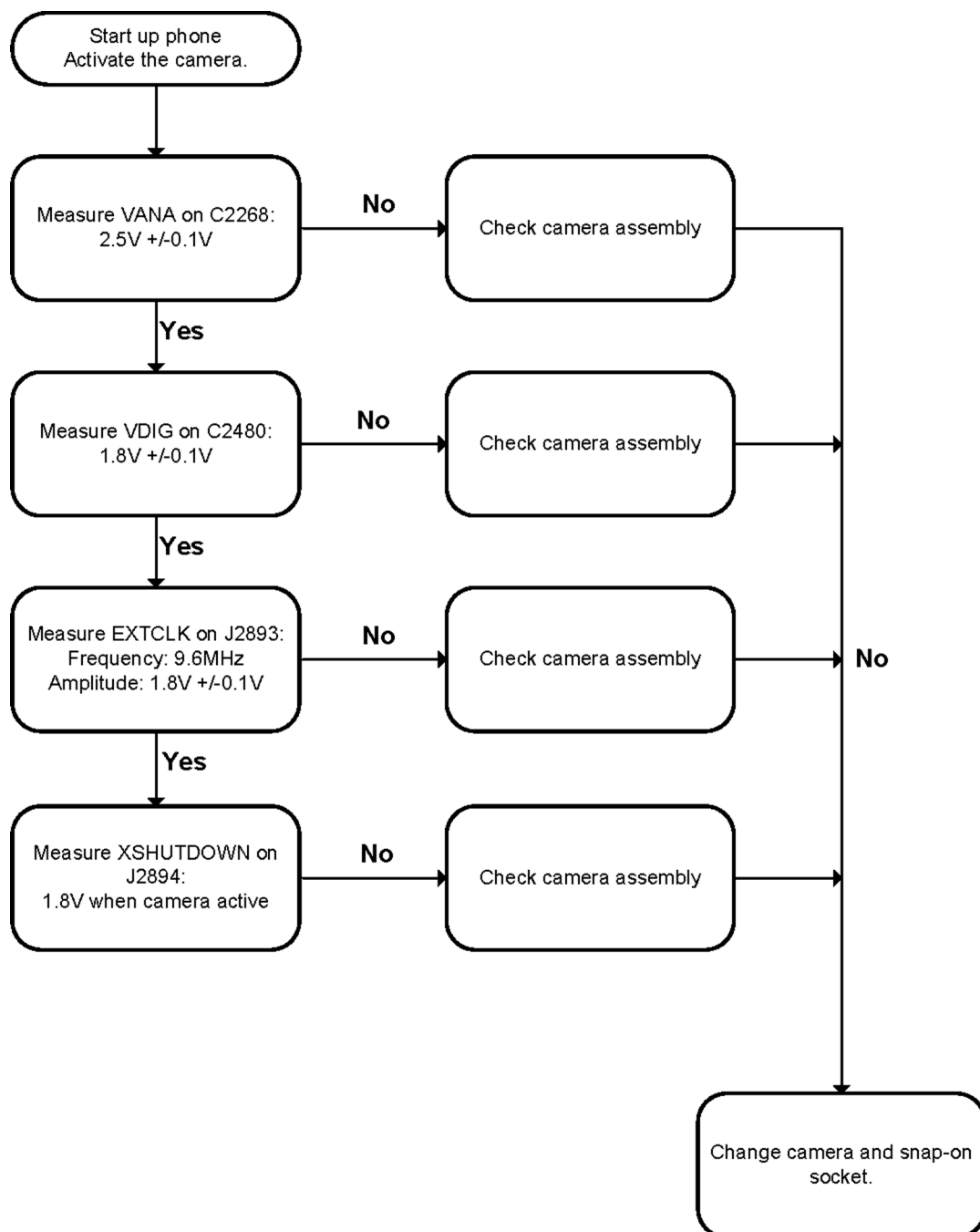
Camera troubleshooting

Troubleshooting flow



Camera hardware troubleshooting

Troubleshooting flow



■ Audio troubleshooting

Audio troubleshooting test instructions

Single-ended 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	E2121 and E2123 pads	28.1	100	2540	0	112mA (calc.)

Measurement data

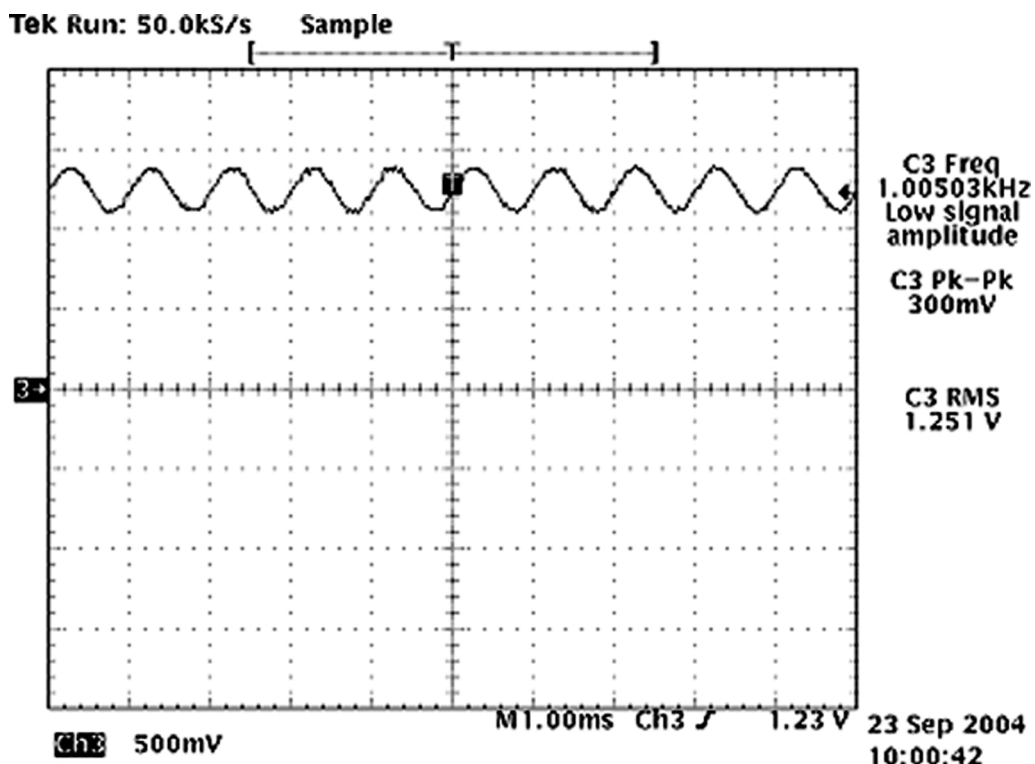
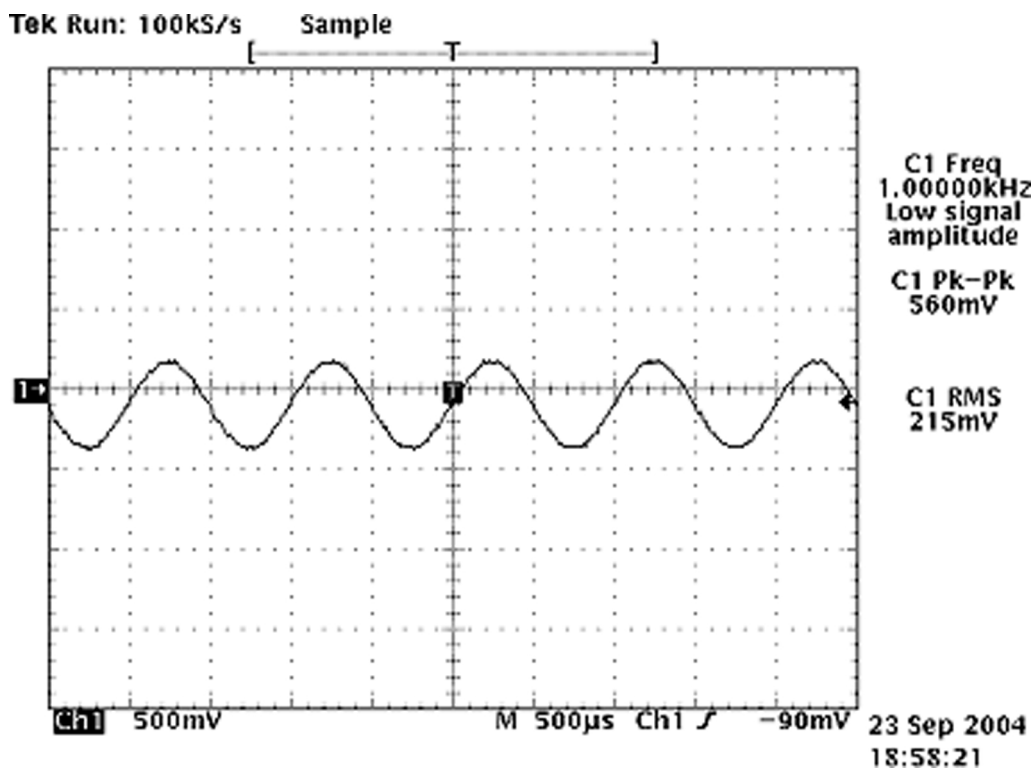


Figure 10 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



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.

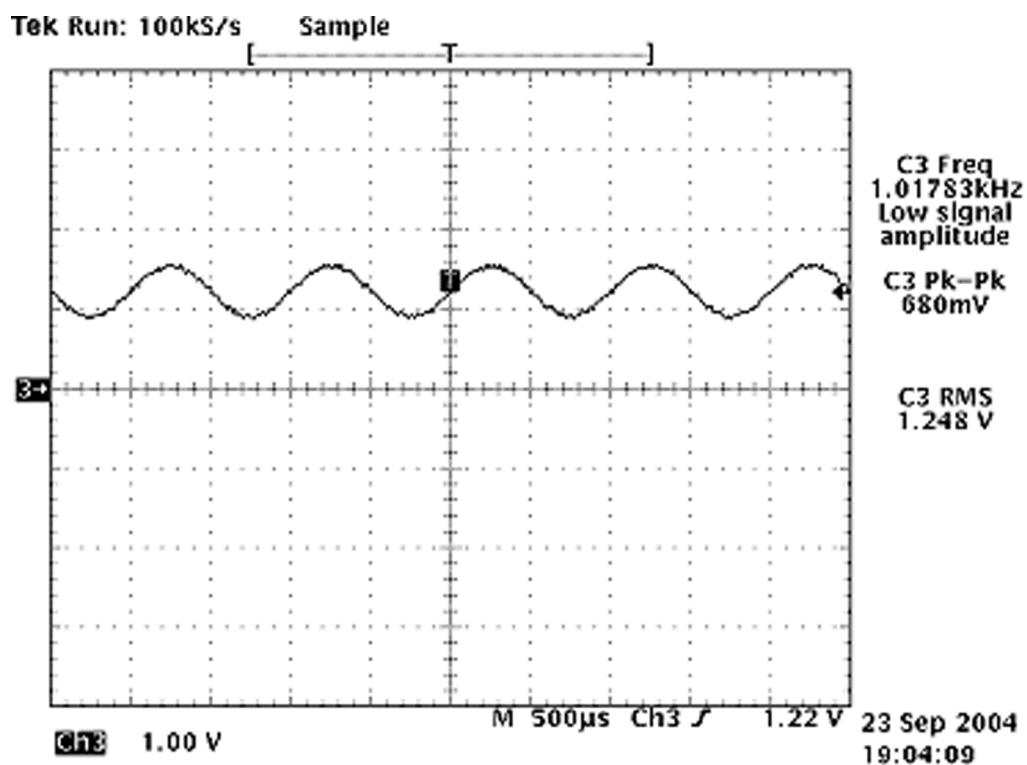
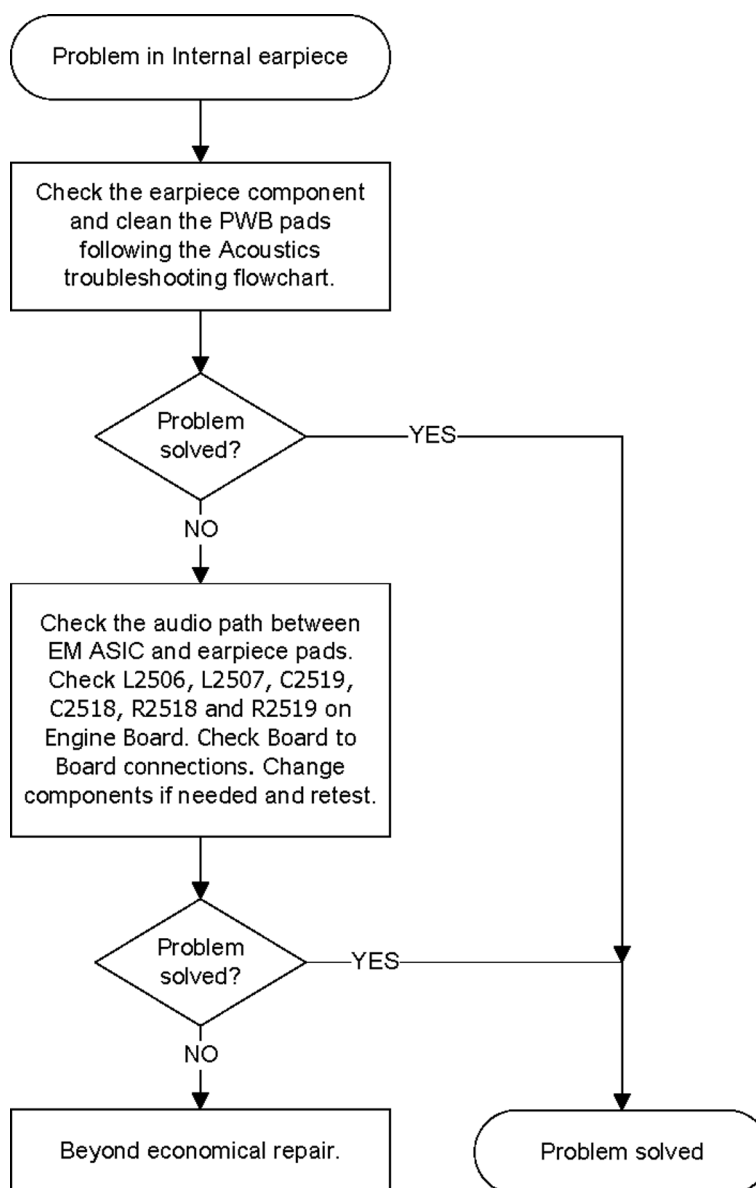


