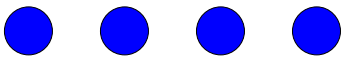
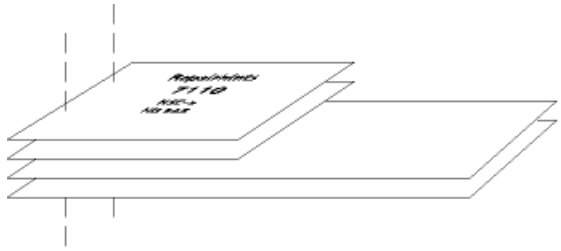
# Repairhints

# 3310/3330

# NHM-5/6



# GENERAL



### - How to use this document

Put the QUICK REPAIR layouts behind this manual.
Now you are able to follow these specifications with graphical layouts and it is easier for you to find the components and measuring points.

### - Component characteristics:

Some components contain important data.
Several described steps are only practicable if you are able to reflash/ realign the phone and/or rewrite IMEI/SIMlock in certain cases. Please pay attention to separate notes.

### - Underfills, broken balls, µBGA

It is not possible to change underfilled components. The trial will damage PCB surely.
All replaceable µBGA-components must be renewed after removing.
Check soldering points, remove oxidated solderings (broken balls) carefully by enclosing few new solder before placing new components.
µBGA **must** be soldered only with NMP approved µBGA-rework machines (e.g. Zevac/OK International).
**Soldering/Resoldering CSP´s with Hot Fan is strictly forbidden**
Use only recommended Fluxtype and an appropriate amount of it.

### - PCB handling & cleaning

Only use appropriate cleaning materials, do not use scratching or rubbing tools. Clean PCB carefully after every rework and take great pains over the keyboard area. Do not make any loose wiring connections anywhere.
If it is necessary to clean the PCB, please pay attention to the following: Due to of organic surface protection (OSP), cleaning must only be done with a lint-free cloth which may be moisten with DI-water. IPA or other solvent like ethanol should only be used to clean gold pads for spring contacts without affecting the surrounding copper layers.
If it is necessary to change any item located under the metal shields, remove the shield first, don not cut partially or bend it.

### - Realign after repair

Characteristics of replacement parts are different.
To prevent additional faults after repair (eg. low standby time, loosing network etc.) it is necessary to retune phone values after repair.

# 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 3310 / 3330 phones.
It contains a lot of collected tips and hints to find failures and repair solutions easily.
It also will give support to the inexperienced technicians.
Saving process time and improving the repair quality is the aim of using this document.
We have built 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 does not contain any circuit descriptions or schematics.

**All measurements are made using following equipment:**

| | |
|---|---|
| Nokia repair SW | : WinTesla Version 6.43 |
| DLL version | : 311.11.00 / 04.12.2001 |
| Digital multimeter | : Fluke 73 |
| Oscilloscope | : Hitachi V-1565; Fluke PM 3380A/B |
| Spectrum Analyzer | : Advantest R3161 with an analogue probe |
| RF-Generator / | : Rohde & Schwarz CMU 200 |
| GSM Tester | |

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.
Page(s) and/or Figure(s) in error.

**Please send to:**

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# Contents

## List of flowcharts



## List of figures

## IMPORTANT INFORMATION

**Changing of EEPROM D301**
If it is necessary to change D301, take a look at chapter 2 on page 9 "Changing of D301" how you to proceed.
Furthermore never change D301 if you have no permission to rewrite IMEI – otherwise all phone data will be lost!
To avoid further problems send the phone to a higher-level NOKIA Service Center.

**Changing of COBBA N800**
If it is necessary to change COBBA, you have to rewrite IMEI & SIMlock data and flash the phone!
Also RX/TX-values must be realigned.

**Changing of CCONT N700**
If it is necessary to change CCONT, you have to realign A/D values.

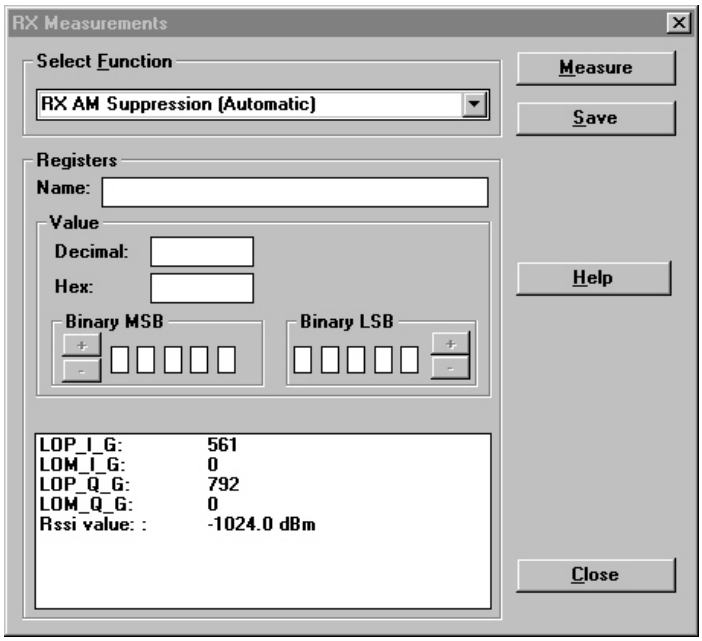
**Changing components in RF-part**
If it is necessary to change any main component in RF-part (IC´s, oscillators, filters...) you have to realign all RX/TX values.

In case of problems to tune RF-values of GSM1800 band, check in WinTesla *Configure/Options* if automatic rescan function for the phone is activated. The band will change to GSM1800 when chosen but the rescan causes that the phone change back to GSM900. If necessary deactivate the automatic rescan function to solve the problem.

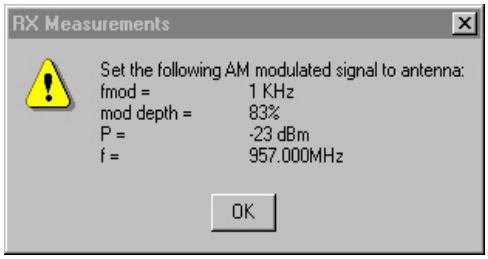
## AM-suppression tuning in NHM-5/6

Because of a software failure in the latest NHM-5/6 DLL 311.11.00 it is necessary to run AM-suppression tuning in a special way which is described on the following pages. In case you do not use this procedure the AM-suppression tuning values will not be saved and WinTesla will not recognize this so that no warning message is performed.

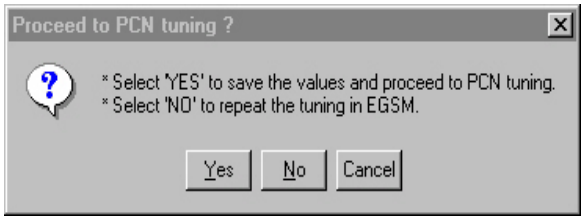
In the first step you have to activate AM-suppression tuning as usual (Tuning/AM Suppression...):



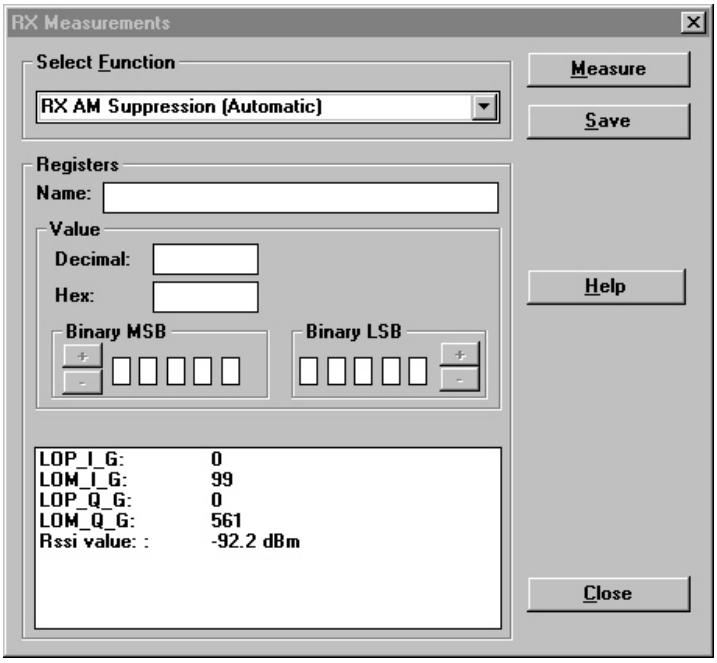

Click on the "Measure" button to get the next window, which shows the signal values you have to adjust, then click "OK".



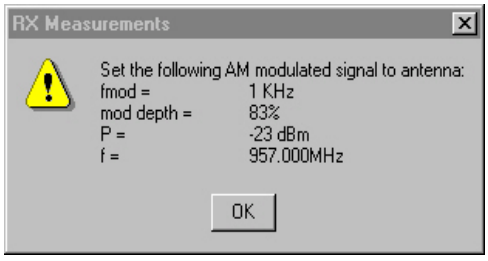

After correct AM-suppression tuning in EGSM900 (RSSI-level shown in the measurement window is < -86dBm) you get the message to proceed the tuning in PCN. At this point do **not** press "YES", because differently from the message box the tuning values will not be saved by choosing this button. Click on the "Cancel" button so that only the window shown on next page stays on the screen.



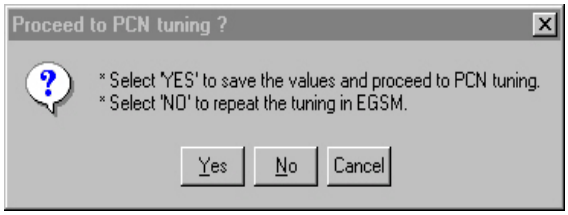
To save the tuning values you have to click the "Save" button in this window. After this start the tuning procedure again by pressing the "Measure" button, because tuning in PCN still must be done.



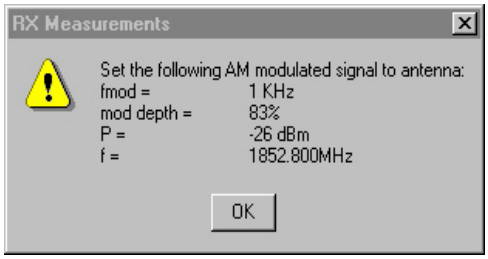

Next window you will get is shown below. Press "OK" (it is not necessary to choose correct signal values).



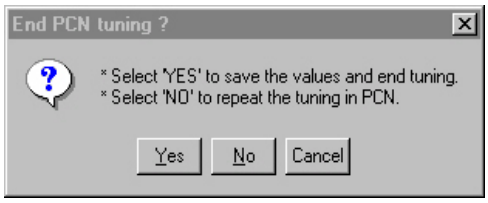

After that AM-suppression tuning in EGSM900 has been done a second time, press now the "Yes" button. The effect is that the tuning values of EGSM900 will not be stored (but these tuning values have been stored before) and you will get the message box shown on next page so that you can continue tuning in PCN band.



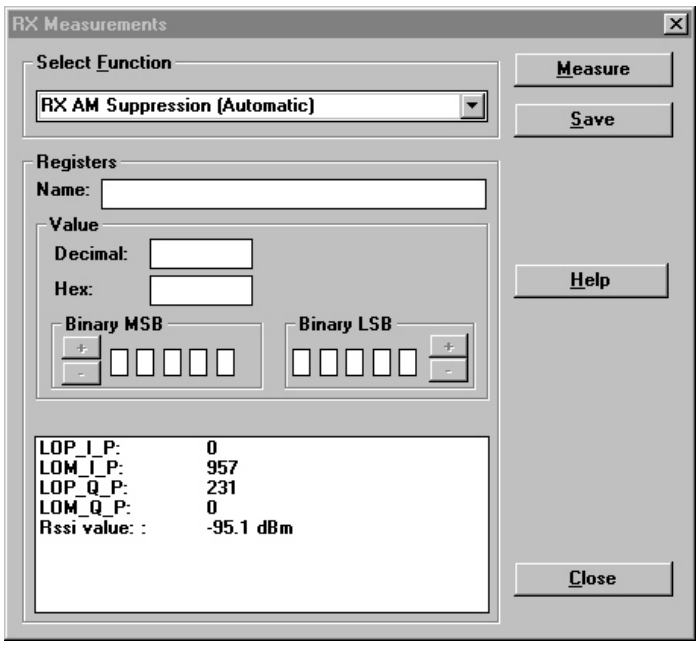
Set generator to the signal values mentioned in the control box, then press the "OK" button.




To save the tuning values of AM-suppression in PCN band, do not use the "Yes" button. As in case of EGSM900 choose the "Cancel" button and click the "Save" button in the remaining window. RSSI-level in PCN tuning must be < -90dBm!




Now AM-suppression has been performed in both EGSM and PCN and you can leave the tuning by choosing "Close".

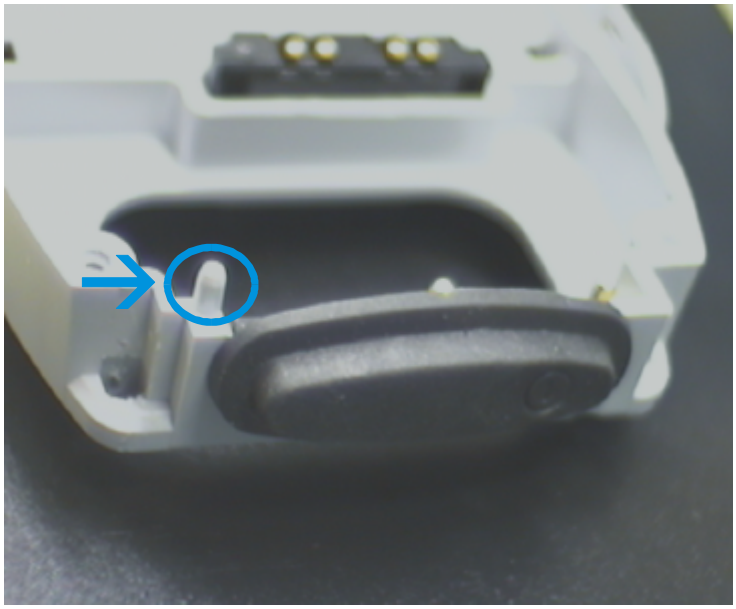


# CHAPTER 1: HW-CHANGES

## Difficulties when removing B-Cover (SB13 / NHM-5)

If customer critisizes bad removal of B-Cover cut away the guiding pin of the D-Cover (*see Figure 1-1*).
After this procedure it is necessary to assemble the phone with a torque screwdriver prepared for **30Ncm**!

*Figure 1-1*



## Intermittent switches off problem (SB 28 / NHM-5, SB 7 / NHM-6)

To solve the problem that phone intermittent switches off even if battery is fully charged the value of R301 has to be changed from 2x 2.2 kΩ to 2x100 Ω.
Since HW 0813 on UP4IV, 0814 on UD4, 0815 on UG4 (NHM-5), HW 0817 on UW4, 0818 on UW4II and 0819 on UX4 (NHM-6) this change is already done.

