Nokia Customer Care

Service Manual

RM-132; RM-133 (Nokia N73)

Mobile Terminal

Part No: 9251883 (Issue 1)

COMPANY CONFIDENTIAL

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	06/2006	M. Hautaniemi	

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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.

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.

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.

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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- Title of the Document + Issue Number/Date of publication
- Latest Amendment Number (if applicable)
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Please send to:

NOKIA CORPORATION
Nokia Mobile Phones Business Group
Nokia Customer Care
PO Box 86
FIN-24101 SALO
Finland
E-mail: Service.Manuals@nokia.com

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. 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.

Nokia N73 Service Manual Structure

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1 — General Information

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RM-133/RM-132 product selection

The Nokia RM-133 is a GSM/WCDMA dual mode handportable phone supporting EGSM 850/900/1800/1900 and WCDMA 2100 (UMTS). The RM-132 variant does not support WCDMA radio interface and related services.

Note: All subsequent references to WCDMA or related services concern RM-133 only.

RM-133 is a 3GPP Release 99H terminal supporting WCDMA, EGPRS and GPRS data bearers. For WCDMA the maximum bit rate is up to 384 kbps for downlink and 384 kbps for uplink with simultaneous CS speech (64 kbps). For GSM networks RM-133 supports EGPRS multislot class 11 (4+3, max 5) and DTM multislot class 9 (3 +2, max 5).

The handset has a full phase 2 Type Approval and complies with the GSM Type Approval. It has a full CE approval and FCC approval.

RM-133 supports two way video calls with two integrated cameras. Nokia RM-133 is an MMS (Multimedia Messaging Service) enabled phone with a large bright colour display and an integrated 3.2 megapixel digital camera. The MMS implementation follows the OMA MMS standard release 1.2. The WAP 2.0 compatible Browser supports XHTML Mobile Profile (MP) and uses a TCP/IP stack to communicate with a gateway in network.

The handset uses Symbian 9.1 operating system and supports also MIDP Java 2.0 & CLDC1.1, providing an excellent platform for 3rd party applications.

Figure 1 View of RM-133/RM-132

Product features and sales package

Display and user interface

- QVGA display (240x320, up to 262,144 colours)
- Automatic brightness control for display
- 4-way scroll key with center select, two softkeys, application-key, edit and clear key, send & end key, multimedia key
- Dedicated capture key, zoom/volume keys and review key
- System: EGSM 850/900/1800/1900 + WCDMA 2100 GHz

- User interface: S60 software on Symbian OS

Imaging and video

- Integrated 3.2 Megapixel camera with up to 20 x digital zoom and mechanical shutter
- Landscape capture with dedicated capture key
- Integrated Flash LED with red-eye reduction function
- High-quality video capture in MP4 and 3GP formats with up to 8x digital zoom
- Image and video editors
- Nokia Lifeblog
- Image and video uploading to the web
- XpressPrint over infrared, Bluetooth wireless technology, PictBridge and UPnP directly from Gallery

Entertainment

- Integrated digital music player with stereo audio. Supported file formats: MP3, AAC, eAAC+ and wma
- USB mass storage that enables easy drag and drop of files, such as music tracks
- Stereo FM radio with support for Visual Radio
- Multimedia player (RealPlayer) with 3GPP & MPEG4 AVC video streaming support
- Internet browser

Productivity

- Office document viewers (Microsoft Word, PowerPoint, Excel) and PDF reader
- PC Suite connectivity with USB, Bluetooth wireless technology, and IrDa
- Advanced S60 PIM (calendar, contacts, task list, PIM printing, etc.)
- Voice recording, dialing and voice commands
- Push to talk (PoC) application
- SettingWizard for easy settings configuration
- Video sharing and two-way video call

Messaging

- E-mail with document viewers to view attachments
- SMS, multimedia messaging (MMS)

Memory functions

- Up to 42 MB of internal dynamic memory for images, contacts, text messages, multimedia messages, ringing tones, images, video clips, calendar notes, to-do list and applications. Please note that the preinstalled applications on the user data area of the device memory will reduce the informed amount of available memory, unless uninstalled.
- Expandable memory: 1 GB miniSD card. *
- Hot swap slot for easy memory card insertion and removal

*The availability of a memory card and memory capacity of the card in the sales package may vary depending on the market and/or your network operator/service provider.

Connectivity

- Bluetooth wireless technology

- Infrared
- Pop-Port™ with USB 2.0 Full Speed with mass storage class

Operating frequency and data transfer

- WCDMA2100 and quadband GSM/EDGE (EGSM 850/900/1800/1900) WCDMA2100 with simultaneous voice and packet data (PS max speed UL/DL= 384/384 kbps, CS max speed 64 kpbs)
- EGPRS (Class A, Multislot class 11) – Max download 236.8 kbps; upload 118.4 kbps
- Data transfer (from compatible S40 and S60 phones)

Java

- Java™ MIDP 2.0, CLDC 1.1
- Over-the-air download of Java™-based applications and games

Sales package

- Transceiver
- Charger (AC-4)
- Battery (BP-6M)
- Stereo headset (HS-23)
- Connectivity cable (CA-53)
- Wrist strap (CP-134)
- Charging adapter (CA-44)
- Lens cleaning cloth

Mobile enhancements

Table 1 Audio

Enhancement	Type
Classic stereo headset	HS-23
Music stereo headset	HS-28+AD-41
Mono Headset	HS-5
Boom Headset	HDB-4
Fashion Stereo Headset	HS-31
Display Headset	HS-69
Bluetooth headset BH-800	HS-24W
Bluetooth Headset BH-900	HS-25W
Wireless Headset	HS-26W
Wireless Headset	HS-11W
Wireless Clip-on Headset	HS-21W
Wireless Headset	HS-36W
Wireless Headset	HS-37W
Wireless Headset	HS-53W

Enhancement	Type
Wireless Headset	HS-55W
Wireless Headset	HS-54W
Wireless Headset	HS-56W
Bluetooth Headset BH-200	HS-58W
Bluetooth Headset BH-700	HS-57W
Bluetooth Headset BH-300	HS-50W
Bluetooth Headset BH-600	HS-59W
Audio Adapter	AD-15
Audio Adapter	AD-46
Music Stand	MD-1
TTY Adapter	HDA-10
Loopset	LPS-4

Table 2 Car

Enhancement	Type
Mobile charger	DC-4
Headrest handsfree	BHF-3
Basic handsfree	HF-3
Advanced car kit (sales pack)	CK-7W
Nokia 616 car kit	N616
Basic car kit	CK-10
Wireless plug-in car handsfree	HF-6W
Universal holder	CR-39

Table 3 Carrying

Enhancement	Type
Multicompatible carrying case	CP-93
Inbox strap	CP-134
Lens cloth	CL-3

Table 4 Data

Enhancement	Type
Mini SD card 128 MB	MU-17
Mini SD card 256 MB	MU-18

Enhancement	Type
Mini SD card 512 MB	MU-23
Mini SD card 1GB	MU-24
Charging connectivity cable	CA-70
Connectivity cable	CA-53

Table 5 Deskstands

Enhancement	Type
Universal passive deskstand	DT-13

Table 6 Imaging

Enhancement	Type
Nokia image album	PD-1
Nokia remote camera	PT-6

Table 7 Messaging

Enhancement	Type
Nokia digital pen	SU-1B
Bluetooth QWERTY keypad	SU-8W

Table 8 Positioning

Enhancement	Type
Wireless GPS Module	LD-1W
Wireless GPS Module update	LD-3W

Table 9 Power

Enhancement	Type
Battery 1100 mAh Li-ion	BP-6M
Compact charger	AC-3
Travel charger	AC-4
Charging adapter	CA-44

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T) (mm)	Weight (g)	Volume (cm3)
Transceiver with BP-6M 1100 mAh li-ion battery back	110 x 49 x 19 (26 mm at camera)	116	89

Main RF characteristics for GSM850/900/1800/1900 and WCDMA 2100 phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA 2100
Rx frequency band	GSM850: 869 - 894MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA2100: 2110 - 2170 MHz
Tx frequency band	GSM850: 824 - 849MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA2100: 1920 - 1980 MHz
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA -50 ... 24 dBm
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
Channel spacing	200 kHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BP-6M	1100	273 mins (GSM) up to 226 mins (WCDMA)	up to 318 hours (GSM) and up to 348 hours (WCDMA)

Charging times

AC-4
up to 90 min

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

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2 — Parts Lists and Component Layouts

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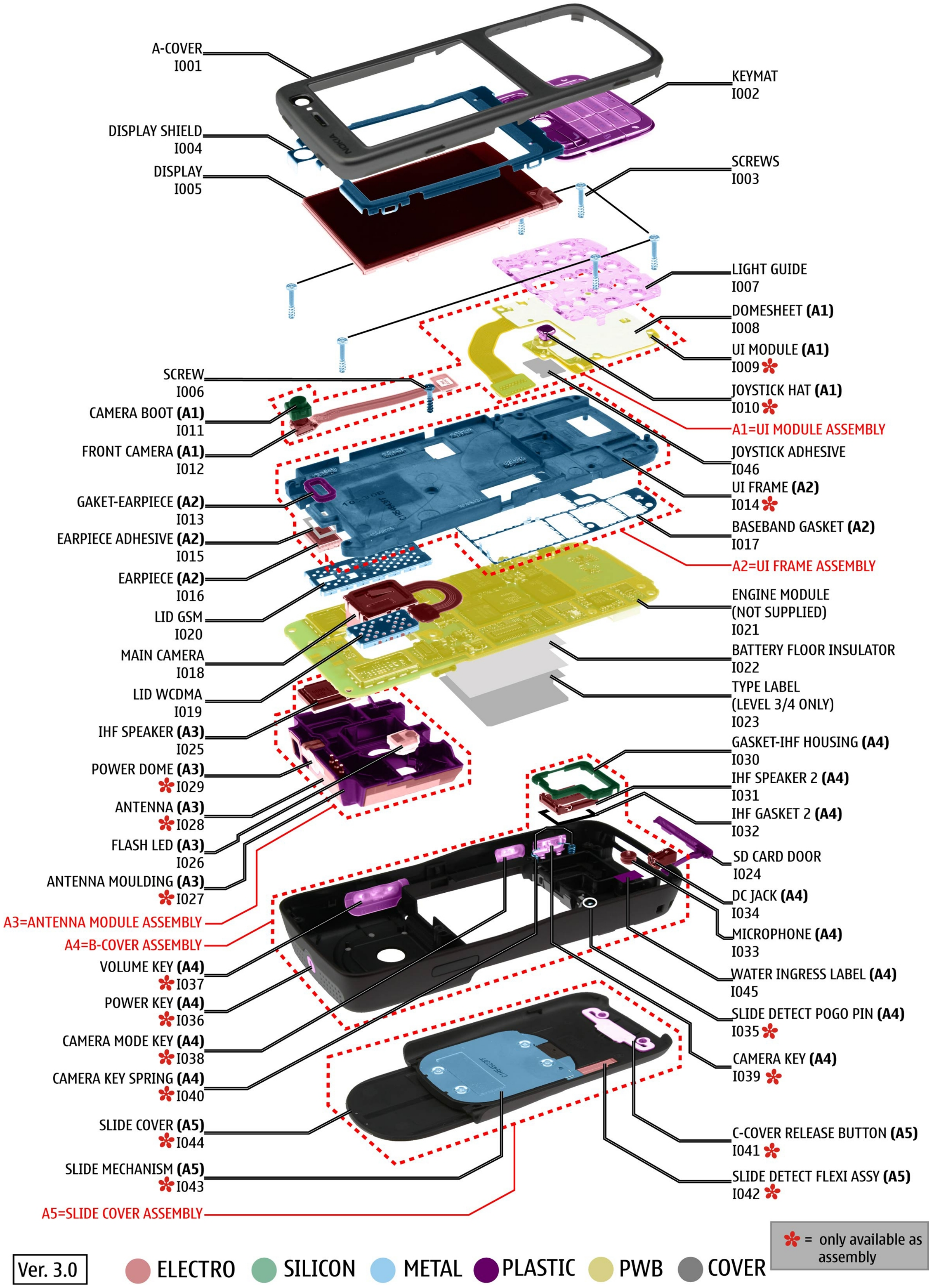
RM-132/133 exploded view



Mechanical spare parts list

- Bold = assembly (assy)
- I0xx = ITEM codes for upper or mono block
- I1xx = ITEM codes for hinge block
- I2xx = ITEM codes for lower block
- I3xx = ITEM codes for soldered spare parts in the upper hinge or lower block and not exchangeable

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

ITEM/ CIRCUIT REF.	QTY	PART NAME
I001	1	A-COVER
I002	1	KEYMAT
I003	6	SCREWS
I004	1	DISPLAY SHIELD
I005	1	DISPLAY
I006	1	SCREW
I007	1	LIGHT GUIDE
A1	1	UI MODULE ASSEMBLY (I008 - I010)
I008	1	DOMESHEET
I009	1	UI MODULE
I010	1	JOYSTICK HAT
I011	1	CAMERA BOOT
I012	1	FRONT CAMERA
A2	1	UI FRAME ASSEMBLY (I013 - I017)
I013	1	GASKET-EARPIECE
I014	1	UI FRAME
I015	1	EARPIECE ADHESIVE
I016	1	EARPIECE
I017	1	BASEBAND GASKET
I018	1	MAIN CAMERA
I019	1	LID WCDMA
I020	1	LID GSM
I021	1	ENGINE MODULE
I022	1	BATTERY FLOOR INSULATOR
I023	1	TYPE LABEL
I024	1	SD CARD DOOR

ITEM/ CIRCUIT REF.	QTY	PART NAME
A3	1	ANTENNA MODULE ASSEMBLY (I025 - I029)
I025	1	IHF SPEAKER
I026	1	FLASH LED
I027	1	ANTENNA MOULDING
I028	1	ANTENNA
I029	1	POWER DOME
A4	1	B-COVER ASSEMBLY (I030 - I040, I045)
I030	1	GASKET-IHF HOUSING
I031	1	IHF SPEAKER 2
I032		IHF GASKET 2
I033	1	MICROPHONE
I034	1	DC JACK
I035	2	SLIDE DETECT POGO PIN
I036	1	POWER KEY
I037	1	VOLUME KEY
I038	1	CAMERA MODE KEY
I039	1	CAMERA KEY
I040	1	CAMERA KEY SPRING
I045	1	WATER INGRESS LABEL
A5	1	SLIDE COVER ASSEMBLY (I041 - I044)
I041	1	C-COVER RELEASE BUTTON
I042	1	SLIDE DETECT FLEXI ASSY
I043	1	SLIDE MECHANISM
I044	1	SLIDE COVER

Component parts lists and layouts

Component parts lists

Table 10 RM-133 component part list (1SU_11)

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Item	Side	Grid ref.		Type	Description and value		
A7002	Top	H	17	SHIELD_0264350	SHIELD RF ASSY 040-021698	~	~
A7003	Top	B	19	SHIELD_0264351	SHIELD WCDMA ASSY 040-021699	~	~

Item	Side	Grid ref.		Type	Description and value		
B2200	Top	C	5	CRYSTAL_3.3X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz	~
C1100	Bot	H	15	0402C	Chipcap 5% NP0	10p	50V
C1101	Bot	H	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2005	Bot	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Bot	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2007	Top	F	2	0402C	Chipcap 5% NP0	10p	50V
C2008	Top	F	2	0402C	Chipcap 5% NP0	10p	50V
C2009	Top	G	2	0402C	Chipcap 5% NP0	10p	50V
C2010	Top	G	2	0402C	Chipcap 5% NP0	10p	50V
C2012	Bot	C	4	0603C_H0.95	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C2202	Top	C	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2203	Top	B	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2204	Top	A	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2206	Top	C	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2210	Bot	E	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2211	Top	A	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2212	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2213	Top	C	6	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2215	Top	B	6	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2217	Top	B	4	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2220	Top	A	4	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2222	Top	A	5	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V

Item	Side	Grid ref.		Type	Description and value		
C2228	Top	B	6	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2250	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2251	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2300	Top	G	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2304	Top	F	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2306	Top	G	5	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2314	Top	H	7	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2316	Top	H	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2317	Top	G	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2700	Bot	D	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2800	Top	F	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2801	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2802	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2803	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2804	Top	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2805	Top	F	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2806	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2809	Top	F	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C3503	Top	B	9	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C4201	Top	B	14	0805C_H0.95	CHIPCAP X5R 10U M 6V3 T=0.95mm 0805	10u	6V3
C4401	Top	F	20	0402C	Chipcap 5% NP0	27p	50V

Item	Side	Grid ref.		Type	Description and value		
C4403	Top	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4404	Top	C	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4405	Top	G	11	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4409	Top	I	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4420	Bot	A	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4800	Top	E	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4801	Top	F	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C4803	Top	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4808	Top	F	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5002	Top	F	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5100	Top	C	10	0402C	Chipcap 5% NP0	27p	50V
C6031	Top	B	7	0402C	Chipcap 5% NP0	18p	50V
C6032	Top	B	7	0402C	Chipcap 5% NP0	100p	50V
C6033	Top	B	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6034	Top	A	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6035	Top	C	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6036	Top	C	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6037	Top	C	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6038	Top	B	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6039	Top	A	6	0402C	Chipcap 5% NP0	18p	50V
C6051	Top	B	7	0402C	Chipcap +-0.25pF NP0	2p7	50V
C6052	Top	B	7	0402C	Chipcap +-0.25pF NP0	2p7	50V
C6055	Top	A	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V

Item	Side	Grid ref.		Type	Description and value		
C6100	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6101	Top	A	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6102	Top	A	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6103	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6104	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6105	Top	C	2	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6108	Top	C	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6109	Top	A	2	0402C	Chipcap 5% NP0	47p	50V
C6110	Top	B	2	0402C	Chipcap 5% NP0	27p	50V
C6112	Top	B	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6113	Top	A	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6502	Bot	B	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6503	Bot	B	17	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6508	Top	E	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6509	Top	C	13	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6510	Top	B	13	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6515	Top	B	13	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6516	Top	C	13	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6590	Top	D	13	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6592	Top	B	14	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C6593	Top	C	15	0805C_H0.95	CHIPCAP X5R 10U M 6V3 T=0.95mm 0805	10u	6V3

Item	Side	Grid ref.		Type	Description and value		
C6594	Top	A	16	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6595	Bot	B	17	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C6598	Top	I	12	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C7500	Top	I	17	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7501	Top	G	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7502	Top	G	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7504	Top	I	17	0402C	Chipcap +-0.25pF NP0	2p2	50V
C7505	Top	G	14	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C7507	Top	I	17	0402C	Chipcap +-0.25pF NP0	1p5	50V
C7508	Top	H	14	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7509	Top	H	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7510	Top	G	14	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7511	Top	D	14	0805C_H0.95	CHIPCAP X5R 10U M 6V3 T=0.95mm 0805	10u	6V3
C7512	Top	A	18	0402C	Chipcap 5% NP0	27p	50V
C7513	Bot	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7514	Bot	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7515	Top	G	19	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7516	Bot	C	19	0402C	Chipcap +-0.25pF NP0	6p8	50V
C7517	Bot	C	19	0402C	Chipcap 5% NP0	10p	50V
C7518	Top	D	13	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7519	Bot	C	19	0402C	Chipcap 5% NP0	27p	50V
C7520	Bot	C	19	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7521	Bot	C	19	0402C	Chipcap X7R 10% 50V 0402	1n0	50V

Item	Side	Grid ref.		Type	Description and value		
C7523	Top	I	14	0402C	Chipcap +-0.25pF NP0	3p3	50V
C7525	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7526	Top	H	14	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7527	Top	H	14	0402C	CHIPCAP NP0 470P J 6V3 0402	470p	6V3
C7528	Bot	B	16	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7529	Top	A	18	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7530	Top	B	18	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7531	Top	B	19	0402C	Chipcap 5% NP0	10p	50V
C7532	Top	B	18	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7533	Top	A	20	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C7534	Top	D	19	0402C	Chipcap 5% NP0	27p	50V
C7537	Bot	E	15	0402C	Chipcap 5% NP0	10p	50V
C7538	Bot	G	16	0402C	Chipcap 5% NP0	10p	50V
C7539	Top	B	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7540	Top	I	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7542	Top	H	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7543	Top	I	17	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7546	Top	C	12	0402C	Chipcap 5% NP0	27p	50V
C7547	Top	E	13	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C7548	Top	F	14	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C7549	Top	F	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C7550	Top	G	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C7551	Top	C	14	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Type	Description and value		
C7553	Top	I	19	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7563	Top	I	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7564	Top	B	20	0402C	Chipcap 5% NP0	27p	50V
C7565	Top	A	14	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C7567	Bot	D	3	0402C	Chipcap 5% NP0	27p	50V
C7568	Top	B	3	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C7569	Bot	E	5	0402C	Chipcap 5% NP0	27p	50V
C7570	Bot	D	4	0402C	Chipcap 5% NP0	27p	50V
C7571	Bot	D	5	0402C	Chipcap 5% NP0	27p	50V
C7572	Top	B	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7573	Top	C	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7590	Top	D	20	0402C	Chipcap 5% NP0	27p	50V
C7591	Top	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7592	Top	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7598	Top	H	18	0402C	Chipcap +-0.25pF NP0	2p2	50V
C9059	Top	E	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C9060	Bot	C	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C9070	Top	C	13	0402C	Chipcap 5% NP0	27p	50V
C9071	Top	A	16	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C9073	Top	C	10	0402C	Chipcap 5% NP0	27p	50V
C9074	Top	C	16	0402C	Chipcap 5% NP0	27p	50V
C9075	Top	D	14	0402C	Chipcap 5% NP0	27p	50V
C9076	Top	H	11	0402C	Chipcap 5% NP0	27p	50V
C9077	Top	I	12	0402C	Chipcap 5% NP0	27p	50V
C9078	Top	H	13	0402C	Chipcap 5% NP0	27p	50V
C9079	Top	F	10	0402C	Chipcap 5% NP0	10p	50V
C9080	Top	B	4	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V

Item	Side	Grid ref.		Type	Description and value		
C9083	Top	H	13	0402C	Chipcap 5% NP0	47p	50V
C9084	Bot	G	17	0402C	Chipcap 5% NP0	56p	50V
C9085	Bot	G	16	0402C	Chipcap 5% NP0	56p	50V
C9086	Bot	H	16	0402C	Chipcap 5% NP0	56p	50V
C9087	Top	B	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C9088	Top	G	13	0402C	Chipcap 5% NP0	33p	50V
C9090	Top	A	13	0402C	Chipcap 5% NP0	27p	50V
C9093	Bot	C	19	0402C	Chipcap +-0.25pF NP0	3p3	50V
D2800	Top	H	9	VFBGA343	RAP3GS V2.0E-PA VFBGA	~	~
D5000	Top	E	7	FBGA133_11.6X13.1	COMBO 512 DDR + 1G NAND FBGA133 PBFREE	32Mx16/128Mx8	~
D6500	Top	D	11	FBGA_195	OMAP DM290 GOLDENEYE NFBGA	~	~
D6501	Top	F	11	WBGA_60_8.1X6.6_H0.9	SDRAM 4X16 1.8V/1.8V FBGA60 PBFREE	4Mx16	~
D6502	Top	H	9	FBGA128_EMPTY	COMBO 128M NOR +128M DDR DRAM FBGA128	8Mx16/8Mx16	~
D6503	Top	B	15	uBGA_6_1.45X0.95	SN72AUC2G04YZT INV GATE WCSP06	~	~
F2000	Bot	C	3	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A	~
G1000	Bot	B	15	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V	~
G7500	Top	G	14	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz	~
G7501	Top	I	14	VCO_DCS02733	VCO 3296-3980MHZ 4-BAND MATSUSHITA	3296-3980MHz	~
J7500	Bot	C	21	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
J7502	Bot	C	21	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
J7590	Bot	D	21	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
L2000	Bot	C	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2002	Bot	E	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~

Item	Side	Grid ref.		Type	Description and value		
L2003	Bot	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2004	Bot	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2011	Bot	G	2	COIL_LK_1608	CHIP COIL 68NH J Q12/100MHZ 0603	68nH	~
L2302	Top	G	8	CHOKE_SER400_H 1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH	~
L2309	Top	H	6	CHOKE_SER300_H 1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH	~
L3002	Bot	A	4	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6030	Top	B	7	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6031	Top	B	7	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6032	Top	B	6	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6100	Top	B	3	0402LQW	CHIP COIL 47N +-3% Q25/200MHZ 0402	47nH	~
L6101	Top	A	2	0402L_POL2	CHIP COIL 120NH J Q8/100MHZ 0402	120nH	~
L6500	Top	C	14	CHOKE_SER300	INDUCT WW 2.2UH 1A2 310 CASE SIZE	2u2H	~
L6501	Bot	B	16	CHOKE_SER300_H 1.5	CHOKE 3U3 1.2A 0R096 3X3X1.5	3u3H	~
L6502	Top	E	14	CHOKE_SER300	INDUCT WW 2.2UH 1A2 310 CASE SIZE	2u2H	~
L6505	Top	B	13	CHOKE_SER400_H 1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH	~
L6509	Top	B	4	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/100MHz	~
L6517	Top	G	3	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6518	Top	F	3	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6519	Bot	G	16	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6520	Bot	G	16	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~

Item	Side	Grid ref.		Type	Description and value		
L6521	Top	E	3	0405_2_TDK	CHIP BEAD ARRAY 2X220R 0405	2x220R	~
L6522	Bot	F	3	0405_2_TDK	CHIP BEAD ARRAY 2X220R 0405	2x220R	~
L6600	Bot	C	17	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6604	Bot	B	17	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7500	Top	I	16	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7520	Top	G	19	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/ 100MHz	~
L7540	Top	B	18	CHOKE_SER300_H1.5	CHOKE 3U3 1.2A 0R096 3X3X1.5	3u3H	~
L7541	Top	B	20	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7542	Bot	C	20	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7544	Top	C	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7545	Top	G	2	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7546	Top	F	2	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7547	Bot	F	2	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7548	Bot	F	20	0402L_XL	CHIP COIL 68N J Q17/300M 0402	68nH	~
L7549	Bot	F	20	0402L_XL	CHIP COIL 68N J Q17/300M 0402	68nH	~
L7551	Top	E	20	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7553	Bot	B	18	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7599	Top	H	18	0402L_H0.45	CHIP COIL 4N7 +-0N1 Q29/1GHZ 0402	4n7H	~
L7601	Top	I	17	0402L	CHIP COIL 8N2 J Q28/800MHZ 0402	8n2H	~
L7603	Top	I	17	0402L	CHIP COIL 18N J Q29/800M 0402	18nH	~

Item	Side	Grid ref.		Type	Description and value		
L7604	Top	D	19	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7605	Top	D	20	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7606	Top	I	18	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	50V
L7607	Bot	B	5	0402L	CHIP COIL 47N J Q23/800MHZ 0402	47nH	~
L7608	Bot	A	5	0402L	CHIP COIL 47N J Q23/800MHZ 0402	47nH	~
L7609	Top	I	13	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7610	Bot	F	20	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7611	Bot	F	20	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L9056	Bot	E	6	0402L	CHIP COIL 47N J Q23/800MHZ 0402	47nH	~
L9057	Top	F	10	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L9060	Top	G	13	0603L	CHIP COIL 470N+-2% Q30/100MHZ 0603	470nH	~
L9097	Bot	C	19	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
M1000	Bot	B	3	VIBRA_M_KHN4N X1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~	~
N2200	Top	B	5	TFBGA_105	AVILMA 1.05C BB MODULE TFBGA105	~	~
N2300	Top	G	6	TFBGA64_H1.2	BETTY V2.1 LF TFBGA64	~	~
N3500	Top	C	9	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-3.0 NOPB USMD5	~	3V
N3501	Top	C	10	PBGA_N20_P0.5	LEVEL SHIFT SN74AVCA406LZXYR S-PBGA-N20 *FOR NRC USE ONLY*	~	~
N4800	Top	E	9	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~	~
N6030	Top	B	7	CSP_47_3.85X4.05	BC4-ROM1.0RDL	~	~
N6100	Top	B	3	WFBGA34_2_3.57X3.57	FM RECEIVER TEA5761UK N4B CSP (TI)	~	~

Item	Side	Grid ref.		Type	Description and value		
N6502	Bot	A	17	TK11892F	STEP-UP DC/DC CONV TK11892F-G-20 SON3024-8	~	~
N6505	Bot	A	16	IRDA_TFBS_GP2W_CIM	IRDA MIR XSMALL	~	~
N6508	Top	E	13	USMD5_1.417X1.087	DC/DC CONV LM3671TLX-1.82V USMD5	~	~
N6509	Bot	E	3	XBGA_N16	AF AMP TPA2012D2 77DB/217HZ WCSP16	~	~
N6513	Top	C	14	USMD_8_1.55X1.55	2XVREG 2.8V/150MA LP3986 USMD8 PB-FREE	~	2.8V
N6515	Top	B	14	USMD_10_2.458X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~	~
N6516	Top	B	15	ECSP2828_10	SHUTTER DRIVER LB8681CL	~	~
N6517	Top	B	13	XBGA_N8_2.02X1.02	DC/DC CONV TPS6231YZD 1.5V CSP8	~	~
N6518	Top	E	13	USMD5_1.468X1.036	REG+ LP3999ITLX 1.8V 150MA NOPB	~	1.8V
N6519	Top	F	14	FC_4_0.99X0.99	LI VREG 1.5V/150MA WLCSP4 TK63115B	~	1.5V
N7500	Top	H	16	TFBGA_188_H1.4	RF SYSTEM MODULE PIHI2.22 9.0X9.0X1	~	~
N7520	Top	H	19	RF9282E3.6	PA RF9282E6.3 GSM/EDGE 850/900/1800/1900	~	~
N7540	Top	B	19	RF9372_H1.5	PA MODULE RF9372E5.2 WCDMA 1850-1980MHZ	~	~
N7541	Top	B	18	uBGA8_1.849X1.696	DC CONV LM3202TLX NOPB REVB USMD8	~	~
N7542	Top	I	12	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
N9002	Top	H	7	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N9003	Top	F	3	uBGA_6_1.45X0.95	TI ANALOG SWITCH TS5A3159YZTR WCSP06	~	~
N9004	Top	G	3	uBGA_6_1.45X0.95	TI ANALOG SWITCH TS5A3159YZTR WCSP06	~	~

Item	Side	Grid ref.		Type	Description and value		
N9006	Top	B	16	FC_4_0.99X0.99	LI VREG 1.5V/150MA WLCSP4 TK63115B	~	1.5V
R1100	Bot	G	16	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R1101	Bot	E	5	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R1102	Bot	H	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2006	Top	G	2	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~	~
R2007	Bot	E	3	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2009	Top	G	5	0402R	Resistor 5% 63mW	220k	~
R2303	Top	H	7	0402R	Resistor 5% 63mW	27R	~
R2800	Top	H	8	0402R	Resistor 5% 63mW	10R	~
R2801	Top	F	10	0402R	Resistor 5% 63mW	4k7	~
R2804	Top	G	8	0402R	Resistor 5% 63mW	4k7	~
R2805	Top	H	8	0402R	Resistor 5% 63mW	4k7	~
R4400	Bot	D	5	0402R	Resistor 5% 63mW	470k	~
R4401	Top	F	20	0402R	Resistor 5% 63mW	100k	~
R4402	Bot	D	5	0402R	Resistor 5% 63mW	470k	~
R4403	Top	F	20	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R4410	Bot	C	5	0402R	Resistor 5% 63mW	47k	~
R4416	Top	B	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4420	Bot	F	20	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4800	Top	E	8	0402R	Resistor 5% 63mW	10R	~
R4801	Top	F	10	0402R	Resistor 5% 63mW	1k0	~
R6030	Top	C	7	0402R	Resistor 5% 63mW	10k	~
R6031	Top	B	6	0402R	Resistor 5% 63mW	10k	~
R6032	Top	C	7	0402R	CHIPRES 0W06 2R2 J 0402	2R2	~
R6034	Top	B	7	0402R	Resistor 5% 63mW	10k	~
R6037	Top	A	6	0402R	Resistor 5% 63mW	100k	~
R6100	Top	B	3	0402R	Resistor 5% 63mW	10k	~
R6101	Top	B	3	0402R	Resistor 5% 63mW	100k	~

Item	Side	Grid ref.		Type	Description and value		
R6102	Top	C	3	0402R	Resistor 5% 63mW	4k7	~
R6103	Top	C	3	0402R	Resistor 5% 63mW	4k7	~
R6505	Bot	A	18	0402R	Resistor 5% 63mW	10k	~
R6506	Bot	A	17	0402R	Resistor 5% 63mW	10k	~
R6507	Bot	B	17	0402R	CHIPRES 0W06 3R3 J 0402	3R3	~
R6508	Bot	A	17	0402R	CHIPRES 0W06 3R3 J 0402	3R3	~
R6510	Top	E	12	0402R	Resistor 5% 63mW	100R	~
R6512	Top	D	12	0402R	Resistor 5% 63mW	100R	~
R6513	Top	E	12	0402R	Resistor 5% 63mW	2k2	~
R6516	Top	G	11	0402R	Resistor 5% 63mW	100R	~
R6517	Top	D	12	0402R	Resistor 5% 63mW	100R	~
R6519	Top	D	13	0402R	Resistor 5% 63mW	10R	~
R6520	Top	B	13	0402R	Resistor 5% 63mW	10R	~
R6590	Top	D	12	0402R	Resistor 5% 63mW	100R	~
R6599	Top	C	12	0402R	Resistor 5% 63mW	100R	~
R7000	Top	F	14	0402R	Resistor 5% 63mW	47R	~
R7501	Top	H	15	0402R	Resistor 5% 63mW	22k	~
R7502	Top	H	13	0402R	Resistor 5% 63mW	330R	~
R7504	Top	I	17	0402R	Resistor 5% 63mW	4k7	~
R7505	Top	H	13	0402R	Resistor 5% 63mW	27k	~
R7507	Top	G	13	0402R	CHIPRES 0W06 1K5 F 100PPM 0402	1k5	~
R7509	Top	G	18	0402R	Resistor 5% 63mW	27k	~
R7514	Top	C	18	0402R	Resistor 5% 63mW	47k	~
R7515	Top	I	15	0402R	Chipres 0W06 5R6 J 0402	5R6	~
R7516	Top	H	14	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7517	Top	H	14	0402R	CHIPRES 0W06 1K0 F 200PPM 0402	1k0	~
R7518	Top	C	19	0402R	Resistor 5% 63mW	10R	~
R7520	Top	A	17	0402R	CHIPRES 0W06 1K2 F 250PPM 0402	1k2	~
R7521	Top	A	19	0402R	Chipres 0W06 jumper 0402	0R	~

Item	Side	Grid ref.		Type	Description and value		
R7522	Top	A	20	0402R	Resistor 5% 63mW	10k	~
R7634	Top	E	20	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7637	Top	A	16	0402R	CHIPRES 0W06 1R J 0402	1R	~
R7646	Top	E	15	0402R	Resistor 5% 63mW	100R	~
R7676	Bot	B	16	0805R	CHIPRES 0W125 4R7 J 0805	4R7	~
R7680	Top	C	13	0402R	Resistor 5% 63mW	47k	~
R7681	Top	C	13	0402R	Resistor 5% 63mW	47k	~
R7690	Top	B	16	0402R	Resistor 5% 63mW	4k7	~
R7691	Top	C	16	0402R	Resistor 5% 63mW	4k7	~
R7692	Top	H	5	0402R	Resistor 5% 63mW	100R	~
R7699	Bot	G	16	0402R	Resistor 5% 63mW	100R	~
R7700	Top	B	10	0402R	Resistor 5% 63mW	1k0	~
R7701	Top	A	10	0402R	Resistor 5% 63mW	1k0	~
R7704	Top	I	3	0402R	Resistor 5% 63mW	220R	~
R7709	Top	B	12	0402R	Resistor 5% 63mW	220R	~
R7710	Top	A	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7711	Top	E	15	0402R	Resistor 5% 63mW	2k2	~
R7712	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7714	Top	F	15	0402R	Resistor 5% 63mW	2k2	~
R7715	Top	E	15	0402R	Resistor 5% 63mW	2k2	~
R7716	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7718	Top	F	14	0402R	Resistor 5% 63mW	2k2	~
R7719	Top	G	2	0402_VAR	RES VARISTOR 14/90V 3PF 0402	14/90V	~
R7720	Top	H	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7721	Top	I	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7722	Top	H	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7723	Bot	I	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7724	Bot	I	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~

Item	Side	Grid ref.		Type	Description and value		
R7725	Top	I	7	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7726	Bot	I	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7732	Bot	B	6	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7735	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7736	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7737	Top	H	2	0402R	Resistor 5% 63mW	100R	~
R7743	Bot	B	5	0402R	Resistor 5% 63mW	1k0	~
R7780	Top	A	8	0402R	Resistor 5% 63mW	47R	~
R9088	Top	H	11	0402R	Resistor 5% 63mW	4k7	~
R9089	Top	H	11	0402R	Resistor 5% 63mW	4k7	~
R9093	Top	F	8	0402R	Resistor 5% 63mW	47k	~
R9094	Top	D	8	0402R	Resistor 5% 63mW	47k	~
R9095	Bot	B	18	0402R	Resistor 5% 63mW	47R	~
R9100	Top	C	11	0402R	Resistor 5% 63mW	470k	~
R9101	Top	C	11	0402R	Resistor 5% 63mW	15k	~
R9102	Top	C	11	0402R	Resistor 5% 63mW	47R	~
R9103	Top	C	11	0402R	Resistor 5% 63mW	47R	~
R9104	Top	B	11	0402R	Resistor 5% 63mW	47R	~
R9111	Top	E	20	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R9112	Top	A	10	0402R	Resistor 5% 63mW	100k	~
R9113	Top	H	14	0402R	Chipres 0W06 jumper 0402	0R	~
R9115	Top	G	3	0402R	Resistor 5% 63mW	47k	~
R9116	Top	G	3	0402R	Resistor 5% 63mW	330R	~
R9117	Top	F	3	0402R	Resistor 5% 63mW	330R	~
R9121	Top	B	4	0402R	Resistor 5% 63mW	1k0	~
R9123	Top	B	7	0402R	CHIPRES 0W06 2R2 J 0402	2R2	~
R9125	Bot	C	19	0402R	Chipres 0W06 jumper 0402	0R	50V
R9127	Bot	C	19	0402R	Resistor 5% 63mW	47R	~
R9128	Top	F	2	0402R	Resistor 5% 63mW	100k	~
R9129	Top	F	2	0402R	Resistor 5% 63mW	100k	~

Item	Side	Grid ref.		Type	Description and value		
R9130	Top	F	3	0402R	Resistor 5% 63mW	100k	~
R9131	Top	F	2	0402R	Resistor 5% 63mW	100k	~
R9132	Top	F	3	0402R	Resistor 5% 63mW	1k0	~
R9133	Top	G	3	0402R	Resistor 5% 63mW	1k0	~
S4400	Top	I	4	SWITCH_EVQQ0C03K	SM SW SPDT 15V 20MA	~	~
S4401	Bot	I	15	SWITCH_EVQP7J01C	SWITCH TACT SPST 12V SIDE KEY 1.6N	~	~
S4402	Bot	I	16	SWITCH_EVQP7J01C	SWITCH TACT SPST 12V SIDE KEY 1.6N	~	~
S4403	Top	I	7	SWITCH_EVQP7J01C	SWITCH TACT SPST 12V SIDE KEY 1.6N	~	~
T7500	Top	H	17	TRANS_LDB15	TRANSF BALUN 2134 +-90MHZ 0805	~	~
T7501	Top	H	15	TRANS_LDB213	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V2000	Bot	C	4	BGA4_1.01X1.07	ASIP TVS BGA4	~	~
V6500	Bot	B	16	DIODE_PMEG3002	SCH DI 30V IF 0A2 UFSM 3A IR 10UA SOD882	~	~
V6501	Top	F	21	TRANS_SFH3710	SILICON PHOTOTRANSISTOR SF3710 SMT 2.1X1.4X	~	~
V6504	Top	G	21	LED_CL_191	LED BLUE 26MCD 5MA CL-191S-HB1R	~	~
V6507	Top	H	3	SOT_666	TRX2 EMX1/PEMX1 P 40V 0A1 SOT666	~	~
V6509	Top	C	12	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V6511	Top	B	15	TUMT6	MOSFET N+P CHANNEL 30V US6M2	~	~
V6512	Top	C	15	TUMT6	MOSFET N+P CHANNEL 30V US6M2	~	~
V6513	Bot	B	18	SOD882	BZX884-AA	~	~
V6514	Top	C	13	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V6515	Top	H	6	SOD323F	SCH DI 30V 2A SOD323F	~	~
V6516	Top	I	5	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~
V6518	Bot	H	16	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~

Item	Side	Grid ref.		Type	Description and value		
V6519	Top	F	15	SOT_666	TRX2 EMX1/PEMX1 P 40V 0A1 SOT666	~	~
V6520	Top	I	8	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~
V6521	Top	I	3	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~
V7500	Top	G	14	SOT323	TR BC849CW N 30V 0.1A >420 SOT323	~	~
V9102	Bot	A	18	SC_75A_H0.95	MOSFET N 20V 350MA SOT416	~	~
V9104	Top	G	2	SOT_666	TRX4 4X10K N&P 50V 0A1 0W1 SOT666	~	~
W1000	Bot	A	3	ANTENNA_NAN68_PC0400C	ANTENNA INT WLAN P2636 (3-PAD)	~	~
X1000	Bot	I	3	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2001	Bot	E	1	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X6501	Bot	B	17	POGO_CNO_3211_3125H	CONN POGO PINS CNO-3211-3125H H4.3	~	~
X6507	Top	B	9	CON_24R_JANK_P0.4_H1.75	CONN BTB 2X12F P0.4	~	~
X6512	Bot	F	15	CONN_CY_5225_1817H	SM BATTERY CONN 3POLE SPR	~	~
X6513	Bot	D	5	SIM_CONN_2X3POL	SM SIM CONN 2X3POL P2.54	~	~
X6515	Top	B	11	MOLEX_54722_0341	SM CONN 2X17F P0.5 PWB/PWB	~	~
X6522	Top	H	12	MOLEX_SD_500913_0248	SM CONN 2X12F P0.4 H1.8 PWB/PWB	~	~
X6523	Top	B	16	MOLEX_SD_51338_0249	SM CONN 2X12F P0.4 PWB/PWB	~	~
X6526	Bot	F	21	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X6527	Bot	F	21	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X6530	Bot	B	6	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
X6531	Bot	A	5	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~

Item	Side	Grid ref.		Type	Description and value		
Z4400	Top	B	10	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z6030	Top	A	7	EZFVQ42NM61S	LTCC FILT 2441.75 +-41.75MHZ 2.5X2	2441.75MHz	~
Z7500	Top	H	17	MODULE_SP_LMZ_137	TX SAW MODULE GSM 850/900MHZ	850/900 MHz	~
Z7540	Top	B	20	P_TC3N_12_1_AGI	DUPL BAW 1920-1980/2110-2170 MHZ 3.8X3.8	1920-1980/2110-2170MHZ	~
Z7541	Bot	C	19	CQF12_N2	RF SWITCH SP3T 850/1800/1900MHZ	880-960/1710-1990MHz	~
Z7542	Top	C	11	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~	~

Table 11 RM-132 component part list (1TR_11)

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Item	Side	Grid ref.		Type	Description and value		
A7002	Top	H	17	SHIELD_0264350	SHIELD RF ASSY 040-021698	~	~
A7003	Top	B	19	SHIELD_0264351	SHIELD WCDMA ASSY 040-021699	~	~
B2200	Top	C	5	CRYSTAL_3.3X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz	~
C1100	Bot	H	15	0402C	Chipcap 5% NP0	10p	50V
C1101	Bot	H	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2005	Bot	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2006	Bot	F	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2007	Top	F	2	0402C	Chipcap 5% NP0	10p	50V
C2008	Top	F	2	0402C	Chipcap 5% NP0	10p	50V
C2009	Top	G	2	0402C	Chipcap 5% NP0	10p	50V
C2010	Top	G	2	0402C	Chipcap 5% NP0	10p	50V
C2012	Bot	C	4	0603C_H0.95	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C2202	Top	C	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V

Item	Side	Grid ref.		Type	Description and value		
C2203	Top	B	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2204	Top	A	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2206	Top	C	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2210	Bot	E	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2211	Top	A	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2212	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2213	Top	C	6	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2215	Top	B	6	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2217	Top	B	4	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2220	Top	A	4	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2222	Top	A	5	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2228	Top	B	6	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2250	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2251	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2300	Top	G	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2304	Top	F	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2306	Top	G	5	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C2314	Top	H	7	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2316	Top	H	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2317	Top	G	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V

Item	Side	Grid ref.		Type	Description and value		
C2700	Bot	D	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2800	Top	F	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2801	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2802	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2803	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2804	Top	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2805	Top	F	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2806	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2809	Top	F	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C3503	Top	B	9	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C4201	Top	B	14	0805C_H0.95	CHIPCAP X5R 10U M 6V3 T=0.95mm 0805	10u	6V3
C4401	Top	F	20	0402C	Chipcap 5% NP0	27p	50V
C4403	Top	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4404	Top	C	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4405	Top	G	11	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4409	Top	I	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4420	Bot	A	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4800	Top	E	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4801	Top	F	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C4803	Top	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4808	Top	F	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Type	Description and value		
C5002	Top	F	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5100	Top	C	10	0402C	Chipcap 5% NP0	27p	50V
C6031	Top	B	7	0402C	Chipcap 5% NP0	18p	50V
C6032	Top	B	7	0402C	Chipcap 5% NP0	100p	50V
C6033	Top	B	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6034	Top	A	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6035	Top	C	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6036	Top	C	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6037	Top	C	7	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6038	Top	B	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6039	Top	A	6	0402C	Chipcap 5% NP0	18p	50V
C6051	Top	B	7	0402C	Chipcap +-0.25pF NP0	2p7	50V
C6052	Top	B	7	0402C	Chipcap +-0.25pF NP0	2p7	50V
C6055	Top	A	7	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6100	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6101	Top	A	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6102	Top	A	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6103	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6104	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6105	Top	C	2	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6108	Top	C	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6109	Top	A	2	0402C	Chipcap 5% NP0	47p	50V
C6110	Top	B	2	0402C	Chipcap 5% NP0	27p	50V
C6112	Top	B	3	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Type	Description and value		
C6113	Top	A	3	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6502	Bot	B	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6503	Bot	B	17	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6508	Top	E	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6509	Top	C	13	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6510	Top	B	13	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6515	Top	B	13	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6516	Top	C	13	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6590	Top	D	13	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C6592	Top	B	14	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C6593	Top	C	15	0805C_H0.95	CHIPCAP X5R 10U M 6V3 T=0.95mm 0805	10u	6V3
C6594	Top	A	16	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6595	Bot	B	17	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C6598	Top	I	12	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C7500	Top	I	17	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7501	Top	G	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7502	Top	G	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7504	Top	I	17	0402C	Chipcap +-0.25pF NP0	2p2	50V
C7505	Top	G	14	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C7507	Top	I	17	0402C	Chipcap +-0.25pF NP0	1p5	50V
C7508	Top	H	14	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Type	Description and value		
C7509	Top	H	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7510	Top	G	14	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7511	Top	D	14	0805C_H0.95	CHIPCAP X5R 10U M 6V3 T=0.95mm 0805	10u	6V3
C7513	Bot	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7514	Bot	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7515	Top	G	19	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7516	Bot	C	19	0402C	Chipcap +-0.25pF NP0	6p8	50V
C7517	Bot	C	19	0402C	Chipcap 5% NP0	10p	50V
C7518	Top	D	13	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7519	Bot	C	19	0402C	Chipcap 5% NP0	27p	50V
C7520	Bot	C	19	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7521	Bot	C	19	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7523	Top	I	14	0402C	Chipcap +-0.25pF NP0	3p3	50V
C7525	Bot	D	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7526	Top	H	14	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7527	Top	H	14	0402C	CHIPCAP NP0 470P J 6V3 0402	470p	6V3
C7528	Bot	B	16	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7534	Top	D	19	0402C	Chipcap 5% NP0	27p	50V
C7537	Bot	E	15	0402C	Chipcap 5% NP0	10p	50V
C7538	Bot	G	16	0402C	Chipcap 5% NP0	10p	50V
C7539	Top	B	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7540	Top	I	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7542	Top	H	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	Grid ref.		Type	Description and value		
C7543	Top	I	17	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7546	Top	C	12	0402C	Chipcap 5% NP0	27p	50V
C7547	Top	E	13	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C7548	Top	F	14	0405_GNM23	CHIP ARRAY X5R 2X1U K 6V3 MA 0405	2x1u	6.3V
C7549	Top	F	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C7550	Top	G	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C7551	Top	C	14	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7553	Top	I	19	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7563	Top	I	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7564	Top	B	20	0402C	Chipcap 5% NP0	27p	50V
C7565	Top	A	14	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C7567	Bot	D	3	0402C	Chipcap 5% NP0	27p	50V
C7568	Top	B	3	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C7569	Bot	E	5	0402C	Chipcap 5% NP0	27p	50V
C7570	Bot	D	4	0402C	Chipcap 5% NP0	27p	50V
C7571	Bot	D	5	0402C	Chipcap 5% NP0	27p	50V
C7572	Top	B	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7573	Top	C	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7590	Top	D	20	0402C	Chipcap 5% NP0	27p	50V
C7591	Top	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7592	Top	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C9059	Top	E	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C9060	Bot	C	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C9070	Top	C	13	0402C	Chipcap 5% NP0	27p	50V

Item	Side	Grid ref.		Type	Description and value		
C9071	Top	A	16	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C9073	Top	C	10	0402C	Chipcap 5% NP0	27p	50V
C9074	Top	C	16	0402C	Chipcap 5% NP0	27p	50V
C9075	Top	D	14	0402C	Chipcap 5% NP0	27p	50V
C9076	Top	H	11	0402C	Chipcap 5% NP0	27p	50V
C9077	Top	I	12	0402C	Chipcap 5% NP0	27p	50V
C9078	Top	H	13	0402C	Chipcap 5% NP0	27p	50V
C9079	Top	F	10	0402C	Chipcap 5% NP0	10p	50V
C9080	Top	B	4	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C9083	Top	H	13	0402C	Chipcap 5% NP0	47p	50V
C9084	Bot	G	17	0402C	Chipcap 5% NP0	56p	50V
C9085	Bot	G	16	0402C	Chipcap 5% NP0	56p	50V
C9086	Bot	H	16	0402C	Chipcap 5% NP0	56p	50V
C9087	Top	B	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C9088	Top	G	13	0402C	Chipcap 5% NP0	33p	50V
C9090	Top	A	13	0402C	Chipcap 5% NP0	27p	50V
C9093	Bot	C	19	0402C	Chipcap +-0.25pF NP0	3p3	50V
D2800	Top	H	9	VFBGA343	RAPS V3.01E-PA	~	~
D5000	Top	E	7	FBGA133_11.6X13.1	COMBO 512 DDR + 1G NAND FBGA133 PBFREE	32Mx16/128Mx8	~
D6500	Top	D	11	FBGA_195	OMAP DM290 GOLDENEYE NFBGA	~	~
D6501	Top	F	11	WBGA_60_8.1X6.6_H0.9	SDRAM 4X16 1.8V/1.8V FBGA60 PBFREE	4Mx16	~
D6502	Top	H	9	FBGA128_EMPTY	COMBO 128M NOR +128M DDR DRAM FBGA128	8Mx16/8Mx16	~
D6503	Top	B	15	uBGA_6_1.45X0.95	SN72AUC2G04YZT INV GATE WCSP06	~	~
F2000	Bot	C	3	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A	~
G1000	Bot	B	15	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V	~
G7500	Top	G	14	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz	~

Item	Side	Grid ref.		Type	Description and value		
G7501	Top	I	14	VCO_DCS02733	VCO 3296-3980MHZ 4-BAND MATSUSHITA	3296-3980MHz	~
J7500	Bot	C	21	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
J7502	Bot	C	21	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
J7590	Bot	D	21	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
L2000	Bot	C	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/ 100MHz	~
L2002	Bot	E	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L2003	Bot	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L2004	Bot	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L2011	Bot	G	2	COIL_LK_1608	CHIP COIL 68NH J Q12/100MHZ 0603	68nH	~
L2302	Top	G	8	CHOKE_SER400_H 1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH	~
L2309	Top	H	6	CHOKE_SER300_H 1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH	~
L3002	Bot	A	4	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6030	Top	B	7	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6031	Top	B	7	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	~
L6032	Top	B	6	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6100	Top	B	3	0402LQW	CHIP COIL 47N +-3% Q25/200MHZ 0402	47nH	~
L6101	Top	A	2	0402L_POL2	CHIP COIL 120NH J Q8/100MHZ 0402	120nH	~
L6500	Top	C	14	CHOKE_SER300	INDUCT WW 2.2UH 1A2 310 CASE SIZE	2u2H	~
L6501	Bot	B	16	CHOKE_SER300_H 1.5	CHOKE 3U3 1.2A 0R096 3X3X1.5	3u3H	~
L6502	Top	E	14	CHOKE_SER300	INDUCT WW 2.2UH 1A2 310 CASE SIZE	2u2H	~

Item	Side	Grid ref.		Type	Description and value		
L6505	Top	B	13	CHOKE_SER400_H 1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH	~
L6509	Top	B	4	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L6517	Top	G	3	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6518	Top	F	3	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6519	Bot	G	16	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6520	Bot	G	16	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6521	Top	E	3	0405_2_TDK	CHIP BEAD ARRAY 2X220R 0405	2x220R	~
L6522	Bot	F	3	0405_2_TDK	CHIP BEAD ARRAY 2X220R 0405	2x220R	~
L6600	Bot	C	17	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L6604	Bot	B	17	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7500	Top	I	16	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7520	Top	G	19	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/ 100MHz	~
L7542	Bot	C	20	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7544	Top	C	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7545	Top	G	2	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7546	Top	F	2	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7547	Bot	F	2	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~
L7548	Bot	F	20	0402L_XL	CHIP COIL 68N J Q17/300M 0402	68nH	~
L7549	Bot	F	20	0402L_XL	CHIP COIL 68N J Q17/300M 0402	68nH	~
L7551	Top	E	20	0405_2_DLM11G	CHIP BEAD ARRAY 2X600R 0405	2x600R/ 100MHz	~

Item	Side	Grid ref.		Type	Description and value		
L7553	Bot	B	18	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7601	Top	I	17	0402L	CHIP COIL 8N2 J Q28/800MHZ 0402	8n2H	~
L7603	Top	I	17	0402L	CHIP COIL 18N J Q29/800M 0402	18nH	~
L7604	Top	D	19	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7605	Top	D	20	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7606	Top	I	18	0402L	CHIP COIL 2N7+-0N3 Q29/800M 0402	2n7H	50V
L7607	Bot	B	5	0402L	CHIP COIL 47N J Q23/800MHZ 0402	47nH	~
L7608	Bot	A	5	0402L	CHIP COIL 47N J Q23/800MHZ 0402	47nH	~
L7609	Top	I	13	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7610	Bot	F	20	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L7611	Bot	F	20	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L9056	Bot	E	6	0402L	CHIP COIL 47N J Q23/800MHZ 0402	47nH	~
L9057	Top	F	10	0402L	CHIP COIL 33N J Q23/800M 0402	33nH	~
L9060	Top	G	13	0603L	CHIP COIL 470N+-2% Q30/100MHZ 0603	470nH	~
L9097	Bot	C	19	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
M1000	Bot	B	3	VIBRA_M_KHN4NX1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~	~
N2200	Top	B	5	TFBGA_105	AVILMA 1.05C BB MODULE TFBGA105	~	~
N2300	Top	G	6	TFBGA64_H1.2	BETTY V2.1 LF TFBGA64	~	~
N3500	Top	C	9	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-3.0 NOPB USMD5	~	3V
N3501	Top	C	10	PBGA_N20_P0.5	LEVEL SHIFT SN74AVCA406LZXYR S-PBGA-N20 *FOR NRC USE ONLY*	~	~

Item	Side	Grid ref.		Type	Description and value		
N4800	Top	E	9	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~	~
N6030	Top	B	7	CSP_47_3.85X4.05	BC4-ROM1.0RDL	~	~
N6100	Top	B	3	WFBGA34_2_3.57X3.57	FM RECEIVER TEA5761UK N4B CSP (TI)	~	~
N6502	Bot	A	17	TK11892F	STEP-UP DC/DC CONV TK11892F-G-20 SON3024-8	~	~
N6505	Bot	A	16	IRDA_TFBS_GP2W_CIM	IRDA MIR XSMALL	~	~
N6508	Top	E	13	USMD5_1.417X1.087	DC/DC CONV LM3671TLX-1.82V USMD5	~	~
N6509	Bot	E	3	XBGA_N16	AF AMP TPA2012D2 77DB/217HZ WCSP16	~	~
N6513	Top	C	14	USMD_8_1.55X1.55	2XVREG 2.8V/150MA LP3986 USMD8 PB-FREE	~	2.8V
N6515	Top	B	14	USMD_10_2.458X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~	~
N6516	Top	B	15	ECSP2828_10	SHUTTER DRIVER LB8681CL	~	~
N6517	Top	B	13	XBGA_N8_2.02X1.02	DC/DC CONV TPS6231YZD 1.5V CSP8	~	~
N6518	Top	E	13	USMD5_1.468X1.036	REG+ LP3999ITLX 1.8V 150MA NOPB	~	1.8V
N6519	Top	F	14	FC_4_0.99X0.99	LI VREG 1.5V/150MA WLCSP4 TK63115B	~	1.5V
N7500	Top	H	16	TFBGA_188_H1.4	RF SYSTEM MODULE PIHI2.22 9.0X9.0X1	~	~
N7520	Top	H	19	RF9282E3.6	PA RF9282E6.3 GSM/EDGE 850/900/1800/1900	~	~
N7542	Top	I	12	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
N9002	Top	H	7	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N9003	Top	F	3	uBGA_6_1.45X0.95	TI ANALOG SWITCH TS5A3159AYZTR WCSP06	~	~

Item	Side	Grid ref.		Type	Description and value		
N9004	Top	G	3	uBGA_6_1.45X0.95	TI ANALOG SWITCH TS5A3159AYZTR WCSP06	~	~
N9006	Top	B	16	FC_4_0.99X0.99	LI VREG 1.5V/150MA WLCSP4 TK63115B	~	1.5V
R1100	Bot	G	16	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R1101	Bot	E	5	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R1102	Bot	H	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2006	Top	G	2	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~	~
R2007	Bot	E	3	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2009	Top	G	5	0402R	Resistor 5% 63mW	220k	~
R2303	Top	H	7	0402R	Resistor 5% 63mW	27R	~
R2800	Top	H	8	0402R	Resistor 5% 63mW	10R	~
R2801	Top	F	10	0402R	Resistor 5% 63mW	4k7	~
R2804	Top	G	8	0402R	Resistor 5% 63mW	4k7	~
R2805	Top	H	8	0402R	Resistor 5% 63mW	4k7	~
R4400	Bot	D	5	0402R	Resistor 5% 63mW	470k	~
R4401	Top	F	20	0402R	Resistor 5% 63mW	100k	~
R4402	Bot	D	5	0402R	Resistor 5% 63mW	470k	~
R4403	Top	F	20	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R4410	Bot	C	5	0402R	Resistor 5% 63mW	47k	~
R4416	Top	B	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4420	Bot	F	20	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4800	Top	E	8	0402R	Resistor 5% 63mW	10R	~
R4801	Top	F	10	0402R	Resistor 5% 63mW	1k0	~
R6030	Top	C	7	0402R	Resistor 5% 63mW	10k	~
R6031	Top	B	6	0402R	Resistor 5% 63mW	10k	~
R6032	Top	C	7	0402R	CHIPRES 0W06 2R2 J 0402	2R2	~
R6034	Top	B	7	0402R	Resistor 5% 63mW	10k	~
R6037	Top	A	6	0402R	Resistor 5% 63mW	100k	~

Item	Side	Grid ref.		Type	Description and value		
R6100	Top	B	3	0402R	Resistor 5% 63mW	10k	~
R6101	Top	B	3	0402R	Resistor 5% 63mW	100k	~
R6102	Top	C	3	0402R	Resistor 5% 63mW	4k7	~
R6103	Top	C	3	0402R	Resistor 5% 63mW	4k7	~
R6505	Bot	A	18	0402R	Resistor 5% 63mW	10k	~
R6506	Bot	A	17	0402R	Resistor 5% 63mW	10k	~
R6507	Bot	B	17	0402R	CHIPRES 0W06 3R3 J 0402	3R3	~
R6508	Bot	A	17	0402R	CHIPRES 0W06 3R3 J 0402	3R3	~
R6510	Top	E	12	0402R	Resistor 5% 63mW	100R	~
R6512	Top	D	12	0402R	Resistor 5% 63mW	100R	~
R6513	Top	E	12	0402R	Resistor 5% 63mW	2k2	~
R6516	Top	G	11	0402R	Resistor 5% 63mW	100R	~
R6517	Top	D	12	0402R	Resistor 5% 63mW	100R	~
R6519	Top	D	13	0402R	Resistor 5% 63mW	10R	~
R6520	Top	B	13	0402R	Resistor 5% 63mW	10R	~
R6590	Top	D	12	0402R	Resistor 5% 63mW	100R	~
R6599	Top	C	12	0402R	Resistor 5% 63mW	100R	~
R7000	Top	F	14	0402R	Resistor 5% 63mW	47R	~
R7501	Top	H	15	0402R	Resistor 5% 63mW	22k	~
R7502	Top	H	13	0402R	Resistor 5% 63mW	330R	~
R7504	Top	I	17	0402R	Resistor 5% 63mW	4k7	~
R7505	Top	H	13	0402R	Resistor 5% 63mW	27k	~
R7507	Top	G	13	0402R	CHIPRES 0W06 1K5 F 100PPM 0402	1k5	~
R7509	Top	G	18	0402R	Resistor 5% 63mW	27k	~
R7515	Top	I	15	0402R	Chipres 0W06 5R6 J 0402	5R6	~
R7516	Top	H	14	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7517	Top	H	14	0402R	CHIPRES 0W06 1K0 F 200PPM 0402	1k0	~
R7541	Top	B	20	0402R	Resistor 5% 63mW	47R	~
R7634	Top	E	20	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~

Item	Side	Grid ref.		Type	Description and value		
R7637	Top	A	16	0402R	CHIPRES 0W06 1R J 0402	1R	~
R7646	Top	E	15	0402R	Resistor 5% 63mW	100R	~
R7676	Bot	B	16	0805R	CHIPRES 0W125 4R7 J 0805	4R7	~
R7680	Top	C	13	0402R	Resistor 5% 63mW	47k	~
R7681	Top	C	13	0402R	Resistor 5% 63mW	47k	~
R7690	Top	B	16	0402R	Resistor 5% 63mW	4k7	~
R7691	Top	C	16	0402R	Resistor 5% 63mW	4k7	~
R7692	Top	H	5	0402R	Resistor 5% 63mW	100R	~
R7699	Bot	G	16	0402R	Resistor 5% 63mW	100R	~
R7700	Top	B	10	0402R	Resistor 5% 63mW	1k0	~
R7701	Top	A	10	0402R	Resistor 5% 63mW	1k0	~
R7704	Top	I	3	0402R	Resistor 5% 63mW	220R	~
R7709	Top	B	12	0402R	Resistor 5% 63mW	220R	~
R7710	Top	A	10	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7711	Top	E	15	0402R	Resistor 5% 63mW	2k2	~
R7712	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7714	Top	F	15	0402R	Resistor 5% 63mW	2k2	~
R7715	Top	E	15	0402R	Resistor 5% 63mW	2k2	~
R7716	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7718	Top	F	14	0402R	Resistor 5% 63mW	2k2	~
R7719	Top	G	2	0402_VAR	RES VARISTOR 14/90V 3PF 0402	14/90V	~
R7720	Top	H	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7721	Top	I	5	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7722	Top	H	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7723	Bot	I	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7724	Bot	I	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7725	Top	I	7	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~

Item	Side	Grid ref.		Type	Description and value		
R7726	Bot	I	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7732	Bot	B	6	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R7735	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7736	Top	I	2	0402R	Resistor 5% 63mW	2k2	~
R7737	Top	H	2	0402R	Resistor 5% 63mW	100R	~
R7743	Bot	B	5	0402R	Resistor 5% 63mW	1k0	~
R7780	Top	A	8	0402R	Resistor 5% 63mW	47R	~
R9088	Top	H	11	0402R	Resistor 5% 63mW	4k7	~
R9089	Top	H	11	0402R	Resistor 5% 63mW	4k7	~
R9093	Top	F	8	0402R	Resistor 5% 63mW	47k	~
R9094	Top	D	8	0402R	Resistor 5% 63mW	47k	~
R9095	Bot	B	18	0402R	Resistor 5% 63mW	47R	~
R9100	Top	C	11	0402R	Resistor 5% 63mW	470k	~
R9101	Top	C	11	0402R	Resistor 5% 63mW	15k	~
R9102	Top	C	11	0402R	Resistor 5% 63mW	47R	~
R9103	Top	C	11	0402R	Resistor 5% 63mW	47R	~
R9104	Top	B	11	0402R	Resistor 5% 63mW	47R	~
R9111	Top	E	20	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R9112	Top	A	10	0402R	Resistor 5% 63mW	100k	~
R9113	Top	H	14	0402R	Chipres 0W06 jumper 0402	0R	~
R9115	Top	G	3	0402R	Resistor 5% 63mW	47k	~
R9116	Top	G	3	0402R	Resistor 5% 63mW	330R	~
R9117	Top	F	3	0402R	Resistor 5% 63mW	330R	~
R9121	Top	B	4	0402R	Resistor 5% 63mW	1k0	~
R9123	Top	B	7	0402R	CHIPRES 0W06 2R2 J 0402	2R2	~
R9125	Bot	C	19	0402R	Chipres 0W06 jumper 0402	0R	50V
R9127	Bot	C	19	0402R	Resistor 5% 63mW	47R	~
R9128	Top	F	2	0402R	Resistor 5% 63mW	100k	~
R9129	Top	F	2	0402R	Resistor 5% 63mW	100k	~
R9130	Top	F	3	0402R	Resistor 5% 63mW	100k	~
R9131	Top	F	2	0402R	Resistor 5% 63mW	100k	~

Item	Side	Grid ref.		Type	Description and value		
R9132	Top	F	3	0402R	Resistor 5% 63mW	1k0	~
R9133	Top	G	3	0402R	Resistor 5% 63mW	1k0	~
S4400	Top	I	4	SWITCH_EVQQ0C03K	SM SW SPDT 15V 20MA	~	~
S4401	Bot	I	15	SWITCH_EVQP7J01C	SWITCH TACT SPST 12V SIDE KEY 1.6N	~	~
S4402	Bot	I	16	SWITCH_EVQP7J01C	SWITCH TACT SPST 12V SIDE KEY 1.6N	~	~
S4403	Top	I	7	SWITCH_EVQP7J01C	SWITCH TACT SPST 12V SIDE KEY 1.6N	~	~
T7501	Top	H	15	TRANS_LDB213	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V2000	Bot	C	4	BGA4_1.01X1.07	ASIP TVS BGA4	~	~
V6500	Bot	B	16	DIODE_PMEG3002	SCH DI 30V IF 0A2 UFSM 3A IR 10UA SOD882	~	~
V6501	Top	F	21	TRANS_SFH3710	SILICON PHOTOTRANSISTOR SF3710 SMT 2.1X1.4X	~	~
V6504	Top	G	21	LED_CL_191	LED BLUE 26MCD 5MA CL-191S-HB1R	~	~
V6507	Top	H	3	SOT_666	TRX2 EMX1/PEMX1 P 40V 0A1 SOT666	~	~
V6509	Top	C	12	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V6511	Top	B	15	TUMT6	MOSFET N+P CHANNEL 30V US6M2	~	~
V6512	Top	C	15	TUMT6	MOSFET N+P CHANNEL 30V US6M2	~	~
V6513	Bot	B	18	SOD882	BZX884-AA	~	~
V6514	Top	C	13	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V6515	Top	H	6	SOD323F	SCH DI 30V 2A SOD323F	~	~
V6516	Top	I	5	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~
V6518	Bot	H	16	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~
V6519	Top	F	15	SOT_666	TRX2 EMX1/PEMX1 P 40V 0A1 SOT666	~	~
V6520	Top	I	8	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~

Item	Side	Grid ref.		Type	Description and value		
V6521	Top	I	3	LED_CL_270	LED BLUE 26MCD 5MA 0603	~	~
V7500	Top	G	14	SOT323	TR BC849CW N 30V 0.1A >420 SOT323	~	~
V9102	Bot	A	18	SC_75A_H0.95	MOSFET N 20V 350MA SOT416	~	~
V9104	Top	G	2	SOT_666	TRX4 4X10K N&P 50V 0A1 0W1 SOT666	~	~
W1000	Bot	A	3	ANTENNA_NAN68_PC0400C	ANTENNA INT WLAN P2636 (3-PAD)	~	~
X1000	Bot	I	3	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2001	Bot	E	1	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~	~
X6501	Bot	B	17	POGO_CNO_3211_3125H	CONN POGO PINS CNO-3211-3125H H4.3	~	~
X6507	Top	B	9	CON_24R_JANK_P0.4_H1.75	CONN BTB 2X12F P0.4	~	~
X6512	Bot	F	15	CONN_CY_5225_1817H	SM BATTERY CONN 3POLE SPR	~	~
X6513	Bot	D	5	SIM_CONN_2X3POL	SM SIM CONN 2X3POL P2.54	~	~
X6515	Top	B	11	MOLEX_54722_0341	SM CONN 2X17F P0.5 PWB/PWB	~	~
X6522	Top	H	12	MOLEX_SD_500913_0248	SM CONN 2X12F P0.4 H1.8 PWB/PWB	~	~
X6523	Top	B	16	MOLEX_SD_51338_0249	SM CONN 2X12F P0.4 PWB/PWB	~	~
X6526	Bot	F	21	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X6527	Bot	F	21	SPRING_WN9149_N10	C-SPRING ANTENNA active	~	~
X6530	Bot	B	6	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
X6531	Bot	A	5	SMK_T_314849D	SM CONN ANTENNA SPACER PAD	~	~
Z4400	Top	B	10	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z6030	Top	A	7	EZFVQ42NM61S	LTCC FILT 2441.75 +-41.75MHZ 2.5X2	2441.75MHz	~

Item	Side	Grid ref.		Type	Description and value		
Z7500	Top	H	17	MODULE_SP_LMZ_137	TX SAW MODULE GSM 850/900MHZ	850/900 MHz	~
Z7541	Bot	C	19	CQF12_N2	RF SWITCH SP3T 850/1800/1900MHZ	880-960/ 1710-1990MHz	~
Z7542	Top	C	11	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~	~

Component layouts

RM-133 component layouts

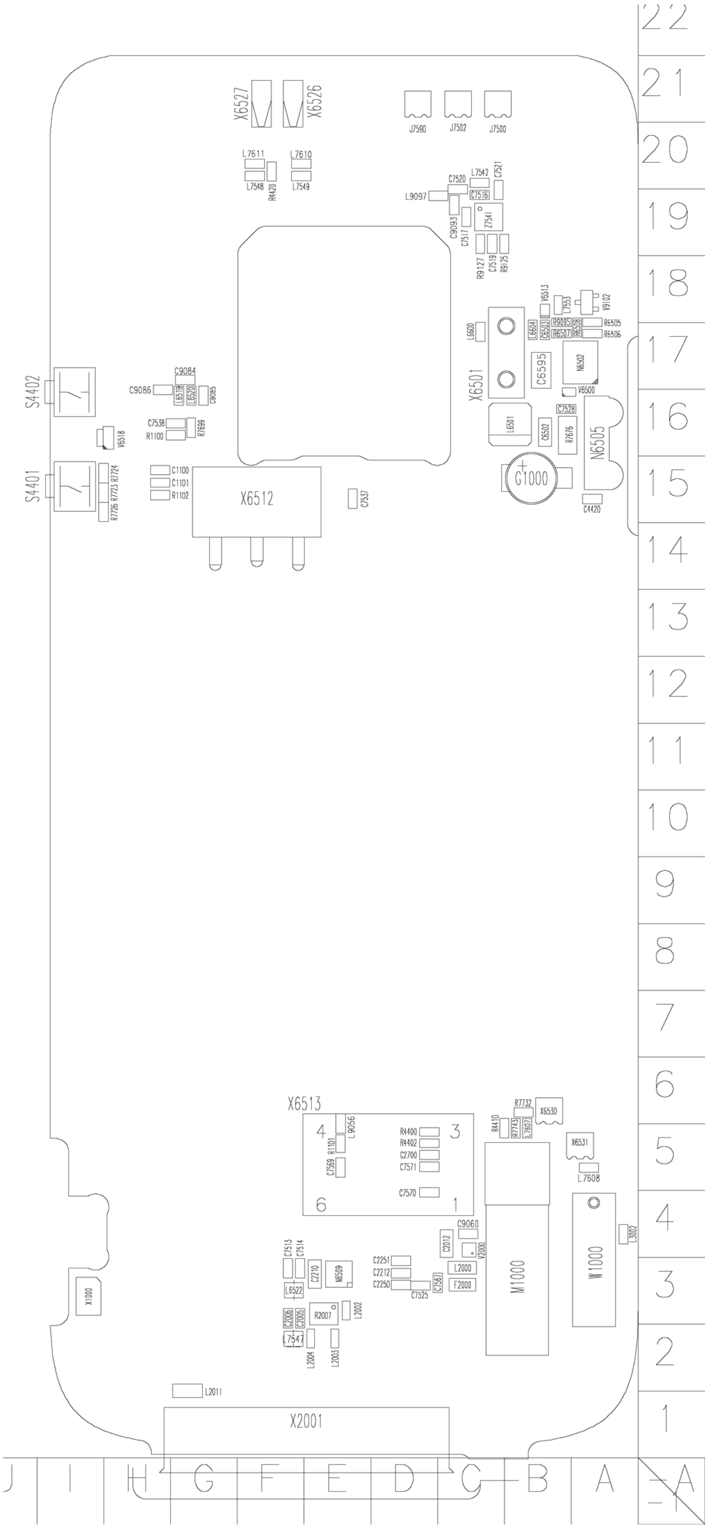


Figure 2 RM-133 component layout - bottom (1SU_11)

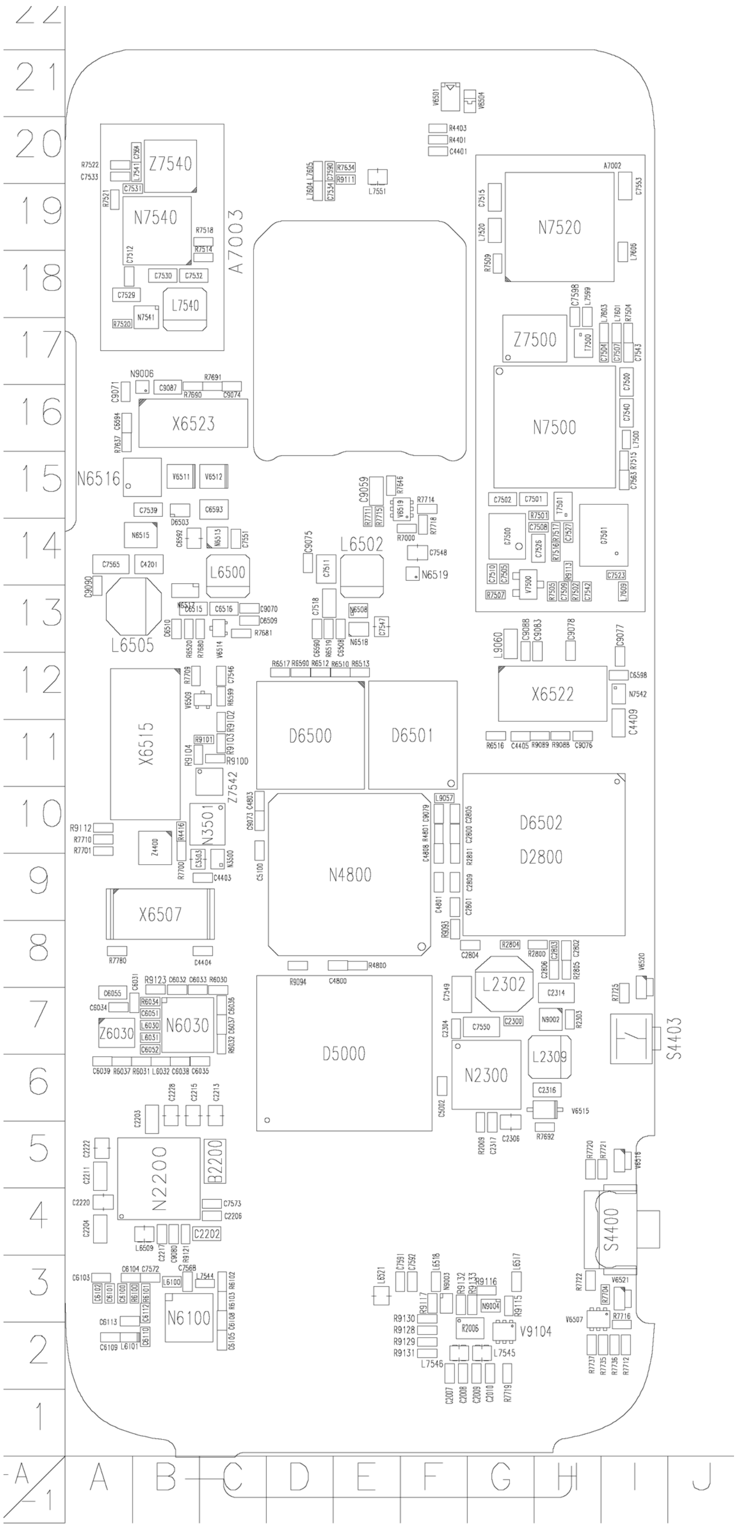


Figure 3 RM-133 component layout - top (1SU_11)

RM-132 component layouts

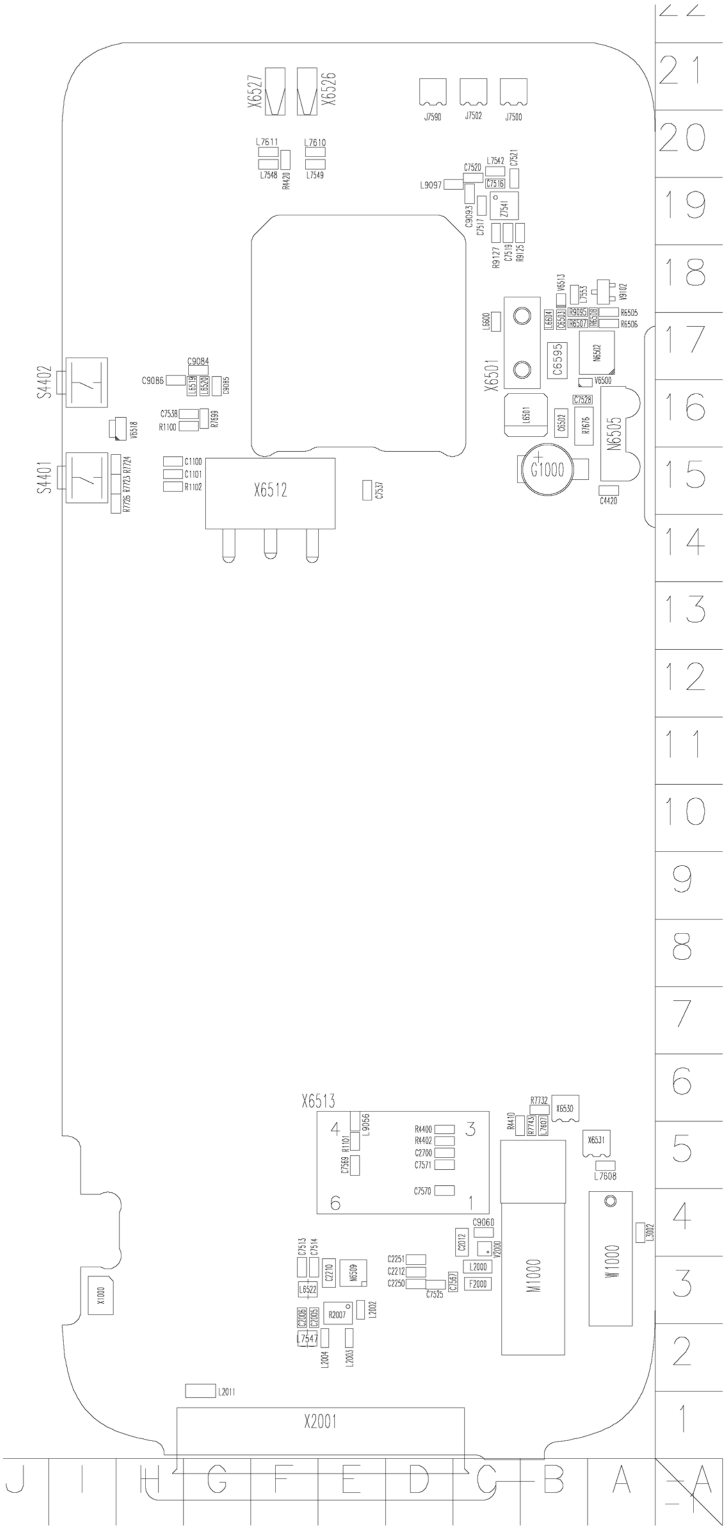


Figure 4 RM-132 component layout - bottom (1TR_11)

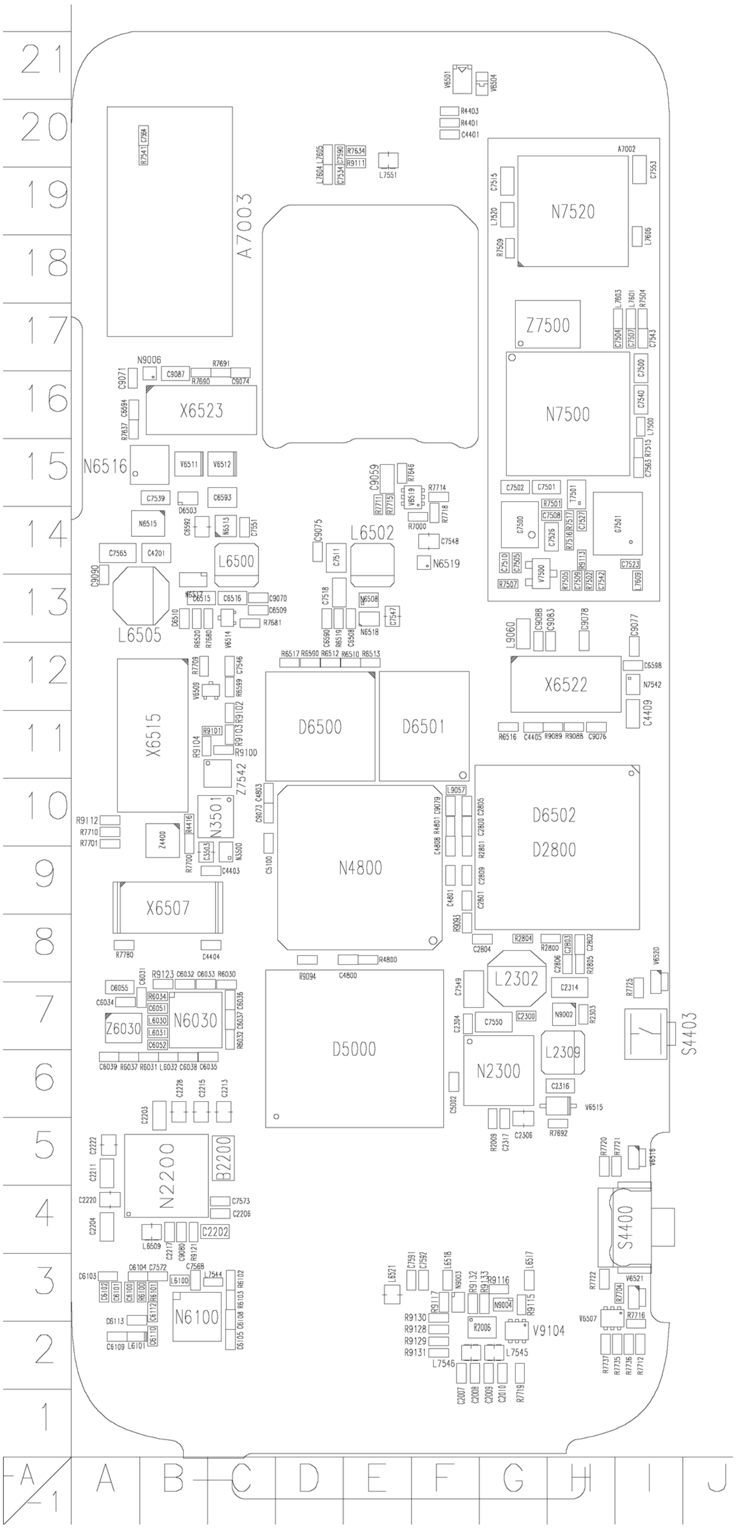


Figure 5 RM-132 component layout - top (1TR_11)

3 — Phoenix Service Software Instructions

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Phoenix installation steps in brief

Prerequisites

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 USB cable

Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.
5. Manage connection settings (depends on the tools you are using).
   - Update FPS-10 software

     Note: There is no need to activate FPS-10.
   - Activate SX-4 smart card, if you need tuning and testing functions.

     Note: When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-10 flash prommer and other service tools.

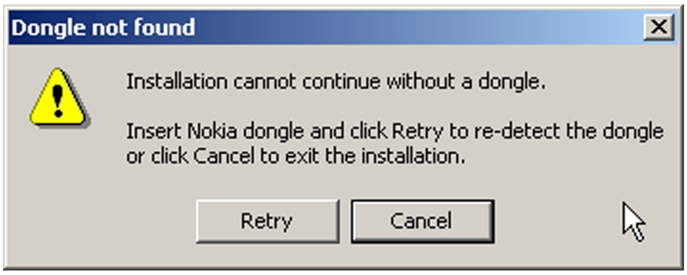
Installing *Phoenix*

Prerequisites

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:


Dongle not found

Installation cannot continue without a dongle.

Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.

Figure 6 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

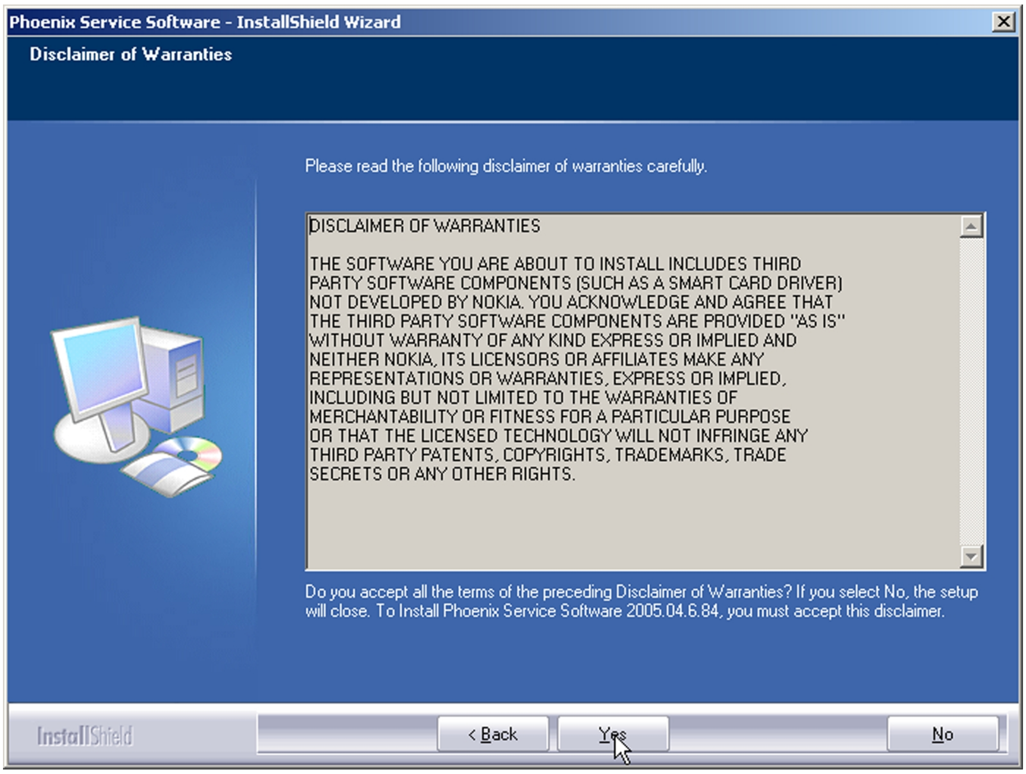
For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature’s **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

3. Read the disclaimer text carefully and click **Yes**.



Please read the following disclaimer of warranties carefully.

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Do you accept all the terms of the preceding Disclaimer of Warranties? If you select No, the setup will close. To Install Phoenix Service Software 2005.04.6.84, you must accept this disclaimer.

Figure 7 Disclaimer text

4. Choose the destination folder.

   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.
5. To continue, click **Next.**

   To choose another location, click **Browse** (not recommended).
6. Wait for the components to be copied.

   The progress of the installation is shown in the *Setup Status* window.
7. Wait for the drivers to be installed and updated.

   The process may take several minutes to complete.

   If the operating system does not require rebooting, the PC components are registered right away.

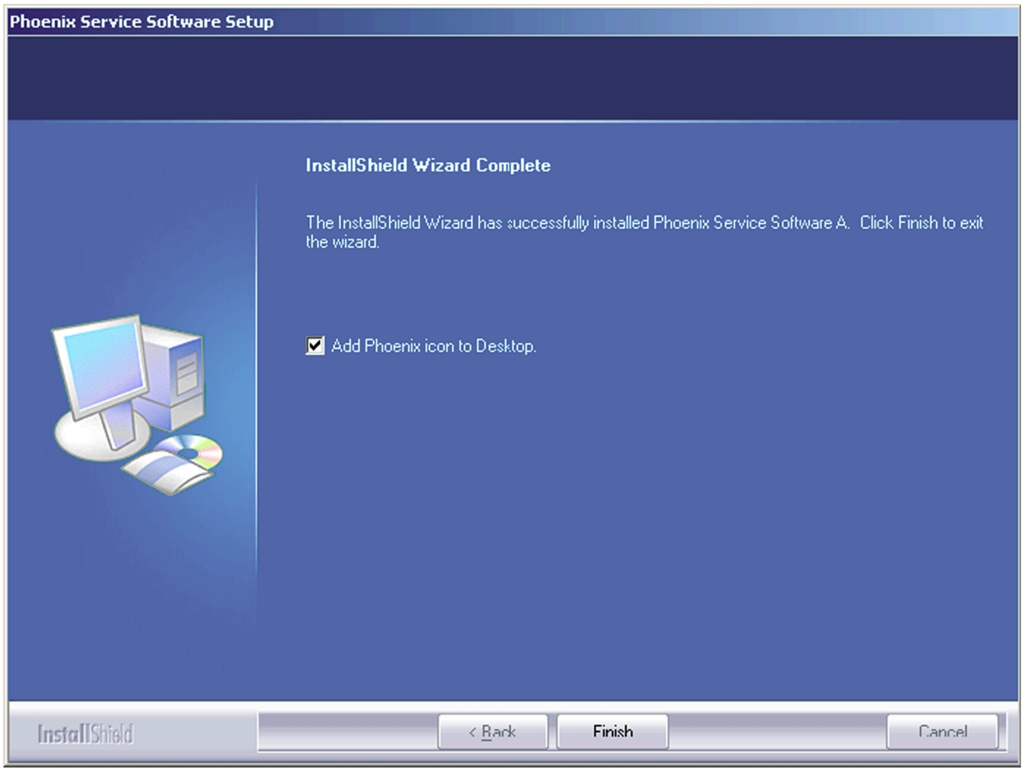
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.

   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.

   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

8. To end the installation, click **Finish**.



The InstallShield Wizard has successfully installed Phoenix Service Software A. Click Finish to exit the wizard.

