

Nokia Customer Care

Service Manual

RH-109 (Nokia 1606Arte; L3&4)

Mobile Terminal

Part No: (Issue 2)

COMPANY CONFIDENTIAL



Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	2008.05.13	Michelle Wang	Initial draft
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The availability of particular products may vary by region.

IMPORTANT

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

Warnings and cautions

Warnings

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

Cautions

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

For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

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

CONNECTION TO OTHER DEVICES

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

Care and maintenance

- This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfill 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. Unauthorized antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

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

ESD protection

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

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

To replace the covers ESD protection must be applied.

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

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

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

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

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

Battery information

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

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

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

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

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

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

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

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

Do not dispose of batteries in a fire!

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

Company Policy

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

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

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Nokia 1606Arte Service Manual Structure

- 1. General information
- 2. Service Devices and Service Concepts
- 3. BB Troubleshooting and Manual Tuning Guide
- 4. RF Troubleshooting
- 5. System Module Description
- Glossary

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Nokia Customer Care

1 – General information

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■ Product selection

RH-109 (Nokia 1606) is a CDMA200 1Xrtt triple band phone, supporting CDMA2000 1Xrtt /Cell/PCS/AWS bands.



Figure 1 RH-109 (Nokia 1606Arte) product picture

■ Phone features

Display and keypad features

- 1.77" 128x160 pixel, 262k true color internal display
- 0.97" 96x32 pixel, white monochrome external display
- 5-way , navi-key (4 way scroll and center key, call and end keys with intelligent key light+)

Hardware features

- Micro USB port for charging and data transfer (USB 2.0+)
- 2.5 phi dedicate headset
- Internal vibrator and antenna
- Internal 512Mb memory
- Torch feature in power on/off
- Support E911

RF features

- CDMA2000 1Xrtt: Cell/PCS/AWS
- AGPS/SGPS: E911 feature only

■ User interface and software features

Selection of software applications and services

- 3GPP streaming / downloading video
- Themes (wallpapers, icons, colors+)
- Music Player supporting MP3, Midi, QCELP and EVRC
- OMA DRM 1.0
- OMA MMS 1.2, MMS Conformance 3.0, AMR and SMIL
- OMA Client Provisioning v1.3
- MP3 ringing tones, true tones and MIDI ringing, alert and gaming tones with support of 64 polyphone
- HTTP 1.1/WAP2.0
- Nokia PC Suite

■ Accessories

Sales package contents

- Nokia 1606 phone
- Nokia Battery BL-4B
- Nokia Charger: AC-6,
- User Guide

■ Technical specifications

General specifications

Unit	Dimension(mm)	Weight(g)	Volume(cc)
Transceiver with BL-4B 700mA Li-Ion battery pack	85x45x16.5	76	48

Battery endurance

Battery	NMP Talk time	NMP Standby time
BL-4B 700mAh Li-Ion battery	Up to 3.5 hours	10 days

Note: The variation in operation times will occur depending on network parameters, phone setting and usage.

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2 – Service Devices and Service Concepts

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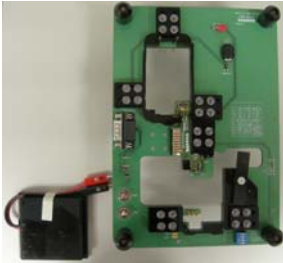
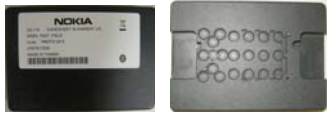
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■ Service Devices

Product specific devices

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RH-109, refer to various concepts.

	MJ-199	Module Jig	
	This device holds the PWB during testing. It has a serial port interface to connect to the service software.		
	RJ-230	Universal Soldering Jig	
	RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.		
	SS-179	Domesheet Alignment Jig	
	This jig is used when replacing the domesheet on the PWB to ensure correct alignment.		

Cables

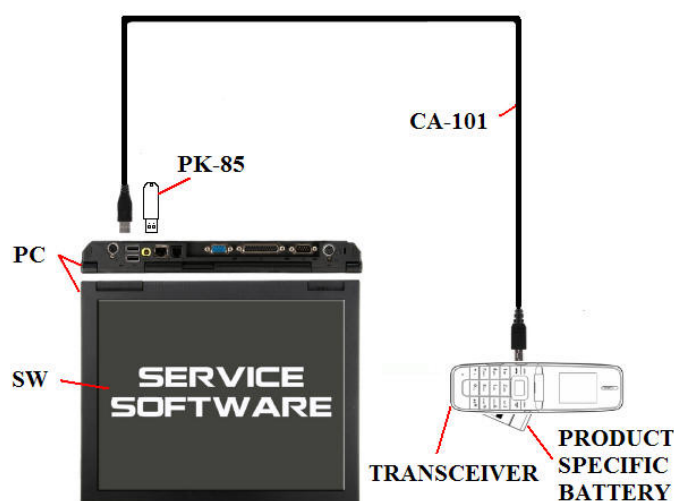
The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RH-109, refer to various concepts.

	CA-128RS	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. Attenuation for: • Cell band: 0.51 • PCS band: 0.85 • AWS Tx band: 0.75		

	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 voltage.		

■ SW Update

POS (Point of Sale) flash concept



Type	Description
Product specific tools	
BL-4B	Battery
Other tools	
PK-85	USB dongle
	PC with PST software
Cables	
CA-101	USB connectivity cable

■ Software download

Introduction

Purpose

The purpose of this section is to show the PST download tool operation steps. User can follow the operation sequence, step by step, to complete the image downloading procedure. This section also shows users what should be careful during downloading.

Scope

This section will show the operations sequence of Single bundle downloading, multi-bundle downloading and single download tool with dead phone revive function.

Definitions, Acronyms, and Abbreviations

PST	Product Service Tool / Product Support Tool
CPC	Customer Product Code / Customer Protect Code
MSI	Microsoft Installer

Reference

[http://msdn2.microsoft.com/en-us/library/wtzawcsz\(VS.80\).aspx](http://msdn2.microsoft.com/en-us/library/wtzawcsz(VS.80).aspx)

Operation guide

Requirements and Notices

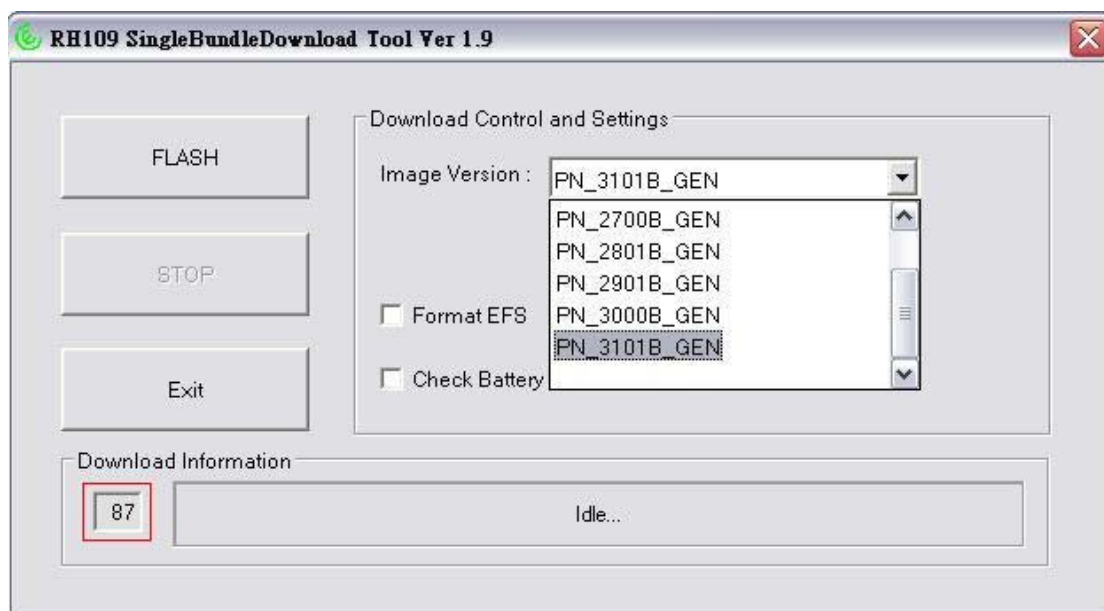
- USB Driver : Before using those tools, user should install the USB driver firstly then connect phone to PC to register phone into PC or the PC can't identify the phone. User can open device manager to check your phone can be identified by PC or not.
- PST Tool : These tools are included in PST tool and can't be used or started without launching from PST tool. Please get valid PST tool packet from the vendor or legal web-site.
- MSI image : Before starting downloading, user should get valid image packet from your vendor or legal web-site. During download, please don't plug-out USB cable or any other USB devices to avoid PC unstable issues.

Single bundle download tool

- Power on phone and connected to computer via USB cable.
- Launch PST tool then select Single Bundle Download Tool by clicking "Bundle Downloader" button on "Downloader" page. Make sure the CPC is not empty on "Phone info" page before switching to "Downloader" page.
- Select Proper image version from the dropdown menu. If the dropdown menu shows "No valid images", it means you don't install proper MSI image packet or the CPC code is empty. Please check it and re-starting again.
- Make sure the COM port number on the left-bottom un-edit field is the same as you see from device manager then clicking "FLASH" button to start downloading.

- The progress bar will show the downloading progress and messages during downloading, please wait programming is completed when “Download Finished” message box pop-up and the progress bar color becomes green.
- Close tool by clicking “Exit” button.

Image Version	Must be chosen manually. It lists the image version that user installed on this computer and which version user wants to download to phone.
Format EFS	It's an option that formatting the phone file system without User Data backup/restore during downloading.
Check Battery	It's an option that check connected battery level before starting downloading images into phone to protect downloading procedure.

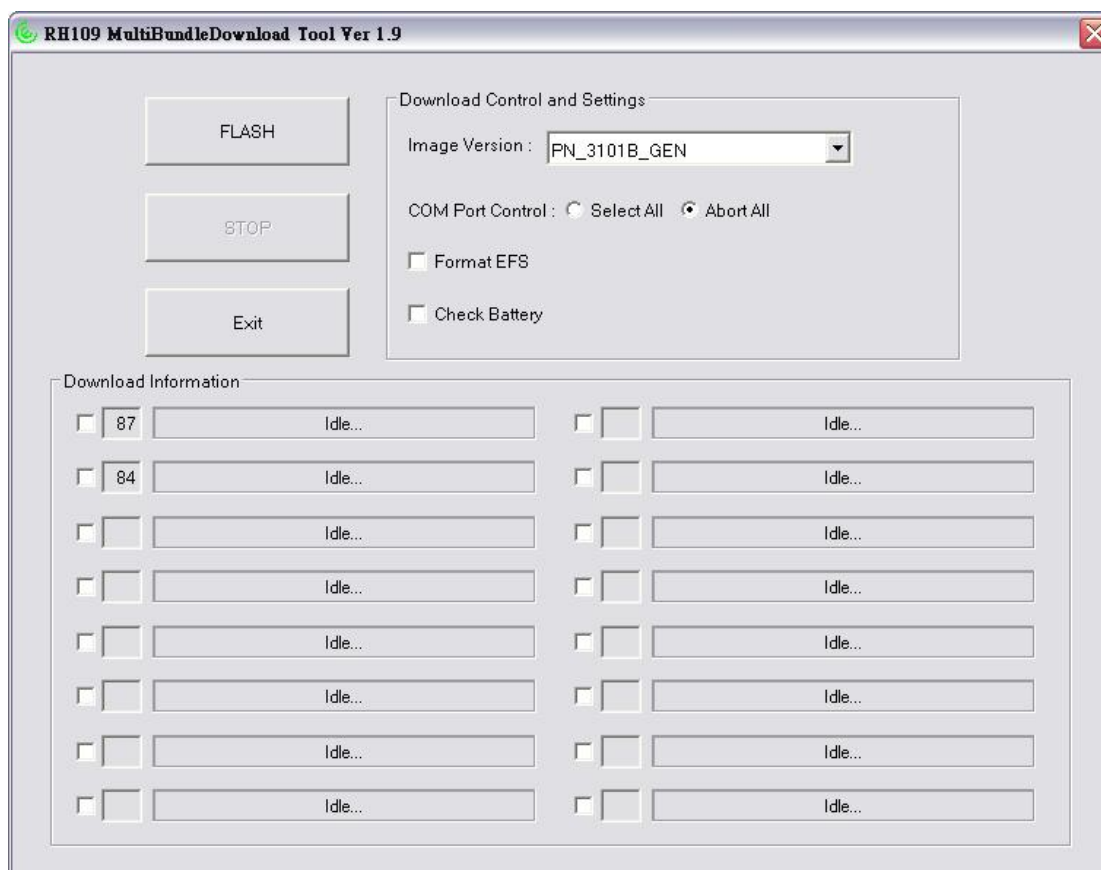


Multi bundle download tool

- Power on phones and connected them to computer via USB cable.
- Launch PST tool then select Multi-Bundle Download Tool by clicking “Multi Downloader” button on “Downloader” page. Make sure the CPC is not empty on “Phone info” page before switching to “Downloader” page.
- Select Proper image version from the dropdown menu. If the dropdown menu shows “No valid images”, it means you don’t install proper MSI image packet or the CPC code is empty. Please check it and re-starting again.
- Make sure the COM port numbers in front of each progress bar can also be seen in device manager. Mark the selection button in front of each COM port number field to make sure user want to programming the phone connected to this port.
- Click “FLASH” button to start downloading.

- The progress bar will show the downloading progress and messages during downloading, please wait programming is completed when "Download Finished" message box pop-up and the progress bar color becomes green.
- Close tool by clicking "Exit" button.

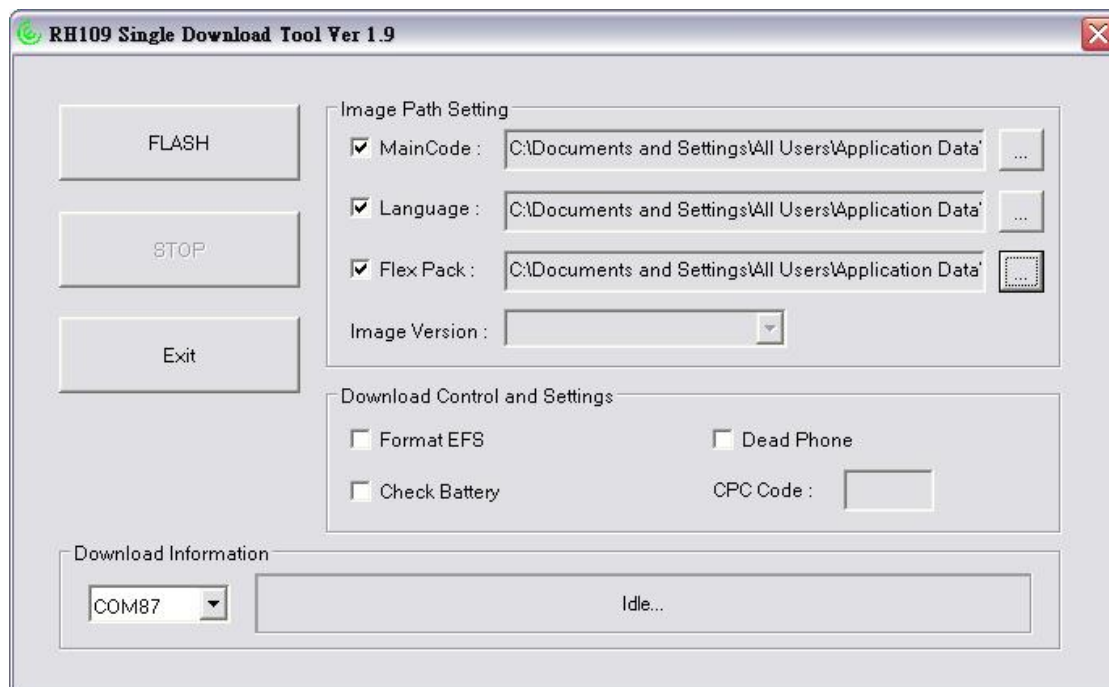
Image Version	Must be chosen manually. It lists the image version that user installed on this computer and which version user wants to download to phone.
COM port control	"Select All" means select all connected phones.
	"Abort All" means abort all connected phones.
Format EFS	It's an option that formatting the phone file system without User Data backup/restore during downloading.
Check Battery	It's an option that check connected battery level before starting downloading images into phone to protect downloading procedure.



Single download tool

- Power on phone and connected them to computer via USB cable.
- Make sure level 3 or RD level USB dongle is inserted into compute.
- Launch PST tool then select Single Download Tool by clicking "Single Downloader" button on "Downloader" page. Make sure the CPC is not empty on "Phone info" page before switching to "Downloader" page.
- Select proper images by clicking the button in back of the MainCode path, Language path and Flex Pack path fields. Make sure the selection button is selected in front of each image paths if user wants to download it.
- Make sure the COM port numbers in front of the progress bar can also be seen in device manager then clicking "FLASH" button to start downloading.
- The progress bar will show the downloading progress and messages during downloading, please wait programming is completed when "Download Finished" message box pop-up and the progress bar color becomes green.
- Close tool by clicking "Exit" button.

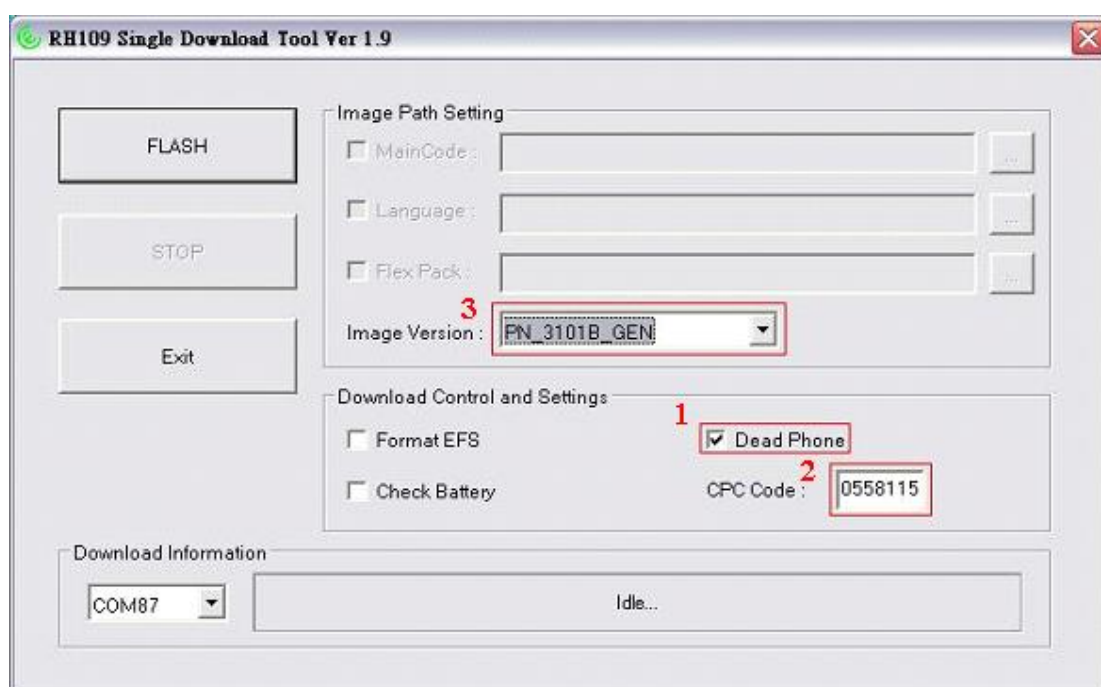
Dead Phone	Switch to dead phone revive function.
Format EFS	It's an option that formatting the phone file system without User Data backup/restore during downloading.
Check Battery	It's an option that check connected battery level before starting downloading images into phone to protect downloading procedure.



Died phone revive tool

- Power on phone into download mode and connected them to computer via USB cable.
- Make sure level 3 or RD level USB dongle is inserted into compute.
- Launch PST tool then select Died Phone Revive Tool by clicking “Died Phone Recover” button on “Device Select” dialog and user will be “Single Download Tool” is showed up.
- Mark “Dead Phone” selection button to switch to dead phone reviving function.
- Input valid and proper CPC code to enable dropdown menu. Select the proper image version as used on Bundle Download Tool then click “FLASH” button to start downloading.
- The progress bar will show the downloading progress and messages during downloading, please wait programming is completed when “Download Finished” message box pop-up and the progress bar color becomes green.
- Close tool by clicking “Exit” button.

Dead Phone	Switch back to Single Download Tool.
Format EFS	If user do dead phone revive function, downloading procedure will force phone doing file system formatting whether user mark “ Format EFS ” selection button or not.
Check Battery	It’s an option that check connected battery level before starting downloading images into phone to protect downloading procedure.