## Note that SB 12 replaces the SB 28. Do not use this procedure anymore !

## Different system modules with PCB-version UB4_10 in NHM-5 (SB 25)

Most conspicuous difference between the three versions is the used power amplifier. In UP4 Hitachi PA has been used while UD4 includes Philips PA and UG4 uses RFMD power amplifier. Last mentioned is meanwhile available as a spare part. Whether R311 and R312 are assembled (marked "X") depends on the used power amplifier as shown in the table below:

FOR PCB UP TO VERSION 09

| PA vendor detection | | | |
|---|---|---|---|
| PA vendor | Part. no. | R312 (PA_vendor2) | R311 (PA_vendor1) |
| RFMD | 435X231 | MOUNTED | |
| Philips | 435X194 | | MOUNTED |
| Hitachi | 4350259 | | |

PCB VERSION 10 AND LATER

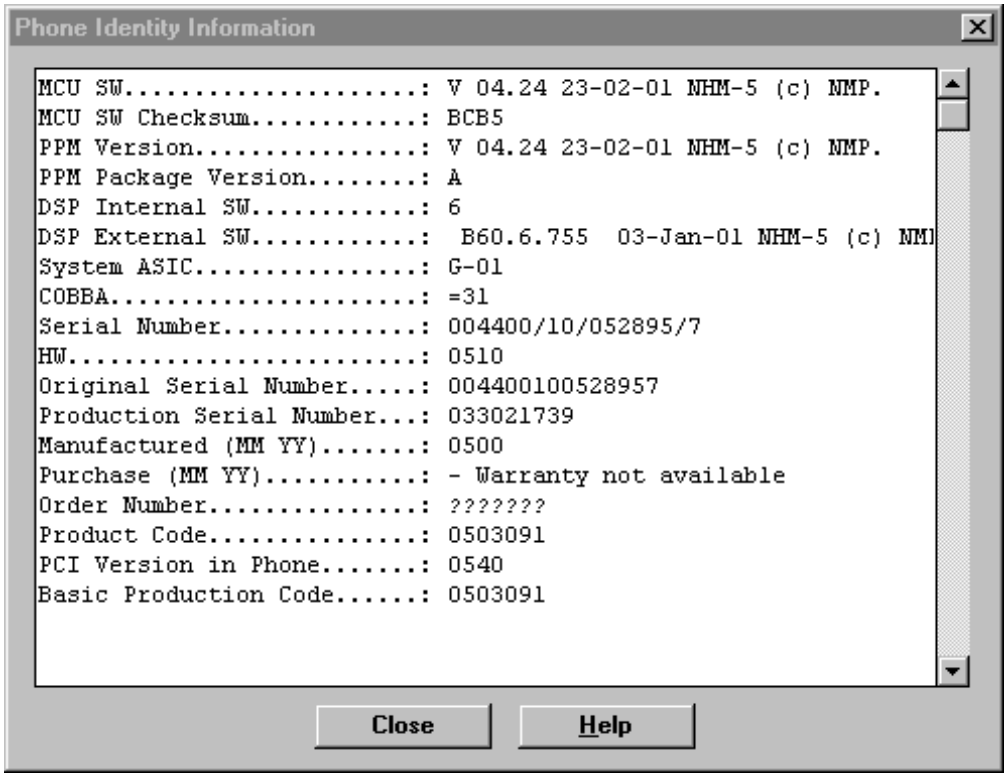
| PA vendor detection | | | |
|---|---|---|---|
| PA vendor | Part. no. | R312 (PA_vendor2) | R311 (PA_vendor1) |
| RFMD | 435X231 | MOUNTED | MOUNTED |
| Philips | 435X194 | | MOUNTED |
| Hitachi | 4350259 | MOUNTED | |

## CHAPTER 2: CHANGING OF D301

**This chapter describes step by step how to change the FLASH/EEPROM-combination D301 in NHM-5/6 phones:**

First to do if you want to change D301 always is a backup of the phone identity information.
Therefore use WinTesla. Under "*View*" open the window "*Phone Information*":

*Figure 2-1*

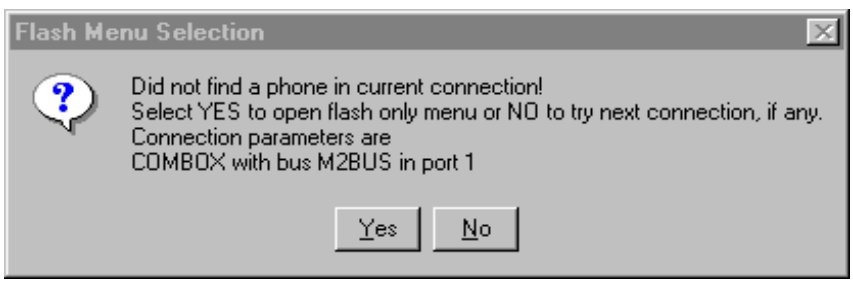



If you have no possibility to save this data (e.g. phone does not switch on because of defect D301), it is necessary to give the phone a new identity!

Having saved the phone identity information, you can now remove D301 and resolder the spare part – always use approved µBGA rework machine for changing any µBGA!

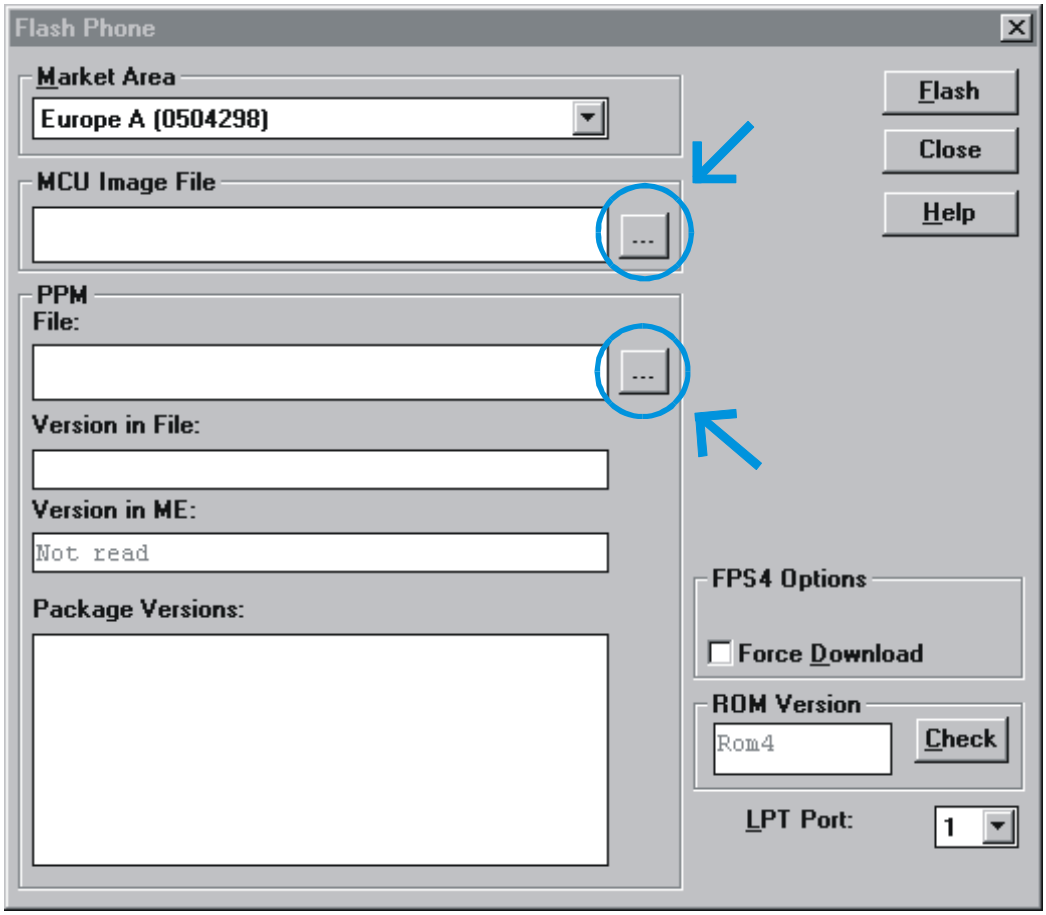
After changing D301, the phone will not switch on because of the empty Flash, so that next action is to make a SW-update.
Start WinTesla and choose *Product / Open / NHM-5* and press ok. Now you will receive the following message:

*Figure 2-2*



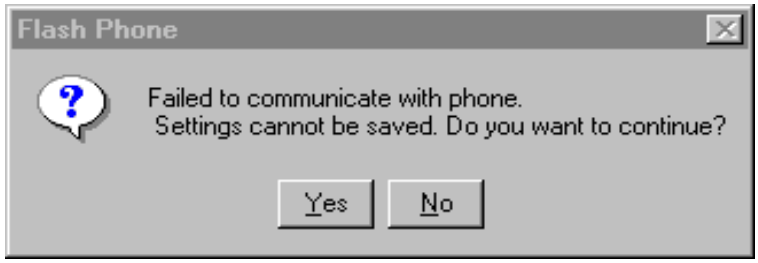

If you select *Yes*, WinTesla will start and you can choose *Dealer / Flash Phone*, so that you get the window shown on the next page:

*Figure 2-3*




Now you have to choose a MCU Image file and PPM file for your phone by pressing on the squares with the three dots.
At this point it is not necessary to choose the right PPM file, because this SW-update is used only to make it possible to power the phone on.
After selecting the two files, you have to press the *Flash*-button to start the SW-update. Next message will be the following:

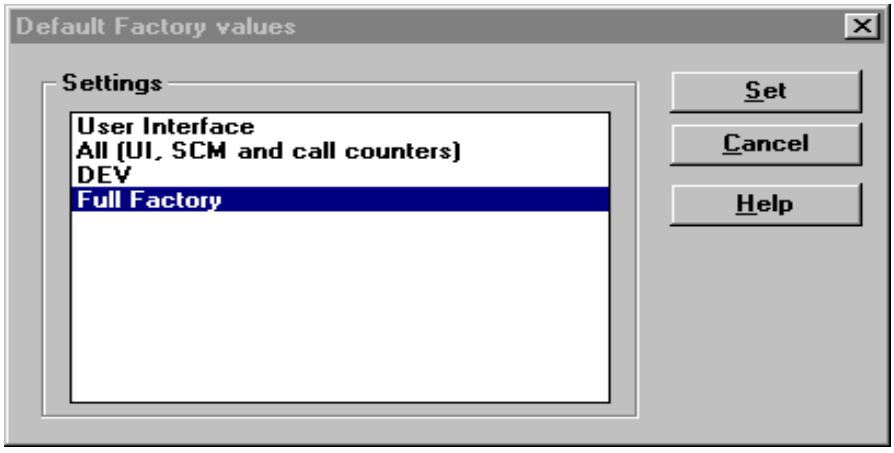
*Figure 2-4*




Select *Yes* and the SW-update will start. If your phone has no fault and the new FLASH/EEPROM was well soldered, you will get order to *Restore Default User Settings* – press ok. After that you will get message, that *flashing completed:* press ok.
Now close the *Flash Phone* window by pushing the *Close* button.

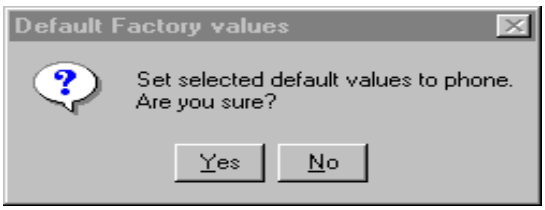
As the next step open *Software / Set Factory Values*, choose *Full factory* and press *Set*:

*Figure 2-5*




The message you will get is :

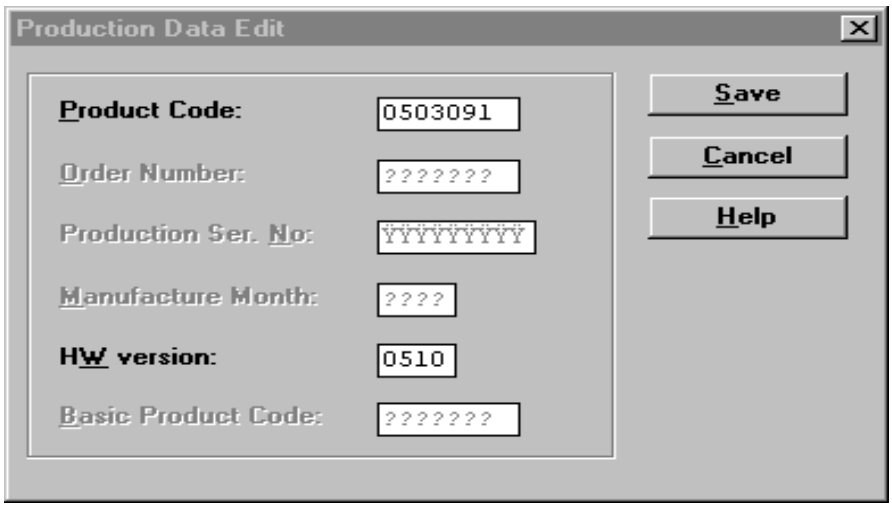
*Figure 2-6*




After pressing *Yes* you will get order to *Restore Default User Settings* – press ok. Now you can close the window shown on the top of this page by pressing *Cancel.*

In the next step you have to open *Software / Production Data Edit*:

*Figure 2-7*



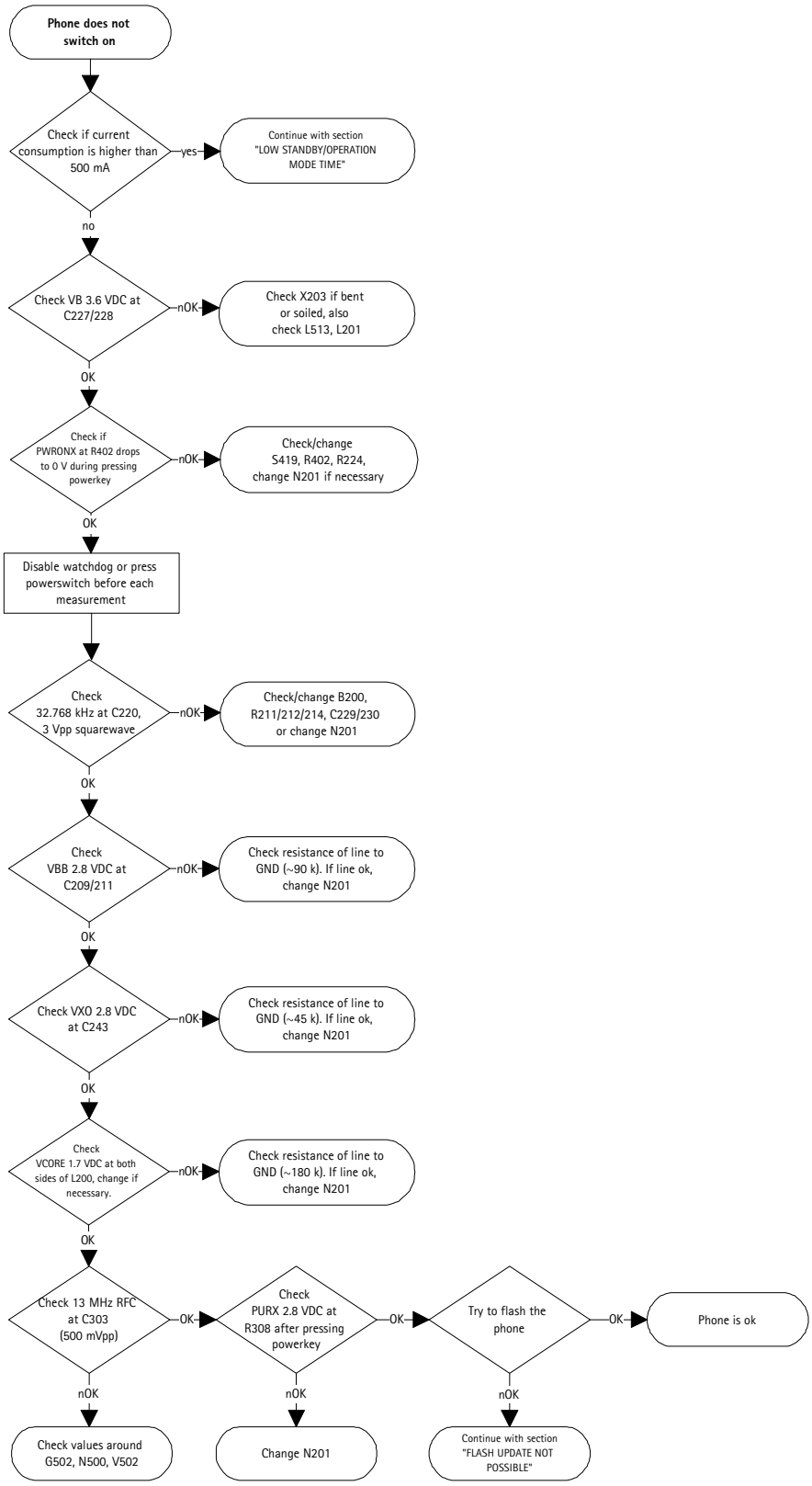

Rewrite product code and HW version out of your saved phone data into this window and press *Save.*

After this procedure you have to write back IMEI / SIMlock data and run SW-update once more. This time you have to choose the correct flash file matching to your product code! Close the window which asks you to save user data to file by pressing *No* and *Restore Default User Settings* by pressing ok after flashing.

