7-Troubleshooting Instructions

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Baseband Troubleshooting

Baseband test points

Figure 1:BB test points

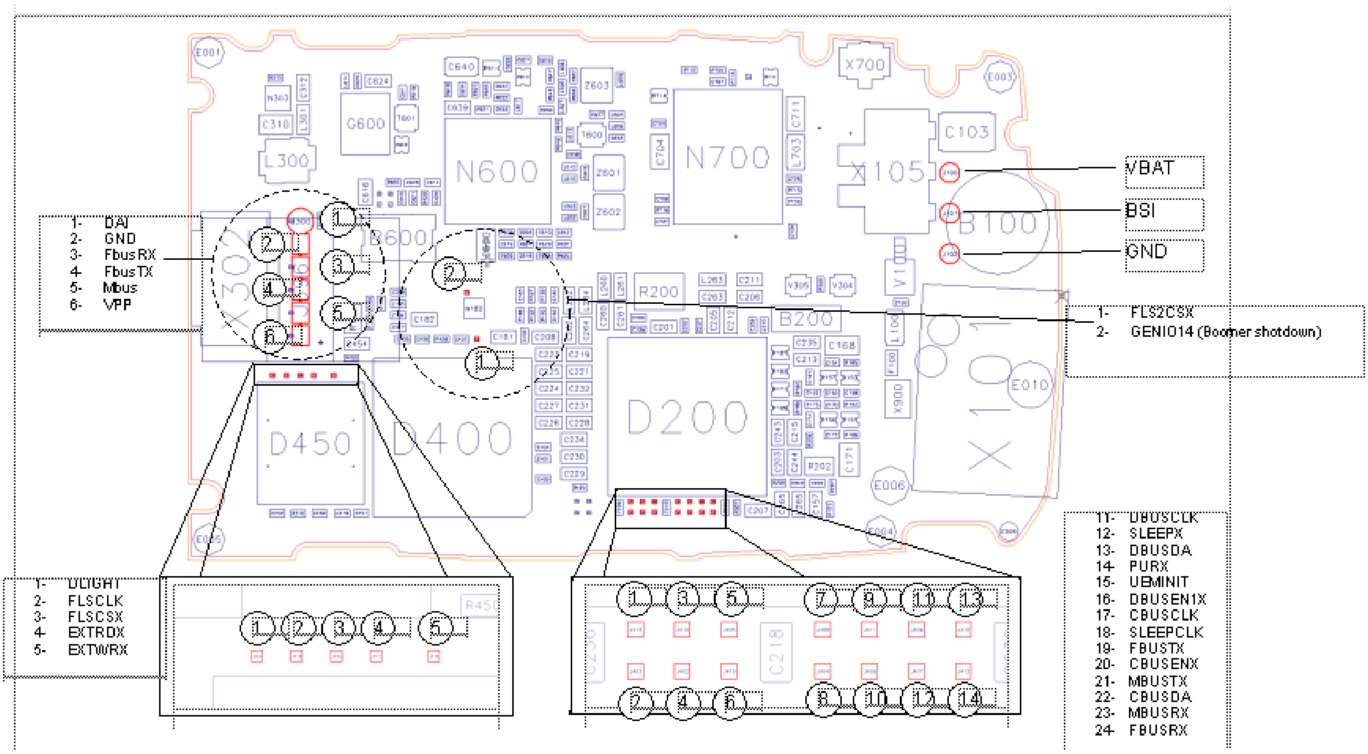
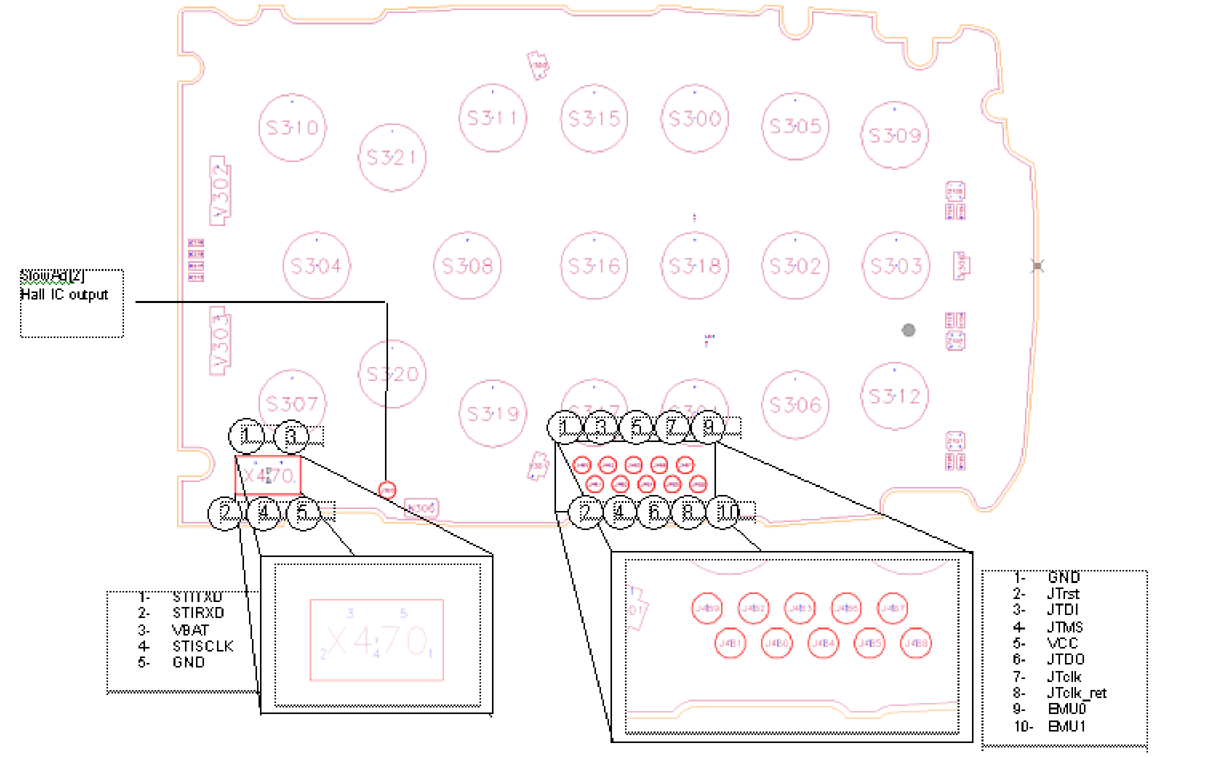


Figure 2:BB test points 2



Troubleshooting diagrams

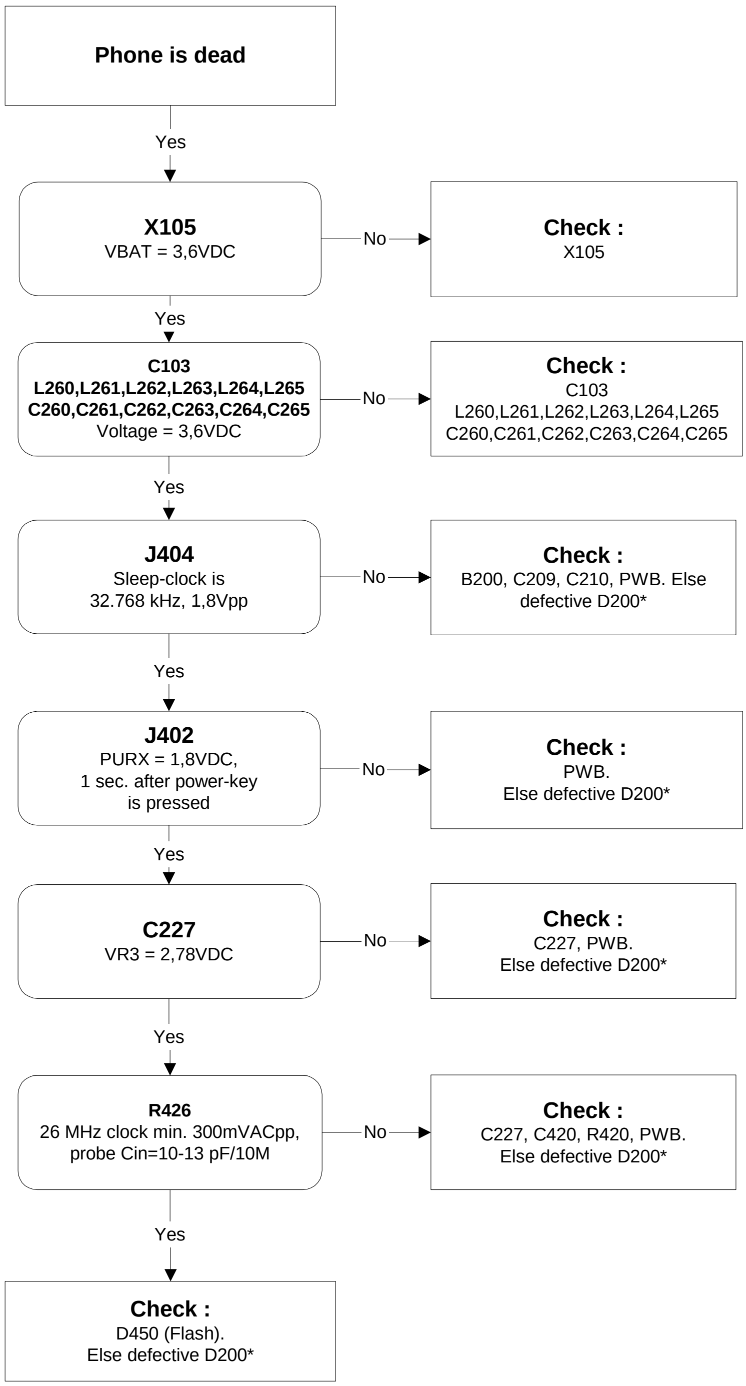
INOTE : Since both D200 (UEM) and D400(UPP) are underfilled, they can not be replaced. If either D200 or D400 is defective, the whole PWB has to be discarded.

Phone is dead

This means that the phone do not draw any current at all when supply is connected and/or powerkey is pressed.

It is assumed that the voltage supplied is 3.6 VDC. The UEM will prevent any functionality what so ever at battery/supply levels below 2.9 VDC.

Figure 3:Phone is dead troubleshooting



Flash programming does not work

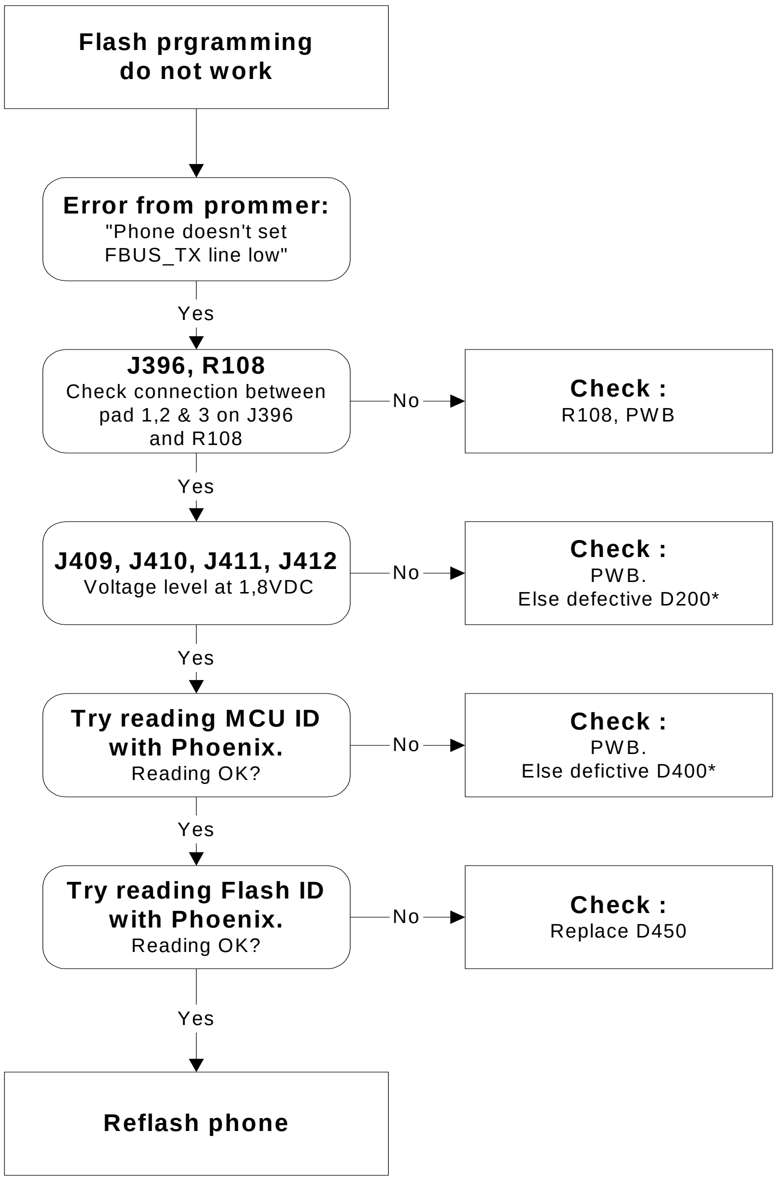
The flash programming can only be done via the pads on the PWB (J396).

In case of Flash failure in FLALI station, problem is most likely related to SMD problems. Possible failures could be short-circuit of balls under µBGAs (UEM, UPP, FLASH). Missing or misaligned components.

In flash programming error cases the flash prommer can give some information about a fault. The fault information messages could be:
- Phone doesn't set FBUS_TX line low

Because of the use of uBGA components it is not possible to verify if there is a short circuit in control- and address lines of MCU (UPP) and memory (flash).

Figure 4:Flash programming troubleshooting

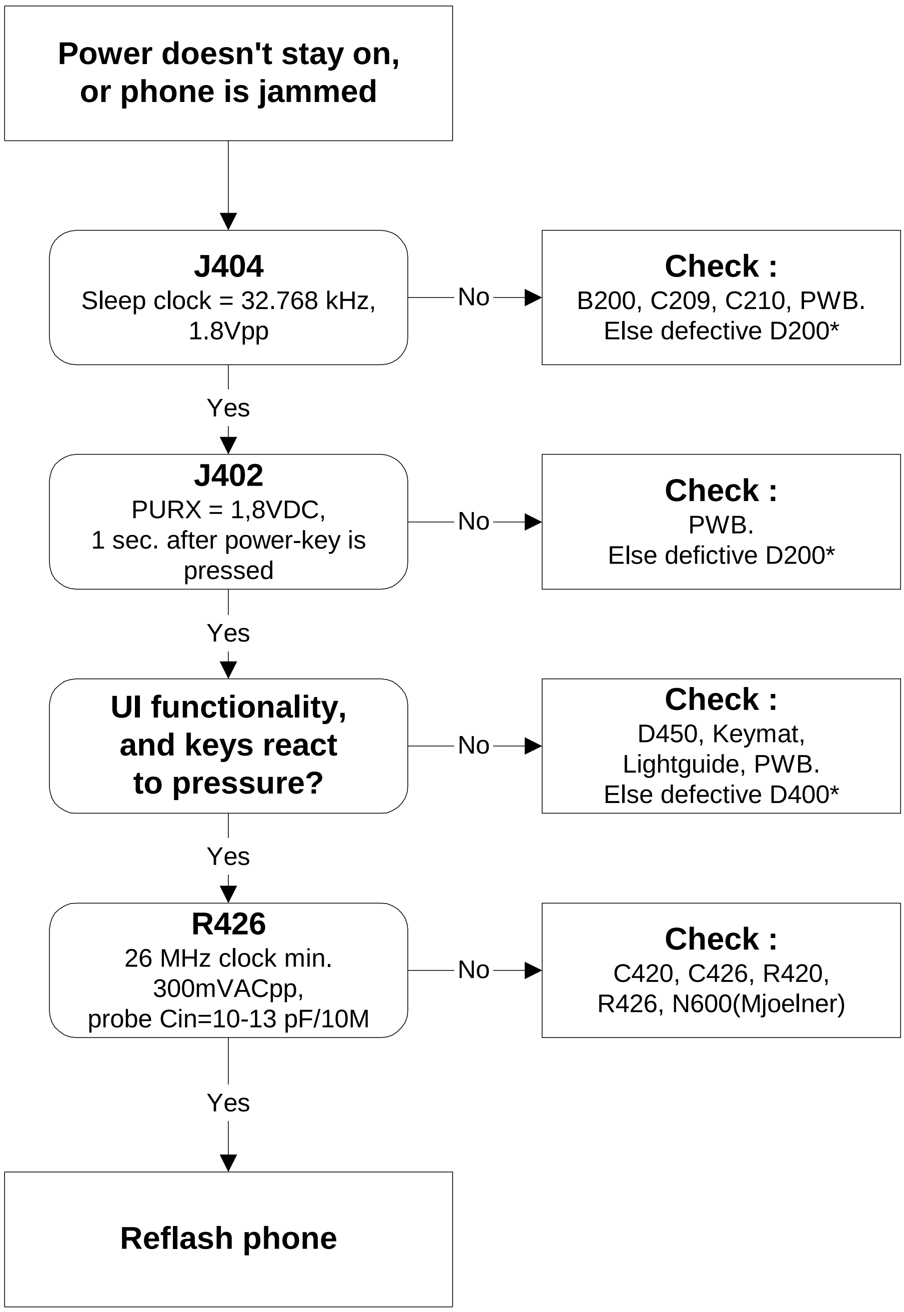


Power does not stay on or phone is jammed

If this kind of failure is presenting itself immediately after FLALI, it is most likely caused by ASICs missing contact with PWB.

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. Unfortunately, the service routine can not be measured.

Figure 5:Phone jammed troubleshooting

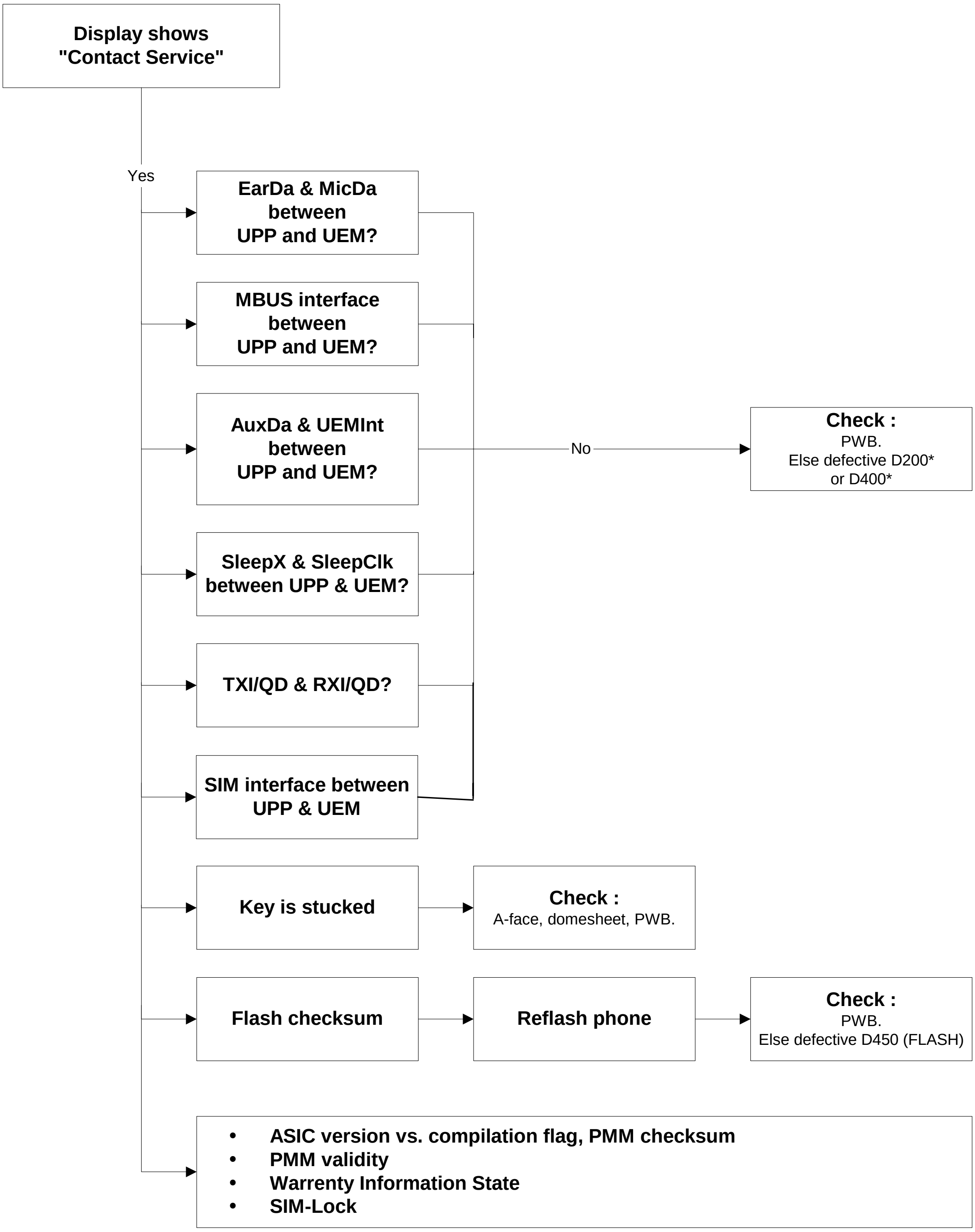


Display information : "Contact Service"

This error can only happen at power up where several self-tests is run. If any of these test cases fails the display will show the message: "Contact Service".