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3 – BB Troubleshooting and Manual Tuning Guide

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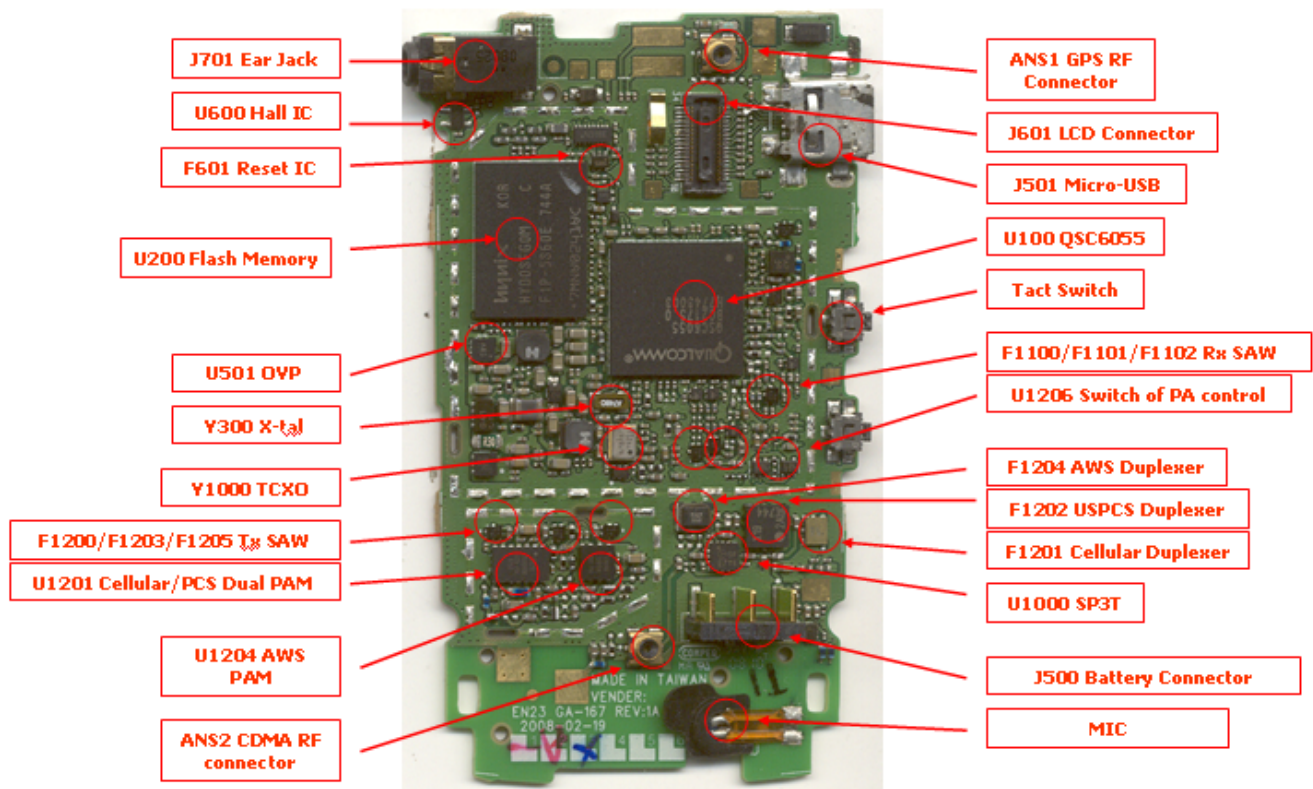
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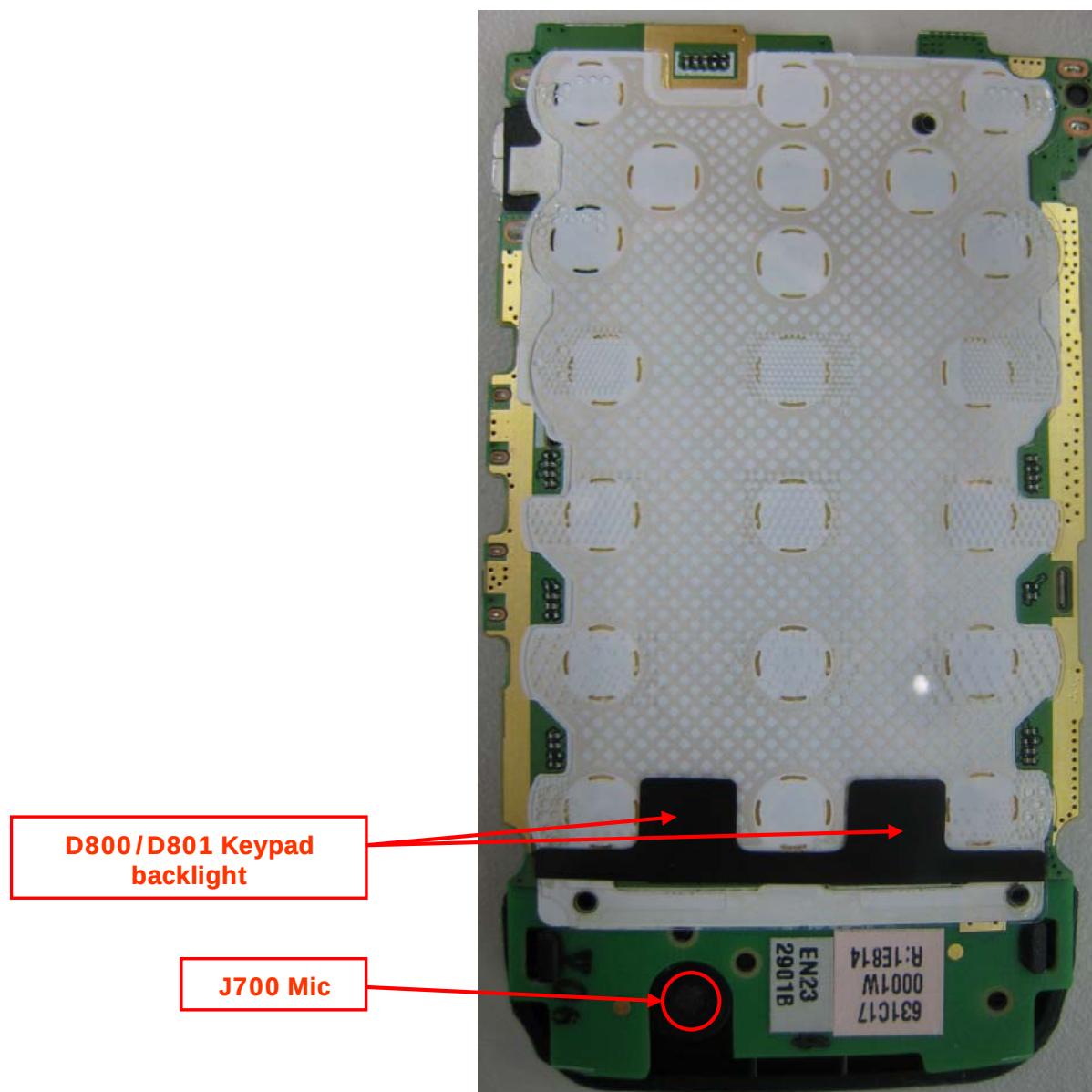
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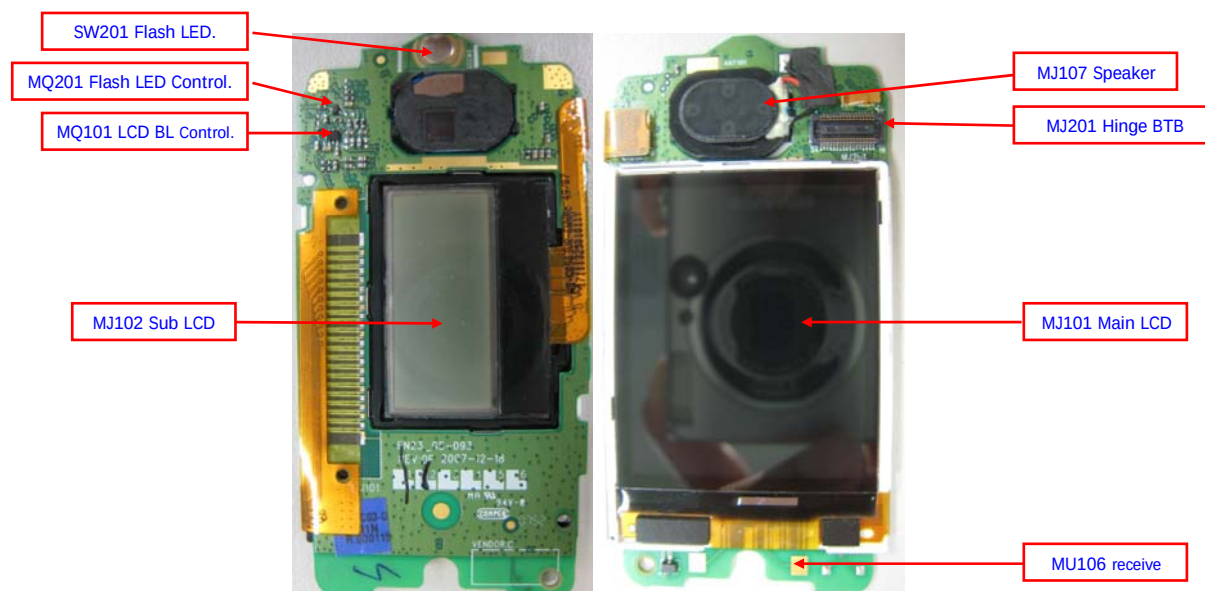
■ Placement

Placement - Main Bottom



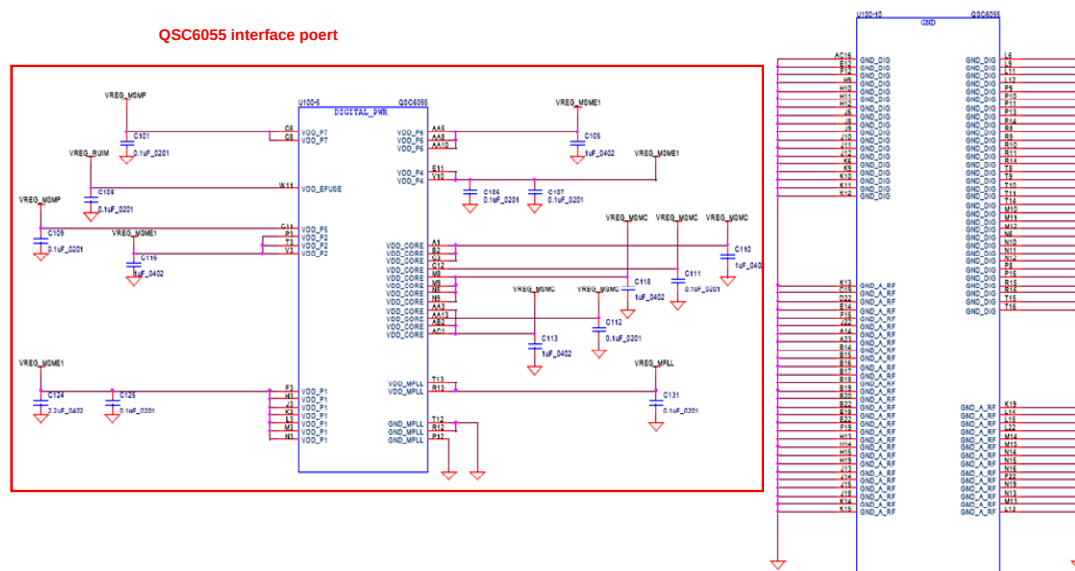
Placement - Main Top

Placement - Sub

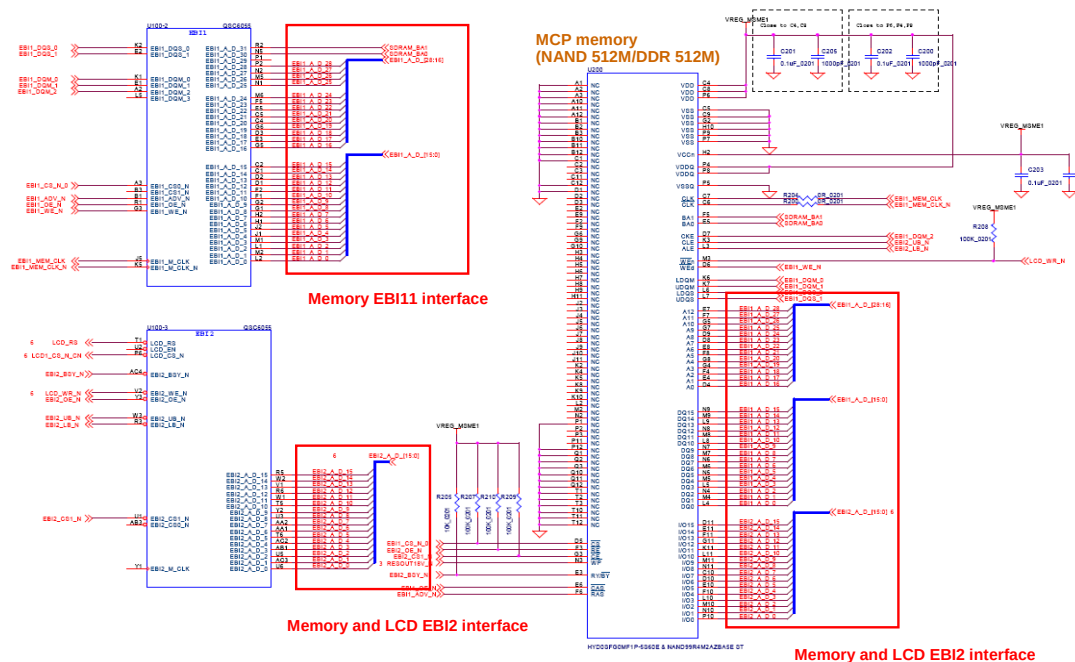


■ Circuit

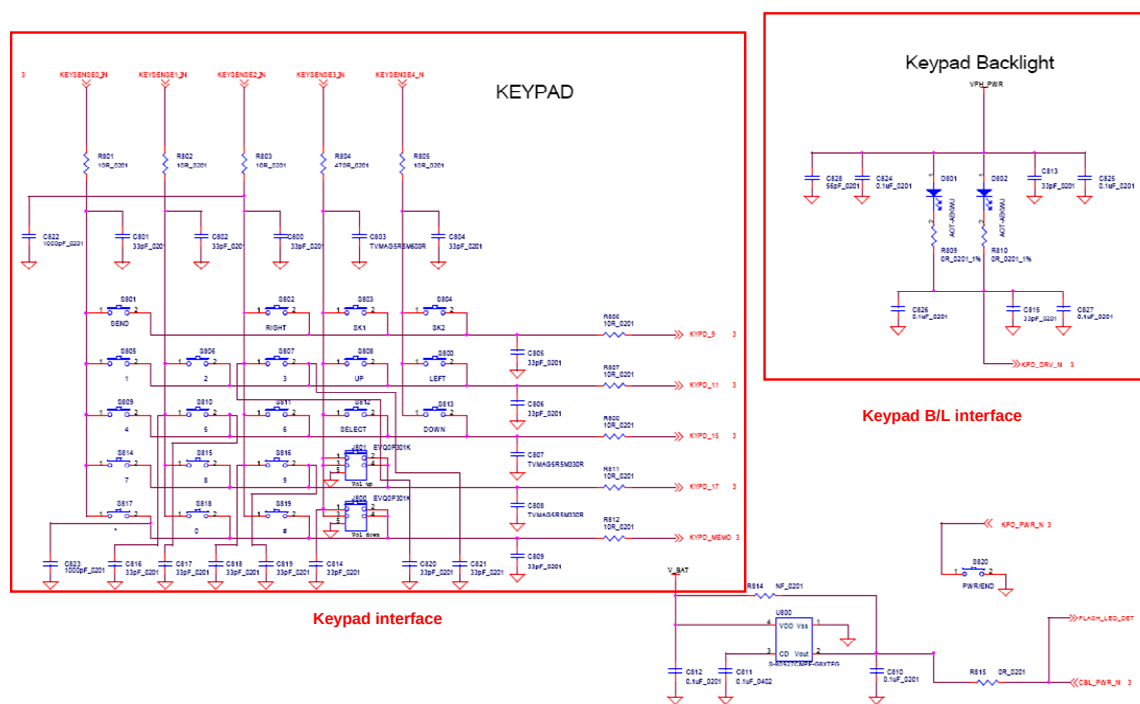
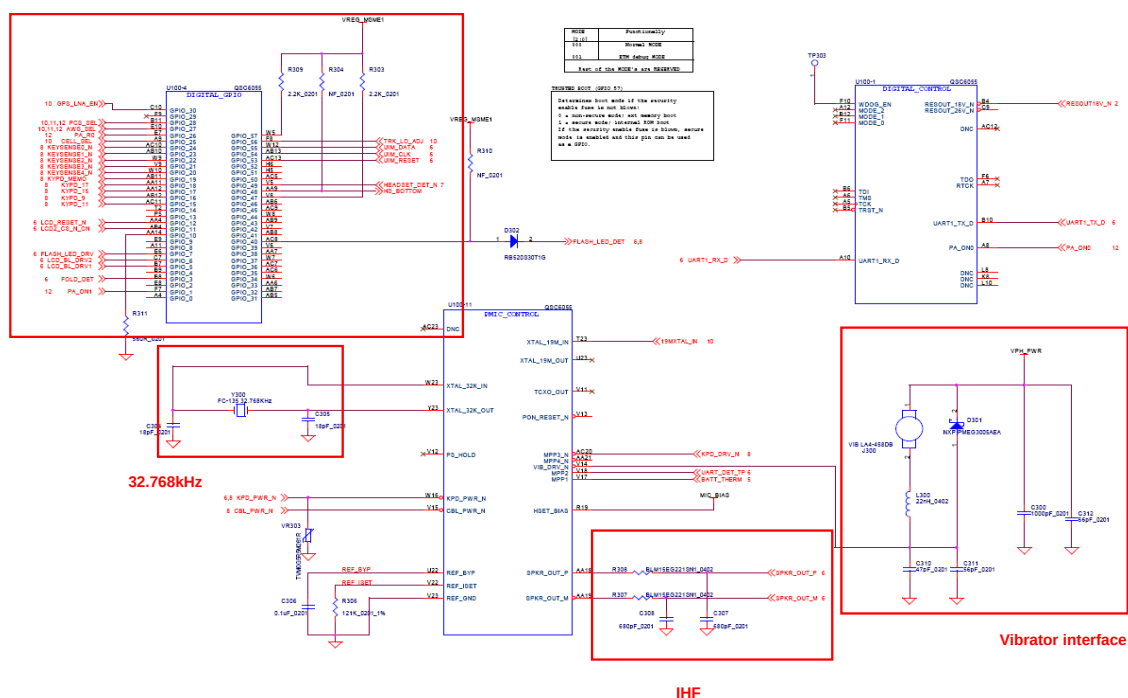
Circuit- QSC6055 interface