Figure 12 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

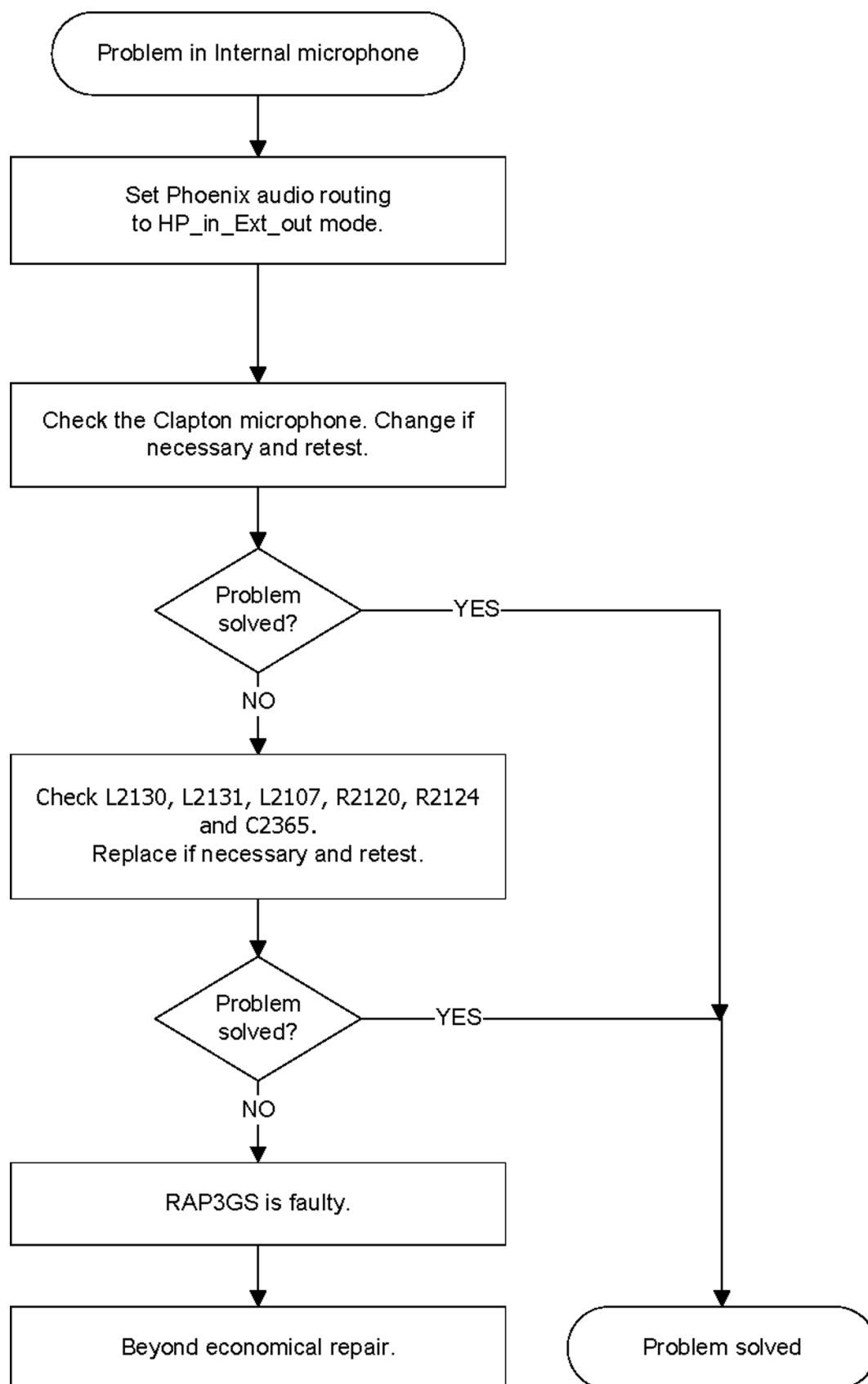
Internal earpiece troubleshooting

Troubleshooting flow



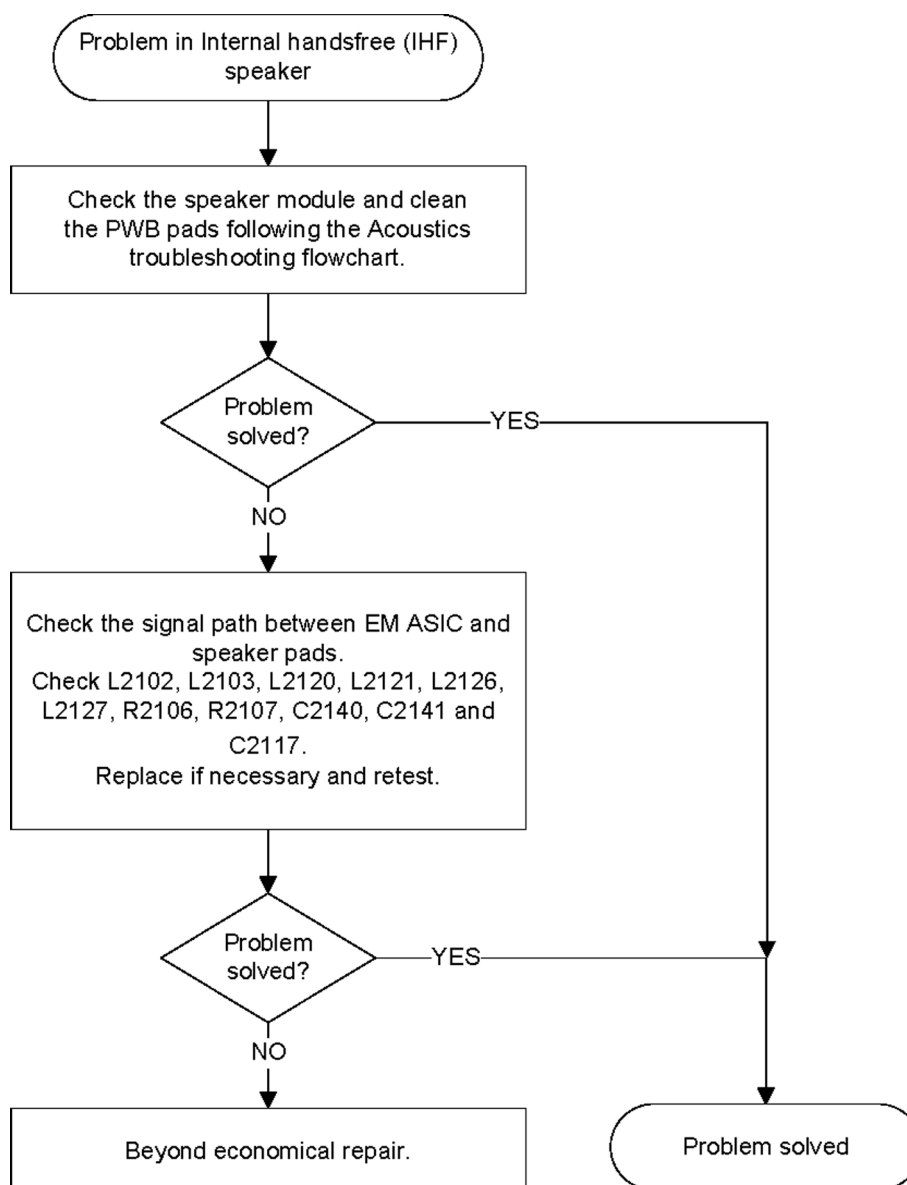
Internal microphone troubleshooting

Troubleshooting flow



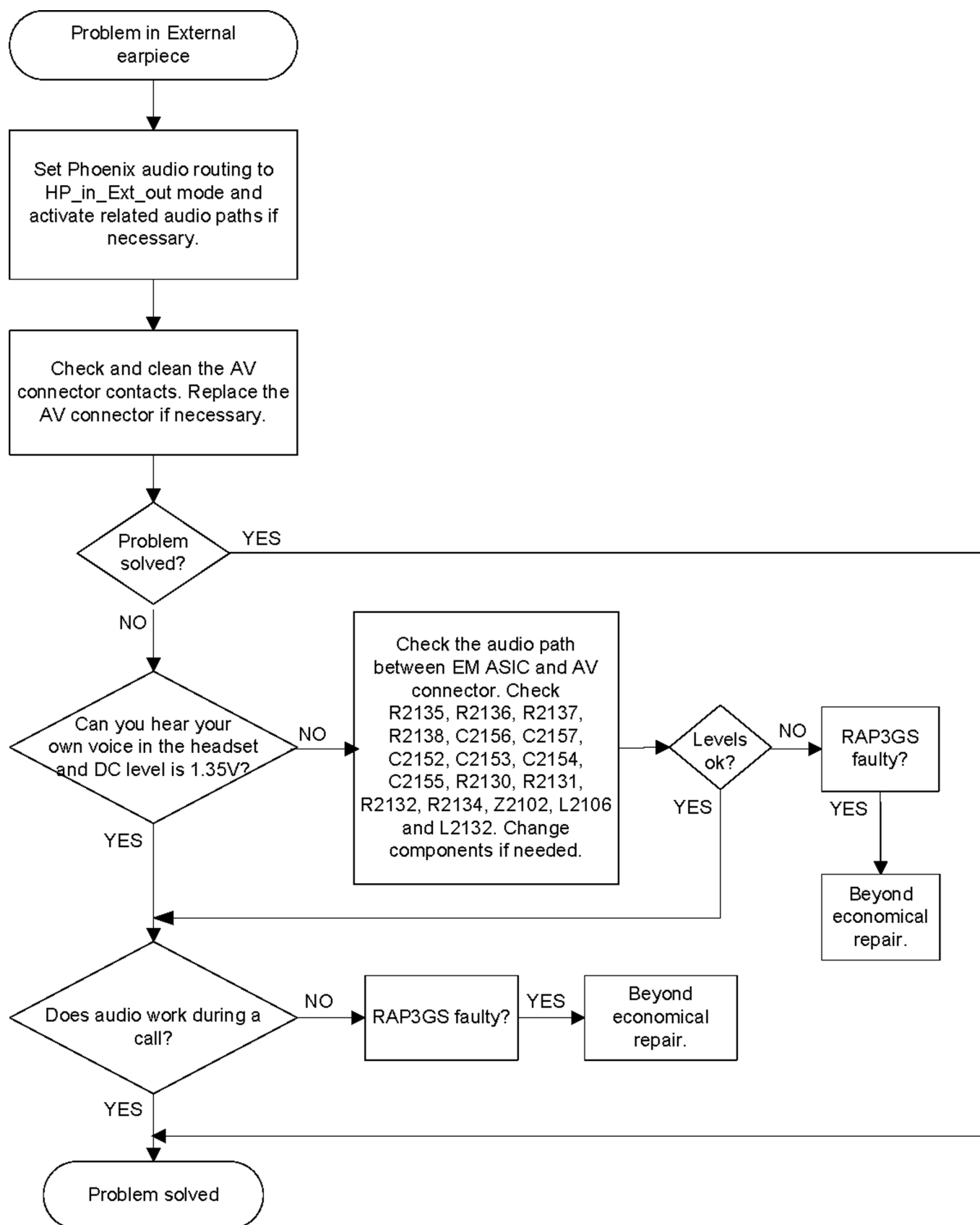
Internal handsfree (IHF) troubleshooting

Troubleshooting flow



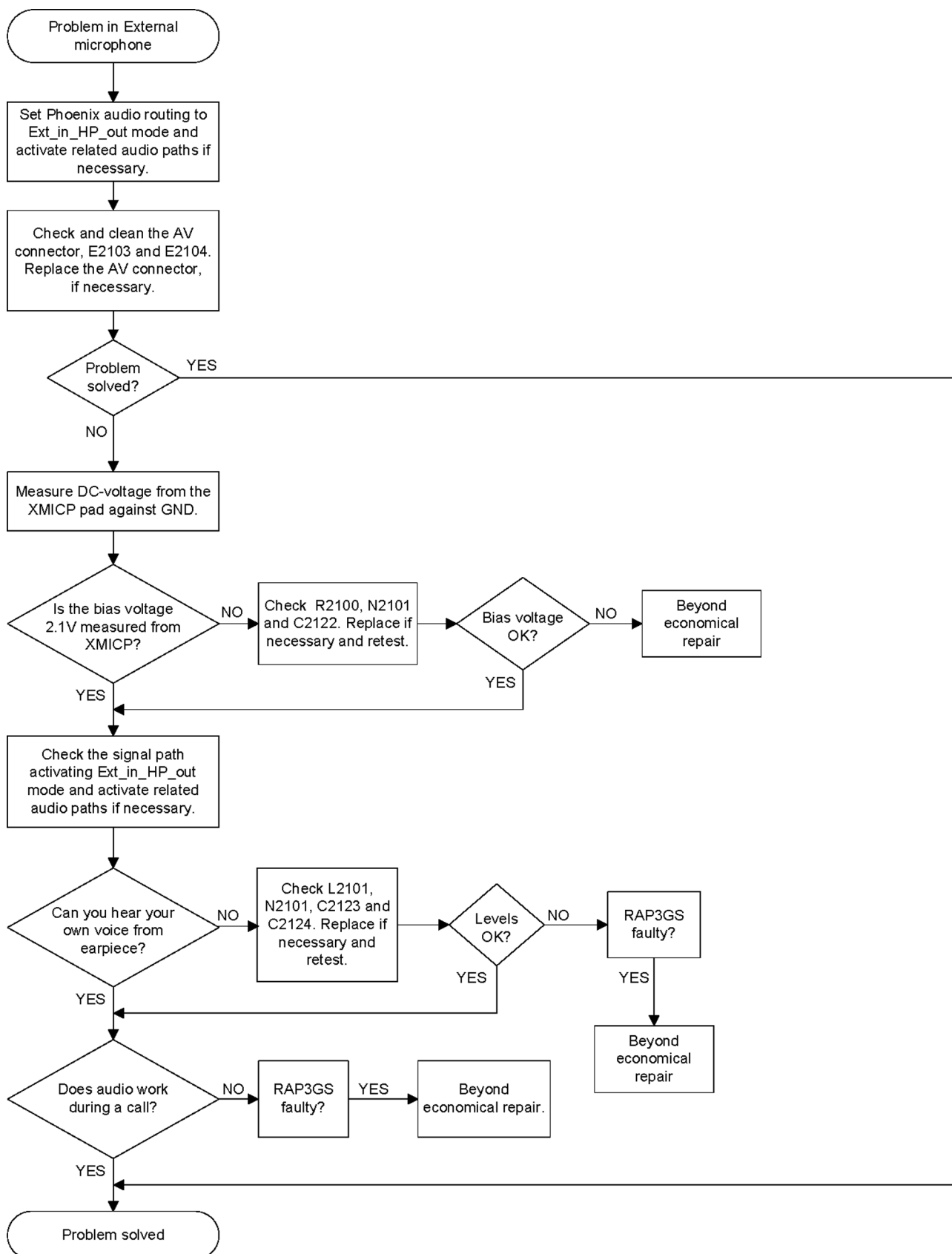
External earpiece troubleshooting

Troubleshooting flow



External microphone troubleshooting

Troubleshooting flow



Acoustics troubleshooting

Introduction to acoustics troubleshooting

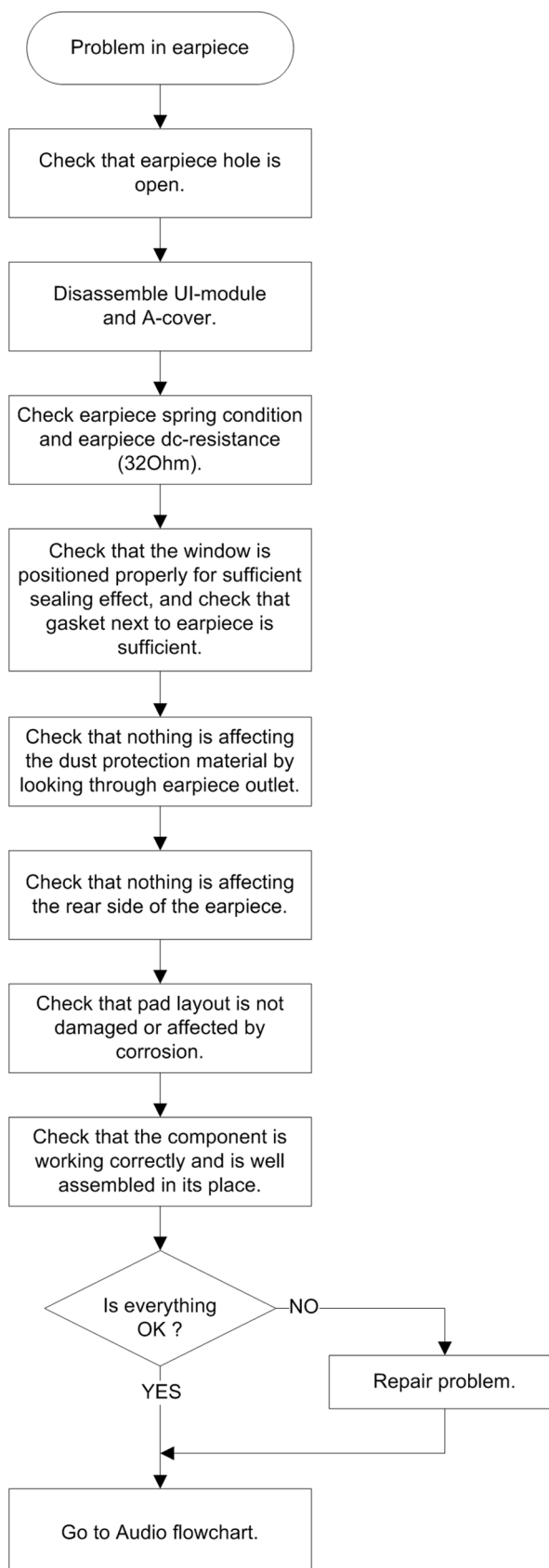
Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by the speaker. The acoustics of the phone include three basic systems: earpiece, integrated handsfree (IHF) and a Clapton microphone (for noise cancelling).

The sound reproduced from the earpiece radiates 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.

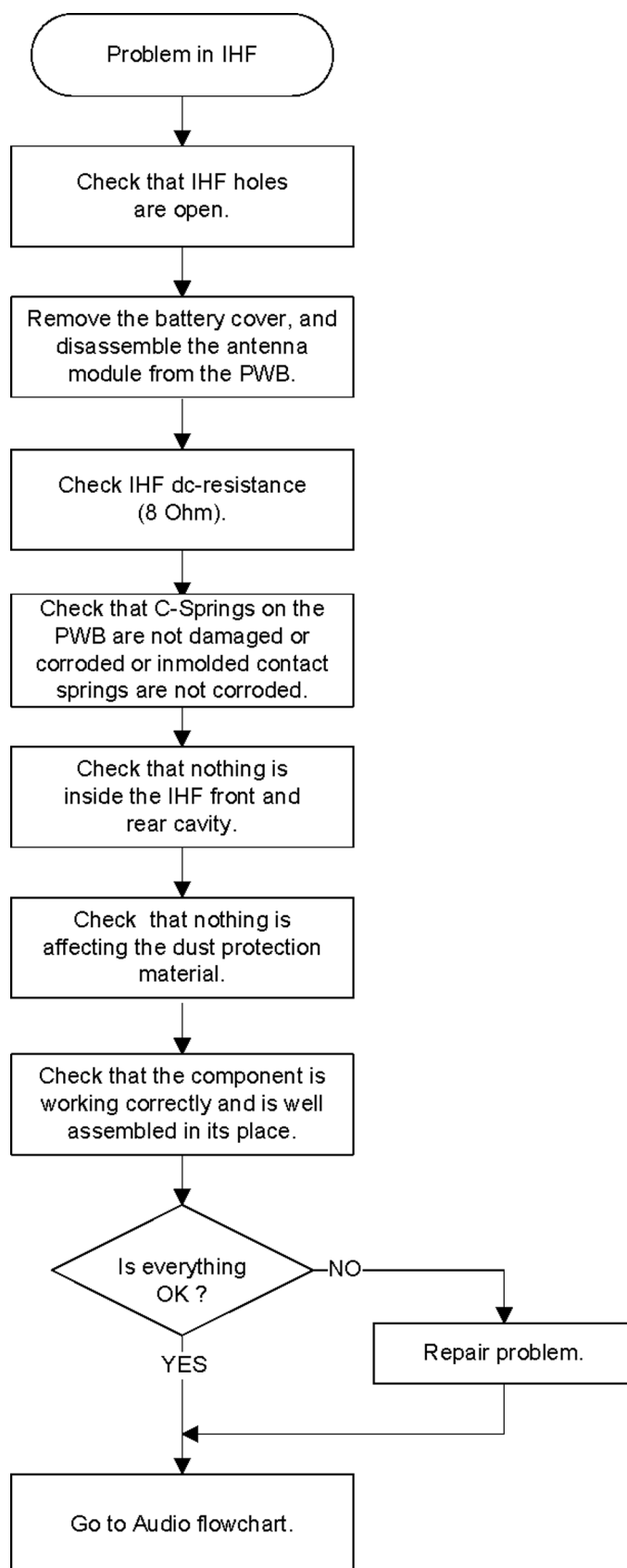
Earpiece troubleshooting

Troubleshooting flow



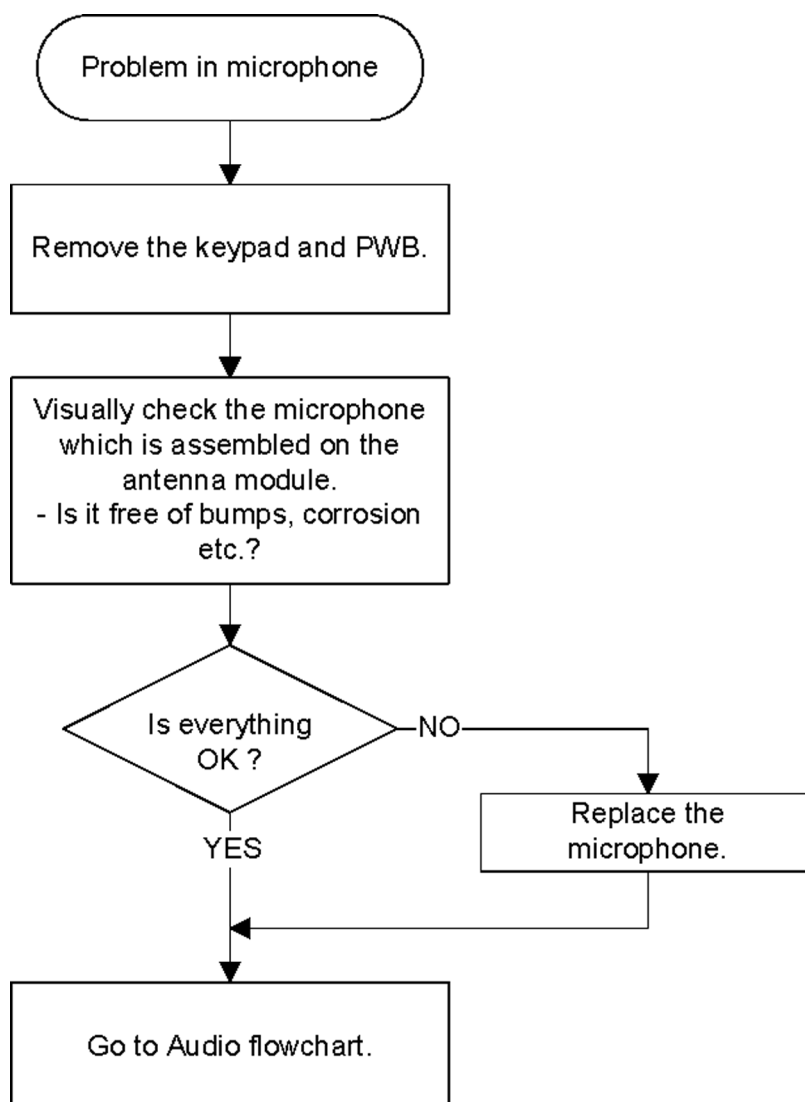
IHF troubleshooting

Troubleshooting flow



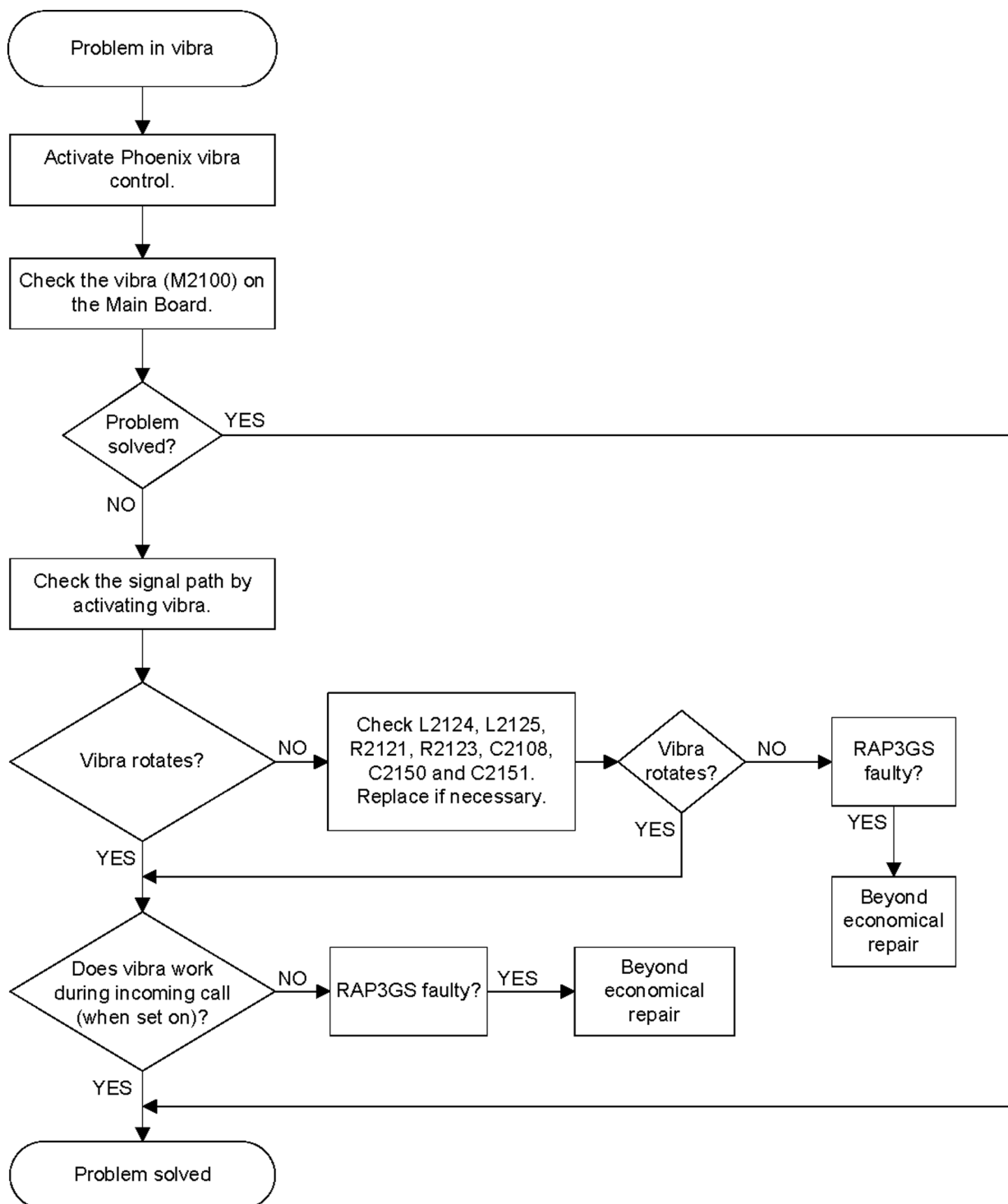
Microphone troubleshooting

Troubleshooting flow



Vibra troubleshooting

Troubleshooting flow



■ Baseband manual tuning guide

Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-20 or FPS-21.
 - Note:** USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
 - APAC: sydney.service@nokia.com
 - CHINA: repair.ams@nokia.com
 - E&A: salo.repair@nokia.com
 - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.
 - Note:** SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2008.34/38 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- Activated FPS-20 flash prommer **OR** FPS-21 flash prommer
- Flash update package 08.30.012 or newer for FPS-20 or FPS-21 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

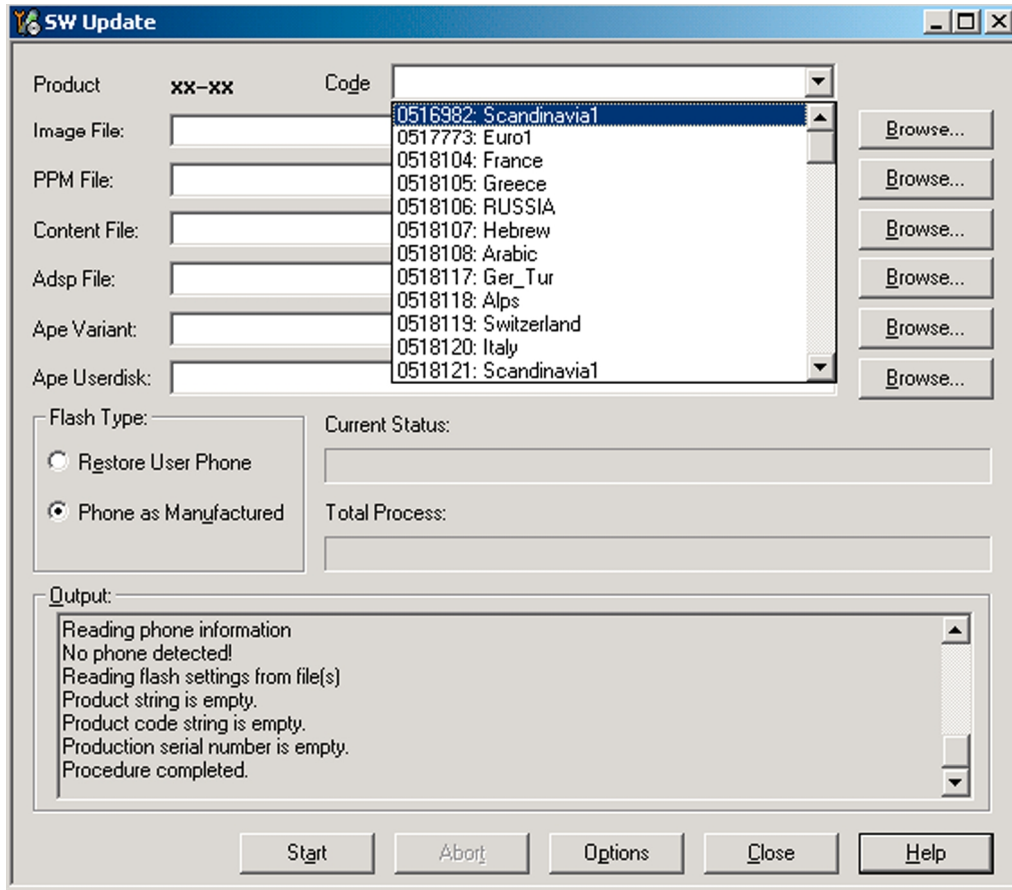
Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.
 - i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-20 or FPS-21.
 - ii Update the phone MCU software to the latest available version.

