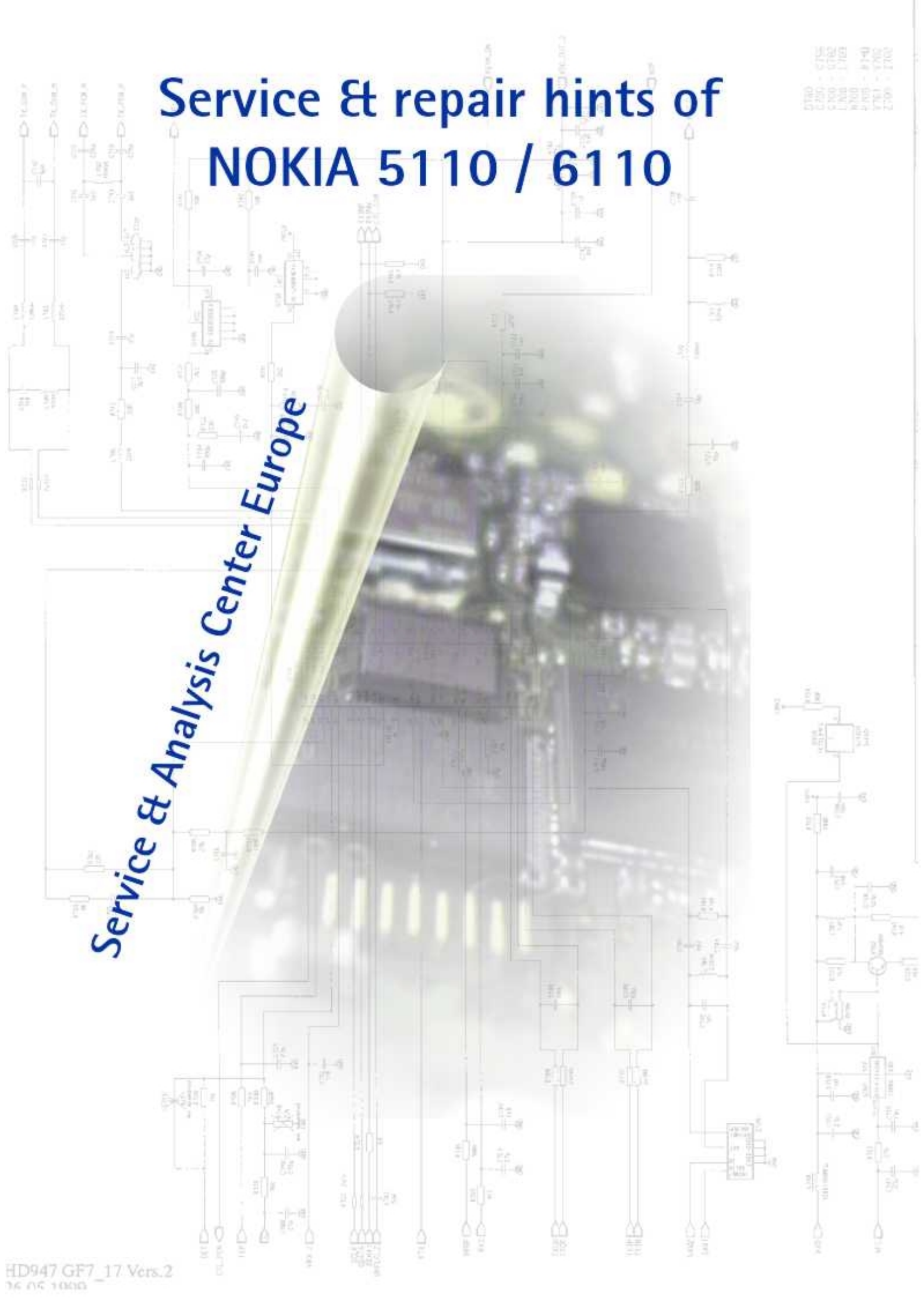
Service & repair hints of NOKIA 5110 / 6110



Service & Analysis Center Europe

HD947 GF7_17 Vers.2
26.05.1999

Change history

Orginator	Approved	Status	Version	Date	Comment
Ralf Heptner		Draft	0.1	11.08.99	
Ralf Heptner		Draft	0.2	25.08.99	Flowcharts updated
Ralf Heptner		Draft	0.3	27.09.99	SIM lock lists updated, some minor changes
Ralf Heptner		Draft	0.4	01.10.99	Forword changed
Jose Marquez		Draft	0.5	08.10.99	Forword changed
Ralf Heptner		Approved	1.0	19.10.99	Forword changed

Introduction

IMPORTANT:

This document is intended for use by authorized NOKIA service centers only.

The purpose of this document is to provide some further service information for NOKIA 6110, 5110 phones.
It contains a lot of collected tips and hints, to find failures and repair solutions easily.
I will also give support to the inexperienced technicians.
Saving processe time and improving the repair quality is the aim of using this document.
We have build it up based on fault symptoms (listed in "Contents") followed by detailed description for further analysis.
It is to be used additionally to the service manual and other service information like Service Bulletins, for that reason it doesn't contain any circuit descriptions or schematics.

All measurements are made with using of following equipment:

Nokia repair SW	: Wintesla Version 6.10
DLL version	: NSEKM-13 version 2.41.03
Nokia Module Jig	: JBS-19
Digital multimeter	: Fluke 73
Oscilloscope	: Hitachi V-1565; Fluke PM 3380A
Spectrum Analyzer	: Advantest R3361C with an analogue probe
RF-Generator / GSM Tester	: Rohde & Schwarz CMD 53

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 should be notified in writing, using following procedure:

Please state:
Title of the Document + Issue Number/Date of publication
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Contents

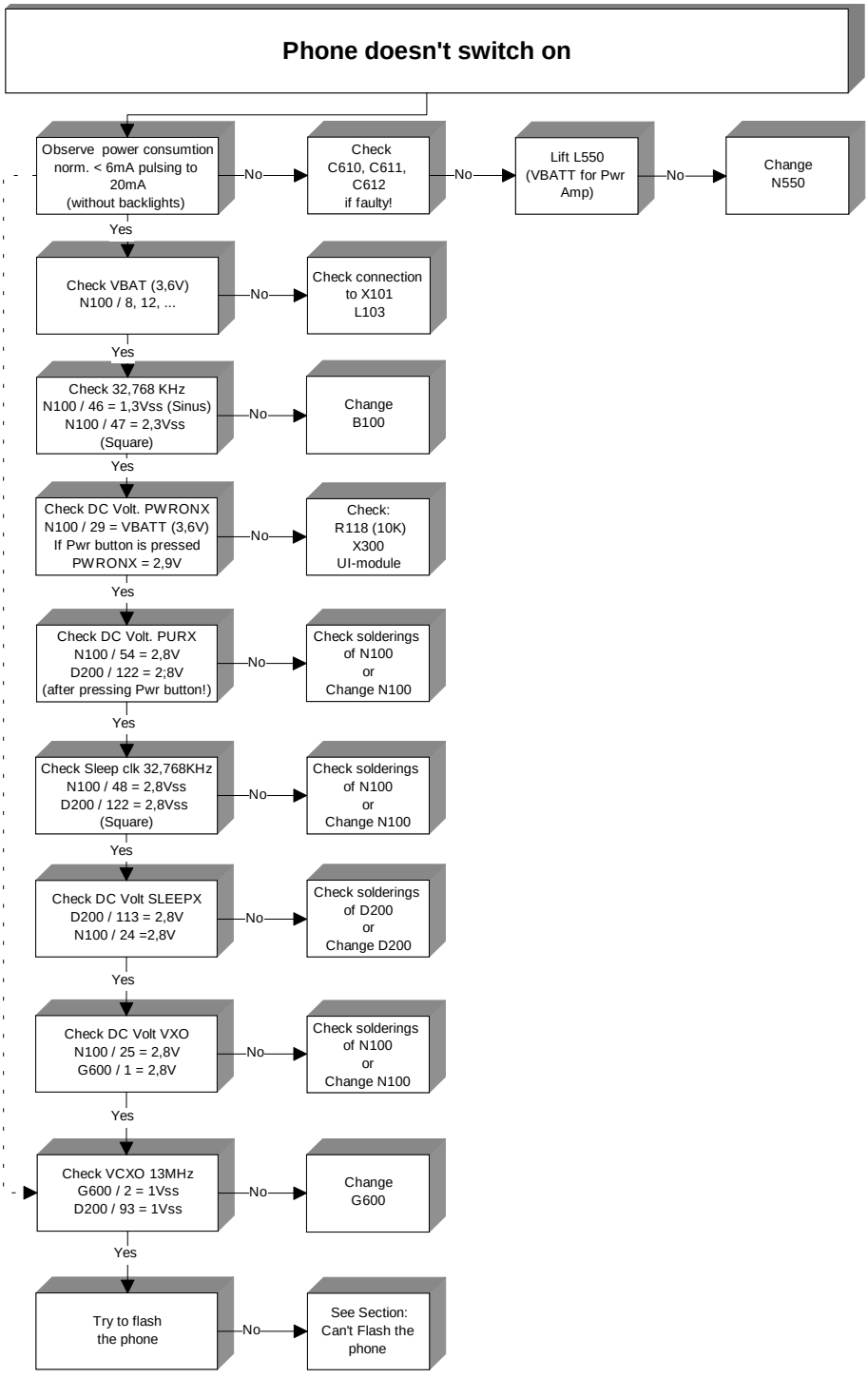
CHANGE HISTORY 2

INTRODUCTION 3

PHONE DOESN'T SWITCH ON 5
PHONE SWITCHES ITSELF OFF 8
SWITCH ITSELF OFF- CONTACT SERVICE APPEARS ON THE DISPLAY 9
CONTACT SERVICE – COBBA PARALLEL BUS FAILED 10
CONTACT SERVICE – COBBA SERIAL BUS FAILED 11
CONTACT SERVICE – EEPROM TUNE CHECKSUM FAIL 12
CONTACT SERVICE – PPM VALIDITY 13
CLOCK TIME OR USER SETTING PROBLEMS 14
THE PHONE HANGS UP, AFTER ENTERING THE PIN-CODE 16
NOT CHARGING 17
LOW STAND BY TIME 21
BUZZER FAILURES 22
INTERNAL AUDIO FAILURES 23
EXTERNAL AUDIO FAILURES 24
ACCESSORY DETECTION FAILURE (HEADSET / CAR KIT ACTIVE) 25
DISPLAY FAILURE 27
KEYPAD FAILURE 29
INSERT SIM CARD 30
SIM CARD NOT ACCEPTED, SIM LOCK FAILURE 31
LOW RECEIVER SIGNAL STRENGTH INDICATOR 35
NO SERVICE 35
NO RX (NO RX CALIBRATION...RSSI READING FIXED VALUE) 36
NO RX (NO RX CALIBRATION...RSSI READING HIGH DIFFERENCE) 36
NO RX (NO RX CALIBRATION...RSSI READING HIGHEST VALUE) 36
NO RX (NO RX CALIBRATION...RSSI READING HIGHEST VALUE) 37
CALL BREAKS / NO SERVICE 38
NO CALL / SERVICE O.K. 38
NO OR TO LOW TX – POWER 38

Phone doesn't switch on

Figure 1: Flow chart of phone doesn't switch on



N100 faulty/ poor solderings

- Check if voltage on Pin 29 drops of 700 mV during pressing the Power on button
- Check if there is a 32.768 KHz square wave on Pin 48
- Check if PURX Pin 54 goes up to 2.8 V DC
- Check if VXO Pin 28 goes up to 2.8 V DC

B100 faulty 32,768KHz

- Check 32.768 KHz ; 1 Vpp clock signal on B100

G600 faulty 13 MHz

- Check VXO 2,8V DC on J522
- Check 13 MHz; 1 Vpp on output

S001 User Interface

- Check if voltage on Pin 29 drops of 700 mV during pressing the Power on button

X300 UI Connector bent

- Check if voltage on Pin 29 drops of 700 mV during pressing the Power on button

R118 missing/ poor soldering

- Check if voltage on Pin 29 drops of 700 mV during pressing the Power on button

D200 MAD faulty/ poor soldering

- Check 32.768 kHz square wave on Pin 124 (comes from CCONT Pin 48)
- Check 13 MHz On Pin 93 (comes from G600)
- Check VBB 2.8 V DC
- Check PURX 2.8 V DC on Pin 122 (comes from CCONT Pin 54)
- Check SLEEPX 2.8 V DC On Pin 113
- Resolder MAD complete

D210 FLASH faulty/ poor soldering/ empty

- Check VBB 2.8 V DC on Pin 47
- If power consumption is around 20mA try to flash the phone
- Resolder FLASH completely