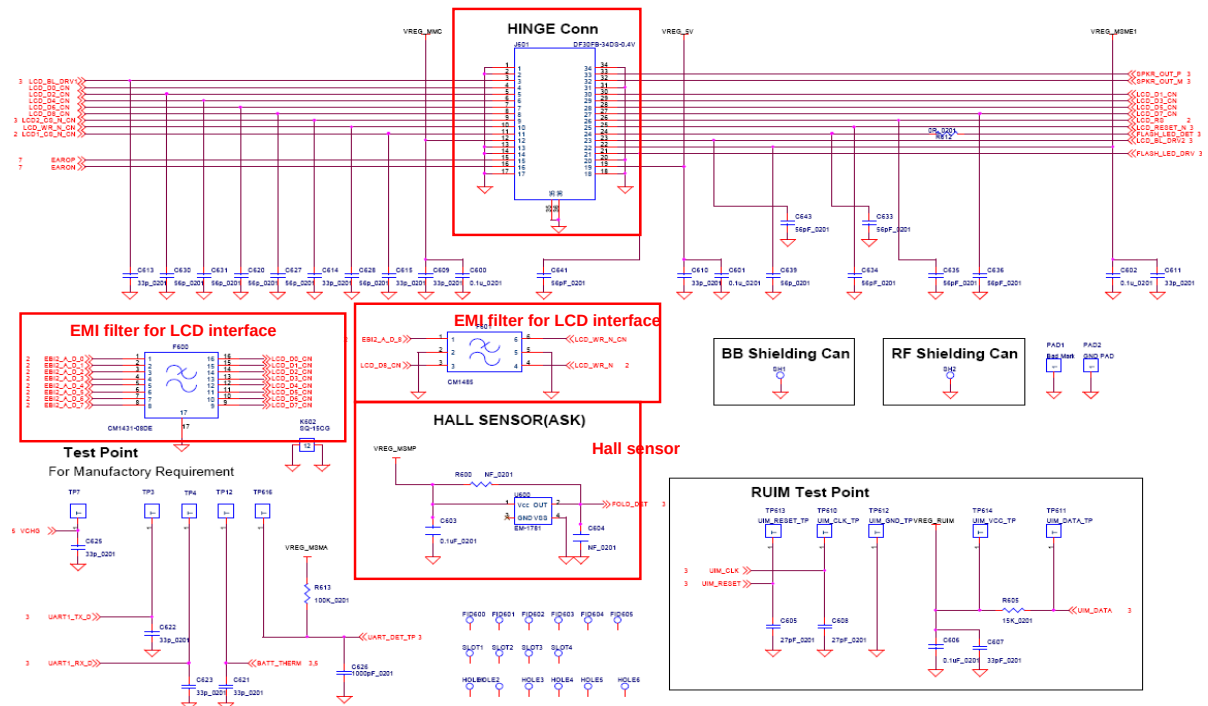


Circuit-QSC6055 memory and LCD interface

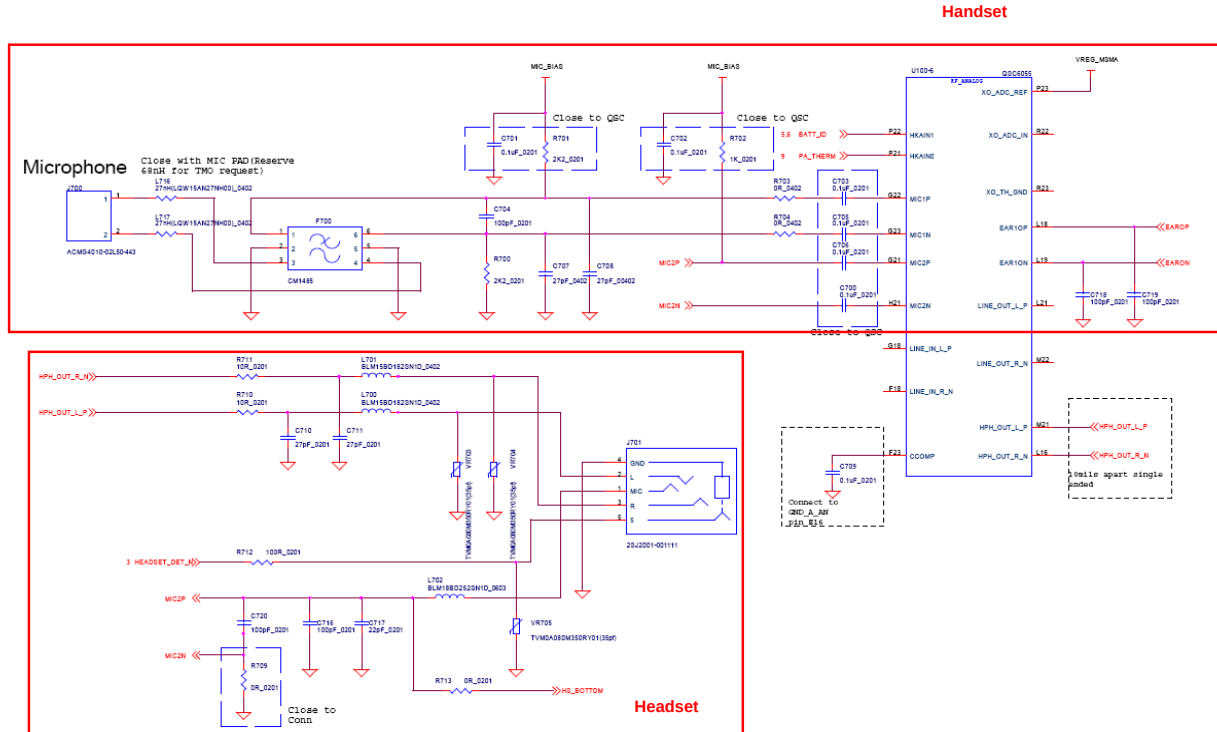


Circuit-QSC6055 peripheral interface

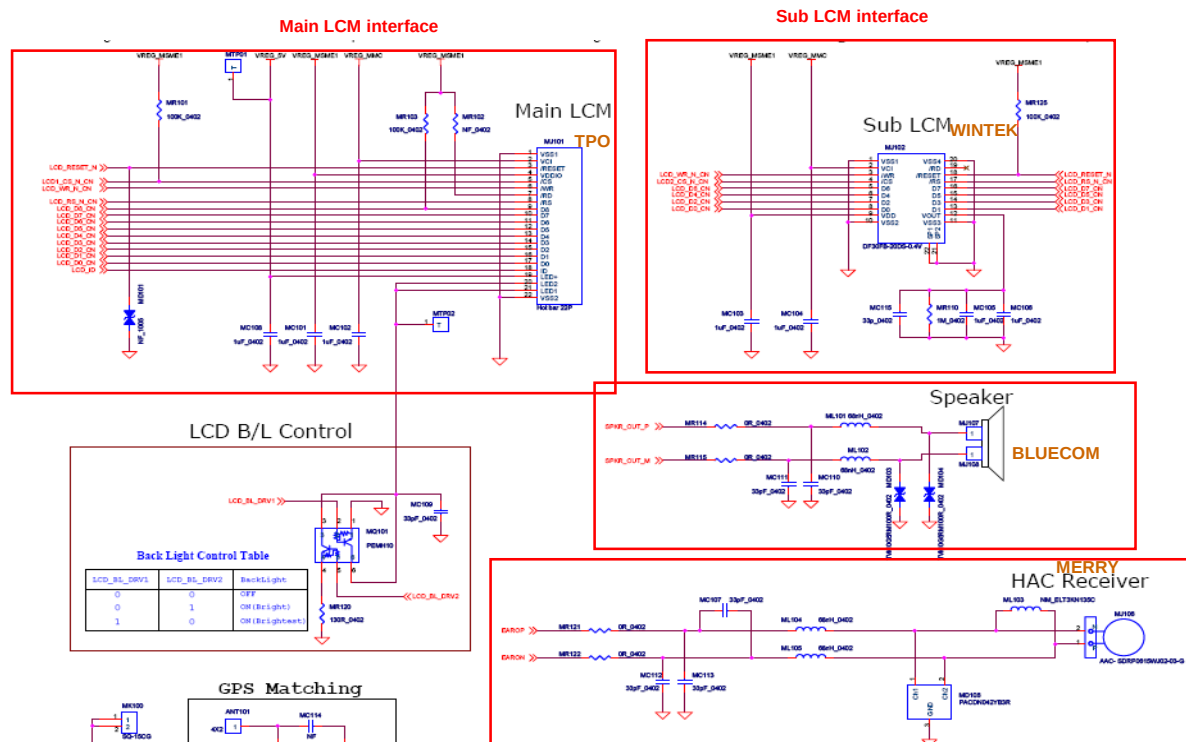




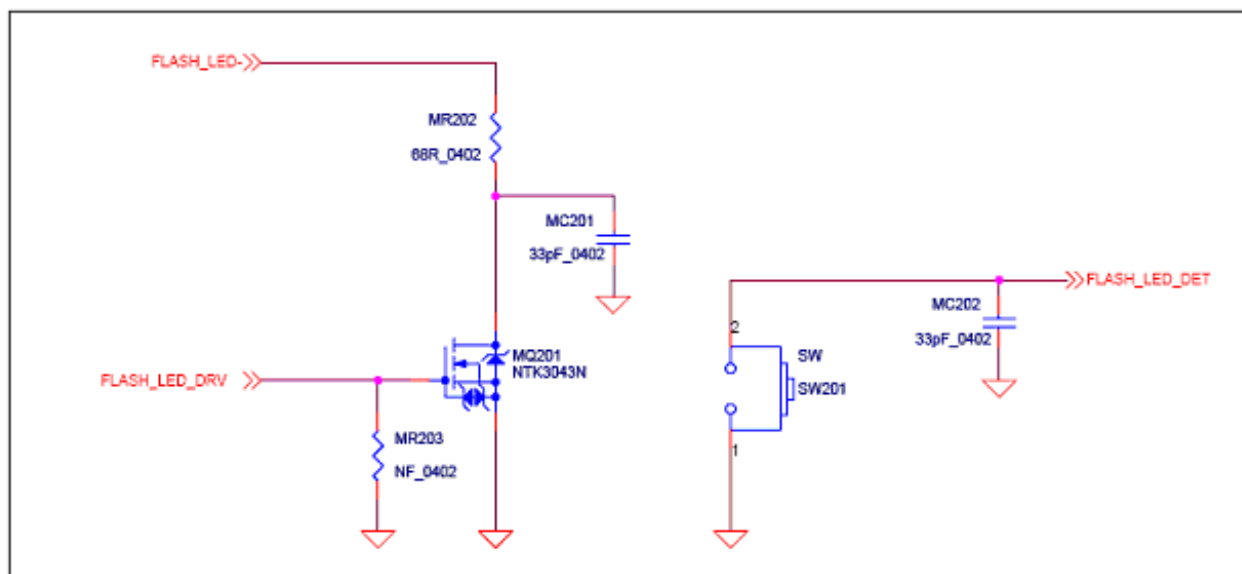
Circuit-Acoustic interface



Circuit-S/B interface

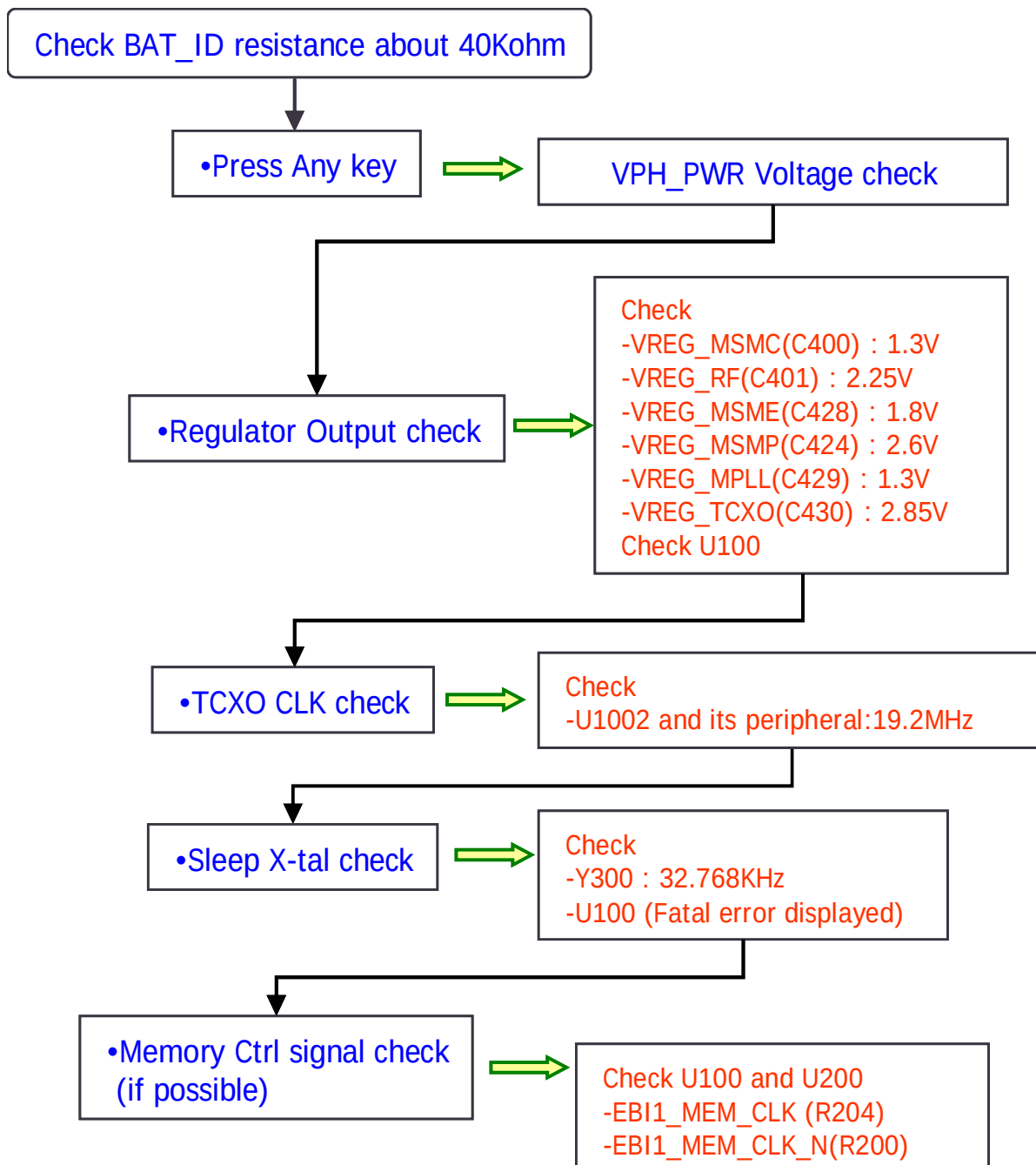


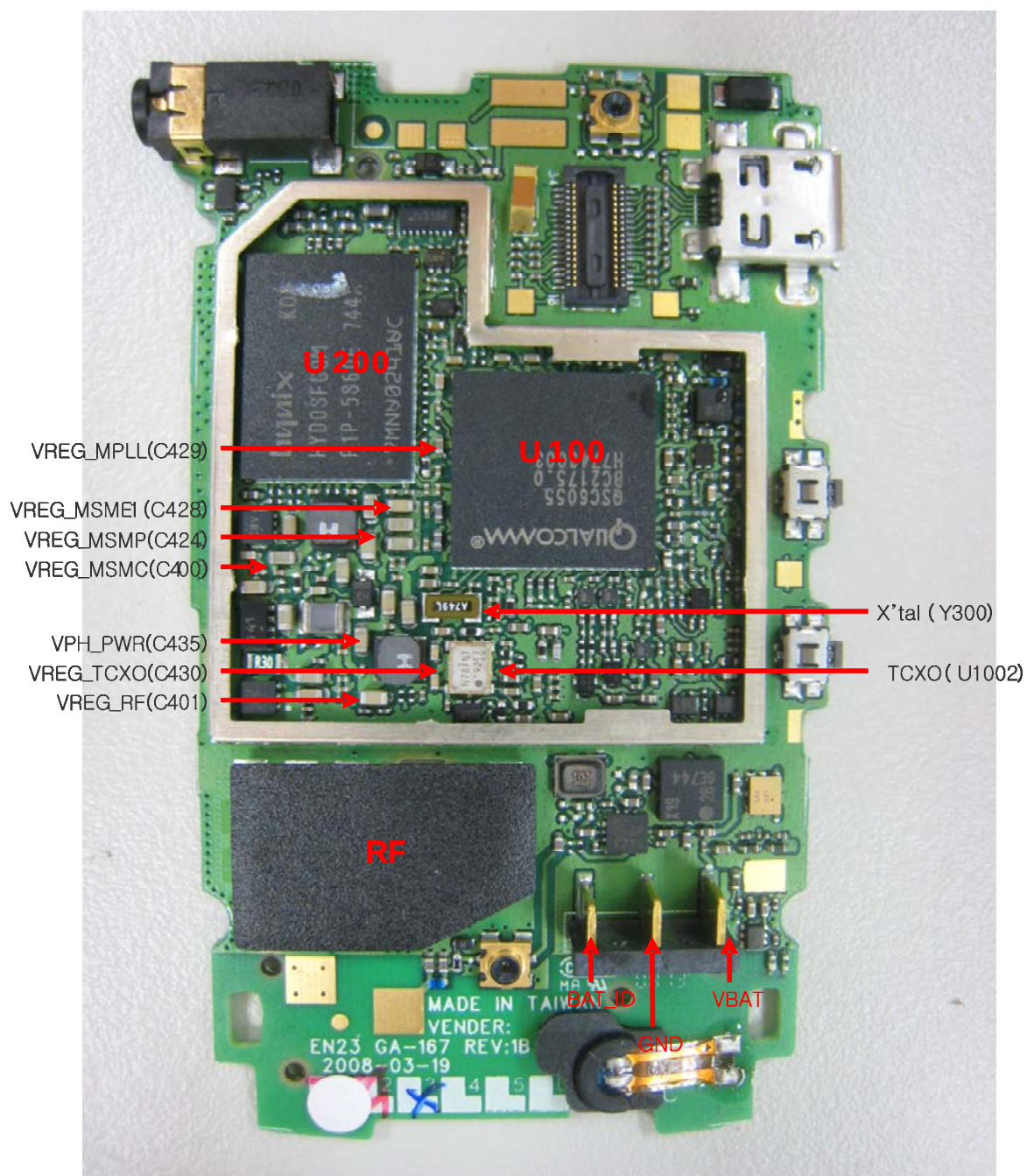
Flash LED Control



■ Trouble Shooting for BB part

Initialization





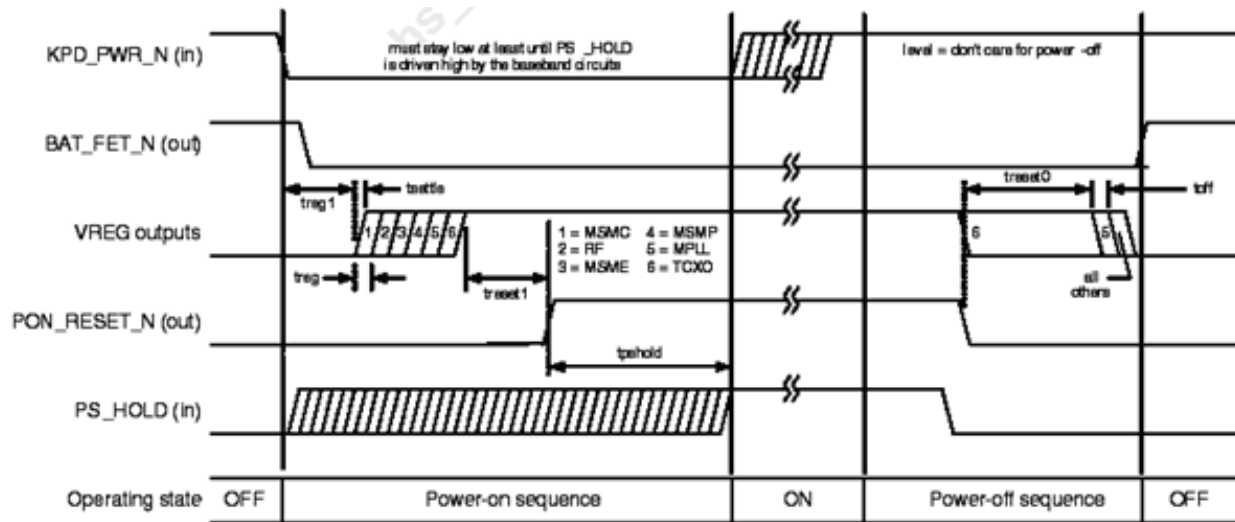
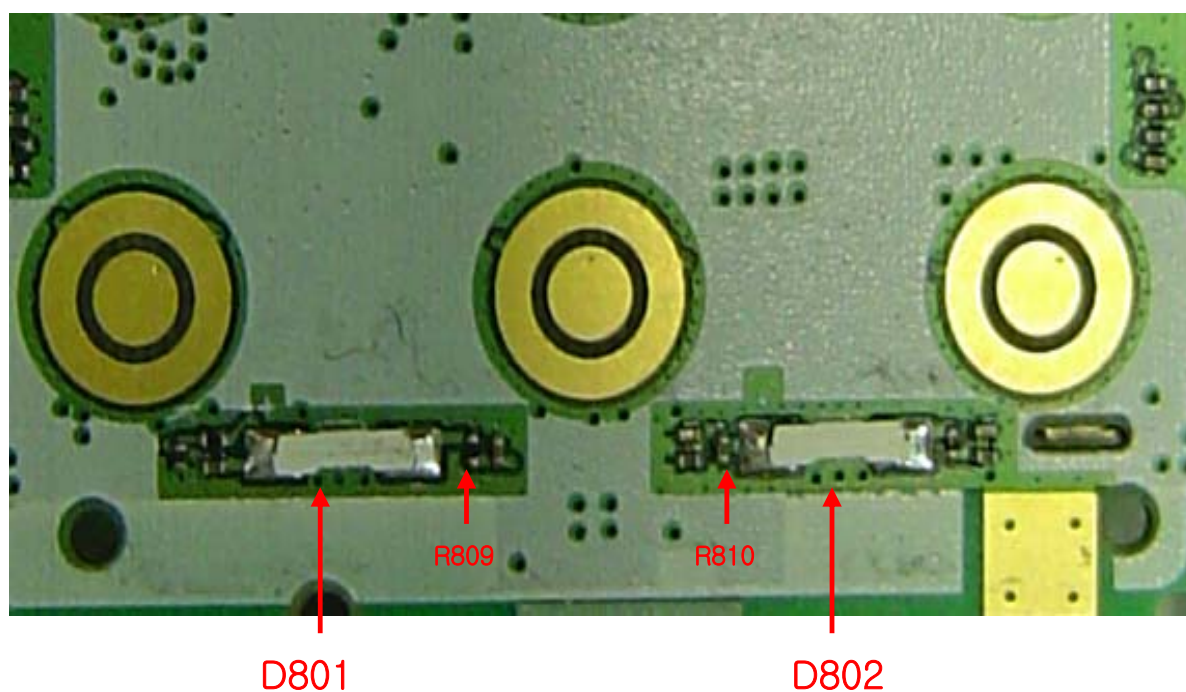
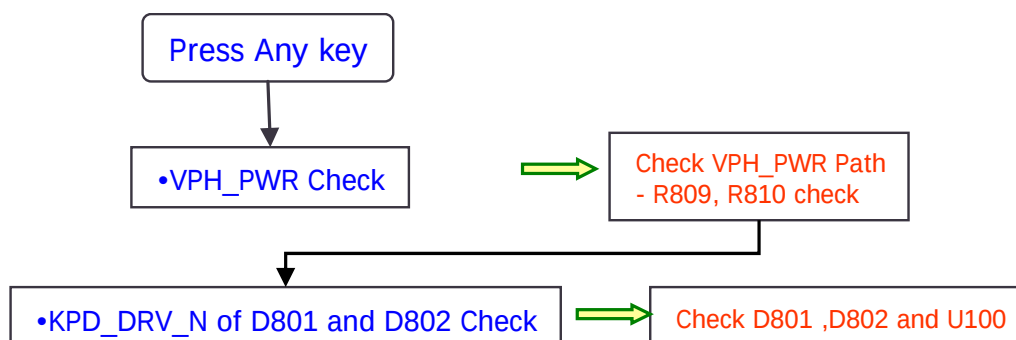