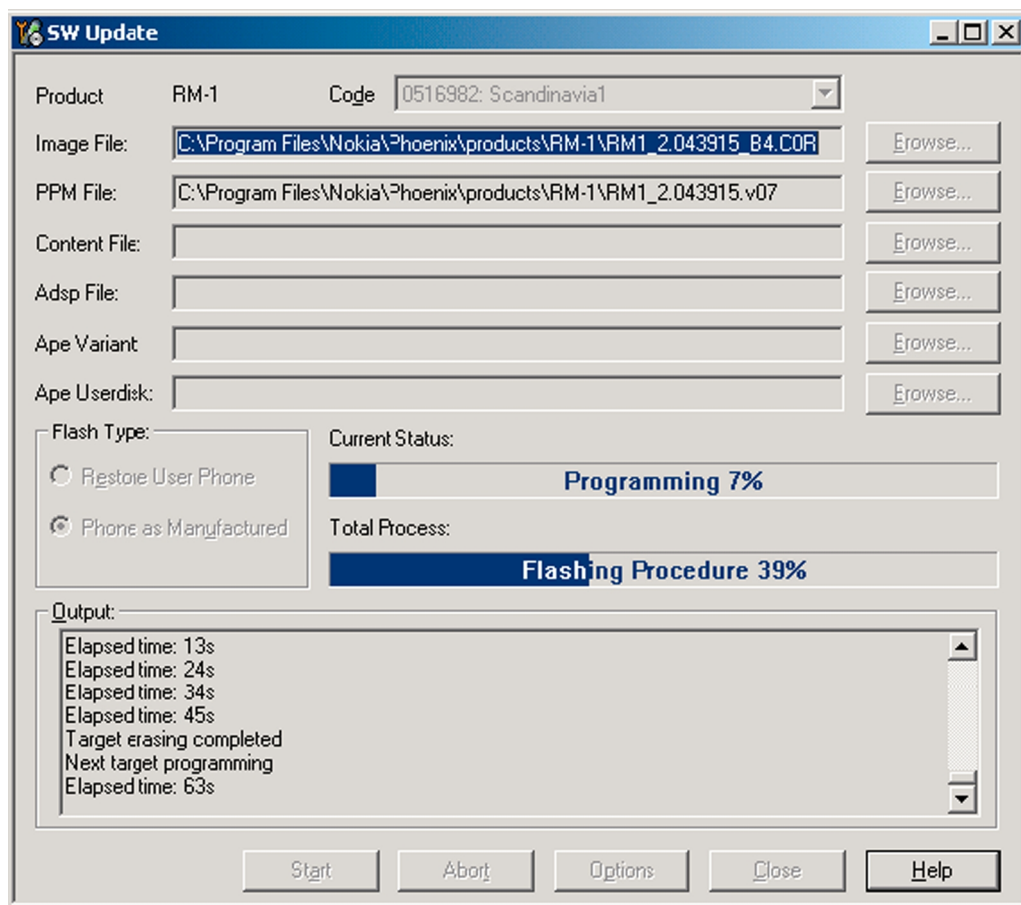
If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

- iii Choose the product manually from **File→Open Product** , and click **OK**.
Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.
- iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to Phone as Manufactured .

- v To continue, click **Start**.
Progress bars and messages on the screen show actions during phone programming, please wait.



Programming is completed when Flashing Completed message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product**.

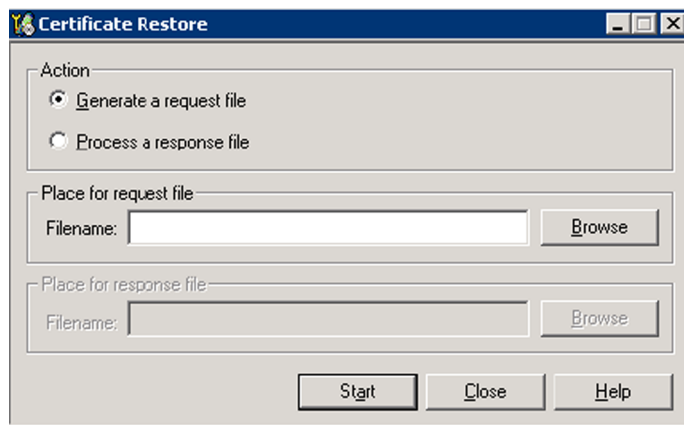
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

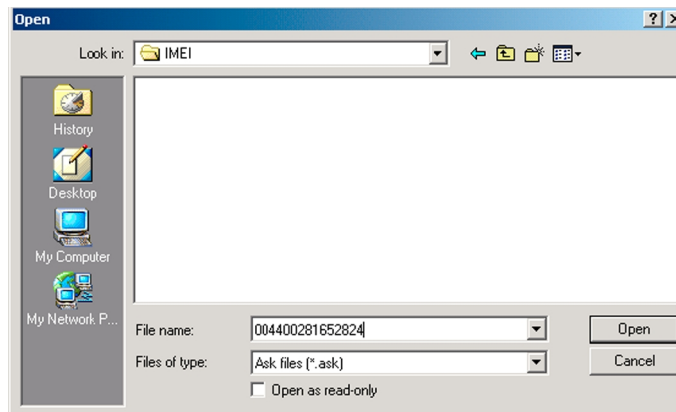
i To connect the phone with *Phoenix*, choose **File→Scan Product**.

ii Choose **Tools→Certificate Restore**.

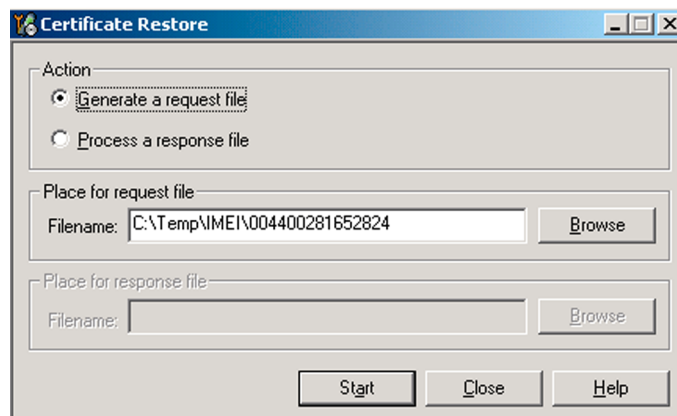
iii To choose a location for the request file, click **Browse**.



- iv Name the file so that you can easily identify it, and click **Open**.

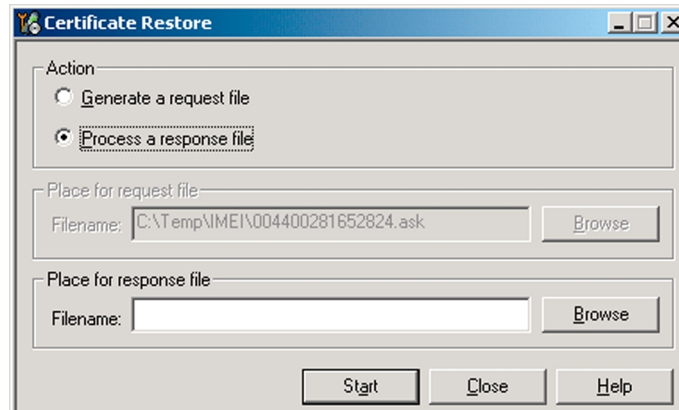


The name of the file and its location are shown.

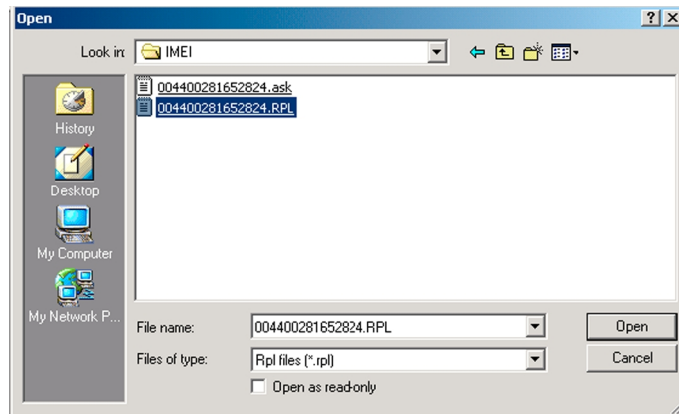


- v To create the *Request* file, click **Start**.
 - vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.
3. Restore certificate.
- For this procedure, you must supply +12 V to CU-4 from an external power supply.
- i Save the reply file sent by Nokia to your computer.
 - ii Start *Phoenix* service software.
 - iii Choose **File**→**Scan Product**.

- iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.

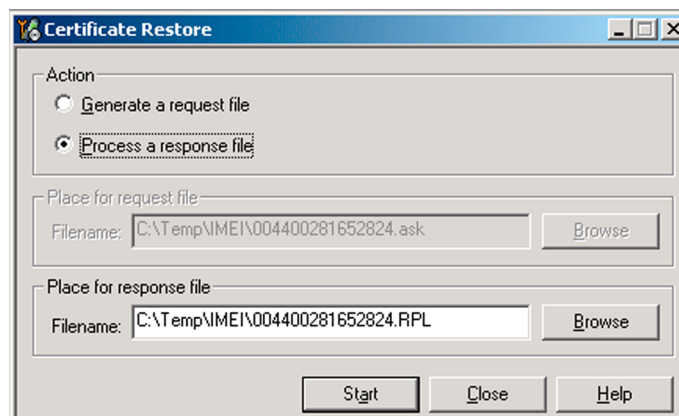


- v To choose the location where response file is saved, click **Browse**.
- vi Click **Open**.



The name of the file and the path where it is located are shown.

- vii To write the file to phone, click **Start**.



Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

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	-30	+40
ADC Gain	12000	14000
BSI Gain	1100	1350
VBAT Offset	2635	2755
VBAT Gain	14900	15900
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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■ 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:

- VAP AUS 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-239
- Flash adapter FS-120
- Control unit CU-4/Interface adapter SS-46
- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10MΩ/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.

Figure 13 RM-598 RF key components - bottom

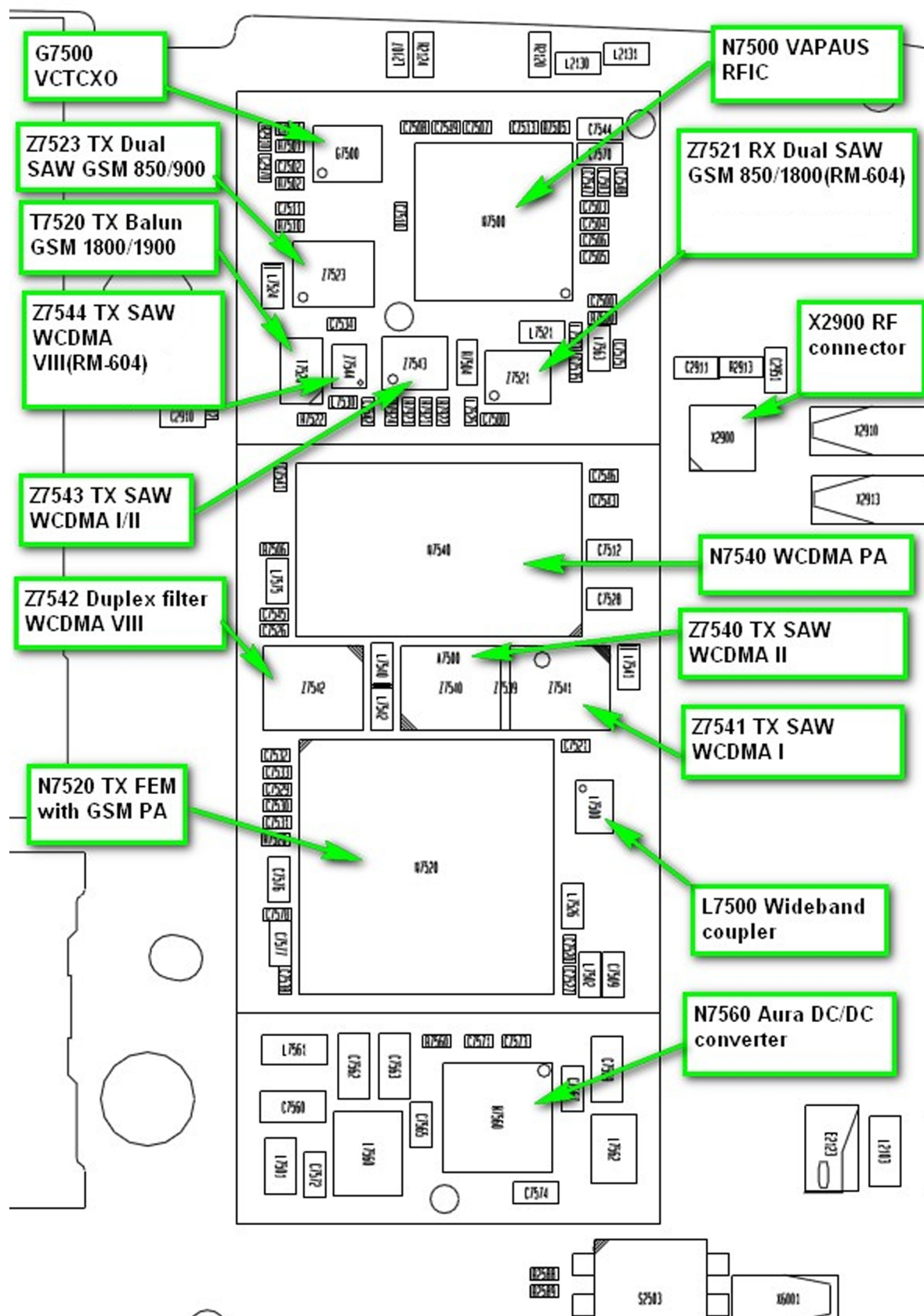


Figure 14 RM-604 RF key components - bottom

■ 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.

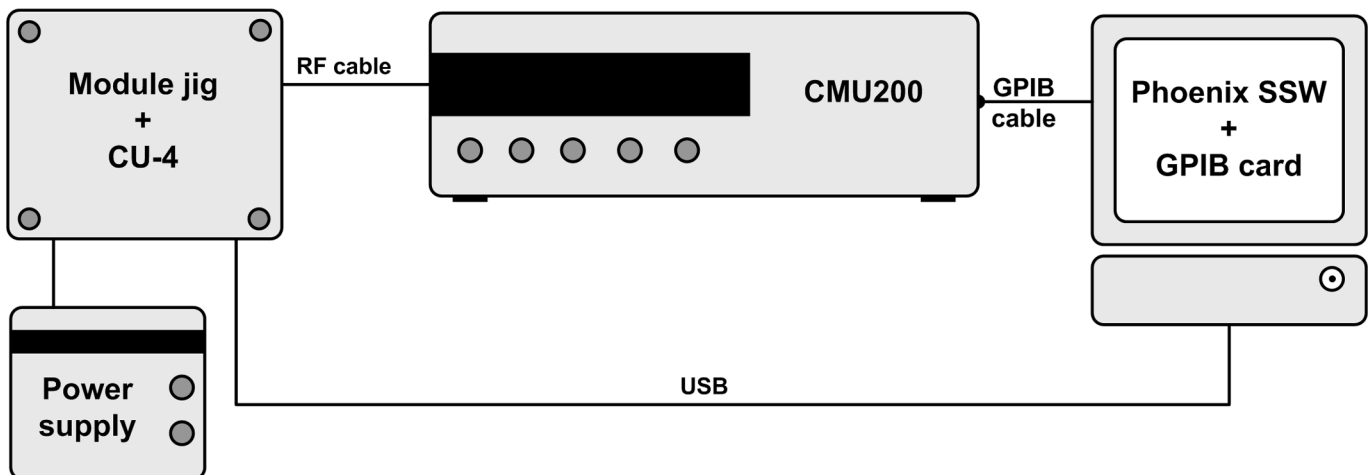


Figure 15 Auto tuning concept with CMU200

Auto tuning procedure

Prerequisites

Install the phone-specific data package, e.g. *Nokia_firmware_RM598/RM604_DP20_3.471_sw-ce3.37.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

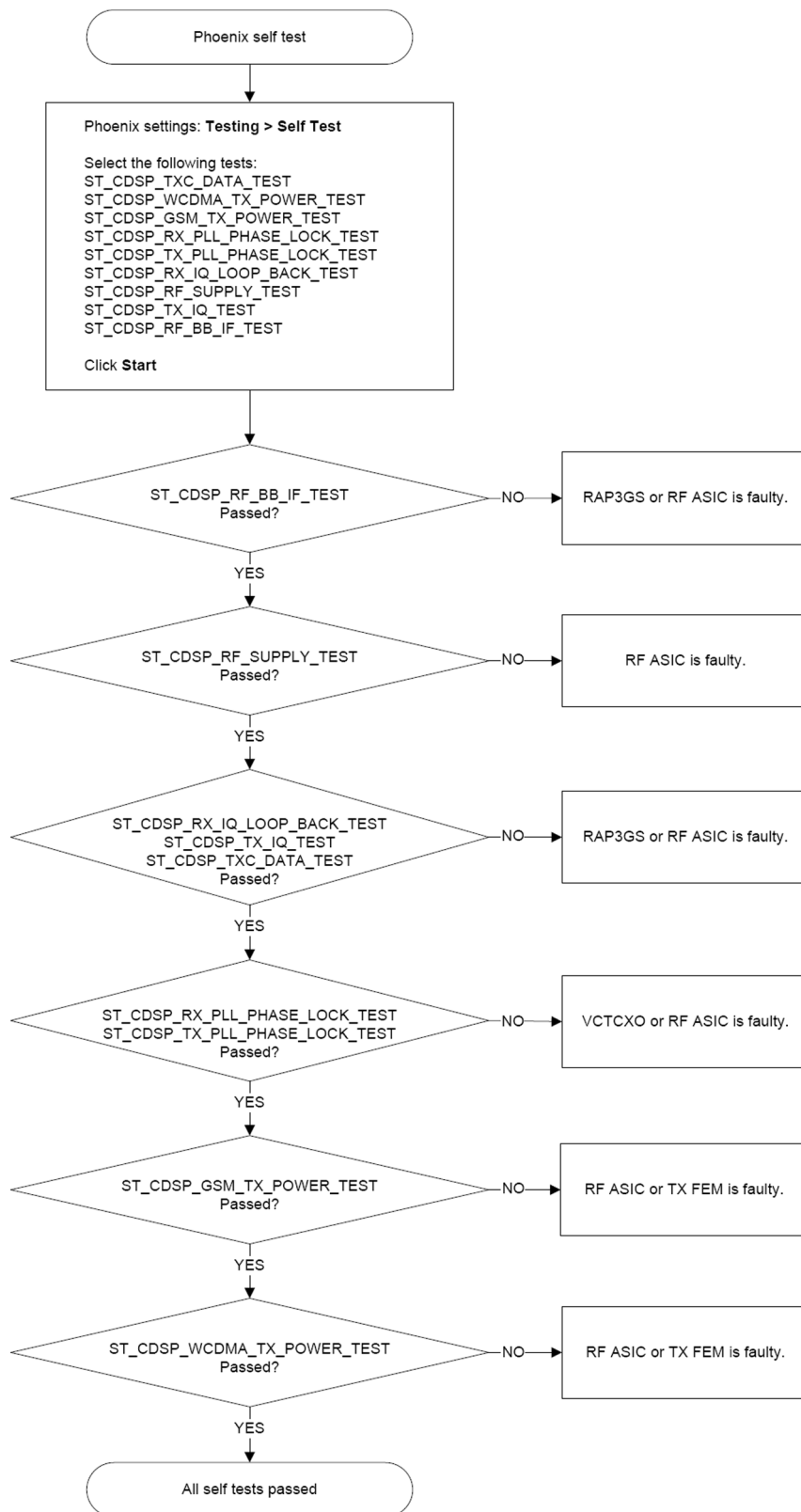
Context

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



■ 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 \(page 4–11\)](#) . For a similar test in WCDMA mode, see section [WCDMA RSSI measurement \(page 4–14\)](#).