It's individual test cases so the below lineup of error hunting's has no chronological order. Use common sense and experience to decide which test case to start error hunting at.

Figure 6:Troubleshooting when Contact Service message seen

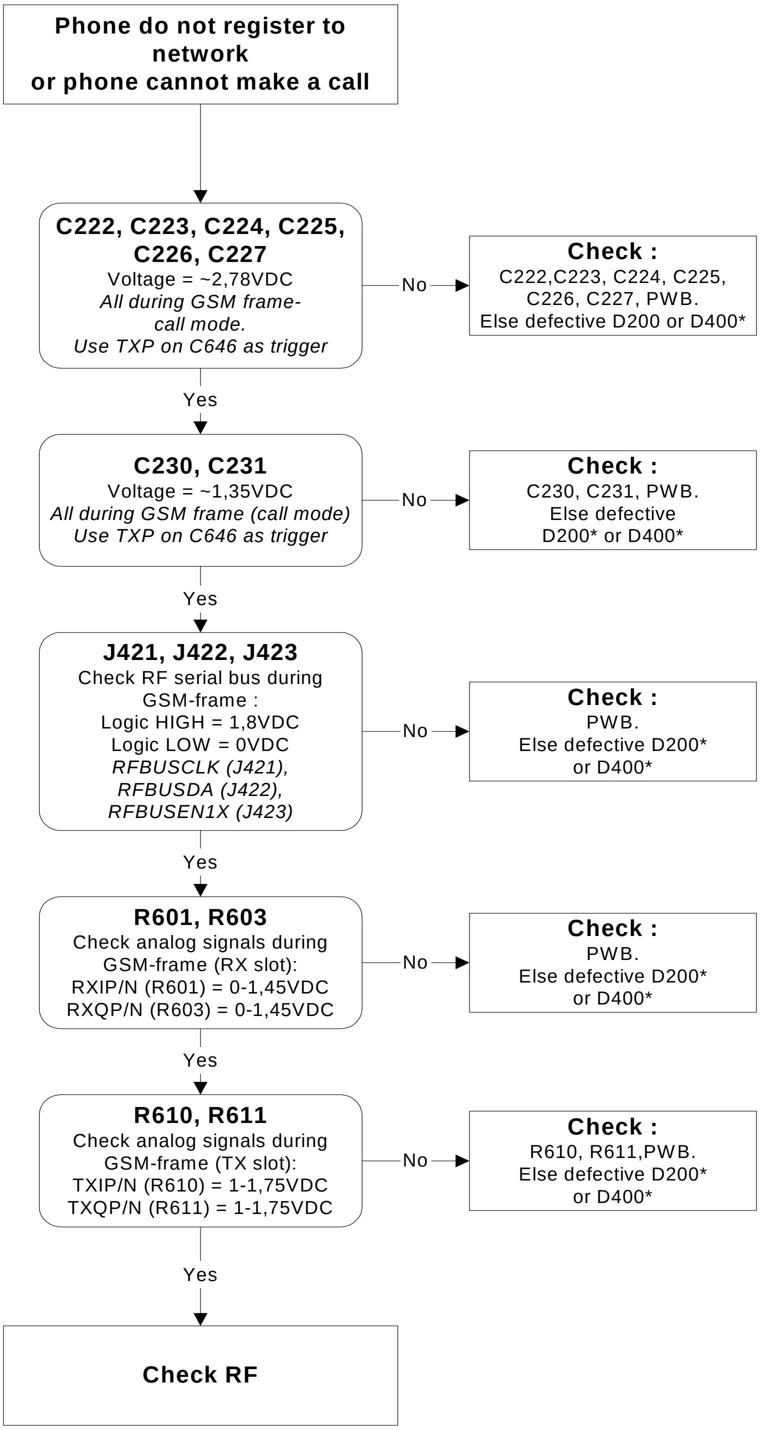


The phone does not register to the network, or the phone cannot make a call

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 'burried' in one or more of the inner layers of the PWB.

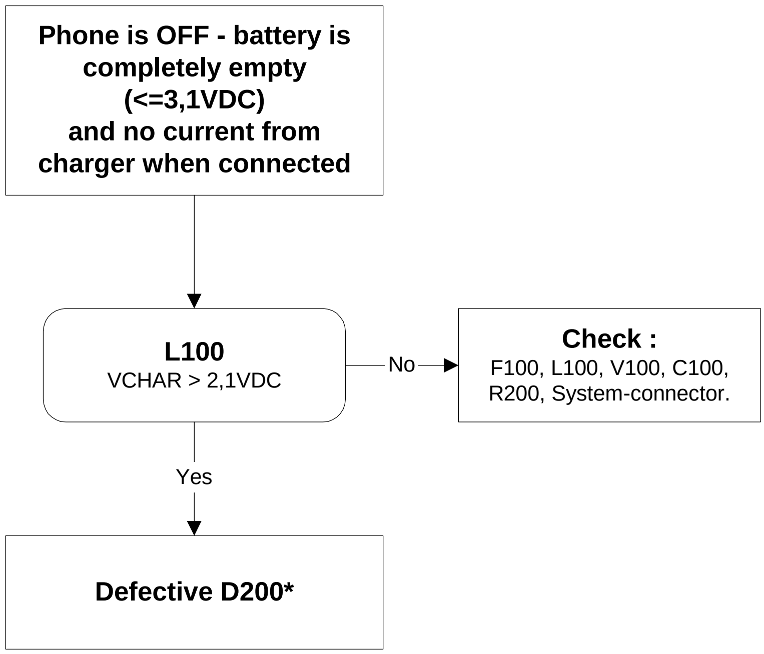
First of all check that SIM LOCK is not causing the error by using a Test-SIM card and connect the phone to a tester.

Figure 7:No call troubleshooting



Charging troubleshooting

Figure 8:Phone is OFF:no current from charger



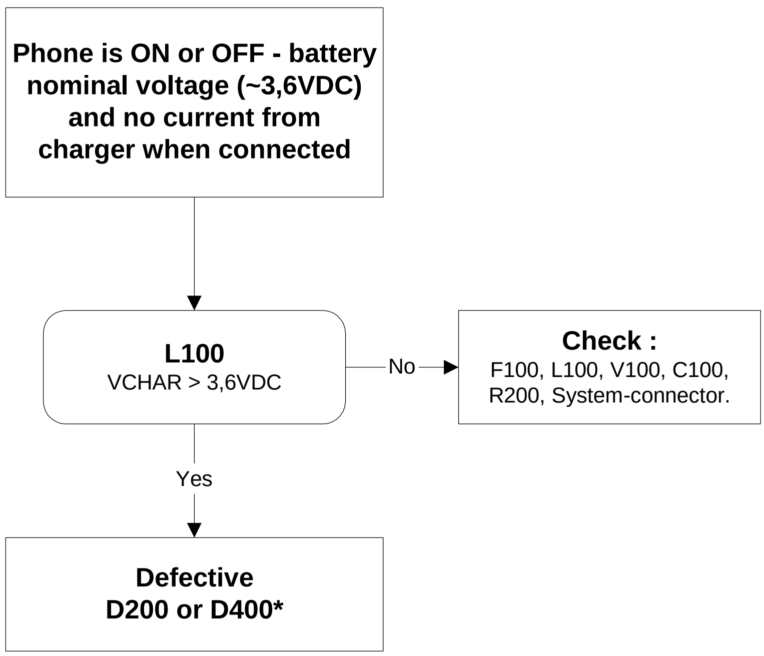
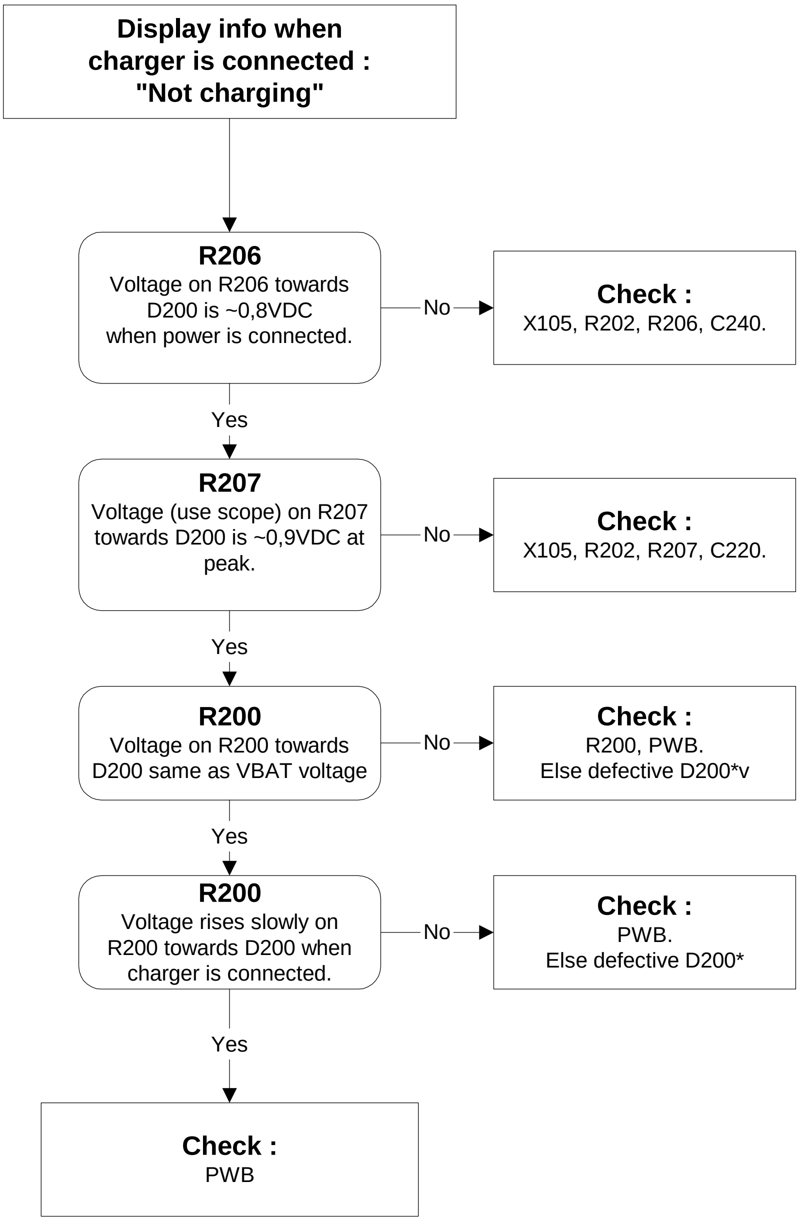


Figure 9:Display info:charger connected, not charging



Audio troubleshooting 1, 2

Figure 10:Microphone does not work

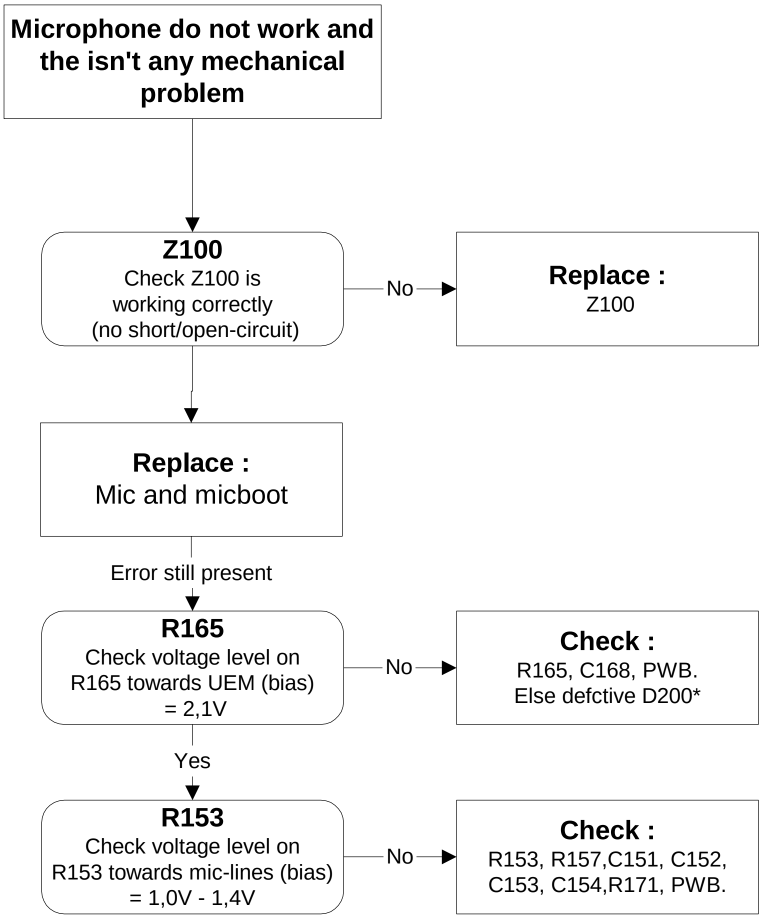
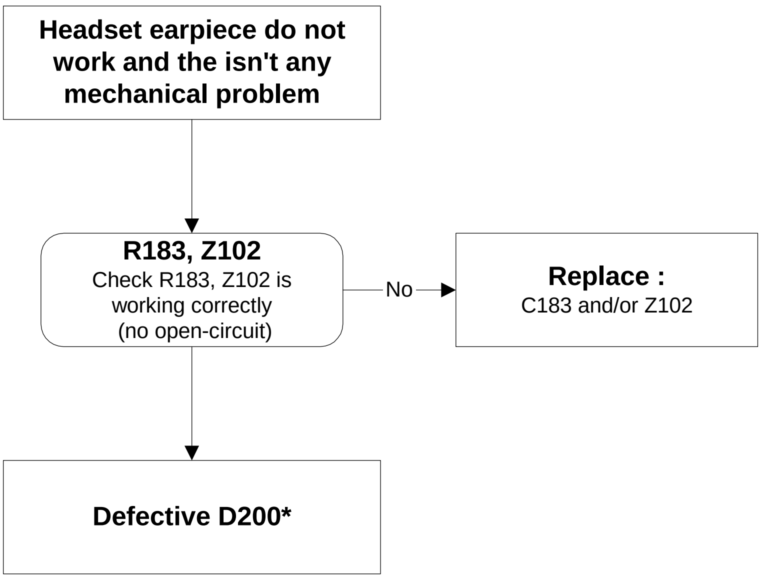
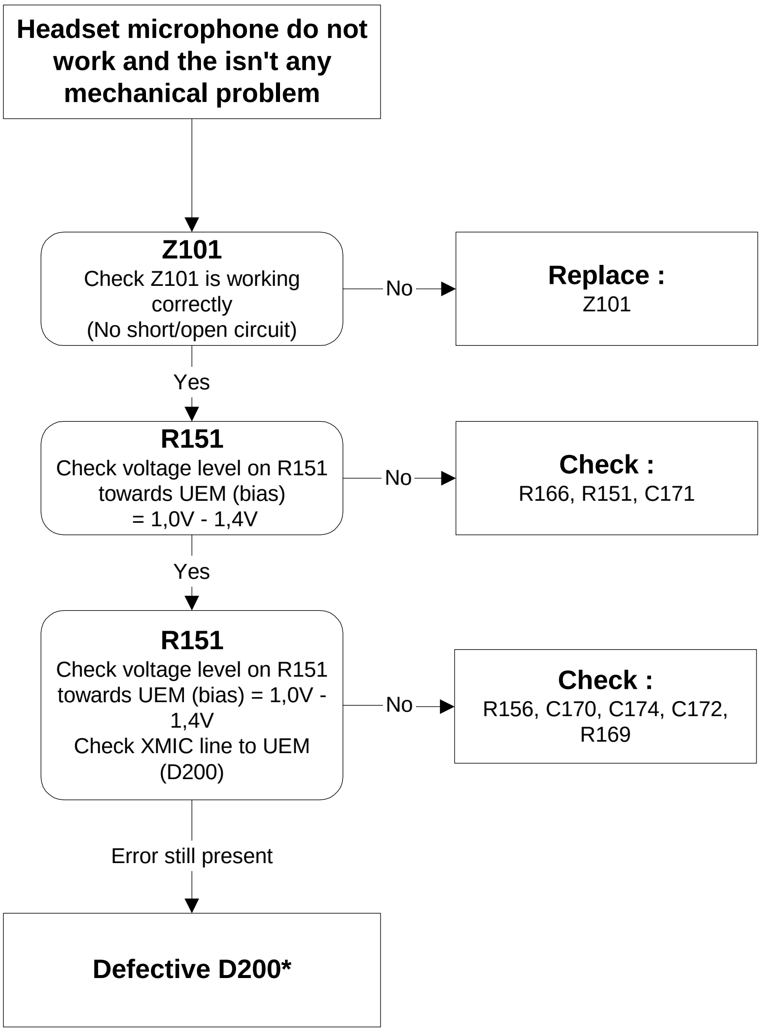


Figure 11:Top: Earpiece does not work



Audio troubleshooting 3: Headset does not work

Figure 12:Headset does not work



Upper block failures

All checks can be done while the phone is partially disamsembled (no need for full reasembly inbetween debugging steps):

SIM failure (including insert SIM faults)

1. Flex B2B connector pressed in?
2. Change LCD can assembly (for new flex) works?
3. C314 (VSIM cap) short circuitting?
4. C313 (SIMIO cap) short circuitting?
5. Voltages (SIM startup sequence)? Board to Board connector pin17
6. Change main PWB (UEM)?

The hardware of the SIM interface from UEM (D200) to the SIM connector 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”.