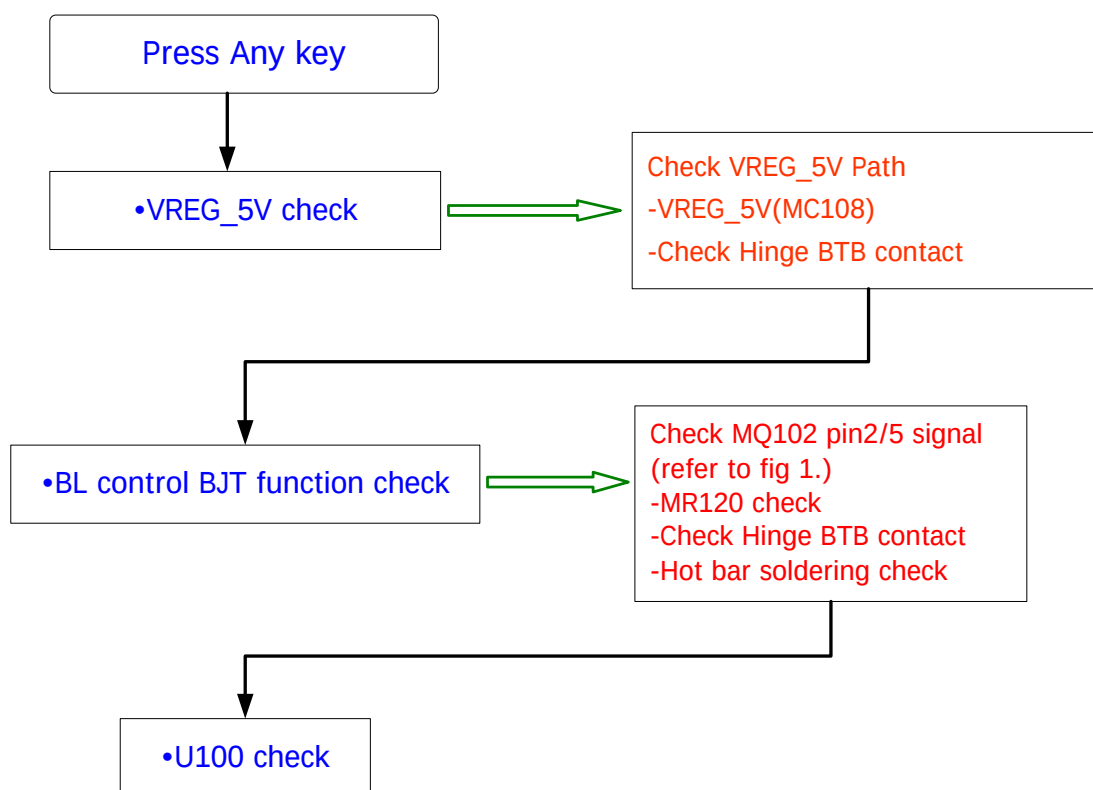
Figure 2 High-level power sequences timing diagram

Table 1 Power-on circuit performance specifications

Parameter	Comments	Min	Typ	Max	Units
t_{reg1}	Power-on event to first regulator enable ³	0	6	10	ms
t_{reg}	Delay between regulator turn-ons ⁴		0.122		ms
t_{settle}	Regulator settling time ⁴		0.122		ms
t_{reset1}	Last regulator on to PON_RESET_N = H	10	20	30	ms
t_{pshold}	PS_HOLD timeout	133	200	300	ms
t_{reset0}	PON_RESET_N = L to first regulator off	6.67	10	15	ms
t_{off}	Delay between regulator turn-offs ⁵	1.6	2	2.4	ms

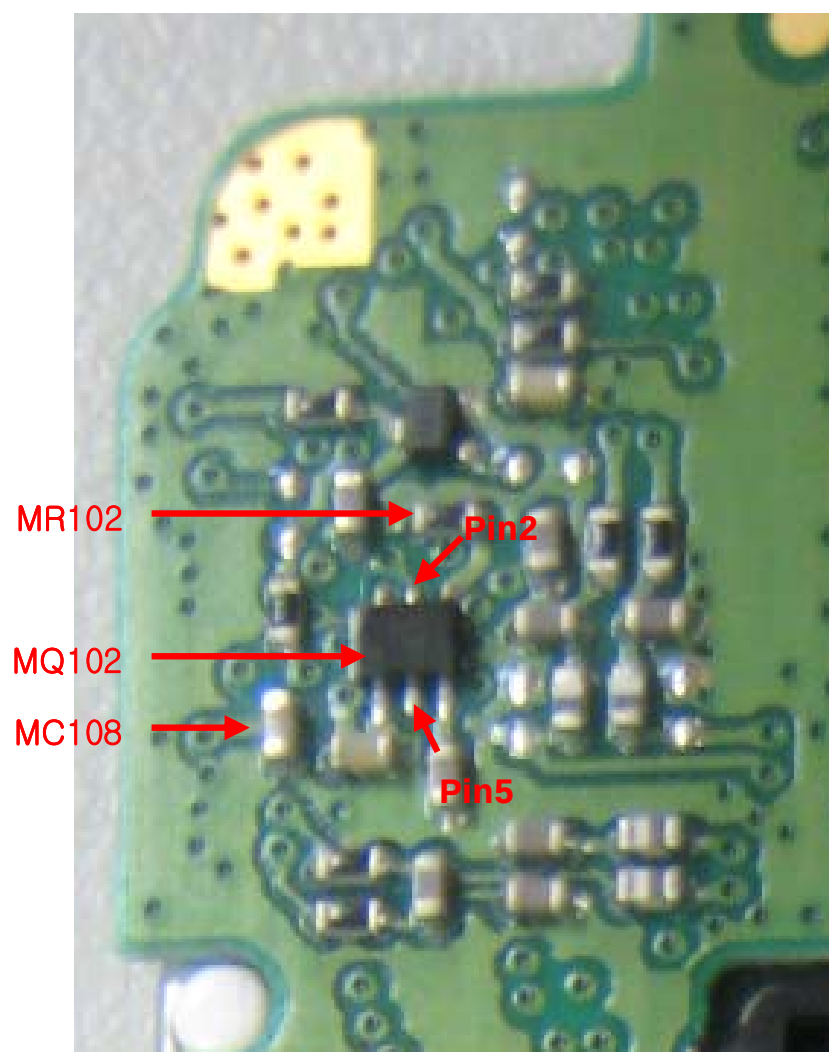
Keypad LED

LCD BL

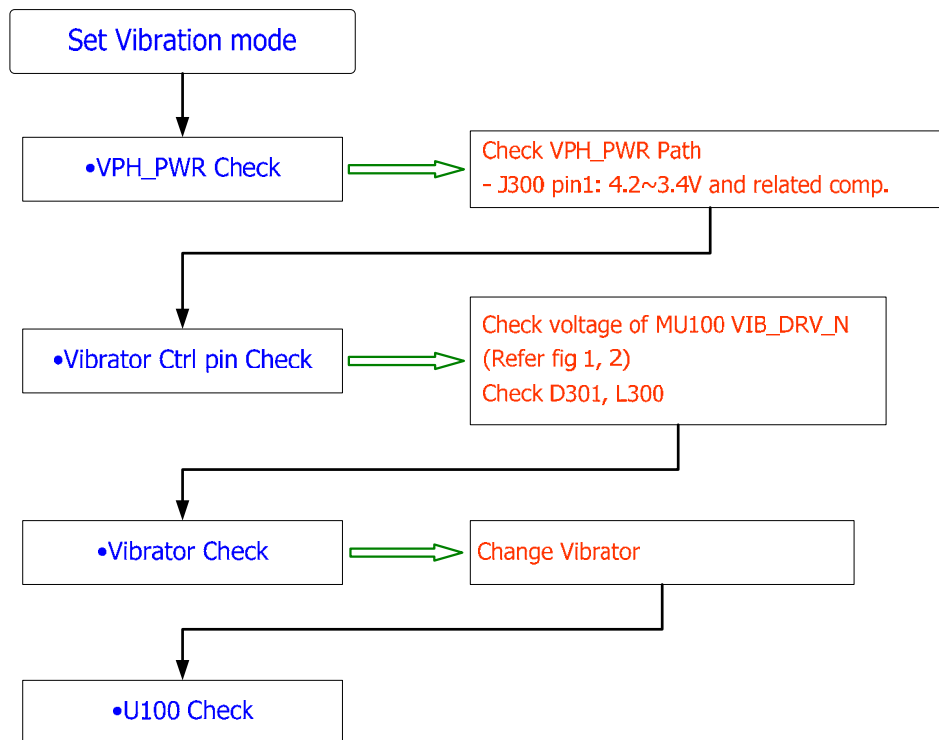


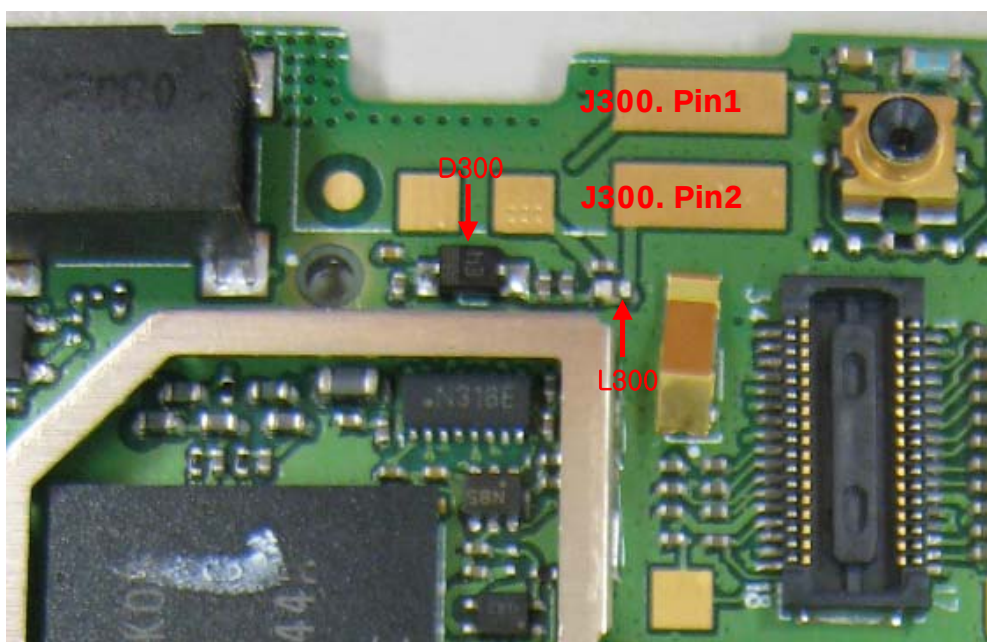
LCD_BL_DRV1	LCD_BL_DRV2	BackLight
0	0	OFF
0	1	ON (Bright)
1	0	ON (Brightest)

Figure 3 Backlight control table

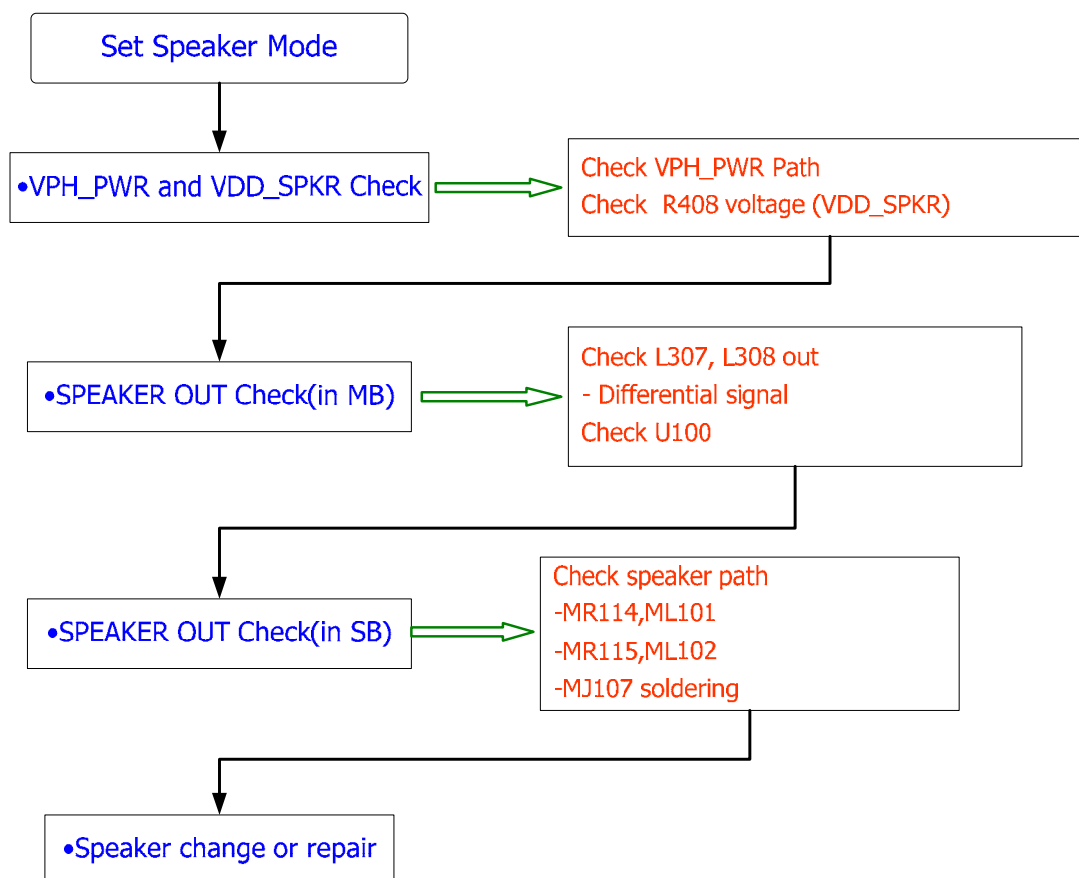


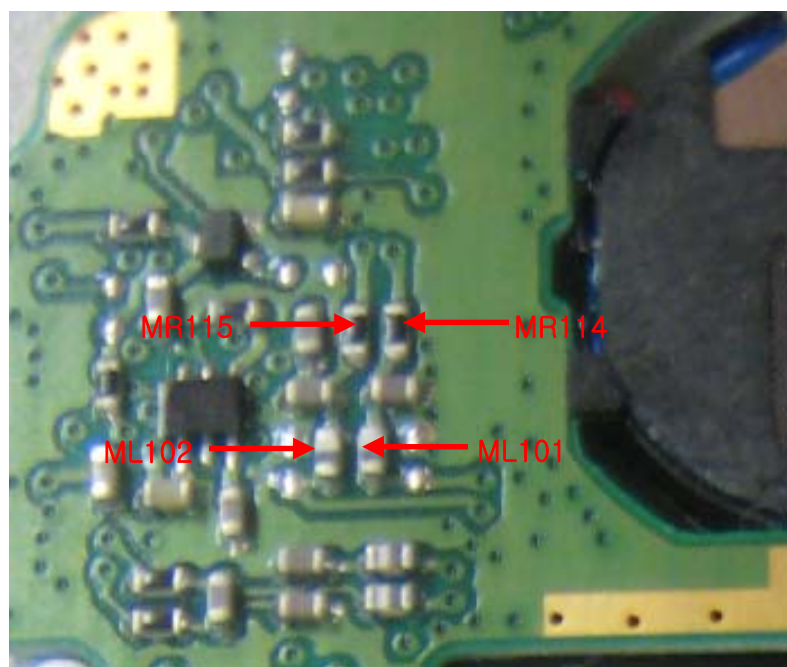
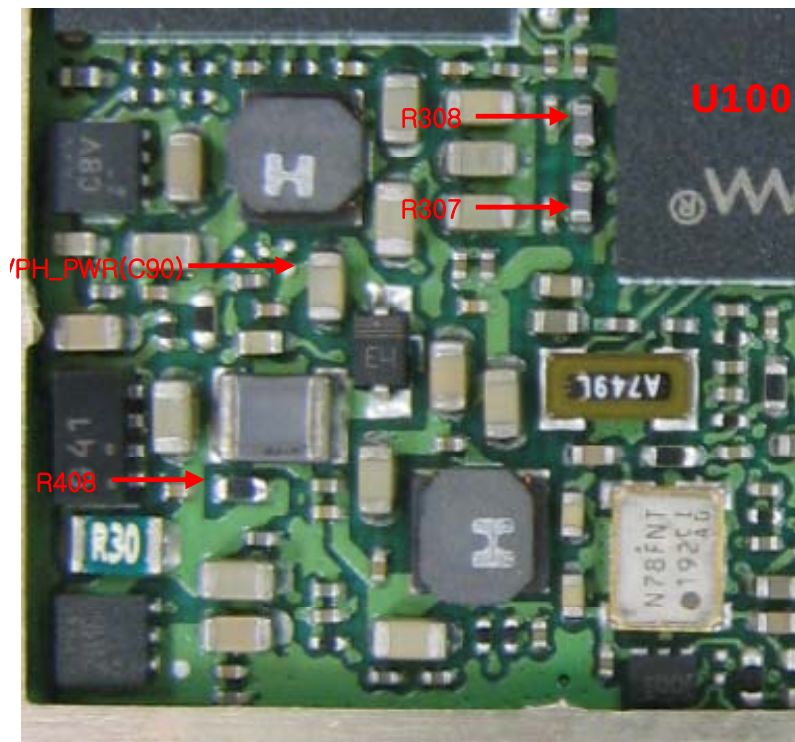
Vibrator



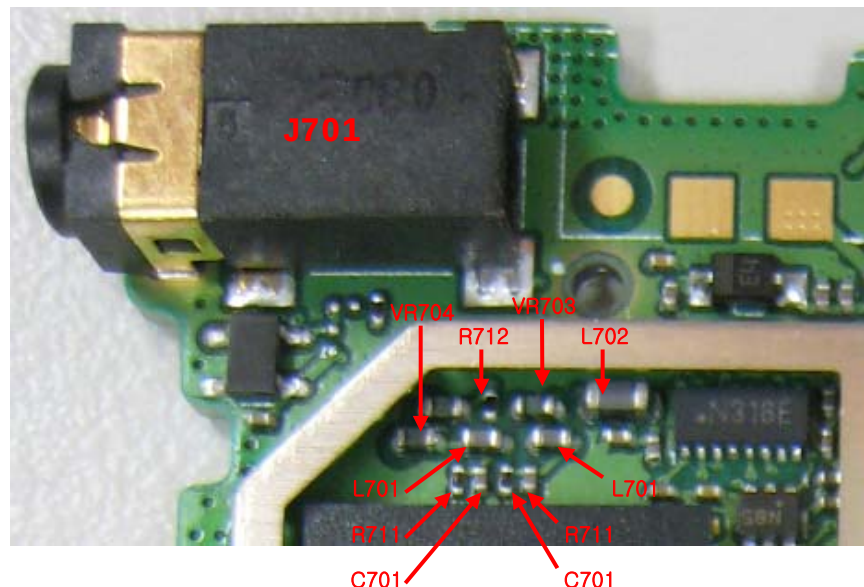
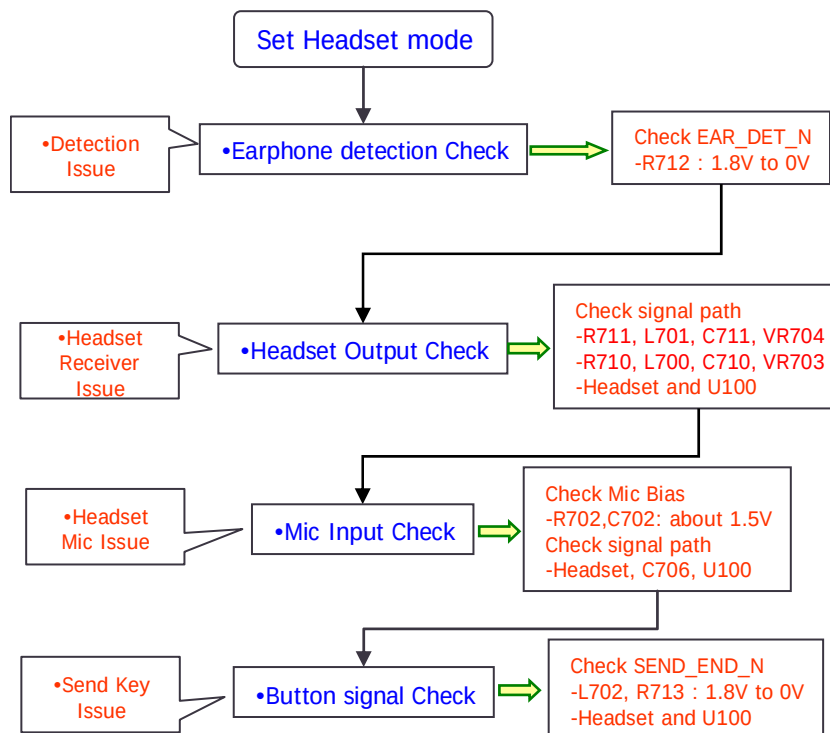


Speaker

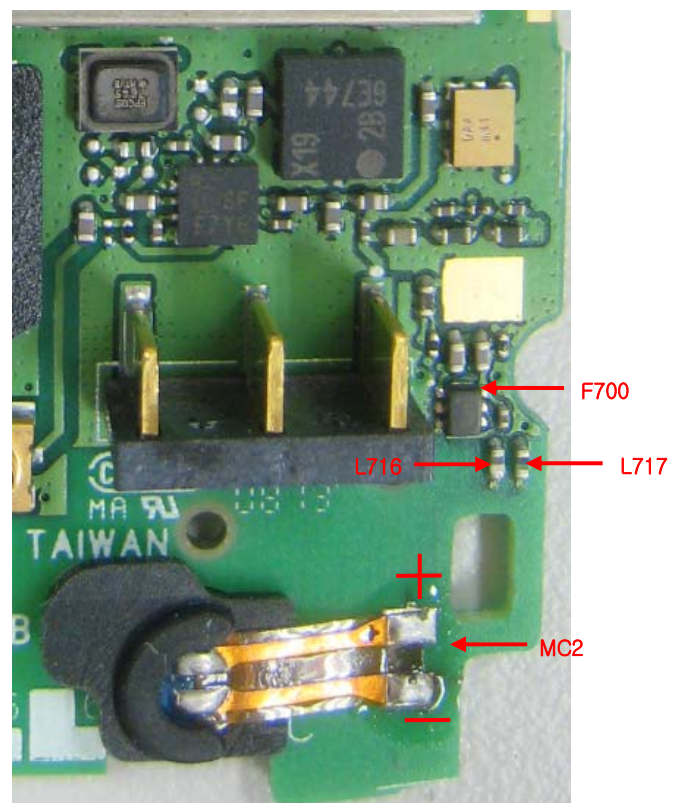
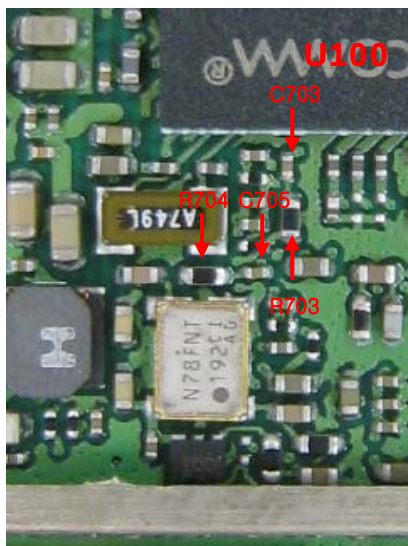
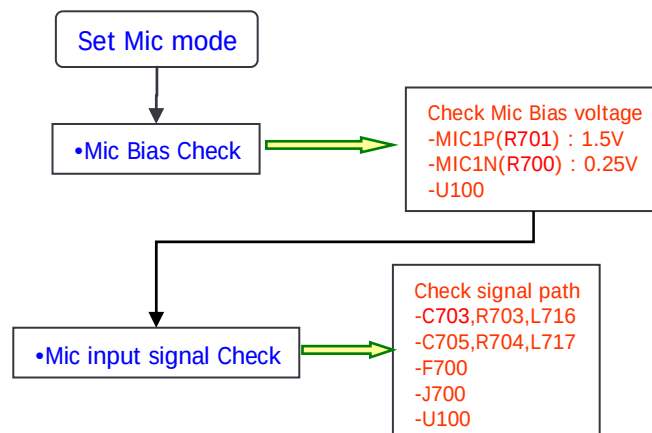




