Nokia Customer Care

Service Manual

RM-13/33 (Nokia 8800/8801)

Mobile Terminal

Part No: (9240218 (Issue 1))

Company Confidential

NOKIA

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Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Original issue	05/2005	J Bryman	

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Introduction the RM-13/33 service manual

This is the original issue of the RM-13/33 service manual.

Service

There are very few serviceable parts on the PWB. Most components are under shielding and are therefore not changeable. Except for some mechanical parts (see Mechanical parts (Page 2–7)), there are only two components on the PWB changeable for service; the battery connector and the SIM connector.

Bands

RM-13 operates on the GSM900/1800/1900 bands, while RM-33 is the US variant, operating on GSM850/1800/1900.

Build version

In this manual, the build versions used are:

- 1eaa_11a for RM-13
- 1eaa_11b for RM-33

There are no major differences between the two builds.

Note: For the latest version of the parts lists, please refer to the Service bulletins.

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IMPORTANT

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Warnings and cautions

Warnings

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

Cautions

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

  Use only approved components as specified in the parts list.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

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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.

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Care and maintenance

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

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

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

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ESD protection

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

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

To replace the covers ESD protection must be applied.

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

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

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

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

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

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Battery information

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

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

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

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

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

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

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

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

Do not dispose of batteries in a fire!

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

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Nokia 8800/8801 Service Manual Structure

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1 — General Information

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Product selection

The RM-13 is a triple band transceiver unit designed for the GSM900/1800/1900 networks, including EGSM. RM-33 is the US variant, designed for the GSM850/1800/1900 networks.

Figure 1 RM-13/33 product picture

Features

Hardware and software features

Hardware features

- Active TFT color display (208x208 pixels) with 256 K colors.
- Douglas 6UI style, 5-way navigation key including select.
- Alfanumeric keypad: 5-way-key, LSK, SEND, END.
- Slide phone in high quality stainless steel metal covers
- Display/keymat in a slide with pop-up motion (spring assisted)
- Tri-band GSM900/1800/1900 (RM-13) and US variant GSM850/1800/1900 (RM-33)
- Internal antenna
- Speech codecs: HR, FR, EFR, AMR
- GPRS: Multislot Class 8
- EDGE/E-GPRS: Multislot Class 8
- Internal SVGA Camera 600x800
- Bluetooth wireless interface
- Internal vibrator
- Integrated hands free (IHF) speaker
- Plug-in SIM (1.8 and 3.0 V)
- Real time clock

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- FM Radio
- MP3 player
- DCT3 charger plug
- Plug and play bottom accessory support

Software features

- ISA OS 8.0s Platform
- Nokia Series 40 UI : C++ and Java MIDP 2.0

UI features

Imaging	• Integrated SVGA camera (0.5 megapixels) • Video player • Improved video recording quality (QCIF) • 3D image engine for enhanced graphics
Messaging	• Send and receive messages containing text, an audio clip, and an image or video clip to other compatible devices (maximum message size: up to 300 kB) • Email: supports SMTP, POP3 and IMAP4 protocols • Predictive text input: support for all major languages for Europe, Africa, Asia Pacific, and the Americas • Instant Messaging and Presence-enhanced contacts: check the status of your friends before you call them
Memory functions	• 64MB internal NAND flash memory
Connectivity	• Bluetooth™ wireless technology stereo, Plug & Play • Bluetooth™ SIM Access Profile • Device-to-device synchronization
Voice features	• Integrated handsfree speaker (IHF)
Browsing	• Integrated XHTML browser connects over TCP/IP • Full OMA Digital Rights Management for content protection • Mobile Wallet 2.0 application
Data transfer	• EDGE/ E-GPRS, class 8 • GPRS class 8 • TCP/IP
Media consumption	• Polyphonic (MIDI) tones with up to 64 voices; plus support for AAC and, MP3 ringing tones • Video recording and streaming • Digital music player • FM radio
JavaTM™ applications	• Java MIDP 2.0 • Over-the-air download of Java-based applications and games
Services	• Exclusive 3D graphics and UI themes • Ringing tones composed by award winning composer Ryuichi Sakamoto • Video streaming services

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Accessories

Table 1 Power

Name	Type
Battery 600 mAh Li-Ion	BL-5X
Charger	ACP-7
Retractable charger	ACP-8
Charger	ACP-12
Mobile charger	LCH-8
Mobile charger	LCH-9
Mobile charger	LCH-12

Table 2 Car accessories

Name	Type
Plug and play handsfree	PPH-1
Wireless plug-in handsfree	HF-6W
Wireless car kit	CK-1W
Advanced car kit	CK-7W
Car kit phone	Nokia 610
Car kit	Nokia 616
Car phone	Nokia 810

Table 3 Audio

Name	Type
Wired headset	HDC-5
Wired headset	HDB-5
Wired headset	HDC-10
Dual headset	HDD-1
Loopset	LPS-3
Wireless headset	HDW-2
Wireless clip-on headset	HS-3W
Wireless boom headset	HS-4W
Wired headset	HS-7
Wireless headset	HS-11W
Wireless headset	HS-12W
Wired headset	HS-14

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Name	Type
Wired headset	HS-15
TTY	HDA-9

Table 4 Connectivity

Name	Type
Digital pen	SU-1B
Desk stand	DT-8

Table 5 Imaging and lifestyle

Name	Type
Image viewer	SU-2
Image frame	SU-7
Image album	PD-1
Camera	PT-5W
SIM copy device	RX-17

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2 — Parts Lists and Component Layouts

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Exploded view

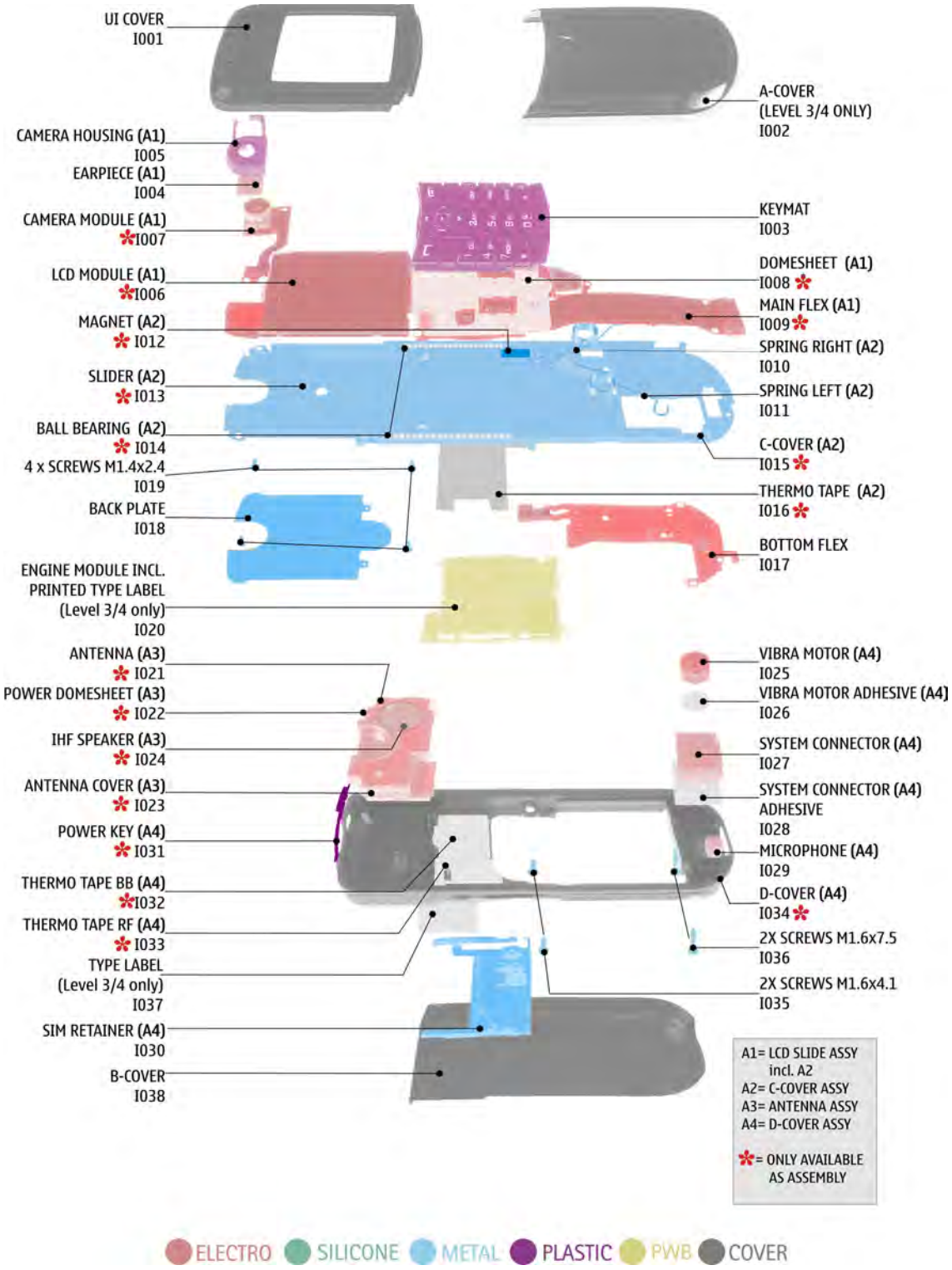

Figure 2 Exploded view

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Spare parts overview

Figure 3 Spare parts overview

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Mechanical parts

Table 6 Mechanical parts list

ITEM/ CIRCUIT REF.	QTY	PART NAME
* = not available as spare part		
I001*	1	UI COVER
I002*	1	A-COVER
I003	1	KEYMAT LATIN
I003	1	KEYMAT Hebrew
I003	1	KEYMAT Arabic
I003	1	KEYMAT Cyrillic
I003	1	KEYMAT Greek
I003	1	KEYMAT Urdu
I003	1	KEYMAT Farsi
I003	1	KEYMAT Thai
I003	1	KEYMAT Stroke (Simplified):
I003	1	KEYMAT BoPoMoFo (Taiwan)
I004	1	EARPIECE
I005	1	CAMERA HOUSING
	1	LCD SLIDE ASSY (I006 - I017)
I006*	1	LCD MODULE
I007*	1	CAMERA MODULE
I008*	1	DOMESHEET
I009*	1	MAIN FLEX
	1	C-COVER ASSY
I010	1	SPRING RIGHT
I011	1	SPRING LEFT
I012*	1	MAGNET
I013*	1	SLIDER
I014*	1	BALL BEARING
I015*	1	C-COVER
I016*	1	THERMO TAPE
I017	1	BOTTOM FLEX
I018	1	BACK PLATE

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ITEM/ CIRCUIT REF.	QTY	PART NAME
I019	4	SCREWS M1.4x2.4 TORX 4 PLUS
I020	1	ENGINE MODULE INCL. PRINTED TYPE LABEL
	1	ANTENNA ASSY
I021*	1	ANTENNA
I022*	1	POWER DOMESHEET
I023*	1	ANTENNA COVER
I024*	1	IHF-SPEAKER
	1	D-COVER ASSY
I025	1	VIBRA MOTOR
I026	1	VIBRA MOTOR ADHESIVE
I027	1	SYSTEM CONNECTOR
I028	1	SYSTEM CONNECTOR ADHESIVE
I029	1	MICROPHONE
I030	1	SIM RETAINER
I031*	1	POWER KEY
I032*	1	THERMO TAPE BB
I033*	1	THERMO TAPE RF
I034*	1	D-COVER
I035	2	SCREWS M1.6x4.1
I036	2	SCREWS M1.6x7.5
I037	1	TYPE LABEL
I038	1	B-COVER

SWAP phones

Table 7 SWAP phones for RM-13

SWAP phones for RM-13
SWAP phone for EU C (Standard) + APAC
SWAP phone for EU Turkey
SWAP phone for EU Russia
SWAP phone for EU France
SWAP phone for EU Ukraine
SWAP phone for EU South Africa

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Component parts

Table 8 Changeable component parts for RM-13/33

Refs	Type	Object Name	PWB Position, X/Y	Assy Side
X100	Battery connector	SMD BATTERY CONN 2POL POGO WITH A SWITCH	C2	B
X386	SIM connector	SM SIM CONNECTOR 2X3POL	G3	B

Note: Most components are under shielding and therefore not changeable.

Component layouts

See also A3 size layouts in the Schematics chapter (Page 9–4).

Note: Shielding cans may ONLY be cut open by Repair analysis technicians, and for analysis only.

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Component layout, build 1eaa_11a/b (RM-13/33), bottom

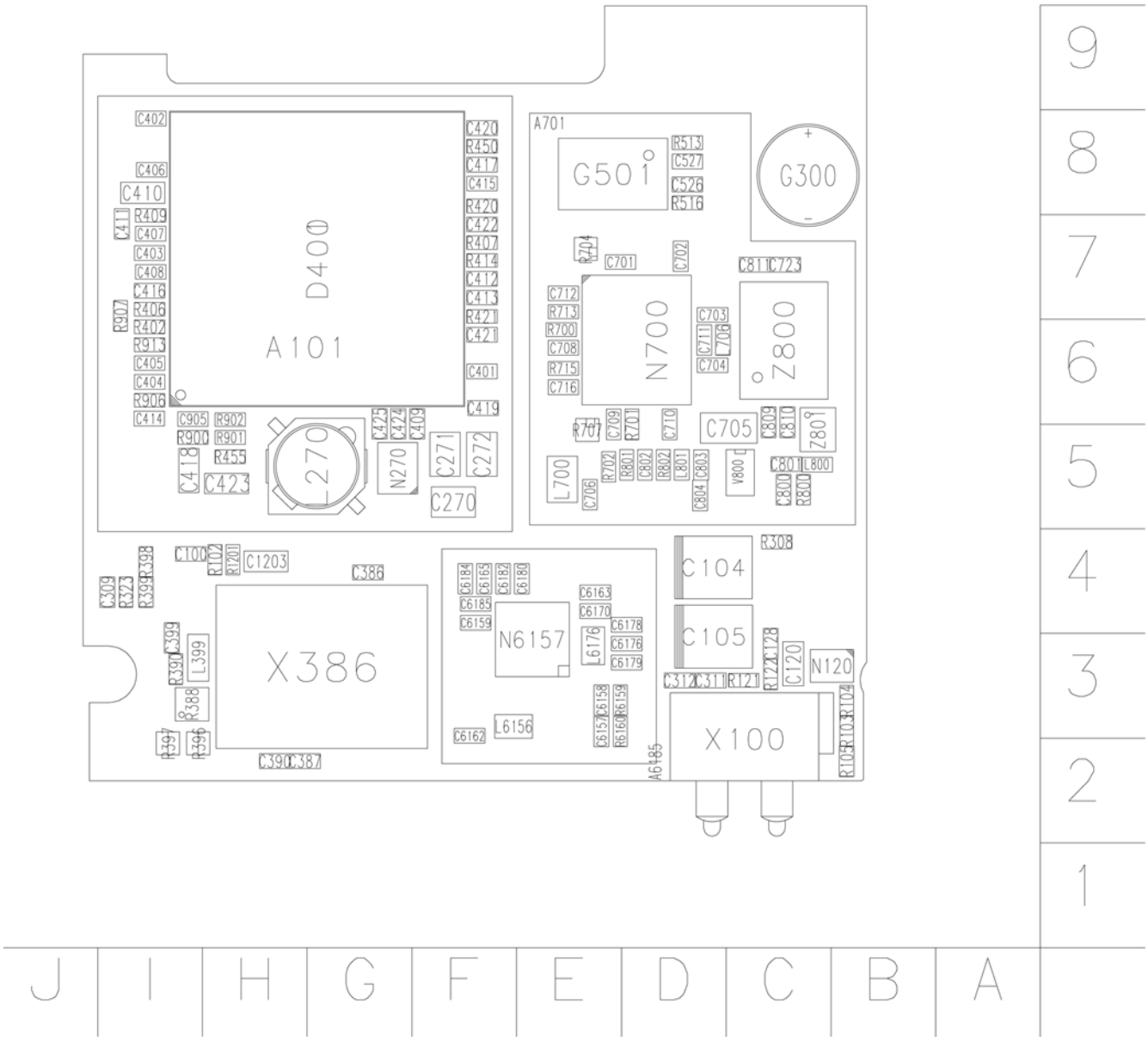

Figure 4 RM-13/33 component layout, bottom

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Component layout, build 1eaa_11a/b (RM-13/33), top

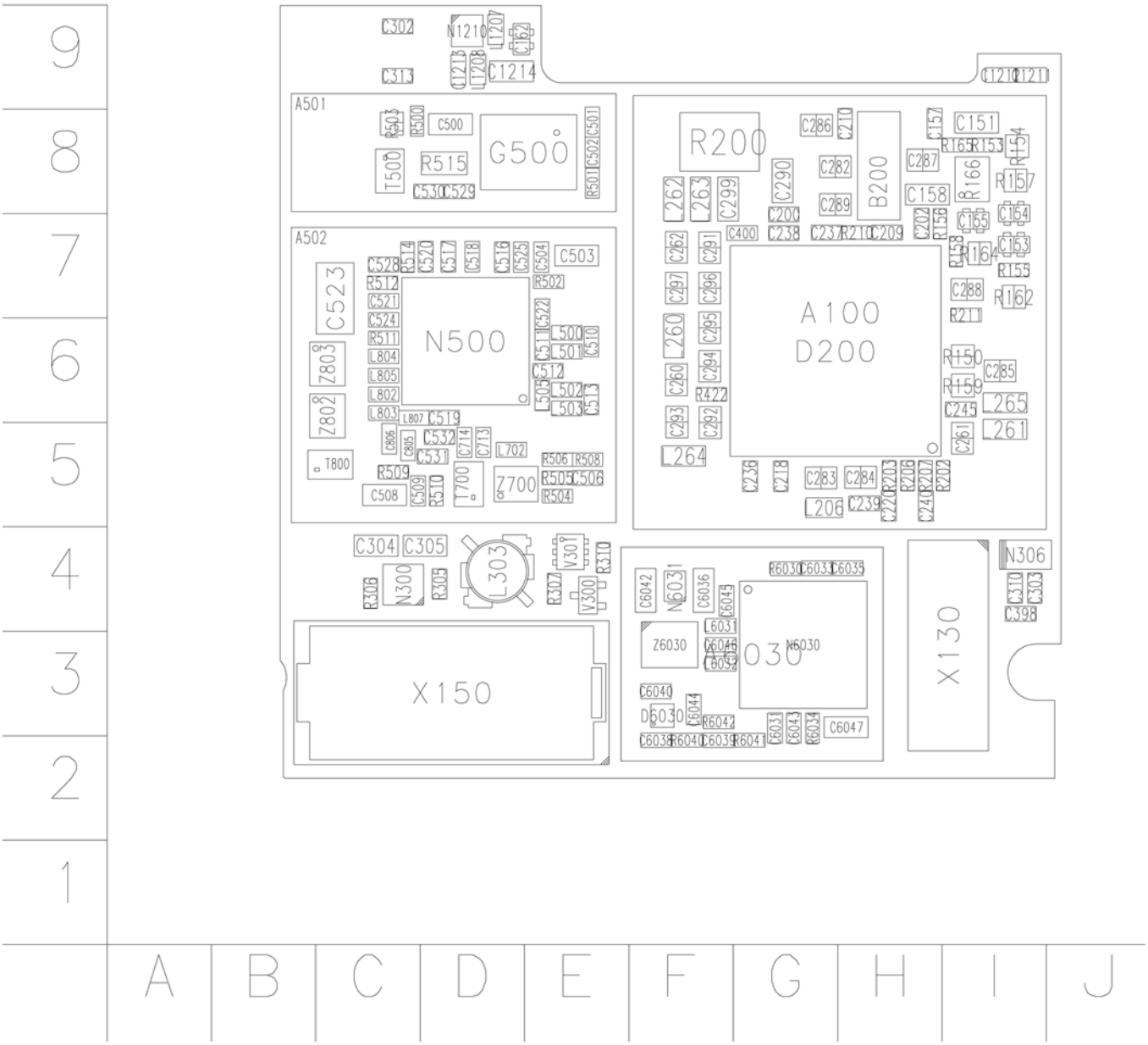

Figure 5 RM-13/33 component layout, top

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3 — Phoenix Service Software Instructions

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Service software installation

Phoenix installation steps in brief

Phoenix is the DCT-4 generation service software for reprogramming, testing and tuning the phone.

To install Phoenix, you need to:

- 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 with FPS-8 flash prommer and other tools as well.

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

Note: 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.

Supported operating systems

- Windows 2000 and XP.

Hardware requirements for using Phoenix

- Minimum: Processor 300 MHz, RAM memory 64 MB, disk space 100 MB.
- Recommended for Windows 2000: Processor 700 MHz, RAM memory 256 MB, disk space 150 MB.

Installing Phoenix

Before you begin

- Check that a Dongle is attached to the parallel port of your computer.
- Download the installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) to your computer (in *C:\TEMP*, for instance).
- Close all other programs.
- Run the application file (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) and follow the 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.

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Context

If at any point during installation you get this message, Dongle is not found and installation cannot continue:

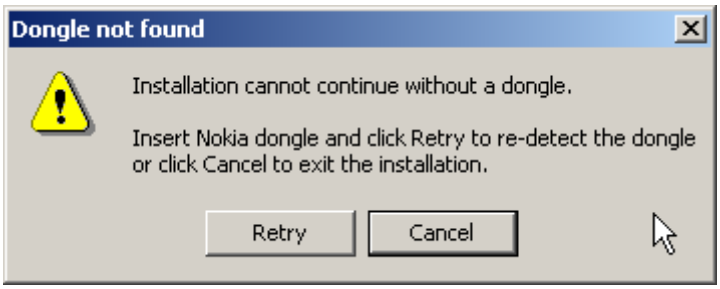

Figure 6 Dongle not found

Possible reasons may be defective or too old PKD-1 Dongle (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.

For more detailed information, please refer to Phoenix Help files. Each feature in Phoenix has its own Help function, which can be activated while running the program. Press the F1 key or the feature's Help button to activate a Help file.

Steps

1. Run the *phoenix_service_sw_a15_2004_24_7_55.exe* to start installation.

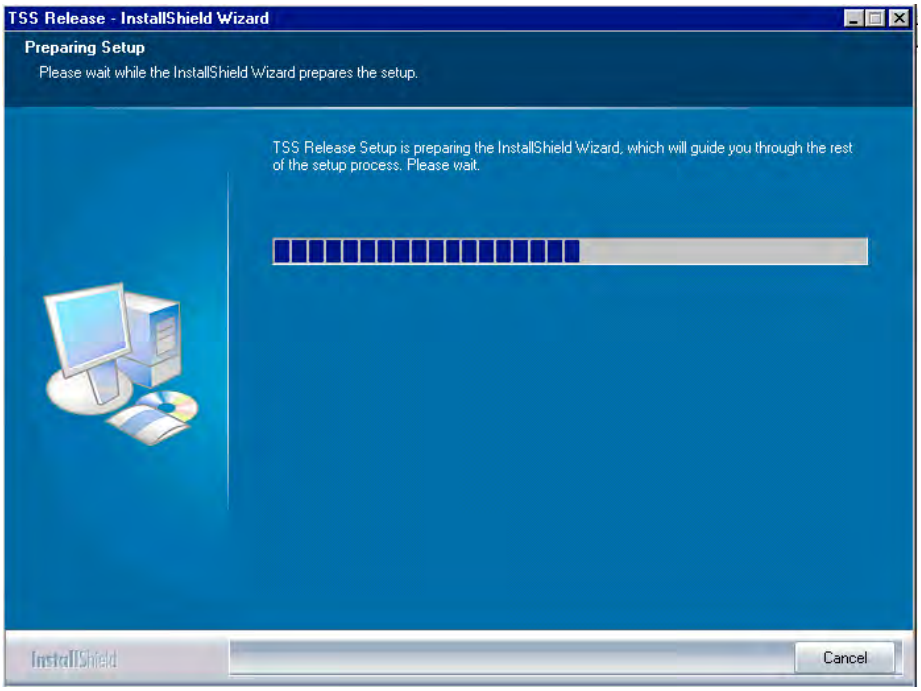

Figure 7 Preparing setup

Install Shield will prepare.

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2. Click Next in Welcome dialog to continue.

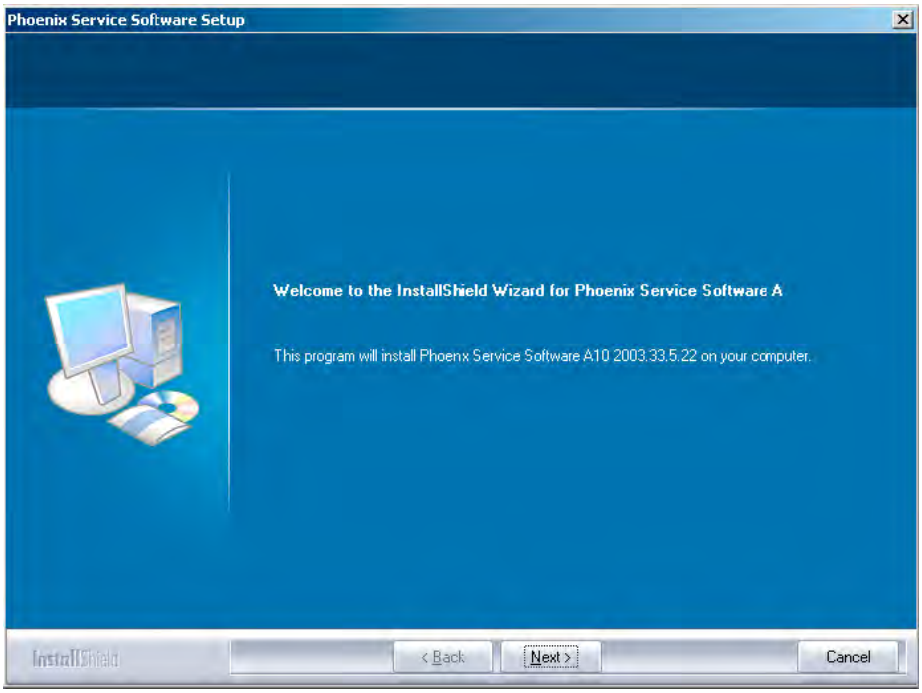

Figure 8 Welcome dialogue

3. Read the disclaimer carefully.

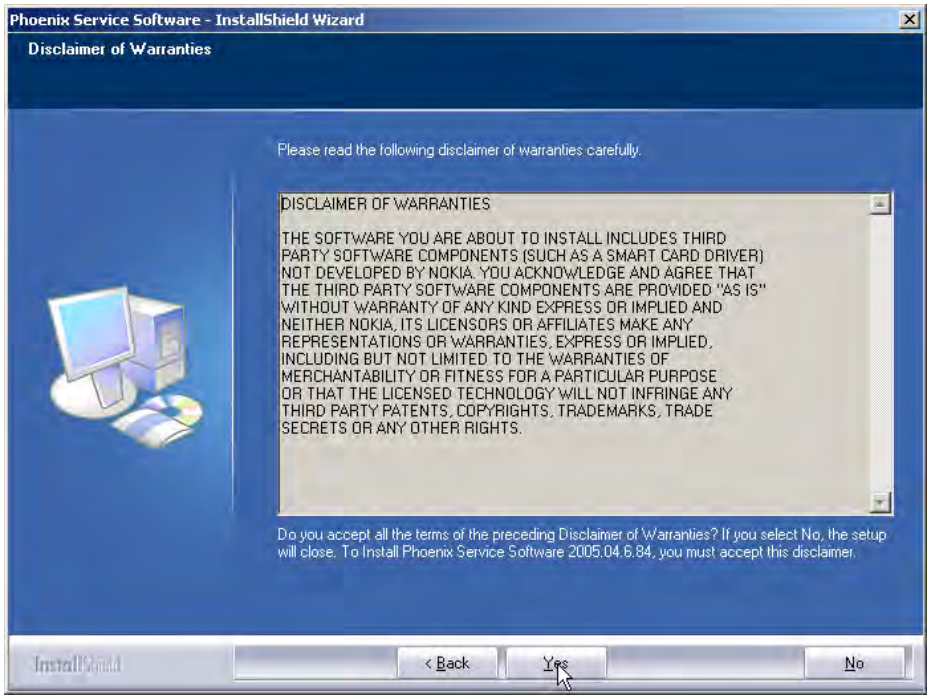

Figure 9 Disclaimer text

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4. Choose destination folder. The default folder *C:\ProgramFiles\Nokia\Phoenix* is recommended.

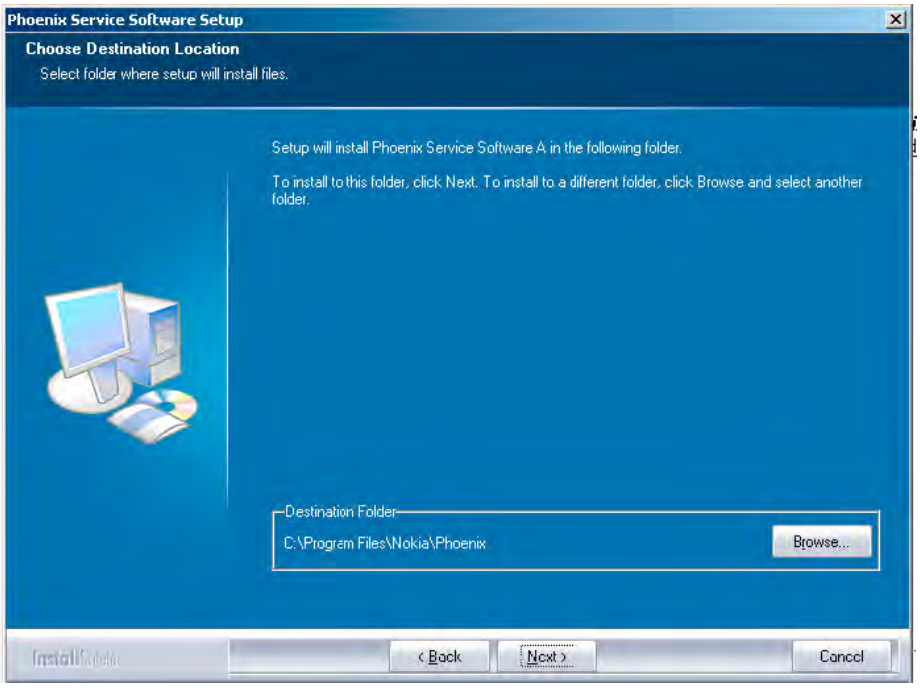

Figure 10 Destination folder

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

5. Wait for the components to be copied.

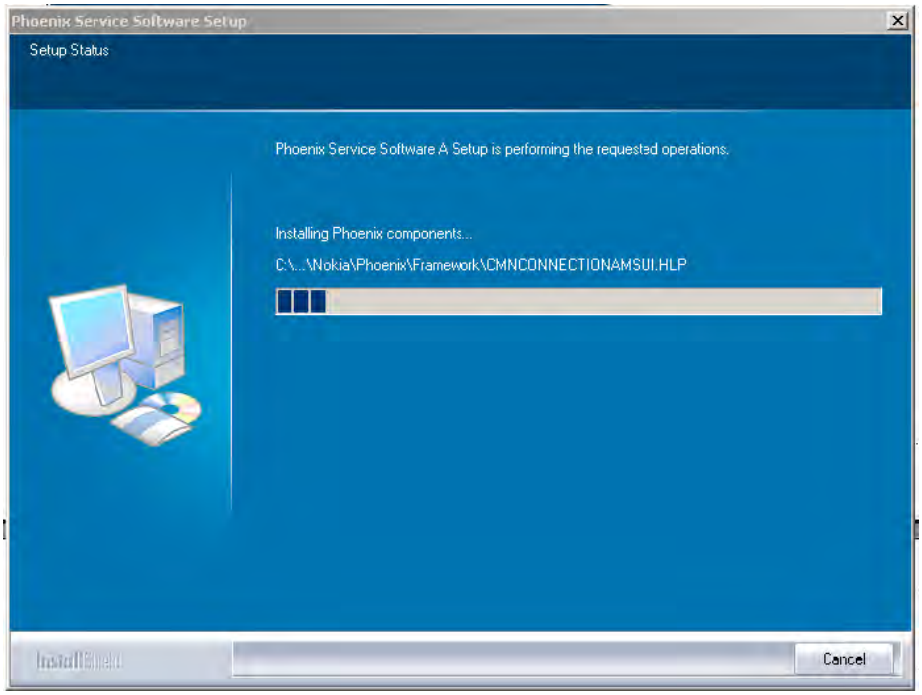

Figure 11 Installation status 1

Progress of the setup is shown in the *Setup Status* window.

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6. Wait for the drivers to be installed and updated.

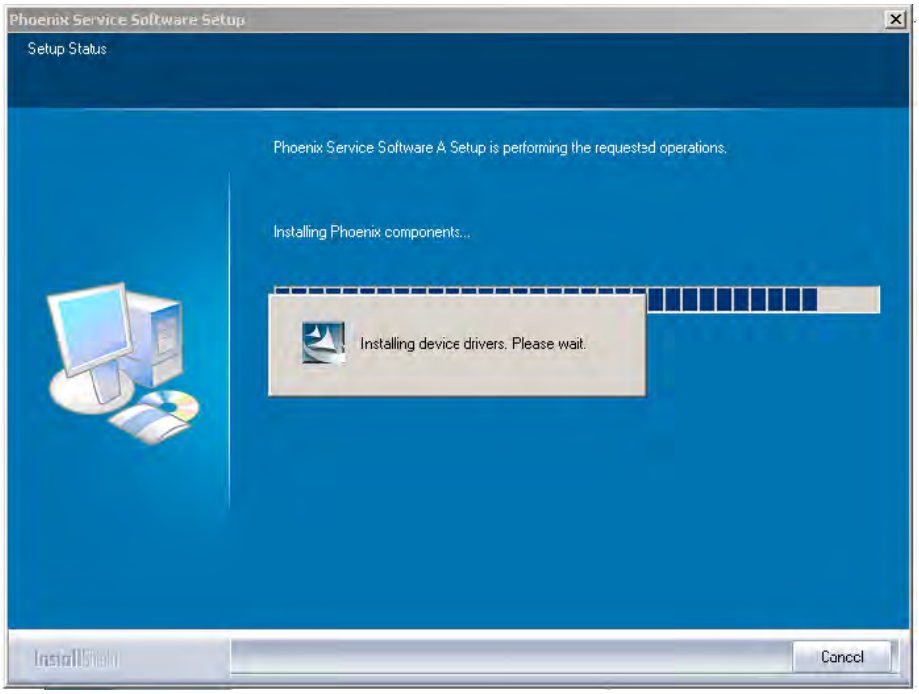

Figure 12 Installation status 2

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.

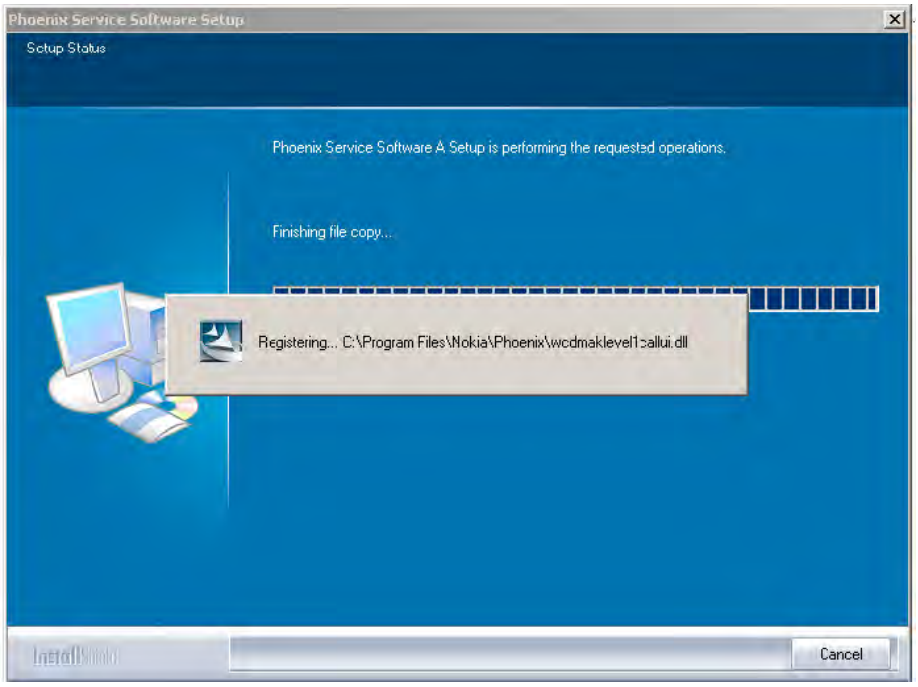

Figure 13 Registering components 1

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

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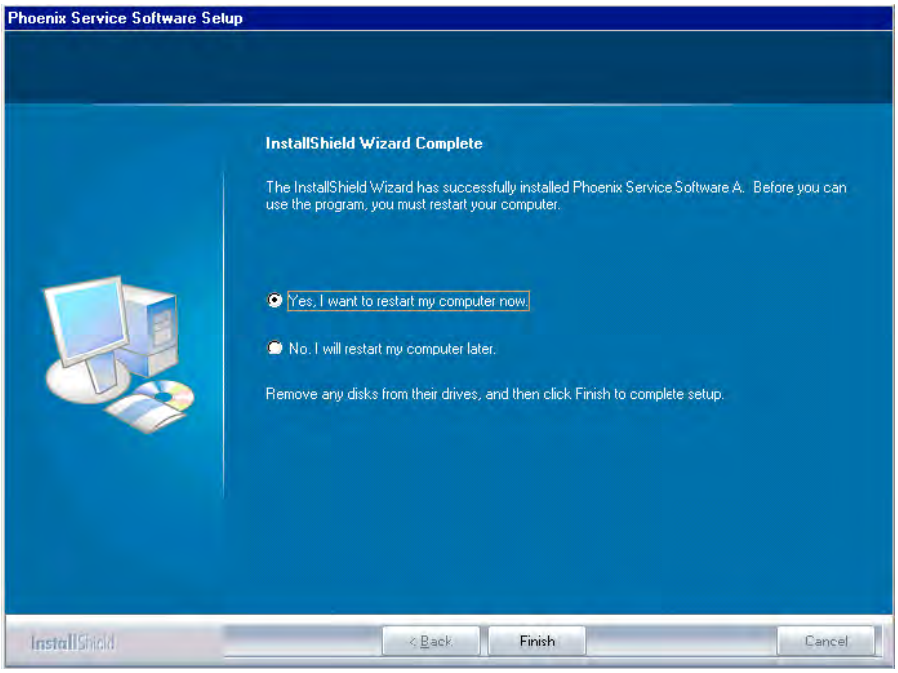

Figure 14 Restart computer

After the reboot, components are registered and Phoenix is ready for use.

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

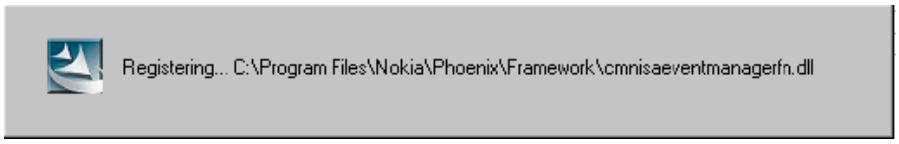

Figure 15 Registering components 2

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7. Click Finish to end installation.

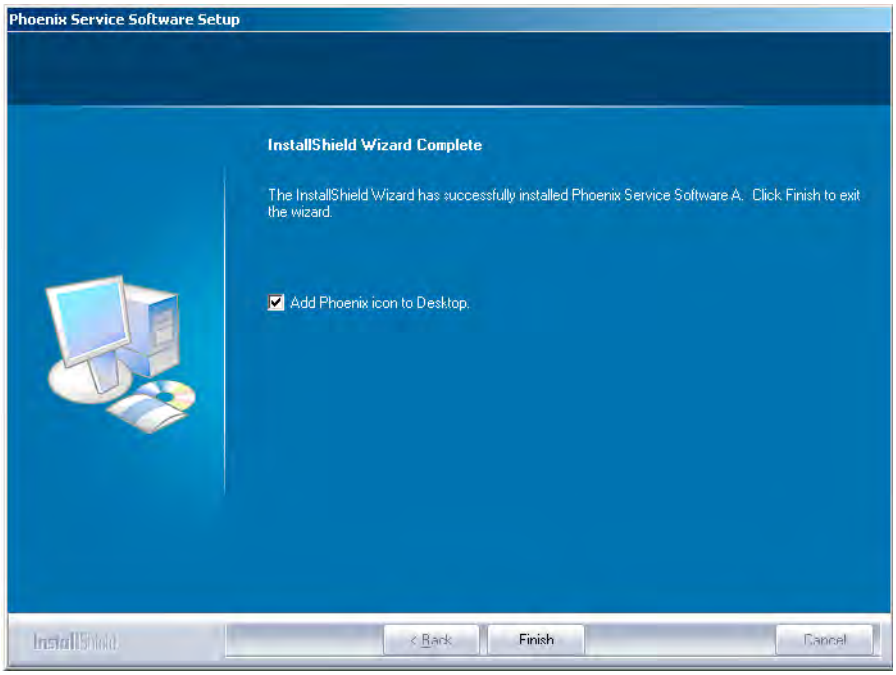

Figure 16 Finish installation

Phoenix is now ready for use.

Next action

After the installation, Phoenix service software can be used after:

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

FLS-4S can be used right away.

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

Phoenix update installation

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 (for example, phoenix_service_sw_a15_2004_24_7_55.exe).
- New version of Phoenix will be installed.
- Driver versions will be checked and updated.

When you update the Phoenix from old to new version (for example, a14_2004_16_4_47 to a15_2004_24_7_55), the update will take place automatically without uninstallation.

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If you try to update the Phoenix with the same version that you already have (for example, a15_2004_24_7_55 to a15_2004_24_7_55) you are asked if you want to uninstall the 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 (for example, downgrade from a15_2004_24_7_55 to a14_2004_16_4_47), installation will be interrupted.

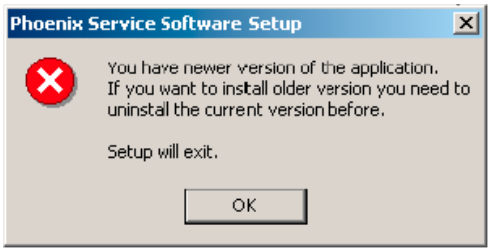

Figure 17 Installation interrupted

Always follow the instructions on the screen.

Uninstalling Phoenix

Context

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

Steps

1. Open the Windows Control Panel and choose Add/Remove Programs.
2. To uninstall Phoenix, choose *Phoenix Service Software* → *Change/Remove* → *Remove* .

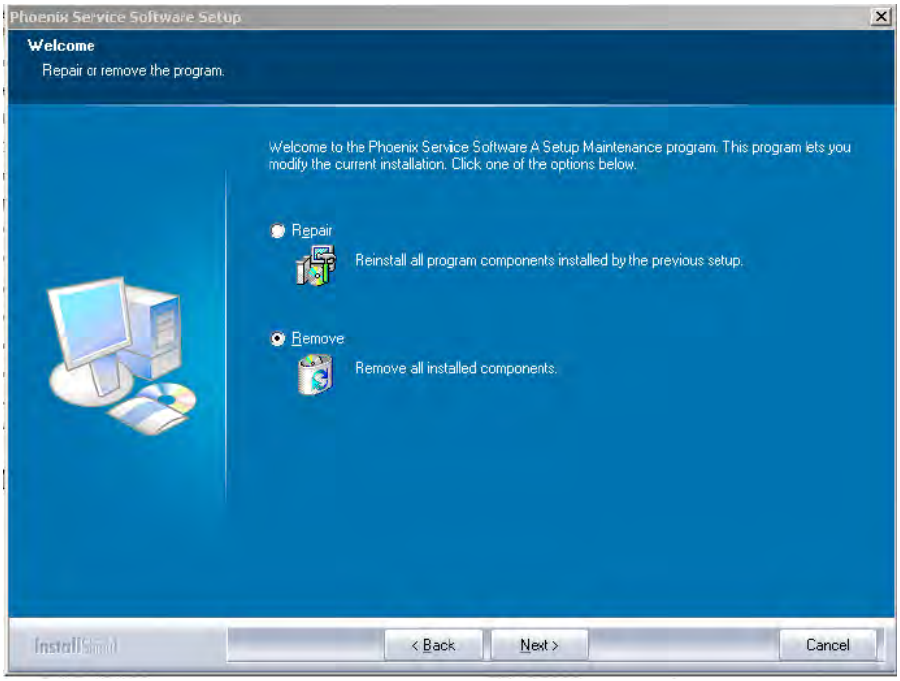

Figure 18 Remove program

The progress of the uninstallation is shown.

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

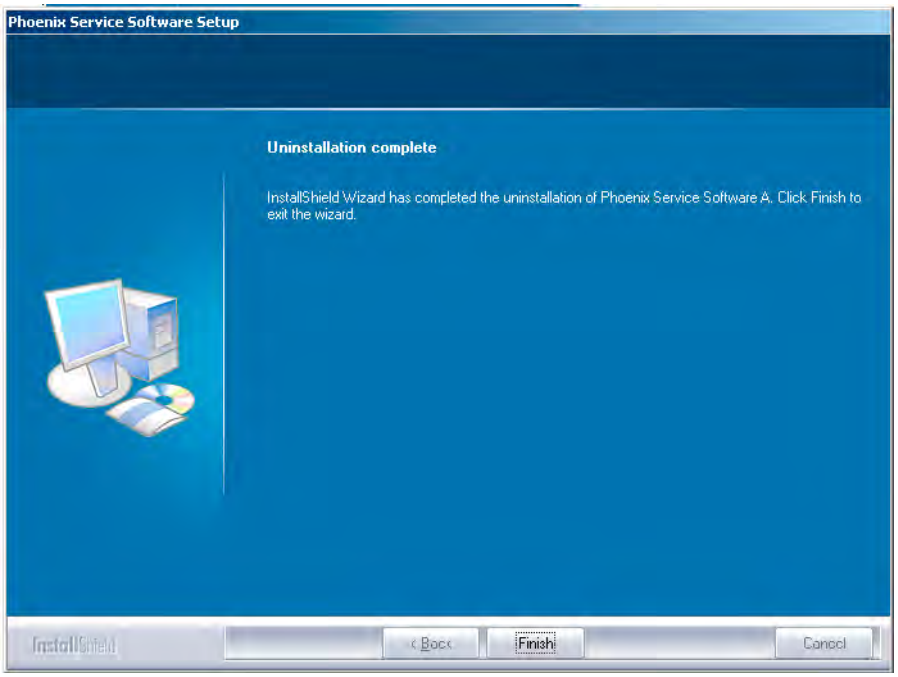

Figure 19 Finish uninstallation

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

Repairing Phoenix installation

Context

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

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

Steps

1. Open *Windows Control Panel* → *Add/Remove Programs* .
2. Select *Phoenix Service Software* → *Change/Remove* .

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3. In the following view, select Repair.

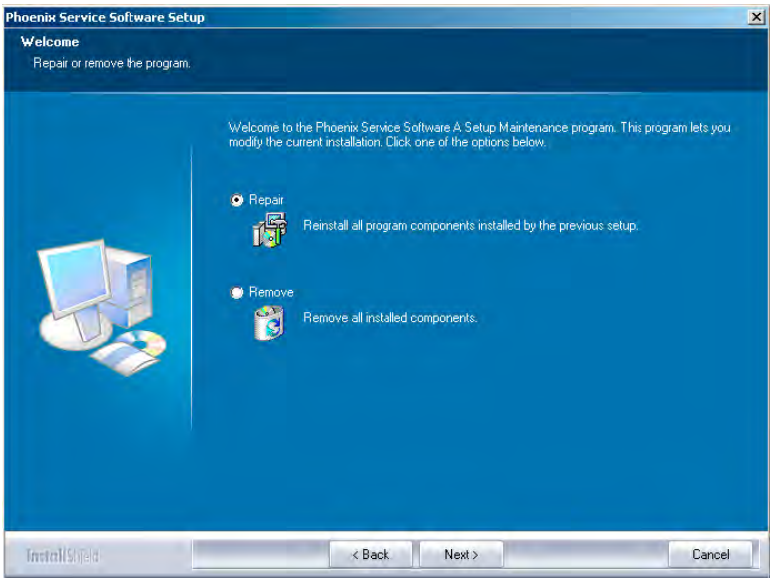

Figure 20 Repair program

Phoenix will now reinstall components and register them.

The procedure is the same as when updating Phoenix.

4. To complete the repair, click Finish.

Phoenix service software data package overview

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

The data package contains the following:

- 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

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

Installing Phoenix data package

Before you begin

- Product data package contains all product-specific data to make the Phoenix Service Software and tools usable with a certain phone model.
- Check that the dongle is attached to the parallel port of your computer.
- Install Phoenix Service SW.
- Download the installation package (for example, *RM-25_dp_EA_v_1_0.exe*) to your computer (for example, in *C:\TEMP*).
- Close all other programs.
- Run the application file (for example, *RM-25_dp_EA_ v_1_0.exe*) and follow the instructions on the screen.

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

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Note: Very often the Phoenix Service SW and the phone-specific data package for Phoenix come in pairs, meaning that a certain version of Phoenix can only be used with a certain version of the 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.

Steps

1. To start installation, run the application file (for example, *RM-25_dp_EA_ v_1_0.exe*).
2. Click Next, and wait for the installation files to be extracted.

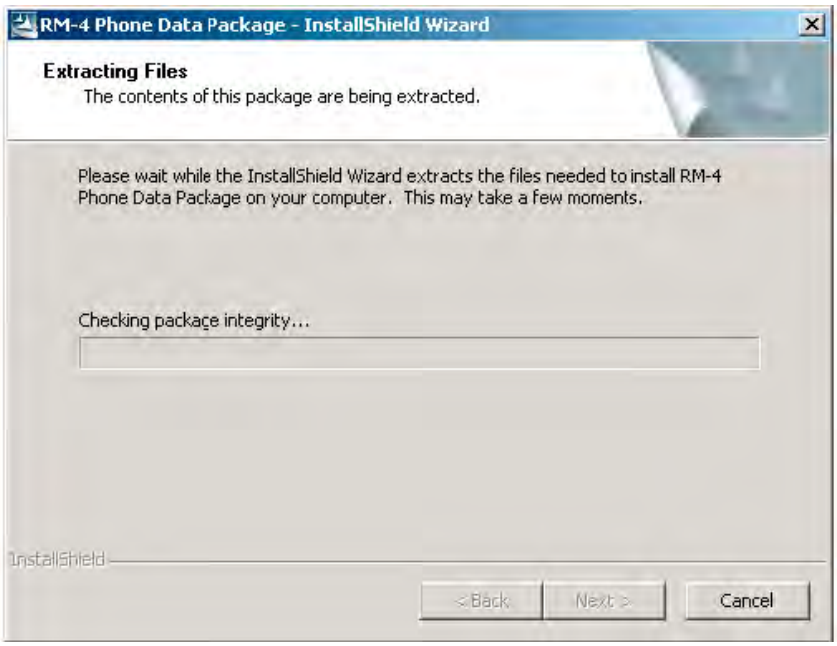

Figure 21 Extracting files

3. Click Next to continue.

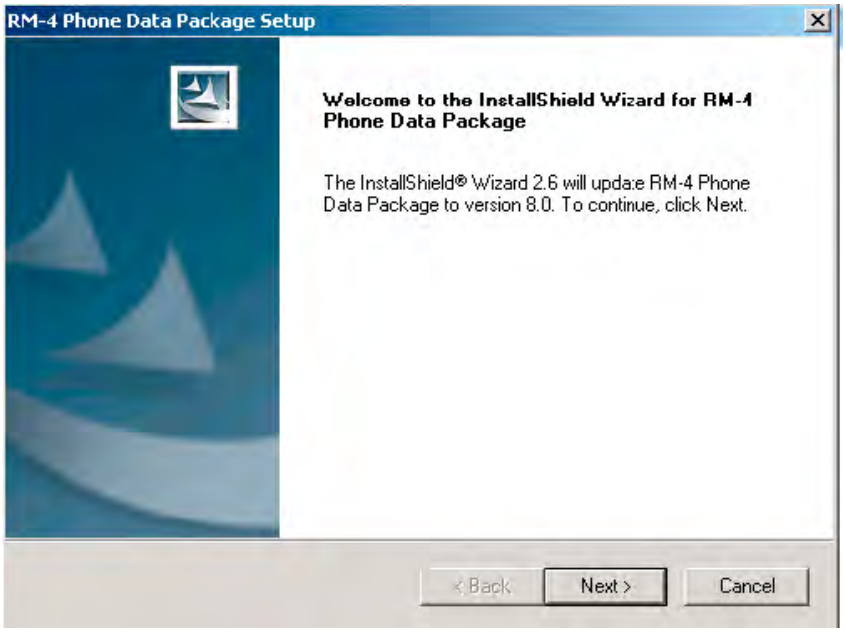

Figure 22 Continue data package installation

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In this view you can see the contents of the data package. Read the text carefully. There should be information about the Phoenix version required with this data package.

Click Next to continue.

