Nokia Customer Care

SERVICE MANUAL

[NMP Part No. 9230246]

RH-53/54

NOKIA 2650
Mobile Terminal

COMPANY CONFIDENTIAL

ISSUE 2 06/2005

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
	09/2004	TSa	Issue 1
2	06/2005	J Bryman	Issue 2 **Changes made:** Product codes removed **Parts:** Added updated lists; “Mechanical parts” and “Component parts” **Service software:** Redundant information removed **Troubleshooting:** Updated “Phone is dead” and “Phone does not stay on or is jammed” **Schematics:** Updated with new build

IMPORTANT

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

Warnings and Cautions

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

Warnings:

1. 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.

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

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

Cautions:

1. Servicing and alignment must be undertaken by qualified personnel only.
2. Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
3. Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
4. Use only approved components as specified in the parts list.
5. Ensure all components, modules screws and insulators are correctly re-fitted after servicing and alignment. Ensure all cables and wires are repositioned correctly.

For your safety

QUALIFIED SERVICE
Only qualified personnel may install or repair phone equipment.

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

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

ESD protection

Nokia requires that *product* service points have sufficient ESD protection (against static electricity) when servicing *products*.

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

To replace the covers ESD protection must be applied.

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

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

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

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

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

Battery information

Note that 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 life-time. 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 house-hold waste.

Care and maintenance

The product is a product 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.

Please state:

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

Please send to:

NOKIA CORPORATION
Nokia Mobile Phones Business Group
Nokia Customer Care

PO Box 86

FIN-24101 SALO

Finland

Email: Service.Manuals@nokia.com

Nokia Customer Care

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RH-53/54, Nokia 2650

Introduction to Issue 2

This is the updated issue of the RH-53/54 service manual. The sections of the manual that have been changed are presented in the Amendment record sheet. However, some changes worth mentioning are:

Flash memory

There have been some errors related to the flash memory (D450). When the phone is dead or jammed, the flash memory is oftentimes the problem. For more information, please refer to the baseband troubleshooting sections "Phone is dead" or "Phone does not stay on or is jammed".

Tuning and calibrating with Phoenix

Some redundant information has been removed from the Manual tuning sections.

Note: always perform auto tuning when possible!

Hardware changes

The following hardware changes of ASICs have been made. The changes will neither have an effect on functionality nor the values presented in this manual.

- UPP_8M is used in version 4.3 instead of 2.6/2.10
- UEMC is used instead of UEMK

Schematics

This Issue contains schemas showing both boards with original build and updated build. Board specific information is marked clearly. These are the board versions:

- 1eja_09a (original)
- 1ejm_02a (updated)

Parts

Updated parts lists have been added and product codes have been removed.

Note: For the latest parts lists and for product codes, always refer to the Service bulletins.

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RH-53/54

2-General Information

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General Information about RH-53/54

RH-53/54 is based on a common phone platform with a colour display. The RH-53 900/ 1800MHz (EU, APAC) and RH/54 850/1900MHz (US) operate on dual-band GSM or EGSM networks.

RH-53/54 basic products and modules are listed below.

Name	Type code	Parts list
Basic handportable	RH-53	
System module		BOM-1
System module		BOM-2
Basic handportable	RH-54	
System module		BOM-1

Figure 1:RH-53/54

Basic transceiver RH-53/54 (Nokia 2650/2651)

Nokia 2650 Eur/Afr/APAC

Technical type RH-53 for Europe/Africa and APAC/LTA

Name	Type code	Parts list
Basic handportable	RH-53	
Engine module		BOM-1
Engine module		BOM-2
Mechanics assembly parts	RH-53	

Swap phones

Area/Country
SWAP ENGINE FRANCE RED
SWAP ENGINE FRANCE SILVER
SWAP ENGINE FRANCE BROWN
SWAP ENGINE S-AFRICA RED
SWAP ENGINE S-AFRICA BROWN
SWAP ENGINE S-AFRICA SILVER
SWAP ENGINE UKRAINE SILVER
SWAP ENGINE UKRAINE BROWN
SWAP ENGINE TURKEY SILVER
SWAP ENGINE TURKEY RED
SWAP ENGINE TURKEY BROWN
SWAP ENGINE UKRAINE RED
SWAP ENGINE RUSSIA SILVER
SWAP ENGINE RUSSIA RED
SWAP ENGINE RUSSIA BROWN
SWAP ENGINE E&A SILVER
SWAP ENGINE E&A RED
SWAP ENGINE E&A BROWN
SWAP ENGINE ISRAEL SILVER
SWAP ENGINE ISRAEL BROWN

Area/Country
SWAP ENGINE GREECE SILVER
SWAP ENGINE ISRAEL RED
SWAP ENGINE GREECE RED
SWAP ENGINE GREECE BROWN
SWAP ENGINE GULF SILVER
SWAP ENGINE GULF RED
SWAP ENGINE GULF BROWN

Nokia 2651 USA

Technical type RH-54 for the North America

Name	Type code	Parts list
Basic handportable	RH-54	
Engine module		BOM-1
Mechanical assembly	RH-54	

Accessories List

Batteries	Type
Battery 760mAH Li-Ion	BL-4C
Chargers	**Type**
Travel Charger	AC-1E
Travel Charger	AC-1X
Travel Charger	AC-1U
Travel Charger	AC-1R
Travel Charger	AC-1A
Travel Charger	AC-1AR
AC Travel Charger	ACP-7E
AC Travel Charger	ACP-7U
AC Travel Charger	ACP-7C
AC Travel Charger	ACP-7X
AC Travel Charger	ACP-7H
AC Travel Charger	ACP-7A
Performance Travel Charger (EUR)	ACP-8E
Performance Travel Charger (Korea)	ACP-8K
Performance Travel Charger (UK)	ACP-8X
Performance Travel Charger (US)	ACP-8U
Performance Travel Charger (China)	ACP-8C
Performance Travel Charger (Australia)	ACP-8A
Travel Charger	ACP-12E
Travel Charger	ACP-12X
Travel Charger	ACP-12U
Travel Charger	ACP-12UB
Travel Charger	ACP-12G
Chargers	**Type**
Travel Charger	ACP-12C
Travel Charger	ACP-12A

Travel Charger	ACP-12AR
Retractable Travel Charger	AC-1
Audio	**Type**
Boom headset	HDB-5
Headset	HDC-5
Mobile Inductive Loopset	LPS-3
Headset	HDE-2
Dual Mono Headset	HS-7
HDA-9 TTY Adapter(for 2651 only)	HDA-9
Car accessories:	Type
Plug-in HF Car Kit	PPH-1
Microphone	HFM-8
Mobile Charger	LCH-9
Mobile charger	LCH-12
Personal accessories:	Type
Carrying cases	

Technical Specifications

General specifications of transceiver

Unit	Dimensions (mm) (L x W x T)	Weight (g)	Volume (cm^3)
Transceiver with BL-4C 760mAh Li-Ion battery pack	86mm x 43,8mm (ends) and 46mm (middle) x 22.9mm (when closed)	96,5	77

Parameter	Value
Cellular System	RH-53: GSM900, EGSM900, GSM1800 RH-54: GSM850, GSM1900
RX Frequency Band	RH-53: EGSM: 925 - 935 MHz GSM900: 935 - 960 MHz GSM1800: 1805 - 1880 MHz RH:54: GSM850: 869 - 894 MHz GSM1900: 1930 - 1990 MHz
TX Frequency Band	RH-53: EGSM: 880 - 890 MHz GSM900: 890 - 915 MHz GSM1800: 1710 - 1785 MHz RH-54: GSM850: 824 - 849 MHz GSM1900: 1850 - 1910 MHz

Transmitter output power

Frequency band	Value
RH-53:	
GSM900, EGSM900	32.5dBm
GSM1800	28.5dBm
RH-54:	
GSM850	32.5dBm
GSM1900	28.5dBm

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-10 ^{o}C ... +55 ^{o}C	Specifications fulfilled
Reduced performance	+55 ^{o}C ... +65 ^{o}C	Operational only for short periods
Intermittent operation	-20 ^{o}C ... -10 ^{o}C and +65 ^{o}C ... +85 ^{o}C	Operation not guaranteed but an attempt to operate will not damage the phone
No operation	-40 ^{o}C ... -20 ^{o}C	Operation not possible but an attempt to operate will not damage the phone
No operation or storage	< -40 ^{o}C and > +85 ^{o}C	No storage; an operation attempt may cause permanent damage
Charging allowed	-25 ^{o}C ... +60 ^{o}C	
Long term storage conditions	0 ^{o}C ... +40 ^{o}C	

Transceiver features

Hardware characteristics

- FR, EFR, HR, AMR·
- 128x128 pixel high resolution color display·
- Jack 4.4 UI·
- 4-way scroll & 2 softkeys·
- Silicone keymat with white pearl paint·
- Fold phone with internal antenna·
- Charger plug & headset connector·
- Built-in vibrator

POWER MANAGEMENT BL-4C:

- Capacity (mAh) 760
- Talk time180 min
- Stand-by300 hr

3-Parts Lists and Component Layouts

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RH-53/54 Exploded Diagram

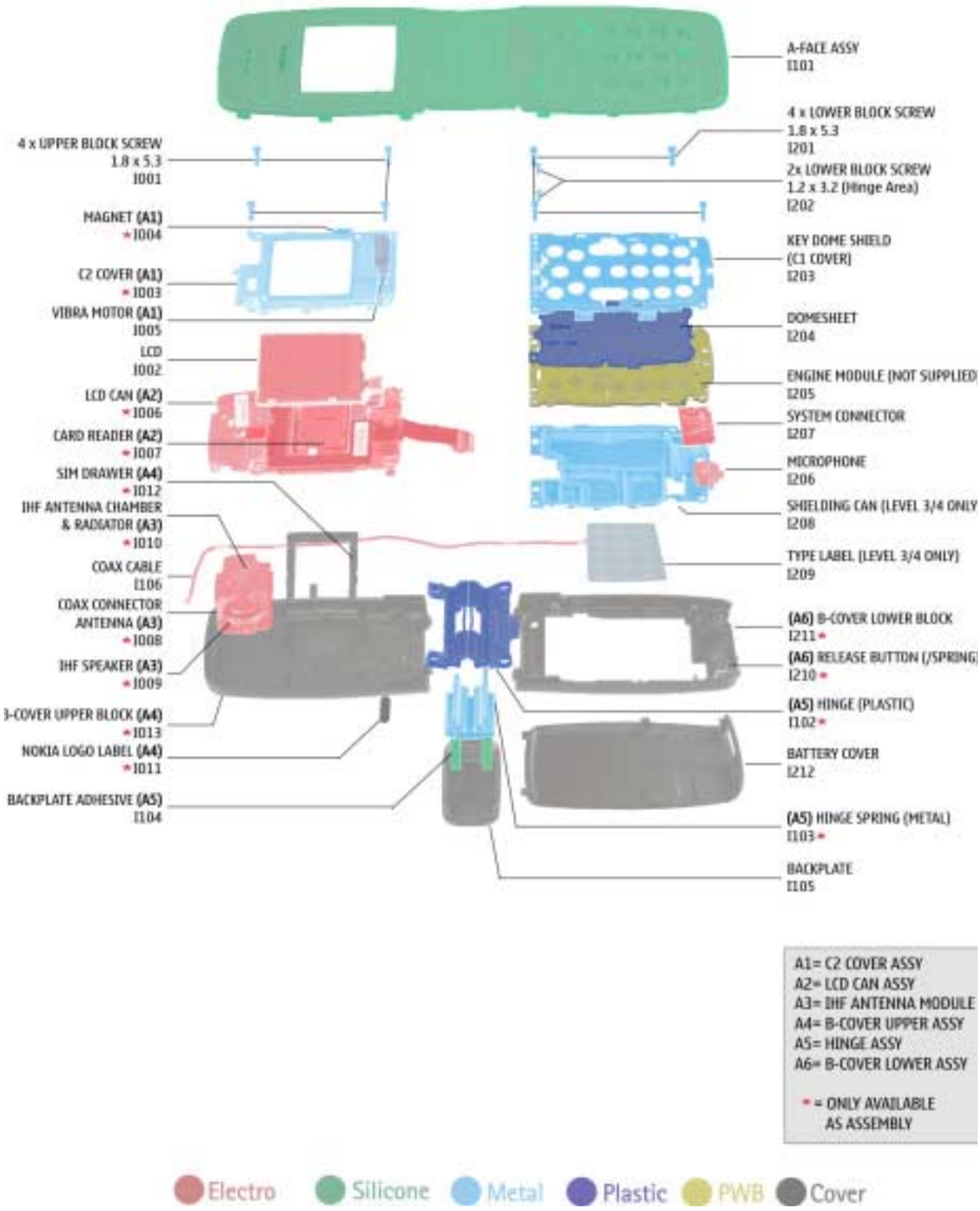


Figure 1: Exploded view of RH-53/54

Figure 2:Assembly picture

Mechanical Parts List , updated edition

Note: For the latest parts lists and for product codes, always refer to the Service bulletins.

Item	Mechanical and electro mechanical parts	EMEA	APAC	CHINA	LTA	NAM
I001	PT-SCREW 1.8X5.3 REMFORM T6+ YEL	●	●	●	●	●
I002	LCD 130X130 CSTN 4K PHILIPS (CITI	●	●	●	●	●
I002	LCD LPH8779-1/**80-1 130X130 CSTN 4K COL	●	●	●	●	●
I002	LCD MOD 130X130 4KCO CSTN SAMSUNG S9.0	●	●	●	●	●
I002	Seiko Epson LCD MOD L1F10257T00 CSTN 130x130	●	●	●	●	●
I003	C2 cover assy	●	●	●	●	●
I005	VIBRA 1.3V 80MA	●	●	●	●	●
I006	LCD-CAN-ASSY	●	●	●	●	●
I010	ANTENNA ASSY HDC15 (N2650 only)	●	●	●	●	
I010	ANTENNA ASSY HDC15 (N2651 only)				●	●
I013	B2-COVER ASSY DMC07892 BROWN	●				
I013	Pattern B2-cover ASSY Silver		●	●	●	●
I013	Pattern B2-cover ASSY BROWN		●	●	●	●
I013	Pattern B2-cover ASSY red		●	●	●	●
I013	B2-COVER ASSY DMC07892 RED HDC15	●				
I013	B2-COVER ASSY DMC07892 SILVER HDC15	●	●	●	●	●
I101	A-FACE ASSY LATIN DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY CYRILLIC DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY HEBREW DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY GREEK DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY ARABIC DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY FARSI DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY URDU DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY THAI DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY HINDI DMC08142 HDC15	●	●	●	●	●

Item	Mechanical and electro mechanical parts	EMEA	APAC	CHINA	LTA	NAM
I101	A-FACE ASSY STROKE DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY BOPOMOFO DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY VIETNAMESE DMC08142 HDC15	●	●	●	●	●
I101	A-FACE ASSY Latin	●	●	●	●	●
I103	HINGE ASSY	●	●	●	●	●
I104	BACKPLATE ADHESIVE HDC15 (100 pcs)	●	●	●	●	●
I104	BACKPLATE ADHESIVE HDC15 (8K pcs)	●	●	●	●	●
I105	BACKPLATE PAINT BROWN HDC15	●	●	●	●	●
I105	BACKPLATE PAINT RED HDC15 (N2650 only)	●	●	●	●	
I105	BACKPLATE PAINT SILVER	●	●	●	●	●
I106	COAX CABLE QF-331-U.FL-R-SMT 50OHM	●	●	●	●	●
I201	PT-SCREW 1.8X5.3 REMFORM T6+ YEL	●	●	●	●	●
I202	SCREW TORX 5 IP+ 1,2 X 3,2	●	●	●	●	●
I203	C1-COVER DMD12422 HDC15	●	●	●	●	●
I206	MICROPHONE ASSY DMC07963 HDC15	●	●	●	●	●
I207	SYST.CONN 2DC+JACK 12VDC 3A	●	●	●	●	●
I208	SHIELDING CAN DMC07941 HDC15	●	●	●	●	●
I209	TYPE LABEL	●	●	●	●	●
I211	B1-COVER ASSY DMC07891 SILVER HDC15	●	●	●	●	●
I211	B1-COVER ASSY DMC07891 RED HDC15	●	●	●	●	●
I211	B1-COVER ASSY DMC07891 BROWN	●	●	●	●	●
I211	B1-COVER ASSY DMC07891 RED HDC15	●	●	●	●	●
I211	B1-COVER ASSY DMC07891 SILVER HDC15	●	●	●	●	●
I212	BATTERY COVER PAINT BROWN HDC15	●	●	●	●	●
I212	BATTERY COVER PAINT RED HDC15 (N2650 only)	●	●	●	●	●
I212	BATTERY COVER PAINT Silver HDC15	●	●	●	●	●
I214	DOMESHEET	●	●	●	●	●

Swap units

Note: For the latest parts lists and for product codes, always refer to the Service bulletins

Swap Units	EMEA
RH-53 N2650 SWAP ENGINE E&A BROWN	●
RH-53 N2650 SWAP ENGINE E&A RED	●
RH-53 N2650 SWAP ENGINE E&A SILVER	●
RH-53 N2650 SWAP ENGINE RUSSIA BROWN	●
RH-53 N2650 SWAP ENGINE RUSSIA RED	●
RH-53 N2650 SWAP ENGINE RUSSIA SILVER	●
RH-53 N2650 SWAP ENGINE TURKEY BROWN	●
RH-53 N2650 SWAP ENGINE TURKEY RED	●
RH-53 N2650 SWAP ENGINE TURKEY SILVER	●
RH-53 N2650 SWAP ENGINE UKRAINE BROWN	●
RH-53 N2650 SWAP ENGINE UKRAINE RED	●
RH-53 N2650 SWAP ENGINE UKRAINE SILVER	●
RH-53 N2650 SWAP ENGINE S-AFRICA BROWN	●
RH-53 N2650 SWAP ENGINE S-AFRICA RED	●
RH-53 N2650 SWAP ENGINE S-AFRICA SILVER	●
RH-53 N2650 SWAP ENGINE FRANCE BROWN	●
RH-53 N2650 SWAP ENGINE FRANCE RED	●
RH-53 N2650 SWAP ENGINE FRANCE SILVER	●
RH-53 N2650 SWAP ENGINE GULF BROWN	●
RH-53 N2650 SWAP ENGINE GULF RED	●
RH-53 N2650 SWAP ENGINE GULF SILVER	●
RH-53 N2650 SWAP ENGINE GREECE BROWN	●
RH-53 N2650 SWAP ENGINE GREECE RED	●
RH-53 N2650 SWAP ENGINE GREECE SILVER	●
RH-53 N2650 SWAP ENGINE ISRAEL BROWN	●
RH-53 N2650 SWAP ENGINE ISRAEL SILVER	●
RH-53 N2650 SWAP ENGINE ISRAEL RED	●

Component Parts Lists

Component parts list for RH-53, original edition

Note: For the latest parts lists and for product codes, always refer to the Service bulletins

Item	Side	X/Y	Description	Value
B200	T	J5	CRYSTAL 32.768KHZ+-30PPM 9PF	32.768kHz
B600	T	D6	CRYSTAL 26.OMHZ+-10PPM 15.5PF	26MHz
C100	T	L5	CHIPCAP X7R 6N8 K 25V 0402	6n8
C101	B	M6	CHIPCAP X7R 10N K 16V 0402	10n
C102	B	M6	CHIPCAP X7R 10N K 16V 0402	10n
C103	T	M7	CHIPTCAP 100u 6V3 70mOhm 3.5x2.8x	100u_6V3
C105	B	M2	CHIPCAP X7R 10N K 16V 0402	10n
C106	B	M2	CHIPCAP X7R 10N K 16V 0402	10n
C123	B	M4	CHIPCAP X7R 10N K 16V 0402	10n
C124	B	M4	CHIPCAP X7R 10N K 16V 0402	10n
C151	T	J4	CHIPCAP X7R 33N K 10V 0402	33n
C152	T	J3	CHIPCAP X7R 33N K 10V 0402	33n
C153	T	K3	CHIPCAP X7R 1N0 K 50V 0402	1n0
C154	T	K4	CHIPCAP X7R 1N0 K 50V 0402	1n0
C157	T	J2	CHIPCAP X5R 1U K 6V3 0603	1u0
C158	T	K3	CHIPCAP X5R 100N K 10V 0402	100n
C159	T	G5	CHIPCAP X5R 100N K 10V 0402	100n
C168	T	K4	CHIPCAP X5R 4U7 K 6V3 0805	4u7
C170	T	K3	CHIPCAP X7R 1N0 K 50V 0402	1n0
C171	T	K2	CHIPCAP X5R 4U7 K 6V3 0805	4u7
C172	T	K3	CHIPCAP X7R 1N0 K 50V 0402	1n0
C173	T	J3	CHIPCAP X7R 33N K 10V 0402	33n
C174	T	J3	CHIPCAP X7R 33N K 10V 0402	33n
C180	T	G5	CHIPCAP X5R 100N K 10V 0402	100n
C181	T	F4	CHIPCAP X5R 470N K 10V 0603	470n
C182	T	E5	CHIPCAP X5R 1U K 6V3 0603	1u0
C183	T	F5	CHIPCAP X7R 330P J 50V 0402	330p

Item	Side	X/Y	Description	Value
C184	T	D5	CHIPCAP NP0 56P J 50V 0402	56p
C185	T	D5	CHIPCAP NP0 56P J 50V 0402	56p
C186	T	F5	CHIPCAP X7R 330P J 50V 0402	330p
C200	T	H5	CHIPCAP X5R 100N K 10V 0402	100n
C201	T	H4	CHIPCAP X5R 1U K 6V3 0603	1u0
C202	T	H4	CHIPCAP X7R 10N K 16V 0402	10n
C203	T	J2	CHIPCAP X5R 1U K 6V3 0603	1u0
C205	T	I5	CHIPCAP X5R 1U K 6V3 0603	1u0
C206	T	I5	CHIPCAP X5R 1U K 6V3 0603	1u0
C207	T	J2	CHIPCAP X5R 1U K 6V3 0603	1u0
C208	T	F4	CHIPCAP X5R 1U K 6V3 0603	1u0
C209	T	J4	CHIPCAP NP0 10P J 50V 0402	10p
C210	T	J4	CHIPCAP NP0 10P J 50V 0402	10p
C211	T	I5	CHIPCAP X5R 1U K 6V3 0603	1u0
C212	T	I5	CHIPCAP X5R 1U K 6V3 0603	1u0
C213	T	J4	CHIPCAP X5R 1U K 6V3 0603	1u0
C215	T	J3	CHIPCAP X5R 1U K 6V3 0603	1u0
C218	T	H2	CHIPCAP X5R 100N K 10V 0402	100n
C219	T	G4	CHIPCAP X5R 1U K 6V3 0603	1u0
C220	T	K2	CHIPCAP X7R 10N K 16V 0402	10n
C221	T	G4	CHIPCAP X5R 1U K 6V3 0603	1u0
C223	T	F4	CHIPCAP X5R 1U K 6V3 0603	1u0
C224	T	F4	CHIPCAP X5R 1U K 6V3 0603	1u0
C225	T	F4	CHIPCAP X5R 1U K 6V3 0603	1u0
C226	T	F3	CHIPCAP X5R 1U K 6V3 0603	1u0
C227	T	F3	CHIPCAP X5R 1U K 6V3 0603	1u0
C228	T	G3	CHIPCAP X5R 1U K 6V3 0603	1u0
C229	T	G2	CHIPCAP X5R 1U K 6V3 0603	1u0
C230	T	G2	CHIPCAP X5R 1U K 6V3 0603	1u0
C231	T	G3	CHIPCAP X5R 1U K 6V3 0603	1u0
C232	T	G4	CHIPCAP X5R 1U K 6V3 0603	1u0
C234	T	G3	CHIPCAP X5R 1U K 6V3 0603	1u0

Item	Side	X/Y	Description	Value
C235	T	J4	CHIPCAP X5R 1U K 6V3 0603	1u0
C236	T	G2	CHIPCAP X5R 100N K 10V 0402	100n
C237	T	I4	CHIPCAP X5R 100N K 10V 0402	100n
C238	T	H4	CHIPCAP X5R 100N K 10V 0402	100n
C239	T	I2	CHIPCAP X5R 100N K 10V 0402	100n
C240	T	J2	CHIPCAP X7R 10N K 16V 0402	10n
C243	T	J3	CHIPCAP X5R 1U K 6V3 0603	1u0
C244	T	J2	CHIPCAP X5R 1U K 6V3 0603	1u0
C260	T	G5	CHIPCAP X5R 1U K 6V3 0603	1u0
C261	T	H5	CHIPCAP X5R 1U K 6V3 0603	1u0
C262	T	G4	CHIPCAP X5R 1U K 6V3 0603	1u0
C263	T	I5	CHIPCAP X5R 1U K 6V3 0603	1u0
C264	T	G4	CHIPCAP X5R 1U K 6V3 0603	1u0
C265	T	J2	CHIPCAP X5R 1U K 6V3 0603	1u0
C310	T	B8	CHIPCAP X5R 2U2 K 10V 0805	2u2
C312	T	C8	CHIPCAP X5R 1U K 16V 0603	1u0
C313	B	A5	CHIPCAP NP0 27P J 50V 0402	27p
C314	B	A5	CHIPCAP NP0 27P J 50V 0402	27p
C315	B	A5	CHIPCAP NP0 27P J 50V 0402	27p
C316	B	A5	CHIPCAP NP0 27P J 50V 0402	27p
C317	T	D4	CHIPCAP NP0 27P J 50V 0402	27p
C318	T	D5	CHIPCAP NP0 27P J 50V 0402	27p
C319	T	C2	CHIPCAP NP0 27P J 50V 0402	27p
C400	T	F2	CHIPCAP X7R 10N K 16V 0402	10n
C401	T	F2	CHIPCAP X5R 100N K 10V 0402	100n
C402	T	F4	CHIPCAP X7R 10N K 16V 0402	10n
C403	T	E4	CHIPCAP X7R 10N K 16V 0402	10n
C404	T	F3	CHIPCAP X7R 10N K 16V 0402	10n
C405	T	D4	CHIPCAP X7R 10N K 16V 0402	10n
C420	T	E6	CHIPCAP NP0 47P J 50V 0402	47p
C426	T	D4	CHIPCAP X7R 1N0 K 50V 0402	1n0
C450	T	C2	CHIPCAP X7R 10N K 16V 0402	10n

Item	Side	X/Y	Description	Value
C451	T	D2	CHIPCAP X5R 100N K 10V 0402	100n
C452	T	B2	CHIPCAP X5R 100N K 10V 0402	100n
C454	T	C4	CHIPCAP X7R 100N K 16V 0603	100n
C607	T	G6	CHIPCAP NP0 1P2 C 50V 0402	1p2
C610	T	F6	CHIPCAP X5R 100N K 10V 0402	100n
C614	T	E7	CHIPCAP X5R 100N K 10V 0402	100n
C616	T	D7	CHIPCAP X5R 1U K 6V3 0603	1u0
C617	T	F8	CHIPCAP X5R 100N K 10V 0402	100n
C618	T	F6	CHIPCAP X5R 100N K 10V 0402	100n
C619	T	F6	CHIPCAP NP0 27P J 50V 0402	27p
C620	T	E6	CHIPCAP X5R 3U3 K 6V3 0805	3u3
C621	T	D6	CHIPCAP X5R 100N K 10V 0402	100n
C624	T	D8	CHIPCAP X5R 1U K 6V3 0603	1u0
C625	T	D8	CHIPCAP NP0 10P J 50V 0402	10p
C626	T	F6	CHIPCAP X7R 10N K 16V 0402	10n
C627	T	F9	CHIPCAP NP0 68P J 50V 0402	68p
C628	T	F8	CHIPCAP NP0 68P J 50V 0402	68p
C632	T	G7	CHIPCAP NP0 1P0 B 50V 0402	1p0
C633	T	F8	CHIPCAP NP0 10P J 50V 0402	10p
C634	T	E8	CHIPCAP X5R 100N K 10V 0402	100n
C635	T	F9	CHIPCAP NP0 27P J 50V 0402	27p
C636	T	F8	CHIPCAP X7R 1N0 K 50V 0402	1n0
C637	T	G8	CHIPCAP X5R 100N K 10V 0402	100n
C638	T	G7	CHIPCAP NP0 15P J 50V 0402	15p
C639	T	E8	CHIPCAP NP0 330P G 50V 0603	330p
C640	T	E8	CHIPCAP NP0 3N9 J 25V 0805	3n9
C641	T	D8	CHIPCAP NP0 150P J 50V 0402	150p
C642	T	G6	CHIPCAP NP0 100P J 50V 0402	100p
C643	T	G7	CHIPCAP NP0 1P0 B 50V 0402	1p0
C644	T	F8	CHIPCAP NP0 100P J 50V 0402	100p
C645	T	D7	CHIPCAP X5R 100N K 10V 0402	100n
C646	T	D6	CHIPCAP NP0 27P J 50V 0402	27p

Item	Side	X/Y	Description	Value
C704	T	H7	CHIPCAP X5R 2U2 K 10V 0805	2u2
C707	T	I8	CHIPCAP NP0 10P J 50V 0402	10p
C708	T	H6	CHIPCAP NP0 33P J 50V 0402	33p
C709	T	H8	CHIPCAP NP0 10P J 50V 0402	10p
C711	T	J8	CHIPCAP X5R 2U2 K 10V 0805	2u2
C727	T	H6	CHIPCAP NP0 3P3 C 50V 0402	3p3
C728	T	J7	CHIPCAP NP0 3P3 C 50V 0402	3p3
C729	T	J6	CHIPCAP NP0 1P0 C 50V 0402	1p0
C730	T	J6	CHIPCAP NP0 10P J 50V 0402	10p
D200	T	I3	UEMK W-DOG ENA TO21 TFBGA168	-
D400	T	E3	UPP8M V2.6/2.10 LF F751986 C035 U	-
D450	T	C3	FLASH 4MX16 1.8/1.8V VFBGA40	4Mx16
F100	T	L4	SM FUSE F 1.5A 32V ROHS-FREE 0603	1.5A
G600	T	D8	VCO 3296-3980MHz 2.7V 20mA EGSM	3296-3980MH
L100	T	L4	FERR.BEAD 0R03 42R/100MHZ 3A 0805	42R/100MHz
L260	T	G5	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L261	T	H5	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L262	T	G5	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L263	T	I5	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L264	T	G5	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L265	T	J2	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L300	T	B7	CHOKE 22U M 0.33A 1R5 3.3X3.3X1.3	22uH
L301	T	C8	CHIP COIL 68NH J Q12/100MHZ 0603	68nH
L602	T	G6	CHIP COIL 10N J Q30/800MHZ 0402	10nH
L603	T	G6	CHIP COIL 10N J Q30/800MHZ 0402	10nH
L604	T	G8	CHIP COIL 10N J Q30/800MHZ 0402	10nH
L605	T	G8	CHIP COIL 3N9 +-0N3 Q28/800M 0402	3n9H
L606	T	G8	CHIP COIL 12N J Q31/800MHZ 0402	12nH
L607	T	G8	CHIP COIL 39N J Q24/800MHZ 0402	39nH
L608	T	G8	CHIP COIL 39N J Q24/800MHZ 0402	39nH
L609	T	H8	CHIP COIL 18N J Q29/800MHZ 0402	18nH
L610	T	G7	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H

Item	Side	X/Y	Description	Value
L612	T	G7	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H
L613	T	G7	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H
L614	T	C8	CHIP COIL 3N3 +-0N3 Q28/800M 0402	3n3H
L703	T	J7	FERR.BEAD 0R03 42R/100MHZ 3A 0805	42R/100MHz
N180	T	E5	AF AMP 0.4W LM4890/NCP2890 PBFREE	-
N303	T	B8	DC/DC CONV LM3500 / TK65600 USMD8	-
N306	B	E1	HALL IC SWITCH SH248CSP VCC	-
N600	T	F7	MJOLNER RF ASIC PMB3347 LFBGA80	-
N700	T	I7	FEM GSM900/1800 3.5V	-
R100	T	C6	NTC RES 0W1 47K J B 4050+-3% 0402	47k
R106	T	D5	CHIP VARISTOR VWM14V VC46V 0402	14V/46V
R107	T	D5	CHIPRES 0W06 220K J 0402	220k
R108	T	C5	RES NETWORK 0W03 4X100R J 0804	4x100R
R109	T	D5	CHIPRES JUMPER 0R0 0402	0R
R123	T	K2	CHIPRES 0W06 100K J 0402	100k
R151	T	K3	RES NETWORK 0W06 2X1K0 J 0404	2x1k0
R153	T	K4	RES NETWORK 0W06 2X1K0 J 0404	2x1k
R154	T	K3	CHIPRES 0W06 10K J 0402	10k
R156	T	K3	RES NETWORK 0W06 2X2K2 J 0404	2x2k2
R157	T	K4	RES NETWORK 0W06 2X2K2 J 0404	2x2k2
R159	T	F5	CHIPRES 0W06 4K7 J 0402	4k7
R160	T	F5	CHIPRES 0W06 4K7 J 0402	4k7
R161	T	F5	CHIPRES 0W06 33K J 0402	33k
R162	T	F5	CHIPRES 0W06 33K J 0402	33k
R164	T	J4	CHIPRES 0W06 22K J 0402	22k
R165	T	K4	CHIPRES 0W06 220R J 0402	220R
R166	T	K3	CHIPRES 0W06 220R J 0402	220R
R167	T	J4	RES NETWORK 0W06 2X10R J 0404	2x10R
R168	T	J3	CHIPRES 0W06 22K J 0402	22k
R169	T	J3	RES NETWORK 0W06 2X2K2 J 0404	2x2k2
R171	T	J4	RES NETWORK 0W06 2X2K2 J 0404	2x2k2
R183	T	J4	RES NETWORK 0W06 2X22R J 0404	2x22R

Item	Side	X/Y	Description	Value
R200	T	H5	CHIPRES 0W5 0R22 J 200PPM 1210	0R22
R202	T	K2	RES NETWORK 0W03 4X100K J 0804	4x100k
R205	T	J3	CHIPRES 0W06 470R J 0402	470R
R206	T	J2	CHIPRES 0W06 4K7 J 0402	4k7
R207	T	K2	CHIPRES 0W06 4K7 J 0402	4k7
R306	T	K5	CHIPRES 0W06 27R J 0402	27R
R307	T	I2	CHIPRES 0W06 10K J 0402	10k
R313	T	B8	CHIPRES 0W06 27R J 0402	27R
R316	T	C2	CHIPRES 0W06 10K J 0402	10k
R420	T	E6	CHIPRES 0W06 1K0 J 0402	1k0
R422	T	G2	CHIPRES 0W06 27K J 0402	27k
R426	T	E4	CHIPRES 0W06 1K0 J 0402	1k0
R450	T	C4	CHIPRES 0W06 4K7 J 0402	4k7
R603	T	D7	CHIPRES 0W06 100R J 0402	100R
R605	T	F6	CHIPRES 0W06 22R J 0402	22R
R607	T	F6	CHIPRES 0W06 1K0 J 0402	1k0
R609	T	F6	CHIPRES 0W06 2K7 F 0402	2k7
R610	T	F8	RES NETWORK 0W06 2X5K6 J 0404	2x5k6
R611	T	F8	RES NETWORK 0W06 2X5K6 J 0404	2x5k6
R618	T	E8	CHIPRES 0W06 5K6 F 0402	5k6
R619	T	D8	CHIPRES 0W06 8K2 F 0402	8k2
R620	T	G6	CHIPRES 0W06 12K J 0402	12k
R621	T	E8	CHIPRES 0W06 10K J 0402	10k
R622	T	F8	CHIPRES 0W06 22K J 0402	22k
R623	T	E8	CHIPRES 0W06 6K8 J 0402	6k8
R629	T	F6	CHIPRES 0W06 18K J 0402	18k
R637	T	G6	CHIPRES 0W06 22K J 0402	22k
R638	T	F6	CHIPRES 0W06 150K J 0402	150k
R640	T	D7	RES NETWORK 0W04 2DB ATT 0404	436R/11R6/4
R645	T	G8	CHIPRES 0W06 82R J 0402	82R
R646	T	G7	CHIPRES 0W06 82R J 0402	82R
R647	T	F8	CHIPRES 0W06 120R J 0402	120R

Item	Side	X/Y	Description	Value
R648	T	F8	CHIPRES 0W06 120R J 0402	120R
R655	T	E8	CHIPRES 0W06 330R J 0402	330R
R657	T	G8	CHIPRES 0W06 18R J 0402	18R
R658	T	G8	CHIPRES 0W06 18R J 0402	18R
R705	T	I8	CHIPRES 0W06 8K2 J 0402	8k2
R711	T	J8	RES NETWORK 0W04 2DB ATT 0404	436R/11R6/4
R712	T	I8	CHIPRES 0W06 100R J 0402	100R
R713	T	I8	CHIPRES JUMPER 0R0 0402	0R
R714	T	H8	RES NETWORK 0W04 2DB ATT 0404	436R/11R6/4
R715	T	J7	CHIPRES 0W06 10R J 0402	10R
R716	T	H6	CHIPRES 0W06 10R J 0402	10R
T600	T	G7	TRANSF BALUN 1800+-100MHZ 2X1.25	-
T601	T	D8	TRANSF BALUN 3290-3980MHZ	-
V100	T	L5	TVS DI 1PMT16AT3 16V 175W PWRMITE	-
V300	B	F8	LED CL270S-MB BLUE>30MCD?20MA 90	-
V301	B	F2	LED CL270S-MB BLUE>30MCD?20MA 90	-
V302	B	B6	LED SCMB12WBC3W1 360-1000 MCD	-
V303	B	B4	LED SCMB12WBC3W1 360-1000 MCD	-
V304	T	K5	PEMH13 TRX2+RX4 N 4.7K/47K SOT6	-
V305	T	J5	PEMH13 TRX2+RX4 N 4.7K/47K SOT6	-
V306	B	M5	LED CL270S-MB BLUE>30MCD?20MA 90	-
X105	T	L7	SM BATTERY CONN 3POL SPR 12V 2A	-
X302	T	B5	SM CONN 2X15F P0.5 50V.5A PCB/PCB	-
X700	T	K9	SM CONN RF 50R 100V 6GHZ STR	-
X900	T	L3	MODULE ID COMPONENT 2.8X1.8X0.3	-
Z100	B	M6	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100
Z101	B	M2	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100
Z102	B	M4	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100
Z601	T	G7	SAW FILT 1842.5+-17.5MHZ 2.5X2	1842.5MHZ
Z602	T	G6	SAW FILT 942.5+-17.5MHZ/3.5 2.5X2	942.5MHZ
Z603	T	G8	SAW FILT 897.5+-17.5MHZ/3.5 2.5X2	897.5MHZ

Component parts list for RH-53, updated edition

Note: For the latest parts lists and for product codes, always refer to the Service bulletins

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
R200	CHIPRES 0W5 0R22 J 200PPM 1210	T	H5	●	●	●	●	●
R713	CHIPRES JUMPER 0R0 0402	T	I8	●	●	●	●	●
R310	CHIPRES JUMPER 0R0 0402	B	A5	●	●	●	●	●
R309	CHIPRES JUMPER 0R0 0402	B	B5	●	●	●	●	●
R308	CHIPRES JUMPER 0R0 0402	B	B5	●	●	●	●	●
R715	CHIPRES 0W06 10R J 0402	T	J7	●	●	●	●	●
R716	CHIPRES 0W06 10R J 0402	T	H6	●	●	●	●	●
R657	CHIPRES 0W06 18R J 0402	T	G8	●	●	●	●	●
R658	CHIPRES 0W06 18R J 0402	T	G8	●	●	●	●	●
R605	CHIPRES 0W06 22R J 0402	T	F6	●	●	●	●	●
R313	CHIPRES 0W06 27R J 0402	T	B8	●	●	●	●	●
R306	CHIPRES 0W06 56R J 0402	T	K5	●	●	●	●	●
R645	CHIPRES 0W06 82R J 0402	T	G8	●	●	●	●	●
R646	CHIPRES 0W06 82R J 0402	T	G7	●	●	●	●	●
R712	CHIPRES 0W06 100R J 0402	T	I8	●	●	●	●	●
R603	CHIPRES 0W06 100R J 0402	T	D7	●	●	●	●	●
R647	CHIPRES 0W06 120R J 0402	T	F8	●	●	●	●	●
R648	CHIPRES 0W06 120R J 0402	T	F8	●	●	●	●	●
R166	CHIPRES 0W06 220R J 0402	T	K3	●	●	●	●	●
R165	CHIPRES 0W06 220R J 0402	T	K4	●	●	●	●	●
R655	CHIPRES 0W06 330R J 0402	T	E8	●	●	●	●	●
R205	CHIPRES 0W06 470R J 0402	T	J3	●	●	●	●	●
R426	CHIPRES 0W06 1K0 J 0402	T	D4	●	●	●	●	●
R607	CHIPRES 0W06 1K0 J 0402	T	F6	●	●	●	●	●
R420	CHIPRES 0W06 1K0 J 0402	T	E6	●	●	●	●	●
R450	CHIPRES 0W06 4K7 J 0402	T	C4	●	●	●	●	●
R159	CHIPRES 0W06 4K7 J 0402	T	F5	●	●	●	●	●
R160	CHIPRES 0W06 4K7 J 0402	T	F5	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
R206	CHIPRES 0W06 4K7 J 0402	T	J2	●	●	●	●	●
R207	CHIPRES 0W06 4K7 J 0402	T	K2	●	●	●	●	●
R623	CHIPRES 0W06 6K8 J 0402	T	E8	●	●	●	●	●
R316	CHIPRES 0W06 10K J 0402	T	C2	●	●	●	●	●
R154	CHIPRES 0W06 10K J 0402	T	K3	●	●	●	●	●
R307	CHIPRES 0W06 10K J 0402	T	I2	●	●	●	●	●
R620	CHIPRES 0W06 12K J 0402	T	G6	●	●	●	●	●
R629	CHIPRES 0W06 18K J 0402	T	F6	●	●	●	●	●
R637	CHIPRES 0W06 22K J 0402	T	G6	●	●	●	●	●
R164	CHIPRES 0W06 22K J 0402	T	J4	●	●	●	●	●
R168	CHIPRES 0W06 22K J 0402	T	J3	●	●	●	●	●
R422	CHIPRES 0W06 27K J 0402	T	G2	●	●	●	●	●
R161	CHIPRES 0W06 33K J 0402	T	F5	●	●	●	●	●
R162	CHIPRES 0W06 33K J 0402	T	F5	●	●	●	●	●
R123	CHIPRES 0W06 100K J 0402	T	K2	●	●	●	●	●
R107	CHIPRES 0W06 220K J 0402	T	D5	●	●	●	●	●
R609	CHIPRES 0W06 2K7 F 0402	T	F6	●	●	●	●	●
R618	CHIPRES 0W06 5K6 F 0402	T	E8	●	●	●	●	●
R619	CHIPRES 0W06 8K2 F 0402	T	D8	●	●	●	●	●
R108	RES NETWORK 0W03 4X100R J 0804	T	C5	●	●	●	●	●
R151	RES NETWORK 0W06 2X1K0 J 0404	T	K3	●	●	●	●	●
R153	RES NETWORK 0W06 2X1K0 J 0404	T	K4	●	●	●	●	●
R610	RES NETWORK 0W06 2X5K6 J 0404	T	F8	●	●	●	●	●
R611	RES NETWORK 0W06 2X5K6 J 0404	T	F8	●	●	●	●	●
R167	RES NETWORK 0W06 2X10R J 0404	T	J4	●	●	●	●	●
R202	RES NETWORK 0W03 4X100K J 0804	T	K2	●	●	●	●	●
R183	RES NETWORK 0W06 2X22R J 0404	T	J4	●	●	●	●	●
R169	RES NETWORK 0W06 2X2K2 J 0404	T	J3	●	●	●	●	●
R171	RES NETWORK 0W06 2X2K2 J 0404	T	J4	●	●	●	●	●
R156	RES NETWORK 0W06 2X2K2 J 0404	T	K3	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
R157	RES NETWORK 0W06 2X2K2 J 0404	T	K4	●	●	●	●	●
R640	RES NETWORK 0W04 2DB ATT 0404	T	D7	●	●	●	●	●
R711	RES NETWORK 0W04 2DB ATT 0404	T	J8	●	●	●	●	●
R714	RES NETWORK 0W04 2DB ATT 0404	T	H8	●	●	●	●	●
R100	NTC RES 0W1 47K J B 4050+-3% 0402	T	C6	●	●	●	●	●
C640	CHIPCAP NP0 3N9 J 25V 0805	T	E8	●	●	●	●	●
C310	CHIPCAP X5R 2U2 K 10V 0805	T	B8	●	●	●	●	●
C704	CHIPCAP X5R 2U2 K 10V 0805	T	H7	●	●	●	●	●
C711	CHIPCAP X5R 2U2 K 10V 0805	T	J8	●	●	●	●	●
C620	CHIPCAP X5R 3U3 K 6V3 0805	T	E6	●	●	●	●	●
C168	CHIPCAP X5R 4U7 K 6V3 0805	T	K3	●	●	●	●	●
C171	CHIPCAP X5R 4U7 K 6V3 0805	T	K2	●	●	●	●	●
C312	CHIPCAP X5R 1U K 16V 0603	T	C8	●	●	●	●	●
C639	CHIPCAP NP0 330P G 50V 0603	T	E8	●	●	●	●	●
C264	CHIPCAP X5R 1U K 6V3 0603	T	G4	●	●	●	●	●
C212	CHIPCAP X5R 1U K 6V3 0603	T	I5	●	●	●	●	●
C182	CHIPCAP X5R 1U K 6V3 0603	T	E5	●	●	●	●	●
C205	CHIPCAP X5R 1U K 6V3 0603	T	I5	●	●	●	●	●
C265	CHIPCAP X5R 1U K 6V3 0603	T	J2	●	●	●	●	●
C624	CHIPCAP X5R 1U K 6V3 0603	T	D8	●	●	●	●	●
C221	CHIPCAP X5R 1U K 6V3 0603	T	G4	●	●	●	●	●
C223	CHIPCAP X5R 1U K 6V3 0603	T	F4	●	●	●	●	●
C225	CHIPCAP X5R 1U K 6V3 0603	T	F4	●	●	●	●	●
C616	CHIPCAP X5R 1U K 6V3 0603	T	D7	●	●	●	●	●
C213	CHIPCAP X5R 1U K 6V3 0603	T	J4	●	●	●	●	●
C157	CHIPCAP X5R 1U K 6V3 0603	T	J2	●	●	●	●	●
C260	CHIPCAP X5R 1U K 6V3 0603	T	G5	●	●	●	●	●
C201	CHIPCAP X5R 1U K 6V3 0603	T	H4	●	●	●	●	●
C232	CHIPCAP X5R 1U K 6V3 0603	T	G4	●	●	●	●	●
C227	CHIPCAP X5R 1U K 6V3 0603	T	F3	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C234	CHIPCAP X5R 1U K 6V3 0603	T	G3	●	●	●	●	●
C207	CHIPCAP X5R 1U K 6V3 0603	T	J2	●	●	●	●	●
C244	CHIPCAP X5R 1U K 6V3 0603	T	J2	●	●	●	●	●
C243	CHIPCAP X5R 1U K 6V3 0603	T	J3	●	●	●	●	●
C224	CHIPCAP X5R 1U K 6V3 0603	T	F4	●	●	●	●	●
C263	CHIPCAP X5R 1U K 6V3 0603	T	I5	●	●	●	●	●
C211	CHIPCAP X5R 1U K 6V3 0603	T	I5	●	●	●	●	●
C229	CHIPCAP X5R 1U K 6V3 0603	T	G2	●	●	●	●	●
C235	CHIPCAP X5R 1U K 6V3 0603	T	F4	●	●	●	●	●
C226	CHIPCAP X5R 1U K 6V3 0603	T	F3	●	●	●	●	●
C208	CHIPCAP X5R 1U K 6V3 0603	T	F4	●	●	●	●	●
C215	CHIPCAP X5R 1U K 6V3 0603	T	J3	●	●	●	●	●
C206	CHIPCAP X5R 1U K 6V3 0603	T	I5	●	●	●	●	●
C219	CHIPCAP X5R 1U K 6V3 0603	T	G4	●	●	●	●	●
C203	CHIPCAP X5R 1U K 6V3 0603	T	J2	●	●	●	●	●
C262	CHIPCAP X5R 1U K 6V3 0603	T	G4	●	●	●	●	●
C228	CHIPCAP X5R 1U K 6V3 0603	T	G3	●	●	●	●	●
C261	CHIPCAP X5R 1U K 6V3 0603	T	H5	●	●	●	●	●
C230	CHIPCAP X5R 1U K 6V3 0603	T	G2	●	●	●	●	●
C231	CHIPCAP X5R 1U K 6V3 0603	T	G3	●	●	●	●	●
C607	CHIPCAP NP0 1P2 C 50V 0402	T	G6	●	●	●	●	●
C727	CHIPCAP NP0 3P3 C 50V 0402	T	H6	●	●	●	●	●
C728	CHIPCAP NP0 3P3 C 50V 0402	T	J7	●	●	●	●	●
C709	CHIPCAP NP0 10P J 50V 0402	T	H8	●	●	●	●	●
C210	CHIPCAP NP0 10P J 50V 0402	T	J4	●	●	●	●	●
C209	CHIPCAP NP0 10P J 50V 0402	T	J4	●	●	●	●	●
C625	CHIPCAP NP0 10P J 50V 0402	T	D8	●	●	●	●	●
C730	CHIPCAP NP0 10P J 50V 0402	T	J6	●	●	●	●	●
C421	CHIPCAP NP0 10P J 50V 0402	T	E6	●	●	●	●	●
C638	CHIPCAP NP0 15P J 50V 0402	T	G7	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C313	CHIPCAP NP0 27P J 50V 0402	B	A5	●	●	●	●	●
C314	CHIPCAP NP0 27P J 50V 0402	B	A4	●	●	●	●	●
C315	CHIPCAP NP0 27P J 50V 0402	B	B5	●	●	●	●	●
C319	CHIPCAP NP0 27P J 50V 0402	T	C2	●	●	●	●	●
C321	CHIPCAP NP0 27P J 50V 0402	B	A5	●	●	●	●	●
C320	CHIPCAP NP0 27P J 50V 0402	B	A5	●	●	●	●	●
C318	CHIPCAP NP0 27P J 50V 0402	T	D5	●	●	●	●	●
C317	CHIPCAP NP0 27P J 50V 0402	T	D4	●	●	●	●	●
C619	CHIPCAP NP0 27P J 50V 0402	T	F6	●	●	●	●	●
C635	CHIPCAP NP0 27P J 50V 0402	T	F9	●	●	●	●	●
C646	CHIPCAP NP0 27P J 50V 0402	T	D6	●	●	●	●	●
C708	CHIPCAP NP0 33P J 50V 0402	T	H7	●	●	●	●	●
C420	CHIPCAP NP0 47P J 50V 0402	T	E4	●	●	●	●	●
C184	CHIPCAP NP0 56P J 50V 0402	T	D5	●	●	●	●	●
C185	CHIPCAP NP0 56P J 50V 0402	T	D5	●	●	●	●	●
C627	CHIPCAP NP0 68P J 50V 0402	T	F9	●	●	●	●	●
C628	CHIPCAP NP0 68P J 50V 0402	T	F8	●	●	●	●	●
C323	CHIPCAP NP0 68P J 50V 0402	B	A5	●	●	●	●	●
C322	CHIPCAP NP0 68P J 50V 0402	B	A5	●	●	●	●	●
C642	CHIPCAP NP0 100P J 50V 0402	T	G6	●	●	●	●	●
C644	CHIPCAP NP0 100P J 50V 0402	T	F8	●	●	●	●	●
C641	CHIPCAP NP0 150P J 50V 0402	T	D8	●	●	●	●	●
C183	CHIPCAP X7R 330P J 50V 0402	T	F5	●	●	●	●	●
C186	CHIPCAP X7R 330P J 50V 0402	T	F5	●	●	●	●	●
C729	CHIPCAP NP0 1P0 B 50V 0402	T	J6	●	●	●	●	●
C153	CHIPCAP X7R 1N0 K 50V 0402	T	K3	●	●	●	●	●
C154	CHIPCAP X7R 1N0 K 50V 0402	T	K4	●	●	●	●	●
C170	CHIPCAP X7R 1N0 K 50V 0402	T	K3	●	●	●	●	●
C172	CHIPCAP X7R 1N0 K 50V 0402	T	K3	●	●	●	●	●
C426	CHIPCAP X7R 1N0 K 50V 0402	T	D4	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C636	CHIPCAP X7R 1N0 K 50V 0402	T	F6	●	●	●	●	●
C100	CHIPCAP X7R 6N8 K 25V 0402	T	L5	●	●	●	●	●
C106	CHIPCAP X7R 10N K 16V 0402	B	M2	●	●	●	●	●
C240	CHIPCAP X7R 10N K 16V 0402	T	J2	●	●	●	●	●
C123	CHIPCAP X7R 10N K 16V 0402	B	M4	●	●	●	●	●
C405	CHIPCAP X7R 10N K 16V 0402	T	D4	●	●	●	●	●
C450	CHIPCAP X7R 10N K 16V 0402	T	C2	●	●	●	●	●
C404	CHIPCAP X7R 10N K 16V 0402	T	F3	●	●	●	●	●
C400	CHIPCAP X7R 10N K 16V 0402	T	F2	●	●	●	●	●
C402	CHIPCAP X7R 10N K 16V 0402	T	F4	●	●	●	●	●
C403	CHIPCAP X7R 10N K 16V 0402	T	E4	●	●	●	●	●
C124	CHIPCAP X7R 10N K 16V 0402	B	M4	●	●	●	●	●
C202	CHIPCAP X7R 10N K 16V 0402	T	H4	●	●	●	●	●
C626	CHIPCAP X7R 10N K 16V 0402	T	F6	●	●	●	●	●
C101	CHIPCAP X7R 10N K 16V 0402	B	M6	●	●	●	●	●
C102	CHIPCAP X7R 10N K 16V 0402	B	M6	●	●	●	●	●
C105	CHIPCAP X7R 10N K 16V 0402	B	M2	●	●	●	●	●
C220	CHIPCAP X7R 10N K 16V 0402	T	K2	●	●	●	●	●
C454	CHIPCAP X7R 100N K 16V 0603	T	C4	●	●	●	●	●
C181	CHIPCAP X7R 100N K 16V 0603	T	F4	●	●	●	●	●
C174	CHIPCAP X7R 33N K 10V 0402	T	J3	●	●	●	●	●
C151	CHIPCAP X7R 33N K 10V 0402	T	J4	●	●	●	●	●
C152	CHIPCAP X7R 33N K 10V 0402	T	J3	●	●	●	●	●
C173	CHIPCAP X7R 33N K 10V 0402	T	J3	●	●	●	●	●
C452	CHIPCAP X5R 100N K 10V 0402	T	B2	●	●	●	●	●
C238	CHIPCAP X5R 100N K 10V 0402	T	H4	●	●	●	●	●
C645	CHIPCAP X5R 100N K 10V 0402	T	D7	●	●	●	●	●
C158	CHIPCAP X5R 100N K 10V 0402	T	K3	●	●	●	●	●
C180	CHIPCAP X5R 100N K 10V 0402	T	G5	●	●	●	●	●
C618	CHIPCAP X5R 100N K 10V 0402	T	F6	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C614	CHIPCAP X5R 100N K 10V 0402	T	E7	●	●	●	●	●
C637	CHIPCAP X5R 100N K 10V 0402	T	G8	●	●	●	●	●
C236	CHIPCAP X5R 100N K 10V 0402	T	G2	●	●	●	●	●
C451	CHIPCAP X5R 100N K 10V 0402	T	D2	●	●	●	●	●
C634	CHIPCAP X5R 100N K 10V 0402	T	E8	●	●	●	●	●
C237	CHIPCAP X5R 100N K 10V 0402	T	I4	●	●	●	●	●
C239	CHIPCAP X5R 100N K 10V 0402	T	I2	●	●	●	●	●
C200	CHIPCAP X5R 100N K 10V 0402	T	H5	●	●	●	●	●
C159	CHIPCAP X5R 100N K 10V 0402	T	G5	●	●	●	●	●
C218	CHIPCAP X5R 100N K 10V 0402	T	H2	●	●	●	●	●
C401	CHIPCAP X5R 100N K 10V 0402	T	F2	●	●	●	●	●
C610	CHIPCAP X5R 100N K 10V 0402	T	F6	●	●	●	●	●
C103	CHIPTCAP 100u 6V3 70mOhm 3.5x2.8x2.0	T	M7	●	●	●	●	●
L263	FERRITE BEAD 0R5 600R/100MHZ 0603	T	I5	●	●	●	●	●
L264	FERRITE BEAD 0R5 600R/100MHZ 0603	T	G5	●	●	●	●	●
L265	FERRITE BEAD 0R5 600R/100MHZ 0603	T	J2	●	●	●	●	●
L260	FERRITE BEAD 0R5 600R/100MHZ 0603	T	G5	●	●	●	●	●
L261	FERRITE BEAD 0R5 600R/100MHZ 0603	T	H5	●	●	●	●	●
L262	FERRITE BEAD 0R5 600R/100MHZ 0603	T	G5	●	●	●	●	●
L100	FERR.BEAD 0R03 42R/100MHZ 3A 0805	T	L4	●	●	●	●	●
L703	FERR.BEAD 0R03 42R/100MHZ 3A 0805	T	J7	●	●	●	●	●
Z100	CHIP BEAD ARRAY 2X1000R 0405	B	M6	●	●	●	●	●
Z101	CHIP BEAD ARRAY 2X1000R 0405	B	M2	●	●	●	●	●
Z102	CHIP BEAD ARRAY 2X1000R 0405	B	M4	●	●	●	●	●
L300	CHOKE 22U M 0.33A 1R5 3.3X3.3X1.3	T	B7	●	●	●	●	●
L301	CHIP COIL 220N J Q8/50MHZ 0603	T	C8	●	●	●	●	●
L602	CHIP COIL 10N J Q30/800MHZ 0402	T	G6	●	●	●	●	●
L603	CHIP COIL 10N J Q30/800MHZ 0402	T	G6	●	●	●	●	●
L604	CHIP COIL 10N J Q30/800MHZ 0402	T	G8	●	●	●	●	●
L613	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	G7	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
L614	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	C8	●	●	●	●	●
L610	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	G7	●	●	●	●	●
L612	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	G7	●	●	●	●	●
L605	CHIP COIL 3N9 +-0N3 Q28/800M 0402	T	G8	●	●	●	●	●
L606	CHIP COIL 12N J Q31/800MHZ 0402	T	G8	●	●	●	●	●
L609	CHIP COIL 18N J Q29/800MHZ 0402	T	H8	●	●	●	●	●
L607	CHIP COIL 39N J Q24/800MHZ 0402	T	G8	●	●	●	●	●
L608	CHIP COIL 39N J Q24/800MHZ 0402	T	G8	●	●	●	●	●
L307	CHIP COIL 39N J Q24/800MHZ 0402	B	B5	●	●	●	●	●
L306	CHIP COIL 39N J Q24/800MHZ 0402	B	B5	●	●	●	●	●
L305	CHIP COIL 39N J Q24/800MHZ 0402	B	B5	●	●	●	●	●
V100	TVS DI 1PMT16AT3 16V 175W PWRMITE	T	L5	●	●	●	●	●
V305	TRX2+RX4 N 4K7/47K SOT666	T	J5	●	●	●	●	●
V304	TRX2+RX4 N 4K7/47K SOT666	T	K5	●	●	●	●	●
N180	AF AMP 0.4W LM4890/NCP2890 NOPB	T	E5	●	●	●	●	●
N303	DC/DC CONV TK65600 USMD8	T	B8	●	●	●	●	●
D450	COMBO 64M NOR + 16M UTRAM FBGA44 PBFREE	T	C3	●	●	●	●	●
N700	FEM GSM900/1800 3.5V (2650 only)	T	I7	●	●	●	●	
N600	Mjolner RF ASIC PMB3347 LFLGA80 F7	T	F7	●	●	●	●	●
B200	CRYSTAL 32.768KHZ+-30PPM 9PF	T	J5	●	●	●	●	●
B600	CRYSTAL 26.OMHZ+-10PPM 15.5PF	T	D6	●	●	●	●	●
Z602	SAW FILT 942.5 +-17.5 MHZ 2.5x2 (2650 only)	T	G6	●	●	●	●	
Z603	SAW FILT 897.5 +-17.5 MHZ 2.5x2 (2650 only)	T	G8	●	●	●	●	
Z601	SAW FILT 1842.5 +-37.5 MHZ 2.5x2 (2650 only)	T	G7	●	●	●	●	
G600	VCO 3296-3980MHz 2.7V 20mA EGSM	T	D8	●	●	●	●	●
T601	TRANSF BALUN 3290-3980MHZ	T	D8	●	●	●	●	●
T600	TRANSF BALUN 1800+-100MHZ 2X1.25	T	G7	●	●	●	●	●
N306	HALL IC SWITCH SH248CSP VCC	B	E1	●	●	●	●	●

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
V303	LED 360-640 MCD SMD2	B	B4	●	●	●	●	●
V302	LED 360-640 MCD SMD2	B	B6	●	●	●	●	●
V306	LED BLUE 75MCD 20MA 90DEG	B	M5	●	●	●	●	●
V301	LED BLUE 75MCD 20MA 90DEG	B	F2	●	●	●	●	●
V300	LED BLUE 75MCD 20MA 90DEG	B	F8	●	●	●	●	●
F100	SM FUSE F 1.5A 32V ROHS-FREE 0603	T	L4	●	●	●	●	●
X105	SM BATTERY CONN 3POL SPR 12V 2A	T	L7	●	●	●	●	●
X900	MODULE ID COMPONENT 2.8X1.8X0.3	T	L3	●	●	●	●	●
X700	SM CONN RF 50R 100V 6GHZ STR	T	K9	●	●	●	●	●
X302	SM CONN 2X15F P0.5 50V.5A PWB/PWB	T	B5	●	●	●	●	●

Component parts list for RH-54, original edition

Note: For the latest parts lists and for product codes, always refer to the Service bulletins

Item	Side	X/Y	Description	Value
B200	T	J5	CRYSTAL 32.768KHZ+-20P	
B600	T	D6	CRYSTAL 26.OMHZ+-10PPM	26MHz
C100	T	L5	CHIPCAP X7R 6N8 K 25V	6n8
C101	B	M6	CHIPCAP X7R 10N K 16V	10n
C102	B	M6	CHIPCAP X7R 10N K 16V	10n
C103	T	M7	CHIPTCAP 100u 6V3 70mO	100u_6V3
C105	B	M2	CHIPCAP X7R 10N K 16V	10n
C106	B	M2	CHIPCAP X7R 10N K 16V	10n
C123	B	M4	CHIPCAP X7R 10N K 16V	10n
C124	B	M4	CHIPCAP X7R 10N K 16V	10n
C151	T	J4	CHIPCAP X7R 33N K 10V	33n
C152	T	J3	CHIPCAP X7R 33N K 10V	33n
C153	T	K3	CHIPCAP X7R 1N0 K 50V	1n0
C154	T	K4	CHIPCAP X7R 1N0 K 50V	1n0
C157	T	J2	CHIPCAP X5R 1U K 6V3	1u0
C158	T	K3	CHIPCAP X5R 100N K 10V	100n
C159	T	G5	CHIPCAP X5R 100N K 10V	100n
C168	T	K4	CHIPCAP X5R 4U7 K 6V3	4u7
C170	T	K3	CHIPCAP X7R 1N0 K 50V	1n0
C171	T	K2	CHIPCAP X5R 4U7 K 6V3	4u7
C172	T	K3	CHIPCAP X7R 1N0 K 50V	1n0
C173	T	J3	CHIPCAP X7R 33N K 10V	33n
C174	T	J3	CHIPCAP X7R 33N K 10V	33n
C180	T	G5	CHIPCAP X5R 100N K 10V	100n
C181	T	F4	CHIPCAP X5R 470N K 10V	470n
C182	T	E5	CHIPCAP X5R 1U K 6V3	1u0
C183	T	F5	CHIPCAP X7R 330P J 50V	330p
C184	T	D5	CHIPCAP NP0 56P J 50V	56p
C185	T	D5	CHIPCAP NP0 56P J 50V	56p

Item	Side	X/Y	Description	Value
C186	T	F5	CHIPCAP X7R 330P J 50V	330p
C200	T	H5	CHIPCAP X5R 100N K 10V	100n
C201	T	H4	CHIPCAP X5R 1U K 6V3	1u0
C202	T	H4	CHIPCAP X7R 10N K 16V	10n
C203	T	J2	CHIPCAP X5R 1U K 6V3	1u0
C205	T	I5	CHIPCAP X5R 1U K 6V3	1u0
C206	T	I5	CHIPCAP X5R 1U K 6V3	1u0
C207	T	J2	CHIPCAP X5R 1U K 6V3	1u0
C208	T	F4	CHIPCAP X5R 1U K 6V3	1u0
C209	T	J4	CHIPCAP NP0 10P J 50V	10p
C210	T	J4	CHIPCAP NP0 10P J 50V	10p
C211	T	I5	CHIPCAP X5R 1U K 6V3	1u0
C212	T	I5	CHIPCAP X5R 1U K 6V3	1u0
C213	T	J4	CHIPCAP X5R 1U K 6V3	1u0
C215	T	J3	CHIPCAP X5R 1U K 6V3	1u0
C218	T	H2	CHIPCAP X5R 100N K 10V	100n
C219	T	G4	CHIPCAP X5R 1U K 6V3	1u0
C220	T	K2	CHIPCAP X7R 10N K 16V	10n
C221	T	G4	CHIPCAP X5R 1U K 6V3	1u0
C223	T	F4	CHIPCAP X5R 1U K 6V3	1u0
C224	T	F4	CHIPCAP X5R 1U K 6V3	1u0
C225	T	F4	CHIPCAP X5R 1U K 6V3	1u0
C226	T	F3	CHIPCAP X5R 1U K 6V3	1u0
C227	T	F3	CHIPCAP X5R 1U K 6V3	1u0
C228	T	G3	CHIPCAP X5R 1U K 6V3	1u0
C229	T	G2	CHIPCAP X5R 1U K 6V3	1u0
C230	T	G2	CHIPCAP X5R 1U K 6V3	1u0
C231	T	G3	CHIPCAP X5R 1U K 6V3	1u0
C232	T	G4	CHIPCAP X5R 1U K 6V3	1u0
C234	T	G3	CHIPCAP X5R 1U K 6V3	1u0
C235	T	J4	CHIPCAP X5R 1U K 6V3	1u0
C236	T	G2	CHIPCAP X5R 100N K 10V	100n

Item	Side	X/Y	Description	Value
C237	T	I4	CHIPCAP X5R 100N K 10V	100n
C238	T	H4	CHIPCAP X5R 100N K 10V	100n
C239	T	I2	CHIPCAP X5R 100N K 10V	100n
C240	T	J2	CHIPCAP X7R 10N K 16V	10n
C243	T	J3	CHIPCAP X5R 1U K 6V3	1u0
C244	T	J2	CHIPCAP X5R 1U K 6V3	1u0
C260	T	G5	CHIPCAP X5R 1U K 6V3	1u0
C261	T	H5	CHIPCAP X5R 1U K 6V3	1u0
C262	T	G4	CHIPCAP X5R 1U K 6V3	1u0
C263	T	I5	CHIPCAP X5R 1U K 6V3	1u0
C264	T	G4	CHIPCAP X5R 1U K 6V3	1u0
C265	T	J2	CHIPCAP X5R 1U K 6V3	1u0
C310	T	B8	CHIPCAP X5R 2U2 K 10V	2u2
C312	T	C8	CHIPCAP X5R 1U K 16V	1u0
C313	B	A5	CHIPCAP NP0 27P J 50V	27p
C314	B	A5	CHIPCAP NP0 27P J 50V	27p
C315	B	A5	CHIPCAP NP0 27P J 50V	27p
C316	B	A5	CHIPCAP NP0 27P J 50V	27p
C317	T	D4	CHIPCAP NP0 27P J 50V	27p
C318	T	D5	CHIPCAP NP0 27P J 50V	27p
C319	T	C2	CHIPCAP NP0 27P J 50V	27p
C400	T	F2	CHIPCAP X7R 10N K 16V	10n
C401	T	F2	CHIPCAP X5R 100N K 10V	100n
C402	T	F4	CHIPCAP X7R 10N K 16V	10n
C403	T	E4	CHIPCAP X7R 10N K 16V	10n
C404	T	F3	CHIPCAP X7R 10N K 16V	10n
C405	T	D4	CHIPCAP X7R 10N K 16V	10n
C420	T	E6	CHIPCAP NP0 47P J 50V	47p
C426	T	D4	CHIPCAP X7R 1N0 K 50V	1n0
C450	T	C2	CHIPCAP X7R 10N K 16V	10n
C451	T	D2	CHIPCAP X5R 100N K 10V	100n
C452	T	B2	CHIPCAP X5R 100N K 10V	100n

Item	Side	X/Y	Description	Value
C454	T	C4	CHIPCAP X7R 100N K 16V	100n
C607	T	G6	CHIPCAP NP0 1P2 C 50V	1p2
C610	T	F6	CHIPCAP X5R 100N K 10V	100n
C614	T	E7	CHIPCAP X5R 100N K 10V	100n
C616	T	D7	CHIPCAP X5R 1U K 6V3	1u0
C617	T	F8	CHIPCAP X5R 100N K 10V	100n
C618	T	F6	CHIPCAP X5R 100N K 10V	100n
C619	T	F6	CHIPCAP NP0 27P J 50V	27p
C620	T	E6	CHIPCAP X5R 3U3 K 6V3	3u3
C621	T	D6	CHIPCAP X5R 100N K 10V	100n
C624	T	D8	CHIPCAP X5R 1U K 6V3	1u0
C625	T	D8	CHIPCAP NP0 10P J 50V	10p
C626	T	F6	CHIPCAP X7R 10N K 16V	10n
C627	T	F9	CHIPCAP NP0 68P J 50V	68p
C628	T	F8	CHIPCAP NP0 68P J 50V	68p
C632	T	G7	CHIPCAP NP0 1P0 B 50V	1p0
C633	T	F8	CHIPCAP NP0 10P J 50V	10p
C634	T	E8	CHIPCAP X5R 100N K 10V	100n
C635	T	F9	CHIPCAP NP0 27P J 50V	27p
C636	T	F8	CHIPCAP X7R 1N0 K 50V	1n0
C637	T	G8	CHIPCAP X5R 100N K 10V	100n
C638	T	G7	CHIPCAP NP0 15P J 50V	15p
C639	T	E8	CHIPCAP NP0 330P G 50V	330p
C640	T	E8	CHIPCAP NP0 3N9 J 25V	3n9
C641	T	D8	CHIPCAP NP0 150P J 50V	150p
C642	T	G6	CHIPCAP NP0 100P J 50V	100p
C643	T	G7	CHIPCAP NP0 1P0 B 50V	1p0
C644	T	F8	CHIPCAP NP0 100P J 50V	100p
C645	T	D7	CHIPCAP X5R 100N K 10V	100n
C646	T	D6	CHIPCAP NP0 27P J 50V	27p
C704	T	H7	CHIPCAP X5R 2U2 K 10V	2u2
C707	T	I8	CHIPCAP NP0 10P J 50V	10p

