Troubleshooting Instructions

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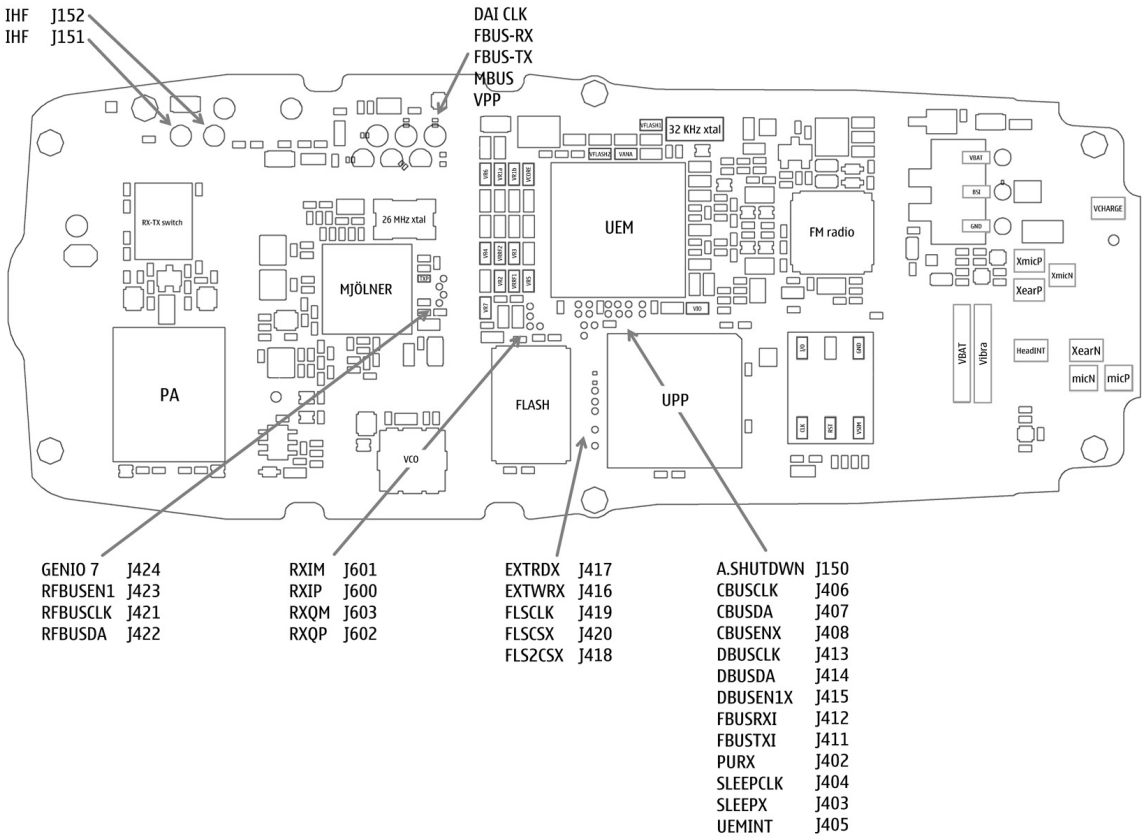
Baseband troubleshooting

Baseband testpads

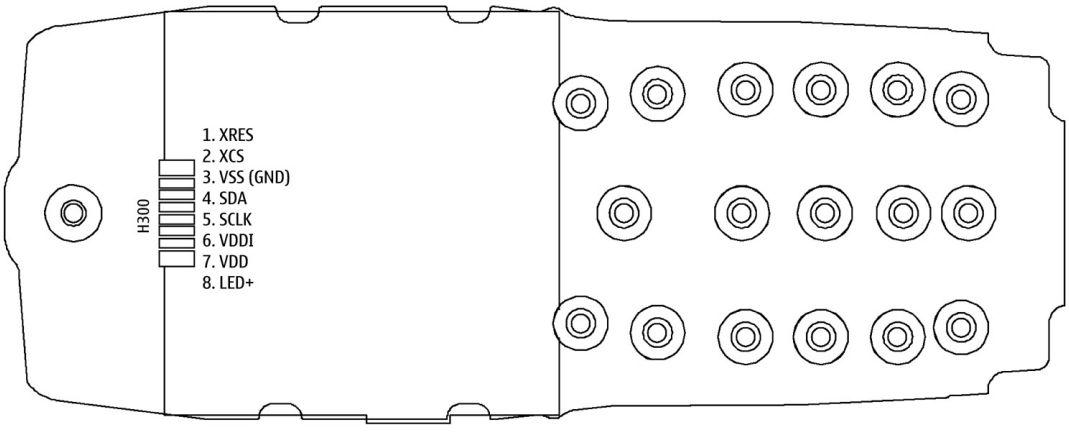
Component side (PWB backside)

Figure 1: Component side (PWB backside)



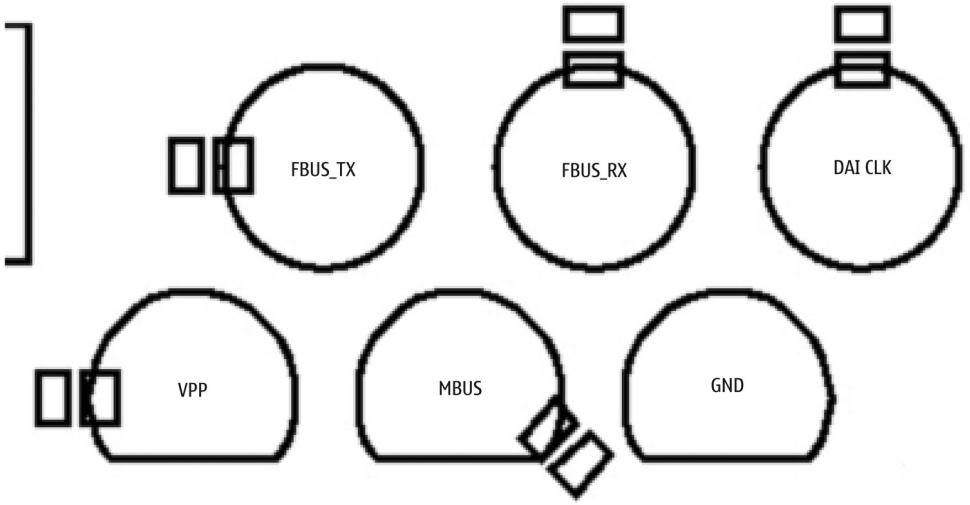
Display connector (PWB front side)

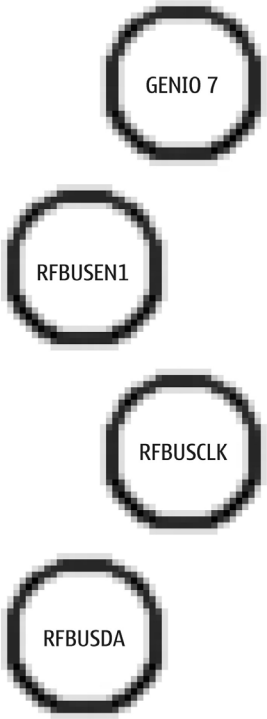
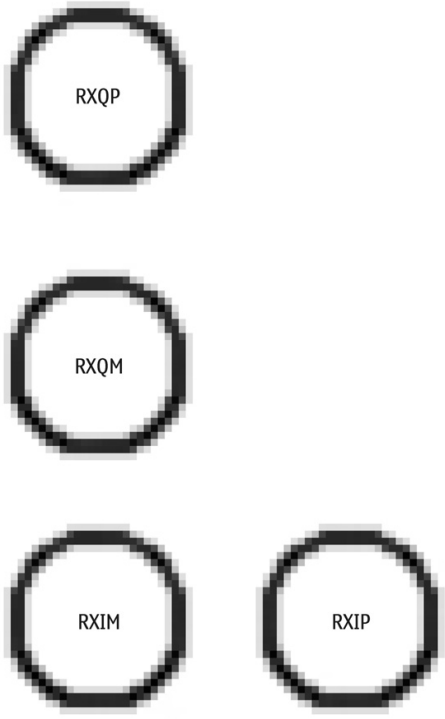
Figure 2: Display connector (PWB front side)

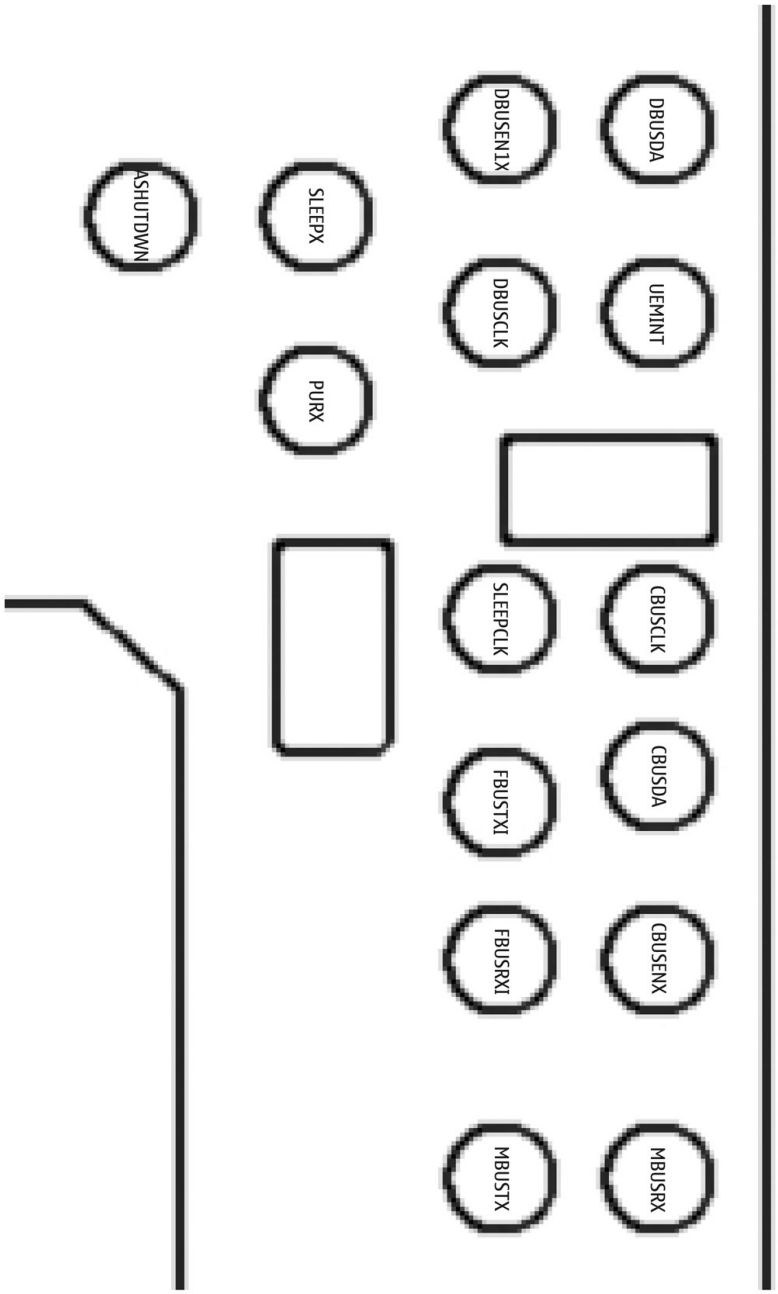


Close up of testpads

Production test pads for programming FLASH and service functions (J396)



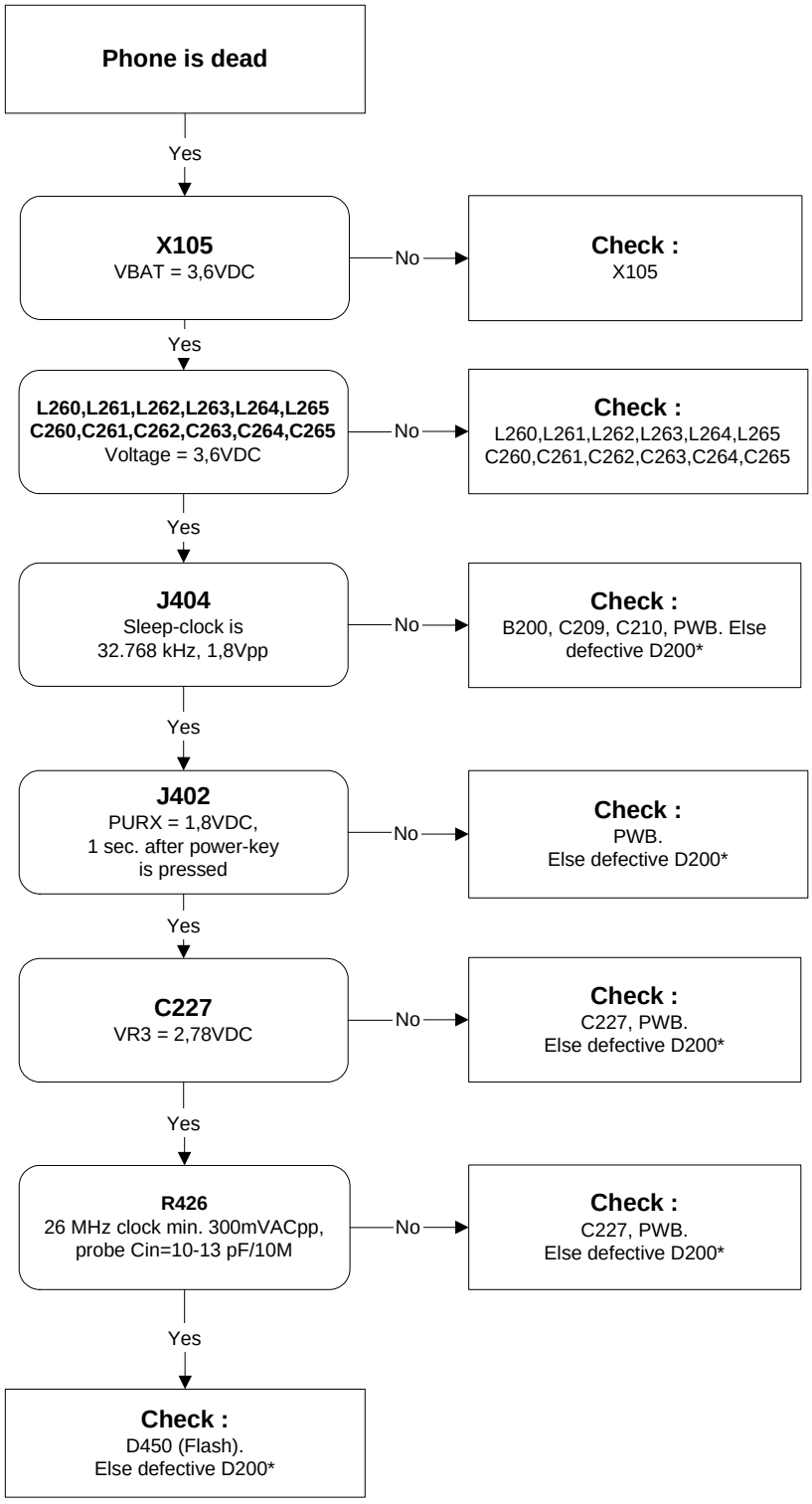
RFBUS	RF I/Q signals
	

FLASH	CBUS / DBUS / FBUS / MBUS / SLEEPX / PURX / AUDIO SHUTDOWN
	

Fault Finding Charts

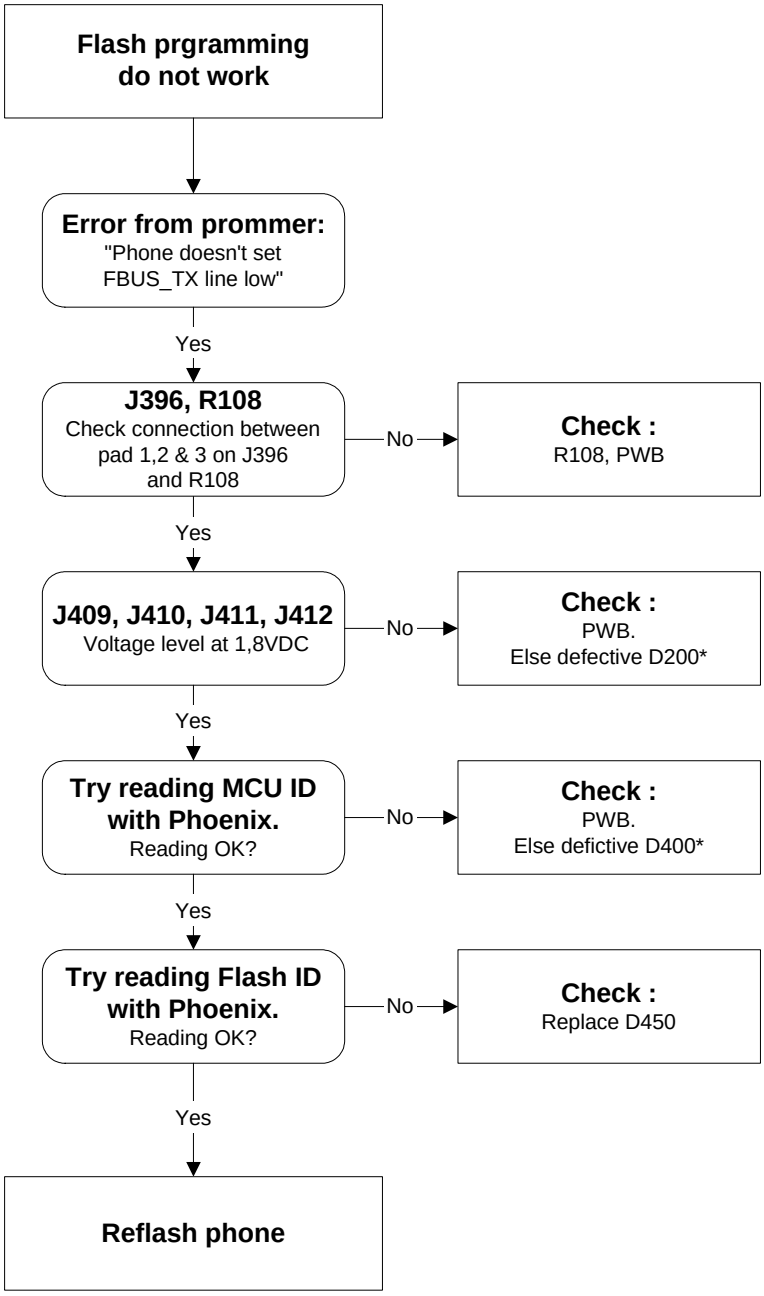
Phone is dead

Nominal battery voltage is 3.7 VDC. The phone (UEM) wont startup at battery/supply levels below 3.1 VDC. The software will turn off the phone at 3.21 VDC.



