

**SERVICE MANUAL  
Level 1&2**

**NOKIA  
E5-00**

RM-632 / RM-634 / RM-699



**Transceiver characteristics**

**Band:**

GSM 850/900/1800/1900 + EDGE  
WCDMA 900/1900/2100 (RM-632)  
WCDMA 850/1900/2100 (RM-634)  
GSM 850/900/1800/1900 (RM-699)

**Display:**

QVGA (320 x 240 pixels) 2.36" screen up to 262k colors

**Camera:**

5 Mpix camera with zoom up to 4x (digital)

**Operating System:**

Symbian v. 9.3  
S60 3<sup>rd</sup> Edition, Feature Pack 2

**Connections:**

Bluetooth 2.0 + EDR  
High Speed Micro USB with charging  
3.5 mm AV connector  
2.0 mm DC charger plug  
Micro SD card up to 32 GB  
WLAN 802.11 b/g  
A-GPS

**Transceiver with BL-4D battery pack**

<b>Talk time</b>	<b>Standby</b>
<b>GSM:</b> Up to 13,25 hours	<b>GSM:</b> Up to 635 hours
<b>WCDMA:</b> Up to 5,25 hours	<b>WCDMA:</b> Up to 670 hours

**Note:**

Talk times are dependant on network parameters and phone settings

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Change history

Status	Version No.	Date	Comments
Approved	1.0	25.05.2010	First approved version
Approved	2.0	29.07.2010	Updated torque value for the assembly hints
Approved	3.0	03.03.2011	Updated operating times, added RM-699 variant

The purpose of this document is to help NOKIA service levels 1 and 2 workshop technicians to carry out service to NOKIA products. This Service Manual is to be used only by authorized NOKIA service suppliers, and the content of it is confidential. Please note that NOKIA provides also other guidance documents (e.g. Service Bulletins) for service suppliers, follow these regularly and comply with the given instructions.

While every endeavor has been made to ensure the accuracy of this document, some errors may exist. If you find any errors or if you have further suggestions, please notify NOKIA using the address below:

**Nokia Care Academy**  
[service.manuals@nokia.com](mailto:service.manuals@nokia.com)

Please keep in mind also that this documentation is continuously being updated and modified, so watch always out for the newest version.

## 1. COPYRIGHT

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The availability of particular products may vary by region.

### **IMPORTANT**

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

## 2. WARNINGS AND CAUTIONS

Please refer to the phone's user guide for instructions relating to operation, care and maintenance including important safety information. Note also the following:

### 2.1 Warnings

1. 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.
2. THE HANDPORTABLE TELEPHONE MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, EG PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
3. 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.

### 2.2 Cautions **Servicing and alignment must be undertaken by qualified personnel only.**

1. Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
2. Use only approved components as specified in the parts list.
3. Ensure all components, modules screws and insulators are correctly re-fitted after servicing and alignment.
4. Ensure all cables and wires are repositioned correctly

### 3. 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.

#### 4. 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.

## 5. 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 Ni-Cd/NiMH 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. Shortcircuiting 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.

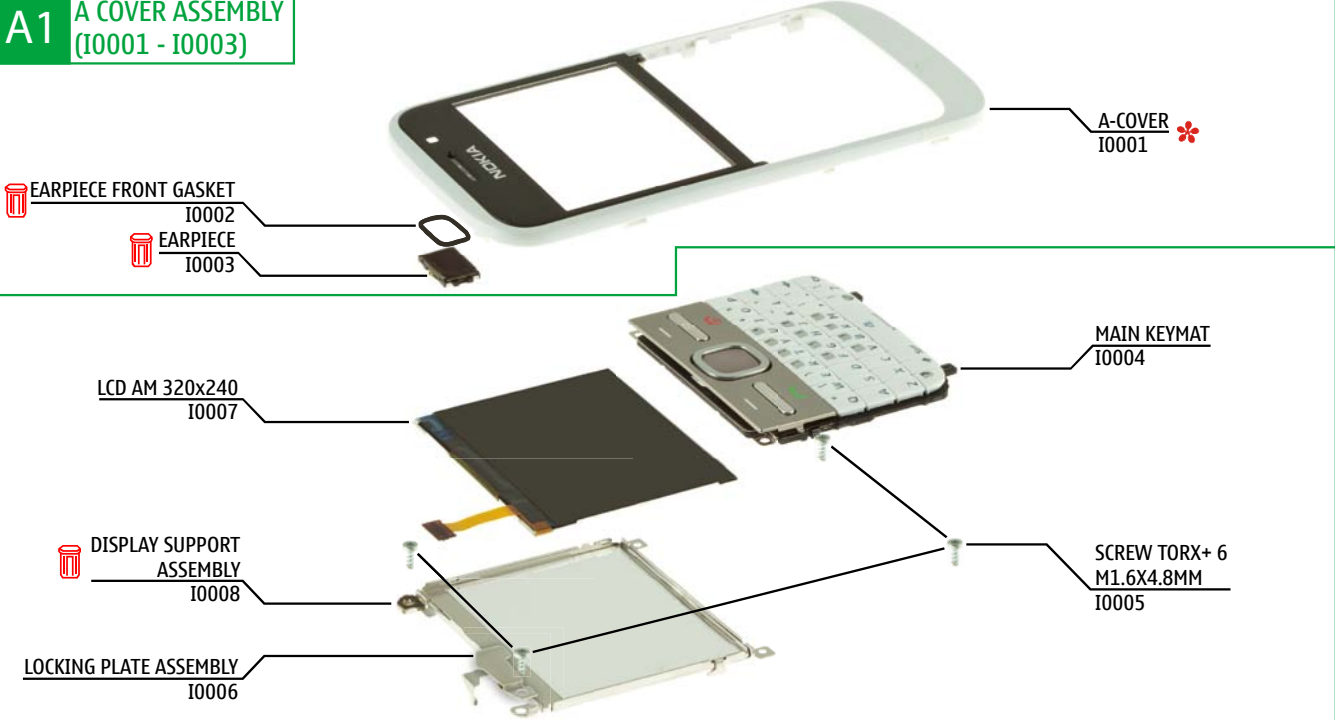
Do not dispose batteries in a fire! Dispose of batteries according to local regulations (e.g. recycling).

Do not dispose as household waste.

6. EXPLODED VIEW

A1

A COVER ASSEMBLY  
(I0001 - I0003)



EARPIECE FRONT GASKET  
I0002

EARPIECE  
I0003

LCD AM 320x240  
I0007

DISPLAY SUPPORT ASSEMBLY  
I0008

LOCKING PLATE ASSEMBLY  
I0006

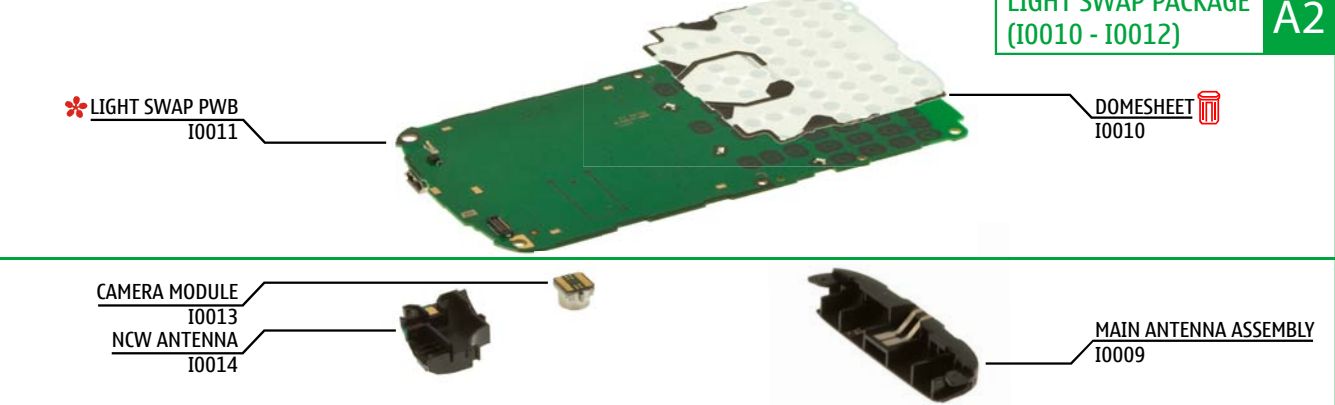
A-COVER  
I0001 \*

MAIN KEYPAD  
I0004

SCREW TORX+ 6  
M1.6X4.8MM  
I0005

A2

LIGHT SWAP PACKAGE  
(I0010 - I0012)



LIGHT SWAP PWB  
I0011 \*

CAMERA MODULE  
I0013

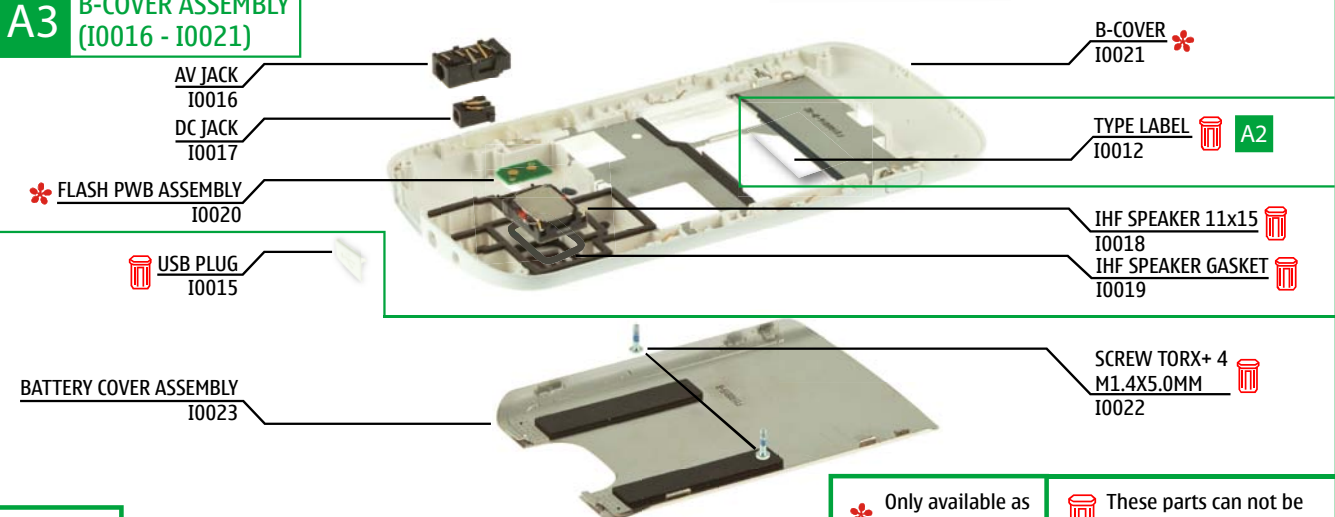
NCW ANTENNA  
I0014

DOMESHEET  
I0010

MAIN ANTENNA ASSEMBLY  
I0009

A3

B-COVER ASSEMBLY  
(I0016 - I0021)



AV JACK  
I0016

DC JACK  
I0017

FLASH PWB ASSEMBLY  
I0020 \*

USB PLUG  
I0015

BATTERY COVER ASSEMBLY  
I0023

B-COVER  
I0021 \*

TYPE LABEL  
I0012

IHF SPEAKER 11x15  
I0018

IHF SPEAKER GASKET  
I0019

SCREW TORX+ 4  
M1.4X5.0MM  
I0022

Ver. 1.0

\* Only available as assembly

🗑️ These parts can not be reused after removal

**7. SERVICE DEVICES**

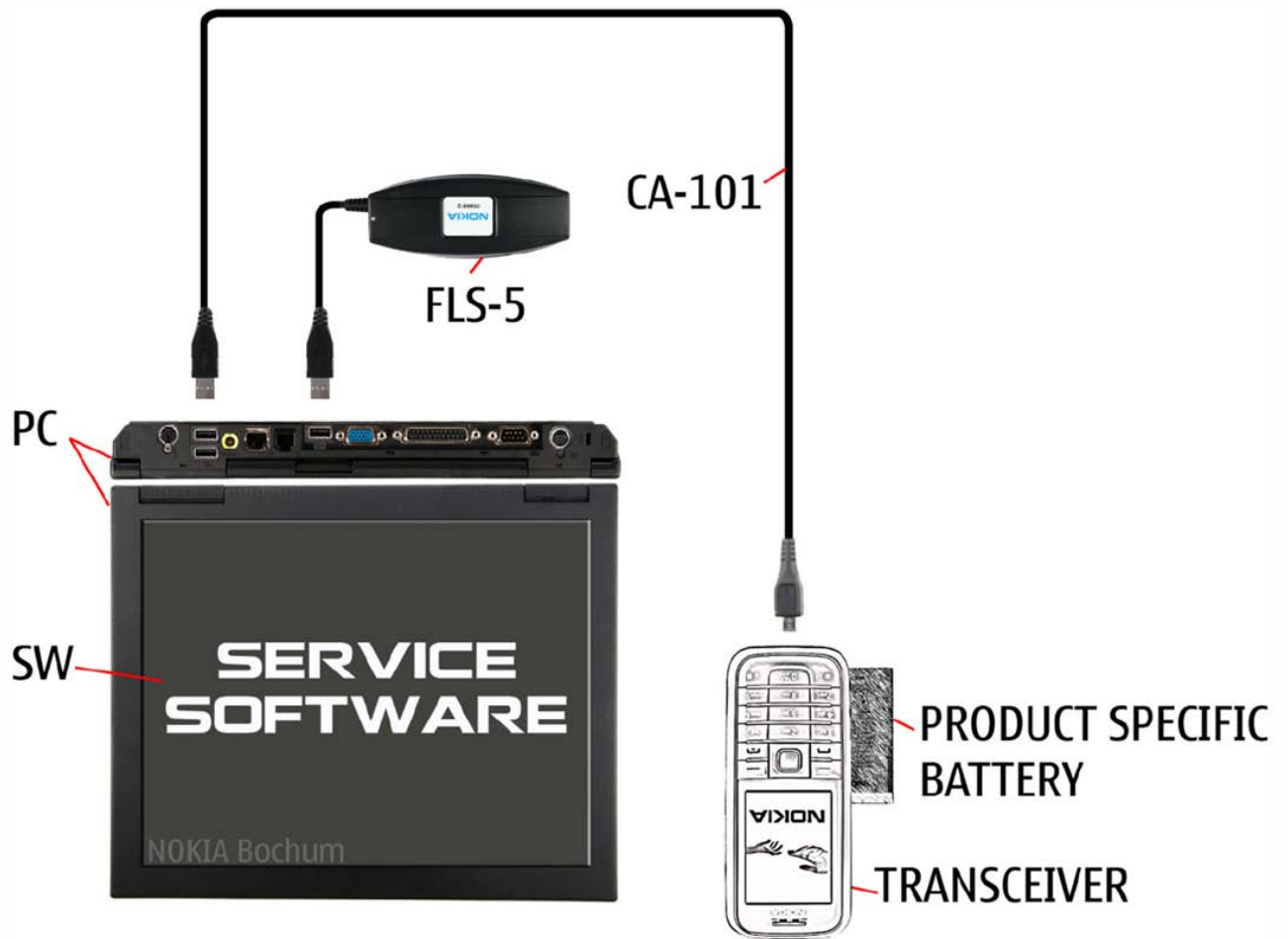
 <p>FLS-5</p> <p>FLS-5 Flash Device</p>	 <p>CA-101 100cm</p> <p>CA-101 Service Cable</p>	 <p>AC-8E Travel Charger</p>
 <p>BL-4D Battery</p>	 <p>SS-88 Camera Removal tool</p>	 <p><b>NMP standard toolkit (v2)</b> For more information, refer to the Service Bulletin (SB-011) on NOKIA Online. Supplier or manufacturer contacts for tool re-order can be found in "Recommended service equipment" document on NOKIA Online.</p>

## 8. SW-UPDATE

### Flash concept (Point of Sales)

To use the FLS-5 Flash Dongle, follow the user guide inside the sales package.

Please check always for the latest version of flash software, which is available on Nokia Online.



## 9. DISASSEMBLY INSTRUCTIONS



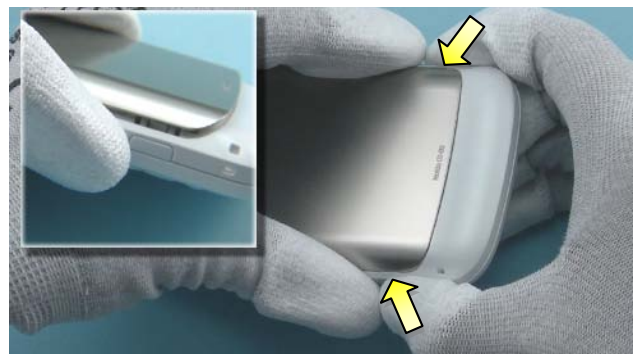
1) Nokia E5-00 disassembly.



2) You must use the Nokia Standard Toolkit version 2. You will also need the camera removal tool SS-88, AV plug and the DC plug.



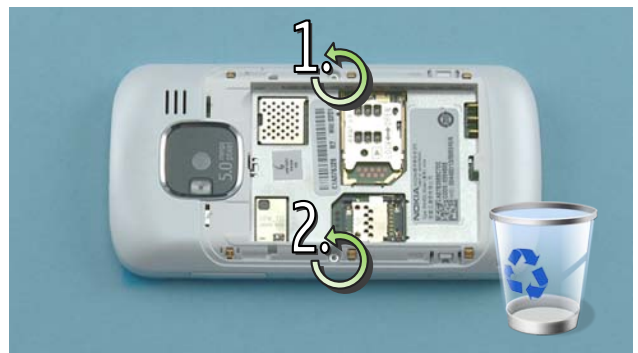
3) Protect the A-COVER window with a protective film.



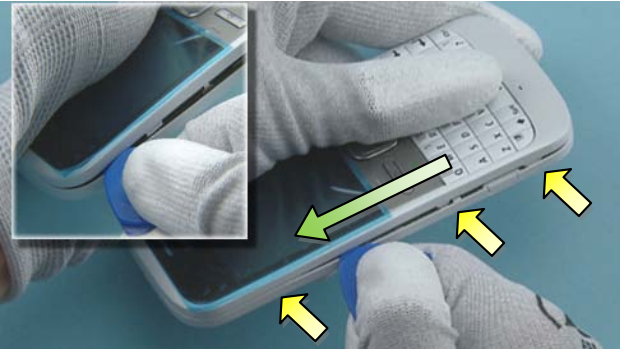
4) Release the BATTERY COVER ASSEMBLY by pressing the release buttons on both sides.



5) Remove the BATTERY COVER ASSEMBLY by first lifting up the bottom end. Then pull the BATTERY COVER ASSEMBLY in the direction shown.



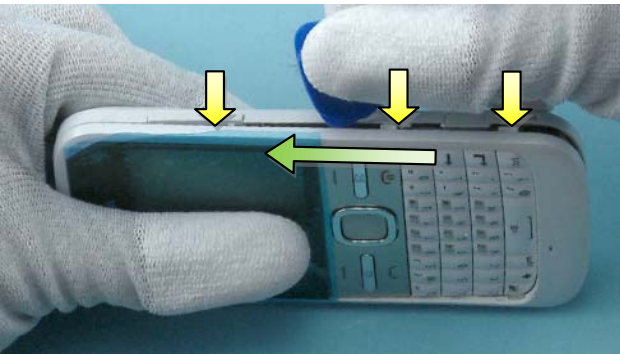
6) Unscrew the two TORX+ size 4 screws in the order shown. Do not use them again!



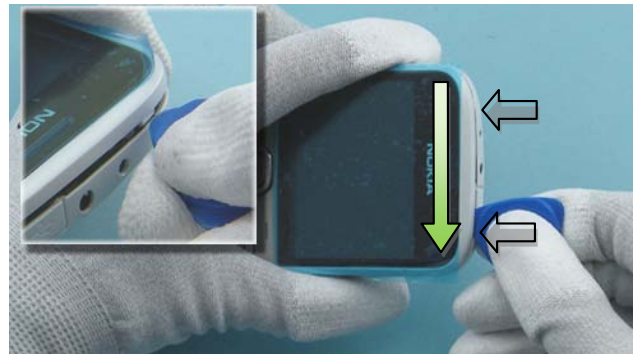
7) To detach the A-COVER ASSEMBLY, first release the three clips on the left side by sliding the SRT-6 to the direction shown.



8) Then release the two clips on the bottom side.



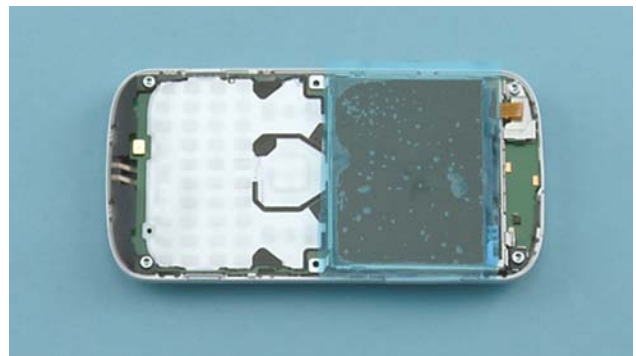
9) Continue to slide the SRT-6 in the direction shown to release the three clips on the right side.



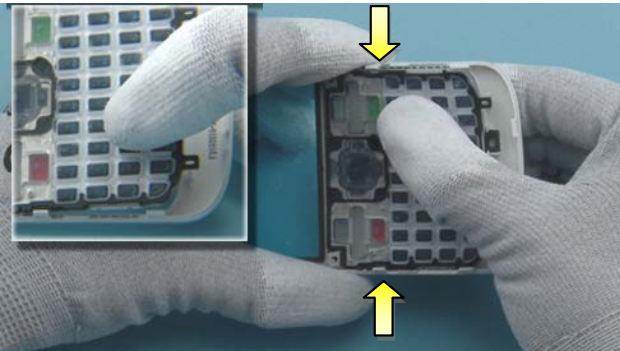
10) Finally release the two clips on the top side.



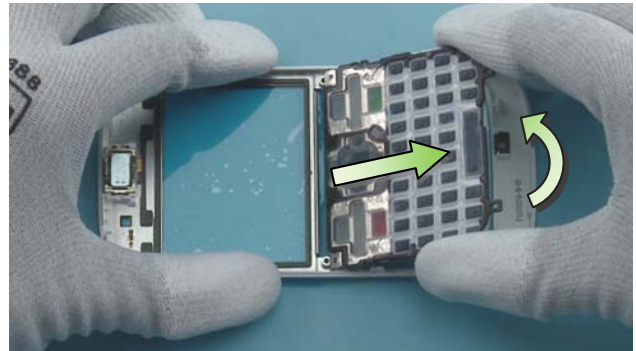
11) The display gasket in the A-COVER is lightly glued to the LCD. Loosen the adhesive by carefully lifting up the A-COVER. The A-COVER can now be separated.



12) Protect the LCD with a protective film.



13) Release the clips holding the MAIN KEYMAT on both sides.



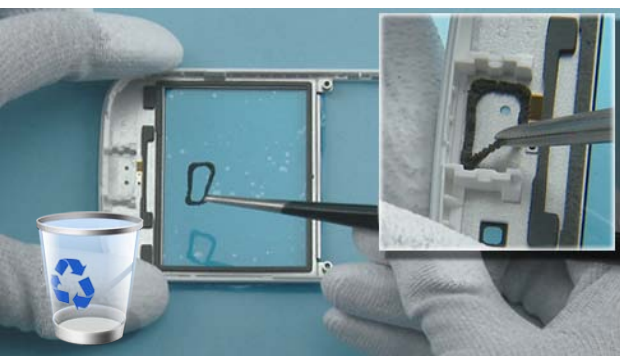
14) Lift up the bottom end of the MAIN KEYMAT. Pull out the MAIN KEYMAT in the direction shown and remove it.



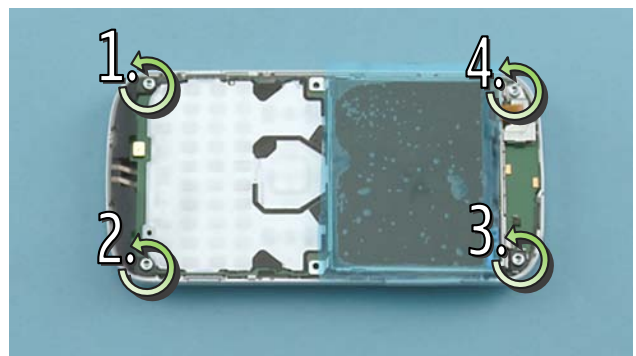
15) Use the SS-93 to release the EARPIECE.



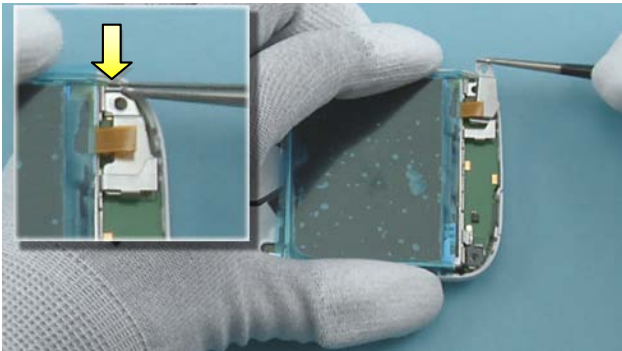
16) Remove the EARPIECE with the tweezers. Do not use it again.



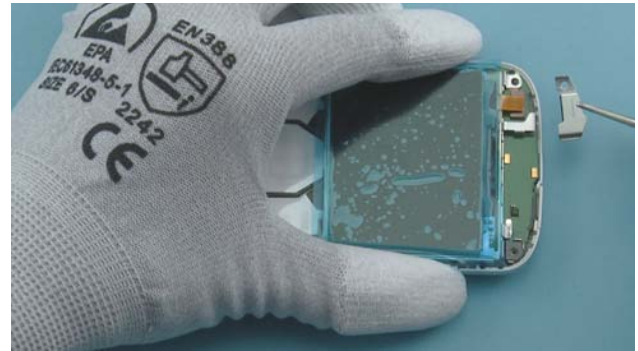
17) Use the tweezers to remove the EARPIECE FRONT GASKET. Discard the EARPIECE FRONT GASKET.



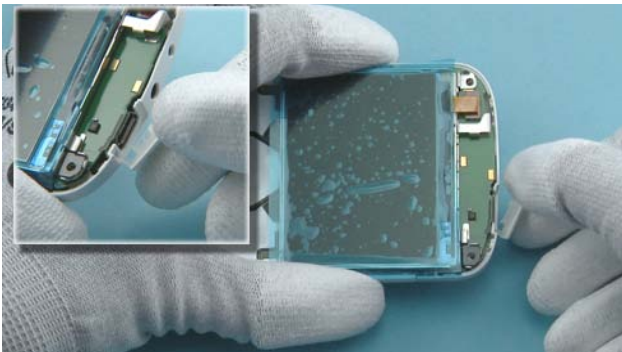
18) Unscrew the four TORX+ size 6 screws in the order shown. Note that these screws can be reused. Do not discard them!



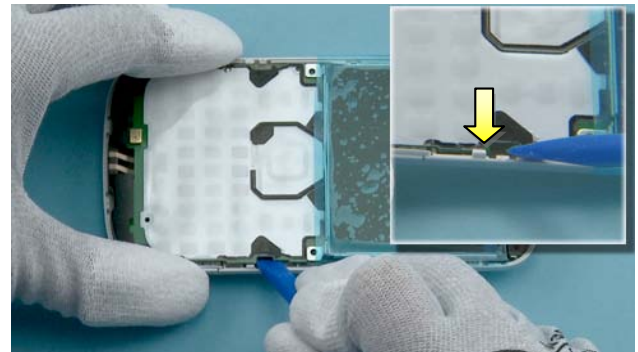
19) Release the clip holding the LOCKING PLATE ASSEMBLY with the tweezers. Lift up the locking plate as shown.



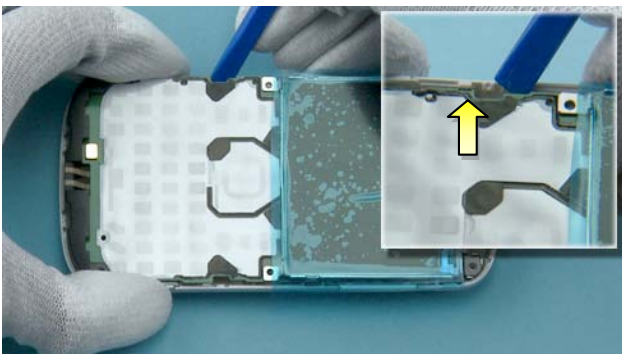
20) Remove the LOCKING PLATE ASSEMBLY with the tweezers.



21) Open the USB PLUG.



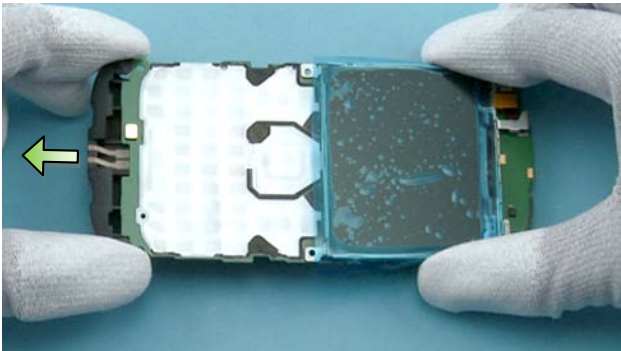
22) To remove the LIGHT SWAP PWB, use the SS-93 to release the first clip ...



23) ... and the second clip on the other side holding the LIGHT SWAP PWB.



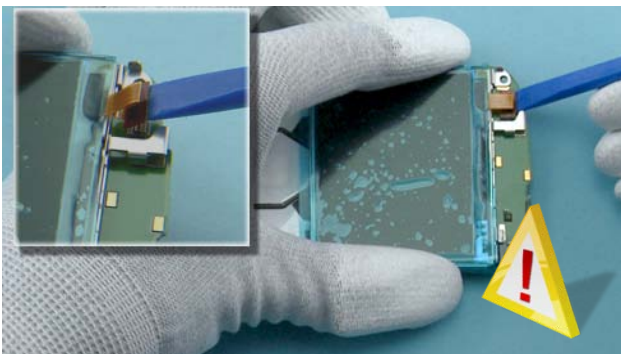
24) Lift up the LIGHT SWAP PWB and remove it.



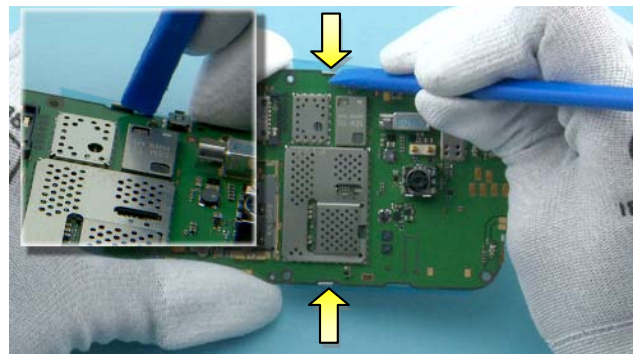
25) To release the MAIN ANTENNA ASSEMBLY, pull it to the direction shown.



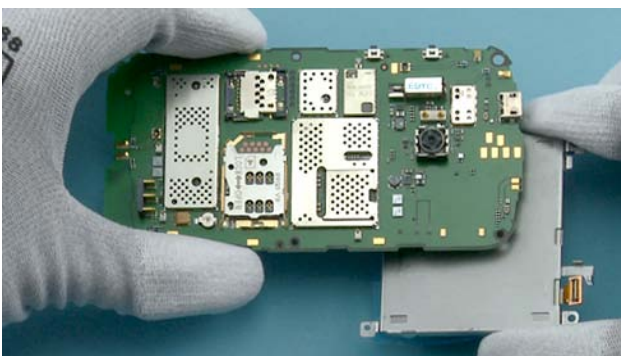
26) Remove the MAIN ANTENNA ASSEMBLY.



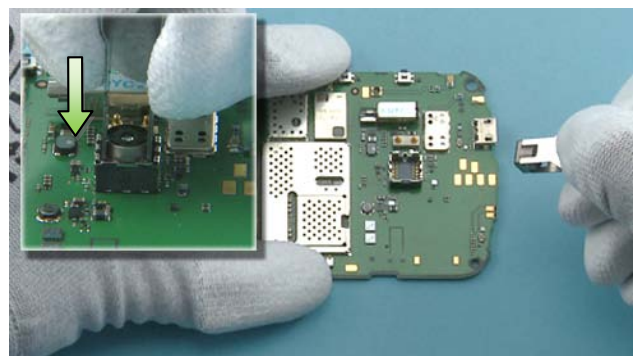
27) Use the SS-93 to open the LCD CONNECTOR. Be careful not to damage the connector!



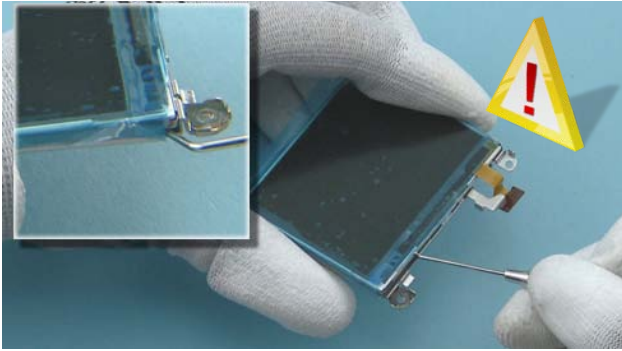
28) Release the two clips holding the DISPLAY SUPPORT ASSEMBLY with the SS-93.



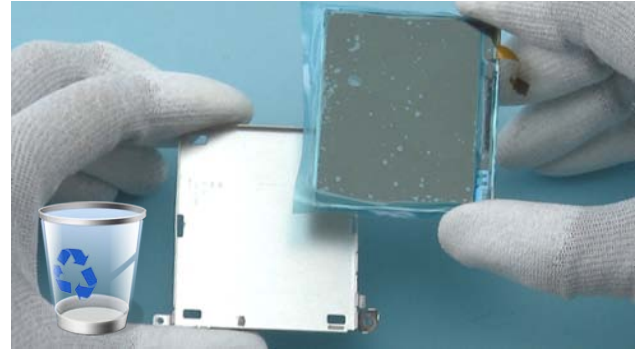
29) Separate the DISPLAY SUPPORT ASSEMBLY.



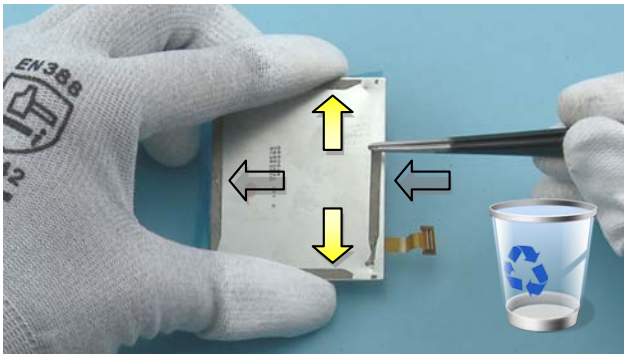
30) Push the camera removal tool SS-88 down until the camera retaining clips are released. Lift up the SS-88 and remove the CAMERA MODULE.



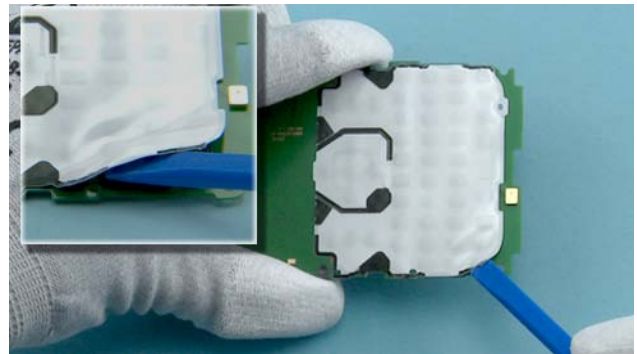
31) To release the LCD, use the dental tool to carefully loosen the adhesive. Be careful not to break the LCD or injure yourself with the sharp end of the dental tool!



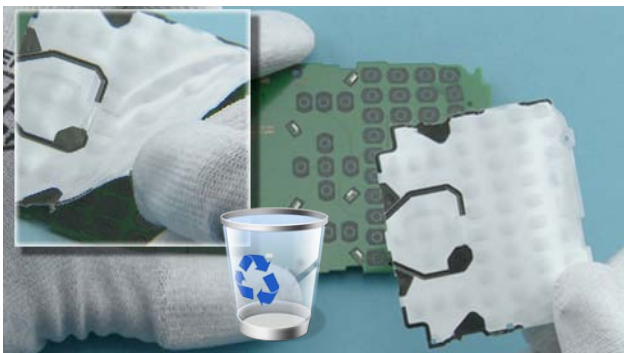
32) Remove the DISPLAY SUPPORT ASSEMBLY. Do not use it again.



33) Remove the adhesive from the LCD with the tweezers. Do not use the adhesive again.



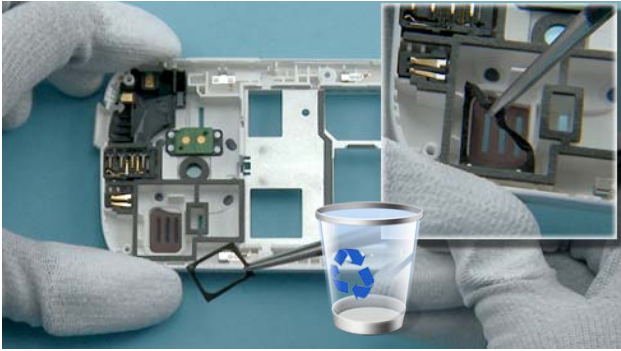
34) Use the SS-93 to lift up one corner of the DOMESHEET.



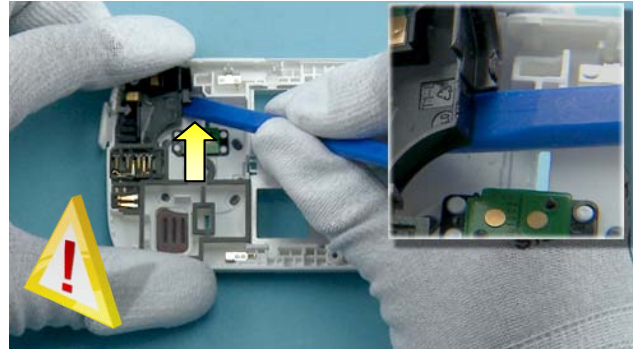
35) Peel off and remove the DOMESHEET. Discard the removed DOMESHEET.



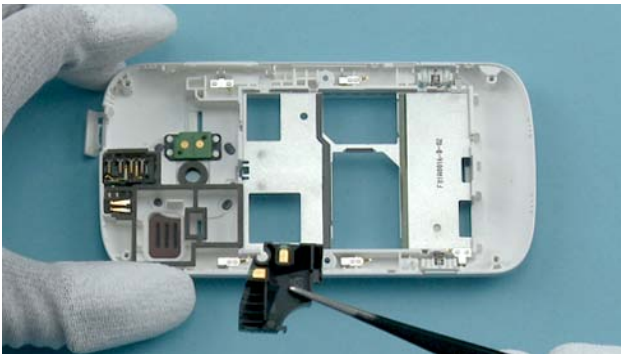
36) Use the SS-93 to release the IHF SPEAKER. Remove the IHF SPEAKER with the tweezers. Do not use it again.



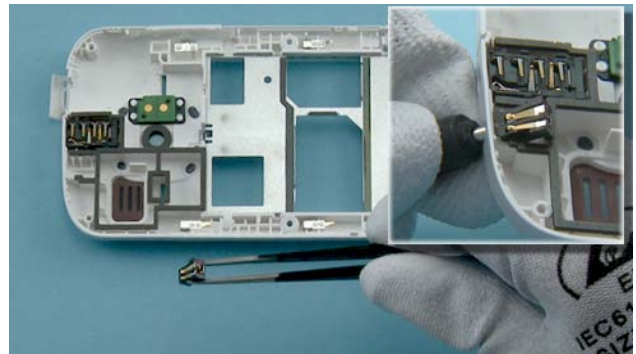
37) Use the tweezers to remove the IHF SPEAKER GASKET. Do not use it again.



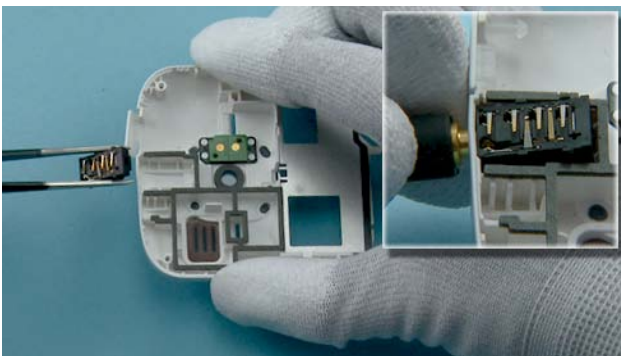
38) Use the SS-93 to carefully release the clip holding the NCW ANTENNA. Lift up the NCW ANTENNA with the SS-93.



39) Remove the NCW ANTENNA.



40) Release the DC JACK with the DC plug and remove it with the tweezers.



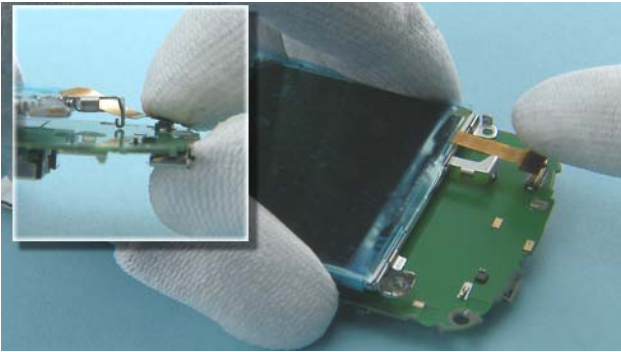
41) Release the AV JACK with the AV plug and remove it with the tweezers.



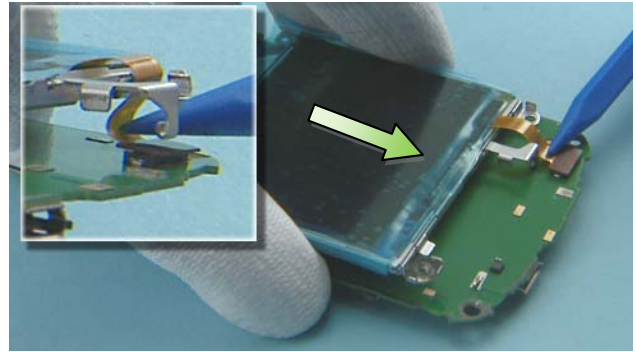
42) Nokia E5-00 disassembly is now complete.

-END OF DISASSEMBLY-

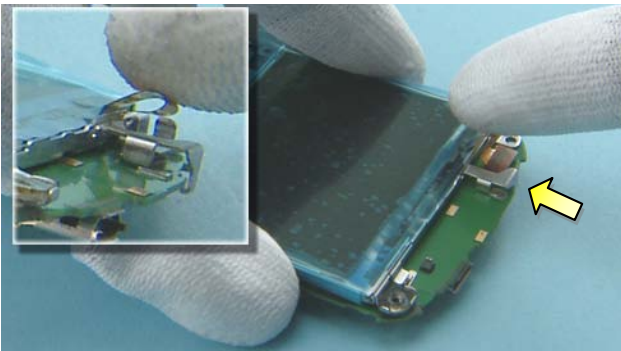
**10. ASSEMBLY HINTS**



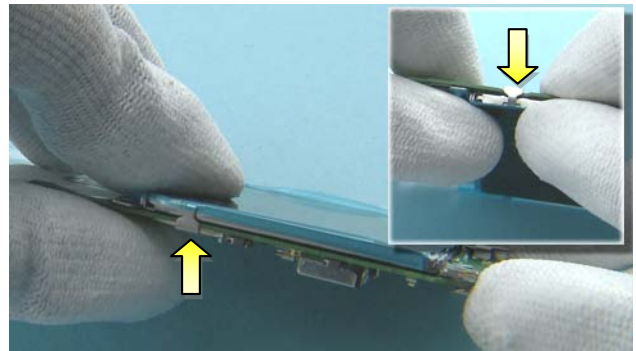
1) Connect the LCD connector to the engine board.



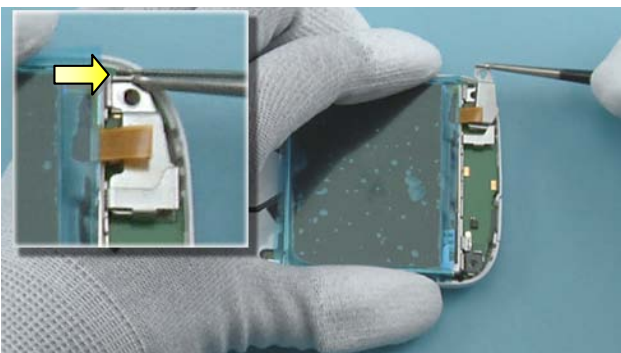
2) Use the SS-93 to carefully bend the LCD flex while pushing the LCD carefully forward.



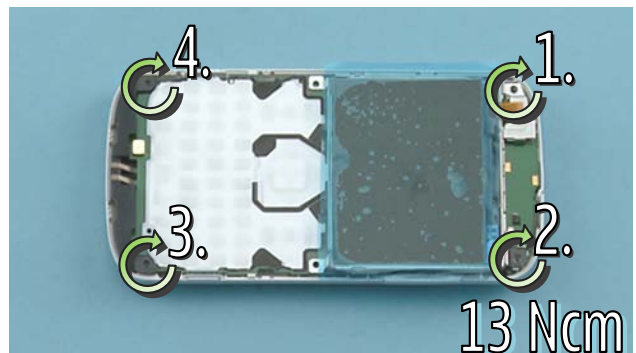
3) Position the top clip and carefully press down the LCD flex.



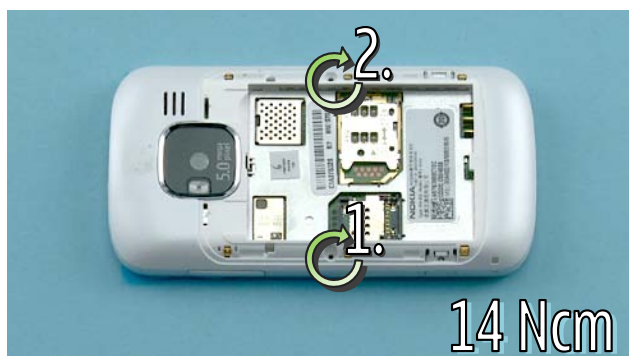
4) Press down the clips on both sides.



5) Slide the LOCKING PLATE ASSEMBLY between the LCD connector and the bent flex. Press down the shown clip to lock the LOCKING PLATE ASSEMBLY.

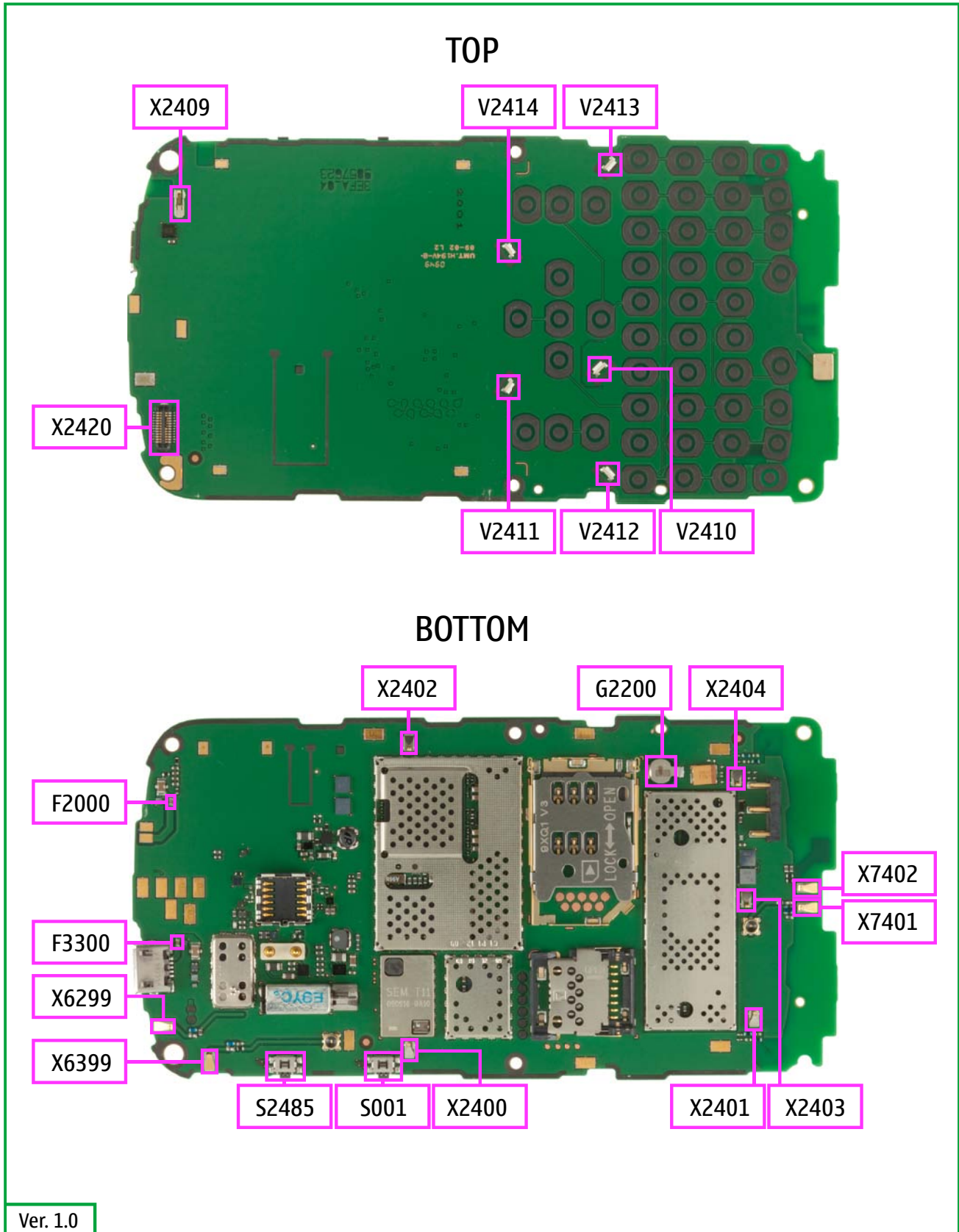


6) Tighten the four TORX + size 6 screws to the torque of 13 Ncm in the order shown.



7) Tighten the two TORX + size 4 screws to the torque of 14 Ncm in the order shown.

11. SOLDER COMPONENTS



**Nokia Customer Care**

# ***Service Manual***

**RM-632; RM-634; RM-699 (Nokia E5-00; L3&4)**

***Part No: (Issue 3)***

***COMPANY CONFIDENTIAL***



**Amendment Record Sheet**

<b>Amendment No</b>	<b>Date</b>	<b>Inserted By</b>	<b>Comments</b>
Issue 1	4/2010	NS	
Issue 2	8/2010	NS	RM-634 added.
Issue 3	11/2010	KF	RM-699 added.

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## **IMPORTANT**

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

## Warnings and cautions

### Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

### Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

## For your safety

### **QUALIFIED SERVICE**

Only qualified personnel may install or repair phone equipment.

### **ACCESSORIES AND BATTERIES**

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

### **CONNECTING TO OTHER DEVICES**

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

## Care and maintenance

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

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

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

## **ESD protection**

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

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

To replace the covers ESD protection must be applied.

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

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

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

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

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

## Battery information

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

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

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

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

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

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

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

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

Do not dispose of batteries in a fire!