Item	Side	X/Y	Description	Value
C708	T	H6	CHIPCAP NP0 33P J 50V	33p
C709	T	H8	CHIPCAP NP0 10P J 50V	10p
C711	T	J8	CHIPCAP X5R 2U2 K 10V	2u2
C727	T	H6	CHIPCAP NP0 3P3 C 50V	3p3
C728	T	J7	CHIPCAP NP0 3P3 C 50V	3p3
C729	T	J6	CHIPCAP NP0 1P0 C 50V	1p0
C730	T	J6	CHIPCAP NP0 10P J 50V	10p
D200	T	I3	UEMK W-DOG ENA	<Changed>
D400	T	E3	UPP8M V2.6/2.10 LF F75	-
D450	T	C3	MB_54MHZ_MAX T COMBO 64M NO	<Changed>
F100	T	L4	SM FUSE F 1.5A 32V ROH	1.5A
G600	T	D8	VCO 3296-3980MHZ 4-BAN	<Changed>
L100	T	L4	FERR.BEAD 0R03 42R/100	42R/100MHz
L260	T	G5	FERRITE BEAD 0R5 600R/	600R/100MHz
L261	T	H5	FERRITE BEAD 0R5 600R/	600R/100MHz
L262	T	G5	FERRITE BEAD 0R5 600R/	600R/100MHz
L263	T	I5	FERRITE BEAD 0R5 600R/	600R/100MHz
L264	T	G5	FERRITE BEAD 0R5 600R/	600R/100MHz
L265	T	J2	FERRITE BEAD 0R5 600R/	600R/100MHz
L300	T	B7	H1.4 CHOKE 22U M 0.33A 1R5	22uH
L301	T	C8	CHIP COIL 68NH J Q12/1	68nH
L602	T	G6	CHIP COIL 10N J Q30/80	10nH
L603	T	G6	CHIP COIL 10N J Q30/80	10nH
L604	T	G8	CHIP COIL 10N J Q30/80	10nH
L605	T	G8	CHIP COIL 3N9 +-0N3 Q2	3n9H
L606	T	G8	CHIP COIL 15N J Q30/80	<Changed>
L607	T	G8	CHIP COIL 39N J Q24/80	39nH
L608	T	G8	CHIP COIL 39N J Q24/80	39nH
L609	T	H8	CHIP COIL 27N J Q27/80	<Changed>
L610	T	G7	CHIP COIL 3N3 +-0N3 Q2	3n3H
L612	T	G7	CHIP COIL 3N3 +-0N3 Q2	3n3H
L613	T	G7	CHIP COIL 3N3 +-0N3 Q2	3n3H

Item	Side	X/Y	Description	Value
L614	T	C8	CHIP COIL 3N3 +-0N3 Q2	3n3H
L703	T	J7	FERR.BEAD 0R03 42R/100	42R/100MHz
N180	T	E5	544_0.675 AF AMP 0.4W LM489	-
N303	T	B8	5 DC/DC CONV LM3500 / TK	-
N306	B	E1	NSC: (No Standard Comp	<Changed>
N600	T	F7	MJOLNER RF ASIC P	-
N700	T	I7	PW AMP FEM GSM900/1800	<Changed>
R100	T	C6	NTC RES 0W1 47K J B 40	47k
R106	T	D5	CHIP VARISTOR VWM14V V	14V/46V
R107	T	D5	CHIPRES 0W06 220K J	220k
R108	T	C5	RES NETWORK 0W03 4X100	4x100R
R109	T	D5	CHIPRES JUMPER 0R0	0R
R123	T	K2	CHIPRES 0W06 100K J	100k
R151	T	K3	RES NETWORK 0W06 2X1K0	2x1k0
R153	T	K4	RES NETWORK 0W06 2X1K0	2x1k
R154	T	K3	CHIPRES 0W06 10K J	10k
R156	T	K3	RES NETWORK 0W06 2X2K2	2x2k2
R157	T	K4	RES NETWORK 0W06 2X2K2	2x2k2
R159	T	F5	CHIPRES 0W06 4K7 J	4k7
R160	T	F5	CHIPRES 0W06 4K7 J	4k7
R161	T	F5	CHIPRES 0W06 33K J	33k
R162	T	F5	CHIPRES 0W06 33K J	33k
R164	T	J4	CHIPRES 0W06 22K J	22k
R165	T	K4	CHIPRES 0W06 220R J	220R
R166	T	K3	CHIPRES 0W06 220R J	220R
R167	T	J4	RES NETWORK 0W06 2X10R	2x10R
R168	T	J3	CHIPRES 0W06 22K J	22k
R169	T	J3	RES NETWORK 0W06 2X2K2	2x2k2
R171	T	J4	RES NETWORK 0W06 2X2K2	2x2k2
R183	T	J4	RES NETWORK 0W06 2X22R	2x22R
R200	T	H5	CHIPRES 0W5 0R22 J 200	0R22
R202	T	K2	RES NETWORK 0W03 4X100	4x100k

Item	Side	X/Y	Description	Value
R205	T	J3	CHIPRES 0W06 470R J	470R
R206	T	J2	CHIPRES 0W06 4K7 J	4k7
R207	T	K2	CHIPRES 0W06 4K7 J	4k7
R306	T	K5	CHIPRES 0W06 27R J	27R
R307	T	I2	CHIPRES 0W06 10K J	10k
R313	T	B8	CHIPRES 0W06 27R J	27R
R316	T	C2	CHIPRES 0W06 10K J	10k
R420	T	E6	CHIPRES 0W06 1K0 J	1k0
R422	T	G2	CHIPRES 0W06 27K J	27k
R426	T	E4	CHIPRES 0W06 1K0 J	1k0
R450	T	C4	CHIPRES 0W06 4K7 J	4k7
R603	T	D7	CHIPRES 0W06 100R J	100R
R605	T	F6	CHIPRES 0W06 22R J	22R
R607	T	F6	CHIPRES 0W06 1K0 J	1k0
R609	T	F6	CHIPRES 0W06 2K7 F	2k7
R610	T	F8	RES NETWORK 0W06 2X5K6	2x5k6
R611	T	F8	RES NETWORK 0W06 2X5K6	2x5k6
R618	T	E8	CHIPRES 0W06 5K6 F	5k6
R619	T	D8	CHIPRES 0W06 8K2 F	8k2
R620	T	G6	CHIPRES 0W06 12K J	12k
R621	T	E8	CHIPRES 0W06 10K J	10k
R622	T	F8	CHIPRES 0W06 22K J	22k
R623	T	E8	CHIPRES 0W06 6K8 J	6k8
R629	T	F6	CHIPRES 0W06 18K J	18k
R637	T	G6	CHIPRES 0W06 22K J	22k
R638	T	F6	CHIPRES 0W06 150K J	150k
R640	T	D7	RES NETWORK 0W04 2DB A	436R/11R6/4
R645	T	G8	CHIPRES 0W06 82R J	82R
R646	T	G7	CHIPRES 0W06 82R J	82R
R647	T	F8	CHIPRES 0W06 150R J	<Changed>
R648	T	F8	CHIPRES 0W06 150R J	<Changed>
R655	T	E8	CHIPRES 0W06 330R J	330R

Item	Side	X/Y	Description	Value
R657	T	G8	CHIPRES 0W06 18R J	18R
R658	T	G8	CHIPRES 0W06 18R J	18R
R705	T	I8	CHIPRES 0W06 8K2 J	8k2
R711	T	J8	RES NETWORK 0W04 2DB A	436R/11R6/4
R712	T	I8	CHIPRES 0W06 100R J	100R
R713	T	I8	CHIPRES JUMPER 0R0	0R
R714	T	H8	RES NETWORK 0W04 2DB A	436R/11R6/4
R715	T	J7	CHIPRES 0W06 10R J	10R
R716	T	H6	CHIPRES 0W06 10R J	10R
T600	T	G7	TRANSF BALUN 1800+-100	-
T601	T	D8	TRANSF BALUN 3290-3980	-
V100	T	L5	TVS DI 1PMT16AT3 16V 1	-
V300	B	F8	NSC: (No Standard Comp	<Changed>
V301	B	F2	NSC: (No Standard Comp	<Changed>
V302	B	B6	LED SCMB12WBC3W1 360-1	-
V303	B	B4	LED SCMB12WBC3W1 360-1	-
V304	T	K5	NSC: (No Standard Comp	<Changed>
V305	T	J5	NSC: (No Standard Comp	<Changed>
V306	B	M5	NSC: (No Standard Comp	<Changed>
X105	T	L7	SM BATTERY CONN 3POL S	-
X302	T	B5	SM CONN 2X15F P0.5 50V.5A PWB/ PWB	-
X700	T	K9	SM CONN RF 50R 100V 6G	-
X900	T	L3	AD MODULE ID COMPONENT 2.	-
Z100	B	M6	CHIP BEAD ARRAY 2X1000	2x1000R/100
Z101	B	M2	CHIP BEAD ARRAY 2X1000	2x1000R/100
Z102	B	M4	CHIP BEAD ARRAY 2X1000	2x1000R/100
Z601	T	G7	SD SAW FILT 1960+-30MHZ/4	<Changed>
Z602	T	G6	SD SAW FILT 881.5+-25MHZ/	<Changed>
Z603	T	G8	SD SAW FILT 836.5+-12.5MH	<Changed>

Component parts list for RH-54, updated edition

Note: For the latest parts lists and for product codes, always refer to the Service bulletin

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
B200	CRYSTAL 32.768KHZ+-20PPM 12.5PF	T	J5				●	
B200	CRYSTAL 32.768KHZ+-20PPM 12.5PF	T	J5				●	
B600	CRYSTAL 26.OMHZ+-10PPM 15.5PF	T	D6				●	
C100	CHIPCAP X7R 6N8 K 25V 0402	T	L5				●	
C101	CHIPCAP X7R 10N K 16V 0402	B	M6				●	
C102	CHIPCAP X7R 10N K 16V 0402	B	M6				●	
C103	CHIPTCAP 100u 6V3 70mOhm 3.5x2.8x2.0	T	M7				●	
C105	CHIPCAP X7R 10N K 16V 0402	B	M2				●	
C106	CHIPCAP X7R 10N K 16V 0402	B	M2				●	
C123	CHIPCAP X7R 10N K 16V 0402	B	M4				●	
C124	CHIPCAP X7R 10N K 16V 0402	B	M4				●	
C151	CHIPCAP X7R 33N K 10V 0402	T	J4				●	
C152	CHIPCAP X7R 33N K 10V 0402	T	J3				●	
C153	CHIPCAP X7R 1N0 K 50V 0402	T	K3				●	
C154	CHIPCAP X7R 1N0 K 50V 0402	T	K4				●	
C157	CHIPCAP X5R 1U K 6V3 0603	T	J2				●	
C158	CHIPCAP X5R 100N K 10V 0402	T	K3				●	
C159	CHIPCAP X5R 100N K 10V 0402	T	G5				●	
C168	CHIPCAP X5R 4U7 K 6V3 0805	T	K4				●	
C170	CHIPCAP X7R 1N0 K 50V 0402	T	K3				●	
C171	CHIPCAP X5R 4U7 K 6V3 0805	T	K2				●	
C172	CHIPCAP X7R 1N0 K 50V 0402	T	K3				●	
C173	CHIPCAP X7R 33N K 10V 0402	T	J3				●	
C174	CHIPCAP X7R 33N K 10V 0402	T	J3				●	
C180	CHIPCAP X5R 100N K 10V 0402	T	G5				●	
C181	CHIPCAP X7R 100N K 16V 0603	T	F4				●	
C182	CHIPCAP X5R 1U K 6V3 0603	T	E5				●	
C183	CHIPCAP X7R 330P J 50V 0402	T	F5				●	
C184	CHIPCAP NP0 100P J 50V 0402	T	D5				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C185	CHIPCAP NP0 100P J 50V 0402	T	D5				●	
C186	CHIPCAP X7R 330P J 50V 0402	T	F5				●	
C200	CHIPCAP X5R 100N K 10V 0402	T	H5				●	
C201	CHIPCAP X5R 1U K 6V3 0603	T	H4				●	
C202	CHIPCAP X7R 10N K 16V 0402	T	H4				●	
C203	CHIPCAP X5R 1U K 6V3 0603	T	J2				●	
C205	CHIPCAP X5R 1U K 6V3 0603	T	I5				●	
C206	CHIPCAP X5R 1U K 6V3 0603	T	I5				●	
C207	CHIPCAP X5R 1U K 6V3 0603	T	J2				●	
C208	CHIPCAP X5R 1U K 6V3 0603	T	F4				●	
C209	CHIPCAP NP0 10P J 50V 0402	T	J4				●	
C210	CHIPCAP NP0 10P J 50V 0402	T	J4				●	
C211	CHIPCAP X5R 1U K 6V3 0603	T	I5				●	
C212	CHIPCAP X5R 1U K 6V3 0603	T	I5				●	
C213	CHIPCAP X5R 1U K 6V3 0603	T	J4				●	
C215	CHIPCAP X5R 1U K 6V3 0603	T	J3				●	
C218	CHIPCAP X5R 100N K 10V 0402	T	H2				●	
C219	CHIPCAP X5R 1U K 6V3 0603	T	G4				●	
C220	CHIPCAP X7R 10N K 16V 0402	T	K2				●	
C221	CHIPCAP X5R 1U K 6V3 0603	T	G4				●	
C223	CHIPCAP X5R 1U K 6V3 0603	T	F4				●	
C224	CHIPCAP X5R 1U K 6V3 0603	T	F4				●	
C225	CHIPCAP X5R 1U K 6V3 0603	T	F4				●	
C226	CHIPCAP X5R 1U K 6V3 0603	T	F3				●	
C227	CHIPCAP X5R 1U K 6V3 0603	T	F3				●	
C228	CHIPCAP X5R 1U K 6V3 0603	T	G3				●	
C229	CHIPCAP X5R 1U K 6V3 0603	T	G2				●	
C230	CHIPCAP X5R 1U K 6V3 0603	T	G2				●	
C231	CHIPCAP X5R 1U K 6V3 0603	T	G3				●	
C232	CHIPCAP X5R 1U K 6V3 0603	T	G4				●	
C234	CHIPCAP X5R 1U K 6V3 0603	T	G3				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C235	CHIPCAP X5R 1U K 6V3 0603	T	J4				●	
C236	CHIPCAP X5R 100N K 10V 0402	T	G2				●	
C237	CHIPCAP X5R 100N K 10V 0402	T	I4				●	
C238	CHIPCAP X5R 100N K 10V 0402	T	H4				●	
C239	CHIPCAP X5R 100N K 10V 0402	T	I2				●	
C240	CHIPCAP X7R 10N K 16V 0402	T	J2				●	
C243	CHIPCAP X5R 1U K 6V3 0603	T	J3				●	
C244	CHIPCAP X5R 1U K 6V3 0603	T	J2				●	
C260	CHIPCAP X5R 1U K 6V3 0603	T	G5				●	
C261	CHIPCAP X5R 1U K 6V3 0603	T	H5				●	
C262	CHIPCAP X5R 1U K 6V3 0603	T	G4				●	
C263	CHIPCAP X5R 1U K 6V3 0603	T	I5				●	
C264	CHIPCAP X5R 1U K 6V3 0603	T	G4				●	
C265	CHIPCAP X5R 1U K 6V3 0603	T	J2				●	
C310	CHIPCAP X5R 2U2 K 10V 0805	T	B8				●	
C312	CHIPCAP X5R 1U K 16V 0603	T	C8				●	
C313	CHIPCAP NP0 27P J 50V 0402	B	A5				●	
C314	CHIPCAP NP0 27P J 50V 0402	B	A5				●	
C315	CHIPCAP NP0 27P J 50V 0402	B	A5				●	
C317	CHIPCAP NP0 27P J 50V 0402	T	D4				●	
C318	CHIPCAP NP0 27P J 50V 0402	T	D5				●	
C319	CHIPCAP NP0 100P J 50V 0402	T	C2				●	
C400	CHIPCAP X7R 10N K 16V 0402	T	F2				●	
C401	CHIPCAP X5R 100N K 10V 0402	T	F4				●	
C402	CHIPCAP X7R 10N K 16V 0402	T	F4				●	
C403	CHIPCAP X7R 10N K 16V 0402	T	E4				●	
C404	CHIPCAP X7R 10N K 16V 0402	T	F3				●	
C405	CHIPCAP X7R 10N K 16V 0402	T	D4				●	
C420	CHIPCAP NP0 47P J 50V 0402	T	E6				●	
C426	CHIPCAP X7R 1N0 K 50V 0402	T	D4				●	
C450	CHIPCAP X7R 10N K 16V 0402	T	C2				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C451	CHIPCAP X5R 100N K 10V 0402	T	D2				●	
C452	CHIPCAP X5R 100N K 10V 0402	T	B2				●	
C454	CHIPCAP X7R 100N K 16V 0603	T	C4				●	
C607	CHIPCAP NP0 1P2 C 50V 0402	T	G6				●	
C610	CHIPCAP X5R 100N K 10V 0402	T	F6				●	
C614	CHIPCAP X5R 100N K 10V 0402	T	E7				●	
C616	CHIPCAP X5R 1U K 6V3 0603	T	D7				●	
C618	CHIPCAP X5R 100N K 10V 0402	T	F6				●	
C619	CHIPCAP NP0 27P J 50V 0402	T	F6				●	
C620	CHIPCAP X5R 3U3 K 6V3 0805	T	E6				●	
C624	CHIPCAP X5R 1U K 6V3 0603	T	D8				●	
C625	CHIPCAP NP0 10P J 50V 0402	T	D8				●	
C626	CHIPCAP X7R 10N K 16V 0402	T	F6				●	
C627	CHIPCAP NP0 68P J 50V 0402	T	F9				●	
C628	CHIPCAP NP0 68P J 50V 0402	T	F8				●	
C634	CHIPCAP X5R 100N K 10V 0402	T	E8				●	
C635	CHIPCAP NP0 27P J 50V 0402	T	F9				●	
C636	CHIPCAP X7R 1N0 K 50V 0402	T	F8				●	
C637	CHIPCAP X5R 100N K 10V 0402	T	G8				●	
C638	CHIPCAP NP0 15P J 50V 0402	T	G7				●	
C639	CHIPCAP NP0 330P G 50V 0603	T	E8				●	
C640	CHIPCAP NP0 3N9 J 25V 0805	T	E8				●	
C641	CHIPCAP NP0 150P J 50V 0402	T	D8				●	
C642	CHIPCAP NP0 100P J 50V 0402	T	G6				●	
C644	CHIPCAP NP0 100P J 50V 0402	T	F8				●	
C645	CHIPCAP X5R 100N K 10V 0402	T	D7				●	
C646	CHIPCAP NP0 27P J 50V 0402	T	D6				●	
C704	CHIPCAP X5R 2U2 K 10V 0805	T	H7				●	
C708	CHIPCAP NP0 33P J 50V 0402	T	H6				●	
C709	CHIPCAP NP0 10P J 50V 0402	T	H8				●	
C711	CHIPCAP X5R 2U2 K 10V 0805	T	J8				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
C727	CHIPCAP NP0 3P3 C 50V 0402	T	H6				●	
C728	CHIPCAP NP0 3P3 C 50V 0402	T	J7				●	
C729	CHIPCAP NP0 1P0 B 50V 0402	T	J6				●	
C730	CHIPCAP NP0 10P J 50V 0402	T	J6				●	
D450	FLASH 2MX16 1.8/1.8V VFBGA44 PBFREE	T	C3				●	
D450	FLASH 2MX16 1.8V/1.8V VFGBA44 PBFREE	T	C3				●	
D450	FLASH 2MX16 1.8V/1.8V VFGBA44 PBFREE	T	C3				●	
F100	SM FUSE F 1.5A 32V ROHS-FREE 0603	T	L4				●	
G600	VCO 3296-3980MHZ 4-BAND Matsushita	T	D8				●	
L100	FERR.BEAD 0R03 42R/100MHZ 3A 0805	T	L4				●	
L260	FERRITE BEAD 0R5 600R/100MHZ 0603	T	G5				●	
L261	FERRITE BEAD 0R5 600R/100MHZ 0603	T	H5				●	
L262	FERRITE BEAD 0R5 600R/100MHZ 0603	T	G5				●	
L263	FERRITE BEAD 0R5 600R/100MHZ 0603	T	I5				●	
L264	FERRITE BEAD 0R5 600R/100MHZ 0603	T	G5				●	
L265	FERRITE BEAD 0R5 600R/100MHZ 0603	T	J2				●	
L300	CHOKE 22U M 0.33A 1R5 3.3X3.3X1.3	T	B7				●	
L301	CHIP COIL 220N J Q8/50MHZ 0603	T	C8				●	
L603	CHIP COIL 10N J Q30/800MHZ 0402	T	G6				●	
L603	CHIP COIL 10N J Q30/800MHZ 0402	T	G6				●	
L604	CHIP COIL 10N J Q30/800MHZ 0402	T	G8				●	
L605	CHIP COIL 3N9 +-0N3 Q28/800M 0402	T	G8				●	
L606	CHIP COIL 15N J Q30/800MHZ 0402	T	G8				●	
L607	CHIP COIL 39N J Q24/800MHZ 0402	T	G8				●	
L608	CHIP COIL 39N J Q24/800MHZ 0402	T	G8				●	
L609	CHIP COIL 27N J Q27/800MHZ 0402	T	H8				●	
L610	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	G7				●	
L612	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	G7				●	
L613	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	G7				●	
L614	CHIP COIL 3N3 +-0N3 Q28/800M 0402	T	C8				●	
L703,	FERR.BEAD 0R03 42R/100MHZ 3A 0805	T	J7				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
N180	AF AMP 0.4W LM4890/NCP2890 PB-FREE	T	E5				●	
N303	DC/DC CONV TK65600 USMD8	T	B8				●	
N306	HALL IC SWITCH SH248CSP VCC	T	E1				●	
N306	HALL IC SWITCH SH248CSP VCC	T	E1				●	
N306	HALL IC SWITCH SH248CSP VCC	T	E1				●	
N600	Mjolner RF ASIC PMB3347 LFLGA80 F7	T	F7				●	
N600	Mjolner RF ASIC PMB3347 LFLGA80 F7 MCT	T	F7				●	
N700	PW AMP FEM GSM900/1800/1900 3.5V	T	I7				●	
R100	NTC RES 0W1 47K J B 4050+-3% 0402	T	C6				●	
R107	CHIPRES 0W06 220K J 0402	T	D5				●	
R108	RES NETWORK 0W03 4X100R J 0804	T	C5				●	
R123	CHIPRES 0W06 100K J 0402	T	K2				●	
R151	RES NETWORK 0W06 2X1K0 J 0404	T	K3				●	
R153	RES NETWORK 0W06 2X1K0 J 0404	T	K4				●	
R154	CHIPRES 0W06 10K J 0402	T	K3				●	
R156	RES NETWORK 0W06 2X2K2 J 0404	T	K3				●	
R157	RES NETWORK 0W06 2X2K2 J 0404	T	K4				●	
R159	CHIPRES 0W06 4K7 J 0402	T	F5				●	
R160	CHIPRES 0W06 4K7 J 0402	T	F5				●	
R161	CHIPRES 0W06 33K J 0402	T	F5				●	
R162	CHIPRES 0W06 33K J 0402	T	F5				●	
R164	CHIPRES 0W06 22K J 0402	T	J4				●	
R165	CHIPRES 0W06 220R J 0402	T	K4				●	
R166	CHIPRES 0W06 220R J 0402	T	K3				●	
R167	RES NETWORK 0W06 2X10R J 0404	T	J4				●	
R168	CHIPRES 0W06 22K J 0402	T	J3				●	
R169	RES NETWORK 0W06 2X2K2 J 0404	T	J3				●	
R171	RES NETWORK 0W06 2X2K2 J 0404	T	J4				●	
R183	RES NETWORK 0W06 2X22R J 0404	T	J4				●	
R200	CHIPRES 0W5 0R22 J 200PPM 1210	T	H5				●	
R202	RES NETWORK 0W03 4X100K J 0804	T	K2				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
R205	CHIPRES 0W06 470R J 0402	T	J3				●	
R206	CHIPRES 0W06 4K7 J 0402	T	J2				●	
R207	CHIPRES 0W06 4K7 J 0402	T	K2				●	
R306	CHIPRES 0W06 56R J 0402	T	K5				●	
R307	CHIPRES 0W06 10K J 0402	T	I2				●	
R313	CHIPRES 0W06 27R J 0402	T	B8				●	
R316	CHIPRES 0W06 10K J 0402	T	C2				●	
R420	CHIPRES 0W06 1K0 J 0402	T	E6				●	
R422	CHIPRES 0W06 27K J 0402	T	G2				●	
R426	CHIPRES 0W06 1K0 J 0402	T	E4				●	
R450	CHIPRES 0W06 4K7 J 0402	T	C4				●	
R603	CHIPRES 0W06 100R J 0402	T	D7				●	
R605	CHIPRES 0W06 22R J 0402	T	F6				●	
R607	CHIPRES 0W06 1K0 J 0402	T	F6				●	
R609	CHIPRES 0W06 2K7 F 0402	T	F6				●	
R610	RES NETWORK 0W06 2X5K6 J 0404	T	F8				●	
R611	RES NETWORK 0W06 2X5K6 J 0404	T	F8				●	
R618	CHIPRES 0W06 5K6 F 0402	T	E8				●	
R619	CHIPRES 0W06 8K2 F 0402	T	D8				●	
R620	CHIPRES 0W06 12K J 0402	T	G6				●	
R623	CHIPRES 0W06 6K8 J 0402	T	E8				●	
R629	CHIPRES 0W06 18K J 0402	T	F6				●	
R637	CHIPRES 0W06 22K J 0402	T	G6				●	
R640	RES NETWORK 0W04 2DB ATT 0404	T	D7				●	
R645	CHIPRES 0W06 82R J 0402	T	G8				●	
R646	CHIPRES 0W06 82R J 0402	T	G7				●	
R647	CHIPRES 0W06 150R J 0402	T	F8				●	
R648	CHIPRES 0W06 150R J 0402	T	F8				●	
R655	CHIPRES 0W06 330R J 0402	T	E8				●	
R657	CHIPRES 0W06 18R J 0402	T	G8				●	
R658	CHIPRES 0W06 18R J 0402	T	G8				●	

Item	Description	Side	XY	EMEA	APAC	CHINA	LTA	NAM
R711	RES NETWORK 0W04 2DB ATT 0404	T	J8				●	
R712	CHIPRES 0W06 100R J 0402	T	I8				●	
R713	CHIPRES JUMPER 0R0 0402	T	I8				●	
R714	RES NETWORK 0W04 2DB ATT 0404	T	H8				●	
R715	CHIPRES 0W06 10R J 0402	T	J7				●	
R716	CHIPRES 0W06 10R J 0402	T	H6				●	
T600	TRANSF BALUN 1800+-100MHZ 2X1.25	T	G7				●	
T601	TRANSF BALUN 3290-3980MHZ	T	D8				●	
V100	TVS DI 1PMT16AT3 16V 175W PWRMITE	T	L5				●	
V300	LED BLUE 75MCD 20MA 90DEG	B	F8				●	
V301	LED BLUE 75MCD 20MA 90DEG	B	F2				●	
V302	LED 360-640 MCD SMD2	B	B6				●	
V303	LED 360-640 MCD SMD2	B	B4				●	
V304	TRX2+RX4 N 4K7/47K SOT666	T	K5				●	
V304	TRX2+RX4 N 4K7/47K SOT666	T	K5				●	
V305	TRX2+RX4 N 4K7/47K SOT666	T	J5				●	
V305	TRX2+RX4 N 4K7/47K SOT666	T	J5				●	
V306	LED BLUE 75MCD 20MA 90DEG	B	M5				●	
X105	SM BATTERY CONN 3POL SPR 12V 2A	T	L7				●	
X302	SM CONN 2X15F P0.5 50V.5A PWB/PWB	T	B5				●	
X700	SM CONN RF 50R 100V 6GHZ STR	T	K9				●	
X900	MODULE ID COMPONENT 2.8X1.8X0.3	T	L3				●	
Z100	CHIP BEAD ARRAY 2X1000R 0405	B	M6				●	
Z101	CHIP BEAD ARRAY 2X1000R 0405	T	M2				●	
Z102	CHIP BEAD ARRAY 2X1000R 0405	T	M4				●	
Z601	SAW FILT 1960+-30MHZ/4DB 2.5X2.0	T	G7				●	
Z602	SAW FILT 881.5+-25MHZ/3DB 2.5X2.0	T	G6				●	
Z603	SAW FILT 836.5+-12.5MHZ/2.5DB2520	T	G8				●	

Component Layouts RH-53/54

Figure 3:RH-53/54 layout, top

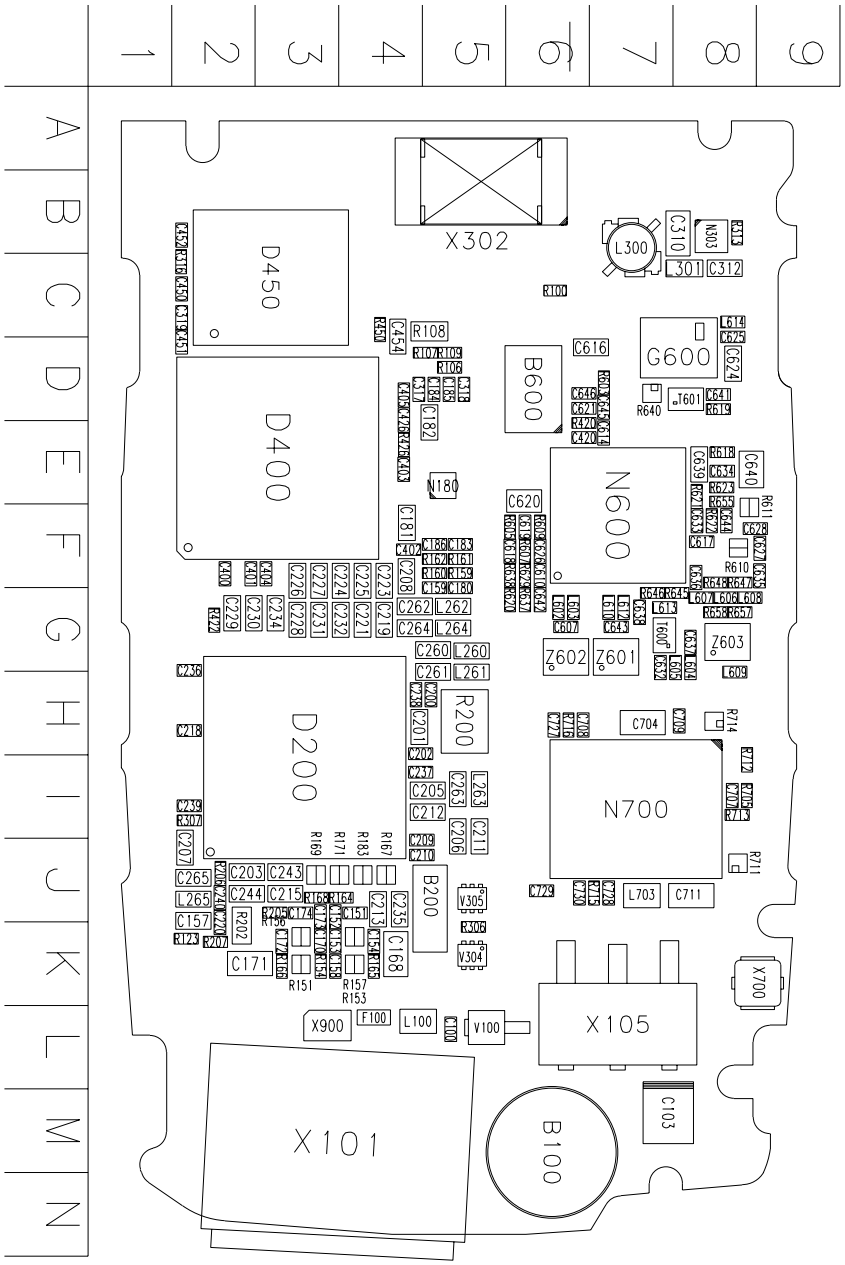
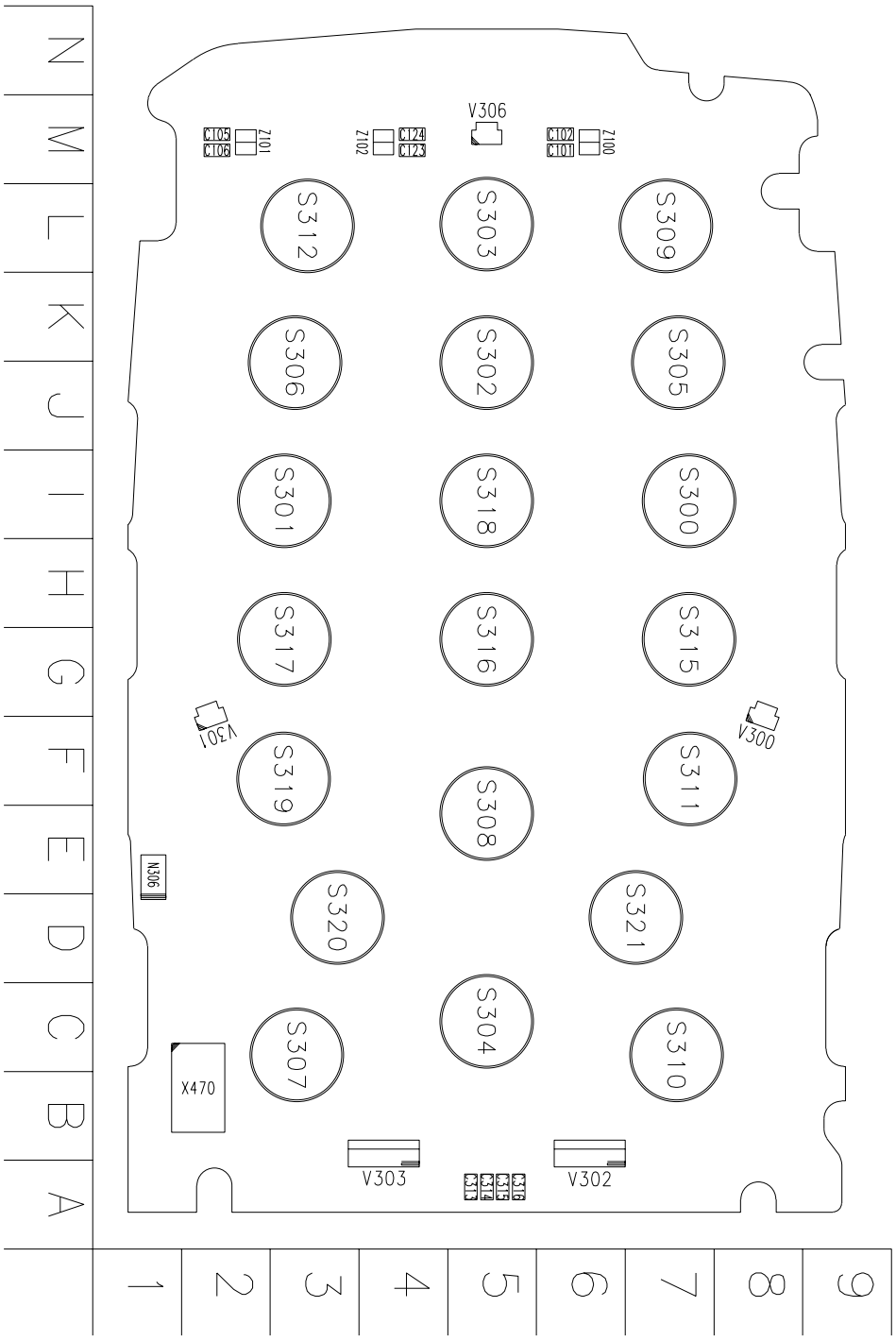


Figure 4:RH-53/54 layout, bottom



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Nokia Customer Care
RH-75 Series Cellular Phones

Service Software Instructions

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Quick guide for Phoenix Service SW installation

Phoenix installation steps in brief

These are the basic steps to install the Phoenix

- Connect a DK2 dongle or FLS-4S POS Flash Device
- Install the Phoenix Service SW
- Install the data package for Phoenix
- Configure users
- Manage connection settings (depends on the tools you are using)
- Phoenix is now ready for FLS-4S Point Of Sales flash device use.
- If you use FPS-8:
  - Update FPS-8 SW
  - Activate FPS-8
  - Update JBV-1 docking station SW (only when needed)

Phoenix is now ready to be used also with FPS-8 flash prommer and other tools.

The Phoenix Service Software installation contains:

- Service software support for all phone models included in the package
- Flash update package files for FPS-8* and FLS-4S programming devices
- All needed drivers for:
  - DK2 dongle
  - FLS-4S point of sales flash device
  - USB devices

Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless updates appear between Phoenix Service SW 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

Please refer to Service Manual and Technical Bulletins for more information concerning phone model specific service tools and equipment setup.

Phoenix Service SW

Note: File names and screen shots are examples only. The name and the type designator may not be correct.

Before installation

- Check that a Dongle is attached to the parallel port of your computer.
- Download the installation package (e.g. *phoenix_service_sw_a10_2003_33_5_22.exe*) to your computer (e.g. C:\TEMP).
- Close all other programs.
- Run the application file (e.g. *phoenix_service_sw_a10_2003_33_5_22.exe*) and follow instructions on the screen.
- Administrator rights may be required to be able to install Phoenix depending on the Operating System.
- If uninstalling or rebooting is needed at any point, you will be prompted by the Install Shield program.

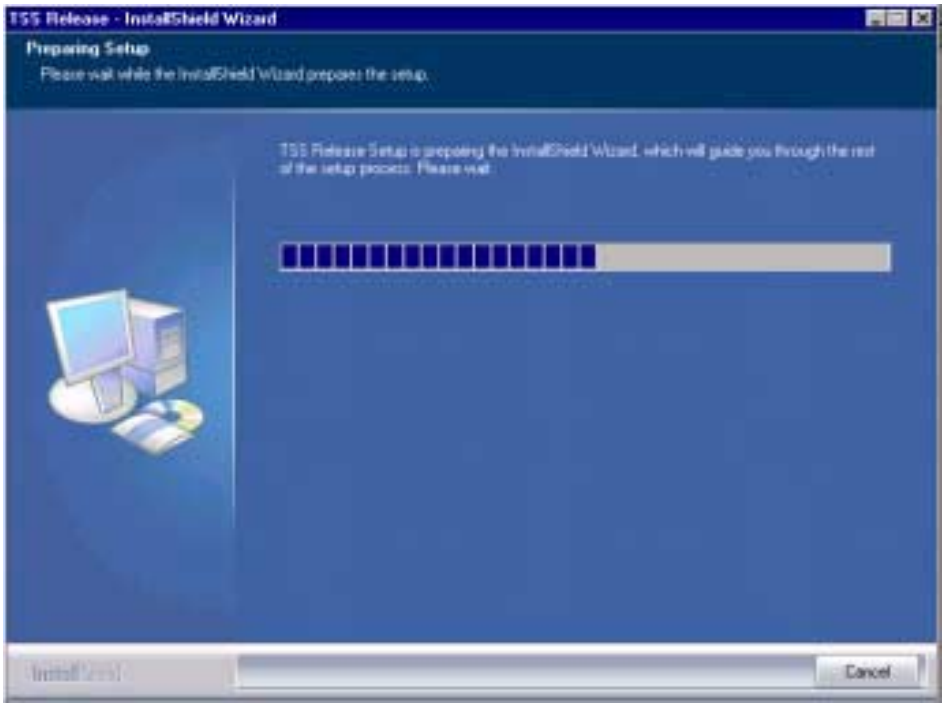
If at any point during installation you get this message, Dongle is not found and installation can´t continue.

Possible reasons may be defective or too old PKD-1Dongle (five digit serial number Dongle when used with FPS-8 Prommer) or that the FLS-4S POS Flash Dongle is defective or power to it is not supplied by external charger.

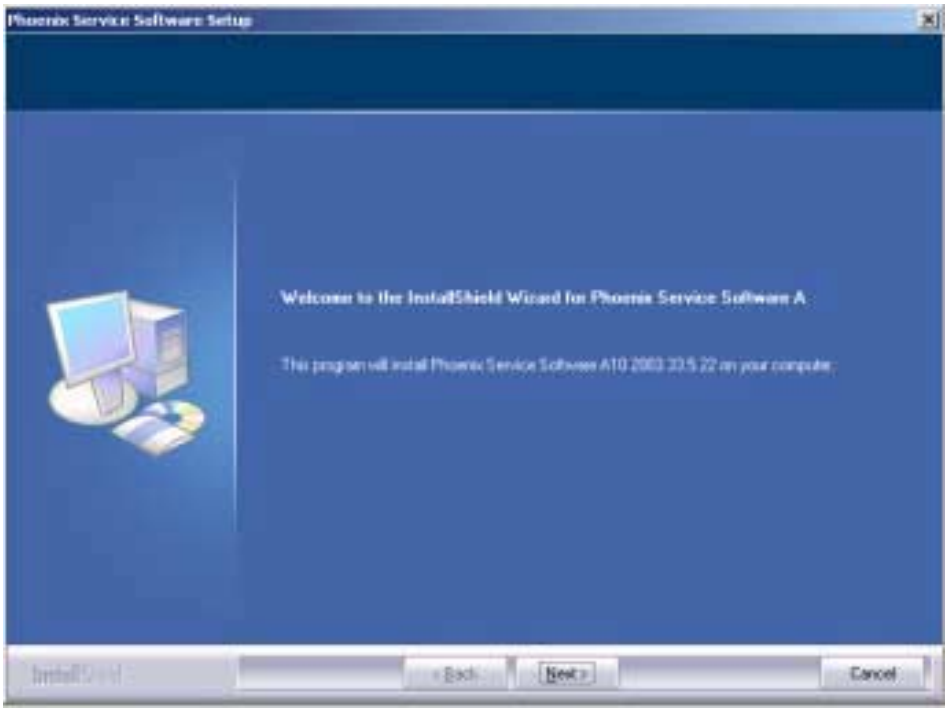
Check the COM /parallel ports used first! After correcting the problem Installation can be restarted.

Startup

Run the *phoenix_service_sw_a10_2003_33_5_22.exe* to start installation. Install Shield will prepare.

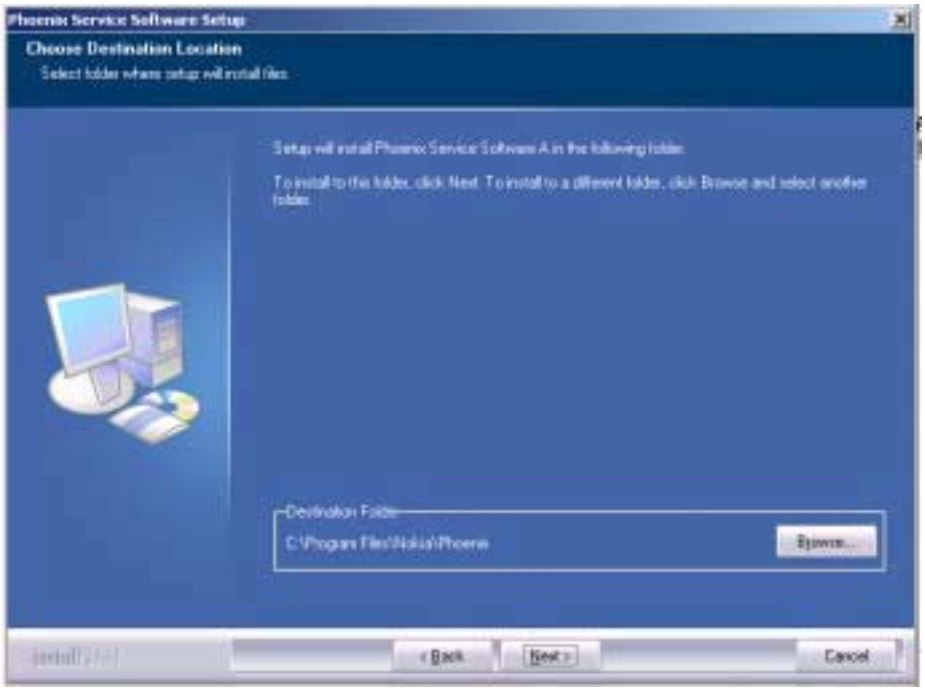


Click "Next" in Welcome dialog to continue.

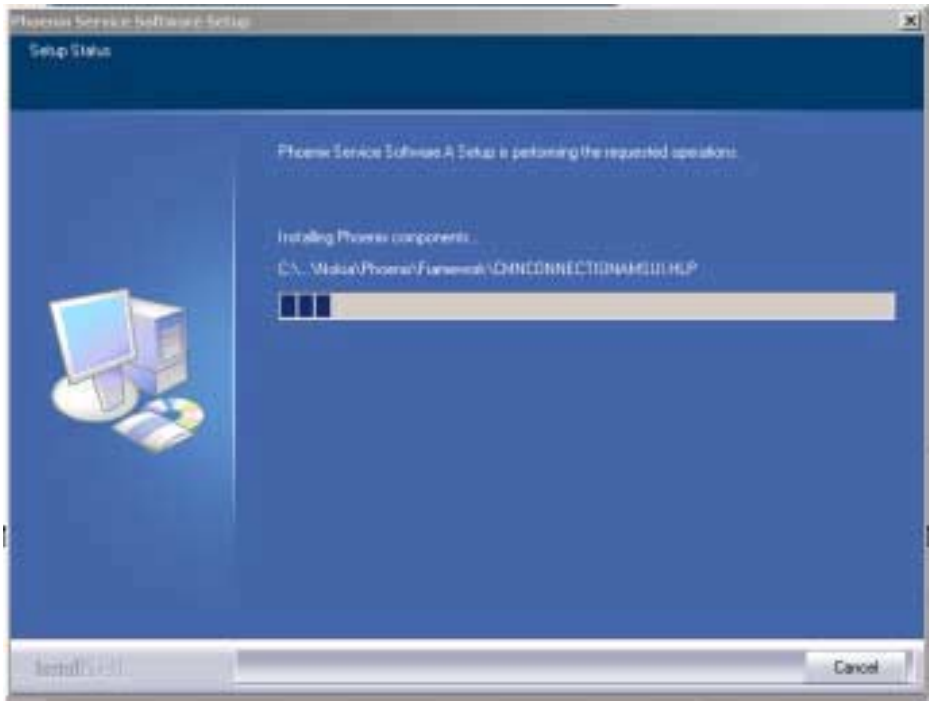


Choose destination folder, it is recommended to use the default folder *C:\Program-Files\Nokia\Phoenix*.

Choose “Next” to continue. You may choose another location by selecting “Browse” (not recommended)

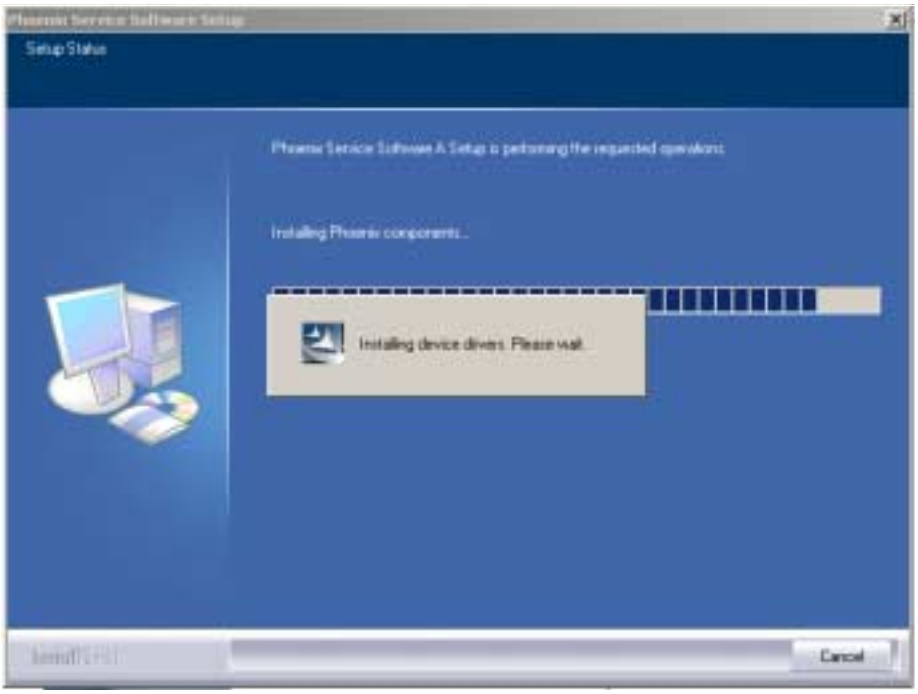


Setup copies the components, progress of the setup is shown. Please wait.

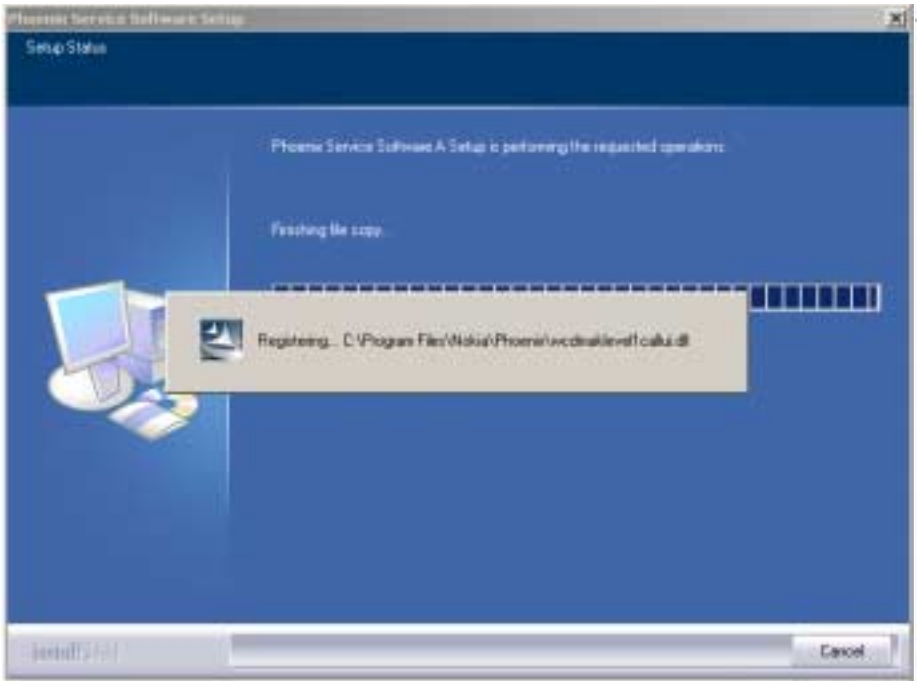


Drivers will be installed and updated, please wait.. the process may take several minutes

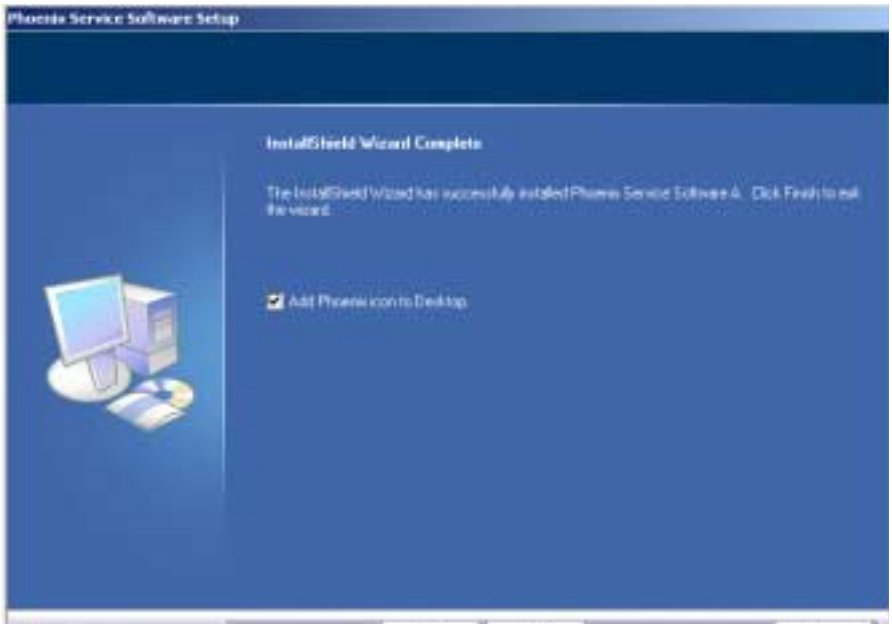
to complete.



If the operating system does not require rebooting (Windows 2000, XP) the PC components are registered right away.



Click "Finish" to finalize. Phoenix is ready for use.



If the operating system used requires restarting your computer (Windows 98, SE, ME) the Install Shield Wizard will tell you about it. Select "Yes..." to reboot the PC immediately and "No..." to reboot the PC manually afterwards.

After the reboot components are registered and Phoenix is ready for use. Note that Phoenix doesn't work, if components are not registered.

Now the installation of Phoenix Service SW is ready and it can be used after:

- installing Phone model specific Phone Data Package for Phoenix
- configuring users and connections

FLS-4S can be used right away.

FPS-8* can be used after updating Flash Update Package files to it.

If reboot is not needed components are registered after copying them.

If restarting of your computer is not needed, Click "Finish" to exit the setup.

Phoenix is now ready for use.

Now the installation of Phoenix Service SW is ready and it can be used after:

- installing Phone model specific Phone Data Package for Phoenix
- configuring the connections
- updating the Flash Update Package files used with FPS-8* and FLS-4S* tools

Update installation of Phoenix

If you already have the Phoenix Service SW installed on your computer, sooner or later there will be need to update it when new versions are released.

Always use the latest available versions of both the Phoenix Service SW and the Phone Specific Data Package . Instructions can be found in phone model specific Technical Bulletins and Phone data package readme.txt files (shown during installation).

To update the Phoenix you need to take exactly the same steps as when installing it for the first time.

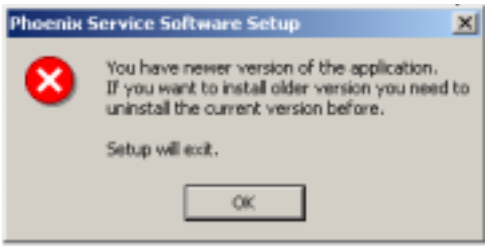
- Download the installation package to your computer hard disk.
- Close all other programs.
- Run the application file (e.g. ***phoenix_service_sw_a10_2003_33_5_22.exe***).
- Newer version of Phoenix will be installed.
- Driver versions are checked and updated if necessary.

When you update the Phoenix from old to new version (e.g. update from 2003_9_2_3 to 2003_33_5_22), the update will take place automatically without uninstallation.

f you try to update the Phoenix with the same version that you already have (e.g. *a10_2003_33_5_22* to *a10_2003_33_5_22*) you are asked if you want to uninstall the version of Phoenix you have on your PC.

In this case you can choose between total uninstallation and repair just like when you choose to uninstall Phoenix service software from the Windows control panel.

If you try to install an older version (e.g. downgrade from *a11_2003_41_1_24* to *a10_2003_33_5_22* installation will be interrupted.



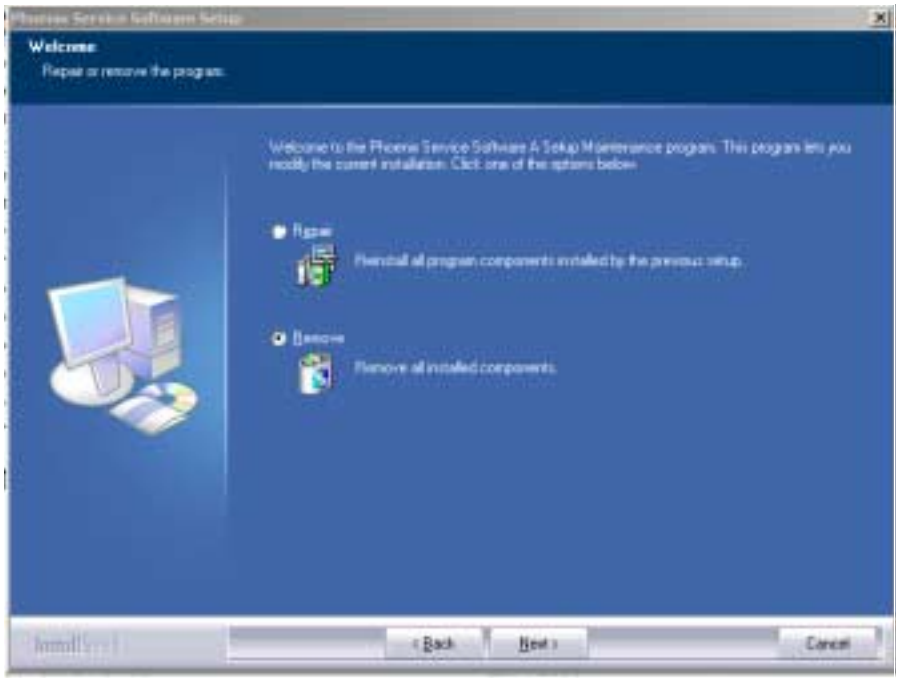
Always follow the instructions on the screen.

Uninstalling Phoenix

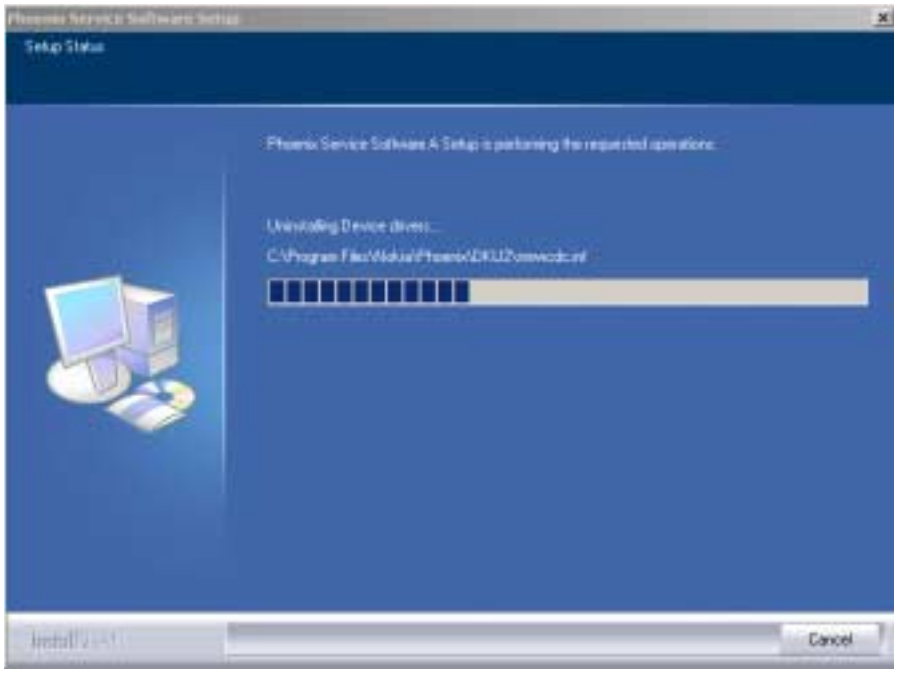
Uninstallation can be done manually from Windows Control Panel - Add / Remove Programs.

Choose “Phoenix Service Software” and click "Add/Remove".

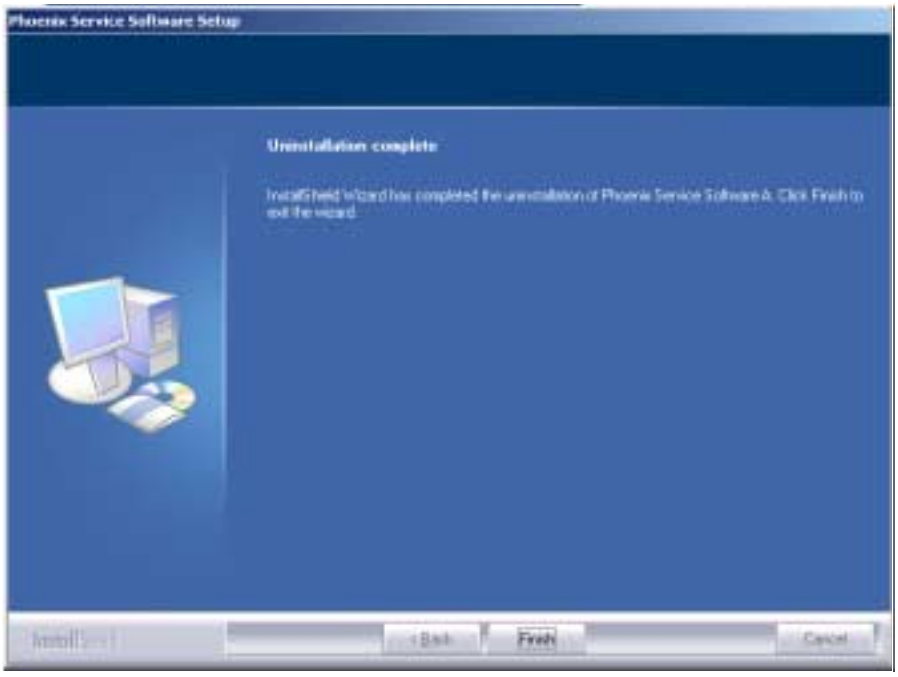
Choose “Remove” to uninstall



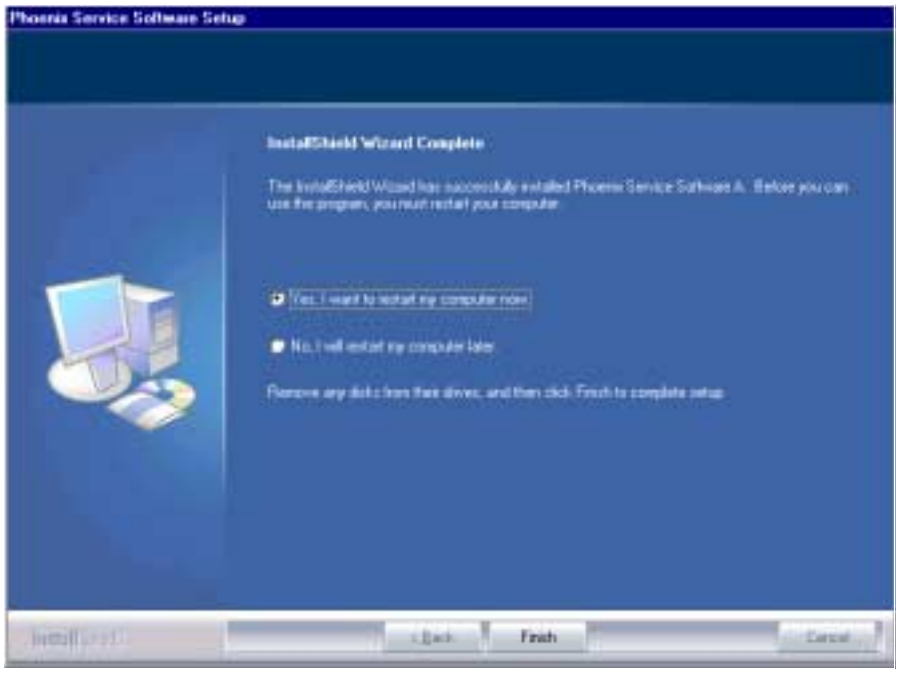
Progress of the uninstallation is shown.



If the operating system does not require rebooting, select “Finish” to complete.



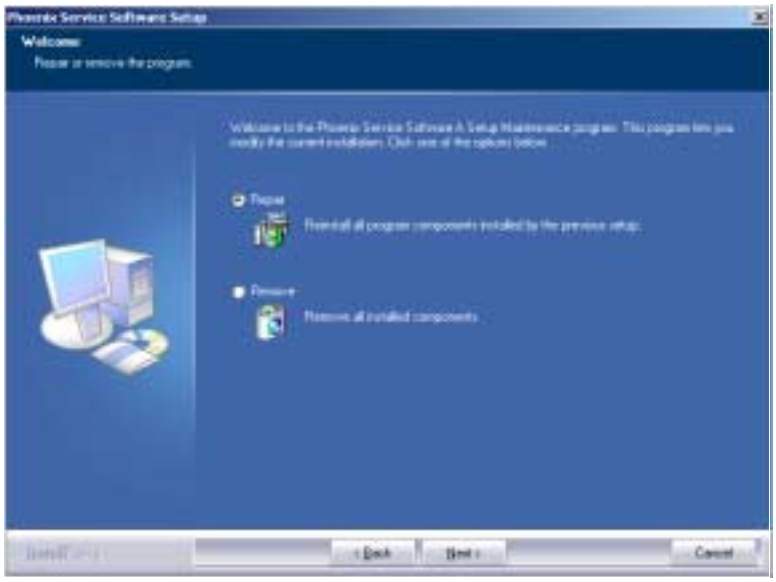
If the operating system used requires rebooting, Install Shield Wizard will tell you about it. Select "Yes..." to reboot the PC immediately and "No..." to reboot the PC manually afterwards.



Repair

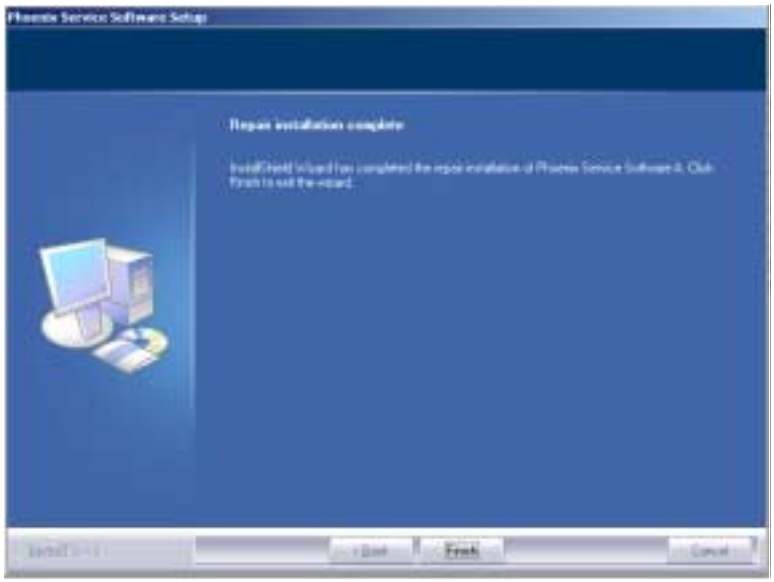
If you experience any problems with service software or suspect that files have been lost, you can use the repair – function before completely reinstalling Phoenix. Note that the original installation package (e.g. *phoenix_service_sw_a10_2003_33_5_22.exe)* must be found on your PC when you run the repair setup.

Run Windows Control Panel - Add / Remove Programs, choose “Phoenix Service Software” and click "Add/Remove". In the following view choose “Repair”.



Phoenix will reinstall components and register them, procedure is the same as in update installation.

Choose “Finish” to complete.



Data package for Phoenix (product specific)

Before installation

Product data package contains all product specific data to make the Phoenix Service Software and tools usable with a certain phone model.

It also includes the latest version of flash update package for FLS-4S* and FPS-8*.

- Check that the dongle is attached to the parallel port of your computer.
- Install Phoenix Service SW.
- Download the installation package (e.g. *RH-18_dp_v_XX_XX_MCUSWx_xx.exe*) to your computer (e.g. C:\TEMP).
- Close all other programs.
- Run the application file (e.g. *RH-18_dp_v_XX_XX_MCUSWx_xx.exe*) and follow instructions on the screen.

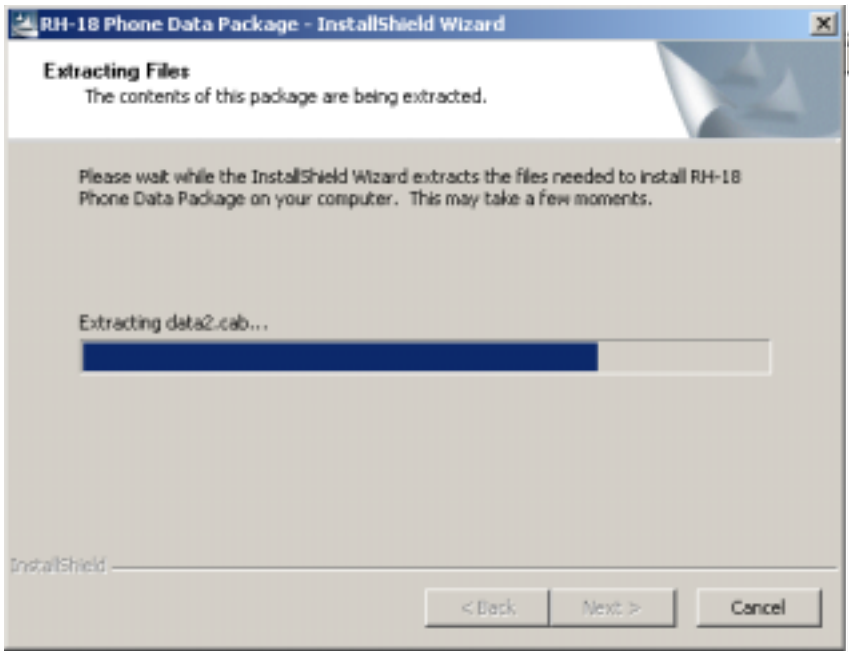
Please note that very often the Phoenix Service SW and the Phone Specific Data Package for Phoenix come in pairs, meaning that certain version of Phoenix can only be used with certain version of Data Package.

Always use the latest available versions of both. Instructions can be found in phone model specific Technical Bulletins and readme.txt – files of the data packages.

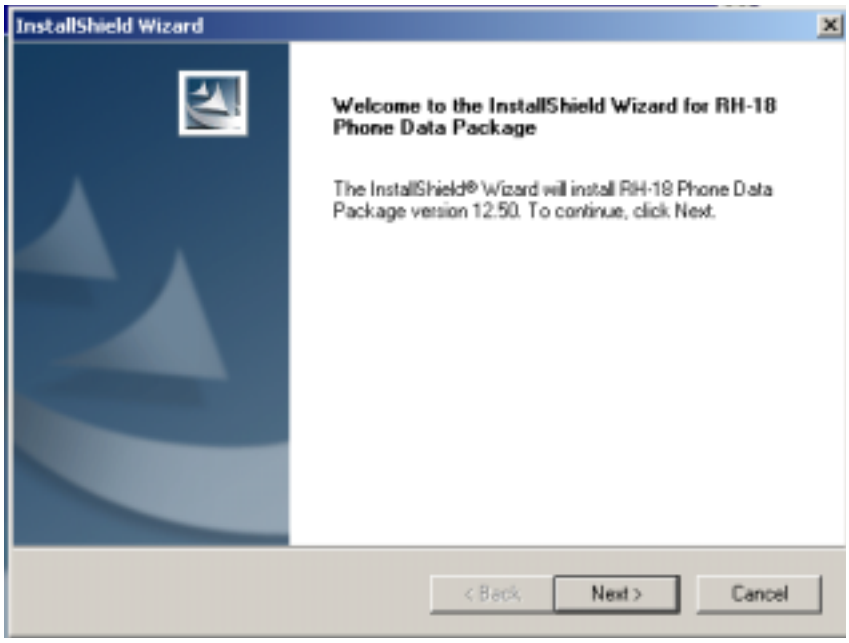
Installing Phoenix data package (product specific)

Run the *RH-18_dp_v_XX_XX_MCUSWx_xx.exe* to start installation.