The RX path for GSM and WCDMA are using the same filters in some bands. Please refer to [RF component reference \(page 4–27\)](#) for details.

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** .

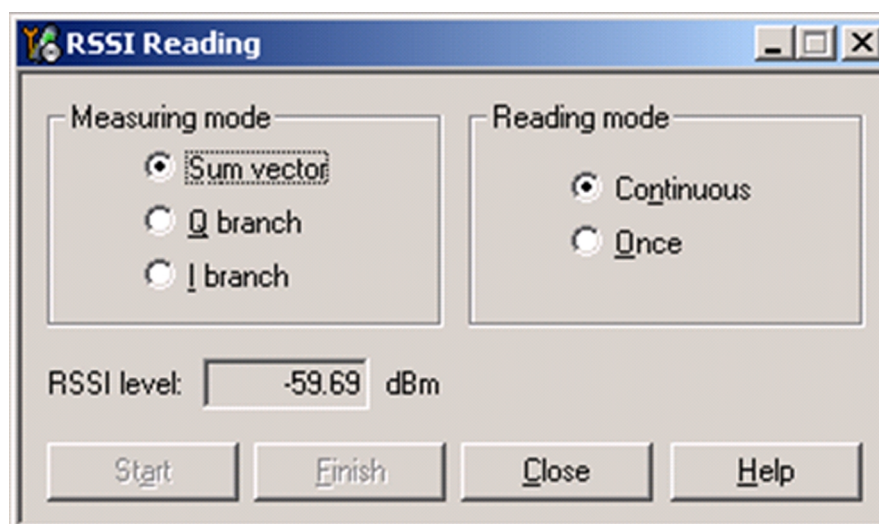


Figure 16 Phoenix RSSI Reading window

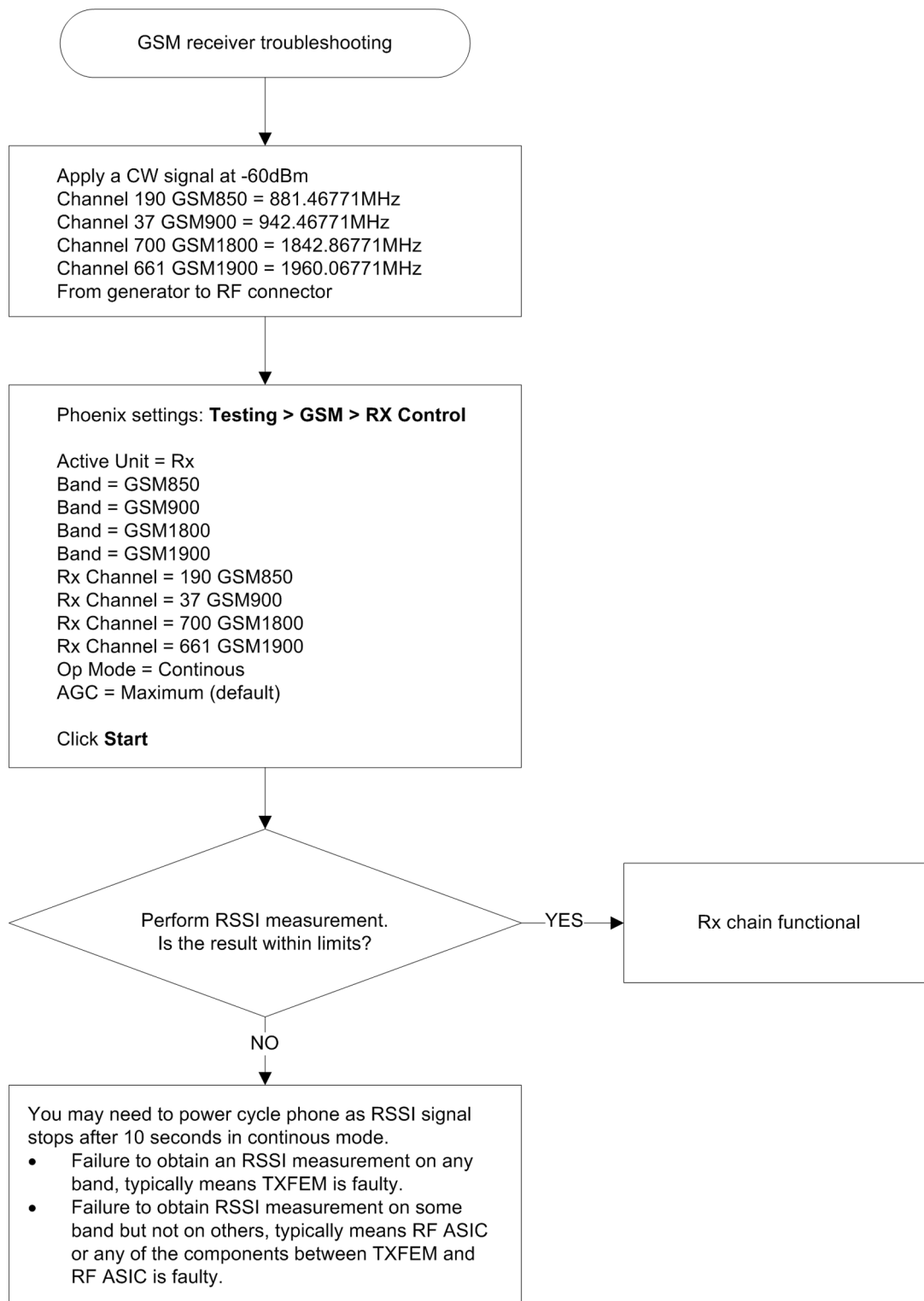
Results

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

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

GSM receiver troubleshooting flowchart

Troubleshooting flow



WCDMA RX chain activation for manual measurement

Steps

1. In Phoenix, select **Testing**→**WCDMA**→**Rx Control** . The Phoenix Rx Control window opens.

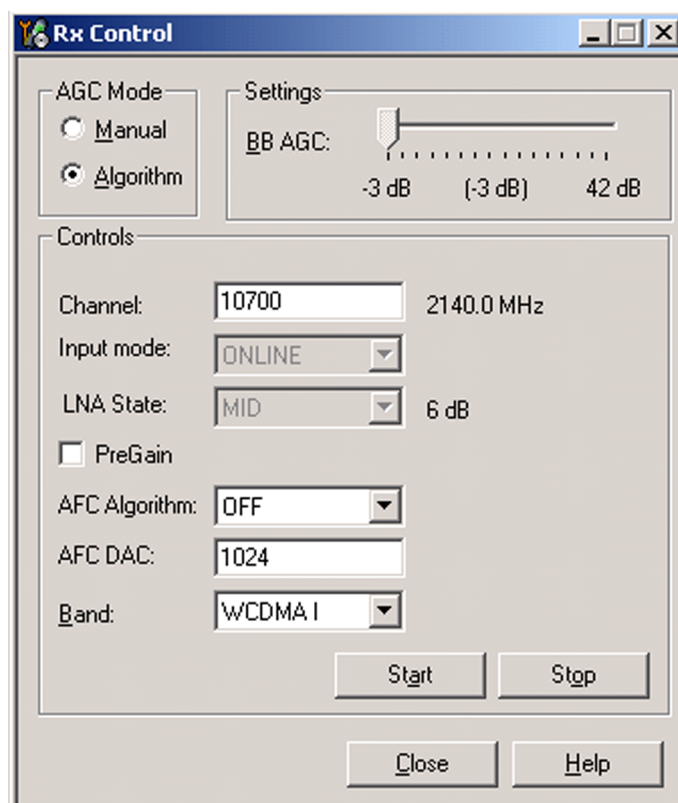


Figure 17 Phoenix Rx Control window with sample settings (WCDMA band I)

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.

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 \(page 4-13\)](#).

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.

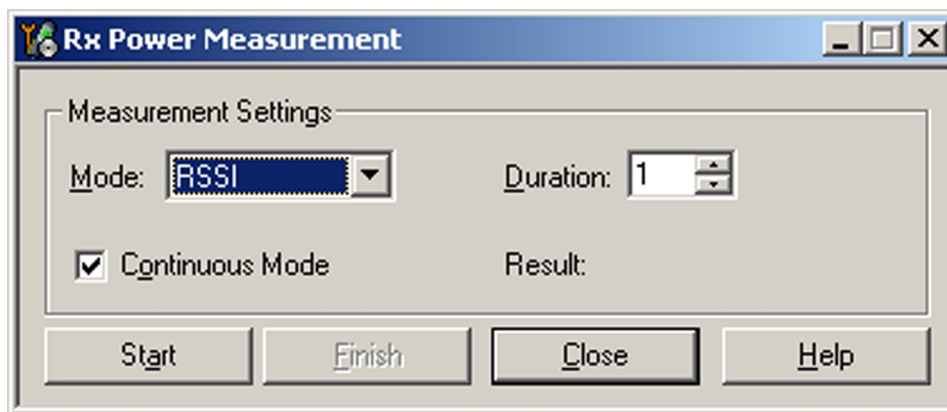


Figure 18 Phoenix Rx Power Measurement window

2. In the RX Power measurement window, select:

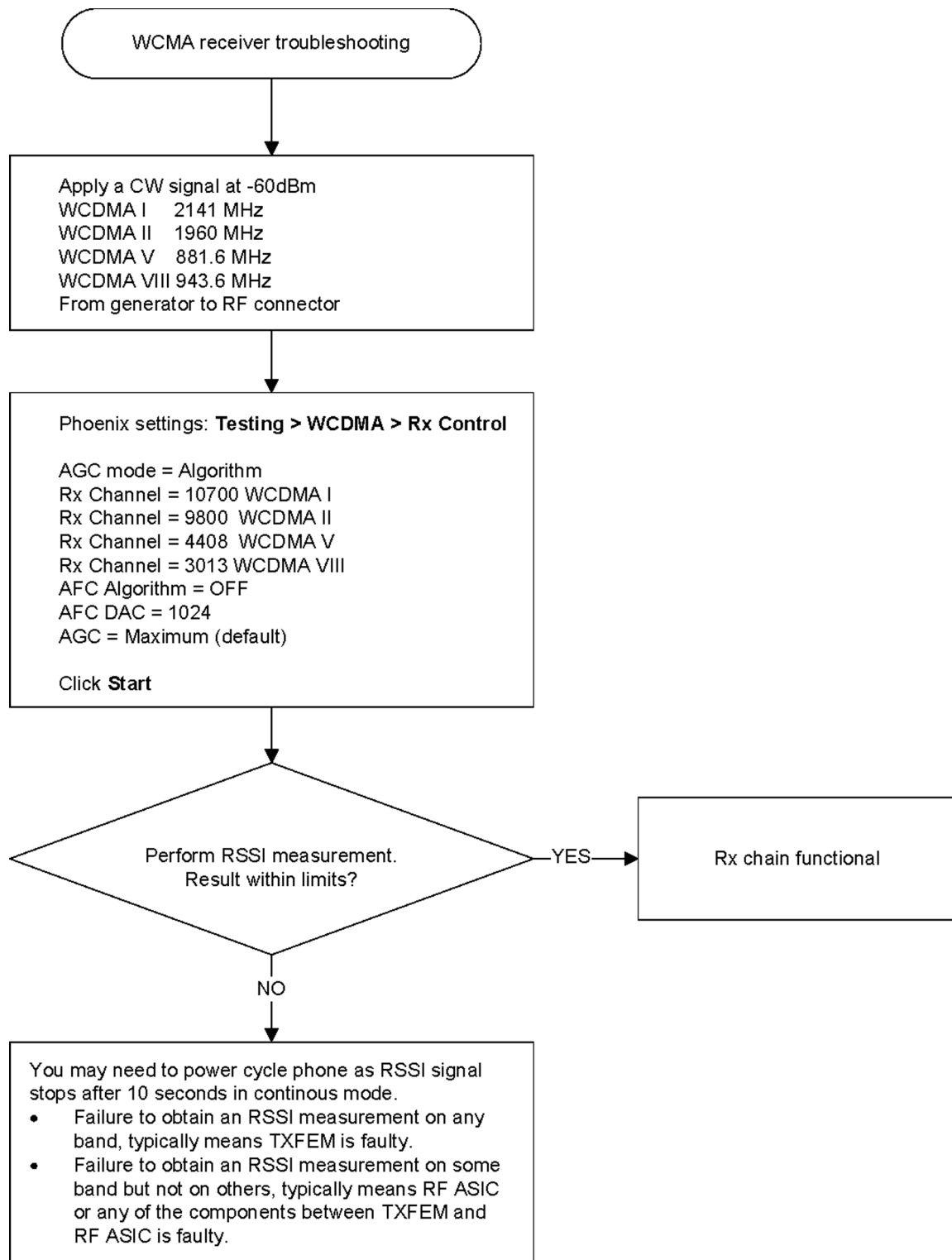
- Mode: RSSI
- Continuous mode

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

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

WCDMA receiver troubleshooting flowchart

Troubleshooting flow



■ 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 \(page 4-27\)](#) 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.

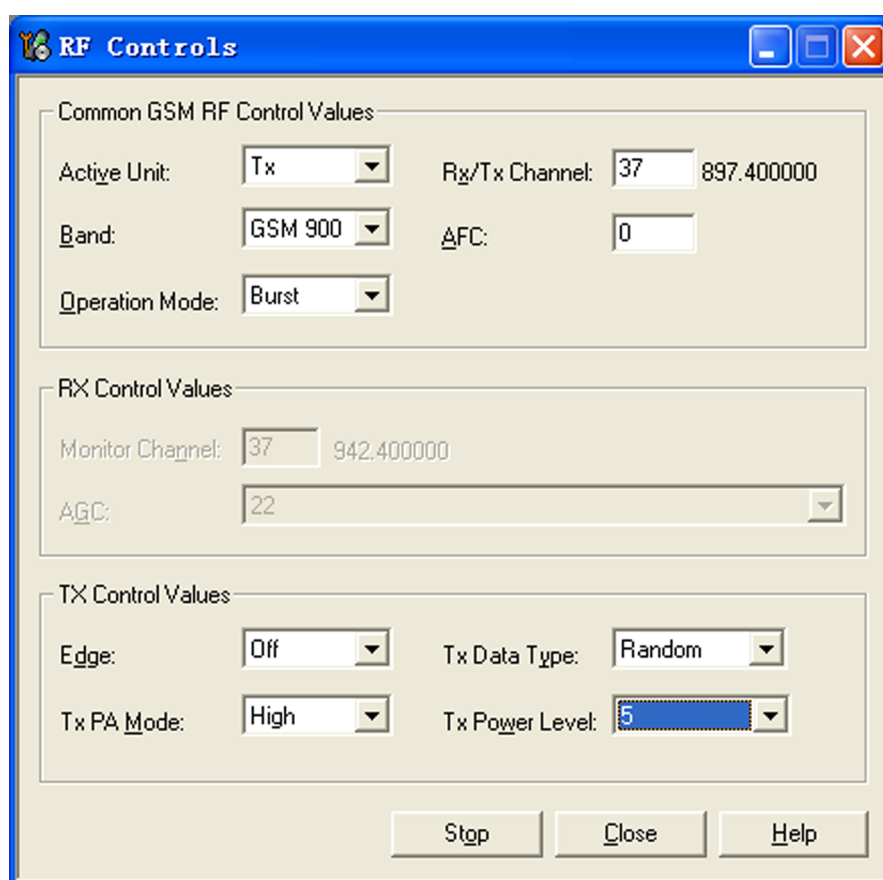


Figure 19 Phoenix RF Controls window

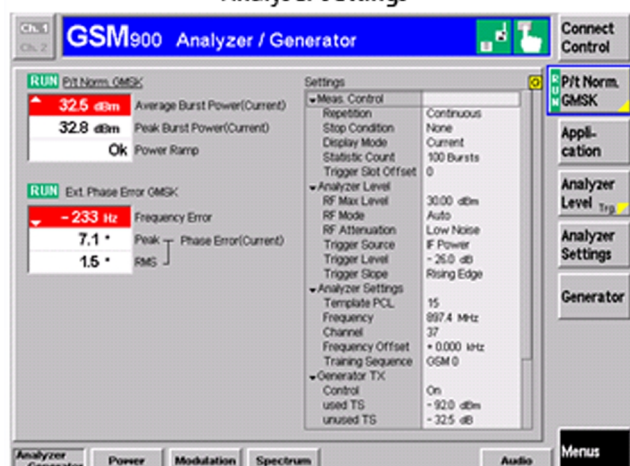
3. Make the following settings:

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

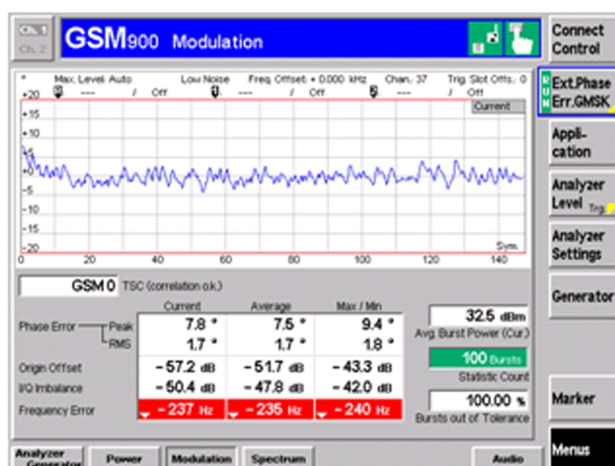
4. Check the basic TX parameters, using a communication analyser (e.g. CMU200).

- Power
- Phase error
- Modulation
- Switching spectrum

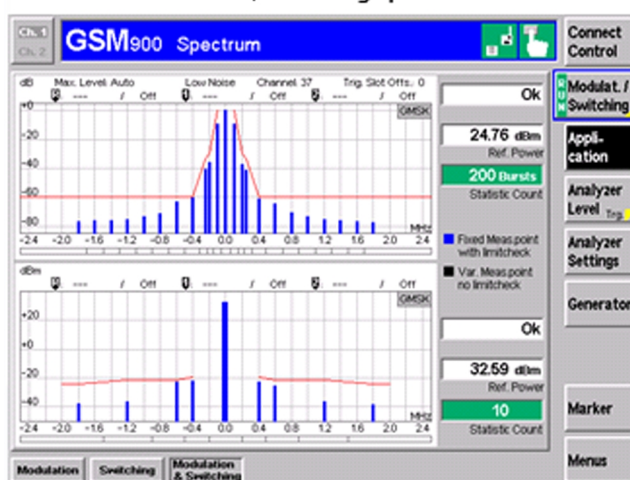
Analysers settings



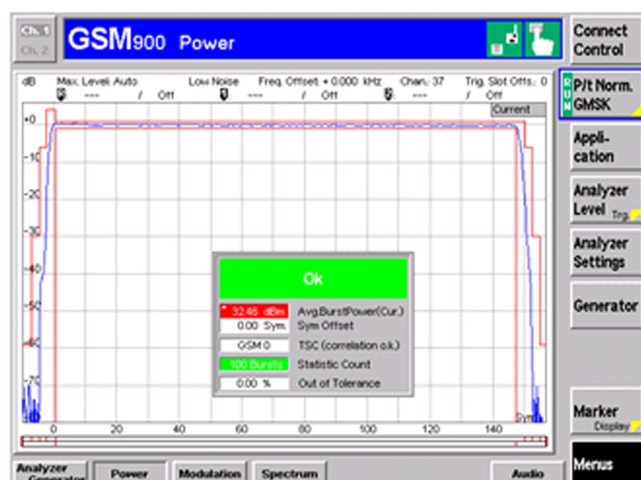
Phase error



Modulation/Switching spectrum



Power/Burst GSM/GPRS (GMSK)



Power/Burst - EDGE (8PSK)



Figure 20 Typical readings

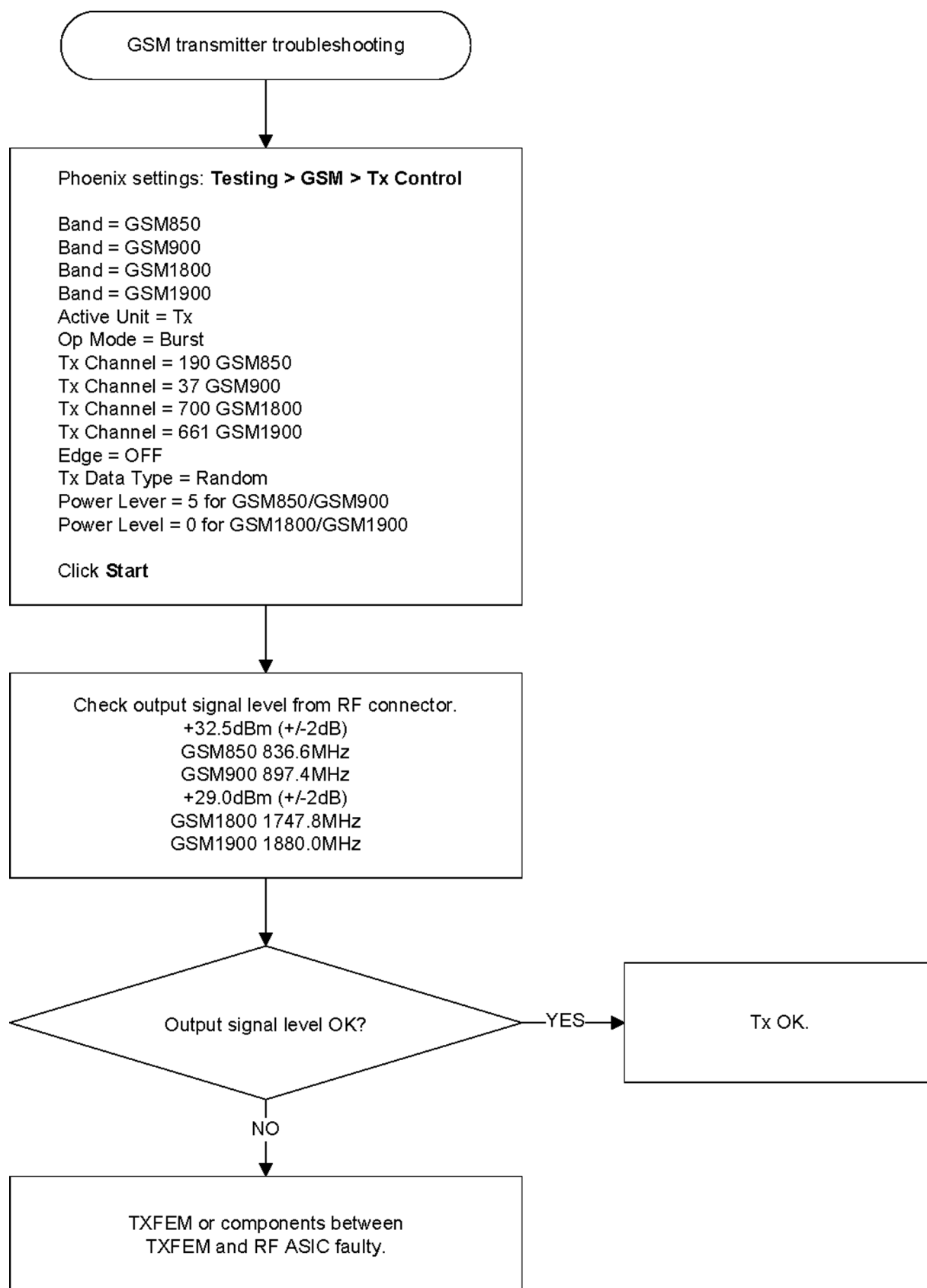
5. Change the power level in RF controls window and make sure the power reading follows accordingly.