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

## Company policy

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

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

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## **Nokia E5-00; L3&4 Service Manual Structure**

- 1 General information
- 2 Service Devices and Service Concepts
- 3 BB Troubleshooting and Manual Tuning Guide
- 4 RF troubleshooting
- 5 System Module
- 6 Service information differences between RM-632 and RM-634
- 7 Service information differences between RM-632 and RM-699
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# Nokia Customer Care

## 1 — General information

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## ■ Product selection

RM-632 (Nokia E5-00) is a GSM/WCDMA dual mode phone, supporting EGSM850/900/1800/1900 and WCDMA bands I, II and VIII.



Figure 1 RM-632 (Nokia E5-00) product picture

## ■ Phone features

### Display and keypad features

- Horizontal 2.36" QVGA display with 256K colors
- Full QWERTY, Home key + Messaging, Call and End keys, 4 way + select, Volume keys

### Hardware features

- Main camera: 5 megapixel EDOF camera with integrated flash
- MicroUSB connector/charger plug for data transfer (USB 2.0) and charging
- High speed USB (FS/HS)
- 2 mm charger plug interface
- Bluetooth version 2.0
- microSD memory card connector
- Stereo Music Player
- Integrated handsfree speaker
- Internal vibra
- Plug-in SIM 1.8V and 3.0V, more than 1000 entries
- Nokia 3.5mm AV connector
- FM-radio with headset as antenna

## RF features

- Internal antennas
- GSM/EDGE 850/900/1800/1900
- WCDMA band I, II and VIII
- High speed upload - HSUPA cat 5 (2.0 Mbps)
- High speed download - HSDPA cat 9 (10.2 Mbps)
- EDGE: MSC 32
- GPRS: MSC 32
- CSD for browsing and as data modem

## ■ Software and user interface features

### Selection of software application and features

- Operating System: Symbian v. 9.3
- User Interface: S60 3rd Edition, Feature Pack 2
- PIM: Contacts, Calendar, To-do, Notes & Active Notes, Recorder, Calculator, Clock, Converter
- Call management: call logs, speed dial, enhanced voice dialing, talking ring tone
- People centric home screen
- 3D stereo ringing tones, Up to 64 Polyphonic Midi, MP3 tones, video ringing tones
- OMA DRM 2.0, OMA DRM2 video, Windows DRM, WMV
- Offline mode, and SIM-less operation
- Flashlite 3.0, Java TM MIDP 2.0
- FM radio
- Audio messaging
- Java & Api's MIDP2.0, JSR75 (file connection and PIM), JSR82 (BT), JSR135, JSR139 (CLDC1.1), JSR184 (3D), JSR185 (JTWI R1)
- 3GPP H.263 playback+streaming, H.264 and MPEG4
- Video, MP3, AAC and 64 polyphonic ringing tones
- Music Player for MP3, AAC, AAC+, eAAC+, WMA
- WAP 2.0, XHTML browser over HTTP/TCP/IP stack
- OMA SyncML 1.1.2 (local)

## ■ Accessories

### Sales package contents

- Nokia E5-00 phone
- Nokia Battery BL-4D
- Travel Charger AC-8E
- Nokia Stereo Headset WH-102
- Nokia Micro USB Cable CA-101D
- Nokia MU-37, 2 GB micro SD

**Table 1 Battery and chargers**

Type	Name
<b>Note:</b> This phone is charged through the smaller Nokia standard charger interface (2.0 mm plug). A 3.5 mm compatible Nokia standard charger can be used together with the CA-44 charger adapter.	
BL-4D	Battery 1200 mAh Li-Ion
AC-8	Travel Charger
AC-6	USB charger

**Table 2 Car accessories**

Type	Name
CK-100	Bluetooth car kit
DC-9	Mobile charger
HK-510	Plug-In car kit with display and DSP

**Table 3 Headsets**

Type	Name
<b>Wired</b>	
WH-102	Stereo headset
<b>Wireless</b>	
BH-105	Bluetooth headset
BH-214	Bluetooth stereo headset

**Table 4 Cables**

Type	Name
CA-101D	Micro USB cable

## ■ Technical specifications

### General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
RM-632 transceiver with BL-4D 1200 mAh Li-Ion battery pack	115*58.9*12.8	128	75

**Main RF characteristics for GSM850/900/1800/1900 and WCDMA band I, II and VIII phones**

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA I (2100), WCDMA II (1900) and WCDMA VIII (900)
Rx frequency band	GSM850: 869 - 894 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA I (2100): 2110 - 2170 MHz
	WCDMA II (1900): 1930 - 1990
	WCDMA VIII (900): 925- 960 MHz
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA I (2100): 1920 - 1980 MHz
	WCDMA II (1900): 1850 - 1910
	WCDMA VIII (900): 880 - 915 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 I (2100): -50 ... +24 dBm/0.01μW ... 251.2mW
	WCDMA II (1900): -50 ... +24 dBm/0.01μW ... 251.2mW
	WCDMA VIII (900): -50 ... +24 dBm/0.01μW ... 251.2mW
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
	WCDMA I (2100): 277
	WCDMA II (1900): 289
	WCDMA VIII (900): 152
Channel spacing	200 kHz

Parameter	Unit
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA I (2100): 75
	WCDMA II (1900): 75
	WCDMA VIII (900): 75

### Battery endurance

Battery	Talk time	Standby time
BL-4D 1200 mAh Li-ion	GSM: up to 8 h 30 min WCDMA: up to 5 h 6 min	GSM: up to 649 h WCDMA: up to 533 h

**Note:** Variation in operation times will occur depending on SIM card, network settings and usage. Talk time is increased by up to 30% if half rate is active, and reduced by 5% if enhanced full rate is active.

### Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15 °C ... +55 °C	Specifications fulfilled
Reduced performance	55 °C ... +70 °C	Operational only for short periods
Intermittent or no operation	-40 °C ... -15 °C and +70 °C ... +85°C	Operation not guaranteed but an attempt to operate will not damage the phone
No operation or storage	<-40 °C and >+85 °C	No storage. An attempt to operate may cause permanent damage
Charging allowed	-10 °C ... +60 °C	
Long term storage conditions	0 °C ... +85 °C	
Humidity and water resistance		Relative humidity range is 5 to 95%. Condensed or dripping water may cause intermittent malfunctions. Protection against dripping water has to be implemented in (enclosure) mechanics. Continuous dampness will cause permanent damage to the module.

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# Nokia Customer Care

## 2 — Service Devices and Service Concepts

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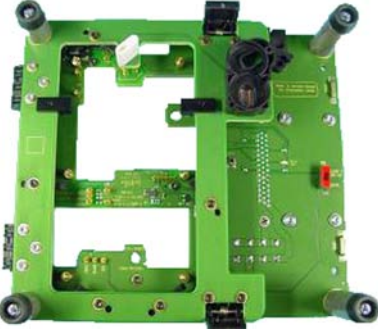

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## ■ Service devices



### 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-632; RM-634; RM-699. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.





 <p>FS-147</p>	FS-147	Flash adapter	
<ul style="list-style-type: none"> <li>• FS-147 is equipped with a clip interlock system</li> <li>• provides standardised interface towards Control Unit</li> <li>• provides RF connection</li> <li>• multiplexing between USB and FBUS media, controlled by VUSB</li> </ul> <p><b>Note:</b> Close lid of SD and SIM reader before attaching the flash adapter.</p>			
	MJ-266	Module jig	
<p>MJ-266 is meant for component level troubleshooting. The jig includes an RF interface for GSM and WCDMA. In addition, it has the following features:</p> <ul style="list-style-type: none"> <li>• Provides mechanical interface with the engine module</li> <li>• Provides galvanic connection to all needed test pads in module</li> <li>• Connector for control unit</li> <li>• Access for USB connector</li> </ul>			
	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>			






### 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-632; RM-634; RM-699. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

<p><b>CU-4</b></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"> <li>• software controlled via USB</li> <li>• EM calibration function</li> <li>• Forwards FBUS/Flashbus traffic to/from terminal</li> <li>• Forwards USB traffic to/from terminal</li> <li>• software controlled BSI values</li> <li>• regulated VBATT voltage</li> <li>• 2 x USB2.0 connector (Hub)</li> <li>• FBUS and USB connections supported</li> </ul> <p>When using CU-4, note the special order of connecting cables and other service equipment:</p> <p><b>Instructions</b></p> <ol style="list-style-type: none"> <li>1 Connect a service tool (jig, flash adapter) to CU-4.</li> <li>2 Connect CU-4 to your PC with a USB cable.</li> <li>3 Connect supply voltage (12 V)</li> <li>4 Connect an FBUS cable (if necessary).</li> <li>5 Start Phoenix service software.</li> </ol>  <p><b>Note:</b> Phoenix enables CU-4 regulators via USB when it is started. Reconnecting the power supply requires a Phoenix restart.</p>			




	<p>FLS-5</p>	<p>Flash device</p>	
<p>FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.</p> <p><b>Note:</b> FLS-5 can be used as an alternative to PK-1.</p>			
<p><b>FPS-21</b></p> 	<p>FPS-21</p>	<p>Flash prommer</p>	
<p><b>FPS-21 sales package:</b></p> <ul style="list-style-type: none"> <li>• FPS-21 prommer</li> <li>• AC-35 power supply</li> <li>• CA-31D USB cable</li> </ul> <p><b>FPS-21 interfaces:</b></p> <p><i>Front</i></p> <ul style="list-style-type: none"> <li>• Service cable connector Provides Flashbus, USB and VBAT connections to a mobile device.</li> <li>• SmartCard socket A SmartCard is needed to allow DCT-4 generation mobile device programming.</li> </ul> <p><i>Rear</i></p> <ul style="list-style-type: none"> <li>• DC power input For connecting the external power supply (AC-35).</li> <li>• Two USB A type ports (USB1/USB3) Can be used, for example, for connecting external storage memory devices or mobile devices</li> <li>• One USB B type device connector (USB2) For connecting a PC.</li> <li>• Phone connector Service cable connection for connecting Flashbus/FLA.</li> <li>• Ethernet RJ45 type socket (LAN) For connecting the FPS-21 to LAN.</li> </ul> <p><i>Inside</i></p> <ul style="list-style-type: none"> <li>• Four SD card memory slots For internal storage memory.</li> </ul> <p><b>Note:</b> 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	
	<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>		
	PKD-1	SW security device	
	<p>SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Without the device, it is not possible to use the service software. Printer or any such device can be connected to the PC through the device if needed.</p>		
	RJ-230	Soldering jig	
	<p>RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.</p>		
	SB-6	Bluetooth test and interface box (sales package)	
	<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"> <li>• SB-6 test box</li> <li>• Installation and warranty information</li> </ul>		


	SB-7	WLAN test box	
<p>WLAN test requires defined position for the device.</p>			
	SRT-6	Opening tool	
<p>SRT-6 is used to open phone covers. <b>Note:</b> The SRT-6 is included in the Nokia Standard Toolkit.</p>			
<p>SS-46</p> 	SS-46	Interface adapter	
<p>SS-46 acts as an interface adapter between the flash adapter and FPS-20/FPS-21.</p>			
	SS-62	Generic flash adapter base for BB5	
<ul style="list-style-type: none"> <li>• generic base for flash adapters and couplers</li> <li>• SS-62 equipped with a clip interlock system</li> <li>• provides standardised interface towards Control Unit</li> <li>• multiplexing between USB and FBUS media, controlled by VUSB</li> </ul>			
<p>SX-4</p> 	SX-4	Smart card	
<p>SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-20/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-632; RM-634; RM-699. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

 <p><b>CA-101</b> 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-31D	USB cable									
<p>The CA-31D USB cable is used to connect FPS-20/FPS-21 to a PC. It is included in the FPS-20/FPS-21 sales packages.</p>											
	CA-58RS	RF tuning cable									
<p>Product-specific adapter cable for RF tuning.</p> <ul style="list-style-type: none"> <li> <p><b>Table 5 Attenuation values</b></p> <table border="1" data-bbox="600 1630 1449 1827"> <thead> <tr> <th>Band</th> <th>Attenuation Rx/Tx</th> </tr> </thead> <tbody> <tr> <td>GSM850/900</td> <td>0.2...0.3 dB</td> </tr> <tr> <td>GSM1800/1900</td> <td>0.3...0.4 dB</td> </tr> <tr> <td>WCDMA/WLAN</td> <td>0.4...0.6 dB</td> </tr> </tbody> </table> </li> </ul>				Band	Attenuation Rx/Tx	GSM850/900	0.2...0.3 dB	GSM1800/1900	0.3...0.4 dB	WCDMA/WLAN	0.4...0.6 dB
Band	Attenuation Rx/Tx										
GSM850/900	0.2...0.3 dB										
GSM1800/1900	0.3...0.4 dB										
WCDMA/WLAN	0.4...0.6 dB										

	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><b>Note:</b> 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"> <li>• GSM850/900: 0.3+-0.1 dB</li> <li>• GSM1800/1900: 0.5+-0.1 dB</li> <li>• WCDMA/WLAN: 0.6+-0.1dB</li> </ul>	

■ Service concepts

POS (Point of Sale) flash concept



Figure 2 POS flash concept

Type	Description
<b>Product specific tools</b>	
BL-4D	Battery
<b>Other tools</b>	
FLS-5	POS flash dongle
	PC with service software

Type	Description
<b>Cables</b>	
CA-101	Micro USB cable

**Flash concept with FPS-21**

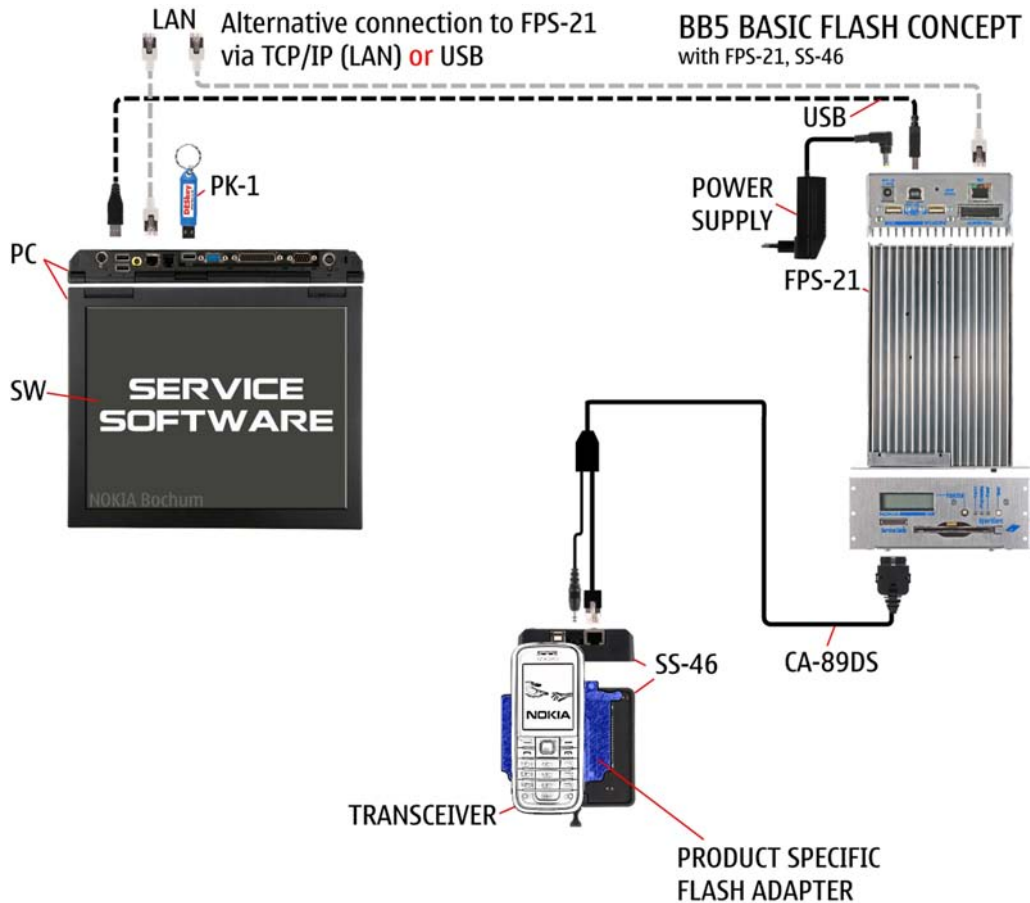


Figure 3 Basic flash concept with FPS-21

Type	Description
<b>Product specific devices</b>	
FS-147	Flash adapter
<b>Other devices</b>	
FPS-21	Flash promoter box
AC-35	Power supply
PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
<b>Cables</b>	
CA-89DS	Service cable

Type	Description
	USB cable

**CU-4 flash concept with FPS-21**

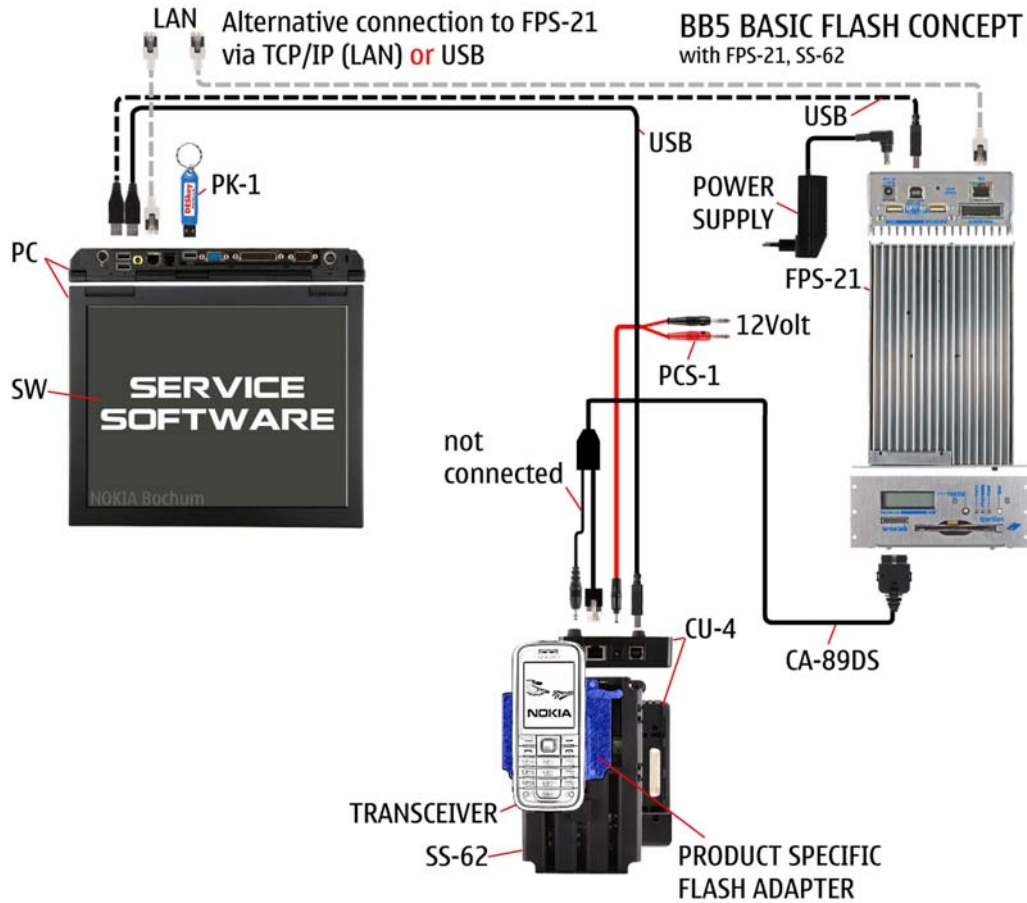


Figure 4 CU-4 flash concept with FPS-21

Type	Description
<b>Product specific devices</b>	
FS-147	Flash adapter
<b>Other devices</b>	
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
<b>Cables</b>	

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

**Module jig service concept**

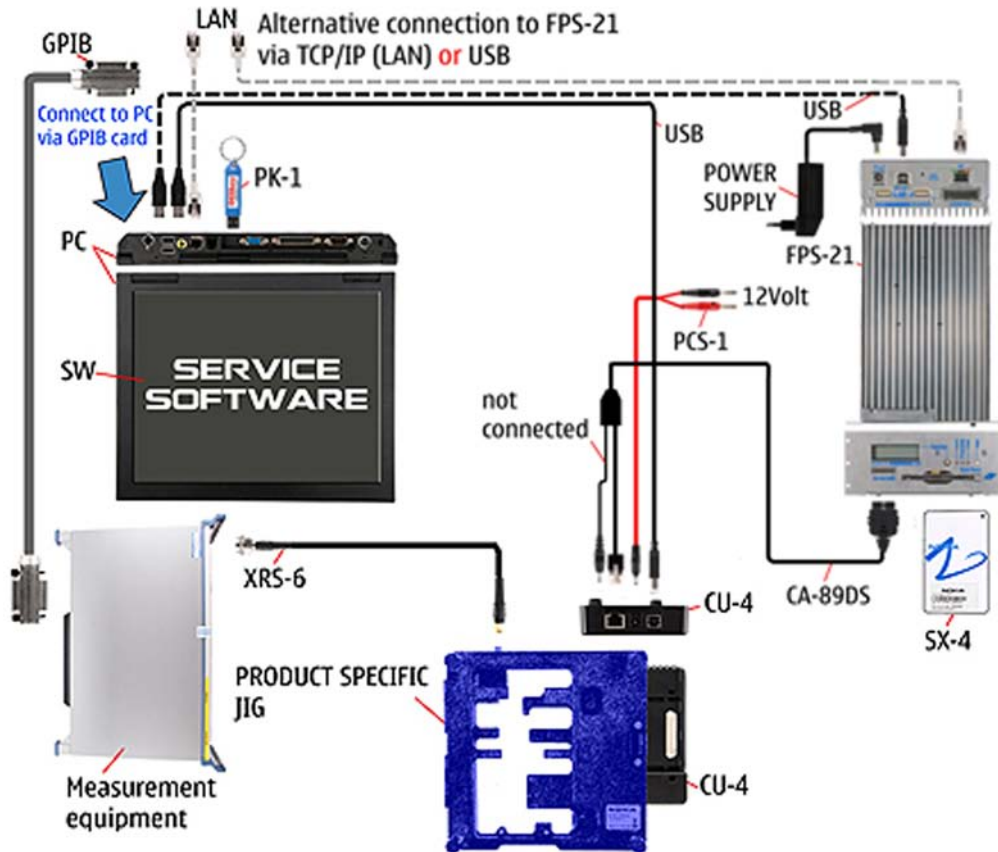


Figure 5 Module jig service concept

Type	Description
<b>Phone specific devices</b>	
MJ-266	Module jig
<b>Other devices</b>	
CU-4	Control unit
FPS-21	Flash prommer box
PK-1/PKD-1	SW security device
SX-4	Smart card
	PC with VPOS and Phoenix service software
	Measurement equipment

Type	Description
<b>Cables</b>	
CA-89DS	Service cable
PCS-1	DC power cable
XRS-6	RF cable
	USB cable
	GPIB control cable

**Service concept for RF testing and RF/BB tuning**

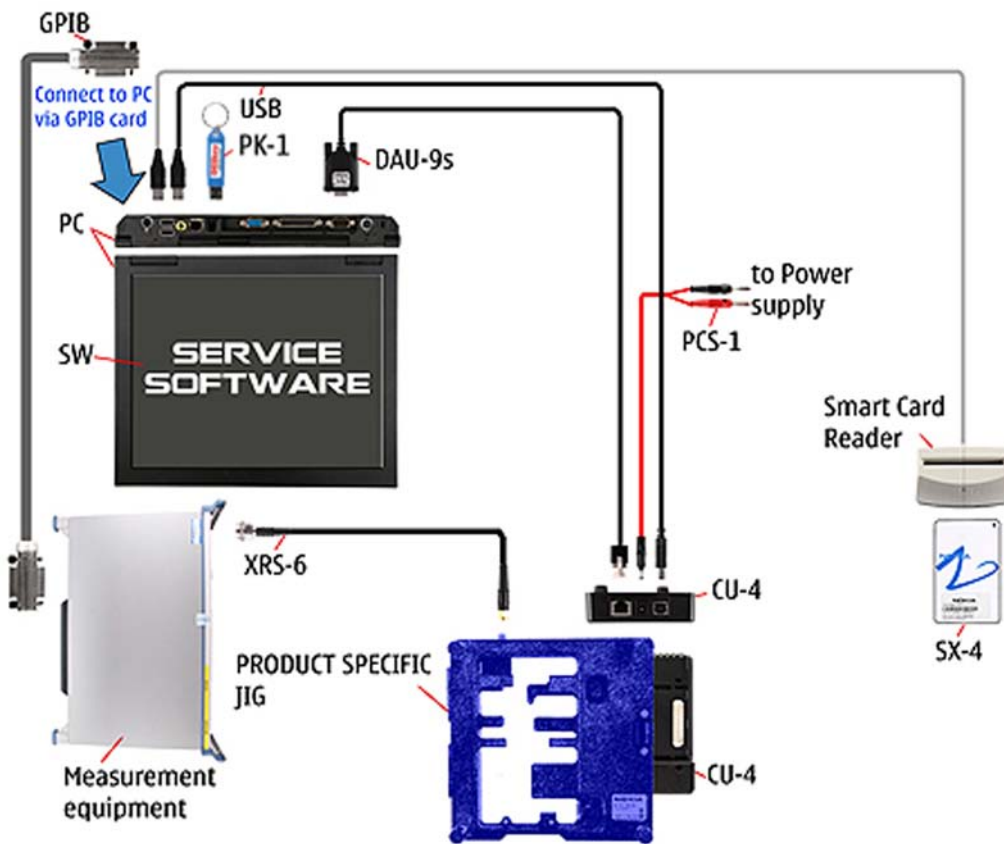


Figure 6 Service concept for RF testing and RF/BB tuning

Type	Description
<b>Product specific devices</b>	
MJ-266	Module jig
<b>Other devices</b>	
CU-4	Control unit
PK-1	SW security device
SX-4	Smart card
	Measurement equipment

Type	Description
	Smart card reader
	PC with Phoenix service software
<b>Cables</b>	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

**Bluetooth testing concept with SB-6**

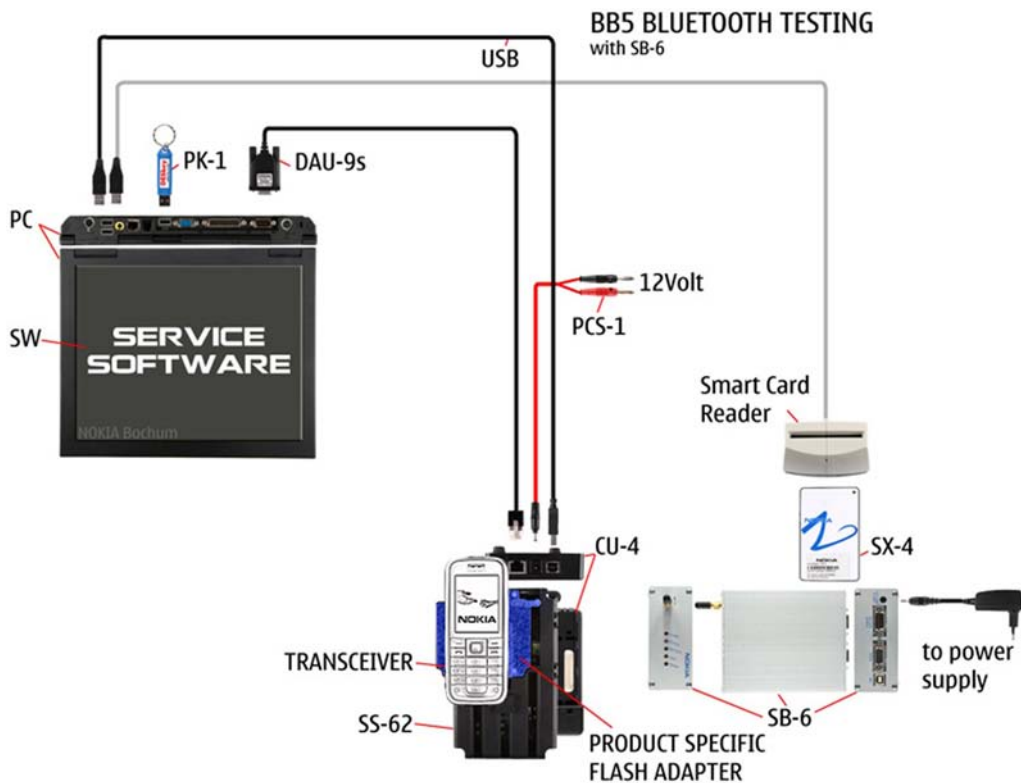


Figure 7 Service concept for RF testing and RF/BB tuning

Type	Description
<b>Product specific devices</b>	
FS-147	Flash adapter
<b>Other devices</b>	
CU-4	Control unit
SS-62	Flash adapter base
PK-1	SW security device
SX-4	Smart card

Type	Description
SB-6	Bluetooth test and interface box
	Smart card reader
	PC with Phoenix service software
<b>Cables</b>	
DAU-9S	MBUS cable
PCS-1	DC power cable
	USB cable

**WLAN functionality testing concept with SB-7**

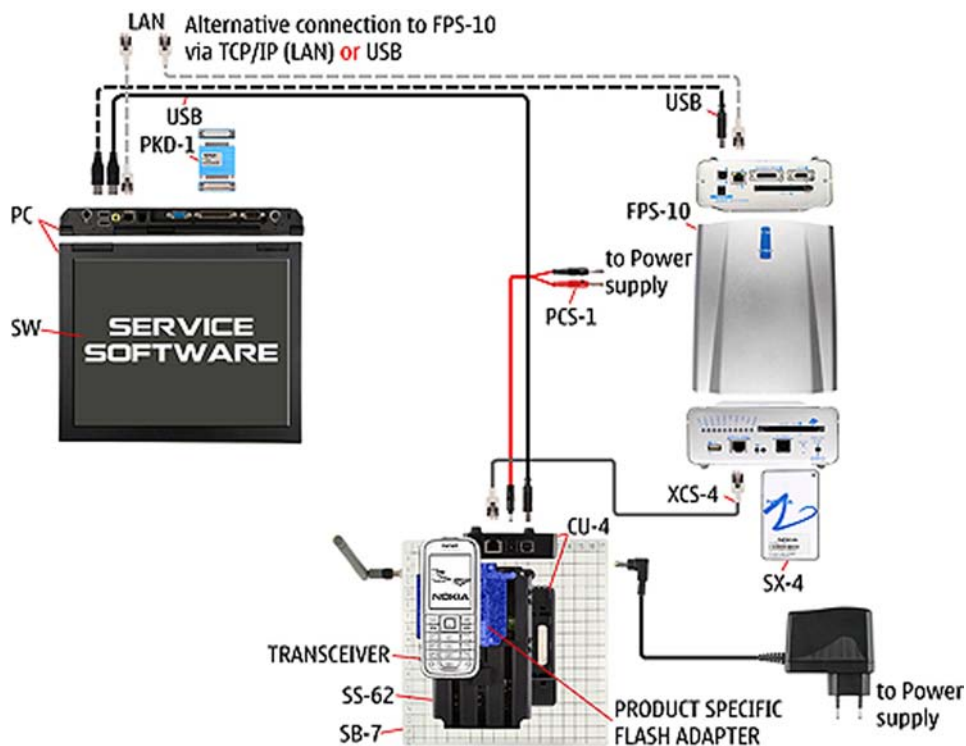


Figure 8 WLAN functionality testing concept with SB-7

Type	Description
<b>Product specific tools</b>	
FS-147	Flash adapter
<b>Other tools</b>	
CU-4	Control unit
PCS-1	DC power cable
PK-1	SW Security device <b>Note:</b> PK-1 can be used instead of PKD-1.
SS-62	Generic base adapter
<b>Cables</b>	

Type	Description
PCS-1	Power cable
DAU-9S	Cable
	Standard USB cable

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## **3 — BB Troubleshooting and Manual Tuning Guide**

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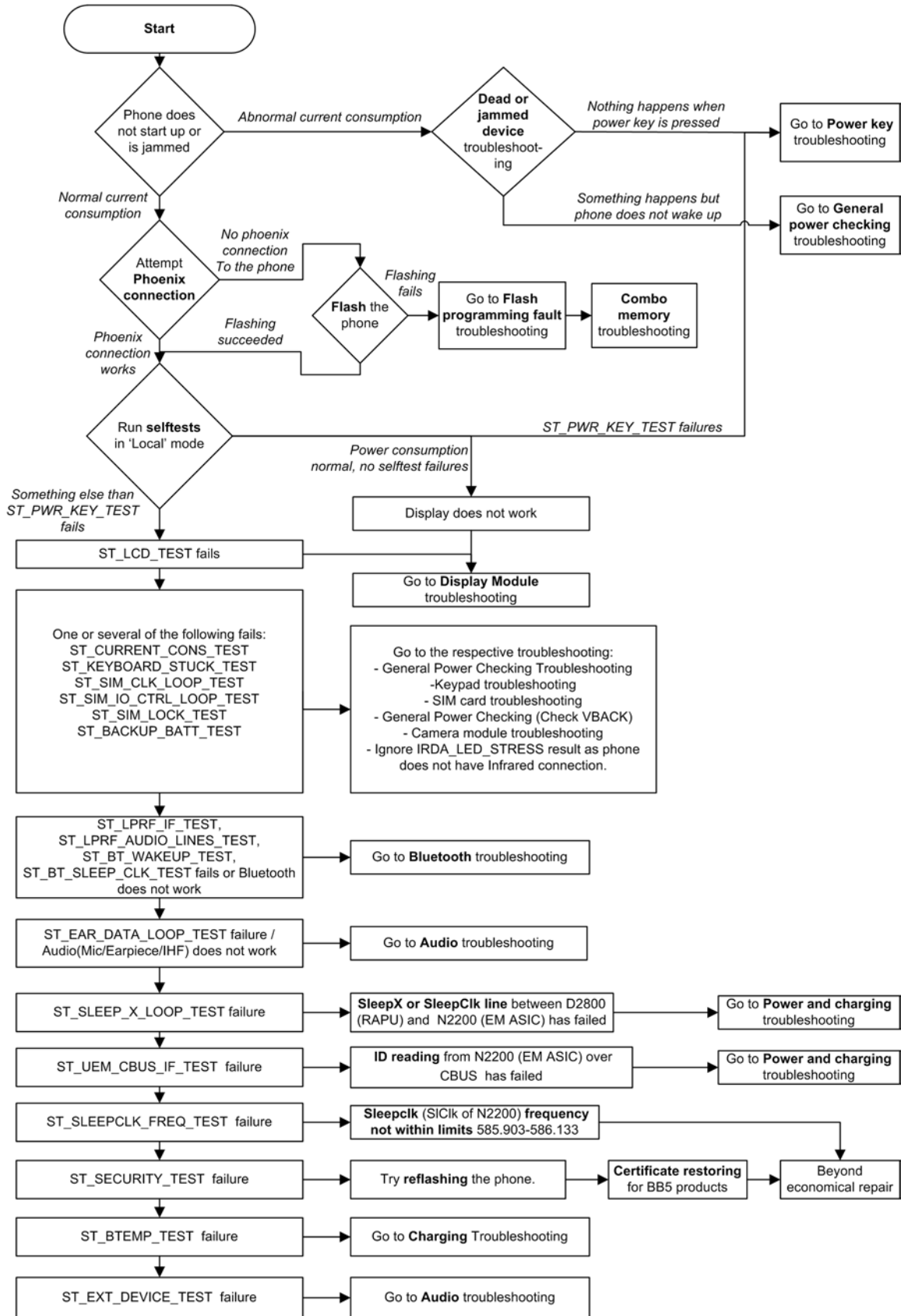
## ■ Baseband self tests in Phoenix

### 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*.

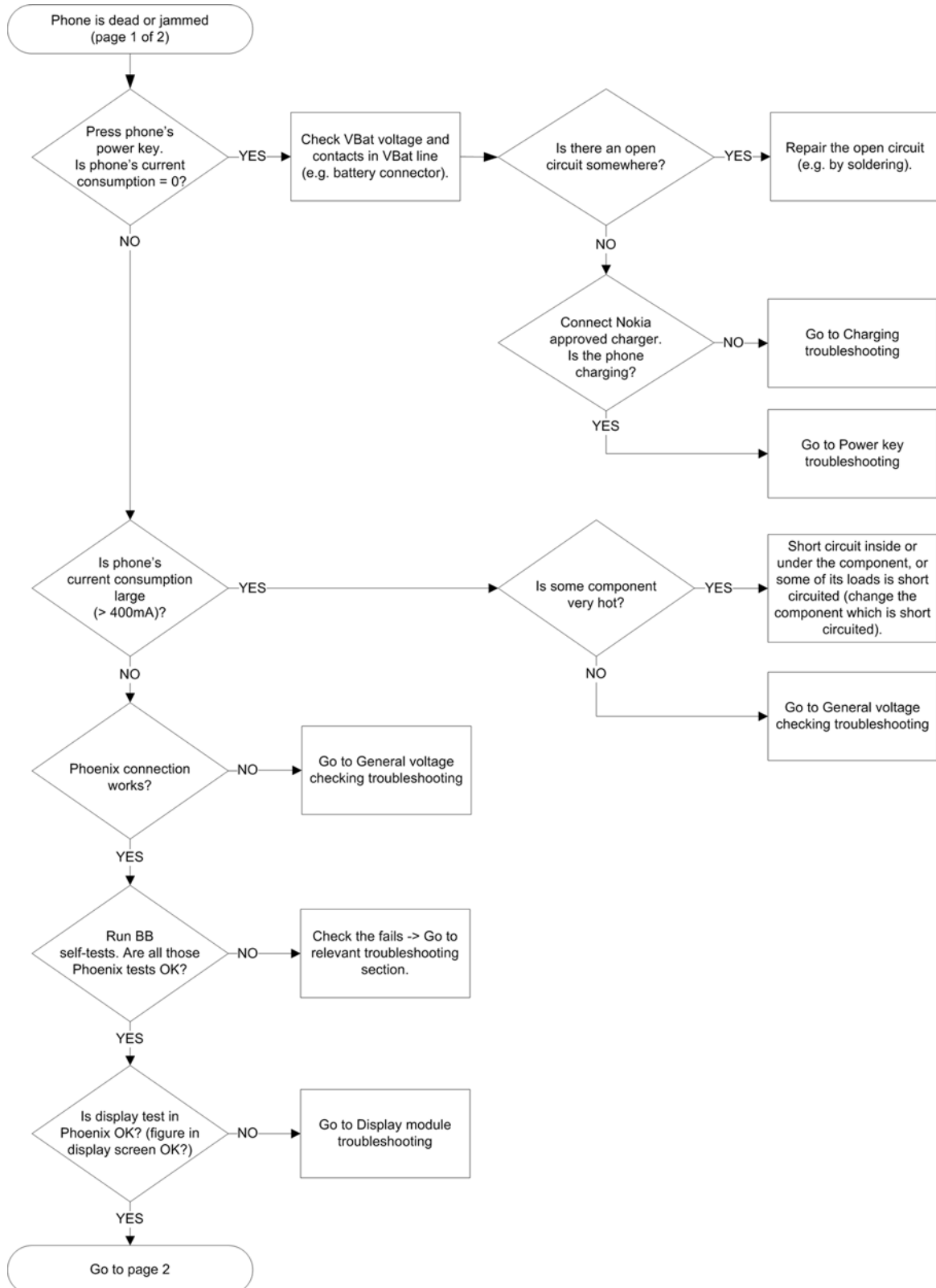
## Troubleshooting flow



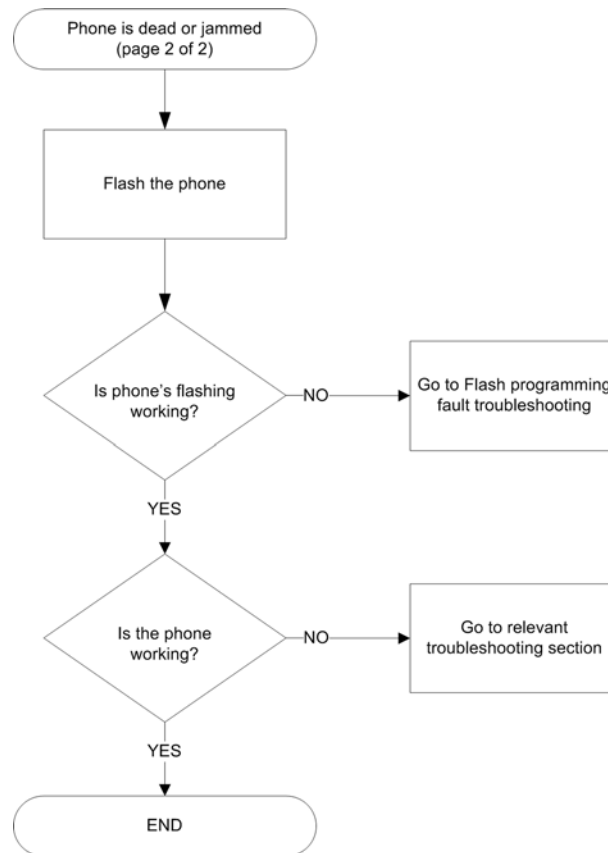
■ **Power and charging troubleshooting**

**Dead or jammed device troubleshooting**

**Troubleshooting flow - Page 1 of 2**

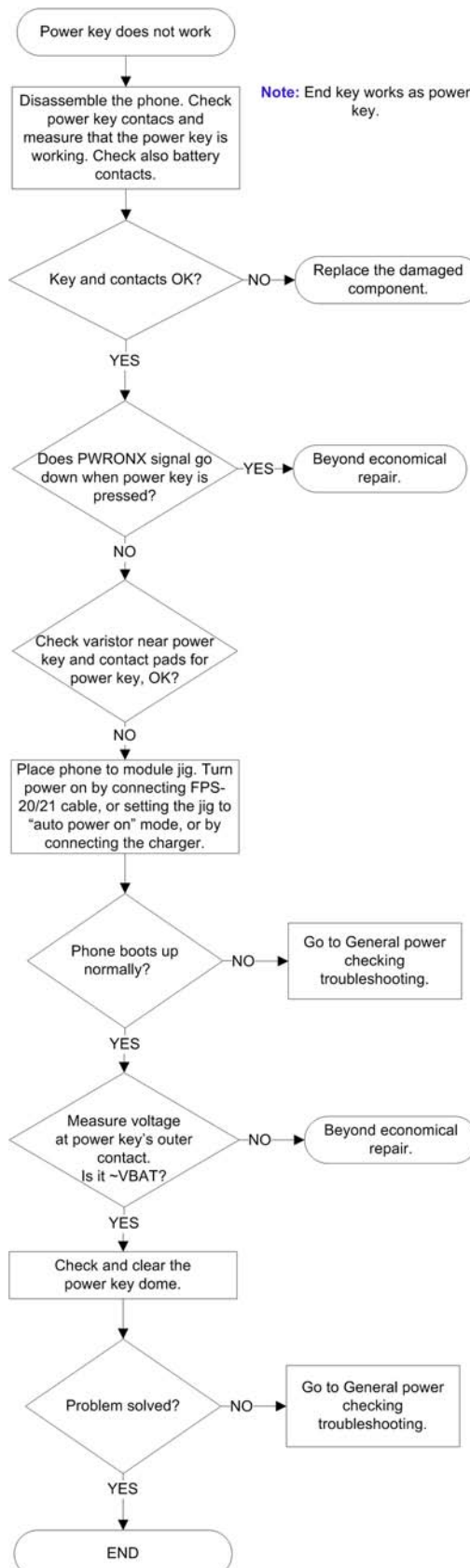


## Troubleshooting flow - Page 2 of 2



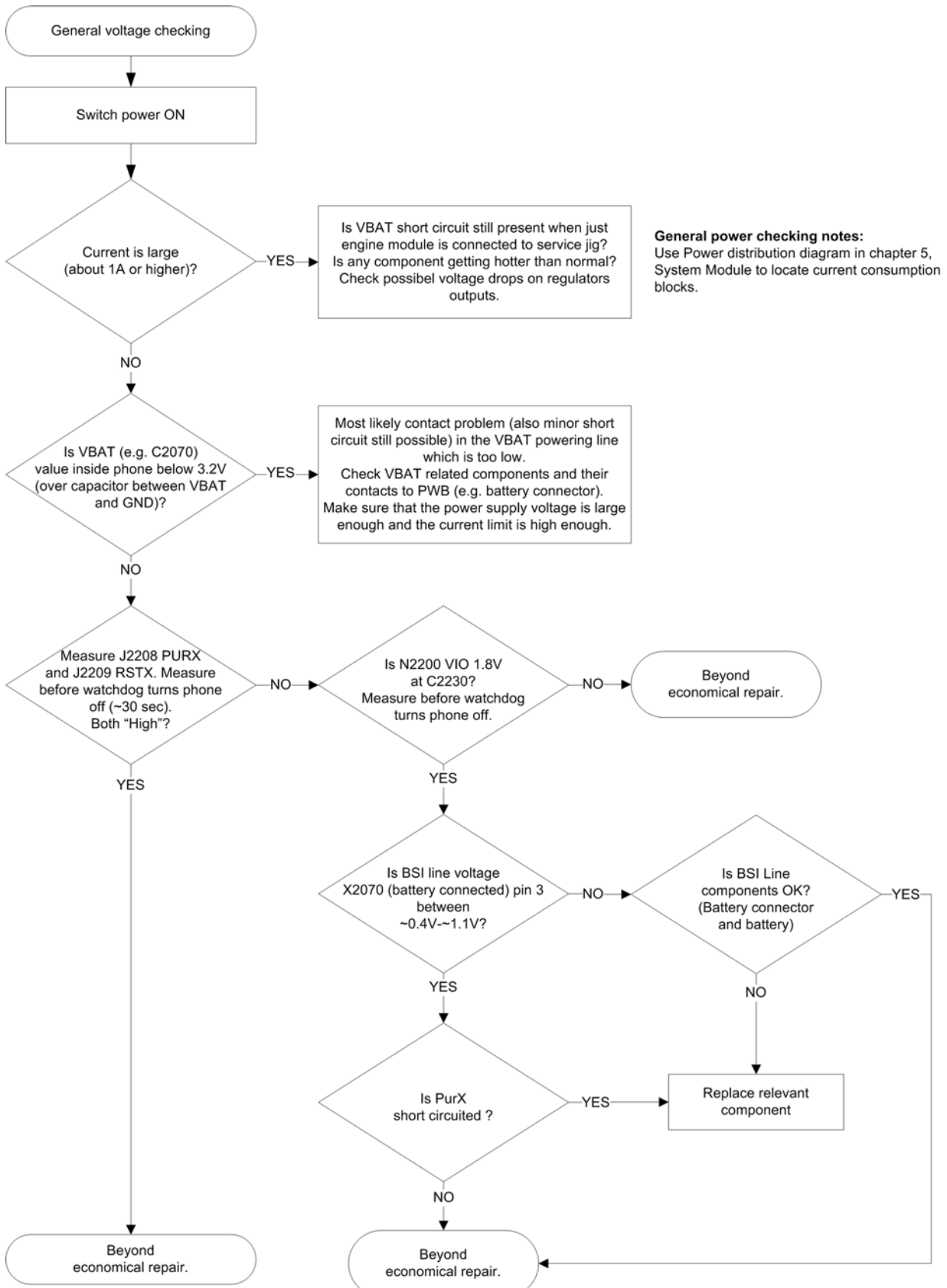
## Power key troubleshooting

### Troubleshooting flow



## General voltage checking troubleshooting

### Troubleshooting flow



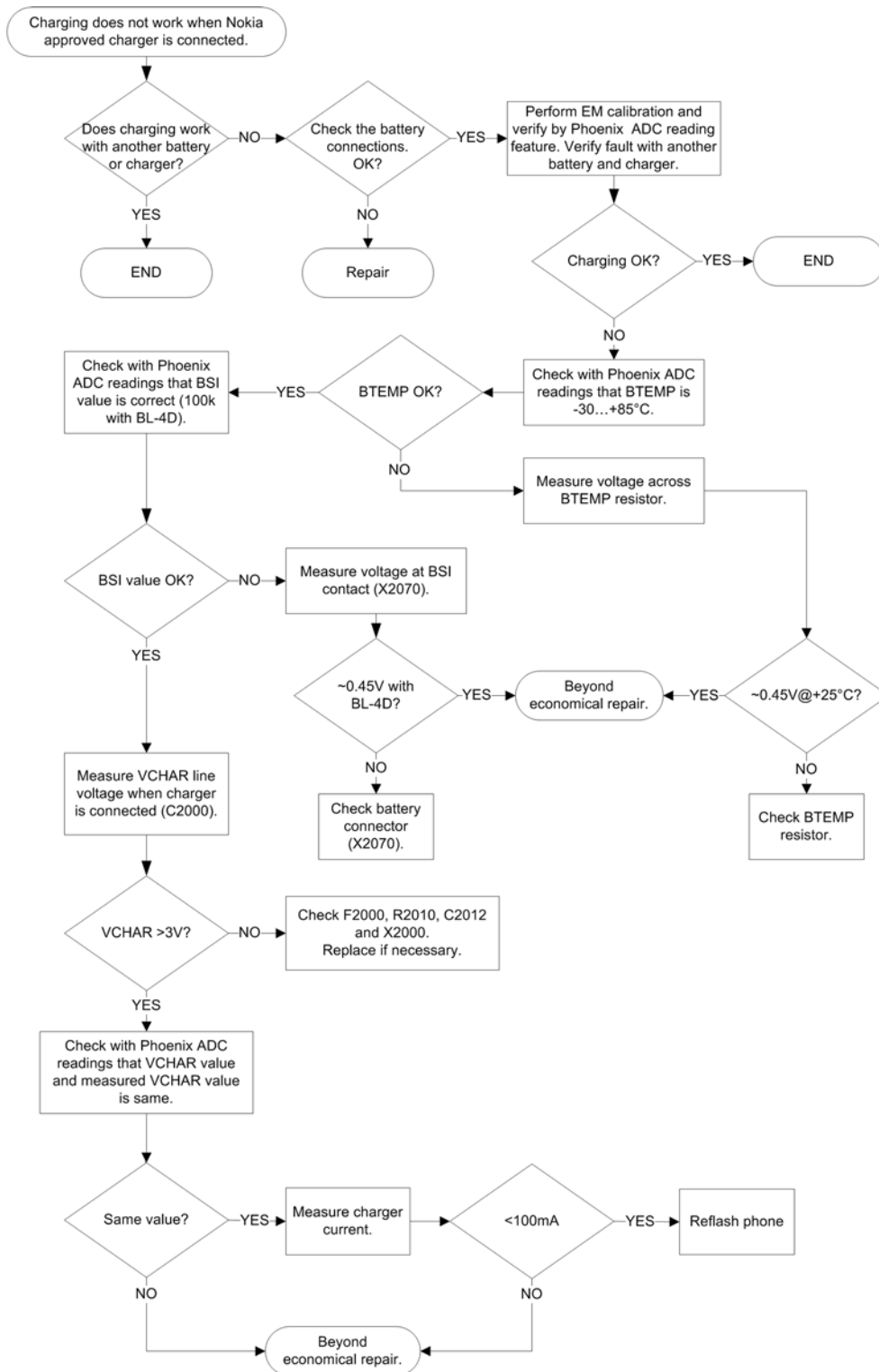
## General power checking

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	
VBACK	Pearl/Gazoo	ON	ON	2.5	Back-up battery	
VSIM1	Pearl/Gazoo	ON	ON	1.8/3.0	SIM card	
VAUX1	Pearl/Gazoo	ON	ON	2.8	TV-OUT, 3DFS, MR, Display	
VAUX2	Pearl/Gazoo	OFF	OFF	2.5	ALS	
VANA	Pearl/Gazoo	ON	ON	2.5	Audio	
VR1	Pearl/Gazoo	OFF	ON	2.5	Crystal oscillators	
VRFC	Pearl/Gazoo	OFF	ON	1.8	RAPU 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	RAPU digital	Can change due to RAPU version & SW
VOUT	Pearl/Gazoo	OFF	OFF	2.5	Video switch	
VCAM_2V8	N1421	OFF	OFF	2.8	Camera	Disabled in sleep
VCAM_1V8	N1420	OFF	OFF	1.800	Camera	Disabled in sleep
VMEM	Pearl/Gazoo	OFF	OFF	2.9	microSD	Disabled in sleep

## Charging troubleshooting

### Troubleshooting flow



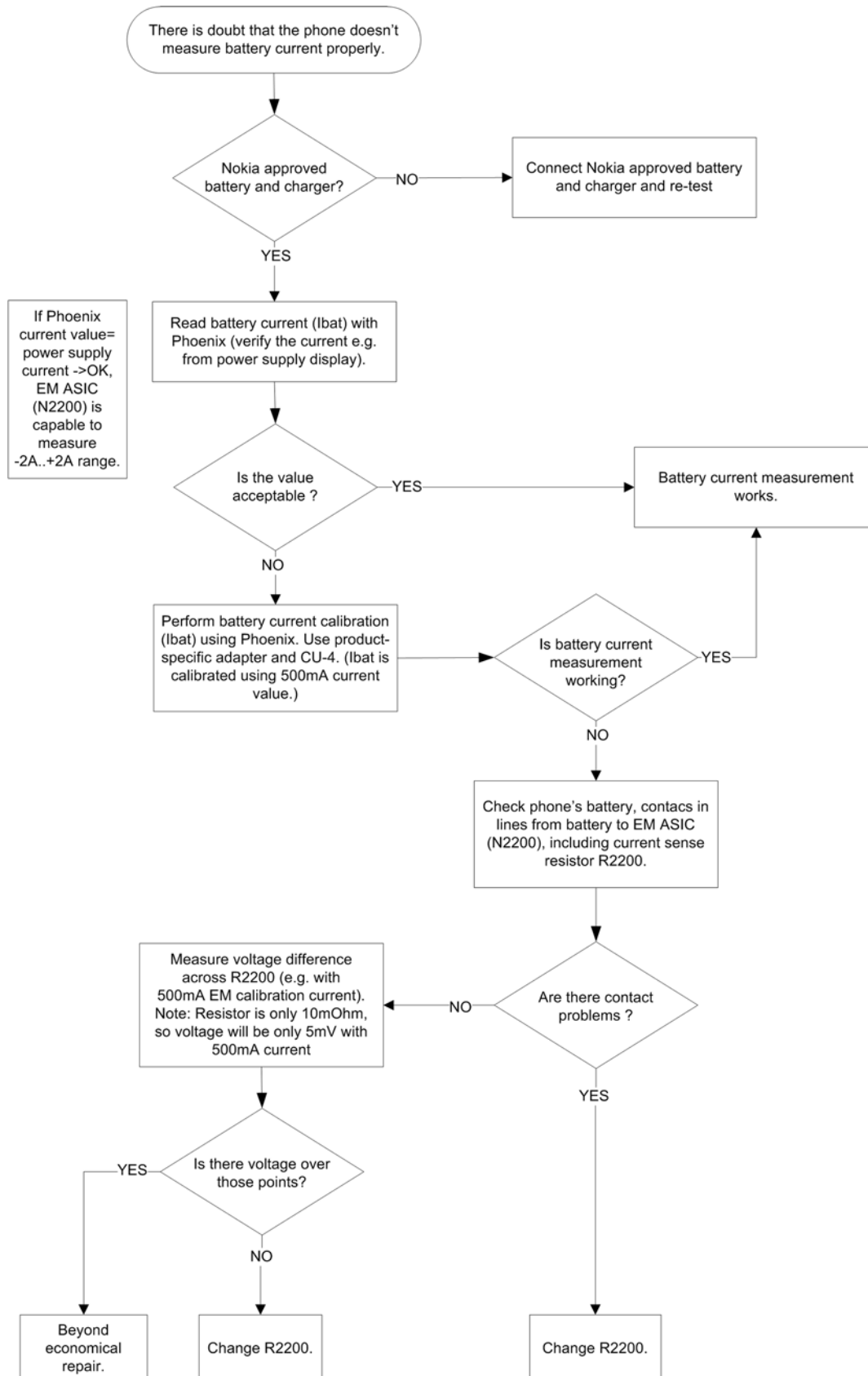
## USB charging troubleshooting

### Context

For instructions regarding USB charging troubleshooting, see section [USB charging troubleshooting \(page 3-24\)](#).