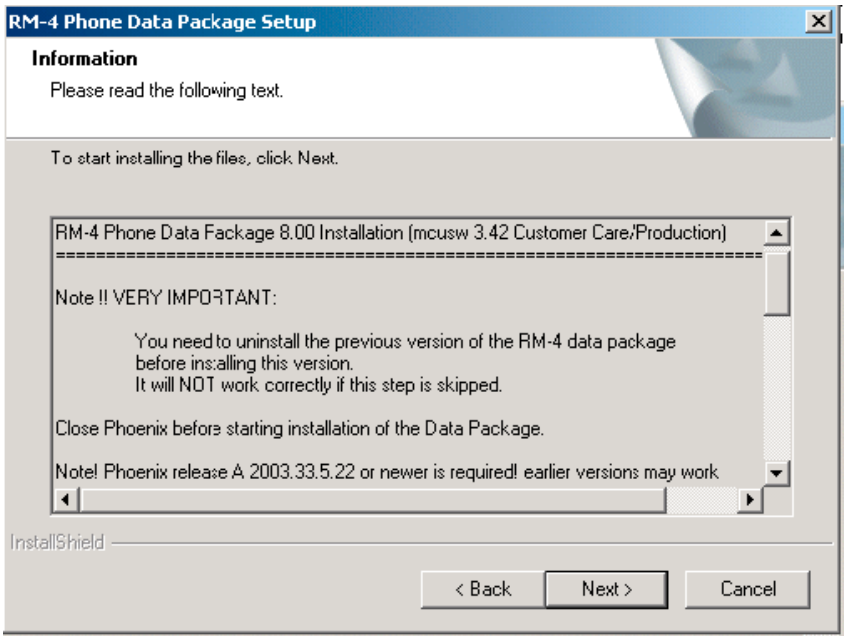

Figure 23 Data package setup information

4. Confirm location and click Next to continue.

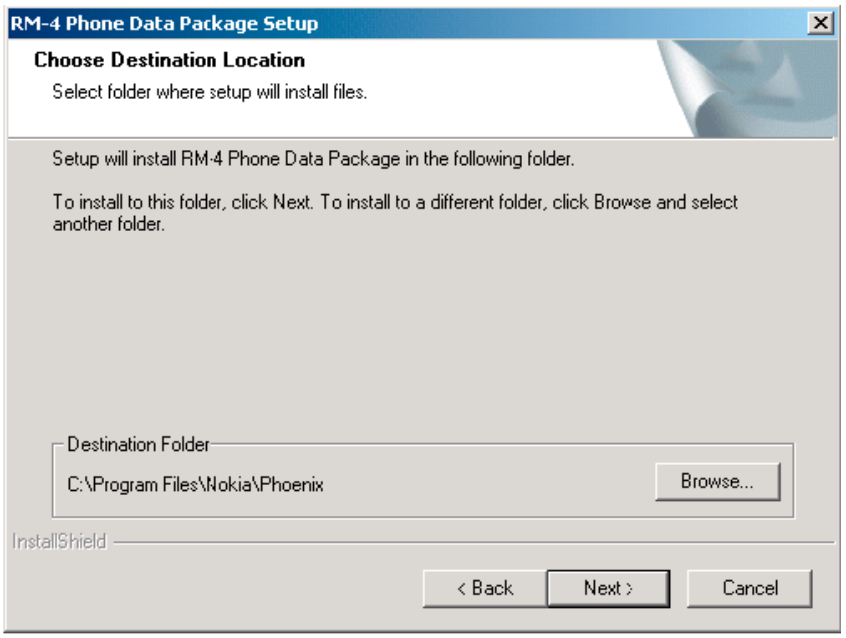

Figure 24 Data package destination folder

The install shield checks where the Phoenix application is installed and the directory is shown.

Click Next to continue.

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5. Click Next to start copying the files.

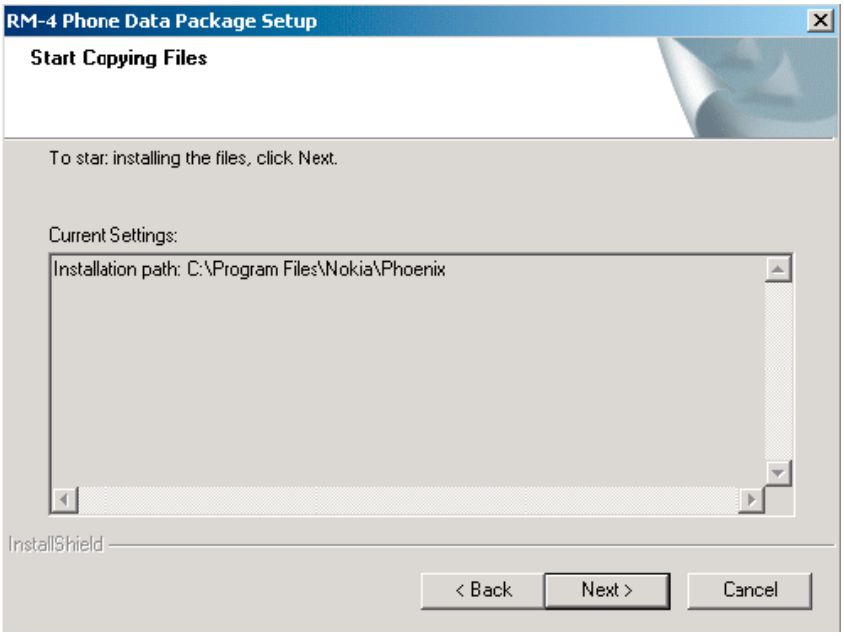

Figure 25 Start copying files

Phone model specific files will be installed. Please wait.

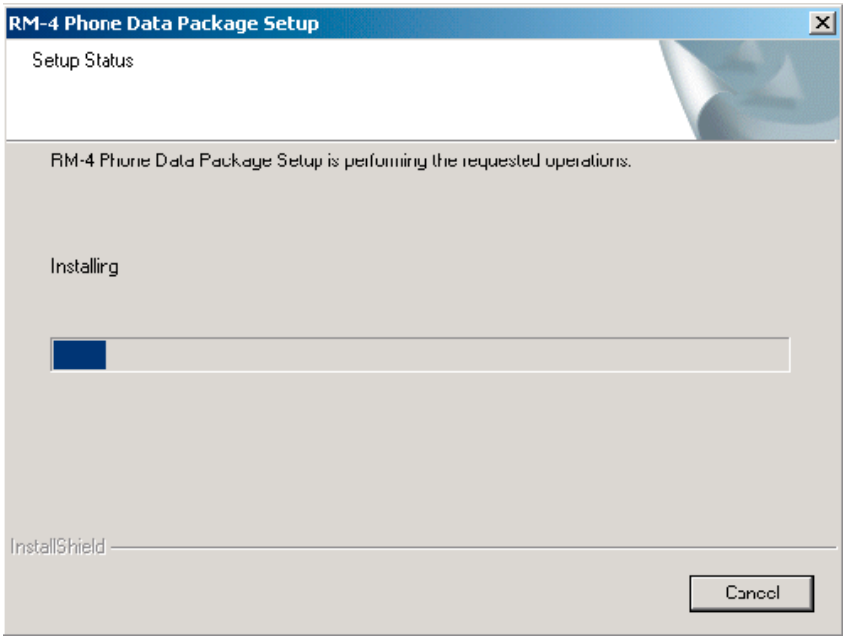

Figure 26 Data package installation status

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6. Click Finish to complete the installation.

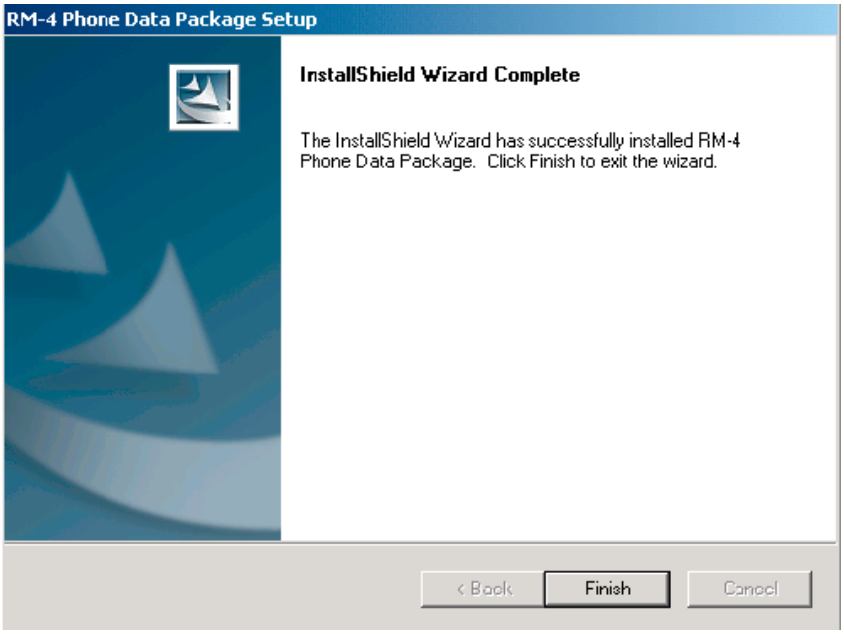

Figure 27 Finish data package installation

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

Next action

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

- configuring users, and
- managing connections.

FLS-4S can be used right away.

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

Uninstalling Phoenix data package

Context

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

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

Please read all related documents carefully.

Steps

1. To uninstall the data package, click OK Cancel to interrupt the uninstallation.

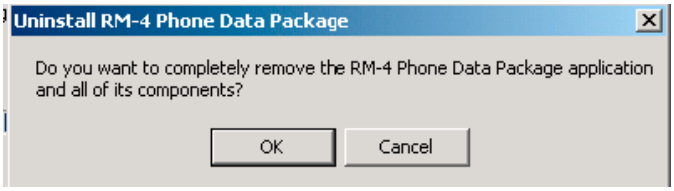

Figure 28 Uninstalling Phoenix data package

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2. Once the previously installed data package is uninstalled, click Finish.

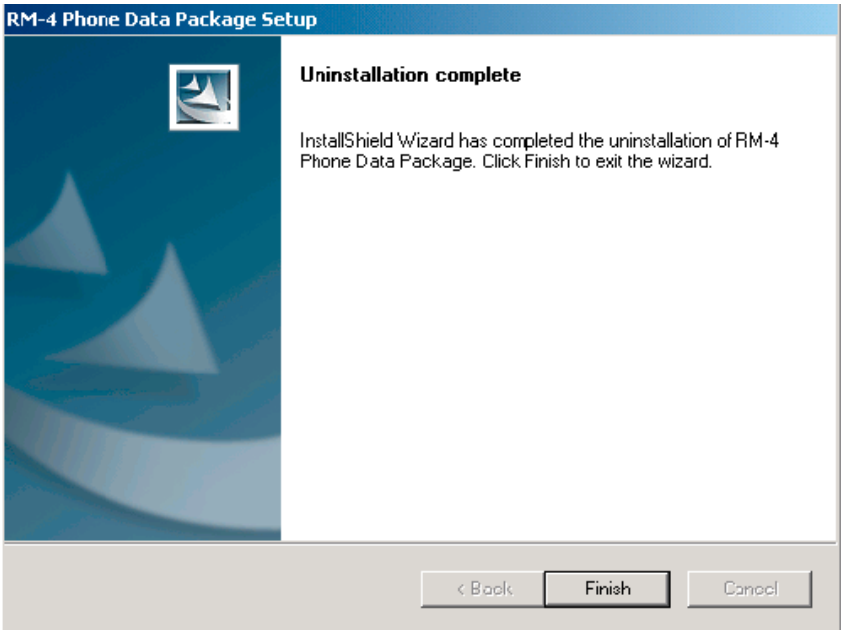

Figure 29 Finishing data package uninstallation

Alternative steps

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

Next action

Run the installation package again to continue installation from the beginning.

Service software instructions

Configuring users in Phoenix

Steps

1. Start Phoenix Service SW and log in.

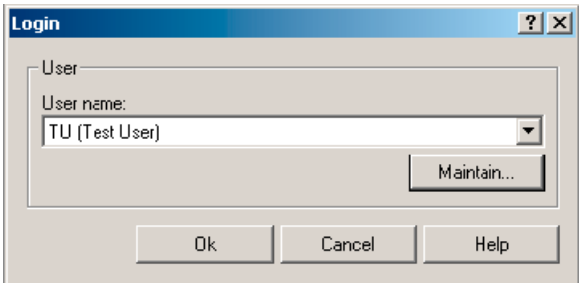

Figure 30 Login

If the user ID is already configured, choose it from the dropdown list and click OK.

To add a new user or edit existing ones, click Maintain.

2. To add information for a new user, click New.

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3. Type in the name and initials of the user and click OK.
   A new user is now created.
4. Click OK.
   You are now able to login with the user name created.
5. Click OK.

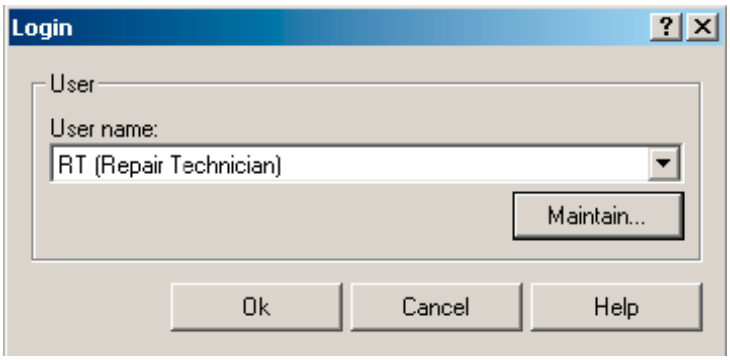

Figure 31 Login, user configured

Managing connections in Phoenix

Steps

1. Start *Phoenix Service SW* and log in.

Figure 32 Phoenix icon

2. Choose *File* → *Manage Connections* .

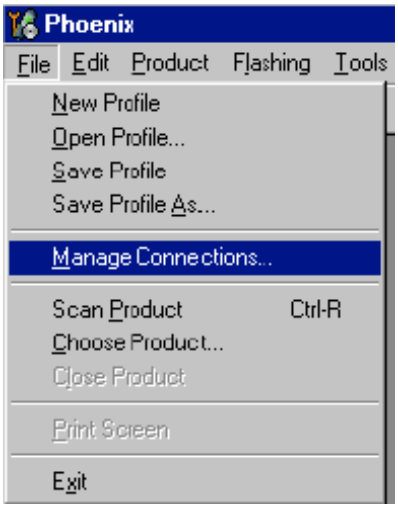

Figure 33 Manage connections

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

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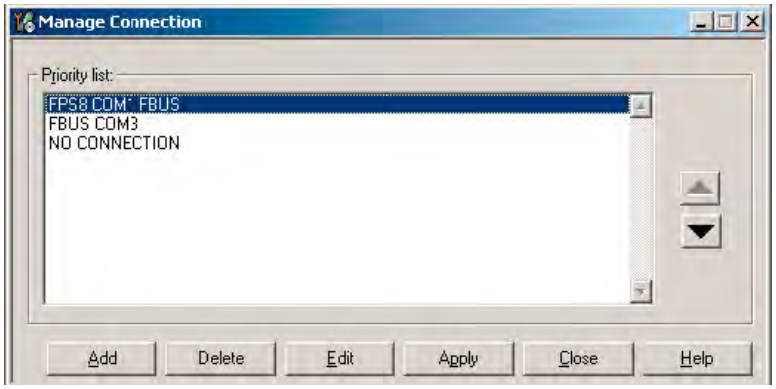

Figure 34 Connections list

3. Click Add to add a new connection, and select if you want to create it manually or by using the Connection Wizard.

   In the following dialogs you will be asked to select settings for the connection. 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.
4. Select Manual mode, and click Next to continue.

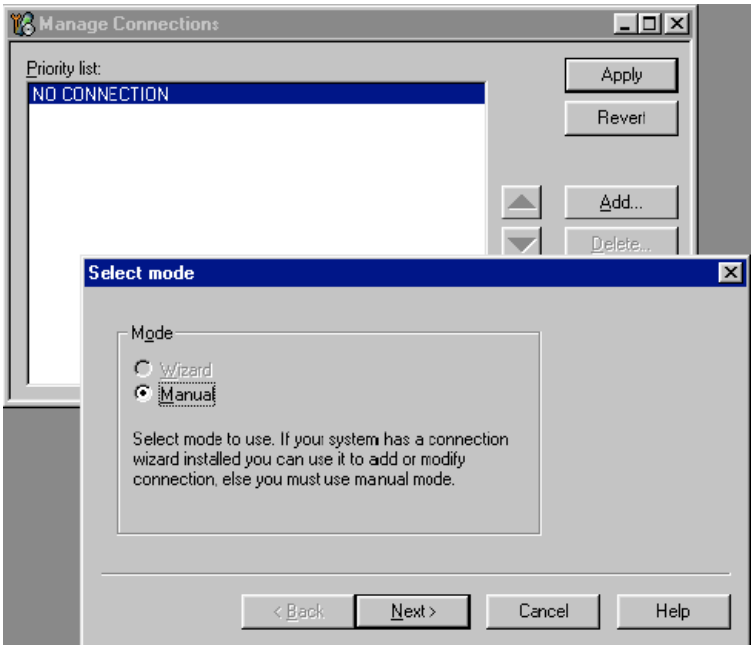

Figure 35 Select mode: Manual

i For FLS-4S POS Flash Device, choose the following connection settings:

- Media: FBUS
- COM Port: Virtual COM Port used by FLS-4

  Note: ALWAYS check this. Go to *Windows* → *Control Panel* → *FLS Virtual Port* → *Configuration* .

Figure 36 FLS virtual port icon

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ii For FPS-8 Flash Prommer, choose the following connection settings:
- Media: FPS-8
- Port Num: COM Port where FPS-8 is connected
- COMBOX_DEF_MEDIA: FBUS

5. Click Finish to complete the configuration.
6. Activate the connection you want to use by clicking it, use up/down arrows to move it on top of the list, and click Apply.

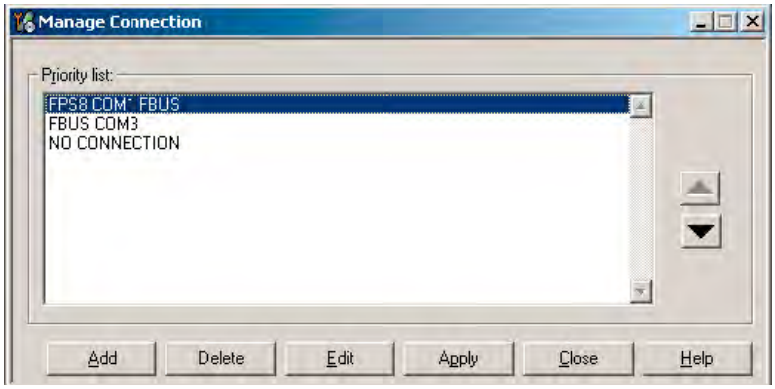

Figure 37 Connections list

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.

Figure 38 Connection information

7. 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.

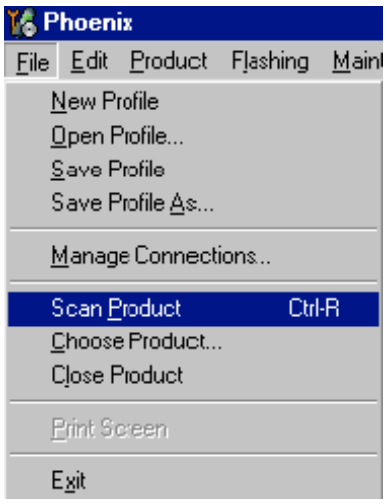

Figure 39 Scan product

When a product is found, Phoenix will load product support. Name of the loaded product support module and its version information will be shown on the bottom of the screen.

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Figure 40 Product support module information

Installing Flash support files for FPS-8* and FLS-4*

Before you begin

Note: Only separate installation package.

- 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 Phoenix and the phone-specific data package because the Phoenix installation always includes the latest flash update package files for FLS-4S/FPS-8*.
- A separate installation package for flash support files is available, and the files can be updated according to this instruction if updates appear between Phoenix/data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with FPS-8 Flash prommer SW update (Page 3–26) after installing a new phone data package.

Steps

1. Start by double clicking *flash_update_03_13_001.exe* to begin installation.

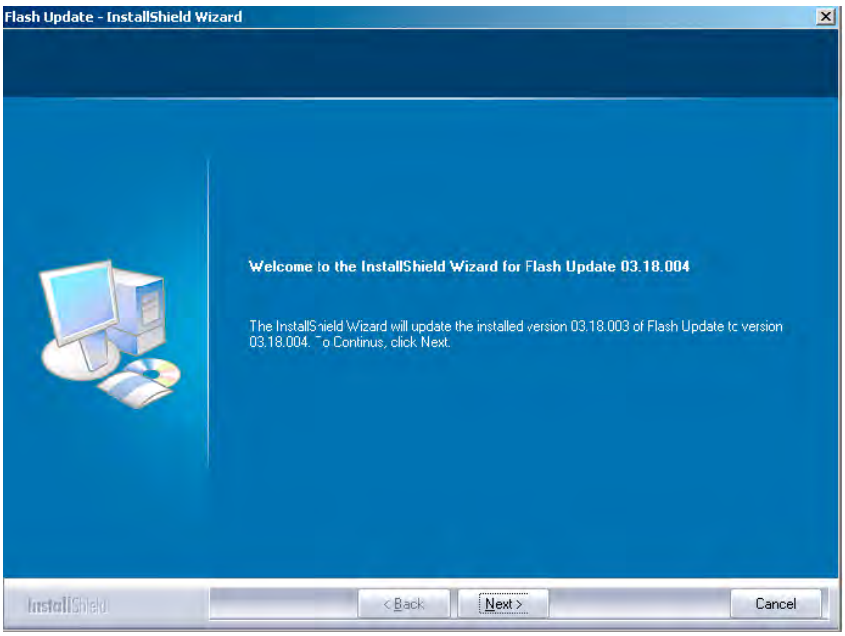

Figure 41 Flash update welcome dialog

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

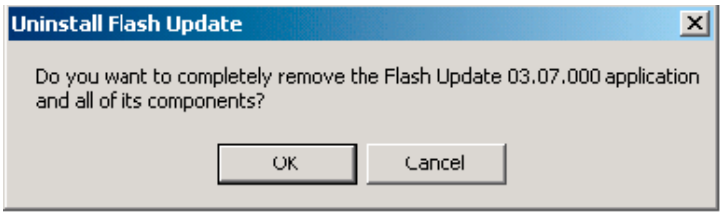

Figure 42 Uninstall flash update package

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 rerun the installation again.

Figure 43 Flash installation interrupted

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

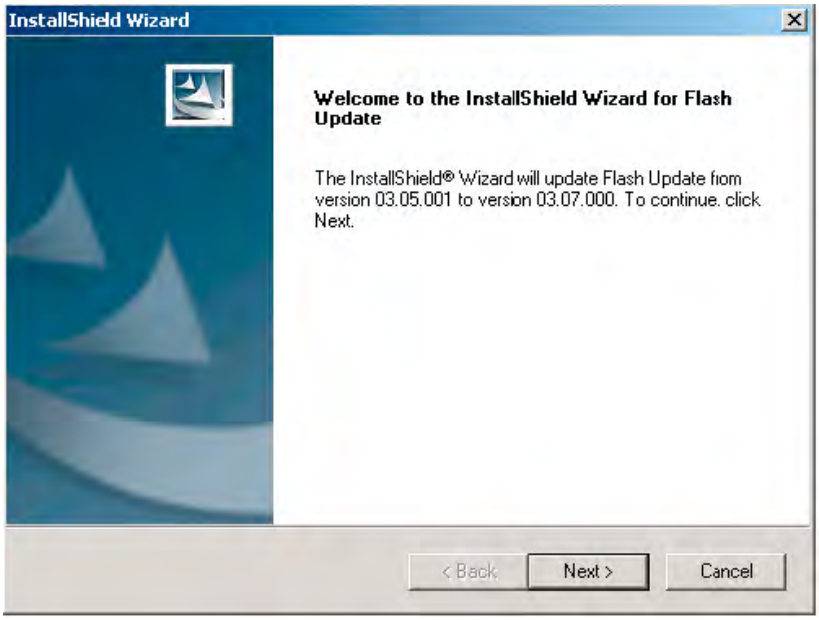

Figure 44 Continue flash update

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

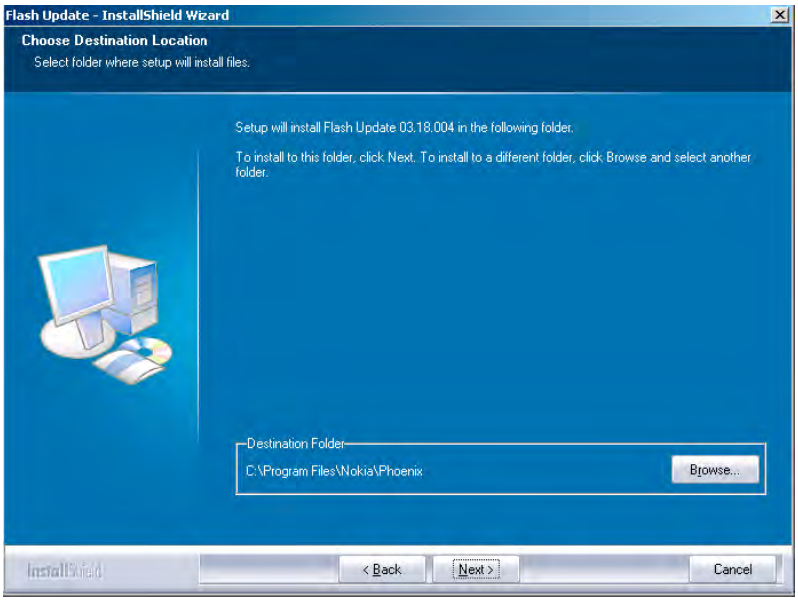

Figure 45 Flash destination folder

When installing the flash update files for the first time you may choose another location by selecting Browse. However, this is not recommended.

Installation will continue.

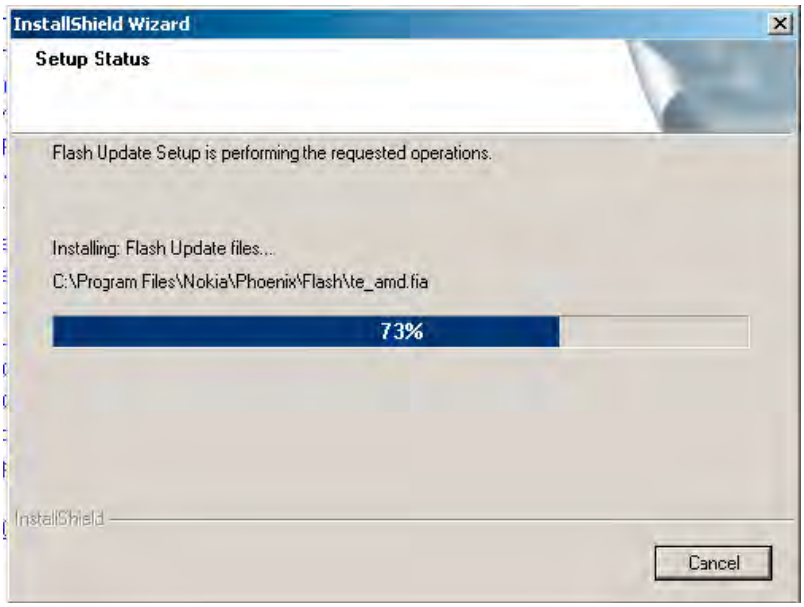

Figure 46 Flash installation status

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4. Choose Finish to complete the installation procedure.

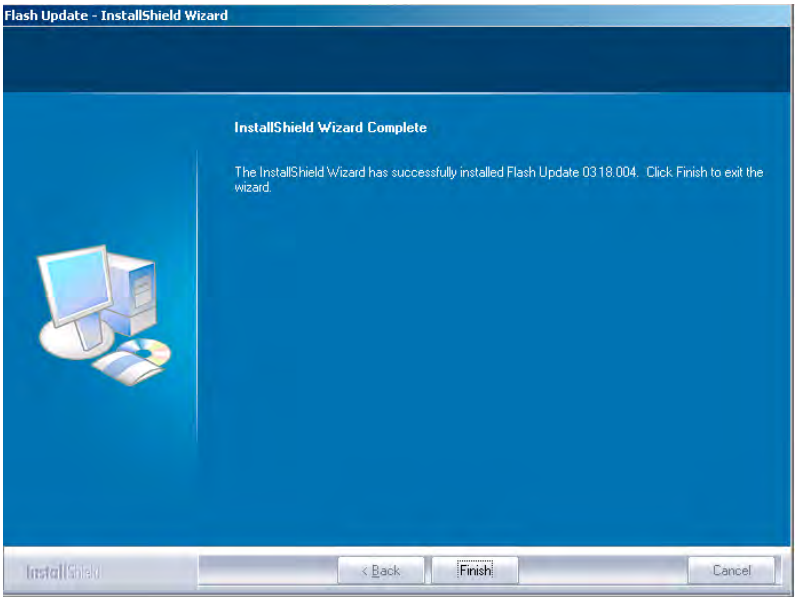

Figure 47 Finish flash update

Next action

FLS-4 can be used right after the Flash Update Package is installed.

FPS-8* flash prommer must be updated using Phoenix!

Updating FPS-8 Flash prommer software

Steps

1. Start *Phoenix Service Software* and log in, manage connection correctly for the FPS-8* flash prommer.

Figure 48 Phoenix icon

2. Choose *Flashing* → *FPS-8 Maintenance* .

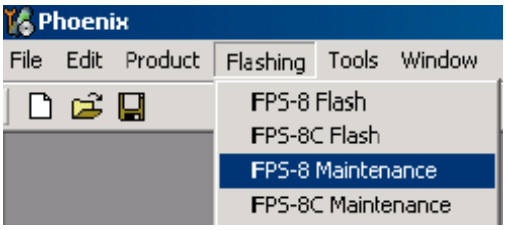

Figure 49 FPS-8 maintenance

Note: Screen shots may be different depending on the Phoenix version used and the connected components.

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3. When the 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.

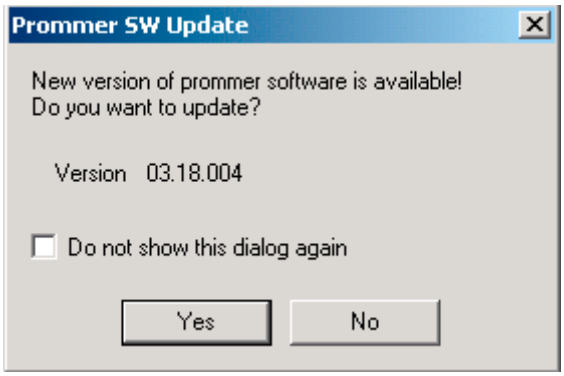

Figure 50 Prommer SW update

4. Wait until you are notified that update has been successful; the procedure will take a couple of minutes. Click OK to close the *FPS-8 Maintenance* window.

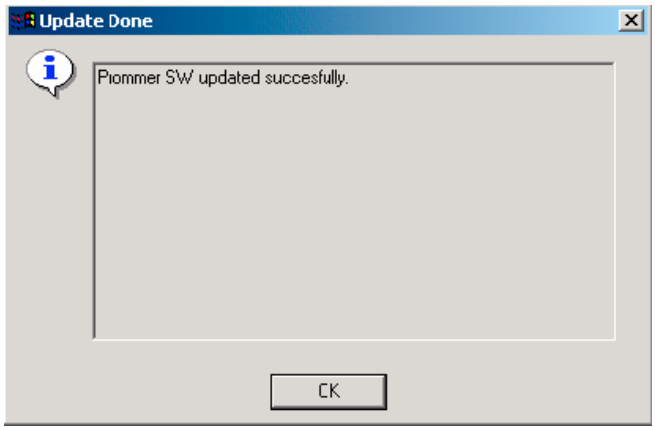

Figure 51 Prommer SW update done

View after successful prommer software update:

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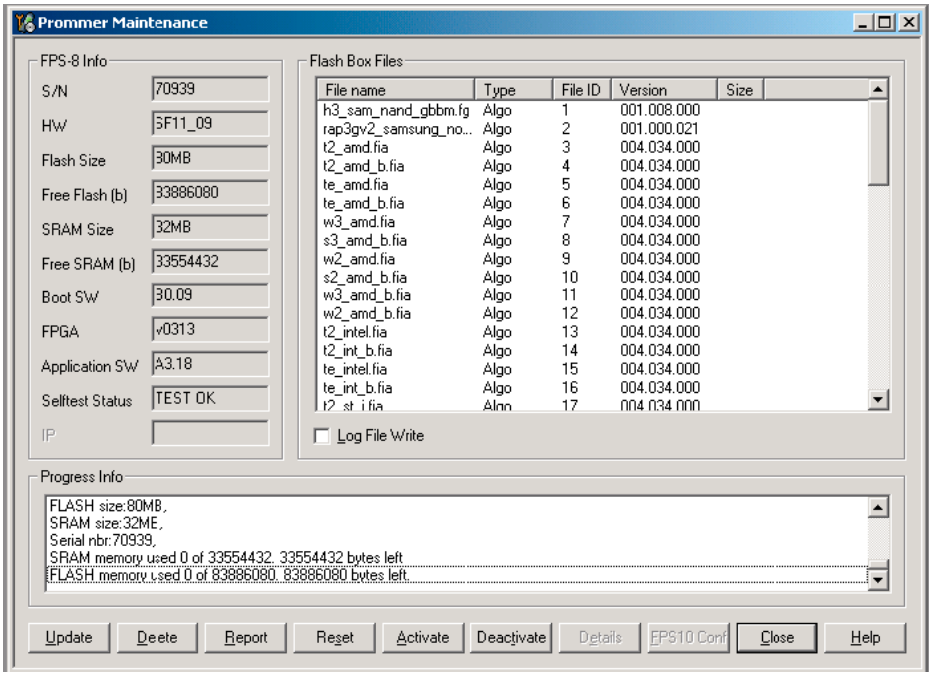

Figure 52 FPS-8 info window

Alternative steps

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

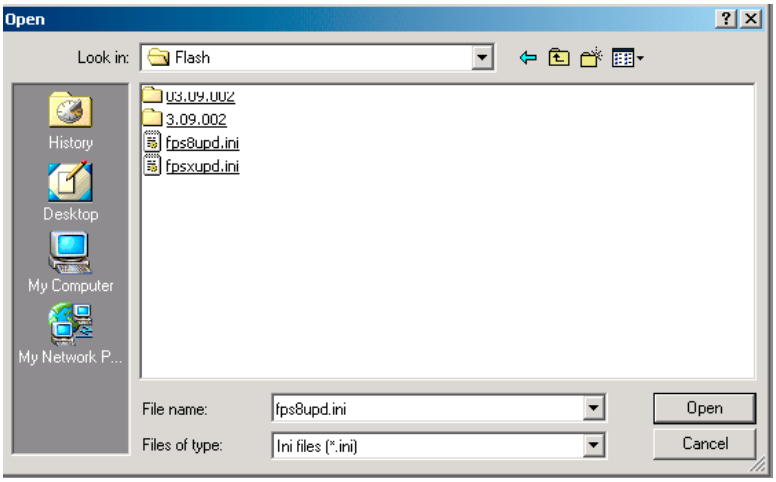

Figure 53 Flash directory window

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

  More information can be found in Phoenix Help.

Activating FPS-8

Context

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

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

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

Steps

1. Start *Phoenix Service Software*.
2. Choose *Maintenance* → *Prommer Maintenance* .

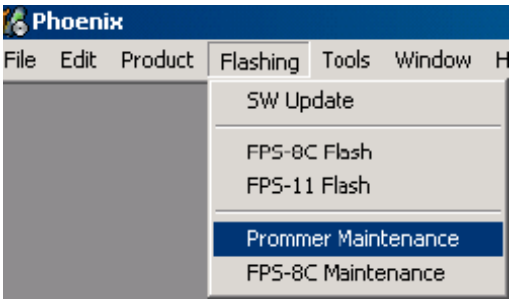

Figure 54 Prommer maintenance

3. In the *Prommer Maintenance* window, click Activate.
4. To find the activation file if you saved it to some other directory on your PC, click Browse.
5. To activate the prommer, select the activation file and click Open.

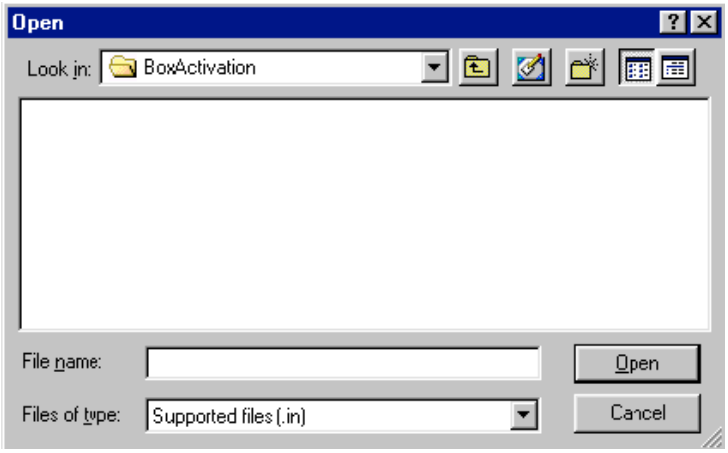

Figure 55 Box activation

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

Deactivating FPS-8

Context

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

Steps

1. Start *Phoenix Service Software*.
2. Choose *Maintenance* → *Prommer Maintenance* .
3. In the *Prommer Maintenance* window, click Deactivate.

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4. To confirm the deactivation, click Yes.

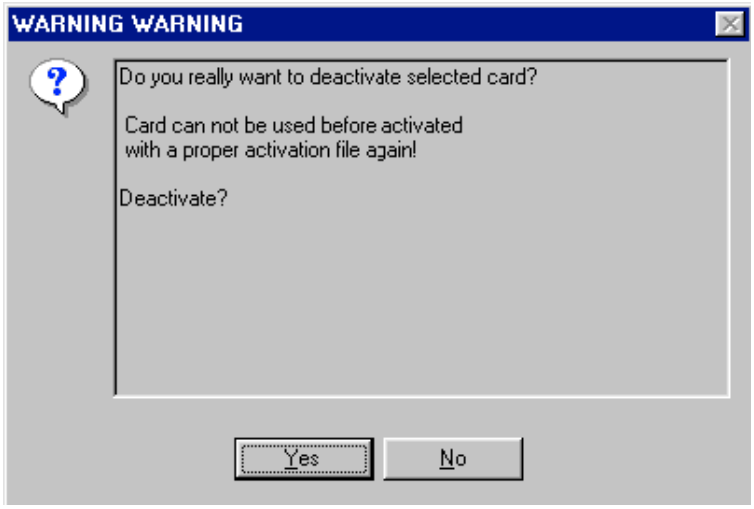

Figure 56 Deactivation warning

The box is deactivated.

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

Updating JBV-1 docking station software

Before you begin

The JBV-1 docking station contains software (firmware) which can be updated. You need the following equipment to update the 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_18_update.zip* file to your computer (in *C:\TEMP* for example) from your download web site.
- Close all other programs.
- Follow instructions on the screen.

Context

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.

Steps

1. Run *Jbv1_18_update.zip* file and start software installation by double clicking *Setup.exe*.

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

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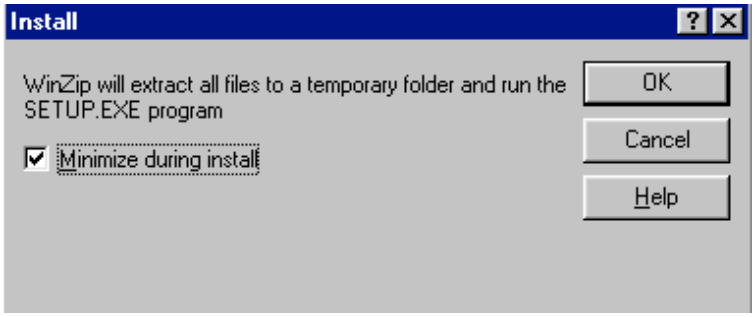

Figure 57 Extracting JBV-1 update files

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

2. Read the instructions in the dialog box and click Next to continue.

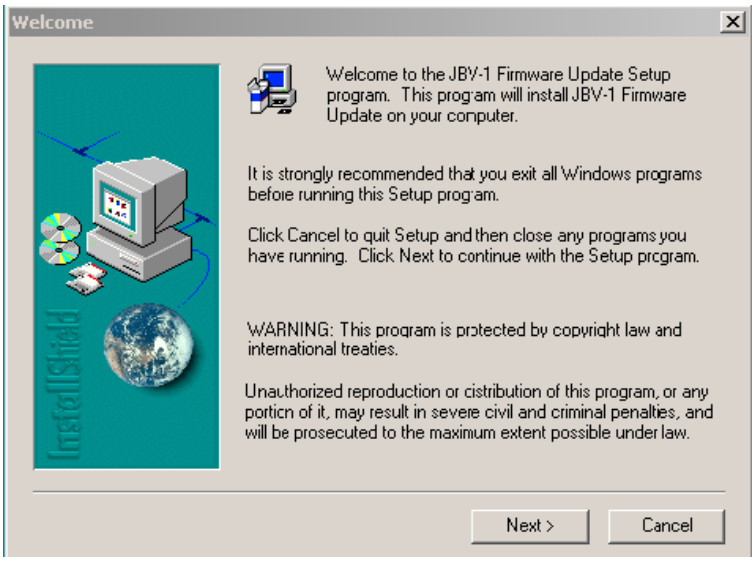

Figure 58 JBV-1 update information

3. Accept the suggested destination folder for installing the JBV-1 SW Package, and click Next to continue.

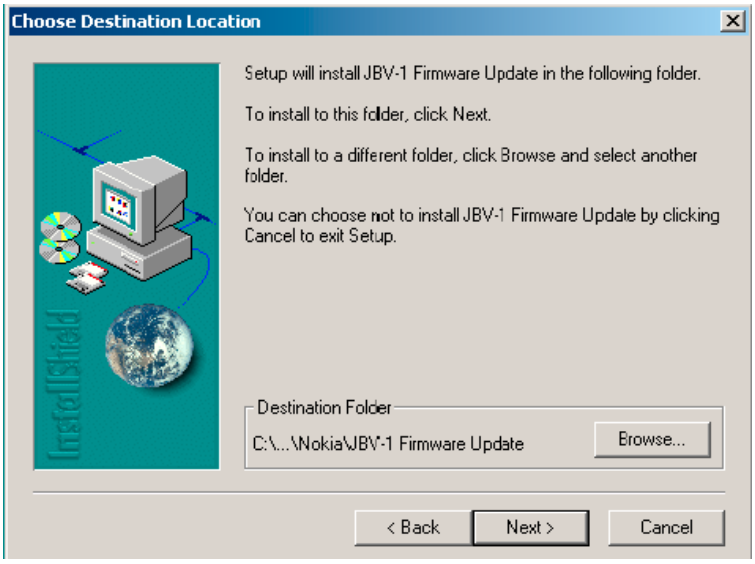

Figure 59 JBV-1 update destination folder

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4. Select Full installation and click Next to continue.

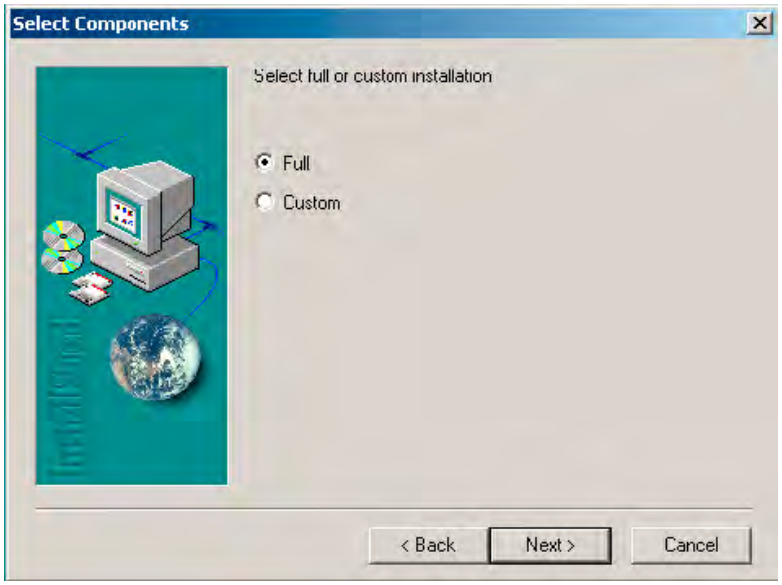

Figure 60 Select installation: Full

5. A program folder is created and the software files are installed there. Click Next to continue.

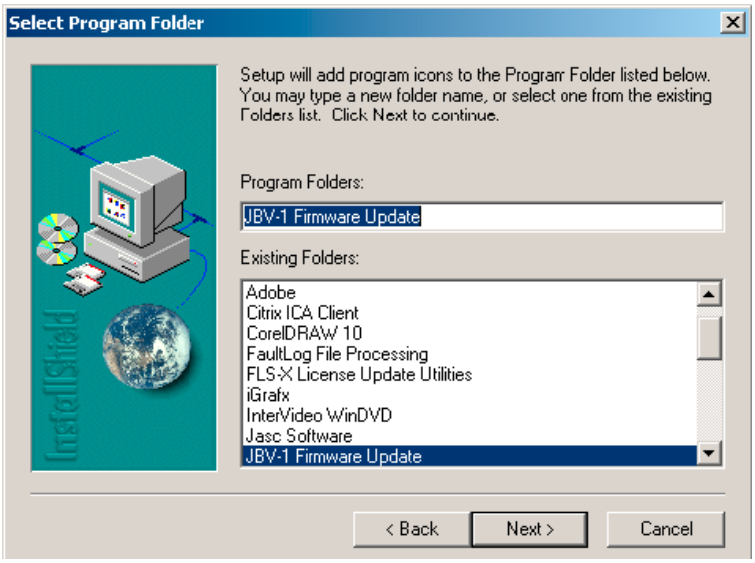

Figure 61 Select program folder

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6. Click Finish to complete the installation.

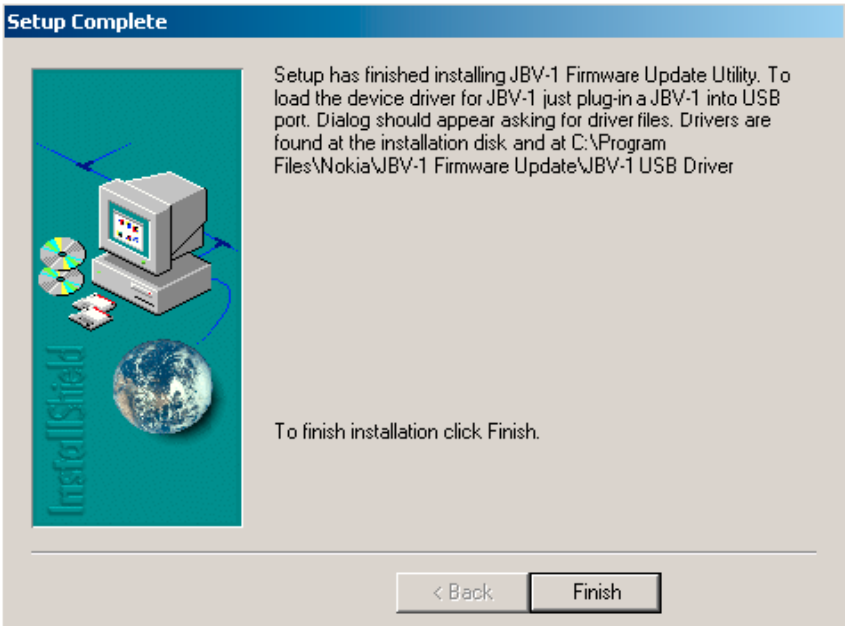

Figure 62 Finish JBV-1 update installation

7. Connect the USB cable/JBV-1 to your computer. Connect power to JBV-1 (11-16V DC) from an external power supply, then connect the USB Cable between the JBV-1 USB connector and the PC.
8. Install or update the JBV-1 USB drivers which are delivered with the JBV-1 SW installation package.

   The drivers can be found in *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 in *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.
9. 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 connected JBV-1. 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 clicking Update Firmware.
10. Choose Refresh Status to check the SW version.

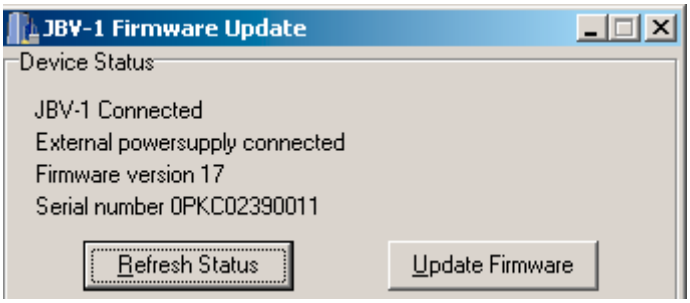

Figure 63 Checking JBV-1 SW version

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11. Choose file JBV1v18.CDE and click Open to update your JBV-1 to a new version (v.18).

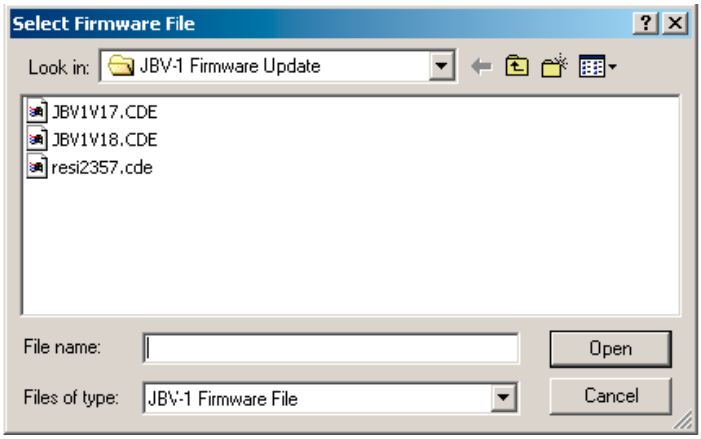

Figure 64 JBV-1 update directory window

Wait until you 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.

12. Click OK to see the current JBV-1 status (after a successful update).

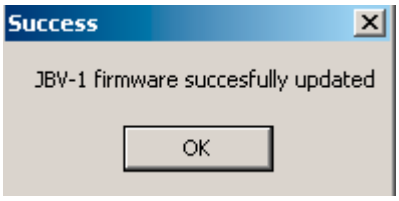

Figure 65 JBV-1 SW update done

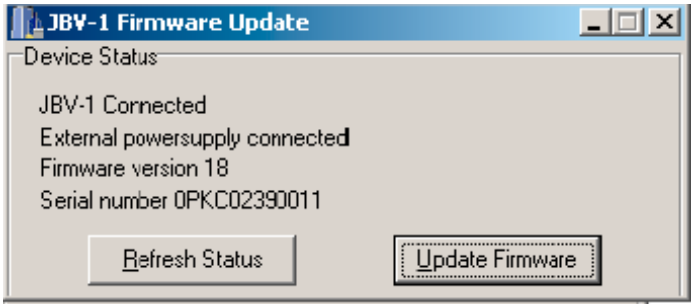

Figure 66 JBV-1 SW status

You have now updated the software of your JBV-1 docking station and it is ready for use.

Next action

If you have several docking stations you need to update, disconnect the power and USB cables from the previous one and connect them to the next docking station. First, click Refresh Status to see the current SW version and then Update Firmware to update the software.

After you have updated all docking stations, close the *JBV-1 Firmware Update* dialog box.

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4 — Service Tools and Service Concepts

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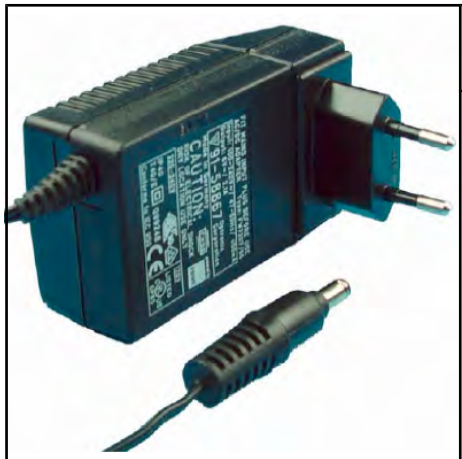
Service tools

List of Service Tools

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

	ACF-8	Universal power supply	
	ACF-8 universal power supply is used to power FPS-8. ACF-8 has 6V DC and 2.1A output.		
	CA-5S	DC cable	
	The DC cable CA-5S is used to connect JBV-1 to the phone charger jack for ADC/VCHAR/ICHAR calibration **Note:** Old SCB-3 can be used as well.		
	DA-41	Docking station adapter	
	The Docking Station adaptor is used for this phone in combination with JBV-1. The adapter supports flashing and energy management calibration. Features include: • compatible with the JBV-1 • easy phone attachment and detachment. • reliable phone locking • switch for detecting phone • replaceable SIM interface		

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	DAU-9S	MBUS cable	
	The MBUS cable DAU-9S has a modular connector and is used, for example, between the PC's serial port and module jigs, flash adapters or docking station adapters.		
	FLC-2	DC cable	
	FLC-2 is used with a flash adapter to supply a controlled operating voltage.		
	FLS-4S	Flash device	
	FLS-4S is a dongle and flash device incorporated into one package, developed specifically for POS use.		

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FPS-10	Flash prommer	

FPS-10 interfaces with:

- PC
- Control unit
- Flash adapter
- Smart card

FPS-10 flash prommer features:

- Flash functionality for BB5 terminals
- Smart Card reader for SX-2 or SX-4
- USB traffic forwarding
- USB to FBUS/Flashbus conversion
- LAN to FBUS/Flashbus and USB conversion
- Vusb output switchable by PC command

FPS-10 sales package includes:

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

FPS-11	Parallel flash prommer	

FPS-11 interfaces with:

- PC
- Control unit
- Flash adapter
- Smart card

FPS-11 flash prommer features:

- Can flash up to 8 phones at a time, controlled by one PC
- Communication method between PC and FPS-11 is single USB2.0
- No need for external power for powering up phones
- Smart Card reader for SX-2 and SX-4
- Updates software
- Future feature: will support all DCT-4 protocols and models

FPS-11 sales package includes:

- FPS-11
- Power Supply for FPS-11
- EUR, UK, USA Power cords
- USB2.0 cable

FPS-8	FLASH prommer	

The Flash Prommer FPS-8 is used with e.g. DA-8 and JVB-1. Power is supplied to FPS-8 from the Universal Power Supply.

Also included in the sales pack:

- ACF-8, AC charger
- CA-10 DS, Printer cable
- AXS-4, D9-D9 cable

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JBV-1	Docking station	

The JBV-1 docking station is a general tool that has been designed for calibration and software update use. The JBV-1 is used together with a docking station adapter as one unit

In calibration mode the JBV-1 is powered by an external power supply: 11-16V DC. When flashing the power for the phone can be taken from the flash prommer or external power supply: 11-16 V DC.

Note: JBV-1 main electrical functions are:

- adjustable VBATT calibration voltage, current measurement limit voltage: VCHAR, current measurement: ICHAR
- adjustable ADC calibration voltage via BTEM and the BSI signal
- BTEMP and BSI calibration resistor
- signal from FBUS to the phone via the parallel jig
- control via FBUS or USB
- Flash OK/FAIL indication

MJ-33	Module jig	

The MJ-33 module jig is used for testing the following modules:

- User interface
- Baseband and RF on system module

Note: The nominal supply voltage for MJ-33 is +6.0 V. The supply voltage must not exceed +12.0 V (min. 5.0 V).