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



WCDMA transmitter troubleshooting

Steps

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

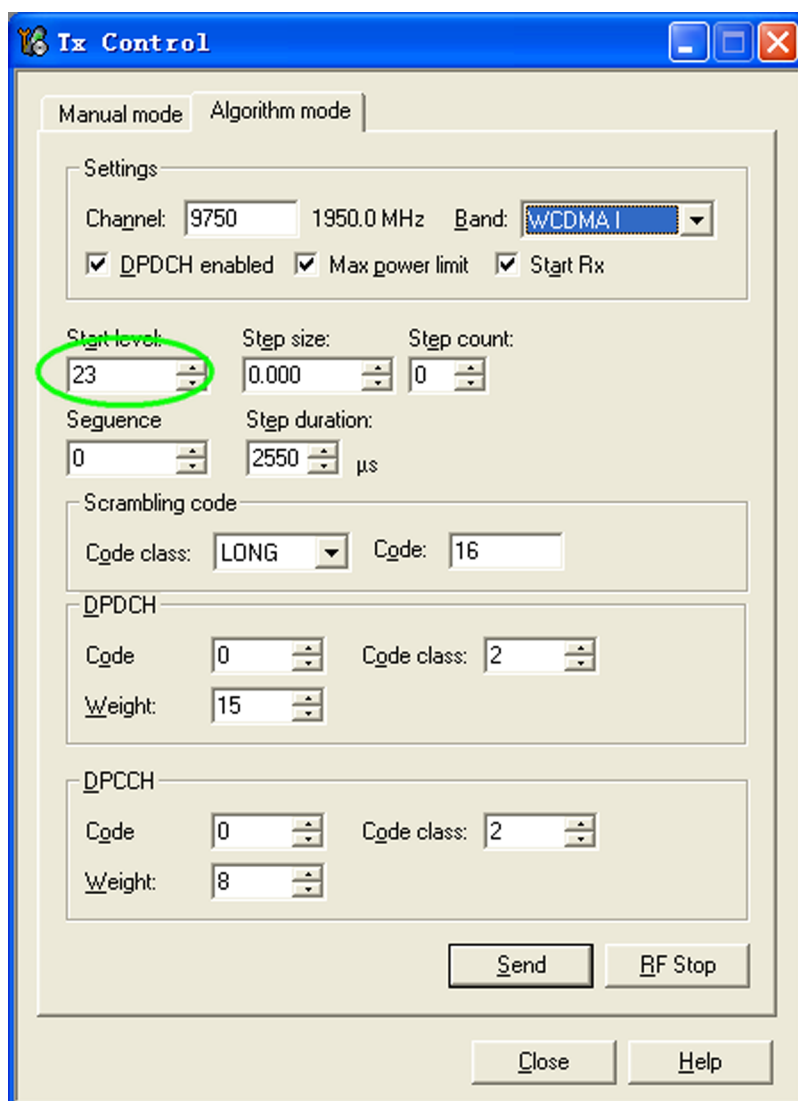


Figure 21 Phoenix WCDMA Tx control window

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	23
Step size	0
Step count	0
Sequency	0
Step duration	2550
Code class	LONG
Code	16
DPDCH code	0
Weight	15
Code class	2
DPCCH code	0
Weight	8
Code class	2

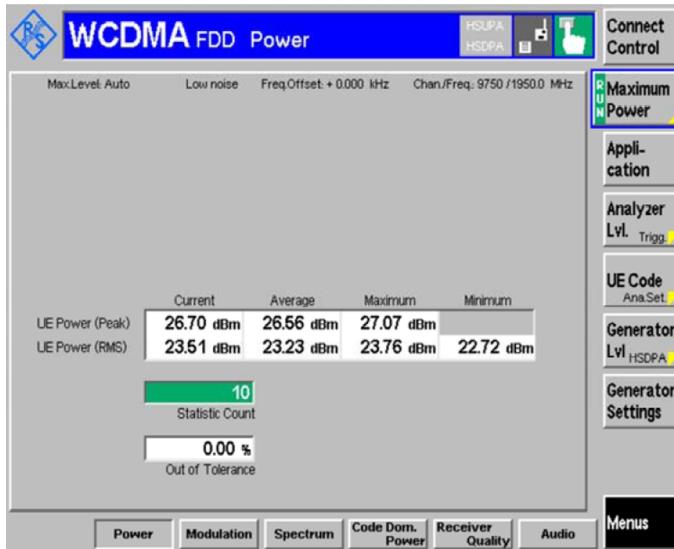
Note: Use the **Start level** option to set the TX power level.

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

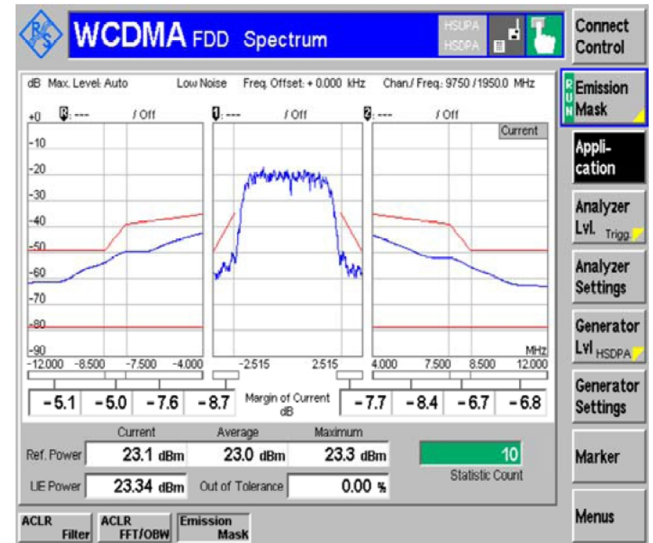
If settings are changed (eg. new channel selected), you have to click **RF Stop** and **Send** again.

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

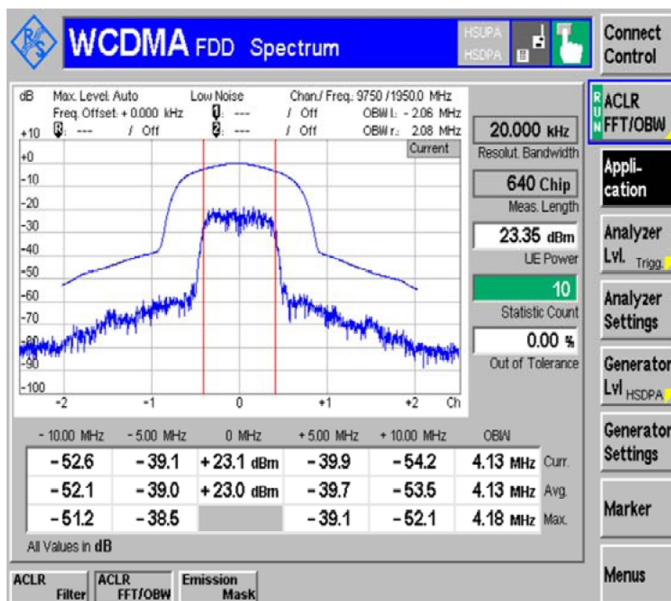
Power



Spectrum - Emission Mask



Spectrum - ACLR (FFT/OBW)



Spectrum - ACLR (Filter)

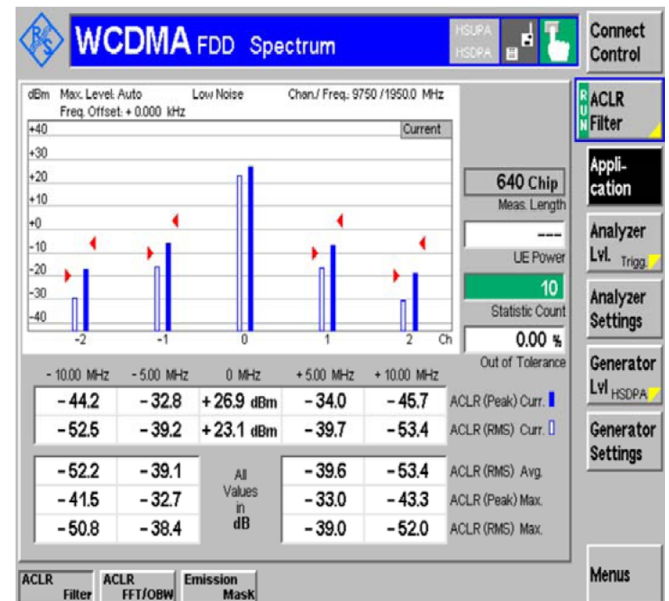
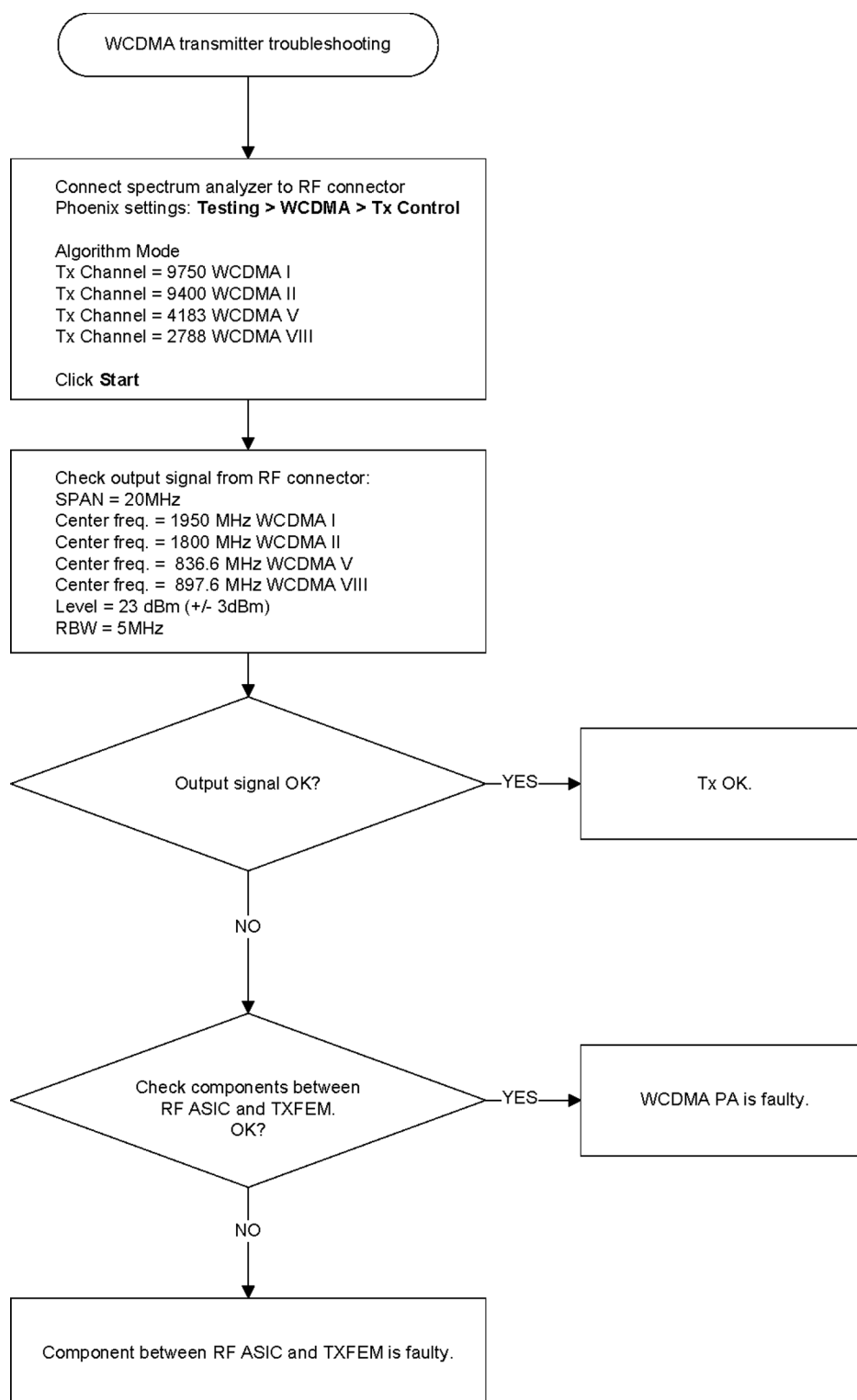


Figure 22 Typical readings

WCDMA transmitter troubleshooting flowchart

Troubleshooting flow



■ Troubleshooting with RF shield removed

Introduction

The RF-shield should not be removed in order to replace single components on the RF block. This chapter only assists in locating the faulty component for statistical purposes.

Voltage checking

Steps

1. Set up the main board in the module jig. The phone should be in local mode.
2. Check the following:

TP#	Signal name	Test point	Voltage (all bands)
1	VCTCX0 (G7500) supply	C7501	2.5V
2	RFIC Vapaus (N7500) supply from DC/DC converter	C7570	2.8V
3	TXFEM (N7520) supply from DC/DC converter	C7521	1.3V-3.8V (only when transmitting and depends on output power).
4	WCDMA PA (N7540) supply from DC/DC converter	C7528	0.7V-3.1V (only when transmitting and depends on output power). The value will be 3.1V when settings as described in the note below are used.
5	Vbat at WCDMA PA (N7540)	C7512	3.7V (Vbattery)
6	Supply input to DC/DC conv	C7527	3.7V (Vbattery)

Note: The result at TP4 should be 3.1V when using the same settings as shown in Figure Phoenix WCDMA Tx control window in section [WCDMA transmitter troubleshooting \(page 4-21\)](#).

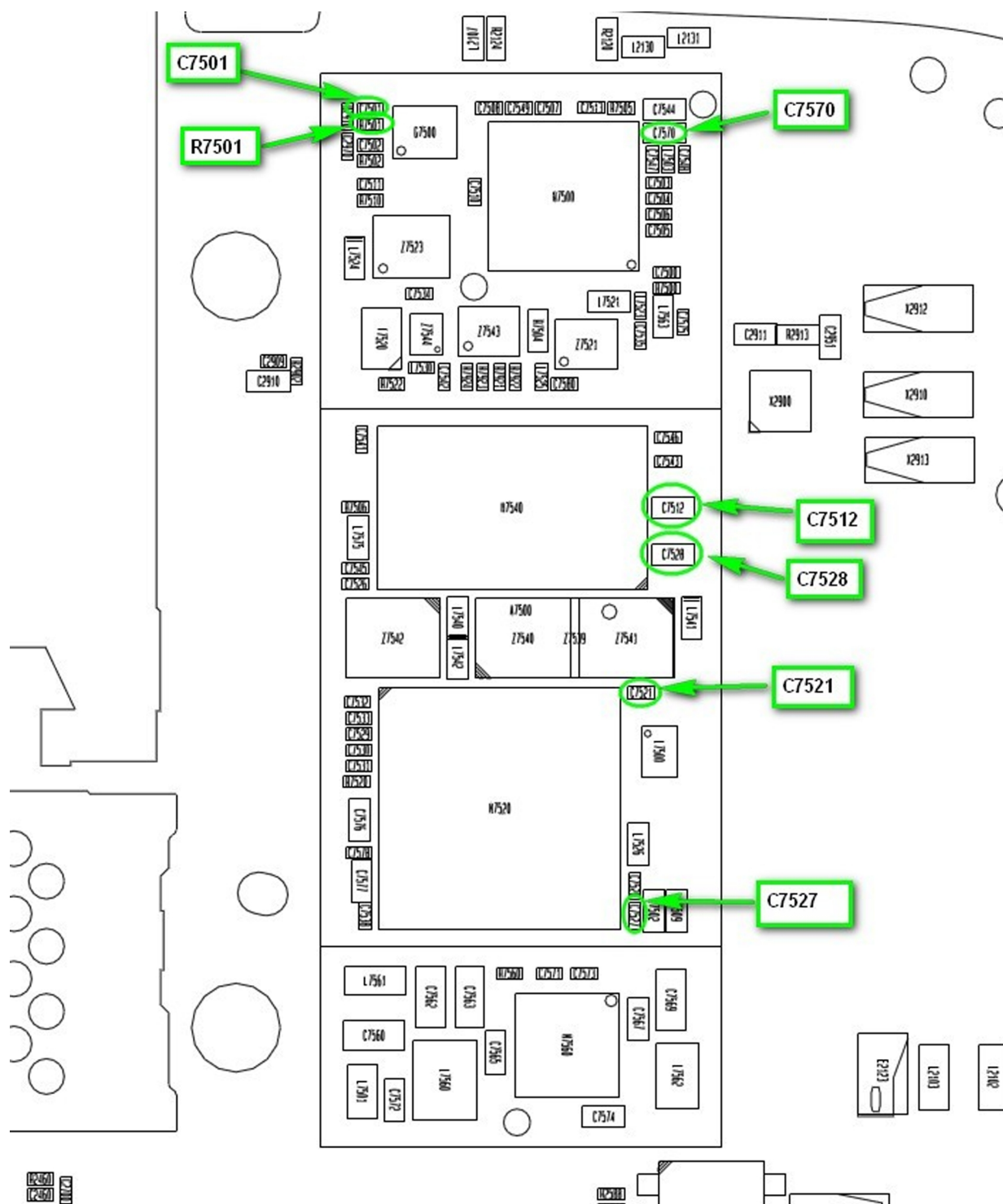
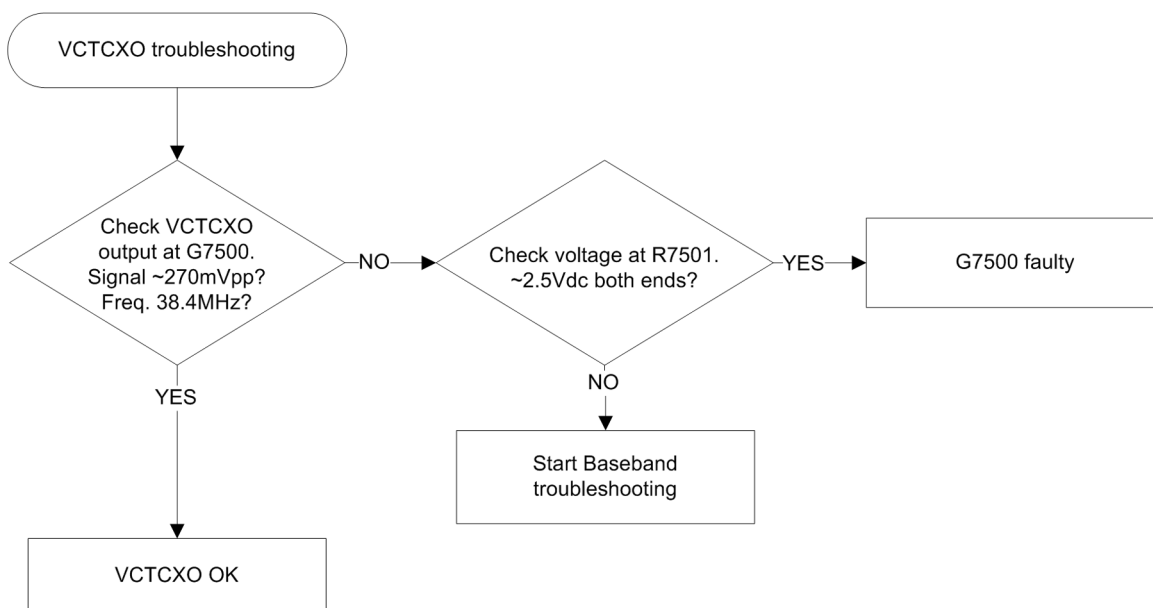


Figure 23 Test points for voltage checking

VCTCXO troubleshooting

Troubleshooting flow



RF component reference

Component reference table

These table show the components used for the different bands. It can be used as a reference when troubleshooting which components may or may not be faulty.