Remember to retune RX/TX values and run energy management calibration, because all tuning data is lost after changing D301!

## CHAPTER 3: PHONE DOES NOT SWITCH ON

*Flowchart 3-1*



## Phone does not switch on

The first thing you should do in case of this fault is to check the current consumption of the phone:
Off-state current normally varies between 0.1 mA and 0.6 mA, sleep mode current varies between 0.6 mA and 4 mA while call mode current varies between 100 mA (lowest TX-power level, lights off) and 550 mA (highest TX-power level, lights on).
In case that current consumption increases to more than 0.5 A directly after connecting the phone to the service-battery or directly after pressing the power button continue with chapter "Low standby/operation mode time".

If current consumption is lower than 0.5 A, check VB 3.6 VDC at C227/228.

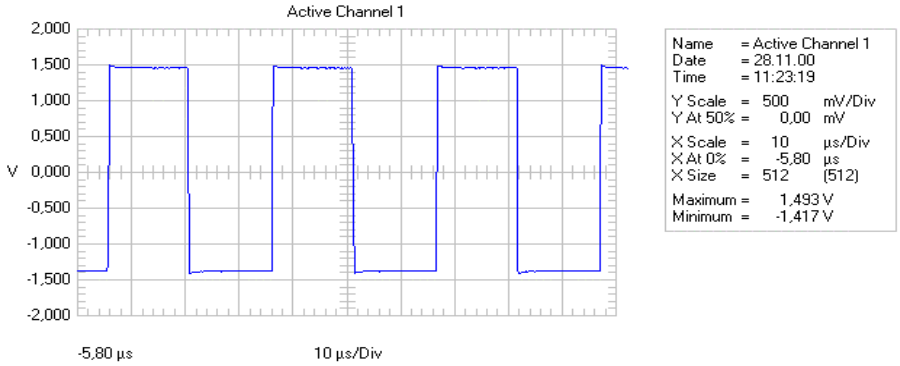
If voltage is not ok, check if contact pads for battery connector on PCB are clean. Also check solderings and resistance of L513 and L201.

If VB 3.6 VDC at C227/228 is ok, check that voltage at R402 drops from 4 VDC to 0 V while pressing the power switch.

If voltage at R402 is 4 VDC but does not lower to 0 V when power switch is pressed, usually the switch S419 itself is defect.
In case that no or too low voltage is measurable at R402, check POWERONX-line for interruption.
Therefore check solderings and resistance of R402 and R224. It also can be necessary to change CCONT N201

Check at C220 whether 32.768 kHz oscillator is working:

*Figure 3-1*



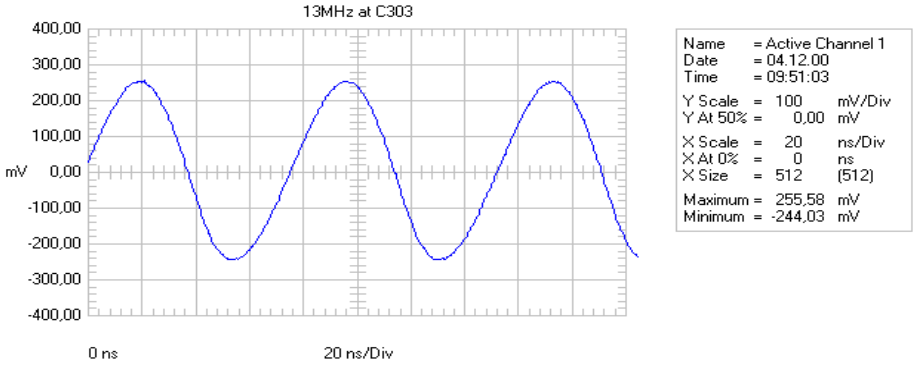

Amplitude of 32.768 kHz at C220 is 3 Vpp. If signal is not measurable check periphery of B200 like R211/212/214 and C229/230, change crystal B200 if necessary. If this does not solve the problem change CCONT N201. Remember to run energy management calibration after changing CCONT N201!

If all the above mentioned works the output voltage lines of CCONT must rise to their supposed values.
Check VBB 2.8 VDC at C209/211, VXO 2.8 VDC at C243 and VCORE 1.7 VDC at both sides of L200.

If only one of these voltages is not measurable, check lines for shorts to ground.
Resistance of VBB-line to GND normally is around 90 kΩ, resistance of VXO-line is ~45 kΩ while resistance of VCORE-line is ~180 kΩ, check parts in corresponding line if resistance is too low.
In case that one of the mentioned voltages is not measurable even if resistance of the line is ok it is necessary to change the CCONT. Remember to run energy management calibration after changing CCONT N201!

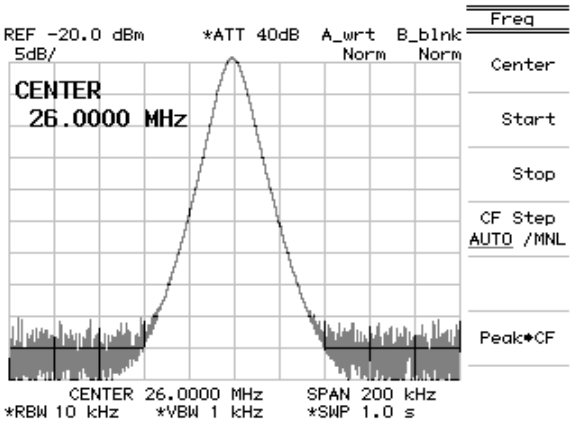
If both VBB, VXO and VCORE are ok, check 13 MHz reference-clock at C303:

*Figure 3-2*



In case that the signal shown in figure 3-2 is not measurable, check voltages at reference oscillator G502: Check VCC 2.6 VDC at G502 pin 2, also check control voltage (AFC) at pin 1 which normally is 1.2 VDC. Note that control voltage may vary between 0.1 VDC and 2.3 VDC. Even without control voltage the oscillator must be able to work on a frequency around 26 MHz as shown in the Figure 3-3.
If this is not the case you have to change G502.

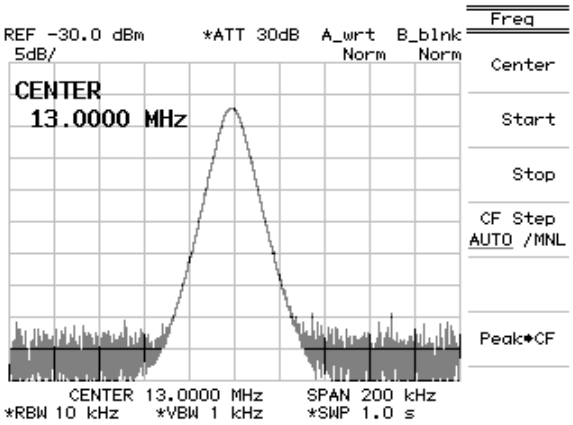
*Figure 3-3*




26 MHz reference clock at the output of G502: Amplitude is around –10 dBm.

If 26 MHz clock at G502 out is ok but no signal is measurable at C303 check 13 MHz system clock at C559:

*Figure 3-4*




Amplitude of 13 MHz system clock at C559 is around –18 dBm.

If the signal shown above is not measurable, check VTCXO 2.7 VDC at C506/518. If both VTCXO and 26 MHz reference clock are ok but 13 MHz system clock at C559 is not measurable, you have to change Hagar N500. Remember to realign RX/TX-values after changing Hagar N500!

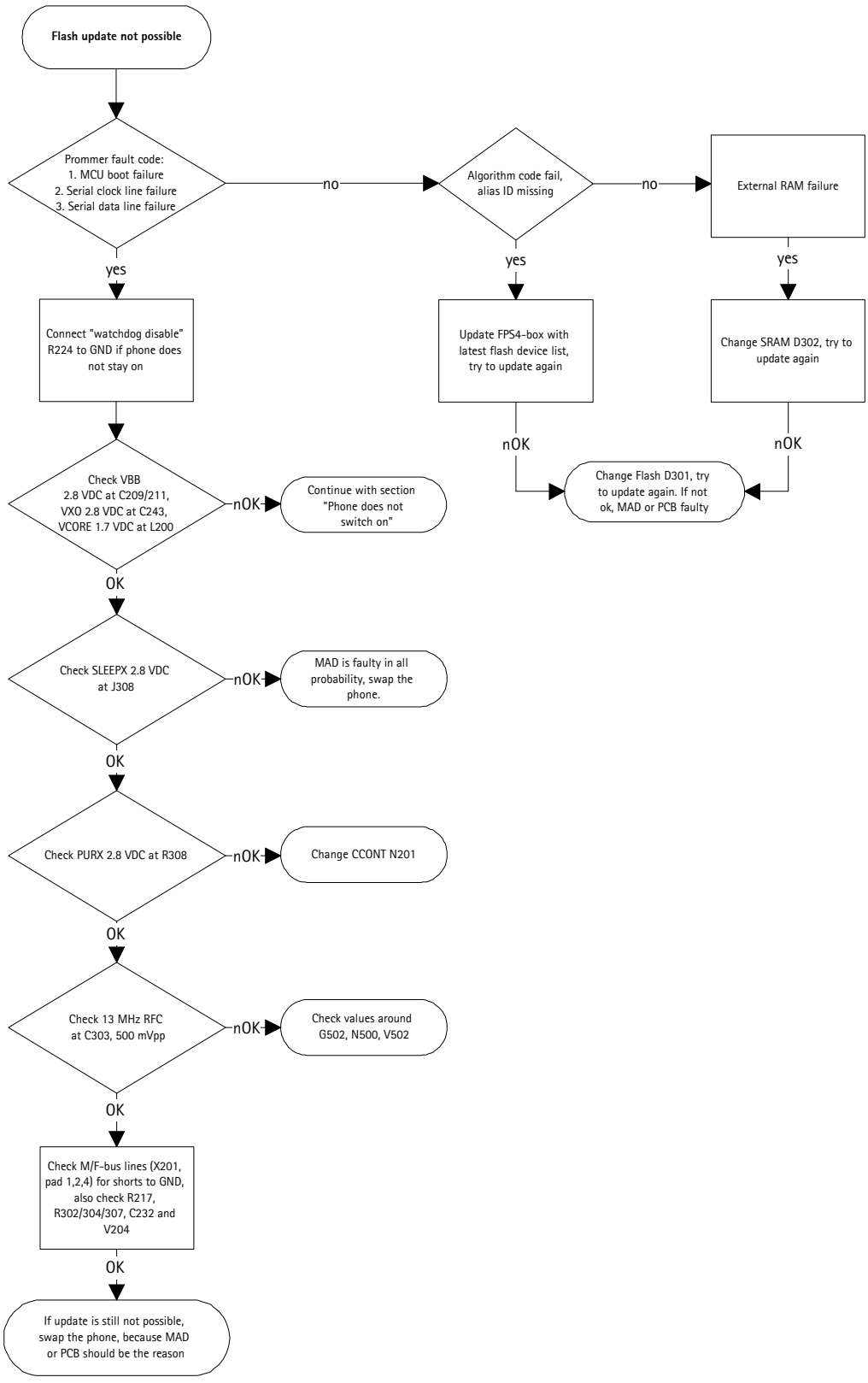
In case that 13 MHz system clock at C559 is ok but signal is not measurable at C303, check function of V502: Check that voltage at base is 0.6 VDC and voltage at collector is 1.15 VDC. Amplitude of 13 MHz system clock at base is –25 dBm while amplitude at collector is –8 dBm, change V502 if necessary.

If 13 MHz system clock at C303 is ok check that PURX at R308 rises to 2.8 VDC after pressing the power switch.
If PURX-line keeps low check line for shorts to ground. Resistance normally is around 5 MΩ.
In case that resistance is ok you have to change CCONT N201. Remember to run energy management calibration after changing CCONT!

If also PURX is ok, try to flash the phone. In case of any failure message appearing while running SW-update, remember the failure message and continue with chapter "Flash update not possible".

## CHAPTER 4: FLASH UPDATE NOT POSSIBLE

*Flowchart 4-1*



## Flash update not possible

### Failure message "MCU boot failure, serial clock-/dataline failure"

If fault-code from prommer is one of the above mentioned and phone does not stay on, disable watchdog by connecting R224 to ground and try to update again. If fault remains, check the following:

- Check VBB 2.8 VDC at C209/211
- Check VXO 2.8 VDC at C243
- Check VCORE 1.7 VDC at both sides of L200
- Check SLEEPX 2.8 VDC at J308 and PURX 2.8 VDC at R308
- Check 13 MHz system-clock at C303, 0.5 Vpp sinewave

If only one of the above-mentioned signals is not measurable, continue with section "Phone does not switch on".
If all signals are ok but fault persists, check MBUS/FBUS-lines for shorts to ground:

- Check MBUS-line (X201 pad 4) to GND: ~ 100 kΩ
- Check FBUS_RX-line (X201 pad 2) to GND: ~ 215 kΩ
- Check FBUS_TX-line (X201 pad 1) to GND: ~ 140 kΩ

To ensure function also check resistors R217, R302/304/307, C232 and V204.
If these parts are ok but Flash update is still not possible, in all probability MAD or PCB is faulty.

### Failure message "Algorithm code fail / alias ID missing"

If this failure message appears while flashing, update your FPS4-box with the latest flash device list and try to flash phone again. If fault persists even thought FPS4-box has been updated, in all probability FLASH D301 is faulty. Note that all phone data (IMEI, PSN, HW-ID, tuning values and so on) is stored inside of D301. If possible save this data as described on page 9, otherwise you have to give the phone a new identity. Do not change D301 if you have no permission to rewrite the IMEI!

### Failure message "External RAM failure"

In case of this failure message in all probability the SRAM D302 is defect. Change D302 with µBGA rework station and try to make a software-update once more. If fault persists after changing SRAM D302, change FLASH D301 (remember procedure described on page 9!) and try to flash the phone again.
In case that also the changing of D301 does not solve the problem, in all probability the MAD or the PCB is faulty.

## CHAPTER 5: PHONE INTERMITTENT SWITCHES OFF

To solve the problem that phone intermittently switches off even battery is fully charged the value of R301 has to be changed from 2x 2.2 kΩ to 2x 100 Ω.
Since HW 0813 on UP4IV, 0814 on UD4, 0815 on UG4 (NHM-5), HW 0817 on UW4, 0818 on UW4II and 0819 on UX4 (NHM-6) this change is already done.

