

Nokia Customer Care

Service Manual

RM-67 (Nokia N71)
Mobile Terminal
Part No: 9250007 (Issue 1)

COMPANY CONFIDENTIAL

NOKIA

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	April 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
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- Page(s) and/or Figure(s) in error

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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!

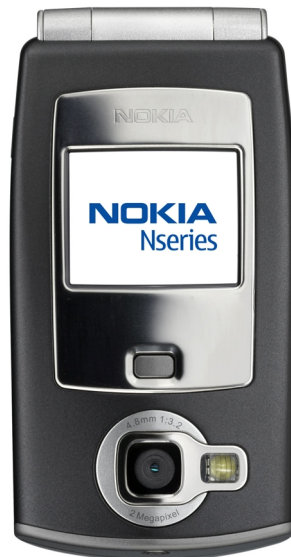
Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Nokia N71 Service Manual Structure

- 1 General Information
- 2 Parts Lists and Component Layouts
- 3 Service Software Instructions
- 4 Service Tools and Service Concepts
- 5 Disassembly/Reassembly Instructions
- 6 BB Troubleshooting and Manual Tuning Guide
- 7 RF Troubleshooting and Manual Tuning Guide
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- 9 System Module
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1 — General Information



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■ RM-67 product selection

Nokia RM-67 is a WCDMA/GSM quadband phone supporting WCDMA 2100 and EGSM 900/1800/1900 bands.



Figure 1 View of RM-67

■ RM-67 product features

Key features

- Stylish simple fold phone with real metal decorations
- Quadband phone EGSM 900/1800/1900 and WCDMA 2100 with internal antennas
- WCDMA 2100 with simultaneous voice and packet data (PS max speed UL/DL= 128/384kbps, CS max speed 64kbps)
- Dual Transfer Mode (DTM) in GSM networks to support simultaneous voice and packet data
- EGPRS cl. 6, WCDMA PS max speeds UL/DL 128/128 kbps or 128/384kbps. WCDMA CS 64kbps U & D
- GPRS, class B, multislot class 10
- Speech codecs: HR, FR, EFR, WCDMA and GSM AMR
- Integrated 2 megapixel camera sensor (effective resolution 1600x1200 pixels) with 4x/20x digital zoom for video/still pictures
- Additional integrated VGA camera sensor with 2 x digital zoom
- Integrated flash LED (operating range up to 1,5 m)

- Up to 10 MB internal memory for user data and miniSD card reader supporting up to 2 GB miniSD cards (hot swap)
- Integrated Bluetooth 1.2, IrDA and USB 2.0 full speed
- Integrated handsfree speaker and internal vibrator
- XHTML internet browser
- OMA DRM 2.0 and CMLA key support
- Off-line mode
- MP3 and AAC for music playback
- Integrated FM stereo radio
- Downloadable traditional monophonic (RNG), polyphonic (MID), True (AWB), Advanced Audio Coding (AAC), Enhanced Advanced Audio Coding (eAAC+) and MP3 tones (MP3) and alerts
- Java™ MIDP 2.0, CLDC 1.1
- Real time clock and minimum 30 min backup battery

Display and keypad features

- Active matrix 2.4" QVGA main colour display (320 x 240 pixel, 42 x 60,6 mm size, up to 262144 colors) and Cover Display (96 x 70 pixel, 37 x 36,9 mm size, up to 65536 colors)
- Automatic brightness control for main display (>200Cd/m²)
- 5-way navikey, two softkeys, application key, edit and clear key, send & end, key matrix, operator key, voice key
- Mute key on front to mute the phone immediately

Productivity features

- SMS, MMS, instant messaging and email
- Office document viewers (ppt, xls, doc, pdf)
- PC Suite connectivity with USB, IrDA & Bluetooth
- Advanced S60 PIM (calendar, contacts, task list, PIM printing etc)
- Multimedia player (Real Player) with 3GPP video streaming support
- Voice recording, Speaker Independent Name Dialling and voice commands
- Push to Talk application
- Active standby screen
- Settings configuration tools for easy configuration
- Data Transfer (from S60 phone to S60 phone)

Imaging features

- Two-way video call
- Real time video or recorded video clip sharing to the compatible phone or PC during the voice call
- Advanced camera modes: still/burst/video and options night/brightness adjustment, image quality, self timer, white balance settings and colour tones
- Flash LED modes: On, Off, Automatic
- Image print application with USB, Pictbridge, Bluetooth wireless technology and miniSD card printing
- Improved multimedia gallery
- Video and still image editors

- Nokia Lifeblog and Image show
- Image and video clip uploading to the web

■ Mobile enhancements

Table 1 Audio

Enhancement	Type
Nokia wireless BT headsets	HS-4W, HS-11W, HS-13W, HS-21W, HS-26W, HS-36W, HS-37W, HDW-3
Nokia mono headset	HS-5
Nokia boom headset	HDB-4
Nokia stereo headsets	HDS-3, HS-3, HS-6, HS-8, HS-20, HS-23
Nokia mobile inductive loopset	LPS-4
Nokia TTY adapter	HAD-10

Table 2 Car

Enhancement	Type
Nokia wireless car kit	CK-1W, CK-7W, Nokia 616
Nokia wireless plug-in car kit	HF-6W
Headset	HSU-4
Universal holder	CR-39

Table 3 Data

Enhancement	Type
Nokia Connctivity Cable	CA-53
Nokia wireless keypad	SU-8W
Nokia external GPS module with BT connection, own battery	LD-1W

Table 4 Imaging

Enhancement	Type
Nokia observation camera	PT-6

Table 5 Entertainment

Enhancement	Type
Nokia music stand	MD-1
Nokia music adapter	AD-15

Table 6 Power

Enhancement	Type
Nokia Li-ion battery	BL-5C
Travel charger	AC-3, AC-4, DC-4
Adapter	CA-44

■ Technical specifications

Transceiver general specifications

Unit	Dimensions (mm) (L x W x T)	Weight (g)	Volume (cm ³)
Transceiver with BL-5C 970mAh li-ion battery back	98.6 x 51.2 x 23 (25.8 at camera peak)	139 (including BL-5C battery)	110

Main RF characteristics for triple-band (EGSM900/GSM1800/GSM1900) and WCDMA phones

Parameter	Unit
Cellular system	EGSM900, GSM1800/1900 and WCDMA
Rx frequency band	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA: 2110 - 2170 MHz
Tx frequency band	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA: 1920 - 1980 MHz
Output power	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	GSM900: 125
	GSM1800: 375
	GSM1900: 300
	WCDMA: 277
Channel spacing	200 kHz

Parameter	Unit
Number of Tx power levels	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BL-5C	970	Up to 2 - 4 hrs	Up to 7 - 9 days

Charging times

AC-3	AC-4	DC-4
~3 h 30 min	~ 1 h 30 min	(TBD)

Environmental conditions

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

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2 — Parts Lists and Component Layouts

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KEY SILENT (A1)
I002

A-COVER (A1)
I001

4XSCREW RF 1.6X6.5 TORX PLUS T-5
I003

SHIELD LID ASSY
I004

PWB LID (A2)
I006
(For component placement refer to the N71 RM-67 Component overview)

LCD PM 98X70 RGB
I005

CAMERA MODULE VGA
I007

CAMERA MAIN ASSY
I008

EARP RDF-07A 320HM
I009

HINGE
I102

LID CENTERFRAME (A3)
I010

B-COVER (A4)
I013

MAGNET (A3)
I011

POWER KEY (A4)
I014

LCD AM 240X320 RGB
I012

MENU KEY SURROUND ASSY (A5)
I201

KEY OPERATOR
I202

FLEX (A5)
I103

SCREW CAP
I203

2XSCREW RF 1.6X6.5 TORX PLUS T-5
I204

C-COVER SLIDE SURROUND
I208

KEYMAT
I210

C-COVER SLIDE ASSY
I209

PWB RIGID 1LQ (A6)
(NOT SUPPLIED)
I214
(For component placement refer to the N71 RM-67 Component overview)

BUSHING (A5)
I206

HINGE COVER
I101

KEYMAT MENU ASSY (A5)
I207

CONNECTOR-CAP
I233

SHIELD KEY
I212

DOMESHEET (A6)
I213

CLAPTON EMC MICROPHONE
I219

SHIELD GSM LID (A6)
I216

2XSCREW RF 1.6X6.5 TORX PLUS T-5
I211

CENTERSHIELD (LEVEL 3/4 ONLY)
I220

CONN CHR DIA 2.0MM
I218

SHIELD WCDMA LID (A6)
I215

SHIELD RF BACKEND LID (A6)
I217

TYPE LABEL (LEVEL 3/4 ONLY)
I221

IHF SHIELD (A8)
I223

PWB RIGID 1LZ (A7)
I222
(For component placement refer to the N71 RM-67 Component overview)

IHF SPEAKER (A8)
I225

IHF SPEAKER ADHESIVE (A8)
I226

SD DOOR
I234

D-COVER IHF LID (A8)
I227

BT ANTENNA (A8)
I228

IR WINDOW (A8)
I224

D-COVER LOGO PLATE
I235

ANTENNA (A8)
I230

BATTERY RELEASE BUTTON (A8)
I229

BATTERY COVER SPRING
I232

BATTERY COVER
I236

D-COVER (A8)
I231

A1= A-COVER ASSY
A2= LR LID PWB
A3= LID CENTERFRAME ASSY
A4= B-COVER ASSY
A5= C-COVER ASSY
A6= 1LQ ENGINE BOARD
A7= LZ BT MODULE
A8= D-COVER ASSY

*** = only available as assembly**

ELECTRO **SILICON** **METAL** **PLASTIC** **PWB** **COVER**

■ Spare parts overview

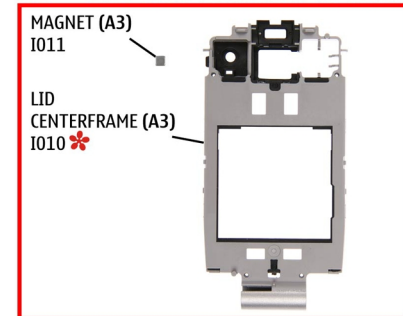
A1 = A-COVER ASSY



A2 = LR LID PWB



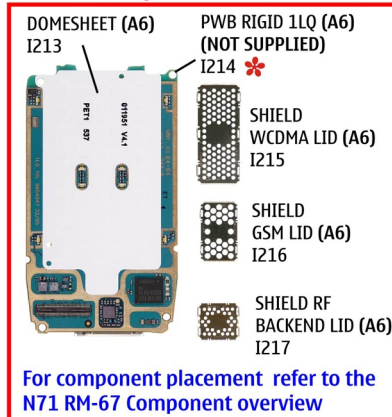
A3 = LID CENTERFRAME ASSY



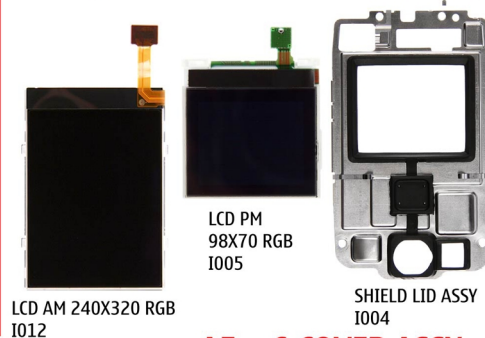
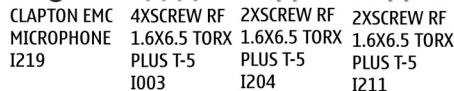
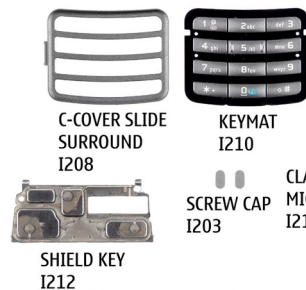
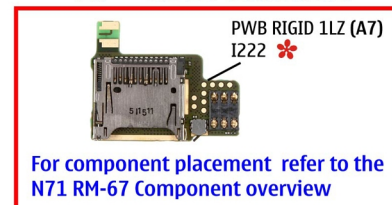
A4 = B-COVER ASSY



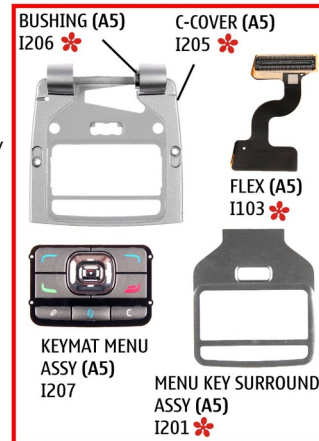
A6 = 1LQ ENGINE BOARD



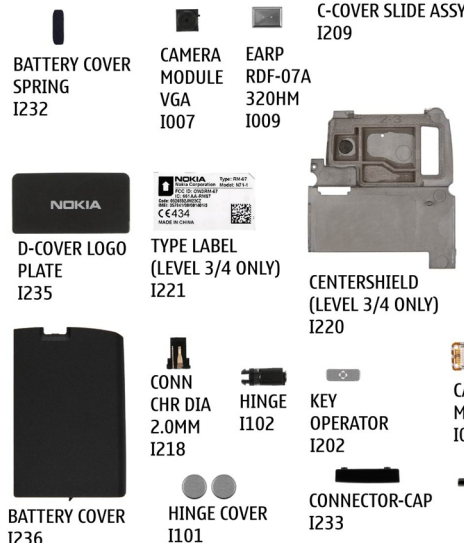
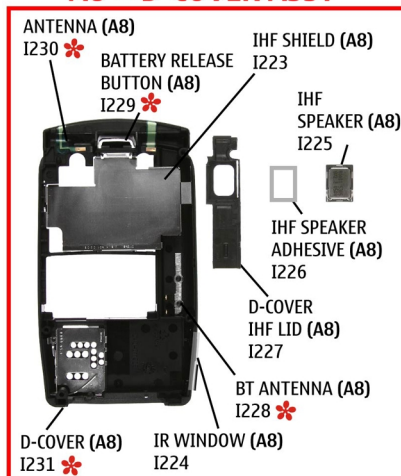
A7 = LZ BT MODULE



A5 = C-COVER ASSY



A8 = D-COVER ASSY



A1 = A-COVER ASSY
A2 = LR LID PWB
A3 = LID CENTERFRAME ASSY
A4 = B-COVER ASSY
A5 = C-COVER ASSY
A6 = 1LQ ENGINE BOARD
A7 = LZ BT MODULE
A8 = D-COVER ASSY
* = only available as assembly

■ Parts lists and component layouts

Mechanical parts list

EXPLANATION		
<ul style="list-style-type: none"> • Ax and in bold = ASSY • I0xx = ITEM codes for upper or mono block • I2xx = ITEM codes for lower block • I3xx = ITEM codes for soldered spare parts on the upper hinge or lower block and not exchangeable 		
<p>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.</p>		
ITEM/ CIRCUIT REF.	QTY	PART NAME
A1	1	A-COVER ASSY (I001 - I002)
I001	1	A-COVER
I002	1	KEY SILENT
I003	4	SCREW RF 1.6x6.5 TORX PLUS T-5
I004	1	SHIELD LID ASSY
I005	1	LCD PM 98 x 70 RGB
A2	1	LR LID PWB (I006 AND SOLDERED PARTS)
I006	1	PWB LID
I007	1	CAMERA MODULE VGA
I008	1	CAMERA MAIN ASSY
I009	1	EARP RDF-07A 320HM
A3	1	LID CENTERFRAME ASSY (I010 - I011)
I010	1	LID CENTERFRAME
I011	1	MAGNET
I012	1	LCD AM 240 X 320
A4	1	B-COVER ASSY (I013 - I014)
I013	1	B-COVER
I014	1	POWER KEY
I101	2	HINGE COVER
I102	1	HINGE
I202	1	KEY OPERATOR
I203	2	SCREW CAP
I204	2	SCREW RF 1.6x6.5 TORX PLUS T-5

A5	1	C-COVER ASSY (I103, I201, I205 - I207)
I103	1	FLEX
I201	1	MENU KEY SURROUND ASSY
I205	1	C-COVER
I206	1	BUSHING
I207	1	KEYMAT MENU ASSY
I208	1	C-COVER SLIDE SURROUND
I209	1	C-COVER SLIDE ASSY
I210	1	KEYMAT
I211	2	SCREW RF 1.6x6.5 TORX PLUS T-5
I212	1	SHIELD KEY
A6	1	1LQ ENGINE BOARD (I213 - I217 AND SOLDERED PARTS)
I213	1	DOMESHEET
I214	1	PWB RIGID 1LQ
I215	1	SHIELD WCDMA LID
I216	1	SHIELD GSM LID
I217	1	SHIELD RF BACKEND LID
I218	1	CONN CHR DIA 2.0MM
I219	1	CLAPTON EMC MICROPHONE
I220	1	CENTERSHIELD
I221	1	TYPE LABEL
A7	1	1Z BT Module (I222 AND SOLDERED PARTS)
I222	1	PWB RIGID 1LZ
A8	1	D-COVER ASSY (I223 - I231)
I223	1	IHF SHIELD
I224	1	IR WINDOW
I225	1	IHF SPEAKER
I226	1	IHF SPEAKER ADHESIVE
I227	1	D-COVER IHF LID
I228	1	BT ANTENNA
I229	1	BATTERY RELEASE BUTTON
I230	1	ANTENNA
I231	1	D-COVER
I232	1	BATTERY COVER SPRING

I233	1	CONNECTOR-CAP
I234	1	SD DOOR
I235	1	D-COVER LOGO PLATE
I236	1	BATTERY COVER

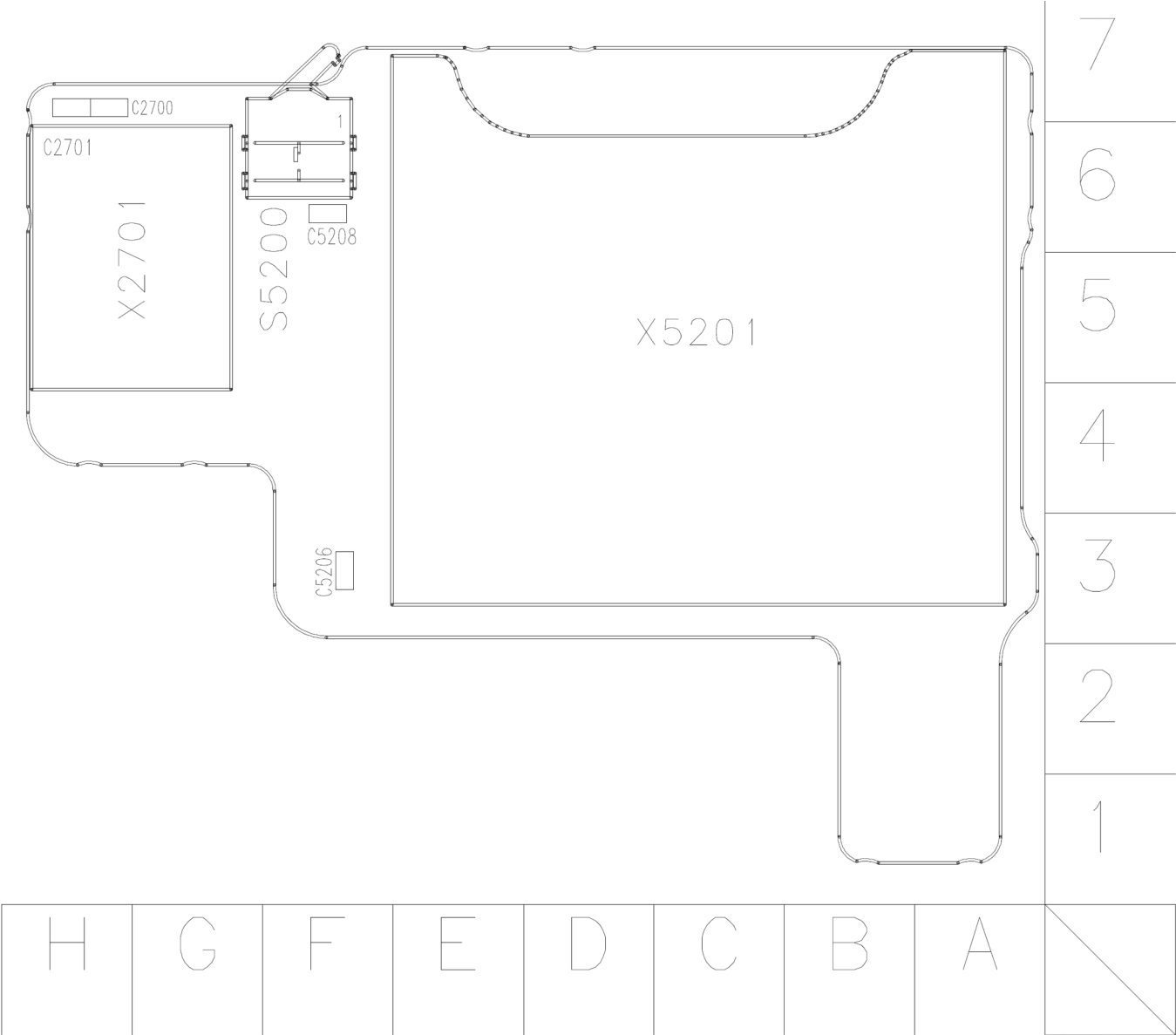
Component parts list (1lz_09b)

Item	Side	Grid ref.		Type	Description and value		
C2700	Bot	H	7	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5200	Top	E	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C5201	Top	D	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5202	Top	E	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C5203	Top	E	4	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C5204	Top	E	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C5205	Top	C	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5206	Bot	F	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C5207	Top	D	3	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C5208	Bot	F	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6030	Top	C	6	0402C	Chipcap 5% NP0	100p	50V
C6031	Top	D	4	0402C	Chipcap 5% NP0	15p	50V
C6033	Top	E	6	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6036	Top	E	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6037	Top	E	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6038	Top	D	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6039	Top	D	5	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6040	Top	D	5	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V

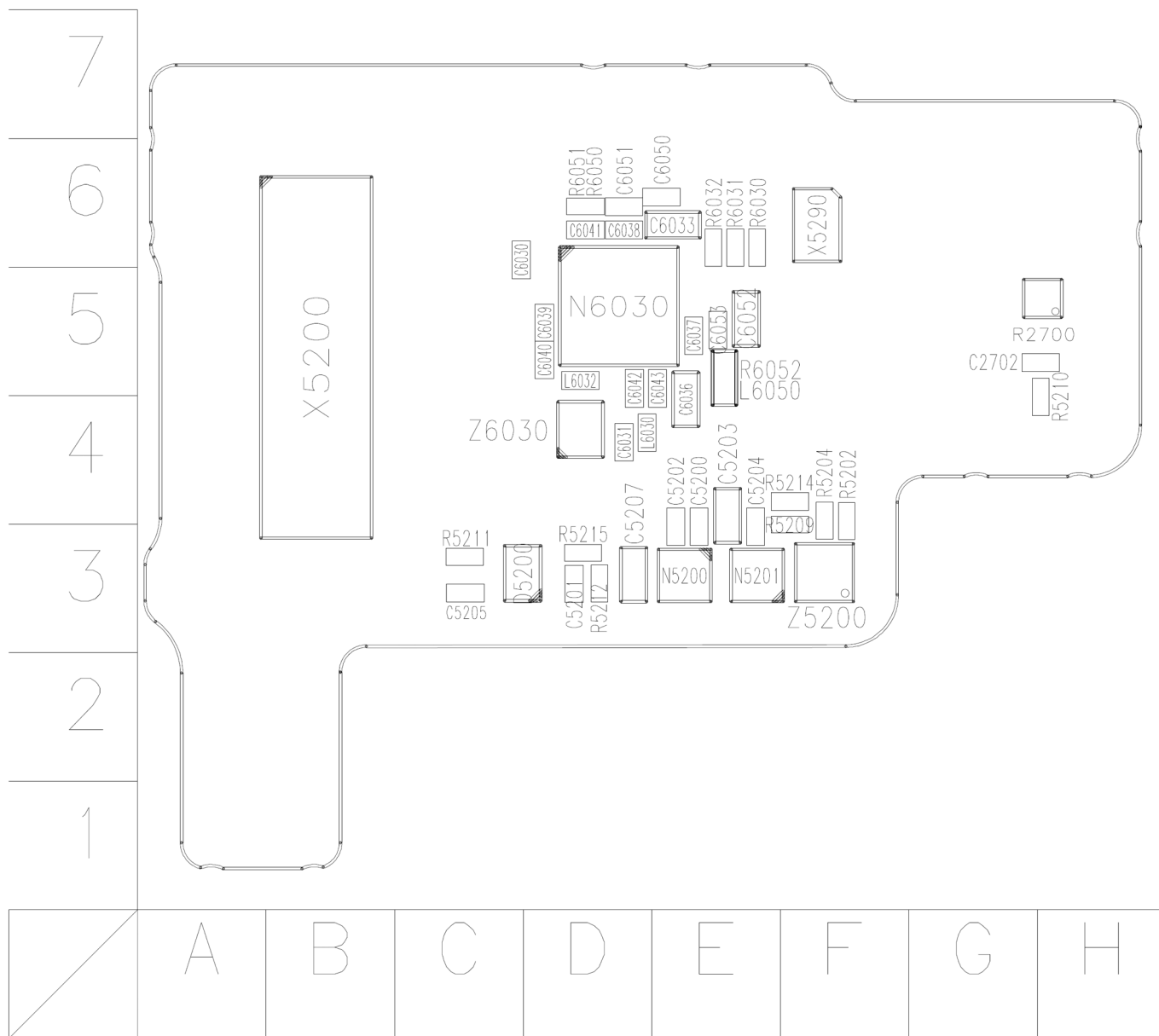
Item	Side	Grid ref.		Type	Description and value		
C6041	Top	D	6	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6042	Top	D	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6043	Top	E	5	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6050	Top	E	6	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6051	Top	D	6	0402C	Chipcap 5% NP0	22p	50V
D5200	Top	C	3	PDSO_G5	OR-GATE 2INPUT 74LVC1G32 SC70-5	~	~
L6030	Top	D	4	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6032	Top	D	5	0402L	CHIP COIL 2N2+-0N3 Q30/800M 0402	2n2H	~
N5200	Top	E	3	USMD16_2.03X 2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N5201	Top	E	3	USMD16_2.03X 2.03	VREG & LEVEL SHIFT LP3928 USMD16	~	2.8V
N6030	Top	D	5	uBGA63_4.6X4 .6	BRF6150	~	~
R2700	Top	H	5	uBGA8_1.47X1 .47	ASIP SIM INTERFACE **LOW CAP**BGA8	~	~
R5202	Top	F	4	0402R	Resistor 5% 63mW	12k	~
R5204	Top	F	4	0402R	Resistor 5% 63mW	47R	~
R5209	Top	F	3	0402R	Resistor 5% 63mW	100k	~
R5210	Top	H	4	0402R	Resistor 5% 63mW	100k	~
R5211	Top	C	3	0402R	Resistor 5% 63mW	47R	~
R5215	Top	D	3	0402R	Resistor 5% 63mW	100k	~
R6030	Top	E	6	0402R	Chipres 0W06 jumper 0402	0R	~
R6032	Top	E	6	0402R	Chipres 0W06 jumper 0402	0R	~
R6051	Top	D	6	0402R	Chipres 0W06 jumper 0402	0R	~
R6052	Top	E	5	0603R	CHIPRES JUMPER 0603	0R	~
S5200	Bot	F	6	SWITCH_SPVN1 20101	SWITCH DET SPST-NO 5V 1MA	~	~

Item	Side	Grid ref.		Type	Description and value		
X2701	Bot	H	5	SIM_CONN_M_S K_200500165_ H1.95	SM SIM CONN 6POL P2.54 H1.3	~	~
X5200	Top	B	5	MOLEX_SD_544 34_0409	CONN BTB 2X20 P0.5 H4 REC	~	~
X5201	Bot	C	5	CONN_DM2B_D SFW_PEJ	MINISD CONN DM2B- DSFW-PEJ-N 125V 0.5A	~	~
Z5200	Top	F	3	FLIP_CHIP_16_ 2.25X2.25	MMC ASP HIGH SPEED BGA16	~	~
Z6030	Top	D	4	EZVQ42NM77 S_V2	LTCC FILT 2441.75 +-41.75MHZ 2.0X1.5	2441.75MH Z	~

Component layout bottom (1lz_09b)



Component layout top (1lz_09b)



Component parts list (1lq_11a)

Item	Side	Grid ref.		Type	Description and value		
A7000	Bot	E	4	SHIELD_RM67_RF	RM-67 SHIELD RF BACKEND ASSY	~	~
A7001	Bot	B	4	SHIELD_040_011957	RM-67 SHIELD GSM SINGLE	~	~
A7002	Bot	H	4	SHIELD_040_011959	RM-67-SHIELD_WCDMA_SINGLE	~	~

Item	Side	Grid ref.		Type	Description and value		
A7003	Bot	H	7	SHIELD_RM6 7_VCO	RM-67 SHIELD VCO	~	~
B2200	Bot	E	12	CRYSTAL_3.3 X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz	~
C2000	Bot	G	15	0402C	Chipcap 5% NP0	27p	50V
C2002	Bot	D	14	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2003	Bot	E	14	0405_2_P0. 65_AVX	CHIP ARRAY X5R 2X33N K 10V 0405	2x33n	10V
C2004	Bot	E	14	0402C	CHIPCAP X7R 5N6 J 25V 0402	5n6	25V
C2005	Bot	D	14	0402C	CHIPCAP X7R 5N6 J 25V 0402	5n6	25V
C2006	Bot	D	15	0405_2_P0. 65_AVX	CHIP ARRAY X5R 2X10N K 16V 0405	2x10n	16V
C2007	Bot	D	15	0405_2_P0. 65	CHIP ARRAY NP0 2X22P K 25V 0405	2x22p	25V
C2008	Bot	D	15	0402C	Chipcap 5% NP0	22p	50V
C2009	Bot	D	15	0405_2_P0. 65_AVX	CHIP ARRAY X5R 2X10N K 16V 0405	2x10n	16V
C2010	Bot	C	15	0405_2_P0. 65_AVX	CHIP ARRAY X5R 2X10N K 16V 0405	2x10n	16V
C2011	Bot	E	15	0402C	CHIPCAP NP0 270P J 25V 0402	270p	25V
C2012	Bot	G	15	0603C_H0.9 5	CHIPCAP X5R 470N K 25V 0603	470n	25V
C2013	Bot	C	15	0402C	Chipcap 5% NP0	10p	50V
C2014	Bot	C	15	0402C	Chipcap 5% NP0	10p	50V
C2015	Bot	D	15	0402C	Chipcap 5% NP0	10p	50V
C2016	Bot	D	15	0402C	Chipcap 5% NP0	10p	50V
C2017	Bot	E	15	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2070	Bot	H	11	0402C	Chipcap 5% NP0	22p	50V
C2071	Bot	G	11	0402C	Chipcap 5% NP0	15p	50V
C2072	Bot	H	11	0402C	Chipcap 5% NP0	47p	50V
C2100	Bot	D	14	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2101	Bot	E	14	0402C	CHIPCAP X7R 5N6 J 25V 0402	5n6	25V

Item	Side	Grid ref.		Type	Description and value		
C2102	Bot	E	14	0402C	CHIPCAP X7R 5N6 J 25V 0402	5n6	25V
C2103	Bot	E	14	0405_2_P0. 65_AVX	CHIP ARRAY X5R 2X33N K 10V 0405	2x33n	10V
C2104	Top	C	16	0405_2_P0. 65_AVX	CHIP ARRAY X5R 2X10N K 16V 0405	2x10n	16V
C2105	Top	B	16	0405_2_P0. 65	CHIP ARRAY NP0 2X22P K 25V 0405	2x22p	25V
C2106	Top	B	16	0402C	Chipcap 5% NP0	22p	50V
C2110	Bot	G	15	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2111	Bot	H	15	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2112	Bot	H	15	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2114	Bot	C	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2115	Bot	C	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2116	Bot	C	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2200	Bot	D	13	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2201	Bot	E	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2202	Bot	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2203	Bot	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2204	Bot	E	14	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2205	Bot	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2206	Bot	E	14	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2207	Bot	E	12	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2208	Bot	E	13	0402C	Chipcap 5% NP0	27p	50V
C2209	Bot	E	12	0402C	Chipcap 5% NP0	22p	50V
C2210	Bot	C	11	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V

Item	Side	Grid ref.		Type	Description and value		
C2211	Bot	C	11	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V
C2212	Bot	C	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2213	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2214	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2215	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2216	Bot	C	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2217	Bot	E	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2219	Bot	E	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2220	Bot	C	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2221	Bot	C	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2222	Bot	C	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2223	Bot	E	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2224	Bot	D	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2225	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Bot	C	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2227	Bot	E	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2228	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2230	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2231	Bot	C	12	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C2232	Bot	D	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2233	Bot	B	8	0402C	Chipcap 5% NP0	27p	50V

Item	Side	Grid ref.		Type	Description and value		
C2234	Bot	E	12	0402C	Chipcap 5% NP0	27p	50V
C2235	Bot	G	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2300	Bot	G	15	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Bot	H	15	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2302	Bot	H	13	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2303	Bot	F	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2304	Bot	H	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2306	Bot	F	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2307	Bot	G	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Bot	H	15	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2312	Bot	F	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2313	Bot	F	15	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2800	Bot	C	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2801	Bot	C	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2802	Bot	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2803	Bot	A	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2804	Bot	D	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2805	Bot	A	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2806	Bot	D	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2807	Bot	B	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2808	Bot	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Type	Description and value		
C2809	Bot	C	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2810	Bot	A	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2811	Bot	A	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2812	Bot	A	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2813	Bot	C	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2814	Bot	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2815	Bot	B	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2817	Bot	A	9	0402C	Chipcap 5% NP0	33p	50V
C3000	Top	A	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3001	Top	C	14	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3002	Top	C	14	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3003	Top	A	15	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3004	Bot	B	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3005	Bot	C	13	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3006	Bot	A	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3007	Bot	B	11	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3008	Bot	A	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4200	Bot	F	13	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4201	Bot	F	14	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4202	Bot	F	13	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4285	Bot	I	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Type	Description and value		
C4286	Bot	F	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4404	Top	D	7	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4405	Top	A	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4406	Top	F	7	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4407	Top	I	3	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4408	Top	I	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4409	Top	I	2	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4601	Bot	A	14	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4602	Bot	A	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4603	Top	A	14	0805C_H0.9 5	CHIPCAP X5R 4U7 K 6V3 T=0.95 0805	4u7	6V3
C4800	Bot	G	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4801	Bot	E	8	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4802	Bot	G	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4803	Bot	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4804	Bot	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4805	Bot	F	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4806	Bot	F	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4807	Bot	D	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4808	Bot	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4809	Bot	G	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	Grid ref.		Type	Description and value		
C4810	Bot	E	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4811	Bot	G	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4812	Bot	E	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4813	Bot	E	8	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C4815	Bot	G	11	0402C	Chipcap 5% X7R	470p	50V
C4816	Bot	F	8	0402C	Chipcap 5% NP0	27p	50V
C4817	Bot	G	9	0402C	Chipcap 5% NP0	27p	50V
C5000	Bot	I	11	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5001	Bot	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5002	Bot	I	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5003	Bot	G	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5004	Bot	G	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5005	Bot	I	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5006	Bot	I	10	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5007	Bot	I	10	0402C	Chipcap 5% NP0	27p	50V
C5008	Bot	I	8	0402C	Chipcap 5% NP0	27p	50V
C5009	Bot	H	8	0402C	Chipcap 5% NP0	27p	50V
C6157	Top	D	16	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6158	Top	D	16	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6159	Top	E	15	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6162	Top	E	16	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6163	Top	D	15	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6165	Top	E	15	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V

Item	Side	Grid ref.		Type	Description and value		
C6170	Top	D	16	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6176	Top	D	15	0402C	Chipcap 5% NP0	100p	50V
C6178	Top	D	15	0402C	Chipcap 5% NP0	27p	50V
C6179	Top	D	16	0402C	Chipcap 5% NP0	47p	50V
C6180	Top	E	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6182	Top	E	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6184	Top	E	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C6185	Top	E	15	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7401	Bot	H	1	0402C_H0.6	CHIPCAP NP0 4P7 +-0.1P 25V 0402	4p7	25V
C7402	Bot	F	2	0402C_AVX	CHIPCAP NP0 HQ 0P7 B 16V 0402	0p7	16V
C7501	Bot	E	2	0402C	Chipcap 5% NP0	18p	50V
C7503	Bot	E	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7504	Bot	D	2	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7505	Bot	F	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7507	Bot	E	4	0402C	Chipcap 5% NP0	18p	50V
C7508	Bot	F	4	0402C	Chipcap 5% NP0	18p	50V
C7509	Bot	D	3	0402C	Chipcap 5% NP0	10p	50V
C7512	Bot	C	2	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7513	Bot	F	4	0402C	Chipcap 5% NP0	10p	50V
C7514	Bot	C	3	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7515	Bot	F	5	0402C_AVX	CHIPCAP TF NP0 HQ QP8 B 25V 0402	1p8	25V
C7516	Bot	F	4	0402C	Chipcap 5% NP0	150p	50V
C7518	Bot	E	7	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C7520	Bot	D	2	0402C	Chipcap 5% NP0	18p	50V
C7522	Bot	E	4	0402C	Chipcap 5% NP0	150p	50V

Item	Side	Grid ref.		Type	Description and value		
C7523	Bot	C	3	0402C	Chipcap +/-0.25pF NP0	5p6	50V
C7524	Bot	E	4	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7525	Bot	C	4	0402C	Chipcap +/-0.25pF NP0	5p6	50V
C7526	Bot	D	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7527	Bot	E	4	0402C	Chipcap 5% NP0	100p	50V
C7528	Bot	E	4	0402C	Chipcap 5% NP0	22p	50V
C7529	Bot	D	4	0402C	Chipcap 5% NP0	100p	50V
C7530	Bot	E	2	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7531	Bot	F	4	0402C	Chipcap 5% NP0	22p	50V
C7532	Bot	F	2	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7533	Bot	E	5	0402C	CERCAP X7R 22N K 16V 0402	22n	16V
C7534	Bot	E	2	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7535	Bot	F	4	0402C	Chipcap 5% NP0	100p	50V
C7536	Bot	E	2	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7541	Bot	F	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7543	Bot	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7545	Bot	A	5	0402C	Chipcap +/-0.25pF NP0	4p7	50V
C7547	Bot	F	6	0402C	Chipcap +/-0.25pF NP0	1p8	50V
C7548	Bot	F	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7549	Bot	E	5	0402C	Chipcap 5% NP0	100p	50V
C7550	Bot	F	7	0402C	Chipcap +/-0.25pF NP0	2p7	50V
C7552	Bot	F	6	0402C	Chipcap +/-0.25pF NP0	2p7	50V
C7553	Bot	F	6	0402C	Chipcap X7R 10% 16V 0402	8n2	16V

Item	Side	Grid ref.		Type	Description and value		
C7554	Bot	G	7	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7555	Bot	G	7	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7556	Bot	C	5	0402C	Chipcap 5% NP0	10p	50V
C7558	Bot	E	6	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7559	Bot	B	4	0402C	Chipcap +-0.25pF NP0	1p0	50V
C7560	Bot	E	7	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7561	Bot	C	5	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7563	Bot	C	4	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7564	Bot	B	4	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7567	Bot	E	6	0402C	Chipcap 5% NP0	15p	50V
C7568	Bot	F	7	0402C	Chipcap 5% NP0	150p	50V
C7569	Bot	C	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7570	Bot	E	7	0402C	Chipcap 5% NP0	18p	50V
C7571	Bot	G	6	0402C	CHIPCAP NP0 330P J 50V 0402	330p	50V
C7573	Bot	F	7	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7575	Bot	E	7	0402C	Chipcap 5% NP0	15p	50V
C7577	Bot	E	6	0402C	Chipcap 5% NP0	15p	50V
C7579	Bot	I	5	0402C	Chipcap 5% NP0	10p	50V
C7580	Bot	I	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7581	Bot	C	3	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7582	Bot	F	7	0402C	Chipcap 5% NP0	100p	50V
C7583	Bot	G	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7584	Bot	C	3	0402C	Chipcap +-0.25pF NP0	5p6	50V
C7585	Bot	H	4	0402C	CHIPCAP NP0 1P0 B 50V 0402	1p0	50V

Item	Side	Grid ref.		Type	Description and value		
C7586	Bot	H	4	0402C	Chipcap 5% NP0	10p	50V
C7587	Bot	H	4	0402C	Chipcap 5% NP0	10p	50V
C7589	Bot	G	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7590	Bot	H	5	0402C	Chipcap 5% NP0	10p	50V
C7591	Bot	G	5	0402C	CHIPCAP NP0 470P J 6V3 0402	470p	6V3
C7592	Bot	H	5	0402C	Chipcap 5% X7R	3n3	50V
C7593	Bot	C	5	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7596	Bot	D	3	0402C	Chipcap +/-0.25pF NP0	2p7	50V
C7597	Bot	C	7	TANT_6.3X3. 5_H2.0	CHIPTCAP 100U M 14V 6X3.2X2	100u_14V	14V
C7598	Bot	F	5	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
D2800	Bot	B	9	uBGA_289	RAP3G V2.20E-PA UMC8D F761800F 12C027	~	~
D3000	Top	B	14	PBFREEBGA4 0_64MB_60/ 11ns_MAX	FLASH 4MX16 1.8/1.8V VFBGA44 PBFREE	4Mx16	~
D3001	Bot	B	12	SDRAM_133 MHZ_64MBI T_BGA60_PB FREE_MAX	SDRAM 4MX16 1.8V/1.8V FBGA60 PBFREE	4Mx16	~
D4800	Bot	E	9	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~	~
D5000	Bot	H	9	FBGA133	COMBO 512 DDR + 512M NAND FBGA133 PBFREE	32Mx16/64 Mx8	~
F2000	Bot	G	15	0603_FUSE_ AVX2MATS	SM FUSE F 2.0A 32V	2A	~
G2200	Bot	A	7	BATTER_EEC EP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V	~
G7500	Bot	F	4	VCO_FDK_W B002	VCO 3610-4340MHZ 2.7V 15MA	3610-4340 MHz	~
G7501	Bot	D	4	VCTCXO_KT2 1P2	VCTCXO 38.4MHZ 2.5V	38.4MHz	~

Item	Side	Grid ref.		Type	Description and value		
G7502	Bot	H	7	VCO_ENFVZ7 Q95	VCO 3296-3980MHZ 2.7V 20MA EGSM	3296-3980 MHz	~
L2000	Bot	F	15	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2001	Bot	D	15	0405_2_MAT SU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2002	Bot	D	15	0405_2_MAT SU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2003	Bot	C	15	0405_2_MAT SU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2004	Bot	C	15	0402L_XL	CHIP COIL 68N J Q17/300M 0402	68nH	~
L2100	Top	B	16	0405_2_MAT SU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2102	Bot	A	2	COIL_0603C S	CHIP COIL 56N J Q38/250MHZ 0603	56nH	~
L2103	Bot	B	2	COIL_0603C S	CHIP COIL 56N J Q38/250MHZ 0603	56nH	~
L2104	Bot	C	13	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2105	Bot	C	13	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2106	Bot	C	13	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2107	Bot	C	13	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2108	Bot	D	14	0405_2_MAT SU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2202	Bot	E	11	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2203	Bot	D	11	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L2204	Bot	E	11	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L2205	Bot	C	13	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~

Item	Side	Grid ref.		Type	Description and value		
L2206	Bot	C	11	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHZ	~
L2301	Bot	H	14	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHZ	~
L2302	Bot	H	14	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4200	Bot	F	12	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4201	Bot	F	14	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHZ	~
L6156	Top	D	16	COIL_0603CS	CHIP COIL 47N G Q38/200MHZ 0603	47nH	~
L6176	Top	D	15	COIL_LQW1608	CHIP COIL 120N J Q32/150MHZ 0603	120nH	~
L7400	Bot	C	1	0402L_H0.45	CHIP COIL 4N7 +-0N1 Q29/1GHZ 0402	4n7H	~
L7401	Bot	F	6	0402L_H0.45	CHIP COIL 4N7 +-0N1 Q29/1GHZ 0402	4n7H	~
L7402	Bot	E	5	0402L_H0.45	CHIP COIL 4N7 +-0N1 Q29/1GHZ 0402	4n7H	~
L7404	Bot	F	2	0402L_H0.45	CHIP COIL 3N3 +-0N1 Q30/1GHZ 0402	3n3H	~
L7502	Bot	F	6	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L7503	Bot	F	5	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHZ	~
L7504	Bot	C	3	0402L	CHIP COIL 27N J Q27/800M 0402	27nH	~
L7505	Bot	C	3	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7506	Bot	C	4	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7510	Bot	E	6	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~

Item	Side	Grid ref.		Type	Description and value		
L7511	Bot	D	6	0402L	CHIP COIL 10N J Q30/800M 0402	10nH	~
L7512	Bot	E	6	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~
L7514	Bot	I	4	0402L	CHIP COIL 8N2 J Q28/800MHZ 0402	8n2H	~
L7515	Bot	G	4	CHOKE_SER4 00	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L7516	Bot	C	6	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L7517	Bot	F	6	0402L	CHIP COIL 1N5 +-0N3 Q33/800M 0402	1n5H	~
M2100	Bot	I	14	VIBRA_M_KH N4NX1RA	SMD VIBRA MOTOR 1.3V 90MA 9000RPM	~	~
N2200	Bot	D	12	TFBGA_108	RETU 3.02 TSA1GJWE TFBGA108	~	~
N2300	Bot	G	14	TFBGA_84_6 .15X6.15	TAHVO V5.2 LF TFBGA84	~	~
N4200	Bot	F	13	USMD_10_2. 458X1.899	DC/DC CONV LM3661-1.40V/ 1.05V NOPB	~	~
N4401	Top	I	2	SH248CSP	HALL IC SWITCH SH248CSP VCC	~	~
N4600	Bot	A	15	IRDA_RPM9 60	IRDA 1.15MBPS 2.2MM ROHS	~	~
N6156	Top	E	15	WFBGA34_2 _3.57X3.57	FM RECEIVER TEA5761UK N4B CSP (TI)	~	~
N7500	Bot	E	3	TFBGA_84_6 .15X6.15	RF ASIC HINKU310A TFBGA84	~	~
N7501	Bot	E	6	TFBGA64_H 1.2	RF ASIC VINKU314A TFBGA64	~	~
N7502	Bot	B	5	RITSA_PA_R EL3	PW AMP PF09014B_CUT5.3 QUADBAND	~	~
N7503	Bot	I	5	PW_AMP_PF 57603B	PW AMP PF57603B CUT8.1 1920-1980MHZ	~	~

Item	Side	Grid ref.		Type	Description and value		
N7504	Bot	G	5	USMD10_2.5 34X2.026	DC CONV SUPA LM2706 PBFREE	~	~
R2000	Bot	D	13	0402R	Resistor 5% 63mW	220R	~
R2001	Bot	E	15	uBGA11_2.1 5X1.65	ASIP MIC W/ESD RES +CAP+ZDI BGA11	~	~
R2002	Bot	E	13	MNR02_SR	RES NETWORK 0W06 2X2K2 J 0404	2x2k2	~
R2003	Bot	E	14	0402R	Resistor 5% 63mW	33k	~
R2004	Bot	C	14	MNR02_SR	RES NETWORK 0W06 2X10R J 0404	2x10R	~
R2005	Bot	C	14	MNR02_SR	RES NETWORK 0W06 2X10R J 0404	2x10R	~
R2006	Bot	C	14	uBGA5	ASIP 4XESD **PB- FREE** BGA5	~	~
R2007	Bot	E	15	uBGA11_1.6 X2.15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2009	Bot	E	15	0402R	Resistor 5% 63mW	100R	~
R2010	Bot	E	15	0402R	Resistor 5% 63mW	220k	~
R2011	Bot	E	15	0402R	Resistor 5% 63mW	120k	~
R2012	Bot	E	15	0402R	Resistor 5% 63mW	10k	~
R2070	Bot	H	12	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2071	Bot	I	11	0402_NTH5	NTC RES 47K J B=4050+-3% 0402	47k	~
R2100	Bot	E	15	uBGA11_2.1 5X1.65	ASIP MIC W/ESD RES +CAP+ZDI BGA11	~	~
R2101	Bot	D	14	0402R	Resistor 5% 63mW	220R	~
R2102	Bot	E	13	MNR02_SR	RES NETWORK 0W06 2X2K2 J 0404	2x2k2	~
R2103	Bot	E	14	0402R	Resistor 5% 63mW	33k	~
R2104	Bot	D	13	MNR02_SR	RES NETWORK 0W06 2X10R J 0404	2x10R	~
R2106	Bot	A	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2107	Bot	A	3	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2200	Bot	G	11	0402R	Resistor 5% 63mW	100k	~

Item	Side	Grid ref.		Type	Description and value		
R2201	Bot	F	12	0402R	Resistor 5% 63mW	120k	~
R2206	Bot	E	12	0402R	CHIPRES 0W06 2M2 J 0402	2M2	~
R2209	Top	I	13	0402R	Resistor 5% 63mW	4k7	~
R2303	Bot	F	14	0402R	Resistor 5% 63mW	1k0	~
R2304	Bot	E	14	0402R	Resistor 5% 63mW	100R	~
R2800	Bot	B	8	0402R	Resistor 5% 63mW	10R	~
R3000	Top	C	14	0402R	Resistor 5% 63mW	4k7	~
R4402	Bot	B	13	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4403	Top	I	13	0603_VAR	CHIP VARISTOR VWM19V VC27V 0603	19V/27V	~
R4404	Top	G	14	0603_VAR	CHIP VARISTOR VWM19V VC27V 0603	19V/27V	~
R4405	Top	I	3	0402R	Resistor 5% 63mW	100k	~
R4407	Top	A	11	0402R	Chipres 0W06 jumper 0402	0R	~
R4408	Top	D	7	0402R	Chipres 0W06 jumper 0402	0R	~
R4409	Top	I	2	0402R	Chipres 0W06 jumper 0402	0R	~
R4424	Top	D	7	0402_VAR	CHIP VARISTOR VWM5.6V VC15.5 0402	5.6V/15V/ 0.05J	~
R4425	Top	A	2	0402_VAR	CHIP VARISTOR VWM5.6V VC15.5 0402	5.6V/15V/ 0.05J	~
R4426	Top	F	7	0402_VAR	CHIP VARISTOR VWM5.6V VC15.5 0402	5.6V/15V/ 0.05J	~
R4427	Top	I	3	0402_VAR	CHIP VARISTOR VWM5.6V VC15.5 0402	5.6V/15V/ 0.05J	~
R4601	Top	A	14	0805R	CHIPRES 0W125 4R7 J 0805	4R7	~
R4800	Bot	G	10	0402R	Resistor 5% 63mW	10R	~
R4809	Bot	D	8	0402R	Resistor 5% 63mW	1k0	~
R4810	Bot	D	10	0402R	Resistor 5% 63mW	100R	~

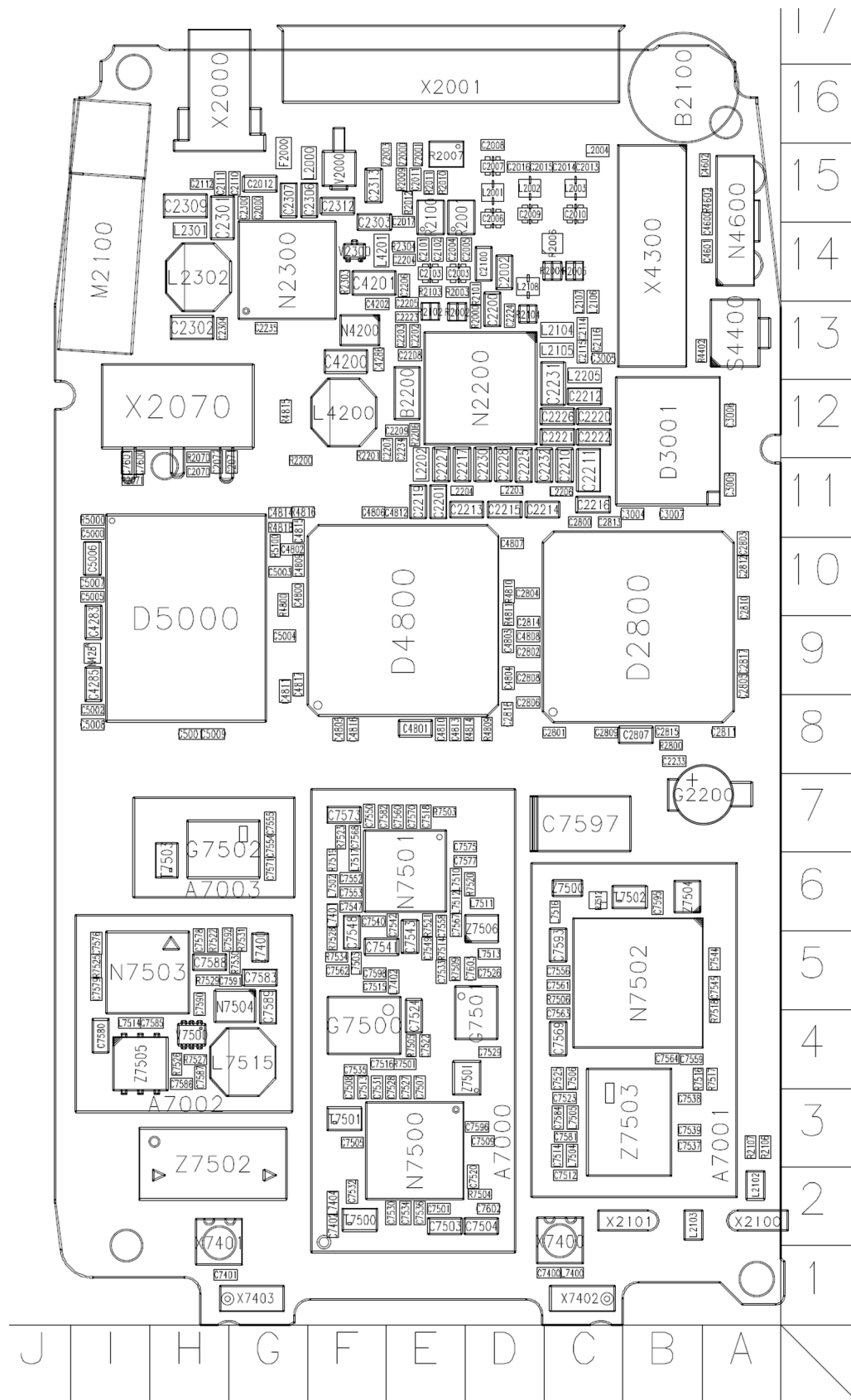
Item	Side	Grid ref.		Type	Description and value		
R4811	Bot	D	10	0402R	Resistor 5% 63mW	100R	~
R4814	Bot	D	8	0402R	Resistor 5% 63mW	10R	~
R4815	Bot	G	12	0402L	FERRITE BEAD 0R8 75R/100MHZ 0402	75R/ 100MHZ	~
R4816	Bot	G	11	0402L	FERRITE BEAD 0R8 75R/100MHZ 0402	75R/ 100MHZ	~
R4818	Bot	G	11	0402R	Resistor 5% 63mW	100R	~
R5000	Bot	I	11	0402R	Chipres 0W06 jumper 0402	0R	~
R5100	Bot	G	10	0402R	Resistor 5% 63mW	10k	~
R6150	Top	E	16	0402R	Resistor 5% 63mW	10k	~
R6159	Top	D	16	0402R	Resistor 5% 63mW	10k	~
R6160	Top	E	16	0402R	Resistor 5% 63mW	100k	~
R6170	Top	E	16	0402R	Resistor 5% 63mW	3k3	~
R6171	Top	E	16	0402R	Resistor 5% 63mW	3k3	~
R7501	Bot	E	4	0402R	Resistor 5% 63mW	1k0	~
R7503	Bot	E	7	0402R	Resistor 5% 63mW	4k7	~
R7504	Bot	D	2	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7505	Bot	E	4	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7506	Bot	C	5	0402R	Resistor 5% 63mW	270R	~
R7509	Bot	E	5	0402R	Resistor 5% 63mW	10k	~
R7512	Bot	C	6	0404_RAC10	RES NETWORK 0W04 2DB ATT 0404	436R/ 11R6/436R	~
R7514	Bot	E	5	0402R	Resistor 5% 63mW	10k	~
R7516	Bot	B	4	0402R	Resistor 5% 63mW	1k0	~
R7517	Bot	A	4	0402R	Resistor 5% 63mW	3k3	~
R7518	Bot	A	4	0402R	Resistor 5% 63mW	470k	~
R7519	Bot	F	6	0402R	Resistor 5% 63mW	1k0	~
R7520	Bot	D	6	0402R	Resistor 5% 63mW	270R	~
R7521	Bot	E	6	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7522	Bot	H	5	0402R	Resistor 5% 63mW	220k	~
R7523	Bot	F	7	0402R	CHIPRES 0W06 9K1 F 100PPM 0402	9k1	~
R7525	Bot	I	5	0402R	Resistor 5% 63mW	10R	~

Item	Side	Grid ref.		Type	Description and value		
R7526	Bot	H	4	0402R	Resistor 5% 63mW	5k6	~
R7527	Bot	H	4	0402R	Resistor 5% 63mW	220R	~
R7528	Bot	F	5	0402R	Resistor 5% 63mW	470k	~
R7529	Bot	H	5	0402R	Resistor 5% 63mW	2k2	~
R7530	Bot	G	5	0402R	Resistor 5% 63mW	8k2	~
R7531	Bot	G	5	0402R	Resistor 5% 63mW	8k2	~
R7534	Bot	F	5	0402R	Resistor 5% 63mW	470k	~
S4400	Bot	A	13	SWITCH_SKR E_II	SM TACT SW TRAV 0.2 4.1X3.55X1.75	~	~
T7500	Bot	F	2	TRANS_LDB1 5	TRANSF BALUN 2134+-90MHZ 0805	~	~
T7501	Bot	F	3	TRANS_LDB1 5	TRANSF BALUN 3800+-550MHZ 0805	~	~
T7502	Bot	B	6	TRANS_LDB1 5	TRANSF BALUN 1800+-100mhz 2x1.25	~	~
T7503	Bot	H	6	TRANS_LDB1 5	TRANSF BALUN 3800+-550MHZ 0805	~	~
V2000	Bot	F	15	CASE_457	TVS DI 1PMT16AT3 16V 175W PWRMITE	~	~
V2300	Bot	F	14	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V4420	Top	A	11	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V4421	Top	I	11	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V4422	Top	D	7	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V4423	Top	A	3	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V4424	Top	D	8	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V4425	Top	F	8	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V4426	Top	F	7	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~

Item	Side	Grid ref.		Type	Description and value		
V4427	Top	I	3	LED_CL270	LED WHITE 100MCD 20MA 0DEG	~	~
V7500	Bot	H	4	SOT_563	SCHDIX2 RF DETECTOR CT 1PF 0V39 SOT666	~	~
X2001	Bot	E	16	SYSCON_MQ 202_NK_14R 3	SM SYSTEM CONNECTOR 14POL	~	~
X2060	Top	I	3	TRACEABILIT Y_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	Bot	H	12	CNO_5225_3 028H	CONN BATT 3POL SPR 2A P3.1	~	~
X2100	Bot	A	2	GND_SPRING _DMD12054	GROUNDING SPRING DMD12054 RM-1	~	~
X2101	Bot	B	2	GND_SPRING _DMD12054	GROUNDING SPRING DMD12054 RM-1	~	~
X4100	Top	G	15	CON_DF30FC _80DP_0.4V	CONN BTB 2X40M P0.4 30V 0.3A	~	~
X4300	Bot	B	14	MOLEX_SD_5 5297_0400	CONN BTB 2X20 P0.5 H4 PLUG	~	~
X7400	Bot	C	2	RF_SWITCH_ MS_156	SM CONN RF JACK 50R 2W 6GHZ	~	~
X7401	Bot	H	2	RF_SWITCH_ MS_156	SM CONN RF JACK 50R 2W 6GHZ	~	~
X7402	Bot	C	1	C_CLIP_6442 631	C-CLIP	~	~
X7403	Bot	G	1	C_CLIP_6442 631	C-CLIP	~	~
Z2000	Bot	E	15	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
Z2001	Bot	E	15	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
Z2003	Bot	F	15	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
Z4100	Top	I	14	uBGA25_2.6 9X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~

Item	Side	Grid ref.		Type	Description and value		
Z4101	Top	H	14	uBGA25_2.6 9X2.69	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4400	Top	G	13	FC6_1.65X1. 15	ASIP 2-CH MIC EMI/ ESD **PB-FREE**	~	~
Z4401	Top	G	14	FC6_1.65X1. 15	ASIP 2-CH MIC EMI/ ESD **PB-FREE**	~	~
Z7400	Bot	G	5	FERRITE_FB MJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/ 100MHz	~
Z7500	Bot	C	6	FERRITE_FB MJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/ 100MHz	~
Z7501	Bot	D	4	FILTER_SAW _2.1X1.7_H0 .8	SAW FILTER 2140 +-30MHZ/4DB 2X1.6	2140MHz	~
Z7502	Bot	H	3	DFYK61G95L BJCB	DUPL 1920-1980/2110-2 170MHZ 9X4.3	1920-1980/ 2110-2170 MHz	~
Z7503	Bot	B	3	ANT_SW_LM SP_0094	ANT.SW+3SAW 880-960/1710-199 0MHZ	~	~
Z7504	Bot	B	6	FILTER_SAW _2.0X1.6_H0 .68	SAW FILTER 897.5 +-17.5MHZ 2X1.6MM	897.5MHz	~
Z7505	Bot	I	4	ISOLATOR_C EZ0047	ISOLATOR 1950 +-30MHZ 13DB 3.55X3.35	~	~
Z7506	Bot	D	6	FILTER_SAW _2.1X1.7_H0 .9	SAW FILTER 1950 +-30MHZ 2.0X1.6	1950MHz	~

Component layout bottom (1lq_11a)



Component parts list (1lr_09a)

Item	Side	Grid ref.		Type	Description and value		
C1100	Top	D	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1101	Top	D	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1102	Top	D	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1200	Top	B	4	TANTAL_TAJ S	CHIPTCAP 1U M 25V 3.2X1.6X1.2	1u_25V	25V
C1201	Top	B	3	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C1203	Bottom	B	4	0603C_H0.9 5	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C1204	Top	B	6	0402C	Chipcap 5% X7R	470p	50V
C1250	Bottom	G	4	0405_2_P0. 65	CHIP ARRAY NP0 2X22P K 25V 0405	2x22p	25V
C1251	Bottom	G	3	0402C	Chipcap 5% NP0	22p	50V
C1252	Bottom	G	2	0405_2_P0. 65	CHIP ARRAY NP0 2X22P K 25V 0405	2x22p	25V
C1253	Bottom	G	2	0402C	Chipcap 5% NP0	22p	50V
C1260	Top	F	1	0402C	Chipcap 5% NP0	22p	50V
C1261	Top	F	7	0402C	Chipcap 5% NP0	22p	50V
C1270	Top	H	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C1271	Top	G	7	0805C_H0.9 5	CHIPCAP X5R 4U7 K 6V3 T=0.95 0805	4u7	6V3
C1272	Top	G	5	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C1273	Top	G	5	0603C_H0.9 5	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C1274	Top	H	5	0603C_H0.9 5	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C1277	Top	H	5	0603C_H0.9 5	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C1278	Top	H	5	0603C_H0.9 5	CHIPCAP X5R 1U K 25V 0603	1u0	25V
C1300	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	Grid ref.		Type	Description and value		
C1301	Top	C	7	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1350	Top	B	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1351	Top	C	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1400	Top	H	16	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C1401	Top	I	16	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C1402	Bottom	H	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1403	Bottom	H	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1404	Bottom	I	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C1405	Bottom	G	2	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C1406	Bottom	I	3	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C1407	Top	F	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1408	Top	F	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1410	Top	I	15	0402C	Chipcap 5% X7R	470p	50V
C1411	Top	G	15	0402C	Chipcap 5% X7R	470p	50V
C1452	Bottom	A	3	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C1453	Bottom	A	2	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C1454	Bottom	C	2	0402C	Chipcap 5% X7R	470p	50V
C1460	Top	C	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1461	Top	C	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1462	Top	B	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1463	Top	B	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1465	Top	C	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V

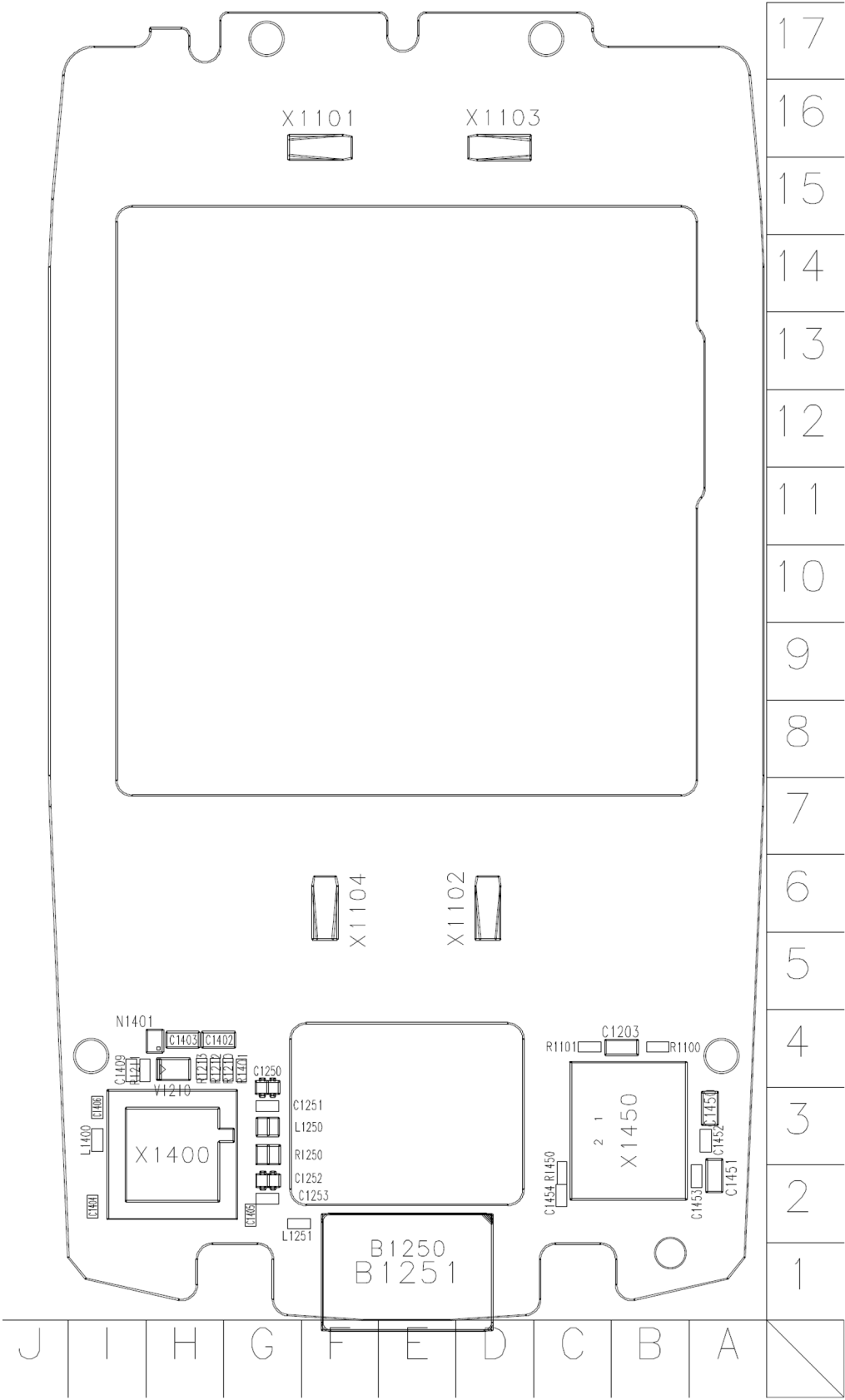
Item	Side	Grid ref.		Type	Description and value		
C1466	Top	B	5	0402C	Chipcap X7R 10% 16V 0402	10n	16V
L1200	Top	C	3	CHOKE_SER3 00	CHOKE 22U M 1R5 0.35A	22uH	~
L1250	Bottom	G	3	0405_2_MA TSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L1251	Bottom	G	2	0402L_H0.4 5	CHIP COIL 10N G Q25/1GHZ 0402	10nH	~
L1270	Top	H	6	CHOKE_SER4 00_H1.2	CHOKE 3U3 M0R1 1.2A4.0X4.0X1.2	3u3H	~
L1271	Top	H	6	0805_BLM2 1	FERR.BEAD 0R03 42R/100MHZ 3A 0805	42R/ 100MHz	~
L1350	Top	C	16	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L1351	Top	C	16	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L1400	Bottom	I	3	0402L	FERRITE BEAD 0R8 75R/100MHZ 0402	75R/ 100MHz	~
L1401	Top	F	5	0402L	FERRITE BEAD 0R8 75R/100MHZ 0402	75R/ 100MHz	~
L1402	Top	G	15	0402L	FERRITE BEAD 0R8 75R/100MHZ 0402	75R/ 100MHz	~
L1403	Top	B	6	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L1404	Top	H	15	0402L	FERRITE BEAD 0R8 75R/100MHZ 0402	75R/ 100MHz	~
L1462	Top	C	5	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
L1463	Top	C	5	FERRITE_04 02	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/ 100MHz	~
N1200	Top	B	4	USMD8_1.69 X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~

Item	Side	Grid ref.		Type	Description and value		
N1270	Top	G	6	SON3024_8	STEP-UP DC/DC CONV SON3024-8	~	~
N1400	Top	I	16	TFBGA_42	14XLEVEL SHIFTER ST16C32245TBR uTFBGA42	~	~
N1401	Bottom	H	4	USMD5_1.47 X1.04_H0.6 75	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
N1402	Top	E	5	LLP6	REG LP3990YDX-1.5V LLP-6	~	1.5V
N1460	Top	C	5	USMD5_1.46 8X1.036	REG+ LP3999ITLX 1.8V 150MA NOPB	~	1.8V
N1461	Top	B	5	USMD5_1.47 X1.04_H0.6 75	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
R1100	Bottom	B	4	0402R	Resistor 5% 63mW	3k3	~
R1101	Bottom	C	4	0402R	Resistor 5% 63mW	3k3	~
R1201	Top	B	3	0402R	Resistor 5% 63mW	33R	~
R1210	Bottom	G	4	0402R	Resistor 5% 63mW	470k	~
R1211	Bottom	I	4	0402R	Resistor 5% 63mW	100k	~
R1212	Bottom	H	4	0402R	Resistor 5% 63mW	470k	~
R1213	Bottom	H	4	0402_NTH5	NTC RES 47K J B=4050+-3% 0402	47k	~
R1220	Top	B	6	0402R	Resistor 5% 63mW	39k	~
R1221	Top	B	7	0402R	Resistor 5% 63mW	1k0	~
R1222	Top	B	7	0402R	Resistor 5% 63mW	68R	~
R1250	Bottom	G	3	0405_2	VARISTOR ARRAY 2XVWM16V VC50 0405	2XVWM16V	~
R1260	Top	F	1	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~

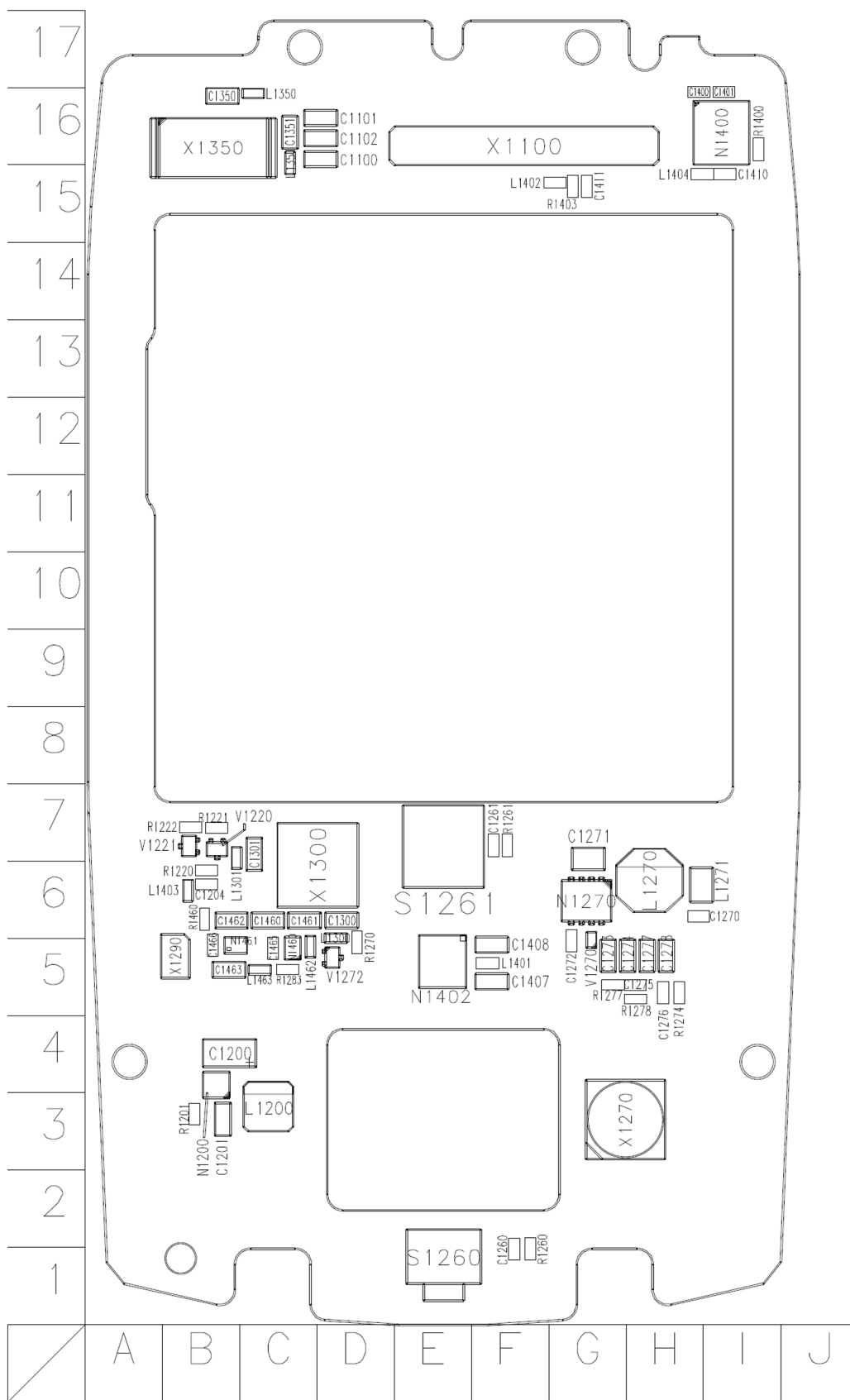
Item	Side	Grid ref.		Type	Description and value		
R1270	Top	D	5	0402R	Resistor 5% 63mW	100k	~
R1274	Top	H	5	0402R	CHIPRES 0W06 6R8 J 0402	6R8	~
R1283	Top	C	5	0402R	Resistor 5% 63mW	470R	~
R1400	Top	I	16	0402R	Resistor 5% 63mW	33R	~
R1401	Bottom	G	4	0402R	Resistor 5% 63mW	15R	~
R1403	Top	G	15	0402R	Resistor 5% 63mW	100R	~
R1450	Bottom	C	2	0402R	Resistor 5% 63mW	100R	~
R1460	Top	B	6	0402R	Resistor 5% 63mW	100k	~
S1260	Top	E	1	BUTTON_EV QPUA02	SM SW TACT SPST 12V 50MA SIDE KEY	~	~
S1261	Top	E	7	PUSH_B_SKQ GA	Pushbutton switch 6.4x5.2 SMD	~	~
V1210	Bottom	H	4	PT202MR0M P	DI PHOTO PT202MR0MP 620NM 1.25X2	~	~
V1220	Top	B	7	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V1221	Top	B	7	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~	~
V1270	Top	G	5	DIODE_PMEG 3002	SCH DI 30V IF 0A2 UFSM 3A IR 10UA SOD882	~	~
V1272	Top	D	5	VMT3_R	TR DTC143ZM N RB=4K7 RBE=47K VMT3	~	~
X1100	Top	F	16	CON_DF30FC _80DP_0.4V	CONN BTB 2X40M P0.4 30V 0.3A	~	~
X1101	Bottom	F	16	CLIP_THUND ER_C	C-CLIP	~	~
X1102	Bottom	D	6	CLIP_THUND ER_C	C-CLIP	~	~

Item	Side	Grid ref.		Type	Description and value		
X1103	Bottom	D	16	CLIP_THUNDER_C	C-CLIP	~	~
X1104	Bottom	F	6	CLIP_THUNDER_C	C-CLIP	~	~
X1270	Top	G	3	LED_CL_712S_4WJ	LED CL-713S-4WJ-SD WHITE FLASH 9CD 5X5X2	~	~
X1300	Top	D	6	CON_DF23C_10DS	SM CONN BTB 2X5 F P0.5	~	~
X1350	Top	B	16	CON_24R_JA_NK_P0.4	CONN BTB 2X12 P0.4 30V 0.2A	~	~
X1400	Bottom	H	3	SOCKET_F6	SMD SOCKET P0.65 8.2X8.2X3.5MM	~	~
X1450	Bottom	B	3	FOXCON_QG2316575Y_V2	CONN BTB SHIELDED 16PIN F P0.4	~	~

Component layout bottom (1lr_09a)



Component layout top (1lr_09a)



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3 — Service Software Instructions

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■ *Phoenix* installation steps in brief

Before you begin

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).

If you use FPS-8:	<ul style="list-style-type: none">• Update FPS-8 software• Activate FPS-8
-------------------	--

If you use FPS-10:	<ul style="list-style-type: none"> • 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-8 or FPS-10 flash prommers and other service tools.

■ Installing *Phoenix*

Before you begin

- 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:

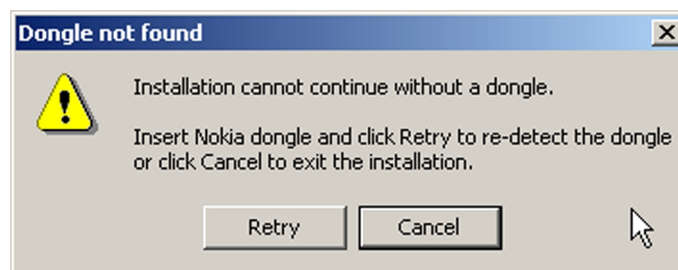


Figure 2 Dongle not found

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**.

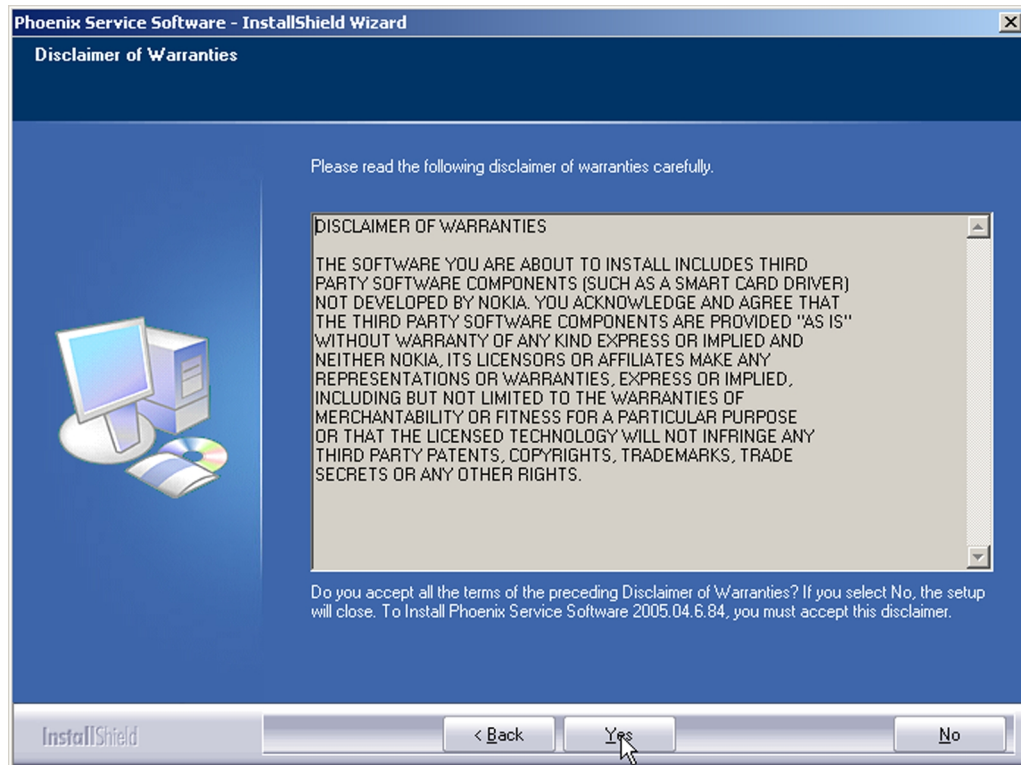


Figure 3 Disclaimer text

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 notify 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**.

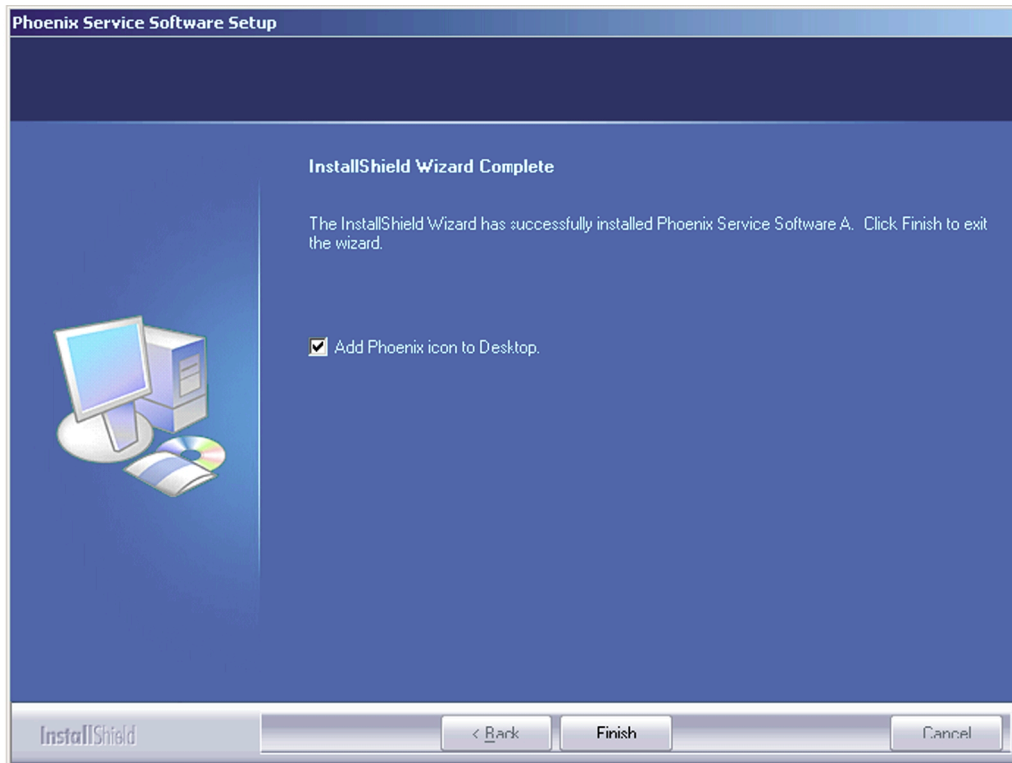


Figure 4 InstallShield Wizard Complete

Next action

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

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

FPS-8 and FPS-10 flash prommers 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.

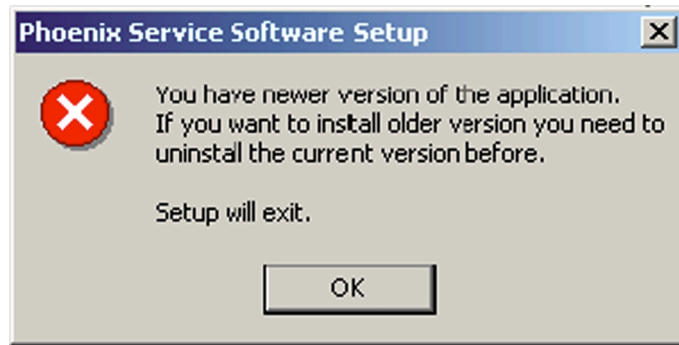


Figure 5 Installation interrupted

- 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** .

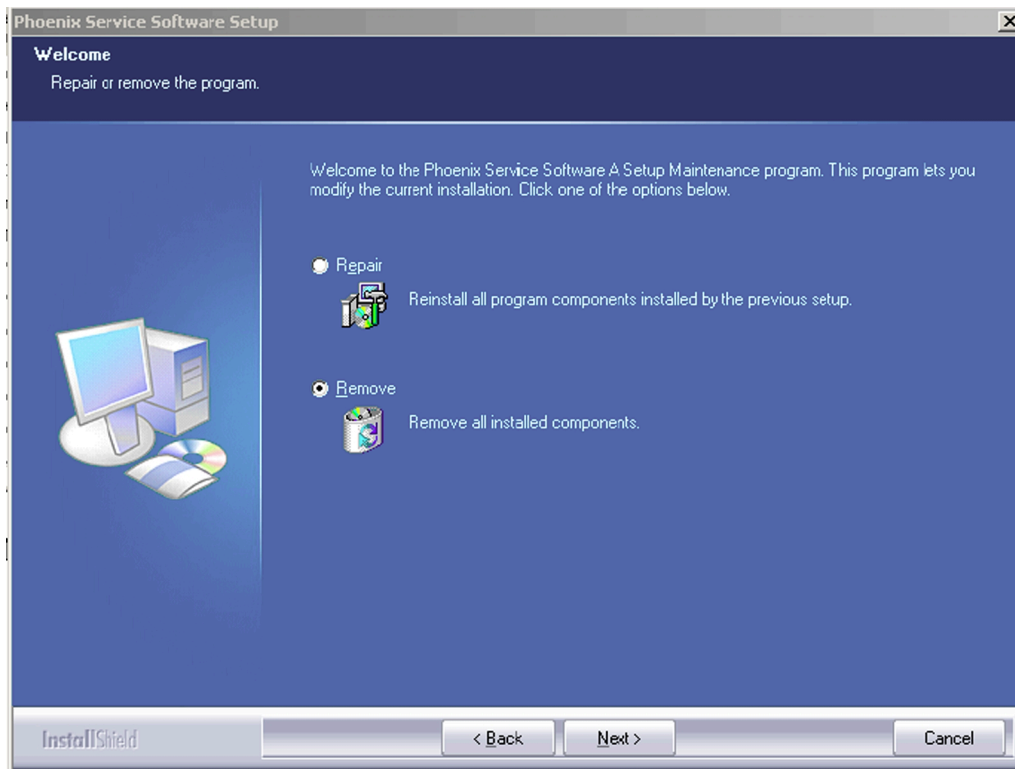


Figure 6 Remove program

The progress of the uninstallation is shown.

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

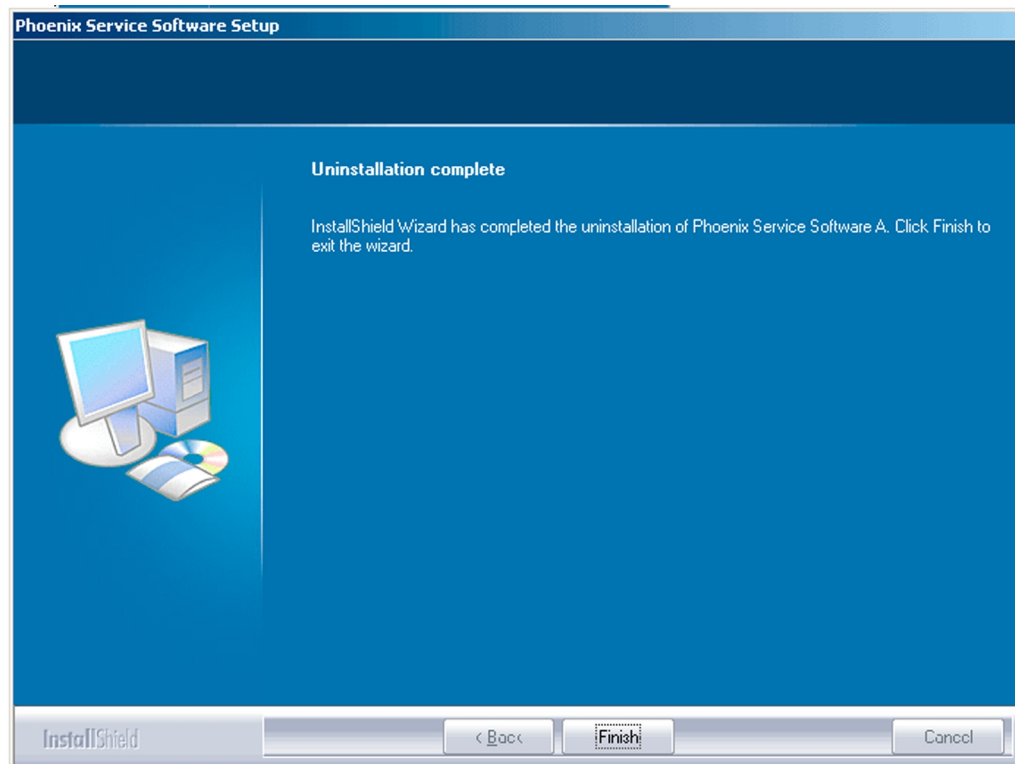


Figure 7 Finish uninstallation

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**.

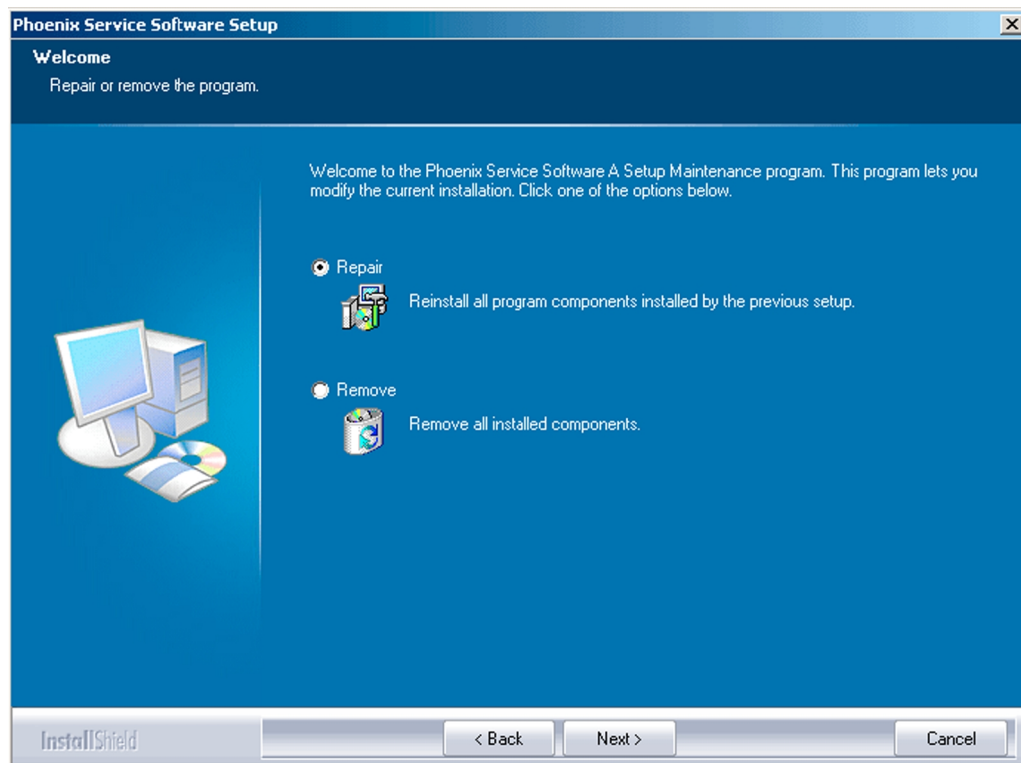


Figure 8 Repair program

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

Before you begin

- 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)

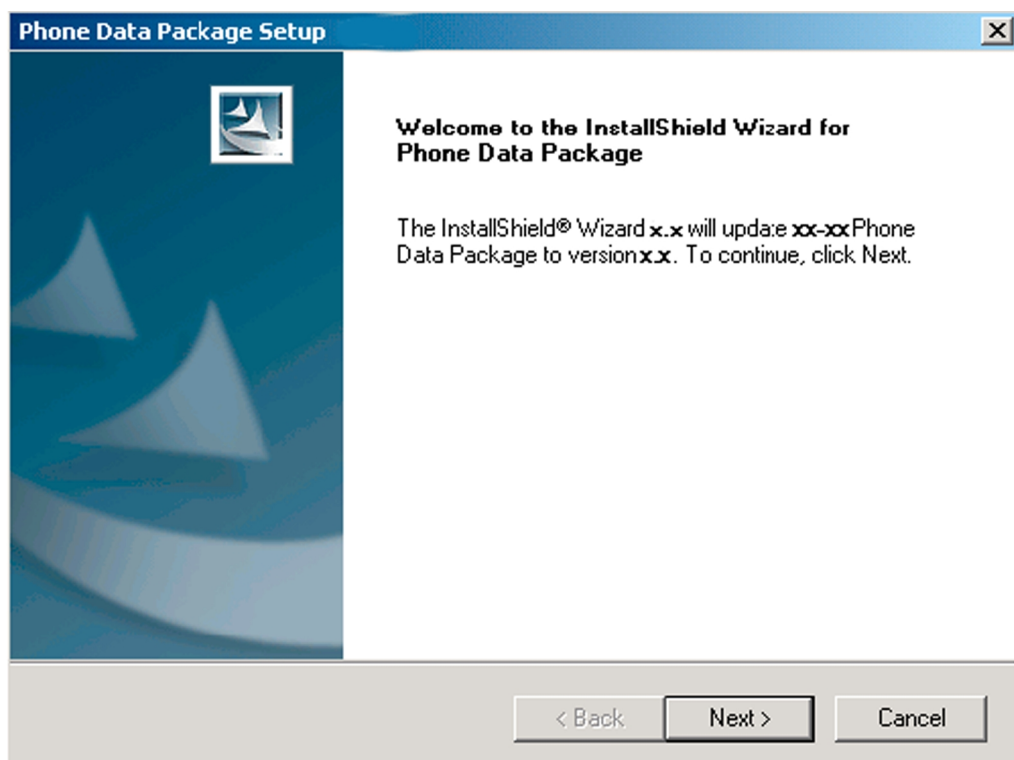
If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

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**.



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.

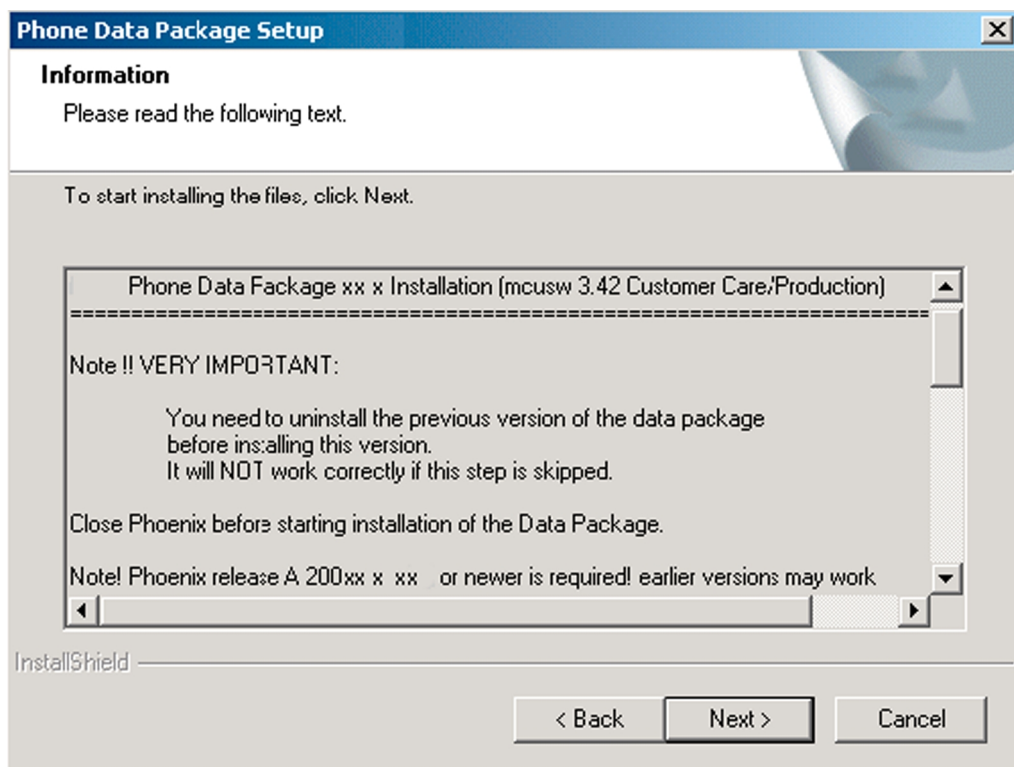


Figure 9 Data package setup information

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

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

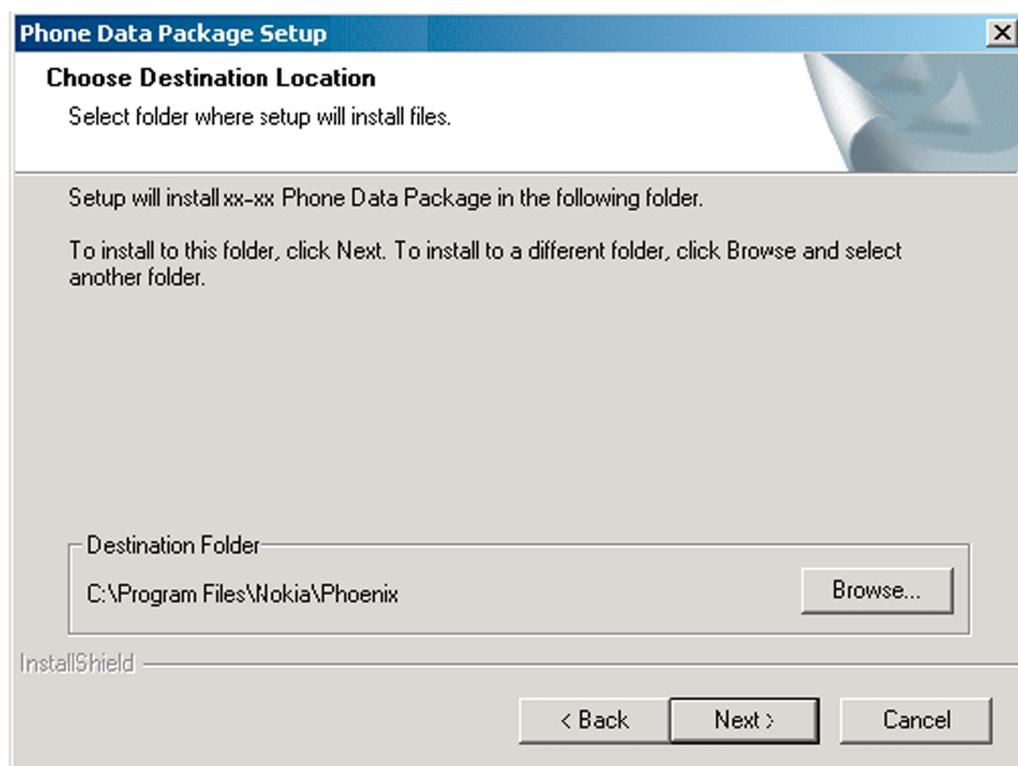
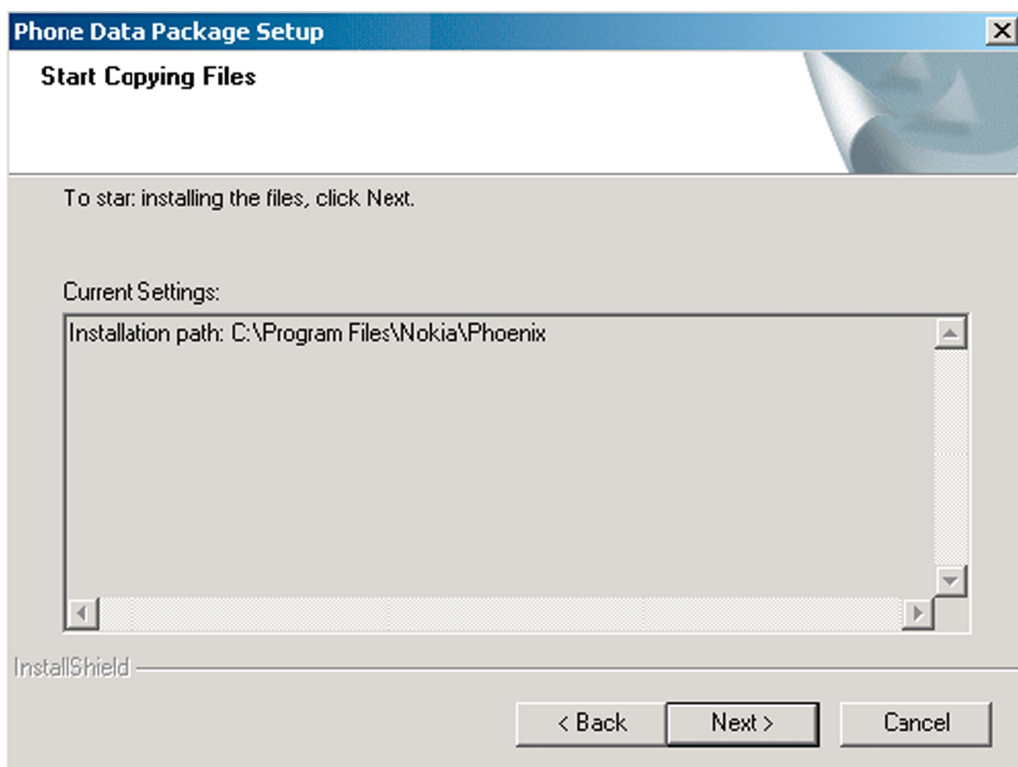


Figure 10 Data package destination folder

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

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



Phone model specific files are installed. Please wait.