Supply the power to the jig only when the jumper is open = regulated.

RF loss in MJ-33:

GSM 850/900: 0.3 dB

GSM 1800/1900: 0.6 dB

Bluetooth: <1 dB

PCS-1	Power cable	

The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.

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	RJ-87	Soldering jig	
	The soldering jig RJ-87 is used for soldering and as a rework jig for the main board. The material is resistant to the heat used by lead free soldering. The PWB can be used with either A or B side upwards.		
	SA-41	RF Coupler	
	SA-41 RF Coupler is used for Go/No-Go test after changing components in the RF part of the phone. The SA-41 is mounted on the docking station adapter, after which the phone can be placed in the docking station adapter. **Note:** For RF attenuation values, please refer to the Service bulletin.		
	SF-29	POS flash adapter	
	The POS flash adapter SF-29 is used in the place of phone's normal battery during service to supply a controlled operating voltage and to connect to flash pads.		
	XCS-1	Service cable	
	The XCS-1 service cable is used to connect FLS-4S to the POS flash adapter for supplying a controlled operating voltage and data connection.		

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	XCS-4	Modular cable	
	XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.		
	XRF-1	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector ca. 610mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB		

Service software concepts

POS flash concept with FLS-4S

Figure 67 POS flash concept

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Item	Type	Description
1	SF-29	Point of Sales flash loading adapter
2	XCS-1	Service cable
3	FLS-4S	Flash device
4	ACF-8	AC charger
5		Computer with Phoenix SSW

POS flash concept with FPS-8

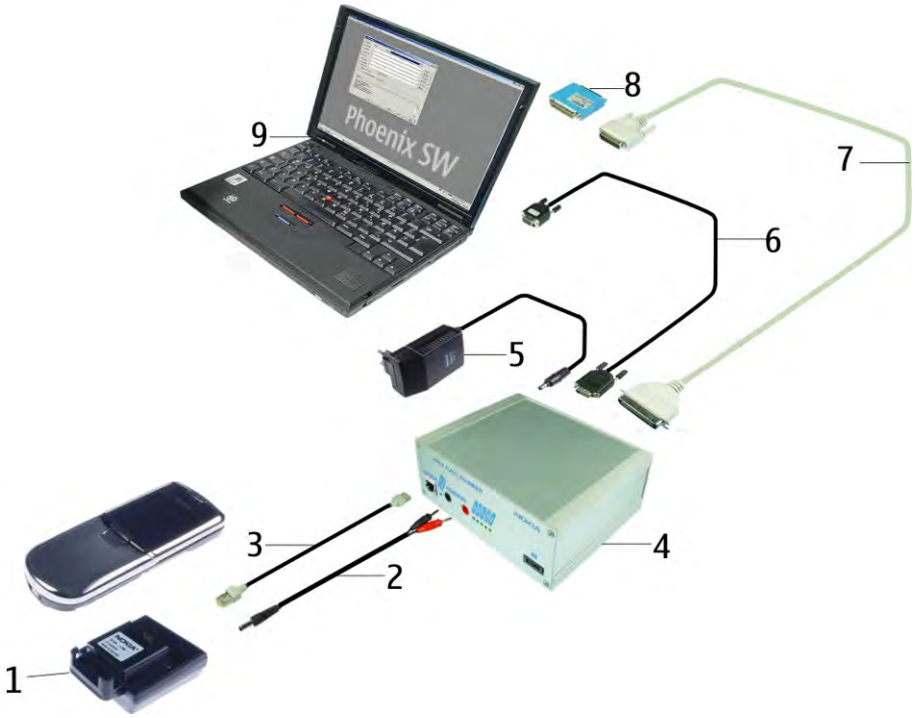

Figure 68 POS Flash concept with FPS-8

Item	Type	Description
1	SF-29	Point of Sales flash loading adapter
2	FLC-2	Power cable
3	XCS-4	Modular cable
4	FPS-8	Flash prommer box
5	ACF-8, included in FPS-8 sales pack	AC Charger
6	CA-10DS, included in FPS-8 sales pack	Printer cable
7	AXS-4, included in FPS-8 sales pack	D9 – D9 cable
8	PKD-1	Software protection key
9		Computer with Phoenix SSW
	SF-12	SRAM Module (3 pcs needed inside FPS-8)

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Note: More than 32MB SRAM required in FPS-8.

POS flash concept with FPS-10

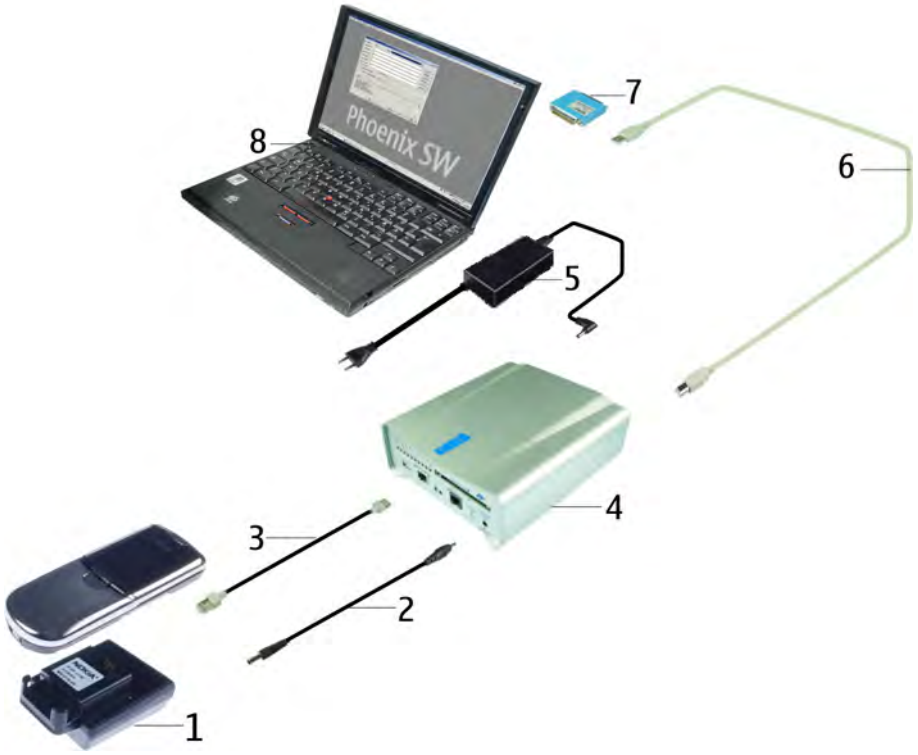

Figure 69 POS flash concept with FPS-10

Item	Type	Description
1	SF-29	Point of Sales flash loading adapter
2	XCS-4	Service cable
3	CA-41PS	Power cable
4	FPS-10	Flash prommer box
5	AC-33 included in sales kit	AC charger
6	CA-31D included in sales kit	USB cable
7	PKD-1	Software protection key
8		Computer with Phoenix SSW

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POS flash concept with FPS-11

Figure 70 POS flash concept with FPS-11

Item	Type	Description
1	SF-29	Point of Sales flash loading adapter
2	CA-28DS	Service cable
3	FPS-11	Flash prommer box
4	AC adapter included in sales kit	AC charger
5	CA-31D included in sales kit	USB cable
6	PKD-1	Software protection key
7		Computer with Phoenix SSW

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JBV-1 flash concept with FPS-8

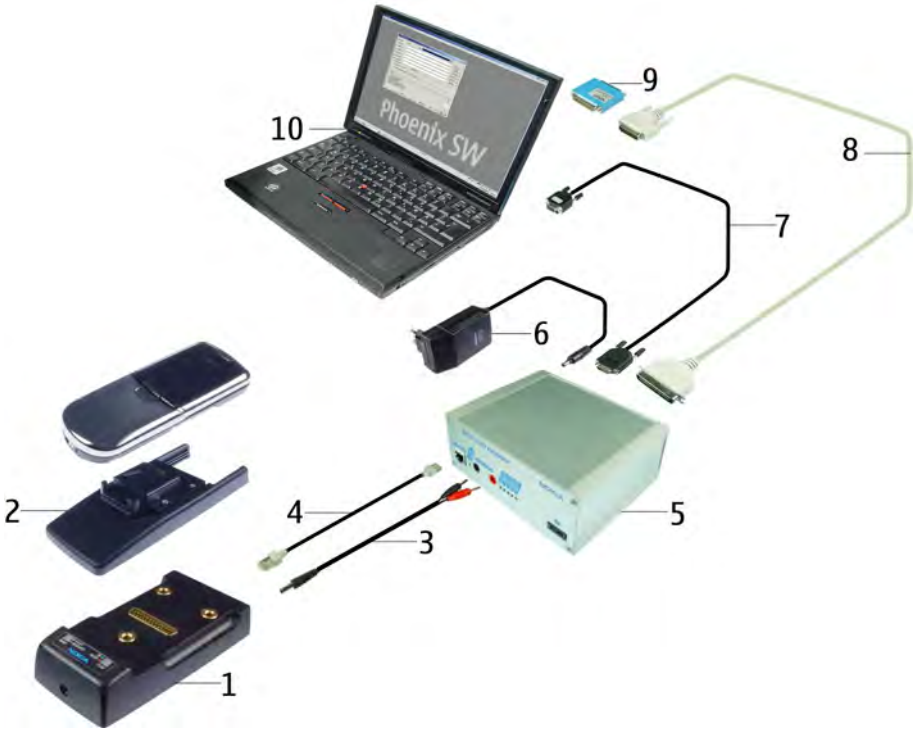

Figure 71 JBV-1 flash concept with FPS-8

Item	Type	Description
1	JBV-1	Docking station
2	DA-41	Docking station adapter
3	PCS-1	Power cable
4	XCS-4	Modular cable
5	FPS-8	Flash prommer box
6	ACF-8, included in FPS-8 sales pack	AC Charger
7	AXS-4, included in FPS-8 sales pack	D9 – D9 cable
8	CA-10DS, included in FPS-8 sales pack	Printer cable
9	PKD-1	Software protection key
10		Computer with Phoenix SSW
	SF-12	SRAM Module (3 pcs needed inside FPS-8)

Note: More than 32MB SRAM required in FPS-8.

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JBV-1 flash concept with FPS-10

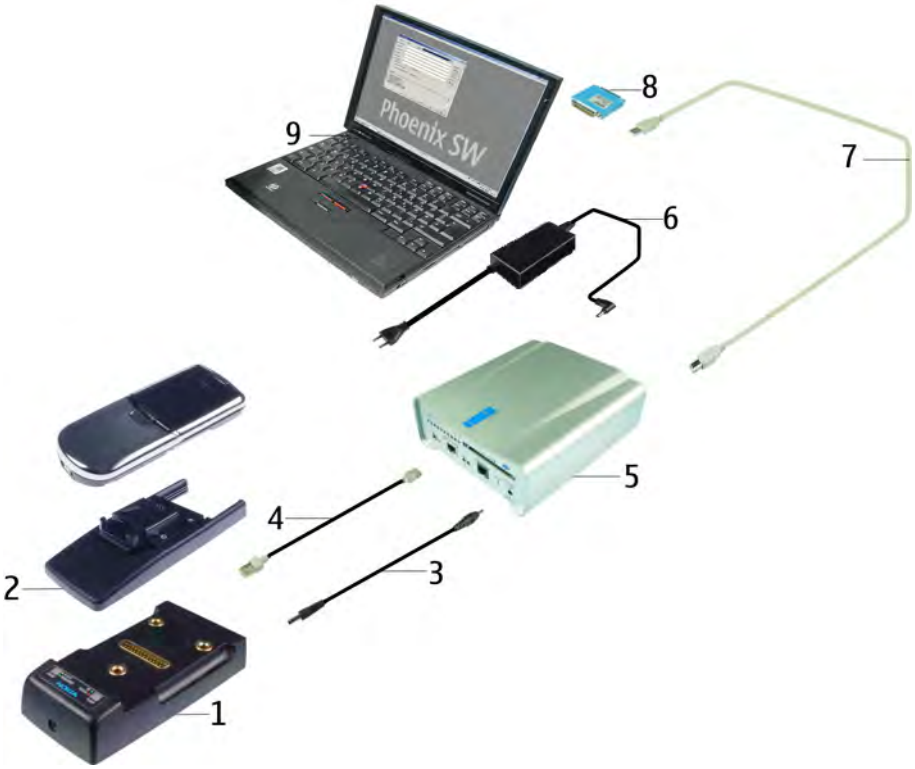

Figure 72 JBV-1 flash concept with FPS-10

Item	Type	Description
1	JBV-1	Docking station
2	DA-41	Docking station adapter
4	CA-41PS	Power cable
3	XCS-4	Modular cable
5	FPS-10	Flash prommer box
6	AC-33, included in sales kit	AC Charger
7	CA-31D, included in sales kit	USB cable
8	PKD-1	Software protection key
9		Computer with Phoenix SSW

JBV-1 service concept

This concept is for baseband calibration.

EM calibration including Zocus should be carried out in JBV-1 and DA-41.

Note: Power to JBV-1 should be supplied from an external DC power supply, NOT A FLASH PROMMER.

JBV-1 input voltage: normal +12V, maximum +16V.

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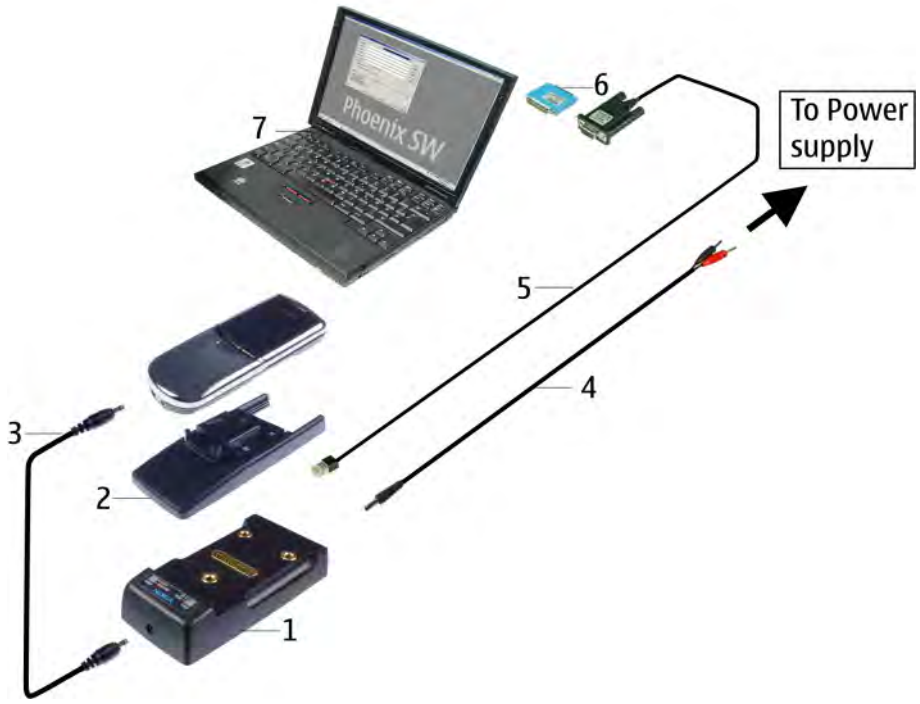

Figure 73 JBV-1 service concept

Item	Type	Description
1	JBV-1	Docking station
2	DA-41	Docking station adapter
3	CA-5S	DC cable
4	PCS-1	Power cable
5	DAU-9S	MBUS cable
6	PKD-1	Software protection key
7		Computer with Phoenix SSW

Module jig flash concept with FPS-8

Flashing with MJ-33 is recommended in local mode.

The following equipment is required for the AMS software update when the system module is placed in the module jig MJ-33 and connected through an FPS-8 set-up:

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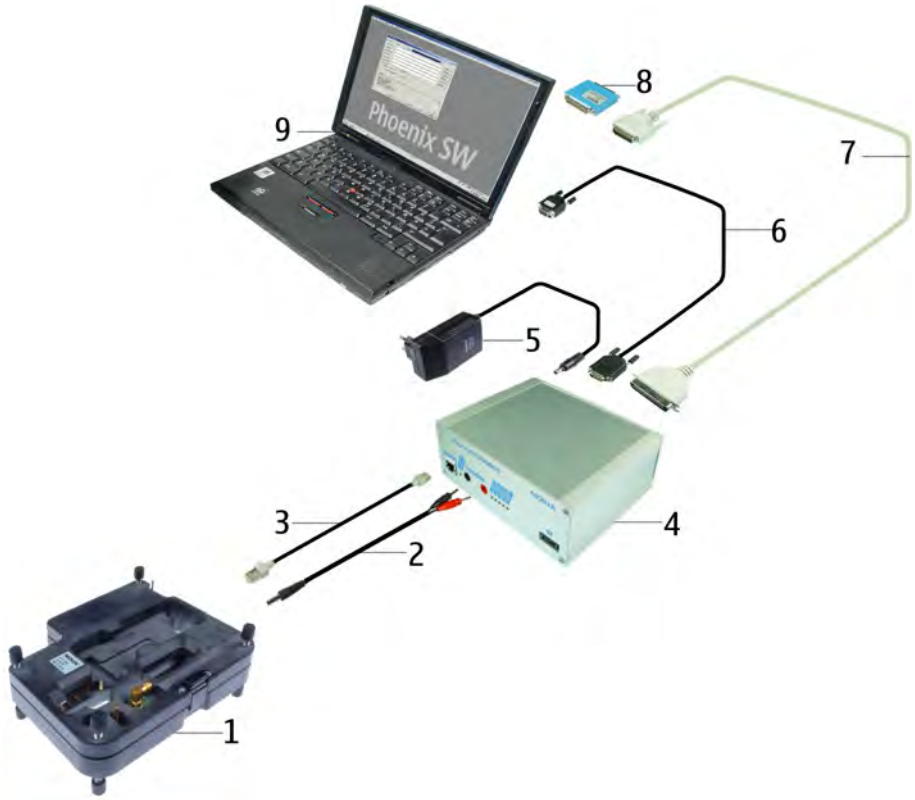

Figure 74 Module jig flash concept with FPS-8

Item	Type	Description
1	MJ-33	Module jig
2	PCS-1	Power cable
3	XCS-4	Modular cable
4	FPS-8	Flash prommer box
5	ACF-8, included in FPS-8 sales pack	AC Charger
6	AXS-4, included in FPS-8 sales pack	D9 – D9 cable
7	CA-10DS, included in FPS-8 sales pack	Printer cable
8	PKD-1	Software protection key
9		Computer with Phoenix SSW
	SF-12	SRAM Module (3 pcs needed inside FPS-8)

Note: More than 32MB SRAM required in FPS-8.

Module jig flash concept with FPS-10

Flashing with MJ-33 is recommended in local mode.

The following equipment is required for the AMS SW update when the system module is placed in the module jig MJ-33 and connected through a prommer set-up:

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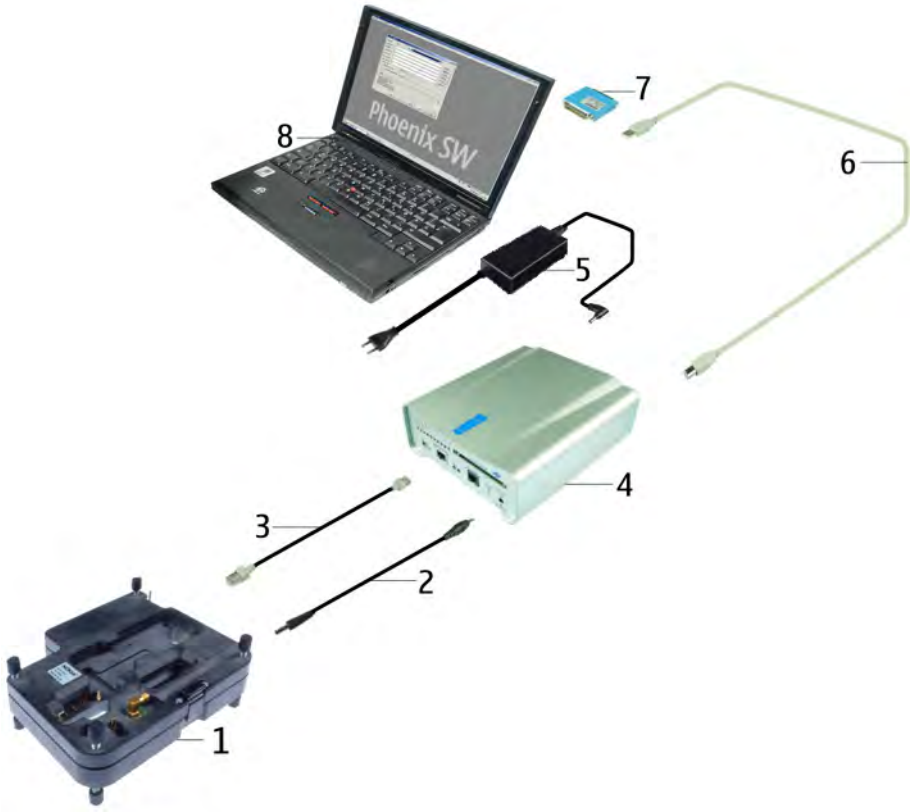

Figure 75 Module jig flash concept with FPS-10

Item	Type	Description
1	MJ-33	Module jig
2	CA-41PS	Power cable
3	XCS-4	Modular cable
4	FPS-10	Flash prommer box
5	AC-33	AC charger
6	CA-31D	USB cable
7	PKD-1	Software protection key
8		Computer with Phoenix SSW

Module jig service concept

This concept is for troubleshooting and RF calibration.

MJ-33 is intended for use with an external power supply.

MJ-33 input voltage: normal +4 V, maximum +6.5 V.

Ensure that the jumper is set for voltage regulation before the external power supply is connected.

When a prommer is used for power supply (4 V), the jumper should be set to bypass regulator.

EM calibrations including Zocus are only done with JBV-1. Module jig MJ-33 does not support Zocus calibration.

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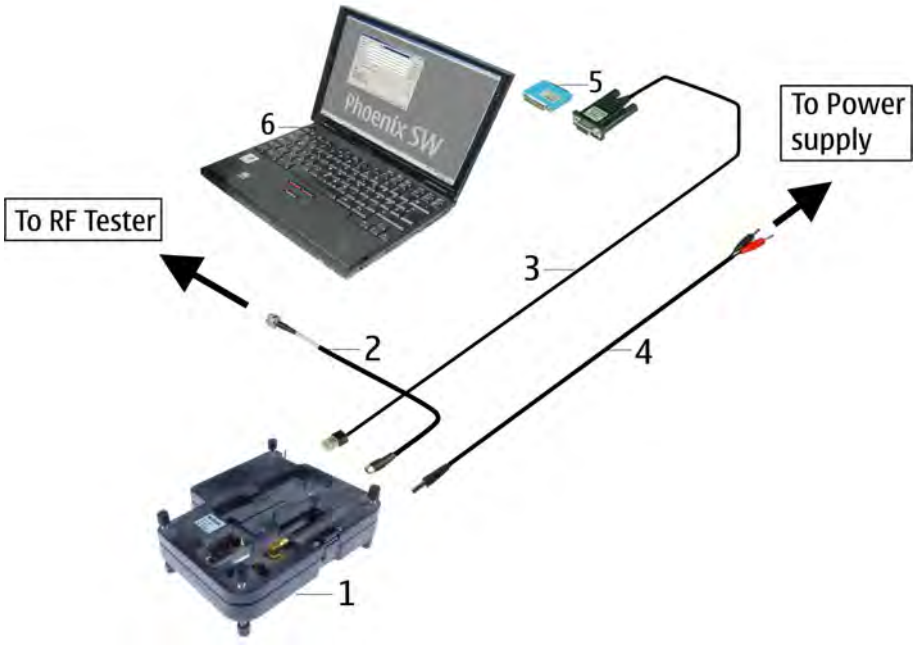

Figure 76 Module jig service concept

Item	Type	Description
1	MJ-33	Module jig
2	XRF-1	RF cable
3	DAU-9S	MBUS cable
4	PCS-1	Power cable
5	PKD-1	Software protection key
6		Computer with Phoenix SSW

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5 — Disassembly and Reassembly instructions

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Reassembly instructions.....5–12

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Disassembly instructions

Steps

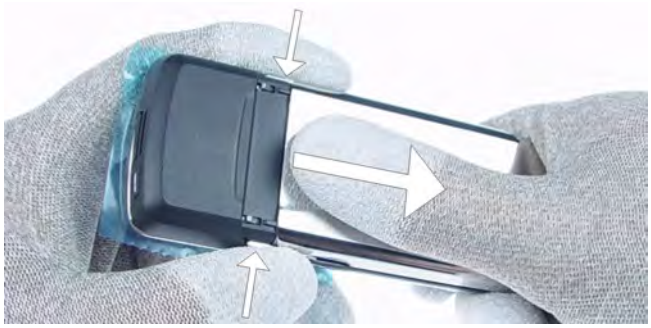
1.

You will need these tools.

2.

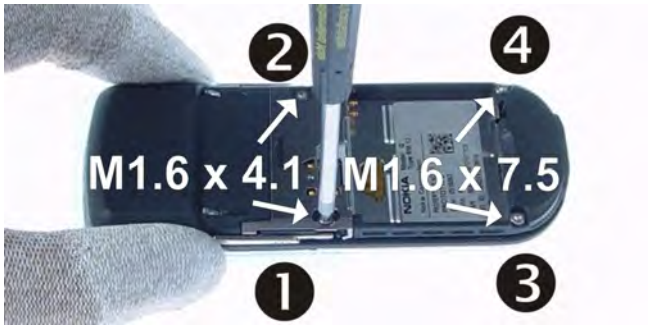
Always protect the window with a plastic film.

3.



Remove the **battery cover**.

4.



Unscrew the 4 torx screws size 6 plus screws in the shown order. Mind the different screw lengths.

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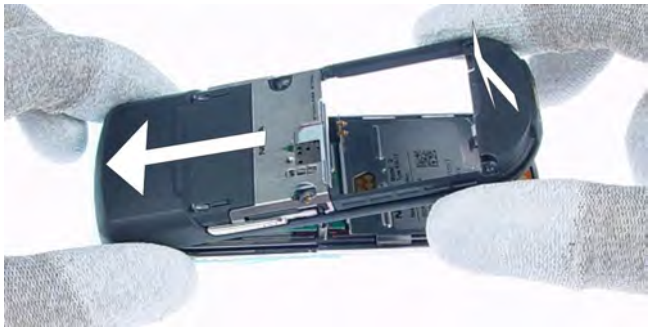
Note: For reassembly ALWAYS USE NEW SCREWS!

When reassembling, use the reverse order and the following torques:

- For M1.6x4.1 : 17 Ncm (1 & 2)
- For M1.6x7.5: 25 Ncm (3 & 4)

5.

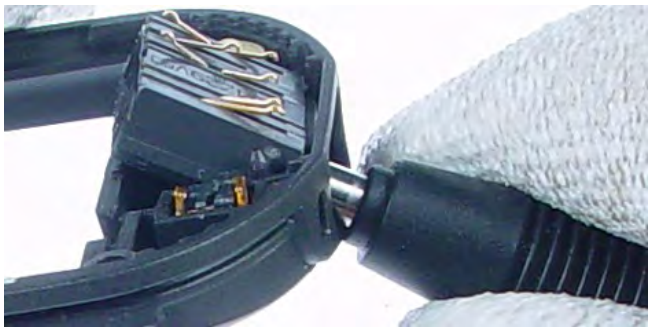


Remove the **B-cover** by shifting it carefully and as shown in the picture below. Mind the sharp contact springs.

6.

Unlock the **antenna assy**, beginning from the left side.

7.



Use the **DC** plug to remove the system connector. Ensure that no adhesive remains.

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8.

Lever out the **vibra motor** with a slotted screwdriver. Ensure that no adhesive remains.

9.

Once removed, the **microphone** cannot be used again.

10.

Unlock and remove the **SIM retainer**.

11.

Pull up the **A-cover**.

Note: Mind the Flex foil components.

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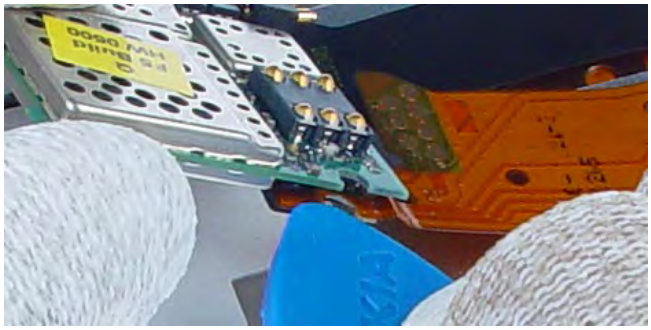
12.

Open the first flex connector of the **PWB** with the SRT-6.

13.



Open the second flex connector and remove the **PWB**.

14.

Peel off the **bottom flex** carefully.

15.

Shift the **slide** to the end position before you continue.

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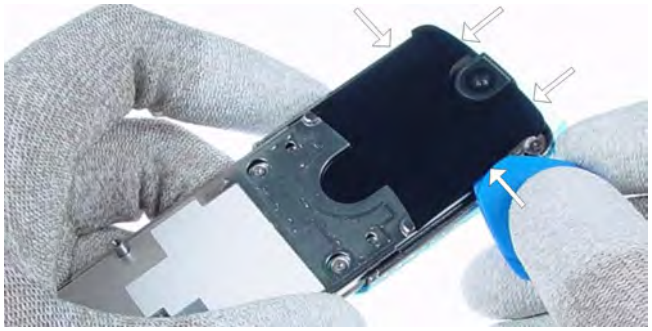
16.



Once released, the **backplate** cannot be used again.

17.

Peel off the **backplate** slowly.

18.

Unscrew the 4 torx size 4 screws in the shown order.

For reassembly use the reverse order and a torque of 17 Ncm.

Note: For reassembly ALWAYS USE NEW SCREWS!

19.

Remove the **UI cover**.

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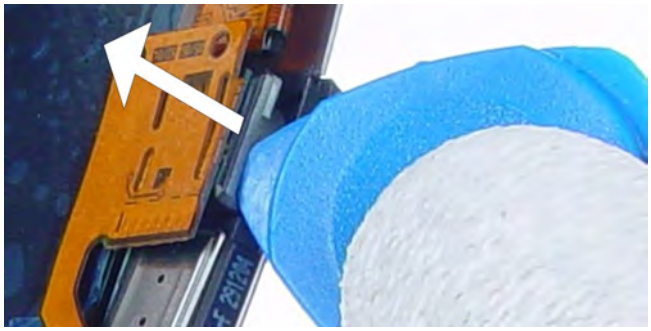
20.

Protect the inner side window and now bared LCD with plastic film.

21.



Carefully lever out the **camera module** with the SRT-6.

22.

Remove the **earpiece** with tweezers.

23.

Pull up the **camera housing**.

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24.

Lever out the **keymat** with the SRT-6.

25.

Carefully lift up the **main flex**.

26.

Peel off the **main flex**.

27.

Release the **springs** from the middle pin first.

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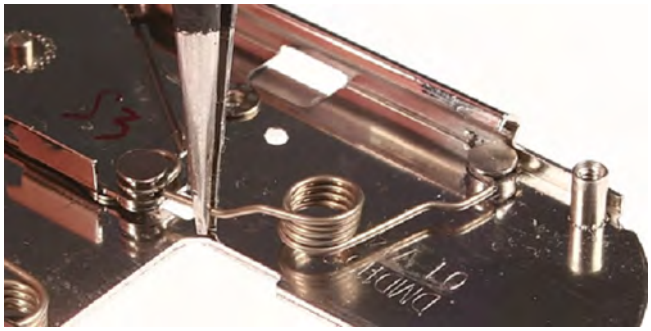
28.

Release the end loop of the **springs**.

Reassembly instructions

Steps

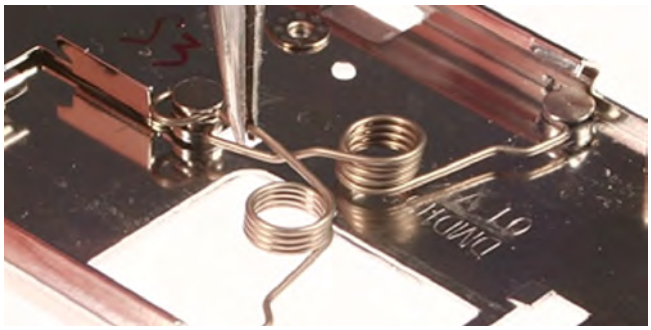
1.



Mind the correct positioning of the **springs**.

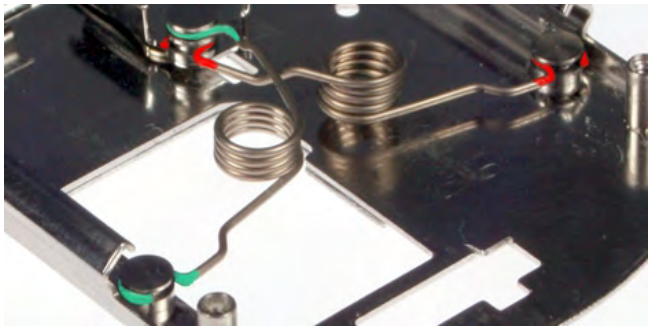
Place the **lower spring**.

2.



Then, place the **upper spring**.

3.



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Make sure the springs have correct functionality.

4. Continue by following the disassembly instructions, but in *reversed order*.

   Note: Pay special attention to step **18** and **4**.

   Note: For reassembly ALWAYS USE NEW SCREWS!

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6 — Baseband Troubleshooting and Tuning

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Introduction to baseband troubleshooting

For service

There are only two changeable parts on the PWB:

- Battery connector (X100)
- SIM connector (X386), troubleshoot: SIM card failure (Page 6–12)

> **Note:** Most components are under shielding and therefore not changeable. You MUST NOT cut the shielding cans open!

For analysis

This document describes in overview the different hardware error possibilities for the phone. Not every possible hardware error is described, only those possible to correct.

> **Note:** Most components and test points are not accessible unless shielding cans are cut open. This must ONLY be done by the Return analysis technicians and for analysis only!

Display information: "Contact service"

When this error appears in the display it means that one or more of the internal baseband tests has failed. The baseband tests (self tests) are performed each time the phone is powered on. The self tests are divided into those performed while powering up (Start up tests) and the ones that can be executed with a PC using Phoenix (Runtime tests). The following Start-up tests are performed during power up:

UEM CBUS IF TEST

SLEEP X LOOP TEST

AUX DA LOOP TEST

EAR DATA LOOP TEST

TX IDP LOOP TEST

TX IQ DP LOOP TEST

SIM CLK LOOP TEST

SIM IO CTRL LOOP TEST

MBUS RX TX LOOP TEST

BACKUP BATT TEST

RADIO TEST

WARRANTY TEST

PA TEMP TEST

SIM LOCK TEST

PPM VALIDITY TEST

KEYBOARD STUCK TEST

LPRF IF TEST

FLASH CHECKSUM TEST

CAMERA IF TEST

EXT RAM DATA BUS TEST

EXT RAM ADDR BUS TEST

NAND FLASH ID TEST

BT WAKEUP TEST

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IR IF_TEST

If all these self tests are passed, the phone will start up. From Phoenix it is possible to run all the self tests and the additional “Runtime test”.

Power and charging troubleshooting

Phone is dead

The phone does not use any current at all when the supply is connected and/or power key is pressed. It is assumed that the voltage supplied is 3.9 VDC. UEMEK will prevent any functionality at battery/supply levels below 2.9 VDC and the software will shut the phone down at 3.1 VDC.

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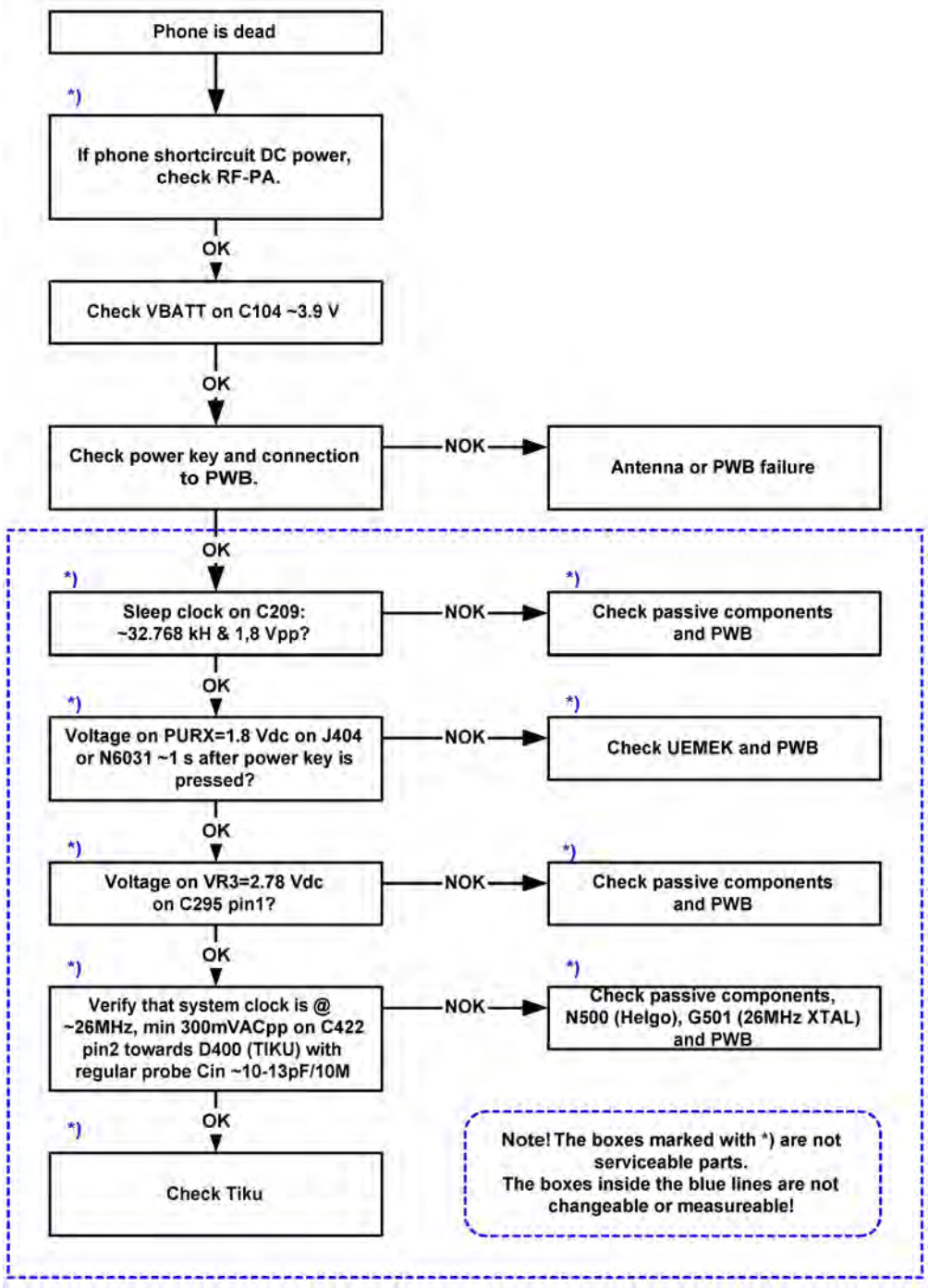

Figure 77 Phone is dead

Phone does not stay on or is jammed

If the MCU does not service the watchdog register within the UEMEK, the operations watchdog will run out after approximately 32 seconds. It is not possible to measure this service routine.

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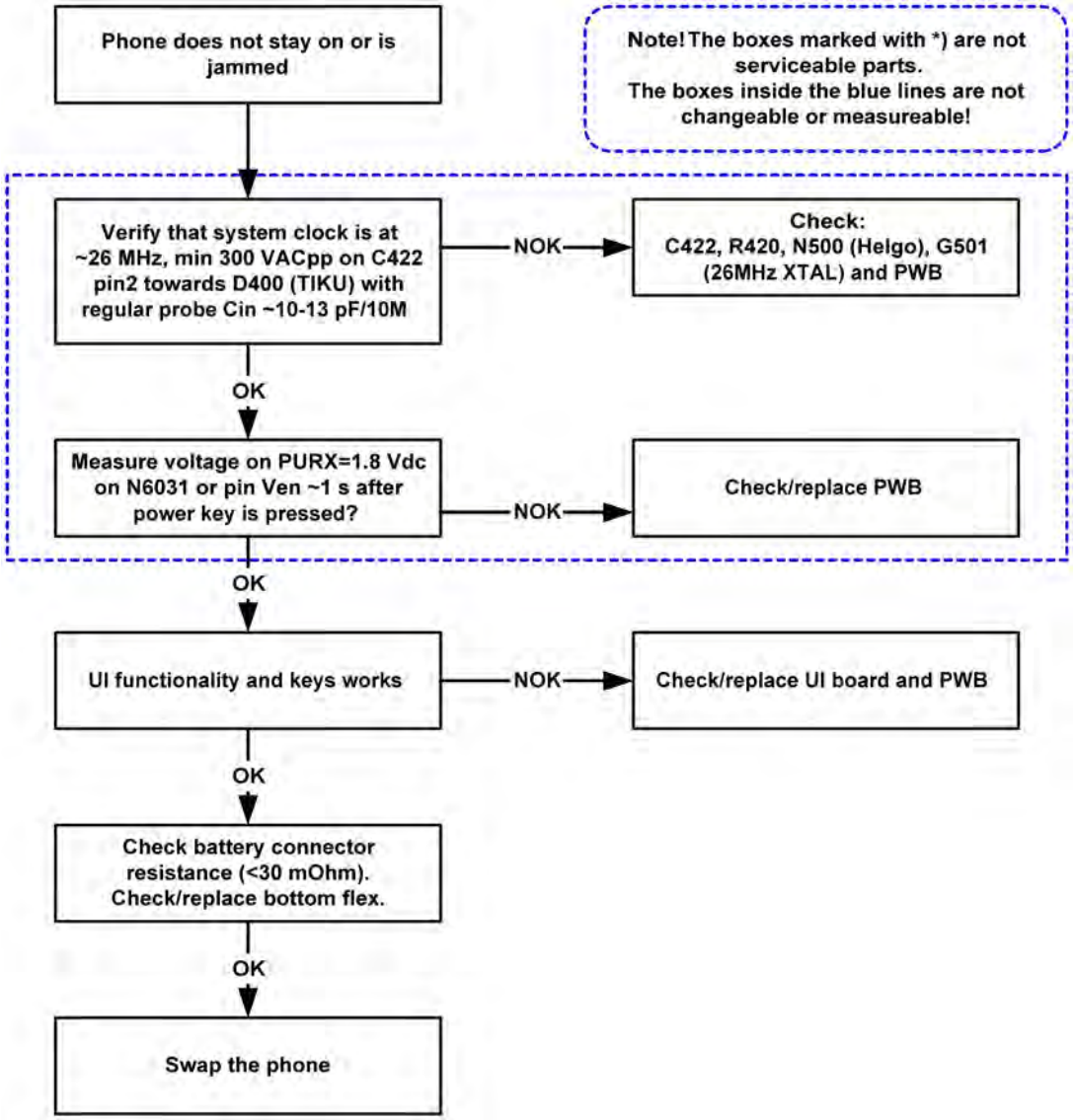

Figure 78 Phone does not stay on or is jammed

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Charging failure

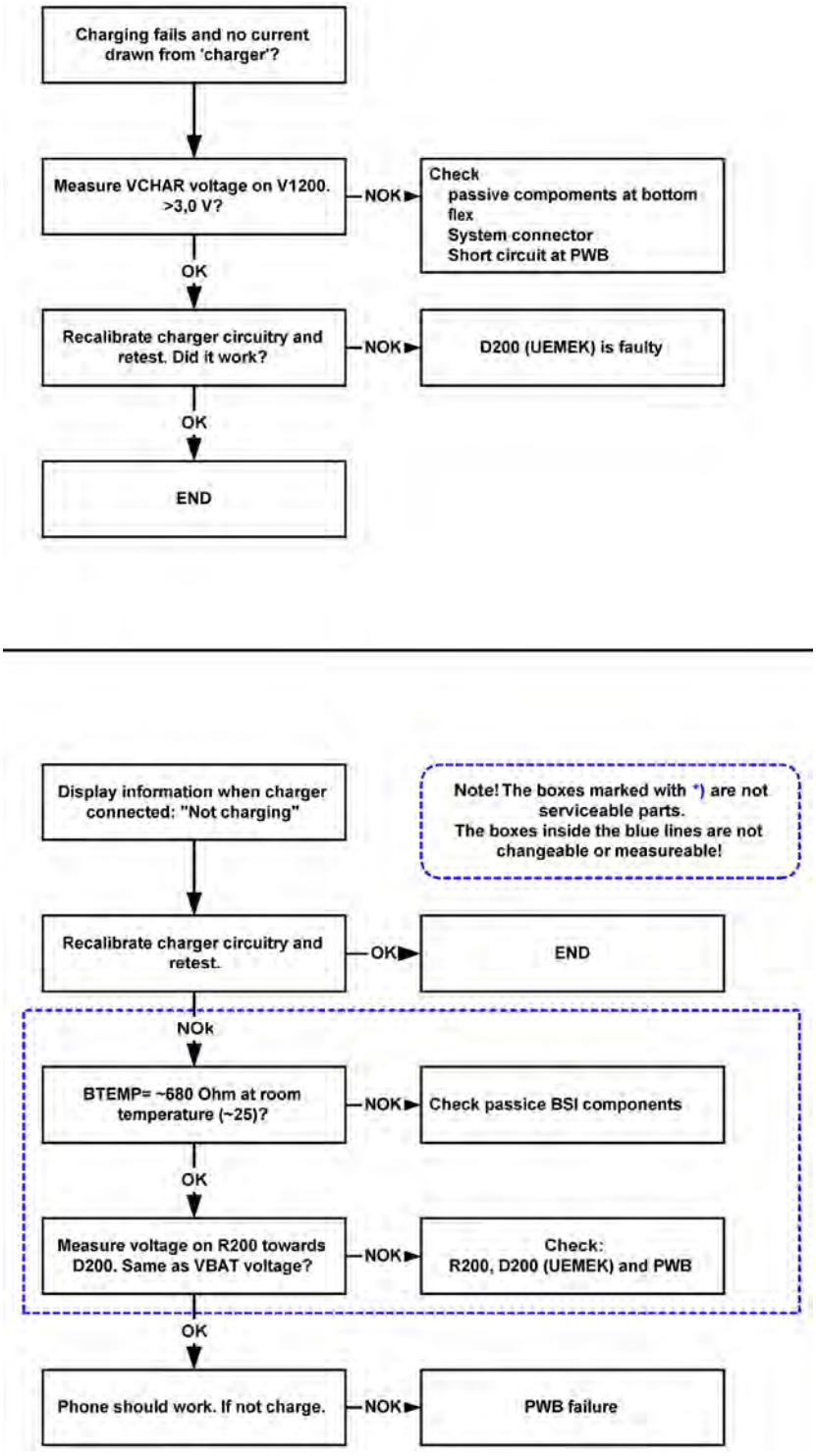

Figure 79 Charging failure

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Low battery operation time

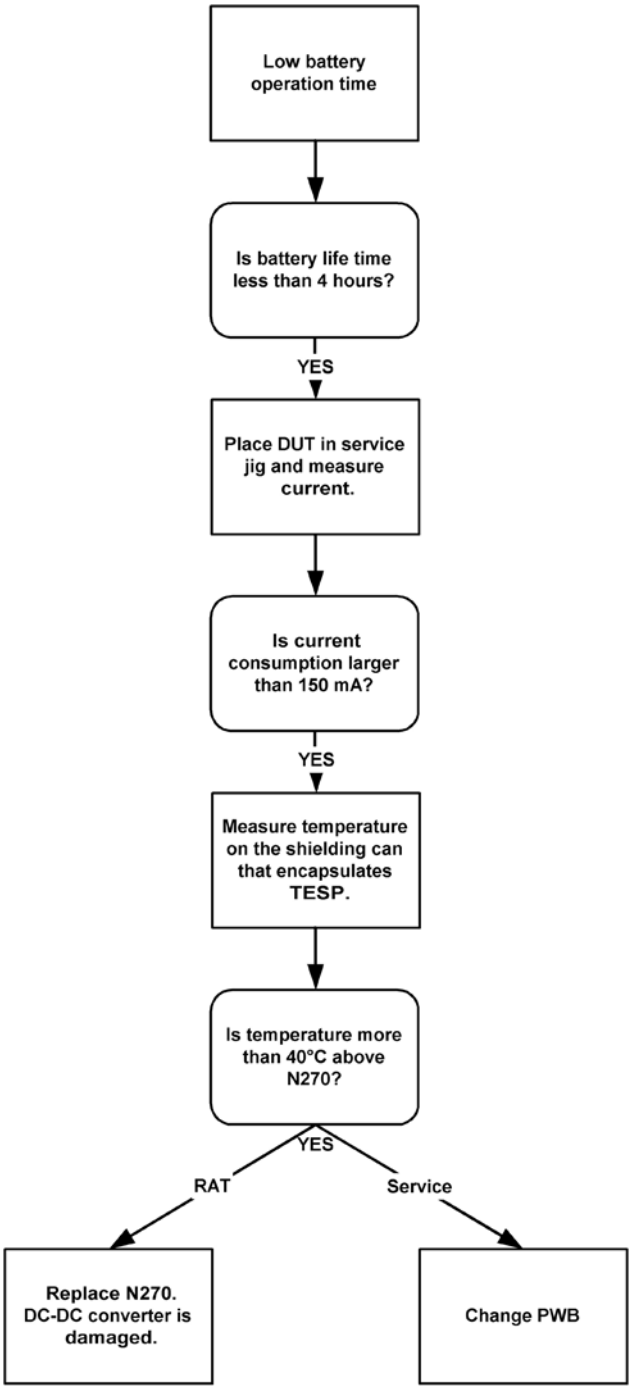

Figure 80 Low battery operation time troubleshooting

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Interface troubleshooting

FM radio troubleshooting

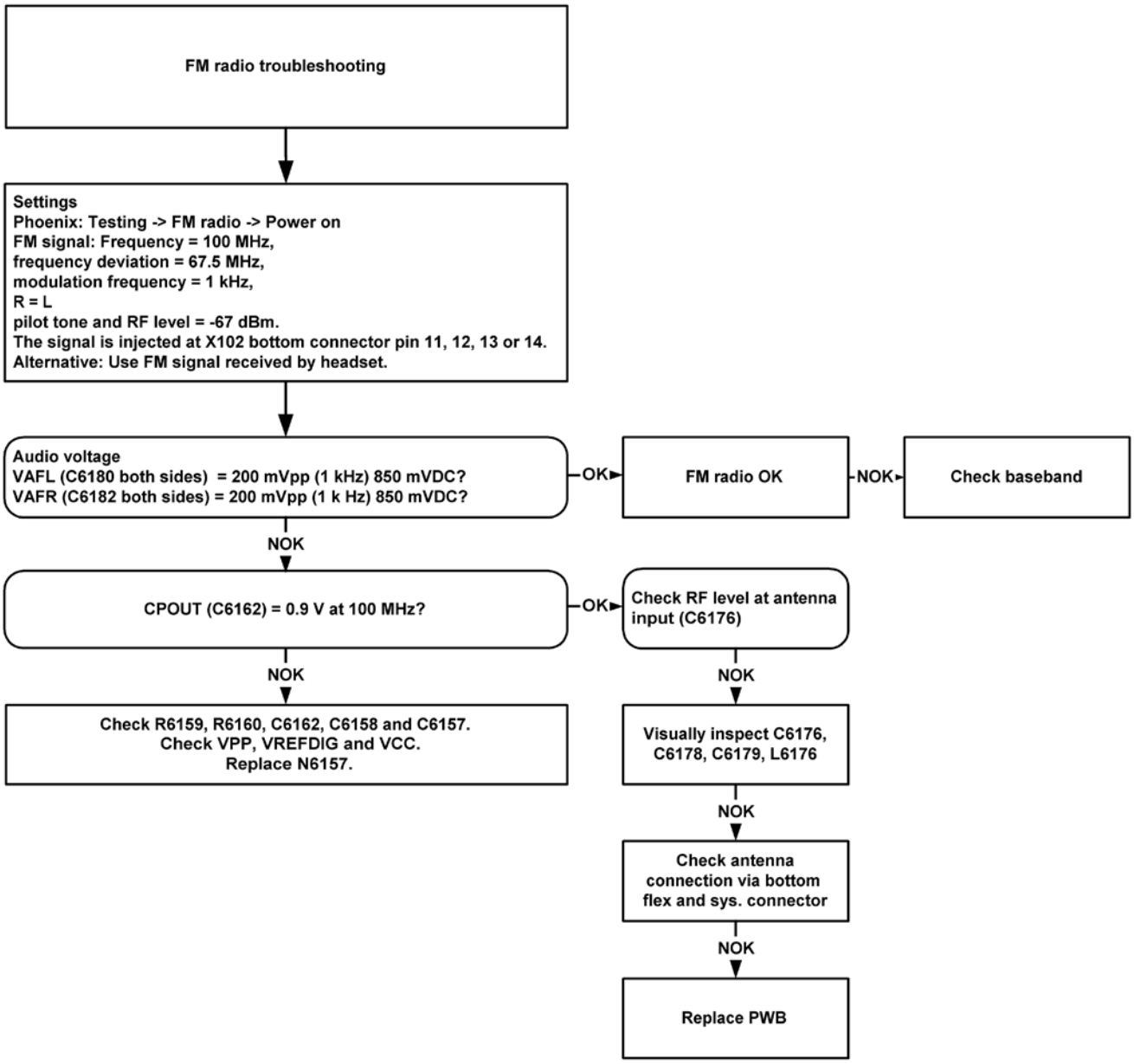

Figure 81 FM radio

Camera failure

Introduction to camera troubleshooting

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

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

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

Taking and evaluating test pictures

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

- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is suffiecient (bright office lightning)
- Do not take the picture towards light source
- Be as still as possible when taking the picture
- Distance should be at least 40cm, 1-2m is recommended

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

- The center of the picture is sharper than the edges
- The image may be blurred, though it does not show in the viewfinder
- Analyse the picture from your PC monitor, full colour setting is recommended
- If possible, compare with a picture of the same motive taken with a similar Nokia device

Camera troubleshooting

If the camera is not working, do the following:

1 Check/replace PWB

2 Replace PWB

SIM card failure

The hardware of the SIM interface from the UEMEK to the SIM connector can be tested without a SIM card. When the power is switched on, the phone first searches for a 1.8 V SIM card and then for a 3 V SIM card. After four failed attempts the display will say "Insert SIM card".