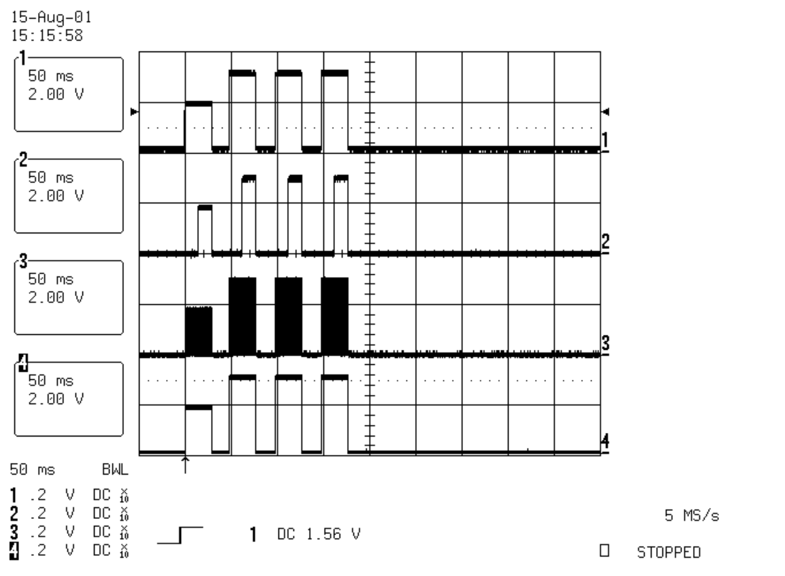
VSIM – Board to board connector pin 17

Reset – Board to board connector pin 29

Clock – Board to board connector pin 20

Data – Board to board connector pin 19

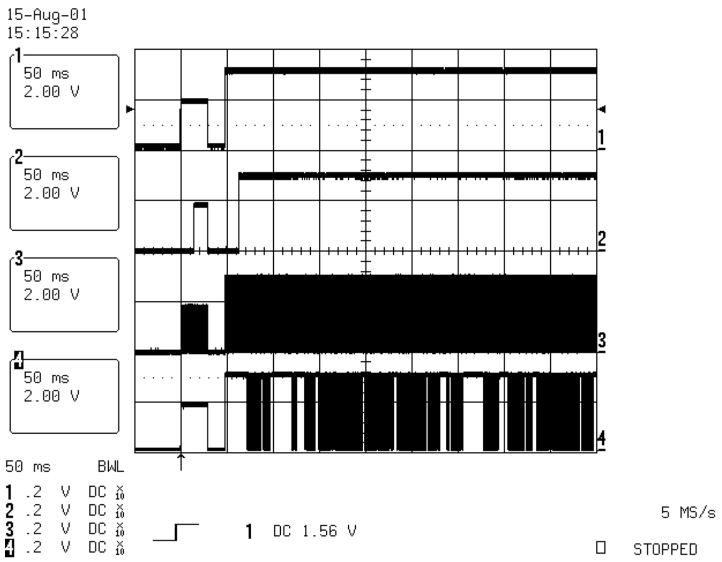
Check for SIM voltage during power-up	
Ch1 : VSIM Ch2 : RESET	Ch3 : CLOCK Ch4 : DATA



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

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

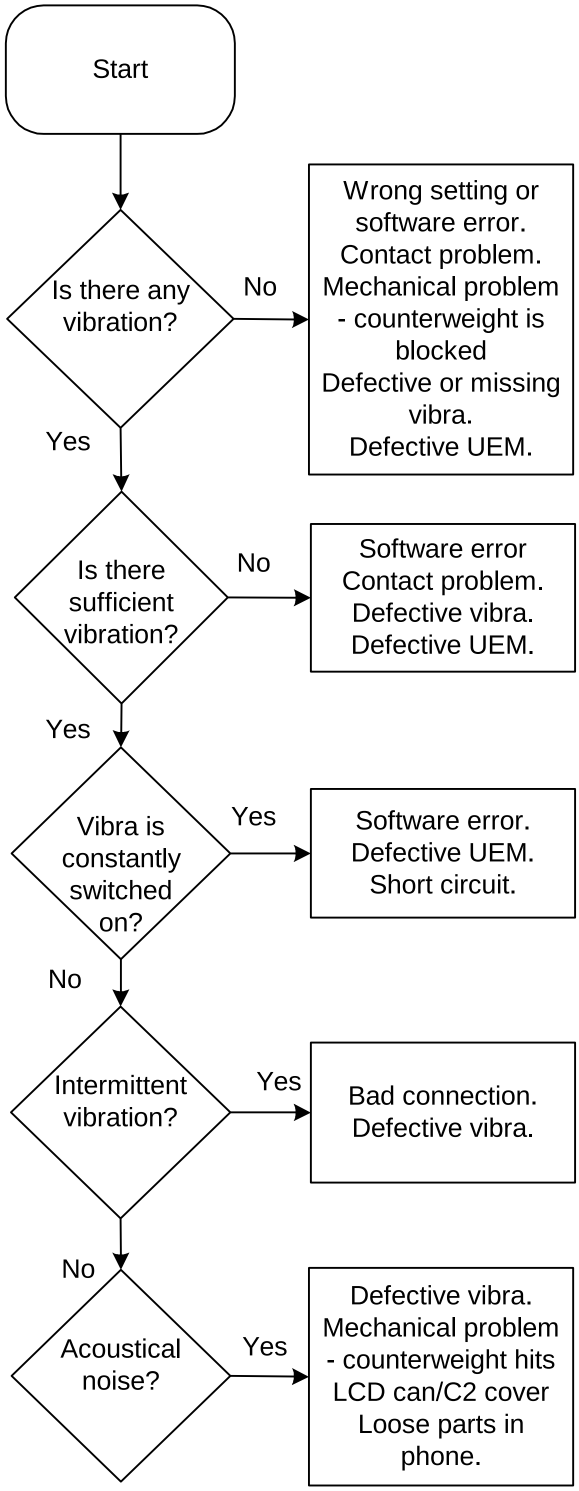
Normal SIM power-up sequence	
Ch1 : VSIM Ch2 : RESET	Ch3 : CLOCK Ch4 : DATA



Vibra failure

1. Flex B2B connector pressed in?
2. Change C2 cover assembly(new vibra)/Vibra works?
3. Change LCD can assembly (new flex) works?
4. Change main PWB (UEM)?

Figure 13:Vibra troubleshooting



Speaker failure

1. Flex B2B connector pressed in?

2. C2 cover mounted correct (red snap not vissible)?
3. Check if system connector is misplaced slightly?
4. Check for ”headset inserted symbol” in display?
5. Change speaker chamber/antenna works?
6. Change LCD can assembly (for new flex) works?
7. Change main PWB (UEM)?

Display failure

1. Flex B2B connector pressed in?
2. Display B2B connector pressed in (press through hole in C2 cover assembly)?
3. Change display works?
4. Change LCD can assembly (for new flex) works?
5. R316 (LCDRESETX) missing?

Fold detection failure

1: Check if magnet is mounted on bottom side of C2 cover assembly (with a spare screw)

2: Check if N306 (Hall IC) is mounted?

Note:

Don’t try and rework flex!! Handling is likely to cause the solder pads to brake or disconncect from track, which cannot be repaired in a reliable way by resoldering. Only reliable repair option is to change the flex (LCD can assembly)!

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Introduction to RH-53/54 RF Troubleshooting

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

- RF measurements should be done with a GSM tester and a suitable connector to the general RF input/output. That connection is for tuning and testing the whole RF in the phone.
- RF test measurements should be done with a Spectrum Analyzer and a high-frequency 500ohm passive probe, for example HP54006A. Use some sort of DC blocking device, to avoid loading the circuit or the SPA with DC. (Note that when measuring with the 500ohm 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 analyzer).
- LF (Low frequency) and DC measurements should be done with a 10:1 probe and an oscilloscope. The probe used in the following is 10MΩ/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 connector. Remember to include the loss in the module repair jig and the coaxial cable when realigning the phone.

Most RF semiconductors are static discharge sensitive. So ESD protection must be taken during repair (ground straps and ESD soldering irons). Mjoelner 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 or checking if the component is missing from PCB. Capacitors can be checked for short-circuit and resistors for value by means of an ohmmeter, but be aware in-circuit measurements should be evaluated carefully.

In the following both the name “low band” will be used to describe both GSM850 - EGSM and GSM900, while “high band” will be used for both PCN and GSM1800.

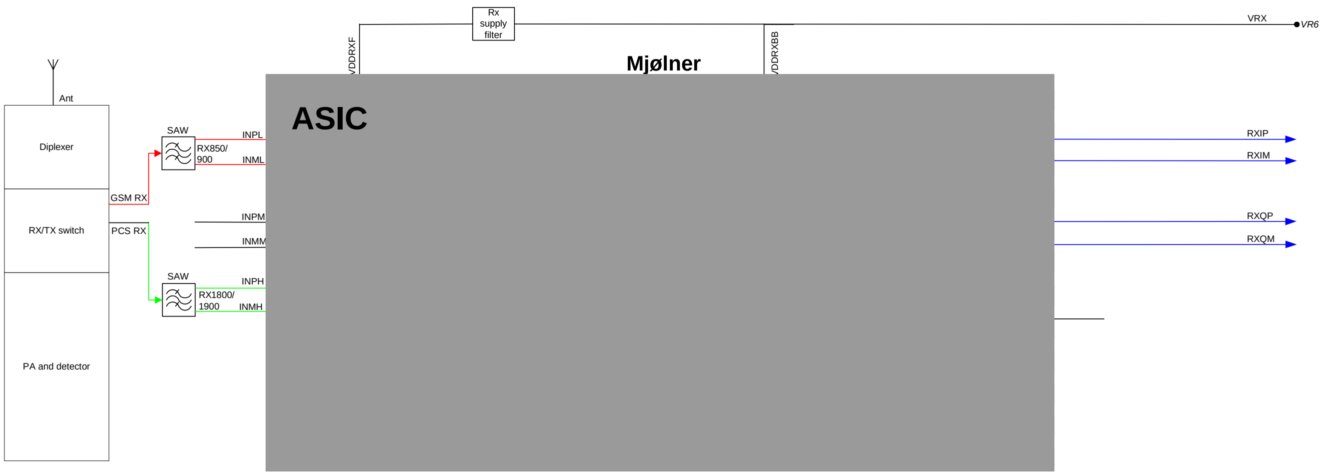
General description of the RF circuits

In the following general desriptions different colours are used in the block diagram. The Low-band signal route is shown in red, the Highband route in green and the common signal lines are shown in blue.

Receiver signal path

The signal from the antenna pad is routed to the Front End Module (FEM - N700). The FEM contains a diplexer and a switch system controlling the direction of the signals, either routing the TX signal from the Power Amplifier (PA) to the antenna or routing the received signal from the antenna to either the Lowband (850/900 MHz) or the Highband (1800/1900 MHz) input on the RF IC (N600).

Figure 14:Receiver signal path



The Lowband signal from the FEM is routed to the SAW filter (Z602). The purpose of the SAW filter is to provide out-of band blocking imummity and to provide the LNA in Mjoelner (N600) with a balanced signal. The front end of Mjoelner is divided into a LNA and Pre-Gain amplifier before the mixers.

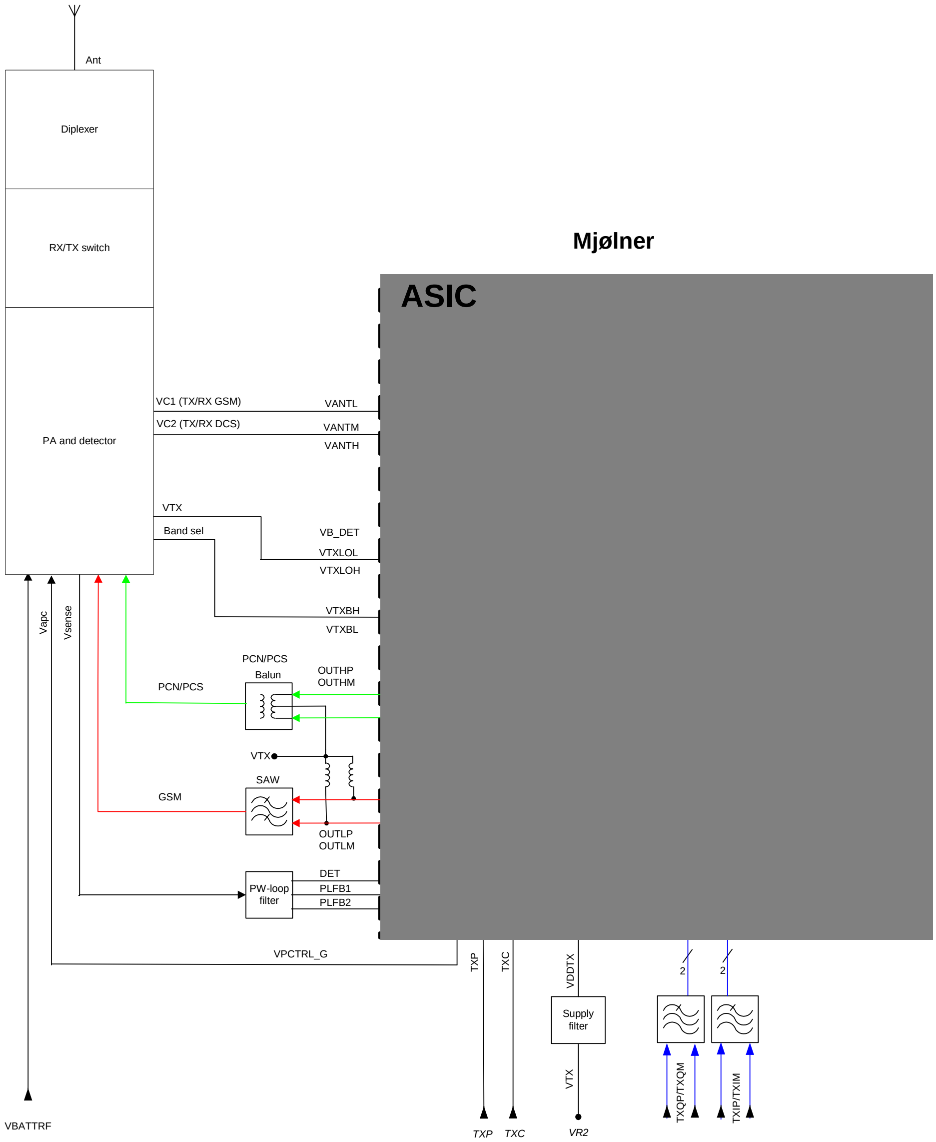
The output from the mixer is fed to Baseband part of Mjoelner where the signals amplified in the BBAMP aand low pass filteret in LPF1 before the DC compensation circuits in DCN1. The DCN1 output is followed by a controlled attenuator and a second lowpass filter LPF2. The output from LPF2 is DC centeret in DCN2 before being feed to the BB for demodulation.

The Highband signal chain is similar to the lowband.

Transmitter signal path

The I/Q signal from the BB is routed two the modulators for both Lowband and Highband. The output of the modulators is either terminated in a SAW filter (Z603) for the Lowband or a balun for the Highband. The signals from the SAW and Balun are then amplified in the Power Amplifier (PA) located in the Front End Module (FEM - N700) where the gain control takes place. In order to control the TX level a sample of the signal is taken in the FEM and used in the power loop amplfier in Mjoelner to establish the right output power. The selection of which amplifier chain in the FEM to be active is controlled through the 4 controllines VC1, VC2, BS and Vtx.

Figure 15:Transmitter signal path



PLL

The PLL supplies Local Oscillator (LO) signals for the RX and TX-mixers. In order to be able to generate LO-frequencies for the required EGSM and PCN channels a regular synthesizer-circuit is used. All blocks for the PLL except for the VCO, reference X-tal and loopfilter is located in the Mjoelner IC, N600.

The reference frequency is generated by a 26MHz Voltage Controlled X-tal Oscillator (VCXO) located in the Mjoelner IC. Only the X-tal is external. 26MHz is supplied to BB where a divide-by-2 circuit (located in the UPP IC) generates the BB-clock at 13MHz. The reference frequency is supplied to the reference divider (RDIV) where the frequency is divided by 65. The output of RDIV (400kHz) is used as reference clock for the Phase Detector (φ).

The PLL synthesizer is a feedback control system controlling the phase and frequency of the LO-signal. Building blocks for the PLL are: Phase detector, Charge Pump, Voltage Controlled Oscillator (VCO), N-Divider and loopfilter. As mentioned earlier only the VCO and loopfilter is external to the Mjoelner IC.

The VCO (G600) is the component that actually generates the LO-frequency. Based on the control voltage input the VCO generates a signal, which is made differential through a balun. This signal is fed to the Prescaler and N-divider in Mjoelner, these 2 block together divide the frequency by a ratio based on the selected channel. The divider output is supplied to the phase detector which compares the frequency and phase to the 400kHz reference clock. Based on this comparison the phase detector controls the charge pump to either charge or discharge the capacitors in the loopfilter. By charging/discharging the loopfilter the control voltage to the VCO changes and the LO-frequency will change. Therefore the PLL will make the LO-frequency stay locked to the 26MHz VCXO frequency.

The loopfilter consists of the following components: C639-C641 and R618-R619.

The PLL is operating at twice the channel center frequency when transmitting or receiving in the PCN band. For the EGSM band the PLL is operating at 4-times the channel frequency. Therefore divide-by-2 and divide-by-4 circuits are inserted between the PLL output and LO-inputs to the PCN and EGSM mixers.

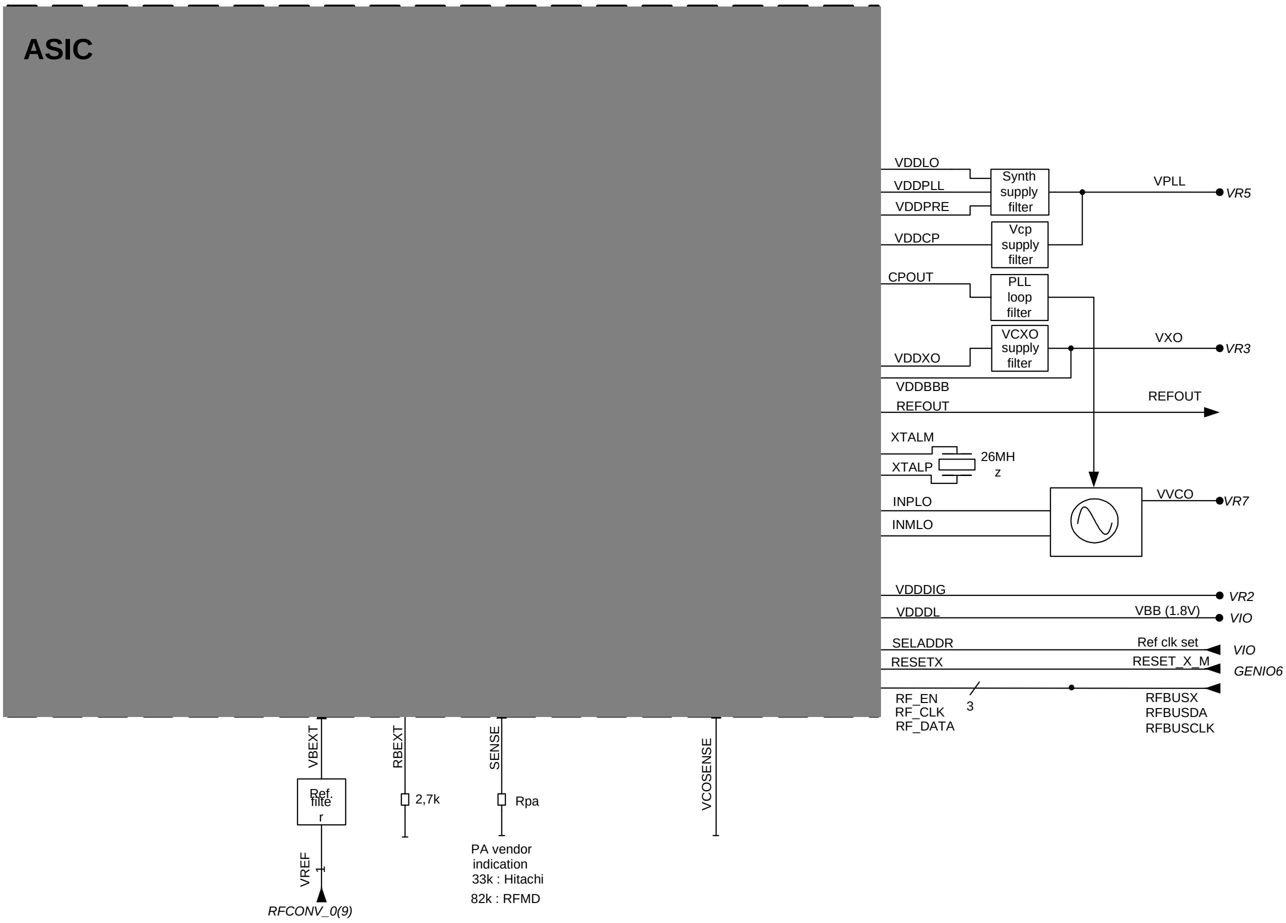
The frequency plan is shown in the figure below:

Table 1: Frequency table

Frequency Band		Channel #	System Frequency Band [MHz]	PLL Frequency Band [MHz]
GSM 850	RX	128 – 251	869.2 – 893.8	3476.8 – 3575.2
	TX		824.2 – 848.8	3296.8 – 3395.2
EGSM 900	RX	975 – 1023 1 – 124	925.2 – 959.8	3700.8 – 3839.2
	TX		880.2 – 914.8	3520.8 – 3659.2
GSM 1800	RX	512 – 885	1805.2 – 1879.8	3610.4 – 3759.6
	TX		1710.2 – 1784.8	3420.4 – 3569.6
PCN	RX	512 – 810	1930.2 – 1989.8	3860.4 – 3979.6
	TX		1850.2 – 1909.8	3700.4 – 3819.6

According to the figures above the PLL must be able to cover the frequency range 3420.4MHz to 3839.2MHz for the GSM900/1800 and 3296.8 to 3979.6MHz for the GSM850/1900.