**Note that SB 12 replaces the SB 28. Do not use this procedure anymore!**

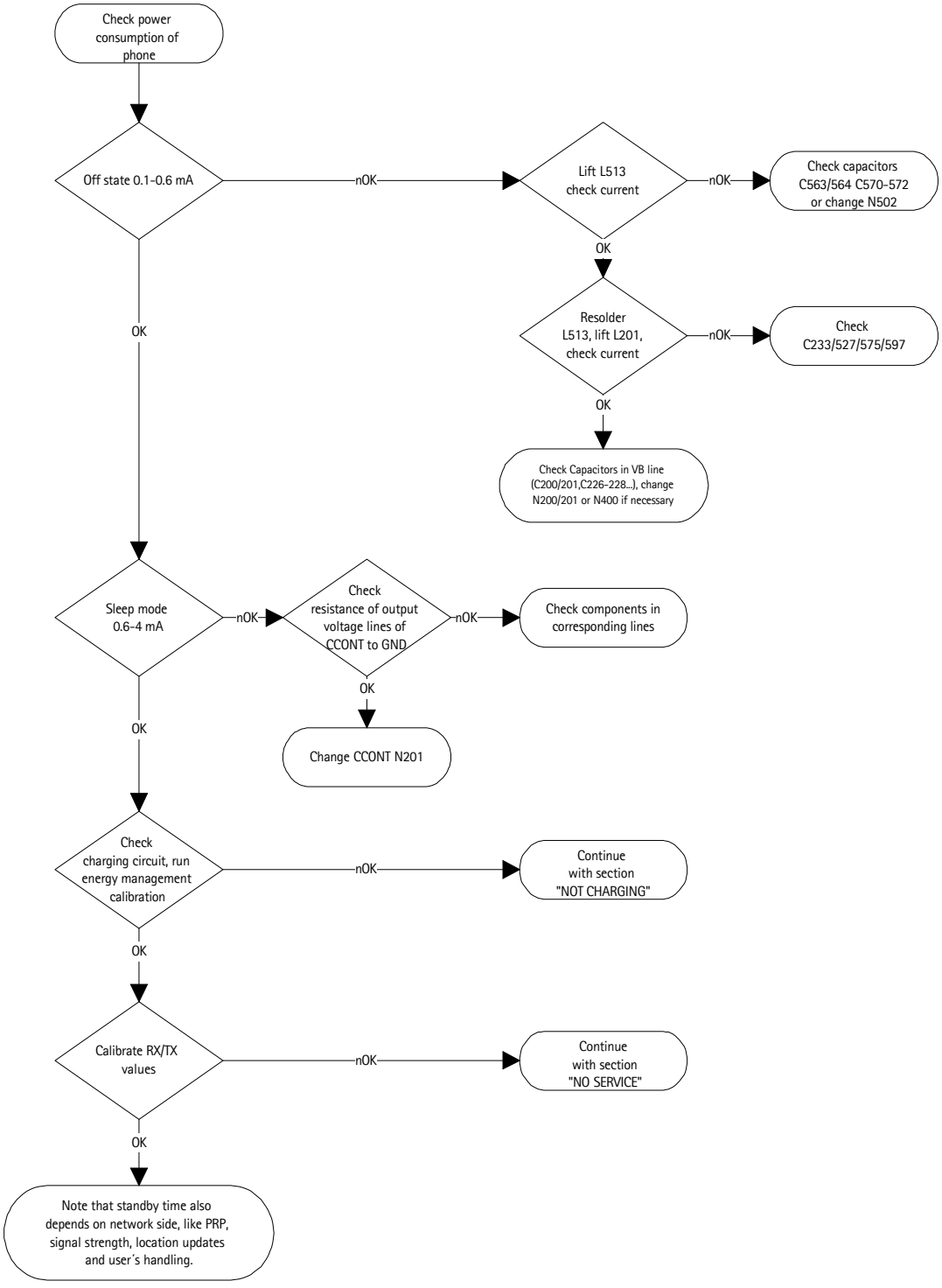
Further possibilities to solve the problem if HW-update has been done already:

- Check mechanical appearance of connector X203.
- Check that pads of X203 on PCB are clean.
- Check amplitude of 32.768 kHz at C220, 3 Vpp squarewave. If signal is temporary not ok there are probably broken solderings under CCONT N201. Remove CCONT and replace it with µBGA soldering machine, run energy management calibration after changing CCONT.
- The same problem may be caused by N500, because the reference oscillator G502 (26 MHz) is divided to 13 MHz system-clock by HAGAR N500.

In case that the above-mentioned does not solve the problem check which kind of FLASH-circuit D301 is used.
In few cases old ST Flashs from before week 05/2001 have been responsible for the fault so it is recommended to use newer versions from ST or the circuit from Intel, which does not have the tendency to cause this fault.
To find out manufacturing date of ST-FLASH check the last four digits in the second line from the bottom on the circuit.
Format is "YearYearWeekWeek", e.g. 0103, that means that circuit was produced in week 3 of 2001.
If it is necessary to change the FLASH D301, keep in mind procedure as described on page 9!

## CHAPTER 6: LOW STANDBY/OPERATION MODE TIME

*Flowchart* **6-1**



## Low standby/operation mode time

First of all check current consumption in different operation modes:

| Function mode | Minimum current in mA | Maximum current in mA |
|---|---|---|
| Off state | 0.1 | 0.6 |
| Sleep mode | 0.6 | 4 |
| Call mode GSM 900 | 130* | 550** |
| Call mode GSM 1800 | 100* | 530** |

* : lowest TX-power level, lights off
**: highest TX-power level, lights on

## Off state current fail

The first you should do in case of this fault is to lift L513 with a soldering iron, then check current consumption again.
If current is still too high, usually the power amplifier N502 is defect but if also possible that one of the capacitors C563/564 or C570-572 is defect – lift them one by one to find the fault.
If current is ok after removing L513, resolder this part and lift L201. If current is too high now, check capacitors C233, C527, C575 and C597.
If current consumption is ok after lifting L201, you have to check capacitors in VB-line (eg C200/201, C226-228, C247...) or change N200/201/400, which all can be responsible for the fault but it is most likely that CCONT N201 is defect.

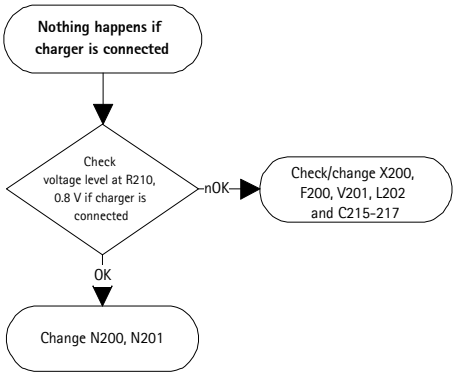
## Sleep mode current fail

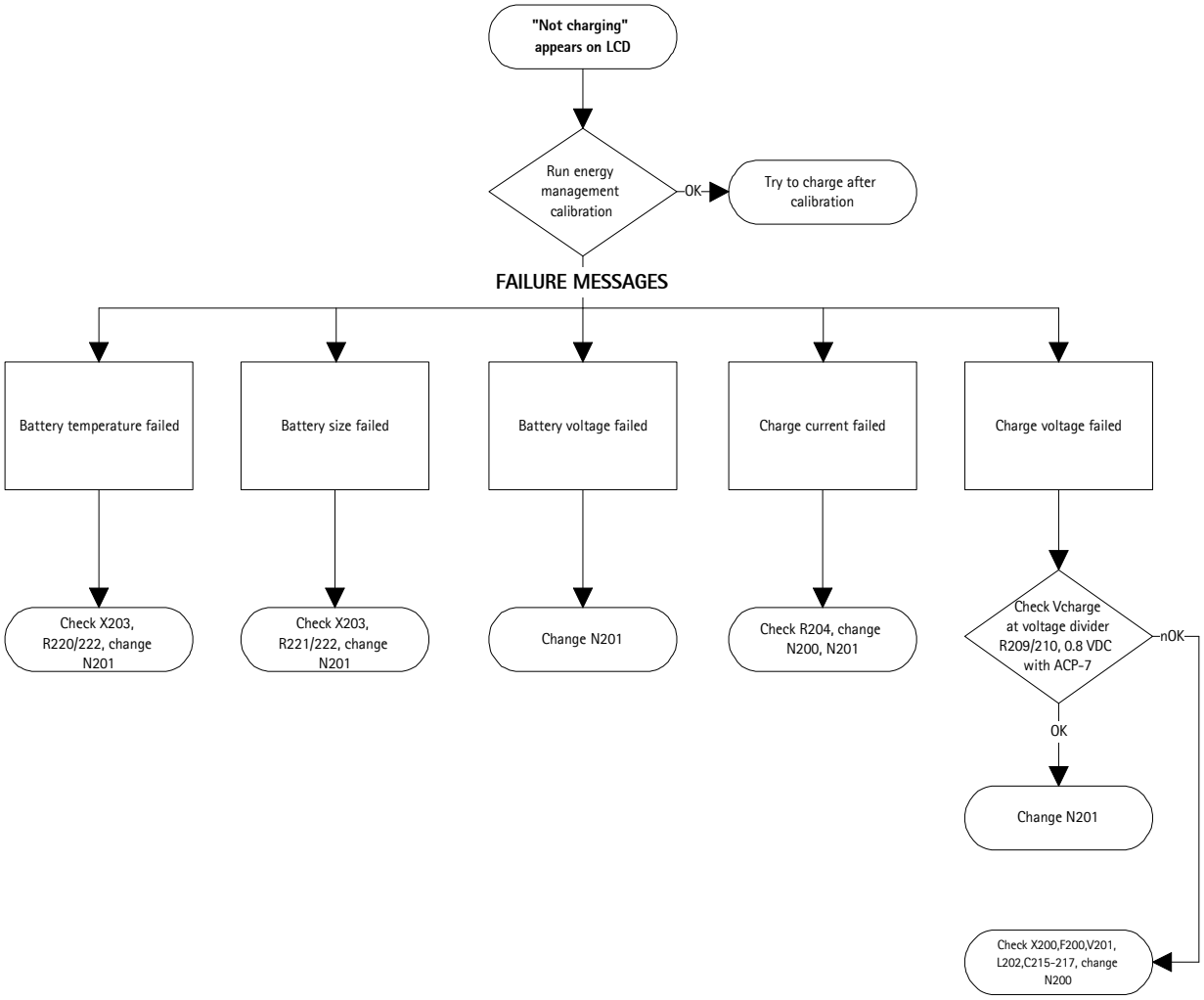
Check resistance of output voltage lines of CCONT N201 to ground.
Resistance of lines should not decrease 40 kΩ except VSYN1 (~ 4.7 kΩ), if resistance of any line is not ok, check/change parts of this line.
If resistance of all lines is ok, change CCONT N201.

If both offstate current and sleep mode current are ok but the standby-/operation mode time is not acceptable, check the charging circuit and run energy management calibration to ensure that the fault does not result of an insufficient charged battery.
If also the charging circuit is ok but fault persists, it can be necessary to calibrate RX/TX values of the phone.
If calibration is not possible continue with section "No Service".

## CHAPTER 7:NOT CHARGING

*Flowchart 7-1*



## Not charging

In case of any fault in the charging circuit: First thing you should do is running the energy management calibration to define the fault!
You also should check whether the fault occurs only intermittendly or if it is permanently impossible to charge the battery. In case that the fault appears only from time to time, especially check contact springs of DC/HS-connector X200 and battery-connector X203 if bent, soiled or corroded. Also ensure that contact-pads for connectors on PCB are not dirty, if necessary clean them with an appropriate amount of IPA. **Do not use any scratching or rubbing tools!**
To ensure function of the phone you have to run the energy management calibration whenever a part was changed in the charger circuit!

### Nothing happens if charger is connected:

Check that voltage at voltage divider R209/210 is 0.8 V DC if ACP-7 charger is connected to the phone.
If no voltage is measurable, check CHRGR+line for disconnection:

- Check mechanical appearance of DC/HS-connector X200, especially check contact springs if bent, soiled or corroded.
- Check solderings and resistance of fuse F200 and coil L202, 0 Ω.
- Check resistance of R209 (47 kΩ) and R210 (4.7 kΩ), also check that CHRGR+line has no short circuit to ground. Resistance normally is 50 kΩ. Check V201 and C215/216/217 if faulty.

If nothing happens when a charger is connected to the phone but voltage at R209/210 is ok, a defect CCONT N201 is responsible for the fault in most cases, but it also can be necessary to change CHAPS N200.

### Display message "Not Charging"

If this message appears on the display after connecting charger to the phone, first you should run the energy management calibration to get more information about the fault. If calibration is possible without failure message, check if charging works now.

If calibration does not work, following failure messages are possible:

- Battery temperature failed:
  Check voltage at C235, normally 0.5 VDC in service-jig. If voltage is not ok, check R220/222 for defect or broken solderings, also check that C235/236 have no shorts to ground.
  If the mentioned parts are ok but fault persists, it is necessary to change the CCONT N201.
- Battery size failed:
  Check voltage at C235, normally 0.38 V DC in service-jig. If voltage is not ok, check R220/221 for defect or broken solderings, also check that C235/236 have no shorts to ground. If the mentioned parts are ok but fault persists, change CCONT N201.
- Battery voltage failed:
  This A/D-value is generated inside of CCONT N201, so that you have to change CCONT if A/D-value is out of limit.
- Charge current failed:
  Probably CHRGR+line interrupted. Check resistance of R204 (0.22 Ω) or change CHAPS N200.
  If this does not solve the problem, change CCONT N201 and try calibration once more.
- Charge voltage failed
  In case of this failure message, check first of all voltage at voltage divider R209/210. Voltage here normally is 0.8 V DC with connected charger ACP-7. If this voltage is ok, it is necessary to change the CCONT N201.
  If voltage at voltage divider is not ok, check contact springs of DC/HS-connector X200, also check F200, L202 and C215-217.

## Display message "Reconnect Charger"

- In most cases CHAPS N200 is damaged after HW update R301 with Hot Air Fan

# CHAPTER 8: CONTACT SERVICE

This fault means that the phone software is able to run and thus the watchdog of CCONT N201 can be served. Selftest functions run when power is switched on and software is executed from FLASH. If any selftest fails, a "Contact Service" text is shown on LCD.

Most common faults:

## MCU ROM Checksum failed

Try to flash the phone. If fault persists after flashing, probably D301 faulty. Change D301 (keep in mind procedure as described on page 9!) with µBGA soldering machine and try to update once more.

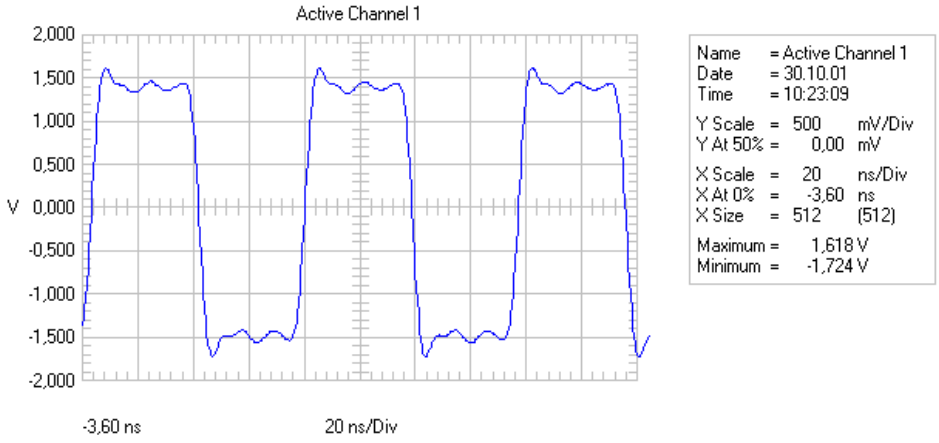
## CCONT Interface failed

Probably faulty CCONT N201 or broken solderings under it.
Replace CCONT with µBGA soldering machine and run the energy management calibration.
If not ok after reworking the CCONT, MAD or PCB faulty in all probability.