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

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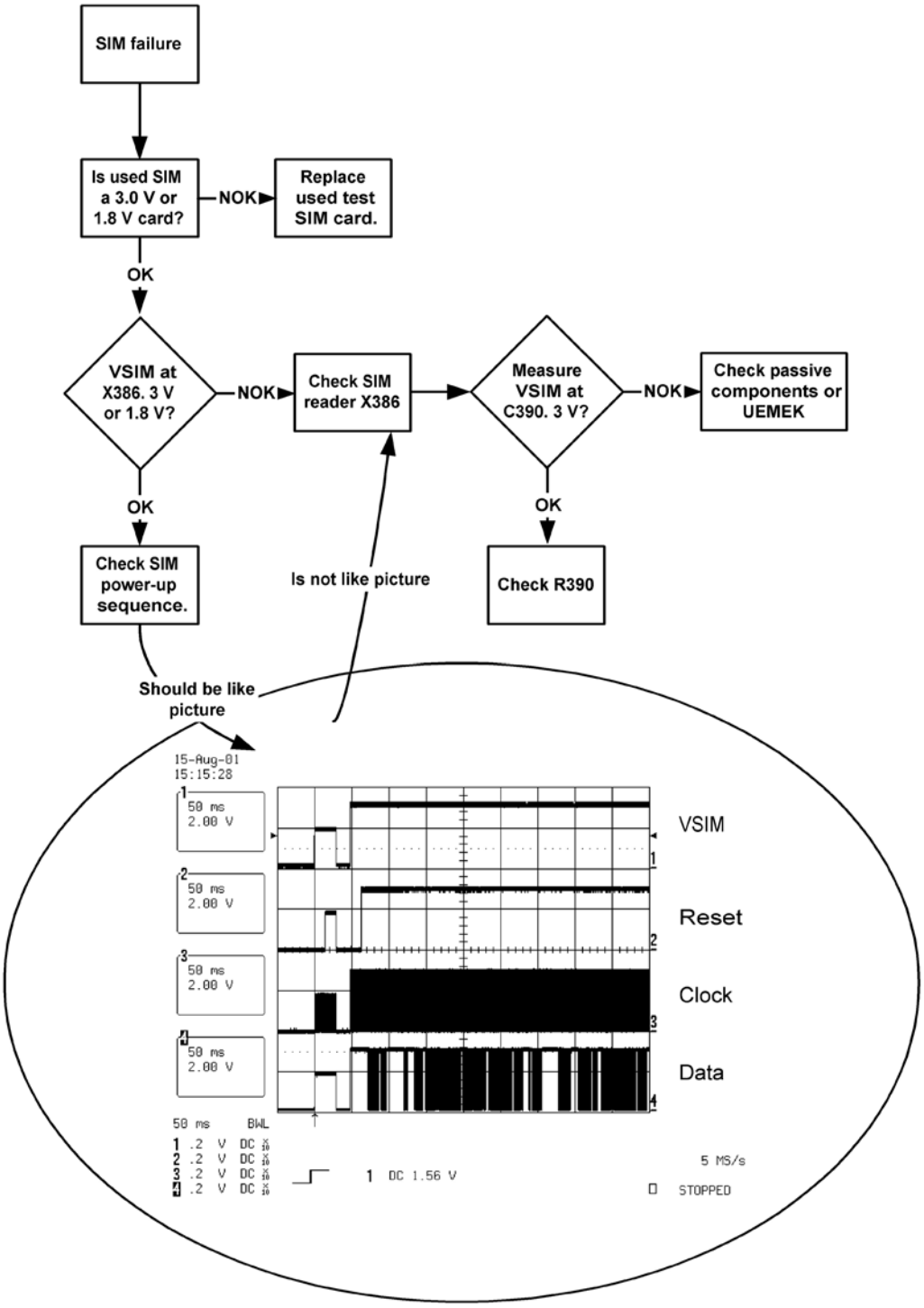

Figure 82 SIM card failure

Flash programming troubleshooting

The flash programming is possible via the pads on the PWB.

In flash programming error cases, the flash prommer (via Phoenix or Darium computer software) can give some information about the error. The most common error information messages are:

- Phone does not set Flashbus TXD line high after VCC is switched on
- External RAM test failed

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Various errors can appear from the prommer when flashing the phone - not all of them can be directly linked to the hardware.

Because uBGA components are used, it is not possible to verify if there is a short circuit in control and address/ data lines on TikuEDGE, NOR flash, NAND flash or SDRAM.

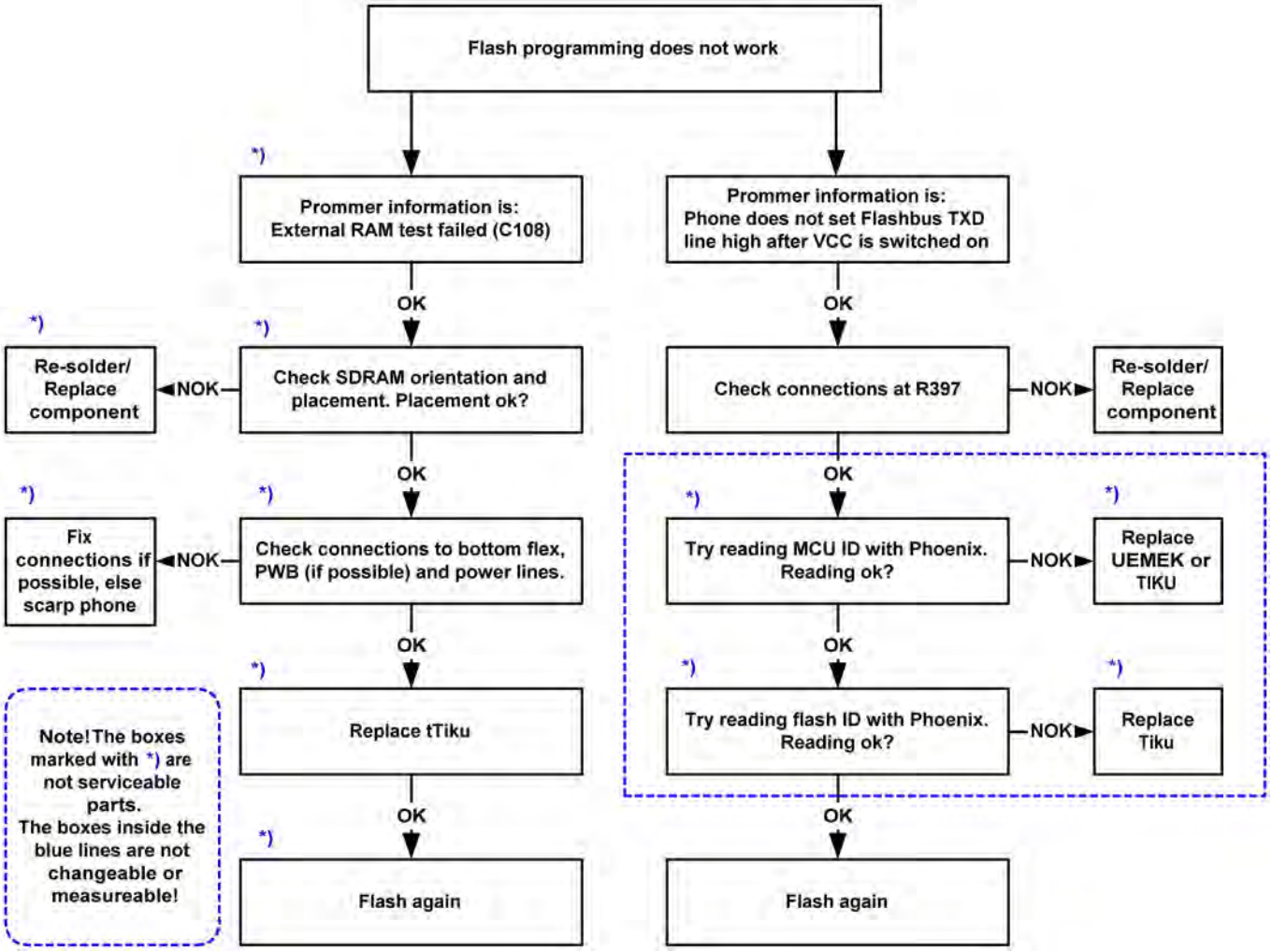

Figure 83 Flash programming troubleshooting

User interface troubleshooting

Display information: "Contact service"

When this error appears in the display it means that one or more of the internal baseband tests has failed. The baseband tests (self tests) are performed each time the phone is powered on. The self tests are divided into those performed while powering up (Start up tests) and the ones that can be executed with a PC using Phoenix (Runtime tests). The following Start-up tests are performed during power up:

UEM CBUS IF TEST

SLEEP X LOOP TEST

AUX DA LOOP TEST

EAR DATA LOOP TEST

TX IDP LOOP TEST

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TX IQ DP LOOP TEST
SIM CLK LOOP TEST
SIM IO CTRL LOOP TEST
MBUS RX TX LOOP TEST
BACKUP BATT TEST
RADIO TEST
WARRANTY TEST
PA TEMP TEST
SIM LOCK TEST
PPM VALIDITY TEST
KEYBOARD STUCK TEST
LPRF IF TEST
FLASH CHECKSUM TEST
CAMERA IF TEST
EXT RAM DATA BUS TEST
EXT RAM ADDR BUS TEST
NAND FLASH ID TEST
BT WAKEUP TEST
IR IF_TEST

If all these self tests are passed, the phone will start up. From Phoenix it is possible to run all the self tests and the additional “Runtime test”.

Power key failure

If the power key does not work properly, follow these instructions:

1 Check power key connection in antenna connector.
2 Replace either antenna or PWB.

UI module keys troubleshooting

If the UI module keys are not working, do the following:

1 Check/replace UI-flex
2 Check baseband (if LED)
3 Replace PWB

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Audio troubleshooting

Uplink or downlink failure

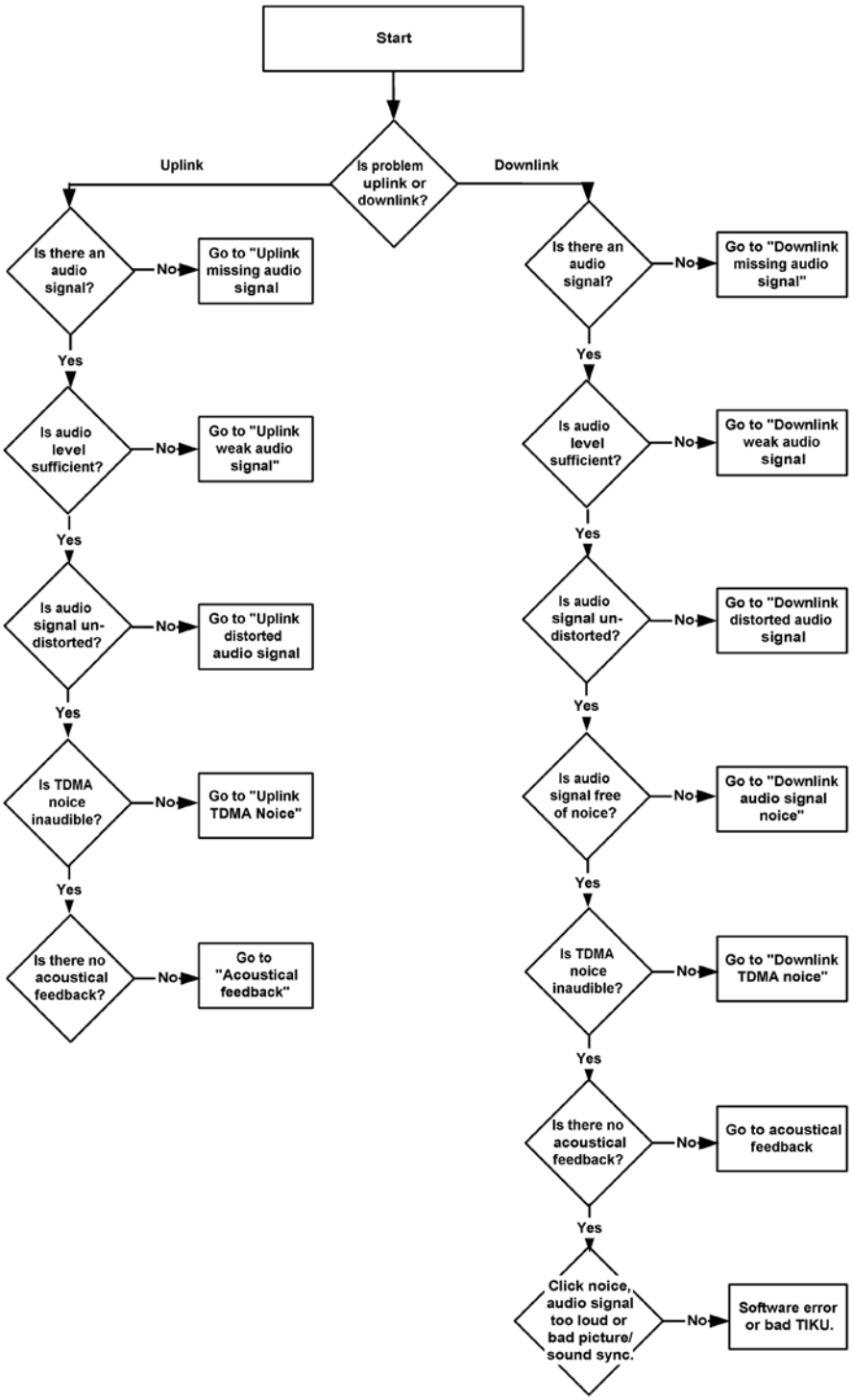

Figure 84 Uplink or downlink failure

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Uplink missing audio signal

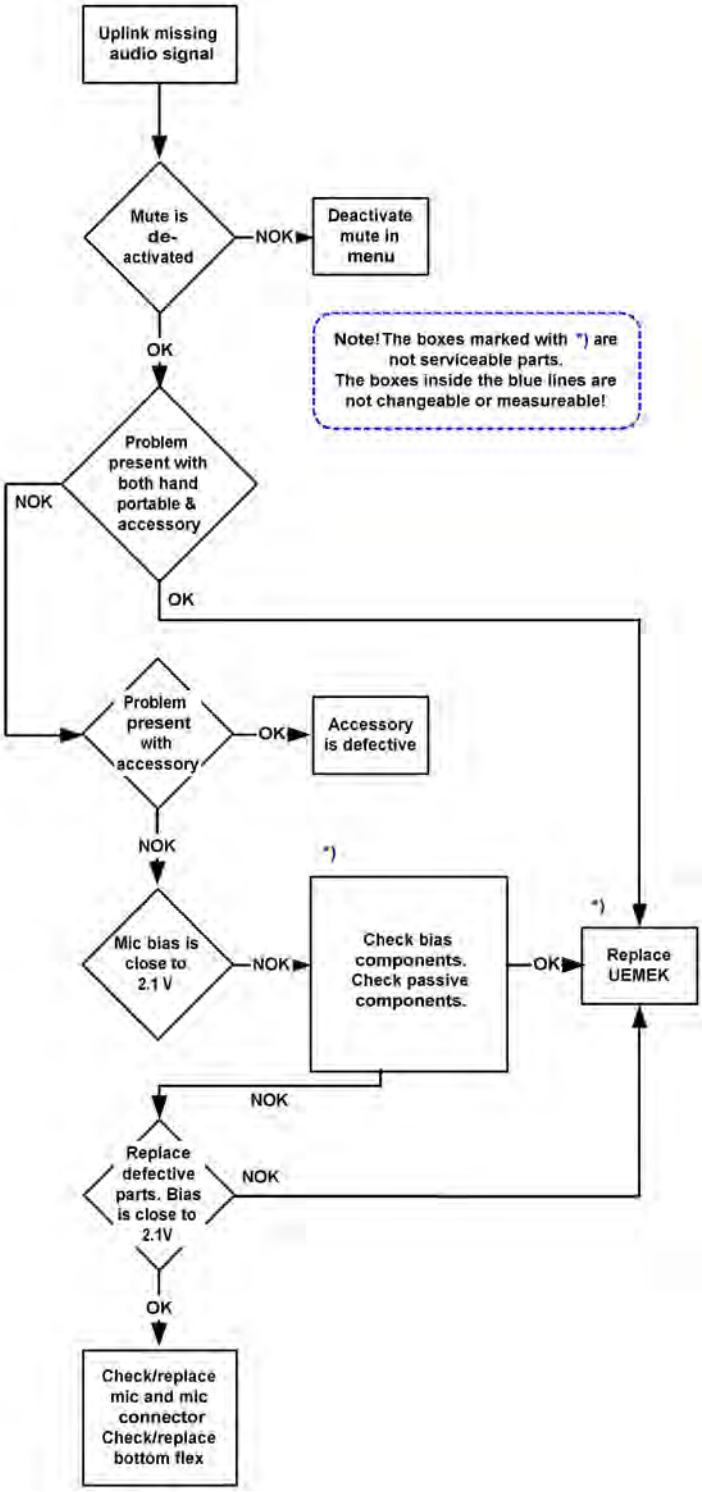

Figure 85 Uplink missing audio signal

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Uplink weak audio signal

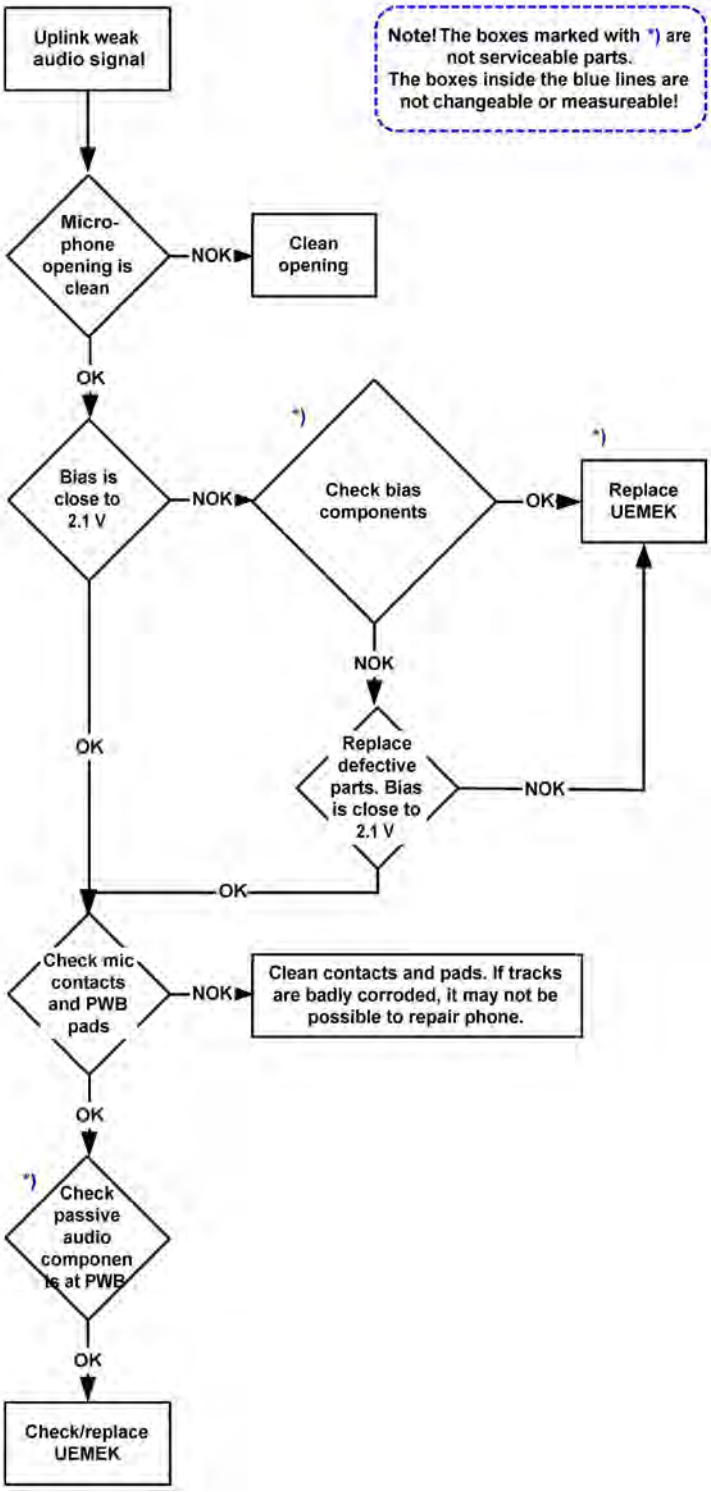

Figure 86 Uplink weak audio signal

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Uplink distorted audio signal

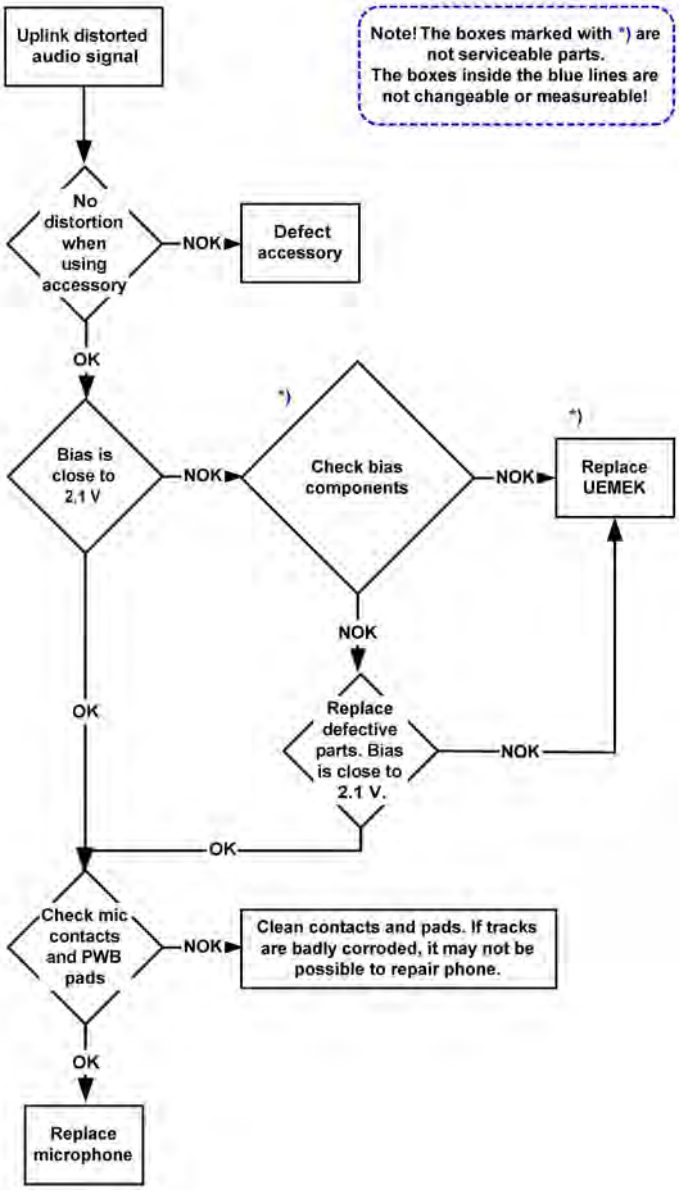

Figure 87 Uplink distorted audio signal

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Uplink TDMA noice

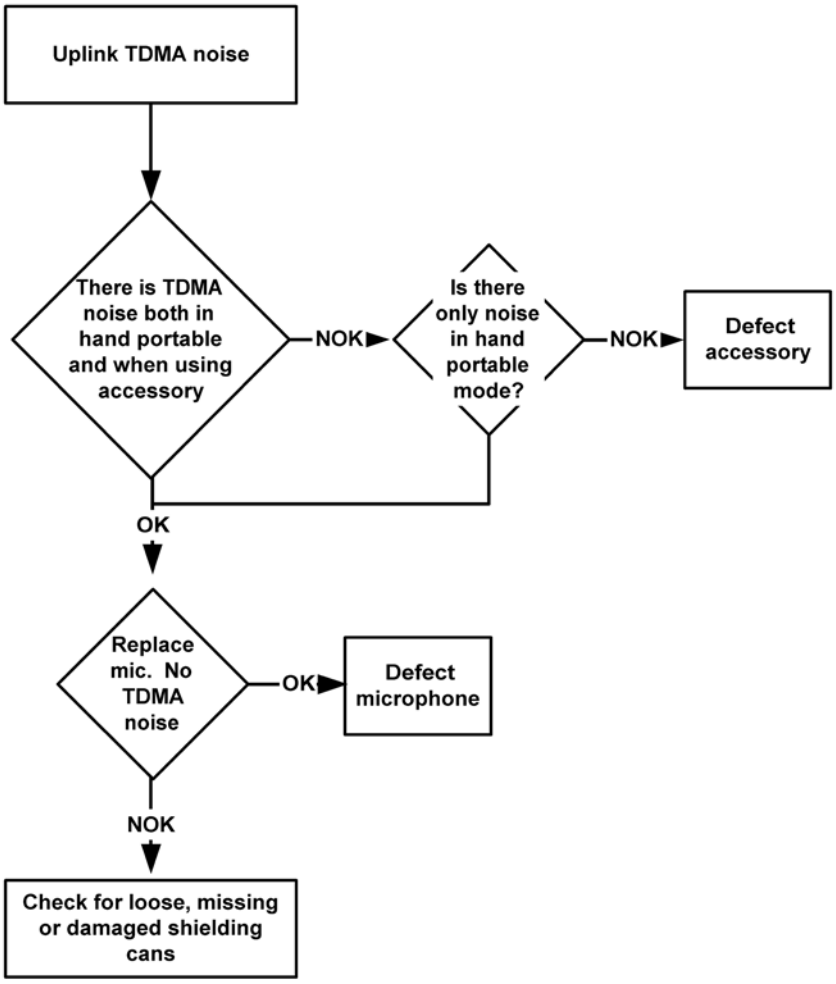

Figure 88 Uplink TDMA noice

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Downlink missing audio signal

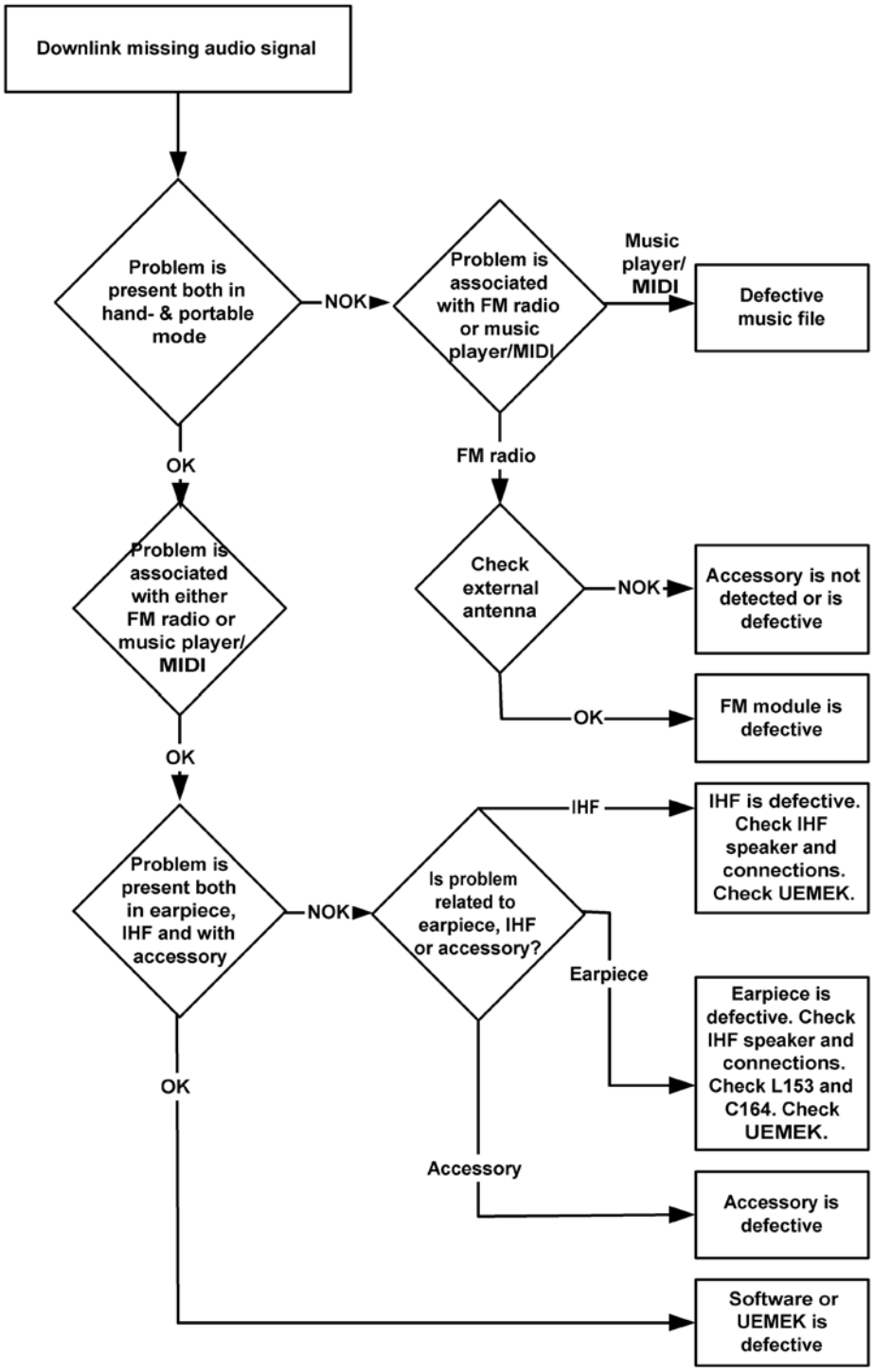

Figure 89 Downlink missing audio signal

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Downlink weak audio signal

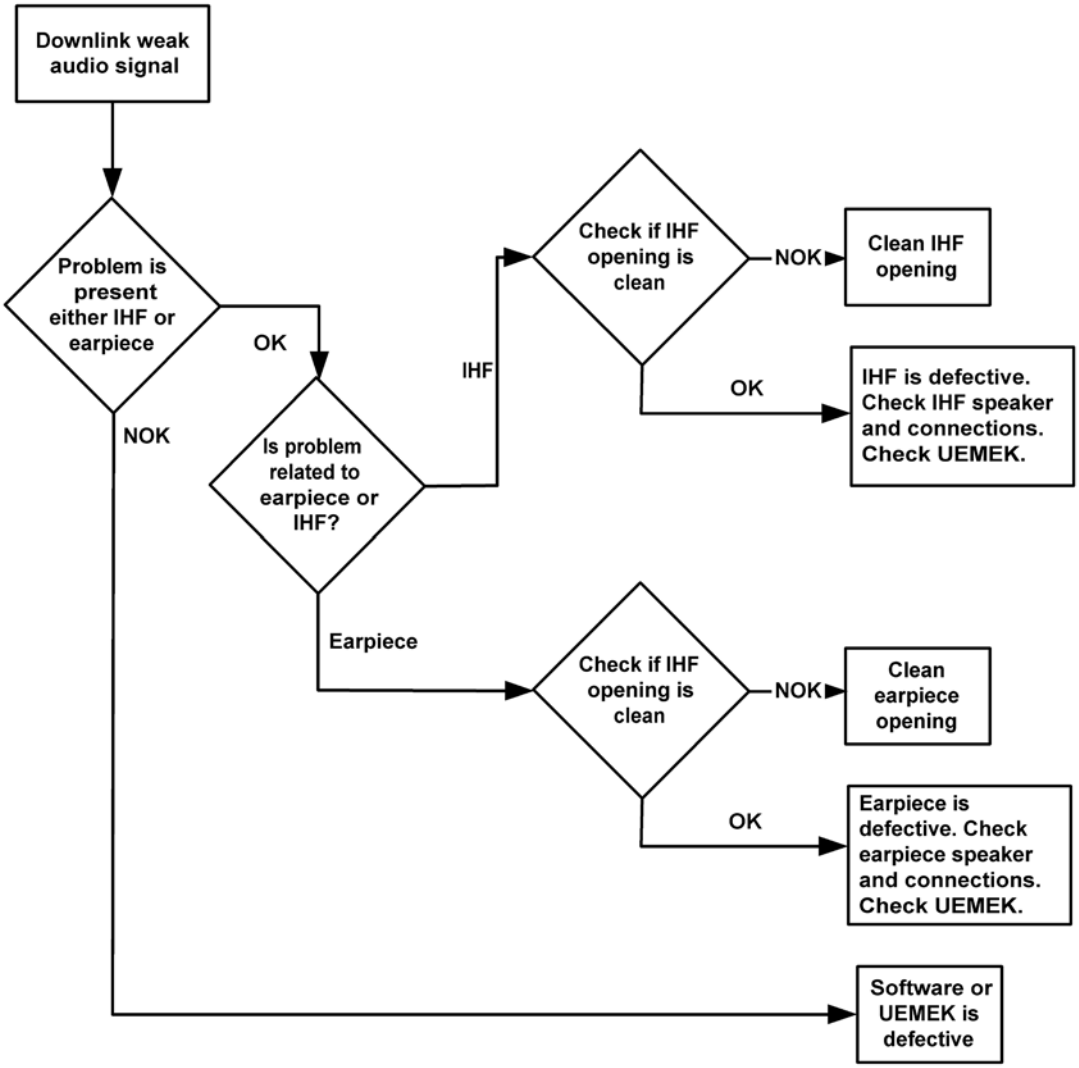

Figure 90 Downlink weak audio signal

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Downlink distorted audio signal

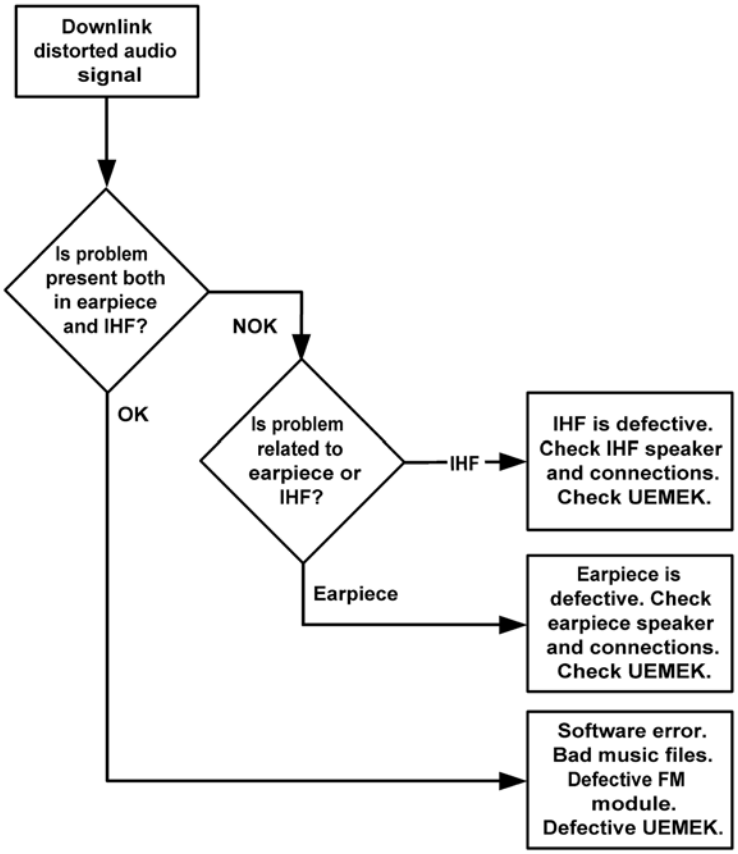

Figure 91 Downlink distorted audio signal

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Downlink noise in audio signal

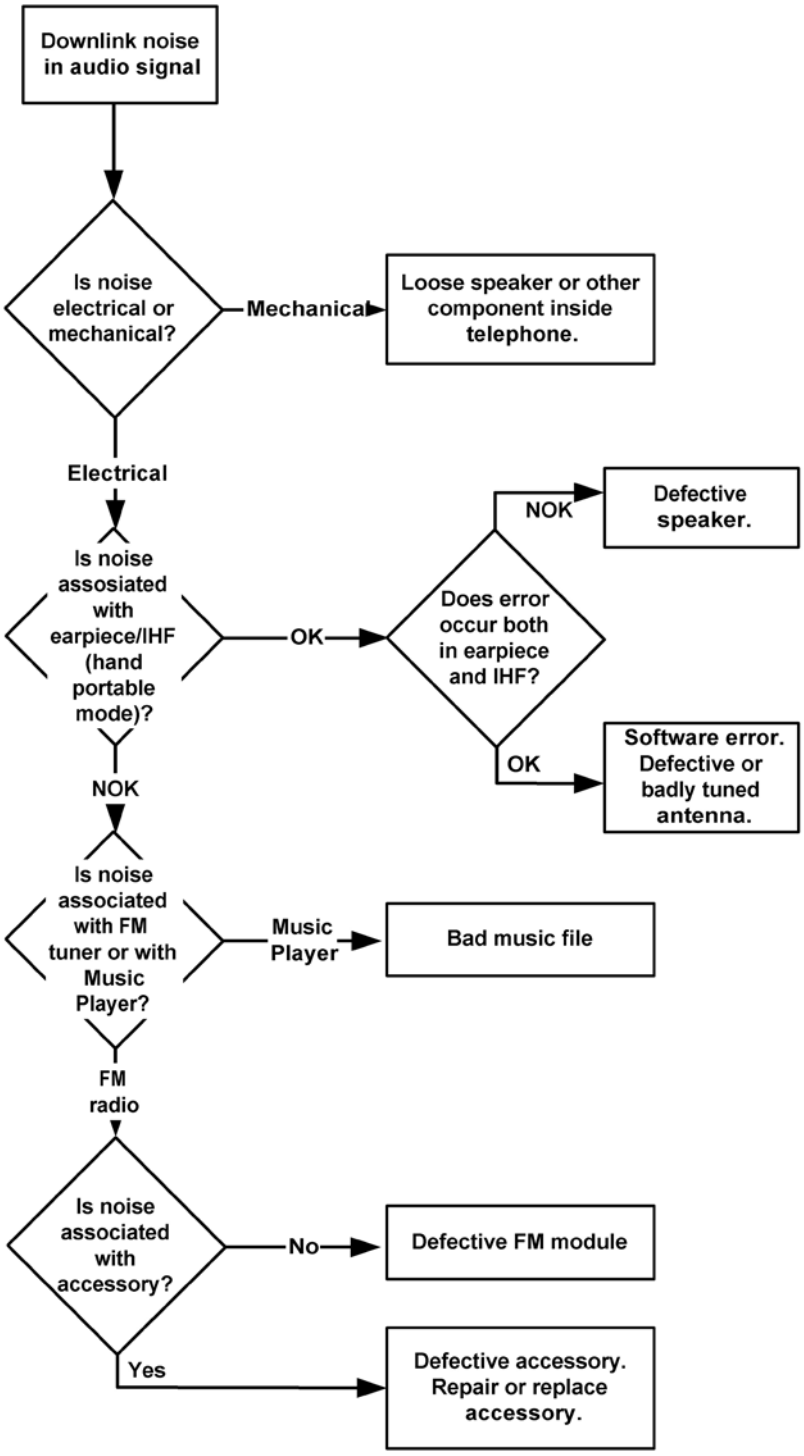

Figure 92 Downlink noise in audio signal

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Downlink TDMA noise

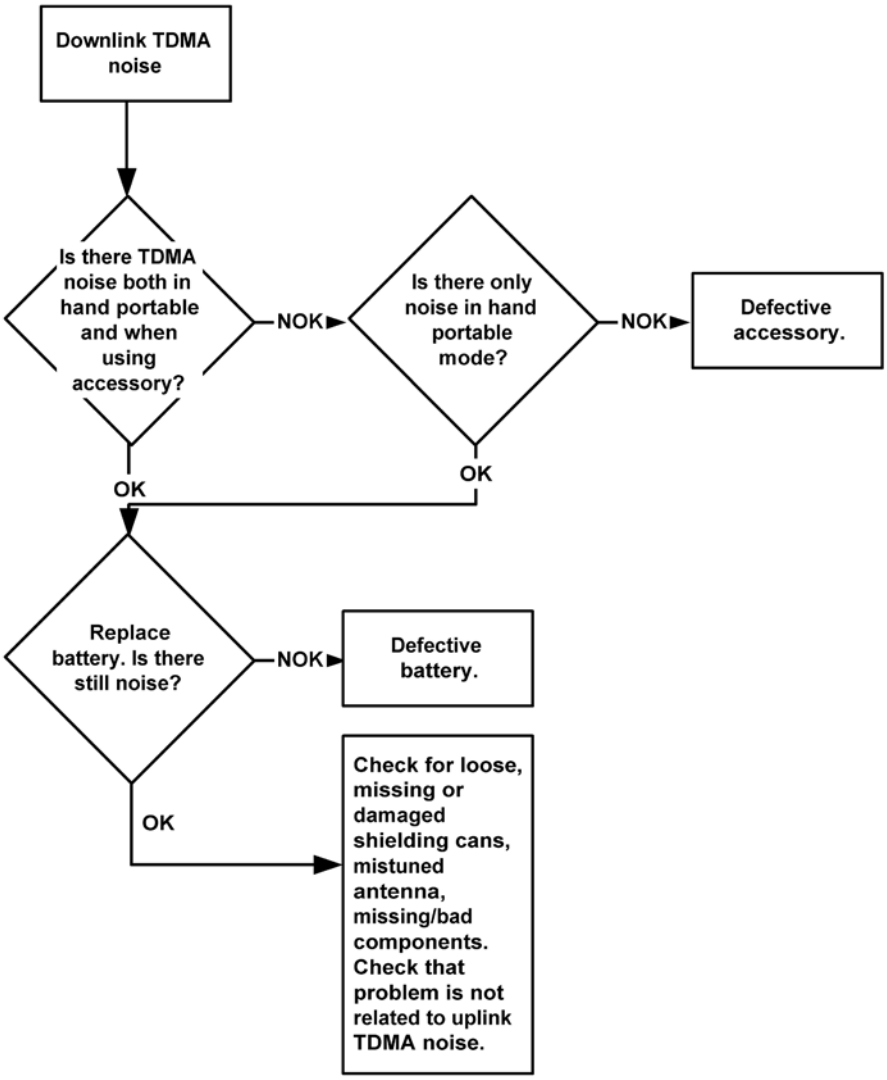

Figure 93 Downlink TDMA noise

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Various noise problems

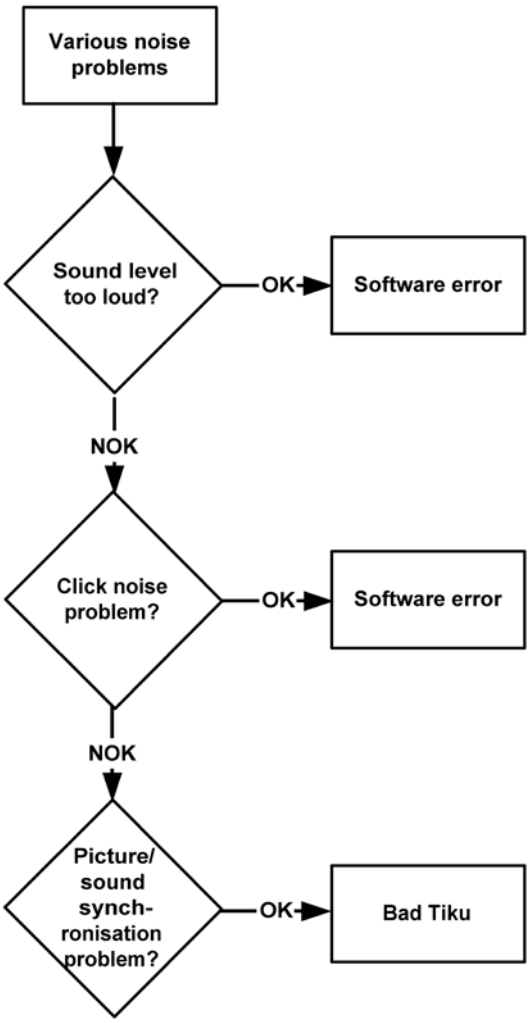

Figure 94 Various noise problems

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BT audio errors

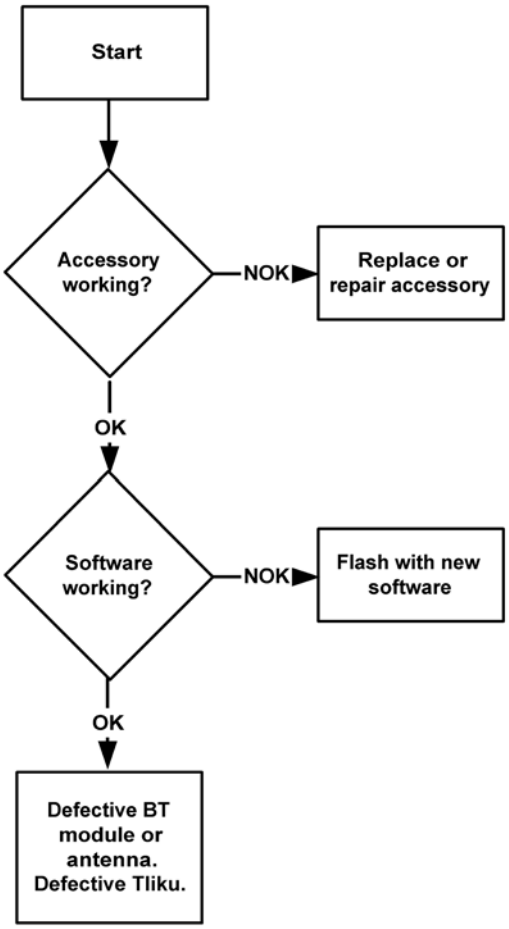

Figure 95 BT audio errors

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Vibra errors

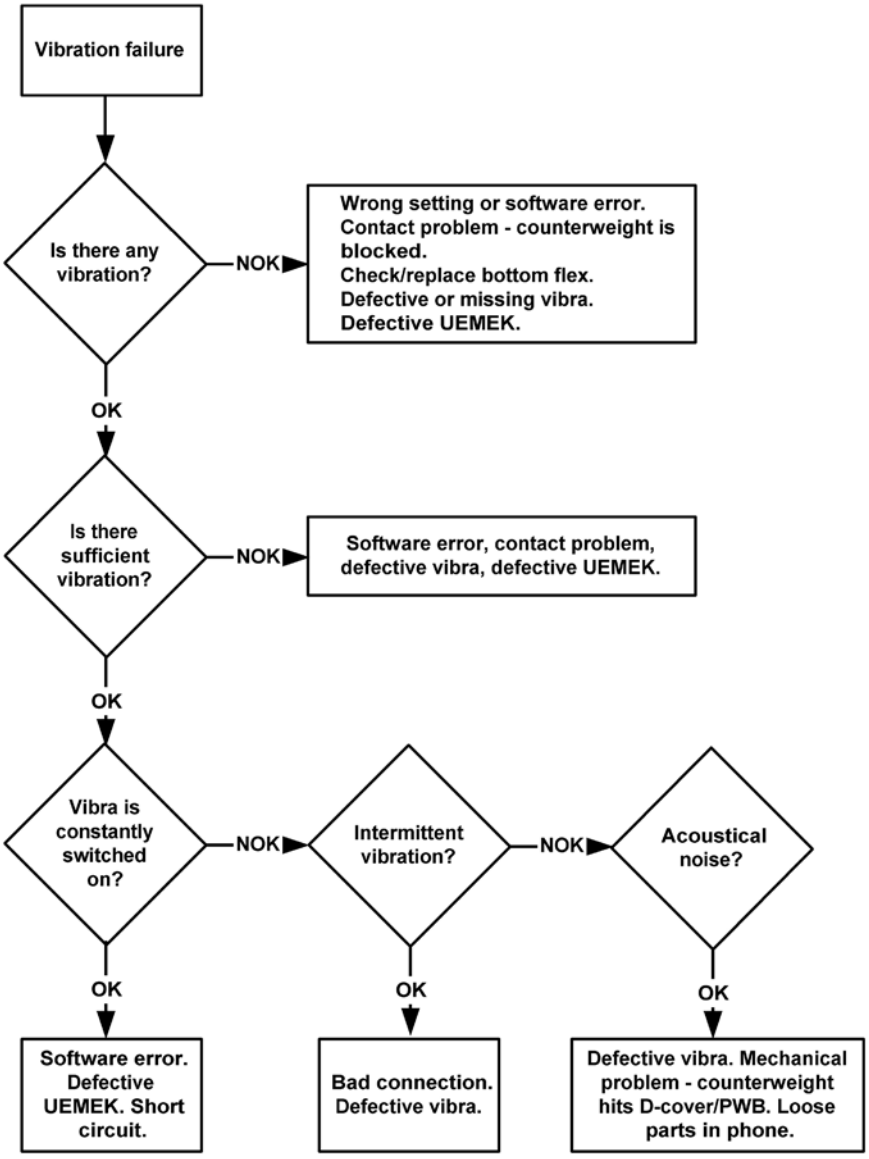

Figure 96 Vibra errors

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Connections troubleshooting

Bluetooth troubleshooting

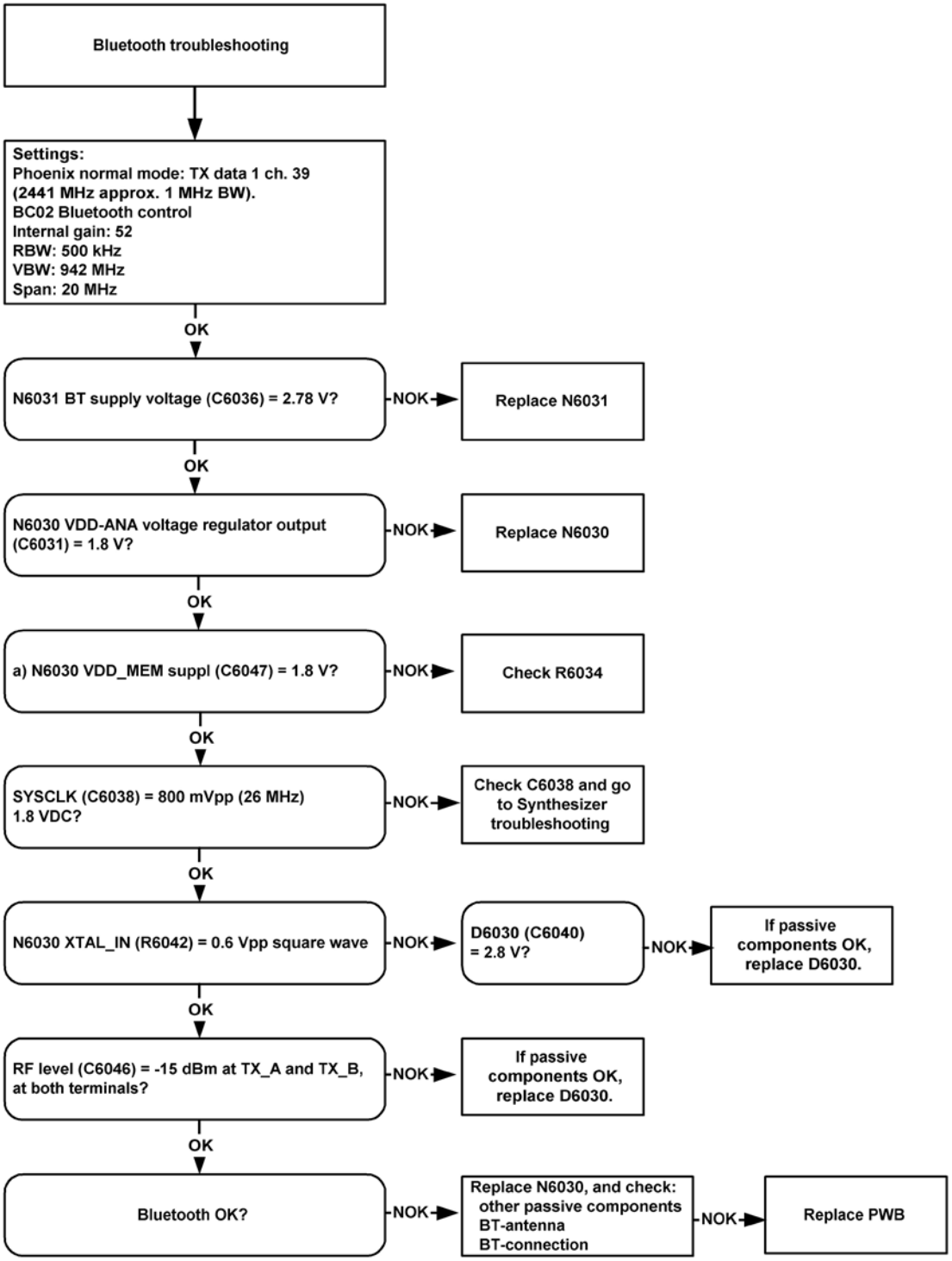

Figure 97 Bluetooth troubleshooting

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Baseband tuning

Energy management calibration

Before you begin

External power is needed.

Energy management calibration is used for calibrating the battery and charger settings of the phone.

Preparation for energy management calibration:

- Charger calibration: Connect DC cable CA-5S between JBV-1 and VIN of the phone.
- Connect 12...15 V from the external power supply to JBV-1.

Note: Make sure that FBUS connection is used. This calibration does not work with MBUS.

Steps

1. Select *Tuning* > *Energy Management Calibration*.

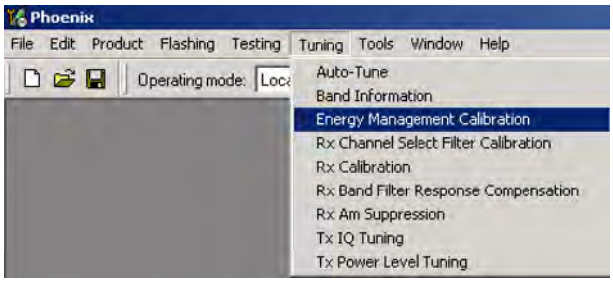

Figure 98 Select energy management calibration

Check the values to calibrate.