Figure 16:Frequency plan



RF Key component placement

Figure 17:RF key component placement

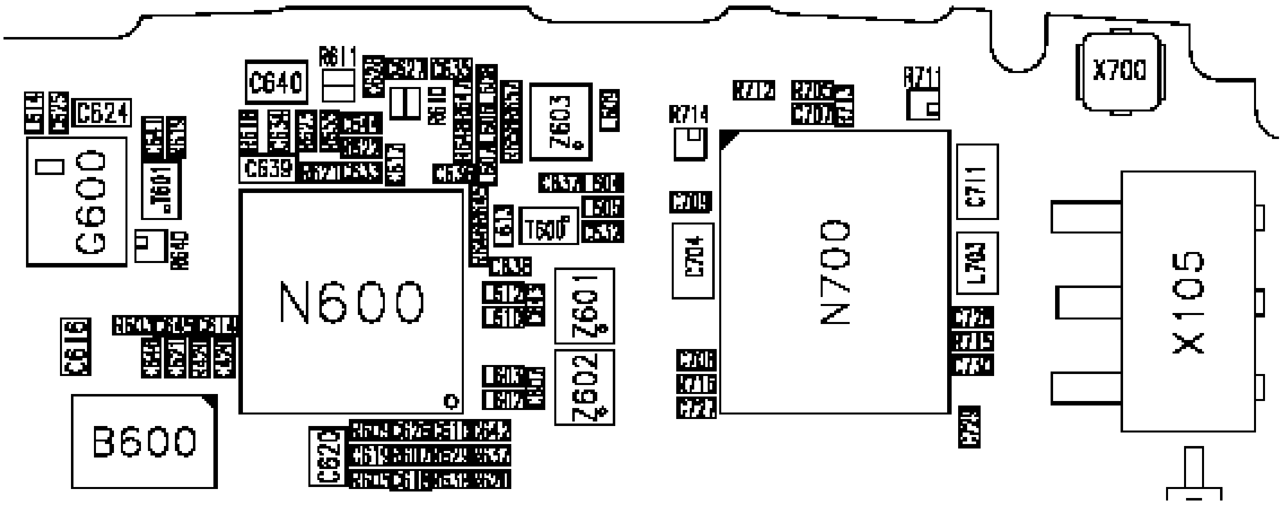


Table 2: Key component placement tABLE

N600	Mjoelner RF IC	
Z601	PCN RX SAW	High band RX SAW filter
Z602	EGSM RX SAW	Low band RX SAW filter
Z603	EGSM TX SAW	Low band TX SAW filter
B600	26 MHz crystal	
G600	VCO (3.6 GHZ VCO)	
N700	Front End Module (FEM)	
X700	RF connector	

Troubleshooting

Common circuit

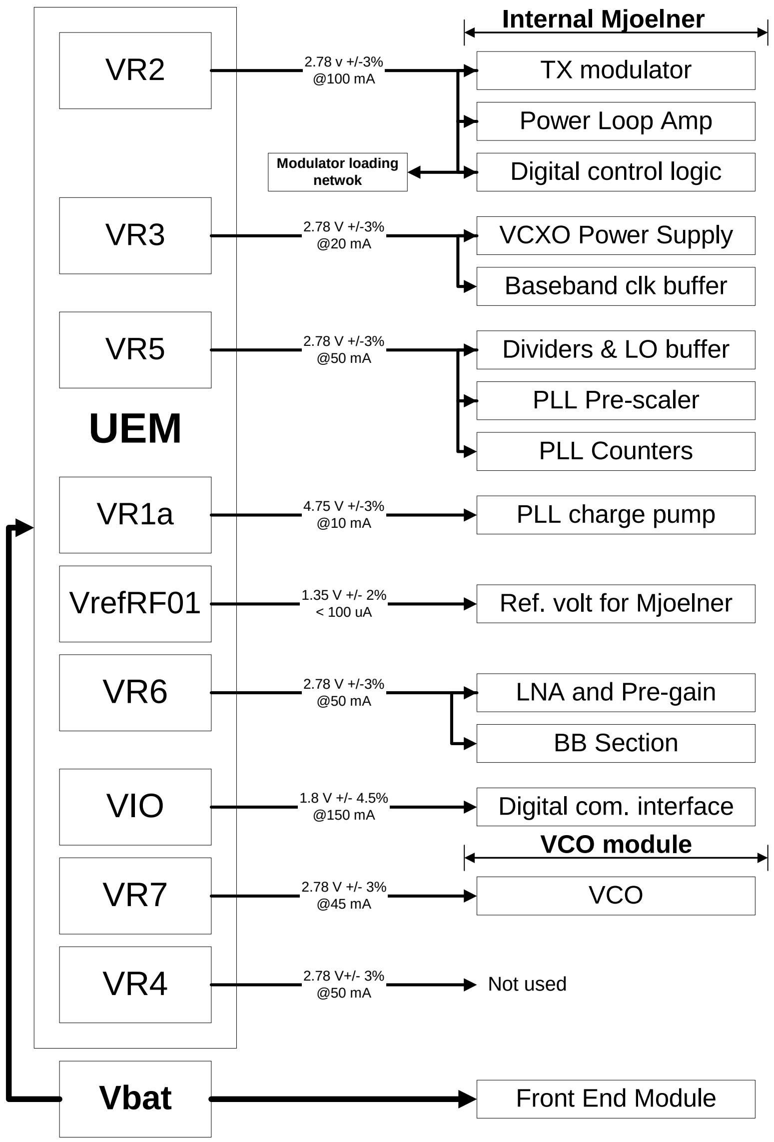
The power supply and the synthesiser is common for RH53/54, except for the synthesiser ranges.

Power Supply Configuration

All power supplies for the RF Unit are generated in the UEM IC (D200). All power outputs from this IC have a decoupling capacitor at which the supply voltage can be checked.

The power supply configuration used in the phone is shown in the block diagram below:

Figure 18:Power supply configuration



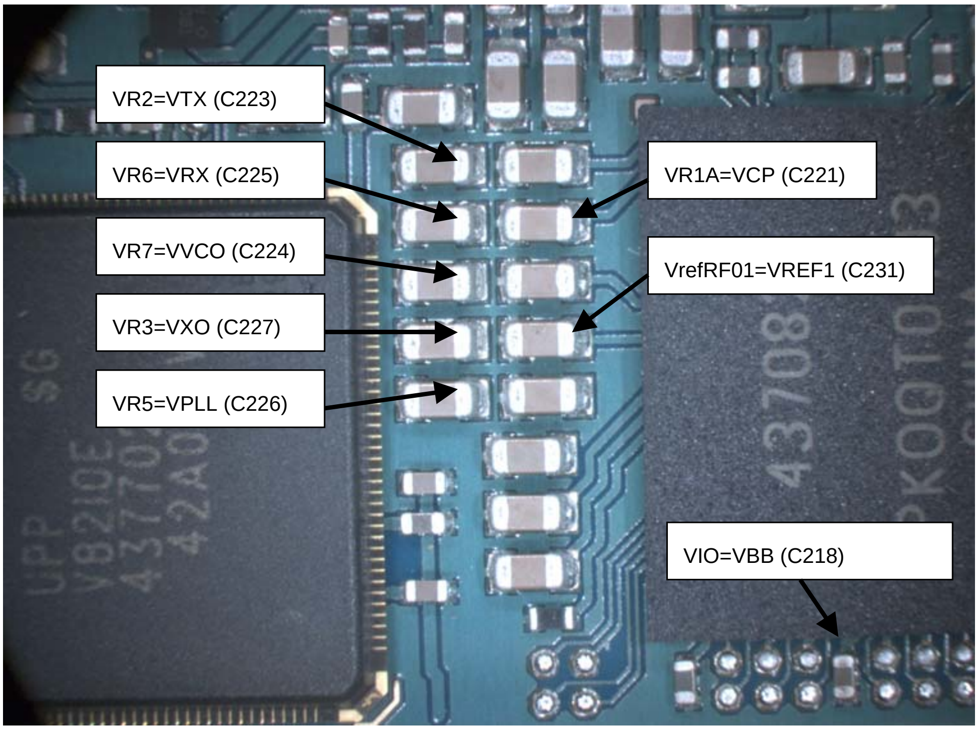
The names to the left are the signal names used on the RF schematics

Table 3: Supply names

Supply name RF	Supply name UEM	Min	Typ	Max	Unit
VCP	VR1A	4.54	4.75	4.9	V
VTX	VR2	2.64	2.78	2.86	V
VXO	VR3	2.64	2.78	2.86	V
VPLL	VR5	2.64	2.78	2.86	V
VRX	VR6	2.64	2.78	2.86	V
VVCO	VR7	2.64	2.78	2.86	V
VBB	VIO	1.72	1.8	1.88	V
VREF2	VrefRF01	1.334	1.35	1.366	V
VBATT	BATTERY	3.1	3.6	5.2	V

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

Figure 19: UEM measuring points



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

General instructions for Synthesizer troubleshooting

Start the Phoenix-Service-Software and

Select:ProductRH53/54 or scan

Select:Testing

RF Controls

Band XX, se table below

Active UnitRX

Operation ModeContinuous

RX/TX ChannelYY se table below

The signal from the VCO is measured at R640 using a spectrum analysator and a 500ohm passive probe. The frequency should be as found in the table below and the power should be around –20dBm.

Table 4: Frequency table

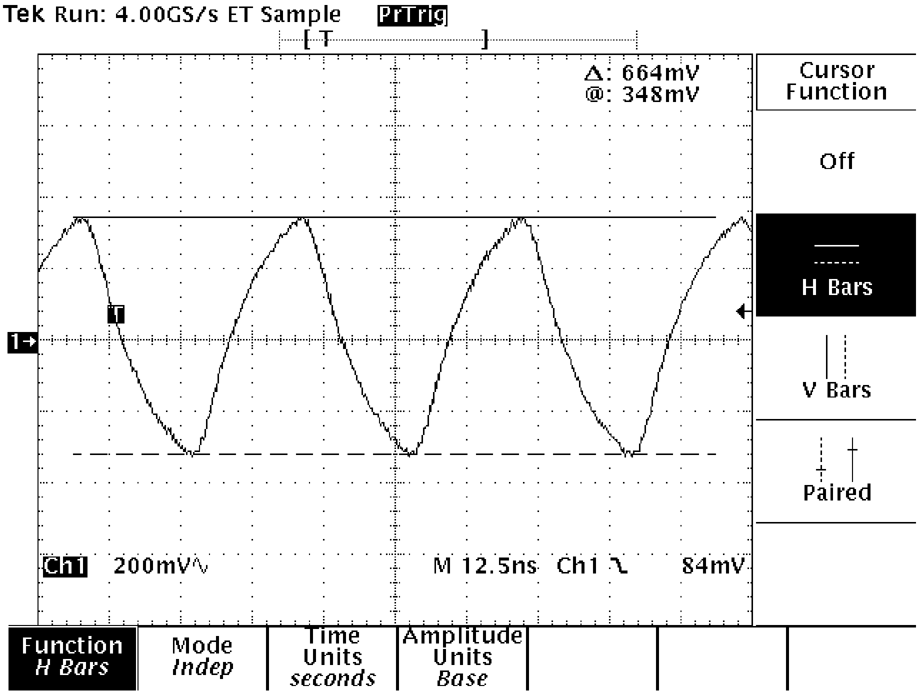
ZZ	XX	YY	PLL frequency [MHz]
RH-54	GSM850	189	3525.6
RH-53	GSM900	36	3768.8
RH-53	GSM1800	700	3685.6
RH-54	GSM1900	661	3920

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 R420 at the end towards the UPP, see “Measurement points for the Synthesizer”. 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 (R420)

Figure 20:Measured signal at VCXO output

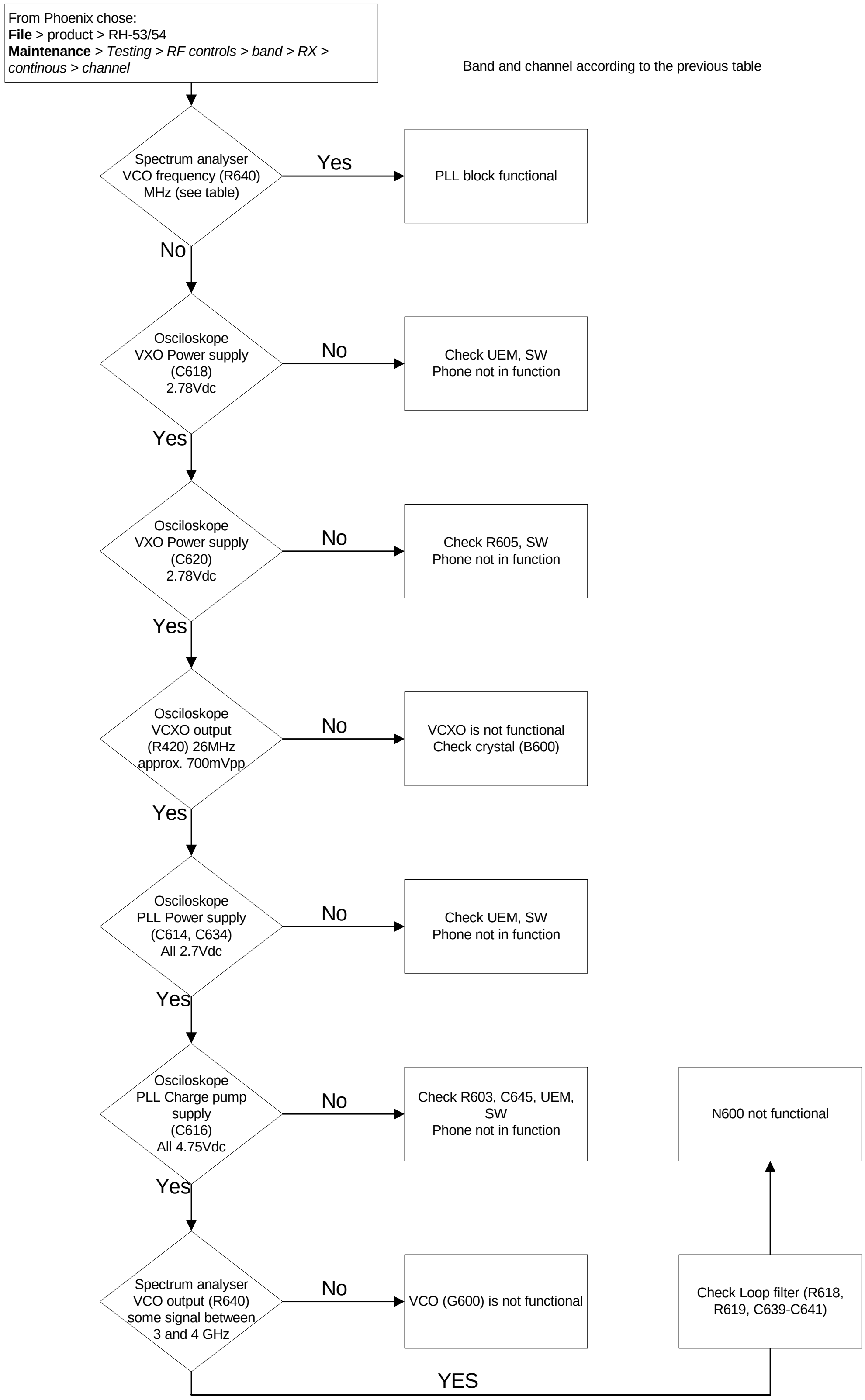


VCO

The VCO is generating frequencies in the range of 3420.4MHz – 3839.2 MHz for the RH-53 and in the range 3296.8 to 3979.6 MHz for RH-54 when the PLL is running. The output frequency from the VCO is led to the Local oscillator input of the Mjoelner IC (N600), where the frequency is divided either by 2 or 4 in order to generate all channels in EGSM and PCN respectively. Frequency of the VCO is controlled by a DC-voltage (Vctrl) coming from the loopfilter. The loopfilter consists of the components R618, R619 and C639-C641. Range of the Vctrl when the PLL is running (locked) is 0.4V – 4.3V. Even if the PLL is not in locked state (Vctrl out of range) there is some frequency at the output of the VCO (G600), which is between 3 and 4 GHz. This is true if the VCO is working and if the VCO power supply is at present (2.7V).

Troubleshooting chart for the Synthesizer

Figure 21:Troubleshooting chart for synthesizer



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

Turn on the phone and check

VCXO Power supply (C620) = 2.7V

VCXO output (R420 – end **not** connected to C420) 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 for the Synthesizer

Figure 22:Measurement points for Synthesizer

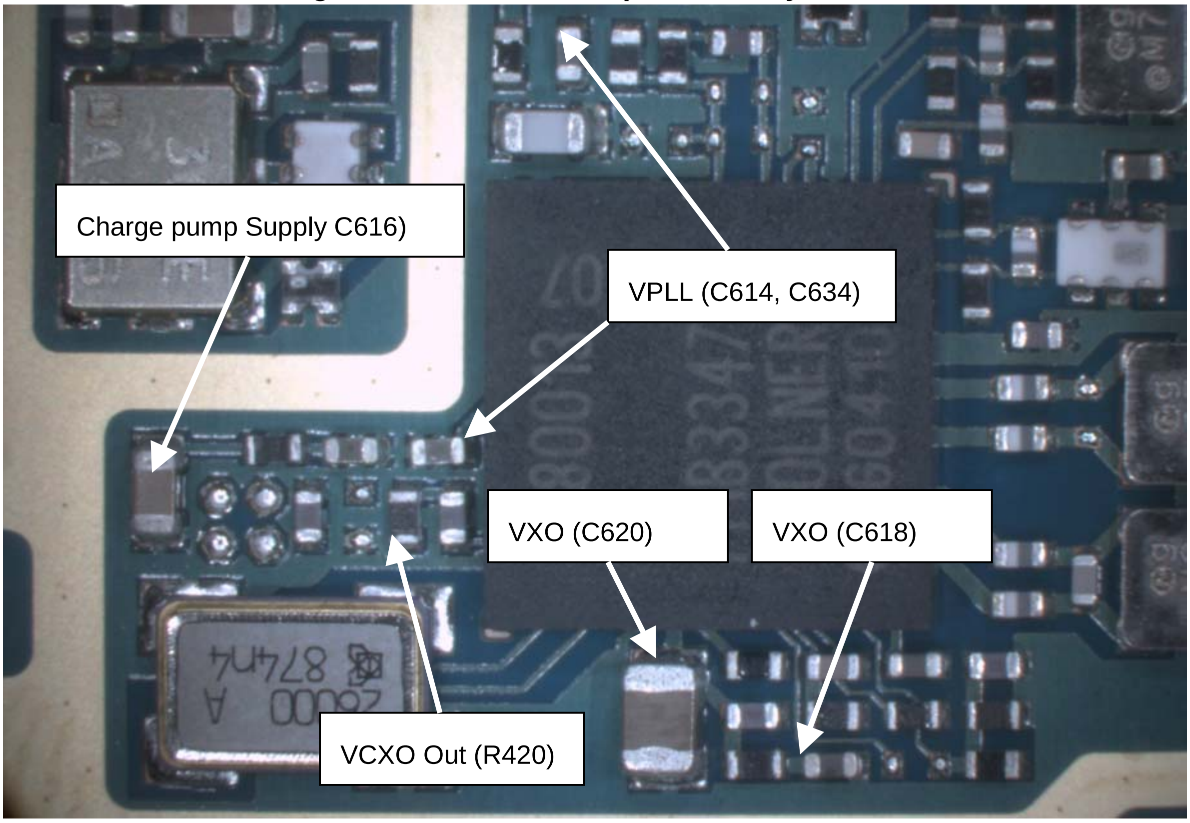
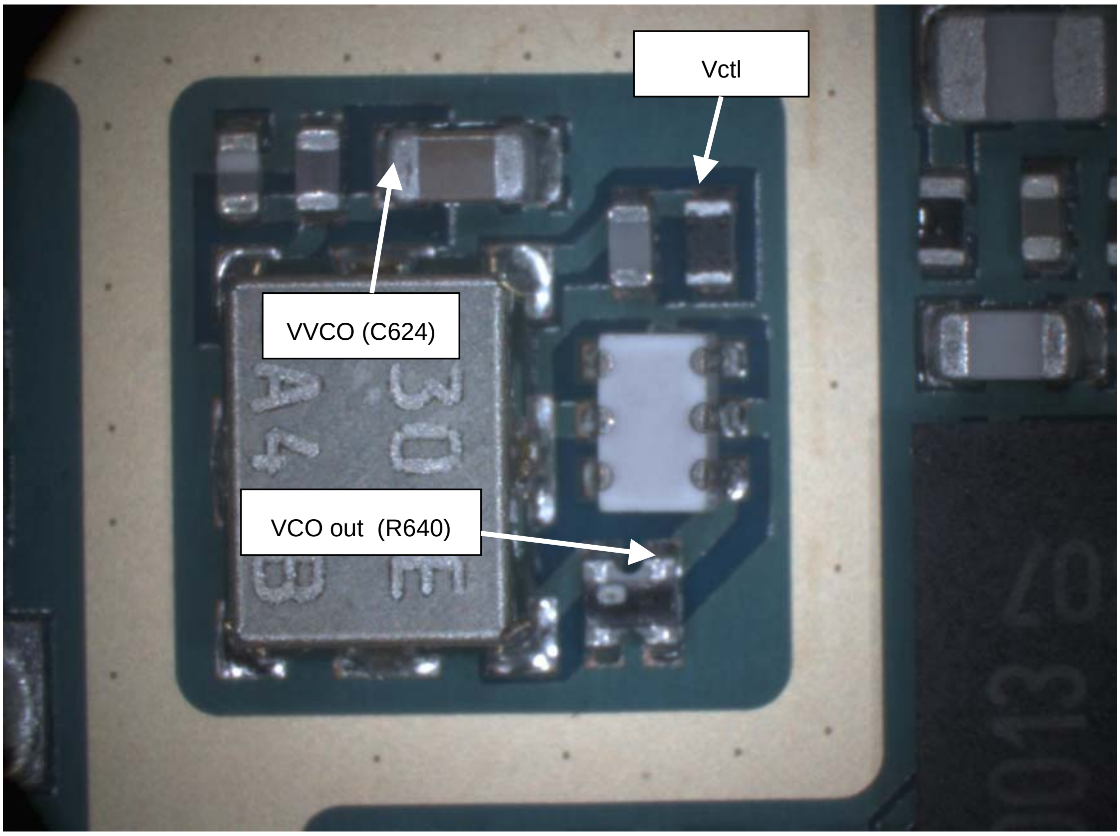


Figure 23:Measurement points for the VCO



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Receiver Troubleshooting

Front End Module (FEM) control signals

Depending on the vendor of the Front End Module (FEM), different timing of the control signals are present. The SW suppoerts both FEMs. R629 tells the SW which FEM control should be active. Renesas FEM control is used when R629 is 18K and RFMD FEM control is used when R629 is 82K.