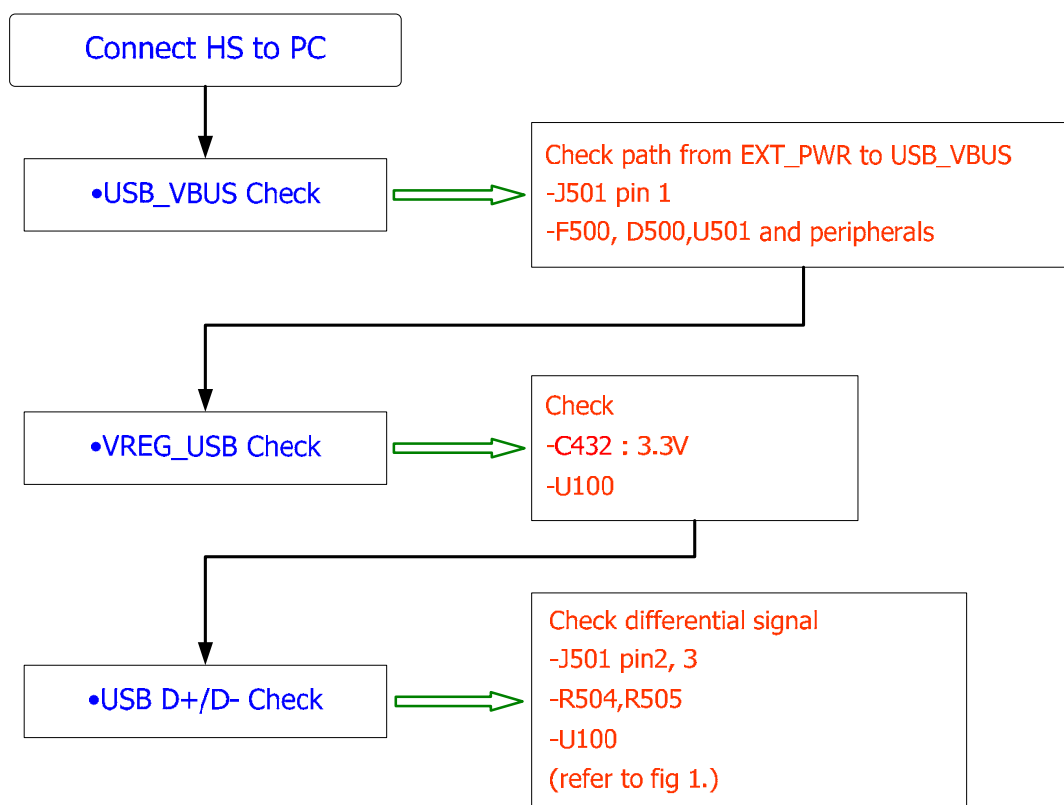
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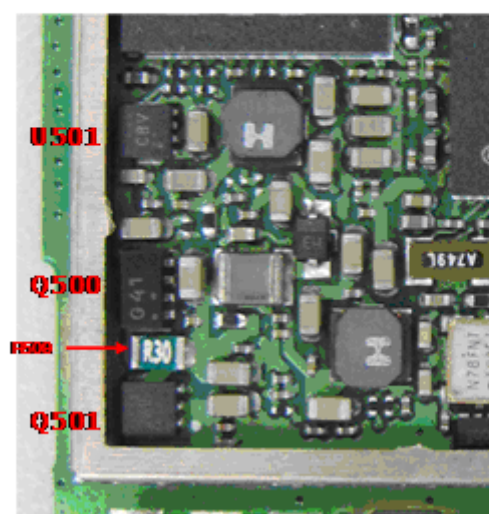
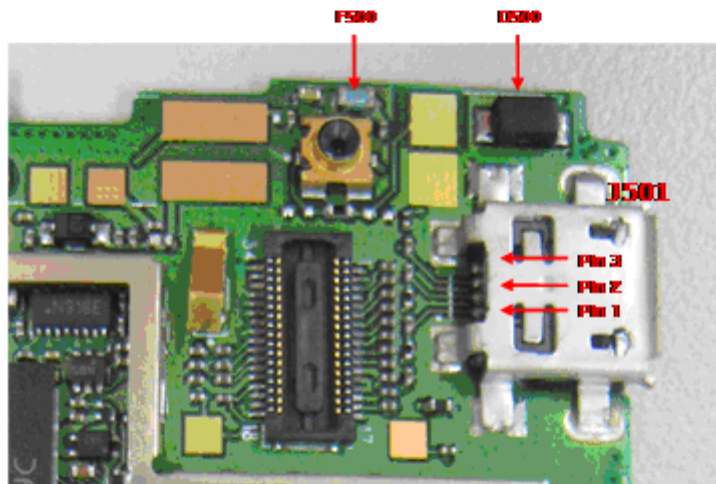


Mic

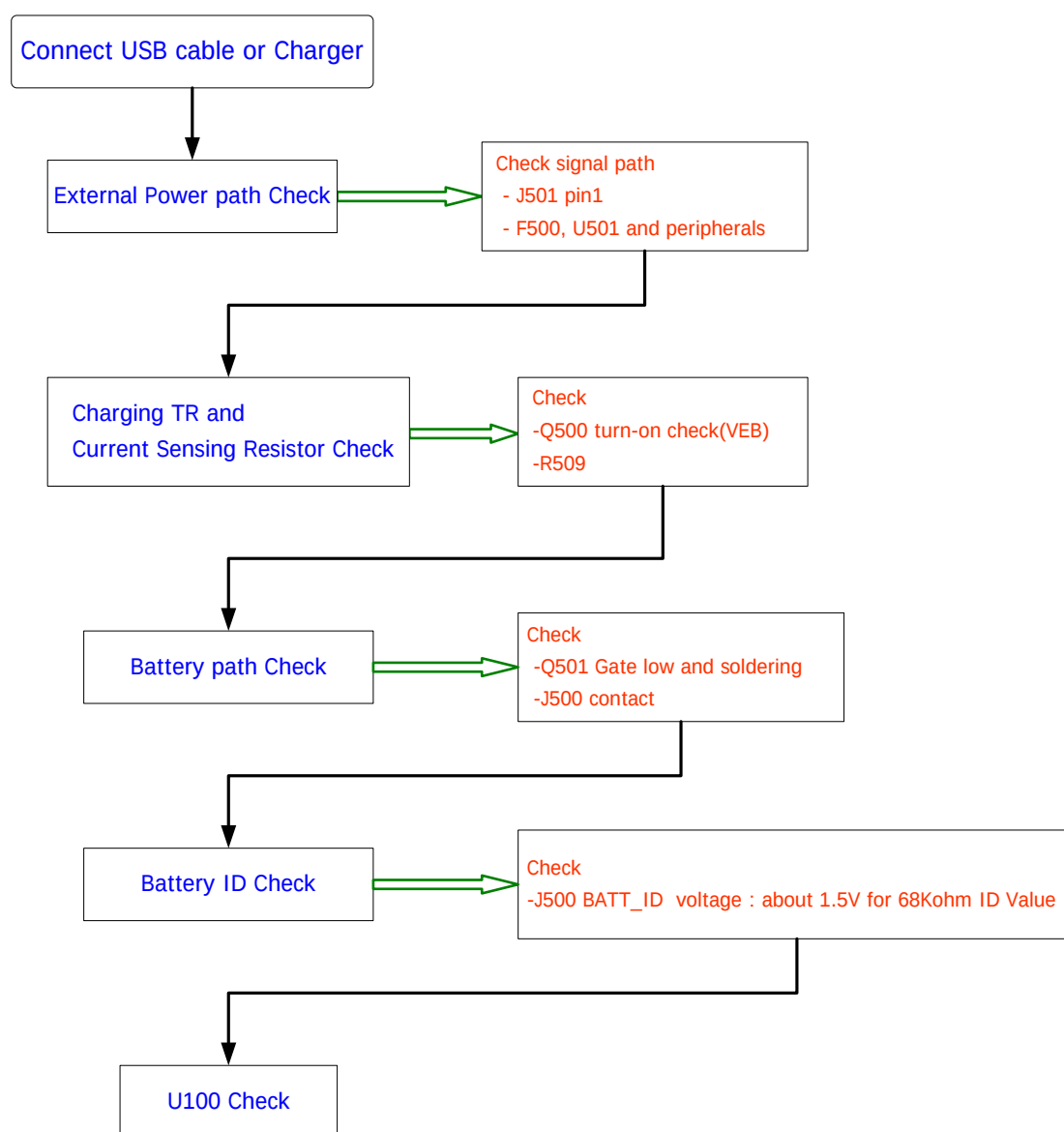


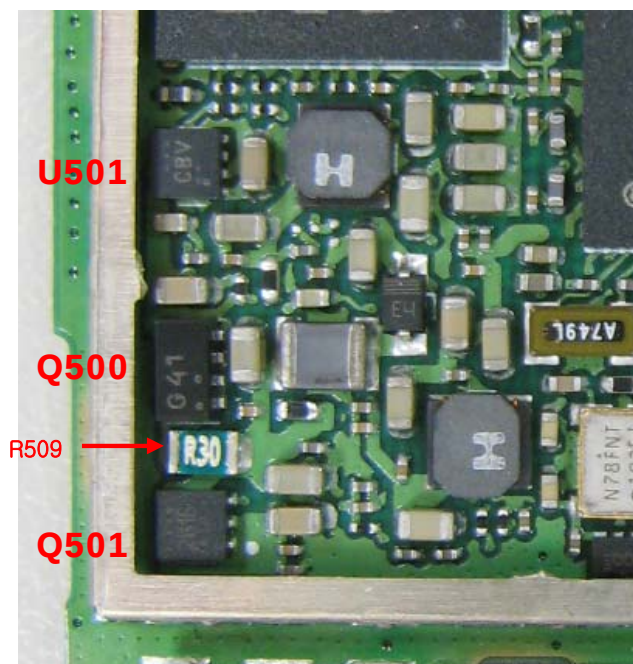
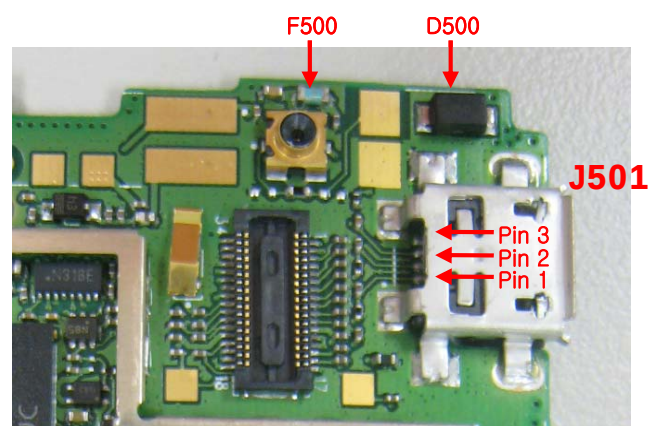
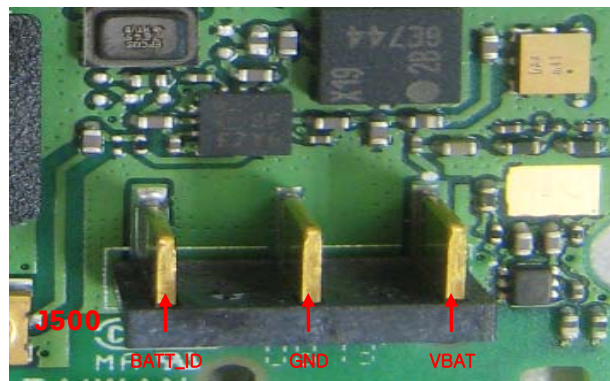
USB



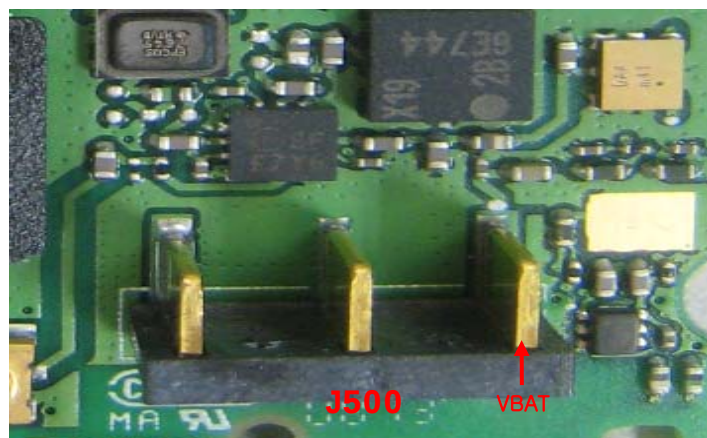
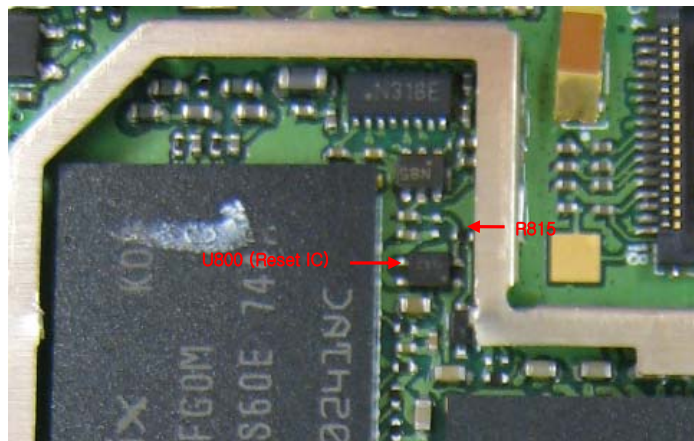
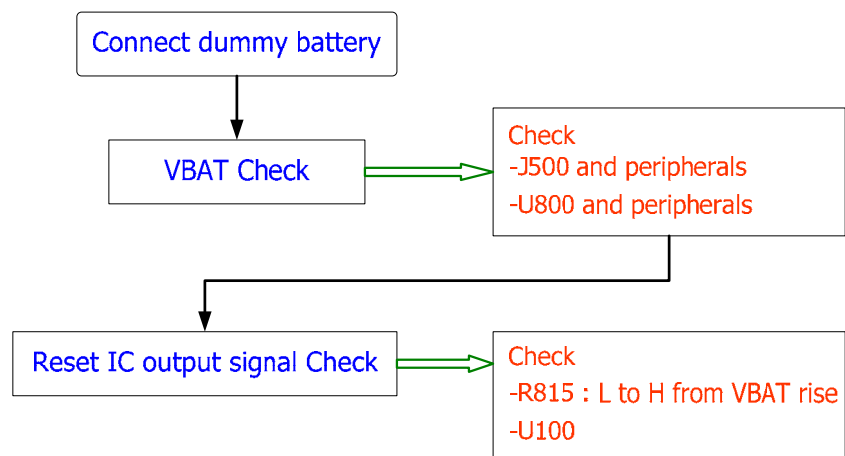


Charging

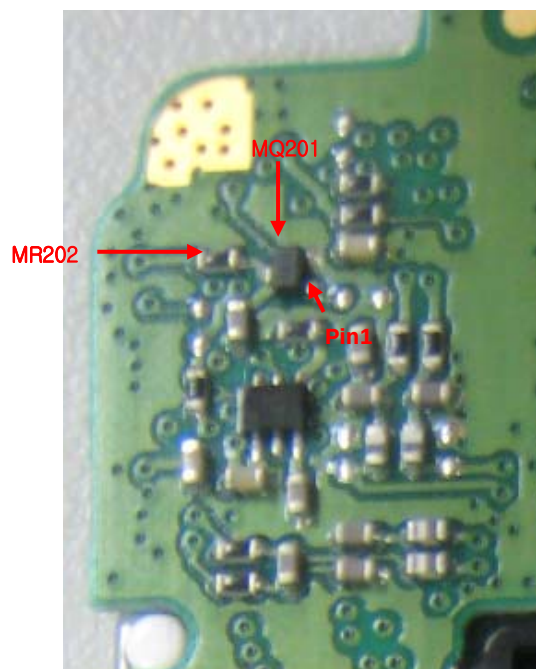
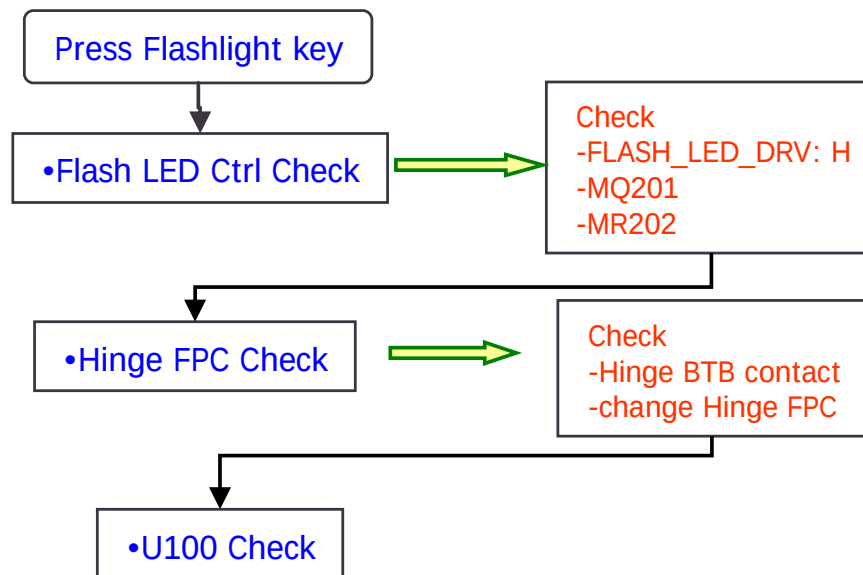




Auto Booting



Flashlight function



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Nokia Customer Care

4 – RF Troubleshooting

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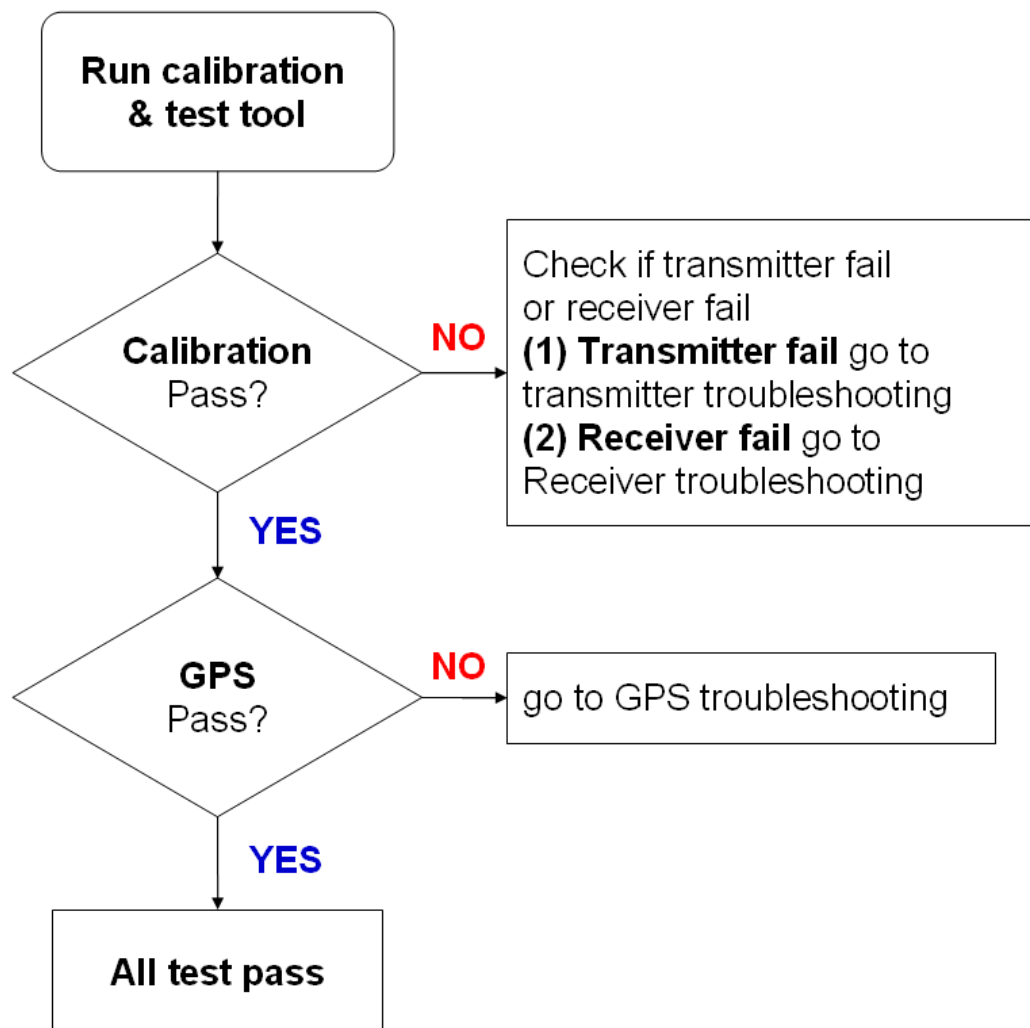
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■ RF self tests in the calibration and test tool

Context

Always start the troubleshooting procedure by running the calibration and test tool. If a test fails, please follow the diagram below.