Table 11 RM-598 RF component reference

RM-598	GSM 850		GSM 900		GSM 1800		GSM 1900		WCDMA I		WCDMA II		WCDMA V	
Reference	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
G7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7520	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7540										X		X		X
N7560	X	X	X	X	X	X	X	X	X	X	X	X	X	X
T7520						X		X						
Z7521			X		X									
Z7523		X		X										
Z7540							X				X	X		
Z7541									X	X				
Z7542	X												X	X
Z7543										X		X		

RM-598	GSM 850		GSM 900		GSM 1800		GSM 1900		WCDMA I		WCDMA II		WCDMA V	
Reference	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
Z7544														X

Table 12 RM-604 RF component reference

RM-604	GSM 850		GSM 900		GSM 1800		GSM 1900		WCDMA I		WCDMA II		WCDMA VIII	
Reference	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
G7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
L7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7500	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7520	X	X	X	X	X	X	X	X	X	X	X	X	X	X
N7540										X		X		X
N7560	X	X	X	X	X	X	X	X	X	X	X	X	X	X
T7520						X		X						
Z7521	X				X									
Z7523		X		X										
Z7540							X				X	X		
Z7541									X	X				
Z7542			X										X	X
Z7543										X		X		
Z7544														X

X means that the component is used for the band in the current column.

For further reference, see Component reference schematics in the following figure.

RF block schematics

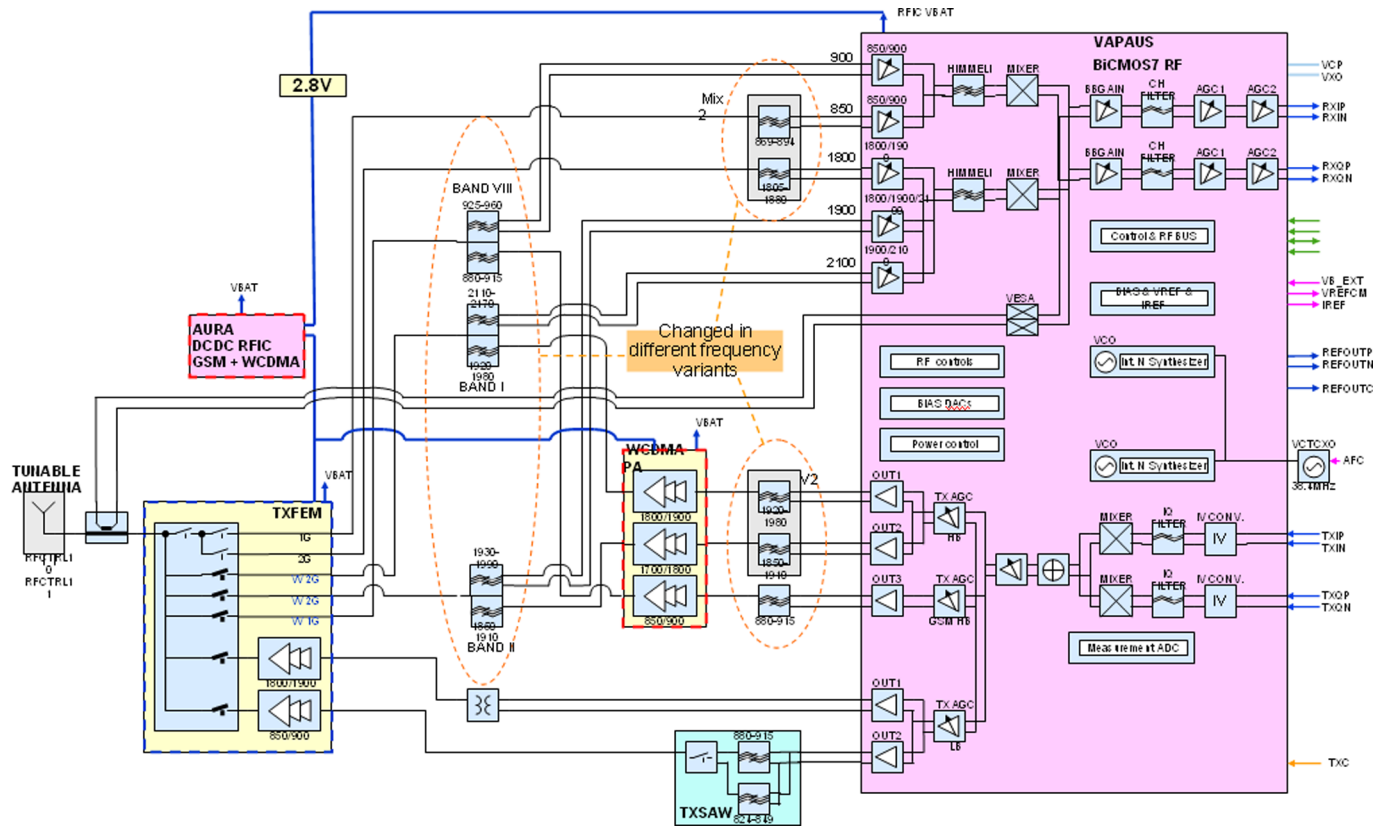
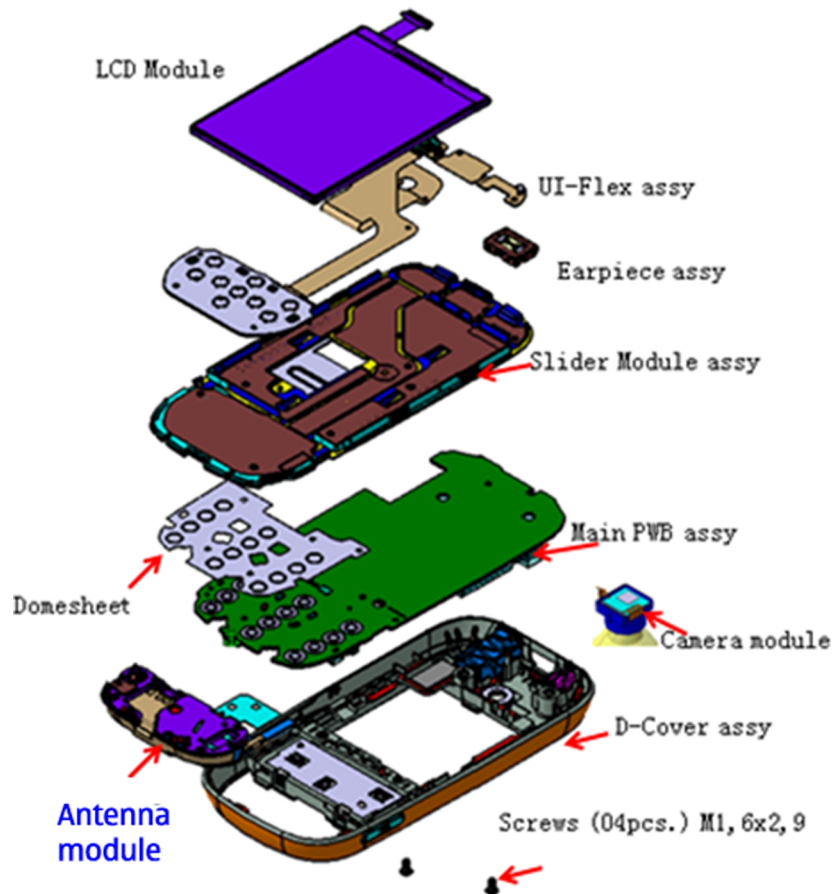


Figure 24 Component reference schematics

■ 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 flex attached to 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 D-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 D-Cover and the IHF speaker is in between the Cellular Antenna Module and the D-Cover.

The Bluetooth antenna also consists of an antenna flex attached to an antenna carrier with an adhesive. It is put in the D-Cover at the side of the phone opposite to the volume key. In the fully assembled phone it is hidden by the D-Cover Trim.

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 following figure.

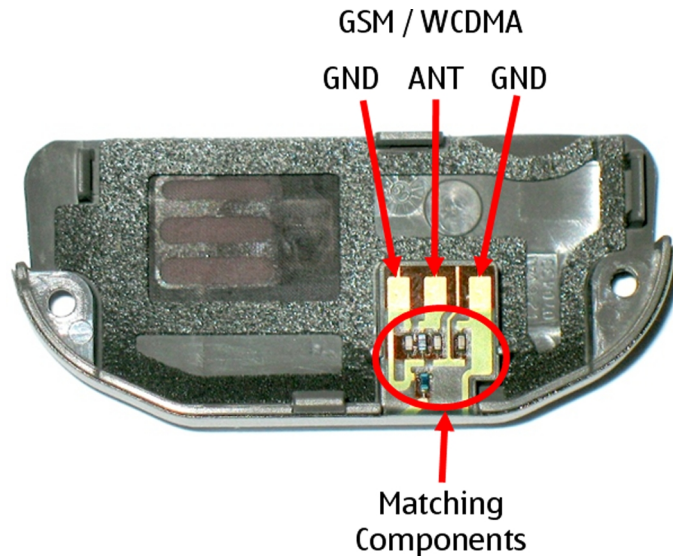


Figure 25 Antenna contacts

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

Bluetooth antenna functionality

The Bluetooth antenna is an IFA type. The grounded branch is a wired line on the PWB, the other branch is a wire on the flex. The Bluetooth antenna includes a spring clip, which establishes the contact to Bluetooth feed via a gold plated contact area on the PWB.

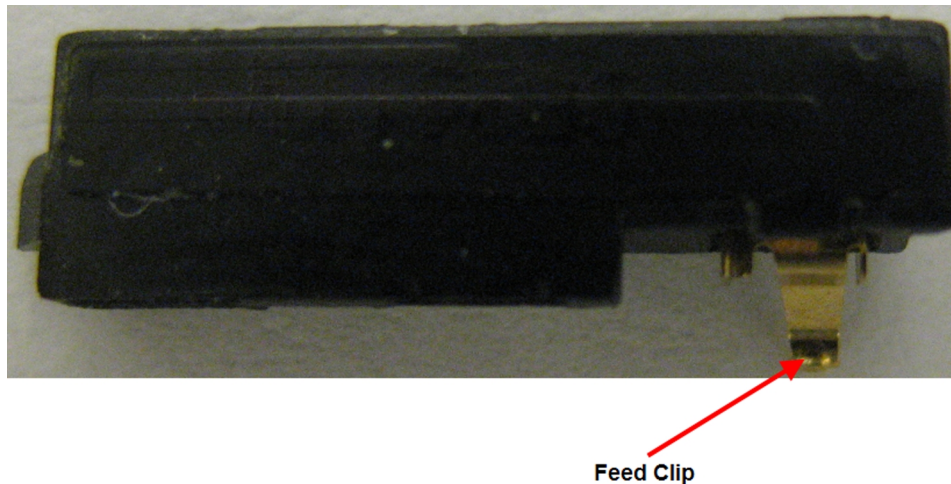


Figure 26 BT antenna

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 on the flex. 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 antenna module needs to 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 antenna needs to be replaced.

5 — System Module

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■ Introduction

Phone description

RAP3GS 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 GAZ00/PEARL. 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. In the cellular baseband there are two alternative pin compatible mixed signal ASICs; GAZ00 and PEARL. 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.

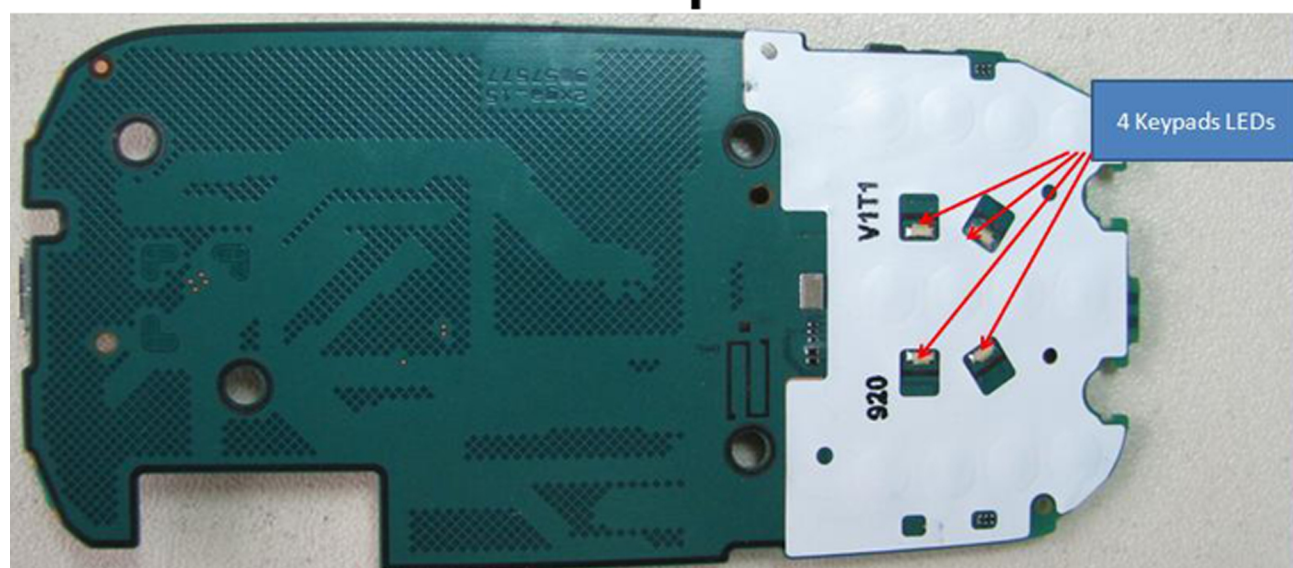
Bluetooth and FM radio are physically integrated in one single ASIC.

Key components

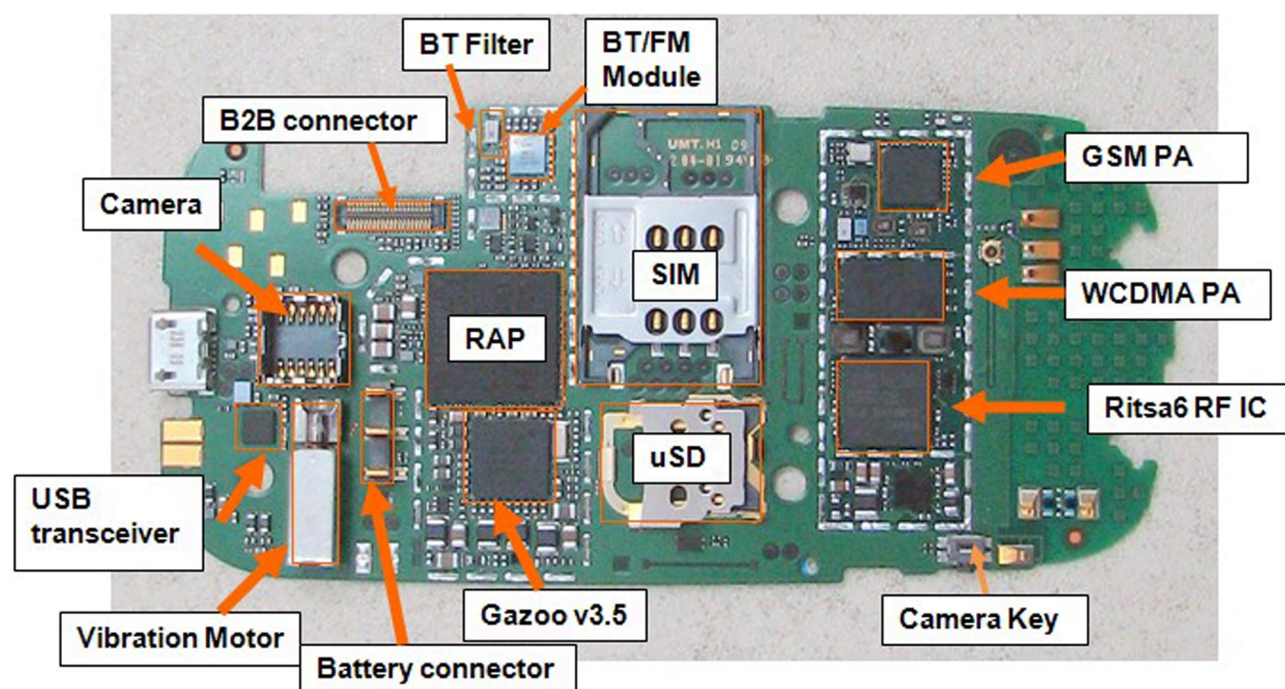
Function	Description	Item ref
Main board	2XGA	
UI flex	2XHA	
Energy management ASIC	GAZ00/PEARL	N2200
RF ASIC	Vapaus	N7500
Processor	RAP3GS2v4	D2800
PA GSM	Front end module (FEM), quad band	N7520
PA WCDMA	Triple band PA	N7540
Oscillators	VCTCX0	G7500
Memory	1 Gbit M3/ DDR SDRAM 512 Mbit combo (stacked with RAP)	D3000
FM radio	BTHFMRDS3.0 module	N6000
Bluetooth	BTHFMRDS3.0 module	N6000
Slide switch	Hall IC switch/position sensor	N2460
Battery	BL-4CT	
Battery connector	Tabby blade interface	X2080
UI flex connector	Coax 40-pin connector	X1000
MicroUSB connector	For data and charging	X2002
MicroSD connector		X3200
SIM connector		X2700
Microphone		B2104
IHF speaker		
Earpiece	On UI flex	B1000