☑ Add Phoenix icon to Desktop.

Figure 8 InstallShield Wizard Complete

Next actions

After the installation, *Phoenix* can be used after:

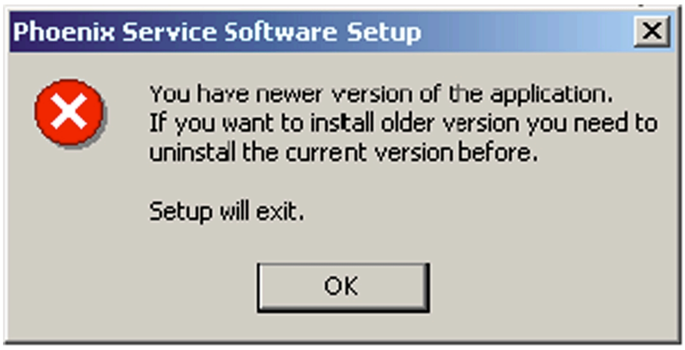
- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-10 flash prommer can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.



You have newer version of the application.
If you want to install older version you need to uninstall the current version before.

Setup will exit.

Figure 9 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

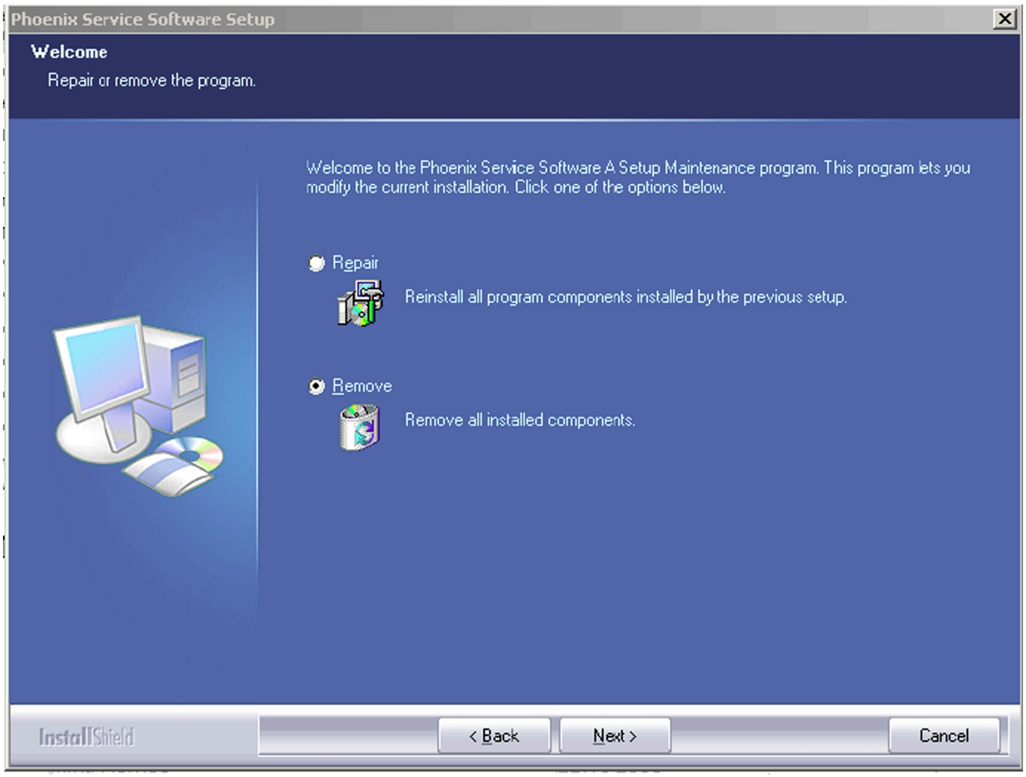
Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .



Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

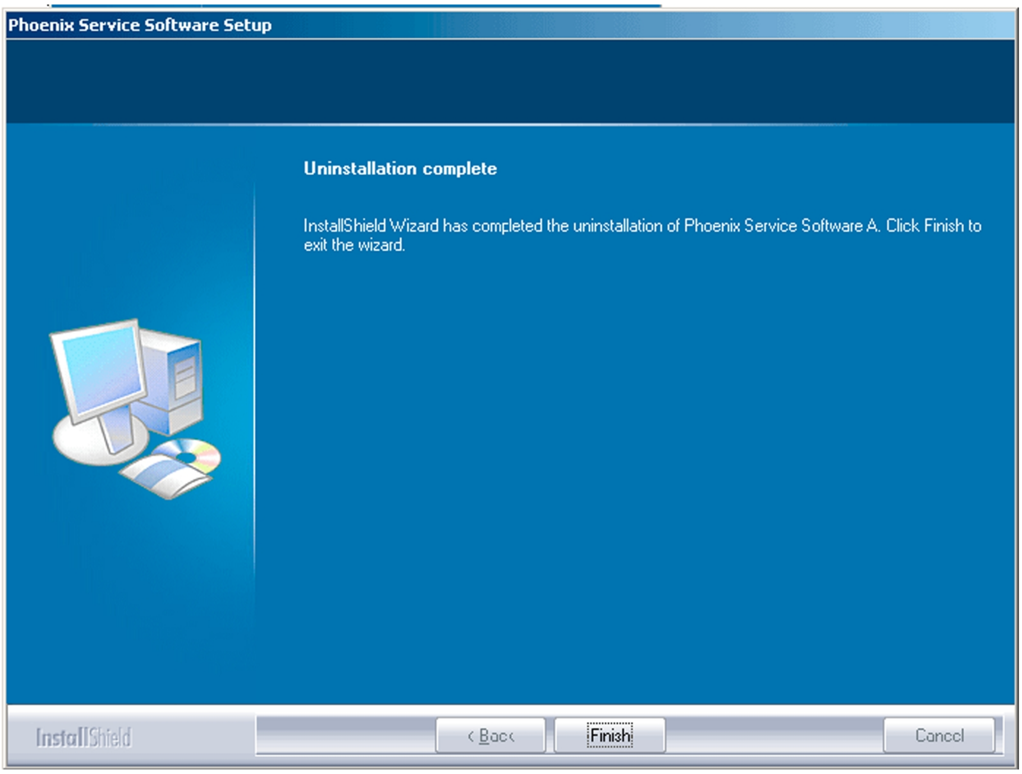
Reinstall all program components installed by the previous setup.

Remove all installed components.

Figure 10 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.



Uninstallation complete

InstallShield Wizard has completed the uninstallation of Phoenix Service Software A. Click Finish to exit the wizard.

Figure 11 Finish uninstallation

If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

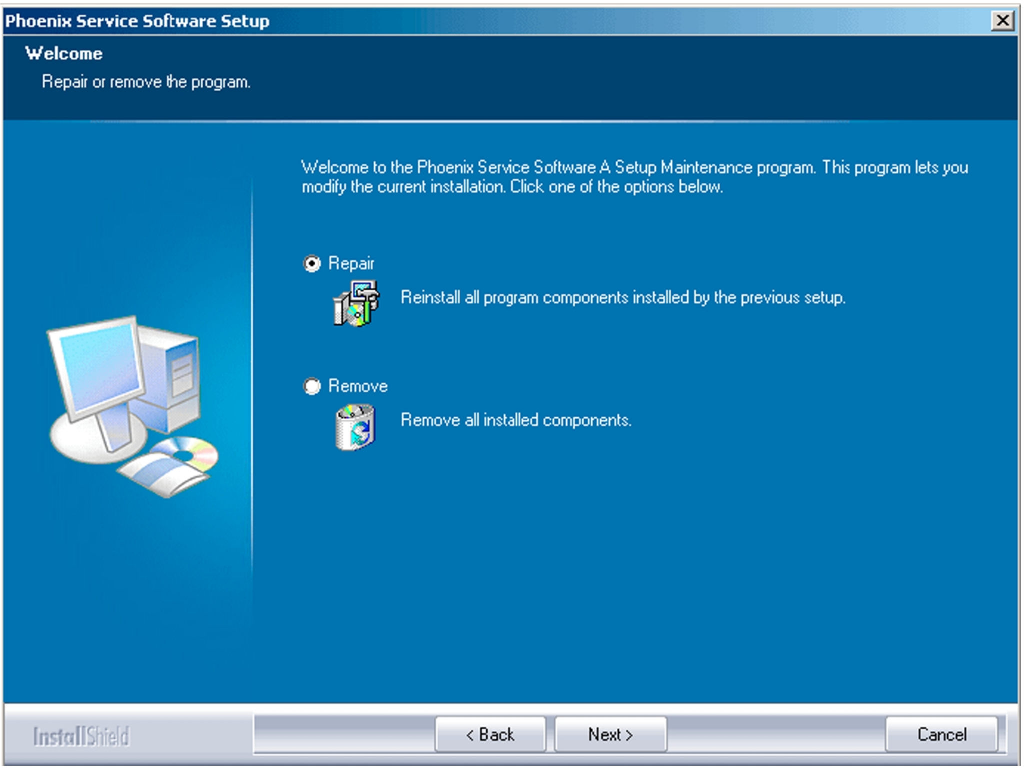
Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

Note: The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

● Repair

Reinstall all program components installed by the previous setup.

○ Remove

Remove all installed components.

Figure 12 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Phone data package overview

Each product has its own data package (DP). The product data package contains all product-specific data files to make the Phoenix service software and tools usable with a certain phone model.

The phone data package contains the following:

- Product software binary files

- Files for type label printing
- Validation file for the fault log repair data reporting system
- All product-specific configuration files for Phoenix software components

Data files are stored in **C:\Program Files\Nokia\Phoenix** (default).

Installing phone data package

Prerequisites

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.
- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

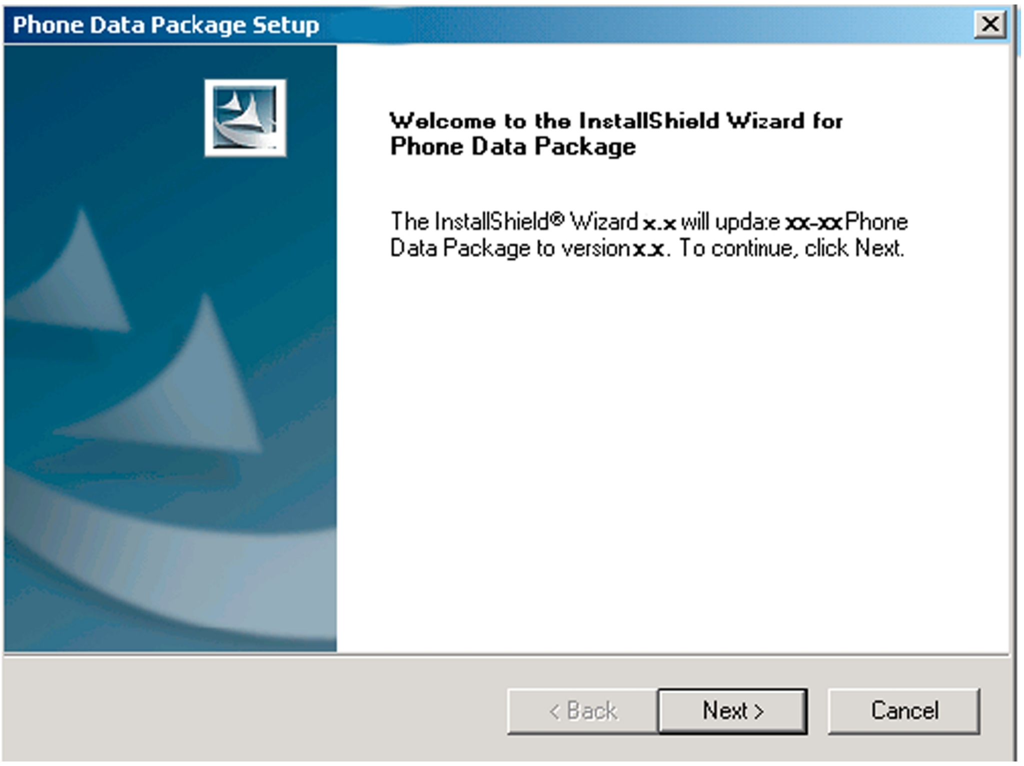
> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

   Wait for the installation files to be extracted.

2. Click **Next**.

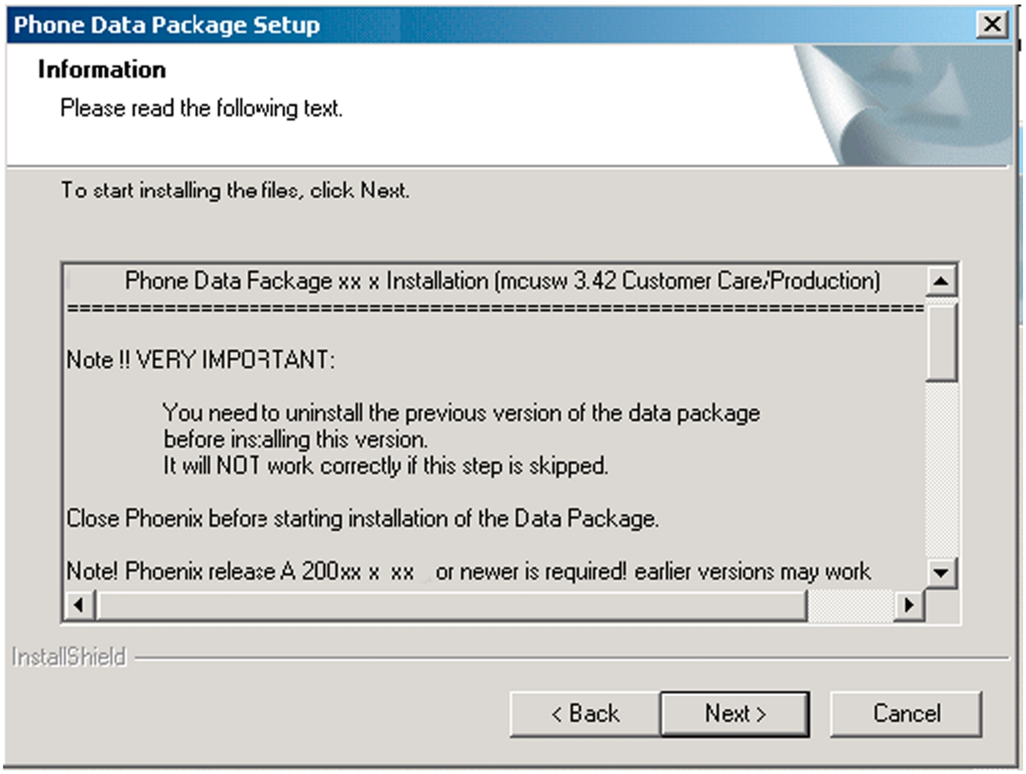


Phone Data Package Setup

Welcome to the InstallShield Wizard for Phone Data Package

The InstallShield® Wizard **x.x** will update **xx-xx** Phone Data Package to version **x.x**. To continue, click Next.

3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.



Phone Data Package Setup

Information

Please read the following text.

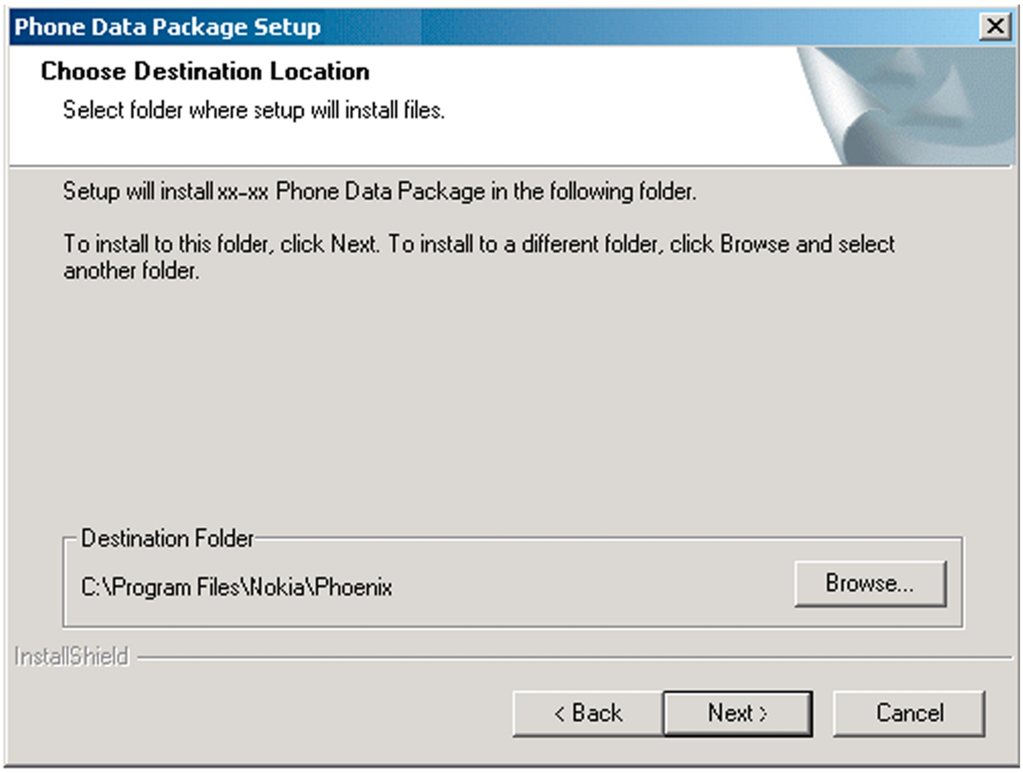
To start installing the files, click Next.

```
     Phone Data Package xx x Installation (mcusw 3.42 Customer Care/Production)
=======================================================================

Note !! VERY IMPORTANT:

          You need to uninstall the previous version of the data package
          before installing this version.
          It will NOT work correctly if this step is skipped.

Close Phoenix before starting installation of the Data Package.

Note! Phoenix release A 200xx x  xx    or newer is required! earlier versions may work
```

Figure 13 Data package setup information

4. To continue, click **Next**.

5. Choose the destination folder, and click **Next** to continue.



Choose Destination Location

Select folder where setup will install files.

Setup will install xx-xx Phone Data Package in the following folder.

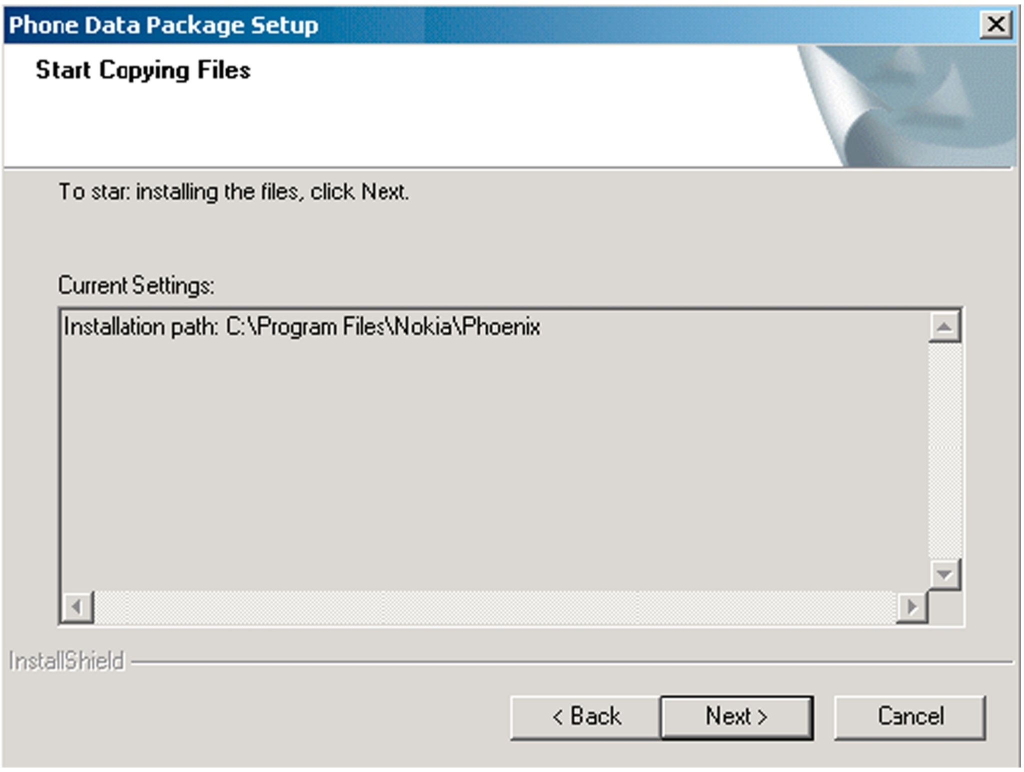
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder
C:\Program Files\Nokia\Phoenix

Figure 14 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



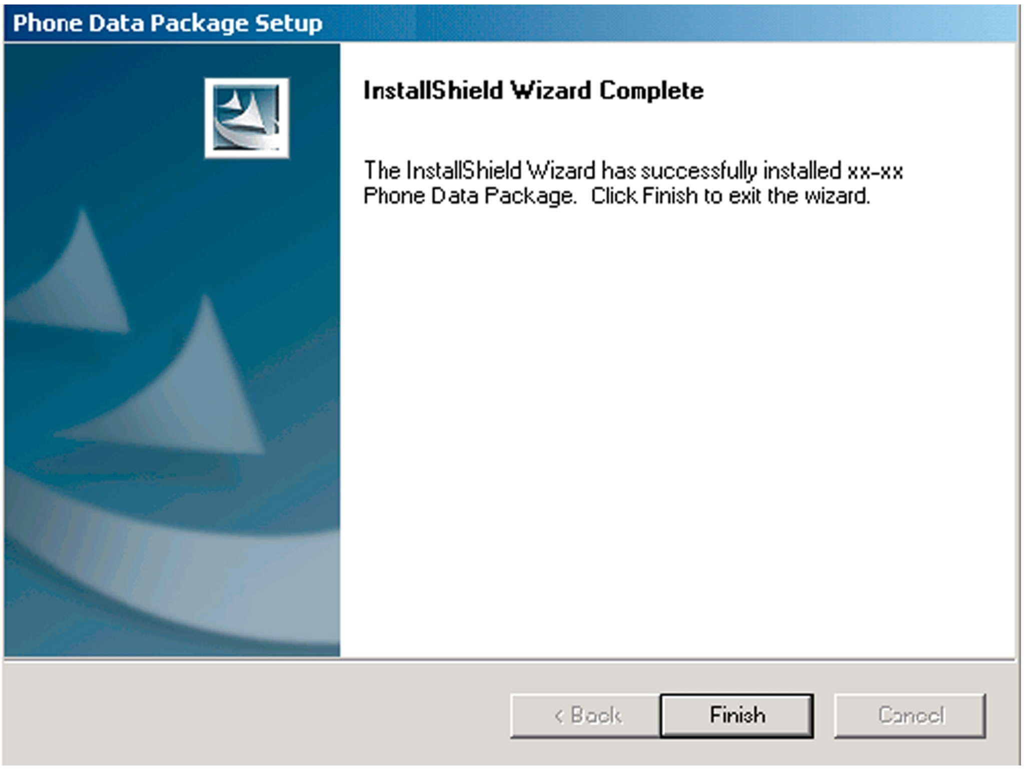
Start Copying Files

To star: installing the files, click Next.

Current Settings:
Installation path: C:\Program Files\Nokia\Phoenix

Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.



InstallShield Wizard Complete

The InstallShield Wizard has successfully installed xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 15 InstallShield Wizard Complete

Next actions

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-8 and FPS-10 can be used after updating their flash update package files.

Uninstalling phone data package

Context

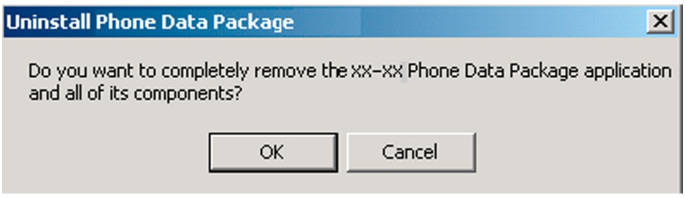
There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.

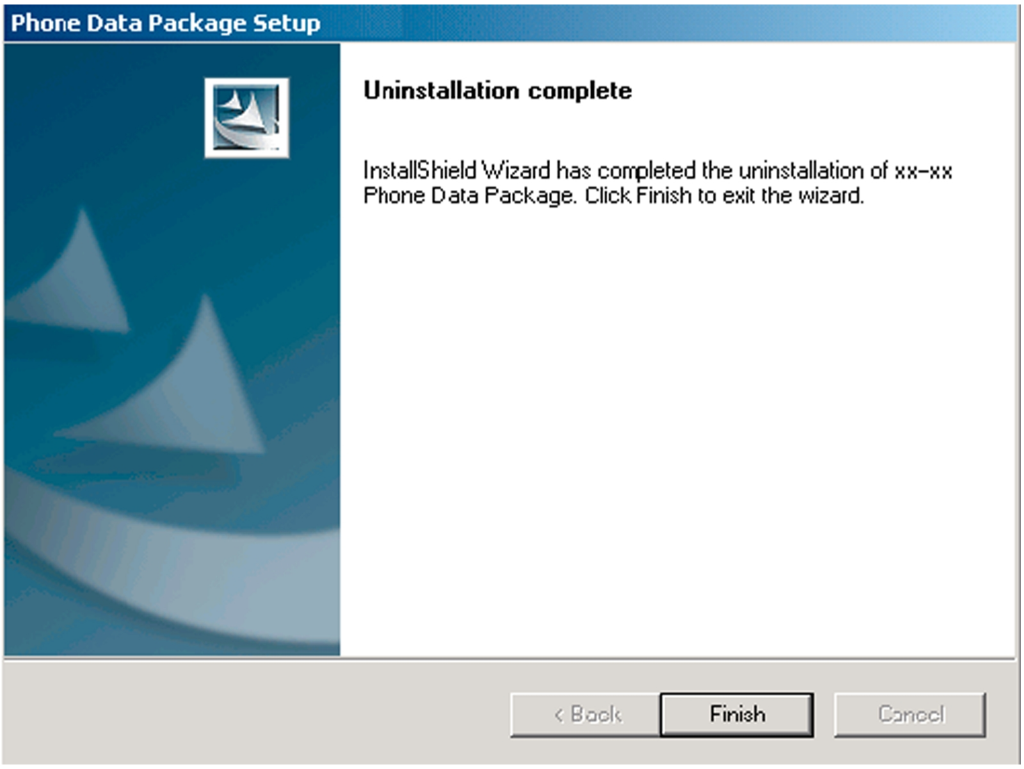
3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.



Do you want to completely remove the xx-xx Phone Data Package application and all of its components?

Figure 16 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.



Uninstallation complete

InstallShield Wizard has completed the uninstallation of xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 17 Finishing data package uninstallation

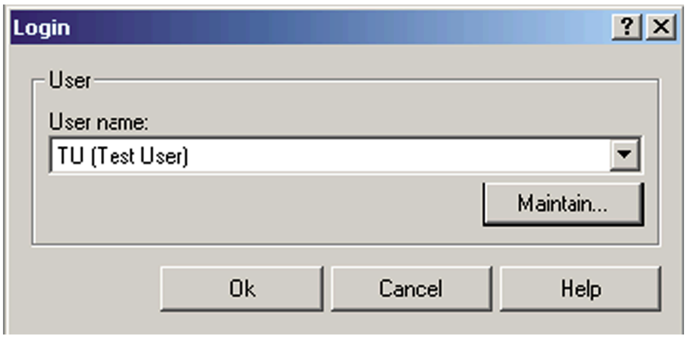
Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.



User name: TU (Test User)

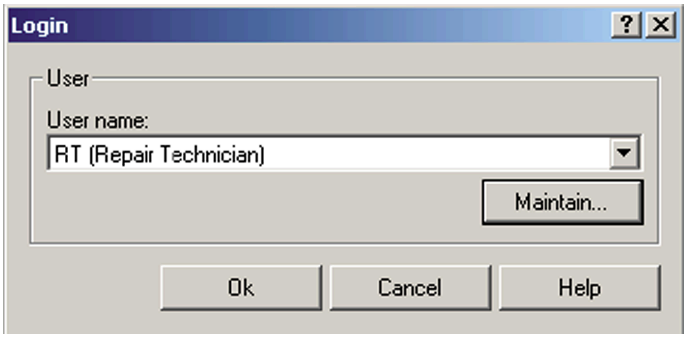
Figure 18 Phoenix login

   If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.
4. Type in the name and initials of the user, and click **OK**.

   The user is added to the user name list.

5. Select the desired user from the *User name* drop-down list, and click **OK**.



User name: RT (Repair Technician)

Figure 19 New user configured

Managing connections in *Phoenix*

Context

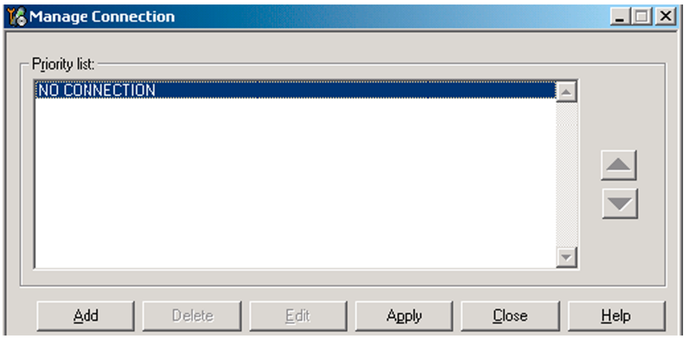
With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

Steps

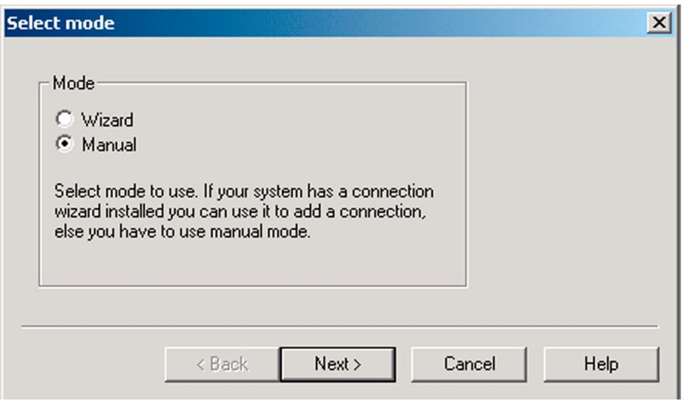
1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .

3. To add a new connection, click **Add**.



4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.



Select mode to use. If your system has a connection wizard installed you can use it to add a connection, else you have to use manual mode.

Figure 20 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:

- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:

- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

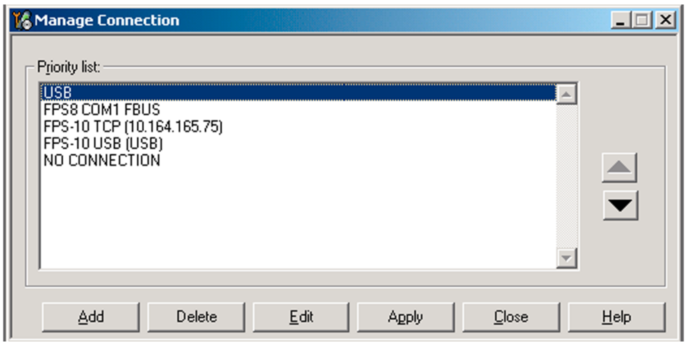
iii For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.

6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.



Priority list:

USB
FPS8 COM1 FBUS
FPS-10 TCP (10.164.165.75)
FPS-10 USB (USB)
NO CONNECTION

Figure 21 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

Figure 22 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:

```
V 2.0436v19.1 , 18-10-04 , RM-1 , (c) NOKIA. / V 2.39.126 , 18-10-04 , RM-1 , (c)
```

Figure 23 Product support module information (example from RM-1)

Installing flash support files for FPS-8 and FPS-10

Prerequisites

- Install *Phoenix* service software.
- Install phone model specific data package for *Phoenix*.
- If you want to update the flash support files, they are delivered in the same installation package with *Phoenix* or newer *Phoenix* packages beginning from December 2004.

  In case you want to update the MCU files, install the latest data package (see Technical Bulletins for information on the latest one).

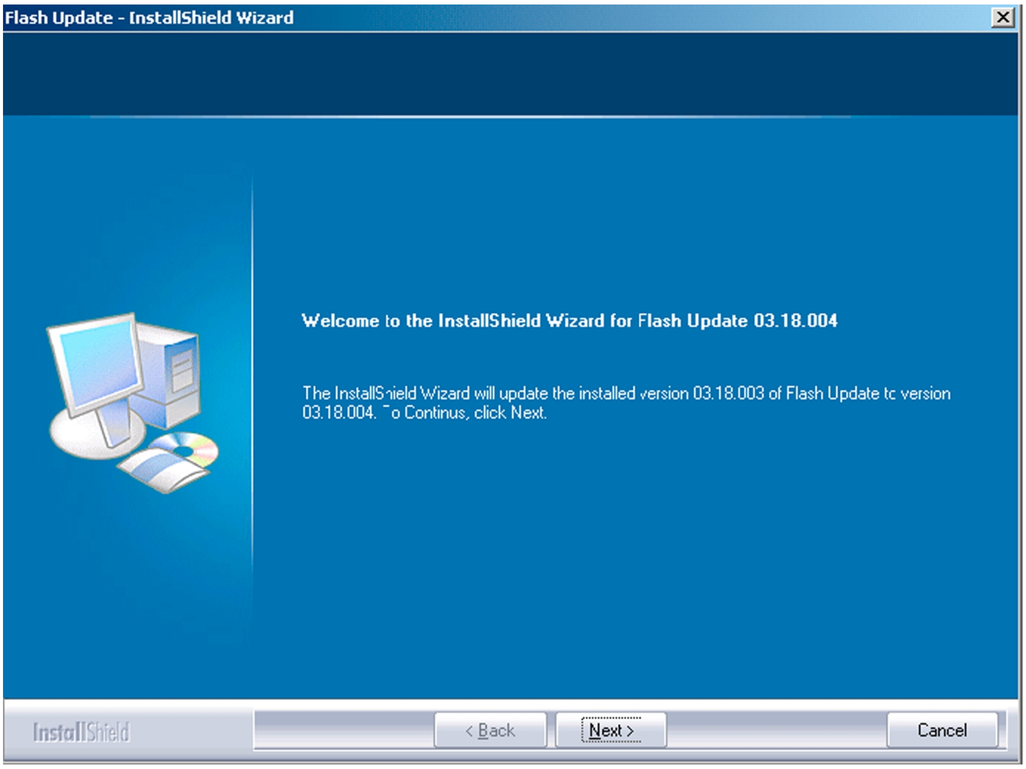
  Normally, it is enough to install *Phoenix* and the phone-specific data package because the installation always includes the latest flash update package files for FPS-8 and FPS-10.
- A separate installation package for flash support files is available. The files can be updated according to these instructions, if updates appear between *Phoenix* data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-8 and FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

Steps

1. To begin the installation, double-click the flash update file (for example, *flash_update_03_183_0014.exe*).



Flash Update - InstallShield Wizard

Welcome to the InstallShield Wizard for Flash Update 03.18.004

The InstallShield Wizard will update the installed version 03.18.003 of Flash Update tc version 03.18.004. To Continus, click Next.

Figure 24 Flash update welcome dialog

If the same version of the flash update package already exists, and you want to reinstall it, the previous package is first uninstalled.

Restart installation again after the uninstallation.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If there is a need to downgrade the version, uninstall newer files manually from the **Windows Control Panel**, and then rerun the installation.

Flash Update - InstallShield Wizard

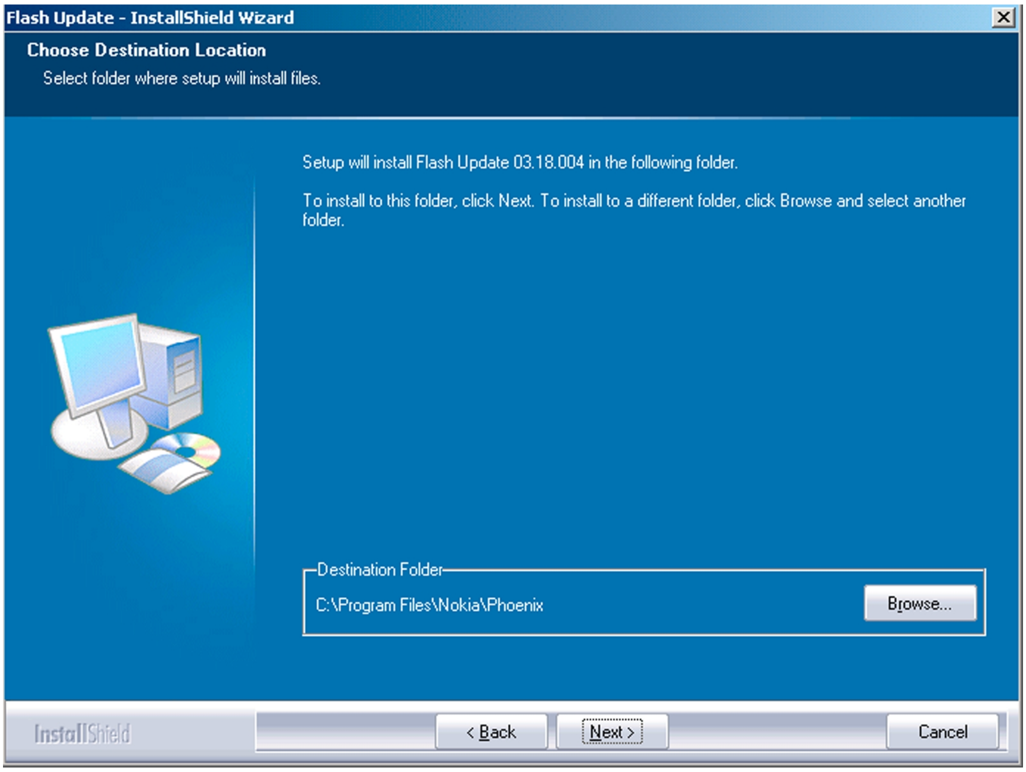
You have newer version 03.18.004 of the application.
If you want to install older version 03.18.003 you need to uninstall the current version before.

Setup will exit.

Figure 25 Flash installation interrupted

If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

3. It is recommended to install the files to the default destination folder *C:|Program Files|Nokia|Phoenix*. To continue, click **Next**.



Flash Update - InstallShield Wizard

Choose Destination Location

Select folder where setup will install files.

Setup will install Flash Update 03.18.004 in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

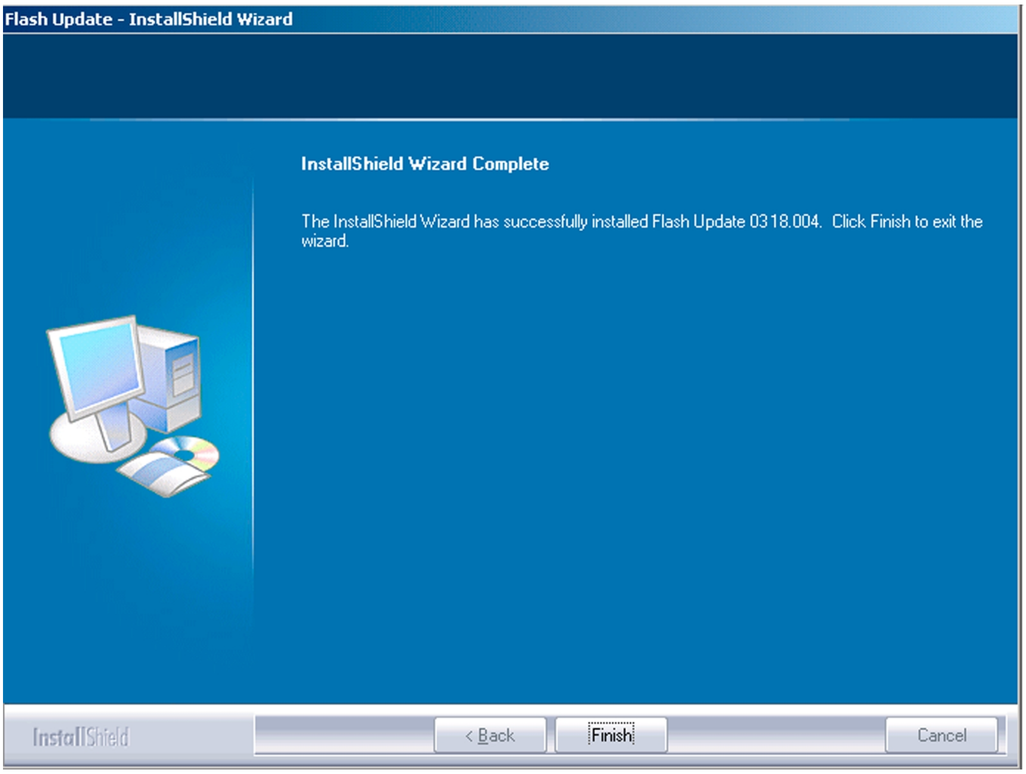
Destination Folder

C:\Program Files\Nokia\Phoenix

Figure 26 Flash destination folder

When installing the flash update files for the first time, you may choose another location by selecting **Browse** (not recommended).

4. To complete the installation procedure, click **Finish** .



Flash Update - InstallShield Wizard

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Flash Update 03.18.004. Click Finish to exit the wizard.

Figure 27 Finish flash update

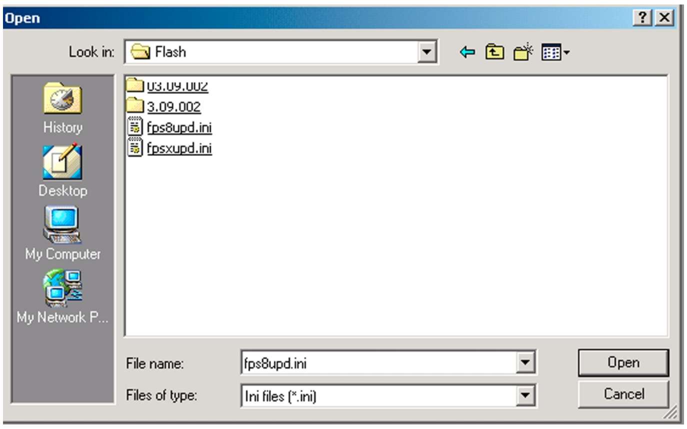
Next actions

FPS-8 and FPS-10 flash prommers must be updated using *Phoenix*.

Updating FPS-8 and FPS-10 flash prommer software

Steps

1. Start *Phoenix* service software, and log in.
2. Choose the correct connection for your flash prommer: **File→Manage Connections...**
3. Choose **Flashing→Prommer maintenance** .
4. To update the **FPS-8/FPS-10** software, click **Update**, and select the appropriate file *fps8upd.ini* (for FPS-8) or *fpsxupd.ini* (for FPS-10) from *C:|Program Files|Nokia|Phoenix|Flash*.



Open

Look in: Flash

03.09.002
3.09.002
fps8upd.ini
fpsxupd.ini

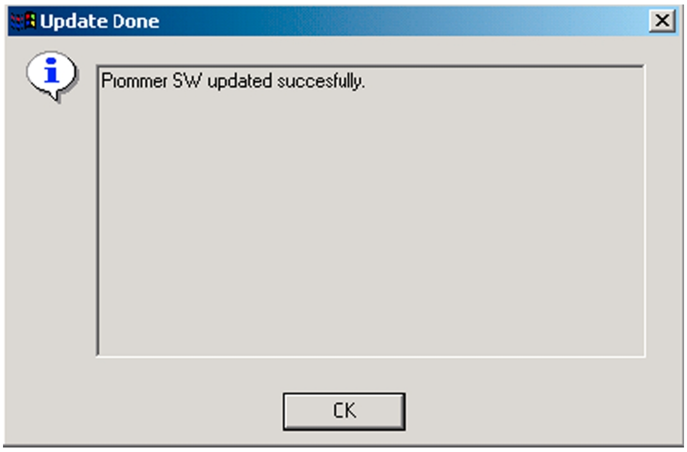
File name: fps8upd.ini

Files of type: Ini files (*.ini)

Figure 28 Flash directory window

Tip: All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash Box Files* pane and select the file type(s) to be loaded.

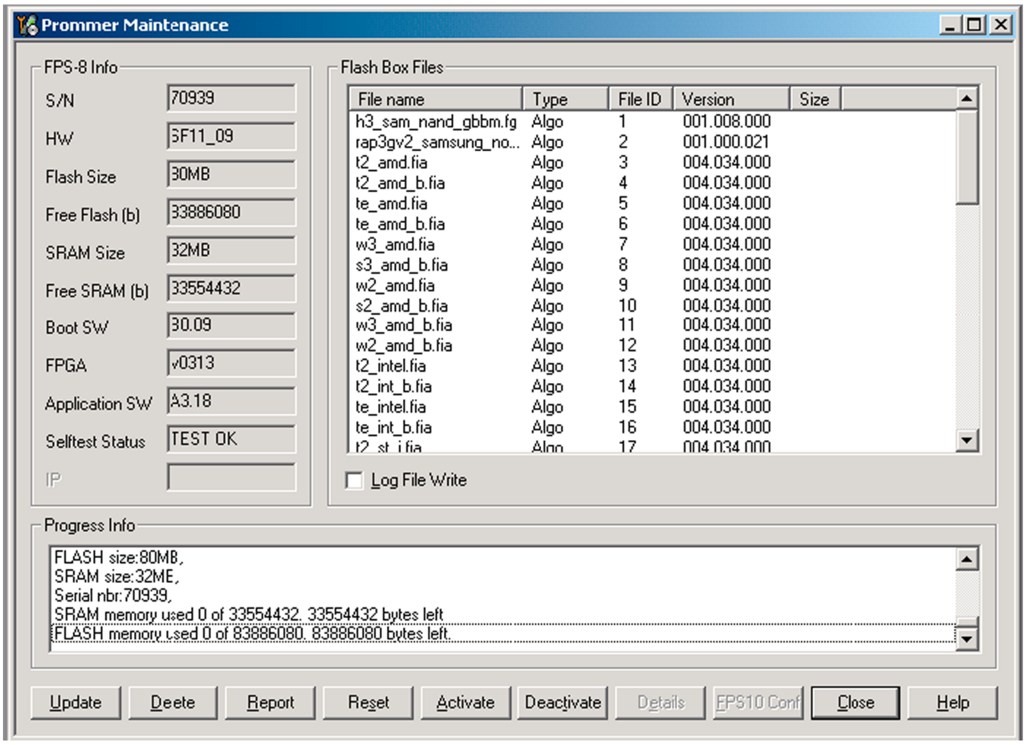
5. Click **OK**.



Prommer SW updated succesfully.

Figure 29 Prommer software update finished

6. To close the *Prommer Maintenance* window, click **Close**.



S/N: 70939
HW: 5F11_09
Flash Size: 30MB
Free Flash (b): 33886080
SRAM Size: 32MB
Free SRAM (b): 33554432
Boot SW: 30.09
FPGA: v0313
Application SW: A3.18
Selftest Status: TEST OK
IP:

File name	Type	File ID	Version	Size
h3_sam_nand_gbbm.fg	Algo	1	001.008.000	
rap3gv2_samsung_no...	Algo	2	001.000.021	
t2_amd.fia	Algo	3	004.034.000	
t2_amd_b.fia	Algo	4	004.034.000	
te_amd.fia	Algo	5	004.034.000	
te_amd_b.fia	Algo	6	004.034.000	
w3_amd.fia	Algo	7	004.034.000	
s3_amd_b.fia	Algo	8	004.034.000	
w2_amd.fia	Algo	9	004.034.000	
s2_amd_b.fia	Algo	10	004.034.000	
w3_amd_b.fia	Algo	11	004.034.000	
w2_amd_b.fia	Algo	12	004.034.000	
t2_intel.fia	Algo	13	004.034.000	
t2_int_b.fia	Algo	14	004.034.000	
te_intel.fia	Algo	15	004.034.000	
te_int_b.fia	Algo	16	004.034.000	
t2_st_i.fia	Algo	17	004.034.000	

☐ Log File Write

```
FLASH size:80MB,
SRAM size:32ME,
Serial nbr:70939,
SRAM memory used 0 of 33554432. 33554432 bytes left
FLASH memory used 0 of 83886080. 83886080 bytes left.
```

Figure 30 *Prommer Maintenance* window

Activating FPS-8

Context

Before FPS-8 can be successfully used for phone programming, it must first be activated.

First fill in the *FPS-8 activation request* sheet in the FPS-8 sales package, and follow the instructions given.

When activation file is received (for example, *00000.in*), copy it to the *C:|ProgramFiles|Nokia|Phoenix |BoxActivation* directory on your computer (this directory is created when *Phoenix* is installed).

Steps

1. Start *Phoenix* service software.
2. Choose **Flashing→Prommer Maintenance** .
3. In the *Prommer Maintenance* window, click **Activate**.
4. To find the activation file, click **Browse**.
5. To activate the prommer, select the activation file and click **Open**.

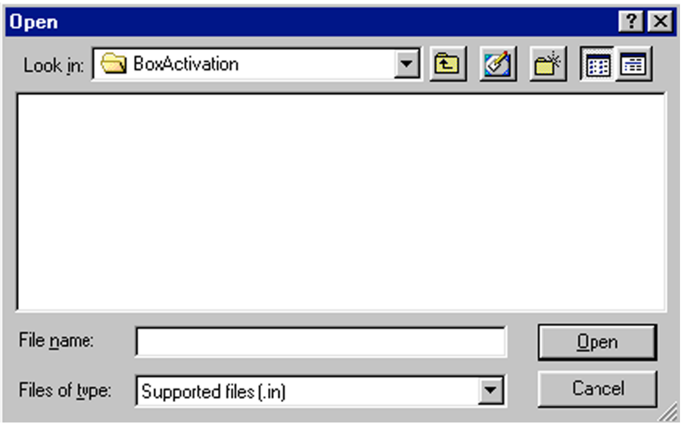


Figure 31 Box activation

6. To complete the activation, restart FPS-8.

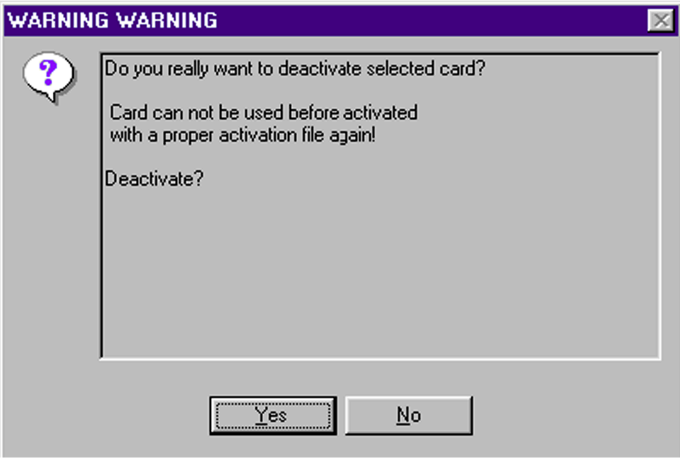
Deactivating FPS-8

Context

If there is, for example, a need to send the FPS-8 box for repair, it must be deactivated first.

Steps

1. Start *Phoenix* service software.
2. Choose **Flashing→Prommer Maintenance** .
3. In the *Prommer Maintenance* window, click **Deactivate**.
4. To confirm the deactivation, click **Yes**.



Do you really want to deactivate selected card?

Card can not be used before activated
with a proper activation file again!

Deactivate?

Figure 32 Deactivation warning

The box is deactivated.

5. To complete the deactivation, restart FPS-8.

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4 — Service Tools and Service Concepts

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Table of Contents

List of Tables

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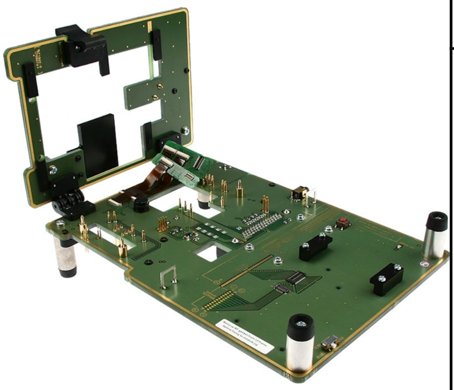
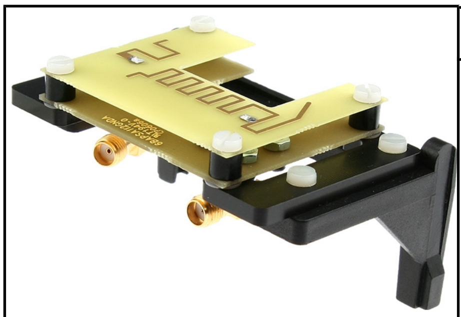
New service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-132; RM-133, refer to various concepts.

<table>
<tr><td rowspan="2"></td><td>FS-19</td><td>Flash adapter</td><td></td></tr>
<tr><td colspan="3">Flash adapter FS-19 is used for phone testing and flashing.
FS-19 is used with the generic flash adapter base SS-60/62 and control Unit CU-4 or interface adapter SS-46. When flashing or system testing the phone, the adapter is attached to replace the phone's own battery.
All functions (as well as the calibration voltages, current and the protections for over voltages, over current and voltage polarity), are performed by CU-4.
Flash adapter FS-19 main features:
• VBATT supply interface
• USB / FBUS multiplexed interface to the phone
• Supply voltage for light source</td></tr>
<tr><td rowspan="2"></td><td>MJ-87</td><td>Module jig</td><td></td></tr>
<tr><td colspan="3">The MJ-87 module jig is used for testing the following modules:
• User interface
• Baseband and RF on system module
Note: The nominal supply voltage for MJ-87 is +6.0 V. The supply voltage must not exceed +12.0 V (min. 5.0 V).
Supply the power to the jig only when the jumper is open = regulated.
RF attenuations:
• Table 12 Attenuation values
<table>
<tr><th>Band</th><th>Attenuation</th></tr>
<tr><td>GSM850</td><td>0.15 dB ± 0.05</td></tr>
<tr><td>GSM900</td><td>0.17 dB ± 0.05</td></tr>
<tr><td>GSM1800</td><td>0.36 dB ± 0.1</td></tr>
<tr><td>GSM1900</td><td>0.46 dB ± 0.1</td></tr>
<tr><td>WCDMA2100</td><td>0.71 dB ± 0.2</td></tr>
</table></td></tr>
</table>



SA-112	RF coupler	

SA-112 is an RF coupler for WCDMA and GSM RF testing. It is used together with the product-specific flash adapter.

The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-112:

Band	Channel	Attenuation Rx	Attenuation Tx
GSM 850	Low 128	11.8	14.2
	Mid 189	11.1	13.6
	High 251	10	12.9
GSM 900	Low 975	8.9	11.1
	Mid 62	8.7	9.8
	High 124	8.8	9.2
GSM 1800	Low 513	19.6	24
	Mid 700	17.9	21.3
	High 884	16.2	20.7
GSM 1900	Low 513	14.2	17.9
	Mid 661	13.3	16.2
	High 809	13	14.9
WCDMA Band I	Low	16.1	21.3
	Mid	15.7	21.6
	High	15.5	22.2

Common service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-132; RM-133, refer to various concepts.

CA-31D	USB cable	

The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.

	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		

CU-4	Control unit	

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

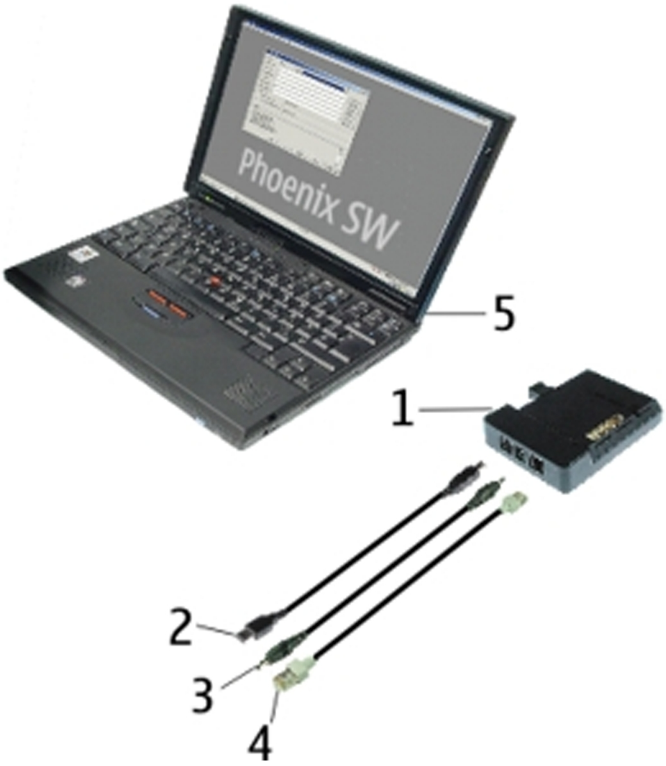
The unit has the following features:

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

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

Instructions

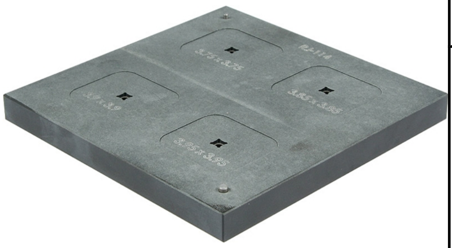
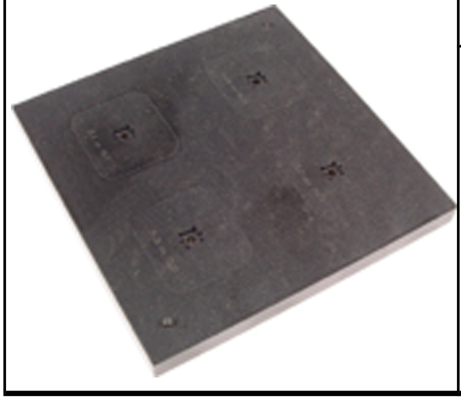
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.

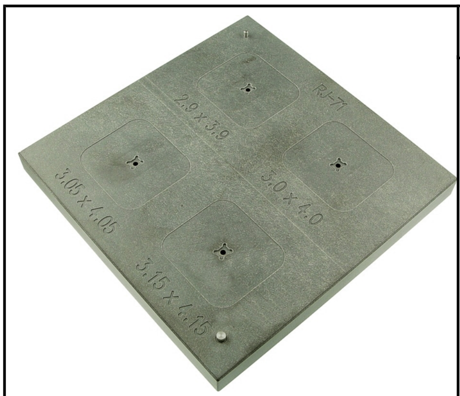
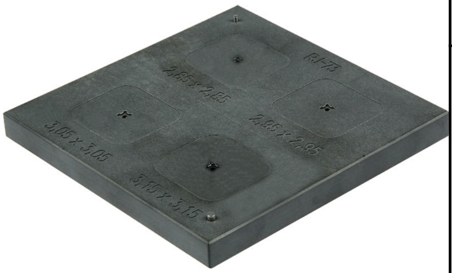
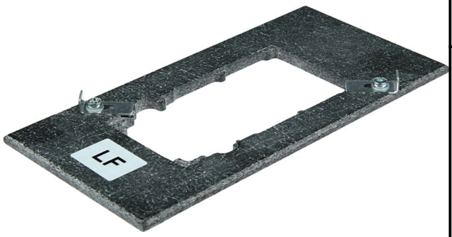


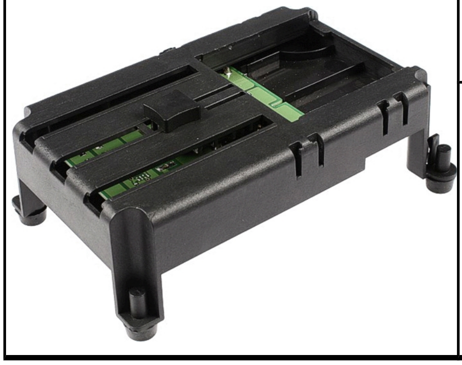
Note: Phoenix enables CU-4 regulators via USB when it is started.

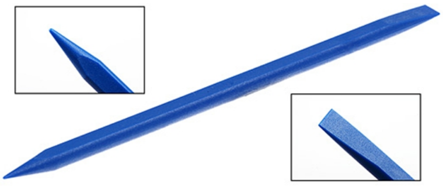
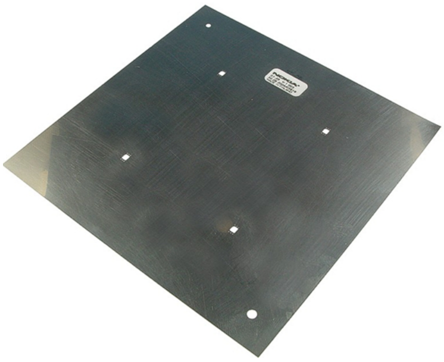
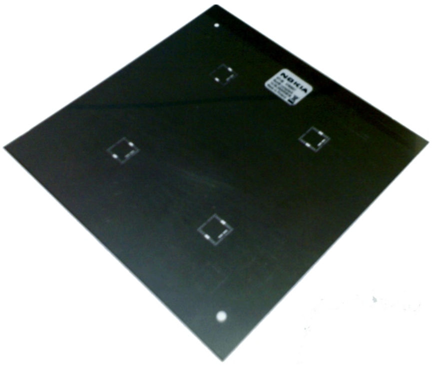
Reconnecting the power supply requires a Phoenix restart.

<table>
<tr><td rowspan="2"></td><td>DKU-2</td><td>USB connectivity cable</td><td></td></tr>
<tr><td colspan="3">USB to system connector cable.</td></tr>
<tr><td rowspan="2"></td><td>FPS-10</td><td>Flash prommer</td><td></td></tr>
<tr><td colspan="3">FPS-10 interfaces with:
• PC
• Control unit
• Flash adapter
• Smart card
FPS-10 flash prommer features:
• Flash functionality for BB5 and DCT-4 terminals
• Smart Card reader for SX-2 or SX-4
• USB traffic forwarding
• USB to FBUS/Flashbus conversion
• LAN to FBUS/Flashbus and USB conversion
• Vusb output switchable by PC command
FPS-10 sales package includes:
• FPS-10 prommer
• Power Supply with 5 country specific cords
• USB cable</td></tr>
</table>

	PCS-1	Power cable	The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.
	PKD-1	SW security device	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.
	RJ-114	Rework jig	RJ-114 is a rework jig used with ST-41.
	RJ-57	Rework jig	RJ-57 is a rework jig used with ST-22.

<table>
<tr><td rowspan="2">
</td><td>RJ-71</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3">RJ-71 is a rework jig used with ST-26 rework stencil.</td></tr>
<tr><td rowspan="2">
</td><td>RJ-73</td><td>Rework jig</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">
</td><td>RJ-75</td><td>Soldering jig</td><td></td></tr>
<tr><td colspan="3">RJ-75 is a soldering jig used for soldering and as a rework jig for the engine module.</td></tr>
<tr><td rowspan="2">
</td><td>SB-6</td><td>Bluetooth tester</td><td></td></tr>
<tr><td colspan="3">The SB-6 test box is a generic device to perform Bluetooth bit error rate testing and doing cordless FBUS connection via Bluetooth.</td></tr>
<tr><td rowspan="2">
</td><td>SPS-2</td><td>Soldering paste spreader</td><td></td></tr>
<tr><td colspan="3"></td></tr>
</table>

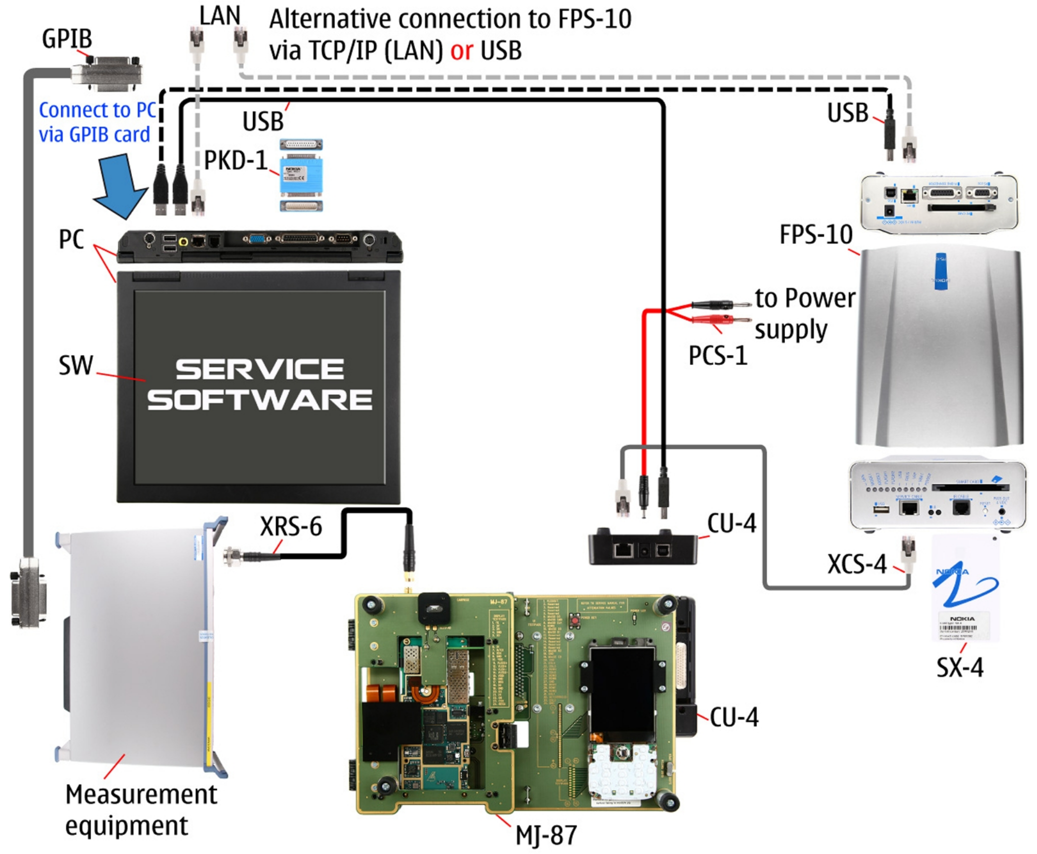
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers and B-to-B connectors.		
	SS-45	Front camera removal tool	
	The front camera removal tool SS-45 is used to remove/attach the front camera module from/to the socket.		
	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-10.		
	SS-51	Front camera removal tool	
	The front camera removal tool SS-51 is used to remove/attach a front camera module from/to the camera socket of the phone PWB.		
	SS-62	Generic flash adapter base for BB5	
	• generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using galvanic connector or coupler • multiplexing between USB and FBUS media, controlled by VUSB		

<table>
<tr><td rowspan="2"></td><td>SS-93</td><td>Opening tool</td><td></td></tr>
<tr><td colspan="3">SS-93 is used for opening JAE connectors.</td></tr>
<tr><td rowspan="2"></td><td>ST-20</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-20 is used with RJ-73 rework jig.</td></tr>
<tr><td rowspan="2"></td><td>ST-26</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-26 is a rework stencil used with rework jig RJ-71.</td></tr>
<tr><td rowspan="2"></td><td>ST-36</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-36 is a rework stencil used with rework jig RJ-103.</td></tr>
<tr><td rowspan="2"></td><td>ST-41</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-41 is a rework stencil used with rework jig RJ-114.</td></tr>
<tr><td rowspan="2"></td><td>ST-44</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-44 is a rework stencil used with rework jig RJ-57.</td></tr>
</table>

<table>
<tr><td rowspan="2"> </td><td>SX-4</td><td>Smart card</td><td></td></tr>
<tr><td colspan="3">SX-4 is a BB5 security device used to protect critical features in tuning and testing.
SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.</td></tr>
<tr><td rowspan="2"></td><td>XCS-1</td><td>Service cable</td><td></td></tr>
<tr><td colspan="3">The XCS-1 service cable is used to connect FLS-4S to the POS flash adapter for supplying a controlled operating voltage and data connection.</td></tr>
<tr><td rowspan="2"></td><td>XCS-4</td><td>Modular cable</td><td></td></tr>
<tr><td colspan="3">XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</td></tr>
<tr><td rowspan="2"></td><td>XRS-6</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector approximately 610 mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

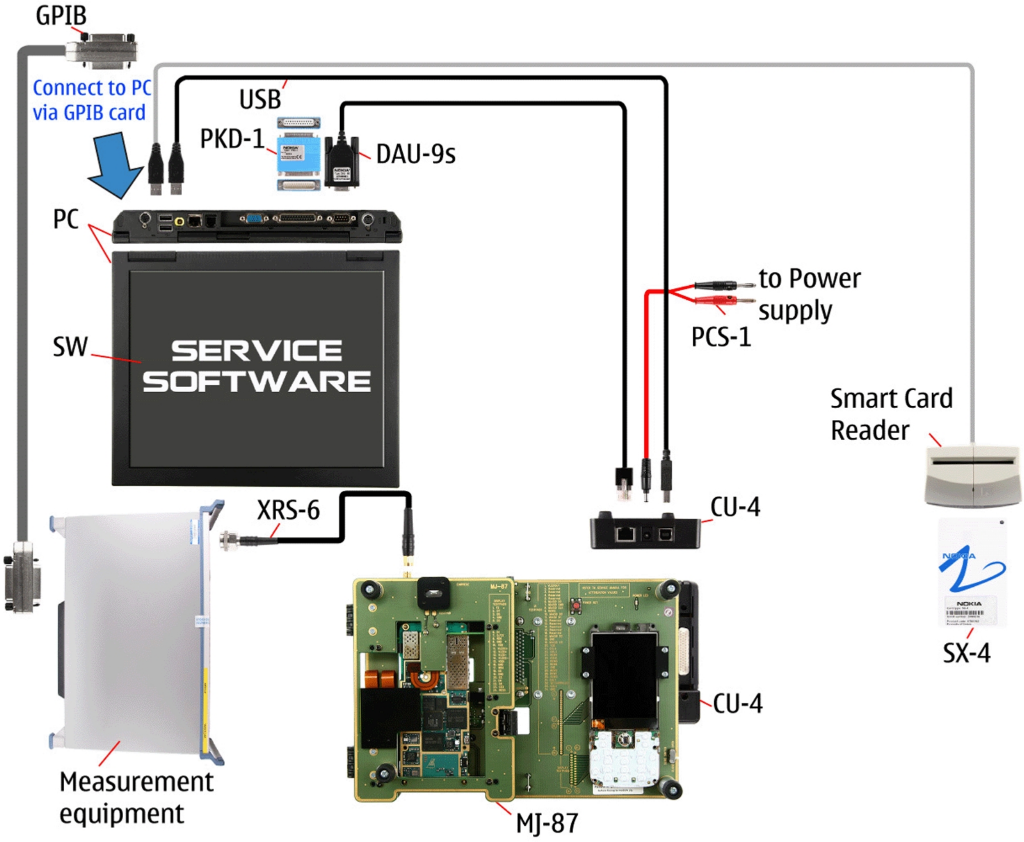
MJ-87 module jig concept



Item	Type	Description
1	MJ-87	Module jig
2	CU-4	Control unit
3	FPS-10	Flash prommer box
4	SX-4	Smart card
5	XCS-4	Modular cable
6	PCS-1	DC power cable
7		Standard USB cable
8		Standard USB cable
9		GPIB control cable
10	XRS-6	RF cable
11	PKD-1	SW security device
12		RF shield box

Note: Item 12 not shown in the picture.

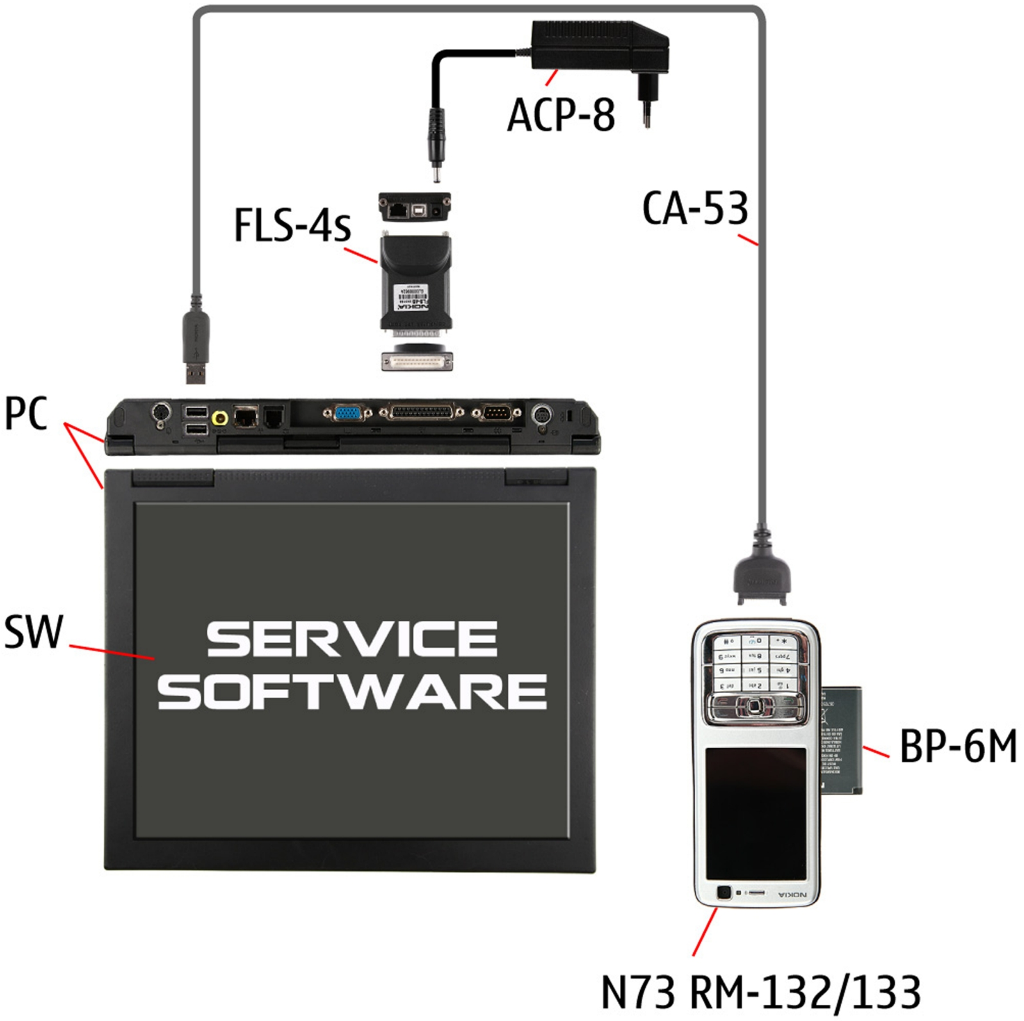
Service concept for RF/BB testing and tuning



Item	Type	Description
1	MJ-87	Module jig
2	CU-4	Control unit
3		Standard USB cable
4	PCS-1	DC power cable
5		Standard USB cable + smart card reader
6	SX-4	Smart card
7	XRS-6	RF cable
8		GPIB control cable
9	PKD-1	SW security device
10		RF shield box

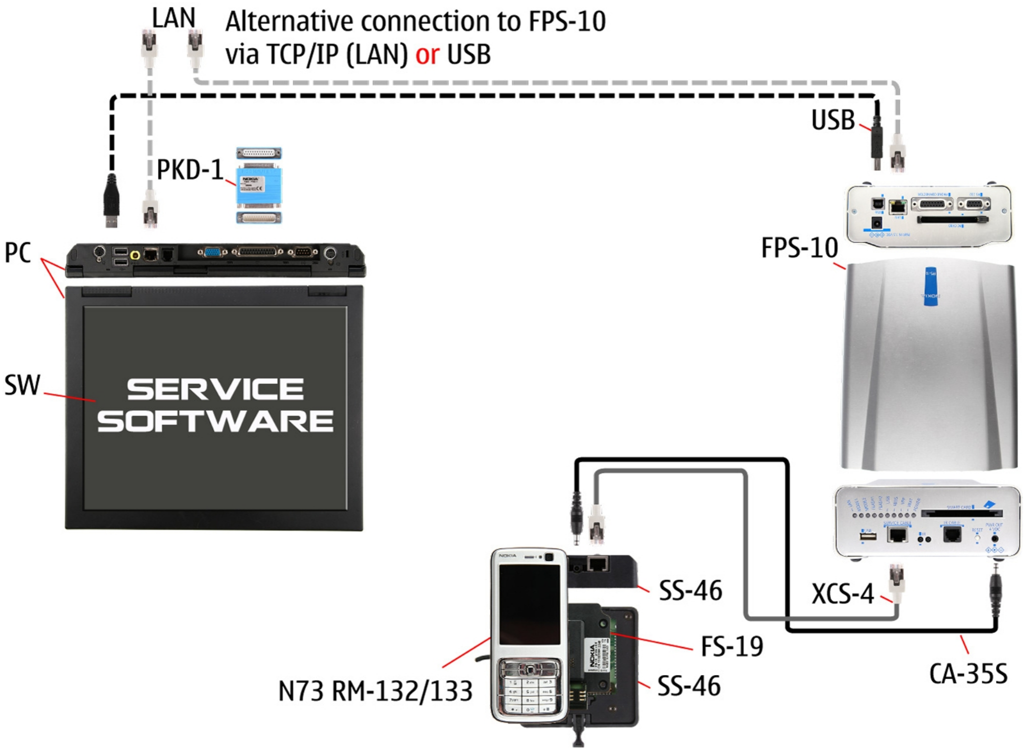
Note: Item 10 not shown in the picture.

POS flash concept



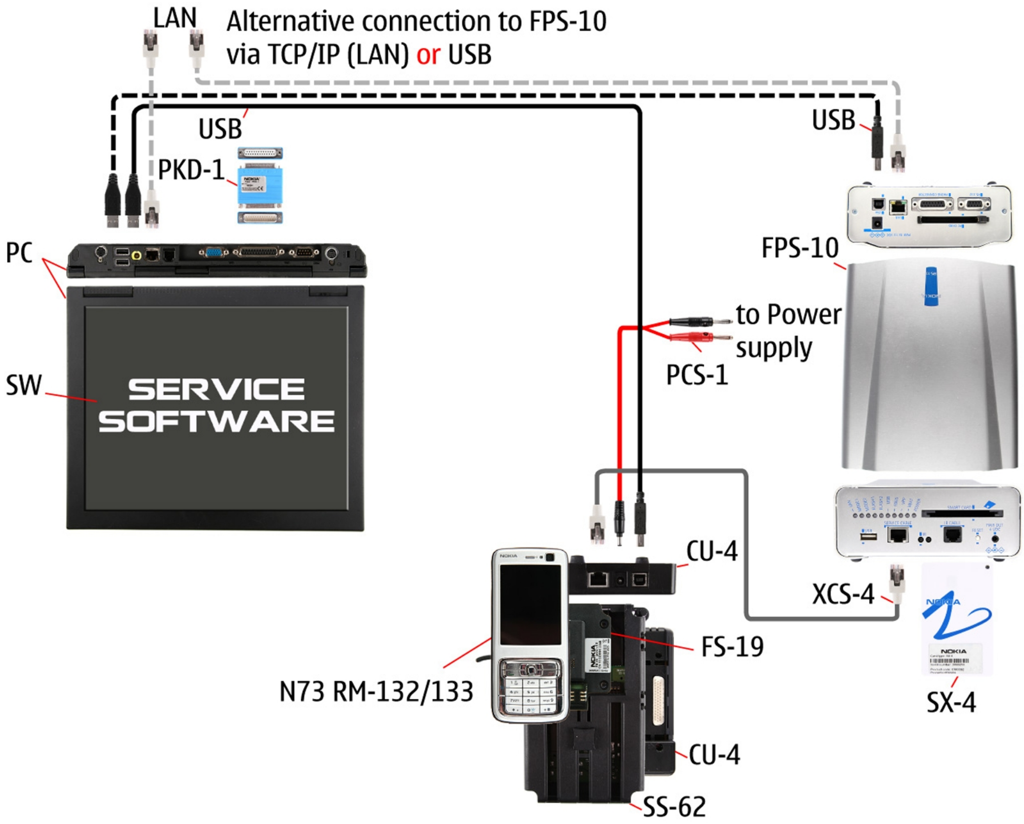
Item	Type	Description
1	RM-133/132 with BP-6MS	Transceiver with a battery
2	CA-53	USB connectivity cable
3	FLS-4S	POS flash device
4	ACF-8	Charger

Flash concept with FPS-10 and LAN



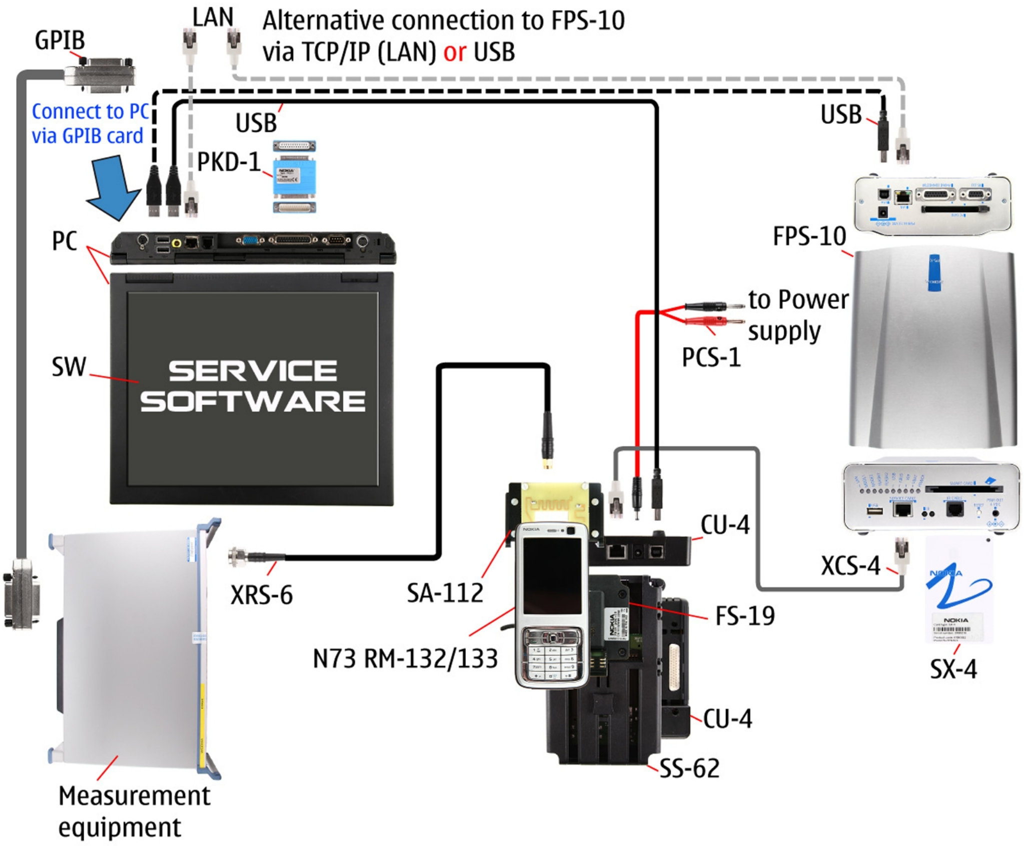
Item	Type	Description
1	FS-19	Flash adapter
2	SS-46	Interface adapter
3	CA-35S	Power cable
4	XCS-4	Modular cable
5	FPS-10	Flash prommer
6		Standard USB cable
7	PKD-1	SW security device

CU-4 flash concept with FPS-10



Item	Type	Description
1	FS-19 + SS-62	Flash adapter + generic flash adapter base for BB5 products
2	CU-4	Control unit
3	XCS-4	Modular cable
4	PCS-1	Power cable
5	FPS-10	Flash prommer
6		Standard USB cable
7		Standard USB cable
8	PKD-1	SW security device

RF testing and BB testing/tuning



Item	Type	Description
1	FS-19 + SS-62	Flash adapter + generic flash adapter base for BB5 products
2	CU-4	Control unit
3	SA-112	RF coupler
4	PCS-1	Power cable
5		Standard USB cable
6		Standard USB cable
7	SX-4	Smart card
8		GBIP control cable
9	XRS-6	RF cable
10	PKD-1	SW security device
11		RF shield box

Note: Item 11 not shown in the picture.

5 — Disassembly/reassembly instructions

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Table of Contents

List of Figures

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Disassembly instructions

Prerequisites

Figure 33 Needed tools: a Torx Plus size 6 screwdriver, metal tweezers, a DC plug, the SS-93 opening tool, a dental pick and the SRT-6.

Steps

1. Cover the window with a protective film.

2. Unlock and open the SLIDE COVER ASSEMBLY.

3. Cover the CAMERA WINDOW with a protective film.

4. Place the SS-93 between the KEYMAT and the edge of the A-COVER and unlock the button clip first.

5. Hold the SS-93 in the shown position and unlock the side clip with SRT-6 by pressing it between the A-COVER and the B-COVER.

6. Do the same on the other side.

7. Slide the SRT-6 along the marked edges to unlock the snaps.

8. Do the same on the other side.

9. Lift the A-COVER a bit and unlock its top side from the BCOVER with the SS-93.

10. Remember to protect the inner side of the window with a protective film.

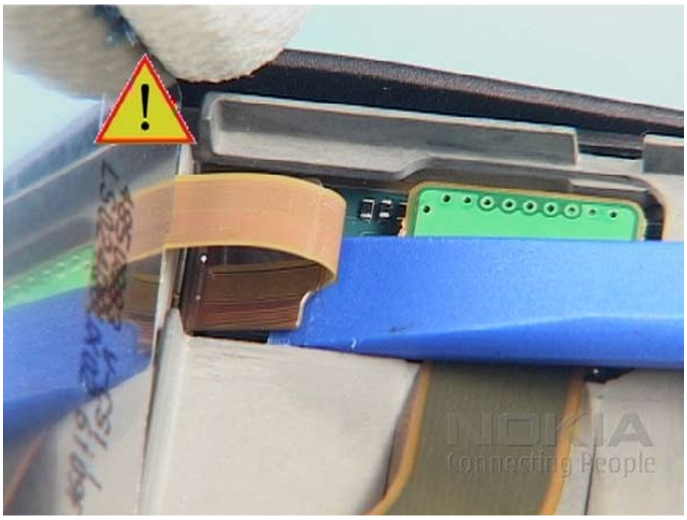
11. Unlock and remove the KEYMAT.

12. Carefully unlock and remove the DISPLAY SHIELD by using the dental tool.

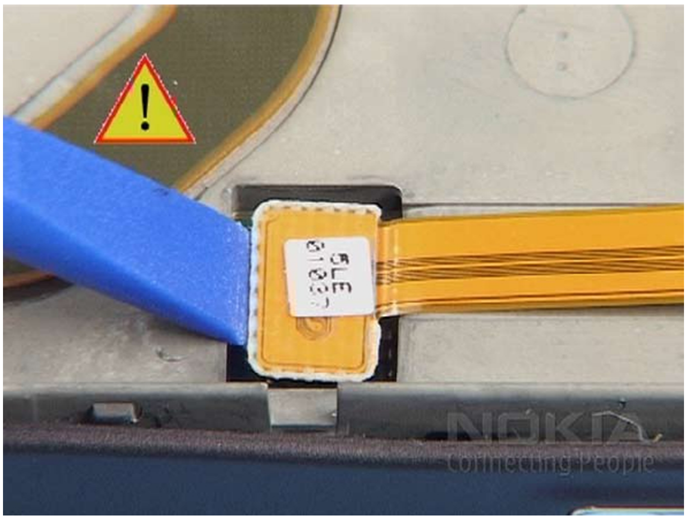
13. Cover the DISPLAY with a protective film.

14. Gently lift out the DISPLAY with the SS-93 from the UI FRAME...

15. ...and disconnect it from the ENGINE MODULE.



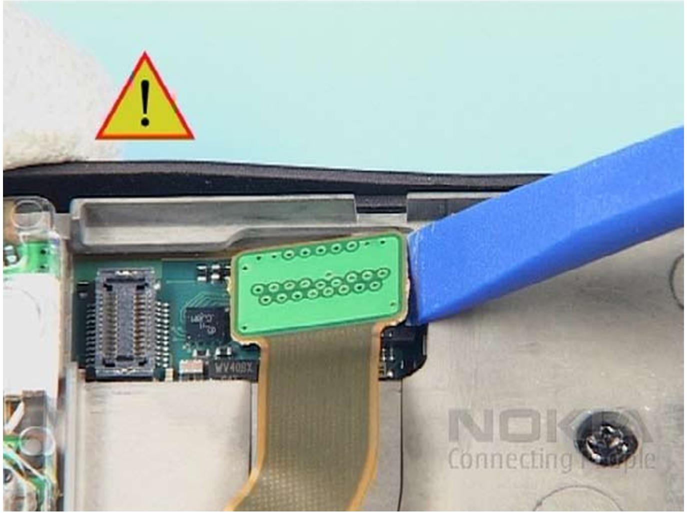
16. Open the FRONT CAMERA connector.



17. Remove the FRONT CAMERA from the UI-FRAME.

18. The CAMERA BOOT can now be separated from the FRONT CAMERA.

19. Carefully open the UI MODULE connector taking special care to the surrounding components.

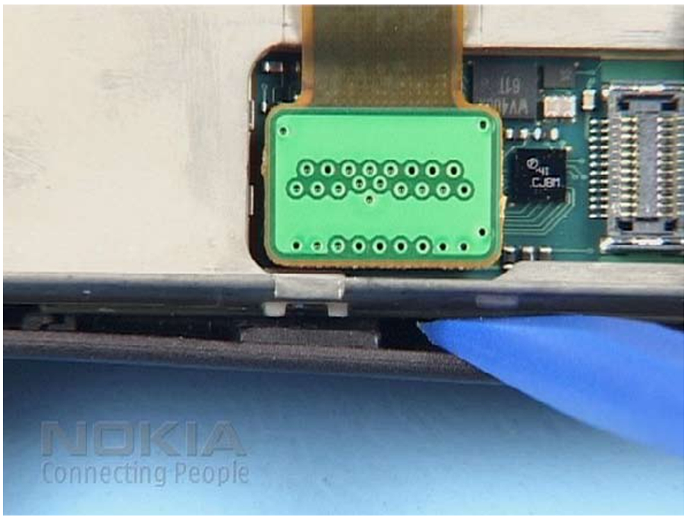


20. Undo the screws in the order shown.

21. Remove the screws and discard them.

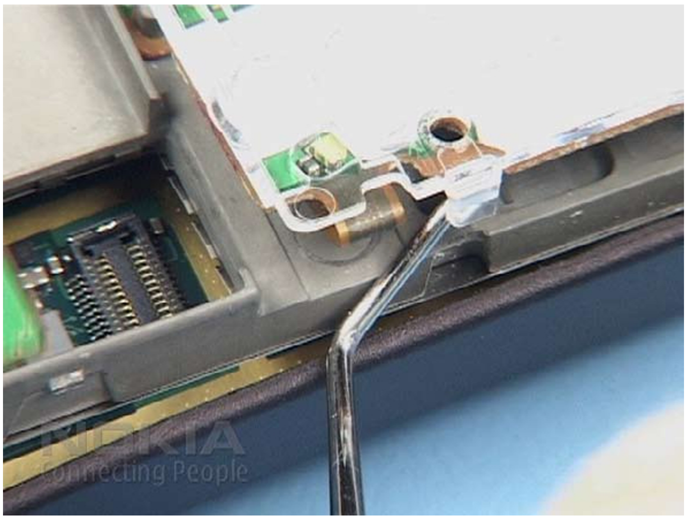
22. The UI FRAME is attached with two snaps to the B-COVER.