Troubleshooting flow



■ General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- PA U1201
- PA U1204
- GPS LNA U1001

Discrete components

In addition to the key-components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by visual inspection.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

Note: In-circuit measurements should be evaluated carefully

Measuring equipment

All measurements should be done using:

- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10Mohm//8pF.
- A radio communication tester including RF generator and spectrum analyzer, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyzer and an RF generator can be used. Some tests in this guide are not possible to perform if this solution is chosen).

Note: A mobile phone CDMA2000 transmitter should never be tested with full TX power (only it possible to perform the measurements in a good RF-shielded room). Even low power CDMA2000 transmitters may disturb nearby CDMA networks and cause problems to 3G cellular phone communication in a wide area.

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

Level of repair

The scope of this guideline is to enable repairs at key-component level. Some key-components are not accessible, i.e. not replaceable. Please refer to the list of Non replaceable RF components.

Note: If the RF shielding can is removed (for measurement or repair), it must always be replaced with a new one.

RF key components

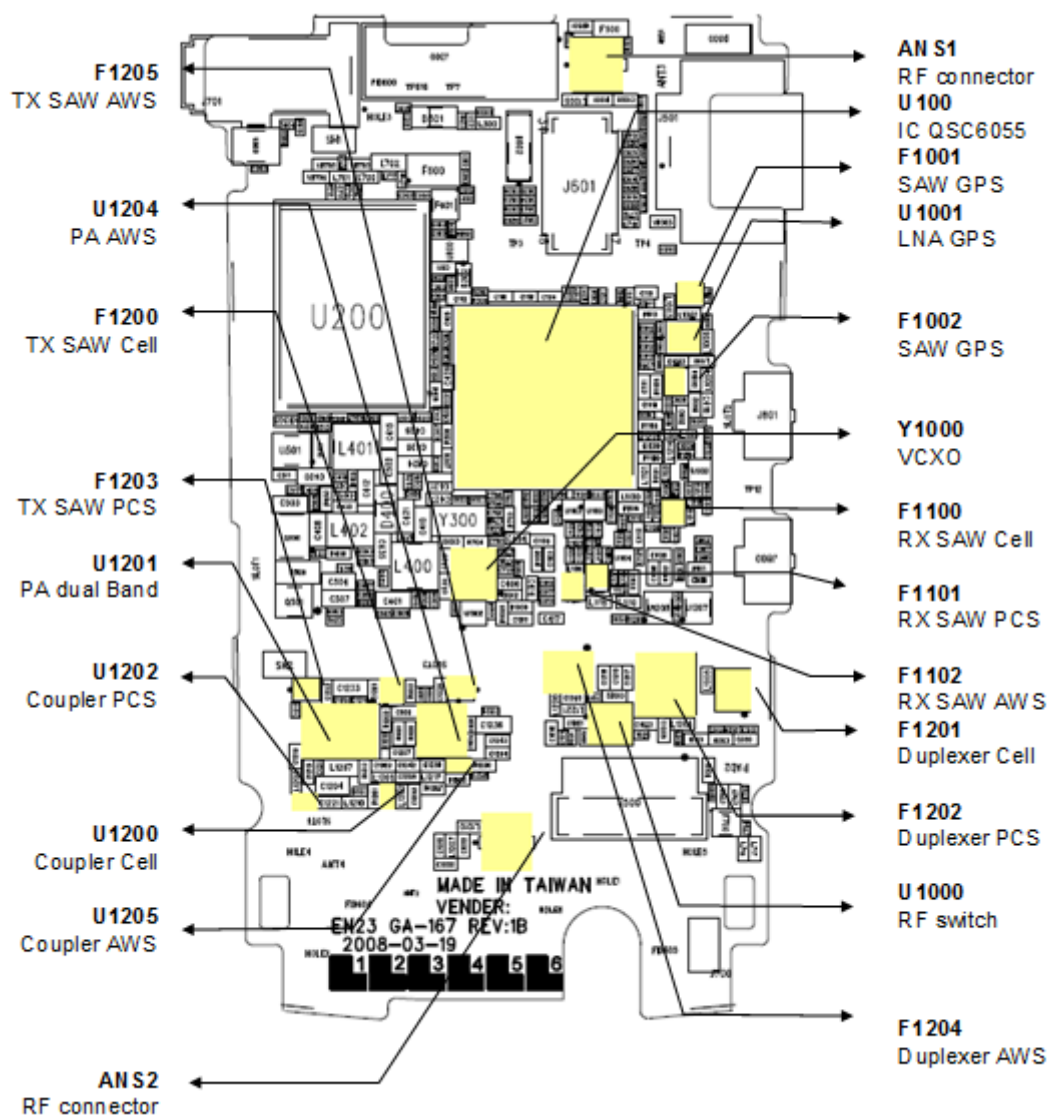


Figure 4 RF key components

Hardware set up

Hardware requirements for tuning:

- PC (Windows 2000/XP)
- Power supply
- Product specific module jig
- Cables: RF cable and USB cable
- Signal analyzer (TX), signal generator (RX) and RF-splitter or one device including all.

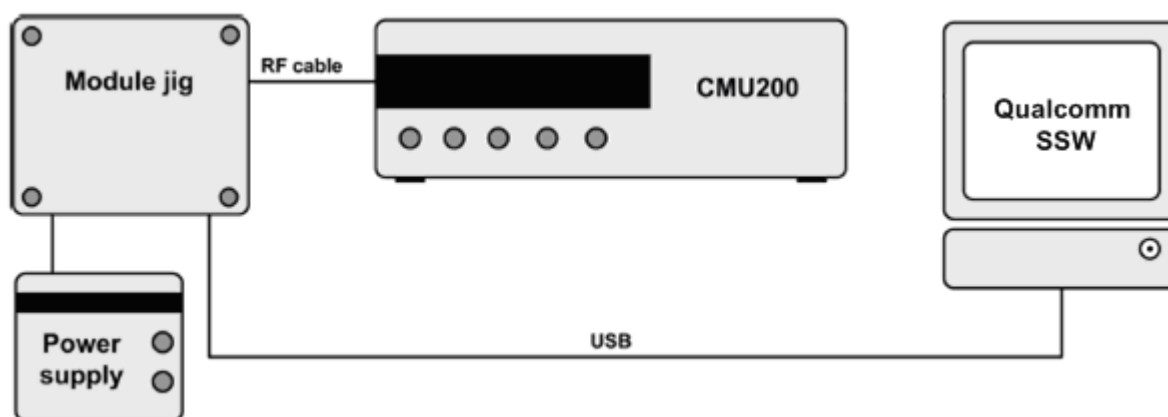


Figure 5 Tuning concept with CMU200

■ General voltage checking

Steps

1. Set up the main board. The phone should be in **FTM** mode.
2. Check the following:

#	Signal name	Test point	Voltage
1	VREG_TCX0	C1009	2.85V
2	VPH_PWR	C1204	3.8V
3	VREG_RFRX1	C909	2.1V
4	VREG_RFTX	C902	2.1V
5	VREG_RFRX2	C919	2.1V

■ Receiver troubleshooting

Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in FTM mode. For the FTM mode testing, use Qualcomm software. The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For CDMA RSSI measurements, see CDMA RX chain activation for manual measurements.

CDMA RX chain activation for manual measurement

Prerequisites

Make the following settings in Qualcomm software and in the signal generator.

Setting	Band 0	Band 1	Band 15
Channel	384	600	425
Signal generator to antenna connector	881.52 MHz	1960 MHz	2131.25 MHz

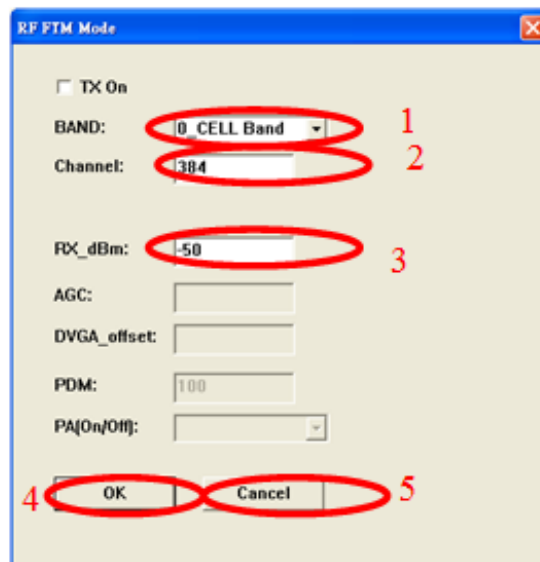
CDMA RX calibration fails in the VGA offset troubleshooting

Cellular band

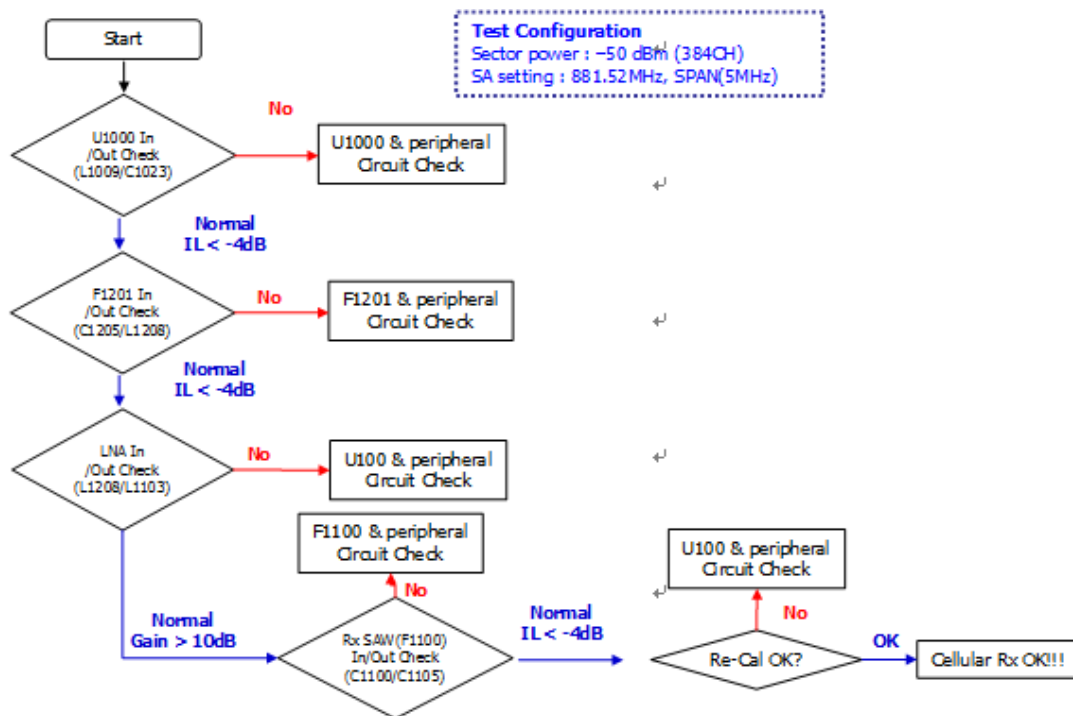
Test configuration:

Sector power: -50 dBm (CH384)

SA setting: 881.52 MHz, SPAN (5 MHz)



Always press Cancel when finish!!

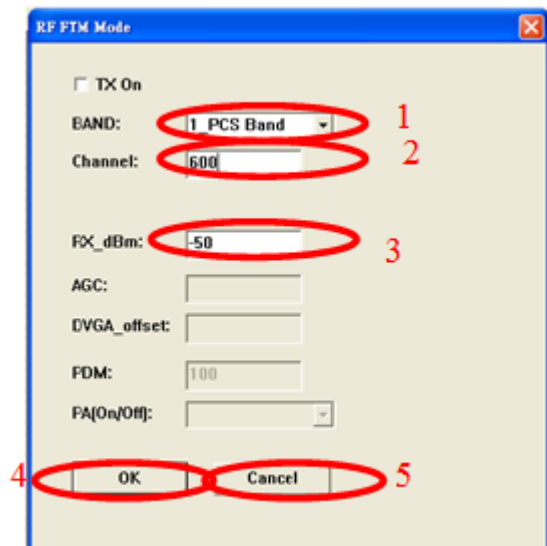


PCS band

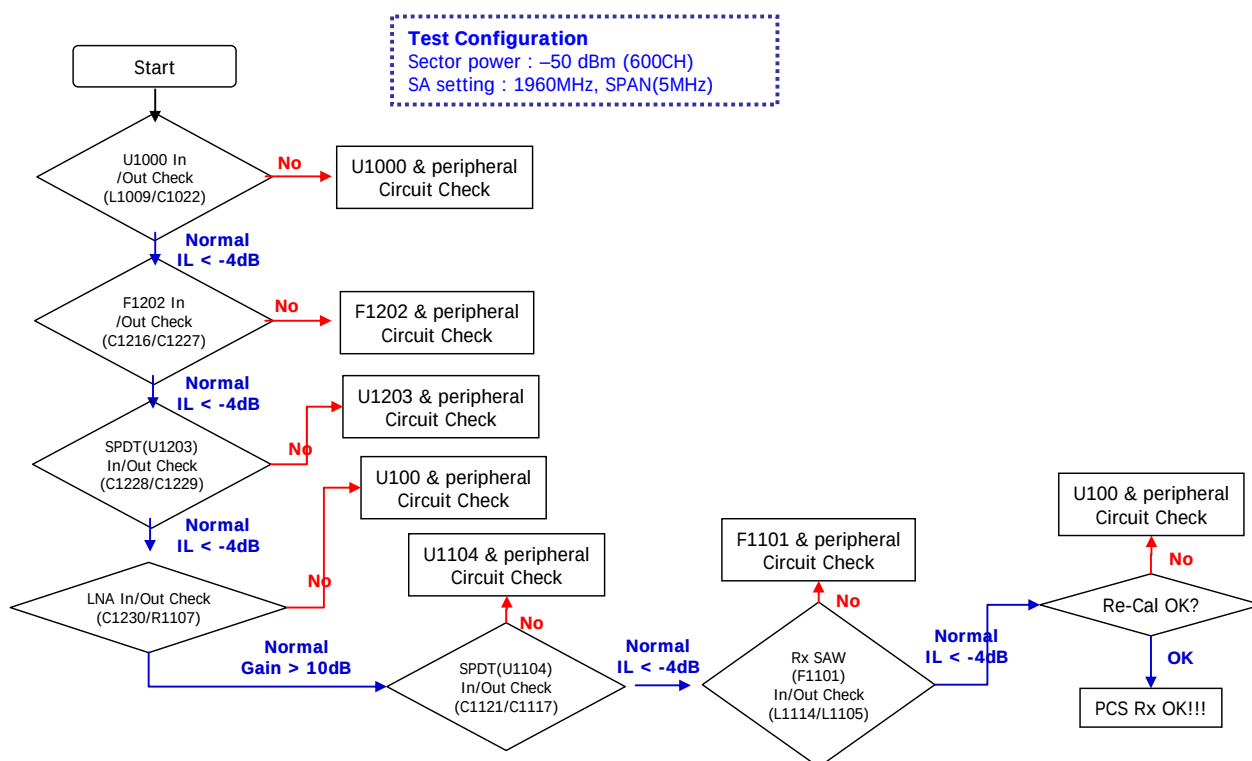
Test configuration:

Sector power: -50 dBm (CH600)

SA setting: 1960 MHz, SPAN (5 MHz)



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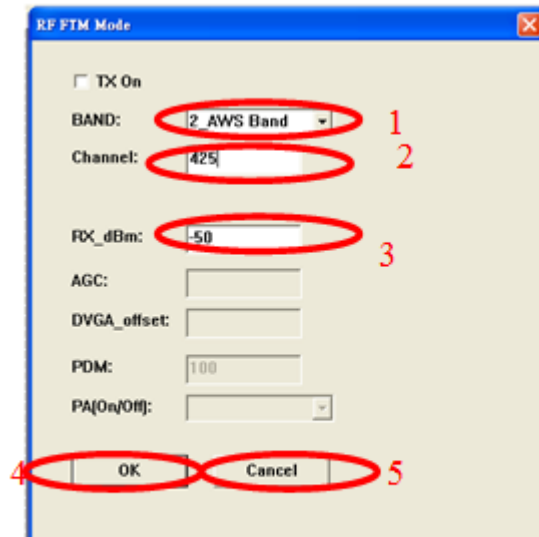


AWS band

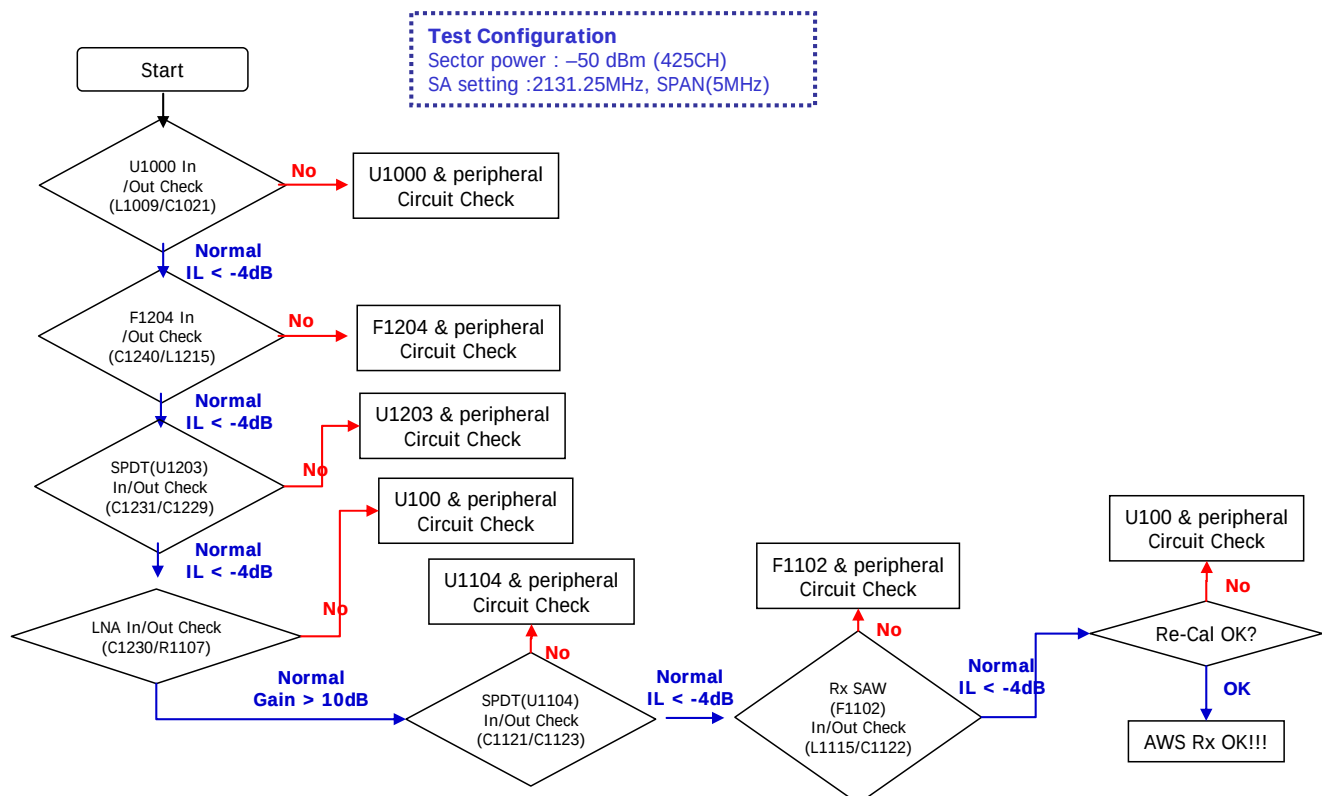
Test configuration:

Sector power: -50 dBm (CH425)

SA setting: 2131.25 MHz, SPAN (5 MHz)



Always press Cancel when finish!!



■ Transmitter troubleshooting

General instructions for transmitter (TX) Troubleshooting

Please note the following before performing transmitter tests:

- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production

Note: Never activate the CDMA transmitter without a proper antenna load. Always connect a 50 Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2 W dummy load); otherwise the CDMA Power amplifier (PA) may be damaged.