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

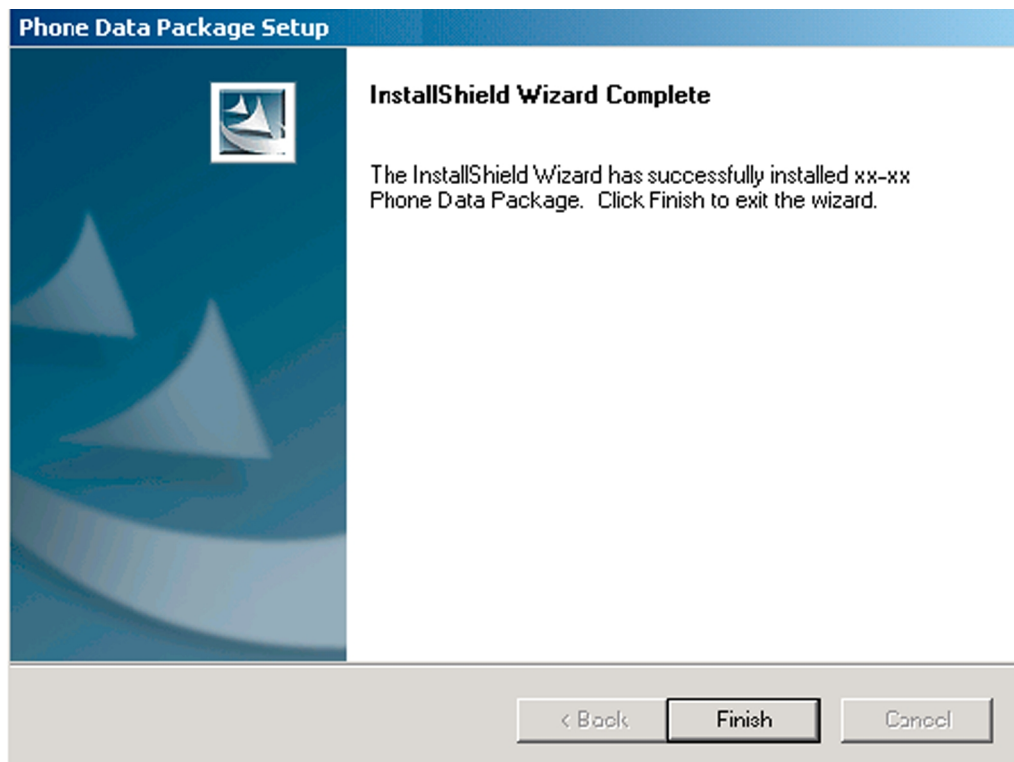


Figure 11 InstallShield Wizard Complete

Next action

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**.

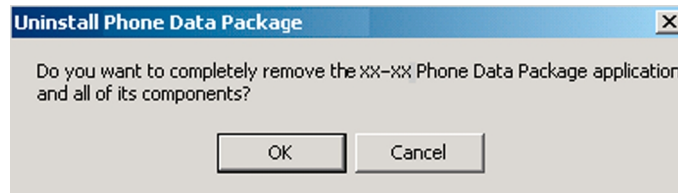


Figure 12 Uninstalling phone data package

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

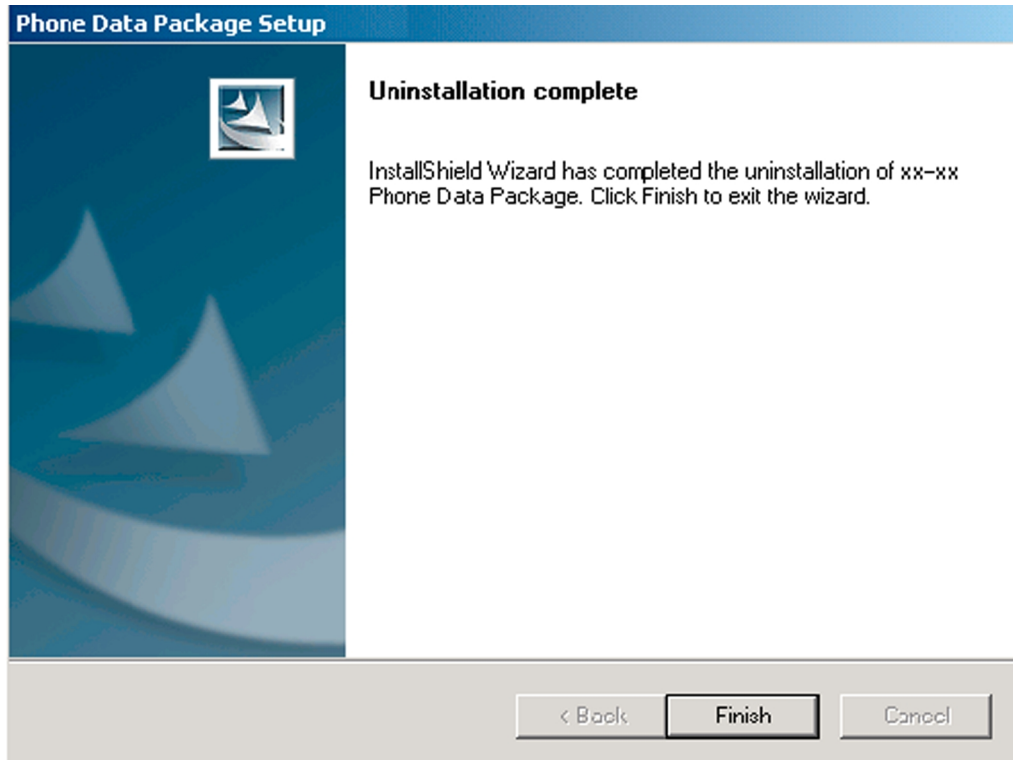


Figure 13 Finishing data package uninstallation

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.

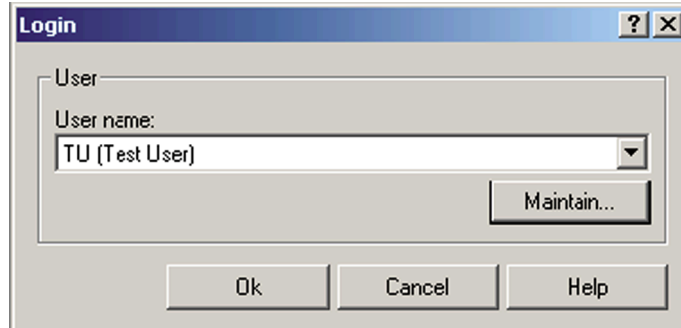


Figure 14 Phoenix login

- 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**.

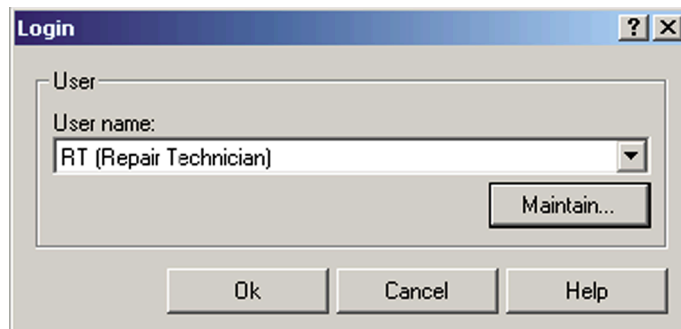


Figure 15 New user configured

■ Managing connections in *Phoenix*

Context

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

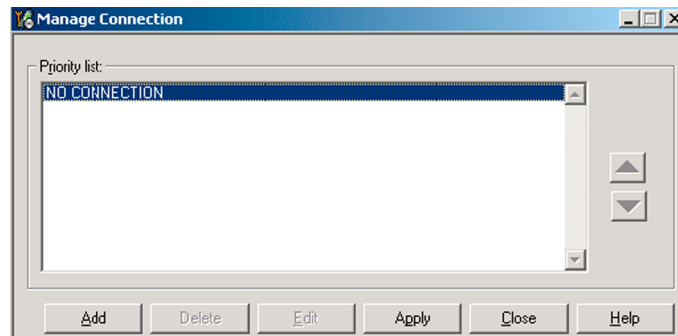
Note: After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.

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.

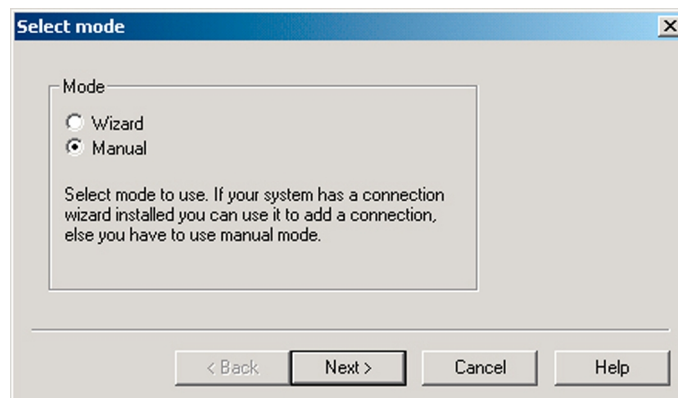


Figure 16 Select mode: Manual

- 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 an FPS-8 flash prommer, choose the following connection settings:
 - Media: **FPS-8**
 - PORT_NUM: COM Port where FPS-8 is connected
 - COMBOX_DEF_MEDIA: **FBUS**

iv 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**.

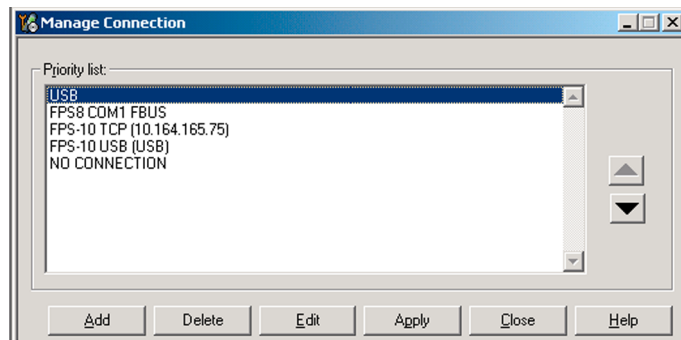


Figure 17 Connections list

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 18 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 19 Product support module information (example from RM-1)

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

Before you begin

- 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*).

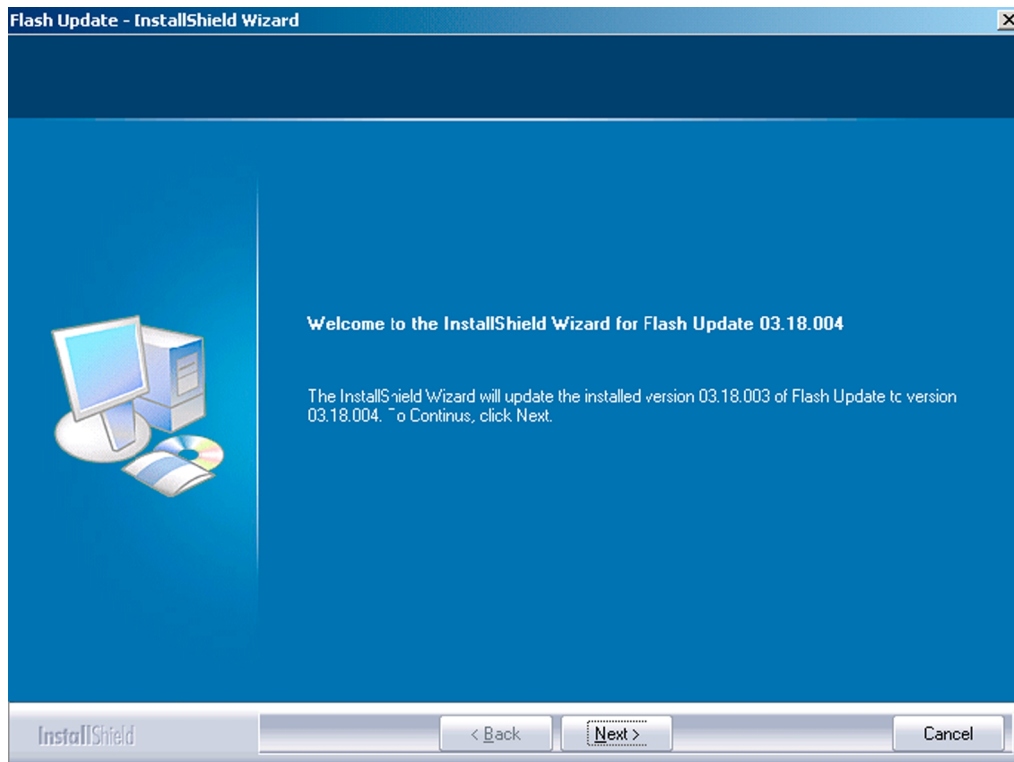


Figure 20 Flash update welcome dialog

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.

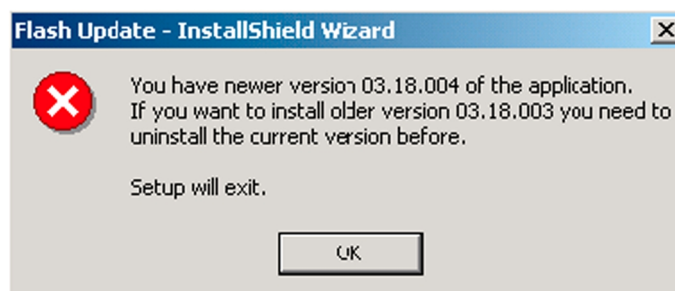


Figure 21 Flash installation interrupted

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**.

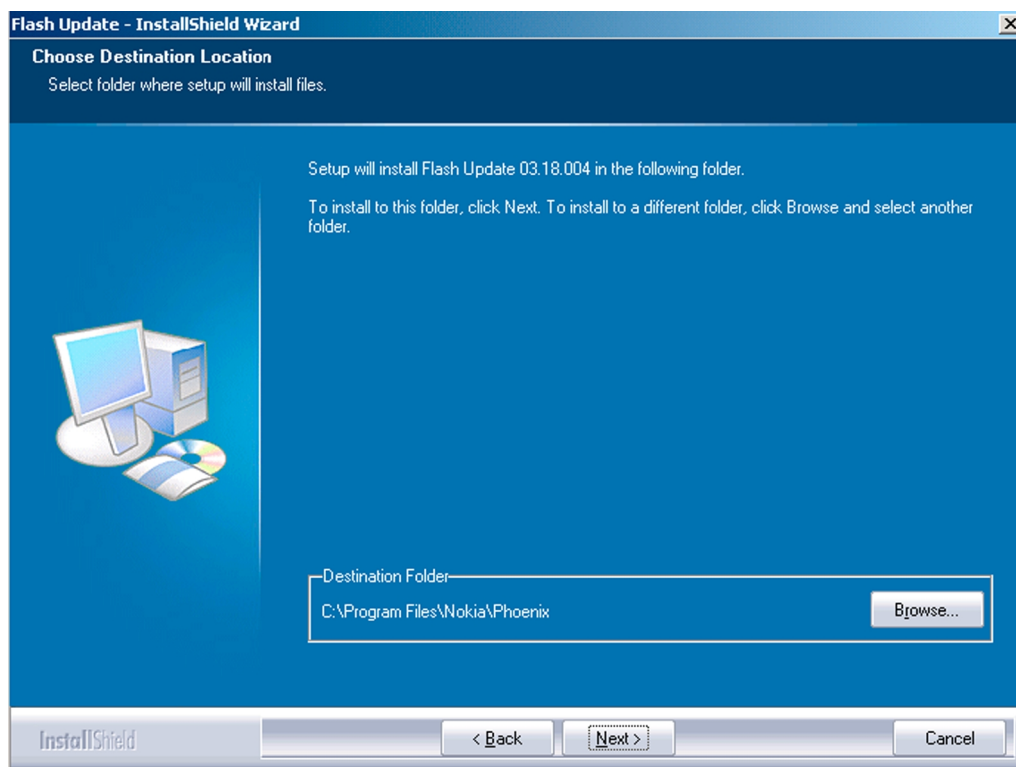


Figure 22 Flash destination folder

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**.

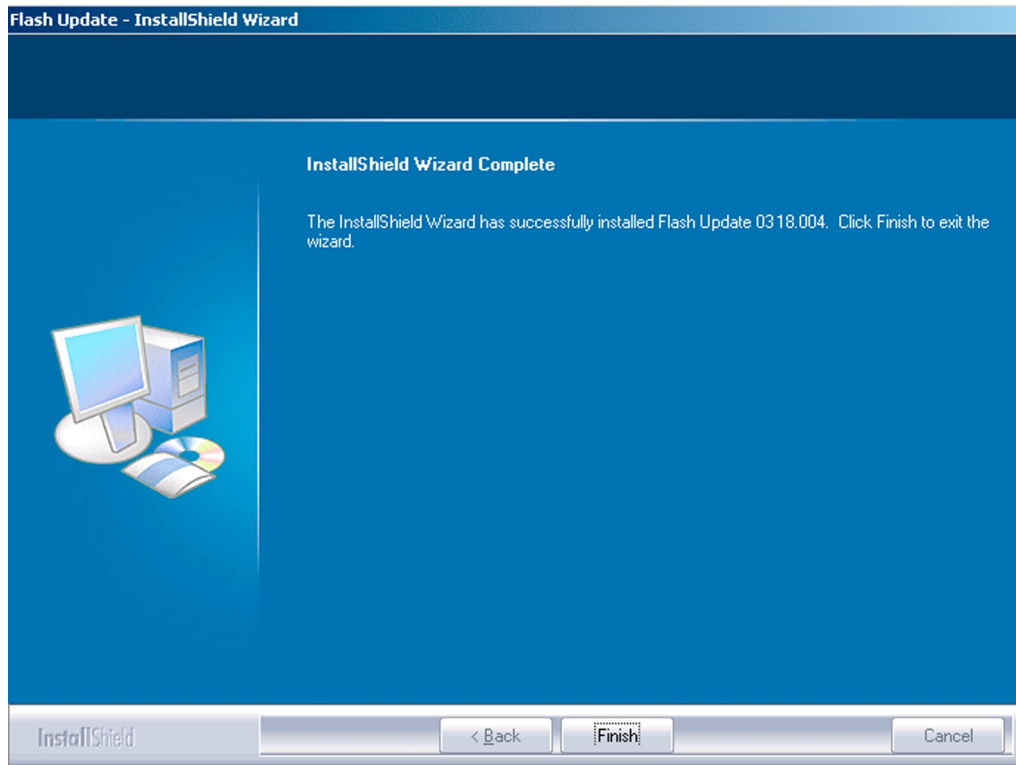


Figure 23 Finish flash update

Next action

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*.

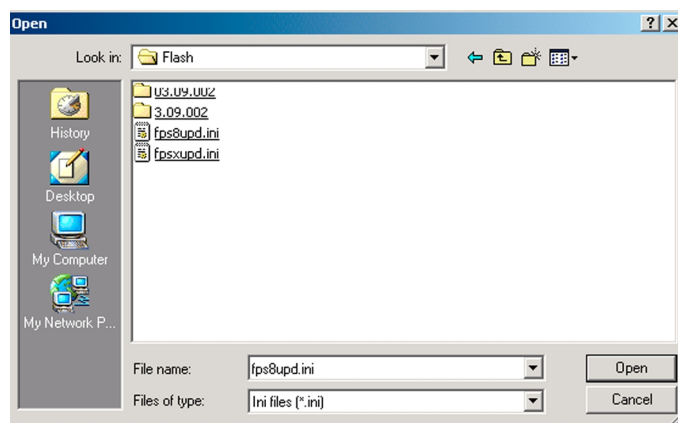


Figure 24 Flash directory window

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**.

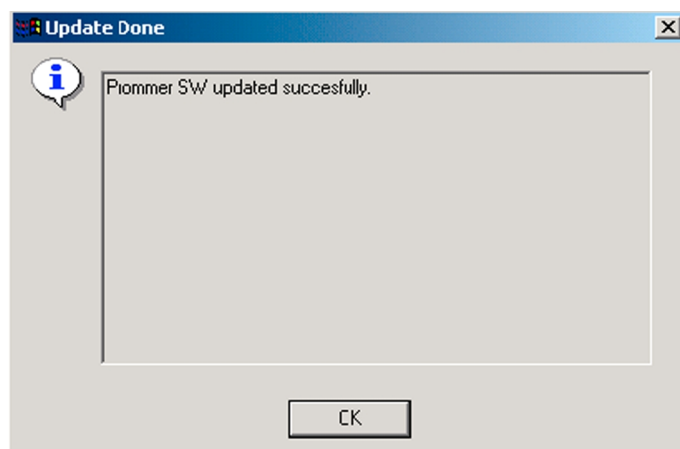


Figure 25 Prommer software update finished

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

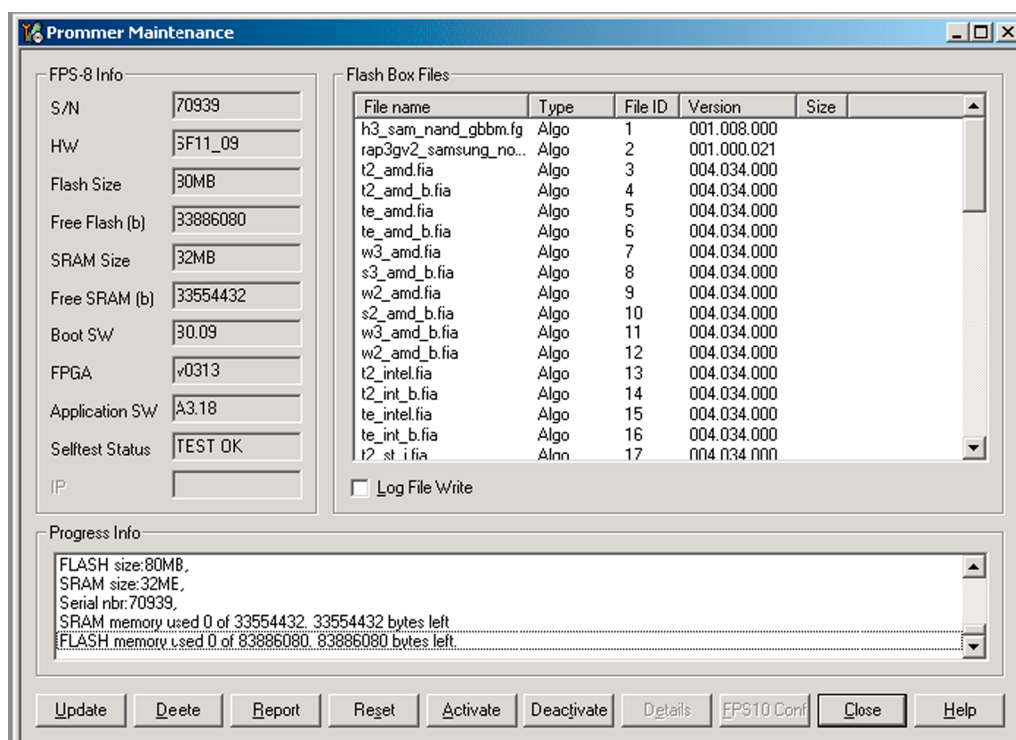


Figure 26 Prommer Maintenance window

■ 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**.

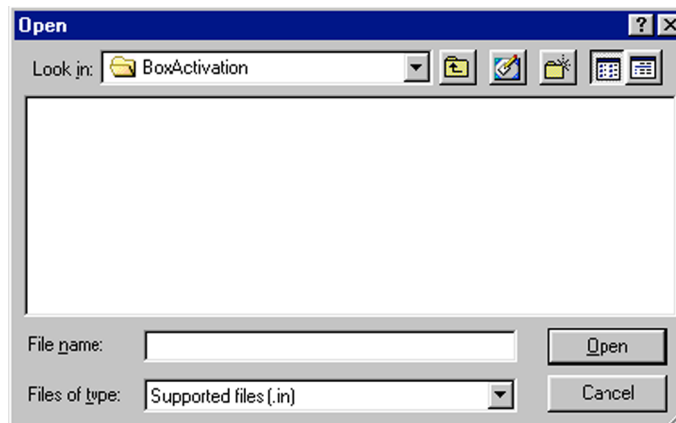


Figure 27 Box activation

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**.

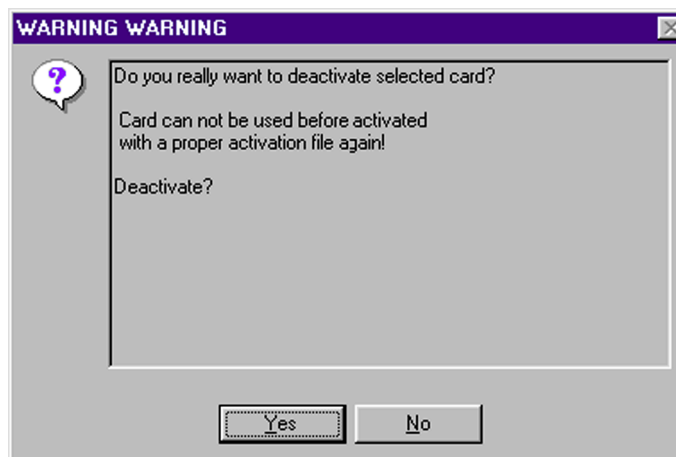


Figure 28 Deactivation warning

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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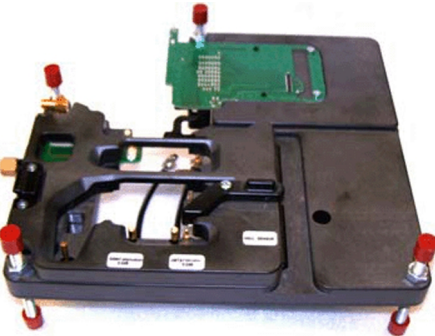

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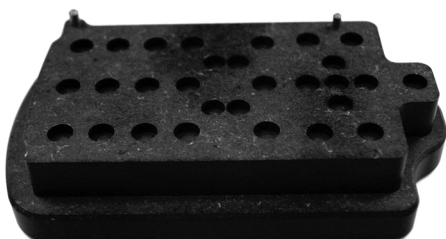

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■ New, product specific service tools




The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-67, refer to various concepts.

	FS-3	Product specific adapter	
	MJ-64	Module jig	<p>MJ-64 is a product specific adapter for SW update and testing purposes. It is compatible to SS-62 and SS-46. It provides galvanic connection to terminal test pads and battery connector.</p> <p>Module jig offers engine module component level repair, analysis and alignment capabilities in combination with CU-4.</p> <p>Features:</p> <ul style="list-style-type: none"> • connection interfaces for GSM, WCDMA and Bluetooth antenna • Galvanic connection to engine module test pads • Multiplexing between USB and FBUS media, controlled by VUSB with CU-4 • Lid interconnection with test points for measurements • Connection to lid assembly incl. displays and earpiece • Connector for e.g. CU-4 control unit • Connection for BT / SIM / SD-card module <p>Note: Lid assembly incl. displays is not designed to be used for repair and analysis. The connection cycles for lid are limited to 10 times.</p>
	RJ-99	Soldering jig	<p>RJ-99 is a jig to support component level exchange with soldering machines. It is designed mainly for the engine module but the B-side can be used for the lid module if needed.</p>

	SA-91	RF coupler																																		
	SA-91 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-91:																																			
	• Table 7 Attenuation values																																			
	<table><tr><th colspan="2">Frequency / MHz</th><th>Loss / dB</th></tr><tr><td colspan="2">836.6</td><td>0.20</td></tr><tr><td colspan="2">881.6</td><td>0.20</td></tr><tr><td colspan="2">897.4</td><td>0.20</td></tr><tr><td colspan="2">942.4</td><td>0.20</td></tr><tr><td colspan="2">1747.8</td><td>0.20</td></tr><tr><td colspan="2">1842.8</td><td>0.20</td></tr><tr><td colspan="2">1880</td><td>0.20</td></tr><tr><td colspan="2">1950</td><td>0.20</td></tr><tr><td colspan="2">1960</td><td>0.20</td></tr><tr><td colspan="2">2140</td><td>0.30</td></tr></table>			Frequency / MHz		Loss / dB	836.6		0.20	881.6		0.20	897.4		0.20	942.4		0.20	1747.8		0.20	1842.8		0.20	1880		0.20	1950		0.20	1960		0.20	2140		0.30
Frequency / MHz		Loss / dB																																		
836.6		0.20																																		
881.6		0.20																																		
897.4		0.20																																		
942.4		0.20																																		
1747.8		0.20																																		
1842.8		0.20																																		
1880		0.20																																		
1950		0.20																																		
1960		0.20																																		
2140		0.30																																		
	SS-80	Domesheet assembly jig																																		
	SS-80 is intended to be used for fixing the domesheet onto the engine module.																																			
	SS-90	Can opening tool																																		
	SS-90 can be used for opening the peel-off cans on the engine PWB's.																																			

■ Re-used standard 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-67, 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.		
	CA-53	USB connectivity cable	
	USB to system connector cable.		



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.

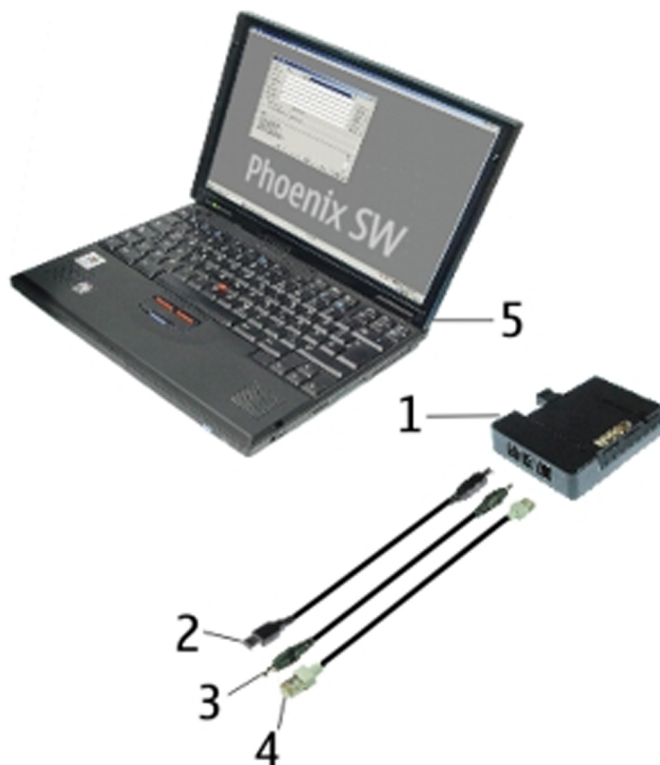
The unit has the following features:

- 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.

	DKU-2	USB connectivity cable	
	USB to system connector cable.		
	FLS-4S	Flash device	
	FLS-4S is a dongle and flash device incorporated into one package, developed specifically for POS use.		

	FPS-10	Flash prommer	
	JBT-9	Bluetooth test and interface box (sales package)	
	PCS-1	Power cable	

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:


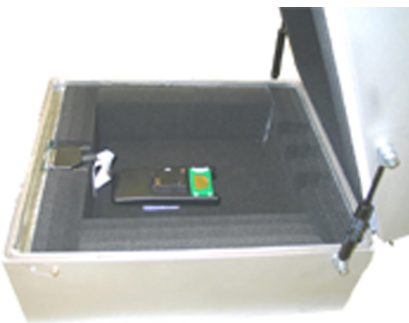
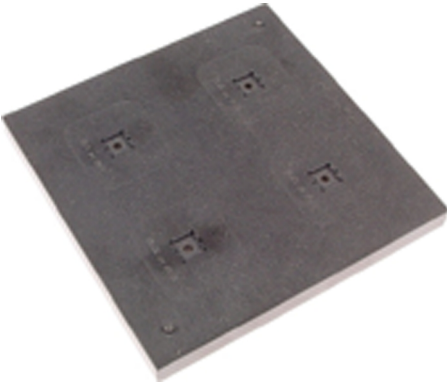
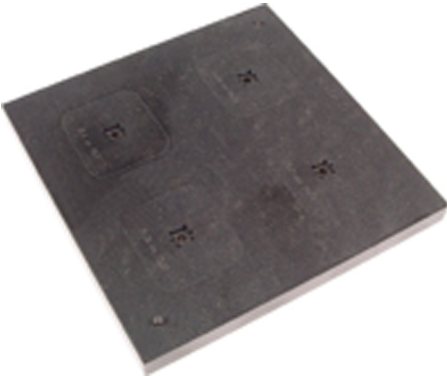
- FPS-10 prommer
- Power Supply with 5 country specific cords
- USB cable





The JBT-9 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .


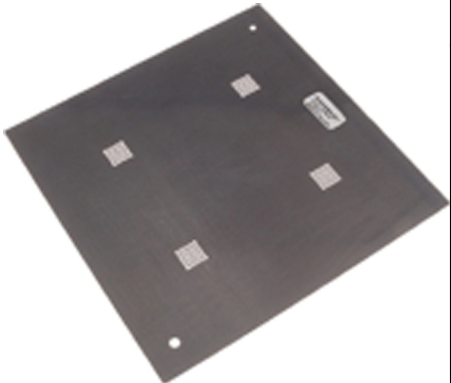
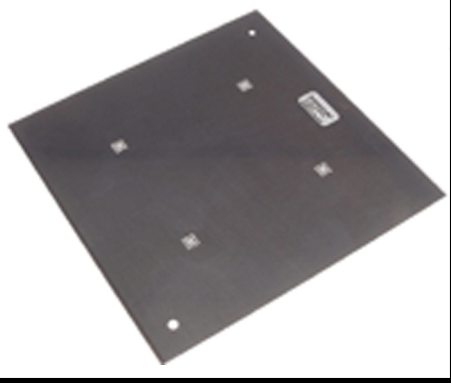

Sales package includes:



- JBT-9 test box
- Installation and warranty information

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	
	<p>SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Without the device, it is not possible to use the service software. Printer or any such device can be connected to the PC through the device if needed.</p>		
		RF shield box	
	<p>Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal.</p> <p>The shield box is not an active device, it contains only passive filtering components for RF attenuation.</p>		
	RJ-56	Rework jig	
	<p>RJ-56 is a rework jig used with ST-21.</p>		
	RJ-57	Rework jig	
	<p>RJ-57 is a rework jig used with ST-22.</p>		

	SPS-1	Soldering Paste Spreader	
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers and B-to-B connectors.		
	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.		

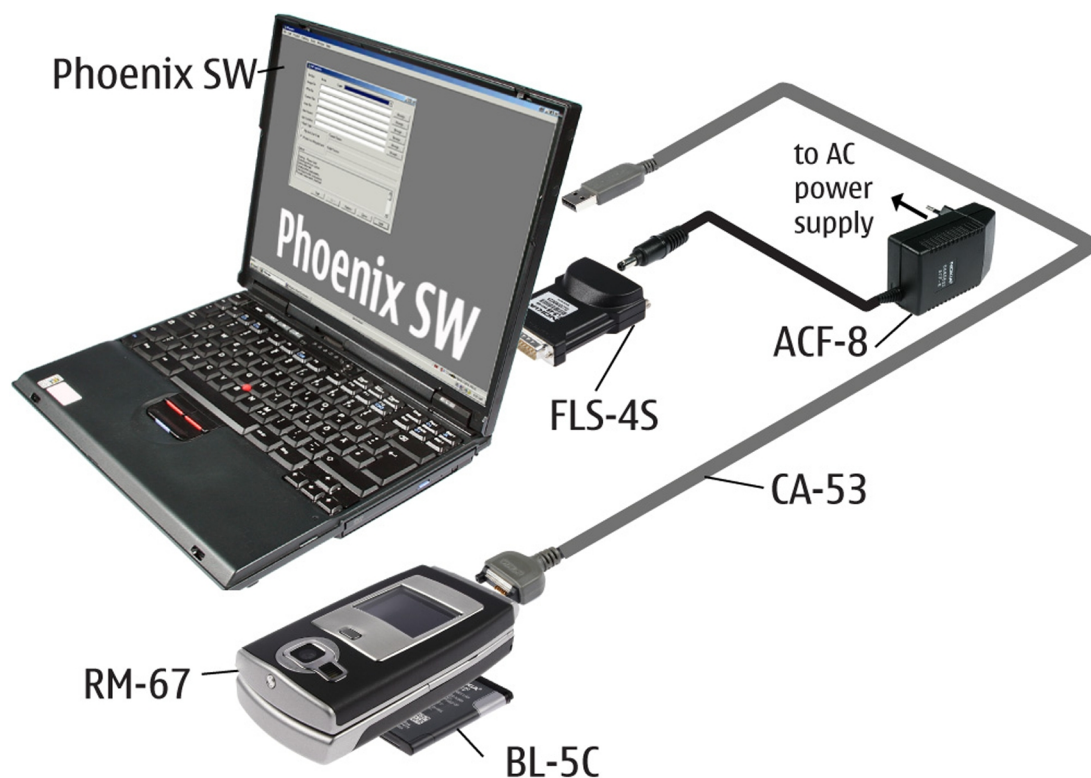
	SS-62	Generic flash adapter base for BB5	
	<ul style="list-style-type: none"> • generic base for flash adapters and couplers • SS-62 equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using galvanic connector or coupler • multiplexing between USB and FBUS media, controlled by VUSB 		
	ST-21	Rework stencil	
	ST-21 is a rework stencil used with rework jig RJ-56.		
	ST-22	Rework stencil	
	ST-22 is a rework stencil used with rework jig RJ-57.		
	SX-4	Smart card	
	<p>SX-4 is a BB5 security device used to protect critical features in tuning and testing.</p> <p>SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.</p>		

	XCS-4	Modular cable	
	XRS-6	RF cable	
<p>XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</p>			
<p>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:</p> <ul style="list-style-type: none"> • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB 			

■ Service concepts

Point-of-Sale (POS) flash concept

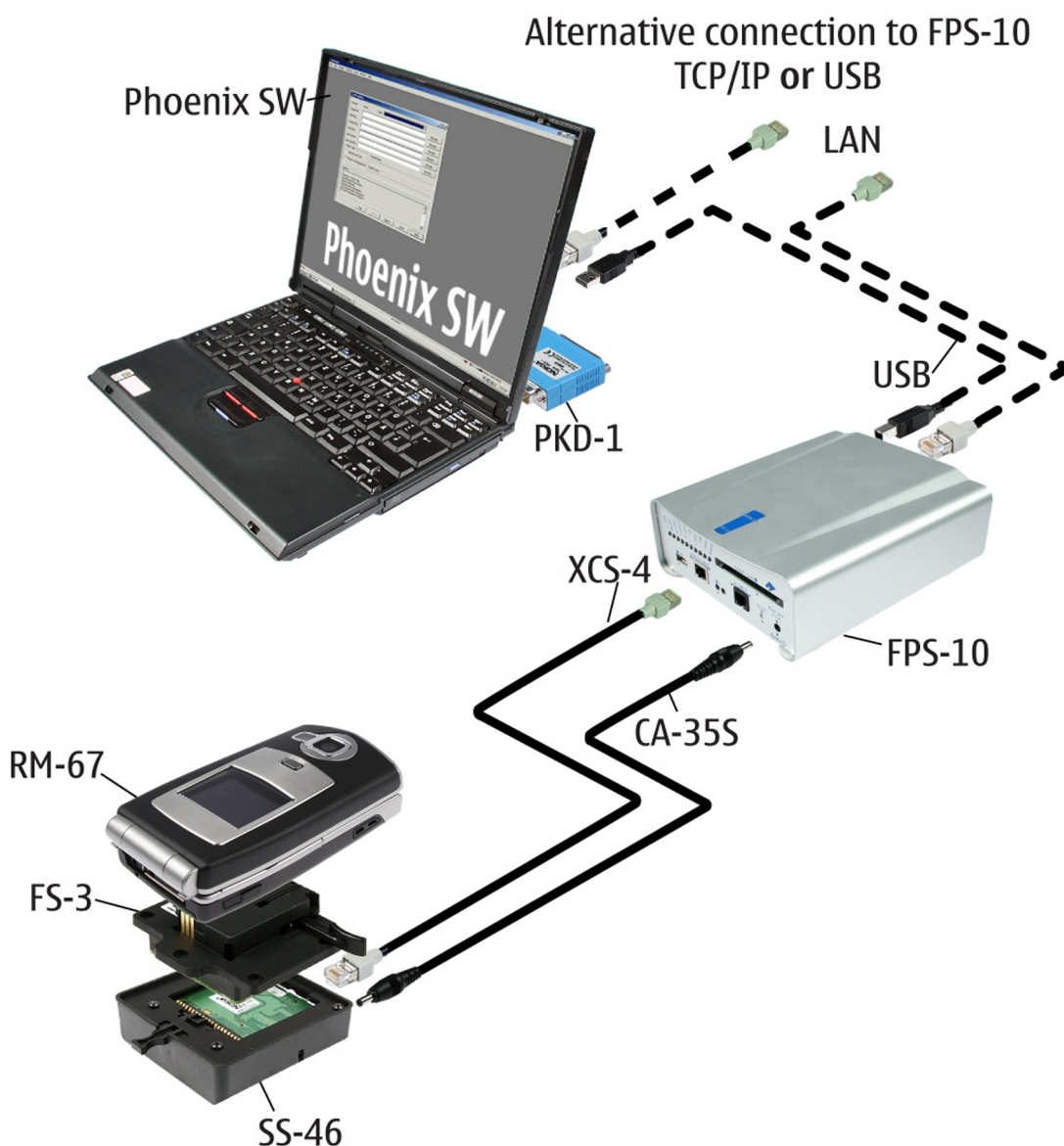
Flashing is supported using DKU-2. This cable is a USB – system connector cable. On the PC site there is Phoenix SW as UI application for the flashing process. Flashing only works if the device is alive.



Type	Description
CA-53	USB to device bottom connector cable
FLS-4S	Point of Sales re-flash device
ACF-8	Charger

Flashing with FPS-10 and SS-46

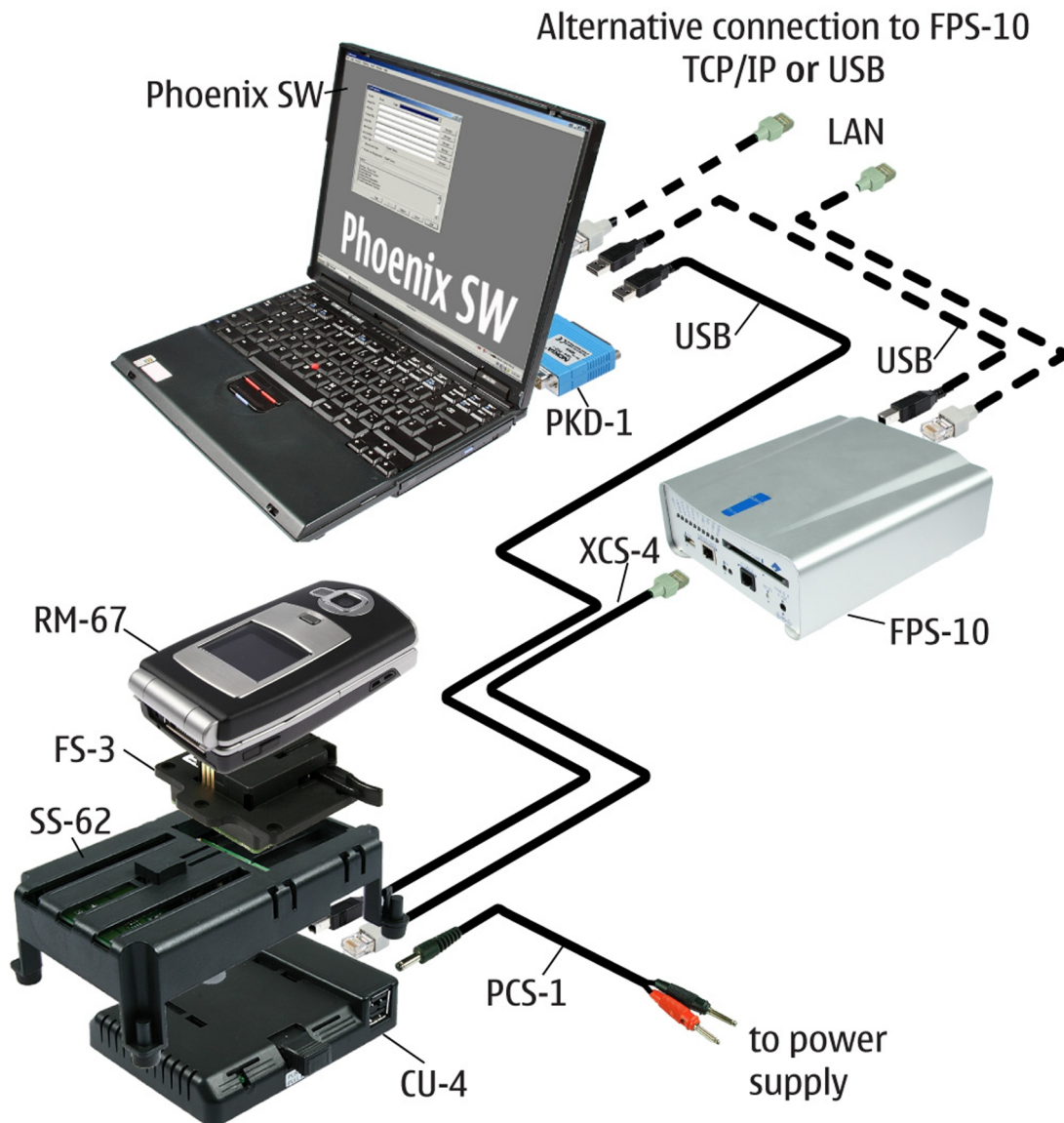
Flashing with FPS-10 flash prommer needs a product specific flash adapter optional a base stand and external power supply to connect to the internal bus and also a control unit with power distribution and interface to device. This setup can be used for repaired devices where flashing via USB is impossible. (e.g. flash components).



Type	Description
FPS-10	Flash Prommer
FS-3	Product Specific Adapter
SS-46	Interface Adapter
PKD-1x	SW Security Device
ACF-8	Charger
XCS-4	Modular data cable
CA-35S	Power Cable
<USB>	Standard USB cable Connector A to B

Flashing with FPS-10, SS-62 and CU-4

Flashing with FPS-10 flash prommer needs a product specific flash adapter, base stand and external power supply to connect to the internal bus and also a control unit with power distribution and interface to device. This setup can be used for repaired devices where flashing via USB is impossible. (e.g. flash components).

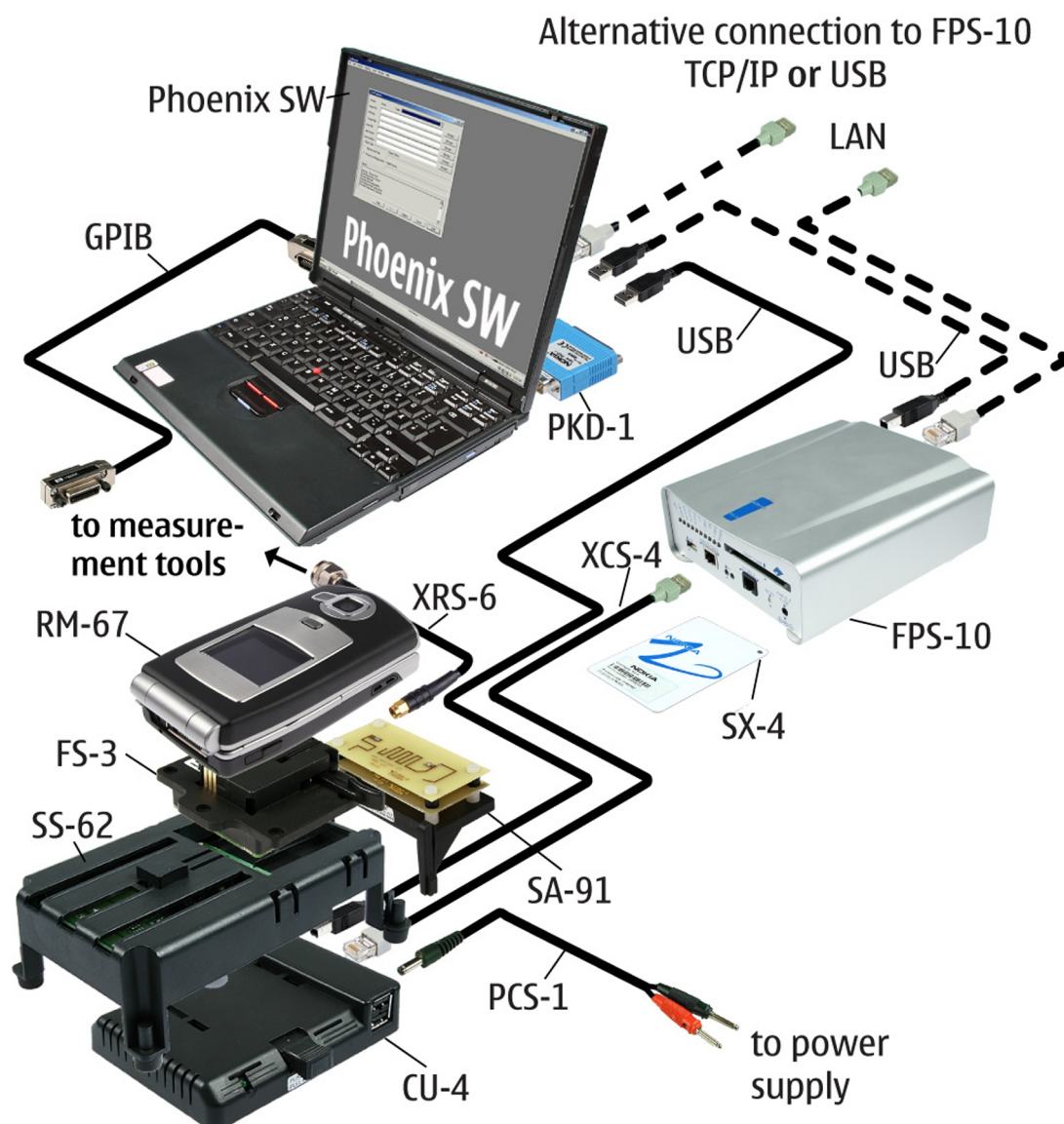


Type	Description
FPS-10	Flash Prommer
FS-3	Product Specific Adapter
CU-4	Control Unit for BB5
SS-62	Flash Adapter Base for BB5
PKD-1 / FLS-45	SW Security Device
ACF-8	Charger
XCS-4	Modular data cable

Type	Description
PCS-1	Power Cable
<USB>	Standard USB cable Connector A to B

BB tuning and RF testing with CU-4 and FPS-10

RF testing (GO-NOGO) with coupler and SIM-card can also be done with SS-46 instead of CU-4. BB tuning is only possible with CU-4 setup. SX-4 smart card can either be inserted into FPS-10 or in a separate USB smart card reader. Shielded box should be used in critical environment. For automatic RF tuning, a GPIB interface is needed.

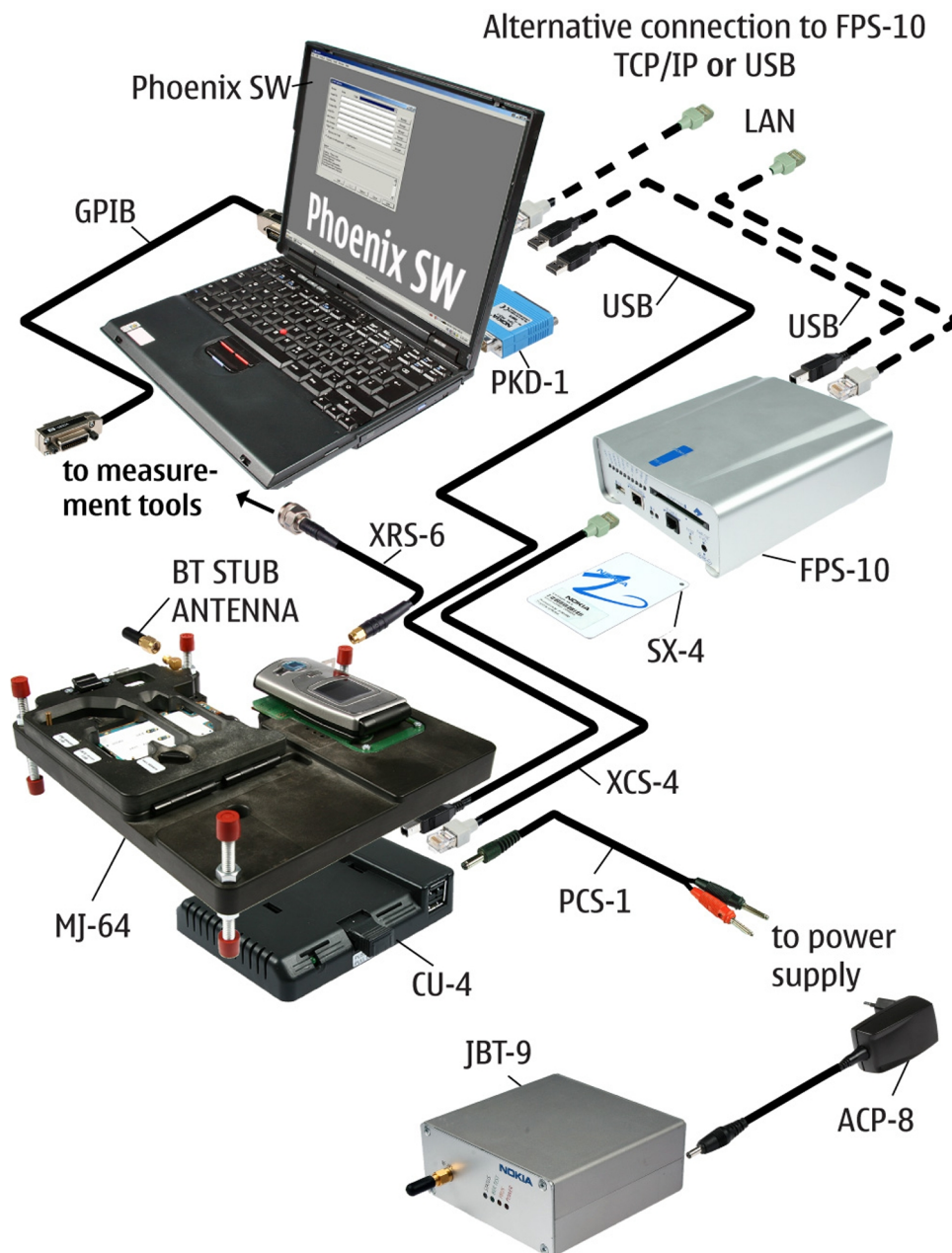


Type	Description
FPS-10	Flash Prommer
FS-3	Product Specific Adapter
CU-4	Control unit

Type	Description
SS-62	Flash Adapter Base for BB5
SX-4	Smart Card
PKD-1x / FLS-4S	SW Security Device
XRS-6	RF cable SMA to N connector
XCS-4	Modular data cable
PCS-1	Power Cable
<USB>	Standard USB cable Connector A to B

BB and RF tuning (WCDMA) and troubleshooting in MJ-64 with FPS-10

RF WCDMA tuning should only be done with the MJ-64 module repair jig in the RF shielded box. With the shielded box, the CU-4 is outside connected via a 44pol sub-D cable. This is the preferred setup to be used for troubleshooting also without a shielded box. Bluetooth testing with connected JBT-9 box.

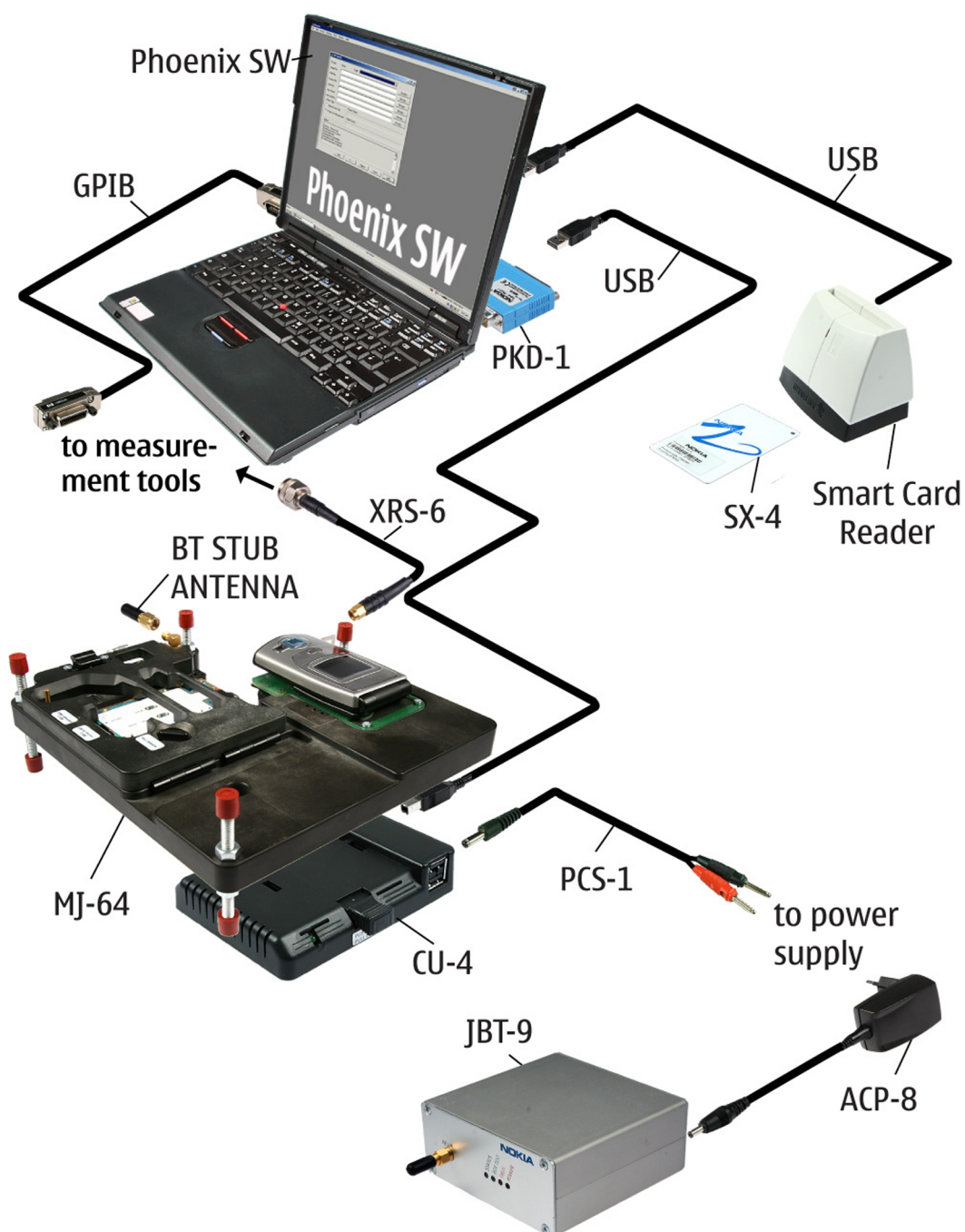


Type	Description
FPS-10	Flash prommer
MJ-64	Module repair jig
CU-4	Control unit
SX-4	Smart card
PKD-1x / FLS-4S	SW security device
XRS-6	RF cable SMA to N connector
XCS-4	Modular data cable
PCS-1	Power cable
JBT-9/SB-6	Bluetooth testbox

Type	Description
XRE-2	RF cable SMA to SMA
<USB>	Standard USB cable connector A to B
<GPIB>	GPIB cable

BB and RF tuning in MJ-64 without FPS-10

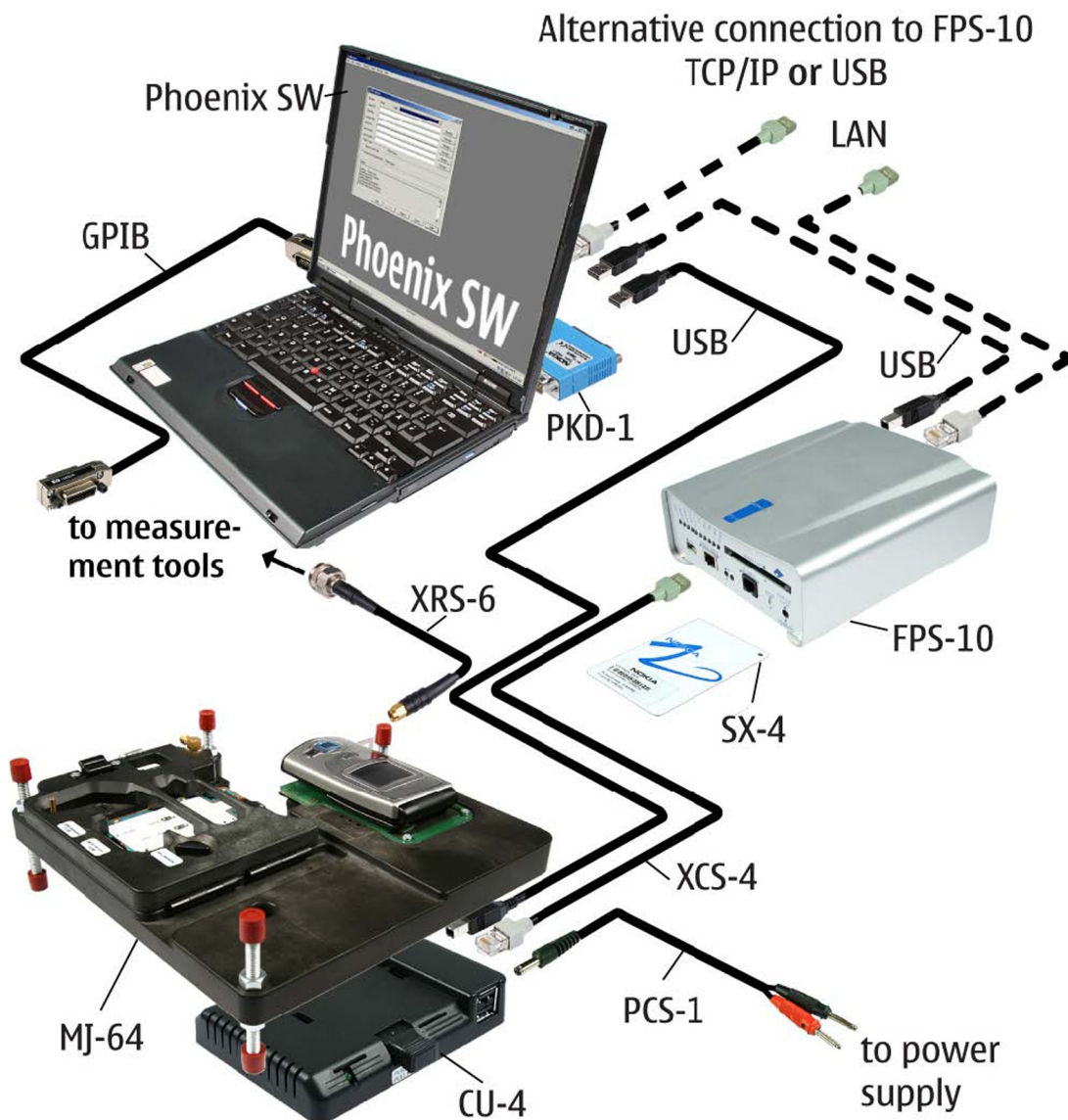
RF WCDMA tuning should only be done with the MJ-64 module repair jig in the RF shielded box. GSM tuning and/or BB tuning is possible without the shielded box and FPS-10. Bluetooth testing with connected JBT-9 box.



Type	Description
FPS-10	Flash prommer
MJ-64	Module repair jig
CU-4	Control unit
SX-4	Smart card
PKD-1x / FLS-4S	SW security device
XRS-6	RF cable SMA to N connector
XRE-2	RF cable SMA to SMA
PCS-1	Power cable
JBT-9/SB-6	Bluetooth testbox
<USB>	Standard USB cable connector A to B
<GPIB>	GPIB cable

BB and RF tuning with CU-4 and FPS-10

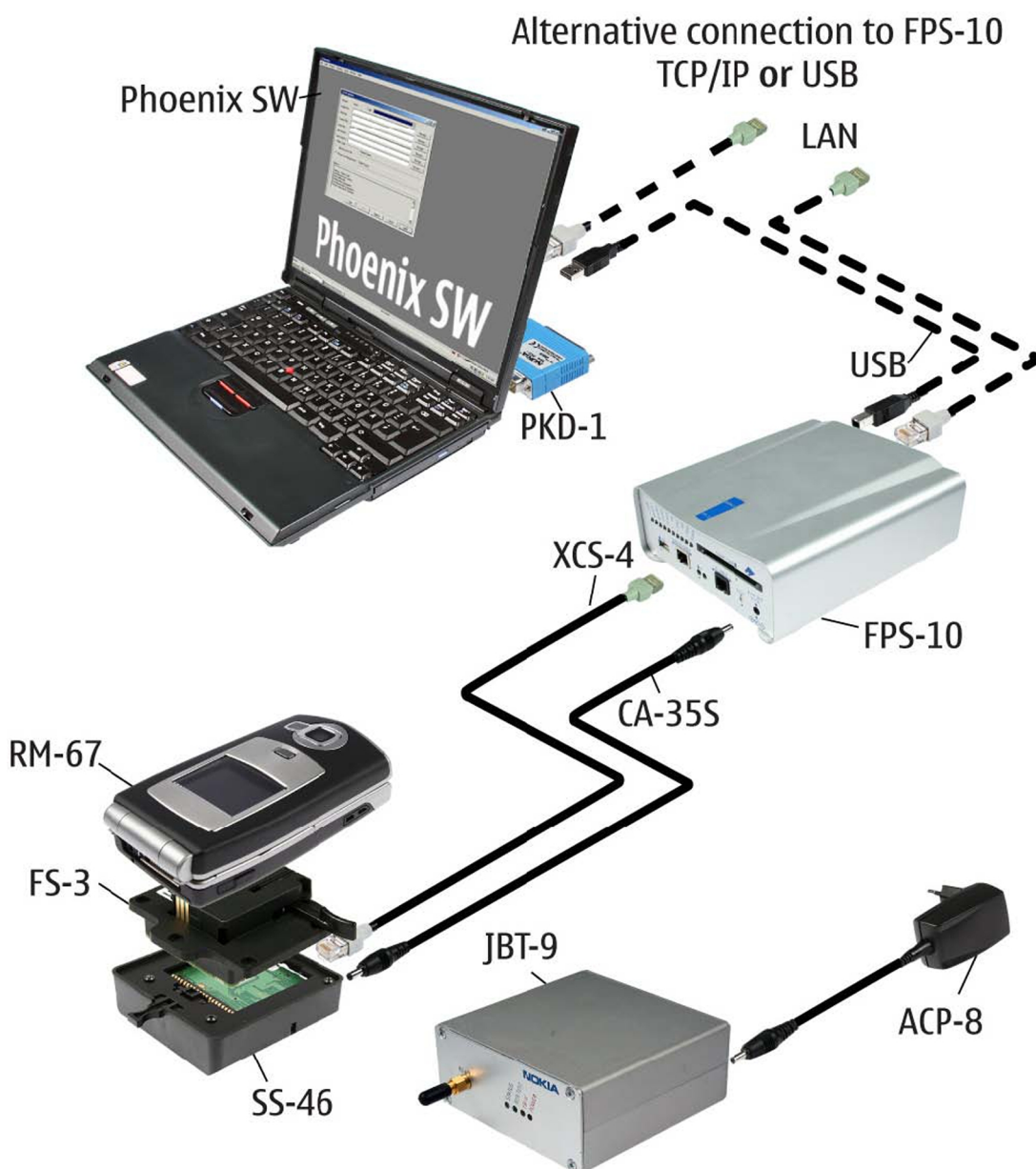
BB and RF tuning can be done in the below setup on engine board level.



Type	DESCRIPTION
FPS-10	Flash Prommer
MJ-64	Module Repair Jig
CU-4	Control unit
PKD-1x / FLS-4S	SW Security Device
XRS-6	RF cable SMA to N connector
PCS-1	Power Cable
<USB>	Standard USB cable connector A to B

Bluetooth testing with JBT-9 or SB-6 and FS-3

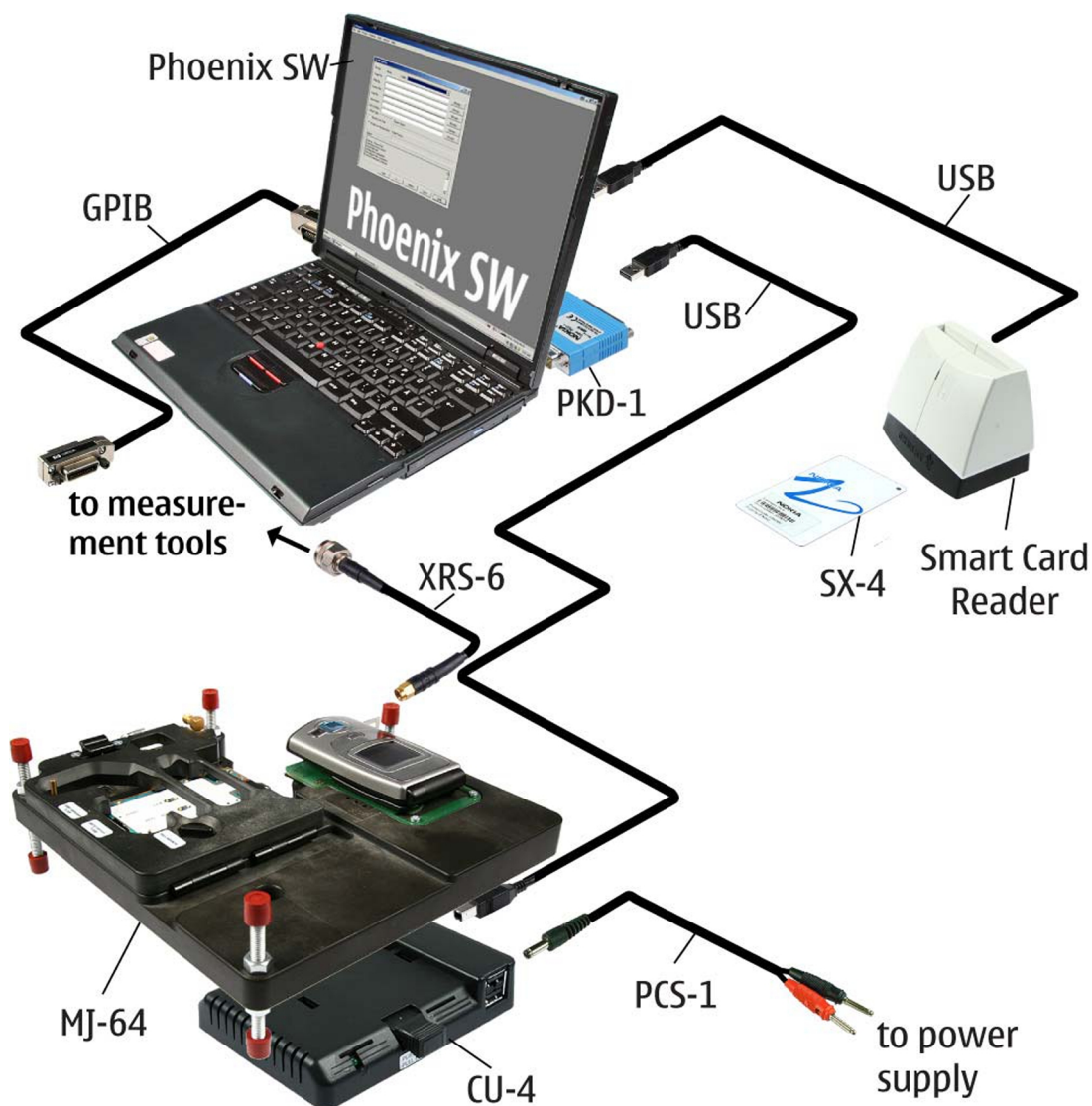
When no JBT-9/SB-6 is available another BT device has to be used for testing by establishing a connection. The test is a typical "GO/NOGO" test via the air controlled by Phoenix service software.



Type	Description
FPS-10	Flash Prommer and control unit
FS-3	Product Specific Adapter
JBT-9 / SB-6	BT Testbox
PKD-1x / FLS-4S	SW Security Device
XCS-4	Modular data cable
CA-35S	Power cable
<USB>	Standard USB cable connector A to B

BB and RF tuning with CU-4 and without FPS-10

Without FPS-10 smart card reader and SX-4 to be used instead of FPS-10.



Type	Description
MJ-64	Module Repair Jig
CU-4	Control unit
PKD-1x / FLS-4S	SW Security Device
XRS-6	RF cable SMA to N connector
PCS-1	Power Cable
<USB>	Standard USB cable connector A to B
SX-4	Smart card
<GPIB>	GPIB cable

MJ-64 test point description

Test points on BT interconnection PWB

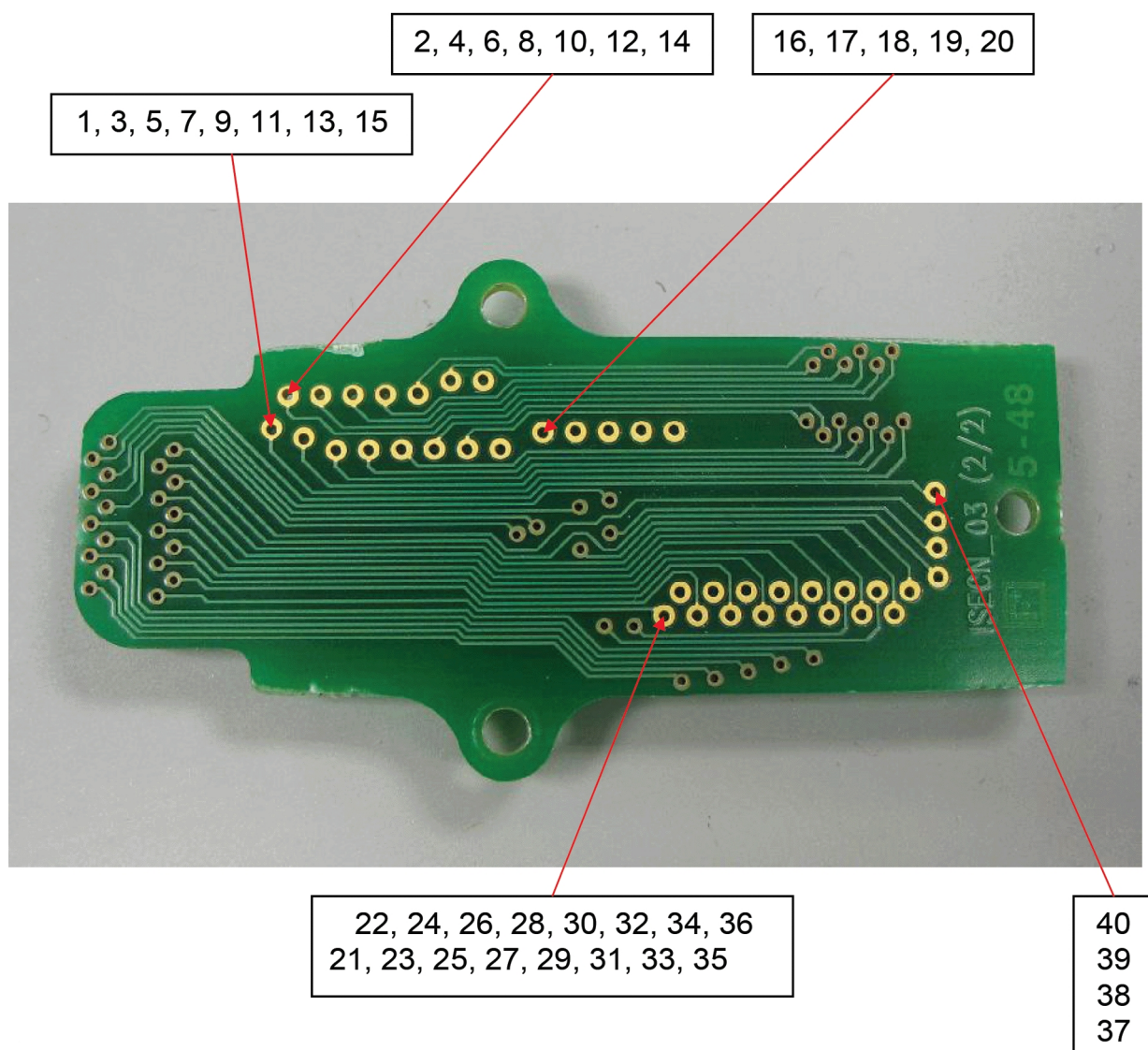


Figure 29 BT interconnection PWB

Pin	Function	Funktion	Pin
1	GND	PCM_Clk	40
2	BT_Clk	GND	39
3	GND	PCM_Out	38
4	Sleep_Clk	PCM_Sync	37
5	GND	PCM_In	36
6	BT_Wakeup	BT_CLK_REQ	35
7	Host_Wakeup	VIO	34
8	BT_ResetX	VBAT	33

Pin	Function	Funktion	Pin
9	VBAT	UART_CTS	32
10	SD_Door_switch	UART_RTS	31
11	SD_Detect	UART_TX	30
12	SD_Cmd	UARTRX	29
13	SD_Data_3	SD_CMD_Dir	28
14	SD_Data_2	SD_Dat_Dir_1	27
15	SD_Data_1	SIM_Data	26
16	SD_Data_0	GND	25
17	SD_LS_EN	SIM_Clk	24
18	SD_Clk	GND	23
19	SD_Dat_Dir_0	SIM_Rst	22
20	SD_Clk_Fb	VSIM_1	21

Test points on lid interconnection PWB

On the lid interconnection PWB designators are visible. Each designator is matched to the test point next to it. Further, it refers also to the pin assignment of the flex connector.

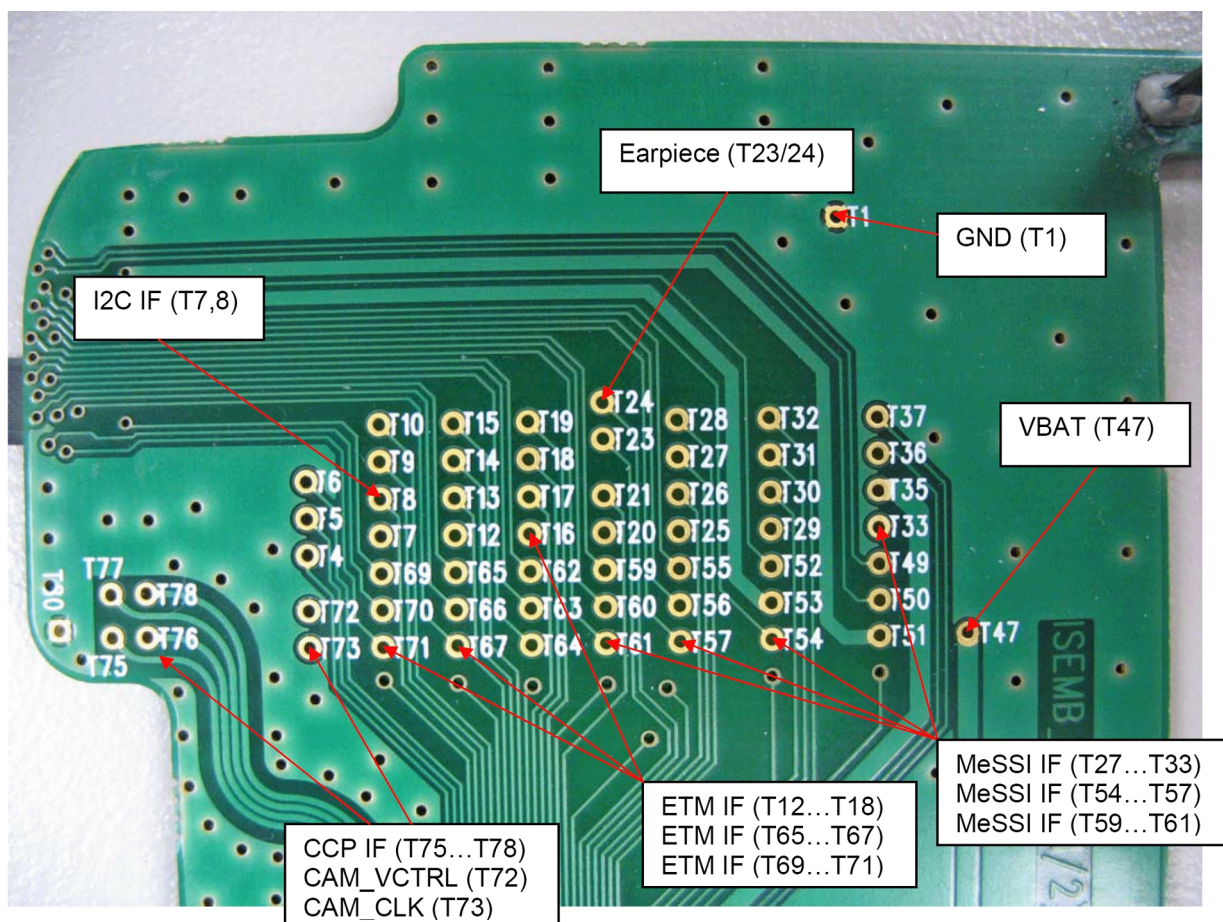


Figure 30 Lid interconnection PWB

Pin	Signal	I/O	Engine connection		Notes
1	GND				
2	GND				
3	GND				
4	PWRONX	<=	EM ASIC (N2200)	S1260	Power on switch
5	MUTE_DETECT	<=	Application processor	S1261	Mute/reject switch
6	CTRL_LS1	=>	Application processor	Level shifter	Enable signal of level shifter
7	SCL	=>	Application processor	2MP + VGA camera	I2C interface
8	SDA	<=>			Limits according I2C spec
9	GND				
10	LED_REC	=>	Application processor	V1272	1 = on if camera recording mode is chosen
11	GND				
12	ETM_EXTCLK	=>	Application processor	VGA camera	Clock 13,8 MHz, rise/fall time: 5ns $V_{IL} = -0,3...0,2$ IOVDD $V_{IH} =$ IOVDD... 3,0V
13	ETM_RESX	=>	Application processor	VGA camera	Reset signal $V_{IL} = -0,3...0,2$ IOVDD $V_{IH} =$ IOVDD... 3,0V
14	ETM_D0	<=	Application processor	VGA camera	Data bus $V_{OL} = 0...0,4V$ $V_{OH} = 2,4...IOVDD$
15	ETM_D1	<=	Application processor	VGA camera	
16	ETM_D2	<=	Application processor	VGA camera	
17	ETM_D3	<=	Application processor	VGA camera	
18	ETM_D4	<=	Application processor	VGA camera	

Pin	Signal	I/O	Engine connection		Notes
19	SPICS1X_F	=>	Application processor	Cover UI display	Chip select signal $V_{IL} = 0...0,3$ VDDI $V_{IH} = 0,7$ VDDI...VDDI
20	NAX_RESX	=>	Application processor	Cover UI display	Reset signal $V_{IL} = 0...0,3$ VDDI $V_{IH} = 0,7$ VDDI...VDDI
21	LS	<=	EM ASIC (N2200)	ALS	Analog input, Ambient light sensor
22	GND				
23	EARP_F	=>	EM ASIC (N2200)	Earpiece	DC level ~1,25V to GND (without signal) AC level ~1Vpp to each other (depends on signal)
24	ERAN_F	=>	EM ASIC (N2200)	Earpiece	
25	GND				
26	GND				
27	MESSI_D6_F	<=>	Application processor	Main display	Data bus
28	MESSI_D4_F	<=>	Application processor	Main display	
29	MESSI_D2_F	<=>	Application processor	Main display	
30	MESSI_D0_F	<=>	Application processor	Main display	
31	MESSI_RESX_F	=>	Application processor	Main display	Reset signal
32	MESSI_CSX_F	=>	Application processor	Main display	Chip select signal
33	MESSI_WRX_F	=>	Application processor	Main display	Write signal
34	GND				
35	VIO				

Pin	Signal	I/O	Engine connection		Notes
36	CAM_EN_1V5	=>	Application processor	N1450, N1461	Regulators enable signal (2MP camera)
37	CAM_EN_2V8	=>	Application processor	N1401, N1402	Regulators enable signal (VGA camera)
38	GND				
39	GND				
40	GND				
41	GND				
42	VBAT				
43	VBAT				
44	VBAT				
45	VBAT				
46	VBAT				
47	VBAT				
48	GND				
49	VCTRL_LED	=>	EM ASIC (N2300)	N1200	Current range of LED brightness
50	BLS	=>	RAP	V1220	LED shift control signal between Cover UI and main display
51	VLEDOUT2	<=	Key LEDs	N1200	Constant current for key LEDs
52	PWM300	=>	EM ASIC (N2300)	N1200	Brightness control for both displays and key LEDs, PWM 0...100%
53	VAUX				
54	MESSI_RDX_F	=>	Application processor	Main display	Read signal
55	MESSI_CMD_F	=>	Application processor	Main display	Command signal

Pin	Signal	I/O	Engine connection		Notes
56	MESSI_D1_F	<=>	Application processor	Main display	Data bus
57	MESSI_D3_F	<=>	Application processor	Main display	
58	GND				
59	MESSI_D5_F	<=>	Application processor	Main display	Data bus
60	MESSI_D7_F	<=>	Application processor	Main display	
61	MESSI_TE_F	<=	Application processor	Main display	Tearing signal
62	LST	<=	EM ASIC (N2200)	R1213	Analog input, temperature at ALS
63	SPI_SCL_F	=>	Application processor	Cover UI display	I2C interface for control and data Limits according I2C spec
64	SPI_SDA_F	<=>			
65	ETM_D5	<=	Application processor	VGA camera	Data bus $V_{OL} = 0...0,4V$ $V_{OH} = 2,4...IOVDD$
66	ETM_D6	<=	Application processor	VGA camera	
67	ETM_D7	<=	Application processor	VGA camera	
68	GND				
69	ETM_DCLK	<=	Application processor	VGA camera	ETM_EXTCLK/2 = 6,9MHz $V_{OL} = 0...0,4V$ $V_{OH} = 2,4...IOVDD$
70	ETM_HD	<=	Application processor	VGA camera	Synchronize signals $V_{OL} = 0...0,4V$ $V_{OH} = 2,4...IOVDD$
71	ETM_VD	<=	Application processor	VGA camera	

Pin	Signal	I/O	Engine connection		Notes
72	CAM_VCTRL	=>		2MP camera	Standby signal, 0 = on, 1 = off $V_{IL} =$ GND-0,3...0,5V $V_{IH} = 1,4...V_{DDI} + 0,3$
73	CAM_CLK	=>		2MP camera	9,6MHz $V_{IL} =$ GND-0,3...0,5V $V_{IH} = 1,4...V_{DDI} + 0,3$ Rise/fall time: 0,5V/ns
74	GND				
75	CCP_CLKN	<=	Application processor	2MP camera	Differential output clock (CCP class 1.0) Operating frequency: ~160MHz $V_{CMF} =$ 0,7...0,85V (Fixed voltage common mode) $V_{OD} =$ 130...250mV (Differential output swing)
76	CCP_CLKP	<=	Application processor	2MP camera	
77	CCP_DN	<=	Application processor	2MP camera	Differential output data (CCP class 1.0) (Fixed voltage common mode) $V_{OD} =$ 130...250mV (Differential output swing)
78	CCP_DP	<=	Application processor	2MP camera	
79	GND				
80	GND				

5 — Disassembly/Reassembly Instructions

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■ Disassembly instructions

Before you begin



Figure 31 Needed tools for disassembly.

Steps

1. Unlock the BATTERY COVER.



2. Remove the BATTERY COVER with the BATTERY.



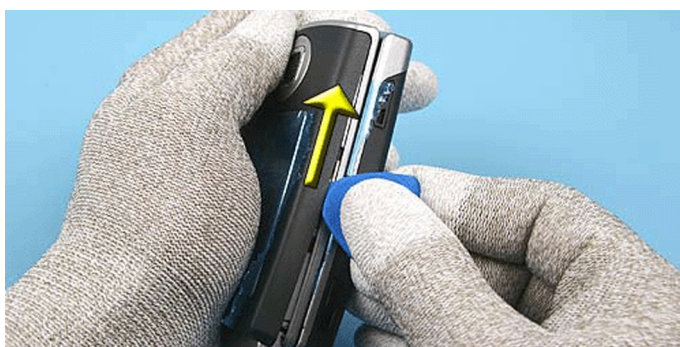
3. Separate the parts from each other.



4. Open the A-COVER ASSY by lifting it with the SRT-6 on the shown side.



5. Unlock the A-COVER.



6. Unlock the other side of the A-COVER.



7. Release the clips on both sides.



8. Carefully remove the A-COVER.



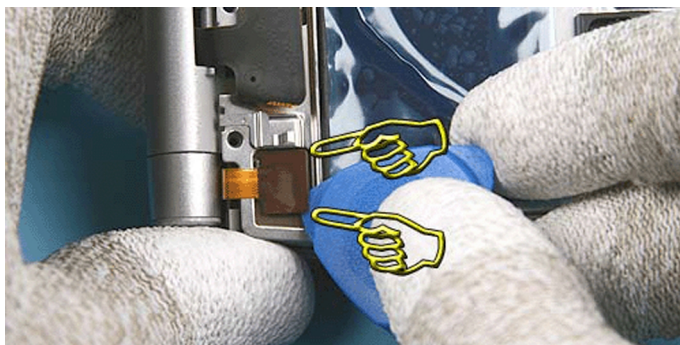
9. Unscrew the four, Torx Plus® size 5 SCREWS in the order shown.



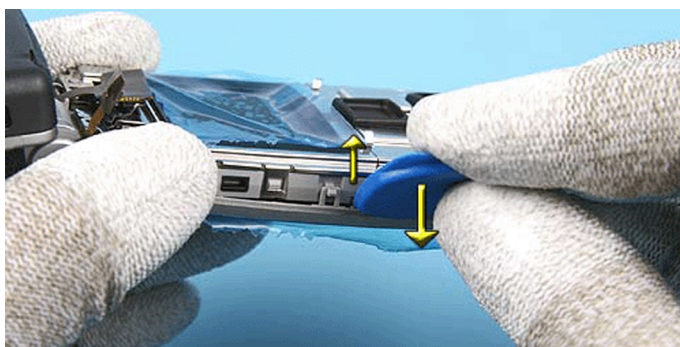
10. Open the FLEX connector.



11. Open the LCD connector.



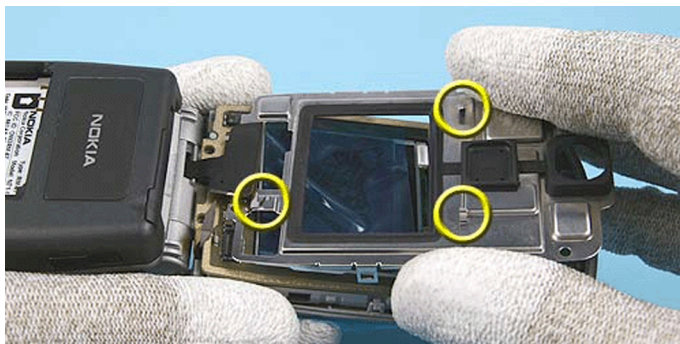
12. Open the unit and unlock the snap of the B-COVER ASSY.



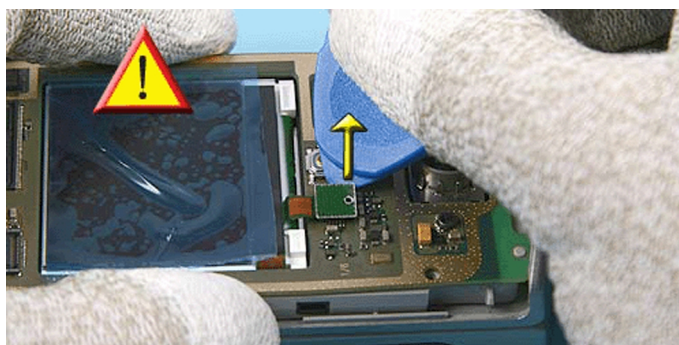
13. Then unlock the SHIELD LID ASSY by using a dental tool. Do the same on both sides.



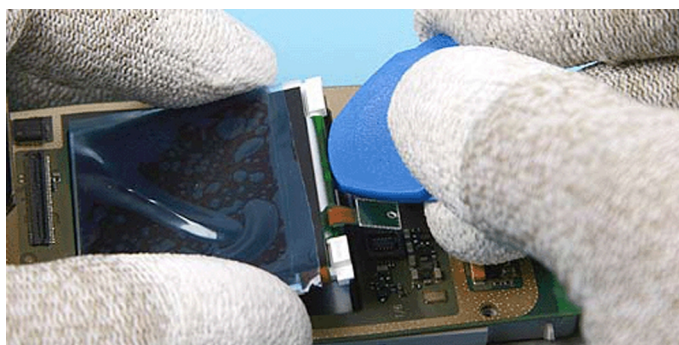
14. Take care to the grounding springs when removing the SHIELD LID ASSY.



15. Gently, open the LCD connector.



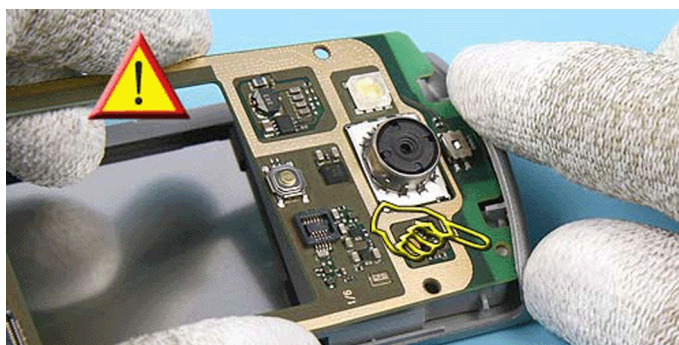
16. Lift the LCD a bit by using the SRT-6 and remove it from its mounting.



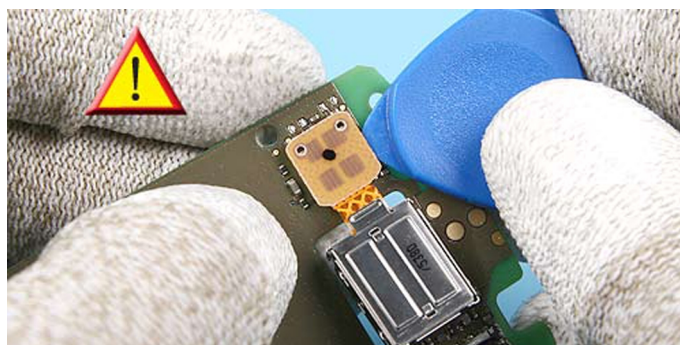
17. Lift the LR LID PWB and the CAMERA as shown and remove the modules carefully.



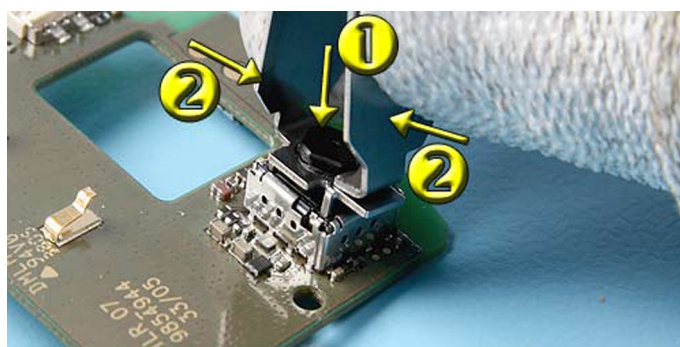
18. Take care to the secure pin when removing the LID PWB.



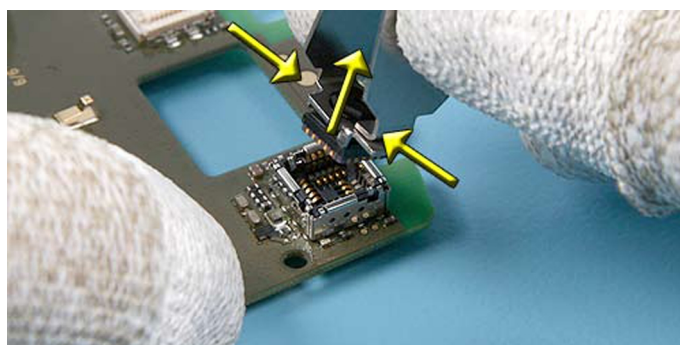
19. Open the CAMERA MAIN ASSY connector.



20. Place the SS-51 over the VGA CAMERA MODULE as shown and press together the blades of the SS-51.



21. Now, remove the VGA CAMERA MODULE, carefully.



22. First, unlock the clip on the shown side.



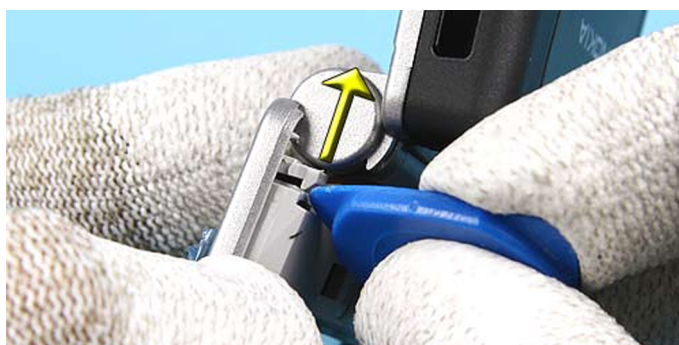
23. Then, release the snap in the middle of the cover with a slotted screwdriver.



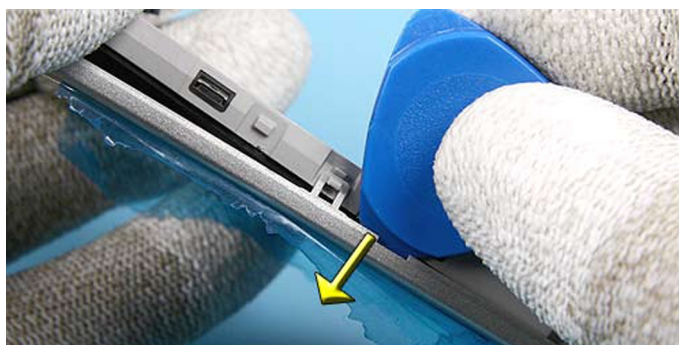
24. Gently, open a bit the B-COVER on the shown side.



25. In the following step, release the shown clip.



26. Place the SRT-6 between the B-COVER and the LID CENTER FRAME and release the last two snaps.



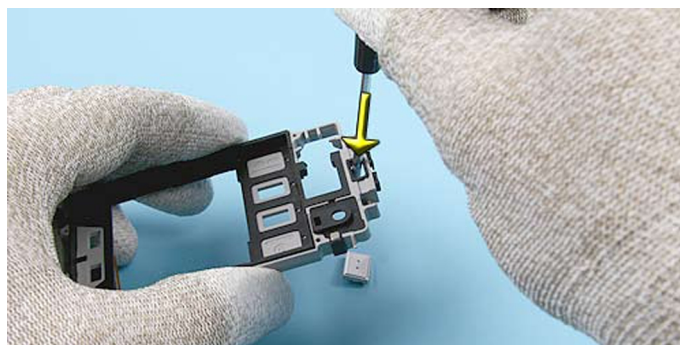
27. Now, the B-COVER can be removed.



28. Protect the LCD with a film and remove it from the LID CENTER FRAME.



29. Push the EARPIECE out of its guidance.



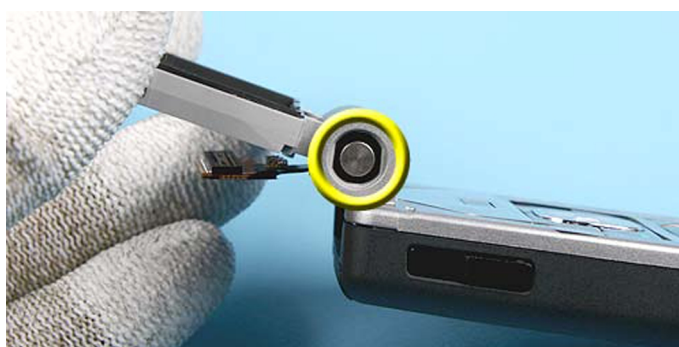
30. Remove the MAGNET.



31. Remove the HINGE COVERS.



32. The HINGE is fixed in the C-COVER.



33. Use the SS-15 as a support when removing the HINGE. Position the HINGE exactly over the recess.



34. Use a Torx driver to push out the HINGE. Take special care to the FLEX.



35. Now, the HINGE can be removed.

Note: This part must not be reused.



36. Push up the BUSHING with a screwdriver.



37. Gently, separate the LID CENTER FRAME from the lower block.



38. Remove the SCREW CAPS.

Note: Do not reuse the SCREW CAPS.



39. Unscrew the two, Torx Plus® size 5 SCREWS in the order shown.



40. Place the SRT-6 between the C-COVER and the D-COVER as shown and lift the C-COVER a bit. Do not slide the SRT-6 along the edge.



41. Now, unlock the C-COVER.



42. Open the FLEX connector carefully.



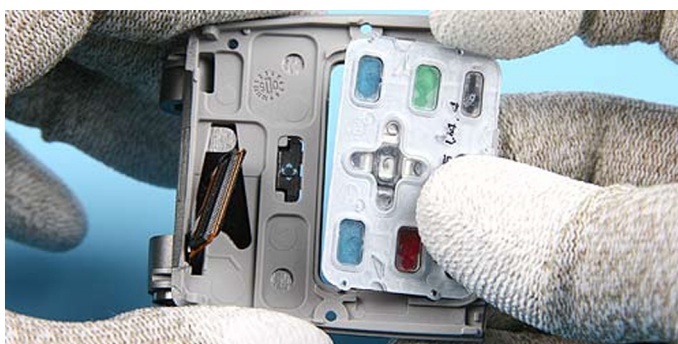
43. Unscrew the Torx Plus® size 5 SCREW.



44. Remove the SHIELD KEY.



45. Remove the KEYMAT MENU.



46. Gently, remove the MENU KEY SURROUNDING ASSY. Please note: This part must not be reused.



47. Feed the FLEX through the slide in the C-COVER.



48. Fit the SRT-6 between the C-COVER SLIDE SURROUND and the C-COVER and unlock the C-COVER SLIDE SURROUND.



49. Remove the KEYMAT assembly.



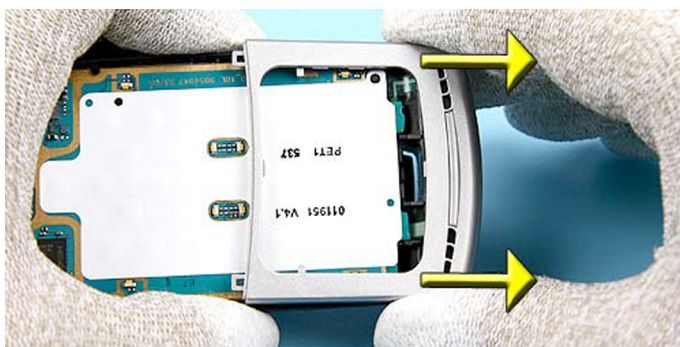
50. Separate the KEYMAT from the C-COVER SLIDE SURROUND.



51. Unlock the C-COVER SLIDE ASSY.



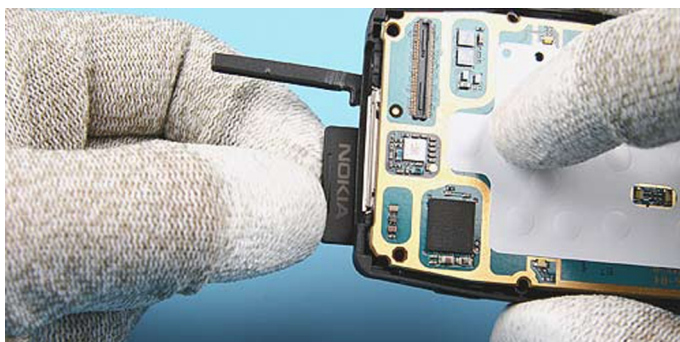
52. And remove it from the D-COVER.



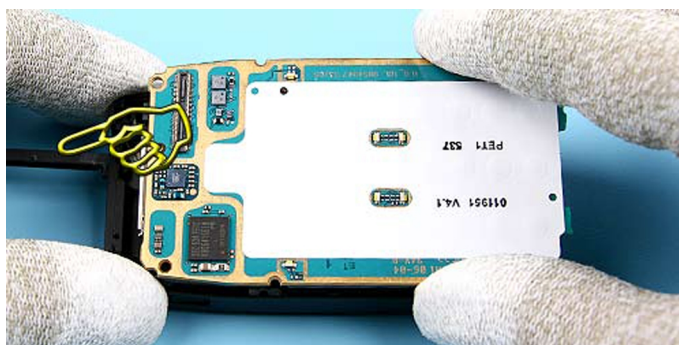
53. Unscrew the Torx Plus® size 5 SCREW.