When you choose “Next” the files needed for installation will be extracted. Please wait.



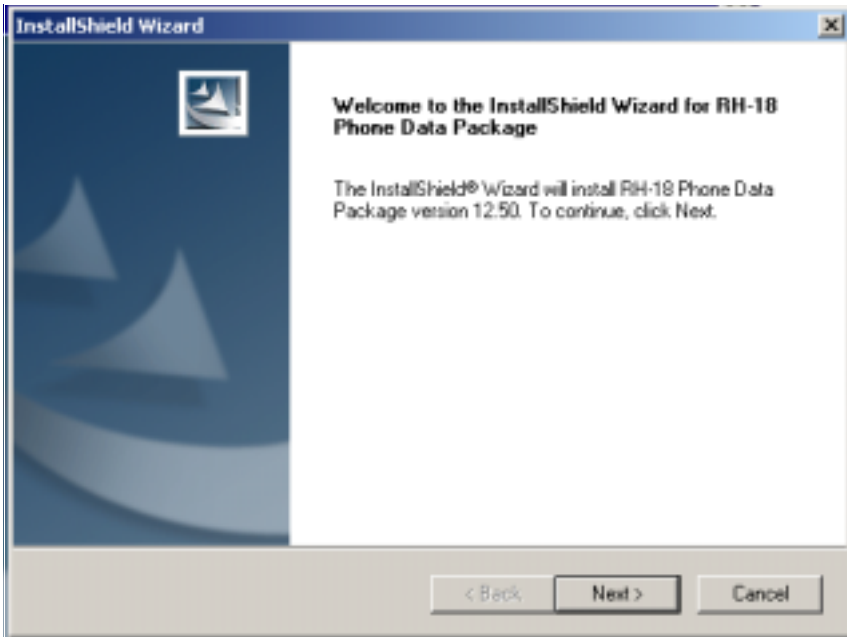
Choose “Next” to continue.



From this view you can see the contents of the Data Package.

Read the text carefully.

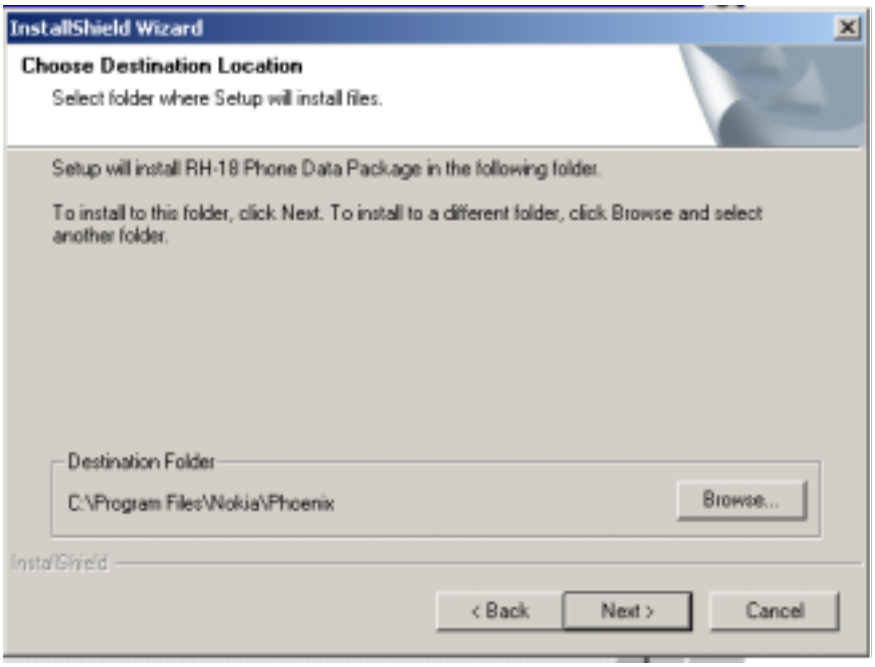
There should be information about the Phoenix version needed with this data package. Choose “Next”.



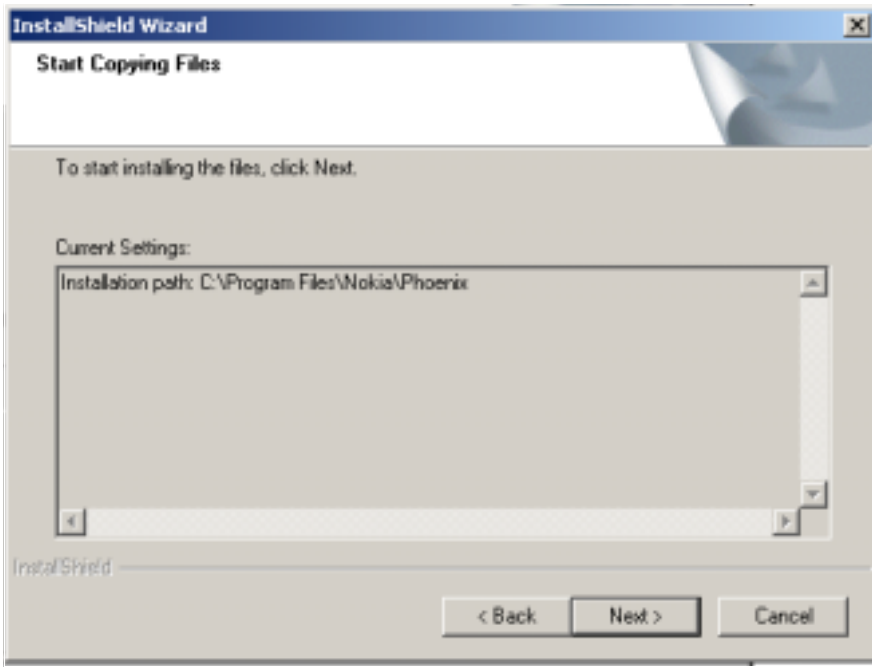
Confirm location and choose “Next” to continue.

Install Shield checks where the Phoenix application is installed and the directory is

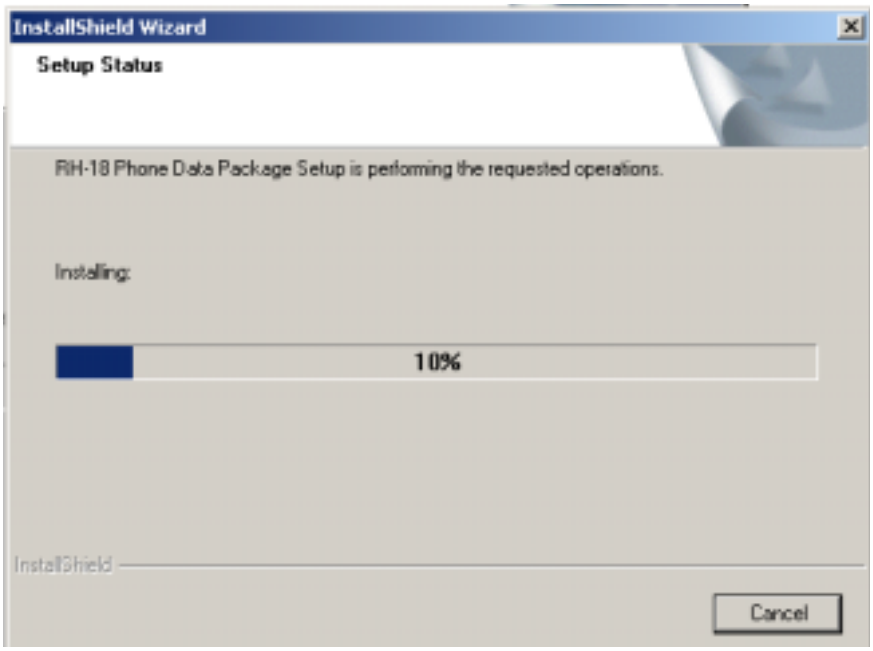
shown. Choose “Next” to continue.



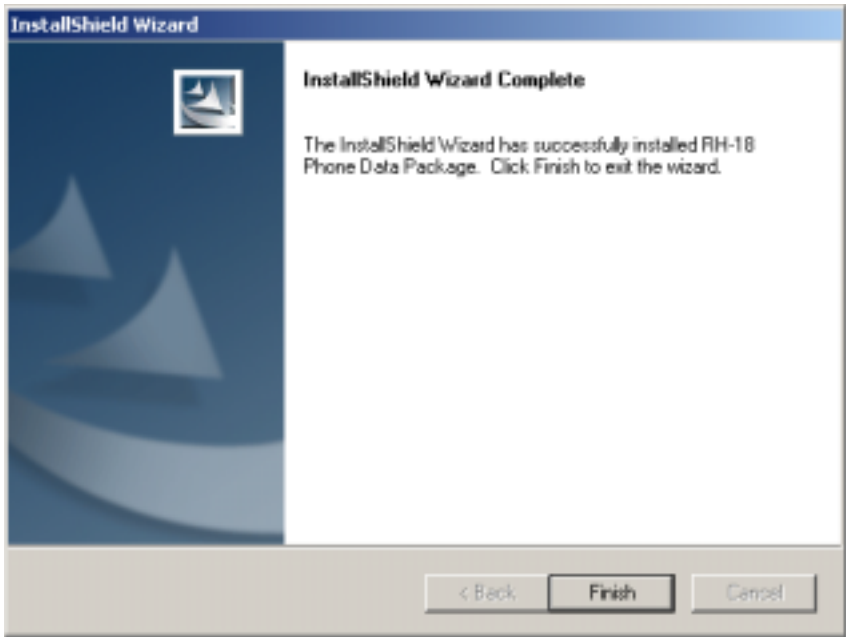
Choose “Next” to start copying the files.



Phone model specific files will be installed. Please wait.



Choose “Finish” to complete installation.



You now have all phone model specific files installed in your Phoenix Service SW.

Now Phoenix can be used to for example flash phones and print type labels after:

- configuring users
- managing connections

FLS-4S can be used right away.

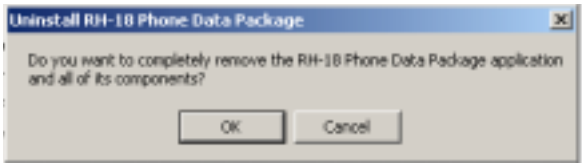
FPS-8* can be used after updating Flash Update Package files to it.

Uninstalling Phoenix data package

Uninstallation can also be done manually from Windows Control Panel / Add / Remove Programs/“RH-18 Phone Data Package”.

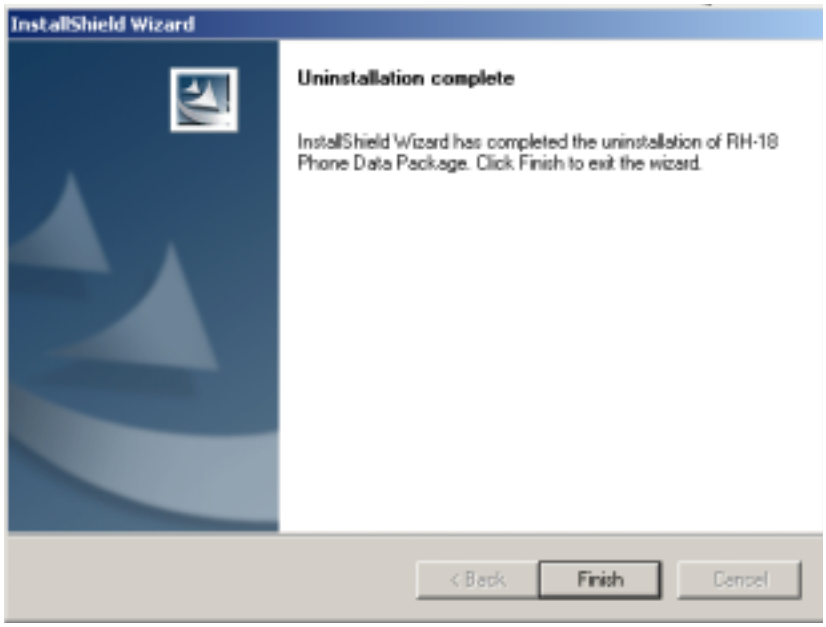
If you try to install the same version of Phoenix data package that you already have, you are asked if you want to uninstall the version you have on your PC.

Answer “OK” to uninstall, “Cancel” if you don’t want to uninstall. Older versions of data packages do not need to be uninstalled.



Older versions of data packages don´t need to be uninstalled unless instructions to do so are given in the readme.txt of the data package and bulletins concerning the release. Please read all related documents carefully.

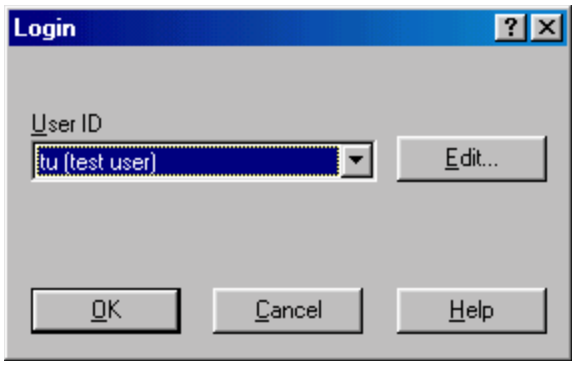
Once the previously installed Data package is uninstalled, choose “Finish”.



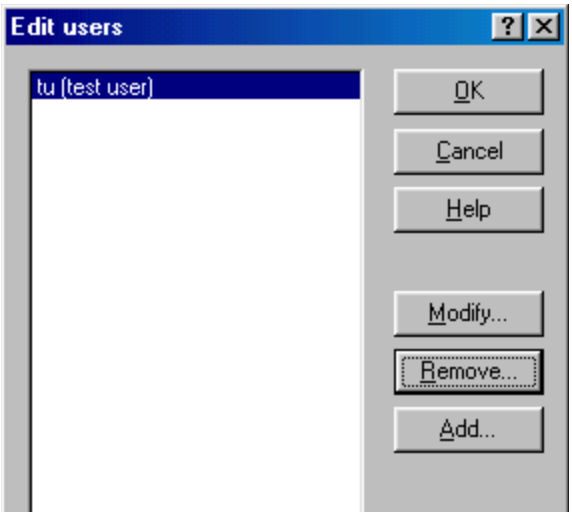
Run the *RH-18_dp_v_XX_XX_MCUSWx_xx.exe* again to continue installation from the beginning.

Configuring users

Start Phoenix Service SW and Login. To add new user choose “Edit”. If user ID is already configured, choose your own user ID from the list and choose “OK”.

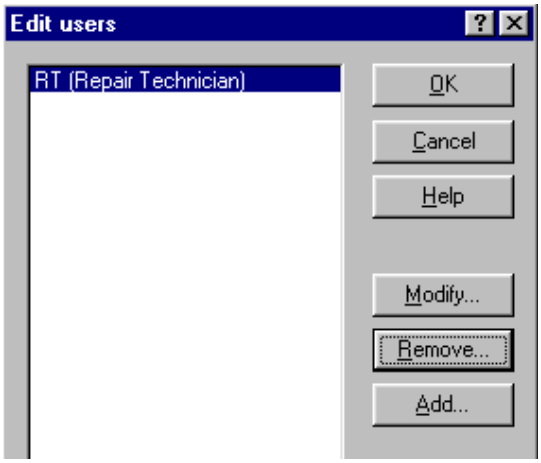


Choose “Add ” to continue.



Type in your name and Initials to fields and choose “OK”.

User has now been created, choose “OK”..

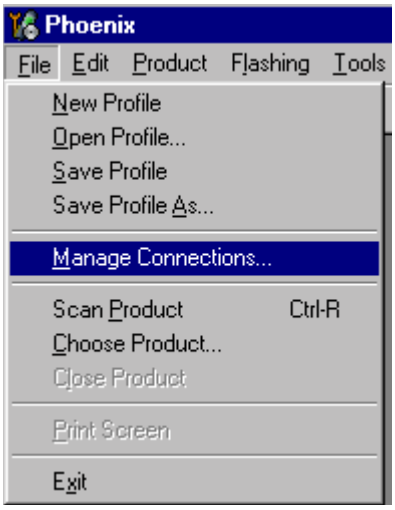


You are now able to login with this user name, choose “OK”.

Managing connections

Start Phoenix Service SW and Login.

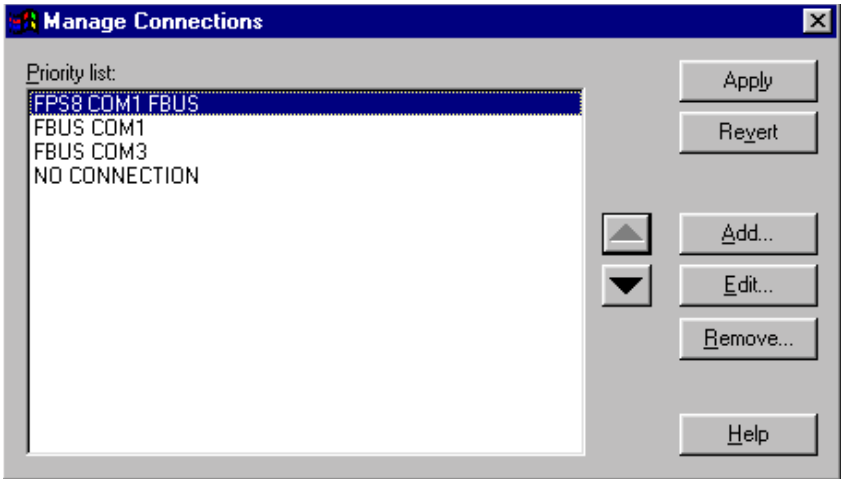
Choose “Manage Connections” From “File” – Menu



Existing connections can be selected , edited, deleted and new ones created by using this dialog.

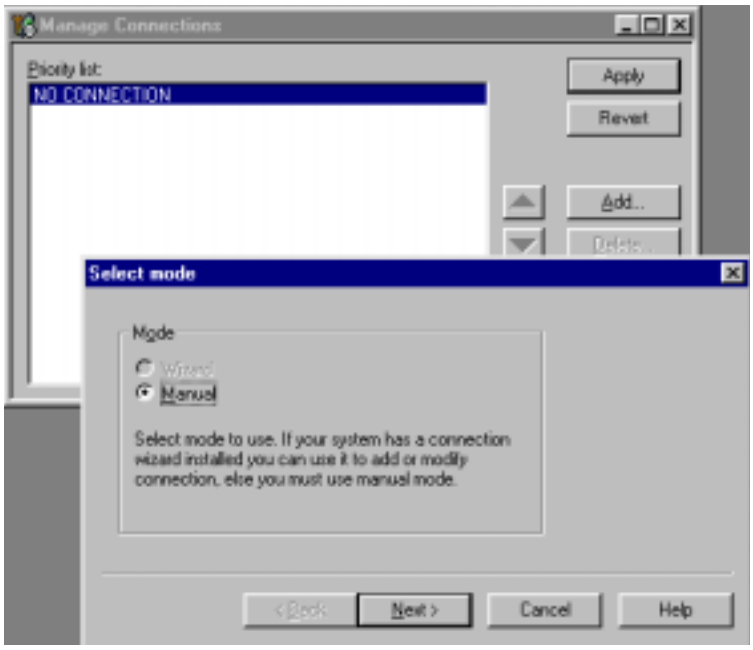
A connection can be created either manually or by using a Connection Wizard.

To add new connection, choose “Add” and select if you want to create it manually or by using the Wizard.



Choose “Next” to continue.

In the next dialogs you will be asked to select some settings for the connection.



Manual settings

A) For FLS-4S POS Flash Device choose following connection settings:

Media: FBUS

COM Port: Virtual COM Port used by FLS-4S. Please check this always!

(To check please go to Windows / Control Panel / FLS Virtual Port / Configuration)

(To check please go to Windows / Control Panel / FLS Virtual Port / Configuration)

B) For FPS-8 Flash Prommer choose following connection settings:

Media: FPS-8

Port Num: COM Port where FPS-8 is connected

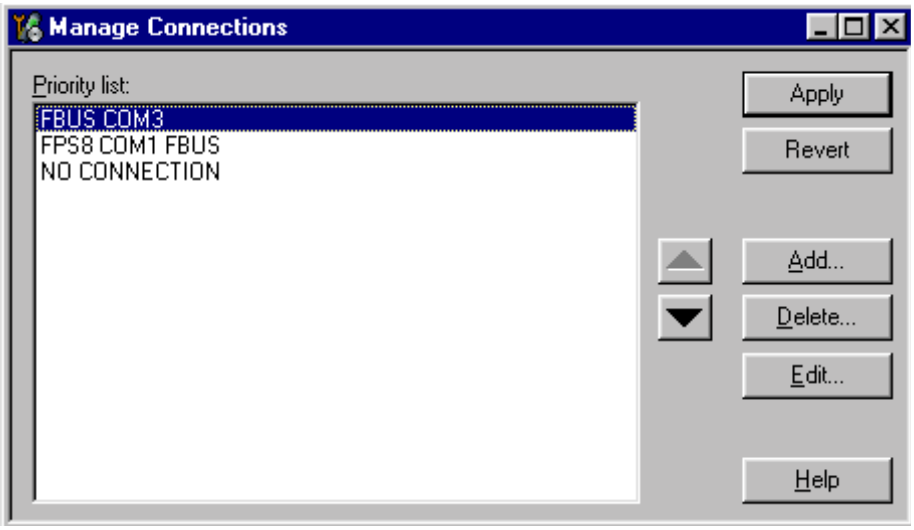
COMBOX_DEF_MEDIA: FBUS

Choose “Finish” to complete.

If you use the Wizard, connect the tools and a phone to your PC and the wizard will automatically try to configure the correct connection.

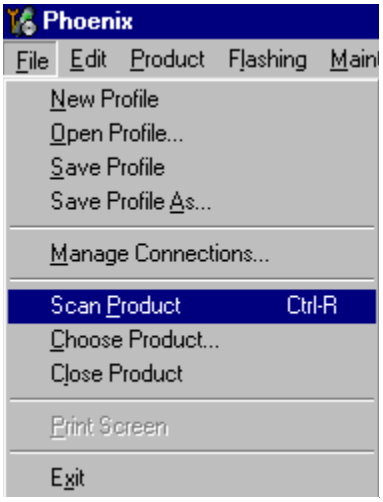
Activate the connection you want to use by clicking it and use up/down arrows to move it on top of the list. Choose “Apply”.

The connection is now selected and can be used after closing the “Manage Connections” window.



Selected connection will be shown on the right hand bottom corner of the screen.

To use the selected connection, connect the phone to Phoenix with correct service tools, make sure that it is switched on and select “Scan Product”.



When the Product is found, Phoenix will load product support and when everything is ready, name of the loaded product support module and its version will be shown on the bottom of the screen.

Updating flash support files for FPS-8* and FLS-4S*

Before installation

Install Phoenix Service SW

Install phone model specific data package for Phoenix

The flash support files are delivered in the same installation package with Phoenix data packages or newer Phoenix packages beginning from September 2003.

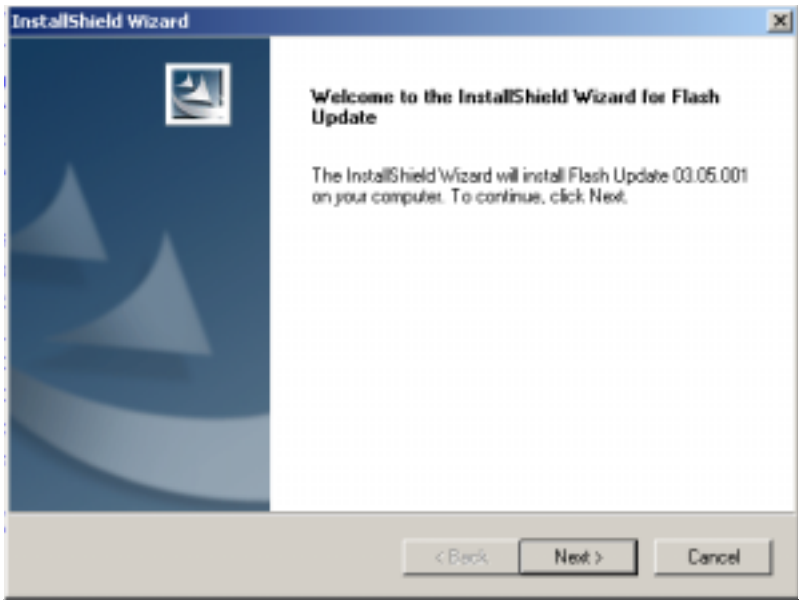
Normally it is enough to install the Phoenix and phone data package only because the Phoenix installation always includes the latest flash update package files for FLS-4S / FPS-8*.

Separate installation package is for flash support files is available, and the files can be updated according to this instruction if updates appear between Phoenix / data package releases.

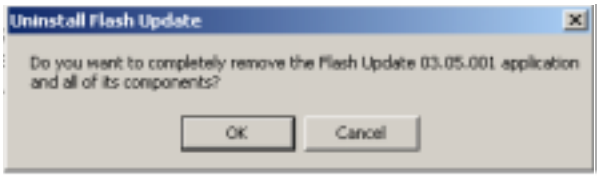
Installing flash support files

If you are not using separate installation package, you can skip this section and continue from the next section after installing a new phone data package.

Start by double clicking *flash_update_03_05_001.exe*. Installation begins.

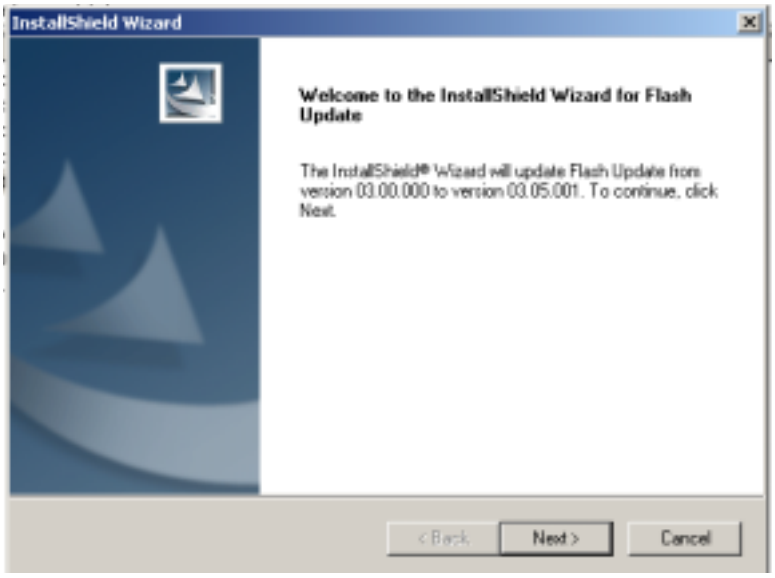


If the same version of Flash Update package already exists, and you want to reinstall them, the previous package is first uninstalled. Restart installation again after that..



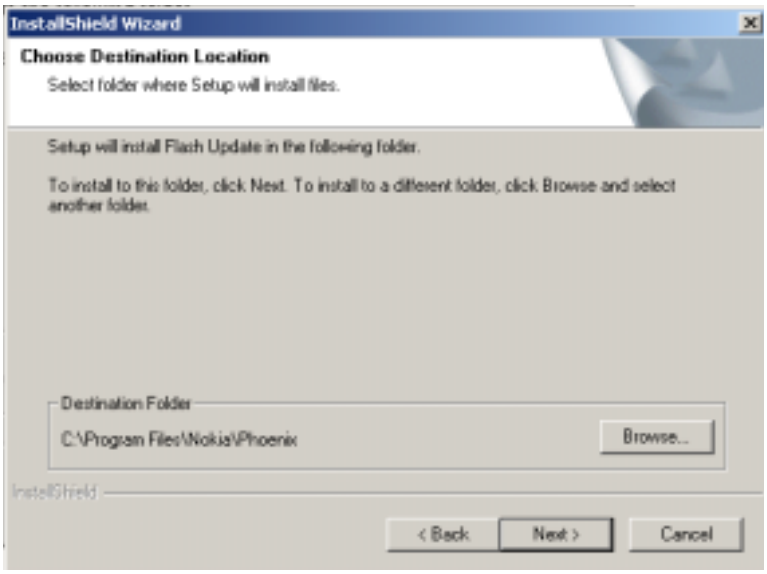
If you try to downgrade the existing version to older ones, the setup will be aborted. If you really want to downgrade, uninstall newer files manually from Control Panel and then re run the installation again.

If an older version exists on your PC and it needs to be updated, Choose “Next” to continue installation.

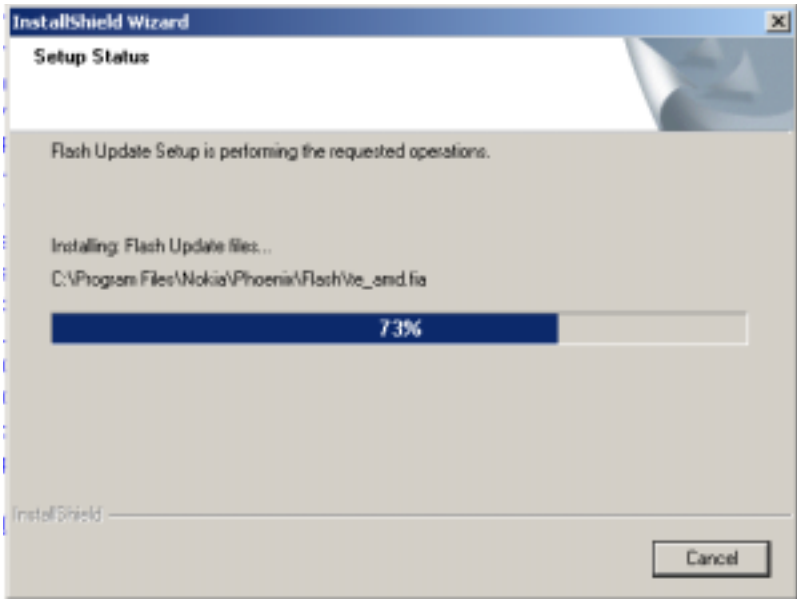


It is highly recommended to install the files to the default destination folder *C:\Program Files\Nokia\Phoenix*.

Choose “Next” to continue. You may choose another location by selecting “Browse” (not recommended).

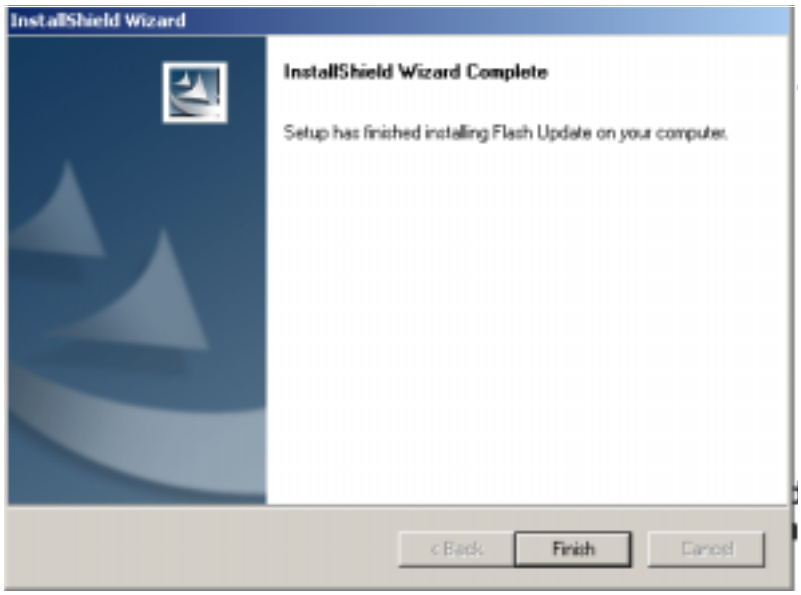


Installation continues...



Choose “Finish” to complete procedure.

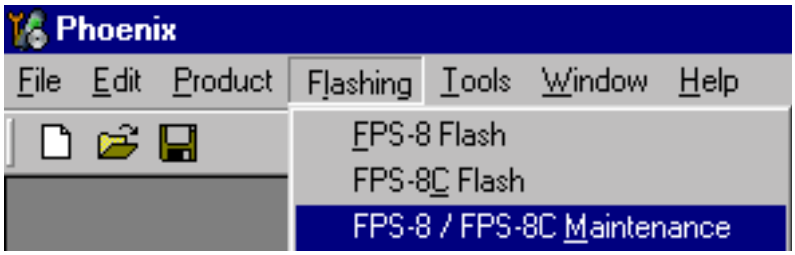
- FLS-4S can be used right after Flash Update Package is installed.
- FPS-8* must be updated by using Phoenix!



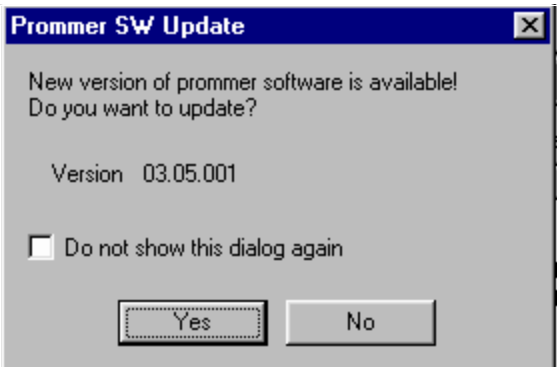
Updating the FPS-8* flash prommer SW

Start Phoenix Service Software

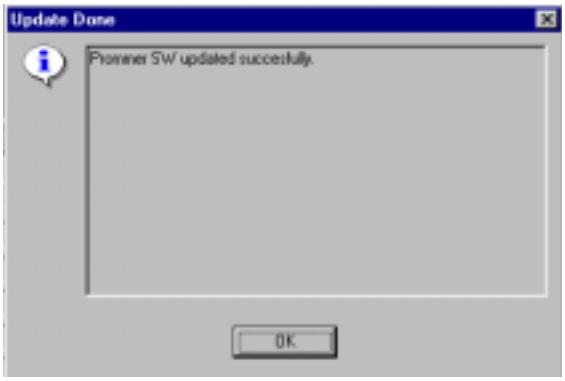
Select"FPS-8 / FPS-8C maintenance" from"Flashing" menu.



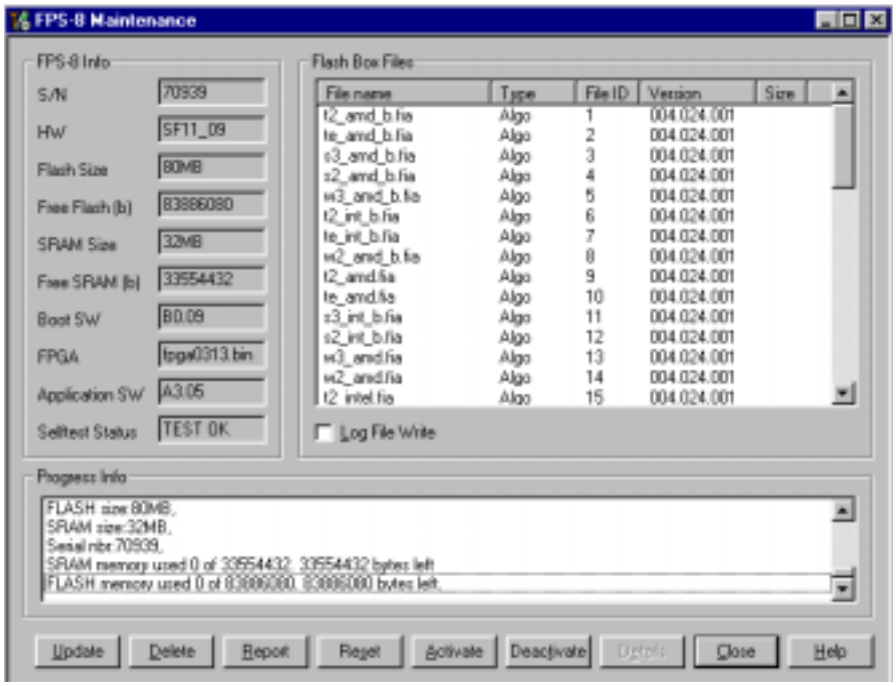
When new FPS-8 flash update package is installed to computer you will be asked to update the files to your FPS-8 prommer. Select"Yes" to update files..



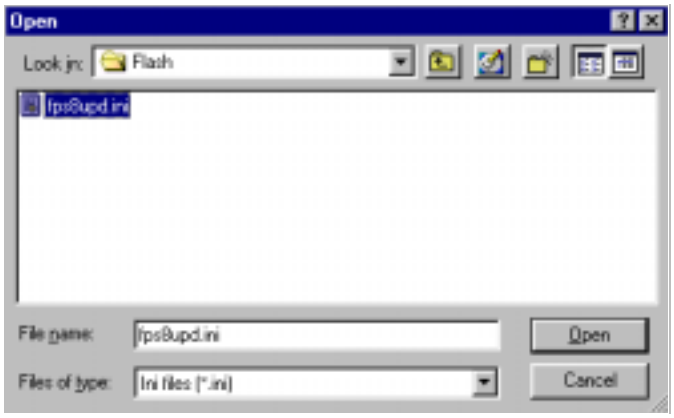
Update procedure takes a couple of minutes, please wait until you are notified that update has been successful. Choose "OK" and close "FPS8 Maintenance" – UI. .



View after successful prommer software update



FPS-8 sw can also be updated by pressing"Update" button and selecting appropriate fps8upd.ini file under *C:\Program Files\Nokia\Phoenix*\Flash - directory



All files can be loaded separately to FPS-8. To do this, just press right mouse button in Flash box files" window and select file type to be loaded.

More information and help can be found from the "Help" dialog.

FPS-8 activation and deactivation

- Before the FPS-8 can be successfully used for phone programming, it must be first activated.
- If there is a need to send FPS-8 box to somewhere e.g. for repair, box must be first deactivated.

Activation

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

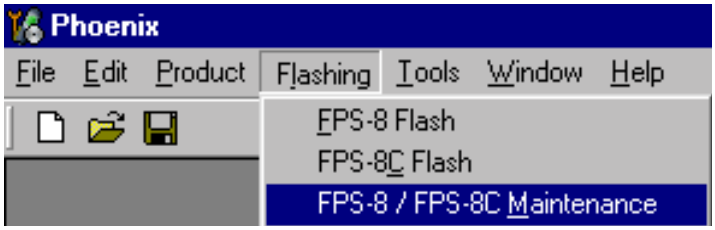
Fill in first “FPS-8 activation request” sheet, in the FPS-8 sales package and follow the instructions in the sheet.

When activation file is received (e.g. 00000.in), copy it to ***C:\Program-Files\Nokia\Phoenix\BoxActivation -*** Directory on your computer

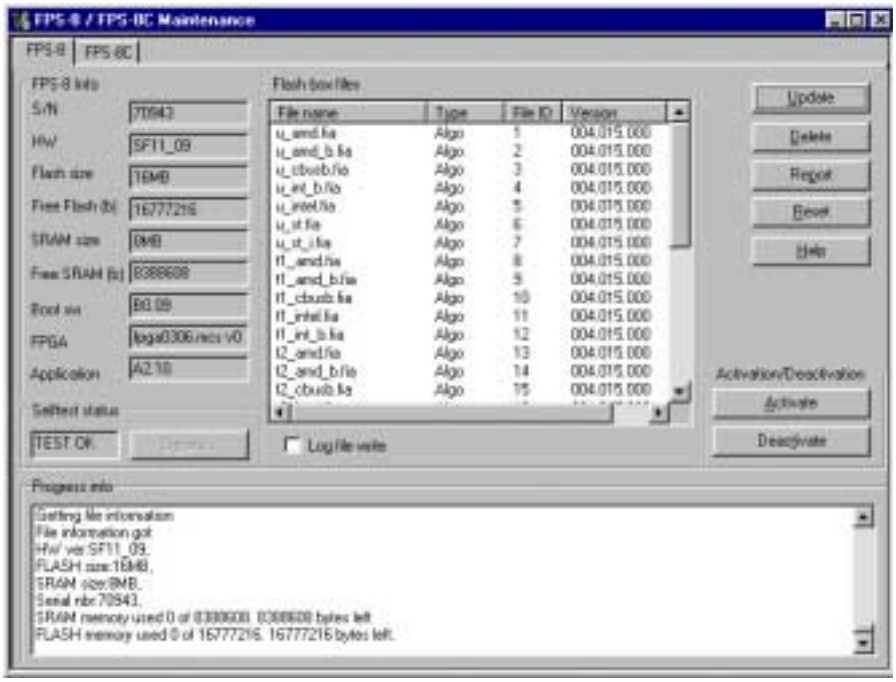
(This directory is created when Phoenix is installed).

Start Phoenix Service Software.

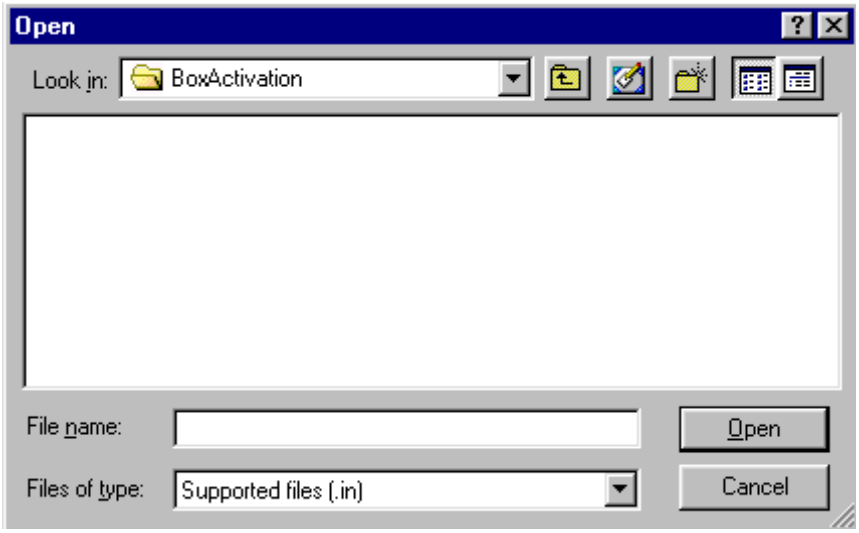
Select ”FPS-8 / FPS-8C maintenance” from ”Flashing” menu.



Select “Activate” from the “FPS8/8C Maintenance” – UI.



The activation file you saved to *C:\ProgramFiles\Nokia\Phoenix\BoxActivation* - directory will be shown (e.g. 00000.in), check that it is correct.



Box will be activated when you choose “Open”.

Turn FPS-8 power off and on to complete activation.

Deactivation

Start Phoenix Service Software.

Select ”FPS-8 / FPS-8C maintenance” from ”Flashing” menu.

Select “Deactivate” from the “FPS8/8C Maintenance” – UI.

Confirm Deactivation by choosing “Yes”, Box will be deactivated.

Turn FPS-8 power off and on to complete deactivation.

JBV-1 docking station SW

The JBV-1 docking station is a common tool for all DCT-4 generation products. In order to make the JBV-1 usable with different phone models, a phone specific docking station Adapter is used for different service functions.

The JBV-1 docking station contains software (firmware) which can be updated.

You need the following equipment to be able to update JBV-1 software:

- PC with USB connection
- Operating system supporting USB (Not Win 95 or NT)
- USB cable (can be purchased from shops or suppliers providing PC hardware and accessories)
- JBV-1 docking station
- External power supply 11-16V

Before installation

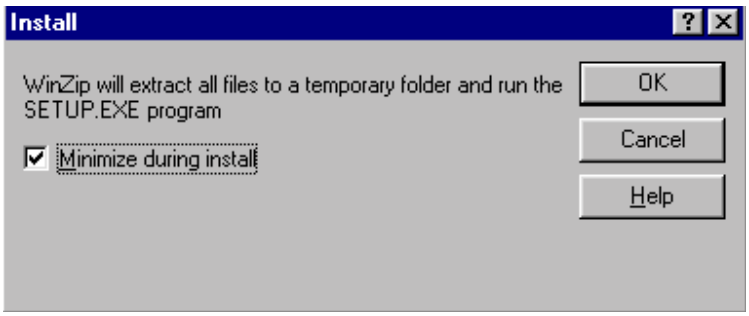
- Download *Jbv1_update.zip* – file to your computer (e.g. C:\TEMP) from your download web site.
- Close all other programs
- Follow instructions on the screen

Installing SW needed for the JBV-1 SW update

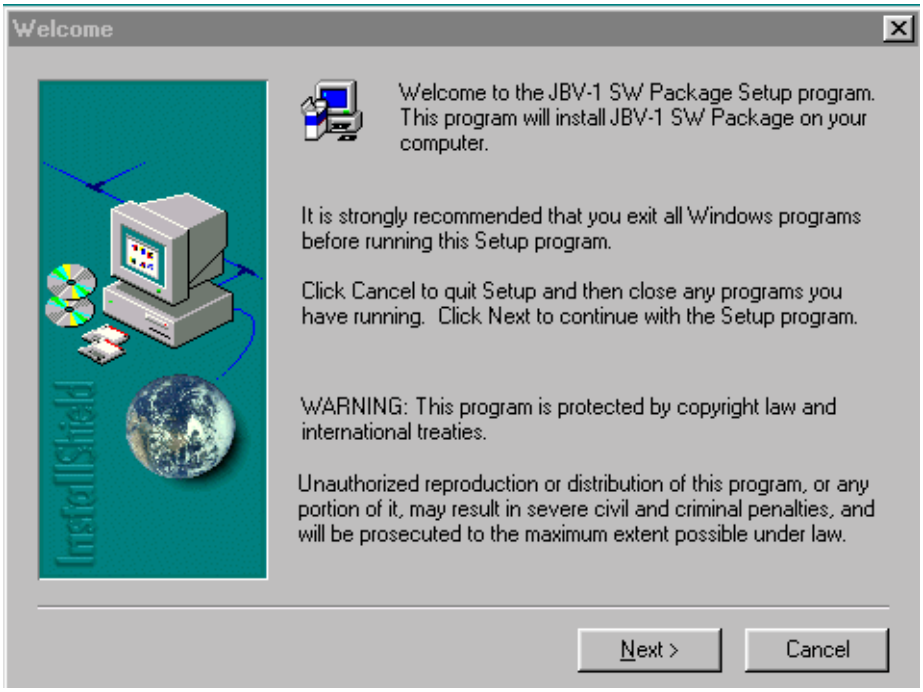
Note: DO NOT CONNECT THE USB CABLE / JBV-1 TO YOUR COMPUTER YET!

Run *Jbv1_update.zip* file and start SW Installation by double clicking *Setup.exe*.

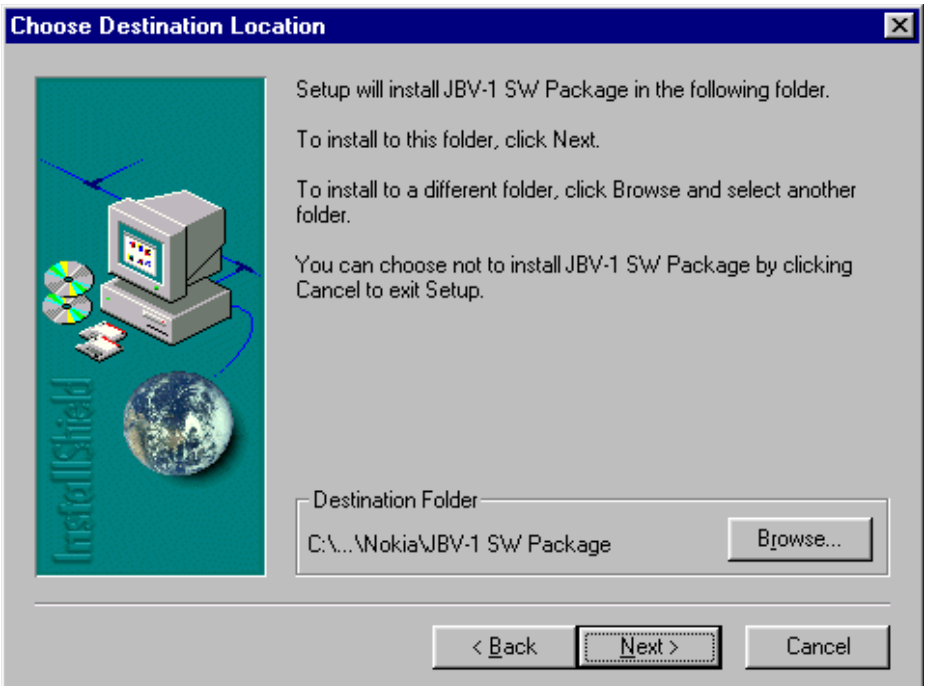
Files needed for JBV-1 package setup program will be extracted.



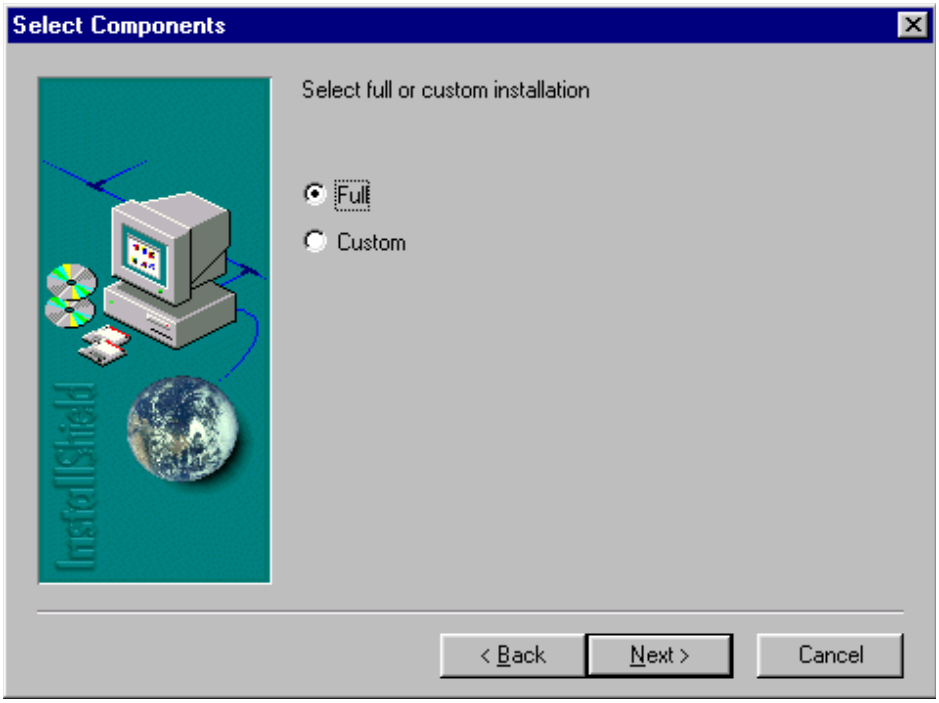
Installation begins, please read the information shown and choose “Next” to continue.



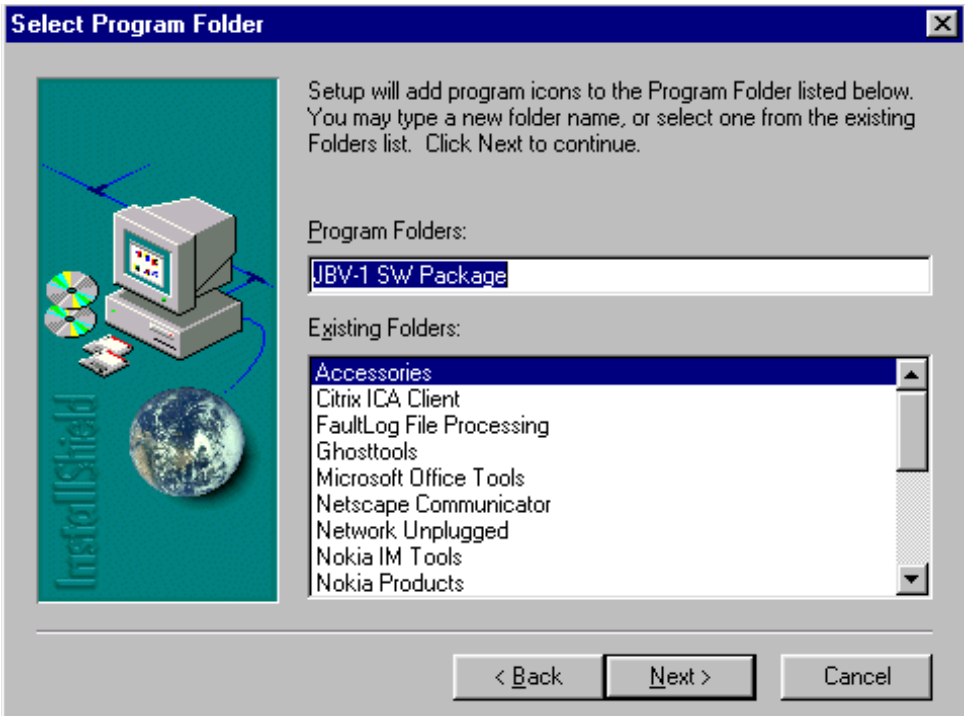
Use suggested destination folder where JBV-1 SW Package will be installed and choose “Next” to continue.



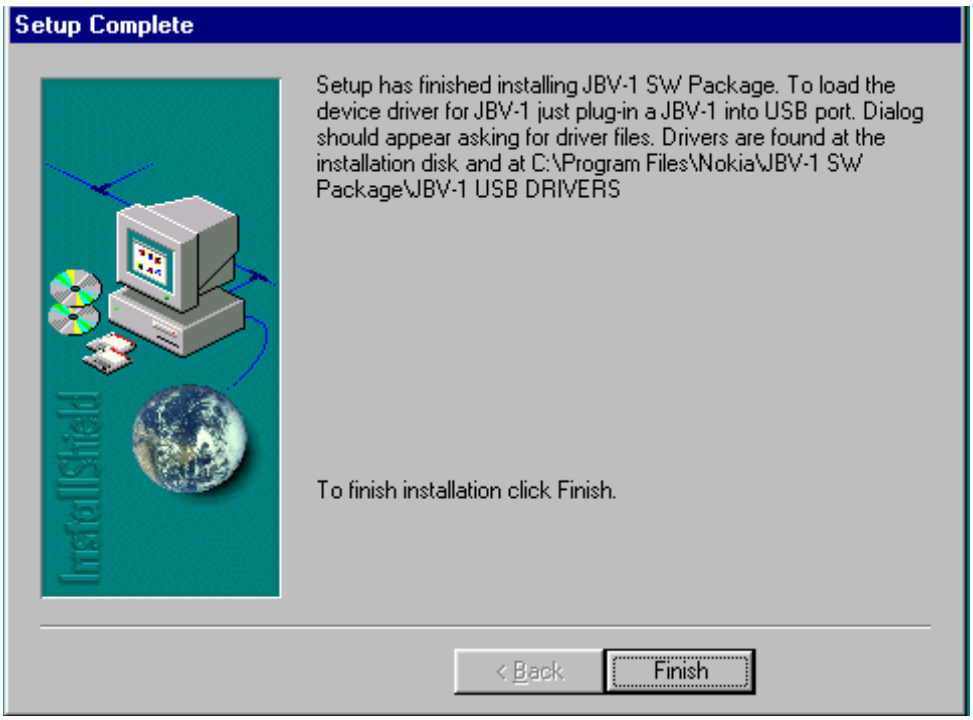
Select “Full” Installation and choose “Next” to continue



Program folder will be created. Choose “Next” to continue, Software files will be installed.



After successful installation, choose “Finish” to complete.



NOW YOU CAN CONNECT THE USB CABLE / JBV-1 TO YOUR COMPUTER!

Connect power to JBV-1 (11-16V DC) from external power supply, then connect USB Cable between JBV-1 USB connector and PC.

Windows will detect connected USB cable and detect drivers for new HW.

Follow the instructions and allow Windows to search and install the best drivers available. After this procedure the actual JBV-1 SW update can begin.

Updating the JBV-1 docking station software

The next step is to install or update the JBV-1 USB drivers which are delivered with the JBV-1 SW installation package. They can be found in folder:

C:\Program Files\Nokia\ JBV-1 Firmware Update\JBV-1USB driver

If there is no previously installed JBV-1 Firmware update package installed on your computer, Windows will detect connected USB cable and detect drivers for new HW. You will be prompted about this, please follow the instructions and allow Windows to search and install the best Drivers available.

If there is a previously installed JBV-1 Firmware update package (v 17 or older) on your computer, please update the JBV-1 USB Driver. *Please see the readme.txt – file under*

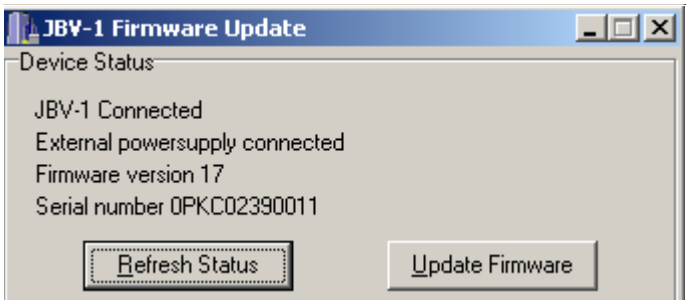
C:\Program Files\Nokia\ JBV-1 Firmware Update\JBV-1USB driver – folder for instructions on how to update the JBV-1 USB Driver.

After you have installed or updated the JBV-1 USB driver, the actual JBV-1 SW update can begin.

Go to folder *C:\Program Files\Nokia\JBV-1 Firmware Update\JBV-1 Firmware Update* and start JBV-1 Update SW by double clicking **fwup.exe**.

JBV-1 Firmware update starts and shows current status of the JBV-1 connected.

If firmware version read from your JBV-1 is not the latest one available (v. 17 or older) , it needs to be updated to version 18 by choosing “Update Firmware”..



To update your JBV-1 to new version 18 choose file *JBV1v18.CDE* and “Open”

Please wait, it takes a while until you can hear a “click” from the JBV-1.

The older sw file JBV1v17.CDE is visible in this view only if the previous JBV-1 SW package has been installed on your computer.

Service Tool Concept For Baseband Tuning Operations

EM calibrations should be carried out in JBV-1 Docking Station equipped with DA-27 Docking Station Adapter.

Note: RF tunings must be carried out in MJ-30 module jig, JBV-1.

Power to JBV-1 should be supplied from an external DC power supply, not FPS-8 prommer.

JBV-1 input voltages:

Maximum +16 VDC

Nominal input for RF tunings is +12 V DC.

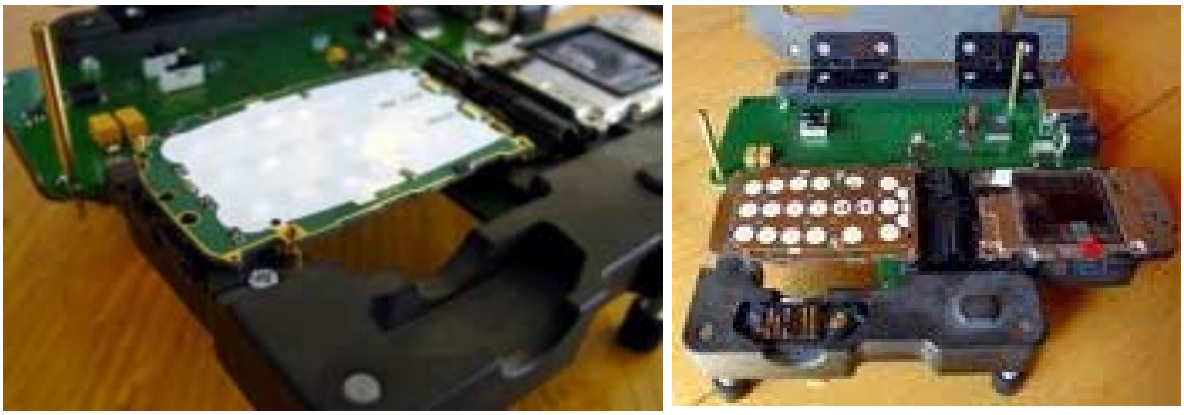


Figure 1:Service concept for baseband tunings

Item	Type	Description
1	JBV-1	Docking station
2	DA-27	Docking station adapter
3	AXS-4	DC9-DC9 cable
5	PCS-1	Power cable
6	DAU-9S	Service FBUS cable
7	PKD-1	Software protection key

Baseband Tuning Operations

Energy Management Tuning

External power supply needed.

Energy Management (EM) Calibration is used for calibrating Battery and Charger settings of the phone.

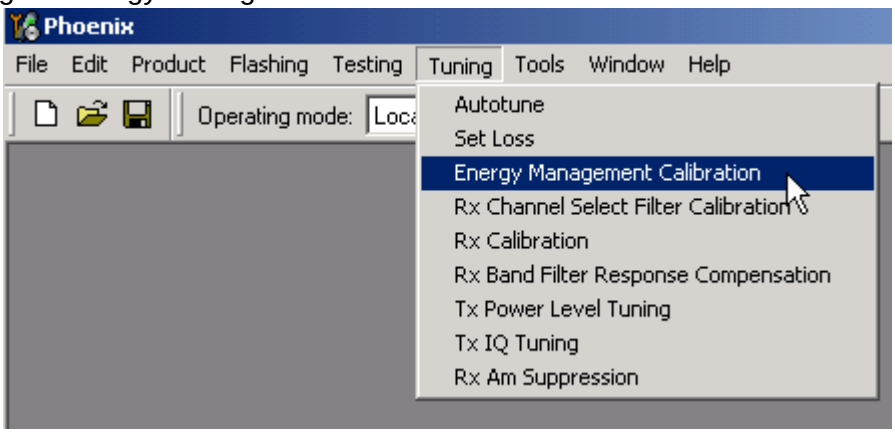
Preparation for EM Calibration:

- Connect the DC Cable SCB-3 between JBV-1 and Vin of the Phone for Charger calibration.

- Connect 12…15 V from the Power Supply to JBV-1.

- NOTE! Check that the connection is F-BUS (does not work with M-BUS).

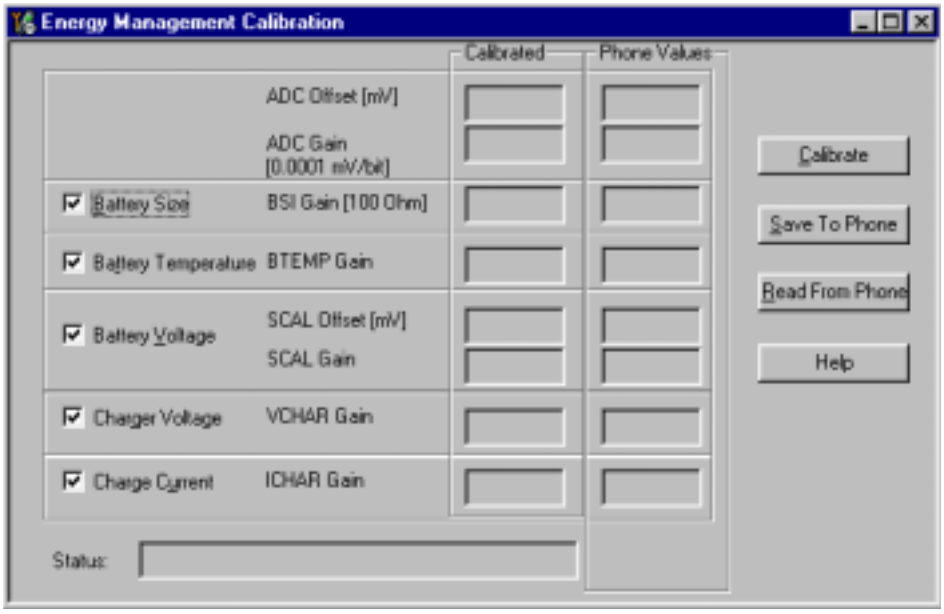
Select Tuning => Energy Management Calibration.



Energy Management values to be calibrated are checked.

Select “Read from Phone” to show the current values in the phone memory and to check that the communication with the phone works.

Select “Calibrate” to run the selected calibrations.



Limits for Energy Management Calibration:

Table 1:

Parameter	Min.	Max	Note
ADC gain	25400	29000	VBatt, BSI, BTemp
DC offset	-50	50	ADC voltage offset
BSI gain	970	1100	ADC BSI calibration gain
BTEMP gain	2075	2275	ADC BTEMP calibration gain
VBAT gain	10000	11000	ADC VBATT Voltage gain
VBAT offset	2300	2900	ADC VBATT Voltage offset scale
VCHAR	58000	62000	Charge voltage
ICHAR	4050	4800	charge current

If values shown are within limits select “Save To Phone” to save the values in the phone.

NOTE! Only the values of the checked tunings (Battery size, Battery Temperature etc…) are saved.

Close the “Energy Management Calibration” – dialog to end tuning.

You must manually switch the phone on after exiting “Energy Management Calibration” – dialog.

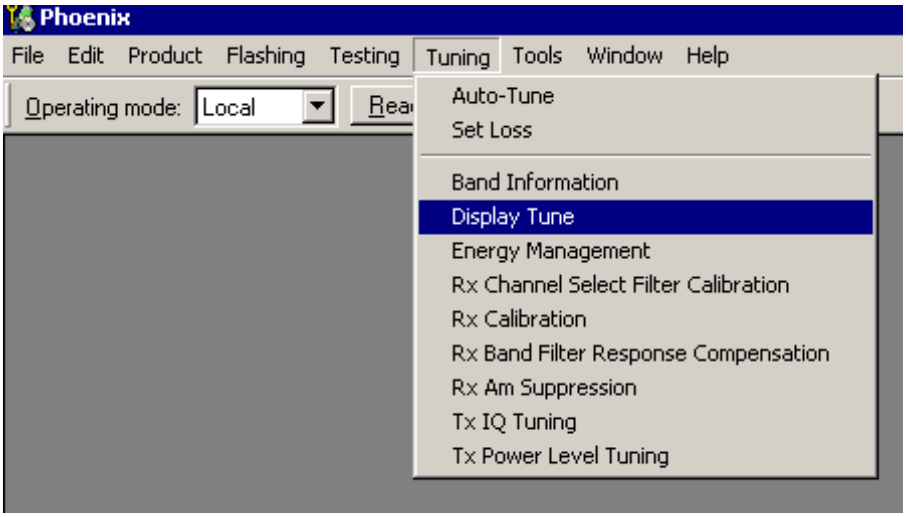
LCD Contrast Tuning

Extra equipment not needed.

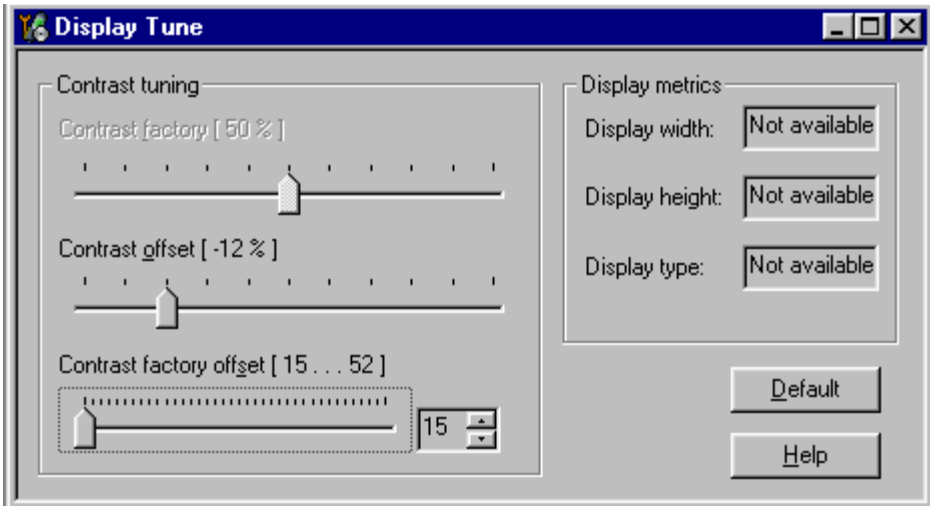
This function is used to calibrate the LCD Contrast.

Must be done when LCD module is changed and there is considerable difference in the contrast.

Select Testing => Display Tune



Move the sliders to reach good LCD contrast.



Close the ”Display tune” dialog to end tuning.

Receiver Tuning: Quick Guide for Tuning With Phoenix

General remarks

RF tunings must be performed in the same order as shown in this document. The order of the corresponding menu items in the Service SW may be different.

If baseband tunings are needed, they should be completed before the RF tunings.

Avoid unnecessary tuning – factory-tuning values are always the most accurate ones.

NOTE! RF tunings need to be done ONLY if any RF block component is replaced.

Screen shots described in this document may change as the service software is developed.

Kindly refer to the Phoenix help files, the phone model specific service manual and bulletins for help.

Service Tool Concept for RF Tuning Operations

NOTE! RF tunings need to be done ONLY if any RF block component is replaced.