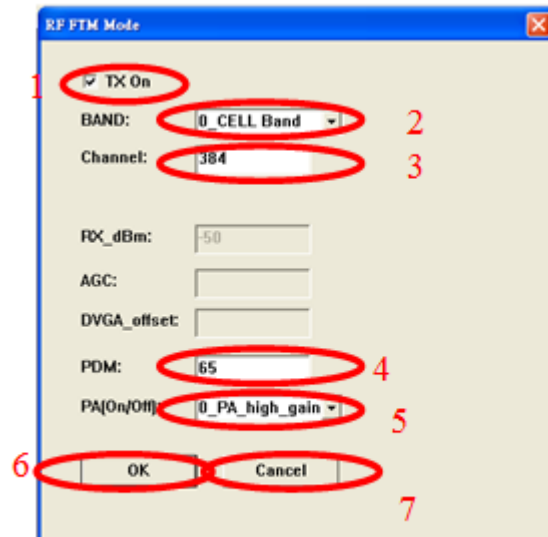
Cellular band

Test configuration:

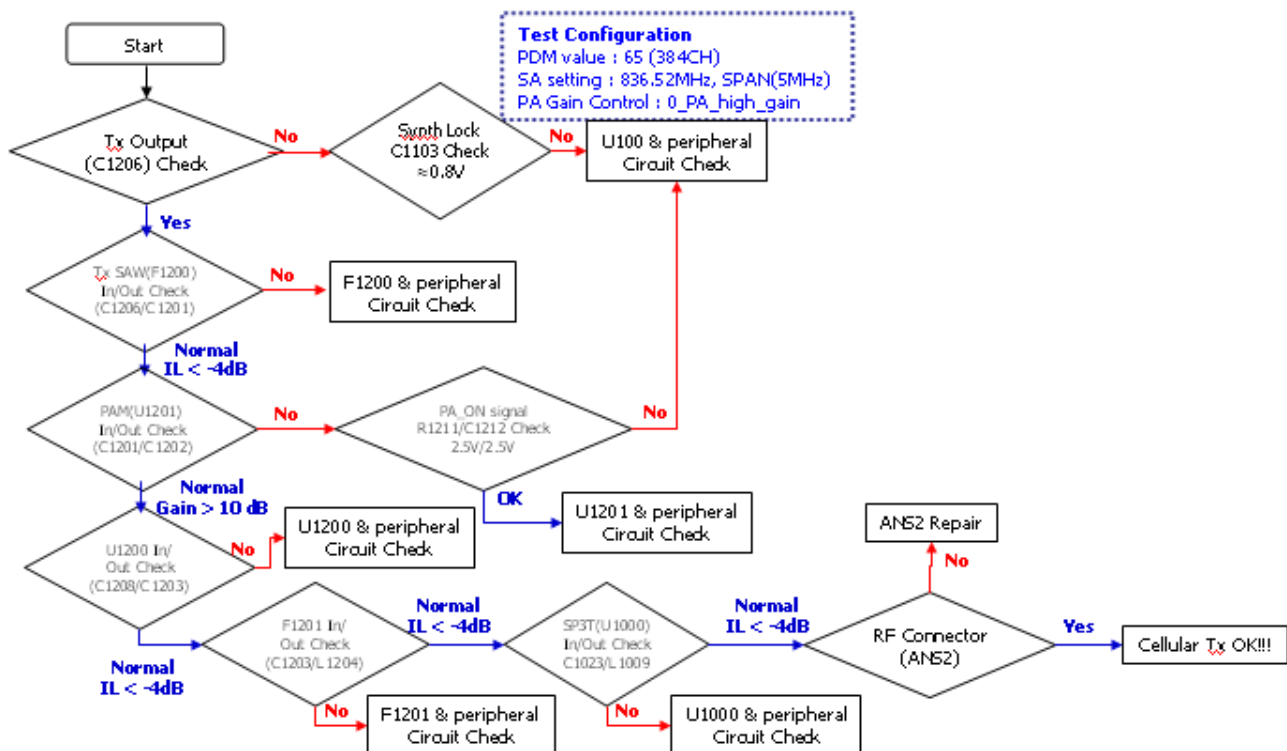
PDM value: 65 (CH384)

SA setting: 836.52 MHz, SPAN (5 MHz)

PA gain control: 0_PA_high_gain



Always press Cancel when finish!!



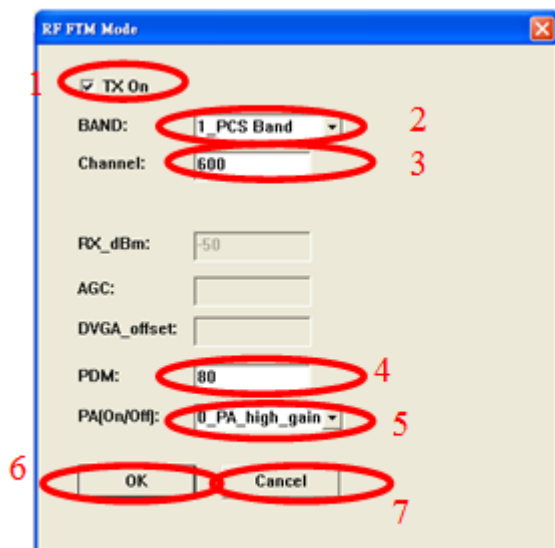
PCS band

Test configuration:

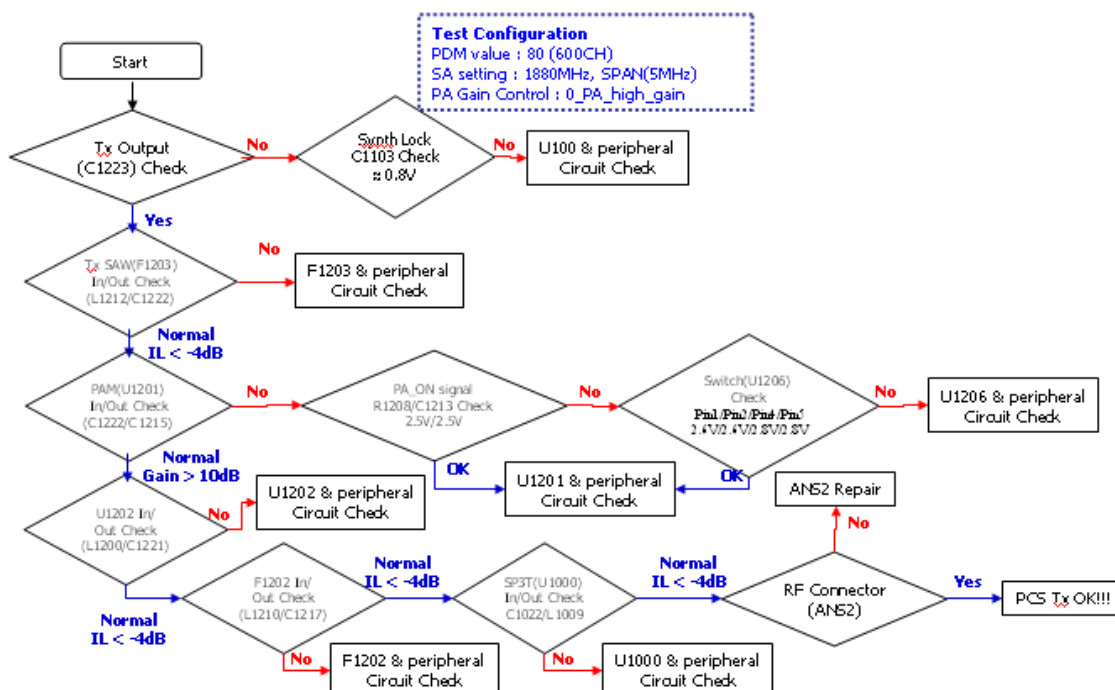
PDM value: 100 (CH600)

SA setting: 1880 MHz, SPAN (5 MHz)

PA gain control: 0_PA_high_gain



Always press Cancel when finish!!



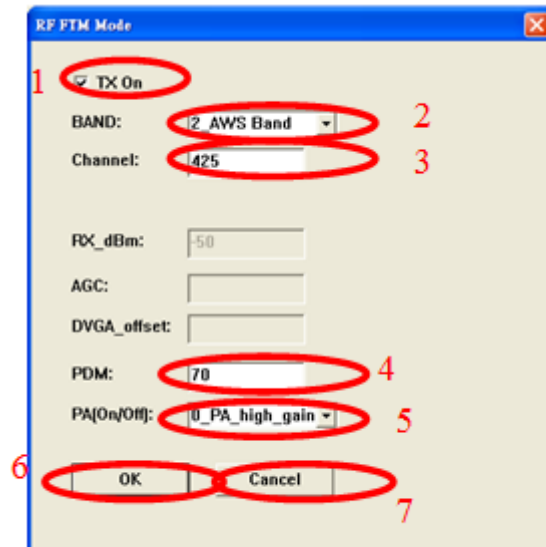
AWS band

Test configuration:

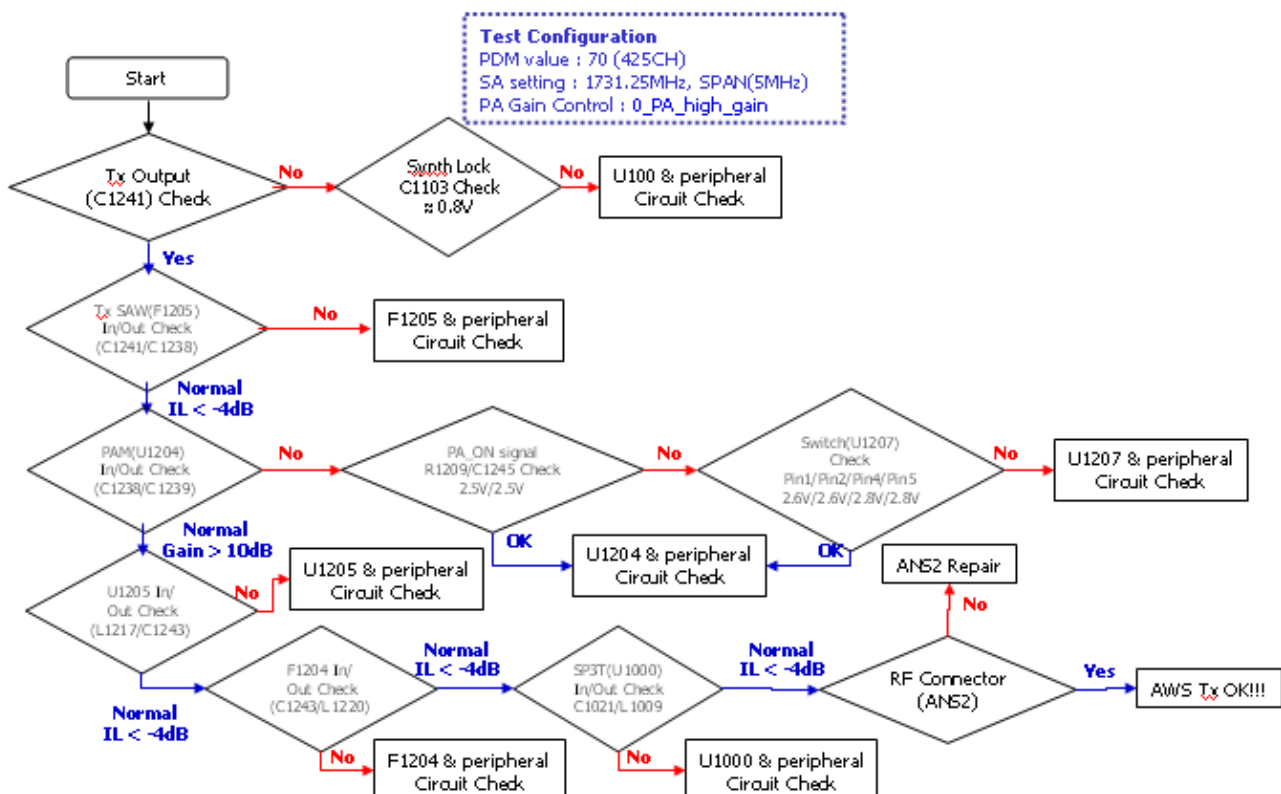
PDM value: 100 (CH425)

SA setting: 1731.25 MHz, SPAN (5 MHz)

PA gain control: 0_PA_high_gain



Always press Cancel when finish!!



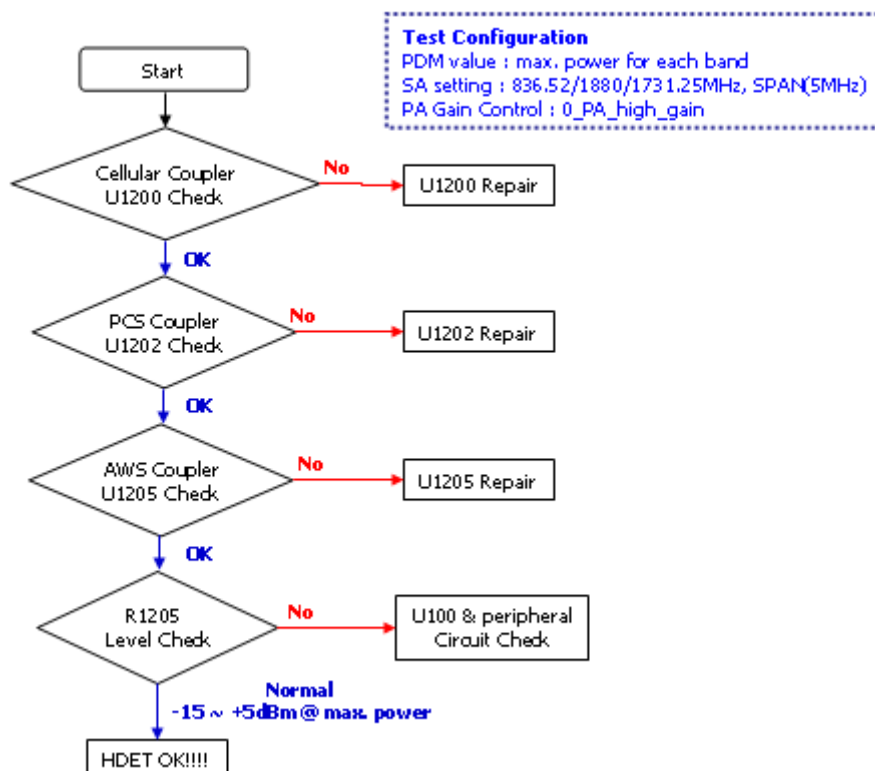
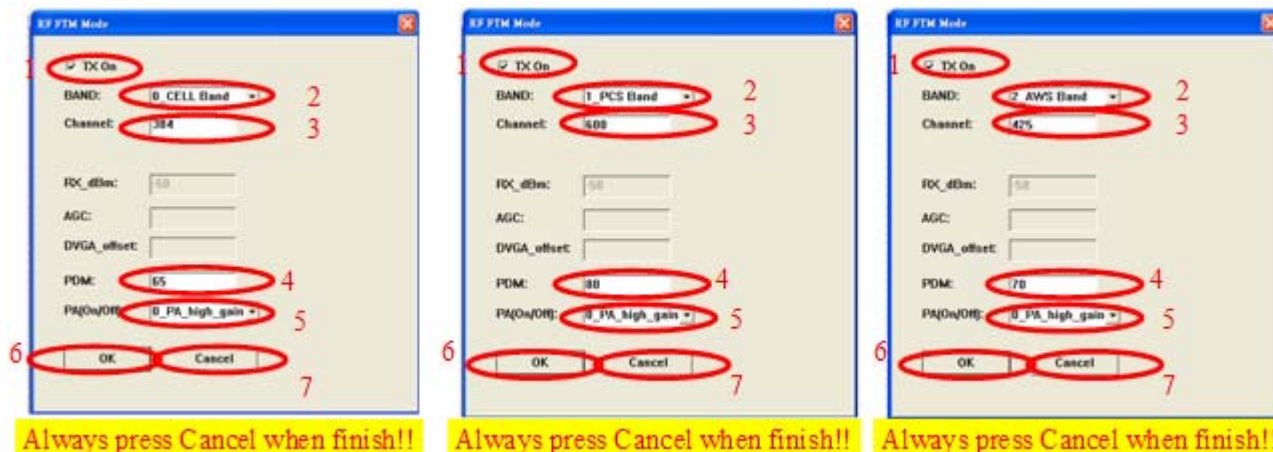
Coupler

Test configuration:

PDM value: MAX power for each band

SA setting: 836.52/1880/1731.25 MHz, SPAN (5 MHz)

PA gain control: 0_PA_high_gain



■ GPS troubleshooting

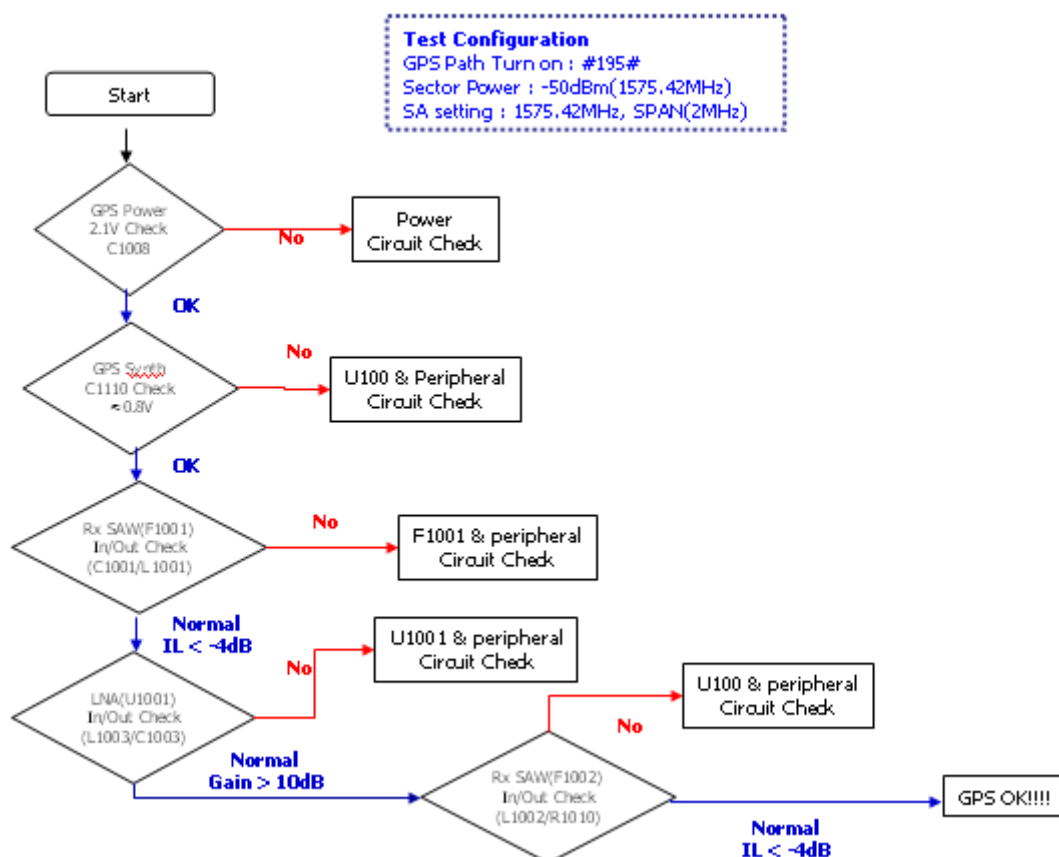
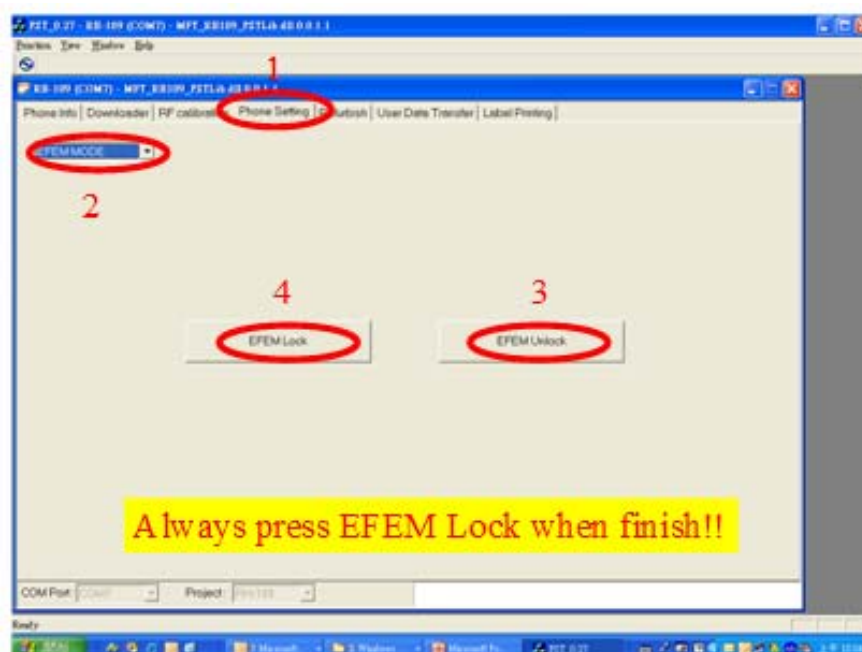


Figure 6 Troubleshooting diagram: GPS

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5 – System Module Description