23. Unlock the UI FRAME with the SS-93.



24. Open the SD DOOR but do not remove it yet.

25. Lift the UI FRAME a bit and unsnap the LIGHT GUIDE.



26. Now remove the SD DOOR.

27. Remove the UI FRAME with the UI MODULE from the B-COVER.

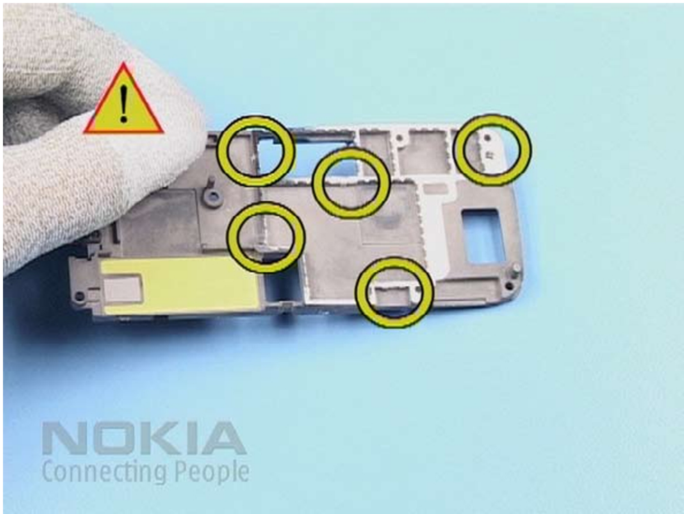
28. Take special care to the BASEBAND GASKET.

29. Open the snap if it snapped back and remove the LIGHT GUIDE.

30. Place the UI MODULE over the JOYSTICK HAT and carefully lever out the MODULE from the UI FRAME with SS-93.

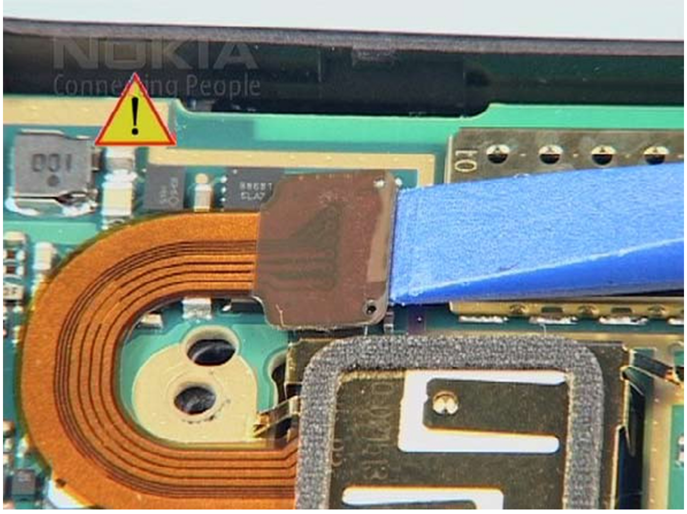
31. Move the UI MODULE to the primary position and then remove the UI MODULE by using the SS-93 as a support.

32. Gently, unlock the BASEBAND GASKET as shown and remove it from the UI FRAME.



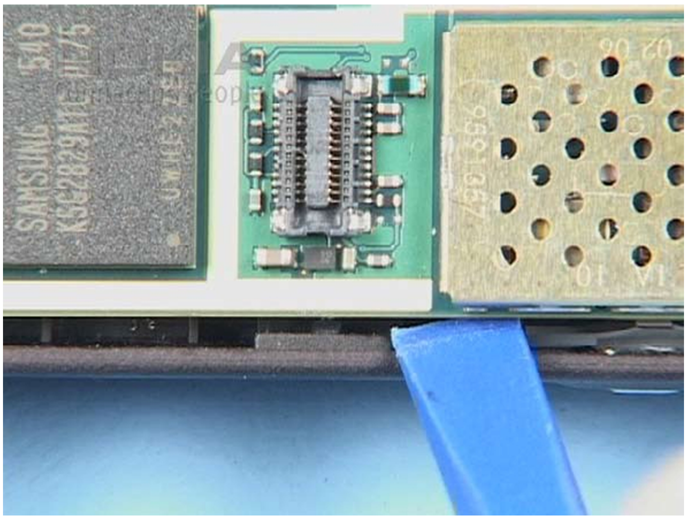
33. Replace the EARPIECE when necessary. Keep in mind to remove the EARPIECE ADHESIVE residues before assembling a new EARPIECE with a new EARPIECE ADHESIVE.

34. Disconnect the MAIN CAMERA from the ENGINE MODULE and remove it carefully from its housing.



35. The ENGINE MODULE is snapped to the B-COVER with two snaps.

36. Unlock the ENGINE MODULE with the SS-93 and remove it as shown taking care to all spring contacts.



37. Unlock the ANTENNA MODULE ASSEMBLY with the SS-93...

38. ...and remove it from the B-COVER.

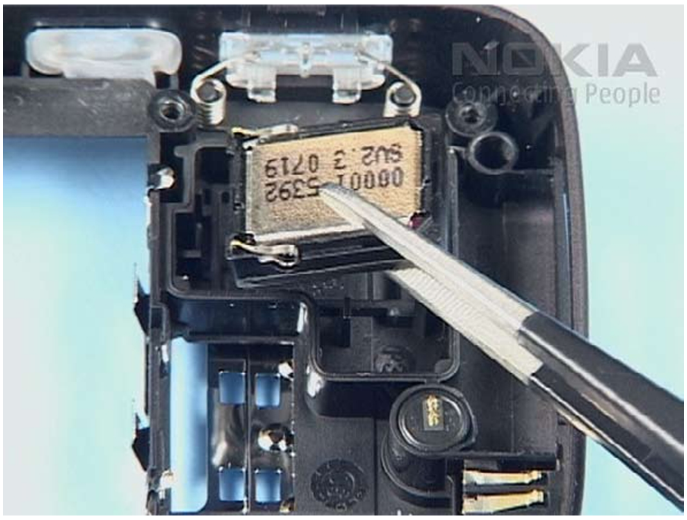
39. Lift the IHF SPEAKER from its housing and remove it easily.

40. Gently push down the FLASH LED from the ANTENNA MOULDING.

41. Remove the GASKET IHF HOUSING.

42. Remove the IHF SPEAKER 2 remember to remove whole IHF GASKET 2 residues.

43. Remove the MICROPHONE with the dental pick.



44. Use the DC plug to release the DC-JACK.

45. The DC-JACK drops out easily when turning the B-COVER.

The disassembly procedure is now finished.

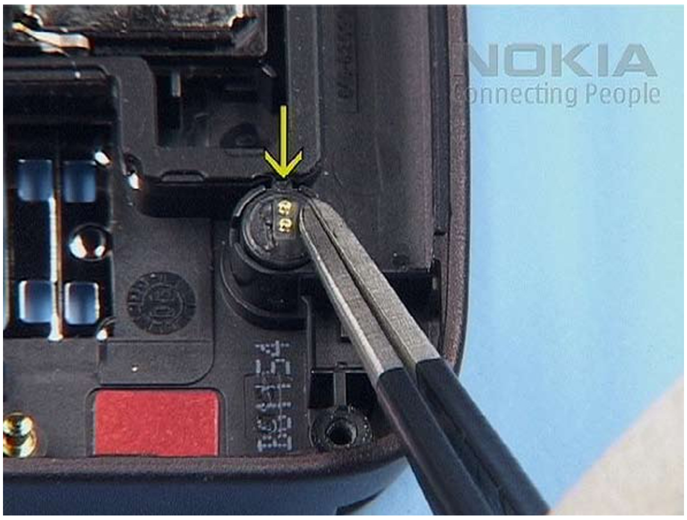
Reassembly instructions

Prerequisites

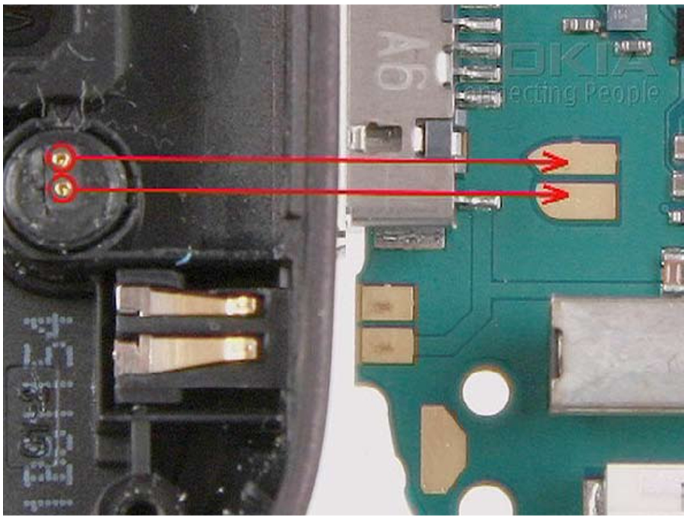
Figure 34 Needed tools: a Torque driver, a Torx size 6 plus bit, metal tweezers and the SS-93 opening tool.

Steps

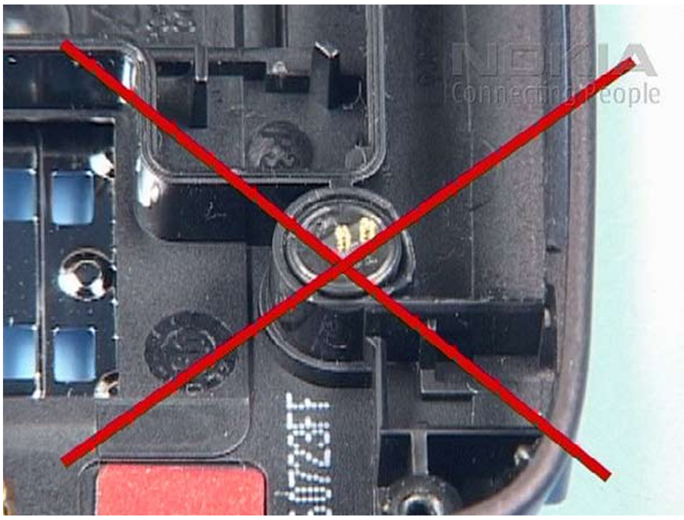
1. Insert the MICROPHONE exactly as shown, avoid bending the spring contacts.



2. Take a special attention to the right position of the spring contacts



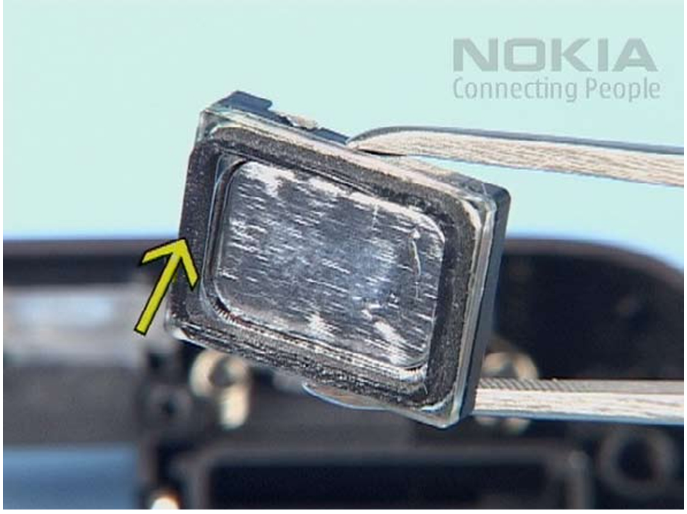
3. to avoid short-circuit or malfunction of the MICROPHONE..



4. Place the DC-JACK with tweezers into its housing ...

5. and push it carefully into place with the SS-93. Do not bend the spring contacts.

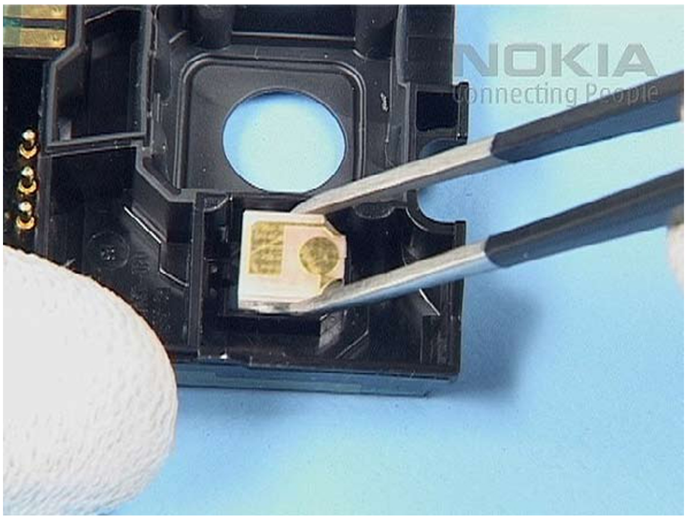
6. Ensure the correct position of the new IHF GASKET 2.



7. Place the IHF SPEAKER 2 into the B-COVER and press it lightly to stick it on correctly.

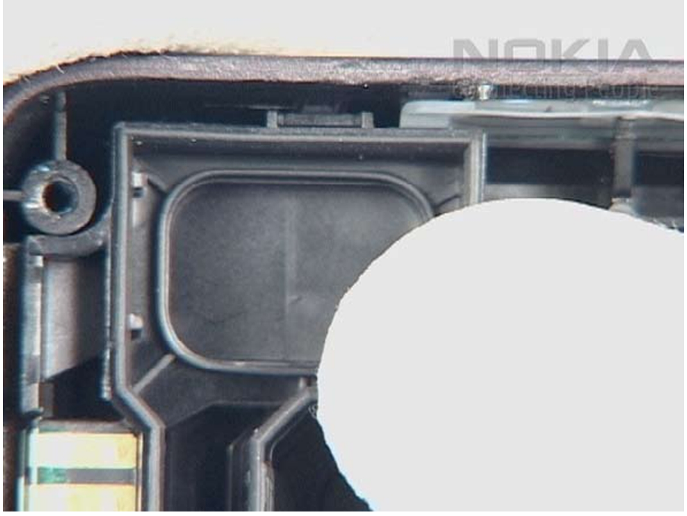
8. Position the GASKET IHF HOUSING onto its place paying attention to the spring contacts of the IHF SPEAKER.

9. Place the FLASH LED into its socket and secure it carefully with the SS-93.



10. Insert the ANTENNA MOULDING in the B-COVER...

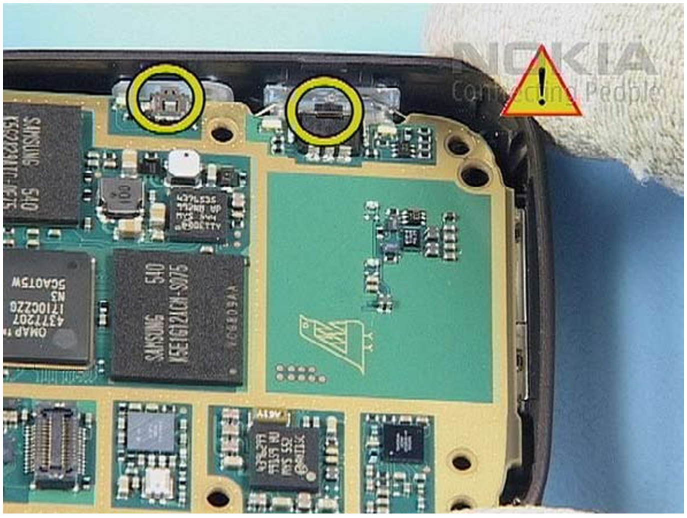
11. ...and press it lightly into place.



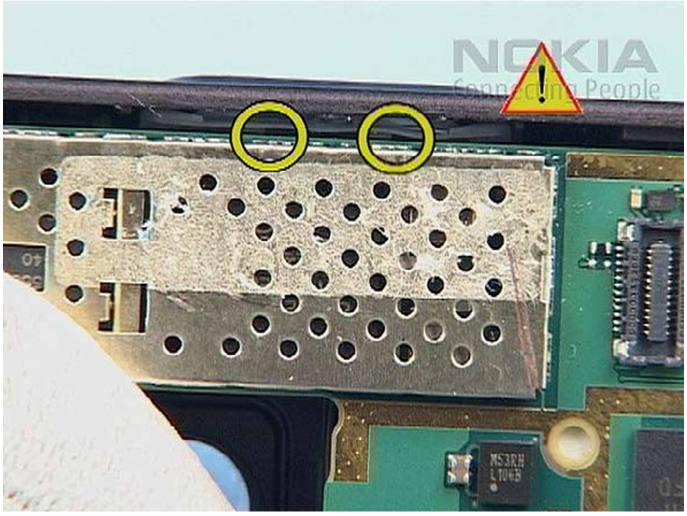
12. Insert the IHF SPEAKER paying attention to its spring contacts.

13. Insert the ENGINE MODULE under the shown angle.

14. Pay special attention to the SWITCHES when inserting the ENGINE MODULE into the B-COVER.



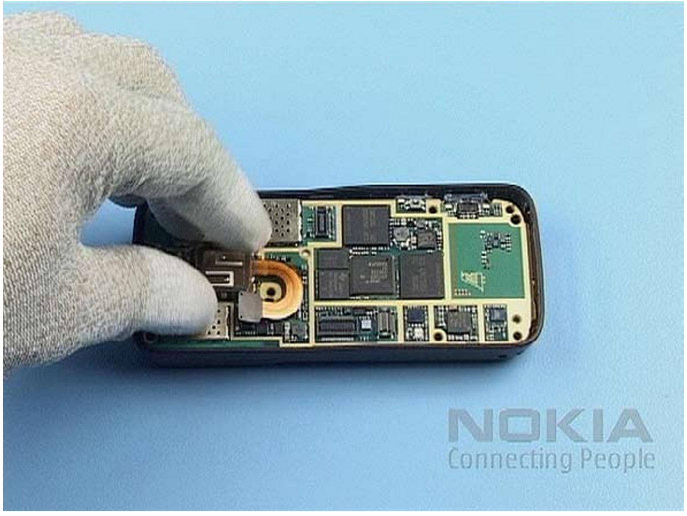
15. Secure the ENGINE MODULE.



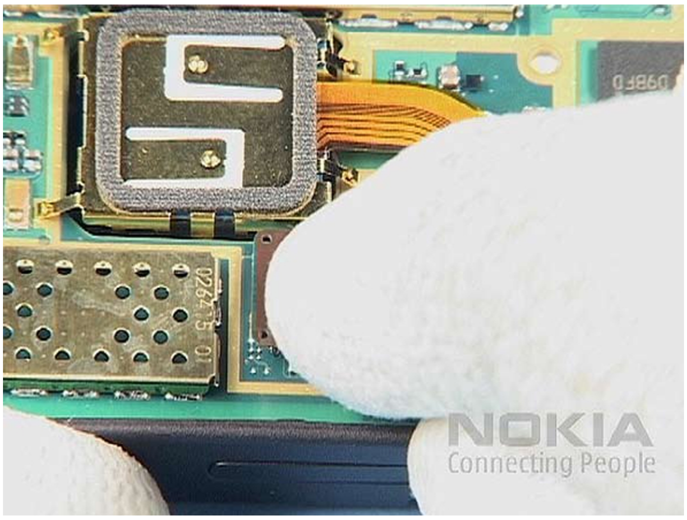
16. Clean the camera window.

17. and the MAIN CAMERA with compressed air.

18. Insert the MAIN CAMERA into its housing...

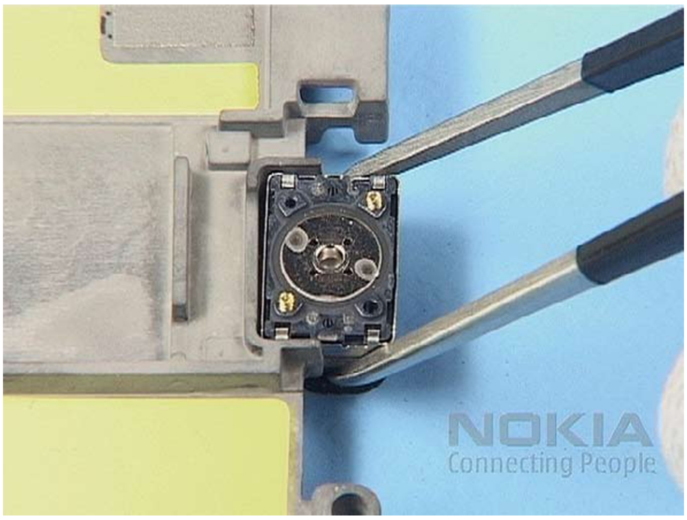


19. ...and carefully close the connector.



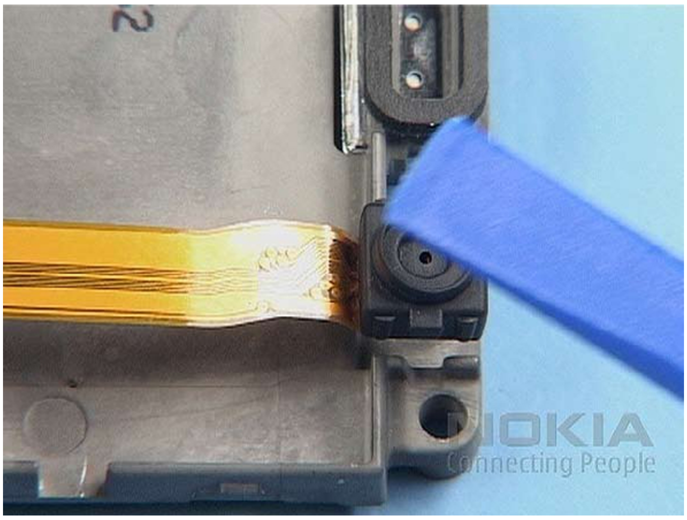
20. Place the BASEBAND GASKET on the IU FRAME and secure it as shown.

21. Place the EARPIECE with a new EARPIECE ADHESIVE into its frame, avoid bending the spring contacts.



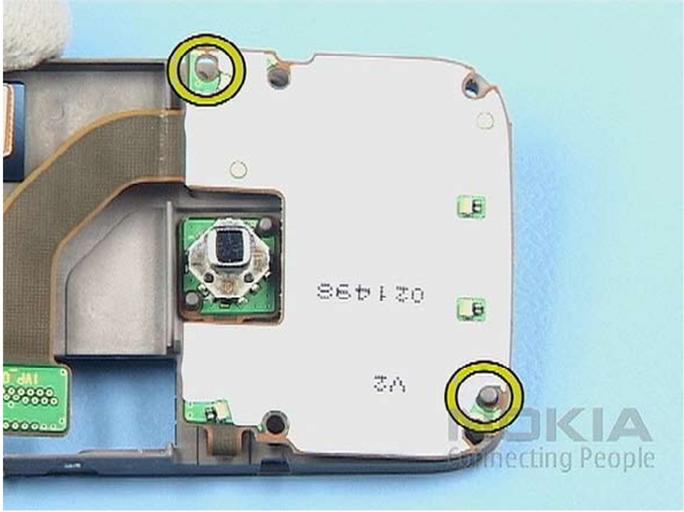
22. Ensure the correct position of the CAMERA BOOT when putting it onto the FRONT CAMERA.

23. Fit the FRONT CAMERA to the UI-FRAME.

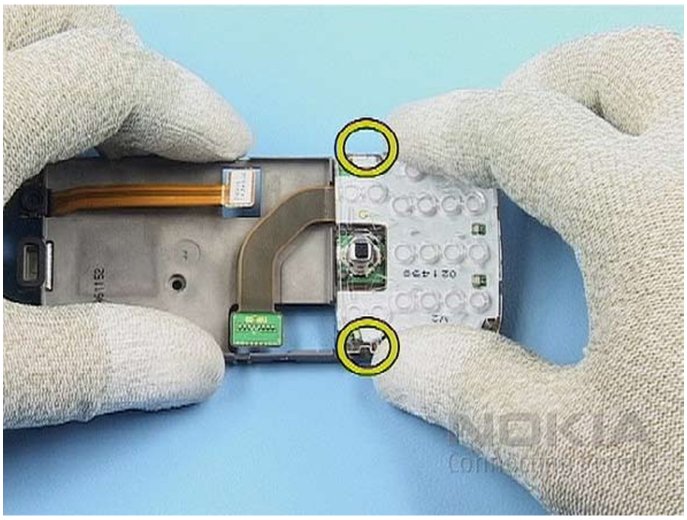


24. Position the UI MODULE onto the UI FRAME and slightly press on the JOYSTICK HAT to ensure that it is glued.

25. Check the right positioning of the UI MODULE.



26. Place the LIGHT GUIDE over the UI MODULE and carefully fit it to the UI FRAME.



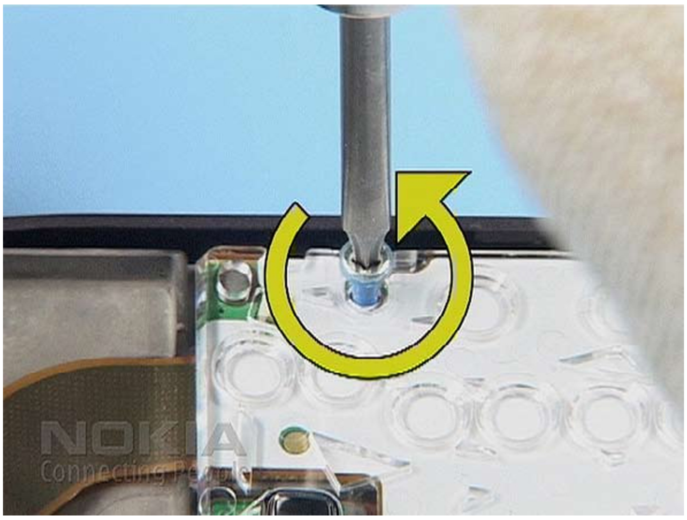
27. Put the UI FRAME into the B-COVER and press it into place.

28. Gently, close the connectors.

29. Use always new screws when assembling the unit.

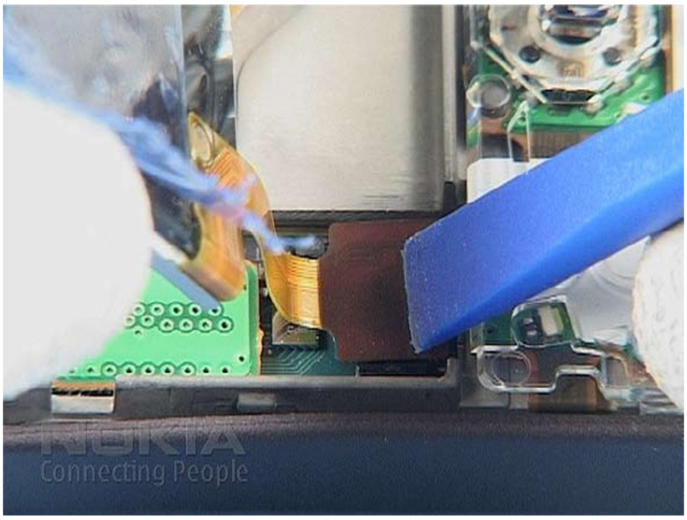
30. Set the torque driver to the torque of 28 Newton centimeter.

31. To avoid damaging the plastic threads, first turn the screws slightly left to engage the thread and then tighten them lightly.



32. Tighten the screws to the correct torque in the order shown.

33. Connect the DISPLAY to the ENGINE MODULE...



34. ...and place it carefully onto the UI FRAME.

35. After removal of the plastic film check the surface of the DISPLAY for cleanliness.

36. Fit the DISPLAY SHIELD to the UI FRAME.

37. Insert the SD DOOR but do not close it yet.

38. Put the KEYMAT into the A-COVER.

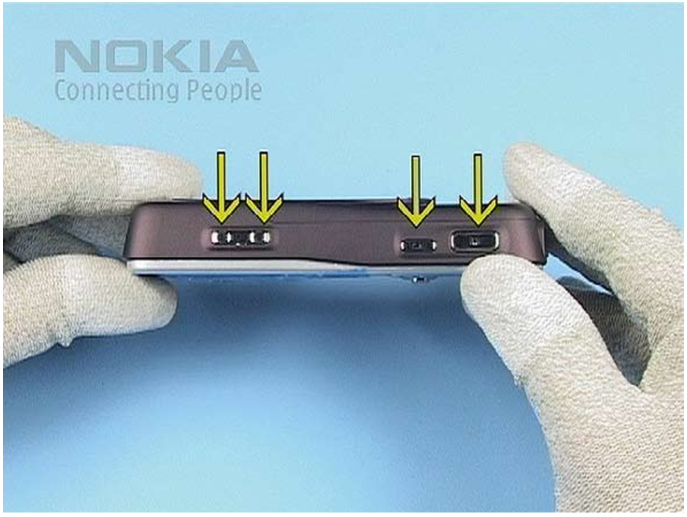
39. Check the window for cleanliness.

40. And fit the A-COVER to the B-COVER.

41. Now, close the SD DOOR.

42. Fit the SLIDE COVER ASSEMBLY

43. Finally, check the functionality of the keys and ensure that there are no gaps between the covers.



6 — BB Troubleshooting and Manual Tuning Guide

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Table of Contents

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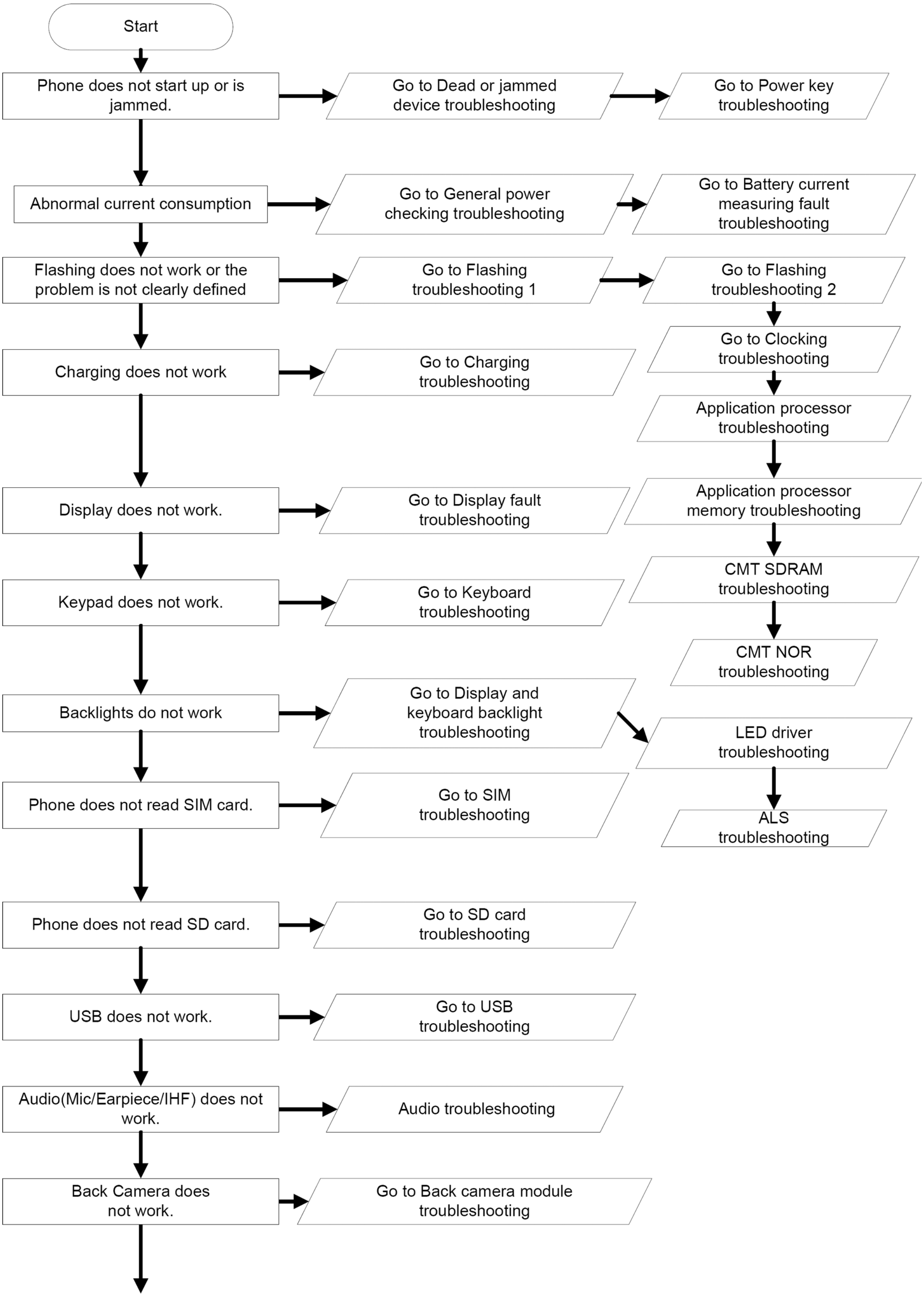
List of Figures

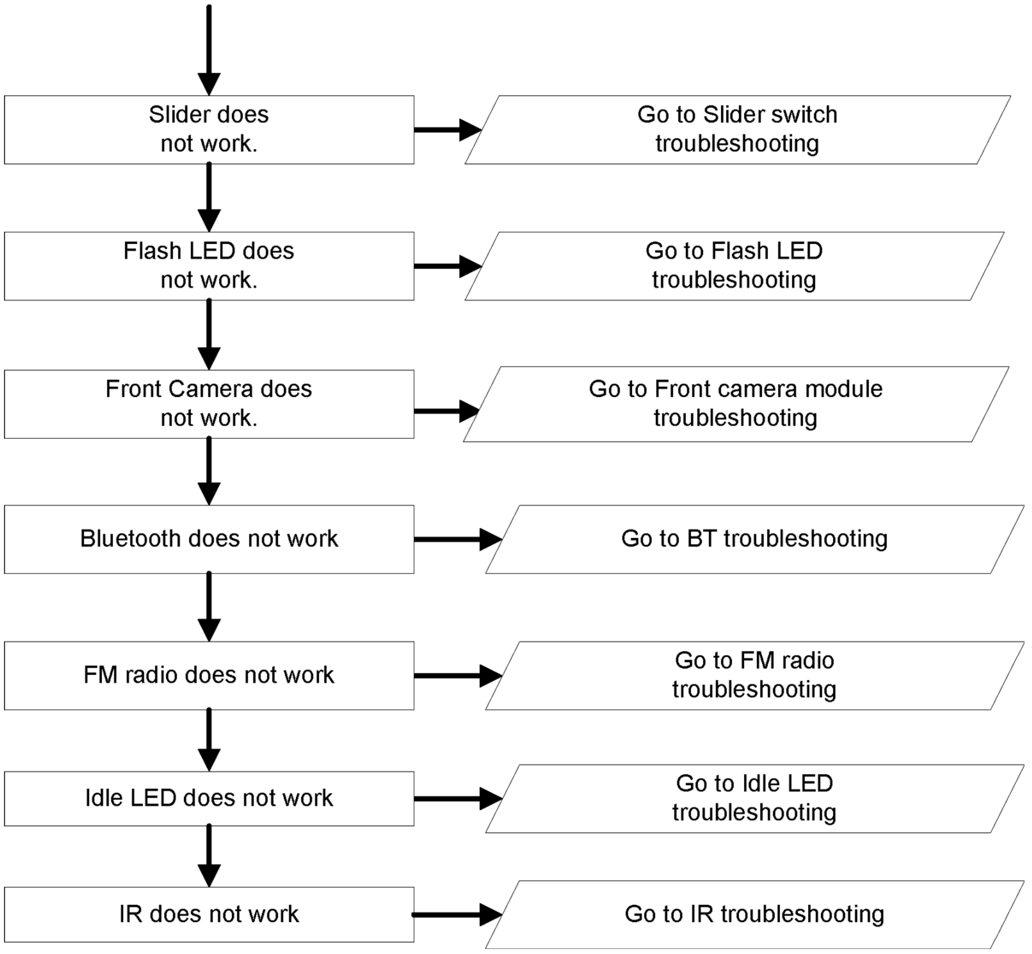
Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths. The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

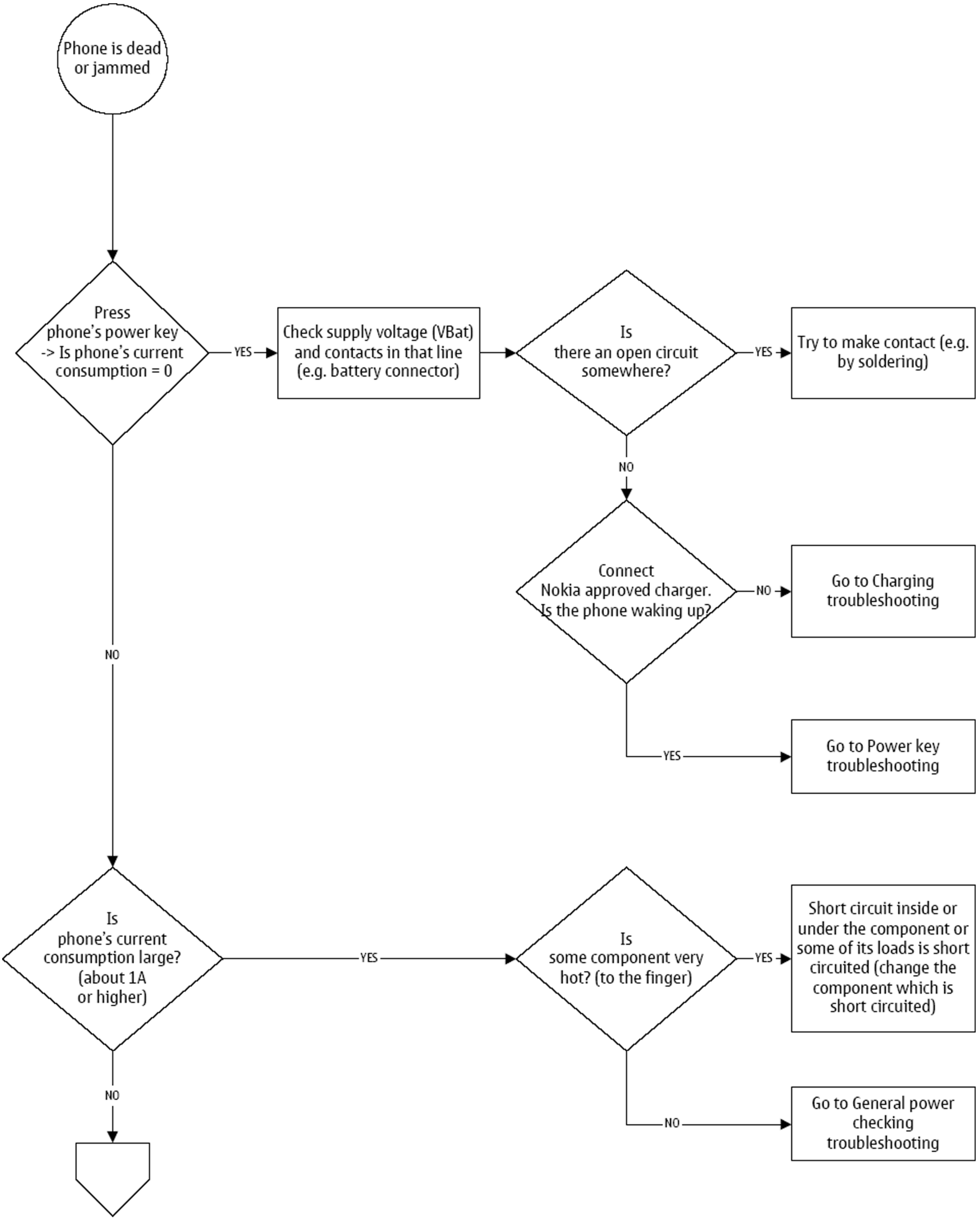
Troubleshooting flow

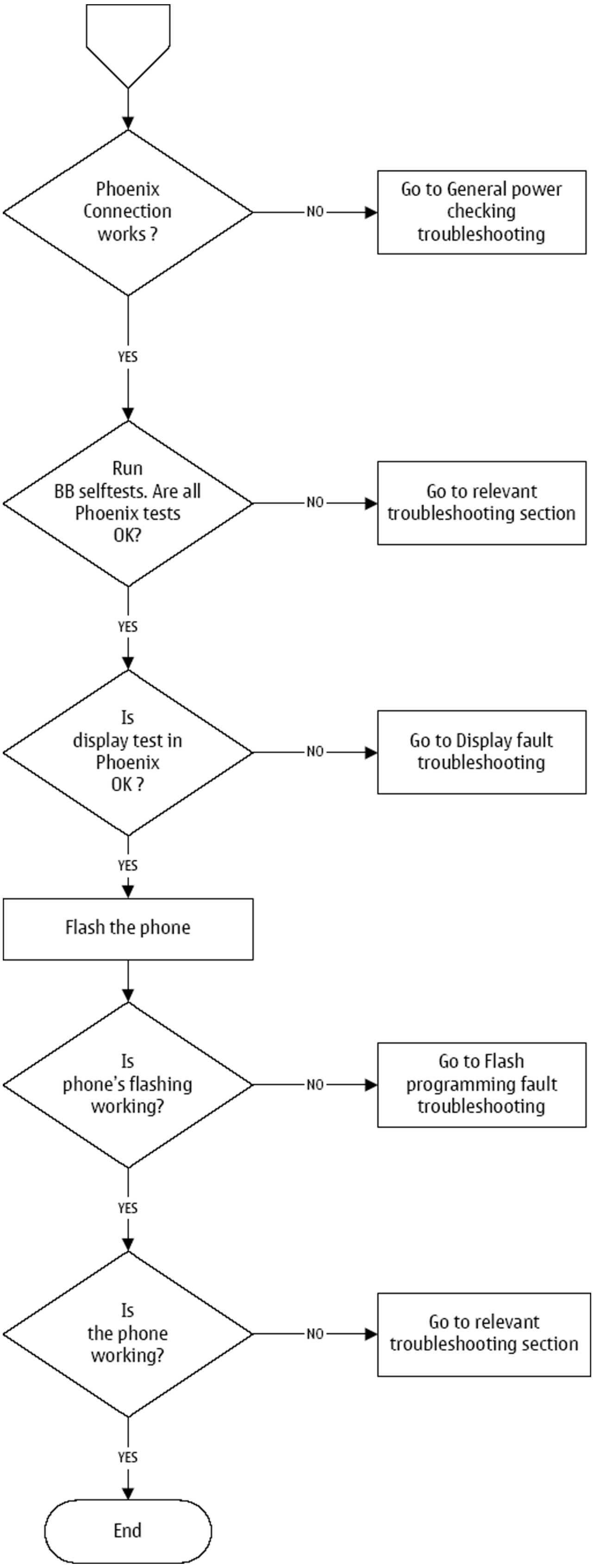



Slider does not work.
Go to Slider switch troubleshooting
Flash LED does not work.
Go to Flash LED troubleshooting
Front Camera does not work.
Go to Front camera module troubleshooting
Bluetooth does not work
Go to BT troubleshooting
FM radio does not work
Go to FM radio troubleshooting
Idle LED does not work
Go to Idle LED troubleshooting
IR does not work
Go to IR troubleshooting

Dead or jammed device troubleshooting

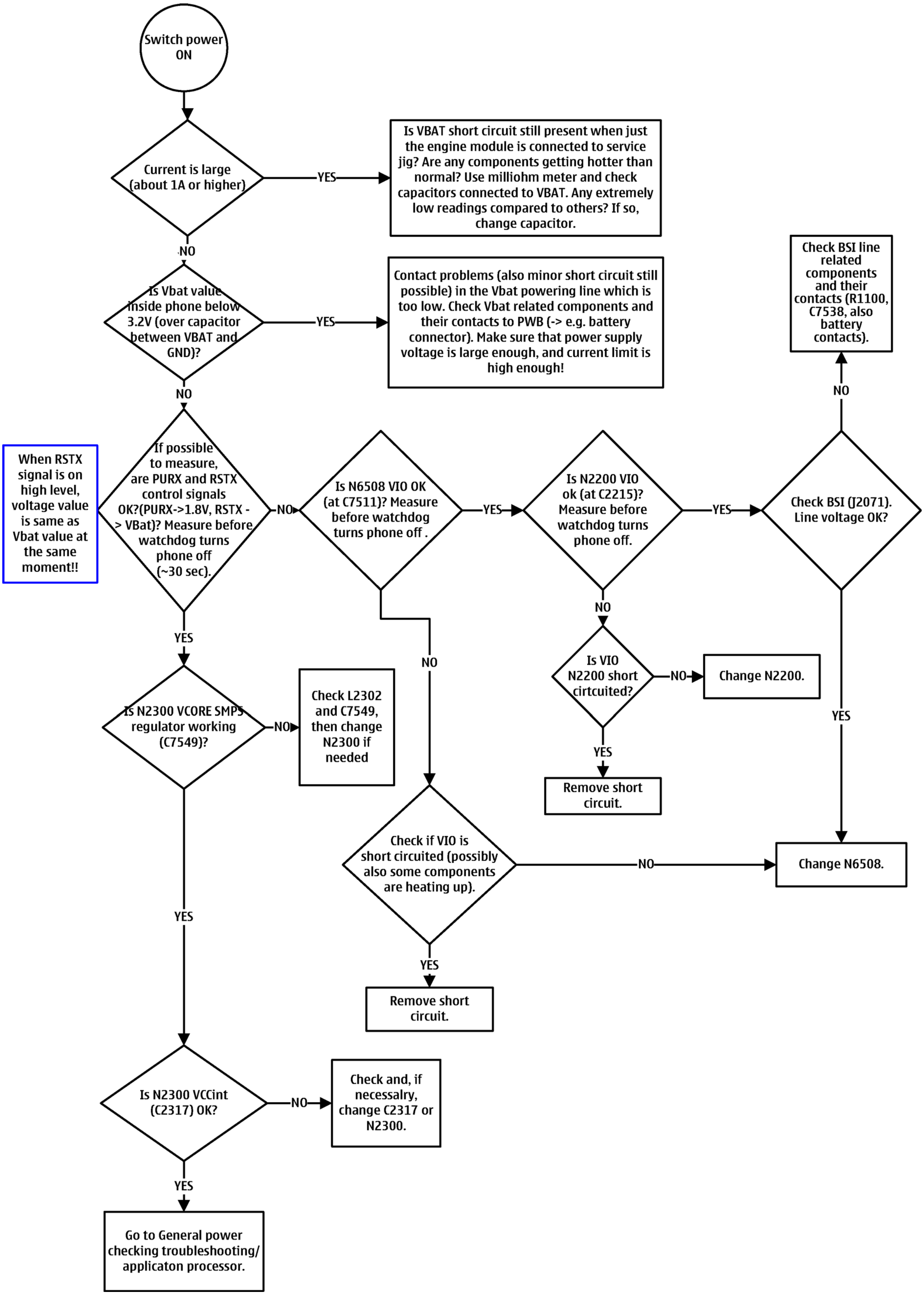
Troubleshooting flow




Phoenix Connection works ?
NO
Go to General power checking troubleshooting
YES
Run BB selftests. Are all Phoenix tests OK?
NO
Go to relevant troubleshooting section
YES
Is display test in Phoenix OK ?
NO
Go to Display fault troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
End

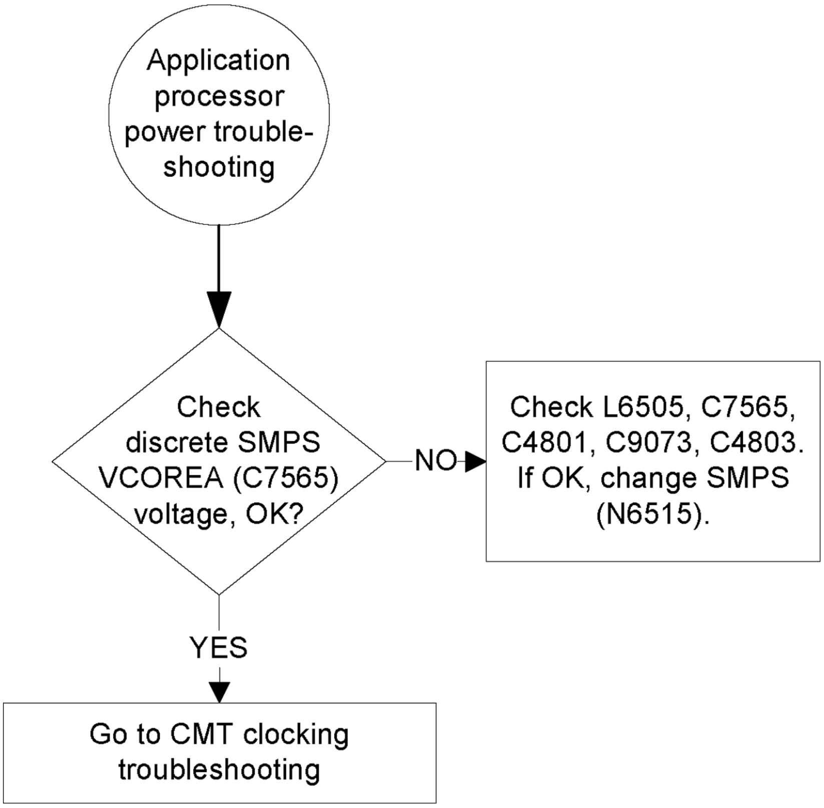
General power checking troubleshooting - CMT

Troubleshooting flow



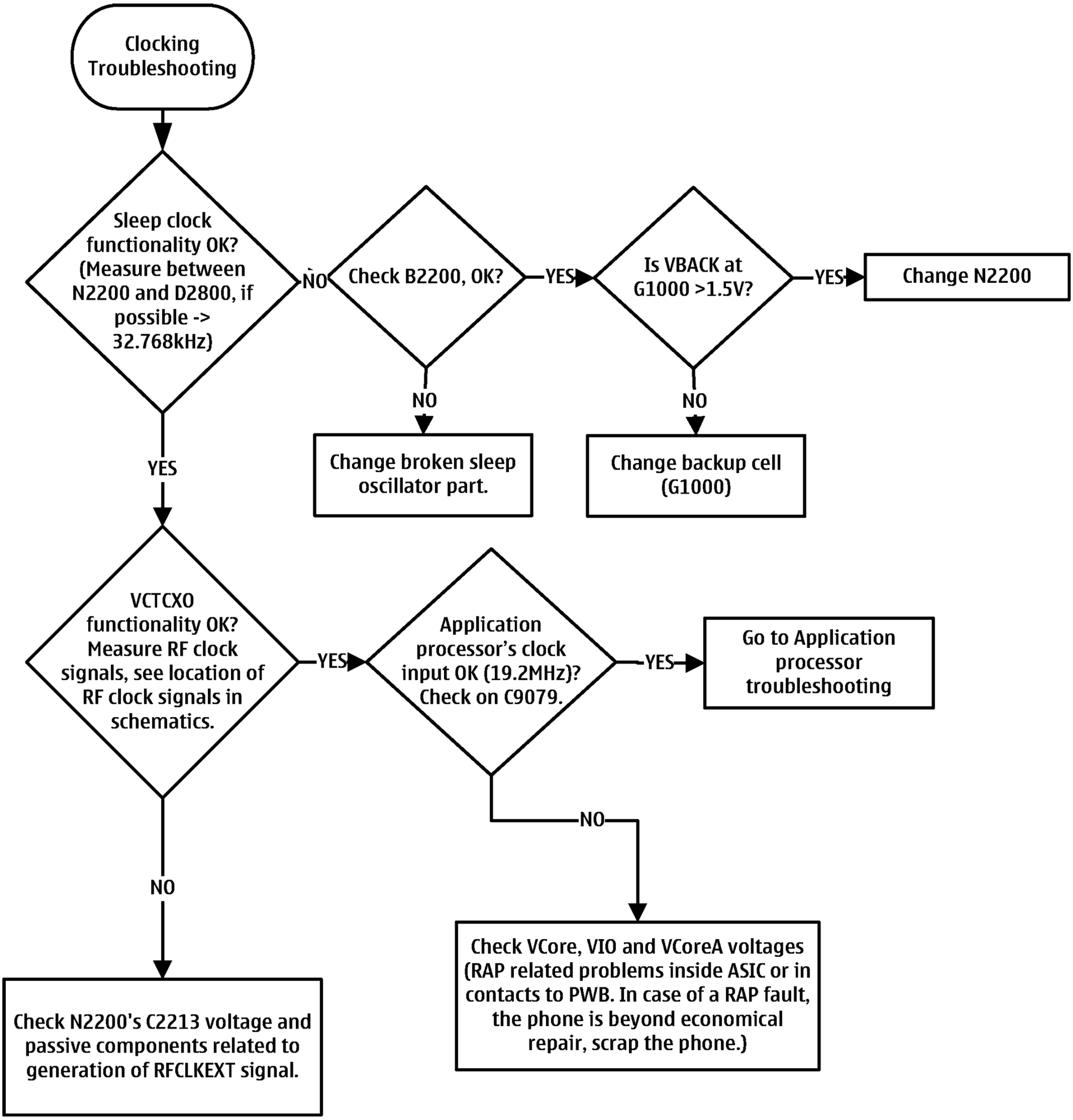
General power checking troubleshooting - application processor

Troubleshooting flow



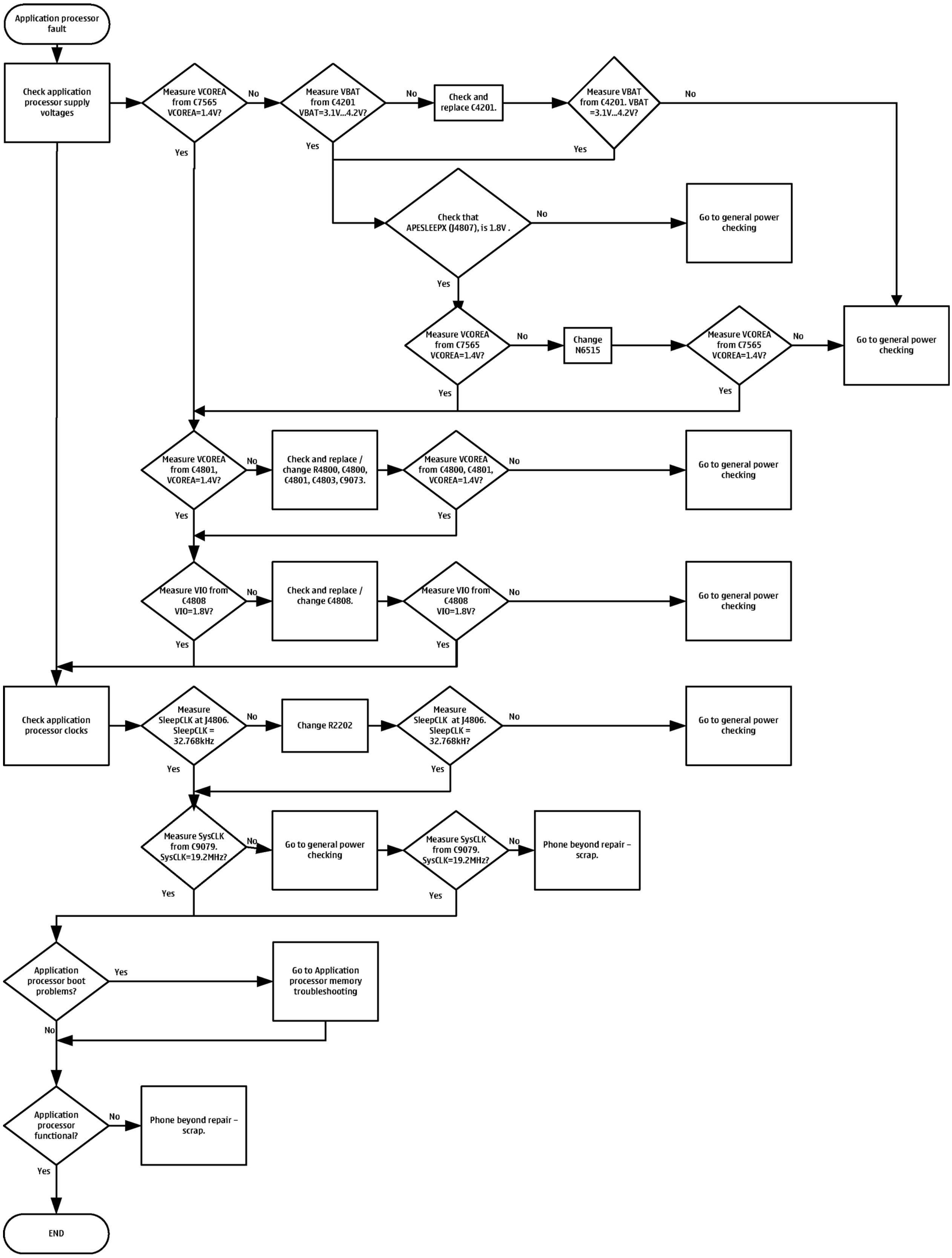
CMT clocking troubleshooting

Troubleshooting flow



Application processor troubleshooting

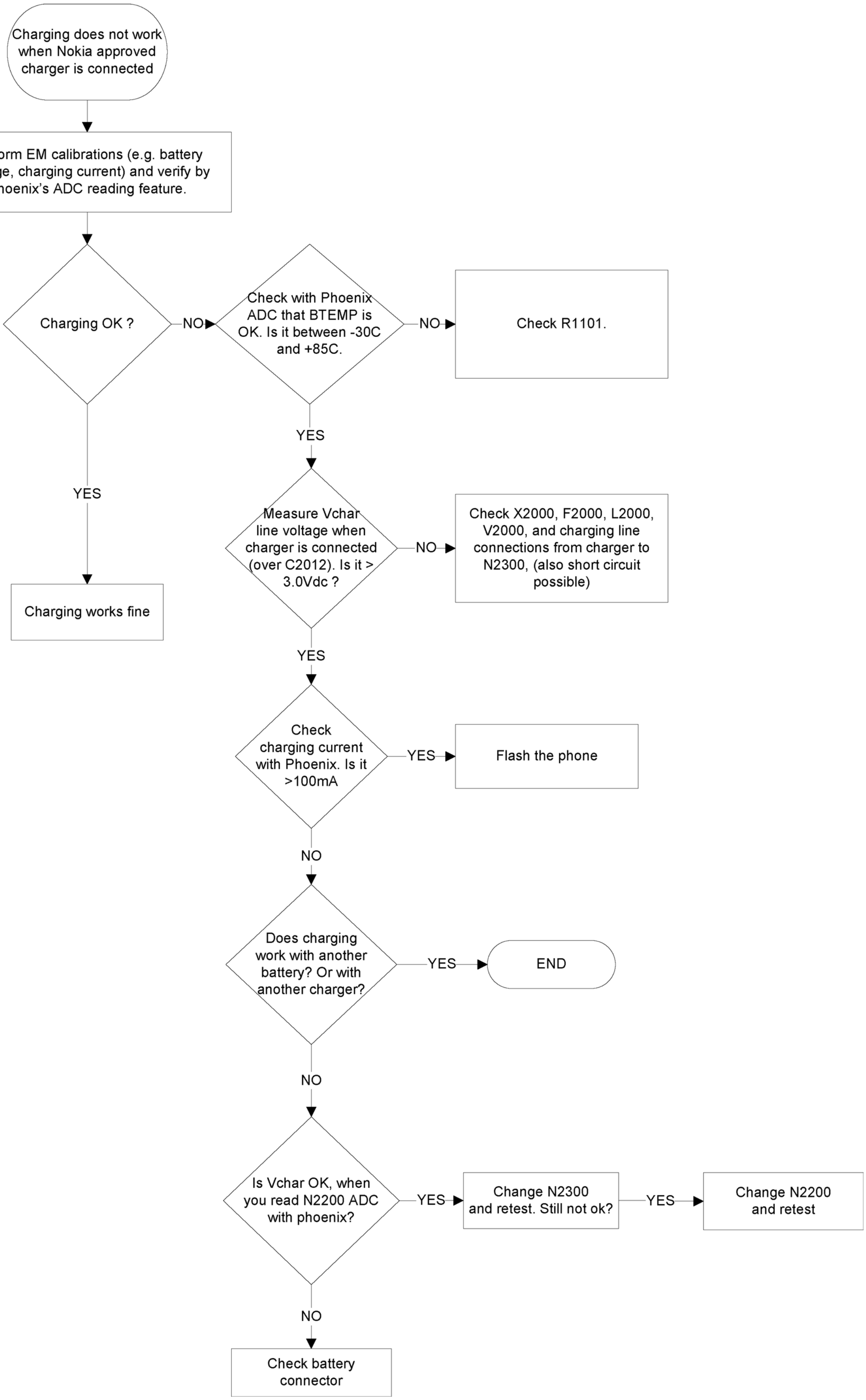
Troubleshooting flow



Note: It is not possble to change the application processor. In this case, the PWB is beyond economical repair.

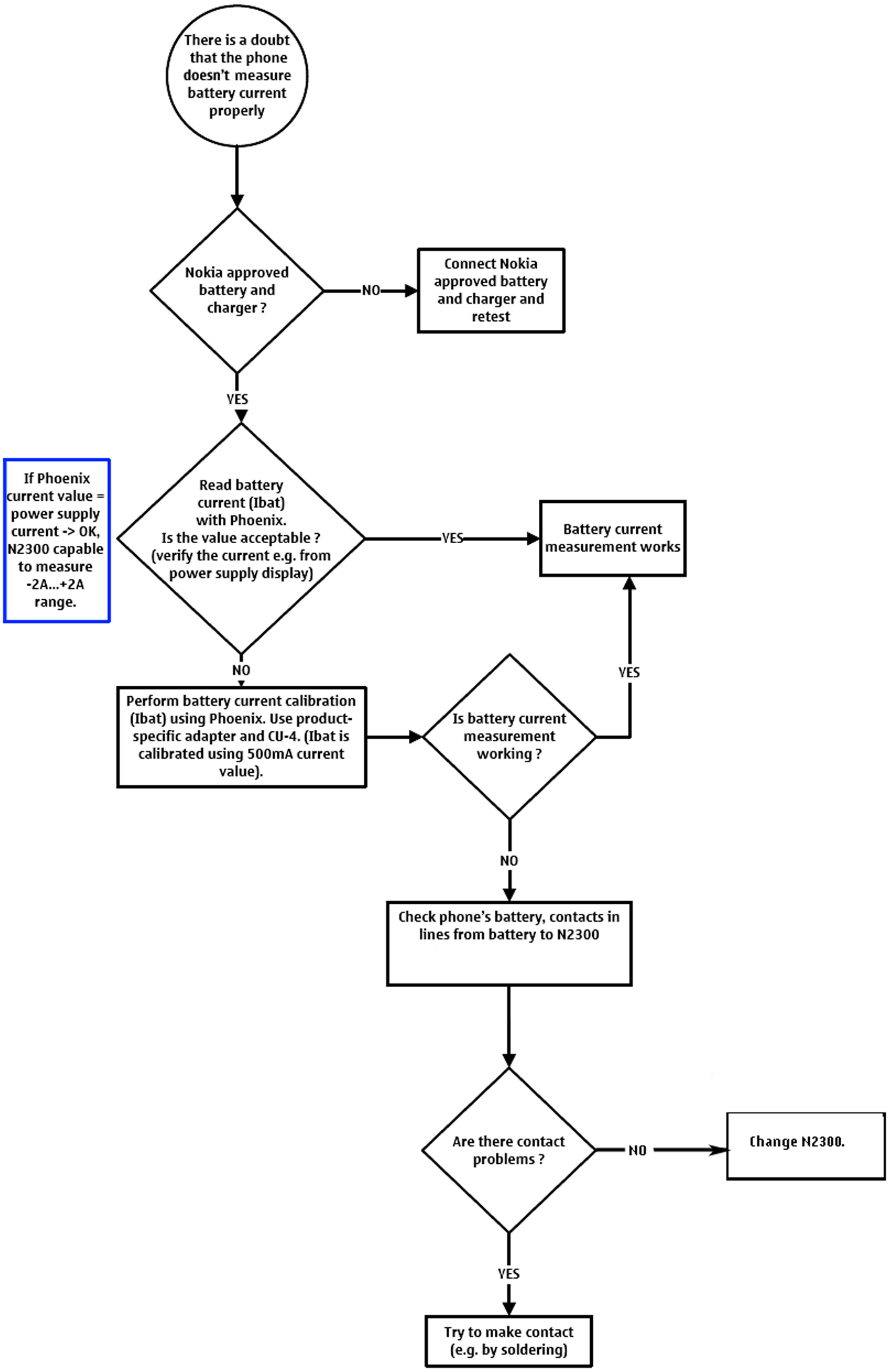
Charging troubleshooting

Troubleshooting flow



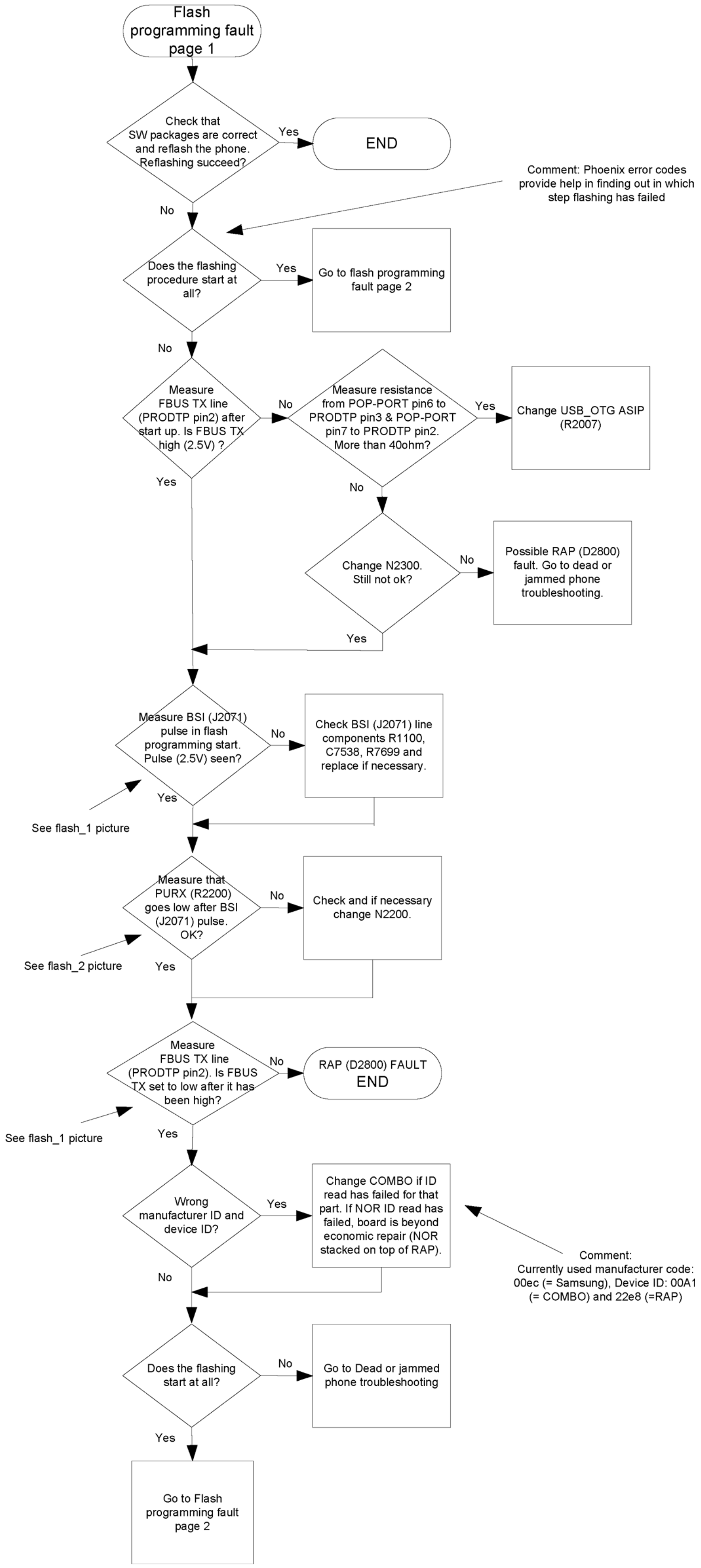
Battery current measuring fault troubleshooting

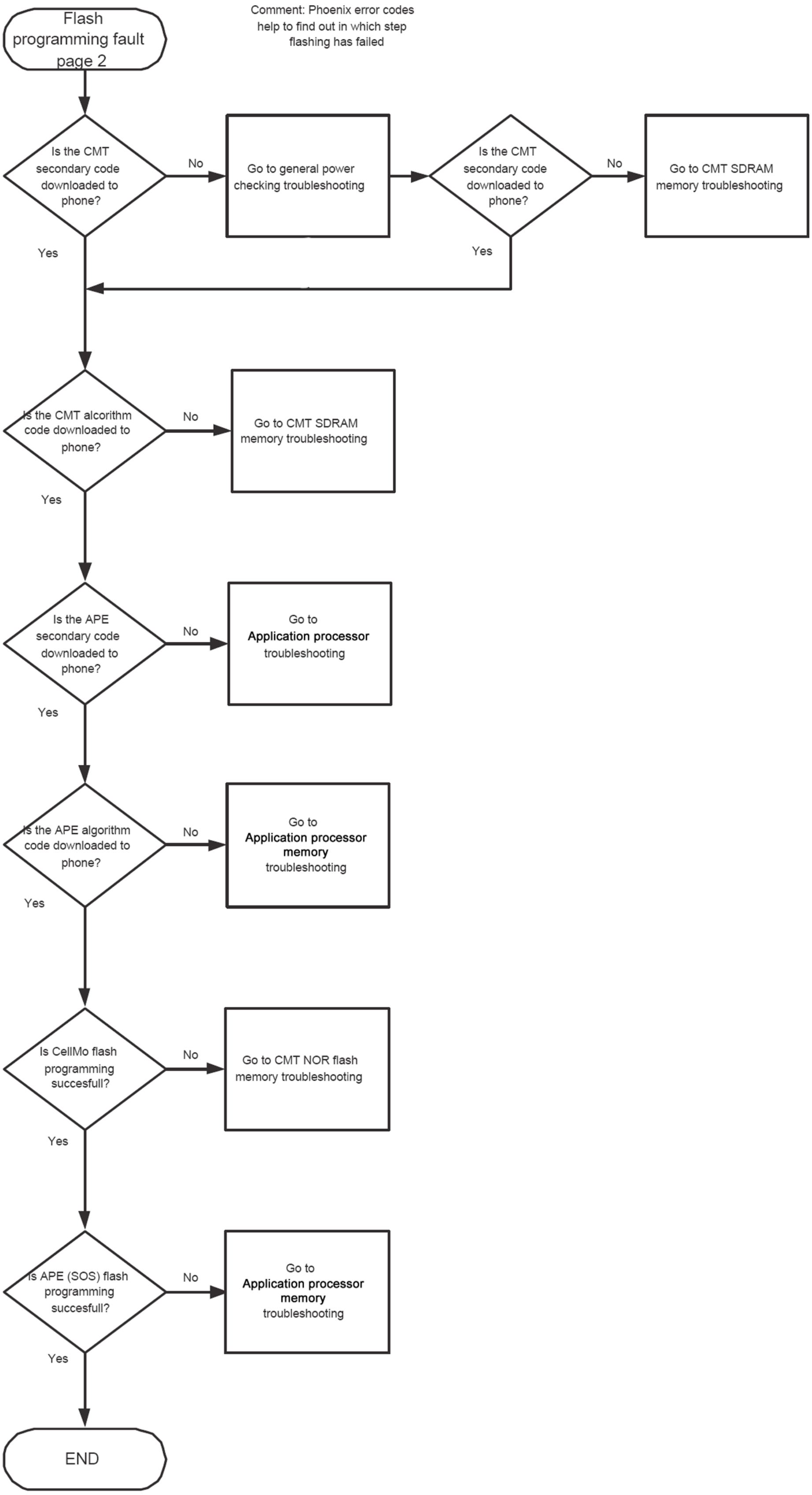
Troubleshooting flow



Flash programming fault troubleshooting

Troubleshooting flow




Flash programming fault page 2
Comment: Phoenix error codes help to find out in which step flashing has failed
Is the CMT secondary code downloaded to phone?
No
Go to general power checking troubleshooting
Is the CMT secondary code downloaded to phone?
No
Go to CMT SDRAM memory troubleshooting
Yes
Yes
Is the CMT alcorithm code downloaded to phone?
No
Go to CMT SDRAM memory troubleshooting
Yes
Is the APE secondary code downloaded to phone?
No
Go to Application processor troubleshooting
Yes
Is the APE algorithm code downloaded to phone?
No
Go to Application processor memory troubleshooting
Yes
Is CellMo flash programming succesfull?
No
Go to CMT NOR flash memory troubleshooting
Yes
Is APE (SOS) flash programming succesfull?
No
Go to Application processor memory troubleshooting
Yes
END

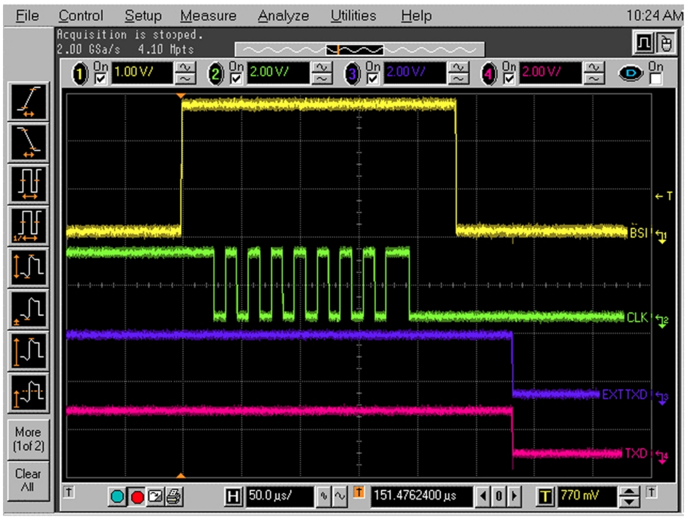


Figure 35 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

Saved: 05 JUL 2004 13:24:19

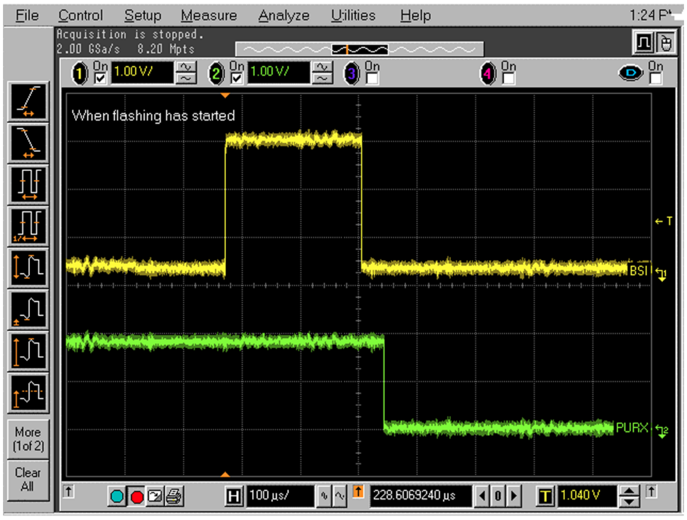
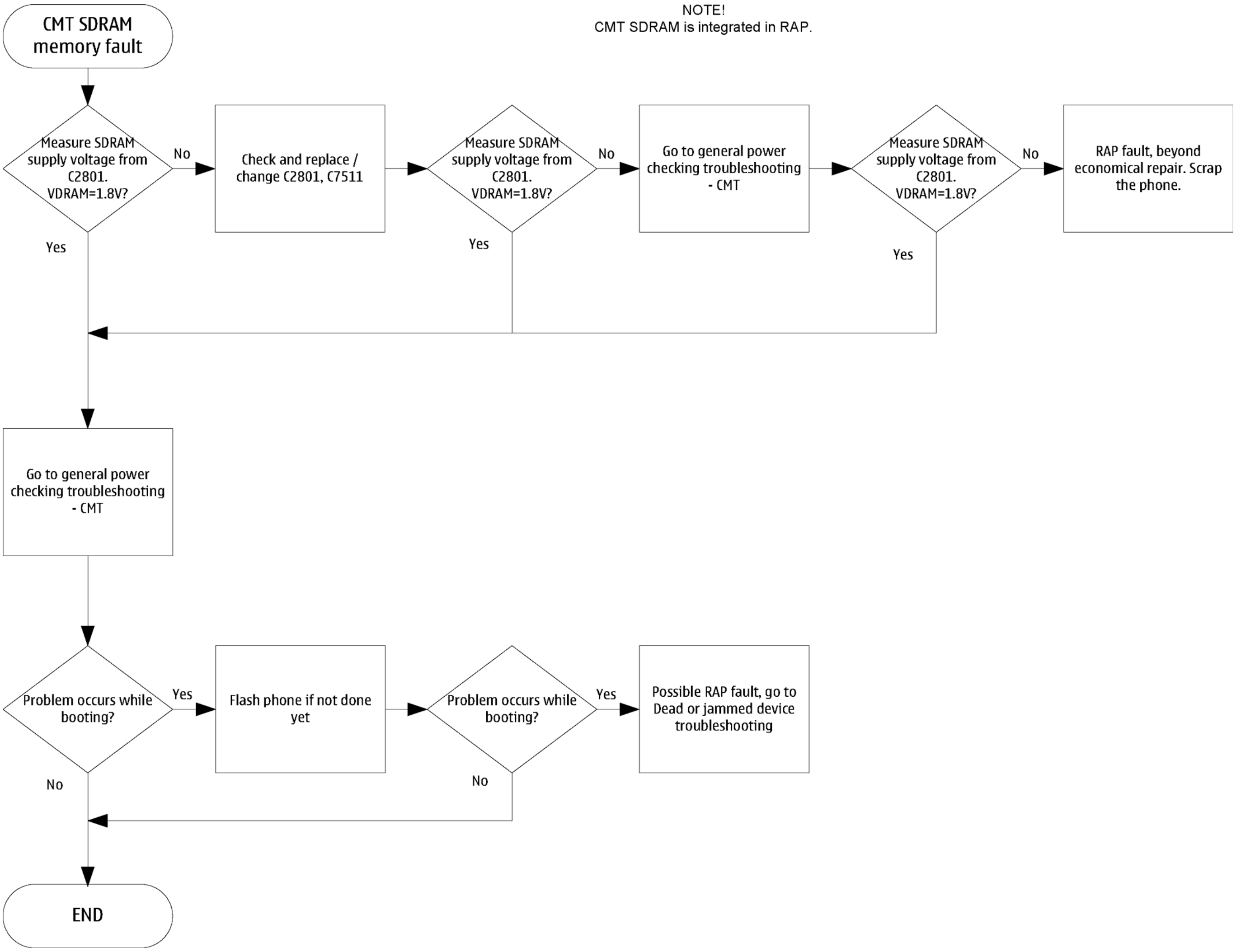


Figure 36 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

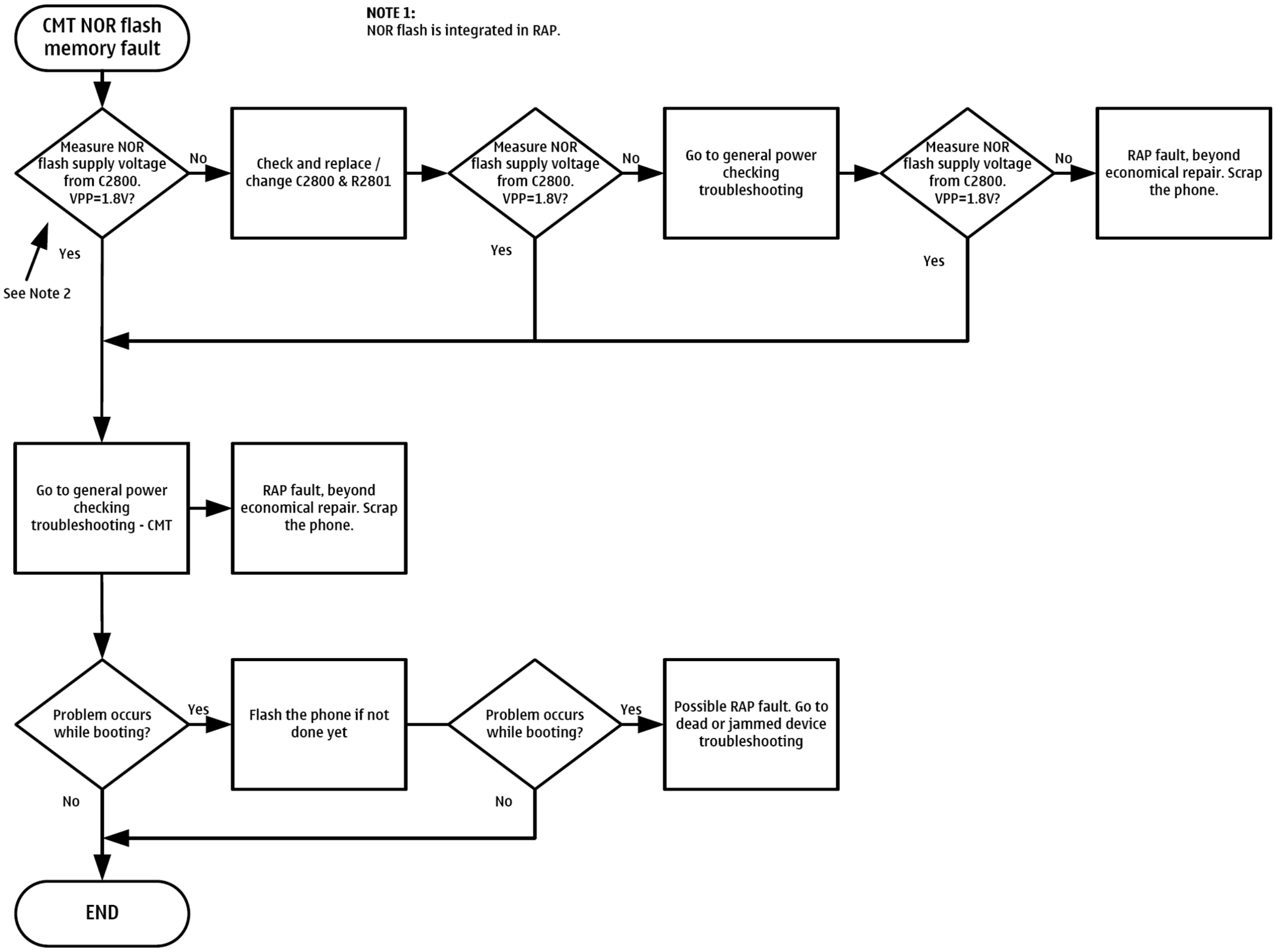
CMT SDRAM memory troubleshooting

Troubleshooting flow



CMT NOR flash fault troubleshooting

Troubleshooting flow

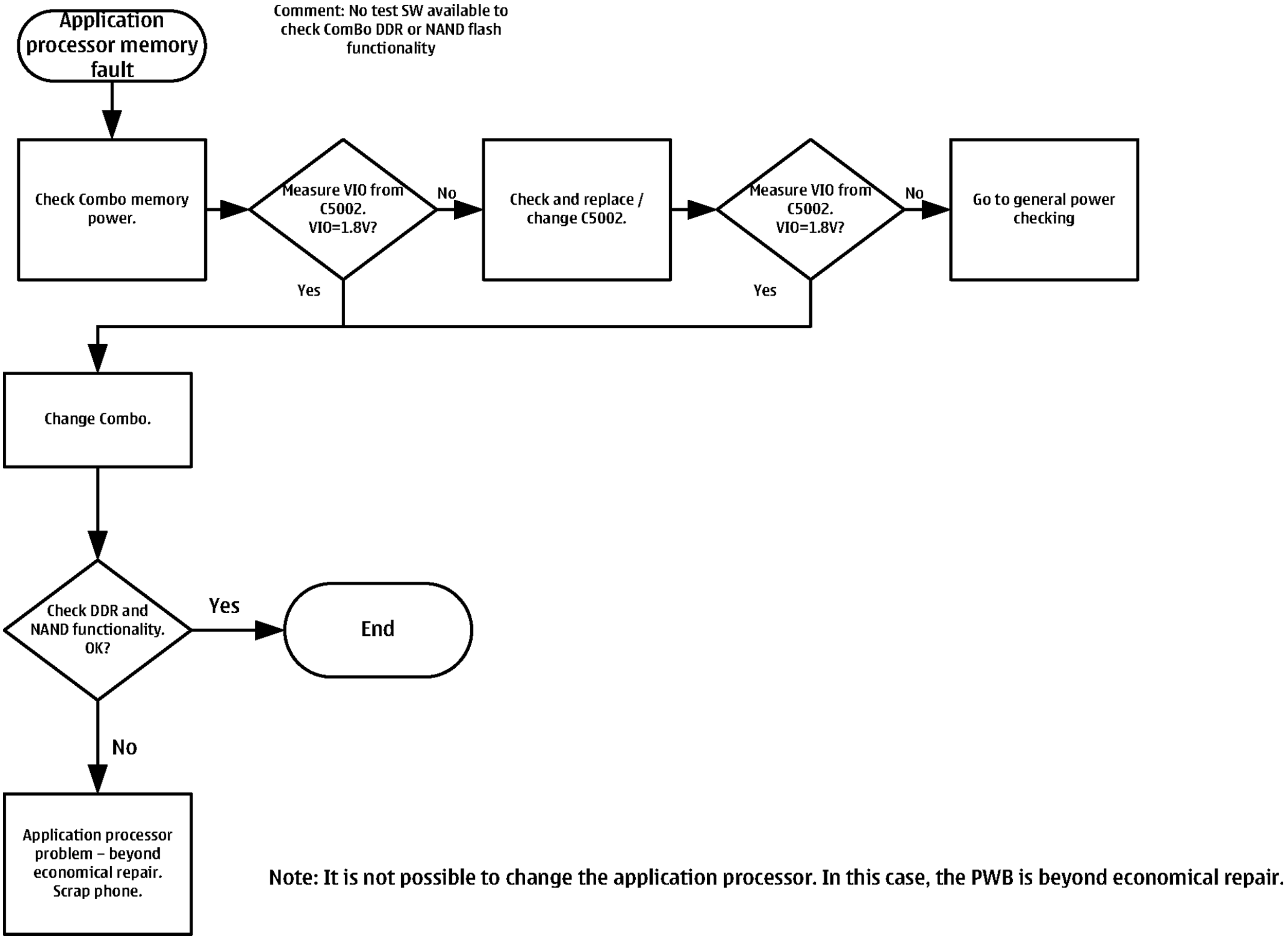


NOTE 1:
NOR flash is integrated in RAP.

NOTE 2: VPP is intitally 1.8V. When Vpp-LED ON FPS-10 goes ON VPP rises to 9V. When USB flashing is used, VPP is always 1.8V.