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

2. Select “Calibrate” to run selected calibrations..

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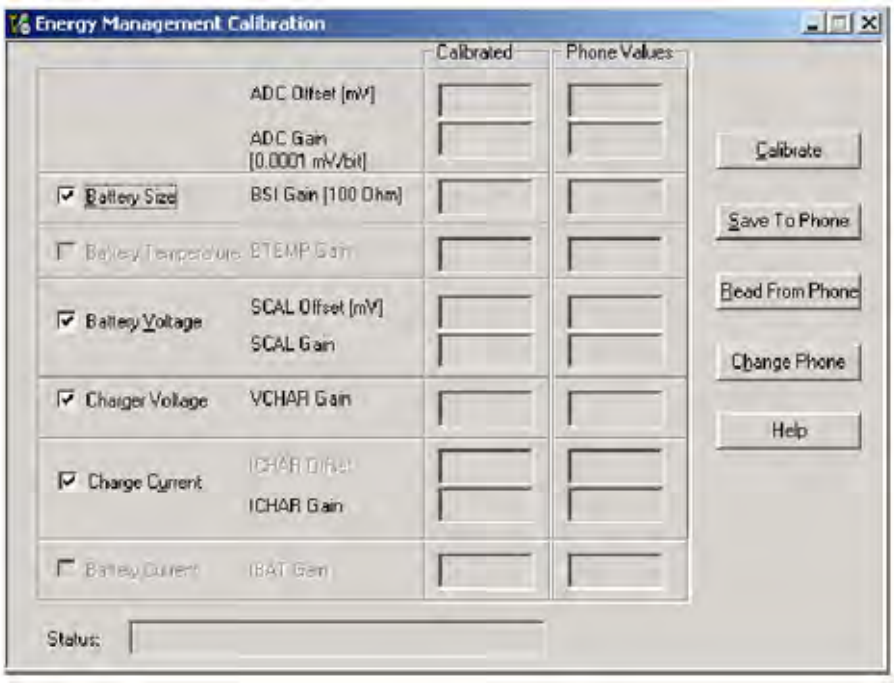

Figure 99 Energy management calibration

3. Set limits for energy management calibration according to the table below.

Table 9 Calibration value limits

Parameter	Min.	Max.
ADC Gain	27000	28000
ADC Offset	-50	50
BSI Gain	930	1100
VBAT Gain	10000	11000
VBAT Offset	2400	2600
VCHAR	58000	62000
ICHAR	3500	4600

4. If values are within limits, select "Save to phone".

   Note: Only values of checked tunings (Battery size, Battery temperature etc.) will be saved.

5. Close the Energy Management Calibration window to end calibration.

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7 — RF Troubleshooting and Tuning

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Introduction to RF troubleshooting

For service

There are no changeable RF components on the PWB when servicing the phone. In case of RF failure, the entire PWB must be replaced.

Go to RF troubleshooting for service (Page 7–5) for assistance.

Note: Most components are under shielding, and must not be replaced for service.

For analysis

On the following pages you will find a step-by-step troubleshooting procedure and reference measurements at the relevant signal points. For functional descriptions, please refer to the System module section (Page 8–5).

Note: Most test points are not accessible unless shielding cans are cut open. This must ONLY be done by the Return analysis technicians and for analysis only!

Notes on reference measurements

- LF & DC signals are measured with Textronix 100 MHz Scope (TDS3014) and P3010 13 pF probe.
- RF signals are measured with R&S FSIQ 7 GHz Spectrum Analyzer and Agilent resistive divider probe (10 dB, 500Ω).
- Please be aware that the RF connector on service adaptor is leaking power (into air) and acts as noise source when probing on RX chain. In 1800 band the problem is most severe while there is no external LNA to amplify the signal above the noise level like in the 1900 band. In 900 band the leakage is not as high due to lower frequency.
- GSM SA settings: RBW=500 kHz, VBW=500 kHz.
- Bluetooth SA settings: RBW=2 MHz, VBW=2 MHz.
- All reference measurements were made on a RM-13 phone (GSM900).
- RF loss Module Repair Jig: 900: 0.3 dB, 1800: 0.6 dB and 1900: 0.6 dB. Bluetooth is 1.8 dB.

Note: At the time of publishing this manual, not all information and all values were available for GSM850. This will be added in the next issue.

RF troubleshooting for service

No RF related components will be changed in service. If the RF module does not function properly, the entire PWB will be replaced. This is how you find out if RF is OK:

1 Place the PWB in the module jig

2 Run the Phoenix auto tuning.

If “fail”, replace PWB.

If “pass”, continue to the next step.

3 Use a test SIM card and set the module to normal mode.

4 Check basic parameters in call mode (all bands) and make a BER measurement.

If “fail”, replace PWB.

If “pass”, continue to the next step.

5 Place the PWB in the phone again and reassemble the phone.

6 Use a test SIM card, set to normal mode and use a GSM tester with antenna or RF coupler.

Measure basic RF parameters in call mode.

If “fail”, replace antenna assy.

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If “pass”, there is no RF failure.

Auto tuning

This phone can be tuned automatically.

Autotune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/NT) with GPIB card
- Power supply
- Product specific module jig
- Cables: 3 (alt.1) RF cable, 1 GPIB cable and DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter *or* one device including all.

Phoenix preparations

Copy the two phone specific ini-files, for example *rm_13_tunings.ini* and *autotune_RM-13.ini*, to a phone specific folder, for example *Phoenix**products**RM-13*\.

Auto tuning procedure

1 Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.

2 The first time you are using automatic tuning on this phone model, on this computer, you will have to *Set loss* for cables and jigs.

3 To go to autotune, select *Tuning (Alt-U)* > *Auto-Tune (Alt-A)* from the menu.

4 If you need more assistance, please refer to the Phoenix *Help*.

RX manual tuning

Calibrating RX Channel Select Filter

Context

This calibration is for the baseband filter inside Helgo ASIC. The calibration is done by internally measuring a prototype filter. For this reason, the calibration is done only once, not separately for 3 bands.

This tuning doesn’t require RF input from an external signal generator.

Steps

1. Select *Tuning* → *RX Channel Select Filter Calibration*

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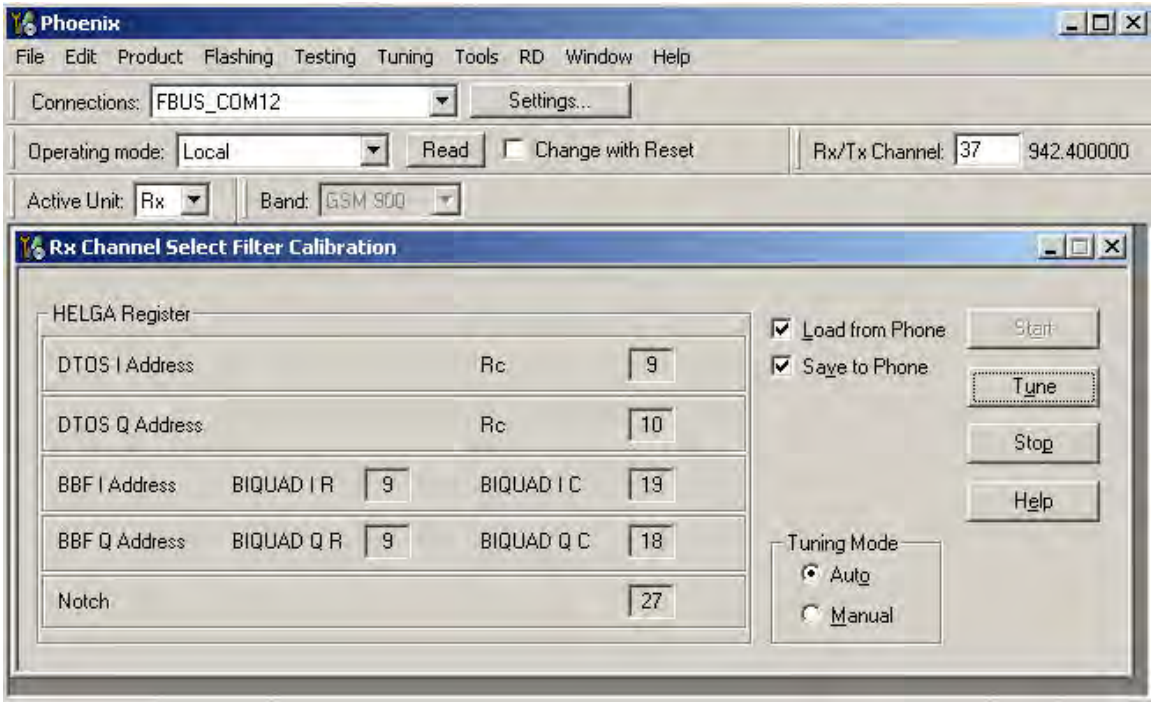

Figure 100 RX Channel Select Filter Calibration

i Check Save to Phone
ii Press Tune
iii Press Stop to store the data to the phone

Results

RX channel select filter calibration is finished.

RX calibration

Context

RX calibration is used to determine gain at different gain settings for front-end and the Helgo ASIC and it needs to be done in all three bands.

Note: Always calibrate band 850/900 first.

RX calibration requires an external signal generator.

Steps

1. Select *Tuning* → *RX calibration*

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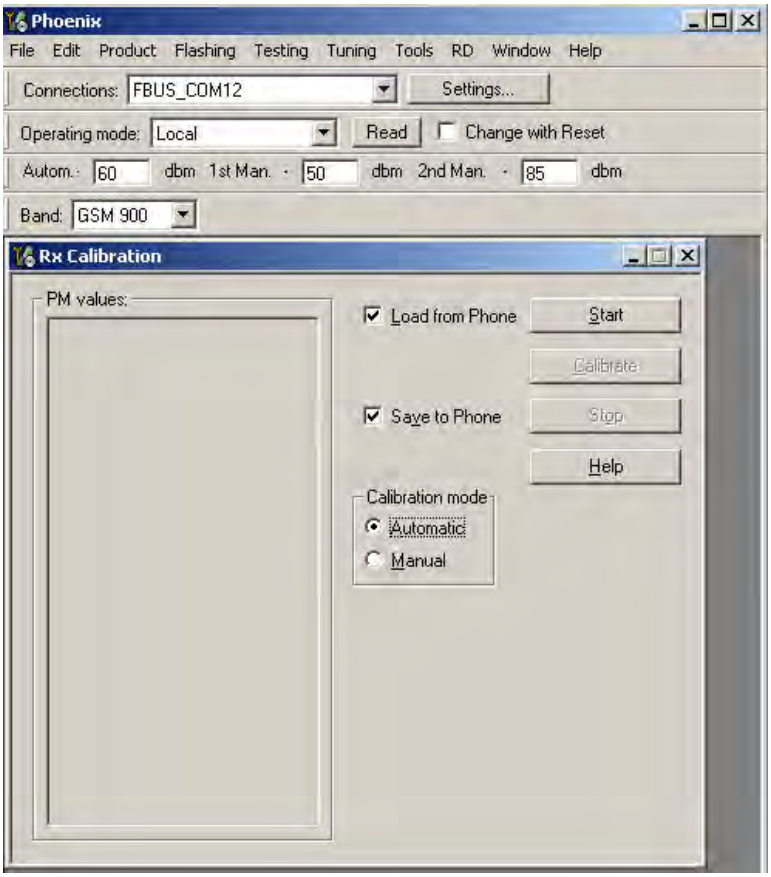

Figure 101 RX calibration (Example)

i Make sure you have made the following settings:

Table 10 RX calibration settings

Band	Calibration mode	1st Manual [dbm]	2nd Manual [dbm]
GSM 850/900	Automatic	-50	-85
GSM 1800/1900	Automatic	-50	-85

ii Check *Load from phone* and *Save to phone*.

iii Press *Start*

Initial data will be loaded from the phone and calibration starts.

The following banner pops up:

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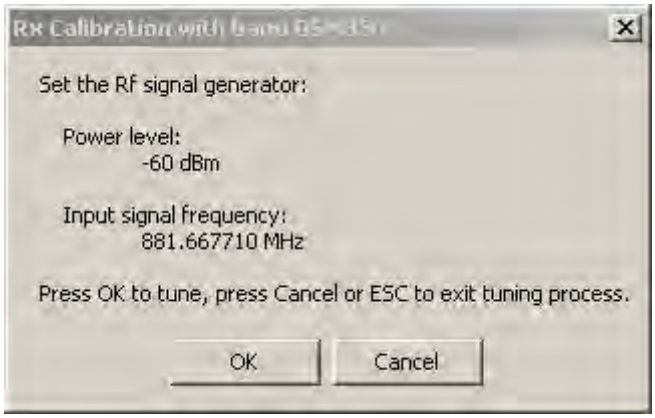

Figure 102 RX calibration with band EGSM900 (Example)

iv Follow the instructions in the pop–up window and set frequency and level of the signal generator.

v Press OK

vi Press “Save & Continue”

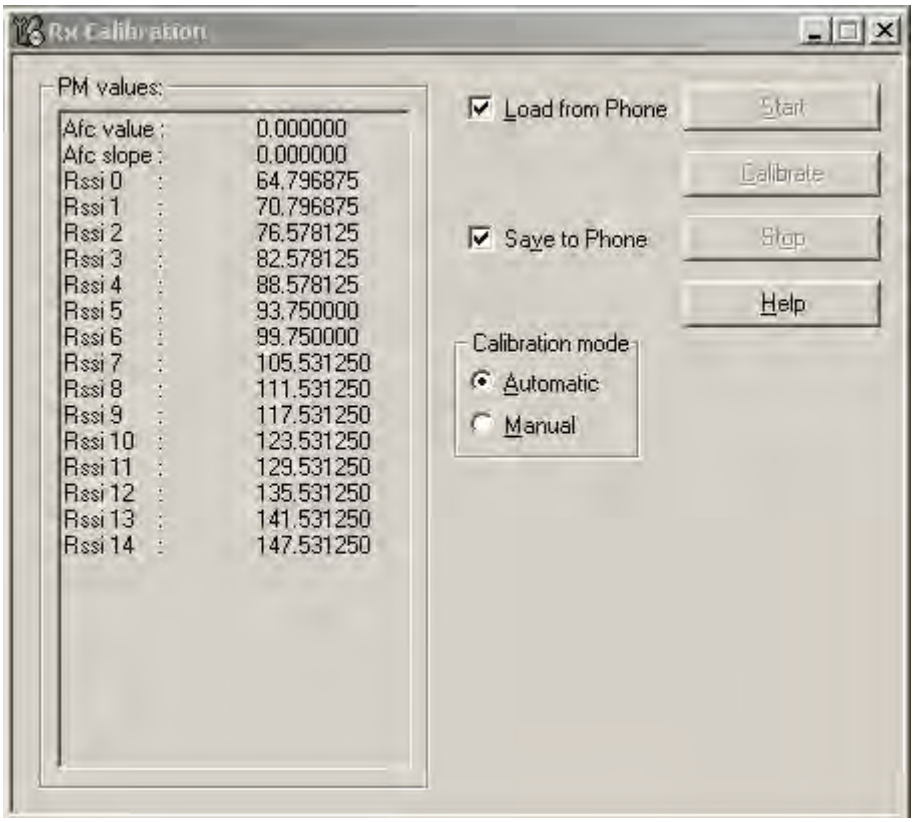

Figure 103 RX calibration values (Example)

Results

Calibration data will be stored to the phone.

Next action

Continue to next band.

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RX band filter response compensation (GSM)

Before you begin

Rx calibration must be done before the RX Band Filter Response Compensation

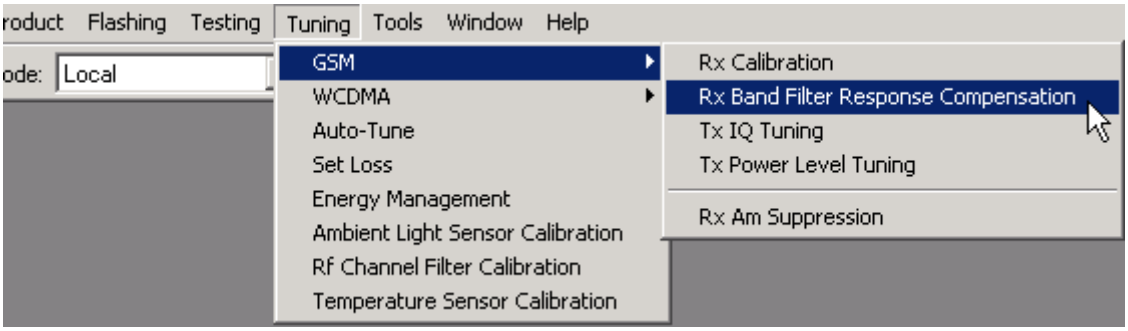
Context

In each GSM RX band, there is a band pass filter in front of Helgo front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

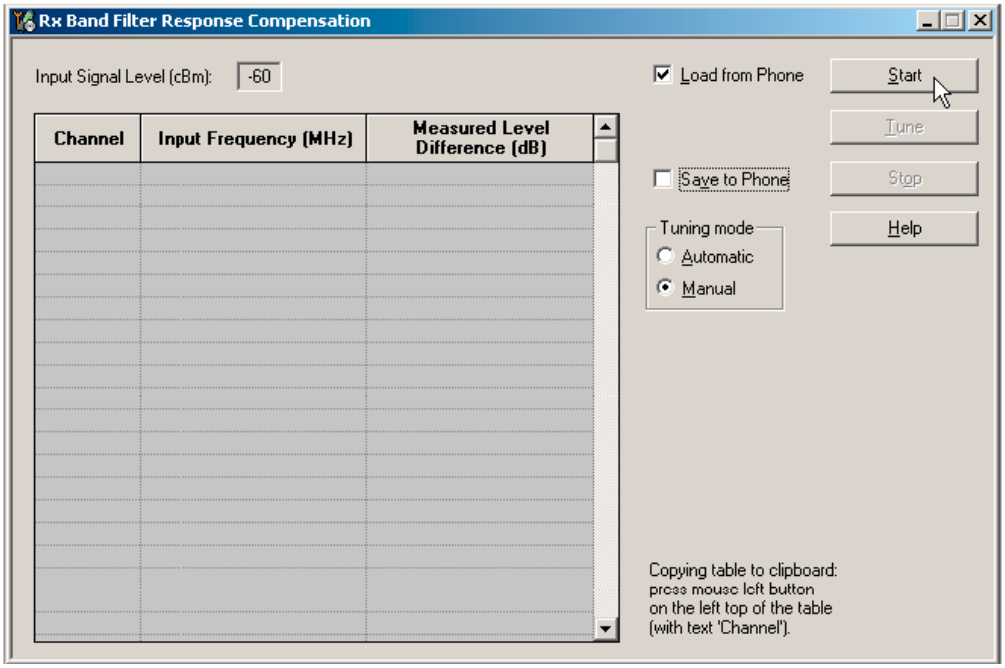
The calibration has to be repeated for each GSM band.

Steps

1. Connect module jig's GSM connector to signal generator.
2. From the dropdown menus, set "Operating mode" to Local, "System mode" to GSM, and Band to GSM900.
3. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.



4. Check "Manual" and "Load from Phone" check boxes. Clear "Save to Phone" check box
5. Click Start.



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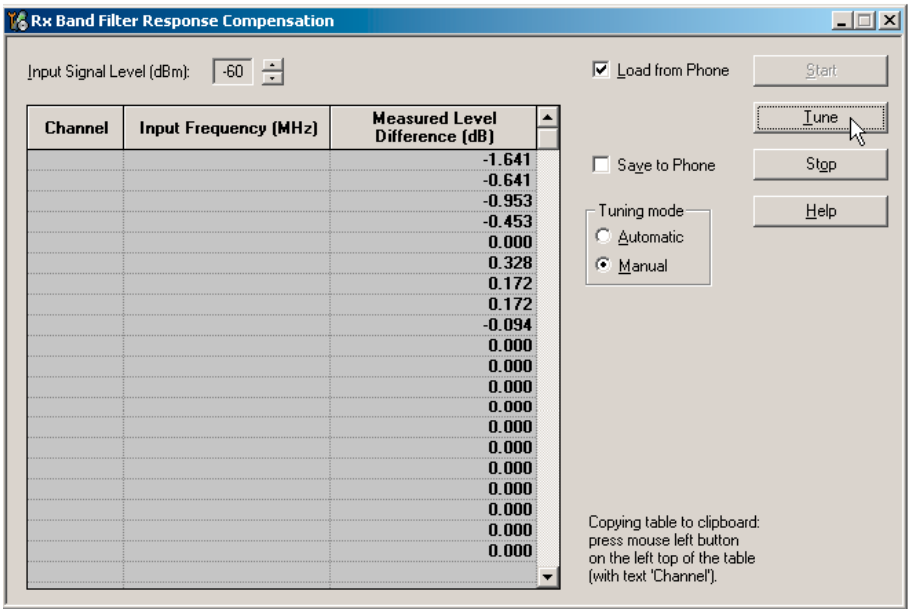
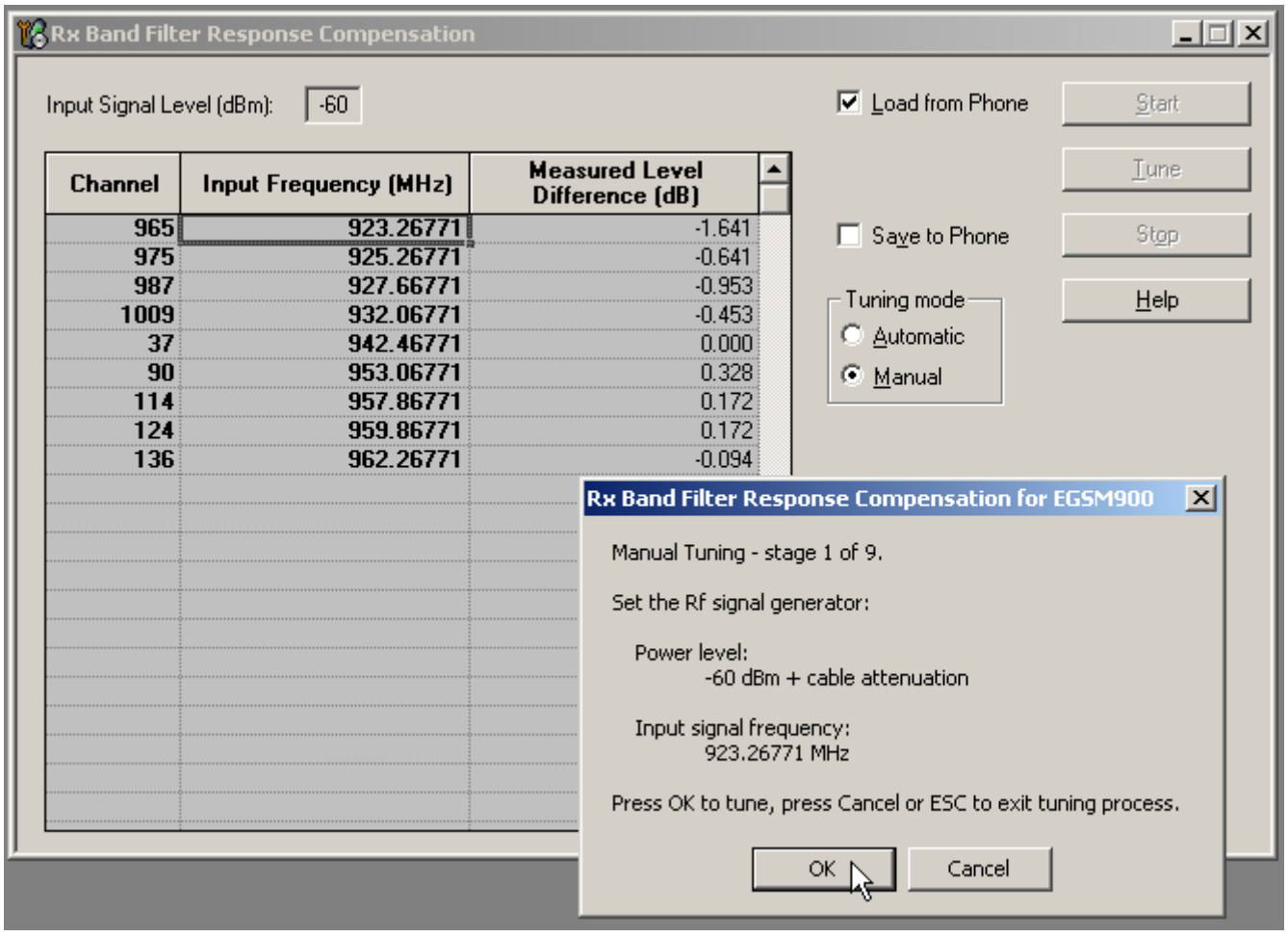
6. Click Tune.



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



8. To perform tuning, click OK.

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9. Go through all 9 frequencies.
10. Check that the tuning values are within the limits specified in this table:

Table 11 RX band filter response tuning values

Band & channel	Min [dB]	Typ [dB]	Max [dB]
GSM900			
Ch. 965/923.26771 MHz	-10	-1	5
Ch. 975/925.26771 MHz	-3	0	5
Ch. 987/ 927.66771 MHz	-3	0	5
Ch. 1009 / 932.06771 MHz	-3	0	5
Ch. 37 / 942.46771 MHz	-3	0	5
Ch. 90 / 953.06771 MHz	-3	0	5
Ch. 114 / 957.86771 MHz	-3	0	5
Ch. 124 / 959.86771 MHz	-3	0	5
Ch. 136 / 962.26771 MHz	-10	-1	5
GSM1800			
Ch. 497 / 1802.26771 MHz	-10	-1	5
Ch. 512 / 1805.26771 MHz	-3	0	5
Ch. 535 / 1809.86771 MHz	-3	0	5
Ch. 606 / 1824.06771 MHz	-3	0	5
Ch. 700 / 1842.86771 MHz	-3	0	5
Ch. 791 / 1861.06771 MHz	-3	0	5
Ch. 870 / 1876.86771 MHz	-3	0	5
Ch. 885 / 1879.86771 MHz	-3	0	5
Ch. 908 / 1884.46771 MHz	-10	-1	5
GSM1900			
Ch. 496 / 1927.06771 MHz	-10	-1	5
Ch. 512 / 1930.26771 MHz	-3	0	5
Ch. 537 / 1935.26771 MHz	-3	0	5
Ch. 586 / 1945.06771 MHz	-3	0	5
Ch. 661 / 1960.06771 MHz	-3	0	5
Ch. 736 / 1975.06771 MHz	-3	0	5
Ch. 794 / 1986.66771 MHz	-3	0	5
Ch. 810 / 1989.86771 MHz	-3	0	5
Ch. 835 / 1994.86771 MHz	-10	-1	5

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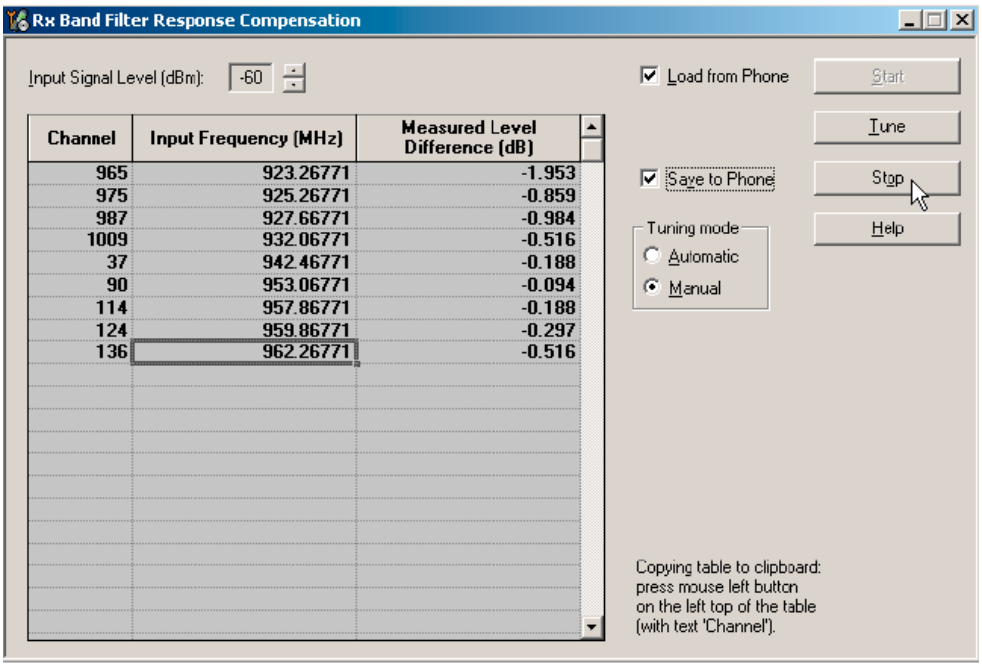
11. Check the "Save to Phone" check box and click Stop if the values are within the limits.



Next action

Repeat the steps 4 to 10 for GSM1800 and GSM1900.

TX manual tuning

TX power level tuning (GSM)

Context

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

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

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

Steps

1. Connect the phone to a spectrum analyzer.
2. From the drop down menus, set "Operating mode" to Local, "System mode" to GSM, and select band.

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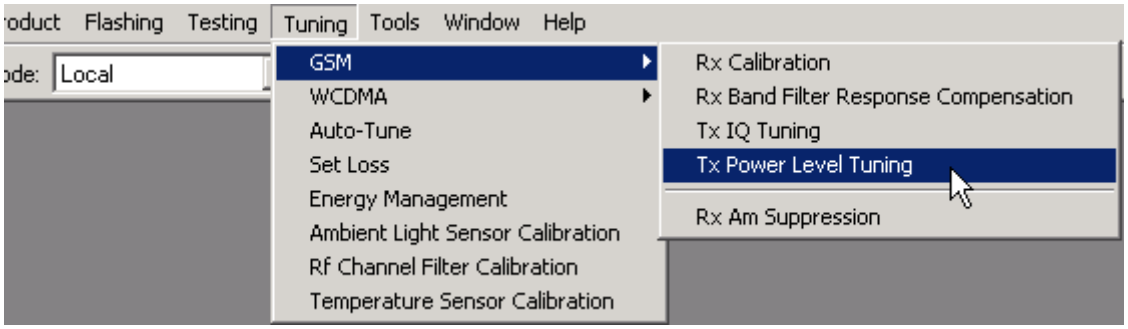
3. From the Tuning menu, choose *GSM -> Tx Power Level Tuning* .



4. Set Mode to *Automatic* and Edge to *Off*.
   TX data type:
   GMSK: Random
   EDGE: PN-9
5. Set the spectrum analyzer for power level tuning:

Frequency	Channel frequency 897.4MHz GSM900 1747.8MHz GSM1800 1880MHz GSM1900
Span	0 Hz
Sweep time	2 ms
Trigger	Video triggering (-10 dBm)
Resolution BW	3 MHz
Video BW	3 MHz
Reference level offset	cable attenuation + module jig attenuation
Reference level	33 dBm

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

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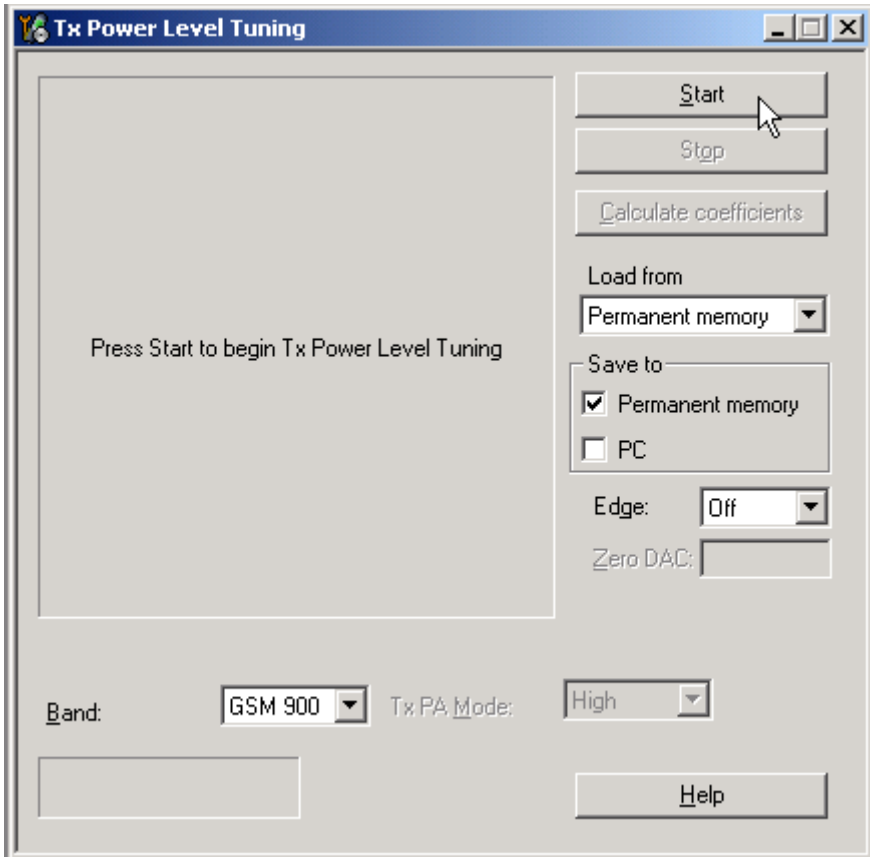
6. Click *Start* .



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7. Adjust power levels 5, 15, 19 and Base to correspond the "Target dBm" column by pressing + or – keys. See target values in table below.

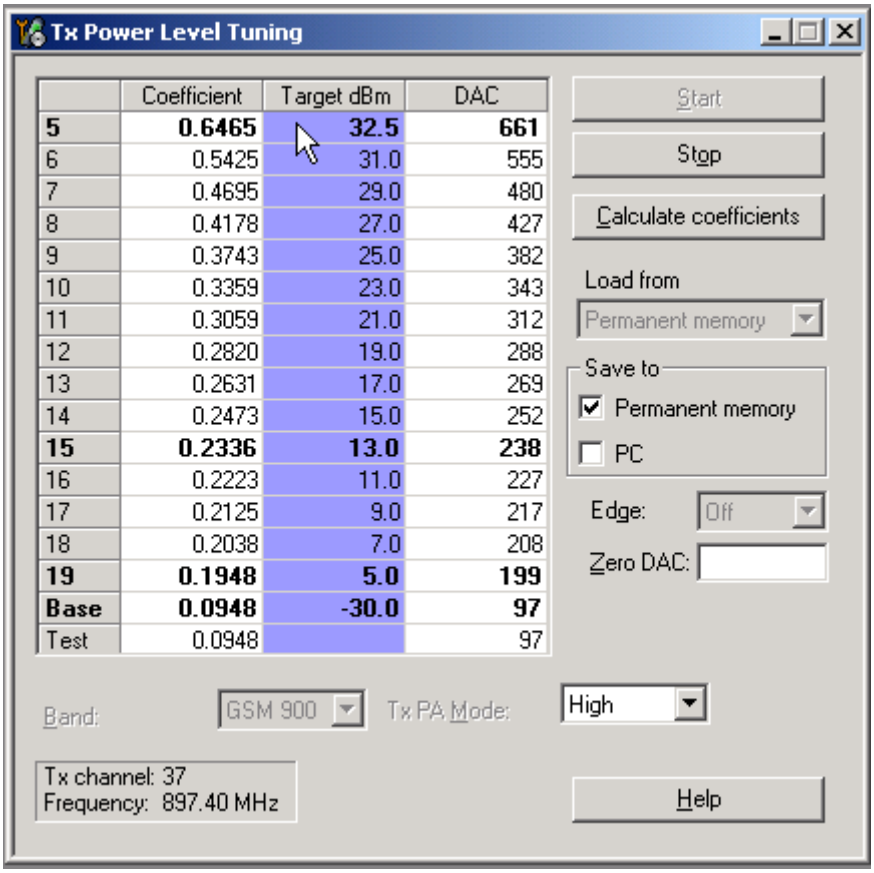

Figure 104 TX power level tuning window (example)

Table 12 TX power tuning targets

TX power tuning targets			
GMSK			
850/900		**1800/1900**	
Power level	Target dBm	Power level	Target dBm
5	32.5	0	29.5 (30.5 for RM-33 GSM1900)
10	23	10	10
19	5	19	0
Base	-15	Base	-15
EDGE			
850/900		**1800/1900**	
Power level	Target dBm	Power level	Target dBm
8	26.5	2	25.5
9	25	3	24

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TX power tuning targets			
10	23	4	22
11	21	5	20
12	19	6	18
13	17	7	16
14	15	8	14
15	13	9	12
16	11	10	10
17	9	11	8
18	7	12	6
19	5	13	4
Base	-15	14	2
		15	0
		Base	-15

8. Click *Calculate Coefficients*.
9. Check that the coeffiecient values are within the limits specified in the following table.

Table 13 TX power level tuning coefficient values

	Min	Typ	Max
GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			

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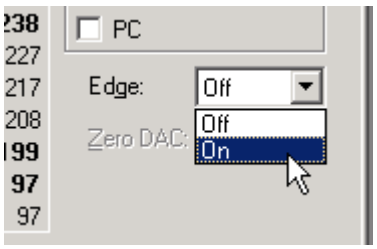
	Min	Typ	Max
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

If the values are within the limits, check that the *Save to Phone Permanent Memory* check box is checked and click Stop.

10. Set **Edge** mode on and start tuning again. Change video averaging to 50.



11. Tune EDGE power levels to the corresponding target power levels.

    All power must be tuned. Check the coefficients against the RF tuning limits table presented in Step 9.

12. When the tuning is completed, click *Stop* .

Next action

Repeat steps 4 to 9 for all bands. On those bands only power levels **0**, **11** and **15** need to be tuned.

Tuning TX/IQ

Context

The tuning must be carried out in all three bands. In addition to Phoenix, a spectrum analyzer (SA) is needed.

Steps

1. Connect the spectrum analyzer (SA) to the RF connector of the module jig. The settings of the SA will depend on the band to be tuned. The following table summarizes the settings for each of the three bands.

Table 14 Spectrum analyzer settings

	GSM900	GSM1800	GSM1900
Center frequency	897.4MHz	1747.8MHz	1880MHz
Frequency span	300kHz	300kHz	300kHz
Resolution Bandwidth	3kHz	3kHz	3kHz
Video Bandwidth	3kHz	3kHz	3kHz
Sweep Time	3 sec	3 sec	3 sec
Trace Type	Clear/Write	Clear/Write	Clear/Write

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	GSM900	GSM1800	GSM1900
Detector Type	Max Peak	Max Peak	Max Peak
Reference Level	35dBm	35dBm	35dBm
Marker 1	897.33229 MHz	1747.73229 MHz	1879.93229 MHz
Marker 2	897.4MHz	1747.8MHz	1880MHz
Marker 3	897.46771MHz	1747.86771MHz	1880.06771MHz

2. Open the following two windows in Phoenix:
   i select *Testing* → *RF Controls*

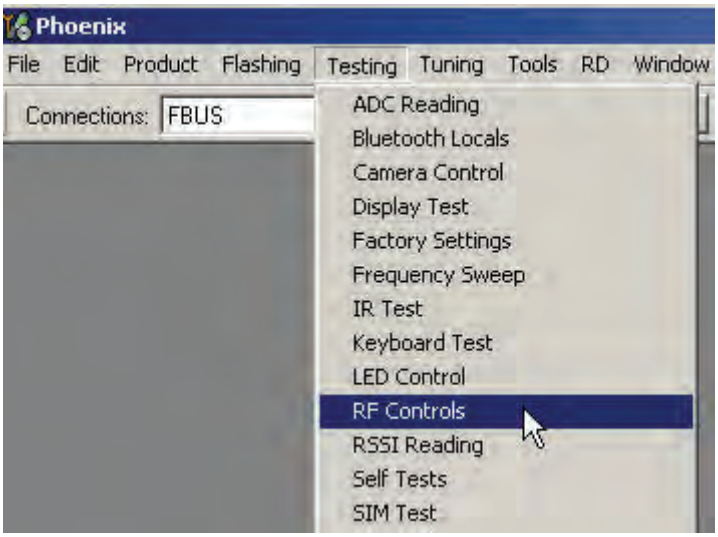

Figure 105 RF controls

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ii select *Tuning* → *TX IQ Tuning* .

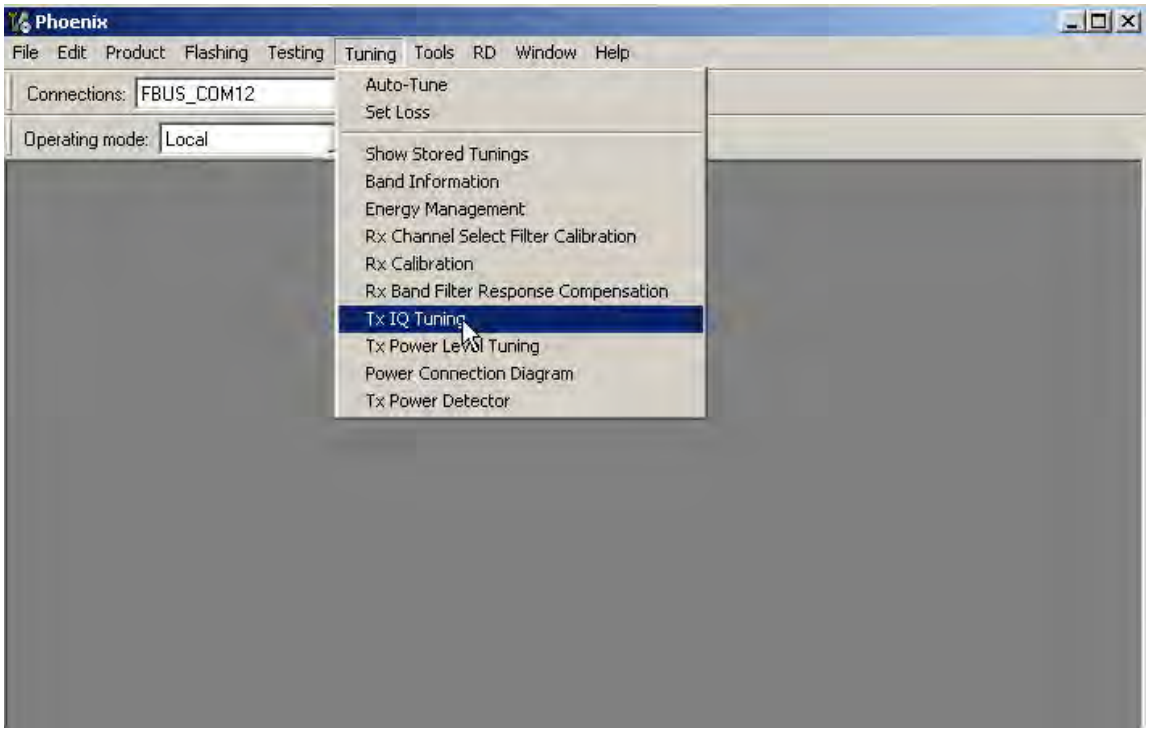

Figure 106 Tx IQ tuning

After opening the two windows, Phoenix should look like this:

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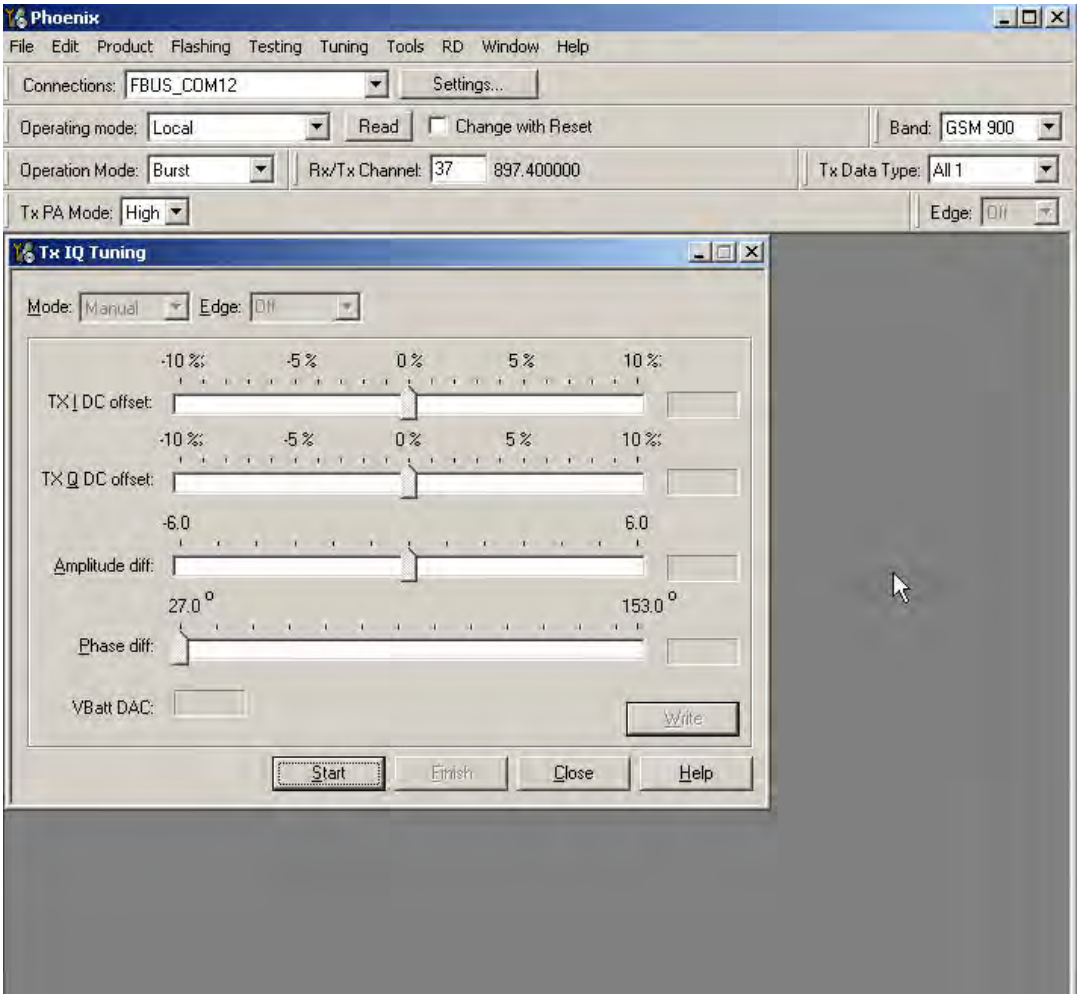

Figure 107 Phoenix set-up (Tx IQ Tuning windows)

3. Select correct settings for the band you are tuning. The following table summarises the settings of the RF control window for IQ tuning of the three bands.

Table 15 RF Control window settings

Band	TX Data Type	TX Power Level	RX/TX Channel
GSM900	All 1	5	37
GSM1800	All 1	0	700
GSM1900	All 1	0	661

4. Start IQ tuning by pressing Start button in the *TX IQ Tuning* window.

   The purpose of this tuning is to reduce the frequency components at marker 2 (carrier leakage) and marker 3 (+67kHz/upper sideband) as much as possible.

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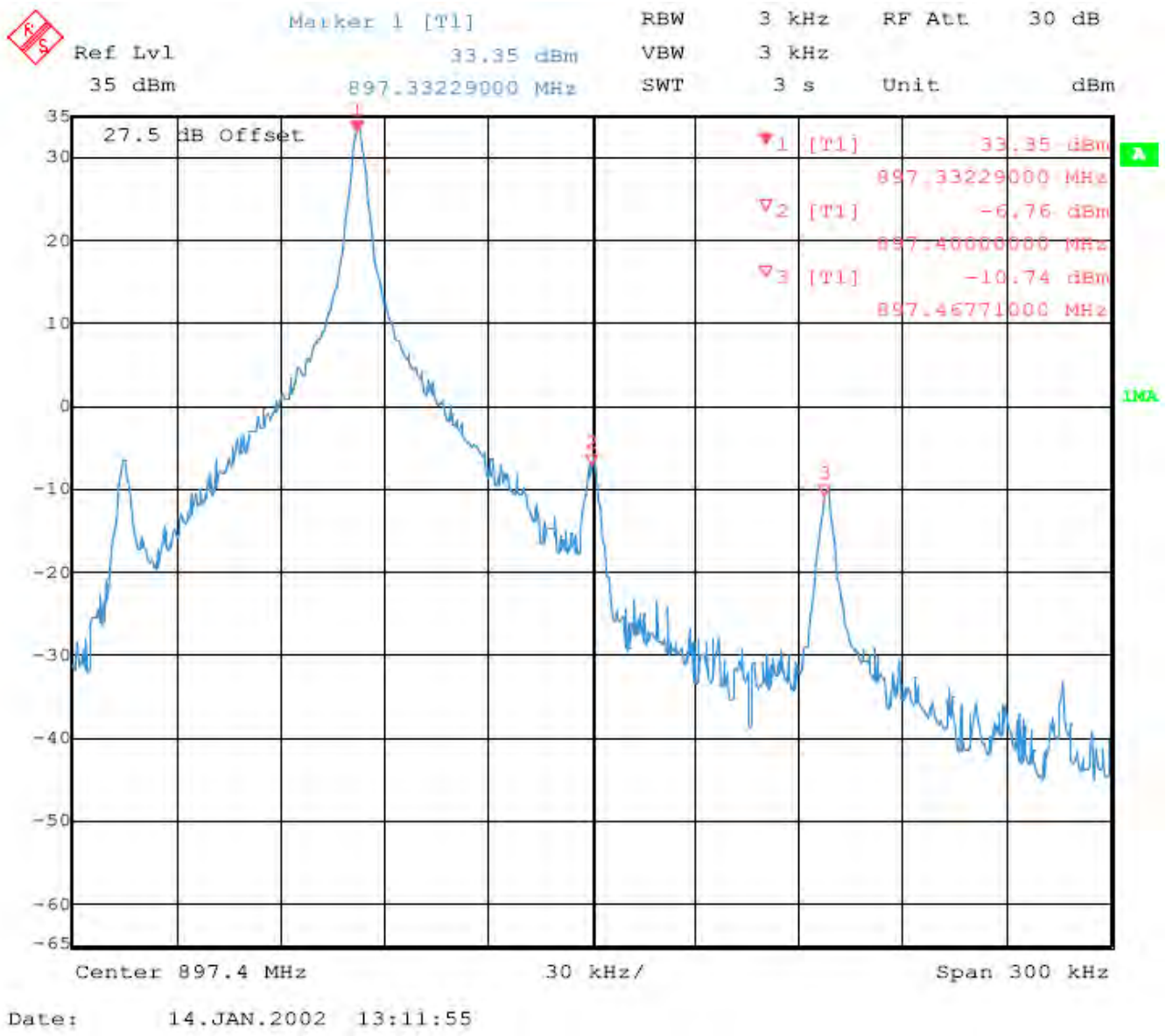

Figure 108 Spectrum analyzer screen shot when performing IQ tuning, part 1

5. Adjust the 'TXI DC Offset' and the 'TXQ DC Offset' buttons in the *TX IQ Tuning* window so that the carrier level (marker 2) reaches a minimum.

   After this adjustment is done, the carrier (marker 2) should be at least 40dB below the lower side band (marker 1).

6. Use the 'Amplitude difference' and the 'Phase difference' buttons in the *TX IQ Tuning* window to adjust the upper side band (marker 3) to a minimum.

   Now, marker 3 should also be at least 40dB below marker 1.

   At this point, the spectrum analyzer screen should look similar to that of the figure below.

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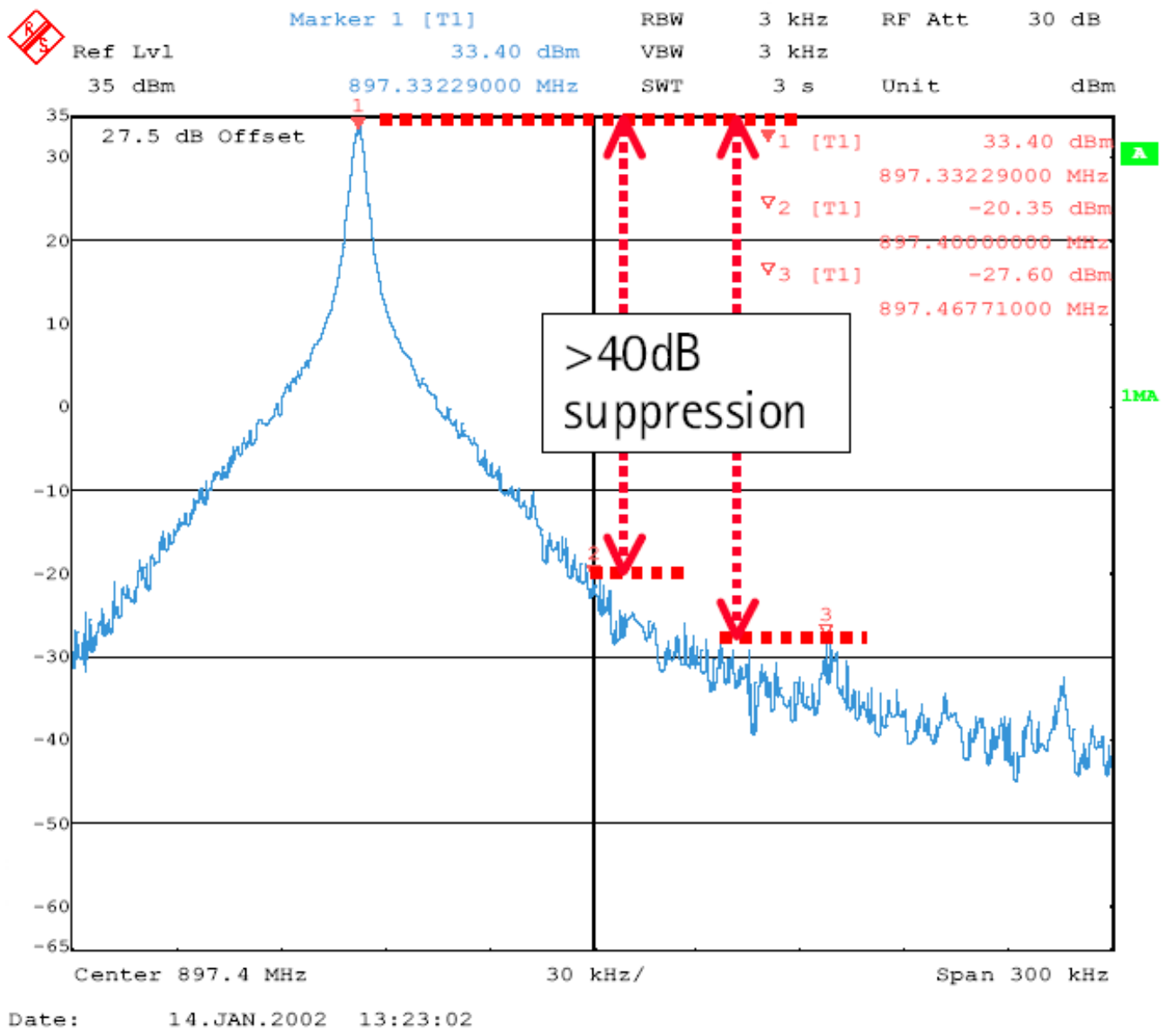

Figure 109 Spectrum analyzer screen shot when performing IQ tuning, part 2

7. After reducing the amplitude of the frequency components at marker 2 and 3 to a minimum, press Save & Continue.

   The EGSM tuning has now been completed.