- All RF tuning operations must be carried out in the MJ-36 Module Jig!
- Power to MJ-36 must be supplied from an external DC power supply, not FPS-8 prommer
- MJ-15 input voltages:

  Maximum + 5 VDC

  Nominal input for RF tunings is +4.2 V DC

  Minimum +3V DC

- Remember the cable attenuation when setting required RF levels

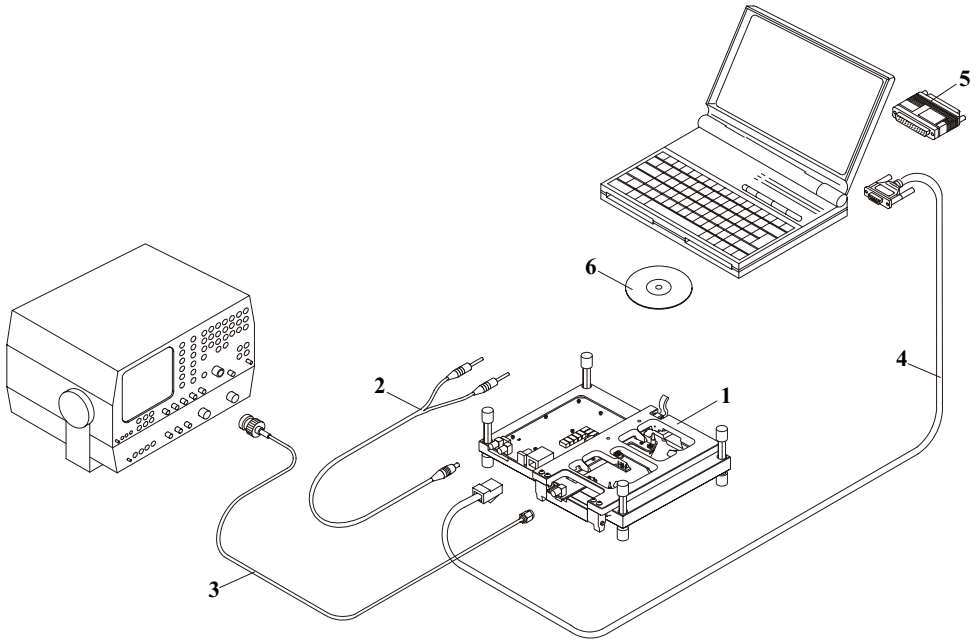


Figure 2:RF tuning setup

Item:	Type:	Service accessory:
1	MJ-36	Module jig
2	PCS-1	DC power cable
3	XCS-1	Modular cable
4	DAU-9S	Service FBUS cable
5	PKD-1	Software protection key

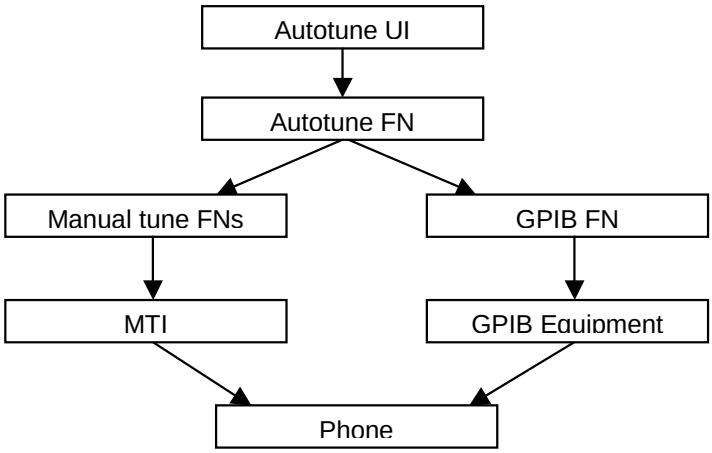
Autotuning

Autotune feature is designed to align product's RF part easier and faster. By this autotune component the product is tuned automatically. The user only needs to press '**Tune'** and the product's RF is tuned and results are shown to the user. Component controls all the needed RF equipment (RF generator and TX measuring device) except voltage supplier.

NOTE! Automatic tuning is ALWAYS the primary tuning mode. Manual tuning is not recommended.

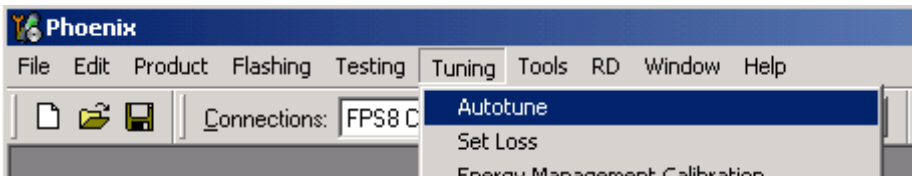
Following diagram describes how the Autotune component is located in the TSS architecture:

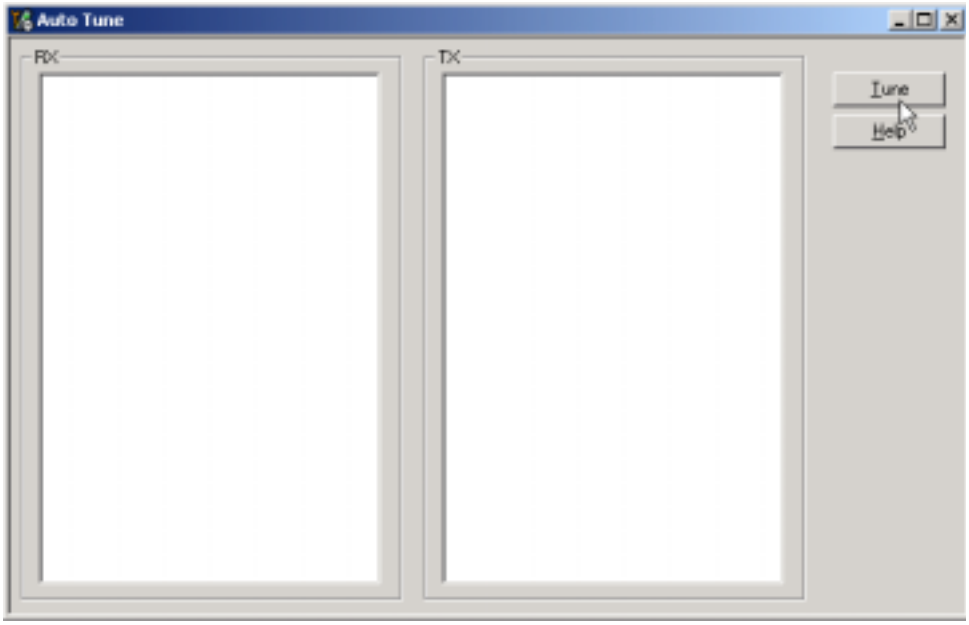
Figure 3: Autotune component in TSS architecture



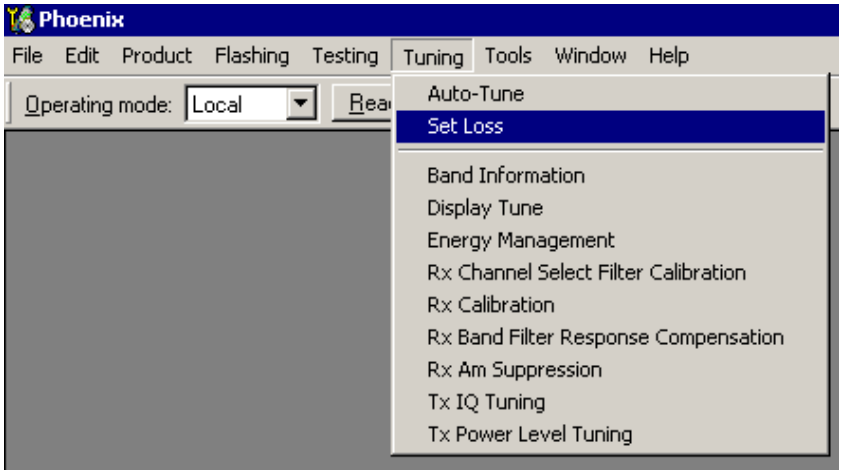
Autotune is a pair of two different components. One is User Interface and the other is FunctioNal. UI does not contain any functionality. MTI takes care of phonet messages.

The Autotune component can be found under Tuning menu:



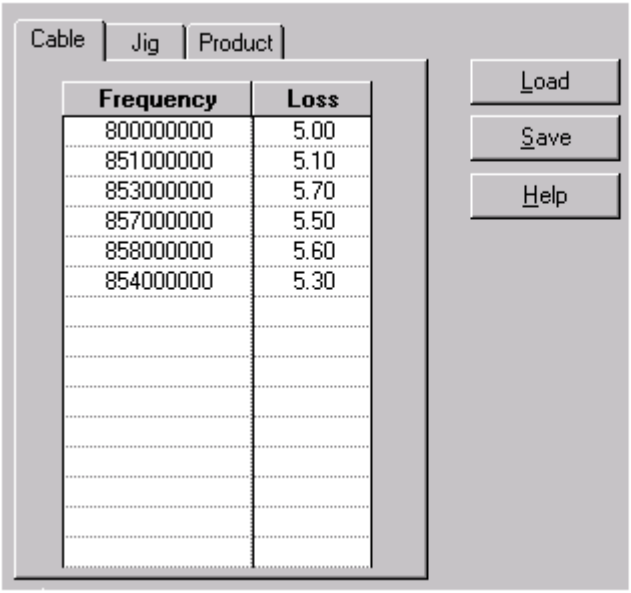


Set Loss



This is the component for saving RF-losses (of cables and jigs) to file. These loss values are needed when you tune the phone with Phoenix (using Auto-Tune component). When you measure the losses you have to be very careful, because these values affect directly how well the phone is tuned.

> *NOTE! This component is only for Auto-Tune uses. Components are protected by PKD-1CS, PKD-1NS, PKD-1 and PKD-1P dongles using standard TSS protection procedure. Autotuning itself is possible with all these dongles but with PKD-1P and PKD-1 dongles user is not able to set the loss.*



Environment

Hardware requirements:

PC with Windows 98/2000/NT

Power supply

Product specific module jig

RF-splitter and -cables

RF equipment (only one of each is needed)

Tx:

Agilent E4406 (VSA series transmitter tester)

Agilent E4445 (PSA series transmitter tester)

Rohde&Schwarz, FSE-family of Signal Analyzers

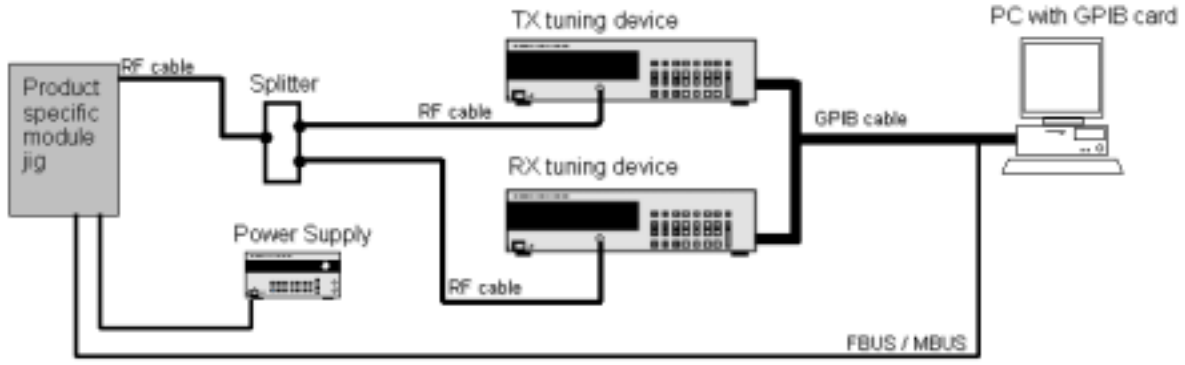
Rohde&Schwarz, FSIQ-family of Signal Analyzers

Rx:

Agilent ESG family of RF Signal Generators

Rohde&Schwarz, SME-family of Signal Generators

Figure 4: Setup environment



GPIB addresses are not defined. Component finds the addresses and uses them automatically.

If several TX tuning devices are connected, this component uses Agilent (VSA or PSA). In RX side, Agilent has highest priority.

Protection

Components are protected by PKD-1CS, PKD-1NS, PKD-1 and PKD-1P dongles using standard TSS protection procedure. Autotuning itself is possible with all these dongles but with PKD-1P and PKD-1 dongles user is not able to set the loss.

RH-53/54 Manual Alignment with Phoenix

Manual alignment with Phoenix

The alignment/calibrations are the same in both GSM900/850 and GSM1800/1900 except for the channels and frequencies. Only the procedures for GSM900/GSM1800 are shown.

The attenuation values for GSM850 are similar to the ones for GSM900, and the ones for GSM1900 to GSM1800. The difference can be 1-2 dBs.

In Phoenix select connection Fbus scan product. If you power up the board before selecting Fbus, it works without any error messages. Use Jig or other device for RF and bus connection. Attenuation in the probe alone is 0dB for 900 and 0.1dB for 1800.

Use CMD55, CMU200 or other suitable device. Default channels are

- GSM850: ch. 190
- GSM900: ch. 37
- GSM1800: ch. 700
- GSM1900: ch. 661

The alignments and calibrations must be performed in the order shown in Phoenix to give reliable results. The way to save data to the phone and to load data from the phone is made different in the various tunings. Always look what is shown in the windows regarding these issues and act accordingly. In some windows the saving is done without any warning or second approval as soon as you stop or end. To vary a selected parameter you can use + and – key or in some cases directly type the new value. + and – steps the value for every press. Repeat function seems not to work. In I/Q you can use the side arrows.

RX calibration

Select Tuning, RX Calibration

Select Band, for example GSM900

Note: You must first tune the lower band to be able to tune the higer band. You can stop at any time by switching off the menu. If the values are outside internal specifications, you can not save them and you will have to leave the tuning without saving.

Press start and follow the description in Phoenix, setting up the signal generator as described

Figure 5: RX calibration values for GSM900 (and GSM850)

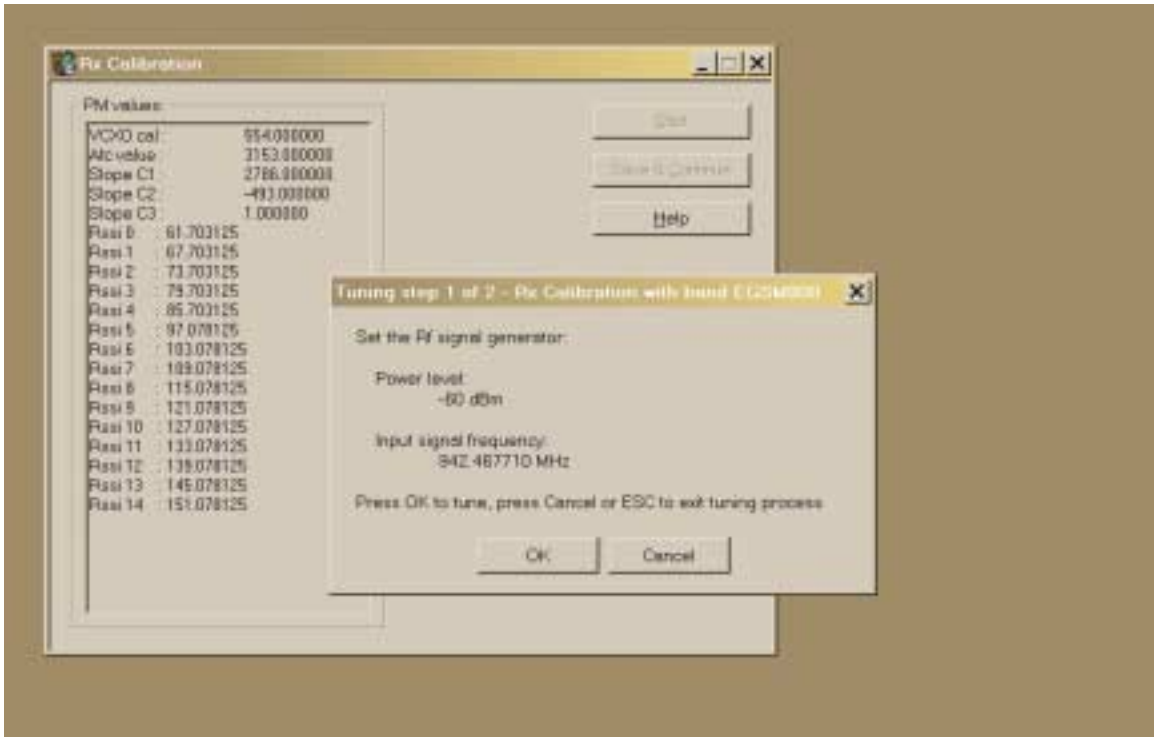
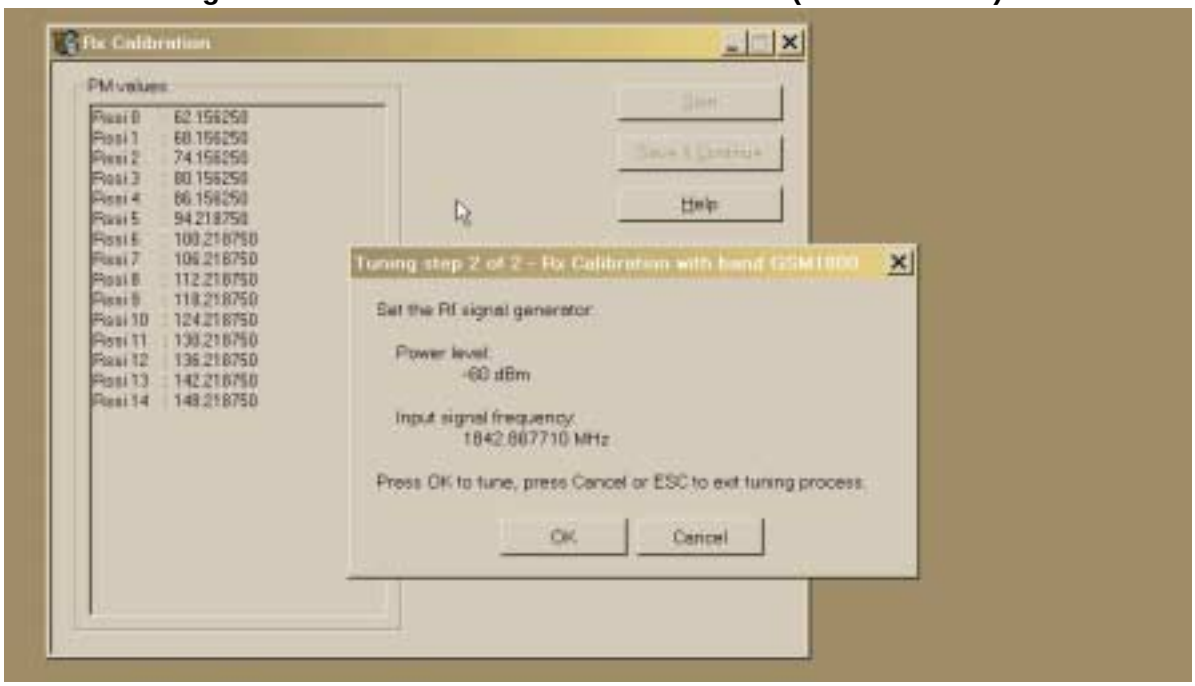


Figure 6:RX calibration values for GSM1800 (and GSM1900)



Press the OK button, and then the Save&Continue button

Follow the description in Phoenix, setting up the signal generator as described

RX Band Filter Response Compensation

This tuning measures the band filters ripple over the bands and the information is used to compensate the RX level reporting.

Note: If you have a signal generator with a frequency list option, please perform Autotuning.

Select Tuning, RX Band Filter Response Compensation

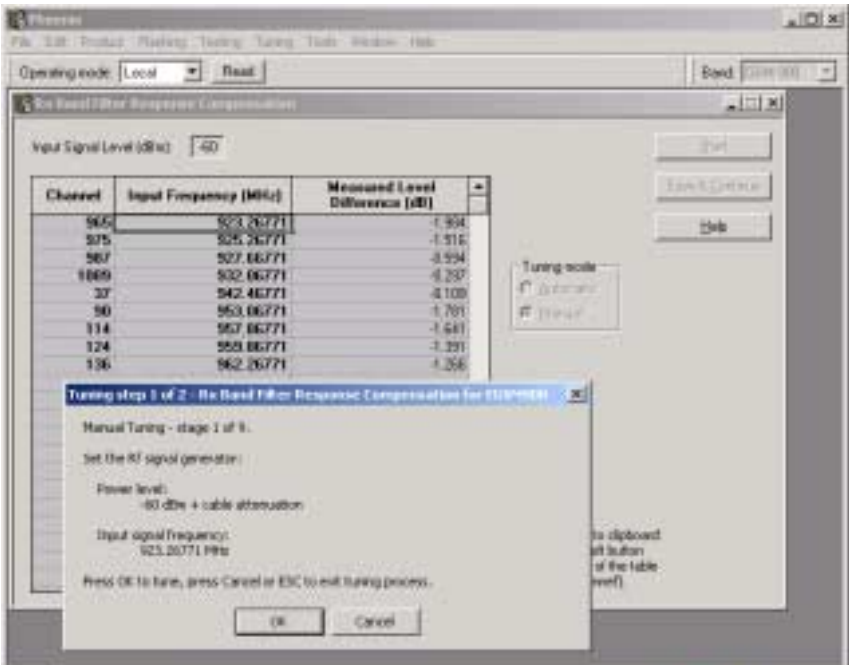
Select Band, for example GSM900

Note: You must first tune the lower band to be able to tune the higer band. You can stop at any time by switching off the menu. If the values are outside internal specifications, you can not save them and you will have to leave the tuning without saving.

Select manual tuning and press Start.

You will now be guided through the 9 steps. Each step asks you to set the generator to a certain frequency and when you press OK, the next step comes up. After every step the value found is shown in bold.

Figure 7: RX Band Filter Response Compensation stages (example)



When all channels have been tuned you must press Save&Continue. It then continues with the high band.

The high band tuning goes on like the low band. Every step leads to the next untill all channels have been tuned.

RX Channel Select Filter (Base Band filter)

The tuning is made internally in the phone by itself. It is the low pass filters in Mjoelner that is calibrated/tuned. Only result is OK or Not OK.

TX Power tuning

Select Tuning, Tx Power Level Tuning

Note: You must first tune the lower band to be able to tune the higer band. You can stop at any time by switching off the menu. If the values are outside internal specifications, you can not save them and you will have to leave the tuning without saving.

Press start and follow the instructions on the pop-up window

Figure 8: TX power level tuning GSM900 (and GSM850)

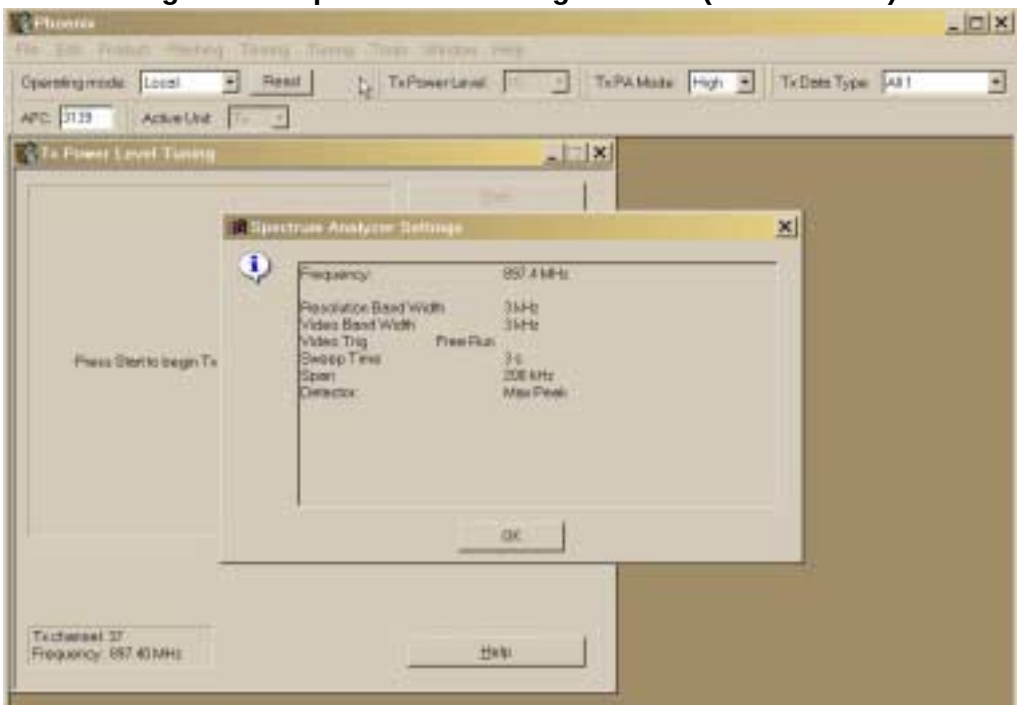
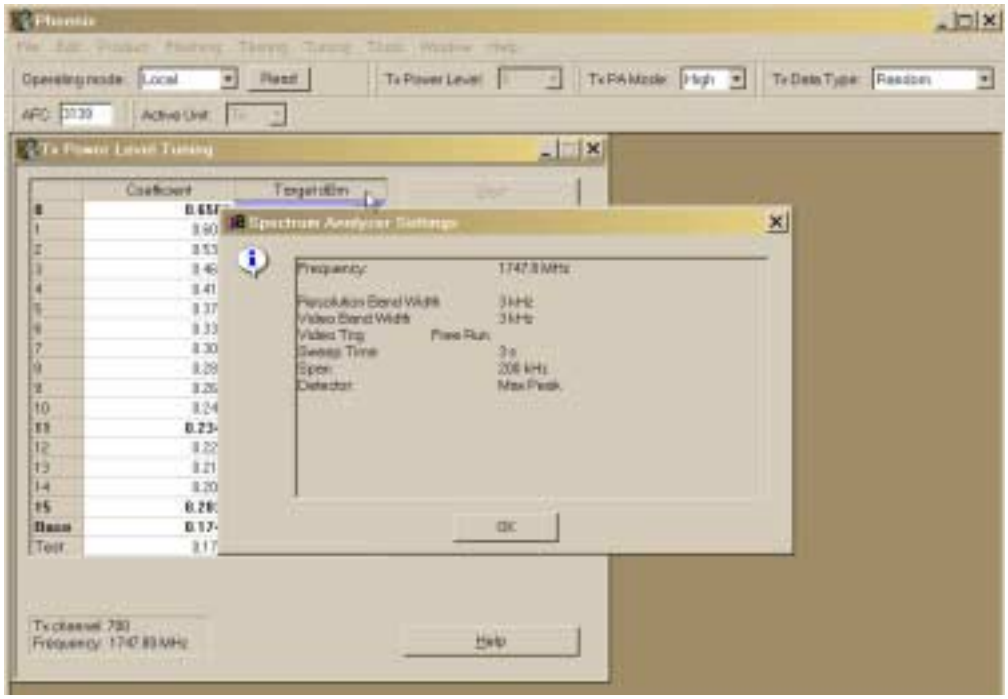


Figure 9: TX power level tuning GSM1800 (and GSM1900)



Set the spectrum analyzer or GSM tester for the required settings and press “OK” If a GSM tester is used set the TX data type to random, so that the tester can trig on the signal.

Figure 10: TX Power Level Tuning values for GSM900 (and GSM850)

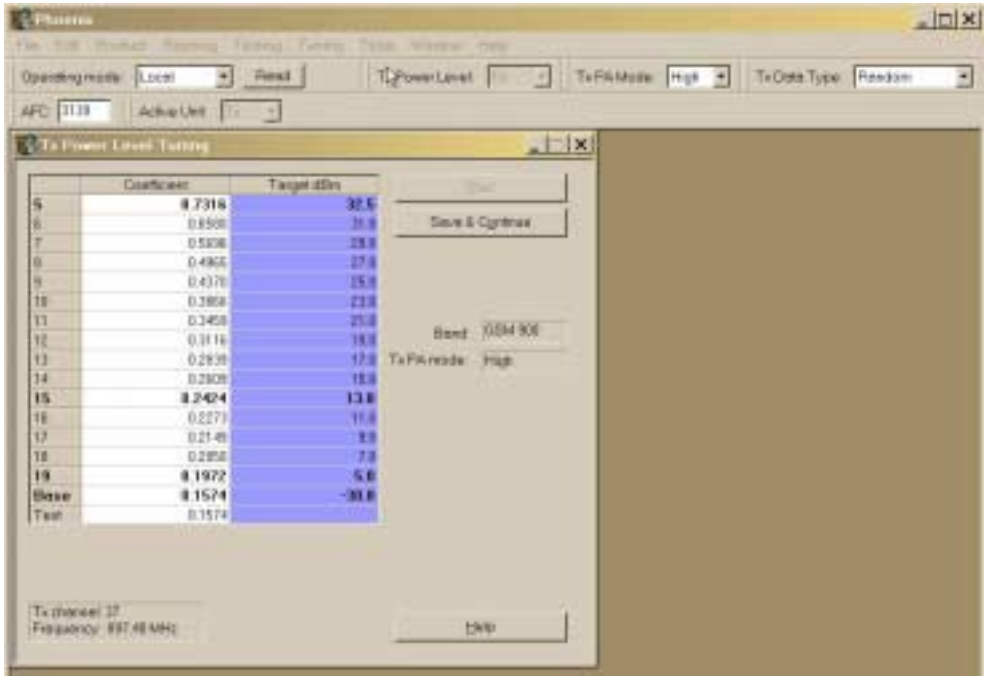
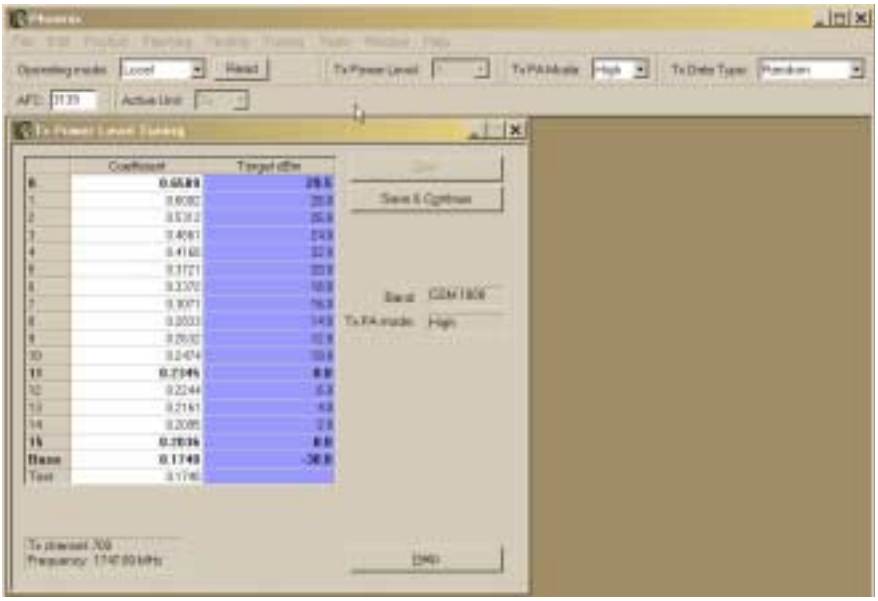


Figure 11:TX Power Level Tuning values for GSM1800 (and GSM1900)



Tune the highlighted values to the wanted power (Use average burst power)

Tune the base level to –25dBm

When done press Save&Continue. If you tune the low band (the first band), Phoenix will automatically shift from low band to high band. At the same time the intermediate values are calculated, but that is first seen next time you start a tuning. If you tune the high band (the second band), the intermediate resullts will be calculated.

I/Q tuning

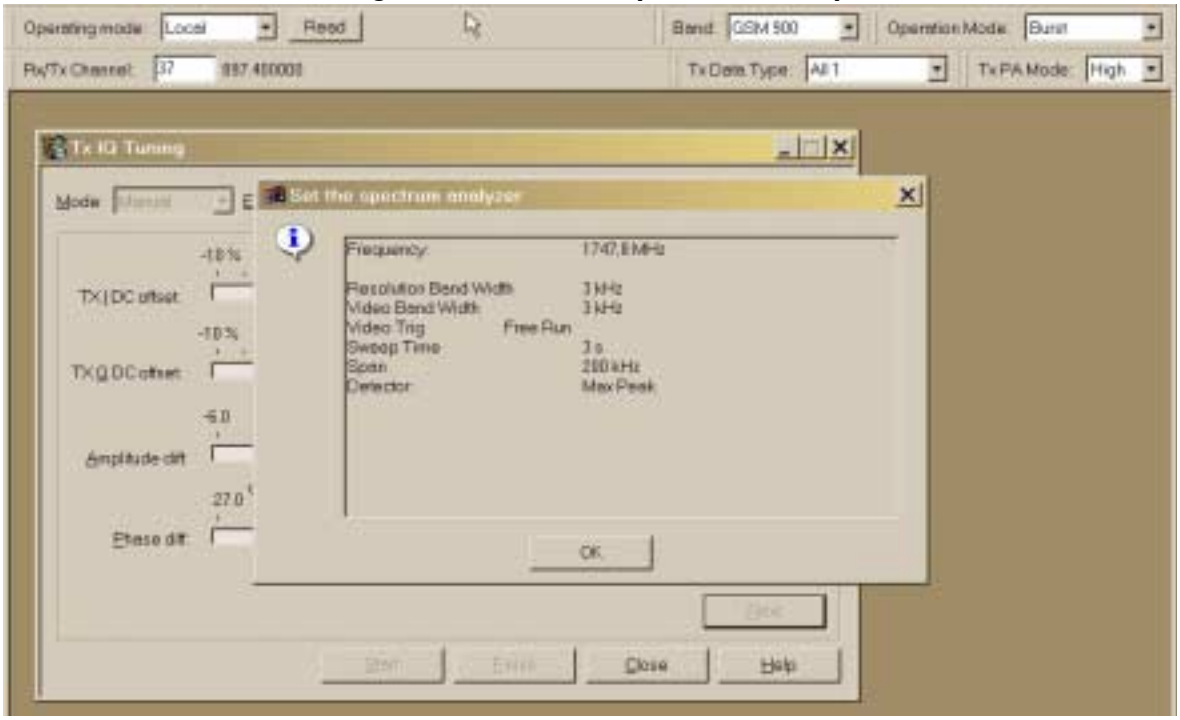
Select Tuning > Tx IQ tuning > TX Data Type “random” for a GSM tester like CMU200 or 1/0 for SPA measuring.

CMD55 shows the same as a spectrum analyzer when I/Q tuning is selected. CMU200 shows the carrier and sideband suppression directly as figures in the modulation mode.

Press Start

Figure 12: GSM900 (and GSM850)

Figure 13: GSM1800 (and GSM1900)



Set the spectrum analyzer or GSM tester for the required settings and press “OK”

Figure 14: GSM900 (and GSM850)

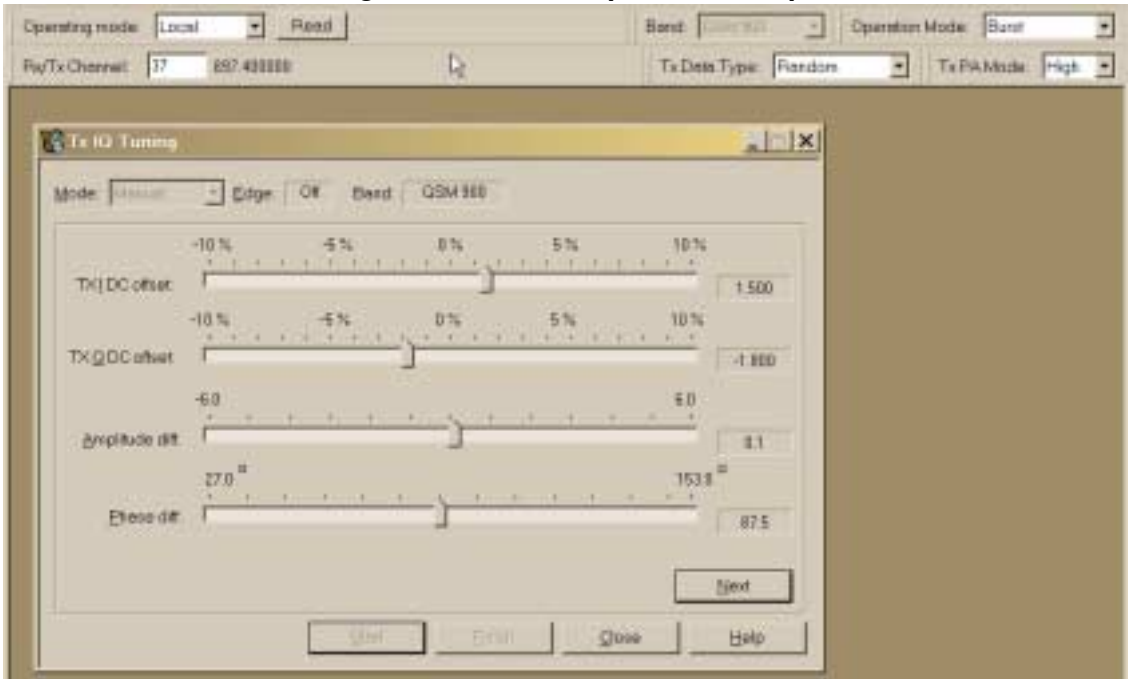
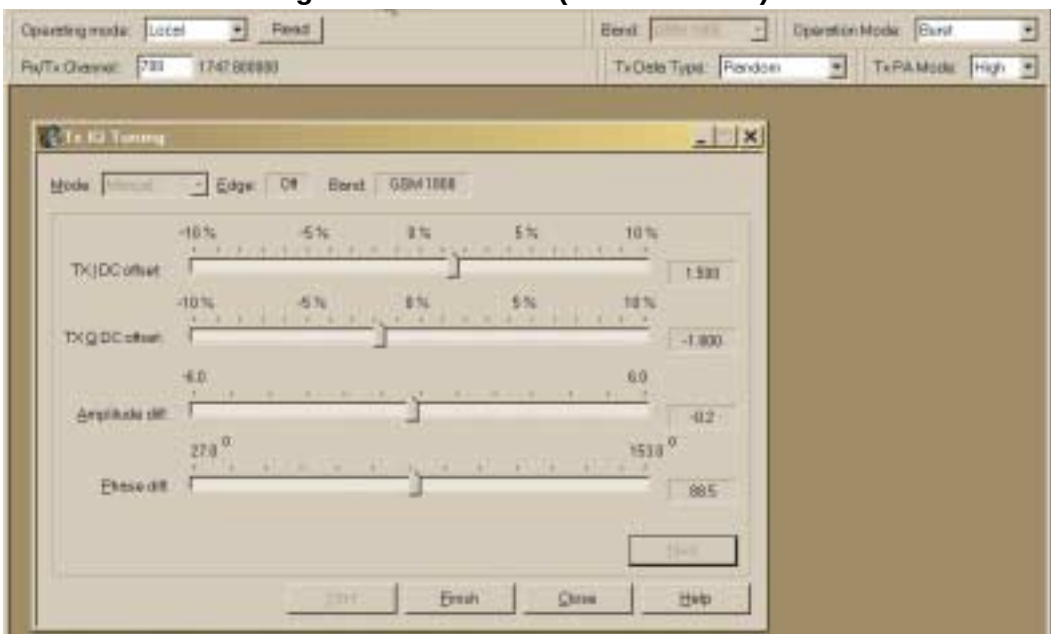


Figure 15: GSM1800 (and GSM1900)



Begin tuning with data from selected place.

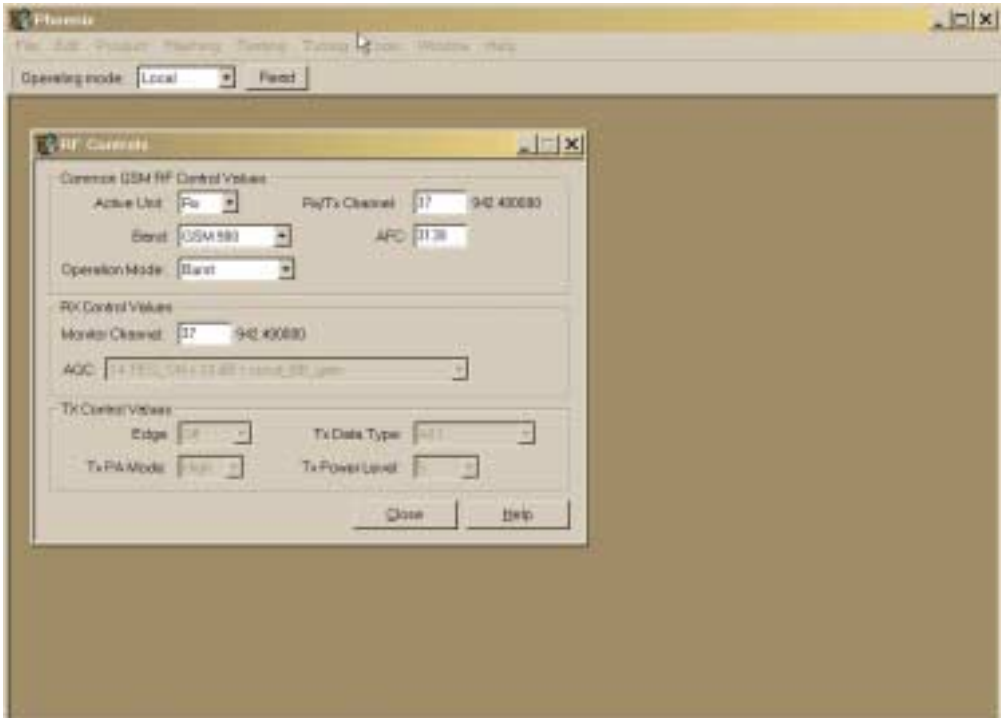
Tune DC offset values to lowest carrier. Use Side arrows or +, - .

Tune Amplitude and phase to lowest sideband.

When satisfied with the result, press Next. (The sidebands should hardly be visible). Or for CMU200 the supression should be better than –40dBc.

RF control

The purpose is to check the receiver or transmitter without going in call. It works very much like a call, but you have control via the PC, and not via the tester. If you want to tune or calibrate at other channels or levels than the default for that function, you can activate RF control at the same time and change the wanted parameters.



If you want to tune at other channels than the default, then you must select it first in RF control and then start the tuning.

Flashing Setup Instructions

FPS-8 flash concept

Figure 16:FPS-8 flash concept

Item	Type	Description
1	SF-33	Point Of sales flash loading adapter
2	FLC-2	Power cable
3	XCS-4	Modular cable
4	FPS-8	Flash prommer box sales pack
5	AXP-8, included in FPS-8 sales pack	FLS-4S sales package US
6	AXS-4, included in FPS-8 sales pack	D9-D9 cable
7	0730090	Software protection key

Item	Type	Description
8	ACF-8, included in FPS-8 sales pack	AC charger
9	SF-12	SRAM module (3pcs needed inside FPS-8

POS (Point of Sale) flash concept

Figure 17:POS flash

Item	Type	Description
1	SF-33	Point Of sales flash loading adapter
2	XCS-1	Service cable
3	FLS-4S	FLS-4S sales package EMEA
4	FLS-4S	FLS-4S sales package APAC
5	FLS-4S	FLS-4S sales package US

POS flashing can also be used with USB connection. (USB cable can be purchased from shops or suppliers providing PC hardware and accessories).

Module Jig flash concept

Figure 18:Module jig concept

Flashing with MJ-36 is recommended in local mode. The following equipment is needed for RH -53/54 Care (AMS) SW ypdate when the system is placed in the module jig MJ-36 and connected through an FPS-8 set-up.

Item	Type	Description
1	MJ-36	Module jig
2	PCS-1	Power cable
3	XCS-1	Modular cable
4	FPS-8	Flash prommer box sales pack
5	AXP-8, included in FPS-8 sales pack	Printer cable
6	AXS-4	D9-D9 cable
7	PKD-1	Software protection key
8	ACF-8, included in FPS-8 sales pack	AC charger
9	SF-12	SRAM module (3pcs needed inside FPS-8)

Note! More than 32MB SRAM may be required in FPS-8

This concept can also be used for troubleshooting and RF calibration.

- MJ-36 is intended for use with an external power supply.
- MJ-36 input voltage : normal +6V, maximum +12V
- Ensure that the jumper is set open for voltage regulation before the external power supply is connected.
- When FPS-8 is used as the power supply (4V), the jumper should be set close to bypass regulator.
- EM calibrations including Zocus are only done with JBV-1. Module jig MJ-36 does not support Zocus calibration for RH-53/54

	
Without shielding can I208 (MJ-36 insert is needed).	With shielding can (the insert can be placed in the compartment).

JBV-1 flash concept

Figure 19:JBV- flash/service concept

Item:	Type:	Description
1	JBV-1	Docking station
2	DA-27	Docking station adapter
3	XCS-4	Modular cable
4	PCS-1	DC power cable
5	DAU-9S	Service FBUS cable
6	AXP-8, included in FPS-8 slaes pack	Printer cable
7	AXS-4, included in FPS-8 slaes pack	D9-D9 cable,
8	PKD-1	Software protection key
9	SF-12	SRAM module (3pcs needed inside FPS-8)

Note! More than 32MB SRAM may be required in FPS-8

This concept can be used for BB and Rf calibration as well. EM calibration including Zocus should be carried out with JBV-1 and DA-27.

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5-Service Tools

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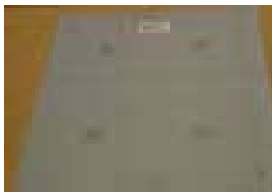
Service Tools

Custom Service Tools

Product	Service Tool	Photo	Description Info
DA-27	Docking Station Adapter		The Docking Station Adapter, together with a Docking Station, is used for analysis of Mbus, Fbus, RF, and audio connections. Pack of test 10 test pins to be used with SF-33 and DA-27.
	Spare lock part for DA-27		Spare lock part for DA-27
MJ-36	Module Jig		This jig allows phone PWB-level service and troubleshooting. Components must be protected against over-voltage and over-current.
RJ-39	Soldering Jig		Used for soldering and as a rework jig for system module.
SA-45	RF Coupler		Enables RF connection with DA-27. Note! Do not use for RF-tuning.

Product	Service Tool	Photo	Description Info
SF-33	POS Flash Adapter		The flash adapter allows FBUS/ MBUS connections for flashing. Pack of test 10 test pins to be used with SF-33 and DA-27.
ST-12	Rework stencil		Front End Module (FEM)
RJ-51	Rework Jig		To be used with ST-12.!

Standard service tools

Product	Service Tool	Photo	Description Info
ACF-8	Universal Power Supply		ACF-8 is used to power FPS-8 and FLS-4S. ACF-8 has 6 Vdc and 2.1A output.
FLS-4S	POS Flash Adapter		The Point of Sale (POS) flash is a low-cost software upgrade tool. This requires the XCS-1 cable and ACP-8U for operation.
FPS-8	Flash Prommer		The Flash Prommer FPS-8 is used for heavy flash.
FPS-11	Parallel Flash Prommer		Flashing several units(max 8) at one time. The FPS-11 multi prommer will replace FPS-8C
JBV-1	Docking Station		The Docking Station and the Docking Station Adapter are needed for Mbus, Fbus, RF, and audio connections This setup allows connection between flash prommers. When the audio box is connected, it has to be connected to the phone's audio connector. The Docking Station can be powered by FPS-8 or external power supply.

Product	Service Tool	Photo	Description Info
PKD-1	SW Security Device		SW security device PKD-1 is hardware device that, when connected to the parallel (LPT) port of the PC, enables the use of the service software. Without the dongle present, it is not possible to use the service software. Printers or other peripheral devices can be connected to the PC through the dongle, if needed. Caution: Make sure that you have switched off the PC and the printer before making connections! Caution: Do not connect the PKD-1 to the serial port. You may damage your PKD-1!
SPS-2	Soldering Paste Spreader		
SRT-6	SRT-6 Opening Tool		Opening tool for e.g. removing display module from C2 cover
CA-5S	Printing Cable		The DC cable CA-5S to be used with the JVB-1 docking station.

Product	Service Tool	Photo	Description Info
	Standard toolkit		Content: -Nokia opening tool SRT-6 -Tonichi torque driver -Hoya micro fibre cloth MX304 -Dastex gloves S, M, XL -Artilux goggles AH166 -Wera bit T5 867/4TX 5x50 -Wera bit T6 867/4TX 6x50 -Wera bit T6 867/4 6IPx50 -Facom side cutter 416E -Facom T5 driver SP.14032 -Facom T6 driver SP.14033 -Facom slot screwdriver AEF. 2x35.E -Wetec tweezers 7abb SA-ESD -Wetec tweezers 22 SA-ESD -Wetec tweezers 13 SA-SMD ESD -Wetec tweezers PSF SA-ESD -Wetec ESD brush E1211 -Kaiser Fototechnik airbrush 6315 -Wetec dental tool DEM83266/0 -RS Components Scissors 323-5732

Service Cables

Product	Service Tool	Photo	Description Info
AXS-4	Service Cable		The AXS-4 D9-D9 service cable is used to connect two 9-pin connectors (e.g., between PC and FPS-8). AXS-4 length is 2 meters.
DAU-9S	MBUS Cable		The MBUS cable DAU-9S has a modular connector and is used between PC serial port and, for example, the MJ-36.
FLC-2	DC Cable		FLC-2 is used to supply a controlled operating voltage.
PCS-1	Power Cable		The Power Cable PCS-1 is used to connect the service tools (JBV-1, MJ-36) to an external power supply.

Product	Service Tool	Photo	Description Info
XCS-1	Service Cable		The XCS-1 Service Cable is used to connect FLS-4S to SF-33.
XCS-4	Modular Cable		XCS-4 is a shielded cable (one specially shielded conductor) modular cable for flashing and service purposes.
XRF-1	RF Test Cable		RF cable XRF-1 is used to connect e.g. Module Jig MJ-36 to RF measurement equipment.)

Docking Station Adapter Working Instruction

Working instructions for docking station adapter DA-27.

Insert the DA-27 like a battery, start at the battery connector side.

First press the phone as shown in figure 1, then push down the phone and release the unit.

First move the phone as shown in figure 1, then lift the phone carefully.

Now remove the phone from DA-27.

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6-Disassembly and Assembly Instructions

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RH-53/54 Disassembly

Disassembly instructions

It is very important to follow this insertion and removal procedure, otherwise the contact pins of Flash Adapter will be damaged.

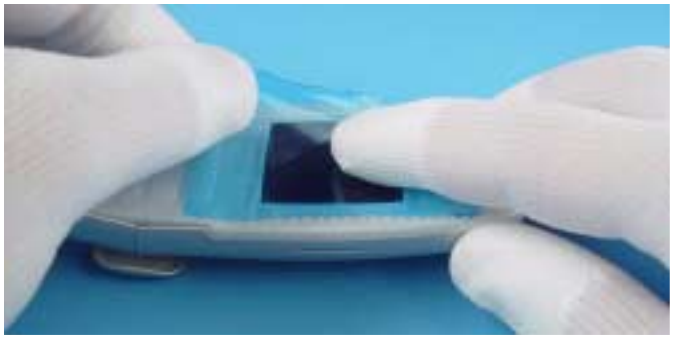
1.) Insert the Flash Adapter SF-33 by starting at the Battery Connector side.

2.) First, press the locking of the Flash Adapter and then push it into the bottom side of the phone, do not use too much force.

3.) When removing the Flash Adapter, press the locking as shown in the picture.

4.) Take away the unit now.

1.) Push down the Release Button before pulling the Battery Cover.



2.) Open the unit and protect the Window with a plastic film.

3.) The Backplate is attached to the Hinge Spring with two adhesive tapes. To avoid the snaps from breaking it is important that the Backplate is at first lifted on the right side referring to the "NOKIA" logo.

4.) Now, remove the Backplate adhesive. If necessary clean the Backplate and the Hinge Spring before attaching using new Backplate Adhesives.

5.) A-Face Assy is attached with snaps to the B-Cover Lower Block. Release the two snaps first.

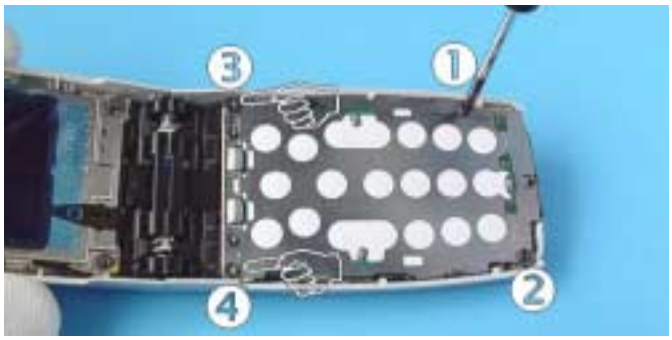
6.) Shift the A-Face Assy from the B-Cover as shown in the picture.

7.) Fold the A-Face Assy as shown in the picture.

8.) Remove the A-Face Assy from the B-Cover Upper Block carefully.

9.) Protect the inner side of the Window with a plastic film.

10.) Unscrew the four Torx Plus® size 6 screws of Upper Block. For assembly, the reverse order and a Torx Plus® driver with a torque of 27Ncm has to be used.



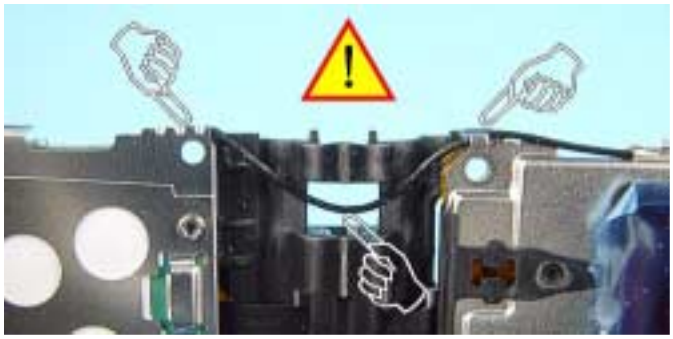
11.) Unscrew the four Torx Plus® size 6 screws of Lower Block. For assembly, the reverse order and a Torx Plus® driver with a torque of 27Ncm has to be used.

12.) Now, the B-Cover Lower Block…

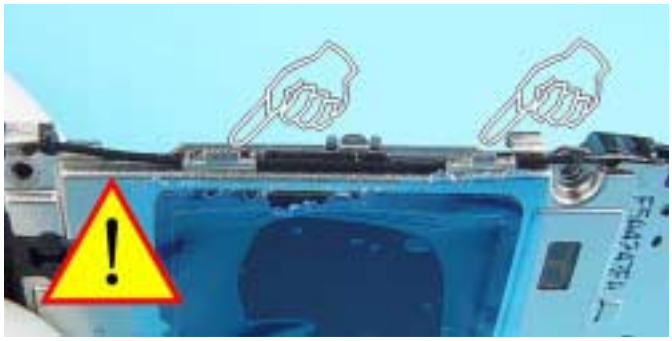
13.) …and the B-Cover Upper Block can be removed.

Consider if the malfunction caused by Upper or Lower Block. Only open the Coax Connector and remove the Coax Cable on the defective Block of the unit.
(For e.g. LCD / Vibra / IHF Speaker fault -> start disassemble upper part, Microphone / Keymat / Charger fault -> start disassemble lower part)

14.) Placement of the Coax Cable in the Lower Block.

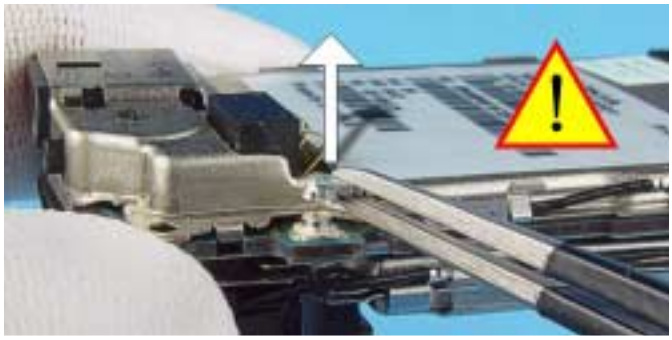


15.) Placement of the Coax Cable in the Hinge.



16.) Placement of the Coax Cable in the Upper Block.

17.) Placement of the Coax Cable in the IHF Antenna Chamber.



18.) Open the Coax Connector of the Engine Module carefully by using tweezers.

19.) Note the exactly position when laying the Coax Cable during assembly.

20.) Remove the Cable carefully. When assembling always starts with the Antenna Connector, "stretch" the cable towards hinge area carefully, then the same procedure when assembling at Engine Module side.

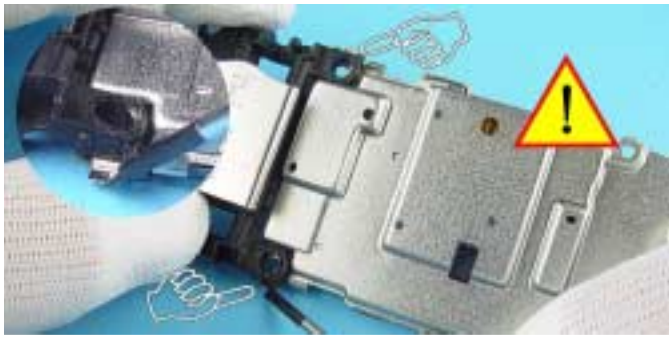
21.) Unscrew the two Torx Plus® size 5 screws from Lower Block. For assembly, a Torx Plus® driver with a torque of 6Ncm has to be used.

22.) Put the Lower Block on the Upper Block as shown in the Picture.

23.) Lift the shown side of the Flex Connector carefully by using the Flex Opening Tool as a lever.

24.) Now, open the Connector carefully.

25.) Separate the Modules.



26.) Open the hooks before removing the Plastic Hinge.

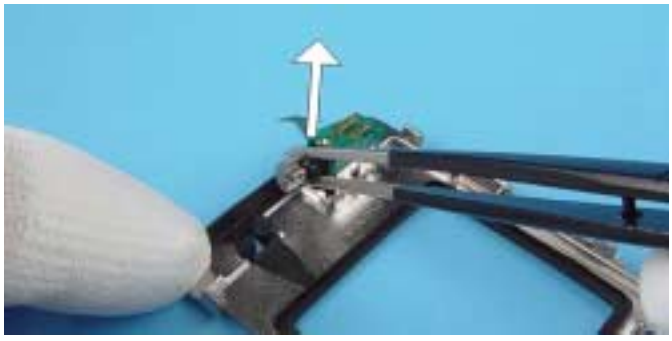
27.) Take care not to damage the Flex Connector when removing the Plastic Hinge.

28.) Unlock the snaps before removing the IHF Antenna Chamber.

29.) Remove the Antenna Chamber.

30.) Release the four hooks carefully by using the SRT-6.

31.) Separate the C2-Cover from LCD CAN Assy.

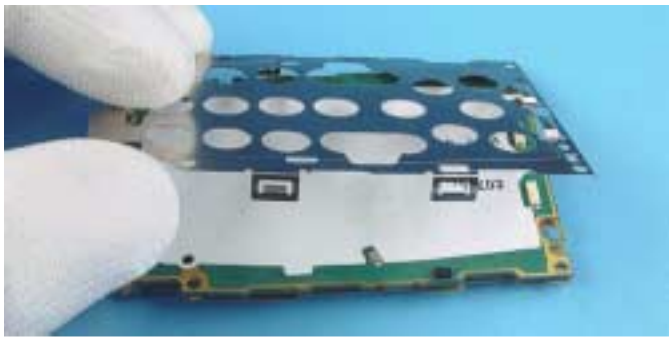


32.) Use tweezers when removing the Vibra Motor.

33.) Open the LCD Connector by using the SRT-6 carefully.

34.) Place the SRT-6 between LCD and the LCD Can as shown in the picture and lever out the LCD carefully.

35.) Release the four springs of Key Dome Shield.

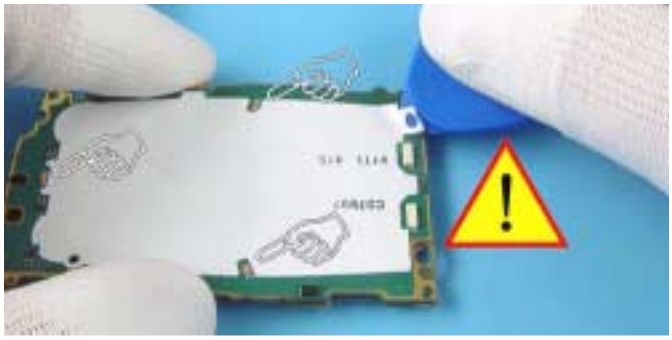


36.) Now, the Key Dome Shield can be removed.

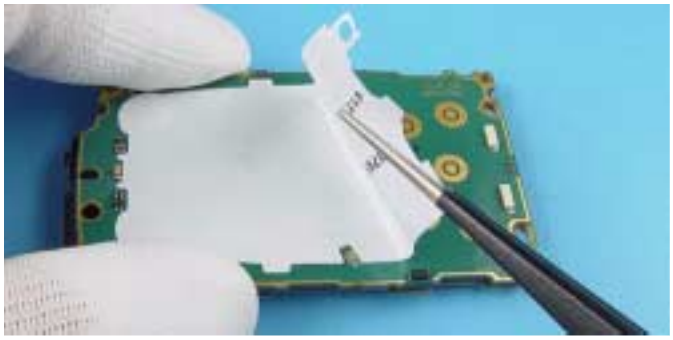
37.) The Engine Module can be removed easily.

38.) System Connector and Microphone drop out when turning the Shielding Can.

Domesheet Exchange instructions

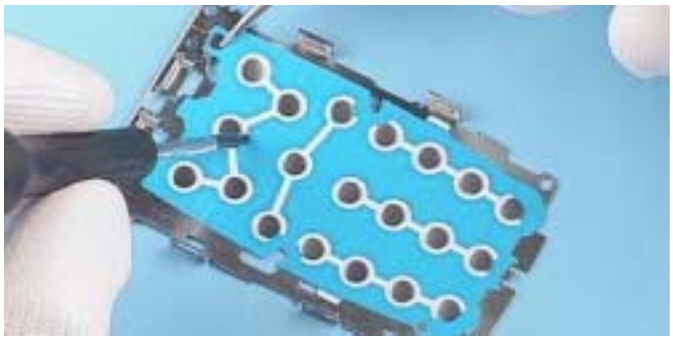


1.) Take care not to damage the LED's when exchanging the Domesheet. Start with SRT-6 as shown in the picture.



2.) Tweezers can be used to remove the defective Domesheet.

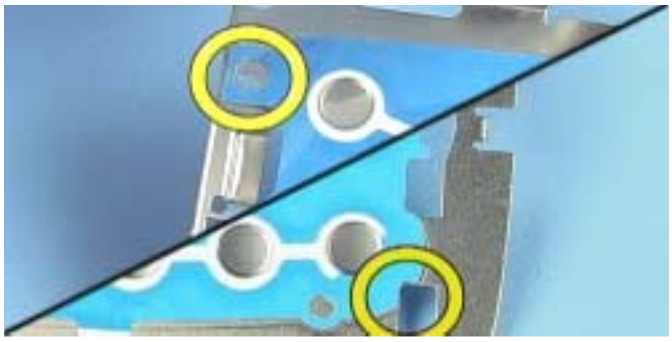
3.) Take the new Domesheet with tweezers.



4.) Place the Domesheet in the Key Dome Shield.

5.) Place the Dome Sheet straps into the slot of the Key Dome Shield.

6.) Same procedure on the opposite side.



7.) Make sure that the edges and the screw holes of Domesheet and the Key Dome Shield are congruent to each other.

8.) Place the Key Dome Shield with the Domesheet on the Engine Module exactly and press-on the Domesheet carefully. Check if the Domesheet is correctly stuck to the Engine Module.

7.) Remove the Key Dome Shield again.

8.) Press on the Domesheet carefully. Ensure also, that there are no open edges or air gap.

RH-53/54 Reassembly

The reassembly takes place in reversed order.

Nokia Customer Care
RH-53/54

7-Troubleshooting Instructions

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Baseband Troubleshooting

Baseband test points

Figure 1:BB test points

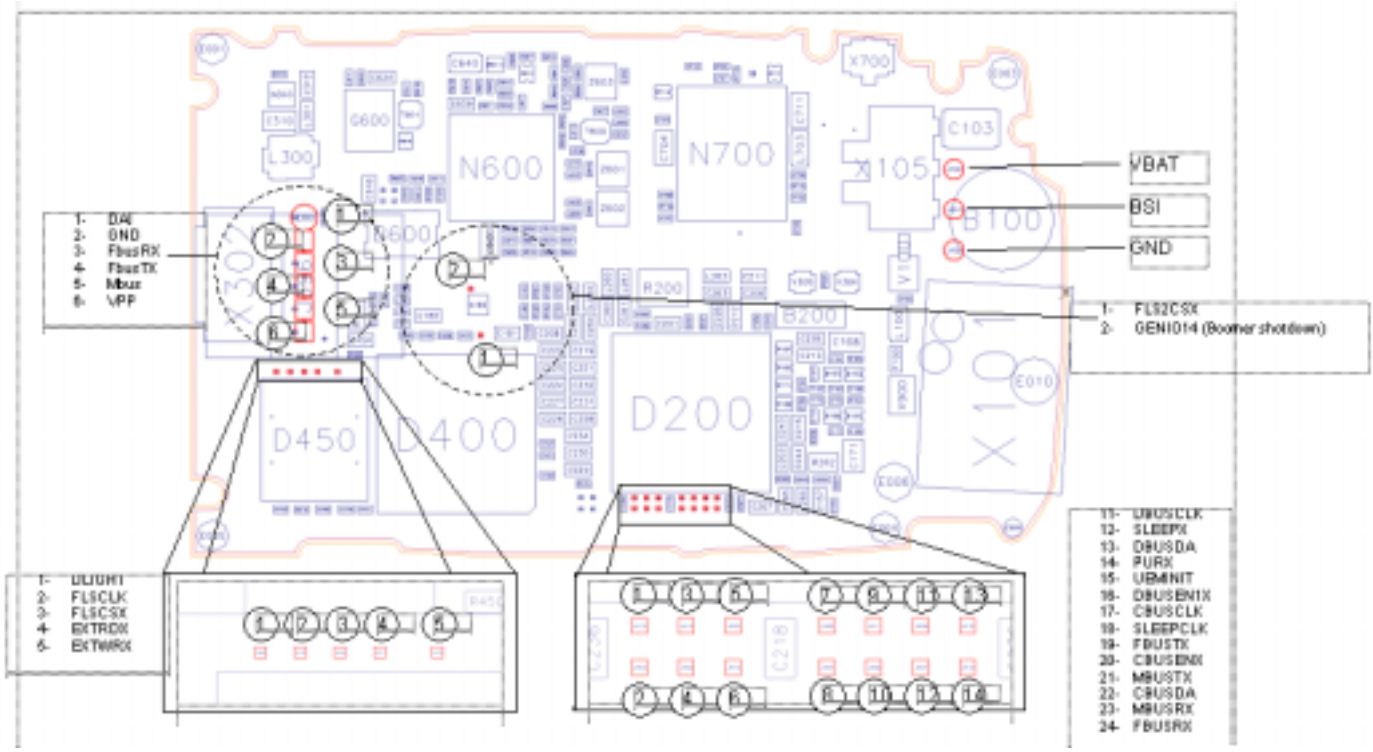
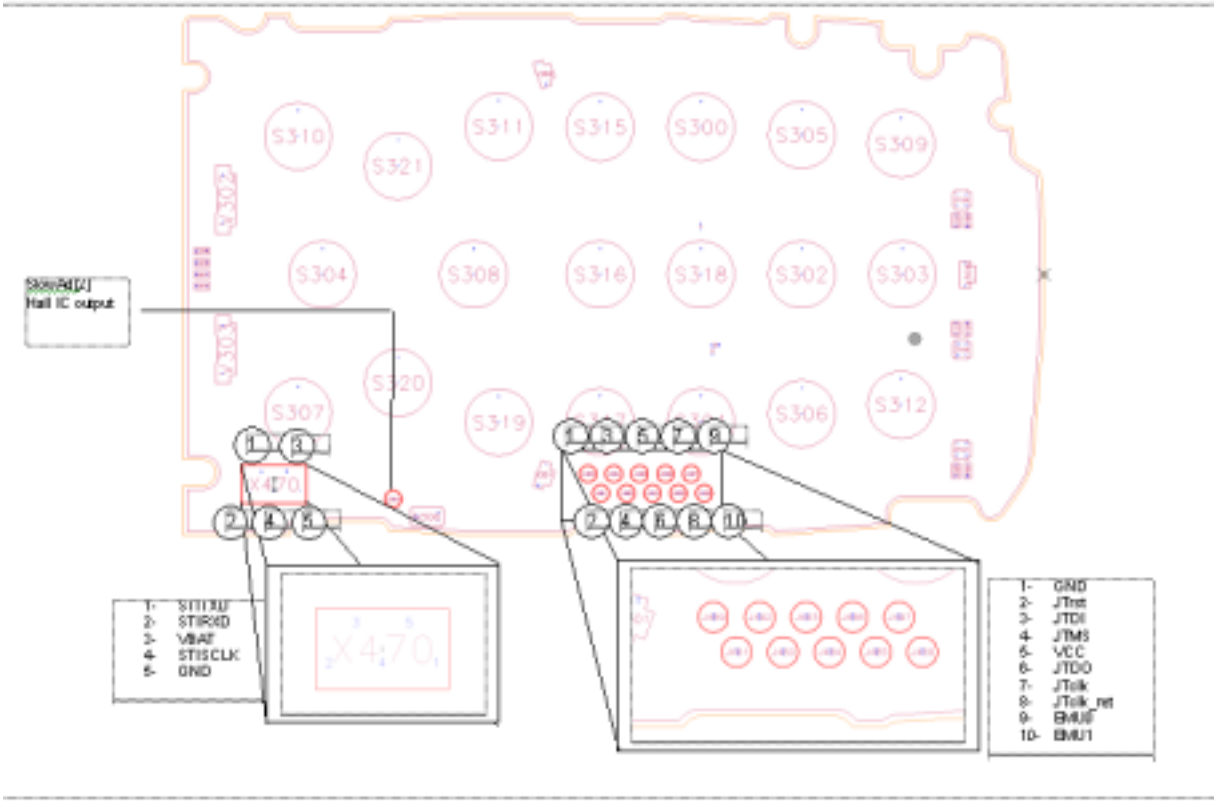


Figure 2:BB test points 2



Troubleshooting diagrams

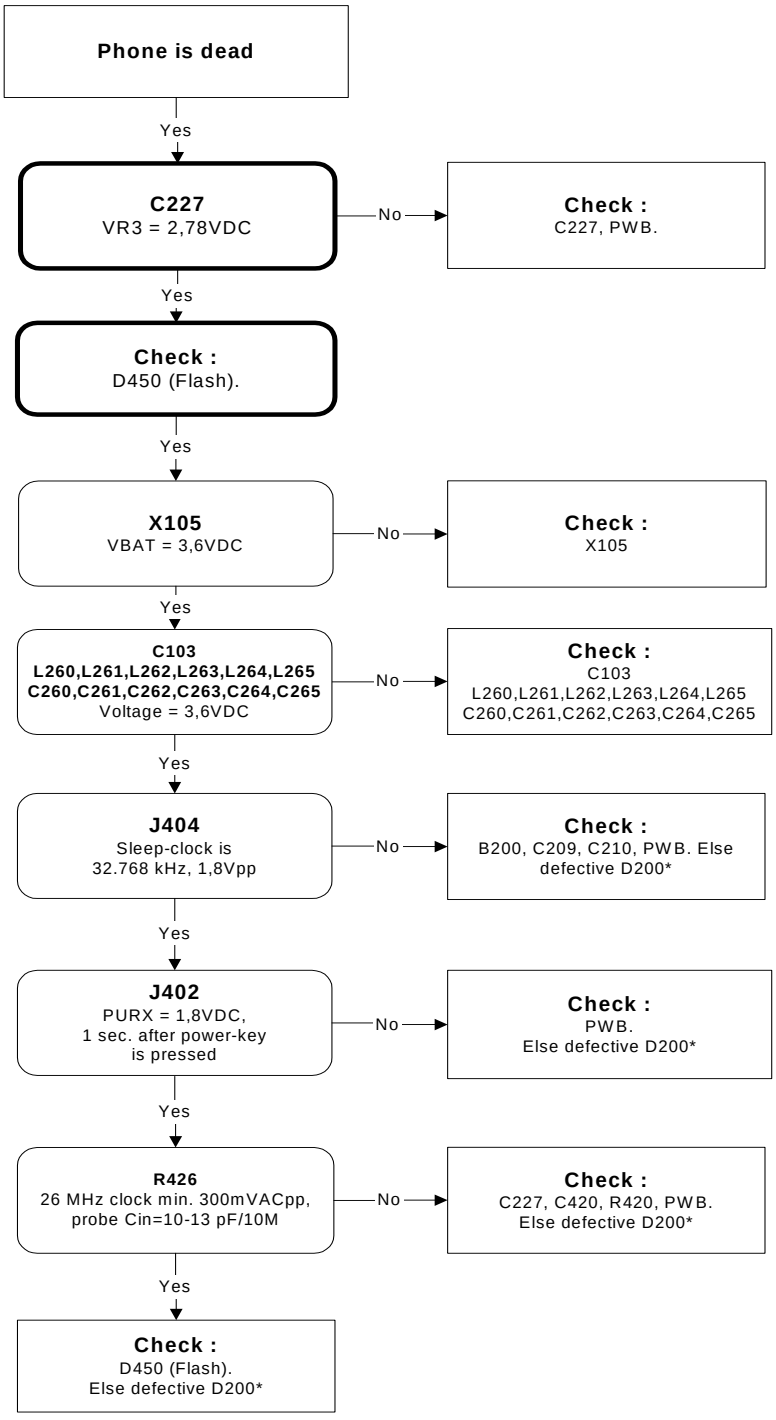
INOTE : Since both D200 (UEM) and D400(UPP) are underfilled, they can not be replaced. If either D200 or D400 is defective, the whole PWB has to be discarded.