## COBBA parallel/serial failed

Check VBB 2.8 VDC at C119, VCOBBA 2.8 VDC at C116/117 and VREF 1.5 VDC at C109, also check COBBACLK at J317:

*Figure 8-1*




Probably COBBA N100 faulty or broken solderings under it – change COBBA and retune RX/TX-values.
If fault remains after changing COBBA, MAD or PCB faulty.

## DSP Alive Test failed

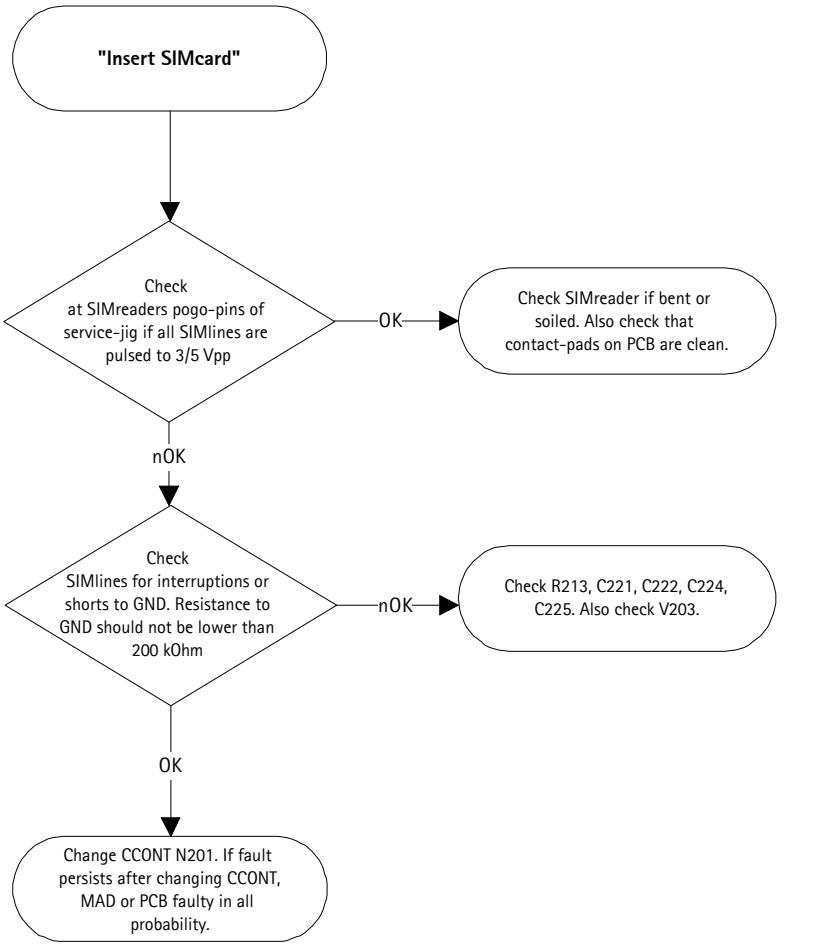
In most of all DSP alive selftest failures MAD is faulty, which is not changeable.

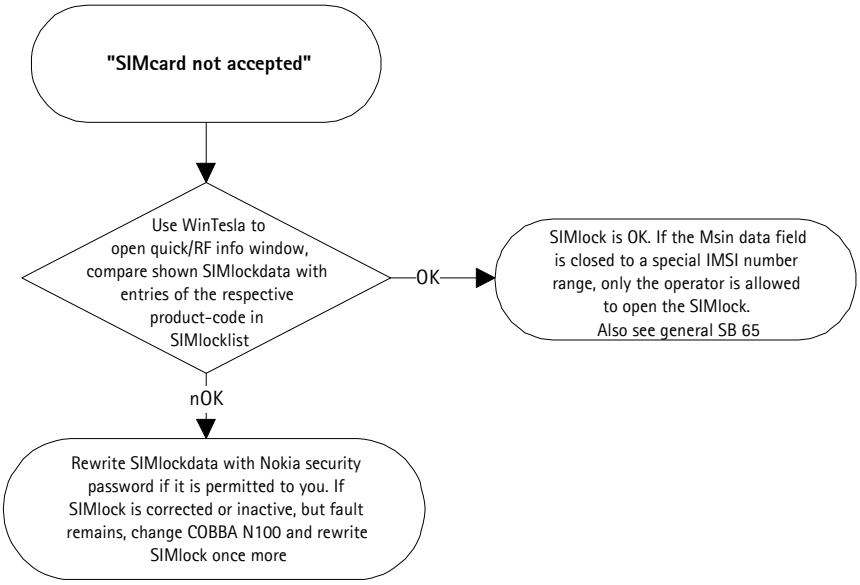
## EEPROM sec/tune checksum failed

Use WinTesla to check if phone data like IMEI, product-code or PSN are corrupted.
If phone data is ok, try to reset the phone. If phone data is not ok or fault remains after reset, change D301 as described on page 9.

## CHAPTER 9: SIMCARD FAULTS

*Flowchart 9-1*



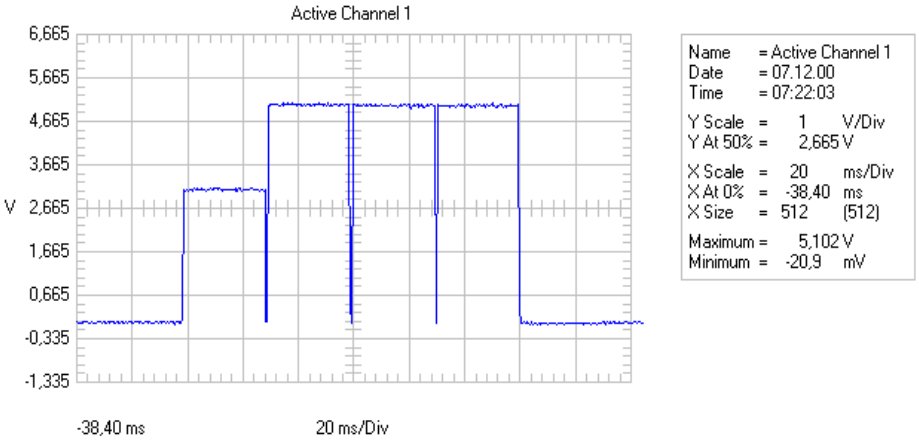



## SIMCARD FAULTS

### Display message "Insert SIMcard"

The easiest way to find out the reason for this fault is to check if every single SIMline is pulsed to the signal shown below after initializing the phone:

*Figure 9-1*




You can check this signal easily at the SIMreader`s pogo-pins of the service-jig.
The signal must be measurable at all pins except the ground pin.

If the above-mentioned signal is ok at all five pogo-pins, check mechanical appearance of SIMreader. Also check that contact-pads for SIMreader on PCB are clean.

If the signal shown above is not measurable at one SIMline, check this line for interruption or short-circuit to ground.
Resistance of VSIM to GND normally is around 230 kΩ, resistance of SIMdata to GND is around 250 kΩ while resistance of SIMreset and SIMclock to GND normally is around 5 MΩ.
In case that resistance of any line is not ok, especially check V203 and capacitors C221/222/224/225.

If resistance of lines to ground is ok but SIMlines are not pulsed to 3/5 Vpp, remove CCONT N201 with µBGA rework machine.
In case of oxidized pads under CCONT, rework them with a few flux and solder, then replace the spare part.
Remember that it is necessary to run the energy management calibration after changing CCONT!

In case that fault persists after changing CCONT N201 probably the SIMinterface between MAD and CCONT is interrupted or the MAD itself is defect. Note that the MAD is underfilled and therefore not changeable.

### Display message "SIMcard not accepted"

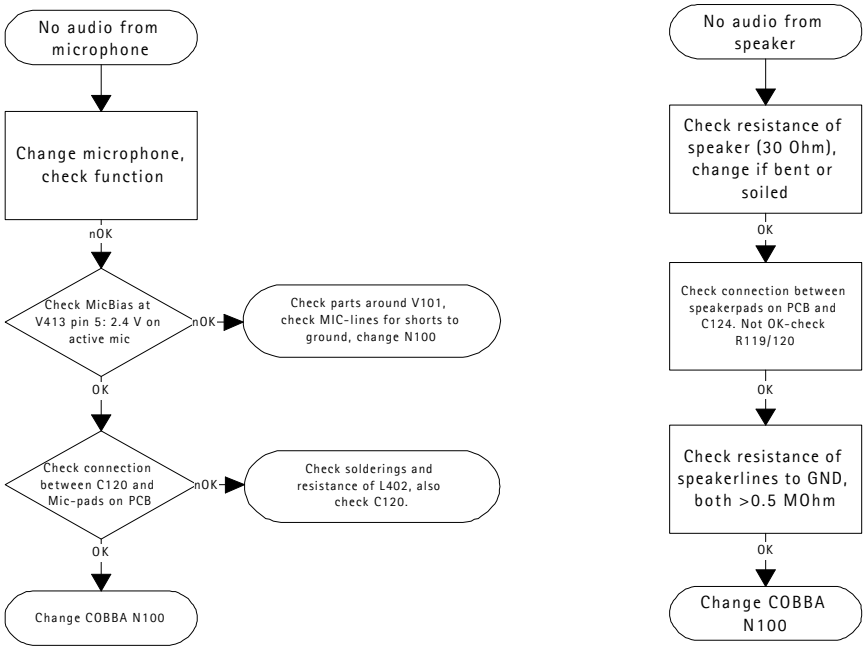
In case of this fault use WinTesla to open Quick /RF-Info window and compare the shown SIMlock-data with the entries of the SIMlock-list for the respective product-code.
If SIMlock-settings are ok or no SIMlock is set, it is necessary to change the COBBA N100.
In case that oxidized pads exist under COBBA, rework them with a few flux/solder and replace part with µBGA rework machine.

**Note that you have to rewrite SIMlock-settings, make SW-update and retune RX/TX-values after changing COBBA!**

## CHAPTER 10: INTERNAL AUDIO FAULTS

**In case of any internal audio-fault in your phone, the easiest way to define the fault is to establish a call to the defect phone with another proper working one. In case that you can hear the speech of your colleague in the defect phone but your colleague cannot hear your speech, you know that you have to search in the microphones signal path for the fault. The other way around, if your colleague can hear you but you cannot hear your colleague you know that you have to search in the speakers signal path for the fault, assumed that you are holding the defect phone.**

*Flowchart 10-1*




### Speaker faulty

- Check that resistance of speaker is 30 Ω.
- Check mechanical appearance of speaker if audio signal is too low or distorted.
- Check solderings and resistance of R119/120 (22 Ω), change parts if necessary.
- Check resistance of speaker lines to ground, should be > 0.5 MΩ. If resistance is not ok especially check capacitors C104 and C124-126 for shorts to ground.
- If all above mentioned is ok but speaker does not work, it is necessary to change the COBBA N100.
  Note that you have to rewrite SIMlock-data, make SW-update and retune RX/TX-values after changing this part!

### Microphone does not work

- Check/change microphone.
- Ensure that pads for microphone on PCB are clean.
- Check bias voltage for microphone at V413 pin 5, 2.4 V on active micro.
- If voltage is not measurable check V101, and R107/115, change COBBA N100 if necessary.
- If bias voltage for microphone is ok, check audio lines for disconnection and shorts to ground.
- Resistance of MICN-line to ground normally is 1 kΩ while resistance of MICP-line to ground is >30 MΩ.
  Especially check C403 and V413 if values are not ok. To ensure function also check C120 and L402.
- If fault persists change COBBA N100 with µBGA rework station.
  Note that you have to rewrite SIMlock-data, make SW-update and retune RX/TX-values after changing this part!

# CHAPTER 11: USER INTERFACE FAULTY

## Display failure

Check mechanical appearance of display assy, change part if necessary.
If LCD does not work after changing display assy, check VBB 2.8 VDC at C409/413.
Voltage at C410/412 is normally 8 VDC (generated inside of LCD assy). Check capacitors for shorts or change LCD assy if voltage is not ok.
Check that voltage at J314 is 2.8 VDC (LCDReset) – if line is short-circuited to ground LCD does not work.
Also check that voltage at both sides of R306 is 2.8 VDC.
If above mentioned values are ok but LCD does not work probably MAD or PCB faulty.

## Keypad malfunction

Check that contacts for keys on display assy are clean. Make sure that PCB is not dirty.
Check resistance of ROW and COL lines between the keys, probably MAD is faulty.

## Backlight failure

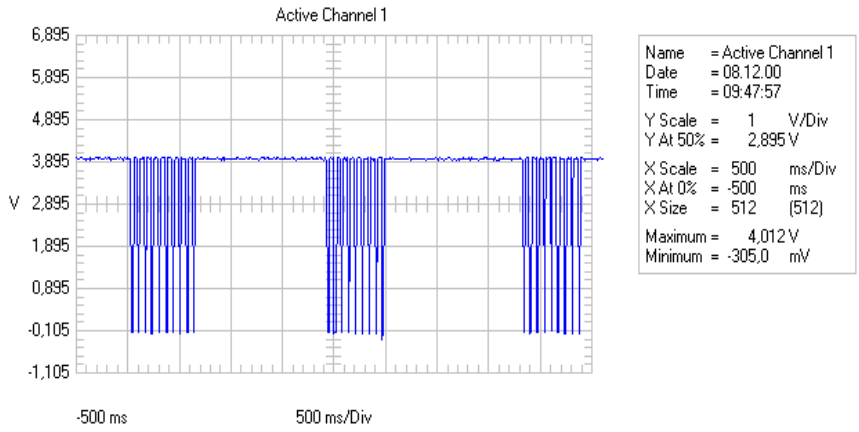
Check VB 3.6 VDC at anode of keypad/display-LED´s.
Check VBB 2.8 VDC pin 2 and VB 3.6 VDC pin 1 of N400.
Check resistance of R403 and R404.
Check signal KBlights 2.8 VDC at pin 7/15 of N400. If voltage is ok but illumination does not work, change N400.
If no voltage is measurable there maybe a disconnection between D300 and N400 or MAD is faulty.

If backlight switches itself on after assembling battery to the phone, even though the phone keeps switched off, check R406/407 for shorts to ground. This fault often occurs in connection with liquid damages.

## Vibra failure

Check contact springs of vibramotor, make sure that pads for vibramotor on PCB are clean.
Check VB 3.6 VDC at vibra pad located to the edge of the PCB, at the other pad and pin 16 of N400. You can check vibra signal with a scope (WinTesla: Testing/Vibra). Also check R401.

*Figure 11-1*




Check VB 3.6 VDC at pin 1 and VBB 2.8 VDC at pin 2 of N400.
Check vibra_cnt at pin 19 of N400. If signal is ok but vibra does not work, change N400, else there is a disconnection between D300 and N400 or MAD is faulty.

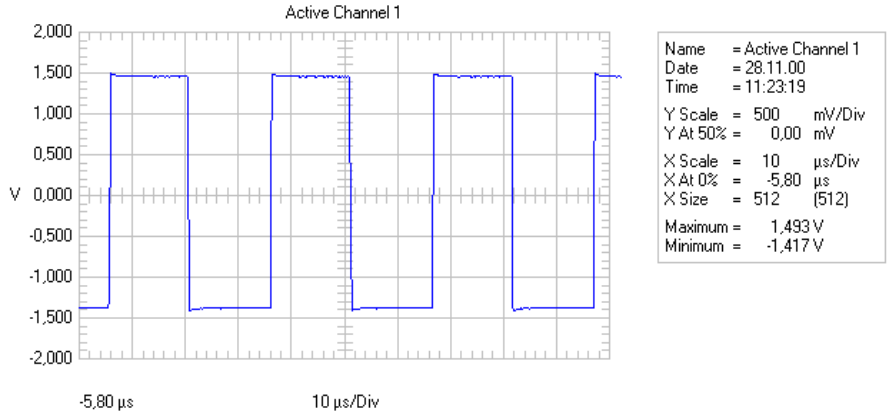
## Buzzer failure

Check mechanical condition / contact springs of buzzer.
Check VB 3.6 VDC at E401.
Check PWM- signal at E400 and pin 6 of N400.
Check VB 3.6 VDC at pin 1 and VBB 2.8 VDC at pin 2 of N400.
Check buzzer_cnt signal at pin 3 of N400. If signal is ok but buzzer does not work, change N400, if signal is not ok, there may be a disconnection between D300 and N400 or MAD is faulty.