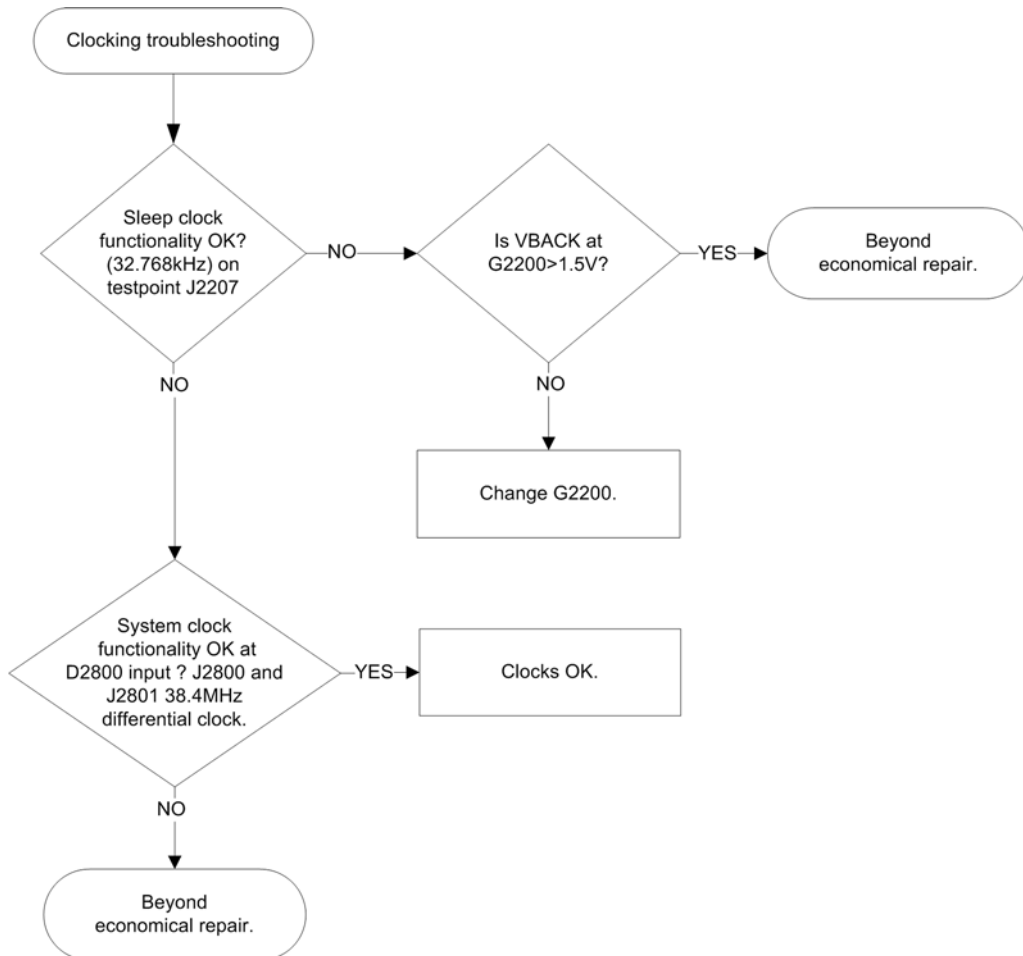
## Battery current measuring fault troubleshooting

### Troubleshooting flow



## Clocking troubleshooting

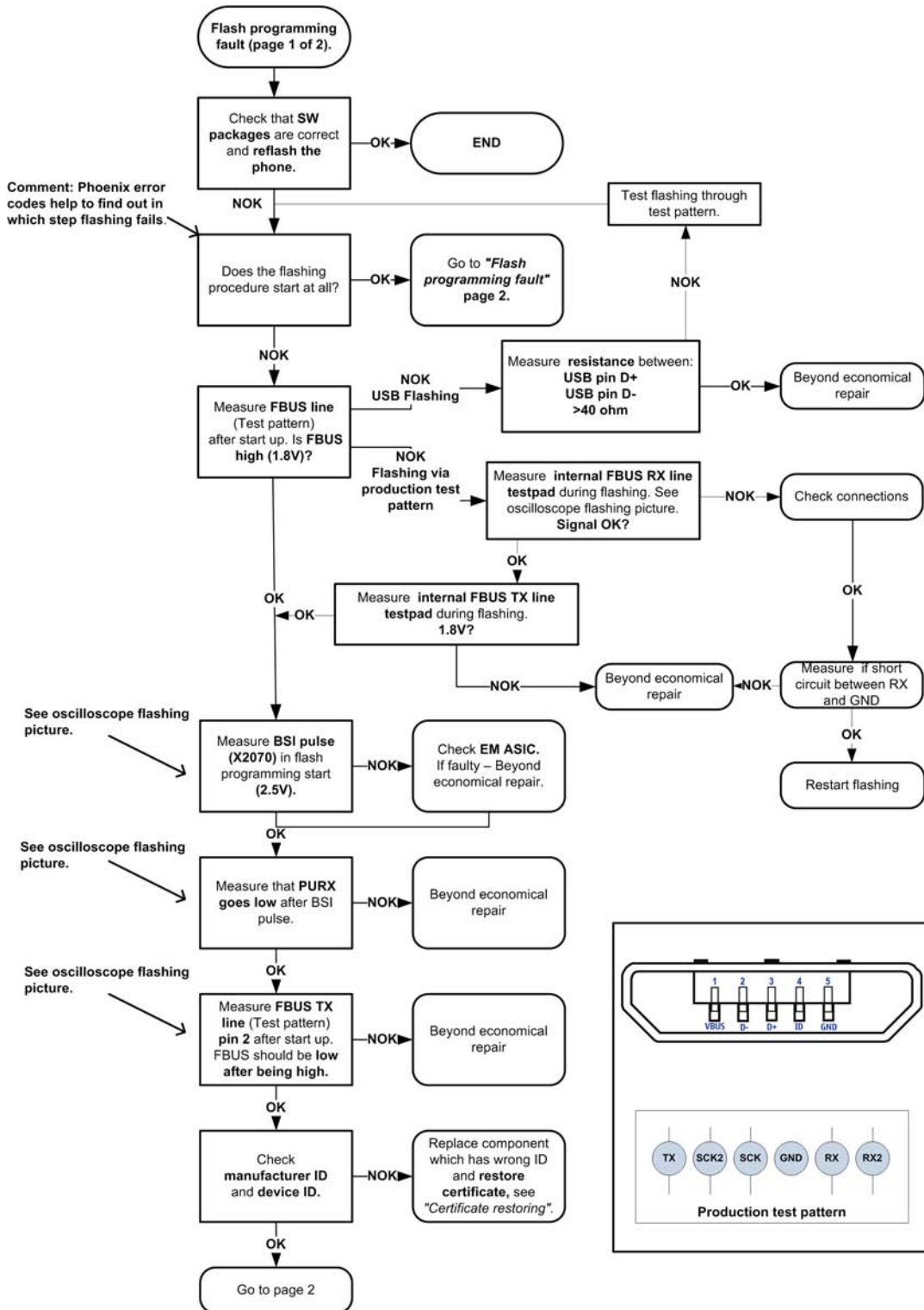
### Troubleshooting flow



Interface troubleshooting

Flash programming fault troubleshooting

Troubleshooting flow - Page 1 of 2



### Troubleshooting flow - Page 2 of 2

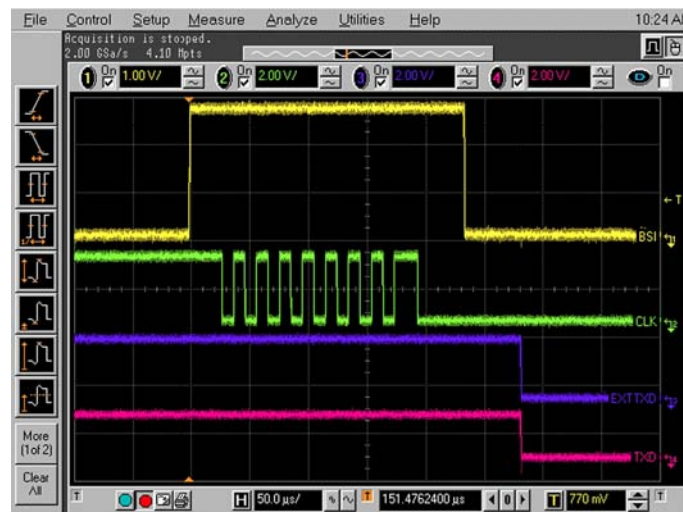
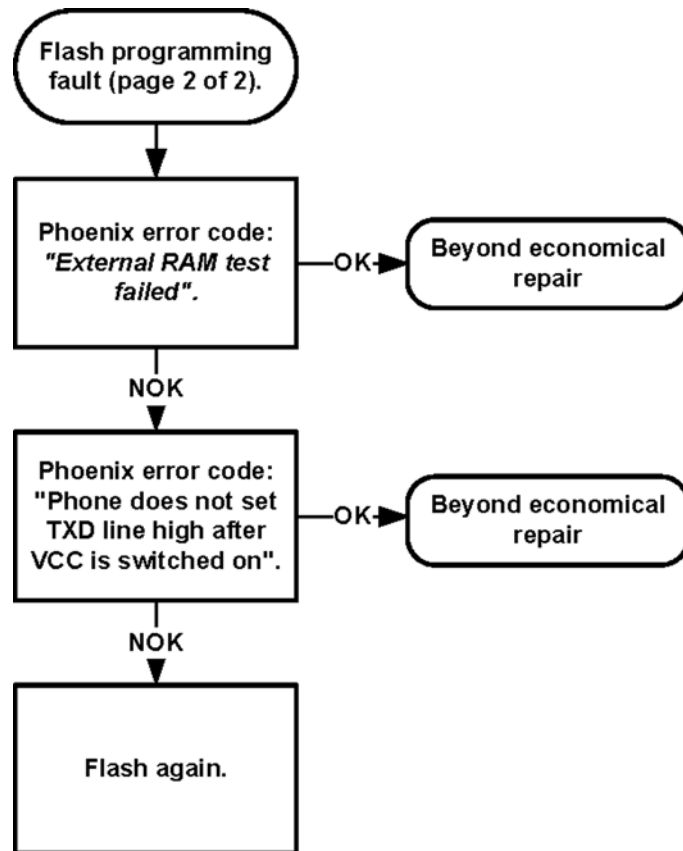


Figure 9 Flashing pic 1. Take single trig measurement for the rise of the BSI signal

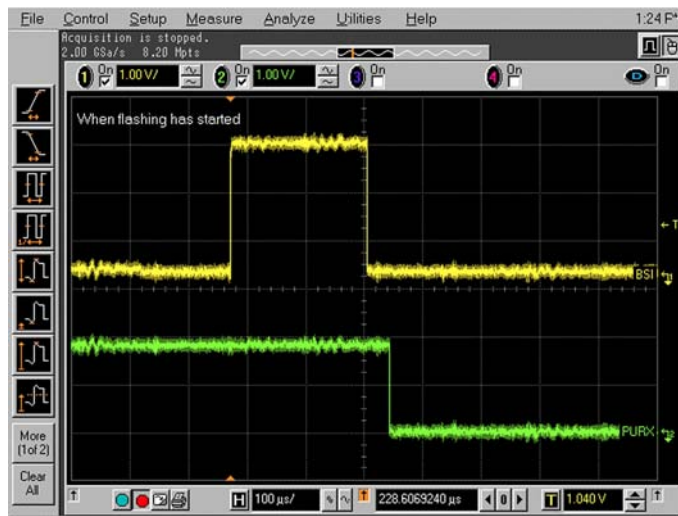
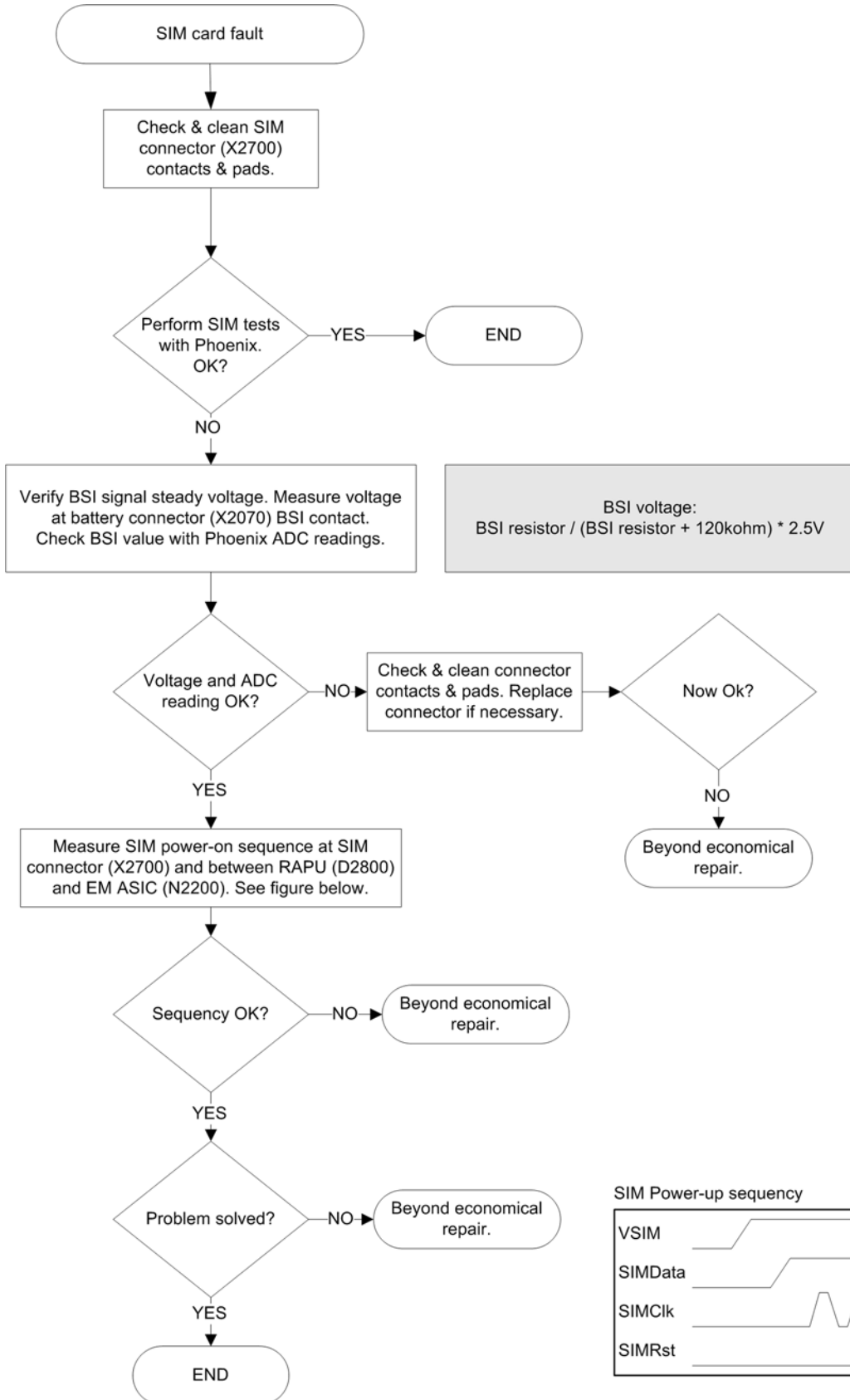


Figure 10 Flashing pic 2. Take single trig measurement for the rise of the BSI signal

**SIM card troubleshooting**

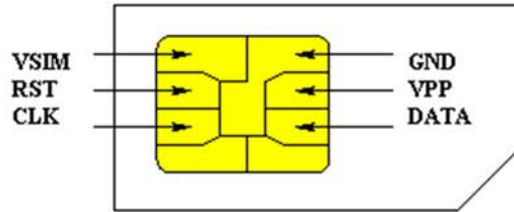
**Troubleshooting flow**



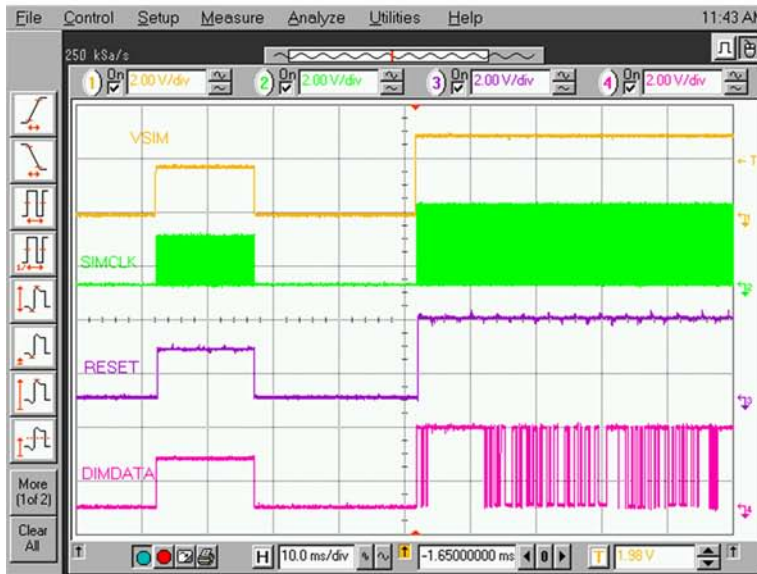
SIM power-on sequence

Testpoints between  
RAPU and EM ASIC  
J2218 = SIMData  
J2219 = SIMClk  
J2220 = SIMIOc

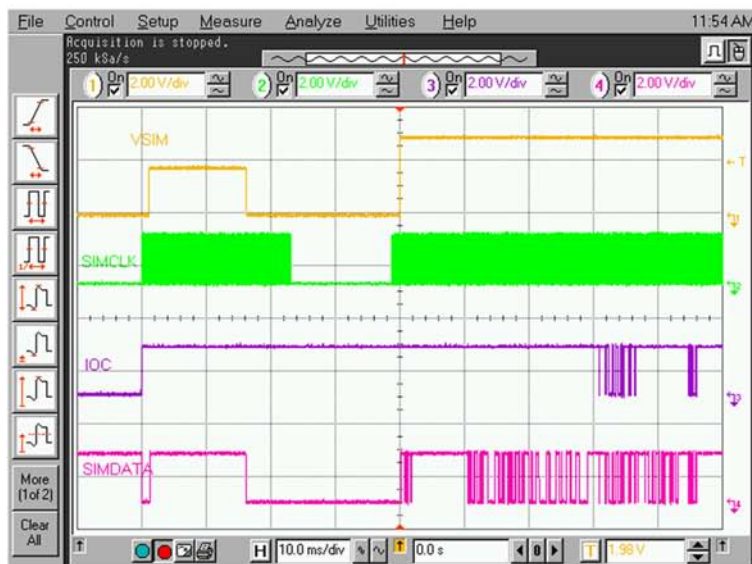
Fsimclk = 3.8MHz



SIM contacts



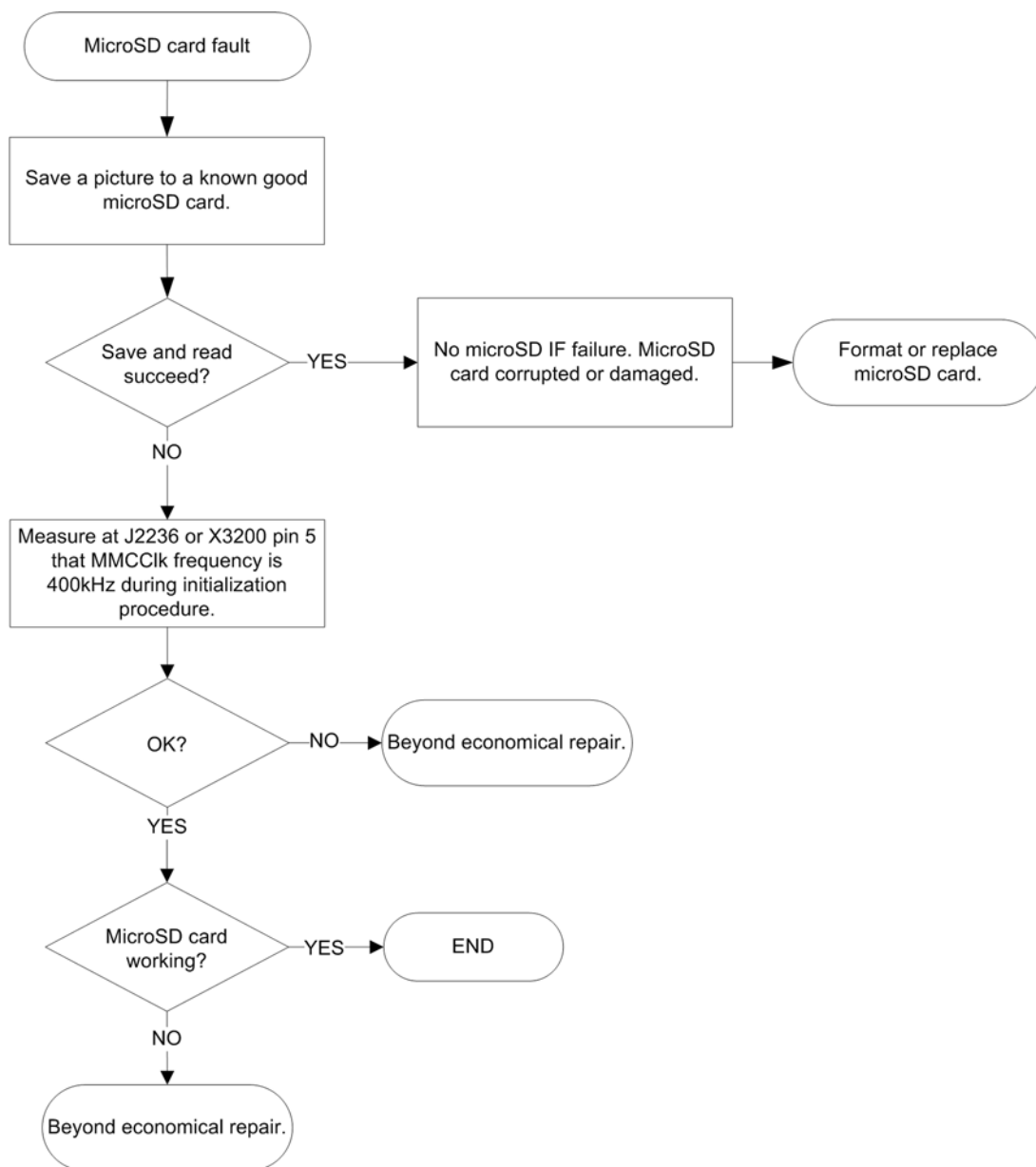
SIM power-on sequence on X2700.



SIM power-on sequence between RAPU and EM ASIC.

## MicroSD card troubleshooting

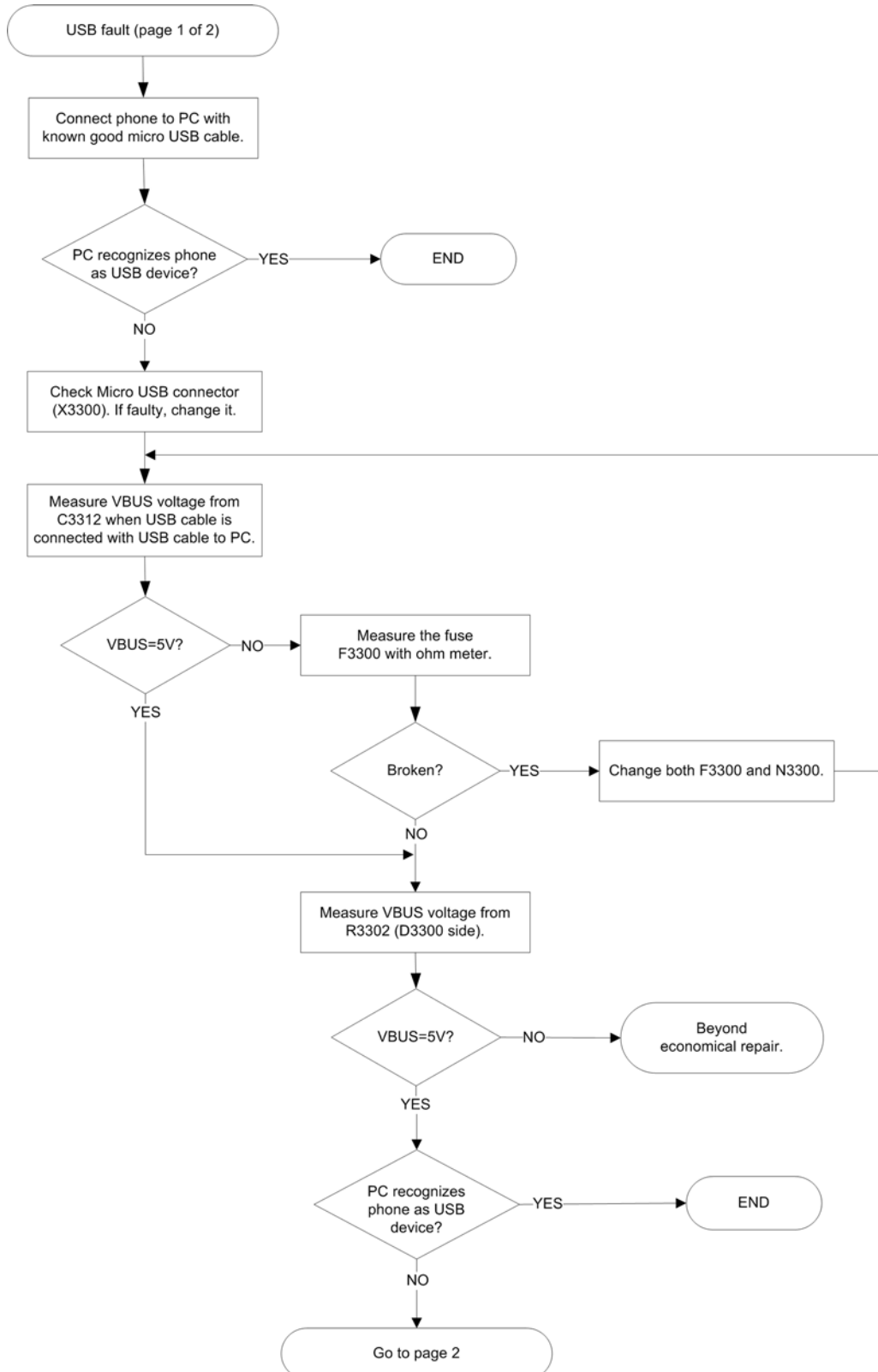
### Troubleshooting flow



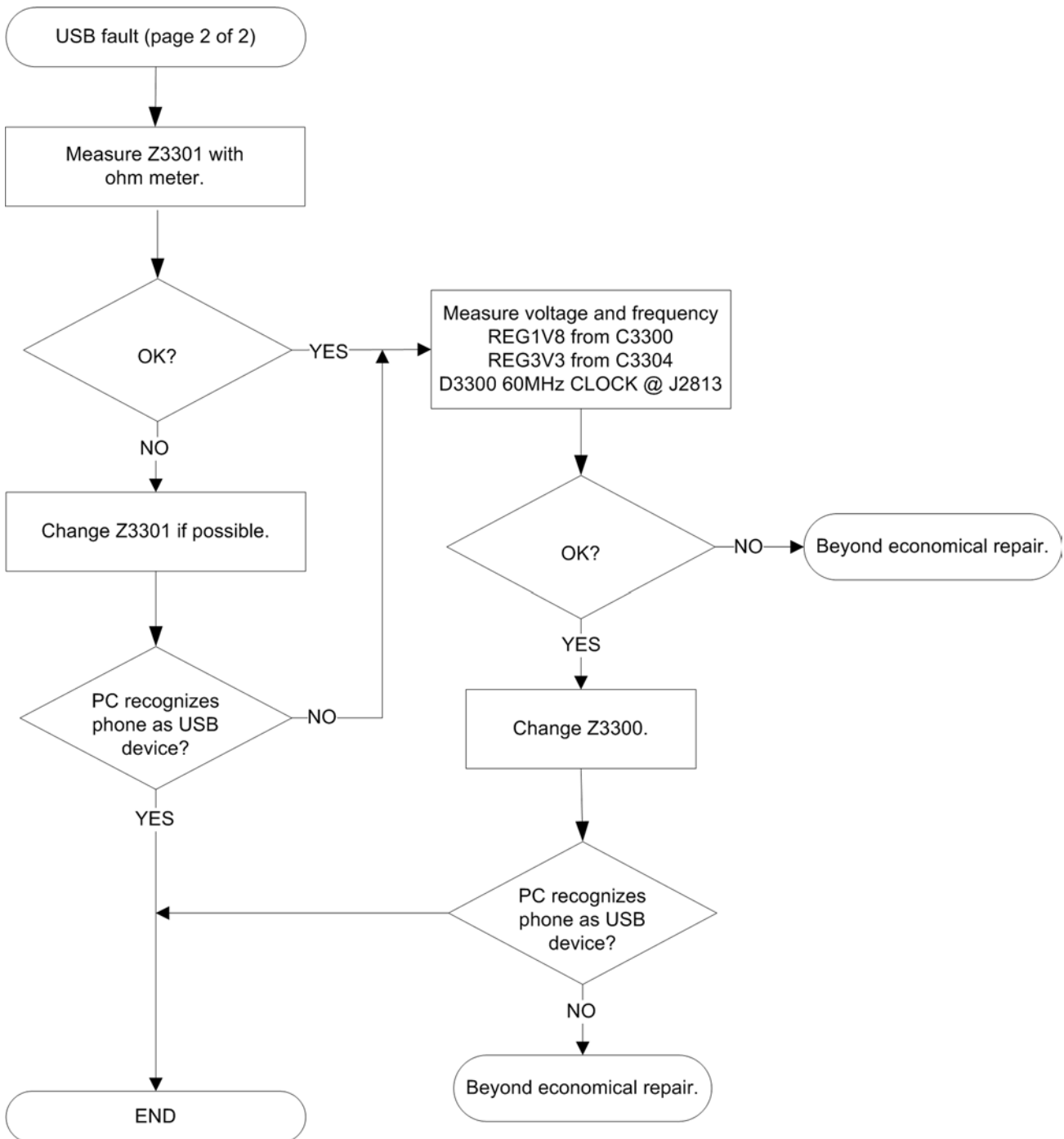
**USB troubleshooting**

*USB data interface troubleshooting*

**Troubleshooting flow - Page 1 of 2**

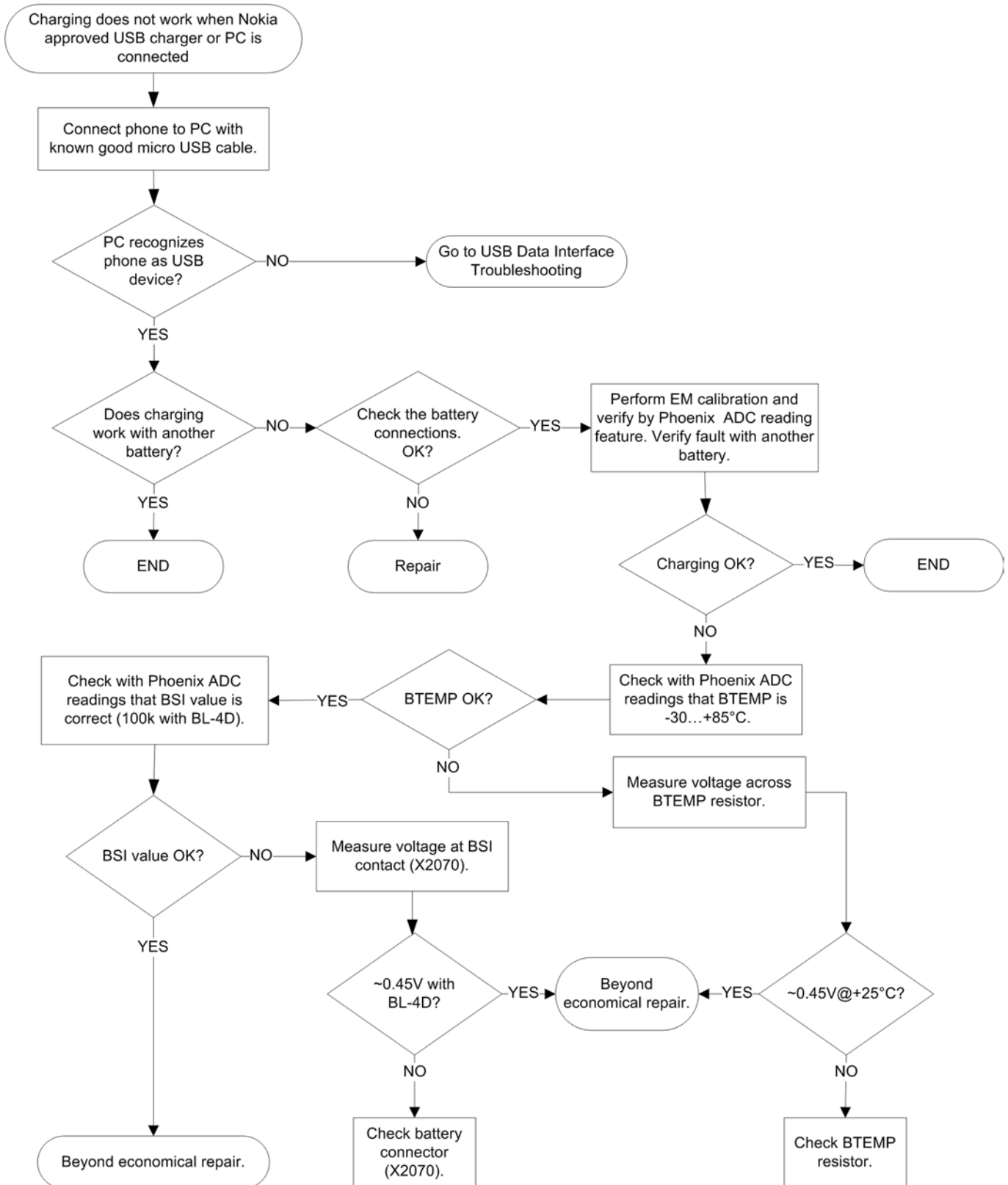


### Troubleshooting flow - Page 2 of 2



*USB charging troubleshooting*

**Troubleshooting flow**



## ■ User interface troubleshooting

### Keyboard troubleshooting

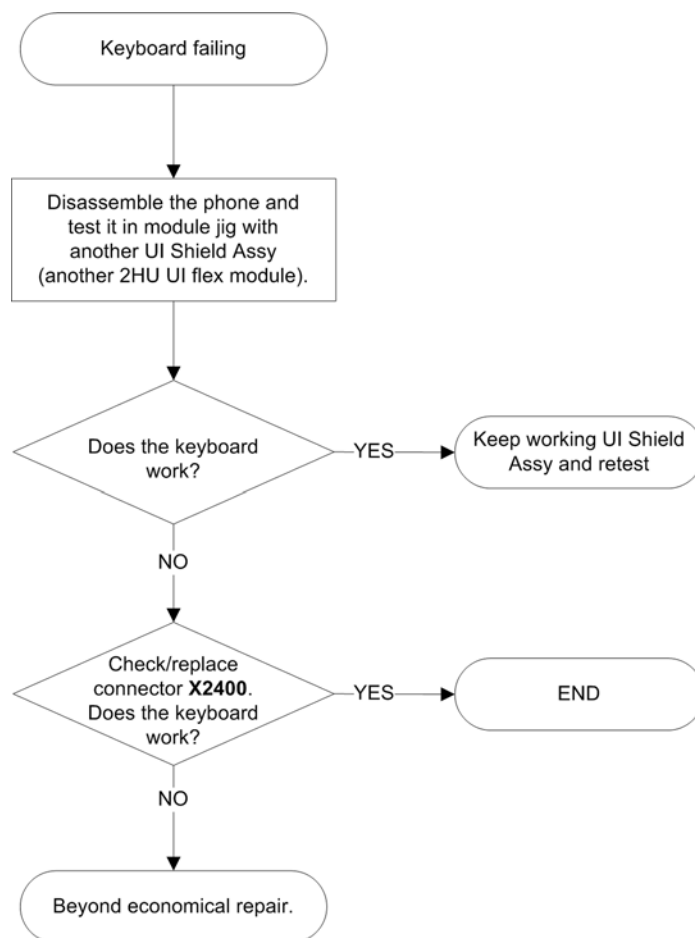
#### Context

There are two possible failure modes in the keyboard module:

- One or more keys are stuck, so that the key does not react when a keydome or a side key is pressed. This kind of failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)
- Malfunction of several keys at the same time; this happens when one or more rows or columns in the key matrix are failing (shortcut or open connection).

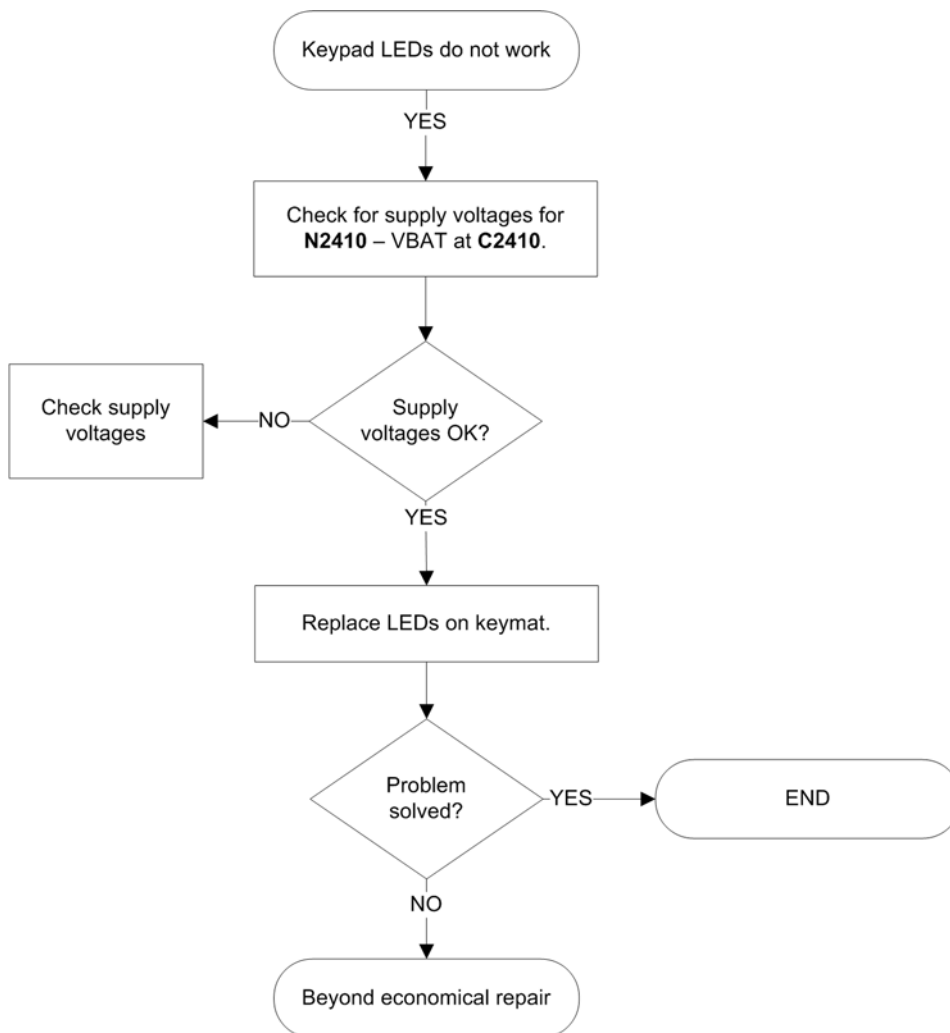
If the failure mode is not clear, start with the Keyboard test in Phoenix.

#### Keyboard troubleshooting



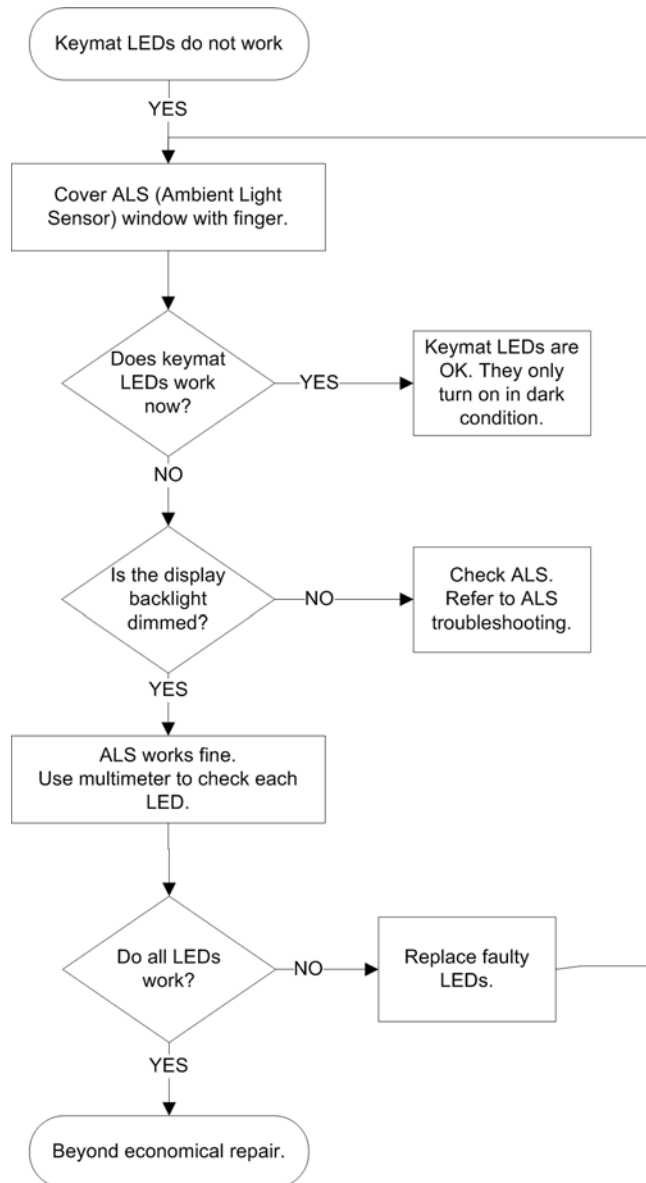
## Navi key LEDs troubleshooting

### Troubleshooting flow



## Keymat LEDs 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.
- The operating modes of the display can be controlled with the help of *Phoenix*.

**Table 6 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	<p>Image on the display can be corrupted or a part of the image can be missing.</p> <ul style="list-style-type: none"> <li>• If a part of the image is missing, change the display module.</li> <li>• If the image is otherwise corrupted, follow the display fault troubleshooting flowchart.</li> </ul>
Backlight dim or not working at all	<p>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.</p> <p>This means that in case the display is working (image OK), the backlight is faulty.</p>
Visual defects (pixel)	<p>Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen.</p> <p>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.</p>

**Table 7 Pixel defects**

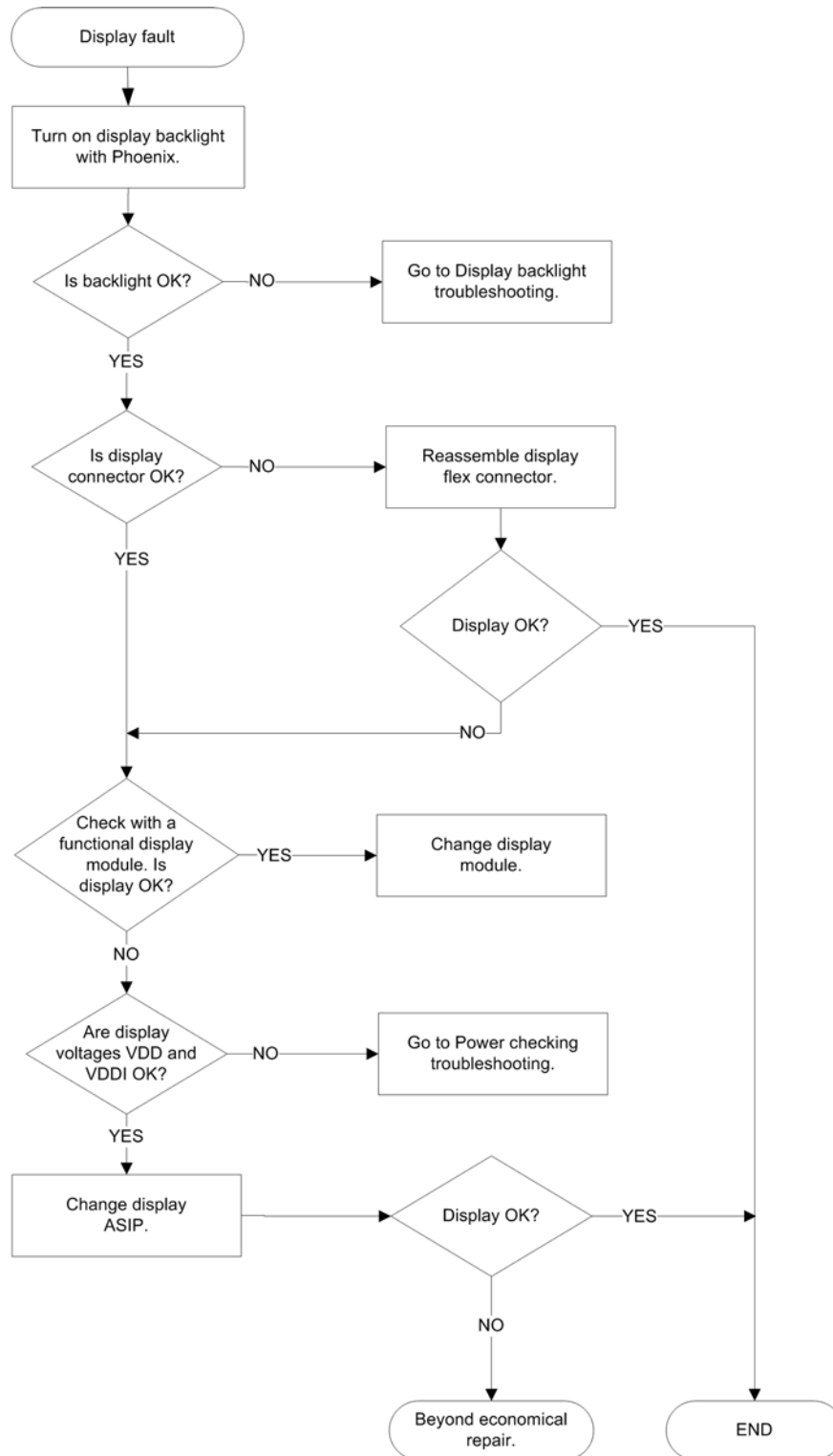
Item		White dot defect				Black dot defect	Total	
		R	G	B	White Dot Total			
1	Defect counts	R	G	B	White Dot Total	1	1	
		1	1	1	1			
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.						