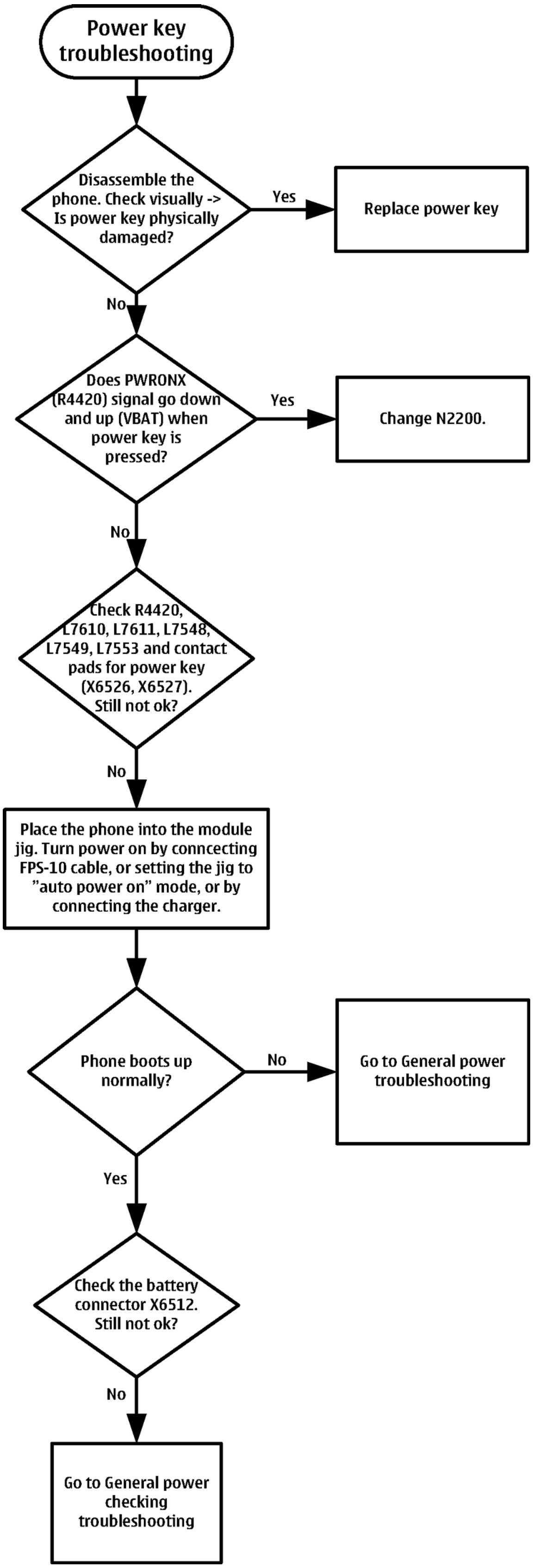
Application processor memory troubleshooting

Troubleshooting flow



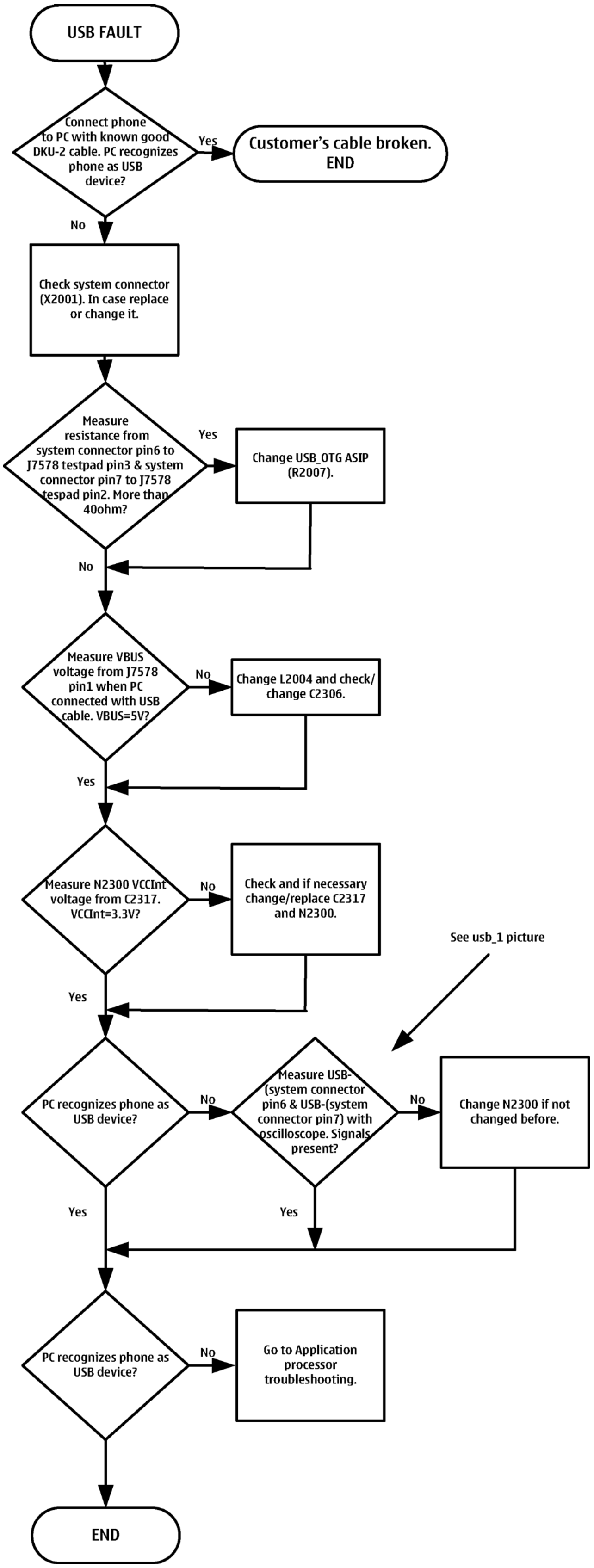
Power key troubleshooting

Troubleshooting flow

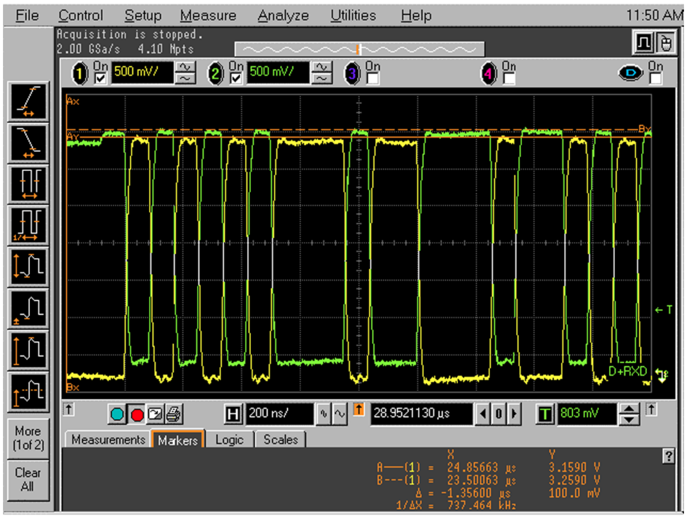


USB interface troubleshooting

Troubleshooting flow



Saved: 25 MAY 2004 11:50:44

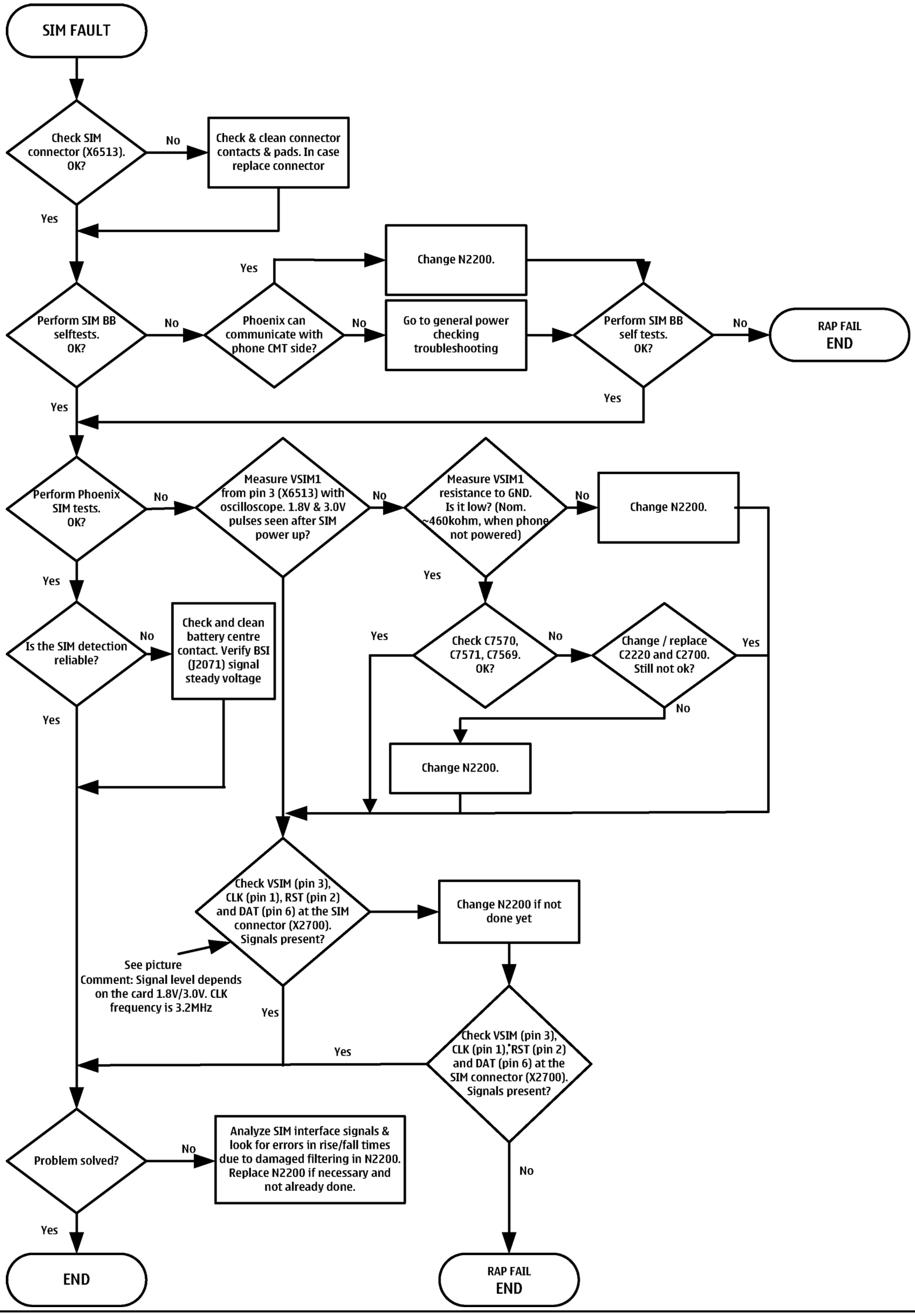


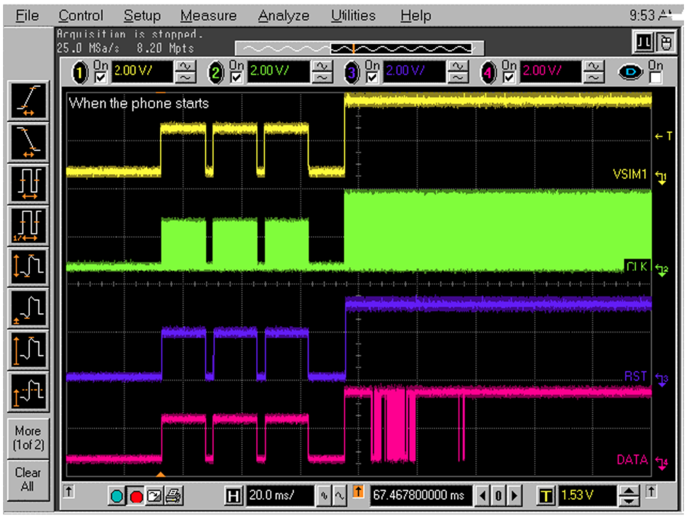
```
                    X                 Y
A——(1) =  24.85663 µs     3.1590 V
B---(1) =  23.50063 µs     3.2590 V
      Δ = -1.35600 µs     100.0 mV
  1/ΔX =  737.464 kHz
```

Figure 37 USB 1: D-TXD (system connector pin6) and D+RXD (system connector pin7) voltage levels when USB connected.

SIM card troubleshooting

Troubleshooting flow





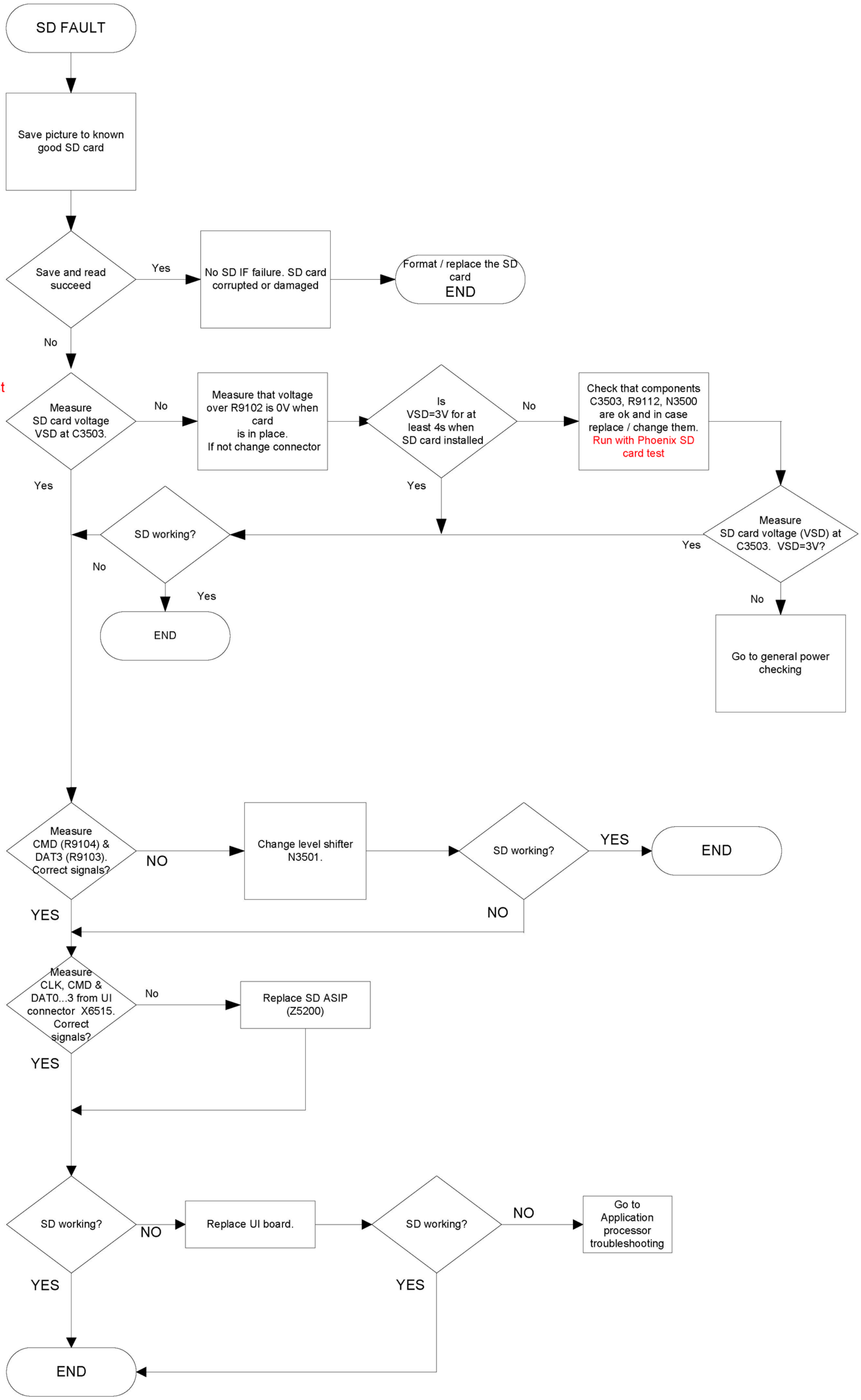
Acquisition is stopped.
25.0 MSa/s 8.20 Mpts

SIM CLK frequency = 3.2MHz (Take single triggered measurement in boot on the VSIM1 line).

Figure 38 SIM interface signals

SD card troubleshooting

Troubleshooting flow



All measurements provide that the SD is initializing or some operation is being tried to perform. SD power is cut after 4s idle time

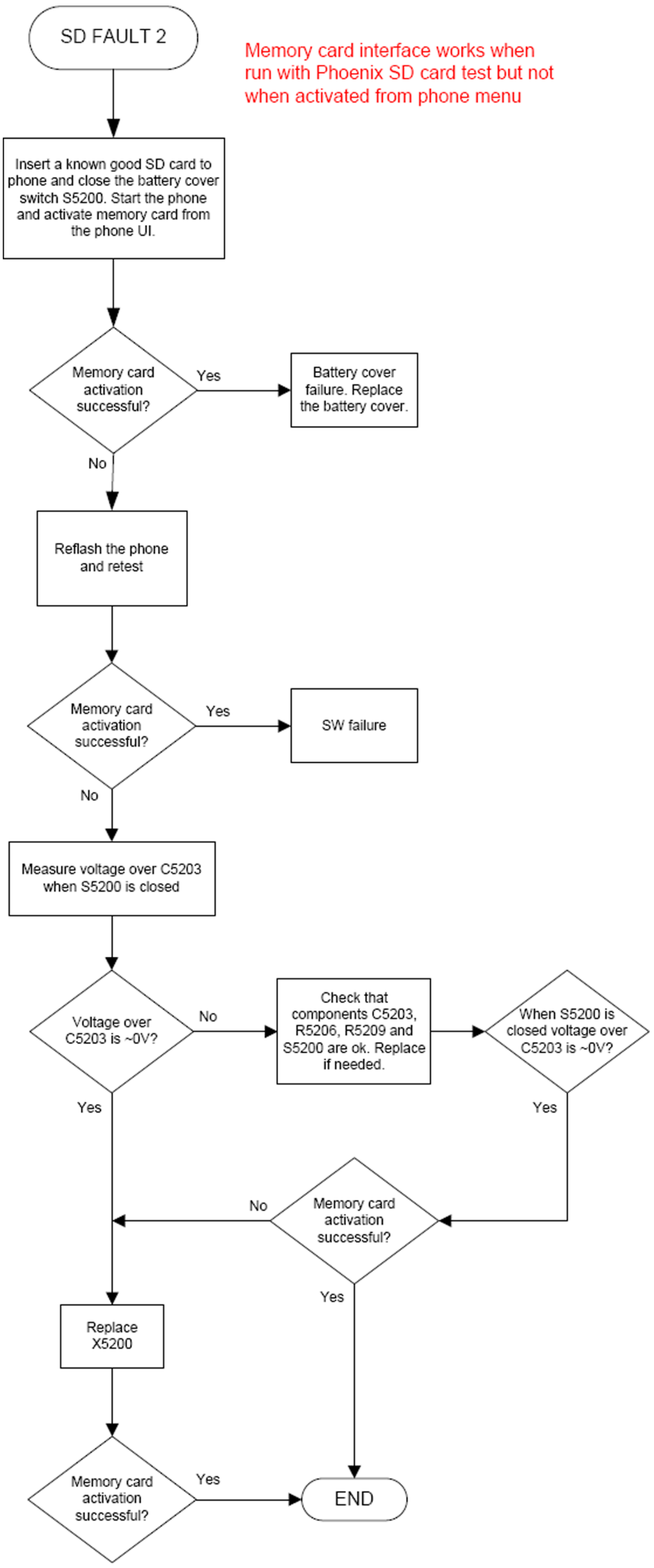
Run with Phoenix SD card test

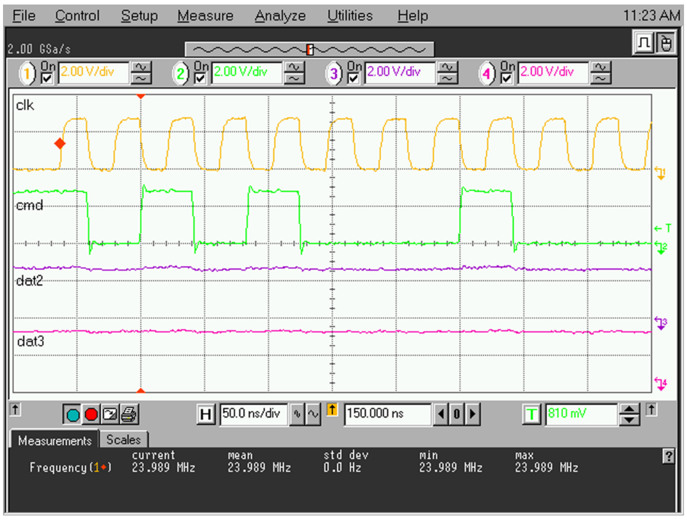
SD initialization is done at first access, after ~4s of idle time VSD voltage drops to zero (SD can be initialized by removing and installing the card) (depends on product type)

See timing pictures

CLK frequency is 24MHz in data transfer mode and 400kHz in initialization mode

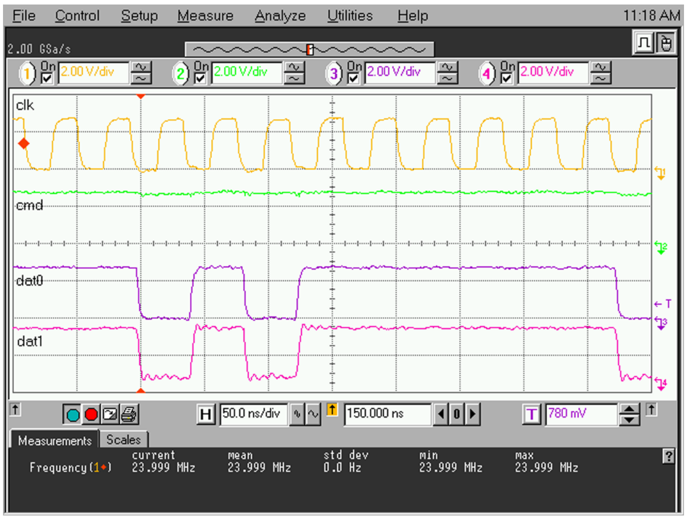
TEST POINTS
CLK =
CMD =
DAT0 =
DAT1 =
DAT2 =
DAT3 =


SD FAULT 2
Memory card interface works when run with Phoenix SD card test but not when activated from phone menu
Insert a known good SD card to phone and close the battery cover switch S5200. Start the phone and activate memory card from the phone UI.
Memory card activation successful?
Yes
Battery cover failure. Replace the battery cover.
No
Reflash the phone and retest
Memory card activation successful?
Yes
SW failure
No
Measure voltage over C5203 when S5200 is closed
Voltage over C5203 is ~0V?
No
Check that components C5203, R5206, R5209 and S5200 are ok. Replace if needed.
When S5200 is closed voltage over C5203 is ~0V?
Yes
Yes
No
Memory card activation successful?
Yes
Replace X5200
Memory card activation successful?
Yes
END



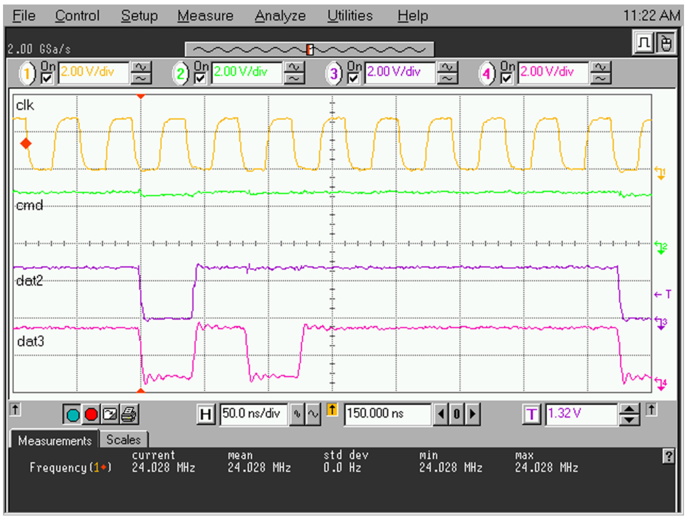
```
           current     mean        std dev   min         max
Frequency(1) 23.989 MHz  23.989 MHz  0.0 Hz    23.989 MHz  23.989 MHz
```

Figure 39 SD clk cdm diagram



```
           current     mean        std dev   min         max
Frequency(1) 23.999 MHz  23.999 MHz  0.0 Hz    23.999 MHz  23.999 MHz
```

Figure 40 SD data 0_1 diagram

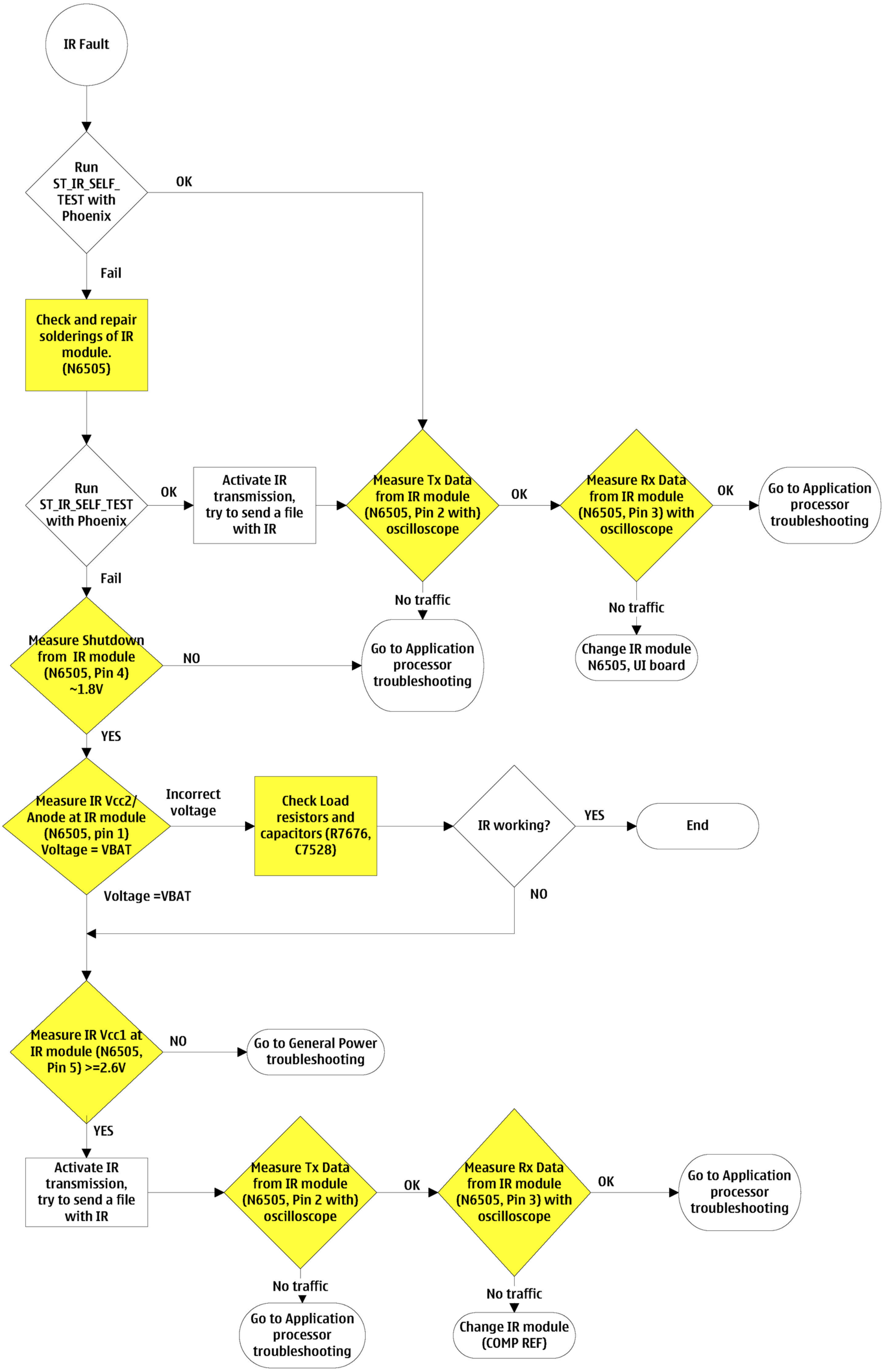


```
           current     mean        std dev   min         max
Frequency(1) 24.028 MHz  24.028 MHz  0.0 Hz    24.028 MHz  24.028 MHz
```

Figure 41 SD data 2_3 diagram

IrDA troubleshooting

Troubleshooting flow



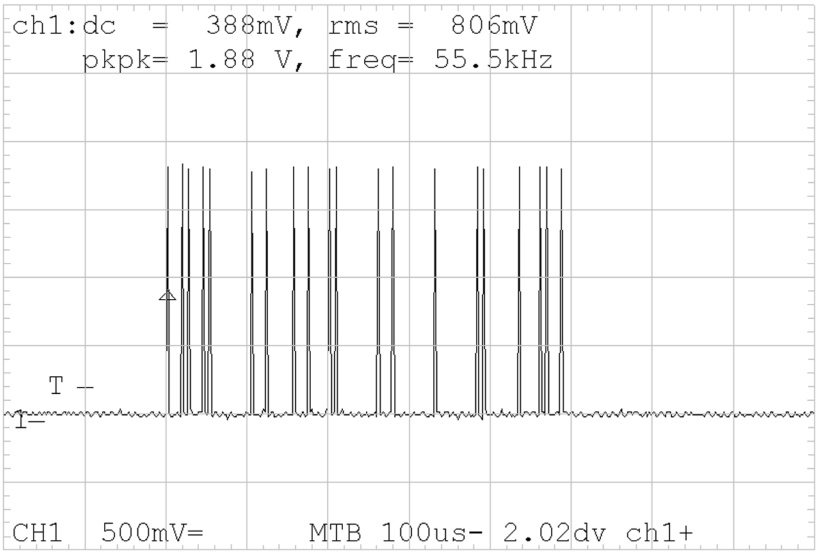


Figure 42 IR TX diagram

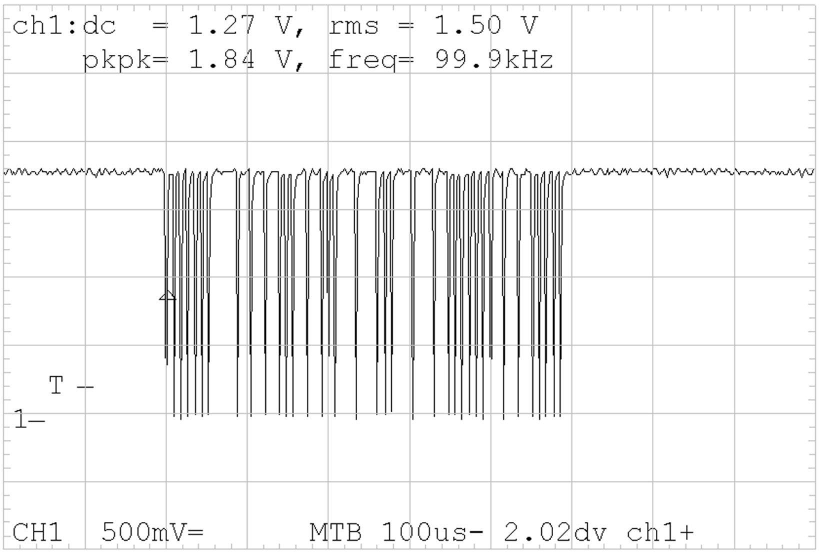
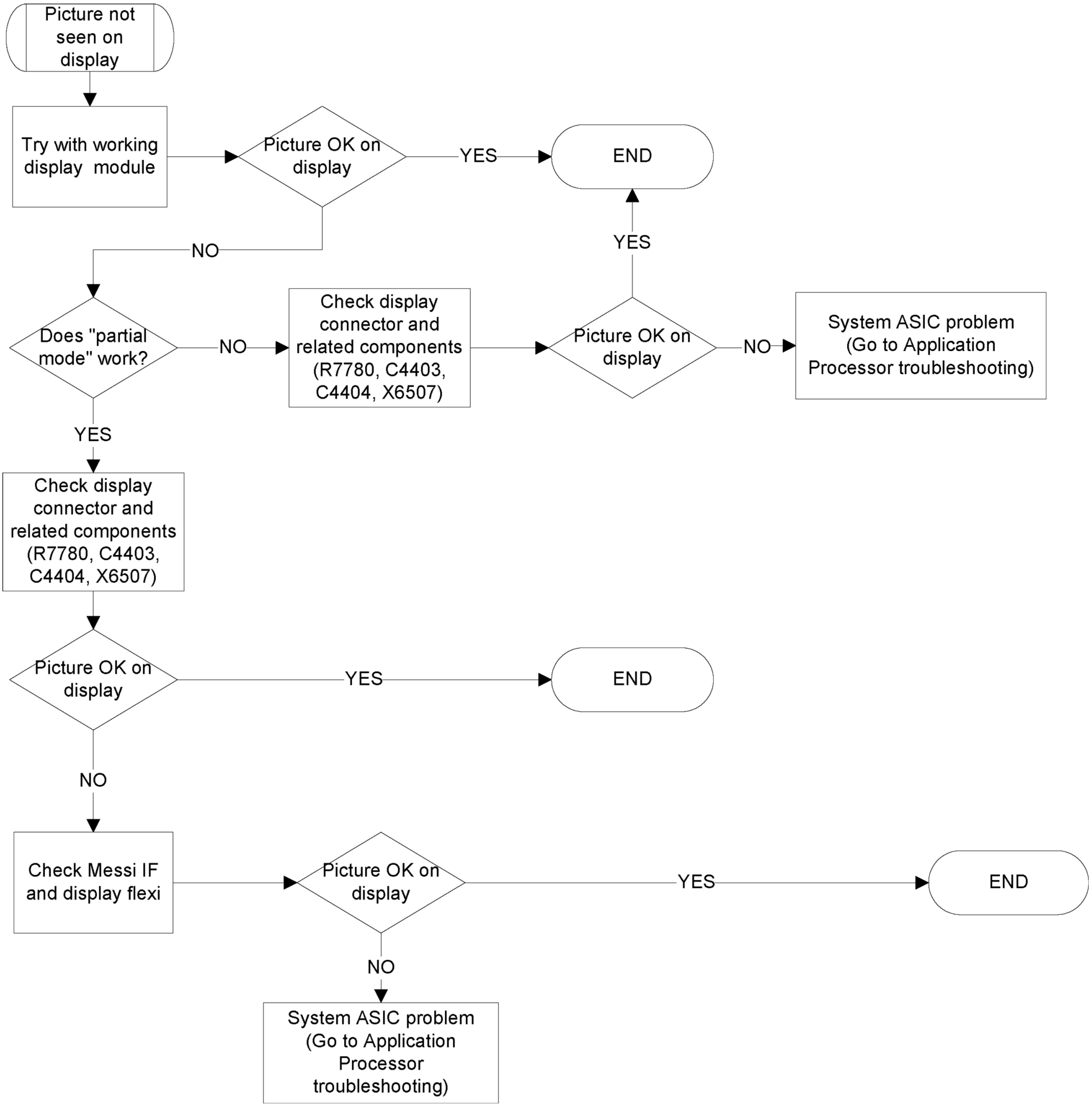


Figure 43 IR RX diagram

Display controller troubleshooting

Troubleshooting flow



Keyboard troubleshooting

Context

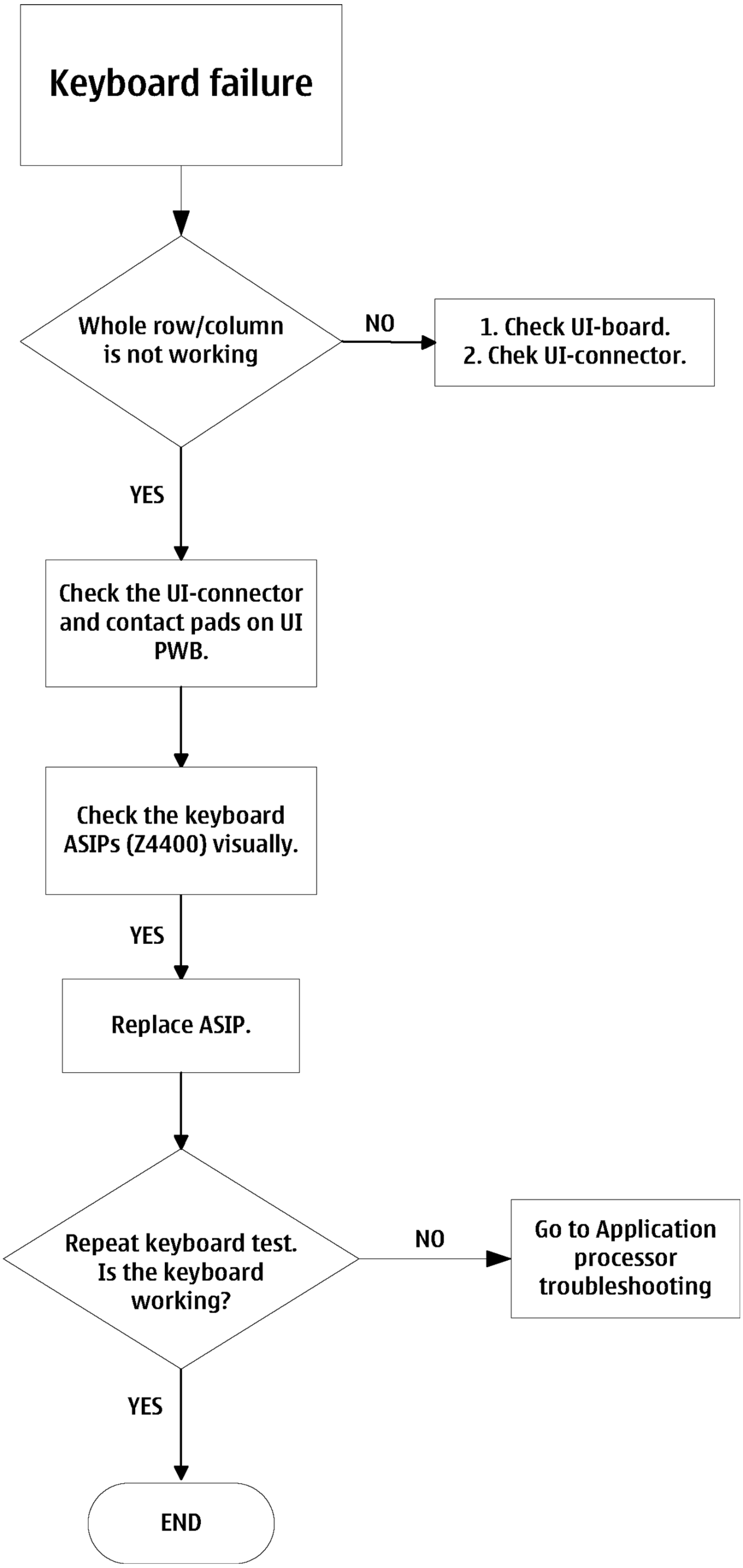
There are two possible failure modes in the keyboard module:

- One or more keys can be stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, corrosion).

- Malfunction of several keys at the same time; this happens when one or more rows or columns are failing (shortcut or open connection). For a more detailed description of the keyboard and keymatrix, see section **Keyboard**.

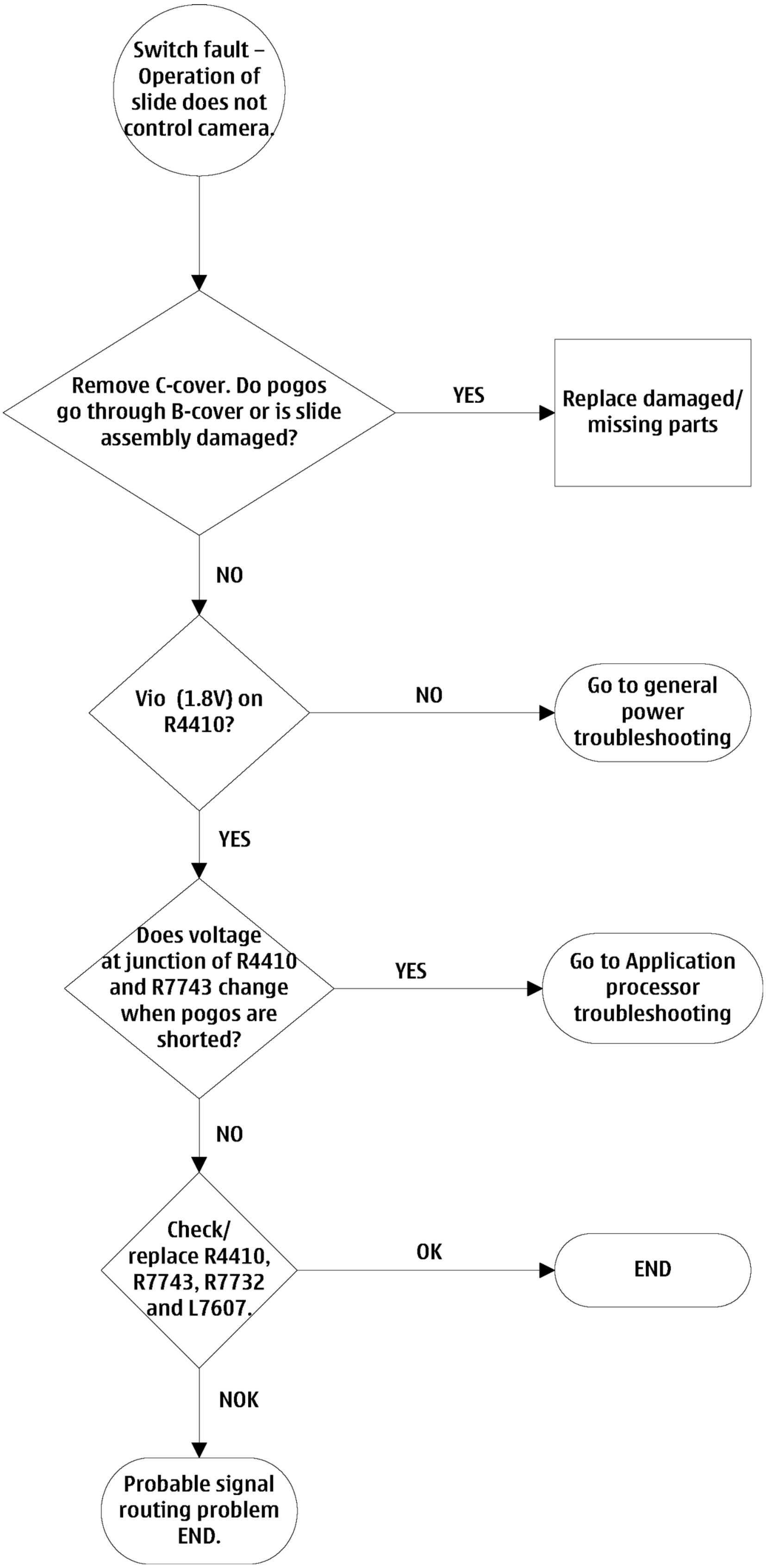
If the failure mode is not clear, start with the **Keyboard Test** in *Phoenix*.

Troubleshooting flow



Slider switch troubleshooting

Troubleshooting flow



Certificate restoring for BB5.0 products

Context

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

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

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-8 or FPS-10.

  Note: USB flashing does not work for a dead BB5.0 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2004.39.7.70 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5.0 testing and tuning features)
- External smart card reader

  Note: The smart card reader is only needed when FPS-8 is used. FPS-10 has an integrated smart card reader.
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

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

Steps

1. Program the phone software.

   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.

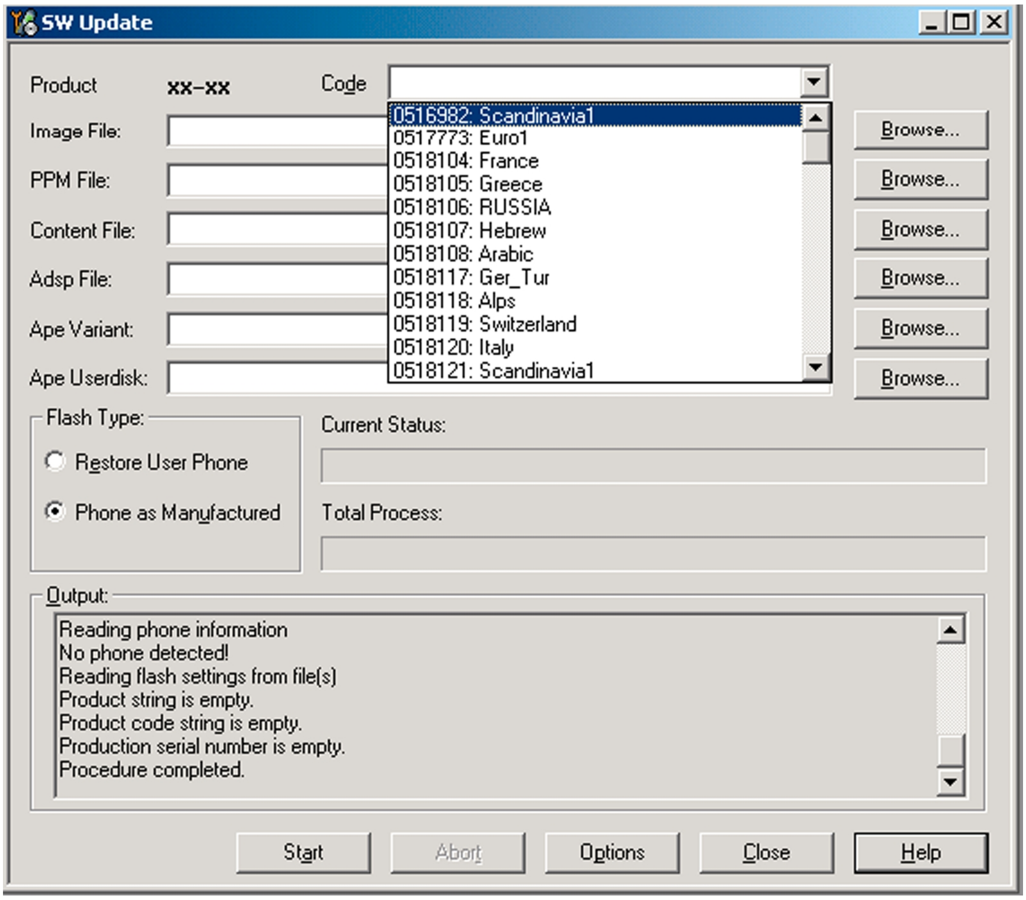
   ii Update the phone MCU software to the latest available version.

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

iii Choose the product manually from **File→Open Product** , and click **OK**.

Wait for the phone type designator (e.g. “RM-1”) to be displayed in the status bar.

iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



Product xx-xx

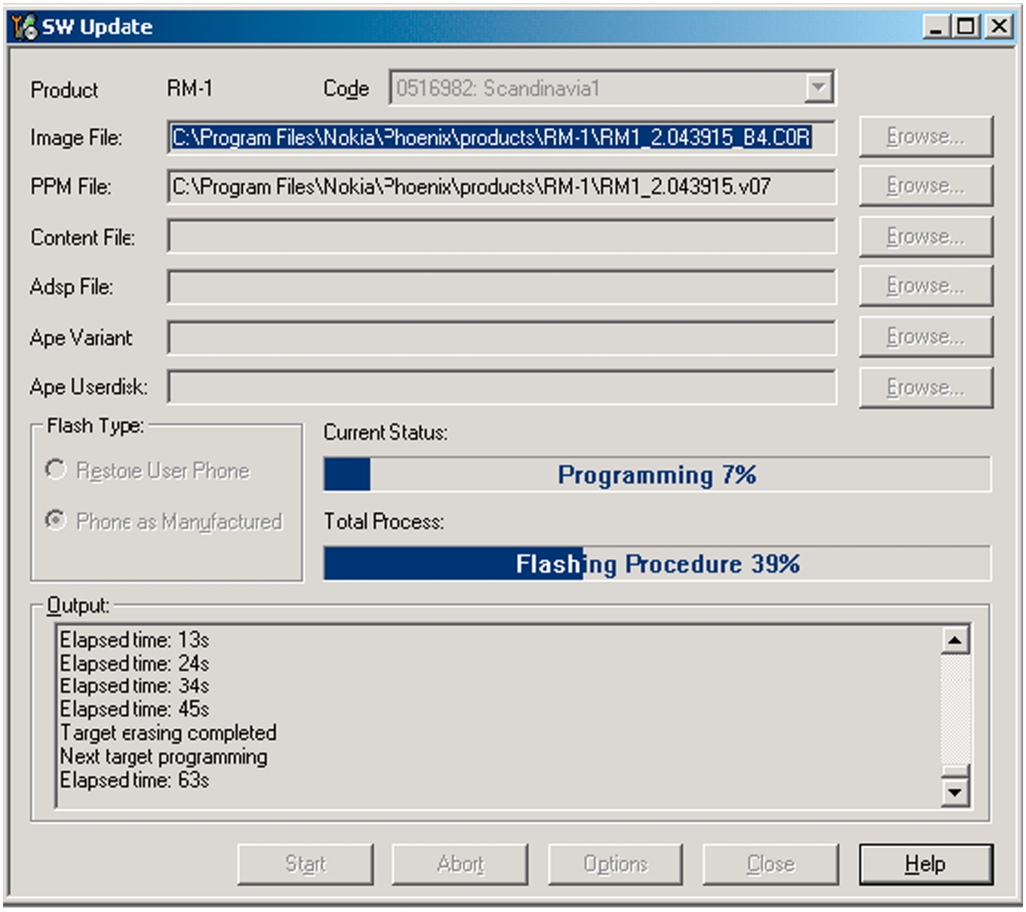
Flash Type: ● Phone as Manufactured

```
Reading phone information
No phone detected!
Reading flash settings from file(s)
Product string is empty.
Product code string is empty.
Production serial number is empty.
Procedure completed.
```

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

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.



Product RM-1

Code 0516982: Scandinavia1

Image File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915_B4.C0R

PPM File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915.v07

Flash Type: ● Phone as Manufactured

Current Status: Programming 7%

Total Process: Flashing Procedure 39%

```
Elapsed time: 13s
Elapsed time: 24s
Elapsed time: 34s
Elapsed time: 45s
Target erasing completed
Next target programming
Elapsed time: 63s
```

Programming is completed when *Flashing Completed* message is displayed.

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

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

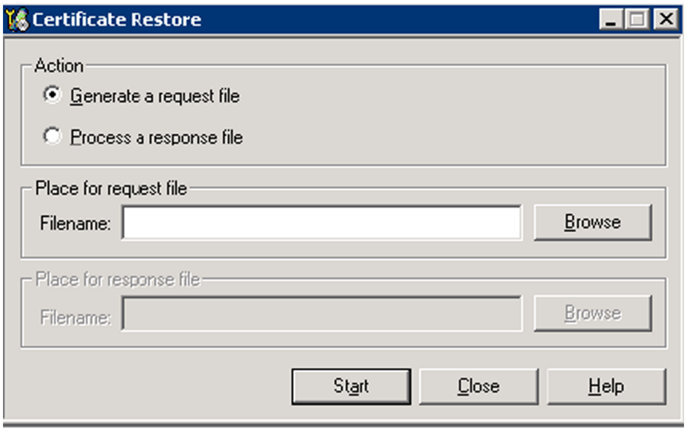
2. Create a *Request* file.

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

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

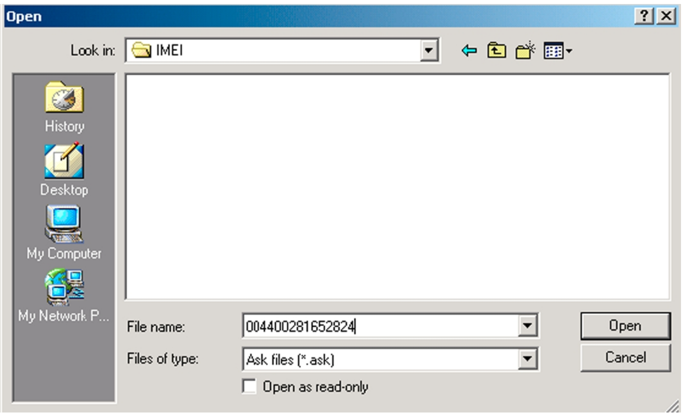
ii Choose **Tools→Certificate Restore** .

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



Action: ● Generate a request file

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



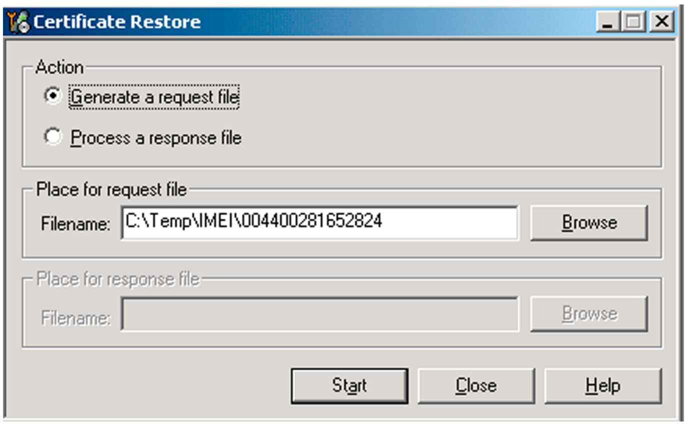
Look in: IMEI

File name: 004400281652824

Files of type: Ask files (*.ask)

☐ Open as read-only

The name of the file and its location are shown.



Action

● Generate a request file

○ Process a response file

Place for request file

Filename: C:\Temp\IMEI\004400281652824

Place for response file

Filename:

v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

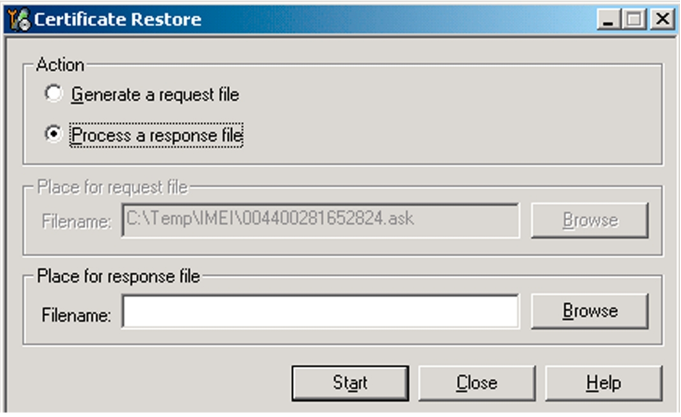
   For this procedure, you must supply +12 V to CU-4 from an external power supply.

   i Save the reply file sent by Nokia to your computer.

   ii Start *Phoenix* service software.

   iii Choose **File→Scan Product** .

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



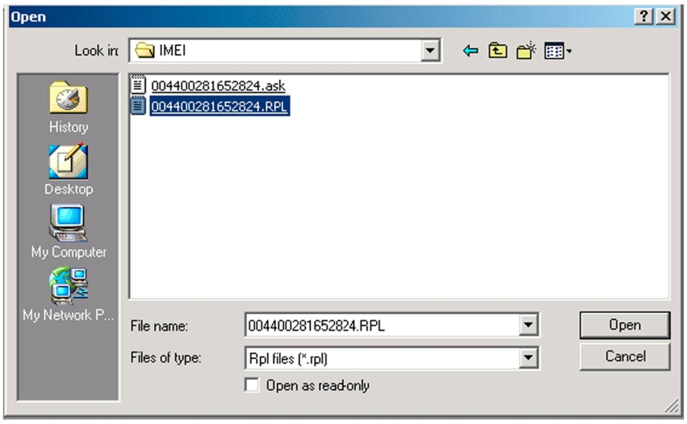
○ Generate a request file
● Process a response file

Filename: C:\Temp\IMEI\004400281652824.ask

Filename:

v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.



Look in: IMEI

004400281652824.ask
004400281652824.RPL

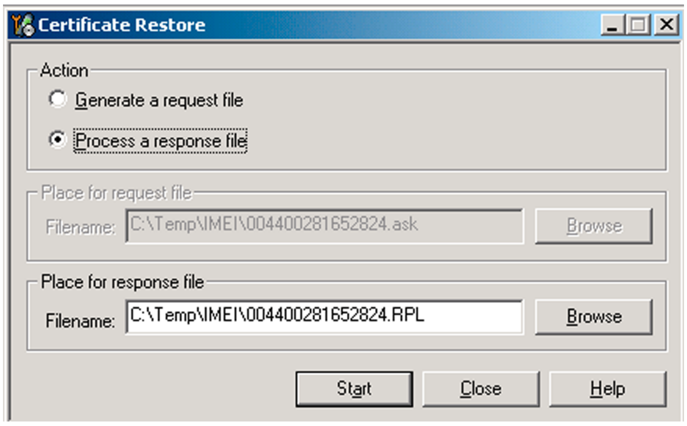
File name: 004400281652824.RPL

Files of type: Rpl files (*.rpl)

☐ Open as read-only

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

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



○ Generate a request file
● Process a response file

Filename: C:\Temp\IMEI\004400281652824.ask

Filename: C:\Temp\IMEI\004400281652824.RPL

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.

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

Display is in a normal mode when the phone is in active use.

Display is in a partial idle mode when the phone is in the screen saver mode.

Display is in OFF mode when the phone is in the full idle mode (idle LED is flashing).

The operating modes of the display can be controlled with the help of Phoenix.

Table 13 Display module troubleshooting cases

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

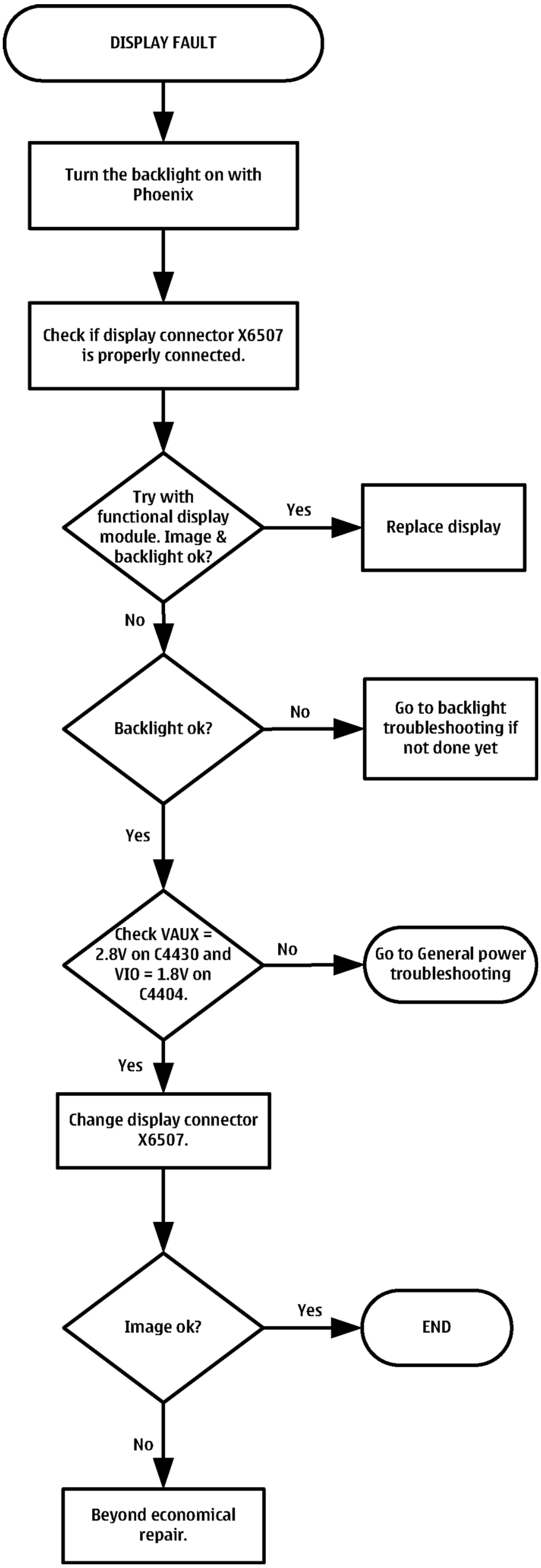
Table 14 Pixel defects

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

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions.

Display fault troubleshooting

Troubleshooting flow



Display and keyboard backlight troubleshooting

Context

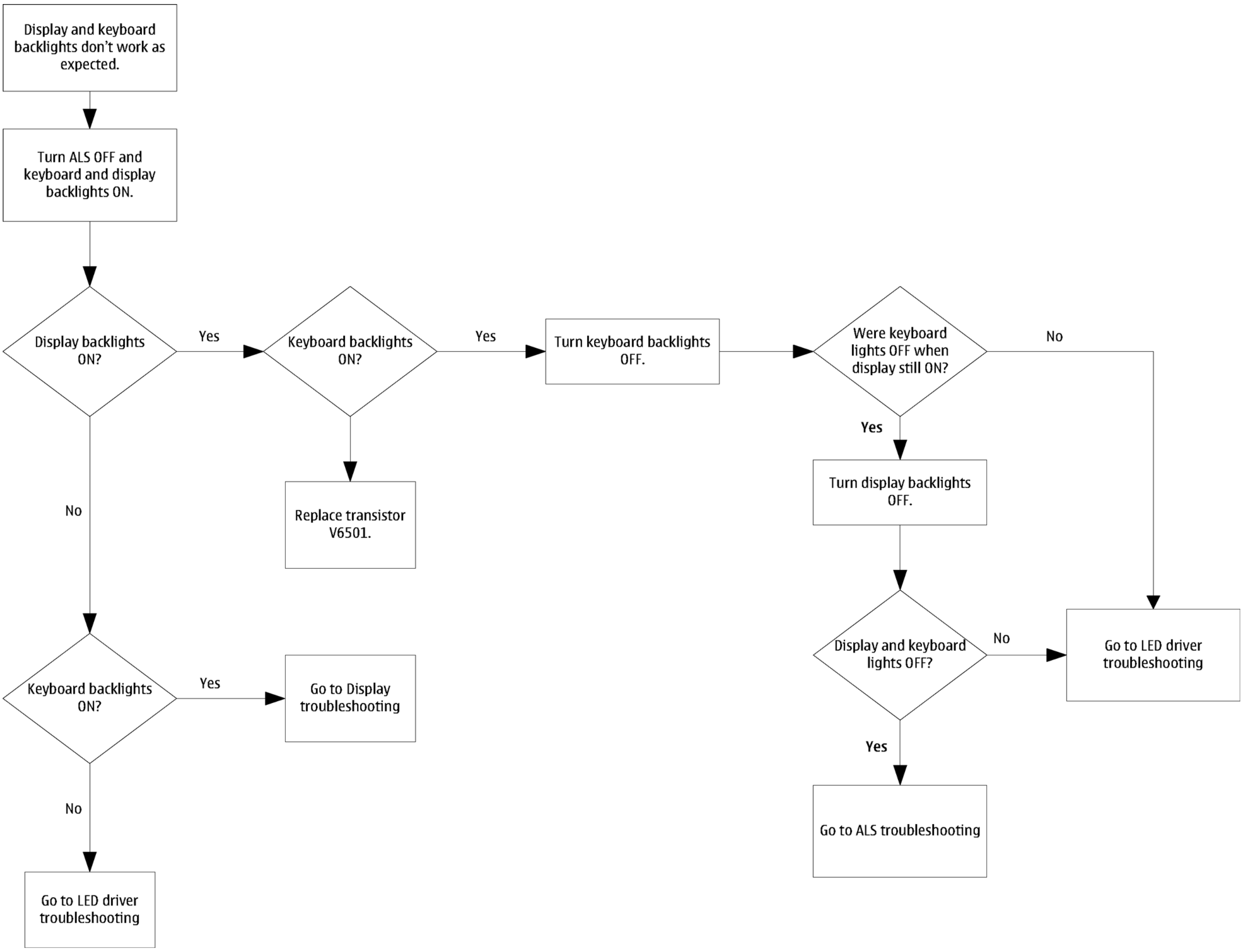
The device has one LED driver that provides current for both display and keyboard backlights.

Keyboard backlights are turned ON only in dark conditions. This is controlled by the Ambient Light Sensor (ALS). Also the brightness of the display is adjusted by the ambient light sensor.

You can enable/disable ALS with the help of Phoenix service software.

Display brightness can be adjusted manually, if ALS is disabled. If the ambient light sensor is enabled, it adjusts the display brightness automatically.

Troubleshooting flow



ALS troubleshooting

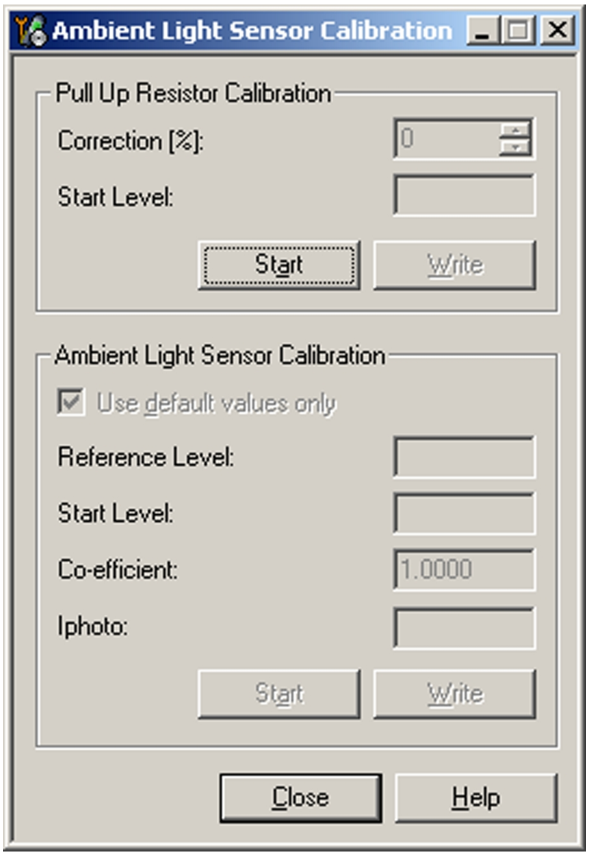
Context

- If a phototransistor is broken, replace it with a typical phototransistor.
- If the phototransistor is changed, the calibration value in the phone memory has to be changed to the default value '1'.

- Make sure that you have completed Display and keypad backlight troubleshooting first before starting ALS troubleshooting.

Here are some hints for ALS troubleshooting; the following troubleshooting diagram refers to these:

- Phoenix LED control tool also shows you luminance. The correct luminance in darkness is <20lx, and in office environment 100-2000lx. The luminance value depends strongly on the light source and the angle of the phone, so these values are only a rough guideline.
- LED driver control voltage measurement points can be found from LED driver troubleshooting section. When backlight brightness is set to 100%, both GENOUT-signals are low, and enable PWM is 100%.
- *Phoenix* has an ambient light sensor calibration tool for changing calibration values. The pull-up resistor calibration is done first:
  a Cover the light guide (upper part of the A Cover).
  b Click **Start Write** .
  c Manually change the ambient light sensor value to the default value. There is no special tool for this, but you have to perform calibration normally and then set the **Co-efficient** result to *1* before writing it to the phone memory.



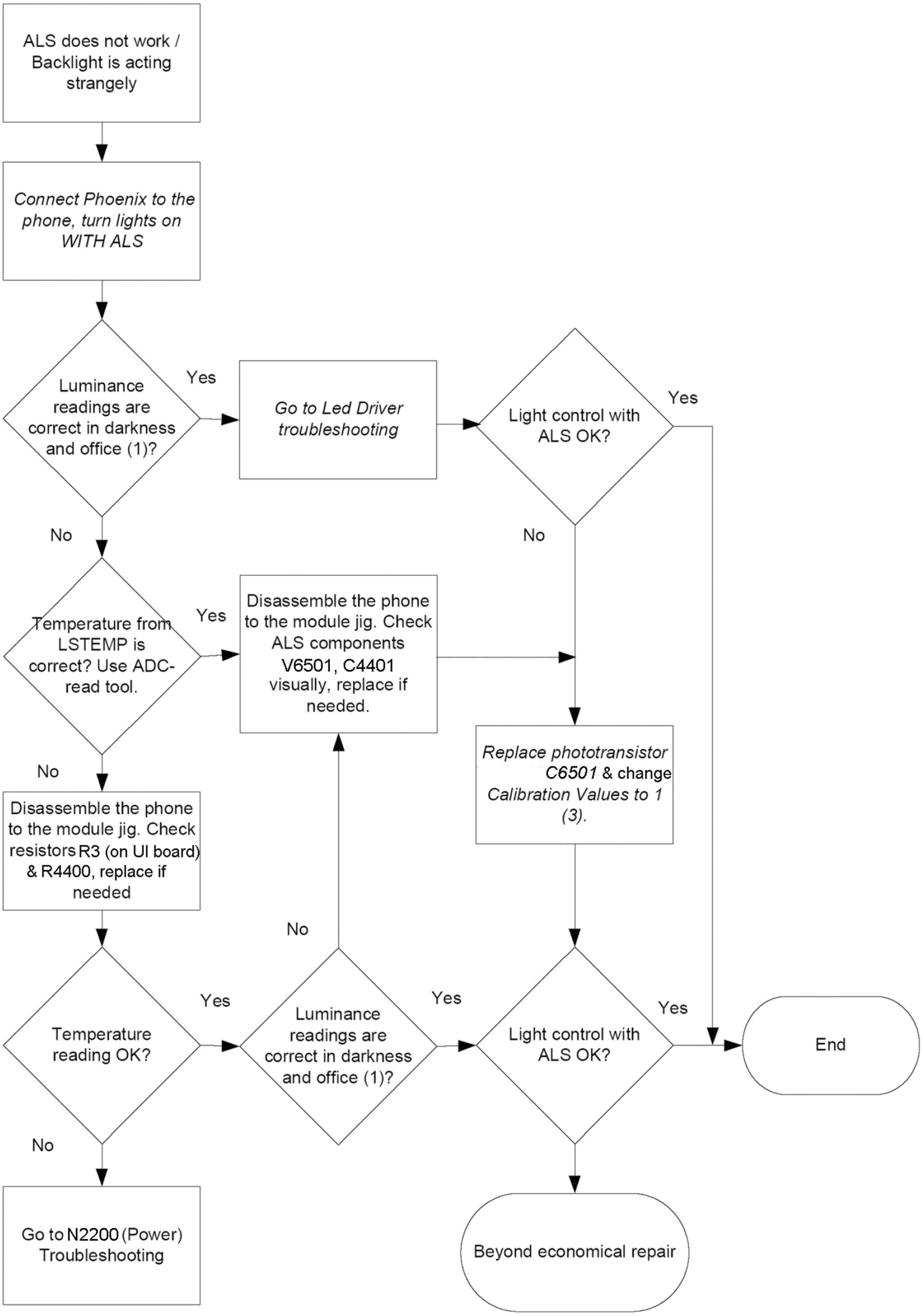
Correction [%]: 0

☑ Use default values only

Co-efficient: 1.0000

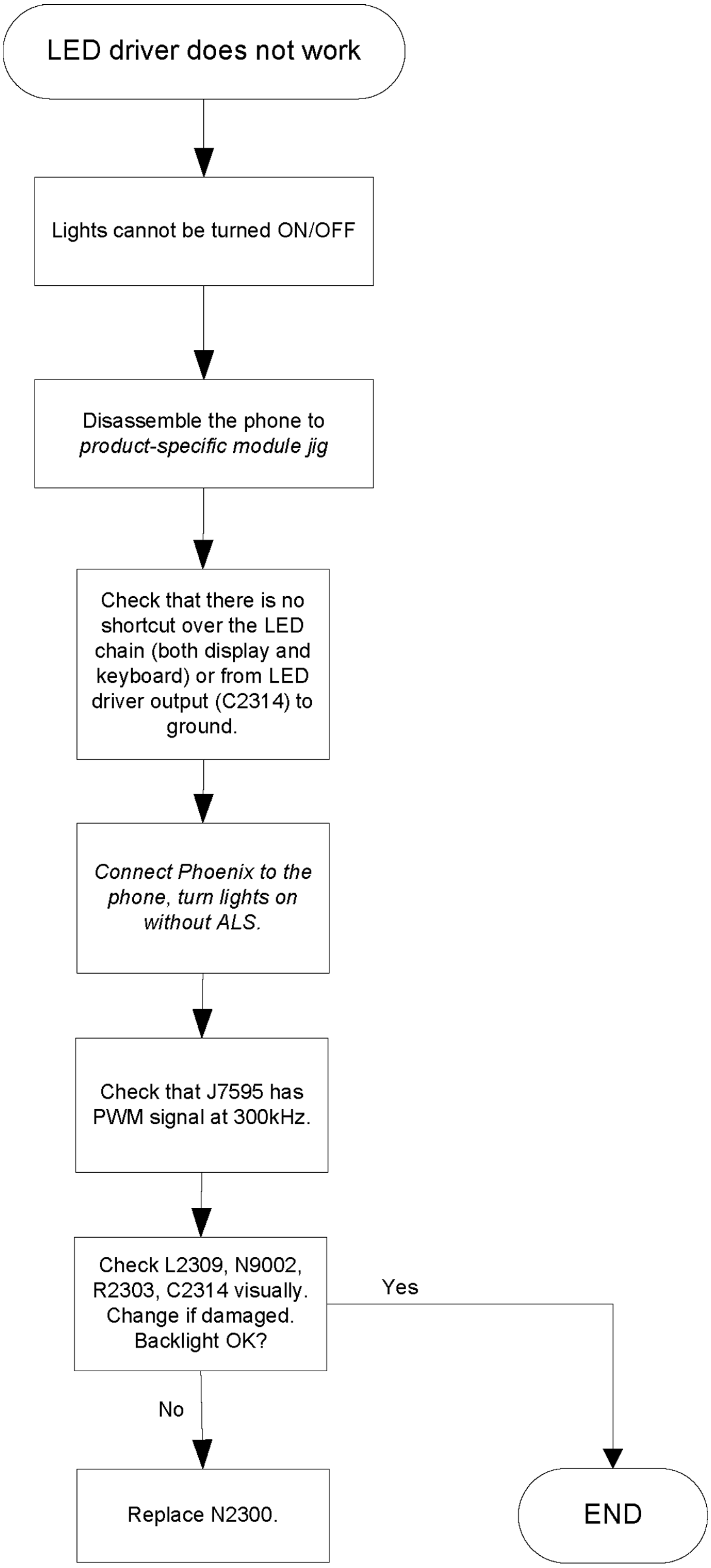
Figure 44 ***Ambient Light Sensor Calibration*** **window**

Troubleshooting flow



LED driver troubleshooting

Troubleshooting flow



Bluetooth troubleshooting

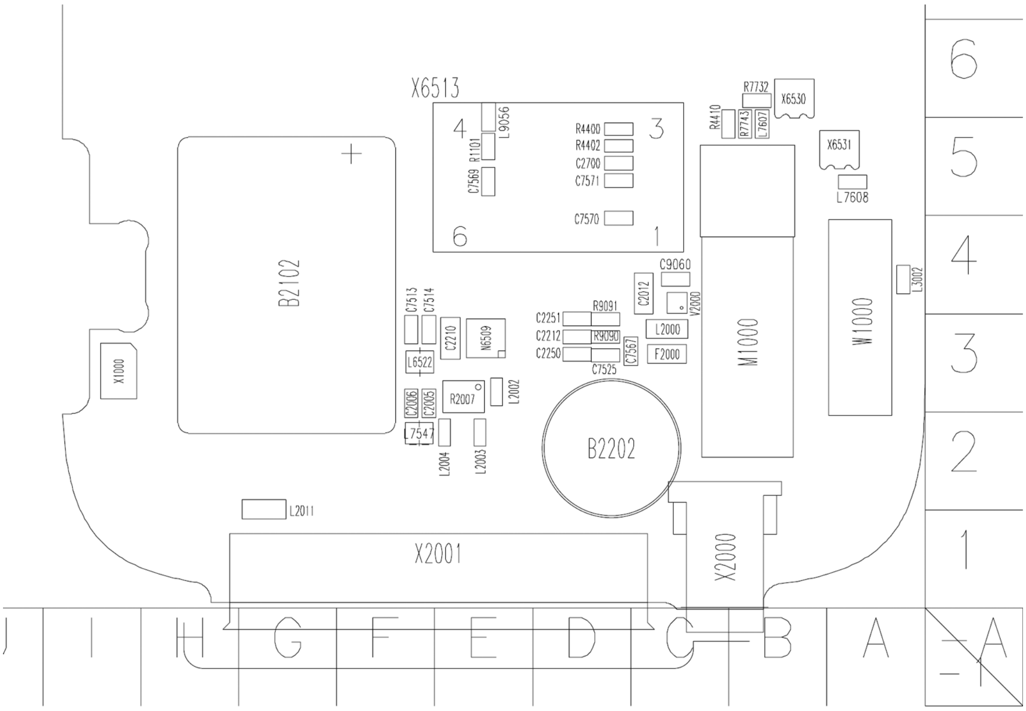
Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

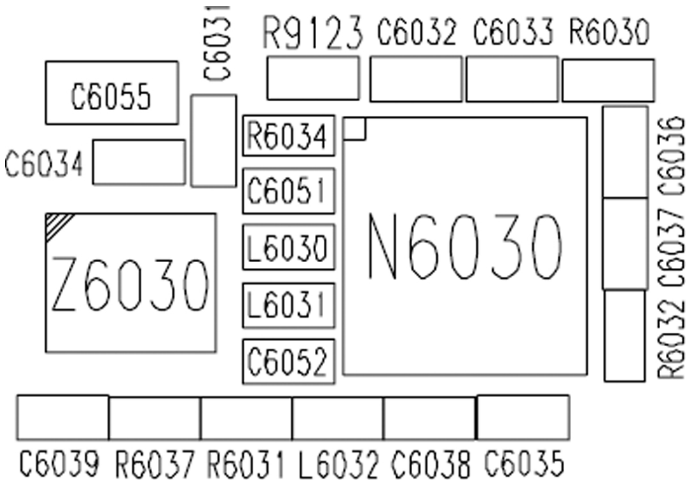
Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Location of the BT antenna



Bluetooth component layout



Bluetooth settings for Phoenix

Steps

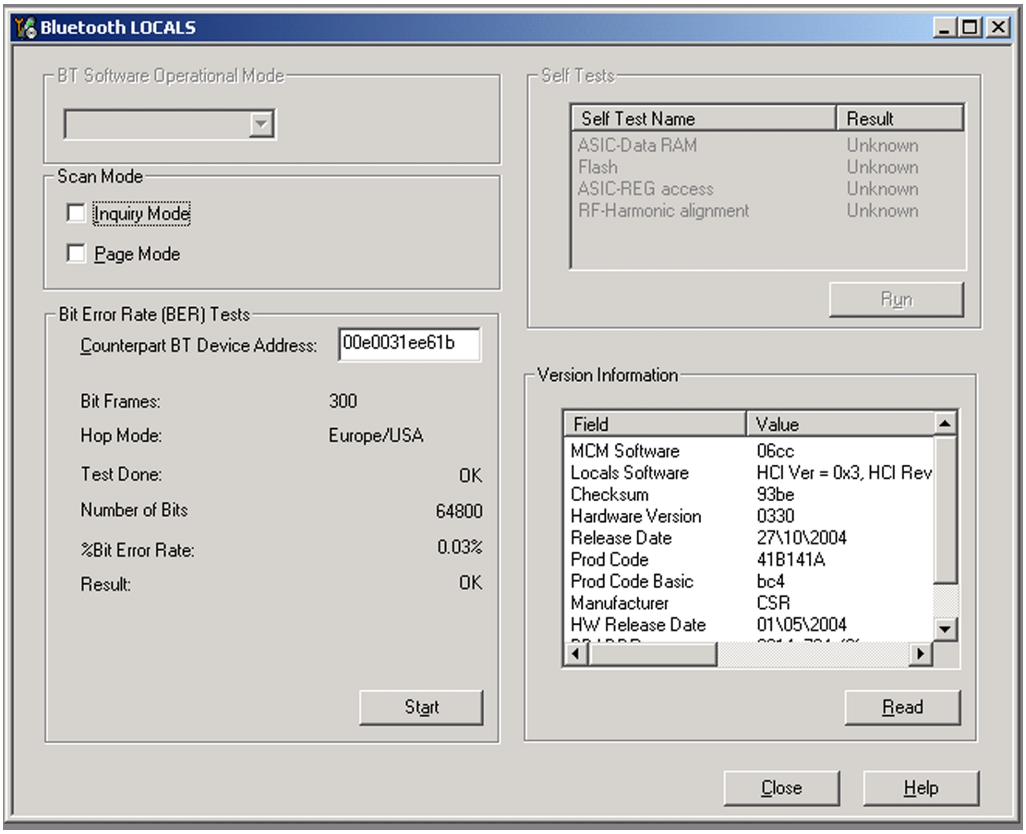
1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9’s serial number (12 digits) found in the type label on the back of JBT-9.

   In addition to JBT-9, also SB-6, JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.



☐ Inquiry Mode

☐ Page Mode

Counterpart BT Device Address: 00e0031ee61b

Bit Frames: 300

Hop Mode: Europe/USA

Test Done: OK

Number of Bits: 64800

%Bit Error Rate: 0.03%

Result: OK

Self Test Name	Result
ASIC-Data RAM	Unknown
Flash	Unknown
ASIC-REG access	Unknown
RF-Harmonic alignment	Unknown

Field	Value
MCM Software	06cc
Locals Software	HCI Ver = 0x3, HCI Rev
Checksum	93be
Hardware Version	0330
Release Date	27\10\2004
Prod Code	41B141A
Prod Code Basic	bc4
Manufacturer	CSR
HW Release Date	01\05\2004

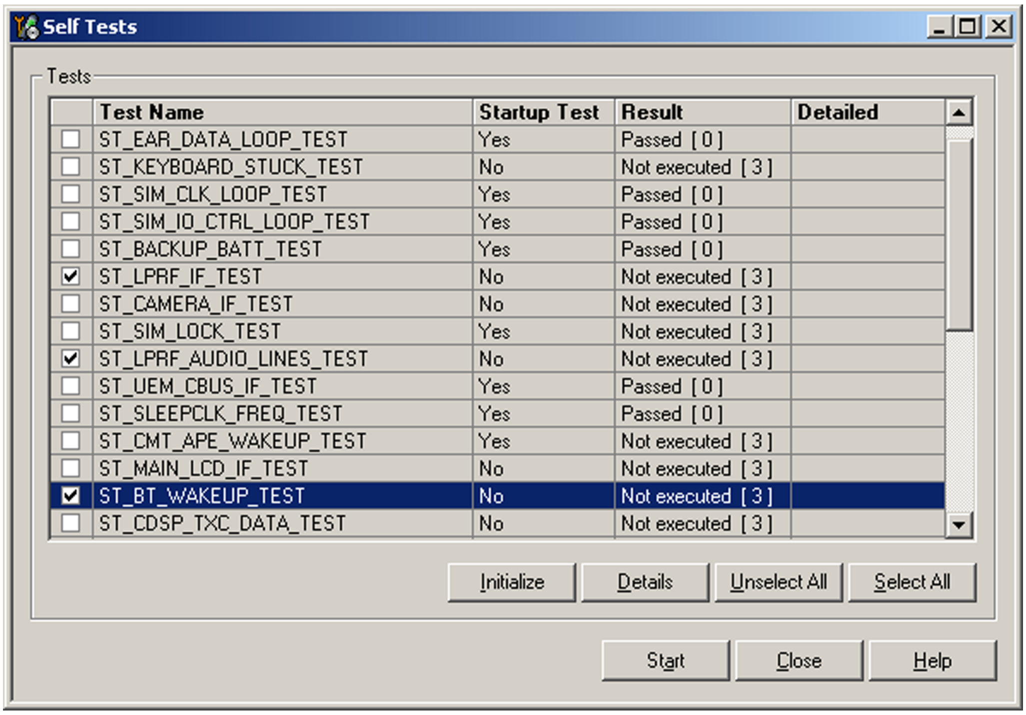
Figure 45 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
   - **ST_LPRF_IF_TEST**
   - **ST_LPRF_AUDIO_LINES_TEST**
   - **ST_BT_WAKEUP_TEST**

7. To run the tests, click **Start**.

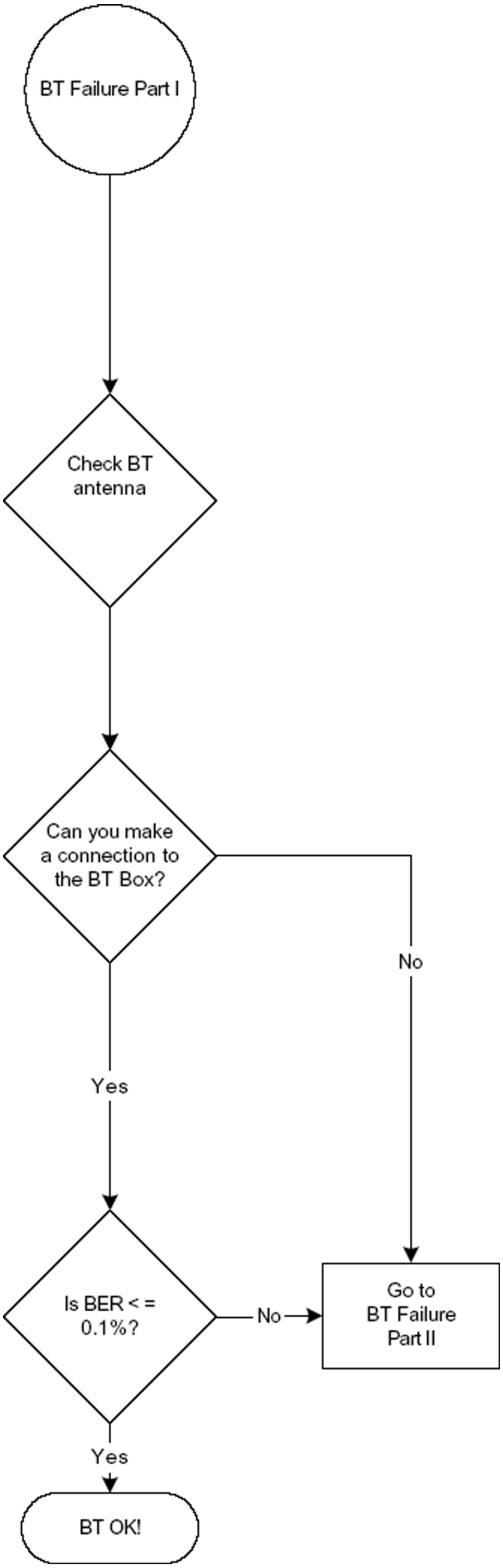


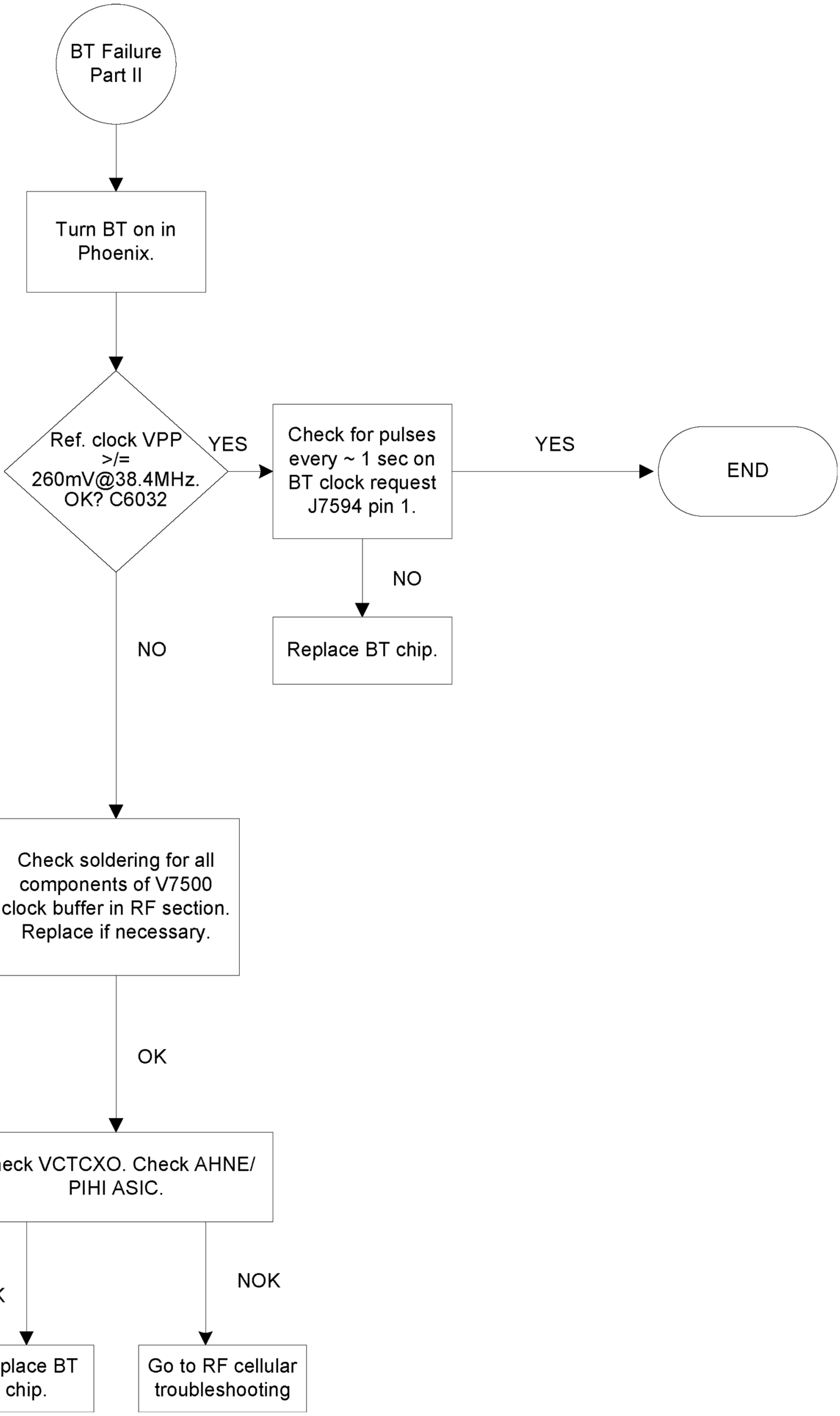
	Test Name	Startup Test	Result	Detailed
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☑	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☑	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☑	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☐	ST_CDSP_TXC_DATA_TEST	No	Not executed [3]	

Figure 46 Bluetooth self tests in *Phoenix*

Bluetooth BER failure troubleshooting

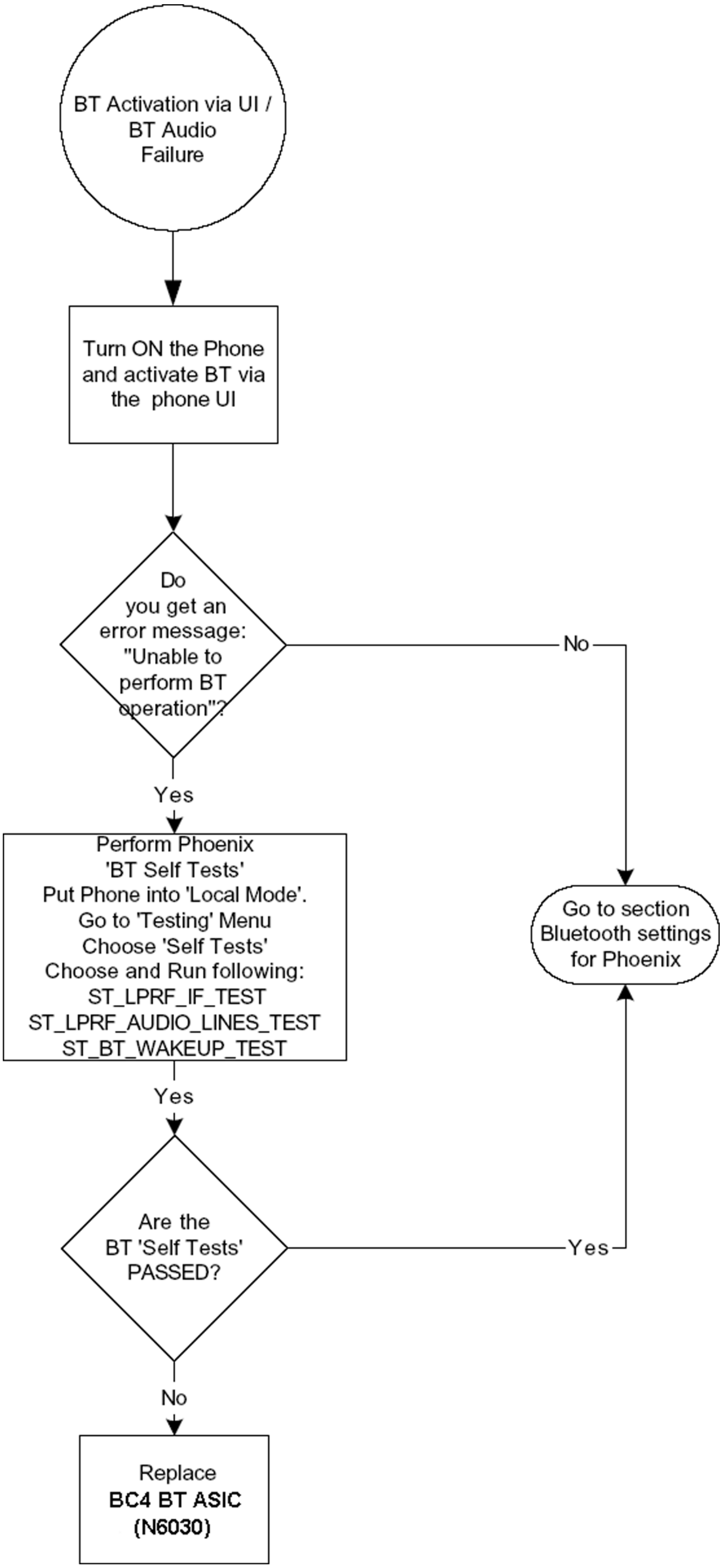
Troubleshooting flow




BT Failure Part II
Turn BT on in Phoenix.
Ref. clock VPP >/= 260mV@38.4MHz. OK? C6032
YES
Check for pulses every ~ 1 sec on BT clock request J7594 pin 1.
YES
END
NO
Replace BT chip.
NO
Check soldering for all components of V7500 clock buffer in RF section. Replace if necessary.
OK
Check VCTCXO. Check AHNE/ PIHI ASIC.
OK
NOK
Replace BT chip.
Go to RF cellular troubleshooting

BT audio failure troubleshooting

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)
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

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

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

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

Phoenix audio loop tests and test results

The results presented in the 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 External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	X2102 pads B2103 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	X2001 pads B2103 pads					
Internal Mic to External Earpiece	B2202 (OUT/GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

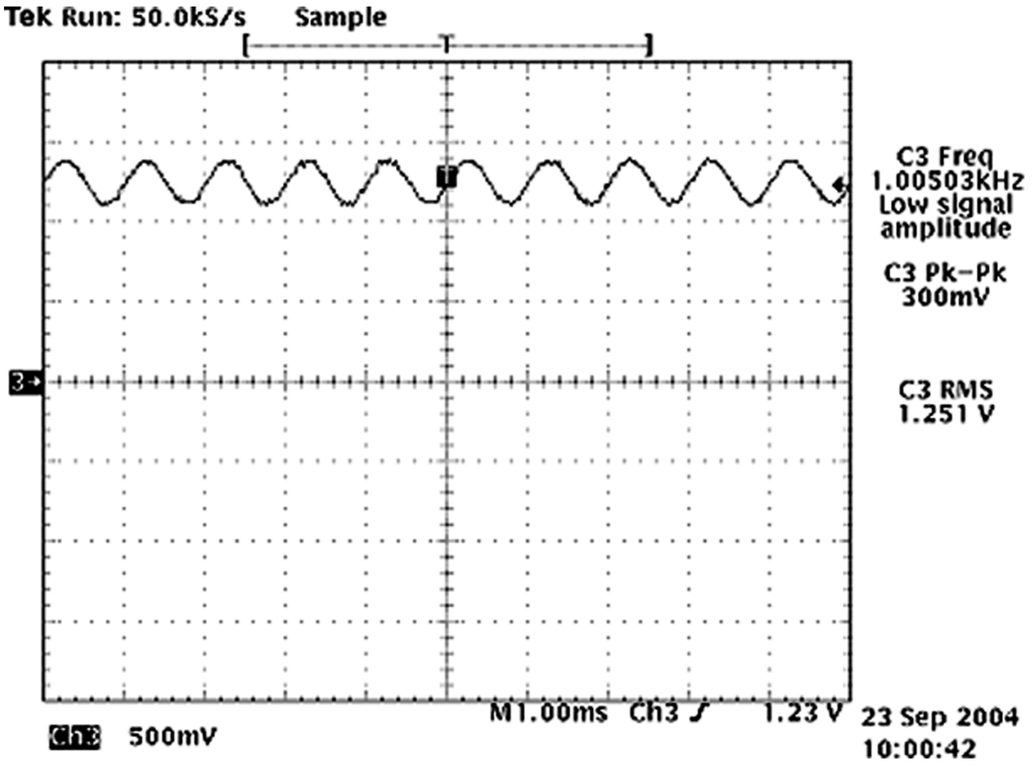
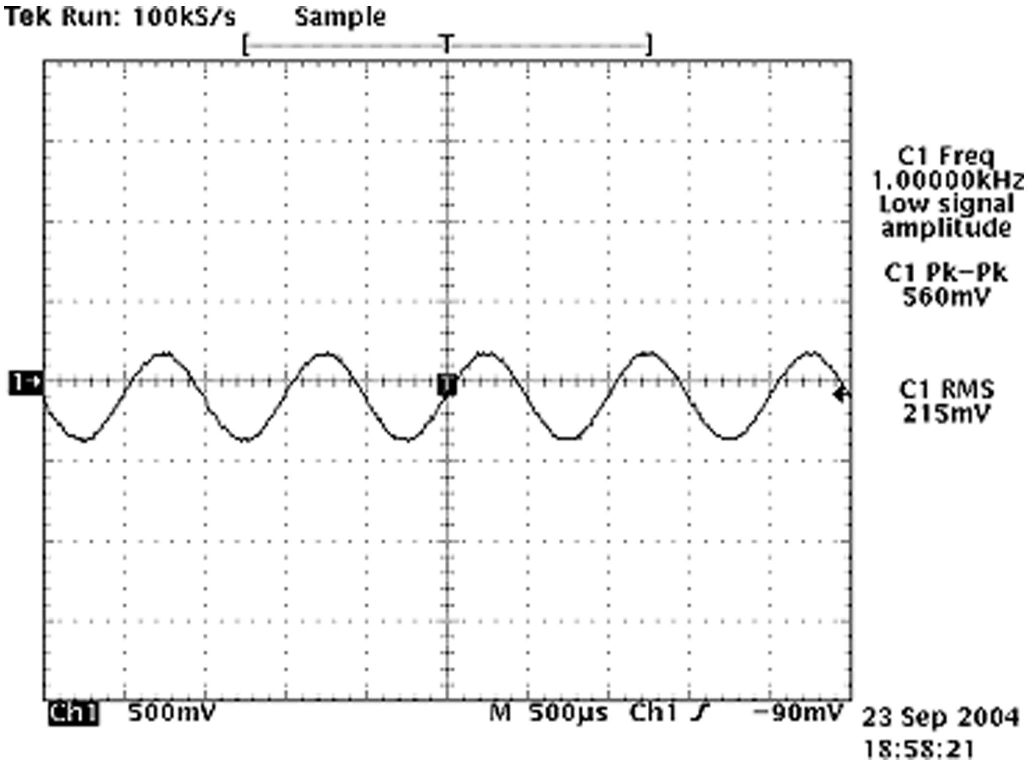