Next action

Now, using the spectrum analyzer settings listed in Table “Spectrum analyzer settings” and the RF control settings listed in Table “RF Control window settings”, follow exactly the same procedure to perform IQ tuning in the remaining bands.

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RX troubleshooting

RX 900

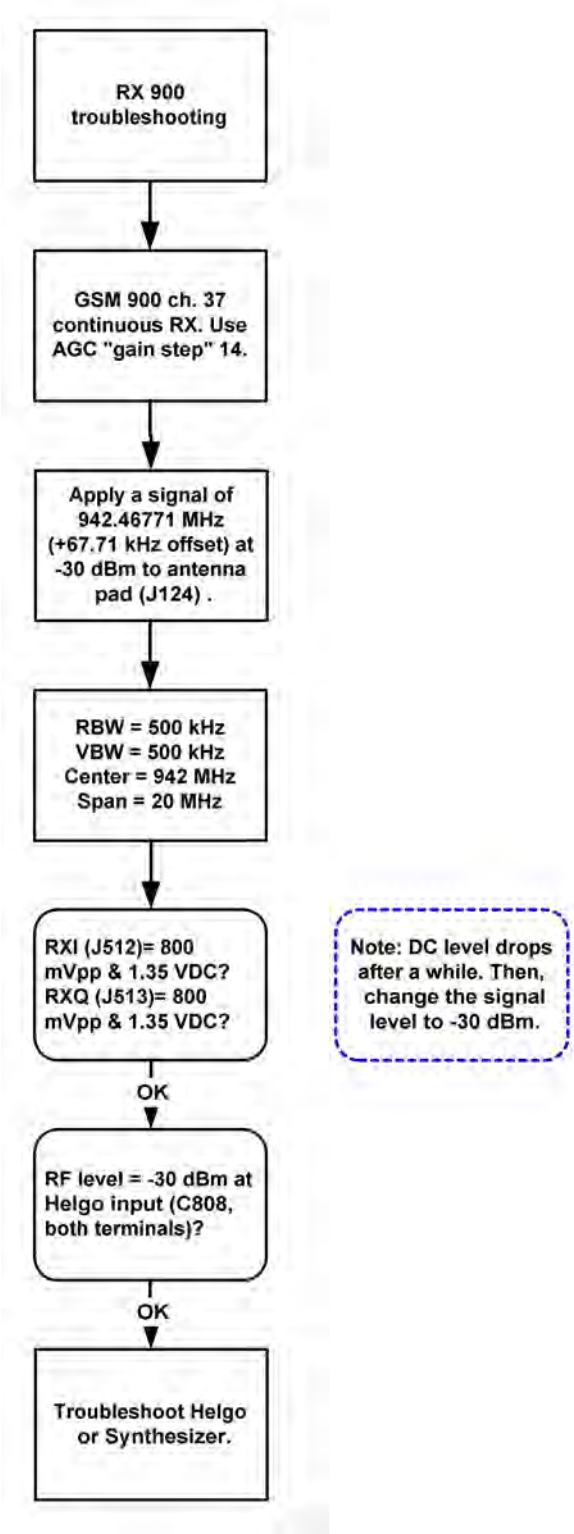

Figure 110 RX 900

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RX 1800

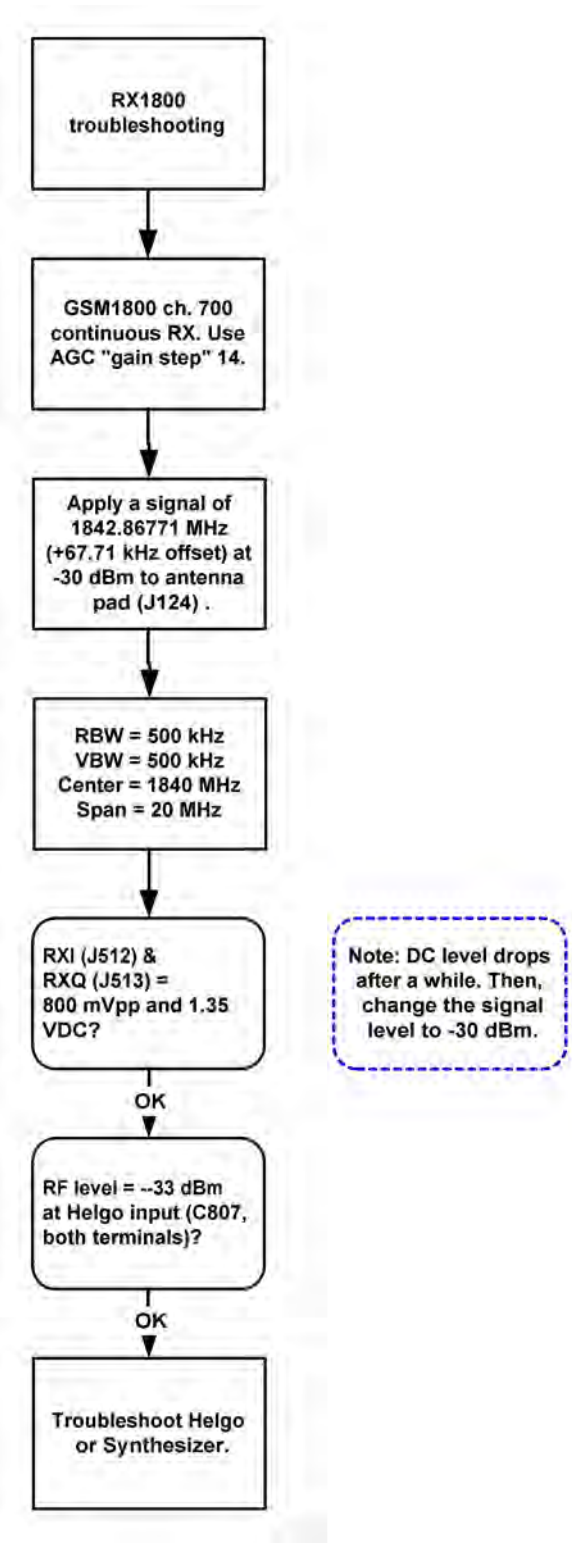

Figure 111 RX 1800

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RX 1900

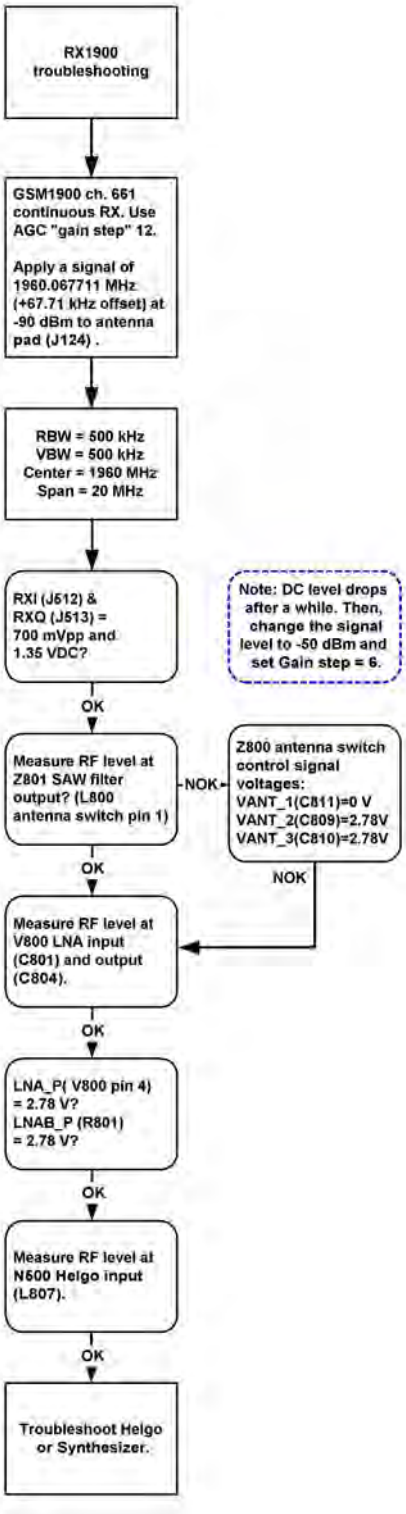

Figure 112 RX 1900

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TX troubleshooting

TX 900 GMSK troubleshooting

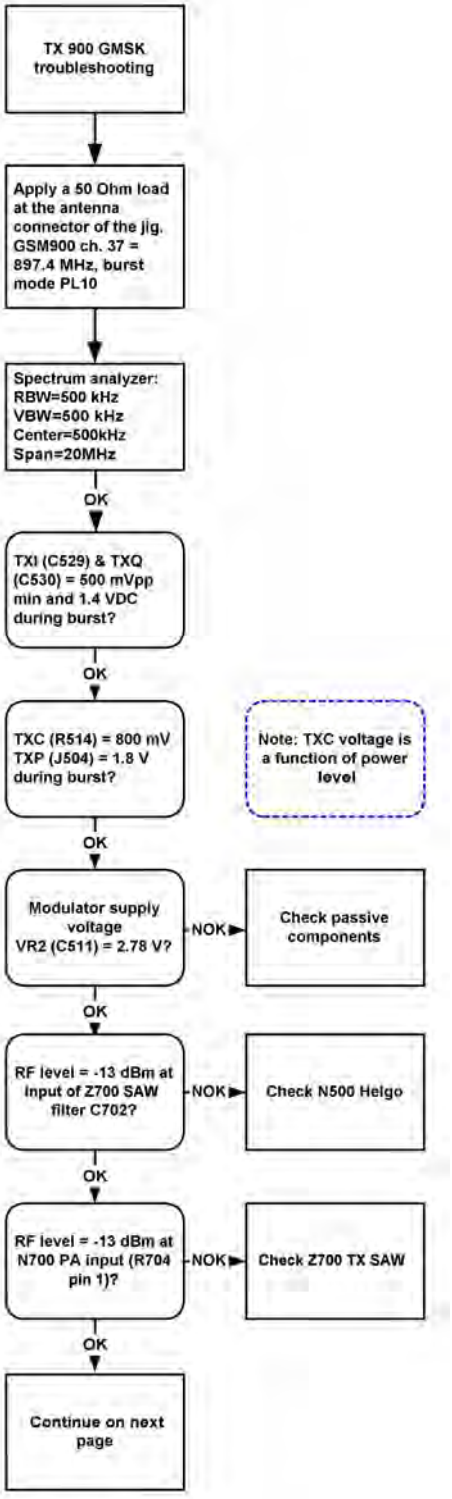

Figure 113 Troubleshooting TX 900 GMSK, part 1

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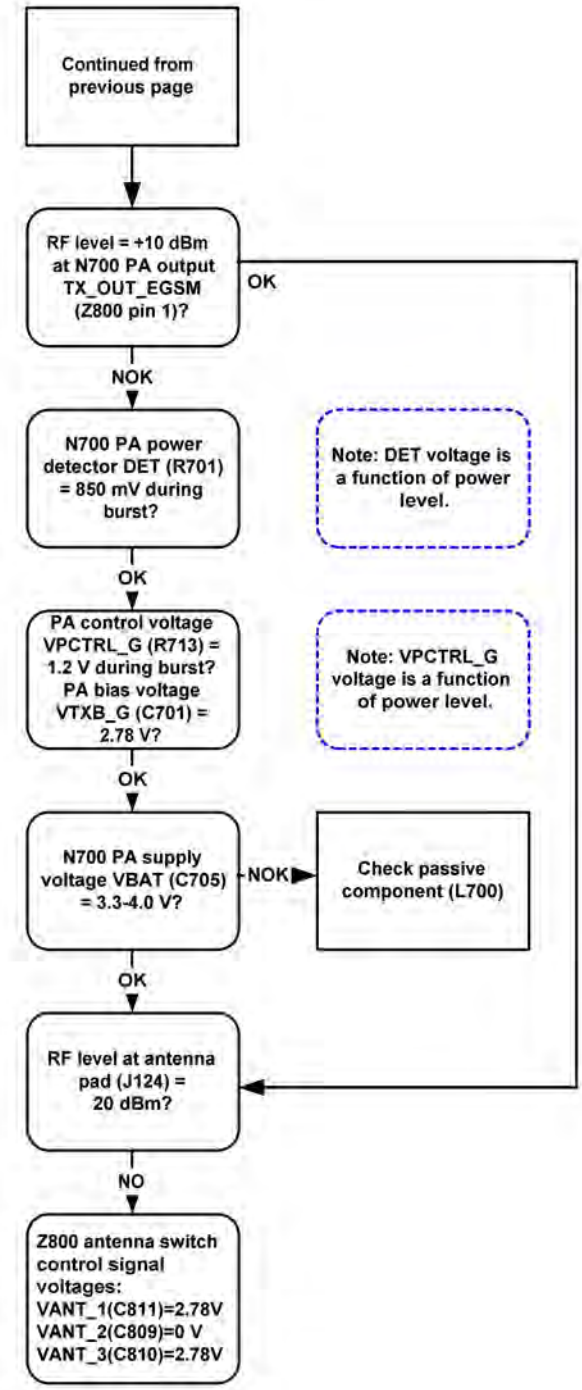

Figure 114 Troubleshooting TX 900 GMSK, part 2

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TX 1800/1900 troubleshooting

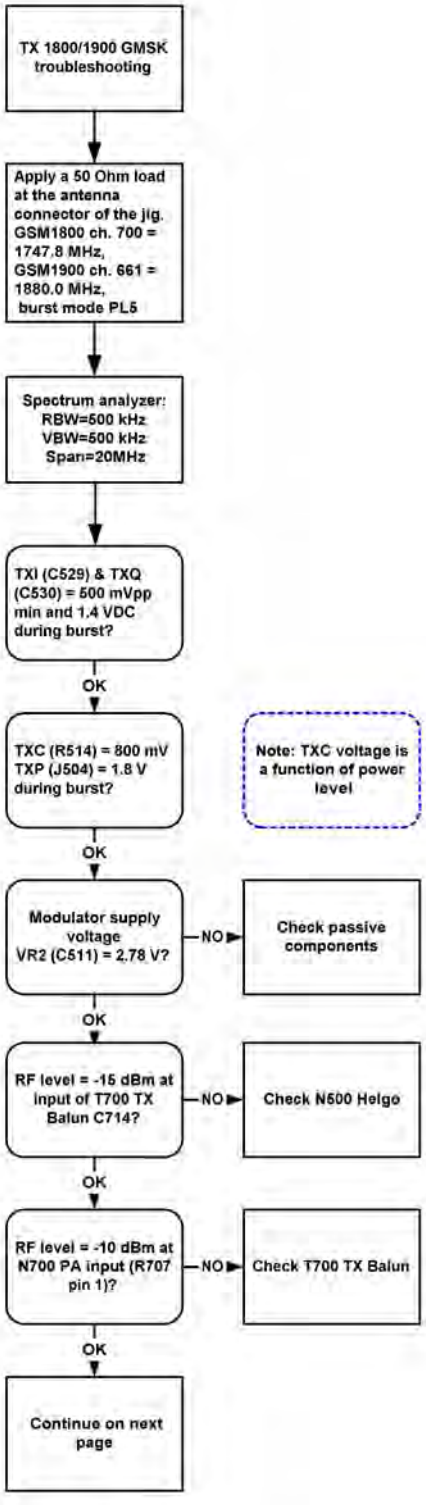

Figure 115 Troubleshooting TX 1800/1900, part 1

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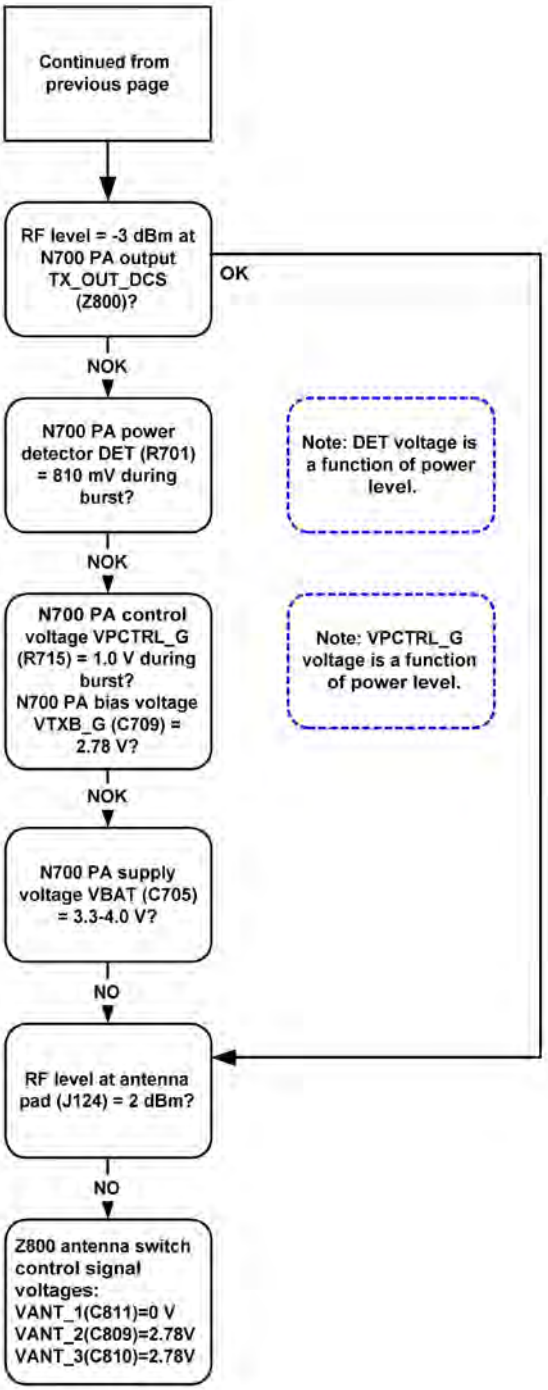

Figure 116 Troubleshooting TX 1800/1900 GMSK, part 2

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RF engine troubleshooting

N500 Helgo

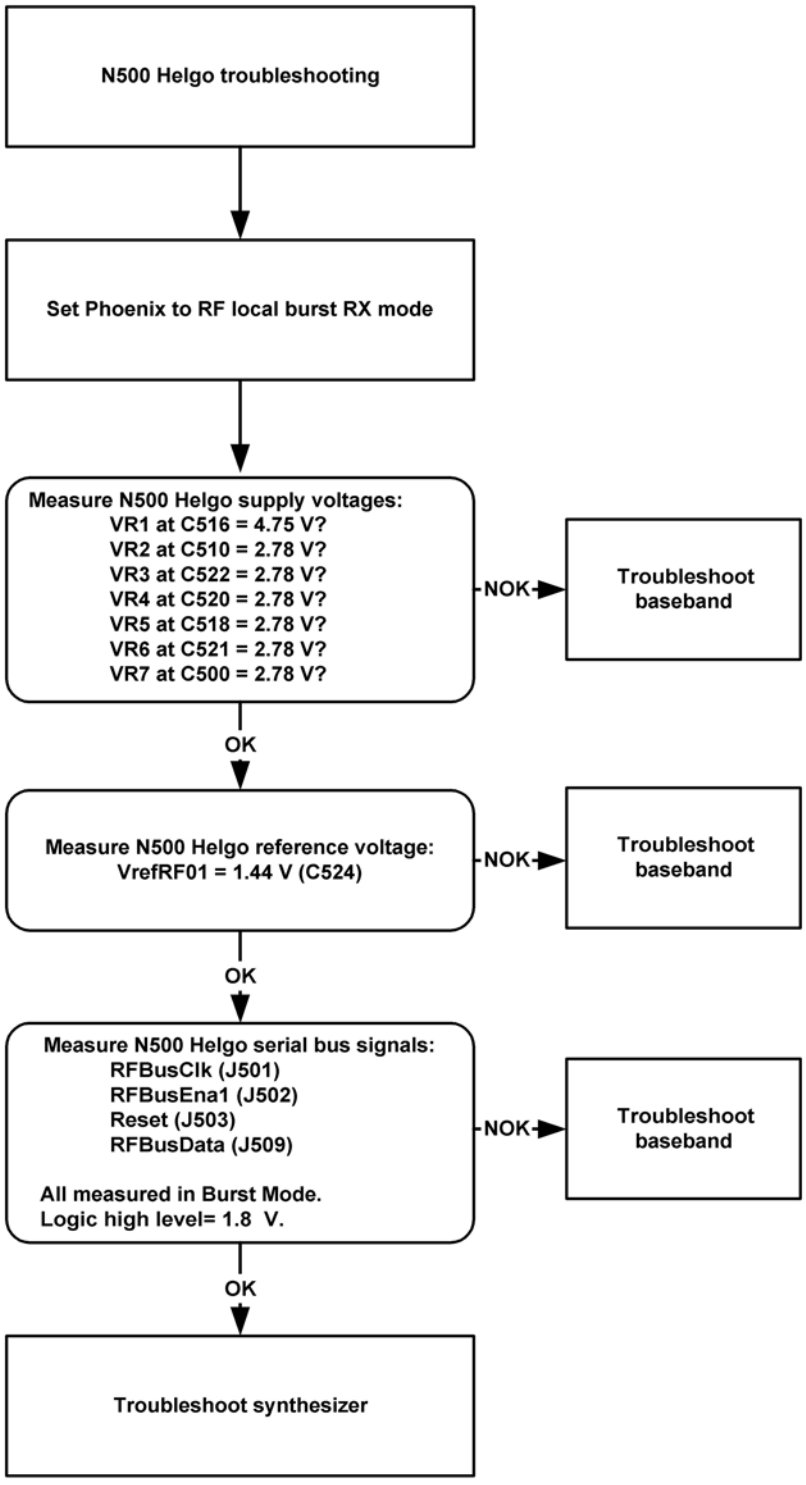

Figure 117 N500 Helgo

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Synthesizer

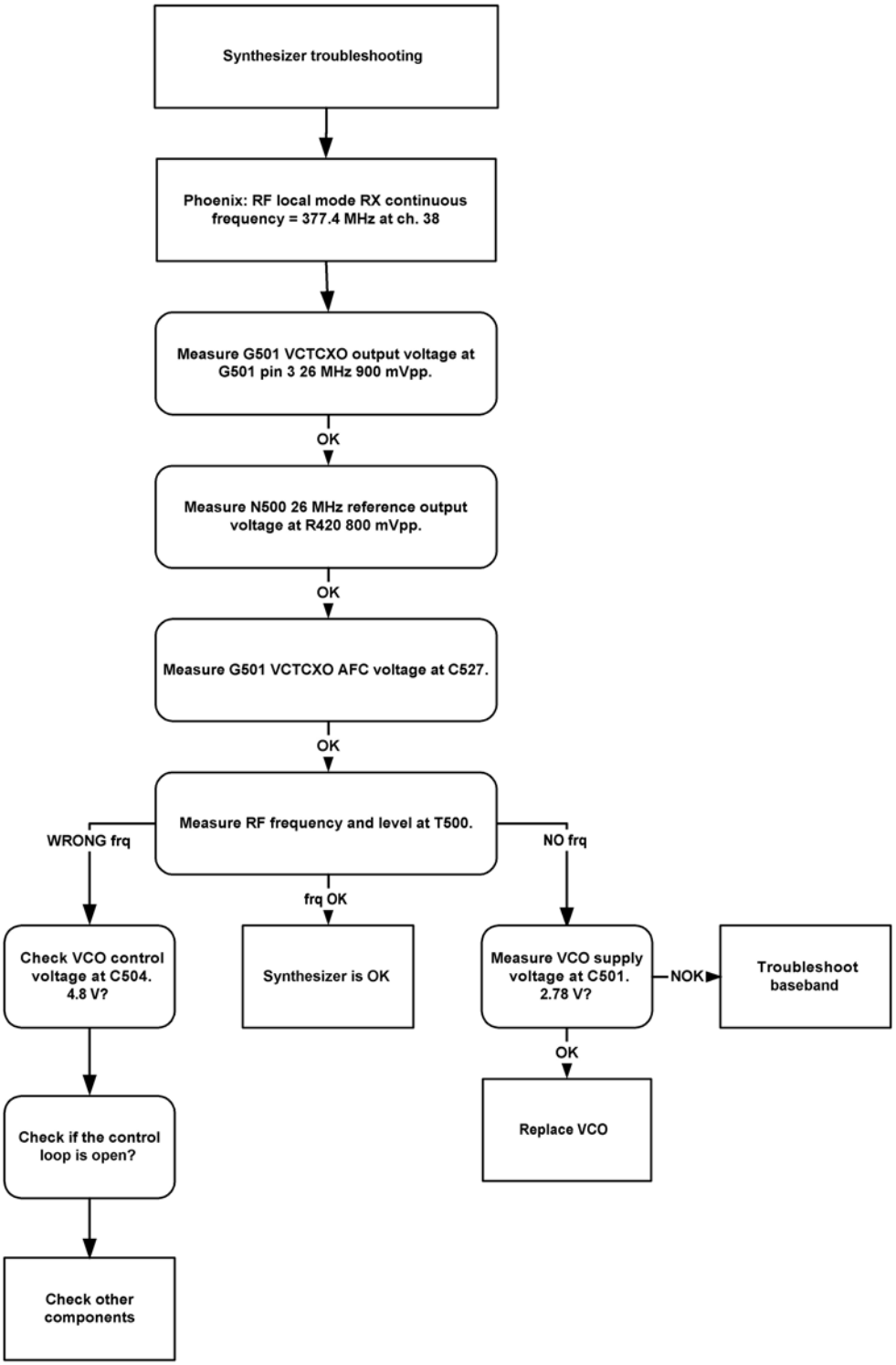

Figure 118 Synthesizer

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8 — System Module Description

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Phone description

Introduction

This chapter describes the baseband module including engine, power management, interfaces, audio etc. The phone is based on a DCT4.5 generation baseband and RF circuitry.

Characteristic components

Table 16 Characteristic components

Function	Name
RF ASIC	HELGO86 LB, TFD8DWIT/AF
BB ASIC	UEMEK2v0 LF WDENA TFBGA244
Main processor	TikuEGDE (TESP)
Current sensor	Zocus, National Semiconductor LM3820
Memory	128 Mbit SDRAM, 128 Mbit NOR and 512 Mbit NAND (integrated in Tiku)
Power amplifier	PW AMP RF9250E4.1 Micro GSM/EDGE
Antenna	3 band PIFA
System connector	Plug and play system connector
Battery	BL-5X
Slide switch magnet	Samsung SH248CSP
FM radio IC	Philips TEA5761UK
Earpiece	SonionKirk LTR711A 13.0mm
Bluetooth	BC3-ROM
IHF Speaker	Pioneer
Microphone	Matsushita
Boomer	National Semiconductor LM4667 (Class D)
Vibra	Matsushita

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PWB overview

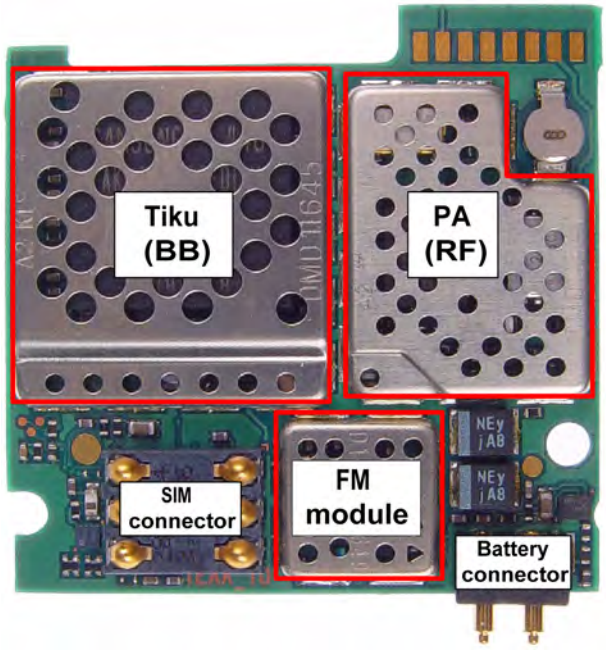

Figure 119 PWB layout overview, bottom side

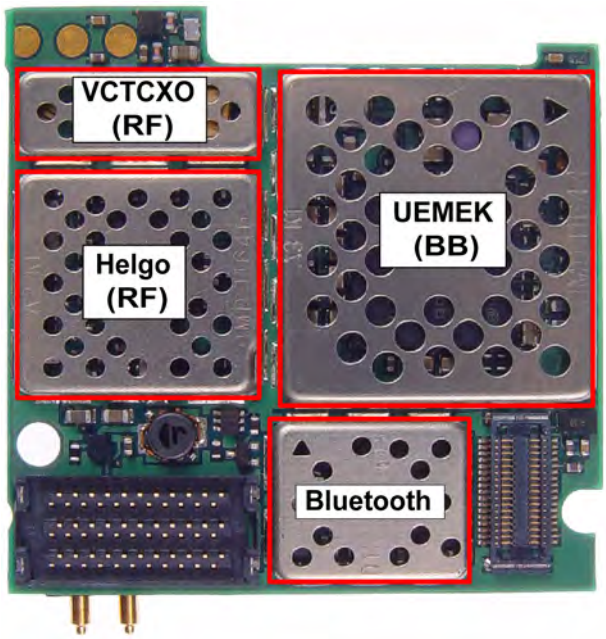

Figure 120 PWB layout overview, top side

Note: Shieldning cans must ONLY be removed by Repair analysis technicians, and for analysis only.

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System block diagram

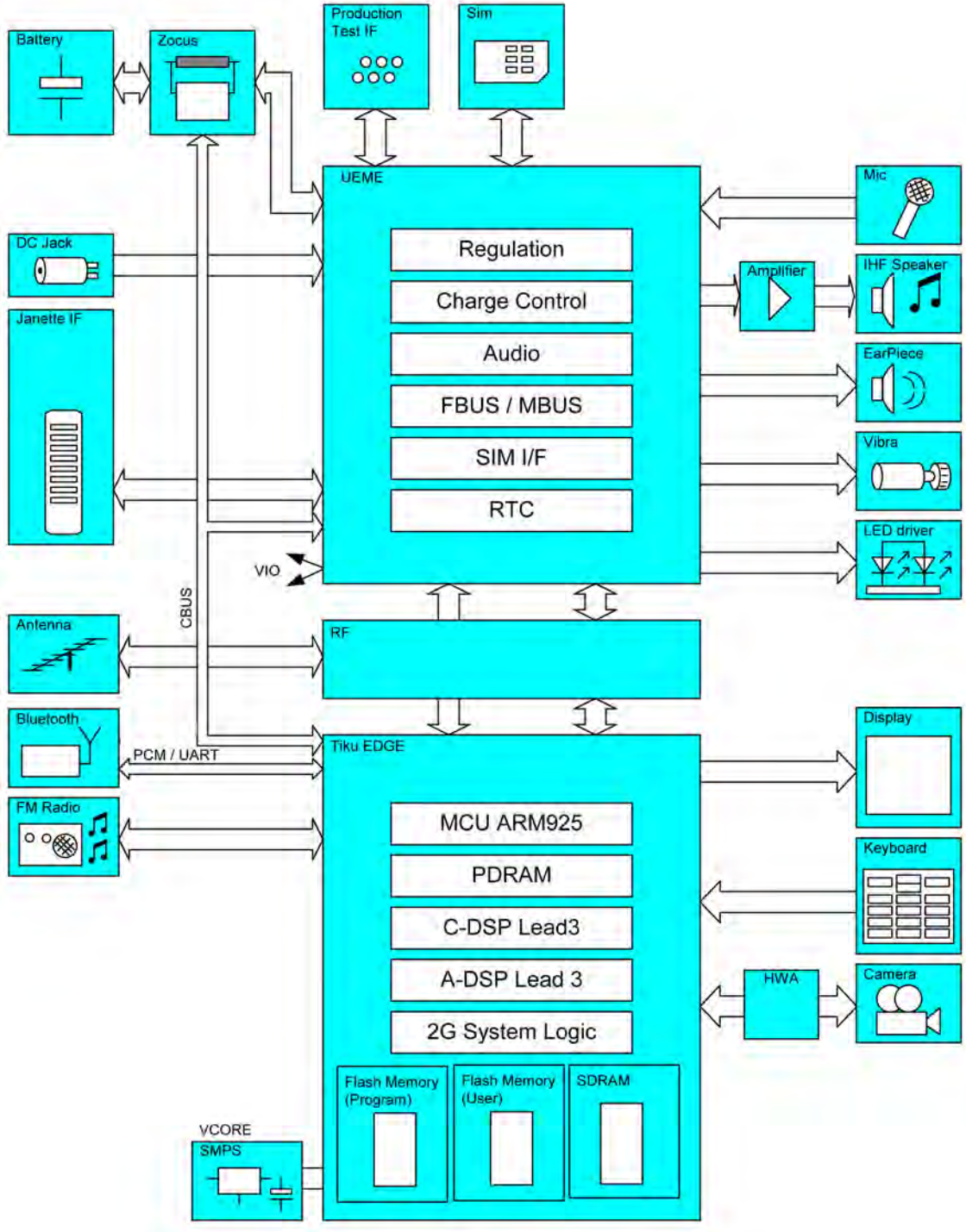

Figure 121 System block diagram

Engine

Engine modules

The engine contains

- RF ASICs (Application specific integrated circuits)

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- TikuEDGE processor with integrated memory
- Baseband ASIC (UEMEK)

RF engine

The RF module performs the necessary high frequency operations of the engine. In both transmitter and receiver, the modulator and demodulator operate at the channel frequency.

The core components of the RF module are:

- Helgo (ASIC)
- Power amplifier module

The key components are:

- 26 MHz VCTCXO for frequency reference
- 3296-3980 MHz super high frequency VCO
- RX/TX switch (in front end module)
- Two RF bandpass SAW filters (in front end module)
- Three additional SAW filters

The baseband section controls the RF module through the serial bus, RFBus. This passes information about frequency band, mode of operation and synthesizer channel for RF as well as exact timing information and receiver gain settings. Helgo controls the mode of operation, and further sends control signals to the front end module and the power amplifier module.

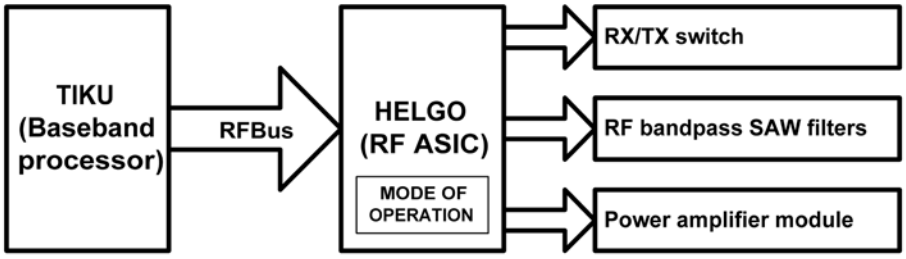

Figure 122 Control signals in RF module

In addition to the RFBus there are still other interface signals for the power control loop and VCTCXO control and for the modulated waveforms.

TikuEDGE and memory block

The main processor in this device is the stacked TikuEDGE (TEMS), which includes the memory/flash combibation ASIC.

Main features

Some of the features of TikuEDGE are:

- DSP processors and co-processors
- Serial flash interface (SFI001)
- 4 Mb of PDRAM
- Traffic controller for memory interface (dct4 flash/sram, sdram)
- General purpose USARTs
- SIM card interface
- I2C interface
- GSM coder
- Interface control for: keyboard, LCD, Camera, audio and UEMEK

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- Accessory interfaces: LPRF (Bluetooth)
- Handling of RF-BB interface
- I/O voltage = 1.8 V, Core voltage <1.8 V

The main sections of the processor are:

- ARM925 mega-module
- C-DSP Lead 3 mega-module
- A-DSP Lead 3 mage module
- PDRAM
- 2G system logic (PDA Peripherals)

The ARM mega-module has a traffic controller, which provides the interface between the memory control unit, external memories, LCD controller, and internal busses. It also processes the data packages for memory access.

The PDA Peripherals consists of Camera Compact Port (CCP) interface and display interfaces.

Memory block

TIKU includes a 2 kB ROM, which is mainly used to store the boot code of the MCU. To speed up the MCU operation, a small 64 B cache is also integrated as a part of the MCU memory interface.

For program memory, a 4Mbit PDRAM is integrated.

The combo memory consist of 128Mbit SDRAM, 128Mbit NOR and 512Mbit NAND, integrated on top if the Tiku..

Energy management (UEM)

The UEMEK, Universal energy management, manages the power in the phone. In addition to that, UEMEK performs all the baseband mixed signal functions.

Main features

The main features of UEMEK are:

- Audio Codec analog
- 11–channel A/D converter (MCU controlled)
- Real Time Clock logic including RTC battery interface ·
- SIM interface and drivers
- FLASH memory for IMEI code and tuning information storage
- Charging control
- Driver for LCD backlight (PWM output used to control external driver due to load)
- Driver for keyboard light (PWM output used to control external driver due to load)
- Baseband regulators (except VCORE)
- RF regulators
- RF interface converters

Modes of operation

The functional behavior of the UEMEK can be divided into seven different states. Since the UEMEK controls the regulated power distribution of the phone, each of these states will affect the general ffunctionalityof the phone:

1 No supply

2 Backup

3 Power off

4 Reset

5 Power on

6 Sleep

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7 Protection

Battery and charging

Battery

Note: For technical data, see Battery endurance (Page 8–19).

This device uses a BL-5X battery. The battery pack is special designed and differs from most Nokia phones. The BSI terminal is removed due to size limitation and the GND and VBAT is interchanged.

The BSI resistor is placed on the PWB, as only one battery capacity is supported.

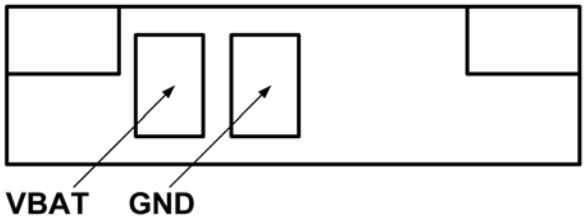

Figure 123 BL-5X battery

Battery connector

The battery connector has two pogo pins for VBAT (pin B) and GND (pin A). The VBAT pin has an additional switch between pin 2 and 3. Pin 3 is connected to the SIMCarDet pin on the UEMEK for SIM card power down. The battery has no BSI (Battery size indicator) terminal, instead there is a BSI resistor is placed on the PWB.

When the battery is inserted, the pogo pins are pressed down to open the switch. SIM power down happens when the battery is removed which causes the switch to close.

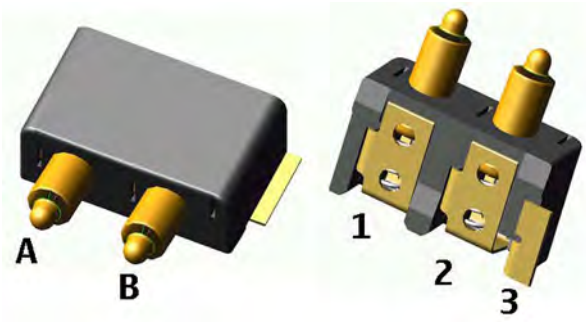

Figure 124 Battery connector with pogo pins

Charging

The charger interface conforms to the global Nokia charger interface. Charging is performed through the charger input in the system connector. (See System connector (Page 8–12))

The charging is controlled by the UEMEK, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Interfaces

FM radio

The FM radio is an integrated circuit, controlled by MCU software through a serial bus interface. The wires of the headset are used as poles of the antenna, and no other antenna is needed for FM radio reception.

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The radio has an automatic band search function, which can search for a strong write/read signal from a certain frequency. When this is found, data is transmitted to the radio. When the signal strength is low, the TikuEDGE can read data, which is available until the signal is strong again.

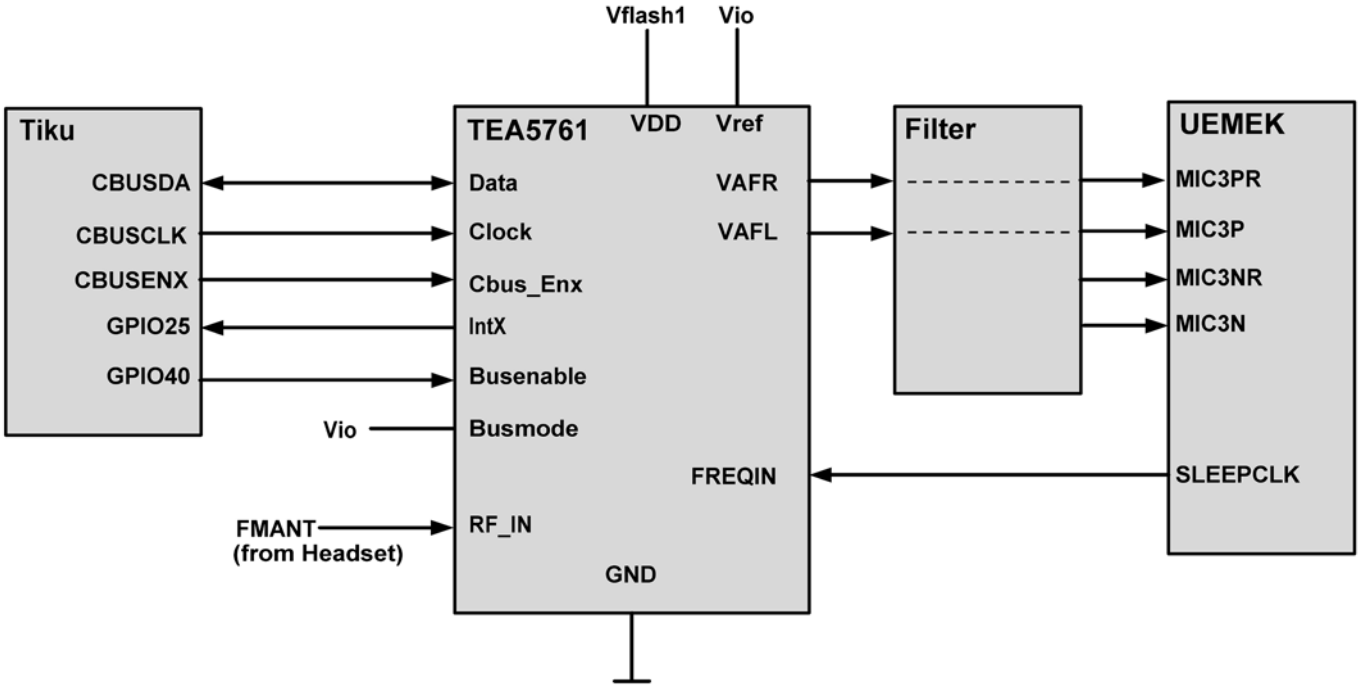

Figure 125 FM radio module interface to engine

Camera

This device is equipped with a SVGA resolution camera. It is able to transfer up to 30 frames per second in viewfinder mode and 15 frames per second in full resolution mode (SVGA).

The camera is connected to the Tiku via a hardware accelerator and a differential camera bus called CCP. The control of the camera is routed through normal type general I/O ports. The camera uses both analoguee and digital supply.

SIM

The SIM interface is the electrical interface between the SIM card and the mobile phone, located in two ASICs; Tiku and UEMEK.

The interface in the UEMEK contains power up/down, port gating, card detect, data receiving, ATR-counter, registers and level shifting buffers logic.

The data communication between the SIM card and the phone is asynchronous half duplex.

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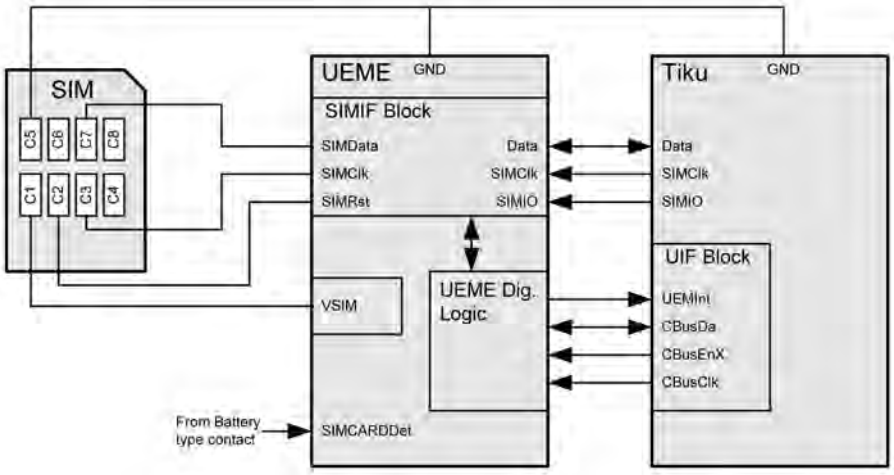

Figure 126 Tiku/UEMEK SIM interface connections

SIM Logic level shifting

The SIM interface can be programmed to support 3V and 1.8V SIM cards. The UEMEK contains a SIM interface called Logic level shifting. A register in the UEMEK selects the supply voltage when the SIM interface is powered down.

SIM Power up/down

The SIM power up/down sequence is generated in the UEMEK. This means that the UEMEK generates the reset switch (RST) signal to the SIM. In addition, the SIMCardDet signal is connected to UEMEK. The card detection is taken from the SIMCarDet signal, which also detects the removal of the battery. A comparator inside UEMEK does the monitoring of the SIMCarDet signal. The comparator outputs do not alter state as long as the battery is connected.

The SIM interface is powered up when the SIMCardDet signal indicates “card in”.

Flash

The flash programming interface uses FBUSX, FBUSRX, MBUS, VPP and BSI to connect to the baseband. The connection goes through the UEMEK, so the logic levels correspond to 2.7 V.

12 V VPP can be used to speed up the programming. When the current is applied on the VPP-pin, the EFP-mode activated. In this mode, 12 V is used for the internal charge pumps, instead of 2.8 V supply (VSDRAM).

System connector

The system connector is a plug and play bottom connector. It supports the fully differential DCT-4, 4-wire audio/ control interface. This includes:

- Charging
  - Pads for 2-wire charging in cradles
- Audio
  - 2-wire fully differiental mono audio
  - 2-wire differiental microphone input
- Detection/controlling
  - HeadInt passive brake switch

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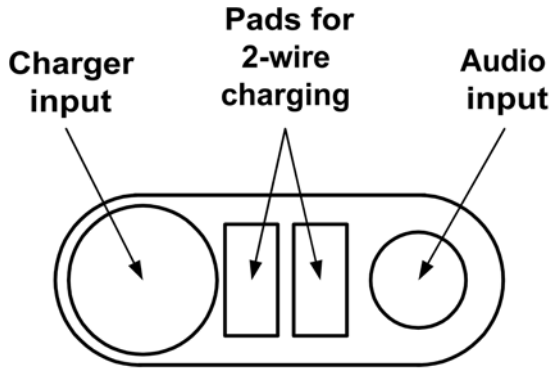

Figure 127 System connector inputs and pads

User interface

Display

The display is mounted on the UI-flex.

The display unit has a parallel interface, consisting of the following:

- 8-bit data bus (DISPDATA(7:0))
- Write enable WRX
- Read enable RDX

The display interface block in Tiku handles the above signals, while the ones in the table below are handled by other components on the PWB.

Table 17 Display signals handled by PWB components

Note: More information about the VLED signals can be found in LED and driver. (Page 8–15)

Signal Name	Value
TE	The tearing effect (TE) signal is generated by the LCD controller and is used as an interrupt input to the interrupt controller built in Tiku. The signal is used to synchronise the process of updating display data with the refreshing rate of the LCD in a way to avoid tearing effect.
CSX	The Chip Select signal is the input to the LCD controller. The signal is used in the serial interface mode. The signal is tied to ground on the PWB, as the parallel interface mode is selected permanently.
VLED1+	Positive power supply to backlight LEDs
VLED2+	
VLED1-	Common ground for the backlight LEDs on the PWB.
VLED2-	
GND	3x Ground connection to the LCD components on the PWB

Engine interface

A 24-pin connector provides the interface between the display unit and the PWB (connected through the UI-flex). Internally, the Tiku display interface has interfaces with the VIAbus and the secondary DMA controller.

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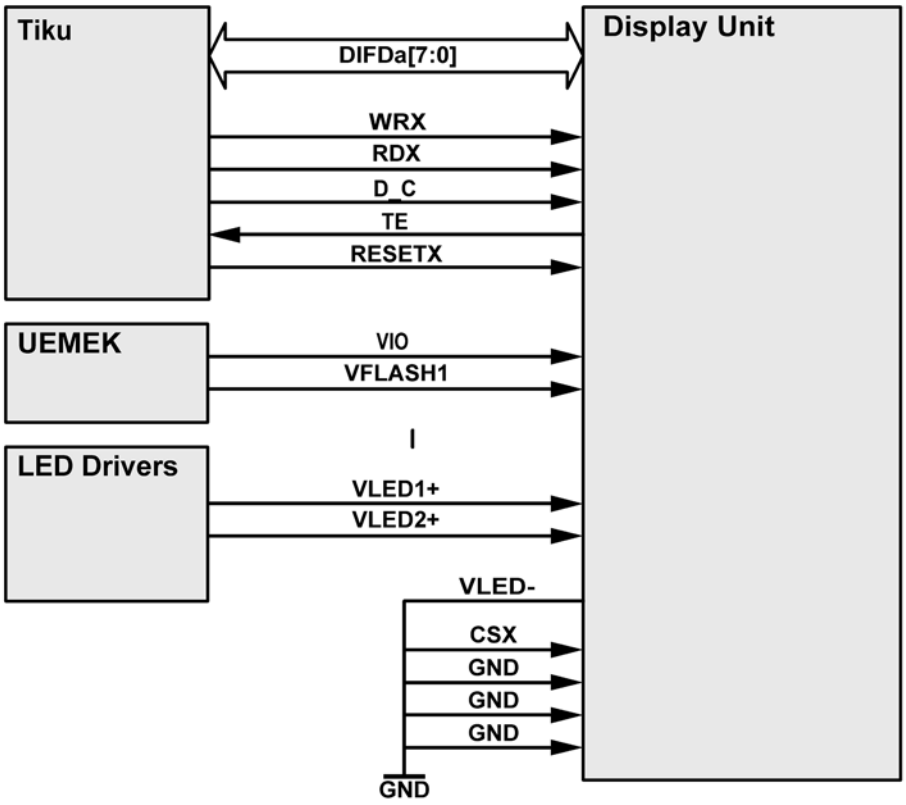

Figure 128 Display unit connections

Keyboard

The keyboard is made up of a 4x5 matrix and three special separate keys. They are connected as described in the table below.

Table 18 Keypad connections

Keypad matrix and Navigation key		Tiku connection		Description
Navigation Key	Left	Tiku	-	Separate controllines (Special keys) for Navi_Up, Navi_Down and Navi_Select. Navi_Left and Navi_Right are connected to the keyboard matrix
	Up		GPIO 6	
	Right		-	
	Down		GPIO 7	
	Select		GPIO 13	
	GND		-	

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Keypad matrix and Navigation key		Tiku connection		Description
Keypad	Column 0	Tiku	GPIO 2	Tiku, Keyboard interface KDI in the UIF block,
	Column 1		GPIO 3	
	Column 2		GPIO 4	
	Column 3		GPIO 5	
	Row 0		GPIO 8	
	Row 1		GPIO 9	
	Row 2		GPIO 10	
	Row 3		GPIO 11	
	Row 4		GPIO 12	

Engine interface

The connection between the main board and the UI board goes through the UI-flex and a 66-pin multi row connector plug.

LED and driver

There are two sets of LEDs, Light emitting diodes;

- LCD display, 4 pcs
- Keyboard, 4 pcs

Both sets are individually controllable by the PWM (Pulse width modulation) output signal from UEMEK ASICs. It is not possible to activate keypad light without activating display light, because they share the driver.

Keypad light is turned on and off with Klight after Dlight has activated the driver and thus the display light. Current mirrors are inserted in display LED lines to secure same light in the different LEDs. The LED driver circuit is placed on the PWB, display LEDs in the display, and keyboard LEDs on the UI flex. Varistors are placed parallel to the keyboard LEDs to protect them from electrostatic discharge.

The feedback is calculated so that constant current will pass through the display LEDs.