## Clock time problems

In case that clock time has to be corrected in short periods check amplitude and frequency of sleepclock-oscillator at C220. (3 Vpp squarewave at 32.768 kHz).
If amplitude or frequency is not ok, change crystal B200.
If fault persists, check parts around B200 as R211/212/214 and C229/230.

*Figure 11-2*



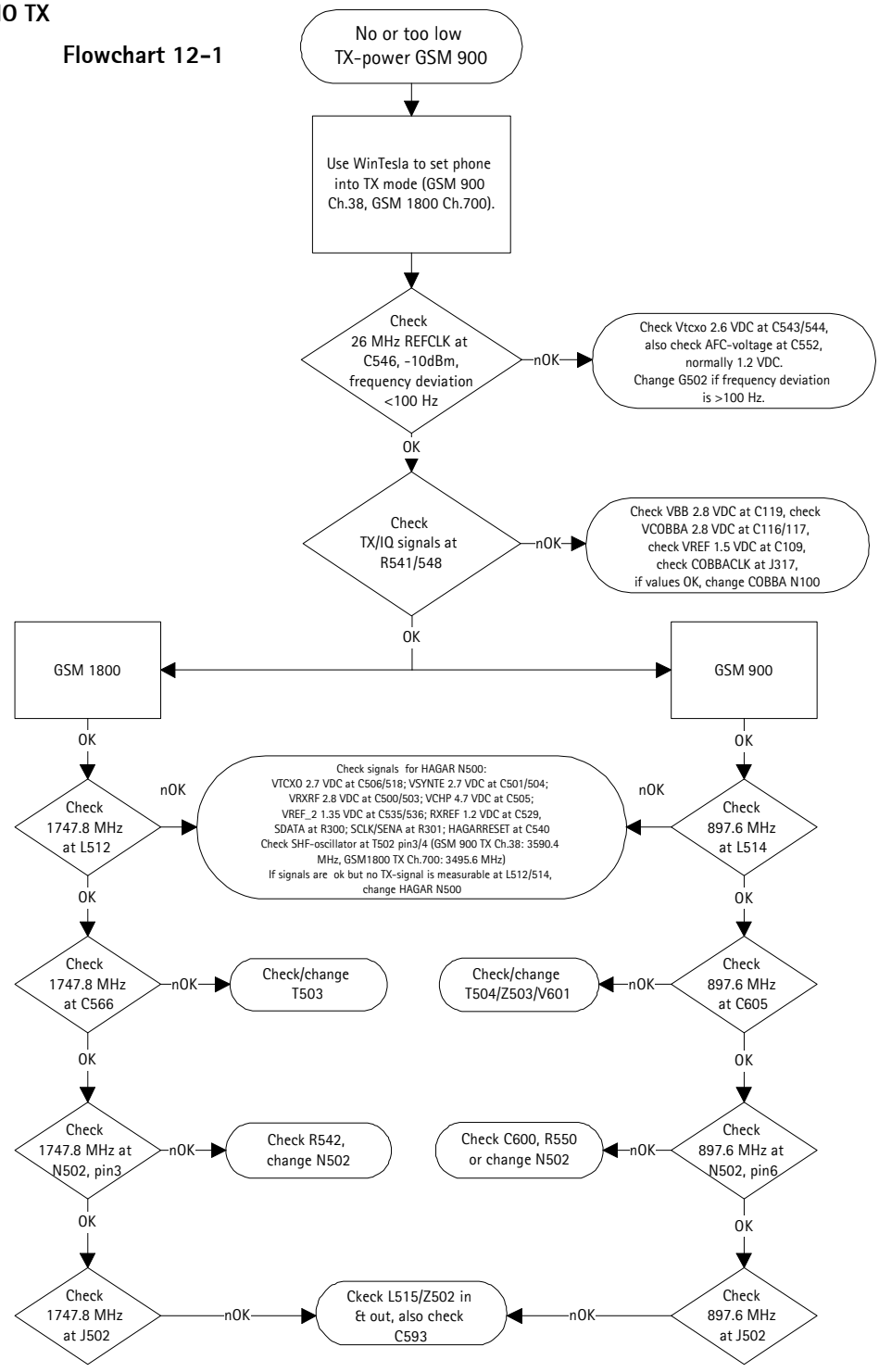

32.768 kHz measured at pad of C220 located towards crystal B200.

## CHAPTER 12: NO SERVICE

The first you should do if this fault occurs is to calibrate RX/TX-values of the phone. If only TX-power is too low or not measurable continue with the chapter below. If only RX-calibration is not possible continue with the corresponding chapter on page 34.
If both TX-power and RX-calibration do not work check spectrum charts on page 33 for possible failure reasons.

**NO TX**

**Flowchart 12-1**

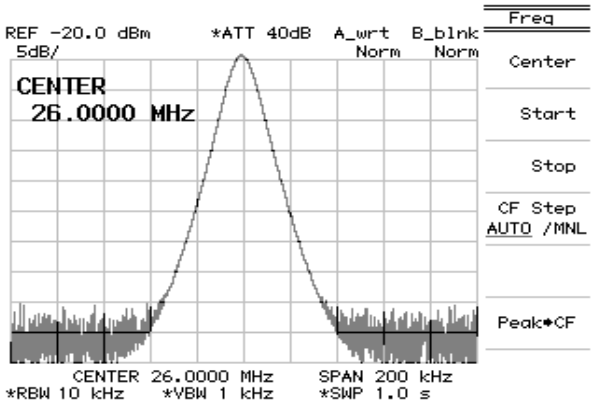


## No or too low TX power GSM 900

Use WinTesla to set phone into following mode: Initialize/ Local mode/Testing/ RF Controls/ active unit TX, Ch.38.

First of all check 26 MHz reference oscillator at C546:

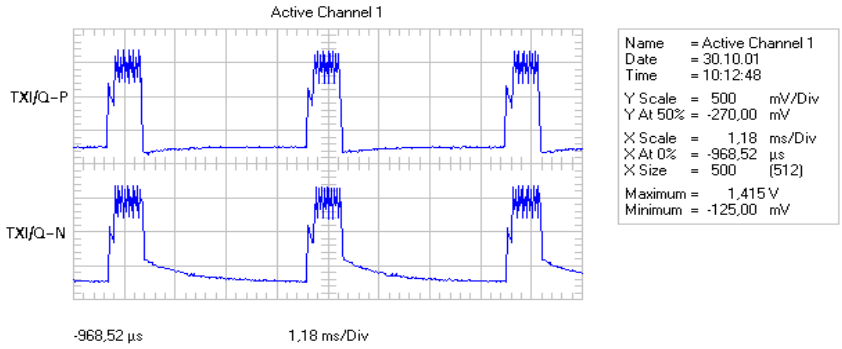
*Figure 12-1*




Amplitude of spectrum is approximately –10 dBm.
If signal is not ok, check Vtcxo 2.6 VDC at C543/544 and AFC-voltage at C552, which normally is 1.2 VDC but may vary between 0.3 V and 2.3 VDC. If AFC-voltage is 0 V, especially check R522 and VREF 1.5 VDC at C109. If DC-voltages are ok but frequency deviation is >100 Hz it is necessary to change G502.

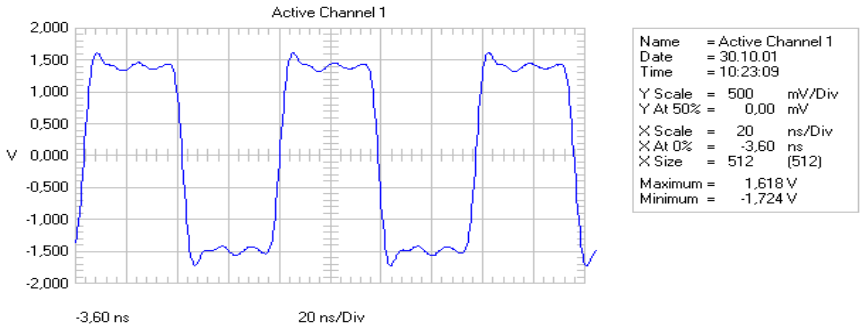
If reference oscillator is working properly, check TXIQ-signals at R541/548:

*Figure 12-2*




If TXIQ-signals at R541/548 are not measurable or somehow corrupted, check the following signals for COBBA N100: VBB 2.8 VDC at C119, VCOBBA 2.8 VDC at C116/117, VREF 1.5 VDC at C109 and 13 MHz COBBACLK at J317:

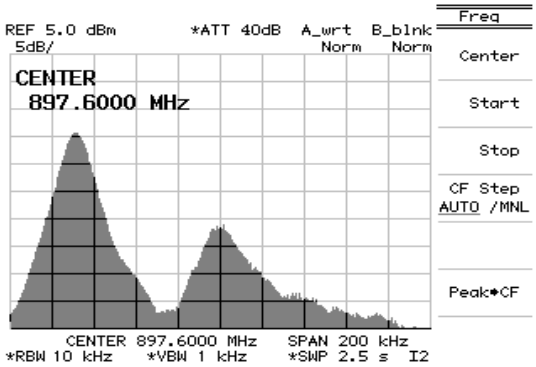
*Figure 12-3*




If the above mentioned signals for COBBA N100 are ok but TXIQ-signals are not measurable, probably COBBA is faulty or has broken solderings under it. Remove COBBA, rework oxidized pads if necessary with flux and solder and replace spare part with µBGA rework machine.
Note that it is necessary to rewrite SIMlock-data, make SW-update and retune RX/TX-values of the phone after changing COBBA N100!

If TXIQ-signals at R541/548 are ok, check 897.6 MHz TX-spectrum at both sides of L514:

*Figure 12-4*




Amplitude of TX-spectrum at L514 is around 0 dBm. If this spectrum is not measurable, you have to check all signals, which HAGAR N500 needs to work:

- VTCXO 2.8 VDC at C506/518,
- VCHP 4.7 VDC at C505,
- VSYNTE 2.8 VDC at C501/502/504
- VRXRF 2.8 VDC at C500/503
- VREF_2 1.35 VDC at C535/536
- RXREF 1.2 VDC at C529
- VMOD 2.8 VDC at L512/514

Also check signals for PLL, which is located inside of HAGAR:

*Figure 12-5*

SCLK at R301:

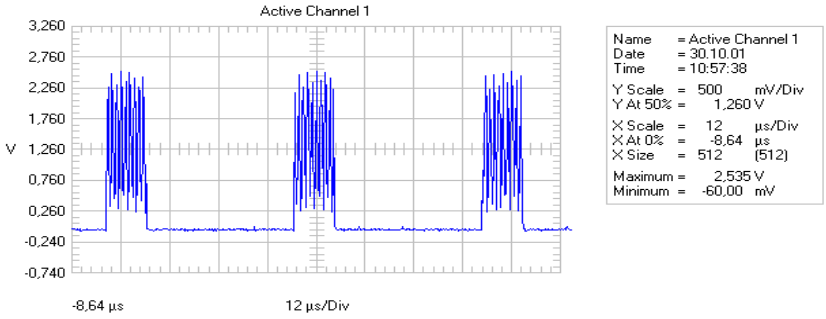



*Figure 12-6*

SENA at R301:

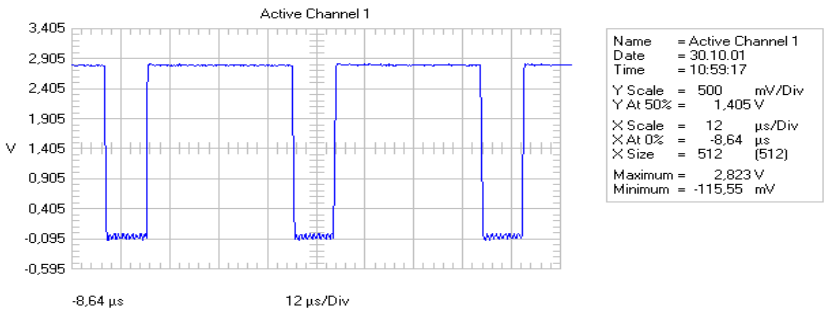
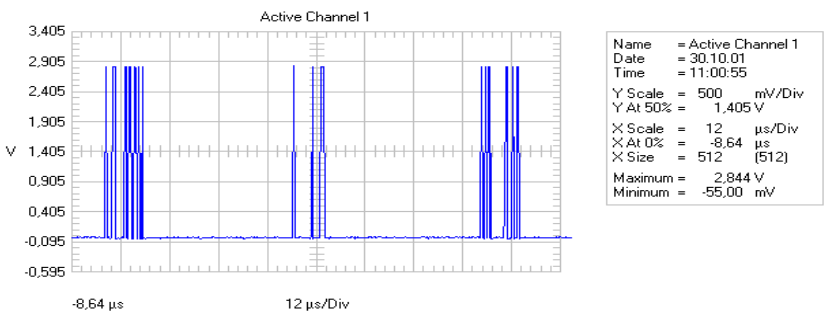


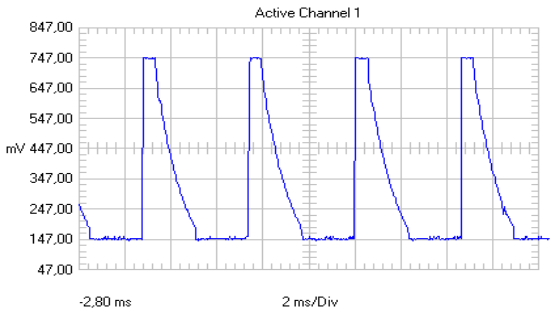

*Figure 12-7*

SDATA at R300:



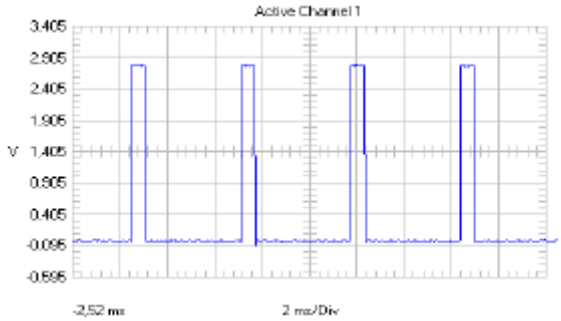
Note that R300 is only assembled on PCB-version < UB4_11!
Further more these signals are necessary for a proper working HAGAR N500:

*Figure 11-8*




TXC measured at C542.
Note that the amplitude of TXC varies between
0.6 Vpp on power level 19 and 2 Vpp on power level 5.