Figure 47 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



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

Figure 48 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

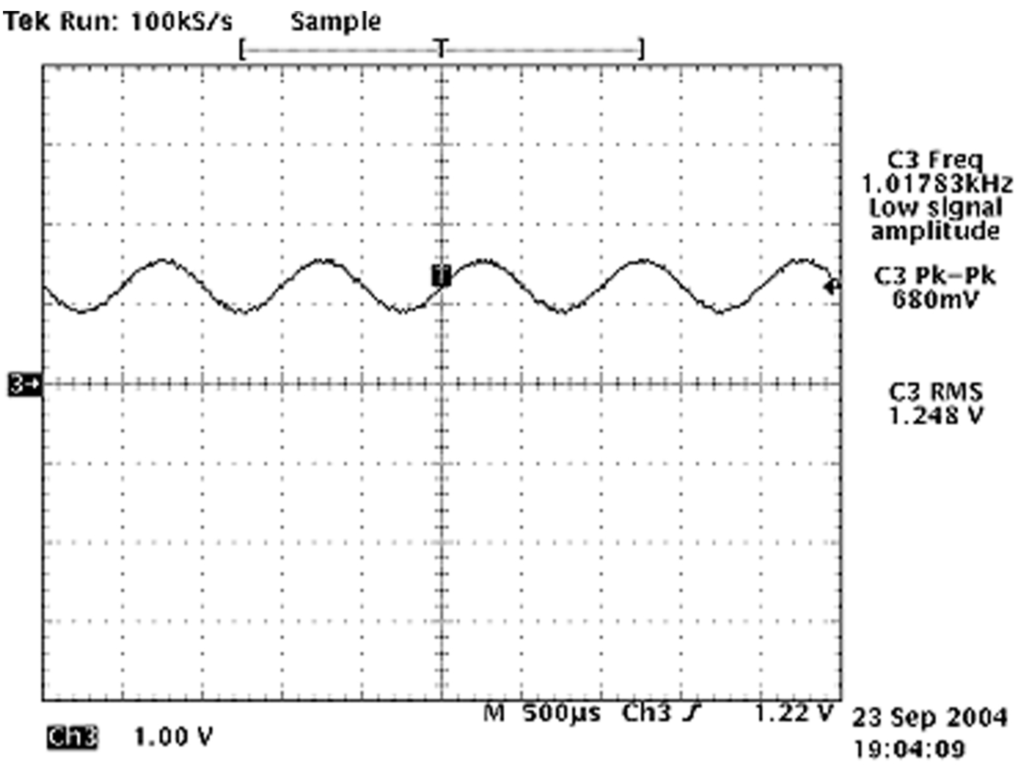
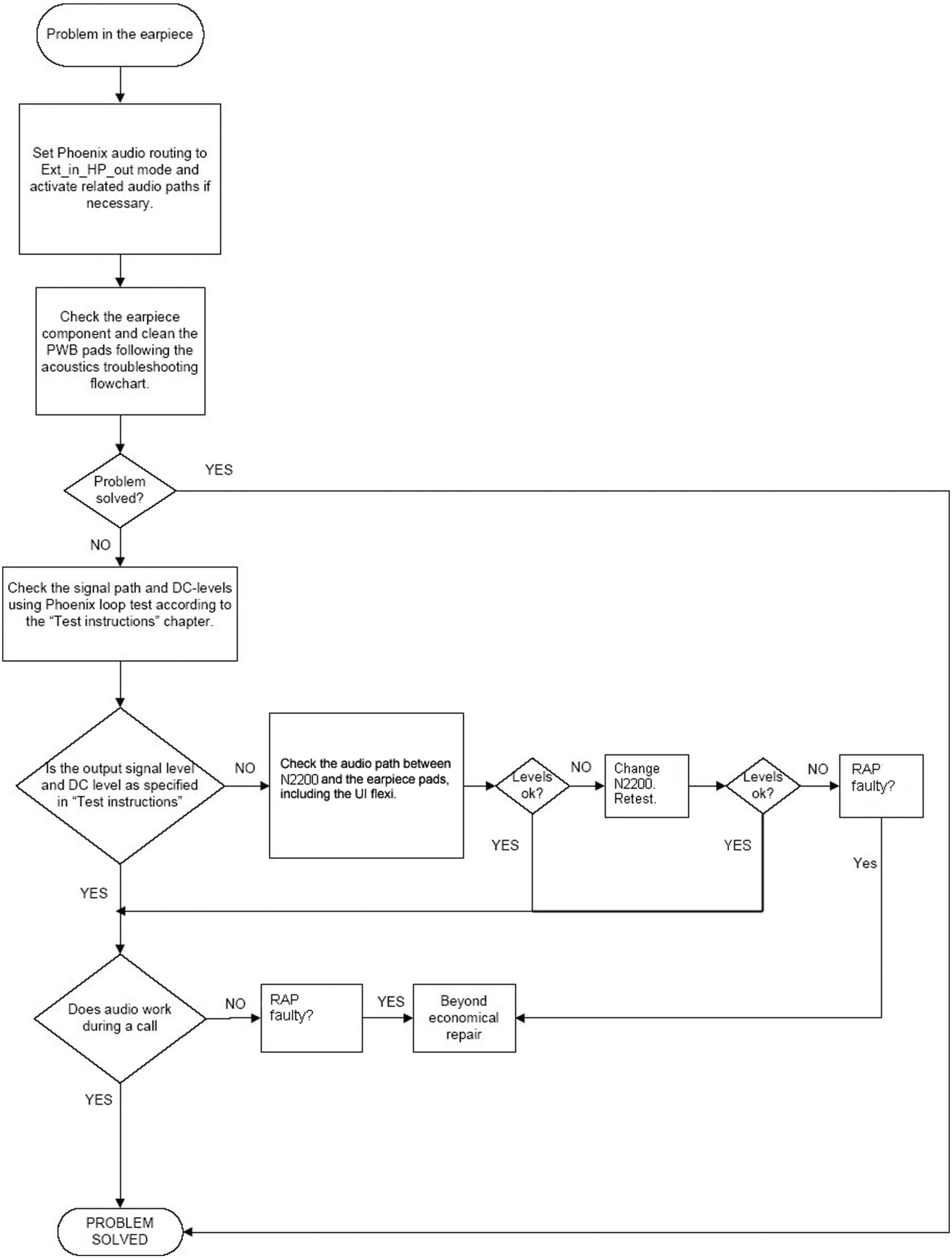


Figure 49 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

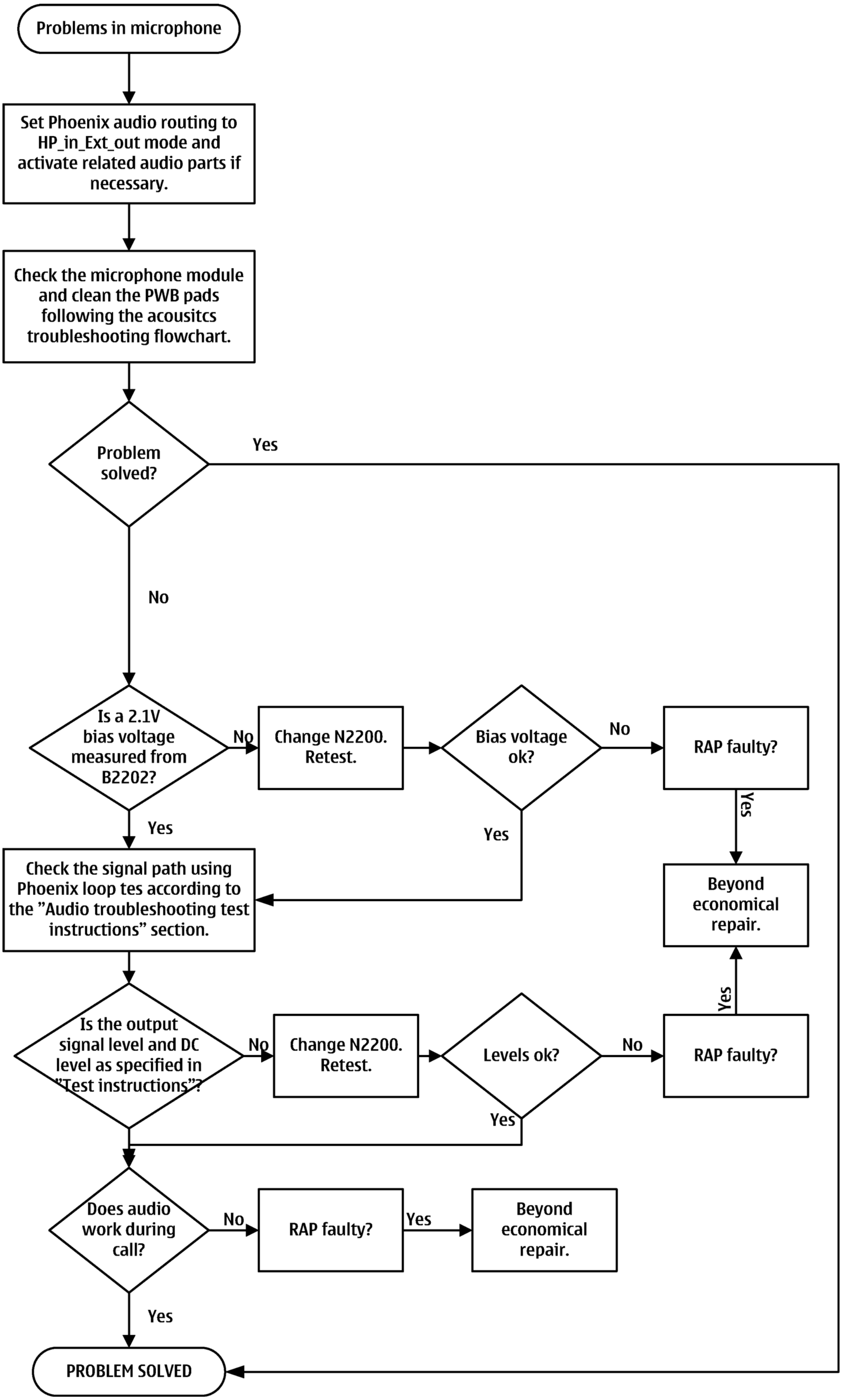
Internal earpiece troubleshooting

Troubleshooting flow



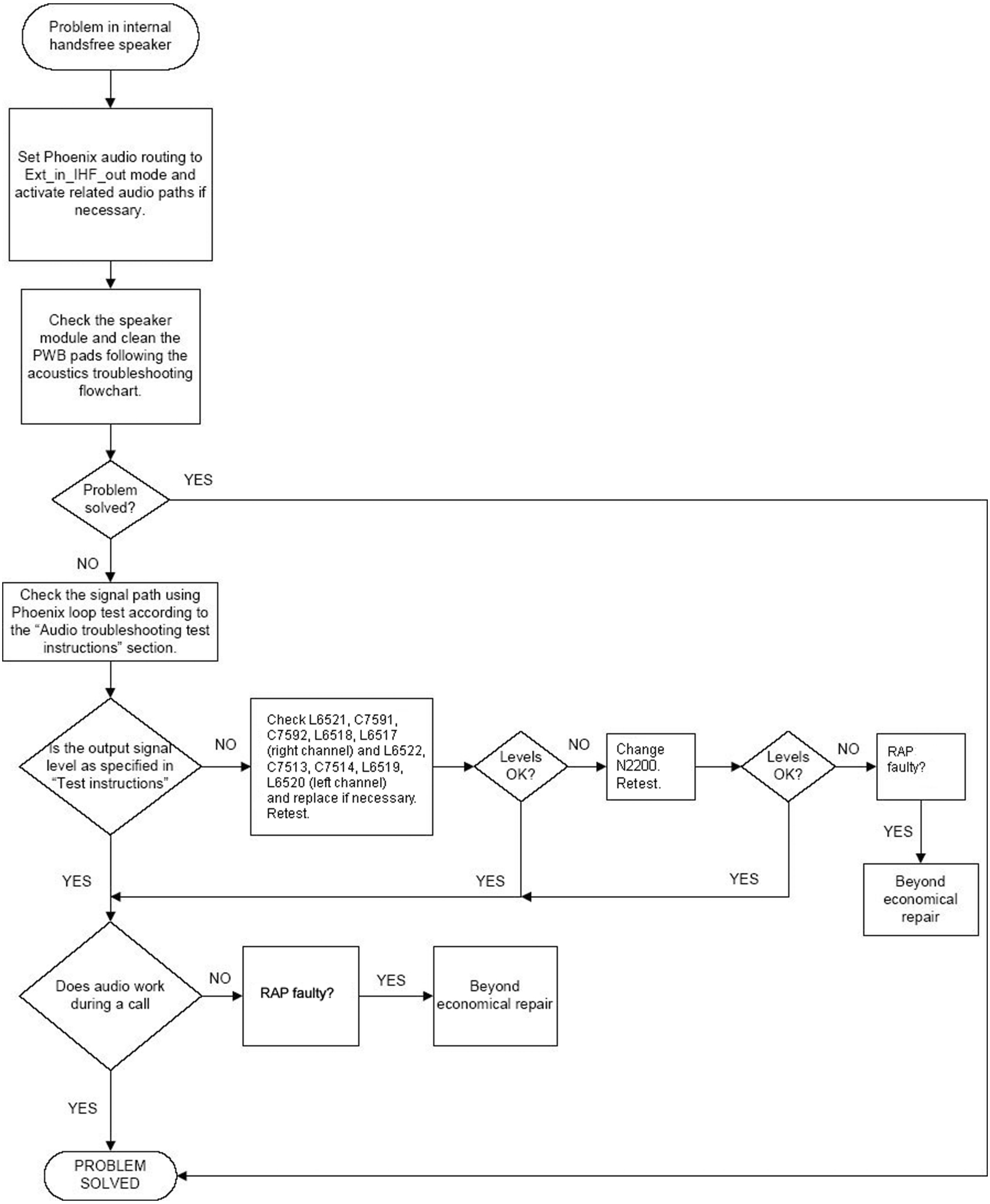
Internal microphone troubleshooting

Troubleshooting flow



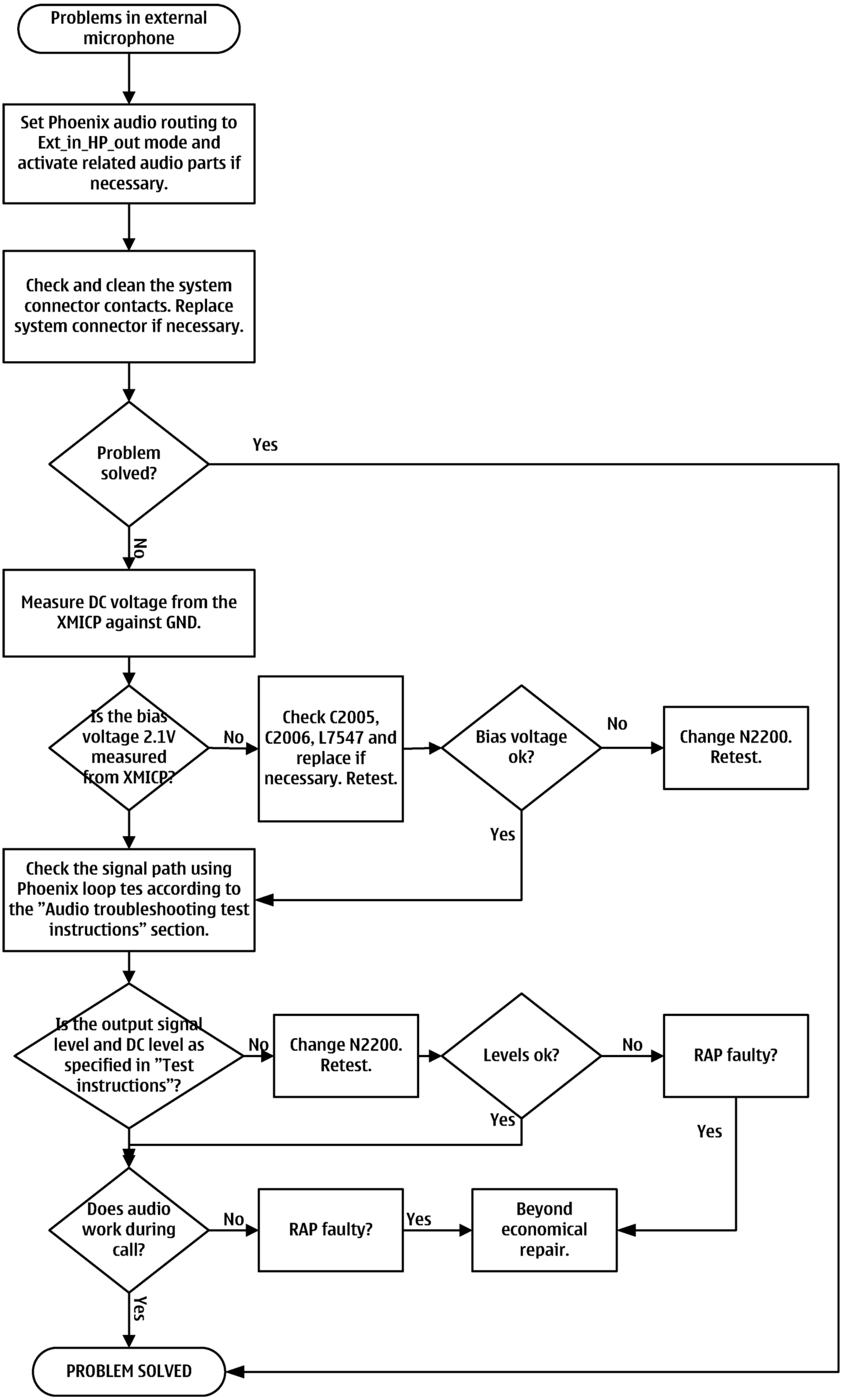
IHF troubleshooting

Troubleshooting flow



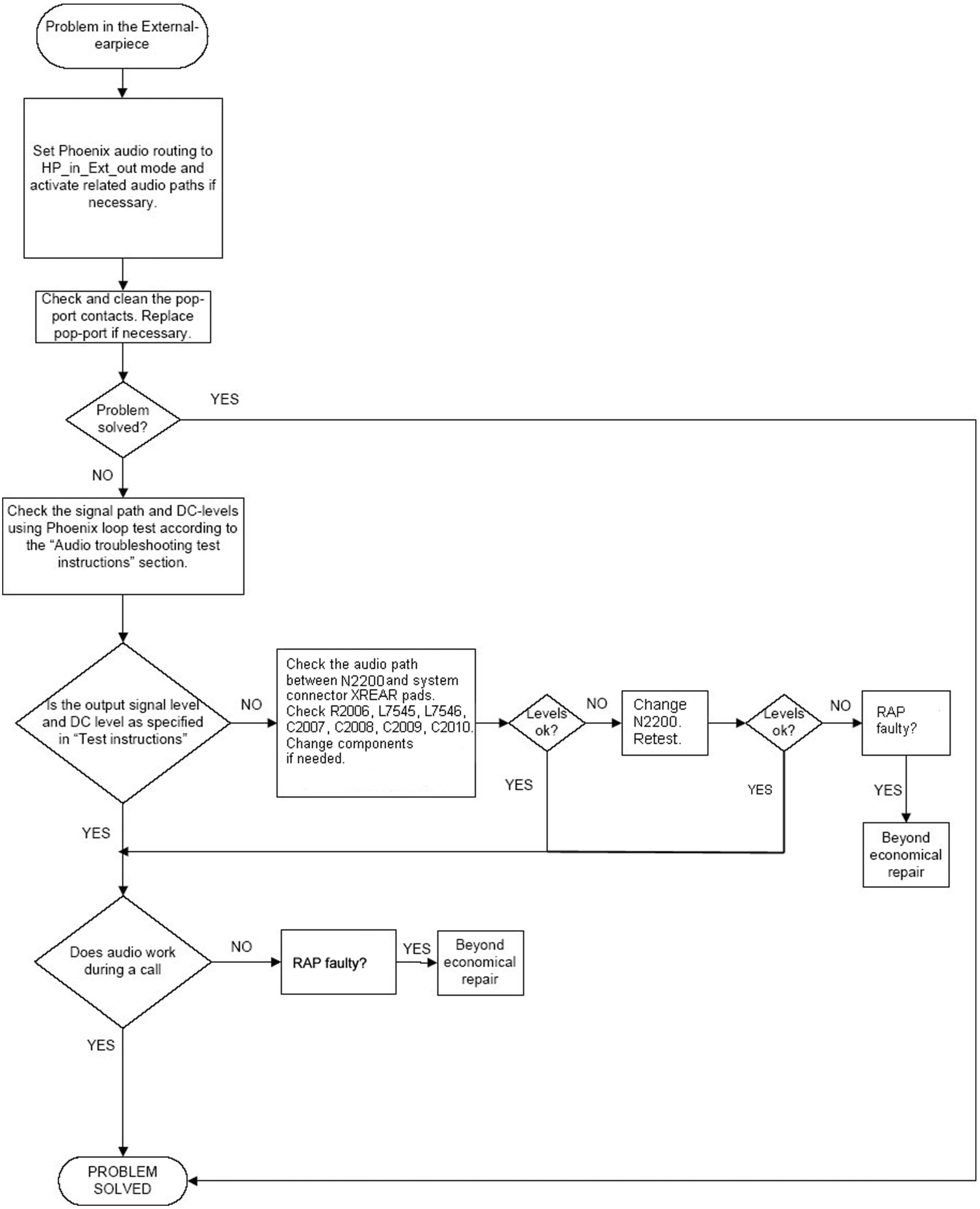
External microphone troubleshooting

Troubleshooting flow



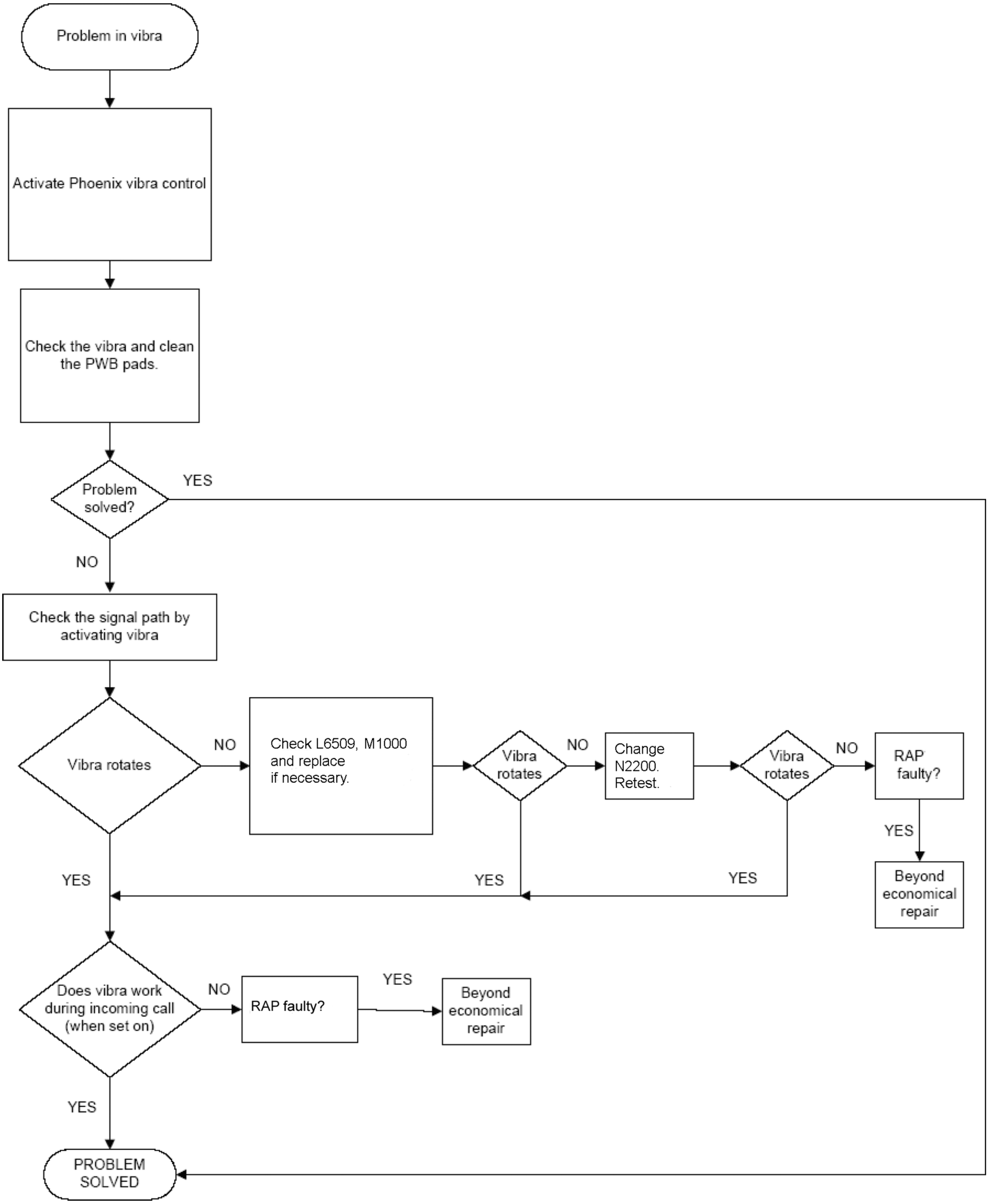
External earpiece troubleshooting

Troubleshooting flow



Vibra troubleshooting

Troubleshooting flow



Baseband manual tuning guide

Energy management calibration

Prerequisites

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

Hardware setup:

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

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

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

8. Click **Calibrate**.

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

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

Table 15 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
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.

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7 — RF Troubleshooting and Manual Tuning Guide

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Table of Contents

List of Tables

List of Figures

Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a low-impedance wideband passive probe (LO-/reference frequencies and RF power levels).

  Note: When measuring frequencies of 4GHz, absolute level measurements are not possible with this probe. Compare levels with a known good board.

- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

  Caution: A mobile phone WCDMA transmitter should never be tested 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 wide area. WCDMA Tx measurements should be performed at least in an RF-shielded box and never with higher Tx power level than 0 dBm! Test full WCDMA Tx power only in RF-shielded environment.

  Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is built around an N7500 RF ASIC with a GSM quad band dual PA and antenna switch module, TXFEM, N7520, and a WCDMA PA, N7540.

The WCDMA PA needs a variable supply to work efficiently. This is provided by a switch mode power supply component, N7541.

Please note that the grounding of the PA module is directly below the PA module. Therefore, it is difficult to check or change the module.

Most RF semiconductors are static discharge sensitive. ESD procedures must be followed during repair, ground straps and ESD soldering irons. RF ASICs, TXFEM, PA and SMPS are moisture sensitive, so parts must be pre-baked prior to soldering.

In addition to key components, there are lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done mainly by checking if the soldering of the component is done properly.

A Capacitor can be checked for shorts and resistors for value by means of an ohmmeter, but be aware, in-circuit measurements should be evaluated carefully.

Keep in mind that all measured voltages or RF levels in the service manual are rough figures. Especially RF levels vary because of different measuring equipment or different grounding of the probe used. All spectrum analyser measurements in this manual are made with a Fluke PM9639/011 10:1 (500 ohm) probe. It is recommended that a similar kind of probe is used for all troubleshooting measurements.

When using an RF probe, use a pair of metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible. If measurements are performed in a product specific module jig, then "GND" pads should be used for the probe ground.

RF key component placement

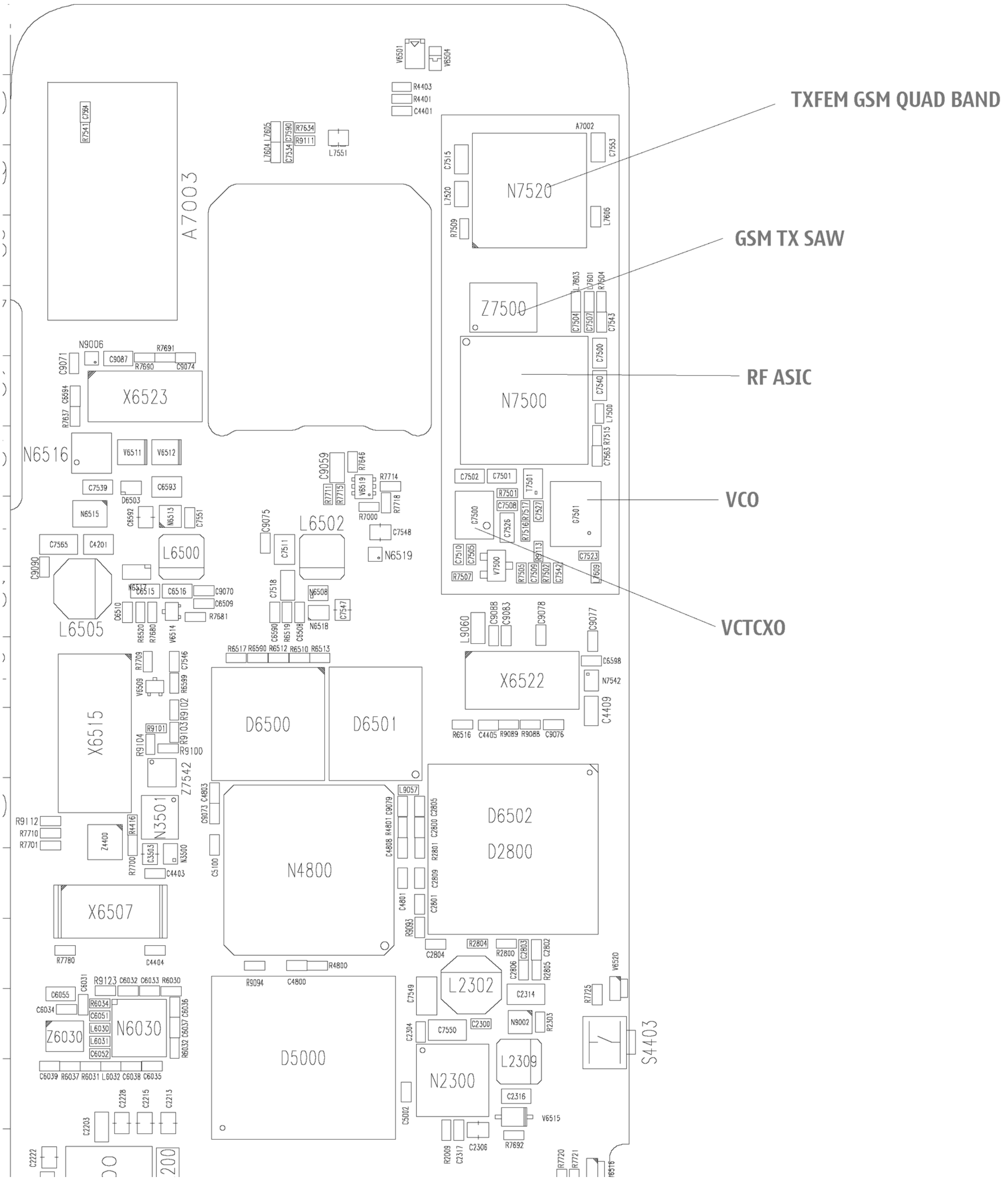


Figure 50 RM-132 RF key component placement

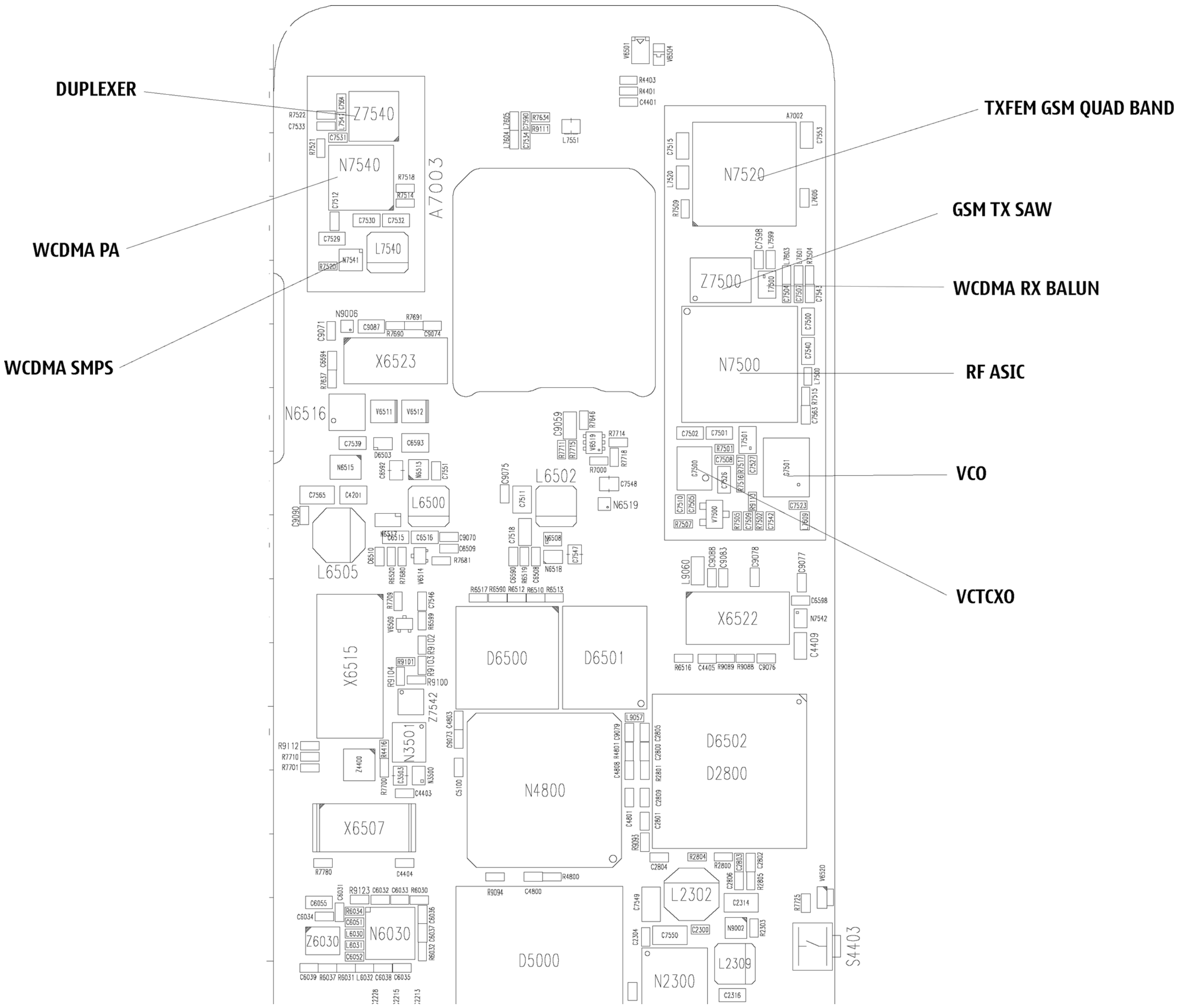
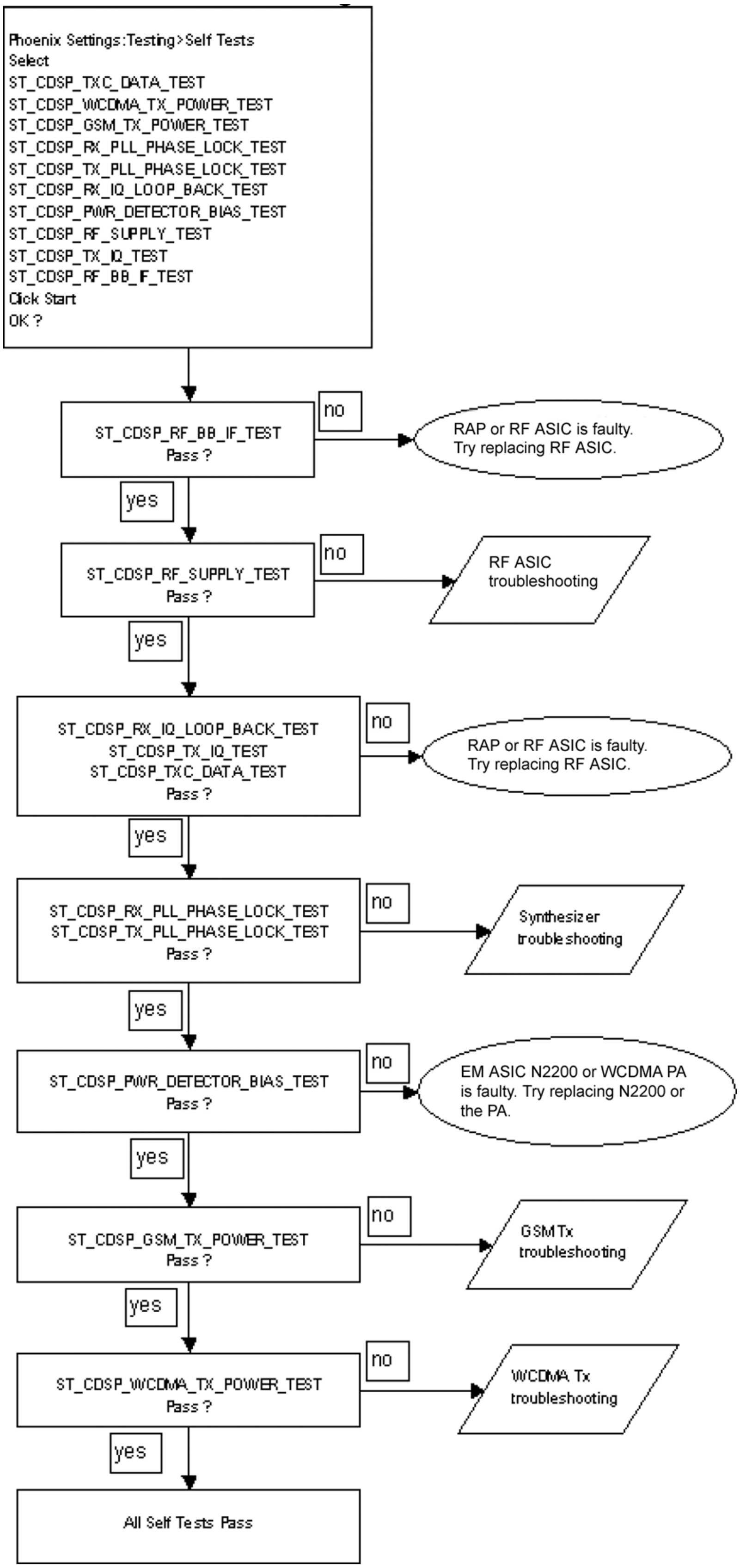


Figure 51 RM-133 RF key component placement

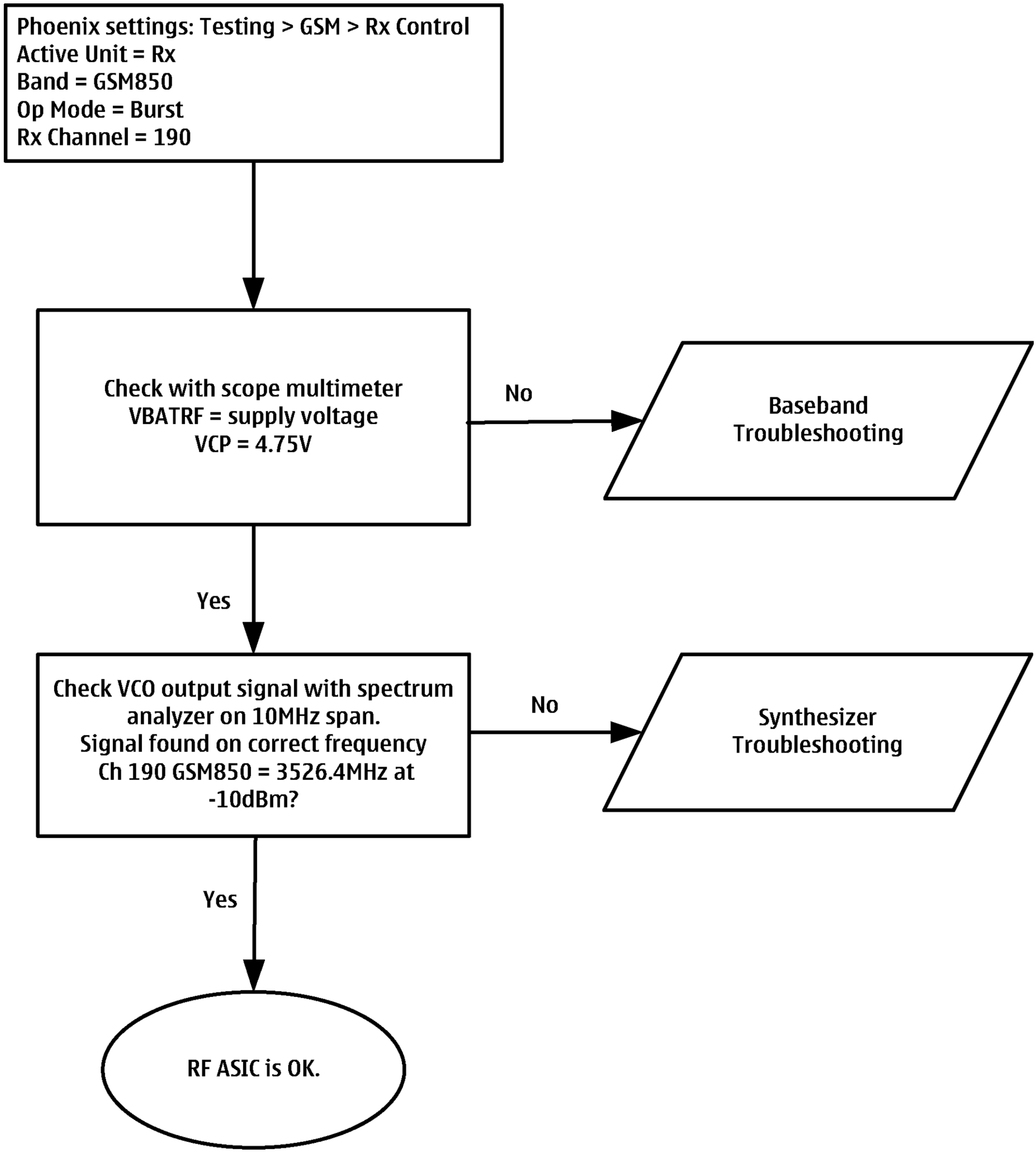
Self test troubleshooting

Troubleshooting flow



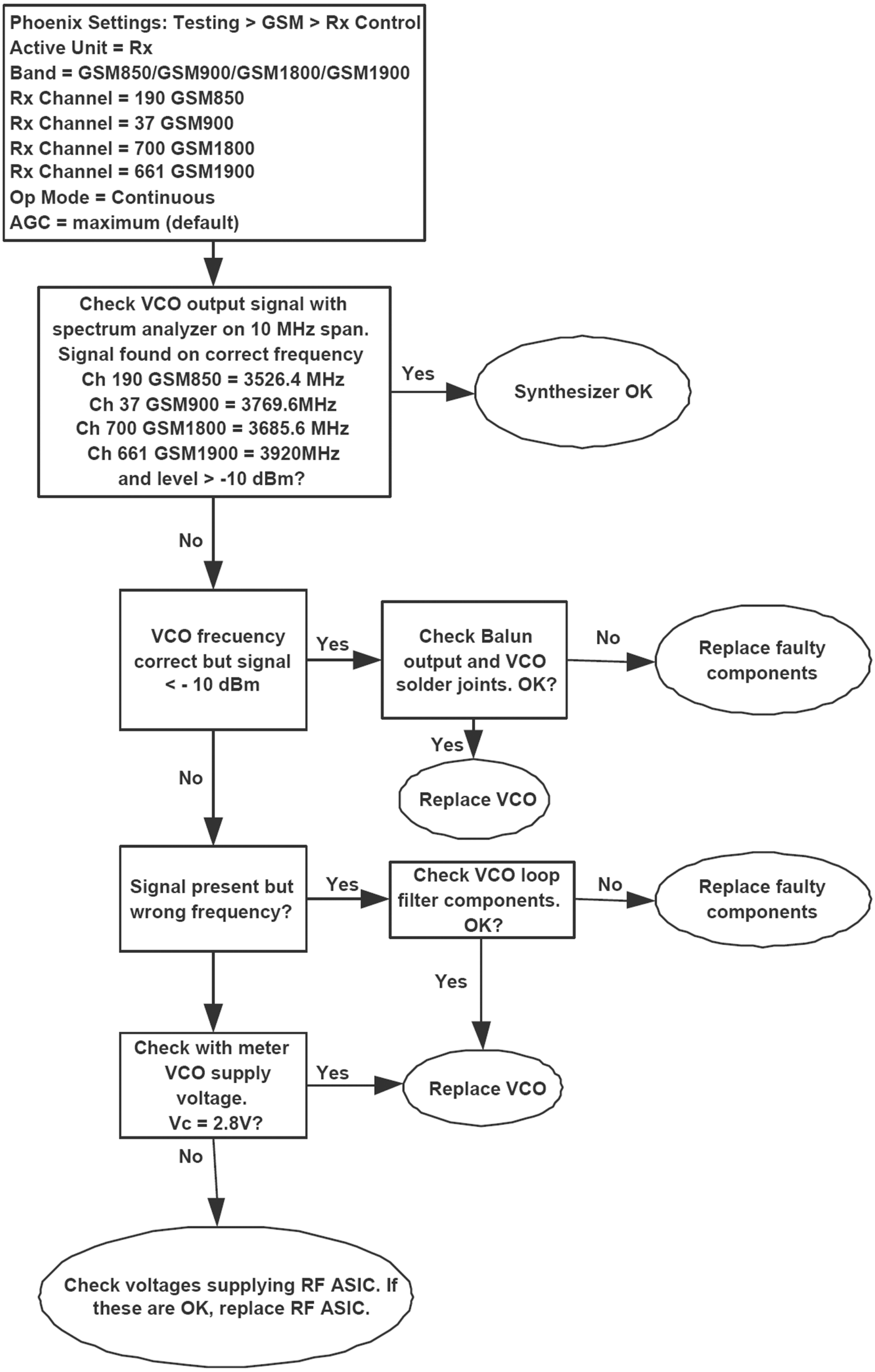
RF ASIC troubleshooting

Troubleshooting flow



Synthesizer troubleshooting

Troubleshooting flow



Synthesizer test points

Measure	RF ASIC N7505	RF ASIC N7500	Expected Result
VCTXCO output voltage	G7501 pin 3	G7500 pin 3	38.4MHz 800 mVpp
RFCLKEXT			38.4MHz 500 mVpp
VCTXCO AFC voltage	C7507	C7505	1V

Measure	RF ASIC N7505	RF ASIC N7500	Expected Result
VCO	G7500	G7501	3526,4 MHz

Measure	RF ASIC N7505	RF ASIC N7500	Expected Result
VCO supply voltage	L7515	C7509	2.8V

Measure	RF ASIC N7505	RF ASIC N7500	Expected Result
VCO control voltage	C7516	C7510	1 to 3 V

RF ASIC N7505	RF ASIC N7500
C7516, C7511, R7501, R7511	C7510, C7512, R7503, R7504

Receiver troubleshooting

Introduction to Rx troubleshooting

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

The primary Rx troubleshooting parameter RSSI (Receiving Signal Strength Indicator). For GSM RSSI measurement, see GSM Rx chain activation for manual measurements / GSM RSSI measurement (page 7–12), and for the same measurement in WCDMA, see WCDMA RSSI measurement (page 7–13).

In GSM, the input signal can be either a real GSM signal or a CW (Continuous Wave) signal, which is 67.771 kHz above the carrier frequency.

In WCDMA, the input signal can be either a real WCDMA signal or a CW signal, which is 1 MHz above the carrier frequency.

For service tool usage instructions, refer to section **Service Tools and Service Concepts**.

Related information

- WCDMA Rx chain activation for manual measurement (page 7–12)

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

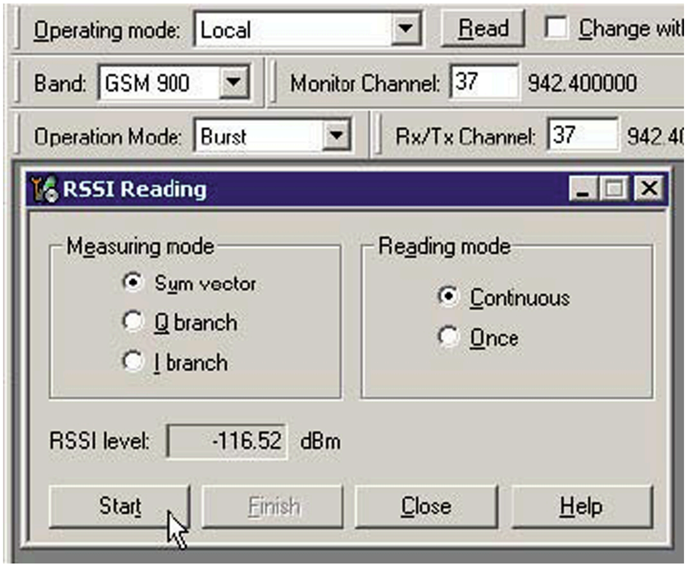
RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for channel frequency +67.771 kHz CW mode with –80 dBm signal.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.
4. In the *RSSI Reading* window, select the appropriate band and channel.



Operating mode: Local
☐ Change wit
Band: GSM 900
Monitor Channel: 37 942.400000
Operation Mode: Burst
Rx/Tx Channel: 37 942.4

RSSI Reading

Measuring mode
● Sum vector
○ Q branch
○ I branch

Reading mode
● Continuous
○ Once

RSSI level: -116.52 dBm

Figure 52 ***RSSI Reading* window**

5. To start the measurement, activate GSM Rx chain, click **Start**.

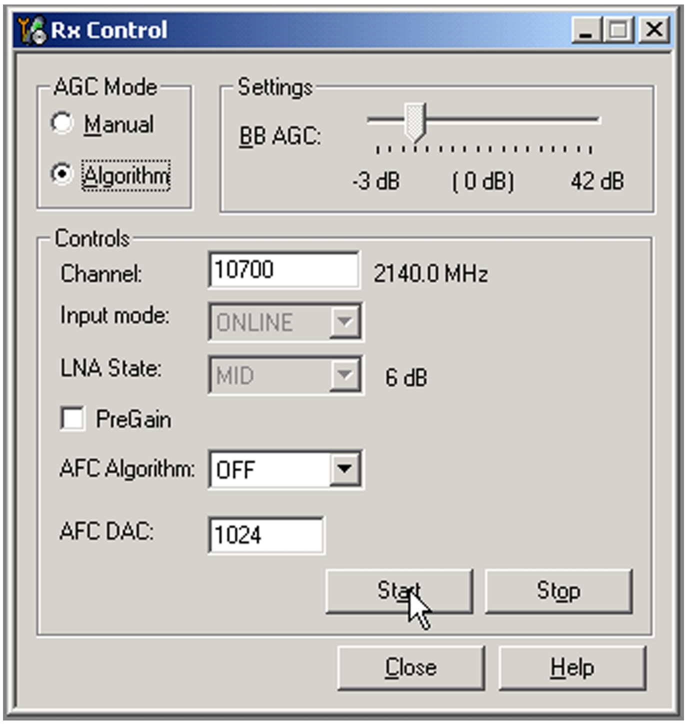
Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value which is set at the signal generator (-80 dBm).

WCDMA Rx chain activation for manual measurement

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Control** .
3. In the *Rx Control* window:



○ Manual
● Algorithm

BB AGC: -3 dB (0 dB) 42 dB

Channel: 10700 2140.0 MHz
Input mode: ONLINE
LNA State: MID 6 dB
☐ PreGain
AFC Algorithm: OFF
AFC DAC: 1024

Figure 53 ***Rx Control*** **window**

- Set **AGC Mode** to **Algorithm**.
- Set **Channel** to **10700**.
- Set **AFC Algorithm** to **OFF** (Default = **OFF**).

Next actions

When settings are ready, click **Start** to activate them.

If settings are changed later on (for example, you give a new channel number), you will need to click **Stop** and **Start** again.

> **Note:** Clicking **Stop** also disables **Tx Control** if that was active!

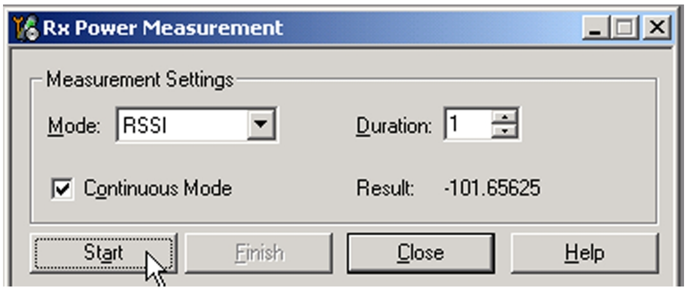
WCDMA RSSI measurement

Prerequisites

WCDMA Rx must be activated before RSSI can be measured. See WCDMA Rx chain activation for manual measurement (page 7–12).

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Power Measurement** .
3. In the *Rx Power Measurement* window, choose the following settings:
    - Mode: RSSI
    - Continuous Mode



Mode: RSSI

Duration: 1

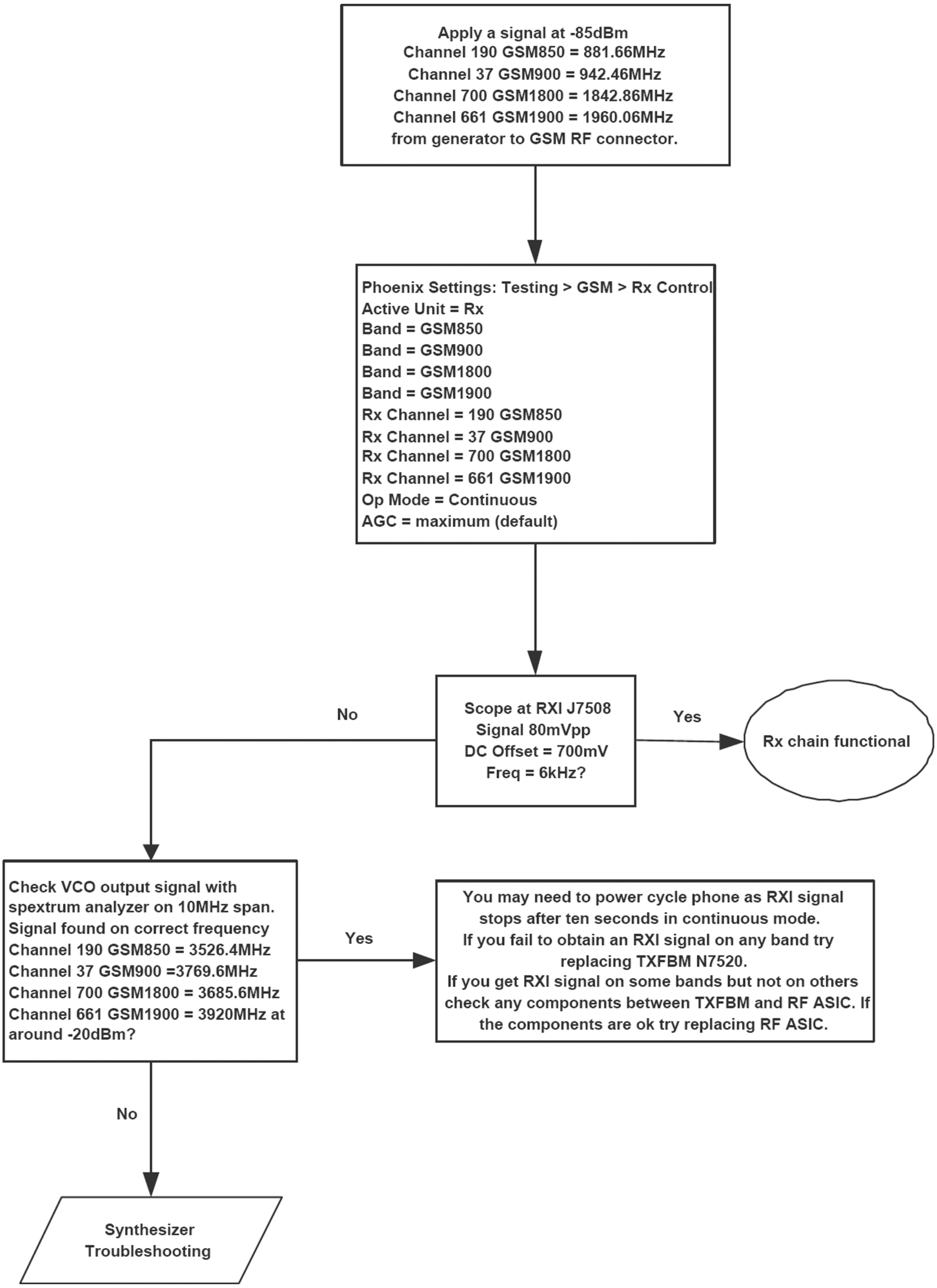
☑ Continuous Mode

Result: -101.65625

4. To perform the measurement, click **Start**.

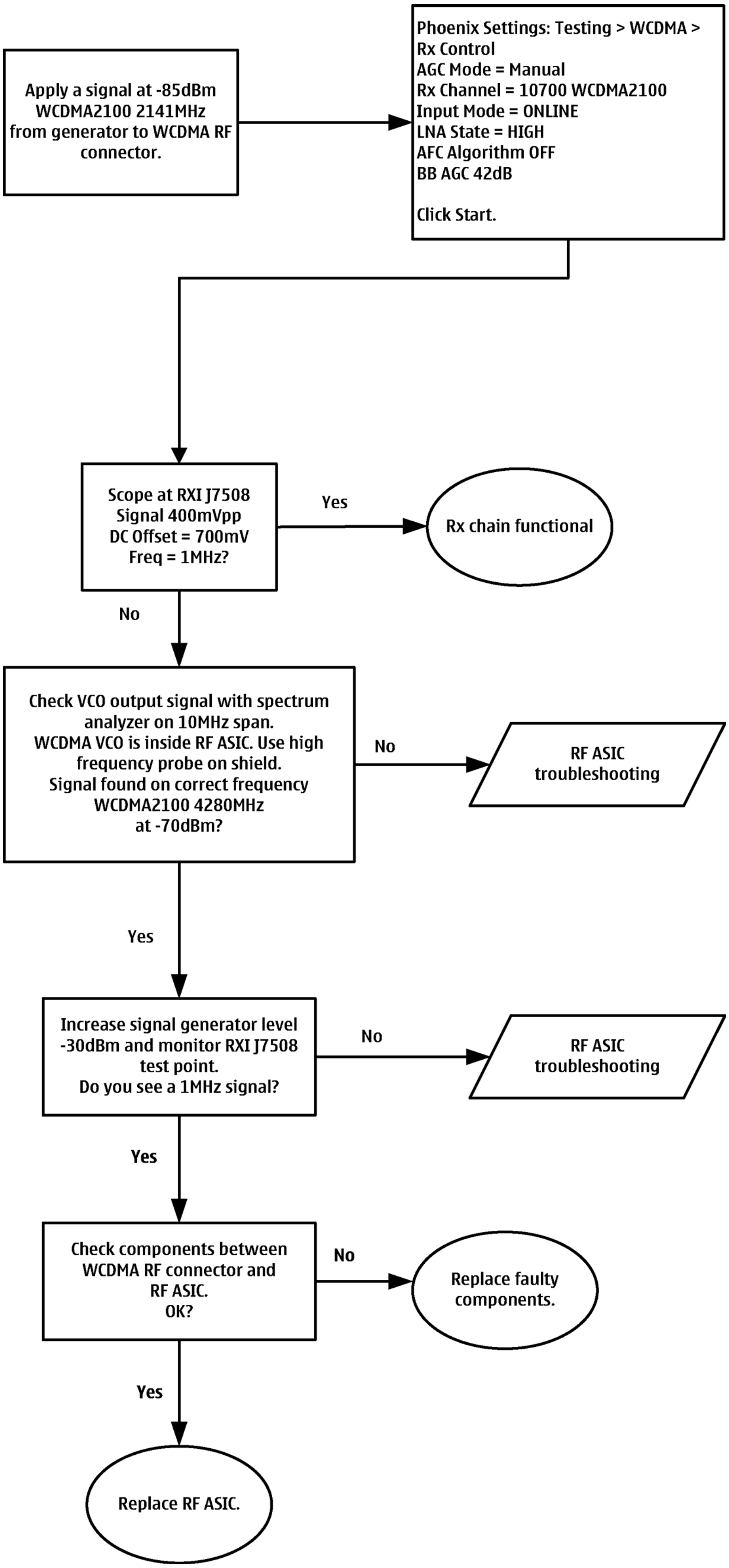
GSM receiver troubleshooting

Troubleshooting flow



WCDMA receiver troubleshooting

Troubleshooting flow



Receiver test points

Measure	RF ASIC N7505	RF ASIC N7500	Expected Result
RXIP	J7508	J7508	400 mVpp and 700mVDC
RXIN	U87	J7509	400 mVpp and 700mVDC
RXQP	J7510	No test point	400 mVpp and 700mVDC
RXQN	J7529	No test point	400 mVpp and 700mVDC

Band	RF ASIC N7505	RF ASIC 7500	Expected Result
GSM850	L7504	No test point	881,66771 MHz at 50dBm
GSM900	L7505	No test point	942,46771 MHz at 50dBm
GSM1800	L7501	C7515	1842,86771 MHz at 50dBm
GSM1900	L7500	C7514	1960,06771 MHz at 50dBm

Transmitter troubleshooting

General instructions for Tx troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use.
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The best diagnostic tool for GSM transmitter testing is **RF Controls**, and for the WCDMA transmitter testing **Tx Control**.

  Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a repair procedure.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software. The first section is for the EGSM900/GSM1800/GSM1900 bands and the latter for WCDMA.

> **Caution:** Never activate the GSM or WCDMA transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM or WCDMA PA may be damaged.

Steps

1. Connect a module jig to a computer with a DAU-9S cable or to a FPS-10 flash prommer with a modular cable.

   Make sure that you have a PKD-1 dongle connected to the computer parallel port.

2. Connect a DC power supply to a product-specific module jig.

   Note: When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.

   Set the DC supply voltage to 3.9 V.

3. Connect an RF cable between the RF connector of the product-specific module test jig and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector; otherwise GSM or WCDMA PA may be damaged.

   Note: There are three antenna connectors in the module jig:

   - one for GSM
   - one for WCDMA
   - one for Bluetooth

   Make sure that all connections are made to the correct RF connector.

   Normally a spectrum analyser is used as measurement equipment.

   Note: The maximum input power of a spectrum analyser is +30 dBm.

   To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

4. Set Tx on.

   i Place the phone module to the test jig and start *Phoenix* service software.

   ii Initialize connection to the phone (with FPS-10 use FBUS when using a DAU-9S cable and a COMBOX driver).

   iii Choose **File→Open Product→xx-x*** (* = type designator of the phone) or **File→Scan Product.** .

   iv From the toolbar, set **Operating mode** to **Local.**

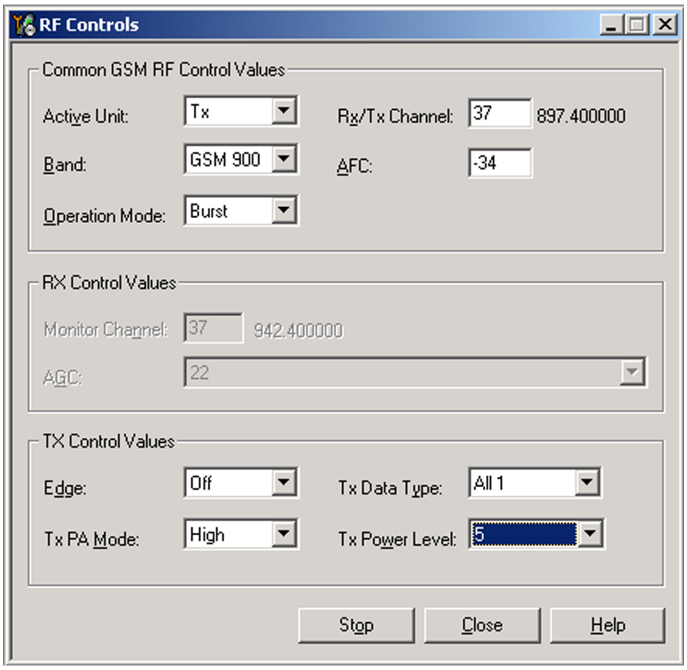
Alternative steps

- EGSM900/GSM1800/GSM1900 troubleshooting

  i Choose **Testing→GSM→RF Controls.**

  ii In the *RF Controls* window:

  - Choose **Band**: **GSM900** or **GSM1800** or **GSM1900** (Default = **GSM900**).
  - Set **Rx/Tx channel** in the following way:
    - GSM900: **37**
    - GSM1800: **700**
    - GSM1900: **661**
  - Set **Active unit** to **Tx** (Default = **Rx**).
  - Set **Operation Mode** to **Burst** (Default = **Burst**).
  - Set **Edge** to **Off** (Default).
  - Set **Tx Data Type** to **All 1** (Default = **All 1**).
  - Set **Tx PA Mode** to **High** (Default).
  - Set **Tx Power Level** in the following way:
    - GSM900: **5** (Default = **19**)
    - GSM1800: **0** (Default = **15**)
    - GSM1900: **0** (Default = **15**)



Common GSM RF Control Values

Active Unit: Tx

Rx/Tx Channel: 37 897.400000

Band: GSM 900

AFC: -34

Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000

AGC: 22

TX Control Values

Edge: Off

Tx Data Type: All 1

Tx PA Mode: High

Tx Power Level: 5

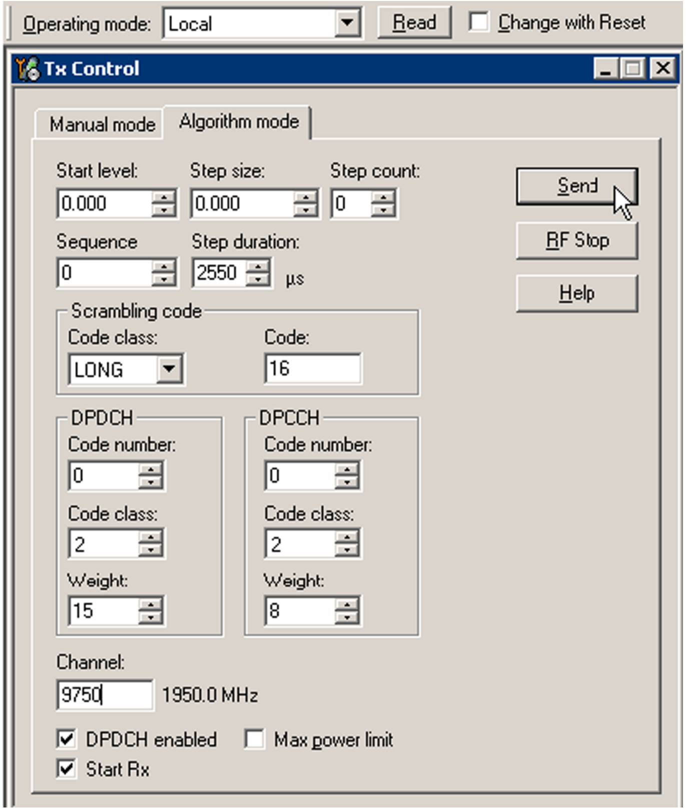
Figure 54 ***RF Controls*** **window**

- WCDMA troubleshooting

  i Choose **Testing→WCDMA→Tx Control.**

  ii In the *Tx Control* window:

  - Select the **Algorithm mode** tab.
  - Set **Start level** to **0** dBm (Default = **0**).
  - Set **Step size**, **Step count** and **Sequence** to **0** (Default = **0**).
  - In the **Scrambling code** pane set **Code class** to **LONG** (Default = **LONG**), and **Code** to **16** (Default = **16**).
  - For **DPDCH** set the following values:
    - **Code number**: **0**
    - **Code class**: **2**
    - **Weight**: **15**
  - For **DPCCH** set the following values:
    - **Code number**: **0**
    - **Code class**: **2**
    - **Weight**: **8**
  - Set **Channel** to **9750**.
  - Check the **DPDCH enabled** check box (Default).



Operating mode: Local
☐ Change with Reset

Start level: 0.000
Step size: 0.000
Step count: 0
Sequence: 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code number: 0
Code class: 2
Weight: 15

DPCCH
Code number: 0
Code class: 2
Weight: 8

Channel: 9750 1950.0 MHz

☑ DPDCH enabled ☐ Max power limit
☑ Start Rx

Figure 55 ***Tx Control*** **window**

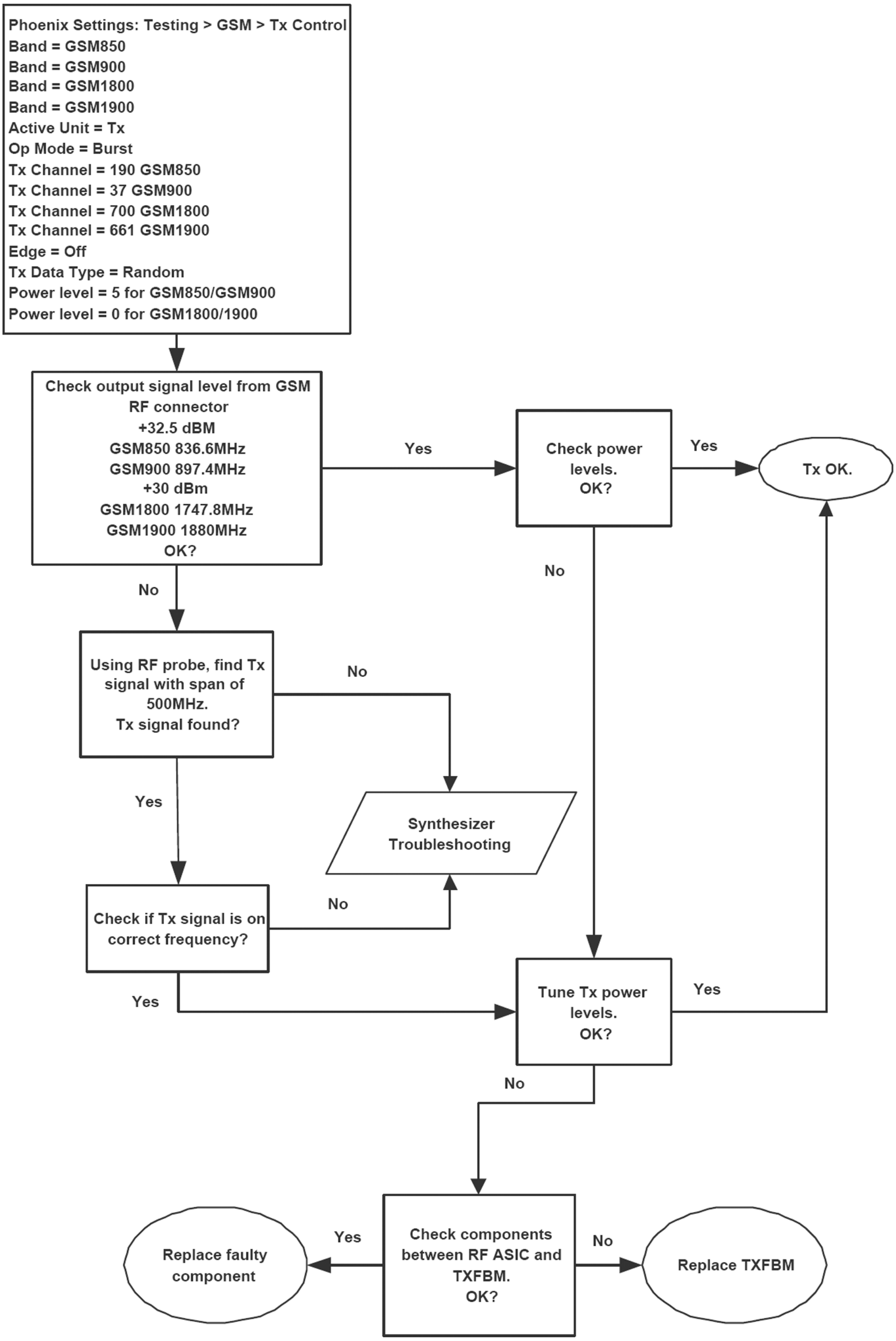
Next actions

When settings are done, click **Send** to enable them.

If you change the settings (e.g. give a new channel number), you need to click **Stop** and **Send** again.

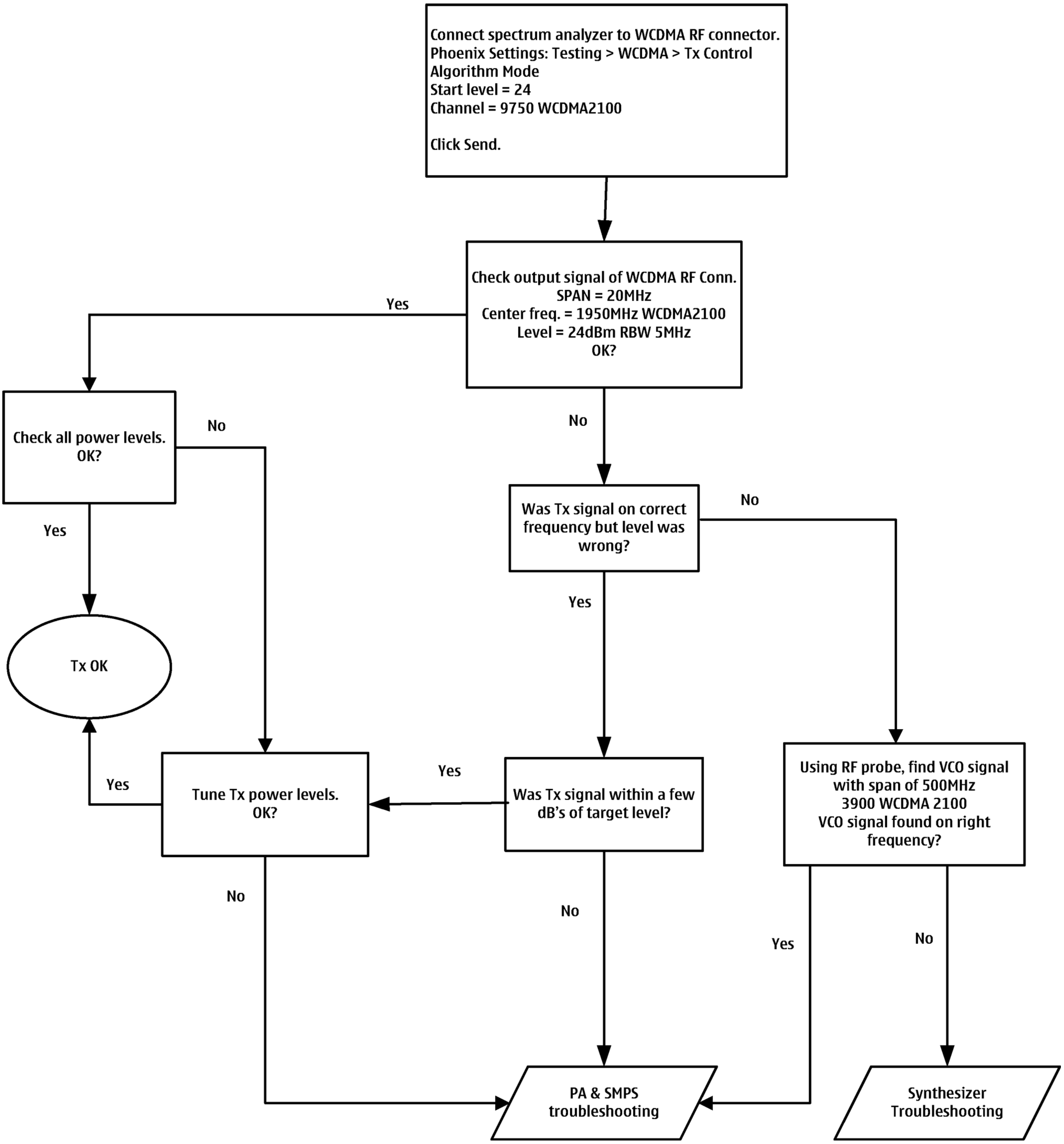
GSM transmitter troubleshooting

Troubleshooting flow



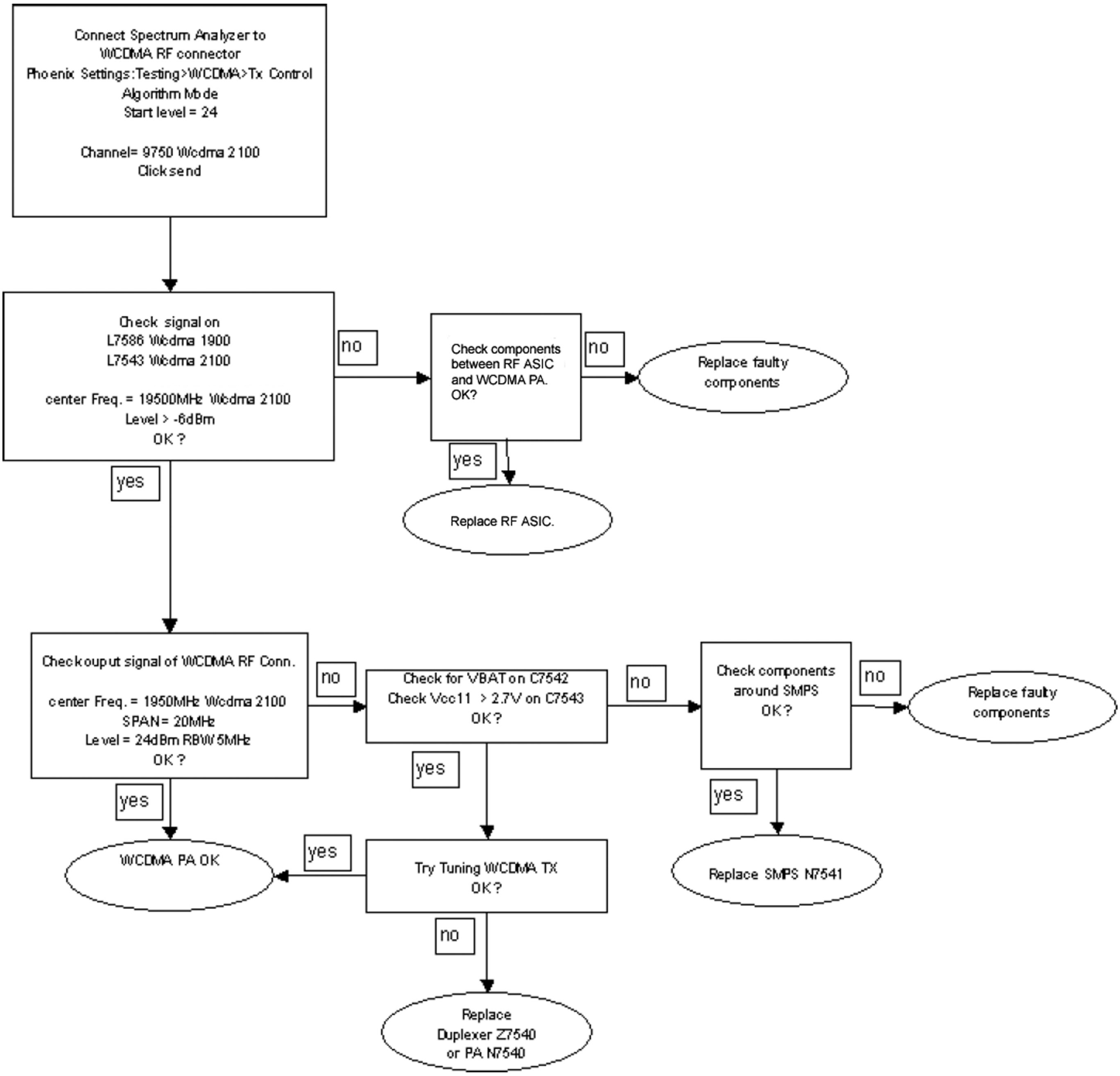
WCDMA transmitter troubleshooting

Troubleshooting flow



Power amplifier (PA) and switch mode power supply (SMPS) troubleshooting

Troubleshooting flow



RF tunings

Introduction to RF tunings

Phone RF is tuned in production. There is no reason to do the re-calibration unless:

- One or more of the RF components is changed
- FLASH memory chip (D5000) is changed or otherwise corrupted.

Note: RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF side.

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken into account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. The following table presents the RF attenuations of the product-specific module jig:

Band	Attenuation
GSM850	0.25dB
GSM900	0.25dB
GSM1800	0.4dB
GSM1900	0.45dB
WCDMA 2100	0.5dB

RF autotuning

Prerequisites

For information on the recommended test set-up, refer to the corresponding information on the Partner Website or Nokia Online.

Before you can use the autotuning feature, the GPIB driver from the GPIB card vendor must be installed and running.

The autotune **.xml** file must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x* \rfconf_xx-x*.xml** (**= indicates the type designator of the phone, e.g. RM-1*)

Context

RF autotuning is performed with the aid of a digital radio communication tester.

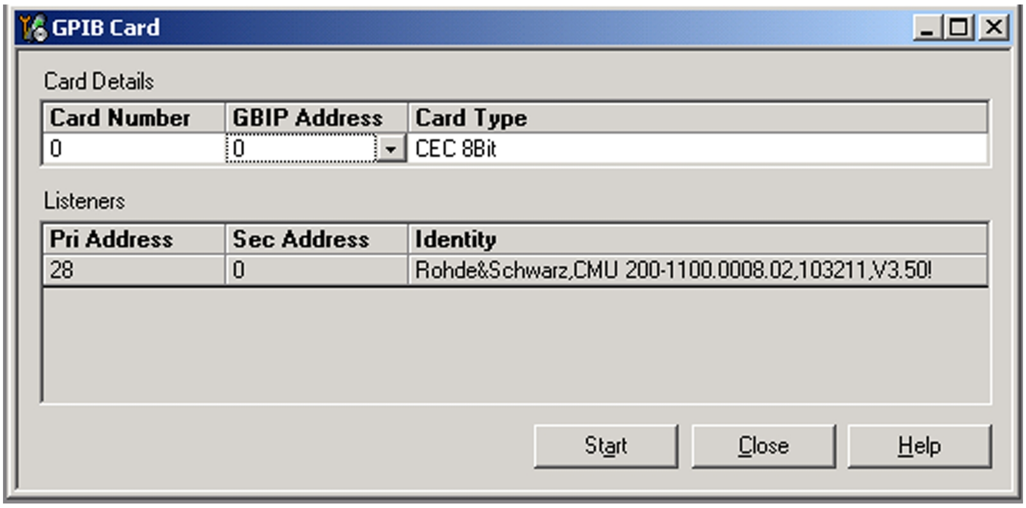
Autotuning covers all RF tunings that are needed to perform after RF component repairs.

Note: Do not perform RF autotuning without a proper reason. Autotuning may only be performed after component repairs or if the RF tuning information is lost.

Steps

1. Connect the communication tester to the GPIB bus.
2. Start *Phoenix* service software.
3. Choose **Tools→Options→GPIB Card.**
4. From the **Card Type** drop-down menu, choose the GPIB card used, then click **Start**.

   The name of the communication tester appears in the **Listeners** pane.

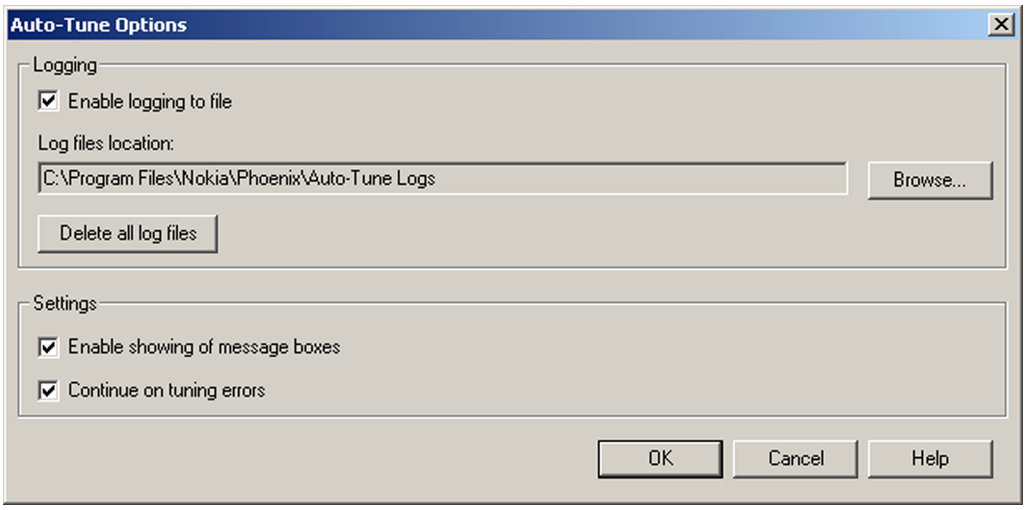


Card Number	GBIP Address	Card Type
0	0	CEC 8Bit

Pri Address	Sec Address	Identity
28	0	Rohde&Schwarz,CMU 200-1100.0008.02,103211,V3.50!

5. To specify the cable loss from a module jig to the communication tester, choose **Set Loss** from the **Tuning** menu.
6. In the *Set Loss* window, click the **Jig** tab, and select the right jig for the phone from the drop-down list.

   Alternatively, you can add a new jig by clicking **Add**, and selecting the desired jig from the list.
7. Click the **Cable** tab and add the extra cable attenuation.
8. To start autotuning, choose **Auto-Tune** from the **Tuning** menu.
9. In the *Auto-Tune* window, click **Options**.
10. In the *Auto-Tune options* window, ensure the **Enable showing of message boxes** check box is checked, and click **OK**.



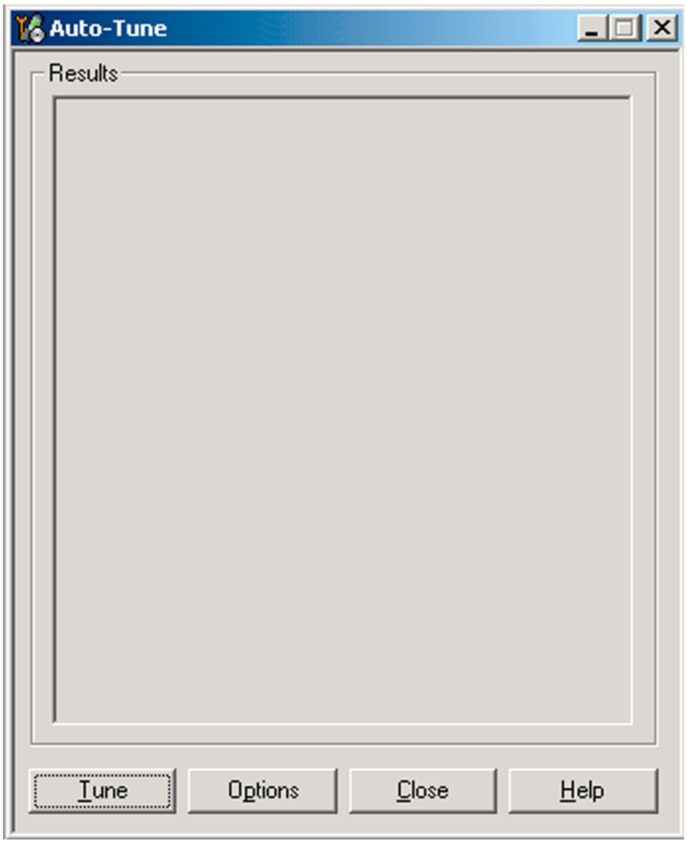
☑ Enable logging to file

Log files location: C:\Program Files\Nokia\Phoenix\Auto-Tune Logs

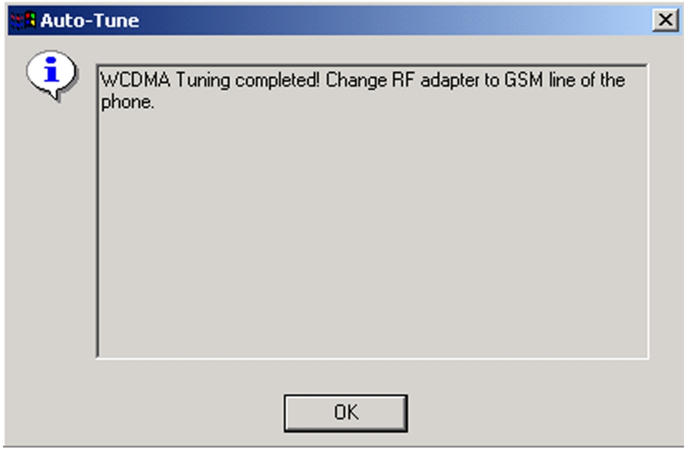
☑ Enable showing of message boxes

☑ Continue on tuning errors

11. Connect the phone WCDMA RF port to the communication tester, and click **Tune**.



12. Change the phone RF adapter from WCDMA port to GSM port.

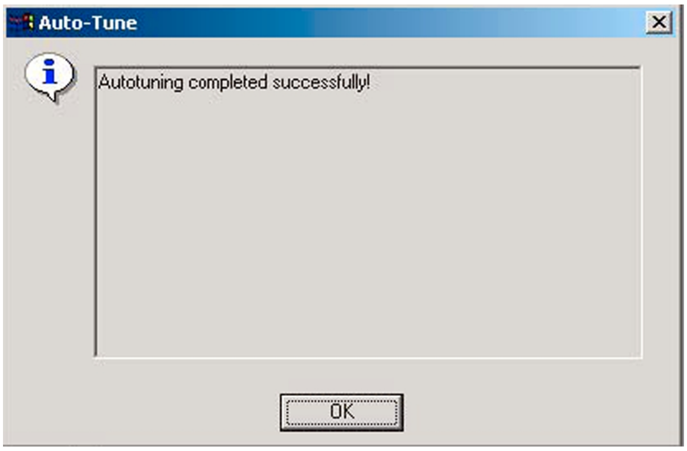


WCDMA Tuning completed! Change RF adapter to GSM line of the phone.

13. To complete the RF autotuning, click **OK**.

Results

Autotuning completed successfully! message appears.