54. Open the SD DOOR and check, that the MINI SD card has been removed from its slot, before removing the ENGINE MODULE from the D-COVER.



55. Remove the ENGINE MODULE.



56. Unlock the IHF SHIELD on the shown side...



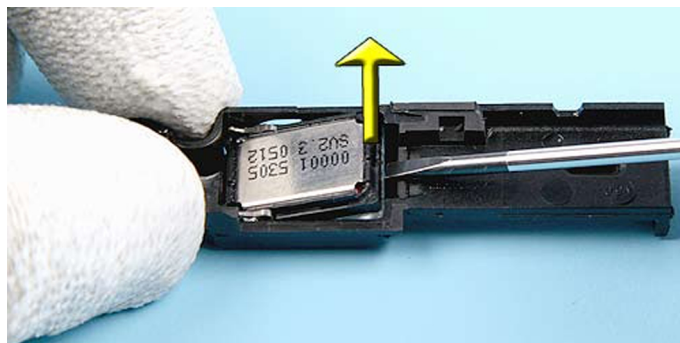
57. ...and lift it from the D-Cover. Do not bend the IHF SHIELD.



58. Remove the D-COVER IHF LID.



59. Use a slotted screwdriver to remove the IHF SPEAKER.



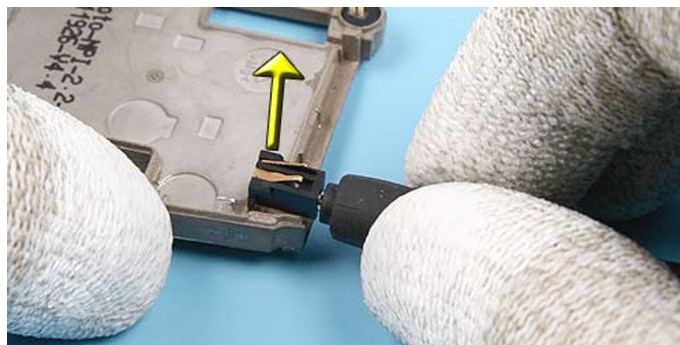
60. Carefully, disconnect LZ BT MODULE from the ENGINE BOARD.



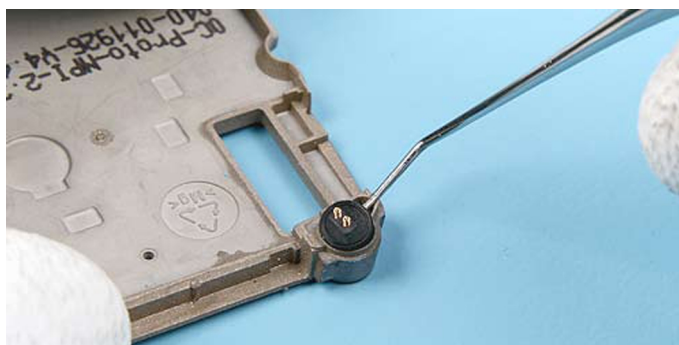
61. Remove the CENTER SHIELD.



62. Lift out the DC-JACK with the DC-Plug.



63. Remove the MICROPHONE with the dental pick.



■ Reassembly instructions

Before you begin



Figure 32 Needed tools for reassembly.

Steps

1. Insert the MICROPHONE. Avoid bending the spring contacts.



2. Use the DC-Plug to position the DC-JACK.



3. Place the CENTER SHIELD on the ENGINE BOARD.



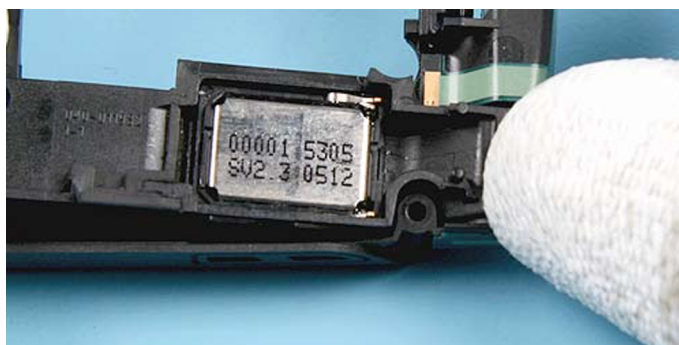
4. Connect the LZ BT MODULE.



5. Insert the EARPIECE with the new IHF SPEAKER ADHESIVE into the D-COVER IHF LID.



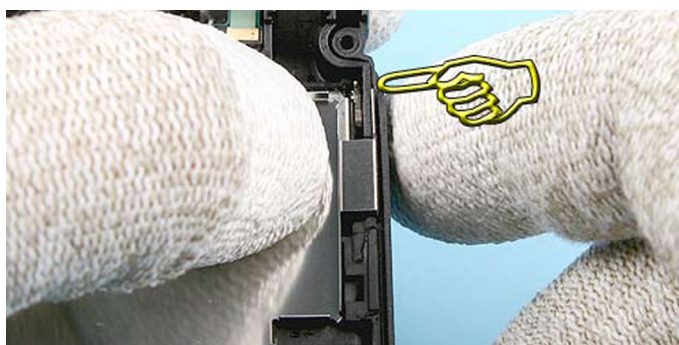
6. Fit the IHF LID in the D-COVER.



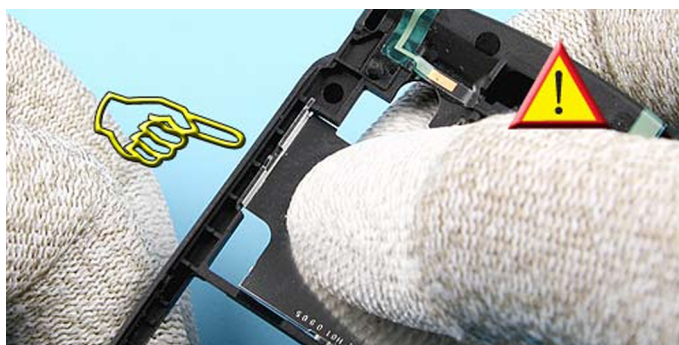
7. Place the IHF SHIELD on the D-COVER.



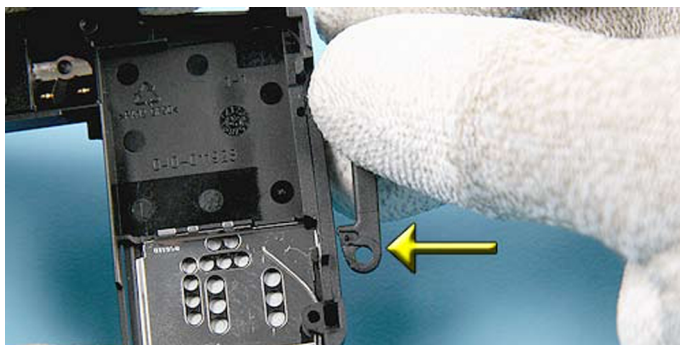
8. Position the IHF SHIELD exactly between D-COVER and the DCOVER IHF LID as shown.



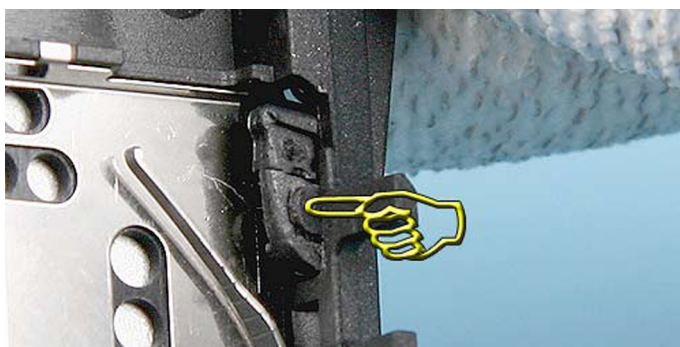
9. Very carefully, fix it into place. Do not bend the IHF SHIELD.



10. Assemble the SD DOOR (only when using a new D-COVER).



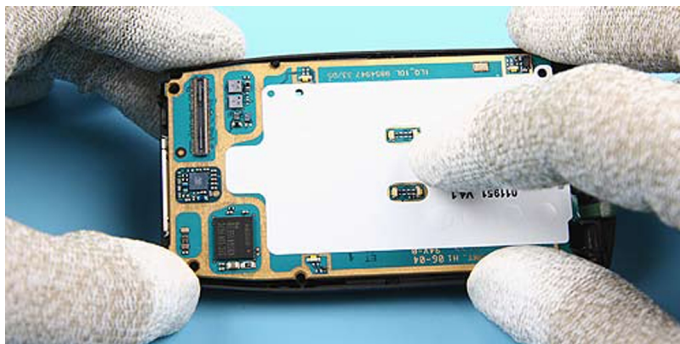
11. Press the SD DOOR into place.



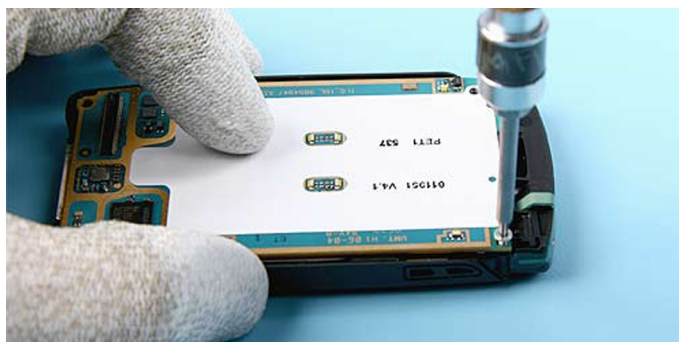
12. Check the right position of the IR WINDOW.



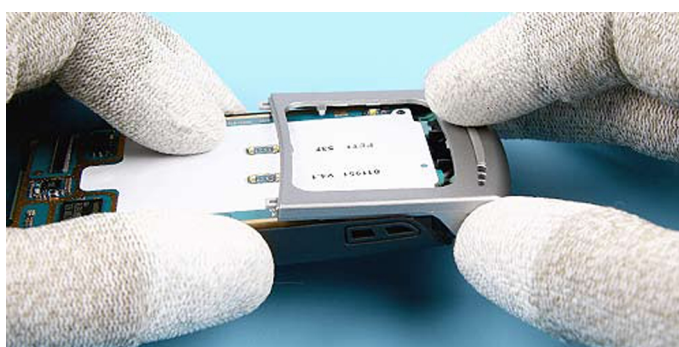
13. Open the SD DOOR and place the ENGINE BOARD into the DCOVER.



14. To prevent damaging the plastic thread, turn the SCREW slightly left first. Then tighten it with a torque setting of 17Ncm.



15. Fit the C-COVER SLIDE.



16. Fix the KEYMAT into the C-COVER SLIDE SURROUND.



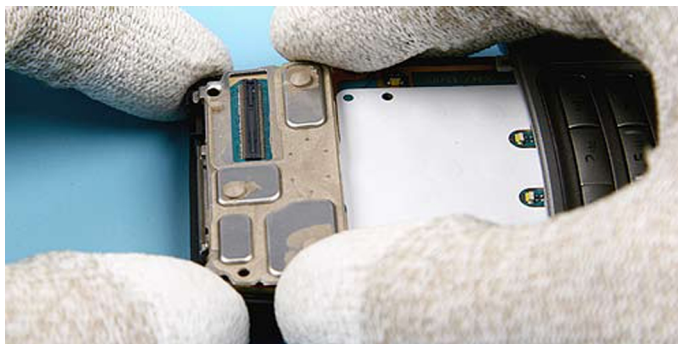
17. Insert the KEYMAT assembly as shown.



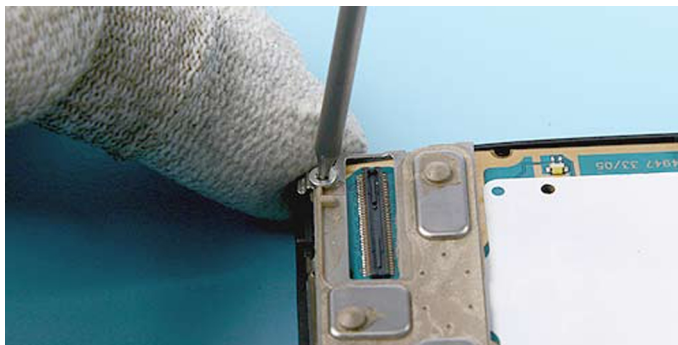
18. Secure the KEYMAT assembly by pressing it into place.



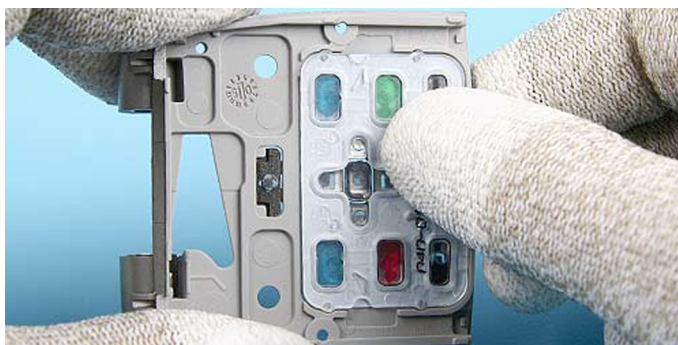
19. Fit the SHIELD KEY.



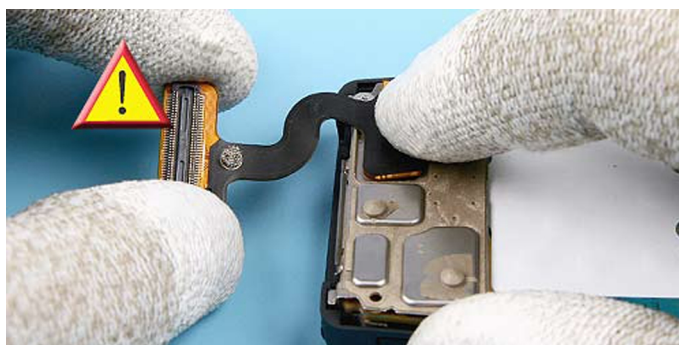
20. To prevent damaging the plastic thread, turn the SCREW slightly left first. Then tighten it with a torque setting of 17Ncm.



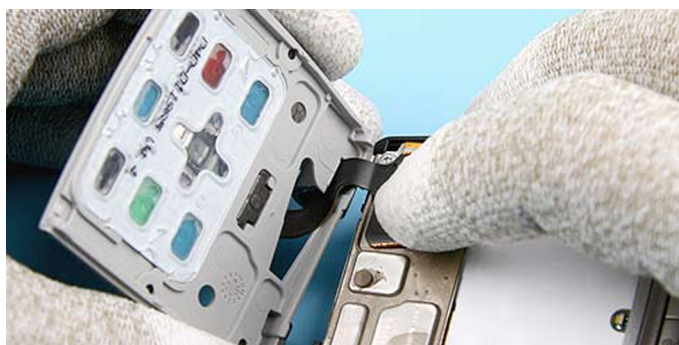
21. Fit the MENU KEYMAT.



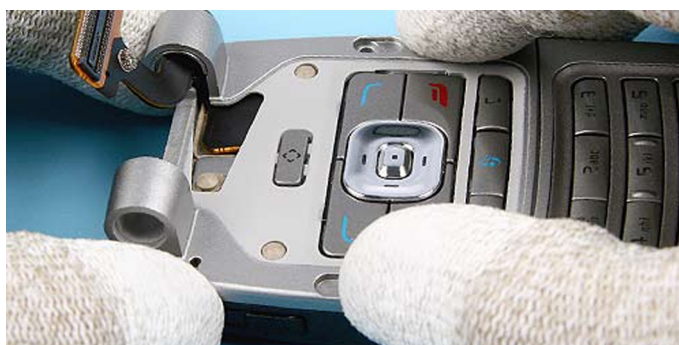
22. Gently, close the FLEX connector.



23. Carefully, feed the FLEX through the slot in the C-COVER by securing the closed connector.



24. Fit the C-COVER into the D-COVER and check the correct position of the FLEX.



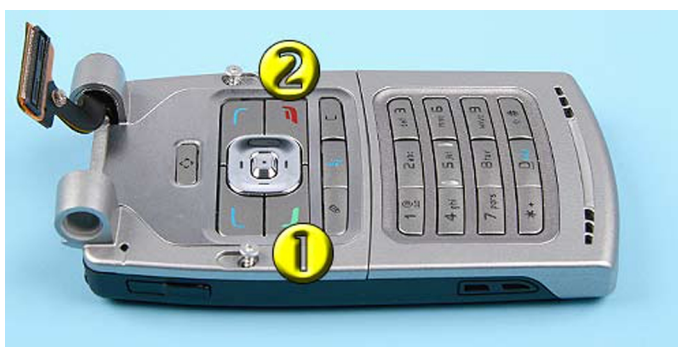
25. Be sure that the surface of the C-COVER is clean. Fit the new MENU KEY SURROUND ASSY.



26. Press the parts together.



27. To prevent damaging the plastic threads, turn the SCREWS slightly left first. Then tighten them in the shown order with a torque setting of 17Ncm.



28. Stick on the new SCREW CUPS.



29. Press the SCREW CUPS into its place.



30. Very carefully, assemble the LID CENTER FRAME paying attention to the FLEX.



31. Push the BUSHING into its place to secure the LID CENTER FRAME.



32. First insert the new HINGE and then gently, open the device. Ensure the correct position of.



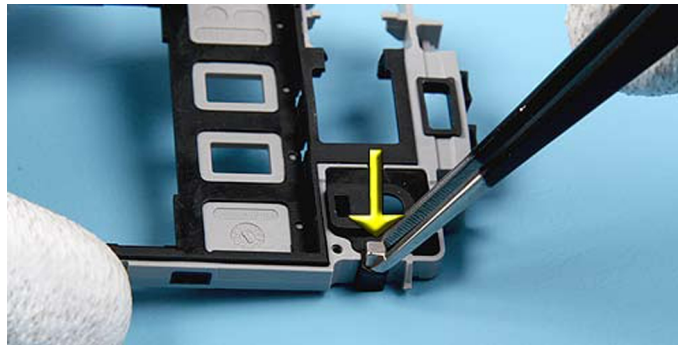
33. Push the HINGE into place.



34. Fit the HINGE COVERS.



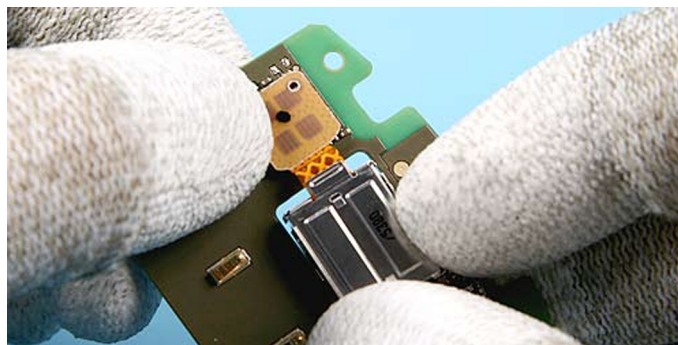
35. Insert the MAGNET.



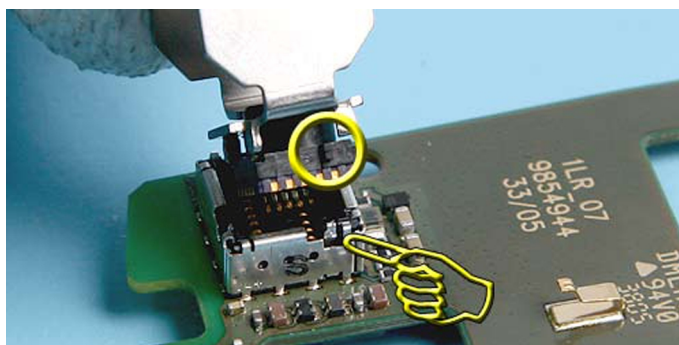
36. Place the LCD onto the LID CENTER FRAME.



37. Position the CAMERA MAIN ASSY on the LR LID PWB and close the CAMERA connector.



38. Ensure the correct position of the VGA CAMERA MODULE and insert it into its housing.



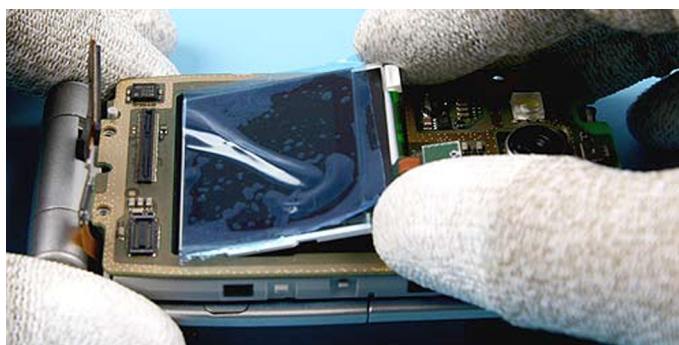
39. Insert the EARPIECE.



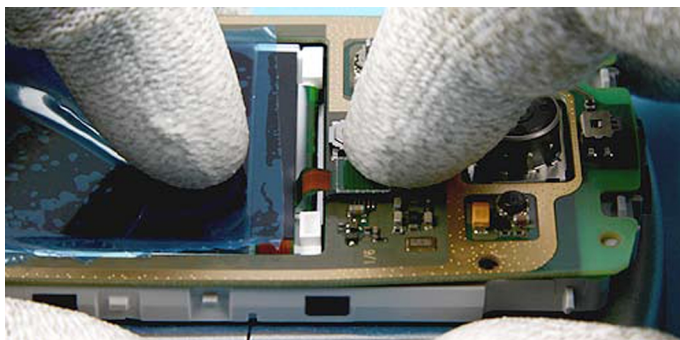
40. Place the LR LID PWB onto the LID CENTER FRAME and check the position of the CAMERA MAIN ASSY.



41. Fit the LCD into its place.



42. Close the LCD connector.



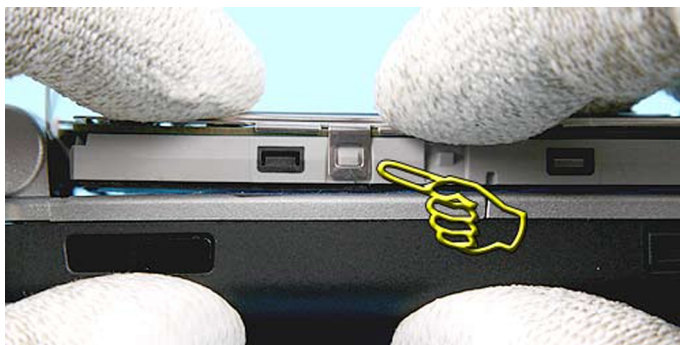
43. Remove the protective film.



44. Fit the SHIELD LID ASSY into the LID CENTER FRAME. Take special care to the grounding springs.



45. Close all snaps.



46. To prevent damaging the plastic threads, turn the screws slightly left first. Then tighten them in the shown order with a torque setting of 17Ncm.



47. Close the LCD connector.



48. Close the FLEX connector.



49. Remove the protective film.



50. Fit the B-COVER ASSY carefully paying attention to the guides of the B-COVER.



51. Press together the B-COVER and the LID CENTER FRAME.



52. Close the snaps on the both sides of the upper block.



53. Fit the A-COVER ASSY. Start at the shown side.



54. Close the A-COVER.



55. Finally, fit the BATTERY COVER.



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6 — BB Troubleshooting and Manual Tuning Guide

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■ 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

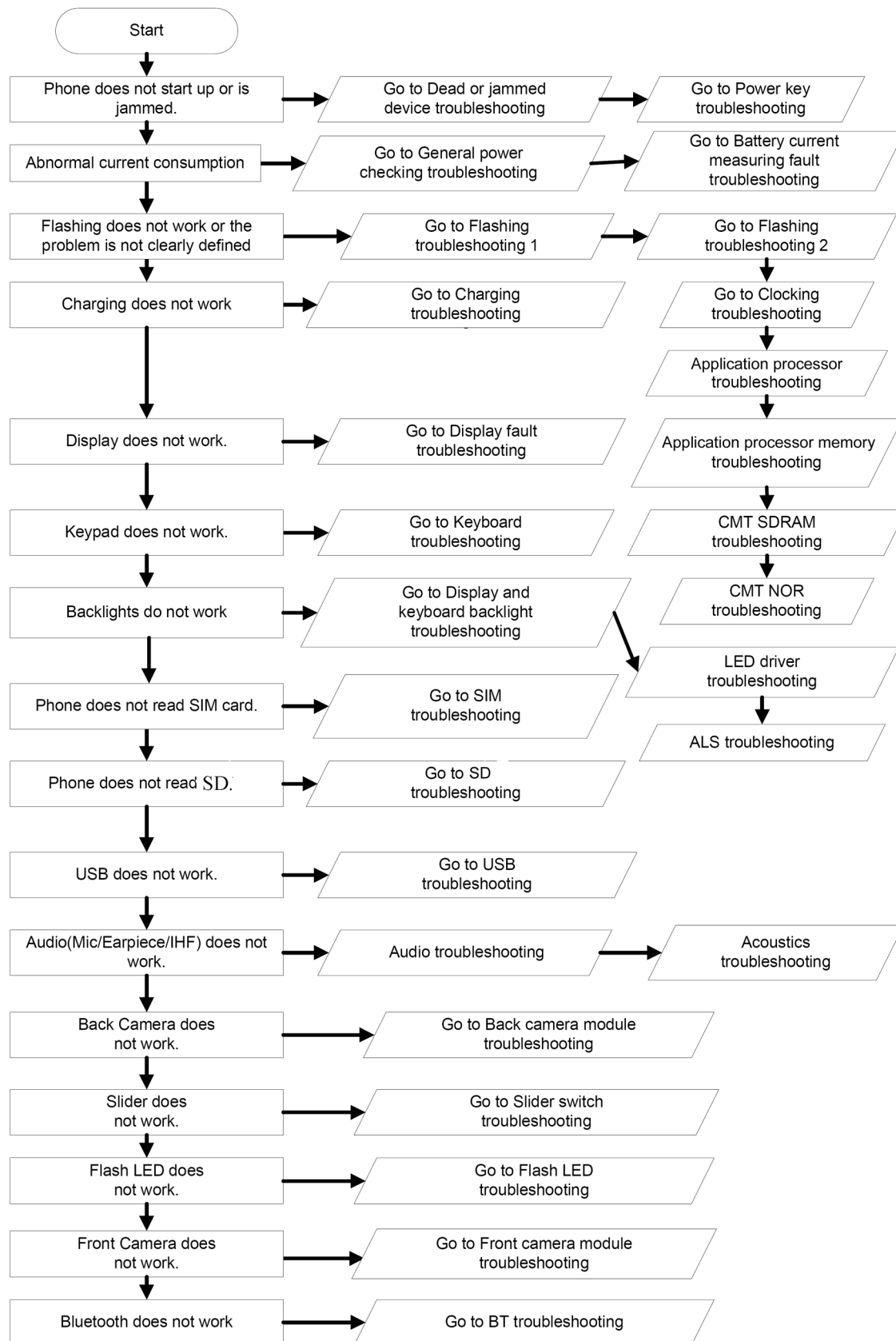
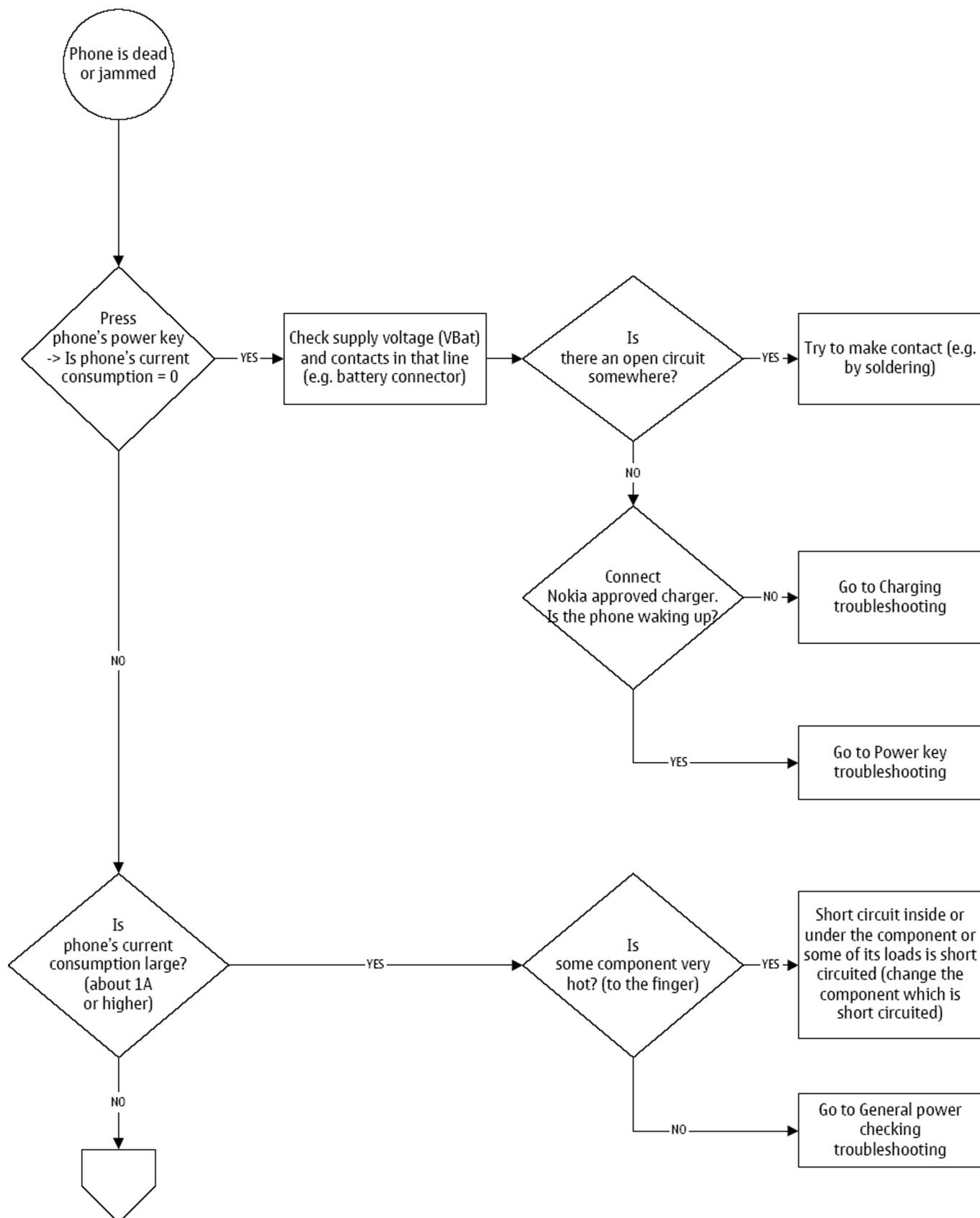
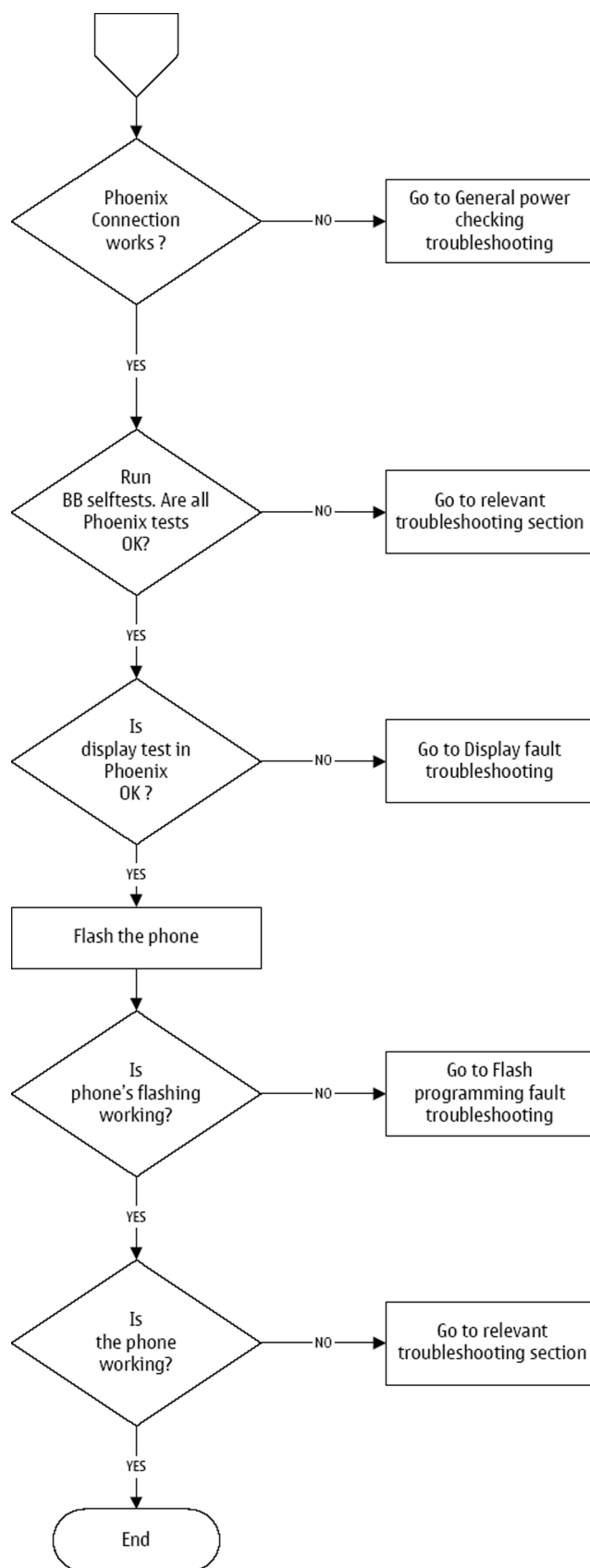


Figure 33 Main troubleshooting tree

■ Dead or jammed device troubleshooting

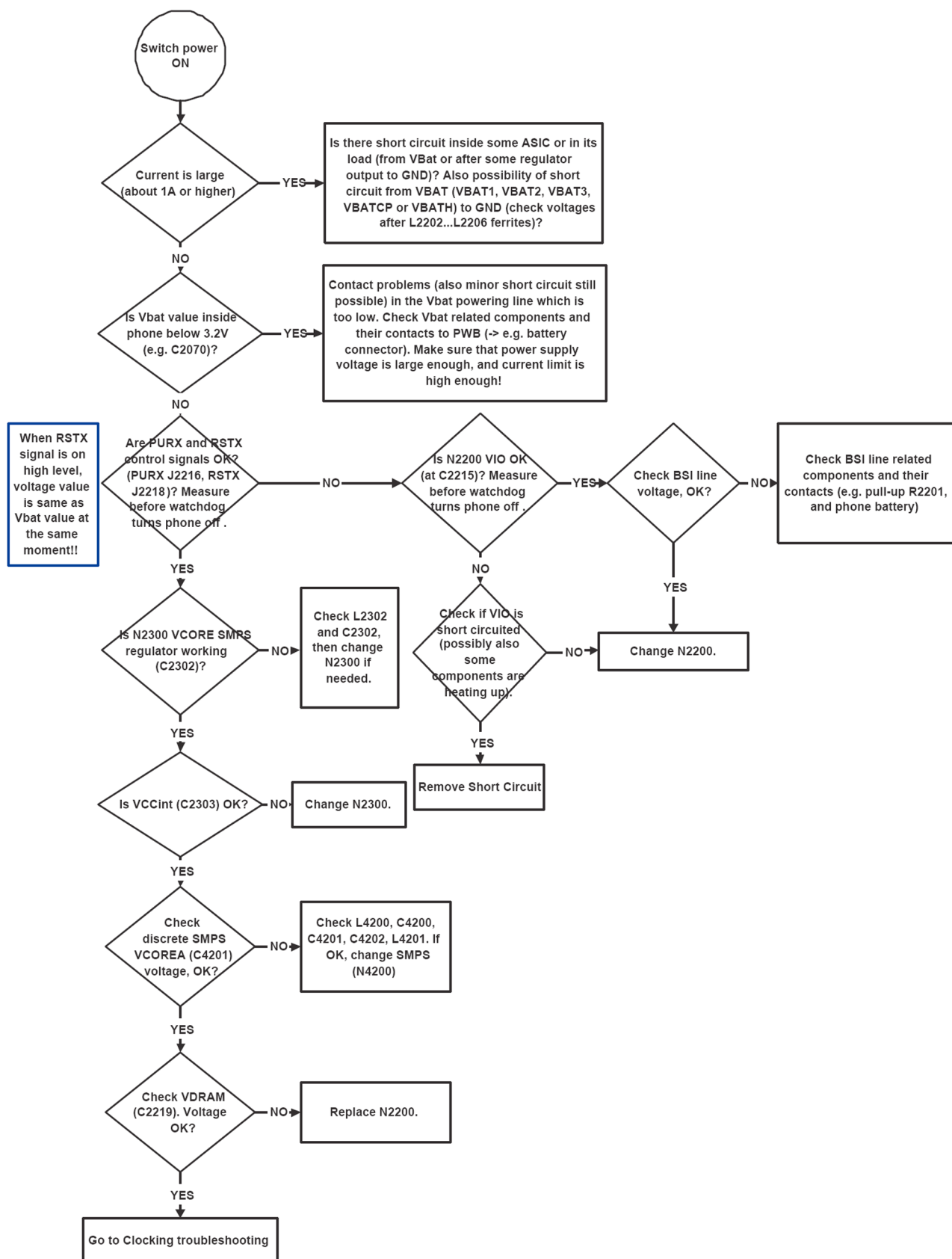
Troubleshooting flow





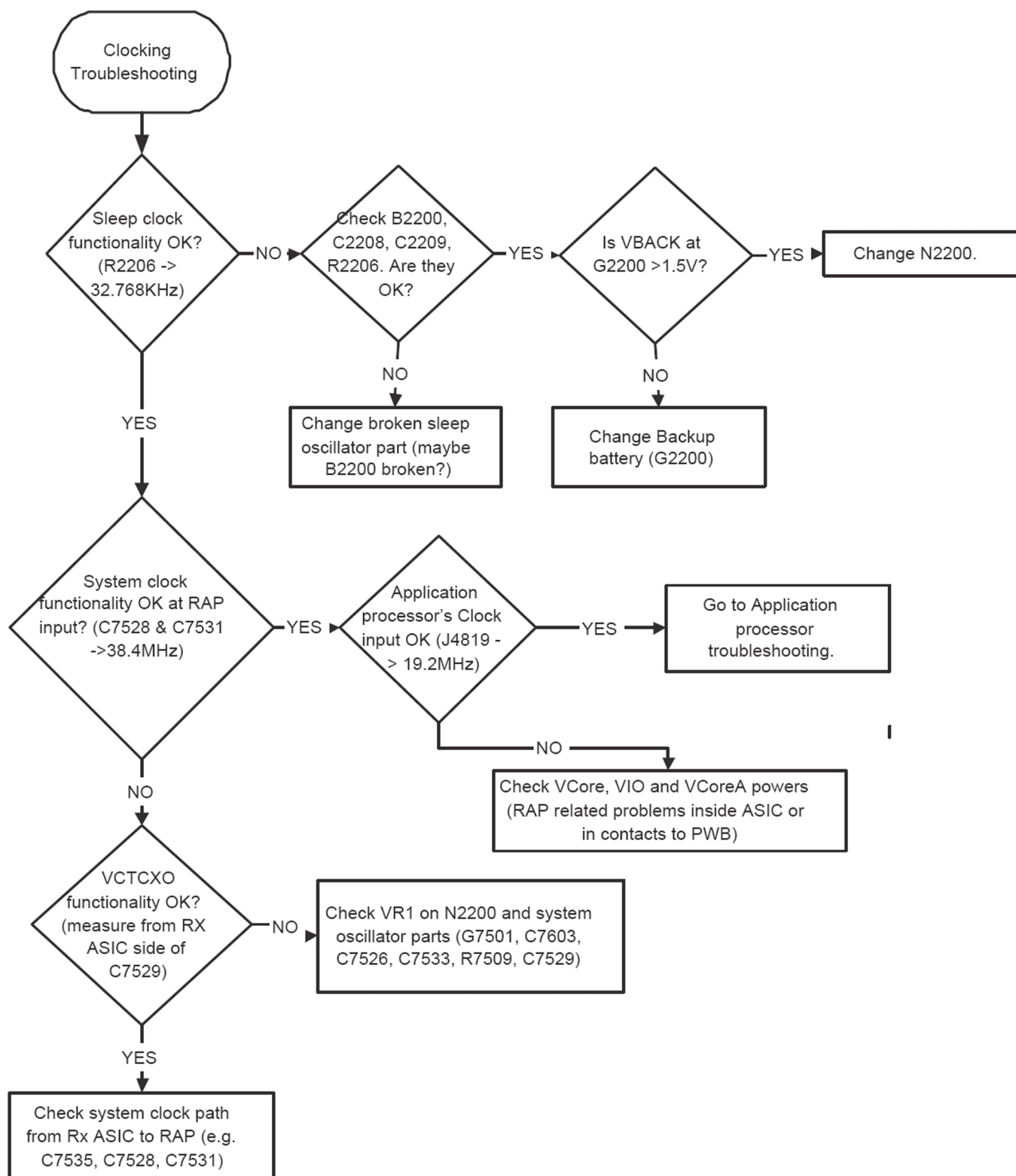
■ General power checking troubleshooting

Troubleshooting flow



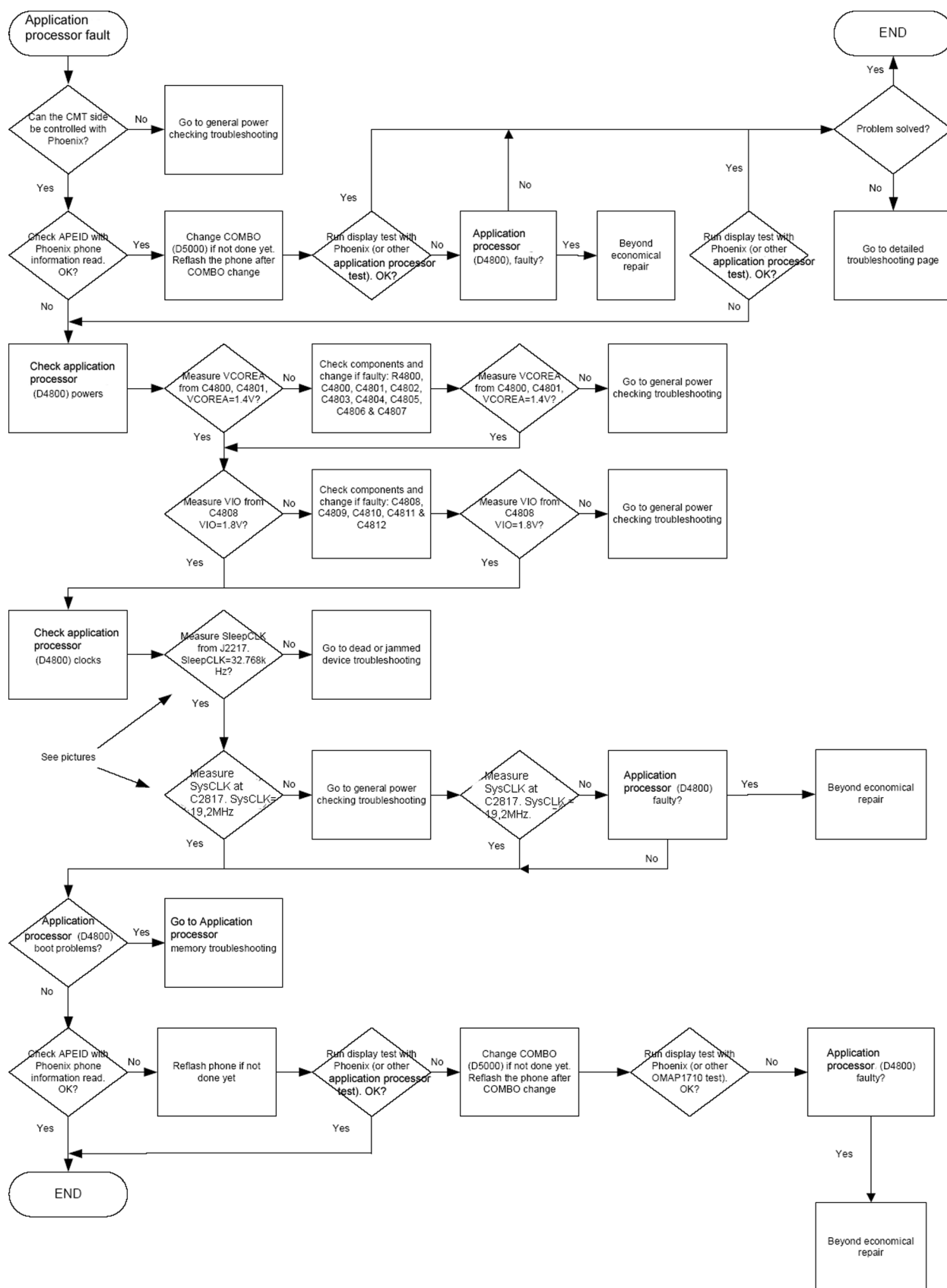
■ Clocking troubleshooting

Troubleshooting flow



■ Application processor troubleshooting

Troubleshooting flow



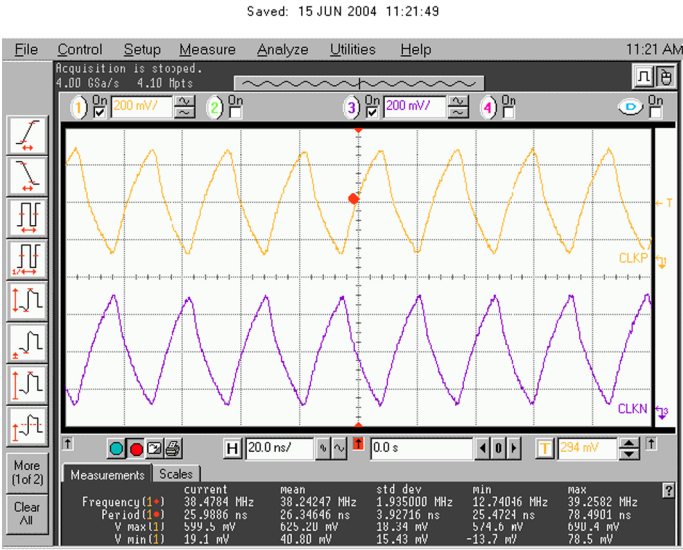


Figure 34 SysCLK from J2800 and J2801

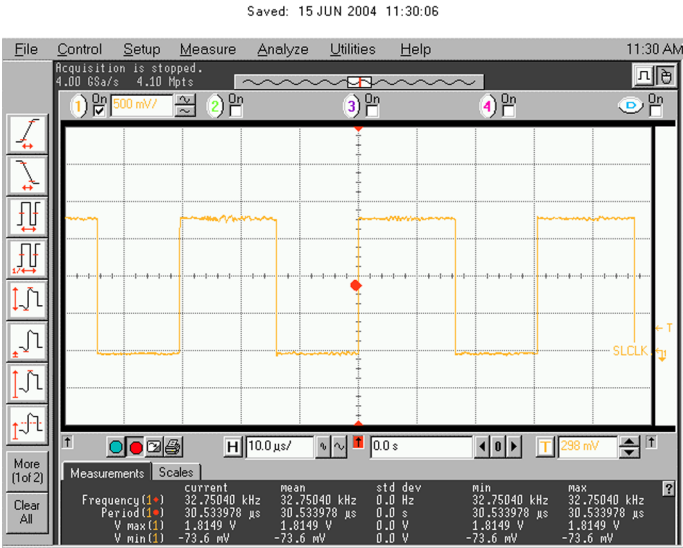
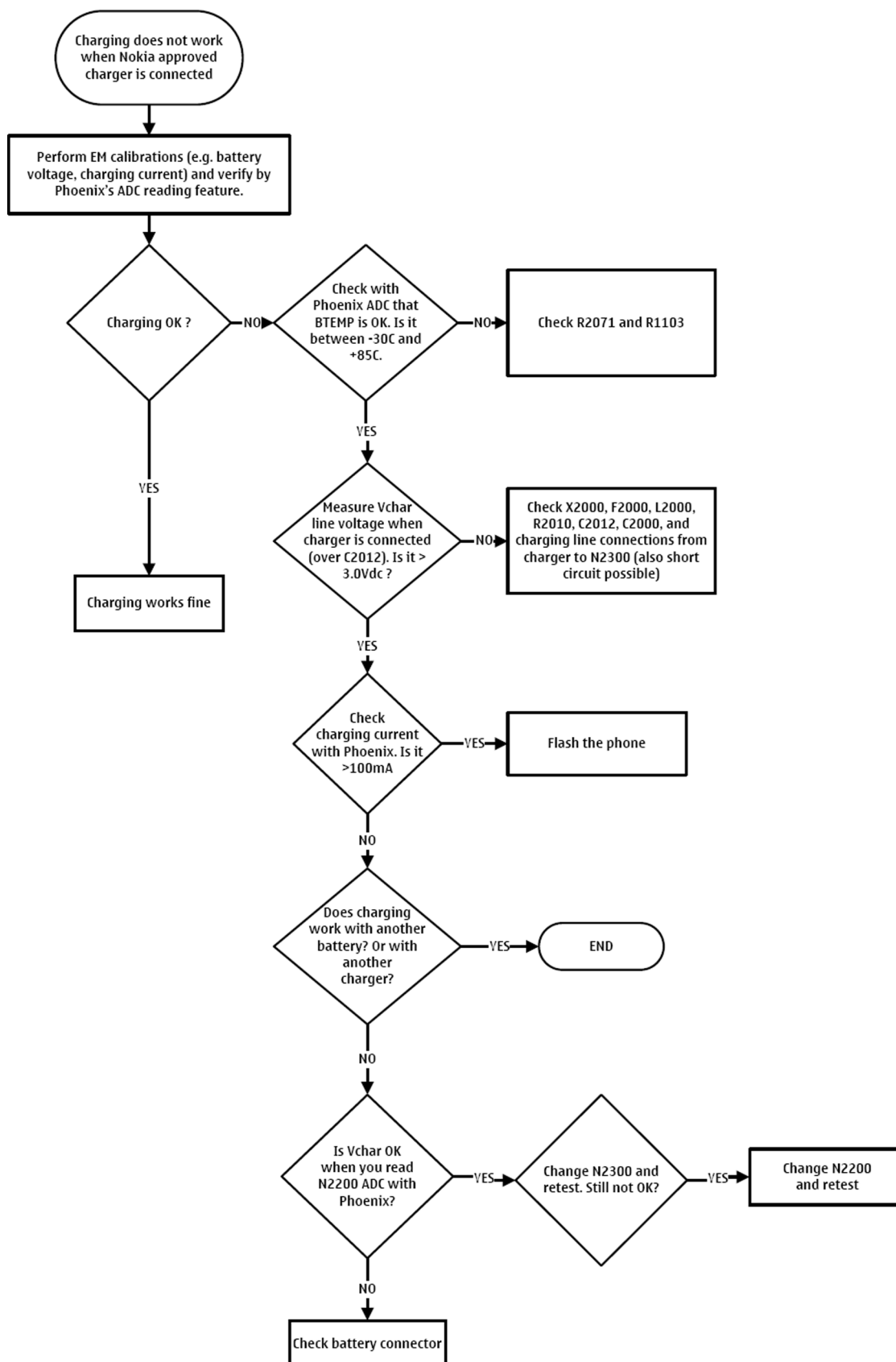


Figure 35 SleepCLK from J2217

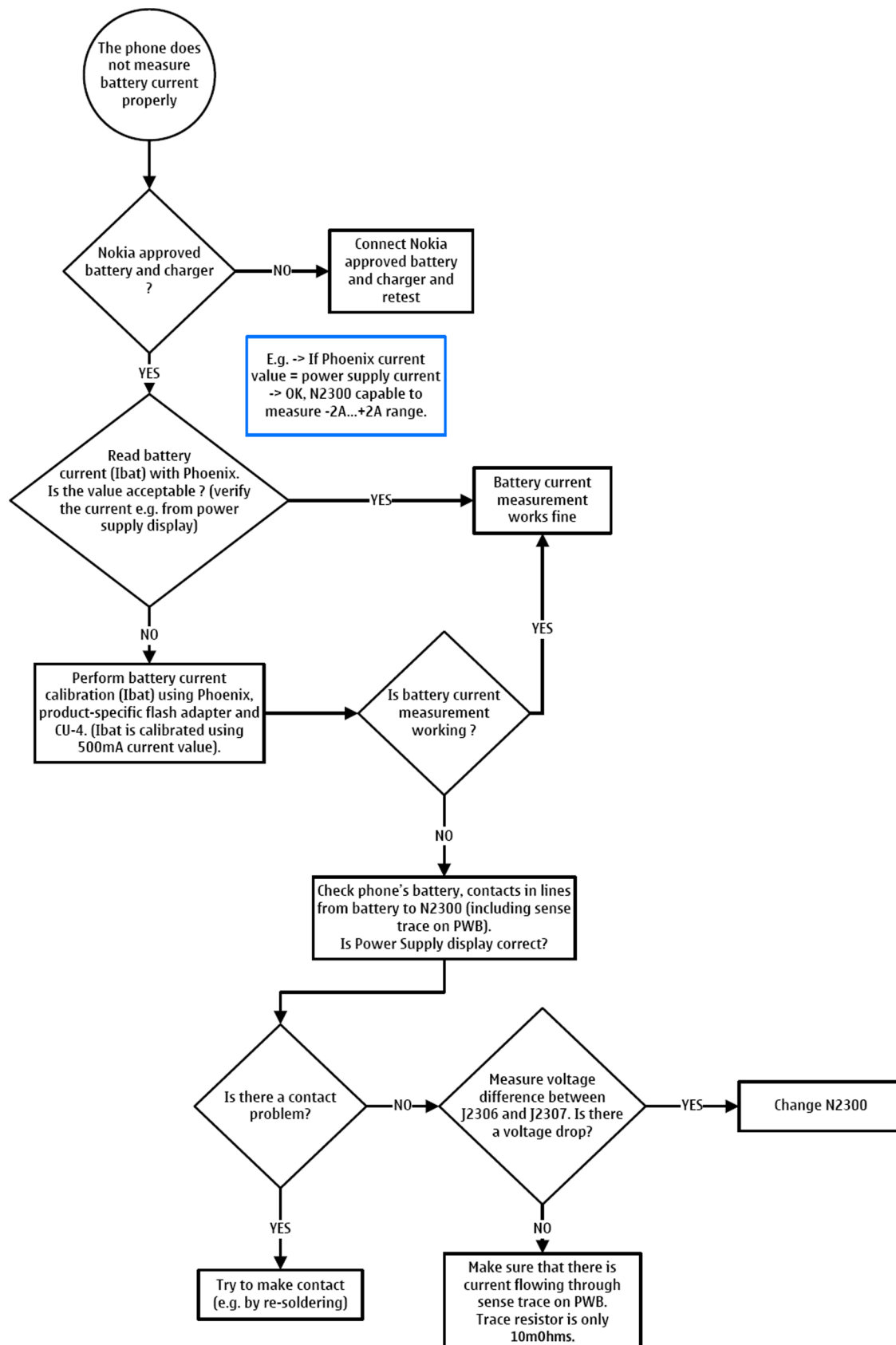
■ Charging troubleshooting

Troubleshooting flow



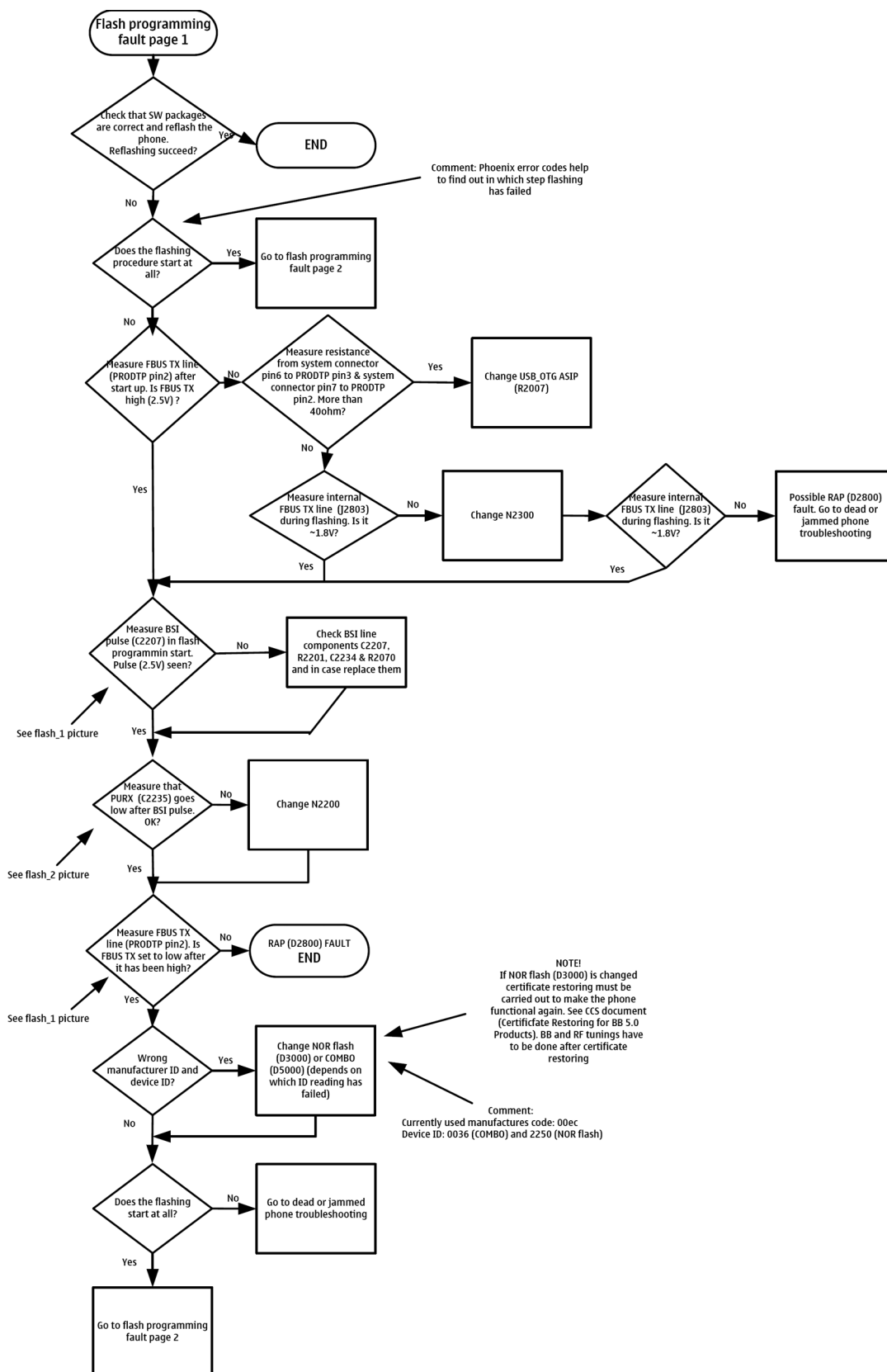
■ Battery current measuring fault troubleshooting

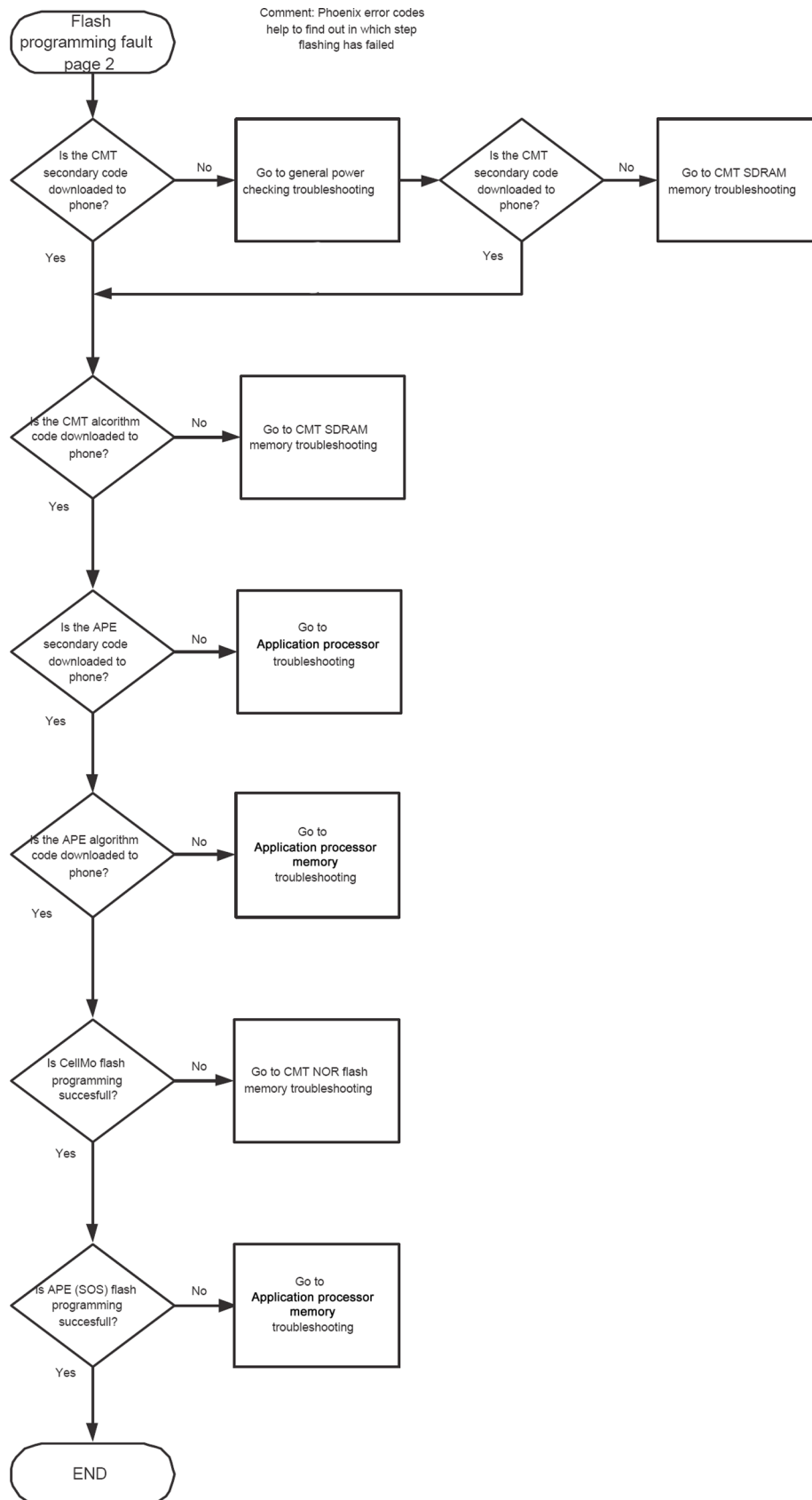
Troubleshooting flow



Flash programming fault troubleshooting

Troubleshooting flow





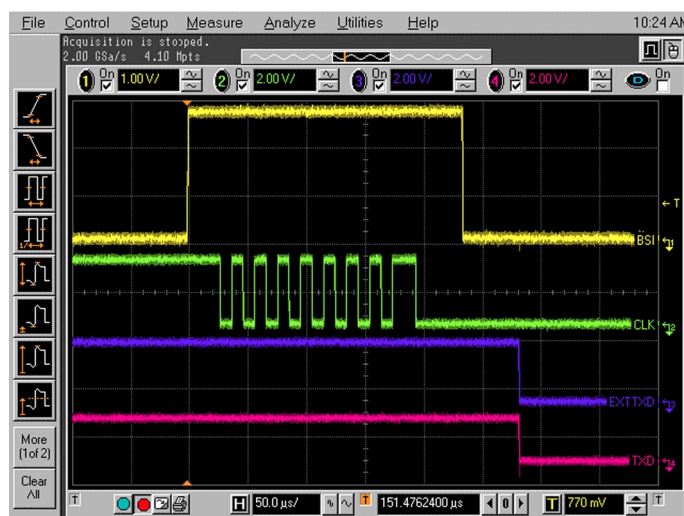


Figure 36 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

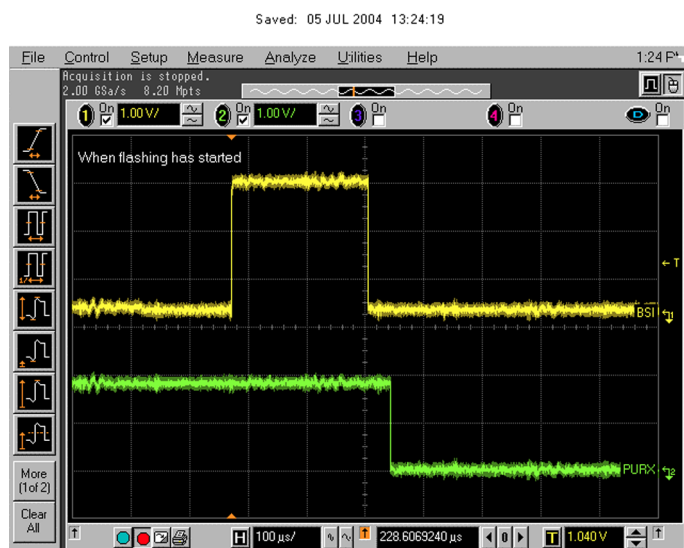
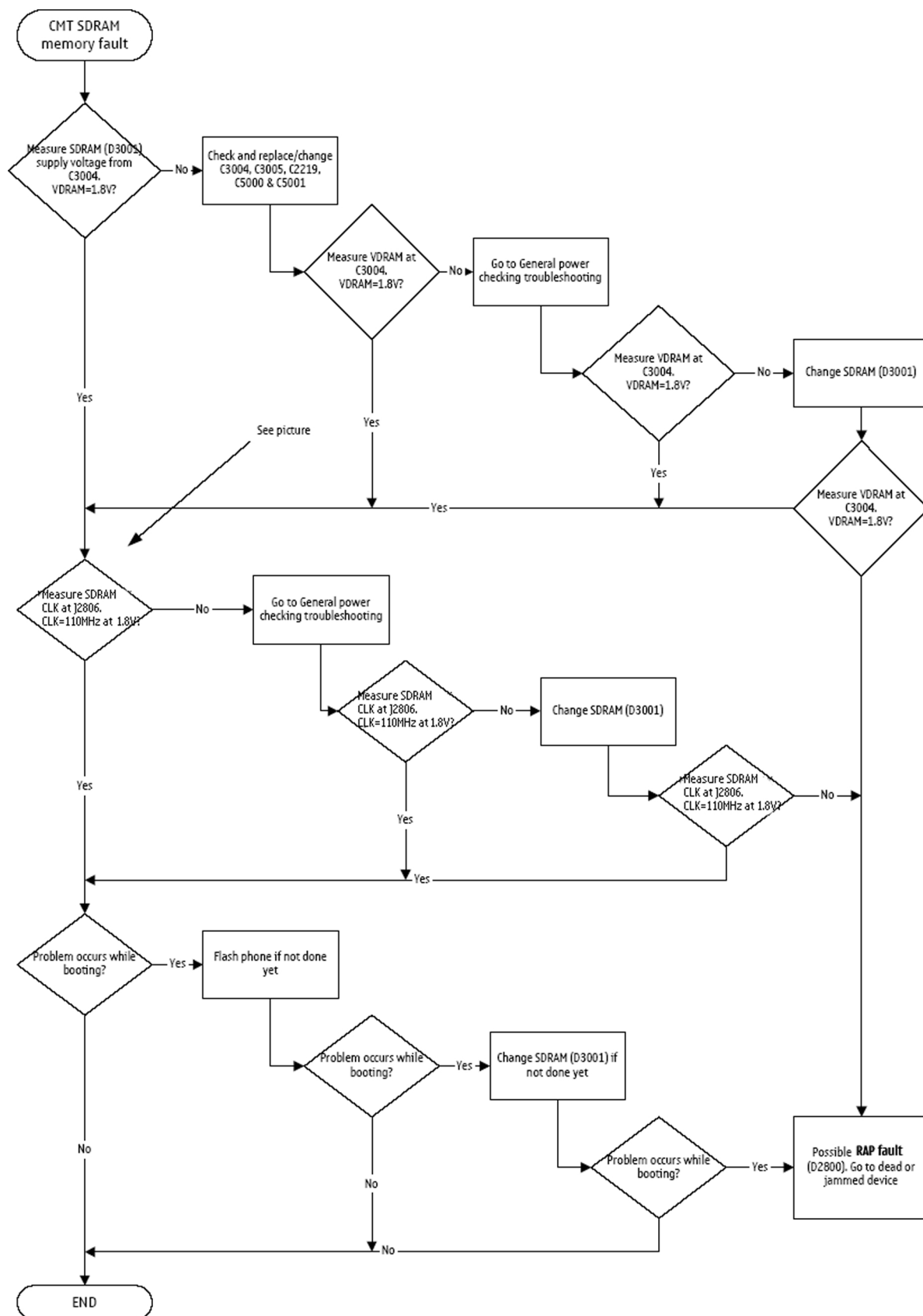


Figure 37 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

■ CMT SDRAM memory troubleshooting

Troubleshooting flow



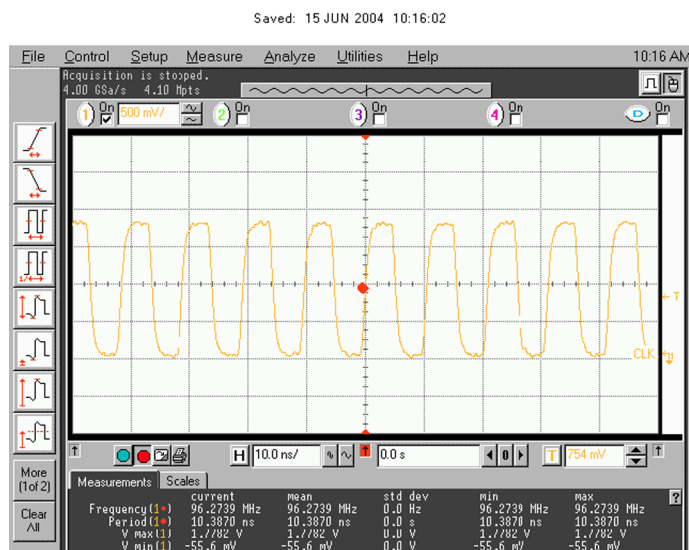
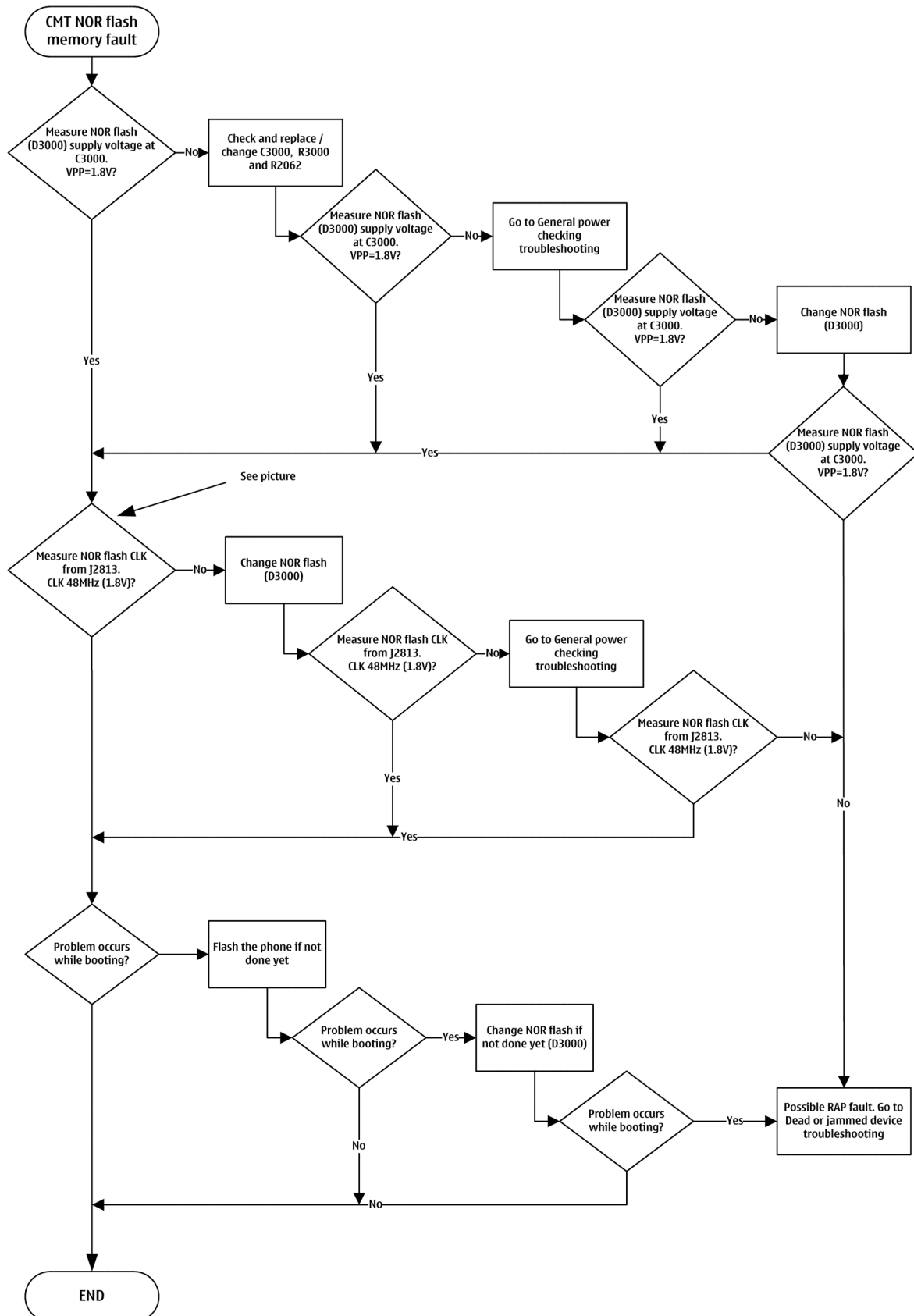


Figure 38 CMT SDRAM CLK from pin J2806

■ CMT NOR flash fault troubleshooting

Troubleshooting flow



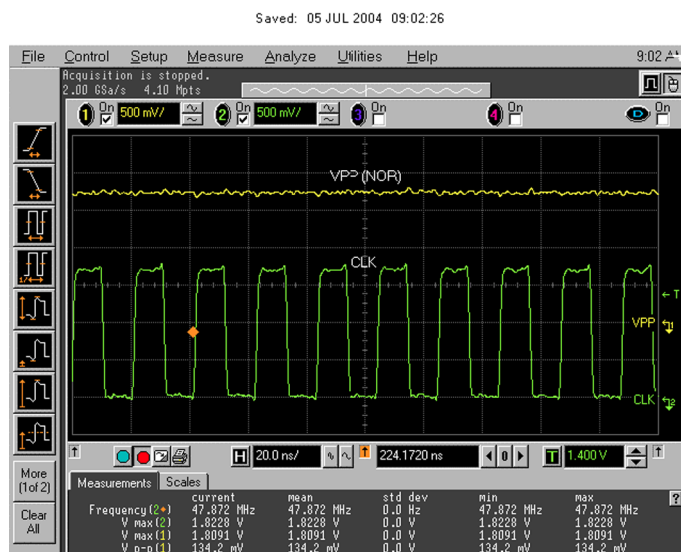
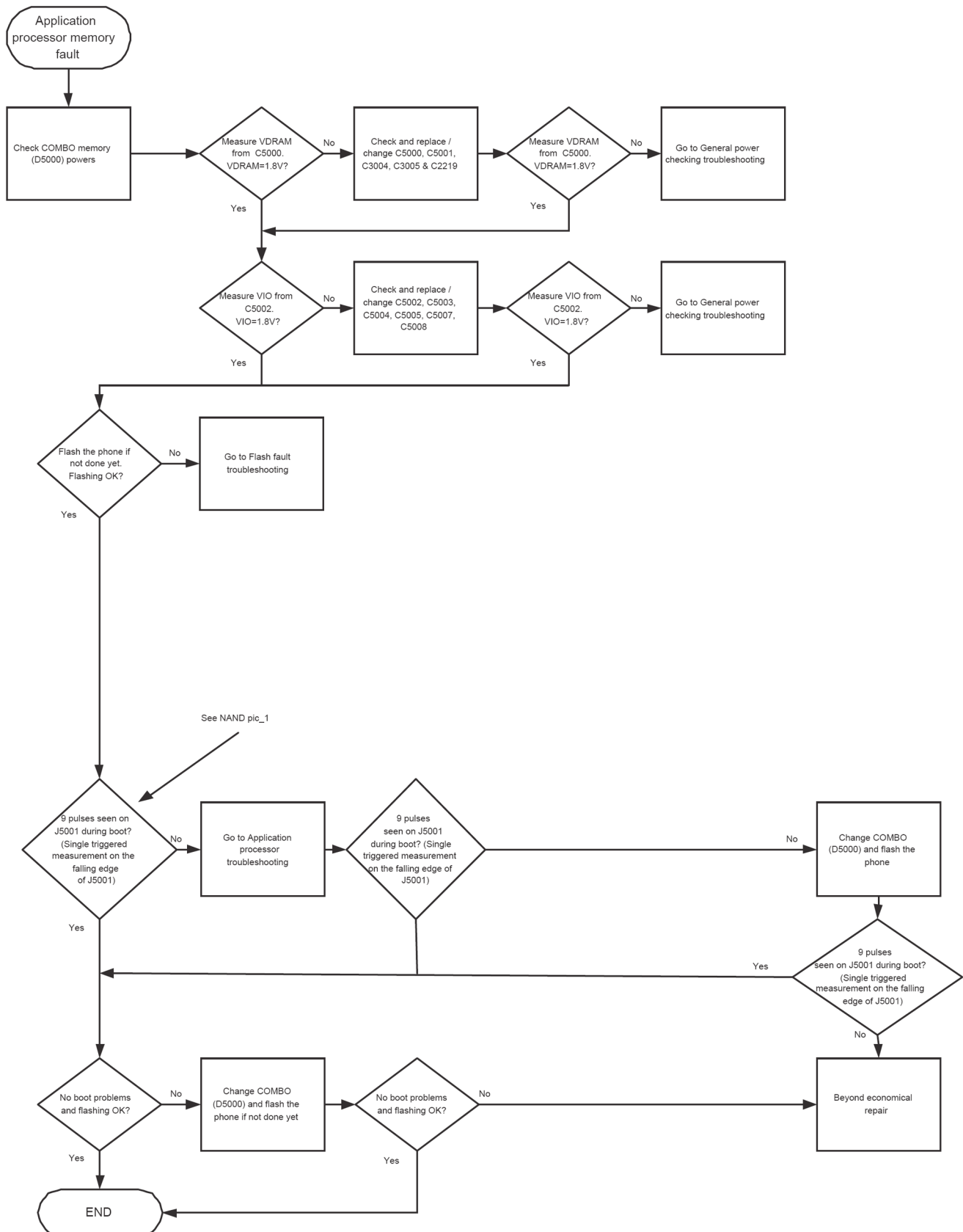
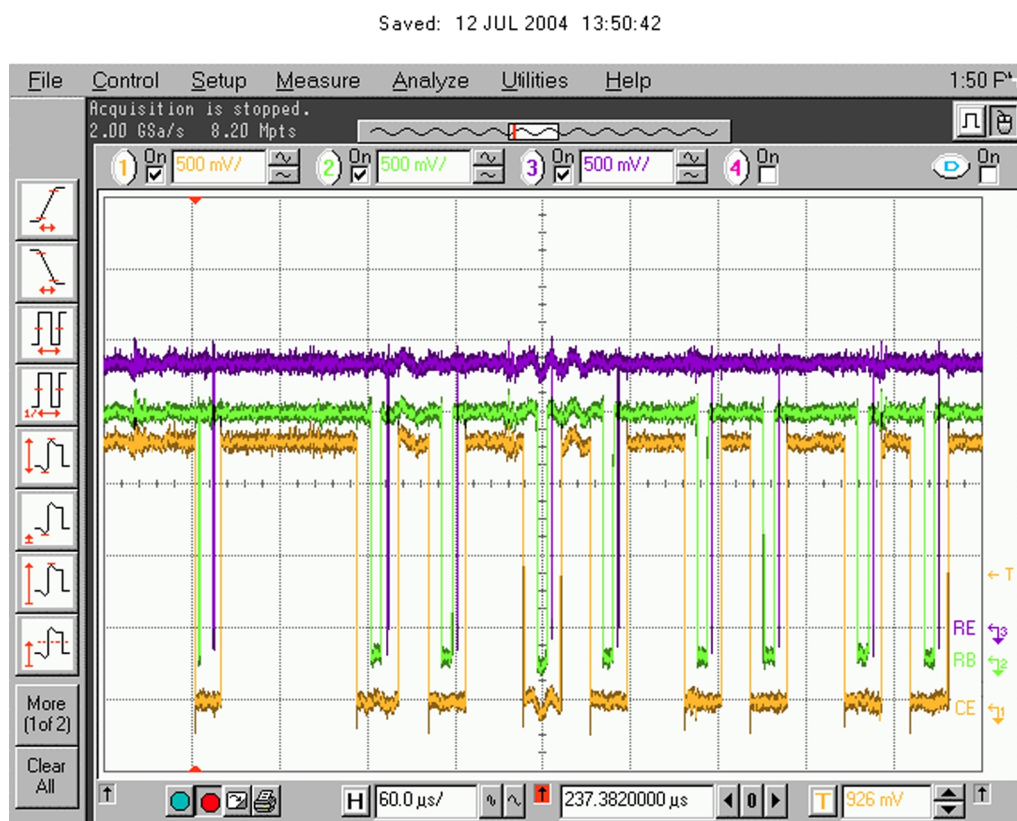


Figure 39 NOR CLK from J2813

■ Application processor memory troubleshooting

Troubleshooting flow



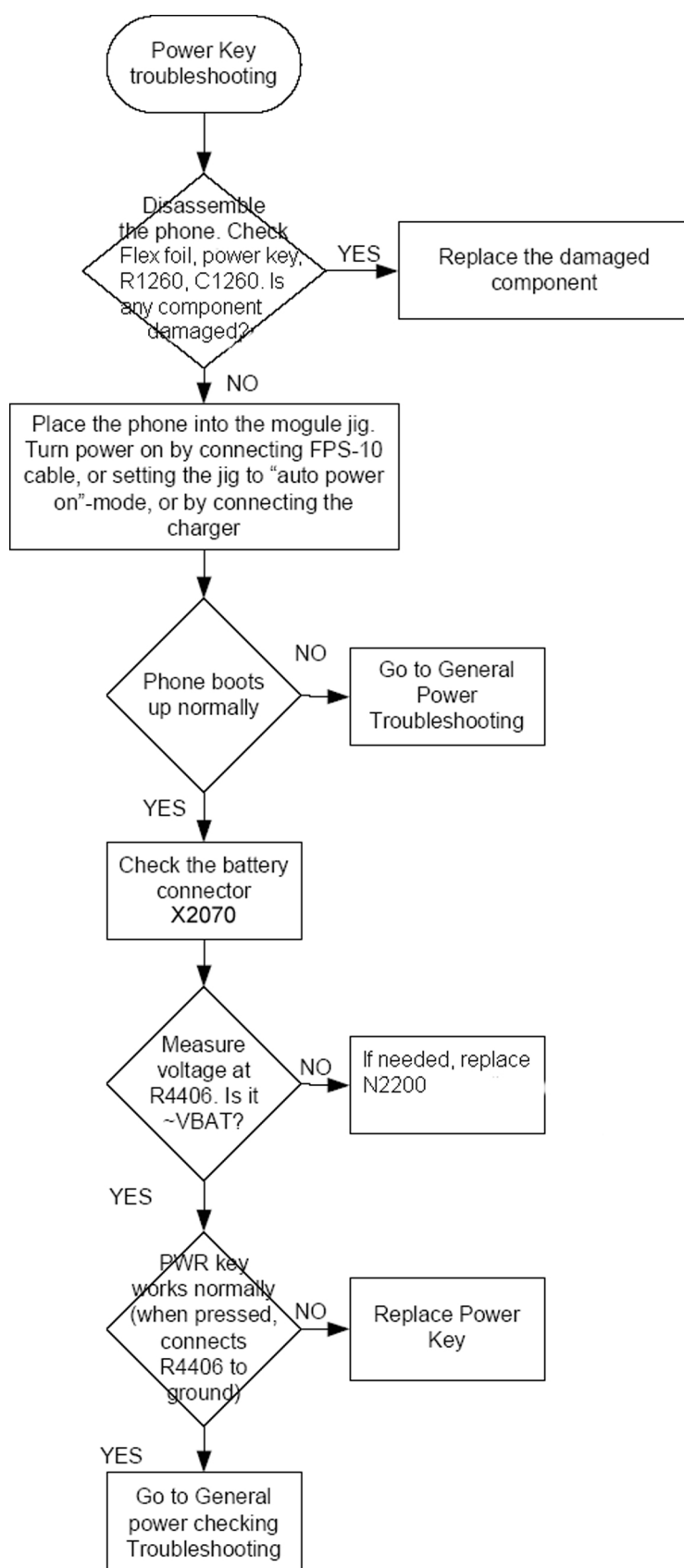


Take single trig measurement on the falling edge of the CE signal.

Figure 40 COMBO NAND in boot pic 1.

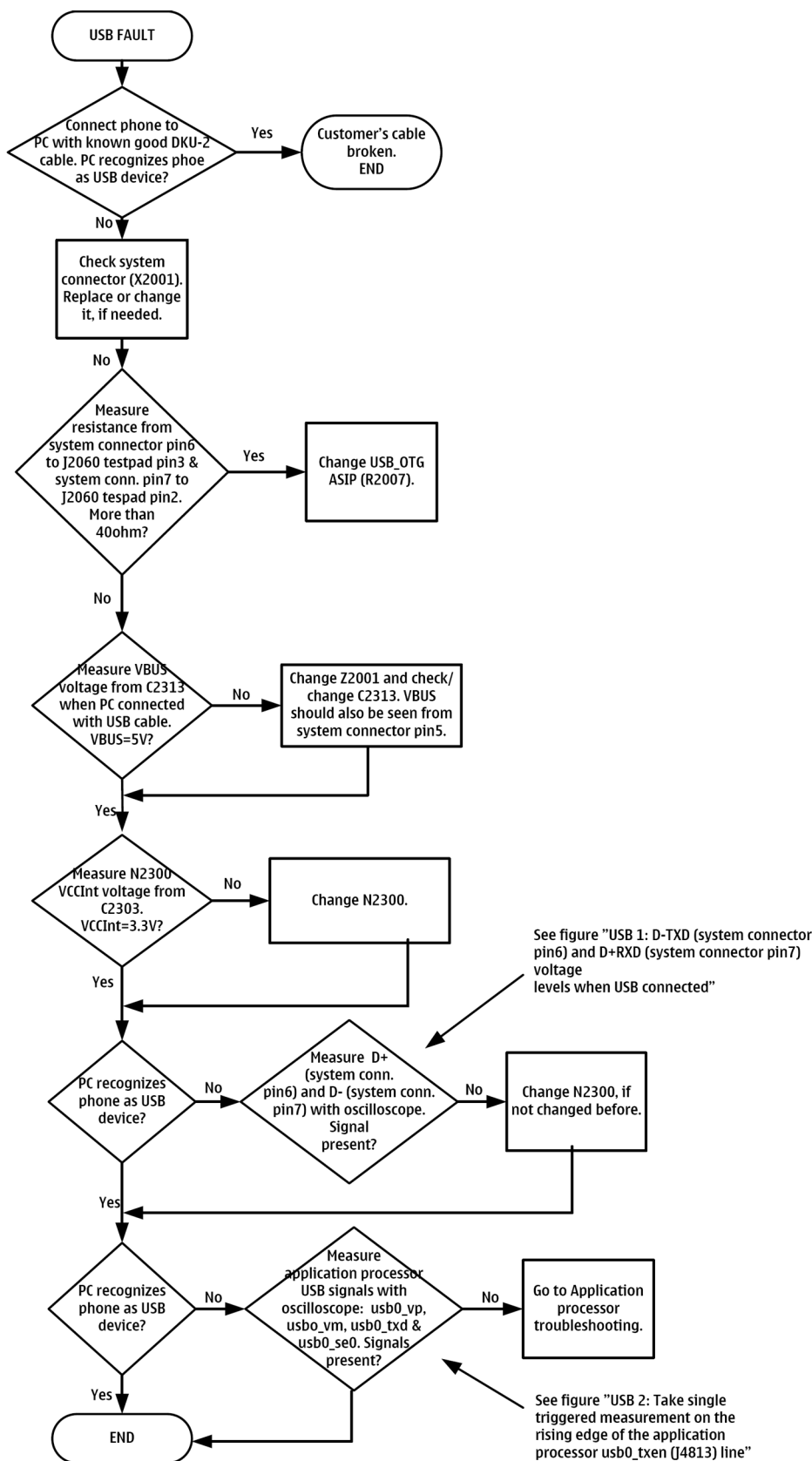
■ Power key troubleshooting

Troubleshooting flow



■ USB interface troubleshooting

Troubleshooting flow



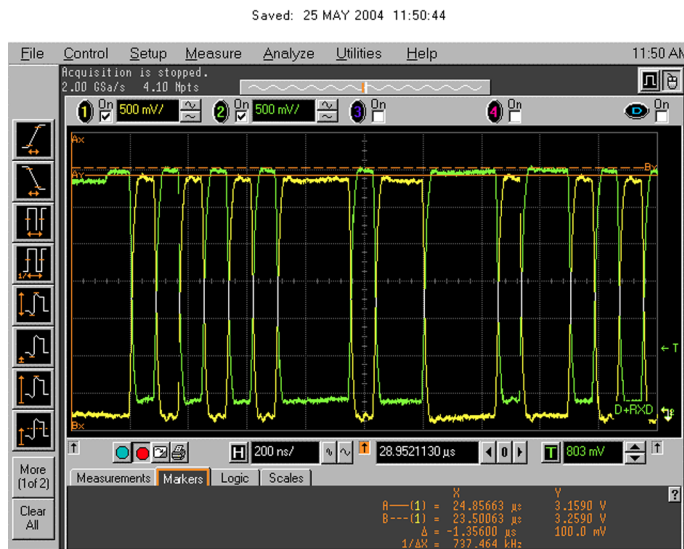


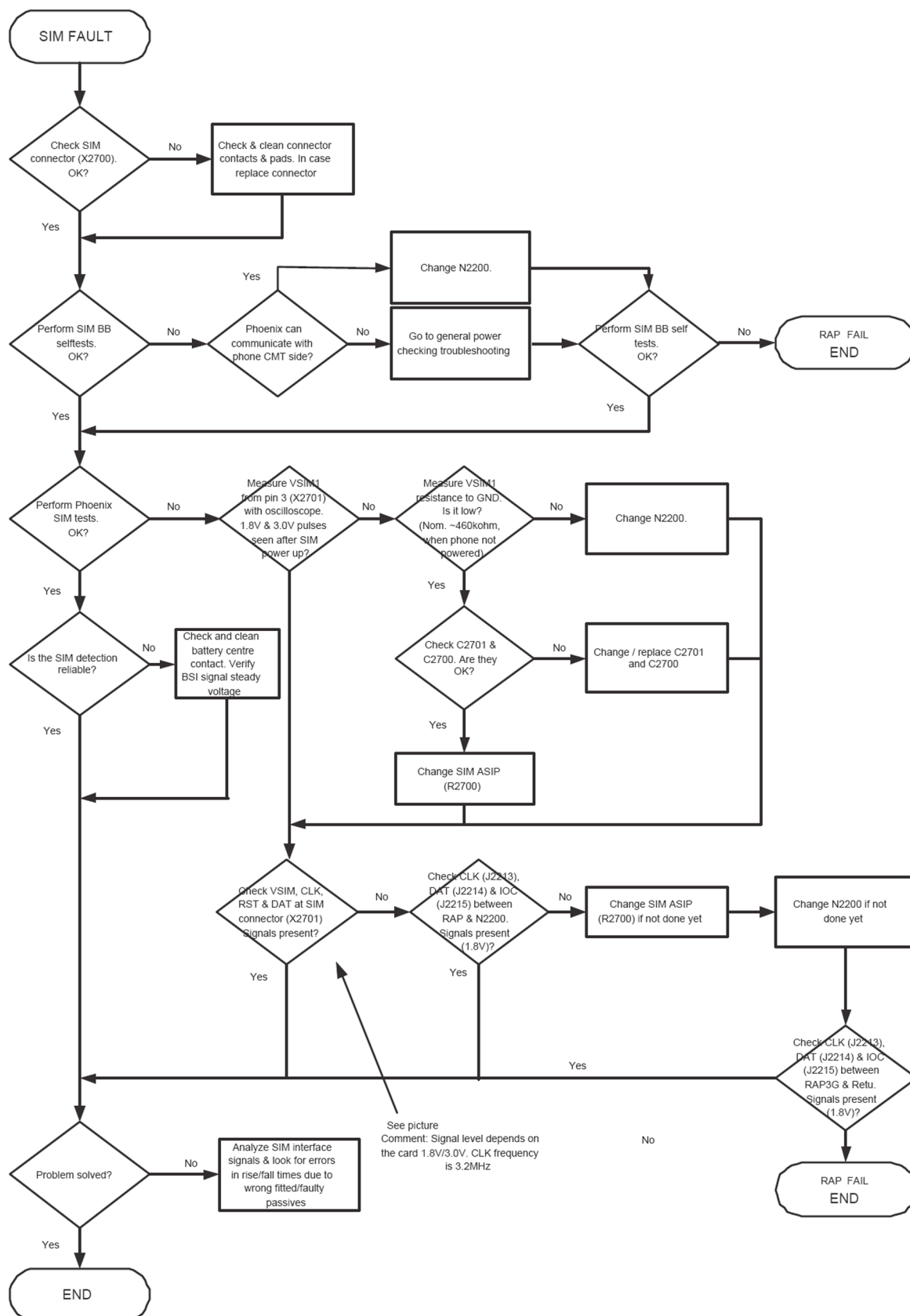
Figure 41 USB 1: D-TXD (system connector pin6) and D+RXD (system connector pin7) voltage levels when USB connected.



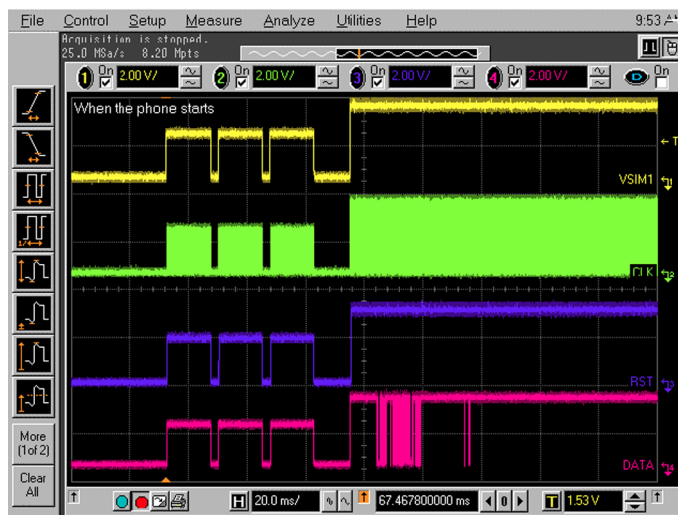
Figure 42 USB 2: Take single triggered measurement on the rising edge of the application processor usb0_txen (J4813) line.

■ SIM card troubleshooting

Troubleshooting flow



Note: Exchanging of PWB 1LZ_xx module helps to locate the error root cause. One of many root causes is possible, SIM reader, VSIM blocking capacitor, SIM ASIP or RAP/EM ASIC N2200 environment for example.

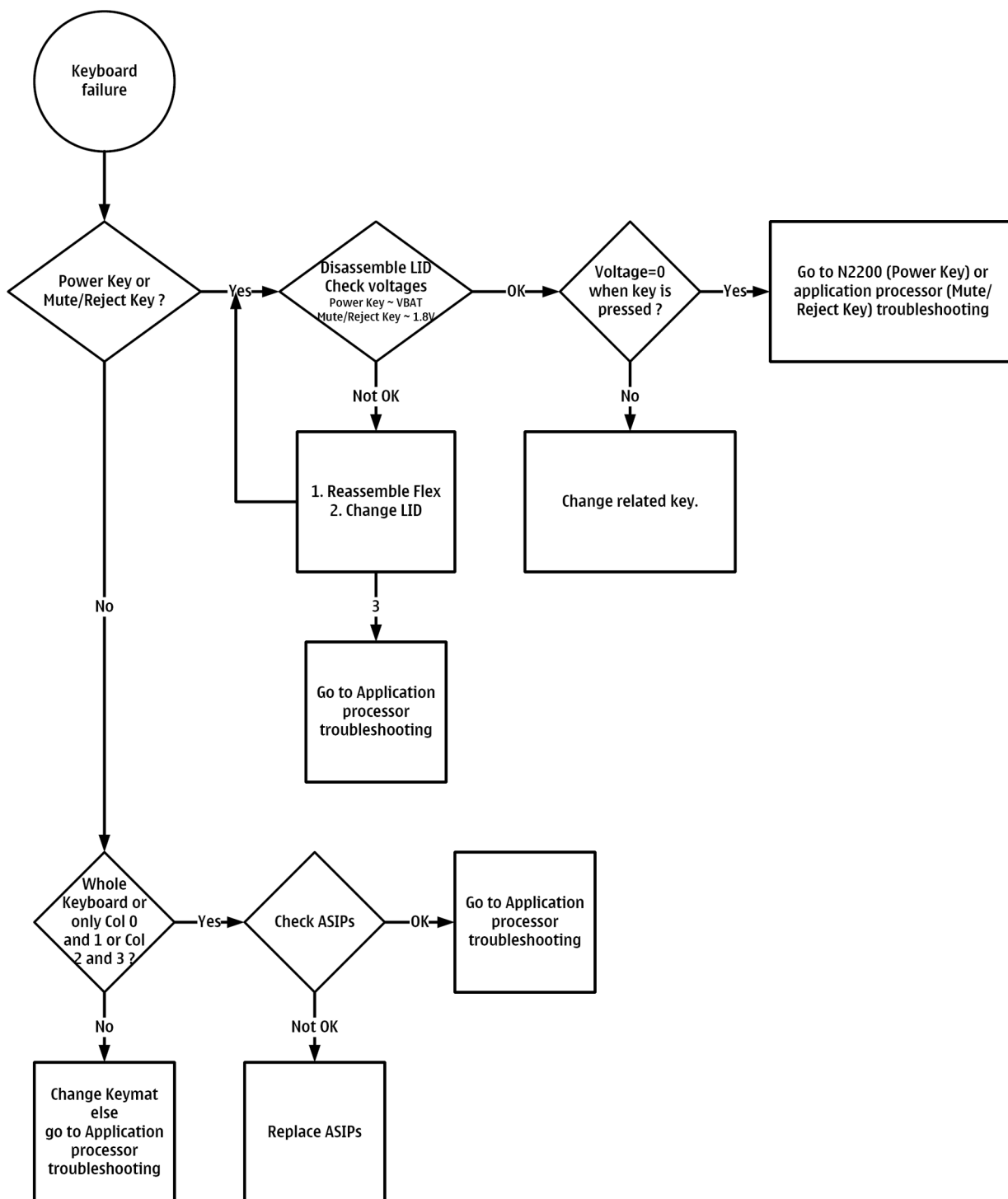


SIM CLK frequency = 3.2MHz (Take single triggered measurement in boot on the VSIM1 line).