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

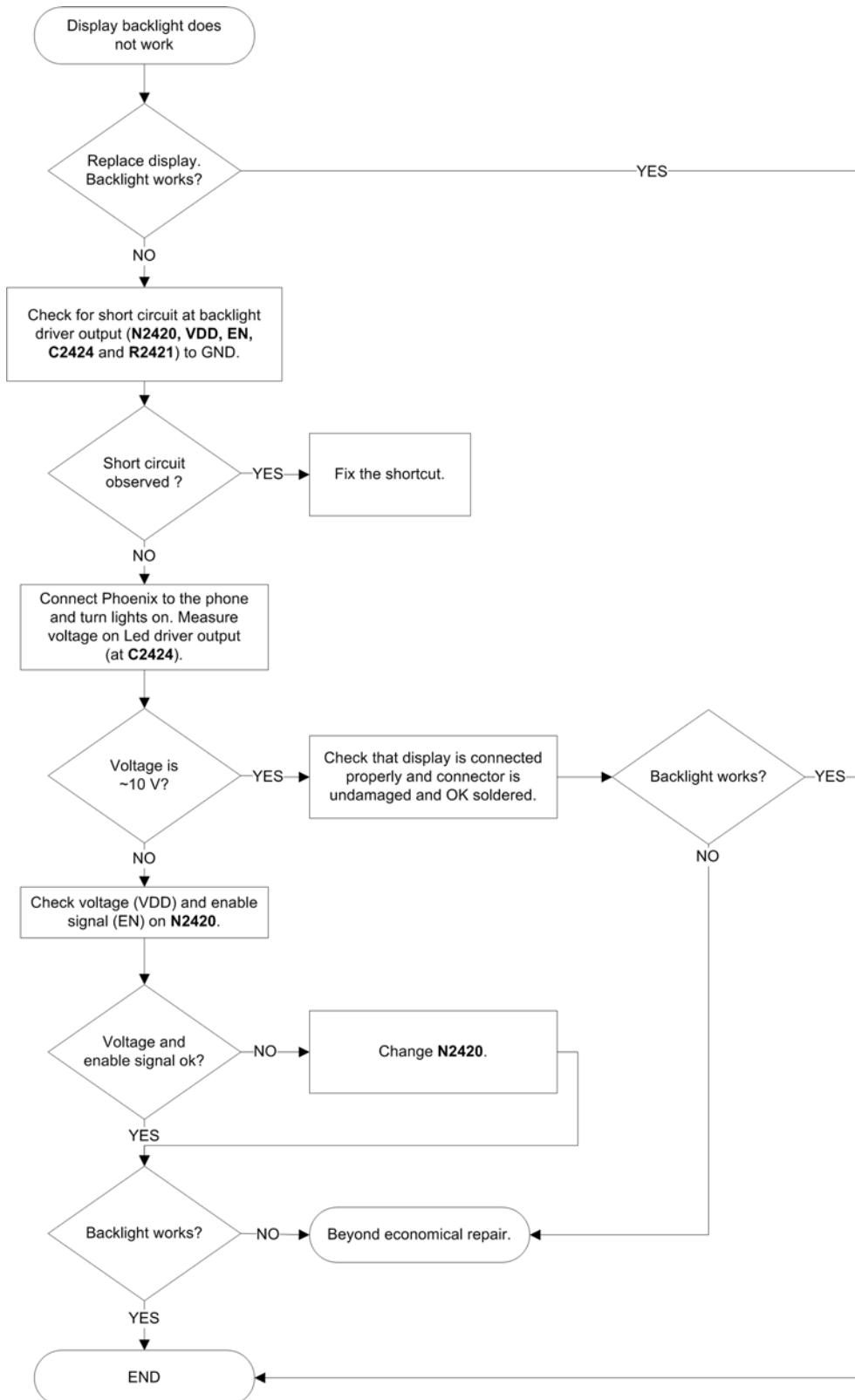
## Display fault troubleshooting

### Troubleshooting flow



*Display backlight troubleshooting*

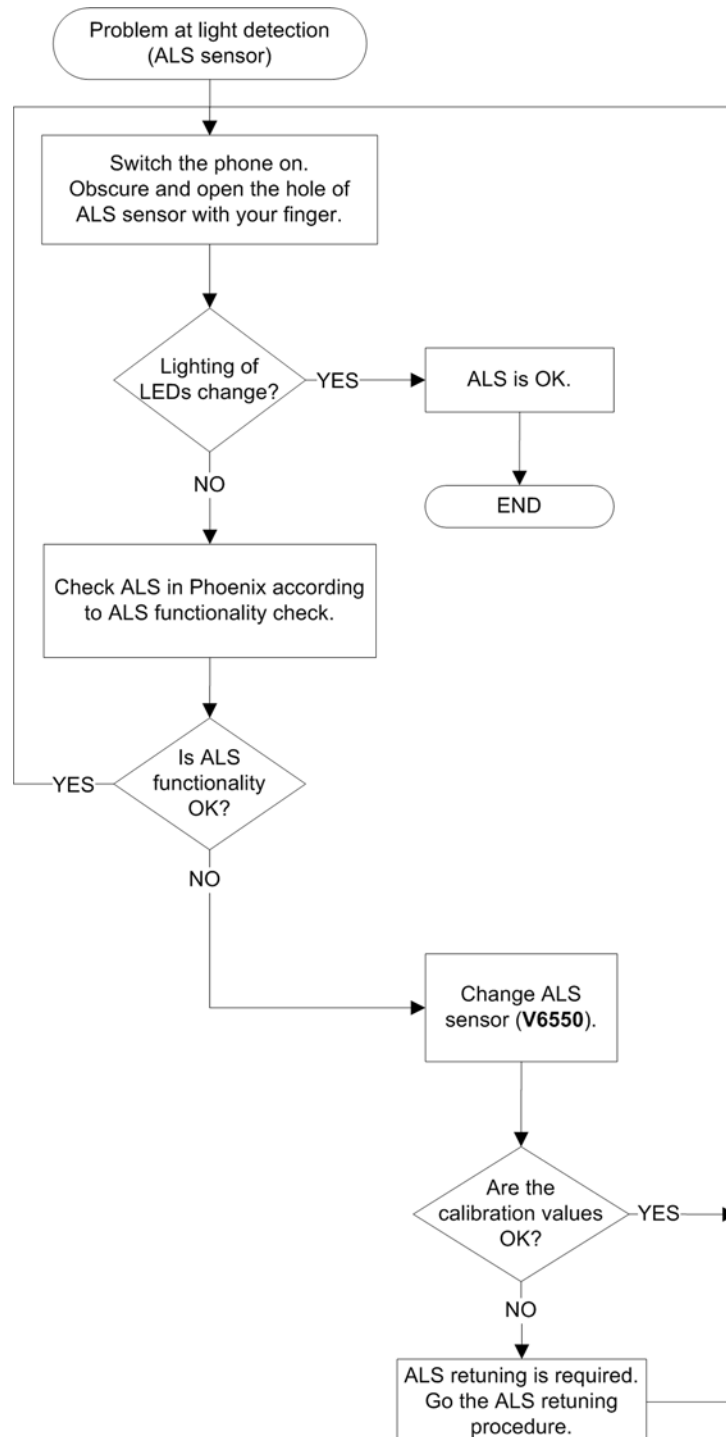
**Troubleshooting flow**



## Ambient light sensor (ALS)

### ALS troubleshooting

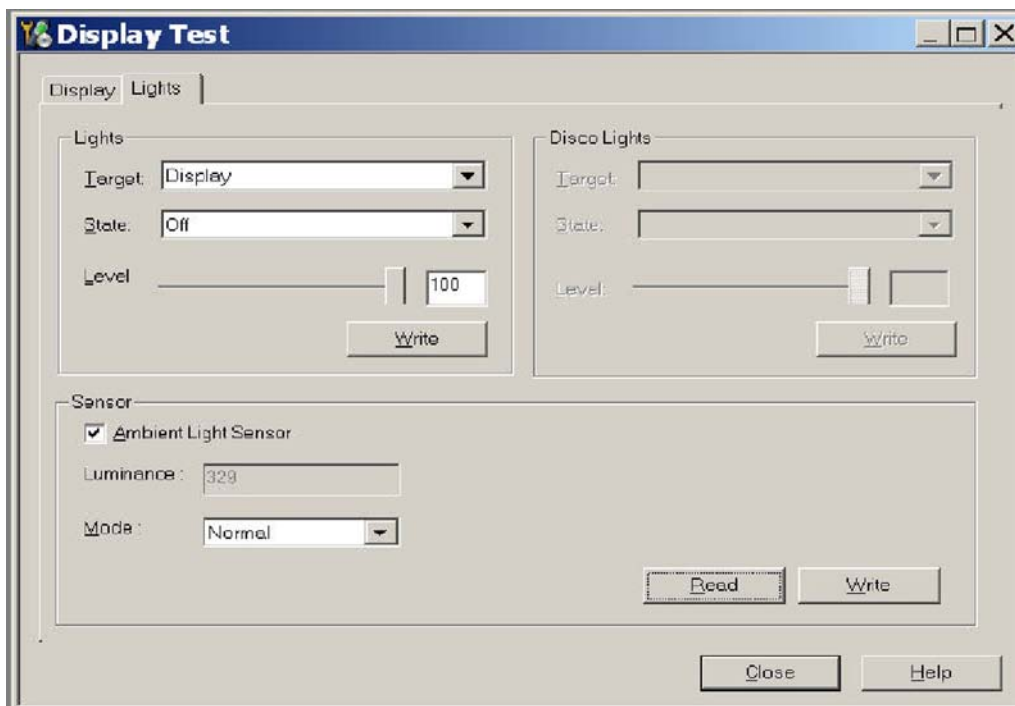
#### Troubleshooting flow



## ALS functionality check

### Steps

1. Connect phone to Phoenix and set the phone (e.g. on the table) so that the amount of ambient light seen by ALS is as stable as possible.
2. Start Phoenix
3. Choose **File -> Scan product**
4. Choose **Testing -> Display Test**
5. Open the **Lights** tab, check Ambient Light Sensor check box, click **Read**, cover the sensor and click **Read** again. When covered, Luminance reading should be less than after clicking **Read** without covering the sensor.
6. If component doesn't give any reading or reading doesn't change when sensor is/is not covered, replace the part.



**Note:** After replacing the ALS. If calibration values of the new sensor are lost or for some other reason, ALS re-tuning is required (see instructions later in this document).

When doing the ALS calibration procedure, it is required to have a reference phone, which includes calibrated ALS. ALS re-tuning instructions show why the reference phone is needed.

## ALS retuning

### Steps

1. Connect reference phone to *Phoenix* and set the phone (e.g. on the table) so that the amount of ambient light seen by ALS is as stable as possible.
2. Start *Phoenix*.
3. Choose **File→Scan Product**.

4. Choose **Tuning -> Ambient Light Sensor Calibration**. You should see the following window



5. Read AD-count values for Channel 0 by click Read button and write them down.
6. Repeat 1-5 for the phone to be calibrated and make sure the phone to be calibrated is located in the same place as reference phone was when luminance reading was taken.
7. Calculate co-efficient from reference phone and phone to be calibrated AD-count values by division: Co-efficient = AD-count(reference phone) / AD-count(phone to be calibrated), write down the calculated co-efficient values.
8. -> Iterate by changing Channel 0 (reference level) value (remove cross from 'Use default values only'). After writing some value to Channel 0 (reference value), calibrate button must be pressed. Stop iterating when Co-efficient is equal to Co-efficient calculated in bullet 7. Note that decimal numbers should be used in the iteration in order to achieve enough precision (e.g. 200.2455)
9. After having same Co-efficient value in "Co-efficient" textbox as the calculated value, make sure that ambient light values (read using **Testing -> Display Test -> "Luminance"** textbox) are almost the same in reference phone and calibrated phone. Remember that illuminance readings for reference and calibrated phones must be done in the same ambient light conditions. If illuminance values differs a lot (difference max. +- 10%), repeat whole ALS re-tuning procedure.
10. To end the calibration, click **Close**.

■ **GPS troubleshooting**

**GPS settings for Phoenix**

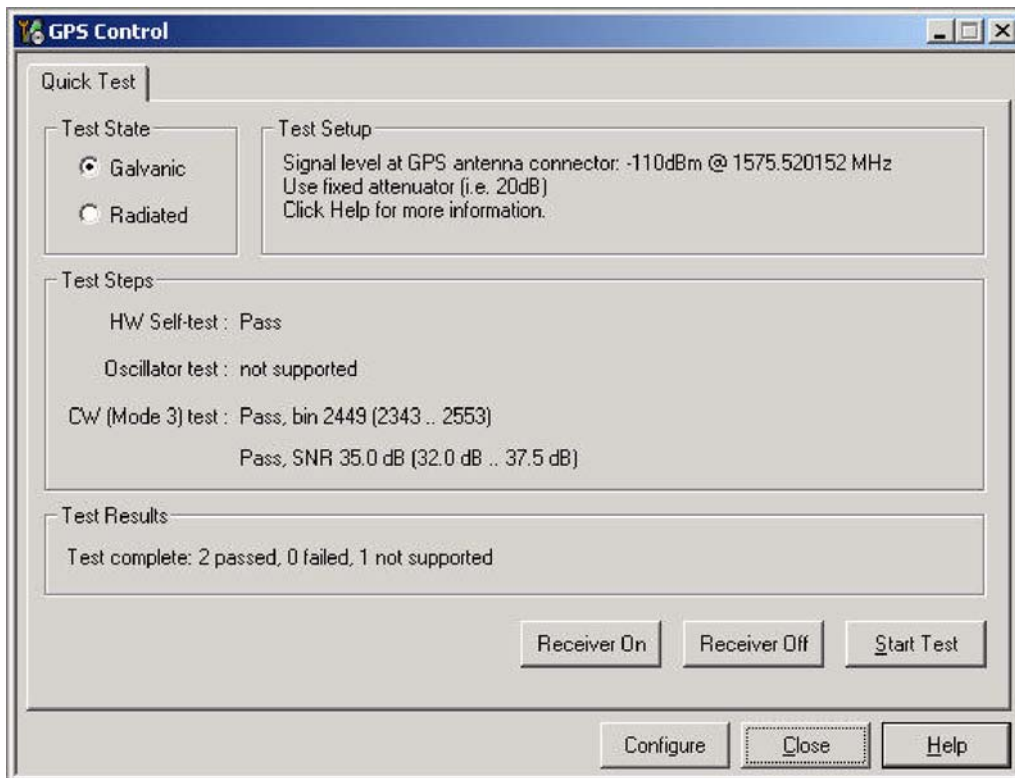
*GPS control*

**Context**

Use the following to test GPS using Phoenix.

**Steps**

1. Start Phoenix service software.
2. From the **File** menu, select **Scan Product** and check that the correct product version is displayed.
3. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box, as shown in the figure below, and enables the GPS.



**Figure 11 GPS Control dialog box**

Select **Receiver On** to confirm the GPS is enabled and is in idle mode; at this point all clocks should be present, GPS\_En\_Reset & SleepX should be high, and Vdd\_Dig, Vcc\_TCXO & Vcc\_PLL/VCO will be present.

**Receiver On** turns on all RF sections of the ASIC and so all LDOs will be on. These checks are part of [GPS basic checks troubleshooting \(page 3- 0 \)](#).

**GPS Quick Test window**

The *GPS Quick Test* window has all the necessary functionality for GPS troubleshooting. Ensure the test setup is correct and click **Start Test**. (Select **Help** for further information).

This test will perform three tests in one; Self Test, Oscillator Test and CW Test, and will provide a Pass/Fail response. The *GPS Quick Test* window also contains a **Receiver On** button. These checks are part of [GPS failure troubleshooting \(page 3- 0 \)](#).

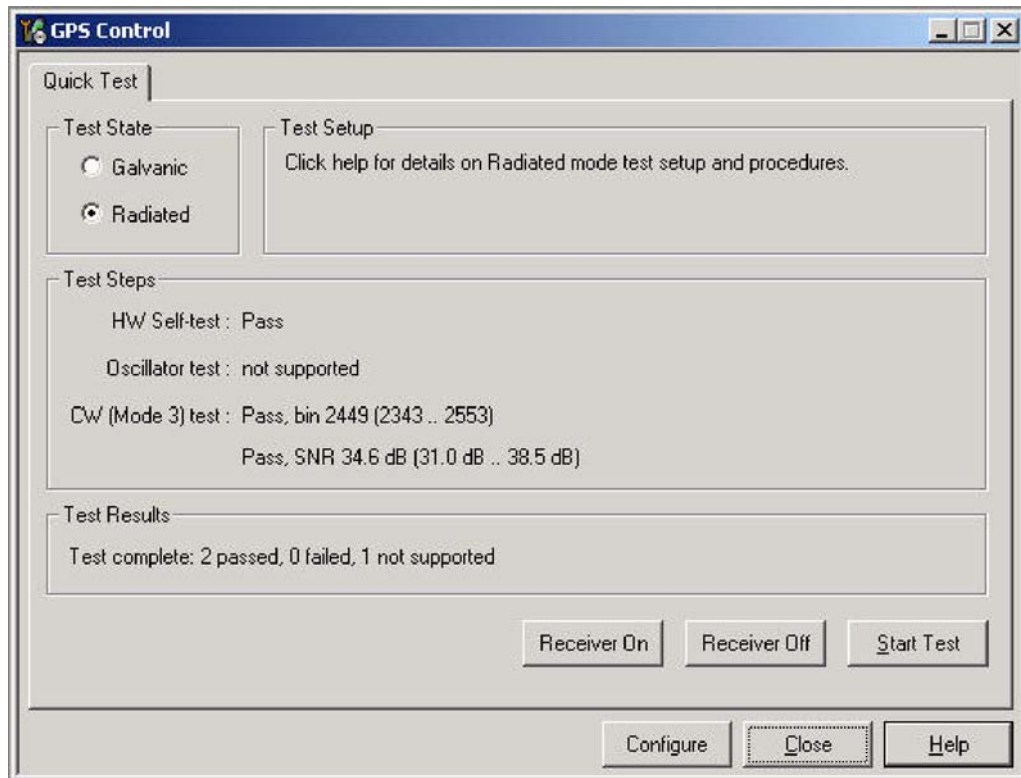


Figure 12 GPS Quick Test window for GPS troubleshooting

### GPS antenna

The GPS antenna is covering the GPS band. It is located on the main PWB as shown below.

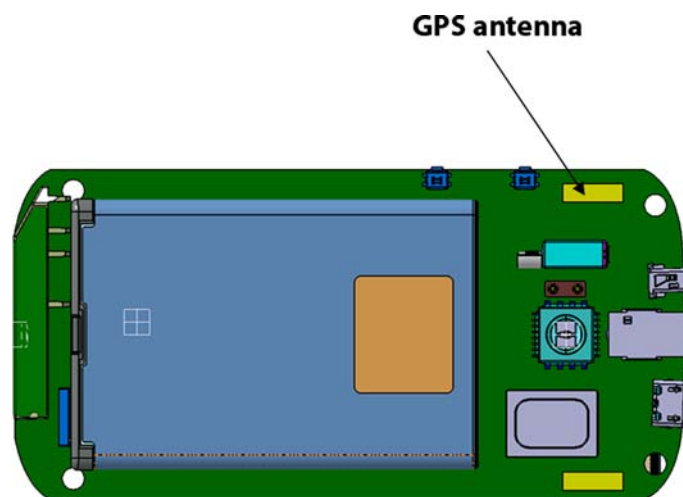


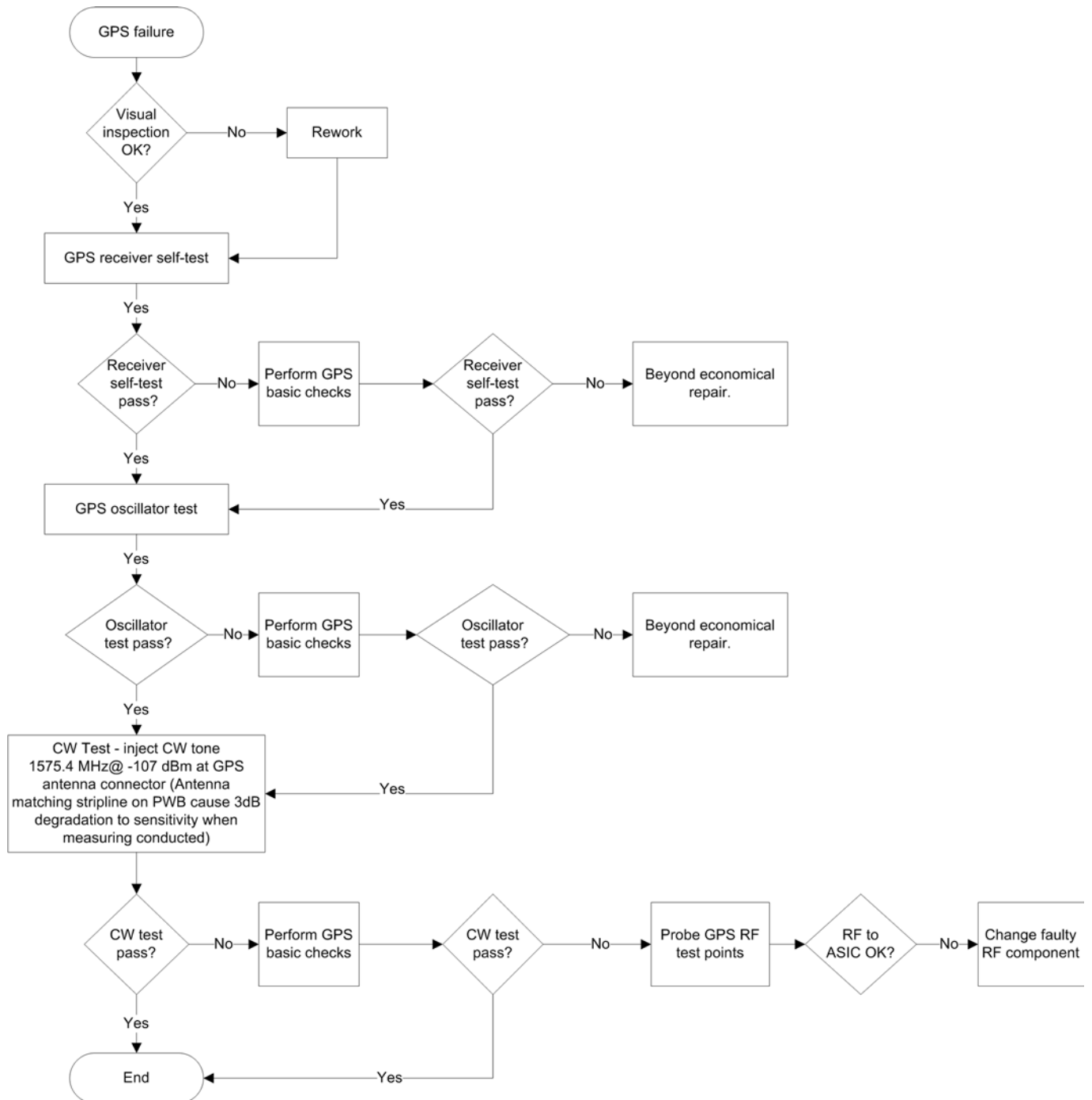
Figure 13 GPS antenna location

## GPS failure troubleshooting

### Context

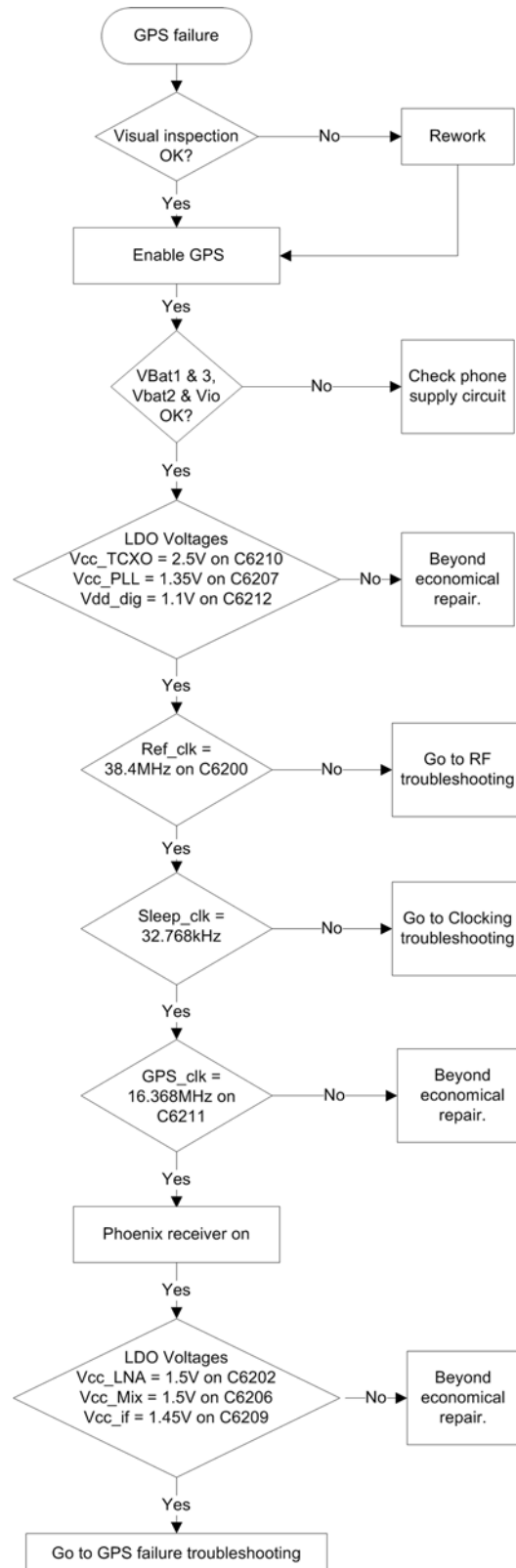
GPS troubleshooting is broken down into two parts: general GPS failure troubleshooting and GPS basic checks troubleshooting. The GPS failure troubleshooting flow can be followed and, where applicable, will feed into the GPS basic checks troubleshooting flow.

### Troubleshooting flow



## GPS basic checks troubleshooting

### Troubleshooting flow



## ■ Camera module troubleshooting

### Introduction to camera troubleshooting

Bad conditions often cause bad pictures. Therefore, the camera operation has to be checked in constant conditions or by using a second, known-to-be-good Nokia device as reference. Image quality is hard to measure quantitatively, and the difference between a good and a bad picture can be small. Some training or experience may be needed to detect what is actually wrong.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems are common:

- Dust (black spots)
- Lack of sharpness
- Bit errors

### Camera troubleshooting

#### *Taking and evaluating test pictures*

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

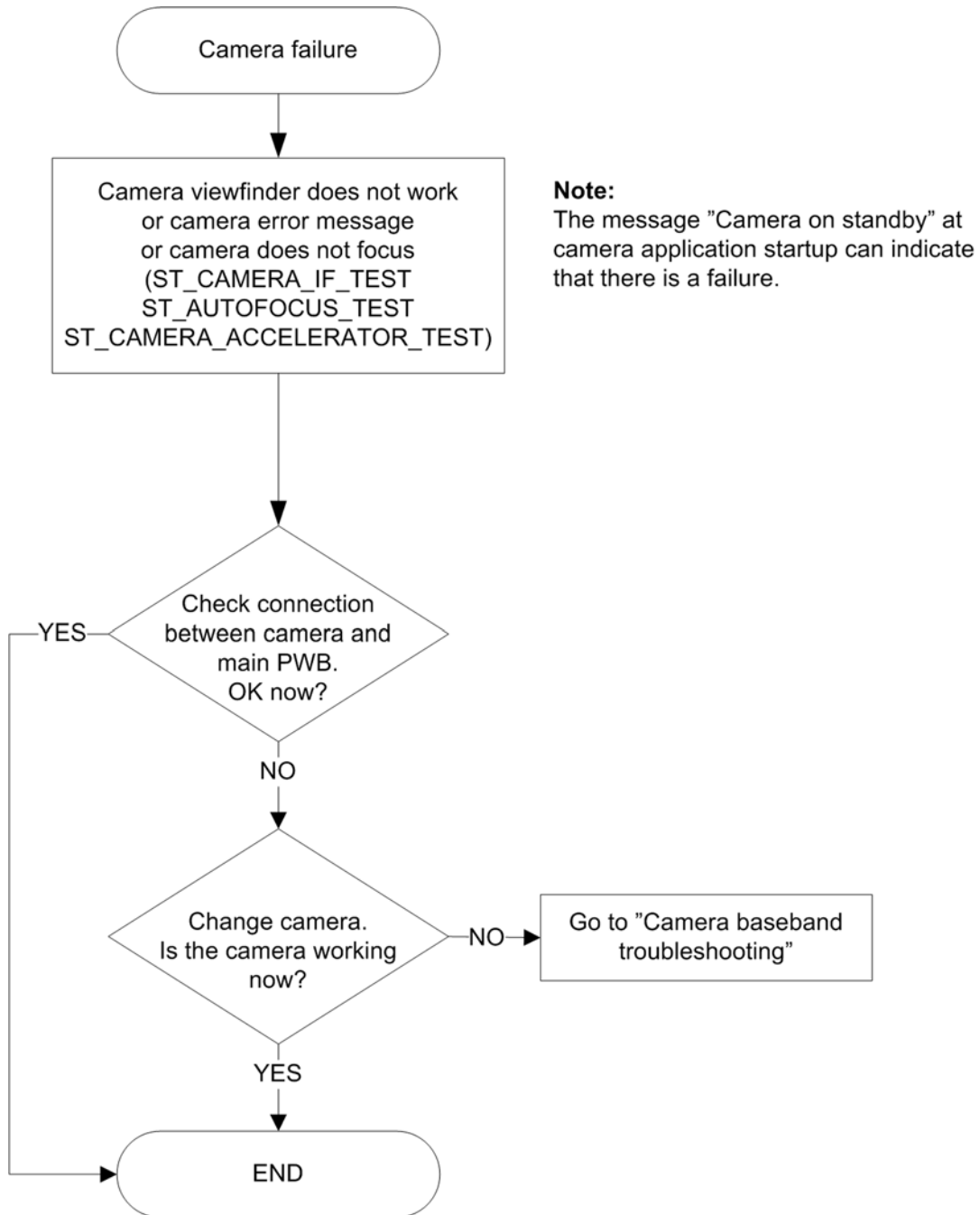
- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is sufficient (bright office lightning)
- 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!

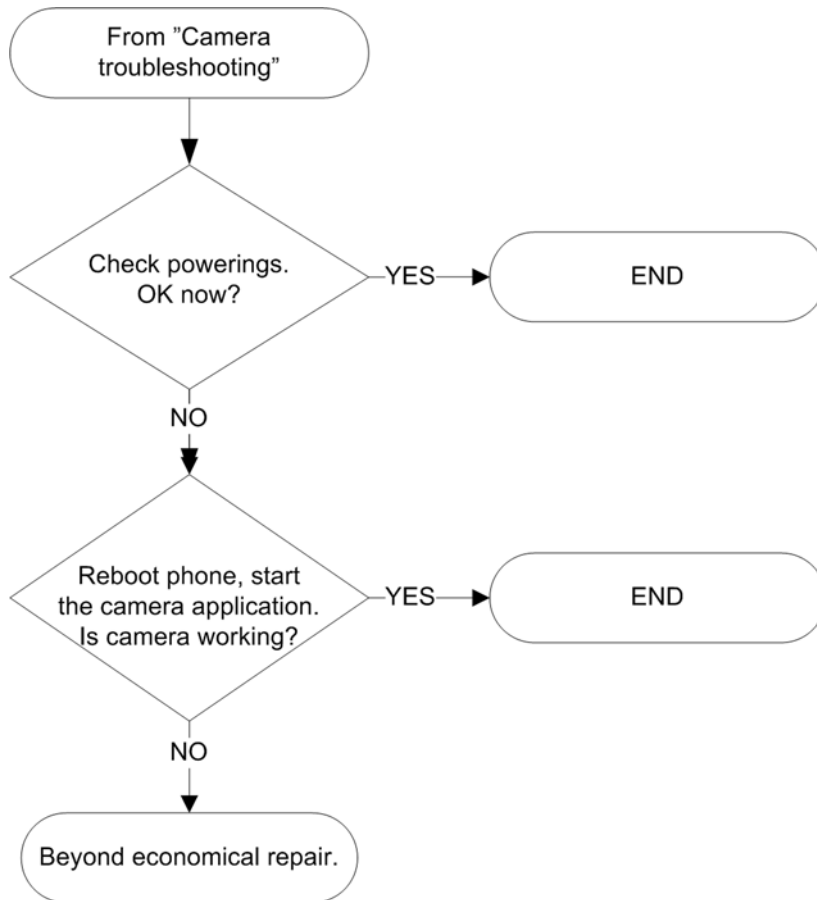
## Camera troubleshooting

### Troubleshooting flow



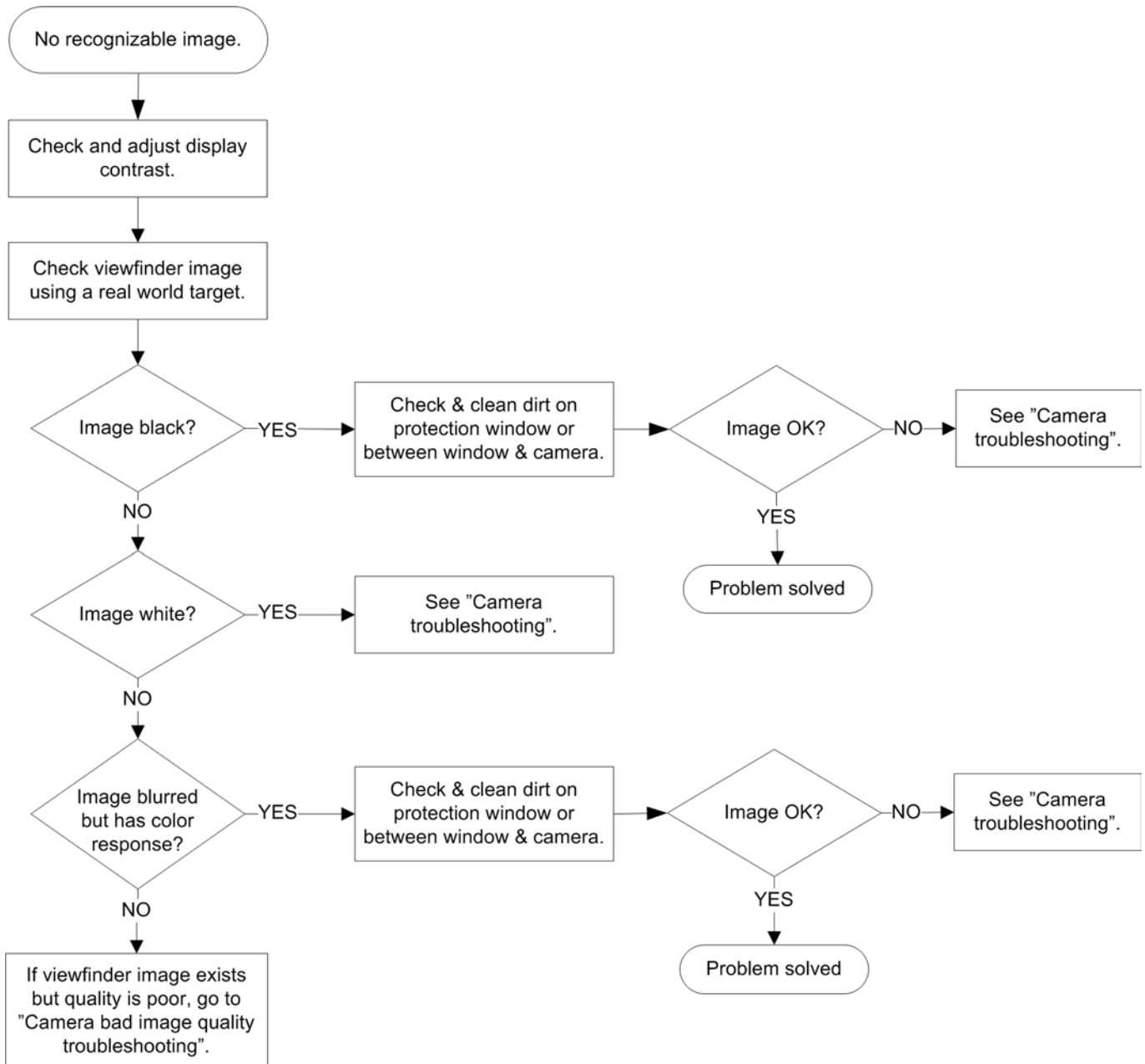
*Camera baseband troubleshooting*

**Troubleshooting flow**



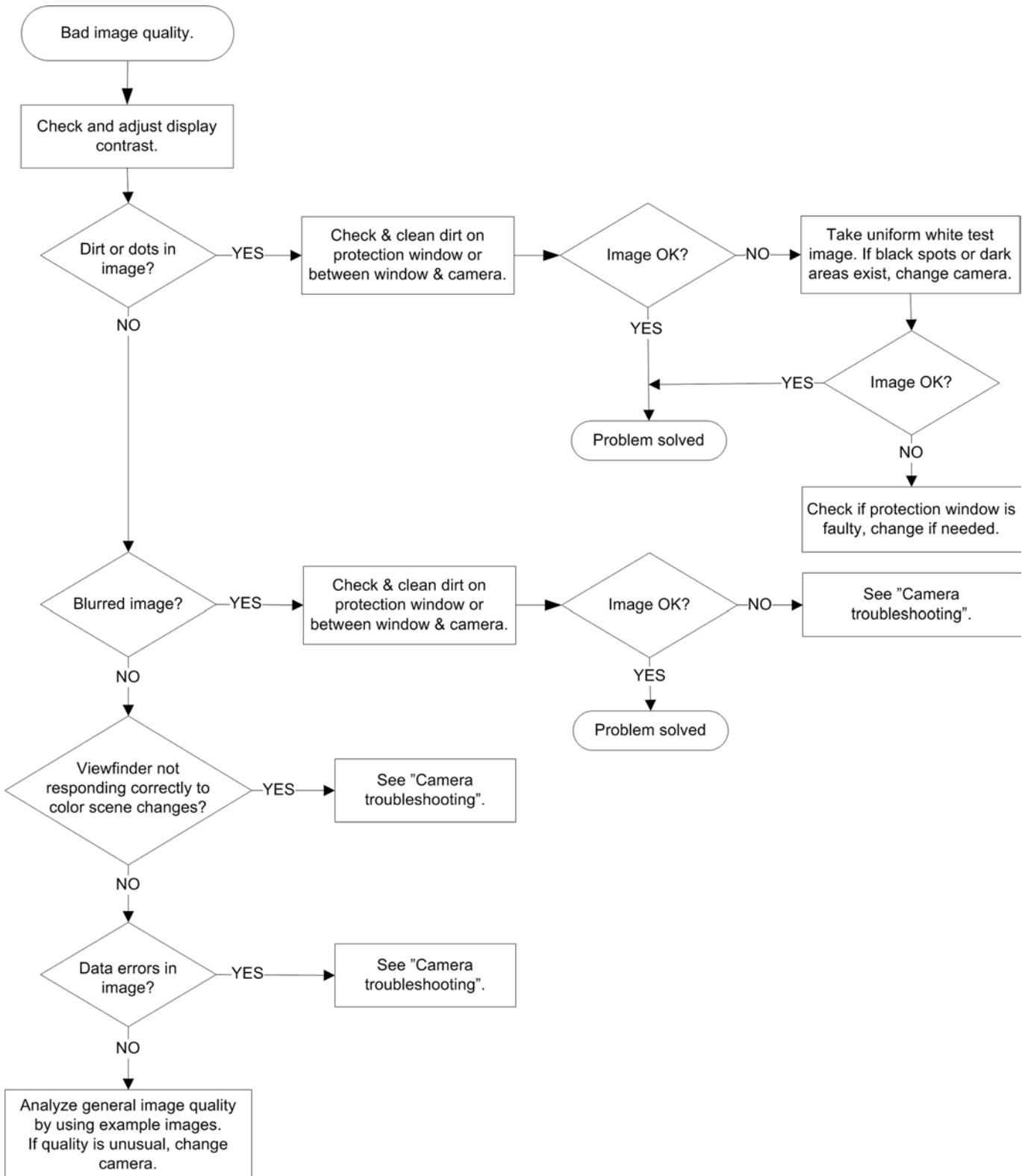
### Camera no recognizable viewfinder image troubleshooting

#### Troubleshooting flow



*Camera bad image quality troubleshooting*

**Troubleshooting flow**

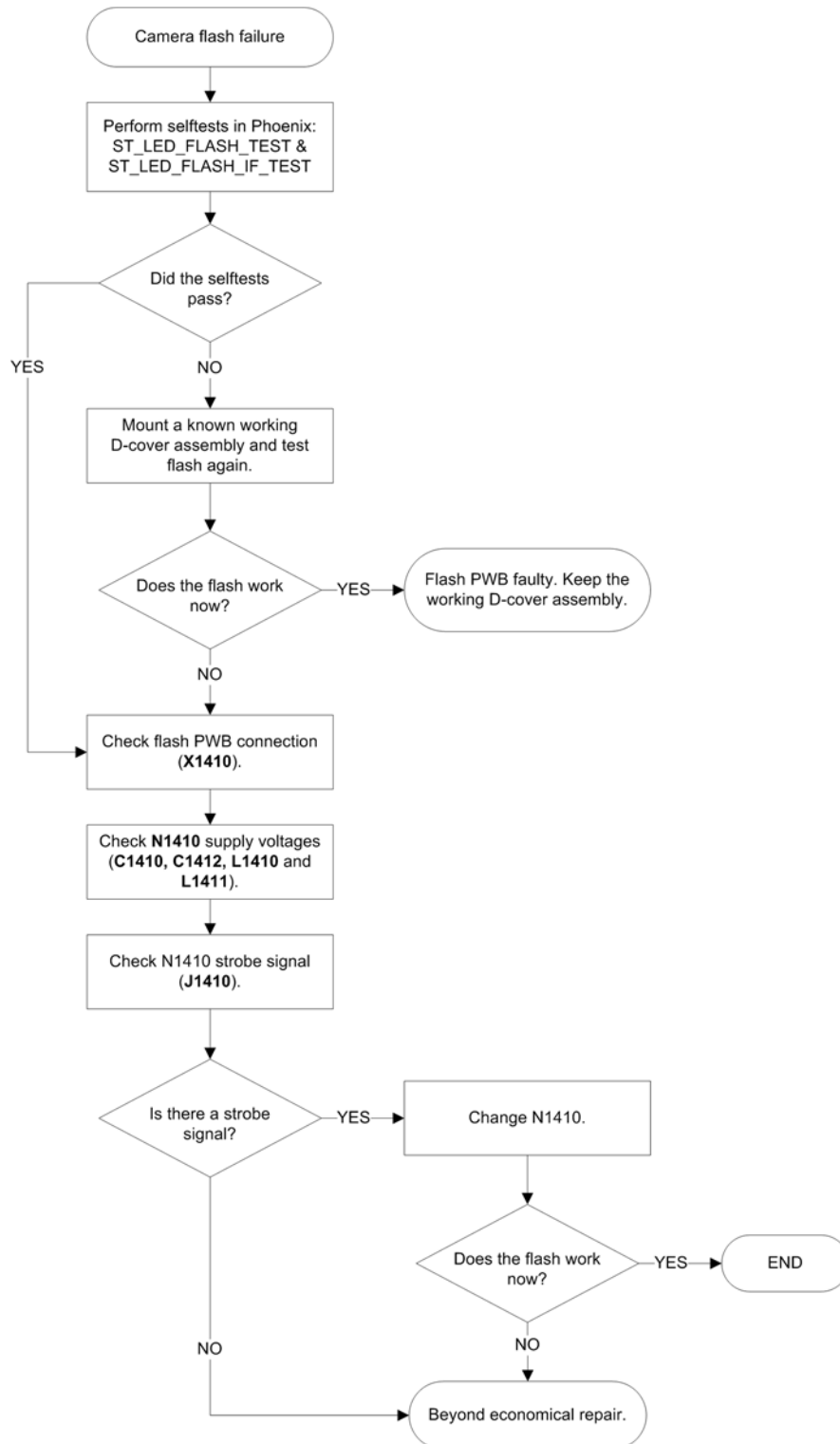


## Camera flash troubleshooting

### Context

**Note:** Before checking flash functionality, make sure that the camera is working ok.

### Troubleshooting flow



## ■ Audio troubleshooting

### Audio troubleshooting test instructions

Differential external earpiece and 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)
- Phoenix service software
- Battery voltage 3.7V

### Test procedure

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

- Mic2P to Internal earpiece
- Mic2P microphone to Internal handsfree speaker

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

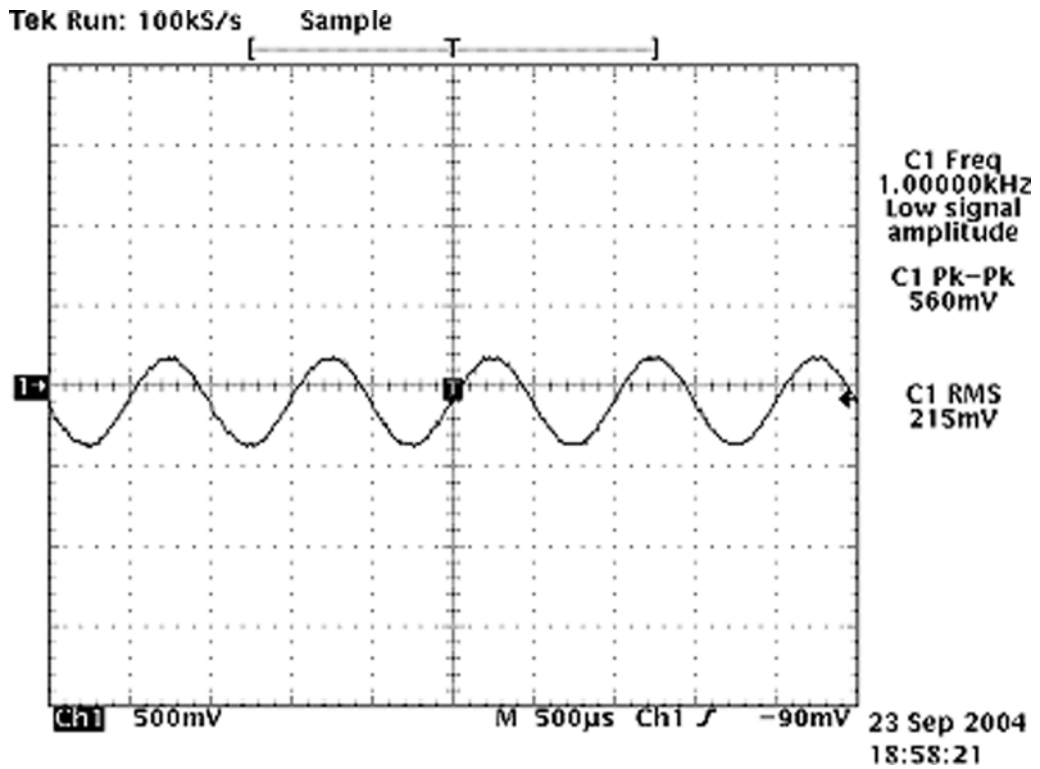
The results presented in this table apply when no accessory is connected and battery voltage is set to 3.7V.