Autotuning completed successfully!

RF manual tuning guide

Required manual tunings after component changes

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

If, however, manual tuning is used, only relevant tunings should be performed. Refer to the following table:

Changed component	Perform the following tunings
RF ASIC N7500	RF Channel Filter Calibration, Temperature Sensor Calibration, Rx calibration (GSM), Rx band filter response compensation (GSM), TxIQ Tuning (GSM), Tx Power Level Tuning (GSM), Rx calibration (WCDMA), Tx AGC & Power Detector (WCDMA), Tx Band Response Calibration (WCDMA), Tx LO Leakage (WCDMA)
Any component in the GSM TX RF chain before the PA	Tx IQ Tuning, Tx Power Level Tuning
Any component in the GSM TX RF chain after the PA or PA	Tx Power Level Tuning
Any component in the WCDMA TX RF chain before the PA	Tx AGC & Power Detector, Tx Band Response Calibration, Tx LO Leakage
Any component in the WCDMA TX RX chain after the PA, PA, power detector or PA switch mode power supply	Tx AGC & Power Detector, Tx Band Response Calibration, PA Detection
Any component in the GSM RX chain	Rx Calibration, RX Band Filter Response Compensation
Any component in the WCDMA RX chain	Rx AGC Alignment, RX Band Response Calibration
VCTCXO G7500	Rx Calibration (GSM900 band)

System mode independent manual tunings

RF channel filter calibration

Context

RF channel filter calibration tunes RF ASIC's internal low pass filters that limit the bandwidth of BB IQ signals.

One common calibration is made for GSM and WCDMA.

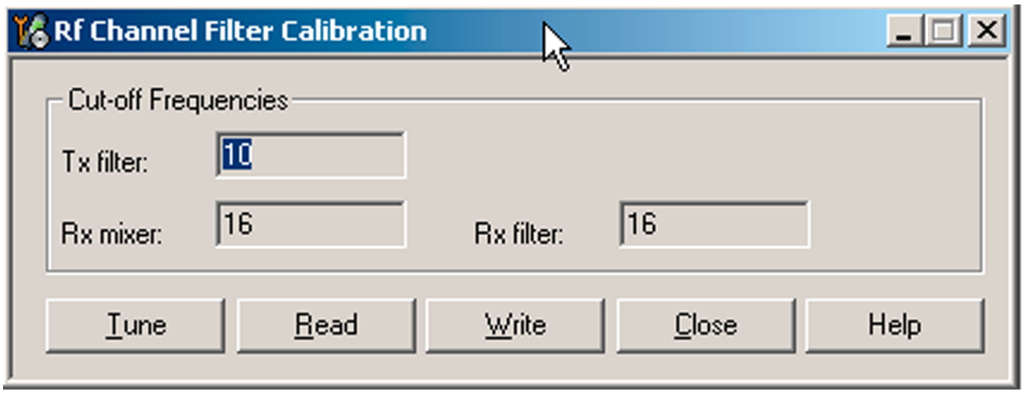
Table 16 RF channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31

Steps

1. From the "Operating mode" dropdown menu, set mode to "Local".
2. From the Tuning menu, choose "RF Channel Filter Calibration".
3. Click Tune.
4. To save the values to the PMM (Permanent Memory) area, click Write.
5. To close the tuning window, click Close.

Results



Tx filter: 10

Rx mixer: 16

Rx filter: 16

Figure 56 RF channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.

4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

Temperature sensor calibration

Context

There is a temperature sensor intergrated into the RF ASIC. The RF ASIC produces a DC-voltage, which is temperature dependent.

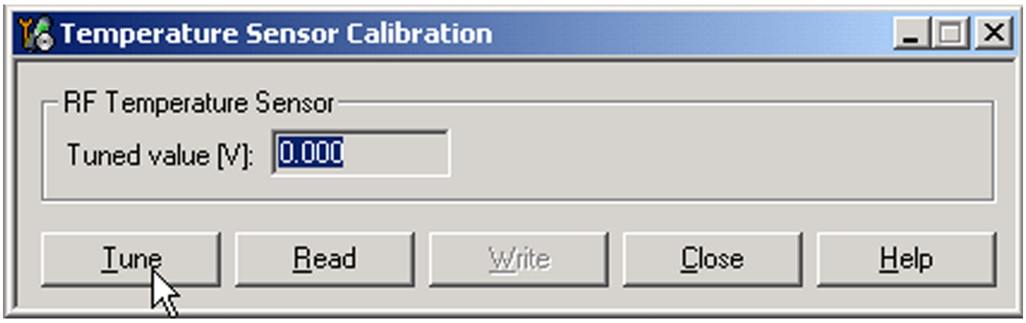
Temperature sensor calibration is done in room temperature, in which offsets caused by variations with Rx/Tx ASIC and the AD-converter inside EM ASIC N2200, are removed.

The engine calibrates itself, no external equipment is required.

The temperature of the engine must be 23°C plus or minus two degrees.

Steps

1. From the "Operating mode" dropdown menu, set mode to "Local".
2. From the Tuning menu, choose "Temperature Sensor Calibration".
3. Click "Tune".



Tuned value [V]: 0.000

Table 17 Temperature sensor calibration tuning limits

Min	Typ	Max	Unit
-20	-4	20	V

4. To save the calibration values, click "Write".
5. To finish the calibration, click "Close".

GSM receiver tunings

Rx calibration (GSM)

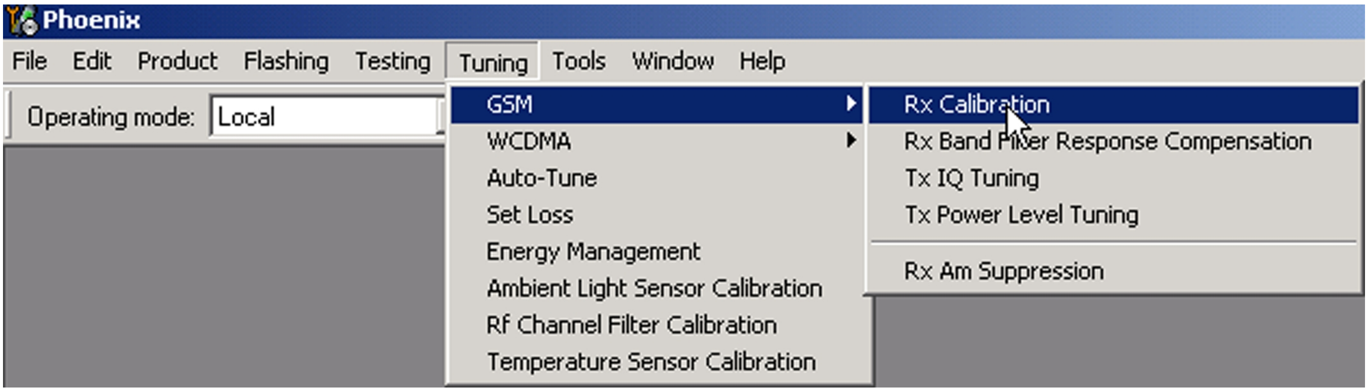
Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

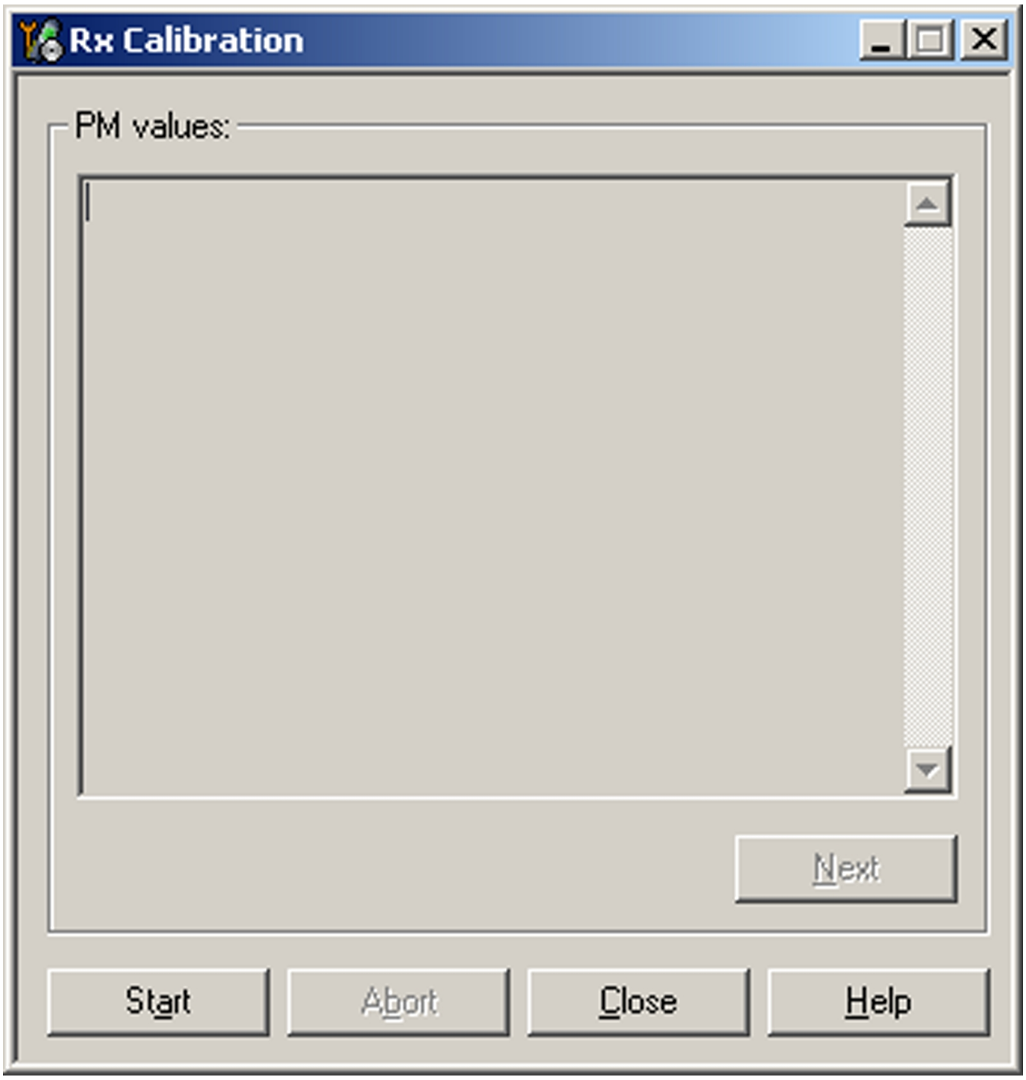
Steps

1. Connect the module jig’s GSM connector to signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".

3. From the Tuning menu, choose GSM -> Rx Calibration.



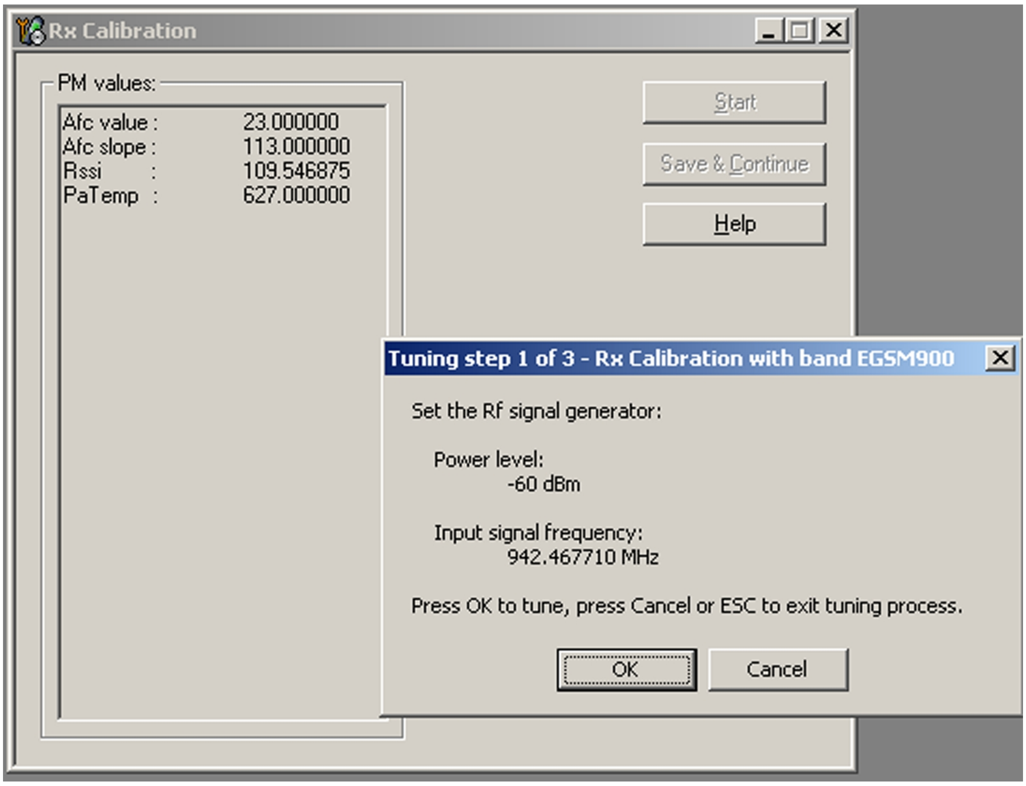
4. Check the “Load from Phone” check box and clear the “Save to Phone” check box.
5. From the Band dropdown menu, choose GSM900.
6. Click Start (if not active already).



7. Click Calibrate.

8. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Calibration with band EGSM900" popup window.

   The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!



Afc value : 23.000000
Afc slope : 113.000000
Rssi : 109.546875
PaTemp : 627.000000

Tuning step 1 of 3 - Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

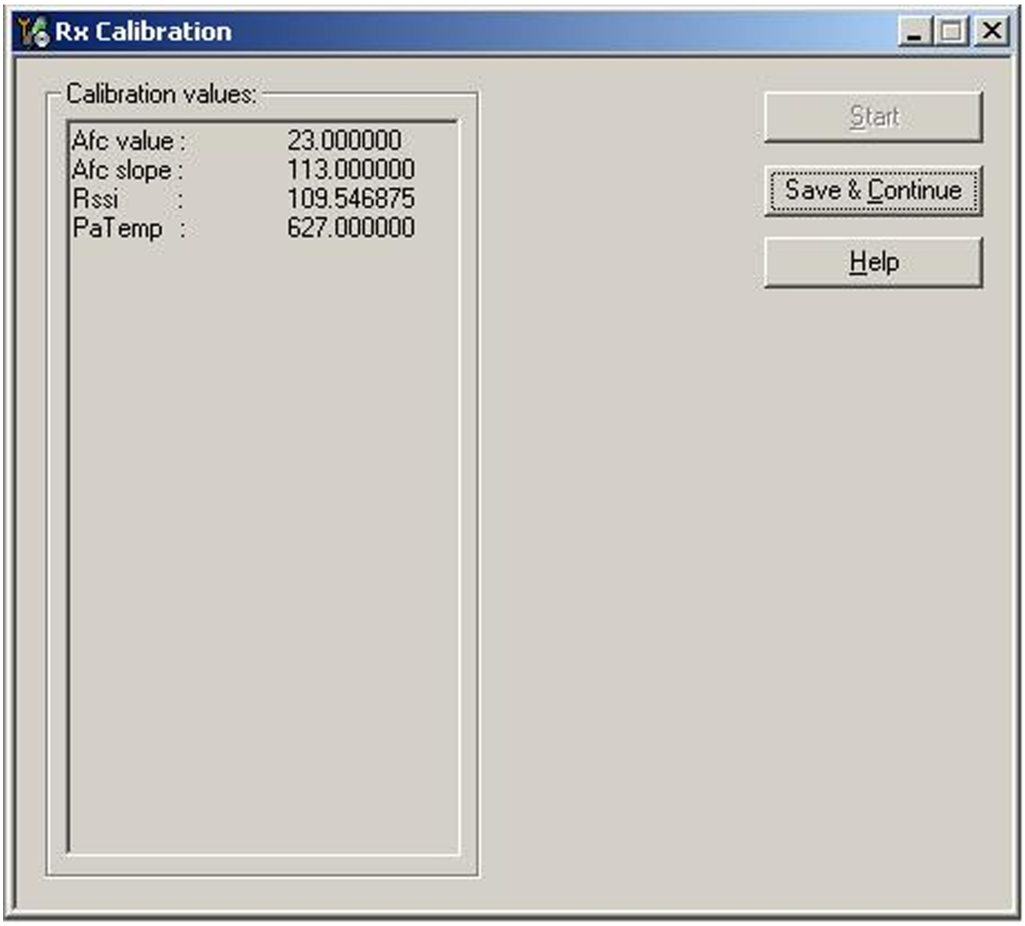
Press OK to tune, press Cancel or ESC to exit tuning process.

9. To perform tuning, click OK.
10. Check that the tuning values are within the limits specified in this table:

Table 18 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM850				
RSSI0	106	109...110	114	dB
GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

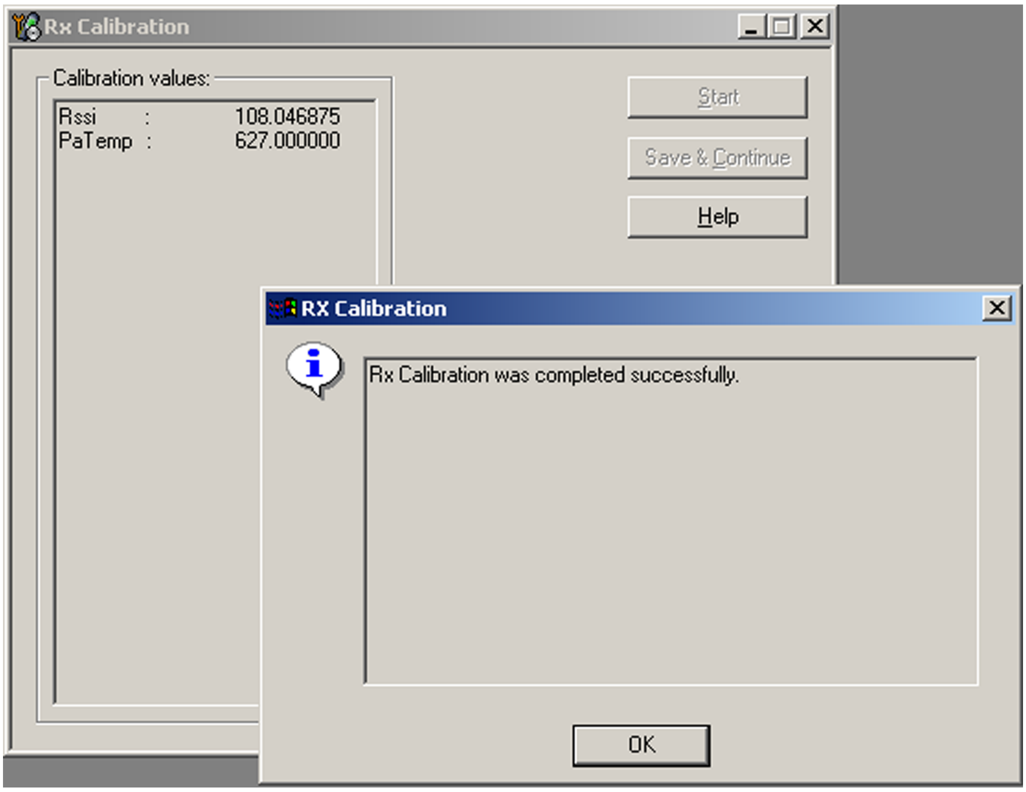
11. To save values to the phone, click "Save & Continue".



Afc value : 23.000000
Afc slope : 113.000000
Rssi : 109.546875
PaTemp : 627.000000

12. Repeat steps 3 to 8 for GSM850, GSM1800 and GSM1900.

Results



Calibration values:

Rssi : 108.046875
PaTemp : 627.000000

Rx Calibration was completed successfully.

Rx band filter response compensation (GSM)

Prerequisites

Rx Calibration must be performed before the Rx Band Filter Response Compensation.

Context

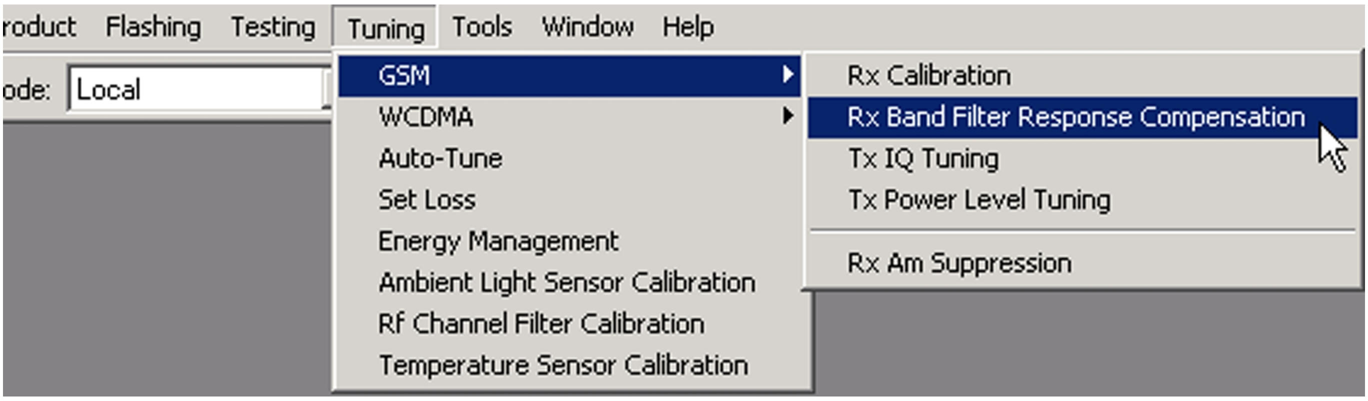
On each GSM Rx band, there is a band rejecting filter in front of the LNA (Low Noise Amplifier). The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

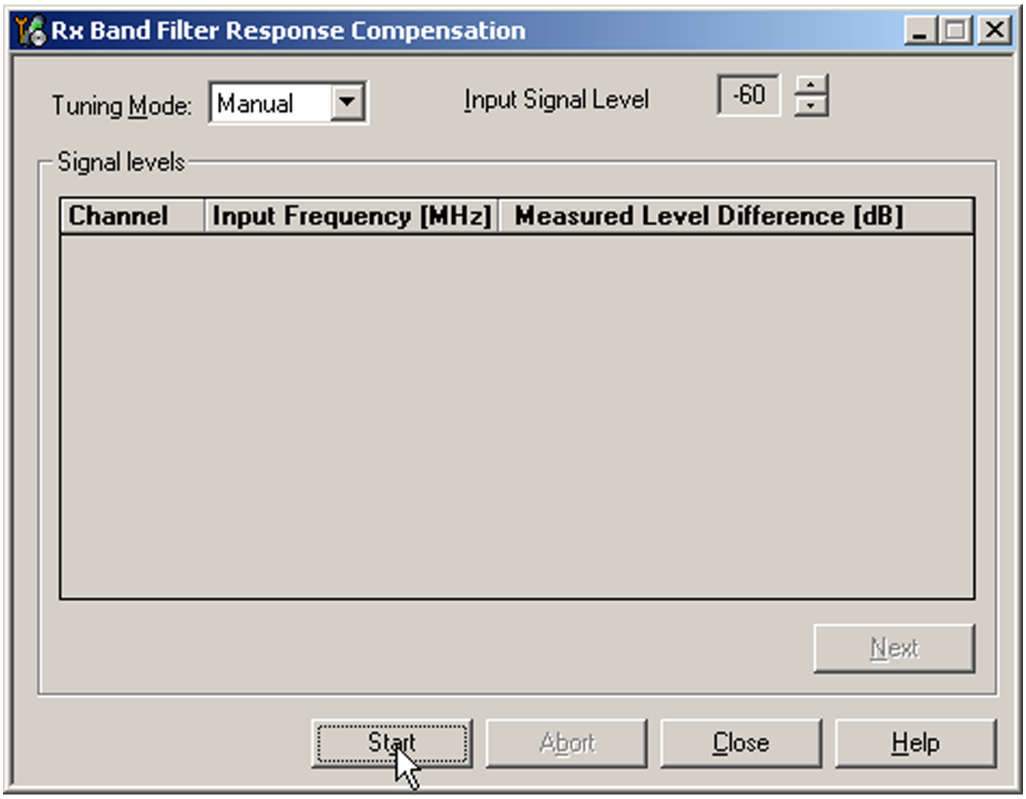
Steps

1. Connect the module jig’s GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. Select GSM900 band.

4. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.



5. In the *Tuning mode* pane, select **Manual**.
6. Click Start.

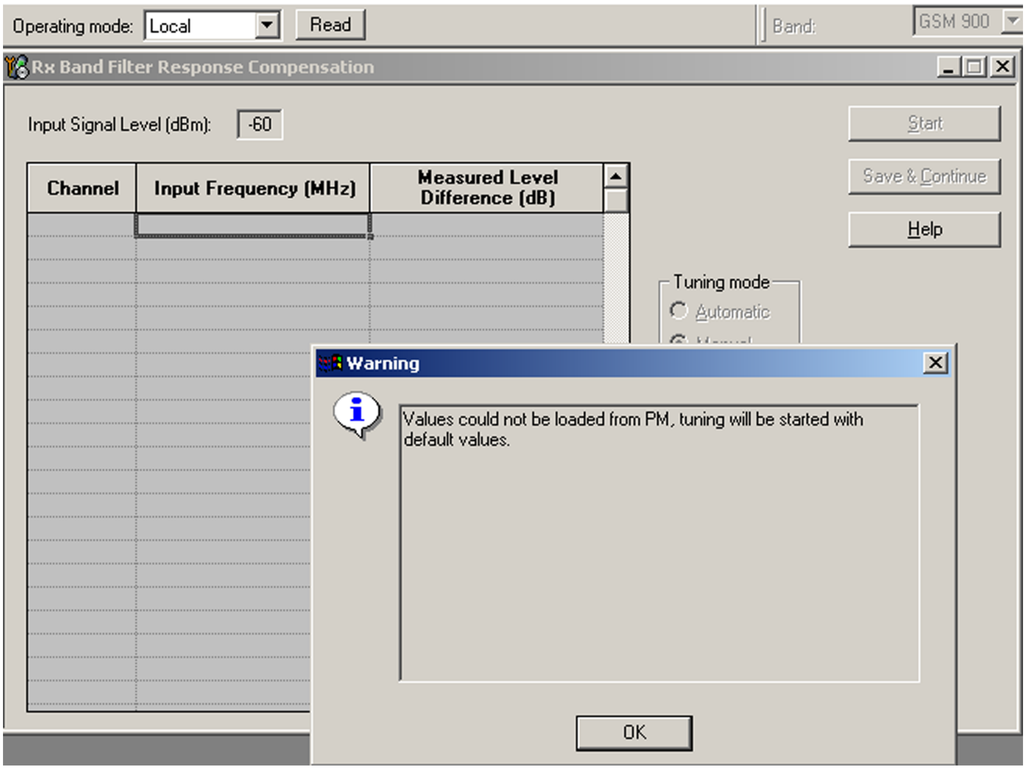


Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]

7. Click *Save & Continue*.

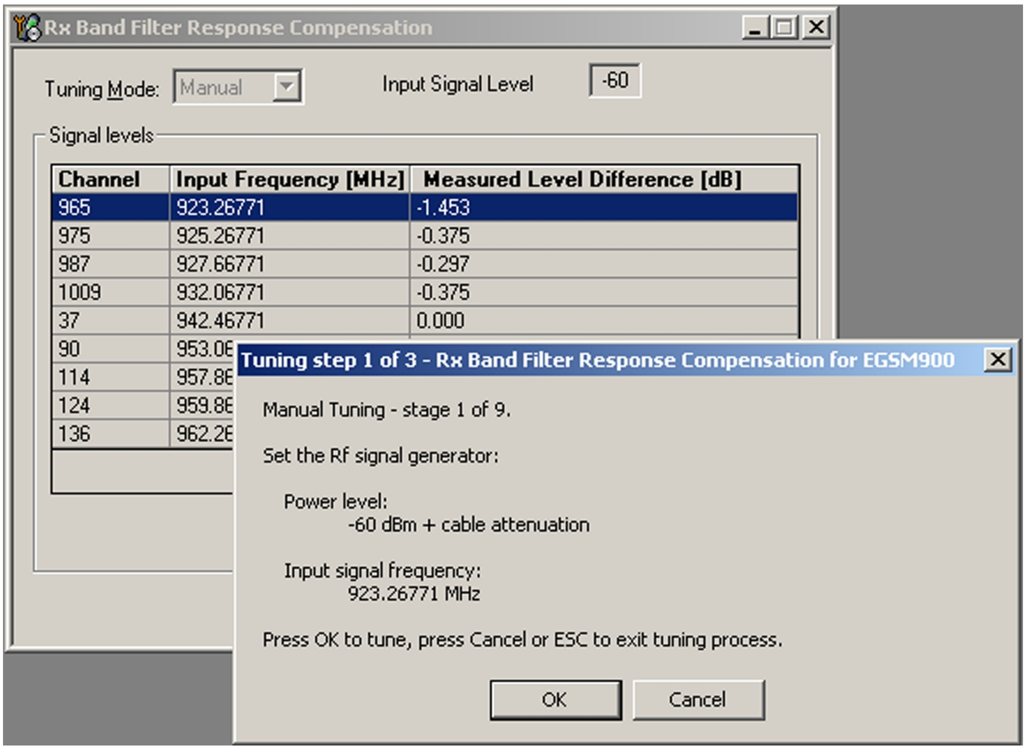


Input Signal Level (dBm): -60

Channel	Input Frequency (MHz)	Measured Level Difference (dB)

Values could not be loaded from PM, tuning will be started with default values.

8. Connect the signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.



Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-1.453
975	925.26771	-0.375
987	927.66771	-0.297
1009	932.06771	-0.375
37	942.46771	0.000
90	953.0	
114	957.8	
124	959.8	
136	962.2	

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

Power level:
-60 dBm + cable attenuation

Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

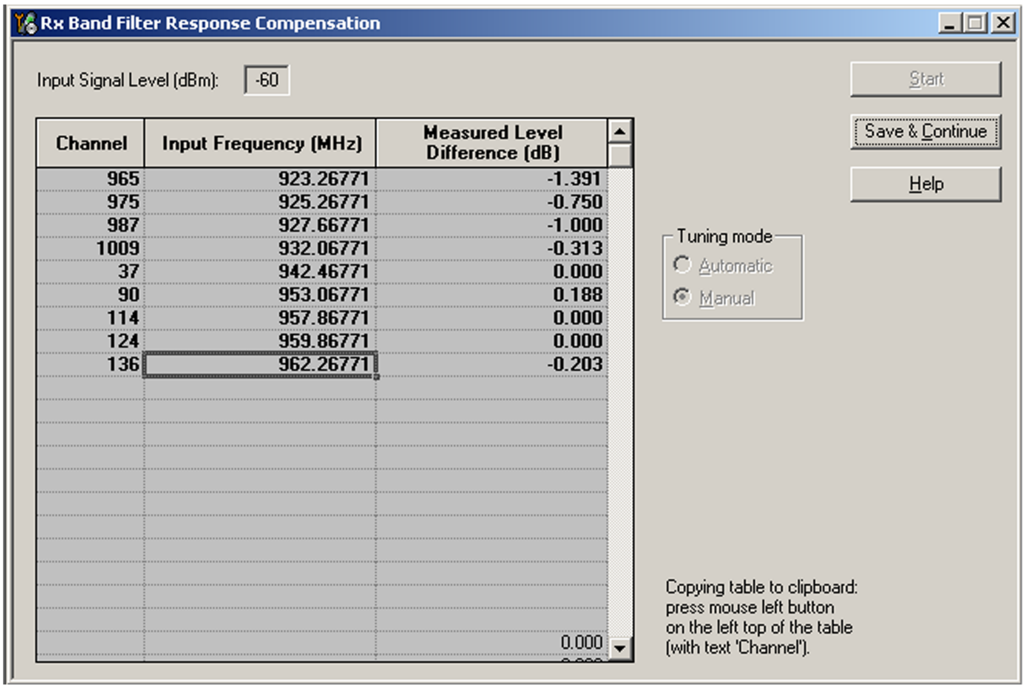
9. To perform tuning, click OK.
10. Go through all 9 frequencies.

11. Check that the tuning values are within the limits specified in the following table:

	Min	Typ	Max	Unit
GSM850				
Ch. 118/867.26771 MHz	-10	-1	5	dB
Ch. 128/869.26771 MHz	-3	0	5	dB
Ch. 140/871.66771 MHz	-3	0	5	dB
Ch. 172/878.06771 MHz	-3	0	5	dB
Ch. 190/881.66771 MHz	-3	0	5	dB
Ch. 217/887.06771 MHz	-3	0	5	dB
Ch. 241/891.86771 MHz	-3	0	5	dB
Ch. 251/893.86771 MHz	-3	0	5	dB
Ch. 261/895.86771 MHz	-10	1	5	dB
GSM900				
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	
GSM1800				
Ch. 497 / 1802.26771 MHz	-10	-1	5	dB
Ch. 512 / 1805.26771 MHz	-3	0	5	dB
Ch. 535 / 1809.86771 MHz	-3	0	5	dB
Ch. 606 / 1824.06771 MHz	-3	0	5	dB
Ch. 700 / 1842.86771 MHz	-3	0	5	dB
Ch. 791 / 1861.06771 MHz	-3	0	5	dB
Ch. 870 / 1876.86771 MHz	-3	0	5	dB
Ch. 885 / 1879.86771 MHz	-3	0	5	dB
Ch. 908 / 1884.46771 MHz	-10	-1	5	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-10	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB

	Min	Typ	Max	Unit
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-10	-1	5	dB

12. If the values are within the limits, click "Save & Continue".



Input Signal Level (dBm): -60

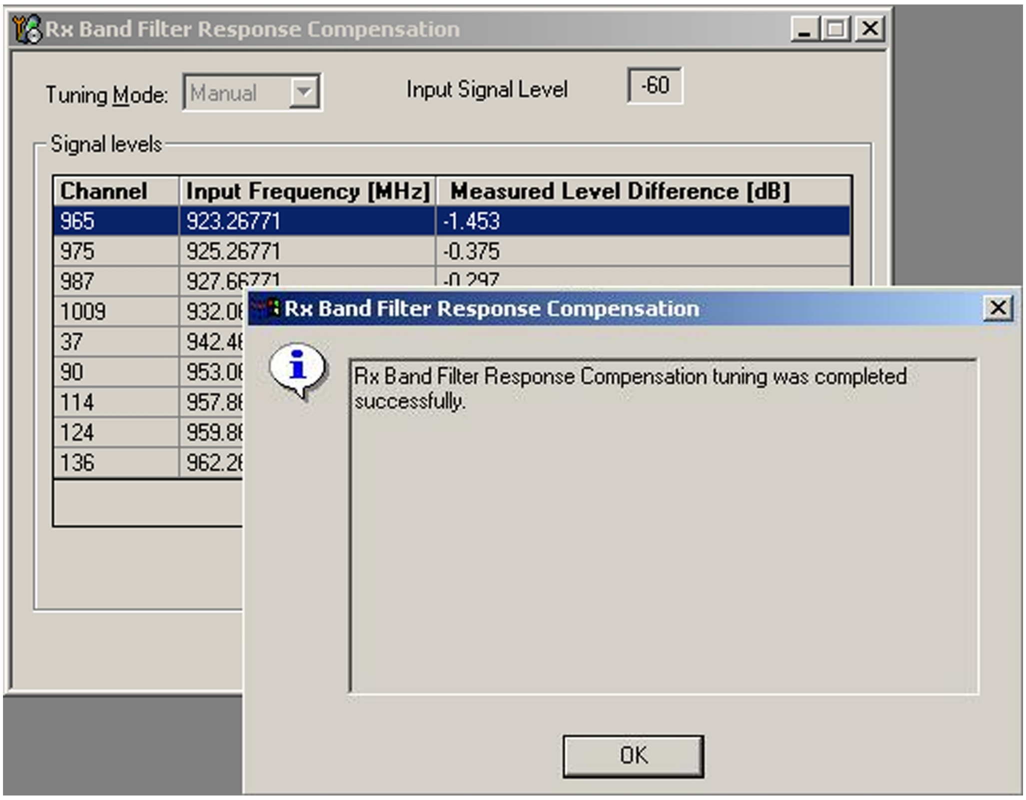
Channel	Input Frequency (MHz)	Measured Level Difference (dB)
965	923.26771	-1.391
975	925.26771	-0.750
987	927.66771	-1.000
1009	932.06771	-0.313
37	942.46771	0.000
90	953.06771	0.188
114	957.86771	0.000
124	959.86771	0.000
136	962.26771	-0.203
		0.000

Tuning mode
○ Automatic
● Manual

Copying table to clipboard:
press mouse left button
on the left top of the table
(with text 'Channel').

13. Repeat the steps 4 to 10 for GSM850, GSM1800 and GSM1900.

Results



Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-1.453
975	925.26771	-0.375
987	927.66771	-0.297
1009	932.0	
37	942.4	
90	953.0	
114	957.8	
124	959.8	
136	962.2	

Rx Band Filter Response Compensation tuning was completed successfully.

GSM transmitter tunings

Tx IQ tuning (GSM)

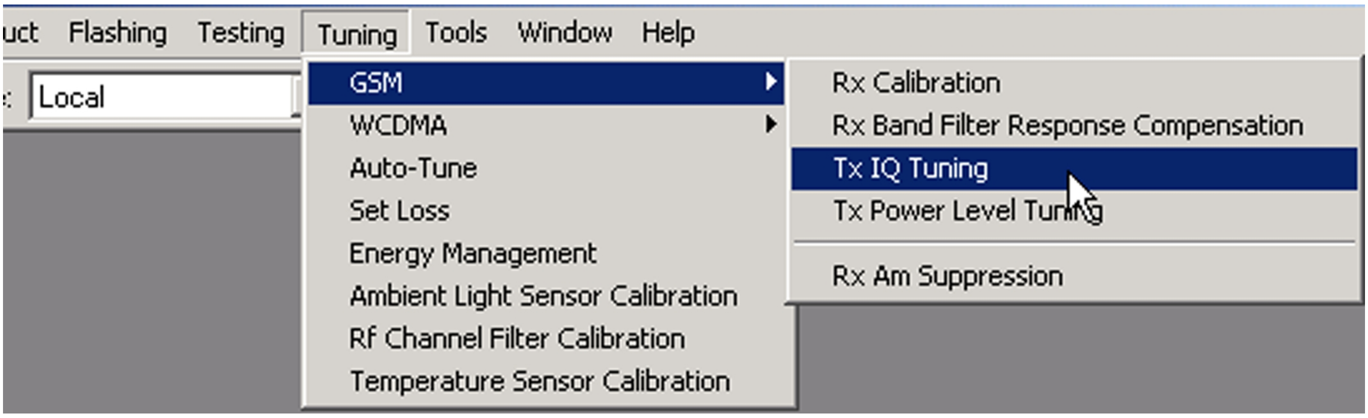
Context

- The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning balances the I and Q branches.
- Tx IQ tuning must be performed on all GSM bands.

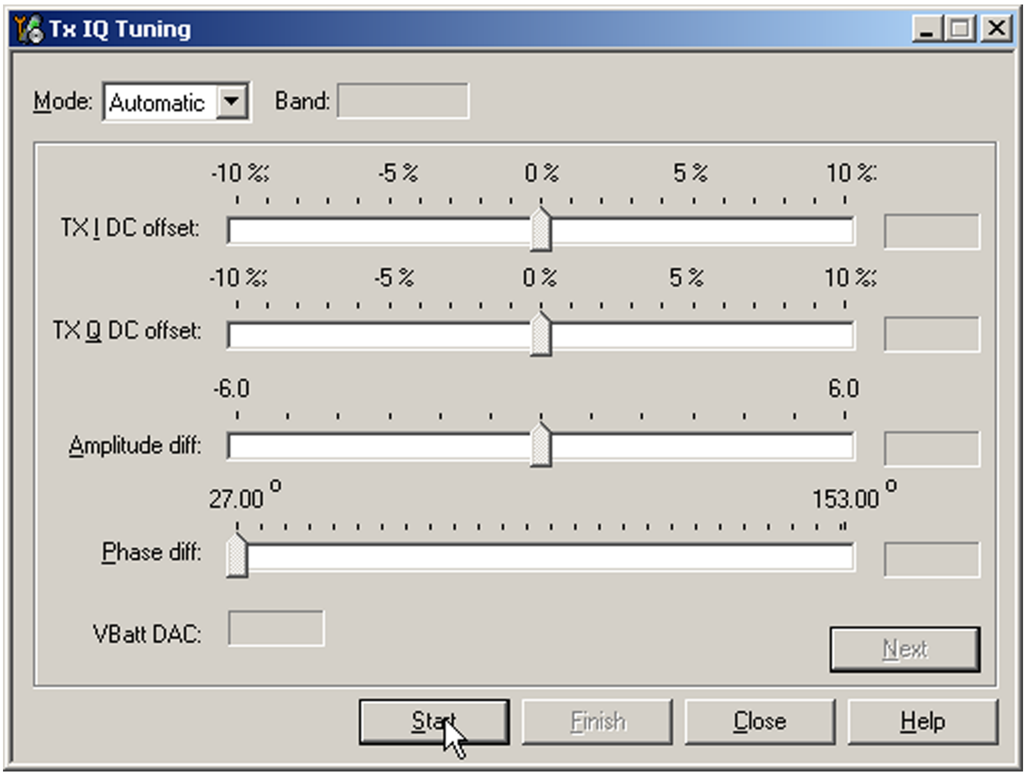
Steps

1. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and "Band" to GSM900.

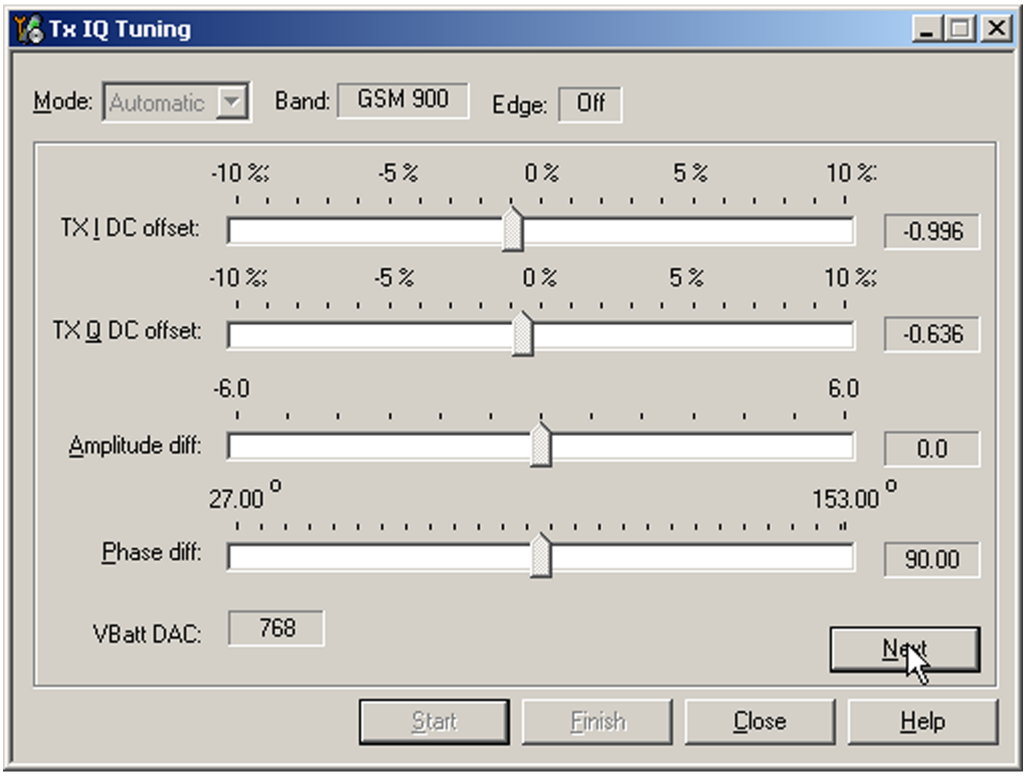
2. From the Tuning menu, choose GSM -> Tx IQ Tuning.



3. Set "Mode" to Automatic and "Edge" to Off.
4. Click Start.
   Wait until automatic tuning has finished and moved the sliders.
   Values are written to the phone memory automatically.


Mode: Automatic

5. When the values have been written to the phone memory, click Next to change to the next band.



Mode: Automatic
Band: GSM 900
Edge: Off
TX I DC offset: -0.996
TX Q DC offset: -0.636
Amplitude diff: 0.0
Phase diff: 90.00
VBatt DAC: 768

6. When all bands have been tuned, click Finish and Close to end the tuning procedure.

Next actions

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the following table. If they are not within the limits, check Tx IQ quality manually.

	Min	Typ	Max	Unit
GSM850/GSM900				
I DC offset / Q DC offset	-6	-4 4	6	dB
Ampl	-1	0	1	dB
Phase	85	90	95	dB
GSM1800/GSM1900				
I/Q DC	-6	0.5	6	dB
Ampl	-1	0	1	dB
Phase	95	100	110	dB

Tx power level tuning (GSM)

Context

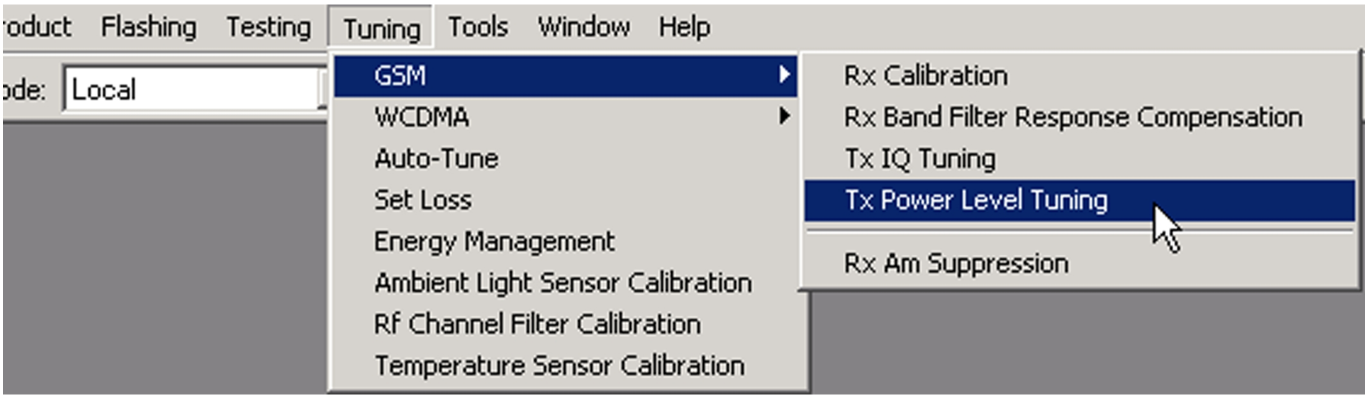
Because of variations at IC process and discrete component values, the actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

For EDGE transmission the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

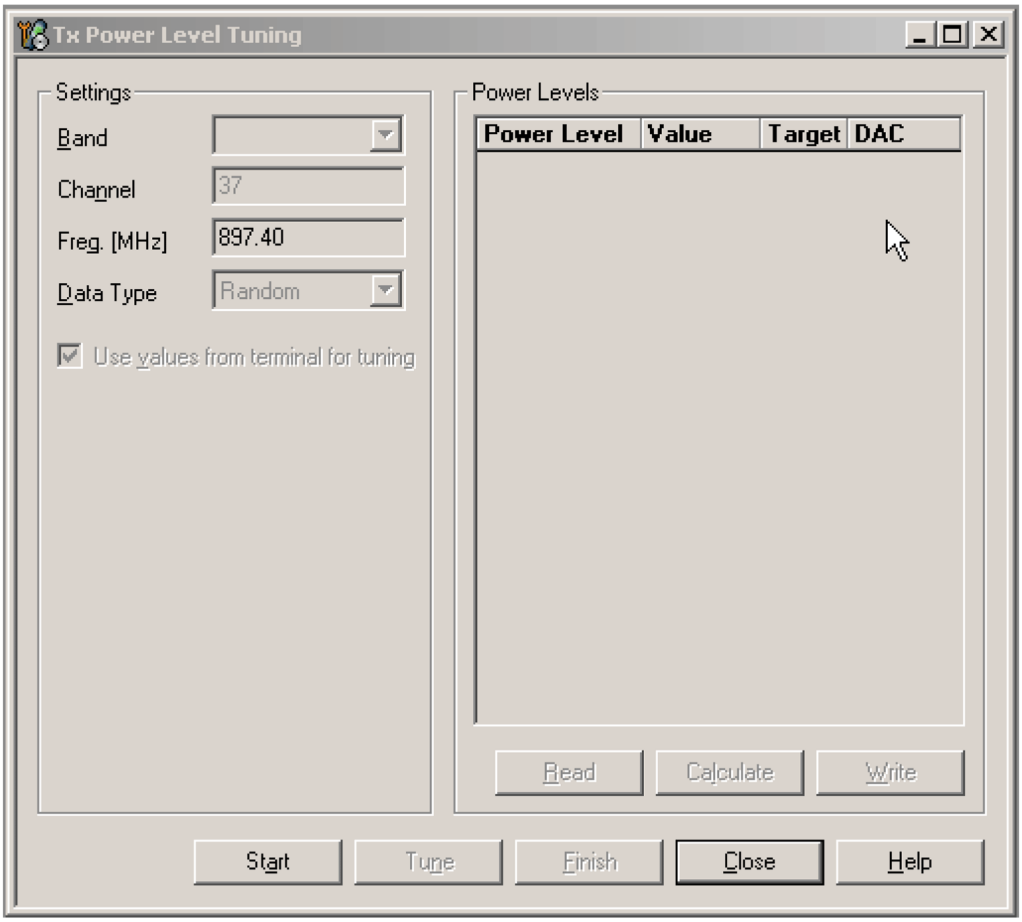
1. Connect the phone to a power meter with peak power detector or Agilent VSA Transmitter Tester.
2. Start Phoenix service software.
3. From the "Operating mode" dropdown menu, set mode to "Local".
4. From the Tuning menu, choose GSM -> Tx Power Level Tuning.



5. If you are using an Agilent VSA use the settings in the table below.

Agilent VSA Transmitter Tester specific settings	
GSM850 Frequency (MHz)	836.6
GSM900 Frequency (MHz)	897.4
GSM1800 Frequency (MHz)	1747.8
GSM1900 Frequency (MHz)	1880
Resolution Bandwidth (MHz)	3
Video Bandwidth (MHz)	3
Trigger	Video
Sweeptime (ms)	1
Span	zero
Average (for non-EDGE)	10
Average (for EDGE)	50

6. Click Start.



Channel: 37

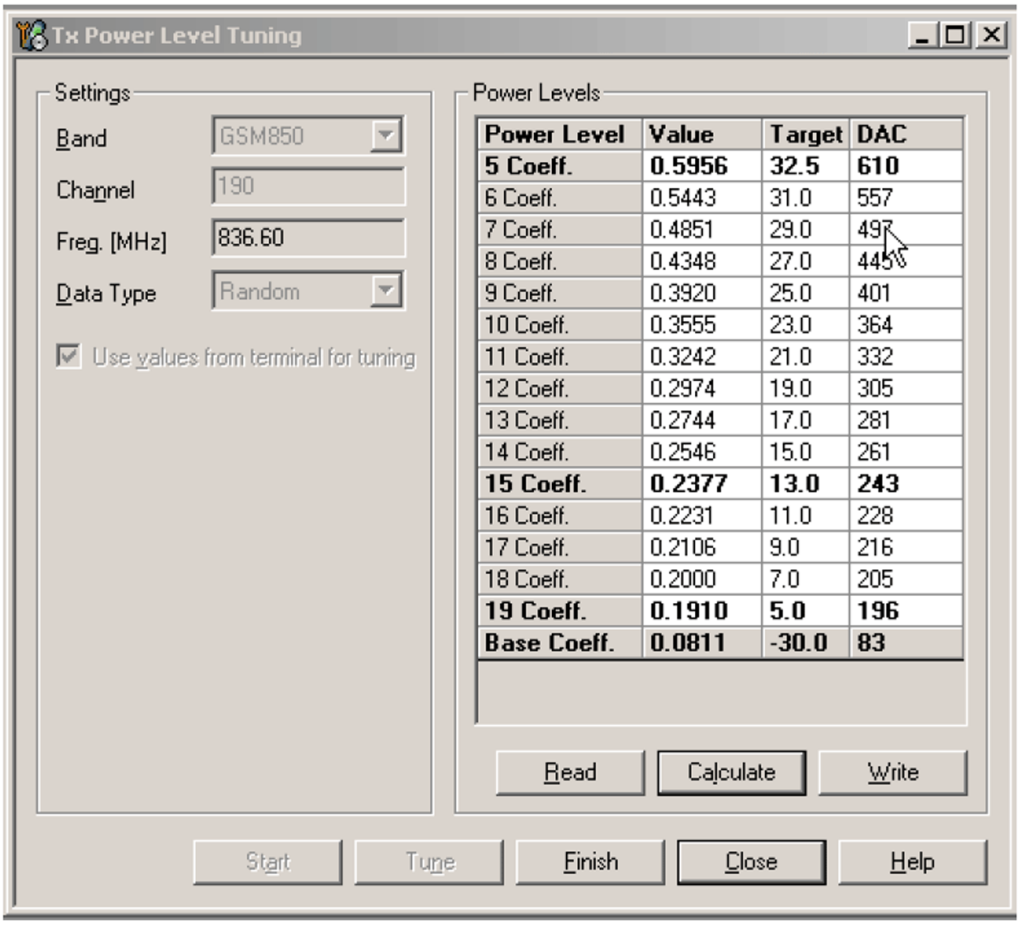
Freq. [MHz]: 897.40

Data Type: Random

☑ Use values from terminal for tuning

7. Select band. Set power meter or VSA to the correct frequency. Click Read and then Tune.

8. Adjust power levels **5**, **15** and **19** to correspond the "Target dBm" column by pressing + or – keys.



Band: GSM850

Channel: 190

Freq. [MHz]: 836.60

Data Type: Random

☑ Use values from terminal for tuning

Power Level	Value	Target	DAC
5 Coeff.	**0.5956**	**32.5**	**610**
6 Coeff.	0.5443	31.0	557
7 Coeff.	0.4851	29.0	497
8 Coeff.	0.4348	27.0	445
9 Coeff.	0.3920	25.0	401
10 Coeff.	0.3555	23.0	364
11 Coeff.	0.3242	21.0	332
12 Coeff.	0.2974	19.0	305
13 Coeff.	0.2744	17.0	281
14 Coeff.	0.2546	15.0	261
15 Coeff.	**0.2377**	**13.0**	**243**
16 Coeff.	0.2231	11.0	228
17 Coeff.	0.2106	9.0	216
18 Coeff.	0.2000	7.0	205
19 Coeff.	**0.1910**	**5.0**	**196**
Base Coeff.	**0.0811**	**-30.0**	**83**

Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM850			
PL5 coefficient	0.45	0.635	0.73
PL15 coefficient		0.238	
PL19 coefficient	0.12	0.185	0.3
GSM850 EDGE			
PL8 coefficient	0.35	0.466	0.6
PL15 coefficient		0.258	
PL19 coefficient	0.12	0.201	0.3
GSM900			
PL5 coefficient	0.45	0.648	0.73
PL15 coefficient		0.241	
PL19 coefficient	0.12	0.188	0.3
GSM900 EDGE			

	Min	Typ	Max
PL8 coefficient	0.35	0.47	0.6
PL15 coefficient		0.261	
PL19 coefficient	0.12	0.203	0.3
GSM1800			
PL0 coefficient	0.45	0.597	0.7
PL11 coefficient		0.18	
PL15 coefficient	0.05	0.147	0.3
GSM1800 EDGE			
PL2 coefficient	0.35	0.446	0.6
PL11 coefficient		0.197	
PL15 coefficient	0.05	0.161	0.3
GSM1900			
PL0 coefficient	0.45	0.536	0.7
PL11 coefficient		0.19	
PL15 coefficient	0.05	0.158	0.3
GSM1900 EDGE			
PL2 coefficient	0.35	0.429	0.6
PL11 coefficient		0.208	
PL15 coefficient	0.05	0.175	0.3

9. If the values are within the limits, click "Calculate,Write & Finish". Repeat steps 7 to 9. for each band that needs tuning.
10. When tuning EDGE with the VSA use 50 averages and 10 averages for non-EDGE.
11. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM850/GSM900 and **2**, **10** and **15** in GSM1800/1900.
12. When the tuning is completed, close the Tx Power Level Tuning window.

WCDMA receiver tunings

RX calibration (WCDMA)

Context

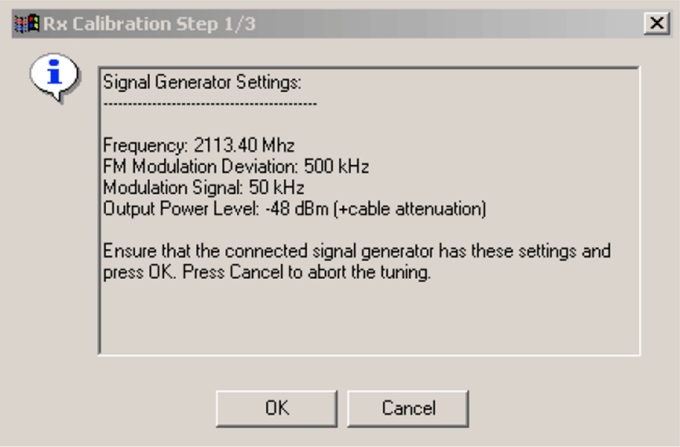
Rx calibration tuning routine calculates the real gain values of the WCDMA Rx AGC system. There is also a SAW filter between front end LNA and mixer in the receive chain, which causes ripple in the RSSI measurement, this is calibrated out. The SAW filter is intergated into RF ASIC N7500.

Rx calibration can be done in two different ways, manual tune and sweep mode tune. If the signal generator in use supports frequency sweep table, the calibration is done in one step.

Steps

1. For manual tuning, set mode to **Local** in the **Operating Mode** dropdown menu.

2. In the **Tuning** menu, choose **WCDMA→Rx Calibration** .
3. Click **Start**.
4. Select **Band**.
5. Click **Tune**.
6. Setup the signal generator to correspond with the values on the, *Rx Calibration* pop-up window and click **OK**.



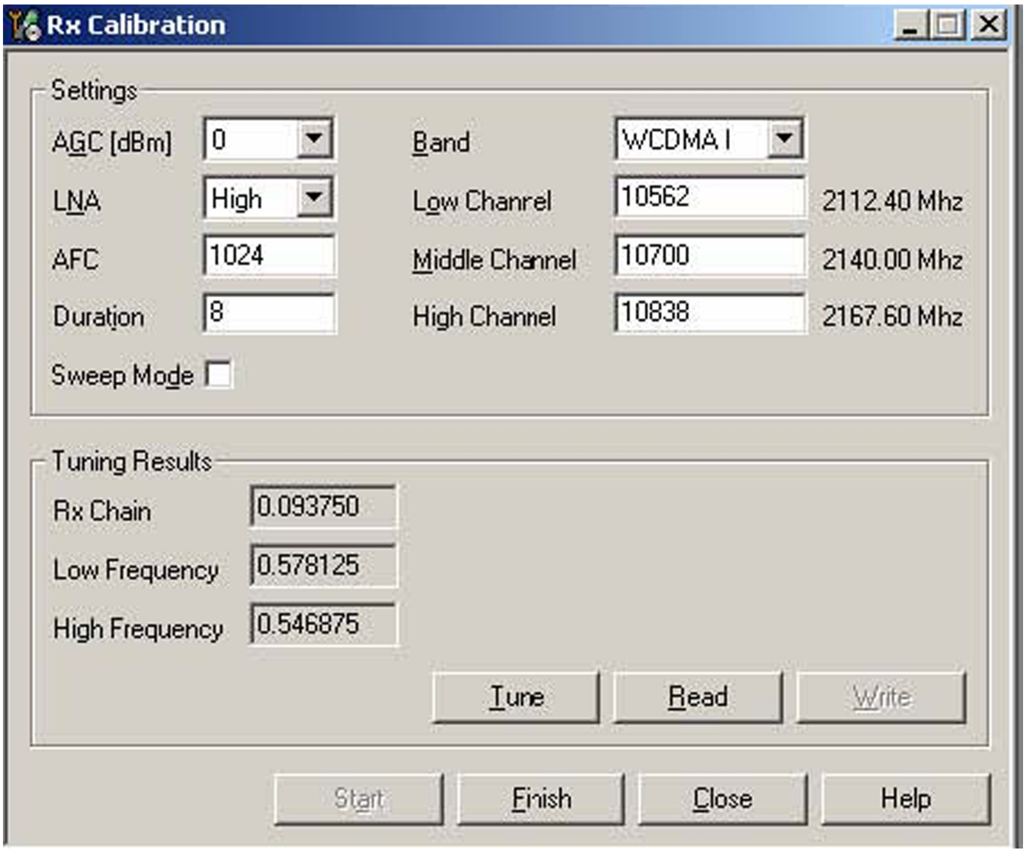
Signal Generator Settings:

Frequency: 2113.40 Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.

Figure 57 Pop-up window for WCDMA2100

7. Repeat step 6. for Middle and High channels.



AGC [dBm] 0
LNA High
AFC 1024
Duration 8
Sweep Mode ☐
Band WCDMA I
Low Channel 10562 2112.40 Mhz
Middle Channel 10700 2140.00 Mhz
High Channel 10838 2167.60 Mhz

Rx Chain 0.093750
Low Frequency 0.578125
High Frequency 0.546875

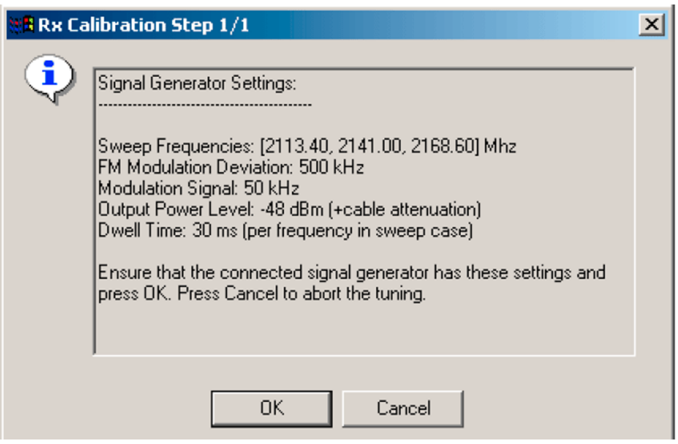
8. Ensure Tuning Results are within limits specified in the table below:

   If values are OK, click **Write** to save the values.

	Band	Min	Typ	Max	Unit
Rx chain	2100	-6	1.5 to 3.5	6	dB
Low Frequency		-5	-0.7 to 4.0	5	
High Frequency		-5	-0.7 to 4.0	5	

Alternative steps

- For sweep mode tuning, set **Mode** to **Local** in the **Operating Mode** dropdown menu.
- In the **Tuning** menu, choose **WCDMA**→ **Rx Calibration** .
- Click **Start**.
- Select **Band**.
- Check the **Sweep Mode** box.
- Click **Tune**.
- Setup the signal generator to correspond with the values on the *Rx Calibration* pop-up window and click **OK**.



Signal Generator Settings:

Sweep Frequencies: [2113.40, 2141.00, 2168.60] Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)
Dwell Time: 30 ms (per frequency in sweep case)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.

Figure 58 Pop-up window for WCDMA2100

- Ensure Tuning Results are within limits specified in the table above: If values are OK, click **Write** to save the values to the phone.
- Close the tuning window.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

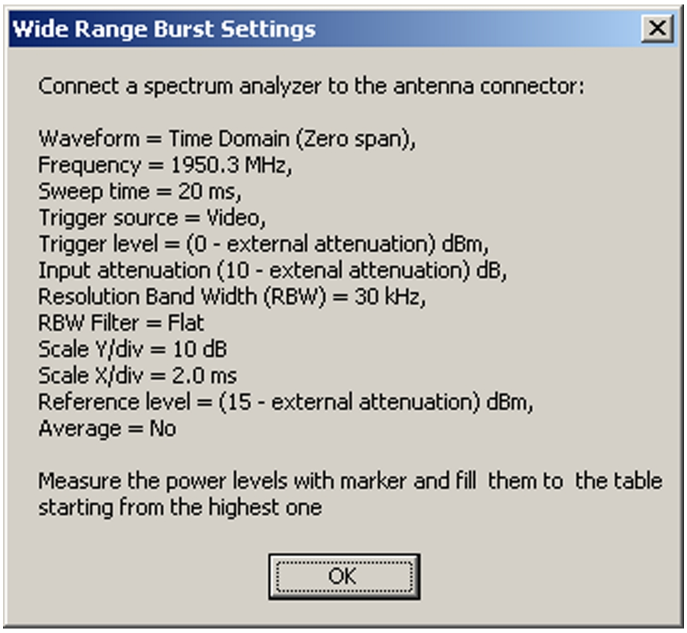
- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

There are two ways to perform the tuning. For an alternative method, see Alternative steps (page 7–52).

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.

2. Choose **Tuning→WCDMA→Tx AGC & Power Detector.**
3. Click **Start**.
4. In the *Wide Range* pane, click **Tune** (the leftmost **Tune** button).
5. Set up the spectrum analyzer in the following way:



Connect a spectrum analyzer to the antenna connector:

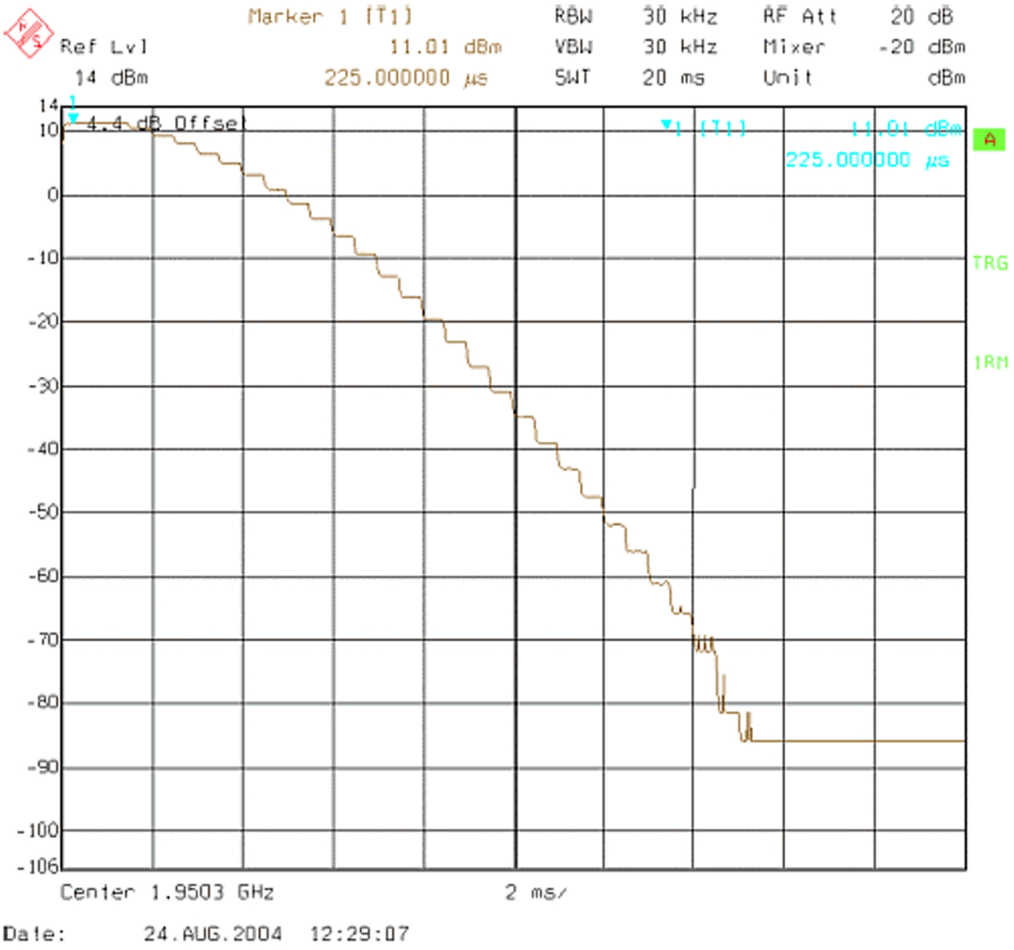
Waveform = Time Domain (Zero span),
Frequency = 1950.3 MHz,
Sweep time = 20 ms,
Trigger source = Video,
Trigger level = (0 - external attenuation) dBm,
Input attenuation (10 - extenal attenuation) dB,
Resolution Band Width (RBW) = 30 kHz,
RBW Filter = Flat
Scale Y/div = 10 dB
Scale X/div = 2.0 ms
Reference level = (15 - external attenuation) dBm,
Average = No

Measure the power levels with marker and fill them to the table starting from the highest one

6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker.

   Take the first measurement from 250 us after the trigger, the second from 750 us, the third on 1220 us and so on in every 500 us until the table is filled.

   > **Note:** It must be possible to measure power levels down to –68 dBm. The measured power levels must be monotonously decreasing.
   >
   > Make sure that the marker is not measuring the level of noise spike on lower levels.



Marker 1 [T1] 11.01 dBm 225.000000 µs

Ref Lvl 14 dBm

RBW 30 kHz

VBW 30 kHz

SWT 20 ms

RF Att 20 dB

Mixer -20 dBm

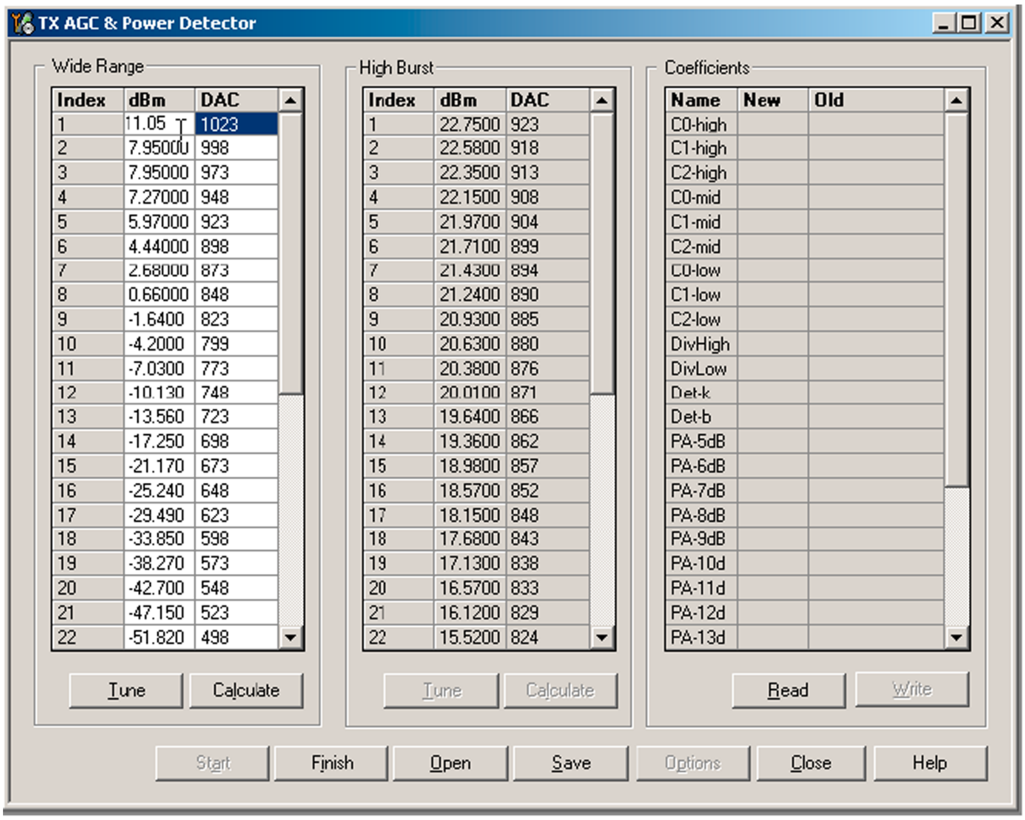
Unit dBm

Center 1.9503 GHz

2 ms/

Date: 24.AUG.2004 12:29:07

8. Fill in the power level values (in dBm) to the *Wide Range* table.



Wide Range

Index	dBm	DAC
1	11.05	1023
2	7.95000	998
3	7.95000	973
4	7.27000	948
5	5.97000	923
6	4.44000	898
7	2.68000	873
8	0.66000	848
9	-1.6400	823
10	-4.2000	799
11	-7.0300	773
12	-10.130	748
13	-13.560	723
14	-17.250	698
15	-21.170	673
16	-25.240	648
17	-29.490	623
18	-33.850	598
19	-38.270	573
20	-42.700	548
21	-47.150	523
22	-51.820	498

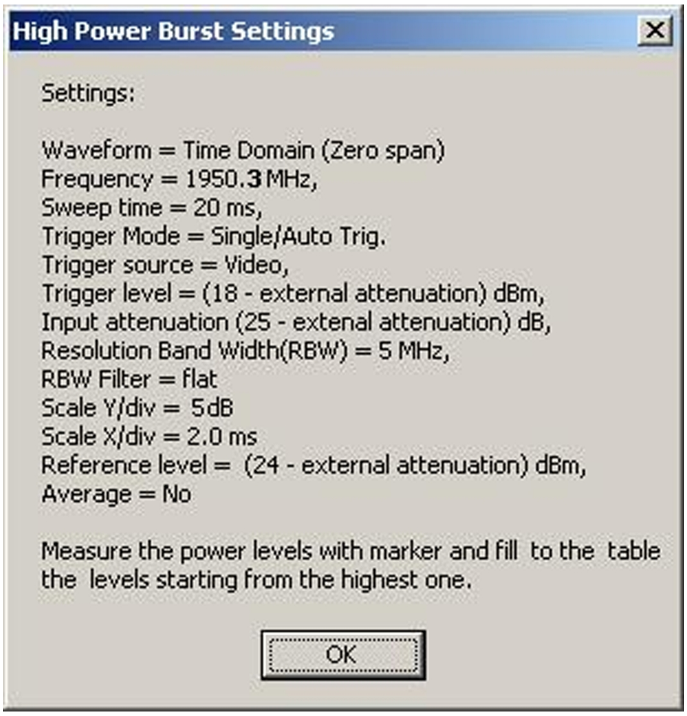
High Burst

Index	dBm	DAC
1	22.7500	923
2	22.5800	918
3	22.3500	913
4	22.1500	908
5	21.9700	904
6	21.7100	899
7	21.4300	894
8	21.2400	890
9	20.9300	885
10	20.6300	880
11	20.3800	876
12	20.0100	871
13	19.6400	866
14	19.3600	862
15	18.9800	857
16	18.5700	852
17	18.1500	848
18	17.6800	843
19	17.1300	838
20	16.5700	833
21	16.1200	829
22	15.5200	824

Coefficients

Name	New	Old
C0-high		
C1-high		
C2-high		
C0-mid		
C1-mid		
C2-mid		
C0-low		
C1-low		
C2-low		
DivHigh		
DivLow		
Det-k		
Det-b		
PA-5dB		
PA-6dB		
PA-7dB		
PA-8dB		
PA-9dB		
PA-10d		
PA-11d		
PA-12d		
PA-13d		

9. In the *Wide Range* pane, click **Calculate**.
10. In the *High Burst* pane, click **Tune**.
11. Adjust the spectrum analyzer according to the following settings:



Settings:

Waveform = Time Domain (Zero span)
Frequency = 1950.3 MHz,
Sweep time = 20 ms,
Trigger Mode = Single/Auto Trig.
Trigger source = Video,
Trigger level = (18 - external attenuation) dBm,
Input attenuation (25 - extenal attenuation) dB,
Resolution Band Width(RBW) = 5 MHz,
RBW Filter = flat
Scale Y/div = 5dB
Scale X/div = 2.0 ms
Reference level = (24 - external attenuation) dBm,
Average = No

Measure the power levels with marker and fill to the table the levels starting from the highest one.

12. Measure the power levels with a marker.

    Take the first measurement from 250 us after the trigger, the second from 750 us, third on 1220 us and so on in every 500 us until the table is filled.

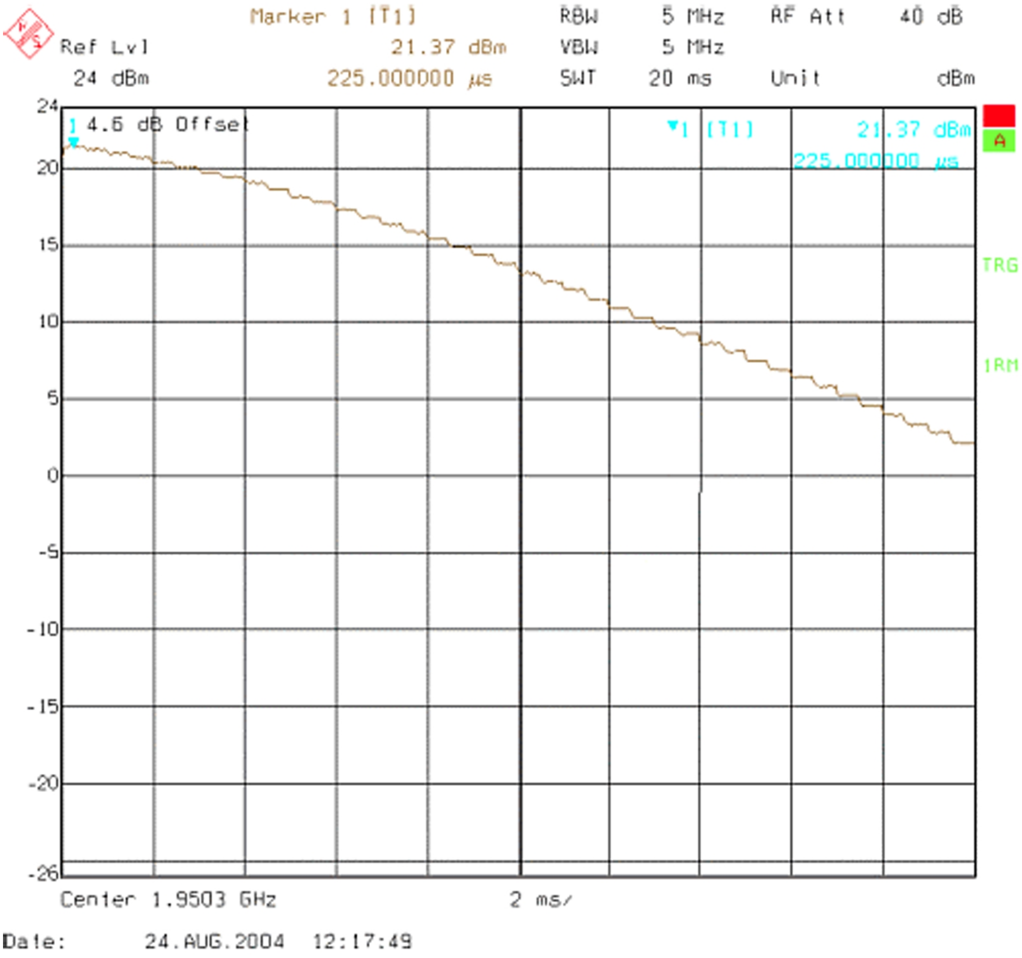


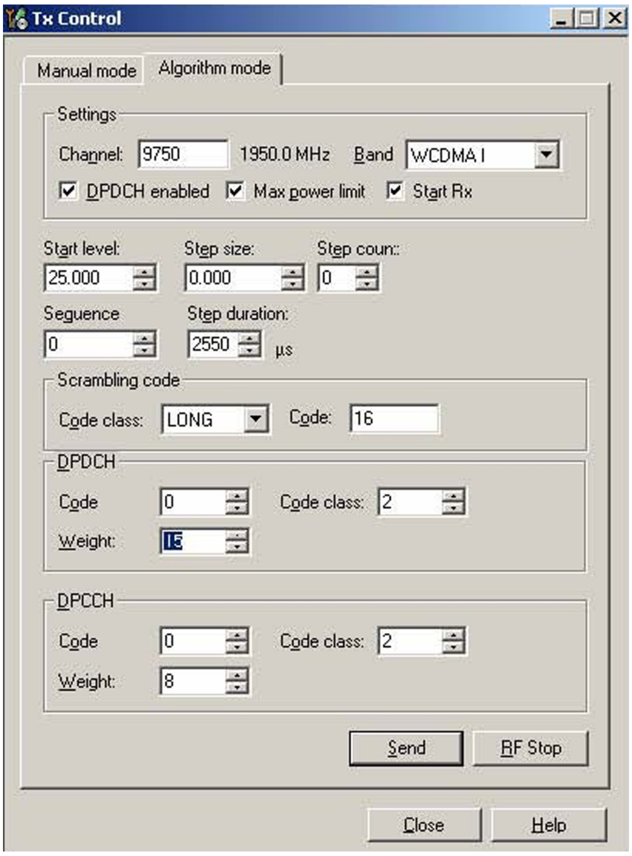
Figure 59 High burst measurement

13. In the *High Burst* pane, click **Calculate**.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000

	Min	Max
Det-k	100	220
Det-b	0	150

15. To save the coefficients to the phone, click **Write**.
16. To close the *Tx AGC & Power Detector* window, click **Close**.
17. Choose **Testing→WCDMA→ Tx Control.**
18. Select the *Algorithm* mode tab.



Settings
Channel: 9750 1950.0 MHz Band WCDMA I
☑ DPDCH enabled ☑ Max power limit ☑ Start Rx

Start level: 25.000
Step size: 0.000
Step coun: 0
Sequence 0
Step duration: 2550 µs

Scrambling code
Code class: LONG Code: 16

DPDCH
Code 0 Code class: 2
Weight: 15

DPCCH
Code 0 Code class: 2
Weight: 8

19. Write the target power level 25 dBm to the *Start level* line and check the **Max power limit** check box (detector calibration check).
20. Setup the spectrum analyzer with the following settings:

Center frequency:	**1950.3 MHz**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**24 dBm or -20 dBm depending on the level measured**
Input attenuation:	Automatic
Resolution bandwidth:	5 MHz
Video bandwidth:	5 MHz
Sweep time:	20 ms

Detector:	**RMS detector**
Average:	No
Trigger:	Free run

21. Click **Send**.
22. Measure the WCDMA output power.

    It should be around 21 dBm.
23. Click **RF Stop** and uncheck the **Max power limit** check box.
24. Repeat steps **19** to **23** for levels +19, +7, 0, -20 and –40 dBm.

    The measured output power may not differ more than +-2 dB from the requested value at level +19 dBm and no more than +-4 dB on lower levels.

    Remember to stop the RF before sending new data.

Alternative steps

- Measure the wide range levels normally and write down the levels that are possible to measure.
- Click **Finish**.
- Click **Options**.
- Change the first wide range DAC value to *573* and change the number of tuning steps to *21*.
- Change the spectrum analyzer reference level to *–20* dBm and adjust the input attenuator to the lowest value possible.
- In the *Wide Range* pane, click **Tune** and fill in the rest of values starting from the 19th level.

Tx band response calibration (WCDMA)

Context

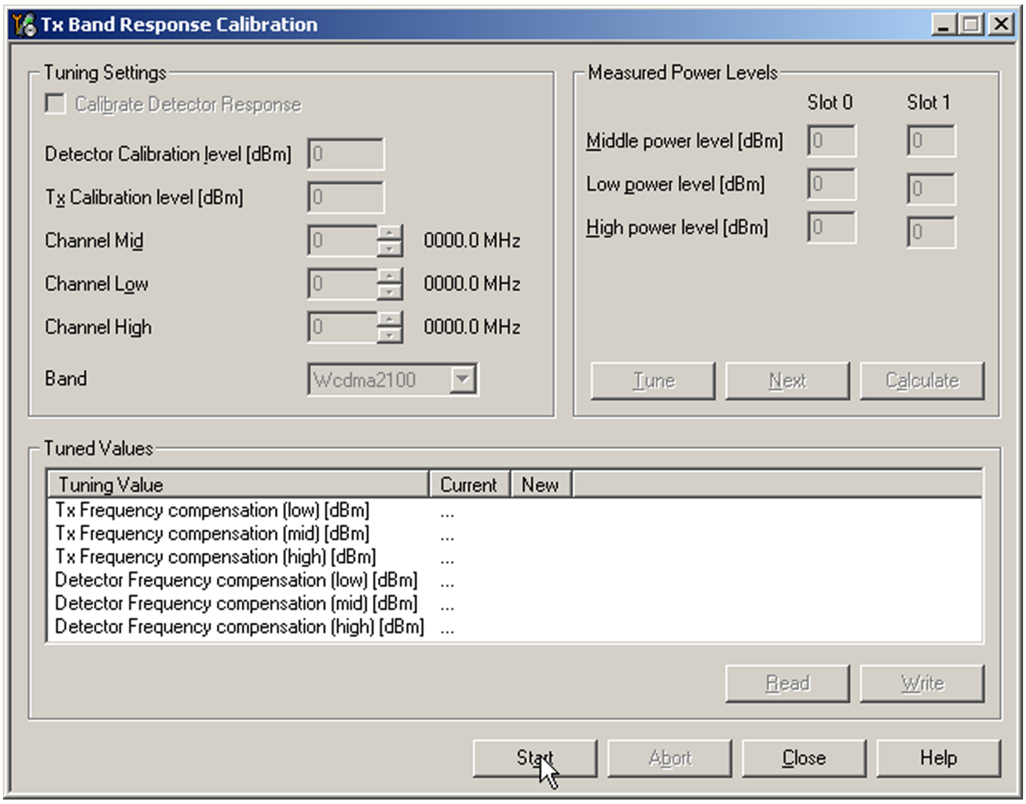
The purpose of this tuning operation is to calibrate the WCDMA Tx performance. It defines the power detector and Tx frequency compensation values. However, before starting this tuning procedure, it is necessary to carry out Tx AGC & Power Detector Calibration tuning. This is because its results will be needed for this tuning operation.

- In the *Tuning Settings* pane, it is possible to edit the numbers of channels used in this tuning operation.
- If the **Calibrate Detector Response** check box is checked, only Tx response is calibrated. Zero is written to the power detector compensation values block in the permanent memory (PM) of the terminal.
- **Detector Calibration level** shows the power level used for calibrating the power detector in this tuning procedure.
- **Tx Calibration level** shows the power level used for calibrating tx frequency in this tuning procedure.
- In *Measured Power Levels* pane, you can insert the dBm values read from the power meter.
- In *Tuned Values* pane, the values that are stored in the permanent memory (PM) of the terminal in Current columns are shown.
- New values are added to *New* column when the **Calculate** button is clicked.
- **Abort** button aborts the tuning operation without saving the tuned values.
- **Read** button reads the tuned values in the PM of the terminal, and displays them in the *Tuned Values* pane in in the *Current* column.

Steps

1. Start *Phoenix* service software.

2. Choose **File→Scan Product** .
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→WCDMA→Tx Band Response Calibration** .
5. Click **Start**.



☐ Calibrate Detector Response

Detector Calibration level [dBm] 0

Tx Calibration level [dBm] 0

Channel Mid 0 0000.0 MHz

Channel Low 0 0000.0 MHz

Channel High 0 0000.0 MHz

Band Wcdma2100

	Slot 0	Slot 1
Middle power level [dBm]	0	0
Low power level [dBm]	0	0
High power level [dBm]	0	0

Tuning Value	Current	New
Tx Frequency compensation (low) [dBm]	...	
Tx Frequency compensation (mid) [dBm]	...	
Tx Frequency compensation (high) [dBm]	...	
Detector Frequency compensation (low) [dBm]	...	
Detector Frequency compensation (mid) [dBm]	...	
Detector Frequency compensation (high) [dBm]	...	

The current values are shown in the *Tuned Values* pane.

6. Click **Tune**.
7. Connect the power meter to the terminal, and set it to **Channel Mid** frequency.
8. Read the values of slot 0 and slot 1 from the power meter and enter them to **Middle power level** fields in the **Measured Power Levels** pane.

   Slot 0 is used for detector calibration and slot 1 for Tx calibration.
9. Click **Next**.
10. Switch the power meter to **Channel Low** frequency.
11. Read the values from the power meter, and enter them to **Low power level** fields.
12. Switch the power meter to **Channel High** frequency.
13. Read the values from the power meter, and enter them to **High power level** fields.
14. Click **Next**.
15. Click **Calculate**.

    The tuned values are shown in the *Tuned Values* pane in the *New* column.
16. Check that the tuned values are within the limits presented in the following table. If they are OK, click **Yes**.

	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

17. To save the tuned values to the terminal, click **Write**.
18. Close the *Tx Band Response Calibration* window.

Tx LO leakage (WCDMA)

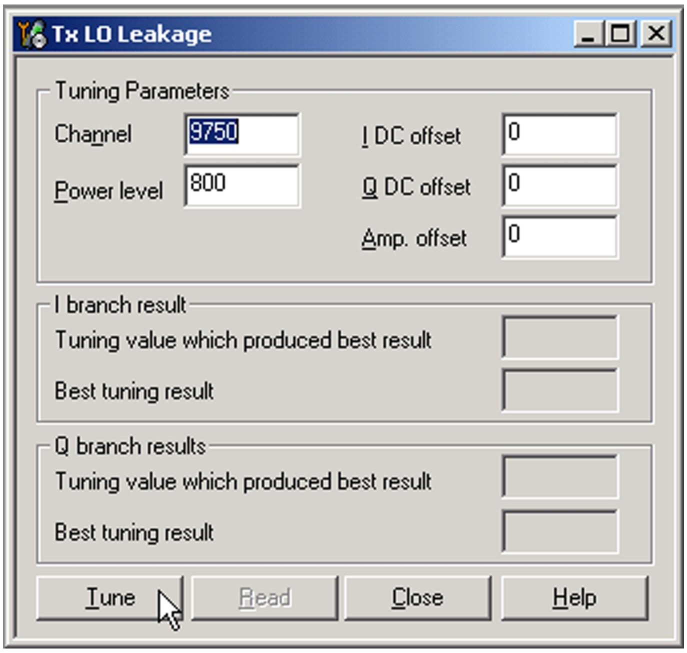
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning**→**WCDMA**→ **Tx LO Leakage** .
3. Click **Tune**.