Figure 43 SIM interface signals

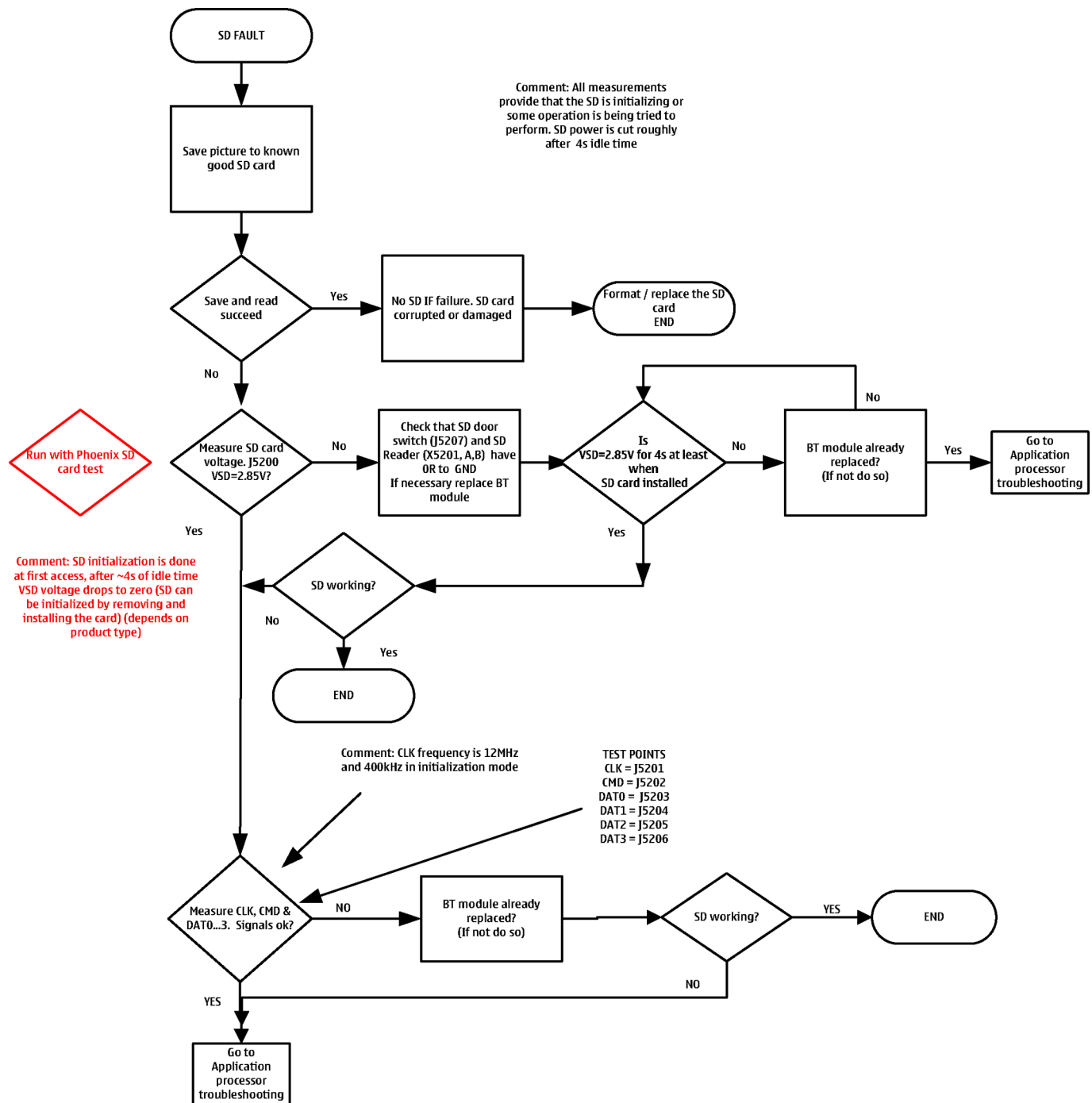
■ Keyboard troubleshooting

Troubleshooting flow



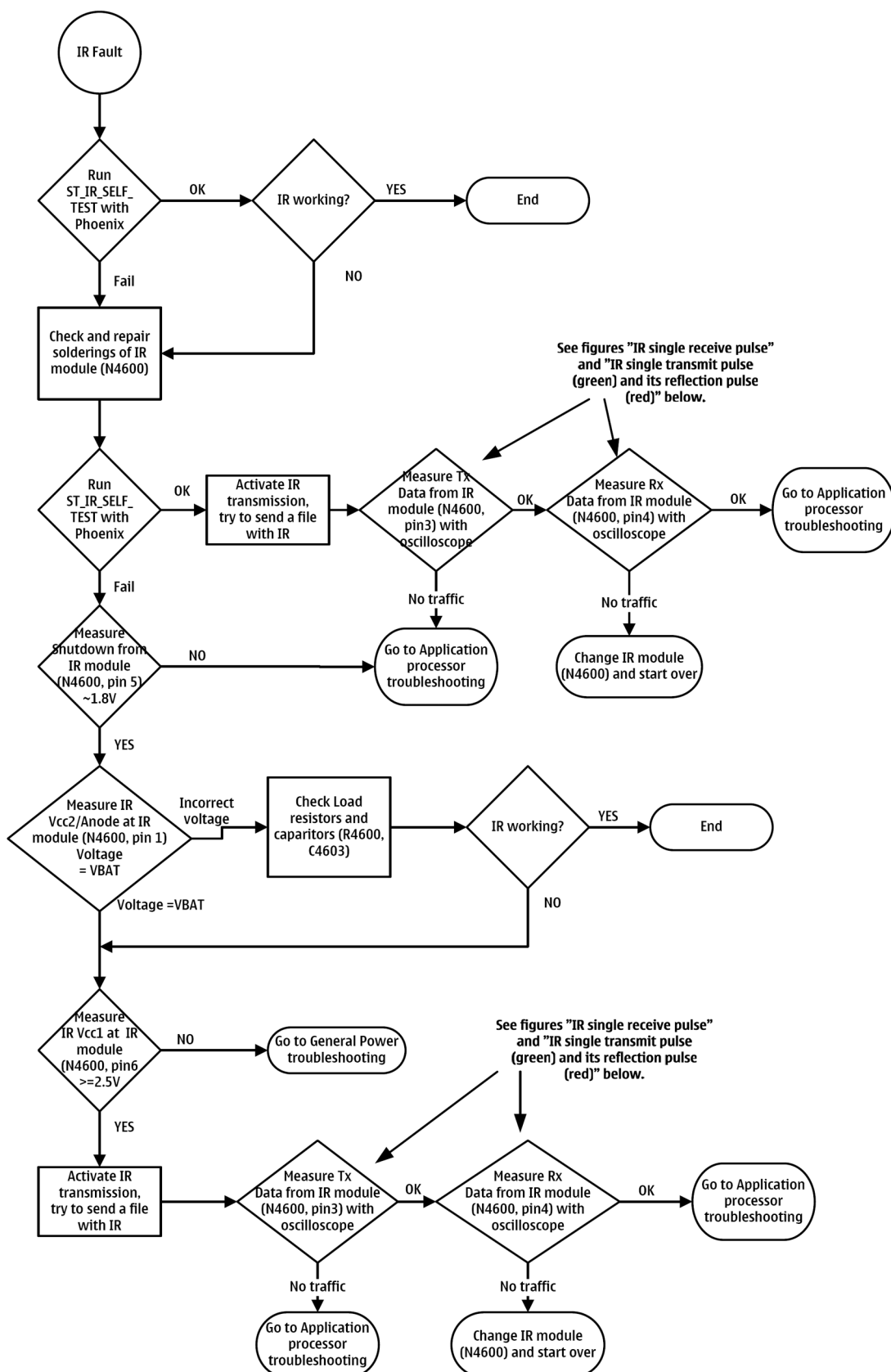
■ SD troubleshooting

Troubleshooting flow



■ IR troubleshooting

Troubleshooting flow



Results

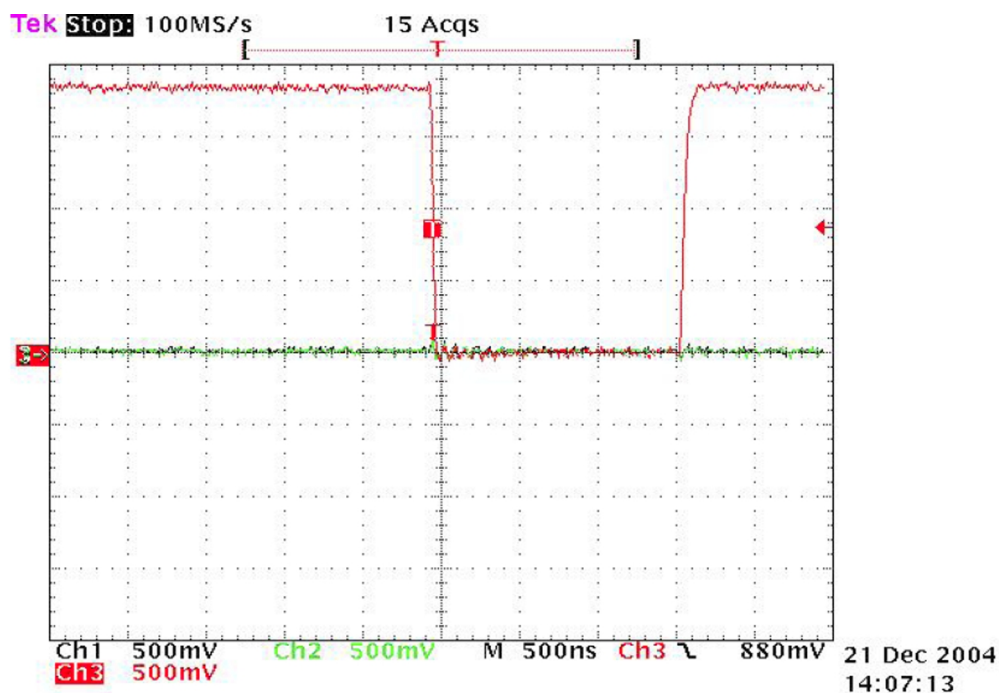


Figure 44 IR single receive pulse

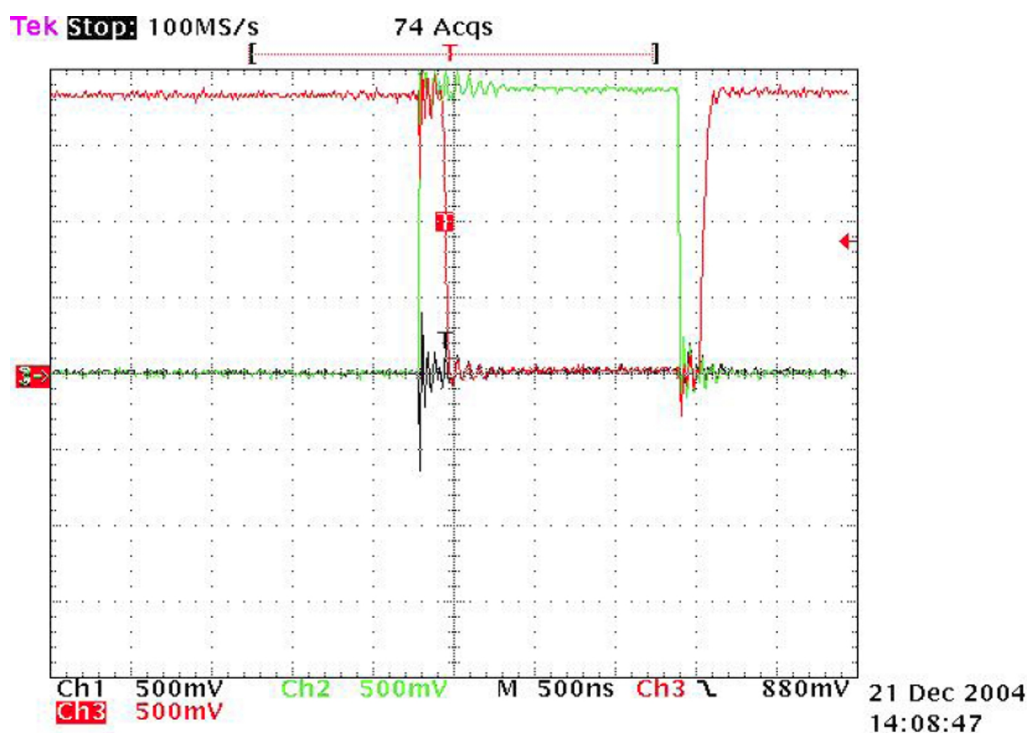


Figure 45 IR single transmit pulse (green) and its reflection pulse (red)

■ 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

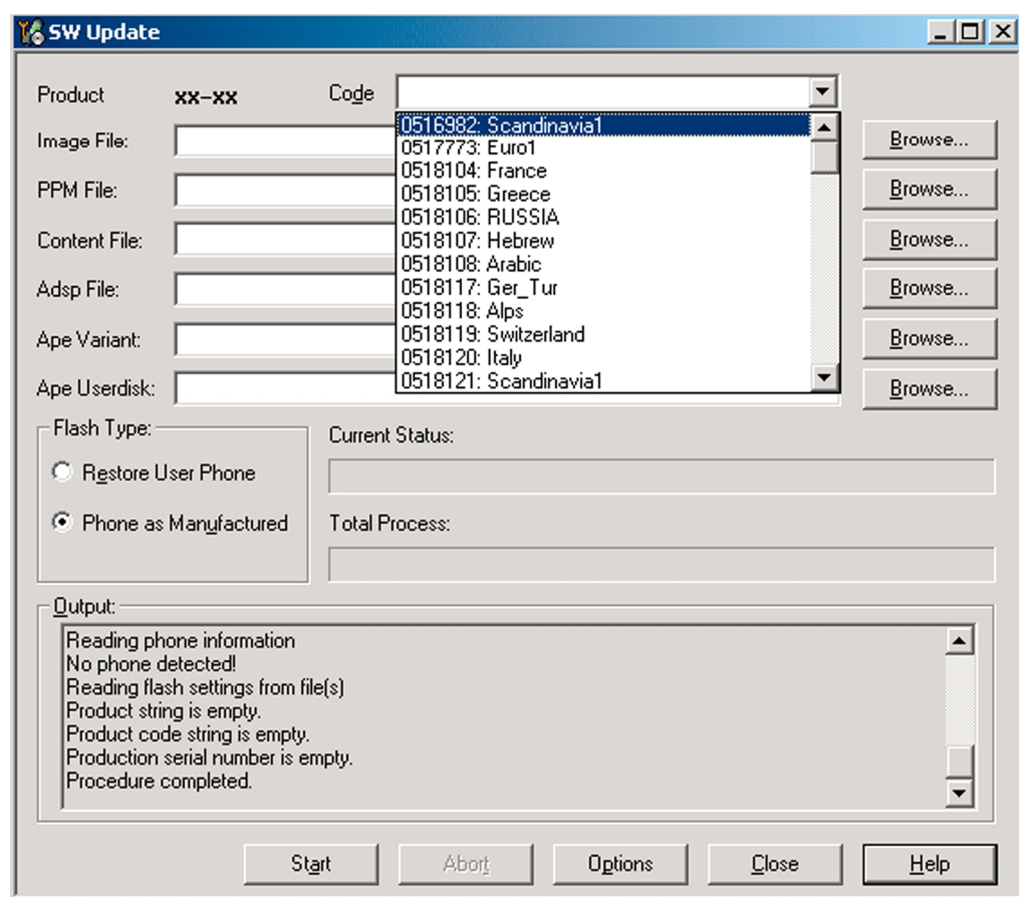
Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

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**.

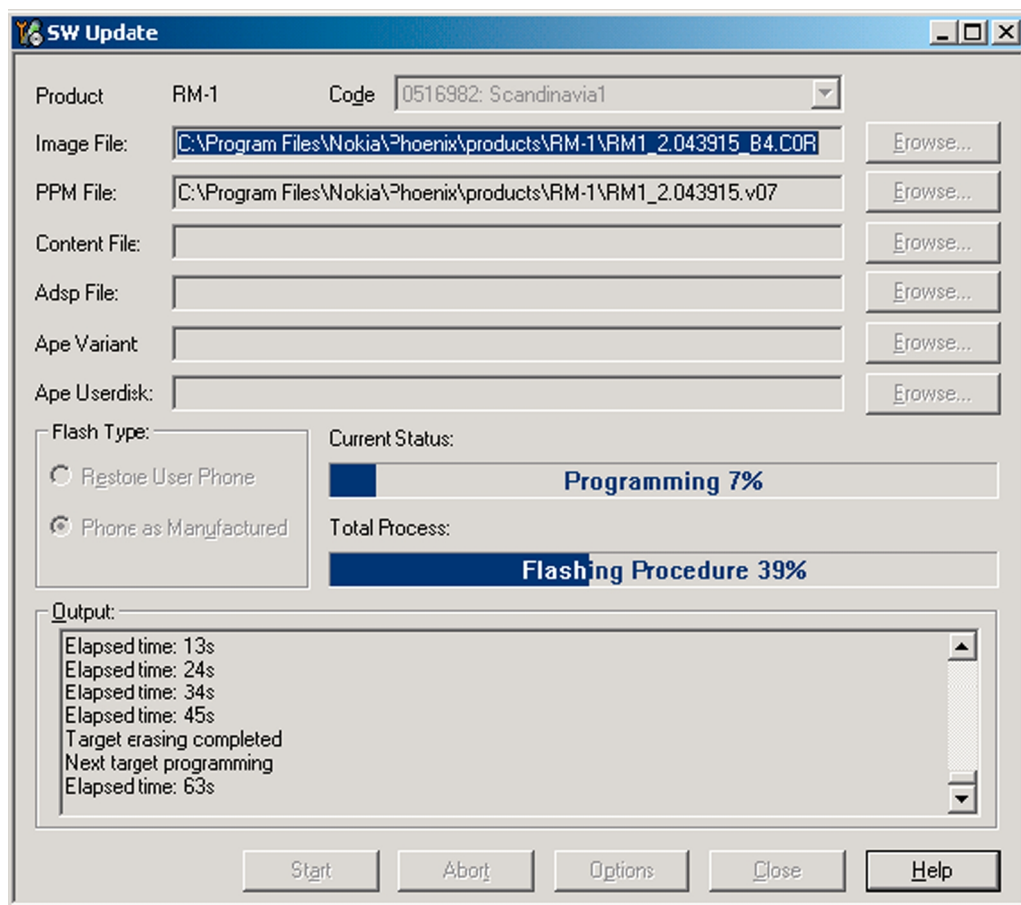
Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.
 - iv Go to **Flashing**→**SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



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

- v To continue, click **Start**.

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



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

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

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

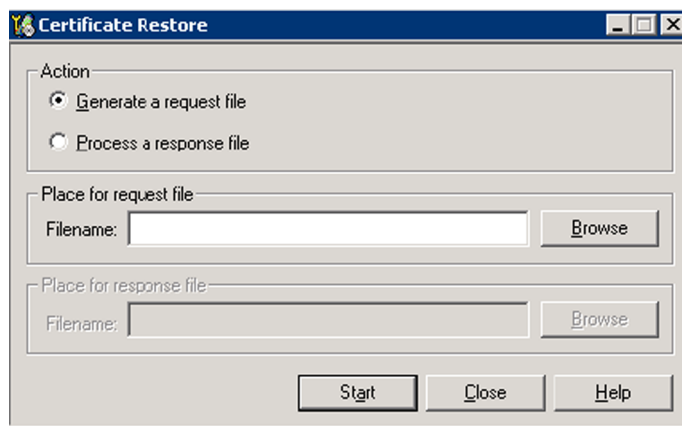
2. Create a *Request* file.

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

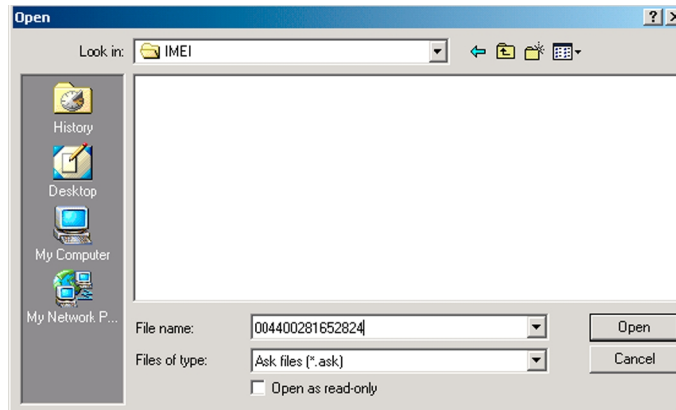
i To connect the phone with *Phoenix*, choose **File→Scan Product**.

ii Choose **Tools→Certificate Restore**.

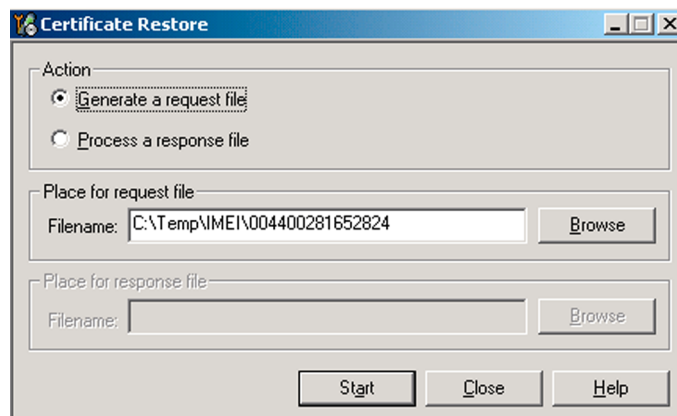
iii To choose a location for the request file, click **Browse**.



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

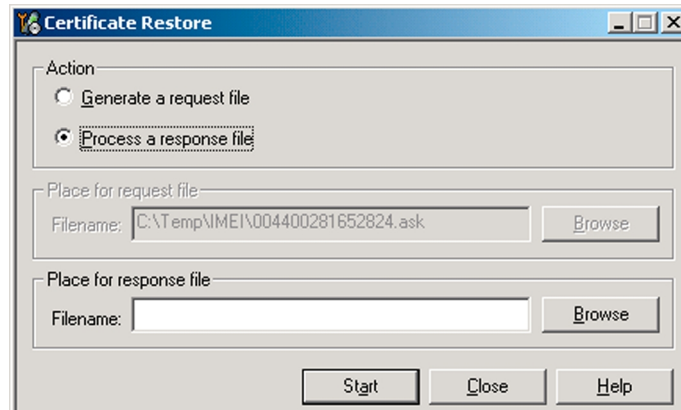


The name of the file and its location are shown.

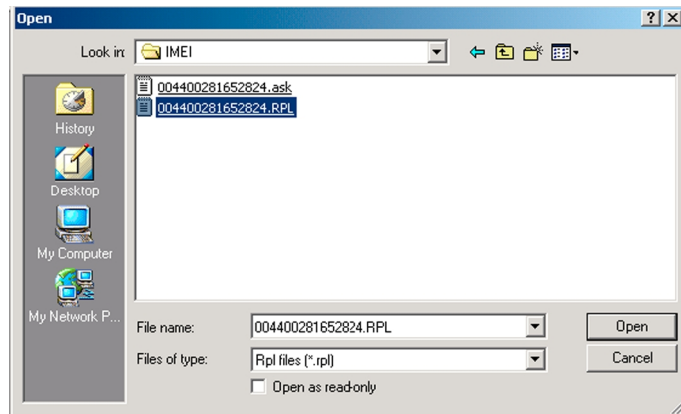


- v To create the *Request* file, click **Start**.
 - vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.
3. Restore certificate.
- For this procedure, you must supply +12 V to CU-4 from an external power supply.
- i Save the reply file sent by Nokia to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

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

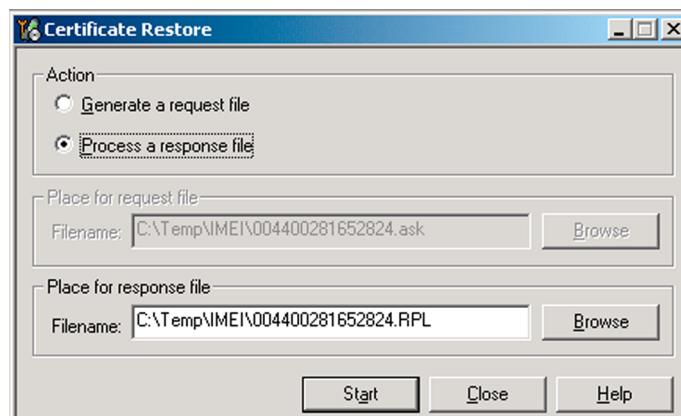


- v To choose the location where response file is saved, click **Browse**.
- vi Click **Open**.



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

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



Next action

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

Note: The whole chapter of troubleshooting is valid for both main display and cover UI display.

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.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. 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 failure can also be in flex connector between lid and engine, in the backlight power source or 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 instructions.
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.

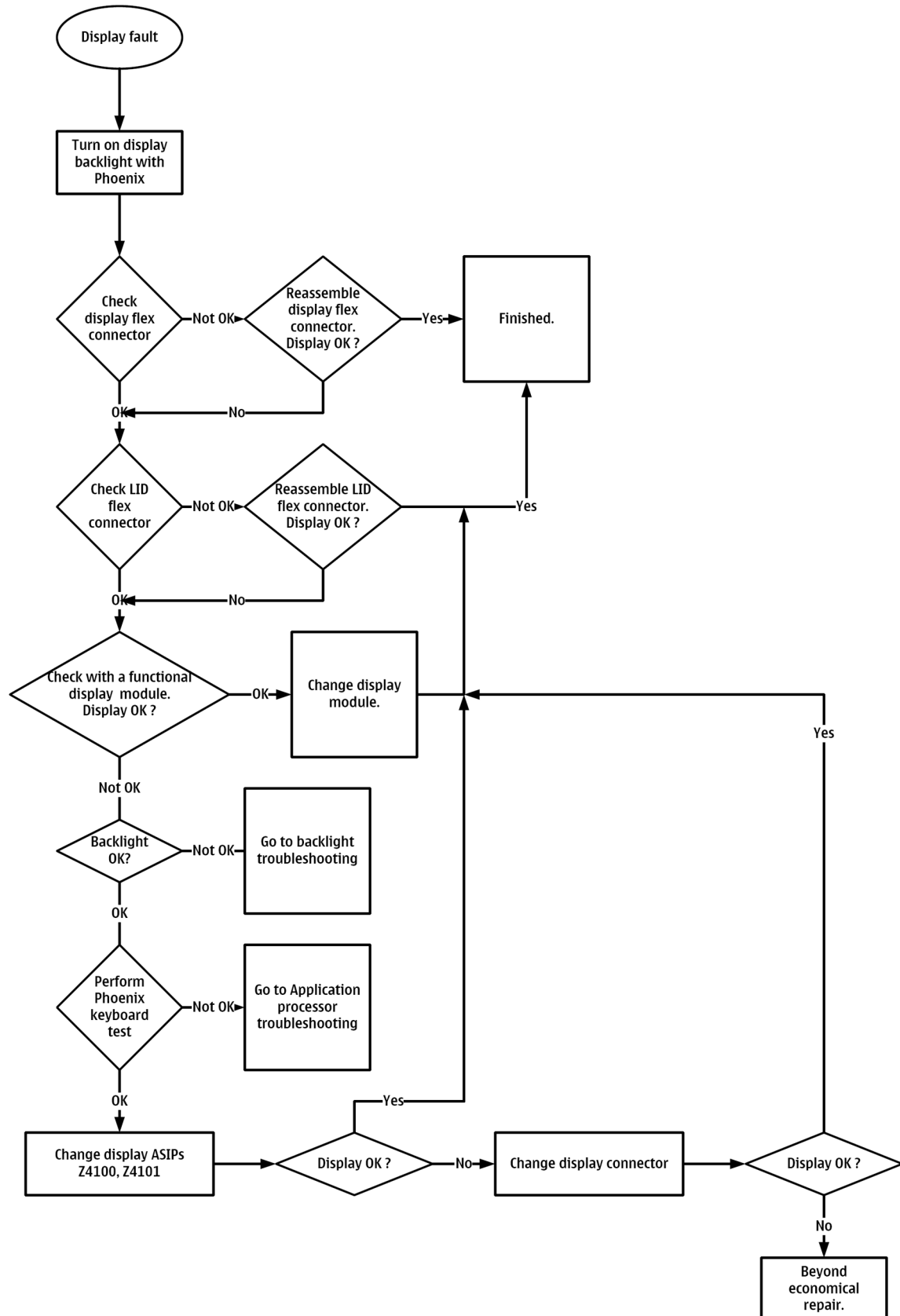
Table 9 Pixel defects

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

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

Display fault troubleshooting

Troubleshooting flow



Display and keyboard backlight troubleshooting

Context

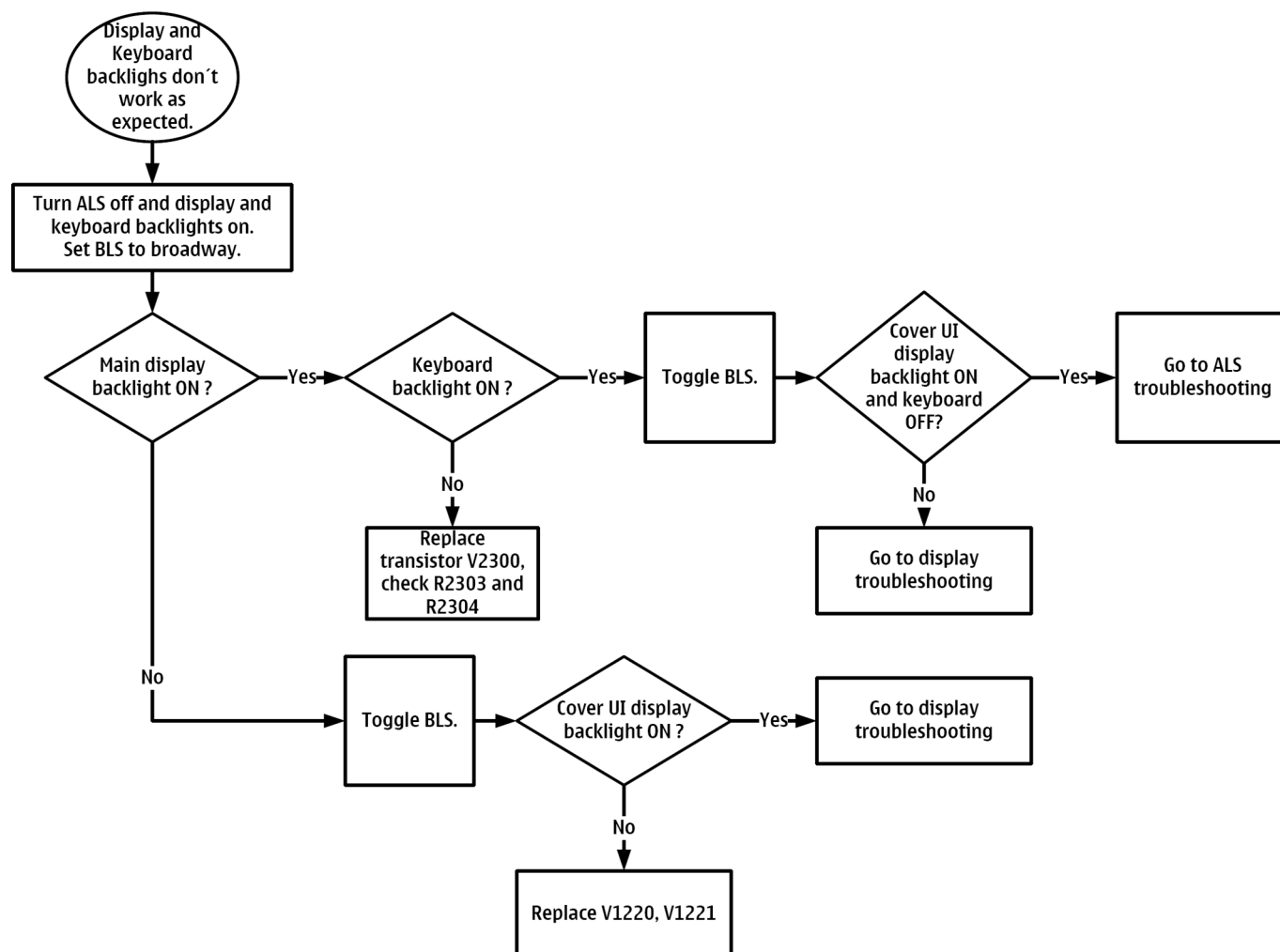
The device has one LED driver that provides current for both displays and keyboard backlights..

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.
- *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.

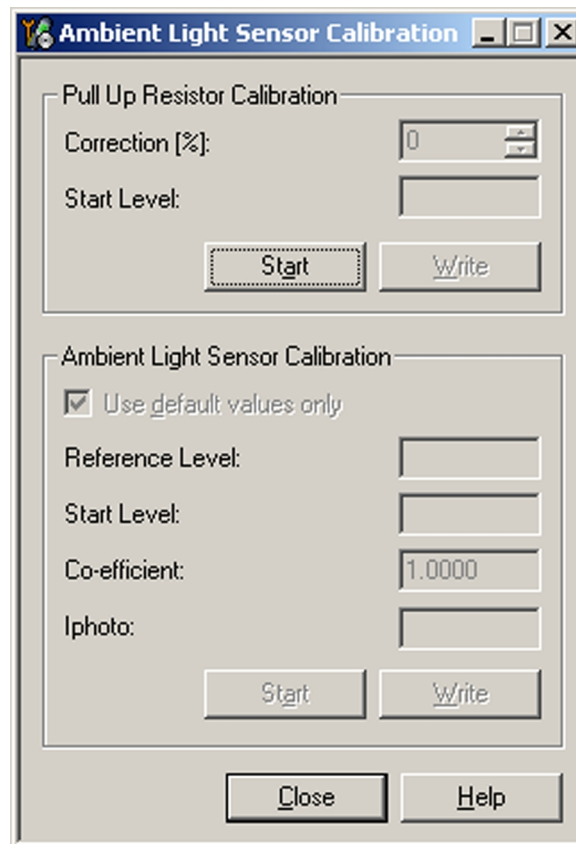
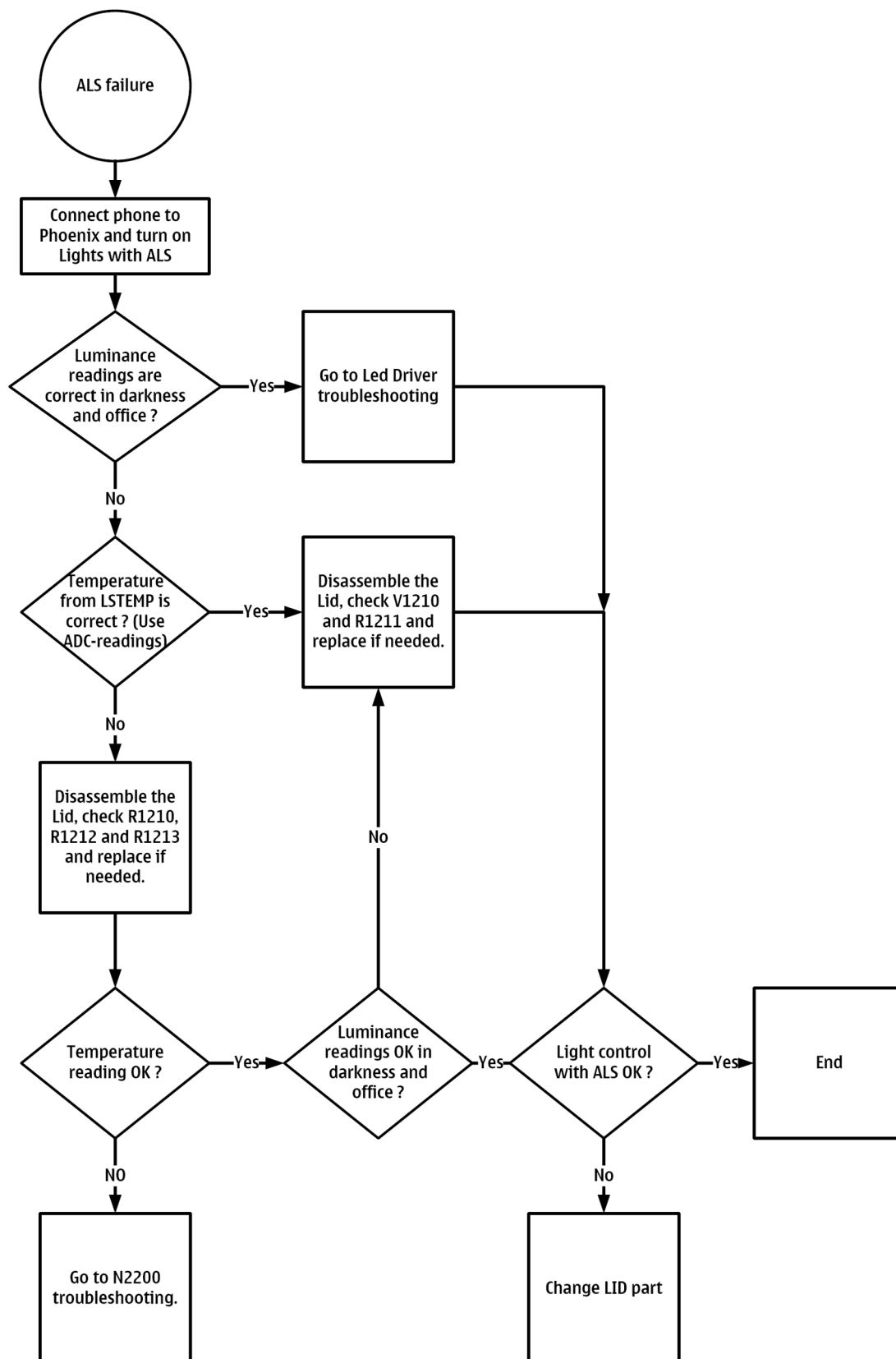


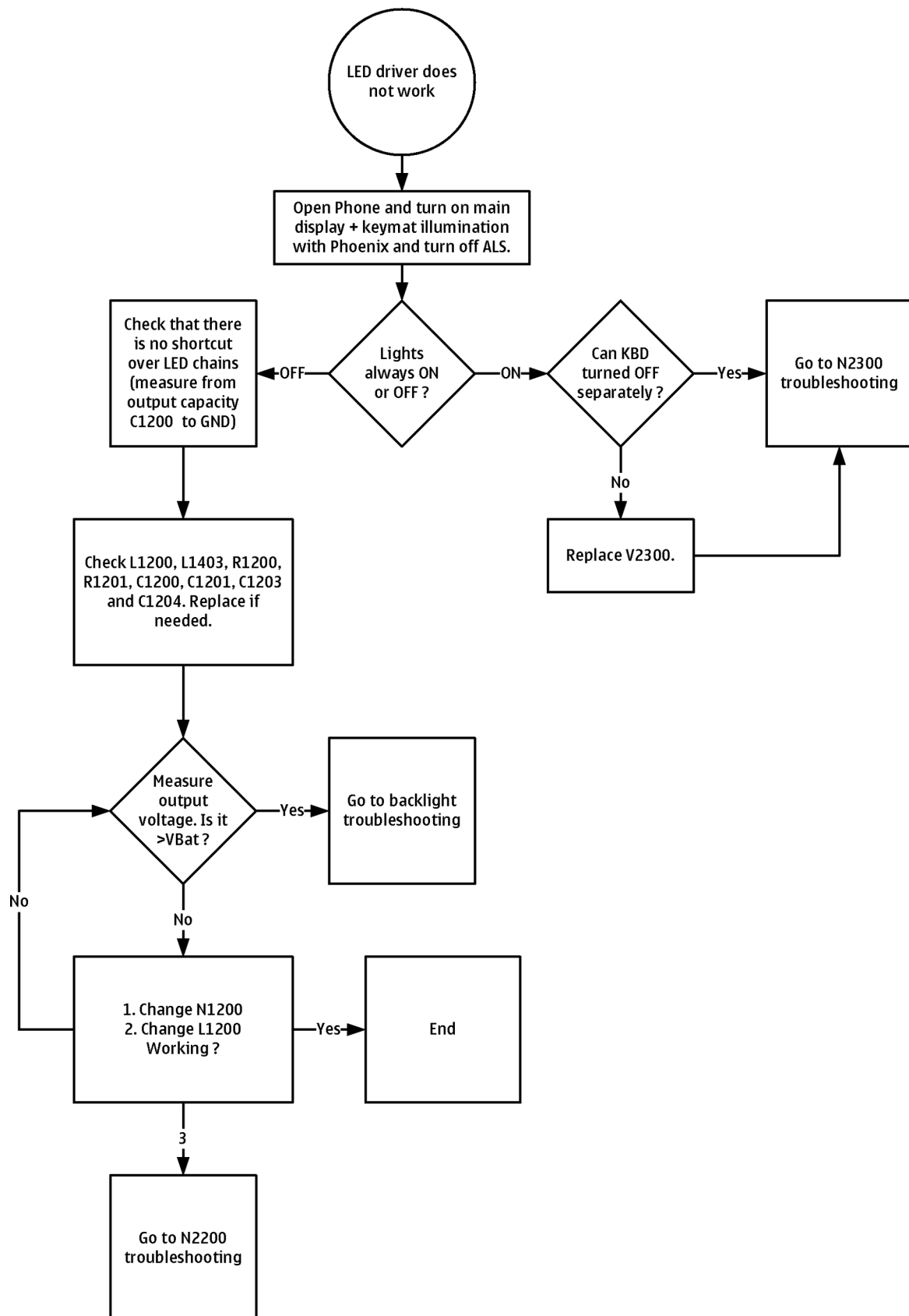
Figure 46 *Ambient Light Sensor Calibration* window

Troubleshooting flow



LED driver troubleshooting

Troubleshooting flow



■ FM radio troubleshooting

Troubleshooting flow

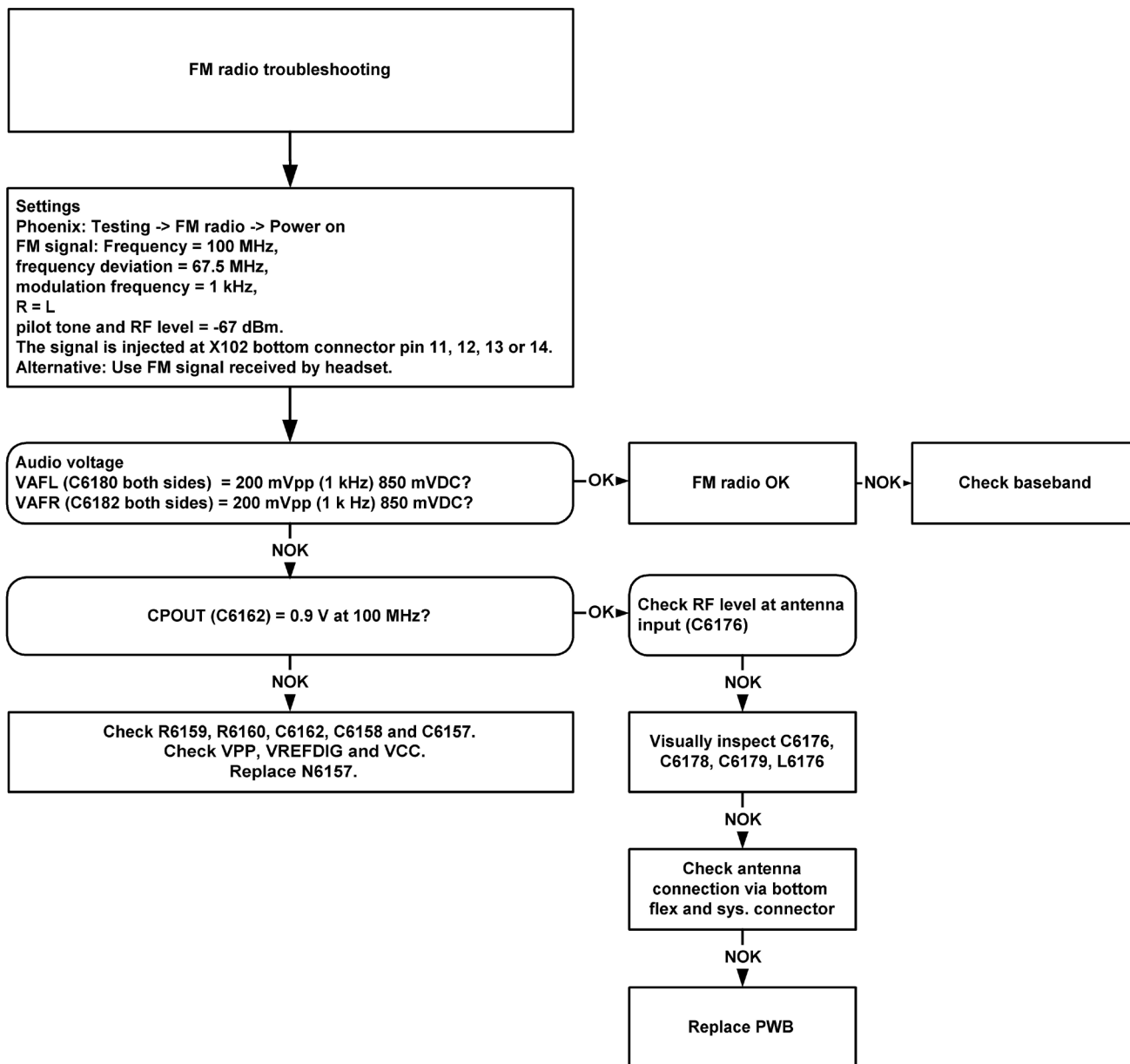


Figure 47 FM radio

■ Bluetooth troubleshooting

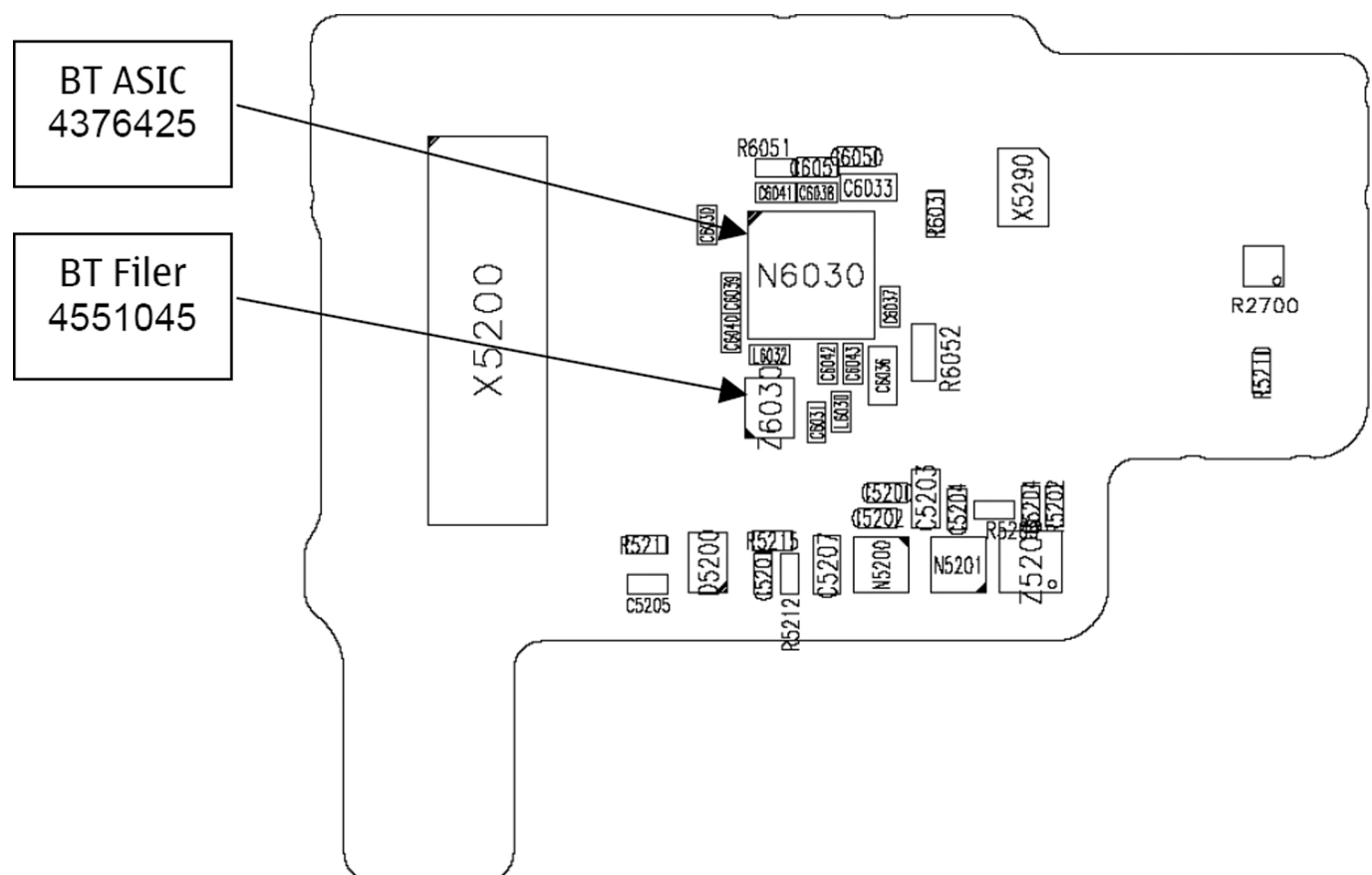
Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

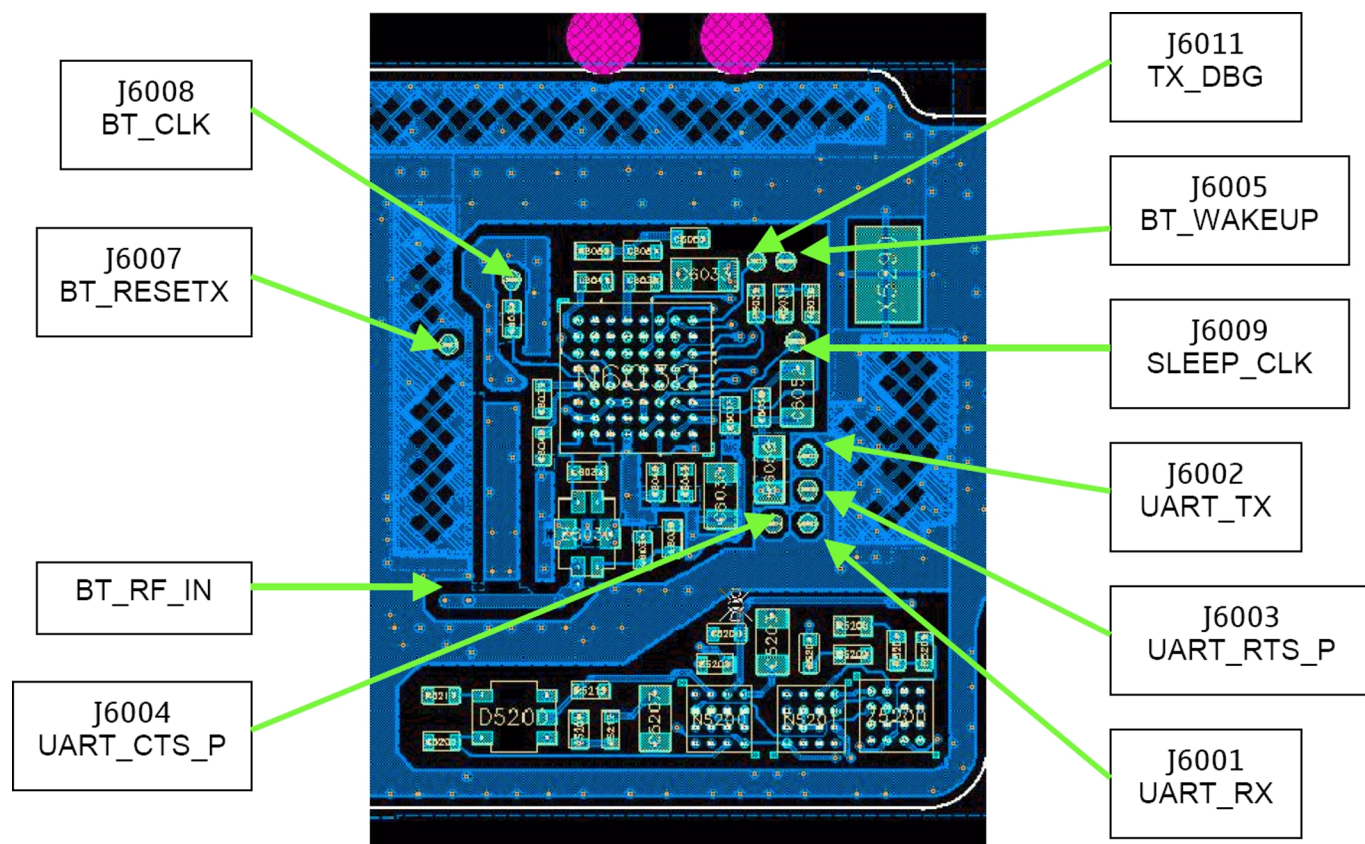
Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the 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.

Bluetooth placement and layout



Bluetooth test points



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.

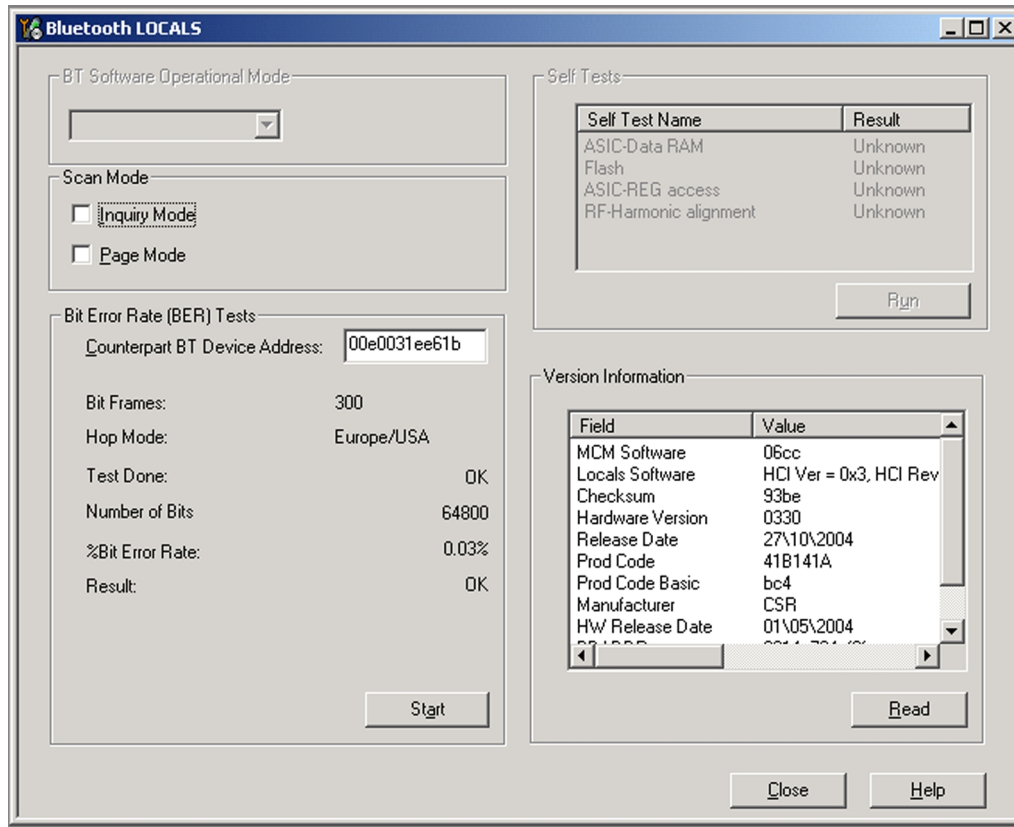


Figure 48 BER test result

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**.

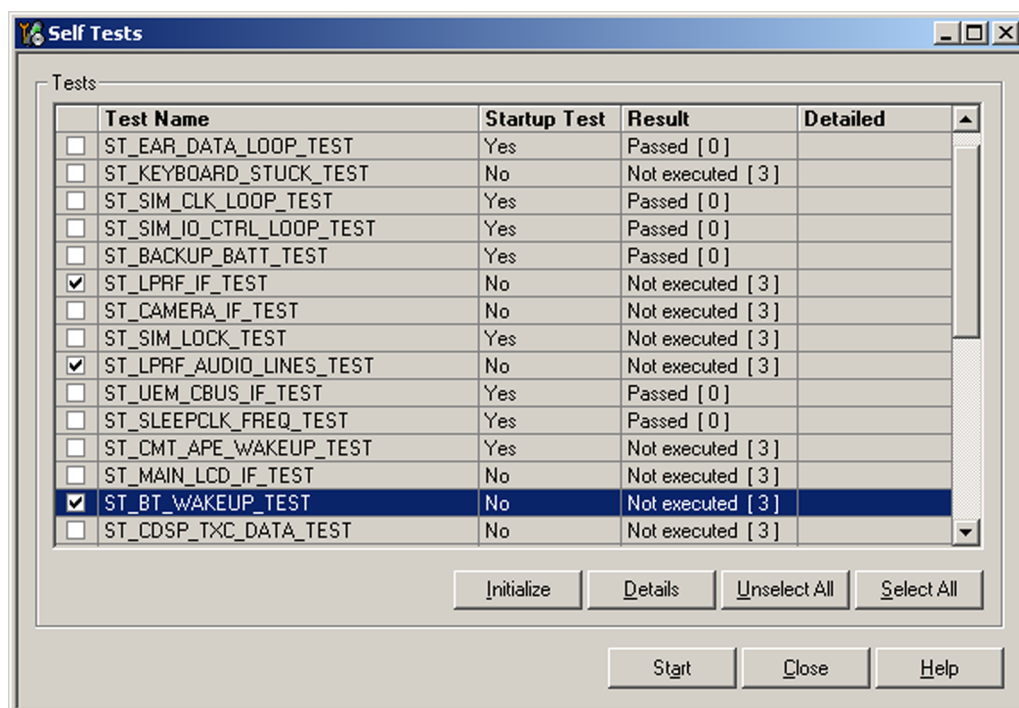
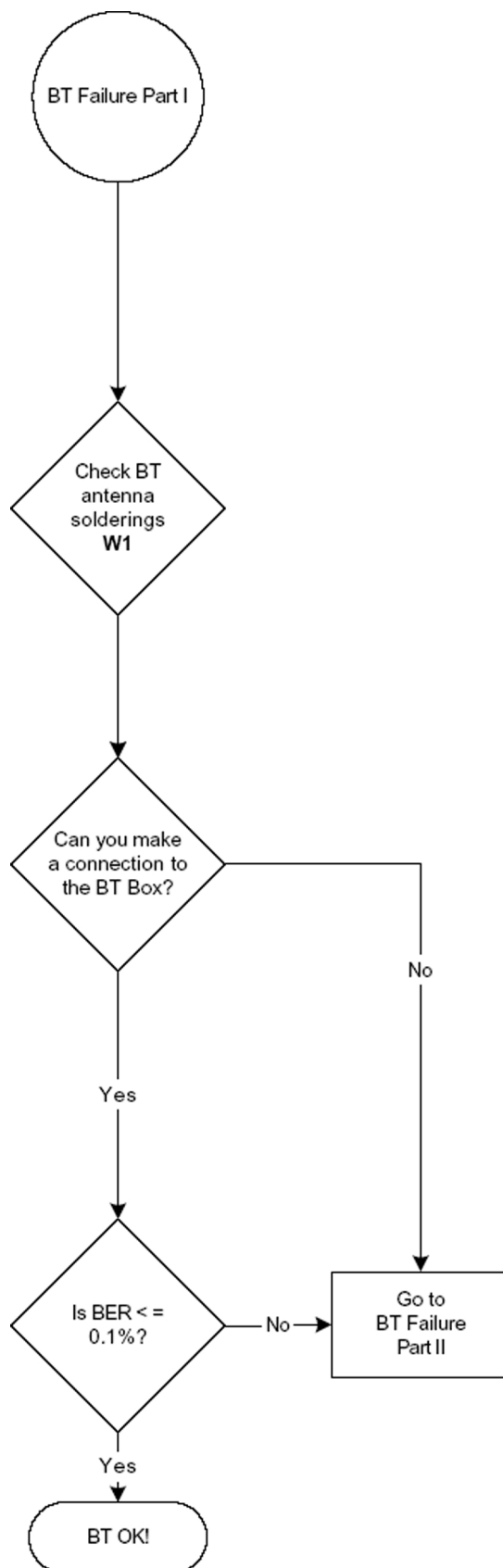
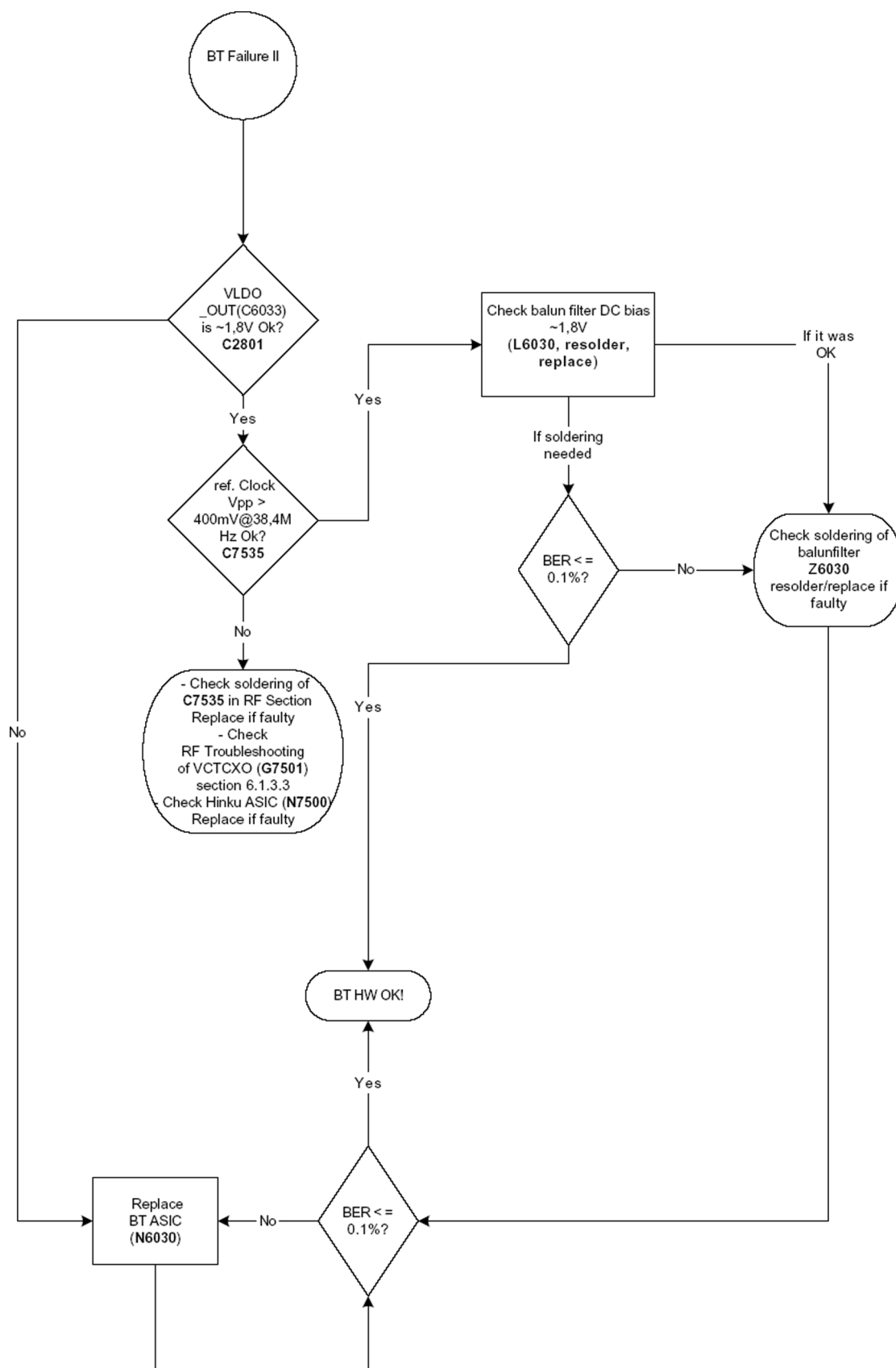


Figure 49 Bluetooth self tests in *Phoenix*

Bluetooth BER 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 1kHz.

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

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (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.

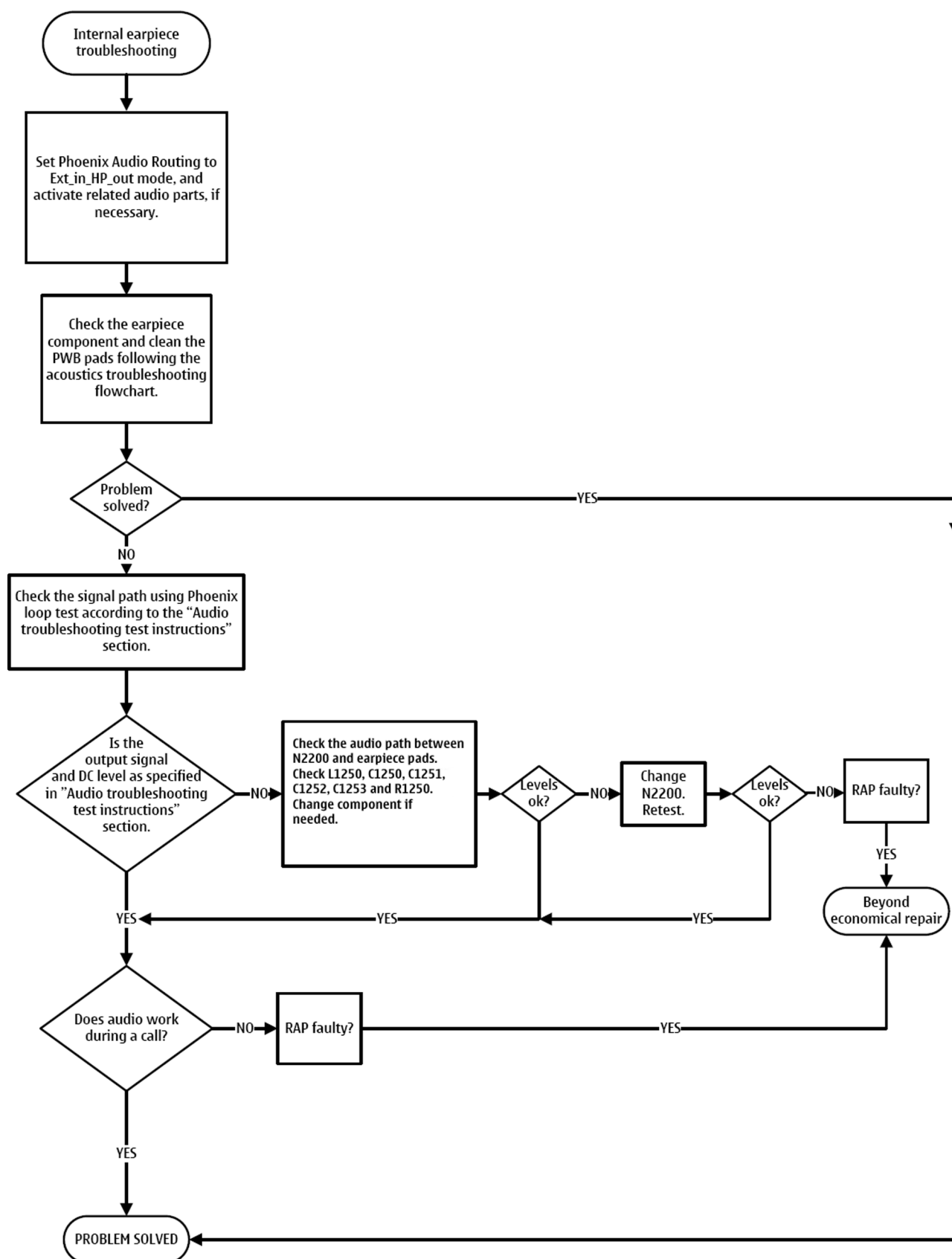
Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

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	2.7	200	275	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	2.7 without earpiece -1.4 with earpiece	200 without earpiece 200 with earpiece	275 without earpiece 170 with earpiece	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	7.9	200	500	0	45mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	Mic pads	HSEAR R P, HSEAR R N and GND	14.5	100	530	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

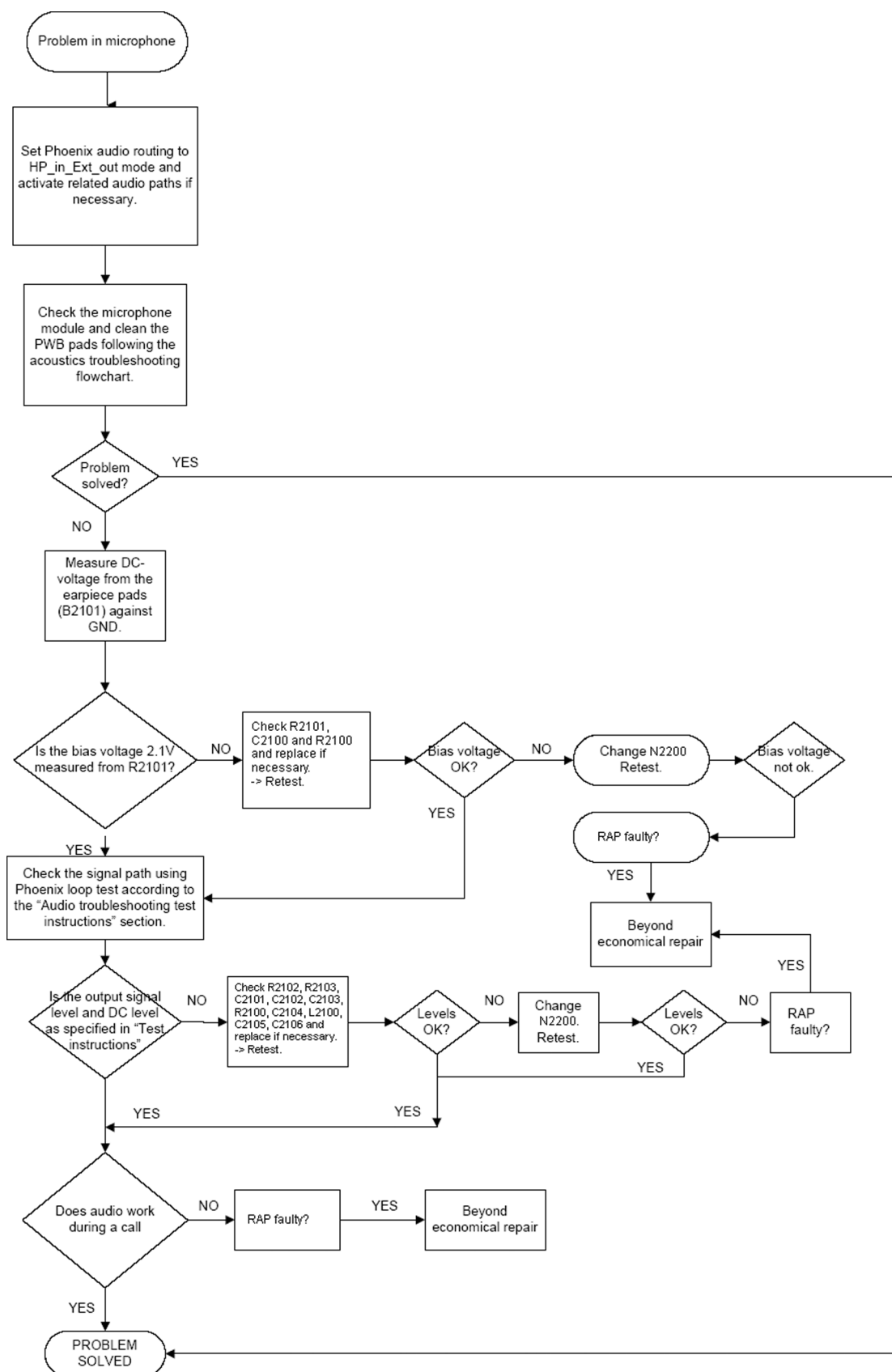
Internal earpiece troubleshooting

Troubleshooting flow



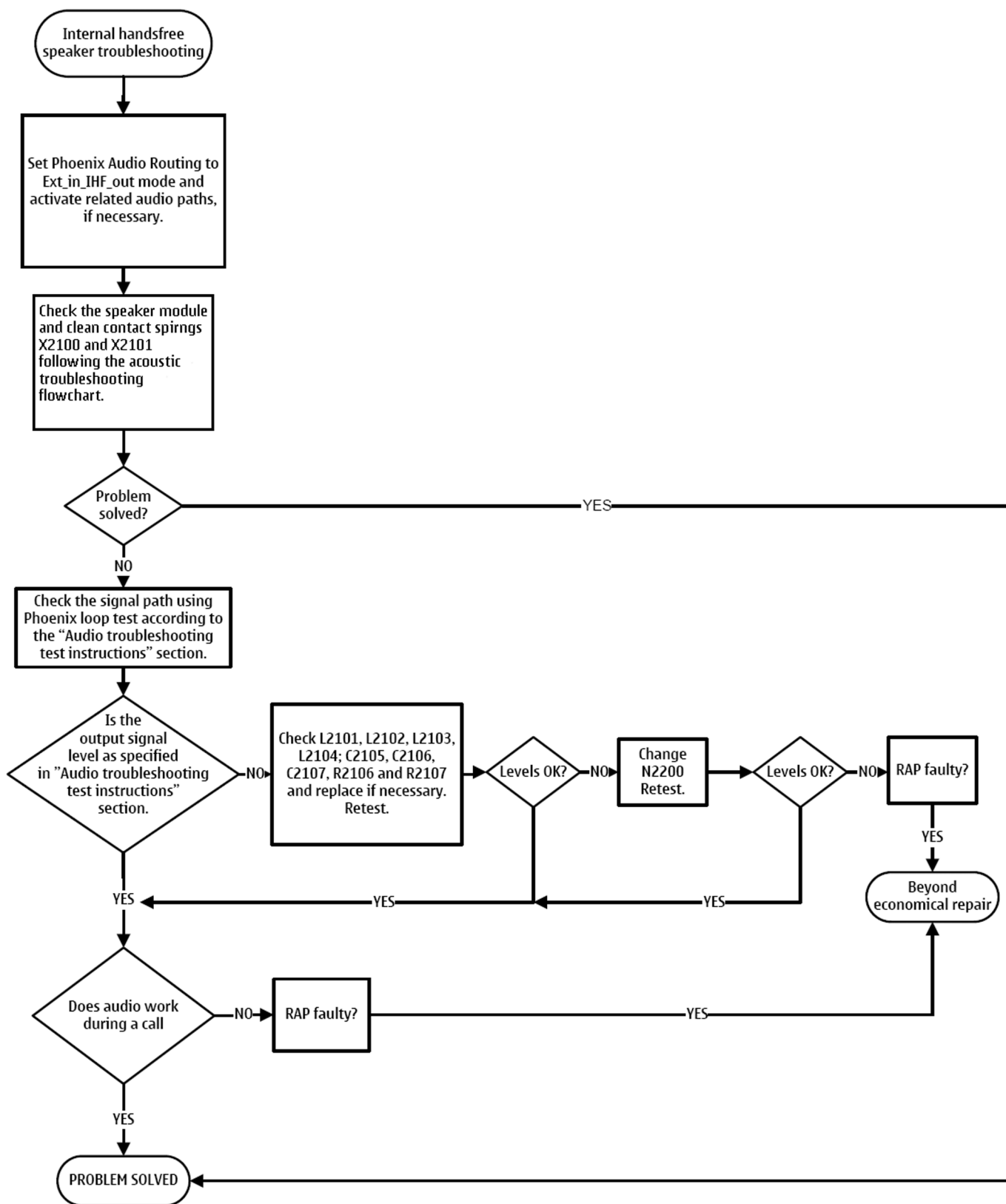
Internal microphone troubleshooting

Troubleshooting flow



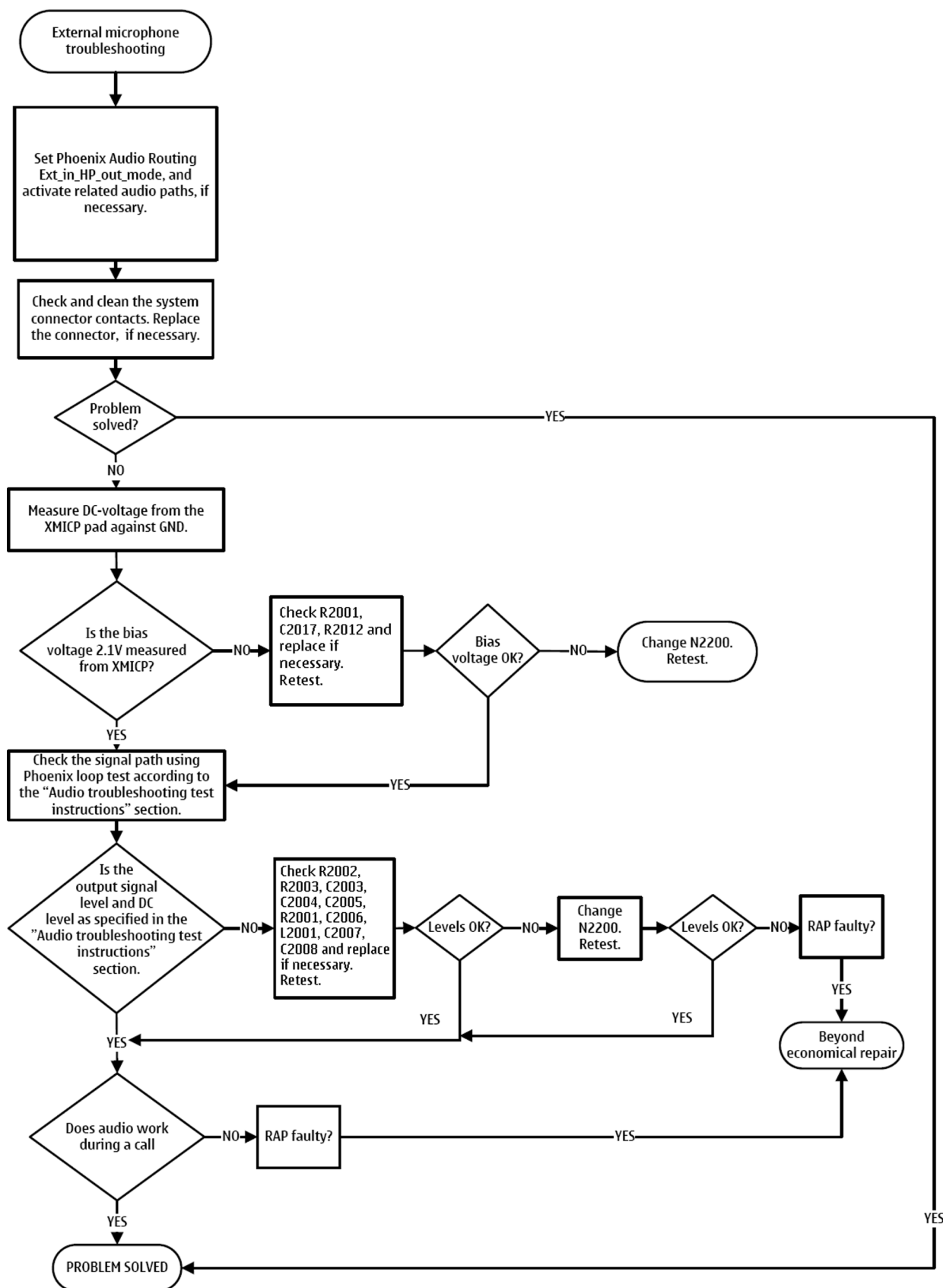
IHF troubleshooting

Troubleshooting flow



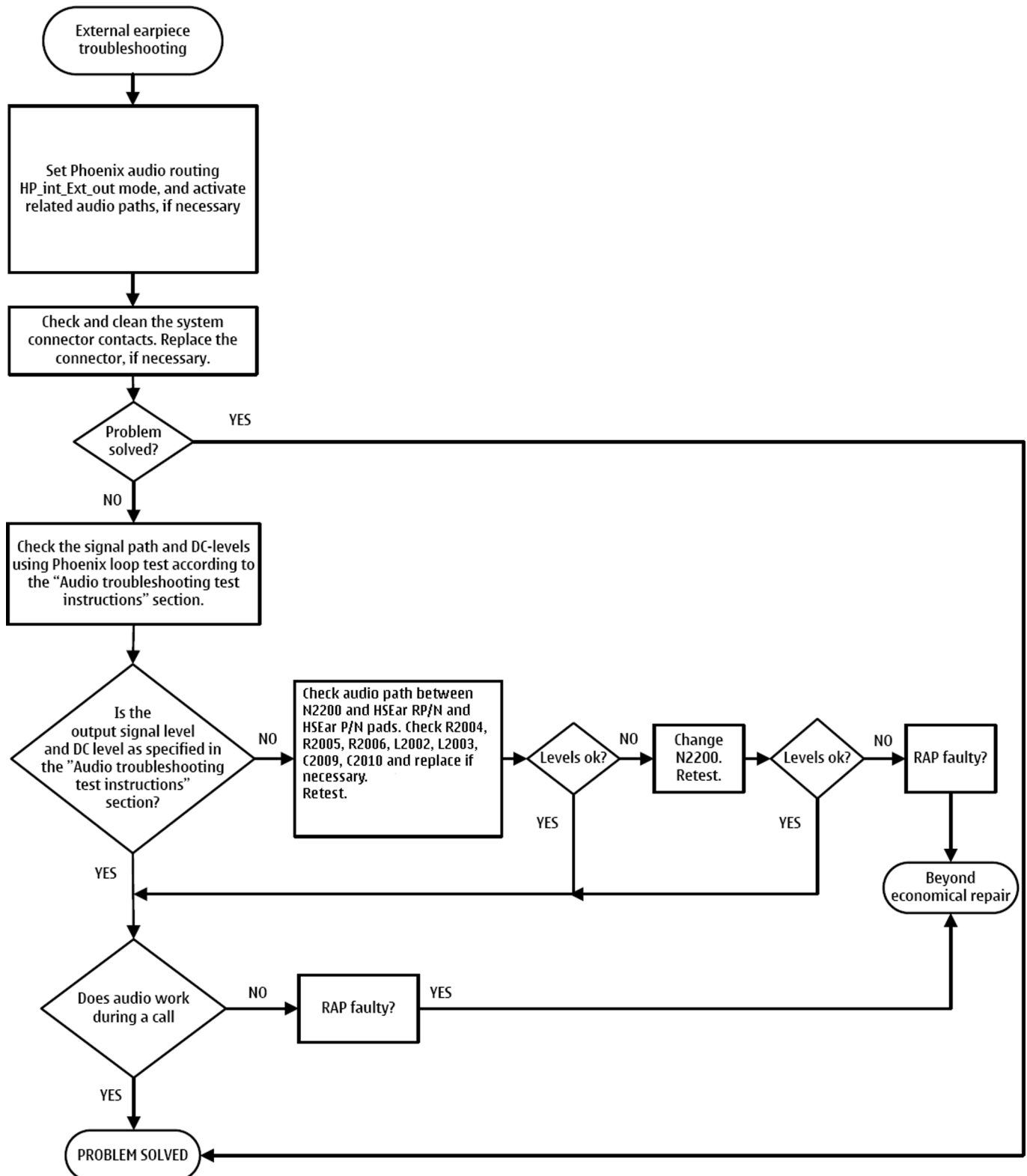
External microphone troubleshooting

Troubleshooting flow



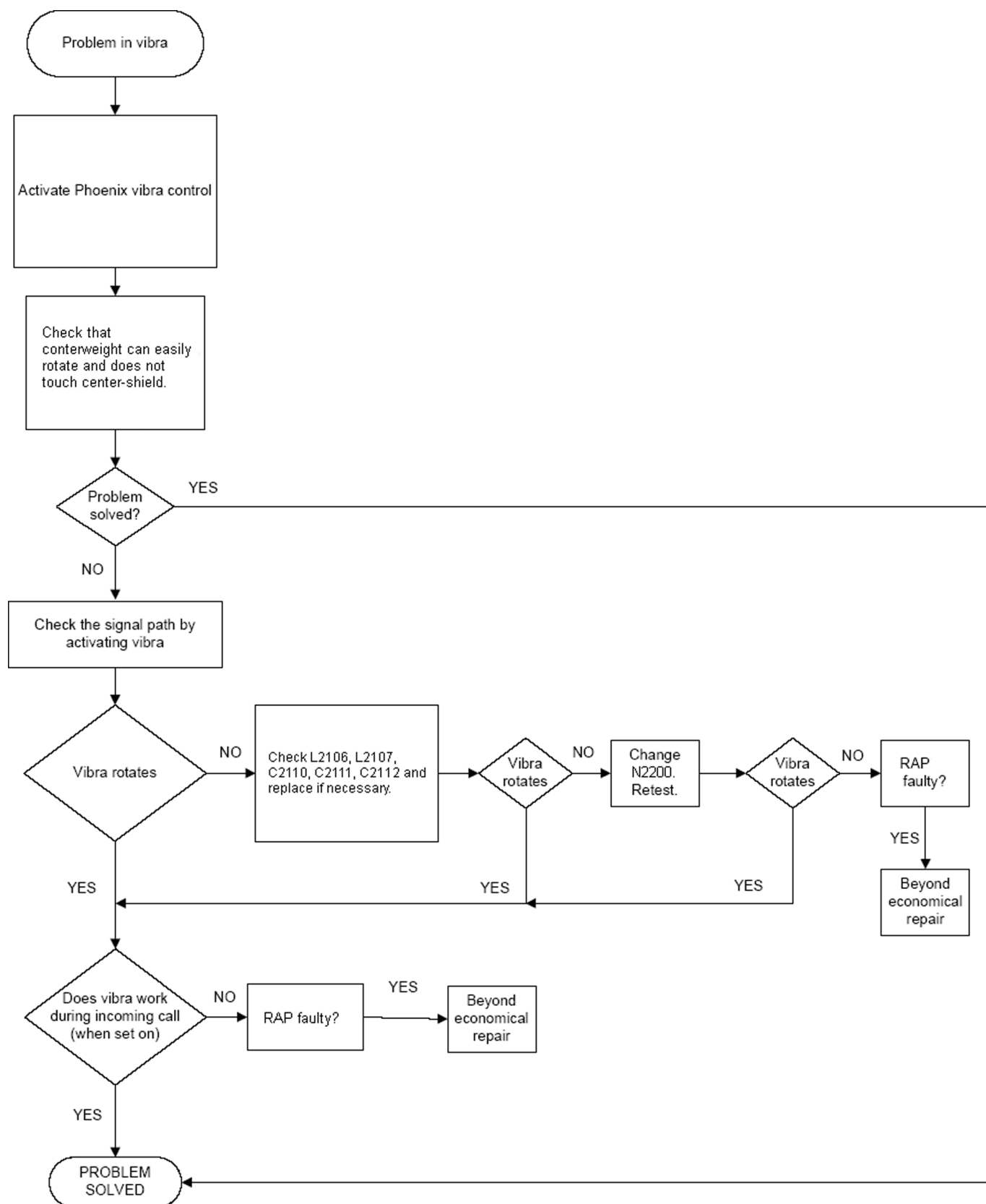
External earpiece troubleshooting

Troubleshooting flow



Vibra troubleshooting

Troubleshooting flow



■ Baseband manual tuning guide

Energy management calibration

Before you begin

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

Hardware setup:

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

Steps

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

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

8. Click **Calibrate**.

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

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

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-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.

7 — RF Troubleshooting and Manual Tuning Guide

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■ Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- 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 build around two RF ASICs: Rx ASIC and Tx ASIC. There are also two PAs (Power Amplifiers) on board, one for GSM and another for WCDMA.

The WCDMA PA needs variable supply voltage to work properly, and therefore there is a switched mode power supply component added to the PWB. 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 protection must be taken care of during repair (ground straps and ESD soldering irons). The RF ASICs, both PAs 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.

For additional RF troubleshooting instructions, see Appendix A. These instructions include descriptions/ instructions for RF self-tests as well as troubleshooting instructions for various fault cases.

■ 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 \(page 7-6\)](#), and for the same measurement in WCDMA, see [WCDMA RSSI measurement \(page 7-7\)](#).

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**.

See also

- [WCDMA Rx chain activation for manual measurement \(page 7-7\)](#)

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.

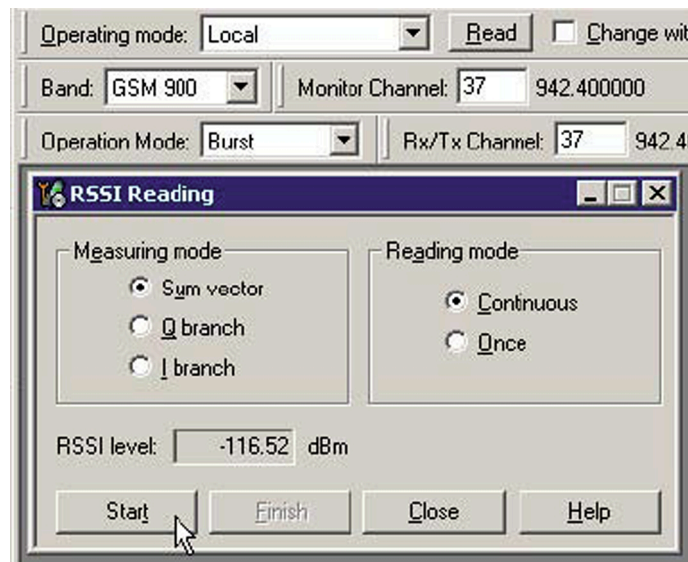


Figure 50 RSSI Reading window

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 (-90 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:

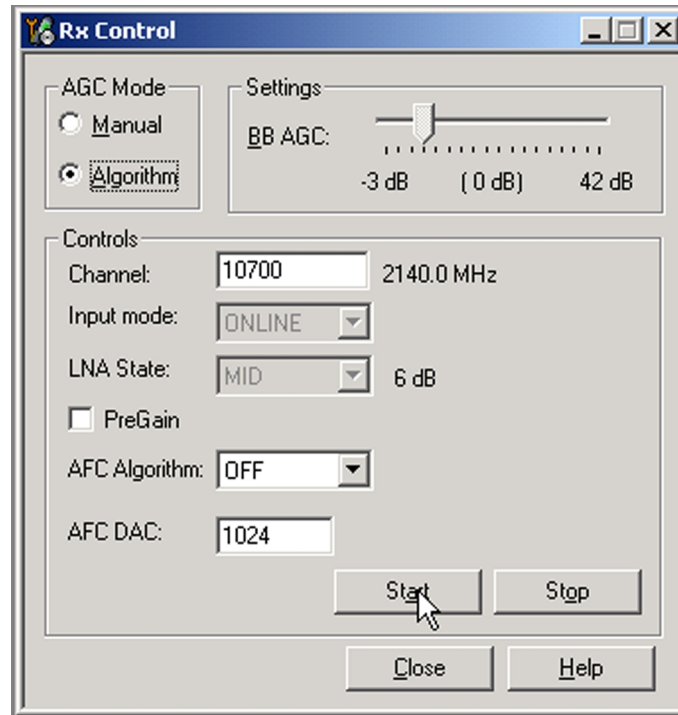


Figure 51 *Rx Control* window

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

Next action

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

Before you begin

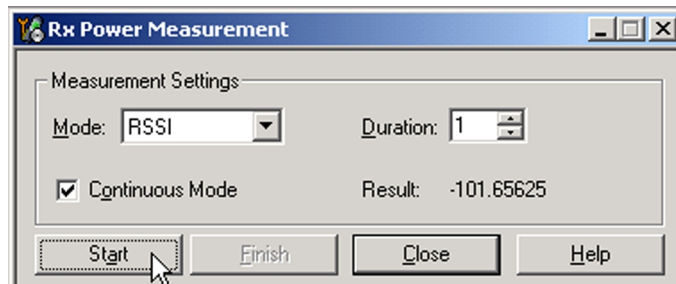
WCDMA Rx must be activated before RSSI can be measured. See [WCDMA Rx chain activation for manual measurement \(page 7–7\)](#).

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



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

■ 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 and WLAN* (* = if applicable)

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.

- Place the phone module to the test jig and start *Phoenix* service software.
- Initialize connection to the phone (with FPS-10 use FBUS when using a DAU-9S cable and a COMBOX driver).
- Choose **File**→**Open Product**→**xx-x*** (* = type designator of the phone) or **File**→**Scan Product**.
- From the toolbar, set **Operating mode** to **Local**.

Alternative steps

- EGSM900/GSM1800/GSM1900 troubleshooting
 - Choose **Testing**→**GSM**→**RF Controls**.
 - 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**)

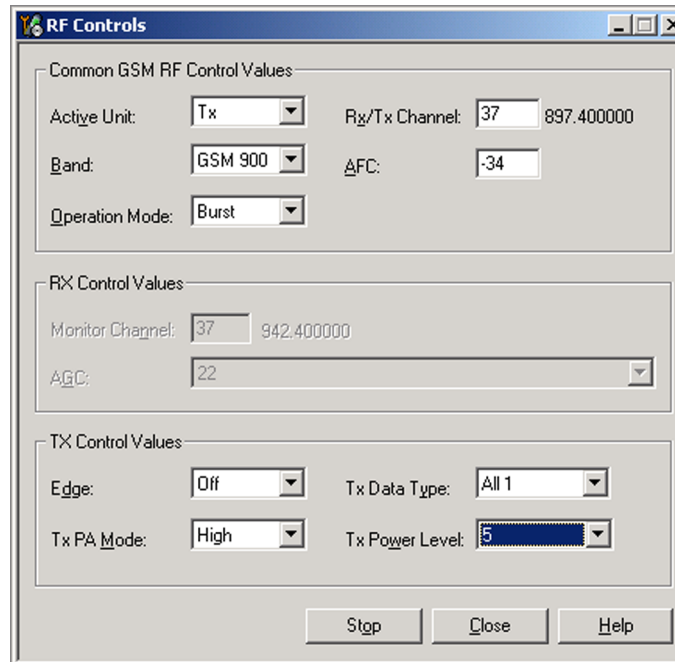


Figure 52 RF Controls window

- 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).

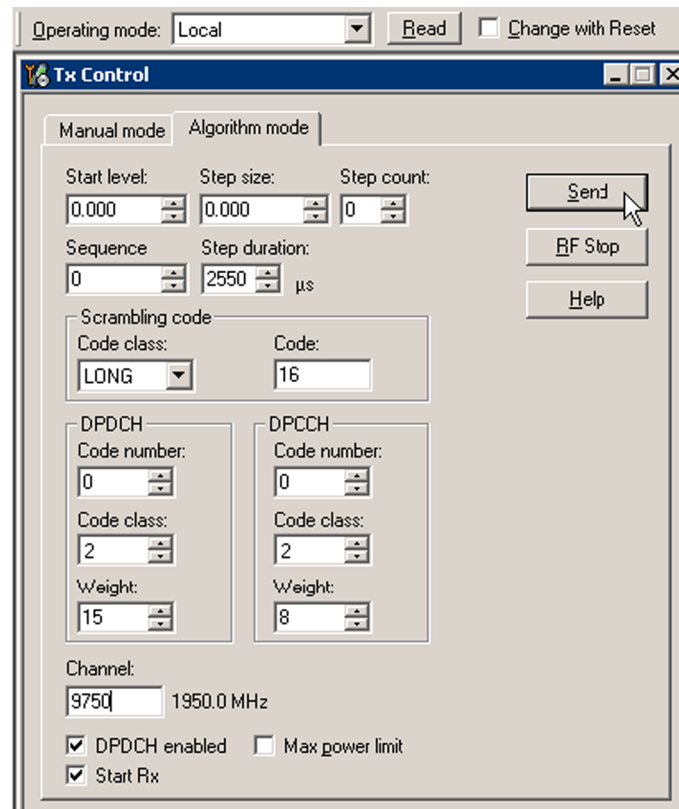


Figure 53 *Tx Control*/window

Next action

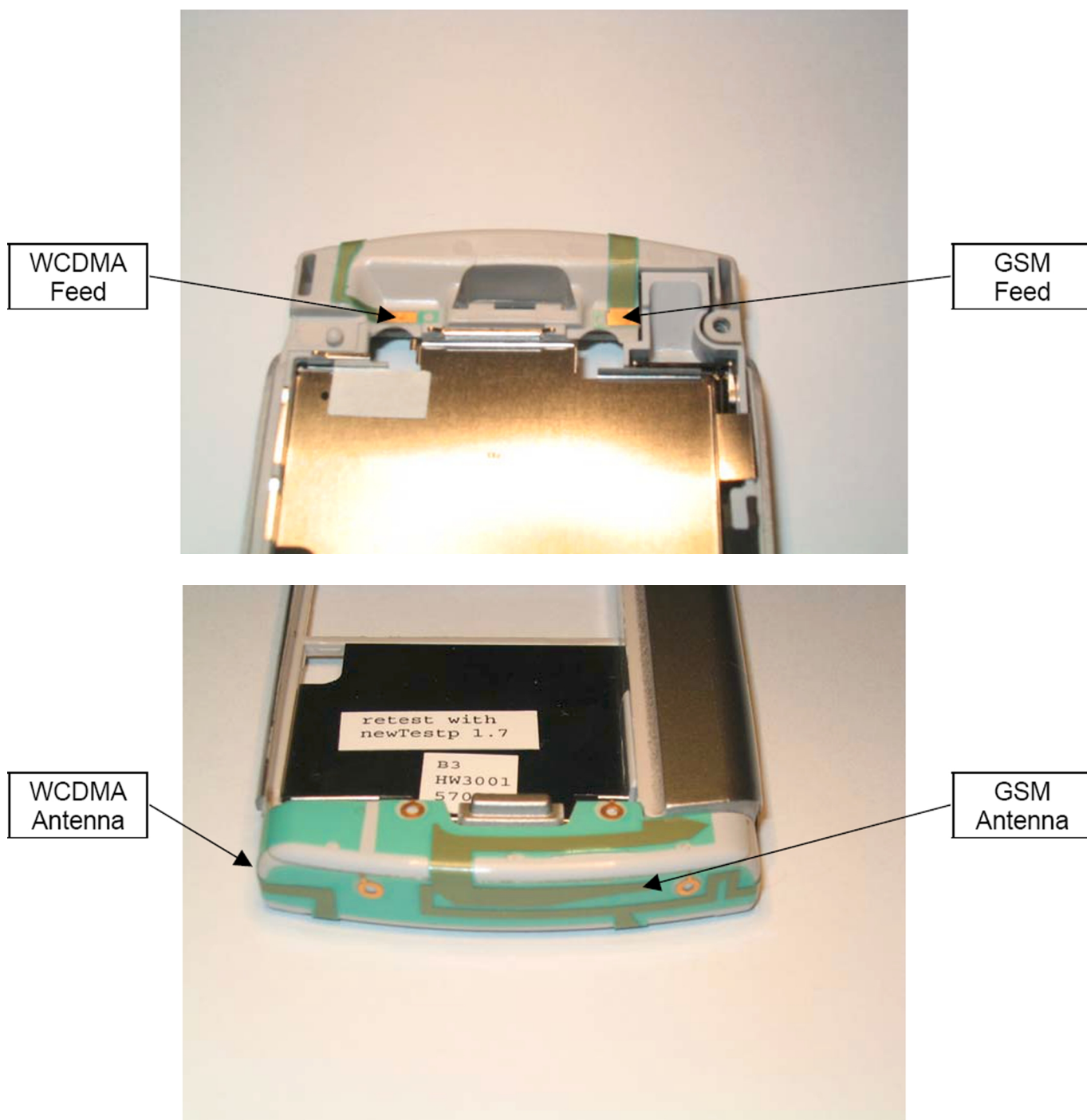
When settings are done, click **Send** to enable them.

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

Checking antenna functionality

The main antenna is an integral part of the RM-67 D-cover Assy.

Both antennas are monopoles with only one feed point. There is one monopole for WCDMA and another triple band monopole for GSM900/1800/1900.



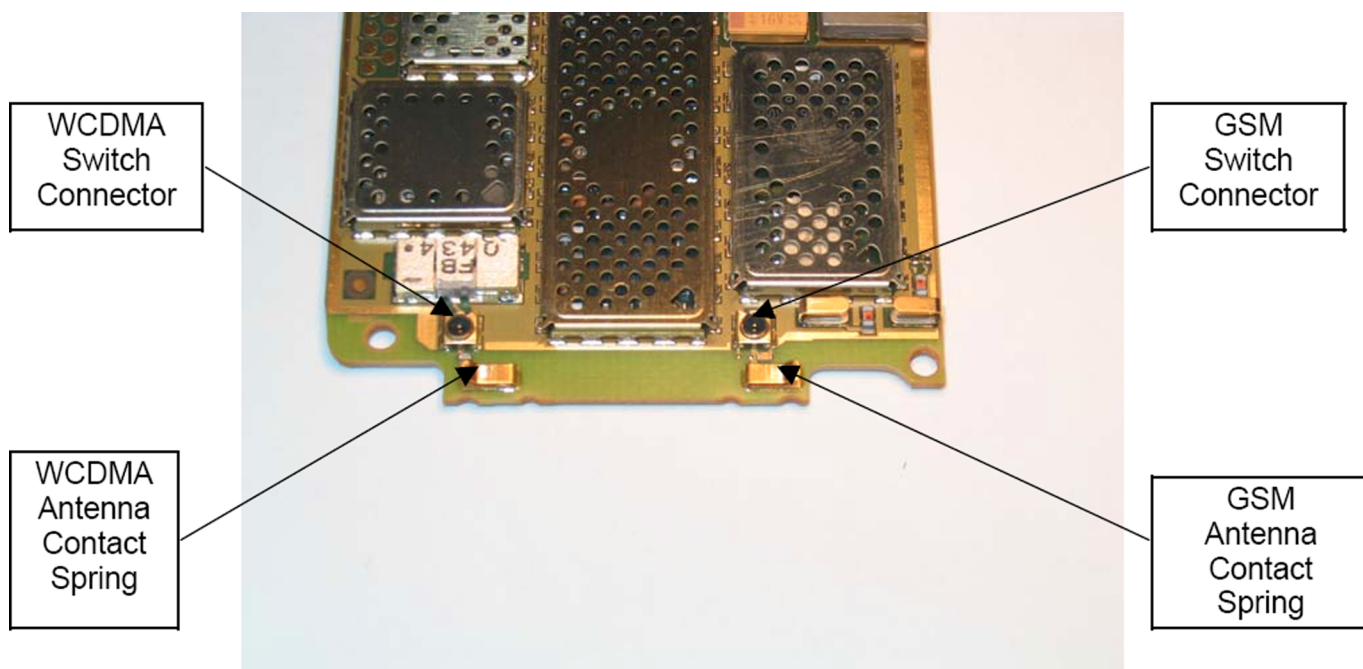


Figure 54 Antenna contacts on PWB

The contact springs should not be bend downwards towards the PWB to provide a good contact to the antenna.

BT antenna

The BT antenna is a traditional PIFA structure also integrated into the D-Cover Assy. Only the two feed points of the BT antenna are accessible.

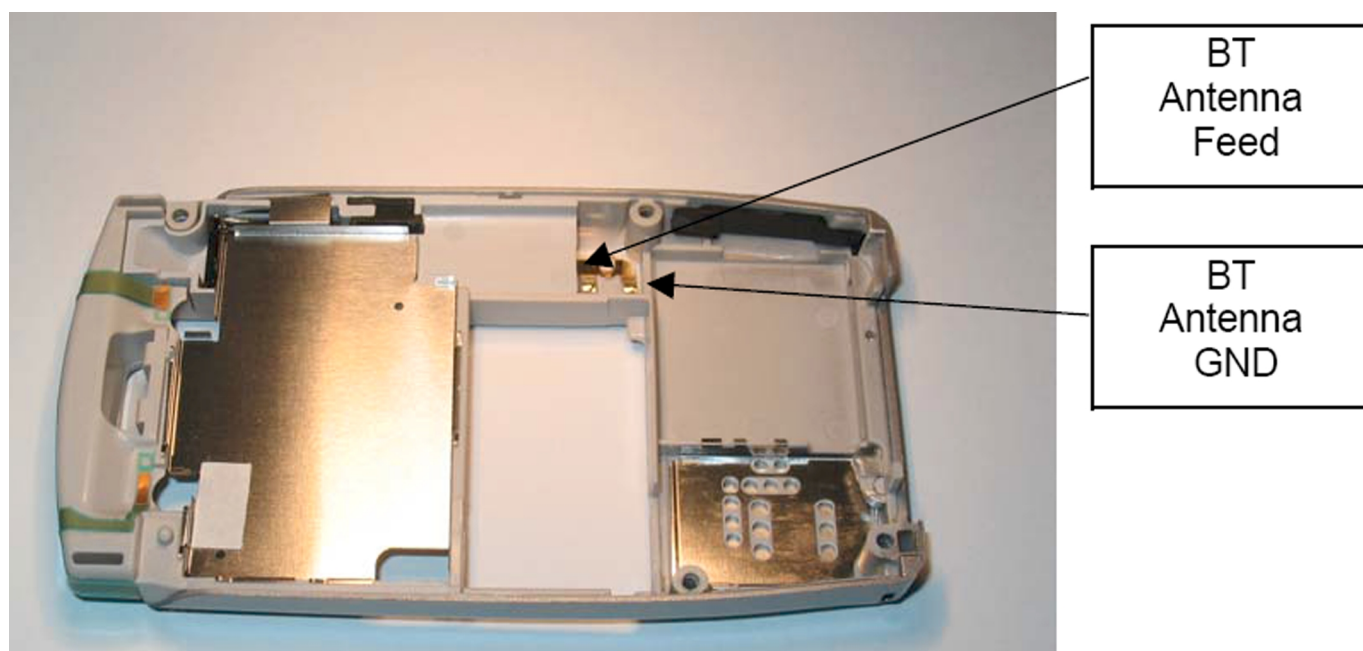


Figure 55 BT antenna

■ RF tunings

Introduction to RF tunings

Only perform RF tunings if:

- one or more of the RF components is changed
- A flash memory chip is changed or otherwise corrupted.

Caution: 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 results in 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, you have to be very careful and understand the measurement setup. The following table presents the RF attenuations of a product-specific module jig:

Band	Attenuation
GSM900	0.2 dB
GSM1800	0.4 dB
GSM1900	0.5 dB
WCDMA 2100	0.7 dB

RF autotuning

RF autotuning

Before you begin

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.