L103 faulty/ poor soldering

- Check VB on J232

X101 / X102 contacts bent/ dirty

- Check if VBATT and Gnd are connected

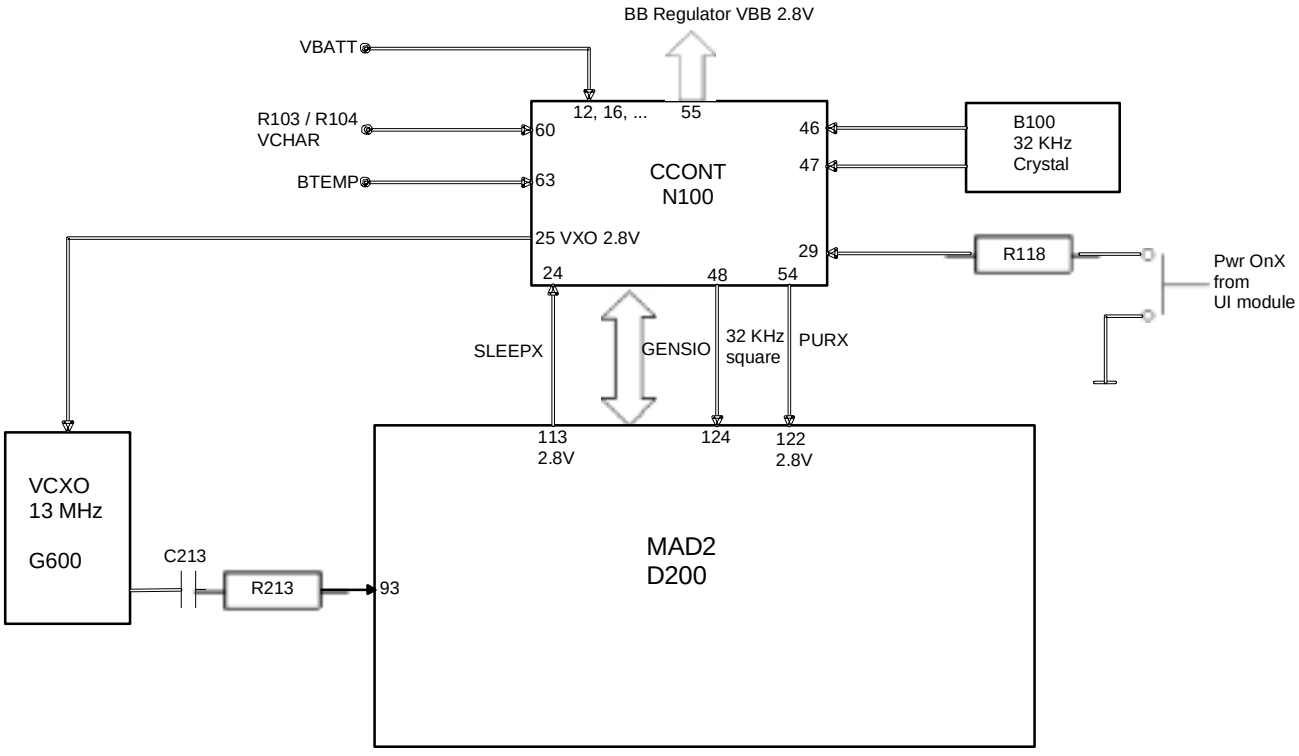
N550 short circuit

- If there is a short circuit on VBATT, lift L550 and check again
- If the PCB is burnt, swap the phone

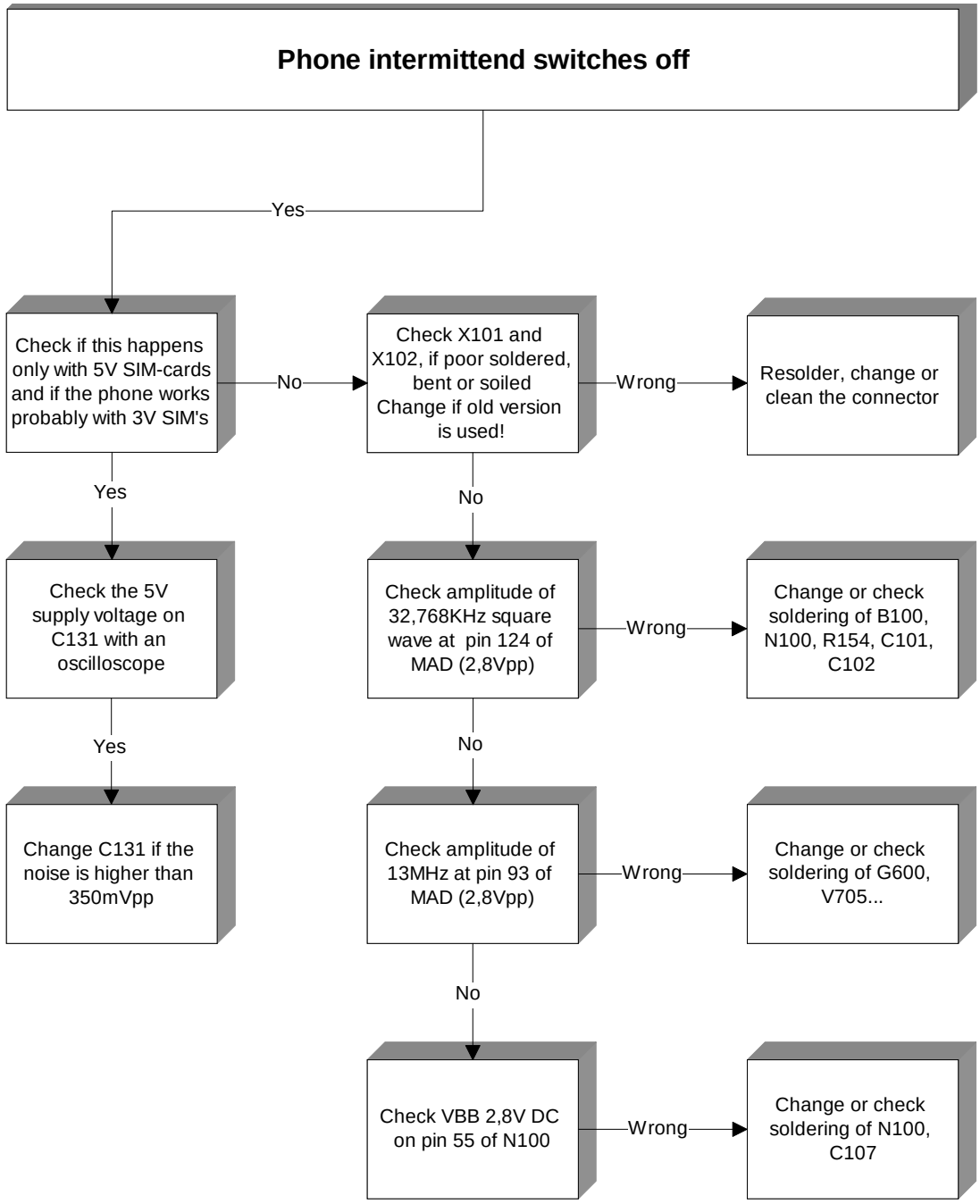
C610; C611; C612 burnt/ short circuit

- Lift the capacitor and check again
- If the PCB is burnt, scrap the phone

Figure 2: Block diagram of switching on routine



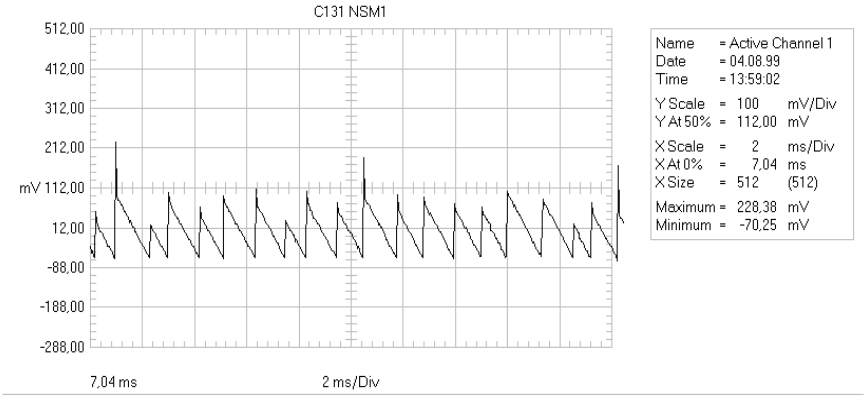
Phone switches itself off



C131 10µF/10V

- Check that the handset work probably with 3V SIM-cards
- Check the 5V supply voltage at C131 (about 4,8V-5,2V, Maximum noise 350mVpp overlap)

Figure 3: diagram of normal noise on C131



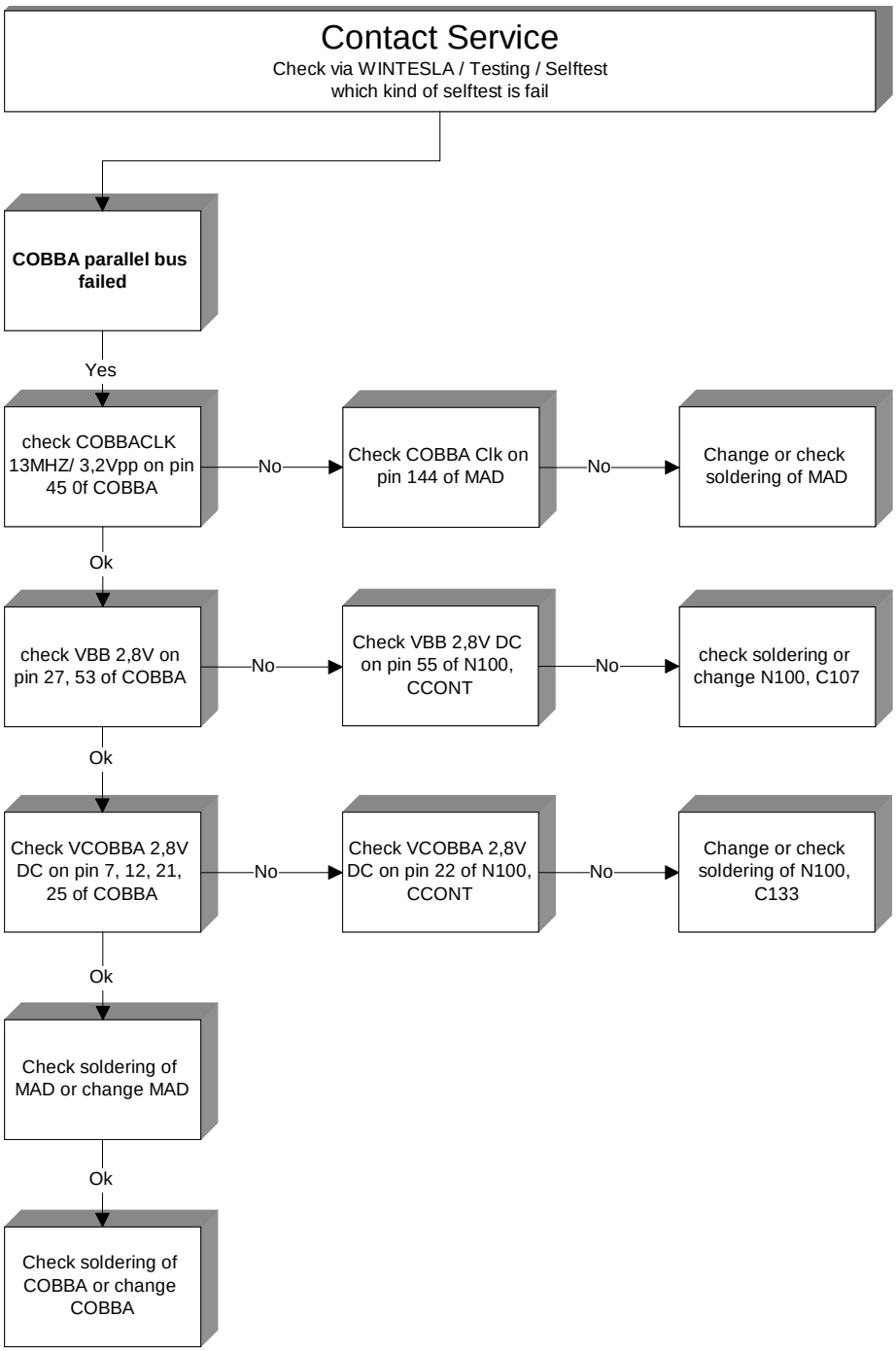
Maximum noise on C131 with 5V SIM-card

Switch itself off- contact service appears on the display

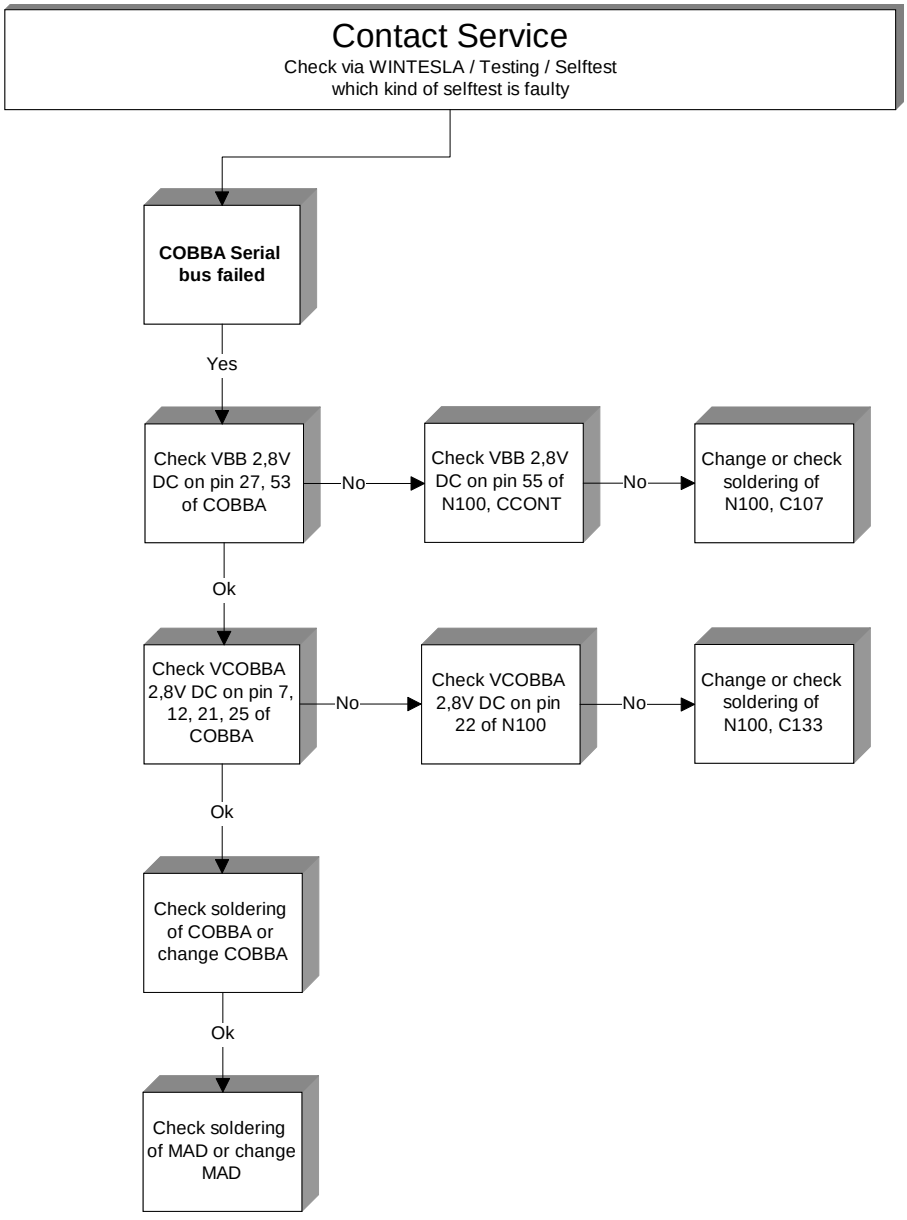
D200 MAD faulty / poor soldering

- Check the amplitude of the 32,768KHz square wave on pin 124 (comes from CCONT pin 48)
- Check the amplitude of the 13MHz clock frequency pin 93 (from G600)
- Check VBB 2,8V DC
- Resolder MAD
- Internal error of MAD