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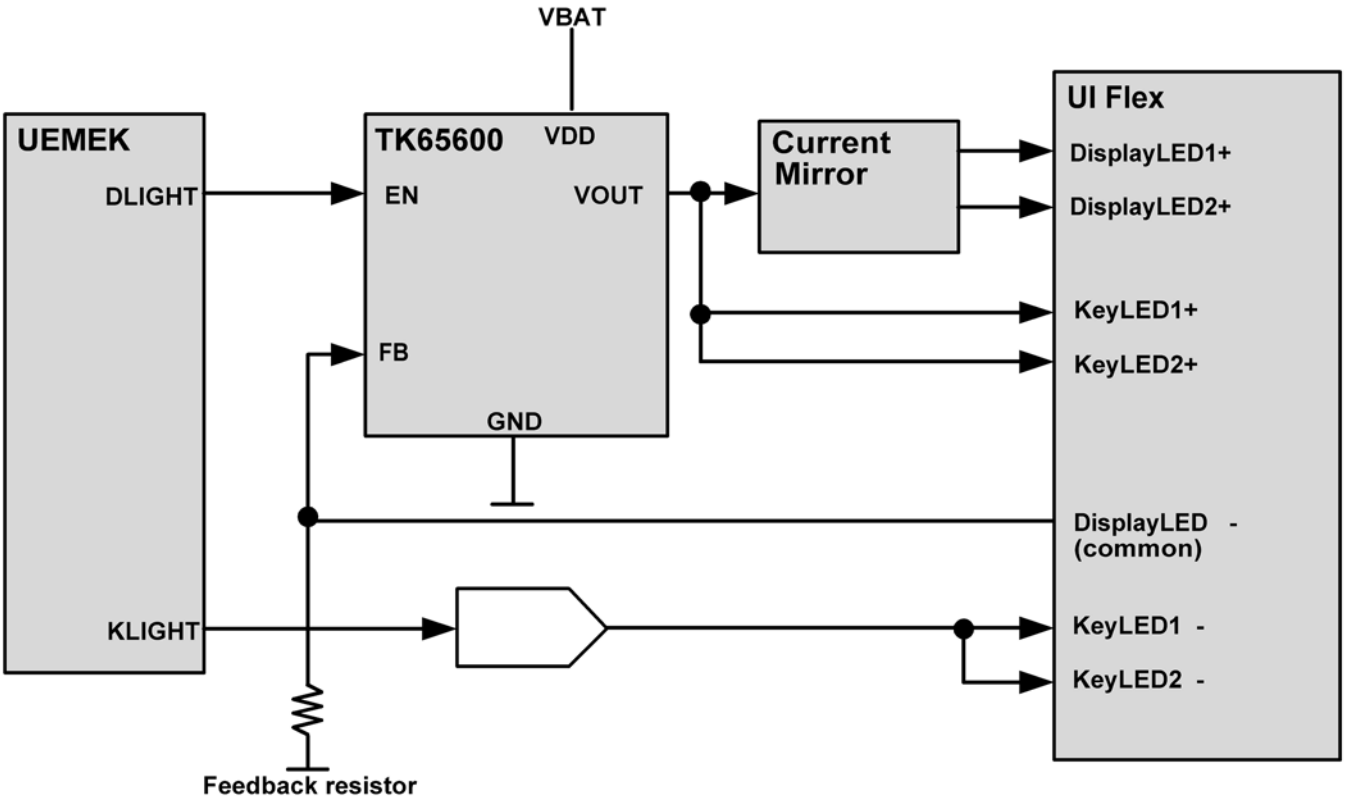

Figure 129 Led driver block

Slide switch

This is a slide phone that wakes up when it slides open. A switch detects the position of the slide. It is implemented with a Hall IC and a magnet.

The signal from the Hall IC is connected to the analouge keyboard input (AuxDet) in the UEMEK, as this is also an interrupt input. The Hall solution requires a magnet, which is placed on top of the Hall IC, and is moved away from the sensor with the moving mechanics, making a change of the magnetic field.

The output from the Hall IC is high (2.78 V) when the slide is open.

Audio concept

The audio concept includes an earpiece, a microphone, and a bottom connector for headset and integrated handsfree (IHF). Audio is based on Tiku, UEMEK and a discrete amplifier for the handsfree speaker, the boomer.

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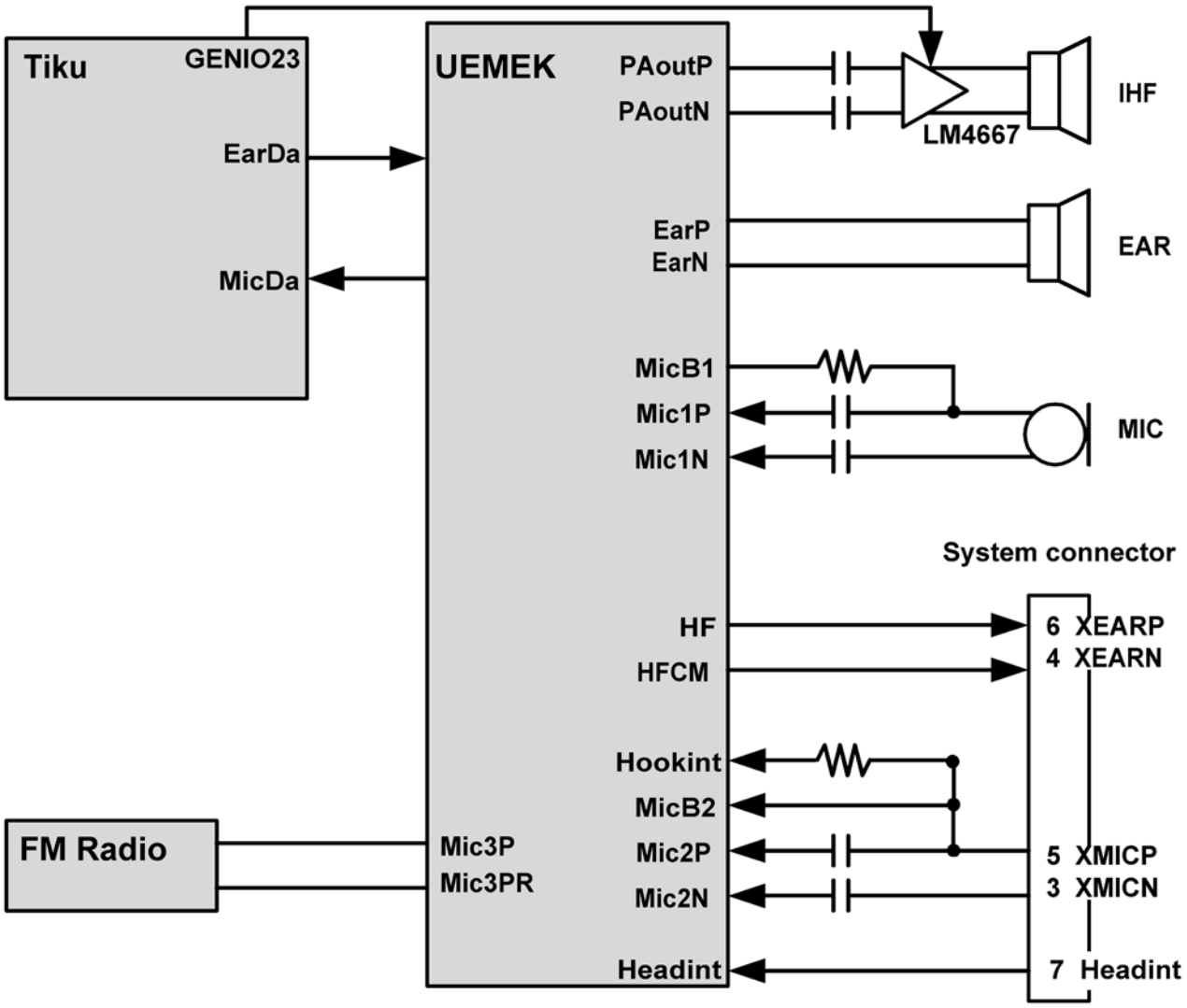

Figure 130 Audio block diagram

Earpiece

The earpiece is driven by differential signals from UEMEK (EARP & EARN). It makes contact with the PWB via spring contacts.

Microphone

Two inputs are used from UEMEK, one for the normal internal microphone and the other for the headset. The third microphone input is used for FM. The microphone bias block in UEMEK generates bias voltages for handportable and handsfree/headset microphones. The microphone makes contact with the PWB via spring contacts.

Button vibra

The button vibra is a new concept vibra. The rated voltage is 3.2 volt and it needs a sweep frequency (140 to155 Hz, 5Hz at 20ms steps) to reach the resonance frequency.

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Power amplifier

The power amplifier, also called boomer, is a differential operational amplifier (opamp). It has a gain of +12 dB. The differential output drives the internal handsfree speaker, IHF. The outputs go into a high impedance state when powered down. The amplifier can be enabled and shut down using a GENIO line from Tiku. The boomer is off when the shutdown pin (GENIO23) is low.

Software controls IHF, headset and earpiece volume via UEMEK. The output sound pressure level of the IHF is controlled by software (Cbus is used for controlling).

The supply voltage for the IHF amplifier is taken directly from the battery voltage.

Mono/stereo implementation

The Digital Music Player is routed in stereo to bluetooth headset and in mono to other devices. FM Radio is implemented only in mono.

Connections

Bluetooth

The Bluetooth solution is a single chip solution. The baseband interface to the bluetooth has a separate PCMbus for audio giving in total 11 connections;

- 4 pins used for UART (data)
- 4 pins for PCM audio and
- 3 pins for control (Host wake-up, BT wake up and BT reset).

Bluetooth connects to TikuEDGE on the GENIO and GPIO busses.

The Bluetooth module is provided with power from an external LDO (Low drop out) regulator. This is enabled by PURX, which is an internal UEMEK reset signal. This signal is high whenever the phone is powered on.

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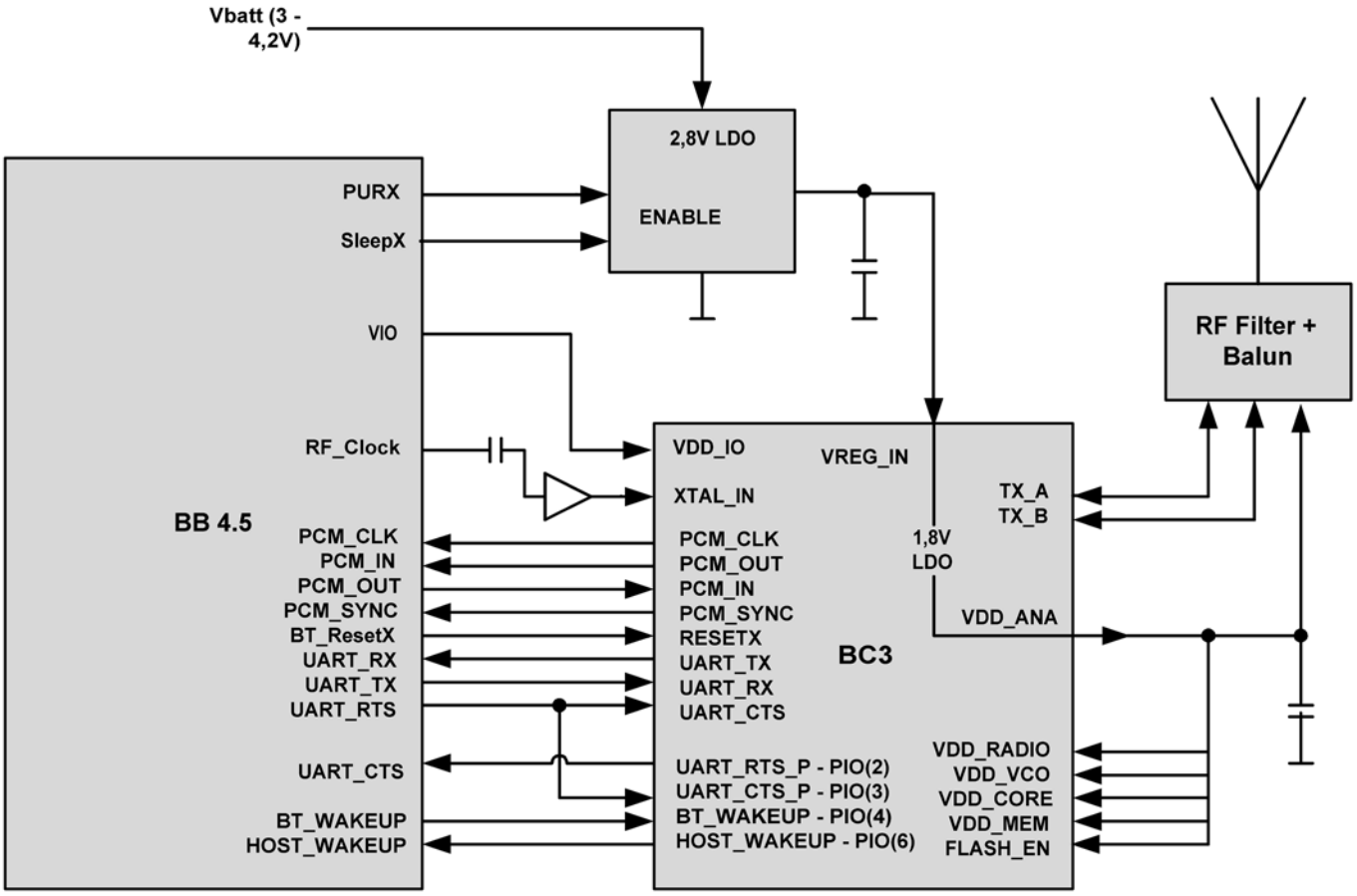

Figure 131 Bluetooth engine interface

Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
Transceiver with BL-5X 600 mAh Li-Ion battery pack	45x15,0/16,5	134	67

Battery endurance

Battery	Talk time	Standby time
BL-5X 600 mAh Li-ion	1.5 - 2.5 hours	Up to 7days

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

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Environmental conditions

Temperature

Temperature range	Min °C	Max °C
Operational (all specs met)	-5	+55
Functional (reduced performance)	-30	+70
Storage	-30	+85

The HW module complies with the SPR4 Operating Conditions.

Humidity

Relative humidity range is 5...95%.

The hardware module is not protected against water. Condensed or splashed water might cause malfunction. Any submerge of the phone will cause permanent damage. Long-term high humidity, with condensation, will cause permanent damage because of corrosion.

The hardware module complies with the SPR4 Operating Conditions.

Electrical characteristics

Table 19 Normal and extreme voltages

Voltage	Voltage (V)	Condition
General conditions		
Nominal voltage	3.700	
Lower extreme voltage	3.145	a
Higher extreme voltage	4.230	b
HW shutdown voltages		
Vmstr+	2.1 ± 0,1	Off to on
Vmstr-	1.9 ± 0,1	On to off
SW shutdown voltages		
SW shutdown	3.1	In call
SW shutdown	3.2	In idle
Min operating voltage		
Vcoff+	3. 1 ± 0,1	Off to on
Vcoff-	2. 8 ± 0,1	On to off

a. ADC settings in the SW might shutdown the phone above this value.

b. During fast charging of an empty battery, this voltage might exceed this value. Voltages between 4.20 and 4.60 might appear for a short while.

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Main RF characteristics

Table 20 Channel numbers and frequencies

System	Channel number	TX frequency	RX frequency	Unit
GSM850	128 <= n <= 251	F = 824.2 + 0.2*(n - 128)	F = 869.2 + 0.2*(n-128)	MHz
GSM900	0 < =n <= 124	F = 890 + 0.2*n	F = 935 + 0.2*n	MHz
	975 <= n <= 1023	F = 890 + 0.2* (n - 1024)	F = 935 + 0.2*(n -1024)	MHz
GSM1800	512 <= n <= 885	F = 1710.2 + 0.2* (n - 512)	F = 1805.2 + 0.2* (n-512)	MHz
GSM1900	512 <= n <= 810	F = 1850.2 + 0.2* (n - 512)	F = 1930.2 + 0.2* (n-512)	MHz

Table 21 Main RF characteristics

Parameter	Unit and value
Cellular systems	[RM-13] EGSM900/GSM1800/GSM1900 [RM-33] GSM850/GSM1800/GSM1900
RX Frequency range	GSM850: 869 ... 894 MHz
	EGSM900: 925 ... 960 MHz
	GSM1800: 1805...1880 MHz
	GSM1900: 1930...1990 MHz
TX Frequency range	GSM850: 824 ... 849 MHz
	EGSM900: 880 ... 915 MHz
	GSM1800: 1710 ...1785 MHz
	GSM1900: 1850...1910 MHz
Duplex spacing	GSM850: 45 MHz
	EGSM900: 45 MHz
	GSM1800: 95 MHz
	GSM1900: 80 MHz
Channel spacing	200 kHz
Number of RF channels	GSM850: 124
	EGSM900: 174
	GSM1800: 374
	GSM1900: 300

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Parameter	Unit and value
Output Power	GSM850: GSMK 5...33 dBm
	GSM850: 8-PSK 5...27 dBm
	EGSM900: GSMK 5...33 dBm
	EGSM900: 8-PSK 5...27 dBm
	GSM1800: GSMK 0...30 dBm
	GSM1800: 8-PSK 0...26 dBm
	GSM1900: GSMK 0...30 dBm
	GSM1900: 8-PSK 0...26 dBm
Number of power levels GMSK	GSM850: 15
	EGSM900: 15
	GSM1800: 16
	GSM1900: 16
Number of power levels 8-PSK	GSM850: 12
	EGSM900: 12
	GSM1800: 14
	GSM1900: 14

Table 22 Transmitter characteristics

Item	Values
Type	Direct conversion, nonlinear, FDMA/TDMA
LO frequency range	GSM850: 3296...3395 MHz (4 x TX freq)
	EGSM900: 3520...3660 MHz (4 x TX freq)
	GSM1800: 3420...3570 MHz (2 x TX freq)
	GSM1900: 3700...3820 MHz (2 x TX freq)
Output power	GMSK 33/33/30/30 dBm
(GSM850/EGSM900/GSM1800/ GSM1900)	8-PSK 27/27/26/26 dBm
Gain control range	min. 30 dB
Phase error (RMS/peak), GMSK	5 deg./20 deg. peak
EVM (RMS/peak), 8-PSK	10%/30%

Table 23 Receiver characteristics

Item	Values
Type	Direct conversion, Linear, FDMA/TDMA

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Item	Values
LO frequencies	GSM850: 3476..3575 MHz (4 x RX freq)
	EGSM900: 3700...3840 MHz (4 x RX freq)
	GSM1800: 3610...3760 MHz (2 x RX freq)
	GSM1900: 3860...3980 MHz (2 x RX freq)
Typical 3 dB bandwidth	+/- 91 kHz
Sensitivity	min. - 102 dBm (normal condition)
Total typical receiver voltage gain (from antenna to RX ADC)	86 dB
Receiver output level (RF level -95 dBm)	230 mVpp, single-ended I/Q signals to RX ADCs
Typical AGC dynamic range	83 dB
Accurate AGC control range	60 dB
Typical AGC step in LNA	25 dB GSM850/EGSM900
	30 dB GSM1800/GSM1900
Usable input dynamic range	-102... -10 dBm
RSSI dynamic range	-110... -48 dBm
Compensated gain variation in receiving band	+/- 1.0 dB

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9 — Schematics

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Schematics

Audio

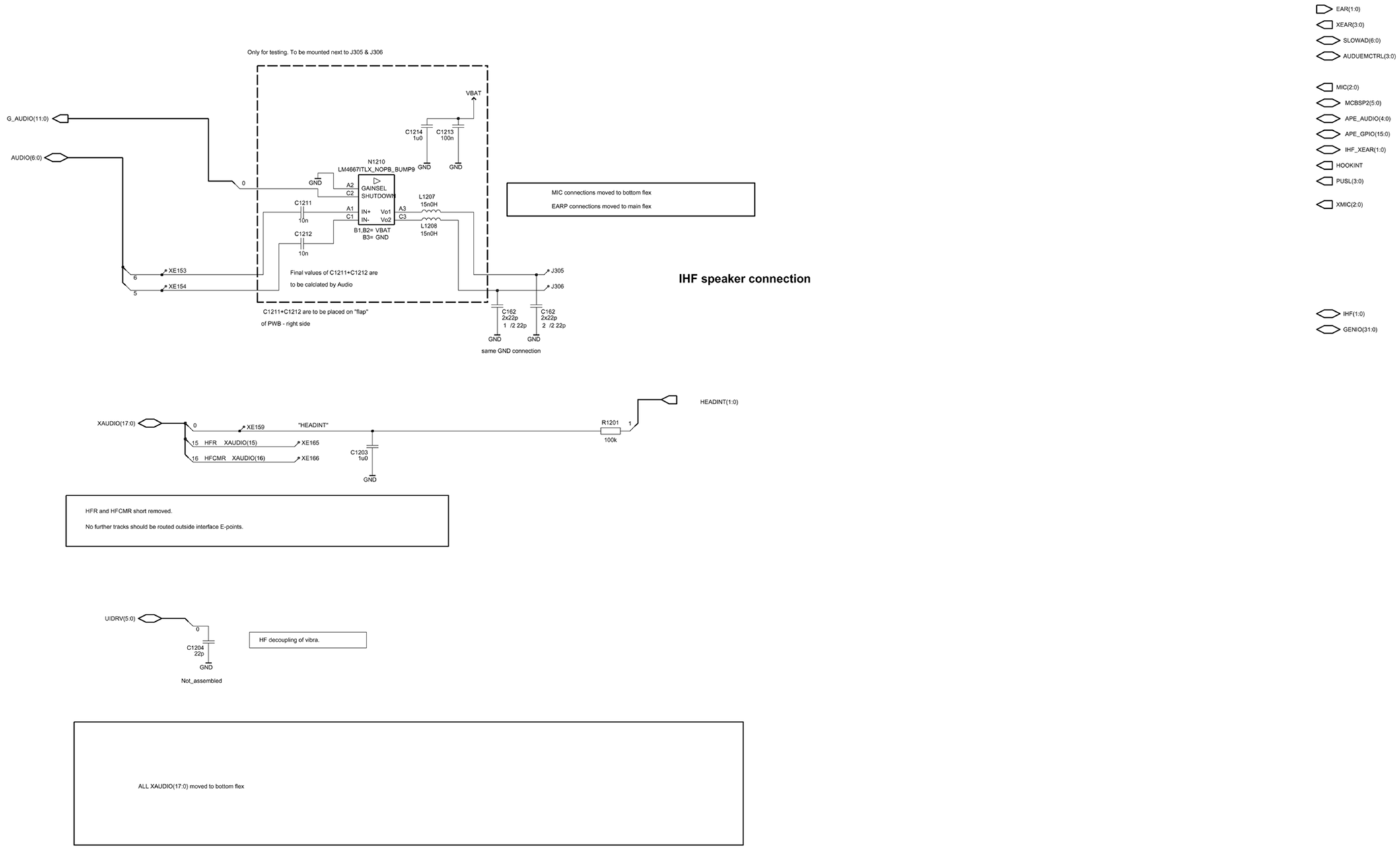

Figure 132 RM-13/33 Audio, v. 2.0, ed. 287

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Bluetooth

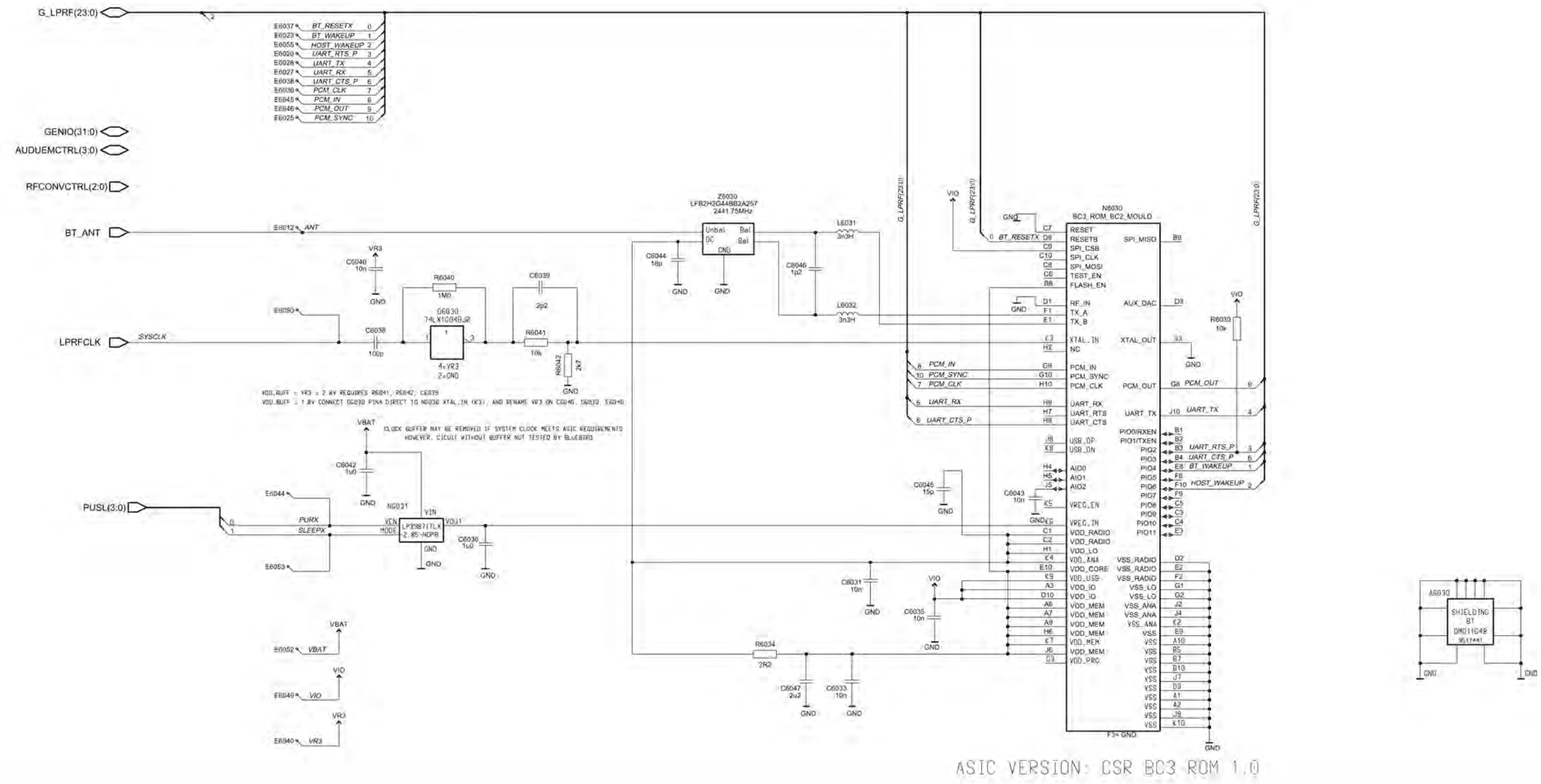

Figure 133 RM-13/33 Bluetooth, ed. 113

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Top level

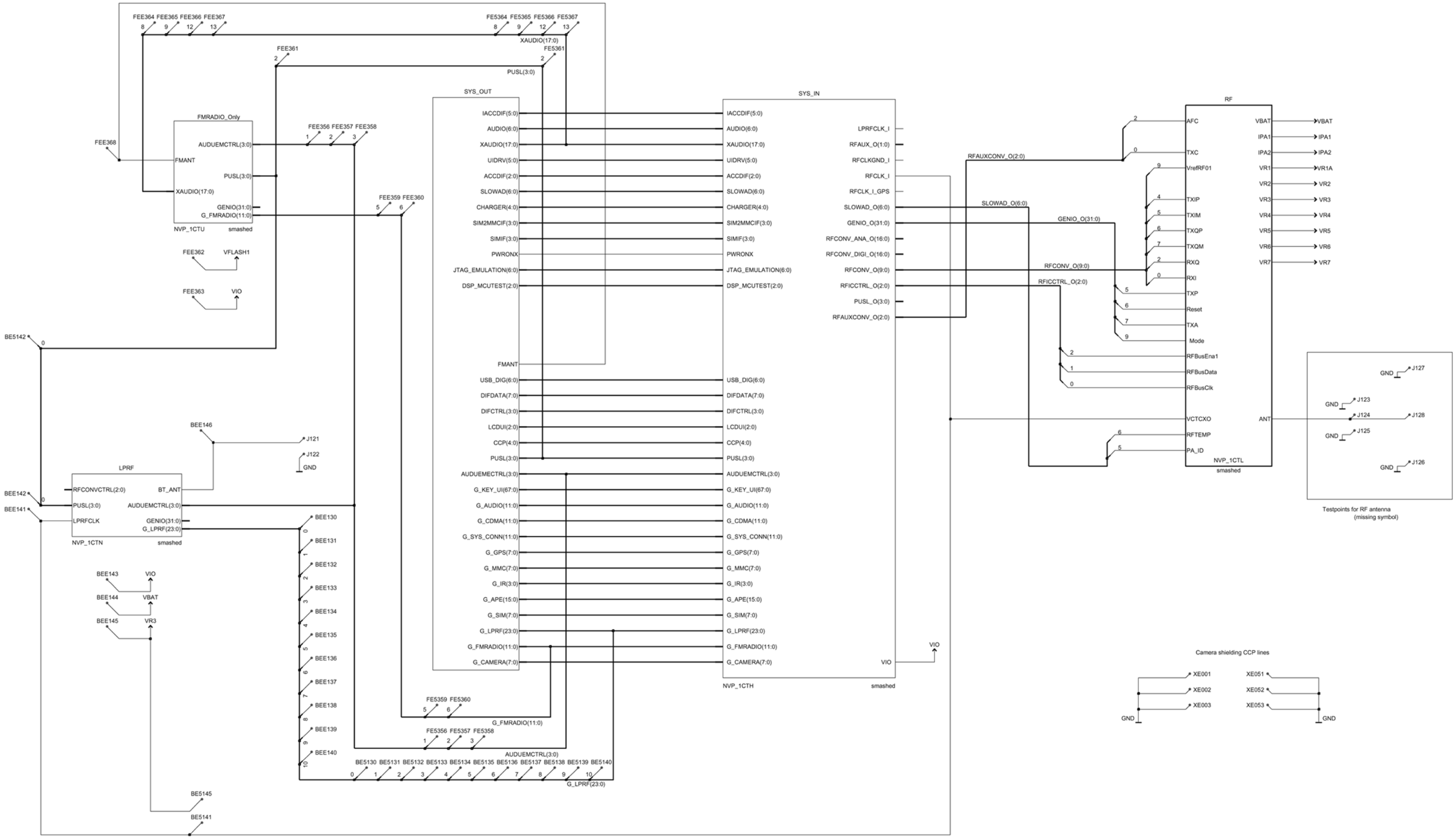

Figure 134 RM-13/33 Top level, ed. 443

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RF top level

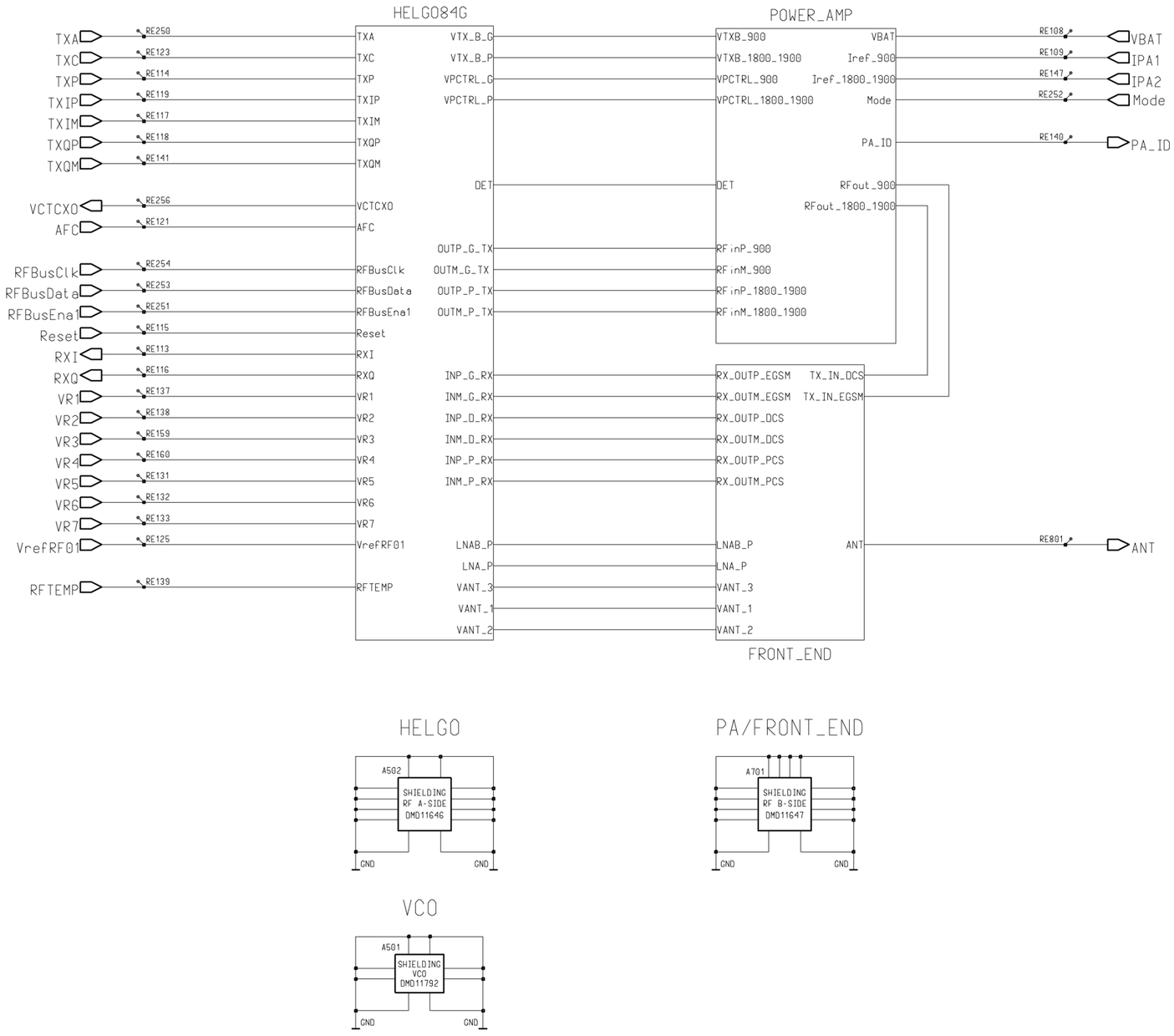

Figure 135 RM-13/33 RF top level, ed. 224

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RX front end and antenna switch

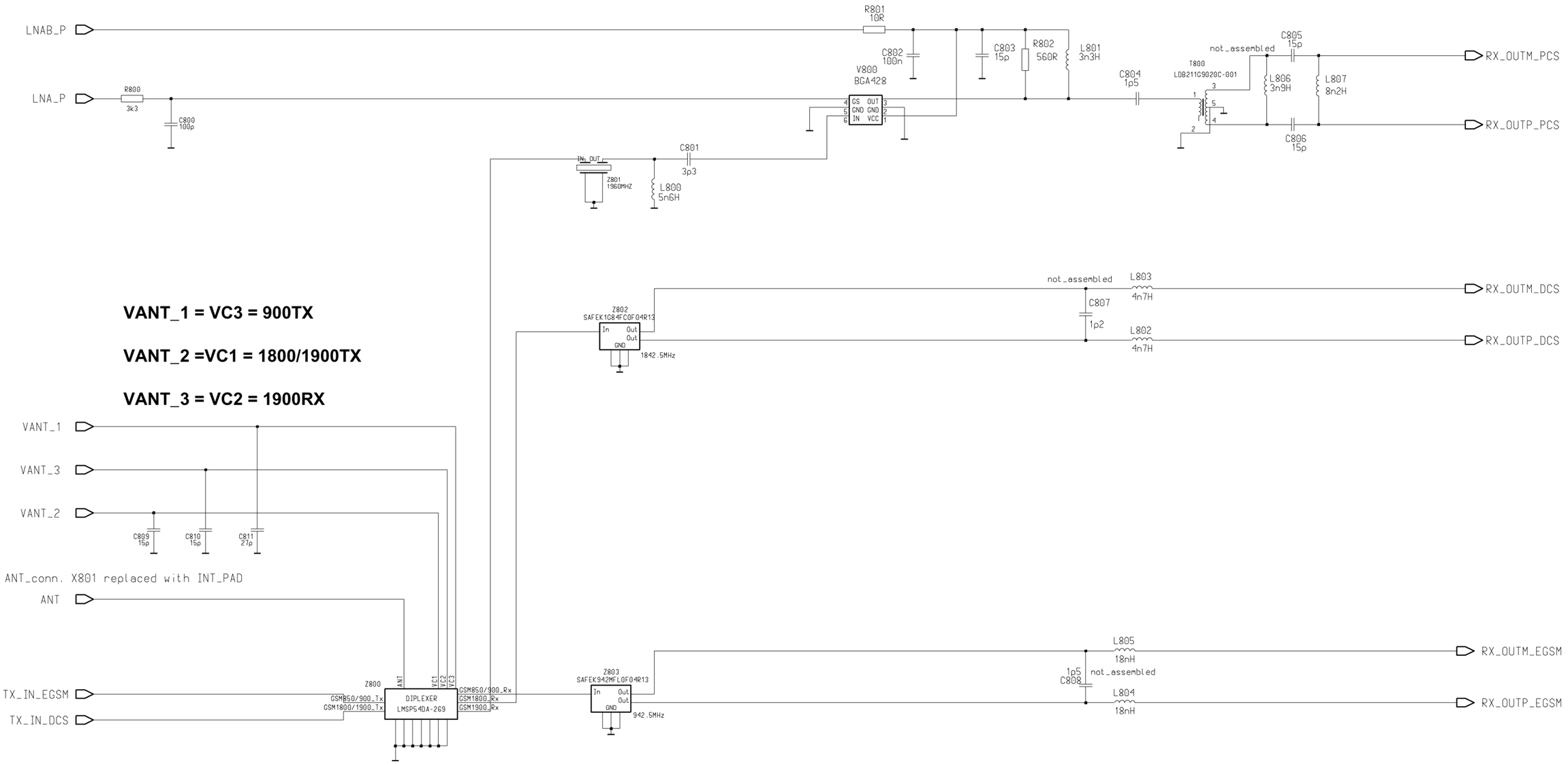

Figure 136 RM-13/33 RX front end and antenna switch, ed. 182

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Helgo (RF ASIC)

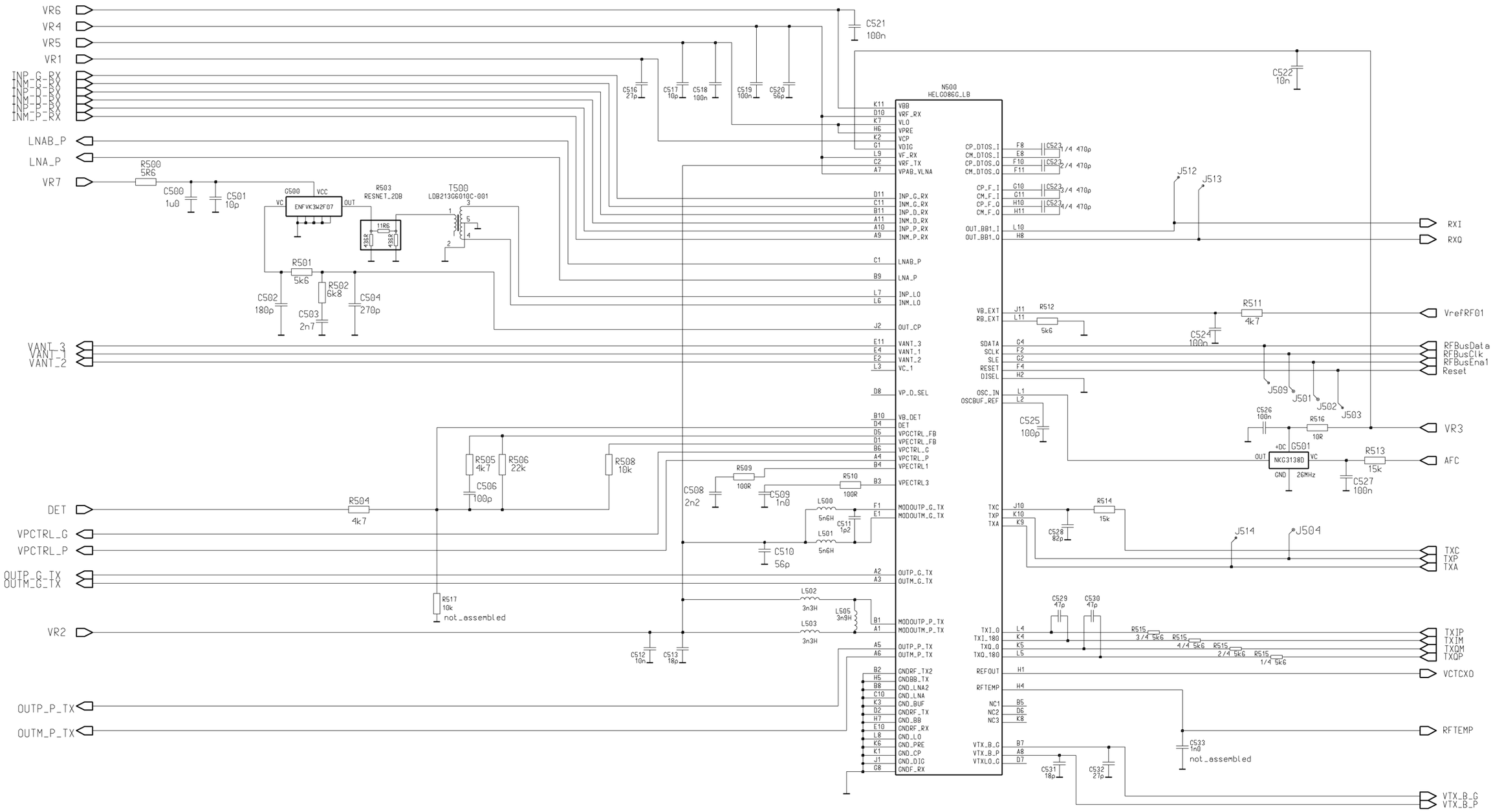

Figure 137 RM-13/33 Helgo, ed. 227

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Power amplifier and detection

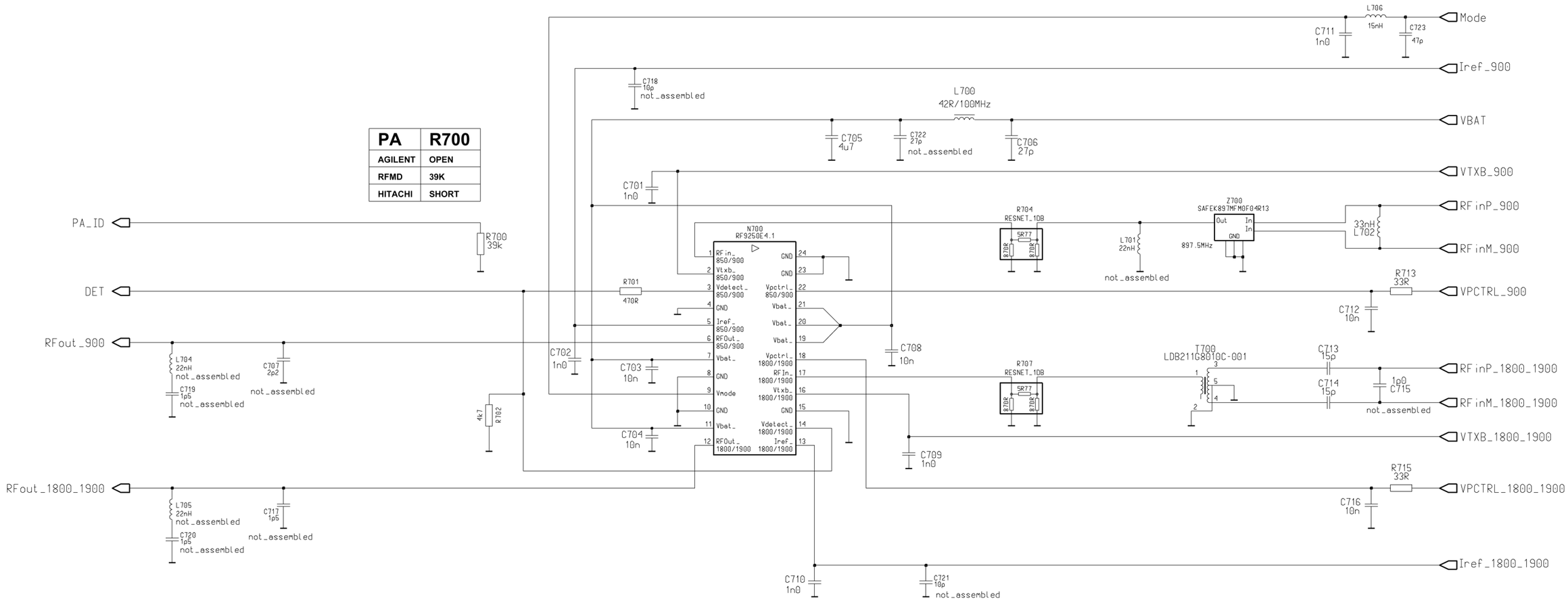

Figure 138 RM-13/33 Power amplifier and power detection, ed. 161

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Baseband engine

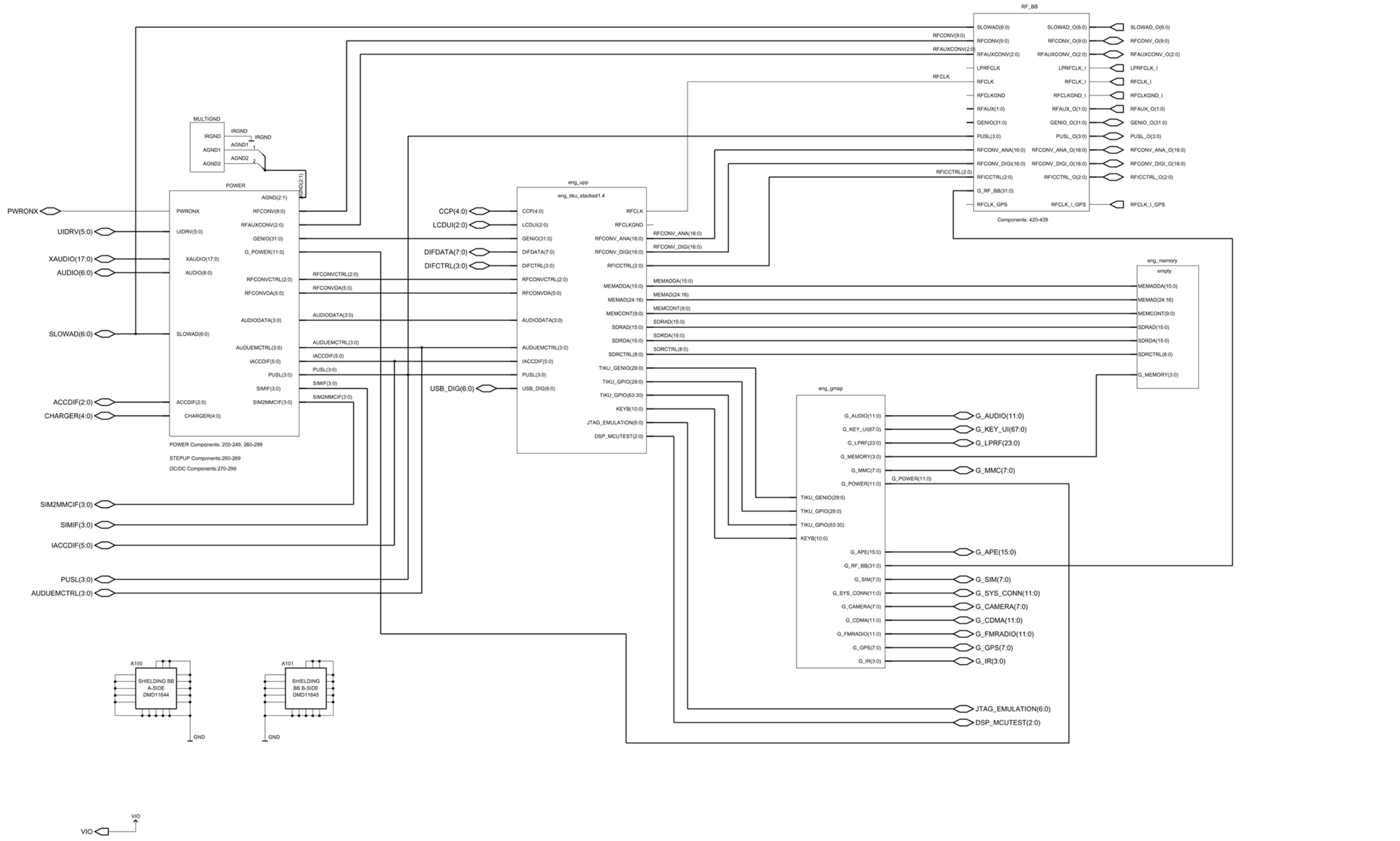

Figure 139 RM-13/33 BB engine, v. 0.0, ed. 3

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RF-baseband interface

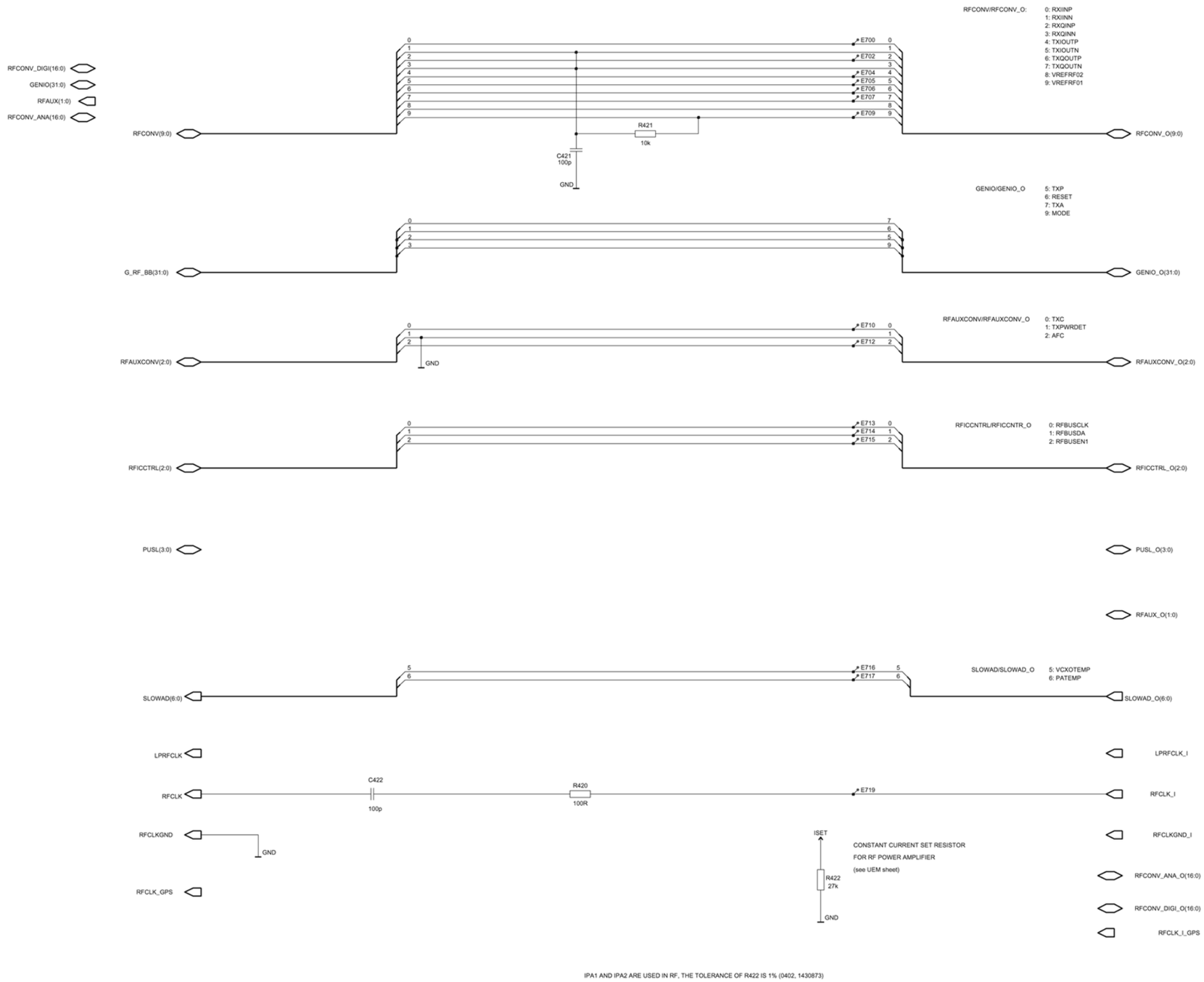

Figure 140 RM-13/33 RF-BB interface, v. 1.3, ed. 3

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Energy management (UEM)