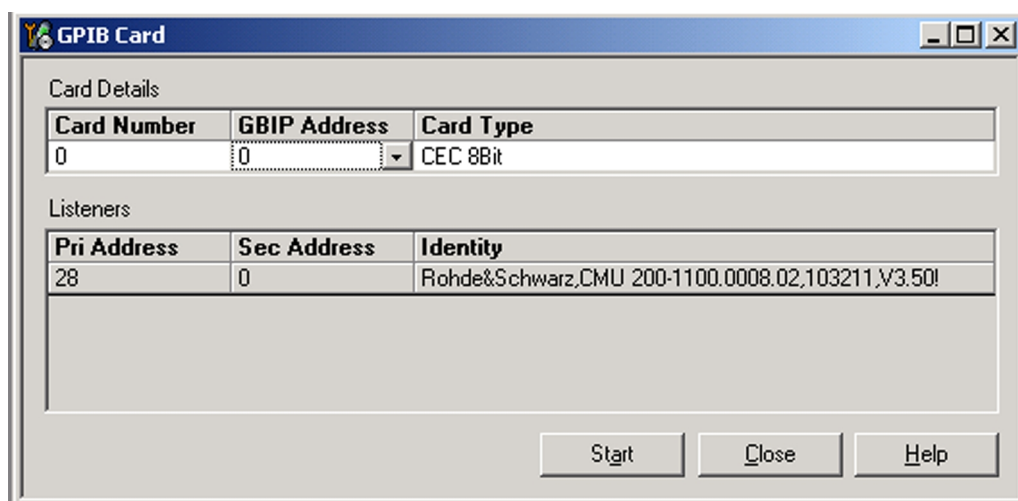
Autotuning covers all RF tunings that are needed to perform after RF component repairs.

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.

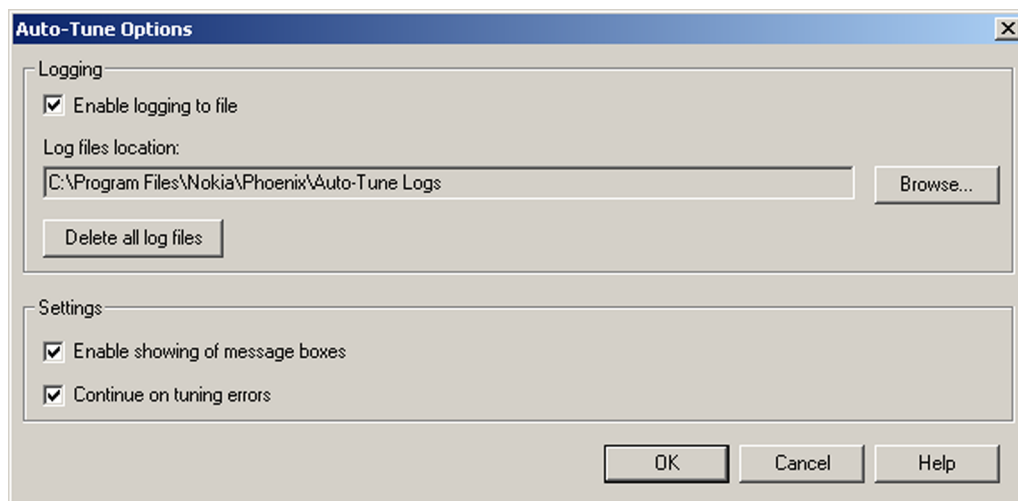
Steps

1. Connect the communication tester to the GPIB bus.
2. Start *Phoenix* service software.
3. Choose **Tools**→**Options**→**GPIB Card**.

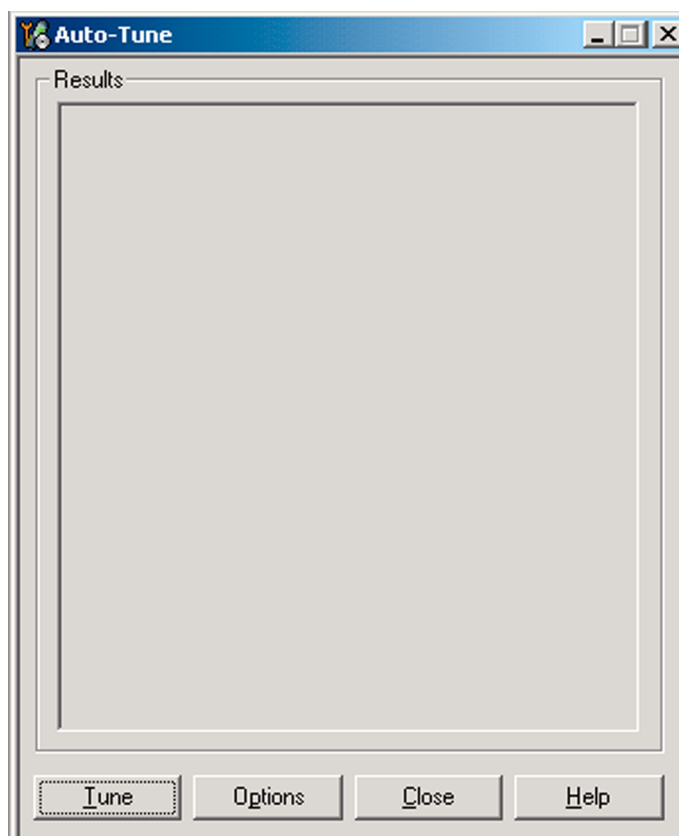
- From the **Card Type** drop-down menu, choose the GPIB card used, then click **Start**.
The name of the communication tester appears in the **Listeners** pane.



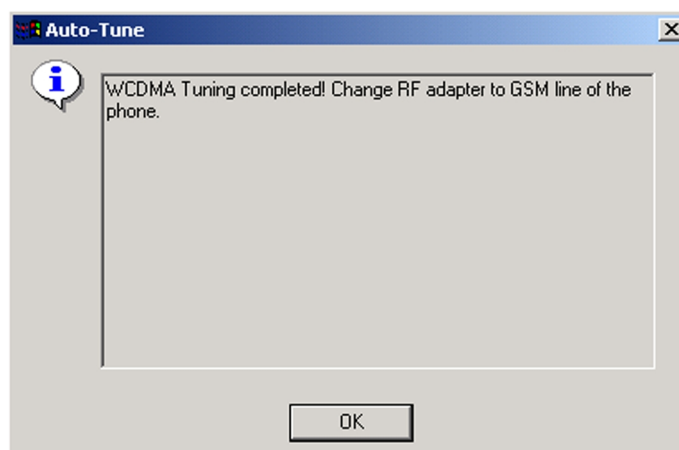
- To specify the cable loss from a module jig to the communication tester, choose **Set Loss** from the **Tuning** menu.
- In the *Set Loss* window, click the **Jig** tab, and select the right jig for the phone from the drop-down list. Alternatively, you can add a new jig by clicking **Add**, and selecting the desired jig from the list.
- Click the **Cable** tab and add the extra cable attenuation.
- To start autotuning, choose **Auto-Tune** from the **Tuning** menu.
- In the *Auto-Tune* window, click **Options**.
- In the *Auto-Tune options* window, ensure the **Enable showing of message boxes** check box is checked, and click **OK**.



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



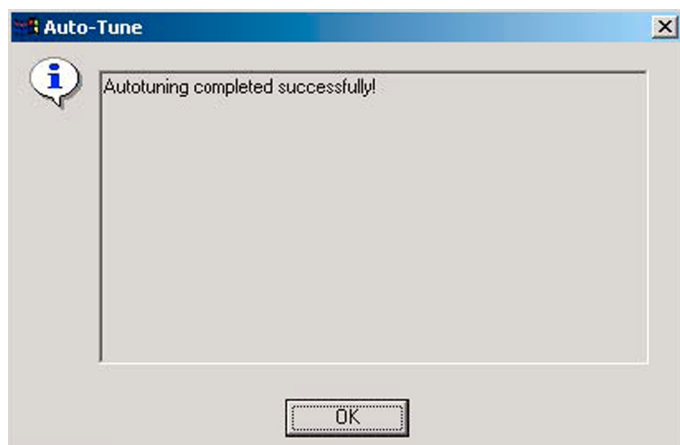
12. Change the phone RF adapter from WCDMA port to GSM port.



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

Results

Autotuning completed successfully! message appears.



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
Tx RF ASIC	RF Channel Filter Calibration, Tx IQ Tuning, Tx Power Level Tuning, Temperature Sensor Calibration, TX AGC & Power Detector, Tx Band Response Calibration, Tx LO Leakage
Rx RF ASIC	RF Channel Filter Calibration, Rx Calibration, Rx Band Filter Response Compensation, Rx AM Suppression, Rx AGC Alignment, Rx Band Response Calibration
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 or Rx chain after the 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, RX AM Suppression
Any component in the WCDMA Rx chain	Rx AGC Alignment, RX Band Response Calibration
VCTCX0	Rx Calibration (GSM850/GSM900 band)

System mode independent manual tunings

Rf channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for both GSM and WCDMA.

Table 11 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** drop-down menu, set mode to **Local**.
2. Choose **Tuning**→**Rf Channel Filter Calibration**.
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To end the tuning, click **Close**.

Results

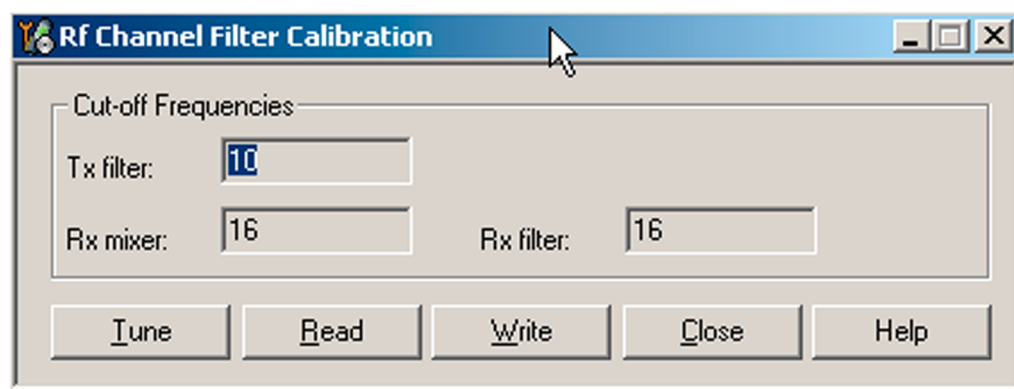


Figure 56 Rf channel filter calibration typical values

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 integrated into one of the device ASICs. The ASIC provides DC-voltage, which is temperature dependent.

Temperature sensor calibration is done in room temperature, in which offset caused by the ASIC variation and AD-converter are nullified.

The module is able to do this calibration by itself, no external equipment is needed.

The temperature of the module and components must be 23 +/-2 degrees.

Steps

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

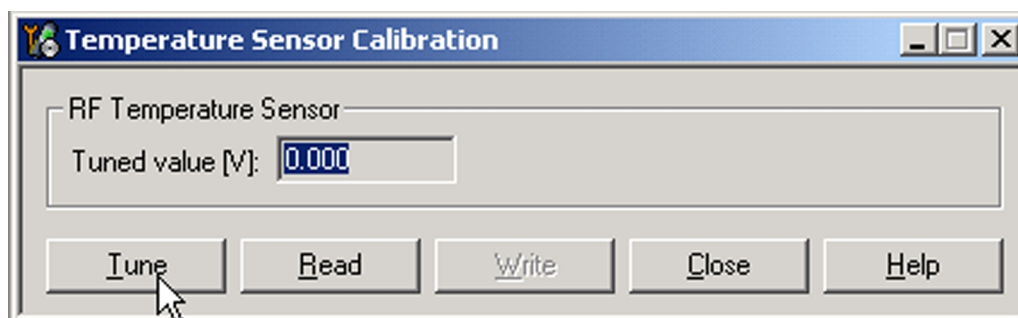


Table 12 Temperature sensor calibration tuning limits

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)

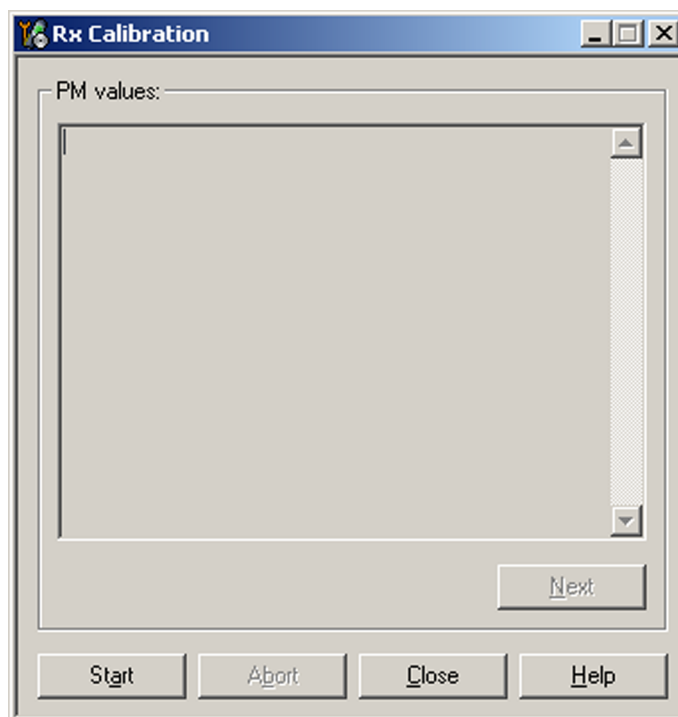
Context

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)

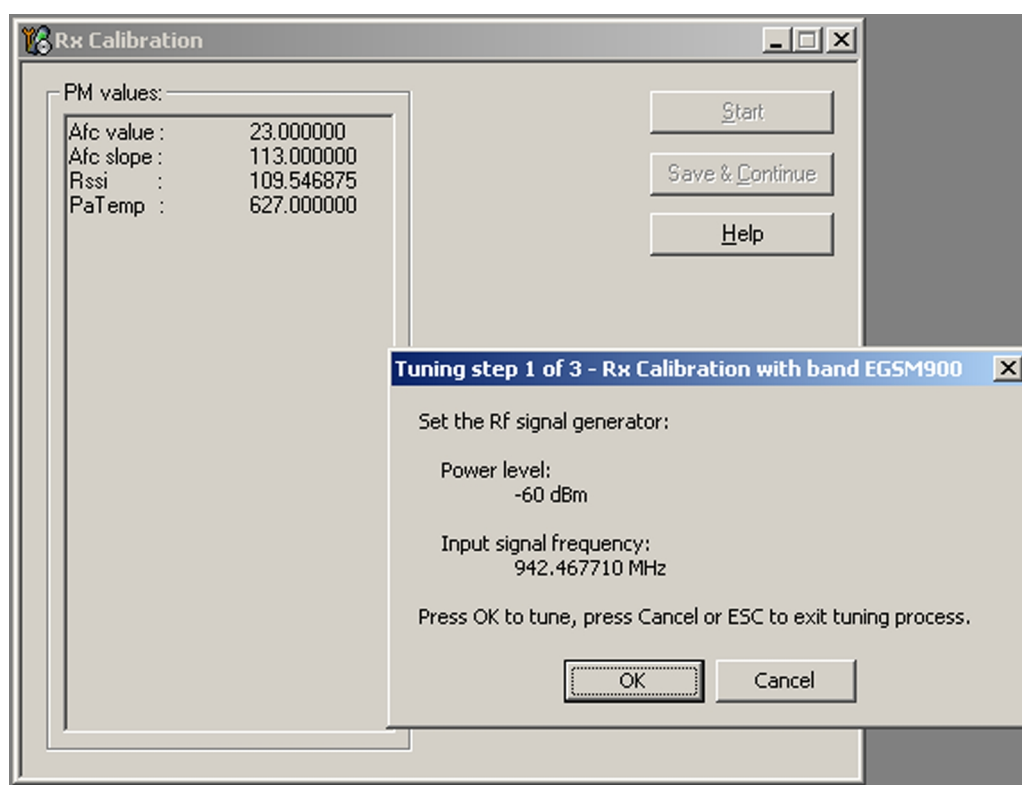
Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. Choose **File**→**Scan Product**.

4. From the **Operating mode** drop-down menu, set mode to **Local**.
5. Choose **Tuning**→**GSM**→**Rx Calibration**.
6. Click **Start**.



7. Connect the signal generator to the phone and set frequency and amplitude as instructed in the *Tuning step 1 of 3 - Rx Calibration with band EGSM900* pop-up window.
Note: The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!



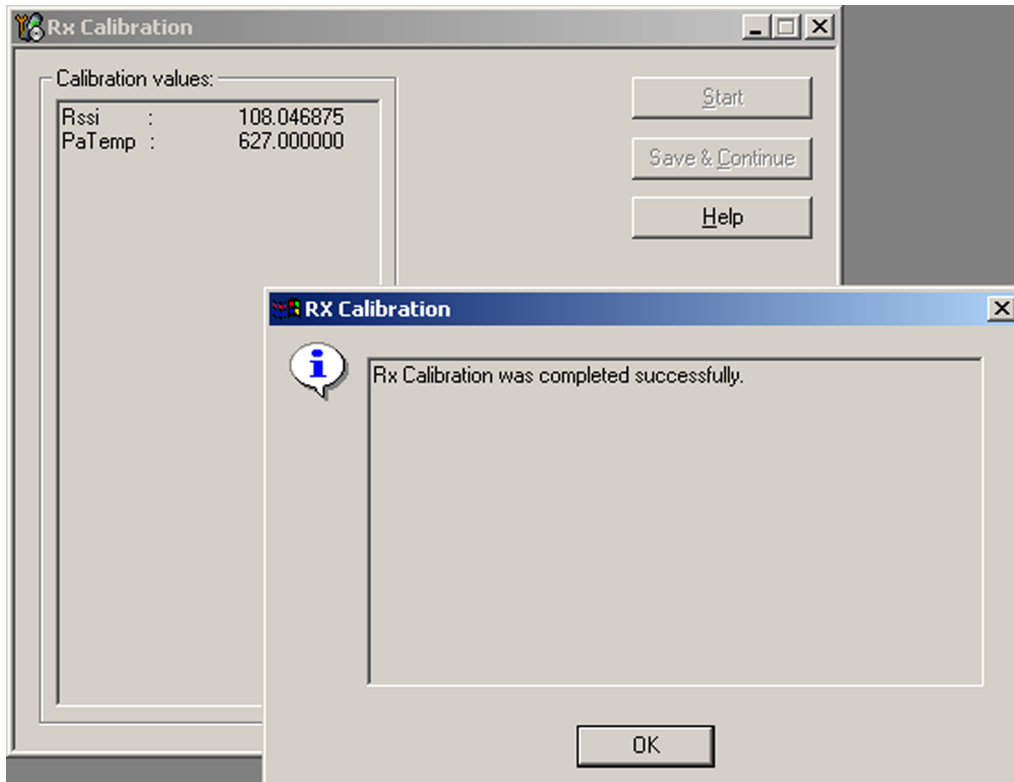
8. To perform the tuning, click **OK**.
9. Check that the tuning values are within the limits specified in the following table:

Table 13 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
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

10. When the first values have been written to the phone memory, click **Next** to change to the next band.
11. To finish the tuning, go through all bands, and click **Close**.

Results



Rx band filter response compensation (GSM)

Before you begin

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

Context

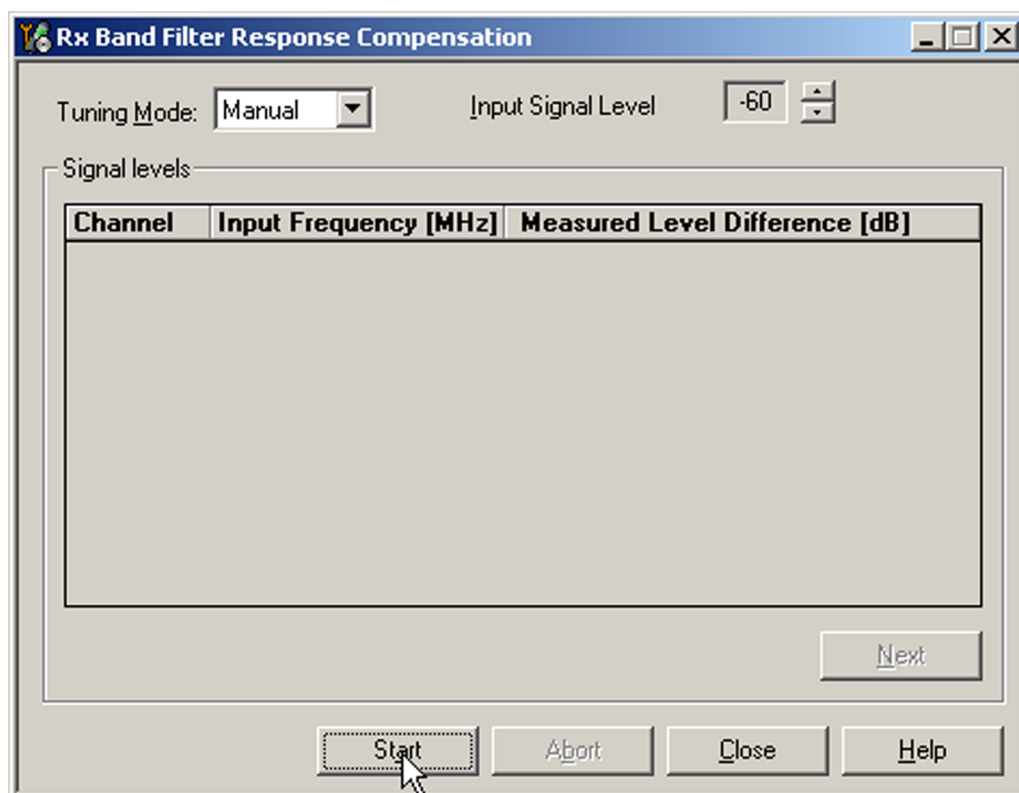
On each GSM Rx band, there is a band rejecting filter in front of an RF ASIC front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

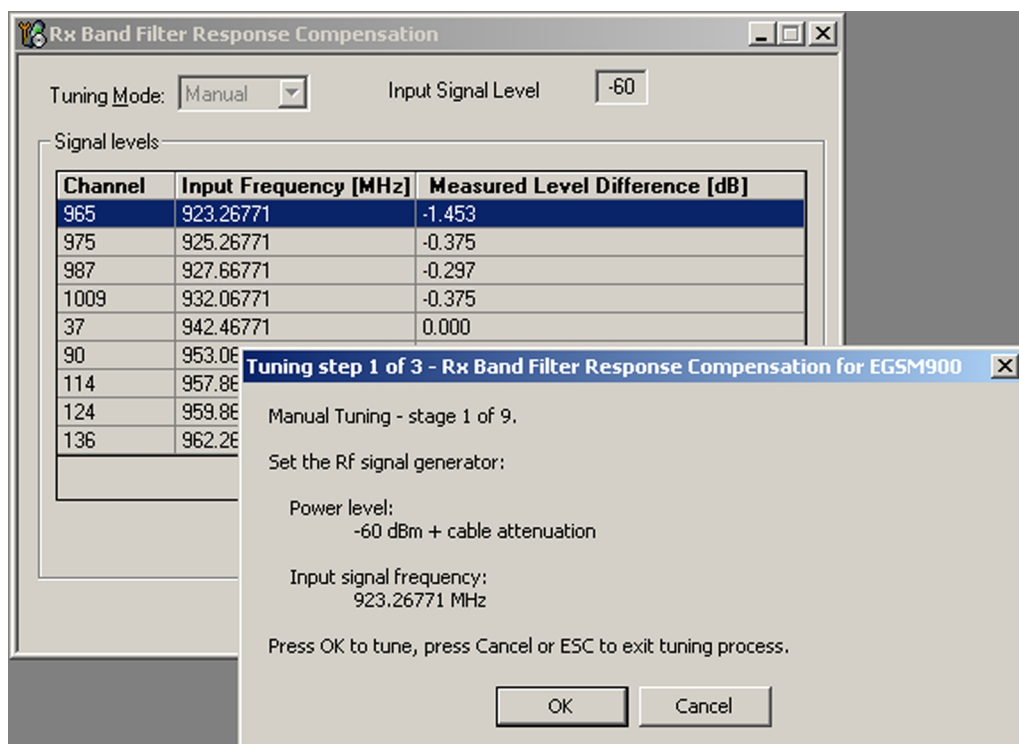
Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. Choose **File Scan Product**.
4. From the **Operating mode** drop-down menu, set mode to **Local**.
5. Select **GSM900** band.
6. Choose **Tuning**→**GSM**→**Rx Band Filter Response Compensation**.
7. From the *Tuning mode* drop-down menu, select **Manual**.

8. Click **Start**.



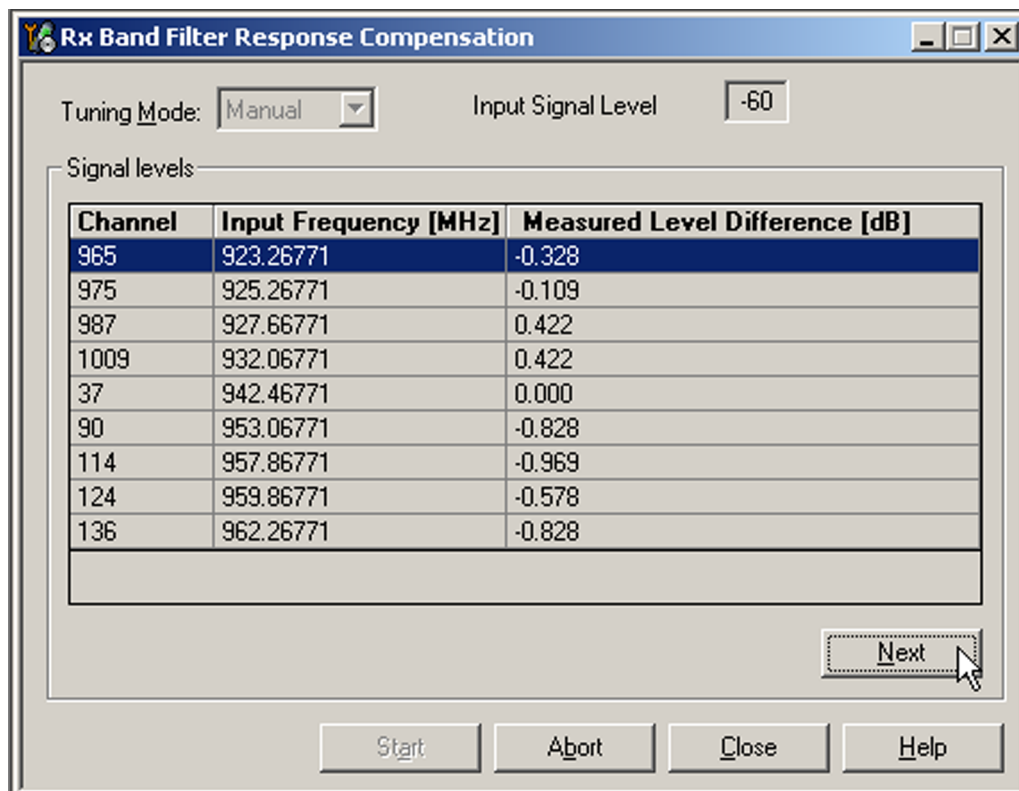
9. Connect the signal generator to the phone and set frequency and amplitude as instructed in the *Tuning step 1 of 3 - Rx Band Filter Response Compensation for EGSM900* pop-up window.



10. To perform the tuning, click **OK**.

11. Go through all 9 frequencies.

The following window appears, showing signal levels for the input frequencies:



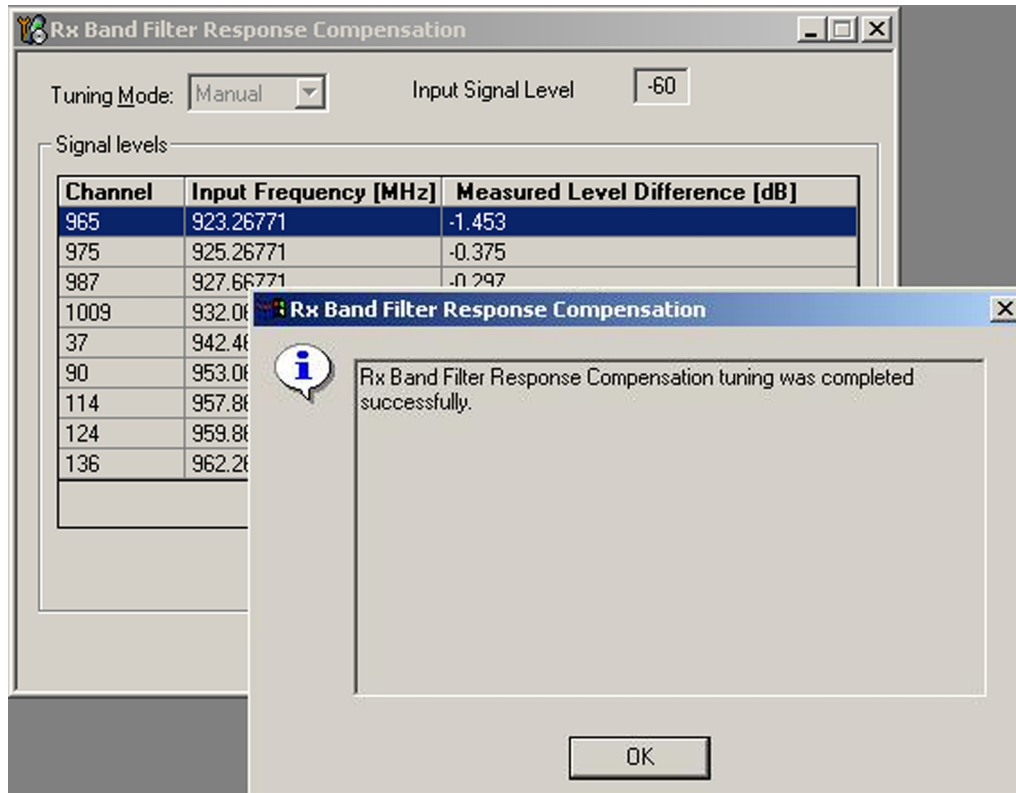
12. Check that the tuning values are within the limits specified in the following table:

	Min	Typ	Max	Unit
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	dB
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

	Min	Typ	Max	Unit
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
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

13. If the values are within the limits, click **Next** to continue with the next band.
14. Go through all bands, and click **Close** to end the tuning.

Results



Rx AM suppression (GSM)

Context

Rx AM suppression is used to tune the AM suppression capabilities of the GSM receiver.

AM suppression is related to the ability of the receiver to operate when there is a disturbing AM modulated signal near the received channel signal frequency.

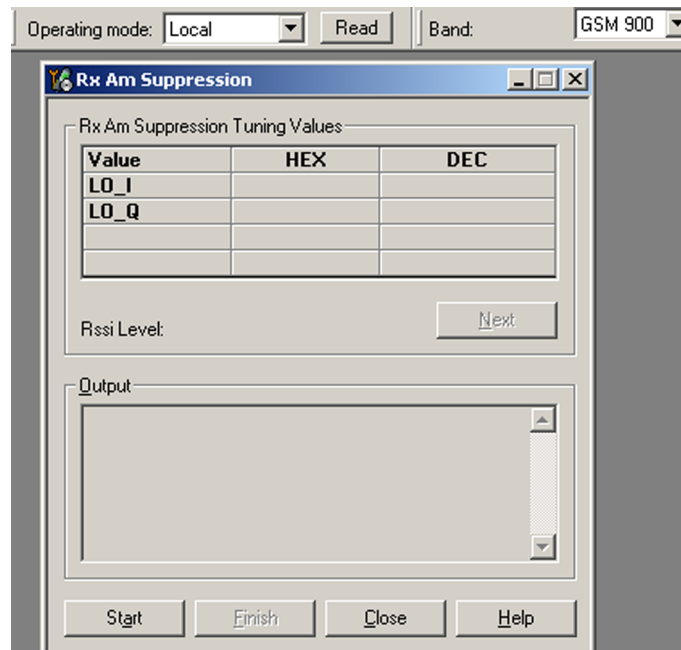
RFIC has a tunable compensation circuit which has an effect on the AM suppression ability.

In Rx AM suppression, a continuous signal accompanied with an AM modulated signal 10 MHz above the current channel is feed to the antenna. RFIC control word values are iterated until a minimum RSSI signal is found.

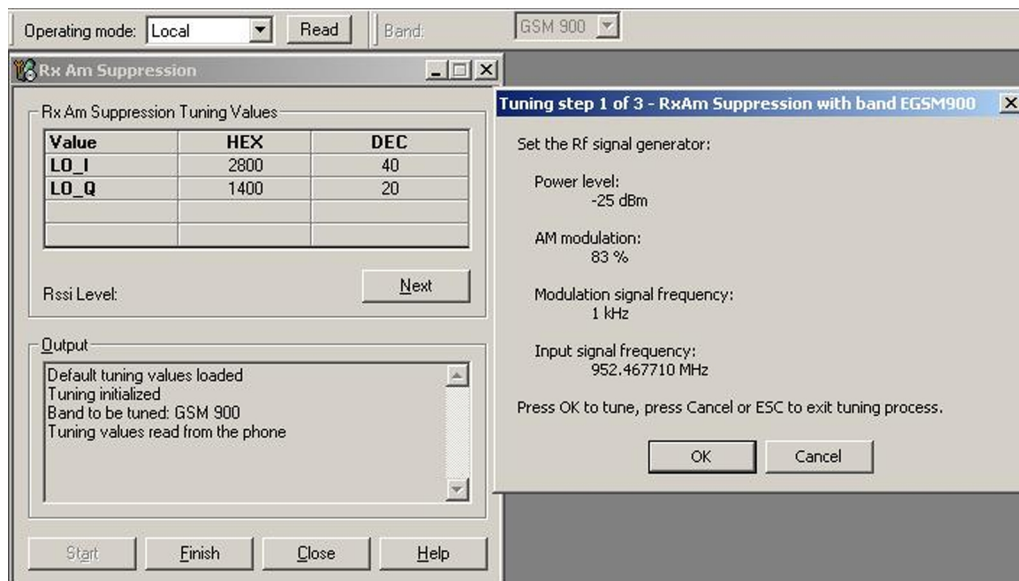
Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. Choose **File**→**Scan Product**.
4. From the drop-down menus, set **Operating mode** to **Local**, and select the **GSM900** band.
5. Choose **Tuning**→**GSM**→**Rx AM Suppression**.

6. Click **Start**.



7. Connect the signal generator to the phone according to the frequency and modulation parameters displayed in the pop-up window:

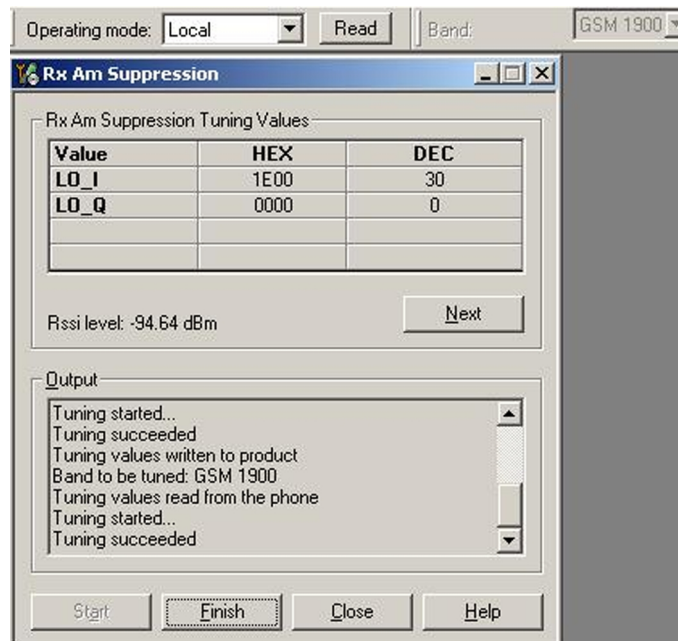


8. Click **OK**.
9. Check that RSSI level value is between the limits presented in the following table.

Table 14 RSSI level values

Band	Min	Max	Unit
GSM900	-115	-90	dB
GSM1800	-115	-85	dB
GSM1900	-115	-100	dB

10. To proceed to the next band, click **Next**.
11. Go through all bands.
12. To end the tuning, click **Finish** and **Close**.



GSM transmitter tunings

Tx IQ tuning (GSM)

Context

- The Tx path branches to I and Q signals at the RF I/Q modulator. Modulator and analog hardware located after the modulator 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. Start *Phoenix* service software.
2. Choose **File**→**Scan Product**.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning**→**GSM**→**Tx IQ Tuning**.
5. From the **Band** drop-down menu, choose **GSM900**.
6. In the *Tx IQ Tuning* window, set mode to **Automatic**.
7. Click **Start**.

Wait until the automatic tuning feature has finished and moved the sliders.

Values are written to the phone memory automatically.

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the following table.

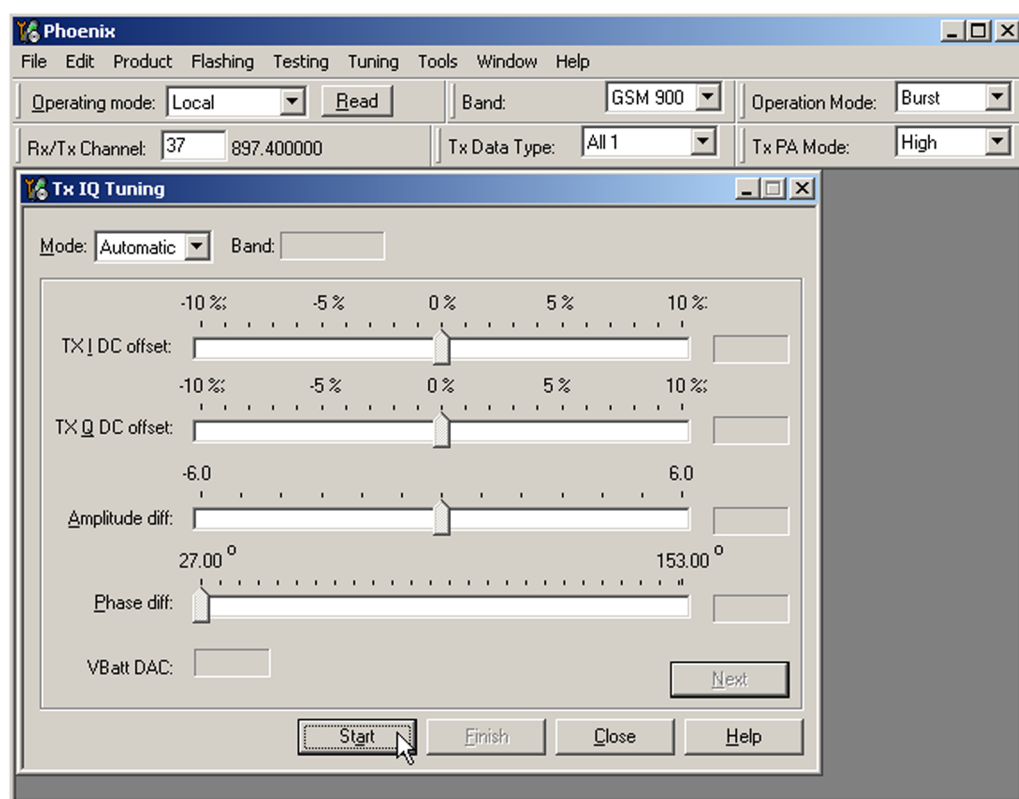
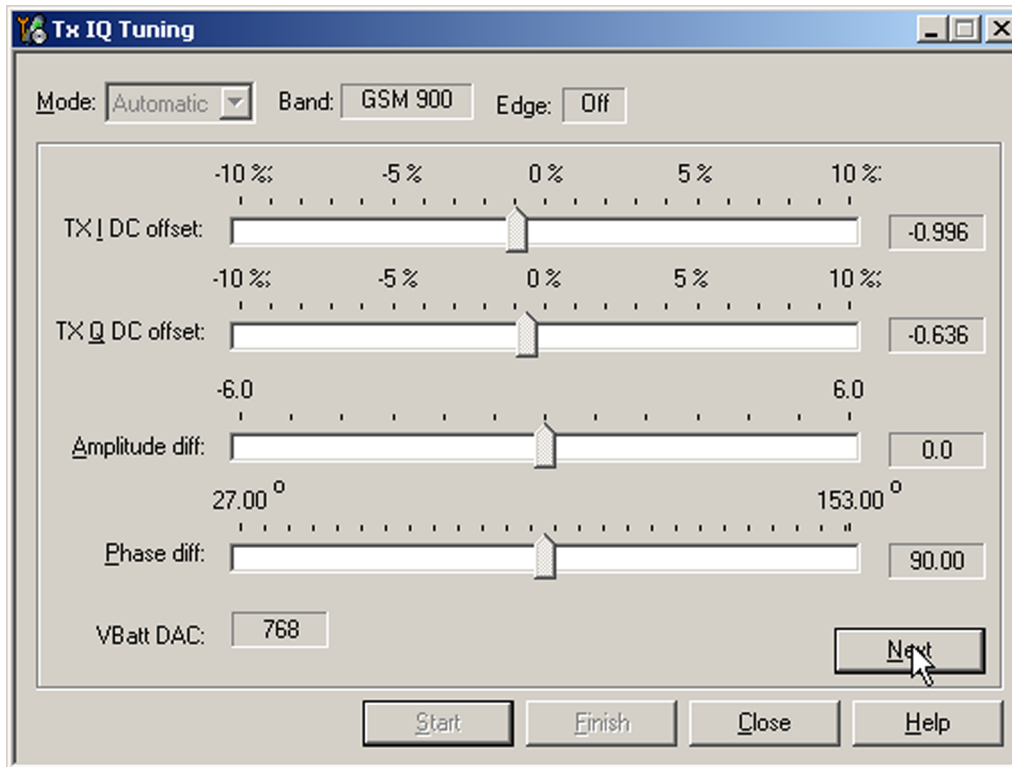


Table 15 Tx IQ tuning limits

	Min	Typ	Max	Unit
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	-0.5/0.5	6	dB
Ampl	-1	0	1	dB
Phase	95	100	110	dB

8. When the first values have been written to the phone memory, click **Next** to continue to the next band.



9. Go through all bands.
10. When all bands have been tuned, click **Finish**, and **Close** to end the tuning procedure.

Next action

If the tuning values are not within the limits specified in the "Tx IQ tuning limits" table, start the procedure again, and check the Tx IQ quality manually.

Tx power level tuning (GSM)

Context

Because of variations in the integrated circuit 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.

In dual or triple band phones, the power level tuning is made for both high and low PA Modes (Power Amplifier Mode) in the GSM900 band but only for high PA mode in GSM1800/GSM1900 bands

For EDGE transmission, the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and therefore 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 spectrum analyzer.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning**→**GSM**→**Tx Power Level Tuning**.

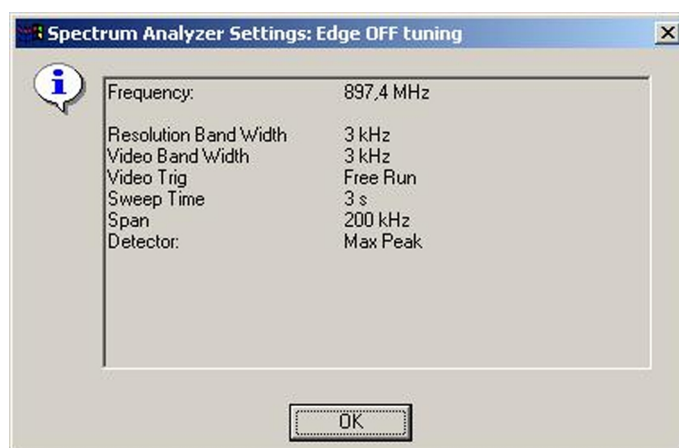
5. Click **Start**.

The current coefficients saved in the permanent memory (PM) of the terminal are shown.

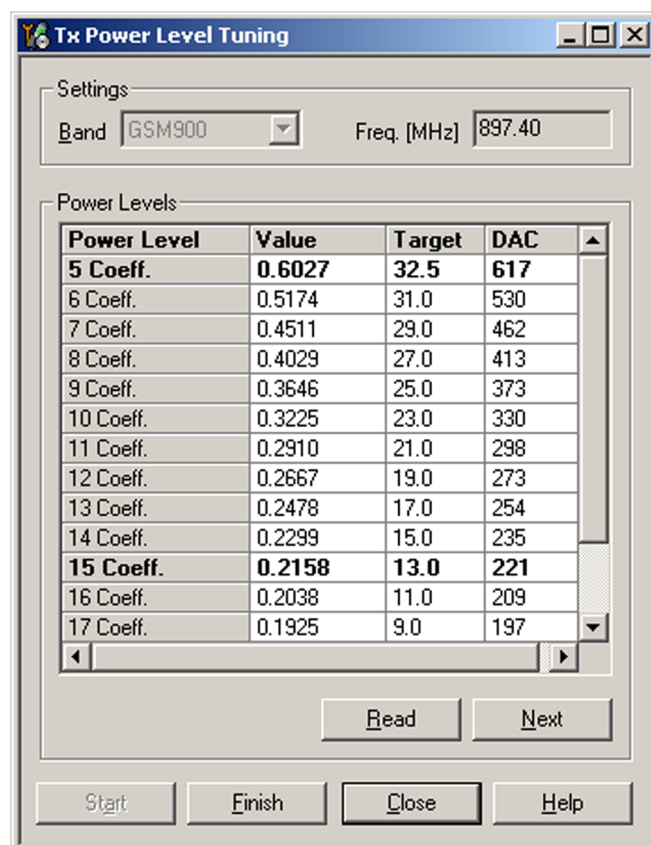
6. Set the spectrum analyzer for power level tuning:

Frequency	channel frequency (897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	200 kHz
Sweep time	3s
Trigger	Video triggering: Free run
Resolution BW	3 kHz
Video BW	3 kHz
Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

A power meter with a peak power detector can be also used. Remember to take the attenuations into account!



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



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

	Min	Typ	Max
GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	

	Min	Typ	Max
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

- If the values are within the limits, click **Next** to proceed to the next band, and click **Start**.
- Set **Edge** mode on and start tuning again. Change video averaging to 50.
- Tune EDGE power levels to the corresponding target power levels.
Only power levels **8**, **15** and **19** are tuned in GSM900, and **2**, **10** and **15** in GSM1800/1900.
- When the tuning is completed, close the *Tx Power Level Tuning* window.

WCDMA receiver tunings

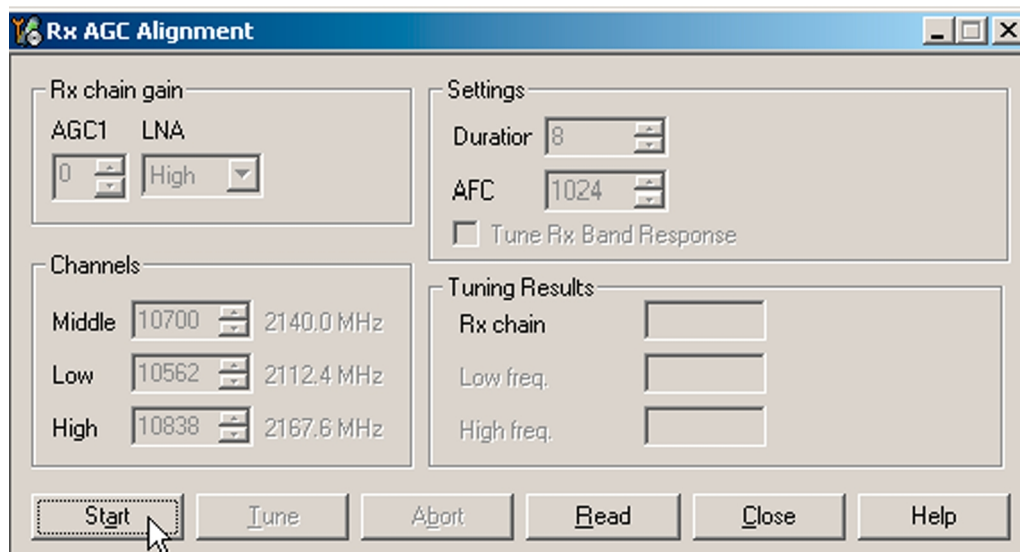
Rx AGC alignment (WCDMA)

Context

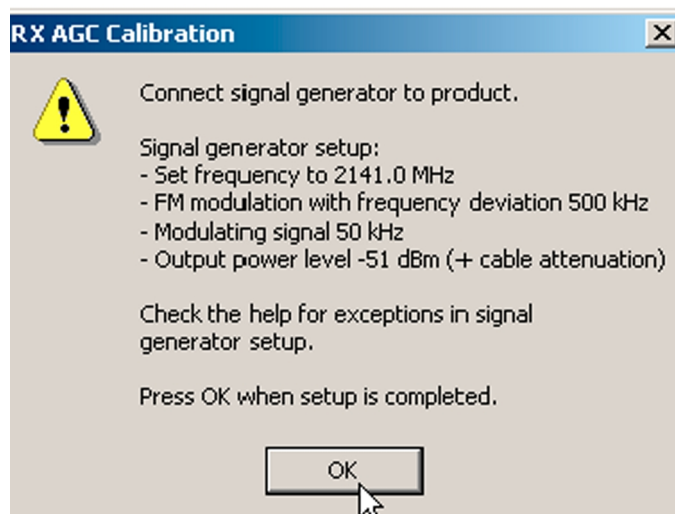
Rx AGC alignment tuning is used to find out the real gain values of the WCDMA Rx AGC system and converters.

Steps

- Connect the GSM connector of the module jig to a signal generator.
- From the **Operating mode** drop-down menu, set mode to **Local**.
- Choose **Tuning**→**WCDMA**→**Rx AGC Alignment**.
- Click **Start** and **Tune**.



5. Setup the signal generator to correspond the values in the *RX AGC Calibration* pop-up window and click **OK**.



Frequency:	2141MHz
Level:	-51 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

6. Check that the *Rx chain* value in *Tuning Results* is within the limits presented in the following table.

	Min	Typ	Max	Unit
RX chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7... 4.0	5	
High freq	-5	-0.7... 4.0	5	

- i If the Rx gain is acceptable, click **Yes** to save the results to the phone.

7. To close the *Rx AGC Alignment* window, click **Close**.

Rx band response calibration (WCDMA)

Context

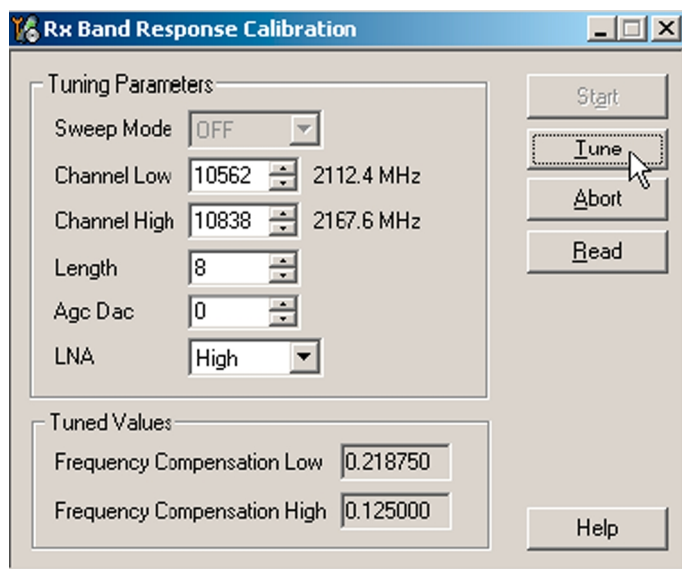
There is a band rejecting filter for each WCDMA Rx band between the front end LNA and the mixer of an RF ASIC. The amplitude ripple caused by this filter causes ripple to the RSSI measurement and therefore Rx band response calibration is needed.

The Rx band response calibration can be done in two different ways. If the signal generator used supports frequency sweep table, the calibration can be done as a part of the Rx calibration. If there is no support for the frequency sweep table, it is possible to calibrate all necessary frequencies one by one.

The first set of steps shows how to perform the calibration without the signal generator sweep feature. The alternative steps give instructions how to perform the calibration if the signal generator supports frequency sweeps, and the calibration can be performed within the Rx AGC calibration.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning**→**WCDMA**→**Rx Band Response Calibration**.
3. Click **Start** and **Tune**.



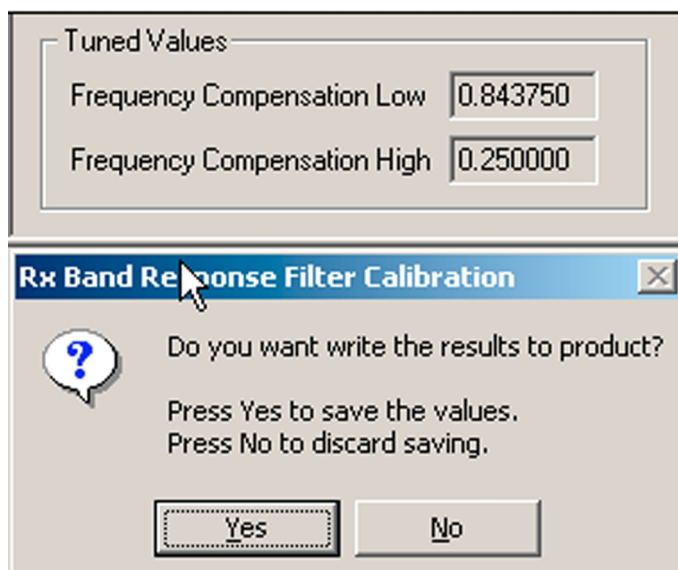
4. Setup the signal generator to correspond the values in the pop-up window:

Frequency:	2113.4 MHz
Level:	-48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

5. Click **OK**.
6. Change frequency to *2166.6 MHz* and click **OK**.
7. Check that the tuned values are within the limits specified in the following table :

	Min	Max
Frequency compensation low	-5	+5
Frequency compensation high	-5	+5

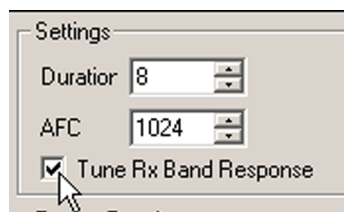
- i If the values are OK, click **Yes** to save the values.



8. Close the tuning window.

Alternative steps

- From the **Operating mode** drop-down menu, set mode to **Local**.
- Choose **Tuning**→**WCDMA**→**Rx AGC Alignment**.
- Click **Start**.
- Check the **Tune Rx Band Response** check box and click **Tune**.



- Setup the signal generator according to the values in the pop-up window:

Frequency list:	2113.4 MHz, 2141 MHz and 2166.6 MHz
Dwell time:	2 ms
Sweep control:	Automatic continuous sweep
Level:	-48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

- Click **OK**.
- Check that the **Rx chain**, **Low freq.** and **High freq.** values in the *Tuning Results* window are within the limits presented in the following table.

Tuning Results	
Rx chain	-7.921875
Low freq.	0.593750
High freq.	0.218750

	Min	Typ	Max	Unit
Rx chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7...4.0	5	
High freq	-5	-0.7...4.0	5	

- If the Rx gain is acceptable, click **Yes** to save the results to the phone.
- To end the calibration, click **Close**.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

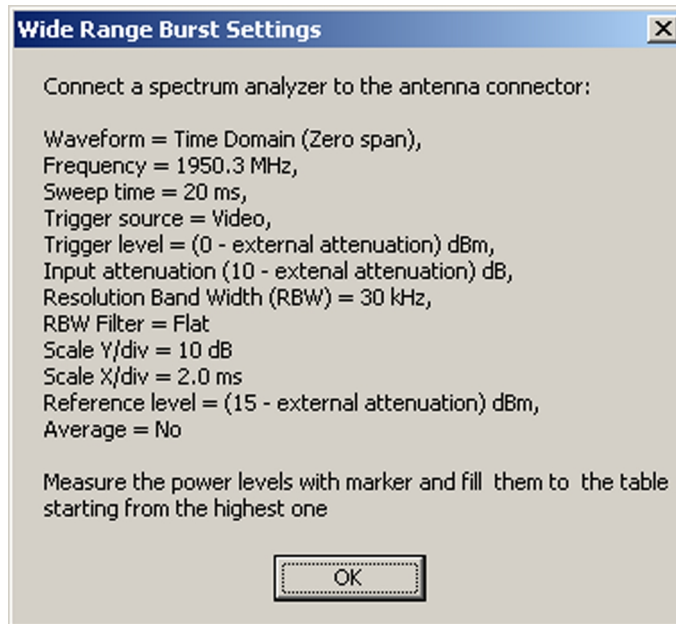
- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

There are two ways to perform the tuning. For an alternative method, see [Alternative steps \(page 7-43\)](#).

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:

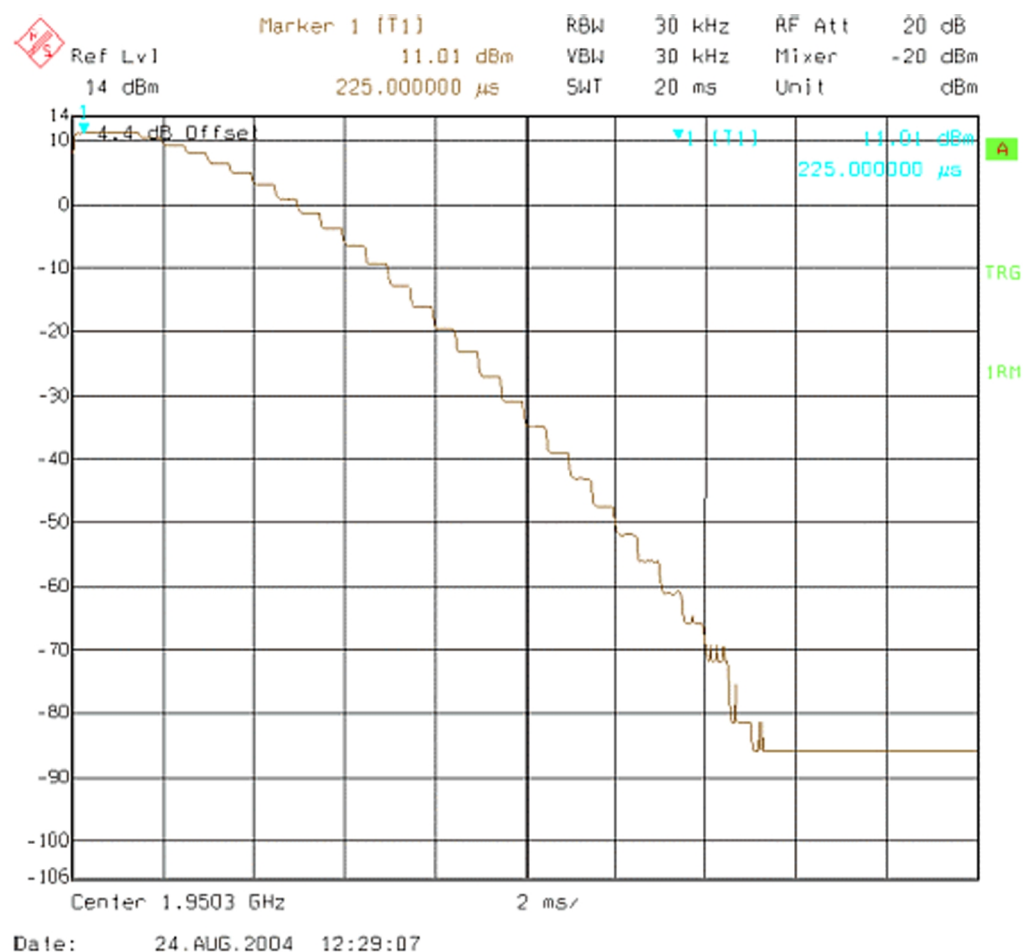


6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker.

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.



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

The TX AGC & Power Detector window contains three main tables for data entry:

Index	dBm	DAC
1	11.05	1023
2	7.9500	998
3	7.9500	973
4	7.2700	948
5	5.9700	923
6	4.4400	898
7	2.6800	873
8	0.6600	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

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

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		

Buttons: Tune, Calculate, Read, Write, Start, Finish, Open, Save, Options, Close, Help.

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:

High Power Burst 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 - external attenuation) dB,
- Resolution Band Width(RBW) = 5 MHz,
- RBW Filter = flat
- Scale Y/div = 5 dB
- 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.

OK

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.

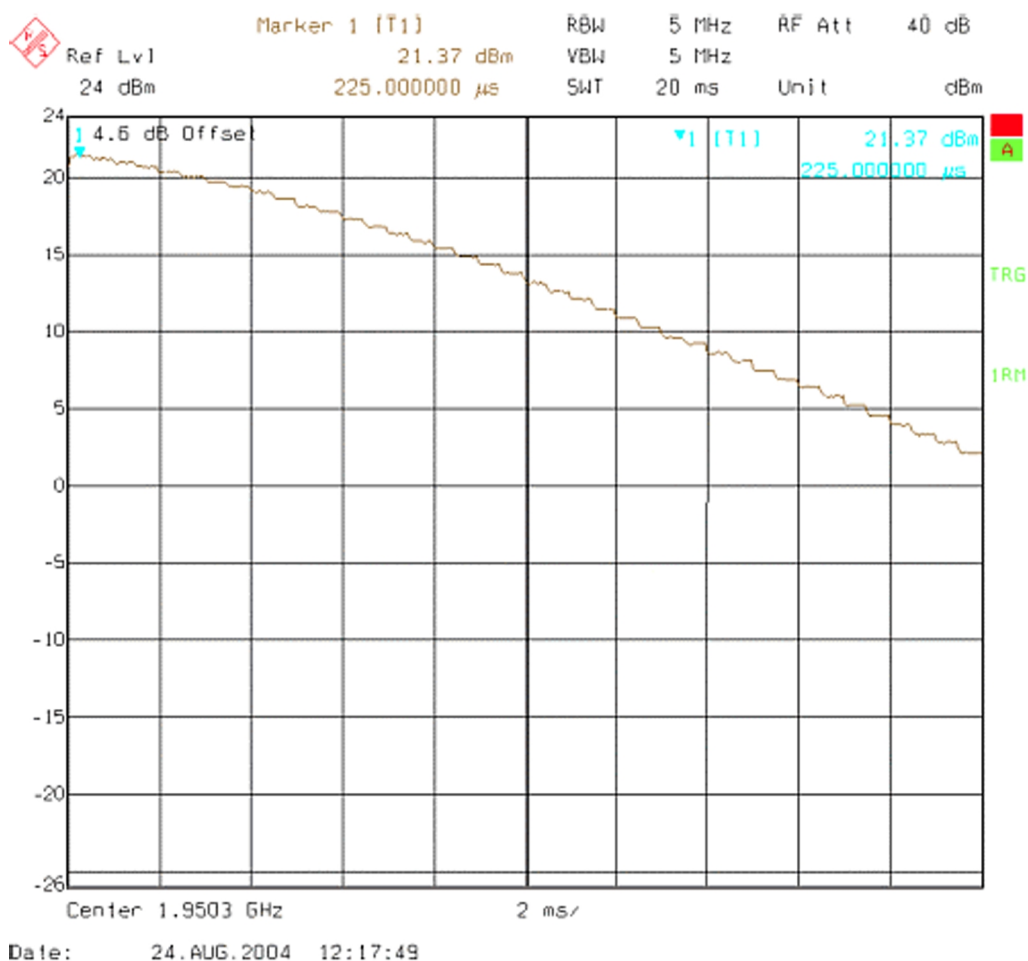


Figure 57 High burst measurement

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.

The screenshot shows the 'Tx Control' window with the 'Algorithm mode' tab selected. The 'Manual mode' tab is also visible. The settings are as follows:

- Start level:** 21.000
- 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
- Checkboxes:**
 - ☒ DPDCH enabled
 - ☒ Max power limit
 - ☒ Start Rx

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 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**.

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)

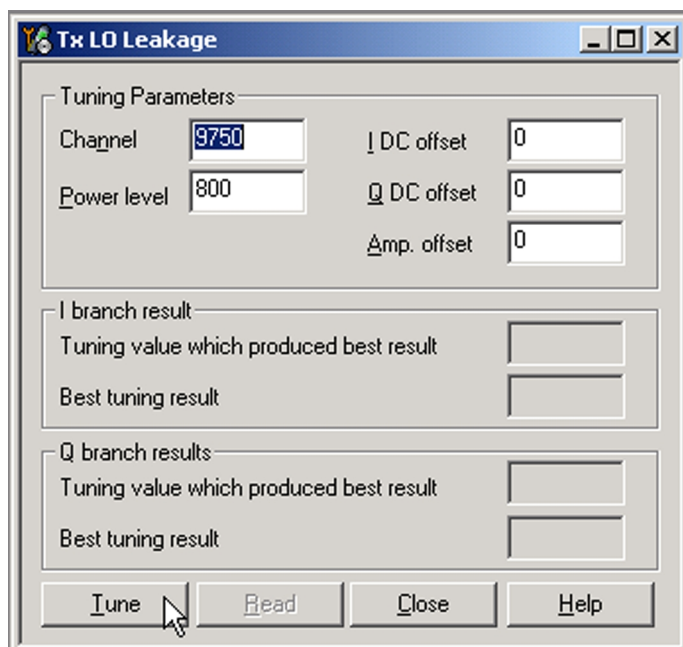
Context

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**.



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

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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.

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.

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.

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

Terms

<i>Dynamic range</i>	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
<i>Exposure time</i>	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.
<i>Flicker</i>	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
<i>Noise</i>	Variation of response between pixels with same level of input illumination.
<i>Resolution</i>	Usually the amount of pixels in the camera sensor. In some occasions the term resolution is used for describing the sharpness of the images.
<i>Sensitivity</i>	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.

<i>Sharpness</i>	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.
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■ 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.

Distance to target

The lens in the module is specified to operate satisfactorily from 64 cm to infinite distance of scene objects. In practice, the operation is such that close objects may be noticed to get more blurred when distance to them is shorter than 64 cm. The lack of sharpness is first visible in full resolution images. If observing just the viewfinder, even very close objects may seem to appear sharp. This is normal; do not change the camera module.



Figure 58 Blurred image. Target too close.

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 $\frac{1}{4}$ 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.

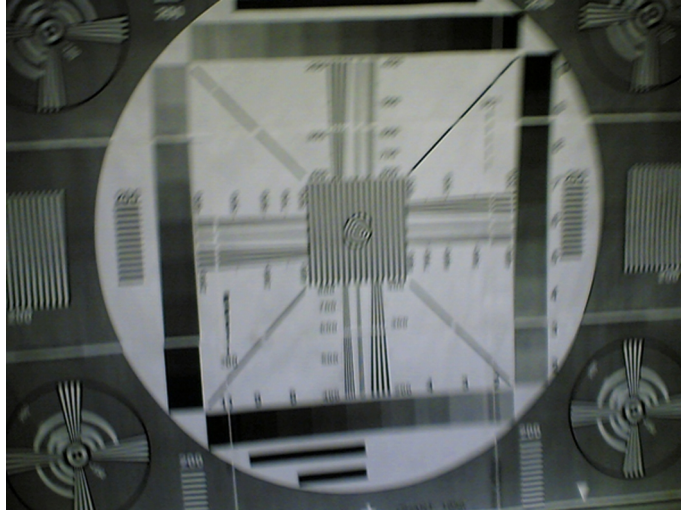


Figure 59 Blurring caused by shaking hands

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 usually cannot be avoided. 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 60 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 61 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.

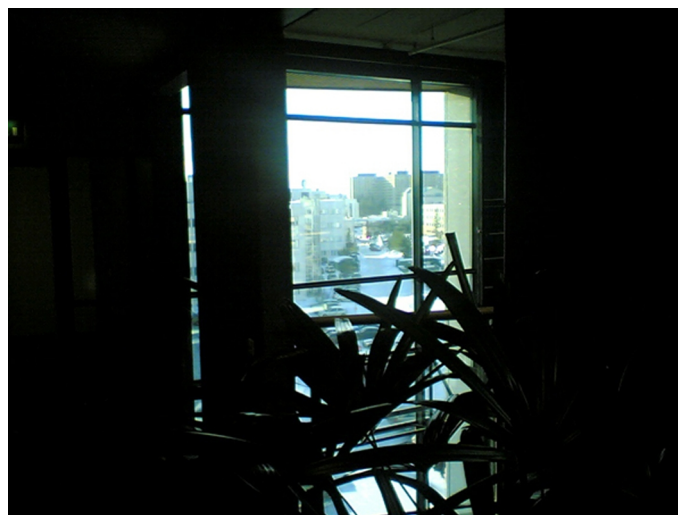


Figure 62 Image taken against light

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. This is normal behaviour; do not change the camera module.

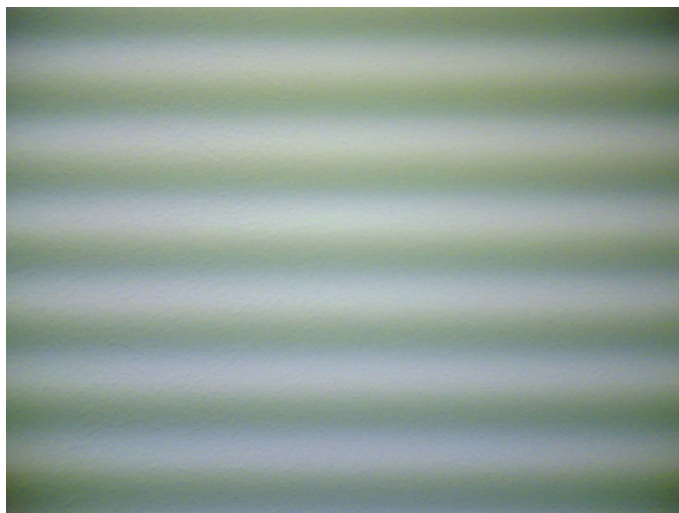


Figure 63 Flicker in an image; object illuminated by strong fluorescent light

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.

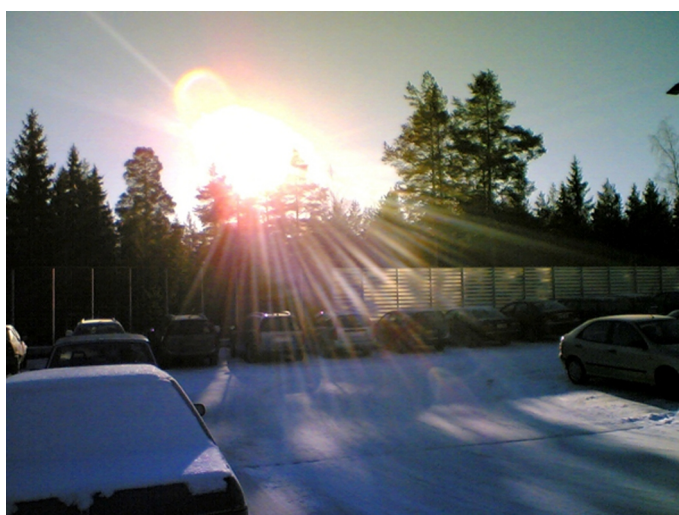


Figure 64 A lens reflection effect caused by sunshine

Examples of good quality images



Figure 65 Good image taken indoors



Figure 66 Good image taken outdoors

■ Back camera (Mirage 2MP camera) troubleshooting

Back 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 16 Camera specifications

Area	Item	Type
Sensor	Maximum Resolution	1600 X 1200 (2MP)
	Color filtering type	Bayer pattern
	Optical format	1/3.2
	Pixel size	2.8um X 2.8um
	Active Pixel Array Area	4.73mm X 3.52mm
	Maximum Frame Rate	15 fps (at maximum resolution), 30 fps (at 800x600)
	Supply Voltage (Analog/Digital/IO)	2.5V-3.1V/1.7V-1.95V/1.7V-3.1V
	Micro Lenses	Yes
Lens	Number and material of lenses	4(1G3P) 1 spherical glass lens 3 pieces of aspherical plastic lens
	Coating	AR coating on all lens surfaces
	F number	3.2
	Horizontal viewing angle [degrees]	51 degrees
	Vertical viewing angle [degrees]	38 degrees
	Diagonal viewing angle [degrees]	61 degrees
	Focal length [mm]	4.68mm
	Focus range	40cm to infinity
	Focusing type: fixed / auto focus	Fixed
Interfacing:	Image data bus	CCP serial type differential bus
HW and SW	Supported output formats	YUV422 YUV420 RGB888 RGB565 RGB444 Raw 8-bit RGB Data Raw 10-bit RGB Data Compression mode
	Nominal voltage levels	2.8V/1.8V/1.8V

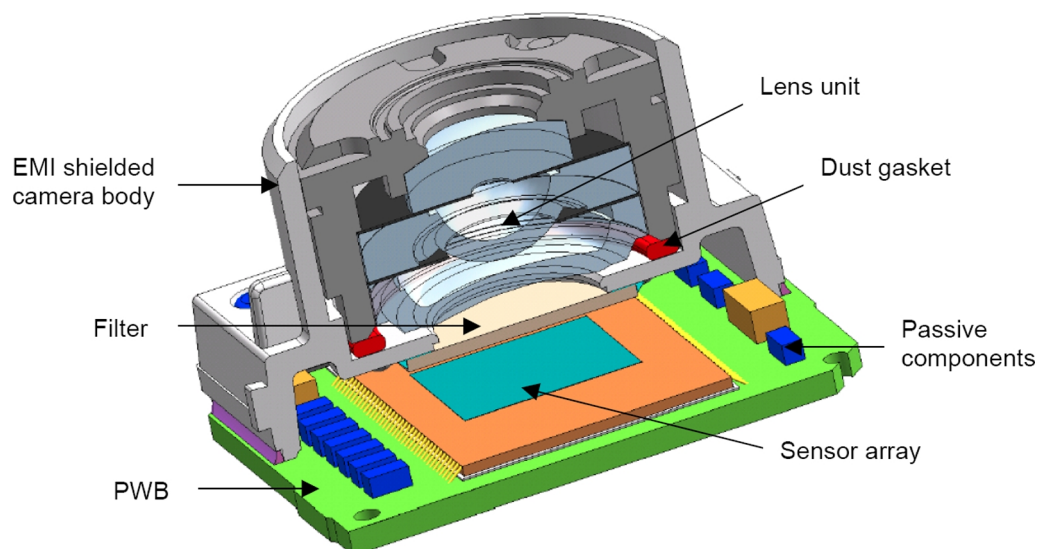


Figure 67 Camera module cross section and assembly principle

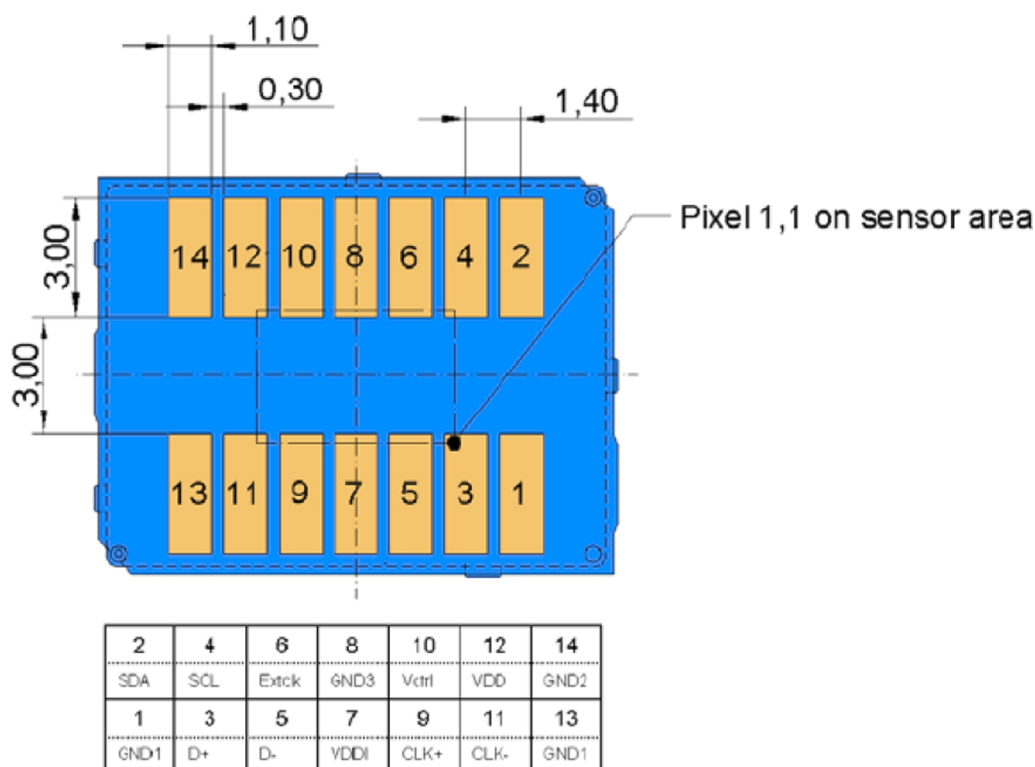


Figure 68 Camera module bottom view including serial numbering

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air.

The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Infrared filter; used to prevent infrared light from contaminating the image colors. The IR filter is glued to the EMI shielded camera body.
- Camera body; made of conductive metallized plastic and attached to the PWB with glue.

- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- PWB, FR-4 type
- Passive components
- Dust gasket between the lens unit and camera housing

Image quality analysis

Testing for dust in camera module

Symptoms and diagnosis

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

When taking a white image, use uniformly lightened white paper or white wall. Another option 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 occurs, try to reduce the 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. Therefore 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 dust particles are 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 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 the camera window and the 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 the 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 six possible sources for the problem:

- 1 The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.
- 2 The photographed object is too close – the camera lens operates with distances from 64 cm to infinity. This is no cause to replace camera module.
- 3 User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is no cause to replace camera module.
- 4 There is dirt between the protection window and 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.
- 6 The camera lens is misfocused because of a manufacturing error.

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 can be used as a target. The main considerations are:

- 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.

Steps

1. Take several images of small objects in the distance of 1-2 metres.
2. Analyse the images on a PC screen at 100% scaling with the reference images.
Pay attention to the computer display settings: at least 65000 colors (16-bit) have to be used. True colour (24-bit, 16 million colours) or 32-bit (full colour) setting is recommended.

Next action

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a misfocused lens -> change the module.

Re-check the resolution after changing the camera module.

If the changed module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module.

Dirty camera lens protection window

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

It should be noted that the effects of any dirt in images can vary much. It may be difficult to judge whether the window has been dirty or if something else is wrong. Therefore, the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

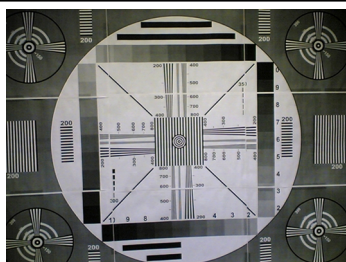


Figure 70 Image taken with clean protection window

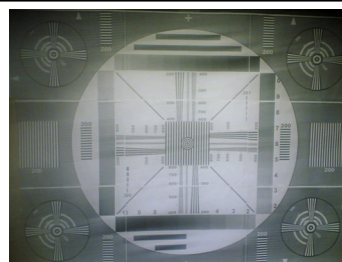


Figure 71 Image taken with greasy protection window

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.



Figure 72 Bit errors caused by JPEG compression

One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

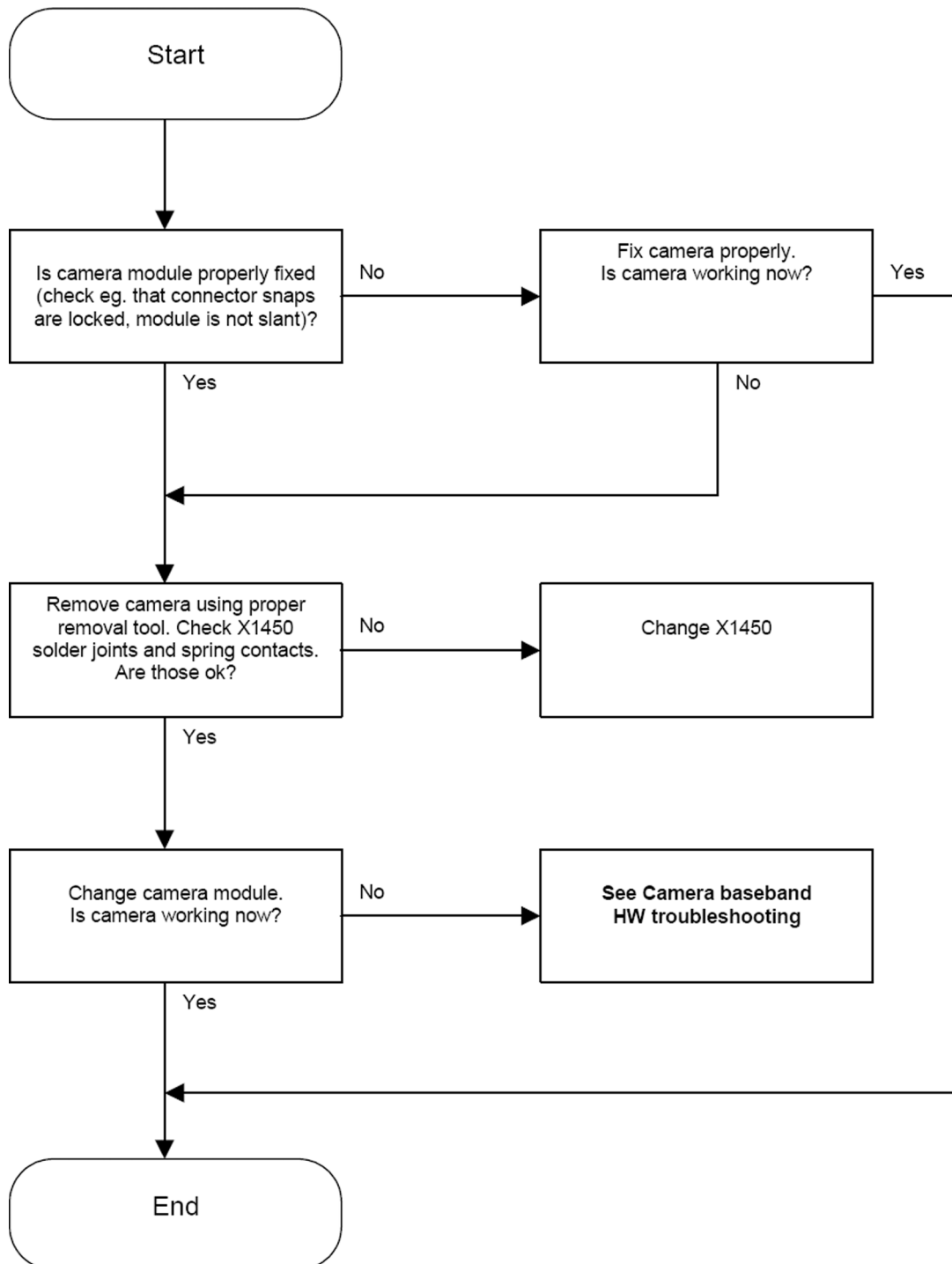
Back camera troubleshooting flowcharts

Camera hardware failure message troubleshooting

Context

If you get a hardware failure message when using the camera, follow the next troubleshooting flowchart.

Troubleshooting flow



Note: Make sure that the phone has the latest software before continuing.

Results

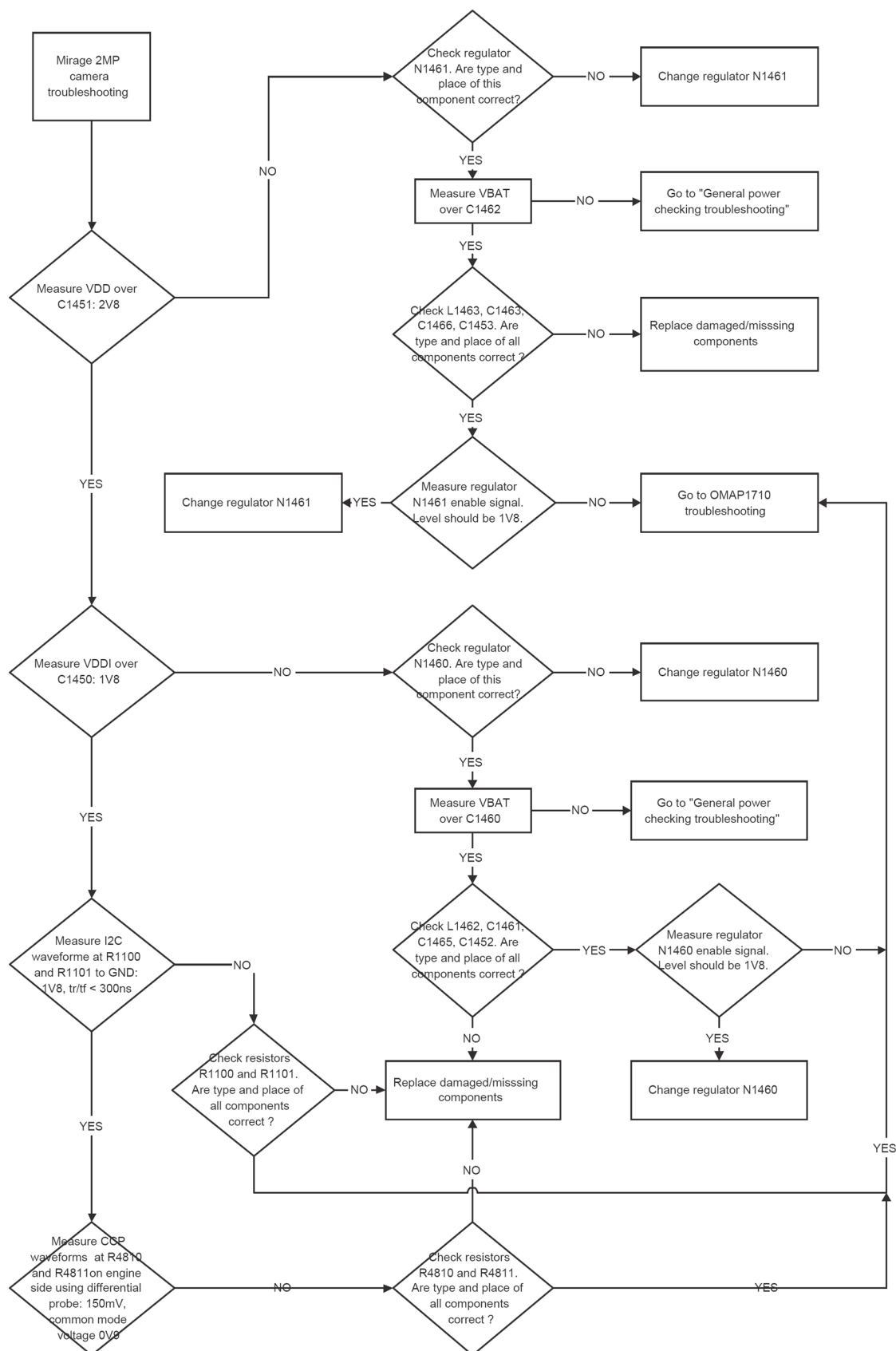
The camera is working properly.

Next action

If there are still problems with the camera, see "Camera baseband hardware troubleshooting".

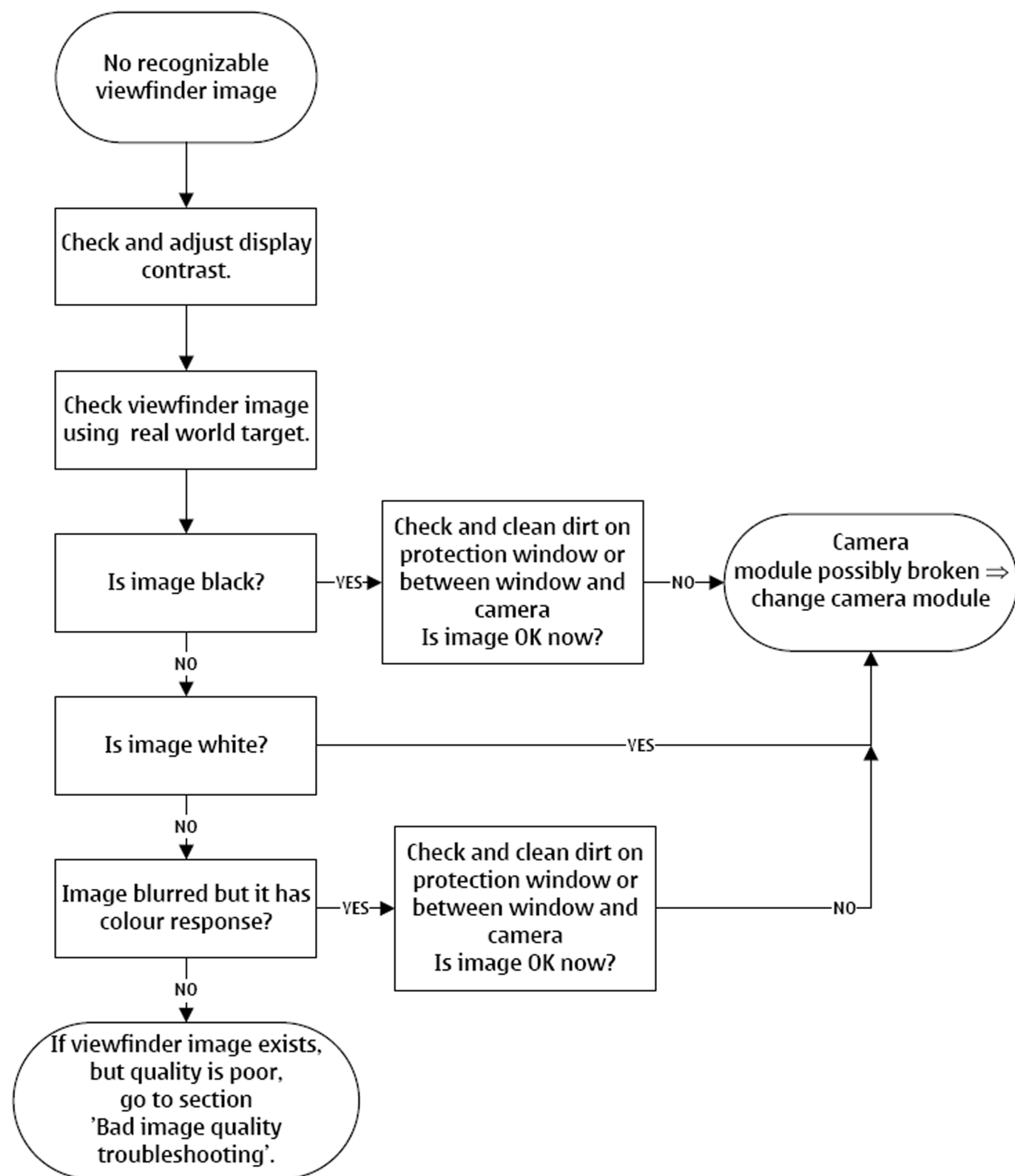
Camera baseband HW troubleshooting

Troubleshooting flow



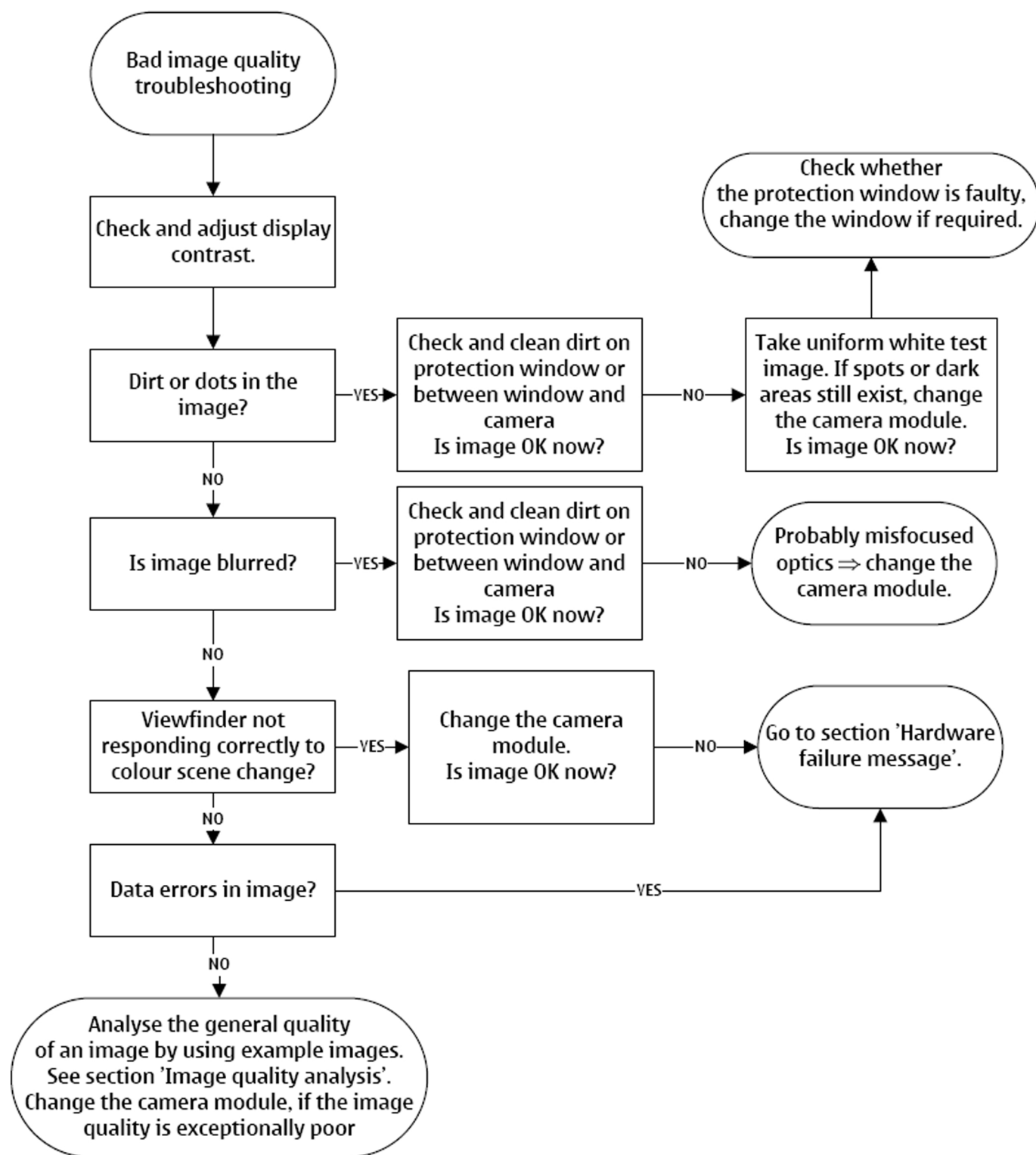
Camera viewfinder troubleshooting

Troubleshooting flow



Bad camera image quality troubleshooting

Troubleshooting flow



■ Front camera (VGA camera) troubleshooting

Front camera construction

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

Table 17 VGA camera specifications

Area	Item	Type
Sensor	Maximum Resolution	658 X 494
	Color filtering type	RGB color filter, Bayer arrangement
	Optical format	1/6
	Pixel size	3.75um X 3.75um
	Maximum Frame Rate	30 fps
	Supply Voltage (Sensor, ADC/Digital)	2.8V±0.2V and 1.5±0.2V
Lens	Focus range	40 cm to infinity
	H view angle	57,4 °
	F number	2.8
Interfacing: HW & SW	Supported output formats	YUV422 RGB565
	Command and data bus	I2C

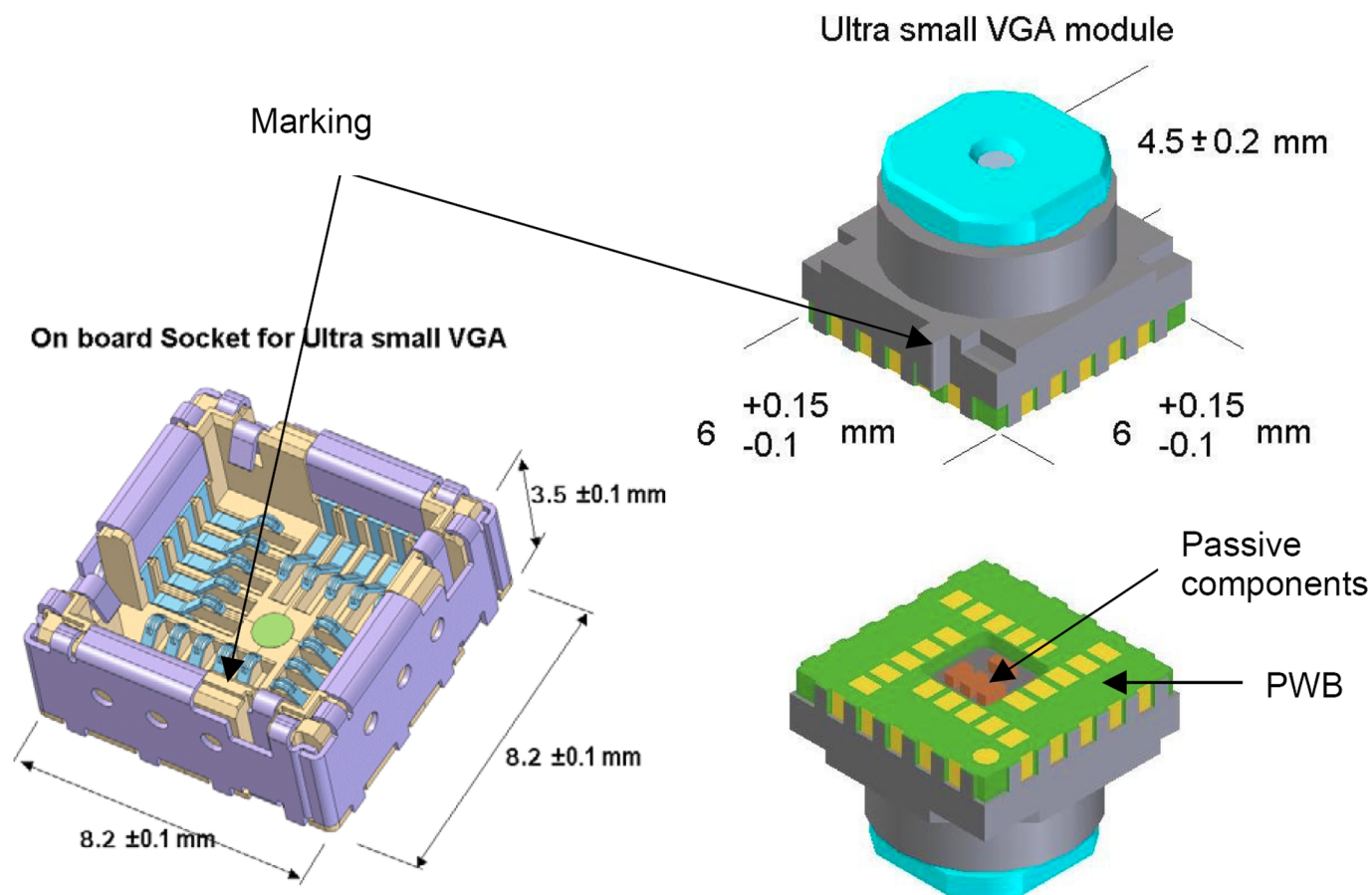


Figure 73 VGA camera module cross section and assembly principle

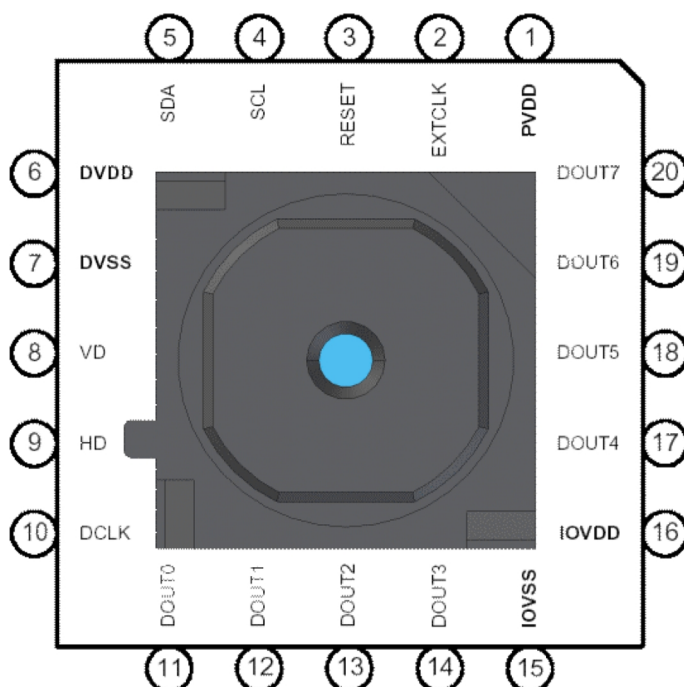


Figure 74 VGA camera module top view including pin assignment

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air. The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Camera body; made of plastic and attached to the PWB with glue.
- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- Passive components.
- Camera protection window; part of the phone cover mechanics.
- Dust gasket between the lens unit and camera protection window.

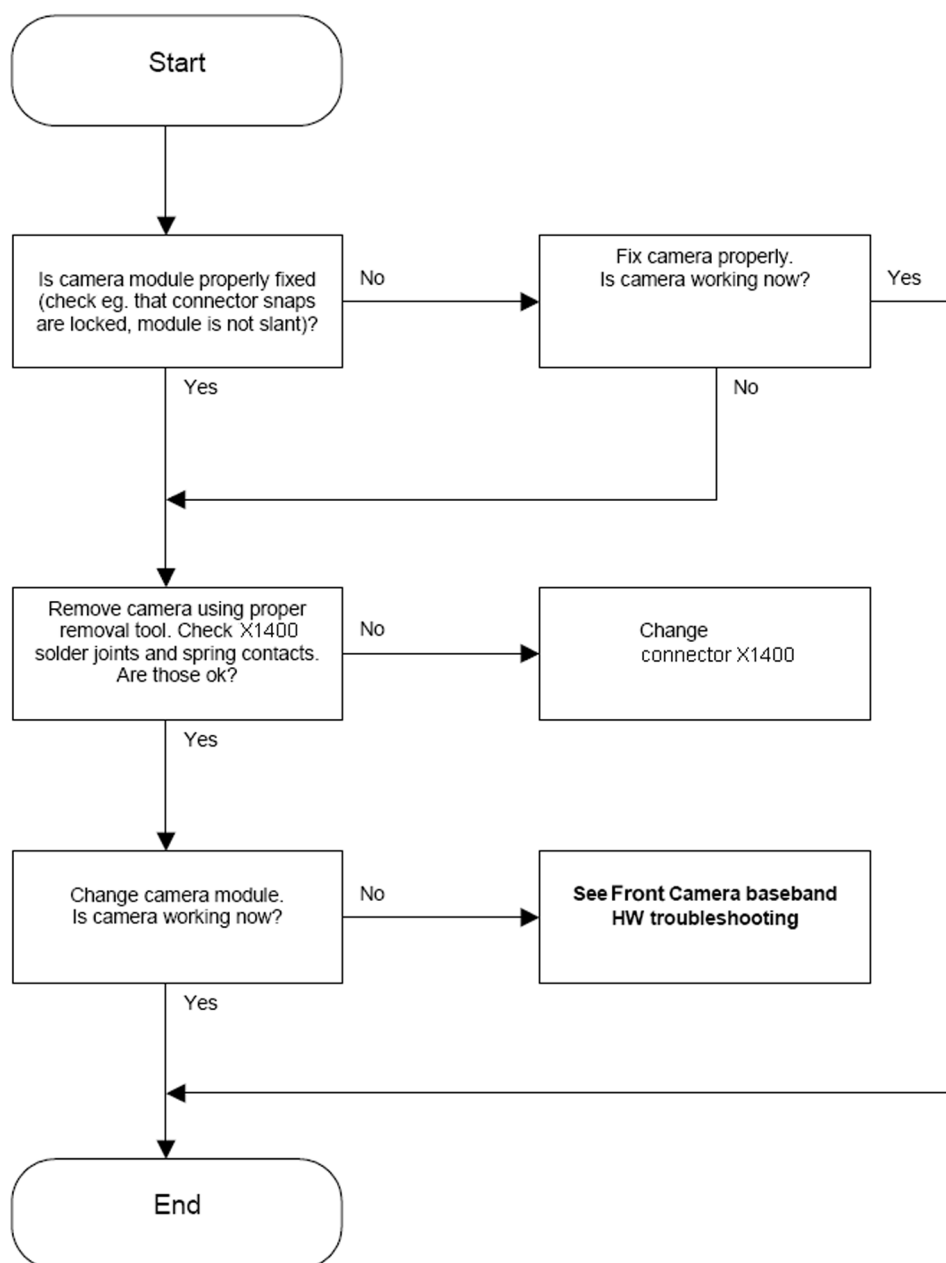
Image quality analysis

Image quality analysis of the VGA camera is similar to the Mirage 2MP camera analysis with the exception of chapter "Image bit errors". VGA camera does not compress output data.