Phone is dead

This means that the phone does not draw any current at all when supply is connected and/or power key is pressed.

It is assumed that the voltage supplied is 3.6 VDC. The UEM will prevent any functionality what so ever at battery/supply levels below 2.9 VDC.

Figure 3:Phone is dead troubleshooting



Flash programming does not work

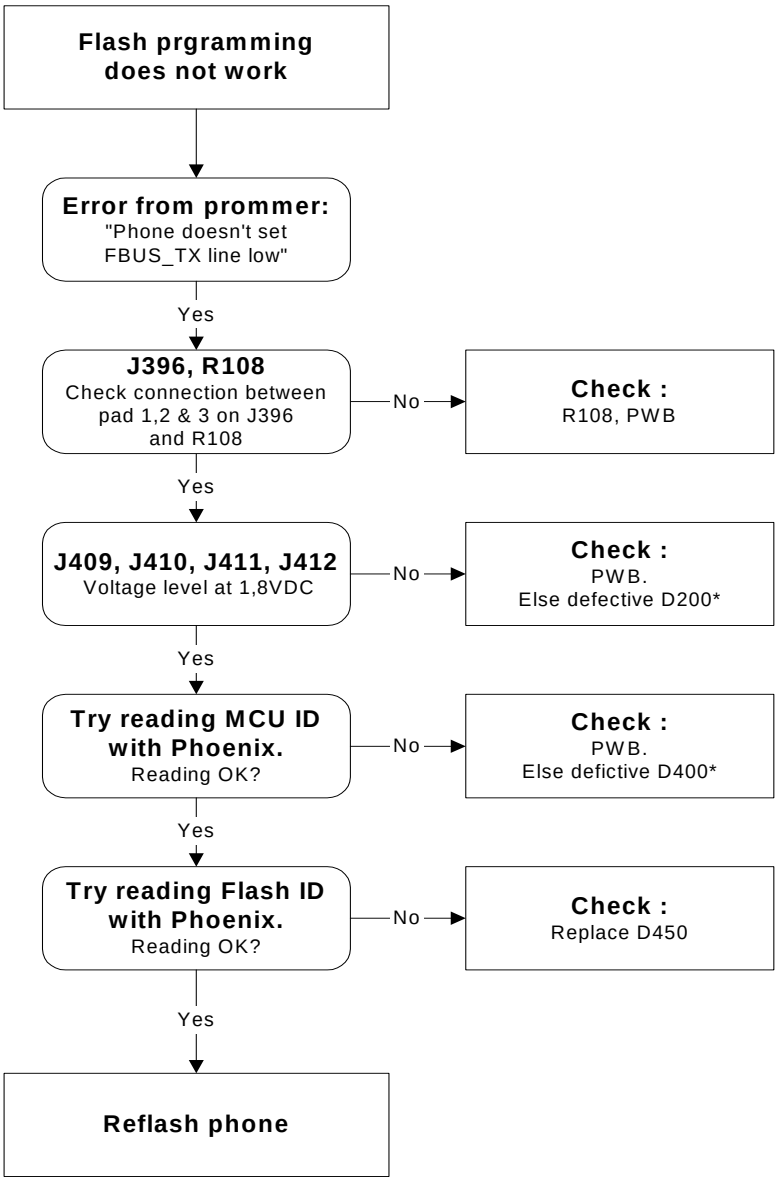
The flash programming can only be done via the pads on the PWB (J396).

In case of Flash failure in FLALI station, problem is most likely related to SMD problems. Possible failures could be short-circuit of balls under µBGAs (UEM, UPP, FLASH). Missing or misaligned components.

In flash programming error cases the flash prommer can give some information about a fault. The fault information messages could be:
- Phone doesn't set FBUS_TX line low

Because of the use of uBGA components it is not possible to verify if there is a short circuit in control- and address lines of MCU (UPP) and memory (flash).

Figure 4:Flash programming troubleshooting

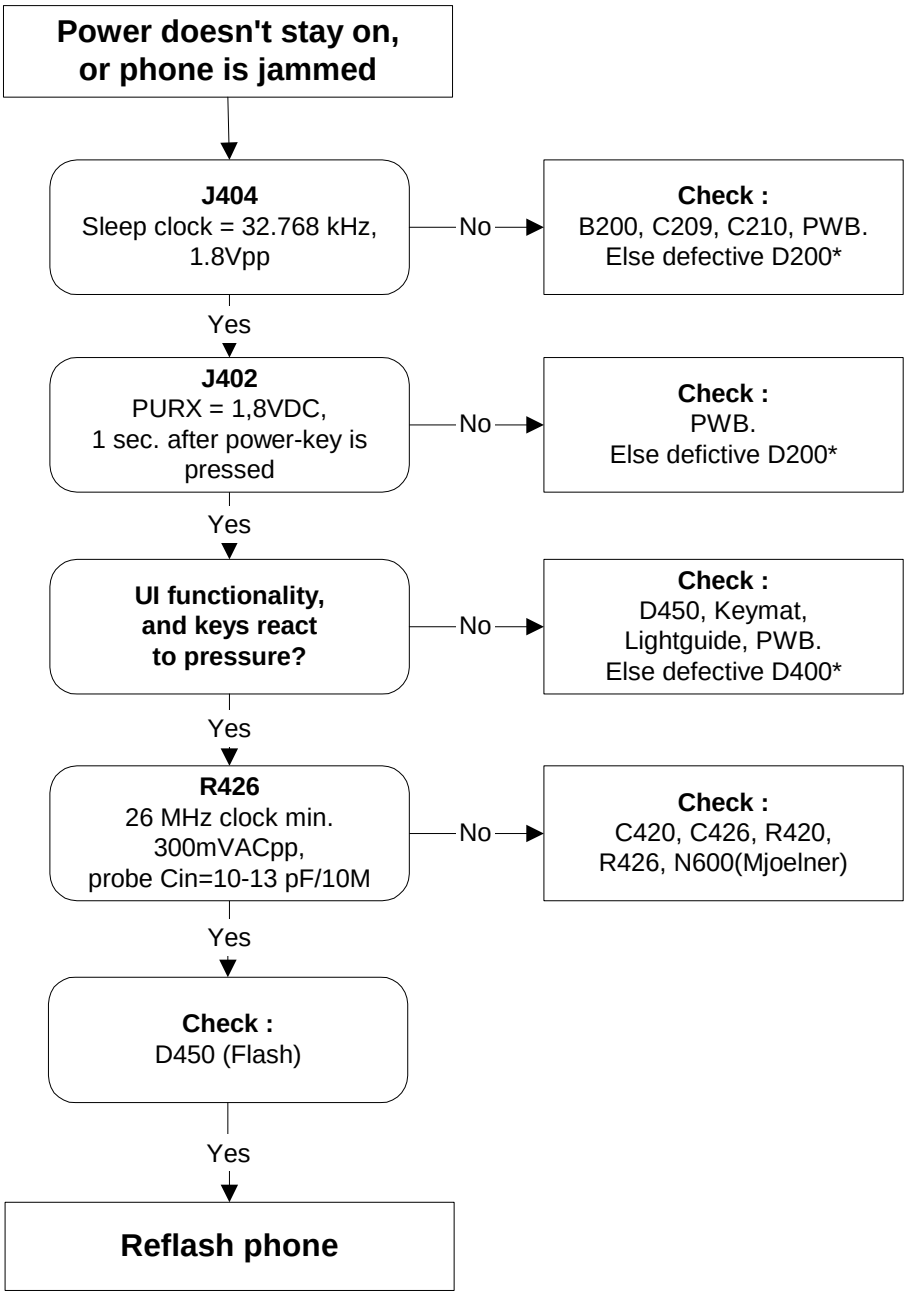


Power does not stay on or phone is jammed

If this kind of failure is presenting itself immediately after FLALI, it is most likely caused by ASICs missing contact with PWB.

If for some reason the MCU does not service the watchdog register within the UEM, the operations watchdog will run out after approximately 32 seconds. Unfortunately, the service routine can not be measured.

Figure 5:Phone jammed troubleshooting

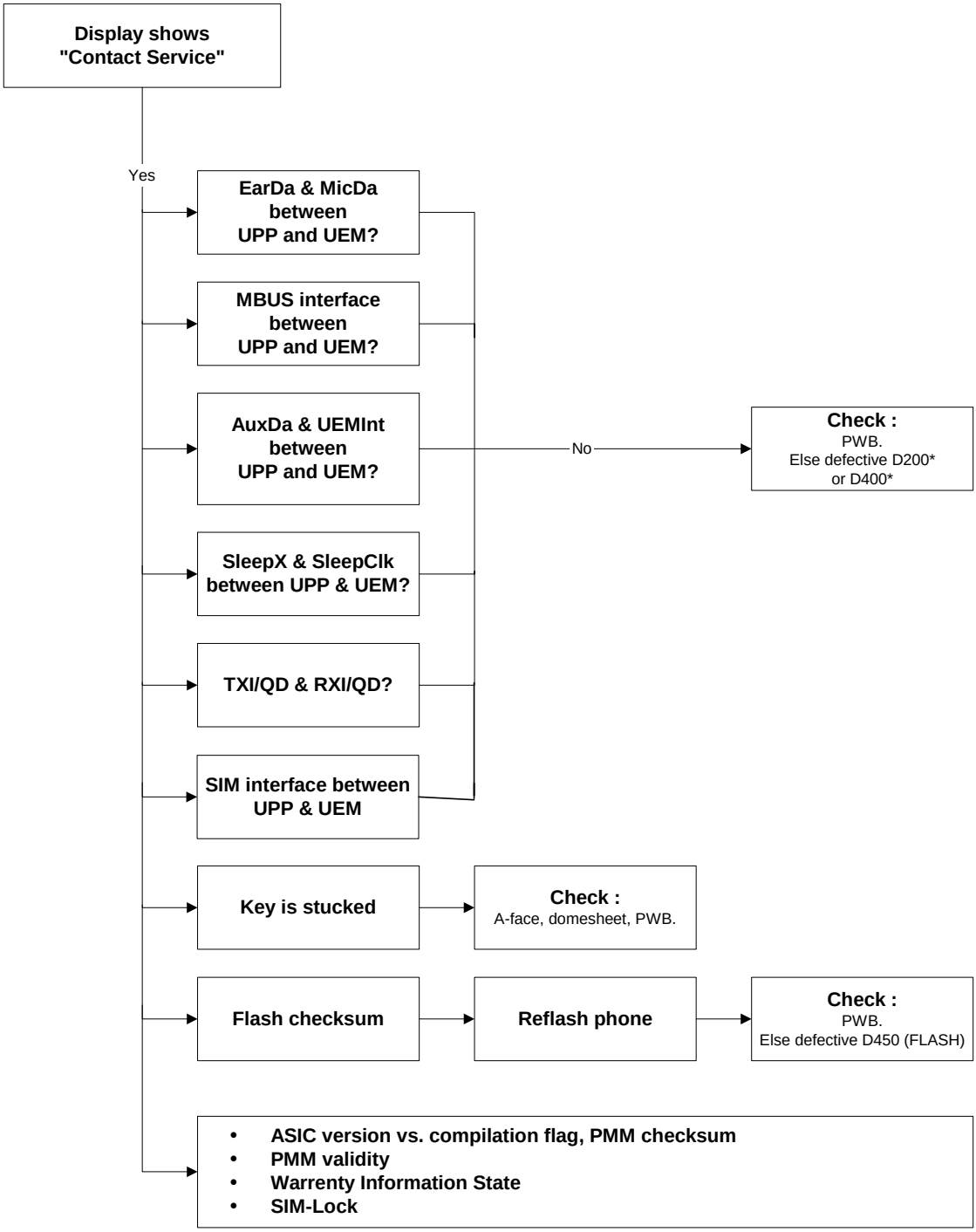


Display information : "Contact Service"

This error can only happen at power up where several self-tests is run. If any of these test cases fails the display will show the message: "Contact Service".

It's individual test cases so the below lineup of error hunting's has no chronological order. Use common sense and experience to decide which test case to start error hunting at.

Figure 6:Troubleshooting when Contact Service message seen

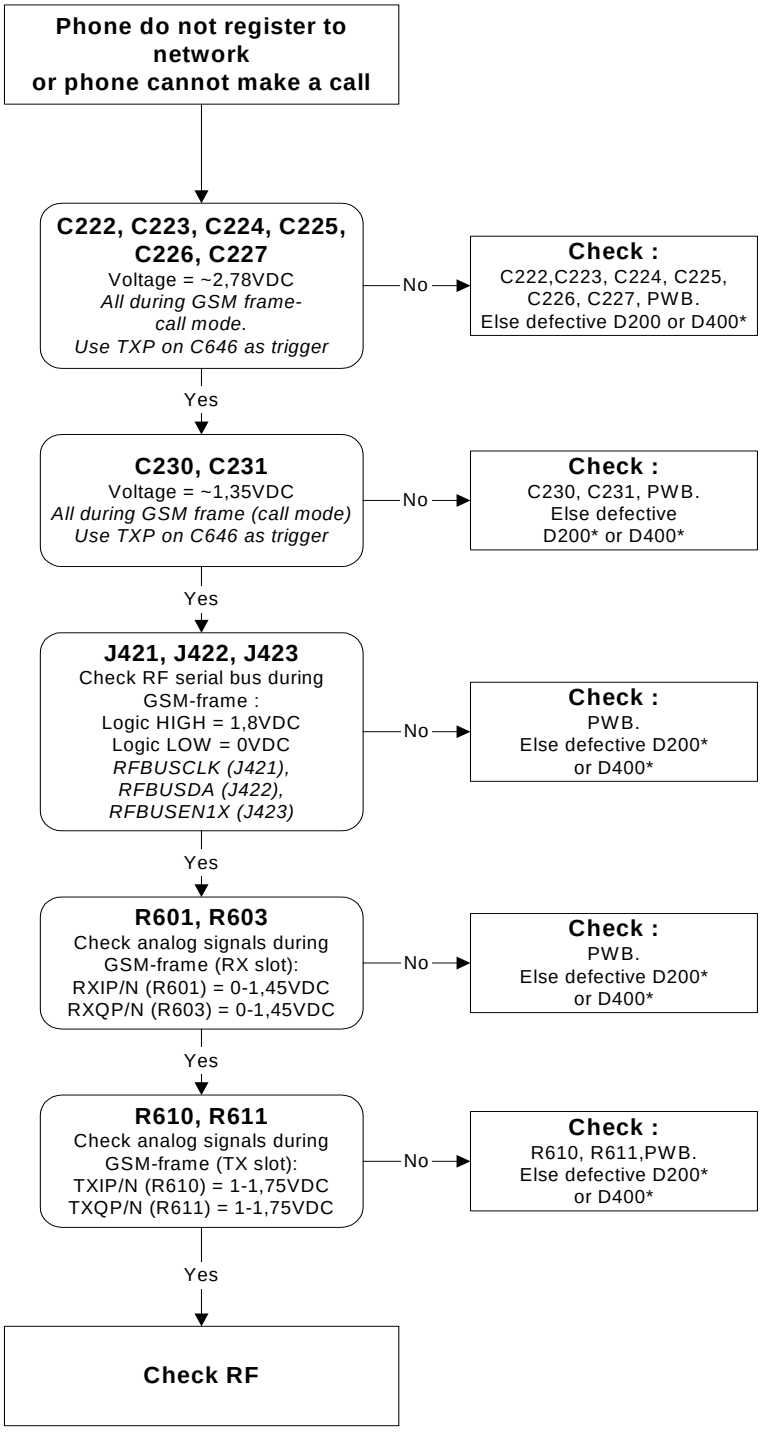


The phone does not register to the network, or the phone cannot make a call

If the phone doesn't register to the network, the fault can be in either BB or RF. Only few signals can be tested since several signals is 'burried' in one or more of the inner layers of the PWB.

First of all check that SIM LOCK is not causing the error by using a Test-SIM card and connect the phone to a tester.

Figure 7:No call troubleshooting



Charging troubleshooting

Figure 8:Phone is OFF:no current from charger

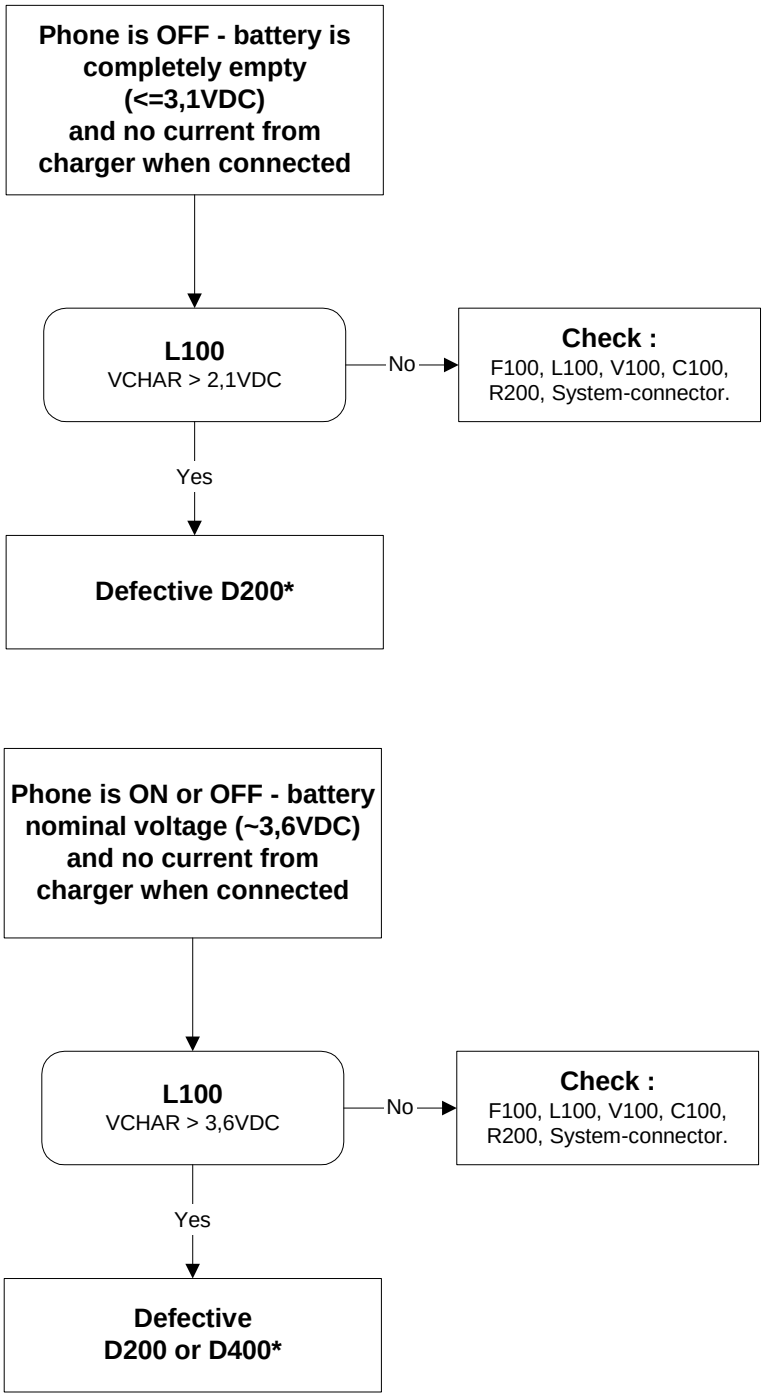
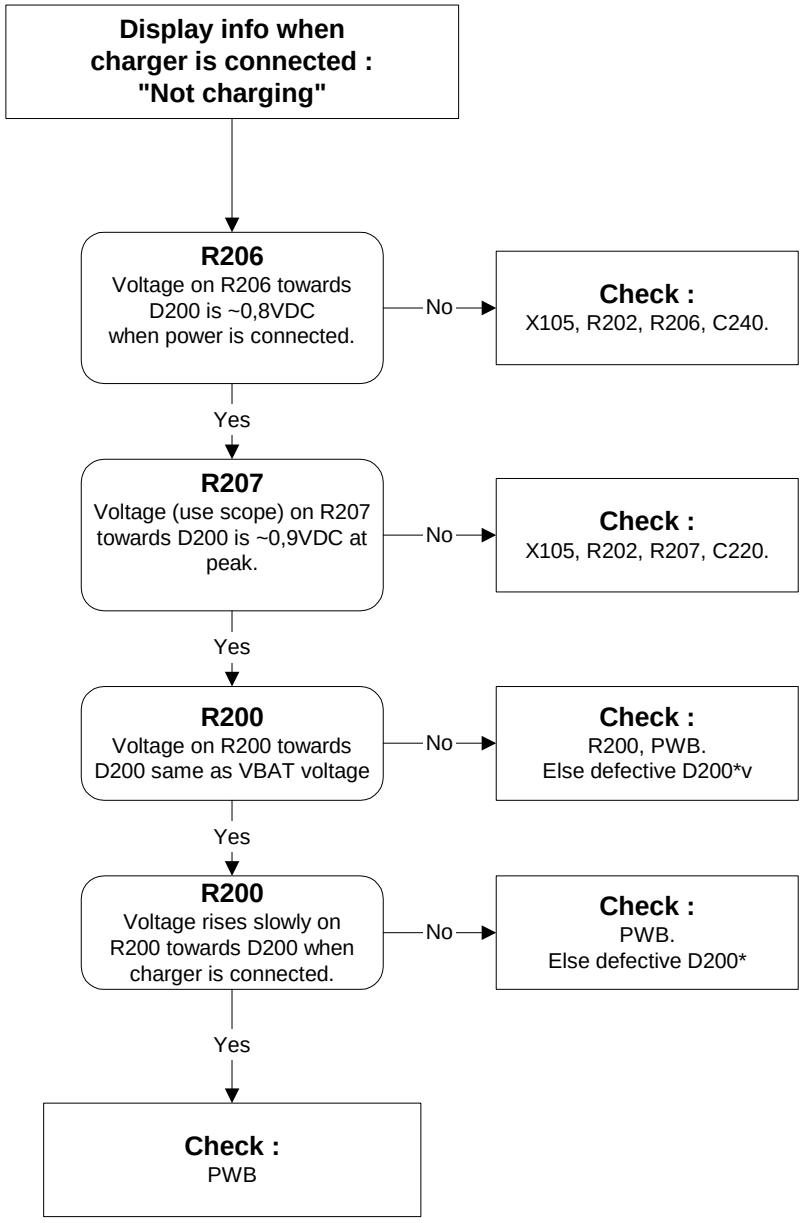


Figure 9:Display info:charger connected, not charging



Audio troubleshooting 1, 2

Figure 10:Microphone does not work

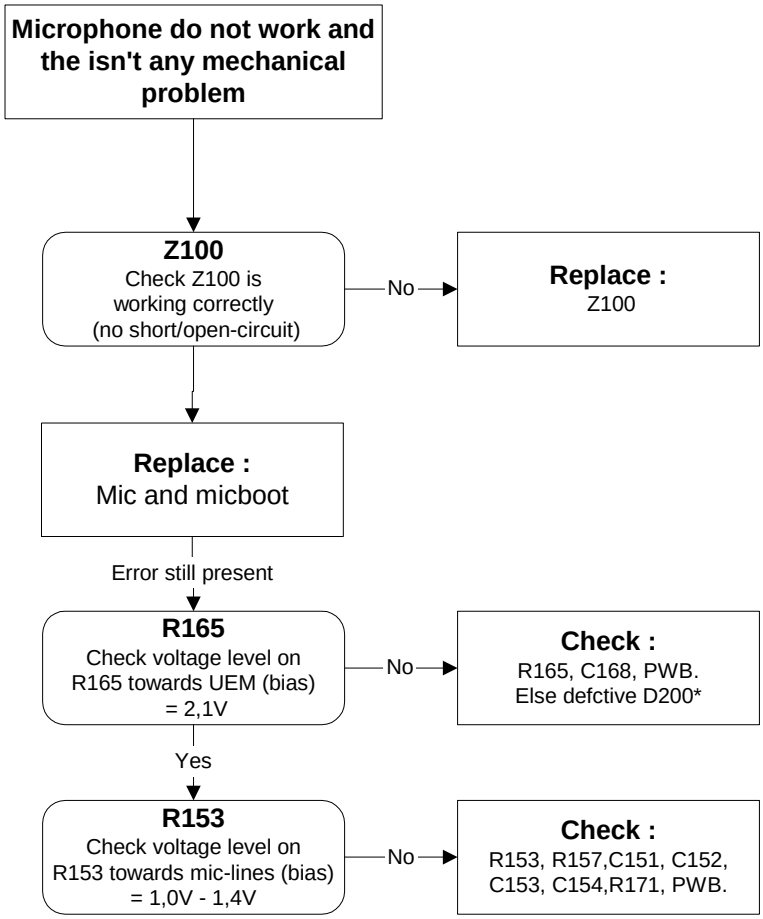
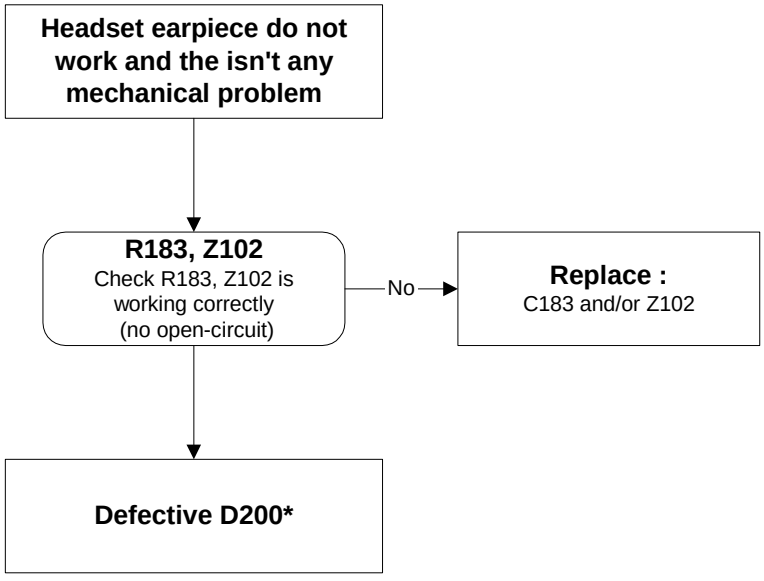
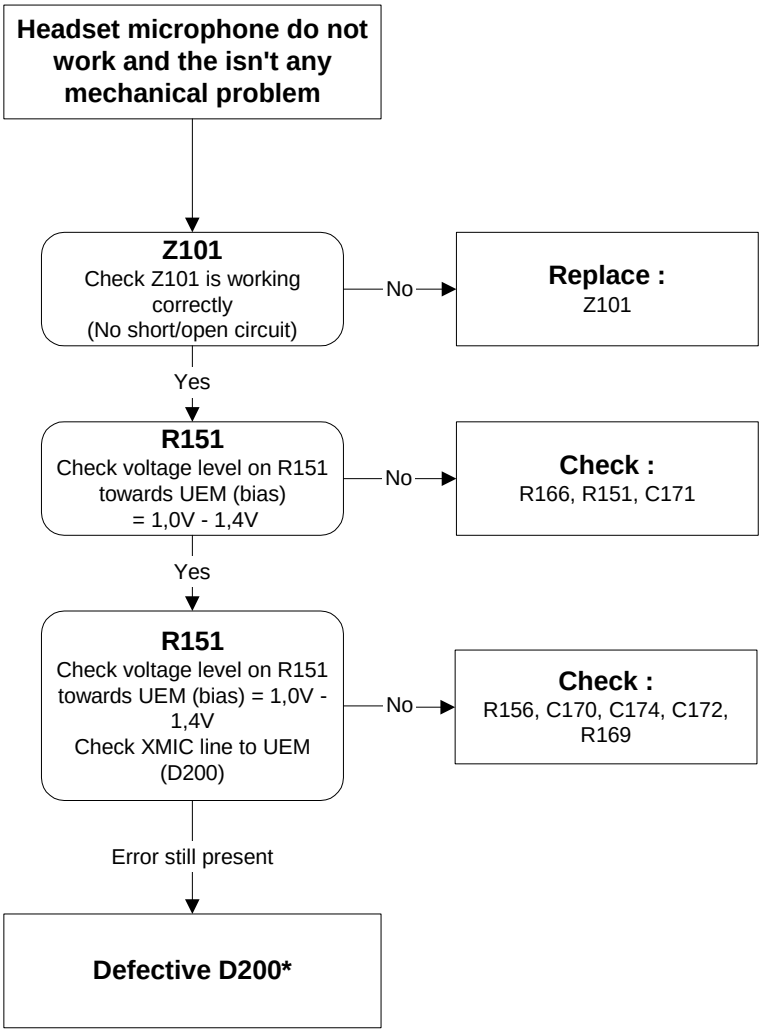


Figure 11:Top: Earpiece does not work



Audio troubleshooting 3: Headset does not work

Figure 12:Headset does not work



Upper block failures

All checks can be done while the phone is partially disassembled (no need for full reasembly inbetween debugging steps):

SIM failure (including insert SIM faults)

1. Flex B2B connector pressed in?
2. Change LCD can assembly (for new flex) works?
3. C314 (VSIM cap) short circuitting?
4. C313 (SIMIO cap) short circuitting?
5. Voltages (SIM startup sequence)? Board to Board connector pin17
6. Change main PWB (UEM)?

The hardware of the SIM interface from UEM (D200) to the SIM connector can be tested without a SIM card. When the power is switched on the phone first check for a 1,8V SIM card and then a 3V SIM card. The phone will try this four times, whereafter it will display ”Insert SIM card”.

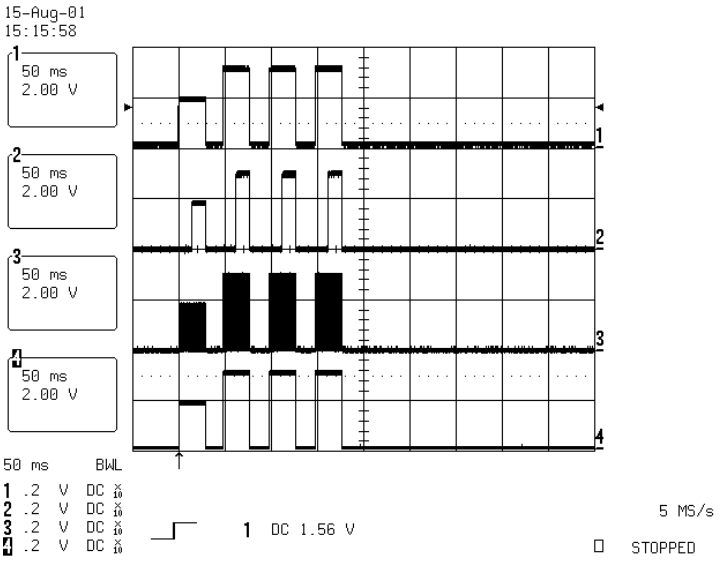
VSIM – Board to board connector pin 17

Reset – Board to board connector pin 29

Clock – Board to board connector pin 20

Data – Board to board connector pin 19

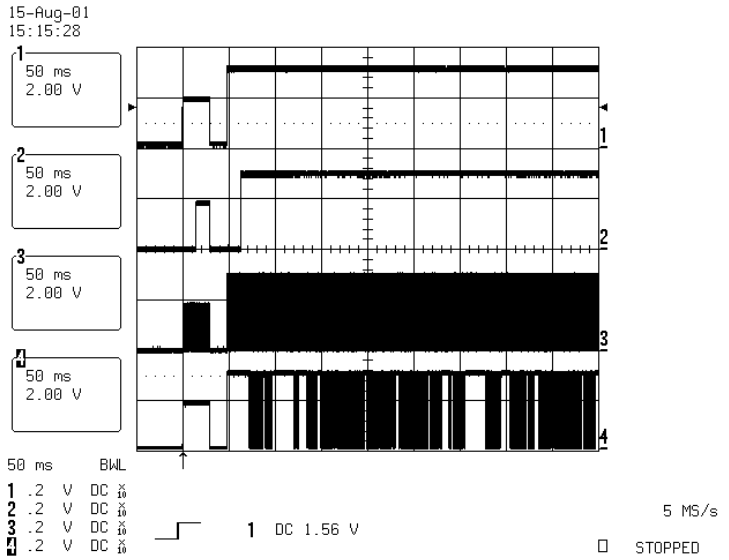
Check for SIM voltage during power-up	
Ch1 : VSIM Ch2 : RESET	Ch3 : CLOCK Ch4 : DATA



The error ”SIM card rejected” means that the ATR message received from SIM card is corrupted, e.g. data signal levels are wrong. The first data is always ATR and it is sent from card to phone.

For reference a picture with normal SIM power-up is shown below.

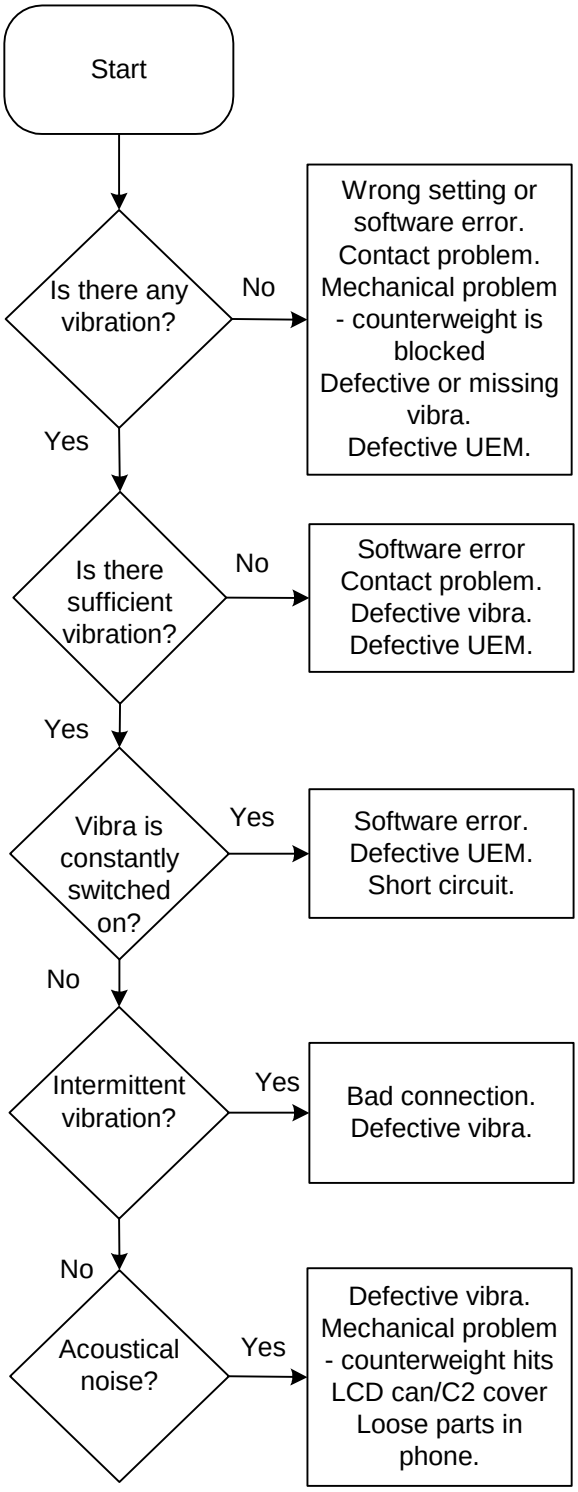
Normal SIM power-up sequence	
Ch1 : VSIM Ch2 : RESET	Ch3 : CLOCK Ch4 : DATA



Vibra failure

1. Flex B2B connector pressed in?
2. Change C2 cover assembly(new vibra)/Vibra works?
3. Change LCD can assembly (new flex) works?
4. Change main PWB (UEM)?

Figure 13:Vibra troubleshooting



Speaker failure

1. Flex B2B connector pressed in?

2. C2 cover mounted correct (red snap not vissible)?
3. Check if system connector is misplaced slightly?
4. Check for ”headset inserted symbol” in display?
5. Change speaker chamber/antenna works?
6. Change LCD can assembly (for new flex) works?
7. Change main PWB (UEM)?

Display failure

1. Flex B2B connector pressed in?
2. Display B2B connector pressed in (press through hole in C2 cover assembly)?
3. Change display works?
4. Change LCD can assembly (for new flex) works?
5. R316 (LCDRESETX) missing?

Fold detection failure

1: Check if magnet is mounted on bottom side of C2 cover assembly
(with a spare screw)
2: Check if N306 (Hall IC) is mounted?

Note:

Don’t try and rework flex!! Handling is likely to cause the solder pads to brake or disconncect from track, which cannot be repaired in a reliable way by resoldering. Only reliable repair option is to change the flex (LCD can assembly)!

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Introduction to RH-53/54 RF Troubleshooting

Three types of measurements are used in the following. It will be specified if the measurement type is "RF" “RF test” or "LF".

- RF measurements should be done with a GSM tester and a suitable connector to the general RF input/output. That connection is for tuning and testing the whole RF in the phone.
- RF test measurements should be done with a Spectrum Analyzer and a high-frequency 500ohm passive probe, for example HP54006A. Use some sort of DC blocking device, to avoid loading the circuit or the SPA with DC. (Note that when measuring with the 500ohm probe, the signal will be around 20 dB attenuated. The values in the following will have these 20 dB subtracted and represent the real value seen on the spectrum analyzer).
- LF (Low frequency) and DC measurements should be done with a 10:1 probe and an oscilloscope. The probe used in the following is 10MΩ/8pF passive probe. If using another probe then bear in mind that the voltages displayed may be slightly different.

Always make sure the measurement set-up is calibrated when measuring RF parameters on the antenna connector. Remember to include the loss in the module repair jig and the coaxial cable when realigning the phone.

Most RF semiconductors are static discharge sensitive. So ESD protection must be taken during repair (ground straps and ESD soldering irons). Mjoelner is moisture sensitive so parts must be pre-baked prior to soldering.

Apart from key-components described in this document there are a lot of discrete components (resistors, inductors and capacitors) for which troubleshooting is done by checking if soldering of the component is done properly or checking if the component is missing from PCB. Capacitors can be checked for short-circuit and resistors for value by means of an ohmmeter, but be aware in-circuit measurements should be evaluated carefully.

In the following both the name “low band” will be used to describe both GSM850 - EGSM and GSM900, while “high band” will be used for both PCN and GSM1800.

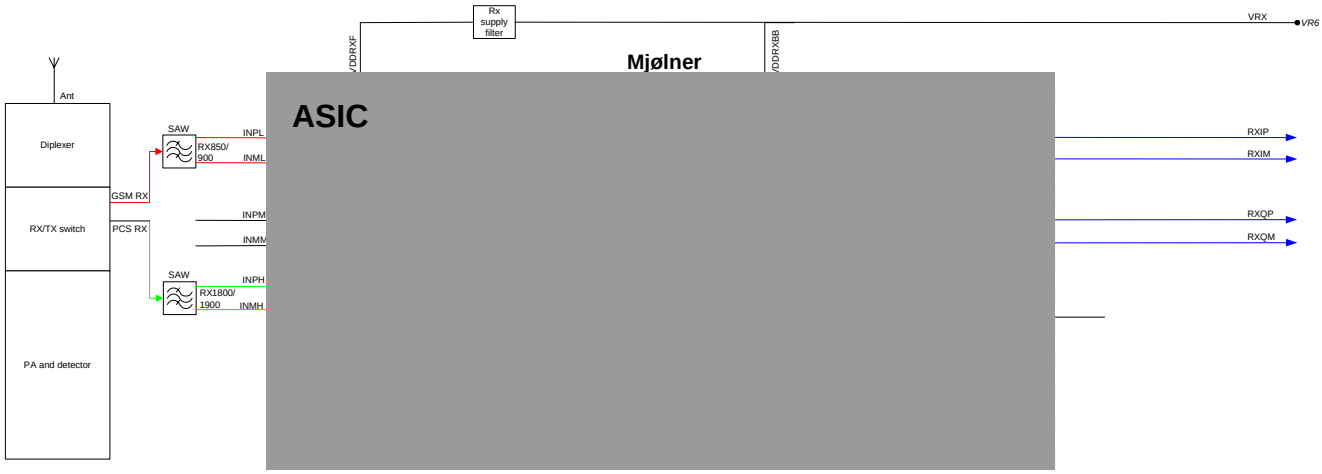
General description of the RF circuits

In the following general desriptions different colours are used in the block diagram. The Low-band signal route is shown in red, the Highband route in green and the common signal lines are shown in blue.

Receiver signal path

The signal from the antenna pad is routed to the Front End Module (FEM - N700). The FEM contains a diplexer and a switch system controlling the direction of the signals, either routing the TX signal from the Power Amplifier (PA) to the antenna or routing the received signal from the antenna to either the Lowband (850/900 MHz) or the Highband (1800/1900 MHz) input on the RF IC (N600).

Figure 14:Receiver signal path



The Lowband signal from the FEM is routed to the SAW filter (Z602). The purpose of the SAW filter is to provide out-of band blocking imummity and to provide the LNA in Mjoelner (N600) with a balanced signal. The front end of Mjoelner is divided into a LNA and Pre-Gain amplifier before the mixers.

The output from the mixer is fed to Baseband part of Mjoelner where the signals amplified in the BBAMP aand low pass filteret in LPF1 before the DC compensation circuits in DCN1. The DCN1 output is followed by a controlled attenuator and a second lowpass filter LPF2. The output from LPF2 is DC centeret in DCN2 before being feed to the BB for demodulation.

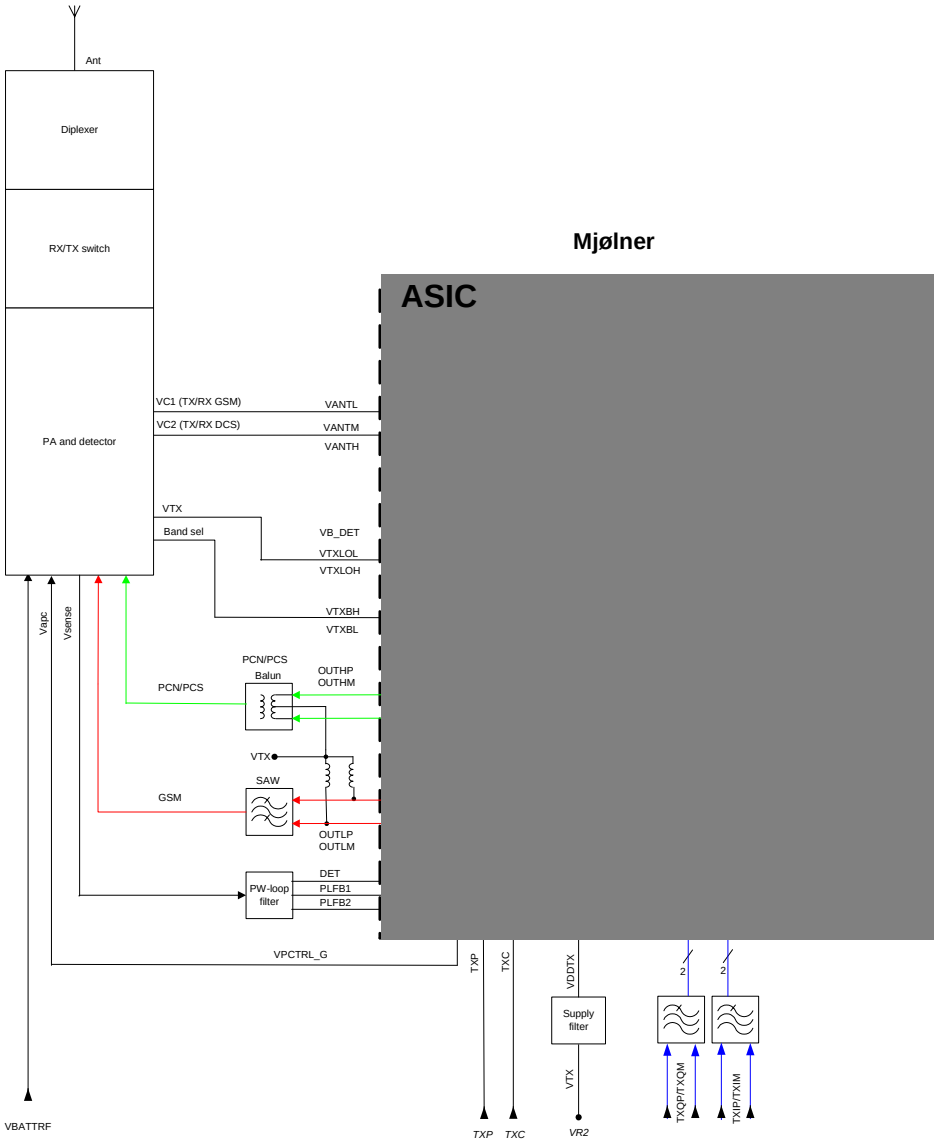
The Highband signal chain is similar to the lowband.

Transmitter signal path

The I/Q signal from the BB is routed two the modulators for both Lowband and Highband. The output of the modulators is either terminated in a SAW filter (Z603) for the Lowband or a balun for the Highband. The signals from the SAW and Balun are then amplified in the Power Amplifier (PA) located in the Front End Module (FEM - N700) where the gain control takes place. In

order to control the TX level a sample of the signal is taken in the FEM and used in the power loop amplfier in Mjoelner to establish the right output power. The selection of which amplifier chain in the FEM to be active is controlled through the 4 controllines VC1, VC2, BS and Vtx.

Figure 15:Transmitter signal path



PLL

The PLL supplies Local Oscillator (LO) signals for the RX and TX-mixers. In order to be able to generate LO-frequencies for the required EGSM and PCN channels a regular synthesizer-circuit is used. All blocks for the PLL except for the VCO, reference X-tal and loopfilter is located in the Mjoelner IC, N600.

The reference frequency is generated by a 26MHz Voltage Controlled X-tal Oscillator (VCXO) located in the Mjoelner IC. Only the X-tal is external. 26MHz is supplied to BB where a divide-by-2 circuit (located in the UPP IC) generates the BB-clock at 13MHz. The reference frequency

is supplied to the reference divider (RDIV) where the frequency is divided by 65. The output of RDIV (400kHz) is used as reference clock for the Phase Detector (φ).

The PLL synthesizer is a feedback control system controlling the phase and frequency of the LO-signal. Building blocks for the PLL are: Phase detector, Charge Pump, Voltage Controlled Oscillator (VCO), N-Divider and loopfilter. As mentioned earlier only the VCO and loopfilter is external to the Mjoelner IC.

The VCO (G600) is the component that actually generates the LO-frequency. Based on the control voltage input the VCO generates a signal, which is made differential through a balun. This signal is fed to the Prescaler and N-divider in Mjoelner, these 2 block together divide the frequency by a ratio based on the selected channel. The divider output is supplied to the phase detector which compares the frequency and phase to the 400kHz reference clock. Based on this comparison the phase detector controls the charge pump to either charge or discharge the capacitors in the loopfilter. By charging/discharging the loopfilter the control voltage to the VCO changes and the LO-frequency will change. Therefore the PLL will make the LO-frequency stay locked to the 26MHz VCXO frequency.

The loopfilter consists of the following components: C639-C641 and R618-R619.

The PLL is operating at twice the channel center frequency when transmitting or receiving in the PCN band. For the EGSM band the PLL is operating at 4-times the channel frequency. Therefore divide-by-2 and divide-by-4 circuits are inserted between the PLL output and LO-inputs to the PCN and EGSM mixers.

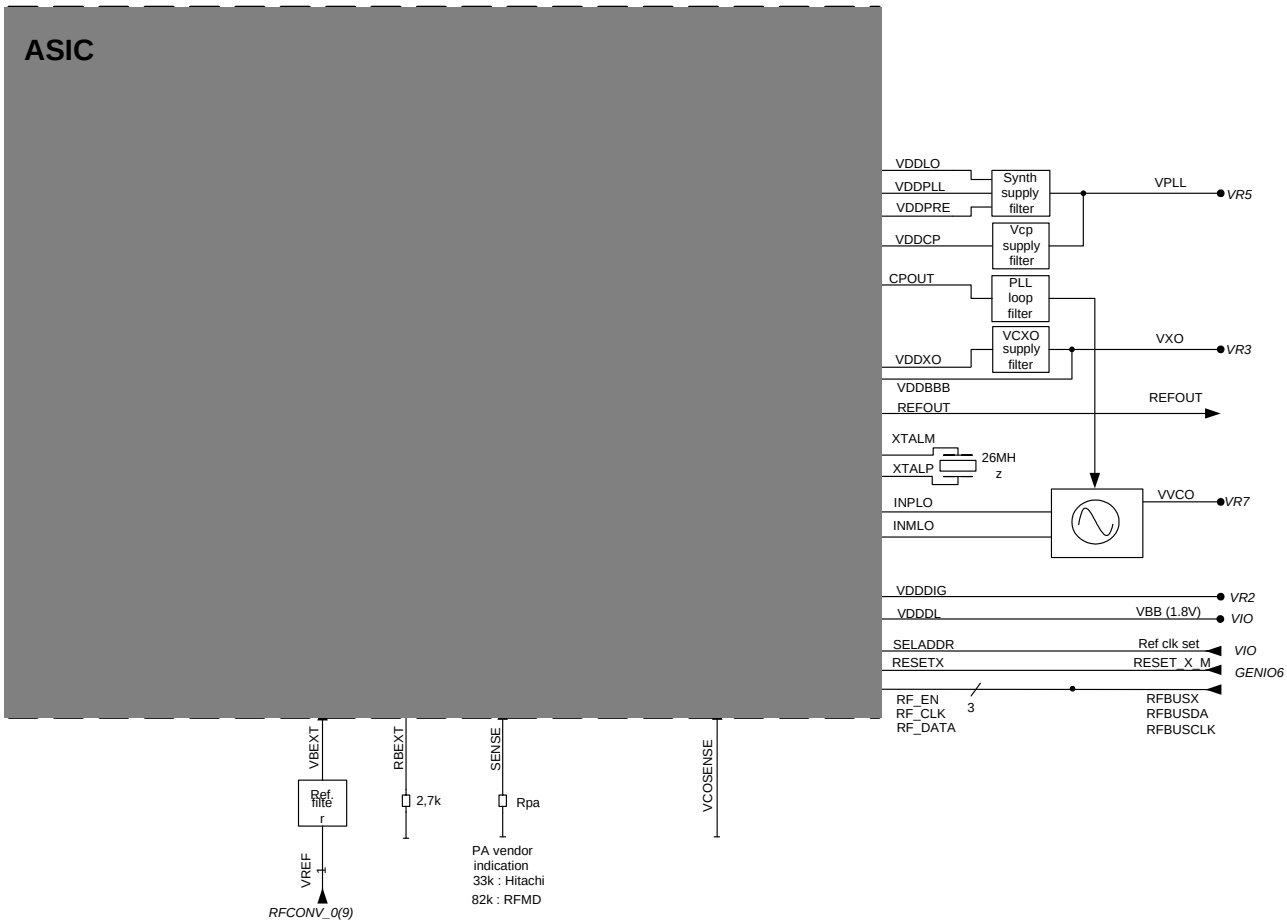
The frequency plan is shown in the figure below:

Table 1: Frequency table

Frequency Band		Channel #	System Frequency Band [MHz]	PLL Frequency Band [MHz]
GSM 850	RX	128 – 251	869.2 – 893.8	3476.8 – 3575.2
	TX		824.2 – 848.8	3296.8 – 3395.2
EGSM 900	RX	975 – 1023 1 – 124	925.2 – 959.8	3700.8 – 3839.2
	TX		880.2 – 914.8	3520.8 – 3659.2
GSM 1800	RX	512 – 885	1805.2 – 1879.8	3610.4 – 3759.6
	TX		1710.2 – 1784.8	3420.4 – 3569.6
PCN	RX	512 – 810	1930.2 – 1989.8	3860.4 – 3979.6
	TX		1850.2 – 1909.8	3700.4 – 3819.6

According to the figures above the PLL must be able to cover the frequency range 3420.4MHz to 3839.2MHz for the GSM900/1800 and 3296.8 to 3979.6MHz for the GSM850/1900.

Figure 16:Frequency plan



RF Key component placement

Figure 17:RF key component placement

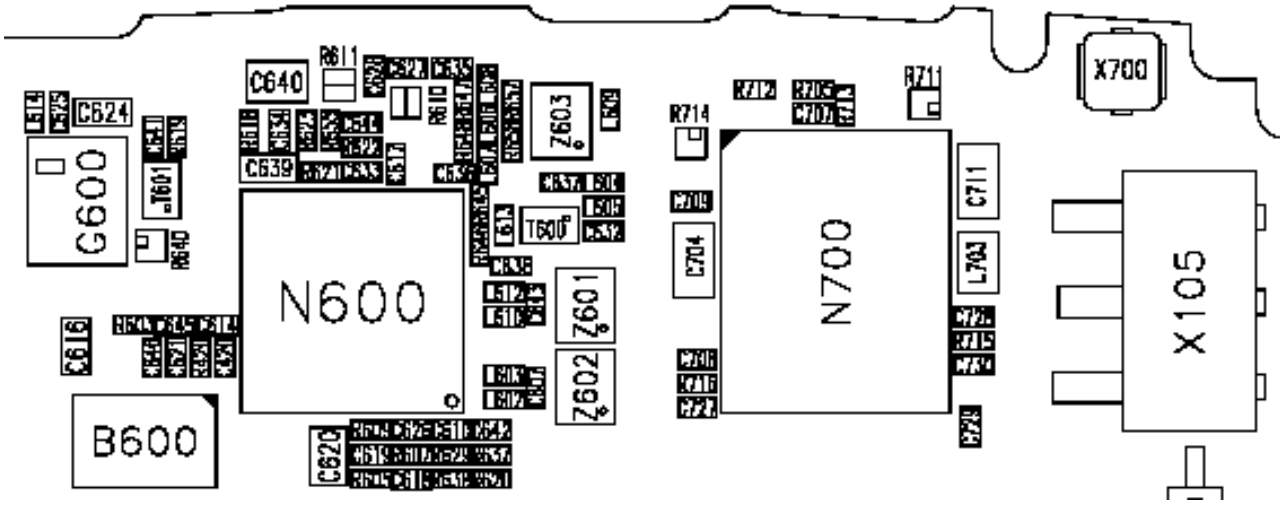


Table 2: Key component placement tABLE

N600	Mjoelner RF IC	
Z601	PCN RX SAW	High band RX SAW filter
Z602	EGSM RX SAW	Low band RX SAW filter
Z603	EGSM TX SAW	Low band TX SAW filter
B600	26 MHz crystal	
G600	VCO (3.6 GHZ VCO)	
N700	Front End Module (FEM)	
X700	RF connector	

Troubleshooting

Common circuit

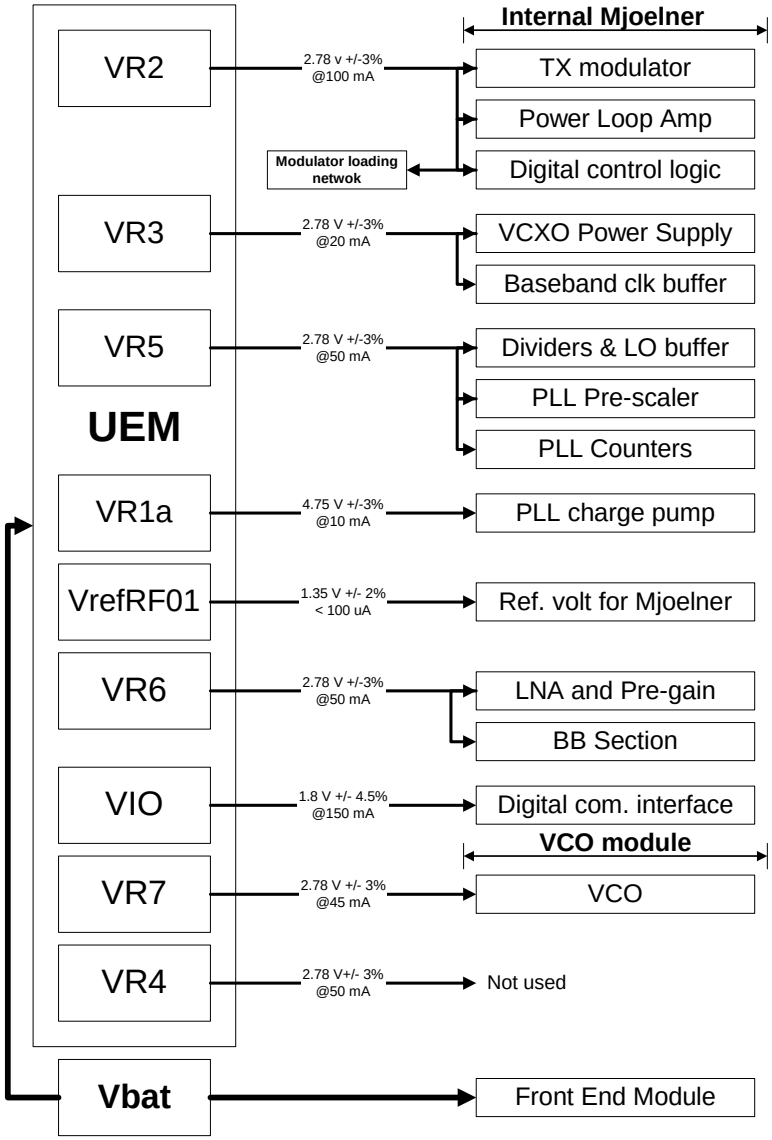
The power supply and the synthesiser is common for RH53/54, except for the synthesiser ranges.

Power Supply Configuration

All power supplies for the RF Unit are generated in the UEM IC (D200). All power outputs from this IC have a decoupling capacitor at which the supply voltage can be checked.

The power supply configuration used in the phone is shown in the block diagram below:

Figure 18:Power supply configuration



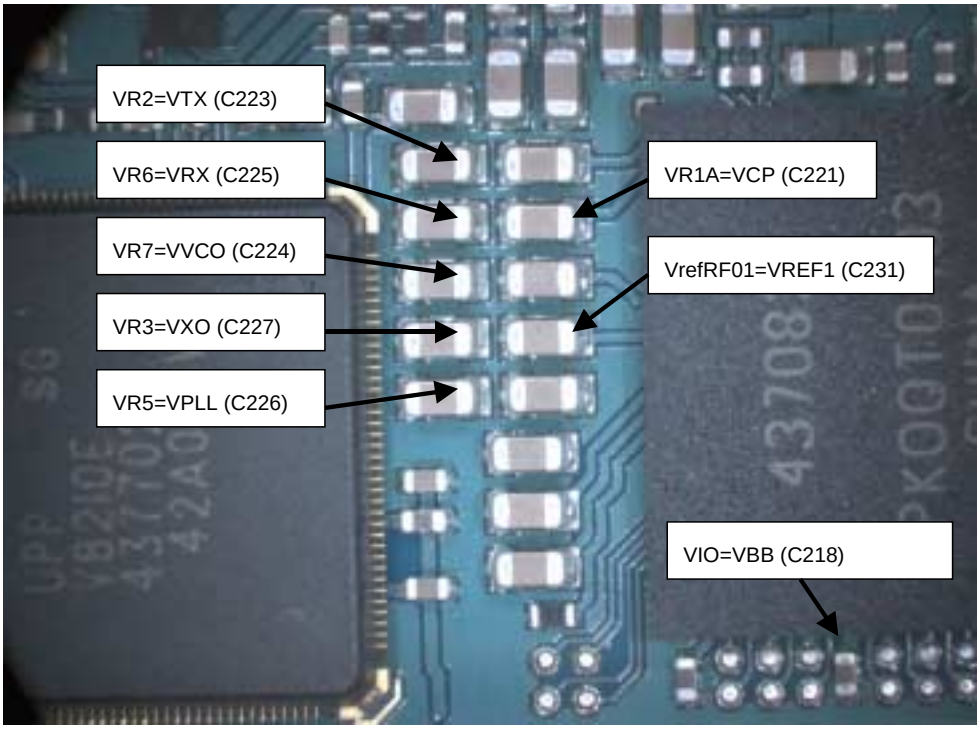
The names to the left are the signal names used on the RF schematics

Table 3: Supply names

Supply name RF	Supply name UEM	Min	Typ	Max	Unit
VCP	VR1A	4.54	4.75	4.9	V
VTX	VR2	2.64	2.78	2.86	V
VXO	VR3	2.64	2.78	2.86	V
VPLL	VR5	2.64	2.78	2.86	V
VRX	VR6	2.64	2.78	2.86	V
VVCO	VR7	2.64	2.78	2.86	V
VBB	VIO	1.72	1.8	1.88	V
VREF2	VrefRF01	1.334	1.35	1.366	V
VBATT	BATTERY	3.1	3.6	5.2	V

See the picture below for measuring points at the UEM (D200).

Figure 19: UEM measuring points



There is only one PLL synthesizer generating Local Oscillator frequencies for both RX and TX in both bands (Lowband and Highband). The VCO frequency is divided by 2 for Highband operation or by 4 for Lowband operation inside the Mjoelner IC.

General instructions for Synthesizer troubleshooting

Start the Phoenix-Service-Software and

Select:ProductRH53/54 or scan

Select:Testing

RF Controls

Band XX, se table below

Active UnitRX

Operation ModeContinuous

RX/TX ChannelYY se table below

The signal from the VCO is measured at R640 using a spectrum analysator and a 500ohm passive probe. The frequency should be as found in the table below and the power should be around –20dBm.

Table 4: Frequency table

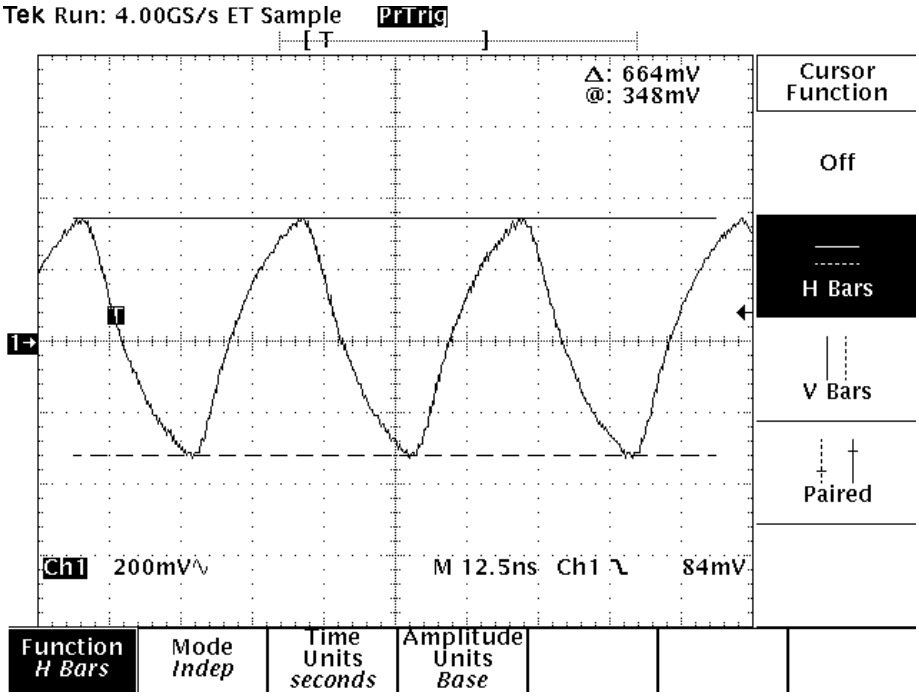
ZZ	XX	YY	PLL frequency [MHz]
RH-54	GSM850	189	3525.6
RH-53	GSM900	36	3768.8
RH-53	GSM1800	700	3685.6
RH-54	GSM1900	661	3920

26 MHz Reference Oscillator (VCXO)

The 26 MHz oscillator is located in the Mjoelner IC (N600). The coarse frequency for this oscillator is set by an external crystal (B600). The reference oscillator is used as a reference frequency for the PLL synthesizer and as the system clock for BaseBand. The 26MHz signal is divided by 2 to achieve 13MHz inside the UPP IC (D400). The 26 MHz signal from the VCXO can be measured by probing R420 at the end towards the UPP, see “Measurement points for the Synthesizer”. The level at this point is approx. 700mVpp. Frequency of this oscillator is adjusted by changing the AFC-register inside the Mjoelner IC. This is done via the Mjoelner serial interface.

Example Signal Measured at VCXO output (R420)

Figure 20:Measured signal at VCXO output

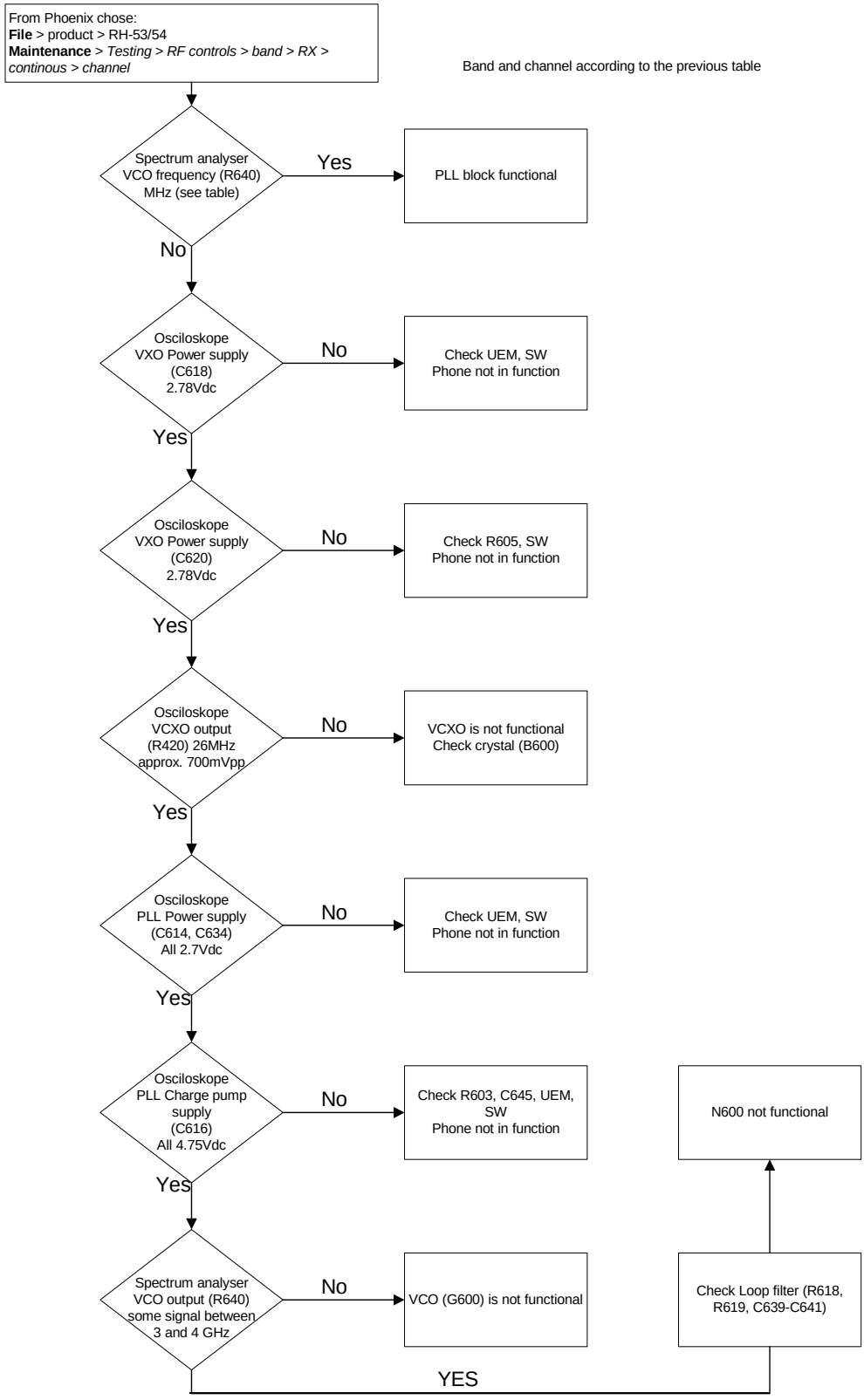


VCO

The VCO is generating frequencies in the range of 3420.4MHz – 3839.2 MHz for the RH-53 and in the range 3296.8 to 3979.6 MHz for RH-54 when the PLL is running. The output frequency from the VCO is led to the Local oscillator input of the Mjoelner IC (N600), where the frequency is divided either by 2 or 4 in order to generate all channels in EGSM and PCN respectively. Frequency of the VCO is controlled by a DC-voltage (Vctrl) coming from the loopfilter. The loopfilter consists of the components R618, R619 and C639-C641. Range of the Vctrl when the PLL is running (locked) is 0.4V – 4.3V. Even if the PLL is not in locked state (Vctrl out of range) there is some frequency at the output of the VCO (G600), which is between 3 and 4 GHz. This is true if the VCO is working and if the VCO power supply is at present (2.7V).

Troubleshooting chart for the Synthesizer

Figure 21:Troubleshooting chart for synthesizer



If the phone stops working a short time after the power is turned ON, a possible reason for this might be the 26MHz system clock signal is not getting to the UPP clock-input in BaseBand. In this case check the following:

Turn on the phone and check

VCXO Power supply (C620) = 2.7V

VCXO output (R420 – end **not** connected to C420) is 26MHz and approx. 700mVpp

If this is not the case check the reference crystal (B600) and Mjolner (N600) as well as R420, R426, C420, C426.