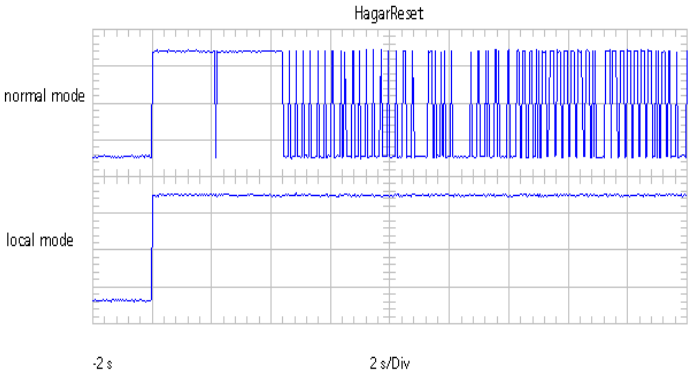
*Figure 11.9*




TXP 2.8Vpp measured at J503

Also check HAGARReset at C540:

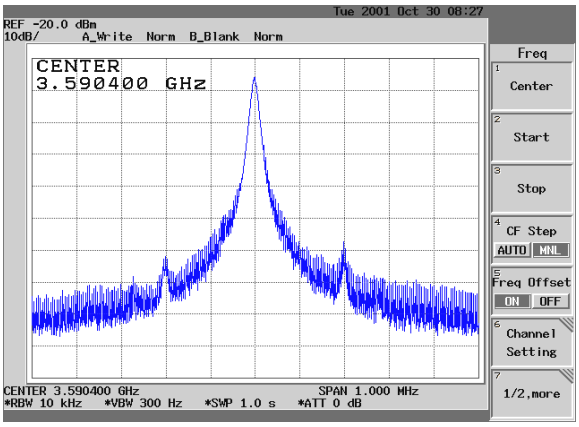
*Figure 12-10*




Remember that HAGARReset varies depending on the phone mode: while it is 2.8 VDC in local mode, it changes between 0 V (low) and 2.8 V (high) in normal mode!

Also check signal of SHF-oscillator G500 at T502 pin 3/4:

*Figure 12-11*




If SHF-oscillator does not work on expected frequency, check that voltage at C522 is 2.7 VDC. Also check control voltage at C558, which varies between 1.2 V and 3.3 VDC. If control voltage is 4.8 VDC, the oscillator is faulty or the control loop is open.
In case that it is necessary to rework G500 unfortunately you have to remove the RF-shielding first.
If all signals shown on the last two pages are ok but no TX-signal is measurable at L514, change HAGAR N500.

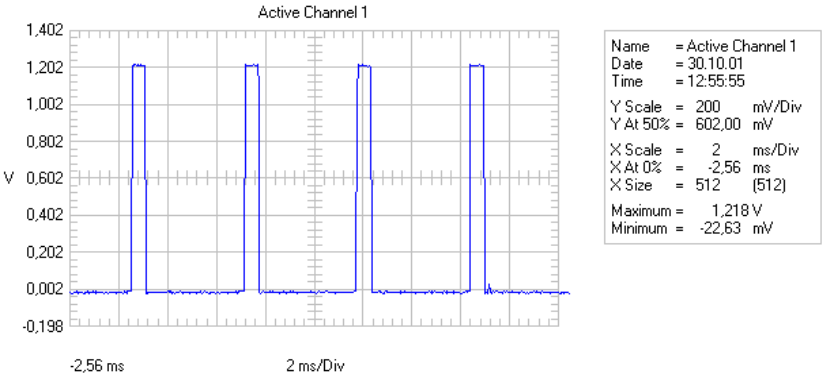
If 897.6 MHz TX-spectrum at L514 is ok, check same signal at C605. Amplitude is around –3 dBm.

If no spectrum is measurable or amplitude is too low, check solderings of balun T504 and filter Z503.
Check that attenuation of filter Z503 is ≤ 2.7 dBm, also check that TX-buffer V601 works:
Voltage at collector of V601 is 2.4 Vpp while voltage at base is 0.8 Vpp, change V601/602 if necessary.

If 897.6 MHz at C605 is ok, check TX-spectrum at L515 pin 1, +5 dBm up to +33 dBm.

If amplitude of spectrum at L515 pin 1 is not measurable or too low, check signals for power amplifier N502:
- Check VBATT 4 VDC at C570/572.
- Check Vapc at C565, which varies between 1.2 Vpp and 1.7 Vpp depending on TX-power level:

*Figure 12-12*




If these values are ok but amplitude of TX-spectrum at L515 pin 1 is too low, change the power amplifier N502.

If also the power amplifier works well, check TX-spectrum at J502 (antenna pad): amplitude varies depending on choosen TX-power level between +5 dBm and +33 dBm.

If amplitude is too low, check mechanical appearance and solderings of coupler L515.
But it is more likely that the diplexer Z502 is responsible for this fault:
Check TXVGSM 2.5 Vpp at both sides of L509, which sets the diplexer into TX-mode.
Especially check the ceramic bottom plate of the diplexer if broken. This often happens if phone has been dropped.

## No or too low TX power GSM 1800

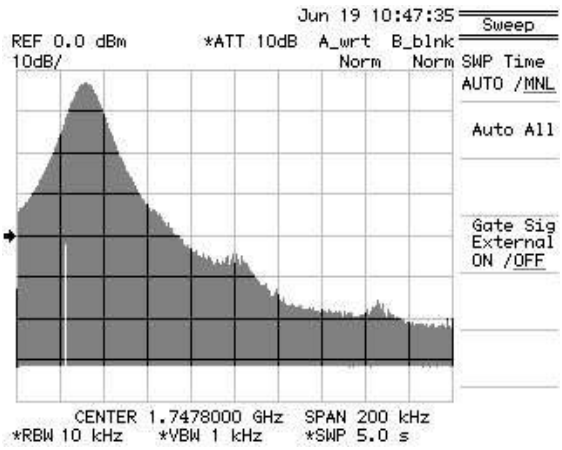
Use WinTesla to set phone in following mode:
Initialize/ Product/ Band/ PCN/ Testing/ RF Controls/ active unit TX Ch.700

To find a fault in GSM 1800 TX mode you can proceed almost the same way as described for GSM 900:

Check 26 MHz reference oscillator at C546, -10 dBm, frequency deviation < 100 Hz
Check TXI/Q signals at R541/548. If not ok, check signals for COBBA N100 (VBB 2.8 VDC at C119, VCOBBA 2.8 VDC at C116/117, VREF 1.5 VDC at C109 and COBBACLK at J317), change COBBA if necessary.
Check 1747.8 MHz at L512. If not ok, check signals for HAGAR N500 (VTCXO 2.7 VDC at C506/518, VCHP 4.7 VDC at C505, VSYNTE 2.7 VDC at C501/502/504, VRXRF 2.8 VDC at C500/503, VREF_2 1.35 VDC at C535/536, RXREF 1.2 VDC at C529, furthermore SCLK/SENA at R301, SDATA at R300, TXC at C542, TXP at J503, HAGARRESET at C540 and signal of SHF- oscillator at T502, 3495.6 MHz).
Check 1747.8 MHz at C566. If not ok, check/change T503.
Check 1747.8 MHz at L515 pin 3. If not ok, check/change R542/N502
Check 1747.8 MHz at J502. If not ok, check L515 in & out, check also signal at Z502 in & out and TXVDCS 2.5 Vpp squarewave at L508 ( sets Z502 to TX-mode ).

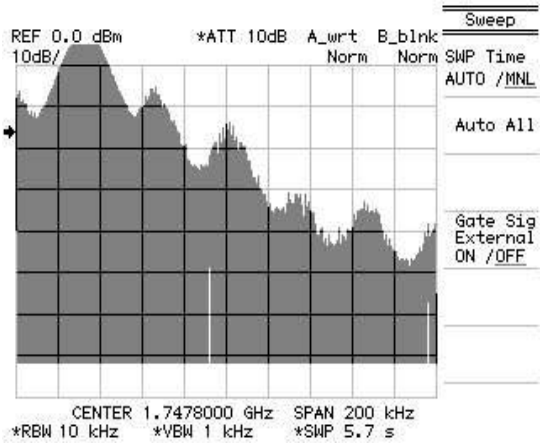
**Faulty spectrum**

*Figure 12-13*



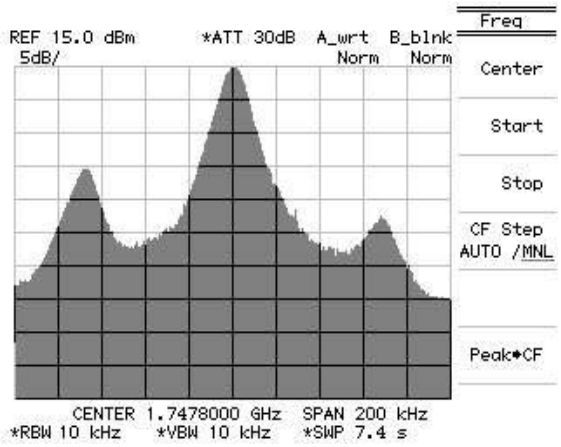

1) Normal spectrum

*Figure 12-14*



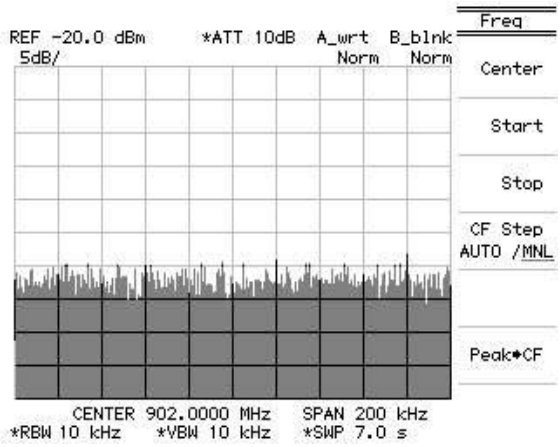

2) Spectrum with broken solderings under CCONT
Spectrum turns to picture 1 if CCONT is pushed careful with some nonmetallic item.

*Figure 12-15*




3) Spectrum of faulty COBBA

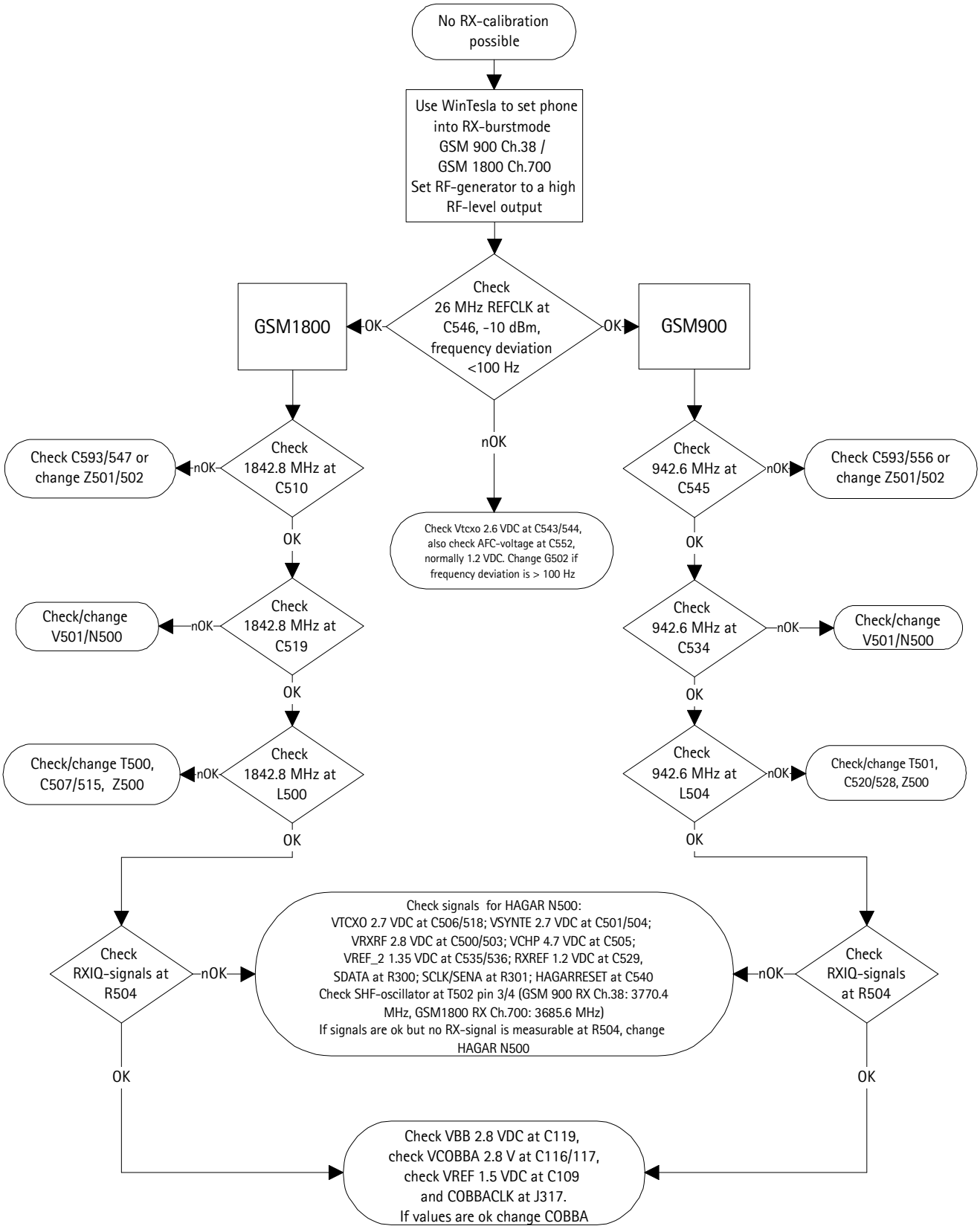
*Figure 12-16*




4) Spectrum of faulty oscillator G500

**No RX calibration GSM 900 possible**

*Flowchart 12-2*



**No RX-calibration GSM 900 possible**

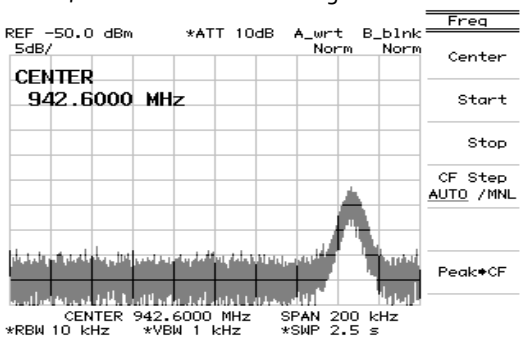
Use WinTesla to set phone into local mode and activate under /Testing/RF Controls/ RX Ch.38, burst mode.
Set RF-generator to RF-level output of –65 dBm.

The first to do, as in case of TX-faults, check signal of 26 MHz reference oscillator at C546 (see figure 12-1 on page 29):

Amplitude of spectrum is around –10 dBm. If signal is not ok, check Vtcxo 2.6 VDC at C543/544 and AFC-voltage at C552, which normally is 1.2 VDC but may vary between 0.3 V and 2.3 VDC. If AFC-voltage is 0 V, especially check R522 if torn off or defect. If DC-voltages are ok but frequency deviation is >100 Hz it is necessary to change G502.

If reference oscillator works well, check 942.6 MHz RX-signal at C545:

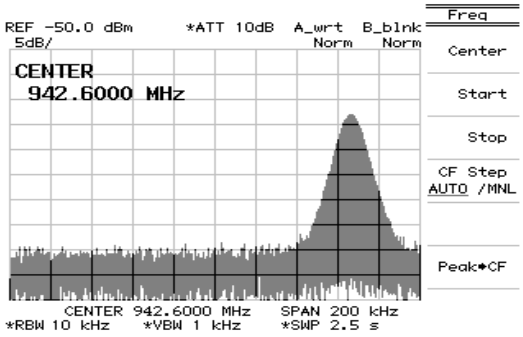
*Figure 12-17*




Amplitude of RX-signal at C545 is approximately –67 dBm.
If signal is not measurable or amplitude is too low, check solderings of C593 and C556. Ensure that attenuation of filter Z501 is not higher than 3.5 dBm. Especially check with microscope ceramic bottom plate of diplexer Z502 if broken in case of temporary receiver faults!