If the FEM is exchanged with an other type, the R629 must be changed, too.

Renesa FEM logic

Table 5: Renesa FEM logic

Mode	Vtx	BS	VC1	VC2
	VTX_B_P	VTX_B_P	Vant1	Vant2
Low Band RX	0	0	0	0
Low Band TX	1	0	1	0
High Band RX	0	1	0	0
High Band TX	1	1	0	1

RFMD FEM logic

Table 6: RFMD FEM logic

	Vtx	BS	VC1	VC2
Mode	VTX_B_P	VTX_B_P	Vant1	Vant2
Idle	0	0	0	0
Low Band RX	0	0	1	0
Low Band TX	1	0	1	0
High Band RX	0	1	1	0
High Band TX	1	1	1	0

Measurements points

Measurement points for the receiver

Figure 24:Measurement points for the FEM

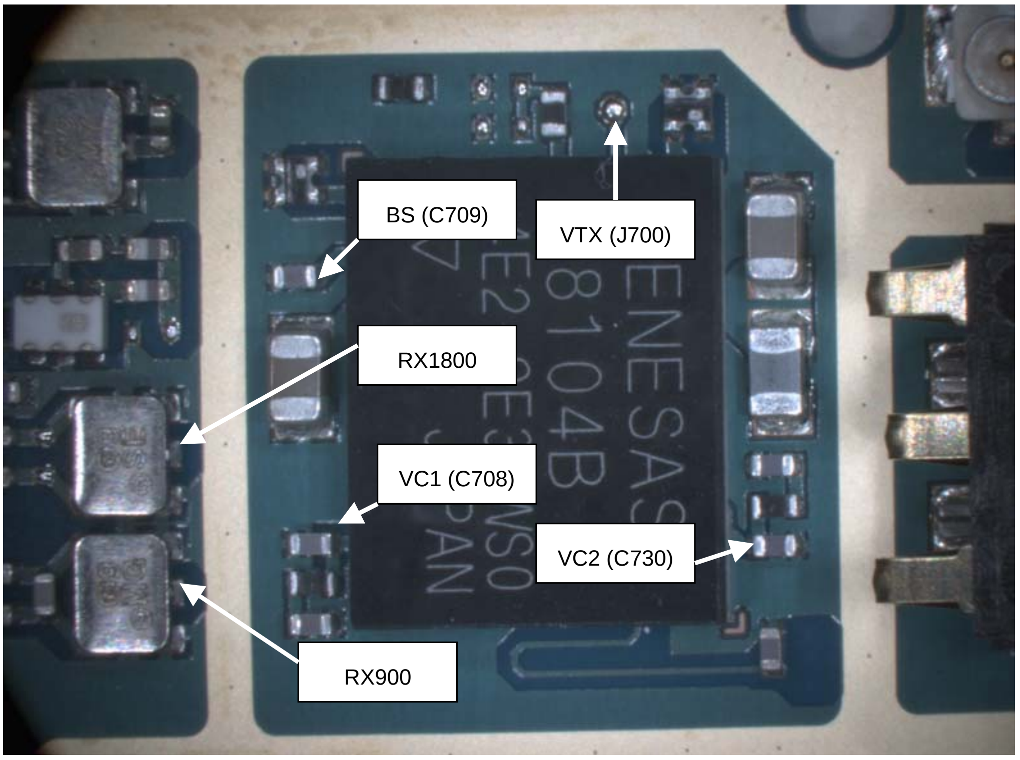


Figure 25:RX interface points between N600/SAW filters

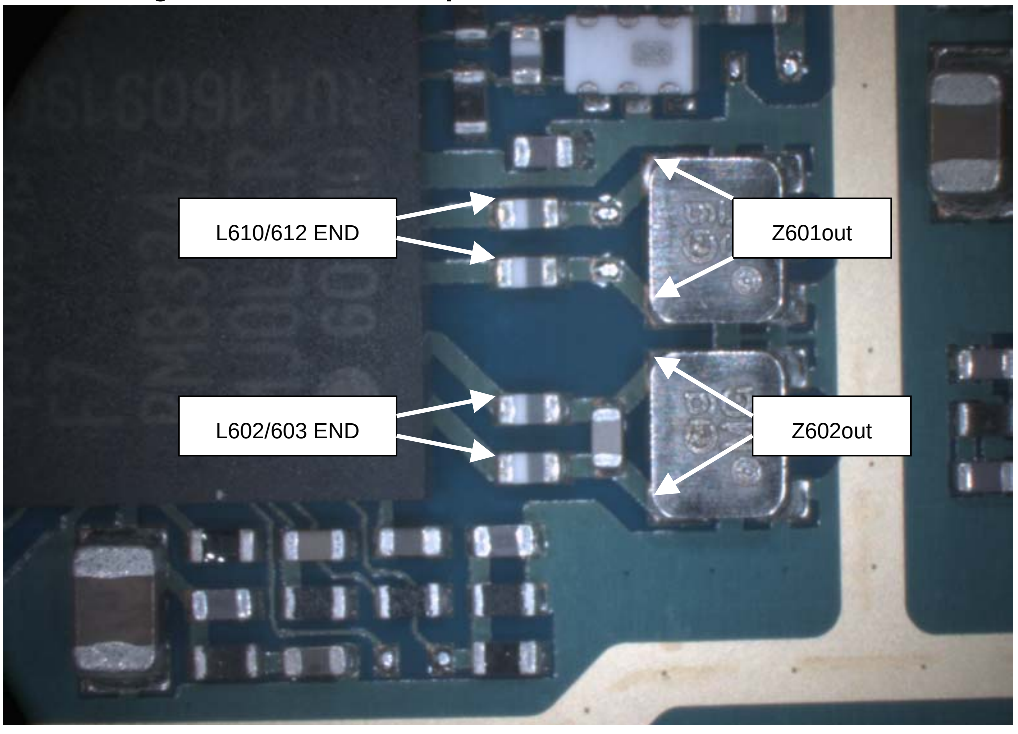


Figure 26:Serial Bus interface measurement points

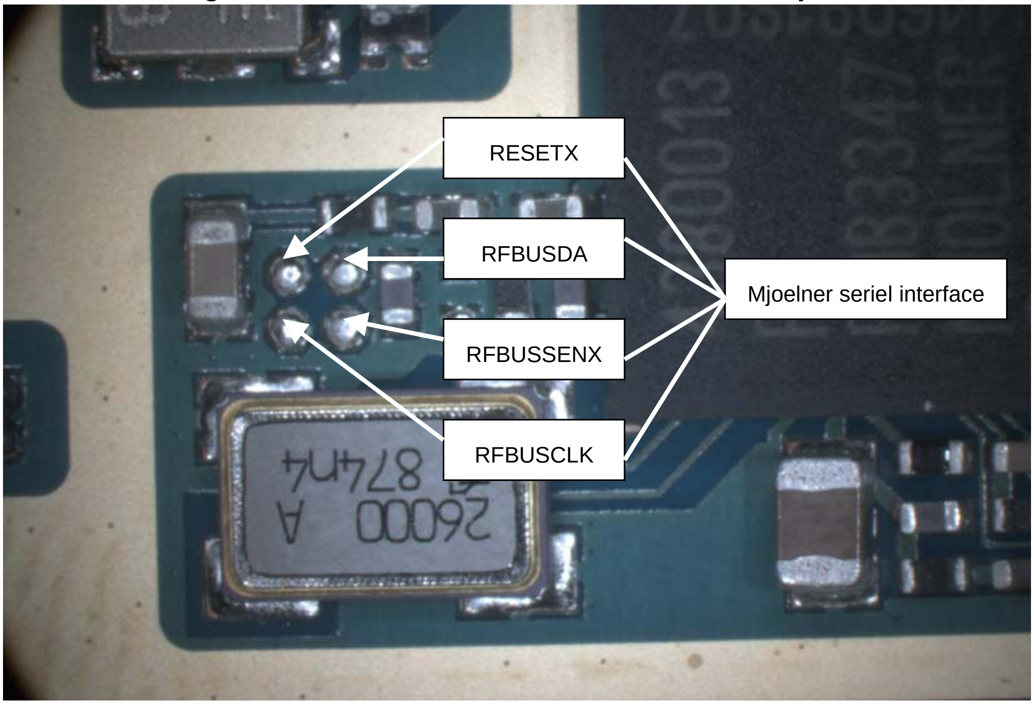
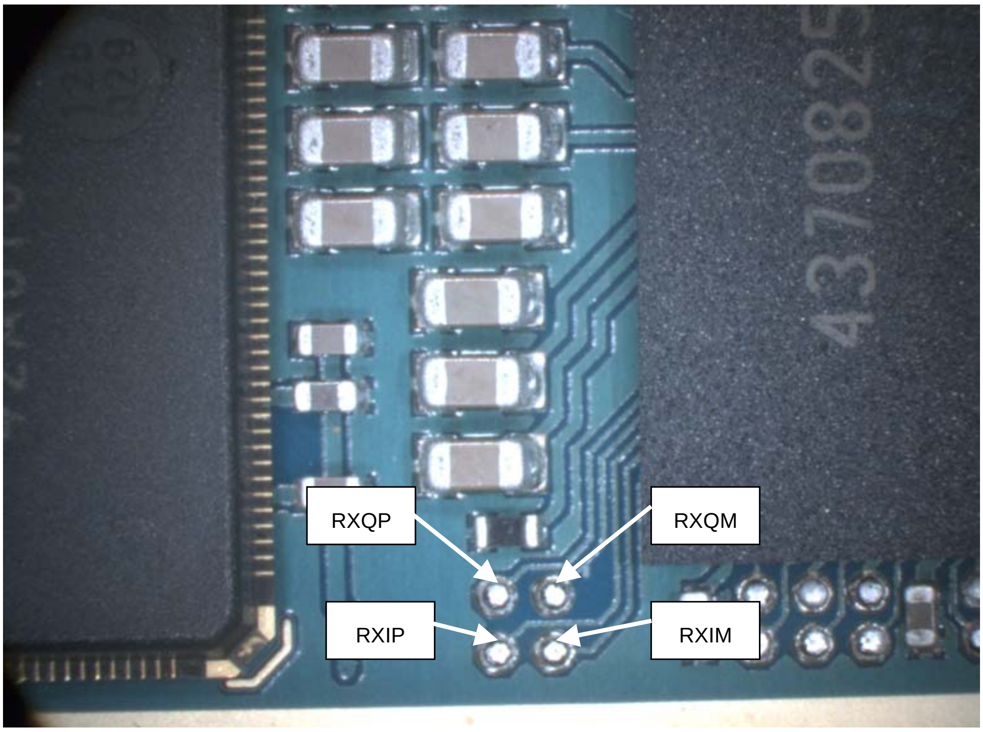


Figure 27:I/Q measurement points



RH-54 Receiver

General Instructions for GSM850 RX Troubleshooting

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

Start Phoenix and establish connection to the phone

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 7: Band values

Band:	GSM850
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	190
AGC:	9

The setup should now look like this:

Figure 28:RF controls

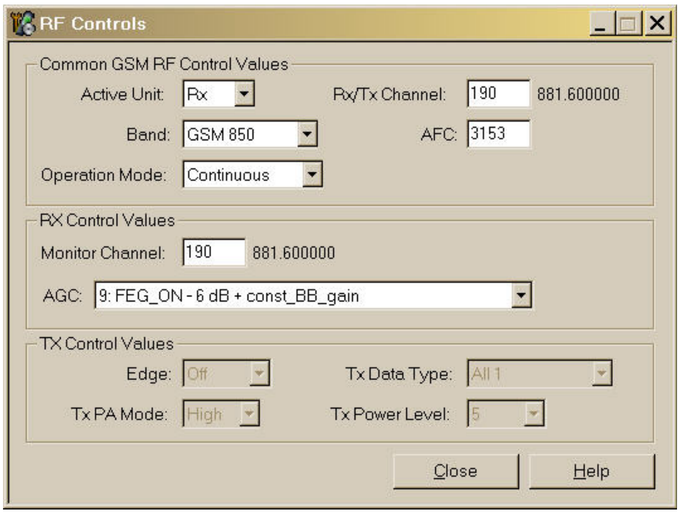
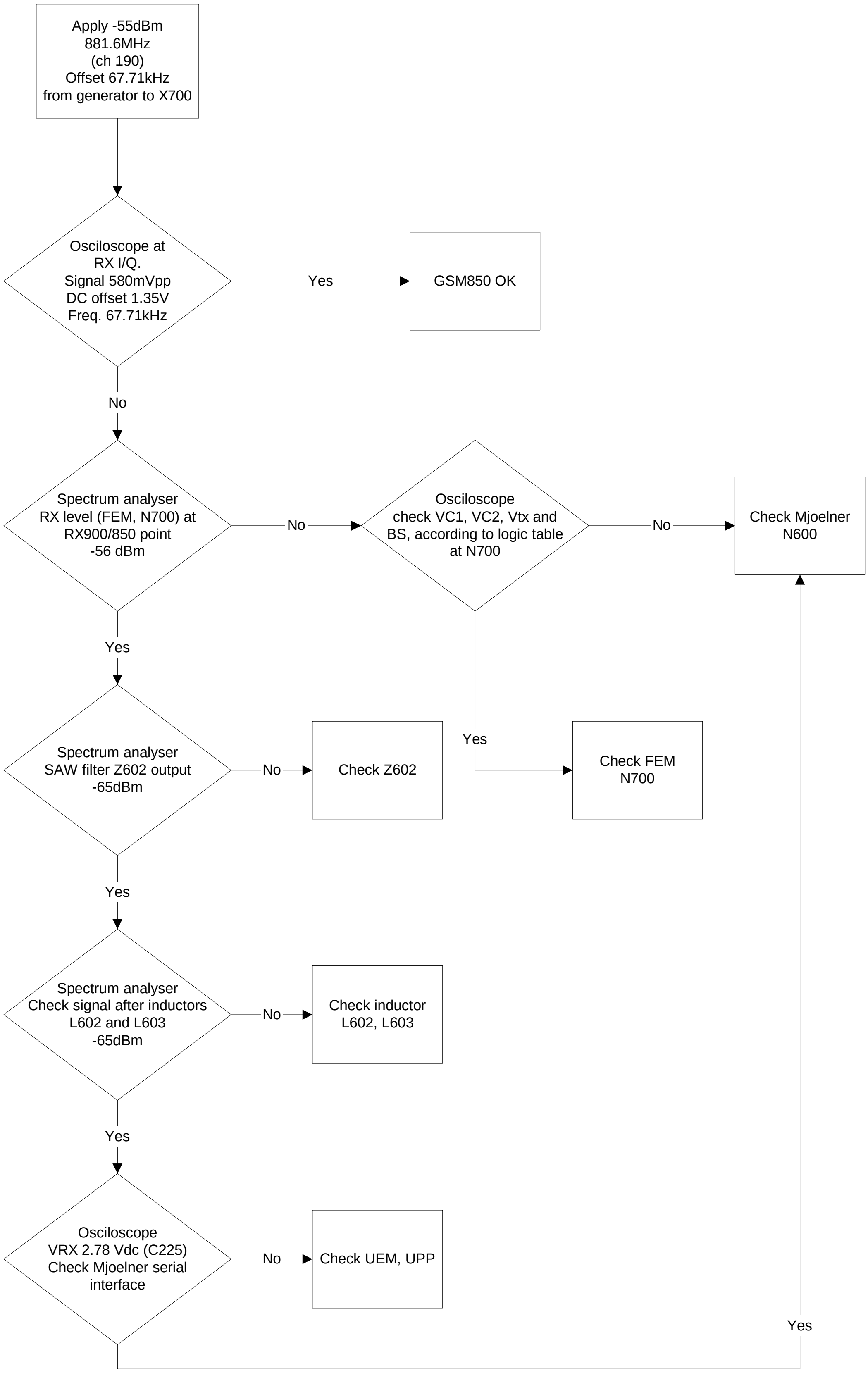


Figure 29:Troubleshooting chart for GSM850 receiver

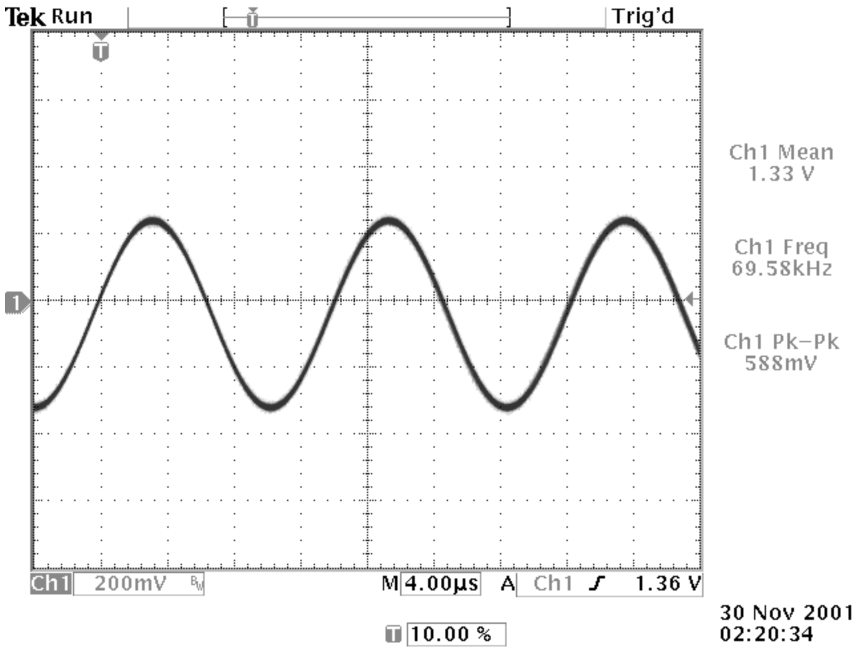


By measuring with an oscilloscope at RXIP or RXQP on a working GSM 850 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33 V