Measurement points for the Synthesizer

Figure 22:Measurement points for Synthesizer

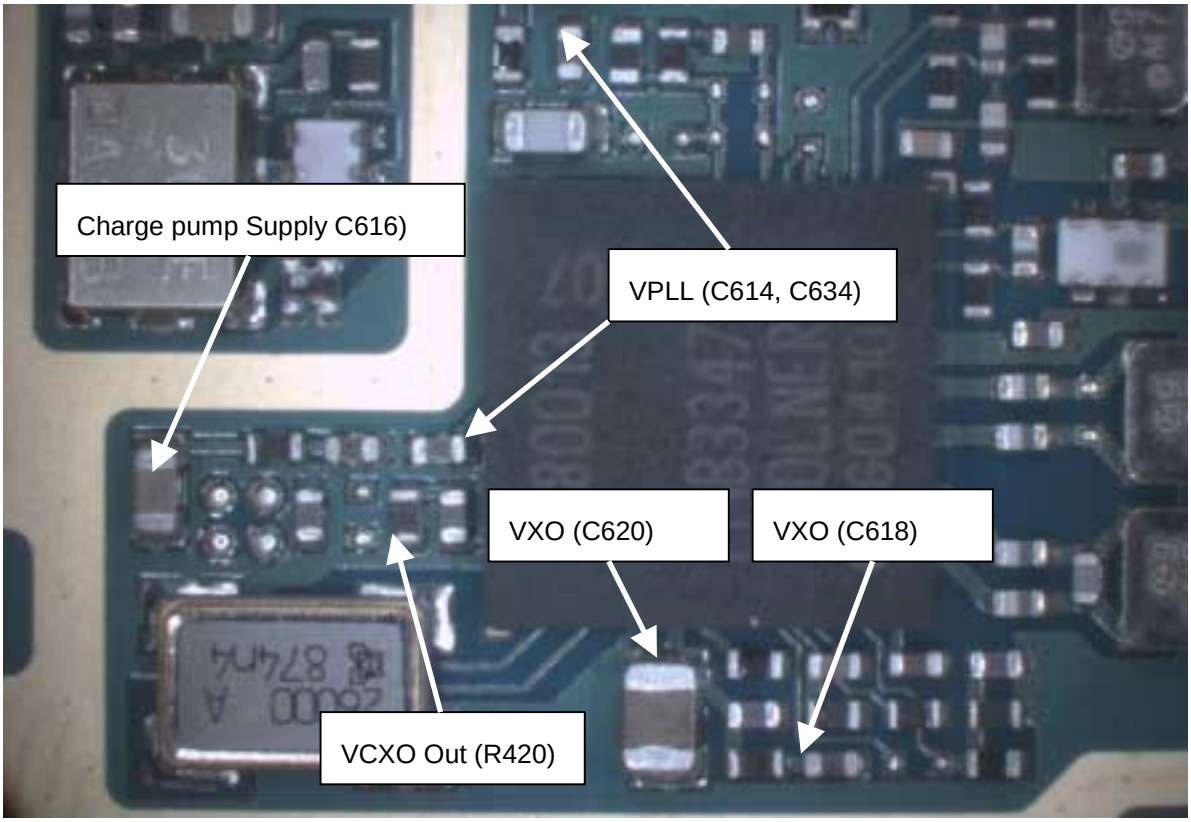
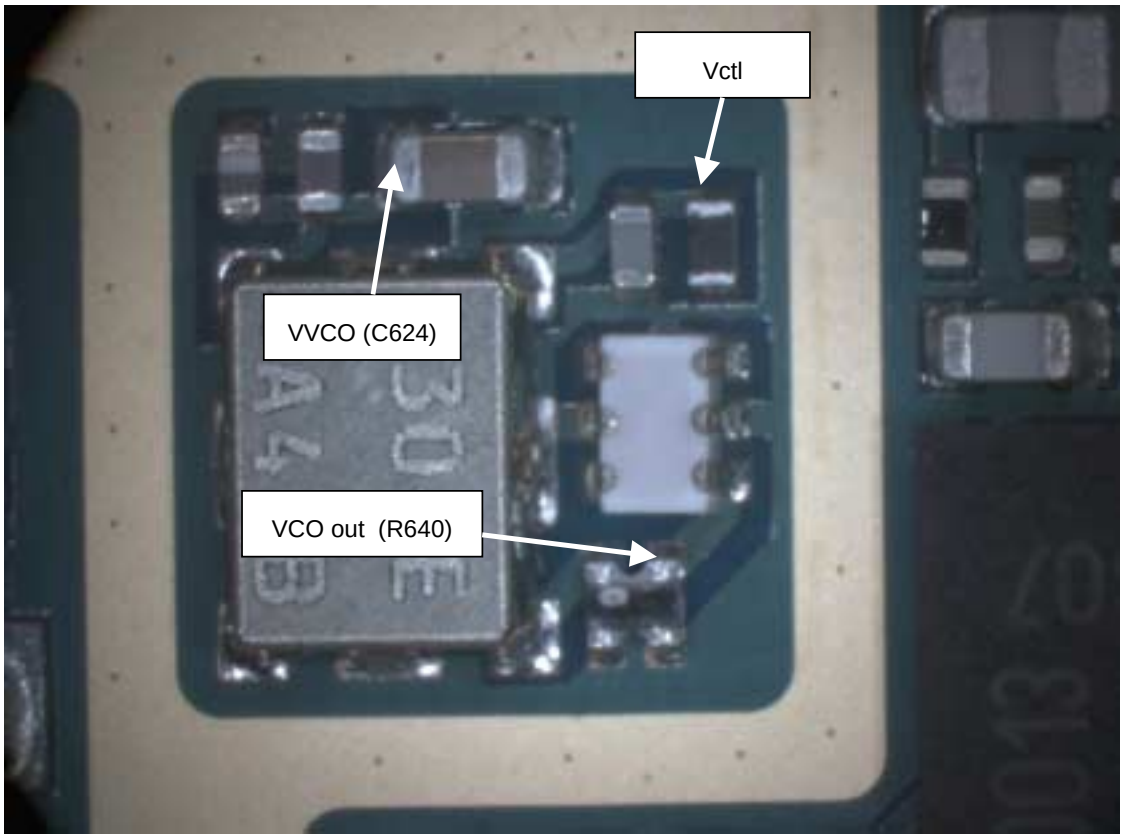


Figure 23:Measurement points for the VCO



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Receiver Troubleshooting

Front End Module (FEM) control signals

Depending on the vendor of the Front End Module (FEM), different timing of the control signals are present. The SW suppoerts both FEMs. R629 tells the SW which FEM control should be active. Renesas FEM control is used when R629 is 18K and RFMD FEM control is used when R629 is 82K.

If the FEM is exchanged with an other type, the R629 must be changed, too.

Renesa FEM logic

Table 5: Renesa FEM logic

Mode	Vtx	BS	VC1	VC2
	VTX_B_P	VTX_B_P	Vant1	Vant2
Low Band RX	0	0	0	0
Low Band TX	1	0	1	0
High Band RX	0	1	0	0
High Band TX	1	1	0	1

RFMD FEM logic

Table 6: RFMD FEM logic

	Vtx	BS	VC1	VC2
Mode	VTX_B_P	VTX_B_P	Vant1	Vant2
Idle	0	0	0	0
Low Band RX	0	0	1	0
Low Band TX	1	0	1	0
High Band RX	0	1	1	0
High Band TX	1	1	1	0

Measurements points

Measurement points for the receiver

Figure 24:Measurement points for the FEM

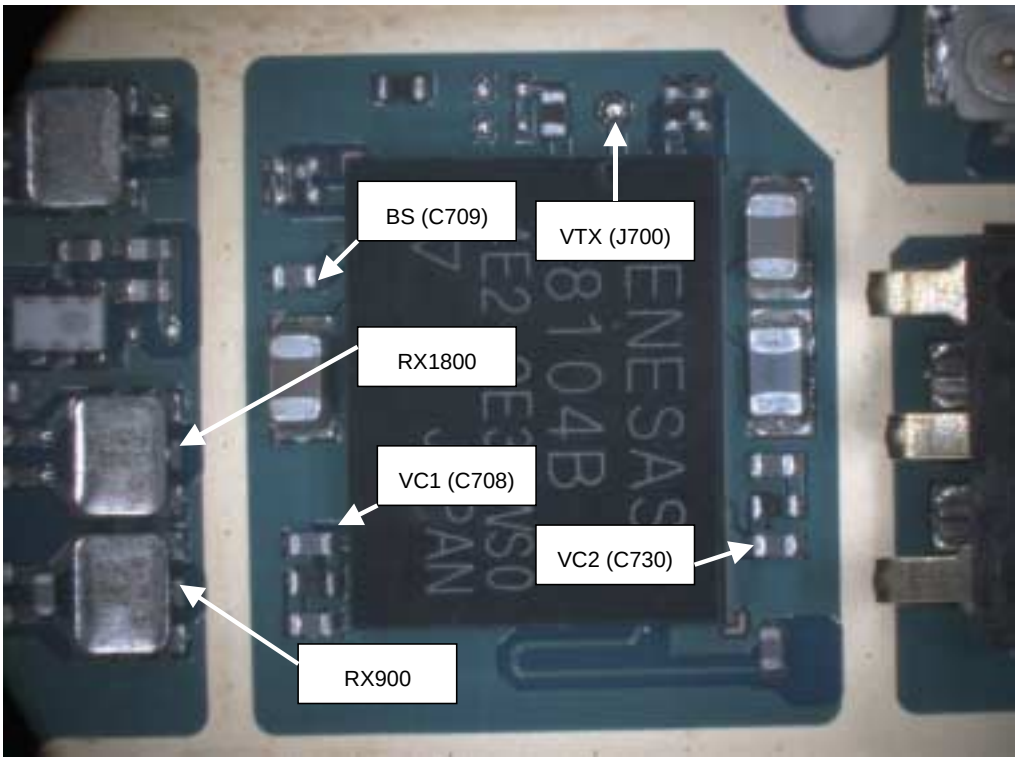


Figure 25:RX interface points between N600/SAW filters

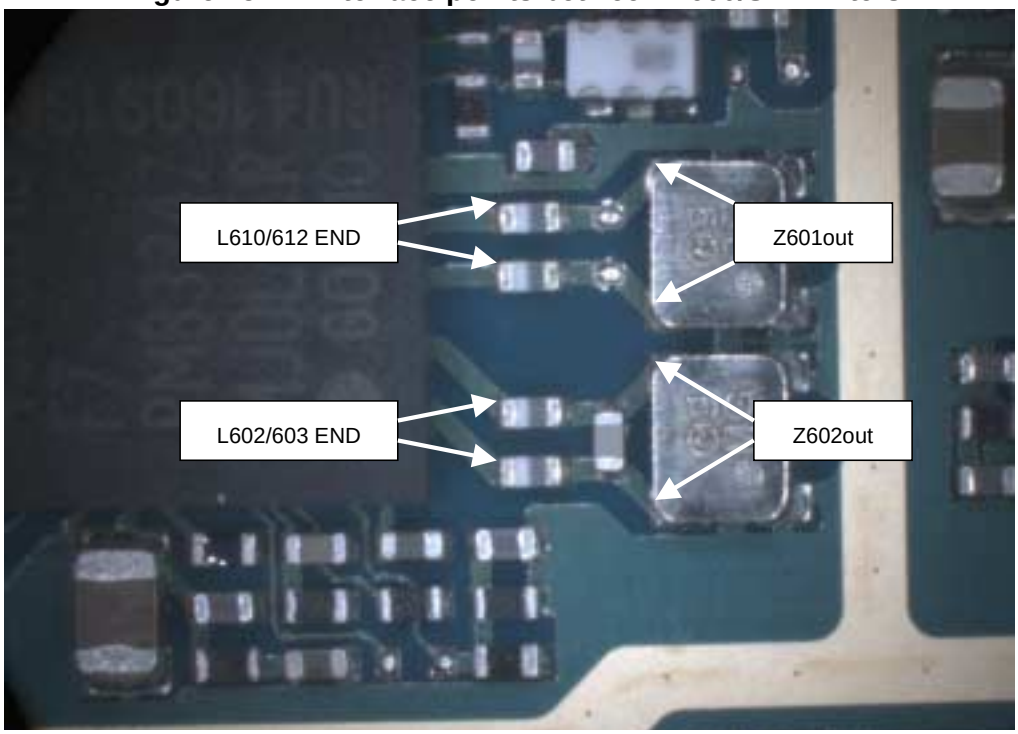


Figure 26:Serial Bus interface measurement points

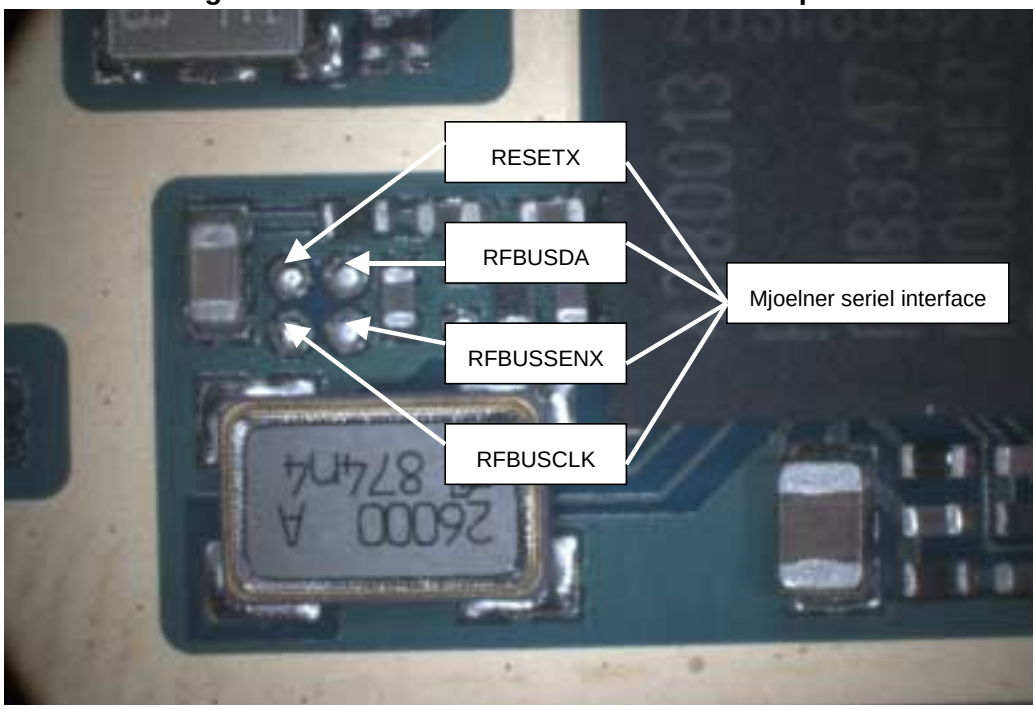
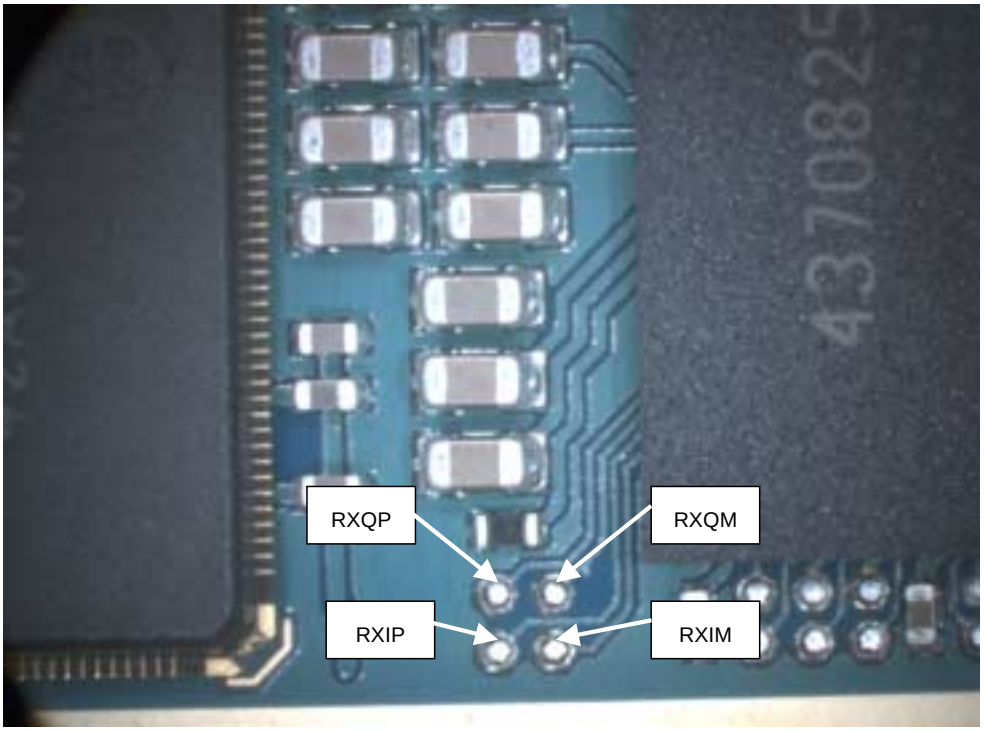


Figure 27:I/Q measurement points



RH-54 Receiver

General Instructions for GSM850 RX Troubleshooting

Connect the phone to a PC with the module repair jig.

Start Phoenix and establish connection to the phone

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 7: Band values

Band:	GSM850
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	190
AGC:	9

The setup should now look like this:

Figure 28:RF controls

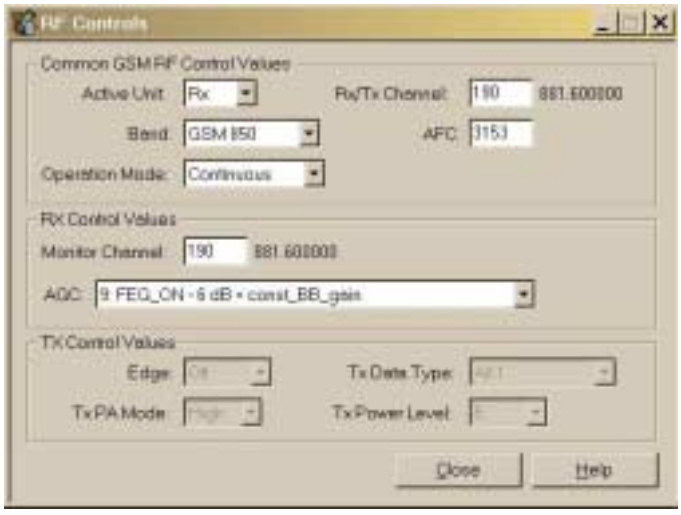
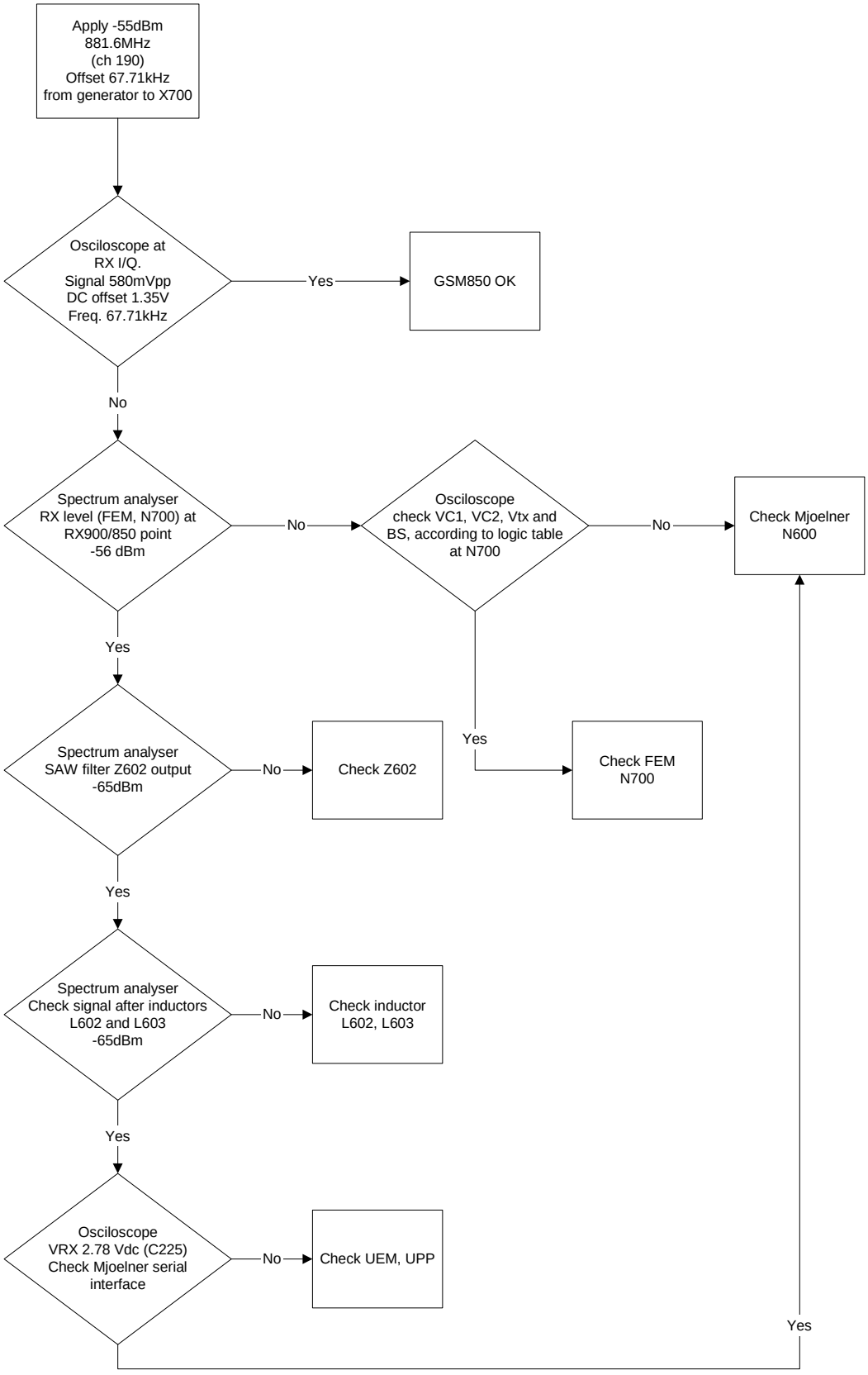


Figure 29:Troubleshooting chart for GSM850 receiver

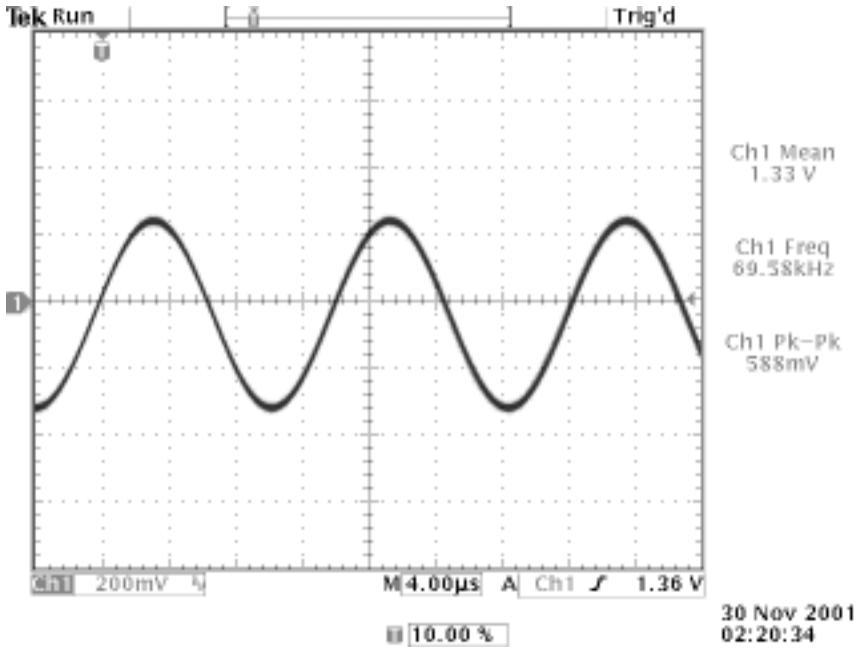


By measuring with an oscilloscope at RXIP or RXQP on a working GSM 850 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33 V

Figure 30:Measuring with oscilloscope



General Instructions for GSM1900 RX Troubleshooting

Connect the phone to a PC with the module repair jig.

Start Phoenix and establish connection to the phone

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 8: Band values

Band:	GSM1900
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	661
AGC:	9

The setup should now look like this:

Figure 31:Control values

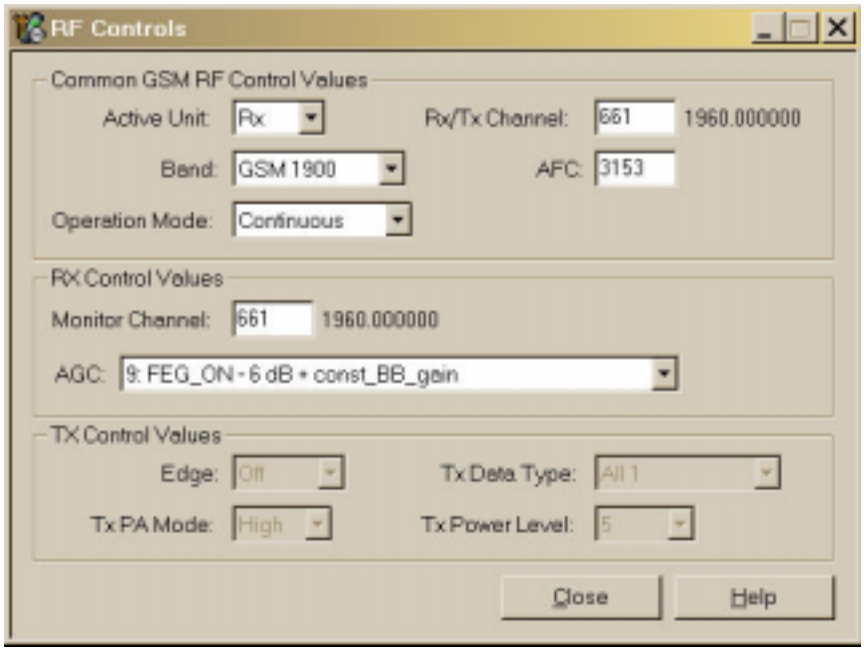
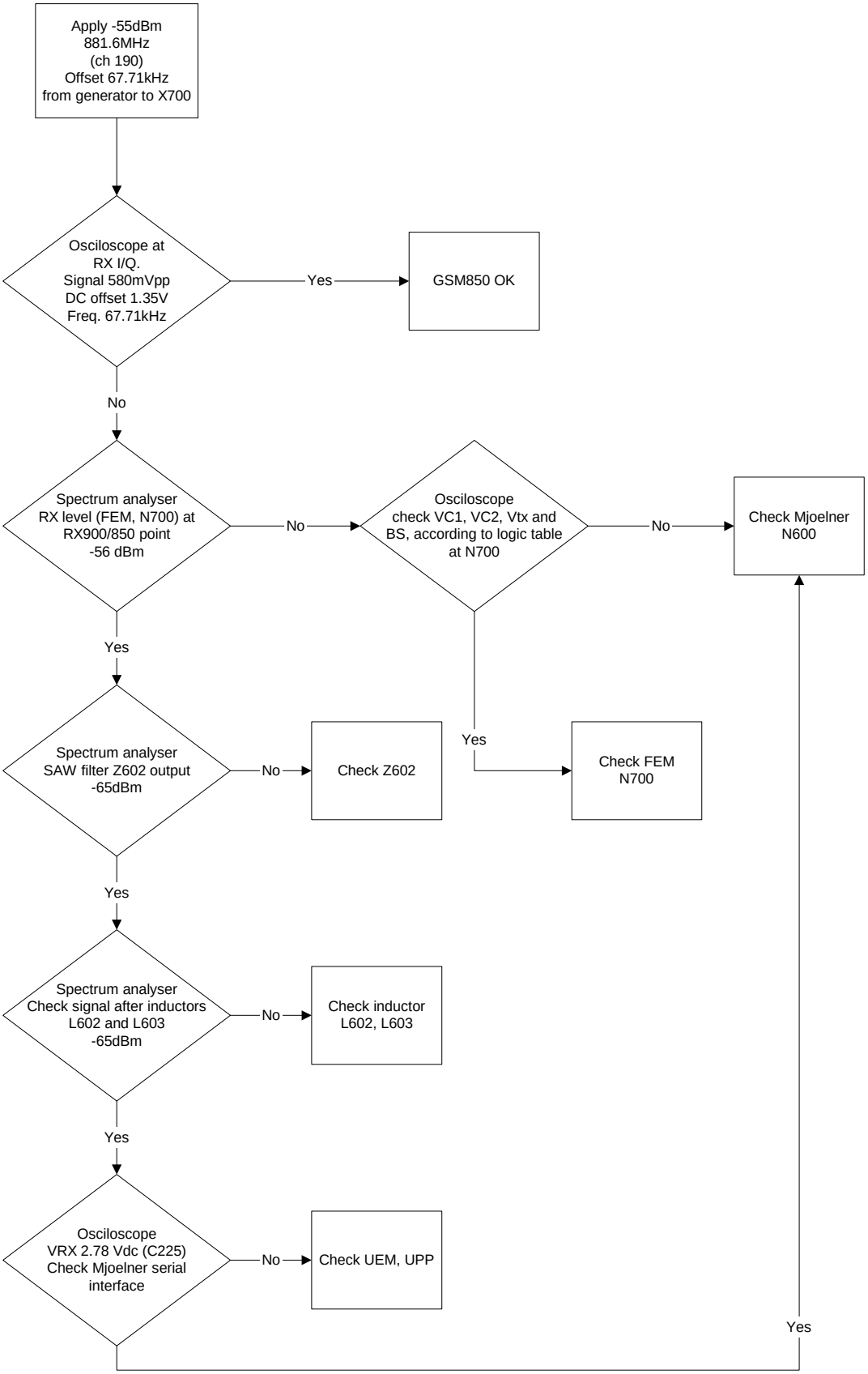


Figure 32:Troubleshooting chart for GSM1900 receiver

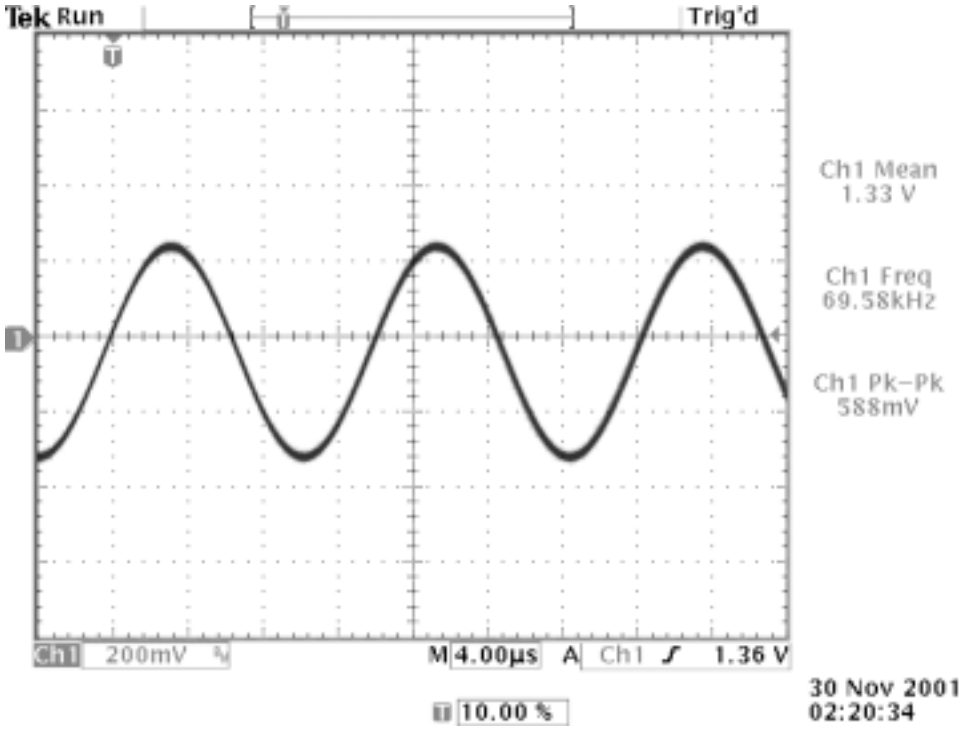


By measuring with an oscilloscope at RXIP or RXQP on a working GSM1900 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33

Figure 33:Measuring with the oscilloscope



RH-53 Receiver

General Instructions for GSM900 RX Troubleshooting

Connect the phone to a PC with the module repair jig.

Start Phoenix and establish connection to the phone

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 9: Band values

Band:	GSM900
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	37
AGC:	9

The setup should now look like this:

Figure 34:Control values

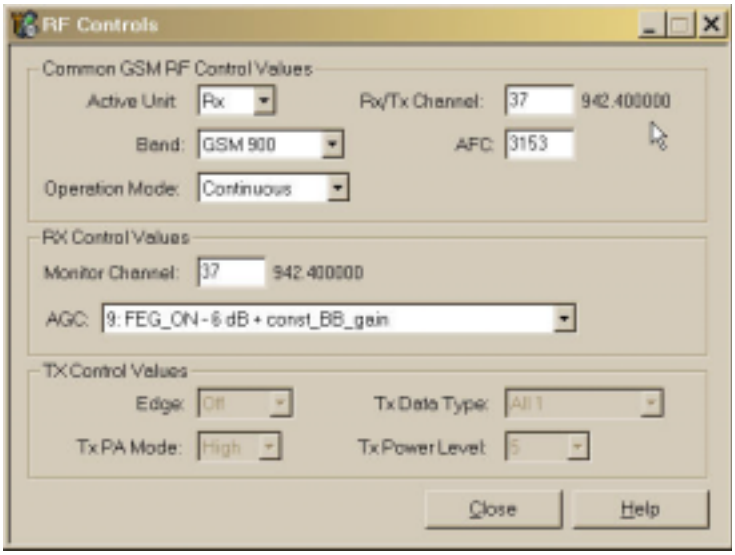
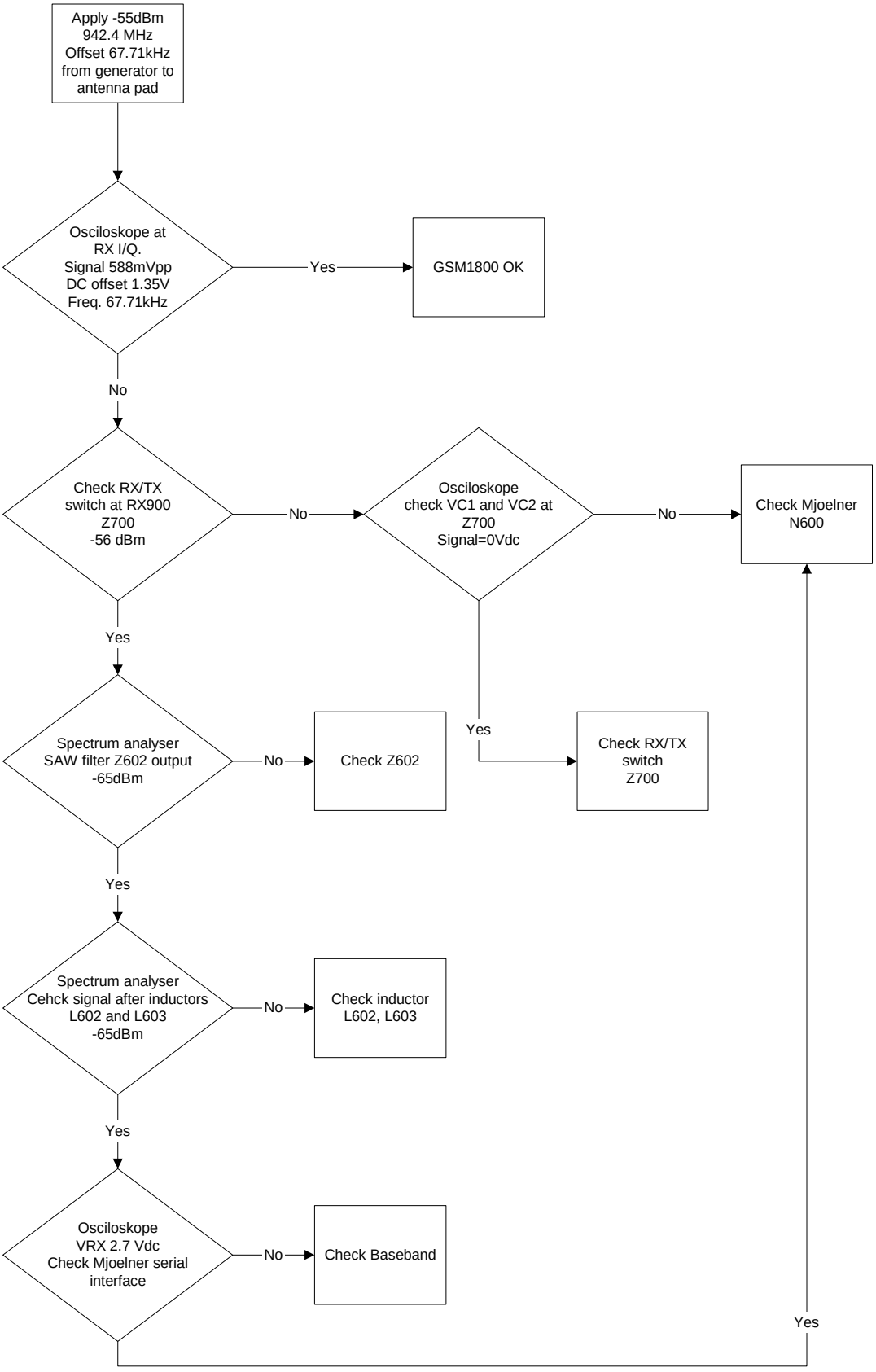


Figure 35:Troubleshooting chart for GSM900 receiver

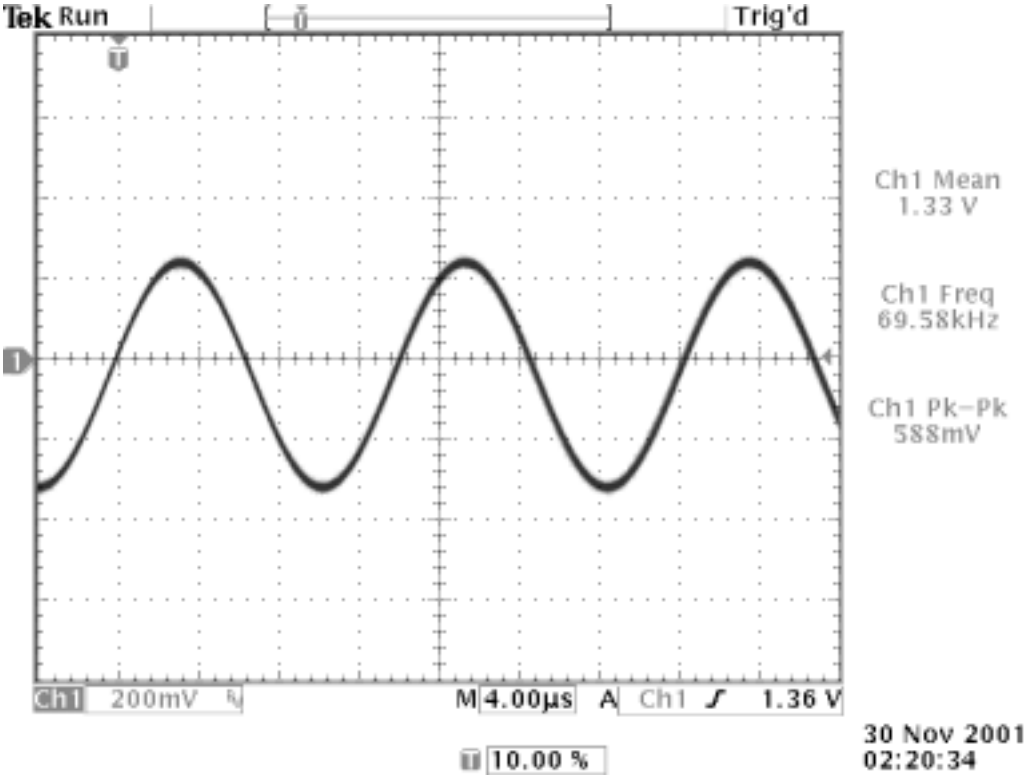


By measuring with an oscilloscope at RXIP or RXQP on a working GSM900 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33 V

Figure 36:Measuring with oscilloscope



General Instructions for GSM1800 RX Troubleshooting

Connect the phone to a PC with the module repair jig.

Start Phoenix and establish connection to the phone

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 10: Band values

Band:	GSM1800
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	700
AGC:	9

The setup should now look like this:

Figure 37:Rf controls

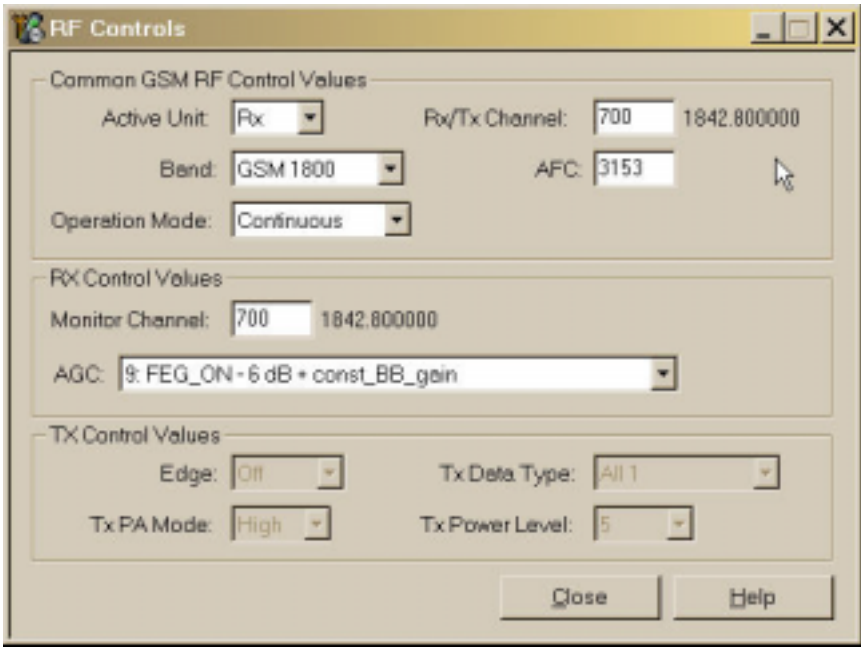
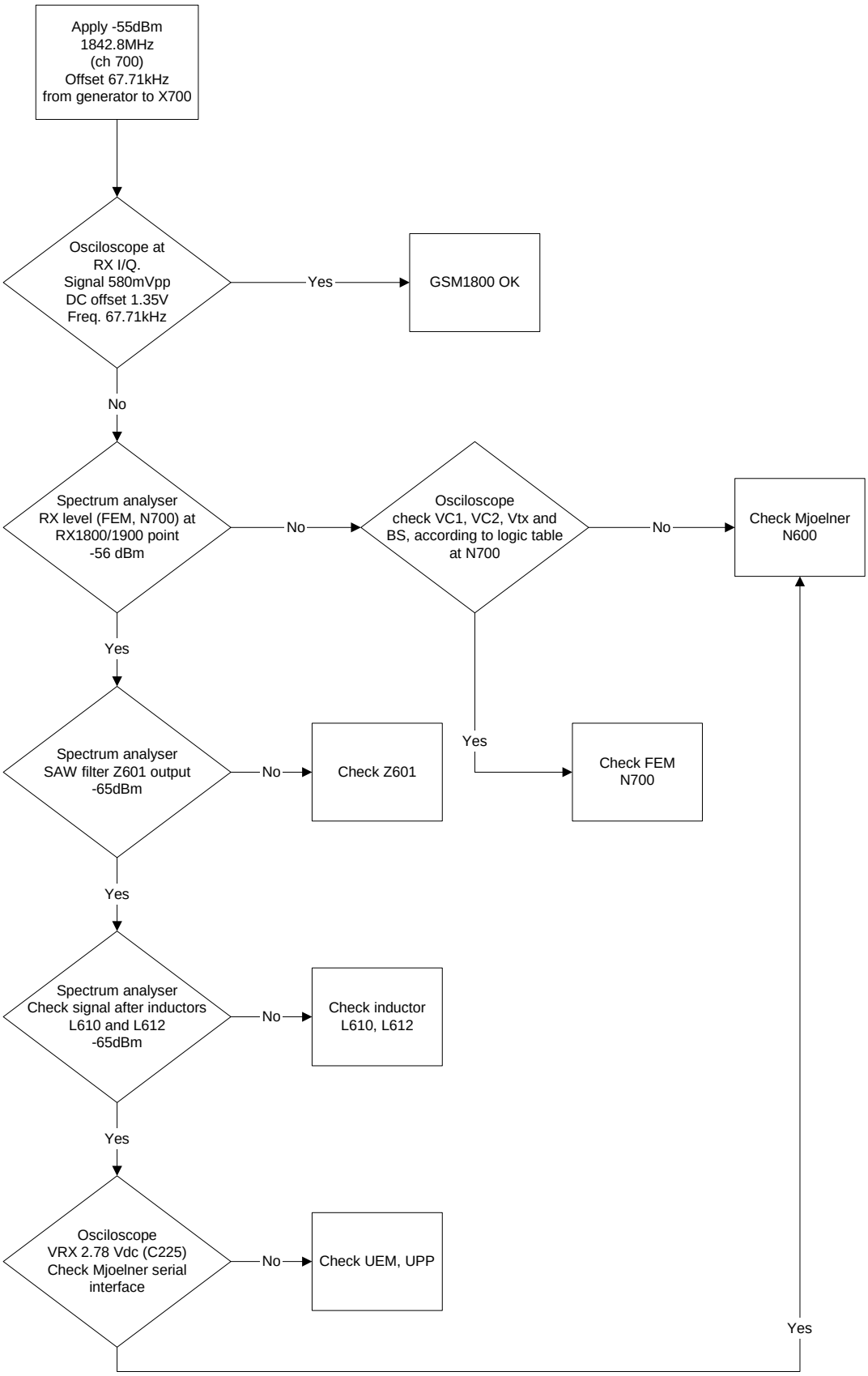


Figure 38:Troubleshooting chart for GSM1800 receiver

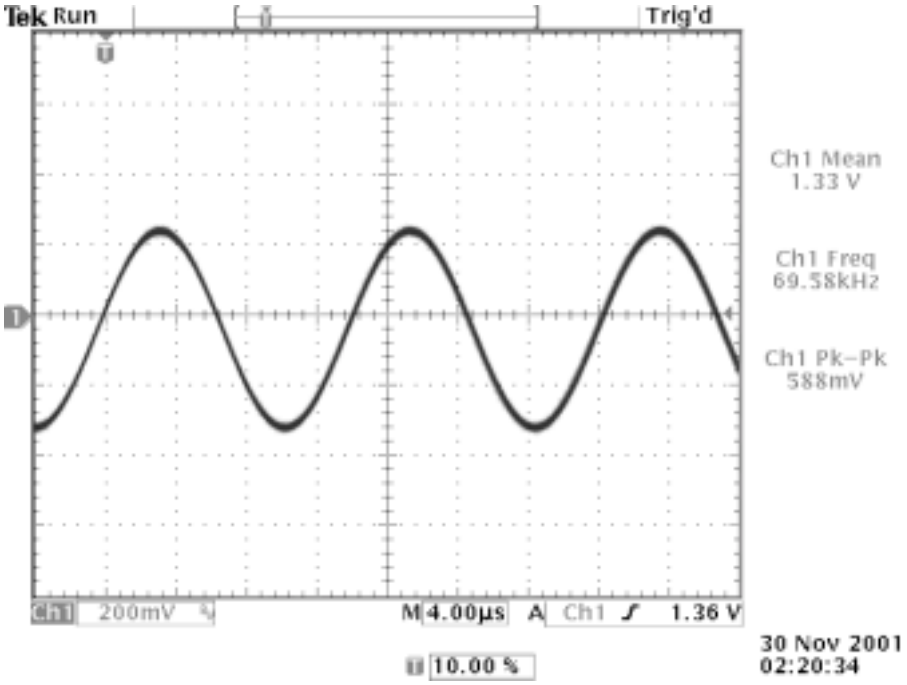


By measuring with an oscilloscope at RXIP or RXQP on a working GSM1800 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33

Figure 39:Measuring with oscilloscope



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RH-53/54 Transmitter Troubleshooting

The troubleshooting of the transmitter for the different phones is similar, meaning that the low band, 850/900 MHz, has similar values and the high band, 1800/1900 MHz, has similar values. The only differences are which selection of product done in Phoenix.

Measurement points for the transmitter

Figure 40:Front End Module FEM

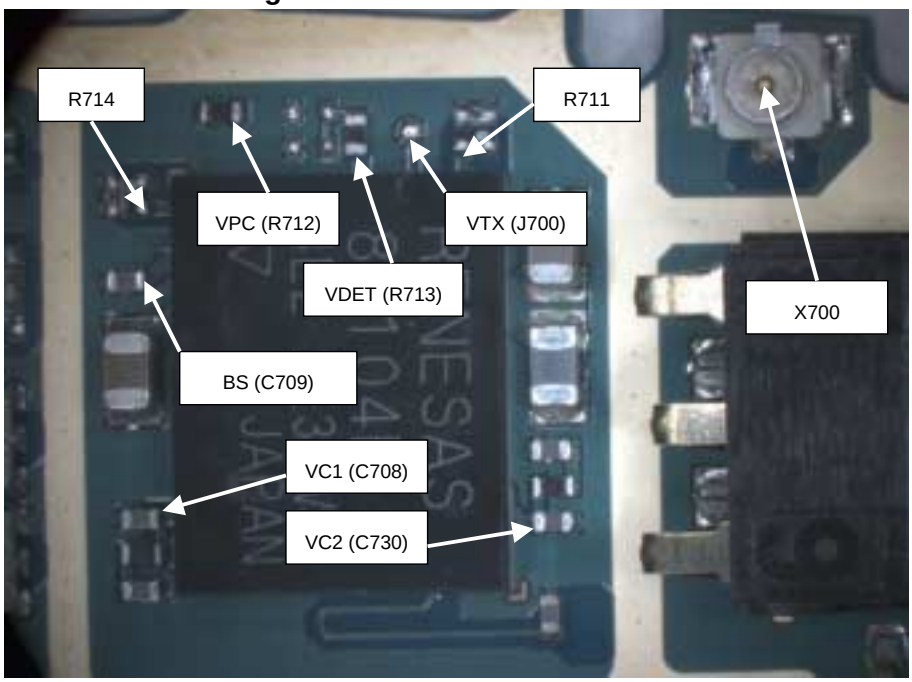


Figure 41:MjoelnerN600 test points

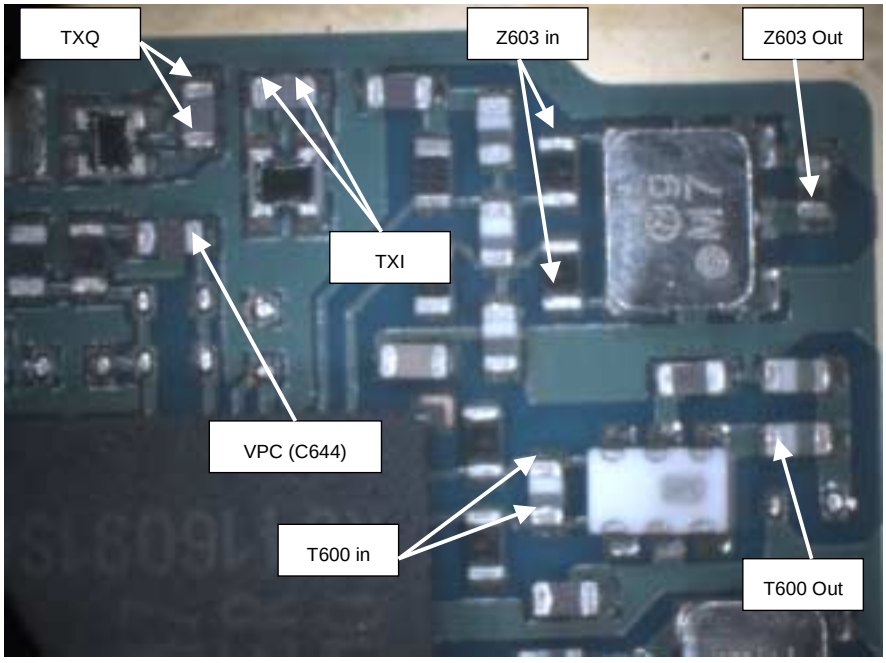
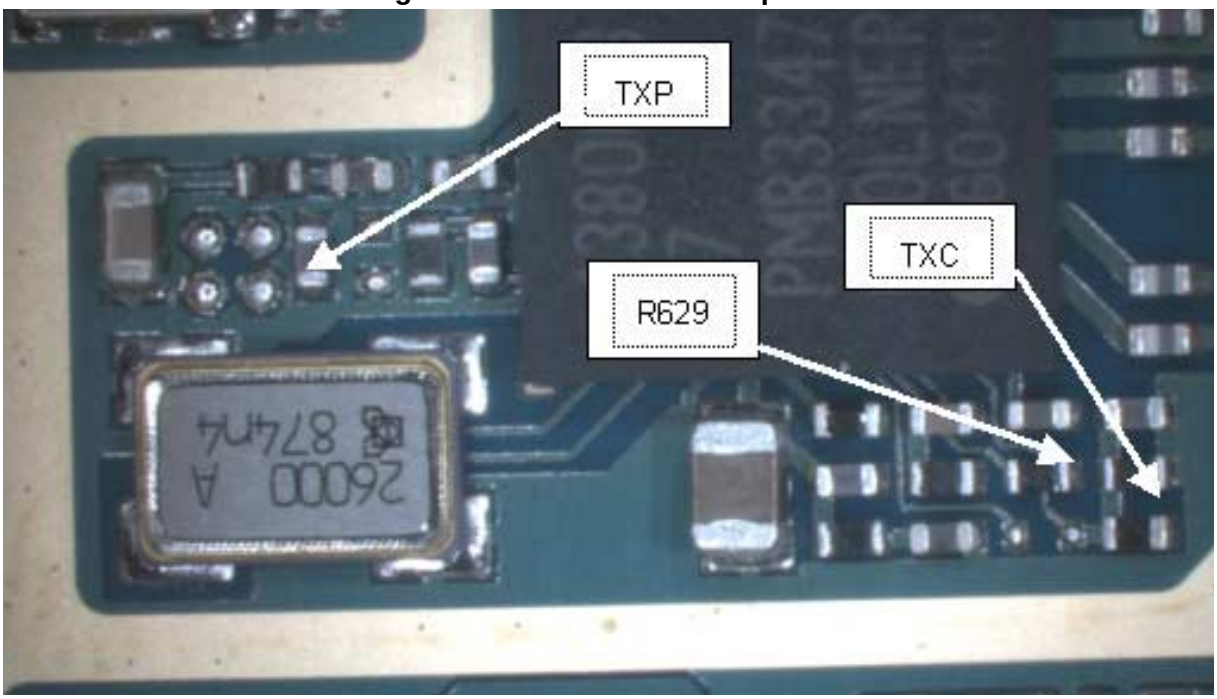


Figure 42:TXP and TXC test points



General instructions for TX troubleshooting

Apply an RF-cable to the RF-connector to allow the transmitted signal act as normal. RF-cable should be connected to measurement equipment or to at least a 10-dB attenuator, otherwise the PA may be damaged.

Start Phoenix Service Software and:

Establish a connection to the phone e.g. FBUS.

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 11: Band values

	Band:	XX
	Active Unit:	TX
	Operation Mode:	Burst
	Rx/Tx Channel:	YY
	TX Power level	ZZ
	TX Data Type	Random

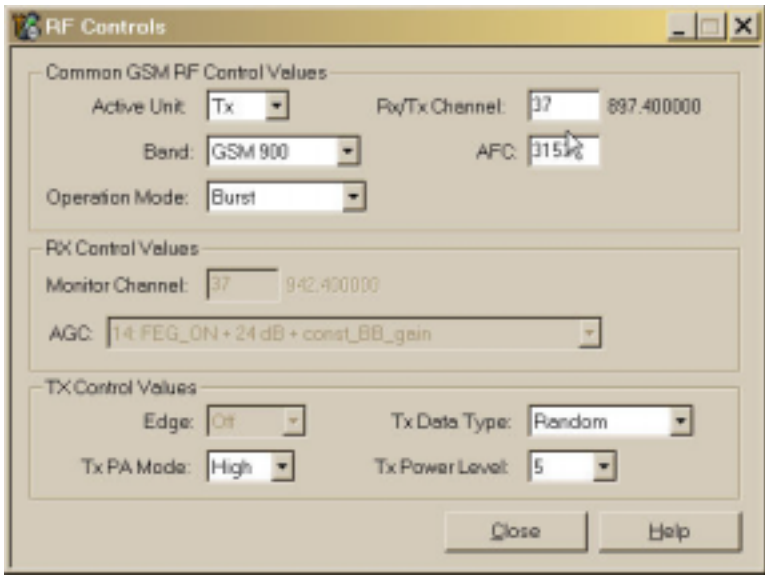
Select ”XX” , ”YY” and ”ZZ” according to the table below

Table 12: Values

Phone	XX	YY	ZZ
RH-54	GSM850	189	5
RH-53	GSM900	37	5
RH-53	GSM1800	700	0
RH-54	GSM1900	661	0

Your screen should look like this:

Figure 43:Control values



Measure the output power of the phone; it should be around 32.5 dBm for low band and 29.5 dBm for highband. Remember the loss in the jig; around 0 dB for the low band and 0.1 dB for the high band.

Troubleshooting chart for GSM900 transmitter

For the spectrum analyzer measurements in the following chart use the 500ohm passive probe giving an approximately 20 dB lower reading than indicate in the following figures. Since the signal measured is bursted it is advised to set the analyzer to maxhold.

Figure 44:Troubleshooting chart for GSM900 transmitter

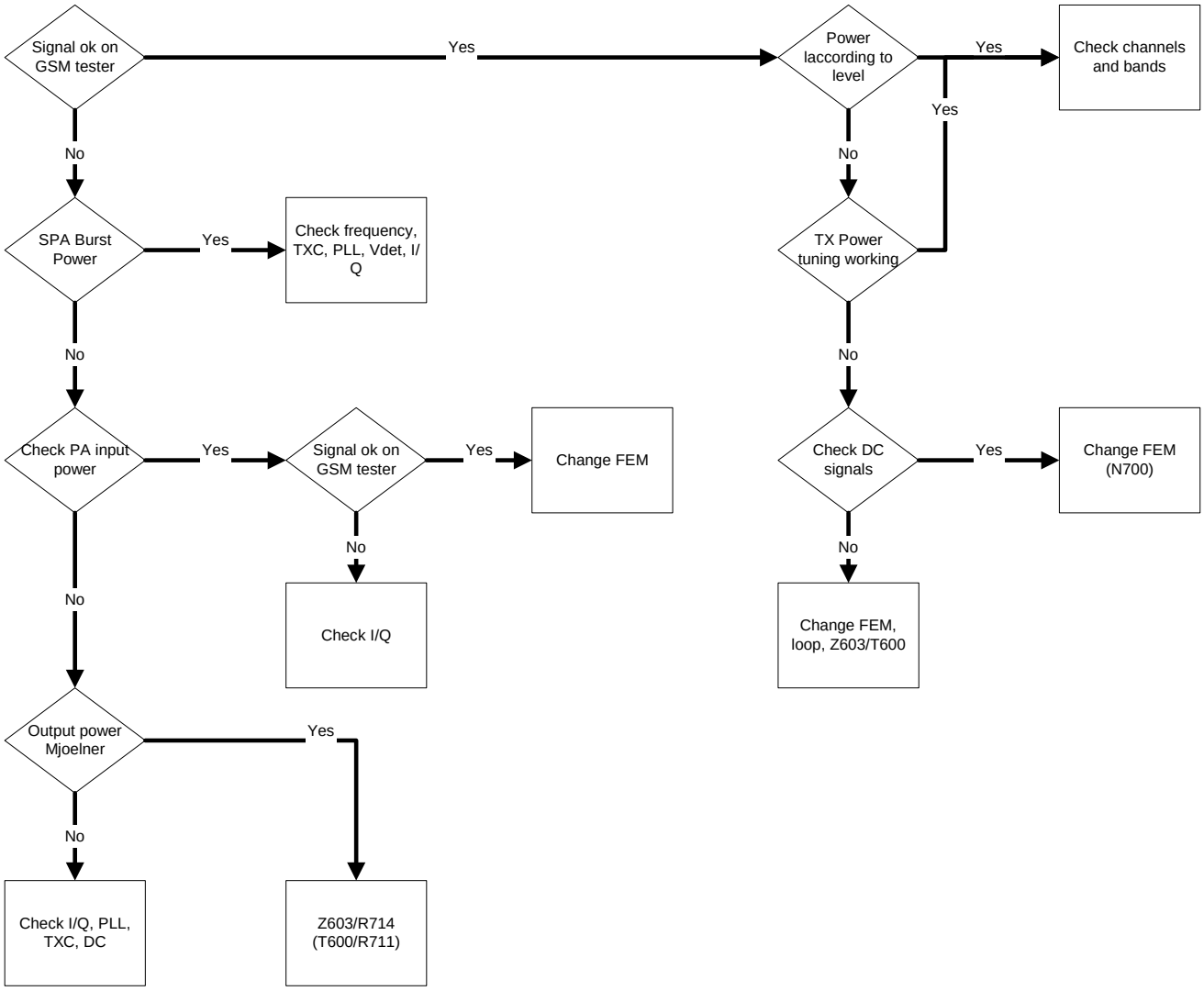
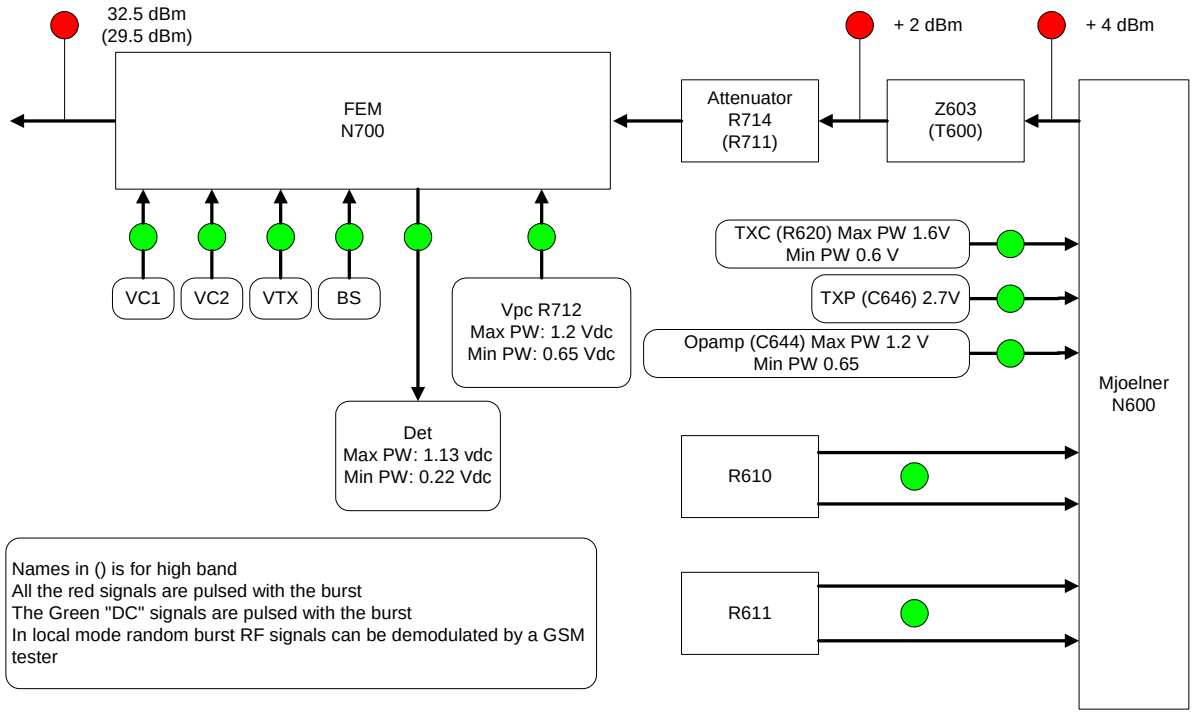


Figure 45:Signals



Logic signals for the Front End Module

Depending on the vendor of the Front End Module (FEM), different timing of the control signals are at present:the SW supports both FEMS. R629 tells the SW which FEM control should be active. Renesas FEM control is used when R629 is 18K and RFMD FEM control is used when R629 is 82K.

If the FEM is exchanged with an other type, the R629 has to be changed, too.

Renesa FEM logic

Table 13: Renesa FEM logic

Mode	Vtx	BS	VC1	VC2
	VTX_B_P	VTX_B_P	Vant1	Vant2
Low Band RX	0	0	0	0
Low Band TX	1	0	1	0
High Band RX	0	1	0	0
High Band TX	1	1	0	1

RFMD FEM logic

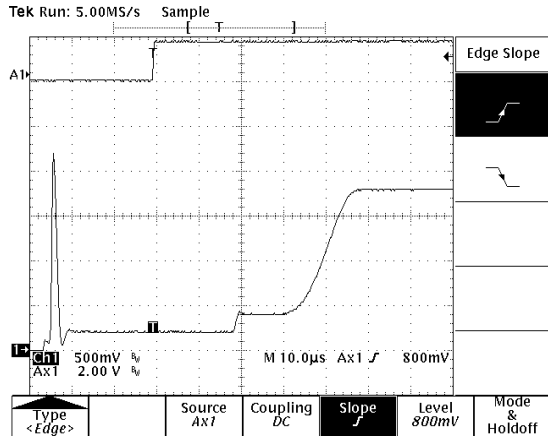
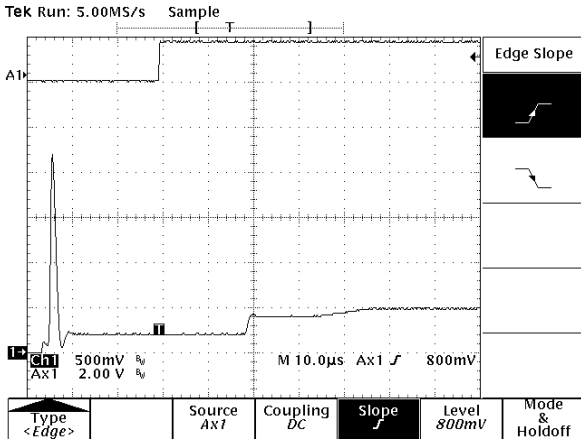
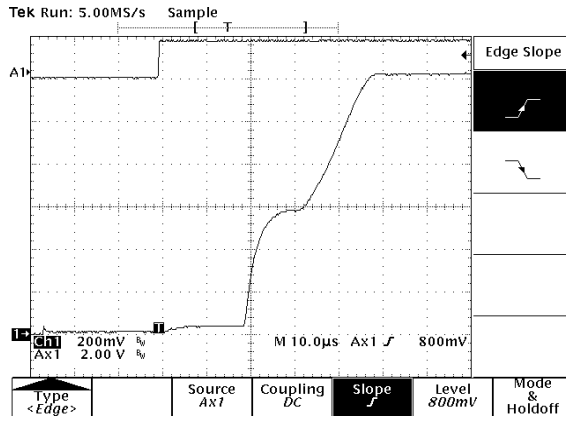
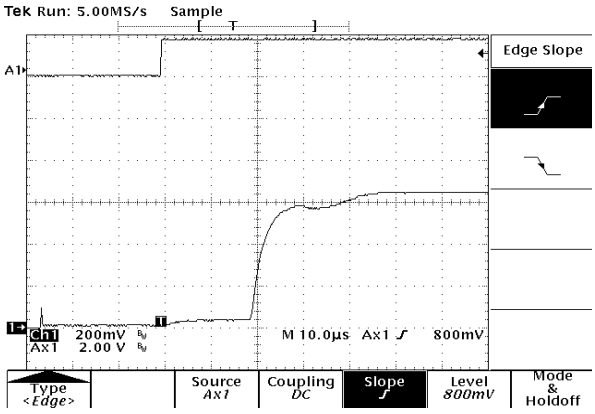
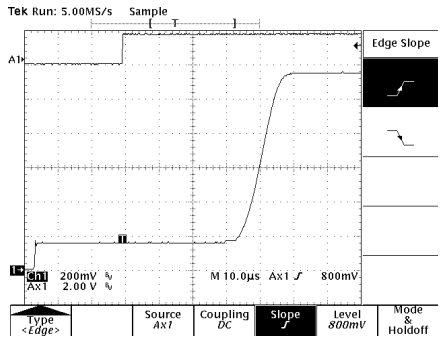
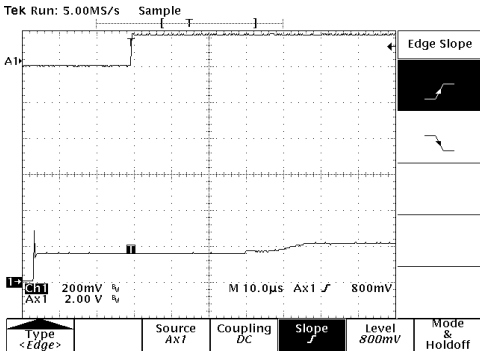
Table 14: RFMD FEM logic

	Vtx	BS	VC1	VC2
Mode	VTX_B_P	VTX_B_P	Vant1	Vant2
Idle	0	0	0	0
Low Band RX	0	0	1	0
Low Band TX	1	0	1	0
High Band RX	0	1	1	0
High Band TX	1	1	1	0

Analog Power control signals (TXC, VPC, VDET)

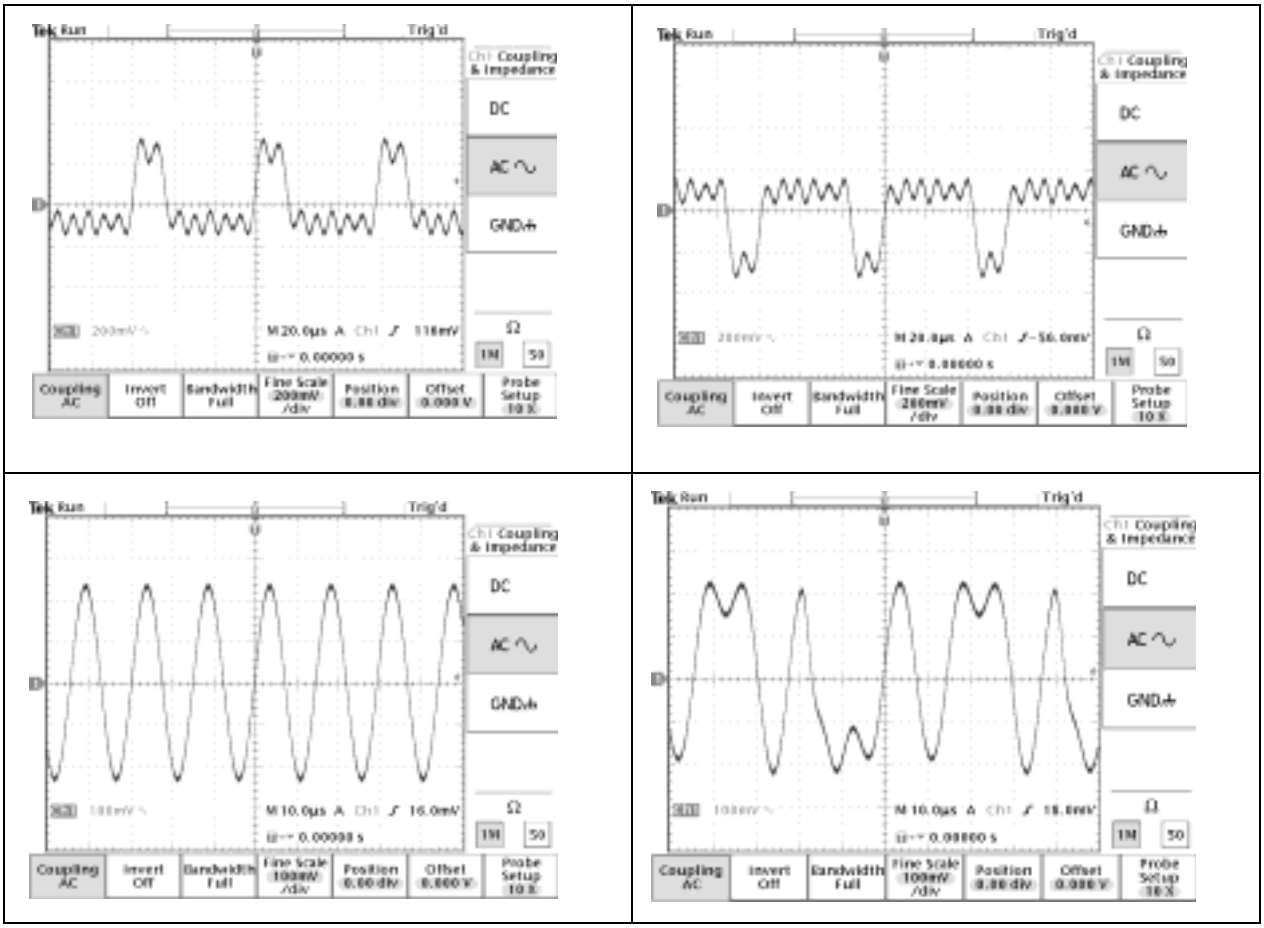
The pictures in the following page show the typical shapes of the control signals low band, right side it for highest power – left side for lowest power. In all the pictures TXP is used a the trigger point and is seen in the top of each picture. The difference between the high band and the low band is that he high band signals looks the same with only small changes in level. The activating of high band Vdet starts 5us earlier than for low band.