Channel 9750
Power level 800
I DC offset 0
Q DC offset 0
Amp. offset 0

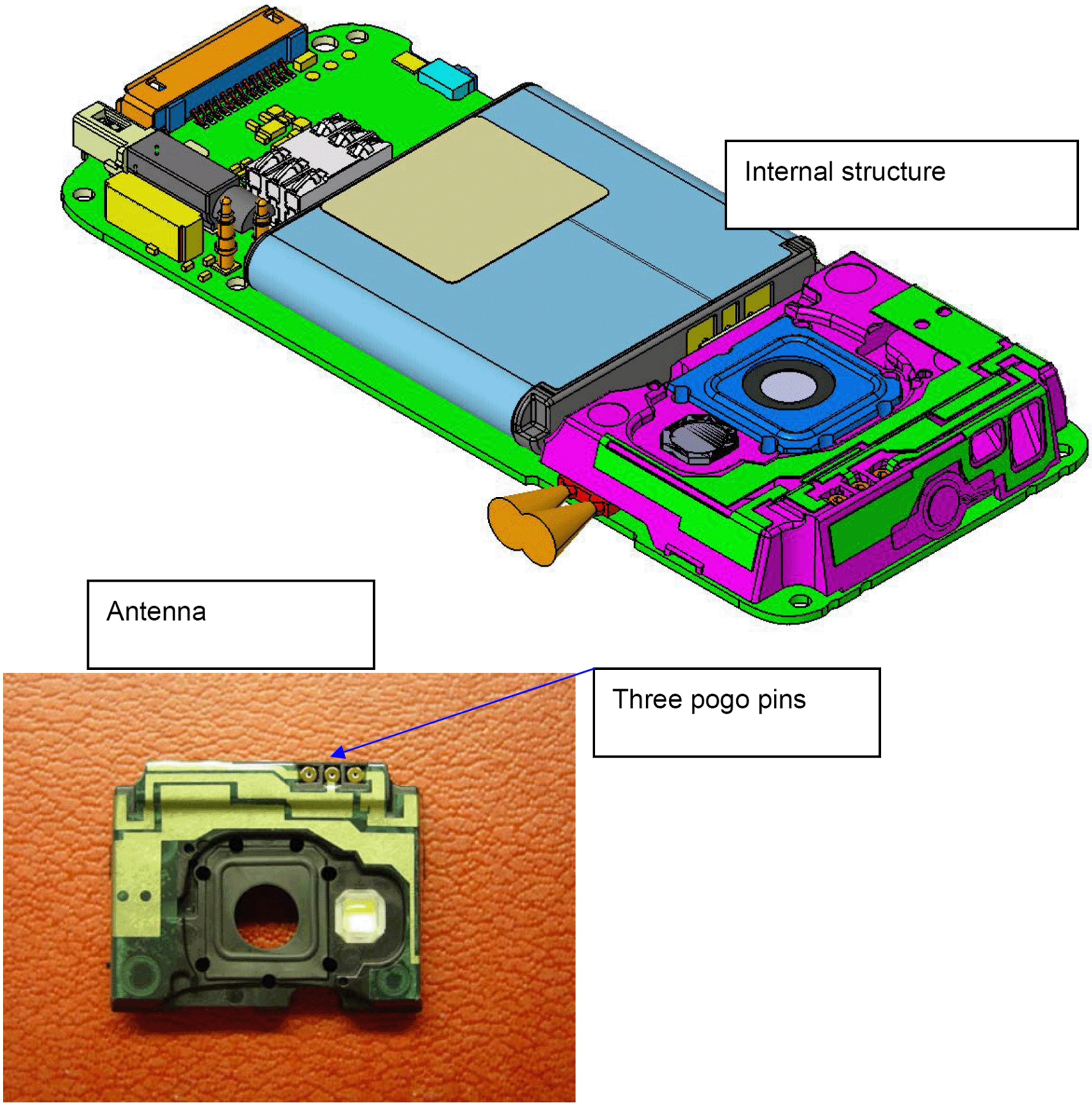
4. To end the tuning, click **Close**.

Antenna troubleshooting

Context

The antennas have contacts with the engine PWB via three pogo pins.

The mechanical construction and antenna are described below.



Symptoms anticipated:

- radiated power degradation, e.g. signal bar is low compared to other phones

Required equipment:

- call test
- ASM coupler
- RF cables

You can use the following table for the coupling loss for the main GSM coupler; you may also need to include RF cable loss.

Attenuation values for inductive RF coupler SA-112						
Band	**Channel**	**Attenuation RX**	**Tolerance RX**	**Attenuation TX**	**Tolerance TX**	**Reported power**
GSM 850	Low 128	11.8	+/-4.5dB	14.2	+/-4.5dB	31.7'+/-4.5dB
	Mid 189	11.1		13.6		
	High 251	10		12.9		

Attenuation values for inductive RF coupler SA-112						
Band	**Channel**	**Attenuation RX**	**Tolerance RX**	**Attenuation TX**	**Tolerance TX**	**Reported power**
GSM 900	Low 975	8.9	+/-4.5dB	11.1	+/-4.5dB	31.5'+/-4.5dB
	Mid 62	8.7		9.8		
	High 124	8.8		9.2		
GSM 1800	Low 513	19.6	+/-4.5dB	24	+/-4.5dB	28.7'+/-4.5dB
	Mid 700	17.9		21.3		
	High 884	16.2		20.7		
GSM 1900	Low 513	14.2	+/-4.5dB	17.9	+/-4.5dB	28.6'+/-4.5dB
	Mid 661	13.3		16.2		
	High 809	13		14.9		
WCDMA Band I	Low	16.1	+/-4.5dB	21.3	+/-4.5dB	23'+/-4.5dB

Steps

1. Place the phone into the AMS coupler jig, establish a call and set the path loss using the above attenuation TX.
2. Check the report power level for the UE. If it is not in the target range, e.g. 31.7+/-4.5dB (31.7-4.5 to 31.7 +4.5) for 850 TX, it may indicate that one of the antenna pogo pins may not contact to the PWB.
3. Replace the antenna.
4. Repeat steps 2 and 3. If the power level is within the target range, the replaced antenna was broken; otherwise, other RF part might not function properly. In this case RF troubleshooting should be carried out.

8 — Camera Module Troubleshooting

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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1 Camera is not functional at all; no image can be taken.

2 Images can be taken but there is nothing recognizable in them.

3 Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded, or customer complains about image quality.

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong, or is there anything wrong at all.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference. Experience helps significantly in analysing image quality.

Terms

Autofocus	Camera module contains lens movement mechanics for focus adjustment. Autofocus enables camera to take sharp images of objects positioned between 10cm to infinity. During AF the viewfinder image will be momentarily blurred as the camera searches for the right focus setting.
Digital zoom	Digital zoom is done by first cropping the image by the zoom ratio and then upscaling it to the output resolution. This will decrease the image quality especially with high zoom ratios.
Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
ND-filter	Neutral density filter is a filter which is used in very bright conditions to reduce the amount of light hitting the sensor. The filter is built into the camera module and applied automatically when needed.
Noise	Variation of response between pixels with same level of input illumination.
Resolution	Usually the amount of pixels in the camera sensor. In some occasions the term resolution is used for describing the sharpness of the images.

Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.
Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.
Shutter	The electronic shutter is used when short exposure times are needed and in video. When the mechanical shutter is used a black sheet will cover the lens after the exposure.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Autofocus

When the camera is focusing a lens is moved inside the module to give the sharpest possible image. This camera module is specified to operate satisfactorily from 10 cm to infinite distance of scene objects. Trying to photograph objects closer than 10 cm is likely to result in a blurred out of focus image. The lack of sharpness is first visible in full resolution images. Images taken very close to the subject, a limited depth of focus will be visible, that is the upper or lower parts of the image may be out of focus. This is normal; do not change the camera module.

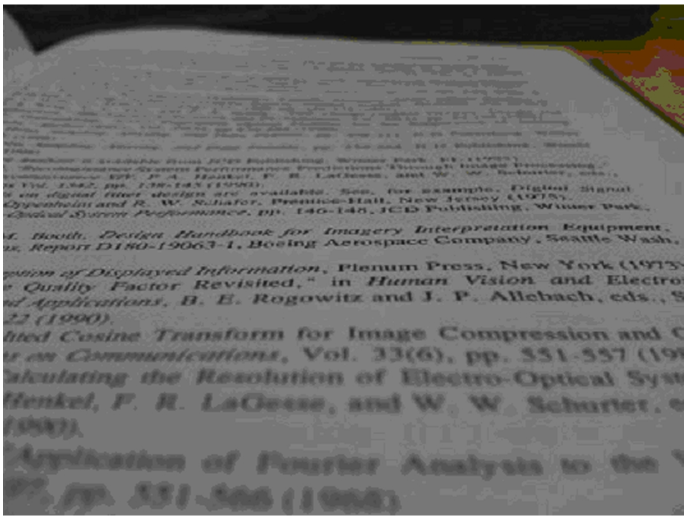


Figure 60 Only center part of image is in focus due to limited depth of focus

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

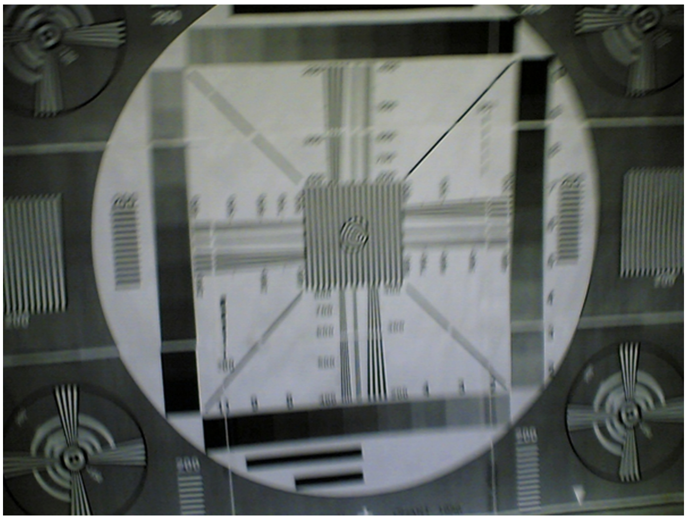


Figure 61 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and may happen when using the electronic shutter. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

Figure 62 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

Figure 63 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

Figure 64 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. Flickering only occurs when the rolling shutter is used. This is normal behaviour; do not change the camera module.

Figure 65 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

Figure 66 A lens reflection effect caused by sunshine

Examples of good quality images

Figure 67 Good image taken indoors

Figure 68 Good image taken outdoors

Image quality analysis

Possible faults in image quality

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 may be expected to appear:

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

In addition, there are many other kinds of possibilities for bad image quality, but those are ruled out from the scope of this document since the probability of their appearance is small.

Testing for dust in camera module

Symptoms and diagnosis

For detecting these kinds of problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC monitor is preferred for analysis. Search carefully, since finding these defects is not always easy. Figure "Effects of dust on optical path" is an example image containing easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. One possibility is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering happens, try to reduce illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Thus it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If a dust particle is lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and thus the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

Figure 69 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between camera window and lens, they will cause image blurring and poor contrast. The dust gasket between the window and lens should prevent any particles from getting into the cavity after the manufacturing phase.

If dust particles are found on the sensor, this is classified as a manufacturing error of the module and the camera should be replaced. Any particles inside the cavity between the protection window and lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are five possible sources for the problem:

1. The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.
2. The camera module has failed to focus correctly, producing a blurred image.
3. User has tried to take pictures and images are blurred due to handshake, shutter button pressing, dark conditions or carelessness.
4. There is dirt between the protection window and the camera lens.
5. The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene, such as the one in Figure "Good image taken indoors", can be used as a target. The main considerations are:

- The camera module has to be given time to focus correctly. Correct focusing is normally indicated with a flashing icon or green bracket in the viewfinder. During focusing, the image in the viewfinder moves slightly back and fourth, this is normal and shows that the lens unit is moving. During the movement a faint sound can be heard from the camera head.
- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

There are several conditions in which AF operation is challenging for the camera module, i.e. failing from time to time. These include:

- Low light scenes and night mode
- Scenes with low contrast
- Fast-moving objects

AF operation is disabled on purpose in “night”, “landscape”, “sports”, and “video” modes. When using these modes the lens is set to a predetermined focal position and isn’t moved during use.

Under low light and night mode the AF function is slower than under good light, it may even fail to find correct focus position. Low contrast scenes or fast moving objects may also slow down or cause AF to fail. This is normal operation, and is not a cause to replace camera.

The operation of AF can be tested by taking images of objects at different distances. Good distances are 30 cm, 60 cm and infinity (>3 m). Any LED or xenon flashes should not be used while taking the images.

The taken images should be analysed on PC screen at 100% scaling simultaneously with a reference image. Pay attention to the computer display settings; at least 65000 colors (16 bit) have to be used. 256 (8-bit) color setting is not sufficient; true color (24 bit, 16 million colors) or 32 bit (full color) setting is recommended.

If the differences are noticeable at a glance and also if the one under investigation is significantly inferior, the module might have a faulty lens. In this case, the module should be changed. Always recheck the resolution after changing the camera module. If a different module produces a clearly noticeable quality gap, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module. As references Figure "Good image taken indoors" and Figure "Good image taken outdoors" can be used. Another possibility is to use a service point comparison phone, if available.

Effects of dirty or defective camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

Note: The effects of any dirt in images can vary very much; it may be difficult to judge if the window has been dirty when some image has been taken or if something else has been wrong. That is why the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

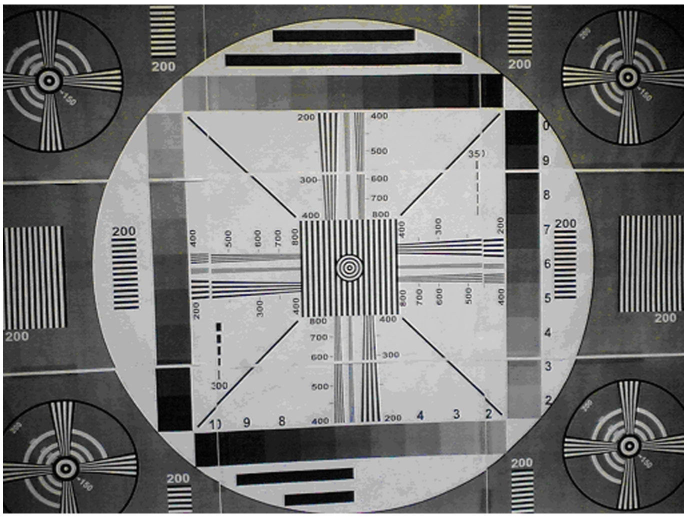


Figure 70 Image taken with clear protection window

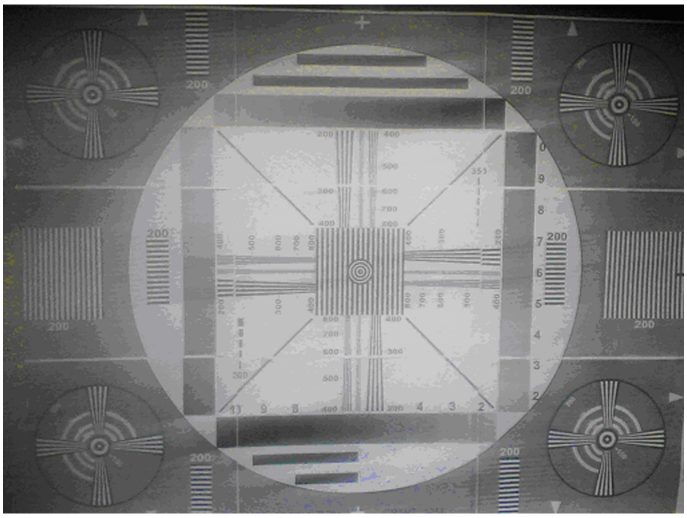


Figure 71 Image taken with greasy protection window

Bright point light sources might cause images that have flares around the light source if the protection window is dirty. A smeared fingerprint may be hard to see on the protective window but if will affect the image quality. These flares can be avoided by cleaning the window with a suitable cloth.

Figure 72 Image of point light sources taken with a clean protective window

Figure 73 Image of point light sources taken with a dirty (finger print) protective window

Faulty pixels in images

Faulty pixels are pixels that do not respond to light in the same way as the pixels around them. There are three main types of faulty pixels, dead, stuck and hot pixels.

Dead pixels are always black or significantly darker than their surrounding. Dead pixels appear as black spots in all lightning conditions. Camera modules producing images with dead pixels that are clearly noticeable should be replaced.

If the pixel remains always saturated to its maximum value it is stuck. Stuck pixels may appear as red, green, blue or white spots in all lightning conditions. Camera modules producing images with one or more stuck pixels should be replaced.

Hot pixels are pixels that easily saturate in dim light conditions. It is normal to get a lot of noise and hot pixels in night conditions or otherwise dark conditions. The hot pixels should disappear when the ambient light is increased, but may still appear in darker areas of an otherwise well illuminated scene.

When examining an image for defect pixels, test images should be viewed as 100% enlargements on a PC monitor.

Figure 74 Enlargement of a hot pixel

Flash photography problems

Use of flash device may affect the image in many ways.

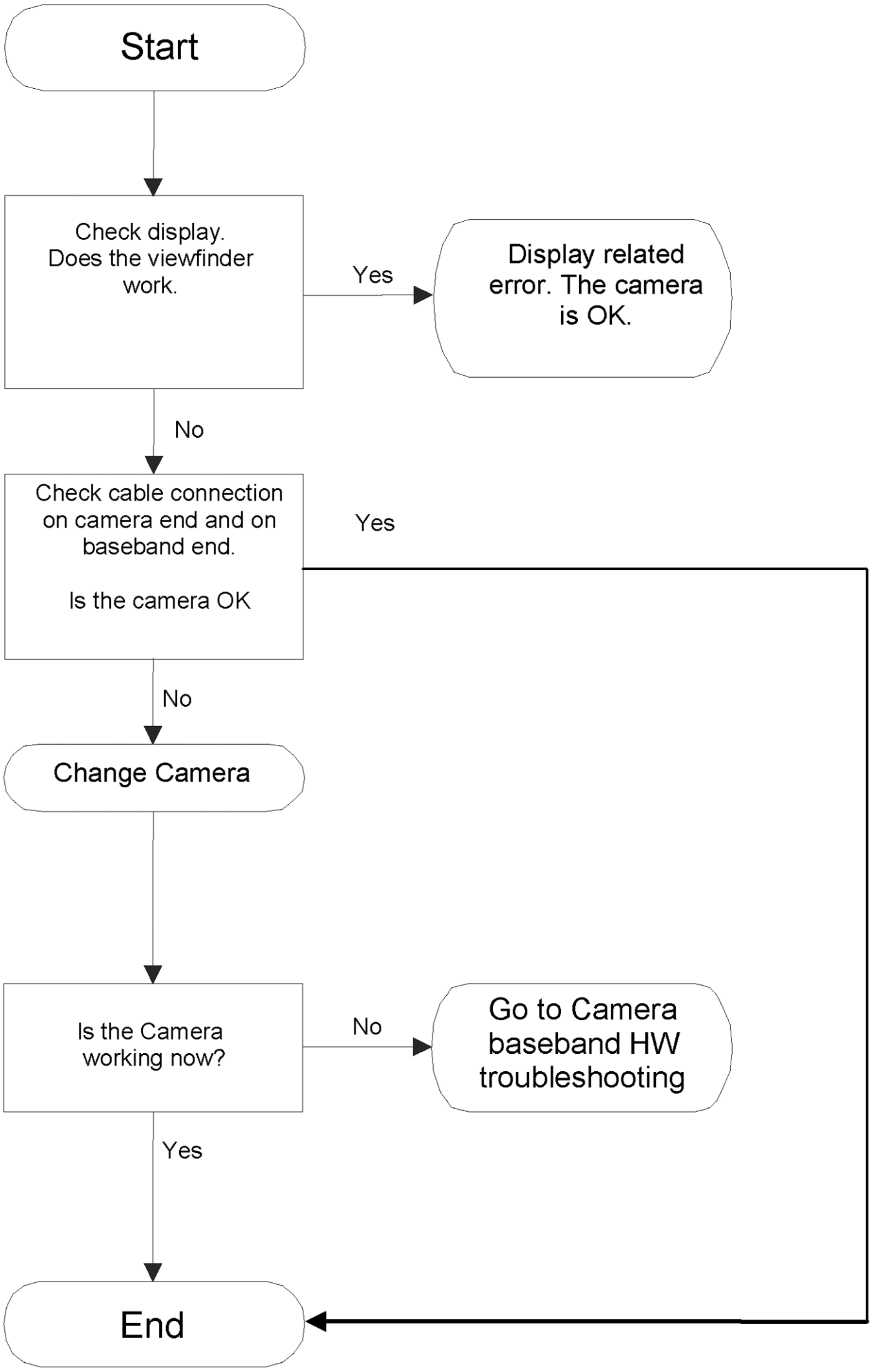
- White balance errors. The image may get a wrong tone due to mixing of flash colour temperature and ambient lightning. This is unwanted but normal feature.
- Dust reflections. Dust or water drops in front of the flash unit may reflect strongly to the camera sensor. See the following figure.

Figure 75 Light from the flash has reflected on particles in front of the camera

Main camera troubleshooting flowcharts

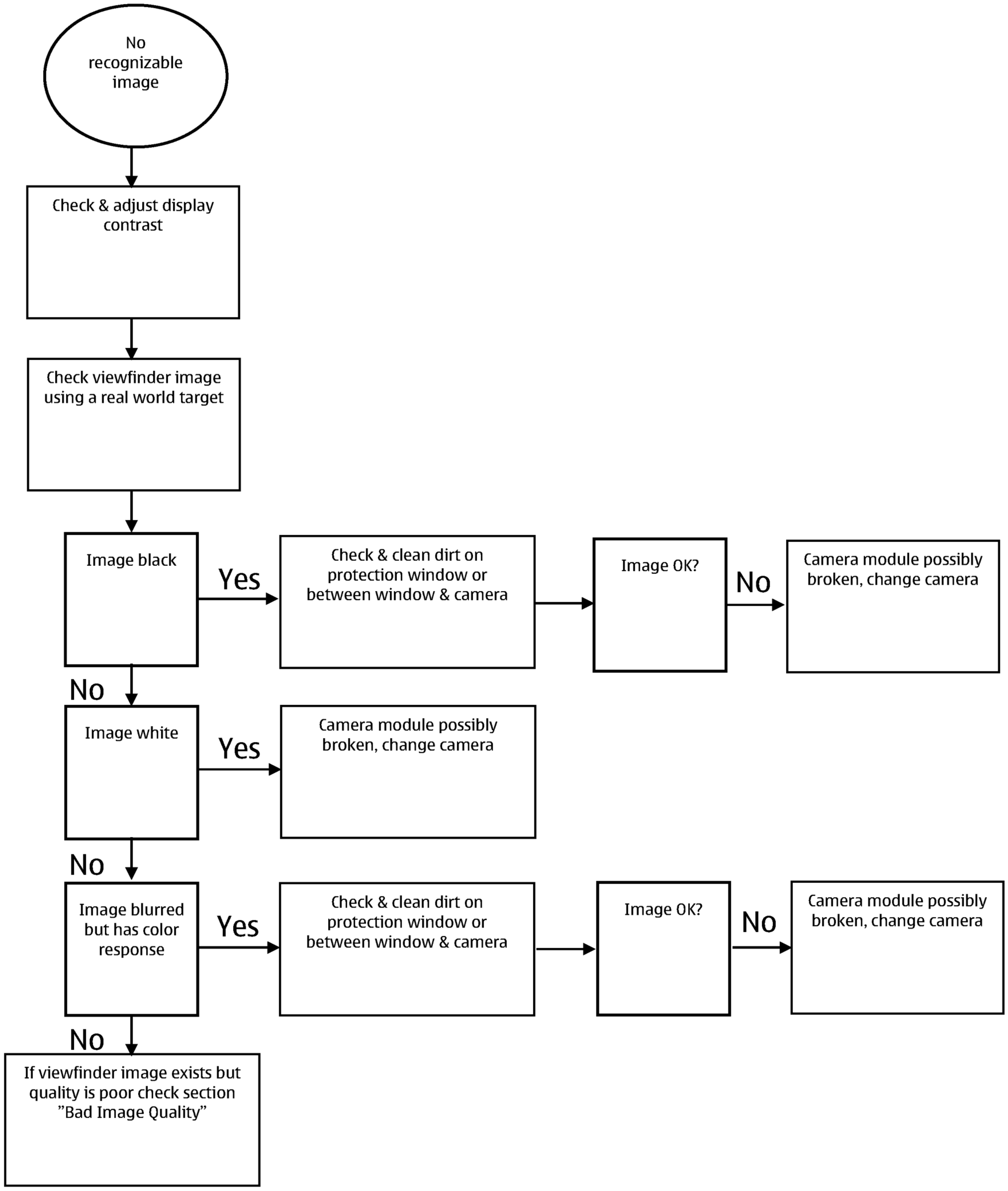
Camera hardware failure troubleshooting

Troubleshooting flow



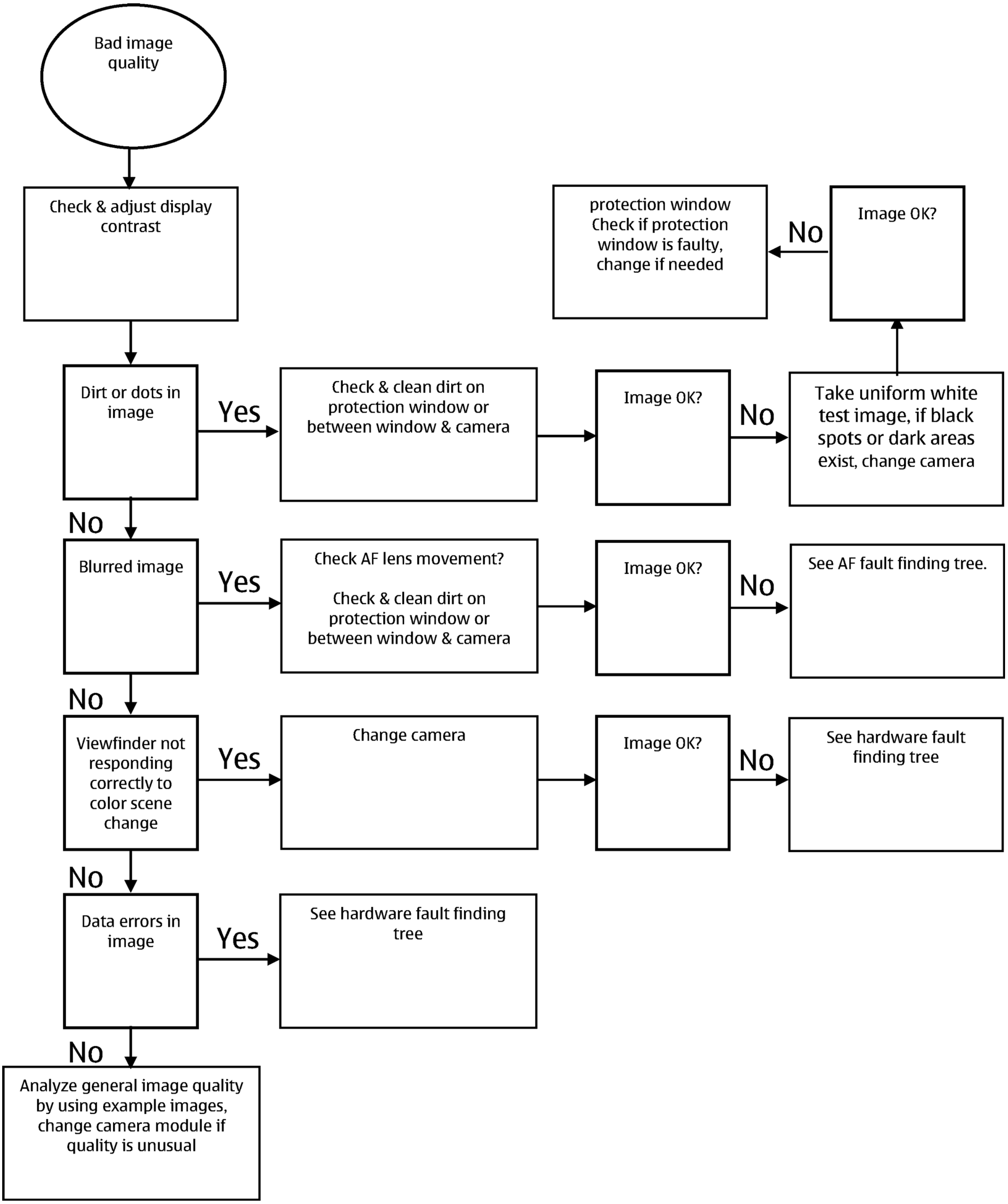
No recognizable viewfinder image

Troubleshooting flow



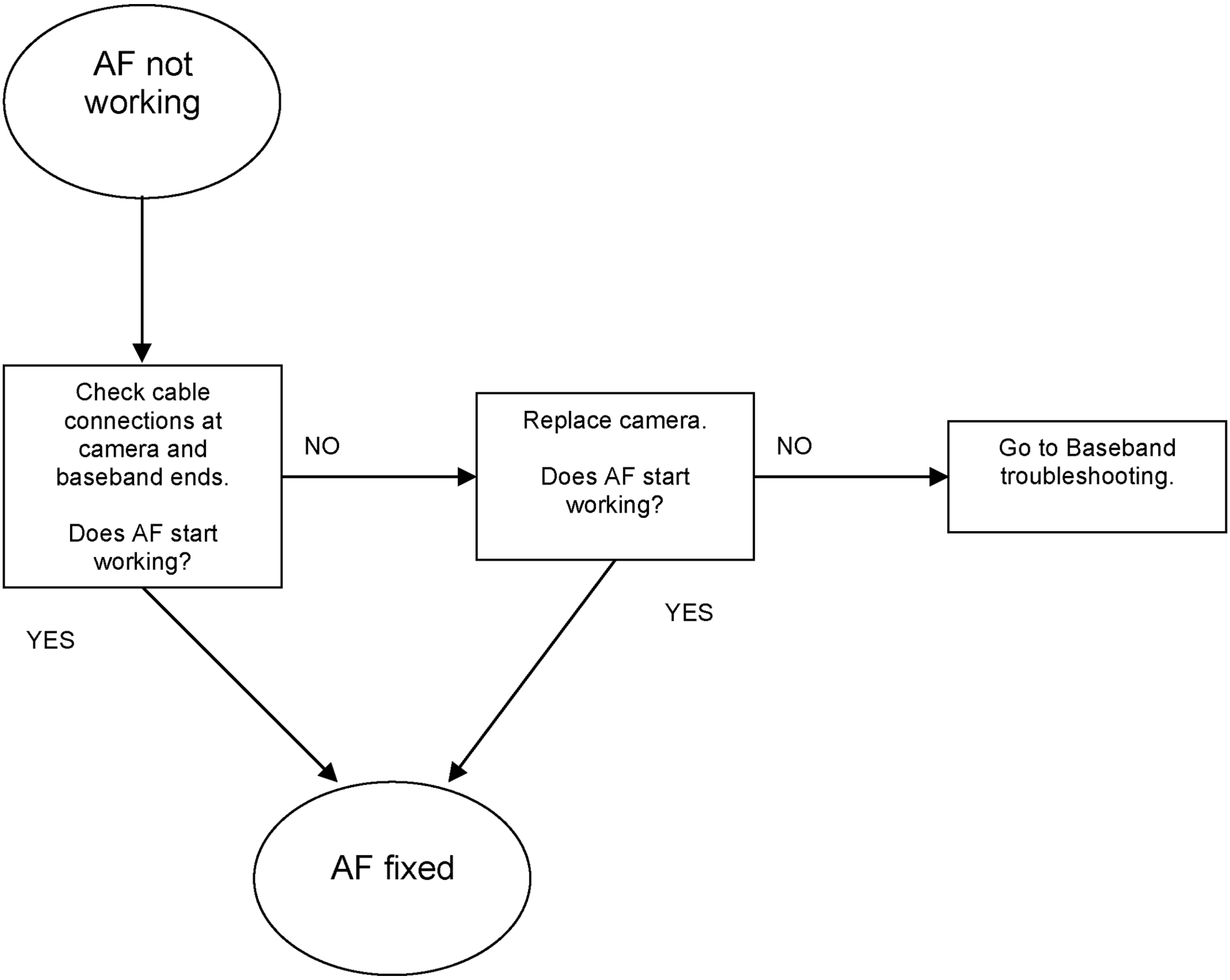
Bad camera image quality troubleshooting

Troubleshooting flow



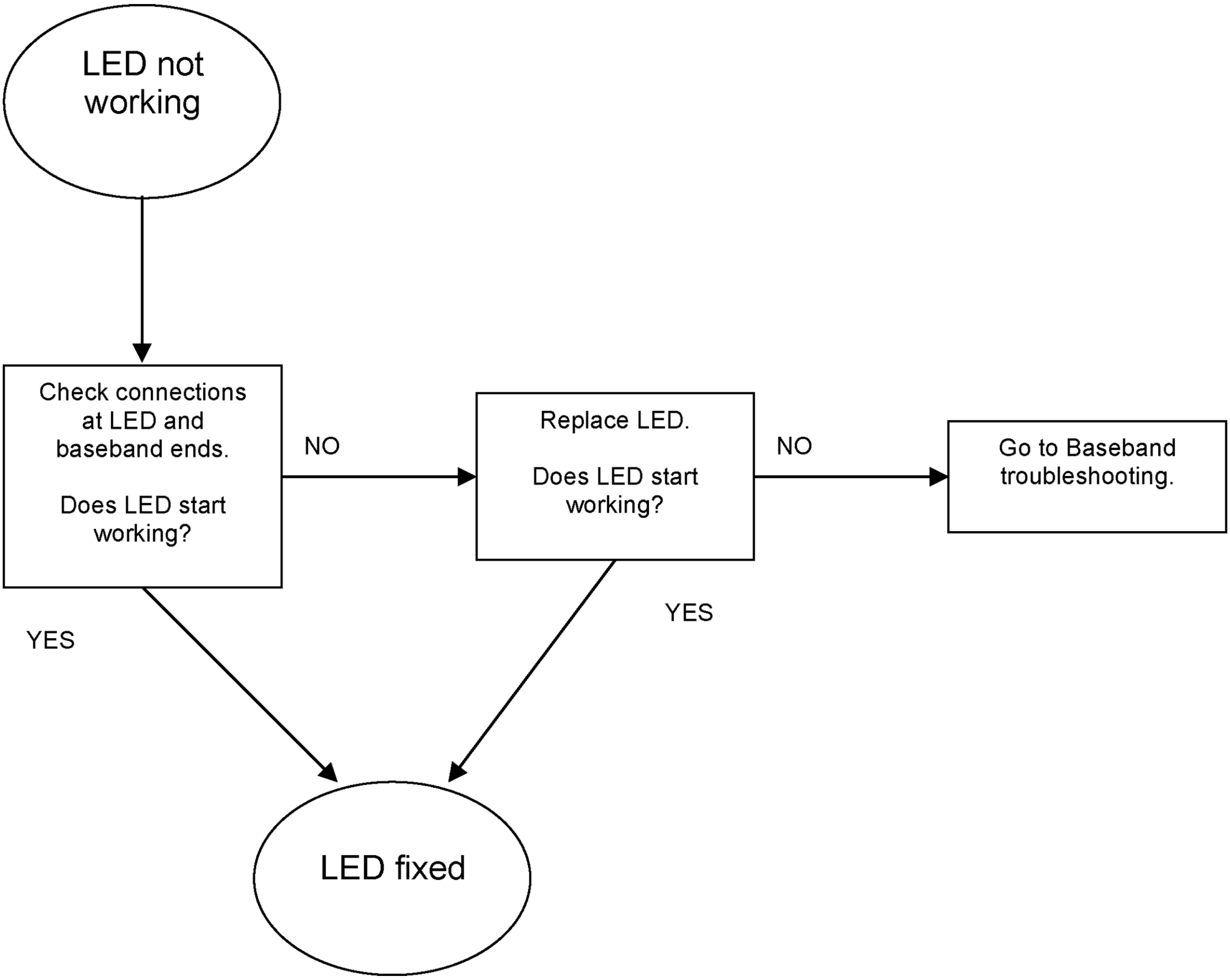
Camera autofocus troubleshooting

Troubleshooting flow



LED flash troubleshooting

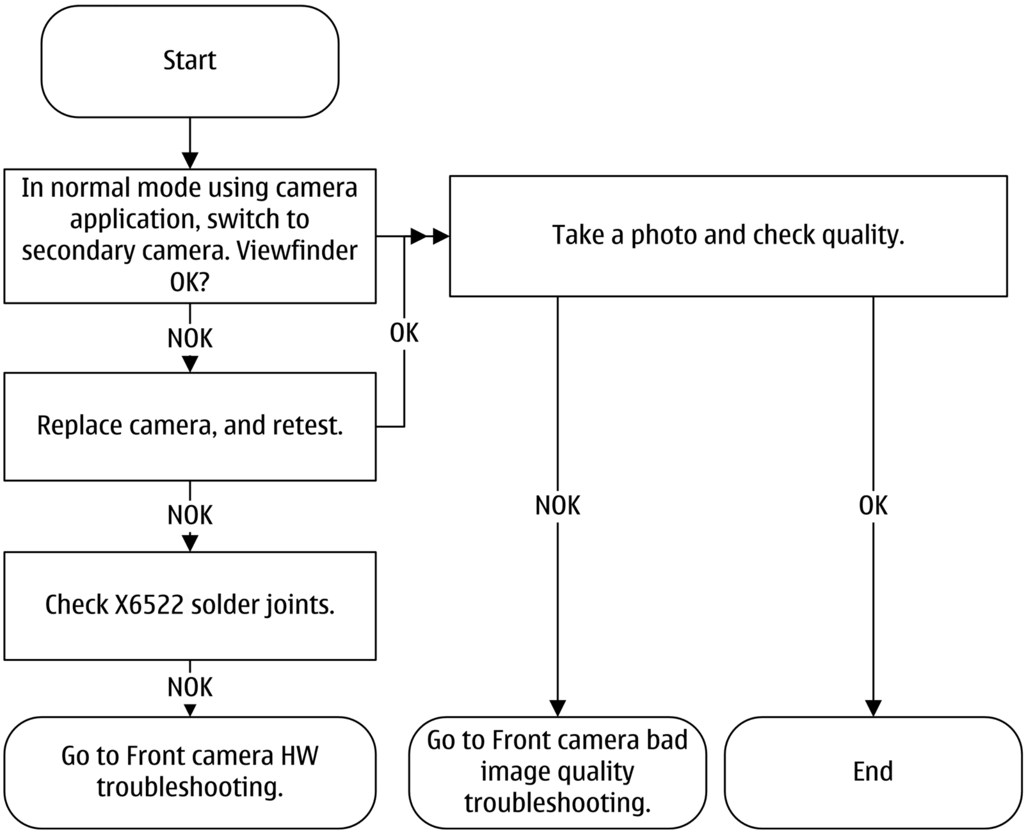
Troubleshooting flow



Front camera troubleshooting flowcharts

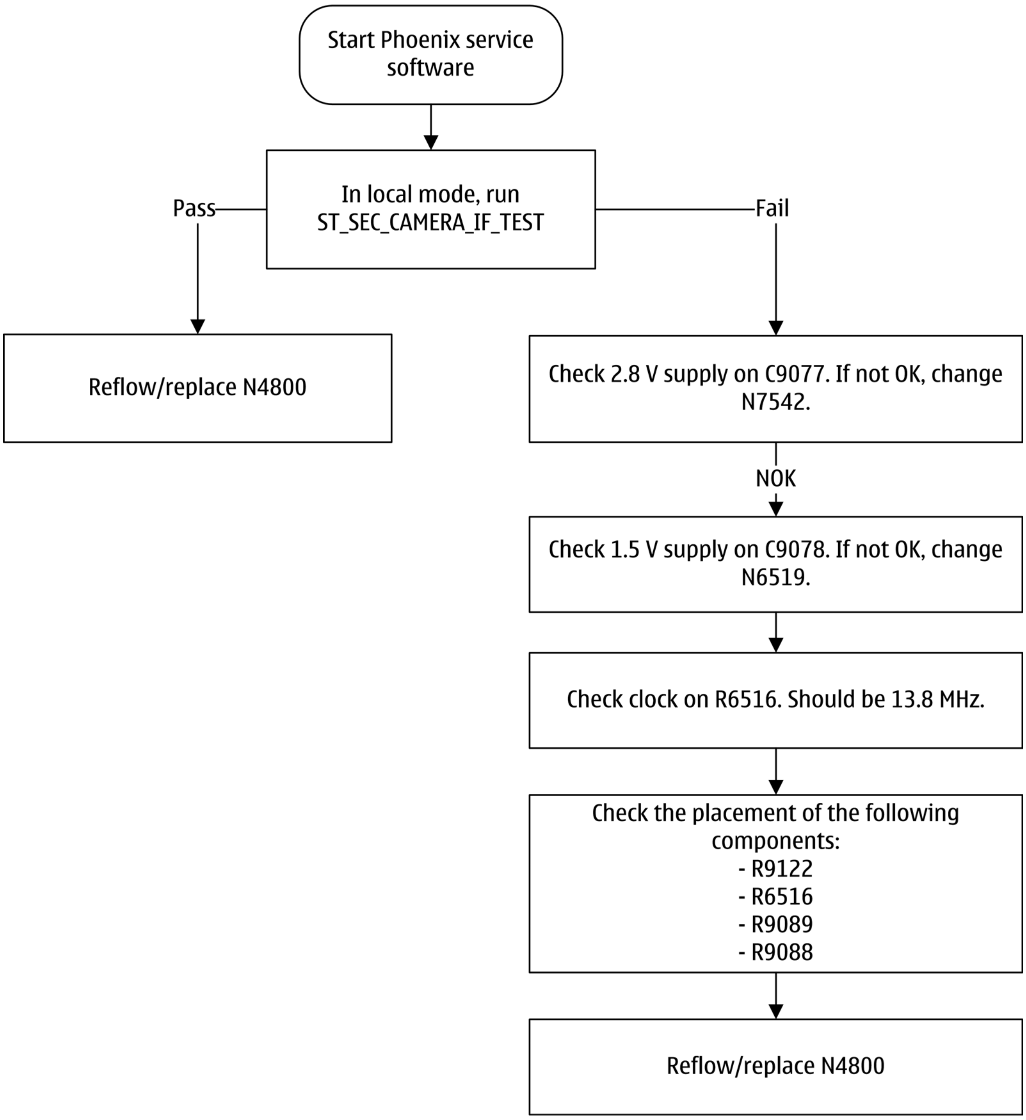
Front camera troubleshooting

Troubleshooting flow



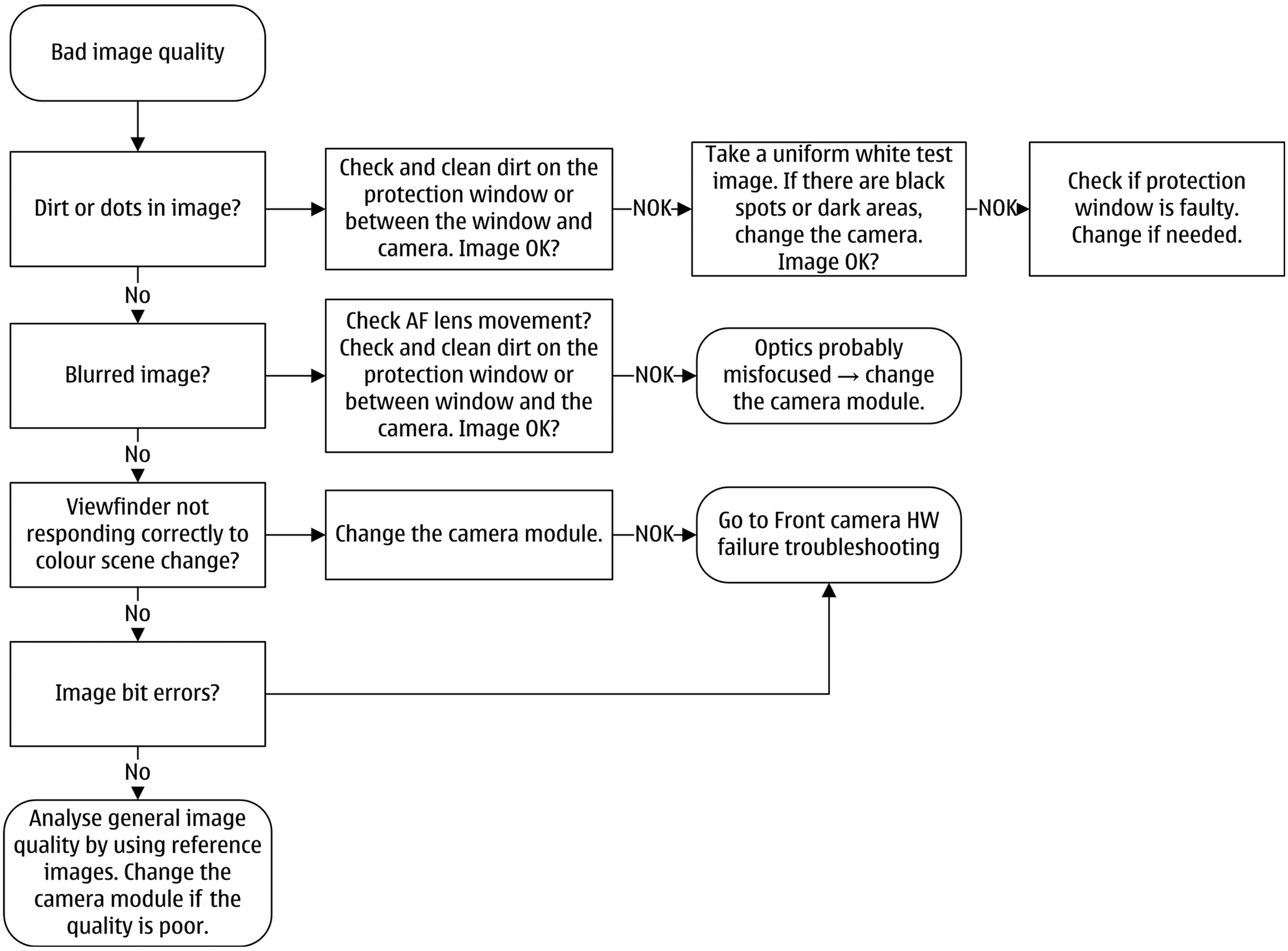
Front camera HW troubleshooting

Troubleshooting flow



Bad image quality troubleshooting

Troubleshooting flow



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9 — System Module

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Baseband description

System module block diagram

The device consists of two different main modules: transceiver and UI. The transceiver board consists of baseband and RF components. The UI board consists of key domes and keypad backlights. Connection between the UI and the transceiver board is established via a board-to-board spring connector.

> **Note:** In this description, the user interface HW covers display, camera, keyboard, keyboard backlight and ALS.

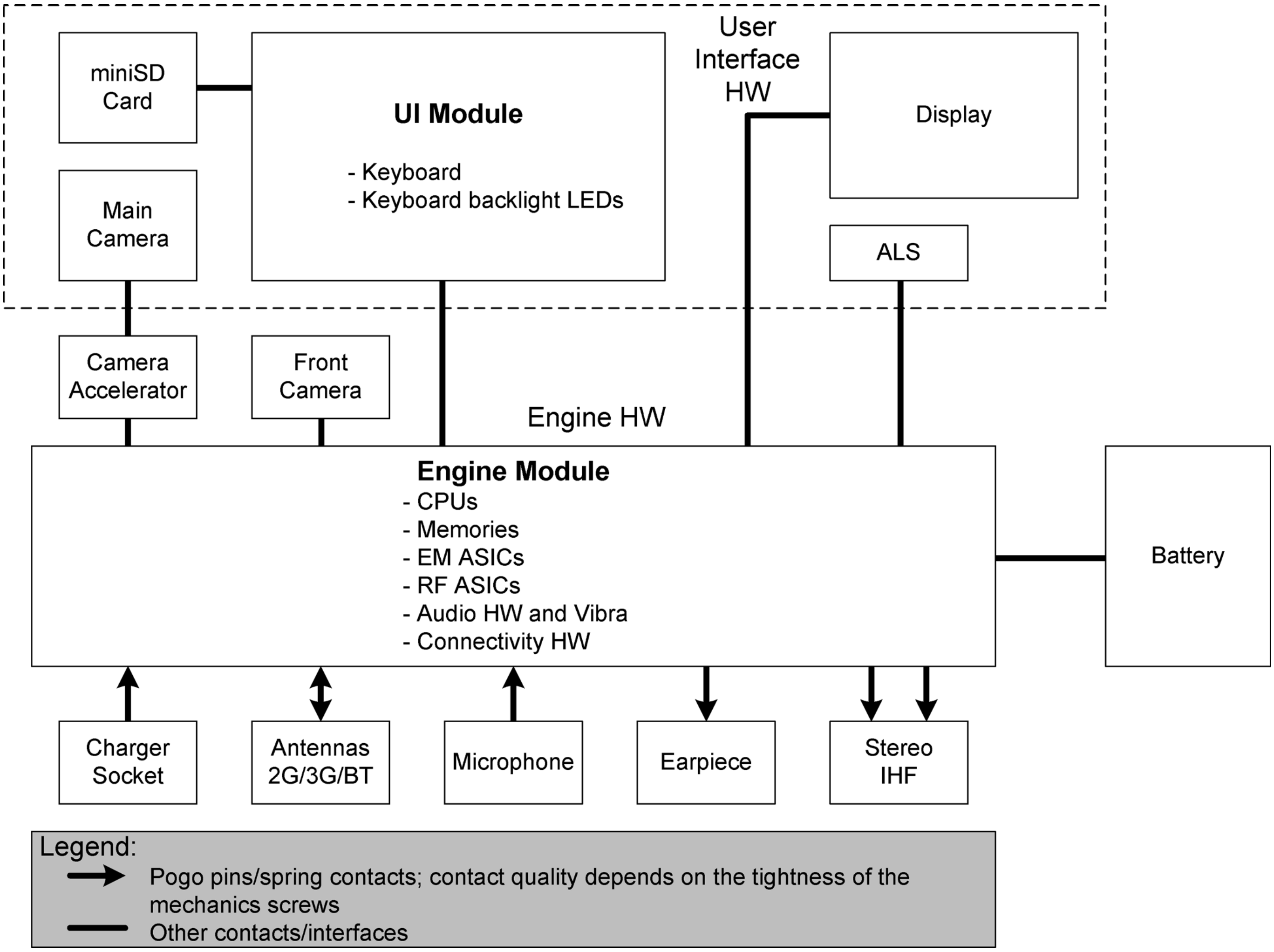

Figure 76 System level block diagram

Baseband functional description

Digital baseband consists of an ISA (Intelligent Software Architecture) based modem and Symbian based application sections. The modem functionality is in RAP, and the application processor acts as a platform for Symbian applications. The terms ISA and Symbian are used refer to the software environment of these devices.

The modem section consists of a RAP ASIC with NOR FLASH and SDRAM memory as the core. RAP supports WCDMA and GSM cellular protocols. The modem DDR SDRAM memory has 128 Mbits of memory and NOR flash has 128 Mbits of memory. RAP operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

The application section includes an application processor ASIC with DDR/NAND combo memory as the core.

Application processor

The application processor is also called an application ASIC because it is processing application SW and handles the UI SW. It consists of the application processor and peripheral subsystems such as camera, display and keyboard driver blocks.

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+20	V	
Back-Up supply voltage	0	2.5	2.6	V	Maximum capacity of the backup power supply 4 µAh.

Phone 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 N2200 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 N2200 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. In this mode certain regulators are enabled and after they and RFClk have stabilized, the system reset (PurX) is released and PWR_ON mode entered. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16 ms).
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.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2 V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1 V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9 V (typ.)
VCOFF+	Hardware cut off (rising)	2.9 V (typ.)

Parameter	Description	Value
VCOFF-	Hardware cut off (falling)	2.6 V (typ.)
SWCOFF	Software cut off limit	~3.2 V

The master reset threshold controls the internal reset of EM ASICs. If battery voltage is above VMSTR, N2300 charging control logic is alive. Also, the RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

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

Power distribution

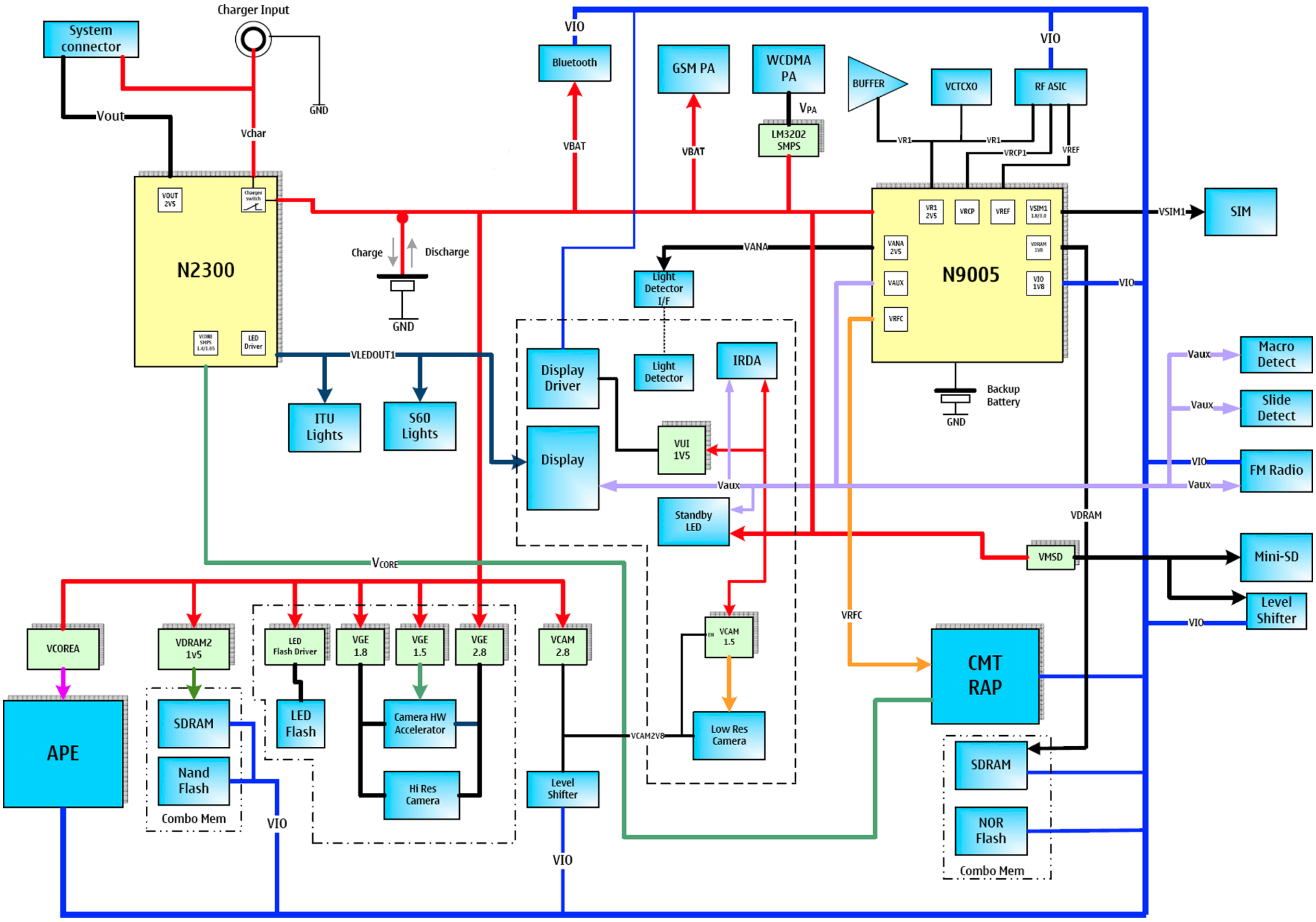

Figure 77 Power distribution diagram

Power supply components

- EM ASIC N2200
- EM ASIC N2300
- Application processor VCORE SMPS, N4200

- APE ADRAM LDO: N4201
- Camera and camera accelerator supplies: N6504, N6501 and N6500
- Mini SD regulator: N3500
- Flash LED driver: N6502
- Front camera regulator: N4405

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA & WCDMA PA) and for RF ASICs.

Discrete power supplies are used to generate 2.8 V to BT, 1.5 V for the camera IO voltage, 2.8 V for the front camera IO voltage, 1.3 V/1.5 V for the application processor and 18 V for the backlight LEDs. The device supports both 1.8 V/3 V SIM cards which are powered by VSIM1. VSIM2 is used to enable the regulator used to supply 3V for the mini-SD card interface.

USB accessories which need power from the device are powered by N2300 / VOUT.

The internal LED driver in N2300 is used in this engine implementation.

System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by the following reasons:

- Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wake-up

After that:

- N2200 activates sleep clock and VANA, VDRAM, VIO and VR1 regulators.
- Voltage appearing at N2200 RSTX pin is used for enabling N2300 ASIC.
- N2300 enables VCORE regulator and its internal RC-oscillator (600 kHz).
- VCTCXO regulator is set ON and RF clock (main system clock) is started to produce.
- N2200 will release PURX ~ 16 ms after power up is enabled (the RF clock is then stable enough).
- Synchronizing clock (2.4 MHz) for N2300 is started to be produced. After PURX is released and two rising edges of 2.4 MHz synchronous clock have been detected in SMPSClk input N2300 starts to use that instead of the 600 kHz internal RC-oscillator.
- HW start-up procedure has been finalized and the system is up and running. Now it is possible for SW to switch ON other needed regulators.

Clocking scheme

There are two main clocks in the system: 38.4 MHz RF clock produced by VCTCXO in RF section and 32.768 kHz sleep clock produced by the EM ASIC N2200 with an external crystal.

RF clock is generated only when VCTCXO is powered on by the EM ASIC regulator. The regulator itself is activated by SleepX signals from both RAP and application processor. When both CPUs are on sleep, RF clock is stopped.

RF clock is used by RAP, which provides (divided) 19.2 MHz SysClk further to the application processor. Both RAP and the application processor have internal PLLs which then create clock signals for other peripheral devices/interfaces like RS MMC, SIM, CCP, I2C and memories.

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

SMPS Clk is 2.4 MHz clock line from RAP to EM ASIC N2300 used for switch mode regulator synchronizing in active mode. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is 38.4 MHz signal from the RF ASIC to the Bluetooth system.

CLK600 is 600 KHz signal from EM ASIC N2300 to APE VCORE SMPS. The clock source is internal RC oscillator in EM ASIC (during the power-up sequence) or RAP SMPS Clk divided by 4 after the power-up sequence.

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. Data rate is regulated between the master and the slave.

USB

USB (Universal Serial Bus) provides a wired connectivity between a USB host PC and peripheral devices.

USB is a differential serial bus for USB devices. USB controller supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the system connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC N2200 and of an external interface between N2200 and SIM contacts.

The SIM IF is shown in the following figure:

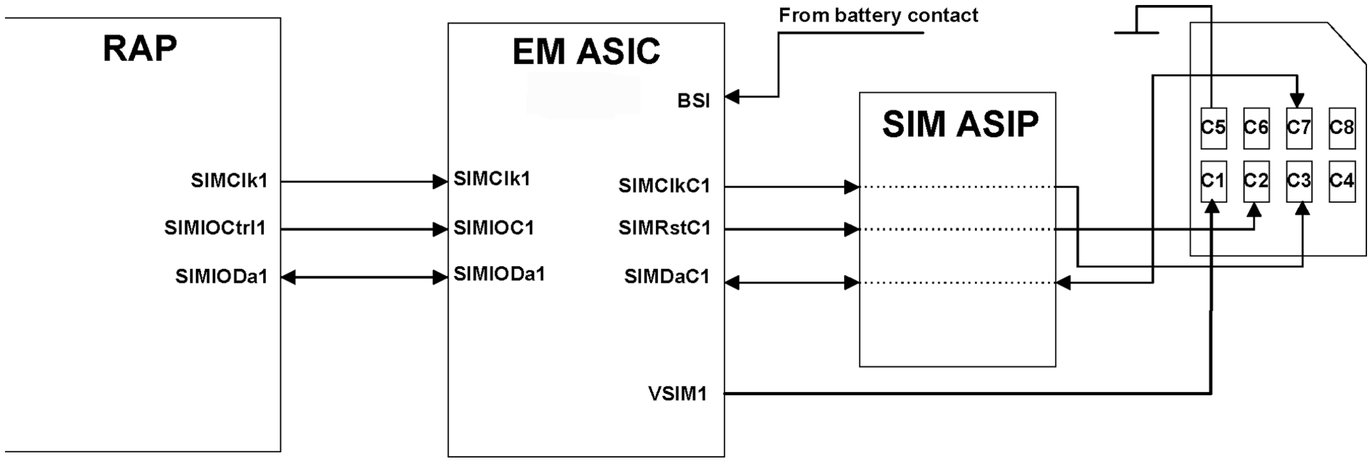

Figure 78 SIM interface

IrDA interface

IrDA specifies a reliable, fully digital peer-to-peer data link between IrDA units at data rates from 9600 bits/s to 4 Mbits/s. The link is based on the serial transmission of data as pulses of infra red light at the wave length of 870 nm and angles of +-15 degrees at the range 0 - 50 to 100 cm. Because of these restrictions and the optical nature of the link, the transmission is not omnidirectional but focused and only reaches a peer at a limited line-of-sight distance from the transmitter thus not disturbing any other units in the neighbourhood.

SD card interface

The SD card connector is mounted on the user interface PWB. The SD card is supplied with 3 V supply voltage. The detection of the SD card removal/insertion is done by a switch in the card connector. Removing the SD card while writing to the card may corrupt data in the SD card.

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

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

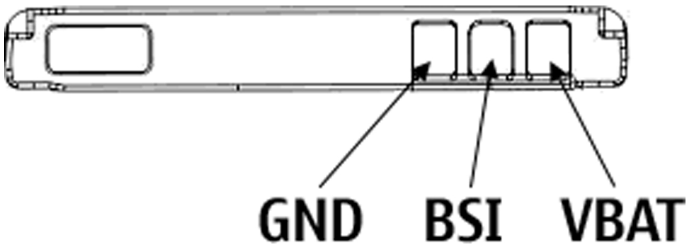

Figure 79 Battery pin order

Table 19 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line, which is located on the transceiver PWB, at a place where the phone temperature is most stable.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

Camera interfaces

Back camera interface

The back camera of the device uses a 3.2 mega pixel camera module with auto-focus, mechanical shutter and neutral density filter, producing pictures with a resolution of up to 2080x1560.

The regulators N9006, N6518, N6513 and N6517 power the graphics accelerator (D6500) and the camera.

Camera construction

This section describes the mechanical construction of the camera module for getting a better understanding of the actual mechanical structure of the module.

Table 20 Camera specifications

Sensor type	CMOS

Sensor photo detectors	3 million
F number/Aperture	f/3.5
Focal length	4.7 mm
Focus range	Normal mode: 68 cm to infinity
Still Image resolutions	2080x1560, 1600x1200, 1280x960, 800x600, 640x480
Still images file format	EXIF (JPEG), *.jpg
Video resolutions	352x288, 176x144, 128x96 all 15 frames per second
Video clip length	30 seconds or free, maximal clip length in free mode is 1 hour
Video file format	3GPP, *.3gp or MPEG-4, *.mp4 (64 kbps in short mode and 128 kbps in maximum mode)
Exposure	Automatic
White Balance	Automatic or adjustable
Colours	16.7 million / 24-bit

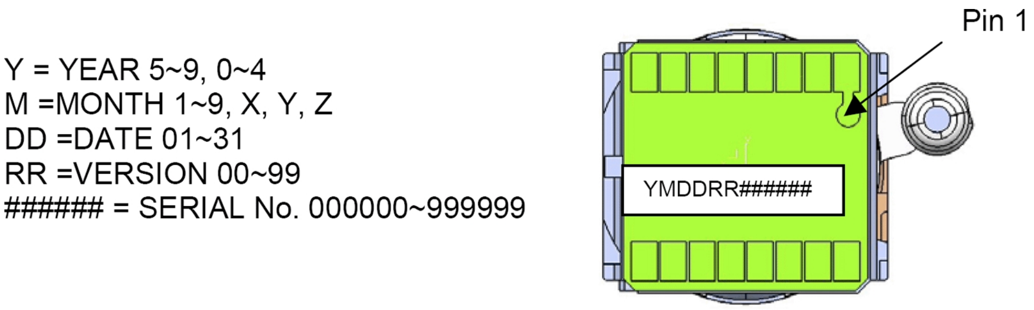

Figure 80 Camera module bottom view including serial numbering

Flash LED

The device back camera has a flash LED (FLED) located directly beside the camera, providing better lighting conditions in darker environments. The same LED is also used as an indicator light to indicate video clip recording, and to indicate when pictures are being taken as a privacy indicator.

The connections between the main PWB and the FLED are implemented with a pair of “pogo” pins shown as X6501 on the schematic.

The FLED has four white LEDs connected in series in one module. The module also includes a lens with its plastic housing to ensure a proper light pattern at the target.

The dimensions of the FLED are 6.5 x 7.5 x 3.5 mm.

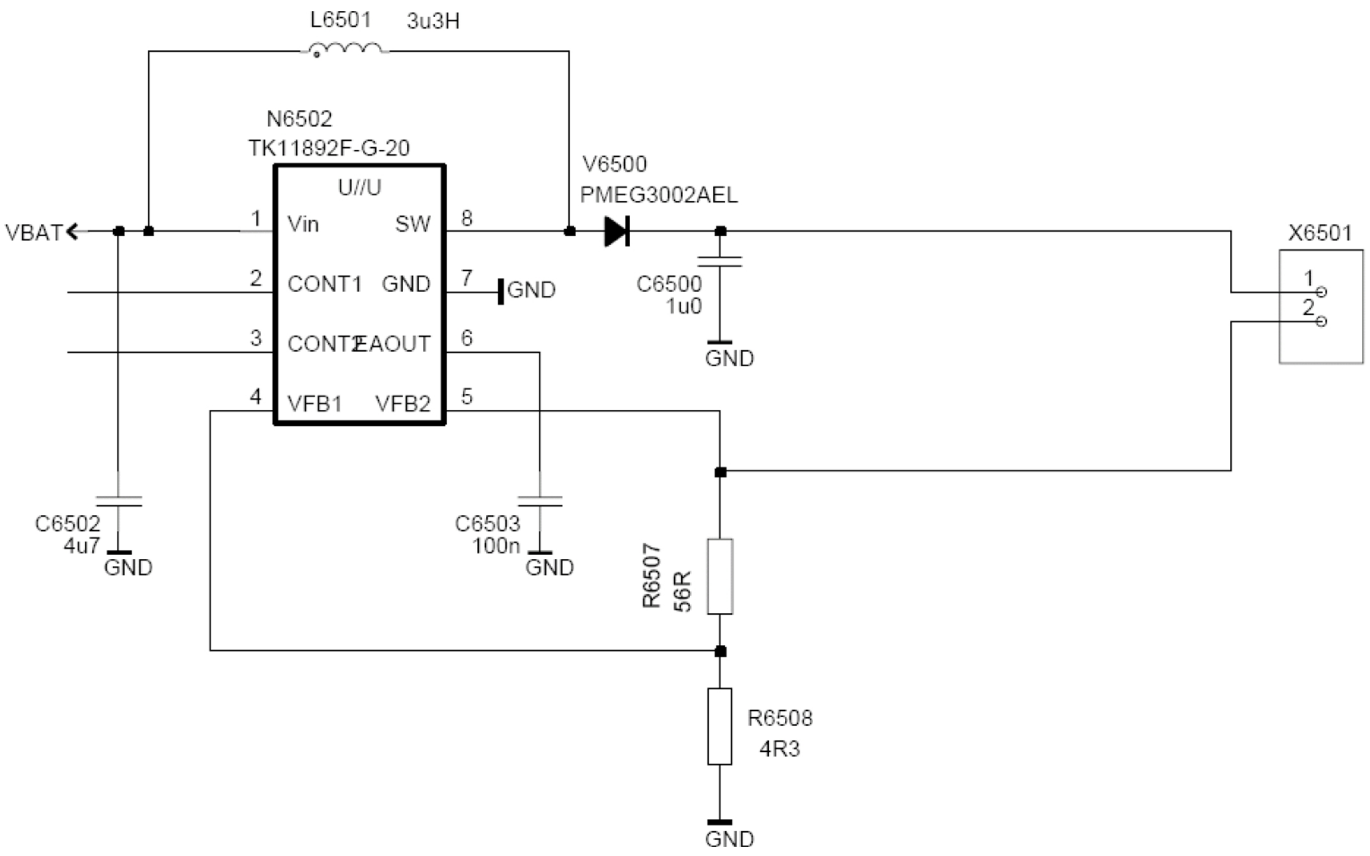

Figure 81 Simplified flash LED connection

Front camera

The front camera has VGA (640x480) resolution, and it is mainly used for video calls. It can also be used as a still camera and camcorder.

The front camera is controlled and its data is collected by the application processor.

The front camera has the following characteristics:

Sensor type:	CMOS
Sensor Photo detectors:	VGA
F number/Aperture:	f/2.9
Focal length:	4.5 mm
Still Image resolutions:	640 x 480
Video frame rate:	up to 30 frames per second
Video clip length:	30 seconds or free, maximal clip length in free mode is 1 hour
Video file format:	MPEG-4 *.mp4 and 3GPP, *.3gp (64 kbps in short clip mode, 128 kbps in maximum mode)
Exposure:	Automatic and manual
White Balance:	Automatic or adjustable
Capture Modes:	Still capture mode, video mode, sequence mode 10,20 or 30 seconds.

User interface

User interface

The user interface of the handset consists of a complete keyboard/navi-key module connected to the engine PWB by a flexi circuit and some parts of the engine PWB.

The user interface sections contained on the engine PWB are:

- Main power key
- Dedicated camera shutter key
- Volume/zoom keys

Slide position sensor

The position (open/shut) of the slide is detected by means of a switch on the C-cover connected to the engine PWB by two pogo connectors.

Keyboard

The device keyboard is contained on a separate UI board. All the keys are part of the same matrix, and the ones on the UI board are connected to the APE ASIC via Z4400 ASIP.

Table 21 Keymatrix

	COL_0	COL_1	COL_2	COL_3	COL_4
ROW_0	Left soft key	Right soft key	Send		
ROW_1	Navi select	Navi left	Navi up	Navi down	Navi right
ROW_2	7	2	3	8	Volume up
ROW_3	5	Imaging	1	6	
ROW_4	9	*	Operator	#	
ROW_5	End	Camera half	Camera full	4	
ROW_6	0	Edit	Clear	Apps	Volume down

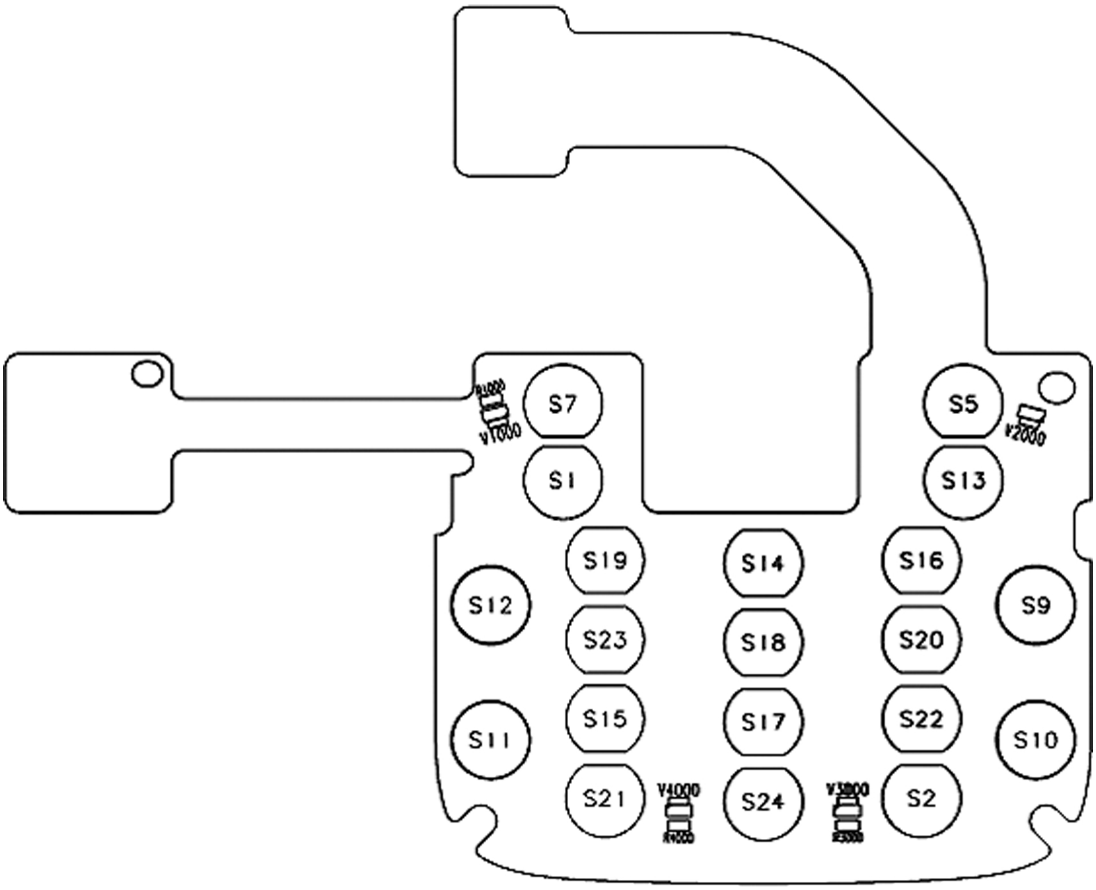

Figure 82 Keyboard layout

Main display

Display module mechanical concept

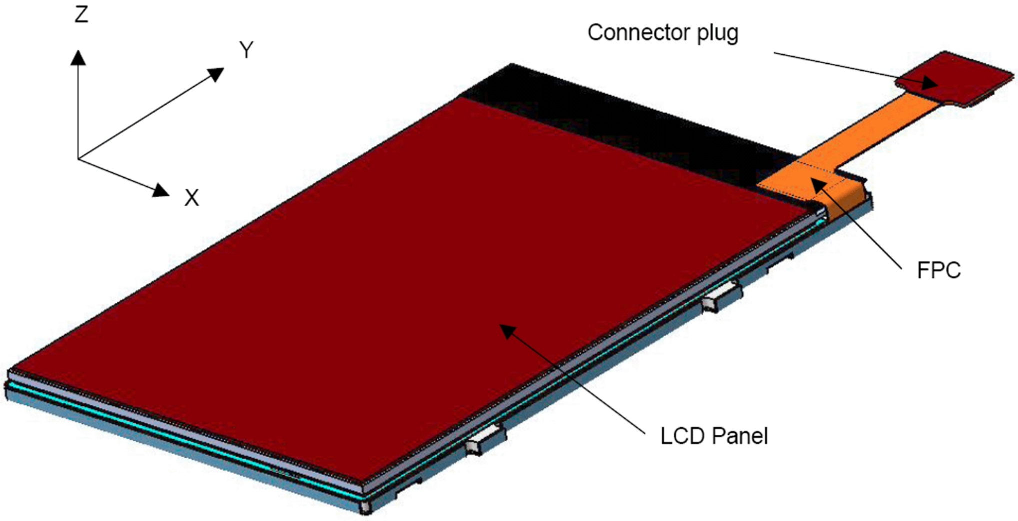

Figure 83 General diagram of the LCD module

Display features:

- Module size (width x height x thickness) 41.92 mm, 60.55 mm, 2.72 mm
- Resolution QVGA

- Numbers of colours up to 262k
- Partial display function; power saving by pausing display process on part of the screen.
- Built-in RAM capacity 240 columns x 320 rows x 18 bits = 1,382,400 bits

The display has two different operating modes:

- Normal mode, Full screen, 262k colors
- Partial idle mode, 8 colours but only part of the display is active

The interconnection between the LCD module and the Nokia engine is implemented with a 24-pin board-to-board connector.

The display is controlled via a MeSSi-16 interface with an 8-bit bus by the application processor. All MeSSi-16 signals go through the EMC filtering ASIPs. The display module does not require any tunings in service.

Display and keyboard backlight

The device uses a LED driver in N9002 to drive the LEDs in both the keyboards and the display. The chain of LEDs on the UI board consists of four LEDs. In addition, there is a separate set of LEDs as part of the UI module.

Current feedback is done through the display LEDs only, with the chains being driven from the display LED voltage through an emitter follower, controlled by BETTY_GenOut 1 into V6509 0V / 1.8 V LED control.

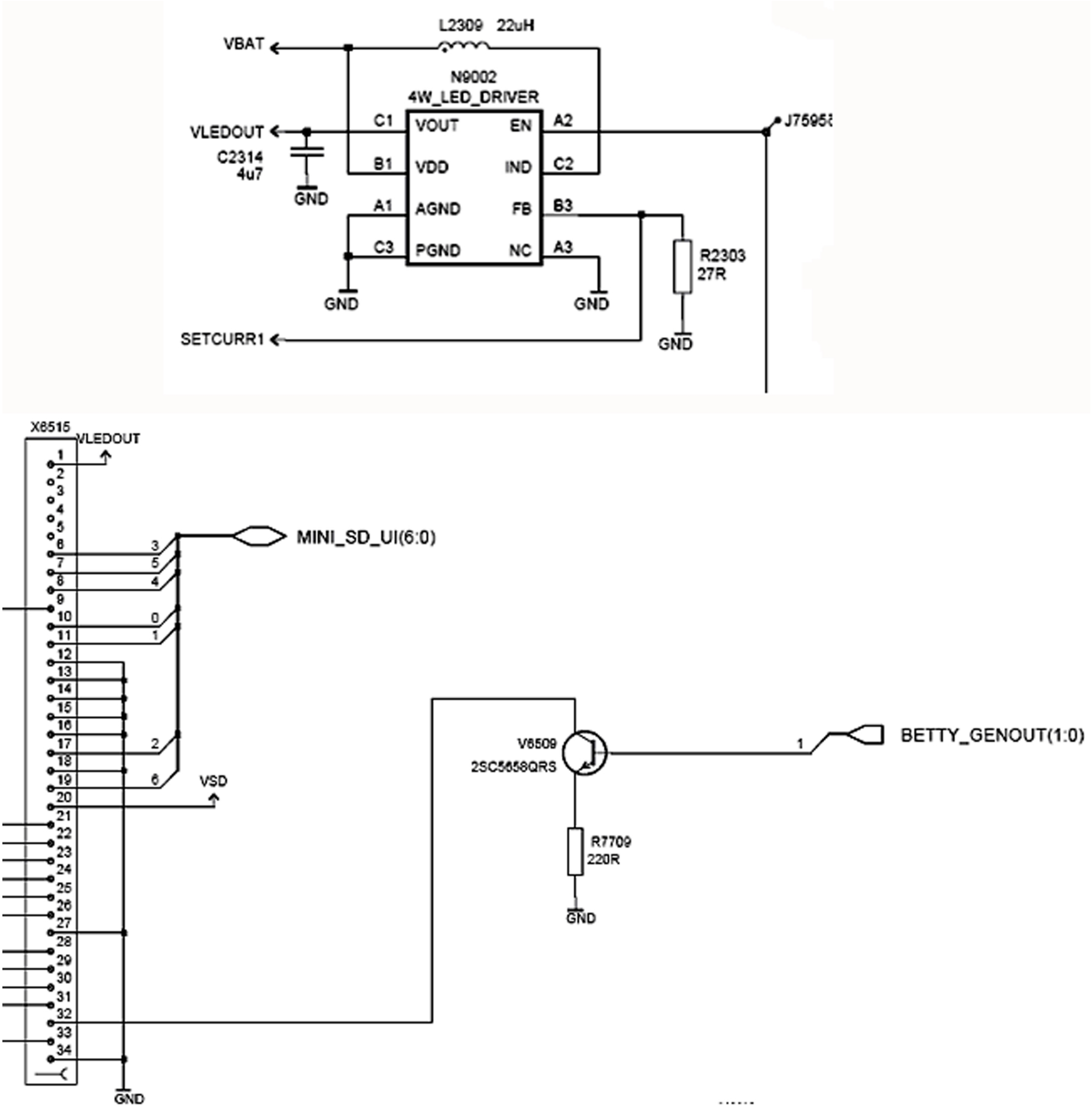

Figure 84 Connections on the engine board

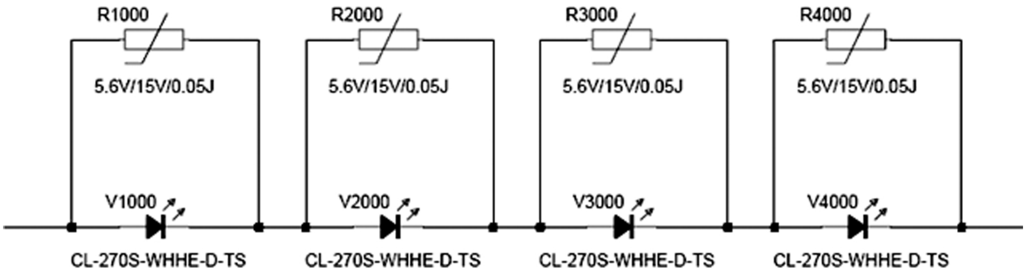

Figure 85 Connections on the UI board

The left-hand end of the chain connects to VLEDOUT, and the right-hand end connects to VLEDRETURN.

ALS interface

Ambient Light Sensor (ALS) is located in the upper part of the phone. It consists of the following components:

- lightguide (part of the front cover)
- phototransistor (V6501) + resistor (R4401)
- NTC + resistors (R4400, R4402, R4403)
- Common mode filter (L7551)
- EM ASIC (N2200)

Information on ambient lighting is used to control the backlights of the phone:

- Keypad lighting is switched on only when the environment is dark
- Display backlights are dimmed, when the environment is dark

The ambient light sensor itself is a photo transistor, which is temperature-compensated by an external NTC resistor. The EM ASIC N2200 reads the light sensor (LS) and temperature (LST) results.

ALS calibration is not possible in the service points. ALS is serviced by replacing faulty phototransistors.

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor. RAM memory is integrated into RAP.

EM ASIC N2200

The EM ASIC (N2200) includes the following functional blocks:

- Start up logic and reset control
- Charger detection
- Battery voltage monitoring
- 32.768kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter
- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC N2300

The EM ASIC (N2300) includes the following functional blocks:

- Core supply generation
- Charge control circuitry
- Level shifter and regulator for USB/FBUS
- Current gauge for battery current measuring
- LED driver for backlights
- Digital interface (CBUS)

Device memories

RAP memories NOR flash and SDRAM

Modem memory consists of 128 Mbit SDRAM and 128 Mbit NOR flash memories.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. The stacked DDR/NAND application memory has 512 Mbit of DDR memory and 1024 Mbit of flash memory.

■ Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAP CMT engine ASIC and the mixed-signal EM ASIC N2200.

There are four audio transducers:

- Dynamic earpiece
- 2 dynamic speakers
- Electret microphone module

In addition to the audio transducers, N2200 also provides an output for the dynamic vibra component.

All galvanic audio accessories are connected to the system connector accessory connector.

A Bluetooth audio module that is connected to RAP supports Bluetooth audio functionality.

There is a separate application processor for Symbian applications.

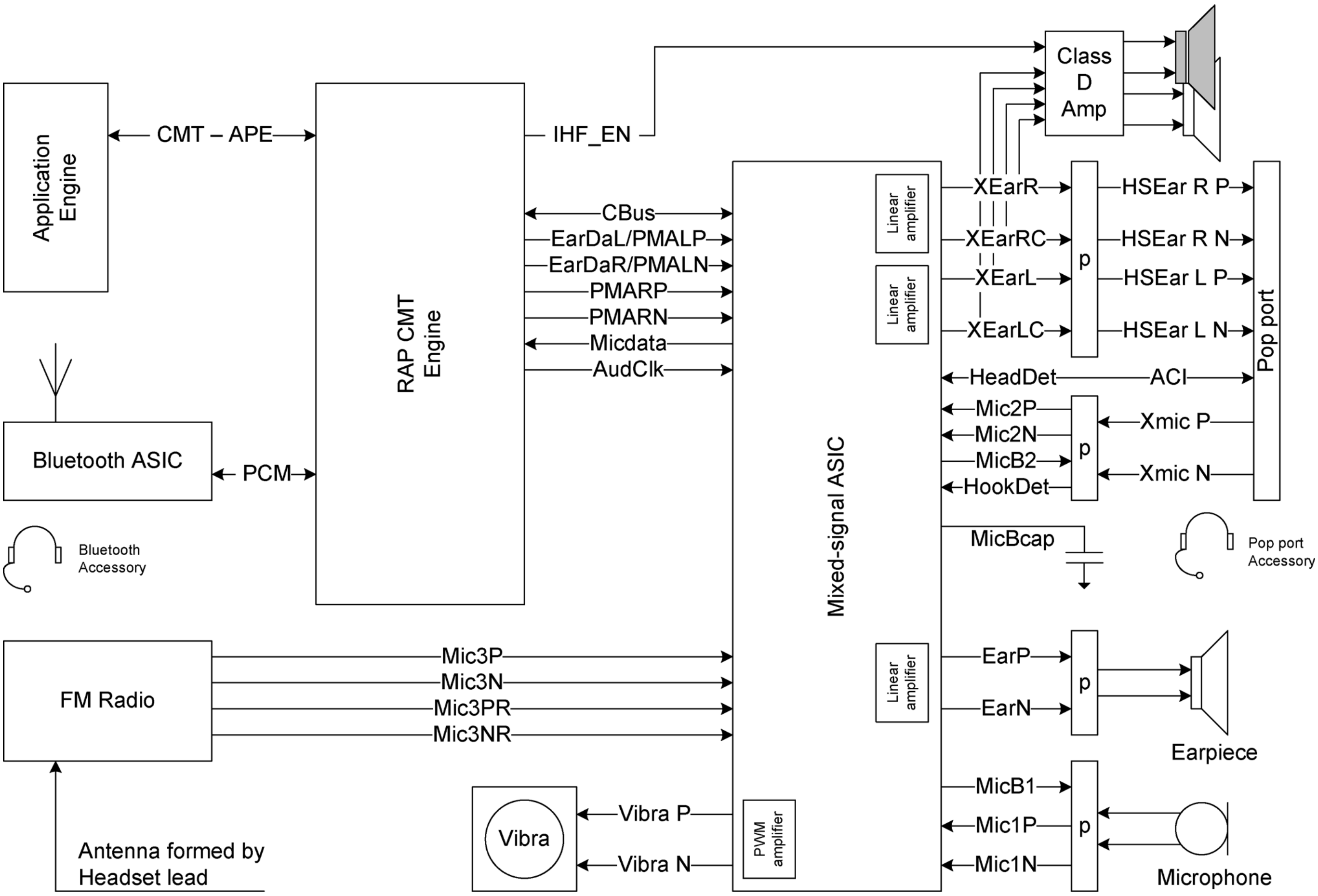

Figure 86 Audio block diagram

Internal microphone

The internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to the EM ASIC (N2200) Mic1P and Mic1N inputs via asymmetric electrical connection.

The microphone is biased by the EM ASIC MicB1 bias voltage output.

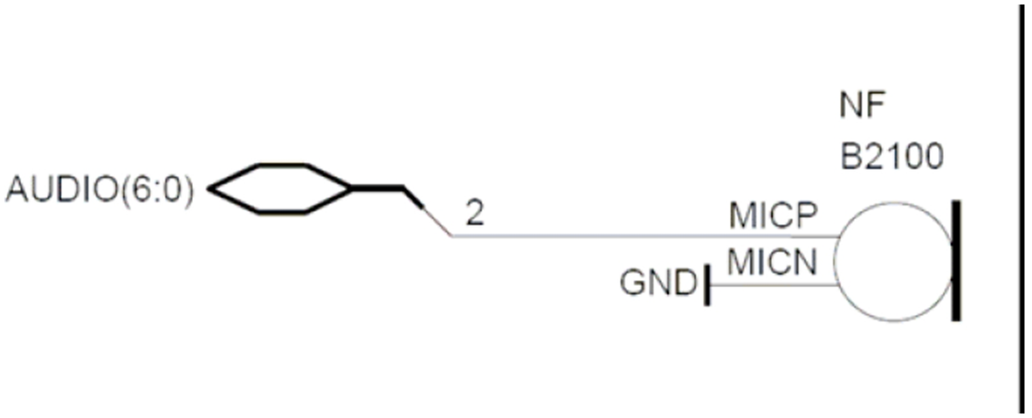

Figure 87 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector.

Accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

A dynamic earpiece capsule is connected directly to the EM ASIC (N2200) differential outputs EarP and EarN.

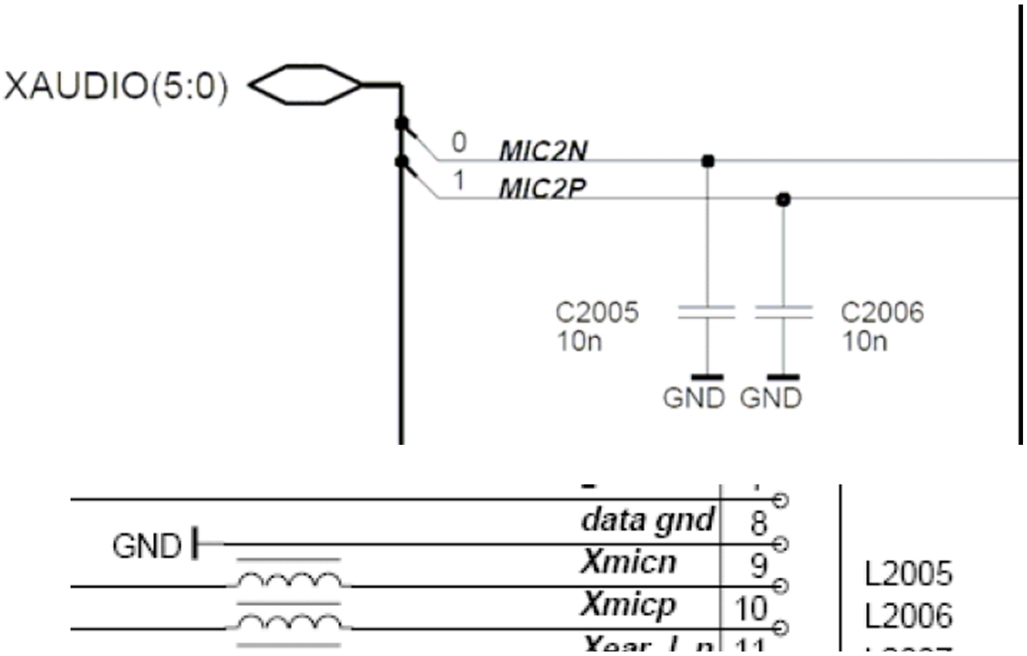

Figure 88 External microphone circuitry (system connector connects to the right side)

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic earpiece capsule is connected directly to the EM ASIC (N2200) differential outputs EarP and EarN.

Internal speaker

The internal speakers are used in Internal HandsFree (IHF) call mode.

Two dynamic speakers are connected to the N6509 dual amplifier.

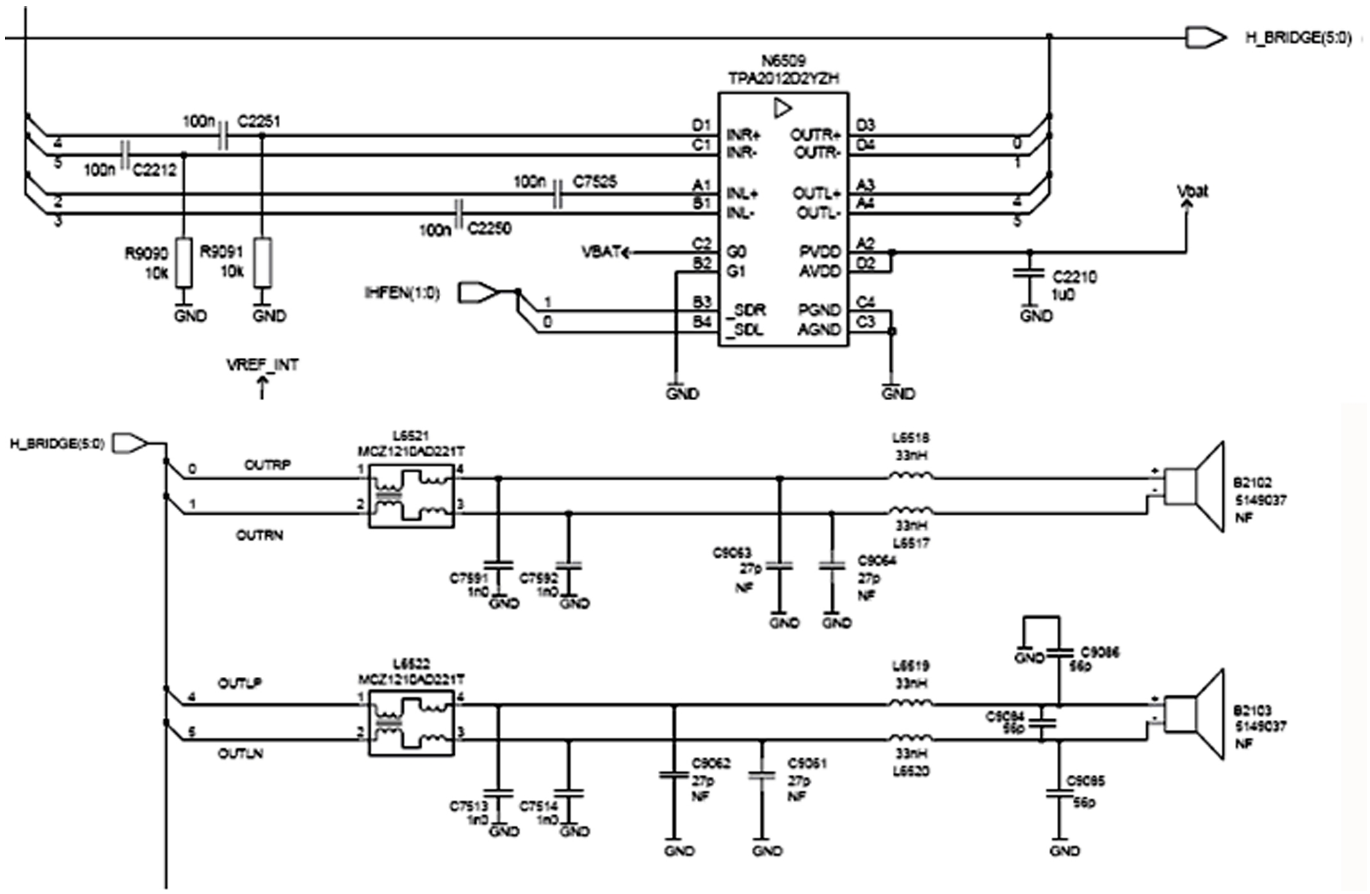

Figure 89 Internal speaker circuitry

External earpiece

All galvanic accessories are connected to the system connector.