Contact service – COBBA parallel bus failed



Contact service – COBBA serial bus failed

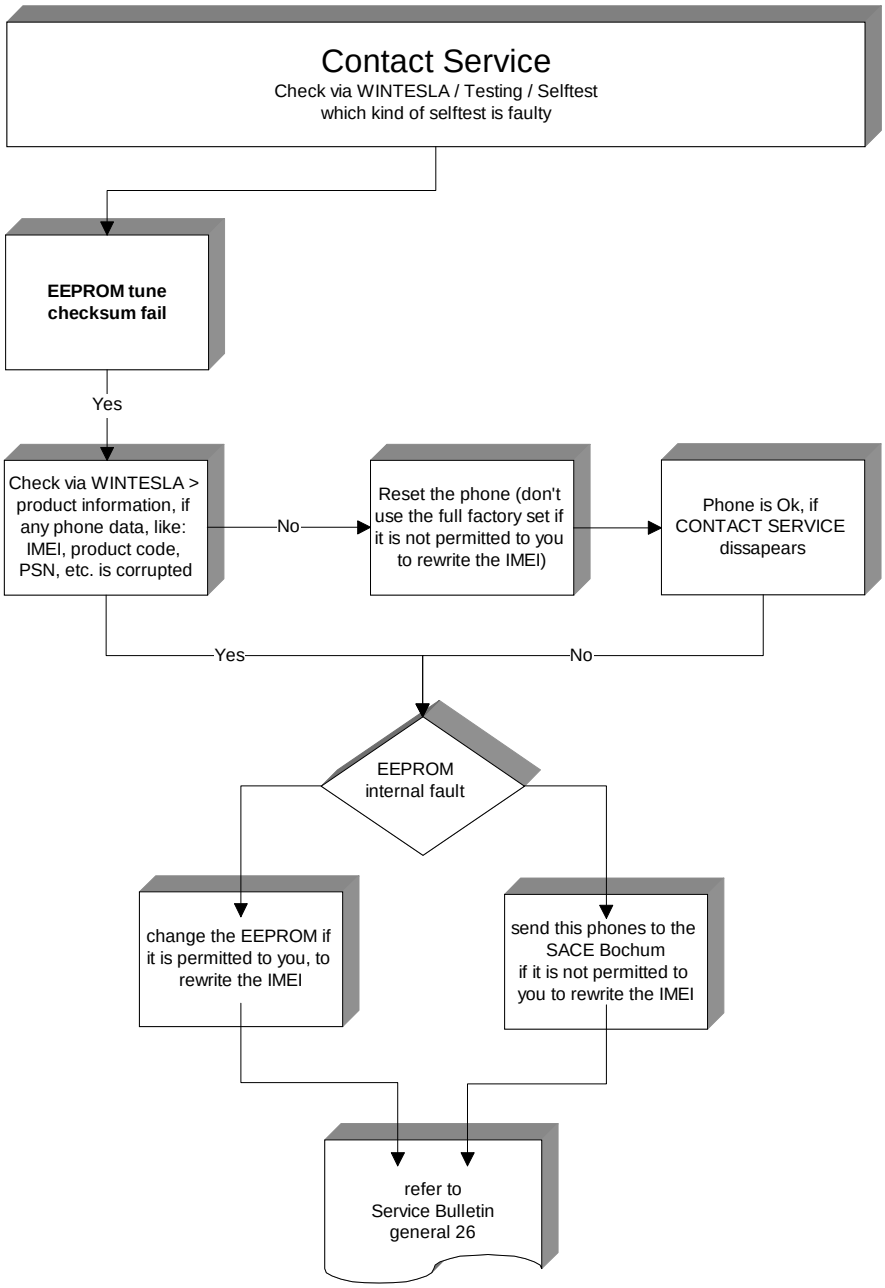


N250 COBBA faulty / poor soldering

- Check VBB 2,8V DC on pin 27, 53 from COBBA
- Check VCOBBA 2,8V DC on pin 7,12,21,25, from COBBA
- Check COBBACKL 13MHz 3,2Vpp pin 45 from COBBA
- Resolder COBBA
- Internal error of COBBA

Note! Rewrite SIMLOCK and IMEI entries with use of the Nokia security SW (SSSW) and make a SW-update or send this phones to the SACE, if this procedure is not permitted to you

Contact service – Eeprom tune checksum fail

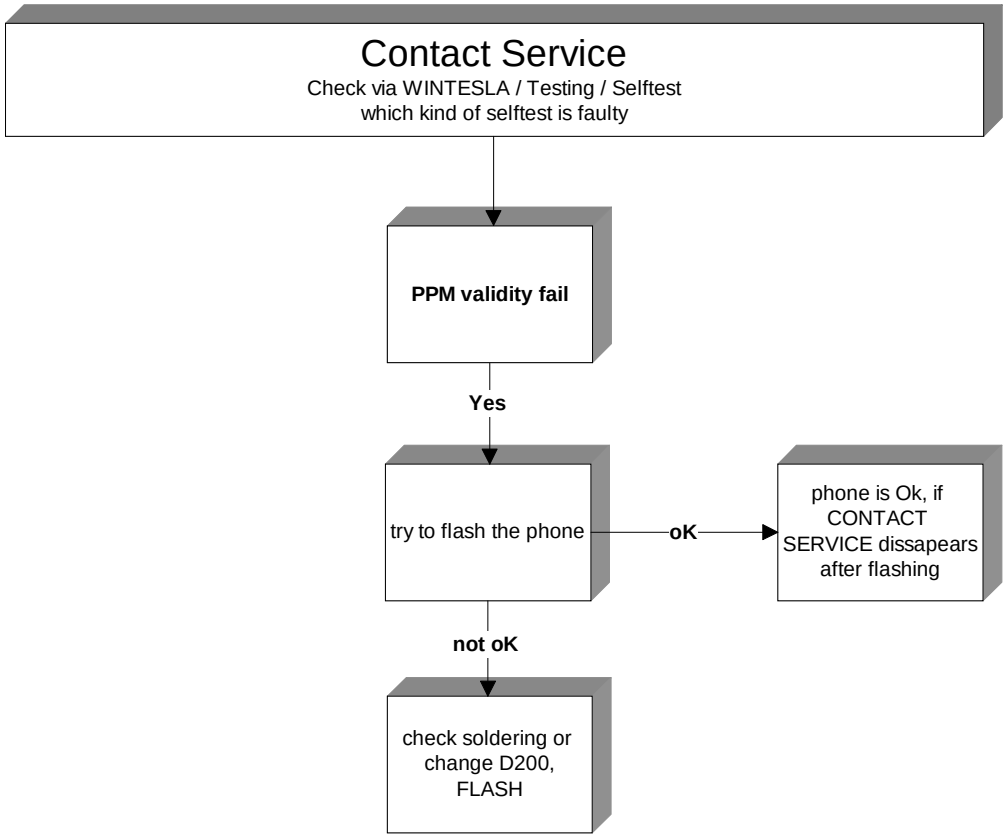


D240 Eeprom faulty

- Check via wintesla if IMEI or product data are corrupted
- Don't use the "Full factory set" via wintesla, otherwise the IMEI will Change to question marks
- Change the Eeprom if it's permitted for you and write all ID data (IMEI, product code...) back
- If you aren't allowed to change the Eeprom and the IMEI is missing, write a note with a little Comment, and send it together with the phone to the SACE

Note! Rewrite SIMLOCK and IMEI entries with use of the Nokia security SW (SSSW) and make a SW-update or send this phones to the SACE, if this procedure is not permitted to you

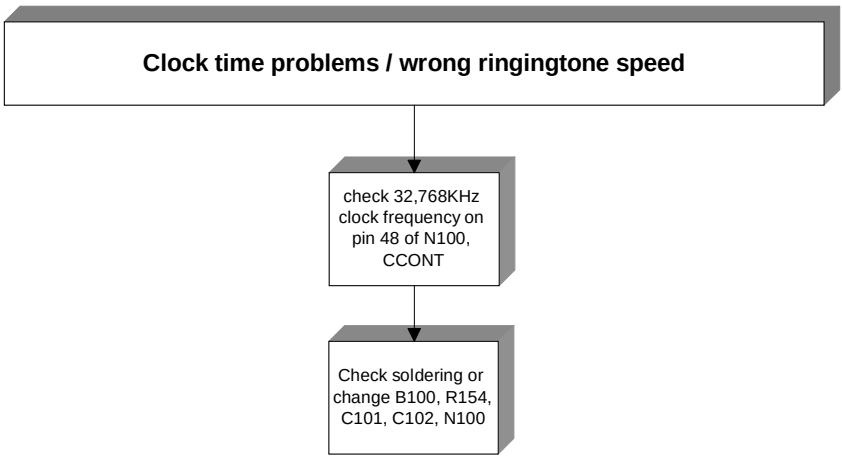
Contact service – PPM validity



SW / D210 Flash faulty / poor soldering

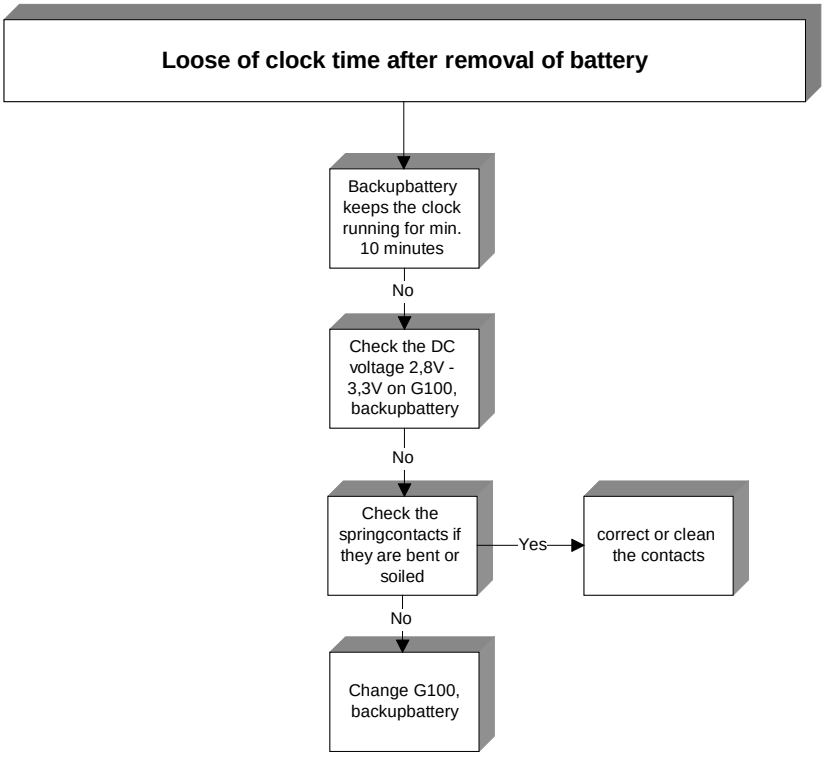
- Check if the fault disappear after update the handset
- Resolder D210 Flash
- Internal error of Flash

Clock time or user setting problems



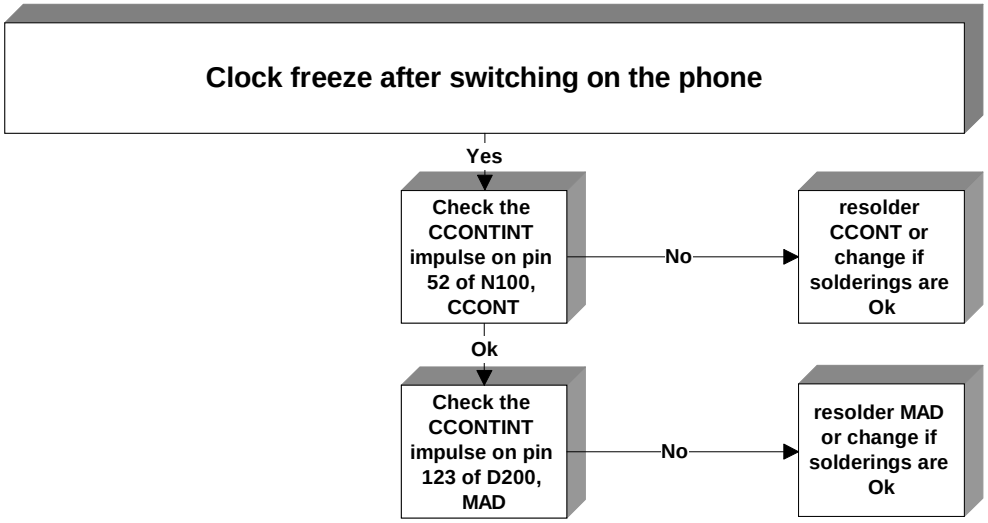
Clock time / ringing tone is to fast or to slowly