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] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to Internal Earpiece	E2005	EarP and EarN	~9	100	288	NA	NA
External Mic to Internal handsfree	E2005	IHFSpLP and IHFSpLN	~16	100	600	NA	NA

## Measurement data

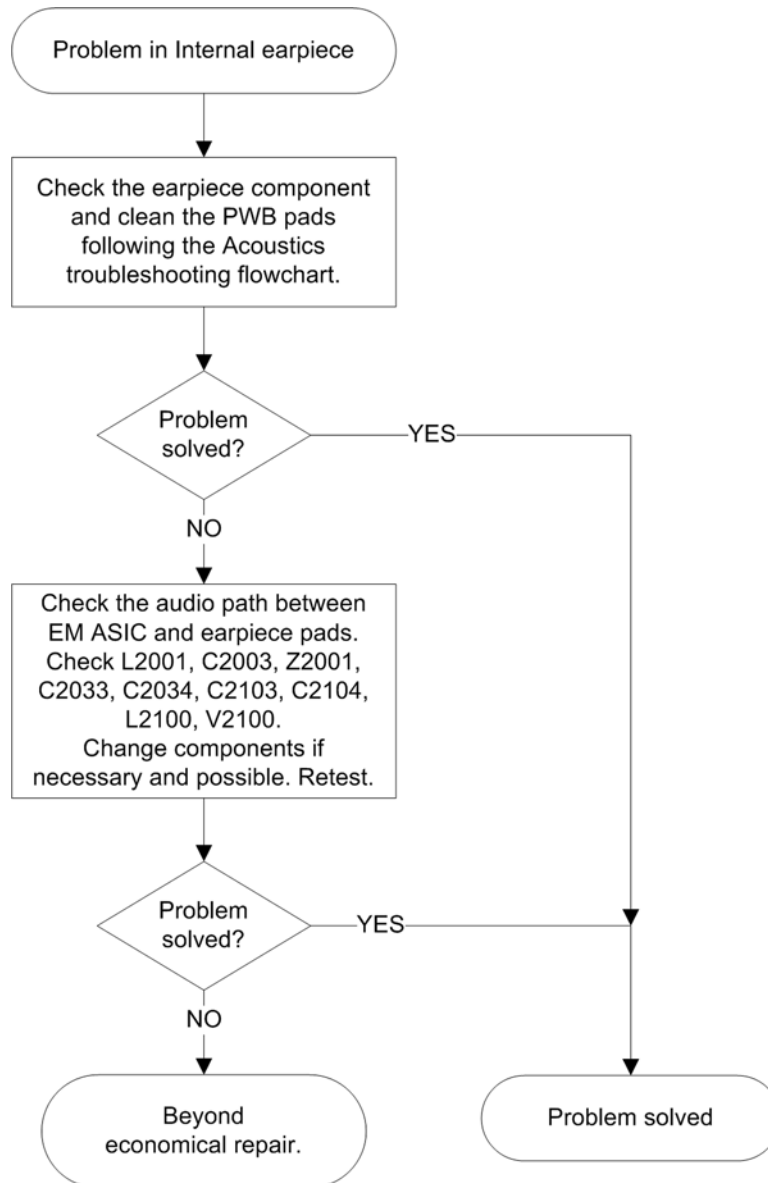


If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

**Figure 14 Differential output waveform of the Ext\_in\_IHF\_out out loop measurement when speaker is connected.**

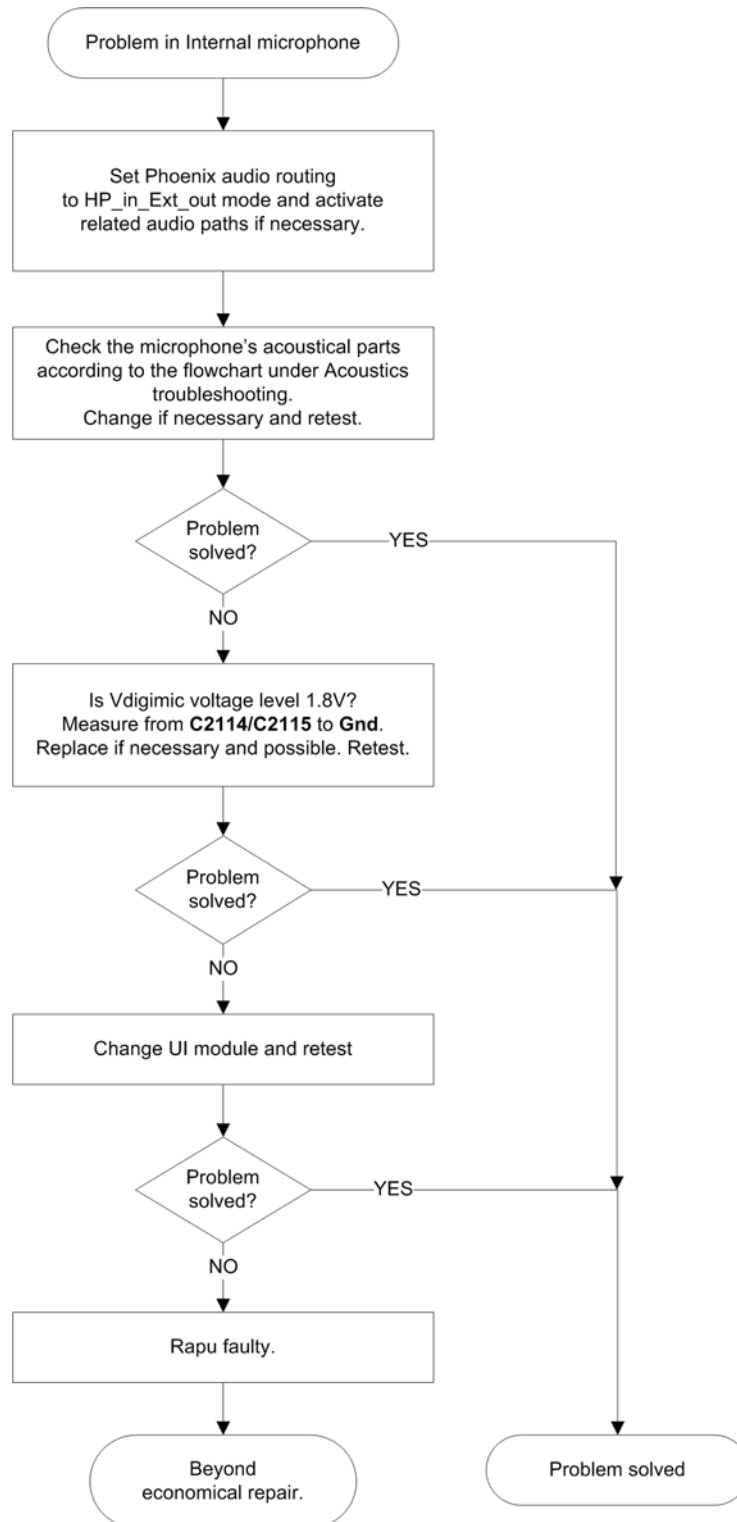
## Internal earpiece troubleshooting

### Troubleshooting flow



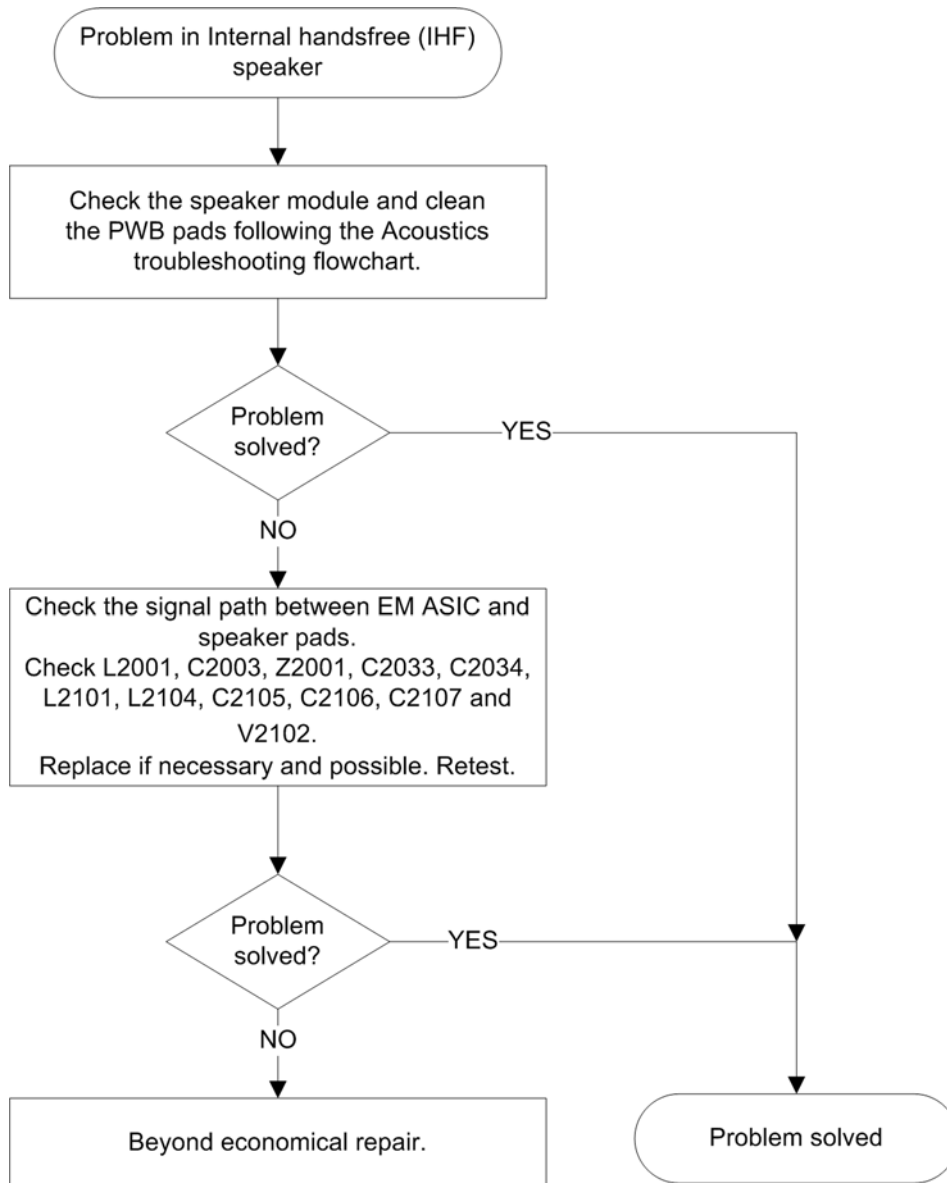
## Internal microphone troubleshooting

### Troubleshooting flow



## Internal handsfree (IHF) troubleshooting

### Troubleshooting flow



## Acoustics troubleshooting

### Introduction to acoustics troubleshooting

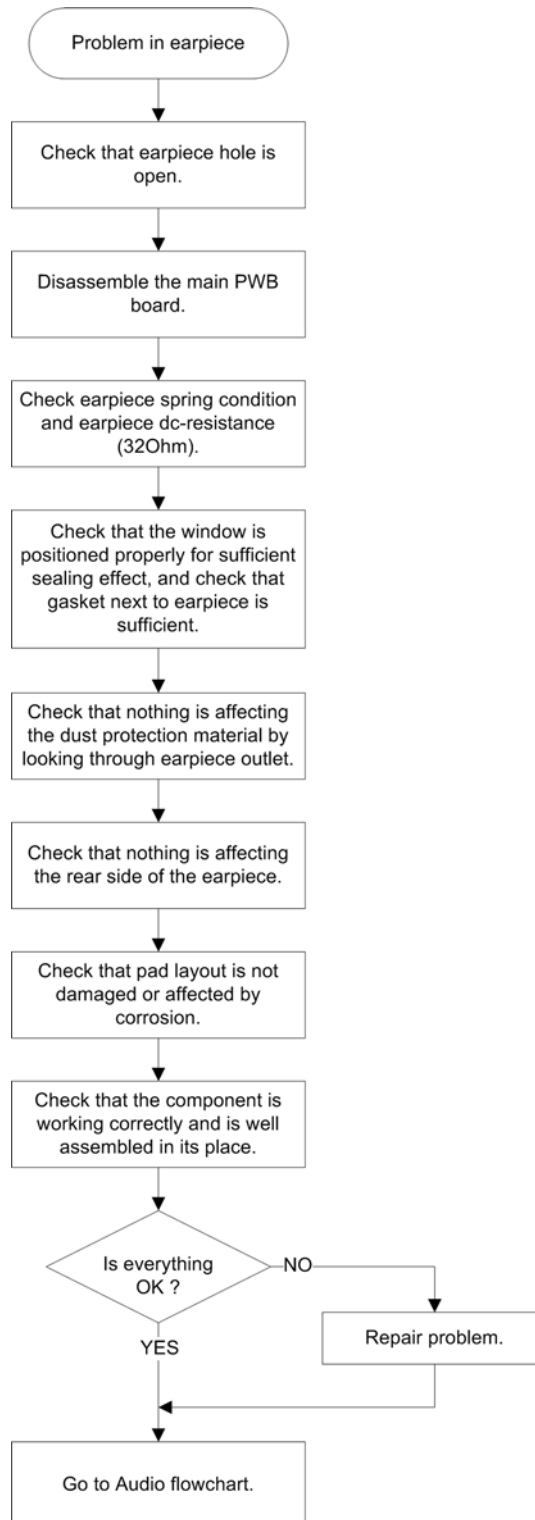
Acoustics design ensures that the sound is detected correctly with a microphone and properly radiated to the outside of the device by the speaker. The acoustics of the phone include three basic systems: earpiece, integrated handsfree (IHF) and microphone.

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 hole located on the back side on the top part of the phone. The inlet for the microphone is found in the bottom.

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.

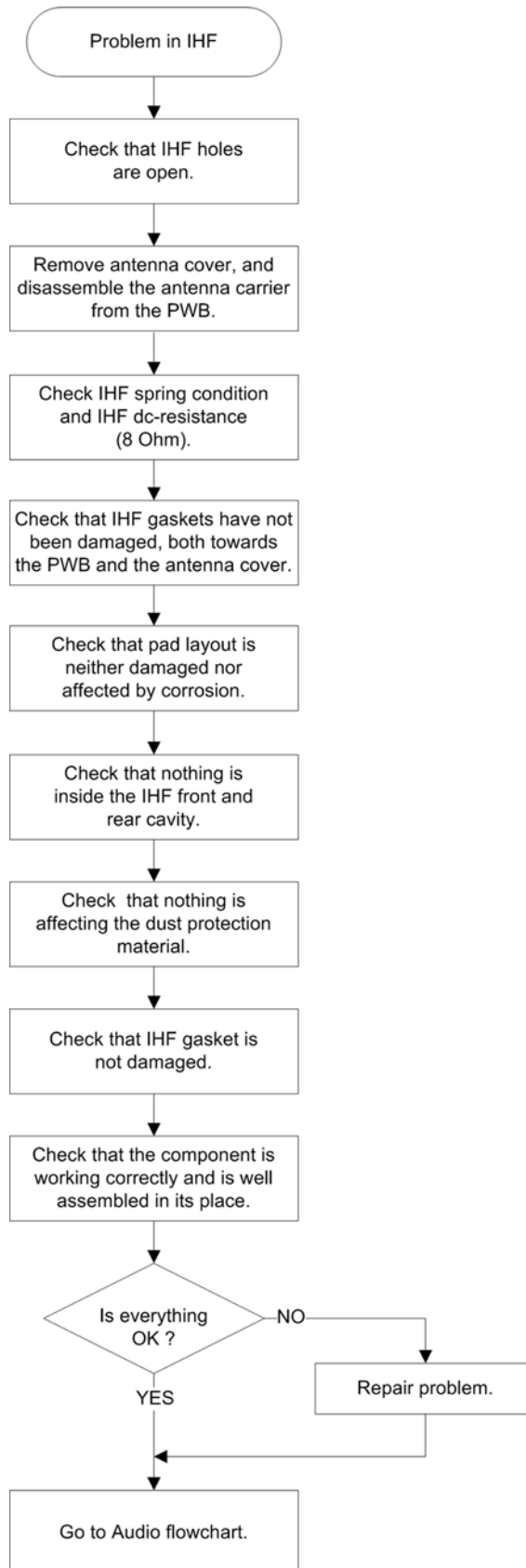
## Earpiece troubleshooting

### Troubleshooting flow



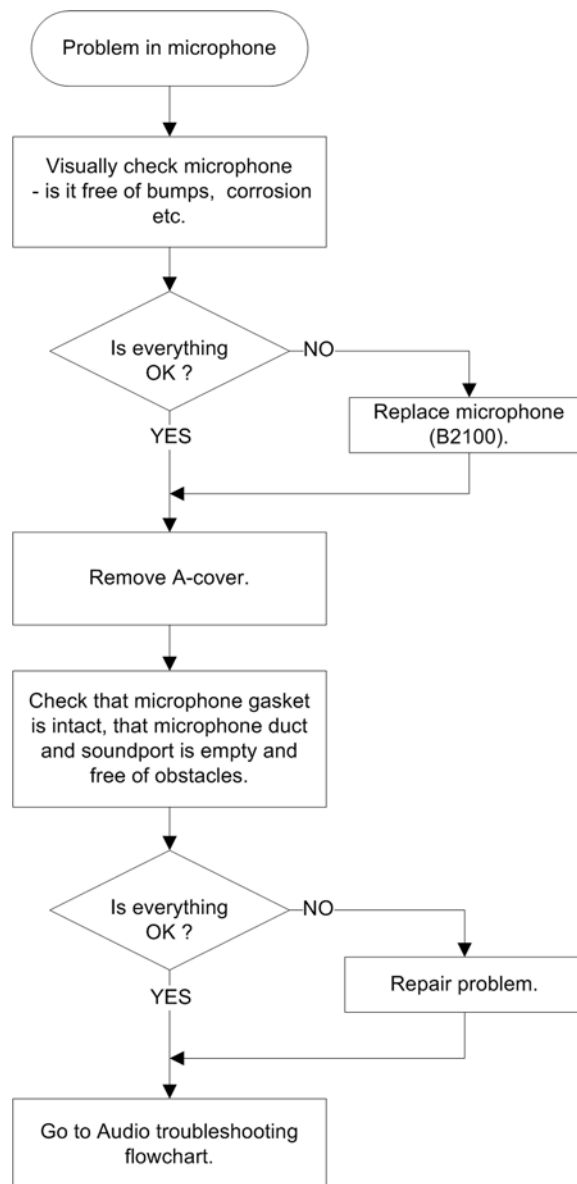
*IHF troubleshooting*

**Troubleshooting flow**



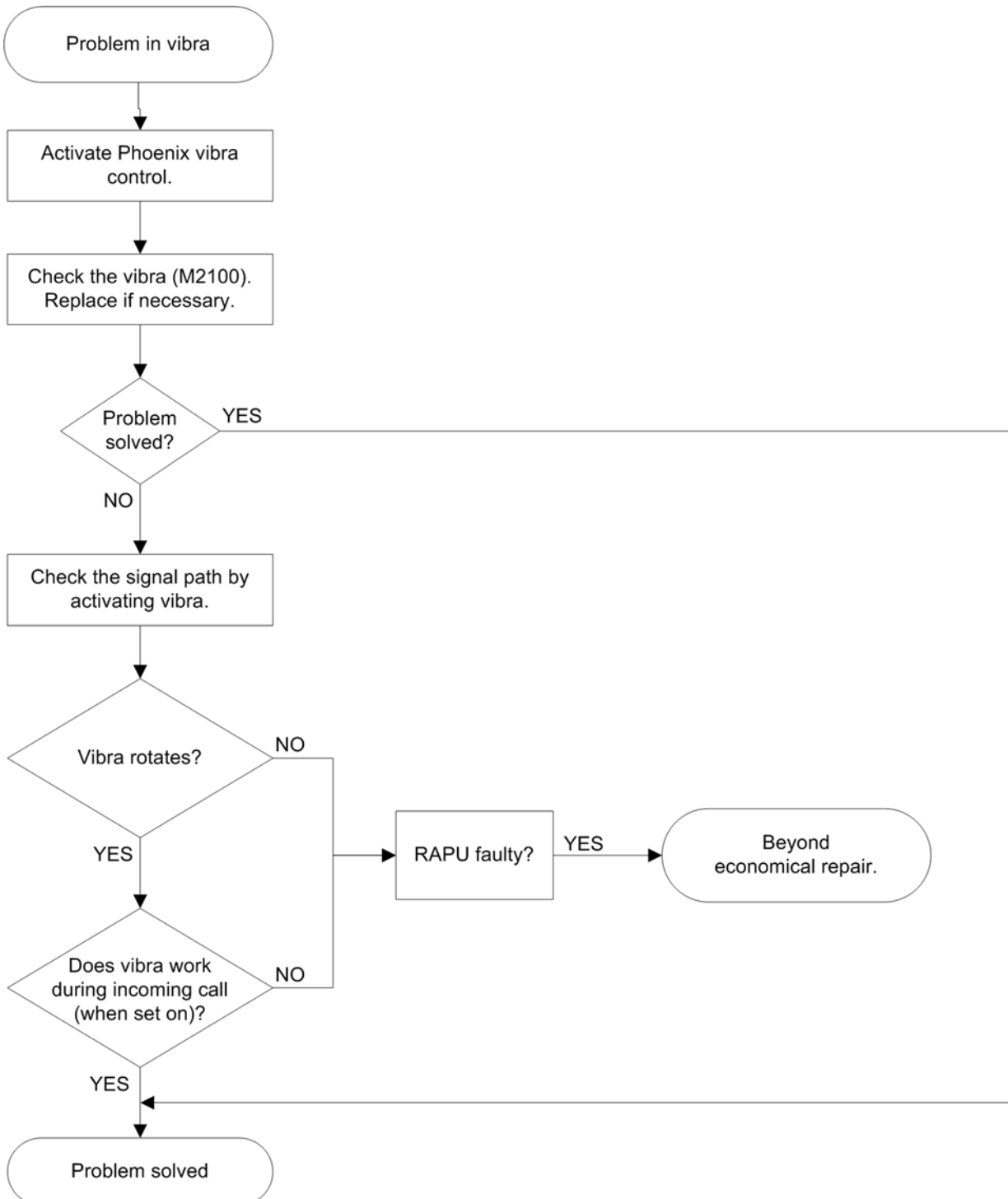
## Microphone troubleshooting

### Troubleshooting flow



## Vibra troubleshooting

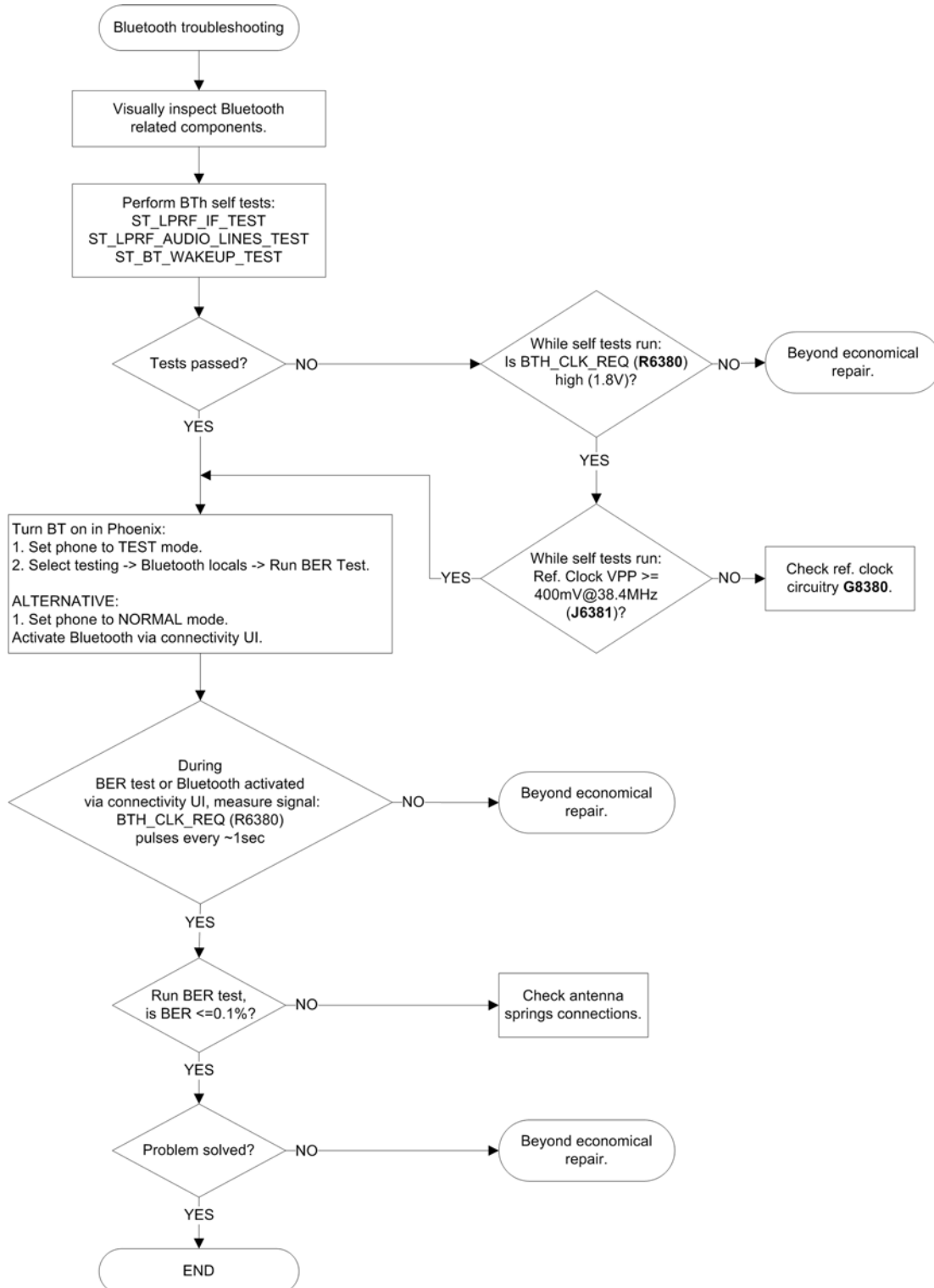
### Troubleshooting flow



■ **Bluetooth and FM radio troubleshooting**

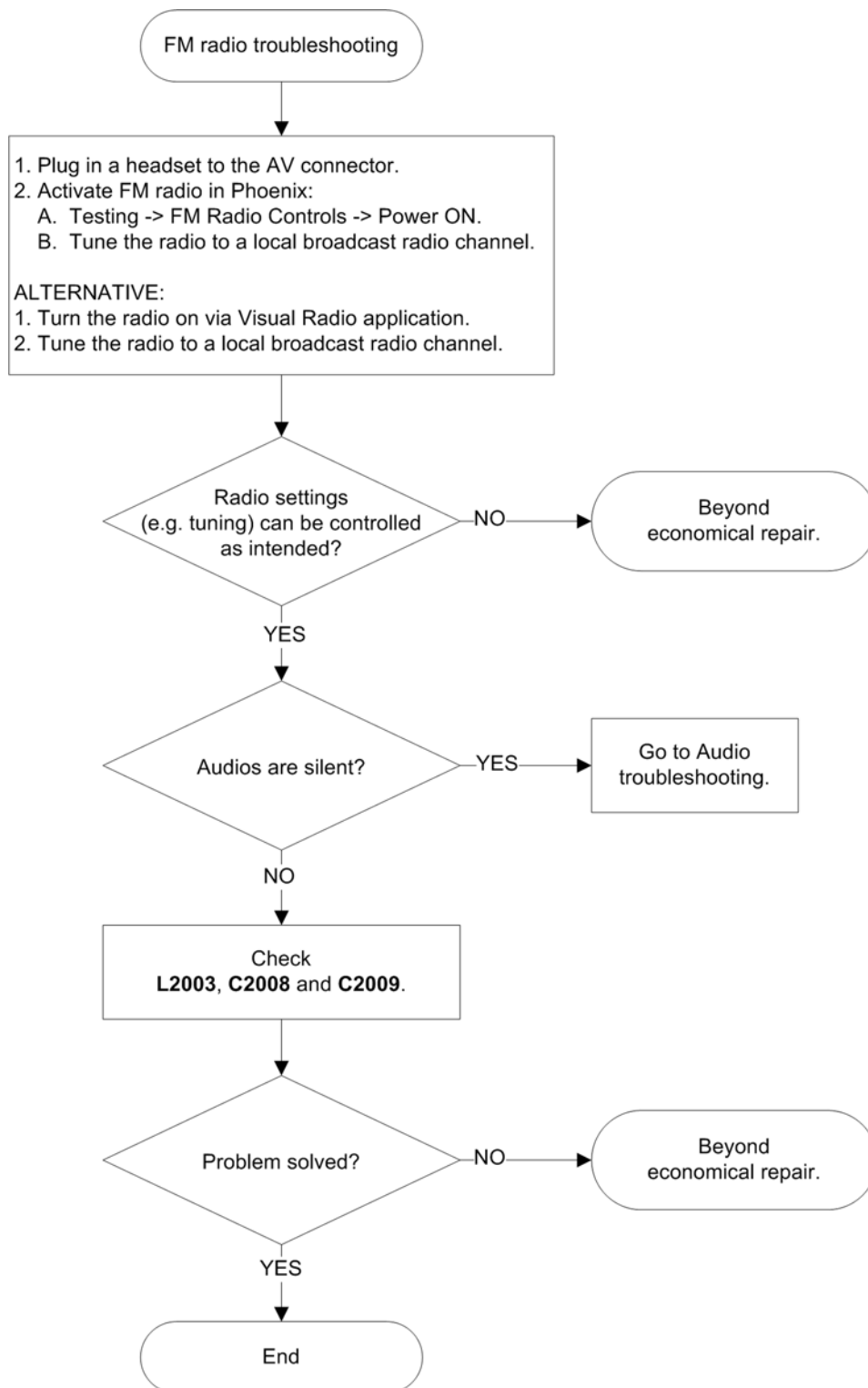
**Bluetooth troubleshooting**

**Troubleshooting flow**



## FM radio troubleshooting

### Troubleshooting flow

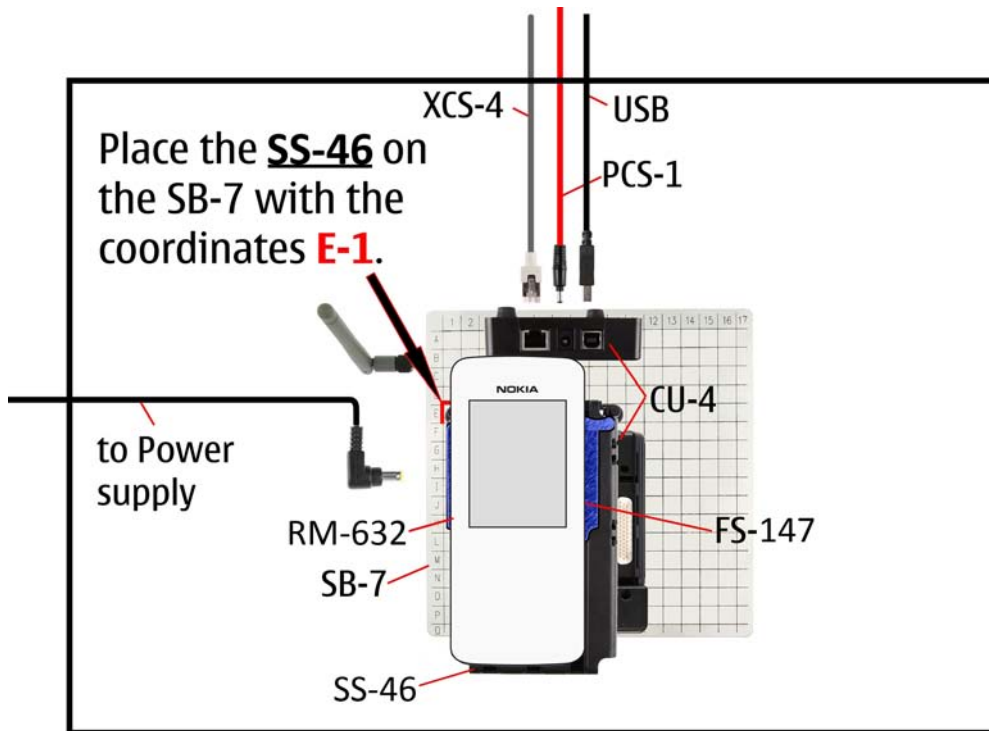


## ■ WLAN troubleshooting

### WLAN functionality test using SB-7 and Phoenix

#### Steps

1. Place the phone on the SB-7 WLAN test box (see figure below). The co-ordinates are E1 - for the upper left foot.



2. Start *Phoenix* service software and turn the phone to normal mode.
3. Make connection to the phone with *Phoenix*, if the phone powers up in local or test mode, then select **Normal** or **RF inactive mode** via the *Phoenix* **Operating mode** function.
4. Search for **SB-7 WLAN Test box** via **WLAN application**. Go to **Menu**→**settings**→**Connectivity**→**Wi-Fi**. Select the first item on the sub-menu **Available Networks**
5. If the name of the **WLAN test Box**"default" appears on the list of found networks, the phone is OK.

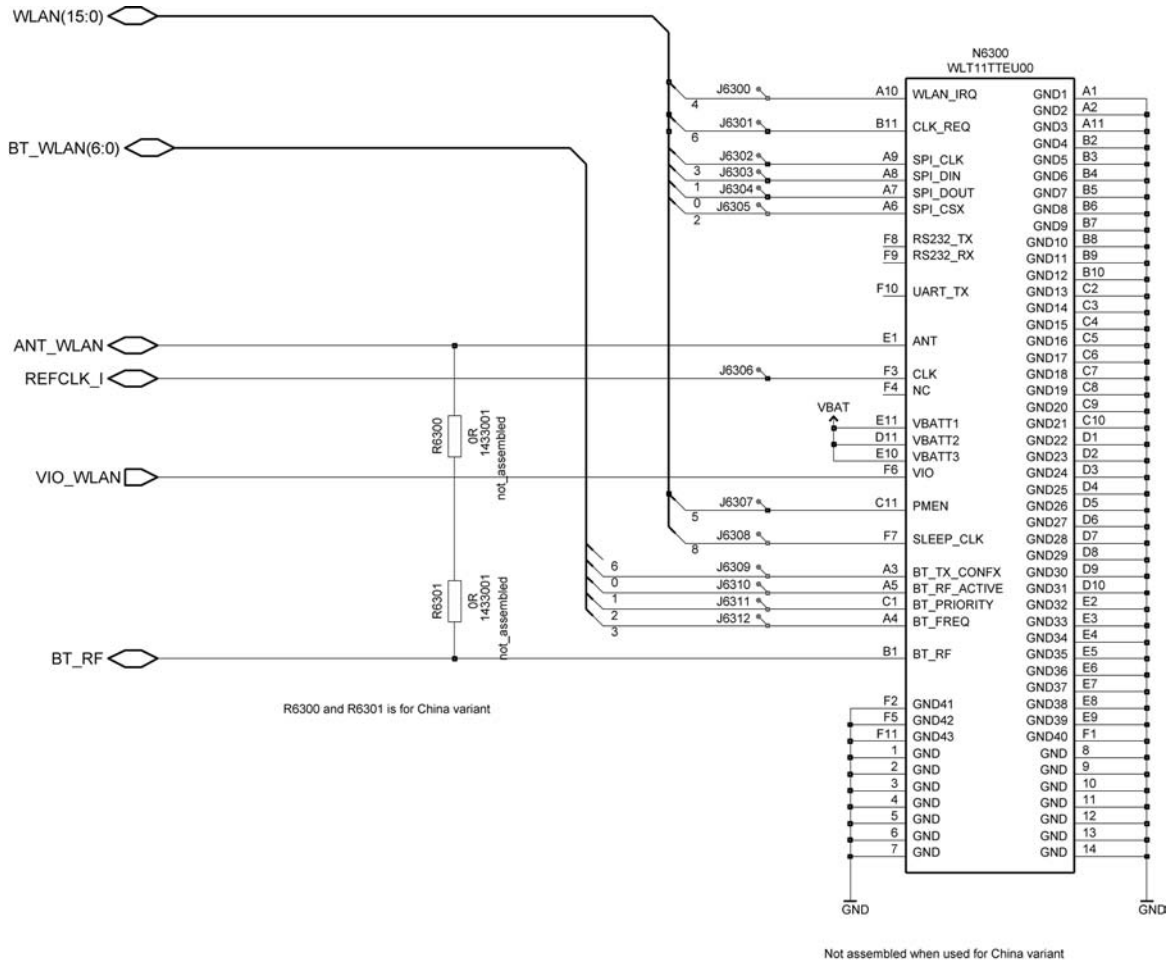
**Note:** Local WLAN environment may affect test results, especially if there are many WLAN access points nearby and any of them are using the same WLAN channel as SB-7. If the phone is able to see and connect to local WLAN networks via its own inbuilt WLAN menu, then the phone is OK even if the SB-7 can not be detected. Consider repeating the test where local networks do not interfere with the lower strength signal of the SB-7 box.

If you still can't find the name of the WLAN test Box (Default) on the list under Scan results, the phone is not OK and you should proceed to WLAN troubleshooting.

### WLAN layout and test points

The WLAN module has been optimised to achieve the smallest possible PWB area and adding test points will compromise this layout efficiency. There is also an added risk that test point will compromise the WLAN performance – the layout is quite sensitive and there have been EMC issues that were directly attributed to use of test points.

The recommendation is to use no test points and use software tests in Phoenix to verify the operation of the WLAN module. For reference, all test points provided on the schematic are summarised below.



The sequence of events during the start up of WLAN is:

- 1 PMEM is asserted high when Wlan module is first enabled by the Host.
- 2 WLAN module should respond by driving CLK REQ high to request the 38.4MHz clock.
- 3 Host engine turns on the 38.4MHz clock and then generates the SPI Clock to start the download of software to the WLAN module.

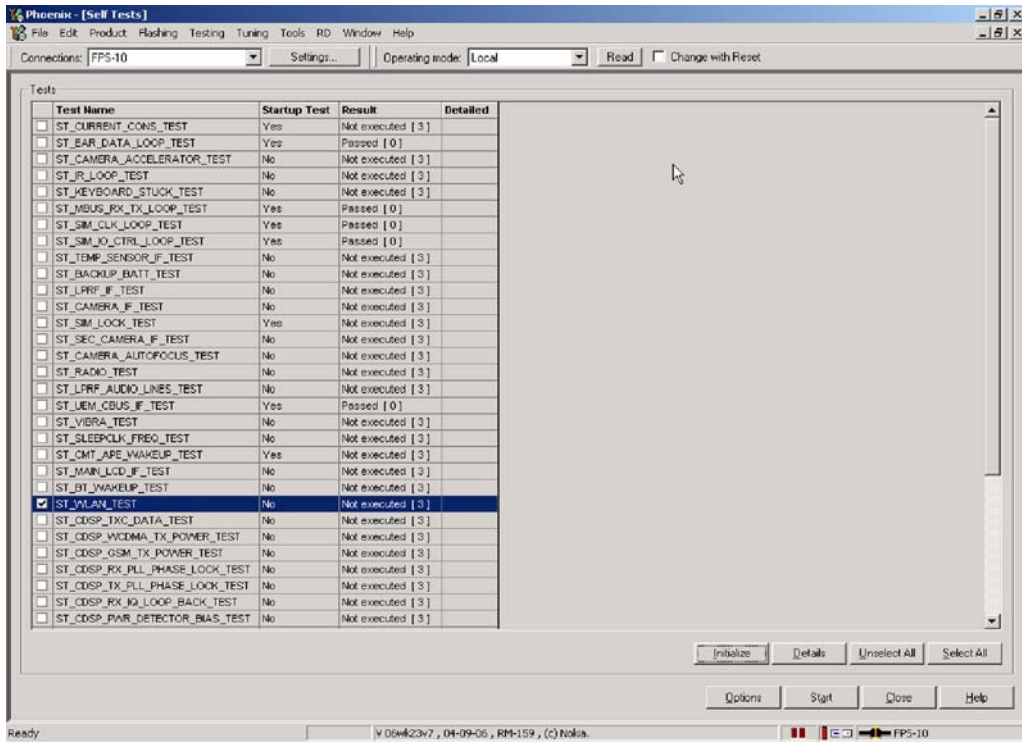
Adding more test points in a product is not strictly necessary.

### WLAN settings for Phoenix

Use the following to test WLAN using Phoenix:

- 1 Set phone into Local Mode .
- 2 From the **File** menu, select **Scan Product** and check that the correct product version is displayed
- 3 From the **Testing** menu, select **Self Test**. This opens up a Self Test dialogue box, as shown below.

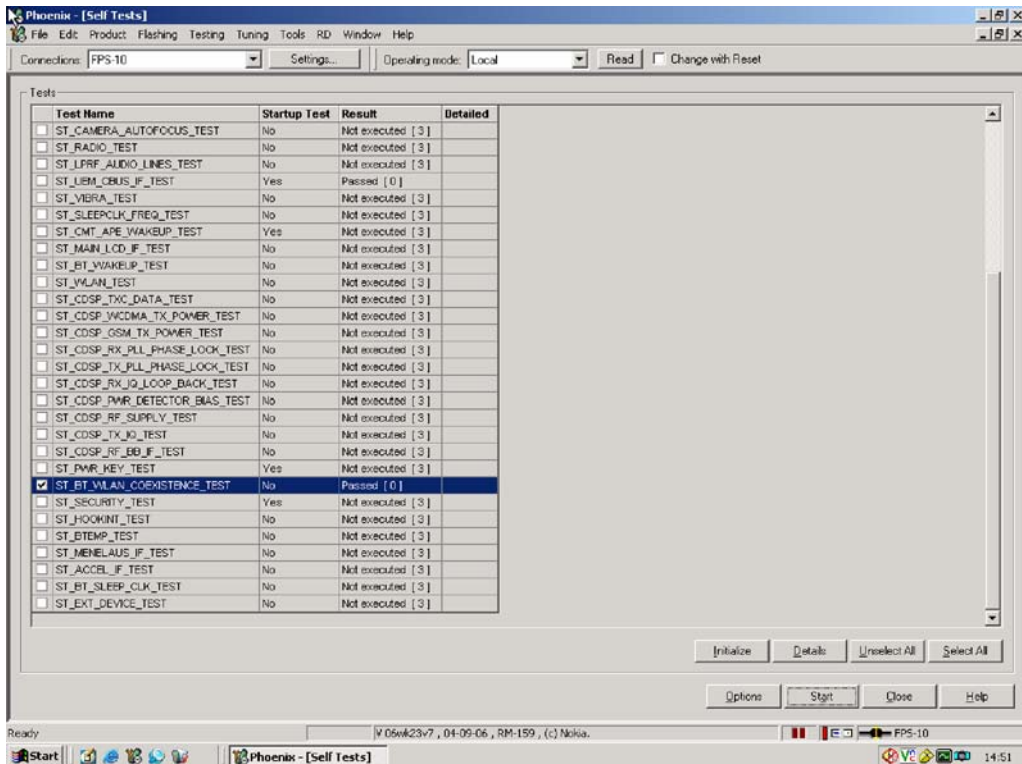
Select the **ST\_WLAN\_TEST** check box as shown and then select **Start** button. The test turns on the WLAN, sets up the SPI interface and then downloads the WLAN firmware into the WLAN module. During the download the WLAN acknowledges the data blocks and so the self test is a good way to confirm that the WLAN module is communicating with the Host. The result column will change to **Passed** after a few seconds if operating properly.



In addition, a test of the WLAN to BT interface can be done by selecting the **ST\_BT\_WLAN\_COEXISTENCE\_TEST** check box and selecting Start button.

This test verifies that the WLAN to BT co-existence interface signals are properly connected and there are no open circuit or shorts on the four interface signals.

The co-existence interface comprises BT Txconfig, BT RF Active, BT Priority, and BT Frequency.



In summary these two Self tests provide a simple means of ensuring the Host engine is able to communicate with the WLAN module and check the interface to BT. More detailed WLAN performance test is covered in WLAN functional test section.

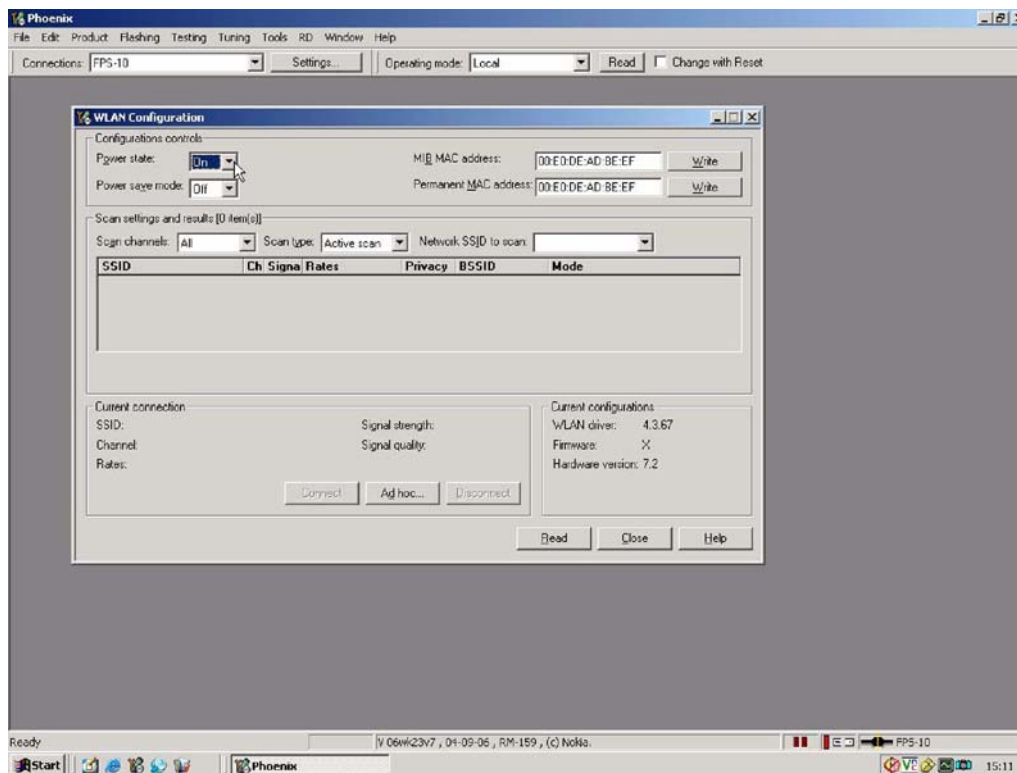
## WLAN functional tests

### On/Off test

From the testing toolbar select **WLAN Configuration** option. This opens the WLAN configuration dialogue box below. Selecting the Power state option button (as indicated), the WLAN can be turned ON and OFF:

- 1 With Power State set to OFF, measure the dc power supply current consumption of the flash adaptor.
- 2 Next return the Power state to ON and re-measure the dc power supply current of the flash adaptor.

The difference between the currents in (1) and (2) should be between 160 to 200mA. When WLAN is ON, the firmware has been downloaded and the WLAN module is in the receive state. When OFF WLAN is powered down.

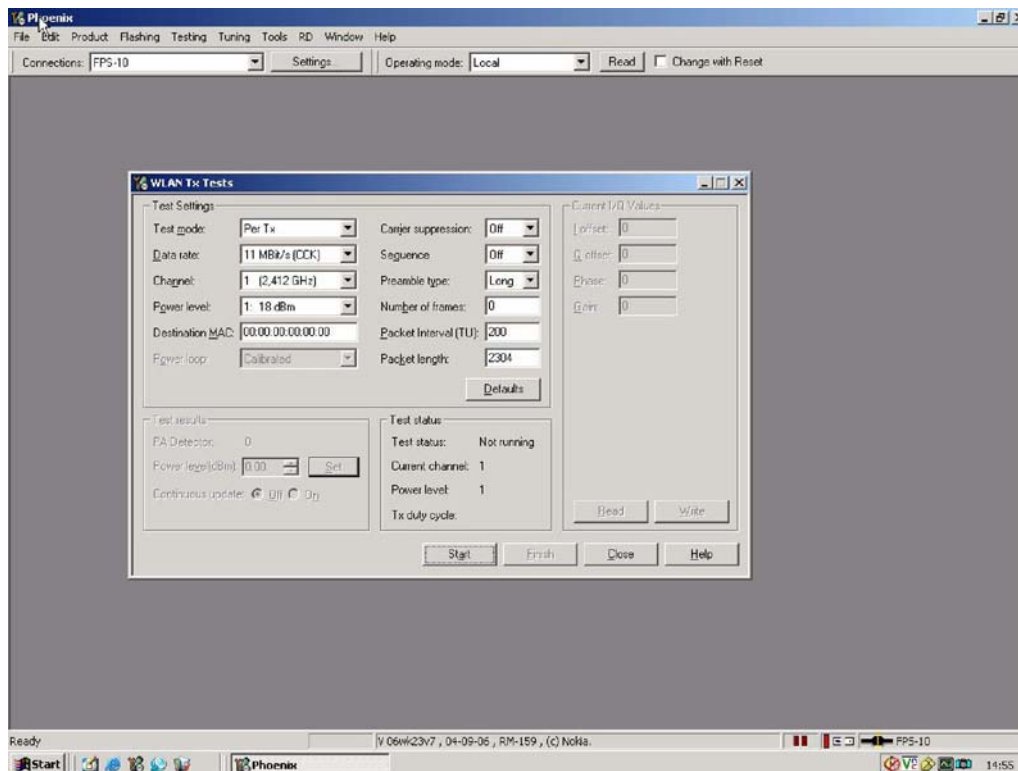


### TX tests

From the testing toolbar select WLAN Tx Test option shown below. This test can be used to verify TX configuration and functionality. The default settings are sufficient for testing the TX operation, although other channels and data rates are equally suitable. To start the test, select the Start option button:

- 1 Measure and record the TX ON current consumption of the Phone/ flash adaptor.
- 2 Monitor the WLAN TX spectrum on a Spectrum analyser either using a co-ax cable connected to the WLAN TX antenna port or by making a radiated test with a suitable WLAN antenna connected to the spectrum analyser input. (When making a radiated test ensure that other WLAN devices are not transmitting as these may be detected as well, confusing the result).
- 3 To finish the test select the Finish option button
- 4 Measure the TX OFF current consumption of the phone/flash adaptor.

The difference between the two readings should be 100mA – 130mA and measures the transmit current in 11MBPS, 802.11b mode of operation.



## RX Tests

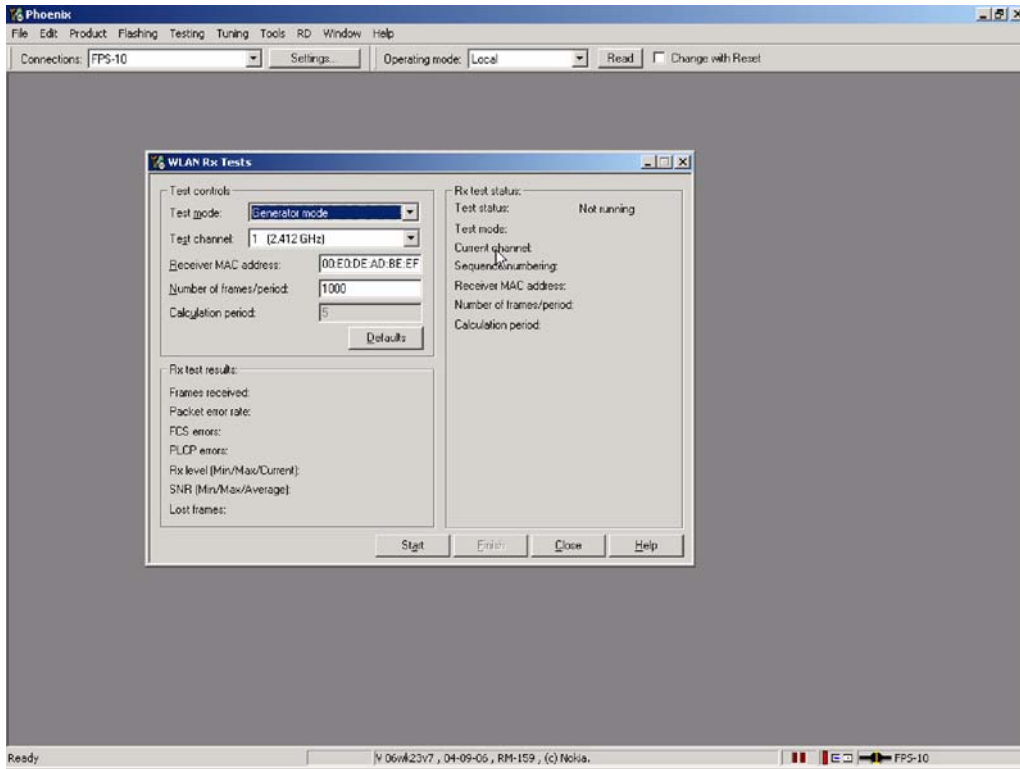
There are different options available for testing the Rx path. The simplest is to use the WLAN to report Rx packets when operating in an area where there is an active WLAN network. Simply starting an Rx test will show the number of packets detected by the WLAN module as it monitors the network. However, it does require a properly configured WLAN network. The alternative approach is to make a conducted test using a signal generator connected to the WLAN antenna port. The drawback in this approach is that the WLAN antenna connection in the phone is not actually tested.

From the testing toolbar select WLAN Rx Test option shown below. This test can be used to verify Rx configuration and functionality.

Before starting the test, change test mode to "Generator mode" and then select the Start option button to start the test.

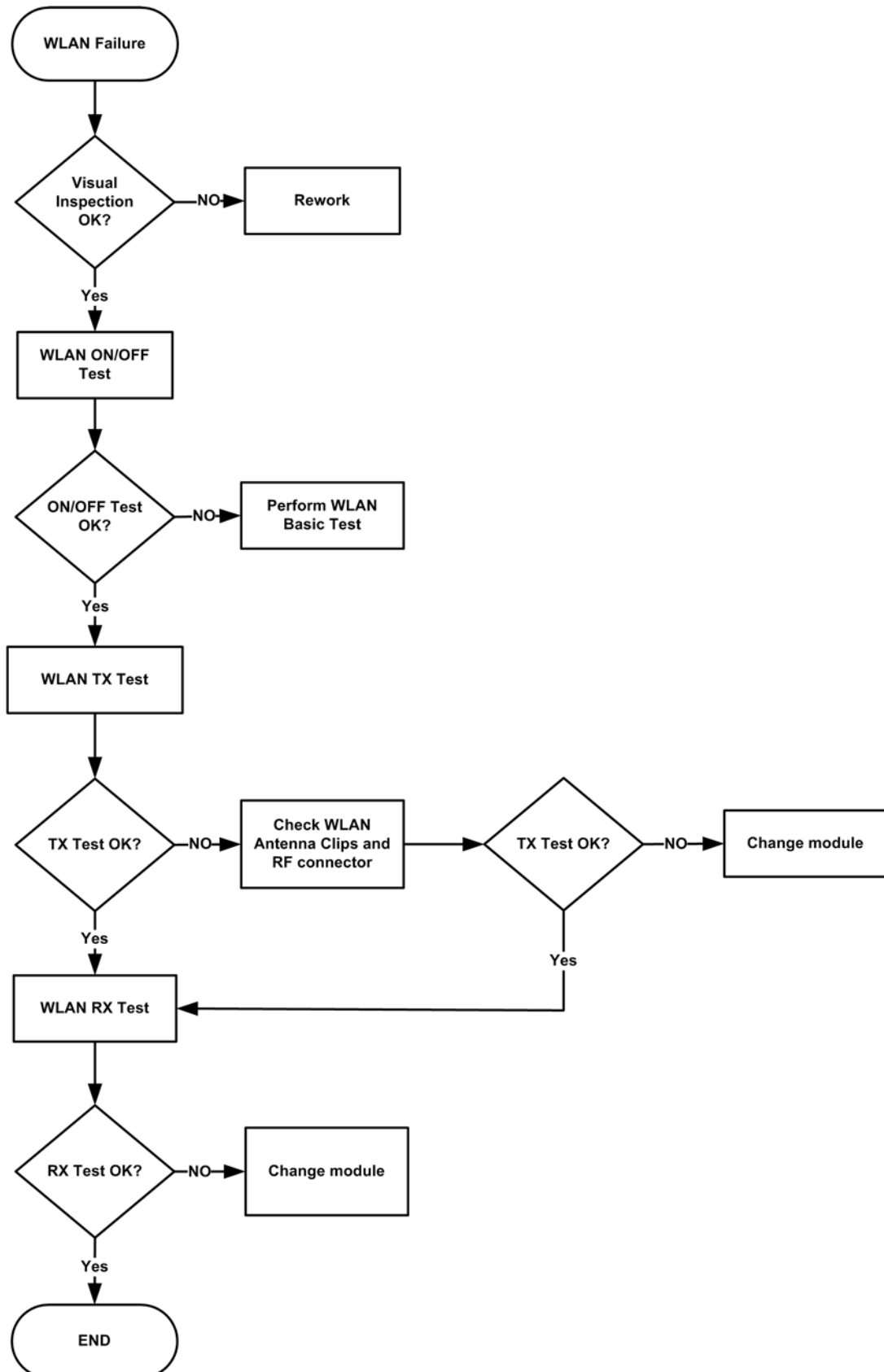
As the WLAN monitors an active WLAN network, the Rx test results window will update and show the number of Frames received, as well as the Packer error rate. If there is no data reported in the "Rx test results" screen, please change the "test channel" number.

Monitoring the detected frames is a simple method to verify the WLAN antenna and receiver path is working properly. The current consumption of the phone/flash adaptor before and during the Rx test should be the same (10 mA max difference).