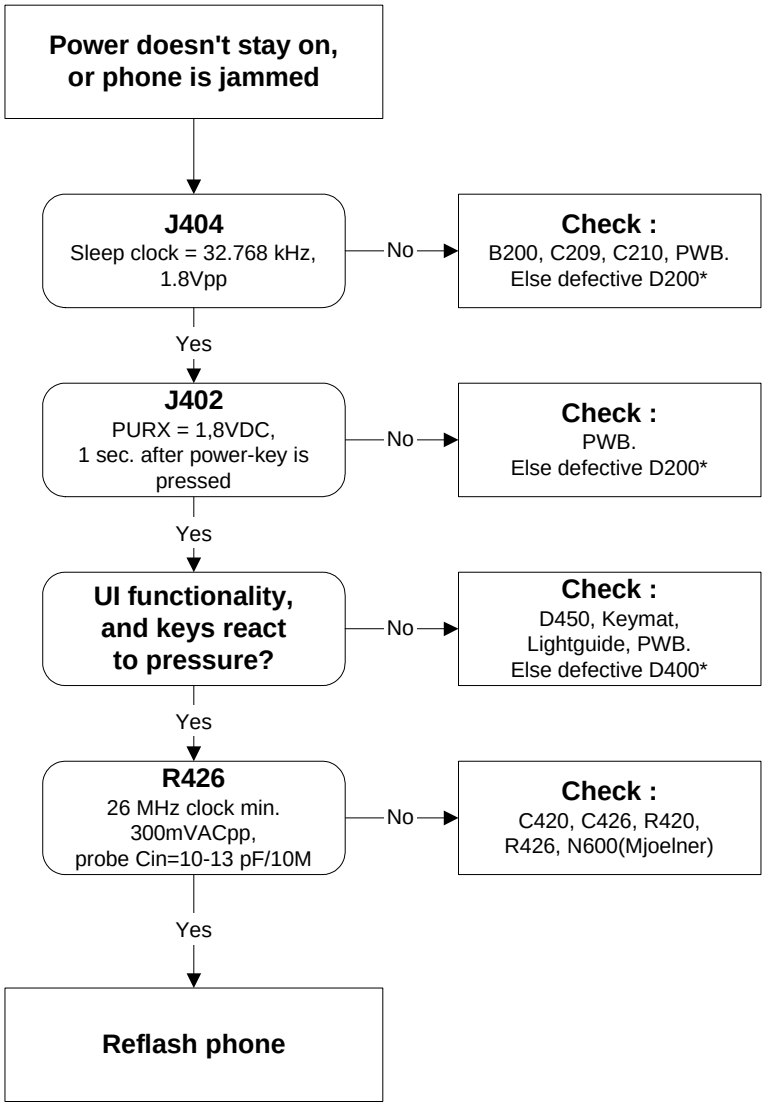
Flash programming does not work

.



Power doesn't stay on or phone is jammed

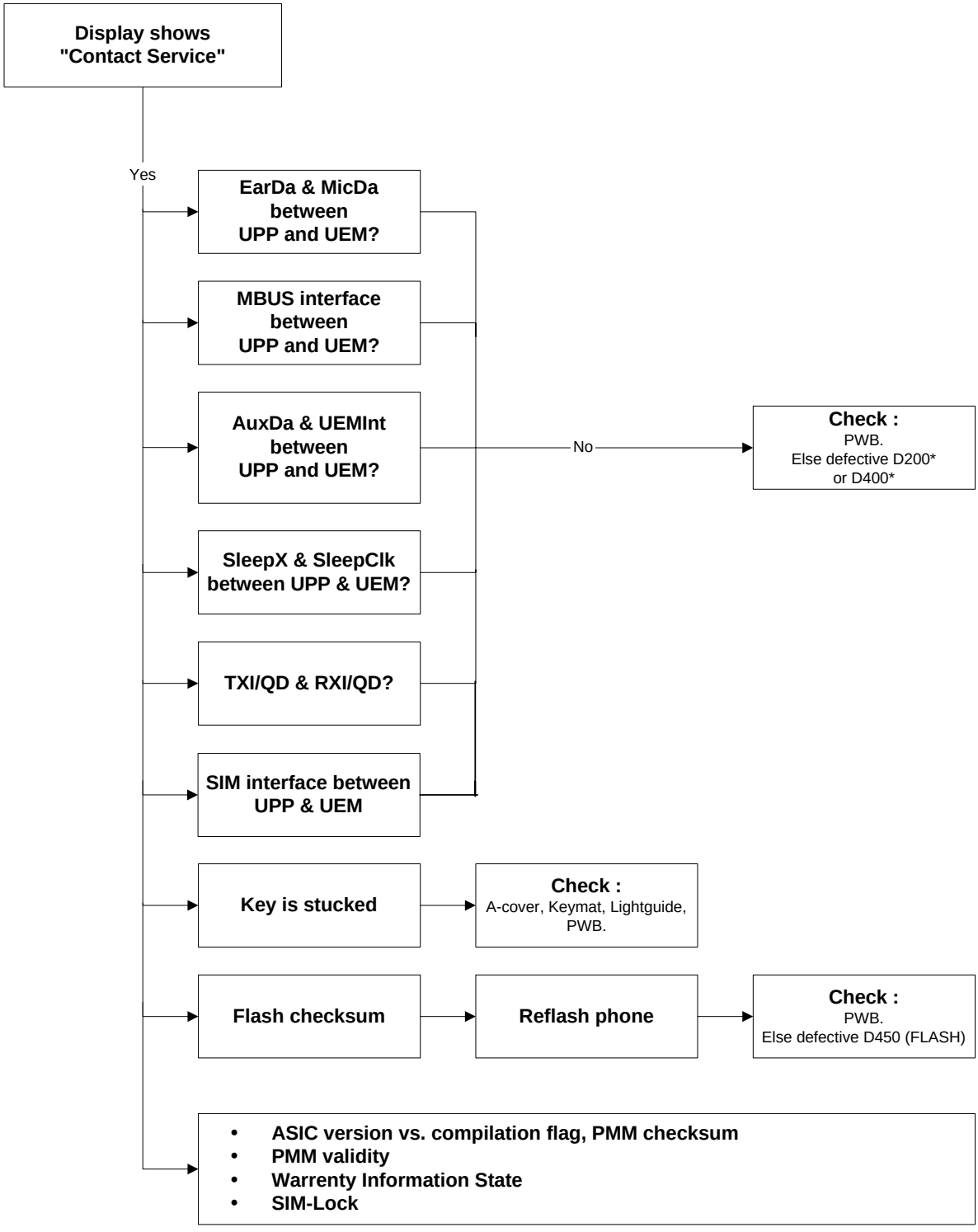
If for some reason the MCU does not service the watchdog register within the UEM, the operations watchdog will run out after approximately 32 seconds and should initiate a reset.



Display information: "Contact Service"

This message shows when internal self-tests have failed. If any of the following cases fails the display will show the message: "Contact Service".

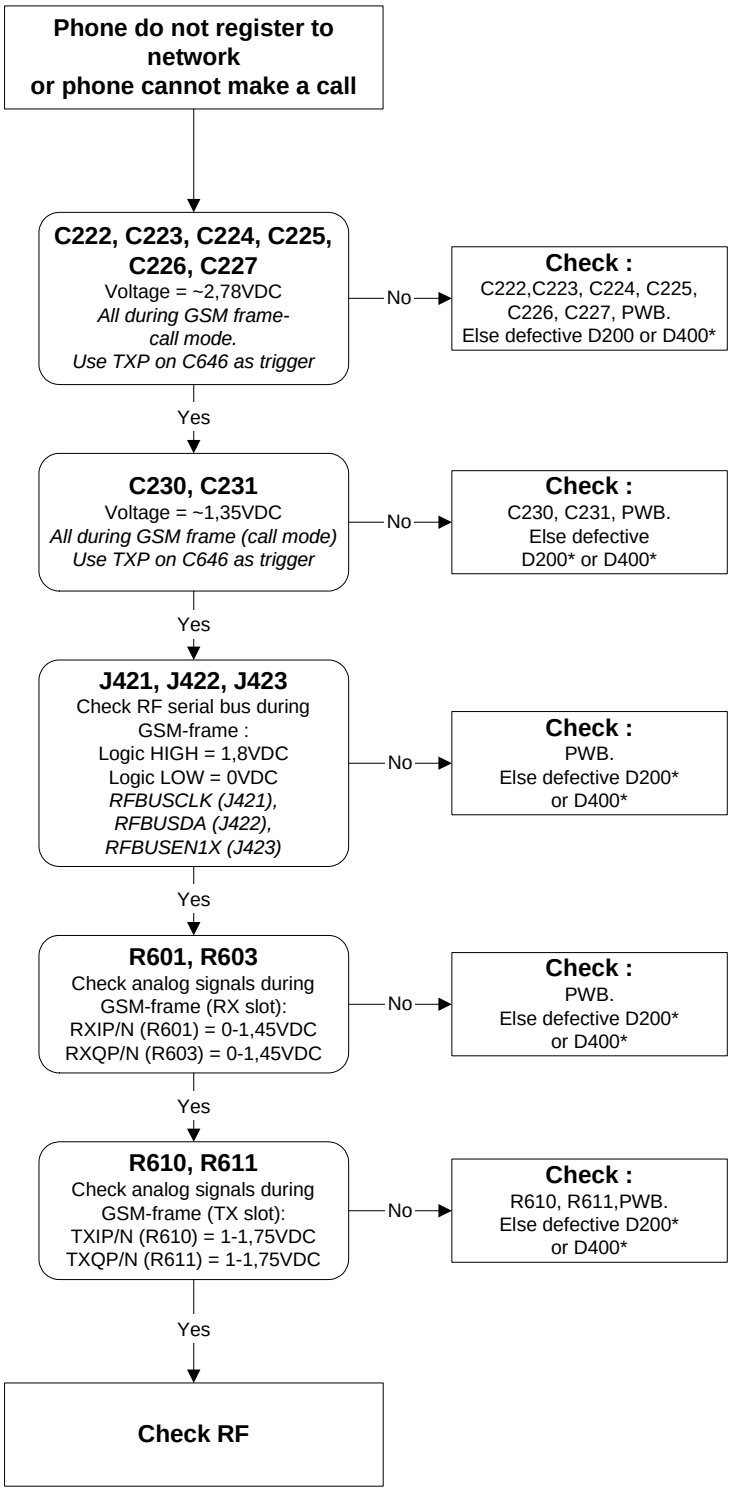
The lineup below has no chronological order. Use common sense and experience to decide which test case to start error hunting at.



No network or no call

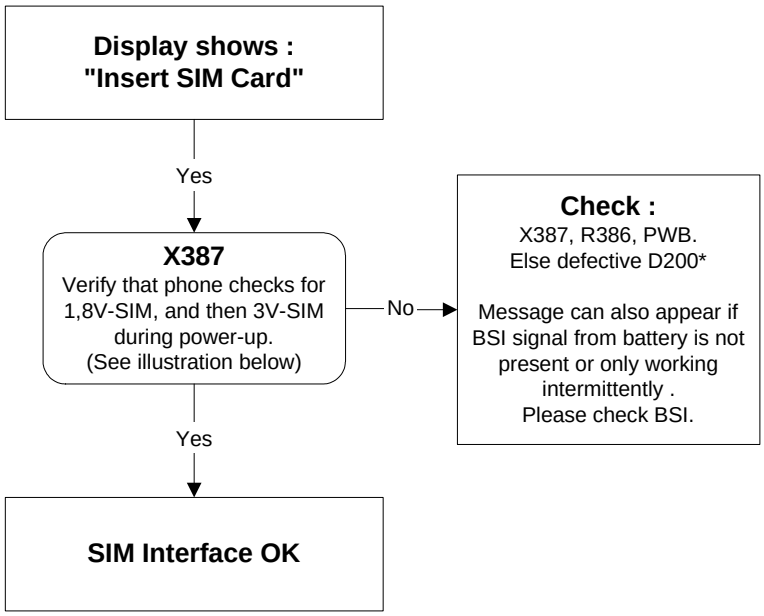
If the phone doesn't register to the network, the fault can be in either BB or RF. Only few signals can be tested since several signals is 'buried' in one or more of the inner layers of the PWB.

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

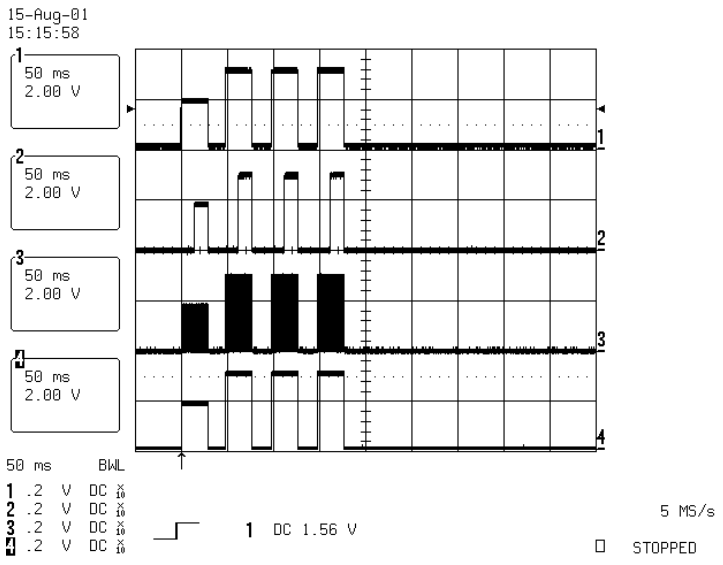


SIM related faults

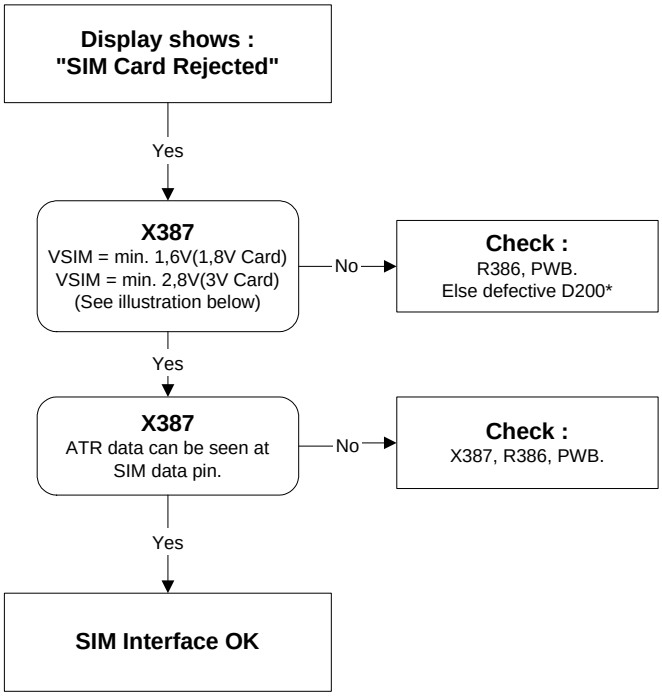
The hardware of the SIM interface from UEM (D200) to the SIM connector (X387) can be tested without a SIM card. When the power is switched on the phone first check for a 1.8V SIM card and then a 3V SIM card. The phone will try this four times, whereafter it will display ”Insert SIM card”.



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

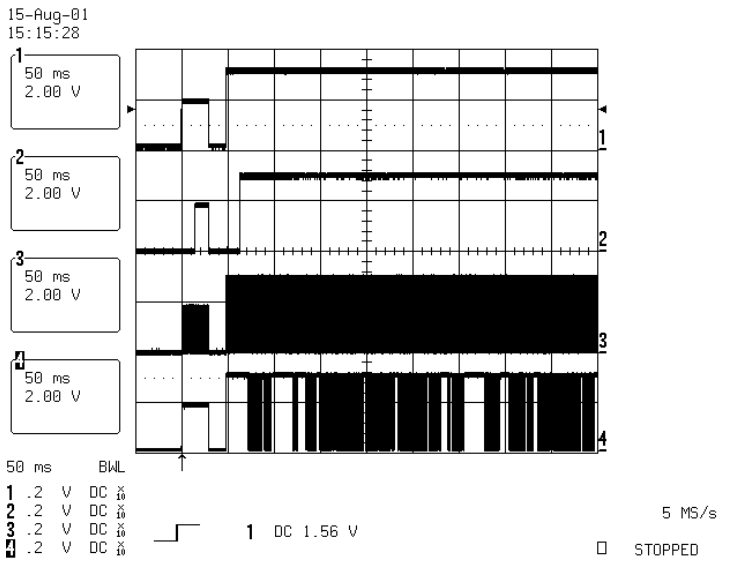


SIM-Card rejected



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

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

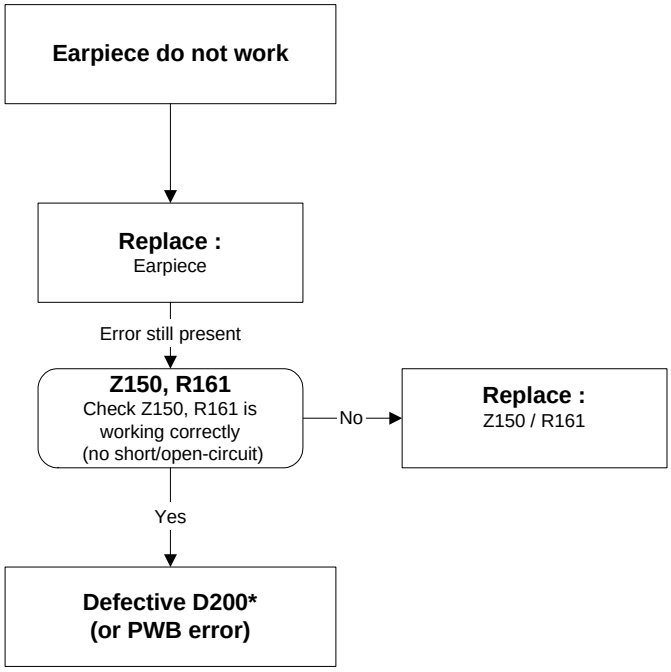


Audio related faults

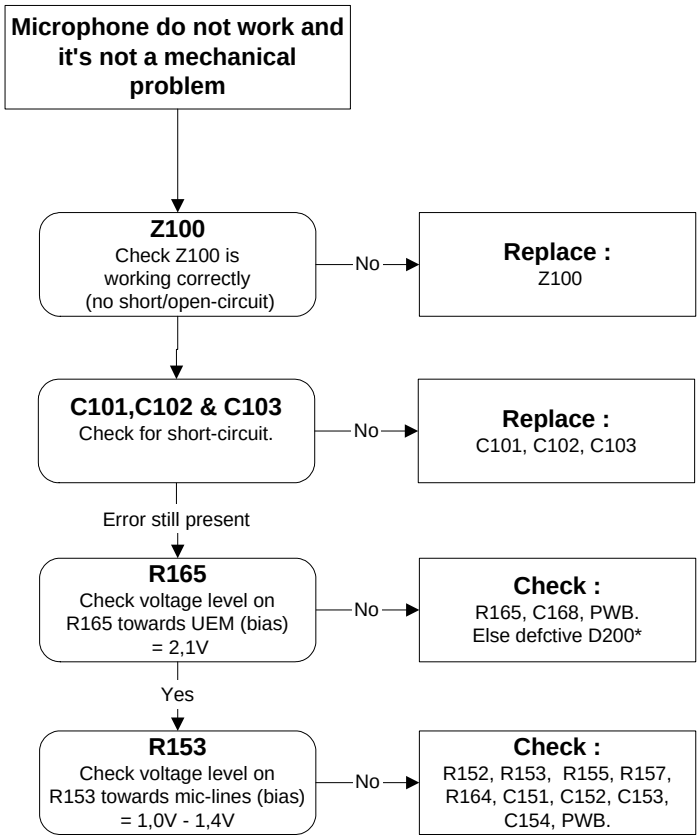
Earpiece = Speaker mounted in display assy.

IHF = Integrated handsfree. Speaker mounted in back cover (D-cover).