- Check that the sleepclk is 32.768KHz square wave on pin 48 CCONT
- Check the crystal B100, R154, C101, C102, N100



G100, Loose of clock time, if the battery is empty or removed for few minutes

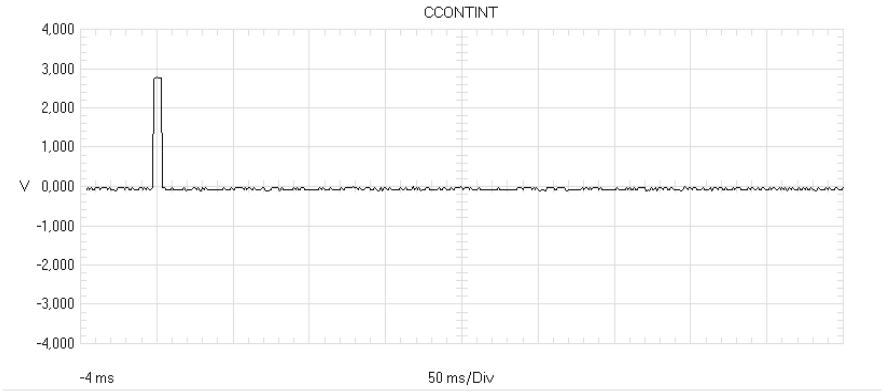
- G100 Back up battery faulty / disconnected
- Check the voltage 2,8V-3,3V over the back up battery connected to the PCB in the service modus
- Check the spring contacts
- Clean the back up battery contacts on the board



N100, Clock will freeze after switching on

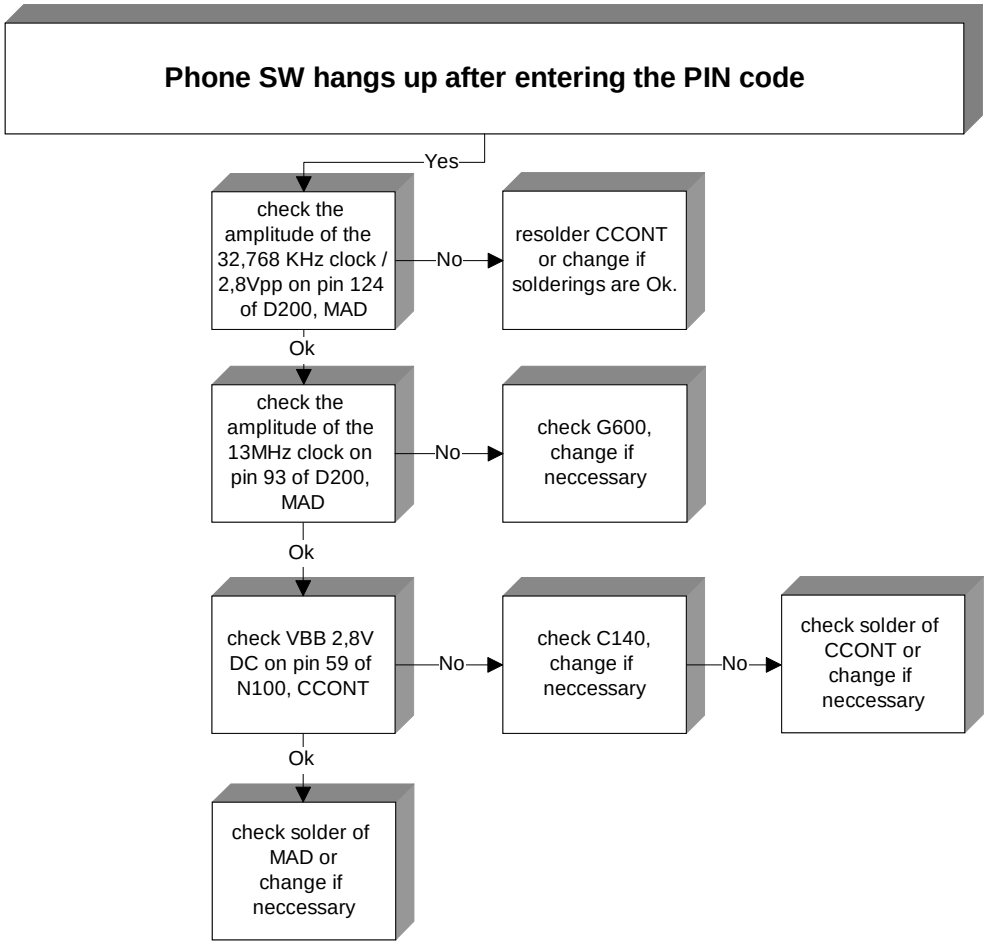
- CCONTINT short circuit / break
- Check the CCONTINT impulse on pin 52 CCONT or pin 123 MAD (see the diagram below)
- Check pin 52 CCONT pin 123 MAD short circuit or break

Figure 4: CCONT INT impulse on CCONT pin 52



CCONTINT mesurable, afer connect or disconnect a charger (ACP-7/9)
Measurement point J223 or pin 52 CCONT, pin123 MAD

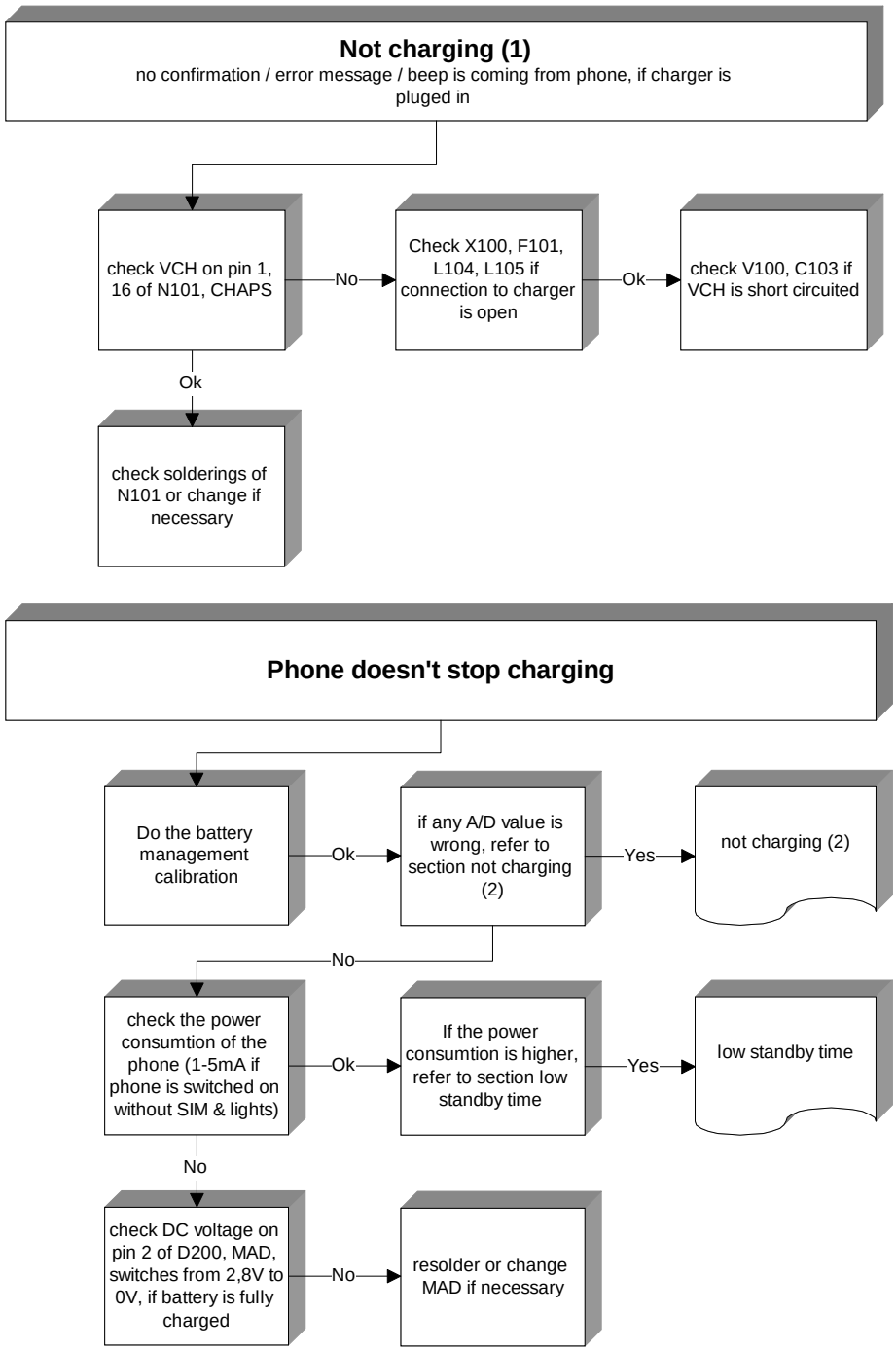
The phone hangs up, after entering the PIN-code

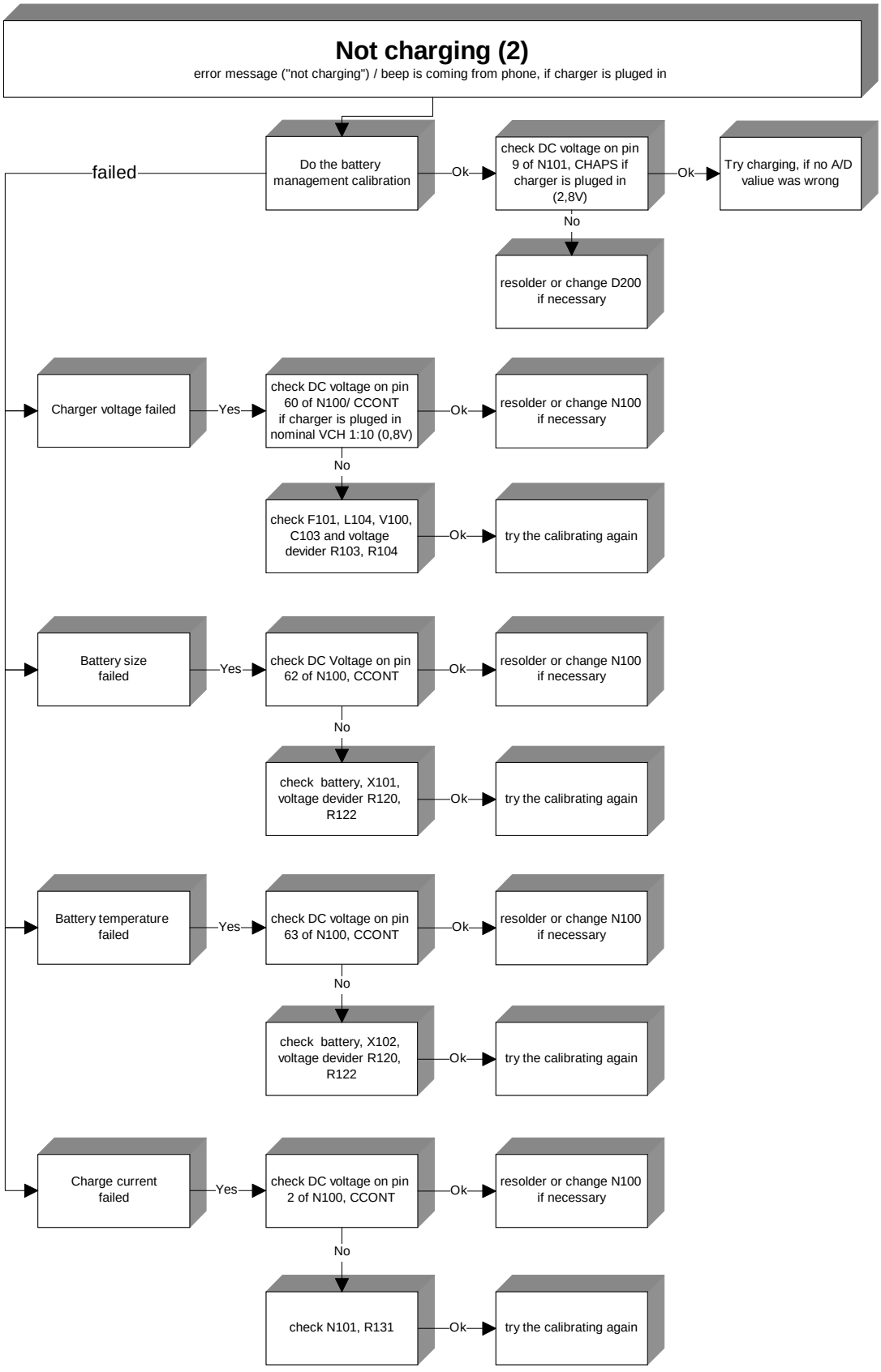


D200 MAD faulty / poor soldering

- Check the amplitude of the 32,768KHz square wave on pin 124 (comes from CCONT pin 48)
- Check the amplitude of the 13MHz clock frequency pin 93 (from G600)
- Check VBB 2,8V DC
- Resolder MAD
- Internal error of MAD

Not charging




Not charging (2)
error message ("not charging") / beep is coming from phone, if charger is pluged in
Do the battery management calibration
failed
Ok
check DC voltage on pin 9 of N101, CHAPS if charger is pluged in (2,8V)
Ok
Try charging, if no A/D valiue was wrong
No
resolder or change D200 if necessary
Charger voltage failed
Yes
check DC voltage on pin 60 of N100/ CCONT if charger is pluged in nominal VCH 1:10 (0,8V)
Ok
resolder or change N100 if necessary
No
check F101, L104, V100, C103 and voltage devider R103, R104
Ok
try the calibrating again
Battery size failed
Yes
check DC Voltage on pin 62 of N100, CCONT
Ok
resolder or change N100 if necessary
No
check battery, X101, voltage devider R120, R122
Ok
try the calibrating again
Battery temperature failed
Yes
check DC voltage on pin 63 of N100, CCONT
Ok
resolder or change N100 if necessary
No
check battery, X102, voltage devider R120, R122
Ok
try the calibrating again
Charge current failed
Yes
check DC voltage on pin 2 of N100, CCONT
Ok
resolder or change N100 if necessary
No
check N101, R131
Ok
try the calibrating again