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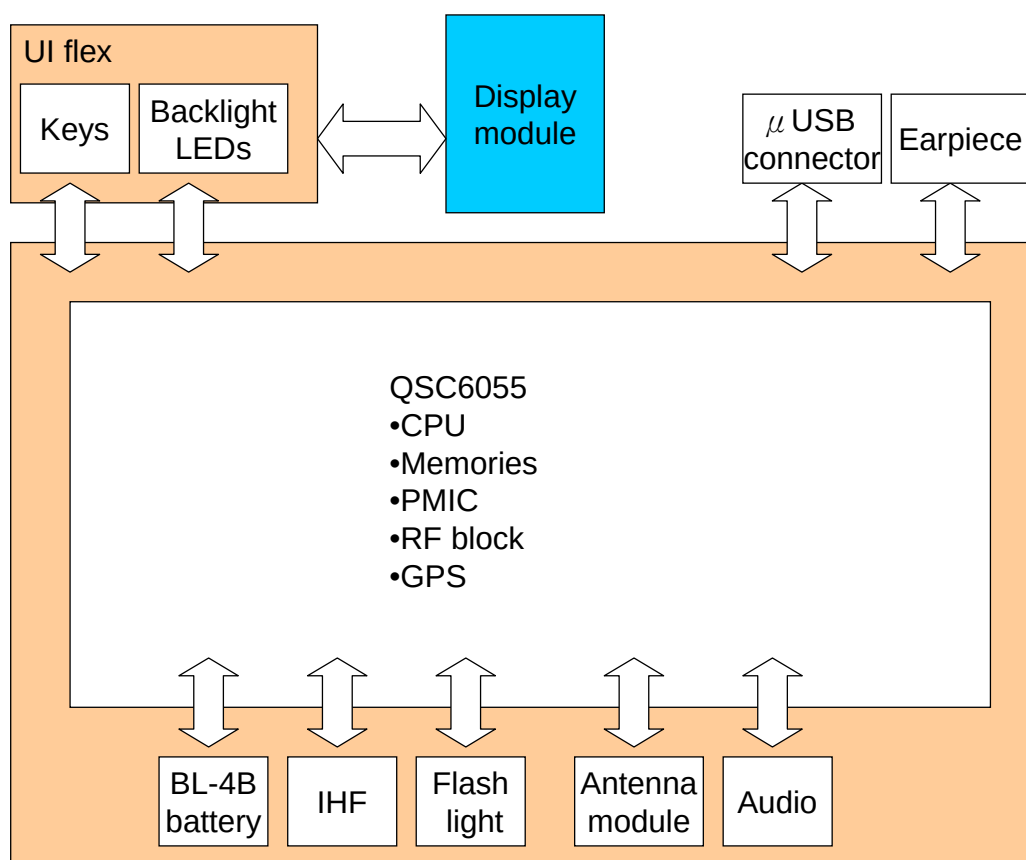
■ Introduction

Phone description

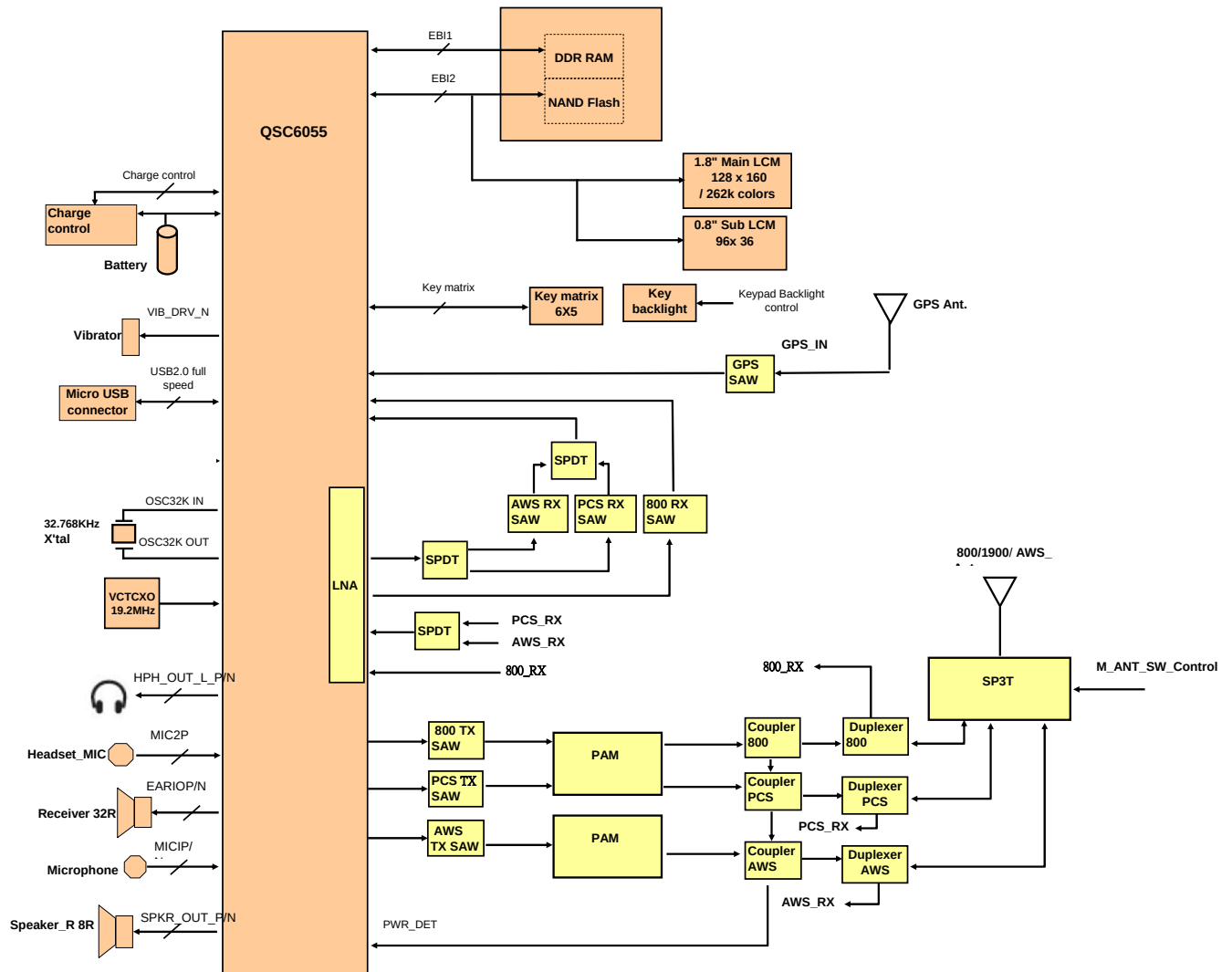
QSC6055 is the single-chip device baseband ASIC in the phone. It contains functionality for RF, MSM, and PM ICs.

System block introduction

QSC6055 System Module Description.



The phone system block Diagram



Phone key components and placement

Function	Description	Item Reference
Main board		
Sub board		
QSC6055	Single-chip, It contains for RF, MSM, and PM ICs	
Ear Jack	Ear Jack	J701
Hall sensor	Fold & unfold detect	U600
Filter	EMI/ESD	F600 / F601
Reset IC	auto power on detect	U800
OVP IC	Over voltage protection	U501
X-tal	32.768kHz	Y300
TCXO	19.2MHz	Y1000
SAW	TX AWS	F1205
SAW	TX PCS	F1203
SAW	TX CELL	F1200
PA	Dual band	U1201
PA	AWS	U1204
Coupler	PCS	U1202
Coupler	Cell	U1200
Coupler	AWS	U1205
connector	CDMA RF	ANS2
PAD	Vibrator	J300
GPS RF Connector	GPS	ANS1
SAW	GPS	F1001 / F1002
LNA	GPS	U1001
switch	Side key	J800 / J801
SAW	RX Cell	F1100
SAW	RX PCS	F1101
Duplexer	Cell	F1201
Duplexer	PCS	F1202
switch	RF	U1000
Duplexer	AWS	F1204
Filter	EMI/ESD	F700

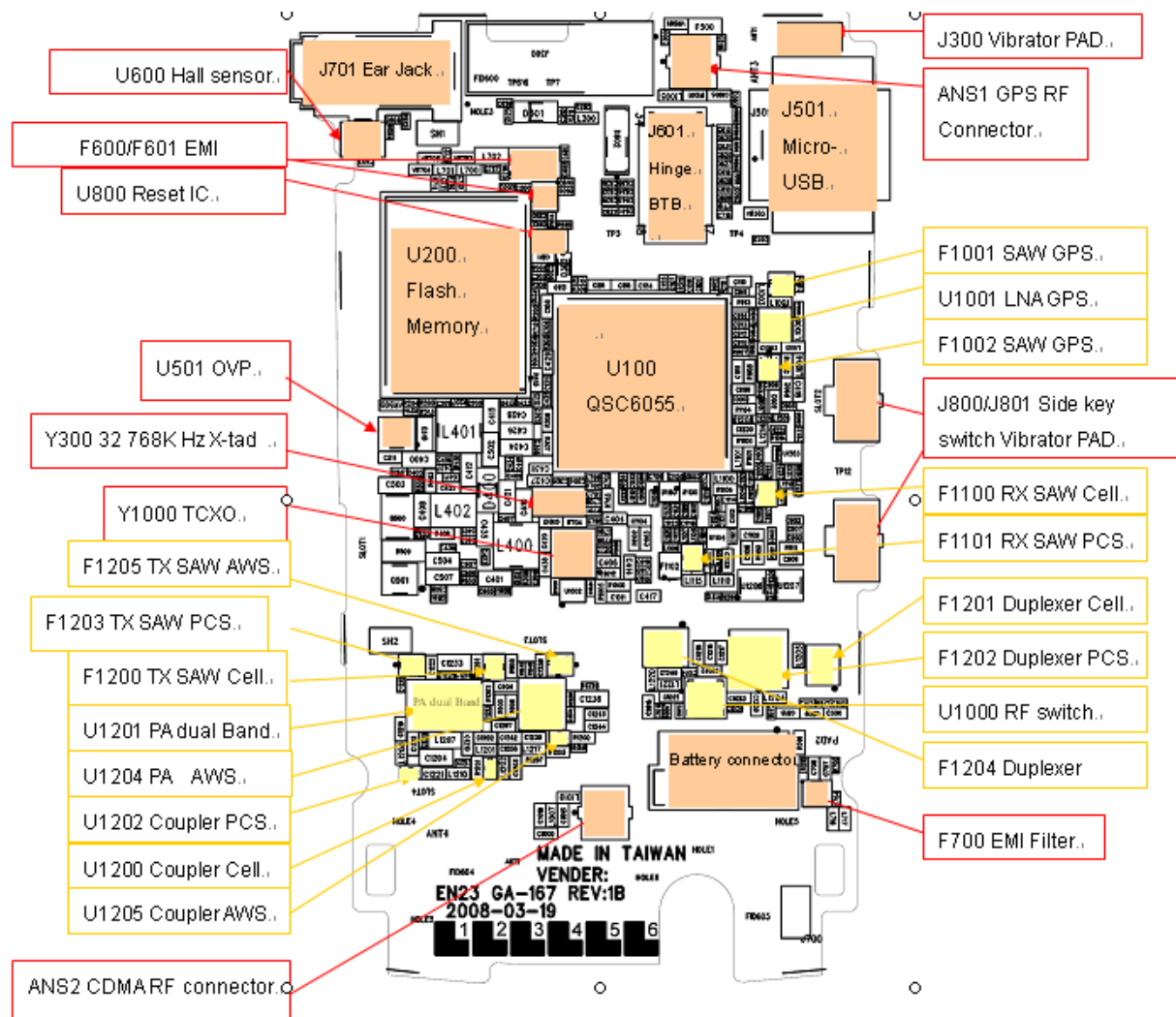


Figure 7 Main board, top side

■ Energy management

Battery and Charging

BL-4B battery

The phone is powered by a 3-pole BL-4B 700 mAh battery. The three poles are named VBAT, GND and ID where the ID line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor 68Kohm



Figure 8 Battery pin order

The battery connector is a blade connector. It has three blades,

- VBAT (Battery voltage)
- GND (Ground)
- ID (Battery size indicator, The ID line is used to recognize the battery capacity by a BL-4B battery internal pull down resistor 68Kohm).

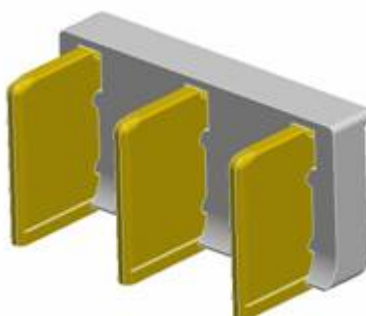


Figure 9 Battery connector

Charging

This phone is charged through the μ USB interface only (there is no separated connector for a charger), Support two charging mode for normal USB charging and two approved NOKIA chargers(AC-6 and DC-6) charging, Charging is controlled by energy management, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Normal and extreme voltages

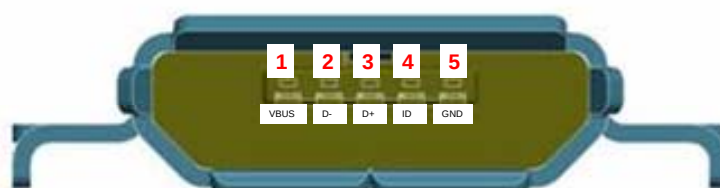
In the table below normal and extreme voltages are shown, when a BL-4B battery is used.

Table 2 Nominal voltages

Voltage	Voltage [V]	Condition
General conditions		
Nominal voltage	3.8	
Lower extreme voltage	3.3	
Higher extreme voltage(fast charging)	4.1	
HW shutdown voltages		
Vmstr +	2.6±0.1	off to on
Vmstr -	2.6±0.1	on to off
SW shutdown voltages		
SW shutdown	3.2	In call
Min operation voltage		
Vcoff +	3.4	off to on
Vcoff -	3.3	on to off

USB

In this phone the USB connector is the only physical connector, which means that the USB port is used both for data transfer as well as for charging. The USB 2.0 is supported with full speed (12 Mbps). It also supports hot swap, which means that USB devices may be plugged in/out at any time. This phone is provided with a specific connector for µUSB.



■ User interface

Display

In this phone, support dual display for internal LCD TFT Transmissive 1.77" and external LCD FSTN Transflective 0.97", in the system, Display controller via EBI2 8bit data bus, display exclusive chip select pin to control the internal & external LCD.

Backlight and illumination

In this phone, Display backlight is common by internal LCD and external LCD, The light source comes from internal LCM, The LCM backlight control has 3 stages for off, dark and bright, the backlight is collocated MMI conditions to adjust the shading value.

Flip open/close switch

This is a fold phone that system wakes up, when close the cover. It is implemented with a hall sensors mounted on the main PCB and a magnet to put on B case housing. The hall detector output is active low (0V) and 1.8V when not active. This arrangement makes the phone able to detect - closed and open position.

Flashlight

Flashlight is support in the product. The external key design on front cover, external key need press more than 1.5s to turn the flashlight On and Off. Other flashlight has the ability to turn on while phone is off.

■ Audio concept

The functional core of the audio hardware is built in QSC6055.

QSC6055 provides an interface for the transducers. Integrated hands free (IHF) speakers are driven by D-class audio amplifier and negative charge pump for (HPH) headset.

There are audio transducers:

- 3 analog input (2 MIC input and 1 LINE_IN input)
- 1 EARPICE for handset
- 1 IHF (internal han
- 1 HPH for headset
- 1 LINE_OUT

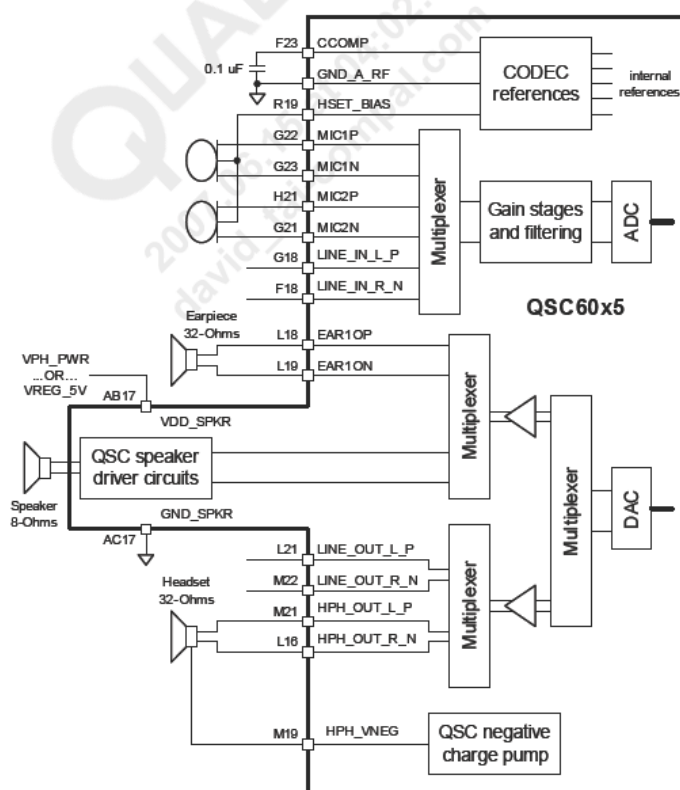


Figure 10 Audio block diagram

Internal audio

The internal audio components are used in these modes

	Hand Portable Mode	Headset Mode	Hand Free Mode
MIC1	X		X
MIC2		X	
LINE_IN			
EARPIECE	X		
SPEAKER			X
LINE_OUT			
HPH_OUT		X	

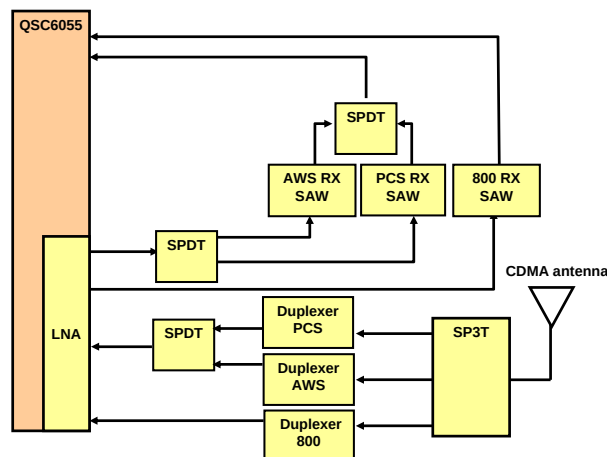
■ RF description

Receiver (RX)

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

The receiver functions are implemented in the QSC6055 RF block. Signals with different frequencies take different paths, therefore being handled by different components.

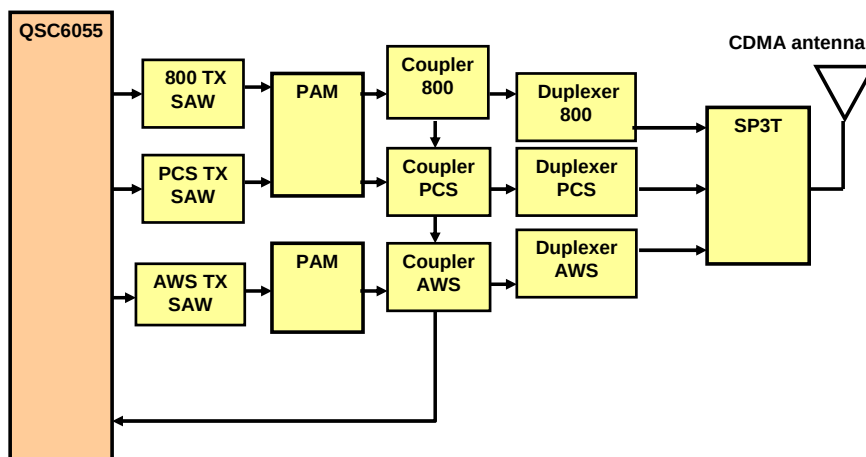
QSC6055 System Module Description



Transmitter(TX)

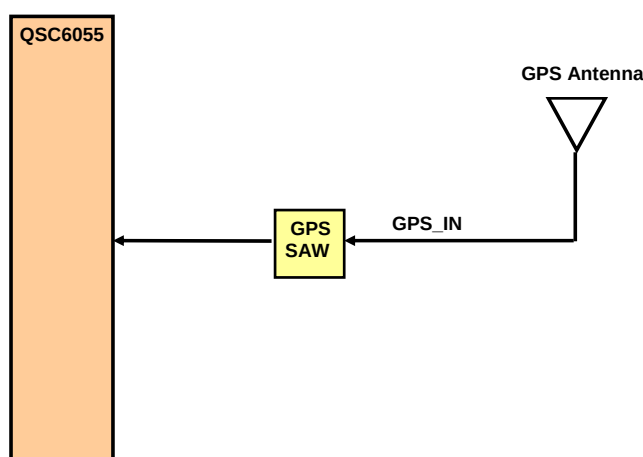
The digital baseband signal (eg. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwidth of the system in use (eg. CDMA CELL band).

The transmitter functions are implemented in the QSC6055 RF block. Even though the CELL/PCS/AWS signals are sent via different components, the principles of the transmission is the same.



GPS

The QSC6055 performs gpsOne technology, and simultaneous- GPS architecture and Assisted- GPS and Standalone-GPS operating mode.



■ Technical specifications Main RF characteristics for CDMA phones

QSC6055 System Module Description

Parameter	Unit
Number of RF channels	CELL : 810
	PCS : 1200
	AWS : 900
Channel Spacing	CELL : 30kHz
	PCS : 50kHz
	AWS : 50kHz

Environmental condition

Environmental Condition	Ambient Temperature	Notes
Normal Operation	-15°C ... +55°C	Specifications fulfilled
Reduced Performance	+55°C ... +70°C	Operational only for short periods
Intermittent or No Operation	-40°C ... -15°C and +70°C ... +85°C	Operation not guaranteed but an attempt to operate will not damage the phone.
No Operation or Storage	<-40°C and >+85°C	No storage. An attempt to operate may cause permanent damage.
Charging Allowed	-15°C ... +55°C	
Long Term Storage Conditions	0°C ... +85°C	
Humidity and Water Resistance		Relative humidity range is 5 to 95%. Condensed or dripping water may cause intermittent malfunctions. Protection against dripping water has to be implemented (enclosure) mechanics. Continuous dampness will cause permanent damage to the module.

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Glossary

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

DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HSDPA	High-speed downlink packet access
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Association

ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC,	mic Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MTP	Multipoint-to-point connection
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF	PopPort™ Reduced function PopPort™ interface
RFBUS	Serial control Bus For RF

RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card
RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW	filter Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator

Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WCDMA	Wideband code division multiple access
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

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