Front camera troubleshooting flowcharts

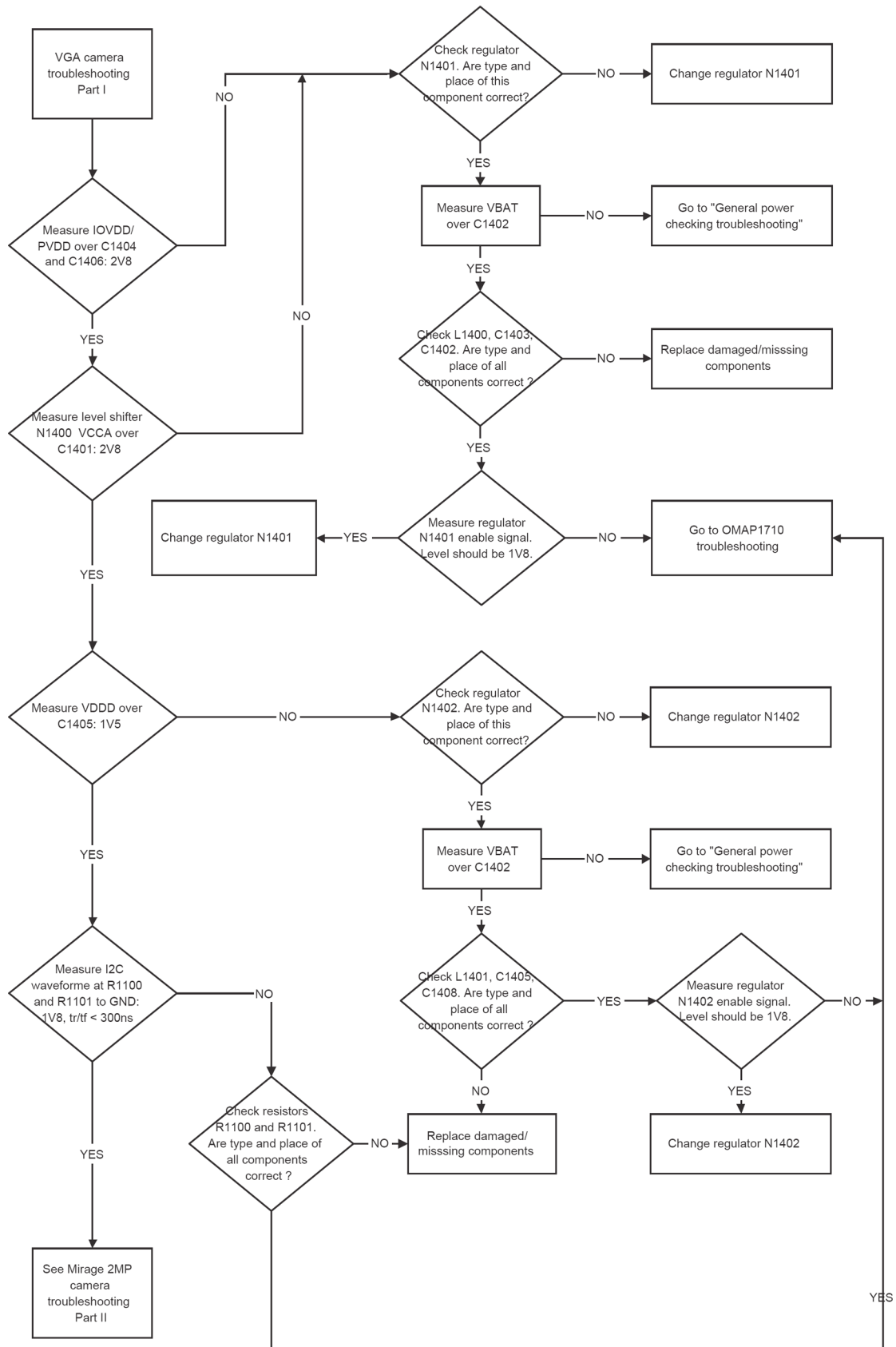
Front camera hardware failure message troubleshooting

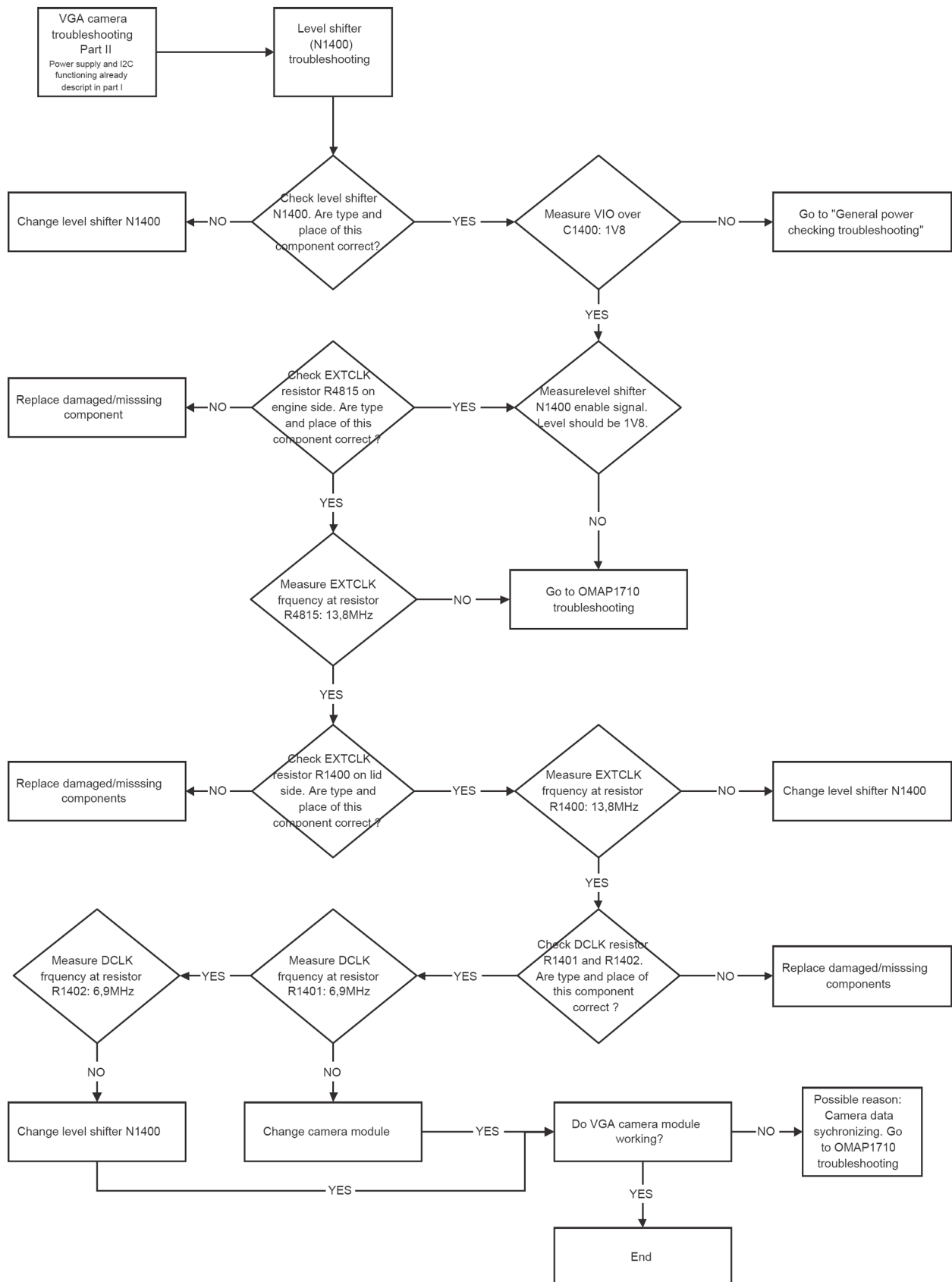
Troubleshooting flow



Front camera HW baseband troubleshooting

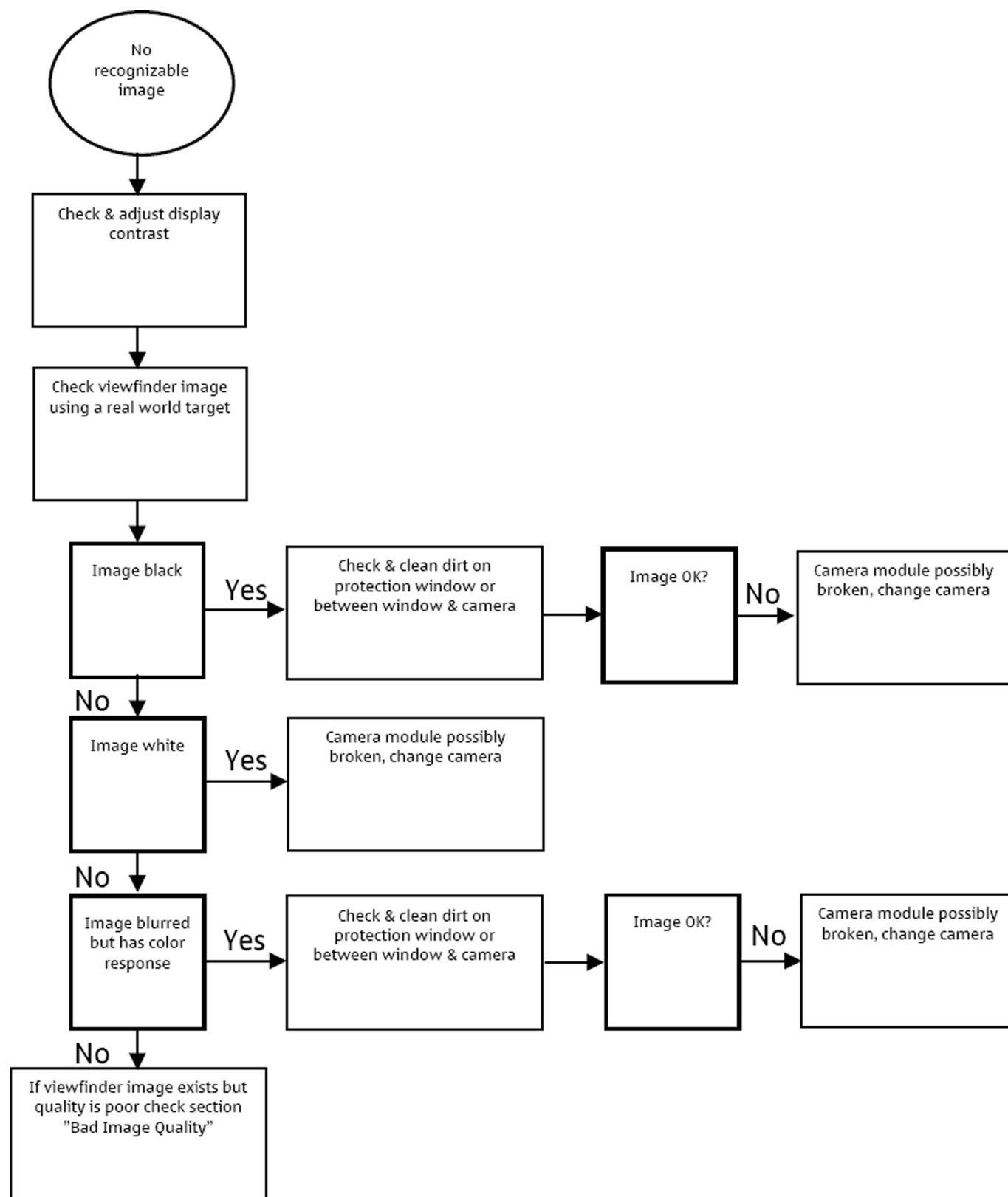
Troubleshooting flow





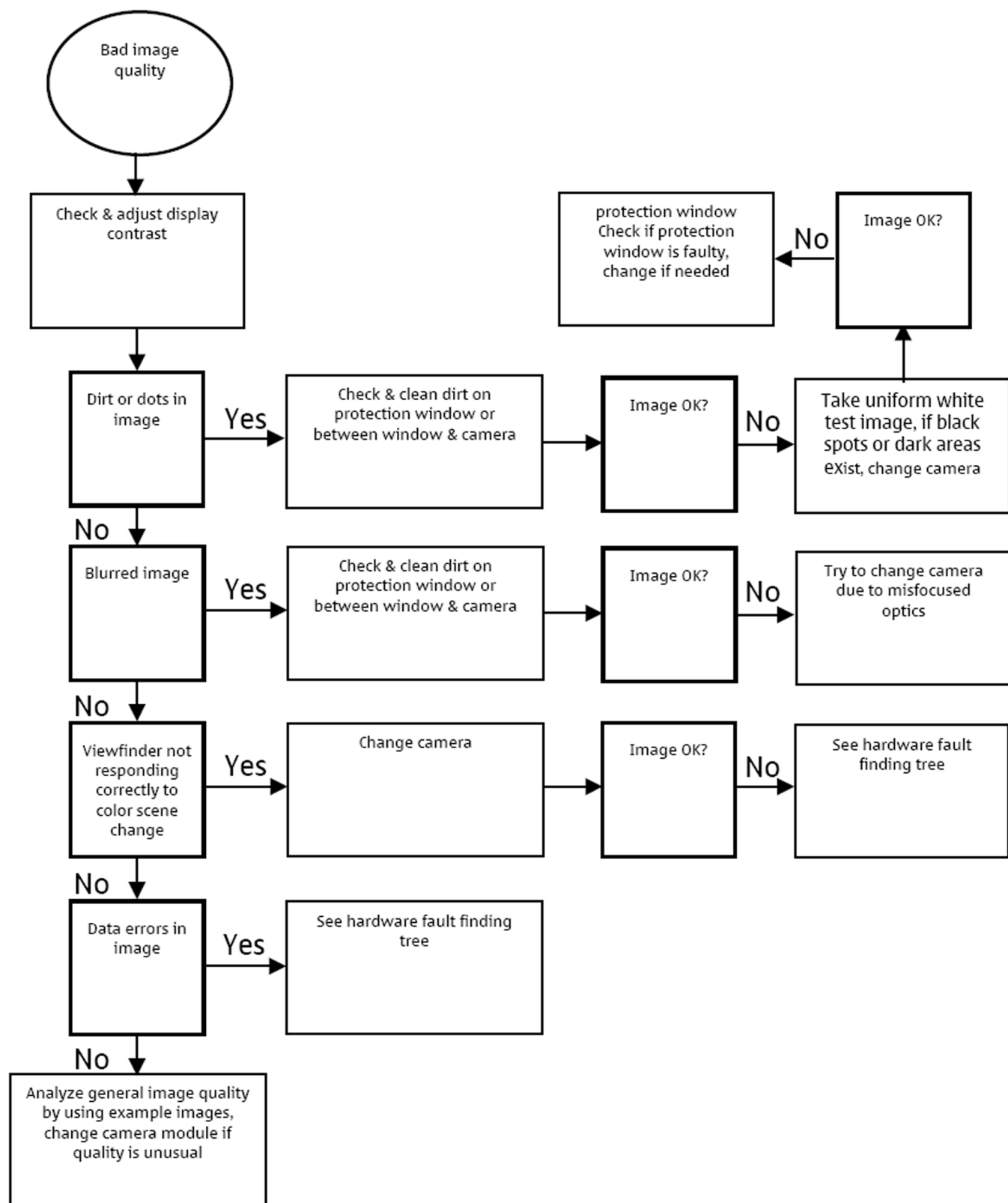
Front camera viewfinder troubleshooting

Troubleshooting flow



Front camera bad image quality troubleshooting

Troubleshooting flow



■ Flash LED troubleshooting

Introduction to flash LED troubleshooting

A fault or complaint associated to LED flash operation can be roughly categorized into two subgroups:

- 1 Flash is not functional at all (no light output at all).
- 2 Images can be taken and they are recognizable but for some reason the quality of images is degraded.

The quality of an image is very difficult to measure quantitatively, and even comparative measurements are difficult (comparing two images), if the difference between reference images is small. If a user is not satisfied with his/her device's image quality, it is fairly difficult to accurately test the device and get an exact result, which would tell if the device is working properly.

Often subjective evaluation has to be used for finding out if there is something wrong in the flash. Some training or experience of a correctly operating reference device may be needed in order to detect possible faults. It is easy for a user to take low quality images in bad conditions. Therefore, the camera and flash operation has to be always checked in constant conditions (lighting, temperature) or by using a second, known-to-be good reference device.

Flash LED and image taking conditions

This section describes some of common factors, which may cause poor image quality if not taken into account by end users when taking pictures, and may therefore result in complaints. The items described are normal to the camera and LED flash operation and do not raise a need for servicing the components.



Figure 75 Example of a good quality image taken with the flash LED

Distance to the target (too close)

There is no feedback in the flash system, which means that the light output is constant in every situation. This causes the images to overexposure, when shot from close distance. The flash LED is designed to work optimally between distances of 70 cm – 1.2 m.

This is normal behaviour; do not change the flash module.



Figure 76 overexposed image

Distance to the target (too far away):

The power of the white LED flash is still very modest compared to xenon flash technology. Even with full power, the maximum distance for an acceptable image quality is roughly 1.2 m. If the distance is greater than 1.2 m, the images will appear dark and the noise level increases.

This is normal behaviour; do not change the flash module.

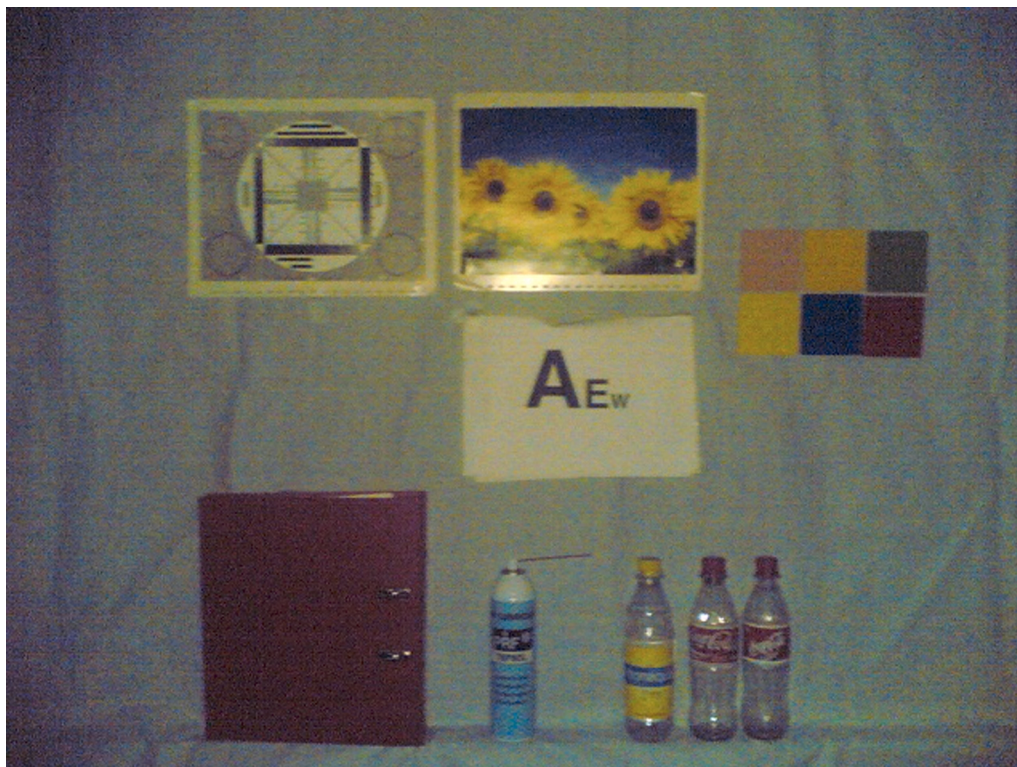


Figure 77 Dark and noisy image

Shaken (= blurred) images

The traditional xenon flash has the advantage of stopping the movement. This is a result of an extremely short and intense light pulse, which makes it possible for a camera to use very short exposure time. Due to the weak output of the LED flash, the exposure time has to be actually increased in the viewfinder mode in total blackness, instead of shortening it. This allows the sensor to integrate longer and collect more light but this also easily creates blurred images if care is not taken.



Figure 78 Shaken image

Camera white balance failure and overexposure due to presence of ambient light

Because the spectral output of the flash is known, the white balance and the exposure control of the camera work in optimal way with the flash in total blackness. This is why some of the pictures may fail, if there is some ambient light present when the image is taken.

If the flash works correctly in dark conditions, there is no need to change the flash module.

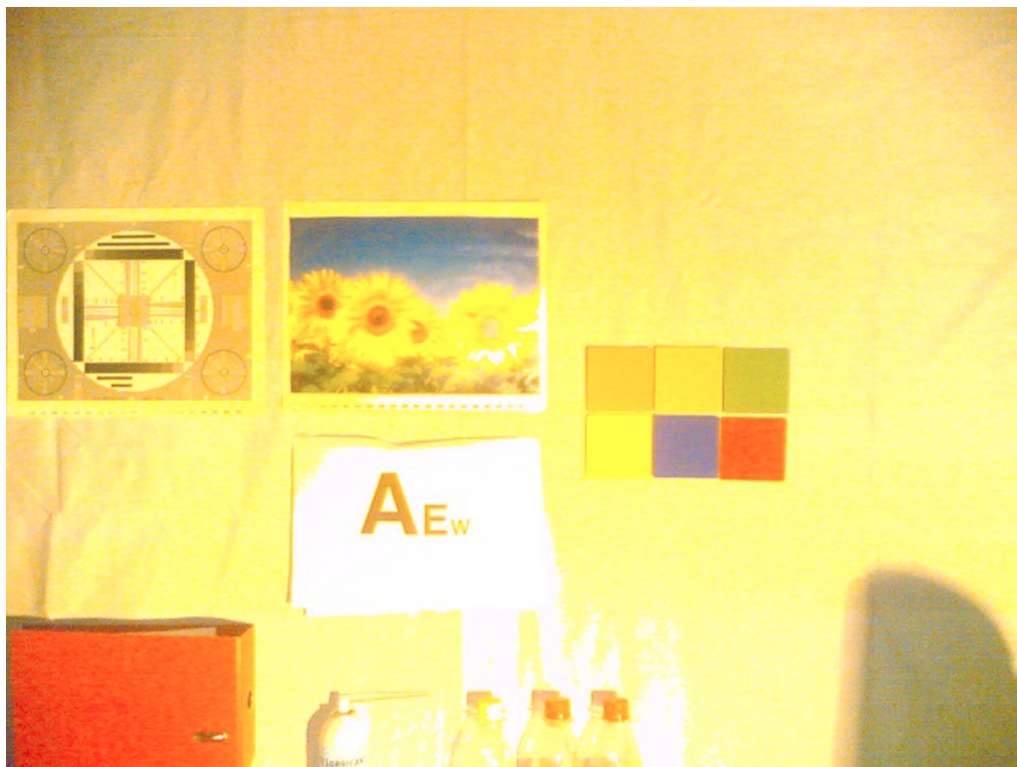


Figure 79 Camera white balance failure and overexposure

Colour difference between different modules

There is some variation in the spectrum of the flash, which derives from the manufacturing process of the white LEDs. Because of this variation, there may be some variation in the colour of the images as well.

This is normal behaviour; do not change the flash module.



Figure 80 Color difference between flash colour limit samples

Flash LED construction

This section describes the actual construction of the LED flash module for getting a better understanding of the mechanics of the module.

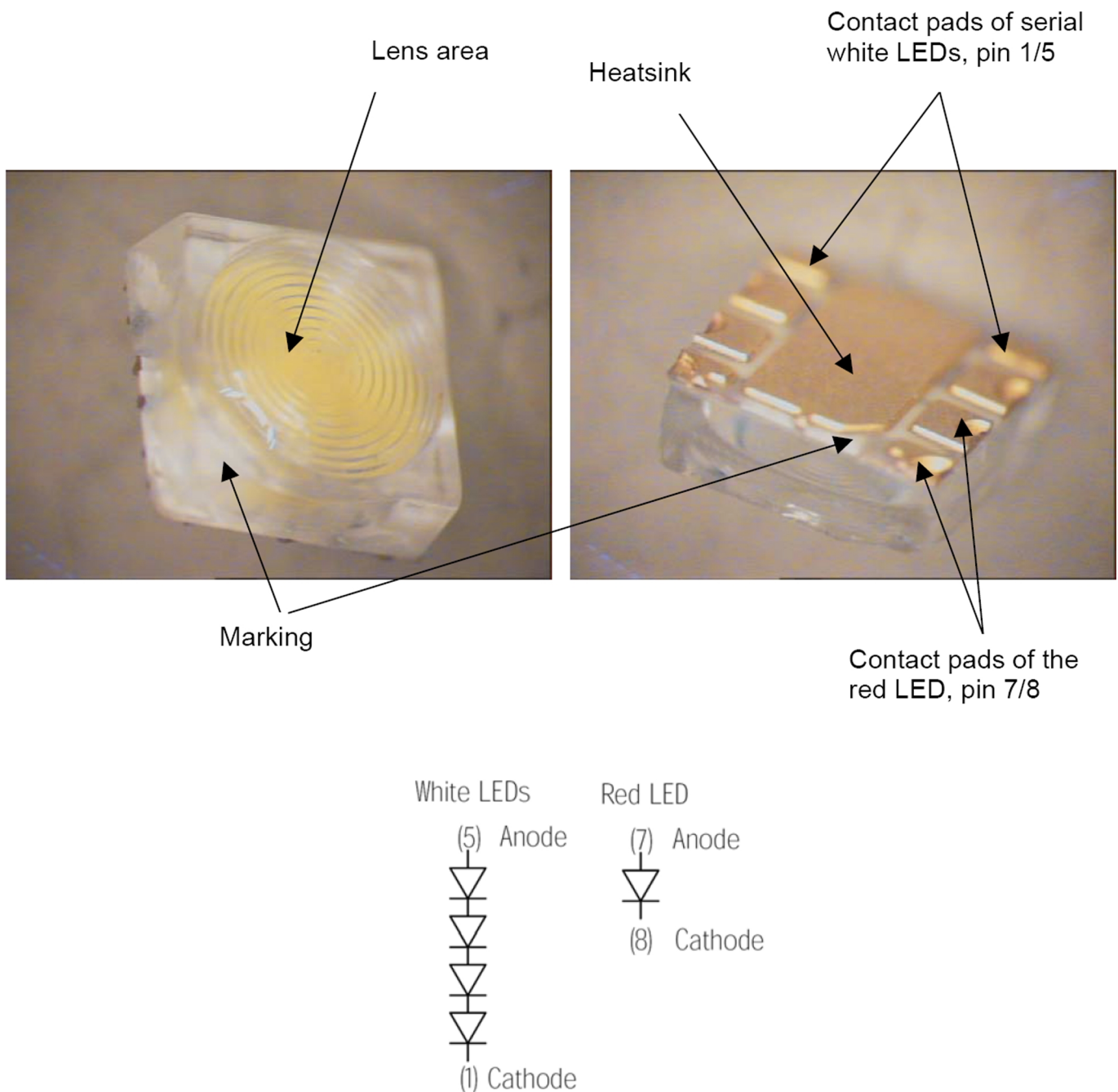


Figure 81 Mechanical construction and schematic of the flash LED module

The flash LED module as a component is not a repairable part, i.e. components / parts in the module cannot be changed. Only cleaning dust from the lens is allowed; use clean compressed air.

The main parts of the module are:

- Housing, which is glued to the PWB
- Lens area (round area on top of the housing with circle patterns)
- LED chip (yellow chip inside the housing), which is soldered to the PWB
- Contact pads for both red LED and serial white LEDs
- Heatsink, floating pad

Analysing image quality

Possible faults in image quality

When checking for possible errors in the flash functionality, knowing what error is suspected, significantly helps the testing by narrowing down the number of possible test cases. The following types of image quality problems may be expected to appear:

- LED module is not flashing at all
- Image colours are not good
- Flash power is weak

Testing flash module functionality

Context

With the help of this test you can check the flash module's overall functionality.

Always set the flash to FORCED FLASH mode when performing the test. The FORCED FLASH mode enforces the LED module to flash, even if there is some ambient light present.

Steps

1. Take an image with the flash and monitor at same time whether the LED module flashes.

Results

If the LED flashes normally, the overall functionality of the module is OK.

Testing image colours with flash

Context

With the help of this test you can check if the image colours are normal when using the flash.

Steps

1. Take an image of a target, which contains something white in total blackness from less than 1 m range.

Results

If the white target appears to be white, the flash is working correctly. However, remember that there is some variation in the flash colour from module to module.

Testing flash power

Context

With the help of this test you can check if the flash is working with adequate power level.

Steps

1. Take an image with the flash in total blackness (ambient light <1 lux) of a target 80 cm - 1 m away.

Results

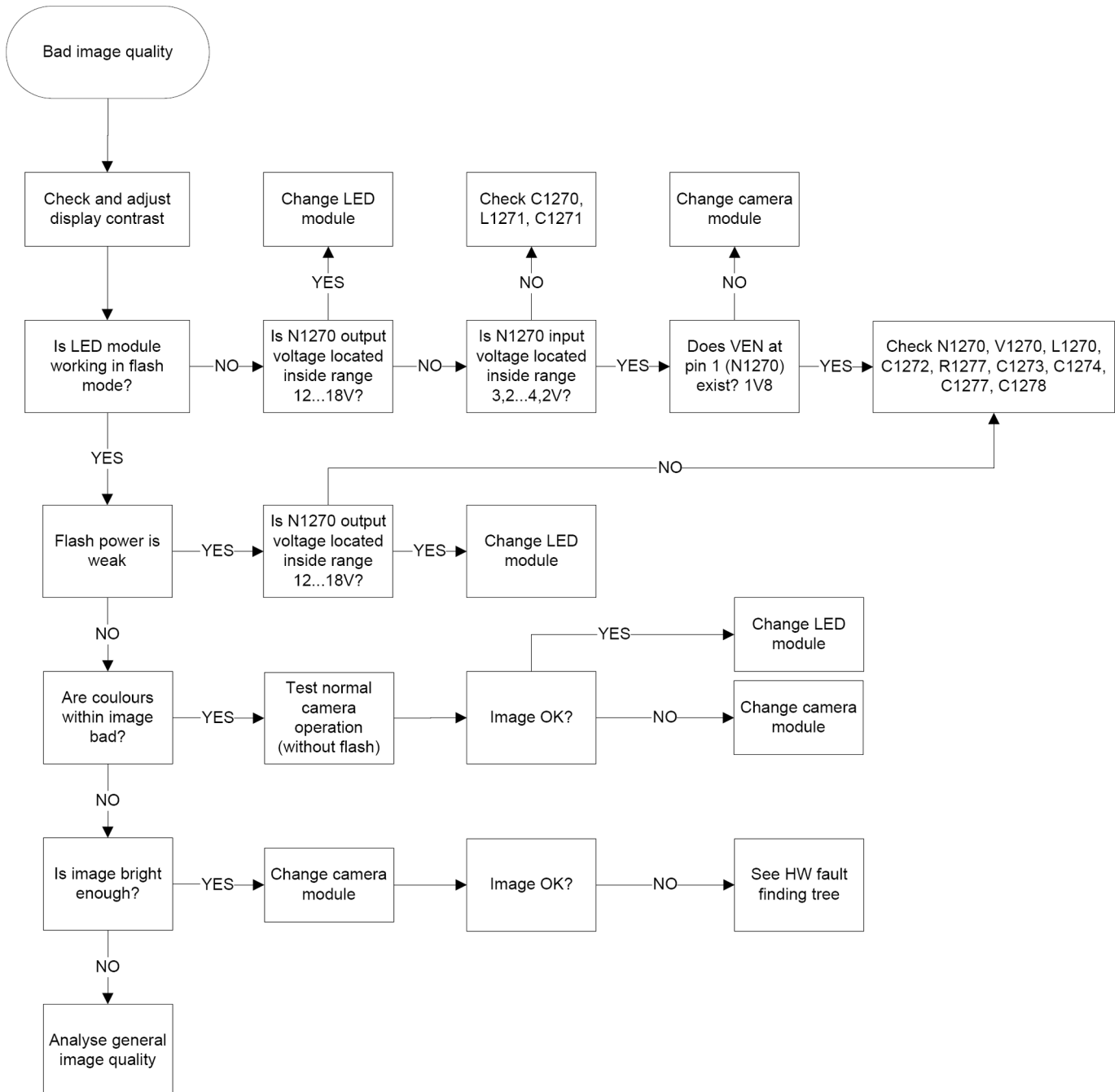
If the flash is working normally with adequate power level, the image is correctly exposed between distances 80 cm to 1 m.

Remember that the brightness level in the corners is always less than in the center of the image because of camera and flash optics.

Flash LED troubleshooting flowcharts

Flash LED mode troubleshooting

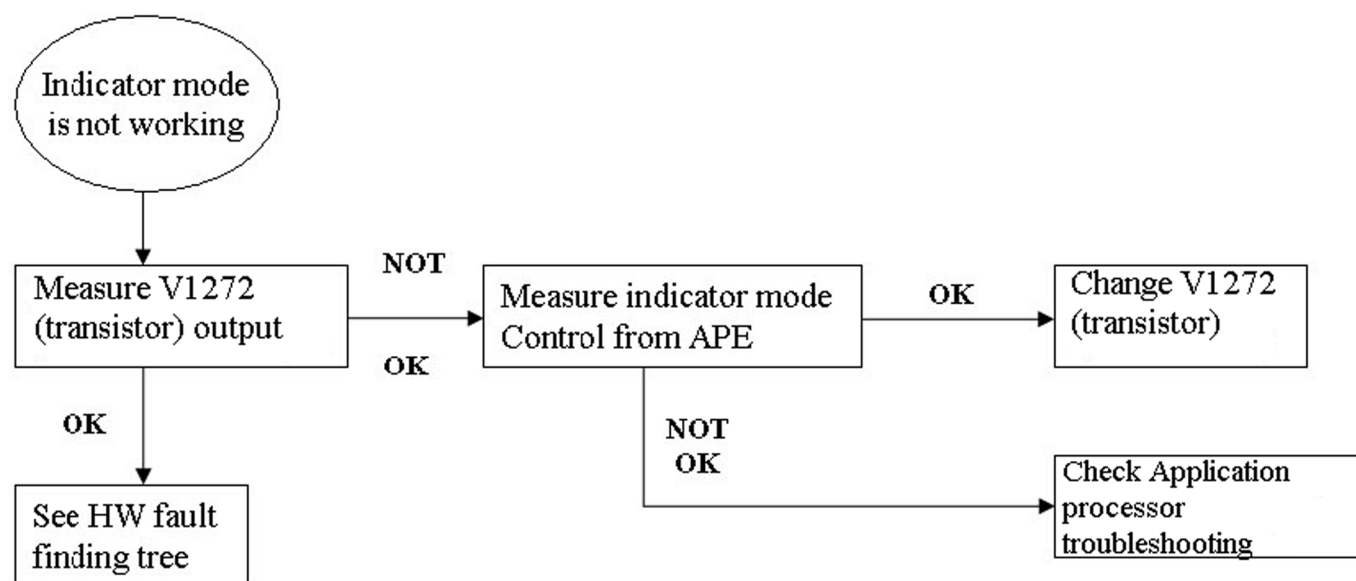
Troubleshooting flow



Flash LED indicator mode troubleshooting

Troubleshooting flow

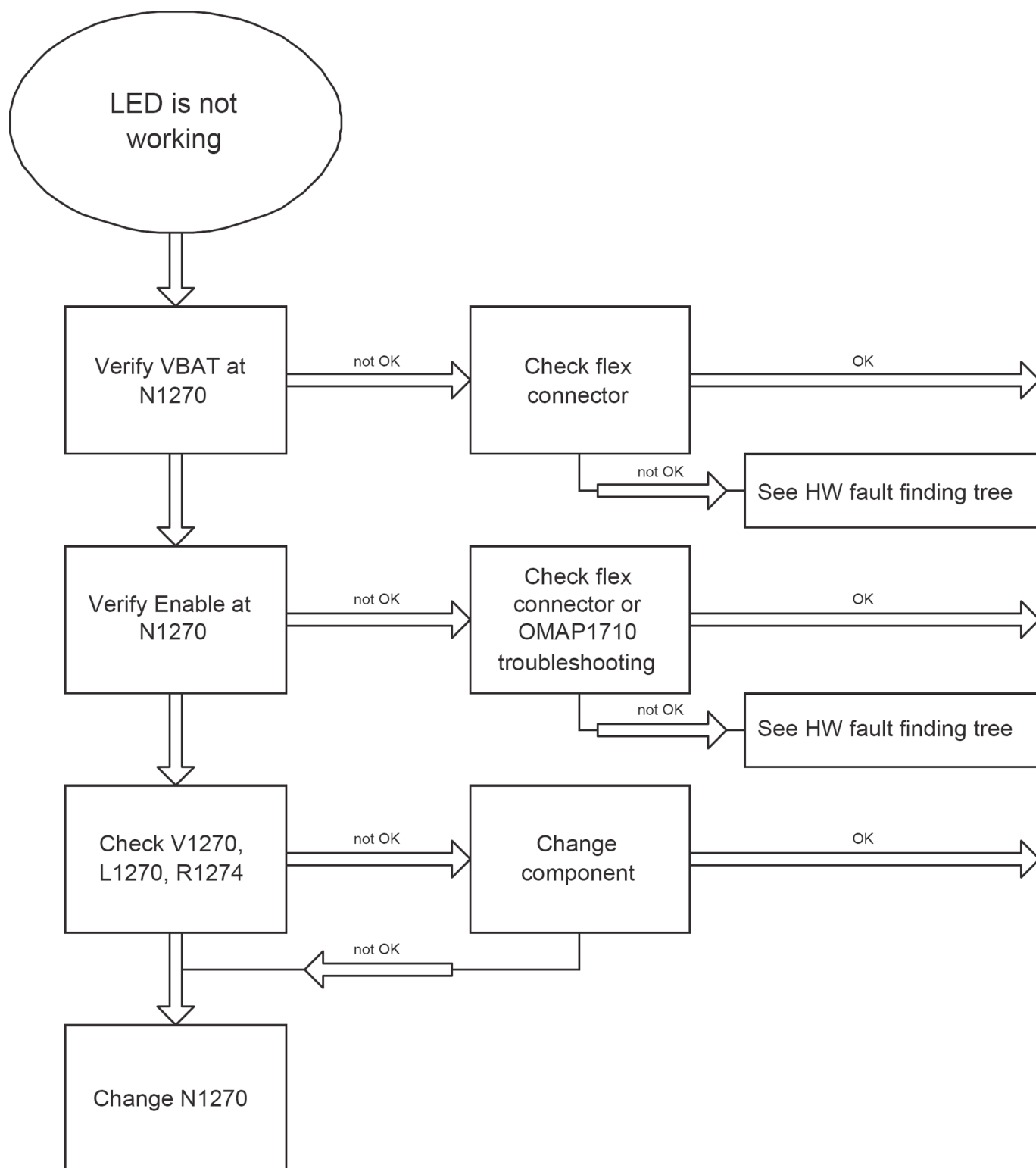
For checking the indicator mode functionality, force the camera to record a video clip and monitor the flash led at the same time. The flash LED should work with very low brightness constantly during the video recording.



Flash LED HW baseband troubleshooting

Troubleshooting flow

If there are problems in the flash LED driver circuit, the testing procedure is complicated, because the lid circuit cannot be reliably measured without engine PWB and main lid parts. In the case of testing LED driver covers have to be removed but all electrical connection have to remain connected.



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9 — System Module

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■ Baseband description

System module block diagram

The device consists of 3 different PWB modules: engine (1LQ), lid (1LR) and BT (1LZ). The engine module consists of main baseband and RF components. The lid module consists of main UI components like VGA camera, back light, keys and regulators. The connection between the engine and the lid module is established via board-to-board connector (flex foil). The BT module consists of SIM and SD card reader, Bluetooth ASIC and door switch. The connection between the engine and BT module is established via Molex connector.

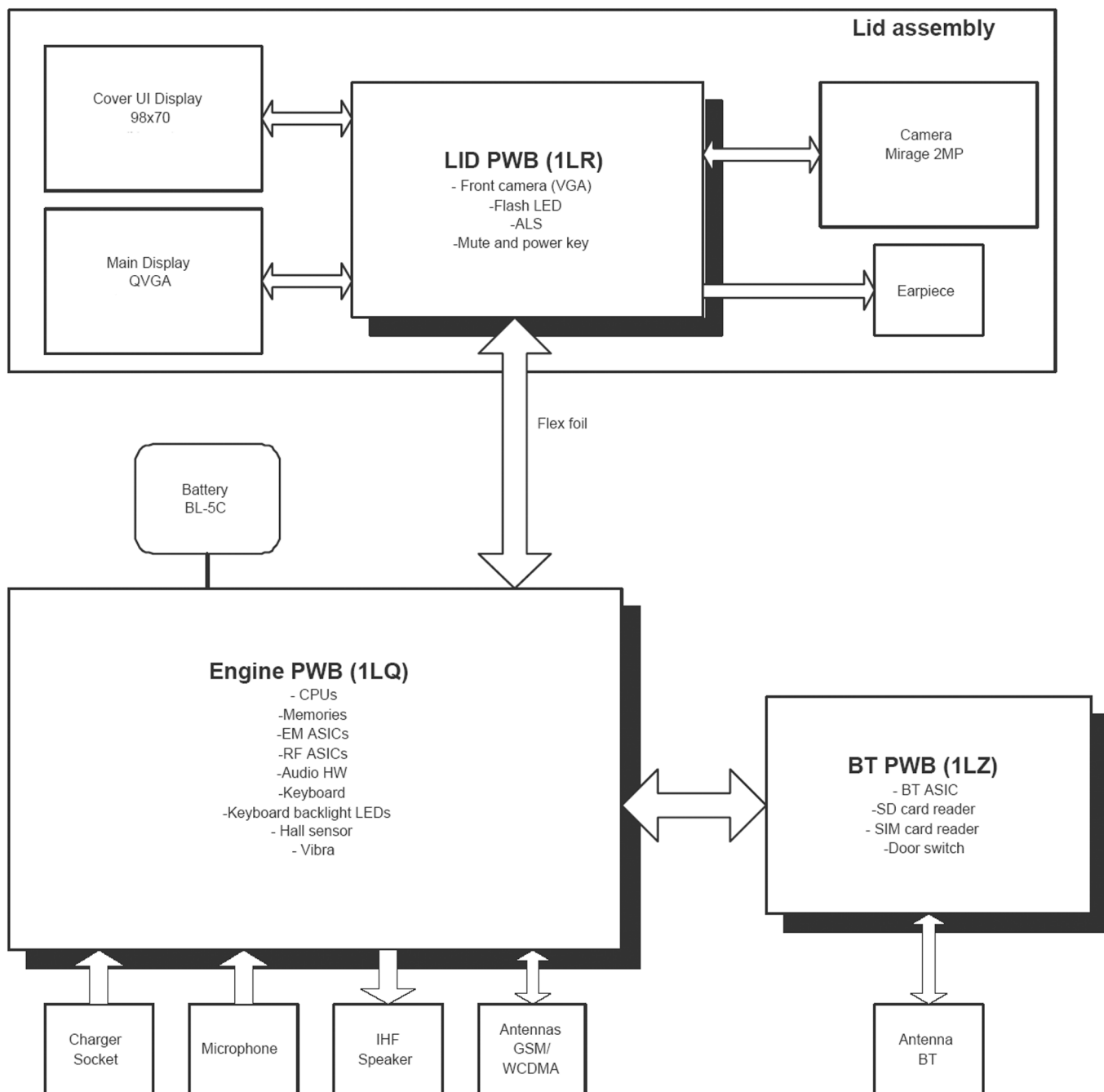


Figure 82 System level block diagram

Baseband functional description

Digital baseband consists of ISA based modem and SYMBIAN based application sections. Modem functionality is in RAP and the application processor acts as a platform for SYMBIAN applications.

Modem section consists of RAP ASIC with NOR FLASH and SDRAM memory as the core. RAP supports cellular protocols of WCDMA (3GPP R-4) and GSM (EGPRS). Modem SDRAM memory have 64Mbits of memory and NOR flash have 64Mbits of memory. RAP operates with the system clock of 38.4 MHz, which comes from the VCTCX0.

Application section includes application processor ASIC with DDR/NAND combo memory as the core. Stacked DDR/NAND application memory has 512Mbits of DDR memory and 512Mbits of flash memory. The application processor uses 19.2MHz clock, which comes from the RAP divided by two from the 38.4 MHz system clock.

The application processor (OMAP1710) is also called as an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like camera-, display- and keyboard driver blocks.

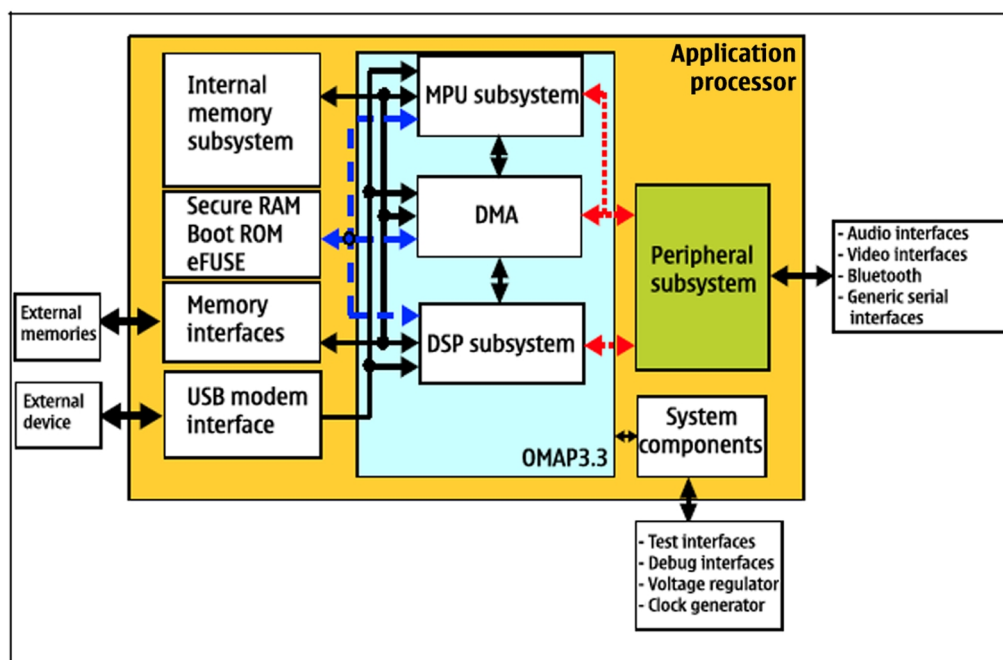


Figure 83 Application processor high level block diagram

Section	Description
Application processor	also called an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like camera, display and keyboard driver blocks.
OMAP3.3	consists of ARM926 (MPU subsystem), TMS320C55x (DSP subsystem), DMA and OMAP3.3s internal peripherals.
Helen3s MPU subsystem	based on an ARM926EJ. MPU is able to perform most of the application operations on the chip.
System DMA component	mainly used to help the MPU and DSP perform data memory transfer-specific tasks.

Section	Description
DSP subsystem	based on a TMS320C55x™ DSP core, which is responsible for intensive data computing tasks like real-time audio and video handling on application side, e.g. voice recording.
Internal memory subsystem	composed of a single port SRAM.
Secure modules	The application processor contains a set of several components, including ROM, a single port SRAM, and eFUSE cells. These components enable the system to support secure applications.
Memory interfaces	The memory interfaces define the system memory access organization of the application processor.
USB & modem interface	These two modules enable the platform to support a universal serial link and a dedicated modem interface, enabling a high data transfer rate between the modem and the application chip.
System components	System components are group of modules responsible for managing system interactions such as interrupt, clock control and idle.
Peripheral subsystem	The peripheral subsystem defines all the components used to interface the application processor with specific external devices such as camera, keyboard, display, etc.

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		+16V	V	
Back-Up supply voltage	0	2.5	2.7	V	Maximum capacity of the backup power supply assumed to be 4μAh.

Phone modes of operation

All phone modes of operation can set by either SW or EM ASIC N2200.

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below 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 32kHz oscillator is running (RTC is on).

Mode	Description
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over 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 RFCIk have stabilized, the system reset (PurX) is released and PWR_ON mode entered. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low. There are in principle three different sleep modes: <ul style="list-style-type: none"> • Application processor sleep • RAP sleep • Application processor and RAP sleep (deep sleep)
FLASHING	FLASHING mode is for SW downloading.

There are four possible reasons for N2200 to enter power on mode: power key being low, charger being connected, MBus being high and internally generated or power up via the Real Time Clock (RTC) alarm.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

The master reset threshold controls the internal reset of N2200 / (N2300). If battery voltage is above VMSTR, EM ASIC's (N2300) charging control logic is alive. Also, 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 EM ASIC N2200 via PWRONX signal.

Power distribution

Power supply components:

- EM ASIC N2200

- EM ASIC N2300
- Application processor VCORE SMPS
- BT
- LDO
- camera LDO
- backlight SMPS

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 Rx/Tx ASIC.

Discrete power supplies are used to generate 2.8V to BT, 1.5V/1.8V/2.8V for front and back camera voltage, 1.3V/1.5V for the application processor and 18V for the backlight LEDs.

The device supports both 1.8V/3V SIM cards which are powered by N2200 / VSIM1. Level shifter VSD is used to power SD card 2.85V only. USB accessories which needs power from the device are powered by N2300 / VOUT.

Because LED driver in N2300 is not used, the external SMPS is used instead. External LED SMPS is still controlled by N2300 and powered by battery voltage.

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

Clocking scheme

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

The RF clock is generated only when VCTCX0 is powered on by an N2200 regulator. The regulator itself is activated by SleepX signals from both RAP and the application processor. When both CPUs are on sleep, the RF clock is stopped.

The RF clock is used by RAP that then 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 memory card, 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 a 2.4 MHz clock line from RAP to EM ASIC N2300 used for switch mode regulator synchronizing in the active mode. In the deep sleep mode, when VCTCX0 is off, this signal is set to '0'-state.

BT Clk is a 38.4 MHz signal from Tx ASIC N7501 to the Bluetooth system.

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

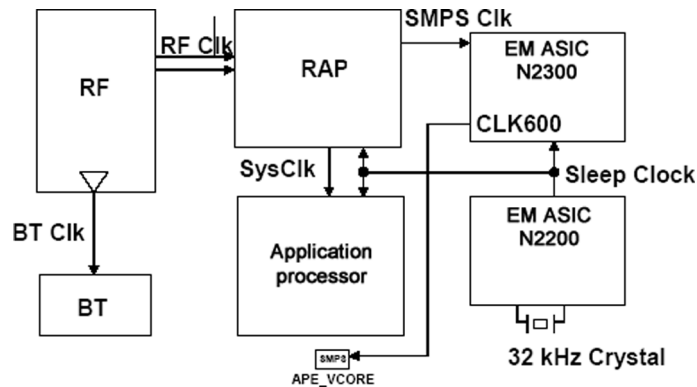


Figure 84 Clocking scheme

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. The data rate is regulated between the master and the slave.

The device Bluetooth is based on the BC3 BT ASIC.

The UART1 interface handles the transfer of control and data information between the application processor and the BT system.

The PCM interface is used for audio data transfer between RAP and the BT system.

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:

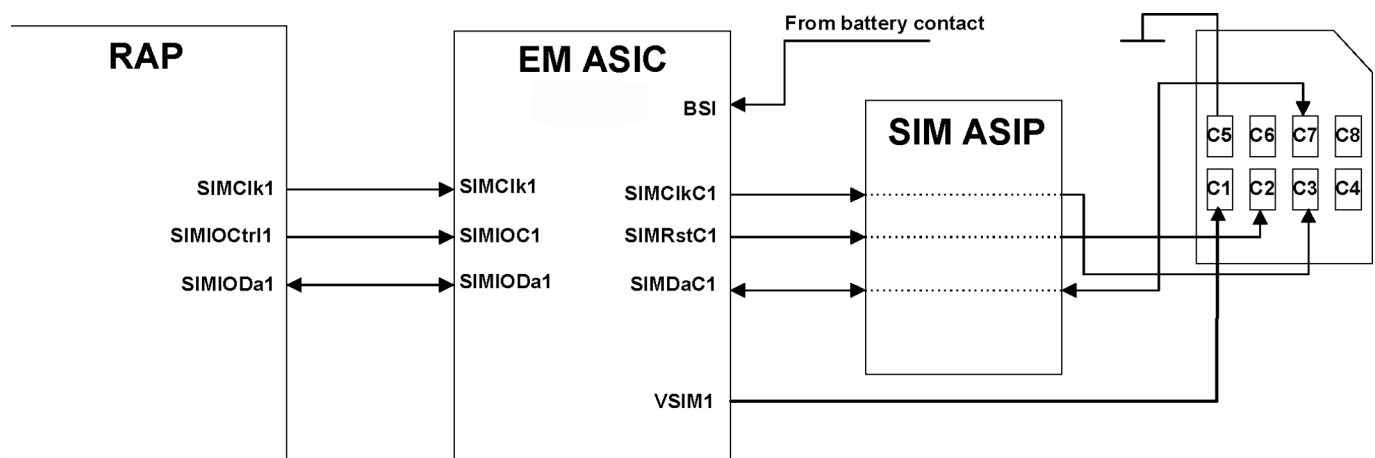


Figure 85 SIM interface

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

The EM ASIC SIM1 interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

The data communication between the card and the phone is asynchronous half duplex, and the clock supplied to the card is 1-5 MHz, which is 3.2 MHz by default (in GSM system). The data baud rate is the SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

SD interface

The miniSD card is a highly integrated flash memory with serial and random access capability. The reduced size (20mm x 21,5mm x 1.4mm) multimedia card slot is located under the system connector. The device is not able to hot plug the SD card. The SD card gets contact only when the door switch is closed.

The SD card is connected to the application processor MMC/SDIO2 (1.8 V) interface. The MMC interface is shown in the following figure:

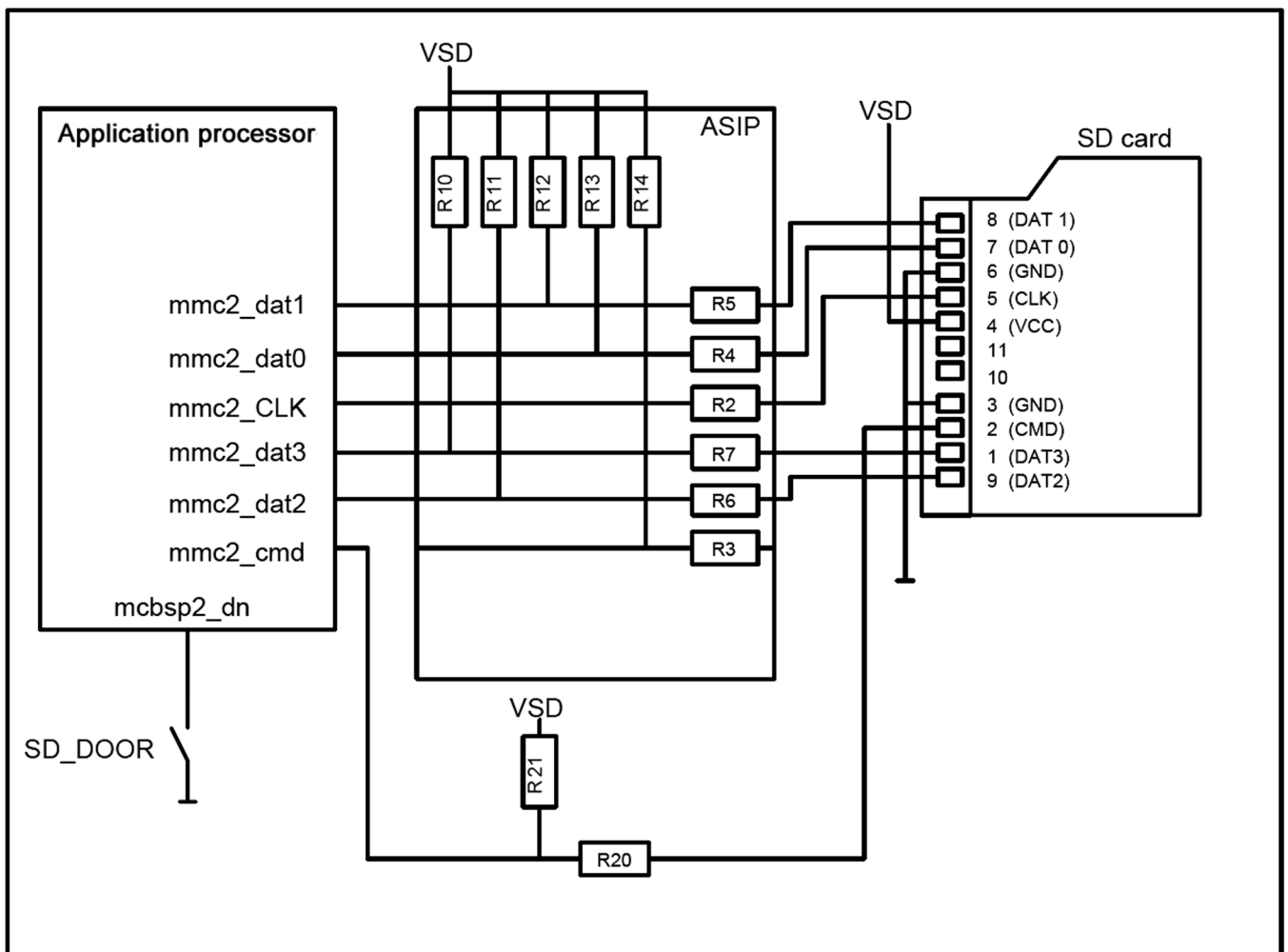


Figure 86 SD interface

CMD is a bi-directional command channel used for card initialization and data transfer commands. The CMD signal has two operational modes: open-drain and push-pull mode. The open-drain mode is used for card initialization and the push-pull mode for fast command transfer. CMD commands are sent by the host and CMD responses are sent by the card.

DAT is a bi-directional data channel, which operates in the push-pull mode.

The detection of the SD card removal/insertion is done via the door switch. The door switch gives an input whether the door is opened or closed. After the SD door has been opened (the SD card SW signal is connected to GND via door switch), the SW powers down the SD card. When the door switch is closed (SD card SW signal is internally connected in the application processor to 1.8 V), the card should be identified if card exists.

Note: Removing the SD card while writing to the card may corrupt data in 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.

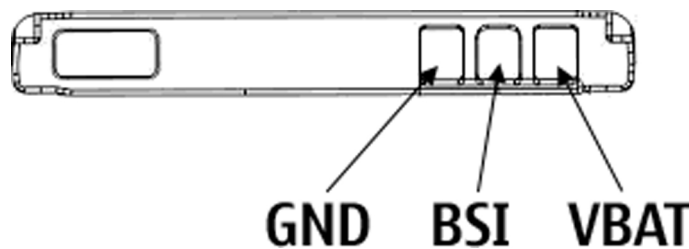


Figure 87 Battery pin order

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.

Back camera

The back camera of the device uses a 2.0 mega pixel camera module with a sensor resolution of UXGA (1600 x 1200).

The following block diagram shows how a CCP bus is used to transfer image data from the camera module to the phone engine. This bi-directional control bus is a software-implemented I2C interface.

The camera regulator N1461 powers the digital parts of the camera and N1460 is used for the analogue parts. To activate camera both signals Vctrl and GEN_CTRL_APE(6) are needed. When Vctrl signal is low and GEN_CTRL_APE(6) is high, the module enters the power on mode.

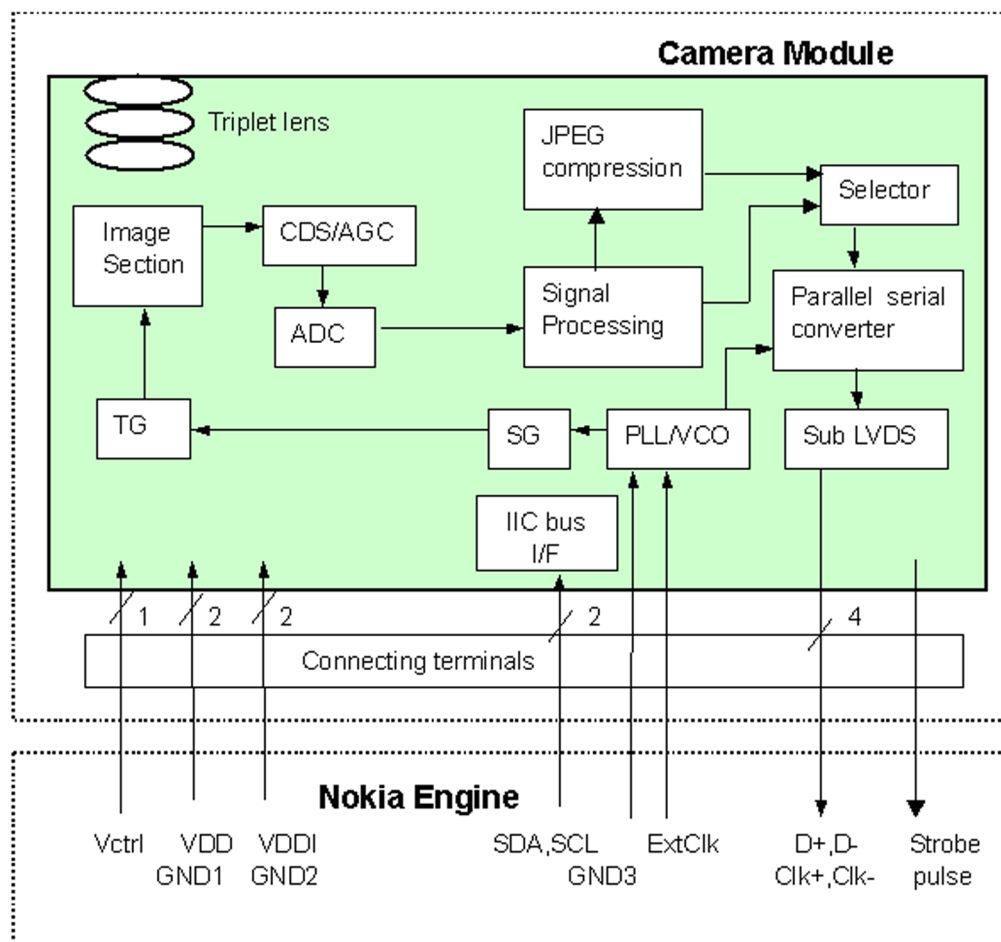


Figure 88 Block diagram of the back camera module

Flash LED

The FLED is located beside the back camera.

There are 5 dies inside FLED, one red and four white LEDs. The red LED is used as an indicator for video recording. The four white LEDs are for brightening the background in still image mode. The operating range in still image mode is approximately 1 to 1.5 m.

All white LEDs are connected in series. The module also includes a lens with its plastic housing. The dimensions of the FLED are 5 x 5 x 2 mm.

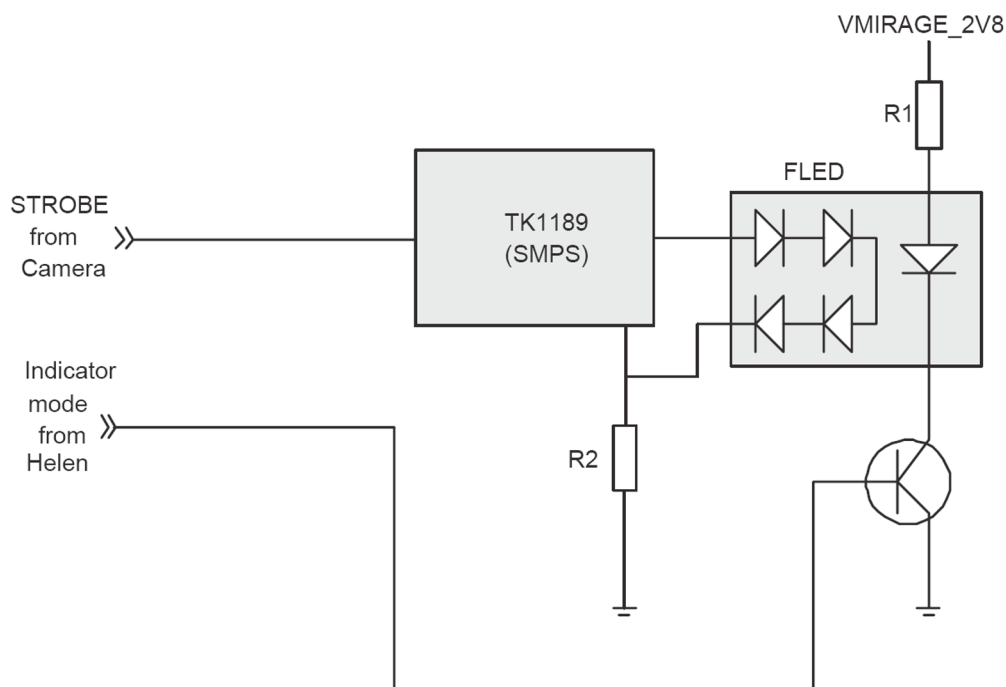


Figure 89 Simplified flash LED connection

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 I/O voltage of the application processor is 1.8V and the I/O voltage of the camera is 2.8V. Because of this, a level shifter is used for the interface between the application processor and the camera.

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
Focus range:	40 cm to infinity
Still Image resolutions:	640 x 480
Video resolutions:	176 x 144, 128 x 96 both 15 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
ISO:	250 - 1000 (Automatic)

Capture Modes:

Still capture mode, video mode, sequence mode 10,20 or 30 seconds.

User interface

Main display

Display module mechanical concept

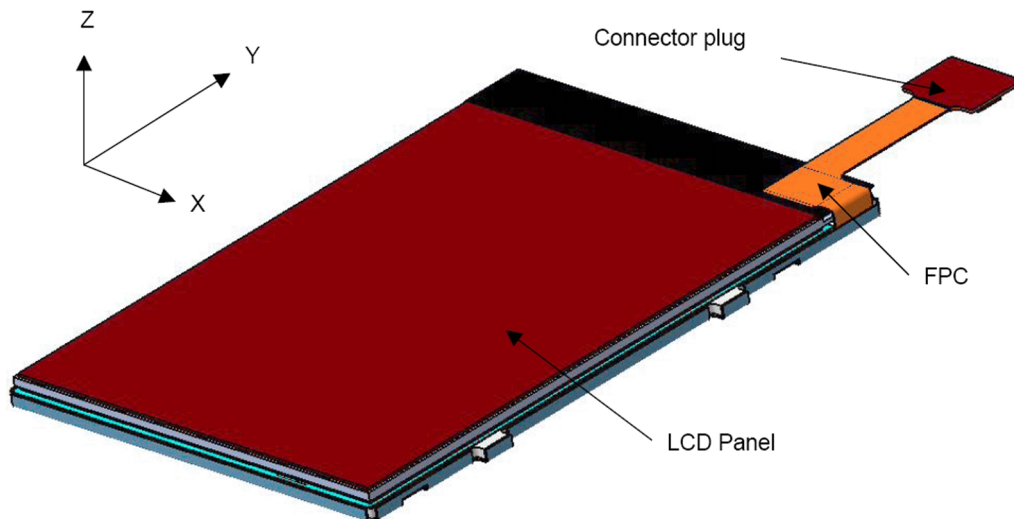


Figure 90 General diagram of the LCD module

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.

Cover UI display

Display module mechanical concept

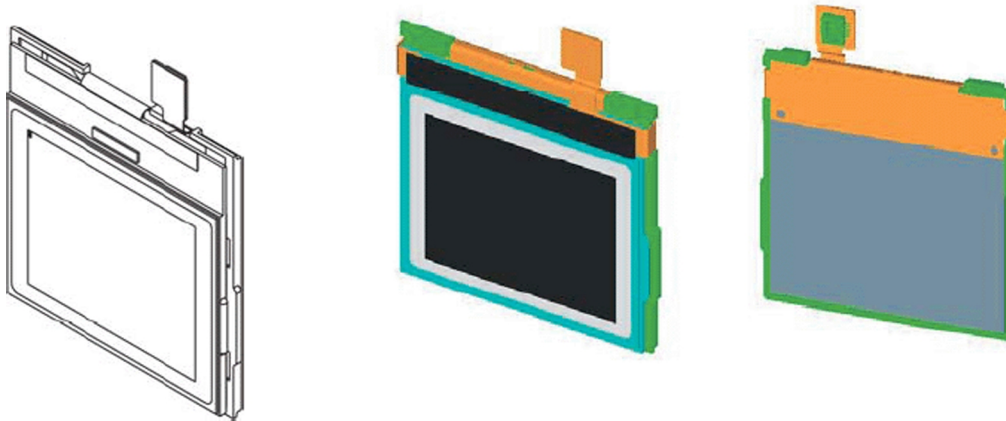


Figure 91 General diagram of the LCD module

Display features:

- Module size (width x height x thickness): 37.00 mm • 36.90 mm • 3.0 mm
- Resolution 98 x 70 pixel
- Numbers of colours up to 65k
- Partial display function; power saving by pausing display process on part of the screen
- Built-in RAM capacity 98 columns x 70 rows x 16bits = 109,760 bits

The display has two different operating modes:

- Normal mode, Full screen, 65k colors
- Normal partial mode, 8 colors but only part of the display is active

The module includes:

- FPWB including connector, required passive components
- Display panel (glass) with COG drivers including controller and 98 x 70 x 16 bits RAM
- Backlight system: light guide, LEDs and necessary optical sheets
- Supporting mechanics/frame

The interconnection between the LCD module and the NOKIA engine is implemented with a 10-pin board-to-board connector. The application processor controls the display via a bi-directional 9-bit serial interface. All signals go through the EMC filtering ASIPs.

The display module does not require any tunings in service.

Keyboard

The device keyboard is part of the main PWB on topside.

The key matrix consists of six rows and four columns. The voice key on the main PWB and the navigation key are connected to the same key matrix.

Table 18

	Col3	Col2	Col1	Col0
Row0	Right	Left	Right soft key	Left soft key
Row1	Down	Up	Send	
Row2	8	3	2	7
Row3	6	1		5
Row4	#		*	9
Row5	4	Operator key	Voice	End
Row6	Apps	Clear	Edit	0

Display and keyboard backlight

The device has one LED driver (SMPS) that is used to drive either the cover UI display LEDs or both keyboard LEDs and main display LEDs. Which display is brighten depends on the hall sensor (fold open or closed).

The LED driver consists of three LED chains: a display LED chain and two keyboard LED chains. Both keyboard chains contain four LEDs, eight in total. The display LEDs chain consists of two LEDs in case of cover UI display or four LEDs in case of main display.

The SMPS feedback resistor does the current adjustment of the driver.

In a typical case, keyboard LEDs are turned ON only in dark ambient lighting conditions.

Table 19 Control signals of the LED driver

Signal	From	To	Voltage	Function
GenOut1	N2300	R2302 (10k)	0V / 1.8V	Maximum current control
GenOut2	N2300	R2301 (4k7)	0V / 1.8V	(0V p max. current)
GenOut3	N2300	N1200 (Lid PWB)	1.8V	PWM on N1200 enable pin
GENIO46	RAP	R1221 (1k)	1.8V	Shift to either main display or cover UI display LEDs

ALS interface

Ambient Light Sensor (ALS) is located next to the VGA camera on the lid PWB. It consists of the following components:

- lightguide
- phototransistor (V1210)+ resistor (R1211)
- NTC + resistors (R1213, R1210, R1212)
- 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 / dim
- Display backlights are dimmed, when the environment is dark / dim

The ambient light sensor itself is a photo transistor, which is temperature-compensated by an external NTC resistor. 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.

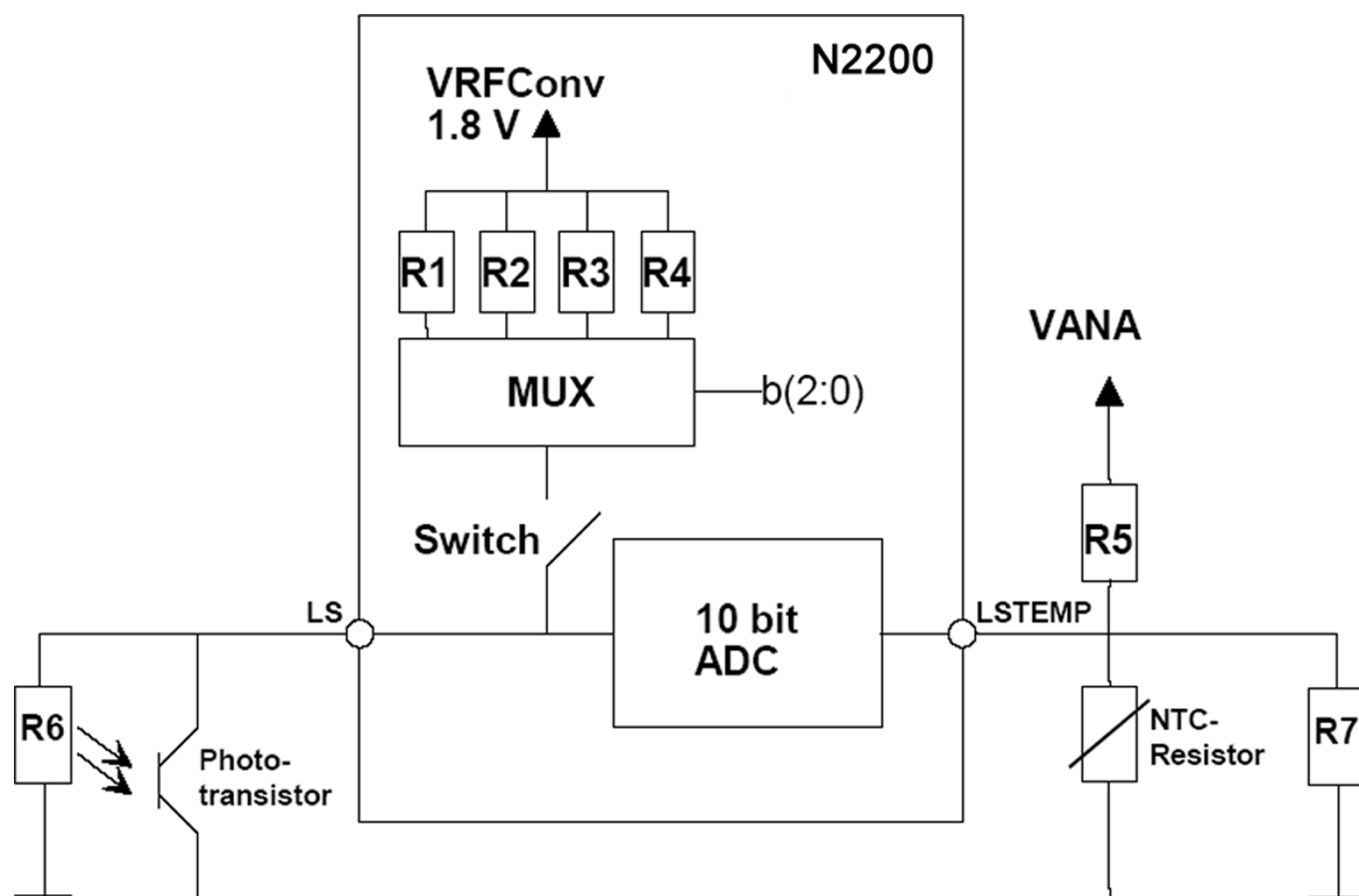


Figure 92 ALS HW implementation

Table 20 ALS resistor values

Symbol	R1	R2	R3	R4	R5	R6	R7	NTC-res
Value	5 kOhm	15 kOhm	30 kOhm	50 kOhm	470 kOhm	100 kohm	470 kohm	47 kOhm

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor.

In general RAP consists of three separate parts:

- Processor subsystem (PSS) that includes the main processor and related functions
- MCU peripherals that are mainly controlled by MCU
- DSP peripherals that are mainly controlled by DSP

RAP core voltage (1.4 V) is generated from the EM ASIC (N2300) VCORE and I/O voltage (1.8 V) is from the EM ASIC (N2200) VIO. The core voltage in sleep mode is 1.05 V.

EM ASIC N2200

EM ASIC N2200 includes the following functional blocks:

- Start up logic and reset control
- Charger detection
- Battery voltage monitoring

- 32.768 kHz 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

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
- External LED driver control interface
- Digital interface (CBUS)
- Accessory supply voltage regulator
- Vout - accessory

Device memories

RAP memories NOR flash and SDRAM

The modem memory consists of 64 Mbit SDRAM and 64 Mbit NOR flash memories.

SDRAM is a dynamic memory for ISA (Intelligent Software Architecture) SW.

NOR is used for ISA SW code and PM data and CDSP (Cellular Digital Signal Processor) SW code.

SDRAM core voltage (1.8 V) is generated from N2200 VDRAM and I/O voltage (1.8 V) is from VIO. NOR flash uses VIO for both core and I/O voltages.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. The stacked DDR/NAND application memory has 512 Mbits of DDR memory and 512 Mbits of flash memory. DDR DRAM memory is stacked above the NAND flash.

Both NAND core and I/O voltages are 1.8 V generated by VIO.

Table 21 Supply voltages for combo memory interfaces

Parameter	Symbol	min	max	unit	note
Supply voltage	VBAT			V	Battery voltage
Combo memory core voltage	Vore	1.65	1.95	V	Nominal 1.8V s
Host I/O supply voltage1.8V	VIO	1.71	1.89	V	Nominal 1.8V

■ 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 ASIC.

The mixed-signal ASIC provides an interface for the transducers and the accessory connector. Because audio amplifiers are also integrated into the ASIC, the only discrete electronics components needed for audio paths are audio filtering components and EMC/ESD components.

There are three audio transducers:

- earpiece 7.5x11 mm
- speaker 15x11 mm
- electret microphone module

In addition to the audio transducers, the mixed-signal ASIC also provides an output for the dynamic vibra component.

All galvanic audio accessories are connected to the system connector.

A Bluetooth audio module, which is connected to the RAP ASIC supports Bluetooth audio functionality.

There is also a separate application ASIC for Symbian applications.

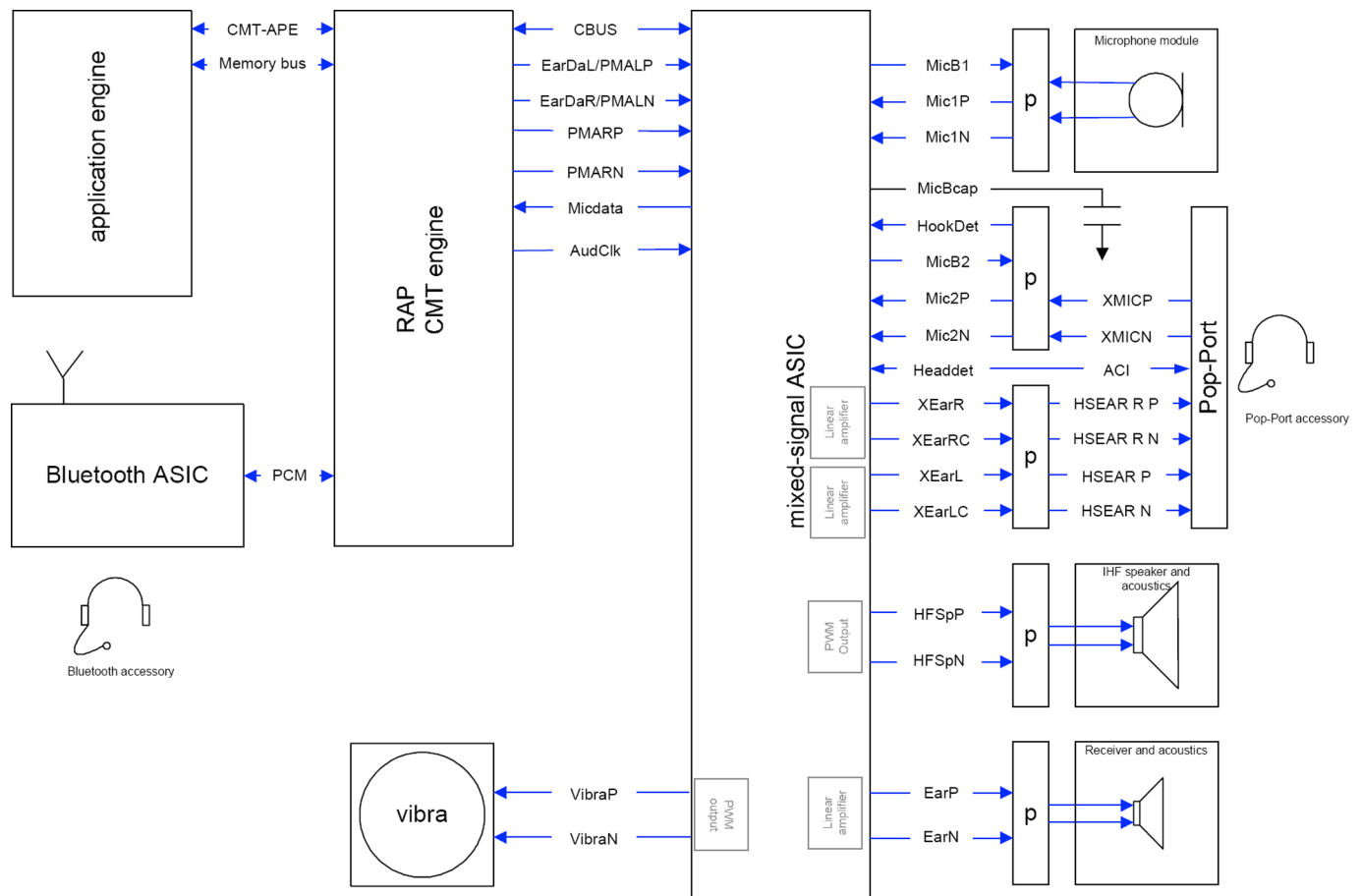


Figure 93 Audio block diagram

Internal microphone

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

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

The microphone is biased by N2200 ASIC MicB1 bias voltage output.

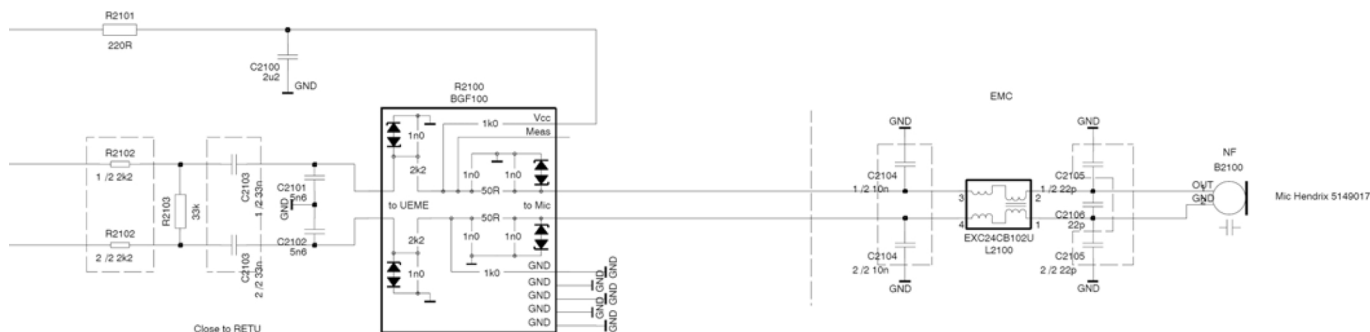


Figure 94 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector.

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

External microphone circuitry is biased by EM ASIC (N2200) MicB2 bias voltage output. The circuitry provides a symmetrical connection for the microphone from the system connector connections, XMICN and XMICP, to EM ASIC (N2200) inputs, Mic2P and Mic2N.

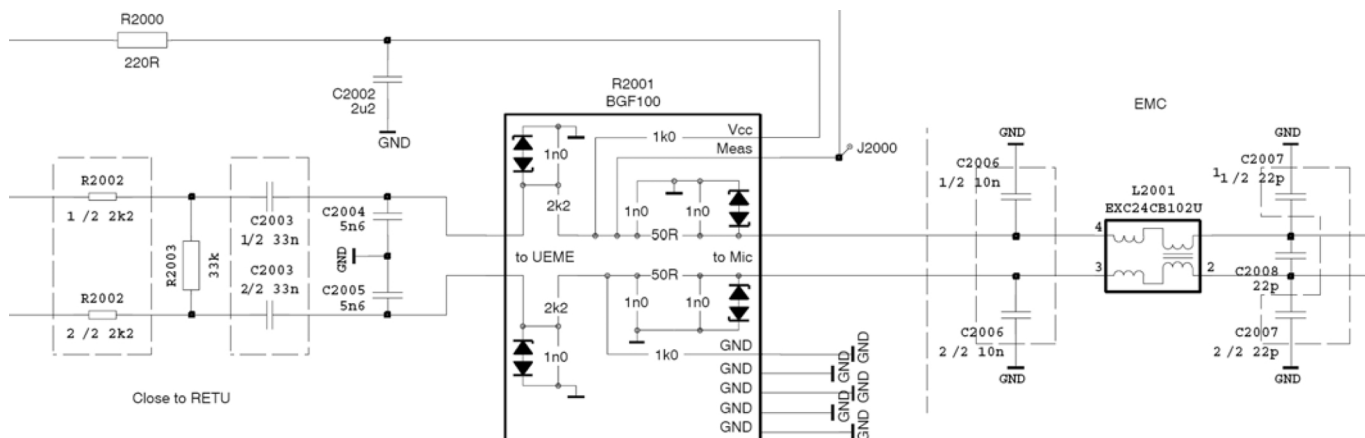


Figure 95 External microphone circuitry (system connector connects to the right side)

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic 7.5x11mm earpiece capsule is connected to EM ASIC's (N2200) differential outputs EarP and EarN.

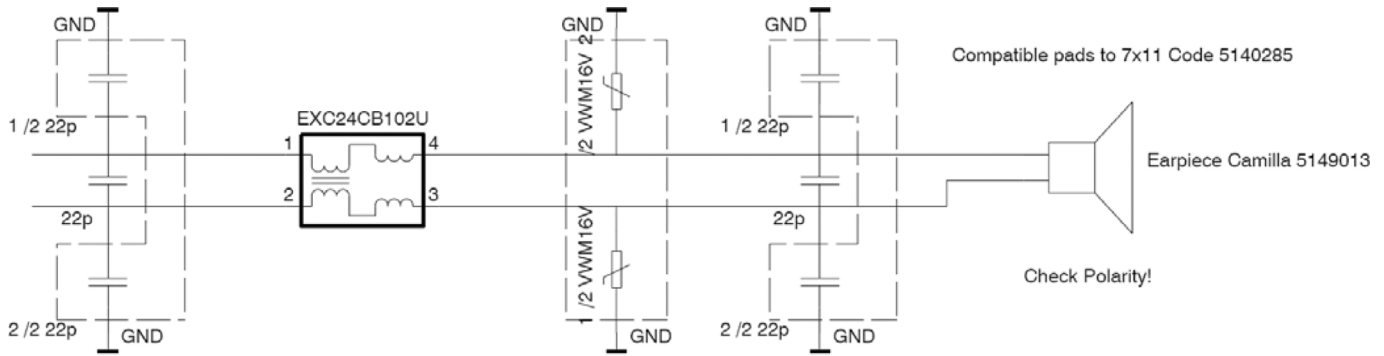


Figure 96 Internal earpiece circuitry

Internal speaker

The internal speaker is used in Internal HandsFree (IHF) call mode.

A dynamic 15x11 mm speaker is connected to EM ASIC's (N2200) outputs HFSpP and HFSpN.

The IHF amplifier integrated in N2200 is a Digital Pulse Modulated Amplifier (DPMA).

IHF- connection

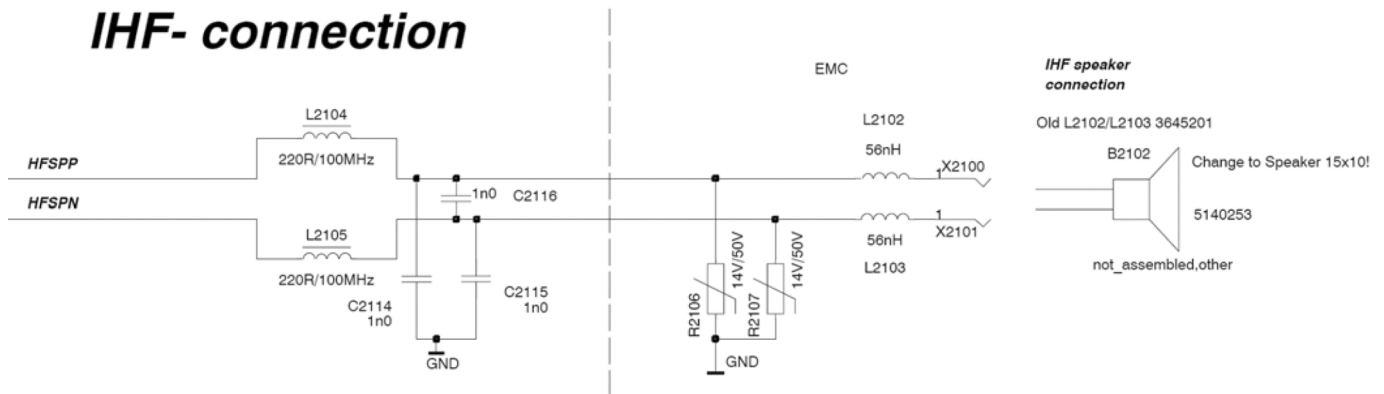


Figure 97 Internal speaker circuitry

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.

EM ASIC (N2200) provides two output channels in either single-ended or differential format. N2200 outputs XearL and XearLC form the left channel audio output, and XearR and XearRC the right channel audio output. XearLC and XearRC are the ground pins if the output works in a single-ended operation.

In 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. Respectively, HSEAR N and HSEAR R N are the ground pins if the output works in a single-ended operation.

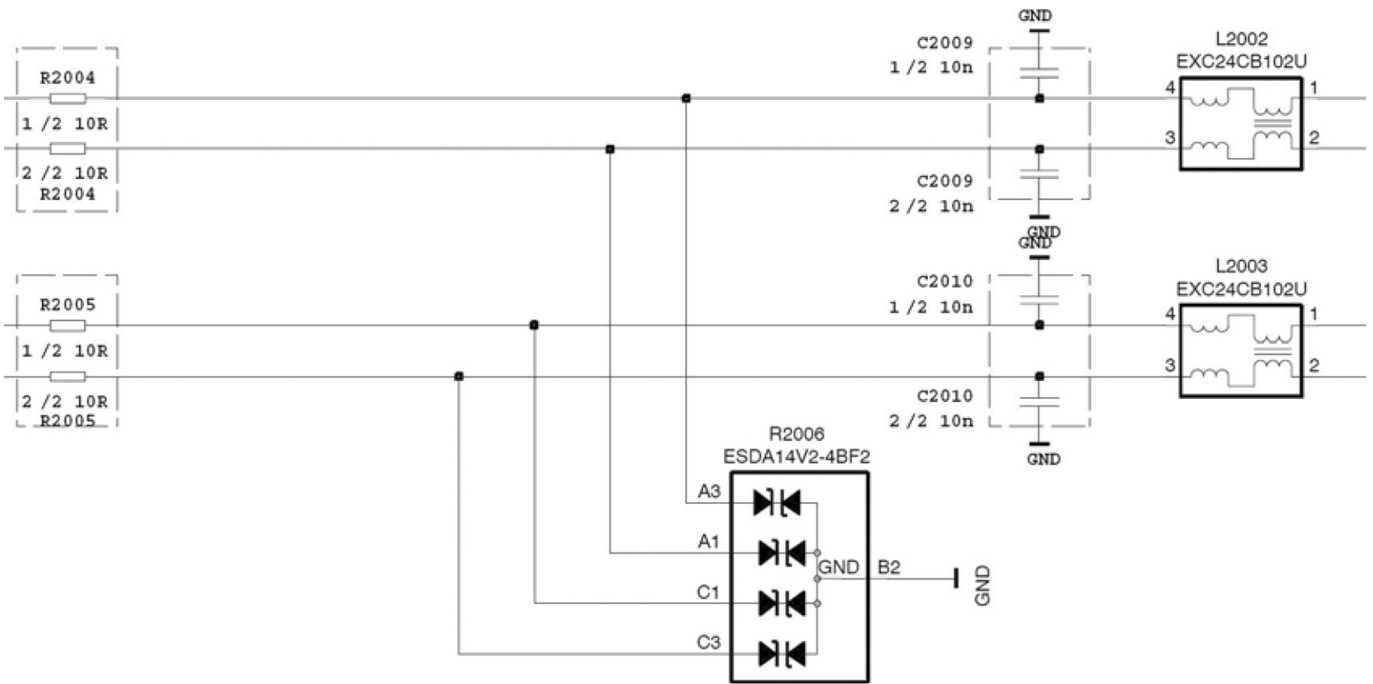


Figure 98 External earpiece circuitry (system connector connected on the right)

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.

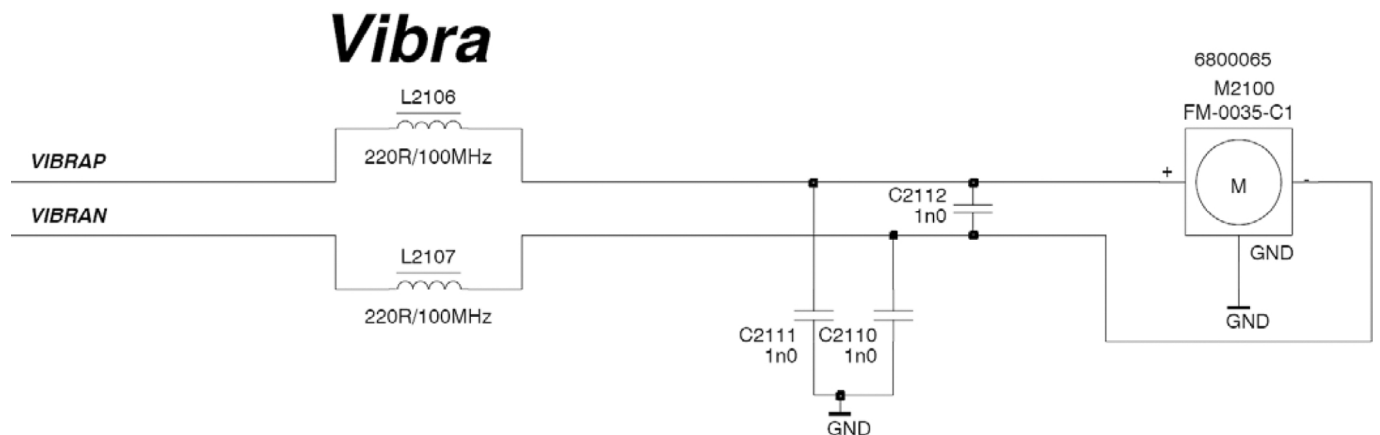


Figure 99 Vibra circuitry

System connector

The system connector provides a fully differential 4-wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The handsfree driver in EM ASIC N2200 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.

PWB

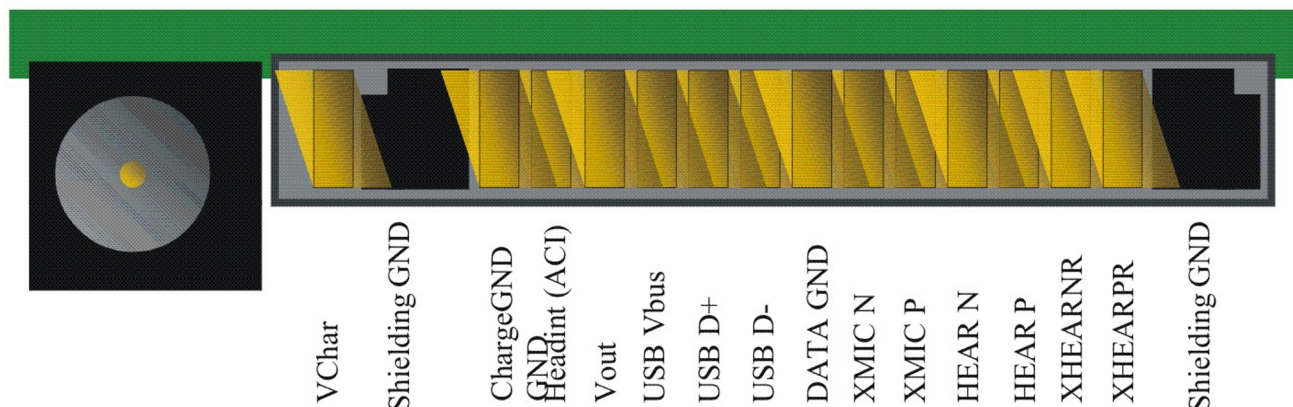


Figure 100 External audio connector

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
5 / UBS Vbus	DC in	DC	4.375-5,25V		USB spec
6 / USB D+	Pos. diff. data	12Mbit	0-3.3V	max. 33W	USB spec
7 / USB D-	Neg. diff. data	12Mbit	0-3.3V	max. 33W	USB spec
8 / USB GND	Data GND		0V		USB spec
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

Name of Connection	Connector reference
USB	X2001
Charger	X2000
Headset	X2001
SIM	X2701
SD card reader	X5201
Battery connector	X2070

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	N2200	VSIM1	Supply voltage to SIM card, 1.8 V or 3.0 V.
C2	SIMRST	Out	N2200	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	N2200	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground
C7	SIMDATA	In/Out	N2200	SIM1DaC	Data input / output

SD card interface connections

Pin	Signal	I/O	Engine connection		Notes
1	CD/DAT3	I/O	Application processor	SD_DAT3_2V8	Data bus
2	CMD	I/O	Application processor	SD_CMD_2V8	Command/Response
3	VSS				GND
4	VDD		N5200/5201	VSD	Power supply, 2,85V
5	CLK	I	Application processor	SD_CLK_2V8	External clock, max. 25MHz p application processor clock 12MHz
6	VSS				GND

Pin	Signal	I/O	Engine connection		Notes
7	DAT0	I/O	Application processor	SD_DAT0_2V8	Data bus
8	DAT1	I/O	Application processor	SD_DAT1_2V8	Data bus
9	DAT2	I/O	Application processor	SD_DAT2_2V8	Data bus
10	NC	---			For future use
11	NC	---			For future use

Charger connector and charging interface connections & electrical characteristics

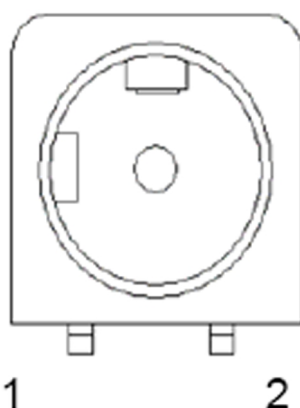


Figure 101 Charger connector

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

Description	Parameter	Min	Max	Unit	Notes
Threshold for charging, falling (N2300)	V_{MSTR-}	1.9		V	Typical value

Battery connector and interface connections & electrical characteristics

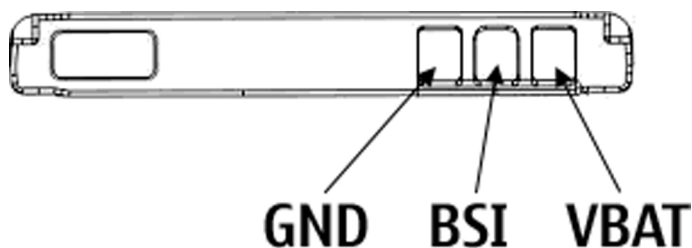


Figure 102 Battery connector

Table 25 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

Table 26 Battery IF electrical characteristics

Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC
Current rating	I_{IN}	0.9	A

Internal interfaces

Name of Connection	Connector reference
Flex connector	X4100
BT connector	X4300

17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

A B C D E F G H I J

1

J

17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

A B C D E F G H I J

1

J

Table 27 Power supply of the main lid components

Parameter	Min	Typ	Max	Notes
VDDI	1,70	1,80	1,91	Mirage 2MP camera power supply range
VDD	2,65	2,78	2,91	
VVGA_2V8	2,6	2,8	3,0	VGA camera power supply range
(IOVDD, PVDD)				
VVGA_1V5	1,4	1,5	1,6	
(VDDD)				
VAUX	2,6	2,75	2,95	Main display power supply range
(VDD)				
VIO	1,65	1,8	1,95	
(VDDI)				
VAUX	2,60	2,75	2,90	Cover UI display power supply range
(VDD)				
VIO	1,65	1,80	1,95	
(VDDI)				

■ RF description

The receiver is a linear direct conversion receiver consisting of separate front ends (LNA (Low Noise Amplifier) and demodulator) for each supported system. After the demodulators, the signal paths are combined to one common BB path.

The last stage of the RF Rx chain is an output buffer which feeds the signal and a reference voltage (VREFCM) to the BB ASIC.

GSM receiver functionality

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 antenna switch module.

The antenna switch module is followed by integrated LNAs residing in the Rx ASIC.

The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

After the down conversion mixer, the Rx chain is similar to the WCDMA Rx. The channel select filter is set to 115 kHz in the GSM mode.

Introduction to transmitter functionality

Transmitter functions are implemented in an RF ASIC. The ASIC contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use.

In addition, the ASIC contains separate RF paths comprising a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter functionality

In the transmitter side, an analogue I/Q modulated signal is received from digital baseband into an RF ASIC and fed through a low pass filter. After the filter the signal is fed to the IQ modulator, which converts the signal to final Tx frequency. There are two separate I/Q modulators: one for WCDMA and another for GSM signals. The signal then exits the RF ASIC via a balanced line. Next, the signal is band pass filtered by a SAW filter before it is fed to the WCDMA PA module. After the PA, the transmitted WCDMA signal is fed through an isolator and a duplex filter to the antenna.

WCDMA power control

WCDMA Tx power control is accomplished by the two VGA amplifier stages in the Tx ASIC.

The VGAs have a common temperature compensation circuit and one voltage mode analogue input for gain control (TXC).

Another function of the detector voltage is to steer the DC/DC converter, which is providing a variable supply voltage for the WCDMA PA.

WCDMA PA module

The 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 two bias current inputs.

Bias currents are generated by 5-bit DA converters in the RF ASIC.

If a different manufacturer's PA is changed to the phone, this setting must be set again.

PA DC/DC converter

The control of the DC/DC converter is fed back from the power detector circuit.

GSM transmitter functionality

An RF ASIC receives an analogue IQ modulated signal from digital BB, which is first low pass filtered with filter corner frequency set to approximately 200 kHz. After the filter, the signal is routed to the GSM modulator.

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 EGSM900 (and GSM850), the PA module is preceded by a SAW filter. After the filter, the signal is fed to the GSM PA module. Finally, the signal is routed via the antenna switch to the antenna.