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

N2200 provides two output channels in either single-ended or differential format. N2200 outputs XearL and XearLC for the left channel audio output, and XearR and XearRC the right channel audio output. XearLC and XearRC are the ground pins if using single-ended mode. On the system connector side, HSEAR_P and HSEAR_N form the left channel output, and HSEAR_R_P and HSEAR_R_N the right channel output. HSEAR_N and HSEAR_R_N are the ground pins in single-ended mode.

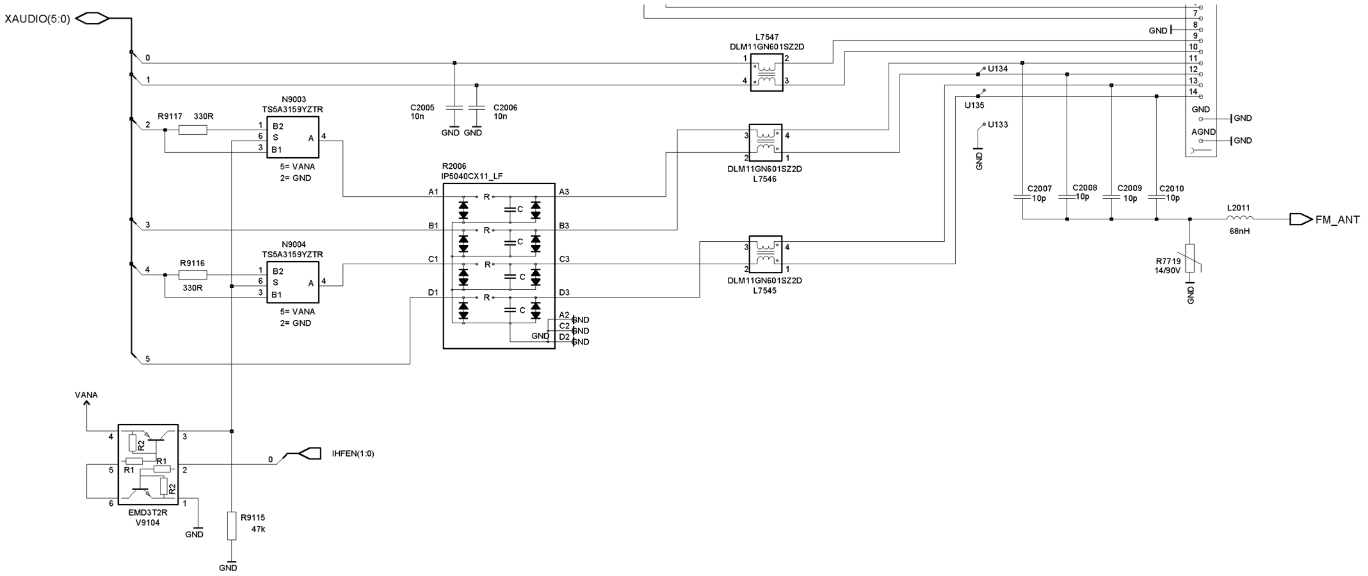

Figure 90 External earpiece circuitry

Vibra circuitry

Vibra is used for vibra-alarm function.

The vibra motor is connected to the EM ASIC (N2200) VibraP and VibraN Pulse Width Modulated (PWM) outputs.

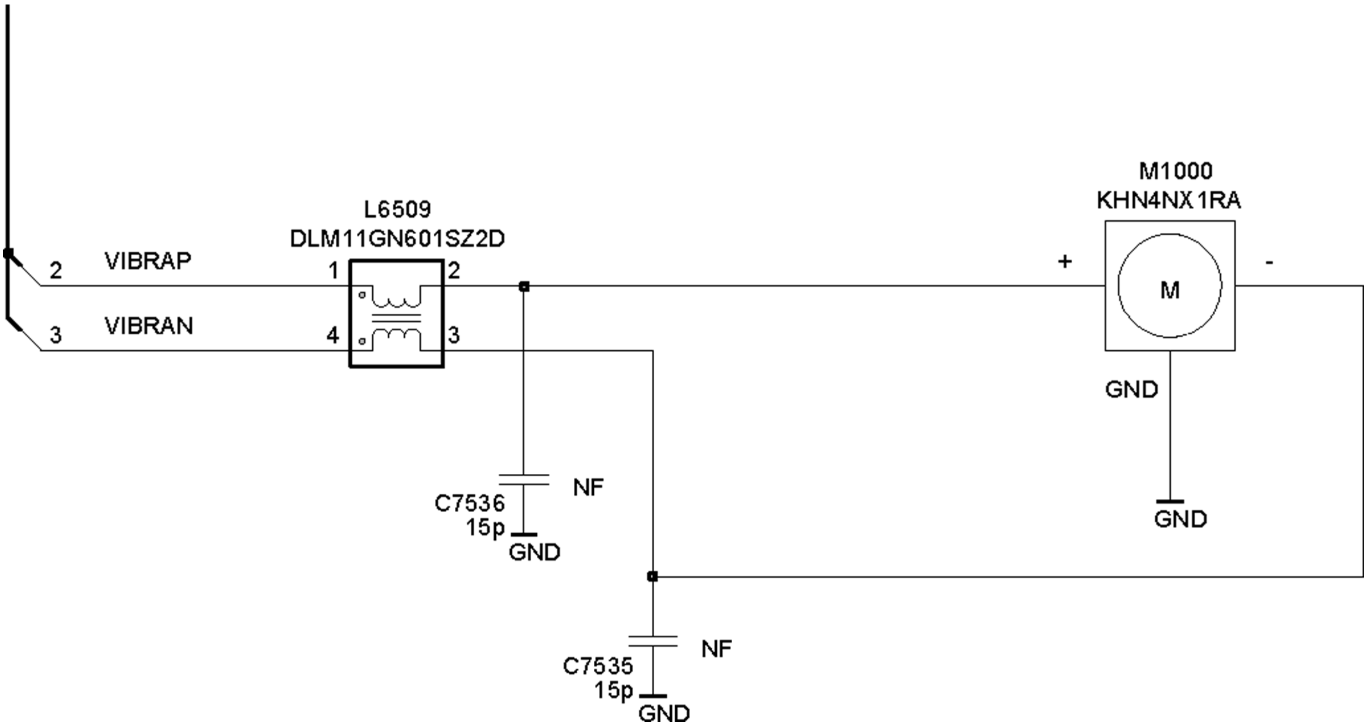

Figure 91 Vibra circuitry

The vibra is soldered onto the engine PWB.

System connector

The system connector provides a fully differential 4–wire stereo line-level output connection and a fully differential 2-wire mono line-level or microphone level input connection.

The handsfree driver in one of the EM ASICs is meant for the headset.

The output is driven in a fully differential mode. In the fully differential mode, the handsfree pin is the negative output and the HFCM pin is the positive output. The gain of the handsfree driver in the differential mode is 6 dB.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

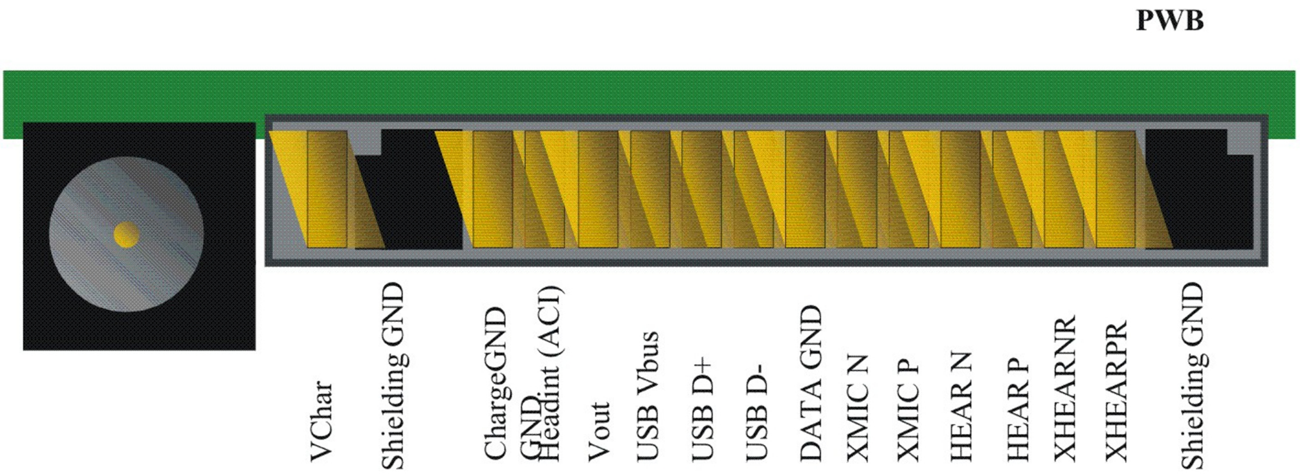

Figure 92 External audio connector

Table 22 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0 / 2.5-2.78V	47Ω	Insertion & removal detection
4/ Vout	DC out	DC	2.78V 70 mA 2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	1Vpp & 2.5-2.78VDC		
11 / HEAR N	Audio out	20-20k	1Vpp	10Ω	
12 / HEAR P	Audio out	20-20k	1Vpp	10Ω	
13 / HEAR R N	Audio out	20-20k	1Vpp	10Ω	Not conn. in mono
14 / HEAR R P	Audio out	20-20k	1Vpp	10Ω	Not conn. in mono

Baseband technical specifications

External interfaces

External interfaces

Name of Connection	Connector reference
USB	X2001
Charger	X2000
Headset	X2001
SIM	X6513
MiniSD	X1001
Battery connector	X6512

VOUT electrical characteristics

Description	Parameter	Min	Max	Typical	Unit	Notes
Vout regulator for external accessories	VOUT	2.43	2.57	2.5	V	Max load 90mA

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	EM ASIC N2200	VSIM1	Supply voltage to SIM card, 1.8V or 3.0V.
C2	SIMRST	Out	EM ASIC N2200	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	EM ASIC N2200	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground
C7	SIMDATA	In/Out	EM ASIC N2200	SIM1DaC	Data input / output
SW	SIM_DET	In	EM ASIC N2200	SIMDetX	Removal detection

Charger connector and charging interface connections & electrical characteristics

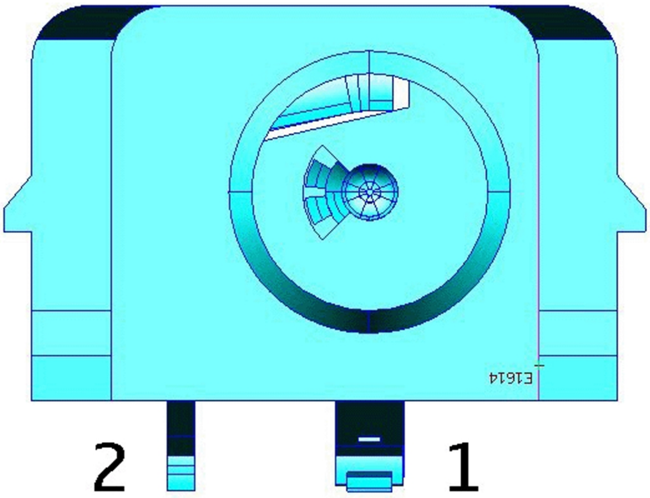

Figure 93 Charger connector

Table 23 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	N2300	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 24 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	9	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	
Threshold for charging, rising (N2300)	V_{MSTR+}	2.1		V	Typical value
Threshold for charging, falling (N2300)	V_{MSTR-}	1.9		V	Typical value

Internal interfaces

Internal interfaces

Name of connection	Connector reference
UI connector	X6515
Back camera	X6523
Front camera	X6522
Flash connector	X6501
Power key	X6526, X6527
Display connector	X6507
Slide switch	X6530, X6531

UI module connector and IF connections

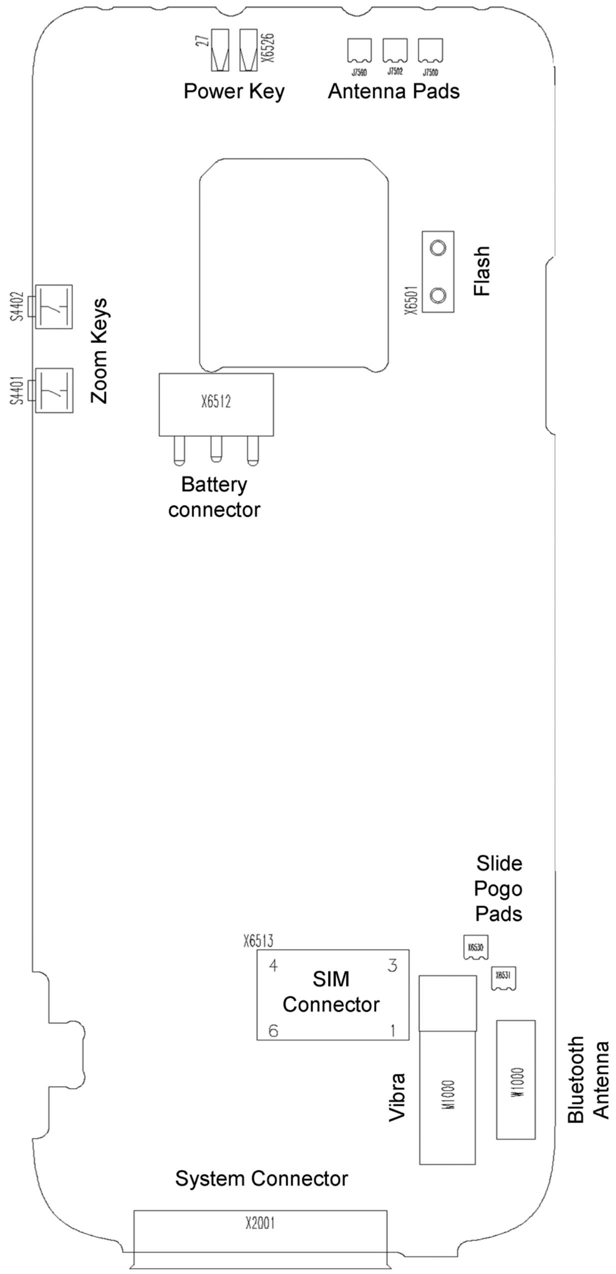

Figure 94 Back side of the board

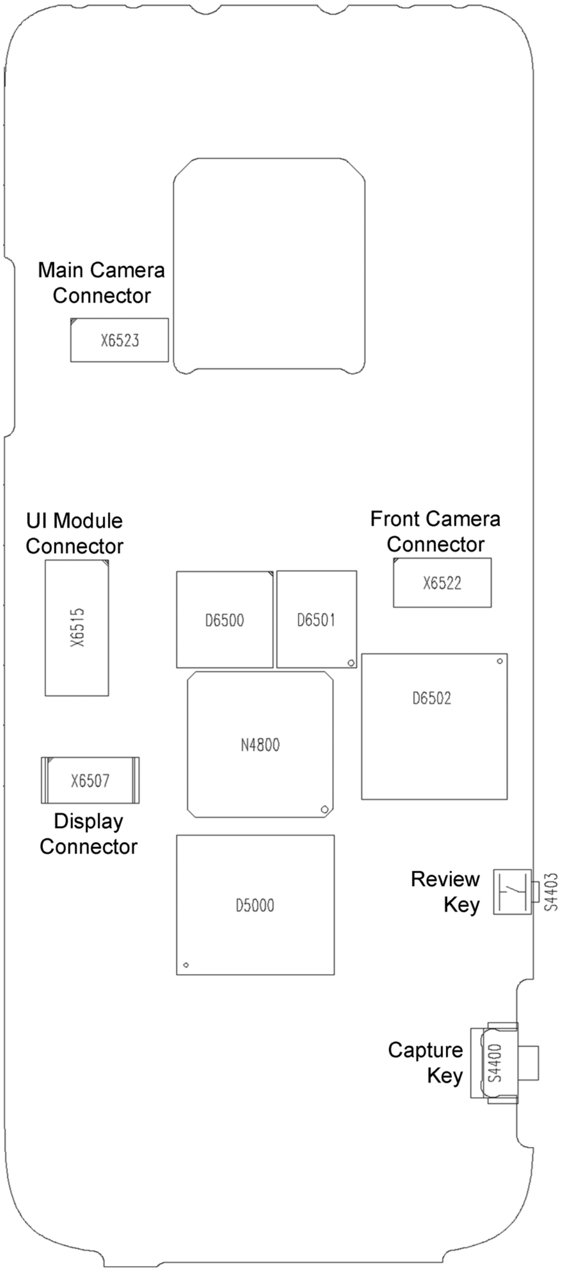

Figure 95 Front side of the board

Keyboard interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
High-level input voltage	V_{IH}	0.65* V_{DDS}	V_{DDS}	0.3+ V_{DDS}	V	Row
Low-level input voltage	V_{IL}	-0.3	0	0.35* V_{DDS}	V	Row
High-level output voltage	V_{OH}	1.62	V_{DDS}	1.98	V	Column

Description	Parameter	Min	Typ	Max	Unit	Notes
Low-level output voltage	V_{OL}		0	0.45	V	Column
(VDDS = 1.8V)						

Keyboard connector and interface connections

Pin	Signal	I/O	Engine connection	Notes
1	VLEDOUT	O	N2200	
6	Dat3/CD	I/O	APE	MiniSD
7	CMD	I/O	APE	MiniSD
8	CLK	I/O	APE	MiniSD
9	Row 0		APE	
10	Dat0		APE	MiniSD
11	Dat1	I/O	APE	MiniSD
12-16	GND			
17	Dat2	I/O	APE	MiniSD
18	GND			
19	Card Detect	I	APE	MiniSD
20	VSD	Power		MiniSD
21	Column 4			
22	Column 3			
23	Row 4			
24	Column 0			
25	Row 5			
26	Row 6			
27	GND			
28	Row 2			
29	Row 1			
30	Row 3			
31	Column 1			
32	VLED return			
33	Column 2			
34	GND			

Back camera electrical characteristics

Table 25 Camera CCP IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Common mode voltage	VCMF	0.8	0.9	1	V	-1
Differential voltage swing	VOD	100	150	250	mV	-2
Operating frequency	fCLK	1		175	MHz	SW controls frequency
Differential rise and fall time		300		800	ps	-3

Note:

- Common mode voltage is a mean value of high and low states of one single-ended signal.
- Differential voltage swing is differential amplitude between signals of differential pair.
- Differential transitions should be only measured with good equipment (bandwidth > 1 GHz), otherwise results will seem too slow.

Table 26 Camera supply voltage characteristics

Description	Parameter	Min	Typ	Max	Unit
Camera analogue voltage	VDD	2.37	2.5	2.63	V
Camera digital voltage	VDDI	1.4	1.5	1.65 V	V

Front camera electrical characteristics

Table 27 Front camera supply voltage characteristics

Description	Parameter	Min	Typ	Max	Unit
Camera I/O and photo sensor voltage	VCAM2	2.6	2.8	3	V
Camera digital circuits and A/D converter voltage	VCAM	1.4	1.5	1.6	V

Flash LED interface and electrical characteristics

Table 28 Flash LED interface connections

Signal name	From	To	Description
GPIO28	D4800	N1471	Indicator mode enable signal

Signal name	From	To	Description
ARMIO4	D4800	N1471, V1472	Flash mode enable test signal (only test use)
VBAT	Battery	N1471	Battery nominal voltage
STROBE	Camera	N1471, V1472	Flash light enable signal from back camera

Table 29 Flash LED interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
GPIO28	GPIO output	1.72	1.8	1.92	V
ARMIO4	GPIO output	1.72	1.8	1.92	V
STROBE	Strobe signal output	2	-	2.5	V

Slider switch electrical characteristics

Signal name	From	To	Low value	High value	Description
GPIO53	Application processor	S5202	160 mV	1.8 V	Slider switch cover status signal.

Back-up battery interface connections and electrical characteristics

Table 30 Back-up battery connections

Pin name	I/O	Connection	Notes
L2207, VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200 via coil

Table 31 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

RF introduction

The RF is controlled by digital baseband circuitry via a serial bus (RFBus). The RFBus is for mode selection, frequency synthesizer control, RX AGC setting, RF regulator control, TX power control loop and PA bias control. In addition to RFBus there are also several other interface signals coming from BB. TX power control (TXC), VCTCXO frequency control (AFC) and some other control signals (voltage and current references, WCDMA TX power detection, PA combination detection).

Regulators

All RF regulators, except one, are located in the EM ASIC N2200 in the baseband section or in the RF ASIC of the device. The discreet regulator, N7541, feeds the WCDMA PA. The EM ASIC N2200 has three regulators for RF:

- 2.5 V regulator VXO
- 4.75 V regulator VCP (VCP1 & VCP2)
- 1.35 V regulator, VB_EXT, which is the reference voltage.

RF block diagrams

The RF block diagram for RM-133 uses RF ASIC N7500 as illustrated by the red border in the block diagram.

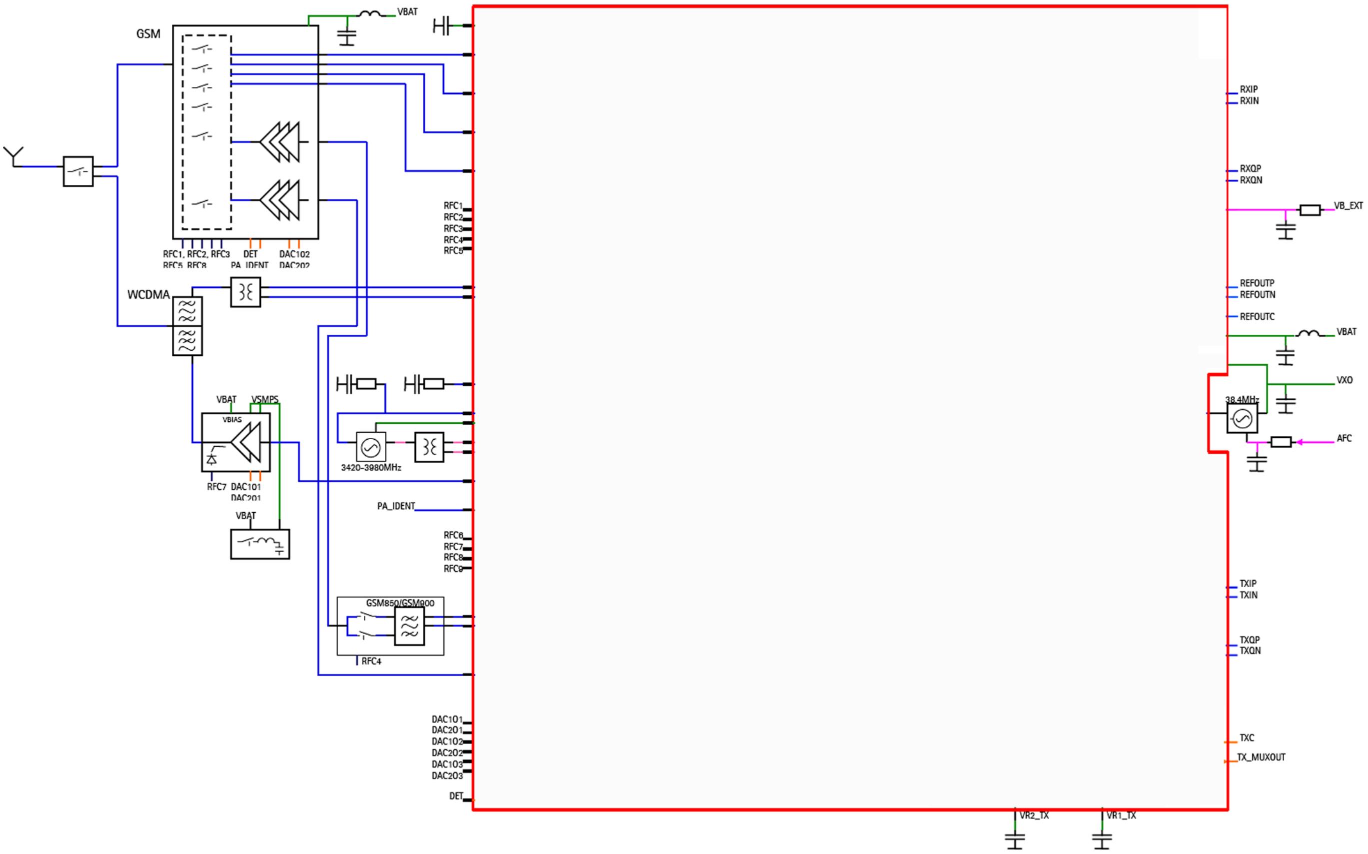

Figure 96 RM-133 RF block diagram

The RF block diagram for RM-132 is the same as for RM-133 except all WCDMA specific components have been removed.

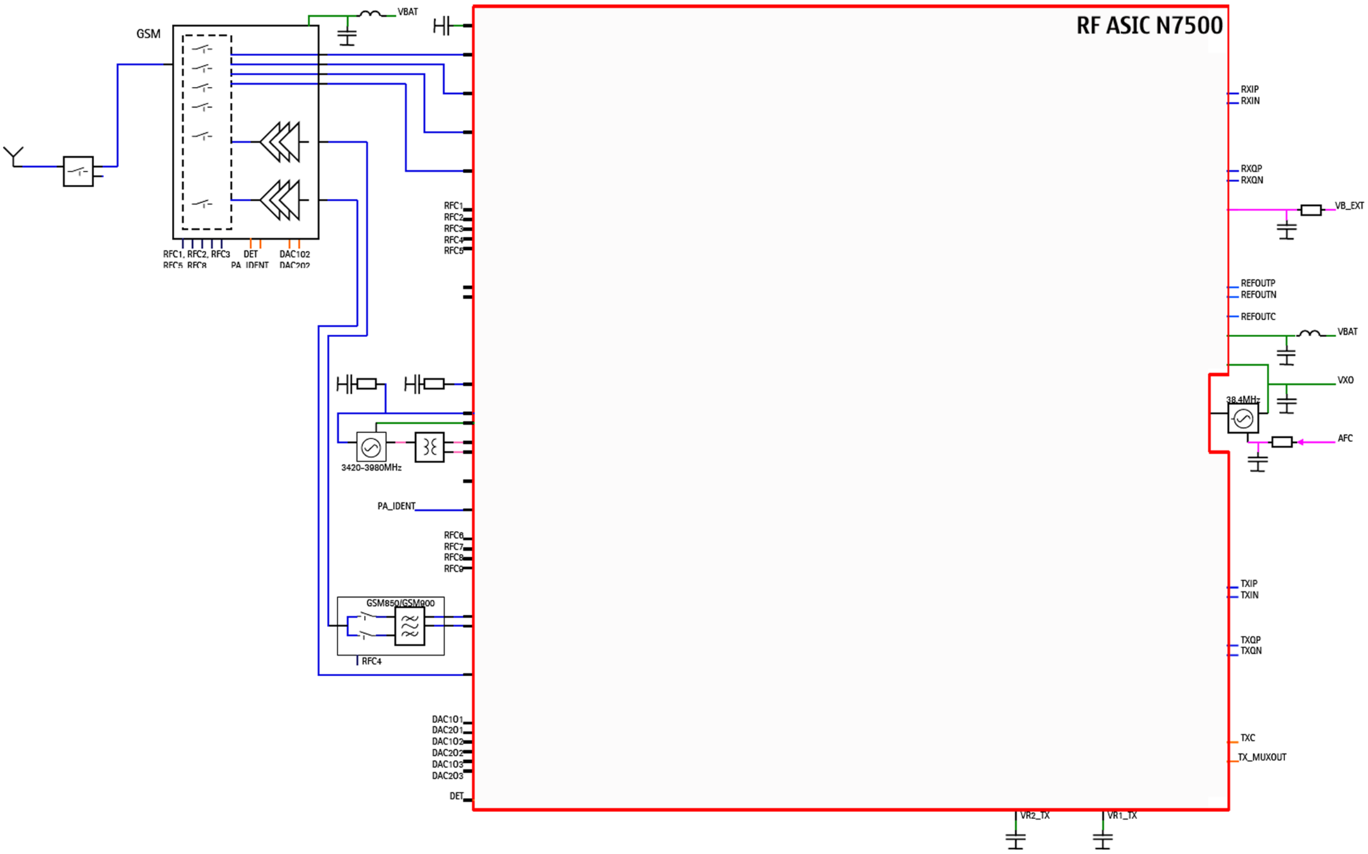

Figure 97 RM-132 RF block diagram

Single feed switch

In RM-133, the single feed antenna switch directs the received signal from the multiband antennas to either the GSM or the WCDMA section. In the case of RM-132, the WCDMA switch output is terminated by a matched load. The GSM section covers the four GSM bands USGSM850, EGSM900, GSM1800 and the GSM1900. The WCDMA section operates at the 2100 MHz band. In the transmit direction the switch takes the transmit signal from either the GSM band or the WCDMA band to the single feed multiband antenna.

Frequency plan

Both, the receiver and the transmitter, are based on direct conversion architecture. The VCOs operate at the channel frequency multiplied by two or four depending on the band of operation. This means that the modulated baseband signals are directly converted up to the transmission frequency and the received RF signals directly down to the baseband frequency.

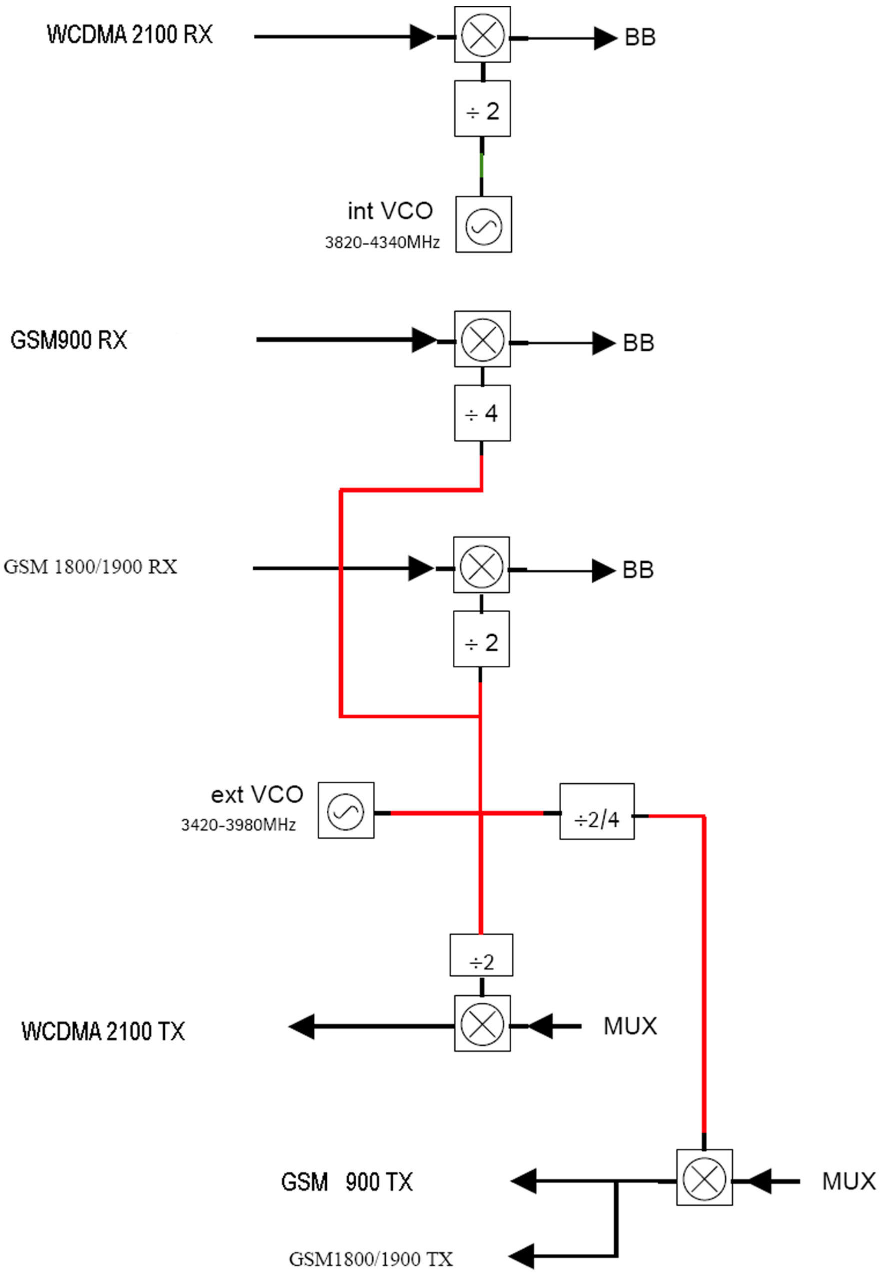

Figure 98 RF frequency plan

Receiver

Introduction to receiver functionality

The receiver is a linear direct conversion receiver containing LNA, band pass filter and demodulator for each supported system and band. After the demodulators the signal paths are combined to one common BB path.

WCDMA receiver

In the WCDMA mode, the received signal is fed from the antenna to the single feed switch, which routes the received WCDMA signal to the SAW duplex filter. From the duplex filter, the signal goes through a balun to the integrated LNA in the RF ASIC. From the LNA, the signal goes through a band pass filter. After filtering, the signal goes to the down conversion mixer, which converts the signal into baseband I and Q signals.

At BB frequency the signal is amplified and fed to a low pass filters.

The filter is followed by an AGC amplifier with adjustable gain. The signal is further amplified before it is fed to balanced analog IQ output pins. Analogue output pins are accompanied by reference voltage output, which sets the DC level for the AD converter in BB ASIC.

GSM receiver

As GSM Rx branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the single feed switch, which routes the received GSM signal to a front-end module, containing a PIN diode switch matrix. The switch matrix is used for the GSM band as well as for the Rx/Tx selection.

The switch matrix is followed by integrated LNA stages in the RF ASIC. The LNAs are followed by demodulators which down-convert the signal to baseband I and Q signals.

In the BB-chain there are two adjustable gain stages and one mode specific gain. The first one called BB-gain is just after the demodulator. It has a 12 dB gain range with 6dB steps. After the BB-gain there is the channel select filter.

The main AGC amplifier precedes the channel selection filter. It has 30 dB of gain control range with 3 dB steps. The final amplifier stage is used as an output buffer for IQ signals. This stage is set to 0 dB gain in the GSM mode.

Transmitter

Introduction to transmitter functionality

Transmitter functions are implemented in the RF ASIC N7500.

The RF ASICs contain a BB frequency low pass filter, which is tuneable according the signal bandwidth of the system in use. In addition, they both contain three separate RF paths (GSM850/900, GSM1800/1900 and WCDMA) comprising of a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter

In the transmitter side, an analogue I/Q modulated signal is fed from the digital baseband into the RF ASIC and through the low pass filter. After the filter the signal is fed to the I/Q modulator, which converts the signal to final TX frequency. There are two separate I/Q modulators, one for WCDMA and another for GSM850/EGSM900 and GSM1800/1900 signals. The WCDMA branch is selected by biasing the appropriate modulator. The modulator is followed by two VGA stages. The signal then exits the RF ASIC via a balanced line. The signal is band pass filtered by a SAW filter before it is fed to WCDMA PA module.

After the PA, the transmitted WCDMA signal is fed through the duplex filter to the single feed antenna switch and then to the antenna.

WCDMA power control

WCDMA TX power control is performed by the two VGA stages in the RF ASIC.

The gain of VGA amplifier chain is controlled by a DA converter in BB. The same DA converter is shared by GSM TX power control function.

WCDMA PA module

WCDMA PA is housed in a separate module having a variable supply voltage input for the amplifier stages (Vcc11), a battery supply voltage for the bias circuits (Vcc12) and one bias current input. Bias current is generated by 5 bit DA (DAC201) converter in RF ASIC N7500. The converter is controlled via RFBus.

In production the PA quiescent current can be tuned to target value by adjusting the bias current of PA output stage. The bias current is also used as PA on/off controls.

PA DCDC converter

The DCDC converter is controlled by 5 bit DA (DAC101) converter in RF ASIC N7500. The converter is controlled via RFBus. The DCDC converter limits the lowest supply voltage to 1.3 V. At the highest power levels, the DCDC converter output settles nominally to 3.1 V.

GSM transmitter

An analogue IQ modulated signal is fed to the RF ASIC from Digital BB. It is first low pass filtered then routed to the GSM modulator. The appropriate routing after the modulator is selected by biasing either GSM850/ EGSM900 or GSM1800/1900 variable gain amplifier.

After the VGA stage, the signal exits the RF ASIC. In case of GSM1800/1900, the signal goes directly to the GSM PA module. In case of GSM850/EGSM900, the PA module is preceded by a switchable SAW filter. After the filter, the signal is fed to GSM TX front-end module (TXFEM), which also contains the switch matrix. It routes the output GSM signal to the single feed antenna switch and then to the antenna.

GSM PA module

The TXFEM module contains two separate amplifier chains, one for GSM850/EGSM900 and another for GSM1800/1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

There are two separate synthesizers for WCDMA Rx and WCDMA Tx / GSM Tx / Rx. This allows the duplex separation to be set according the network settings in the WCDMA mode.

The VCOs are locked by PLLs into a reference oscillator, VCTCXO (Voltage Controlled Temperature Compensated Crystal Oscillator).

The PLLs are located in RF ASICs and controlled via RFBus.

Reference oscillator

A 38.4MHz VCTCXO is used as a reference oscillator for the frequency synthesizers.

The frequency of the reference oscillator is locked into the frequency of the base station with the help of an AFC voltage, which is generated in BB by DSP and converted by dedicated DAC.

Frequency mappings

GSM850 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
128	824.2	869.2	3296.8	3476.8	170	832.6	877.6	3330.4	3510.4	212	841.0	886.0	3364.0	3544.0
129	824.4	869.4	3297.6	3477.6	171	832.8	877.8	3331.2	3511.2	213	841.2	886.2	3364.8	3544.8
130	824.6	869.6	3298.4	3478.4	172	833.0	878.0	3332.0	3512.0	214	841.4	886.4	3365.6	3545.6
131	824.8	869.8	3299.2	3479.2	173	833.2	878.2	3332.8	3512.8	215	841.6	886.6	3366.4	3546.4
132	825.0	870.0	3300.0	3480.0	174	833.4	878.4	3333.6	3513.6	216	841.8	886.8	3367.2	3547.2
133	825.2	870.2	3300.8	3480.8	175	833.6	878.6	3334.4	3514.4	217	842.0	887.0	3368.0	3548.0
134	825.4	870.4	3301.6	3481.6	176	833.8	878.8	3335.2	3515.2	218	842.2	887.2	3368.8	3548.8
135	825.6	870.6	3302.4	3482.4	177	834.0	879.0	3336.0	3516.0	219	842.4	887.4	3369.6	3549.6
136	825.8	870.8	3303.2	3483.2	178	834.2	879.2	3336.8	3516.8	220	842.6	887.6	3370.4	3550.4
137	826.0	871.0	3304.0	3484.0	179	834.4	879.4	3337.6	3517.6	221	842.8	887.8	3371.2	3551.2
138	826.2	871.2	3304.8	3484.8	180	834.6	879.6	3338.4	3518.4	222	843.0	888.0	3372.0	3552.0
139	826.4	871.4	3305.6	3485.6	181	834.8	879.8	3339.2	3519.2	223	843.2	888.2	3372.8	3552.8
140	826.6	871.6	3306.4	3486.4	182	835.0	880.0	3340.0	3520.0	224	843.4	888.4	3373.6	3553.6
141	826.8	871.8	3307.2	3487.2	183	835.2	880.2	3340.8	3520.8	225	843.6	888.6	3374.4	3554.4
142	827.0	872.0	3308.0	3488.0	184	835.4	880.4	3341.6	3521.6	226	843.8	888.8	3375.2	3555.2
143	827.2	872.2	3308.8	3488.8	185	835.6	880.6	3342.4	3522.4	227	844.0	889.0	3376.0	3556.0
144	827.4	872.4	3309.6	3489.6	186	835.8	880.8	3343.2	3523.2	228	844.2	889.2	3376.8	3556.8
145	827.6	872.6	3310.4	3490.4	187	836.0	881.0	3344.0	3524.0	229	844.4	889.4	3377.6	3557.6
146	827.8	872.8	3311.2	3491.2	188	836.2	881.2	3344.8	3524.8	230	844.6	889.6	3378.4	3558.4
147	828.0	873.0	3312.0	3492.0	189	836.4	881.4	3345.6	3525.6	231	844.8	889.8	3379.2	3559.2
148	828.2	873.2	3312.8	3492.8	190	836.6	881.6	3346.4	3526.4	232	845.0	890.0	3380.0	3560.0
149	828.4	873.4	3313.6	3493.6	191	836.8	881.8	3347.2	3527.2	233	845.2	890.2	3380.8	3560.8
150	828.6	873.6	3314.4	3494.4	192	837.0	882.0	3348.0	3528.0	234	845.4	890.4	3381.6	3561.6
151	828.8	873.8	3315.2	3495.2	193	837.2	882.2	3348.8	3528.8	235	845.6	890.6	3382.4	3562.4
152	829.0	874.0	3316.0	3496.0	194	837.4	882.4	3349.6	3529.6	236	845.8	890.8	3383.2	3563.2
153	829.2	874.2	3316.8	3496.8	195	837.6	882.6	3350.4	3530.4	237	846.0	891.0	3384.0	3564.0
154	829.4	874.4	3317.6	3497.6	196	837.8	882.8	3351.2	3531.2	238	846.2	891.2	3384.8	3564.8
155	829.6	874.6	3318.4	3498.4	197	838.0	883.0	3352.0	3532.0	239	846.4	891.4	3385.6	3565.6
156	829.8	874.8	3319.2	3499.2	198	838.2	883.2	3352.8	3532.8	240	846.6	891.6	3386.4	3566.4
157	830.0	875.0	3320.0	3500.0	199	838.4	883.4	3353.6	3533.6	241	846.8	891.8	3387.2	3567.2
158	830.2	875.2	3320.8	3500.8	200	838.6	883.6	3354.4	3534.4	242	847.0	892.0	3388.0	3568.0
159	830.4	875.4	3321.6	3501.6	201	838.8	883.8	3355.2	3535.2	243	847.2	892.2	3388.8	3568.8
160	830.6	875.6	3322.4	3502.4	202	839.0	884.0	3356.0	3536.0	244	847.4	892.4	3389.6	3569.6
161	830.8	875.8	3323.2	3503.2	203	839.2	884.2	3356.8	3536.8	245	847.6	892.6	3390.4	3570.4
162	831.0	876.0	3324.0	3504.0	204	839.4	884.4	3357.6	3537.6	246	847.8	892.8	3391.2	3571.2
163	831.2	876.2	3324.8	3504.8	205	839.6	884.6	3358.4	3538.4	247	848.0	893.0	3392.0	3572.0
164	831.4	876.4	3325.6	3505.6	206	839.8	884.8	3359.2	3539.2	248	848.2	893.2	3392.8	3572.8
165	831.6	876.6	3326.4	3506.4	207	840.0	885.0	3360.0	3540.0	249	848.4	893.4	3393.6	3573.6
166	831.8	876.8	3327.2	3507.2	208	840.2	885.2	3360.8	3540.8	250	848.6	893.6	3394.4	3574.4
167	832.0	877.0	3328.0	3508.0	209	840.4	885.4	3361.6	3541.6	251	848.8	893.8	3395.2	3575.2

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
10591	2118.2	4236.4	10654	2130.8	4261.6	10717	2143.4	4286.8	10780	2156	4312			
10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
10611	2122.2	4244.4	10674	2134.8	4269.6	10737	2147.4	4294.8	10800	2160	4320			
10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
10613	2122.6	4245.2	10676	2135.2	4270.4	10739	2147.8	4295.6	10802	2160.4	4320.8			
10614	2122.8	4245.6	10677	2135.4	4270.8	10740	2148	4296	10803	2160.6	4321.2			
10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
9636	1927.2	3854.4	9695	1939	3878	9754	1950.8	3901.6	9813	1962.6	3925.2	9872	1974.4	3948.8
9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

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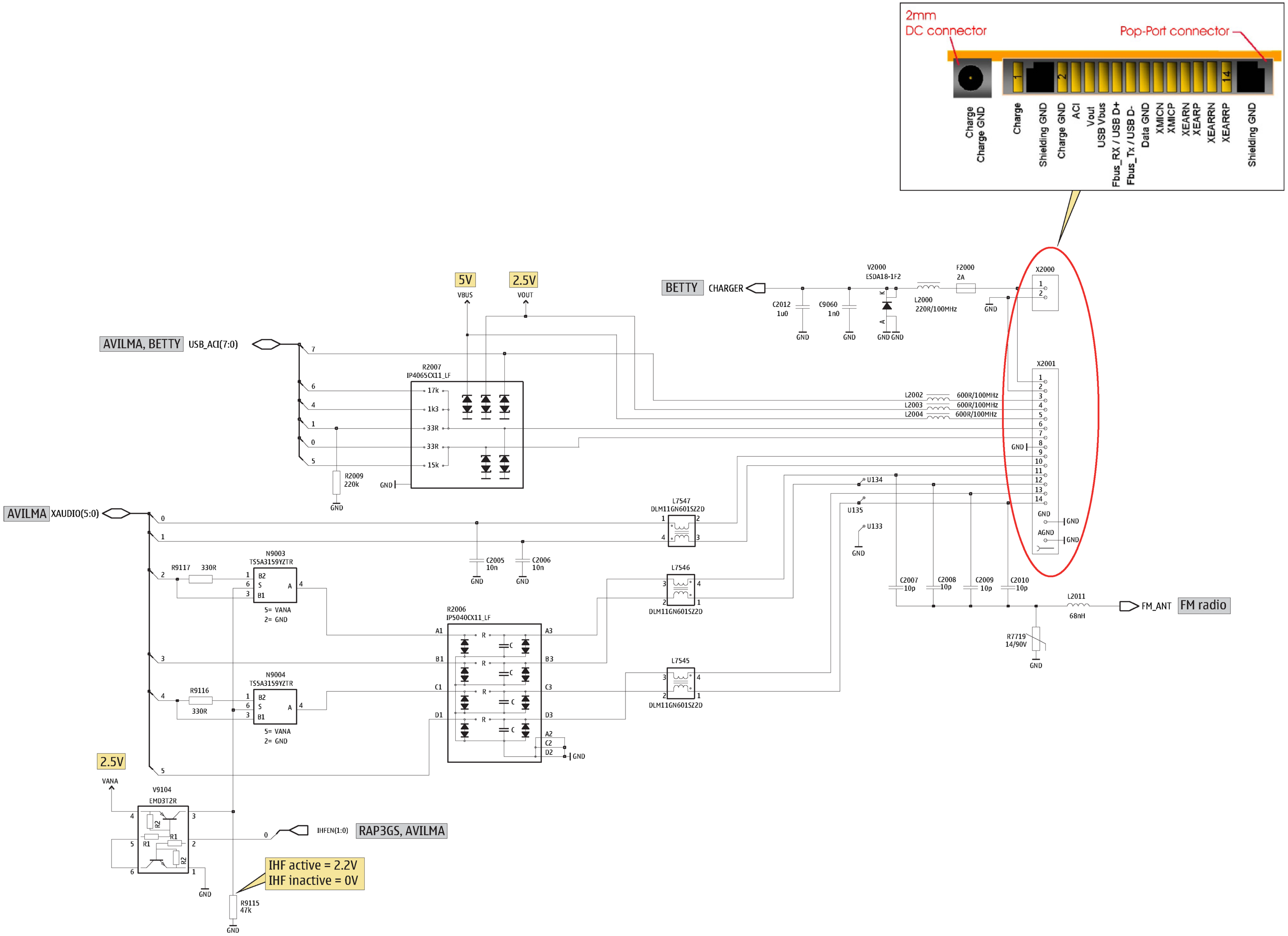
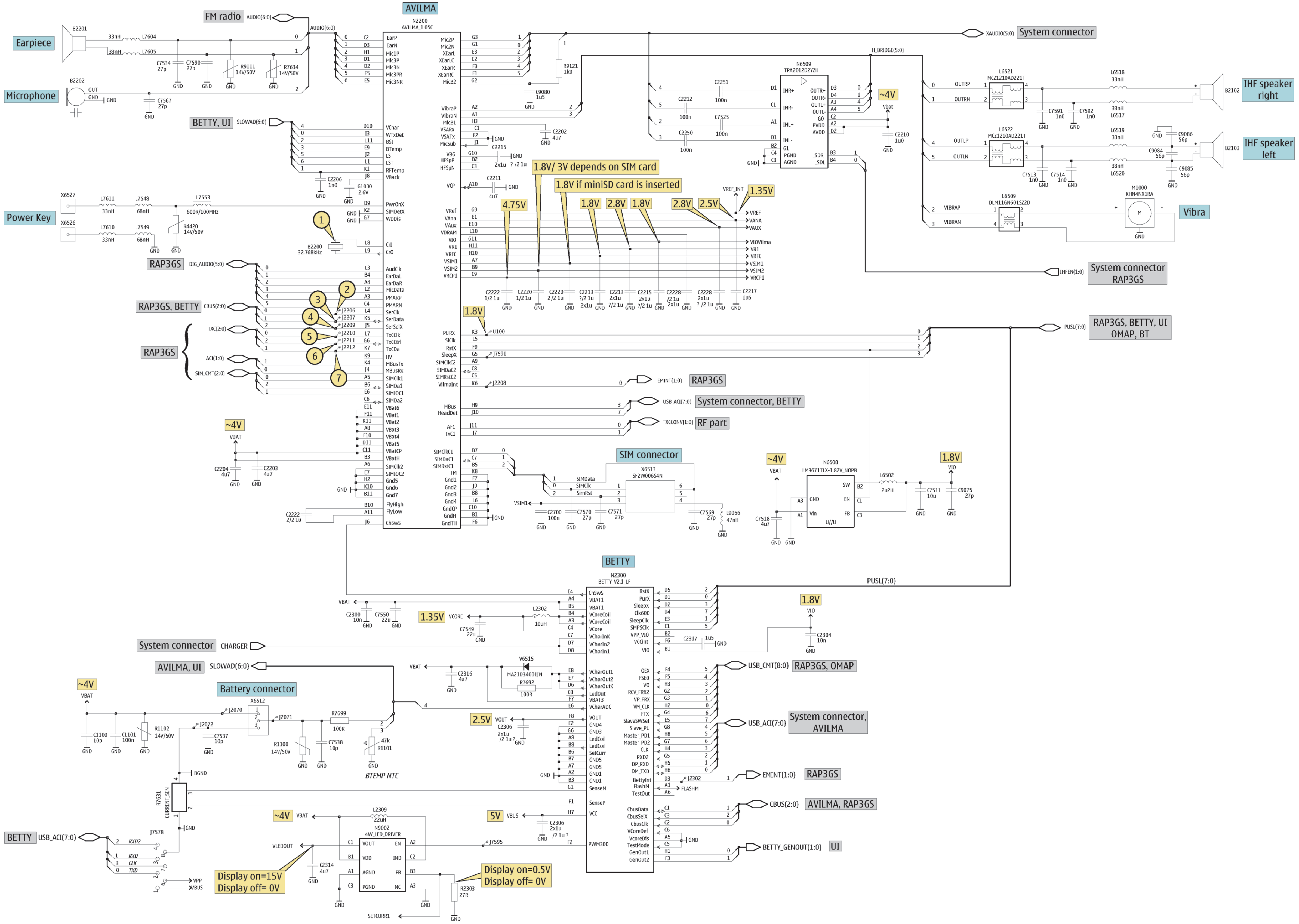
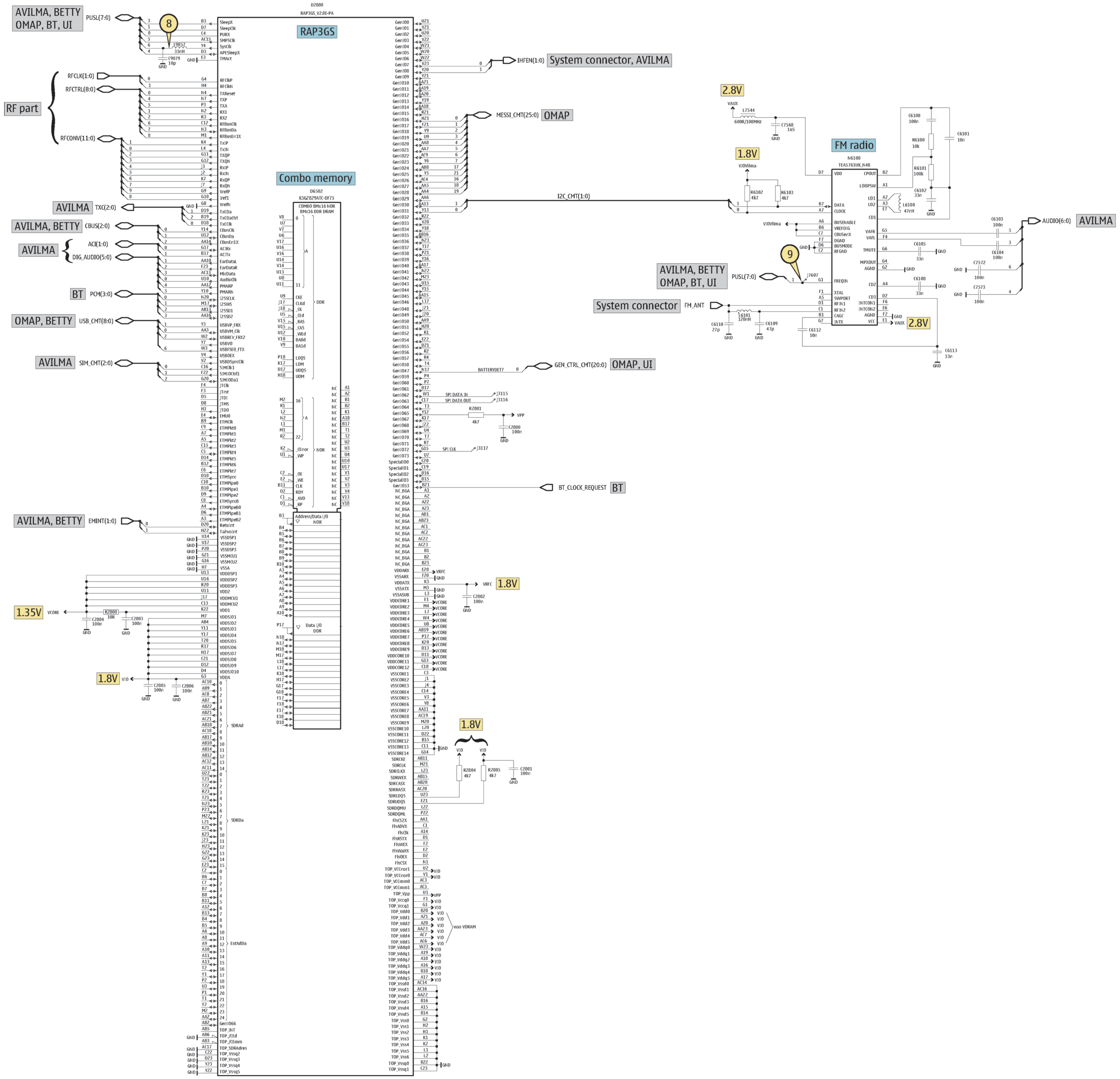
System connector



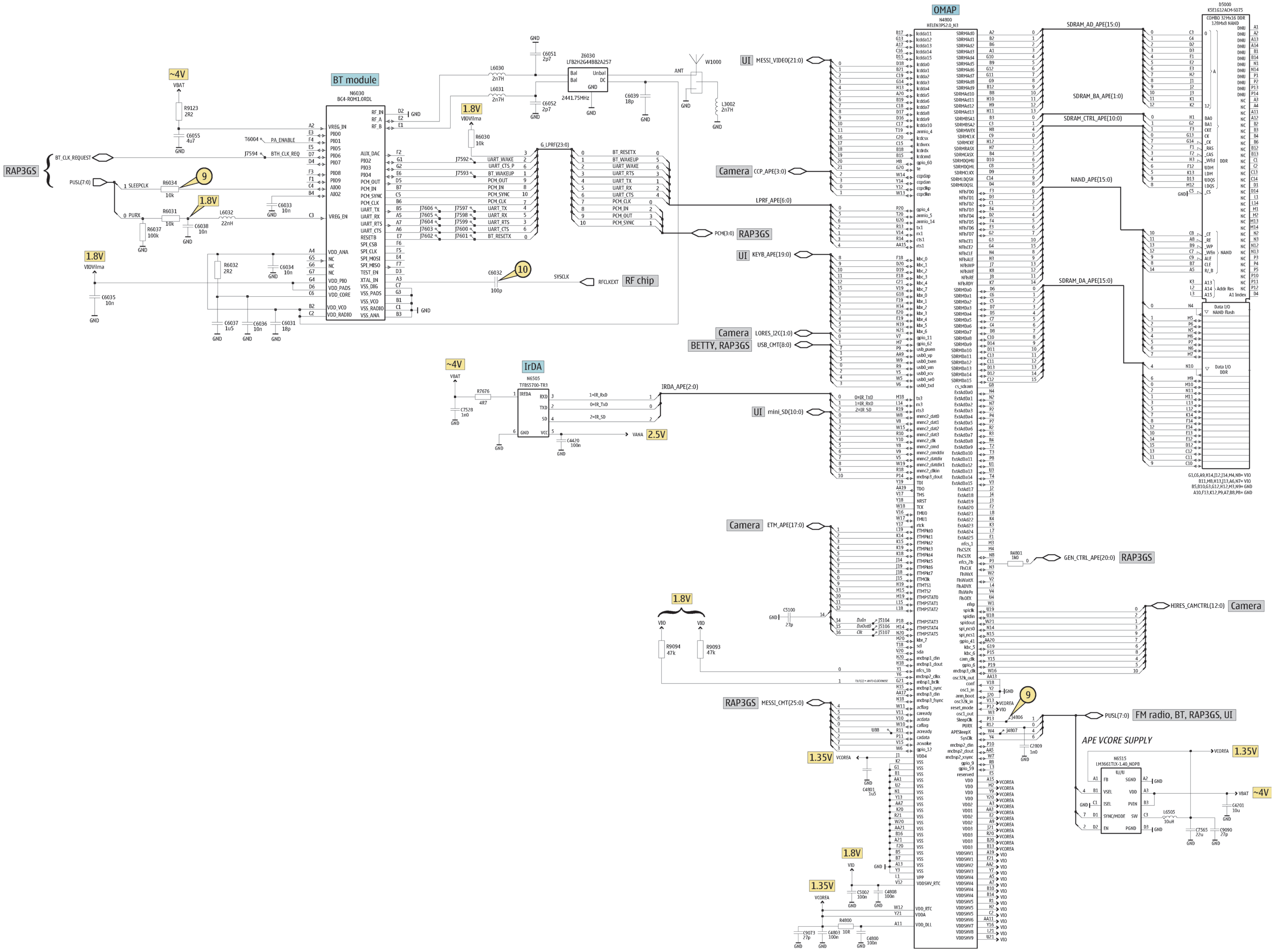
AVILMA & BETTY



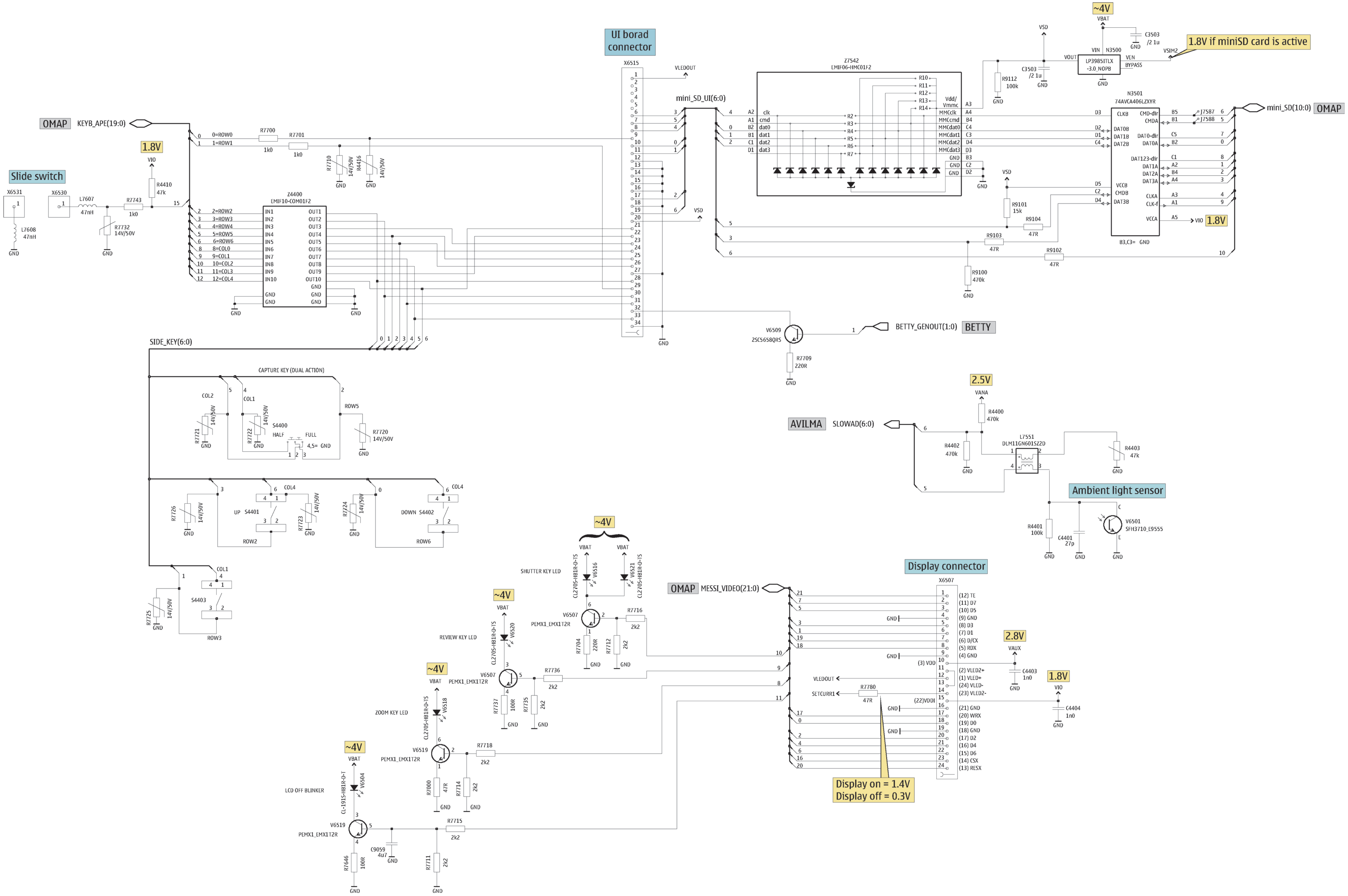
RAP3GS & FM radio



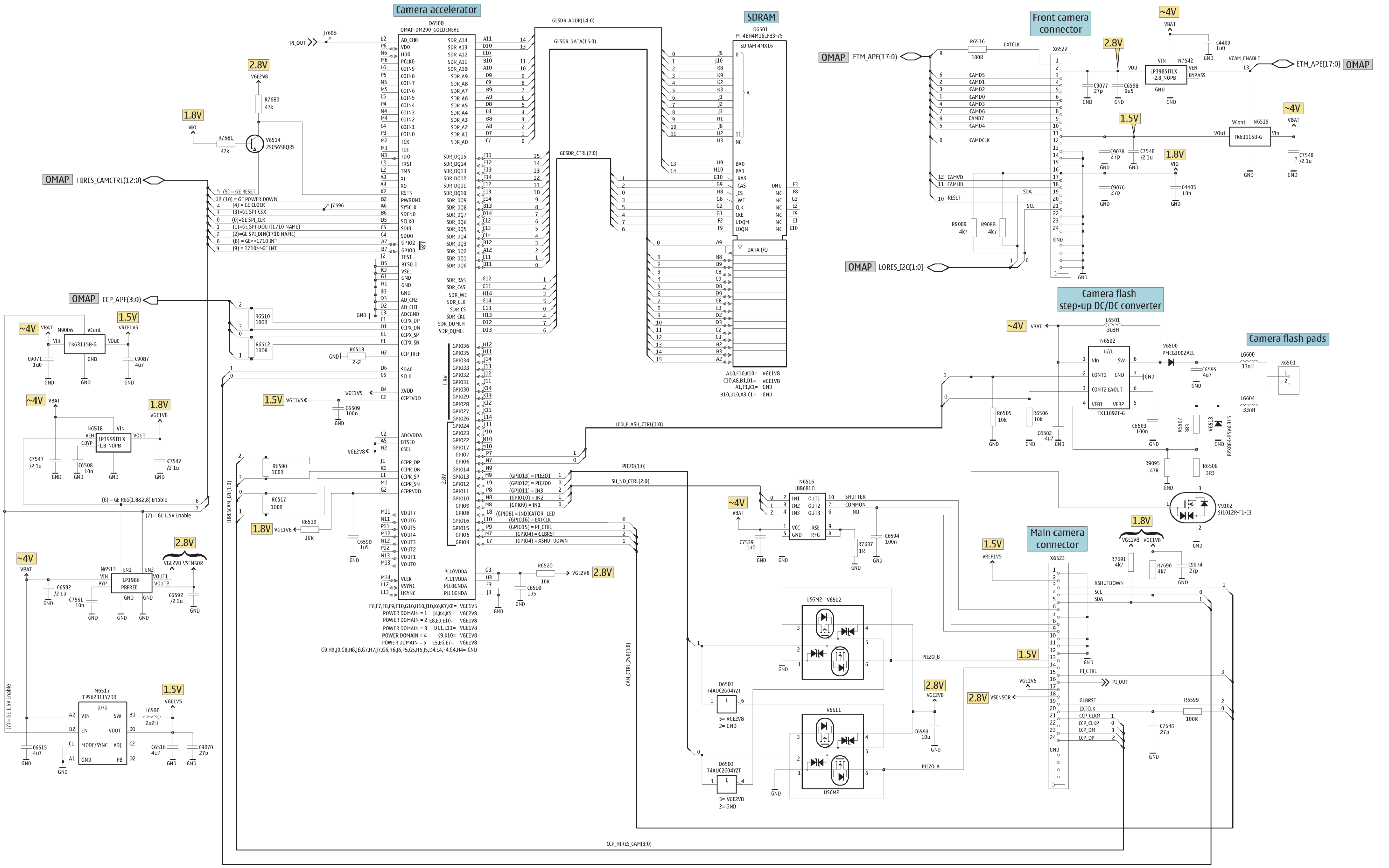
OMAP, BT & IrDA


OMAP
N4800
BT module
N6030
BC4-ROM1.0RDL
IrDA
N6505
TFBS5700-TR3
RAP3GS
Camera
UI
BETTY, RAP3GS
RF chip
FM radio, BT, RAP3GS, UI
APE VCORE SUPPLY
N6515
D5000
Z6030
W1000
~4V
1.8V
1.35V
2.5V
SDRAM_AD_APE(15:0)
SDRAM_BA_APE(1:0)
SDRAM_CTRL_APE(10:0)
NAND_AP(15:0)
SDRAM_DA_APE(15:0)
MESSI_VIDEO(21:0)
CCP_APE(3:0)
LPRF_APE(6:0)
PCM(3:0)
KEYB_APE(19:0)
LORES_I2C(1:0)
USB_CMT(8:0)
IRDA_APE(2:0)
mini_SD(10:0)
ETM_APE(17:0)
GEN_CTRL_APE(20:0)
HIRES_CAMCTRL(12:0)
MESSI_CMT(25:0)
PUSL(7:0)
BT_CLK_REQUEST
G_LPRF(23:0)
SYSCLK
RFCLKEXT
VBAT
VIO
VCOREA
GND
9
10

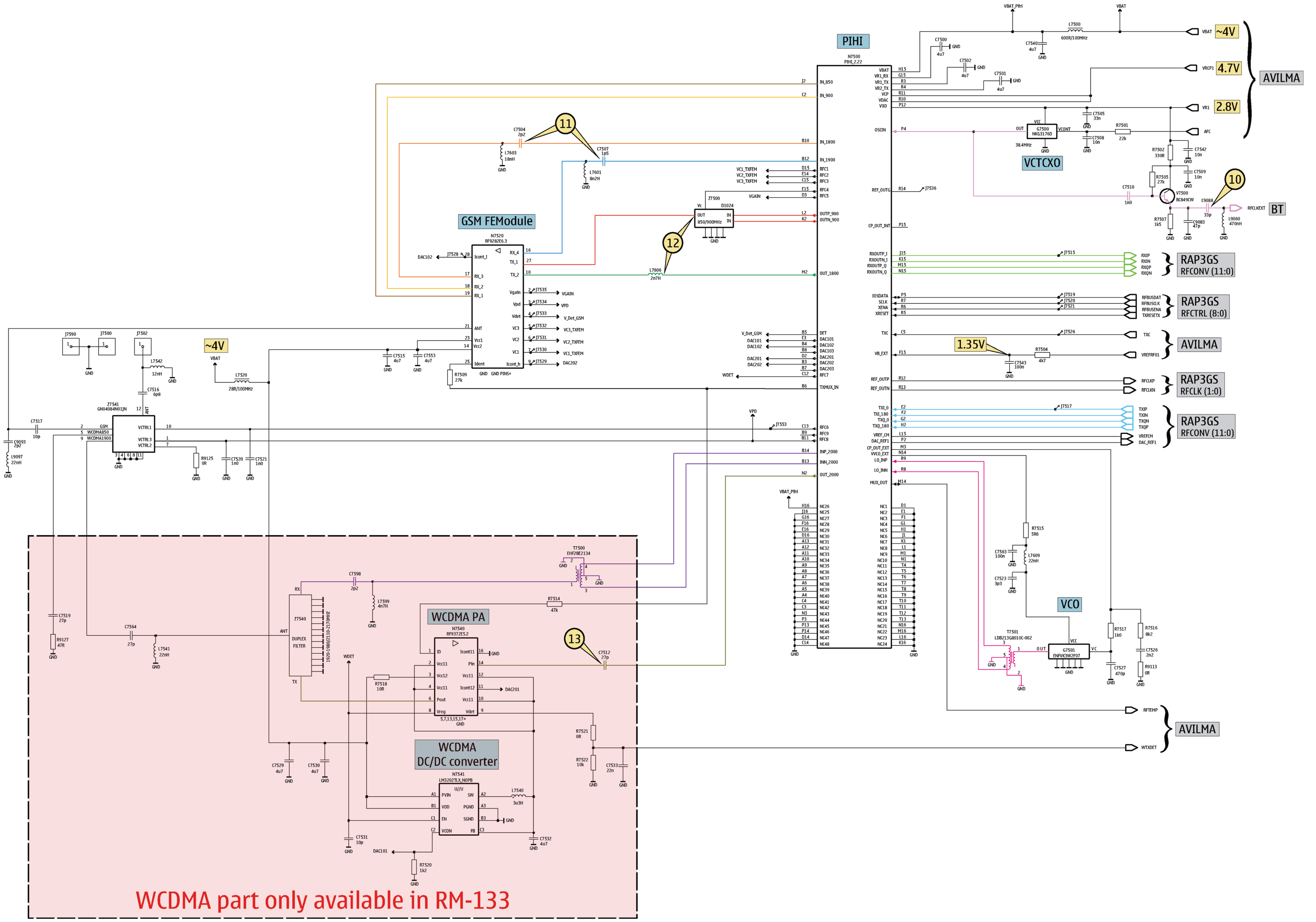
User interface



Camera

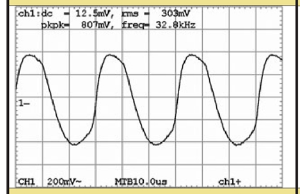

Camera accelerator
D6500
OMAP-DM290_GOLDENEYE
SDRAM
D6501
MT48H4M16LF83-75
SDRAM 4MX16
Front camera connector
X6522
Camera flash step-up DC/DC converter
N6502
TK11892F-G
Camera flash pads
X6501
Main camera connector
X6523
OMAP
HIRES_CAMCTRL(12:0)
CCP_APE(3:0)
ETM_APE(17:0)
LORES_I2C(1:0)
GESDR_ADDR(14:0)
GESDR_DATA(15:0)
GESDR_CTRL(7:0)
LED_FLASH_CTRL(1:0)
PIEZO(1:0)
SH_ND_CTRL(2:0)
CAM_CTRL_2v8(3:0)
CCP_HIRES_CAM(3:0)
HIRESCAM_I2C(1:0)
N9006
TK63115B-G
N6518
LP3999ITLX -1.8_NOPB
N6513
LP3986 PBFREE
N6517
TPS62311YZDR
N7542
LP3985ITLX -2.8_NOPB
N6519
TK63115B-G
N6516
LB8681CL
V6512
US6M2
V6511
US6M2
D6503
74AUC2G04YZT
V6514
2SC5658QRS
V9102
SI1012R-T1-E3
V6500
PMEG3002AEL
~4V
1.8V
1.5V
2.8V
VBAT
(6) = GE_REG(1.8&2.8) Enable
(7) = GE 1.5V Enable
F6,F7,F8,F9,F10,G10,H10,J10,K6,K7,K8= VGE1V5
POWER DOMAIN = 1 J4,K4,K5= VGE2V8
POWER DOMAIN = 2 L8,L9,L10= VGE1V8
POWER DOMAIN = 3 D11,E11= VGE1V8
POWER DOMAIN = 4 K9,K10= VGE1V8
POWER DOMAIN = 5 L5,E6,E7= VGE1V8
G9,H9,J9,G8,H8,J8,G7,H7,J7,G6,H6,J6,F5,G5,H5,J5,D4,L4,F4,G4,H4= GND
A10,F10,K10= VGE1V8
C10,A8,B1,D1= VGE1V8
A1,F1,K1= GND
B10,D10,A3,C1= GND

RF part


PIHI
N7500
PIHI_2.2
VCTCXO
GSM FEModule
N7520
WCDMA PA
N7540
WCDMA
DC/DC converter
N7541
VCO
AVILMA
~4V
4.7V
2.8V
1.35V
BT
RAP3GS
RFCONV (11:0)
RAP3GS
RFCTRL (8:0)
AVILMA
RAP3GS
RFCLK (1:0)
RAP3GS
RFCONV (11:0)
AVILMA
10
11
12
13
~4V
WCDMA part only available in RM-133

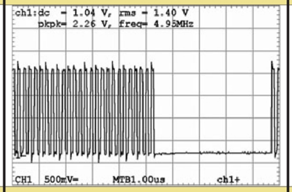
Signal overview

1) 32.768kHz at B2200



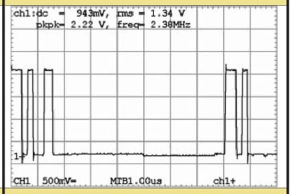
```
ch1:dc  = 12.5mV, rms =  303mV
   pkpk=  807mV, freq= 32.8kHz
CH1  200mV~      MTB10.0us      ch1+
```

2) SerClk at J2206 (CBUS)



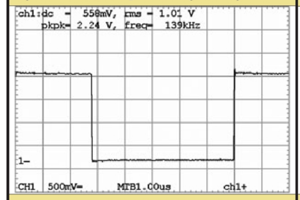
```
ch1:dc  = 1.04 V, rms = 1.40 V
   pkpk= 2.26 V, freq= 4.95MHz
CH1  500mV=      MTB1.00us      ch1+
```

3) SerData at J2207 (CBUS)



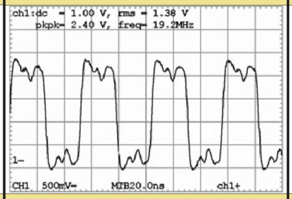
```
ch1:dc  =  943mV, rms = 1.34 V
   pkpk= 2.22 V, freq= 2.38MHz
CH1  500mV=      MTB1.00us      ch1+
```

4) SerSelX at J2209 (CBUS)



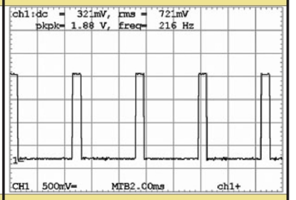
```
ch1:dc  =  558mV, rms = 1.01 V
   pkpk= 2.24 V, freq=  139kHz
CH1  500mV=      MTB1.00us      ch1+
```

5) TxCClk at J2210 (TXC)



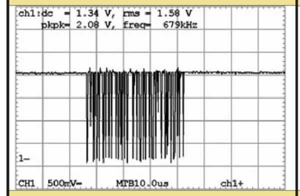
```
ch1:dc  = 1.00 V, rms = 1.38 V
   pkpk= 2.40 V, freq= 19.2MHz
CH1  500mV=      MTB20.0ns      ch1+
```

6) TxCCtrl at J2211 (TXC)



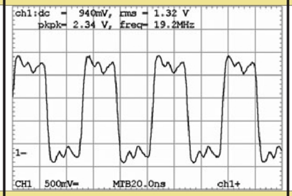
```
ch1:dc  =  321mV, rms =  721mV
   pkpk= 1.88 V, freq=  216 Hz
CH1  500mV=      MTB2.00ms      ch1+
```

7) TxCDa at J2212 (TXC)



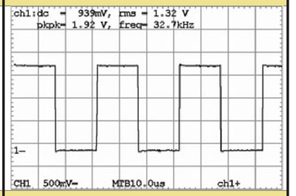
```
ch1:dc  = 1.34 V, rms = 1.58 V
   pkpk= 2.08 V, freq=  679kHz
CH1  500mV=      MTB10.0us      ch1+
```

8) SYSClk at L9057



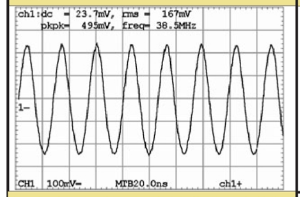
```
ch1:dc  =  940mV, rms = 1.32 V
   pkpk= 2.34 V, freq= 19.2MHz
CH1  500mV=      MTB20.0ns      ch1+
```

9) SleepClk at J7607



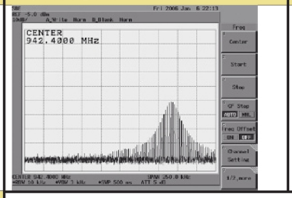
```
ch1:dc  =  939mV, rms = 1.32 V
   pkpk= 1.92 V, freq= 32.7kHz
CH1  500mV=      MTB10.0us      ch1+
```

10) RFCLKEXT at C9088



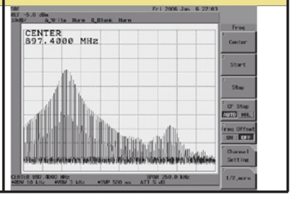
```
ch1:dc  = 23.7mV, rms =  167mV
   pkpk=  495mV, freq= 38.5MHz
CH1  100mV=      MTB20.0ns      ch1+
```

11)RX signal at C7504 & C7507



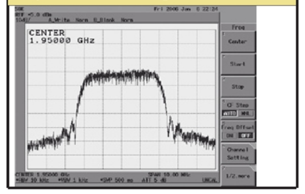
```
CENTER
942.4000 MHz
```

12)TX signal at Z7500 & L7606

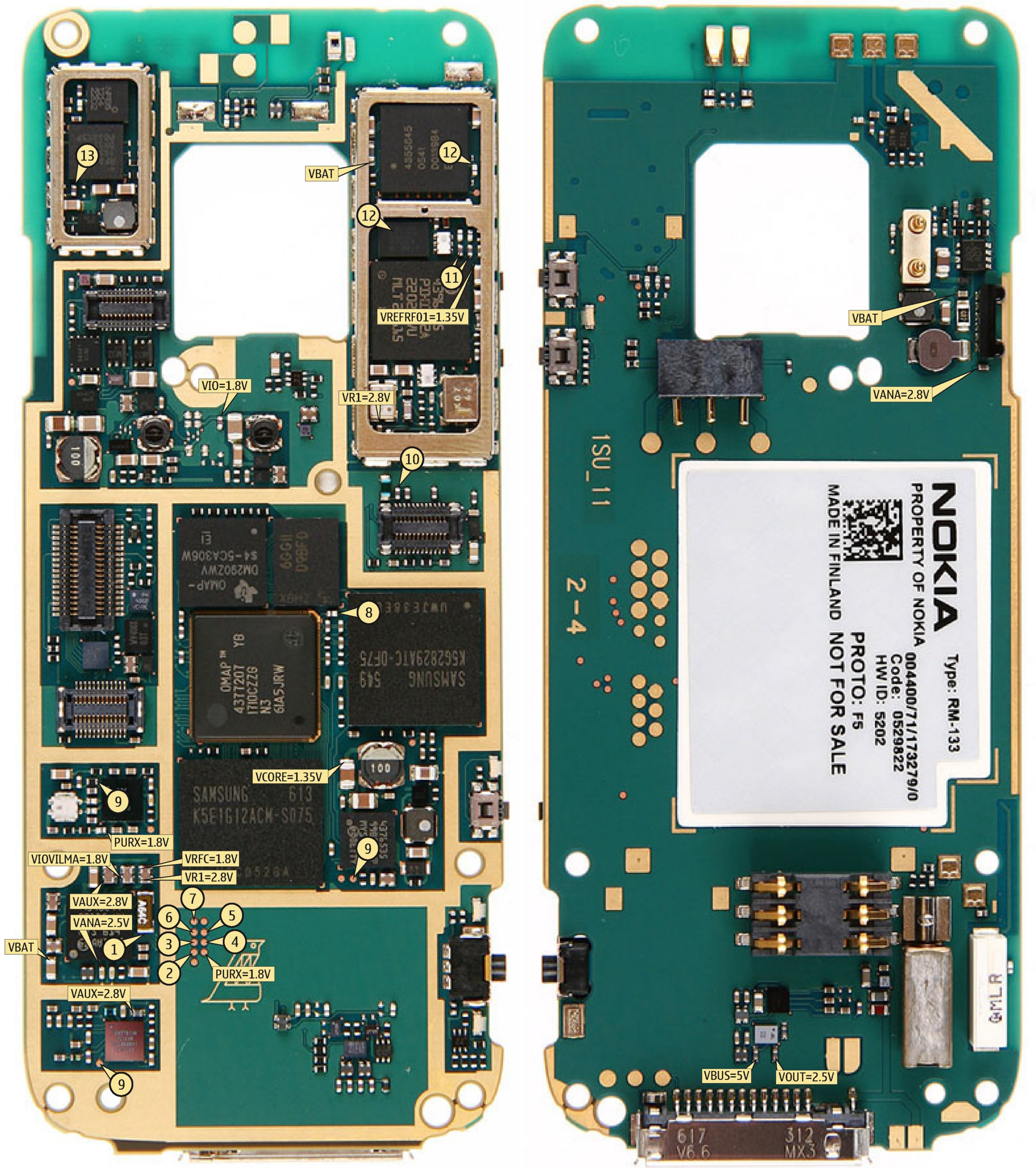


```
CENTER
897.4000 MHz
```

13) WCDMA TX signal at C7512



```
CENTER
1.95000 GHz
```



Component finder

B	
B2200	C5
C	
C1100	H15
C1101	H15
C2005	F3
C2006	F3
C2007	F2
C2008	F2
C2009	G2
C2010	G2
C2012	C4
C2202	C4
C2203	B6
C2204	A4
C2206	C4
C2210	E3
C2211	A5
C2212	D3
C2213	C6
C2215	B6
C2217	B4
C2220	A4
C2222	A5
C2228	B6
C2250	D3
C2251	D3
C2300	G7
C2304	F7
C2306	G5
C2314	H7
C2316	H6
C2317	G5
C2700	D5
C2800	F10
C2801	F9
C2802	H8
C2803	H8
C2804	G8
C2805	F10
C2806	H8
C2809	F9
C3503	B9
C4201	B14
C4401	F20
C4403	C9
C4404	C8
C4405	G11
C4409	I11
C4420	A15
C4800	E8
C4801	F9
C4803	C10
C4808	F10
C5002	F6
C5100	C10
C6031	B7
C6032	B7
C6033	B7
C6034	A7
C6035	C6
C6036	C7
C6037	C7
C6038	B6
C6039	A6
C6051	B7
C6052	B7
C6055	A7
C6100	A3
C6101	A3
C6102	A3
C6103	A3
C6104	A3
C6105	C2
C6108	C3
C6109	A2
C6110	B2
C6112	B3
C6113	A3
C6502	B16
C6503	B17
C6508	E13
C6509	C13
C6510	B13
C6515	B13
C6516	C13
C6590	D13
C6592	B14
C6593	C15
C6594	A16
C6595	B17
C6598	I12
C7500	I17
C7501	G15
C7502	G15
C7504	I17
C7505	G14
C7507	I17
C7508	H14
C7509	H13
C7510	G14
C7511	D14
C7512	A18
C7513	F3
C7514	F3
C7515	G19
C7516	C19
C7517	C19
C7518	D13
C7519	C19
C7520	C19
C7521	C19
C7523	I14
C7525	D3
C7526	H14
C7527	H14
C7528	B16
C7529	A18
C7530	B18
C7531	B19
C7532	B18
C7533	A20
C7534	D19
C7537	E15
C7538	G16
C7539	B15
C7540	I16
C7542	H13
C7543	I17
C7546	C12
C7547	E13
C7548	F14
C7549	F7
C7550	G7
C7551	C14
C7553	I19
C7563	I15
C7564	B20
C7565	A14
C7567	D3
C7568	B3
C7569	E5
C7570	D4
C7571	D5
C7572	B3
C7573	C4
C7590	D20
C7591	F3
C7592	F3
C7598	H18
C9059	E15
C9060	C4
C9070	C13
C9071	A16
C9073	C10
C9074	C16
C9075	D14
C9076	H11
C9077	I12
C9078	H13
C9079	F10
C9080	B4
C9083	H13
C9084	G17
C9085	G16
C9086	H16
C9087	B16
C9088	G13
C9090	A13
C9093	C19
D	
D2800	H9
D5000	E7
D6500	D11
D6501	F11
D6502	H9
D6503	B15
F	
F2000	C3
G	
G1000	B15
G7500	G14
G7501	I14
J	
J2206	D4
J2207	D4
J2208	D5
J2209	D4
J2210	D5
J2211	D5
J2212	D5
J2302	F5
J4806	G5
J4807	A15
J7526	H16
J7528	G18
J7529	I18
J7530	H18
J7531	H18
J7532	H18
J7533	H18
J7534	H18
J7535	G18
J7536	I15
J7553	H16
J7591	D4
J7594	C6
J7607	B2
U100	D4
U88	H8
L	
L2000	C3
L2002	E3
L2003	E2
L2004	E2
L2011	G2
L2302	G8
L2309	H6
L3002	A4
L6030	B7
L6031	B7
L6032	B6
L6100	B3
L6101	A2
L6500	C14
L6501	B16
L6502	E14
L6505	B13
L6509	B4
L6517	G3
L6518	F3
L6519	G16
L6520	G16
L6521	E3
L6522	F3
L7544	C3
L7545	G2
L7546	F2
L7547	F2
L7548	F20
L7549	F20
L7551	E20
L7553	B18
L7599	H18
L7601	I17
L7603	I17
L7604	D19
L7605	D20
L7606	I18
L7607	B5
L7608	A5
L7609	I13
L7610	F20
L7611	F20
L9056	E6
L9057	F10
L9060	G13
L9097	C19
L6600	C17
L6604	B17
L7500	I16
L7520	G19
L7540	B18
L7541	B20
L7542	C20
M	
M1000	B3
N	
N2200	B5
N2300	G6
N3500	C9
N3501	C10
N4800	E9
N6030	B7
N6100	B3
N6502	A17
N6505	A16
N6508	E13
N6509	E3
N6513	C14
N6515	B14
N6516	B15
N6517	B13
N6518	E13
N6519	F14
N7500	H16
N7520	H19
N7540	B19
N7541	B18
N7542	I12
N9002	H7
N9003	F3
N9004	G3
N9006	B16
R	
R1100	G16
R1101	E5
R1102	H15
R2006	G2
R2007	E3
R2009	G5
R2303	H7
R2800	H8
R2801	F10
R2804	G8
R2805	H8
R4400	D5
R4401	F20
R4402	D5
R4403	F20
R4410	C5
R4416	B10
R4420	F20
R4800	E8
R4801	F10
R6030	C7
R6031	B6
R6032	C7
R6034	B7
R6037	A6
R6100	B3
R6101	B3
R6102	C3
R6103	C3
R6505	A18
R6506	A17
R6507	B17
R6508	A17
R6510	E12
R6512	D12
R6513	E12
R6516	G11
R6517	D12
R6519	D13
R6520	B13
R6590	D12
R6599	C12
R7000	F14
R7501	H15
R7502	H13
R7504	I17
R7505	H13
R7507	G13
R7509	G18
R7514	C18
R7515	I15
R7516	H14
R7517	H14
R7518	C19
R7520	A17
R7521	A19
R7522	A20
R7634	E20
R7637	A16
R7646	E15
R7676	B16
R7680	C13
R7681	C13
R7690	B16
R7691	C16
R7692	H5
R7699	G16
R7700	B10
R7701	A10
R7704	I3
R7709	B12
R7710	A10
R7711	E15
R7712	I2
R7714	F15
R7715	E15
R7716	I2
R7718	F14
R7719	G2
R7720	H5
R7721	I5
R7722	H3
R7723	I15
R7724	I15
R7725	I7
R7726	I15
R7732	B6
R7735	I2
R7736	I2
R7737	H2
R7743	B5
R7780	A8
R9088	H11
R9089	H11
R9093	F8
R9094	D8
R9095	B18
R9100	C11
R9101	C11
R9102	C11
R9103	C11
R9104	B11
R9111	E20
R9112	A10
R9113	H14
R9115	G3
R9116	G3
R9117	F3
R9121	B4
R9123	B7
R9125	C19
R9127	C19
S	
S4400	I4
S4401	I15
S4402	I16
S4403	I7
T	
T7500	H17
T7501	H15
V	
V2000	C4
V6500	B16
V6501	F21
V6504	G21
V6507	H3
V6509	C12
V6511	B15
V6512	C15
V6513	B18
V6514	C13
V6515	H6
V6516	I5
V6518	H16
V6519	F15
V6520	I8
V6521	I3
V7500	G14
V9102	A18
V9104	G2
W	
W1000	A3
X	
X1000	I3
X2001	E1
X6501	B17
X6507	B9
X6512	F15
X6513	D5
X6515	B11
X6522	H12
X6523	B16
X6526	F21
X6527	F21
X6530	B6
X6531	A5
X9006	I20
X9007	F20
X9008	D20
Z	
Z4400	B10
Z6030	A7
Z7500	H17
Z7540	B20
Z7541	C19
Z7542	C11