F101 faulty

- Check resistance of F101 (0Ω)

V100 faulty

- Check resistance of V100 (50KΩ in circuit)

L104 faulty Vcharge

- Check resistance of L104 (0Ω)

L105 faulty Charge ground

- Check resistance of L105 (0Ω)

C103 faulty short circuit on Vcharge

- Check resistance of C103 (50KΩ in circuit)

N101 faulty/ poor soldering

- Check PWMOUT on Pin 7 (1 Hz standard / 32Hz fast)
- Check if CHARLIM on Pin 9 is 2.8V DC

N100 faulty/ poor soldering

- Change if any A/D value is out of limit but the DC voltages are ok.
- If DC voltages are wrong, check corresponding voltage dividers
- Check PWMOUT on Pin 56 (1 Hz standard / 32 Hz fast)

X100 faulty/ poor soldering

- Check connection of Vcharge; charge ground; charge control

X101 BSI; X102 BTEMP

- Check connection if battery size or battery temp A/D are out of limit

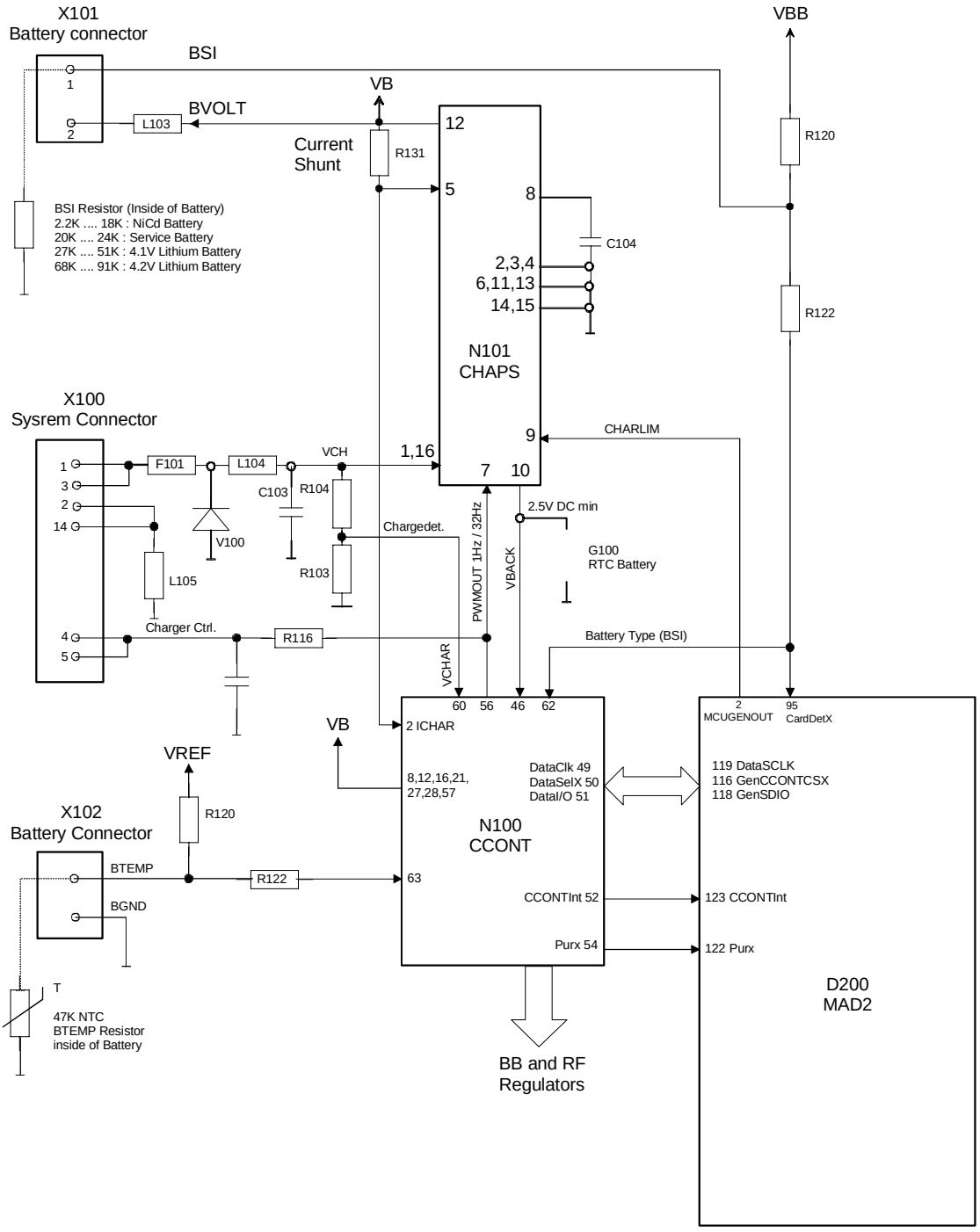
V102 faulty

- Check if there is a short circuit in charge control line

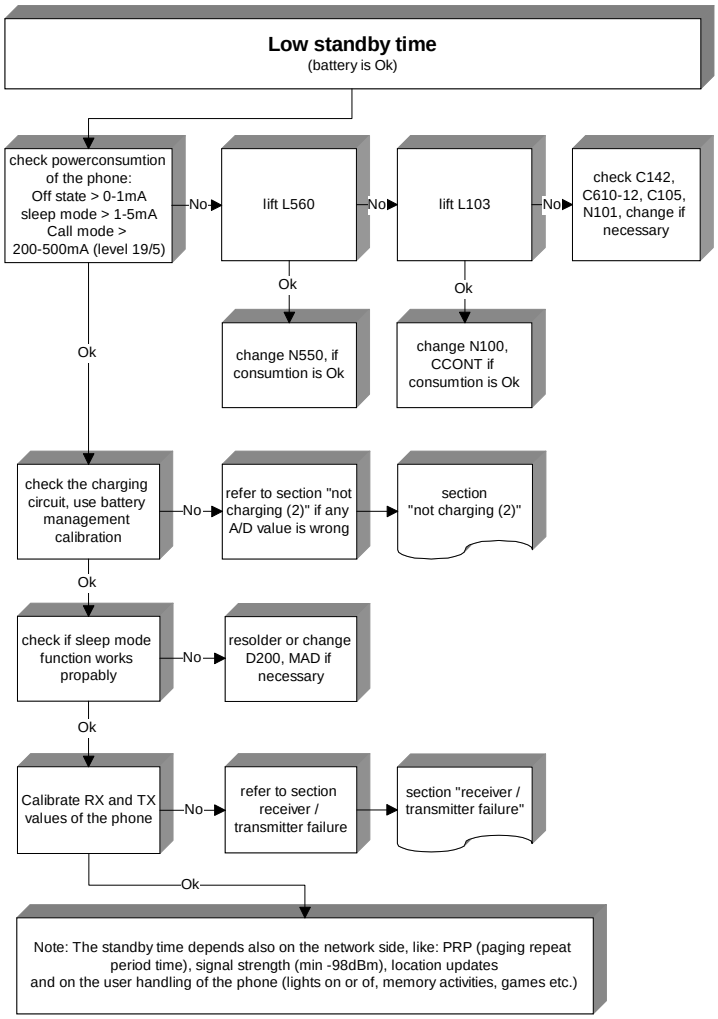
Energy management Calibration

- If charging stops to early
- If message "not charging appears on LCD"
- If any part in charging circuit has changed
- If any A/D value is out of limit, check the corresponding DC Voltages on CCONT

Figure 5: Block diagram of charging concept



Low Stand by time



N550 / N100 / N101 / D200 / Battery calibration - faulty

- Check the current consumption in different operation modes

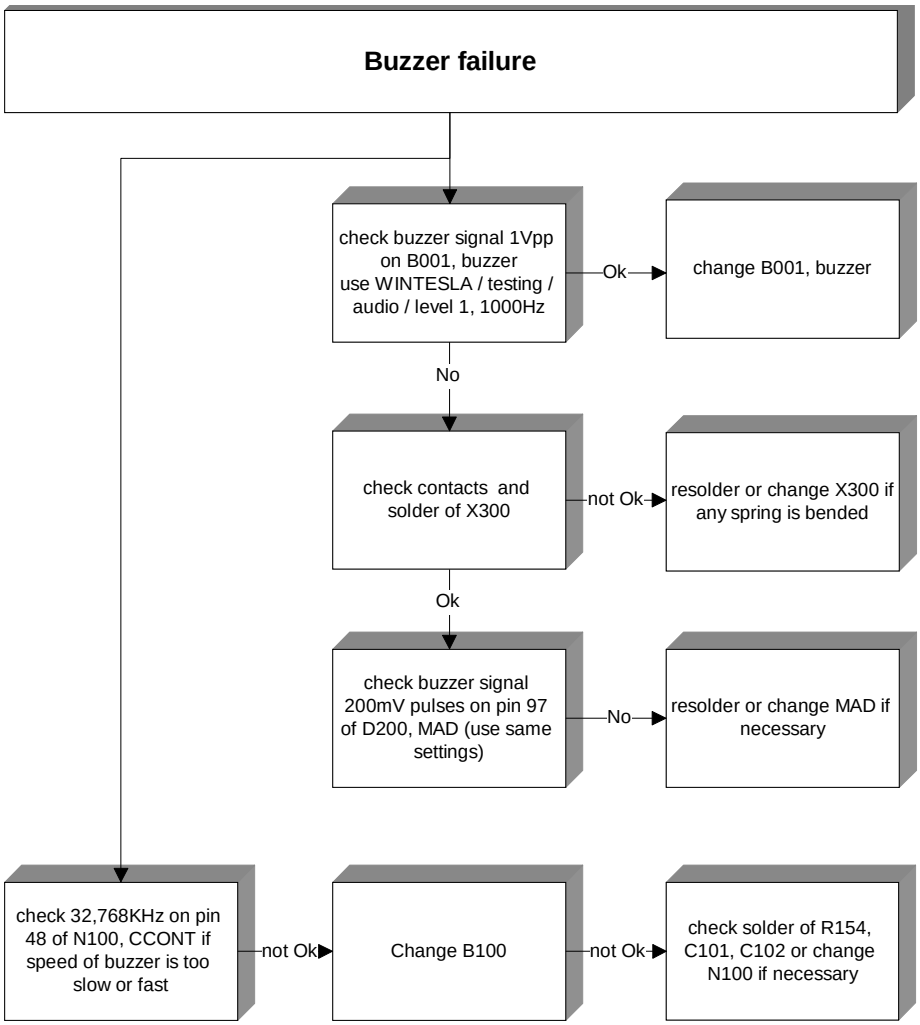
Figure 6: current consumption values

Function mode	Minimum current in mA	Maximum current in mA
Off state	0	1
Sleep mode	1	5
Call mode, Pover level 5	200	550

- Disconnect the PA N550, lift L560 and check the current again
- Check, if the current consumption comes from the first or second side of CCONT, lift L103
- Check C105, C142 or N101
- Check soldering of the MAD
- Change MAD
- calibrate Battery and charging values, if charging stops to early or battery get hot during charging (see also chapter "Not charging)

Note! The Stand by time depends very much on the network side and handling of the phone

Buzzer failures



B001 / UI-module

- Check buzzer signal about 1Vpp pulses (use WINTESLA / testing / audio Level 1, 1000Hz)
- Change component if signal is ok

X300, board to board connector

- Check soldering
- Check contact springs, change component if bent

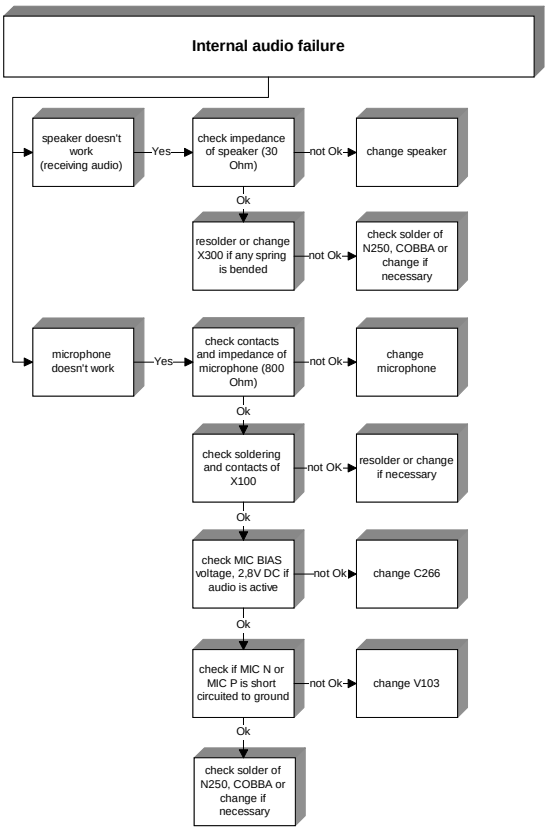
D200, MAD

- Check buzzer signal on Pin 97 (200mV pulses) use WINTESLA / testing / audio Level 1, 1000Hz

B100, 32.768KHz crystal

- Change component if ringing tone speed is to low or high if a call comes in. If you pick a ringing tone from the menu, the speed is normal.
- In this case, also the clock is running wrong if the phone is switched off.