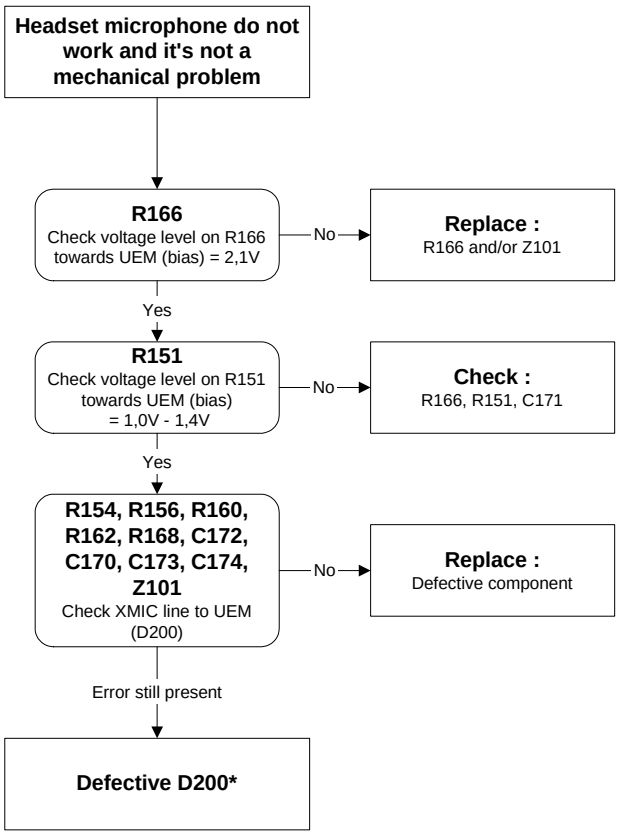
No sound in earpiece



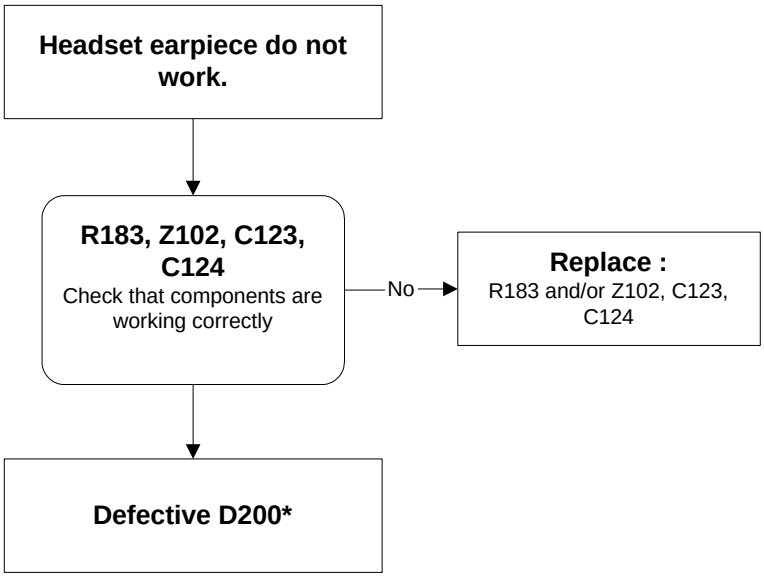
Microphone does not work



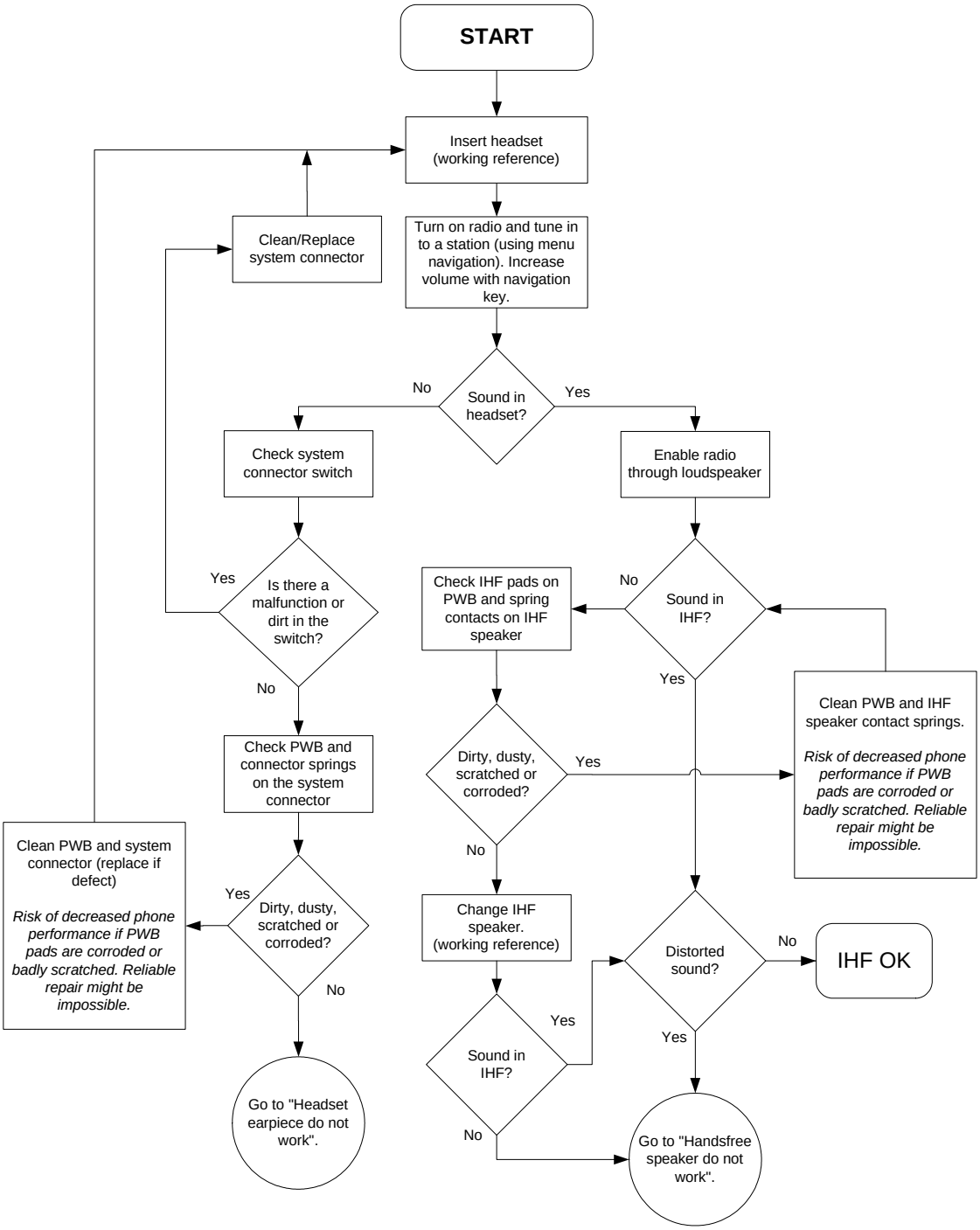
Headset microphone does not work



Headset earpiece does not work



No sound from IHF or headset



Handsfree speaker does not work

A FM signal generator at 88 MHz (1KHz LF) and 99% modulation was used as “radio station”.

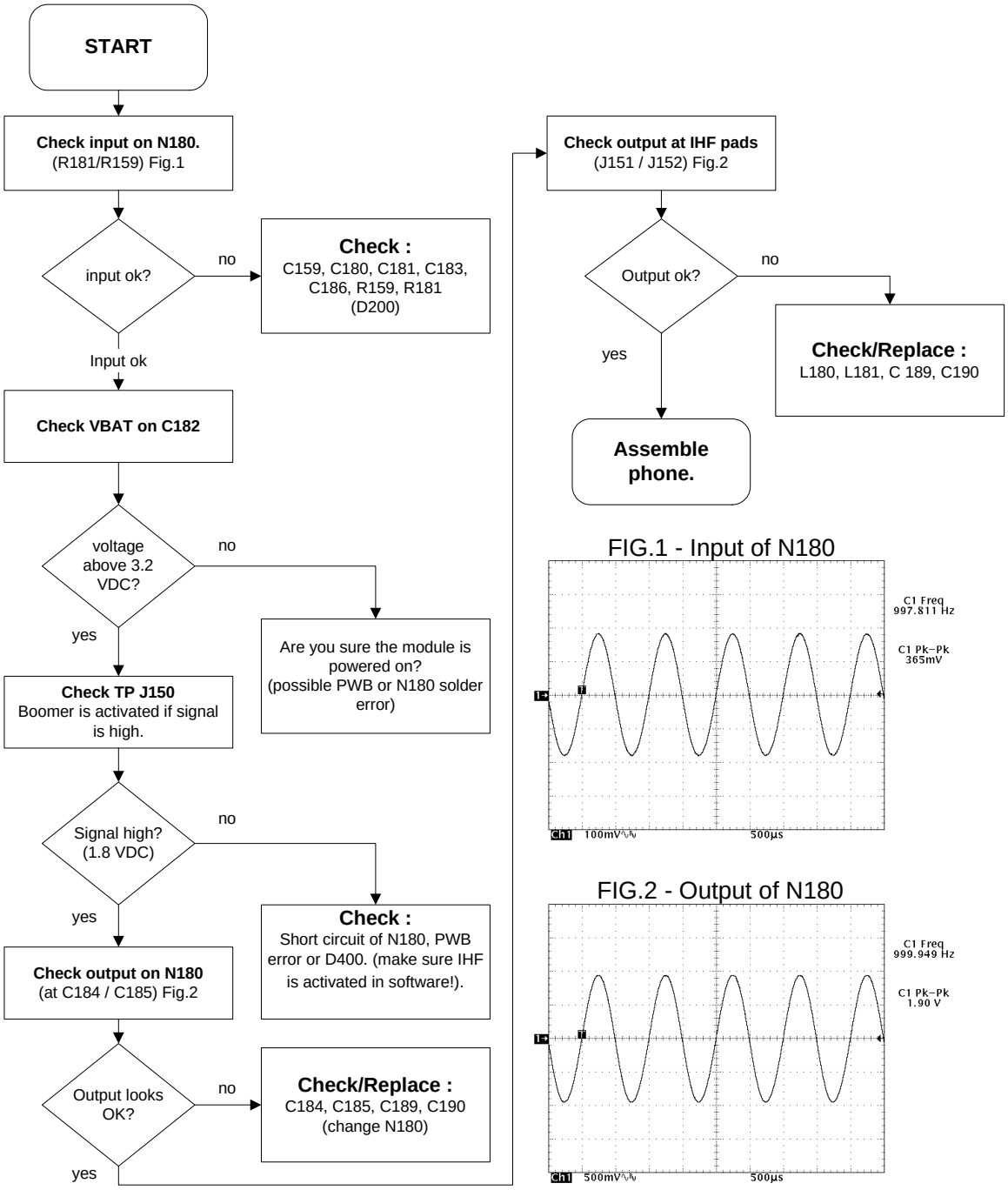
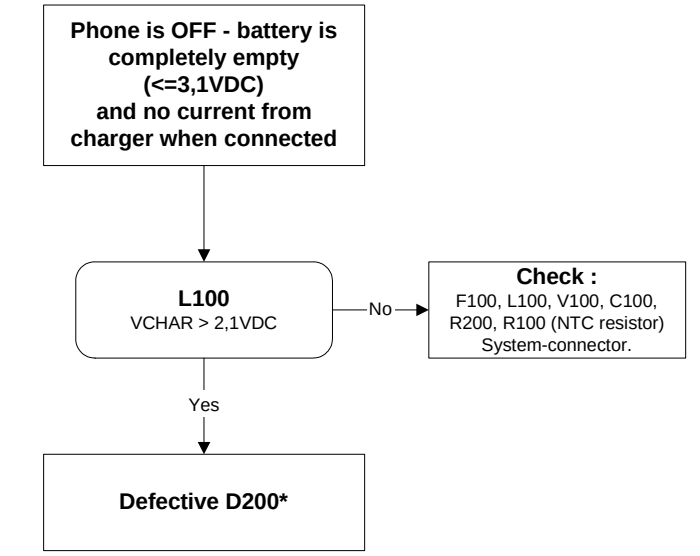
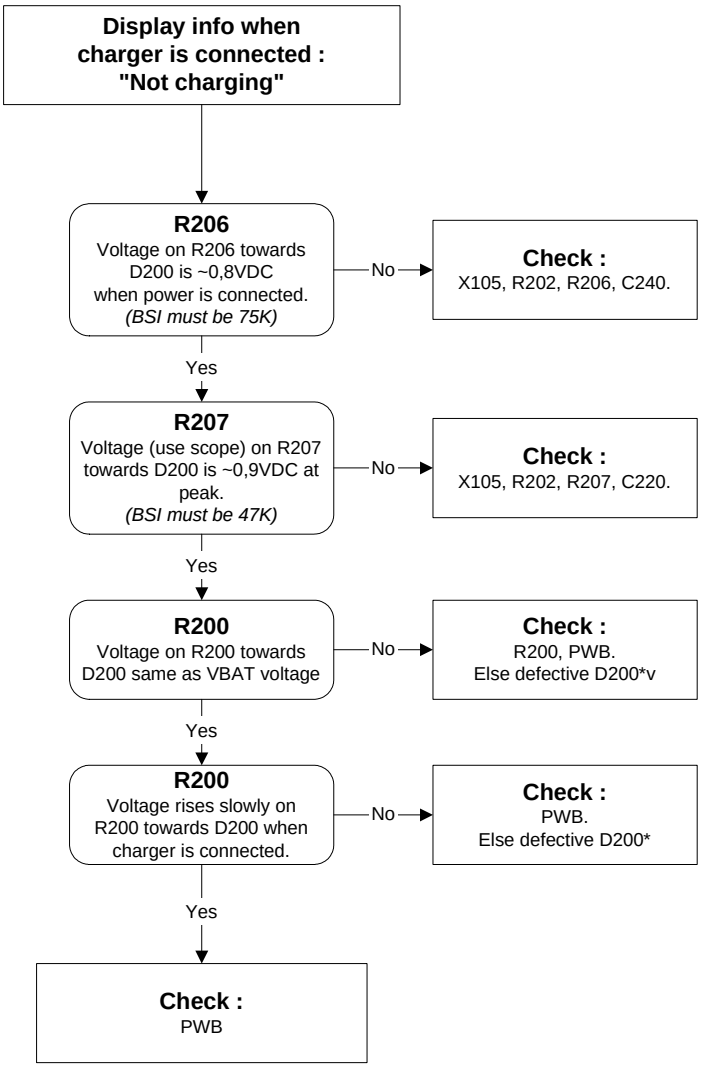


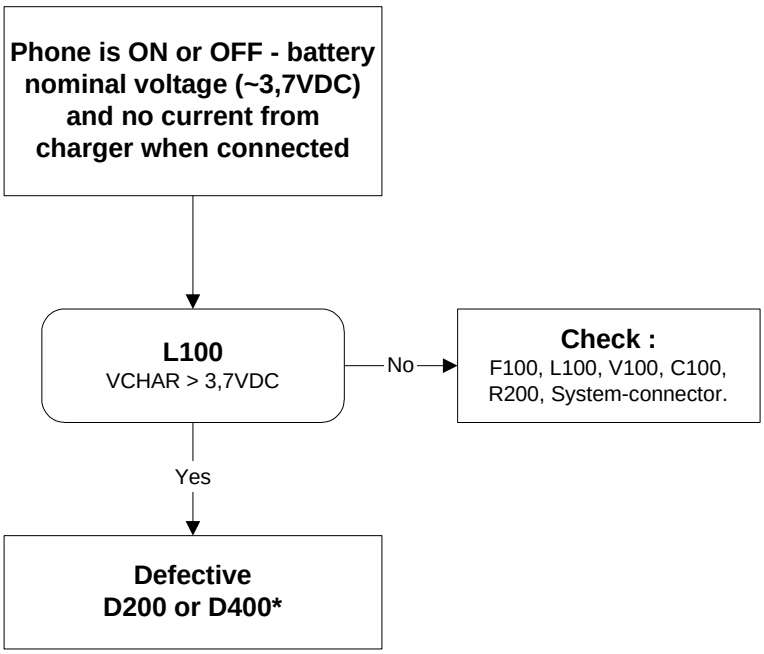
FIG.1 - Input of N180

FIG.2 - Output of N180

Charging faults







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General RF Troubleshooting

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

- RF measurements are done with a Spectrum Analyser and a high-frequency 500 ohm passive probe, for example HP54006A. (Note that when measuring with the 500 ohm probe the signal will be around 20 dB attenuated. The values in the following will have these 20 dB subtracted and represent the real value seen on the spectrum analyser).

Note that the testjig have some losses which must be taken into consideration when calibrating the test system.

- LF (Low frequency) and DC measurements should be done with a 10:1 probe and an oscilloscope. The probe used in the following is 10 Mohm, 8pF passive probe. If using another probe then bear in mind that the voltages displayed may be slightly different.

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

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

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

RF Key component placement

Figure 3: RF key components

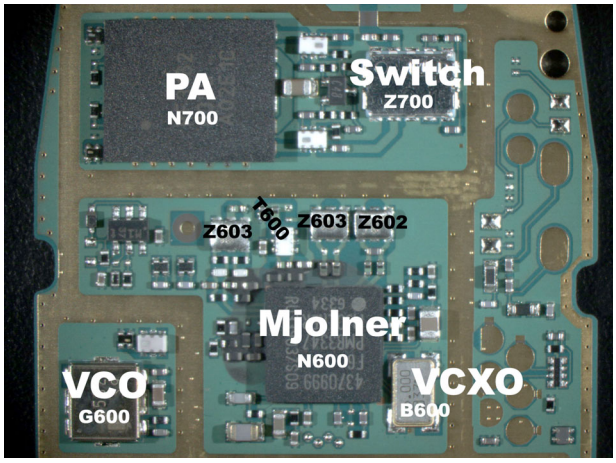


Table 1: RF component placement

N600	Mjoelner RF IC
Z601	PCN RX SAW
Z602	EGSM RX SAW
Z603	EGSM TX SAW
B600	26 MHz crystal
G600	VCO (4.0 GHz UHF VCO)
N700	Power Amplifier (PA)
Z700	RX/TX switch

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

Figure 4: Supply points at UEM (D200)

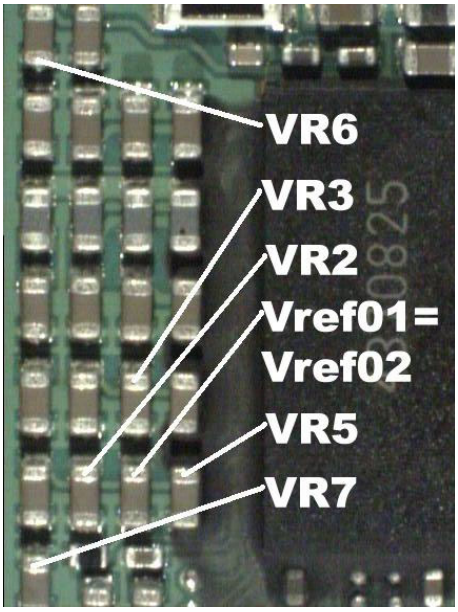
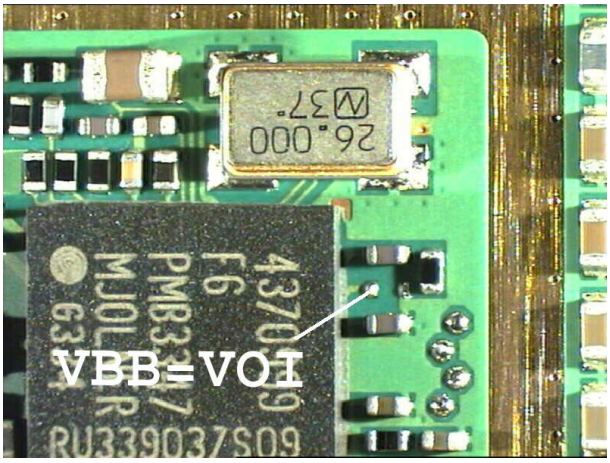


Figure 5: Supply point at Mjoelner (N600)