Figure 30:Measuring with oscilloscope



General Instructions for GSM1900 RX Troubleshooting

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

Start Phoenix and establish connection to the phone

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 8: Band values

Band:	GSM1900
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	661
AGC:	9

The setup should now look like this:

Figure 31:Control values

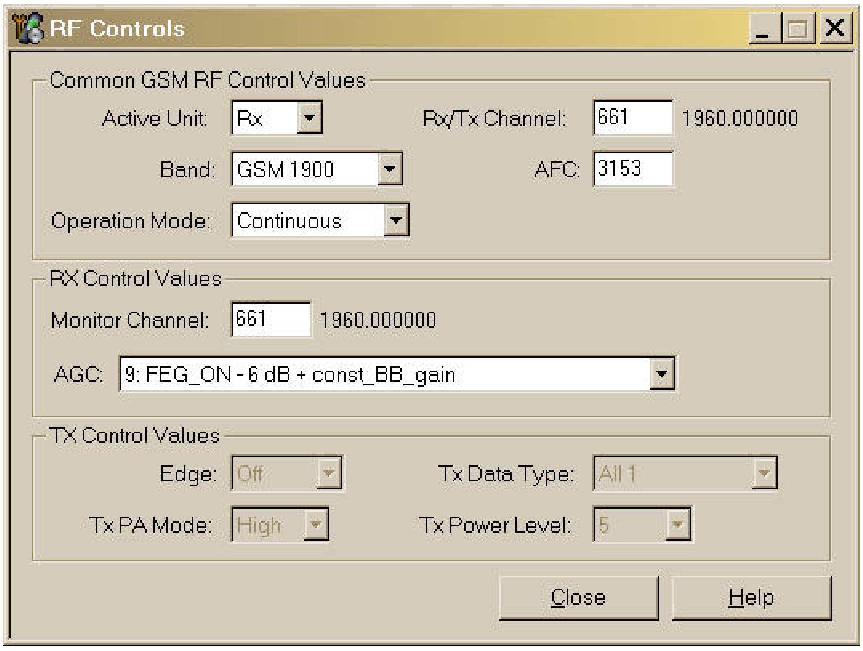
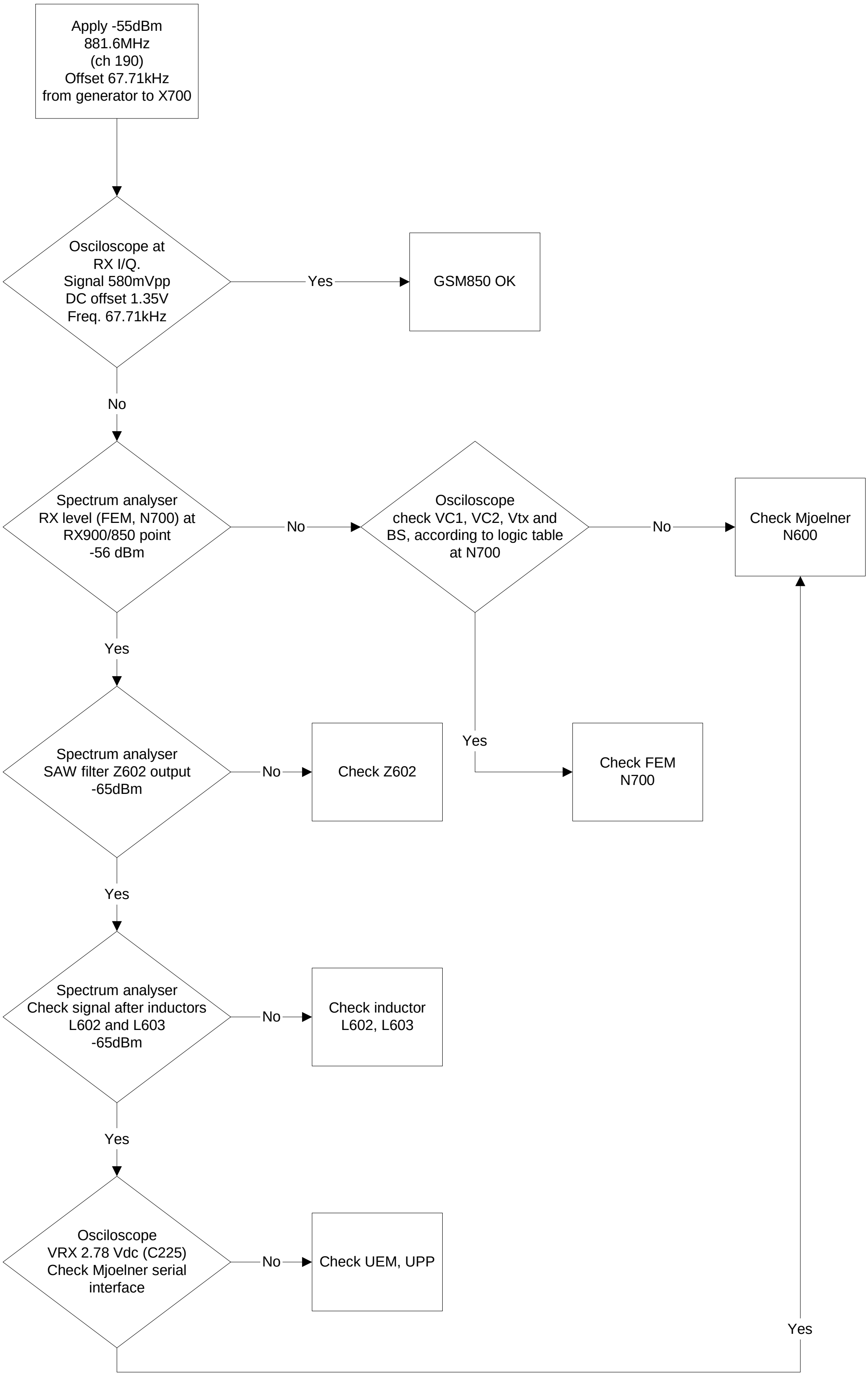


Figure 32:Troubleshooting chart for GSM1900 receiver

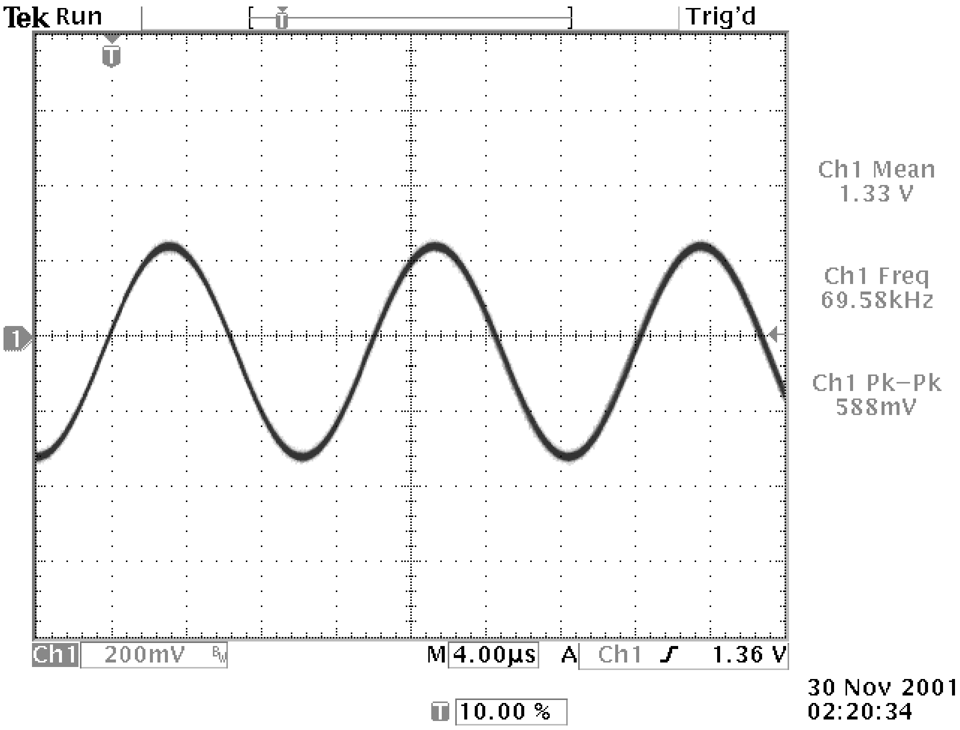


By measuring with an oscilloscope at RXIP or RXQP on a working GSM1900 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33

Figure 33:Measuring with the oscilloscope



RH-53 Receiver

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

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 9: Band values

Band:	GSM900
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	37
AGC:	9

The setup should now look like this:

Figure 34:Control values

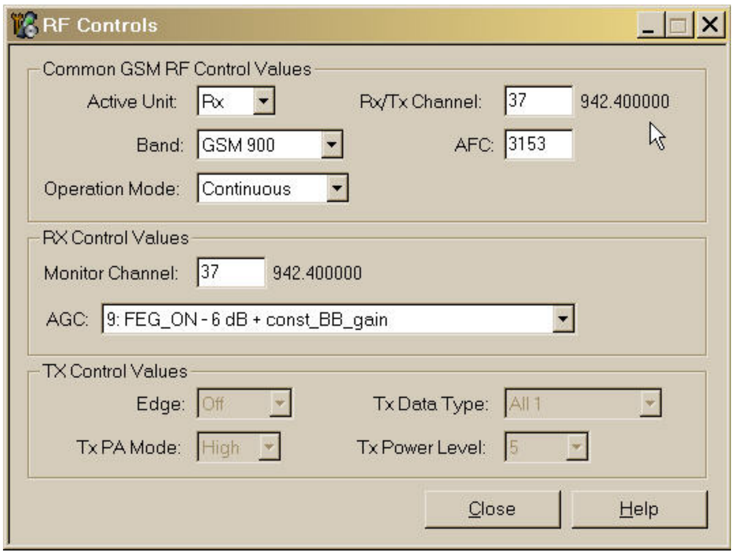
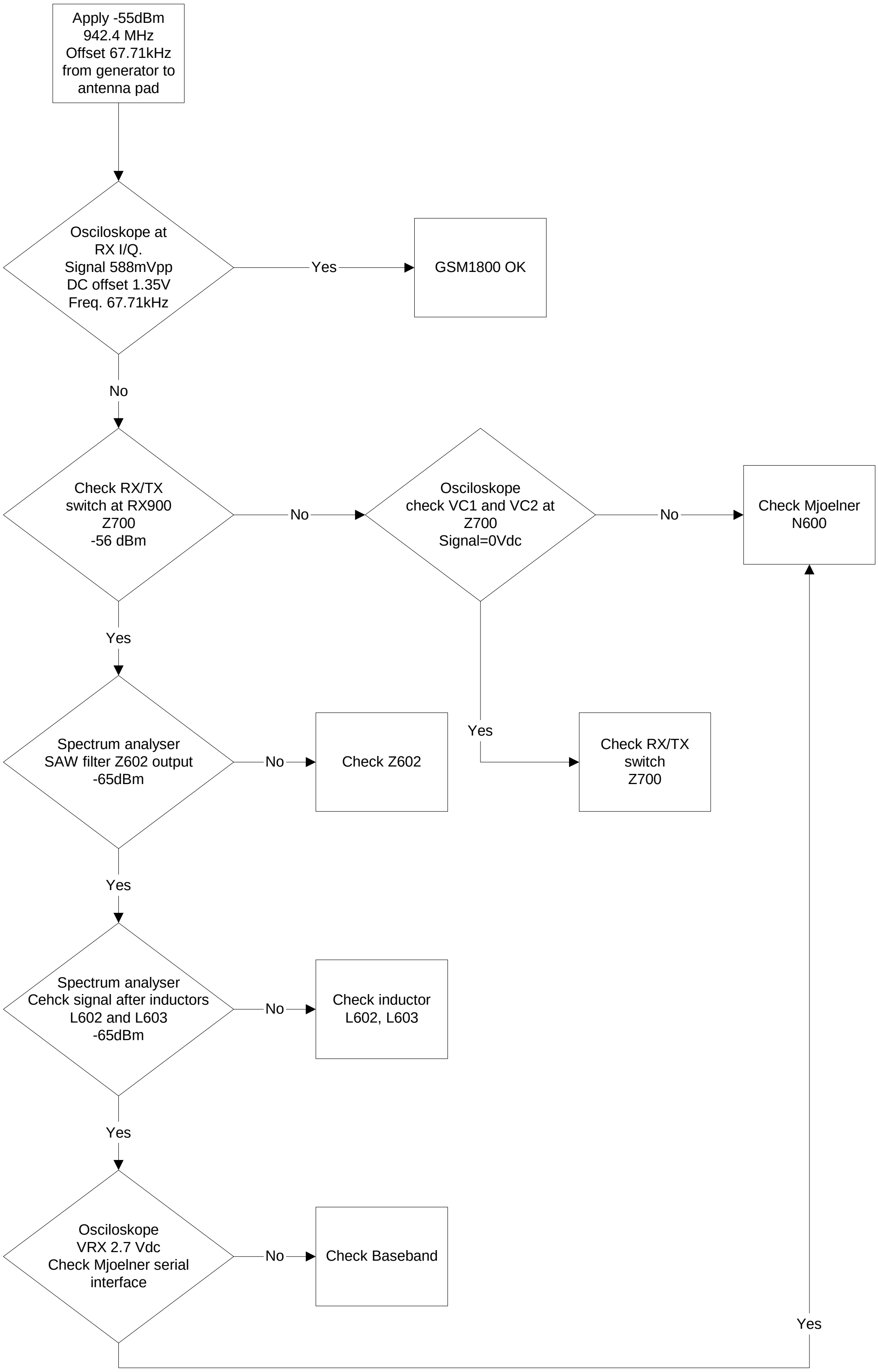


Figure 35:Troubleshooting chart for GSM900 receiver

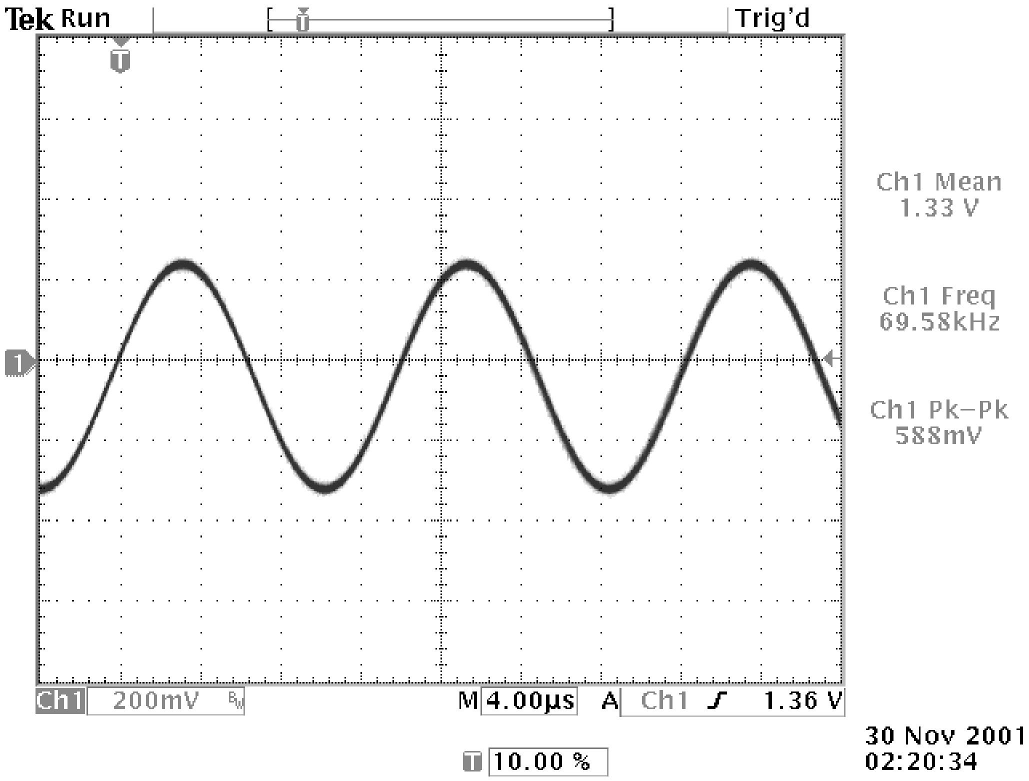


By measuring with an oscilloscope at RXIP or RXQP on a working GSM900 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33 V

Figure 36:Measuring with oscilloscope



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

Select->File

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 10: Band values

Band:	GSM1800
Active Unit:	RX
Operation Mode:	Continuous
Rx/Tx Channel:	700
AGC:	9

The setup should now look like this:

Figure 37:Rf controls

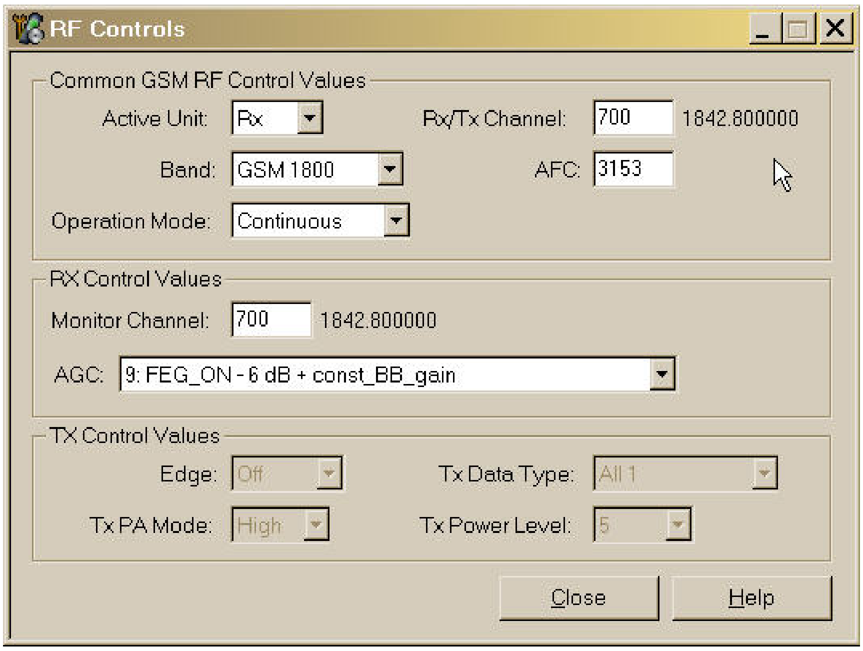
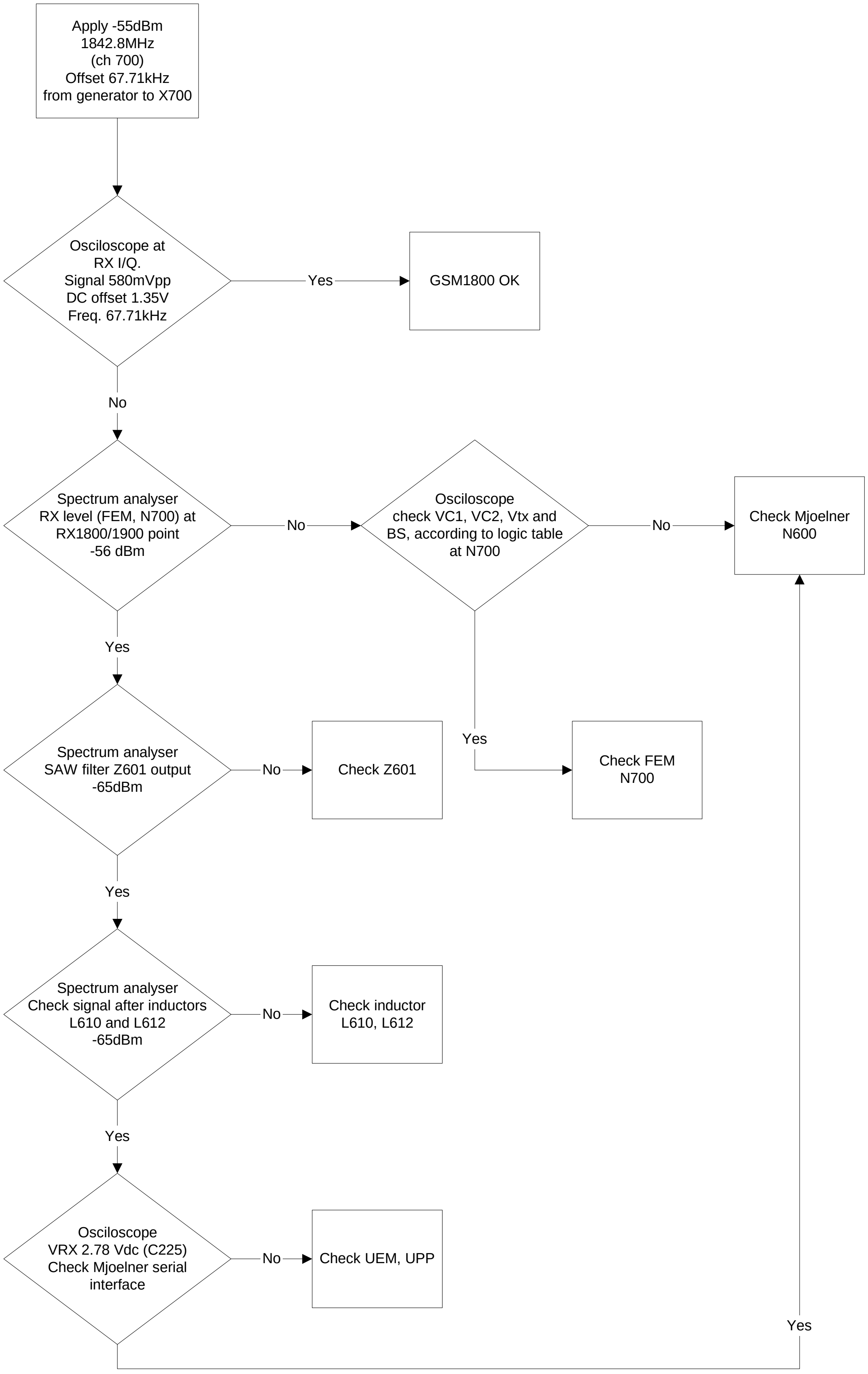