Internal Audio Failures



Speaker

- No / quiet / distorted receiving audio signal
- Check the mechanic of speaker, contacts, membrane, soiling
- Check resistance of speaker (about 30Ω)

Microphone

- No / quiet / distorted transmitting audio signal
- Check contacts of microphone
- Check resistance of microphone (about 800Ω)

X300

- Check soldering
- Check contacts (change connector if bent)

X100

- Check microphone spring contacts
- Check soldering

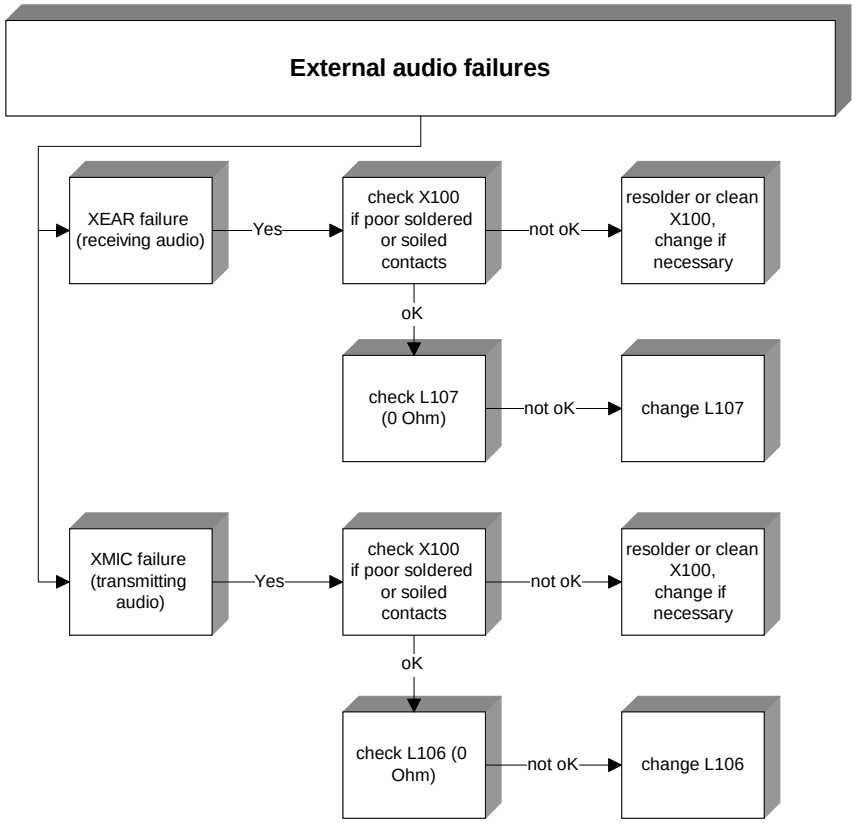
V103

- Check resistance from MIC N or MIC P to ground (about 1KΩ and 2KΩ)
  change component if resistance is 0Ω

C266

- Check MIC BIAS voltage 2.8V DC if audio is active (use WINTESLA / testing / audio)

External Audio Failures



L106

- Check resistance of coil (0Ω), if there is no XMIC

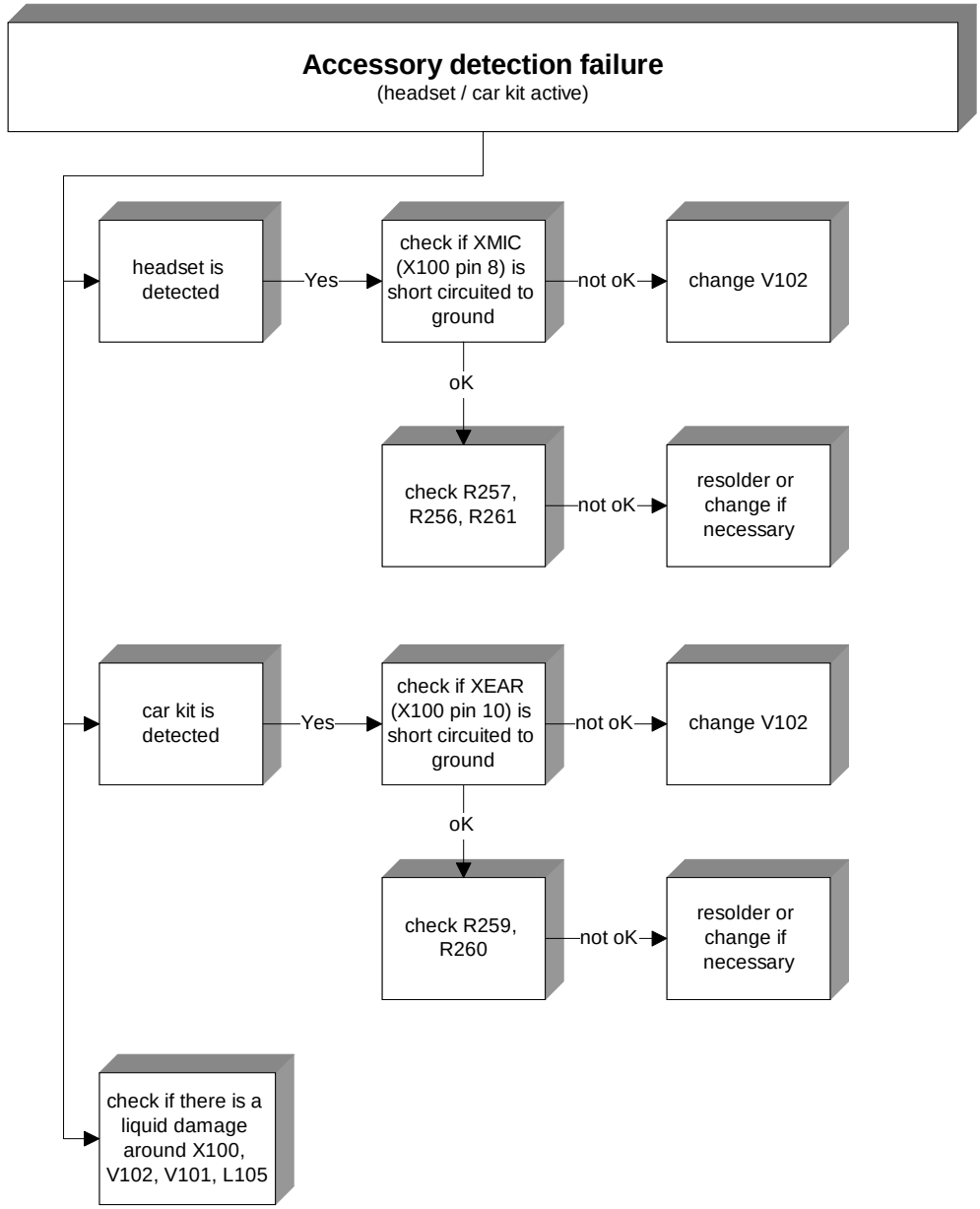
L107

- Check resistance of coil (0Ω), if there is no XEAR

X100

- Check soldering
- Check contacts (soiling)

Accessory detection failure (headset / car kit active)



V102

- Check resistance of XMIC to ground if headset is detected
- Check resistance of XEAR to ground if car kit is detected
- Change component if resistance is low

R259 / R260

- Check soldering and resistance of components if car kit is detected (45KΩ / 22KΩ inside PCB)

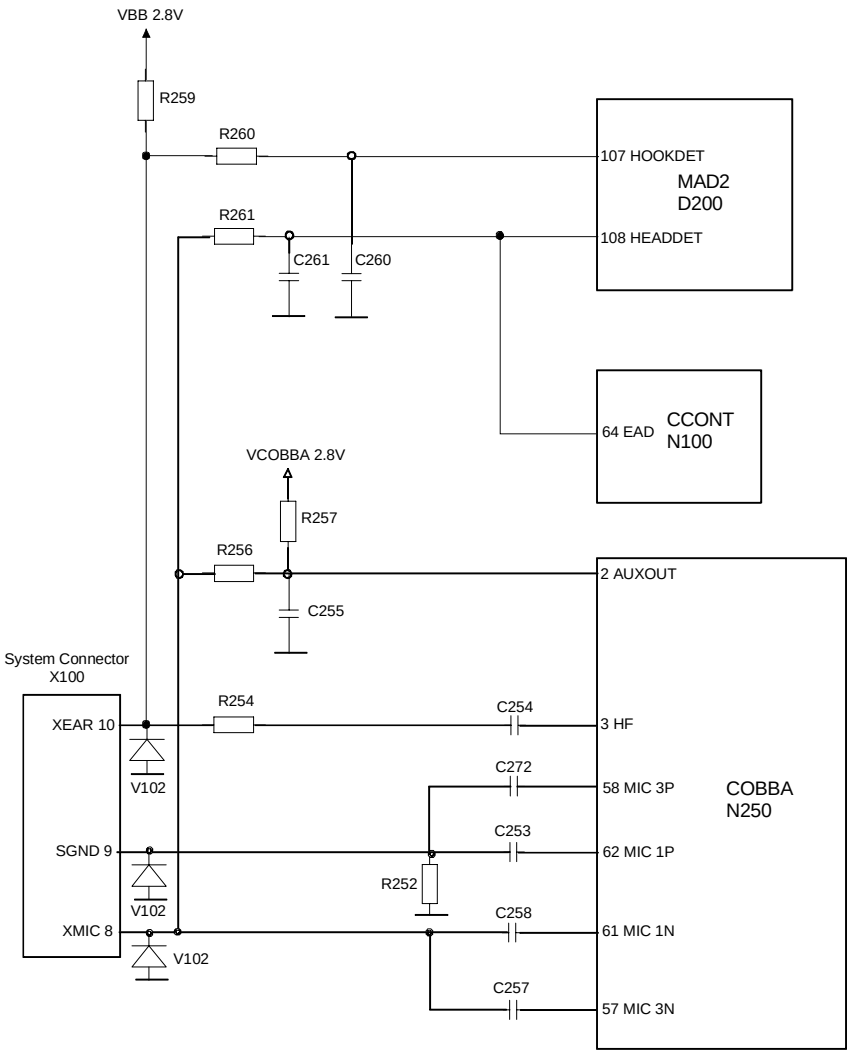
R256 / R257 / R261

- Check soldering and resistance of components if headset is detected (2,2KΩ, 45KΩ, 22KΩ inside PCB)

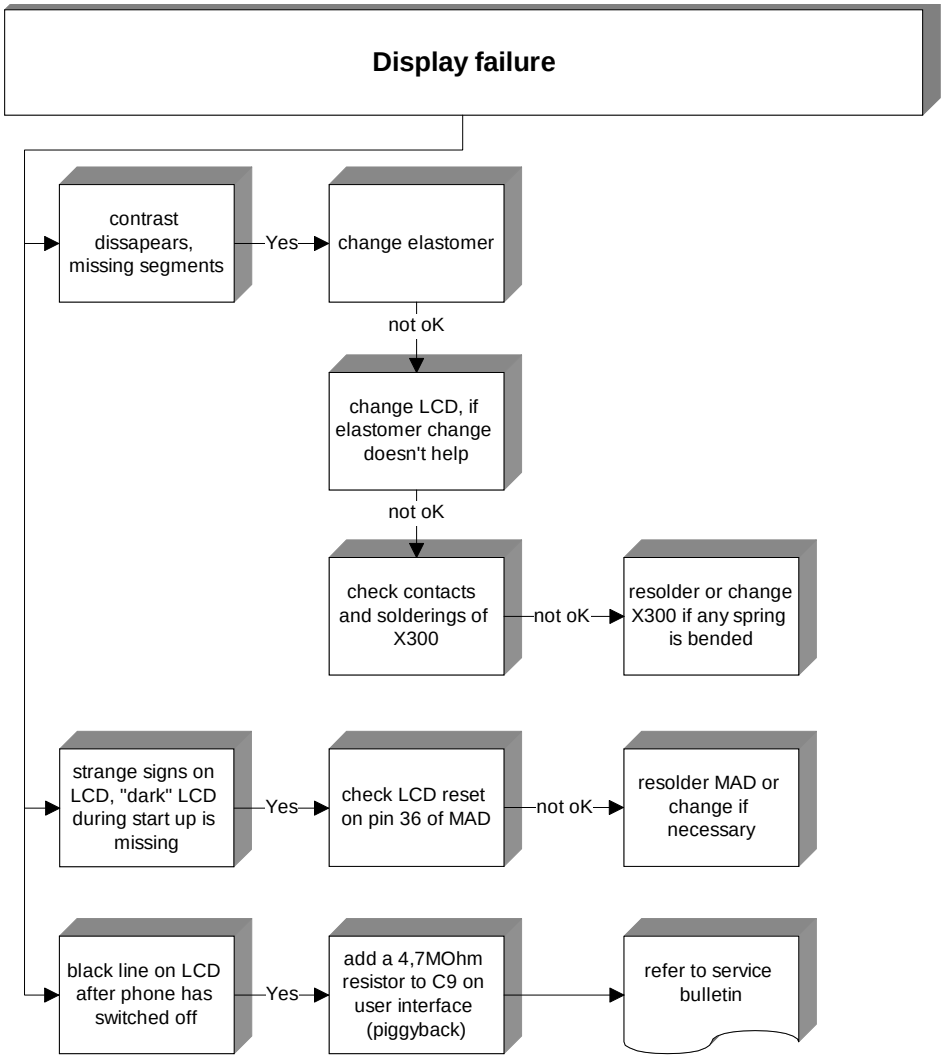
Liquid damage

- Check if there is a liquid damage around X100, V101, V102 and L105)