General Instructions for GSM900 RX Troubleshooting

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

Start Phoenix and establish connection to the phone

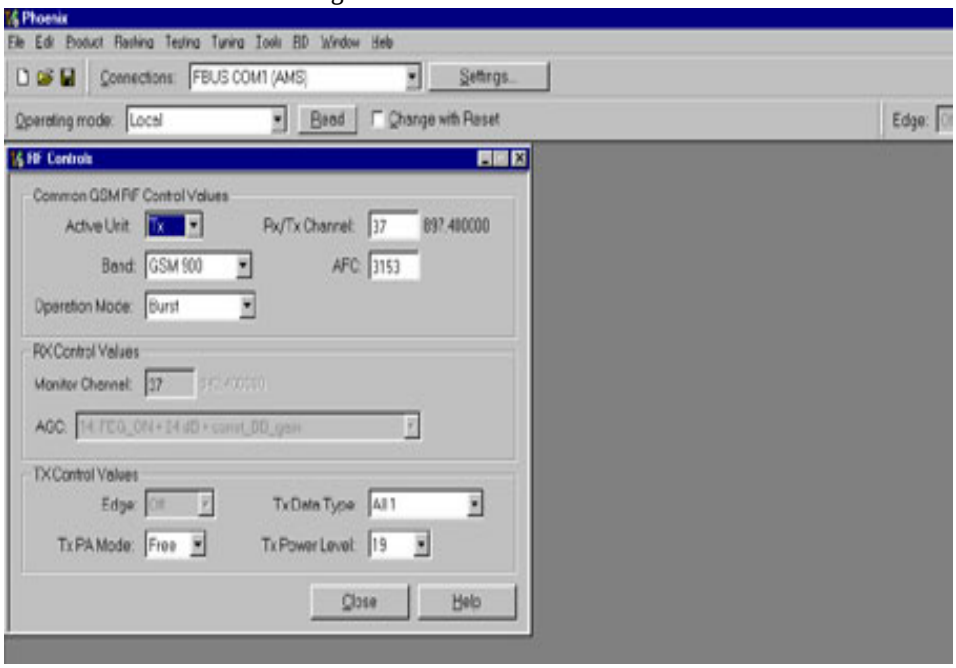
Phoenix commands

RF Controls .Band GSM 900 RX .Continuous mode

Channel 37 .AGC 8 FEG ON + 46 dB

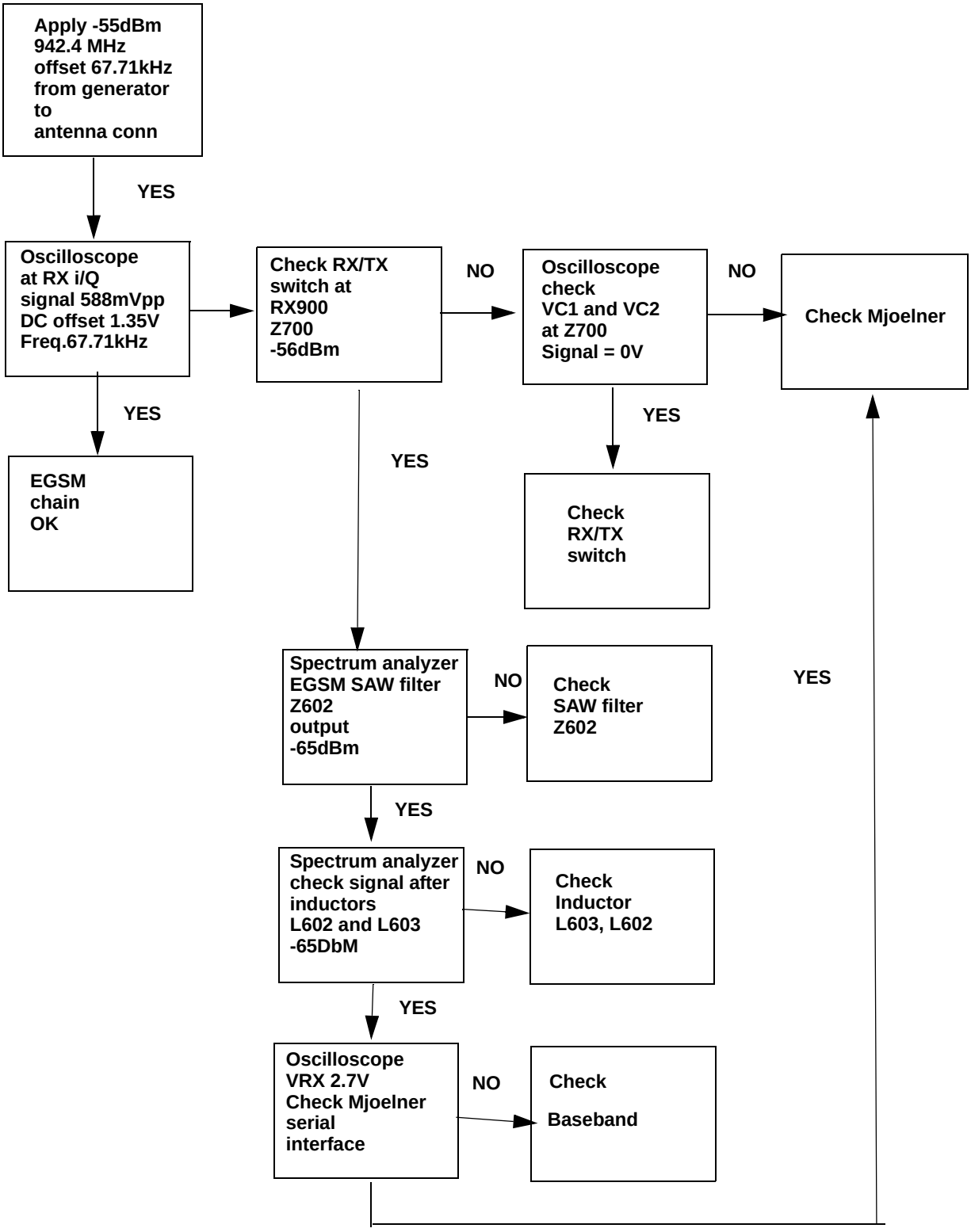
The setup should now look like this:

Figure 6: GSM900 RF Controls window



Troubleshooting Chart for GSM900 Receiver

Figure 7: EGSM Receiver Troubleshooting chart

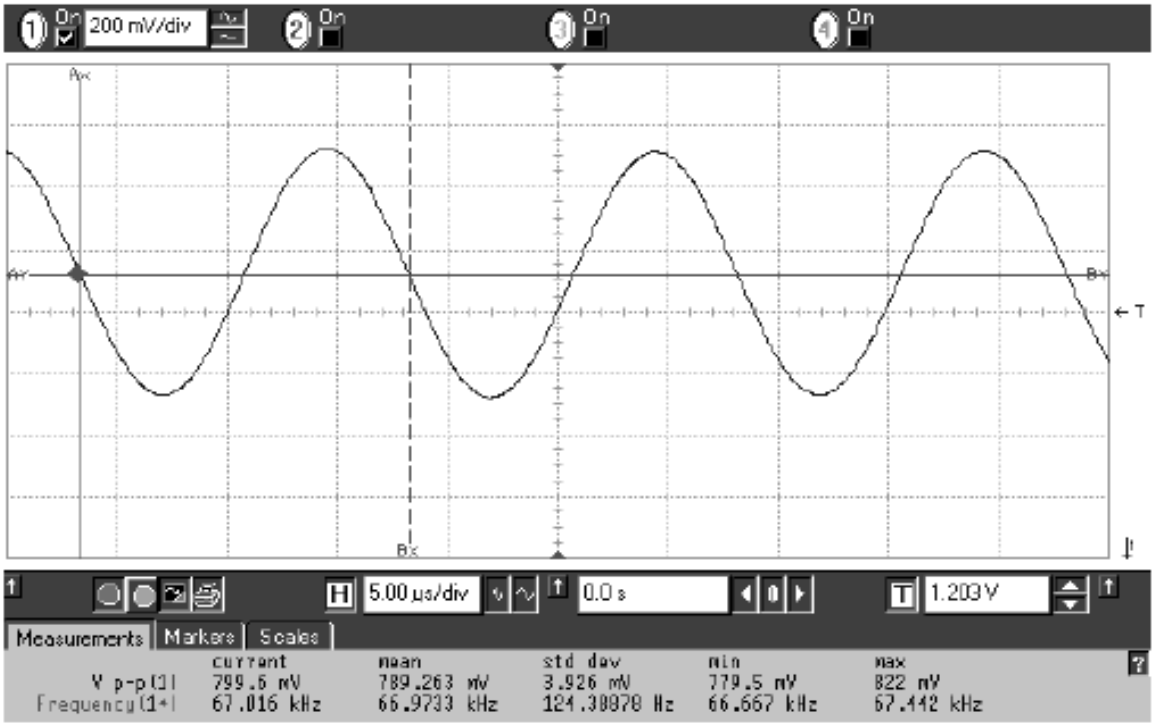


By measuring with an oscilloscope at RXIP or RXQP on a working GSM 900 receiver this picture should be seen.

Signal amplitude peak-peak 789 mV

DC offset 1.2 V

Figure 8: RX900 I / Q signal waveform



General Instructions for GSM1800 RX Troubleshooting

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

Start Phoenix and establish connection to the phone

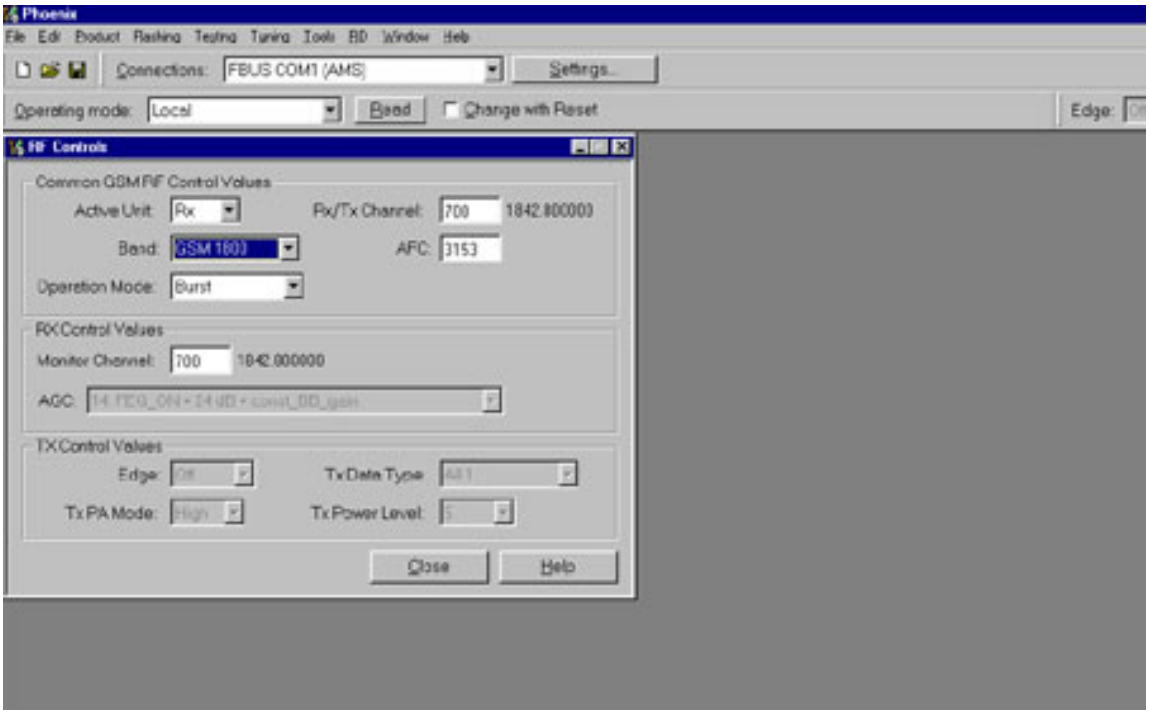
Phoenix commands

RF Controls .Band GSM 1800 RX .Continuous mode

Channel 700 .AGC 8 FEG ON + 46 dB

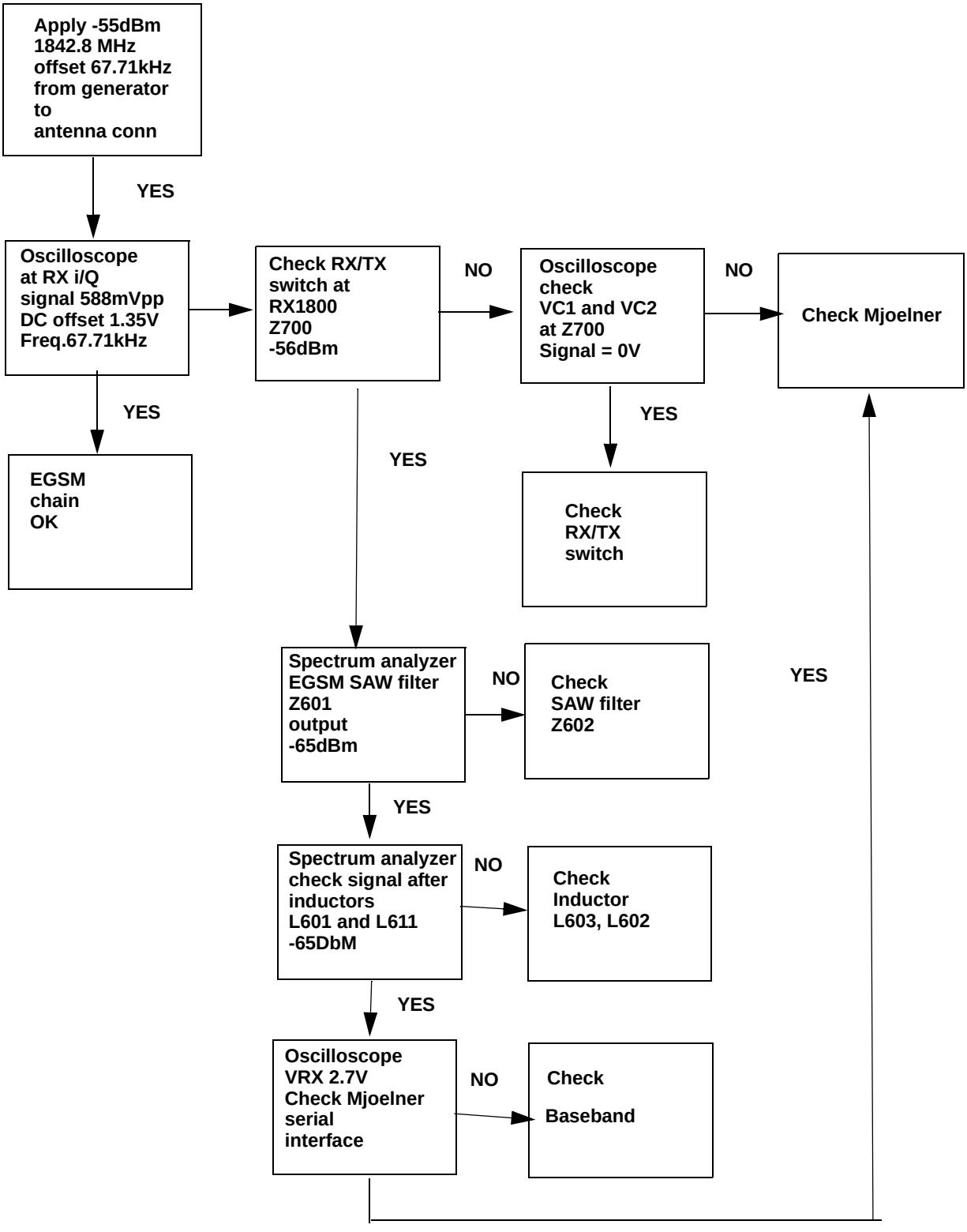
The setup should now look like this:

Figure 9: GSM1800 RF control window



Troubleshooting Chart for GSM1800Receiver

Figure 10: GSM1800 receiver Troubleshooting chart

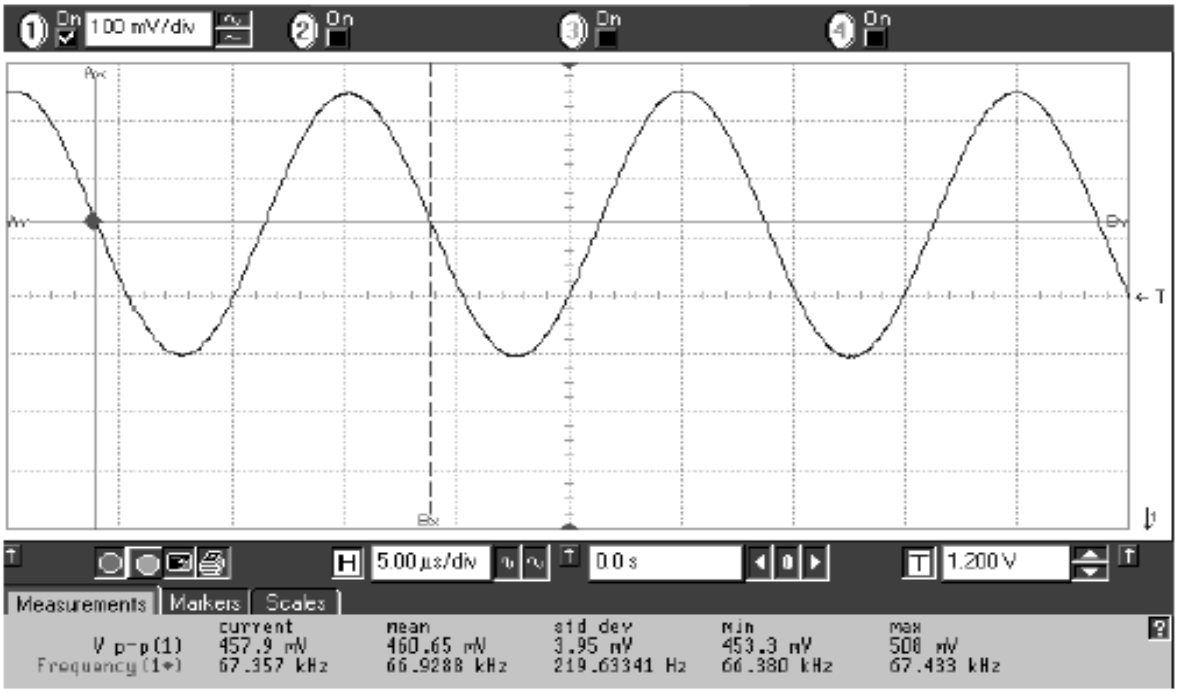


XIP or RXQP on a working GSM 1800 receiver this picture should be seen.