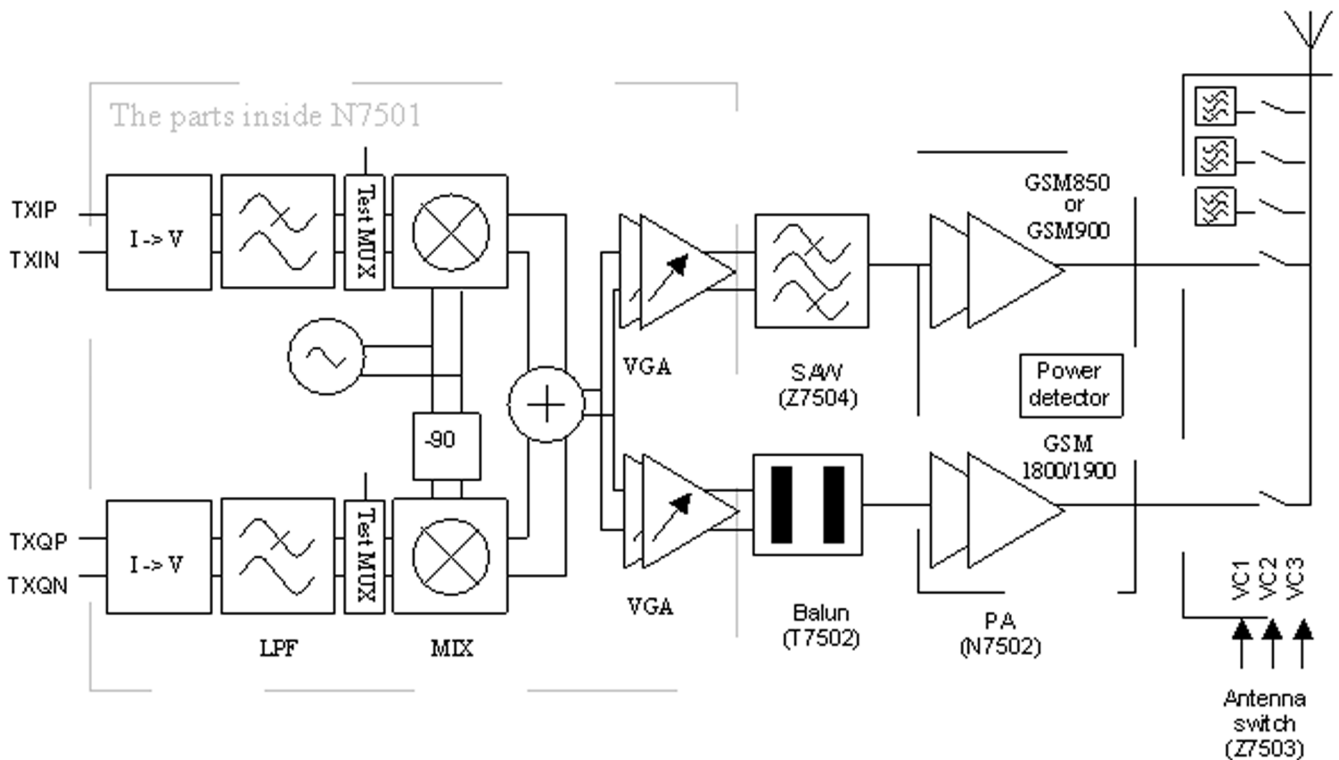


Figure 105 GSM transmitter

GSM power control

A closed control loop comprises an integrated power detector (in PA module) and an error amplifier. The error amplifier resides in N7501, and it controls the transmitter power of GSM.

GSM PA module

A single GSM/EDGE PA module contains two separate amplifier chains, one for EGSM900 (and GSM850) and another for GSM1800/1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF has separate synthesizers for Rx and Tx. Both synthesizers consist of:

- PLL (Phase-Locked Loop)
- loop filter
- VCO (Voltage Controlled Oscillator)
- balun

The VCO frequencies are locked by PLLs into a reference oscillator, VCTCX0 (Voltage Controlled Temperature Compensated Crystal Oscillator).

The PLLs are located in RF ASICs and controlled via RFBUS.

The VCOs operate at the channel frequency multiplied by two in the upper bands and by four in EGSM900 (and GSM850, if applicable). The required frequency dividers required for modulators and demodulators are integrated into RF ASICs. The dividers are controlled via RFBUS.

Reference oscillators

A 38.4MHz VCTCX0 is used as a reference oscillator for the frequency synthesizers.

Regulators

RF ASICs contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts. Rx VCO supply is got via a switch from an RF ASIC VR1 regulator.

■ Frequency mappings

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	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	608	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																		

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	608	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							

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			
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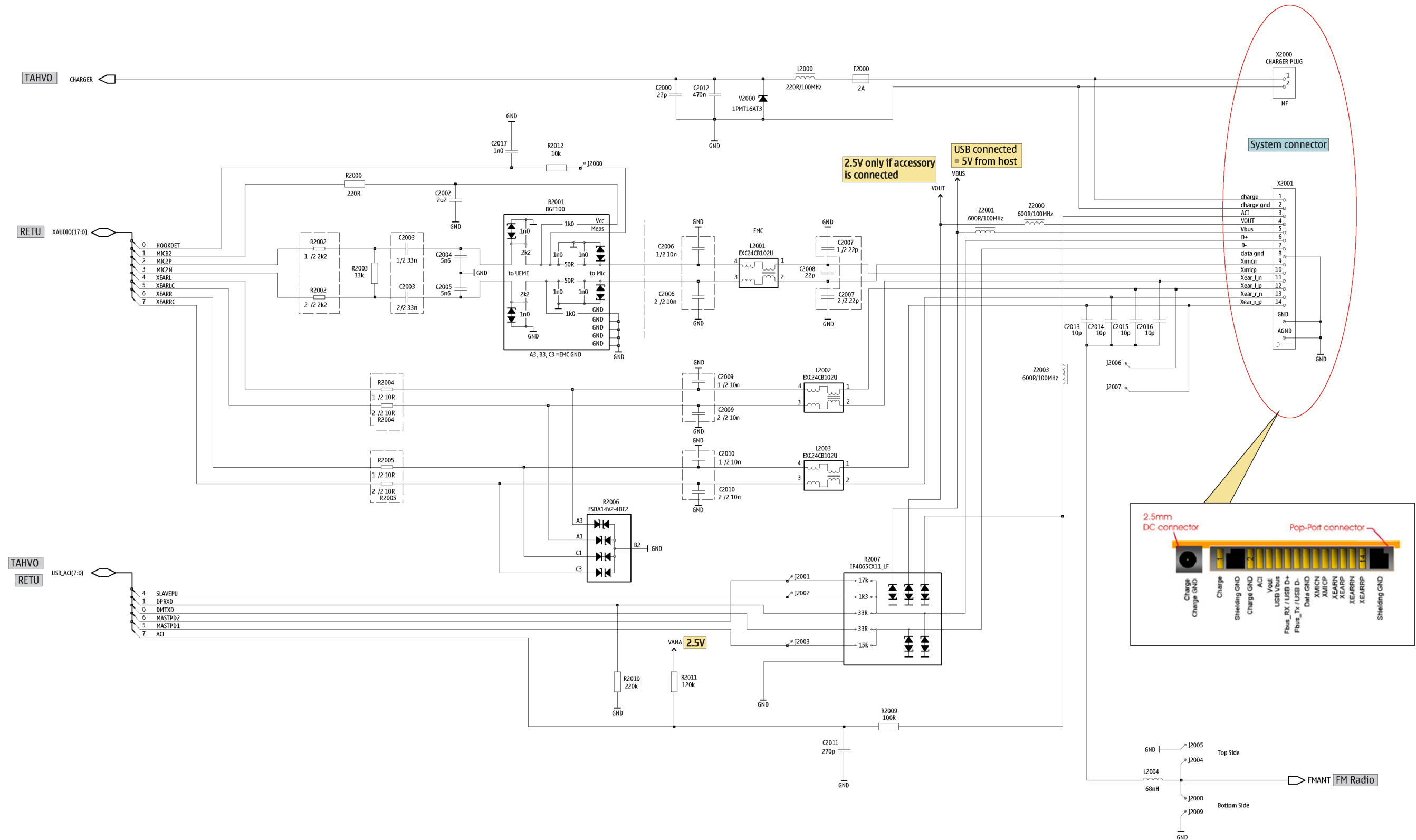
10 — Schematics

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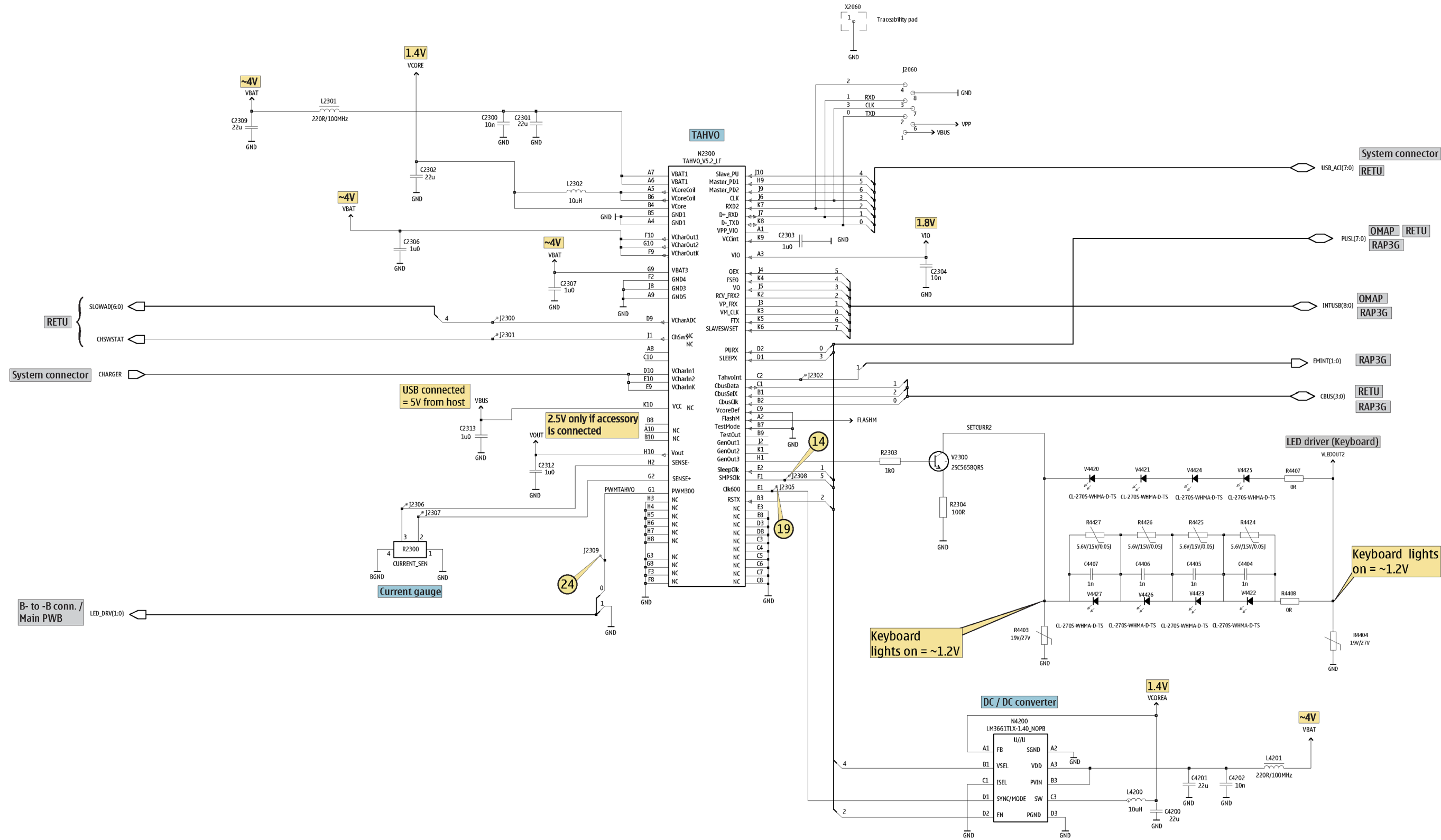
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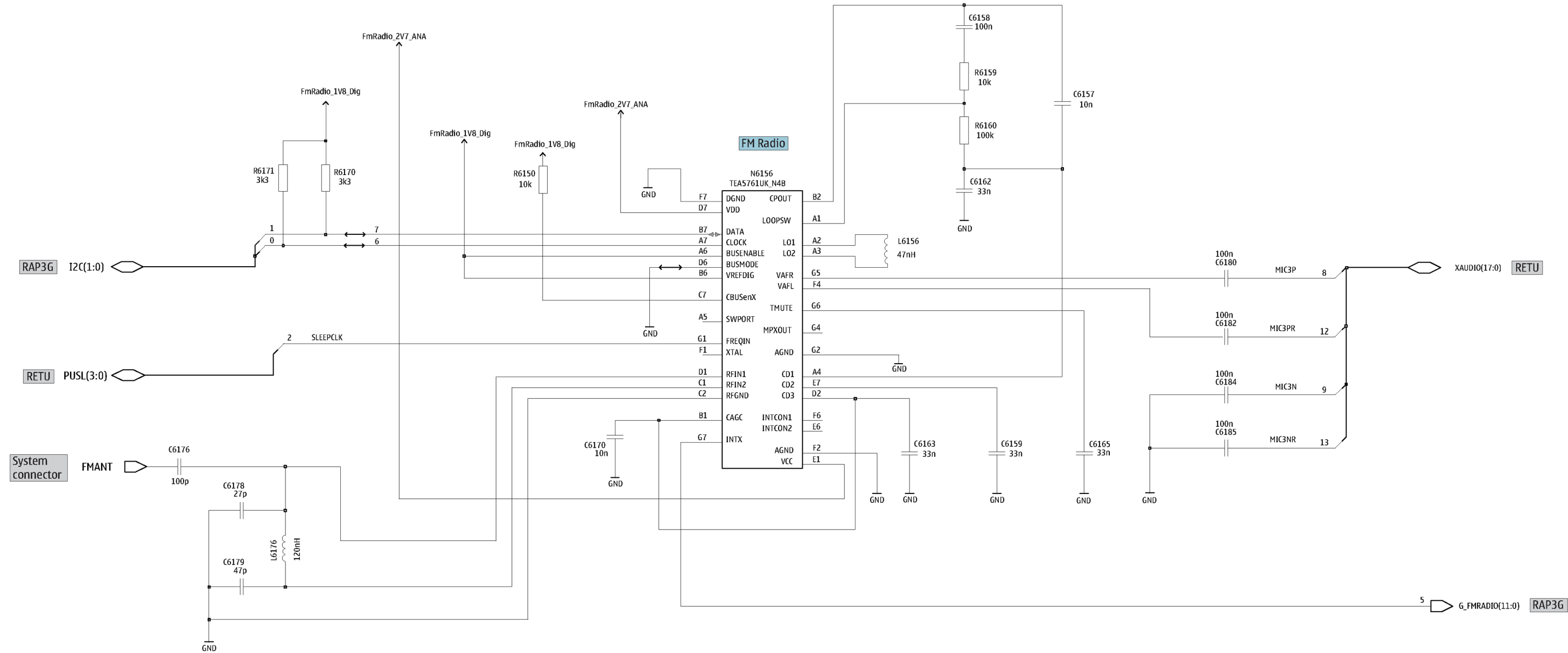
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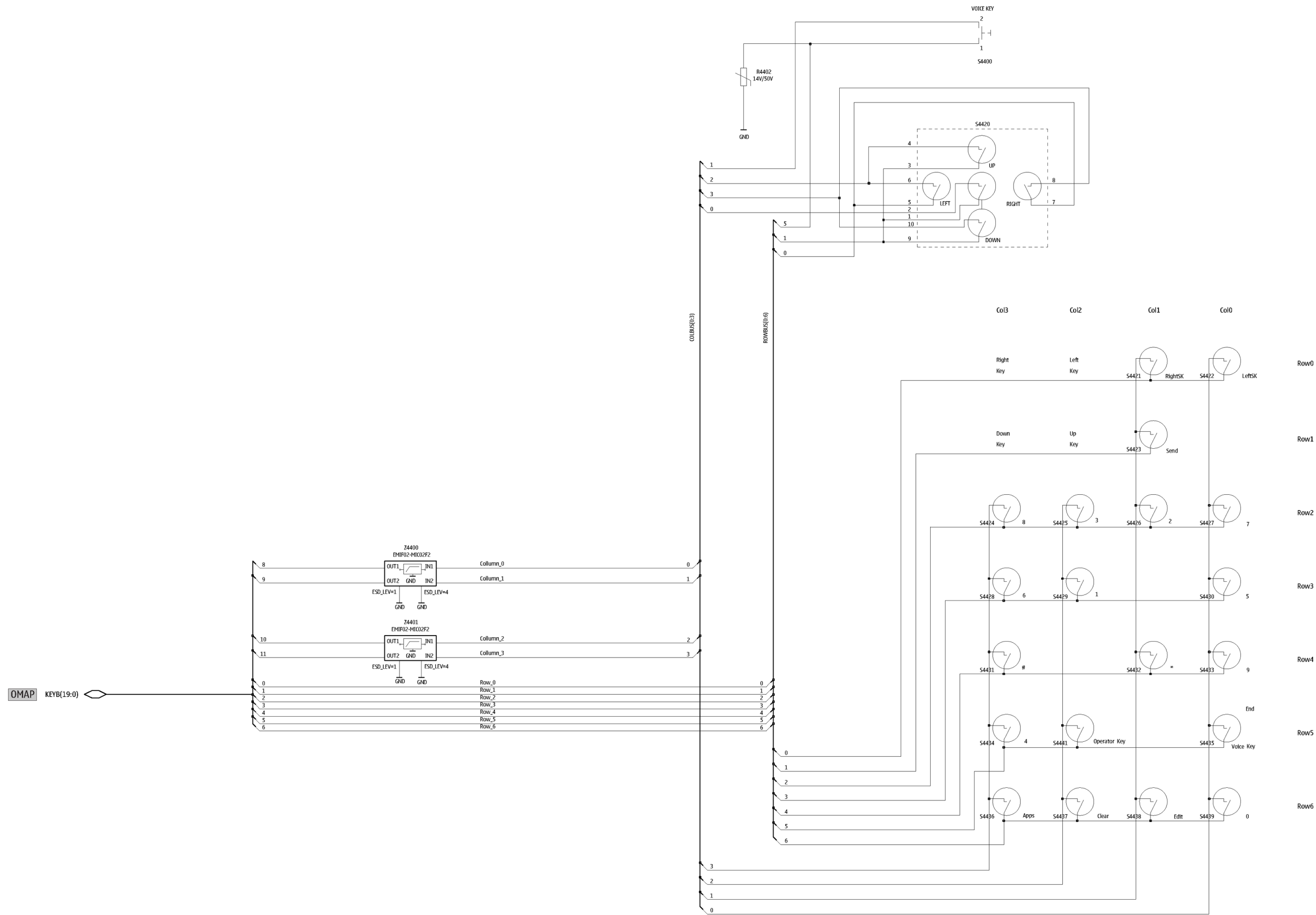
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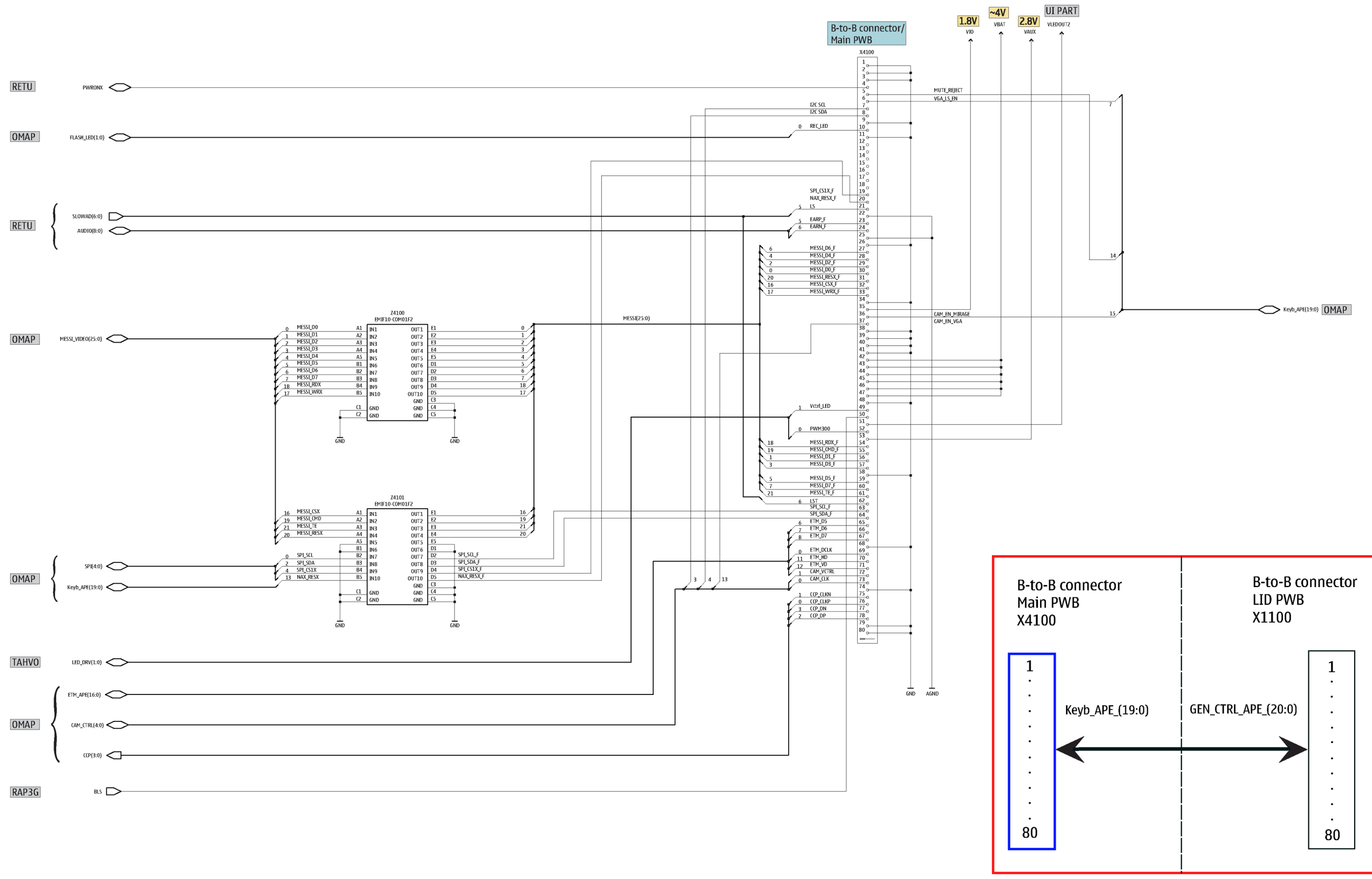
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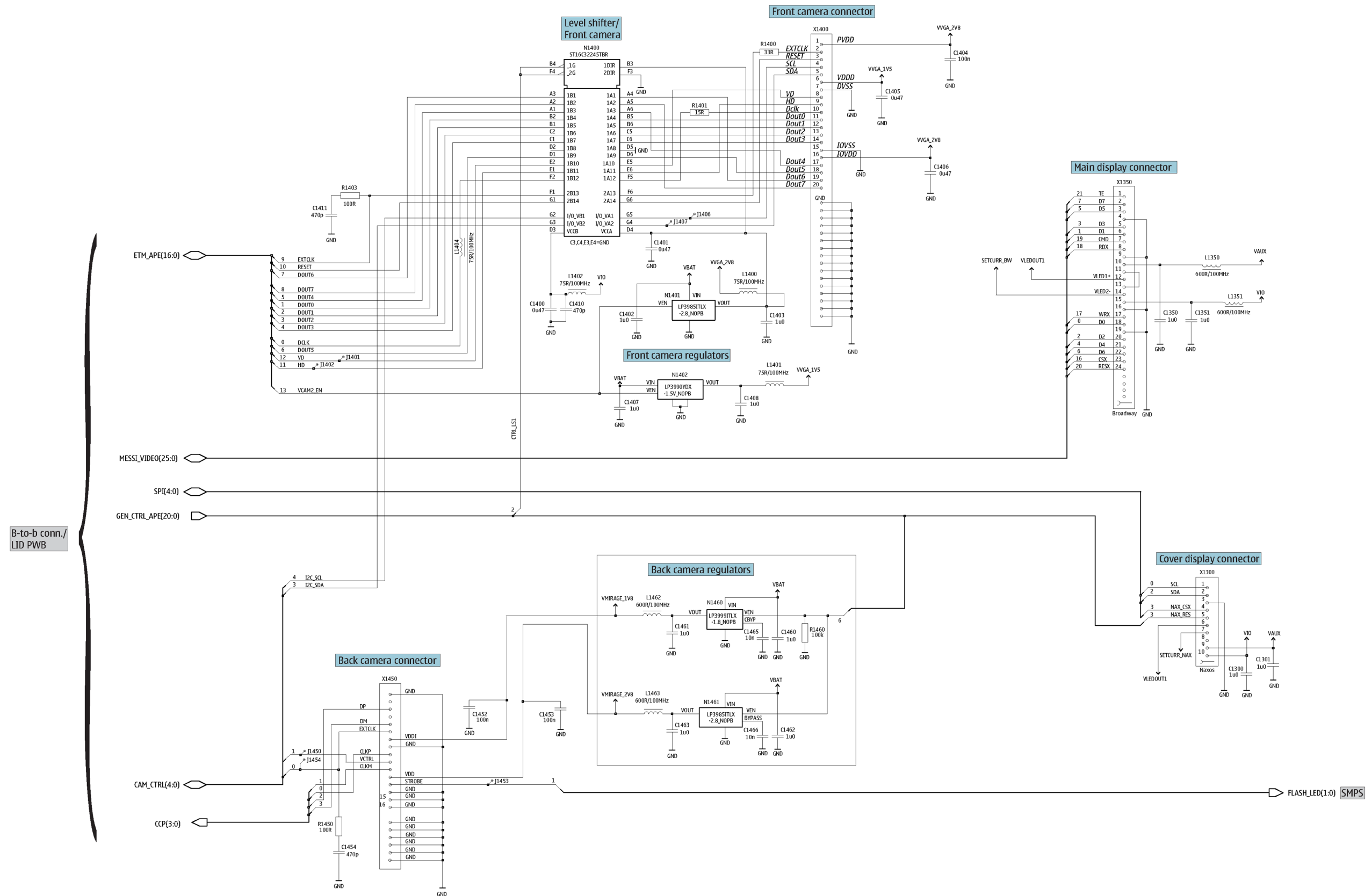
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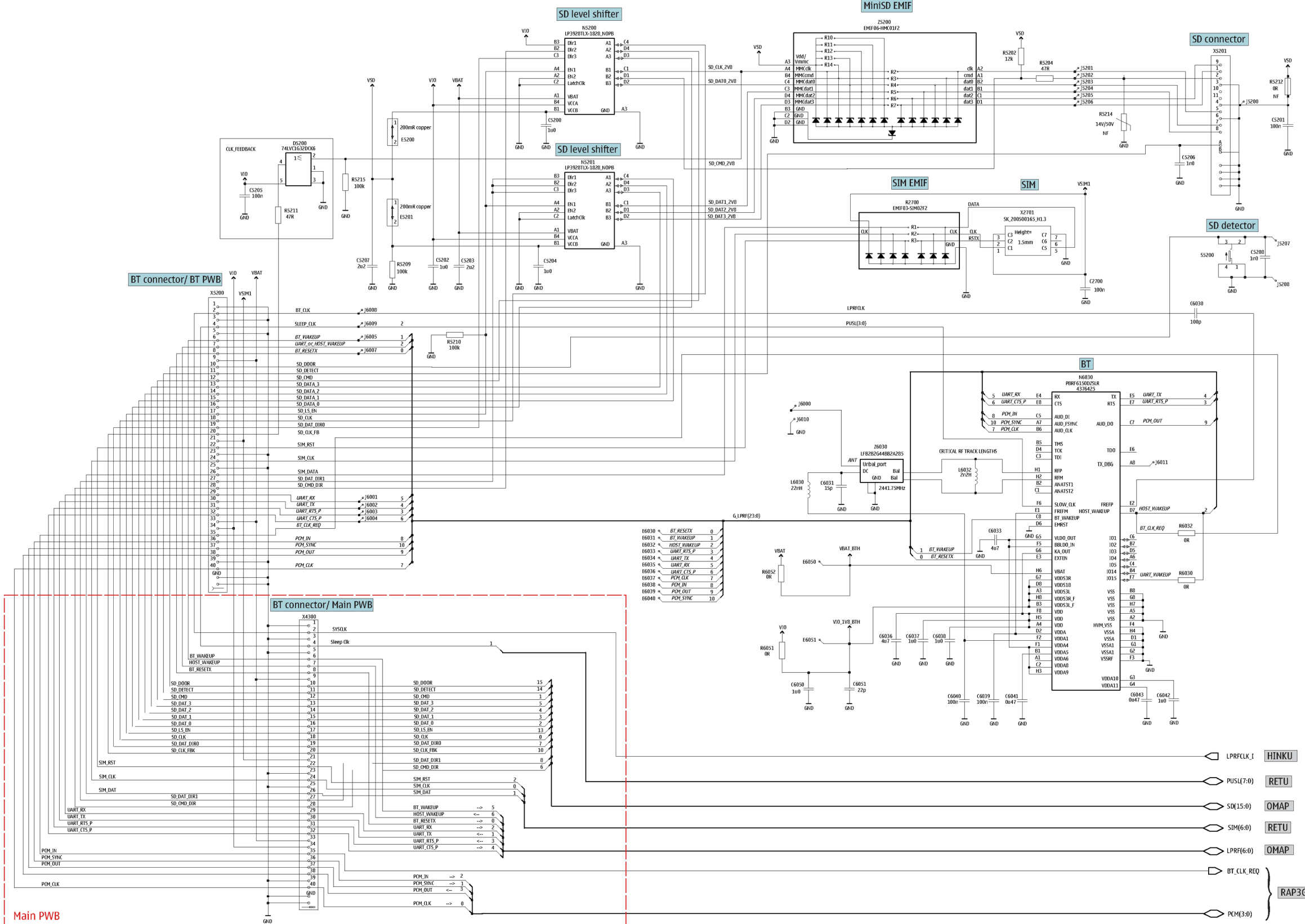
■ Board to board connector, main PWB



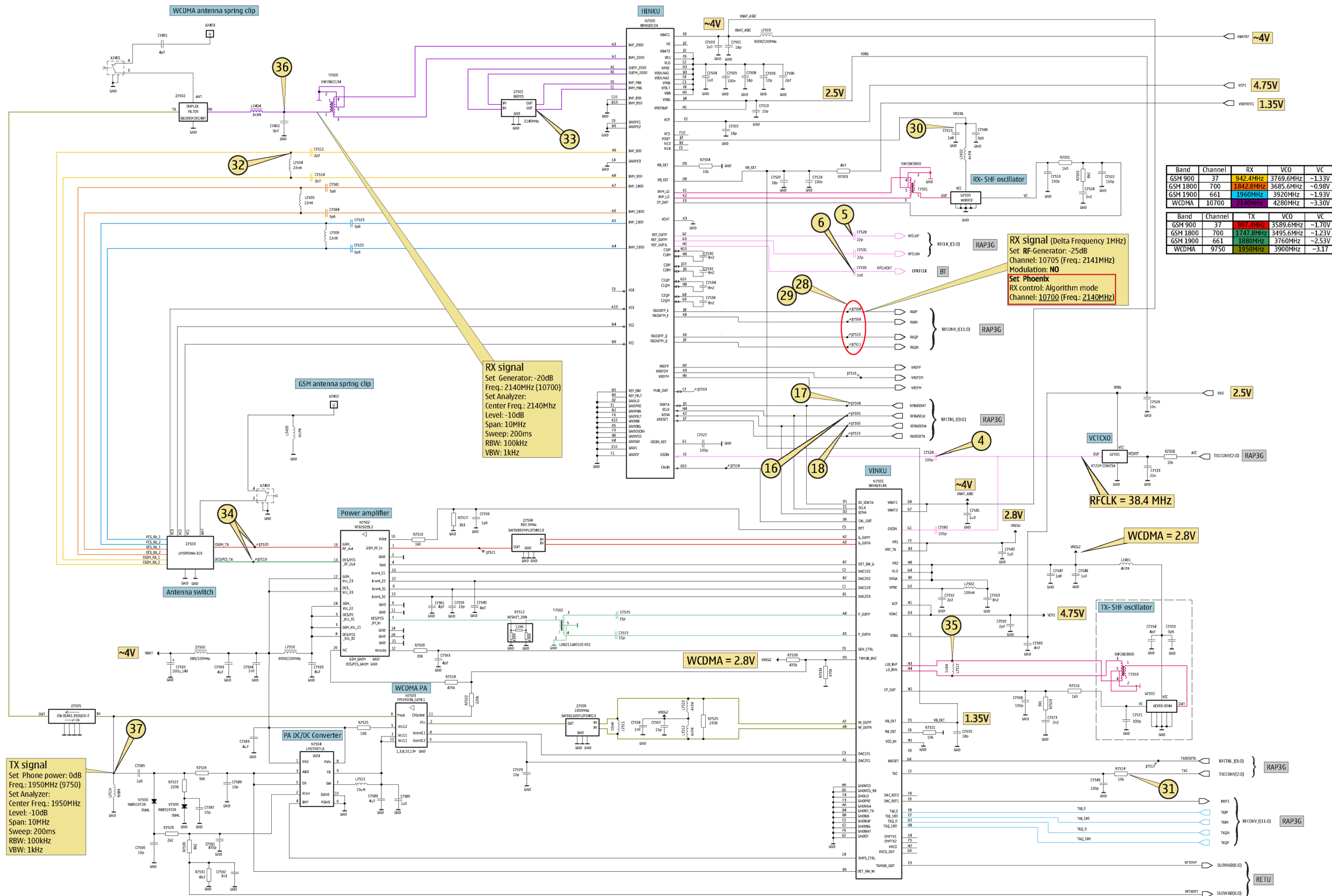
■ Display and cameras, lid PWB



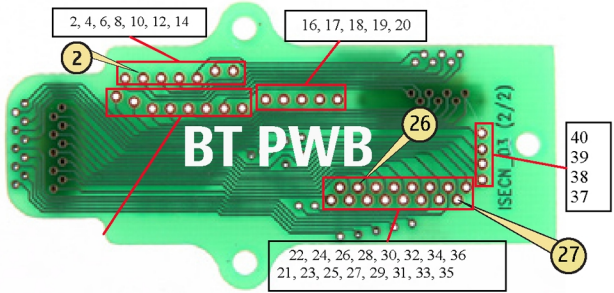
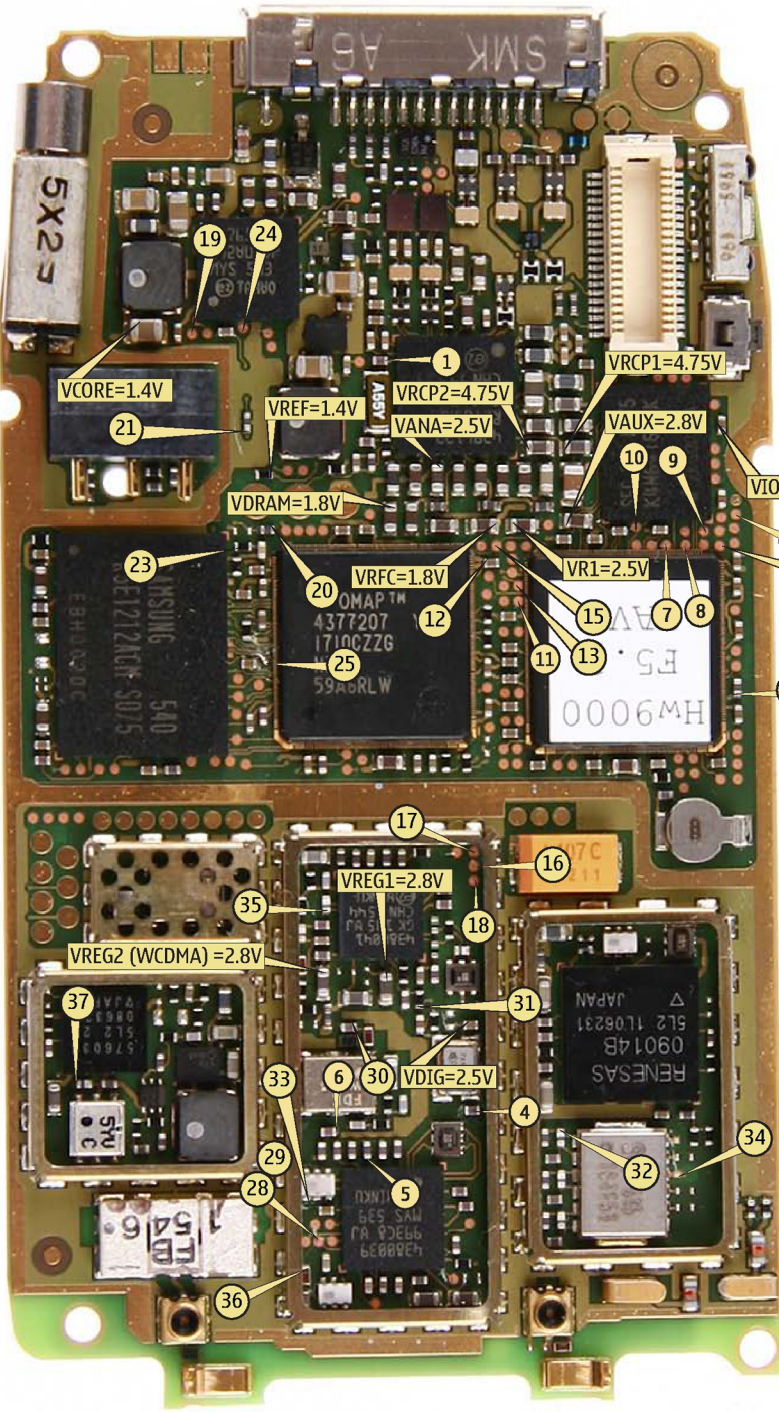
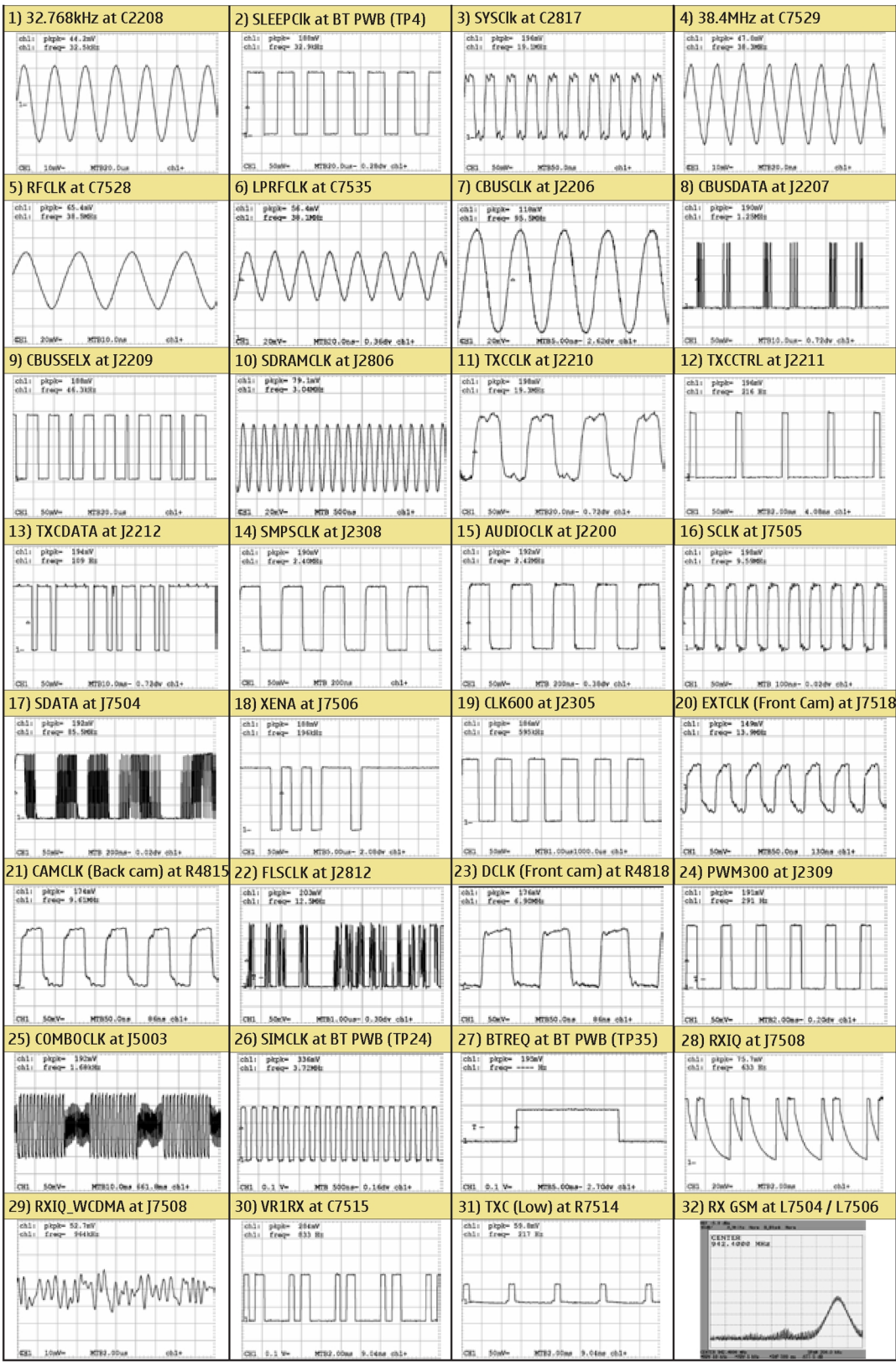
■ Bluetooth PWB



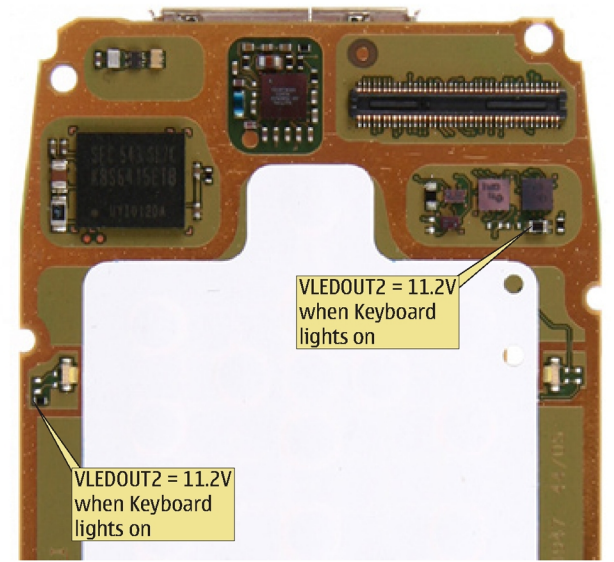
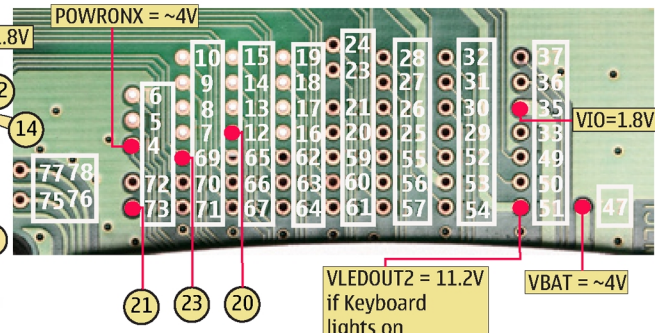
RF part



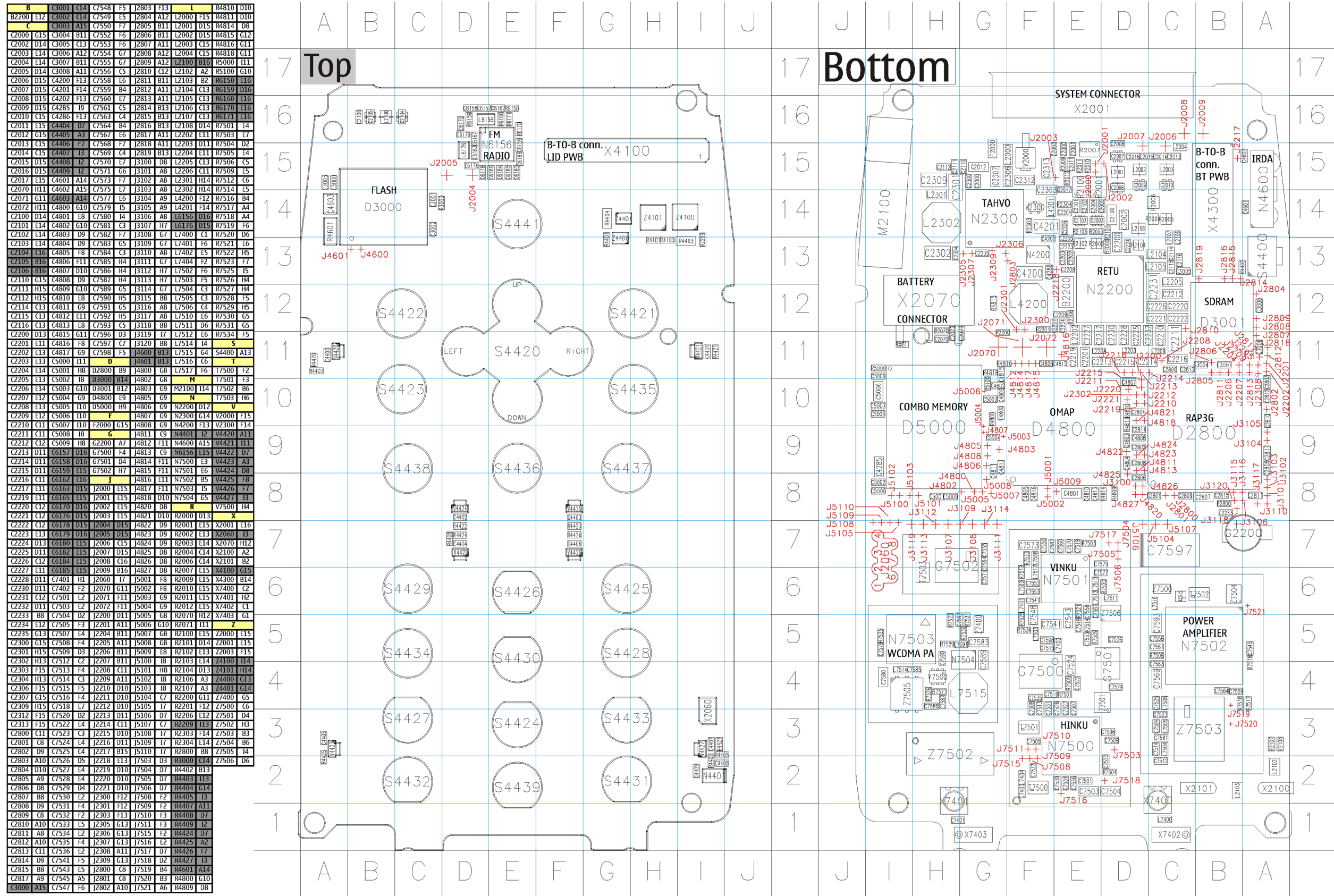
■ Signal overview



Module Jig - LID PWB Test points



■ Component finder



Appendix A: Additional RF Troubleshooting Instructions

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1. USING THESE INSTRUCTIONS

The following sections include lots of headings and subheadings that are asking simple positive style questions.

For example heading 4.2 asks if the phone does measure RSSI-values correctly in GSM-bands. If the answer is “Yes” then user should go to the next heading on the same level (heading number that has as many decimal numbers as the heading 4.2) In our example case moving to the section 4.3. If the answer is “No” then user should go to one heading level deeper in hierarchical system meaning the section 4.2.1 in our example case.

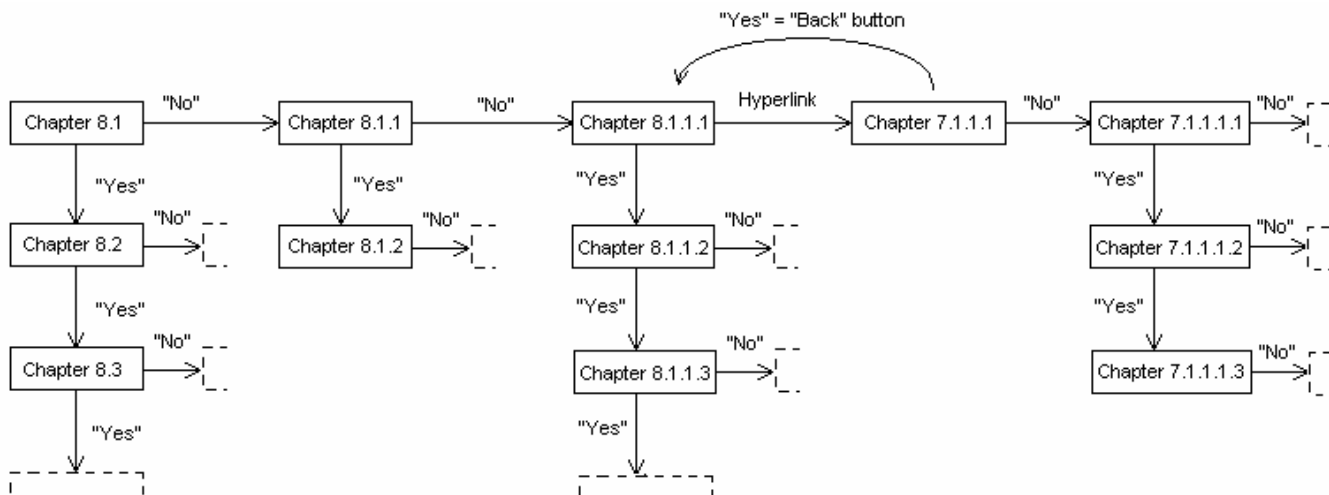


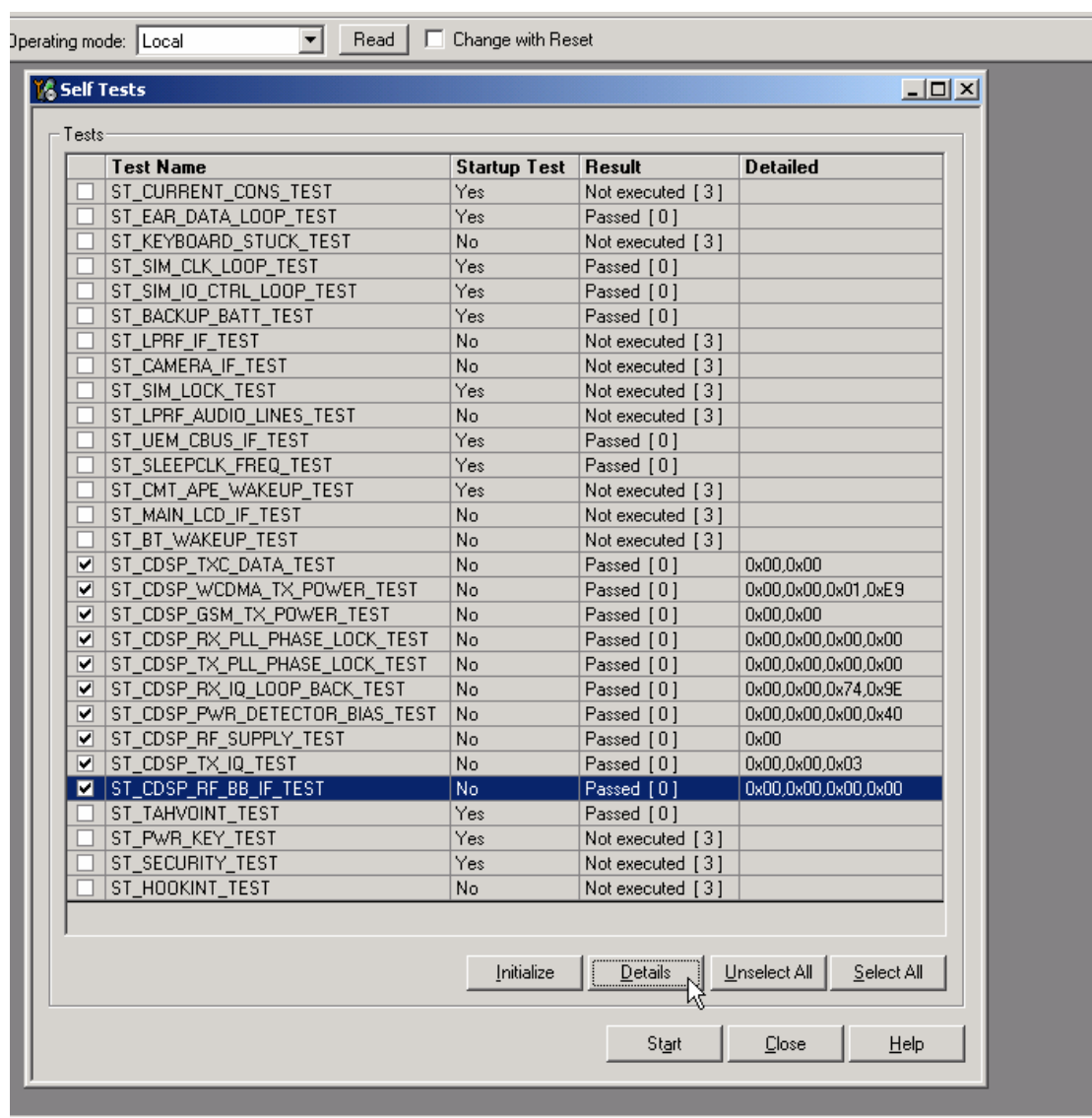
Figure 1 Use of this troubleshooting manual presented with an example. Notice that real section numbers are not used.

2. RF SELF TESTS

The RF part of the device is equipped with self test functionality which tests most of RF-BB interface signals and some parts of RF circuitry. Self tests are designed to detect faults on some critical parts, but they can not prove that everything is OK even if all the self tests are passed.

Self-tests can be run with Phoenix service software. Tests can return pass/fail result and detailed measurement data and error codes in fail case. Select "Testing" -> "Self Tests" from the Phoenix menu. Select appropriate RF self tests and run them with "Start"-button. Notice that self tests should be run in "Local"-mode (change "Operating Mode" to "Local" in Phoenix before running self tests). For service tool usage instructions refer to the "Service Software" and "Service Tools and Service Concepts" sections.

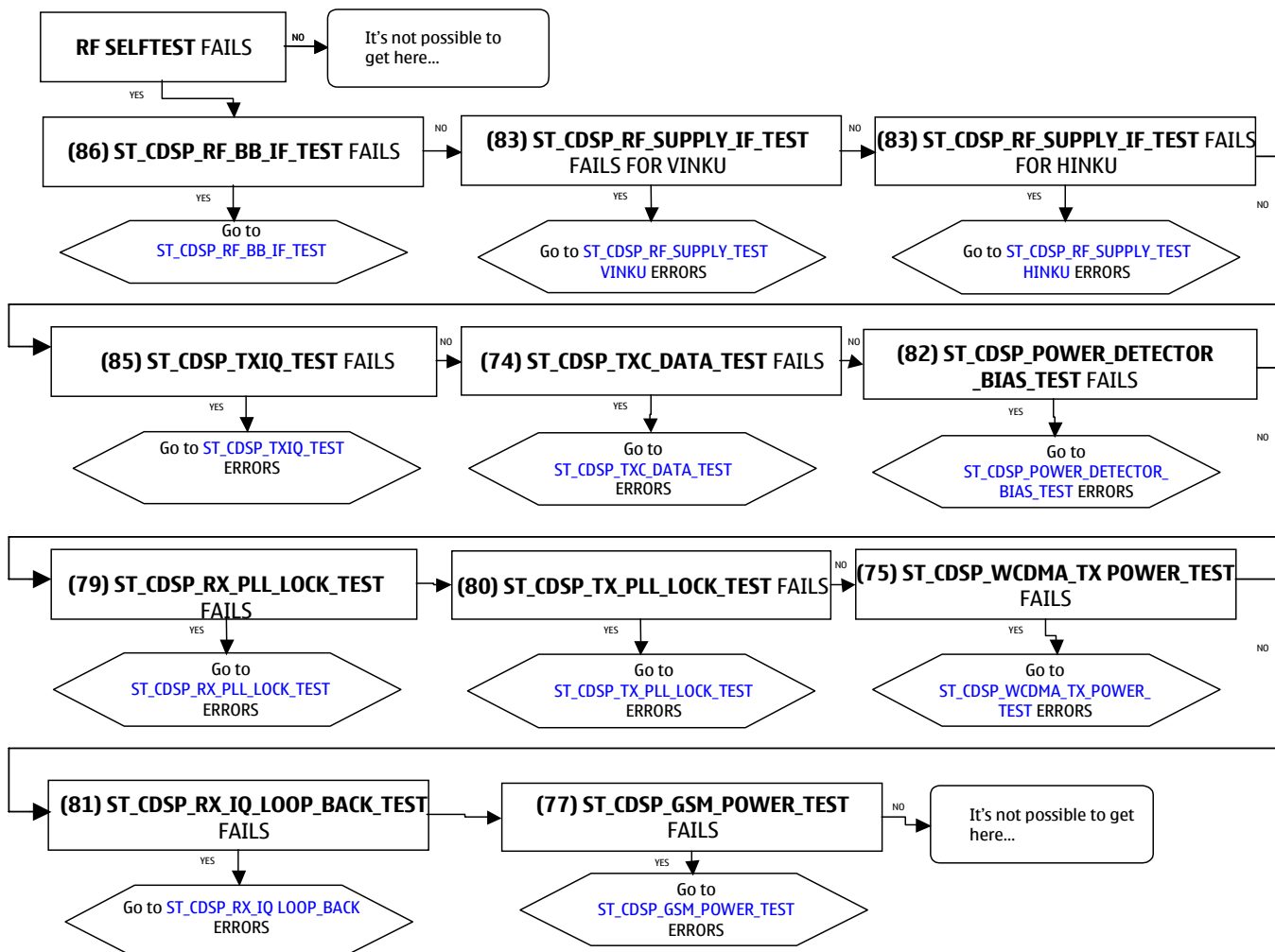
NOTICE! Perform WCDMA transmitter self test ([ST_CDSP_WCDMA_TX_POWER_TEST](#)) always in an RF shielded environment (for example in an RF-shield box).



If one or more self tests show fail results (for example: “minor” or “fatal”) more detailed error codes can be read from the phone with “Details” button. Error codes are shown in hexadecimal format, but notice that all returned hexadecimal values are not necessarily useful in RF troubleshooting because some of the self tests return also different kind of measurement information together with “real” error codes. If self tests are not passed, please refer to following subchapters for detailed troubleshooting information.

IMPORTANT!

In order to use these self-tests most efficiently, it is very important that the tests are performed in certain order (or at least the error data is analyzed in this order). The tests are designed so that by performing them in this order it is easy to find the problematic component without any redundant checks. The following flowchart is based on that idea (i.e. if RFBUS fails, there is no need to spend time wondering why there is no power at TX).



2.1 RF-BB interface (ST_CDSP_RF_BB_IF_TEST)

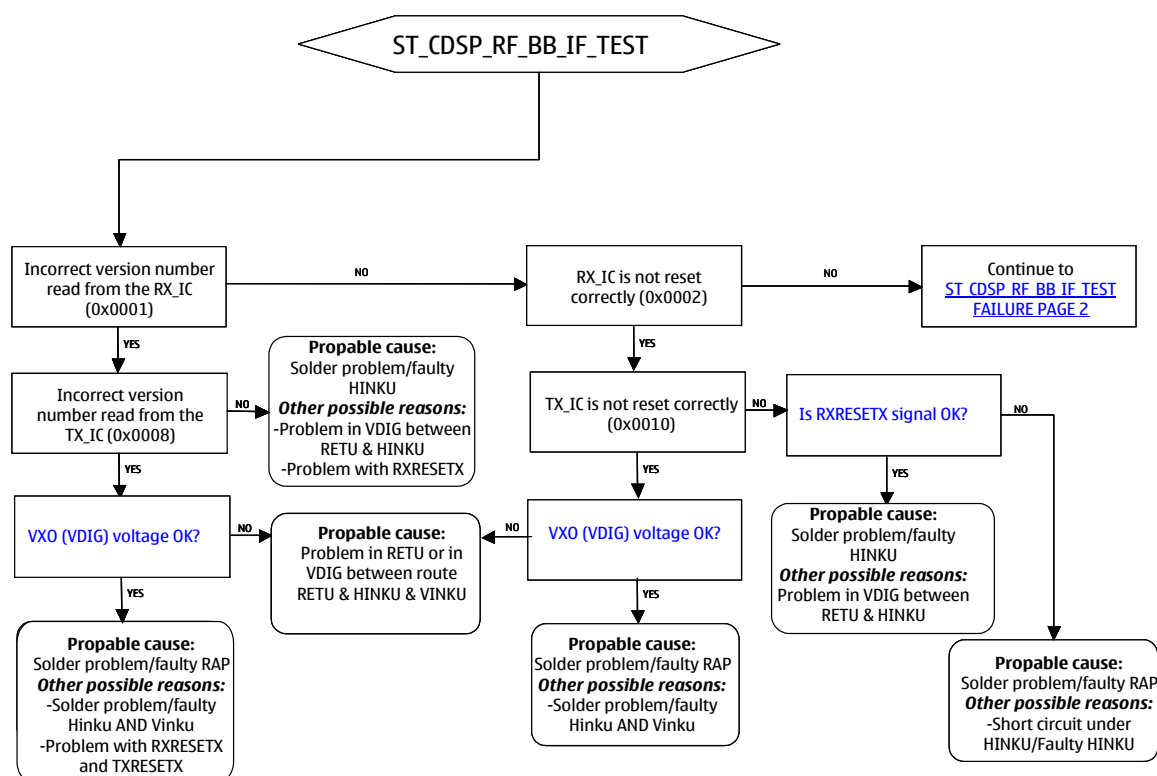
RF_BB_IF test (86) tests the functionality of the RAP3G/HINKU/VINKU serial interface & reset lines. If this test fails, it means that there's a problem programming Hinku and or Vinku and all of the following tests cannot give correct data.

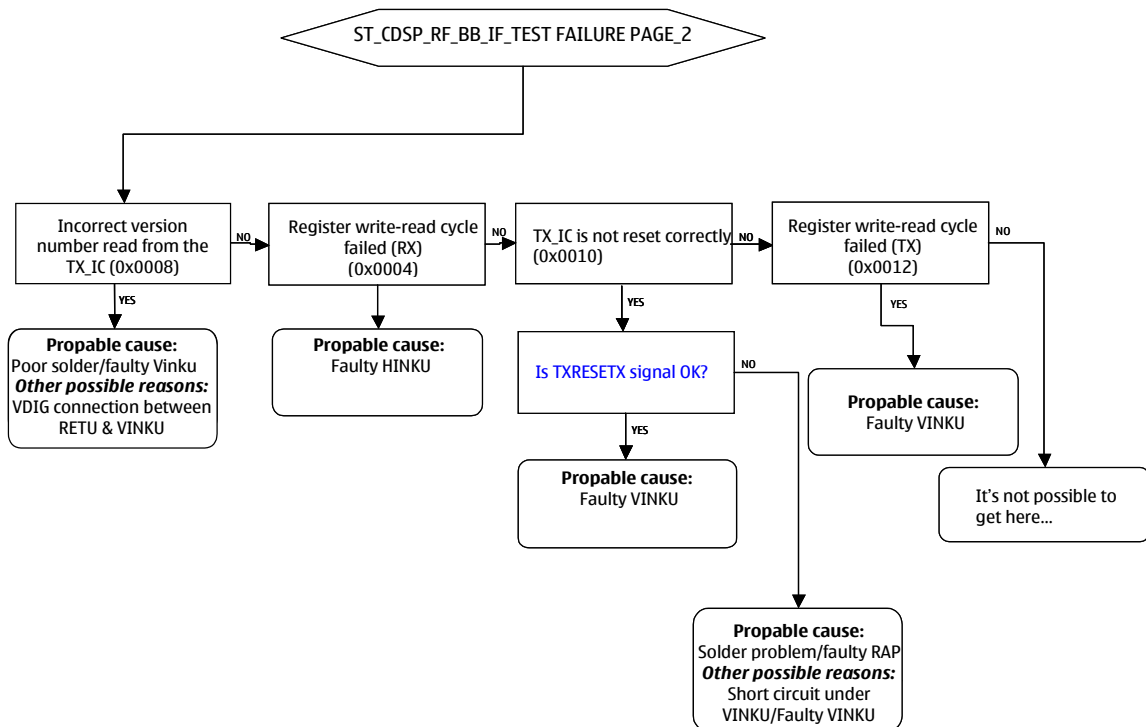
Tested signals: VBAT_ASIC, VDIG, VREFRF01, VXO, RFBUSDAT, RFBUSCLK, RFBUSENA, RXRESETX, TXRESETX

Error code for this self test is given in format:

- 0xyy, 0xzz

,where 0xyy, 0xzz part is the total error code: 0xyyzz





Please, refer to chapter [Error Code Interpretation Examples](#) if more information about error code interpretation is needed.

2.2 Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST)

This self test includes two different RF-supply self tests...one for Vinku and one for Hinku:

RF_SUPPLY_TEST (VINKU) (83) tests the functionality of Vinku's bias block, regulators, reference voltage line and, supply connections.

If these fail, all other Vinku tests can/will fail. Also many Hinku tests can be affected and can't be trusted.

RF_SUPPLY_TEST (HINKU) (83) tests the functionality of Hinku's bias block, regulators, reference voltage line and, supply connections.

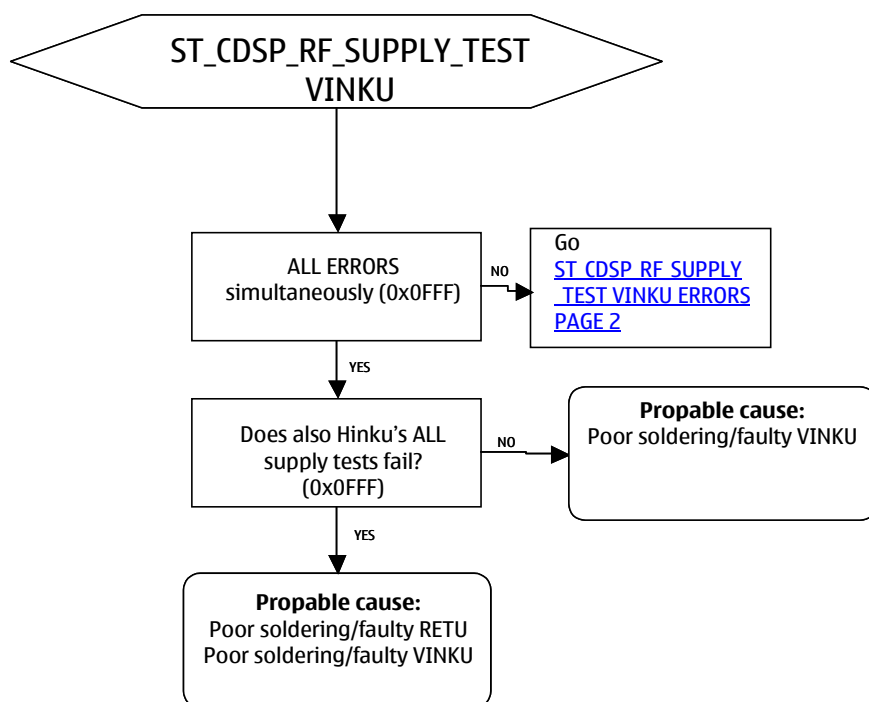
If these fail, all other Hinku tests can/will fail and can't be trusted.

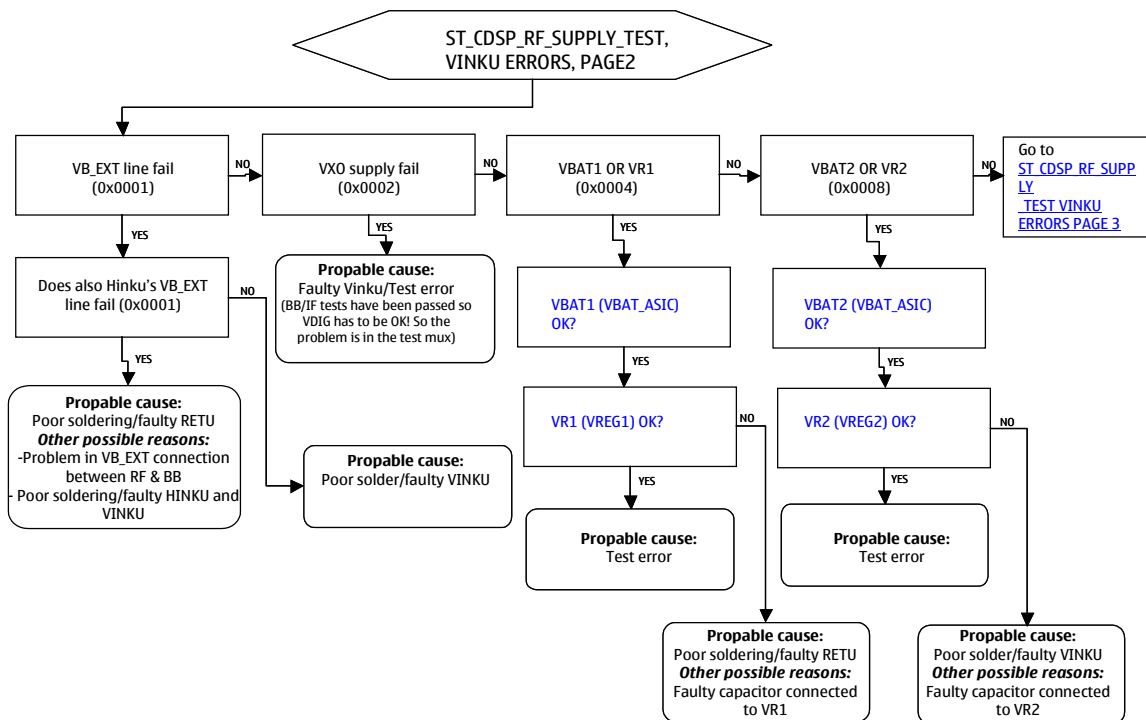
Error code for this self test is given in format:

- *0xyy, 0xyy, 0xzz, 0xzz, MeasResult1, MeasResult2, ...*

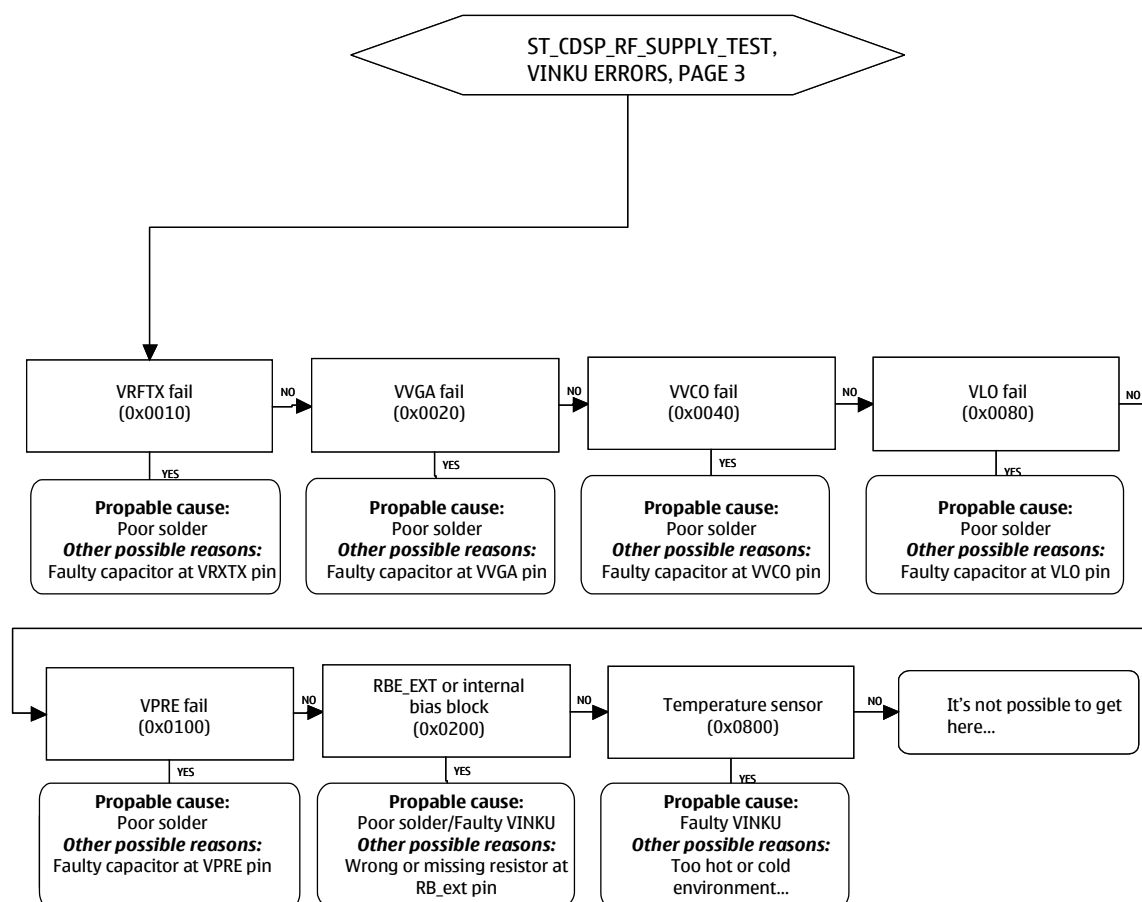
,where 0xyy, 0xyy part is the main part of the error code for Vinku TX ASIC: *0xyyyy*

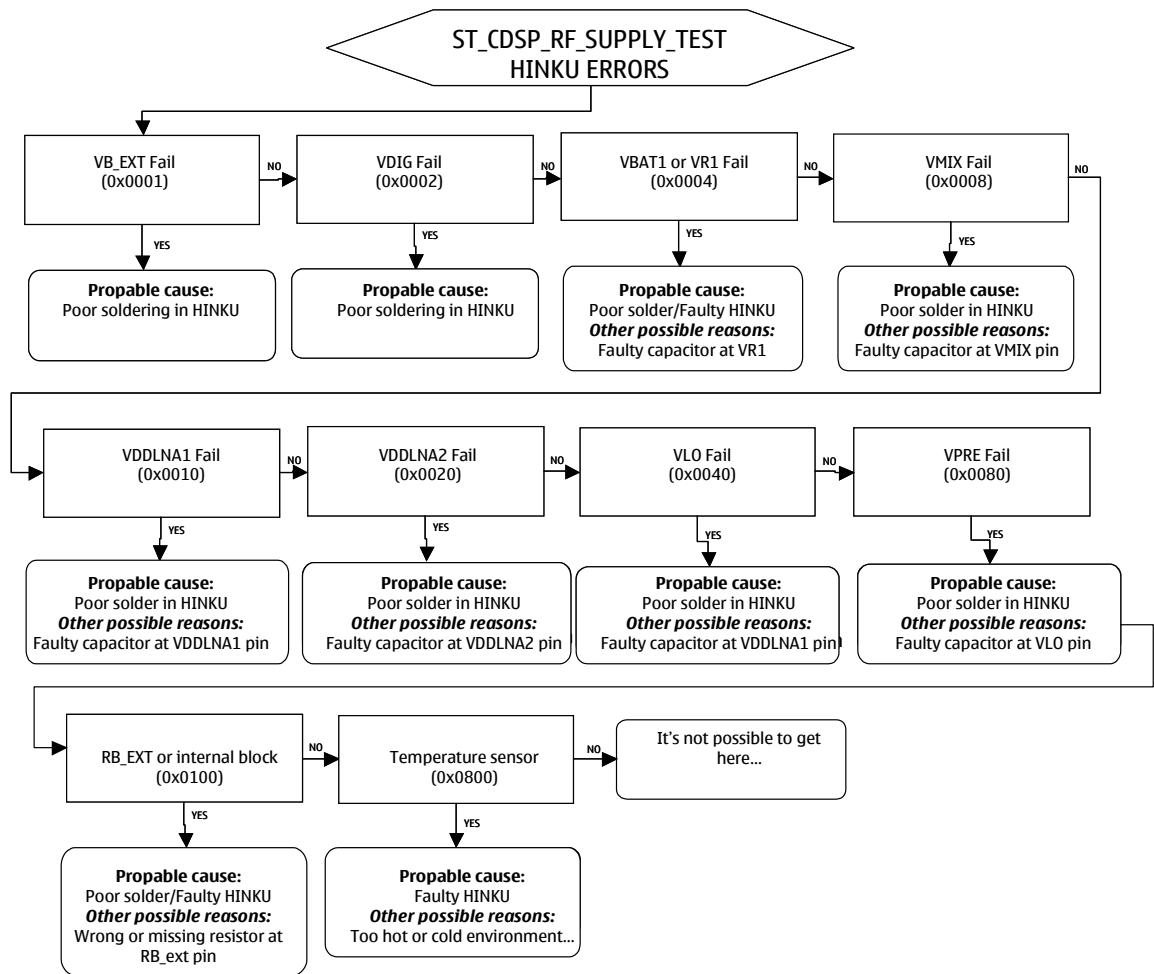
and 0xzz, 0xzz is the main part of the error code for Hinku TX ASIC: *0xzzzz*





Appendix A: RF Troubleshooting





Please, refer to chapter [Error Code Interpretation Examples](#) if more information about error code interpretation is needed.

2.3 TX IQ self test (ST_CDSP_TX_IQ_TEST)

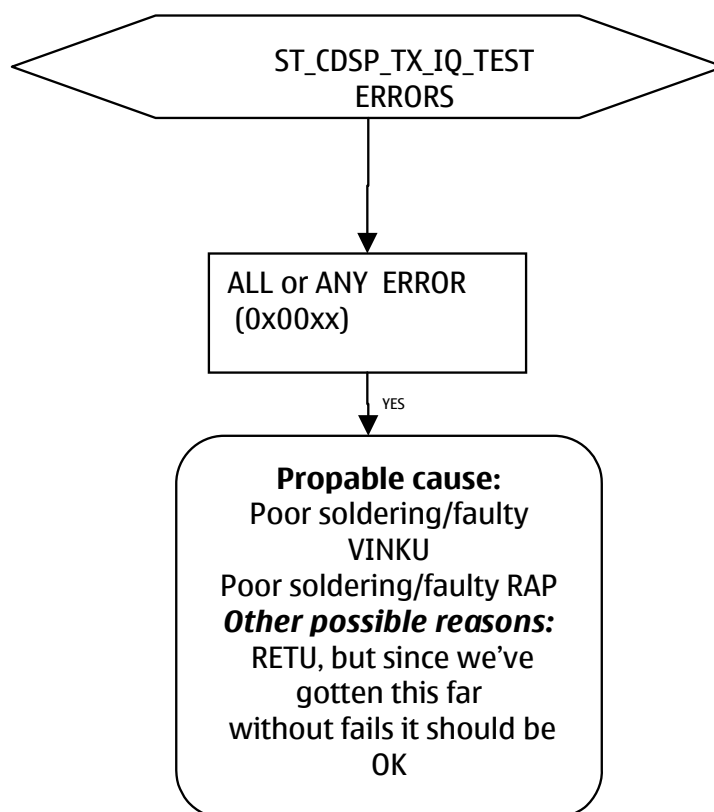
TX_IQ_TEST (85) checks that the TXIQ lines between RAP & Vinku are properly connected. If this fails also power tests and RXIQ loopback will fail.

Tested signals: VBAT_ASIC, TXIP, TXIQ, TXQP, TXQN, DAC_REF1, RFBUS

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz is the main part of the error code: *0xyyzz*



2.4 TxC Data test (ST_TXC_DATA_TEST)

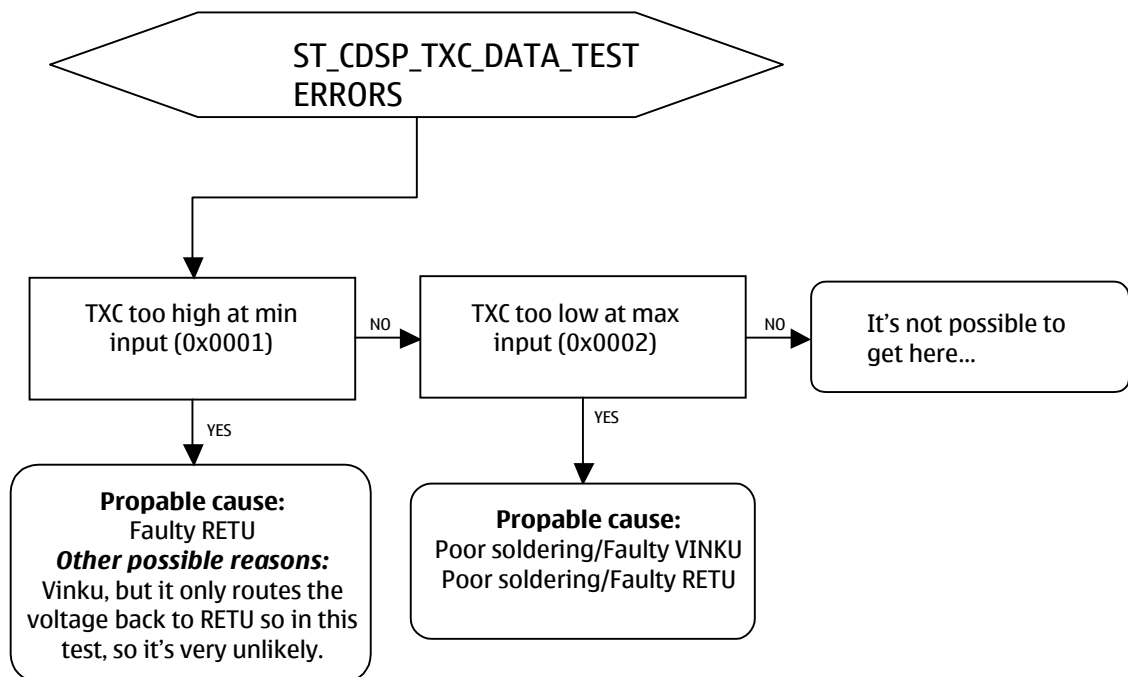
TXC_DATA_TEST (74) tests that the TXC line between RETU & VINKU is properly connected. If this fails also TX power tests will fail.

Test covers: TxC power control signal, Retu (N2200), RFBUS, Vinku (N7501), VBAT_ASIC

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz part is the main part of the error code: *0xyyzz*



2.5 WCDMA power detector biasing self test (ST_CDSP_PWR_DETECTOR_BIAS_TEST)

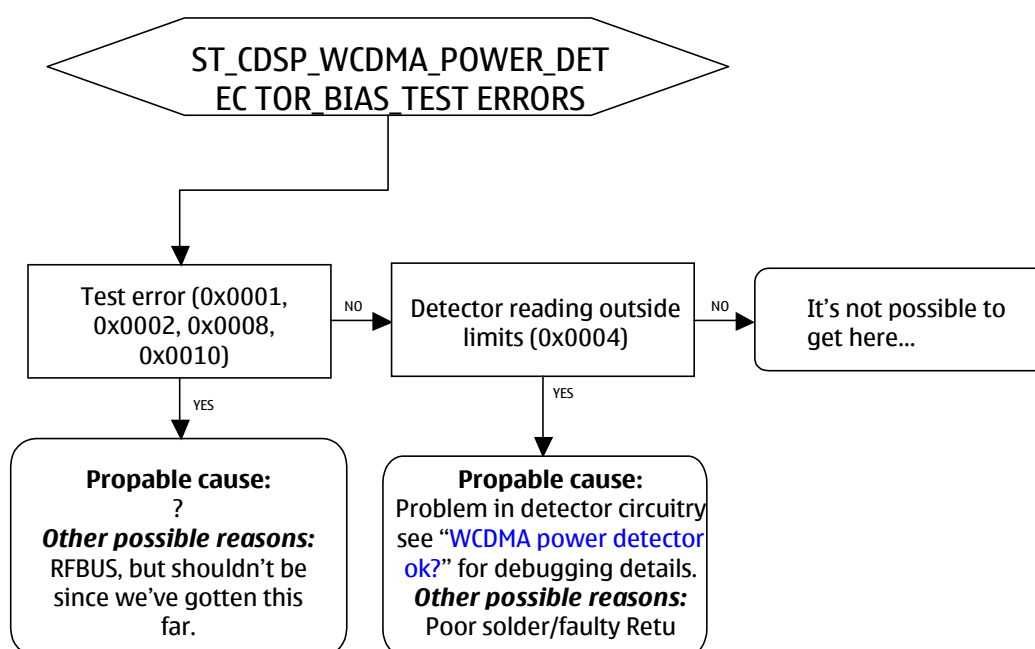
POWER_DETECTOR_BIAS_TEST (82) tests the biasing of the power detector.
If this fails, also the power tests will fail/can't be trusted.

Test covers: Vinku (N7501) WCDMA power detector biasing circuit functionality, Retu (N2200) WTXDET input. RFBUS, VBAT_ASIC

Error code for this self test is given in format:

- 0xyy, 0xzz, MeasResult1, MeasResult2

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz



Please, refer to chapter [Error Code Interpretation Examples](#) if more information about error code interpretation is needed.

2.5.1 WCDMA power detector ok?

Follow these instructions if it's needed to check WCDMA power detector functionality. Please notice that WCDMA power detector is used only in maximum TX power limiting and WCDMA PA supply voltage controlling purposes.

- WCDMA transmitter has to be active before measurements. Procedure is explained in chapter "Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7531.
- WTXDET signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- WTXDET should be about 325 mV with power level +10 dBm, about 1.03 V with power level +21 dBm and about 150 mV when power levels below 0 dBm are used.
- **NOTICE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.**
- If WTXDET –signal is not as expected follow the same troubleshooting instructions as in: [Does SMPS get correct control voltage from the WCDMA power detector \(signal Vcontrol\)?](#)

2.6 RX PLL phase lock self test (ST_CDSP_RX_PLL_PHASE_LOCK_TEST)

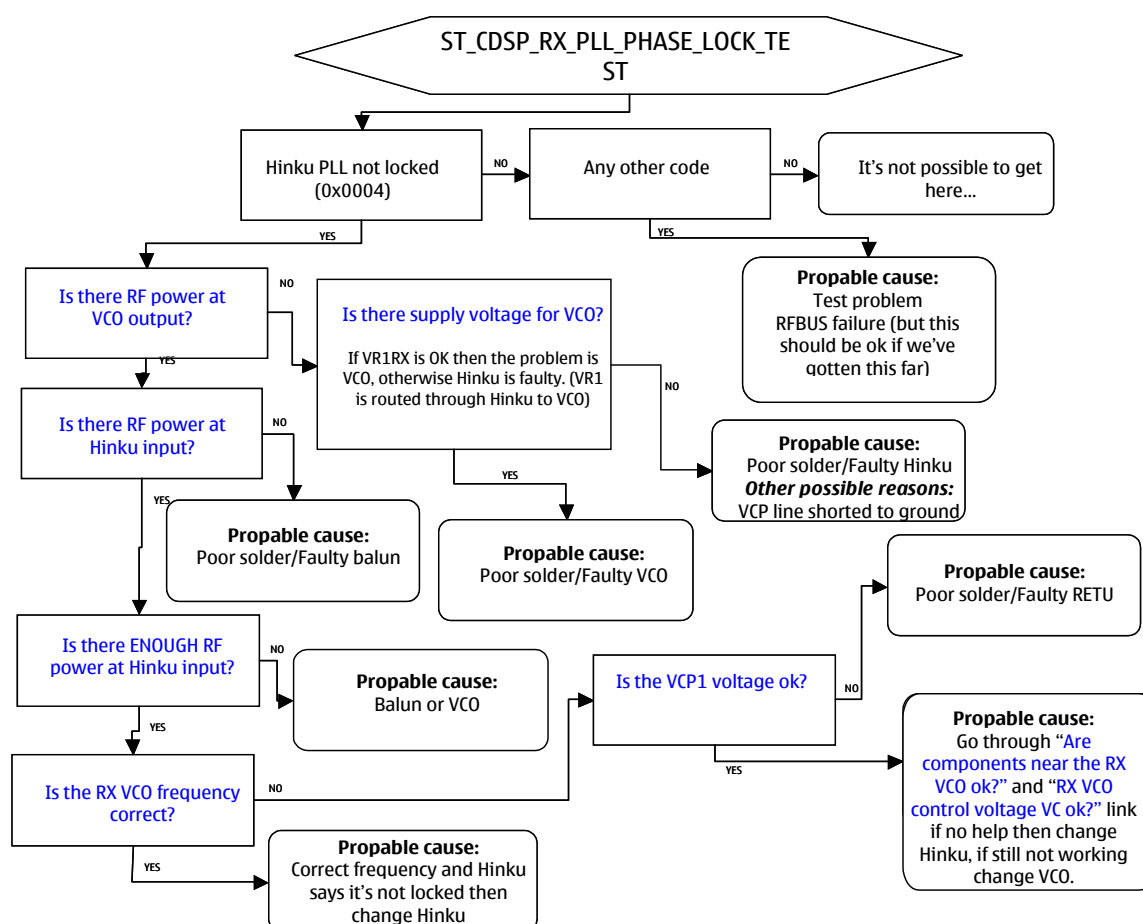
RX_PLL_LOCK_TEST (79) tests the functionality of RX PLL. If this fails, none of the RX related measurements cannot be trusted.

Tested signals: VBAT_ASIC, VDIG, VR1, VR1RX, VCP1, RFBUSDAT, RFBUSCLK, RFBUSENA, RXRESETX

Error code for this self test is given in format:

- 0xyy, 0xzz

,where 0xyy, 0xzz part is the total error code: 0xyyzz



2.7 TX PLL phase lock self test (ST_CDSP_TX_PLL_PHASE_LOCK_TEST)

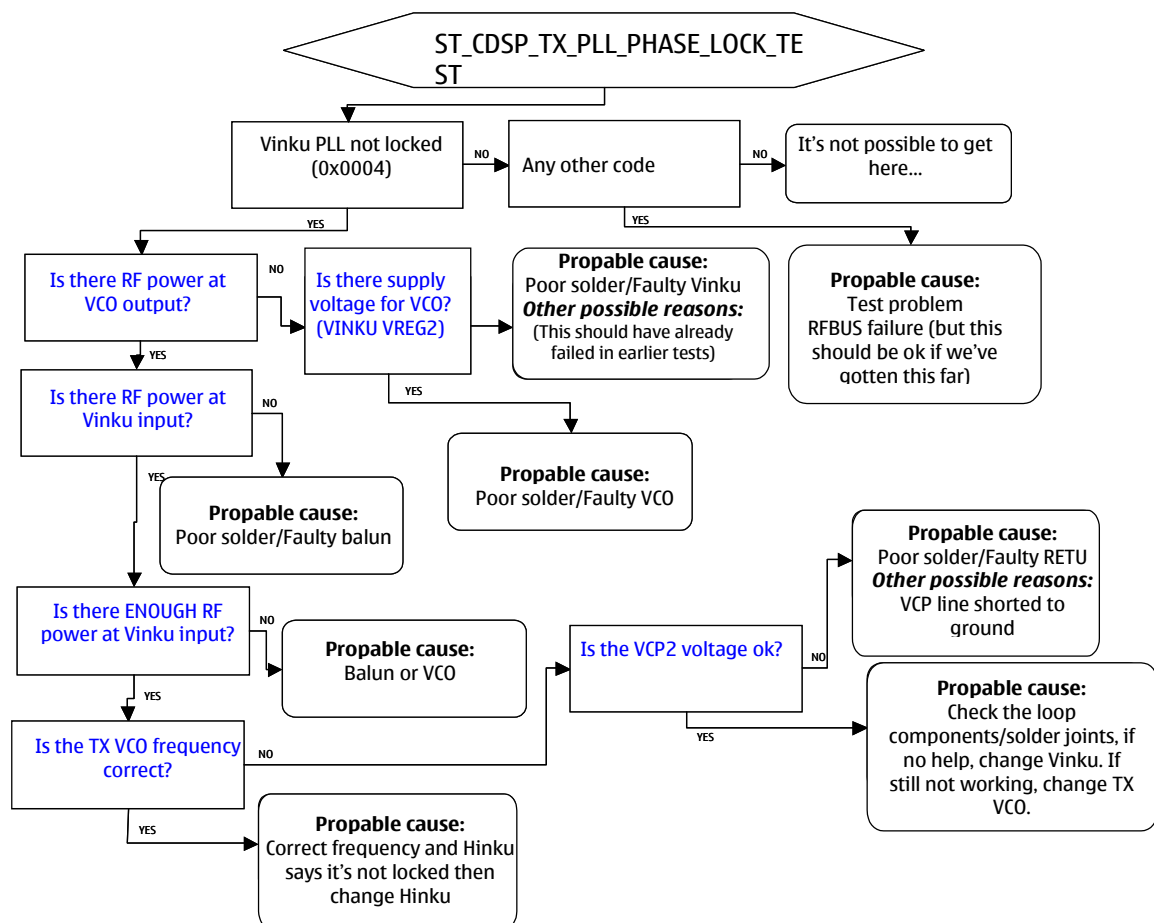
TX_PLL_LOCK_TEST (80) tests the functionality of RX PLL. If this fails also the TX power tests will fail.

Tested signals: VBAT_ASIC, VDIG, VR1, VCP2, RFBUSDAT, RFBUSCLK, RFBUSENA, TXRESETX

Error code for this self test is given in format:

- 0xyy, 0xzz

,where 0xyy, 0xzz part is the total error code: 0xyyzz



2.8 WCDMA transmitter self test (ST_CDSP_WCDMA_TX_POWER_TEST)

TX_WCDMA_POWER_TEST (75) checks the output power of the WCDMA transmitter.

Test covers: Modulator, Vinku (N7501) IC gain stages, IC output supply components, TX filter, WCDMA PA (N7503), DCDC-converter (N7504), RFBUS, VBAT_ASIC, VBAT_PA

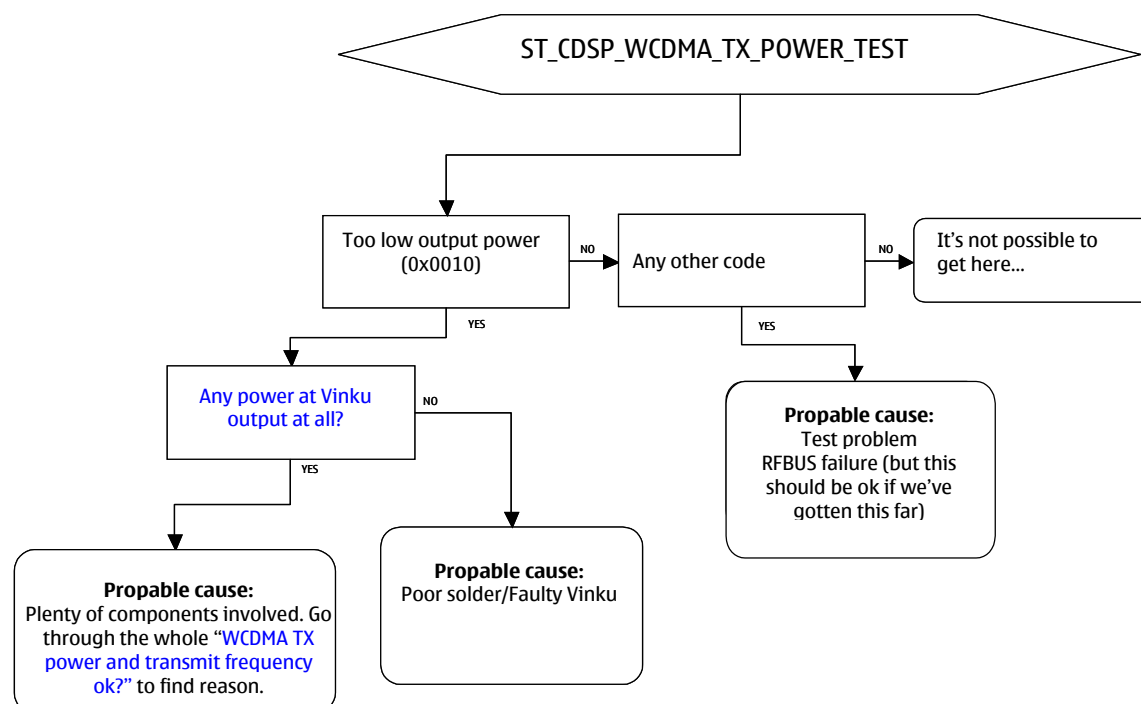
Test does not cover: Circulator (Z7505), duplexer (Z7502), and antenna

To prevent network interference, the phone must be in an RF shield box, when this test is run!

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: *0xyyzz*



2.9 RX IQ loop back self test (ST_CDSP_RX_IQ_LOOP_BACK_TEST)

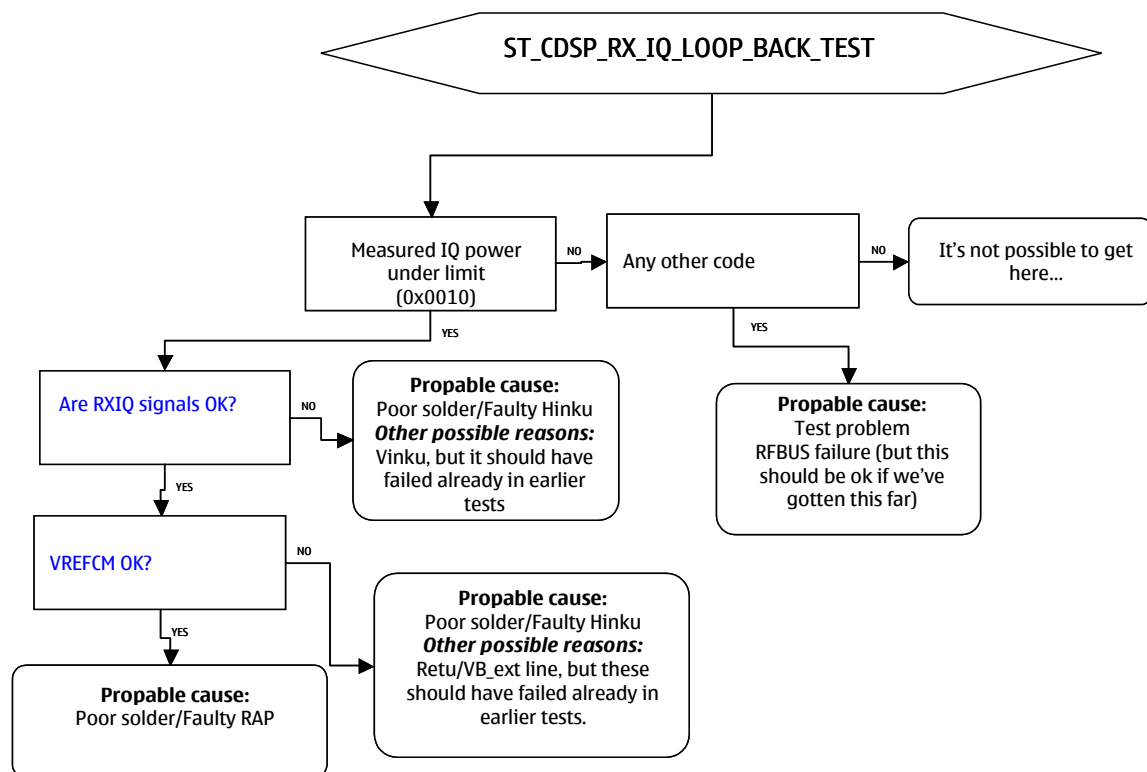
RX_IQ_LOOPBACK (81) tests that the RXI lines & VREFCM line between RAP & HINKU are connected.

Tested signals: VBAT_ASIC, RXQP, RXQN, RXIP, RXIN, VREFCM, TXIP, TXIN, RFBUS

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: *0xyyzz*



2.10 GSM transmitter self test (ST_CDSP_GSM_TX_POWER_TEST)

TX_GSM_POWER_TEST (77) checks the output power of the GSM transmitter.

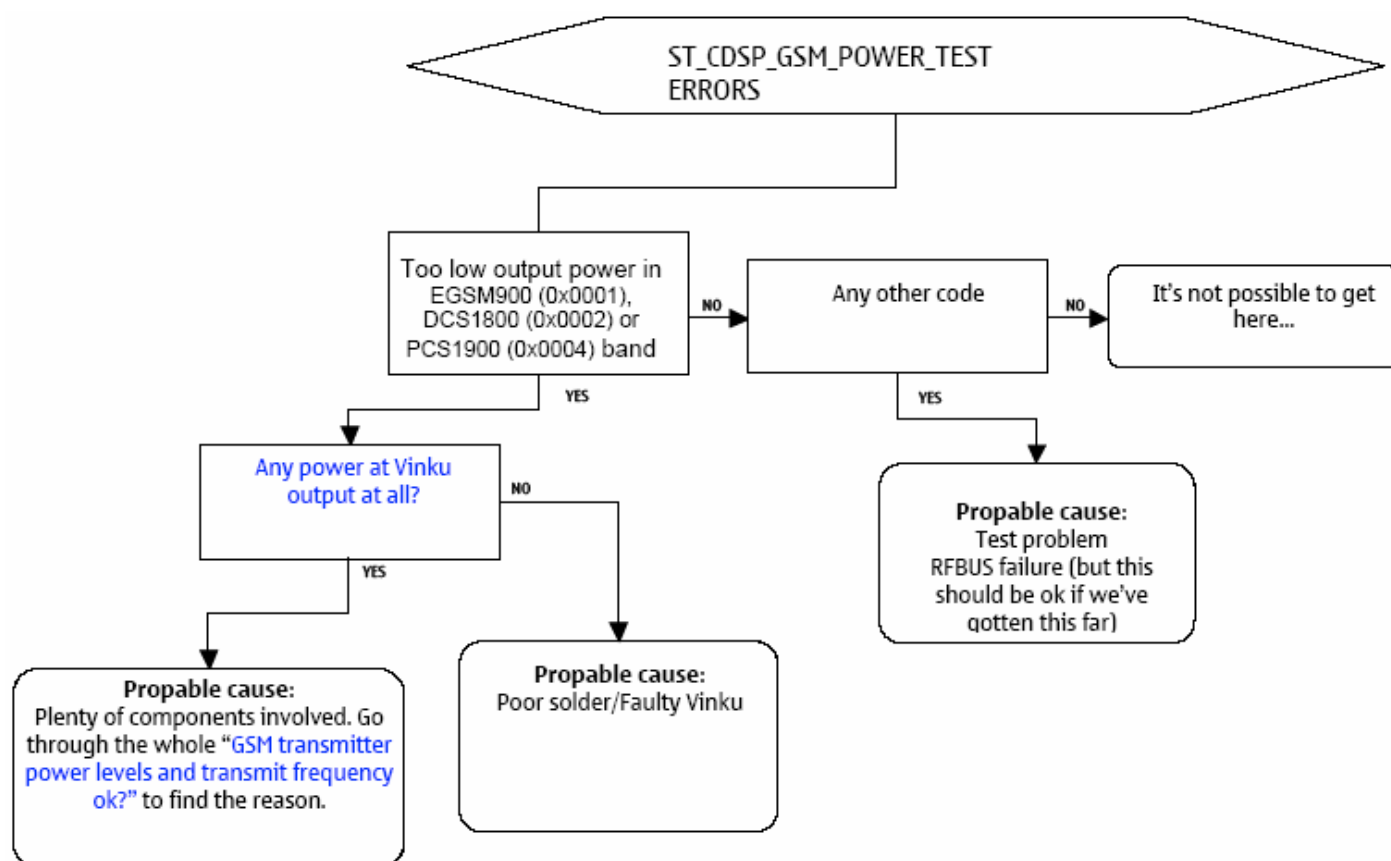
Test covers: RFIC Vinku (N7501), modulator, IC gain control stages, filter/balun solder joints, GSM PA (N7502), PA bias lines & DACs, RFBUS, TX power detector functionality, VBAT_ASIC, VBAT_PA.