Figure 7: Block diagram of audio switching concept



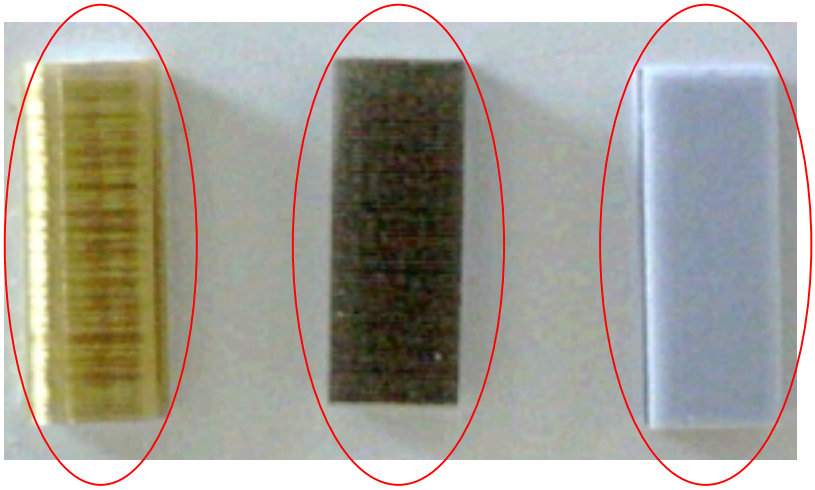
Display Failure



Elastomer

- Change Elastomer if contrast disappears, missing segments

Figure 8: different types of elastomer



LCD

- Change LCD if elastomer change doesn't help

Figure 9: different types of LCD's

Philips LCD

NO capacitors inside

Seiko LCD

capacitors inside

X300

- Check soldering
- Check contacts (change connector if bent)

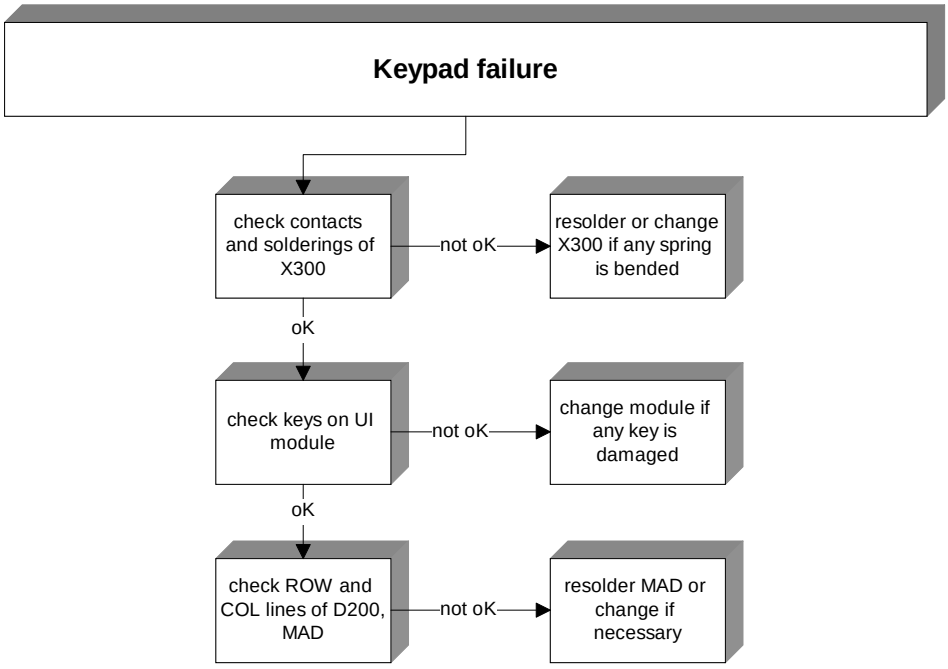
D200

- If there are wrong signs on LCD and the filled LCD during start up is missing, check LCD reset on JBS-19 Test Pin 25 or D200/ 36 during start up

UI-module

- Check LCD contact Pads, clean if soiled
- Change if elastomer and LCD change doesn't help
- UE4S_05 (NSE-1), UE4_13 (NSE-3) makes a better contact between elastomer and PCB

Keypad failure



X300

- Check soldering
- Check contacts (change connector if bent)

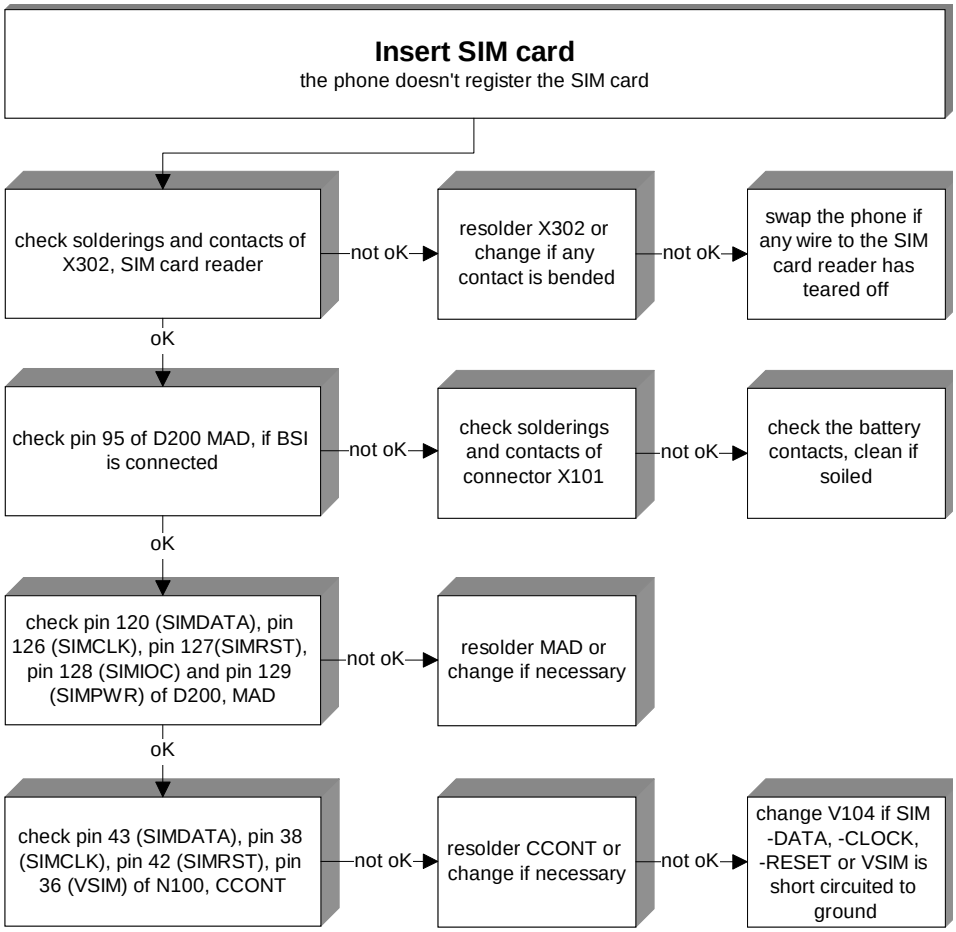
D200

- Check ROW and COL lines

UI-module

- Check keys on UI, change UI-module if any keydome is damaged

Insert SIM card



X302, SIM card reader

- Check soldering
- Check contacts (change connector if bent)

X101, battery connector

- Check BSI connection to D200 / 95 CardDetX

D200, MAD

- Check SIM card -DATA (Pin120), -Clock 3,25MHz (Pin 126), -Reset (Pin 127), -IOC (Pin 128) and -Power (Pin 129)

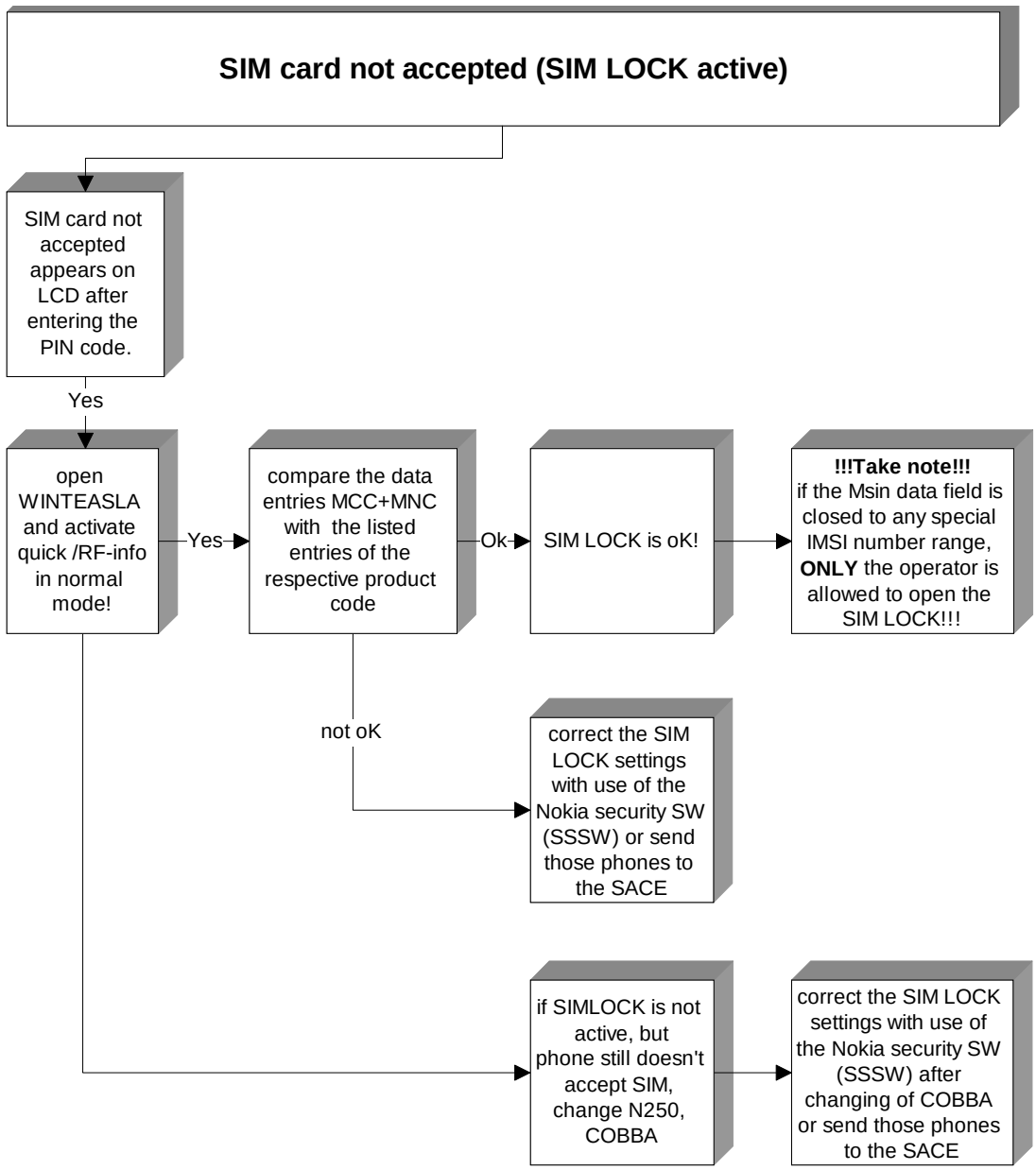
N100, CCONT

- SIM card -DATA (Pin 43), -Clock 3,25MHz (Pin 38), -Reset (Pin 42) and VSIM 3V/5V DC (Pin 36) depends on SIM card

V104

- Change component if SIM -DATA, -Clock, -Reset or VSIM is short circuited to ground

SIM card not accepted, SIM LOCK failure



- If message "SIM Card not accepted" appears on LCD after entering PIN code, a SIM LOCK is activated in this phone.
- Initialize phone into normal mode and activate Quick/ RF-info (WINTESLA) compare the SIM LOCK entries with the below listed references
- If MCC+MNC or status doesn't match to the listed entries, correct the SIMLOCK entries with use of the Nokia security SW (SSSW) or send this phones to the SACE if it is not permitted to you

N100, CCONT

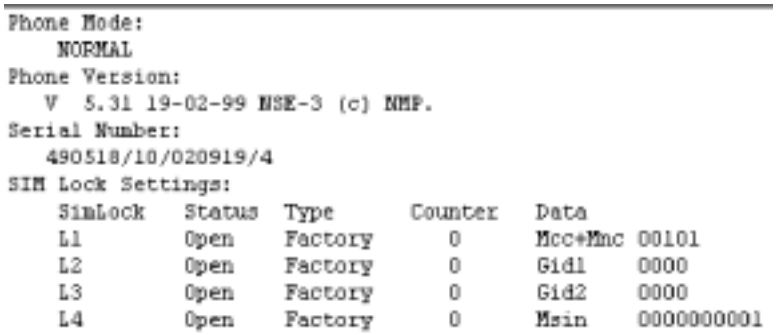
- Refer to insert SIM Card procedure

N250, COBBA

- Change COBBA if all SIM LOCK entries and SIM card signals from CCONT are ok

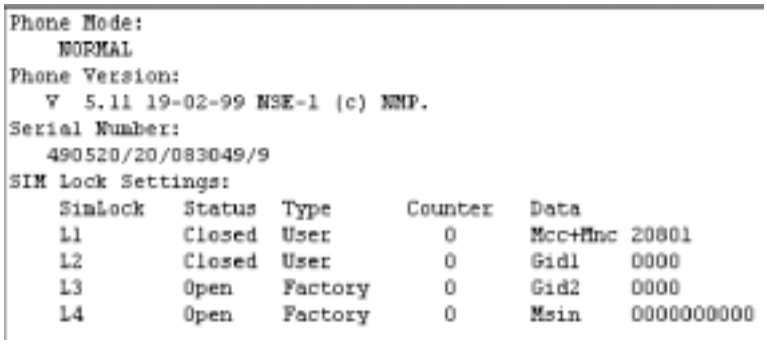
Note! Rewrite SIMLOCK and IMEI entries with use of the Nokia security SW (SSSW) and make a SW-update or send this phones to the SACE, if this procedure is not permitted to you

Figure 10: No SIMLOCK set to the phone



```
Phone Mode:
    NORMAL
Phone Version:
   V  5.31 19-02-99 NSE-3 (c) NMP.
Serial Number:
   490518/10/020919/4
SIM Lock Settings:
    SimLock   Status  Type      Counter   Data
    L1        Open    Factory     0       Mcc+Mnc 00101
    L2        Open    Factory     0       Gid1    0000
    L3        Open    Factory     0       Gid2    0000
    L4        Open    Factory     0       Msin    0000000001
```