Signal amplitude peak-peak 460 mV

DC offset 1.2 V

Figure 11: RX1800 I/Q signal waveform



Measurement points in the receiver

Figure 12: RX measurements point at the RX/TX Switch - Z700

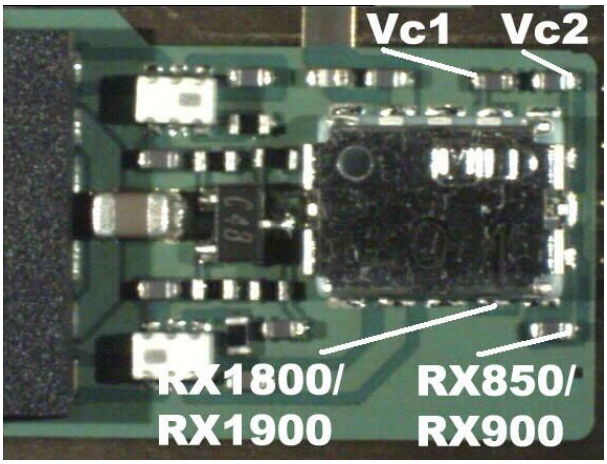


Figure 13: Measurements points at the RX-Filters – Z601 / Z602

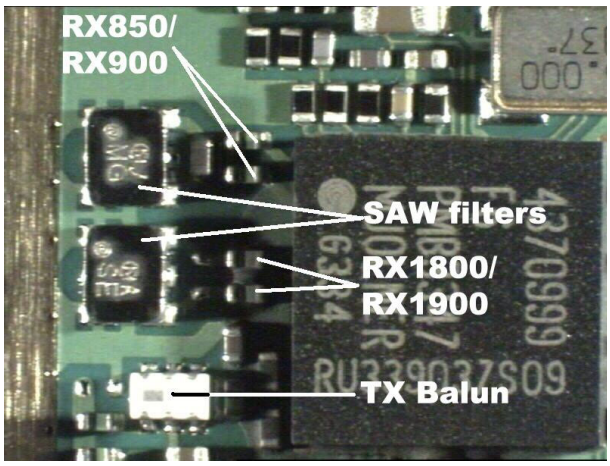
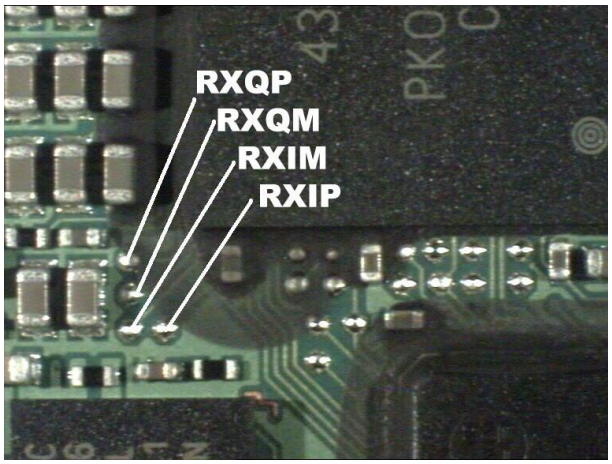


Figure 14: RX I / Q Signals, Baseband shielding can UEM (D200)



RM-4/RM-5 Transmitter troubleshooting

Measurement points for the transmitter

Figure 15: TX measurement points in the PA (N700) shielding can

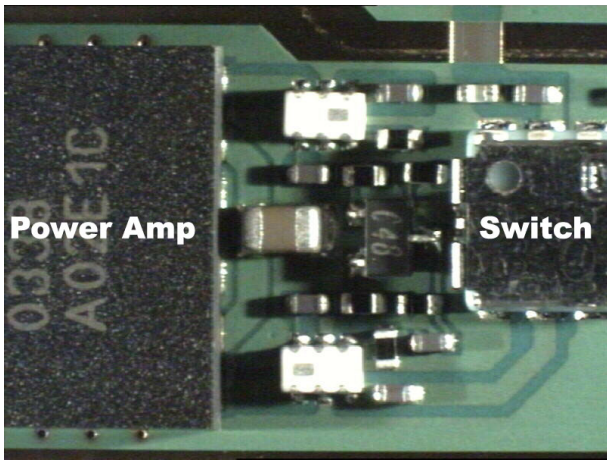
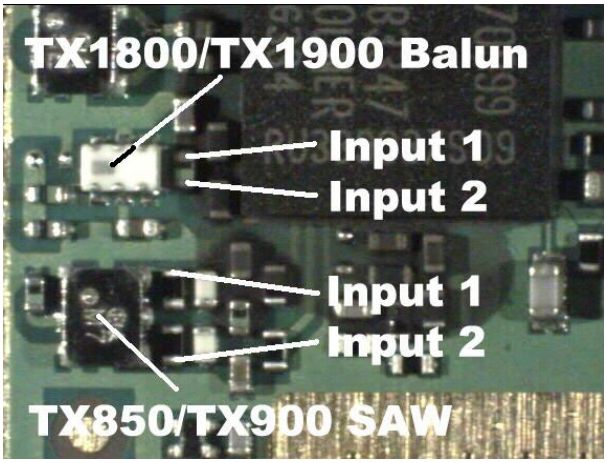


Figure 16: TX measurement points in Mjolner (N600) shielding can



General instructions for RM4/RM-5 GSM TX troubleshooting

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

Start Phoenix-Service-Software and establish a connection to the phone e.g. FBUS.

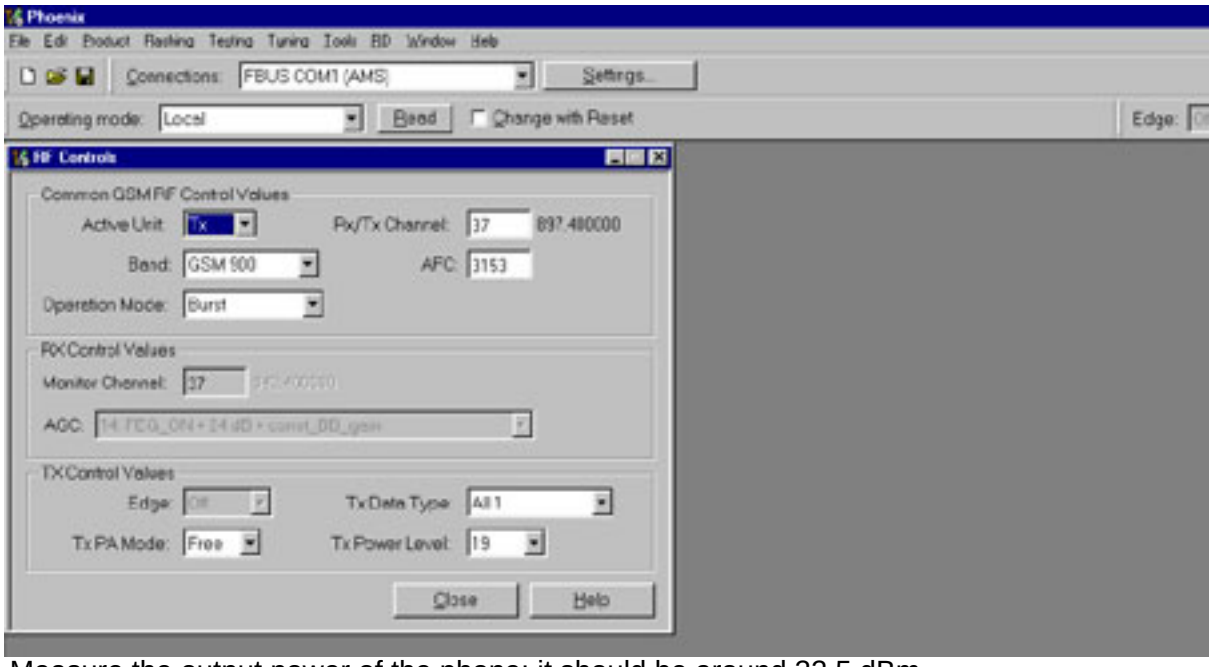
Select File and Product.

Select: Maintenance, Testing and RF Controls

Band:	GSM 900
Active Unit:	TX
Tx Power Level:	19
Tx Data Type:	All 1

Your screen should look like:

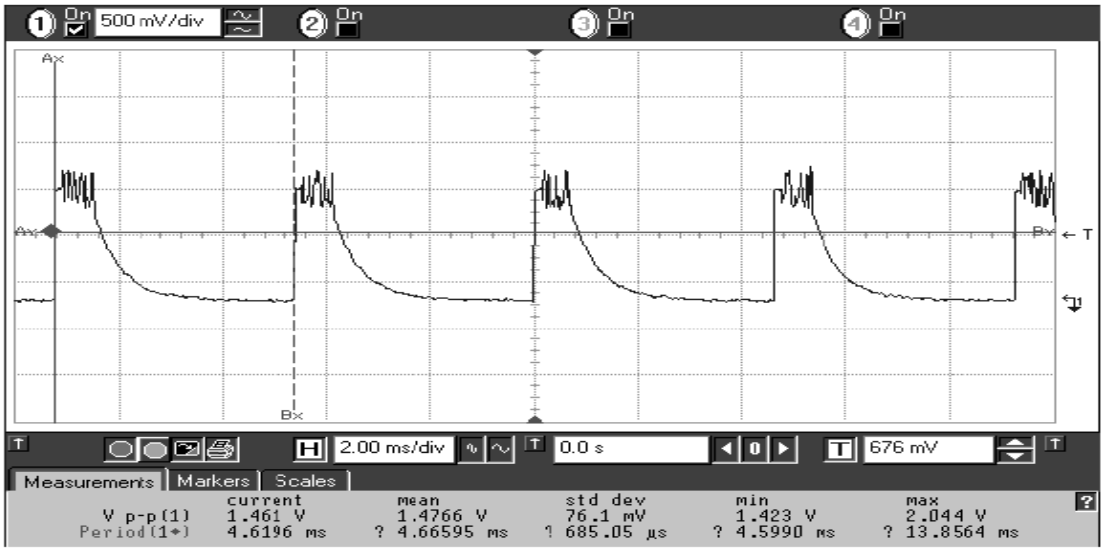
Figure 17: GSM900 RF controls window



Measure the output power of the phone; it should be around 32.5 dBm.

Remember the loss in the jig; around 0.3 dB.

Figure 18: VPCTRL_G and TXC signal



PCN Transmitter General instructions for PCN TX troubleshooting

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

Start Phoenix-Service-Software and establish a connection to the phone e.g. FBUS.

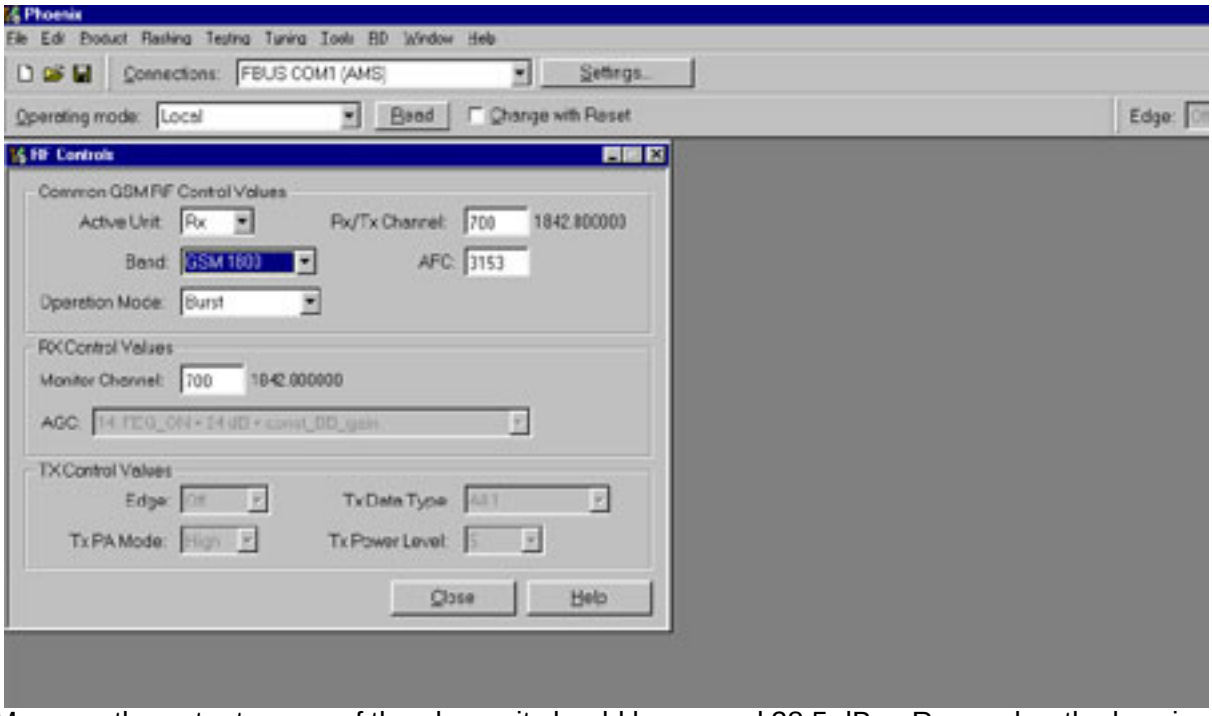
Phoenix commands

RF Controls .Band GSM 1800 RX .Continuous mode

Channel 700 .AGC 14 FEG ON + 24 dB

Your screen should look like:

Figure 19: RF controls window



Measure the output power of the phone; it should be around 28.5 dBm. Remember the loss in the jig; around 0.7 dB.

Synthesizer

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

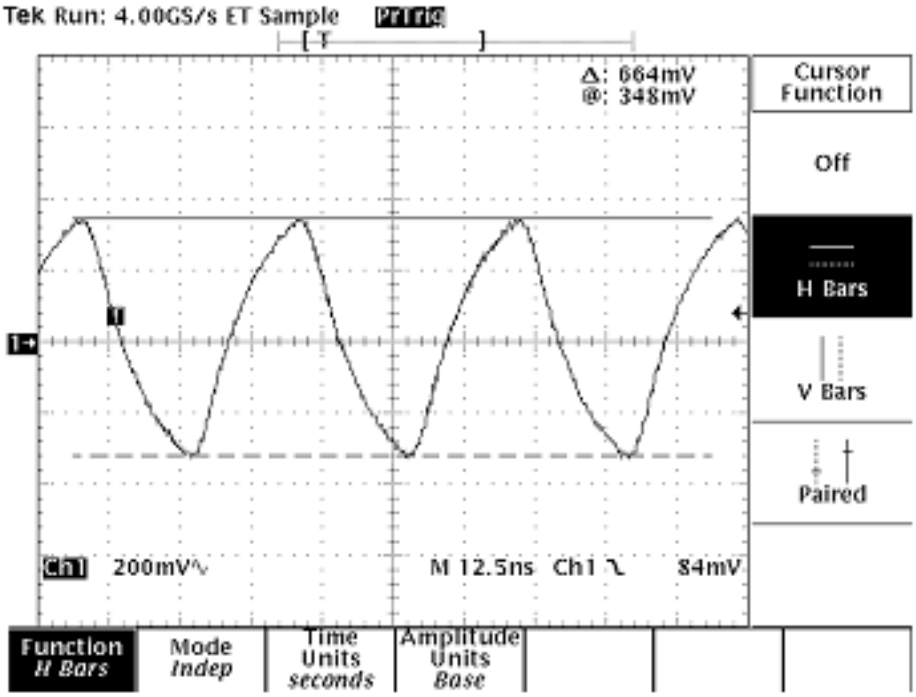
26 MHz Reference Oscillator (VCXO)

The 26 MHz oscillator is located in the Mjoelner IC (N600). The coarse frequency for this oscillator is set by an external crystal (B600). The reference oscillator is used as a reference frequency for the PLL synthesizer and as the system clock for BaseBand. The 26MHz signal is divided by 2 to achieve 13MHz inside the UPP IC (D400).

The 26 MHz signal from the VCXO can be measured by probing R425 (must be measured on the UPP side of R425 i.e. the end **not** connected to C425). The level at this point is approx. 700mVpp. Frequency of this oscillator is adjusted by changing the AFC-register inside the Mjoelner IC. This is done via the Mjoelner serial interface.

Example Signal Measured at VCXO output (R425)

Figure 20: VCXO 26 MHz waveform



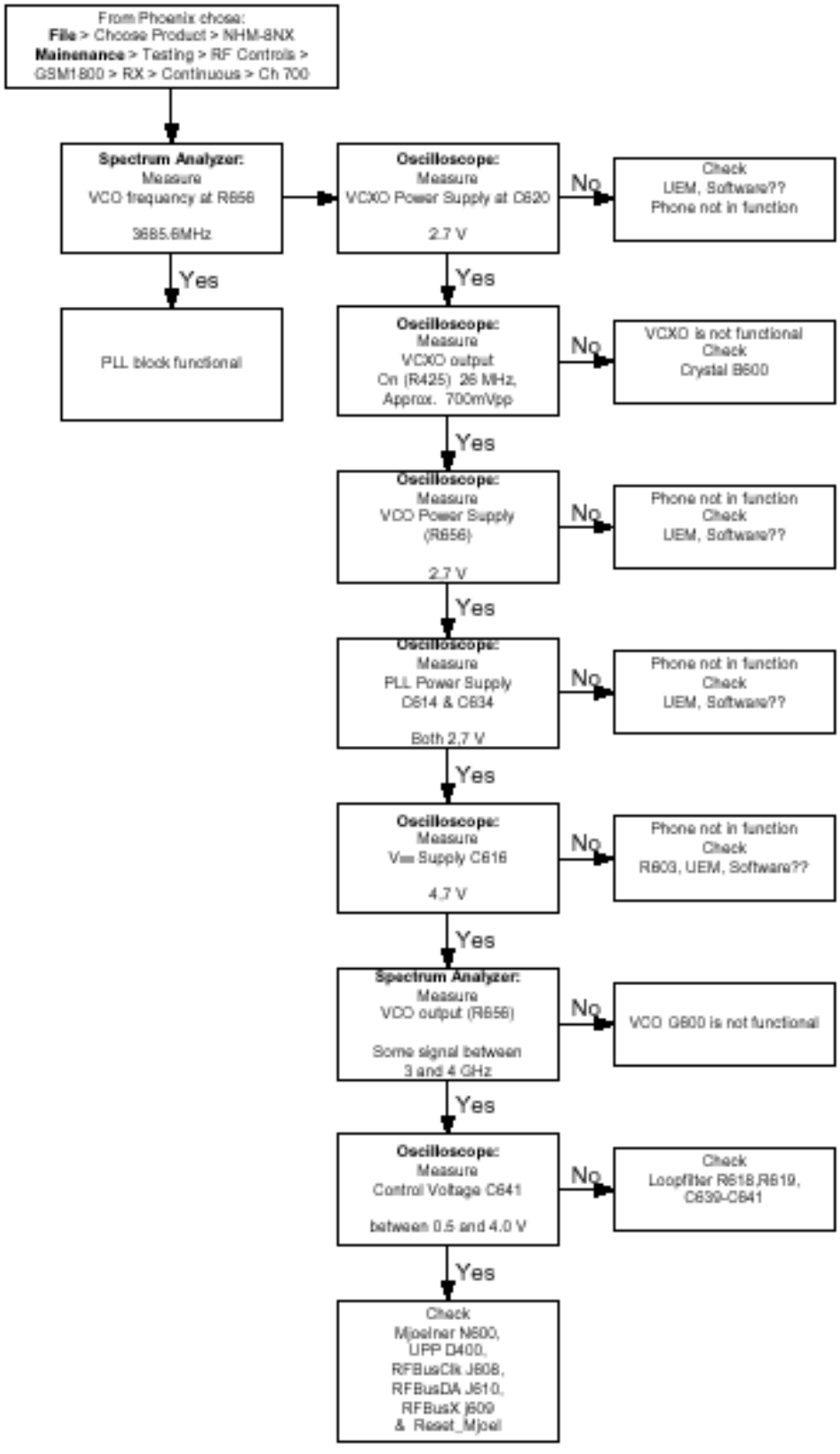
VCO

The VCO is an ASIC with all the frequency determining parts inside.

In order to reduce the requirements of the tuning voltage and coverage of the VCO, the VCO core is composed of four VCOs in parallel. This VCO circuit enables a very wide tuning range of 3.4 - 4.0 GHz .