In case that 942.6 MHz RX-signal at C545 is ok, check same signal at C534:

*Figure 12-18*




Amplitude is around –52 dBm. Check solderings of C537. Also ensure that LNA V501 works:
Check with an oscilloscope voltages at base *(figure 12.19*, 1.1 Vpp) and collector (*figure 12.20*, 2.6 Vpp) of V501, change V501 or N500 if necessary.

*Figure 12.19*

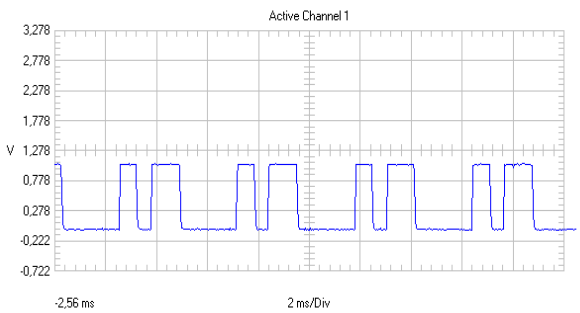
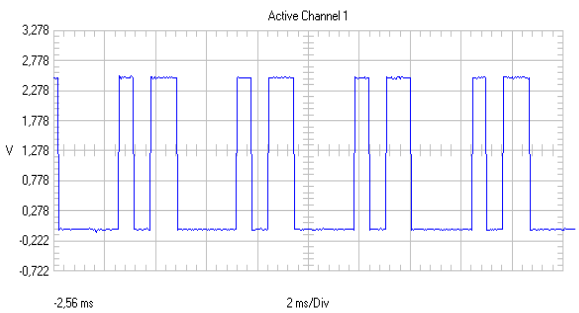



*Figure 12.20*

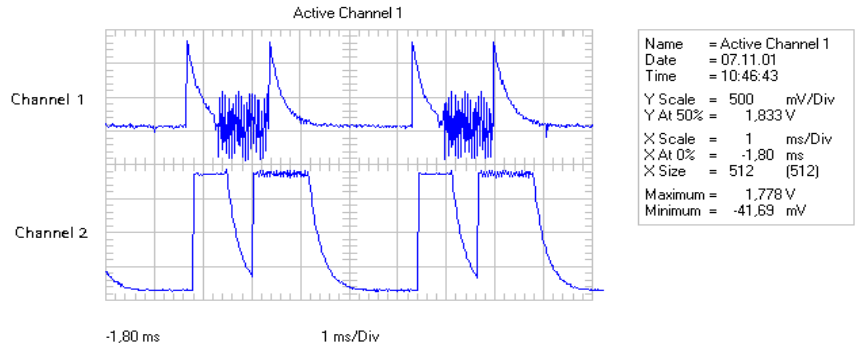


If 942.6 MHz RX-signal at C534 is ok, check same signal at both sides of L504:

Amplitude at L504 approximately is –56 dBm. If signal is not ok, check solderings of T501 and C520/528. Also check that attenuation of Z500 is not higher than 3.5 dBm.

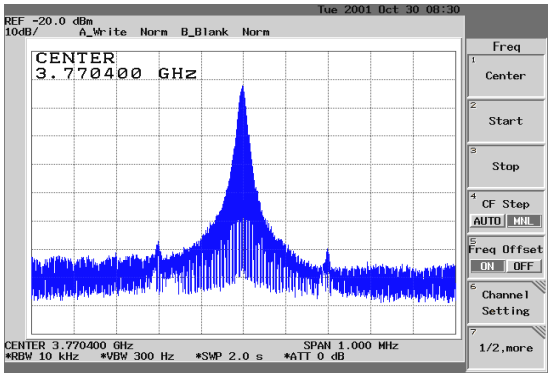
If 942.6 MHz RX-signal at L504 is ok, check 67.708 kHz at the four pads of C512 located towards N500:

*Figure 12-21*




Channel 1 only shows the AC-part of the signal while channel 2 shows the same signal on its DC-level.
If 67.708 kHz are not measurable, check signals which HAGAR needs to work:
Check VTCXO 2.7 VDC at C506/518, VRXRF 2.8 VDC at C500/503, VSYNTE 2.7 VDC at C501/502/504 and VCHP 4.7 VDC at C505. Also check HAGARReset at C540, SDATA at R300, SCLK/SENA at R301, refer to diagrams shown in section "No or too low TX-power GSM900".
Furthermore check signal of SHF-oscillator at T502 pin 3/4, 3770.4 MHz:

*Figure 12-22*

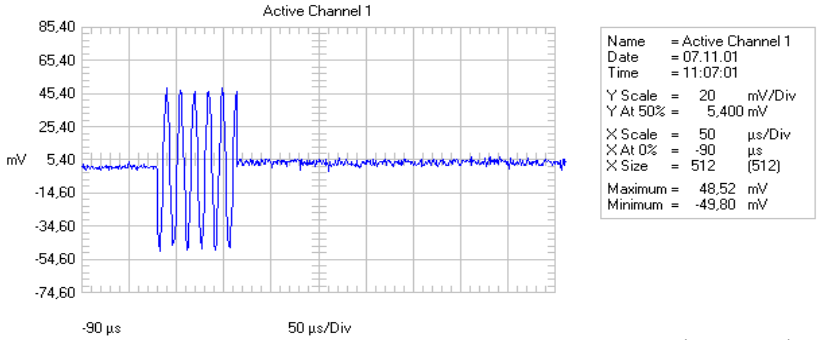



If SHF-oscillator does not work on expected frequency, check that voltage at C522 is 2.6 VDC. Also check control voltage at C558, which varies between 1.2 V and 3.3 VDC. If control voltage is 4.8 VDC, the oscillator is faulty or the control loop is open.
In case that it is necessary to rework G500 unfortunately you have to remove the RF-shielding first.

If all signals mentioned before are ok but no 67.708 kHz signal is measurable at the four pads of C512 located towards N500, change HAGAR N500.

If 67.708 kHz at the four pads of C512 located towards N500 are ok, check 67.708 kHz on 1.7 VDC–level at all four lines of R500:

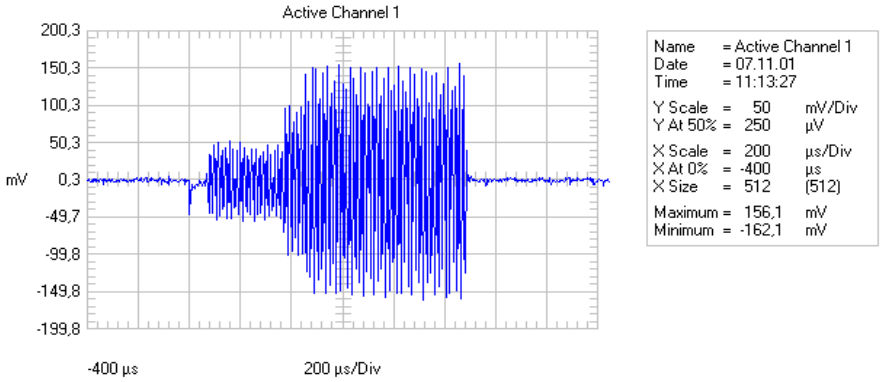
*Figure 12-23*




If signal is not ok, check C508 for shorts to ground, check resistance of R500 (4 x 100Ω) or change HAGAR N500.

If signals at R500 are ok, check 67.708 kHz on its constant DC-level of 1.2 V at R504:

*Figure 12-24*




If signal at R504 is not measurable, check VREF_2 1.35 VDC at C535/536 and RXREF 1.2 VDC at C529. Also check C514/526 if broken or cold soldered, change HAGAR N500 if necessary.

If 67.708 kHz at R504 is ok but RX-calibration is still not possible, check the following signals for COBBA N100:
Check VBB 2.8 VDC at C119, VCOBBA 2.8 VDC at C116/117 and VREF 1.5 VDC at C109, also check 13 MHz COBBACLK at J317 **(see figure 12-3 on page 29)**:

If these signals are ok, change COBBA N100.
In case that oxidized pads exist under COBBA, rework them with a few flux and solder, then replace the spare part with µBGA soldering machine.
Note that rewriting of SIMlock-data is necessary after changing COBBA, furthermore you have to make SW-update und retune RX/TX-values of the phone!

If fault persists after changing COBBA, MAD or PCB faulty in all probability.

### No RX-calibration GSM 1800 possible

Use WinTesla to set phone in following mode:
Initialize/ Product/ Band/ PCN/ Testing/ RF Controls/active unit RX Ch.700, burst mode.
Set RF-generator to a high RF-level output, e.g. –65 dBm.

To find a fault in GSM 1800 RX mode you can proceed almost the same way as described for GSM 900:

Check 26 MHz reference oscillator at C546, -10 dBm, frequency deviation < 100 Hz
Check 1842.8 MHz at C510. If not ok, check C593/547 or change Z501/502.
Check 1842.8 MHz at C519. If not ok, check that LNA V500 works, change V500 or N500 if necessary.
Check 1842.8 MHz at both sides of L500. If not ok, check C507/515, T500 or change Z500.
Check RXIQ signals at R504. If not ok, check signals at HAGAR N500 (VTCXO 2.7 VDC at C506/518, VCHP 4.7 VDC at C505, VSYNTE 2.7 VDC at C501/502/504, VRXRF 2.8 VDC at C500/503, VREF_2 1.35 VDC at C535/536, RXREF 1.2 VDC at C529, furthermore SCLK/SENA at R301, SDATA at R300, TXC at C542, TXP at J503, HAGARRESET at C540 and signal of SHF- oscillator at T502, 3685.6 MHz).
If signal at R504 is ok but still no RX-calibration possible, check signals at COBBA N100 (VBB 2.8 VDC at C119, VCOBBA 2.8 VDC at C116/117, VREF 1.5 VDC at C109 and COBBACLK at J317), change COBBA if necessary.

**Poor service or no network coverage, C508 faulty**

In case of this fault combined with an RX-calibration which works, but whose values are not ok (incorrect stepwidth as shown in figure 12-25), check signals at R500 and R504. The signals below were measured in RX-burstmode with an input level of –65 dB. Channel 1 shows the signals of a proper working phone while channel 2 shows the same signals of a phone in which C508 is faulty. R500 contains four resistors, so that you have to measure all four lines. It could happen that you will get the signal shown in channel 2 more than once. That means that more than one of the four capacitors in C508 are broken.

*Figure 12-25*

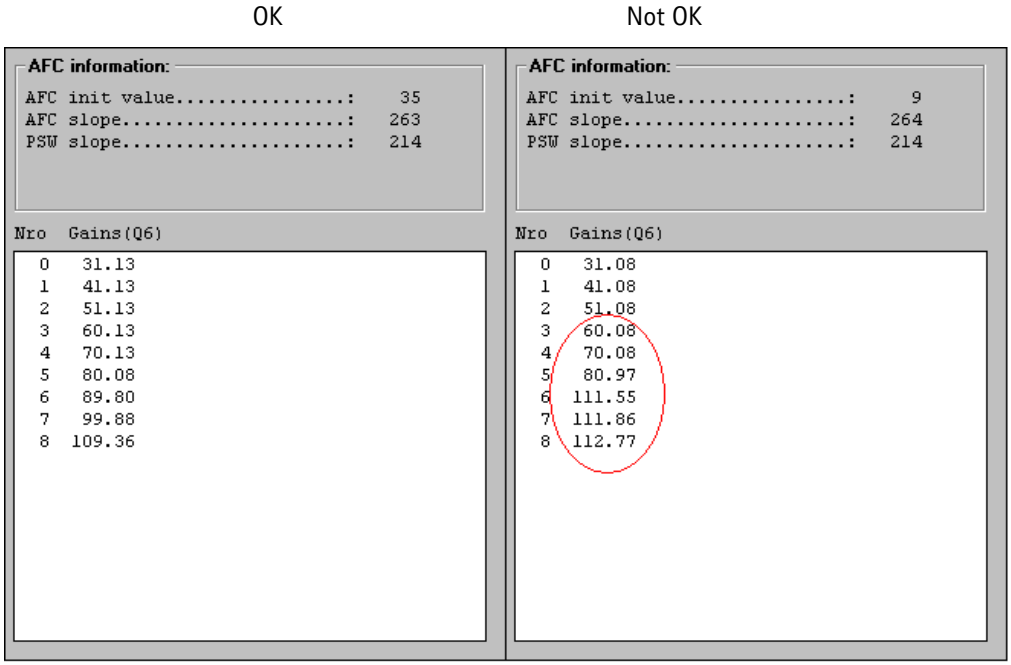



*Figure 12-26*

Signals measured at R504
(RX burstmode, input level –65 dBm):

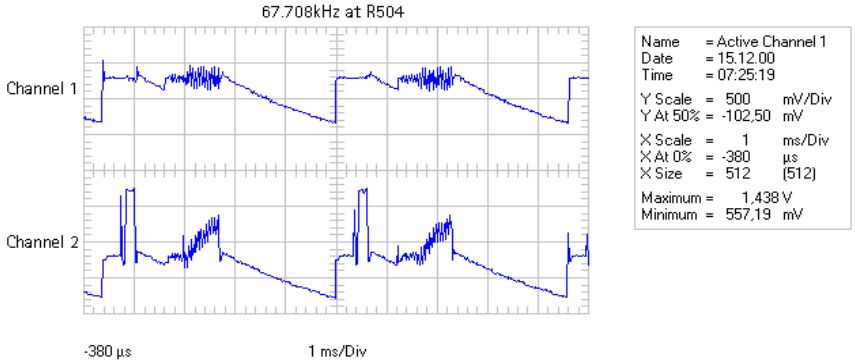
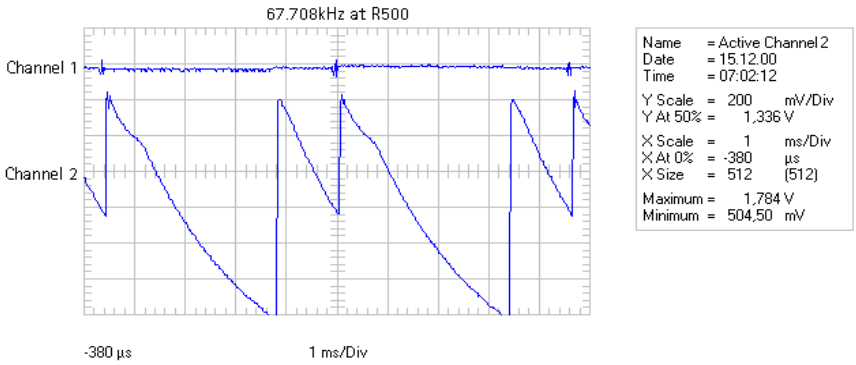



*Figure 12-27*

Signals measured at R500
(RX burstmode, input level –65 dBm):



## CHANGE HISTORY

| Originator | Status | Version | Date | Comment |
|---|---|---|---|---|
| CC-Training-Group | Draft | 0.1 | 14.02.2001 | First draft version for the repair group |
| CC-Training-Group | Draft | 0.5 | 02.03.2001 | Remarks of Repairgroup added |
| CC-Training-Group | Draft | 0.6 | 05.03.2001 | Chapter "Flash update not possible" added. |
| CC-Training-Group | Draft | 0.7 | 19.03.2001 | Remarks of Repairgroup added |
| CC-Training-Group | Draft | 0.8 | 23.03.2001 | Flowcharts and Frequency list Improved |
| CC-Training-Group | Approved | 1.0 | 27.03.2001 | First approved version |
| CC-Training-Group | Approved | 2.0 | 18.01.2002 | Notes AM-supression tuning added |
| CC-Training-Group | Approved | 3.0 | 01.02.2001 | Important Information "RF-tuning" added |