Figure 11: SIMLOCK is set to operator OLA France



```
Phone Mode:
    NORMAL
Phone Version:
   V  5.11 19-02-99 NSE-1 (c) NMP.
Serial Number:
   490520/20/083049/9
SIM Lock Settings:
    SimLock   Status  Type      Counter   Data
    L1        Closed  User        0       Mcc+Mnc 20801
    L2        Closed  User        0       Gid1    0000
    L3        Open    Factory     0       Gid2    0000
    L4        Open    Factory     0       Msin    0000000000
```

Table 1: List of current SIM LOCK phones NSE-1

Code NSE-1	Country	Operator	IMSI MCC+MNC
501639	Spain	Movistar	214070
501640	Spain	Airtel	214010
501641	Poland	Polkomtel	260010
501901	Austria	Max.Mobil	232030
502054	Hungary	Westel	216300
502055	Hungary	Pannon	216010
502056	Poland	Era	260020
502057	South Africa	Vodacom	655010
502058	Greece	TeleStet	2021099????????
502059	Greece	Panafon	2020590???????0
502060	Spain	Airtel	214018:????????
502061	Spain	Movistar (Activa)	214070?61???????
502063	France	OLA	208010
502092	Ireland	Eircell	272010
502094	Portugal	TMN	26803??????????
502299	France	OLA	208010
502394	South Africa	MTN	655100000000000
502413	Portugal	Optimus	26803??????????
502510	Romania	Dialog	22610??????????
502561	Portugal	Optimus	26803??????????
502562	Poland	Polkomtel	260010
502638	Turkey	Turkcell	28601??????????
502639	Turkey	Telsim	28602??????????
502834	Ireland	Digifone	27202??????????
502975	Spain	Movistar	2140;??????????
502976	Spain	Movistar	2140;??????????
502986	Sweden	Comviq	24007??????????
503020	Austria	Mobilkom	23201??????????
503021	Austria	Mobilkom	23201??????????
503137	Portugal	Telecel	26801??????????
503141	Portugal	TMN	26806??????????
503393	France	OLA	208010
503503	UK	Vodafone	26806??????????
503574	Rumania	Connex	22601??????????

Table 2: List of current SIM LOCK phones NSE-3

Code	Country	Operator	IMSI MCC+MNC
501561		Plus	
501562	Spain	Airtel	214010
501563	Spain	Movistar	214070
501791	Hungary	Westel blue	216300
501792	Hungary	Westel green	216300
501875	Poland	ERA green	260020
501876	Poland	ERA blue	260020
501878	Spain	Movistar Activa	21407?61???????
501880	Spain	Airtel blue	214010
502053	Austria	Max Mobil blue	232030
502113	Spain	Airtel Continua	214018:????????
502147	Hungary	Pannon blue	216010
502148	Hungary	Pannon green	216010
502149	France	SFR blue	20810????????
502162	Austria	Max Mobil blue WLL	232030
502163	Austria	Max Mobile Green WLL	232030
502164	Spain	Airtel blue WLL	214010
502165	Spain	Movistar blue WLL	214070
502166	Spain	Airtel green WLL	214010
502167	Spain	Movistar green WLL	214070
502430	France	SFR blue	20810????????
?	Poland	Polkomtel	2600100
502599	Dubai	(Dubai)	655100
502636	Turkey	Turkcell	28601??????????
502637	Turkey	Telsim	28602??????????
502972	Spain	Movistar	2140;??????????
502973	Spain	Movistar green WLL	2140;??????????
502974	Spain	Movistar blue WLL	2140;??????????
503143	Greece	Panafon	2020590

Low receiver signal strength indicator

Antenna faulty / wrong - Tuning

- Check the code of the antenna label (see below)
- Check the receiver signal indicator with a new antenna
- Retune the handset

NMP CODE	DESCRIPTION	TYPE CODE (Stamped in helix antenna)	NOTE
0660178	ANTENNA FXD 890-960/1710-1880 MHz	DGPxxxxx	NSM-1*
0660160	ANTENNA FIXED HELIX 890-960 MHz	SGSxxxxx	NSE-1/3*
0660145	HELIX 1710-1880 MHz PCN	SPNxxxxx	NSK-1/3*

No service

13MHz VCTCXO G600 out of range

- Check the 13MHz reference frequency pin 21 N620 (PLUSSA) or pin 2 from G600, set first the module in service mode, a frequency error of +-50Hz can create deviation of the IF frequencies

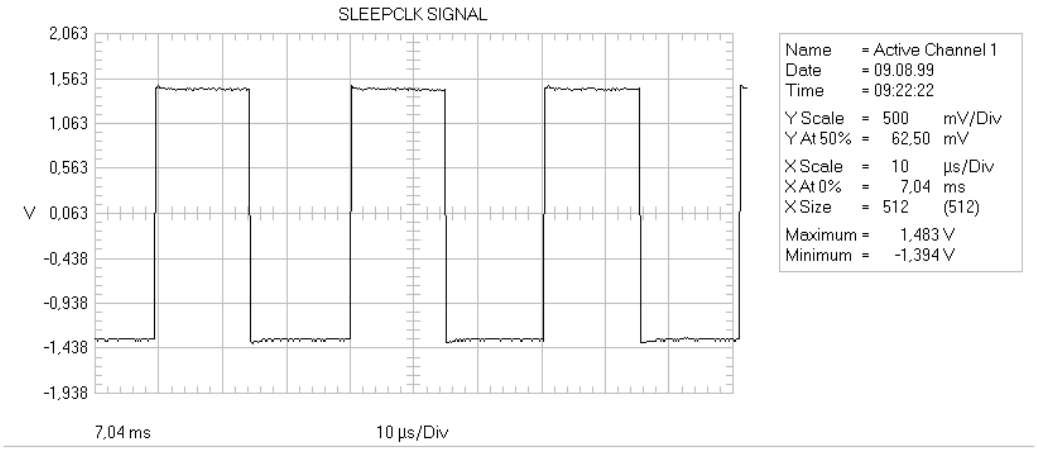
X560 Antenna connector / switch mechanical faulty

- Check the handset with the external antenna
- Check the resistance "0Ohm" from the internal antenna pad to the "in" pin of X560

B100 32,768KHz crystal

- Check the amplitude of the 32,768KHz square wave on pin 48 of CCONT

Figure 12: diagram of N100 pin 48 32,768KHz square wave



Sleepclk signal measurable on pin 48 from CCONT in Local mode

No RX (no Rx calibration...RSSI reading fixed value)

D200, MAD / N250, COBBA faulty

- Check if the 13MHz IF frequency on pin 22,23 COBBA change the amplitude, if the generator frequency level has changed
- Check if the RXC impulse on pin 53 N620 (PLUSSA) change the amplitude, if the generator frequency level has changed
- Change MAD
- Change COBBA

Note! Rewrite SIMLOCK and IMEI entries with use of the Nokia security SW (SSSW) and make a SW-update or send this phones to the SACE, if this procedure is not permitted to you

No RX (no Rx calibration...RSSI reading high difference)

Z550 Duplexer faulty / poor soldering

- Check the rx signal on the ANT pin and on the output
- Check that the attenuation between duplexer "in" and "out" is about 2dbm
- Resolder the duplexer or change it

No RX (no Rx calibration...RSSI reading highest value)

Z621 / Z620 faulty / poor soldering

- Check the 71MHz IF frequency on Z621
- Check the components C505, C507, L500, L503 if the signal amplitude is different between the two lines
- check the soldering of Z621 or change it
- check the 13MHz IF frequency on Z620, about 3dbm attenuation between signal-in and signal-out
- check the soldering of Z620 or change it

No RX (no Rx calibration...RSSI reading highest value)

N620 PLUSSA faulty / poor soldering

- check the UHF- and VHF oscillator frequency
- check the control-lines for the PLL, pin 54, 55, 56 of N620 (see the diagrams below)
- check the UHF-VC on pin 27 N620 1,9V-3.2V depending of the channel
- check the VHF-VC on pin 18 N620 2,6V
- check the 5V VCP supply voltage drop over R640 (normal 0,2V)
- change the N620 PLUSSA

Figure 13: diagram of SCLK

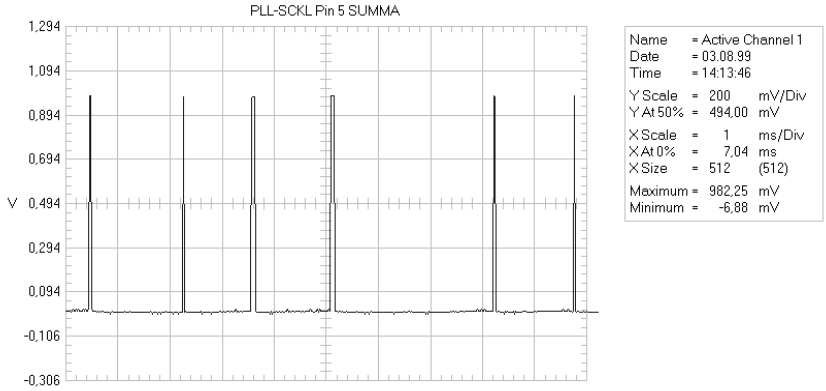


Figure 14: diagram of SDATA

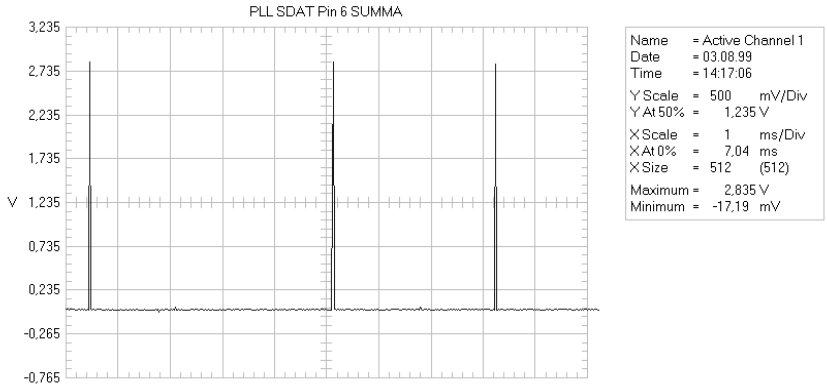
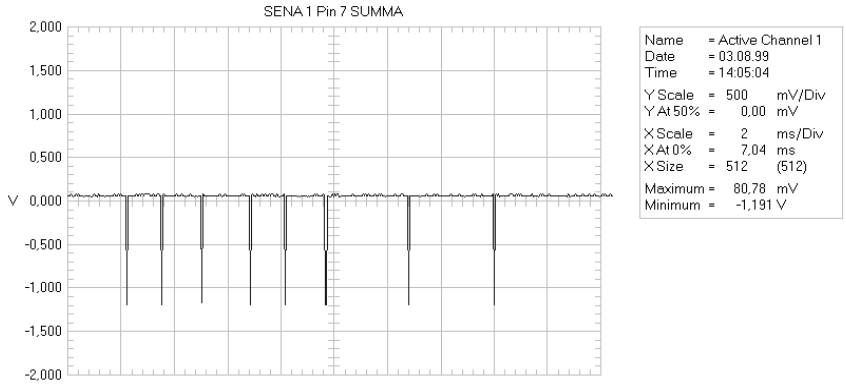


Figure 15: diagram of SENA1



Call breaks / No service

G550 UHF Oscillator out of range or high spurious emission

- check the UHF frequency on G530 for high spurious or deviation
- check the UHF-VC on pin 27 N620 1,9V-3.2V depending on the channel
- check the 5V VCP supply voltage on pin 17, 28 of N620 PLUSSA or pin 32 of CCONT
- check R533 47Kohm, C535 1,5nF

No Call / service O.K.

N100 CCONT faulty

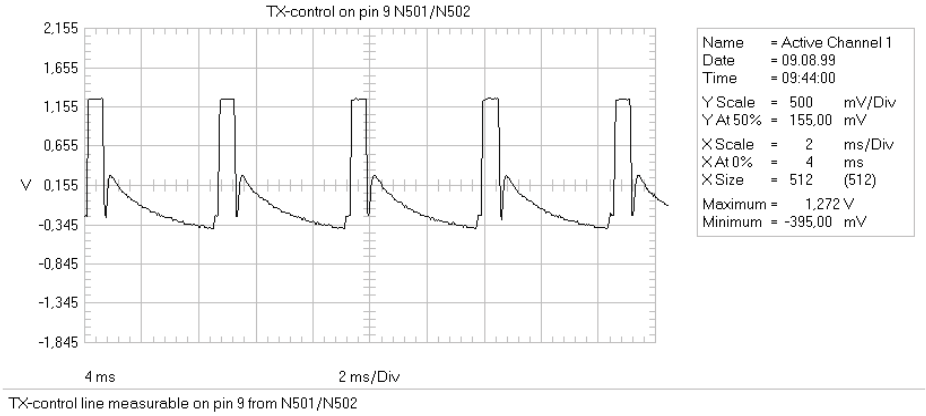
- check if the "Insert SIM-card" message appear sometime on the display
- check if it's possible to read the saved phone numbers of the SIM-card
- Resolder CCONT
- Change CCONT

No or to low TX – Power

N550 / X 560 faulty

- Check the power supply Vbat N550 pin 2, 4, 6, 12, 13, 14
- Check the input power on pin 8 N550 (nominal 0dbm)
- Check the output power on pin 12, 13, 14 of N550
- Check the TX-Power control on pin 9 of N550 (1Vpp-1, 5Vpp / 0,4..V - 0,9..V DC depend of the power-level) (see the diagram below)
- Change the PA if no or to low gain comes out
- Check the TX-Power on the antenna IN/OUT pads from X 560
- Check the attenuation of the connector

Figure 16: Diagram of TX-control



TX-control line measurable on pin 9 from N501/N502