Figure 38:Troubleshooting chart for GSM1800 receiver

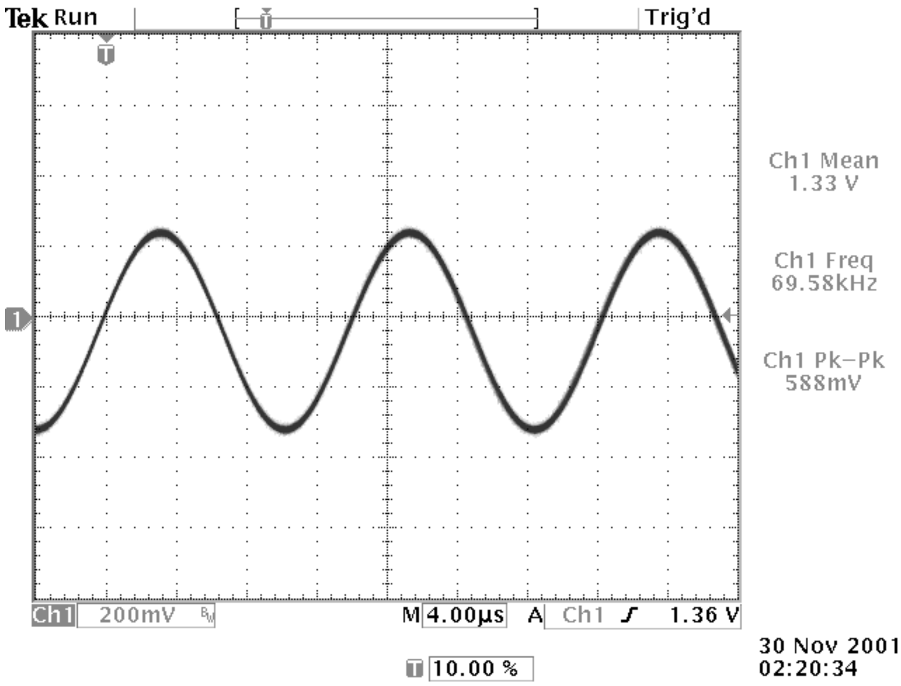


By measuring with an oscilloscope at RXIP or RXQP on a working GSM1800 receiver this picture should be seen

Signal amplitude peak-peak 588 mV

DC offset 1.33

Figure 39:Measuring with oscilloscope



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RH-53/54 Transmitter Troubleshooting

The troubleshooting of the transmitter for the different phones is similar, meaning that the low band, 850/900 MHz, has similar values and the high band, 1800/1900 MHz, has similar values. The only differences are which selection of product done in Phoenix.

Measurement points for the transmitter

Figure 40:Front End Module FEM

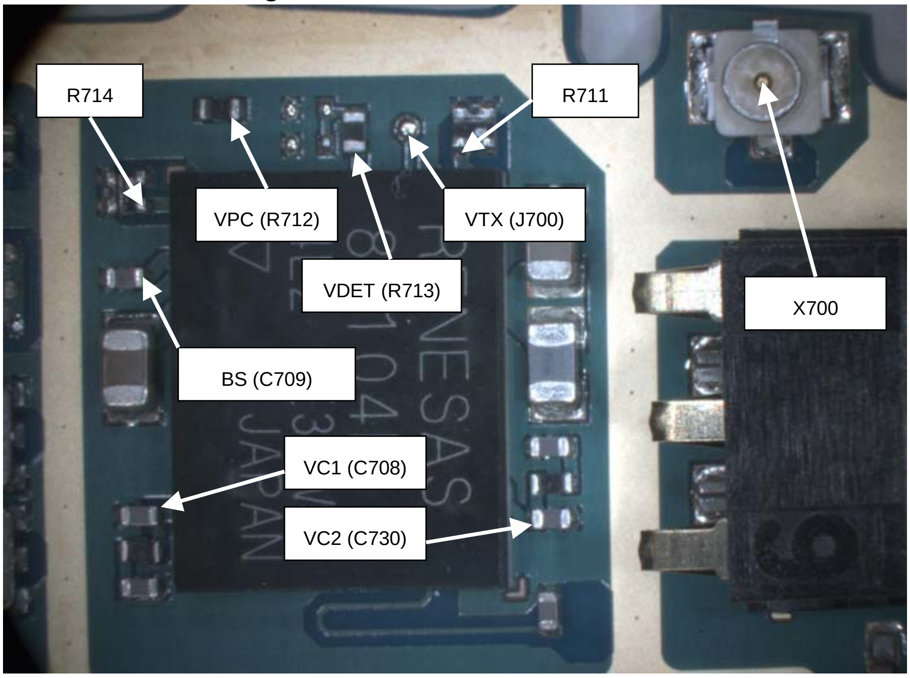


Figure 41:MjoelnerN600 test points

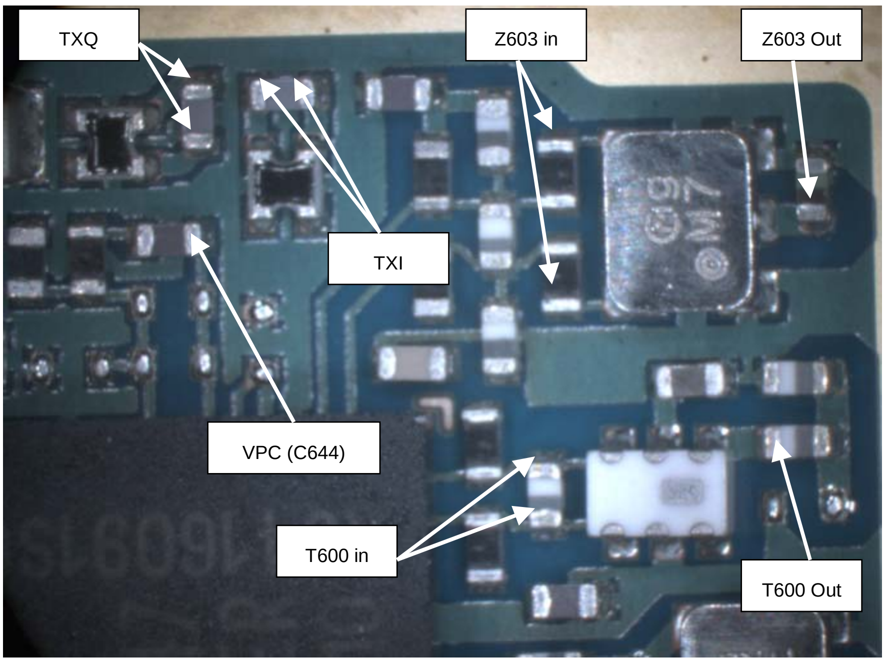
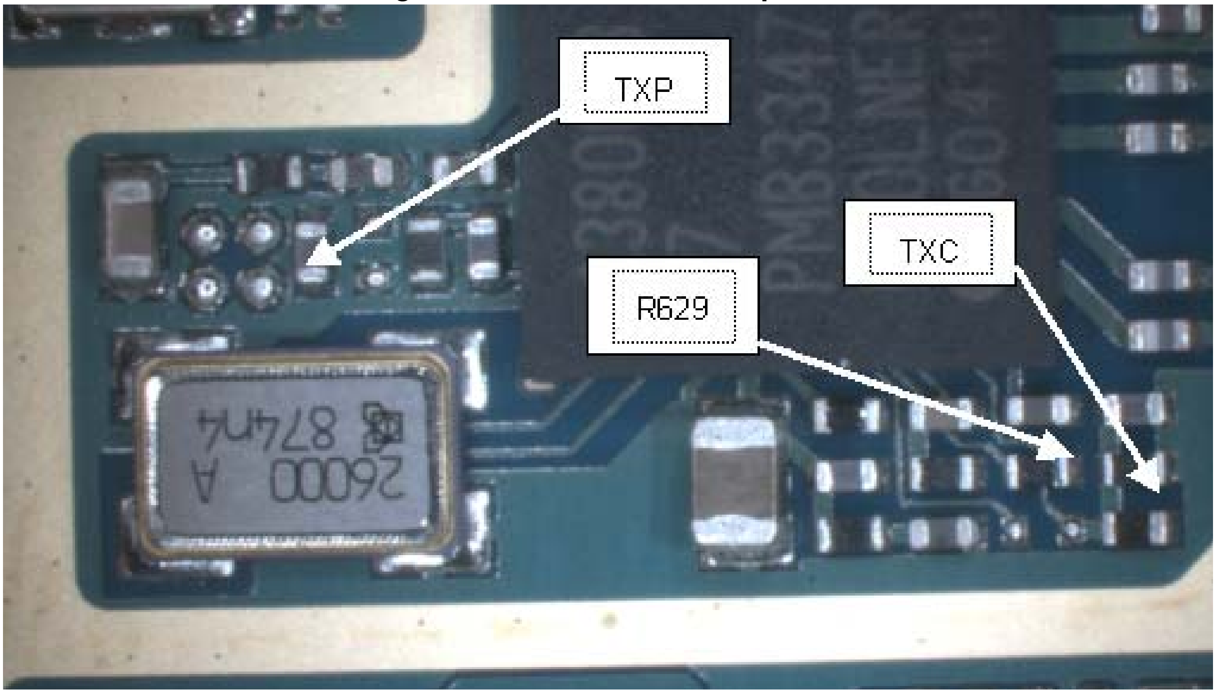


Figure 42:TXP and TXC test points



General instructions for TX troubleshooting

Apply an 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

->Scan for product->CTRL-R

Select->

Testing ->

RFcontrols

Select:

Table 11: Band values

	Band:	XX
	Active Unit:	TX
	Operation Mode:	Burst
	Rx/Tx Channel:	YY
	TX Power level	ZZ
	TX Data Type	Random

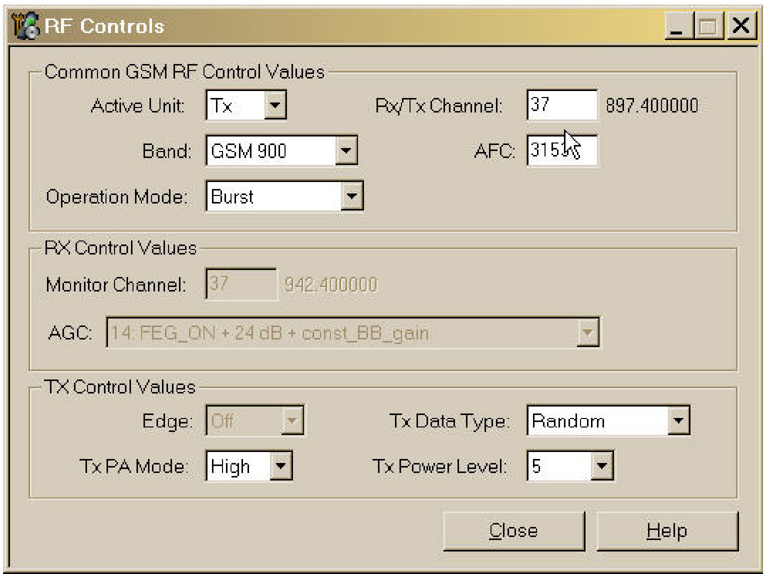
Select "XX" , "YY" and "ZZ" according to the table below

Table 12: Values

Phone	XX	YY	ZZ
RH-54	GSM850	189	5
RH-53	GSM900	37	5
RH-53	GSM1800	700	0
RH-54	GSM1900	661	0

Your screen should look like this:

Figure 43:Control values



Measure the output power of the phone; it should be around 32.5 dBm for low band and 29.5 dBm for highband. Remember the loss in the jig; around 0 dB for the low band and 0.1 dB for the high band.

Troubleshooting chart for GSM900 transmitter

For the spectrum analyzer measurements in the following chart use the 500ohm passive probe giving an approximately 20 dB lower reading than indicate in the following figures. Since the signal measured is bursted it is advised to set the analyzer to maxhold.

Figure 44:Troubleshooting chart for GSM900 transmitter

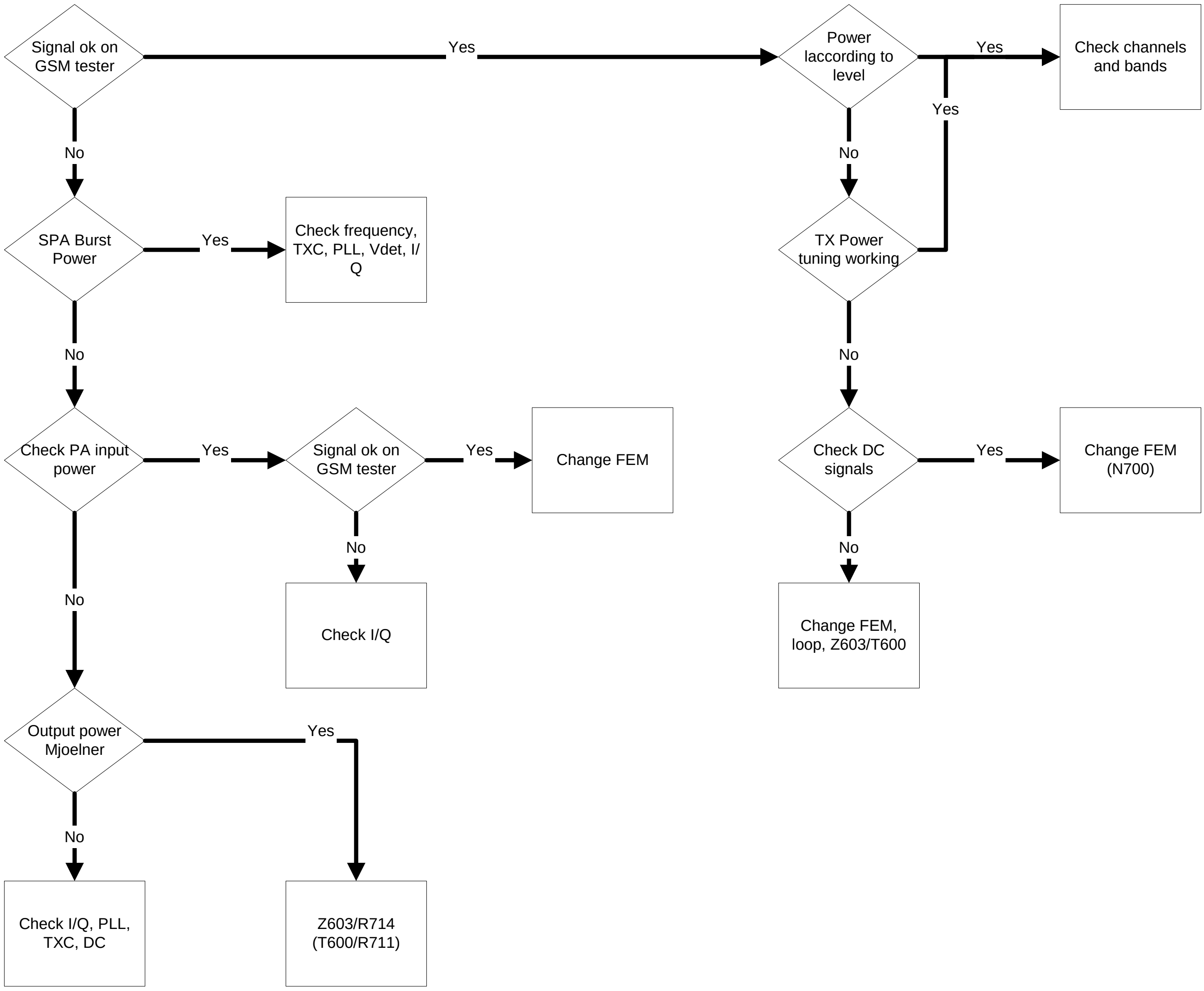
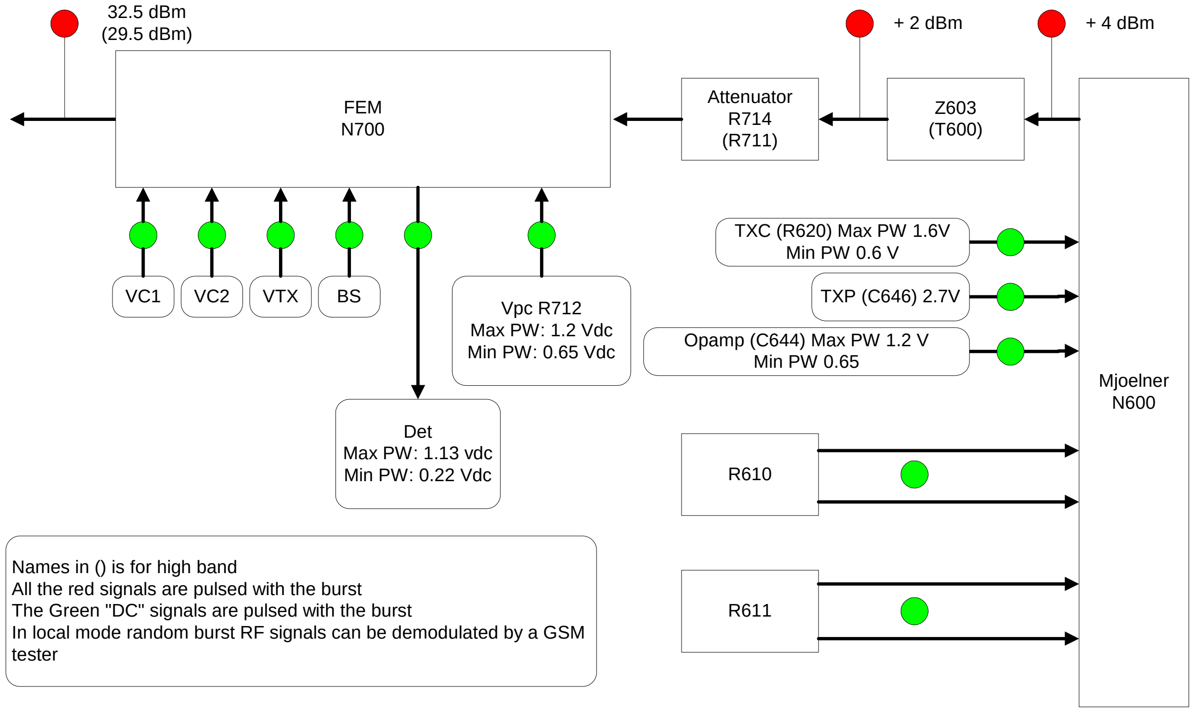


Figure 45:Signals



Logic signals for the Front End Module

Depending on the vendor of the Front End Module (FEM), different timing of the control signals are at present:the SW supports both FEMS. R629 tells the SW which FEM control should be active. Renesas FEM control is used when R629 is 18K and RFMD FEM control is used when R629 is 82K.