## WLAN failure troubleshooting

### Troubleshooting flow



## ■ Baseband manual tuning guide

### Certificate restoring

#### 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.

Required equipment and setup:

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

Connection to Tucson online server:

- All requests are handled online. That means a permanent Internet connection is required. Previously used e-mail based system is no longer in use.
- Phoenix, when contacting Tucson server, is using IP address, **147.243.3.169 port 443**

Terms in Tucson:

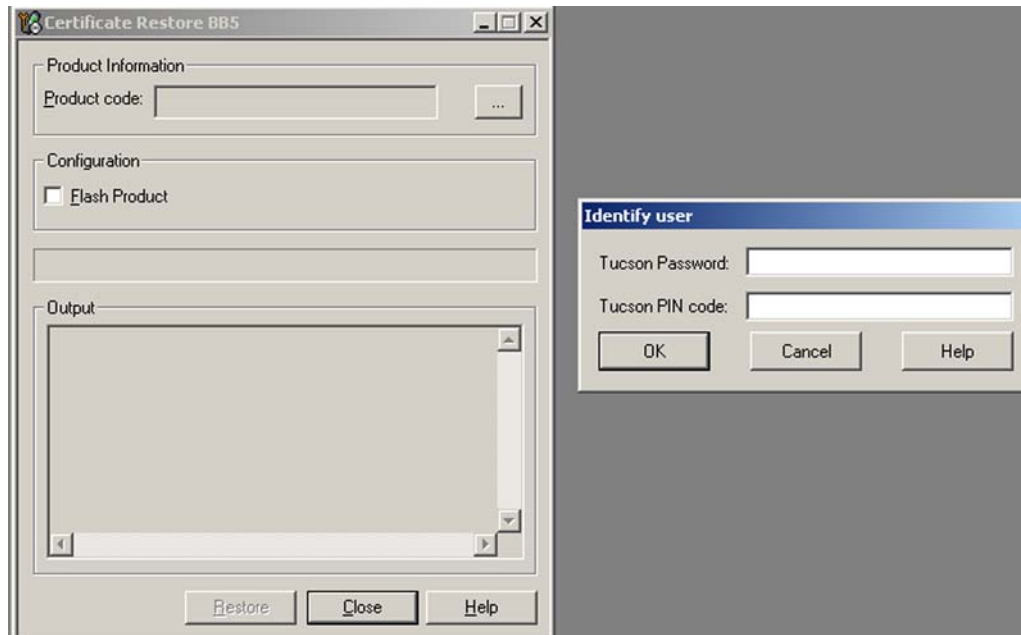
- When certificate restoring for BB 5 products or IMEI rebuild for DCT-4 products is performed, existing data from Nokia System is programmed in the phone. The phone will be in the same condition as it was when it left the factory for the first time.
- If “Product Code Change” has been SUCCESSFULLY performed with Tucson after the phone left the factory, it will be restored back to the variant it was made into during Product Code change event.
- It is recommended to perform “Restore” function without selecting “Flash Product” – option to avoid possible SW downgrade which causes the phone to die.

The procedure for certificate restoring is the following:

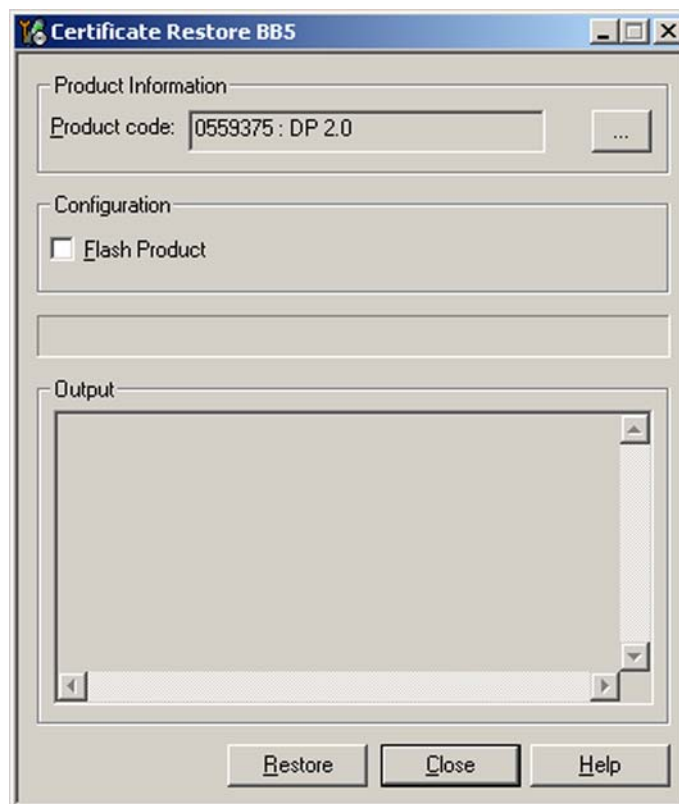
#### Steps

1. Connect phone and scan product, read phone information to check communication with phone.
2. Open *Tools->Menu*.

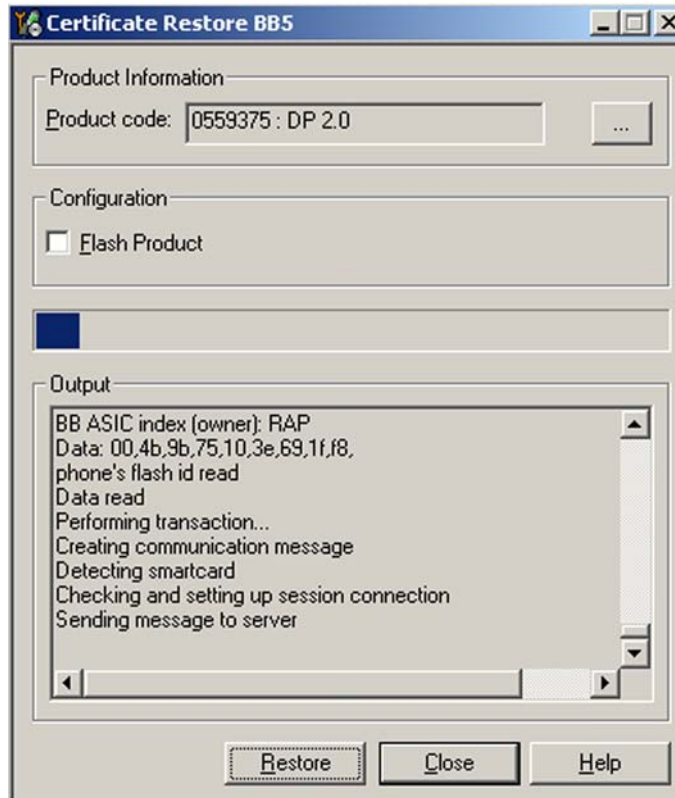
3. Provide Tucson password and PIN code which have been delivered to you by email. Please note that characters are case sensitive.



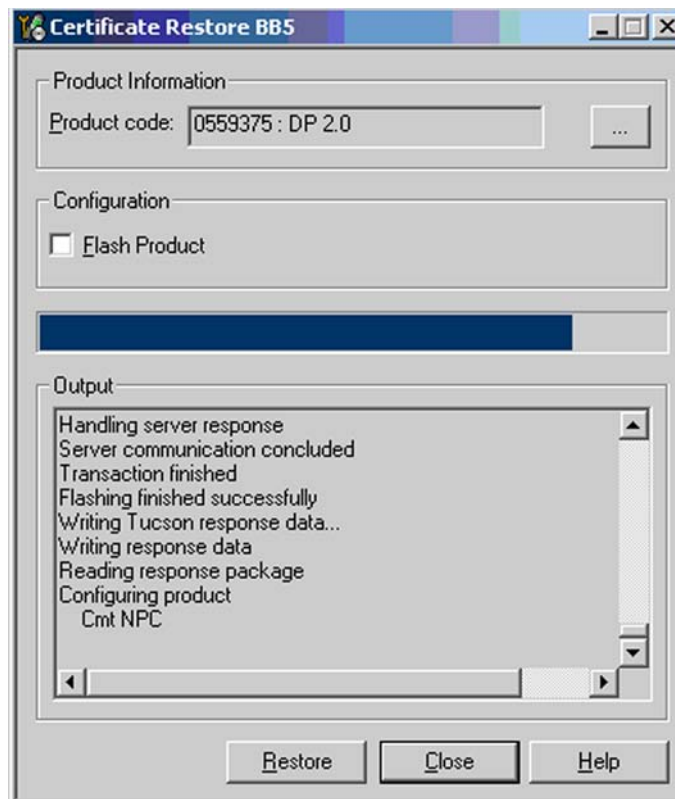
4. Select OK, Phoenix will read product information from phone.
5. Product code shown on the UI does not matter, because during restoring it will be replaced by the product code which is the latest one stored in Nokia system.
6. It is recommended to perform "Restore"-function without selecting "Flash Product"-option to avoid possible SW downgrade which causes the phone to die.



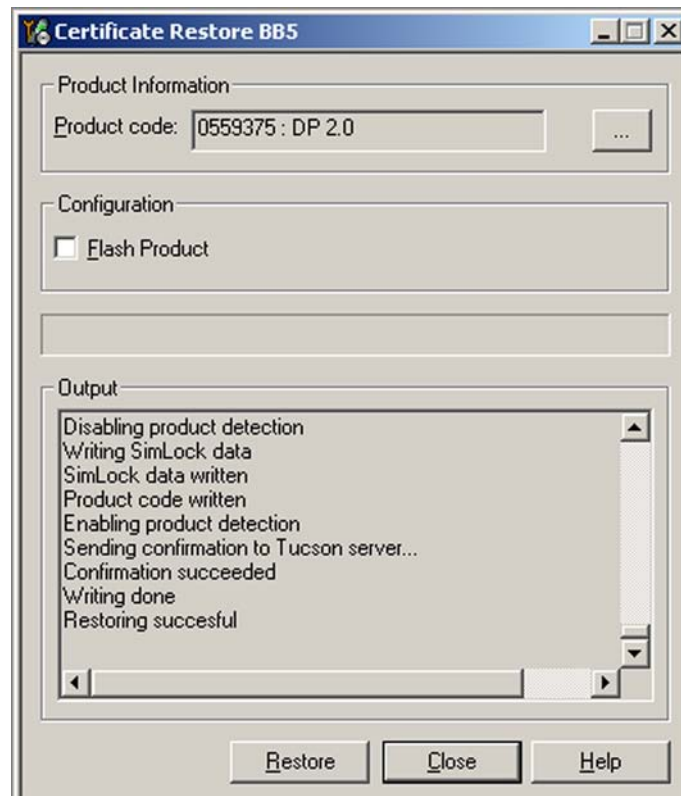
7. Information from phone and Smart Card are read and connection to Tucson server is established.



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



9. After programming, confirmation about successful event is sent to Nokia system.



## 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.

## Product code change

### Context

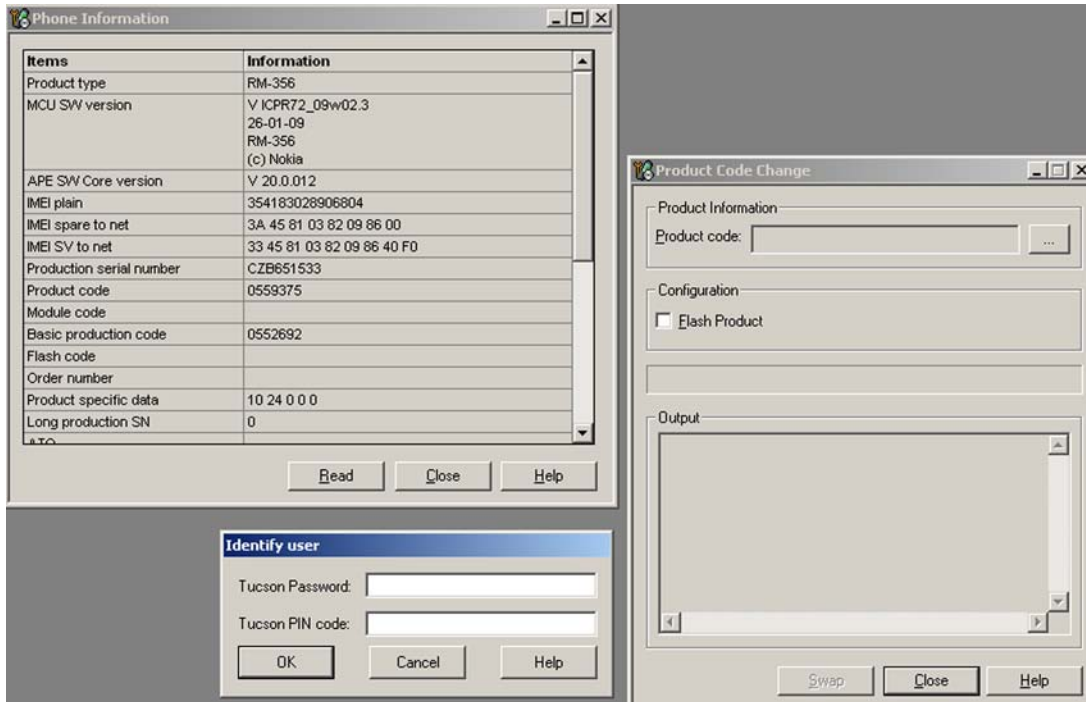
- When Product Code change with Tucson is successfully performed, phone variant will be changed. Data for the new variant is extracted from Nokia System, and programmed in the phone.
- After successful change, phone specific information in Nokia systems will match the new variant, and it can be used for e.g. certificate restoring. If you perform several product code changes, Nokia system will always be up to date with the latest successful event.
- Failed / incomplete actions will not change the phone specific information in Nokia systems.
- This function can be performed with or without flashing the phone with correct software, selection can be made by checking / unchecking the tick box on Phoenix UI.

The procedure for product code change is the following:

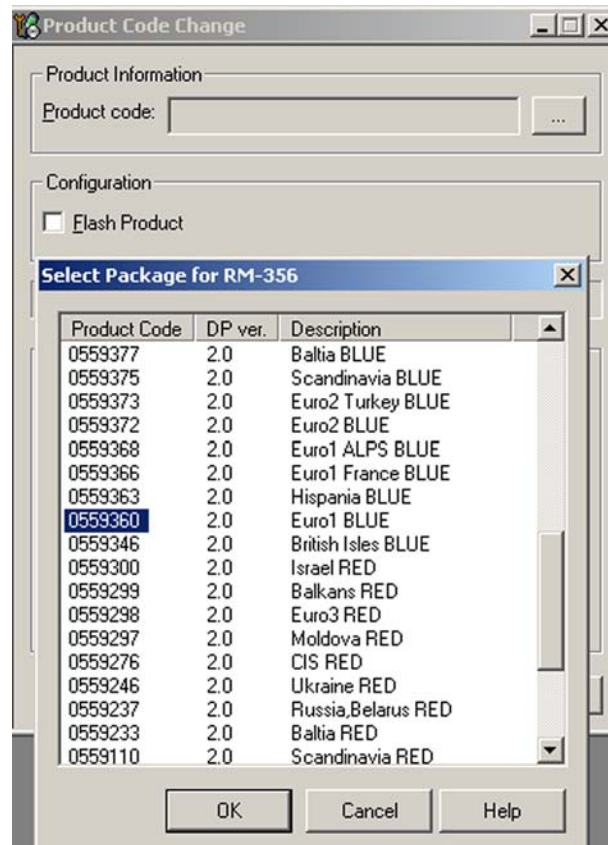
### Steps

1. Connect phone and scan product, read phone information to check communication with phone
2. Open *Tools* -> *Product Code Change*.

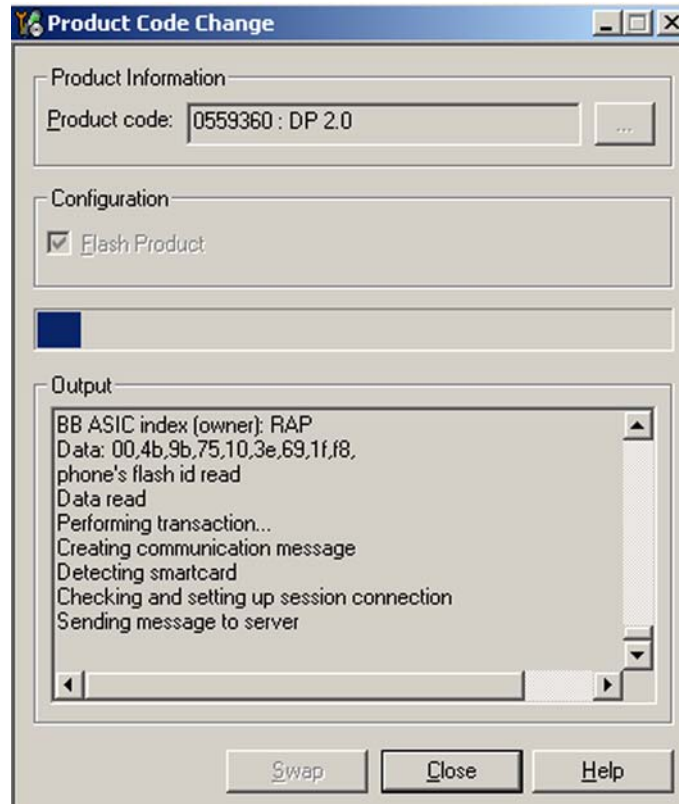
- Provide Tucson password and PIN code which have been delivered to you by email. Please note that characters are case sensitive.



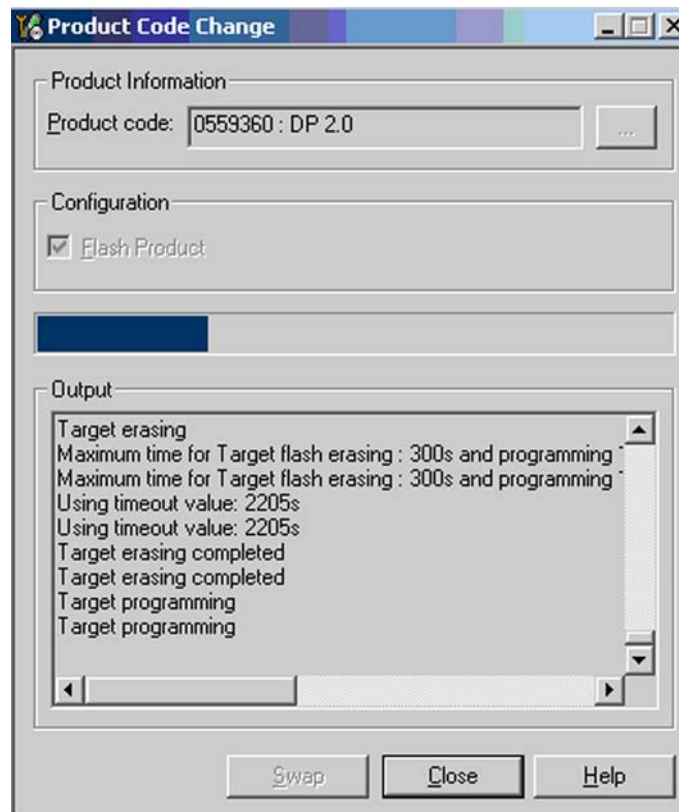
- Select product code of new variant from list. If the product code you want is not shown, please install correct data package including the variant.
- Select "OK" and "SWAP".



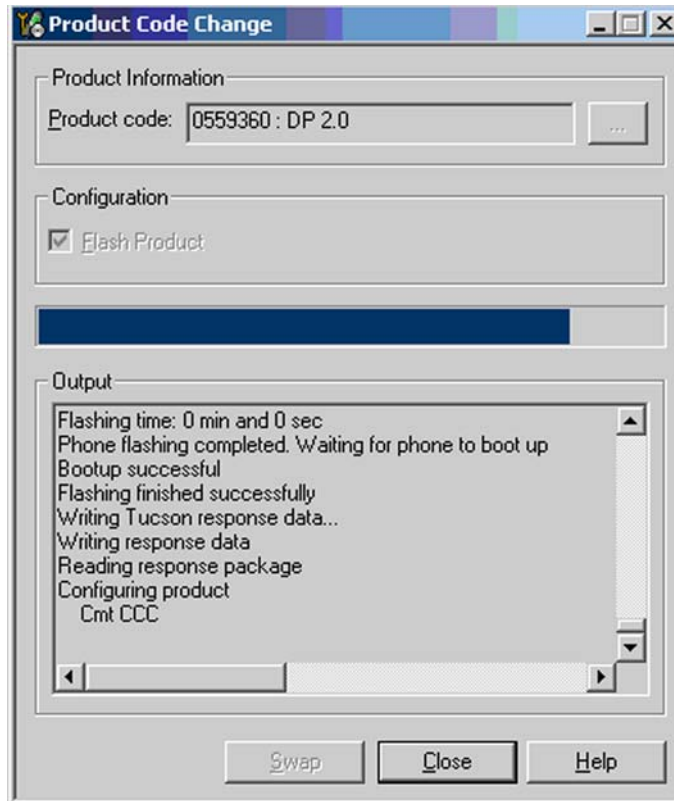
- Information from phone is read and connection to Tucson server is established.



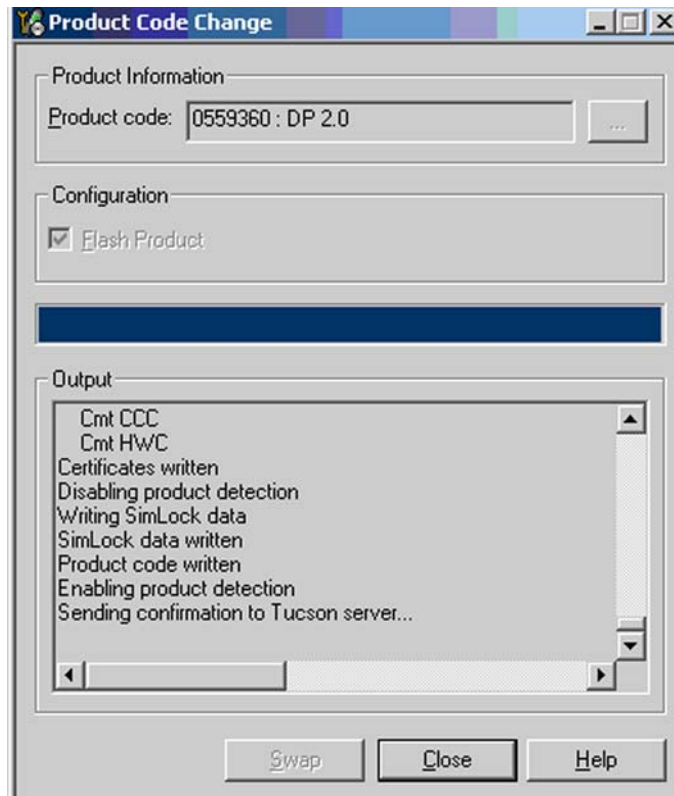
- If "Flash Product" – option was selected, phone SW is programmed.



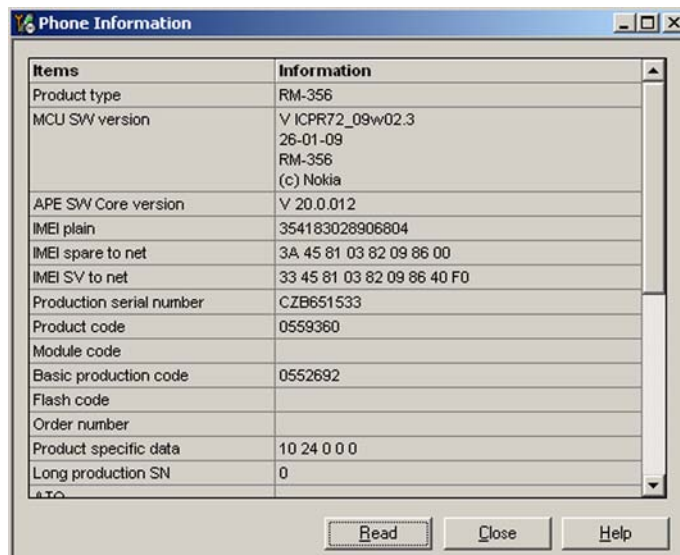
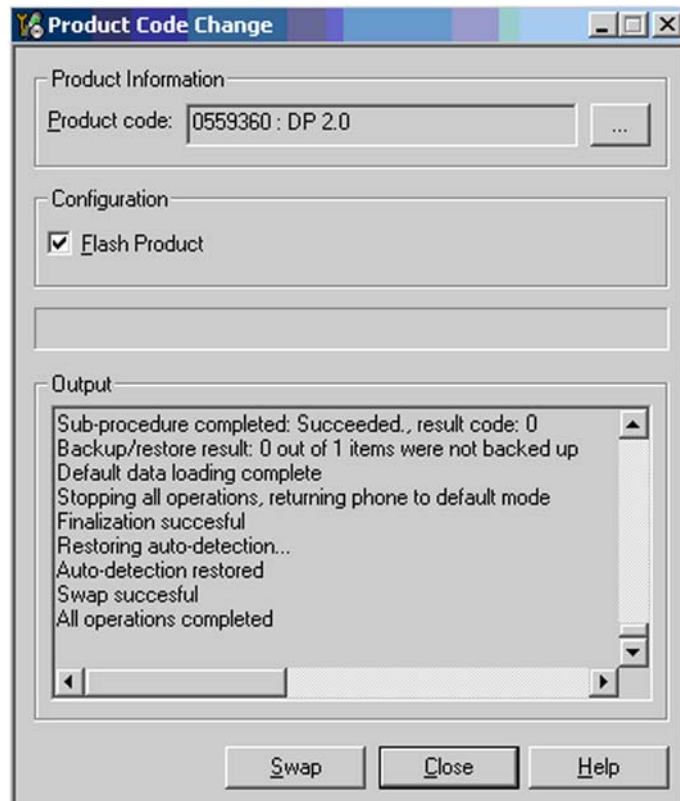
8. New data retrieved from Nokia system is programmed in the phone.



9. Confirmation about successful event is sent to Nokia system.



- 10. Phone has now been changed to another variant. If there is need to restore the data, this information will be sent back to phone. Warranty information in NOL will show the current information in about 24 hours.



## 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 8 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)
- Mikki 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-266
- Flash adapter FS-147
- Control unit CU-4/Interface adapter SS-46
- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10M $\Omega$ /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.

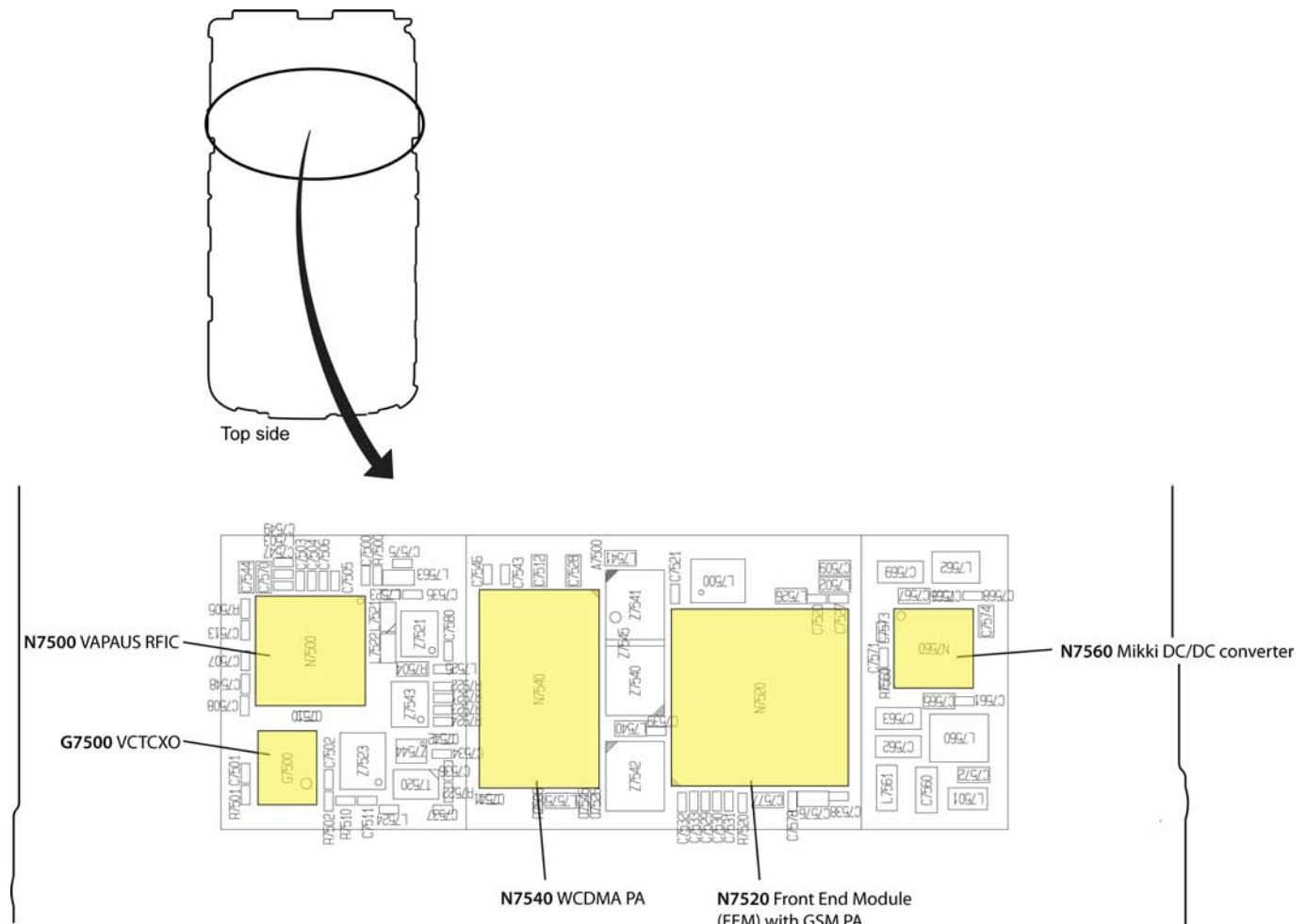
**Note:** All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

#### 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 RF block still needs to be replaced even when a single component is faulty.

## RF key components



**Figure 15 RF key components**

## ■ 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 XRS-6, USB cable, GBIP cable and MBUS cable DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter or one device including all.

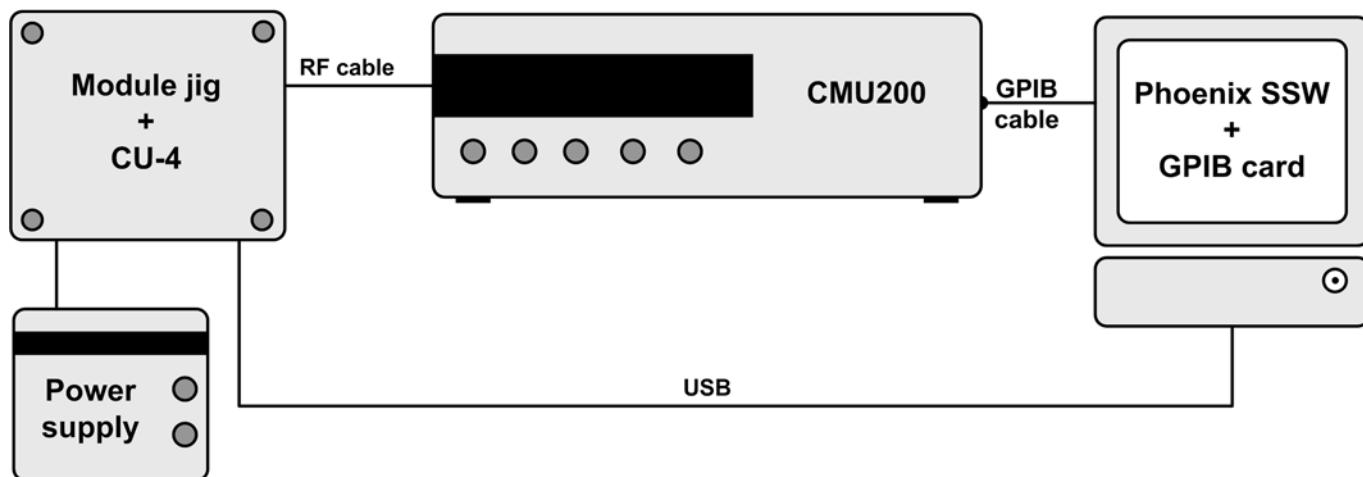


Figure 16 Auto tuning concept with CMU200

## Auto tuning procedure

### Prerequisites

Install the phone-specific data package, e.g. *Nokia\_firmware\_RM\_576\_xxx\_v1.00.exe*.  
The data package defines the phone-specific settings.

### Steps

1. Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.
2. Go to loss settings by selecting **Tuning (Alt\_U)** → **SET LOSS** from the menu.
3. Set the loss between CMV200 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

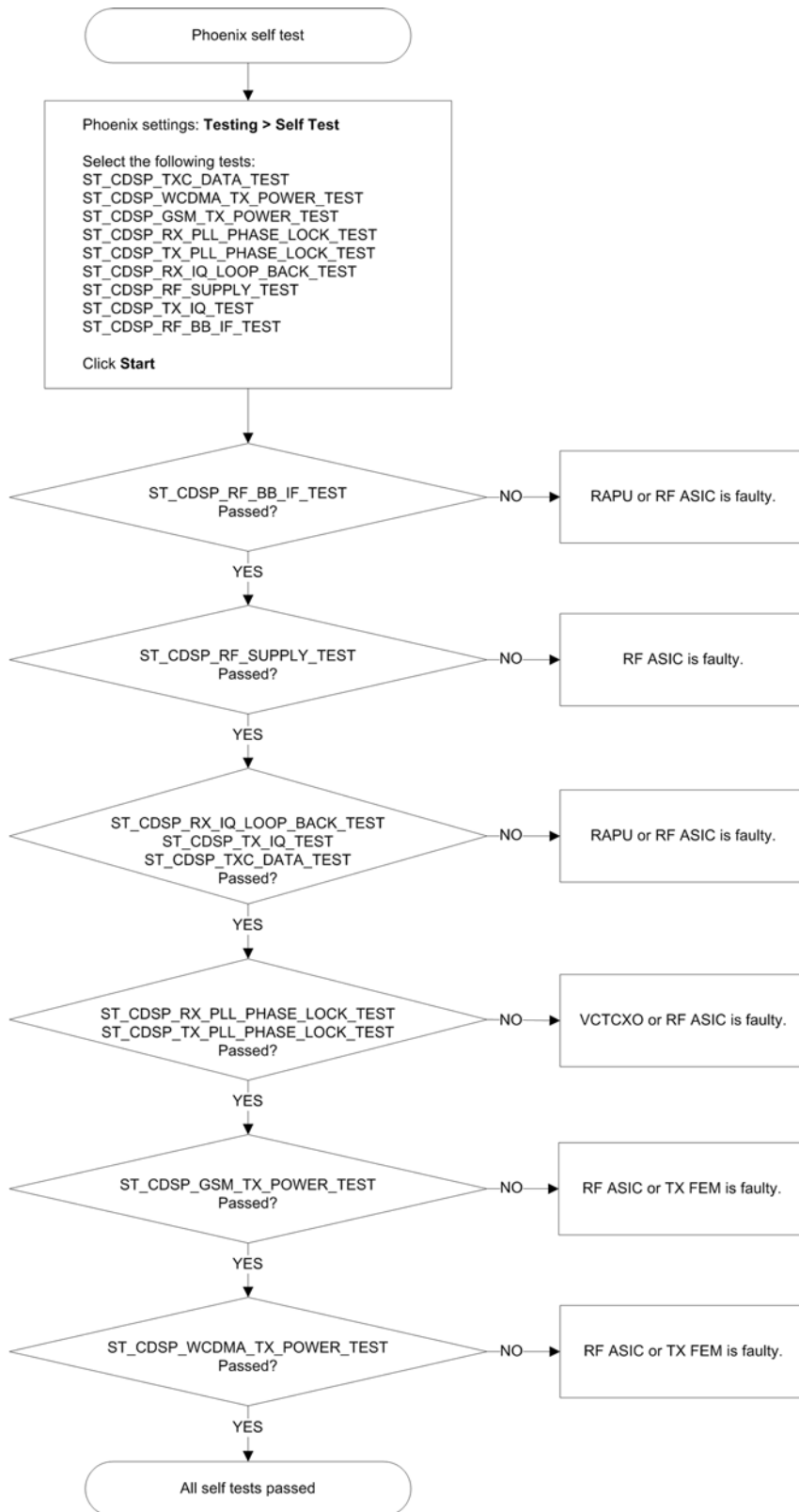
#### Context

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 \(page 4-7\)](#) in chapter 3, Baseband 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 \(page 4–9\)](#) . For a similar test in WCDMA mode, see section [WCDMA RSSI measurement \(page 4–12\)](#) .

The RX path for GSM and WCDMA are using the same filters in some bands. Please refer to [RF components reference \(page 4–26\)](#) 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 17 Phoenix RSSI Reading window

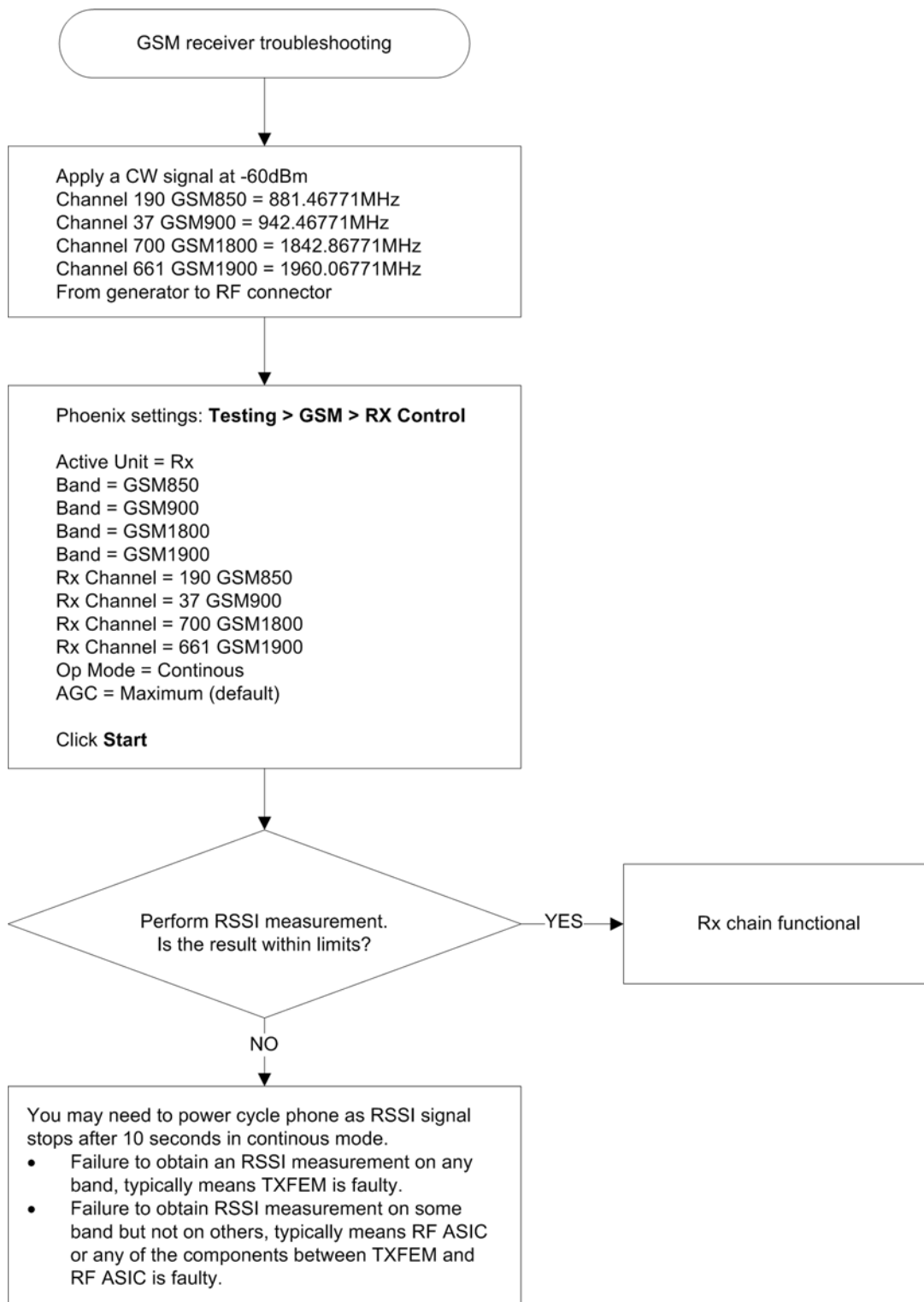
#### Results

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

When varying the level in the range -30 to -102dBm the reading should then follow within  $\pm 5$ 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.

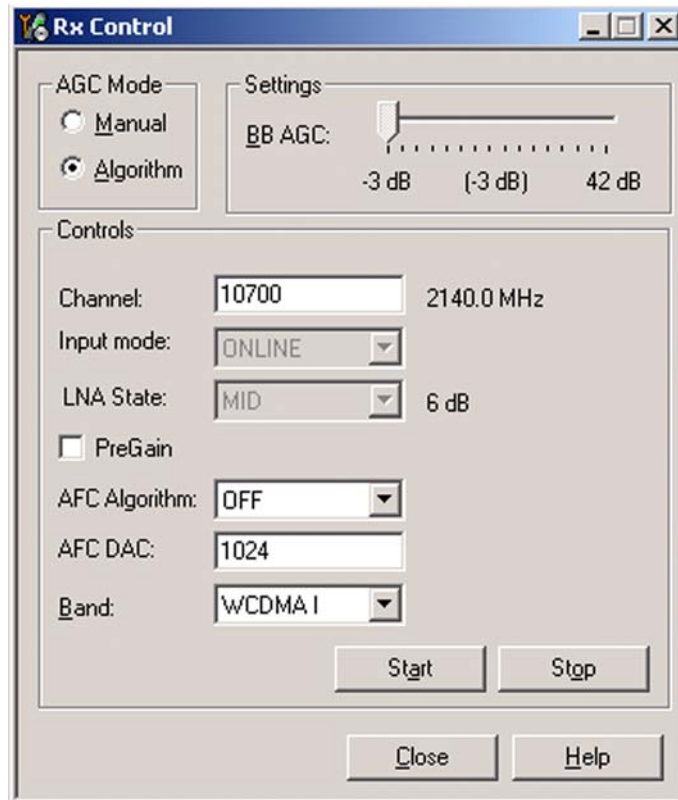


Figure 18 Phoenix Rx Control window with sample settings (WCDMA band I)

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	2141.0MHz
WCDMA II	9800	1961.0MHz
WCDMA VIII	3013	943.6MHz

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 \(page 4–11\)](#).

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.

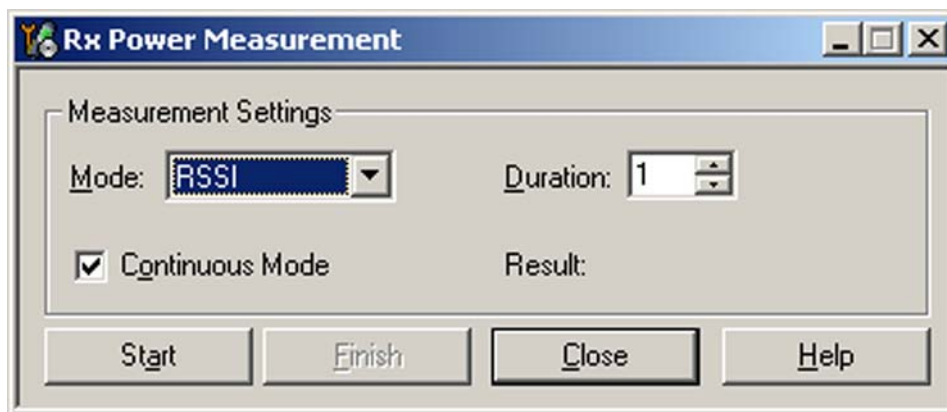


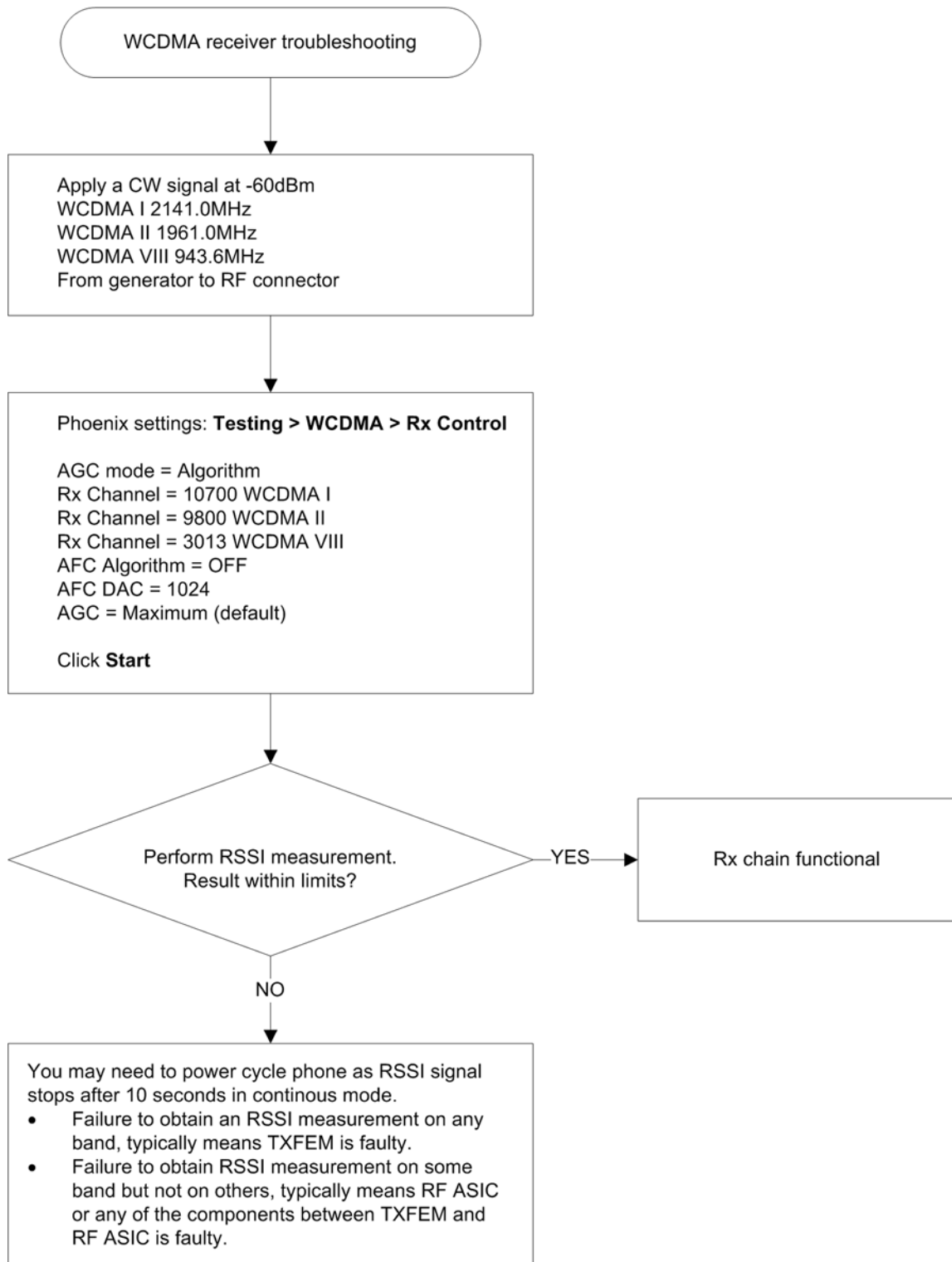
Figure 19 Phoenix Rx Power Measurement window

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 RX path for GSM and WCDMA are using the same filters in some bands. Please refer to [RF components reference \(page 4-26\)](#) 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.