Troubleshooting diagram for PLL Synthesizer

Figure 21: PLL Troubleshooting diagram



Phone fails after power on

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

1 Turn on the phone and check

2 VCXO Power supply (C620) = 2.7V

3 VCXO output (R420 – end **not** connected to C425) is 26MHz and approx. 700mVpp

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

Measurement points at the VCXO

Figure 22: Measurement point for VCXO supply

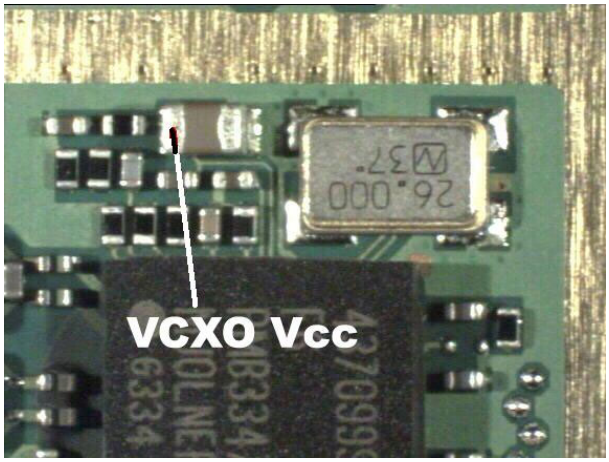
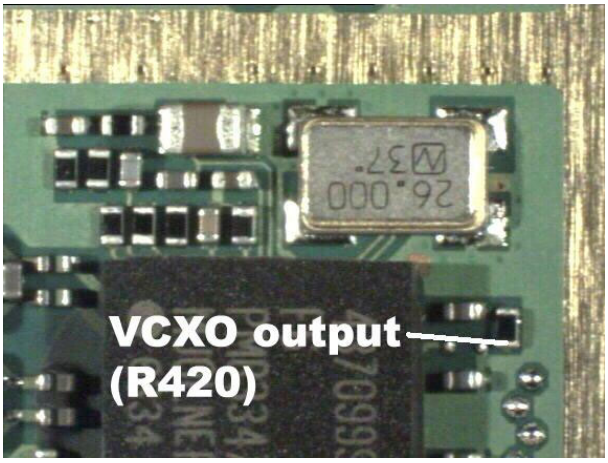
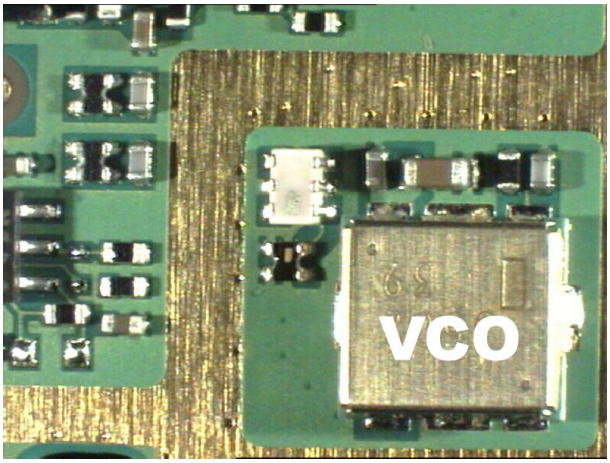


Figure 23: Measurement point for VCXO output



Measurement points at the PLL/VCO

Figure 22: Measurement point for PLL



Manual Alignment using Phoenix

In Phoenix select connection Fbus and Product Gemini. If you power up the board before selecting Fbus, it works without any error messages.

Use Jig or other device for RF and bus connection. Attenuation in the probe alone is 0.5dB for 900 and 1dB for 1800. Use CMD55 or other suitable device. Default channels are 37 for GSM900 and 700 for GSM1800. The alignments and calibrations must be performed in the order shown to give reliable results.

The way to save data to the phone and to load data from the phone is made different in the various tunings. Always look what is shown in the windows regarding these issues and act accordingly.

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

RX calibration

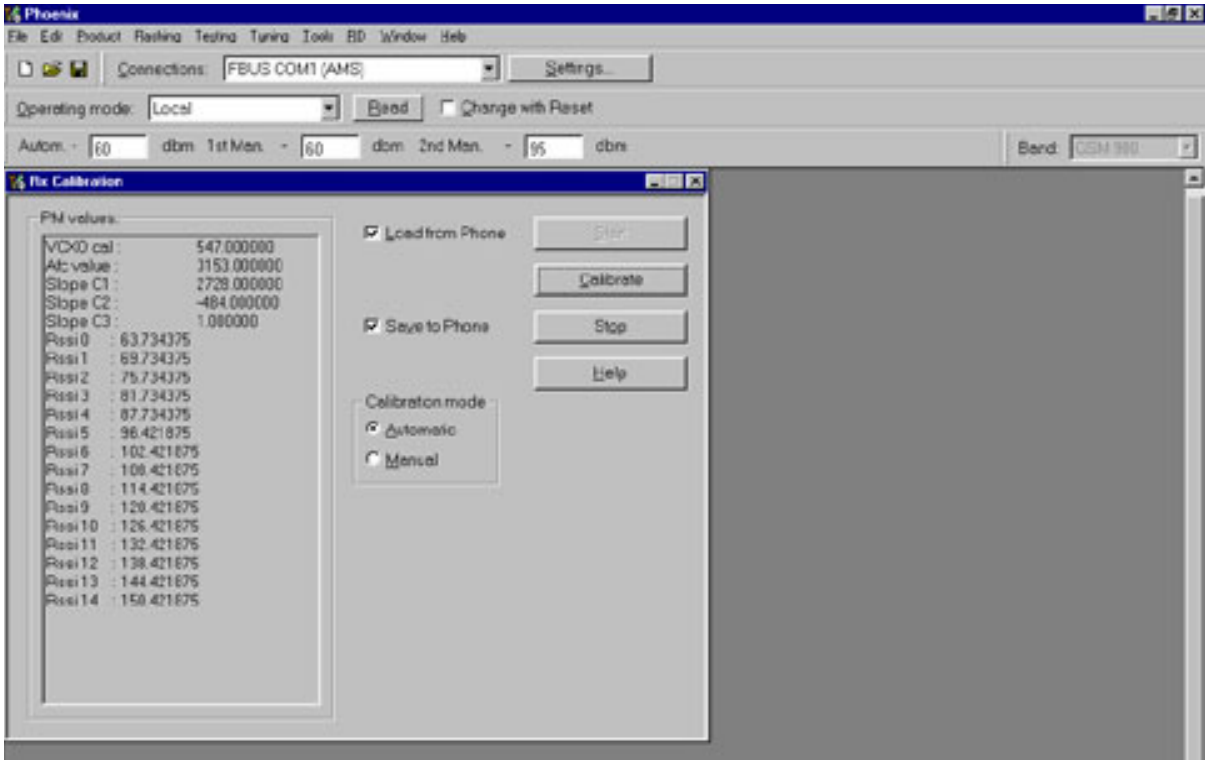
Select **Maintenance**, **Tuning**, **RX Calibration**

Select **Band:** GSM 900

Select Automatic and follow the prompts

The result should be like the shown:

Figure 23: RX calibration window



GSM1800 RX calibration

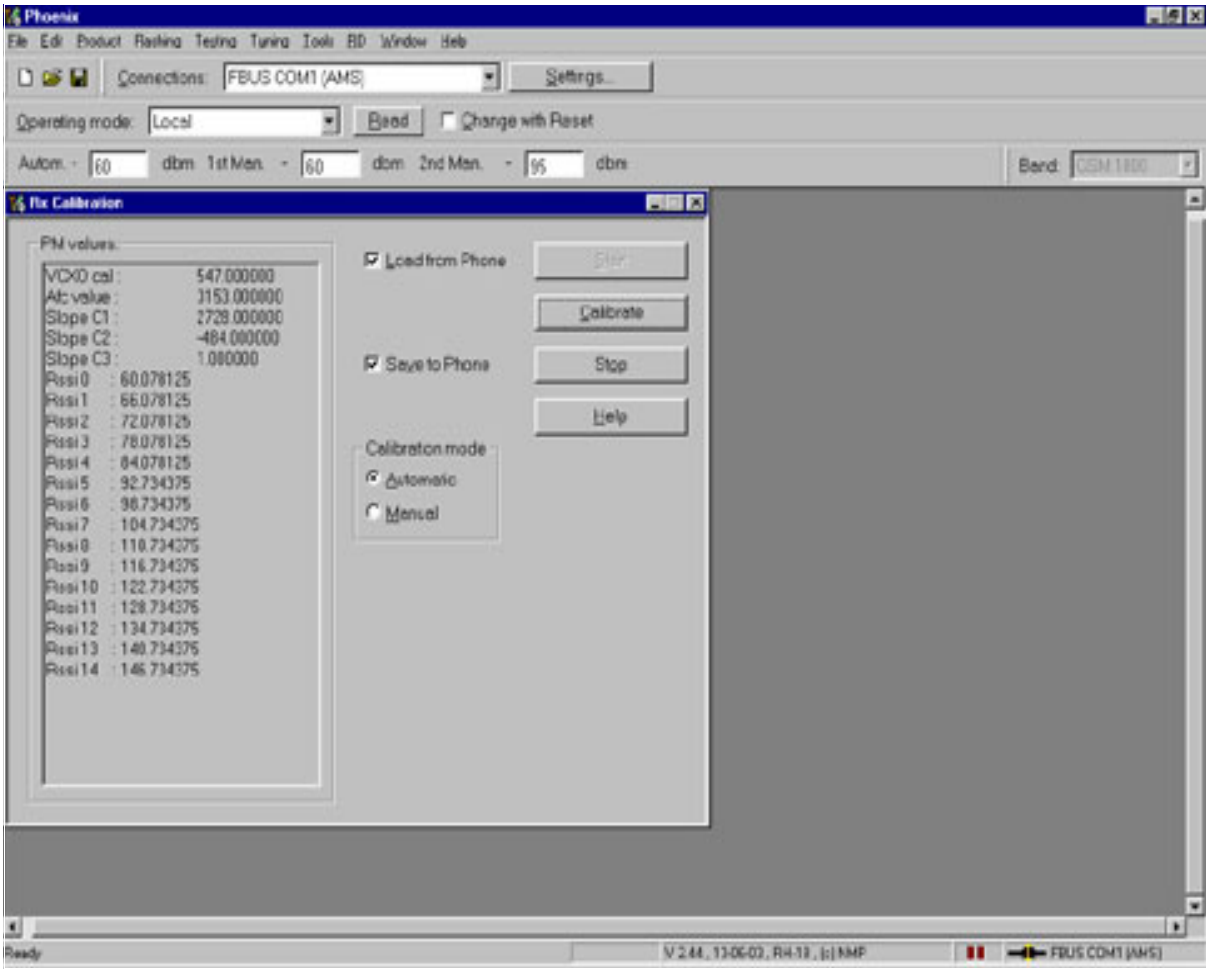
1 The existing data in the phone is shown

2 Calibrate, and the new data is shown

3 Stop, and the little window pops up where you can select to save or not

4 Select GSM1800 in the top bar and repeat at channel 700

Figure 24: GSM1800 RX calibration window



1 The existing data in the phone is shown

2 Calibrate, and the new data is shown

3 Stop, and the little window pops up where you can select to save or not

RX channel select filter

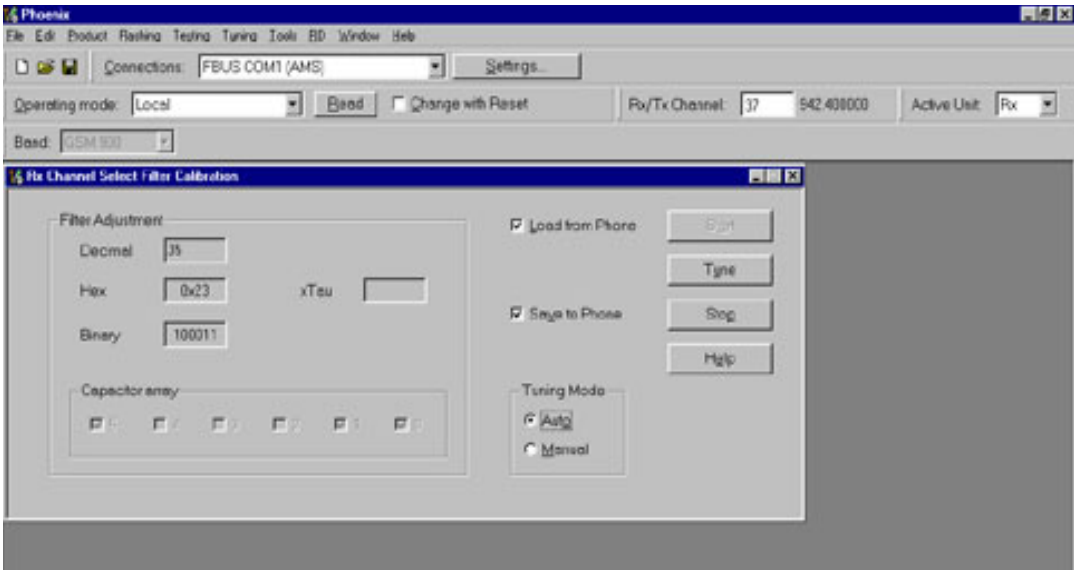
1 Select Maintenance, Tuning, Rx Channel Select Filter Calibration.

2 Press Start and you can select to load values from the phone or not.

3 Press AutoTune

4 Press Stop and you can select to save values to the phone or not to..

Figure 25: RX channel selection window



Note: This calibration requires no input signal

RX Band Filter Response

1 Select Maintenance, Tuning, Rx Band Filter Response Compensation

2 Press Start, Read from PM area and you can select to load values from the phone or not

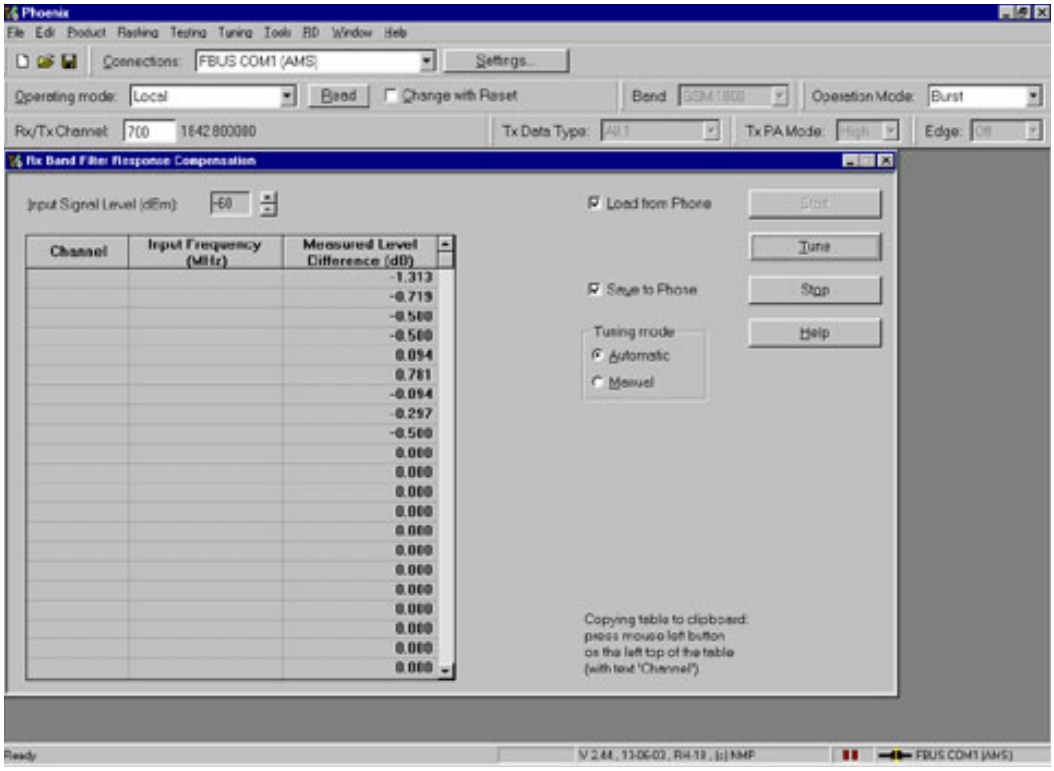
3 Press Manual Tuning

4 Set the Signal generator according to the pop-up windows

5 When finished press Stop, Write to PM area and you can select to save values to the phone or not

6 Repeat for GSM1800

Figure 26: RX Band filter response window



Note: This calibration requires a lot of different frequencies from the generator. If you have a signal generator with a frequency list option you can with advantage use Auto Tuning (Dwell should be around 10ms).

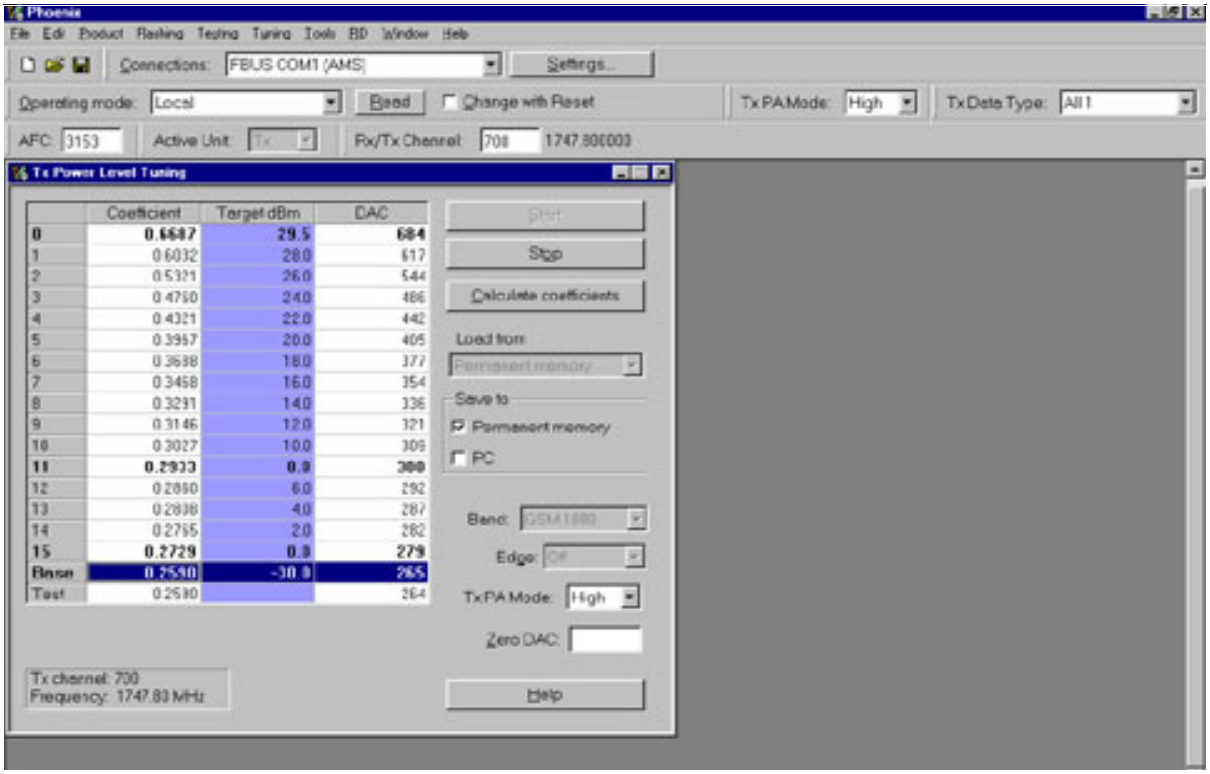
Tx Power tuning

Select **Maintenance**, **Tuning**, **Tx Power Level Tuning**

TX power tuning GSM

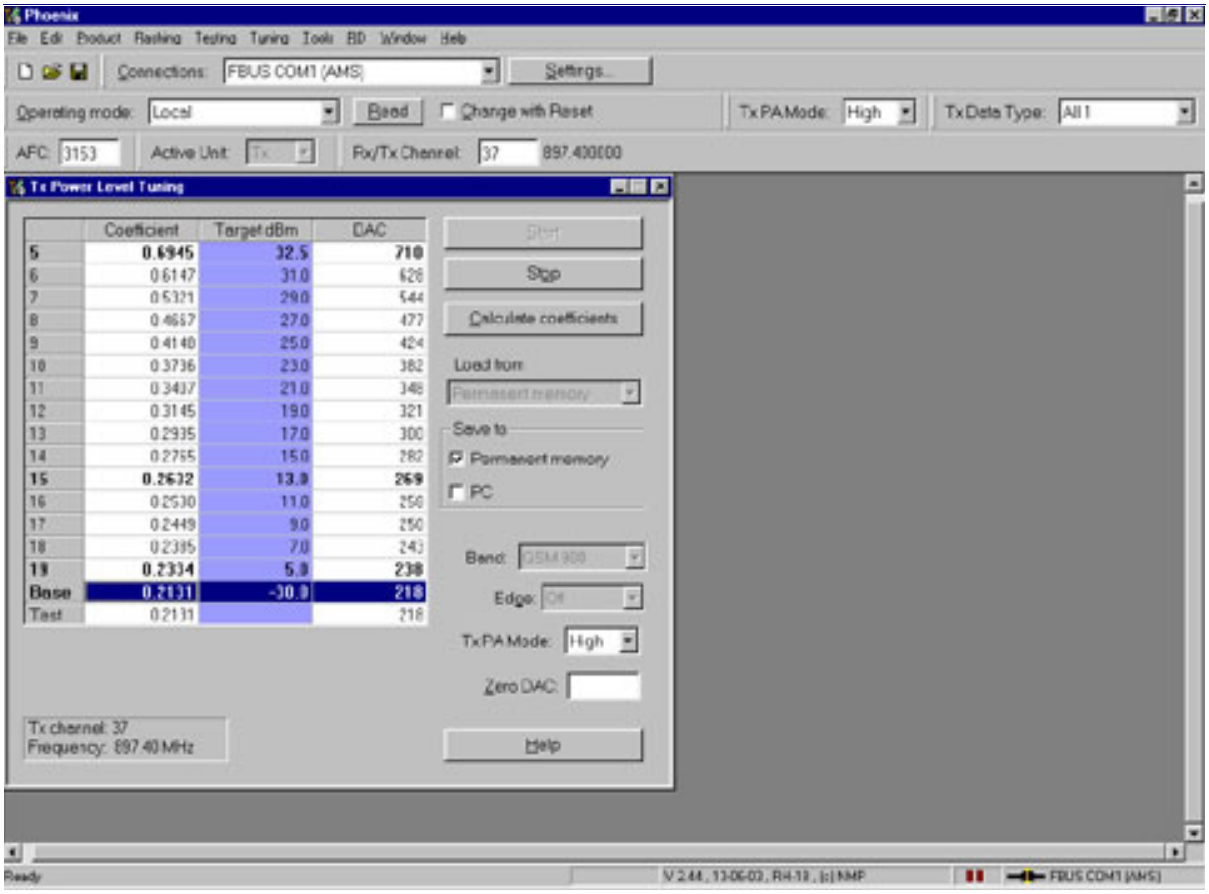
1 Select edge off, GSM 900

Figure 27: TX power tuning window1



2 Press Start and select from where to load values. It is best to have PC saved data from a good phone. The data from a "good" phone can be saved to PC for use later.