Figure 46:Power control signals

High Power	Low Power
	
TXC	**TXC**
	
VPC	**VPC**
	
VDET	**VDET**

I/Q signals

The following diagrams show different situations of TX IQ measurements. Depending on the time the modulation may cause the signal to look different.



Alignment

Manual alignment with Phoenix

The alignment/calibration is the same in both GSM900/850 and GSM1800/1900 except for the channels and frequencies. Only the the procedures for GSM900/GSM1800 are shown.

In Phoenix select connection Fbus scan product. If you power up the board before selecting Fbus, it works without any error messages. Use Jig or other device for RF and bus connection. Attenuation in the probe alone is 0dB for 900 and 0.1dB for 1800. Use CMD55,CMU200 or other suitable device. Default channels are 37 for GSM900 and 700 for GSM1800 (Ch 190 and 661 for GSM850/1900). The alignments and calibrations must be performed in the order shown to give reliable results.

The way to save data to the phone and to load data from the phone is made different in the various tunings. Always look what is shown in the windows regarding these issues and act accordingly. In some windows the saving is done without any warning or second approval as soon as you stop or end.

To vary a selected parameter you can use + and – key or in some cases directly type the new value. + and – steps the value for every press. Repeat function seems not to work. In I/Q you can use the side arrows.

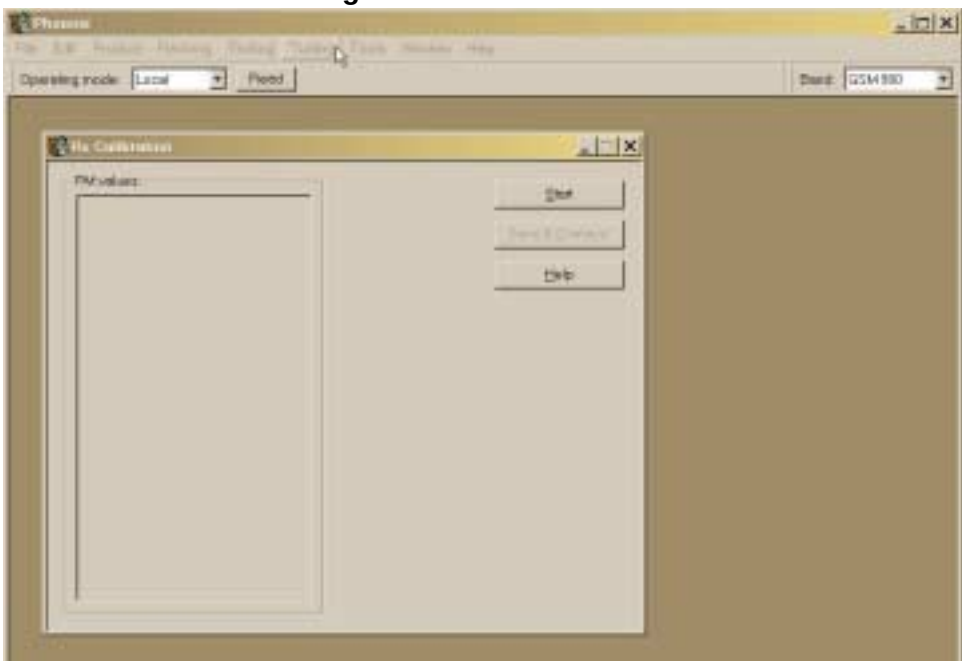
RX calibration

Select Tuning, RX Calibration

Select band GSM900

Press start

Figure 47:RX calibration

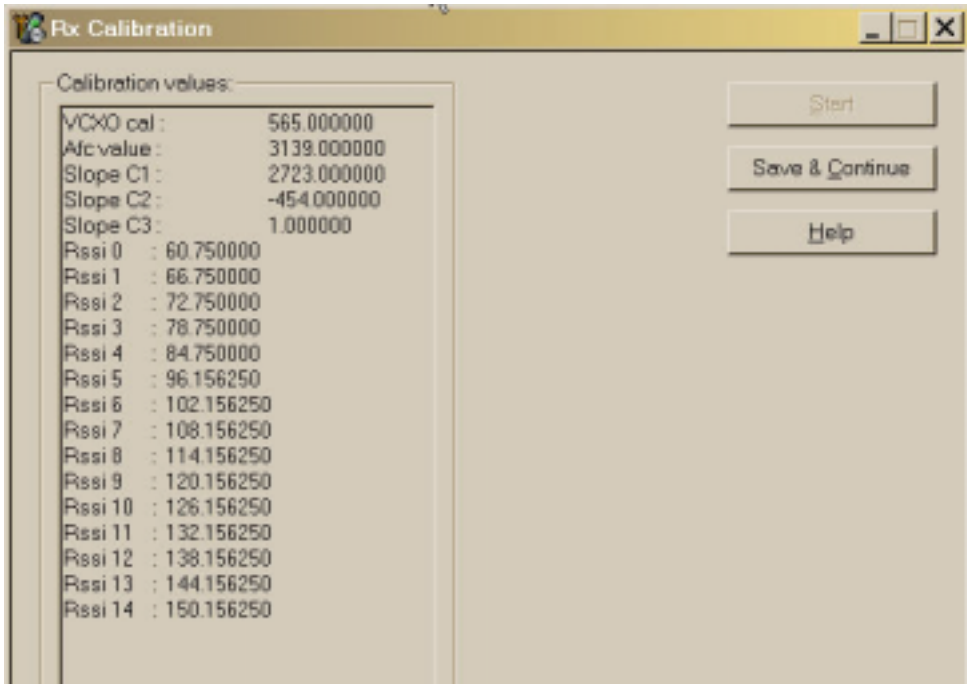


Follow the description in Phoenix, setting up the signal generator as described

Figure 48:Calibration tuning

Press the OK button

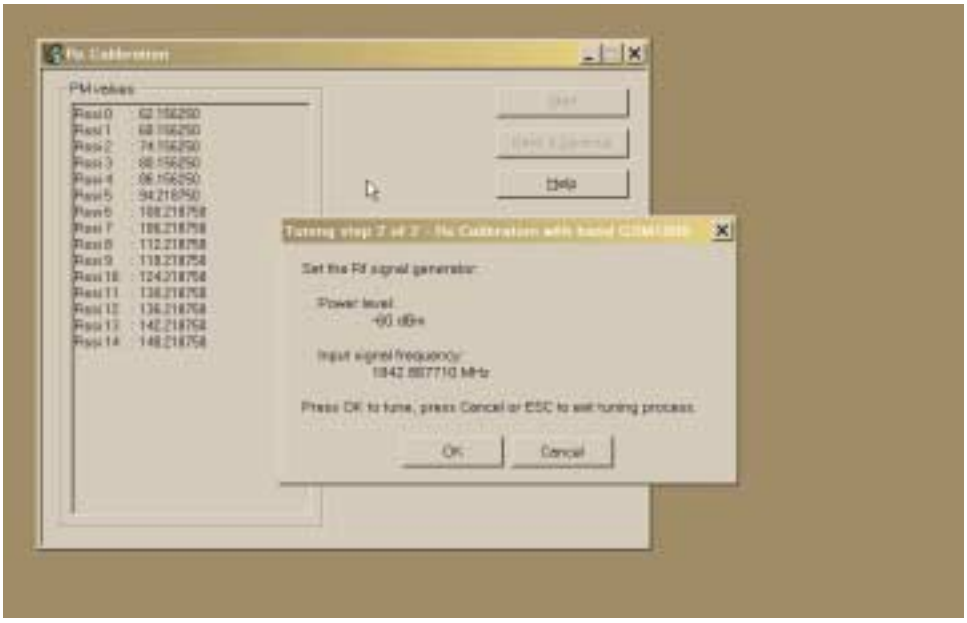
Figure 49:Calibration tuning



Press the Save&Continue botton.

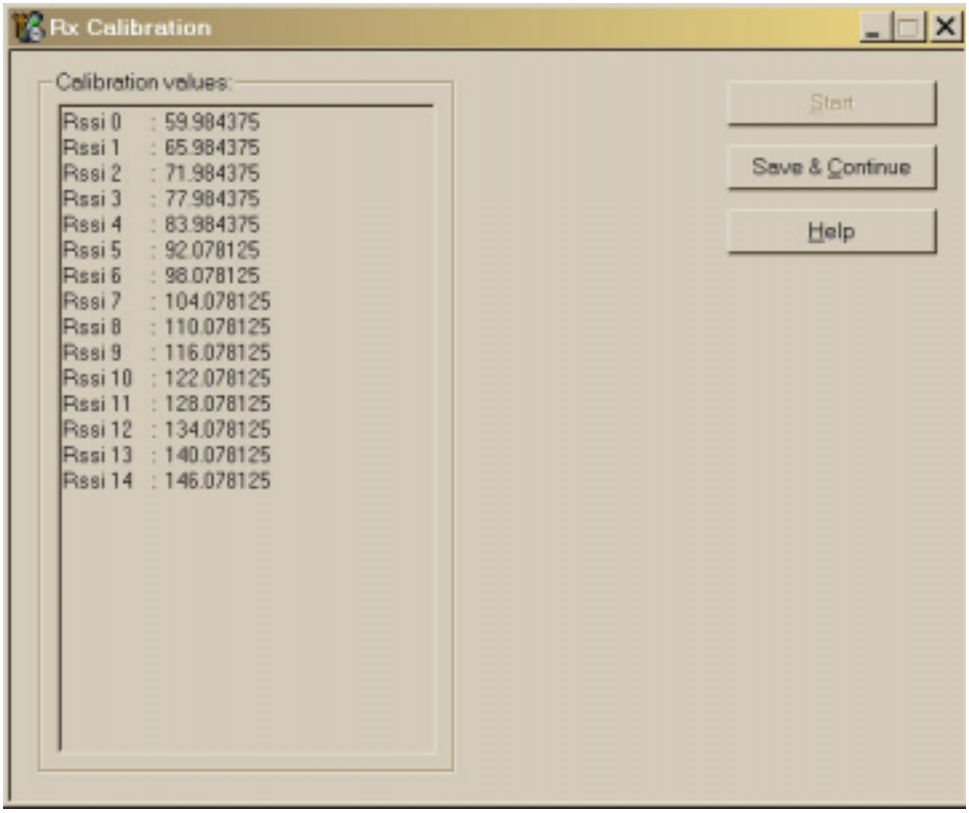
Follow the description in Phoenix, setting up the signal generator as described

Figure 50:Calibration tuning



Press the OK button

Figure 51:Calibration tuning



Press the Save&Continue botton

Note! You have to follow the shown procedure. It is not possible to tune the high band alone. You need to make a tuning of the low band first to come to the high band. You can stop at any time by switching off the menu. If the values are outside internal specs, you can not save them and have to leave the tuning without saving.

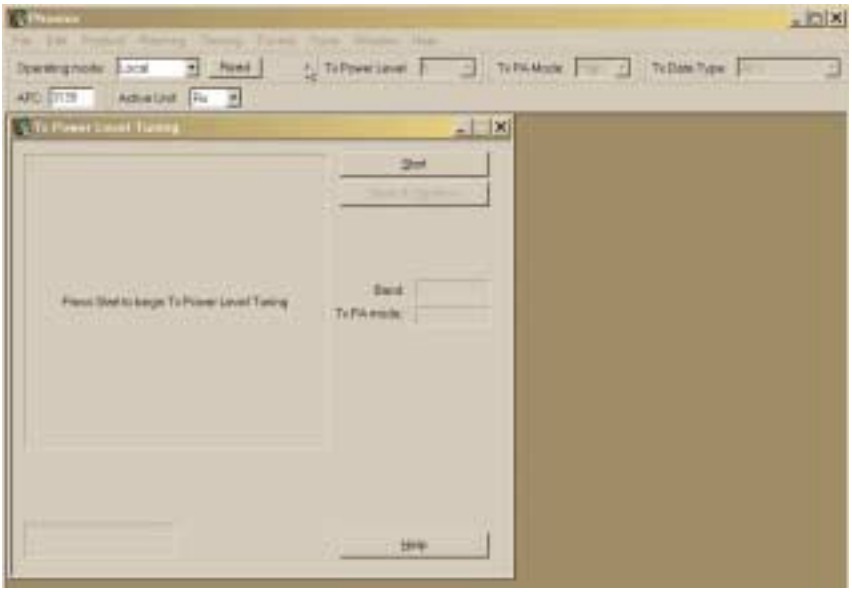
RX Band Filter Response

Normally not needed in repair.

Tx Power tuning

Select Tuning, Tx Power Level Tuning

Figure 52:TX tuning

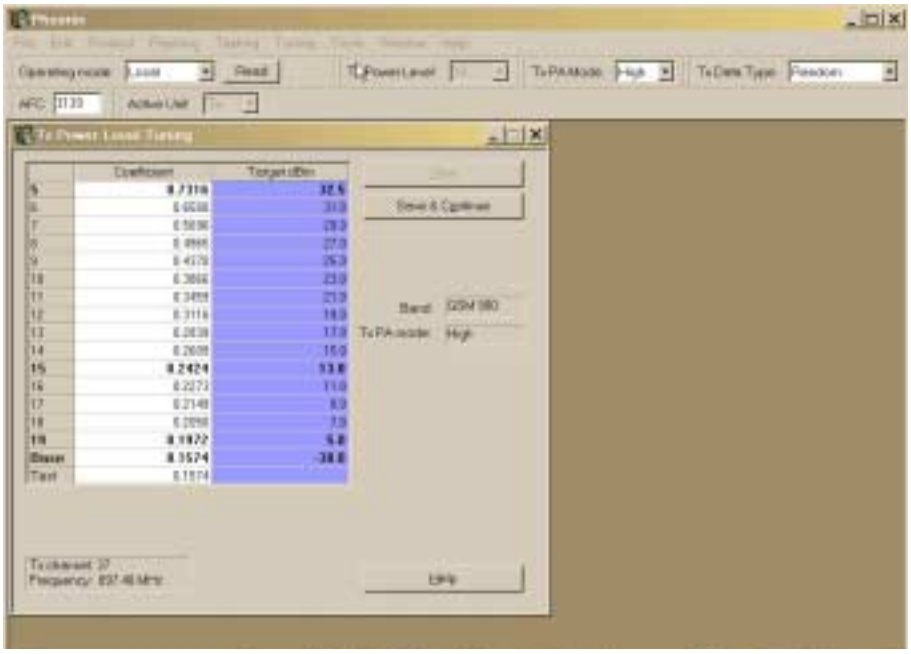


Press start and follow the instructions in the pop-up window

Figure 53:TX tuning

Set the spectrum analyser or GSM tester for the required settings and press “OK” If a GSM tester is used, set the TX data type to random so that the tester can trig on the signal.

Figure 54:TX tuning

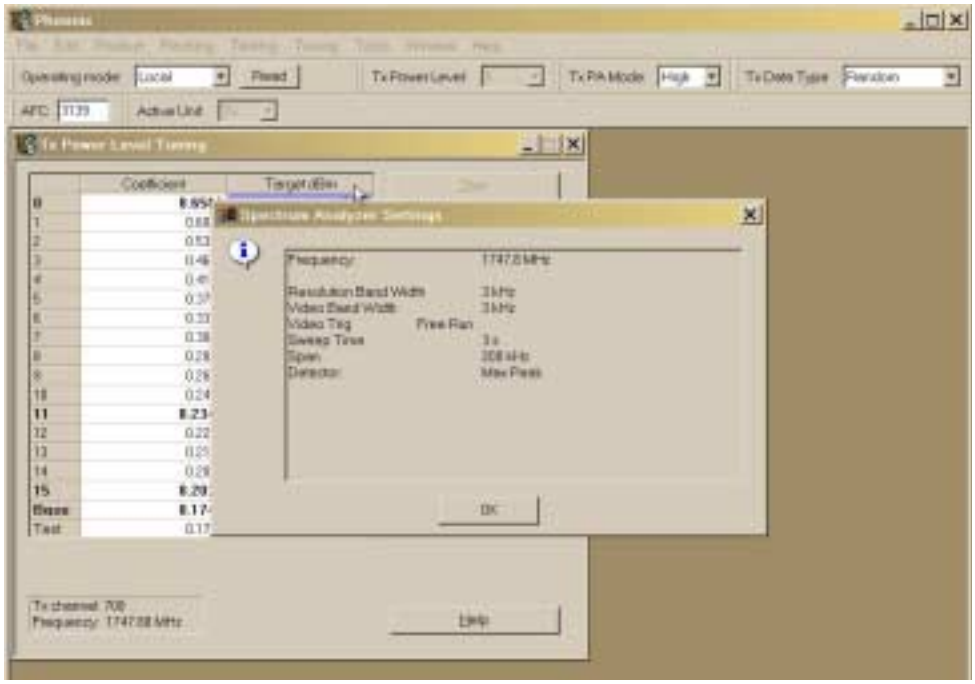


Tune the highlighted values to the wanted power (Use average burst power)

Tune the base level to –25dBm

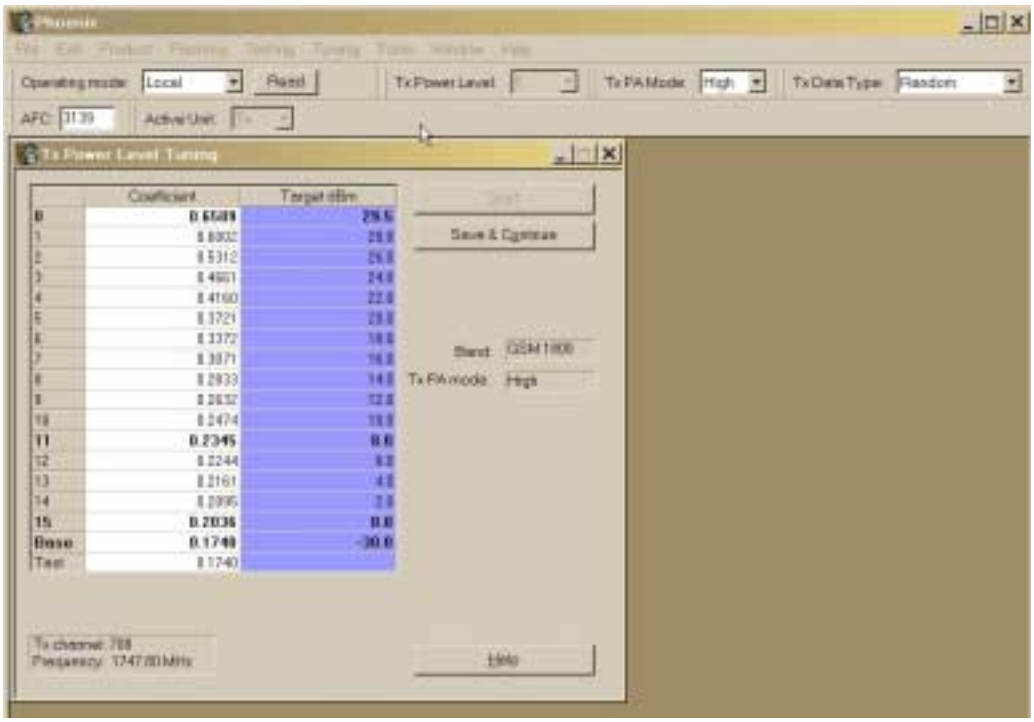
When done press Save&Continue and Phoenix will automatically shift from lowband to highband. At the same time the intermidiate values are calculated, but that is first seen next time you start a tuning.

Figure 55:TX tuning



Set the spectrum analyser or GSM tester for the required settings and press “OK” . If a GSM tester is used, set the TX data type to random so that the tester can trig on the signal.

Figure 56:TX tuning



Tune the highlighted values to the wanted power (Use average burst power).

Tune the base level to –25dBm.

When done press Save&Continue. The intermediate results are then calculated.

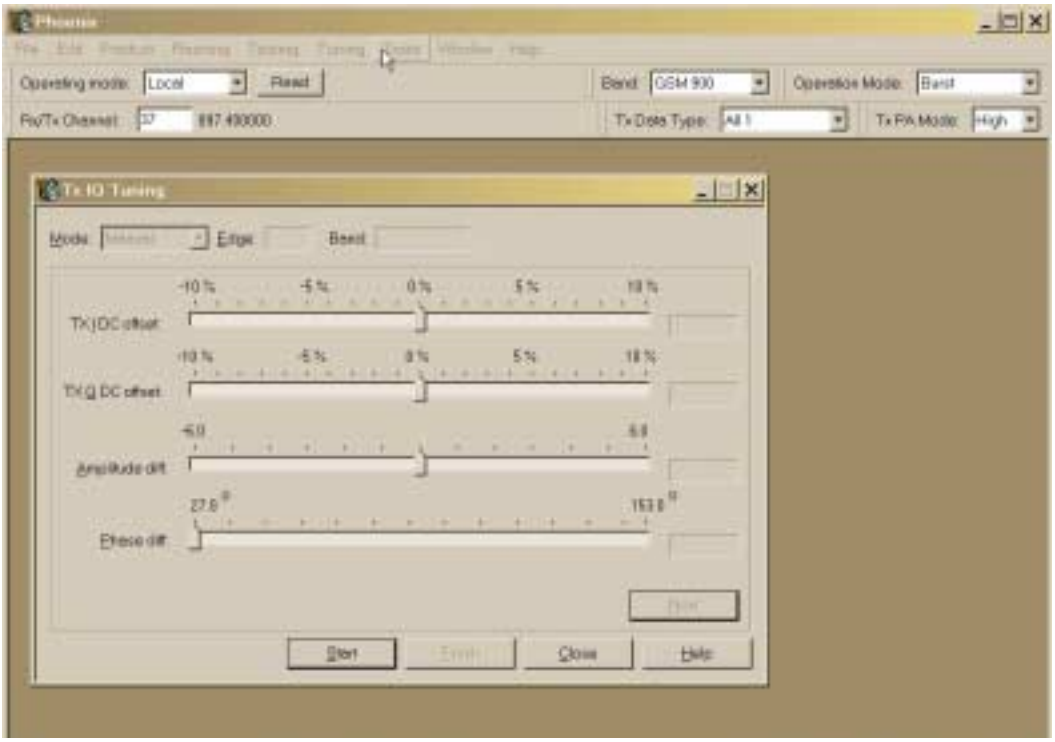
The procedure has to be followed. First low band tuning and then high band tuning. You do not need to change anything.

I/Q tuning

Select Tuning, Tx IQ tuning, TX Data Type “random” for a GSM tester like CMU200 or 1/0 for SPA measuring.

CMD55 shows the same as a spectrum analyzer when I/Q tuning is selected. CMU200 shows the carrier and sideband supression directly as figures in the modulation mode.

Figure 57:i/Q tuning

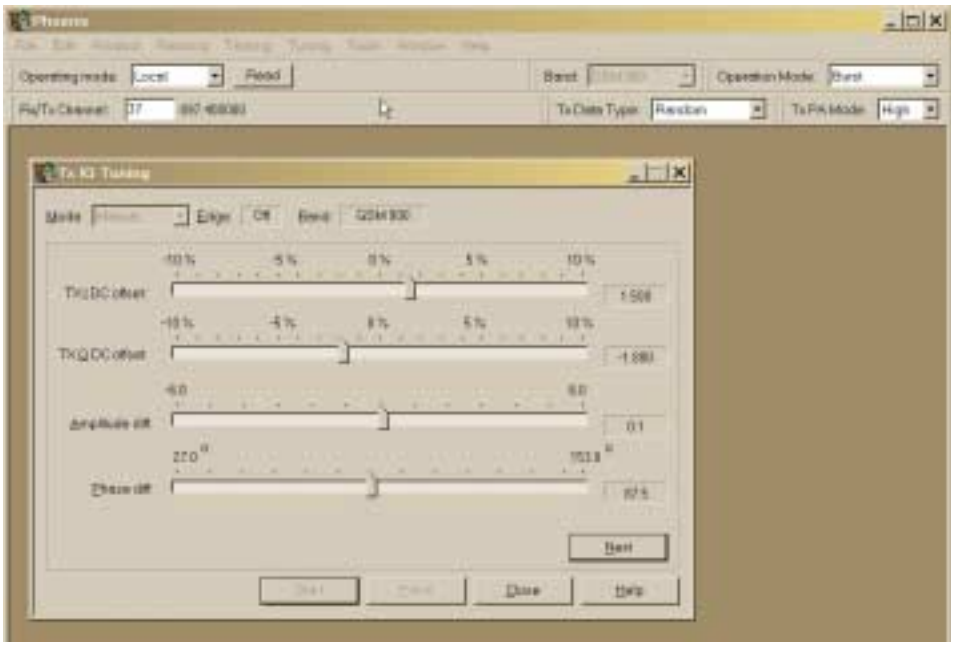


Press Start

Figure 58:I/Q tuning

Set the spectrum analyser or GSM tester for the required settings and press “OK”

Figure 59:I/Q tuning



Begin tuning with data from selected place.

Tune DC offset values to lowest carrier. Use Side arrows or +, - .

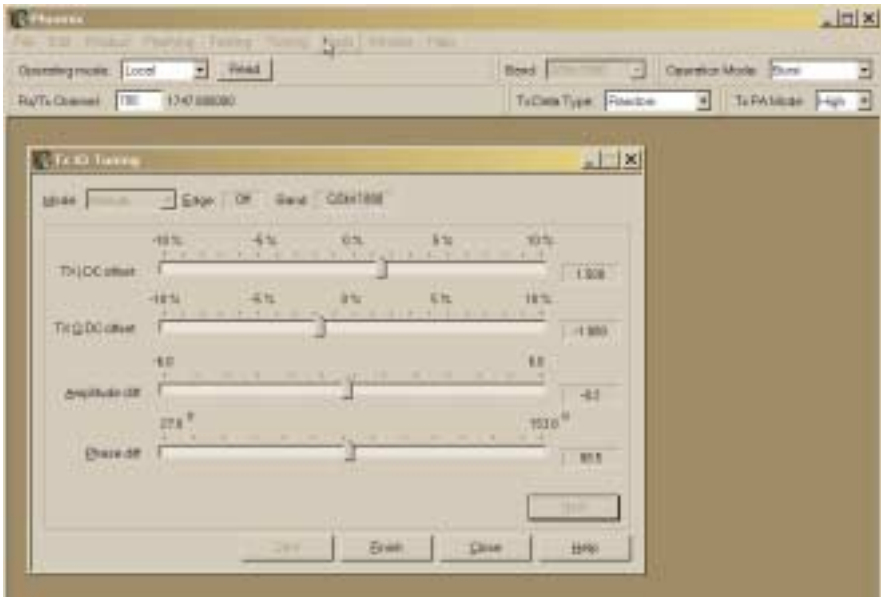
Tune Amplitude and phase to lowest sideband.

When satisfied with the result, press Next. (The sidebands should hardly be visible).Or for CMU200 the supression should be better than -40dBc.

Figure 60:I/Q tuning

Set the spectrum analyser or GSM tester for the required settings and press “OK”

Figure 61:I/Q tuning



Press Start to begin tuning with data from selected place.

Tune DC offset values to lowest carrier. Use Side arrows or +, - .

Tune Amplitude and phase to lowest sideband.

When satisfied with the result, press Finish. (The sidebands should hardly be visible).

RF control

The purpoase is to check the receiver or transmitter without going in call. It works very much like a call, but you have control via the PC and not via the tester. If you want to tune or calibrate at other channels or levels than the default for that function, you can activate RF control at the same time and change the wanted parameters.

Figure 62:RF controls

Autotune (RH-53 with CMU200)

File adjustments

Edit the file RH_53_tunings.ini and save it in the product folder under Phoenix with the right name. It defines the target values for the tunings which need targets or can be a general one that only needs small updates for the values that might change (e.g. the base target).

Edit the file autotune_RH-53.ini and save it in the product folder under Phoenix with the right name.

Change the Baselevel init values so that the expected base coefficient is among them. It is not absolutely needed but it speeds up the tuning. Larger steps can be used but with lower accuracy.

Eventually, change also the Coeff init values if the tuning deviates too much from the target.

The lowest coefficient must be very close to 0. Check how the power tuning goes and try with some changes.

In case of edge capability, copy from RH-12 and make some changes. RH-12 is for Gemini engine, RH-53 is for Mjoelner engine.

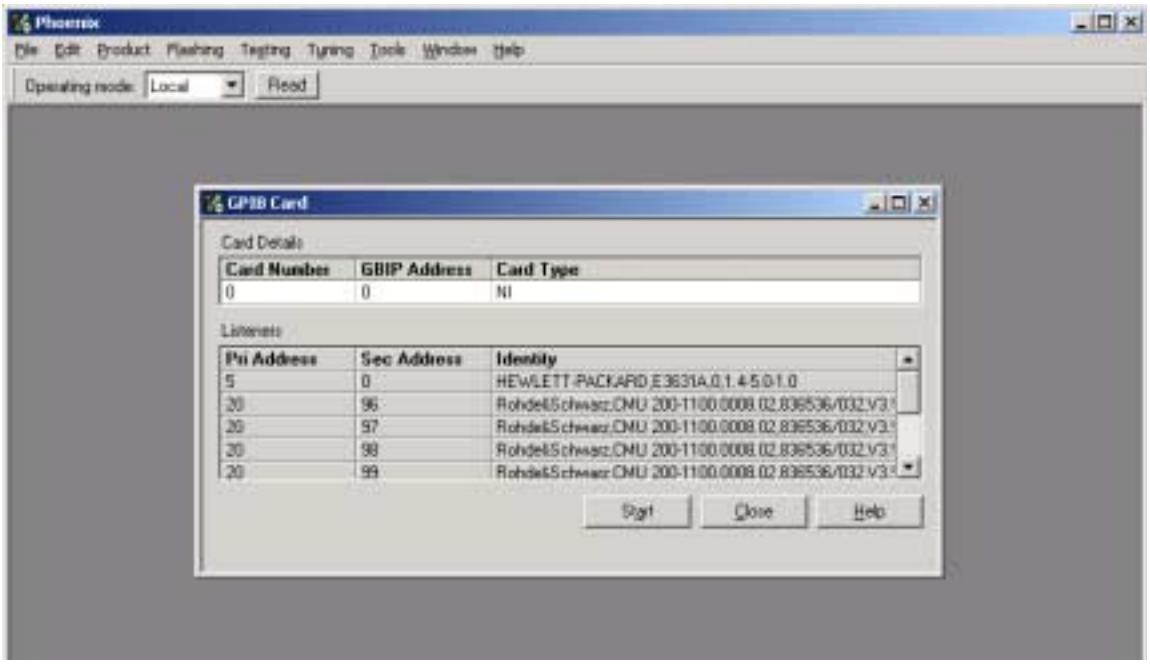
For autotuning, please see also TB “Autotuning function in Phoenix”.

Phoenix setup

In Phoenix tools-options-gpib card select the type of card used.

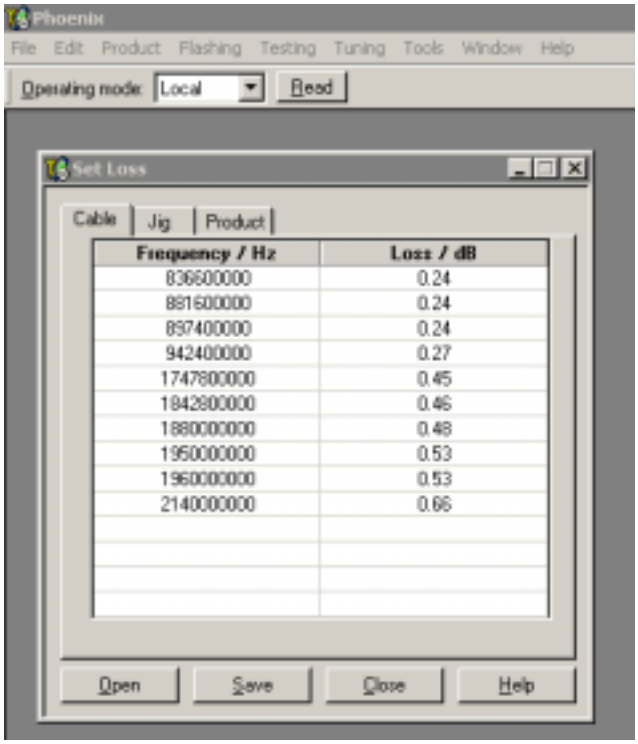
Press start to check if the equipment can be found.

Figure 63:Phoenix-GPIB card



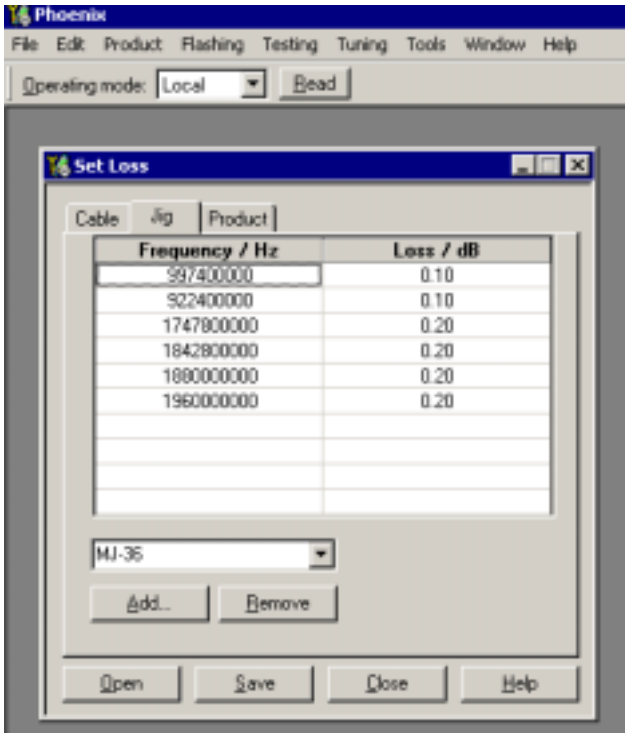
With a PKD-1NS dongle the loss in cables and jigs has to be set, and the jig type must be defined to the product. When that is done the PKD-1 donkle can be used, and the losses can not be changed with that dongle.

Figure 64:Set loss



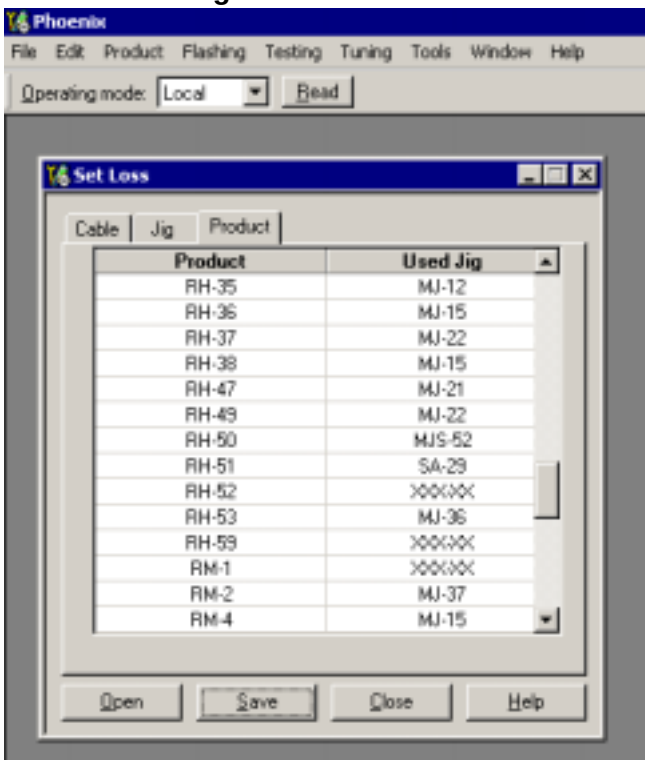
Select or add a jig and define the losses

Figure 65:Set loss 2



Make sure the product has the right type of jig. (At the moment new products like RH-54 can not be added)

Figure 66:Set loss 3



Note! CMU200:

Remember that CMU200 is left as it was set in the autotune. Attenuation settings are at 0.

Nokia Customer Care
RH-53/54

8-System Module

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Abbreviations

Abbr.	Description
ADC	Analog Digital Connector
ASIC	Application Specific Integrated Circuit
ATR	Answer To Reset
BB	Baseband
BL-4C	Battery type.
BSI	Battery Size Indicator
Cbus	Control bus (internal phone interface between UPP-UEM)
CTSI	Clock Timing Sleep and Interrupt
Dbus	DSP controlled bus (Internal phone interface between UPP-UEM)
DC	Direct Current
DCT4.0	Digital Core Technology, generation 4.0
DSP	Digital Signal Processor
EMC	Electro Magnetic Compatibility
ESD	Electro Static Discharge
Fbus	Fast Bus, asynchronous message bus connected to DSP (communications bus)
FPC	Flexible printed circuit
GENIO	General Purpose Input/Output
GPRS	General Packed Radio Services
HW	Hardware
IF	Interface
IMEI	International Mobile Equipment Identity
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light Emitting Diode
Li-Ion	Lithium Ion battery
Lion	Battery program, Salo - Finland
MALT	Medium And Loud Transducer

Mbus	Asynchronous message bus connected to MCU (phone control interface). Slow message bus for control data.
MCU	Micro Controller Unit
NO_SUPPLY	UEM state where UEM has no supply what so ever
NTC	Negative temperature Coefficient, temperature sensitive resistor used as a temperature sensor.
PA	Power Amplifier (RF)
PDM	Pulse Density Modulation
Phoenix	SW tool of DCT4.x
PLL	Phase locked loop
PnPHF	Plug and Play Handsfree
PUP	General Purpose IO (**P**IO), **U**SARTS and **P**ulse Width Modulators
PWB	Printed Wired Board
PWR_OFF	UEM state where phone is off
PWRONX	Signal from power on key.
R&D	Research and development
RESET	UEM state where regulators are enabled
RTC	UEM internal Real Time Clock
SIM	Subscriber Identification Module
SLEEP	UEM power saving state controlled by UPP
SPR	Standard Product Requirements
SRAM	Static RAM
SW	Software
TB	To Be Defined
TI	Texas Instruments, American company
UEM	Universal Energy Management
UI	User Interface
UPP	Universal Phone Processor
VBAT	Main battery voltage
VCHAR	Charger input voltage
VCHARDET	Charger detection threshold level

VMSTR+, VMSTR	Master Reset threshold level

Introduction

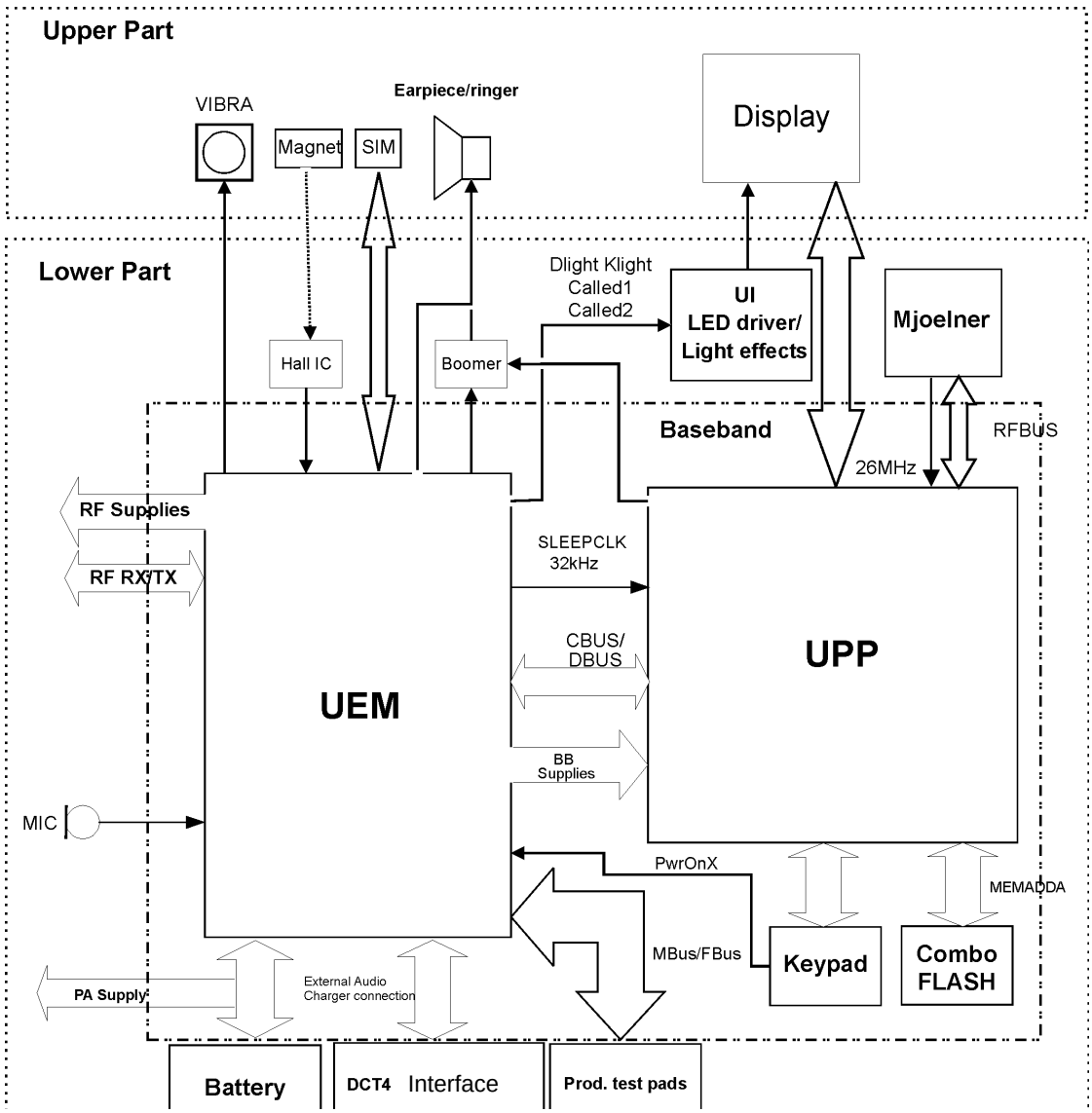
This document specifies the baseband module for the RH-53/54 platform program. The baseband module includes the baseband engine chipset, the UI components and the acoustical parts for the transceiver.

RH-53/54 is a hand-portable dualband GSM/GPRS 900/1800MHz fold-phone, having the DCT4 generation baseband (UEM/UPP) and RF (MJOELNER) circuitry. The RH-53 platform also supports a GSM 850/1900 US variant called RH-54. RH-53 platform is based on common baseband engine 4.0.

Technical Summary

The baseband module contains 2 main ASICs named the UEM and UPP. The module furthermore contains a Combo Flash IC of 64Mbit flash and 16Mbit RAM.

Figure 1:RH-53/54 bb block diagram



The UEM supplies both the baseband module as well as the RF module with a series of voltage regulators. Both the RF and baseband modules are supplied with regulated voltages of 2.78 V and 1.8V. UEM includes 6 linear LDO (low drop-out) regulators for baseband and 7 regulators for RF. The UEM is furthermore supplying the baseband SIM interface with a programmable voltage of either 1.8 V or 3.0 V. The core of the UPP is supplied with a programmable voltage of 1.0 V, 1.3 V, 1.5 V or 1.8 V.

UPP operates from a 26MHz clock, coming from the RF ASIC MJOELNER, the 26 MHz clock is internally divided by two, to the nominal system clock of 13MHz. DSP and MCU contain phase locked loop (PLL) clock multipliers, which can multiply the system frequency by factors from 0.25 to 31.

The UEM contains a real-time clock, sliced from the 32768 Hz crystal oscillators. The 32768 Hz clock is fed to the UPP as a sleep clock.

The communication between the UEM and the UPP is done via the bi-directional serial busses CBUS and DBUS. The CBUS is controlled by the MCU and operates at a speed of 1 MHz set by SW. The DBUS is controlled by the DSP and operates at a speed of 13 MHz. Both processors are located in the UPP.

The UEM ASIC handles the interface between the baseband and the RF section**.** UEM provides A/D and D/A conversion of the in-phase, quadrature receive/transmit signal paths and also A/D and D/A conversions of received and transmitted audio signals to and from the user interface. The UEM supplies the analog signals to RF section according to the UPP DSP digital control. RF ASIC MJOELNER is controlled through UPP RFBUS serial interface. There are also separate signals for PDM coded audio. Digital speech processing is handled by the DSP inside UPP ASIC.

UEM is a dual voltage circuit, the digital parts are running from the baseband supply 1.8V and the analog parts are running from the analog supply 2.78V also VBAT is directly used by some blocks.

The baseband supports both internal and external microphone inputs and speaker outputs.

RH-53/54 has two external serial control interfaces: FBUS and MBUS. These busses can be accessed through production test pattern as described in section 8.

RH-53/54 transceiver modules are implemented on 8 layers and the surface are with selective Ni/Au OSP.

List of Features

RH-53 platform common features:

- Jack UI style 20 keys (with 4 ways scroll) ESD-proof layout, multiple keypress.
- Battery BL-4C
- UEMK
- UPP8Mv2.6/2.10 Lead Free
- Combo Flash 8MByte flash memory and 2MByte PSRAM (64Mbit+16Mbit)
- Power key integrated in keypad (common with End key)
- Internal vibra
- Colour display (colures 4096, resolution: 130 columns x 130 rows, technology: CSTN)

- Polyphonic ringing tones
- 2 white LED’s for LCD Backlight.
- 2 white LEDs for key mat & 3 blue LED’s for Light-effect in key mat.
- JAVA
- MMS
- GPRS

Technical Specifications

Modes of Operation

RH-53/54 baseband engine has six different ‘normal’ operating modes:

- No supply
- Power off
- Acting dead
- Active
- Sleep
- Charging

No supply

In this mode the phone has no supply voltage.

The phone enters this mode if the battery is disconnected, or the battery voltage drops below V_{MSTR-} (1.8V~2.0V)

The phone exits ‘No supply’ mode, into hardware ‘Reset’ mode (not described here), after a 20ms delay, if the battery voltage rises above V_{MSTR+} (2.0~2.2V). This will occur either by replacing the battery with a new battery ($V_{BAT>}V_{MSTR+}$), or by connecting a charger and charging the battery above V_{MSTR+}.

The phone exits ‘Reset’ mode into ‘Active’/Acting dead’ mode when the battery voltage rises above V_{COFF+} (3.0~3.2V) within the watchdog time period, and subsequently stays above V_{COFF-} (2.7~2.9V) for a minimum of 240.5ms. If the battery voltage has not risen beyond V_{COFF+} before the internal watchdog elapses the phone is forced into ‘Power off’ mode instead.

Power off

In this mode the phone is powered off, but has a supply voltage.

The phone enters ‘Power off’ mode from all other modes, except ‘No supply’, if internal watchdog elapses. VRTC regulator is active (enabled), and supplied from the main battery (the RTC status depends on whether RTC was enabled or not when entering ‘Power off’ mode).

The phone exits ‘Power off’ mode, into hardware ‘Reset’ mode (not described here), after a 20ms delay, if either of the following conditions are met:

- Power on button detected (PwrOffX).
- Charger connection detected (VCharDet)(VCharIn>VCH_{DET+} (1.9~2.1V)).
- RTC alarm detected (RTC_ALARM).

The phone exits ‘Reset’ mode into ‘Active’/Acting dead’ mode when the battery voltage rises above V_{COFF+}, and stays above V_{COFF-} for a minimum of 240.5ms.

Acting dead

This mode is just a sub mode of normal ‘Active’ mode, where everything, except for VSIM and the RF parts, is powered up. This mode is only used for when the phone is in ‘Power off’ or ‘No supply’ mode and a charger is connected. To the user, the phone acts as if it was switched off. A battery-charging alert is given and/or a battery charging indication on the display is shown, to acknowledge the user that the battery is being charged.

The phone exits from ‘Power off’ or ‘No supply’ mode, into hardware ‘Reset’ mode (not described here), after a 20ms delay, if a charger connection is detected (VCharDet)(VCharIn>VCH_{DET+}).

The phone then enters ‘Acting dead’ mode, after a 100ms delay, if the battery voltage rises above V_{COFF+} (sub mode of normal ‘Active’).

The phone exits ‘Acting dead’, into ‘Active’ mode, if the power on button is detected (PwrOffX).

Active

In the active mode the phone is in normal operation, scanning for channels, listening to a base station, transmitting and processing information. There are several sub-states in the active mode depending on if the phone is in burst reception, burst transmission, if DSP is working, if the phone is folded or unfolded etc.

Sleep mode

The phone enters ‘Sleep’ mode when the UPP goes into standby mode and forces the UEM into sleep mode by pulling SleepX low.

The UEM puts VCORE, VIO and VFLASH1 into sleep mode and disables VANA and all of the RF regulators except VR2, VSIM is also put into sleep mode if supported by the SIM card. The main oscillator (26MHz) is also shut down and the 32 kHz sleep clock oscillator is used as reference clock for the baseband.

The phone exits sleep mode when SleepX is set high by the UPP, or by expiration of a sleep clock counter in the UEM or by some external interrupt, generated by a charger connection, key press, headset connection etc.

Charging

Charging can be performed in parallel with any other operating mode. The charging will be controlled by hardware until the phone enters either ‘Sleep’, ‘Acting dead’ or ‘Active’ mode. Hereafter it will be controlled by software.

A BSI resistor inside the battery pack indicates the battery type/size. The resistor value corresponds to a specific battery capacity and technology.

The battery voltage, temperature, size and current are measured by the UEM, and controlled by the charging software running in the UPP.

The charging control circuitry (CHACON) inside the UEM controls the charging current delivered from the charger to the battery. The battery voltage rise is limited by turning the UEM switch off when the battery voltage has reached VBATLim (programmable charging cut-off lim-

its 3.6V / 5.0V / 5.25V). Charge current is monitored by measuring the voltage drop across a 0.22 ohm resistor.

Regulators

Overview of the regulator state in ‘Active’, ‘Acting dead’ and ‘Sleep’ mode is shown in table 1.

Table 1: Overview

Regulator	Active	Acting dead	Sleep
VFLASH1	Enabled	Enabled	Sleep mode
VFLASH2	Disabled (Not used)	Disabled (Not used)	Disabled (Not used)
VANA	Enabled	Enabled	Disabled
VIO	Enabled	Enabled	Sleep mode
VCORE	Enabled	Enabled	Sleep mode
VSIM	Enabled (voltage controlled by software)	Disabled	Enabled/Sleep mode (depending on SIM card)
VR1A	Enabled	Enabled	Disabled
VR1B	Disabled (Not used)	Disabled (Not used)	Disabled (Not used)
VR2	Enabled (voltage controlled by software)	Enabled (voltage controlled by software)	Enabled (voltage controlled by software)
VR3	Enabled	Disabled	Disabled
VR4	Disabled	Disabled	Disabled
VR5	Enabled	Disabled	Disabled
VR6	Enabled	Disabled	Disabled
VR7	Enabled	Disabled	Disabled
IPA1-2	Disabled (not used)	Disabled (not used)	Disabled (not used)

DC Characteristics

Supply Voltage Ranges

Table 2: Supply voltage ranges

Signal	Rating
Battery Voltage	0 ... 4.39V (VBAT)
Flashing Voltage	0 … 5.15V
Charger Input Voltage	-0.3 ... 9.2VRMS (16,9 Vpeak)

Following voltages are assumed as normal and extreme voltages for used battery:

Table 3: Battery voltages

Source	Min	Nom	Max	Note
VBAT	3.21V	3.80V	4.39V	1
Vcoff+	3.0V	3.1	3.2	HW off to on
Vcoff-	2.7V	2.8V	2.9V	HW on to off
Vmstr+	2.0V	2.1V	2.2V	HW off to on
Vmstr-	1.8V	1.9V	2.0V	HW on to off
Sw shutdown	-	3.1V	-	In Call

1 TA will test with the nominal voltage at an 85% range (0.85 x 3.7V = 3.145V); therefore the nominal voltage has been set to 3.8V. ADC settings in the SW might shutdown the phone above the min value. During fast charging of an empty battery, the max voltage might exceed this value. Voltages between 4.20 and 4.60 might appear for a short while.

Regulators Voltage Ranges

Table 4: Regulators voltage ranges

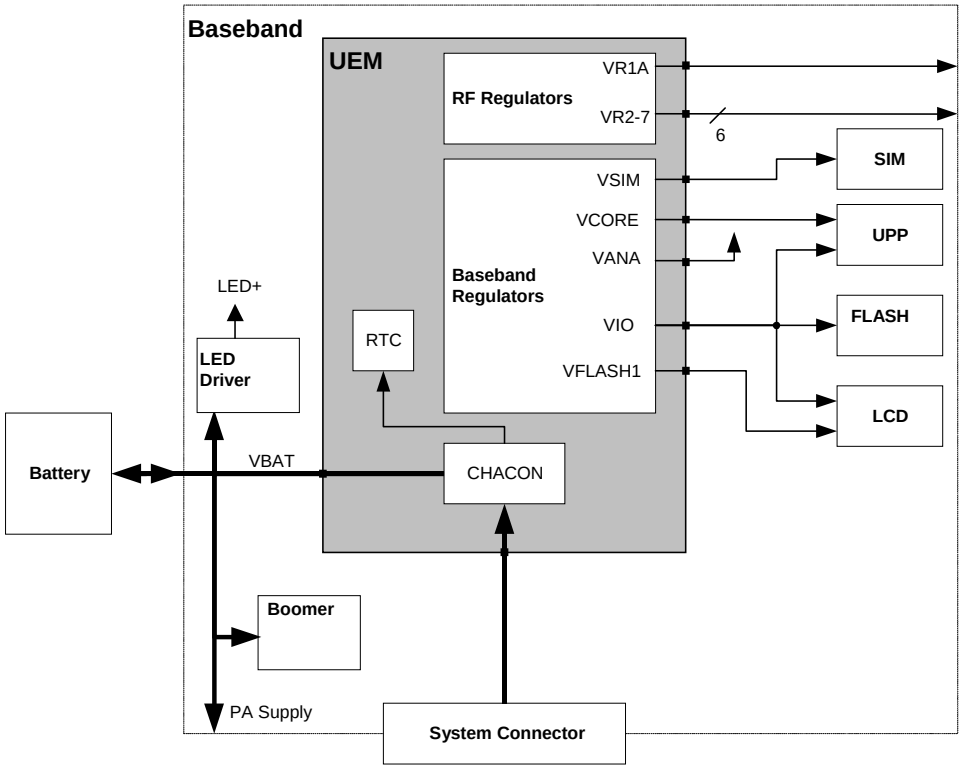
Source	Min	Nom	Max	Note
VANA	2.70V	2.78V	2.86V	I_{max} = 80mA
VFLASH1	2.70V	2.78V	2.86V	I_{max} = 70mA I_{sleep} = 4mA
VFLASH2	2.70V	2.78V	2.86V	Not used
VSIM	1.745V 2.91V	1.8V 3.0V	1.855V 3.09V	I_{max} = 25mA I_{sleep} = 0.5mA
VIO	1.72V	1.8V	1.88V	I_{max} = 150mA I_{sleep} = 0.5mA
VCORE Higher range	1.000V 1.140V 1.235V 1.425V 1.710V	1.053V 1.2V 1.3V 1.5V 1.8V	1.106V 1.260V 1.365V 1.575V 1.890V	I_{max} = 200mA I_{Sleep} = 0.2mA Used voltages: (c035) = 1.5V (c027) = 1.3V

Table 5: RF regulators

Source	Min	Nom	Max	Note
VR1A	4.6V	4.75V	4.9V	Imax = 10mA
VR1B	4.6V	4.75V	4.9V	Not used
VR2	2.70V	2.78V	2.86V	I_{max} = 100mA
VR3	2.70V	2.78V	2.86V	I_{max} = 20mA
VR4	2.70V	2.78V	2.86V	Not used
VR5	2.70V	2.78V	2.86V	I_{max} = 50mA
VR6	2.70V	2.78V	2.86V	I_{max} = 50mA
VR7	2.70V	2.78V	2.86V	I_{max} = 45mA

Interconnection Diagram

Figure 2:IPower distribution diagram



External Signals and Connections

Battery connector

The battery temperature is estimated by measurement in the transceiver PWB with a separate NTC resistor. Thus the Battery Interface has only 3 contacts. The Battery Interface will not support NiMh batteries.

Table 6: Battey connetor

Name	Description	Test usage
VBAT	Battery voltage terminal.	Battery calibration.
GND	Battery ground terminal.	
BSI	Battery size identification.	Flash and local mode forcing.

Baseband - RF interface

The interface between the baseband and the RF can be divided into three categories:

- The digital interface from the UPP to the RF ASIC (Mjoelner). The serial digital interface is used to control the operation of the different blocks in the RF ASICs.

- The analogue interface between UEM and the RF. The analogue interface consists of RX and TX converter signals. The power amplifier control signal TXC and the AFC signal comes as well from the UEM.

- Reference clock interface between Mjoelner and UPP, which supplies the 26Mhz system clock for the UPP.

Internal Signals and Connections

The tables below describe internal signals. The signal names can be found on the schematic for the PWB.

Audio

Table 7: Internal microphone

Signal	Min	Nom	Max	Condition	Note
MIC1P (Differential input P)	-	5mV	-	TBD	
MIC1N (Differential input N)	-	5mV	-	TBD	
MICB1 (Microphone Bias)	2.0 V	2.1 V	2.25 V	DC	
External loading of MICB1	-	-	600uA	DC	

Table 8: Internal speaker (Differential output EARP & EARN)

Signal	Min	Nom	Max	Units	Note
Output voltage swing	4.0	-	-	Vpp	Differential output
Load Resistance (EARP to EARN)	25,5	27,2	28,9	W	2*10Ù 5% + 7,2Ù±10%
Load Capacitance (EARP to EARN)	-	-	50	nF	

Speaker (Ringer & Earpiece)

Table 9: Connections between UPP and Boomer

Signal	From	To	Parameter	Min.	Max.	Unit	Notes
Shutdown (Only Ringer)	UPP GENIO[14]	Boomer Shut-down (pin 5)	Vih Vil	1.2 -	- 0.4	V V	Boomer Shutdown treshold levels

Table 10: Connections between UEM/Battery and Boomer

Signal name	From	To	Parameter	Min.	Max.	Unit	Notes
XAU-DIO[1] Fil-tered signal	Differential between HF and HFCM. No direct connection between UEM and Boomer	Boomer	Output Swing	-	80mV	Vpp	Long-term consump-tion
VBAT	Battery	Boomer (pin 6)	Supply	3.2	4.39	V	Lower limit is SW cut-off

Hinge flex connection

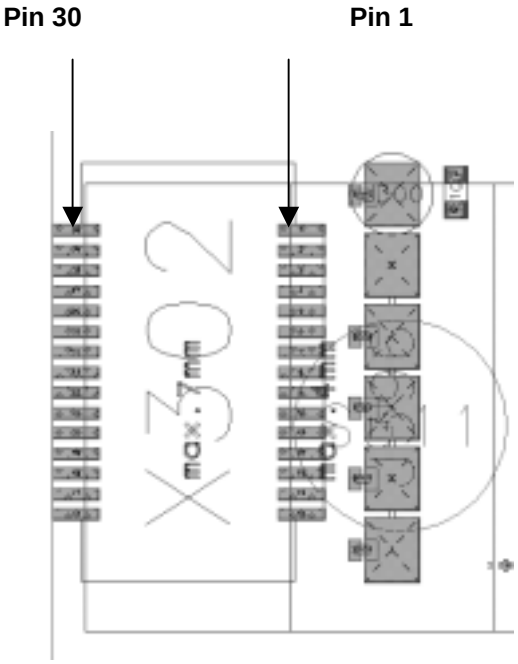
Connection between main engine (lower block) and upper is done by hinge flex via 30 pins board to board connector. Hinge flex includes Earpiece/Ringer, Display, SIM, LCD led and Vibra signals.

Table 11: Hinge flex signals

Pin	Signal	Comments
1,2,3,4	GND	
5	LCD_CSL	Display Serial Clock
6	LCD_CSX	Display Chip Select
7,8,9	GND	
10	Vibra	PWM signal
11	Vbat	For Vibra
12,13,14,15	GND	
16	SIMCARD_Det	Detection of SIM Card
17	VSIM	3.0V/1.8V for SIM
18	SIM_RST	SIM Reset
19	SIM_IO	SIM Data
20	SIM_CLK	SIM Clock

Pin	Signal	Comments
21	GND	
22	EARP	For MALT
23	EARN	For MALT
24	GND	
25	VDD "Vflash1"	2.78 V for Display
26	LED-	Return from LEDs
27	LED+	Pos supply for LEDs
28	VDDI "Vio"	1.80 V for Display
29	LCD_RESETX	Display Reset
30	LCD_SI	Display Serial Data

Figure 3:Flex con. pin out



Baseband board clocks

Table 12: Board Clocks

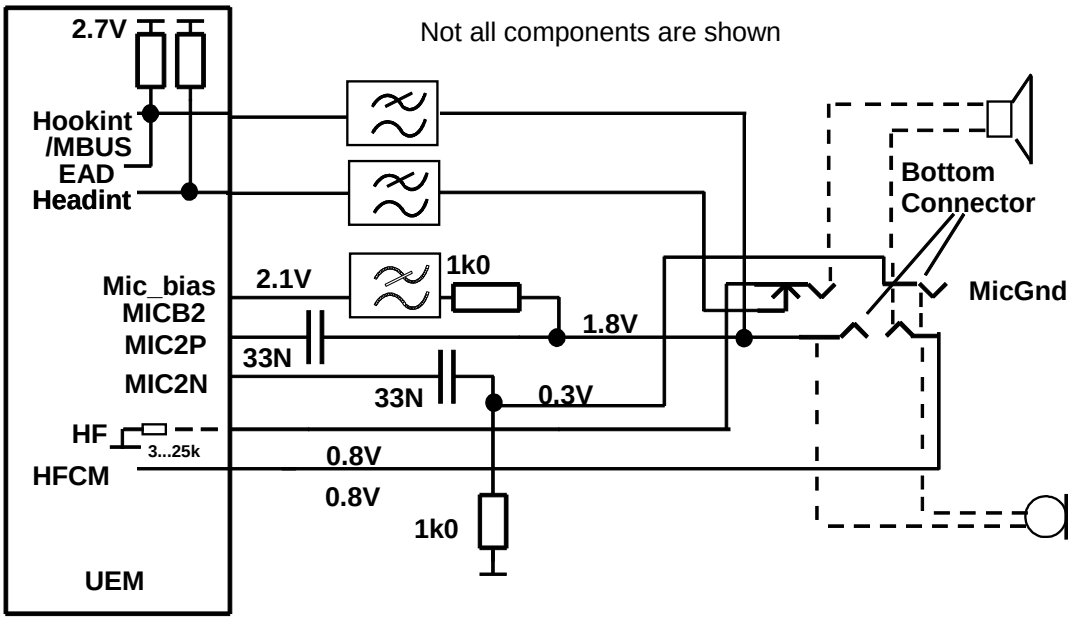
Signal name	From	To	Min.	Typ.	Max.	Unit	Notes
RFCLK	MJOEL-NER	UPP	-	26	-	MHz	Active when SLEEPX is high
SLEEPCLK	UEM	UPP	-	32.768	-	KHz	Active when VBAT is supplied
RFCONV-CLK	UPP	UEM		13	-	MHz	Active when RF converters are active
RFBUSCLK	UPP	MJOEL-NER	-	13	13	MHz	Only active when bus-enable is active
DBUSCLK	UPP (DSP)	UEM	-	13	13	MHz	Only active when bus-enable is active
CBUSCLK	UPP (MCU)	UEM	-	1	1.2	MHz	Only active when bus-enable is active
LCDCAM-CLK	UPP	LCD	0.3	6.25	8.4	MHz	Only active when bus-enable is active
MemClk/ Flash	UPP	Flash		40		MHz	

Functional Description

Audio External

RH-53/54 is designed to support fully differential external audio accessory connection. A headset and PnPHF can be directly connected to system connector. Detection of the different accessories is made in analog way by reading the DC voltage value of EAD converter.

Figure 4:External audio interface



Headset Detection

Supported headsets are 4-wire fully differential accessories. The hardware used to detect accessories is contained in the UEM and BB area. For interrupt purposes the UEM inputs HOOKINT and HEADINT are used. The bottom connector contains a switch, which opens when an accessory is connected. The switch is routed to the UEM HEADINT input.

The current generators on the HOOKINT and HEADINT pins acts as internally pull-up resistors with values equivalent to 675 k - 2.86 M, tolerances of the current source and VFLASH1 considered. The HOOKINT input comparator threshold level can be set to two different values. Levels can be found in the table.

Table 13: Comparator threshold levels and pull-up current source strength (hysteresis included)

Parameter	Variable	Min	Typ	Max
HOOKINT comparator threshold	Vhook1	1.21 V	1.35 V	1.49 V
HOOKINT comparator threshold	Vhook2	0.50 V	0.60 V	0.70 V
HEADINT comparator threshold	Vhead	1.71 V	1.90 V	2.09 V
VFLASH1 voltage regulator	VFLASH1	2.70 V	2.78 V	2.86 V
Current source strength	Ipullup	1 µA	2 µA	4 µA

Note that hysteresis of the comparators has been taken into account in the HOOKINT and HEADINT Min and Max values.

PnPHF Detection

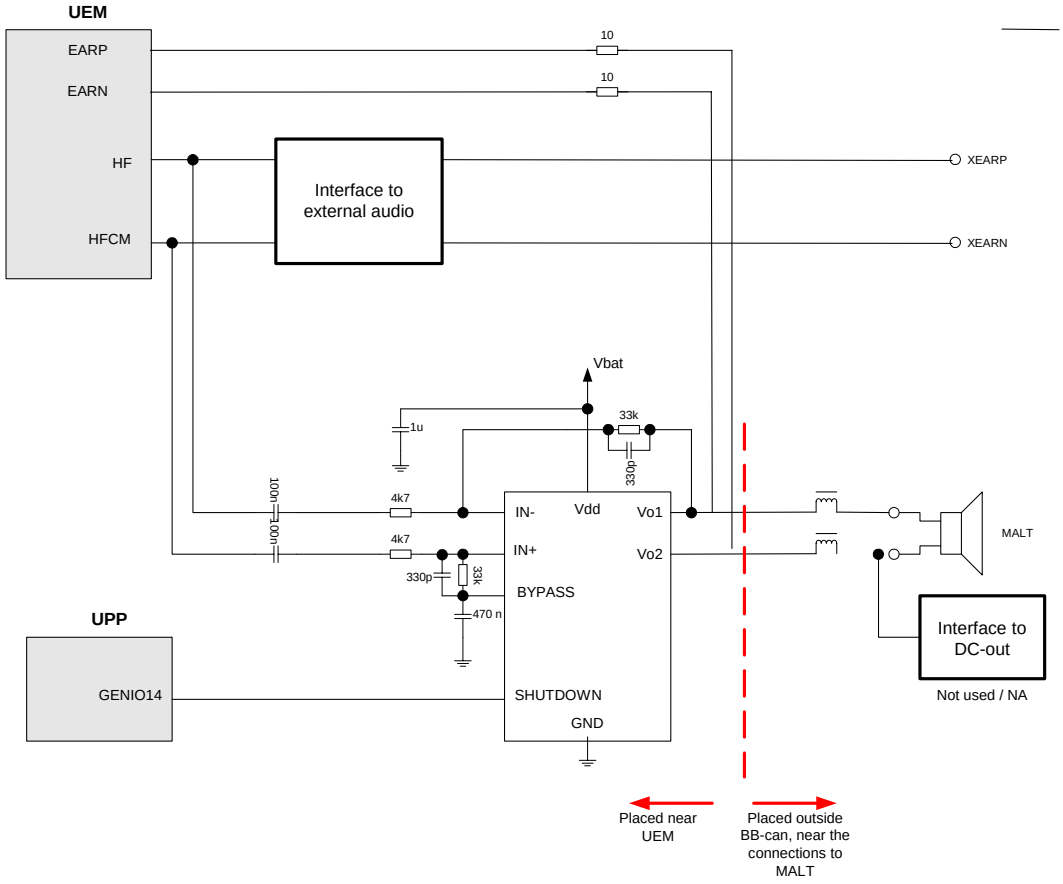
PnPHF accessory uses 4-wire fully differential audio connection. The accessory is detected by the Headint signal when the plug is inserted.

Audio Internal

Earpiece/Ringer

The transducer used both as earpiece and ringer is the 16 mm loudspeaker called MALT. This solution will implement polyphonic ringing tones.