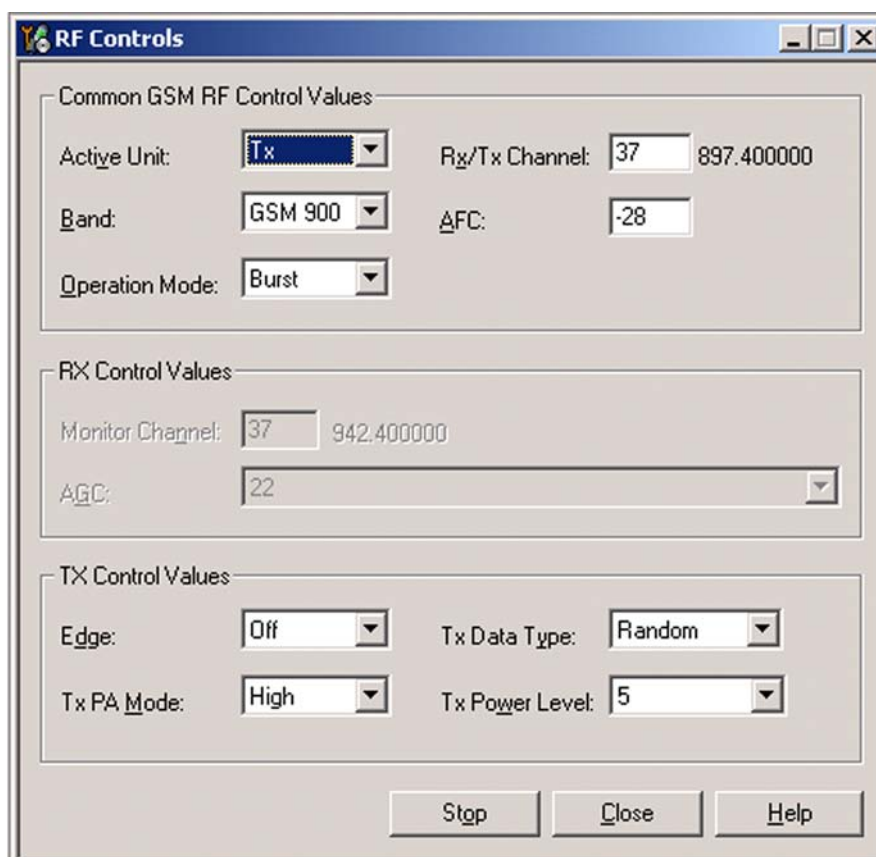


Figure 20 Phoenix RF Controls window

3. Make the following settings:

Setting	Value
Active Unit	Tx
Rx/Tx Channel	37
Band	GSM 900
AFC	-28
Operation Mode	Burst
Edge	Off
Tx Data Type	Random
Tx PA Mode	High
Tx Power Level	5

4. Check the basic TX parameters, using a communication analyser (e.g. CMU200).
- Power
  - Phase error
  - Modulation
  - Switching spectrum

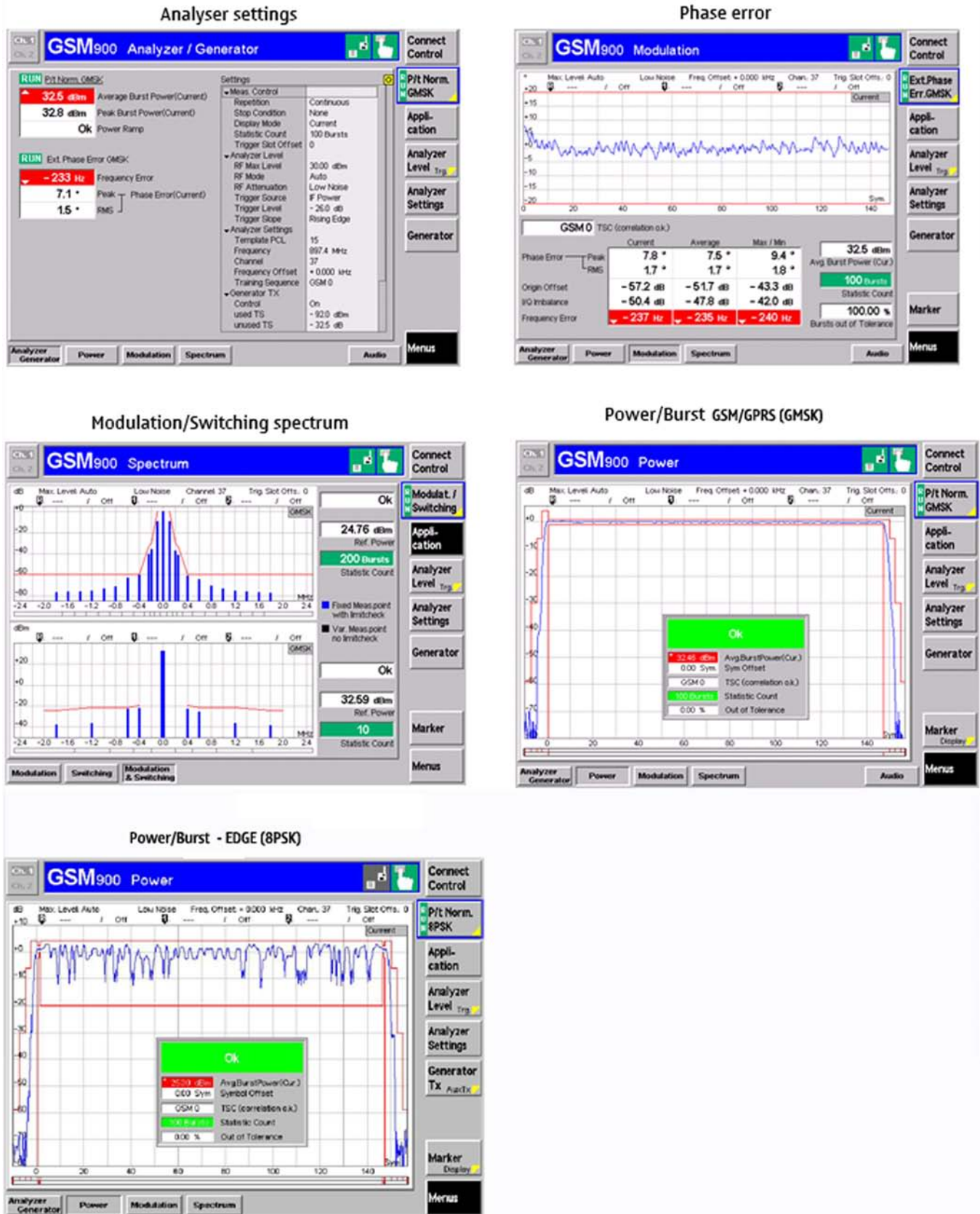


Figure 21 Typical readings

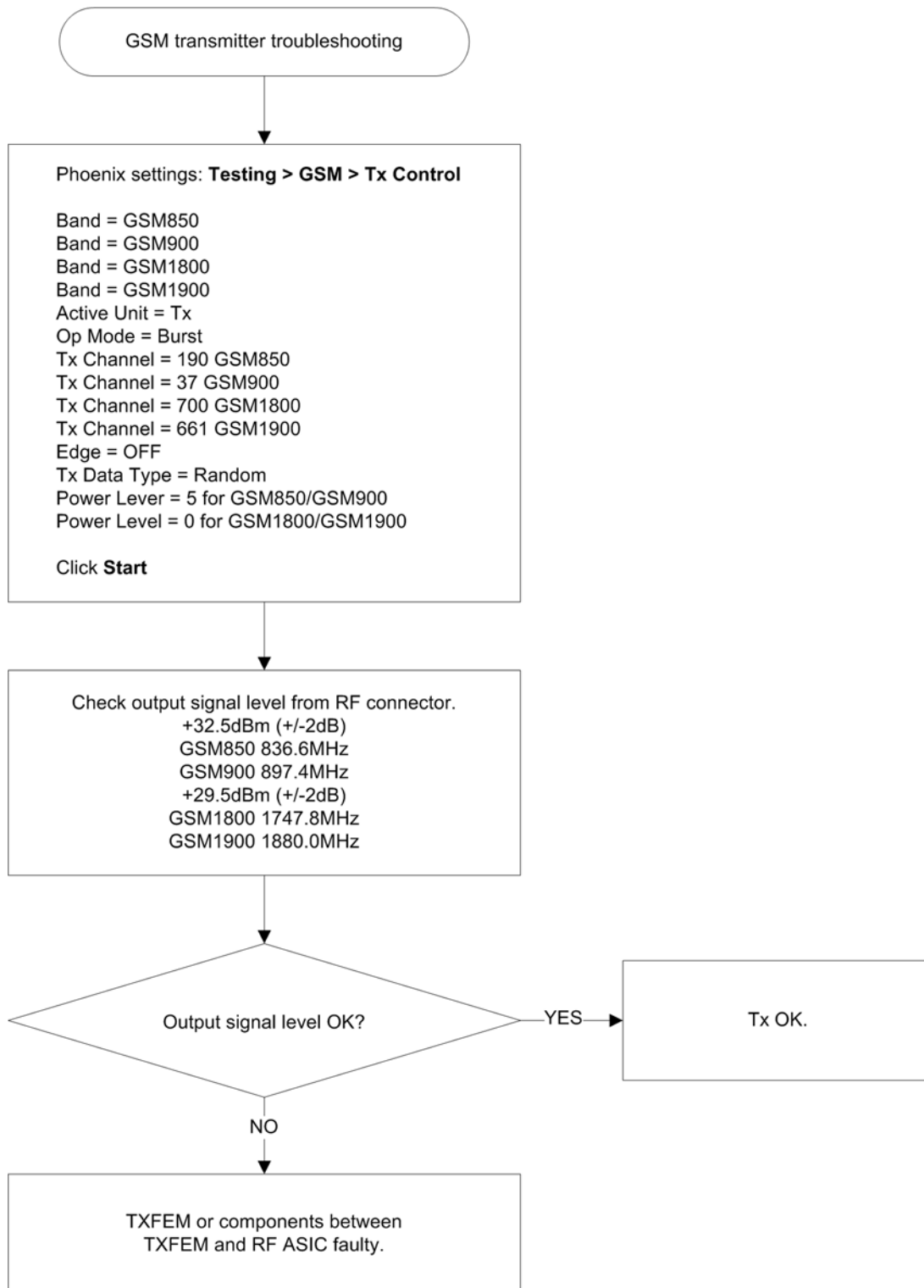
5. Change the power level in RF controls window and make sure the power reading follows accordingly.

## **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.

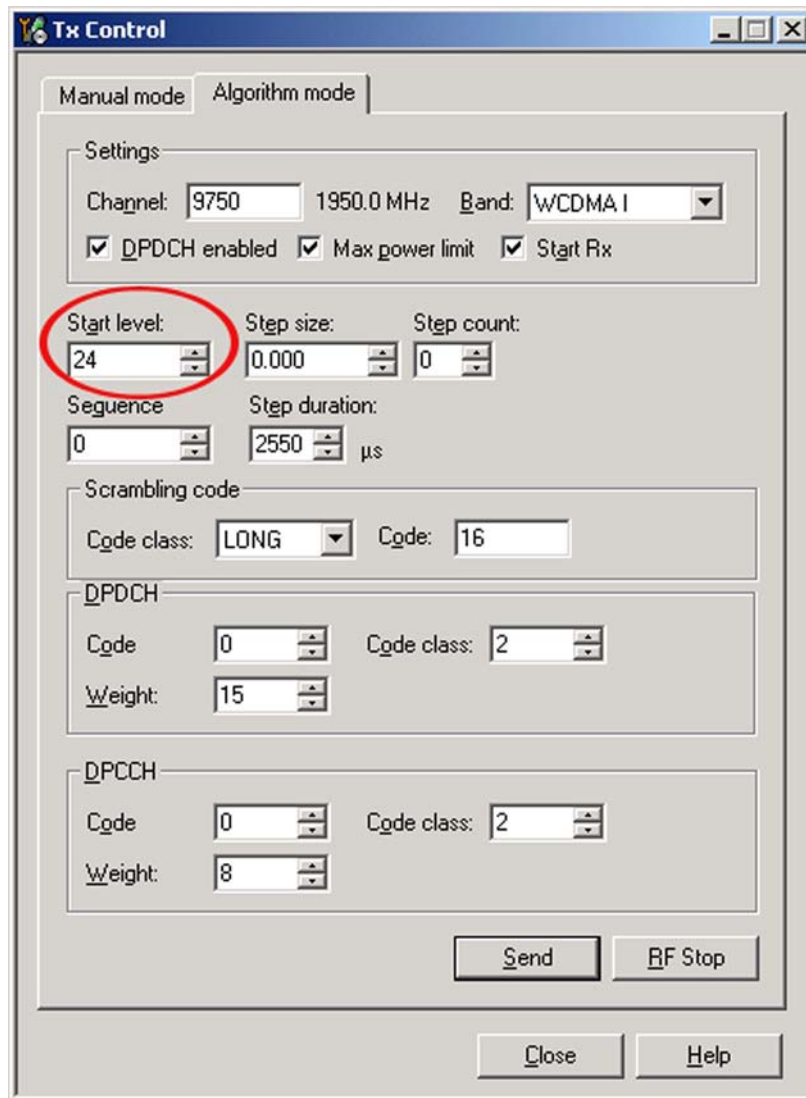


Figure 22 Phoenix WCDMA Tx control window

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

Band	Channel
WCDMA I	9750
WCDMA II	9400
WCDMA 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	24
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

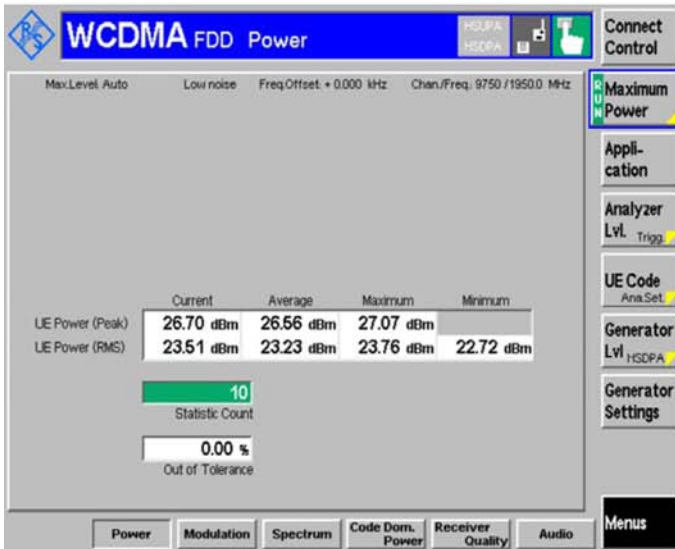
**Note:** Use the **Start level** option to set the TX power level.

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

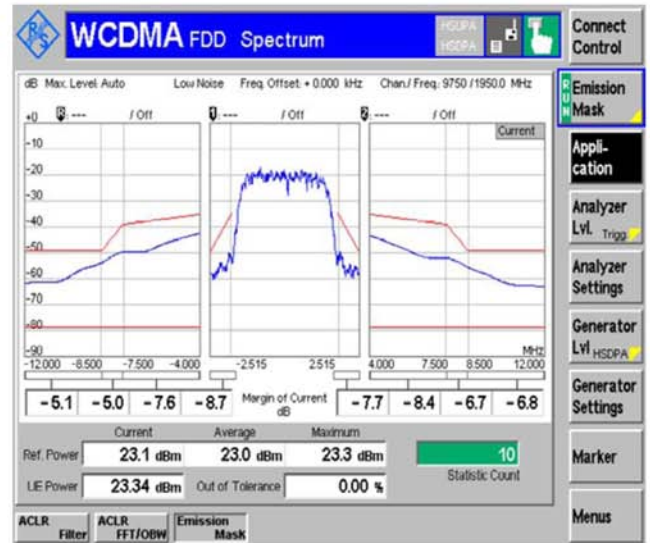
If settings are changed (eg. new channel selected), you have to click **RF Stop** and **Send** again.

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

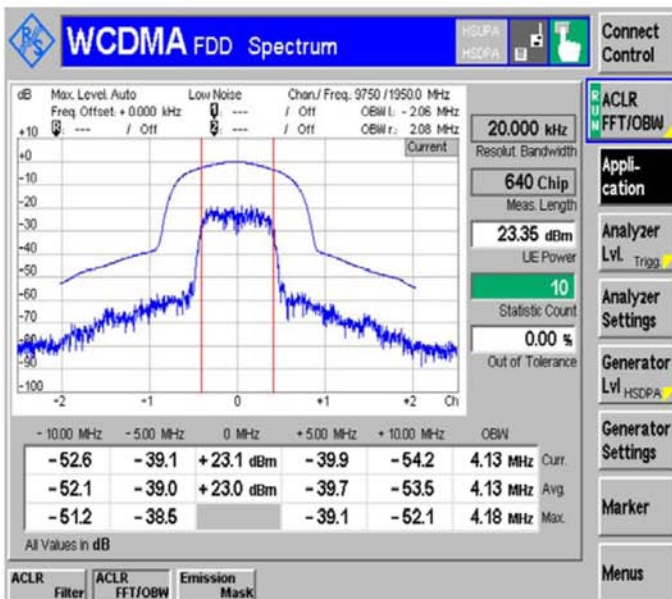
Power



Spectrum - Emission Mask



Spectrum - ACLR (FFT/OBW)



Spectrum - ACLR (Filter)

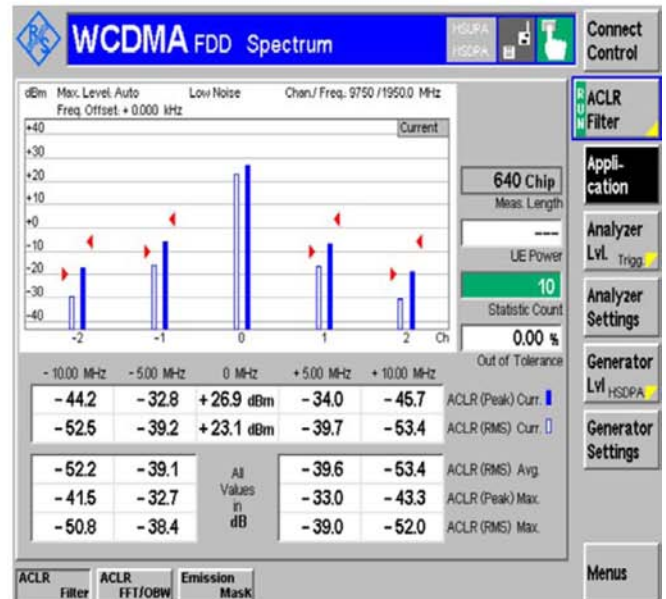
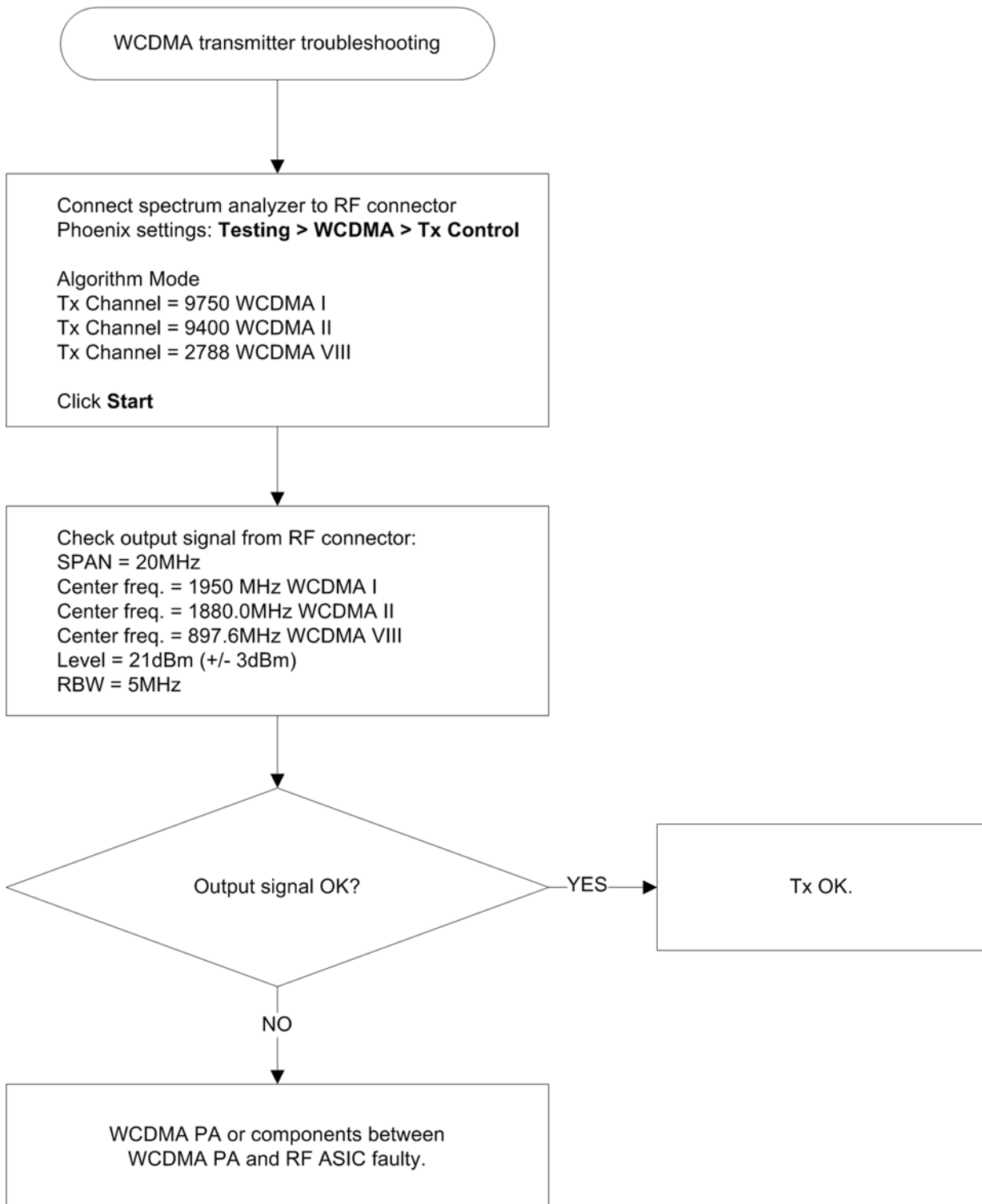


Figure 23 Typical readings

## 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:** When using settings as shown in the following Tx Control window, the result at TP4 should be 3.1V.

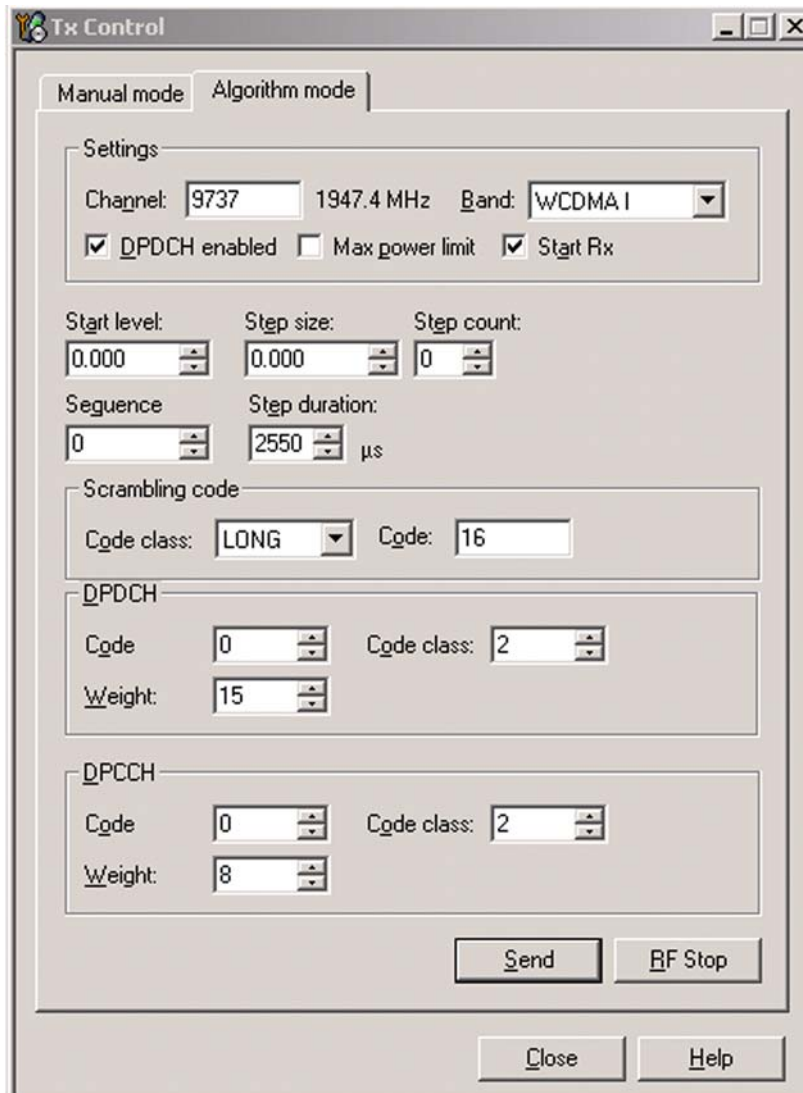


Figure 24 Phoenix WCDMA Tx Control window settings

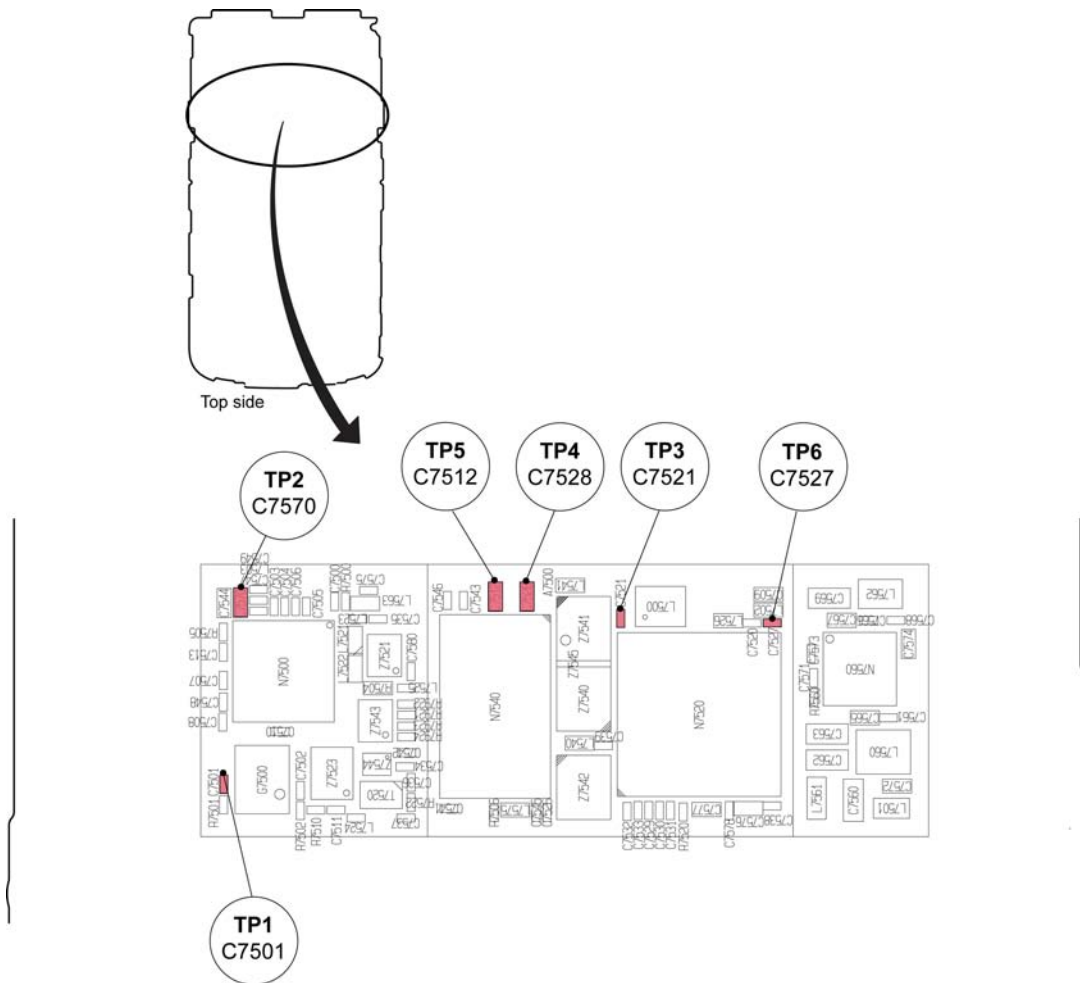
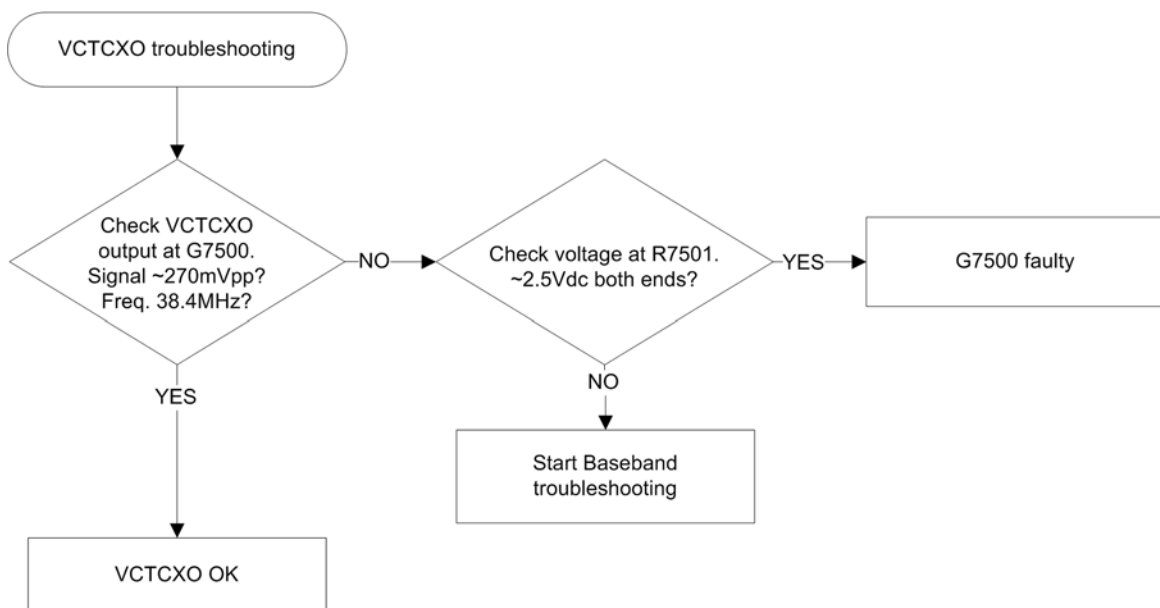


Figure 25 Test points for voltage checking

## VCTCXO troubleshooting

### Troubleshooting flow



## RF component reference

### Component reference table

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

Reference	GSM850		GSM900		GSM1800		GSM1900		WCDMA1		WCDMA2		WCDMA8	
	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 on the following page.

**RF block diagram**

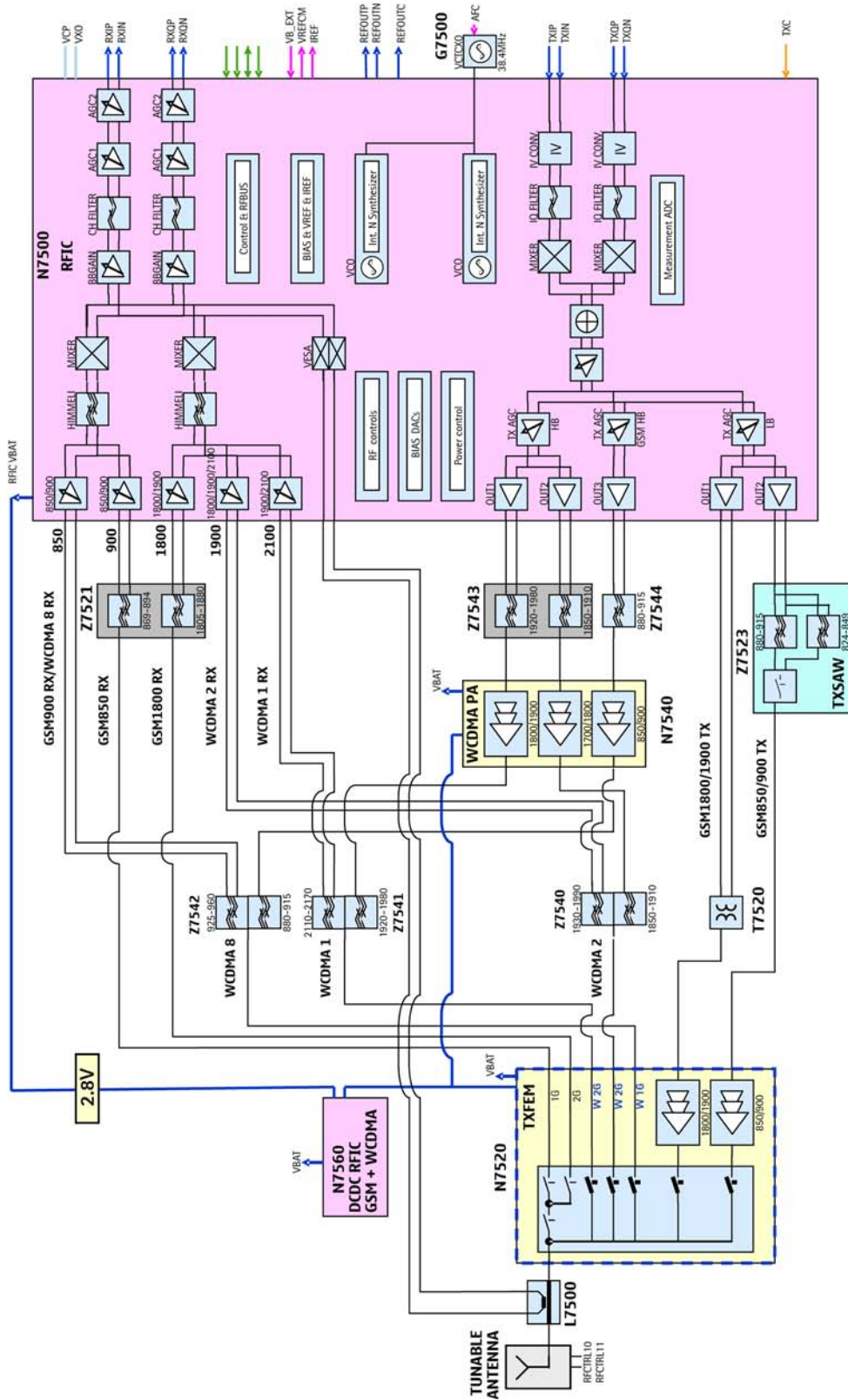


Figure 26 Component reference block diagram

## ■ Antenna

### Antenna overview

The main antenna has one antenna element (GSM and WCDMA).

In the GSM/WCDMA antenna there is one feed and one ground contact.

The BT/WLAN antenna is a discrete component on PWB. The GPS antenna is also a discrete component on PWB.

### Main antenna functionality

The main GSM+WCDMA antenna is functioning normally when the feed and GND C-clips take proper contact to the PWB, and the antenna foil is visually intact in the antenna frame. The main antenna functionality must also be checked by measuring the transmitted power with RF coupler at GSM900 channel 124.

# Nokia Customer Care

## 5 — System Module

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## ■ Introduction

### Phone description

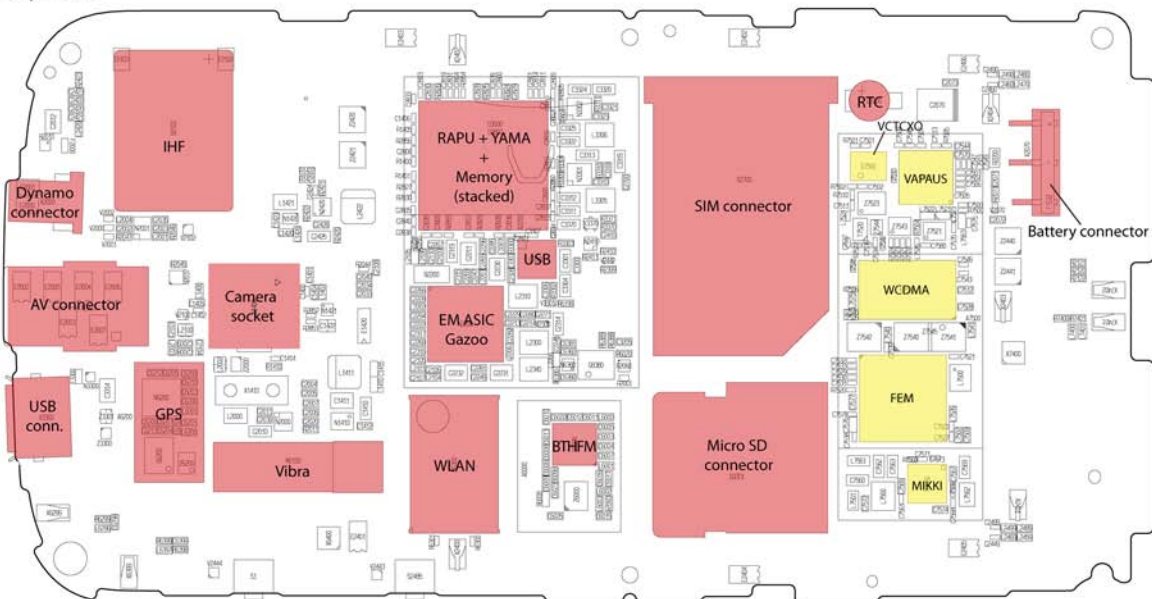
RAPU is the main digital baseband ASIC in the phone. It contains functionality for both WCDMA and GSM EDGE. Gazoo (N2200) is main audio and energy management controller for the phone.

### Key components

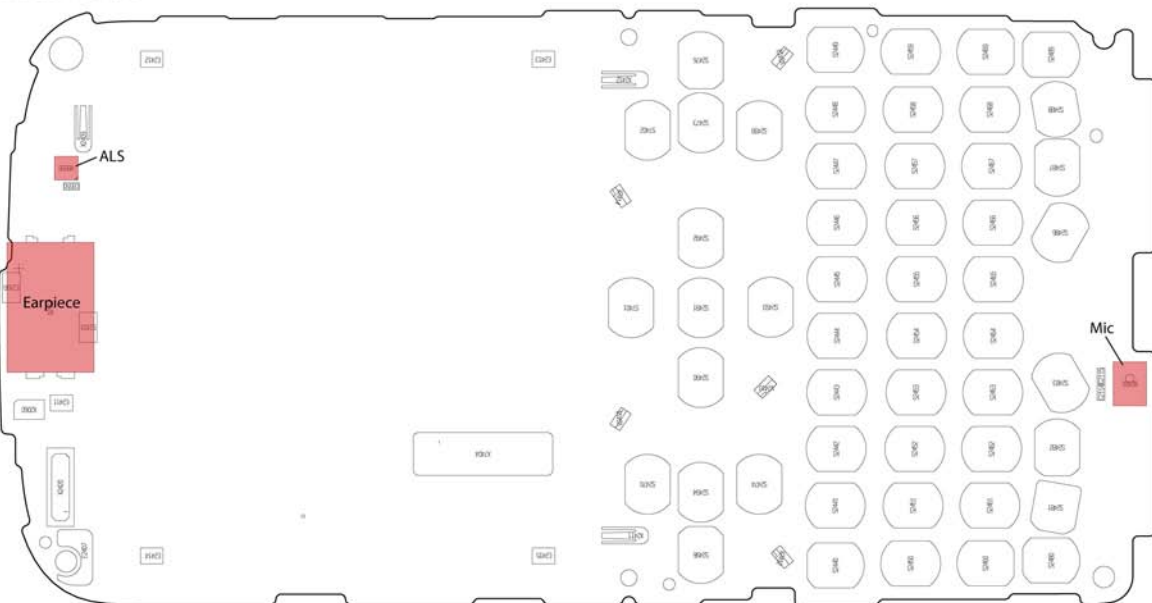
Function	Description	Item ref
Main PWB		
AV connector		X2001
Baseband ASIC	EM ASIC Gazoo	N2200
RF ASIC	VAPAUS	N7500
Processor	RAPU	D2800
GSM PA	Front end module (FEM), quad band	N7520
WCDMA PA		N7540
Oscillators	VCTCX0 Balun GSM	G7500 T7520
Memory	Combo 2G DDR + 4G M3 (stacked with RAPU)	D3000
Back-up battery	RTC back-up battery 311	G2200
Bluetooth + FM radio	BTHFMRDS2.2D module	N6000
USB	USB tranceiver	D3300
GPS	GPS5350	N6200
WLAN	TI WL1251	N6300
Battery	BL-4D	
Battery connector	Tabby blade interface	X2070
MicroSD connector		X3200
RF connector		X7400
SIM connector		X2700
Charging connector		X2000

## Key component placement

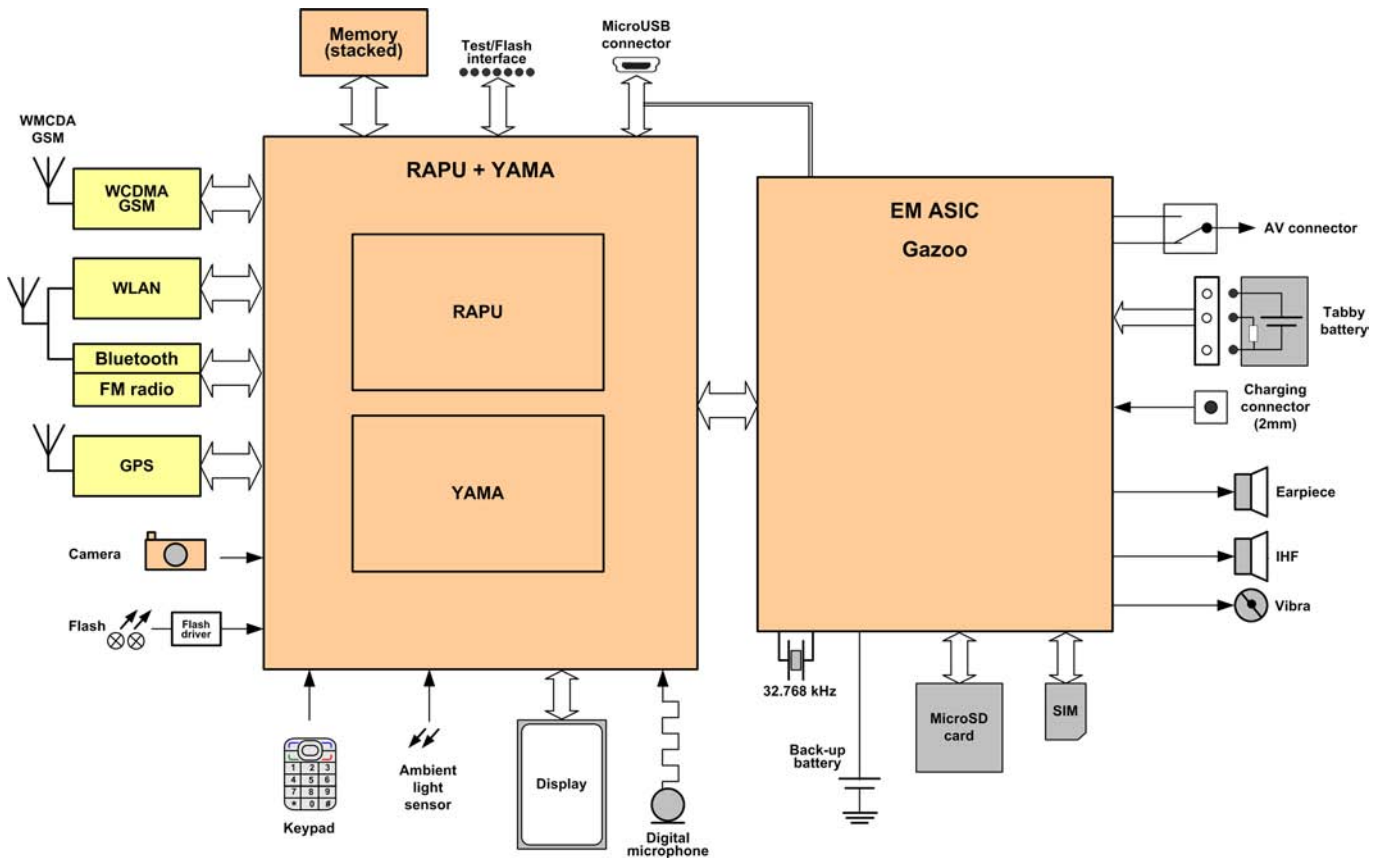
Top side



Bottom side



## System module block diagram



## ■ Energy management

### Battery and charging

#### BL-4D battery

The phone is powered by a 3-pole BL-4D 1200 mAh battery (Li-Ion). The three poles of the battery 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.

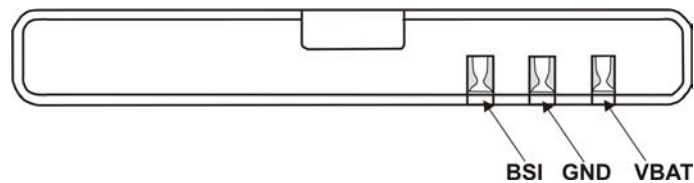


Figure 27 Battery pin order

The battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line of EM ASIC (N2200). This resistor is located on the main PWB, at a place where the phone temperature is closest to the battery temperature.

#### 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.



Figure 28 Blade battery connector

## Charging

This phone is charged through the smaller Nokia standard interface (2.0 mm plug). The wider standard charger plug (3.5 mm) can be used together with a CA-44 charger adapter.



Figure 29 Small (right) and wide (left) charger plugs

The phone can also be charged via USB using CA-101 or a USB charger e.g. AC-6.

Charging is controlled by EM ASIC (N2200), and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

## Charging a dead battery

Charging of a dead battery has to be carried out via an approved NOKIA charger. If the phone is charged via USB, CA-101 or preferably an AC-6 must be used.

## Normal and extreme voltages

Energy management is mainly carried out in the EM ASIC (N2200). that contains a number of regulators. In addition there are also some external regulators.

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

Table 9 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	3.700	
Lower extreme voltage	3.145	

Voltage	Voltage [V]	Condition
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	3.1	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	2.9 ± 0.1	Off to on
Vcoff-	2.6 ± 0.1	On to off

### Power key and system power-up

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

Power down can be initiated by pressing the power key again and the system is powered down with the aid of SW. The power key is connected to EM ASIC (N2200) via the 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 EM ASIC 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 EM ASIC 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 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

### Clocking scheme

In BB5.44, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCX0 in the RF section and 32.768kHz sleep clock produced by EM ASIC N2200 with an external crystal.

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

**SMPS Clk** is 2.4MHz clock line from RAPU to EM ASIC N2200. In deep sleep mode, when VCTCX0 is off, this signal is set to '0'-state.

**CLK600.** The clock source is an internal RC oscillator in EM ASIC N2200 (during the power-up sequence) or RPU SMPS Clk.

Bluetooth has a separate 38.4MHz TCXO clock oscillator.

**Power distribution**

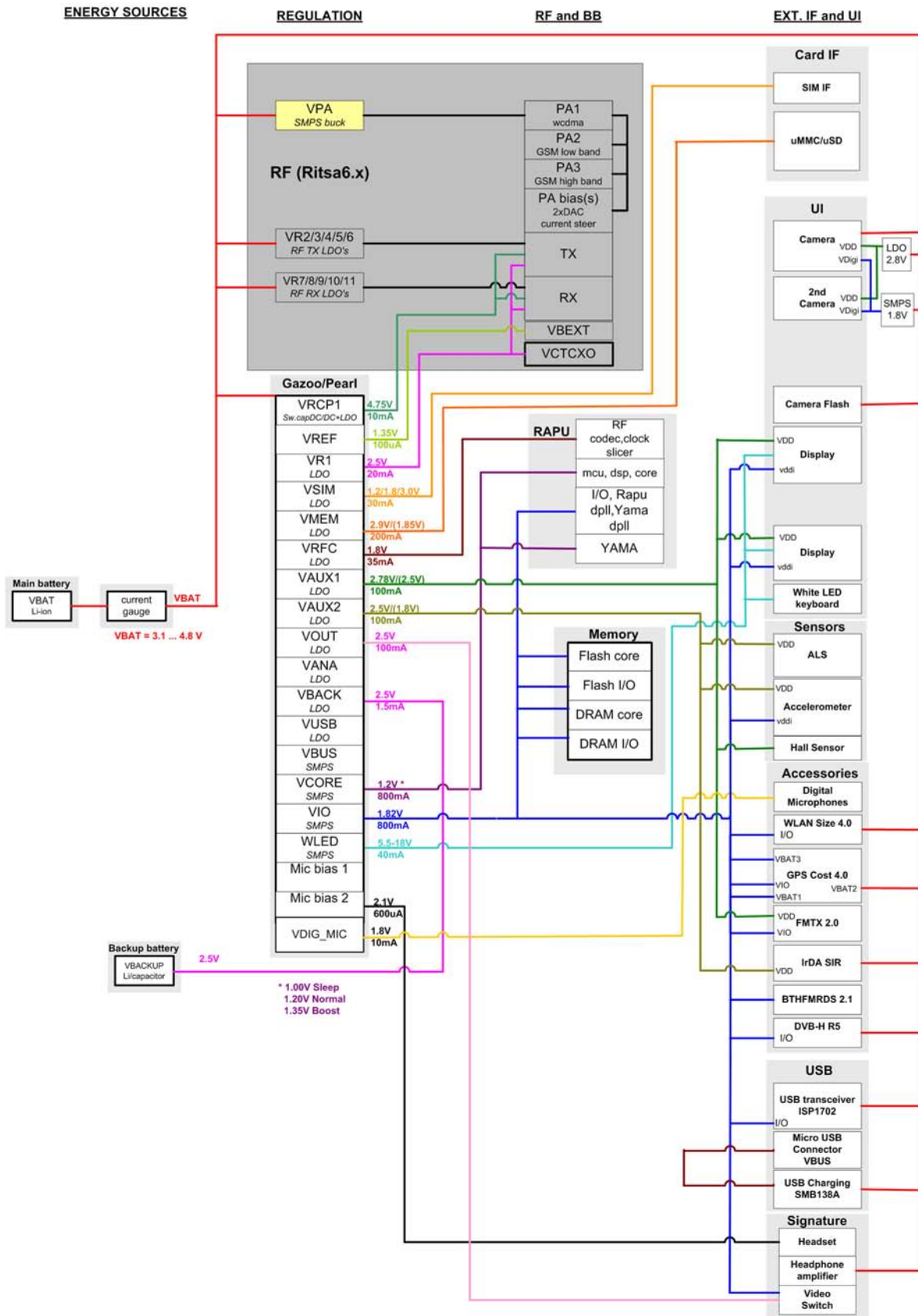


Figure 30 Power distribution diagram

**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 SIM interface consists of an internal interface between RAPU and EM ASIC (N2200), and an external interface between EM ASIC and SIM contacts.

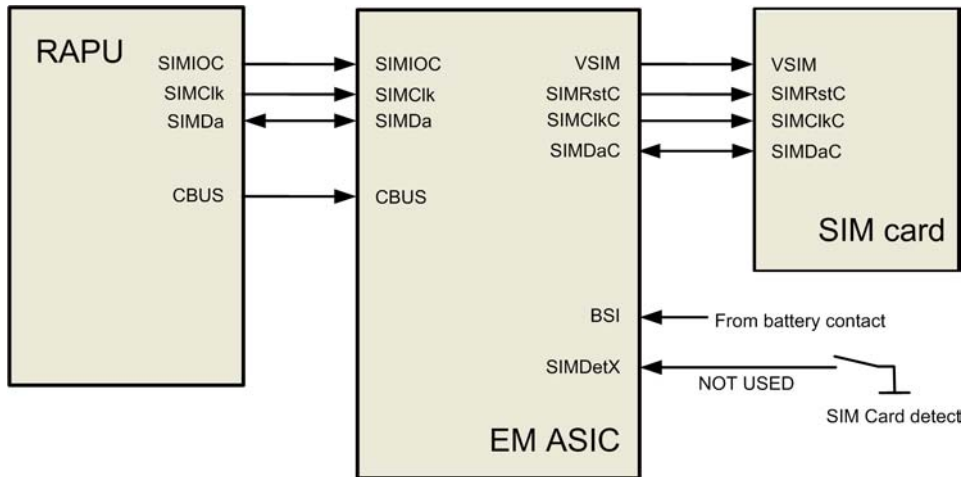


Figure 31 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based on the BSI line. Because of the location of the SIM connector, removing the battery causes a quick power down of the SIM interface.

The SIM interface supports both 1.8V and 3.0V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR (Answer to Request), a 3V interface voltage is used.

**MicroSD card interface**

The microSD card interface has one internal interface between RAPU and EM ASIC and one external interface between EM ASIC and the microSD card. The microSD card connector is mounted on a separate PWB, the Micro PWB.

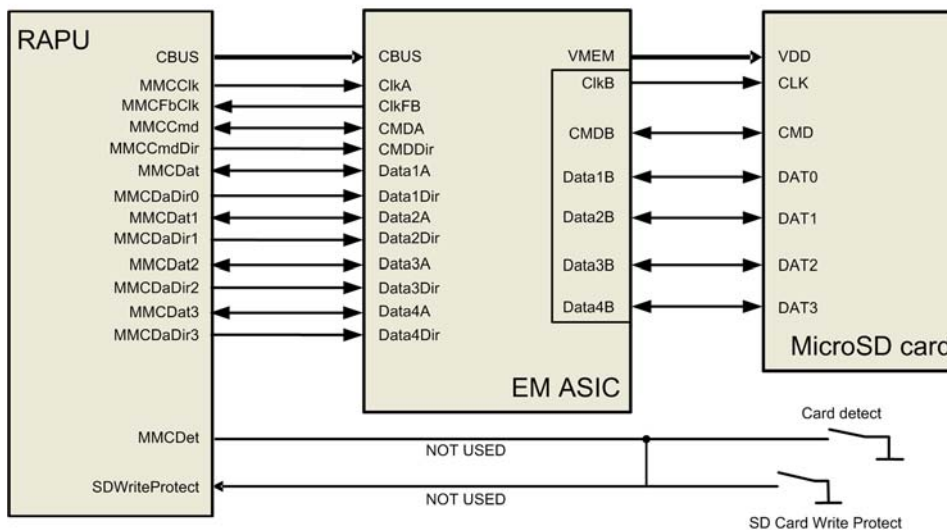
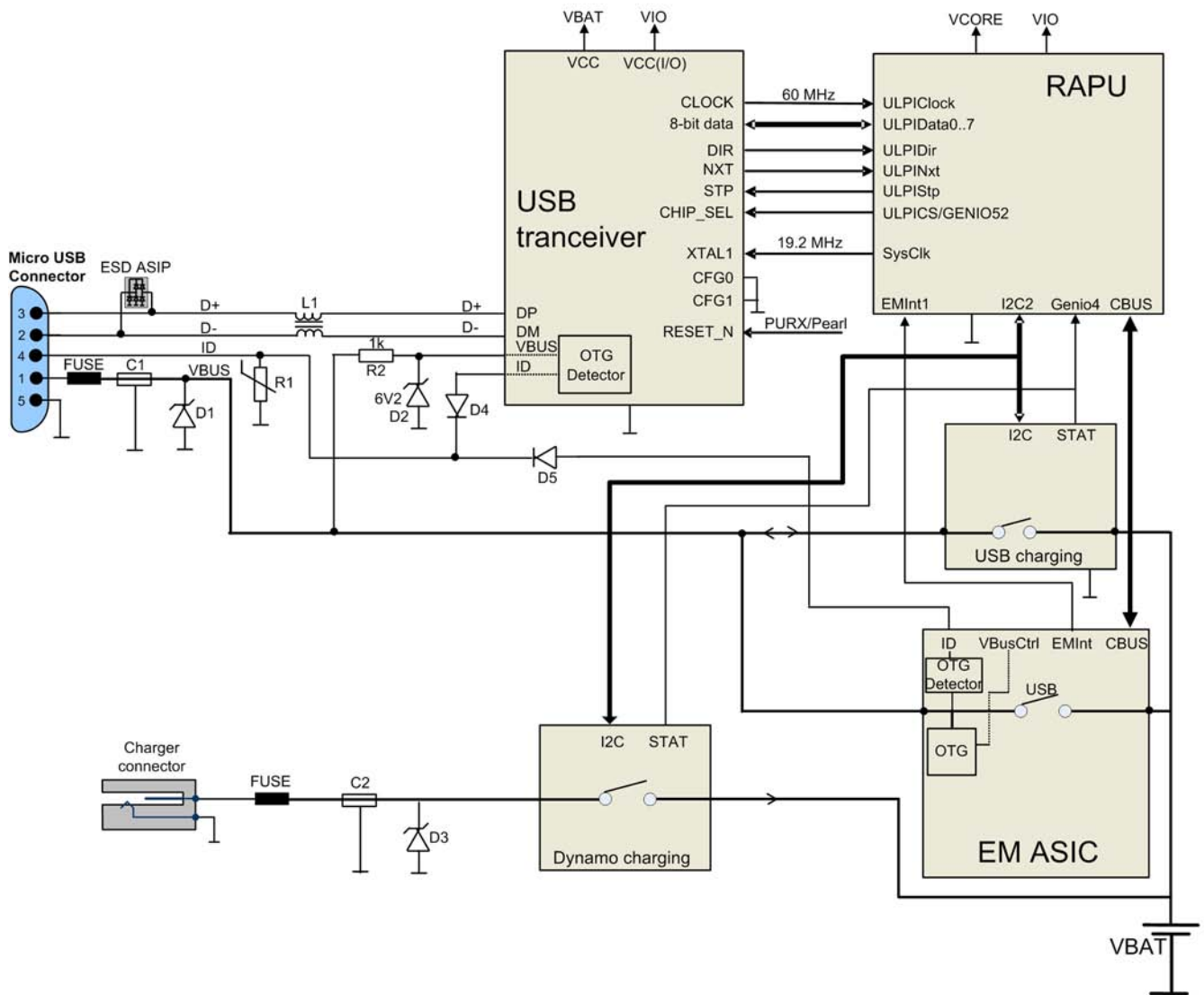


Figure 32 MicroSD card interface

■ **USB**

**USB interface**

The phone has an interface for USB (Universal Serial Bus). USB is a differential serial bus that provides a wired connectivity between the phone and, for example a PC.