Test does not cover: Antenna functionality, RX/TX-switch functionality, and TX signal quality

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz part is the main part of the error code: *0xyyzz*



2.11 Error Code Interpretation Examples

This section presents three different examples of RF error code interpretation.

2.11.1 Example 1

ST_CDSP_RX_PLL_PHASE_LOCK self test gives “Fatal” result with error code: **0x00, 0x04**

This means that the total error code is “**0x004**” (“**0000 0000 0000 0100**” in binary format) and if we look a flowchart in section [RX PLL phase lock self test \(ST_CDSP_RX_PLL_PHASE_LOCK_TEST\)](#) the meaning for the code is “*Hinku PLL is not locked*”.

2.11.2 Example 2

Some of the self-tests can return multiple errors at the same time.

For example: RF-BB interface (ST_CDSP_RF_BB_IF_TEST) self test gives “Fatal” result with error code: **0x00, 0x09, ...**

This means that the total error code without measurement values is “**0x0009**” and this is the same as “**0000 0000 0000 1001**” in binary format. If we look closer there are multiple errors (2) found:

Bit mask “**-----1**” = “**0x0001**”

Bit mask “**-----1---**” = “**0x0008**”

Troubleshooting can be continued with [RF-BB interface \(ST_CDSP_RF_BB_IF_TEST\)](#) flowchart because there are errors with two error codes: **0x0001** and **0x0008**.

2.11.3 Example 3

Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST) is slightly different self test from others because there are both Vinku and Hinku errors shown in the same error code (*The format for error code is explained in section [Supply test for Hinku and Vinku](#)*).

For example: ST_CDSP_RF_SUPPLY_TEST gives “Fatal” result with error code: **0x0B, 0xBC, 0x00, 0x00, ...**

This error code means that there are probably no errors in Hinku RX ASIC supply voltages because the main part of the error code for Hinku is **0x00, 0x00 (=0x0000)** and means the same as “no errors”.

Anyway, there are many errors with Vinku TX ASIC supply voltages. The main part of the error code for Vinku is **0x0B, 0xBC** and that’s the same as “**101110111100**” in binary format. If we look closer there are multiple (8) errors found:

Bit mask “**-----1--**” = “**0x0004**”

Bit mask “**-----1---**” = “**0x0008**”

Bit mask “**-----1----**” = “**0x0010**”

Bit mask “**-----1----**” = “**0x0020**”

Bit mask “----- 1-----” = “0x0080”

Bit mask “-----1-----” = “0x0100”

Bit mask “-----1-----” = “0x0200”

Bit mask “---- 1-----” = “0x0800”

Troubleshooting can be continued with [ST CDSP RF SUPPLY TEST VINKU](#) flowchart because there are errors with eight VINKU error codes.

Typically this kind of error occurs if there is no VBAT_ASIC voltage coming to the Vinku TX ASIC at all or the ASIC is poorly soldered to the PWB (All voltages that are somehow related to VBAT_ASIC are causing errors).

3. DOES THE PHONE REGISTER TO THE NETWORK AND MAKE A CALL (GSM)?

- Test against a GSM communication tester or real GSM network with a proper SIM.

3.1 GSM transmitter power levels and transmit frequency ok?

- Attach the phone to the product specific test jig and a spectrum analyser to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- Set GSM Tx ON. Procedure is explained in section “Transmitter troubleshooting”.
- Spectrum analyser centre frequency should be set according the used TX channel (See section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 1 MHz, Span 0 MHz, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Test at least the maximum and minimum power levels:
 - EGSM900: The maximum power level is “5” (31 – 34 dBm, typ. value +33 dBm)
The minimum power level is “19” (3 – 7 dBm, typ. value +5 dBm)
 - GSM1800: The maximum power level is “0” (28 – 32 dBm, typ. value +30 dBm)
The minimum power level is “15” (-2 - +2 dBm, typ. value +0 dBm)
 - GSM1900: The maximum power level is “0” (28 – 32 dBm, typ. value +30 dBm)
The minimum power level is “15” (-2 - +2 dBm, typ. value +0 dBm)
- If power is not as expected separate the phone into parts and place to the module jig. Connect the spectrum analyser to the module jig GSM RF connector and measure power levels again (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).
 - Power levels ok in the module jig: Antenna or antenna connection bad. Replace the antenna
 - Power levels still wrong or no TX signal found at all: Continue troubleshooting
- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If the signal is found to be on wrong frequency or frequency is not stabile, see section [3.1.3. "GSM transmitter frequency correct"](#).

3.1.1 Does GSM TX transmit RF-power at all?

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency or frequency is not stable, see section, [3.1.3. "GSM transmitter frequency correct"](#).

3.1.1.1 Is Vinku (N7501) transmitting RF-power at all?

- GSM transmitter has to be active before Vinku's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900:
 - Connect the RF probe to Z7504 input. The level should be about the same on both input pins. Check output level with at least the maximum (5) and the minimum (19) power levels.
 - Maximum power level – Output level should be about -15...-25 dBm
 - Minimum power level – Output level should be about -45...-55 dBm
- GSM1800/GSM1900:
 - Connect the RF probe to C7577 or C7575. The level should be about the same on both capacitors. Check output level with at least the maximum (0) and the minimum (15) power levels.
 - Maximum power level – Output level should be about -25...-35 dBm
 - Minimum power level – Output level should be about -55...-65 dBm
- Check if output levels of Vinku are as expected.
- **NOTE!** If VINKU output RF-power is totally missing just in one or two GSM-bands, typically this means that Vinku ASIC (N7501) is faulty or the ASIC is badly soldered. For example: VINKU is not transmitting at all in EGSM900-band but TX-power is ok in other GSM-bands. Then it's quite clear that VINKU (N7501) is faulty or badly soldered and the component should be replaced.

3.1.1.1.1 RF operating voltage VBAT_ASIC?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7503 (or C7501, C7541)
- VBAT_ASIC voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.1.1.1.1 Ferrite inductor L7503 ok?

- Check that component is in place and solder joints are ok
- Measure voltage from the both ends of L7503. Is it faulty or is there short circuit in RF end?

- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.1.1.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”. Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don’t necessarily look like in figures mentioned below.
- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:
 - *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in section 6.5.9.3 “[RFBUSDAT \(GSM RX\)](#)”
 - *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in sections 6.5.9.1 “[RFBUSCLK \(GSM RX\)](#)” and 6.5.9.2 “[RFBUSCLK and RFBUSENA \(GSM RX\)](#)”
 - *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in section 6.5.9.2 “[RFBUSCLK and RFBUSENA \(GSM RX\)](#)”
 - *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.
 - *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

3.1.1.1.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

3.1.1.1.3 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- GSM transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section “Transmitter troubleshooting.”
- Measurements can be done with an oscilloscope and a probe.
- VREG1: Connect the probe to C7543
- VREG2: Connect the probe to C7548 (or C7547)
- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.1.1.1.3.1 Vinku (N7501) RB_EXT voltage ok?

- GSM transmitter has to be active before Vinku’s RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.

Appendix A: RF Troubleshooting

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.1.1.1.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.1.1.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after the measurement.

3.1.1.1.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.1.1.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.1.1.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

3.1.1.1.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.1.1.3.1.3.1 Is R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.1.1.1.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not

help go to the next step.

3.1.1.1.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.1.1.3.1.4 Replace Vinku (N7501)

3.1.1.1.3.2 Are capacitors in Vinku (N7501) regulator lines working correctly?

VREG1: C7543

VREG2: C7547, C7548, C7554, C7555, C7553, C7552, C7558 and C7567

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that regulator lines are not short-circuited to the ground. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.1.1.3.3 TX VCO (G7502) ok?

3.1.1.1.3.4 Replace Vinku (N7501)

3.1.1.1.4 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.1.1.1.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.1.1.1.4.2 Replace Retu

3.1.1.1.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTX0 (G7501) or all three components

3.1.1.1.5 VCP2-voltage ok?

- GSM transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

3.1.1.1.5.1 C7550 and C2221 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VCP2-line is short-circuited to the ground. If short-circuit is found replace C7550 and C2221. If this does not help go to the next steps.

3.1.1.1.5.2 Retu ok?

3.1.1.1.5.3 Vinku (N7501) ok?

3.1.1.1.6 Is there RF power in the TX VCO output at all?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done also without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The correct VCO frequency can be found in section "Frequency mappings". The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.1.1.6.1 TX VCO operating voltage VREG2 (VR2) ok?

- See section ["Vinku \(N7501\) regulator voltages VREG1, VREG2 ok?"](#)

3.1.1.1.6.2 Replace TX VCO (G7502)

3.1.1.1.7 Is TX VCO RF-signal coming to the Vinku at all?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").

- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.1.1.7.1 Replace balun T7503

3.1.1.1.8 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3. "[ST CDSP TX IQ TEST](#)" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.1.1.1.9 Is there TXC-signal coming to Vinku ASIC (N7501)?

- GSM transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level first to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- Typical TX control voltage TXC timing should look somehow similar to figure [6.5.2 "TXC in GSM mode \(DC Offset 0 V\)"](#) (EGSM900 TX power level 5) and voltage levels should be roughly:
 - EGSM900: 1.8 V while TX burst and 0 V otherwise.
 - GSM1800/GSM1900: 1.8 V while TX burst and 0 V otherwise.
- Change the TX to the minimum power level ("19" in EGSM and "15" in GSM1800/GSM1900)
- Typical TX control voltage TXC levels should be now about:
 - EGSM900: 1.0 V while TX burst and 0 V otherwise.
 - GSM1800/GSM1900: 0.7 V while TX burst and 0 V otherwise.

3.1.1.1.9.1 R7514 in place?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7514 resistance value with an ohmmeter

3.1.1.1.9.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok

- Disconnect the power supply from the phone and use an ohmmeter to check that C7549 is not short-circuited. If short-circuit is found replace the capacitor.

3.1.1.1.9.3 Retu ok?

3.1.1.1.10 VCTCX0 frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1. "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

3.1.1.1.10.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.1.1.1.10.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.1.1.1.10.1.2 Replace Retu

3.1.1.1.10.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

3.1.1.1.10.2 BB AFC-voltage ok?

- See section ["BB AFC-voltage ok?"](#)

3.1.1.1.10.3 Replace VCTCX0 G7501

3.1.1.1.11 Replace Vinku (N7501)

3.1.1.2 Is there RF-power in the GSM PA (N7502) input at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)

- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7521 (test point). The RF level should be roughly -15...-20 dBm.
- GSM1800 or GSM1900: Connect the probe to R7512 output. The RF level should be roughly -20...-30 dBm.

3.1.1.2.1 EGSM900: Replace SAW Z7504

3.1.1.2.2 GSM1800/GSM1900: Is Vinku (N7501) output RF-signal coming to the T7502 (Balun)?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to T7502 input. There are two input ports in T7502 because the input port is balanced. The RF level should be roughly -25 dBm in both inputs.

3.1.1.2.2.1 Matching components ok?

GSM1800/GSM1900: C7575 and C7577

- Check that components are in place and solder joints are ok
- GSM1800 and GSM1900: Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7575 and C7577 are not short-circuited. If short-circuit is found replace the faulty capacitor.

3.1.1.2.3 GSM1800/GSM1900: Is there RF power in the balun (T7502) output at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM

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transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- GSM1800 or GSM1900: Connect the probe to R7512 input. The RF level should be roughly -20...-30 dBm.

3.1.1.2.3.1 Replace balun T7502

3.1.1.2.4 GSM1800/GSM1900: Replace attenuator R7512

3.1.1.3 Does GSM PA (N7502) transmit RF-power at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the **minimum** (“19” in EGSM900 and “15” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7520 (test point). The RF level should be about -16...-17 dBm.
- GSM1800 or GSM1900: Connect the probe to J7519 (test point). The RF level should be roughly -29...-30 dBm in both bands.

3.1.1.3.1 GSM PA (N7502) operating voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7593
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V

3.1.1.3.1.1 PA operating voltage VBAT_PA ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.1.3.1.1.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.1.3.1.2 C7593 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

3.1.1.3.1.3 Replace inductor L7516

- If replacing does not help, replace GSM PA (N7502)

3.1.1.3.2 Are bias currents coming correctly to the GSM PA (N7502)?

EGSM: Icont_21 and Icont_22

GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
 - Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
 - Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure [6.5.4 "Icont_21/Icont_22 \(DC offset 1.2V\)"](#) when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:
 - Connect the probe to C7561 or C7556.
 - Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 when measured with an oscilloscope and a probe. Check both currents.

3.1.1.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section ["Vinku \(N7501\) RB_EXT voltage ok?"](#)

3.1.1.3.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku

Icont_22 missing – C7545 short-circuited?

GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?

Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are

not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.1.3.2.3 Replace Vinku (N7501)

3.1.1.3.3 Replace PA (N7502)

3.1.1.4 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations from section “Test point locations”). Notice: these test points are PWB pads for three non-assembled capacitors.

Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.1.1.4.1 Replace Hinku (N7500)

3.1.1.5 Replace antenna Switch Z7503

3.1.2 Does GSM TX transmit enough RF-power and power levels otherwise ok?

3.1.2.1 Is Vinku ASIC (N7501) transmitting correct RF-power?

- GSM transmitter has to be active before Vinku’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900:
 - Connect the RF probe to Z7504 input. The level should be about the same on both input pins. Check output level with at least the maximum (5) and the minimum (19) power levels.

- Maximum power level – Output level should be about -15...-25 dBm
- Minimum power level – Output level should be about -45...-55 dBm
- GSM1800/GSM1900:
 - Connect the RF probe to C7577 or C7575. The level should be about the same on both capacitors. Check output level with at least the maximum (0) and the minimum (15) power levels.
 - Maximum power level – Output level should be about -25...-35 dBm
 - Minimum power level – Output level should be about -55...-65 dBm
- Check if output levels of Vinku are as expected.
- **NOTE!** If VINKU ASIC is transmitting wrong TX power just in one or two GSM-bands, typically this means that Vinku ASIC (N7501) is faulty or the ASIC is badly soldered. Of course SAW-filter Z7504 or balun T7502 can be also faulty/badly soldered and causing short-circuit, but probability to this is quite low. For example: VINKU is transmitting too low power in EGSM900-band but TX-power is ok in other GSM-bands. Then it's almost clear that VINKU (N7501) is faulty or badly soldered and the component should be replaced.

3.1.2.1.1 RF operating voltage VBAT_ASIC ok?

- See section [“RF operating voltage VBAT ASIC ok?”](#)

3.1.2.1.2 Are Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- GSM transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with an oscilloscope and a probe.
- VREG1: Connect the probe to C7543
- VREG2: Connect the probe to C7548 (or C7547)
- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.1.2.1.2.1 Vinku (N7501) RB_EXT voltage ok?

- GSM transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.1.2.1.2.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.

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- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.2.1.2.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after the measurement.

3.1.2.1.2.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.2.1.2.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.2.1.2.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

3.1.2.1.2.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.2.1.2.1.3.1 Is R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.1.2.1.2.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.1.2.1.2.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

3.1.2.1.2.2 Replace Vinku (N7501)

3.1.2.1.3 Are TX-IQ signal waveforms looking correct?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there

is no fail in 2.3 [ST CDSP TX IQ TEST](#) these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.1.2.1.4 Is the TXC-signal coming to Vinku ASIC (N7501) OK? Is signal level correct?

- GSM transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level first to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- Typical TX control voltage TXC timing should look somehow similar to figure 6.5.2 “[TXC in GSM mode \(DC offset 0 V\)](#)” (EGSM900 TX power level 5) and voltage levels should be roughly:
 - EGSM900: 1.8 V while TX burst and 0 V otherwise.
 - GSM1800/GSM1900: 1.8 V while TX burst and 0 V otherwise.
- Change the TX to the minimum power level (“19” in EGSM and “15” in GSM1800/GSM1900)
- Typical TX control voltage TXC levels should be now about:
 - EGSM900: 1.0 V while TX burst and 0 V otherwise.
 - GSM1800/GSM1900: 0.7 V while TX burst and 0 V otherwise.

3.1.2.1.4.1 R7514 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R514 resistance value with an ohmmeter

3.1.2.1.4.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7549 is not short-circuited.

3.1.2.1.4.3 Retu ok?

3.1.2.1.5 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)?

- GSM transmitter has to be active before DET_SW_G voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7595 pad. Notice: C7595 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.

- DET_SW_G voltage should be about 2.8 V while TX burst and 0 V otherwise.

3.1.2.1.5.1 C7595 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7595 is not short-circuited.

3.1.2.1.5.2 Replace Vinku (N7501)

3.1.2.1.6 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor.
- Check R7516 resistance value with an ohmmeter and replace resistor if needed.

3.1.2.1.7 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.2.1.7.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.2.1.7.1.1 Replace TX VCO G7502

3.1.2.1.7.2 Replace balun T7503

3.1.2.1.8 Replace Vinku (N7501) or GSM PA (N7502)

- If the output level of Vinku is higher than wanted then replace GSM PA (N7502). Otherwise replace TX ASIC Vinku (N7501).

3.1.2.2 Does GSM PA (N7502) have enough RF-power in its input?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7521 (test point). The RF level should be roughly -15...-20 dBm.
- GSM1800 or GSM1900: Connect the probe to R7512 output. The RF level should be roughly -20...-30 dBm.

3.1.2.2.1 EGSM900: Replace SAW Z7504

3.1.2.2.2 GSM1800/GSM1900: Is Vinku (N7501) output RF-signal coming correctly to the T7502 (Balun)?

- GSM transmitter has to be active before measurements Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to T7502 input. There are two input ports in T7502 because the input port is balanced. The RF level should be roughly -25 dBm in both inputs.

3.1.2.2.2.1 Matching components ok?

GSM1800/GSM1900: C7575 and C7577

- Check that components are in place and solder joints are ok
- GSM1800 and GSM1900: Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7575 and C7577 are not short-circuited. If short-circuit is found replace the faulty capacitor.

3.1.2.2.3 GSM1800/GSM1900: Is there correct RF power in the balun (T7502) output?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to R7512 input. The RF level should be roughly -20...-30 dBm.

3.1.2.2.3.1 Replace balun T7502

3.1.2.2.4 GSM1800/GSM1900: Replace attenuator R7512

3.1.2.3 GSM PA (N7502) transmitting correct RF-power?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the **minimum** (“19” in EGSM900 and “15” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to J7520 (test point). The RF level should be about -16...-17 dBm.
- GSM1800 or GSM1900: Connect the probe to J7519 (test point). The RF level should be roughly -29...-30 dBm in both bands.

3.1.2.3.1 GSM PA (N7502) operating voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7593
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.2.3.1.1 PA operating voltage VBAT_PA ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.2.3.1.1.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.2.3.1.2 C7593 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

3.1.2.3.1.3 Replace inductor L7516

- If replacing doesn't help then replace GSM PA (N7502)

3.1.2.3.2 Are bias currents coming correctly to the GSM PA (N7502)? Level ok?

EGSM: Icont_21 and Icont_22

GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
 - Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
 - Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure [6.5.4](#) "Icont_21/Icont_22 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check

both currents.

- GSM1800 or GSM1900:
 - Connect the probe to C7561 or C7556.
 - Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure [6.5.5](#) “Icont_31/Icont_32 (DC Offset 1.2 V)” when measured with an oscilloscope and a probe. Check both currents.

3.1.2.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section ["Vinku \(N7501\) RB_EXT voltage ok?"](#)

3.1.2.3.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku

Icont_22 missing – C7545 short-circuited?

GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?

Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

3.1.2.3.2.3 Replace Vinku (N7501) or GSM PA (N7502)

3.1.2.3.3 Replace GSM PA (N7502)

3.1.2.4 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations, see section “Test point locations”). Notice: these test points are PWB pads for three non-assembled capacitors.

Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.1.2.4.1 Replace Hinku (N7500)

3.1.2.5 Replace antenna Switch Z7503

3.1.2.6 Replace antenna switch Z7503

3.1.3 GSM transmitter frequency correct?

- Connect a spectrum analyser to the module test jig's RF connector.
- Set GSM Tx ON. Procedure is explained in section "Transmitter troubleshooting".
- Check if the frequency of the GSM transmitter is as expected. If output signal is not found try to use 500 MHz span setting.

The correct TX frequency is shown in Phoenix "RF Controls (GSM)" window and can be found also in see section "Frequency mappings". If the frequency is not found at all then go to 3.1.1 ["Does GSM TX transmit RF-power at all?"](#)

3.1.3.1 Is TX VCO frequency as expected?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. It won't expose if the T7503 is broken or the output level of the VCO is too low. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

Appendix A: RF Troubleshooting

3.1.3.1.1 C7543, C7548 and L7517 ok?

- These components should be checked if TX VCO frequency is not stable and TX PLL frequency not locked.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.3.1.2 TX VCO control voltage VC ok?

- GSM transmitter has to be active before TX VCO control voltage VC can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7519.
- Typical TX VCO control voltage VC should look somehow similar to figure [6.5.3 "TX VC in GSM mode \(DC offset 1.8V\)"](#). DC voltage level should change if TX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

3.1.3.1.2.1 VCP2-voltage ok?

- GSM transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

3.1.3.1.2.1.1 C7550 and C2221 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VCP2-line is short-circuited to the ground. If short-circuit is found replace C7550 and C2221. If this does not help go to the next steps.

3.1.3.1.2.1.2 Retu ok?

3.1.3.1.2.1.3 Vinku (N7501) ok?

3.1.3.1.2.2 Vinku (N7501) RB_EXT voltage ok?

- See section ["Vinku \(N7501\) RB_EXT voltage ok?"](#)

3.1.3.1.2.3 Balun T7503 ok?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is

explained in section “Transmitter troubleshooting”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.3.1.2.4 Components near TX VCO ok?

C7571, R7519, R7523, C7573 and C7568 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

3.1.3.1.2.5 Replace Vinku (N7501) or TX VCO (G7502) or both

3.1.3.1.3 Replace TX VCO G7502

3.1.3.2 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.3.2.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.

Appendix A: RF Troubleshooting

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.3.2.1.1 Replace TX VCO G7502

3.1.3.2.2 Replace balun T7503

3.1.3.3 VCTCX0 frequency and output level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

3.1.3.3.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.1.3.3.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.1.3.3.1.2 Replace Retu

3.1.3.3.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

3.1.3.3.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

3.1.3.3.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

3.1.3.3.2.2 VCTCX0 ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCX0 G7501 and solder R7509 (new component) back to the PWB

3.1.3.3.2.3 Replace Retu

3.1.3.3.3 Replace VCTCX0 G7501

3.2 Does the phone give realistic RSSI-values?

Attach the phone to the product specific test jig and a signal generator to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

Use the signal generator to supply -90 dBm RF-level (unmodulated signal) to the phone via the antenna coupler. Set generator RF-level to -90 dBm + cable and coupler attenuation. This measurement should be performed in a RF-shielded environment because existing GSM-network base stations can disturb this measurement otherwise.

- Set RF-generator frequency as following:
 - EGSM900: 942.46771 MHz (channel 37)
 - GSM1800: 1842.86771 MHz (channel 700)
 - GSM1900: 1960.06771 MHz (channel 661)
- Use Phoenix testing & tuning software to perform GSM receiver activation and RSSI measurement for proper channels. Procedure is explained in section “GSM RX chain activation for manual measurements” (Start “Testing” -> “GSM” -> “RSSI Reading” tool in Phoenix. Select the correct band and channel).
- “RSSI Reading” -tool should show quite exact -90 dBm RSSI level. Remember to take into account attenuation between the phone and signal generator. Test also Q and I branches separately.

Signal level in both I and Q lines should be about -93 dBm

- Increase signal generator RF level to -60 dBm. Phoenix "RSSI Reading" tool should show now quite exact RSSI level -60 dBm. Test also Q and I branches separately. Signal level in both I and Q lines should be about -63 dBm
- If RSSI-levels are not as expected separate the phone into parts and place to the module jig. Connect the signal generator to the module jig GSM RF connector (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.2.1 Is Hinku (N7500) ASIC receiving RF-power correctly from the GSM-antenna connector?

- GSM receiver has to be active before measurements. Procedure is explained in section "GSM RX chain activation for manual measurements."
- Connect an RF-generator to the GSM-antenna connector
- Set RF-generator frequency as following:
 - EGSM900: 942.46771 MHz
 - GSM1800: 1842.86771 MHz
 - GSM1900: 1960.06771 MHz
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW and VBW = 10 kHz, Span = 0 kHz, sweep time 5 ms.
- RF-signals in this measurement are pulsed and video triggering is needed in the spectrum analyser (software dependent issue. With some phone softwares these signals are constant in "Local" mode and triggering is not needed)
- EGSM900: Connect the probe to C7512 or C7514. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- GSM1800: Connect the probe to C7581 or C7584. The RF level should be roughly -85...-90 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- GSM1900: Connect the probe to C7523 or C7525. The RF level should be roughly -85...-90 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- **NOTE!** If RSSI-values are correct only in one or two GSM-bands but RX ASIC HINKU (N7500) is receiving RF-power correctly from the GSM antenna connector in all three GSM-bands, typically this means that Hinku ASIC (N7500) is faulty or the ASIC is badly soldered. For example: RSSI-values are not realistic in EGSM900-band but are ok in other bands and HINKU is receiving RF-power correctly in all bands. Then it's quite clear that HINKU (N7500) is faulty or badly soldered and the component should be replaced.

3.2.1.1 Is Z7503 (antenna switch) working correctly?

- GSM receiver has to be active before measurements. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Connect an RF-generator to the GSM-antenna connector
- Set RF-generator frequency as following:
 - EGSM900: 942.46771 MHz (Channel 37)
 - GSM1800: 1842.86771 MHz (Channel 700)
 - GSM1900: 1960.06771 MHz (Channel 661)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW and VBW = 10 kHz, Span = 0 kHz, sweep time 5 ms.
- RF-signals in this measurement are pulsed and video triggering is needed in the spectrum analyser (software dependent issue. With some phone softwares these signals are constant in “Local” mode and triggering is not needed).
- EGSM900: Connect the probe to L7504. The RF level should be roughly -75 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.
- GSM1800: Connect the probe to L7505. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.
- GSM1900: Connect the probe to L7506. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.

3.2.1.1.1 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations, see section “Test point locations”). Notice: these test points are PWB pads for three non-assembled capacitors.

Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.2.1.1.1 Replace Hinku (N7500)

3.2.1.1.2 Replace antenna switch Z7503

3.2.1.2 Are matching components in place and working correctly?

EGSM900: C7512, C7514 and L7504

GSM1800: C7581, C7584 and L7505

GSM1900: C7523, C7525 and L7506

- Check that components are in place and solder joints are ok
- Use an ohmmeter to check that inductors are conducting DC.
- Replace matching components

3.2.2 Are RX-IQ signal waveforms and levels correct?

- Measurements can be done with an oscilloscope, a probe and signal generator.
- GSM receiver has to be active before RX IQ-signals can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Apply -70 dBm RF signal from a signal generator to the module jig antenna connector and use following frequencies:
 - EGSM900: 942.46771 MHz (Channel 37)
 - GSM1800: 1842.86771 MHz (Channel 700)
 - GSM1900: 1960.06771 MHz (Channel 661)
- Remember to change correct RX channels also to Phoenix "RF controls" window!
- Check RX I and RX Q -signals in following test points:
 - RX I (positive): Connect the probe to test point J7508
 - RX I (negative): Connect the probe to test point J7509
 - RX Q (positive): Connect the probe to test point J7510
 - RX Q (negative): Connect the probe to test point J7511
- The correct RX IQ-signal is shown in figure [6.5.6 "GSM RX IQ \(DC Offset 0.4 V\)"](#). Level of all four IQ-

signals should be about the same and RX IQ-signal frequency should be 67.71 kHz (lower detail figure). The phase shift between I- and Q-signals should be 90 degrees.

3.2.2.1 RF operating voltage VBAT_ASIC ok?

- See section [“RF operating voltage VBAT ASIC ok?”](#)

3.2.2.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”. Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don’t necessarily look like in figures mentioned below.
- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:
 - *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in figures in section [6.5.9.3 “RFBUSDAT \(GSM RX\)”](#).
 - *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in section [6.5.9.1 “RFBUSCLK \(GSM RX\)”](#) and [6.5.9.2 “RFBUSCLK and RFBUSENA \(GSM RX\)”](#)
 - *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in section [6.5.9.2 “RFBUSCLK and RFBUSENA \(GSM RX\)”](#)
 - *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.
- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

3.2.2.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

3.2.2.3 Hinku (N7500) regulator voltage VR1 ok?

- GSM receiver has to be active before Hinku’s VR1 voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7504 (or C7505)
- VR1 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.2.2.3.1 Hinku (N7500) RB_EXT voltage ok?

- GSM receiver has to be active before Hinku’s RB_EXT voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.

Appendix A: RF Troubleshooting

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.2.2.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

3.2.2.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.2.2.3.1.1.2 Retu ok?

3.2.2.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R521 and R504 resistance values with an ohmmeter.

3.2.2.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.2.2.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok

- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.3.1.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

3.2.2.3.1.4 Replace Hinku (N7500)

3.2.2.3.2 Are capacitors in Hinku (N7500) regulator lines working correctly?

C7504, C7515, C7509, C7508, C7596, C7598 and C7505

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.3.3 RX VCO G7500 ok?

3.2.2.3.4 Replace Hinku (N7500)

3.2.2.4 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.2.2.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.2.2.4.2 Replace Retu

3.2.2.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

3.2.2.5 VCP1-voltage ok?

- GSM receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

3.2.2.5.1 C7507 and C2222 working properly?

- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C507 and C2222 are not short-circuited.

3.2.2.5.2 Retu ok?

3.2.2.5.3 Hinku (N7500) ok?

3.2.2.6 VCTCX0 frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

3.2.2.6.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.2.2.6.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.2.2.6.1.2 Replace Retu

3.2.2.6.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

3.2.2.6.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)

- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

3.2.2.6.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

3.2.2.6.2.2 VCTCX0 ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCX0 G7501 and solder R7509 (new component) back to the PWB

3.2.2.6.2.3 Replace Retu

3.2.2.6.3 Replace VCTCX0 G7501

3.2.2.7 Is there RF power in the RX VCO output at all?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

3.2.2.7.1 RX VCO operating voltage VR1 RX ok?

- GSM receiver has to be active before Hinku's VR1 voltage can be measured. Procedure is explained in GSM RX chain activation for manual measurements.
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7504 (or C7505) VR1 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.2.2.7.1.1 Hinku (N7500) regulator voltage VR1 ok?

- See section “[Hinku \(N7500\) regulator voltage VR1 ok?](#)”

3.2.2.7.1.2 Replace Hinku (N7500)

3.2.2.7.2 Replace RX VCO (G7500)

3.2.2.8 Is RX VCO RF-signal coming to the Hinku at all?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm in both output lines. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

3.2.2.8.1 Replace balun T7501

3.2.2.9 Is RX VCO frequency as expected?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

3.2.2.9.1 RX VCO control voltage VC ok?

- GSM receiver has to be active before RX VCO control voltage VC can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7501.

- Typical RX VCO control voltage VC should look somehow similar to figure [6.5.7](#) (GSM mode). VC voltage should be between 0.7 - 3.8 V. DC voltage level should change if RX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

3.2.2.9.1.1 VCP1-voltage ok?

- GSM receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

3.2.2.9.1.1.1 C7507 and C2222 working properly?

- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C507 and C2222 are not short-circuited.

3.2.2.9.1.1.2 Retu ok?

3.2.2.9.1.1.3 Hinku (N7500) ok?

3.2.2.9.1.2 Hinku (N7500) RB_EXT voltage ok?

- GSM receiver has to be active before Hinku's RB_EXT voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.2.2.9.1.2.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.9.1.2.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

3.2.2.9.1.2.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are

not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.9.1.2.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.2.2.9.1.2.1.2 Retu ok?

3.2.2.9.1.2.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R521 and R504 resistance values with an ohmmeter.

3.2.2.9.1.2.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.2.9.1.2.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.2.2.9.1.2.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.2.9.1.2.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

3.2.2.9.1.2.4 Replace Hinku (N7500)

3.2.2.9.1.3 Balun T7501 ok?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm in

both output lines. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

3.2.2.9.1.4 Are components near the RX VCO ok?

R7501, C7516, R7505, C7524 and C7522 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

3.2.2.9.1.5 Replace Hinku (N7500) or RX VCO (G7500) or both

3.2.2.9.2 Replace RX VCO G7500

3.2.2.10 Is RX VCO signal level in the T7501 output high enough?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm in both output lines. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

3.2.2.10.1 RX VCO G7500 output level high enough?

- GSM receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during RX is active (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. Output level of the VCO should be about -20...-30 dBm.

Appendix A: RF Troubleshooting

3.2.2.10.1.1 Replace RX VCO G7500

3.2.2.10.2 Replace balun T7501

3.2.2.11 VCTCX0 frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

3.2.2.11.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.2.2.11.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.2.2.11.1.2 Replace Retu

3.2.2.11.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

3.2.2.11.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix "RF Controls" tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

3.2.2.11.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an

ohmmeter.

- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

3.2.2.11.2.2 VCTCX0 ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCX0 G7501 and solder R7509 (new component) back to the PWB

3.2.2.11.2.3 Replace Retu

3.2.2.11.3 Replace VCTCX0 G7501

3.2.2.12 Replace Hinku ASIC (N7500)

3.2.3 Is RAP3G ASIC getting ok VREFCM-signal from Hinku (N7500)? Signal level ok?

- GSM receiver has to be active before VREFCM signal can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to J7516.
- VREFCM voltage should be about 780 mV (continuous voltage).

3.2.3.1 Hinku (N7500) RB_EXT voltage ok?

- GSM receiver has to be active before Hinku's RB_EXT voltage can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.
- RB_EXT voltage should be 1.325 – 1.375 V.

3.2.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

3.2.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok

Appendix A: RF Troubleshooting

- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.3.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

3.2.3.1.1.2 Retu ok?

3.2.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R521 and R504 resistance values with an ohmmeter.

3.2.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.2.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

3.2.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.2.3.1.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

3.2.3.1.4 Replace Hinku (N7500)

3.2.3.2 Replace Hinku (N7500)

- Also RAP3G can be faulty but it's not possible to replace this component

3.2.4 RAP3G faulty?

- Not possible to replace!

3.3 GSM Transmitter phase error ok?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting". Change TX data type to "Random" in Phoenix.

- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Trigger to TX burst midamble should be used.
- Attach the phone to the product specific test jig and the RF-measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- The RMS Phase error shall not be greater than 5° and the peak phase error not greater than 20°.
- If phase error is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.3.1 Are capacitors in Vinku REG1 and REG2 lines in place?

C7554, C7555 and C7547 (GSM1800 and GSM1900: also C7552)

- Check that components are in place and solder joints are ok

3.3.2 Are capacitors in GSM PA power supply line in place?

- C7569 and C7583
- Check that component is in place and solder joints are ok

3.3.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "[ST CDSP TX IQ TEST](#)" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.3.4 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.3.4.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre

frequency should be set according the used TX channel (see section "Frequency mappings").

- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.3.4.1.1 Replace TX VCO G7502

3.3.4.2 Replace balun T7503

3.3.5 VCTCX0 frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

3.3.5.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

3.3.5.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

3.3.5.1.2 Replace Retu

3.3.5.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

3.3.5.2 BB AFC-voltage ok?

- See section ["BB AFC-voltage ok?"](#)

3.3.5.3 Replace VCTCX0 G7501

3.4 GSM (GMSK) modulation spectrum ok?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Settings have to be done according to the 3GPP specifications. Modulation spectrum measurement is possible to perform also with a spectrum analyser, but in this case measurement settings have to be done manually.
- Attach the phone to the product specific test jig and the RF-test device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- Set TX Data Type to "Random" in Phoenix
- Enter correct "Centre frequency" to the spectrum analyser (see section "Frequency mappings") and "Span" should be set to 2 MHz. "RBW" and "VBW" should be set to 30 kHz.
- Select a correct attenuator in the spectrum analyser and set "reference level offset" according attenuation between the phone and the spectrum analyser.
- Enter "Sweep time" at least to 2.5 s.
- Check that the TX power is not over the specification limits in following offsets (tables below). If the measurement is performed with a spectrum analyser according above settings then there may be 1 to 3 dB exceeding with some limit values. This is caused because above settings are meant only for fast modulation spectrum checking and are not exactly done according 3GPP specification.

EGSM900/GSM1800:

Offset (kHz)	100	200	250	400	≥ 600 < 1 800
Limit (dBc)	+0,5	-30	-33	-60	-60

GSM1900:

Offset (kHz)	100	200	250	400	□ 600 < 1 200	□ 1 200 < 1 800
Limit (dBc)	+0,5	-30	-33	-60	-60	-60

One example of measured GSM Modulation Spectrum in EGSM900 band is presented in figure [6.5.8 "TX Modulation spectrum \(GSM\)"](#).

- If modulation spectrum is not as expected separate the phone into parts and place to the module jig (Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-

connector).

3.4.1 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor. Check R7516 resistance value with an ohmmeter and replace resistor if needed.

3.4.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok?

EGSM: Icont_21 and Icont_22

GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
 - Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
 - Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure [6.5.4 "Icont_21/Icont_22 \(DC Offset 1.2 V\)"](#), when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:
 - Connect the probe to C7561 or C7556.

Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure [6.5.5 "Icont_31/Icont_32 \(DC Offset 1.2 V\)"](#) when measured with an oscilloscope and a probe. Check both currents.

3.4.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section ["Vinku \(N7501\) RB_EXT voltage ok?"](#)

3.4.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku

Icont_22 missing – C7545 short-circuited?

GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?

Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are

not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.4.2.3 Replace Vinku (N7501)

3.4.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "[ST CDSP TX IQ TEST](#)" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.4.4 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.4.4.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.4.4.1.1 Replace TX VCO G7502

Appendix A: RF Troubleshooting

3.4.4.2 Replace balun T7503

3.4.5 Replace Vinku (N7501) or GSM PA (N7502) or both

3.5 TX power vs. time ok?

This section means situation when GSM TX power levels are ok, but burst timing is not correct or power changes during TX burst.

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. **Note!** *It is probably needed to change the Tx Data Type in Phoenix to “Random” before this measurement can be performed.*
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Attach the phone to the product specific test jig and the measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- If TX power vs. time is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

3.5.1 Is the TXC-signal coming to Vinku ASIC (N7501) OK?

- GSM transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level first to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- Typical TX control voltage TXC timing should look somehow similar to figure [6.5.2 "TXC in GSM mode \(DC Offset 0 V\)"](#) (EGSM900 TX power level 5) and voltage levels should be roughly:
 - EGSM900: 1.8 V while TX burst and 0 V otherwise.
 - GSM1800/GSM1900: 1.8 V while TX burst and 0 V otherwise.
- Change the TX to the minimum power level (“19” in EGSM and “15” in GSM1800/GSM1900)
- Typical TX control voltage TXC levels should be now about:
 - EGSM900: 1.0 V while TX burst and 0 V otherwise.
- GSM1800/GSM1900: 0.7 V while TX burst and 0 V otherwise.

3.5.1.1 R7514 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R514 resistance value with an ohmmeter

3.5.1.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7549 is not short-circuited.

3.5.1.3 Retu ok?

3.5.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok?

EGSM: Icont_21 and Icont_22

GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
 - Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
 - Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure [6.5.4 "Icont_21/Icont_22 \(DC Offset 1.2 V\)"](#) when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:
 - Connect the probe to C7561 or C7556.
 - Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure [6.5.5 "Icont_31/Icont_32 \(DC Offset 1.2 V\)"](#) when measured with an oscilloscope and a probe. Check both currents.

3.5.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section ["Vinku \(N7501\) RB_EXT voltage ok?"](#)

3.5.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku

Icont_22 missing – C7545 short-circuited?

GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?

Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.5.2.3 Replace Vinku (N7501)

3.5.3 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)?

- GSM transmitter has to be active before DET_SW_G voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7595. Notice: C7595 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- DET_SW_G voltage should be about 2.8 V while TX burst and 0 V otherwise.

3.5.3.1 Replace Vinku (N7501)

3.5.4 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor.
- Check R7516 resistance value with an ohmmeter and replace resistor if needed.

4. DOES THE PHONE REGISTER TO THE NETWORK AND MAKE A CALL (WCDMA)?

- Test against a WCDMA communication tester or real WCDMA network with a proper SIM.

4.1 WCDMA TX power and transmit frequency ok?

- Attach the phone to the product specific test jig and a spectrum analyser to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Set WCDMA TX ON. Procedure is explained in section “Transmitter troubleshooting”.
- Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms.
- Test at power level 21 dBm
- The output power should be +17 – +23 dBm, typical value 21 dBm.
- Remember to select “Stop RF” in Phoenix before opening the shield box hatch.
- If power is not as expected separate the phone into parts and place to the module jig. Connect a spectrum analyser to the module jig WCDMA RF connector and measure TX power again (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).
- TX power ok in the module jig: Antenna or antenna connection bad. Replace the antenna
- TX power still wrong or no TX signal found at all: Continue troubleshooting
- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency, see section, 4.1.3. ["WCDMA transmitter frequency correct?"](#).

4.1.1 Does the WCDMA TX transmit RF-power at all?

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency, see section 4.1.3. ["WCDMA transmitter frequency correct?"](#).

4.1.1.1 Is Vinku (N7501) transmitting RF-power at all?

- WCDMA transmitter has to be active before Vinku's output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms.
- Connect the RF probe to R7520. The RF-level should be about the same on both ends of the resistor. Check output level with 0 dBm power level (Set start level “0” to Phoenix).
- Power level “0” – Output level should be about -40...-48 dBm

4.1.1.1.1 RF operating voltage VBAT_ASIC ok?

- See section [“RF operating voltage VBAT_ASIC ok?”](#)

4.1.1.1.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section “GSM RX chain activation for manual measurements”. Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don’t necessarily look like in figures mentioned below.
- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:
- *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in section 6.5.9.3 [“RFBUSDAT \(GSM RX\)”](#)
- *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in sections 6.5.9.1 [“RFBUSCLK \(GSM RX\)”](#) and 6.5.9.2 [“RFBUSCLK and RFBUSENA \(GSM RX\)”](#)
- *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in section 6.5.9.2 [“RFBUSCLK and RFBUSENA \(GSM RX\)”](#)
- *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.
- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

4.1.1.1.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

4.1.1.1.3 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- WCDMA transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with an oscilloscope and a probe.
- VREG1: Connect the probe to C7543
- VREG2: Connect the probe to C7548 (or C7547)
- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.1.1.1.3.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.1.1.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.1.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.1.1.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.1.3.1.1.2 Retu ok?

4.1.1.1.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.1.1.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.1.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok

- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.1.1.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.1.3.1.4 Replace Vinku (N7501)

4.1.1.1.3.2 Are capacitors in Vinku (N7501) regulator lines working correctly?

VREG1: C7543

VREG2: C7547, C7548, C7554, C7555, C7553, C7552, C7558 and C7567

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that regulator lines are not short-circuited to the ground. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.3.3 TX VCO (G7502) ok?

4.1.1.1.3.4 Replace Vinku (N7501)

4.1.1.1.4 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513). **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

4.1.1.1.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.1.1.1.4.2 Replace Retu

4.1.1.1.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTX0 (G7501) or all three components

4.1.1.1.5 VCP2-voltage ok?

- WCDMA transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

4.1.1.1.5.1 C7550 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7550 is not short-circuited. If short-circuit is found replace the capacitor mentioned above. If this does not help go to the next step.

4.1.1.1.5.2 Retu ok?

4.1.1.1.5.3 Vinku (N7501) ok?

4.1.1.1.6 Is there RF power in the TX VCO output at all?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The correct VCO frequency can be found in see section “Frequency mappings”. The output level of the VCO should be about -25 dBm.

4.1.1.1.6.1 TX VCO operating voltage VREG2 (VR2) ok?

- See section 4.1.1.1.3 “[Vinku \(N7501\) regulator voltages VREG1, VREG2 ok?](#)”

4.1.1.1.6.2 Replace TX VCO (G7502)

4.1.1.1.7 Is TX VCO RF-signal coming to the Vinku at all?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is

explained in section “Transmitter troubleshooting”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.1.1.7.1 Replace balun T7503

4.1.1.1.8 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3. “[ST CDSP TX IQ TEST](#)” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.1.1.1.9 Is the TXC-signal coming to Vinku ASIC (N7501) OK?

- WCDMA transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -50 dBm (Set start level “-50” to Phoenix)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- TX control voltage TXC should be constant DC-voltage between 0.1 - 2.3 V. Voltage level should change if TX power is changed. TXC is lower on lower power levels and higher if higher power levels are used.
- TXC voltage should be about 1.0 V with power level -50 dBm and about 1.5 V with power level 0 dBm.

4.1.1.1.9.1 R7514 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7514 resistance value with an ohmmeter

4.1.1.1.9.2 C7549 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7549 is not short-circuited.

4.1.1.1.9.3 Retu ok?

4.1.1.1.10 WCDMA-modulator supply voltage (VREG2) ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7520
- DC voltage level should be 2.65 – 2.86 V in both R7520 pads. Typical value is 2.7 V.

4.1.1.1.10.1 Inductors L7512 and L7510 in place and working correctly?

- Disconnect the power supply from the phone and use an ohmmeter to check that L7510 and L7512 are conducting DC.

4.1.1.1.11 VCTCX0 frequency and output level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

4.1.1.1.11.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

4.1.1.1.11.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.1.1.1.11.1.2 Replace Retu

4.1.1.1.11.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

4.1.1.1.11.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)

Appendix A: RF Troubleshooting

- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix “RF Controls” tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

4.1.1.11.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

4.1.1.11.2.2 VCTCX0 ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCX0 G7501 and solder R7509 (new component) back to the PWB

4.1.1.11.2.3 Replace Retu

4.1.1.11.3 Replace VCTCX0 G7501

4.1.1.1.12 Replace Vinku (N7501)

4.1.1.2 Is there RF-power in the WCDMA PA (N7503) input at all?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms
- Connect the probe to Z7506 output. The RF level should be roughly -40...-48 dBm.

4.1.1.2.1 Is Vinku (N7501) output RF-signal coming correctly to the Z7506 (SAW filter)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms
- Connect the RF probe to L7511. The RF-level should be about the same on both ends of the

inductor. Check the level with 0 dBm power level (Set start level “0” to Phoenix).

- Power level “0” – Vinku output level should be about -40...-48 dBm

4.1.1.2.1.1 Inductor L7511 and resistor R7520 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7520 resistance value with an ohmmeter.
- If resistance of R7520 is correct then replace L7511.

4.1.1.3 Is WCDMA PA (N7503) transmitting RF-power at all?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms
- Connect the probe to Z7505 input. The RF level should be roughly -16...-28 dBm.

4.1.1.3.1 Does WCDMA PA (N7503) get operating voltage Vcc12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7525
- Vcc12 voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.3.1.1 R7525 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7525 resistance value with an ohmmeter

4.1.1.3.1.2 PA operating voltage VBAT_PA ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)

- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.3.1.2.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.1.3.2 Does WCDMA PA (N7503) get operating voltage Vcc11?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm).
NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.1.3.2.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.1.1.3.2.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.3.2.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.

- Voltage level should be about 2.78 V.

4.1.1.3.2.3.1 Replace Vinku (N7501)

4.1.1.3.2.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.1.3.2.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.1.3.2.4.1.1 Replace Vinku (N7501)

4.1.1.3.2.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter also to check that L7514 is conducting DC.

4.1.1.3.2.5 Replace SMPS N7504

4.1.1.3.3 Does WCDMA PA (N7503) get bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)
- Measurements can be done with an oscilloscope and a probe.

- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.1.1.3.3.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.1.3.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.3.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.1.3.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.3.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.3.3.1.1.2 Retu ok?

4.1.1.3.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.1.3.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.3.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.1.3.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.3.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.1.3.3.1.4 Replace Vinku (N7501)

4.1.1.3.3.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 missing – C7579 short-circuited?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor. If this does not help go to the next step.

4.1.1.3.3.3 Replace Vinku (N7501) or WCDMA PA (N7503)

4.1.1.3.4 Replace PA (N7503)

4.1.1.4 Does duplex-filter (Z7502) get correct RF-power level from WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms
- Connect the probe to Z7502 TX input. The RF level should be roughly -20...-30 dBm.

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4.1.1.4.1 Replace isolator Z7505

4.1.1.5 Replace duplex-filter Z7502

4.1.2 Does WCDMA TX transmit enough RF-power and power levels otherwise ok?

4.1.2.1 Is Vinku ASIC (N7501) transmitting correct RF-power?

- WCDMA transmitter has to be active before Vinku's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Connect the RF probe to R7520. The RF-level should be about the same on both ends of the resistor. Check output level with 0 dBm ("0") power level.
 - Power level ("0") – Output level should be about -45...-48 dBm
- Check if output levels of Vinku are as expected.

4.1.2.1.1 RF operating voltage VBAT_ASIC ok?

- See section ["RF operating voltage VBAT ASIC ok?"](#)

4.1.2.1.2 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- WCDMA transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section "Transmitter troubleshooting". Measurements can be done with an oscilloscope and a probe.
- VREG1: Connect the probe to C7543
- VREG2: Connect the probe to C7548 (or C7547)
- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.1.2.1.2.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.2.1.2.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.

- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.1.2.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.2.1.2.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.1.2.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.1.2.1.1.2 Retu ok?

4.1.2.1.2.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.2.1.2.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.1.2.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.2.1.2.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.1.2.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.1.2.2 Replace Vinku (N7501)

4.1.2.1.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there

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is no fail in 2.3 “ST_CDSP_TX_IQ_TEST” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.1.2.1.4 Is the TXC-signal coming to Vinku ASIC (N7501) OK? Is signal level correct?

- WCDMA transmitter has to be active before TX control voltage TXC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -50 dBm (Set start level “-50” to Phoenix)
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7549
- TX control voltage TXC should be constant DC-voltage between 0.1 - 2.3 V. Voltage level should change if TX power is changed. TXC is lower on lower power levels and higher if higher power levels are used.
- TXC voltage should be about 1.0 V with power level -50 dBm and about 1.5 V with power level 0 dBm.

4.1.2.1.4.1 R7514 resistance value correct?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7514 resistance value with an ohmmeter

4.1.2.1.4.2 C7549 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7549 is not short-circuited.

4.1.2.1.4.3 Retu ok?

4.1.2.1.5 Does Vinku (N7501) WCDMA-modulator get correct supply voltage (VREG2)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7520
- DC voltage level should be 2.65 – 2.86 V in both R7520 pads. Typical value is 2.7 V.

4.1.2.1.5.1 Inductors L7512 and L7510 in place and working correctly?

- Disconnect the power supply from the phone and use an ohmmeter to check that L7510 and L7512 are conducting DC.

4.1.2.1.6 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.2.1.6.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.2.1.6.1.1 Replace TX VCO G7502

4.1.2.1.6.2 Replace balun T7503

4.1.2.1.7 Replace Vinku (N7501)

4.1.2.2 Is there correct RF-power in the WCDMA PA (N7503) input?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to 0 dBm (Set start level "0" to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms.
- Connect the probe to Z7506 output. The RF level should be roughly -40...-48 dBm.

4.1.2.2.1 Is Vinku (N7501) output RF-signal coming correctly to the Z7506 (SAW filter)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section

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“Transmitter troubleshooting”.

- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms.
- Connect the RF probe to L7511. The RF-level should be about the same on both ends of the inductor. Check the level with 0 dBm power level (Set start level “0” to Phoenix).
- Power level “0” – Vinku output level should be about -40...-48 dBm

4.1.2.2.1.1 Inductor L7511 and resistor R7520 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7520 resistance value with an ohmmeter.
- If resistance of R7520 is correct then replace L7511.

4.1.2.3 Does WCDMA PA (N7503) transmit correct RF-power?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms.
- Connect the probe to Z7505 input. The RF level should be roughly -16...-28 dBm.

4.1.2.3.1 Does WCDMA PA (N7503) get correct operating voltage Vcc12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7525
- Vcc12 voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.3.1.1 R7525 in place and working correctly?

- Check that the component is in place and solder joints are ok

- Disconnect the power supply from the phone and check R7525 resistance value with an ohmmeter

4.1.2.3.1.2 PA operating voltage VBAT_PA ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.3.1.2.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.2.3.2 Does WCDMA PA (N7503) get correct operating voltage Vcc11?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm).
NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.2.3.2.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.1.2.3.2.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)

- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.3.2.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.2.3.2.3.1 Replace Vinku (N7501)

4.1.2.3.2.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.2.3.2.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.2.3.2.4.1.1 Replace Vinku (N7501)

4.1.2.3.2.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter to check that L7514 is conducting DC.
- Use a diode meter to make sure that diodes inside V7500 are working correctly.

4.1.2.3.2.5 Replace SMPS N7504

4.1.2.3.3 Does WCDMA PA (N7503) get bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)
- Measurements can be done with an oscilloscope and a probe.
 - Connect the probe to C7579
 - WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
 - Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
 - WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.1.2.3.3.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.2.3.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.3.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.2.3.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.3.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

Appendix A: RF Troubleshooting

4.1.2.3.3.1.1.2 Retu ok?

4.1.2.3.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.2.3.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.3.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.2.3.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.2.3.3.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.2.3.3.1.4 Replace Vinku (N7501)

4.1.2.3.3.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 – C7579 short-circuited?

- Check that the capacitor is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

4.1.2.3.3.3 Replace Vinku (N7501) or WCDMA PA (N7503)

4.1.2.3.4 Replace PA (N7503)

4.1.2.4 Does duplex-filter (Z7502) get correct RF-power from WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)

- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”)
- Spectrum analyser RBW = VBW = 10 MHz, Span \leq 2 MHz, sweep time 100 ms
- Connect the probe to Z7502 TX input. The RF level should be roughly -20...-30 dBm.

4.1.2.4.1 Replace isolator Z7505

4.1.2.5 Replace duplex-filter Z502

4.1.3 WCDMA transmitter frequency correct?

- Connect a spectrum analyser to the module test jig RF connector.
- Set WCDMA Tx ON. Procedure is explained in section “Transmitter troubleshooting”.
- Check if the frequency of the transmitter is as expected. If output signal is not found try to use 500 MHz span setting.

The correct TX frequency is shown in Phoenix “Tx Control (WCDMA)” window and can be found also in see section “Frequency mappings”. If the frequency is not found at all then go to 4.1.1” [Does the WCDMA TX transmit RF-power at all?](#)”

4.1.3.1 Is TX VCO frequency as expected?

- WCDMA transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. It won’t expose if the T7503 is broken or the output level of the VCO is too low. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.3.1.1 C7543, C7548 and L7517 ok?

- These components should be checked if TX VCO frequency is not stable and TX PLL frequency not locked.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is

conducting DC.

4.1.3.1.2 TX VCO control voltage VC ok?

- WCDMA transmitter has to be active before TX VCO control voltage VC can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7519.
- TX VCO control voltage VC should be constant DC-voltage between 0.7 - 3.8 V. DC voltage level should change if TX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

4.1.3.1.2.1 VCP2-voltage ok?

- WCDMA transmitter has to be active before VCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221 (or C7550).
- VCP2 voltage should be about 4.75 V.

4.1.3.1.2.1.1 C7550 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C7550 is not short-circuited. If short-circuit is found replace the capacitor mentioned above. If this does not help go to the next step.

4.1.3.1.2.1.2 Retu ok?

4.1.3.1.2.1.3 Vinku (N7501) ok?

4.1.3.1.2.2 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku's RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.1.3.1.2.2.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.

- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.3.1.2.2.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.1.3.1.2.2.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.3.1.2.2.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.3.1.2.2.1.2 Retu ok?

4.1.3.1.2.2.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.1.3.1.2.2.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.3.1.2.2.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.1.3.1.2.2.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.3.1.2.2.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.1.3.1.2.2.4 Replace Vinku (N7501)

4.1.3.1.2.3 Balun T7503 ok?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.3.1.2.4 Are components near the TX VCO ok?

C7571, R7519, R7523, C7573 and C7568 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

4.1.3.1.2.5 Replace Vinku (N7501) or TX VCO (G7502) or both

4.1.3.1.3 Replace TX VCO G7502

4.1.3.2 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.3.2.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement.

Remember to solder the shield back after the phone repairing.

- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.3.2.1.1 Replace TX VCO G7502

4.1.3.2.2 Replace balun T7503

4.1.3.3 VCTCX0 frequency and output level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24V\)"](#).

4.1.3.3.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

4.1.3.3.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.1.3.3.1.2 Replace Retu

4.1.3.3.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

4.1.3.3.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix "RF Controls" tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

Appendix A: RF Troubleshooting

4.1.3.3.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

4.1.3.3.2.2 VCTCX0 ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCX0 G7501 and solder R7509 (new component) back to the PWB

4.1.3.3.2.3 Replace Retu

4.1.3.3.3 Replace VCTCX0 G7501

4.2 Does the phone give realistic RSSI-values?

Attach the phone to the product specific test jig and a signal generator to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

Use the signal generator to supply -90 dBm RF-level to the phone via the antenna coupler. Set generator RF-level to -90 dBm + Cable and coupler attenuation. This measurement should be performed in a RF-shielded environment because existing WCDMA-network base stations can disturb this measurement otherwise.

- Set RF-generator frequency to 2141.0 MHz (unmodulated signal).
- Use Phoenix testing & tuning software to perform WCDMA receiver activation and RSSI measurement for channel 10700. Procedure is explained in sections "WCDMA RX chain activation for manual measurement" and "WCDMA RSSI measurement".
- "Rx Power Measurement" tool should show quite exact -90 dBm RSSI level. Remember to take into account attenuation between the phone and signal generator.
- Increase signal generator RF level to -60 dBm. Phoenix "Rx Power Measurement" tool should show now quite exact RSSI level -60 dBm.
- If RSSI-levels are not as expected separate the phone into parts and place to the module jig. Connect the signal generator to the module jig WCDMA RF connector (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

4.2.1 Is Hinku ASIC (N7500) receiving RF-power correctly from the WCDMA-antenna connector?

- WCDMA receiver has to be active before measurements. Procedure is explained in section "Receiver troubleshooting".
- Connect an RF-generator to the WCDMA-antenna connector

- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to T7500 output. There are two output pins because of balanced output. The RF level should be roughly -85...-90 dBm in both output pads when input signal level in WCDMA antenna connector is -50 dBm.

4.2.1.1 Does duplex-filter (Z7502) work properly?

- WCDMA receiver has to be active before measurements. Procedure is explained in section "Receiver troubleshooting".
- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the T7500 input. The RF level should be roughly -80...-85 dBm in the input pad when input signal level in WCDMA antenna connector is -50 dBm.

4.2.1.1.1 Replace filter Z7502

4.2.1.2 Replace balun T7500

4.2.2 Hinku WCDMA LNA output ok?

- WCDMA receiver has to be active before measurements. Procedure is explained in section "Receiver troubleshooting".
- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the Z7501 input. The RF level should be roughly -65...-70 dBm in both input pads when input signal level in WCDMA antenna connector is -50 dBm.

4.2.2.1 Replace Hinku N7500

4.2.3 WCDMA SAW Z7501 in place and working correctly?

- WCDMA receiver has to be active before measurements. Procedure is explained in section "Receiver troubleshooting".

Appendix A: RF Troubleshooting

- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the Z7501 output. The RF level should be roughly -70...-75 dBm in both output pads when input signal level in WCDMA antenna connector is -50 dBm.

4.2.3.1 Replace SAW Z7501

4.2.4 Are RX-IQ signal waveforms and levels correct?

- Measurements can be done with an oscilloscope, a probe and signal generator.
- WCDMA receiver has to be active before RX IQ-signals can be measured. Procedure is explained in section "Receiver troubleshooting".
- Apply -50 dBm RF-signal (unmodulated) from a signal generator to the module jig antenna connector and use frequency 2140.1 MHz (Channel 10700)
- Remember to change the correct RX channel also to Phoenix "RX control" window!
- Check RX I and RX Q -signals in following test points:
 - RX I (positive): Connect the probe to test point J7508
 - RX I (negative): Connect the probe to test point J7509
 - RX Q (positive): Connect the probe to test point J7510
 - RX Q (negative): Connect the probe to test point J7511
- Signal in all four test points should be about the same. Output should be a sine wave with frequency 100 kHz and amplitude about 650 mV.
- Change the signal generator to frequency 2142.0 MHz (Channel 10700)
- Signal in all four test points should be about the same. Output should be a sine wave with frequency 2.0 MHz and amplitude about 550 mV.

4.2.4.1 RF operating voltage VBAT_ASIC ok?

- See section ["RF operating voltage VBAT ASIC ok?"](#)

4.2.4.2 RFBUS signals ok?

- GSM receiver has to be active before RFBUS signals can be measured. Procedure is explained in section "GSM RX chain activation for manual measurements". Also WCDMA/GSM transmitter and WCDMA receiver activation can be used for the measurement but then RFBUS -signals don't necessarily look like in figures mentioned below.
- Measurements can be performed with an oscilloscope and a probe. Check all five RF BUS signals:
 - *RFBUSDAT*: Connect the probe to J7504. Typical RFBUSDAT -signal is shown in section [6.5.9.3](#)

"RFBUSDAT (GSM RX)".

- *RFBUSCLK*: Connect the probe to J7505. Typical RFBUSCLK -signal is shown in figures ["RFBUSCLK \(GSM RX\)"](#) and ["RFBUSCLK and RFBUSENA \(GSM RX\)"](#).
- *RFBUSENA*: Connect the probe to J7506. Typical RFBUSENA -signal is shown in the figure ["RFBUSCLK and RFBUSENA \(GSM RX\)"](#).
- *RXRESETX*: Connect the probe to J7515. RXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.
- *TXRESETX*: Connect the probe to J7517. TXRESETX -signal is a constant 2 V DC-signal after GSM or WCDMA transceiver has been activated the first time after phone boot up. The level of this signal should be about 0 V before transceiver activation.

4.2.4.2.1 RAP3G (or Vinku or Hinku) faulty?

- RAP3G (D2800) cannot be replaced.

4.2.4.3 Hinku (N7500) regulator voltage VR1 ok?

- WCDMA receiver has to be active before Hinku's VR1 voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7504 (or C7505)
- VR1 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.2.4.3.1 Hinku (N7500) RB_EXT voltage ok?

- WCDMA receiver has to be active before Hinku's RB_EXT voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7504.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.2.4.3.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.2.4.3.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

Remember to solder a new component to R7503 pads after measurement.

4.2.4.3.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.2.4.3.1.1.1.2 Replace Vinku (N7501) or Hinku (N7500) or both

4.2.4.3.1.1.2 Retu ok?

4.2.4.3.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.2.4.3.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.2.4.3.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.2.4.3.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.2.4.3.1.3.3 Replace Hinku (N7500) or Vinku (N7501) or both

4.2.4.3.1.4 Replace Hinku (N7500)

4.2.4.3.2 Are capacitors in Hinku (N7500) regulator lines working correctly?

C7504, C7515, C7509, C7508, C7596, C7598 and C7505

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are

not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.2.4.3.3 RX VCO G7500 ok?

4.2.4.3.4 Replace Hinku (N7500)

4.2.4.4 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

4.2.4.4.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.2.4.4.2 Replace Retu

4.2.4.4.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

4.2.4.5 VCP1-voltage ok?

- WCDMA receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

4.2.4.5.1 C7507 and C2222 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7507 and C2222 are not short-circuited. If short-circuit is found replace faulty capacitor. If this does not help go to the next steps.

4.2.4.5.2 Retu ok?

4.2.4.5.3 Hinku (N7500) ok?

Appendix A: RF Troubleshooting

4.2.4.6 Is there RF power in the RX VCO output at all?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

4.2.4.6.1 RX VCO operating voltage VR1 RX ok?

- WCDMA receiver has to be active before Hinku's VR1RX voltage can be measured. Procedure is explained in section "Receiver troubleshooting"
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7515 (or C7598)
- VR1RX voltage level should be continuous 2.65 - 2.86 V in WCDMA mode. Typical value is 2.7 V.

4.2.4.6.1.1 Hinku (N7500) regulator voltage VR1 ok?

- See section "[Hinku \(N7500\) regulator voltage VR1 ok?](#)"

4.2.4.6.1.2 Replace Hinku (N7500)

4.2.4.6.2 Replace RX VCO (G7500)

4.2.4.7 Is RX VCO RF-signal coming to the Hinku at all?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm. If the signal level is correct in the input (-20...-30 dBm) but output level is not as expected then replace T7501.

4.2.4.7.1 Replace balun T7501

4.2.4.8 Is RX VCO frequency as expected?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

4.2.4.8.1 RX VCO control voltage VC ok?

- WCDMA receiver has to be active before RX VCO control voltage VC can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7501.
- RX VCO control voltage VC should be constant DC-voltage between 0.7 - 3.8 V. Voltage level should change if RX channel is changed. VC is lower on lower channels and higher if higher channel numbers are used.

4.2.4.8.1.1 VCP1-voltage ok?

- WCDMA receiver has to be active before VCP1 voltage can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VCP1 voltage should be about 4.75 V.

4.2.4.8.1.1.1 C7507 and C2222 working properly?

- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that C507 and C2222 are not short-circuited.

4.2.4.8.1.1.2 Retu ok?

4.2.4.8.1.1.3 Hinku (N7500) ok?

4.2.4.8.1.2 Balun T7501 ok?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm. If

the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

4.2.4.8.1.3 Are components near the RX VCO ok?

R7501, C7516, R7505, C7524 and C7522 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

4.2.4.8.1.4 Replace Hinku (N7500) or RX VCO (G7500) or both

4.2.4.8.2 Replace RX VCO G7500

4.2.4.9 Is RX VCO signal level in the T7501 output high enough?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the VCO frequency in T7501 outputs. The level should be about -25...-35 dBm. If the signal level is correct in the input (about -20...-30 dBm) but output level is not as expected then replace T7501.

4.2.4.9.1 RX VCO G7500 output level high enough?

- WCDMA receiver has to be active before RX VCO's output frequency and output level can be measured. Procedure is explained in section "Receiver troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used RX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7501 input.
- Check if the frequency of the RX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -20...-30 dBm.

4.2.4.9.1.1 Replace RX VCO G7500

4.2.4.9.2 Replace balun T7501

4.2.4.10 Are capacitors C7530, C7532, C7534 and C7536 in place?

- Check that components are in place and solder joints are ok

4.2.4.11 VCTCX0 frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24V\)"](#).

4.2.4.11.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

4.2.4.11.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

4.2.4.11.1.2 Replace Retu

4.2.4.11.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

4.2.4.11.2 BB AFC-voltage ok?

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to R7509 (or C7533)
- AFC-voltage may vary between 0.1 - 2.3 V. Typical value is 1.2 V. Phoenix "RF Controls" tool can be used to change the AFC value. Voltage level should be about 0.1 V with AFC value -1024 and about 2.3 V with AFC value 1023.

4.2.4.11.2.1 Low pass filter components R7509 and C7533 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7509 resistance value with an ohmmeter.
- Use an ohmmeter to find out also if the AFC-line is short-circuited to the ground. If short-circuit is found replace C7533. If this does not help then go to the next steps.

4.2.4.11.2.2 VCTCX0 ok?

- Remove R7509. If AFC-voltage is correct after removing then replace faulty VCTCX0 G7501 and solder R7509 (new component) back to the PWB

4.2.4.11.2.3 Replace Retu

4.2.4.11.3 Replace VCTCX0 G7501

4.2.5 Does RAP3G ASIC get ok VREFCM-signal from Hinku (N7500)? Signal level ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to J7516.
- VREFCM voltage should be about 780 mV (continuous voltage).

4.2.5.1 Hinku (N7500) RB_EXT voltage ok?

- See section ["Hinku \(N7501\) RB_EXT voltage ok?"](#)

4.2.5.2 Replace Hinku (N7500)

- Also RAP3G can be faulty but it's not possible to replace this component

4.2.6 RAP3G faulty?

- Not possible to replace!

4.3 WCDMA modulation spectrum and ACLR ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with a WCDMA transmitter tester or other WCDMA communication tester. Settings have to be done according to the 3GPP specifications. Modulation spectrum and ACLR measurements are possible to perform also with a spectrum analyser, but in this case measurement settings have to be done manually according to the 3GPP specifications.
- Attach the phone to the product specific test jig and a spectrum analyser or other RF-measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- If modulation spectrum is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

4.3.1 Does N7504 give correct voltage level (Vcc11) to the WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -40 dBm (Set start level to "-40.0" in Phoenix)

- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm).
NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.3.1.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.3.1.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.3.1.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.3.1.3.1 Replace Vinku (N7501)

4.3.1.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.

- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.3.1.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.3.1.4.1.1 Replace Vinku (N7501)

4.3.1.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter also to check that L7514 is conducting DC.

4.3.1.5 Replace SMPS N7504

4.3.2 Does WCDMA PA (N7503) get correct bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- WCDMA transmitter has to be active before Vinku’s RB_EXT voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7521.
- RB_EXT voltage should be 1.325 – 1.375 V.

4.3.2.1.1 VREFRF01-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7503.
- VREFRF01 voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.3.2.1.1.1 Desolder R7503. Is VREFRF01 voltage still wrong?

- Remember to solder a new component to R7503 pads after measurement.

4.3.2.1.1.1.1 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.3.2.1.1.1.1.1 Replace Vinku (N7501) or Hinku (N7500) or both

4.3.2.1.1.1.2 Retu ok?

4.3.2.1.2 R7521 and R7504 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check R7521 and R7504 resistance values with an ohmmeter.

4.3.2.1.3 VB_EXT voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7518.
- VB_EXT voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.3.2.1.3.1 R7503 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7503 resistance value with an ohmmeter

4.3.2.1.3.2 Capacitors C7518, C7520 and C7570 working correctly?

- Check that components are in place and solder joints are ok

Appendix A: RF Troubleshooting

- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.3.2.1.3.3 Replace Vinku (N7501) or Hinku (N7500) or both

4.3.2.1.4 Replace Vinku (N7501)

4.3.2.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 missing – C7579 short-circuited?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor. If this does not help go to the next step.

4.3.2.3 Replace Vinku (N7501) or WCDMA PA (N7503)

4.3.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 “[ST_CDSP_TX_IQ_TEST](#)” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.3.4 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.3.4.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider

span setting. The output level of the VCO should be about -25 dBm.

4.3.4.1.1 Replace TX VCO G7502

4.3.4.2 Replace balun T7503

4.3.5 Replace Vinku (N7501) or WCDMA PA (N7503) or both

5. DOES THE PHONE HAVE A RELIABLE CONNECTION TO THE NETWORK (GSM)?

This section refers to a situation when the phone registers to the GSM-network and is capable to make a call, but the call is not reliable even if the GSM-network field strength is strong. The phone call is maybe disconnected or interrupted.

5.1 GSM receiver Bit Error Rate (BER) ok?

- This test needs a GSM communication tester and if there is no that kind of tester available continue troubleshooting in section 3.2 [“Does the phone give realistic RSSI-values?”](#).
- Attach the phone to the product specific test jig and a GSM communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a GSM call against the tester
- Settings to the tester have to be done according to the 3GPP specifications:
 - Set base station downlink power to -102 dBm
- Bit Error Rate should be less than 2 %

5.1.1 Does the phone give realistic RSSI-values?

- See section [3.2. “Does the phone give realistic RSSI-values?”](#)

5.1.2 Hinku (N7500) or RAP3G (D2800) faulty?

- RAP3G is not possible to replace

5.2 GSM transmitter power levels and transmit frequency ok?

- See section [3.1. “GSM transmitter power levels and transmit frequency ok?”](#)

5.3 GSM Transmitter phase error ok?

- See section [3.3. “GSM Transmitter phase error ok?”](#)

5.4 GSM (GMSK) modulation spectrum ok?

- See section [3.4. “GSM \(GMSK\) modulation spectrum ok?”](#)

5.5 TX power vs. time ok?

- See section [3.5. “TX power vs. time ok?”](#)

6. DOES THE PHONE HAVE A RELIABLE CONNECTION TO THE NETWORK (WCDMA)?

This section means situation when the phone registers to the WCDMA-network and is capable to make a call, but the call is not reliable even if WCDMA-network field strength is strong. The phone call is maybe disconnected or interrupted.

6.1 WCDMA receiver Bit Error Rate (BER) ok?

- This test needs a WCDMA communication tester and if there is no that kind of tester available continue troubleshooting in section 4.2 [“Does the phone give realistic RSSI-values?”](#).
- Attach the phone to the product specific test jig and a GSM communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a GSM call against the tester
- Settings to the tester have to be done according to the 3GPP specifications:
 - Set base station output level (for) to -106.7 dBm / 3.84 MHz
 - Set DPCH_Ec level to -117 dBm / 3.84 MHz
- Bit Error Rate should be less than 0.1 %

6.1.1 Does the phone give realistic RSSI-values?

- See section 4.2 [“Does the phone give realistic RSSI-values?”](#)

6.1.2 Hinku (N7500) or RAP3G (D2800) faulty?

- RAP3G is not possible to replace

6.2 WCDMA TX power and transmit frequency ok?

- See section [4.1. “WCDMA TX power and transmit frequency ok?”](#)

6.3 WCDMA Transmitter error vector magnitude ok?

- This test needs a WCDMA communication tester and if there is no that kind of tester available continue troubleshooting in section 4.3 [“WCDMA modulation spectrum and ACLR ok?”](#)
- Attach the phone to the product specific test jig and the WCDMA communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a WCDMA call against the tester
- The Error Vector Magnitude shall not exceed 17.5 % with power levels ≥ -20 dBm.
- If Error Vector Magnitude is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth. Make sure that all connections are made to the correct RF-connector*).

Appendix A: RF Troubleshooting

6.3.1 Is capacitor C7579 in WCDMA PA (N7503) bias line in place?

- Check that the component is in place and solder joints are ok

6.3.2 Are capacitors in Vinku REG1 and REG2 lines in place?

C7554, C7555 and C7547

- Check that components are in place and solder joints are ok

6.3.3 Are capacitors in WCDMA PA power supply lines in place?

C7569 and C7583

- Check that components are in place and solder joints are ok

6.3.4 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in section 2.3. “[ST_CDSP_TX_IQ_TEST](#)” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

6.3.5 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

6.3.5.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span \leq 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

6.3.5.1.1 Replace TX VCO G7502

6.3.5.2 Replace balun T7503

6.3.6 VCTCX0 frequency and output level correct?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7529 (or C7582)
- The frequency of the VCTCX0 should be quite exactly 38.4 MHz and level about 0.5 - 0.9 Vpp. Example of the correct VCTCX0 output signal is presented in figure [6.5.1 "VCTCX0 Output \(DC Offset 1.24 V\)"](#).

6.3.6.1 VX0-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C7560 (or C7526, C7513) **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- VX0-voltage should be about 2.5 V

6.3.6.1.1 C7560, C7513, C7526 and C2214 ok?

- Check that components are in place and solder joints are ok
- **Notice:** C7526 is a non-assembled component so the probe should be connected to the pad that can still be found from the PWB.
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VX0-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214. If replacing does not help then go to the next steps.

6.3.6.1.2 Replace Retu

6.3.6.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCX0 (G7501) or all three components

6.3.6.2 BB AFC-voltage ok?

- See section ["BB AFC-voltage ok?"](#)

6.3.6.3 Replace VCTCX0 G7501

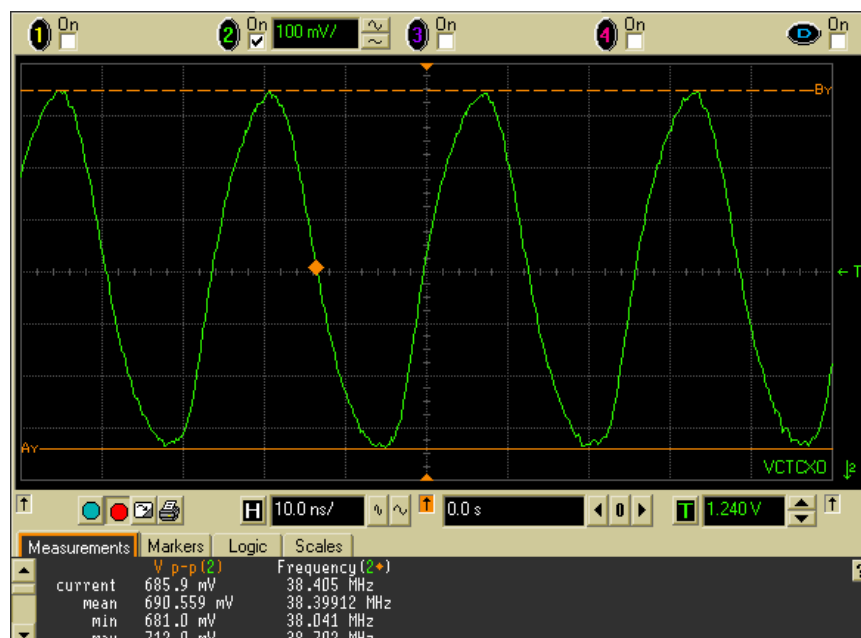
6.4 WCDMA modulation spectrum and ACLR ok?

- See section 4.3 ["WCDMA modulation spectrum and ACLR ok?"](#)

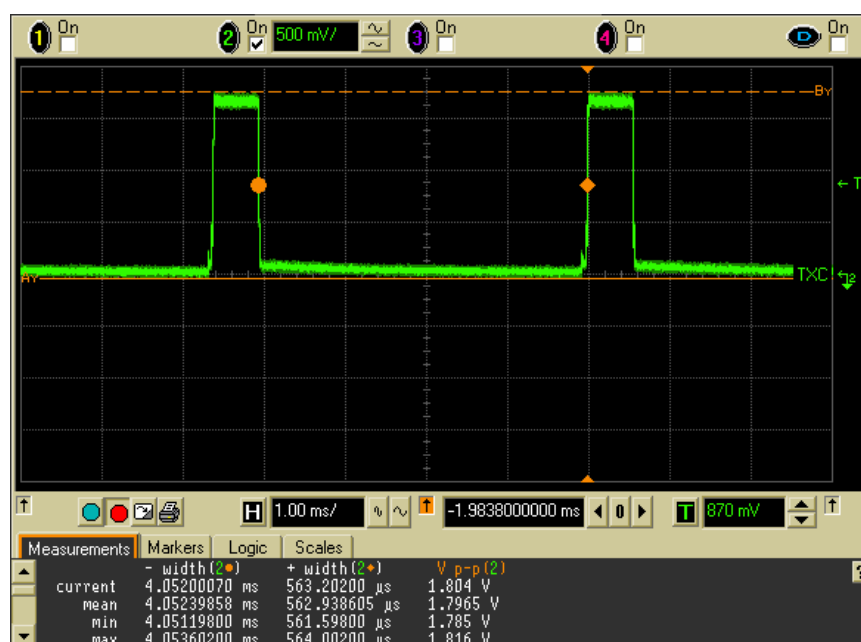
Appendix A: RF Troubleshooting

6.5 Troubleshooting pictures

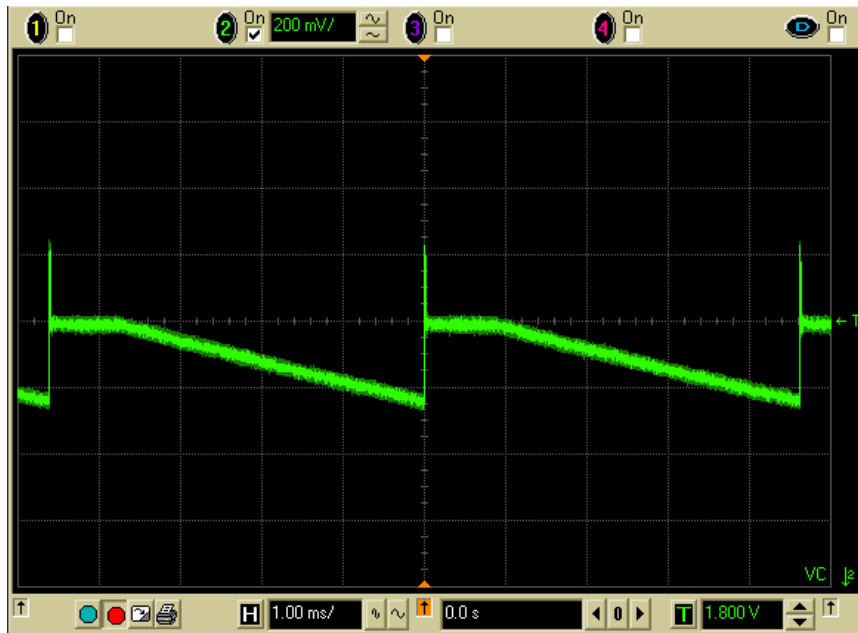
6.5.1 VCTCX0 Output (DC Offset 1.24 V)



6.5.2 TXC in GSM mode (DC Offset 0 V)

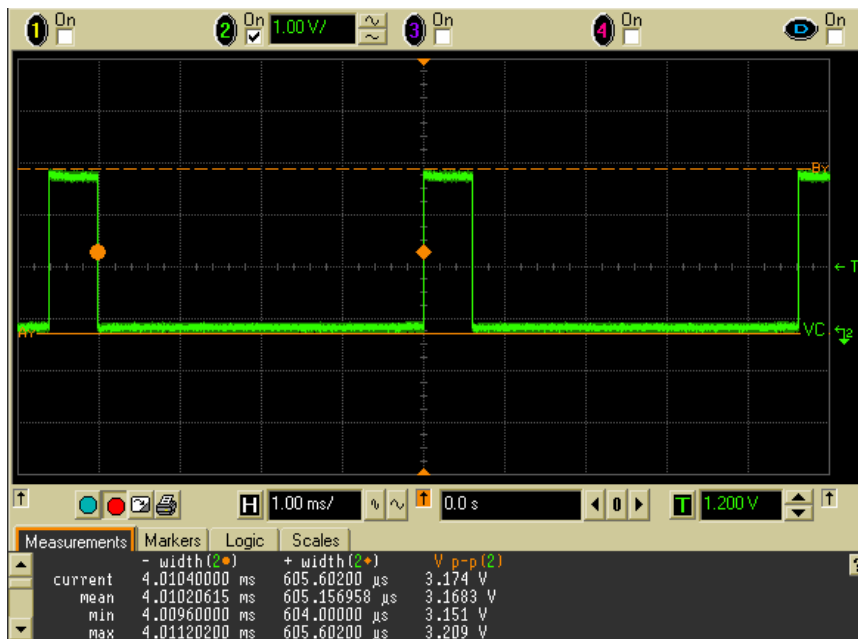


6.5.3 TX VC in GSM mode (DC Offset 1.8 V)



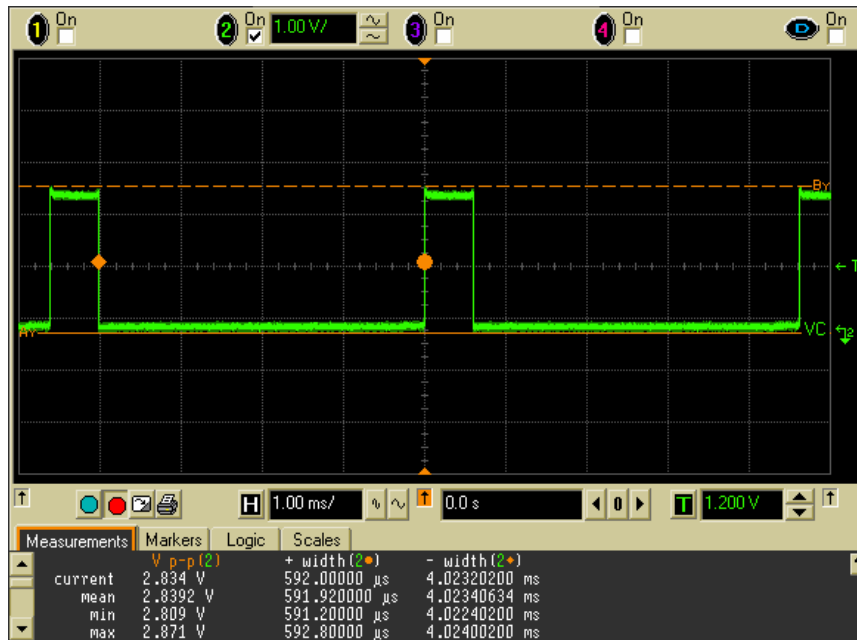
DC value changes if channel or band is changed. Upper figure has been taken in EGSM900 band and on channel 37.

6.5.4 Icont_21/Icont_22 (DC Offset 1.2 V)

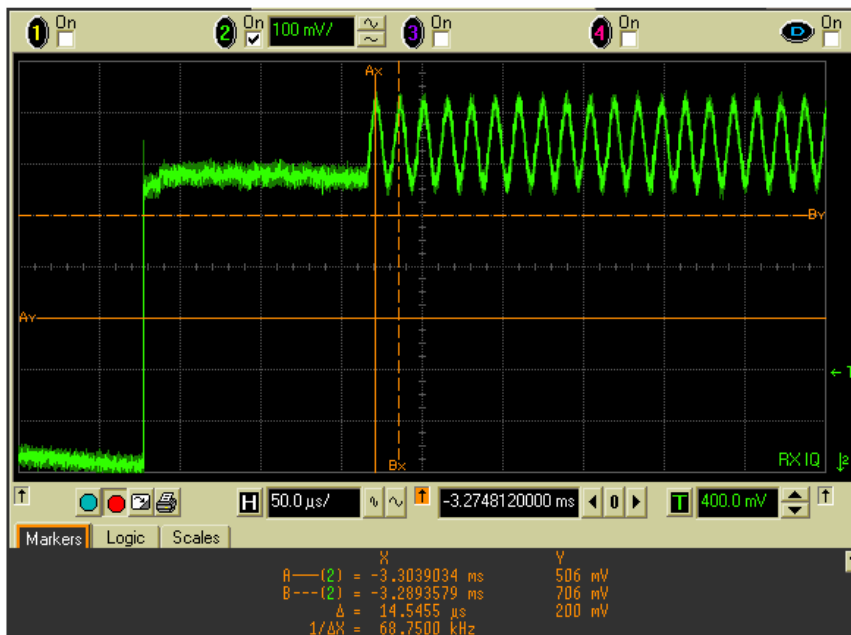
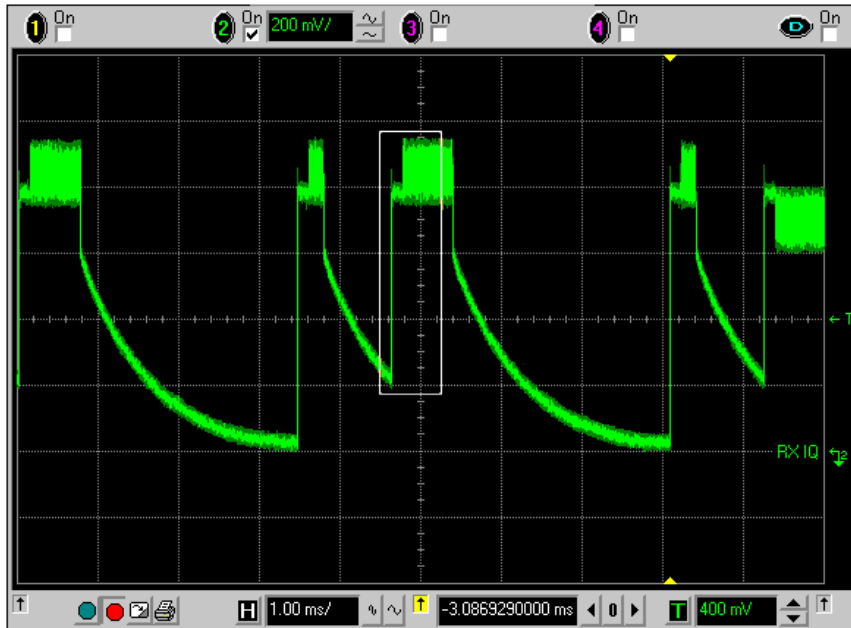


Appendix A: RF Troubleshooting

6.5.5 Icont_31/Icont_32 (DC Offset 1.2 V)



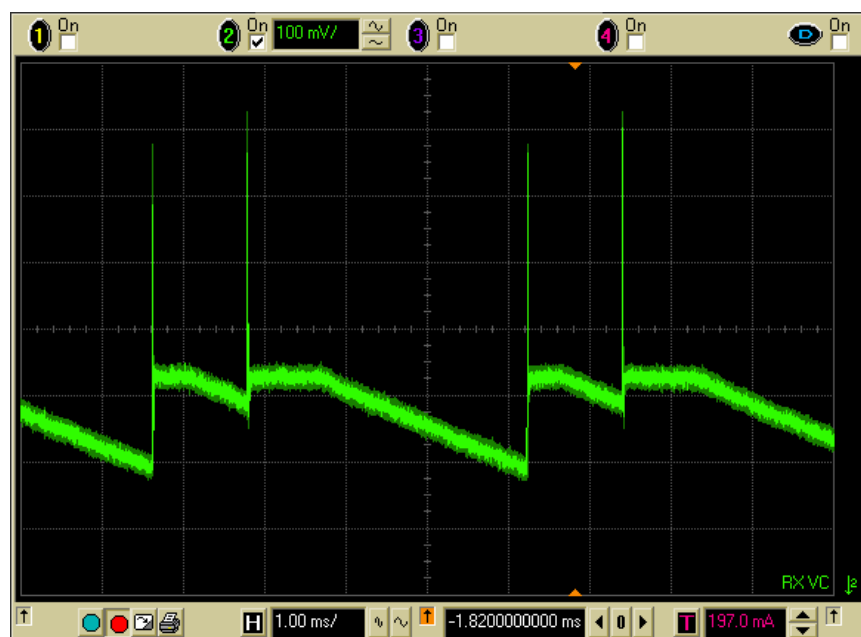
6.5.6 GSM RX IQ (DC Offset 0.4 V)



The lower figure is a detail from the upper figure (detail area marked with a white box).

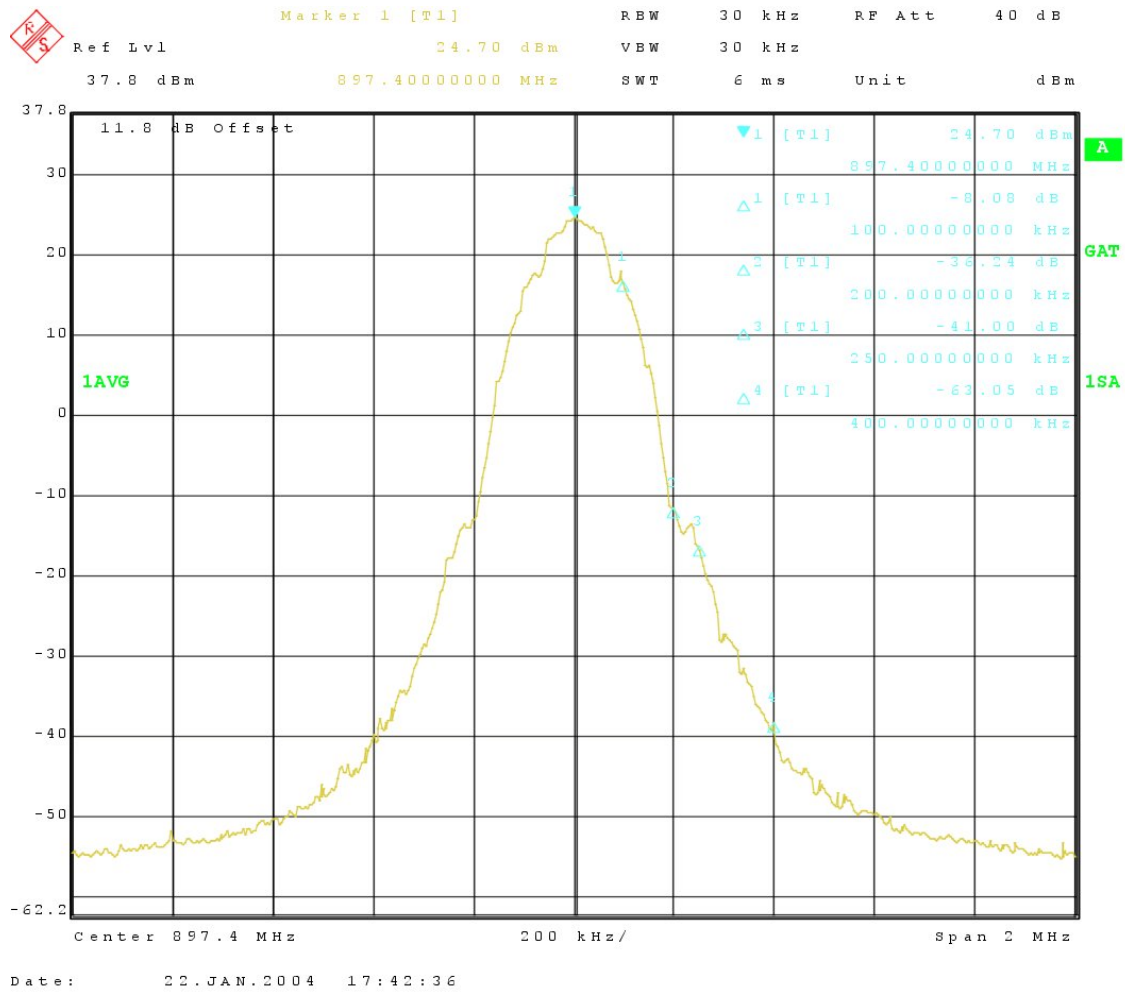
Appendix A: RF Troubleshooting

6.5.7 RX VC in GSM mode (DC Offset 1.5 V)



DC value changes if channel or band is changed. Upper figure has been taken in EGSM900 band and on channel 37.

6.5.8 TX Modulation spectrum (GSM)

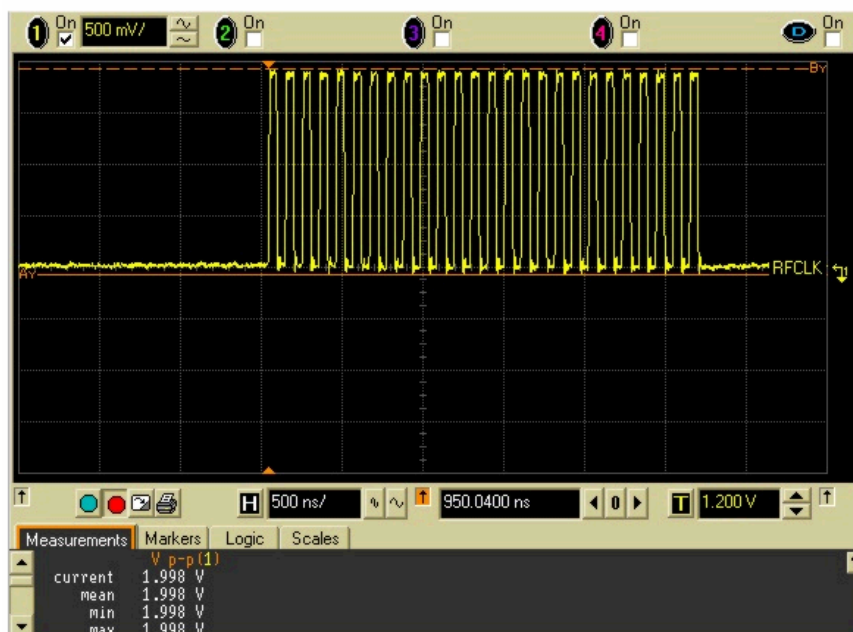
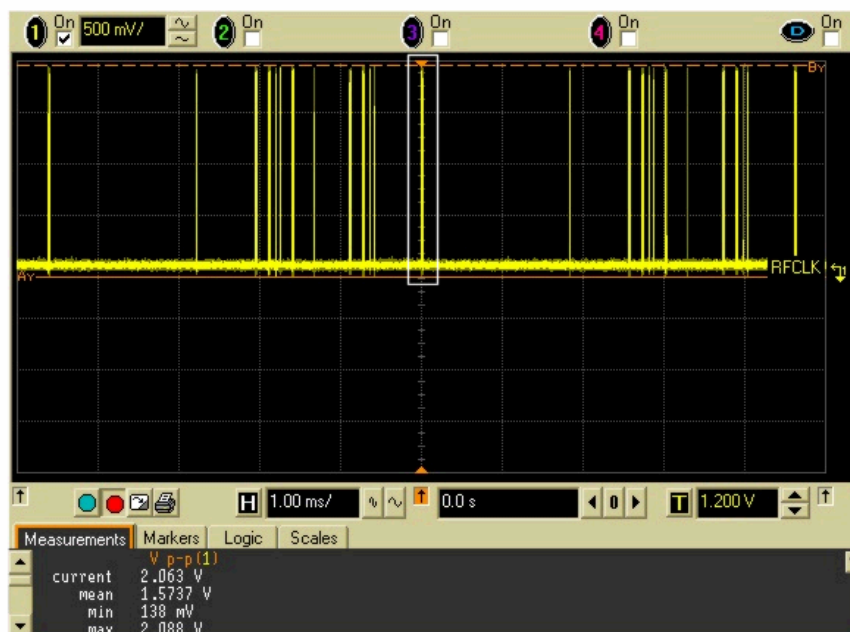


Example of the TX modulation spectrum (GMSK) in EGSM900 band.

Appendix A: RF Troubleshooting

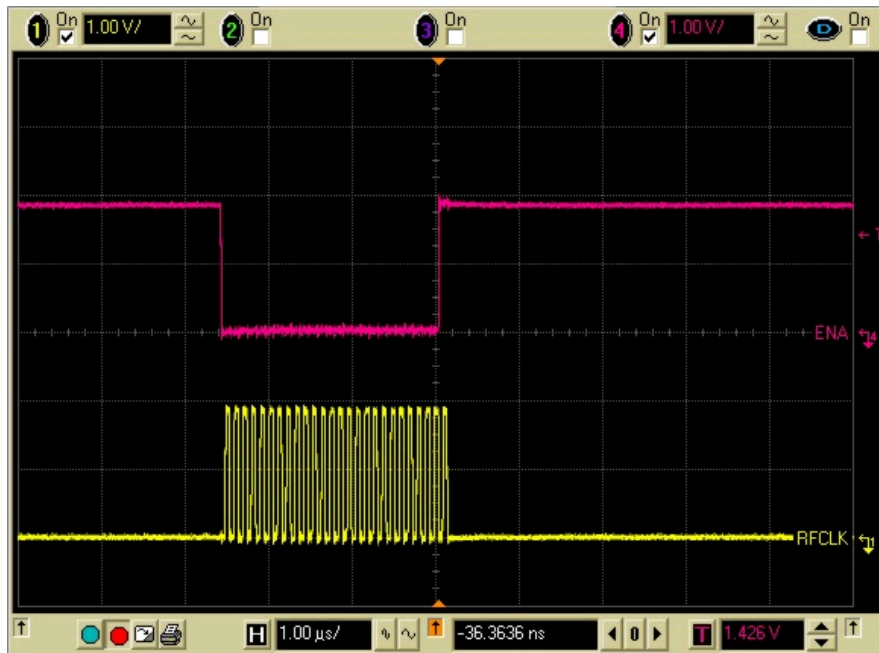
6.5.9 RFBUS

6.5.9.1 RFBUSCLK (GSM RX)



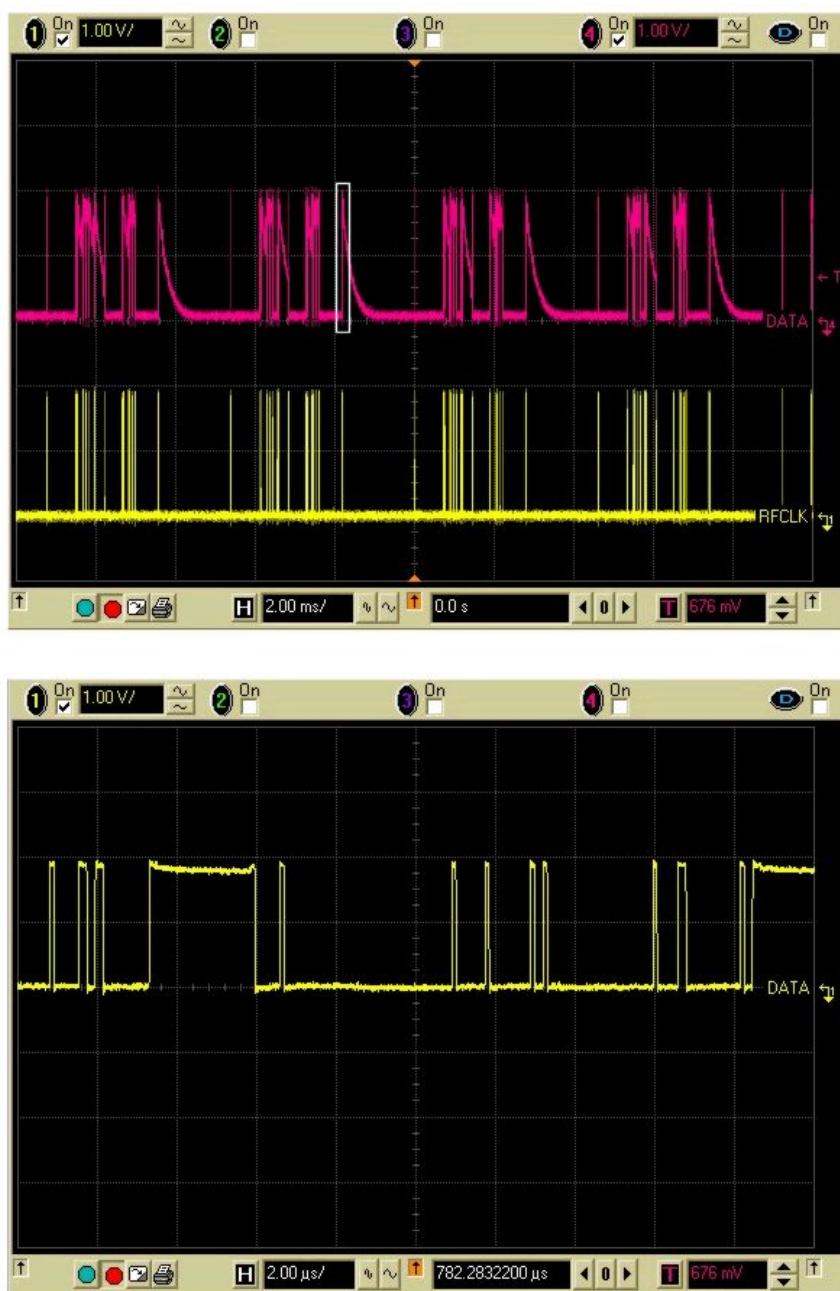
The lower figure is a detail from the upper figure (detail area marked with a white box).

6.5.9.2 RFBUSCLK and RFBUSENA (GSM RX)



Appendix A: RF Troubleshooting

6.5.9.3 RFBUSDAT (GSM RX)



The lower figure is a detail from the upper figure (detail area marked with a white box).

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