Key component placement

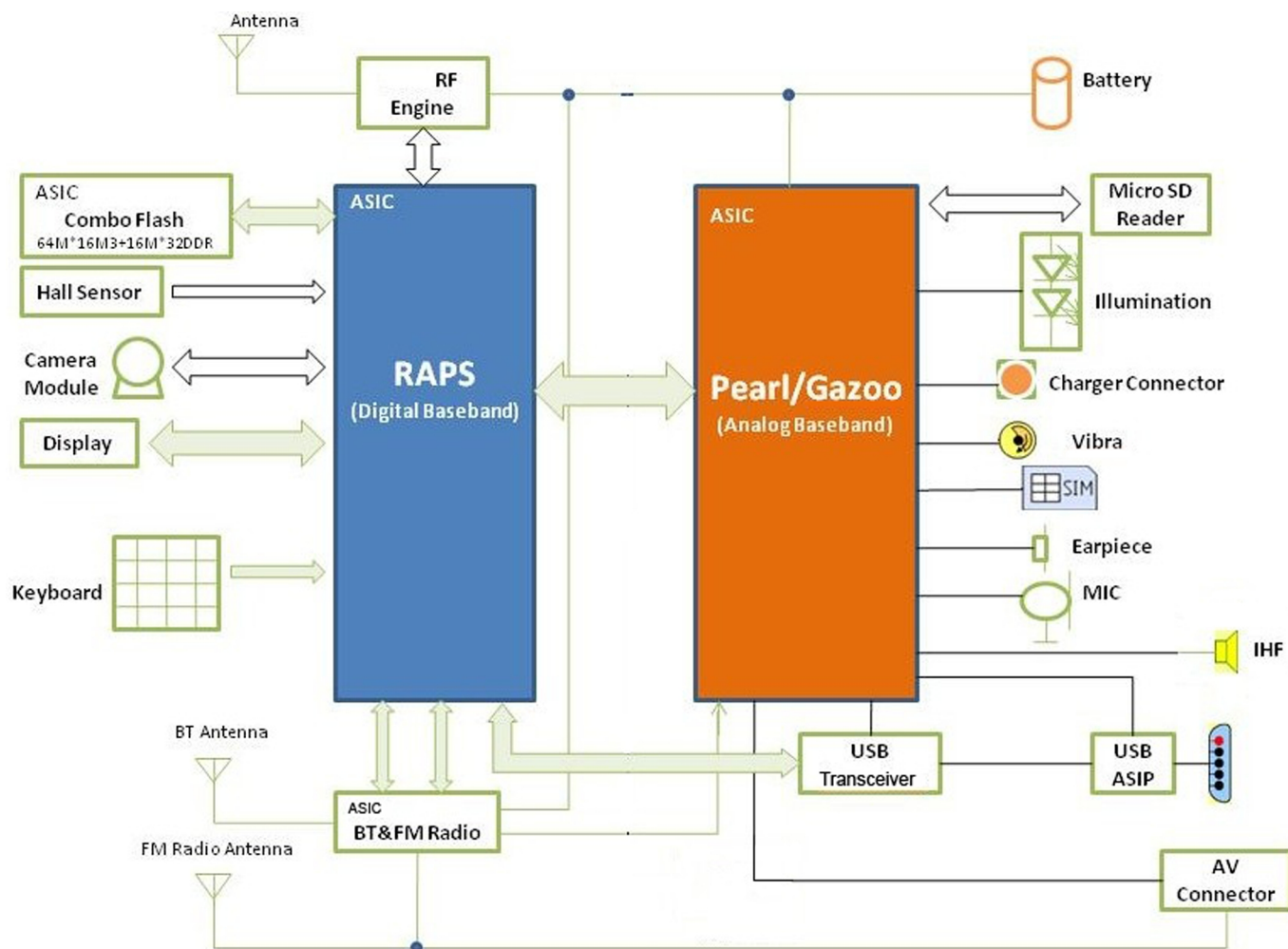
Top



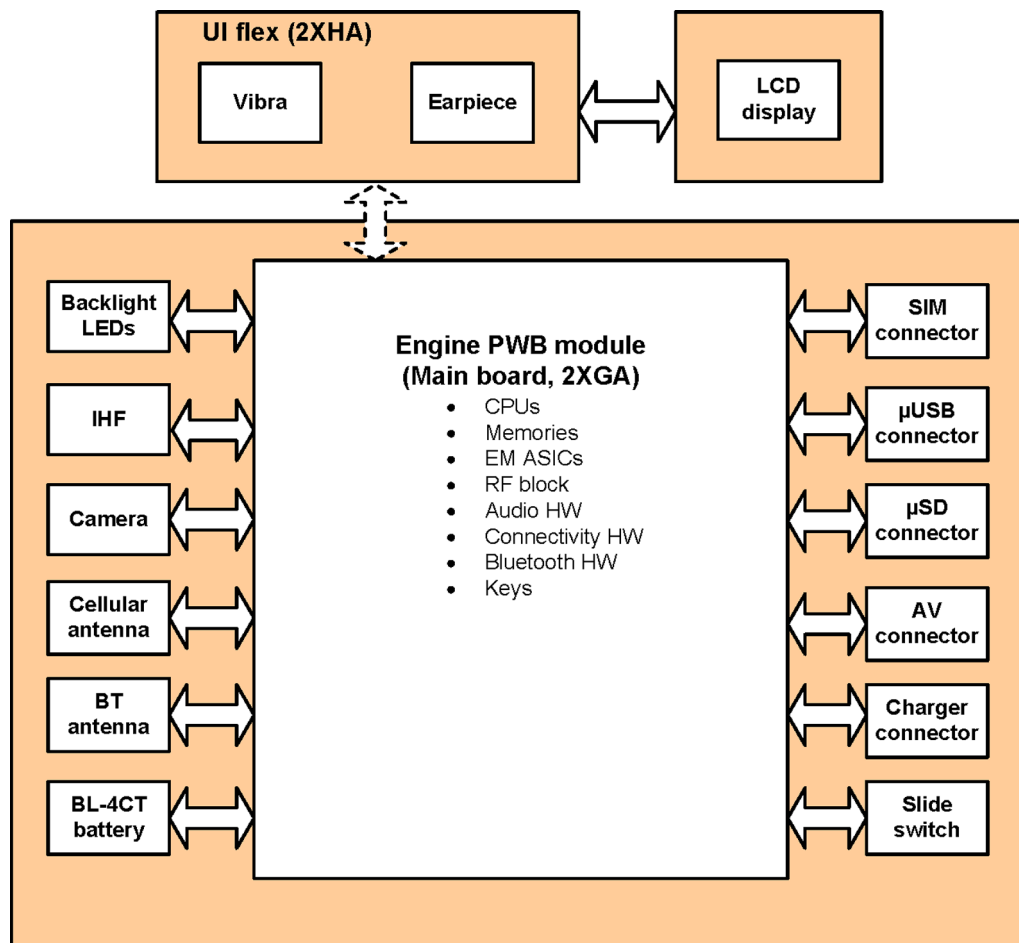
Bottom



System module block diagram



Board and module connections



Energy management

Battery and charging

BL-4CT battery

The phone is powered by a 3-pole BL-4CT 860 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.

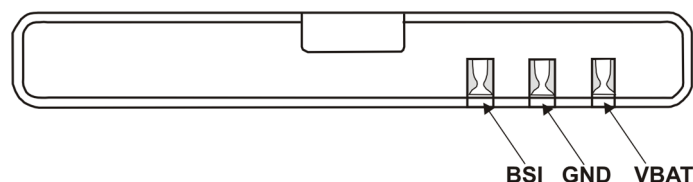


Figure 27 Battery pin order

Battery connector

The battery connector is a blade connector. It has three blades;

- 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/GAZOO. These circuits contain a number of regulators. In addition there are some external regulators.

In the table below normal and extreme voltages are shown when a BL-4CT battery is used.

Table 13 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	4.1	
Lower extreme voltage	3.5	
Higher extreme voltage (fast charging)	4.2	
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-	2.7 ± 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 (Gazoo/Pearl) 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 Gazoo/Pearl 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 Gazoo/Pearl 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 RESET 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 VCTCXO in 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 N7500 and distributed to BTHFMTXRDS.

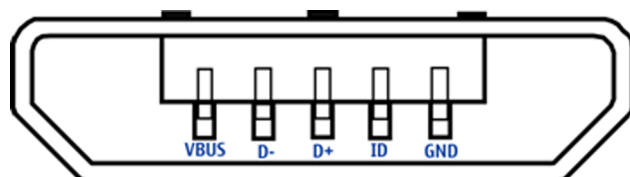
Connectivity

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 μ USB connector (AB 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 28 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.

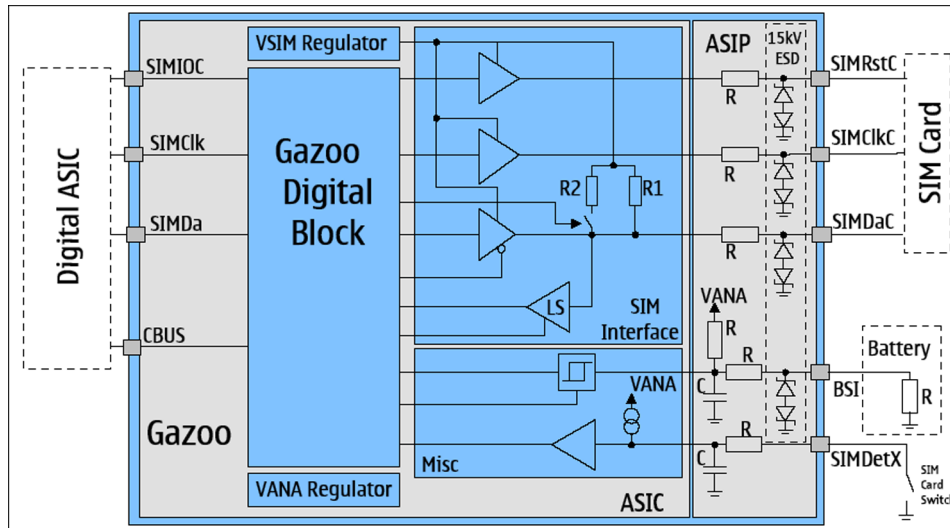


Figure 29 SIM interface

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.

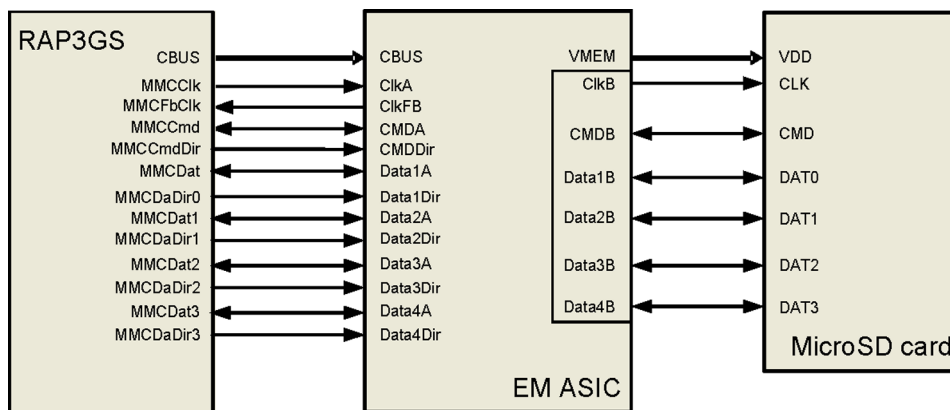


Figure 30 MicroSD card interface

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.

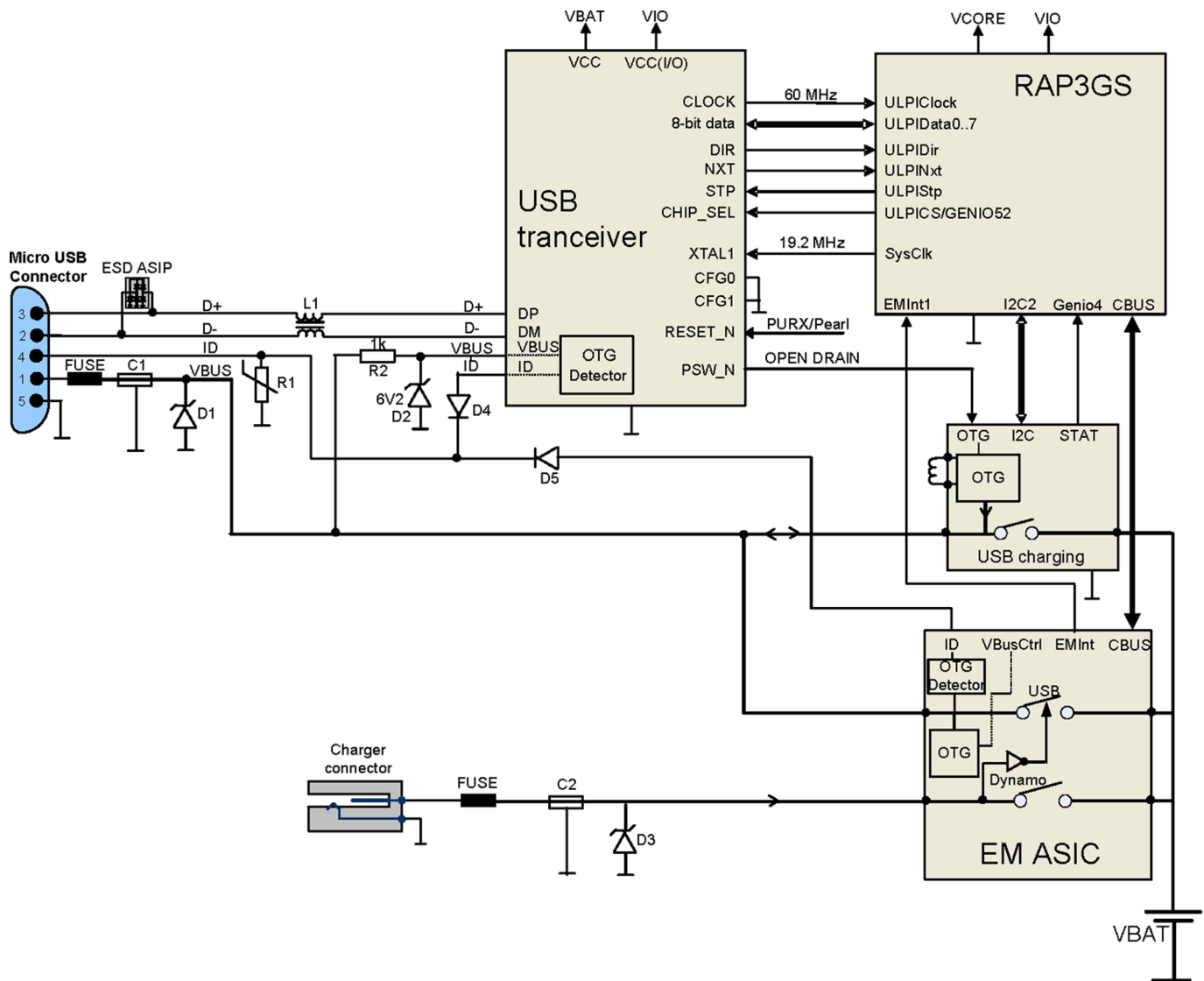


Figure 31 USB interface

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 GAZ00 (N2200). Additional external components are needed for EMC purposes, reverse polarity and transient protection of the input to the baseband module.

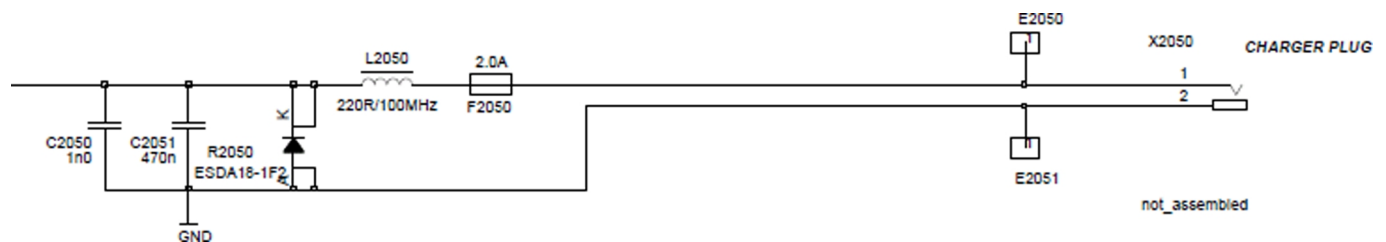


Figure 32 Charger interface

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.

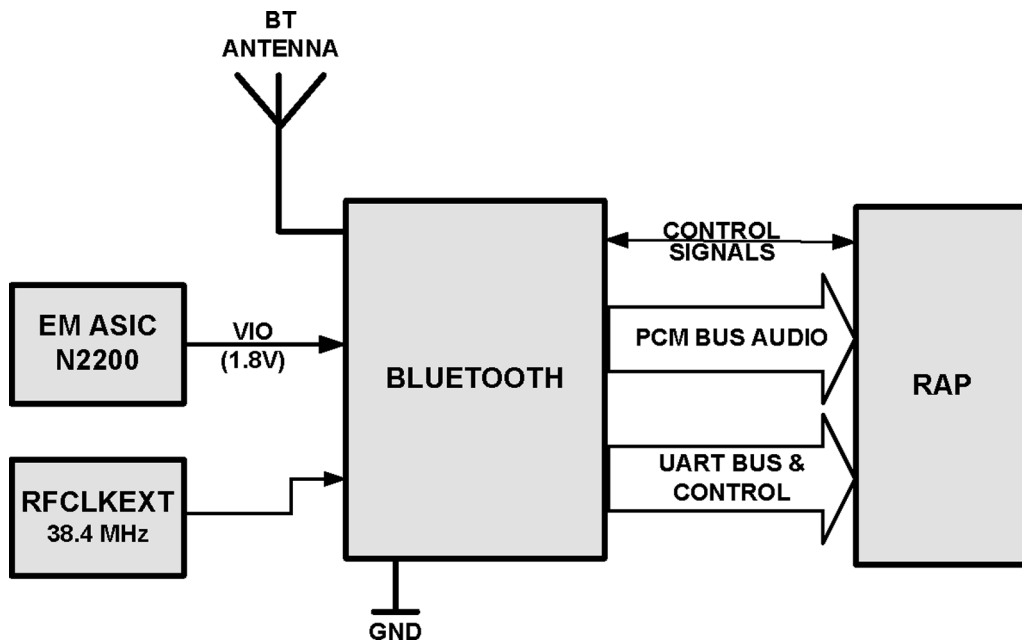


Figure 33 Bluetooth interface

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.

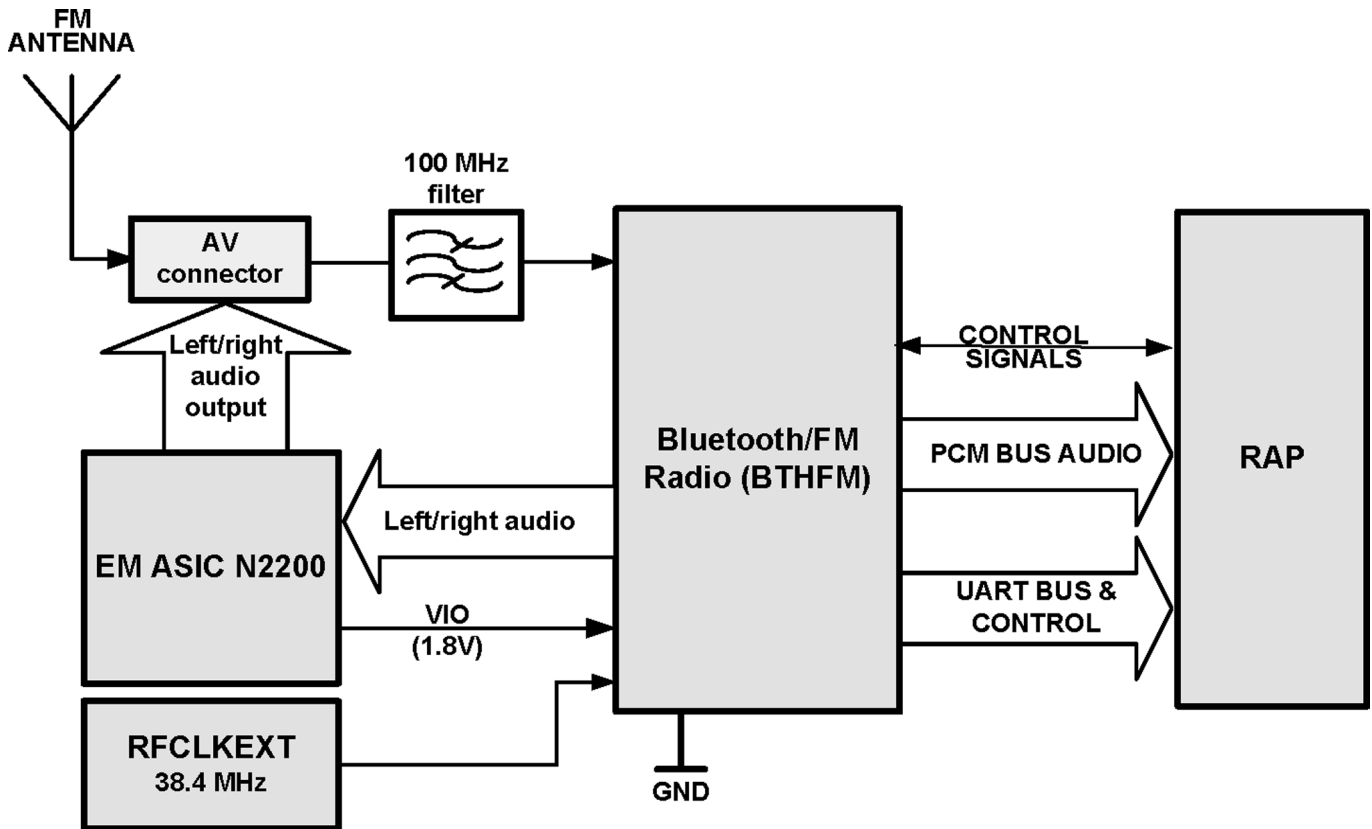


Figure 34 FM interface

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 2.4" 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

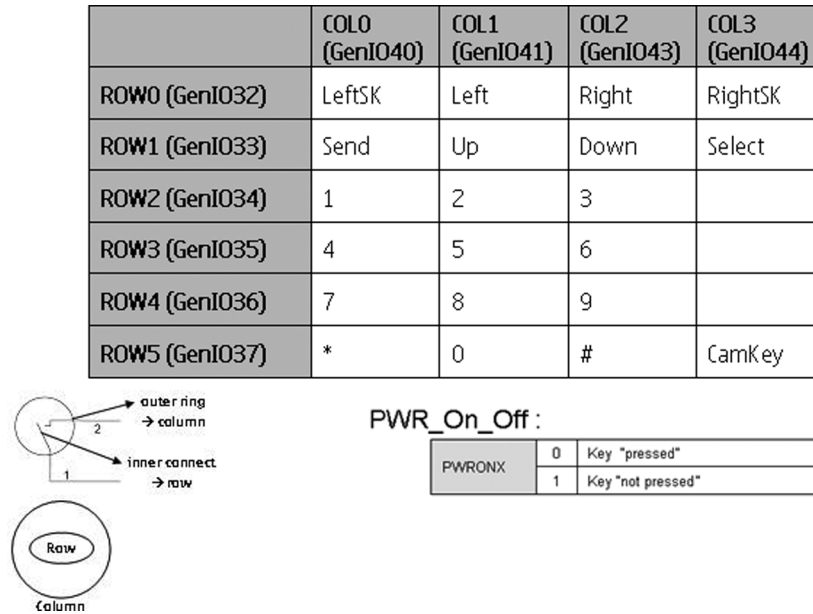


Figure 35 Keypad matrix

Backlight and illumination

The illumination has four main areas: numeric keypad (4 x white LEDs), functional keypad (UI) (2 x white LEDs), display backlight (3 x white LEDs) and reminder light (1 x white LED). The display backlight is powered by the integrated DC/DC converter of the Pearl/Gazoo IC. In addition to these LEDs, the two functional keypad LEDs are powered via a current mirror from the Pearl/Gazoo.

The reminder LED is directly switched to VBAT via GENIO1. 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).



The form factor of this phone is slide, which means that it has to wake up when it slides open. The slide operation is sensed by a MR sensor (hall sensor) mounted on the main PWB and a magnet fitted to the sliding mechanism.

The output of the sensor is connected to GenIO38 of RAP3GS2v4.



■ 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.