Figure 28: TX power level tuning window 2



1 Select the modulation 1, 0 or random in Tx Data Type. Select random if a GSM tester is used. Then it can synchronise to the burst.

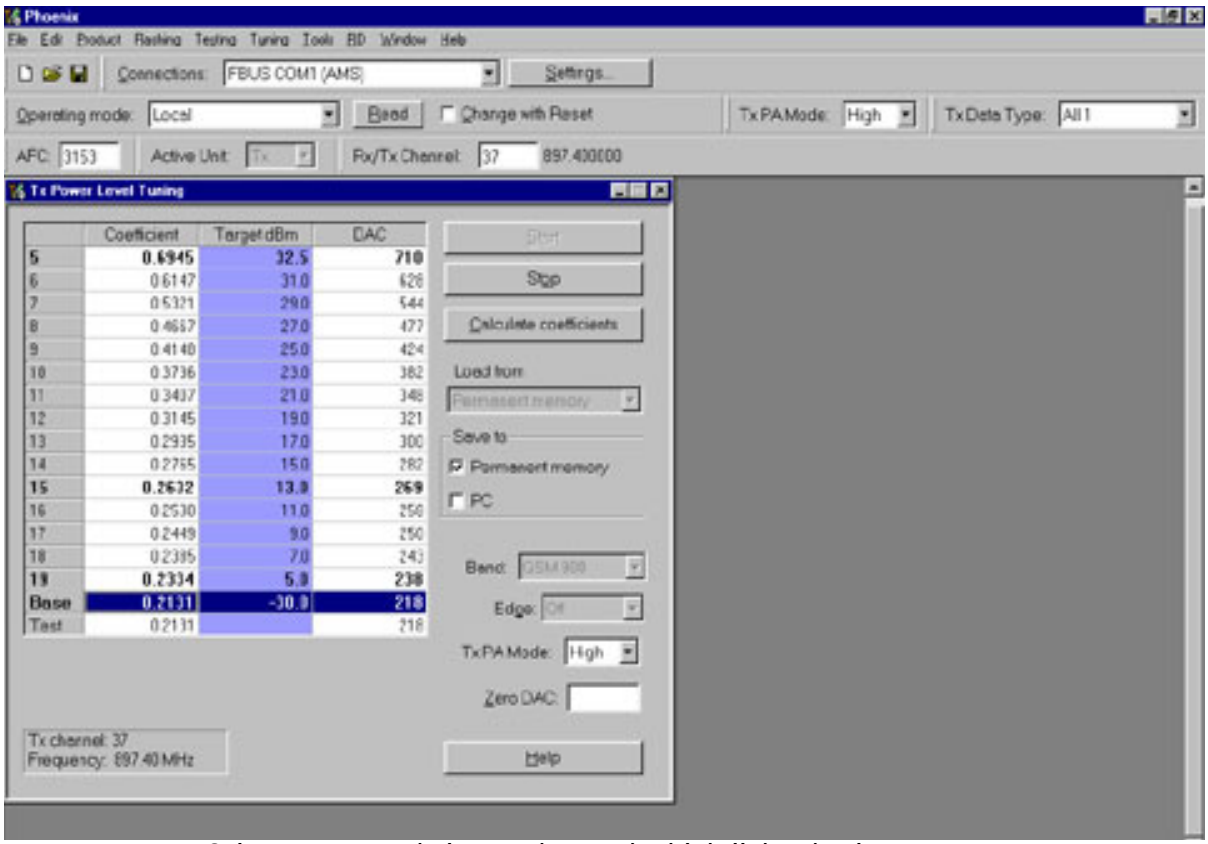
2 Select Tx PA Mode High

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

4 Tune base level to –28dBm (Close to lowest level CMD55 can keep synchronisation)

5 Calculate coefficients

Figure 29: TX power level tuning 3

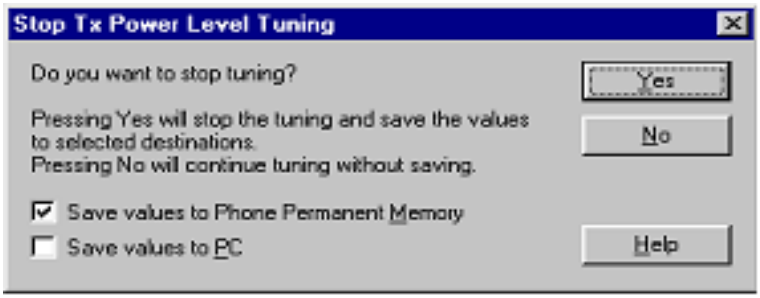


1 Select Tx PA Mode low and tune the high lighted values.

2 The base level coefficient is taken from the high mode. Do not change it.

3 Calculate and select Stop

Figure 30: Stop TX power level tuning dialogue



If you are satisfied with the coefficients and the power, then save to the Permanent memory.

You can also save the table to the PC, so that you can load it to an other phone. Or you can select not to do anything by removing both ticks.

Only way to end the tuning session is with Yes

TX power tuning PCN

Figure 31: PCN (GSM1800) TX power tuning window

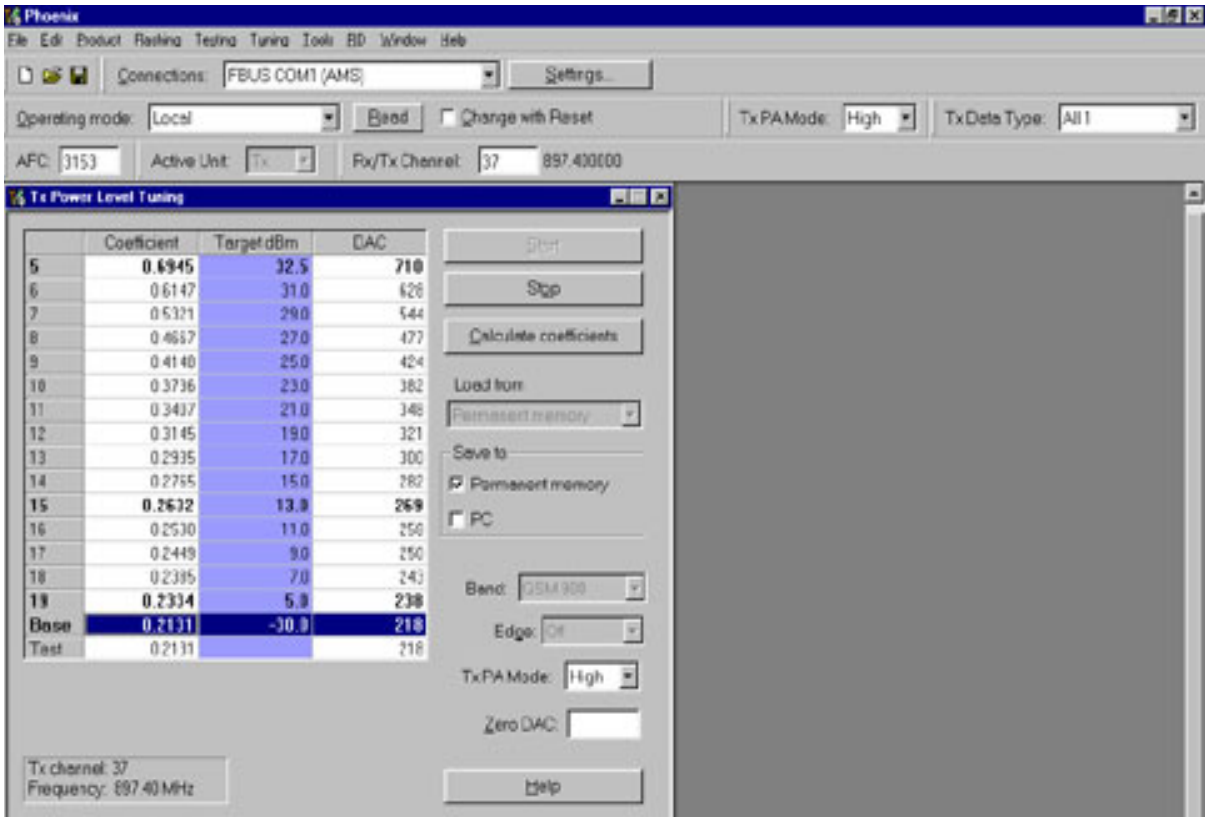
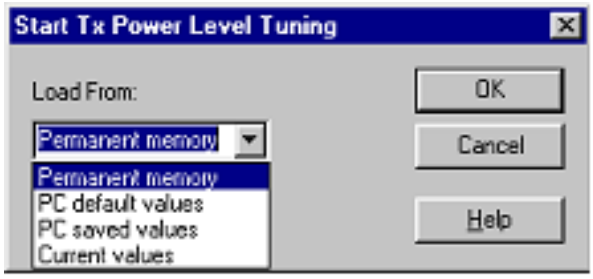


Figure 32: Start TX power level tuning dialogue



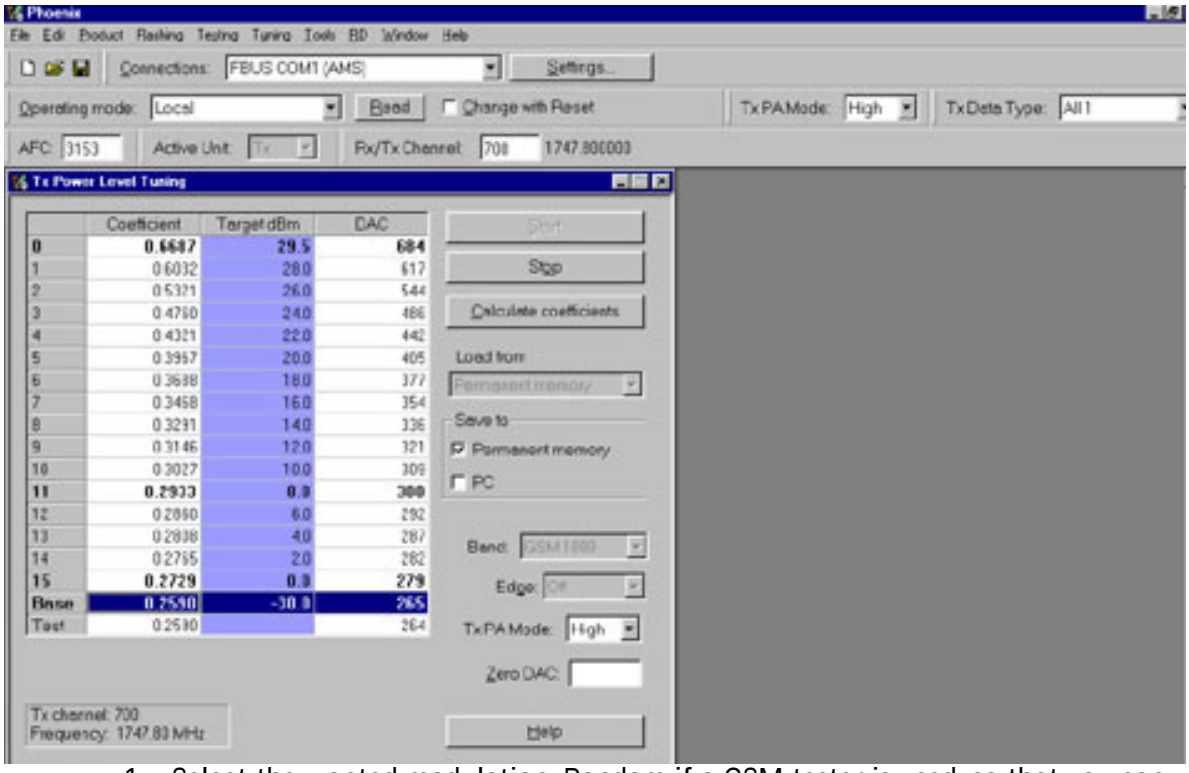
1 Select GSM 1800 band (PCN)

2 Start

3 Select where to get values from. Normally Permanent Memory

4 OK

Figure 33: GSM1800 TX power level tuning window



1 Select the wanted modulation. Random if a GSM tester is used, so that you can synchronise the burst.

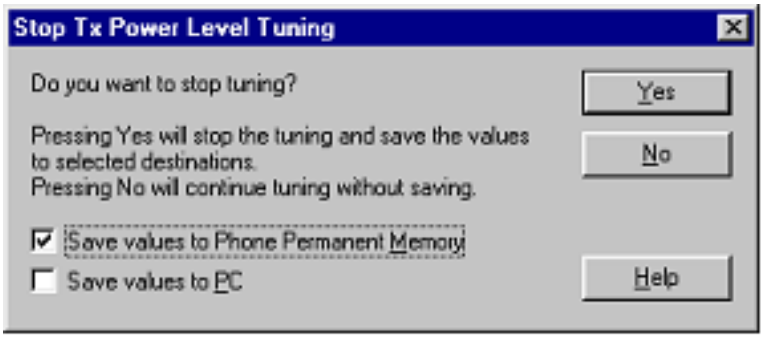
2 Only high mode is possible

3 Tune the highlighted values to the wanted power

4 Tune base level to –27dBm

5 Stop

Figure 34: Stop TX power level tuning dialogue



6 Select where to save the values, one, both or no one can be selected.

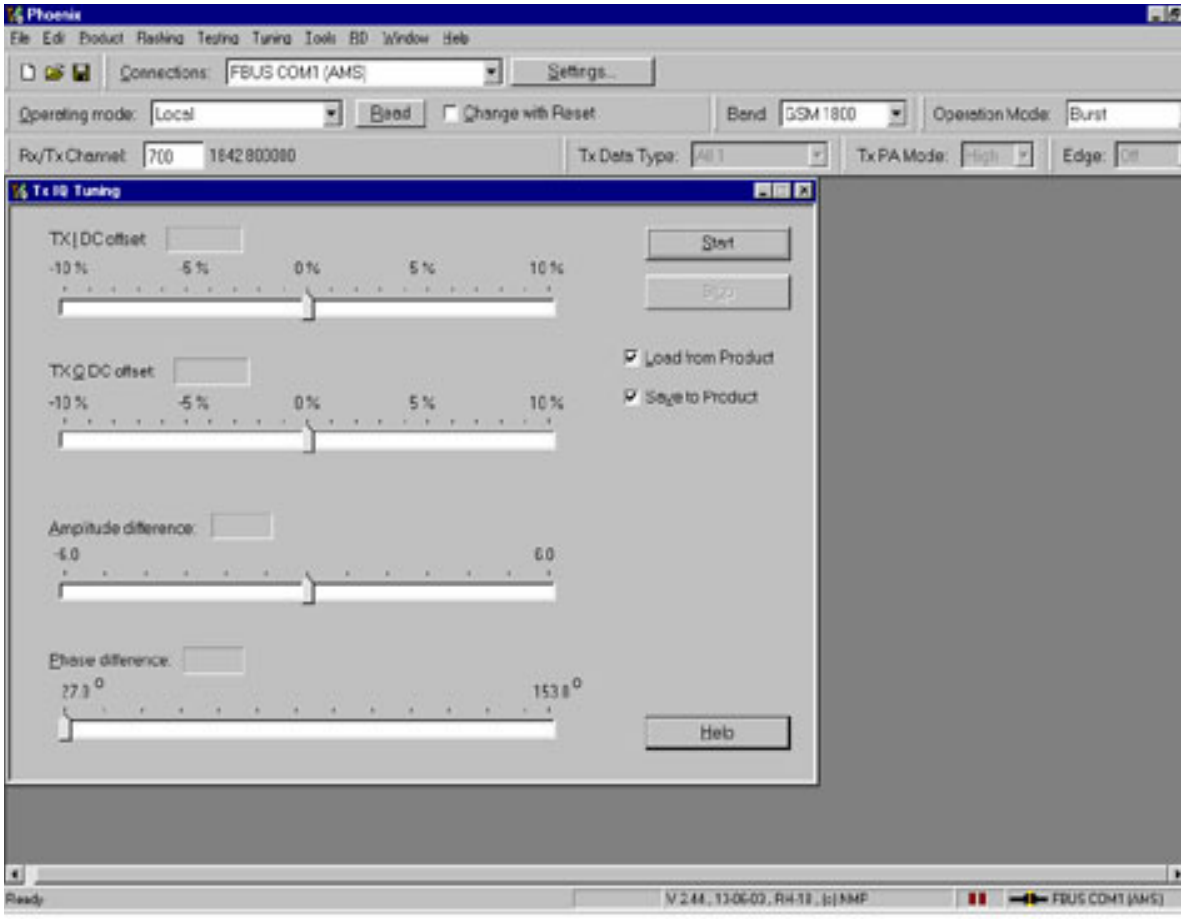
7 Yes. That's the only way to end tuning.

I/Q tuning

Select **Maintenance**, **Tuning**, **Tx IQ tuning**

Set CMD55 to Narrow Spectrum on the same band as the phone. Selected in the top menu.