Figure 5:Earpiece/ringer interface



Microphone

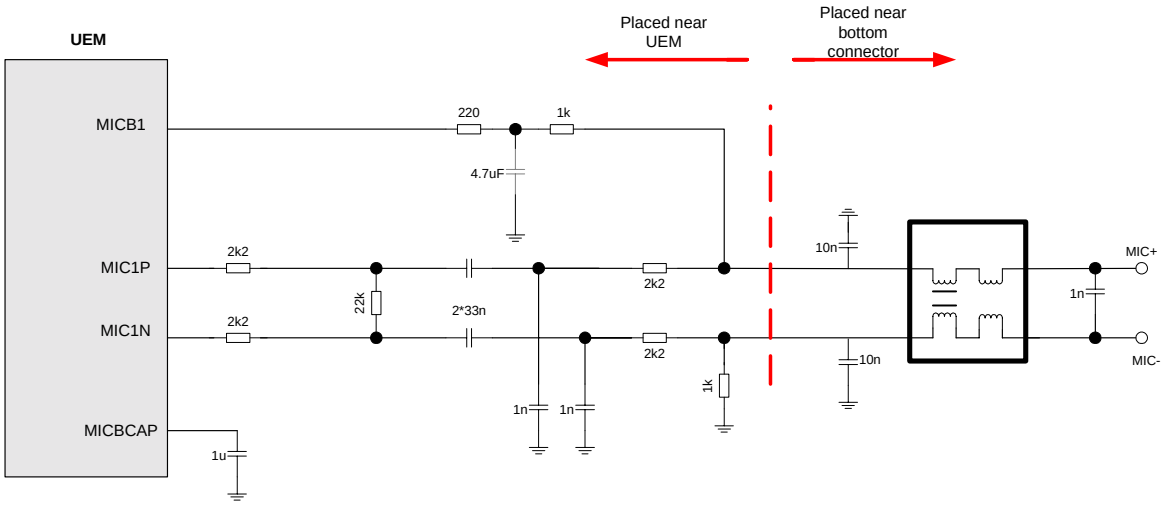
The acoustical design is copied from Nokia 7210 with some modifications. The microphone boot is a separate component placed next to the bottom connector.

The electrical Microphone design is a differential bias circuit, driven directly from the MICB1 bias output with external RC-filters.

The RC filter (220 Ω, 4.7µF) is scaled to provide damping at 217 Hz.

The microphone bias is controlled in the 8 bit AudioBiasR register. The figure below shows the electrical interface.

Figure 6:Microphone interface



Vibra

Introduction

Vibra is a small cylindrical DC motor with a ∅4.0-mm in diameter that generating vibration by rotating an un-balanced mass (counter weight) with radius of R=2.5-mm when the applied voltage is on.

The vibration signal will be used as a silent alert call and also as a noticeable shock in gaming.

Acoustic design

The vibra is placed in the top of the phone when it is fold/closed but it placed under the display when it is unfold.

The vibra is electrically connected to the flexfilm by spring contacts.

The vibra is controlled from the UEMK by a PWM (Pulse Wide Modulated) square wave signal.

The nominal rated voltage for the vibra is approximately about 1.3 volts and the nominal battery voltage is about 3.6 volts.

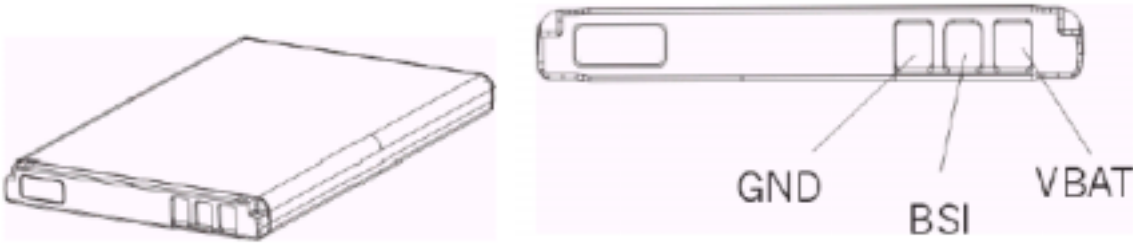
Batteries

Type:BL-4C battery

Technology:Li-Ion. 4.2V charging. 3.1V cut-off

Capacity:760 mA/h

Figure 7:BL-4C battery



The BSI values for the batteries:

Inside the battery, an over-voltage protection circuit are present.

The battery does not contain a temperature sensor. Since the battery is using the Li-Ion technology, care should be taken while charging. The material might be overheated when charged above 60 degrees Celsius. Charging should be terminated when this temperature is reached. An external temperature sensor (NTC resistor) is placed on the PWB close to the end of the battery.

Keyboard

The keyboard PWB layout consists of a grounded outer ring and an inner pad see **Figure 8**.

Figure 8:Keyboard PWB layout

The keyboard is not a matrix keyboard, but is connected direct to UPP. The following table shows the keyboard connection.

Table 14: Overview of keyboard configuration

UPP Pin	RH-53 Key	In/ Out	Internal Pull Up/down	Interrupt	
GenIO1	0	In	Up	GenIOInt5	Falling edge interrupt
GenIO2/ P05	7	In	Up	P0 int	Falling edge interrupt

GenIO20	Soft Right	In	Up	GenIOInt2	Falling edge interrupt
GenIO21	*	In	Up	GenIOInt3	Falling edge interrupt
GenIO25	Up	In	Up	GenIOInt4	Falling edge interrupt
GenIO27	1	In	Up	GenIOInt6	Falling edge interrupt
GenIO28	Left	In	Up	GenIOInt7	Falling edge interrupt
GenIO13	#	In	Up	GenIOInt1	Falling edge interrupt
P00	Send	In	Up	P0 int	Falling edge interrupt
P01	3	In	Up	P0 int	Falling edge interrupt
P02	9	In	Up	P0 int	Falling edge interrupt
P03	8	In	Up	P0 int	Falling edge interrupt
P04	Down	In	Up	P0 int	Falling edge interrupt
P10	6	In	Up	P1 int	Falling edge interrupt
P11	4	In	Up	P1 int	Falling edge interrupt
P12	Right	In	Up	P1 int	Falling edge interrupt
P13	5	In	Up	P1 int	Falling edge interrupt
P14	Soft Left	In	Up	P1 int	Falling edge interrupt
P15	2	In	Up	P1 int	Falling edge interrupt
UEM Pin					
PwrOnX	End / power on/off	In	Current source Pull up	INT on UPP	Falling edge interrupt

NOTES:

- Key number “#” is located on GenIO13 with interrupt on GenIOInt1. RH-53 Marketing accept the reduction in performance when there is no wake up from deep sleep.
- Power on/off and End Call are combined. For ending call: “short” keypress. For power off: “Long” keypress

All lines are configured as input, when there is no key pressed; the inputs are high due to that the UPP has internally pull-up resistors on those lines. When a key is pressed, the specific line where the key is placed is pulled low. This generates an interrupt to the MCU and the MCU now starts its scanning procedure.

Display & Keyboard Backlight

LCD Backlight

LCD Backlight consists of 2 side firing white LED's, which are placed on the display FPC below the LCD area.

Keyboard light effects

Keyboard is lighting up by 2 white side firing LED’s for keyboard. 3 blue LED’s are used for Light effects in the keyboard.

LCD

The LCD display module is a 130 x 3RGB x 130, 4096-color/ 256-color /8-color transflective passive matrix (CSTN) LCD display.

The LCD module interface follows 130x130 X4_CSTN Display module interface specification (Nokia doc. Code: DHS02040-EN 0.2). Nile display family is using serial interface only

Memory Module

The RH-53/54 baseband memory module consists of external burst NOR flash memory 8Mbyte (64Mbit) and CMOS 2Mbyte (16Mbit) PSRAM

The flash interface follows the common baseband interface.

The operations voltage is Vcc=1.8 V (Voltage range 1.7-1.9 V).

Fold detection-switch

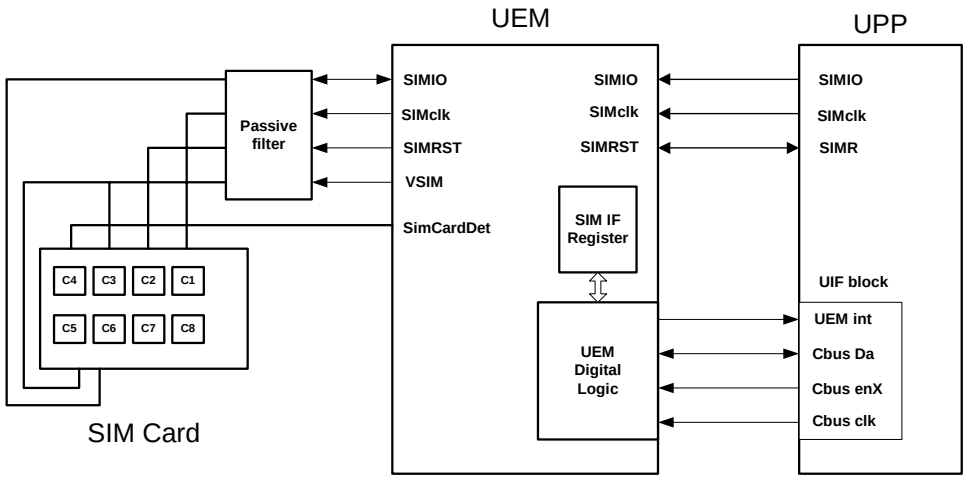
Detection for fold position has been done with HALL- switch SH248CSP which is located in lower block part and the magnet is located on upper block.

The output is high level for B=0mT (flip open).

SIM Interface

The SIM interface can be described as electrical interface between the SIM card and the phone via UEM. The SIM interface in the UEM contains power up/down, port gating, card detect, data receiving, ATR-counter, registers and level shifting buffers logic.

Figure 9:UEM, UPP and SIM interface

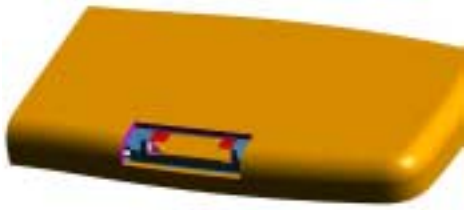


The data communication between the card and the phone is asynchronous half duplex. The clock supplied to the card in GSM system is either 1.083 MHz or 3.25 MHz. The data baud rate is SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

SIM -reader

The SIM card reader is located on upper block part of the phone and is connected to UEM via the flex. For RH-53 a slide-in draw is used as SIM slot. Picture below depicts the SIM slot on the side of the upper block.

Figure 10:Upper block B-cover SIM-slide slot



The entire SIM interface is located in the two ASICs, UPP and UEM. The UEM contains the SIM interface logic level shifting. The SIM interface can be programmed to support 3V and 1.8V SIMs. A register in the UEM controlled by SW is used to selects SIM supply voltage for different SIMs. However, it is only allowed to change the SIM supply voltage when the SIM IF is initialised i.e. SIM IF id powered down.

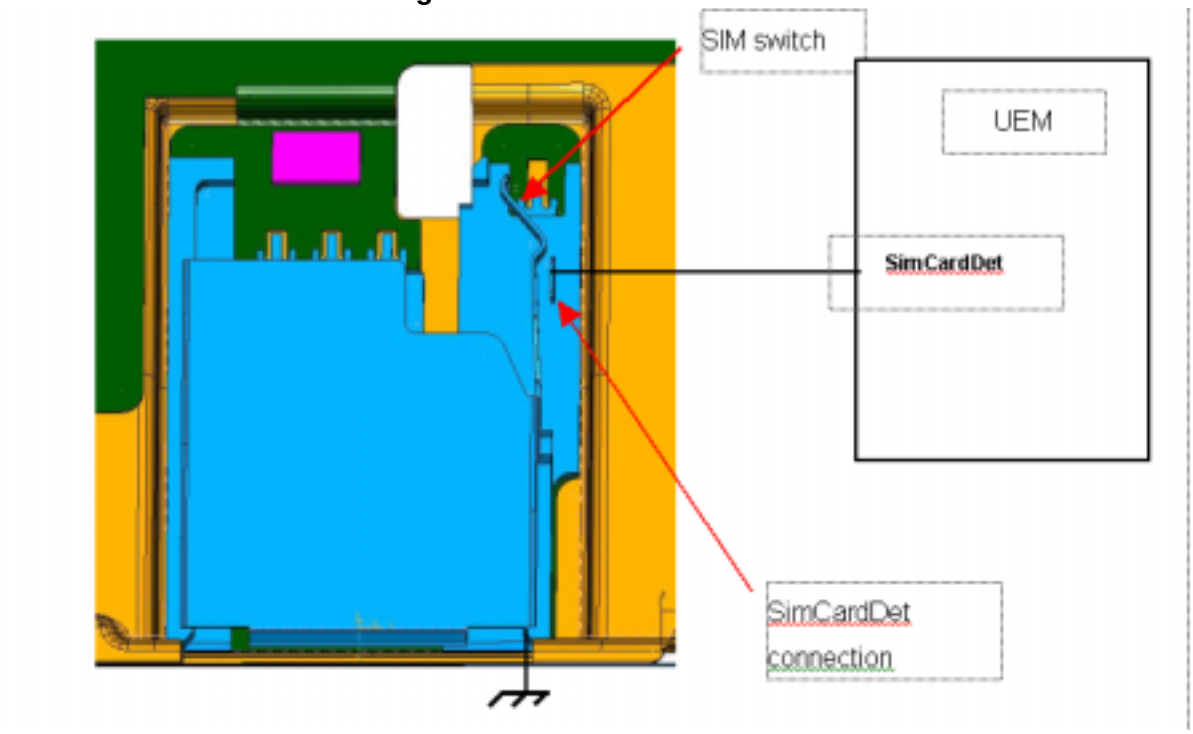
Of the eight card contacts only 5 will be connected: C1 (Vcc), C2 (Card Reset), C3 (Card Clock), C5 (Ground) and C7 (Data I/O).

SIM switch and card detection

The SIM power up/down sequence is generated in the UEM. This means that the UEM generates the RST signal to the SIM. A mechanical switch is connected to UEM SimCardDet pin to monitor the presence of the SIM card, i.e. card detection. When the SIM card is inserted, the switch connects the SimCardDet to GND.

To avoid probable SIM card corruption caused by “hot-swapping”, the UEM will automatically power down the SIM card interface within 2ms if the switch is opened.

Figure 11:SIM draw and switch



Assembly

Flex

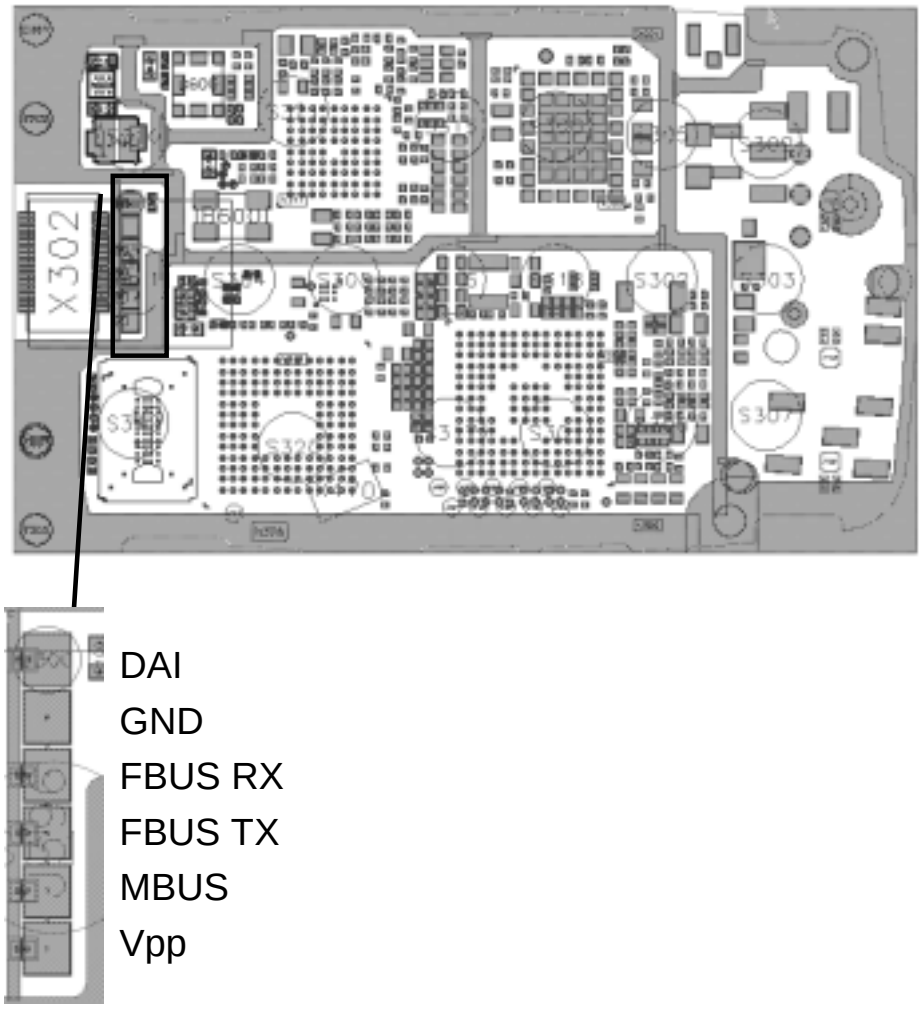
RH-53/54 uses a single layer flex with ground tracks distributed between signal groups, and wide ground tracks running in both sides of the flex to serve as main ground.

Test Interfaces

Test pattern is placed on engine PWB, for service purposes, same test pattern is used for after sales purposes as well.

Through MBUS or FBUS connections, the phone HW can be tested by PC software (Phoenix) and equipment.

Figure 12: Test pattern



Connections to Baseband

The flash programming box, FPS8, is connected to the baseband using a galvanic connector or test pads for galvanic connection. The flash programming interface connects the flash prommer to the UPP via the UEM and the connections correspond to a logic level of 2.7 V. The flash prommer is connected to the UEM via the MBUS (bi-directional line), FBUS_TX, and FBUS_RX.

Test points

The following table show the test points on the main board.

Table 15: Test points

Test point:	Description:
J100	Vbatt on battery connector
J101	BSI on battery connector
J102	GND on battery connector
J300	DAI_CLK on production test pattern
J150	GENIO 14 (Boomer)
J002	DLight
J303	Keyb1 (output from Hall IC)
J396	Test pattern (see **Figure 14**)
J402	PURX (UPP)
J403	SLEEPX (UPP)
J404	SLEEPCLK (UPP)
J405	UEMINT (UPP)
J406	CBUSCLK (UPP)
J407	CBUSDA (UPP)
J408	CBUSENX (UPP)
J409	MBUSTX (UPP)
J410	MBUSRX (UPP)
J411	FBUSTX (UPP)
J412	FBUSRX (UPP)
J413	DBUSCLK (UPP)
J414	DBUSDA (UPP)
J415	DBUSEN1X (UPP)
J416	EXTWRX (UPP)
J417	EXTRDX (UPP)
J418	FLS2CSX (UPP)
J419	FLSCLK (UPP)
J420	FLSCSX (UPP)

J421	RFBUSCLK
J422	RFBUSDA
J423	RFBUSEN1
J424	GENIO 7 (BB-RF Interface)
J600	RXIP (Mjoelner)
J601	RXIM (Mjoelner)
J602	RXQP (Mjoelner)
J603	RXQM (Mjoelner)

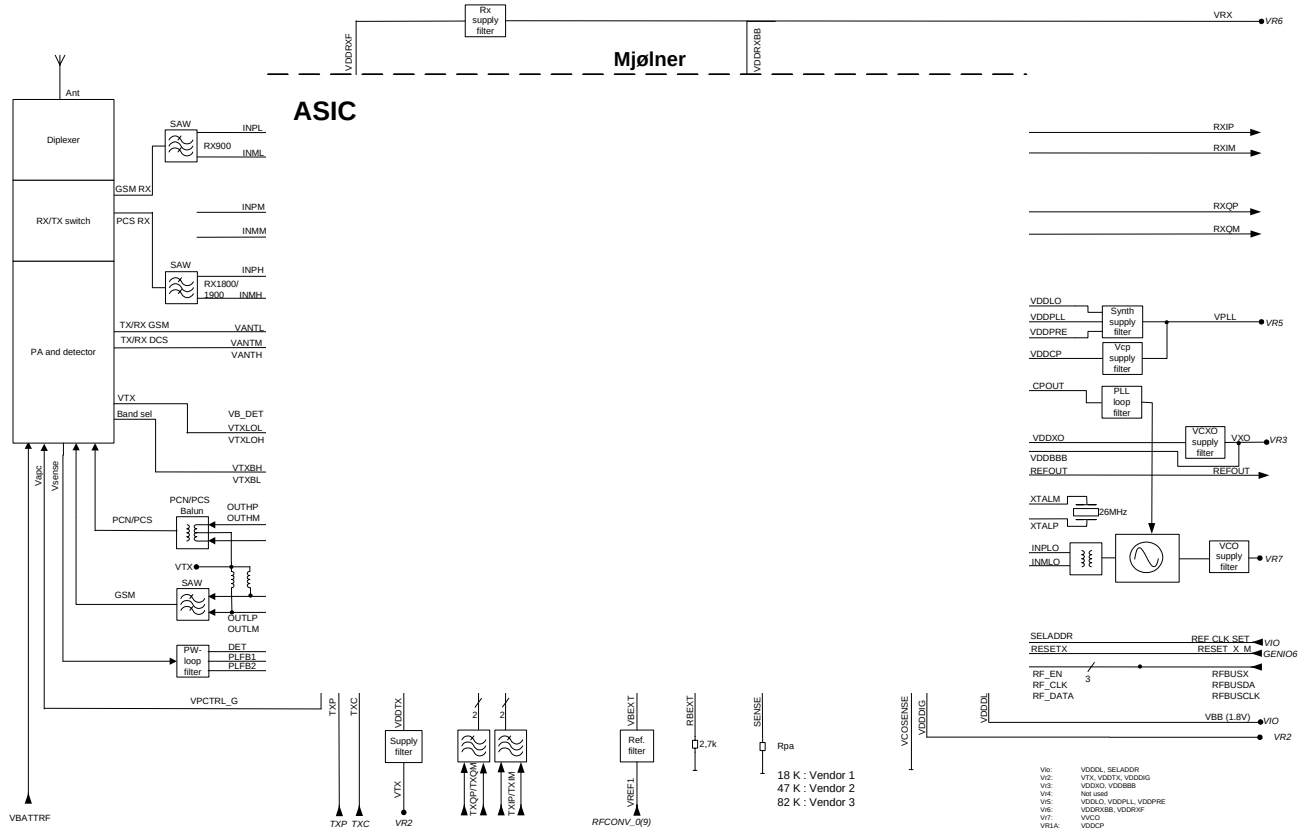
RF Functional Descriptions

RF block diagram

Block diagrams of direct conversion receiver and transmitter RF section has described in the following figure.

The architecture is based on Mjoelner, the RF ASIC, which contains most of the functionality of the RF Engine. The ASIC contains RX and TX functions, VCXO (crystal is placed external to the ASIC), se the block diagram.

Figure 13:RF block diagram



Frequency synthesizers

VCXO

The VCXO is an on-chip oscillator with off-chip crystal with a frequency of 26 MHz.

VCO

The VCO used is a quad band which covers the neaded frequency range for both 900/1800 and 850/1900.

The VCO for the 900/1800 (RH-53) bands covers the range of 3420 to 3840 MHz, while the VCO for 850/1900 (RH-54) (and thereby the quad band) covers 3296 to 3980 MHz.

PLL Synthesizer, Functional Description

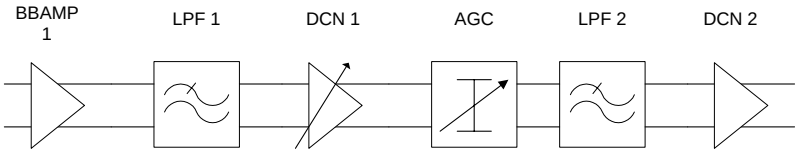
The frequency synthesis PLL in conjunction with the VCO and 2/4 dividers generates the LO signal for both RX and TX paths, locked to the VCXO which again is locked to the base station through the AFC.

Receiver

The Receiver, figure 14, is a dual band direct conversion linear receiver. The received RF signal is routed from the antenna to the FEM, where the RX/TX switch is located. The RX/TX switch performs both the switching between receive – transmit routing of the antenna signals as well as the selection of the band to be used.

The RX signal is routed from the RX/TX switch, in the FEM, to the RX bandpass filter. The filter input is single ended and the output is balanced. The bandlimited signal is amplified in the internal LNA and the Pre-gain amplifier before being converted to a BB signal in the passive mixer.

Figure 14:Simplified BB, either I or Q channel



4 MHz pole at input	250 kHz pole at output	86 kHz pole			114 kHz pole pair	
Gain ~24 dB		Gain ~14 dB	Gain ~ 0 to 24 dB	Gain ~ -48 to 0 dB	Gain ~20 dB	Gain ~0 dB
AGC ~ 0 dB		AGC ~ 0 dB	AGC ~ 24 dB	AGC ~ 48 dB	AGC ~ 0 dB	AGC ~ 0 dB
			Step ~ 6 dB	Step ~ 6 dB		

The BB signal from the passive mixer is amplified by 24 dB in BBAMP1. BBAMP1 is followed by LPF1 with a gain of 14 dB and with a pole at 86 kHz. LPF1 is followed by DCN1 (DC compensation amplifier 1) with a minimum gain of 0 dB and a maximum gain of 24. The attenuator output is filtered in LPF2, a biquad filter, before passing DNC2, (DC compensation amplifier 1). The total filter combination gives a flat transfer function from DC to 90 kHz. All capacitors for both filters are located in the RF-ASIC.

The gain characteristic of the BB amplifier is an amplifier with a maximum gain of 80 dB with an AGC range of 72 dB.

AGC

The AGC keeps the BB level form the receiver within a certain range in order to stay within the dynamic range for the BB, even during fading.

Transmitter

The transmitter chain consists of two direct frequency I/Q-modulators, one for the GSM850/E-GSM900 and one for GSM1800/1900, and a dual-band power amplifier.

The I/Q-signals, generated in BB, are fed to the individual I/Q-modulators in the RF-ASIC. The frequency and phasing parameters for the individual modulators/bands is generated by the LO dividers, division is by 2 in GSM1800/1900 and by four in GSM900/E-GSM900. Each modulator has a separate output.

In GSM850/E-GSM900 the modulator is terminated in a balanced input SAW filter.

The GSM1800/1900 modulator is using a balun instead of a SAW filter.

Dual band FEM

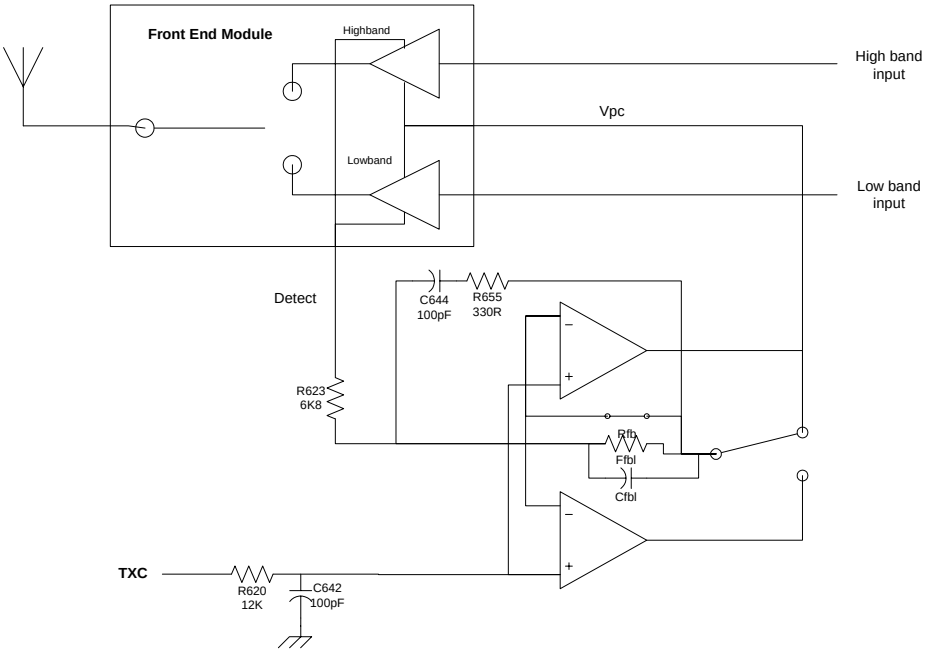
The dual-band FEM contains two separate gain chains, with separate inputs and outputs, where the GSM850/E-GSM900 part is able to produce over 33 dBm and the GSM1800/ PCS1900 part over 30 dBm, both in 50 Ω. The two gain chains shares a common control line to set the gain of amplifiers.

The output from the individual gain chains is feed to the internal RX/TX switch in the FEM.

Power control scheme

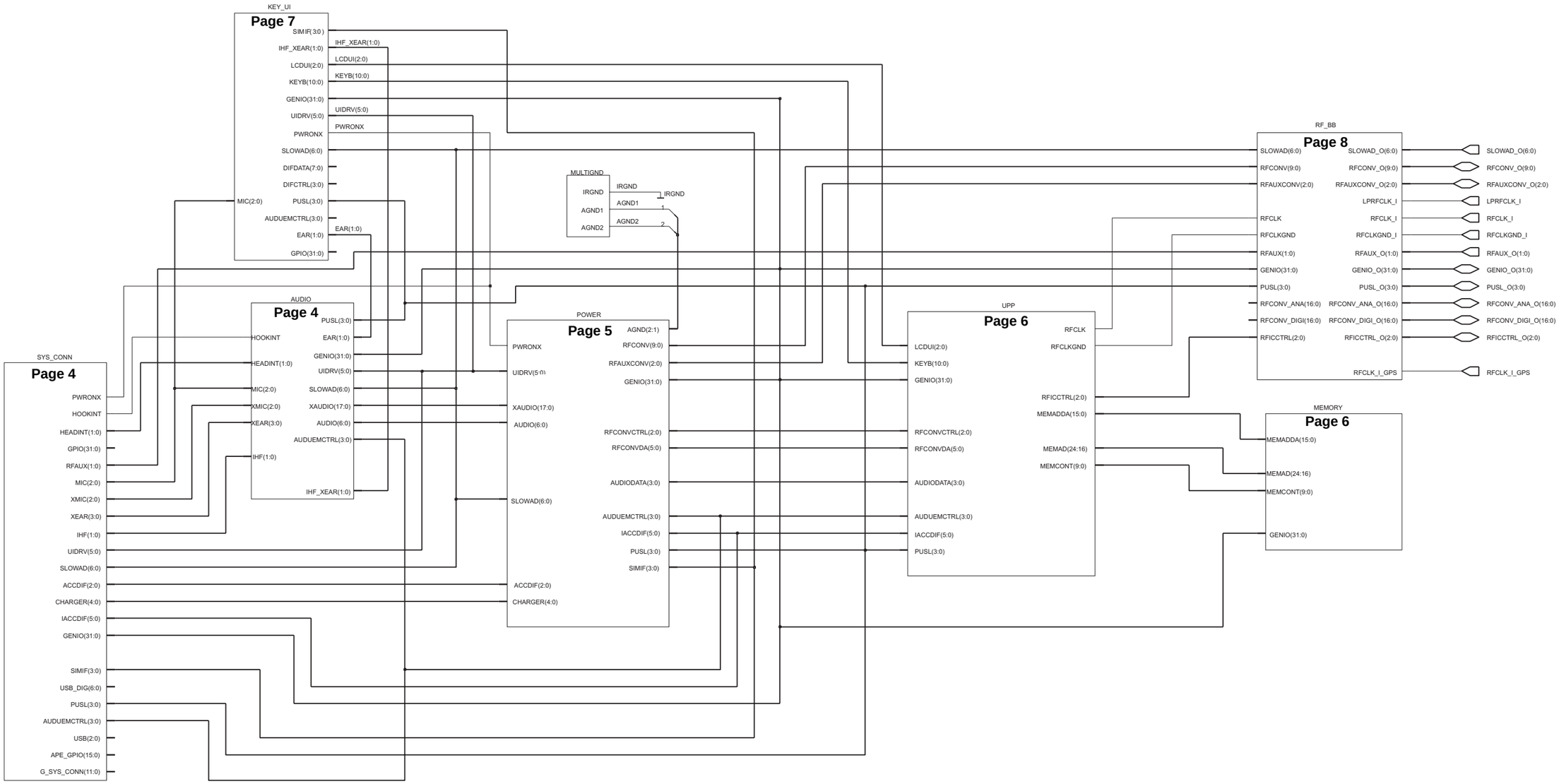
The detected voltage is compared in the error-amplifier in Mjoelner to TXC- voltage, which is generated by a DA-converter in BB.

Figure 15:Power loop

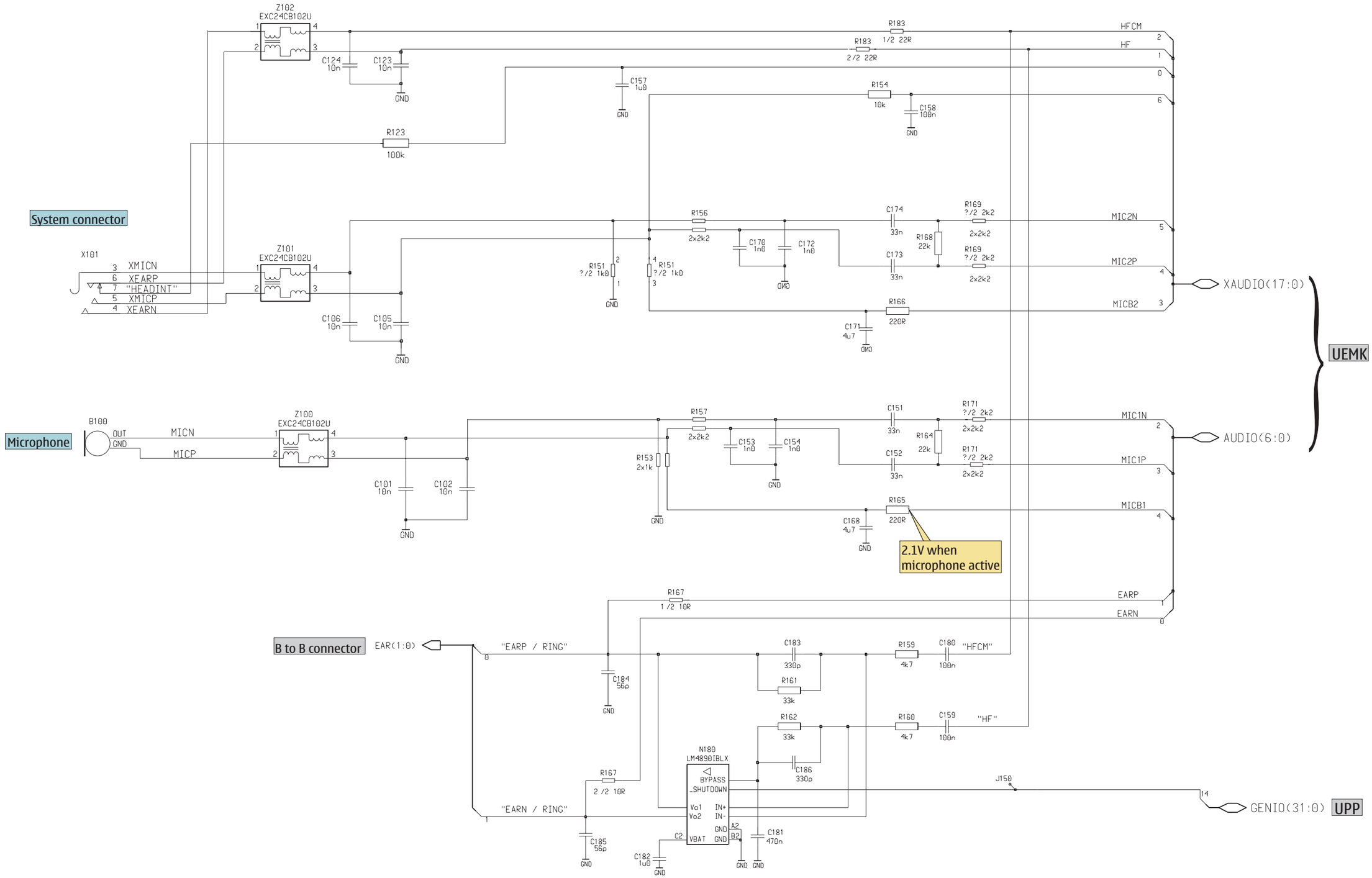


RH-53/54 Schematic Diagrams

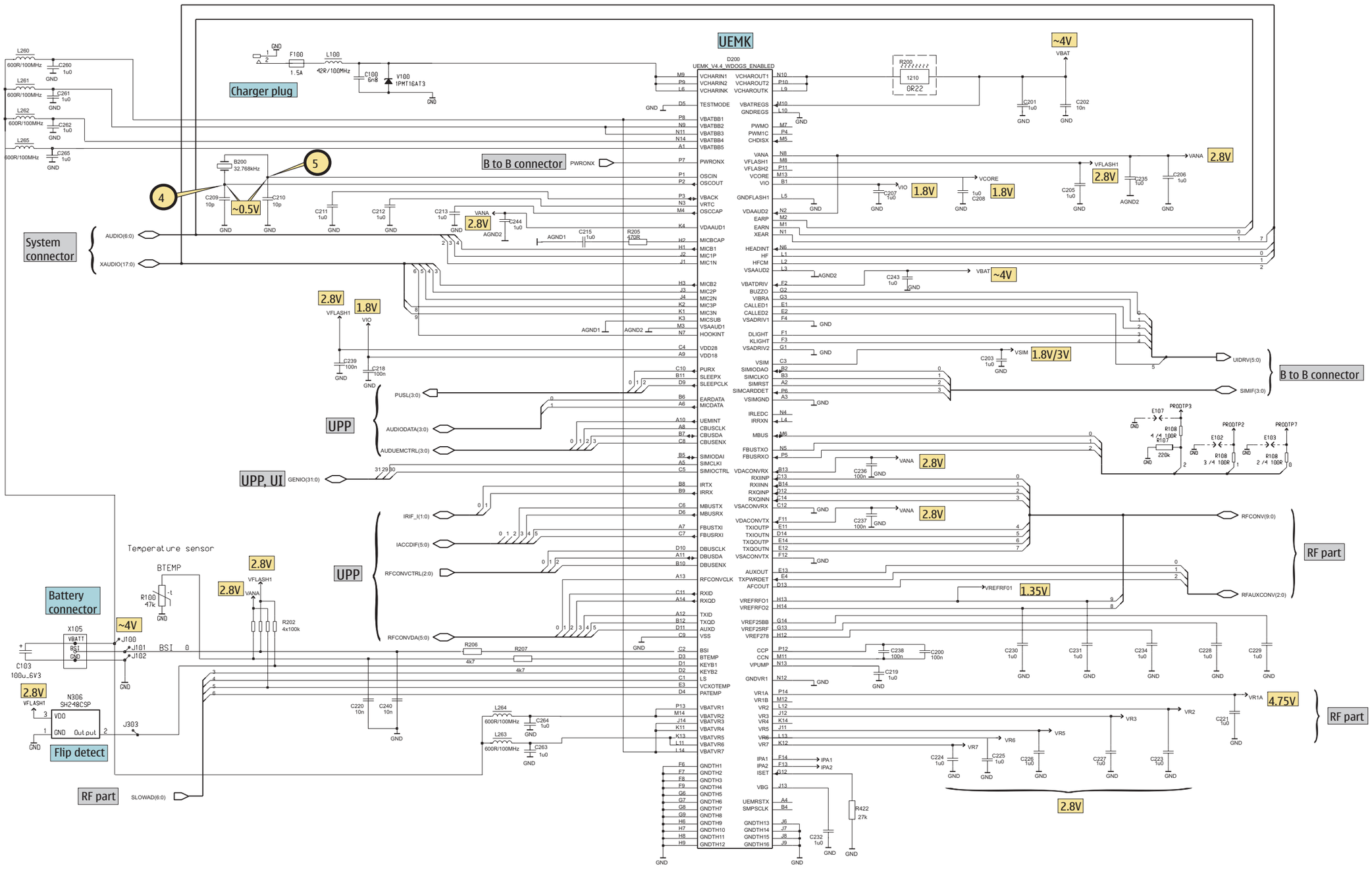
DCT4 common baseband



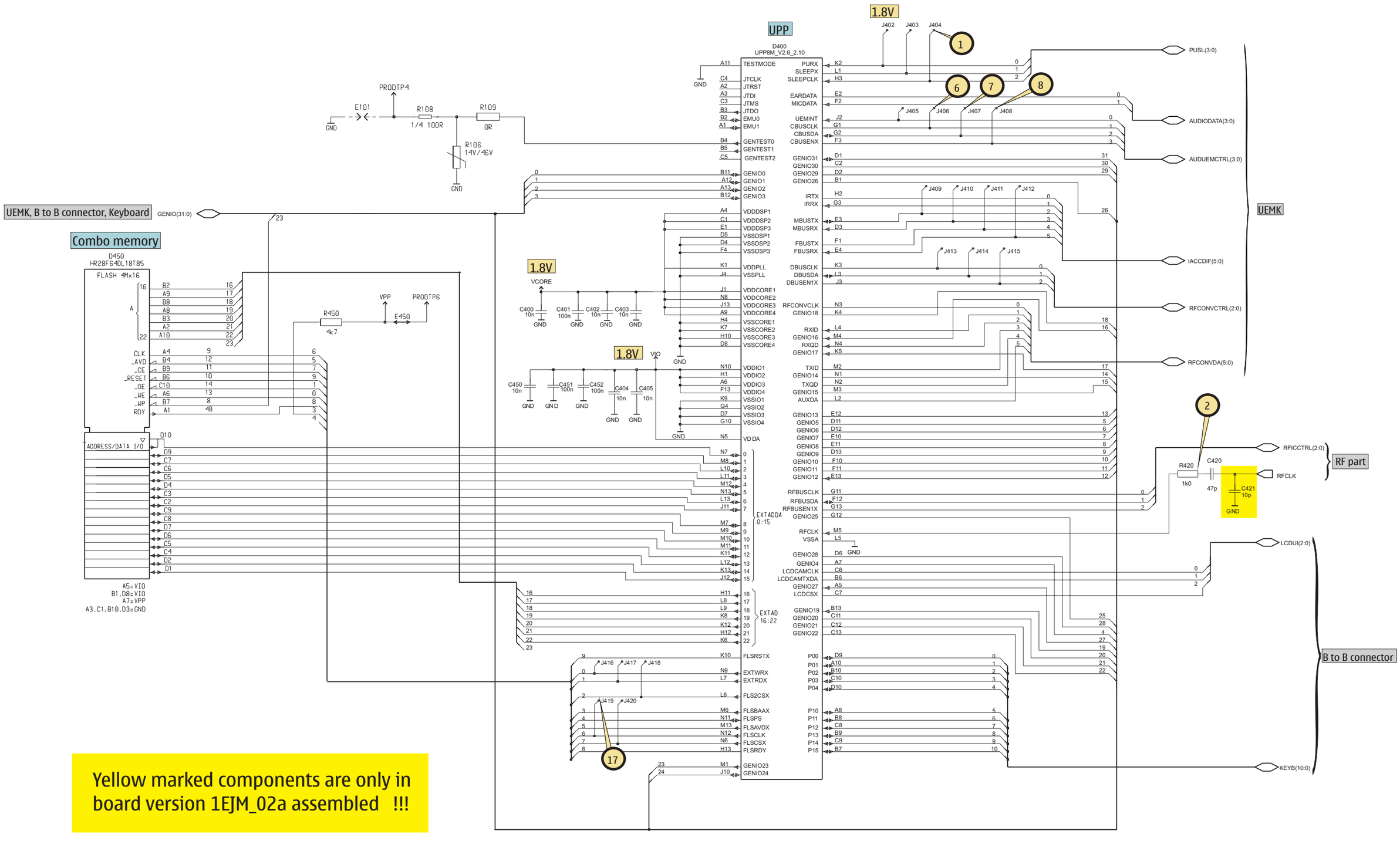
System connector, Audio



UEMK

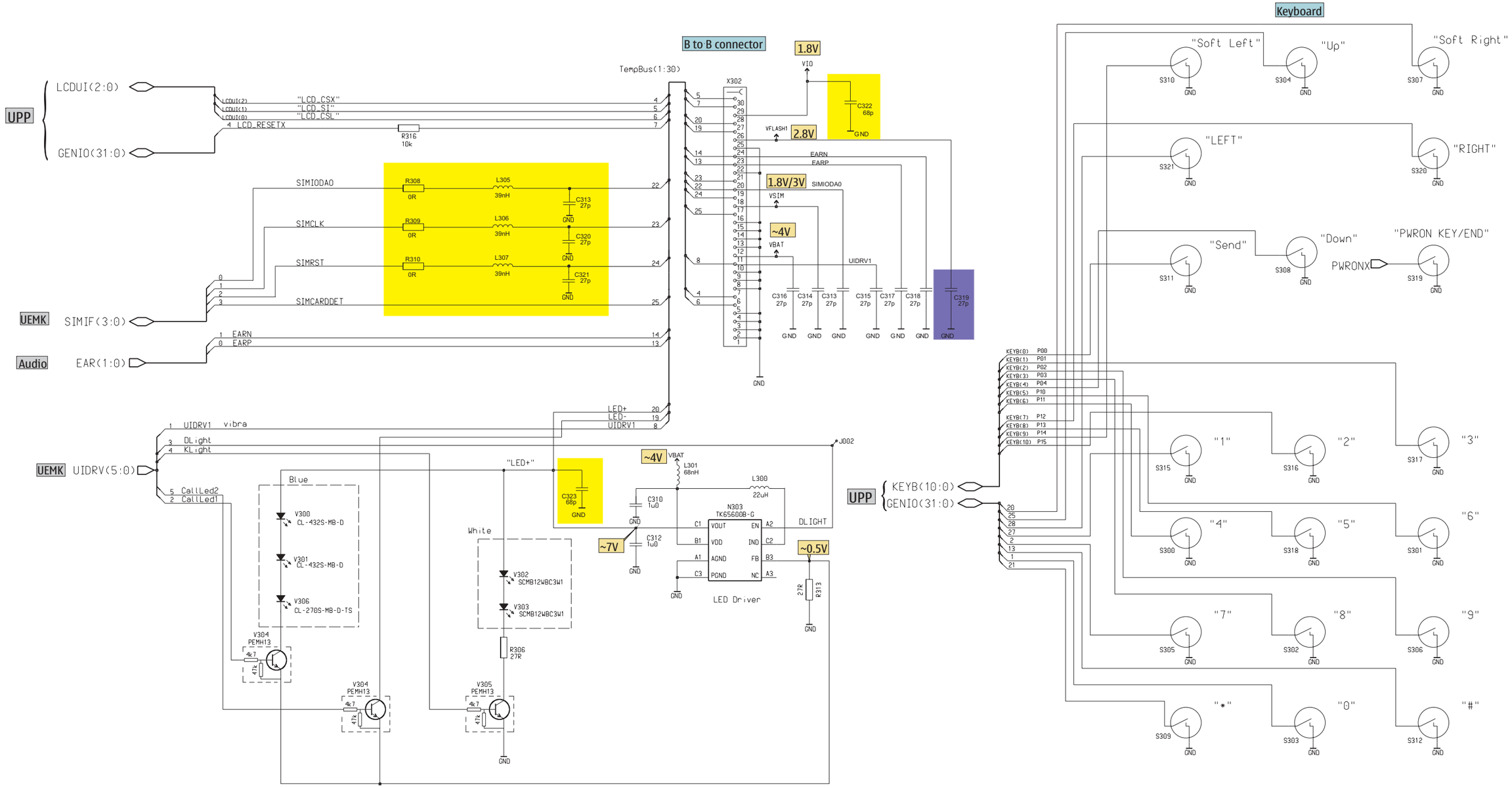


UPP, Combo memory



Yellow marked components are only in board version 1EJM_02a assembled !!!

UI, B to B connector,Keyboard



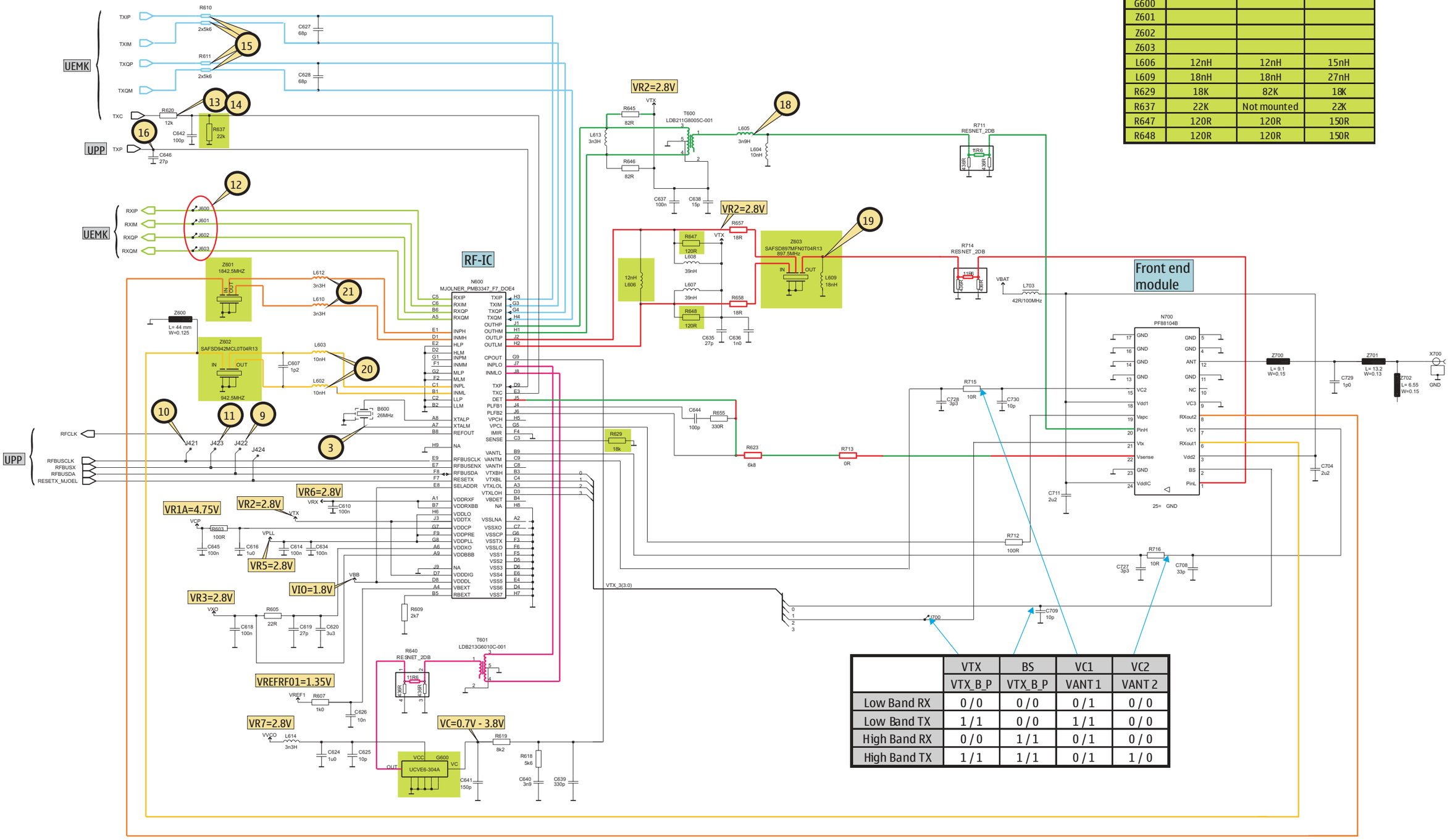
	EU - ver.1 / 2	US - ver.
	Version A / B	Version C
C319	27pF	100pF

Yellow marked components are only in board version 1EJM_02a assembled !!!

RF part

Variant	Band	Channel	RX	VCO/RX	VC/RX	TX	VCO/TX	VC/TX
2650/RH-53	GSM900	37	942.4MHz	3796.6MHz	~2.77V	897.4MHz	3589.6MHz	~2.43V
2650/RH-53	GSM1800	700	1842.8MHz	3685.6MHz	~2.03V	1747.8MHz	3495.6MHz	~1.64V
2651/RH-54	GSM850	189	881.4MHz	3525.6MHz	~1.76V	836.4MHz	3345.6MHz	~1.01V
2651/RH-54	GSM1900	661	1960.0MHz	3920.0MHz	~3.33V	1880.0MHz	3760.0MHz	~2.73V

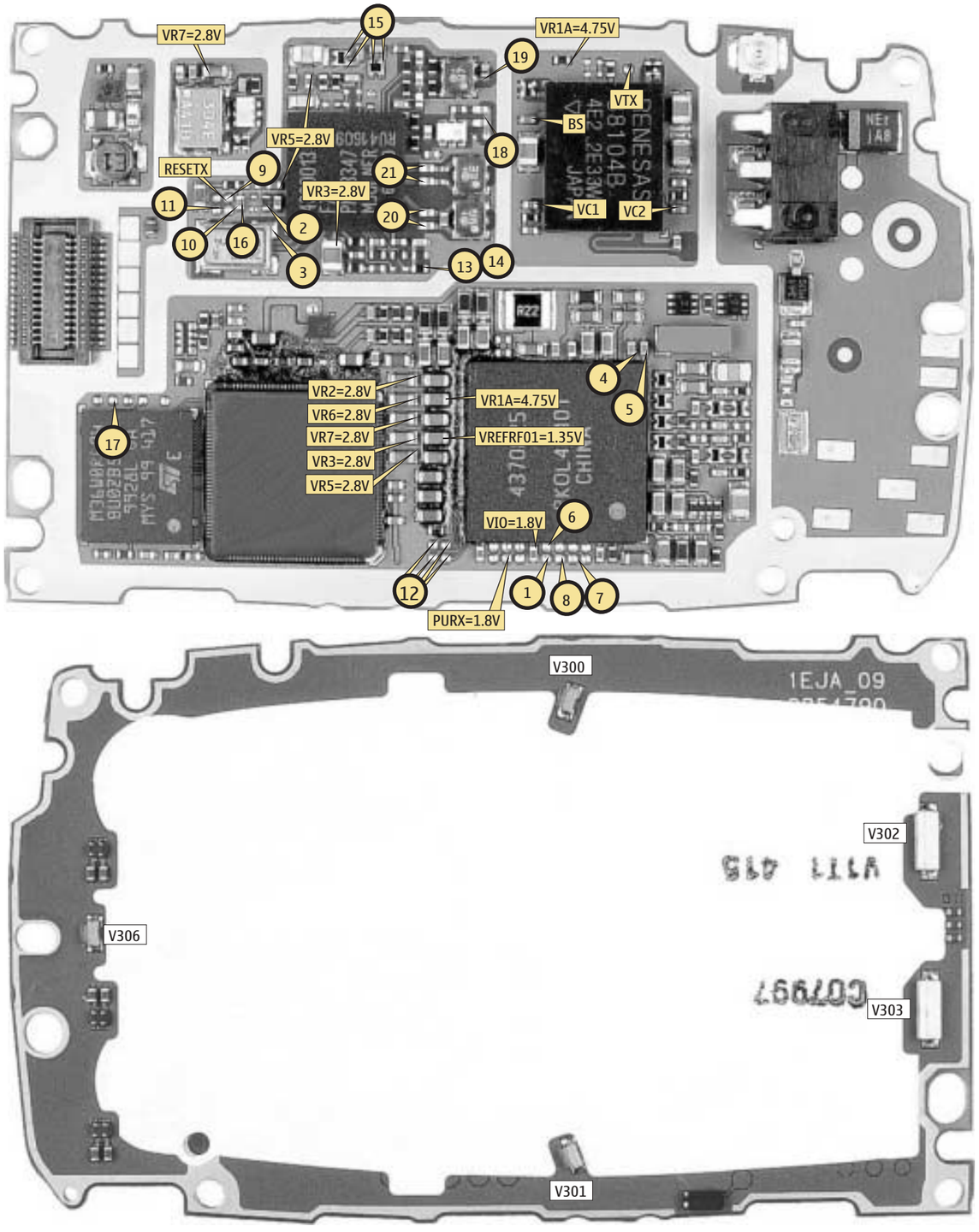
	RH-53		RH-54
	Renesas FEM	RFMD FEM	Renesas FEM
N700	PF088104B	RF3290	PF088102B
G600			
Z601			
Z602			
Z603			
L606	12nH	12nH	15nH
L609	18nH	18nH	27nH
R629	18K	82K	18K
R637	22K	Not mounted	22K
R647	120R	120R	150R
R648	120R	120R	150R



	VTX	BS	VC1	VC2
	VTX_B_P	VTX_B_P	VANT1	VANT2
Low Band RX	0 / 0	0 / 0	0 / 1	0 / 0
Low Band TX	1 / 1	0 / 0	1 / 1	0 / 0
High Band RX	0 / 0	1 / 1	0 / 1	0 / 0
High Band TX	1 / 1	1 / 1	0 / 1	1 / 0

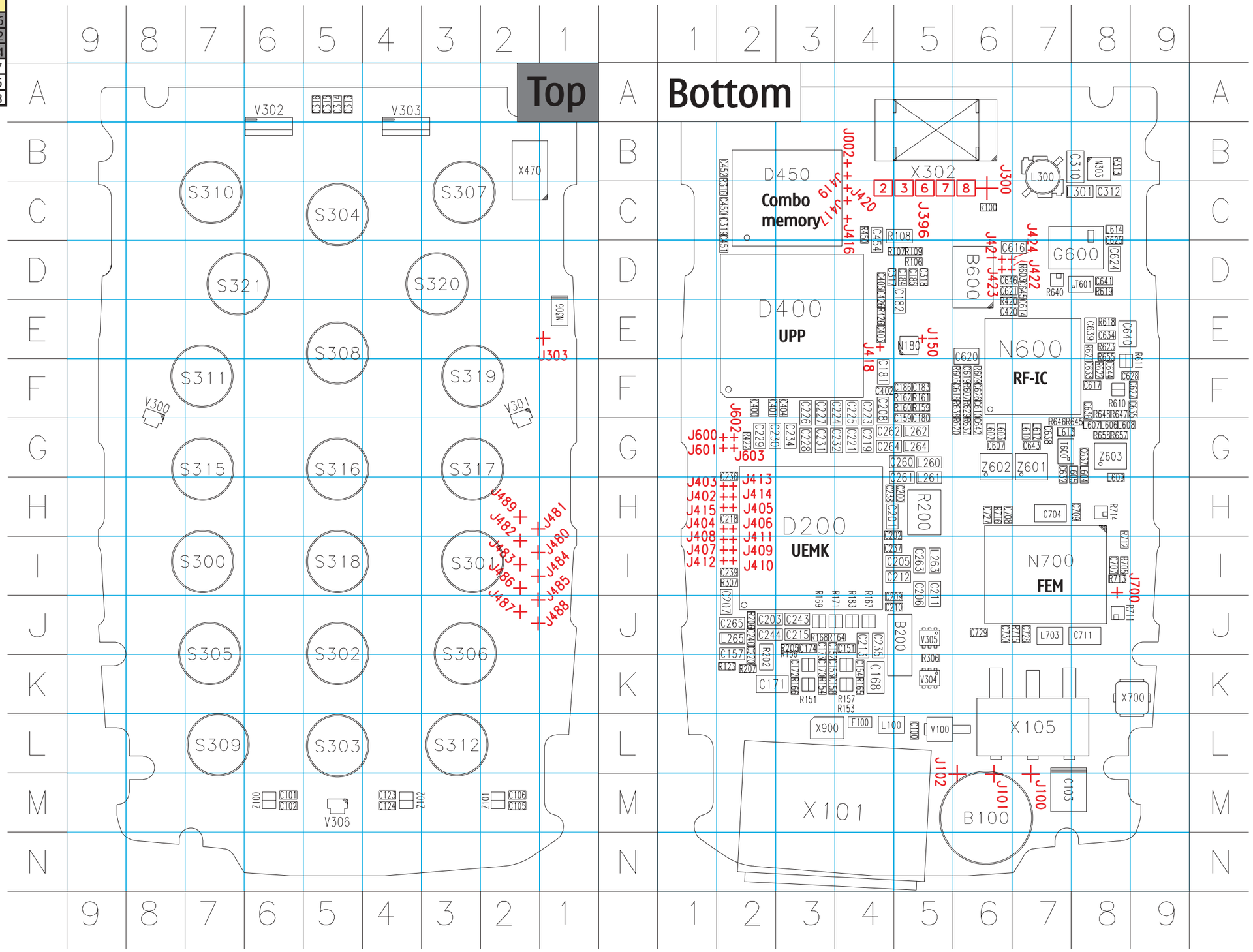
Signal overview

1) SLEEPCLK at J404	2) RFCLK at R420	3) 26MHz at B600	4) 32kHz at C209
5) 32kHz at C210	6) CBUSCLK at J406	7) CBUSDA at J407	8) CBUSEN at J408
9) RFBUSDA at J422	10) RFBUSCLK at J421	11) RFBUSEN at J423	12) RX I/Q at J600-J603
13) TXC GSM900 PL 19 at R620	14)TXC GSM900 PL 5 at R620	15) TX I/Q at R610/R611	16) TXP at C646
17) FLASHCLK at J419	18) TX GSM900 Lev. 5 at L605	19)TX GSM1800 Lev. 0 at L609	20)RX GSM900 at L602/L603
21)RX GSM1800 at L610/L612			



Component finder, RH-53 (1eja_09a)

B		C234	G3	C642	G6	J486	H2	R171	J4	X470	B2
B200	I5	C235	I4	C643	G7	J487	I2	R183	I4	X700	K9
B600	D6	C236	G2	C644	F8	J488	I2	R200	H5	X900	L3
C		C237	I4	C645	D7	J489	G2	R202	K2	Z	
C100	L5	C238	H4	C646	D6	J600	G2	R205	J3	Z100	M6
C101	M6	C239	I2	C704	H7	J601	G2	R206	J2	Z101	M2
C102	M6	C240	J2	C707	I8	J602	G2	R207	K2	Z102	M4
C103	M7	C243	J3	C708	H6	J603	G2	R306	K5	Z601	G7
C105	M2	C244	J2	C709	H8	J700	I8	R307	I2	Z602	G6
C106	M2	C260	G5	C711	J8	L		R313	B8	Z603	G8
C123	M4	C261	H5	C727	H6	L100	I4	R316	C2		
C124	M4	C262	G4	C728	J7	L260	G5	R420	E6		
C151	J4	C263	I5	C729	J6	L261	H5	R422	G2		
C152	J3	C264	G4	C730	J6	L262	G5	R426	E4		
C153	K3	C265	J2	D		L263	I5	R450	C4		
C154	K4	C310	B8	D200	I3	L264	G5	R603	D7		
C157	J2	C312	C8	D400	E3	L265	J2	R605	F6		
C158	K3	C313	A5	D450	C3	L300	B7	R607	F6		
C159	G5	C314	A5	F		L301	C8	R609	F6		
C168	K4	C315	A5	F100	L4	L602	G6	R610	F8		
C170	K3	C316	A5	G		L603	G6	R611	F8		
C171	K2	C317	D4	G600	D8	L604	G8	R618	E8		
C172	K3	C318	D5	J		L605	G8	R619	D8		
C173	J3	C319	C2	J002	B4	L606	G8	R620	G6		
C174	J4	C400	F2	J100	M7	L607	G8	R621	E8		
C180	G5	C401	F2	J101	M6	L608	G8	R622	F8		
C181	F4	C402	F4	J102	M6	L609	H8	R623	E8		
C182	E5	C403	E4	J150	E5	L610	G7	R629	F6		
C183	F5	C404	F3	J300	C6	L612	G7	R637	G6		
C184	D5	C405	D4	J303	D1	L613	G7	R638	F6		
C185	D5	C420	E6	J396	C5	L614	C8	R640	D7		
C186	F5	C426	D4	J402	H2	L703	J7	R645	G8		
C200	H5	C450	C2	J403	H2	N		R646	G7		
C201	H4	C451	D2	J404	H2	N180	E5	R647	F8		
C202	H4	C452	B2	J405	H2	N303	B8	R648	F8		
C203	J2	C454	C4	J406	H2	N306	E1	R655	E8		
C205	I5	C607	G6	J407	I2	N600	F7	R657	G8		
C206	I5	C610	F6	J408	I2	N700	I7	R658	G8		
C207	J2	C614	E7	J409	I2	R		R705	I8		
C208	F4	C616	D7	J410	I2	R100	C6	R711	J8		
C209	J4	C617	F8	J411	I2	R106	D5	R712	I8		
C210	J4	C618	F6	J412	I2	R107	D5	R713	I8		
C211	I5	C619	F6	J413	H2	R108	C5	R714	H8		
C212	I5	C620	E6	J414	H2	R109	D5	R715	J7		
C213	J4	C621	D6	J415	H2	R123	K2	R716	H6		
C215	J3	C624	D8	J416	C4	R151	K3	T			
C218	H2	C625	D8	J417	C4	R153	K4	T600	G7		
C219	G4	C626	F6	J418	E4	R154	K3	T601	D8		
C220	K2	C627	F9	J419	B4	R156	K3	V			
C221	G4	C628	F8	J420	C4	R157	K4	V100	L5		
C223	F4	C632	G7	J421	D6	R159	F5	V300	F8		
C224	F4	C633	F8	J422	D7	R160	F5	V301	F2		
C225	F4	C634	E8	J423	D6	R161	F5	V302	B6		
C226	F3	C635	F9	J424	D7	R162	F5	V303	B4		
C227	F3	C636	F8	J480	H2	R164	J4	V304	K5		
C228	G3	C637	G8	J481	G2	R165	K4	V305	J5		
C229	G2	C638	G7	J482	H2	R166	K3	V306	M5		
C230	G2	C639	E8	J483	H2	R167	J4	X			
C231	G3	C640	E8	J484	H2	R168	J3	X105	L7		
C232	G4	C641	D8	J485	I2	R169	J3	X302	B5		



Component finder, RH-54 (1ejm_02a)

B		C234	G3	C642	G6	J408	I2	R109	D5	R716	H6
B200	J5	C235	I4	C644	F8	J409	I2	R123	K2	T	
B600	D6	C236	G2	C645	D7	J410	I2	R151	K3	T600	G7
C		C237	I4	C646	D6	J411	I2	R153	K4	T601	D8
C100	L5	C238	H4	C704	H7	J412	I2	R154	K3	V	
C101	M6	C239	I2	C708	H7	J413	H2	R156	K3	V100	L5
C102	M6	C240	J2	C709	H8	J414	H2	R157	K4	V300	F8
C103	M7	C243	J3	C711	J8	J415	H2	R159	F5	V301	F2
C105	M2	C244	J2	C727	H6	J416	C4	R160	F5	V302	B6
C106	M2	C260	G5	C728	J7	J417	C4	R161	F5	V303	B4
C123	M4	C261	H5	C729	J6	J418	E4	R162	F5	V304	K5
C124	M4	C262	G4	C730	J6	J419	B4	R164	J4	V305	J5
C151	J4	C263	I5	D		J420	C4	R165	K4	V306	M5
C152	J3	C264	G4	D200	I3	J421	D6	R166	K3	X	
C153	K3	C265	J2	D400	E3	J422	D7	R167	J4	X105	L7
C154	K4	C310	B8	D450	C3	J423	D6	R168	J3	X302	B5
C157	J2	C312	C8	E		J424	D7	R169	J3	X470	B2
C158	K3	C313	A5	E001	A9	J600	G2	R171	J4	X700	K9
C159	G5	C314	A4	E003	M8	J601	G2	R183	J4	X900	L3
C168	K4	C315	B5	E004	K1	J602	G2	R200	H5	Z	
C170	K3	C317	D4	E005	A1	J603	G2	R202	K2	Z100	M6
C171	K2	C318	D5	E006	L2	J700	I8	R205	J3	Z1000	I4
C172	K3	C319	C2	E009	M1	L		R206	J2	Z1001	I4
C173	J3	C320	A5	E100	B5	L100	L4	R207	K2	Z101	M2
C174	J3	C321	A5	E101	B6	L260	G5	R306	K5	Z102	M4
C180	G5	C322	A5	E102	B4	L261	H5	R307	I2	Z600	I6
C181	F4	C323	A5	E103	B5	L262	G5	R308	B5	Z601	G7
C182	E5	C400	F2	E107	B5	L263	I5	R309	B5	Z602	G6
C183	F5	C401	F2	E450	C4	L264	G5	R310	A5	Z603	G8
C184	D5	C402	F4	E451	C2	L265	J5	R313	B8	Z700	I6
C185	D5	C403	E4	E452	B2	L300	B7	R316	C2	Z701	K7
C186	F5	C404	F3	E453	C3	L301	C8	R420	E6	Z702	K8
C200	H5	C405	D4	E454	B3	L305	B5	R422	G2		
C201	H4	C420	E4	E480	H2	L306	B5	R426	D4		
C202	H4	C421	E6	E481	G2	L307	B5	R450	C4		
C203	J2	C426	D4	E482	H2	L602	G6	R603	D7		
C205	I5	C450	C2	E483	H2	L603	G6	R605	F6		
C206	I5	C451	D2	E484	H1	L604	G8	R607	F6		
C207	J2	C452	B2	E486	H2	L605	G8	R609	F6		
C208	F4	C454	C4	E487	I2	L606	G8	R610	F8		
C209	J4	C607	G6	E488	I2	L607	G8	R611	F8		
C210	J4	C610	F6	F		L608	G8	R618	E8		
C211	I5	C614	E7	F100	L4	L609	H8	R619	D8		
C212	I5	C616	D7	G		L610	G7	R620	G6		
C213	J4	C618	F6	G600	D8	L612	G7	R623	E8		
C215	J3	C619	F6	J		L613	G7	R629	F6		
C218	H2	C620	E6	J002	B4	L614	C8	R637	G6		
C219	G4	C624	D8	J100	M7	L703	J7	R640	D7		
C220	K2	C625	D8	J101	M6	N		R645	G8		
C221	G4	C626	F6	J102	M6	N180	E5	R646	G7		
C223	F4	C627	F9	J150	E5	N303	B8	R647	F8		
C224	F4	C628	F8	J300	C6	N306	E1	R648	F8		
C225	F4	C634	E8	J303	D1	N600	F7	R655	E8		
C226	F3	C635	F9	J396	C5	N700	I7	R657	G8		
C227	F3	C636	F8	J402	H2	R		R658	G8		
C228	G3	C637	G8	J403	H2	R100	C6	R711	J8		
C229	G2	C638	G7	J404	H2	R106	D5	R712	I8		
C230	G2	C639	E8	J405	H2	R107	D5	R713	I8		
C231	G3	C640	E8	J406	H2	R108	C5	R714	H8		
C232	G4	C641	D8	J407	I2	R109	D5	R715	J7