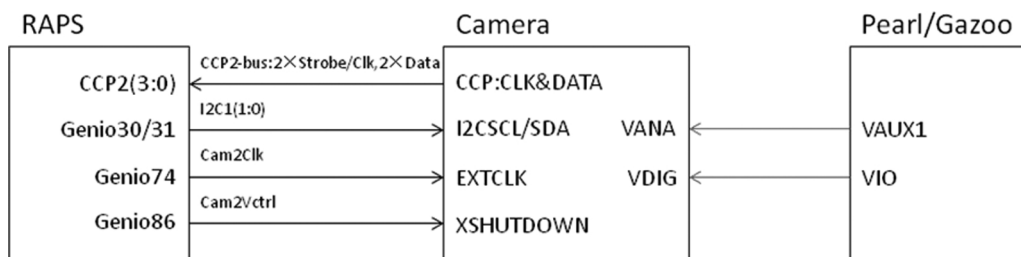


Figure 38 Camera concept

■ 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:

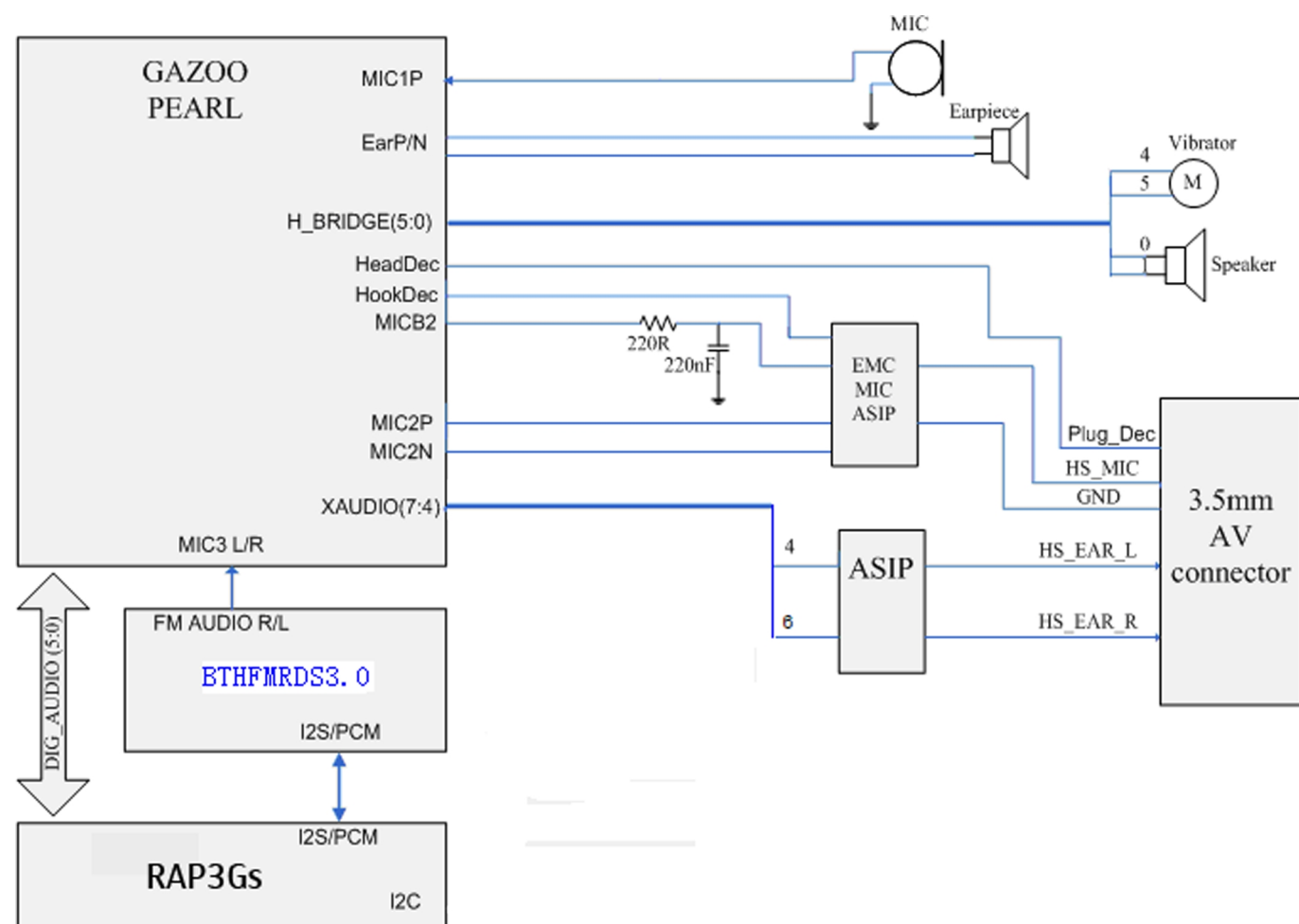


Figure 39 Audio block diagram

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 (Gazoo/Pearl).

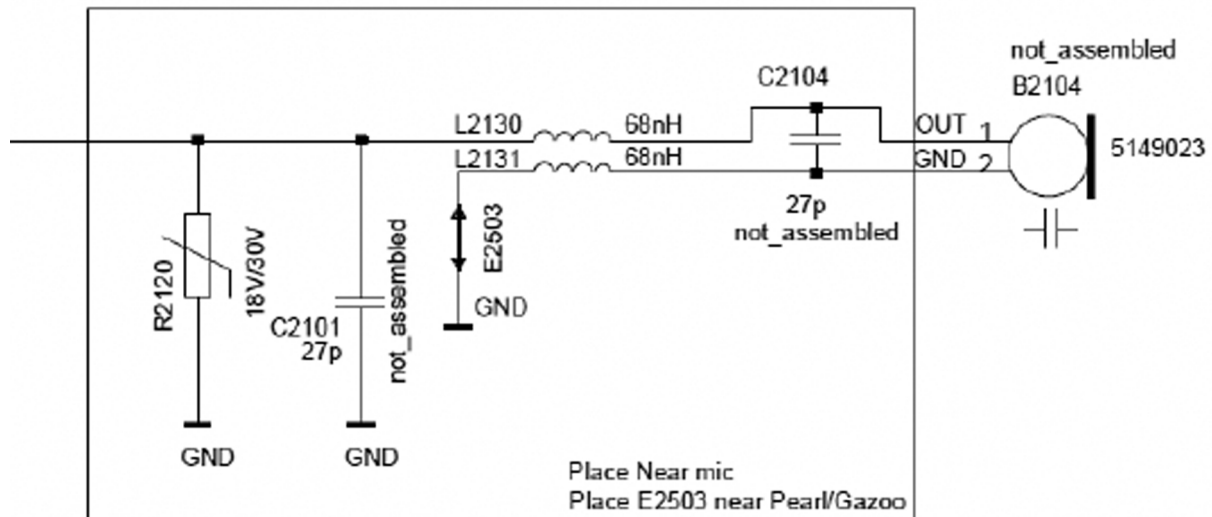


Figure 40 Internal microphone

Internal earpiece

The internal earpiece (B1000) is located at the top side of the UI flex. The earpiece is directly driven by the internal ear amplifiers of the Pearl/Gazoo (N2200) and no additional amplifier is needed

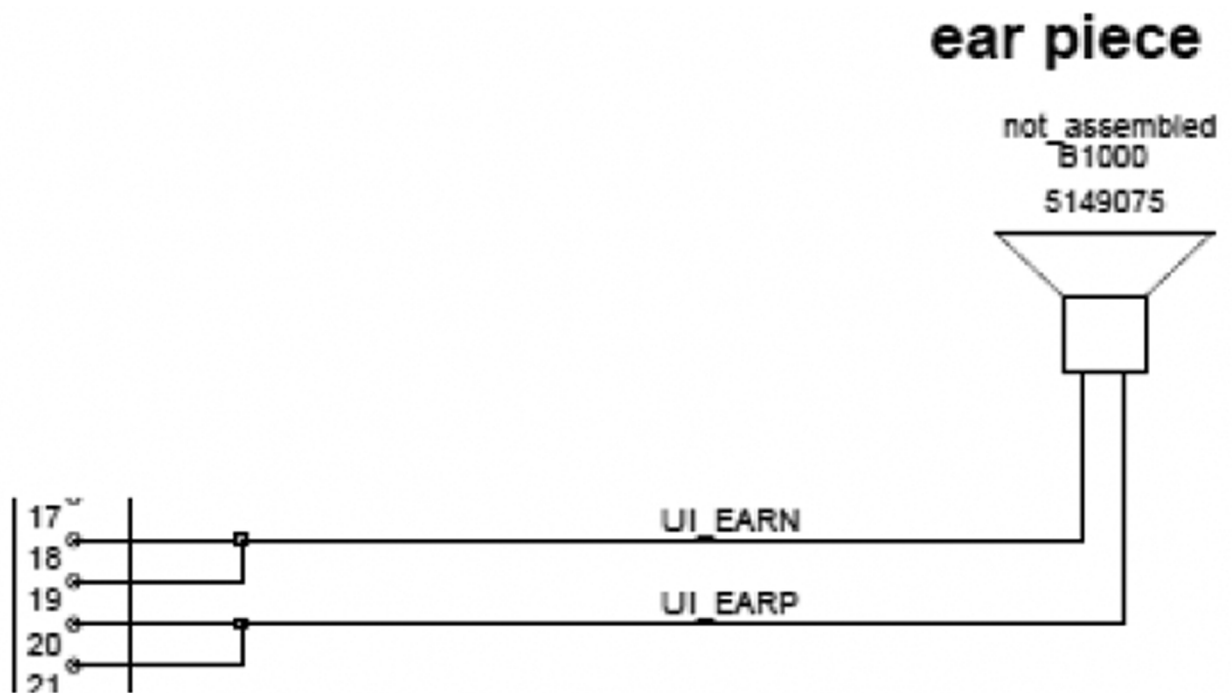


Figure 41 Internal earpiece

IHF speaker

The IHF speaker (E2121/E2123) is located at the bottom side of the main board. No additional amplifier is used.

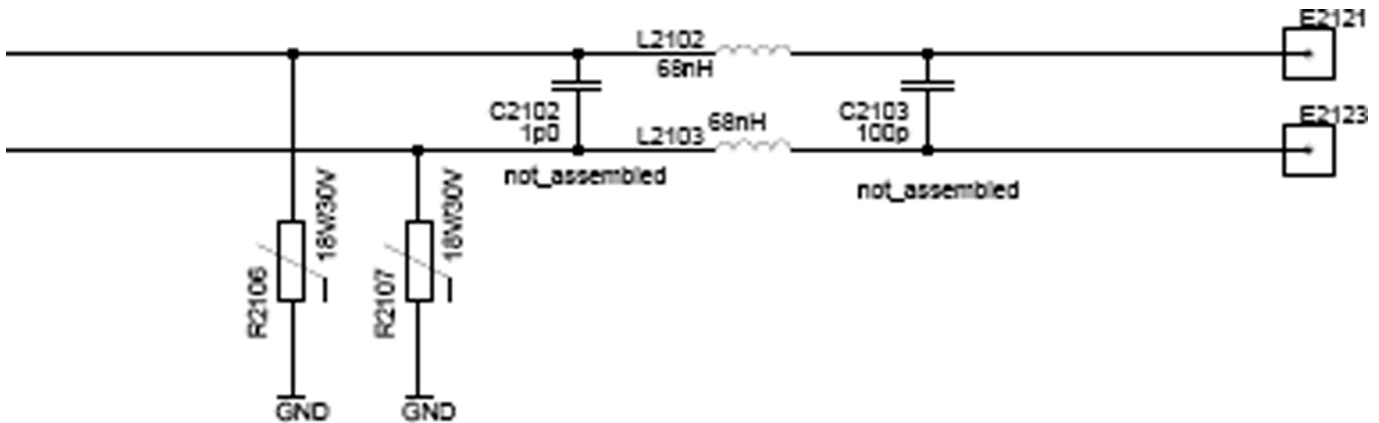


Figure 42 IHF speaker

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.

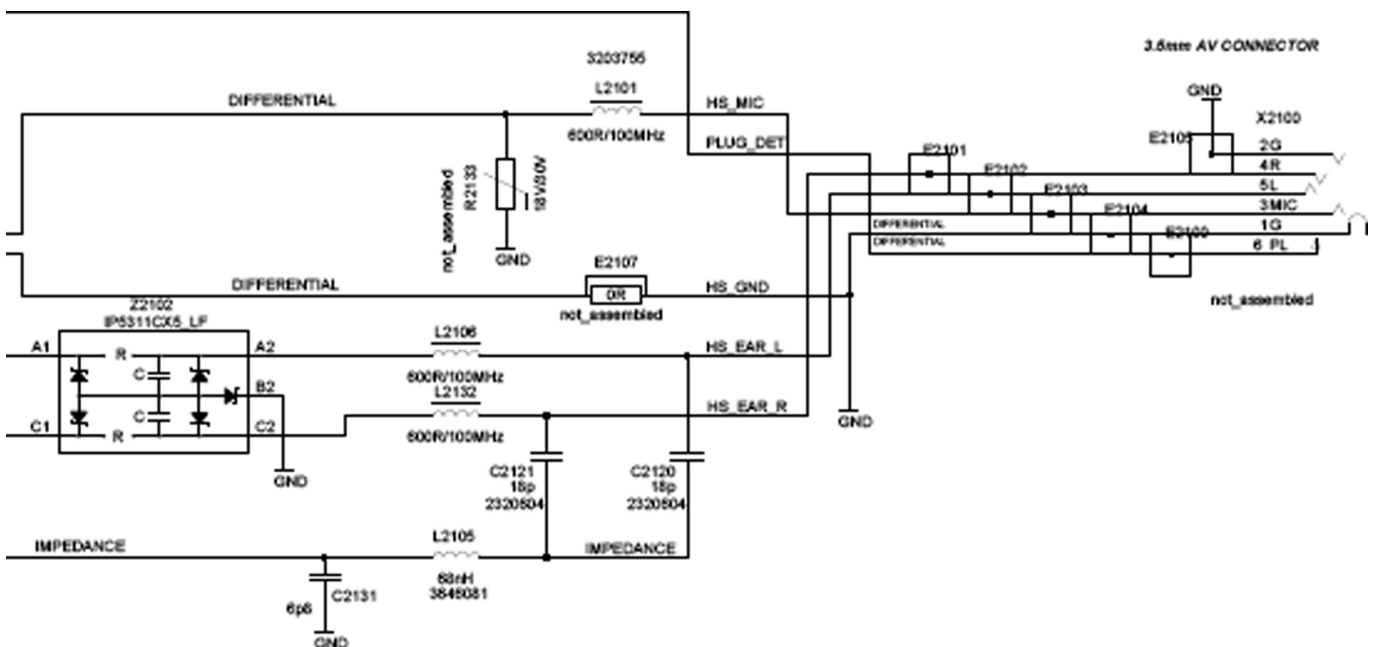


Figure 43 AV connector

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 Gazoo/Pearl. There are no external amplifiers.



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

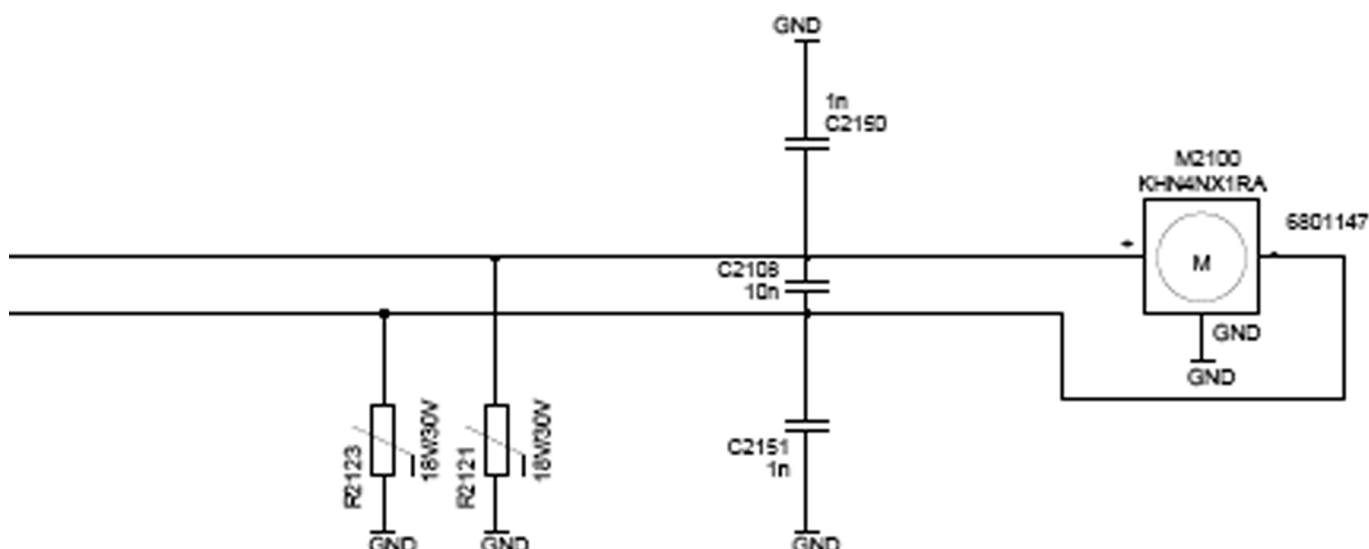


Figure 46 Vibra

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).

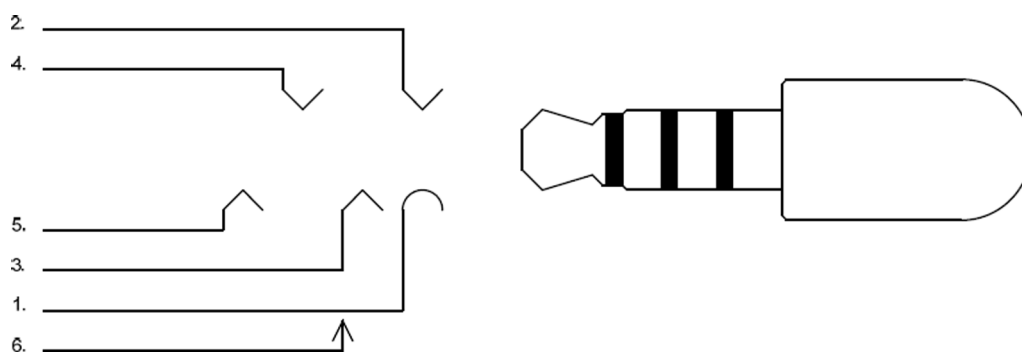


Figure 47 AV connector pin layout

Table 14 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, control: GenIO34
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/ GenIO 33

■ 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.

■ RF description

Block diagram

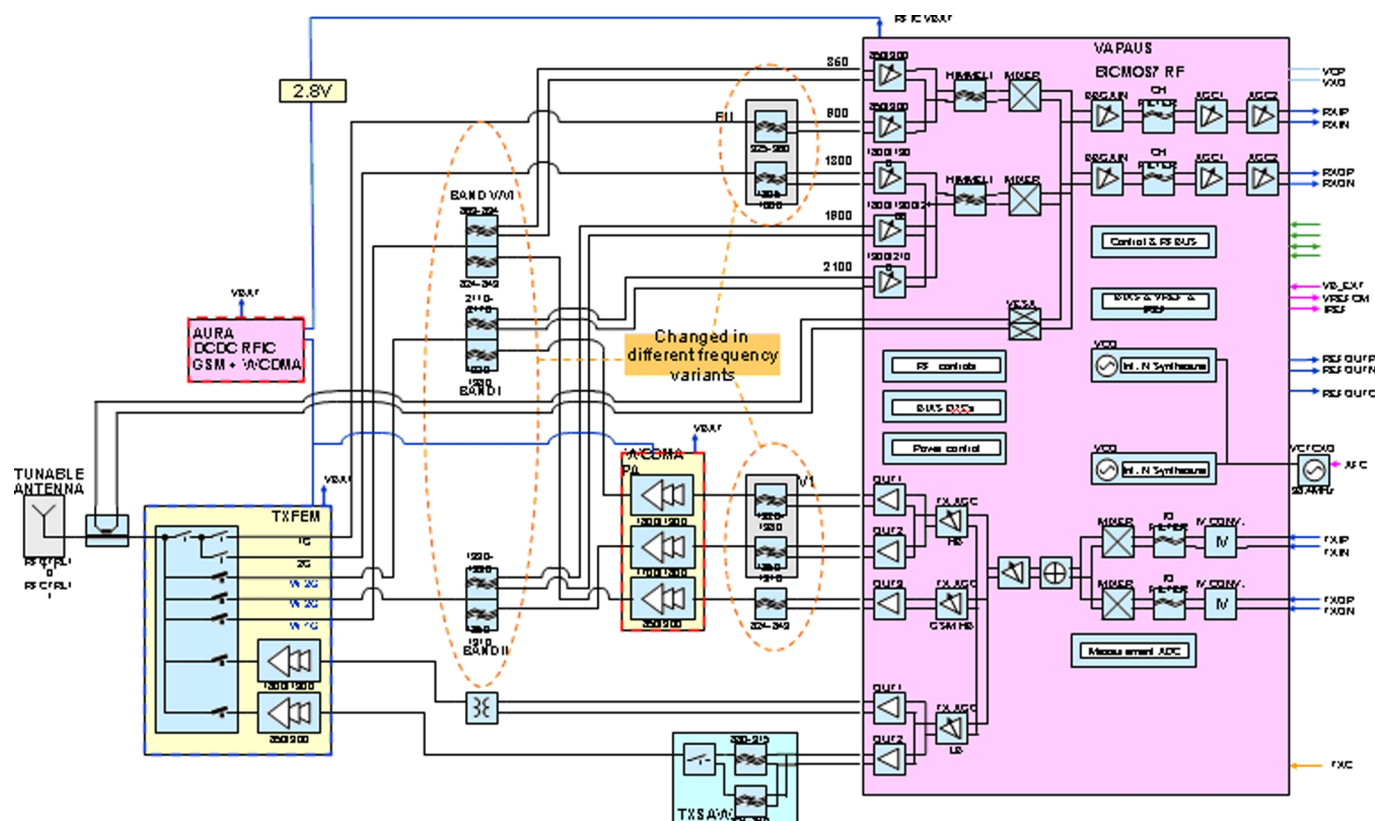


Figure 48 RF block diagram RM-598 using RF ASIC N7500



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
GPIO	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
ICHR	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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