**Figure 33 USB interface**

The phone supports USB 2.0 with High-Speed (480 Mbps).

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

**MicroUSB connector**

This phone is provided with a specific connector for microUSB.

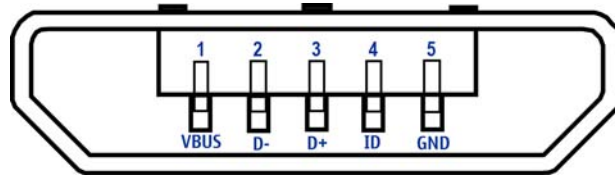


Figure 34 MicroUSB connector

■ **User interface**

**Display interface**

The following block diagram illustrates the display interface. Command signals and transmitted data to the display module comes directly from RAPU.

Display backlight is provided by an external LED driver.

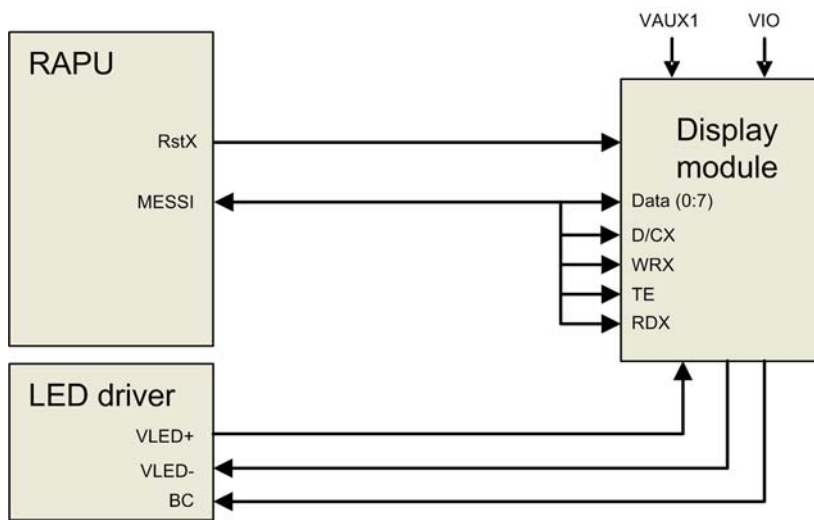


Figure 35 Display interface

**Keyboard interface**

Table 10 Key signal matrix

KEY_COL KEY_ROW	<0>	<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>
<0>	FN	Shift	Chr	Space	N	Vol +	Space	&	
<1>	Z	X	C	V	B	Vol -	M	, ;	
<2>	A	S	D	F	G	H	J	K	
<3>	Q	W	E	R	T	Y	U	I	
<4>	?!	CTRL	Left	Select	Right	Down	S60-L		
<5>	. :	Return	Soft-Left	Up	Soft-Right	S60-R	Send		
<6>	L	BS							
<7>	O	P							
<8>									

The following block diagram shows the keyboard interface.

The keyboard interface is implemented with RAPU's GENIOs.

The LED's at the UI keys are controlled by a LED driver. The driver is controlled by a PWM signal from EM ASIC Gazoo.

The keyboard LED's are controlled directly by EM ASIC Gazoo.

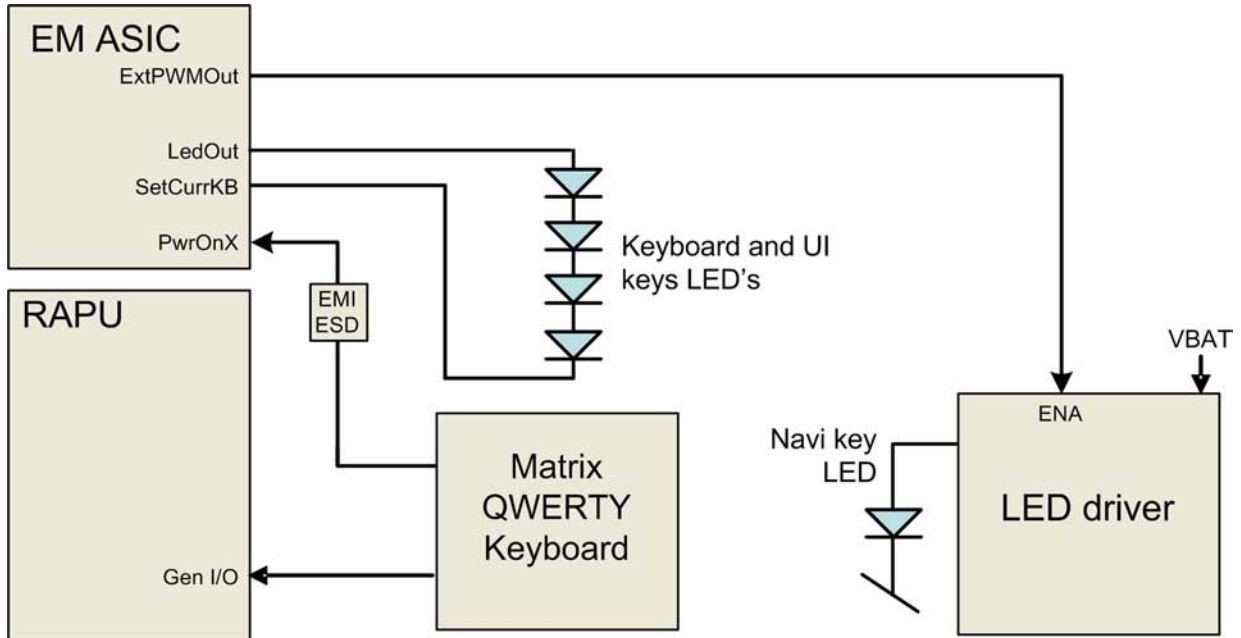


Figure 36 Keyboard interface

### Ambient light sensor (ALS) interface

Ambient light sensor information is used to control keyboard and display brightness.

- Keyboard backlight is turned OFF, when it is not needed.
- Display brightness is dimmed, when environment lighting is dark.

The ambient light sensor is calibrated in production and can be re-tuned in service points, though not recommended unless calibration coefficient is lost for some reason

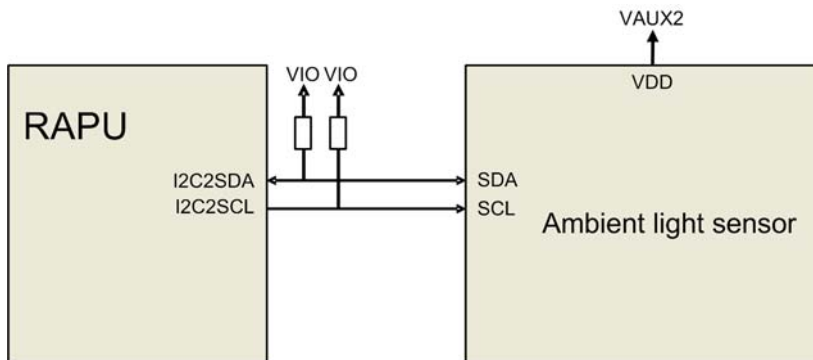
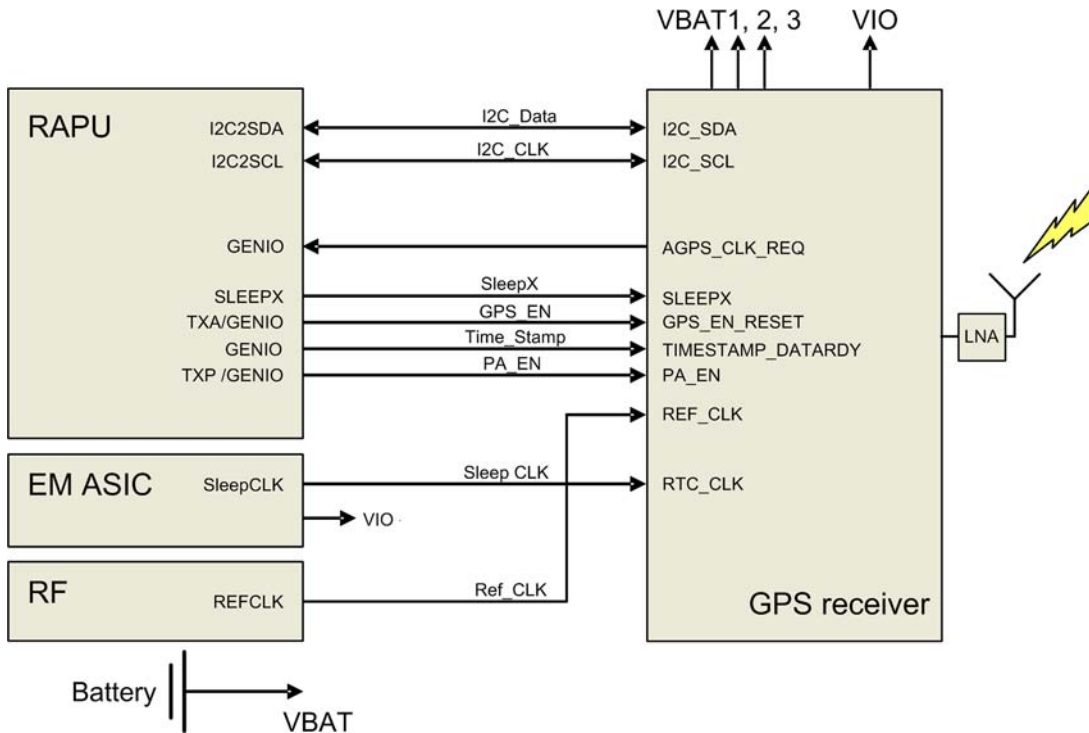


Figure 37 Ambient light sensor (ALS) interface

### ■ GPS interface

The phone includes a built in GPS receiver and could operate as a stand-alone positioning device. The antenna for GPS is located at the top of the A-cover, see section [GPS antenna \(page 5- 0 \)](#).

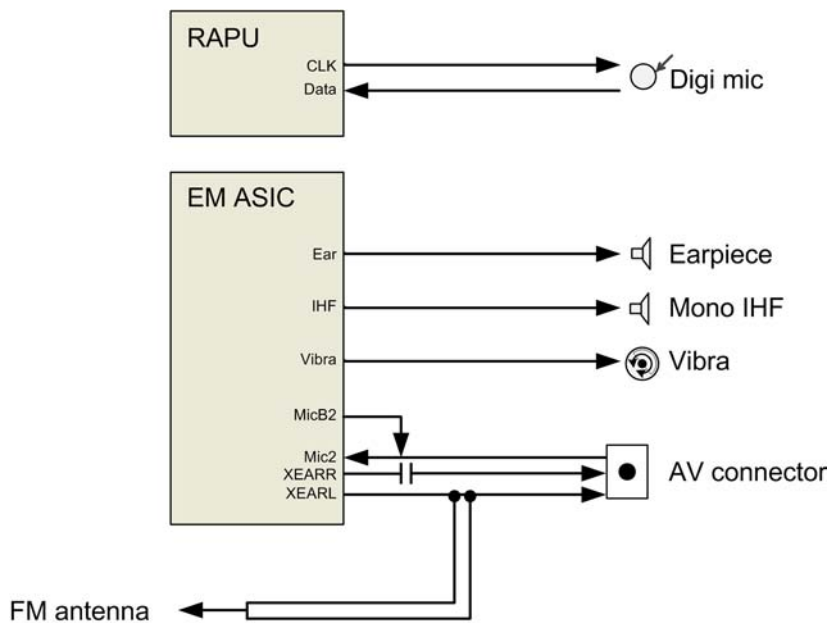
The GPS receiver is connected to RAPU ASIC.



**Figure 38 GPS interface**

**Audio interface**

The following block diagram illustrates the audio interface of the phone:



**Figure 39 Audio interface**

The digital microphone is connected directly to RPU.

The earpiece is driven directly by a built-in amplifier included in EM ASIC.

The IHF speaker is driven directly by a built-in stereo amplifier included in EM ASIC.

The vibra is driven directly by a built-in amplifier included in EM ASIC.

**■ AV connector**

The AV connector handles audio signals output and input. It has audio left and right signals separately (pins 4 and 5) and microphone signals wired to pin 3.

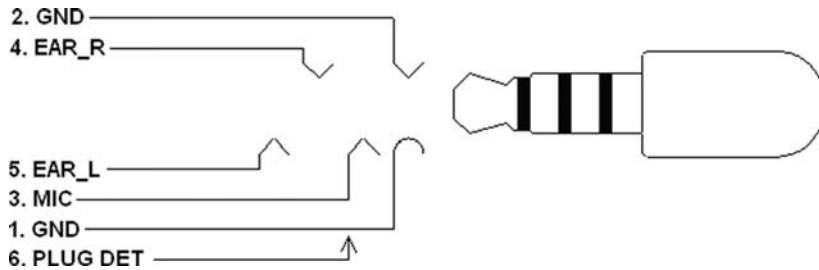


Figure 40 AV connector

The plug detection signal handles the AV connector plug detection with HeadDet signal from EM ASIC.

**■ Bluetooth interface**

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 BTHFM module.

Bluetooth is physically integrated with FM radio in the BTHFM module ASIC, but from a functional point of view they have nothing in common

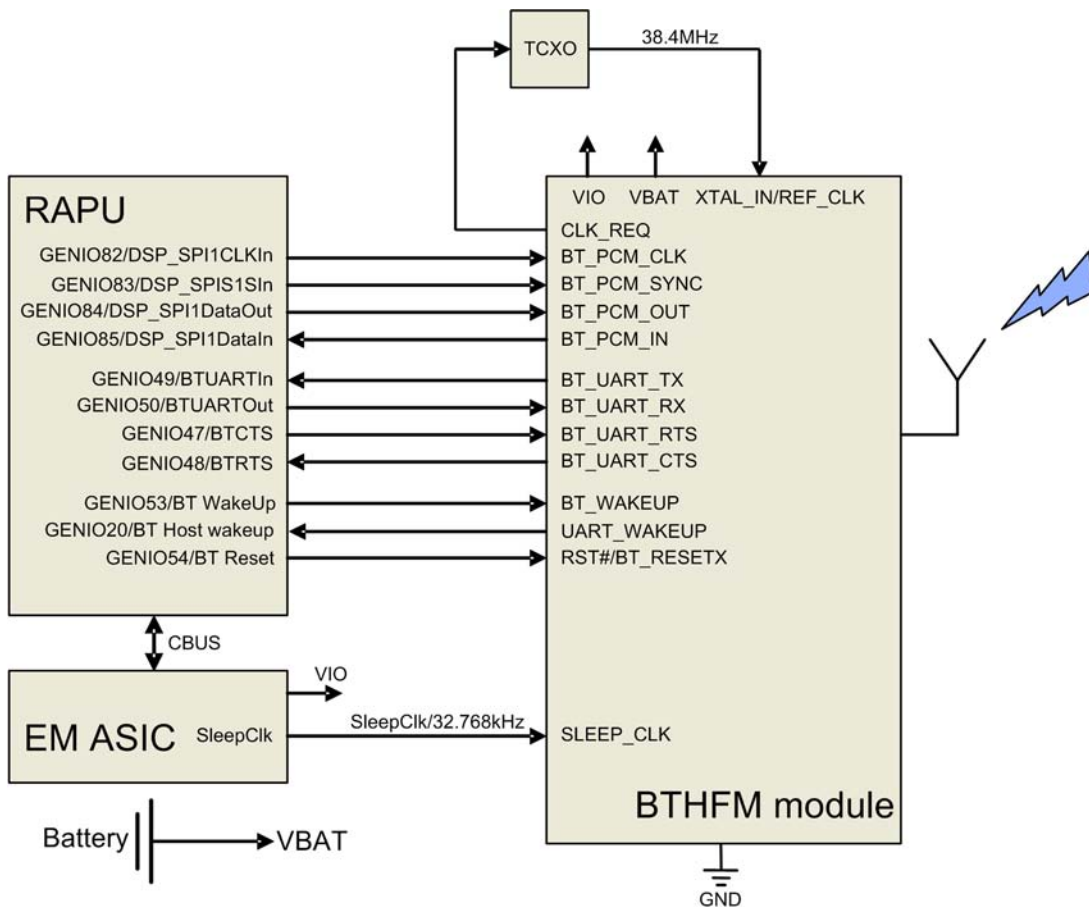


Figure 41 Bluetooth interface

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

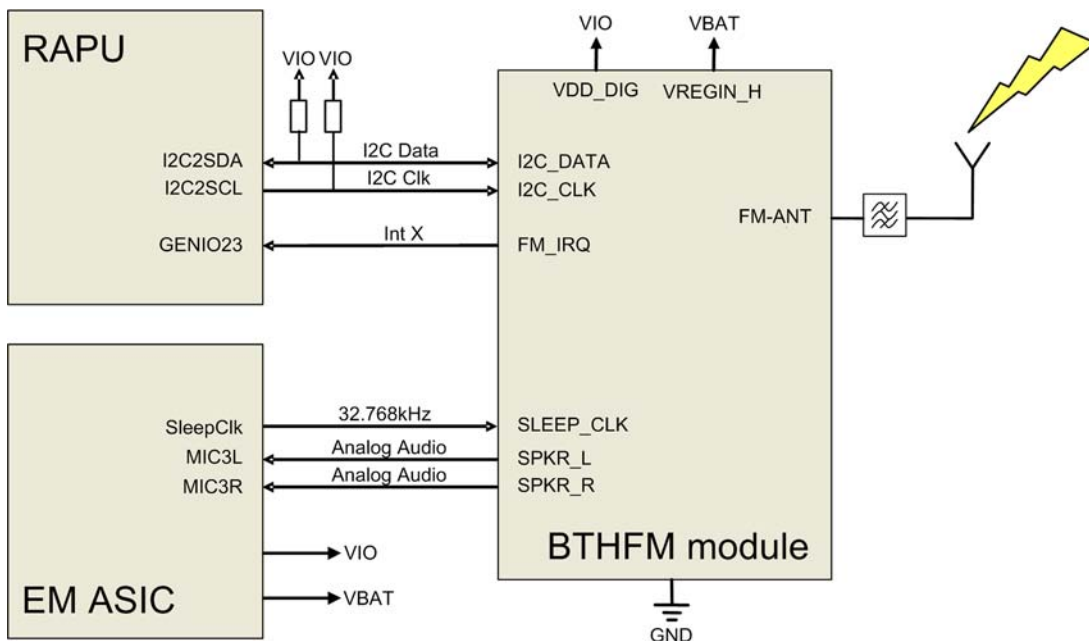
**FM radio interface**

The FM radio system is controlled by RAPU via the I2C bus. EM ASIC delivers the needed voltages and the clock reference (32.768kHz SleepClk). EM ASIC also processes the analog audio.

The FM receiver fully supports reception over US/European (87.5MHz to 108MHz) and Japanese (76MHz to 90MHz) FM band. The FM receiver comprises an RF receiver with fully integrated VCO, a stereo FM demodulator and a RDS demodulator.

A headset accessory is used as an external antenna. The headset is connected to the AV connector.

FM radio is physically integrated with Bluetooth in the BTHFM module ASIC, but from a functional point of view FM radio and Bluetooth have nothing in common.



**Figure 42 FM radio interface**

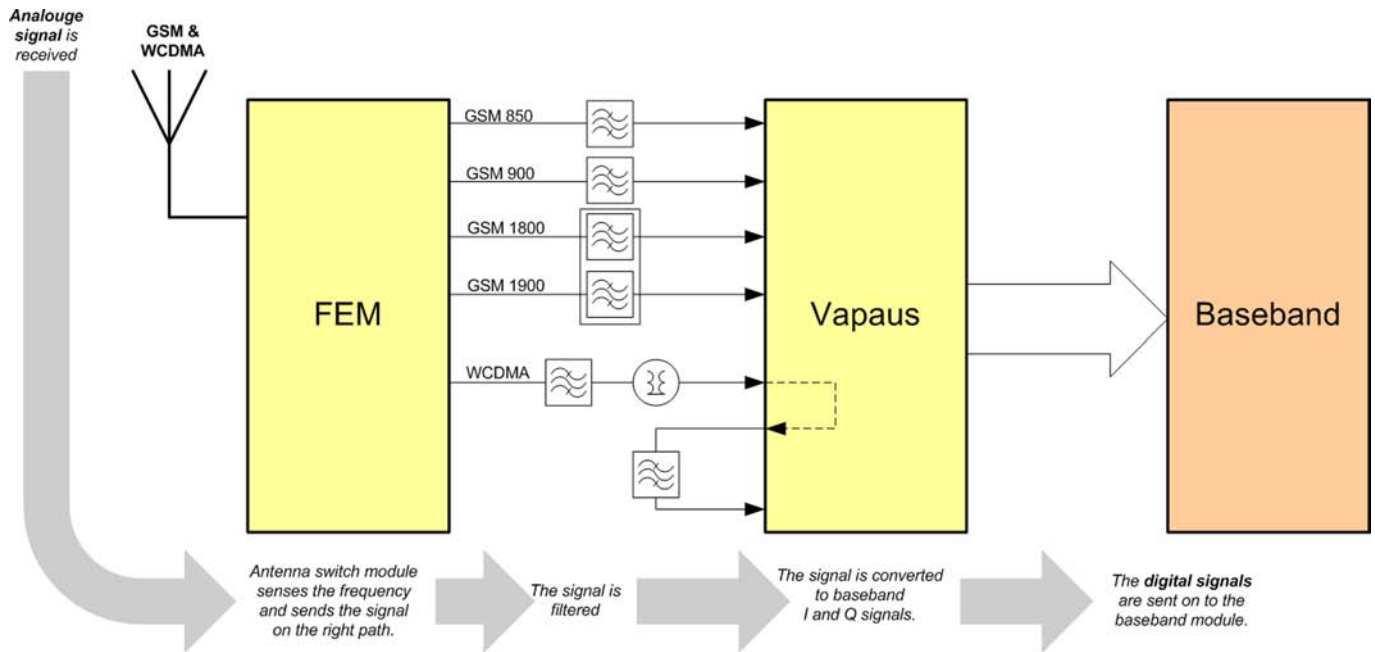
**RF description**

**Receiver (RX)**

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

The receiver functions are implemented in the RF ASIC.

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

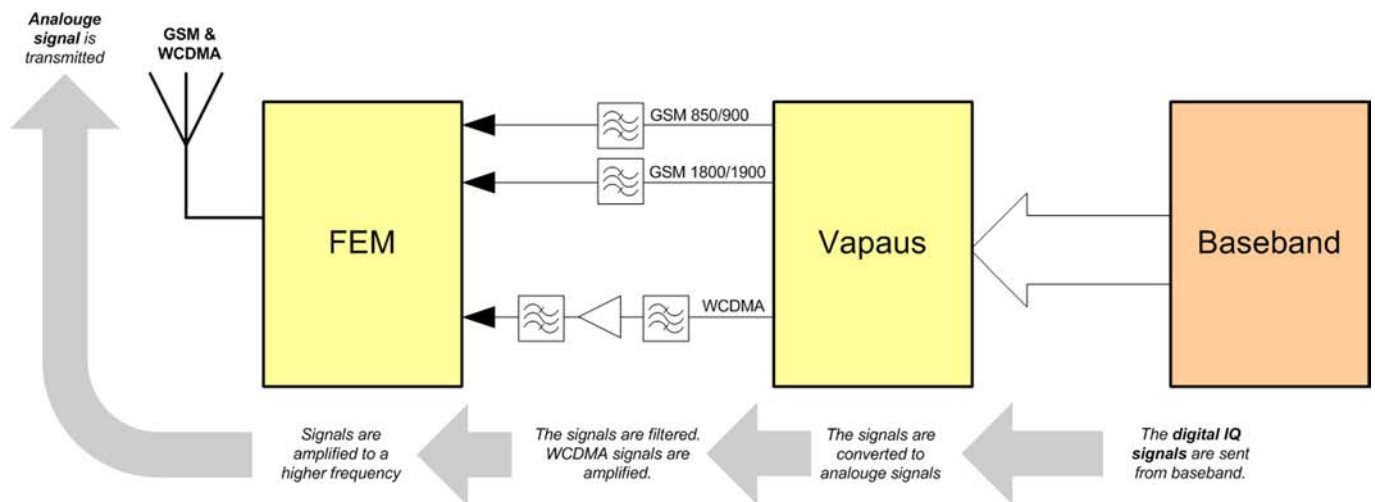


### Transmitter (TX)

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

The transmitter functions are implemented in the RF ASIC.

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



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## **6 — Service information differences between RM-632 and RM-634**

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## ■ General information

### RM-634 product data

RM-634 (Nokia E5-00.2) is an LTA variant of the RM-632.

The key product data differences between the RM-632 and RM-634 are described below.

### Connectivity

Table 11 Remote connectivity

<b>Operating bands</b>	RM-634: EGSM 850/900/1800/1900, WCDMA/HSDPA 850/1900/2100 (V/II/I)
------------------------	--

### Main RF characteristics for GSM850/900/1800/1900 and WCDMA V (850), WCDMA II (1900) and WCDMA I (2100) phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA V (850), WCDMA II (1900) and WCDMA I (2100)
Rx frequency band	GSM850: 869 - 894MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA V (850): 871 - 892 MHz
	WCDMA II (1900): 1932 - 1988 MHz
	WCDMA I (2100): 2110 - 2170 MHz
Tx frequency band	GSM850: 824 - 849MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA V (850): 826 - 847 MHz
	WCDMA II (1900): 1852 - 1908 MHz
	WCDMA I (2100): 1920 - 1980 MHz
Output power	GSM850: +5 ...+32.5dBm/3.2mW ... 2W
	GSM900: +5 ... +32.5dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA V (850): -50 ... +23 dBm/0.01μW ... 199.5mW
	WCDMA II (1900): -50 ... +22 dBm/0.01μW ... 158.5mW
	WCDMA I (2100): -50 ... +23 dBm/0.01μW ... 199.5mW

Parameter	Unit
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 V (850): 108
	WCDMA II (1900): 289
	WCDMA I (2100): 277
Channel spacing	GSM: 200 kHz
	WCDMA: 4.8 MHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA V (850): 75
	WCDMA II (1900): 75
	WCDMA I (2100): 75

## ■ RF troubleshooting

### Differences between RM-632 and RM-634

The type designator can be seen on the product type label.

### RF components difference

The PWB type code is the same for both RM-632 and RM-634. The only PWB difference is on the RF block, in which the assembly of the following components differs between RM-632 and RM-634:

- Z7521
- Z7542
- Z7544

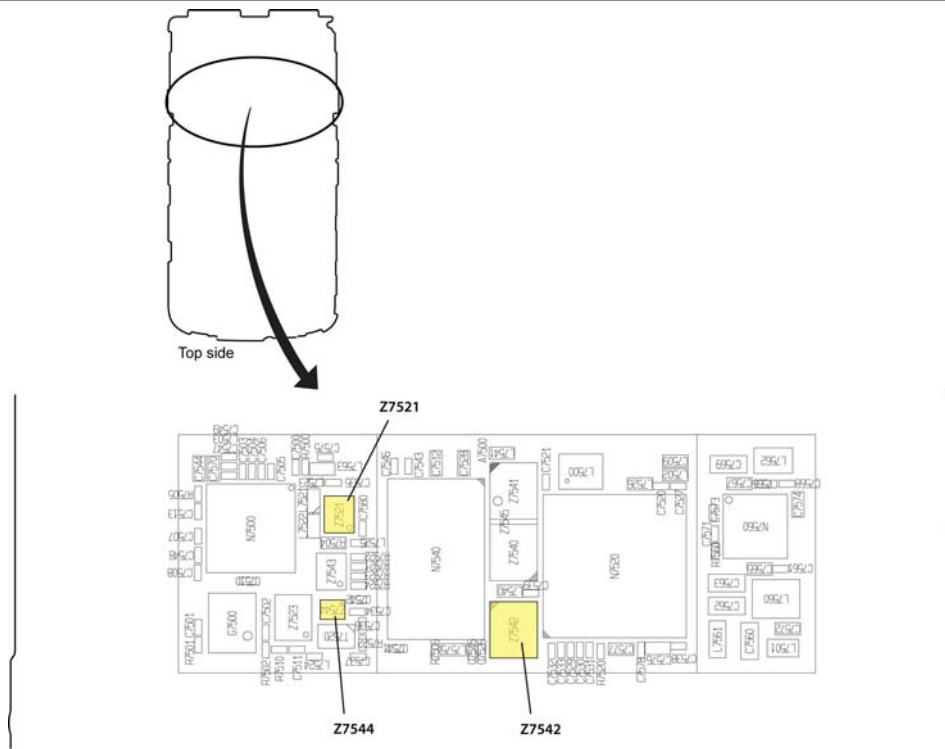


Figure 43 RM-632 RF components difference

## Receiver troubleshooting

### *WCDMA RX chain activation for manual measurement*

#### Steps

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

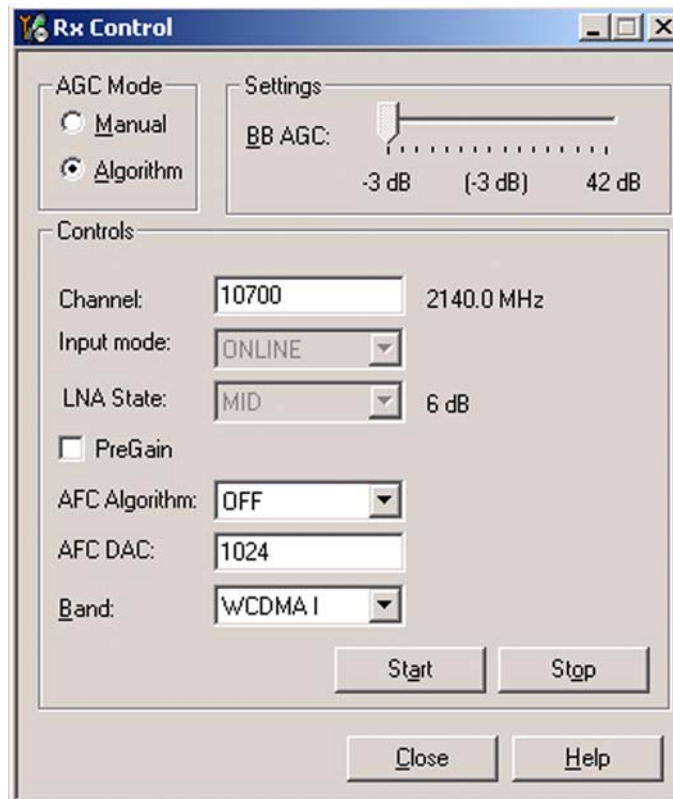


Figure 44 Phoenix Rx Control window with sample settings (WCDMA band I)

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	2141.0MHz
WCDMA II	9800	1961.0MHz
WCDMA V	4400	881.0MHz

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

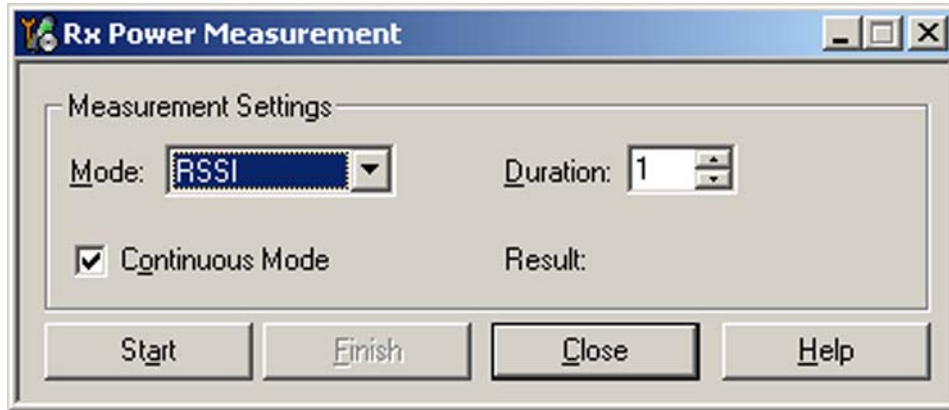
#### Prerequisites

WCDMA RX must be activated before RSSI can be measured. For instructions, please refer to [WCDMA RX chain activation for manual measurement \(page 6–11\)](#).

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.



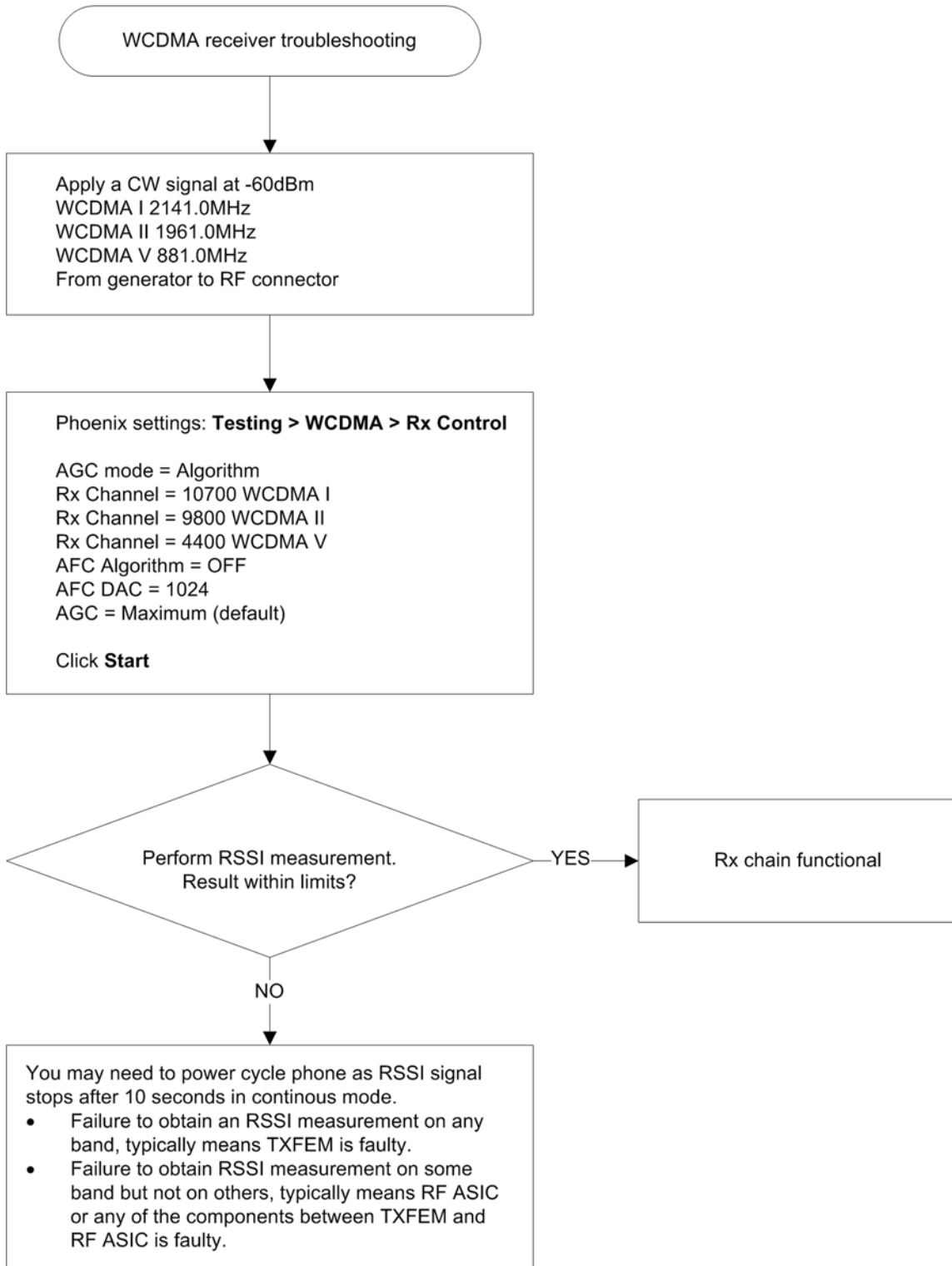
**Figure 45 Phoenix Rx Power Measurement window**

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

### WCDMA transmitter troubleshooting

#### Steps

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

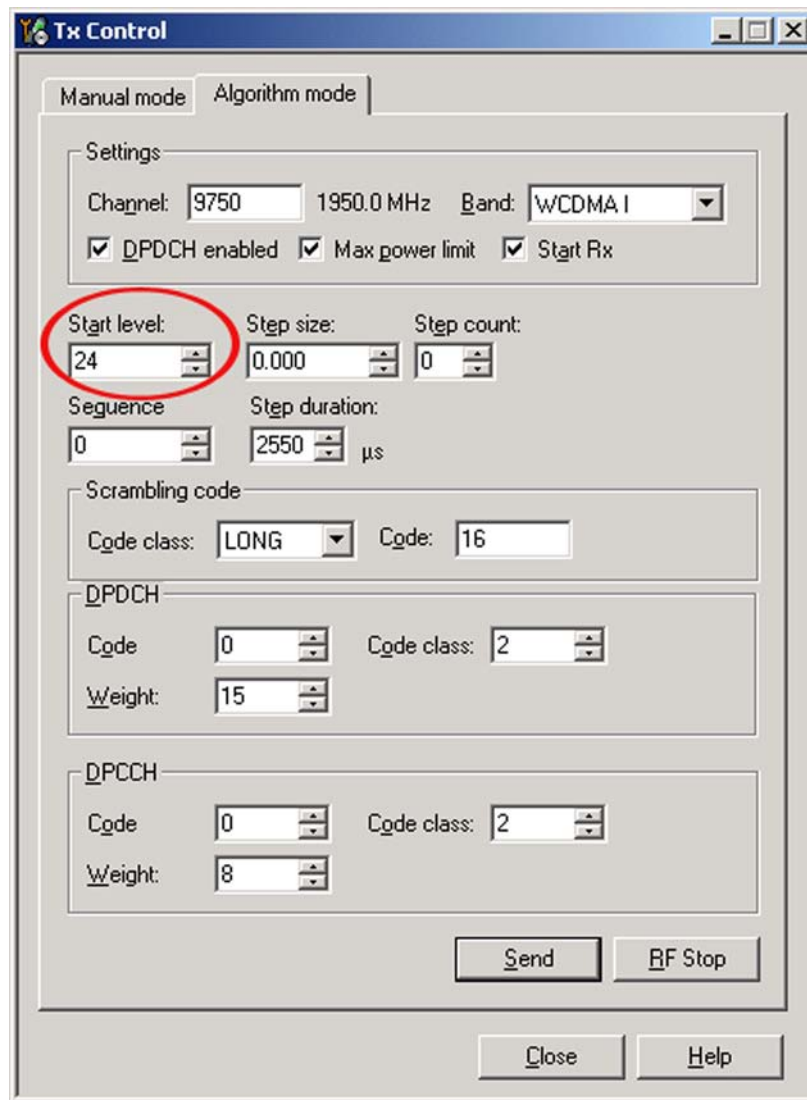


Figure 46 Phoenix WCDMA Tx control window

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

Band	Channel
WCDMA I	9750
WCDMA II	9400
WCDMA V	4175

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	24
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.

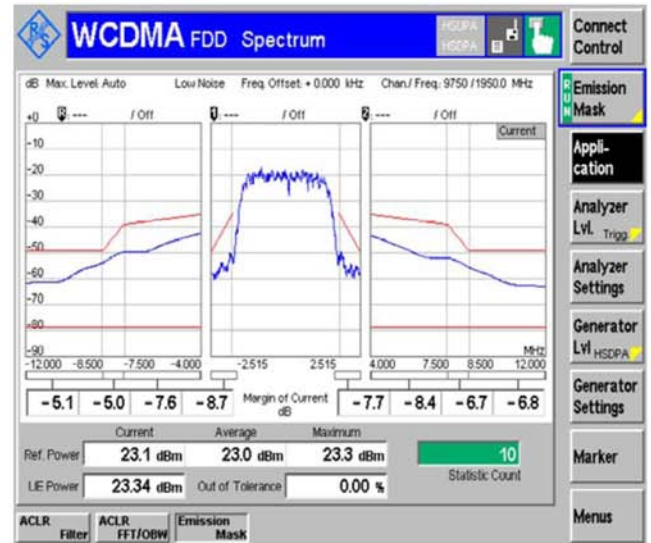
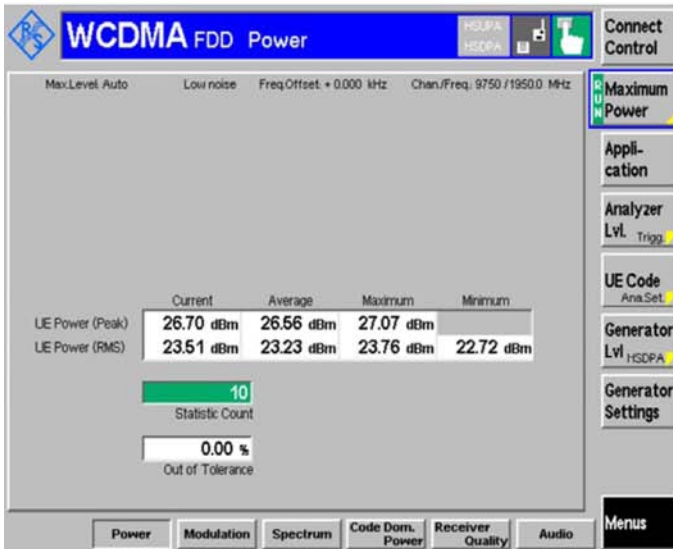
5. Click **Send** to enable the settings and activate TX.

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)

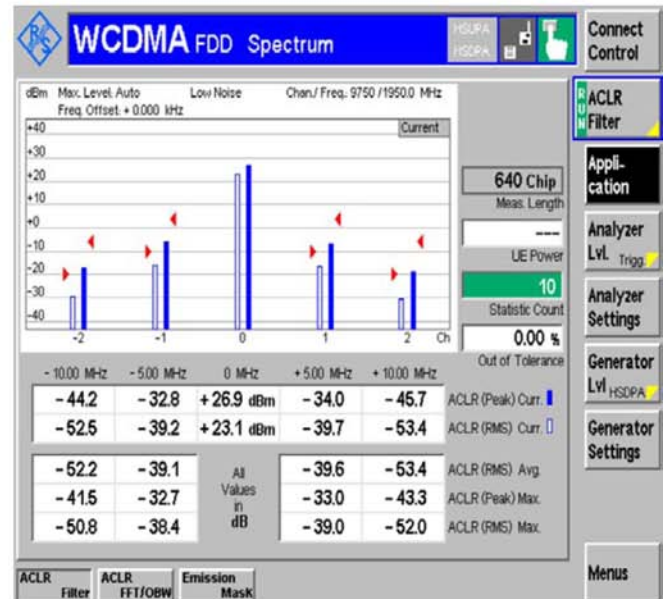
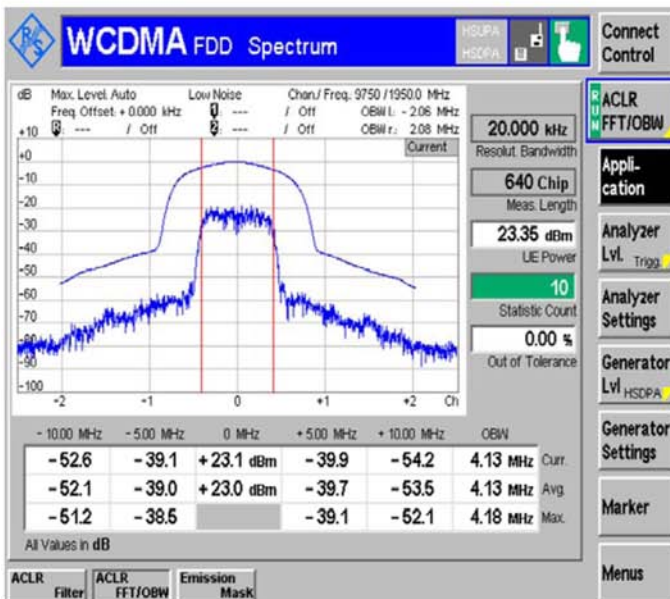
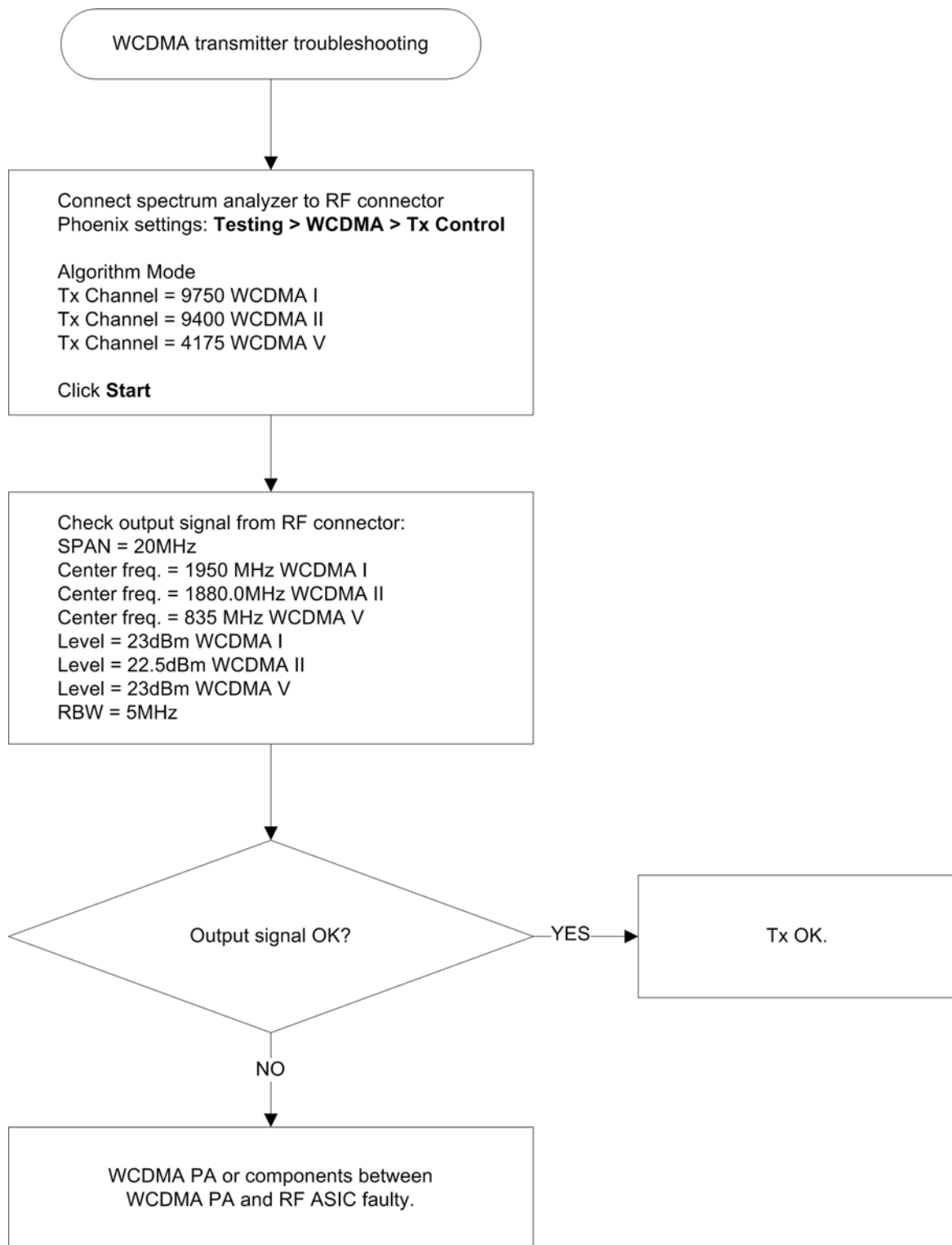


Figure 47 Typical readings

**WCDMA transmitter troubleshooting flowchart**

**Troubleshooting flow**



## **7 — Service information differences between RM-632 and RM-699**

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■ **RM-699 product data**

RM-699 is a 2G variant of RM-632. The difference is software controlled, so there is no difference mechanically. The key product data differences between the RM-699 (2G) and RM-632 (3G) are described below.



Figure 48 RM-699 product picture

**Connectivity**

Table 12 Remote connectivity

Operating bands	RM-699: EGSM 850/900/1800/1900 (no WCDMA/HSDPA)
-----------------	---

**Sales package**

- Nokia E5-00 phone (RM-699)
- Nokia Battery (BL-4D)
- Travel charger AC-8C
- Nokia Stereo Headset WH-102
- Nokia Micru USB Cable CA-101D
- Nokia MU-37, 2 GB micro SD

■ **BB troubleshooting**

**RM-632 and RM-699 differences**

Mechanically the RM-632 and RM-699 are identical. As illustrated in the figure below, the label on the C-cover/PWB enable quick differentiation between the two variants.

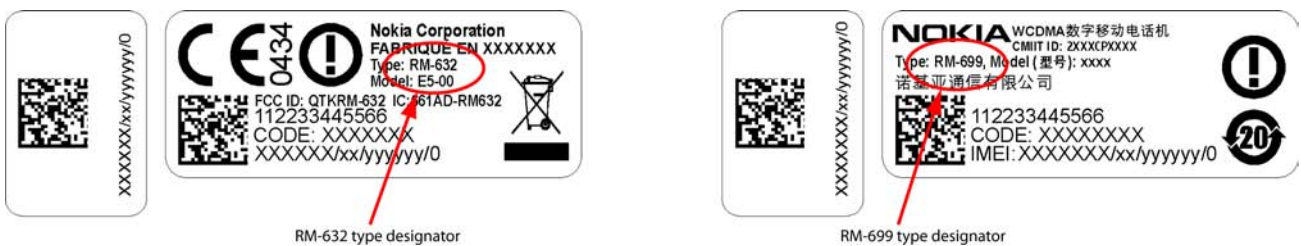


Figure 49 Type designators in RM-632 and RM-699 C-cover type label

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# 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
ICHA	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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