Figure 35: I/Q tuning window



1 Select where to get values. Normally select Load From Product

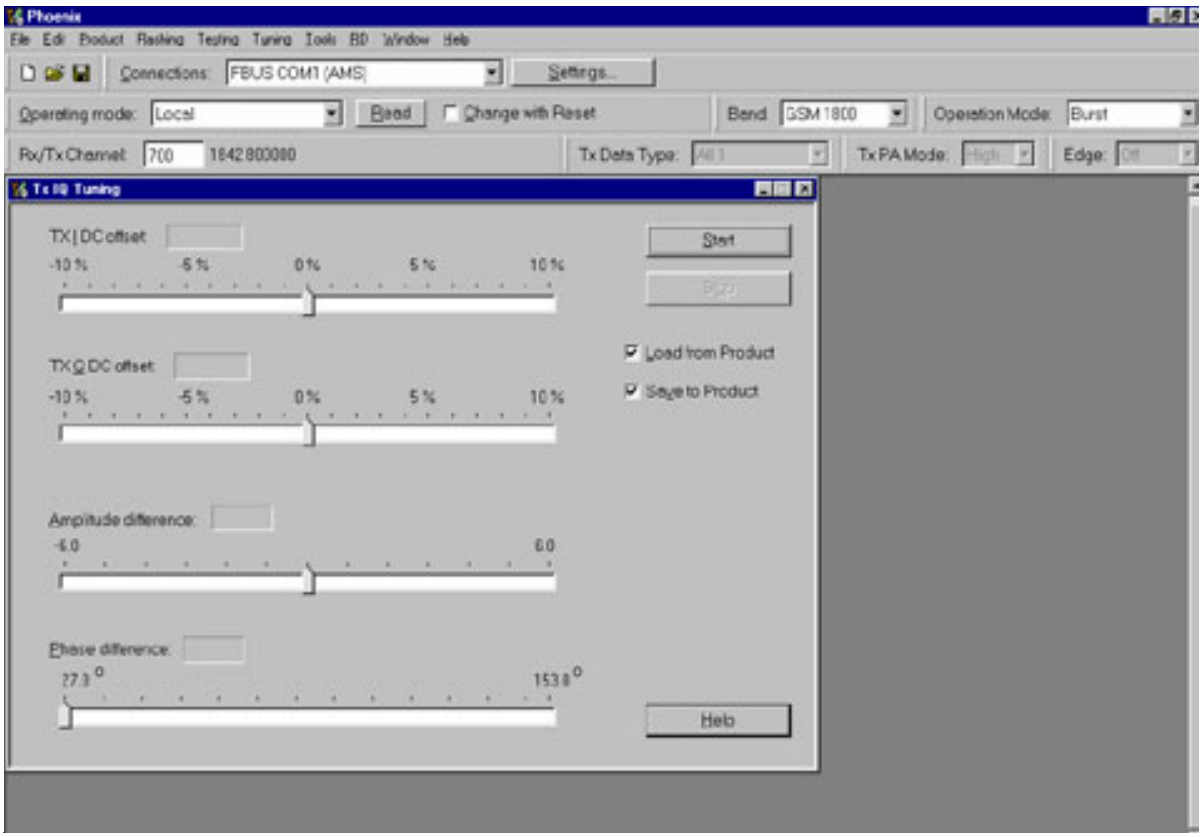
2 Start

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

4 Tune Amplitude and phase to lowest sideband.

5 Check eventually with other modulation (0).

Figure 36: TX I/O tuning window



Note: Remember to tick **Save to Product if you want to save the values in the phone.**

1 Stop to end the tuning with the selected save option

2 Same procedure for PCN as for GSM.

3 Remember to tick Save To Product.

4 Stop. Ends tuning and does what you have ticked.

RF control

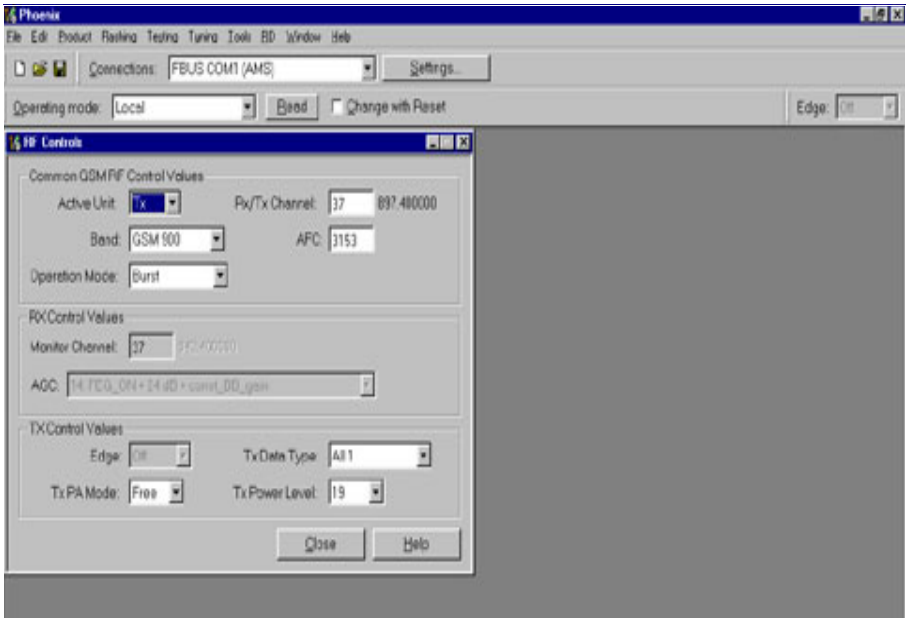
This menu can be placed in maintenance or in tuning depending on the Phoenix.

It is meant to check the receiver or transmitter without going in call. It works very much like a call, but you have control via the PC, and not via the tester.

The TX mode GSM900 can select between Free, High and low mode. It changes the PA mode, but changes also the power level if a level is selected that is not supported in that mode.

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

Figure 37: RF control window



Call testing

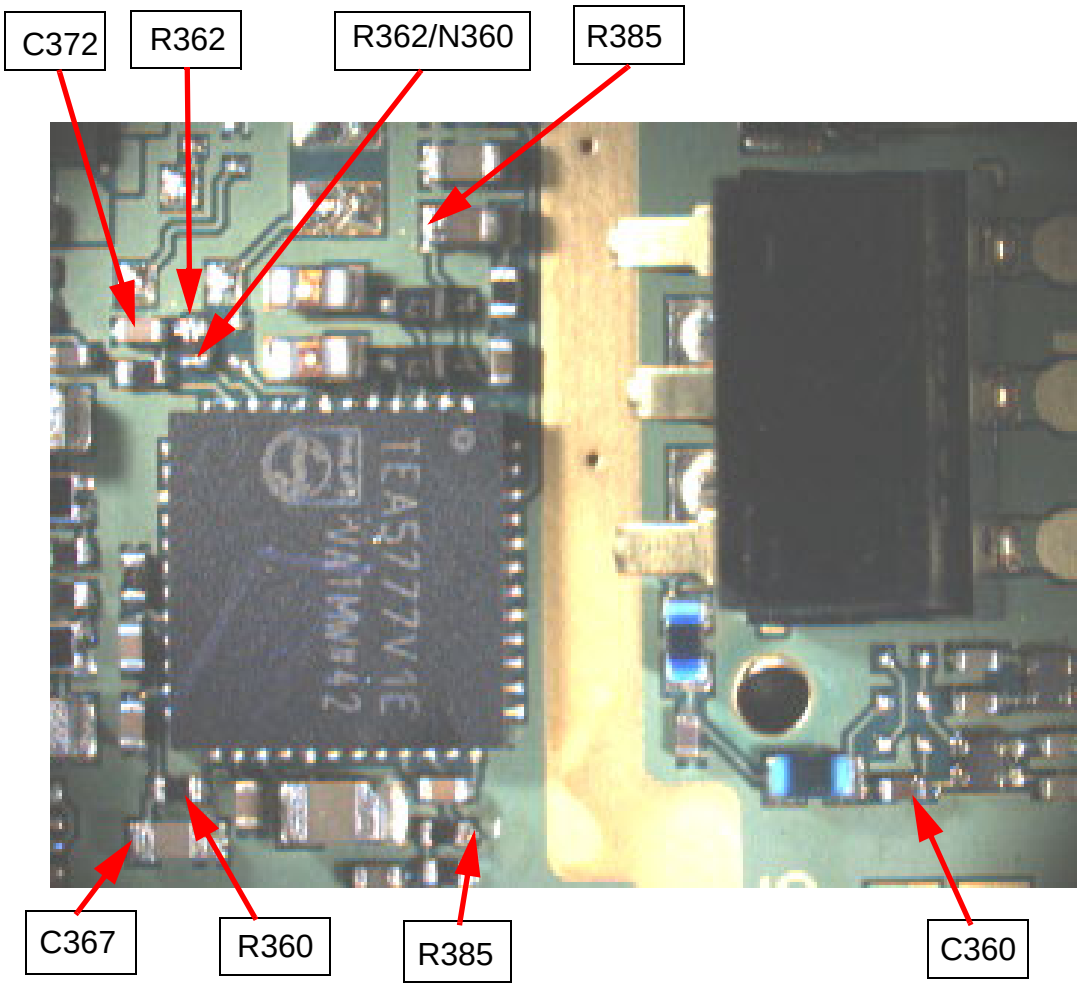
If all tunings are done, and the phone TX and RX is working a call is the ultimate test of the phone.

Set CMD55, or similar tester, to manual test and switch the phone to normal if it was in local. Remember to have a test sim card in the phone.

When the phone has made a registration a call can be made, and it is possible to let the phone answer via Phoenix. In the Autocaller (Maintenance Testing) you can answer by ticking Answer when button pushed and then posh the button.

General instructions for RM-4/5 FM radio Troubleshooting

Location of testpoints



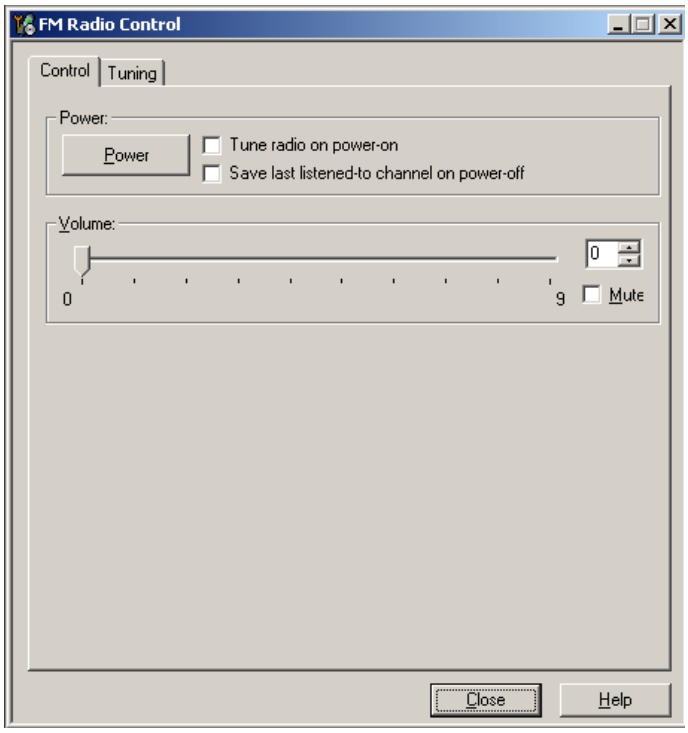
Phoenix control

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

Start Phoenix and establish connection with the phone.

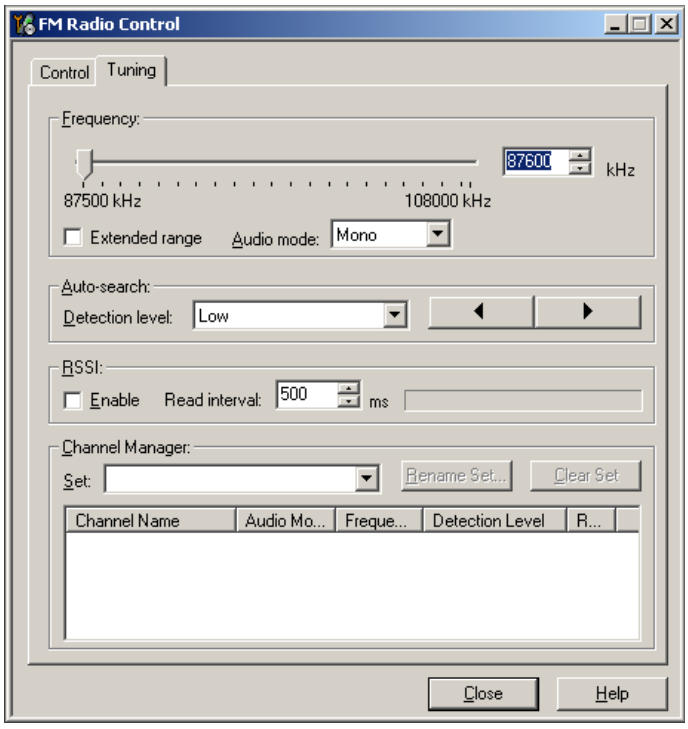
Select “FM Radio Control” in the Testing menu.

The setup should look like this:



Turn on the FM radio through the key marked “Power” and select Tuning.

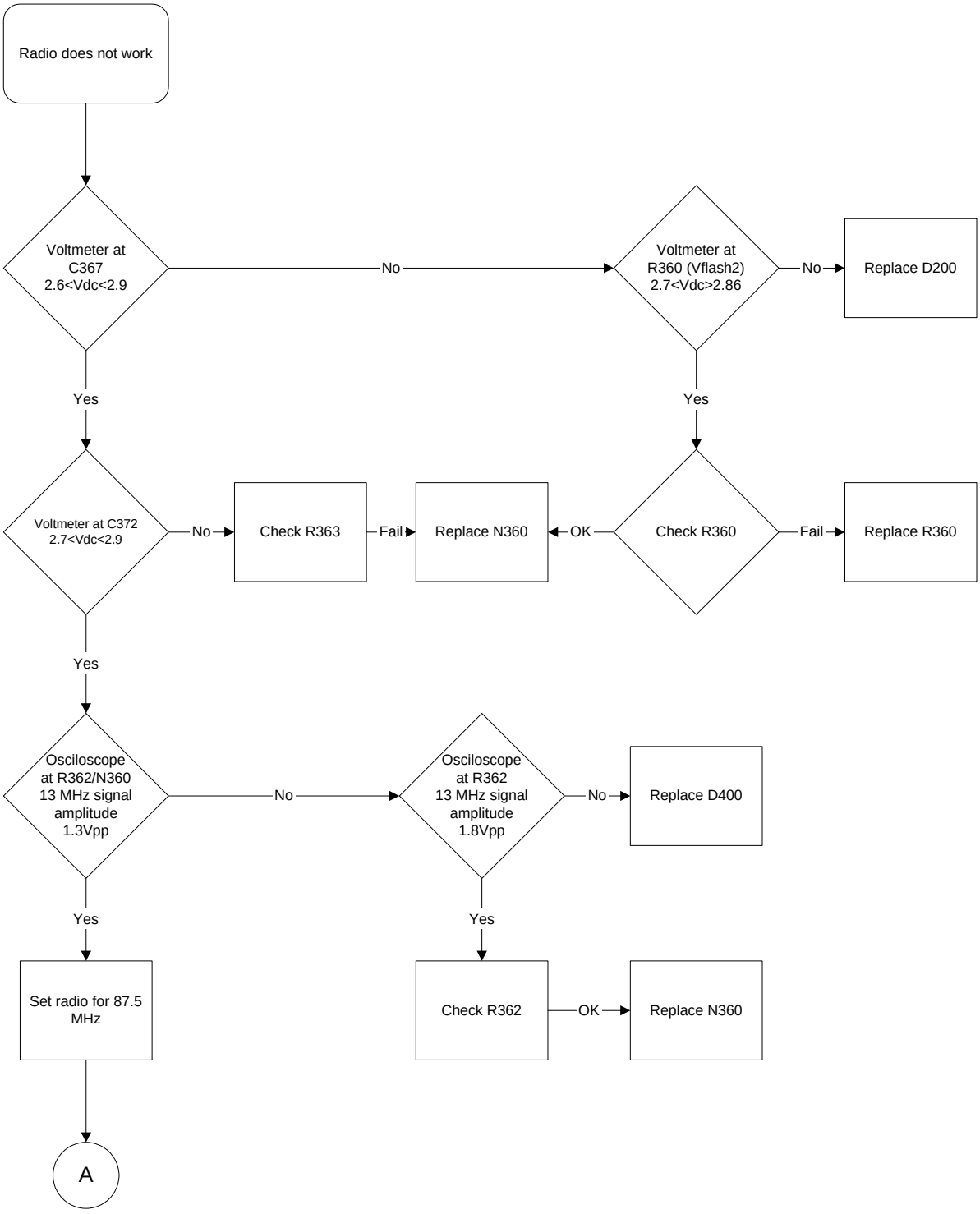
The setup should look like this:

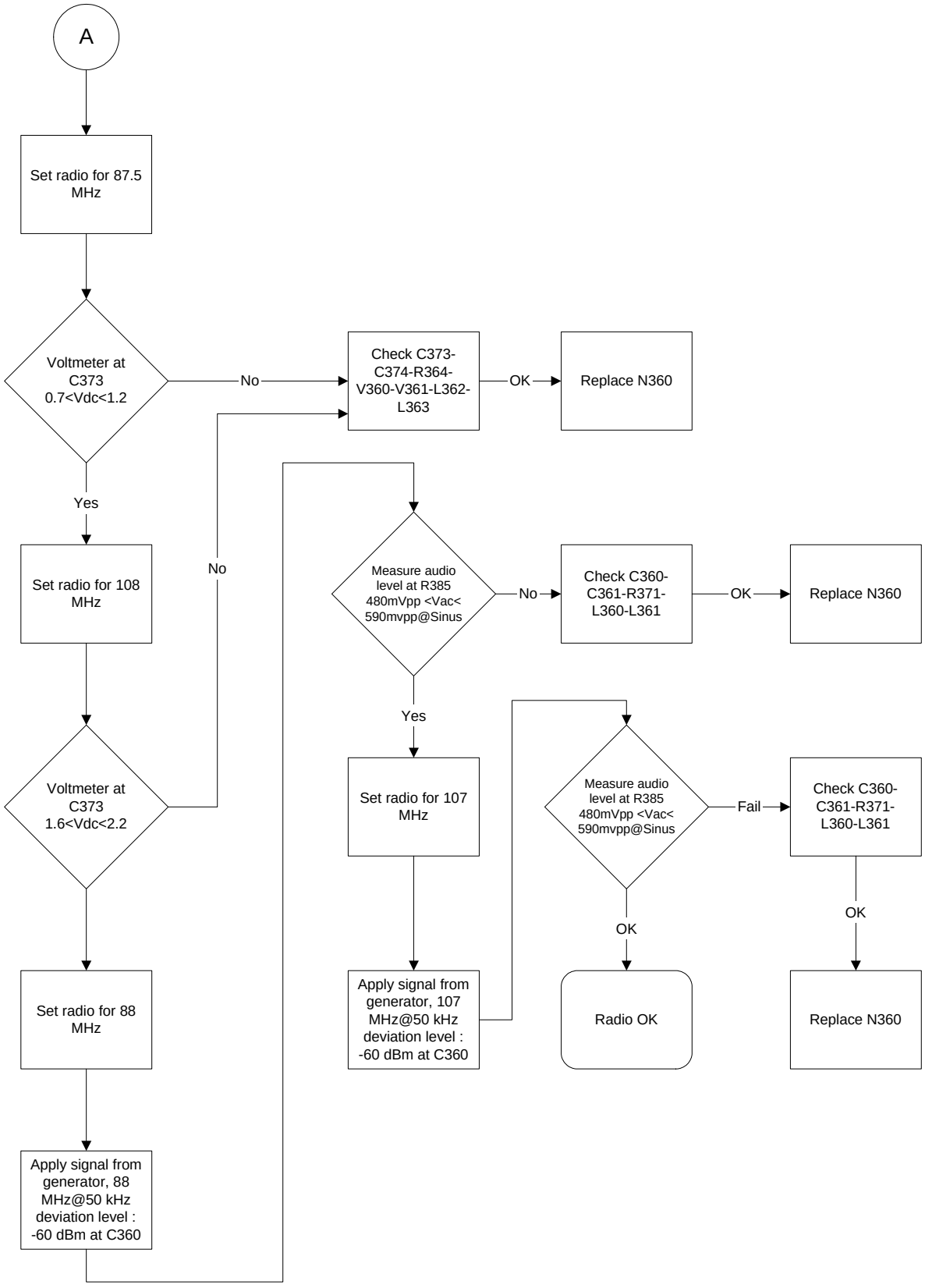


It is now possible to tune the radio for the wanted frequency.

The troubleshooting guide requires that the radio is turned on.

Fault finding guide





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