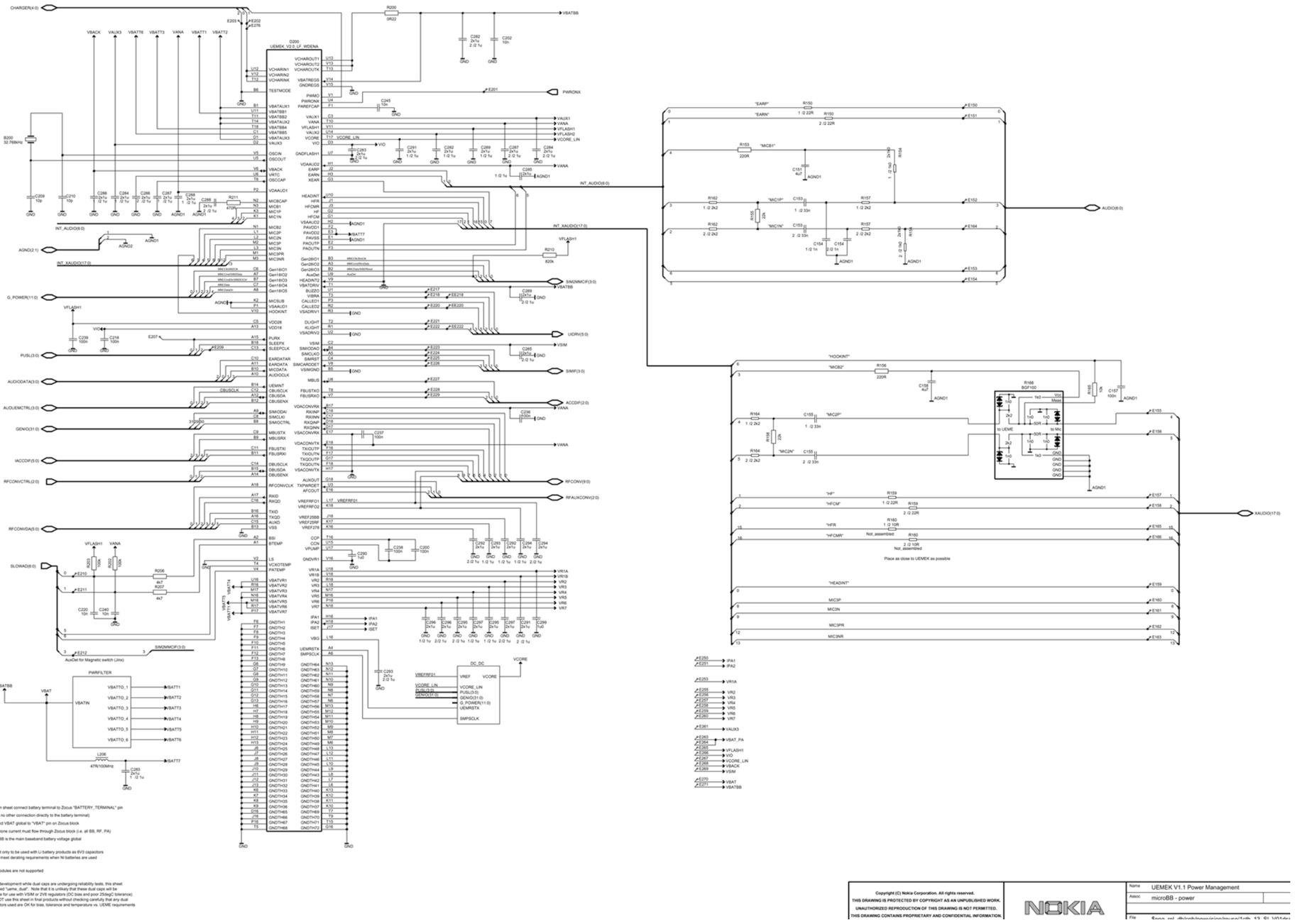

Figure 141 RM-13/33 UEMEK power management, v. 1.0, ed. 3

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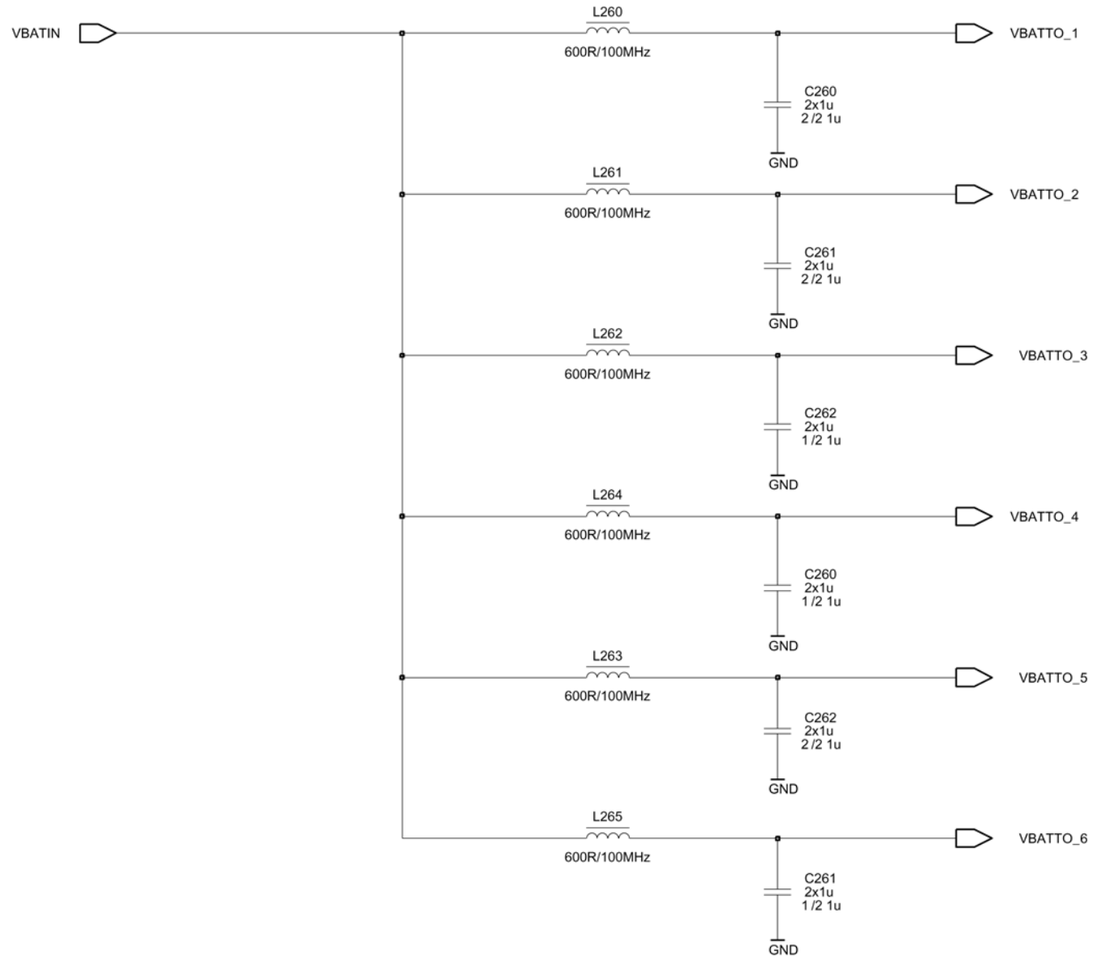
Light filtering



NOTE: This sheet uses dual 1uF capacitors. Check that full approval has been granted for these parts before use, or use this sheet at risk

Figure 142 RM-13/33 Light filtering, v. 1.0, ed. 3

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DC_DC for Tiku and VIO

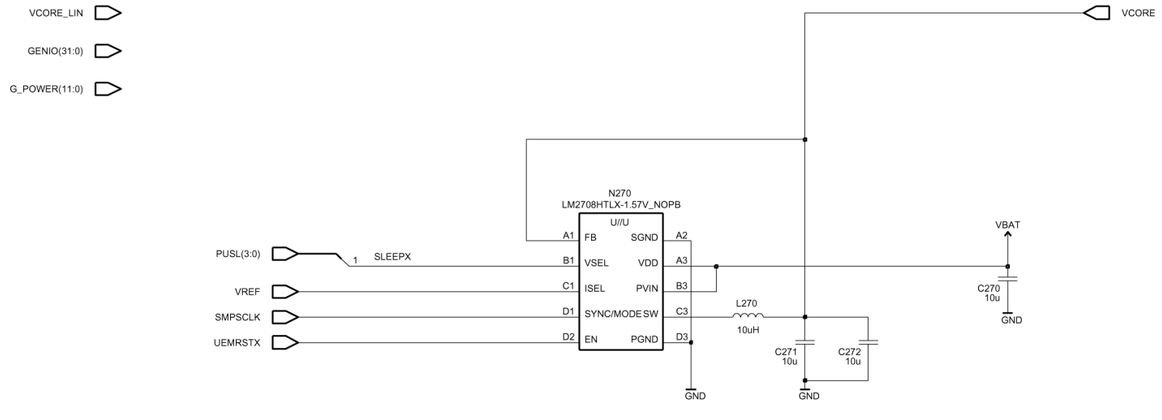

Figure 143 RM-13/33 DC_DC for Tiku and VIO, v. 1.7, ed. 3

MultiGND and connections

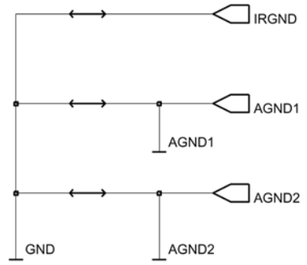

Figure 144 RM-13/33 MultiGND connecting AGNDs & IRGND to global GND, v. 0.0, ed. 3

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Flash memory

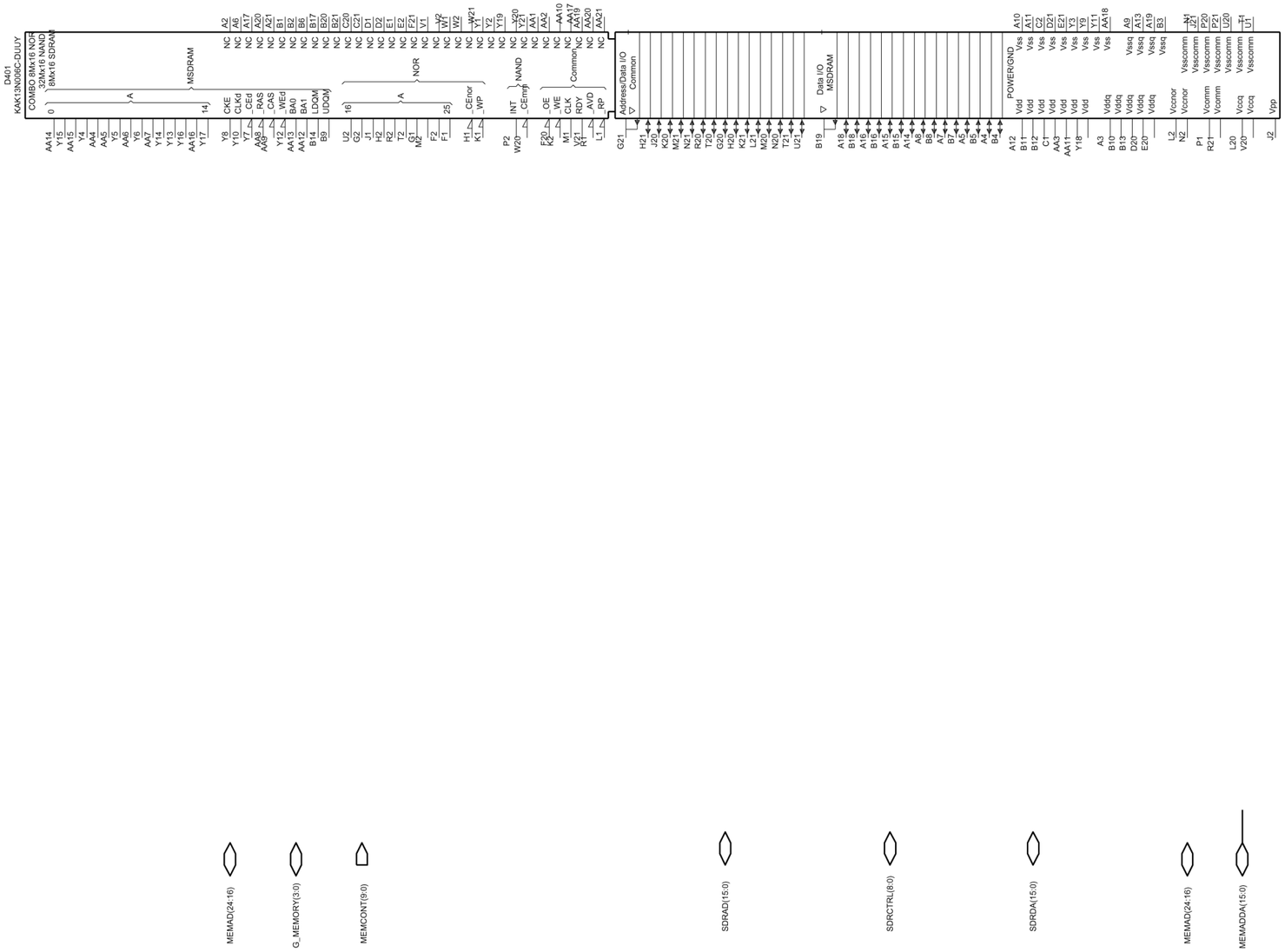

Figure 145 RM-13/33 Flash memory 128 Mbit, v. 2.0, ed. 3

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TikuEDGE

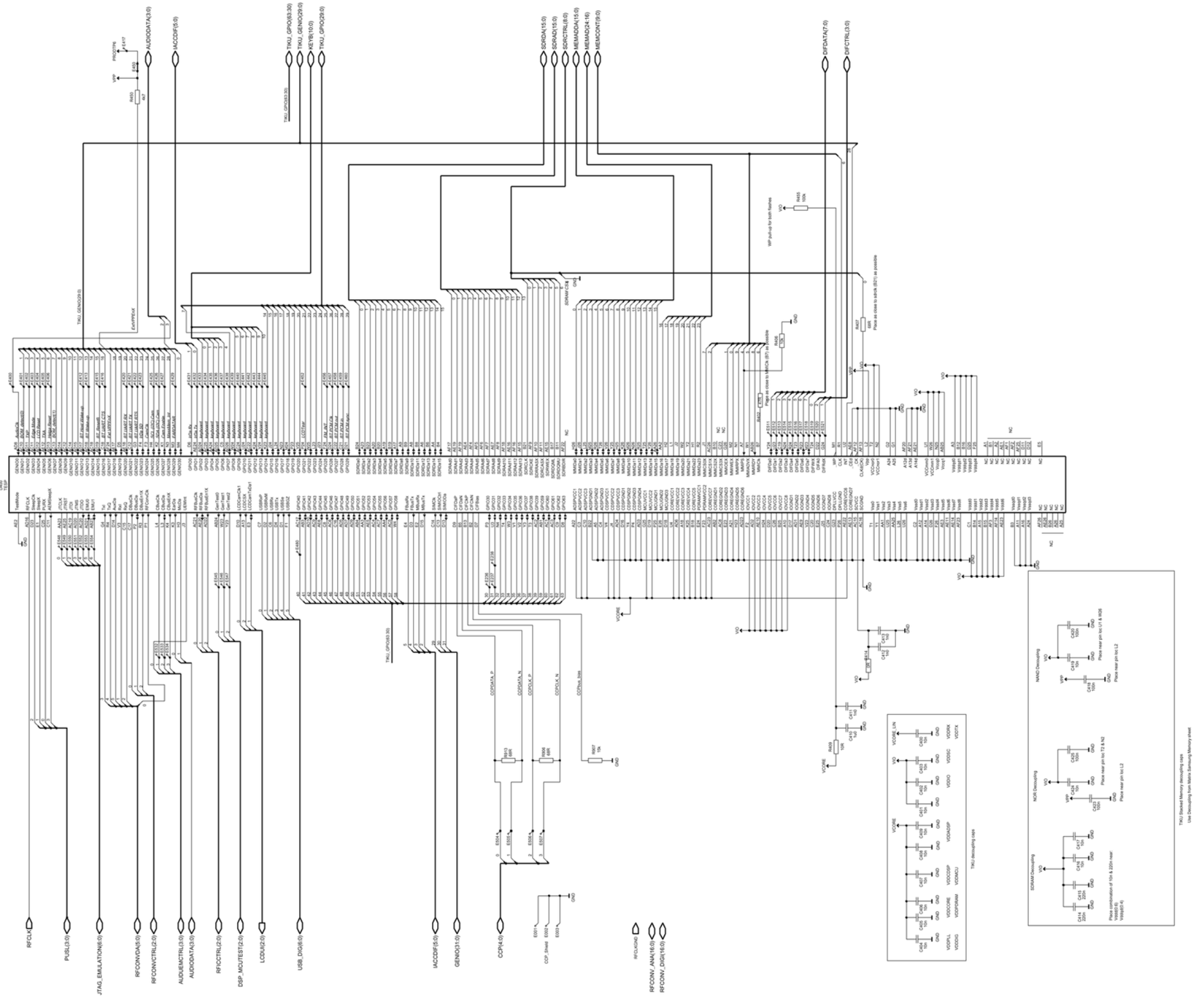

Figure 146 RM-13/33 TikuEDGE part of uBB engine, v. 1, ed. 3

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GENIO and GPIO

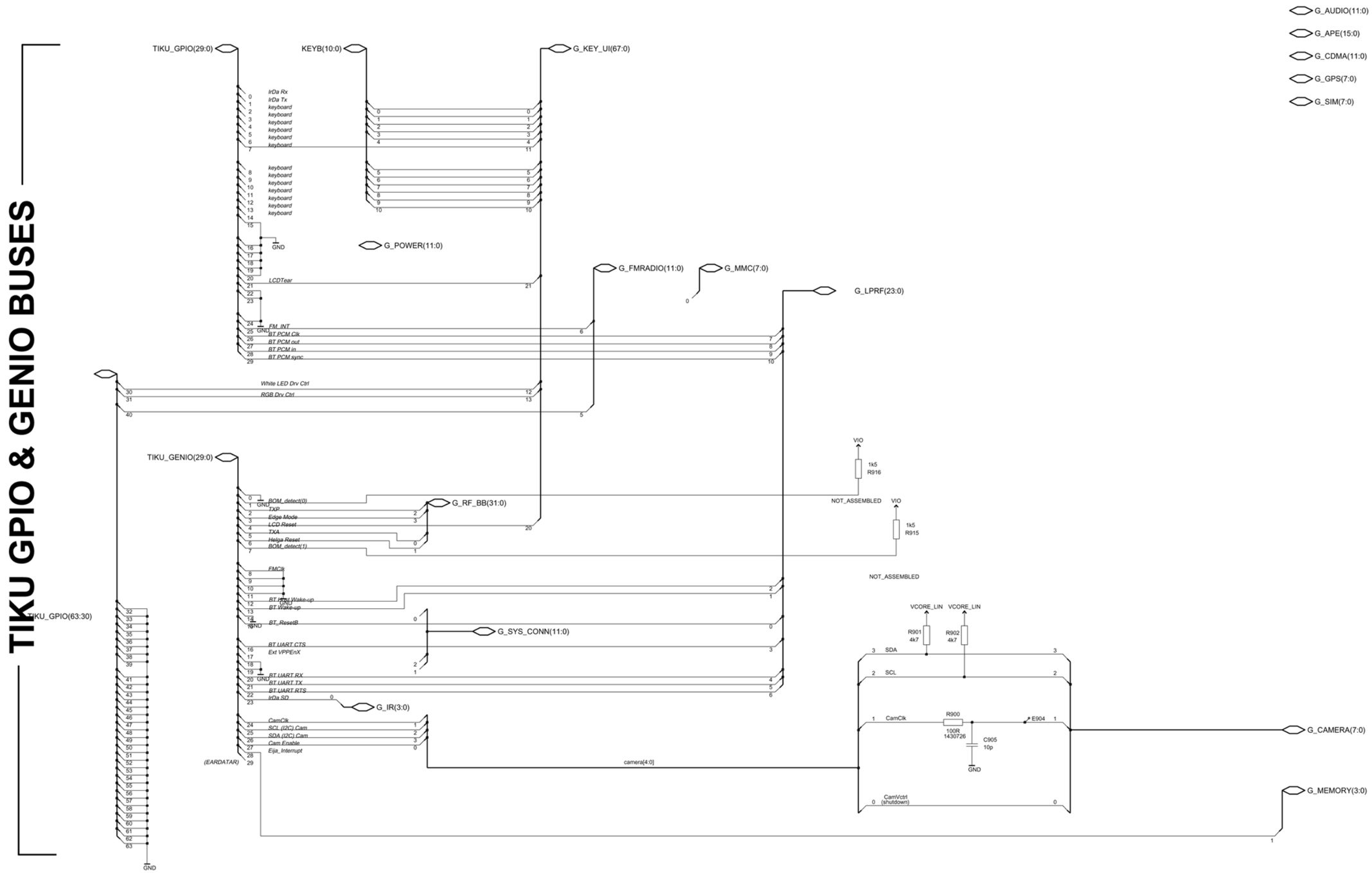

Figure 147 RM-13/33 GENIO & GPIO connection block, v. 0.0, ed. 3

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SYS_OUT

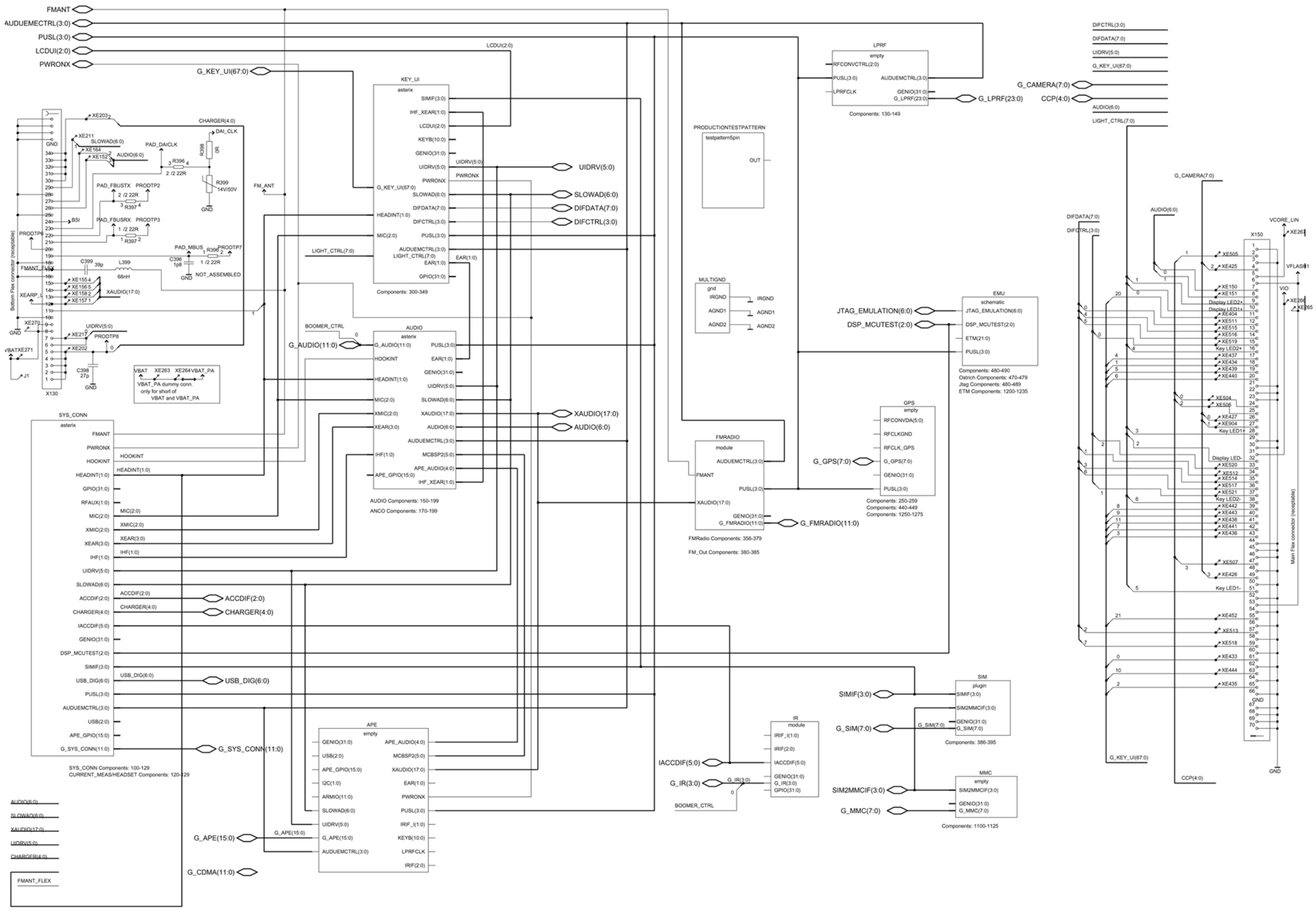

Figure 148 RM-13/33 SYS_OUT top level, v. 2.0, ed. 329

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SIM reader

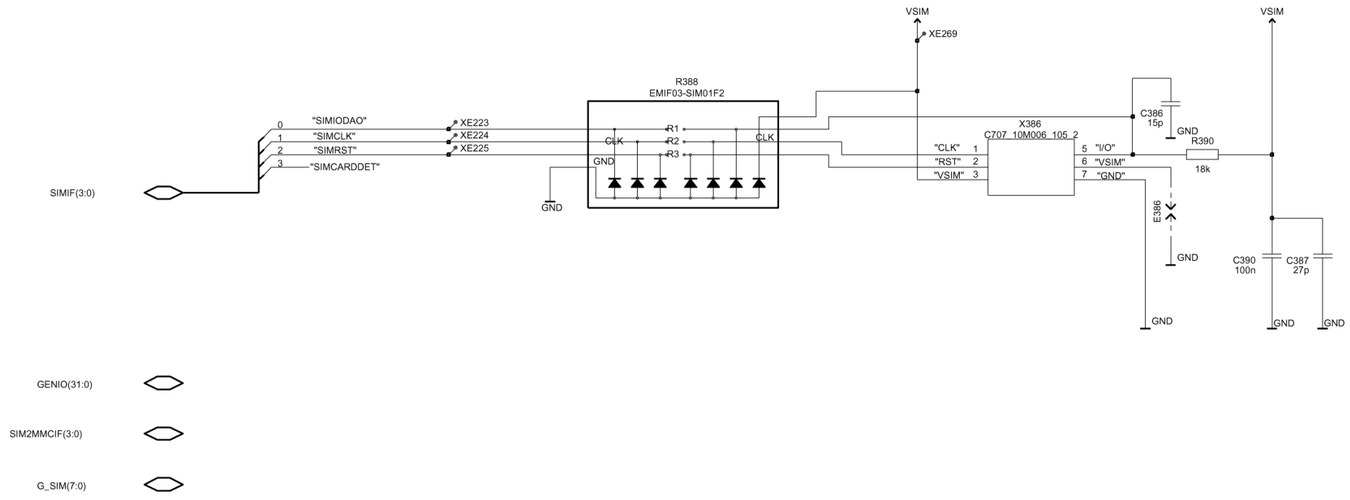

Figure 149 RM-13/33 SIM reader, v. 2.0, ed. 143

MultiGND symbol bypass

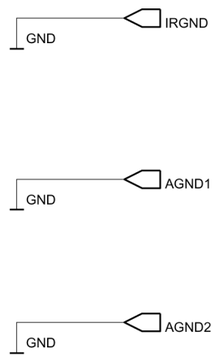

Figure 150 RM-13/33 MultiGND symbol bypass, v. 0.0, ed. 28

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System connector

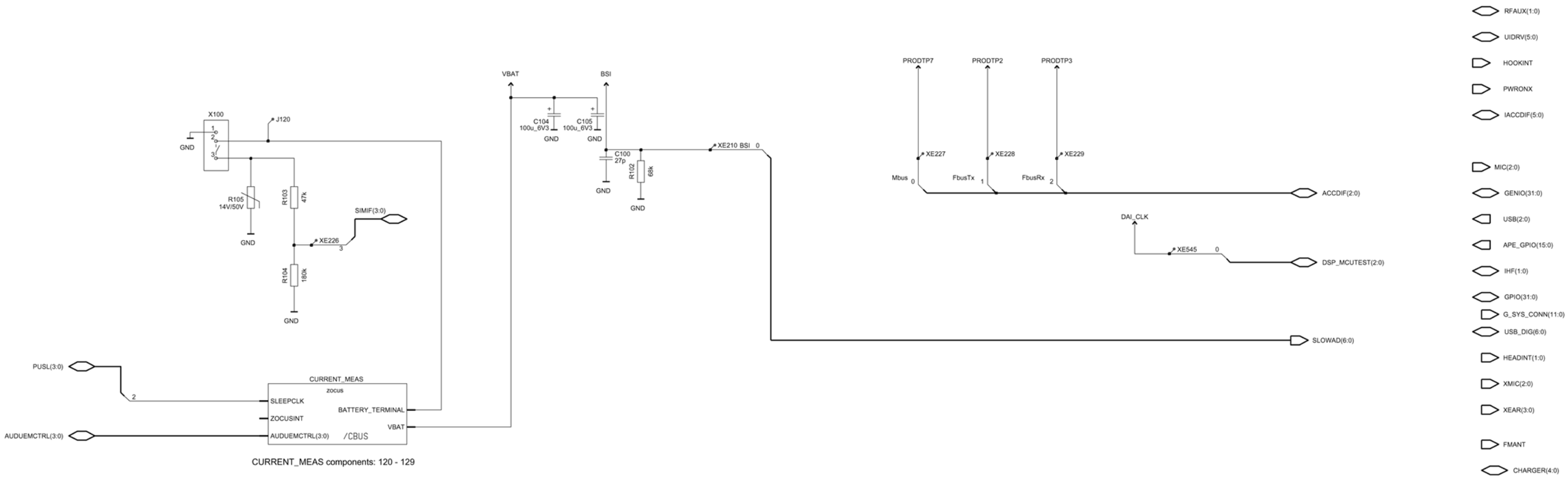

Figure 151 RM-13/33 System connector, v. 3.3, ed. 327

Zocus (current measurement)

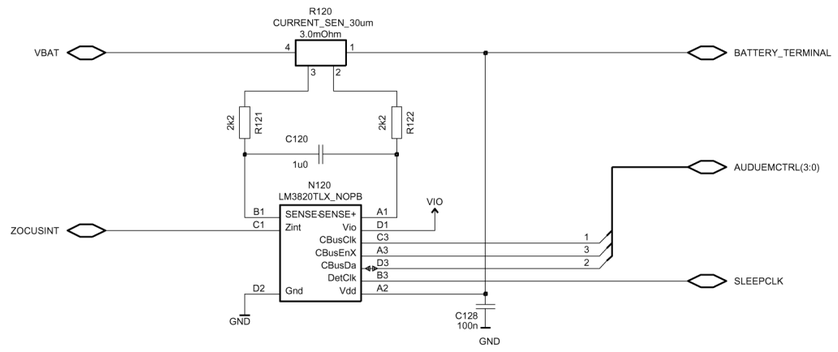

Figure 152 RM-13/33 Zocus current measurement, v. 2.1, ed. 99

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UI components

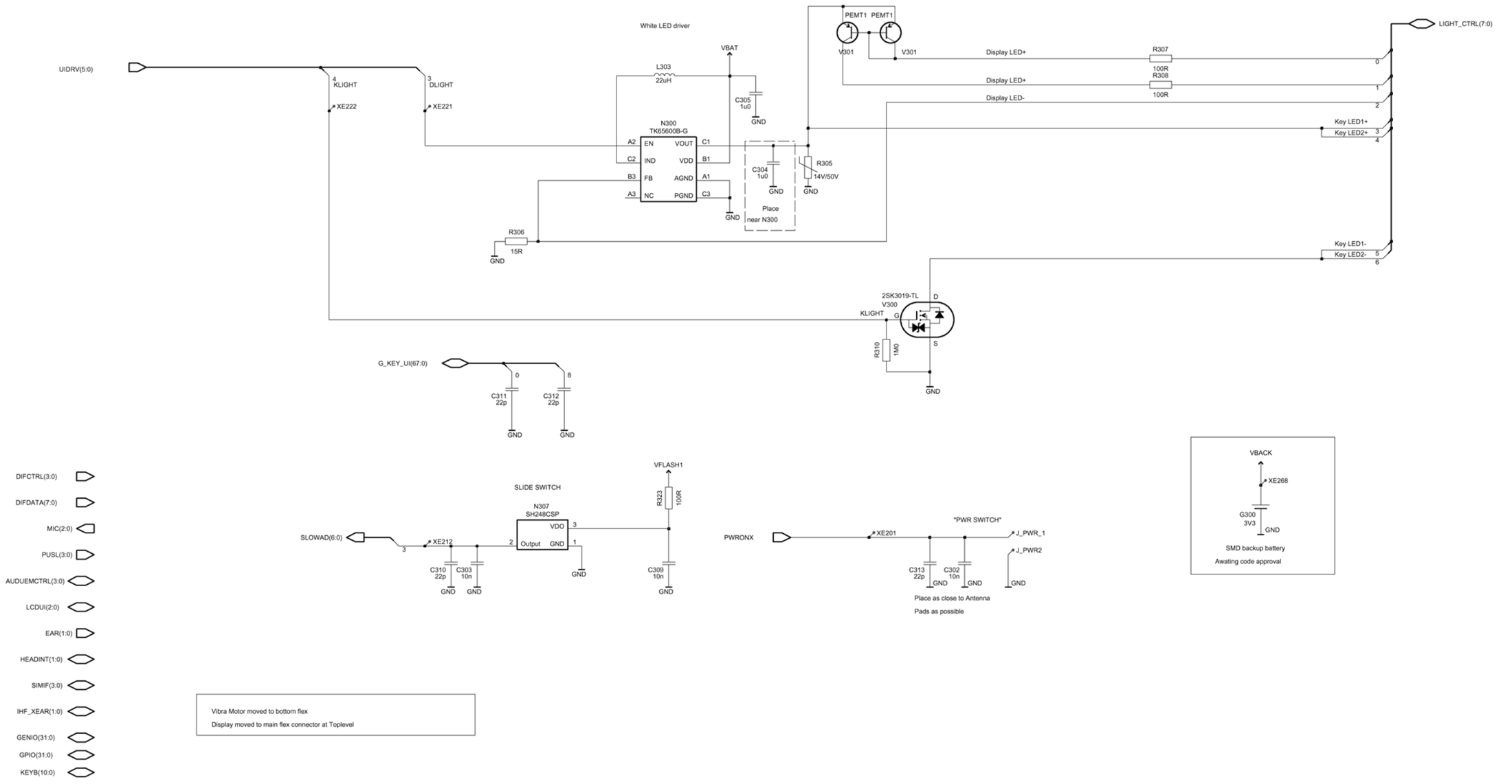

Figure 153 RM-33 UI components, v. 2.3, ed. 534

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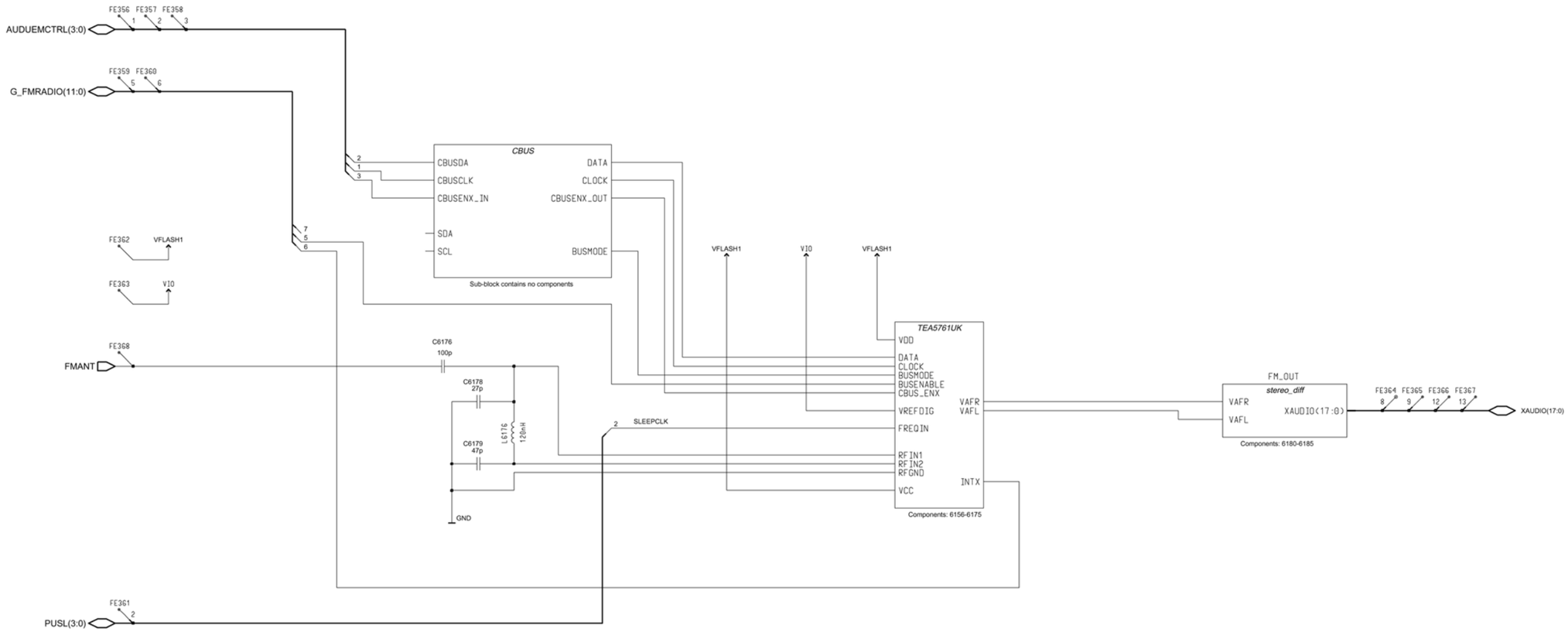
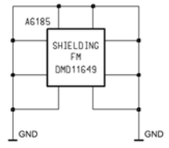
FM interface (RM-33)



Note: For Layout information, see FM Radio Application Note: Document No. DHJ00379

Interface Designation	*BB Release*	*G_MAP sheet Recommended connection(s)*	*Signal*	*Function*
G_FMRADIO(5)	*BB4.0*	*GENIO(24)*	*INTX*	*Falling Edge Interrupt*
	BB4.5	*GENIO(8) or GENIO(9) or GENIO(10) or GENIO(11)*		
FmRadio_2V7_ANA		*VANA*	*VCC/VDD*	*Main 2.7Vdc Supply*
FmRadio_1V8_Dig		*VIO*	*VREFDIG*	*1.8Vdc IO Supply*



GENIO(31:0)

Figure 154 RM-33 FM interface, v. 0.0, ed. 124

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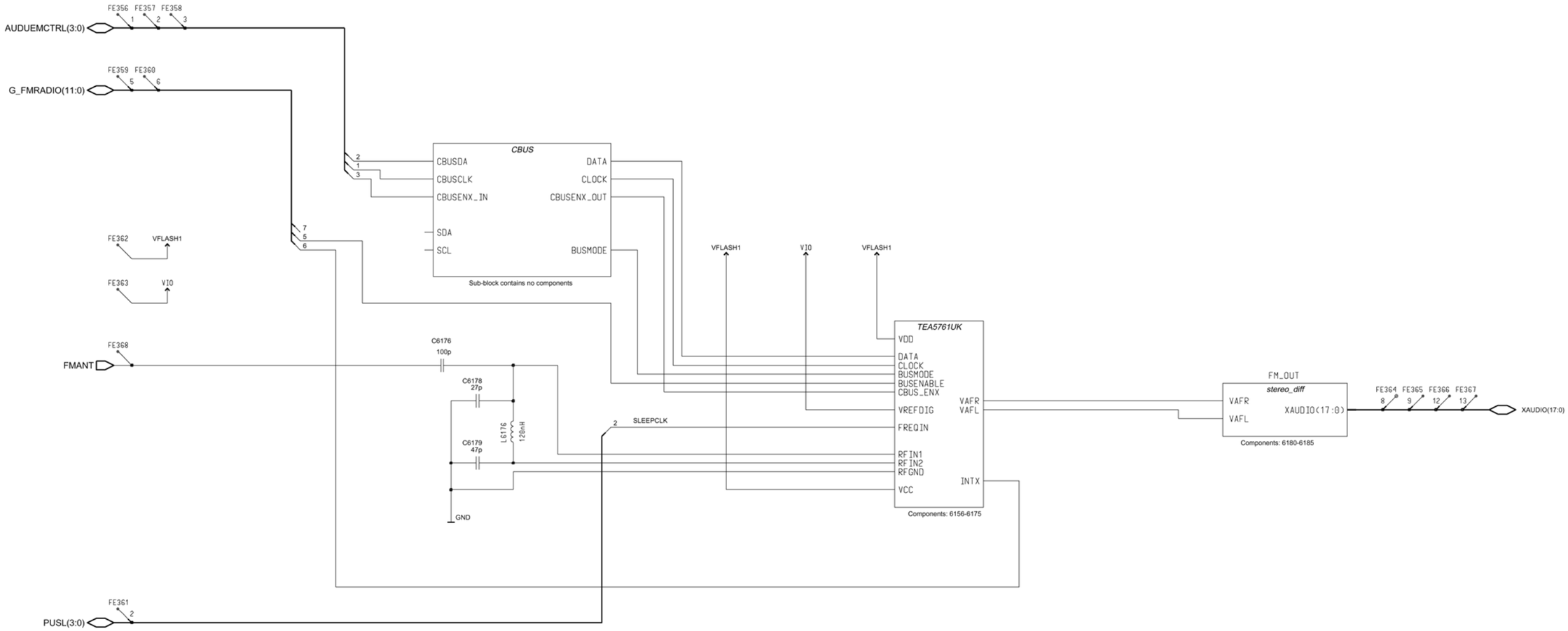
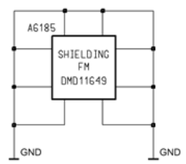
FM interface (RM-13)





Note: For Layout information, see FM Radio Application Note: Document No. DHJ00379

Interface Designation	*BB Release*	*G_MAP sheet Recommended connection(s)*	*Signal*	*Function*
G_FMRADIO(5)	*BB4.0*	*GENIO(24)*	*INTX*	*Falling Edge Interrupt*
	BB4.5	*GENIO(8) or GENIO(9) or GENIO(10) or GENIO(11)*		
FmRadio_2V7_ANA		*VANA*	*VCC/VDD*	*Main 2.7Vdc Supply*
FmRadio_1V8_Dig		*VIO*	*VREFDIG*	*1.8Vdc IO Supply*

Figure 155 RM-13 FM interface, v. 0.0, ed. 128

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CBus

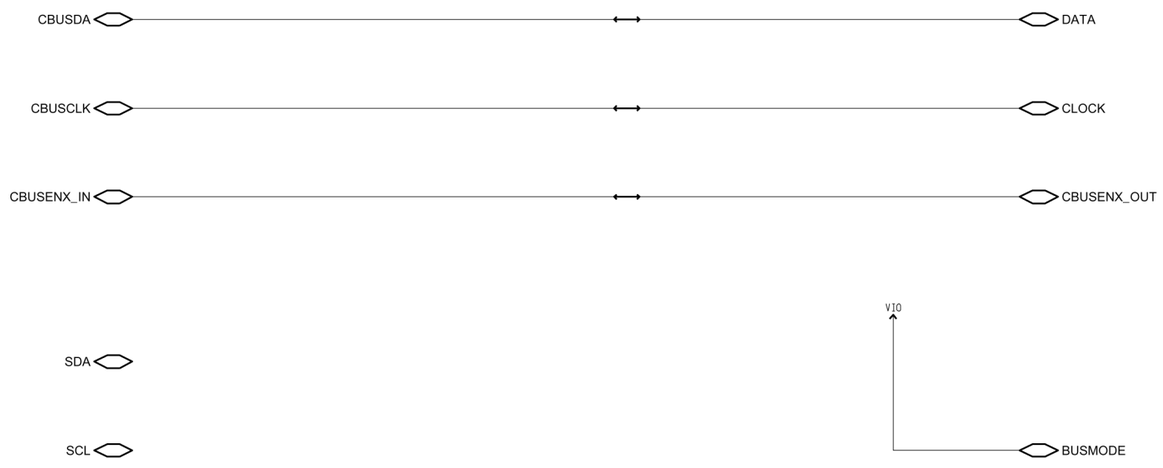

Figure 156 RM-13/33 CBus, v. 0.0, ed. 64

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Differential stereo

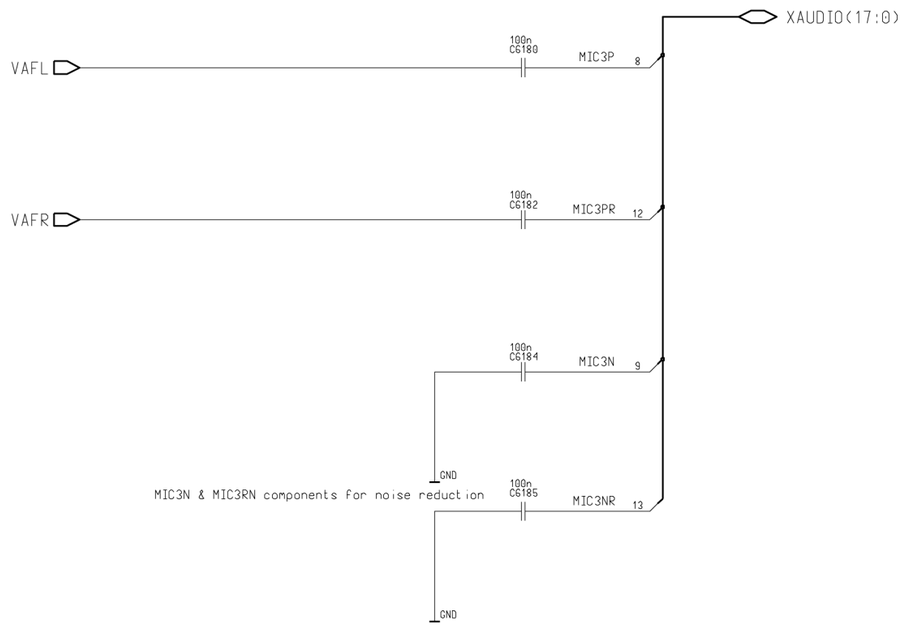

Figure 157 RM-13/33 Differential stereo, v. 0.0, ed. 71

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FM radio

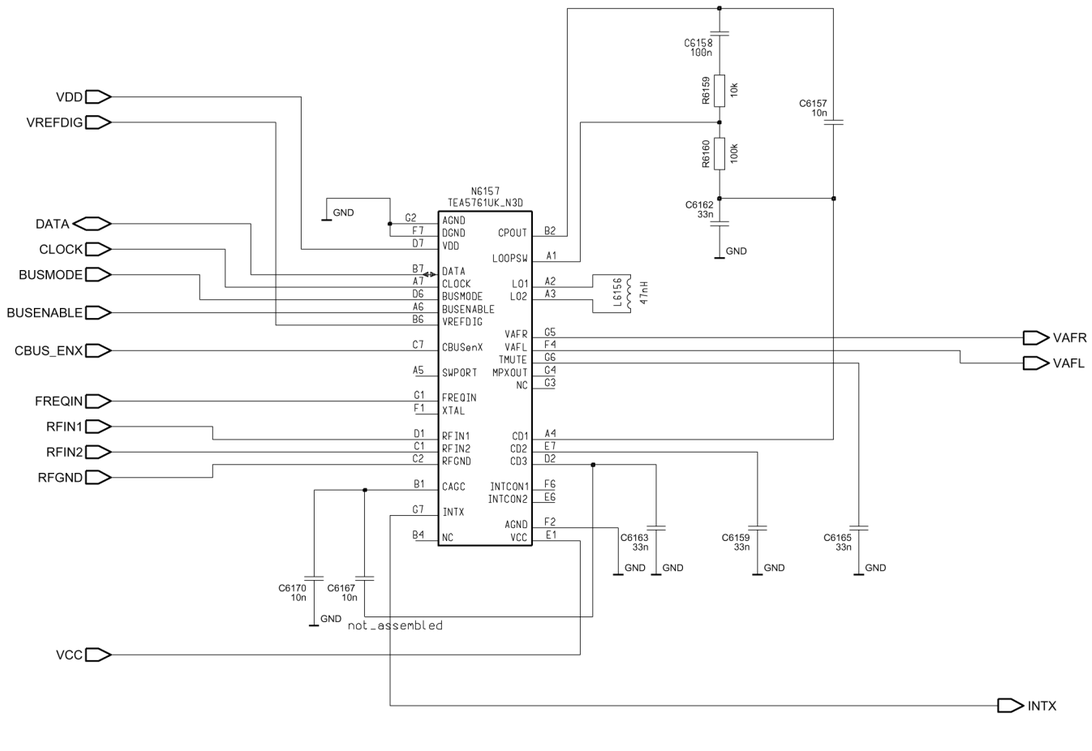

Figure 158 RM-13/33 FM radio, v. 0.0, ed. 31

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Component layout, top side

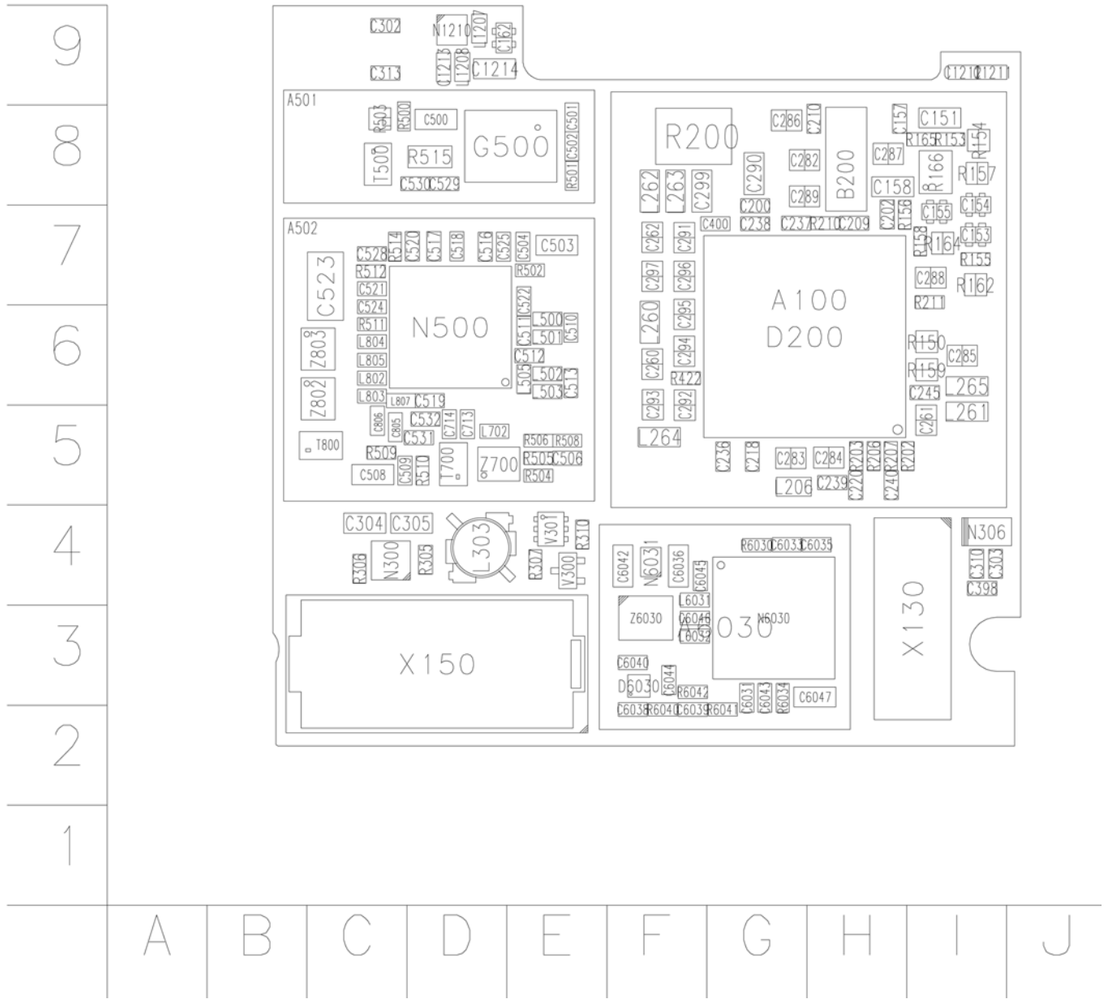

Figure 159 RM-13/33 Component layout 1eaa_11a/b, top side

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Component layout bottom side

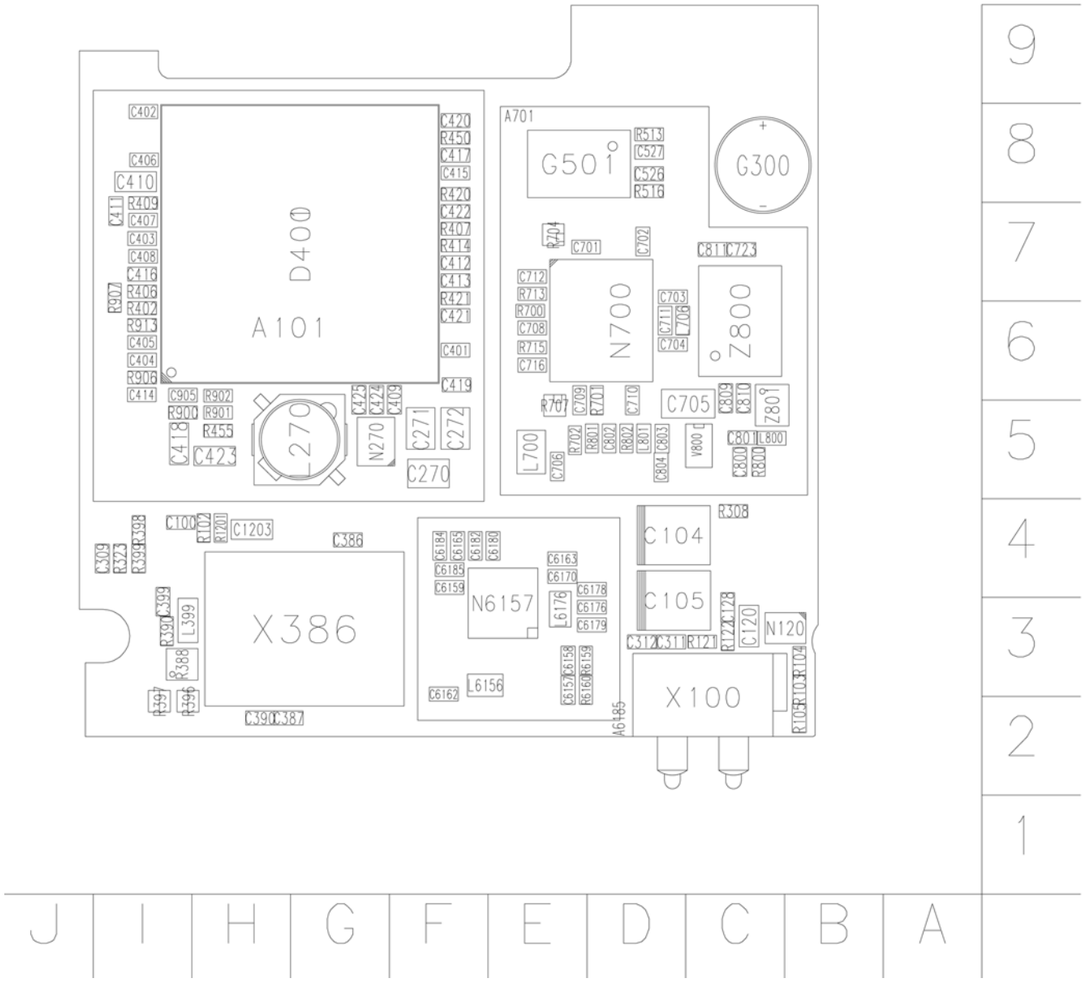

Figure 160 RM-13/33 Component layout 1eaa_11a/b, bottom side

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Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

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DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode

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LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver

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SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP, Official Tiku3G
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)

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