If the FEM is exchanged with an other type, the R629 has to be changed, too.

Renesa FEM logic

Table 13: Renesa FEM logic

Mode	Vtx	BS	VC1	VC2
	VTX_B_P	VTX_B_P	Vant1	Vant2
Low Band RX	0	0	0	0
Low Band TX	1	0	1	0
High Band RX	0	1	0	0
High Band TX	1	1	0	1

RFMD FEM logic

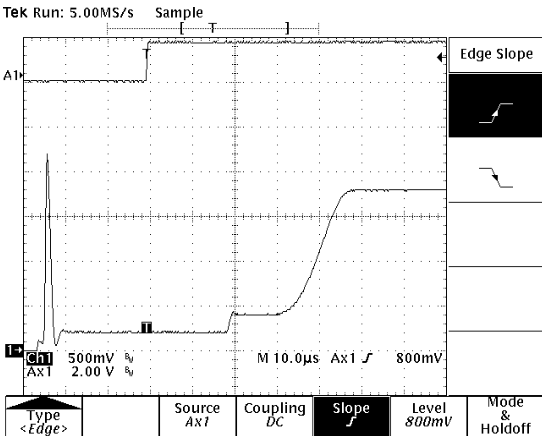
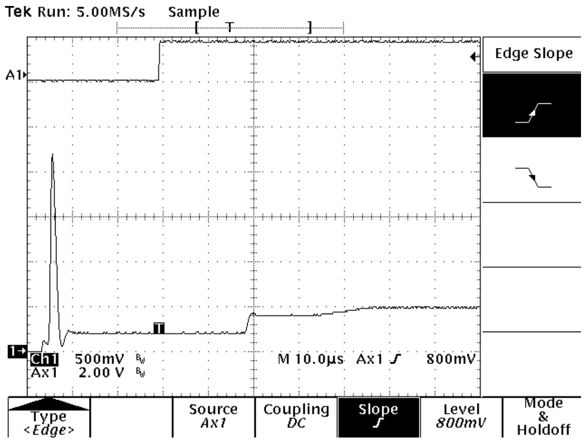
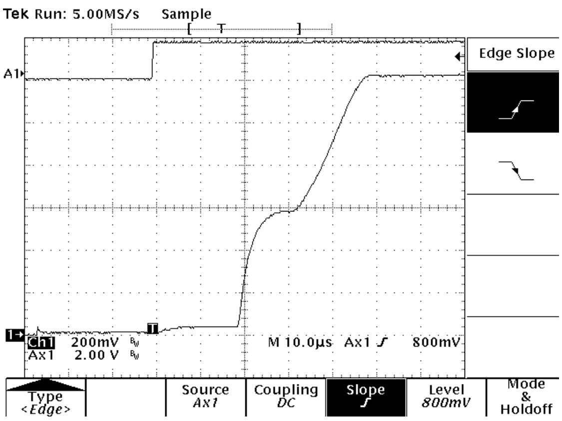
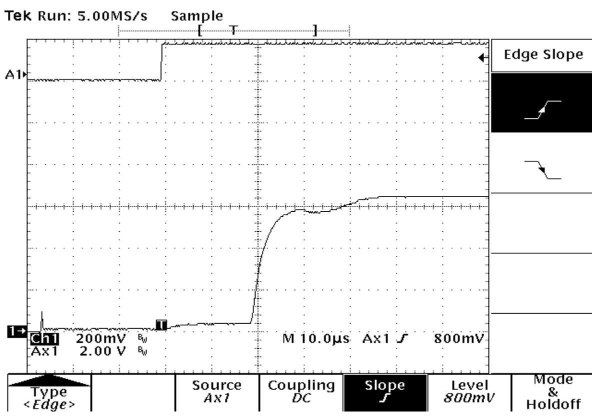
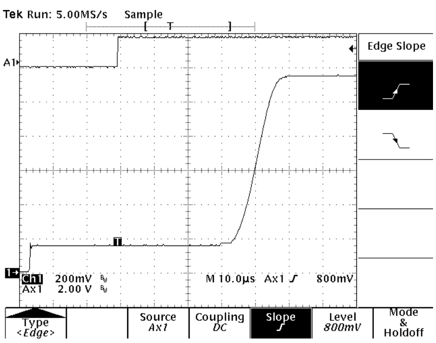
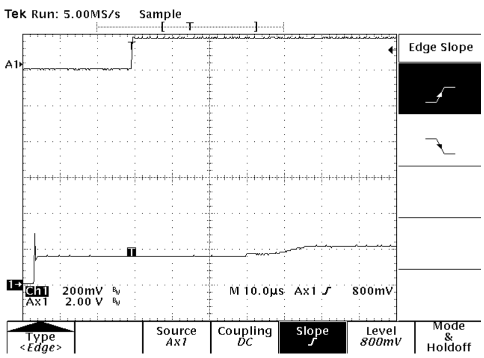
Table 14: RFMD FEM logic

	Vtx	BS	VC1	VC2
Mode	VTX_B_P	VTX_B_P	Vant1	Vant2
Idle	0	0	0	0
Low Band RX	0	0	1	0
Low Band TX	1	0	1	0
High Band RX	0	1	1	0
High Band TX	1	1	1	0

Analog Power control signals (TXC, VPC, VDET)

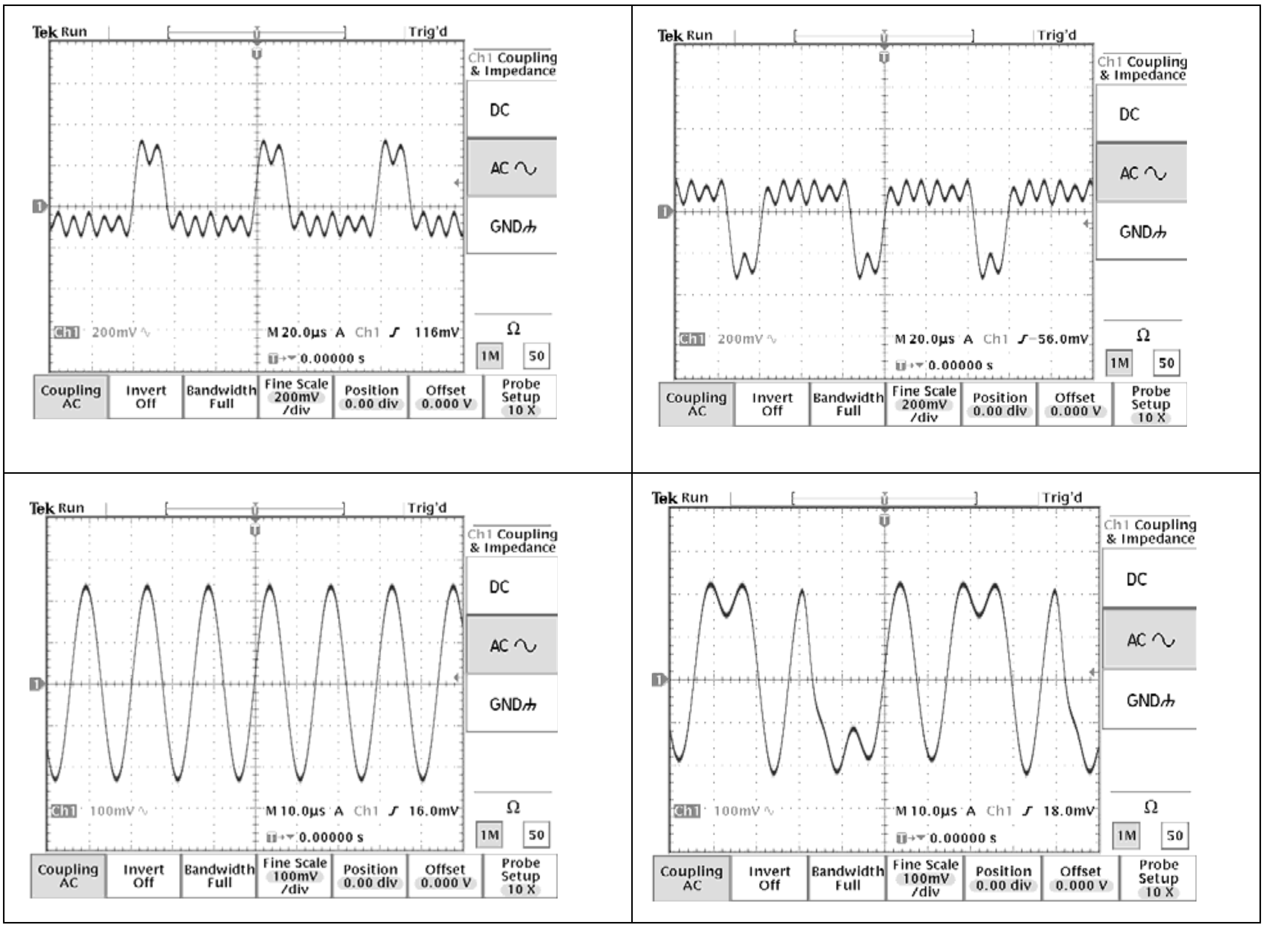
The pictures in the following page show the typical shapes of the control signals low band, right side it for highest power – left side for lowest power. In all the pictures TXP is used a the trigger point and is seen in the top of each picture. The difference between the high band and the low band is that he high band signals looks the same with only small changes in level. The activating of high band Vdet starts 5us earlier than for low band.

Figure 46:Power control signals

<table>
<tr><th>High Power</th><th>Low Power</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>TXC</td><td>TXC</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>VPC</td><td>VPC</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>VDET</td><td>VDET</td></tr>
</table>

I/Q signals

The following diagrams show different situations of TX IQ measurements. Depending on the time the modulation may cause the signal to look different.



Alignment

Manual alignment with Phoenix

The alignment/calibration is the same in both GSM900/850 and GSM1800/1900 except for the channels and frequencies. Only the the procedures for GSM900/GSM1800 are shown.

In Phoenix select connection Fbus scan product. 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 0dB for 900 and 0.1dB for 1800. Use CMD55,CMU200 or other suitable device. Default channels are 37 for GSM900 and 700 for GSM1800 (Ch 190 and 661 for GSM850/1900). 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. In some windows the saving is done without any warning or second approval as soon as you stop or end.

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.

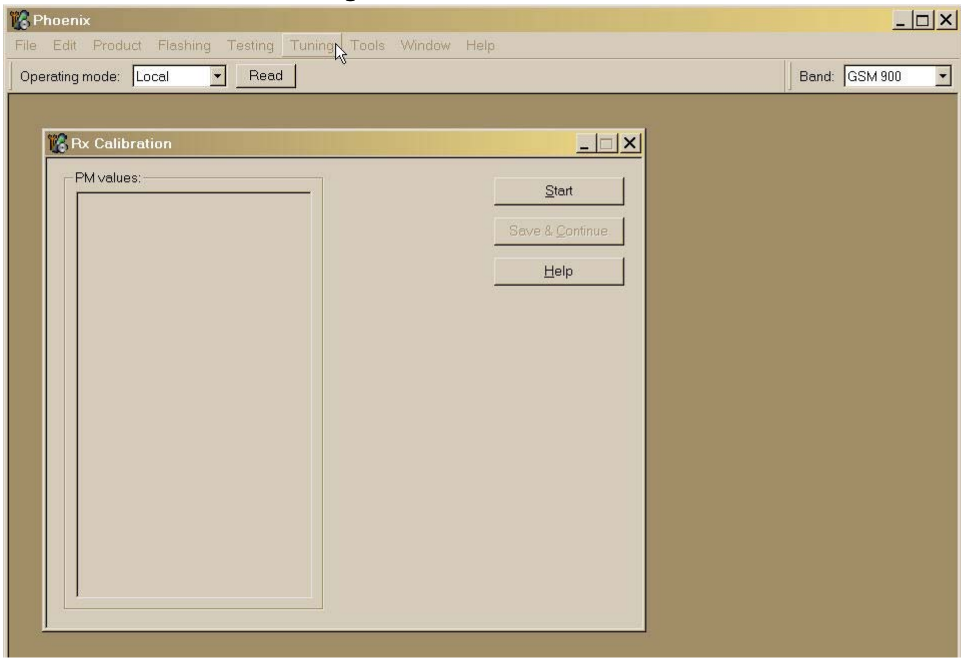
RX calibration

Select Tuning, RX Calibration

Select band GSM900

Press start

Figure 47:RX calibration

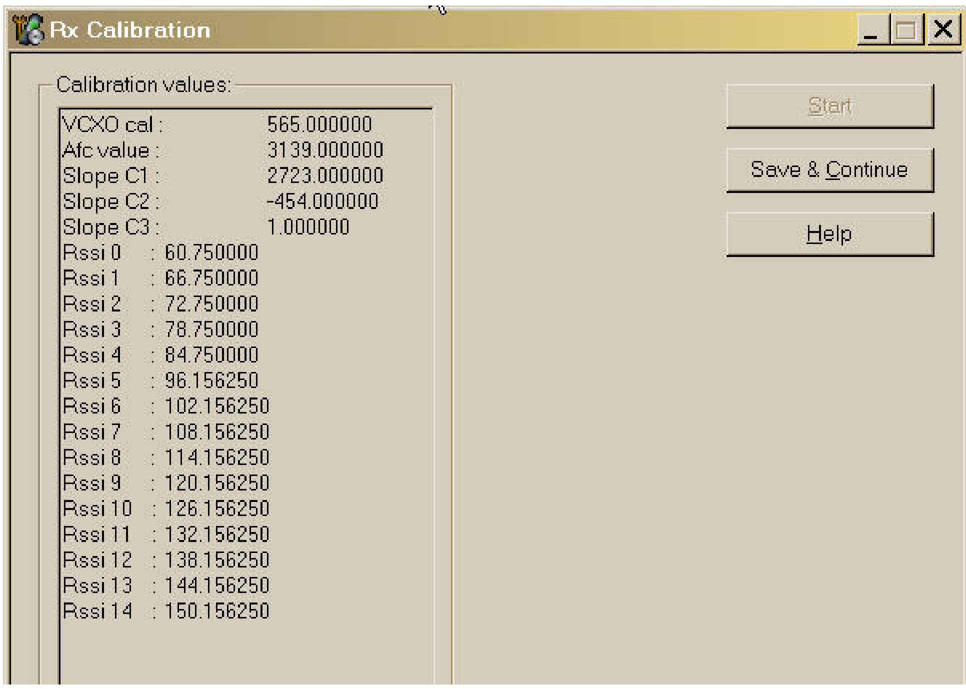


Follow the description in Phoenix, setting up the signal generator as described

Figure 48:Calibration tuning

Press the OK button

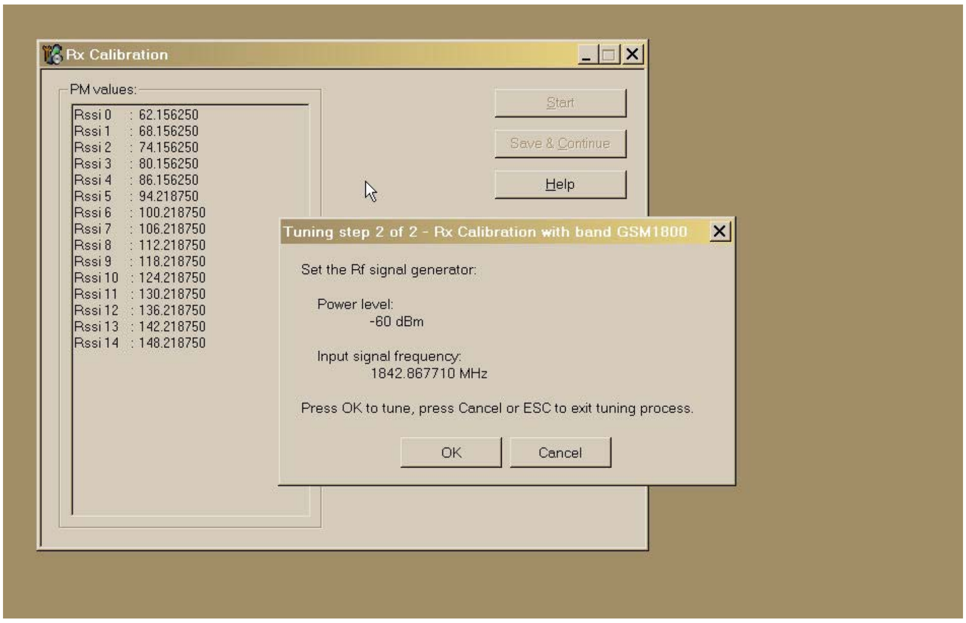
Figure 49:Calibration tuning



Press the Save&Continue botton.

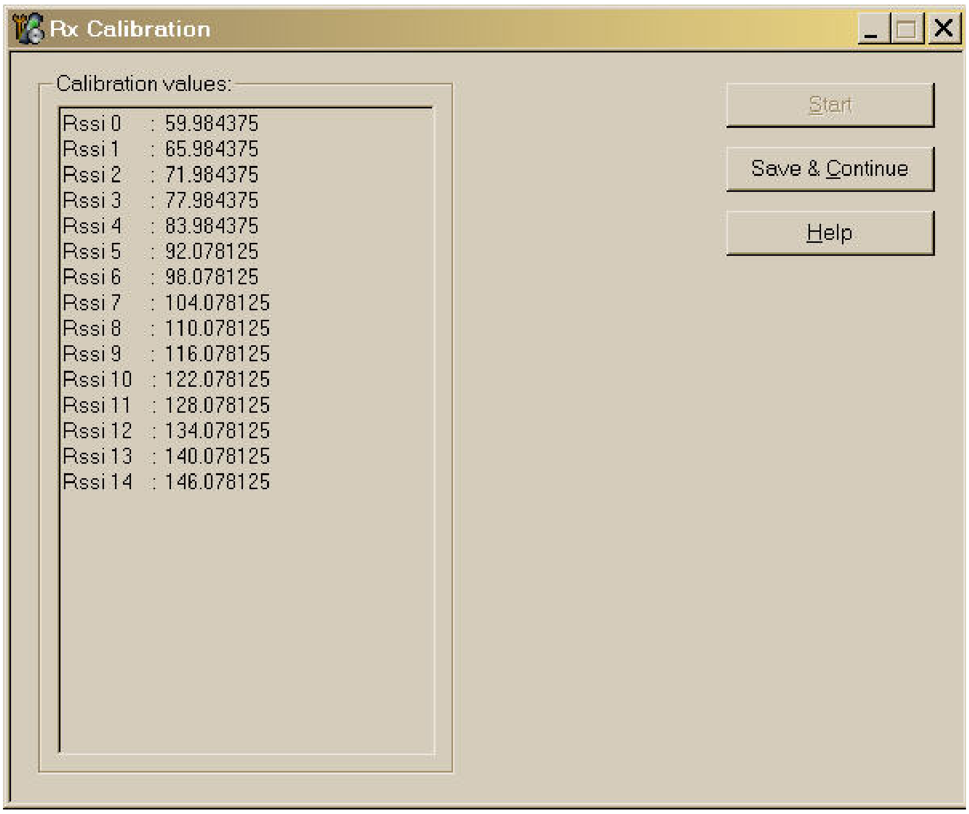
Follow the description in Phoenix, setting up the signal generator as described

Figure 50:Calibration tuning



Press the OK button

Figure 51:Calibration tuning



Press the Save&Continue botton

Note! You have to follow the shown procedure. It is not possible to tune the high band alone. You need to make a tuning of the low band first to come to the high band. You can stop at any time by switching off the menu. If the values are outside internal specs, you can not save them and have to leave the tuning without saving.

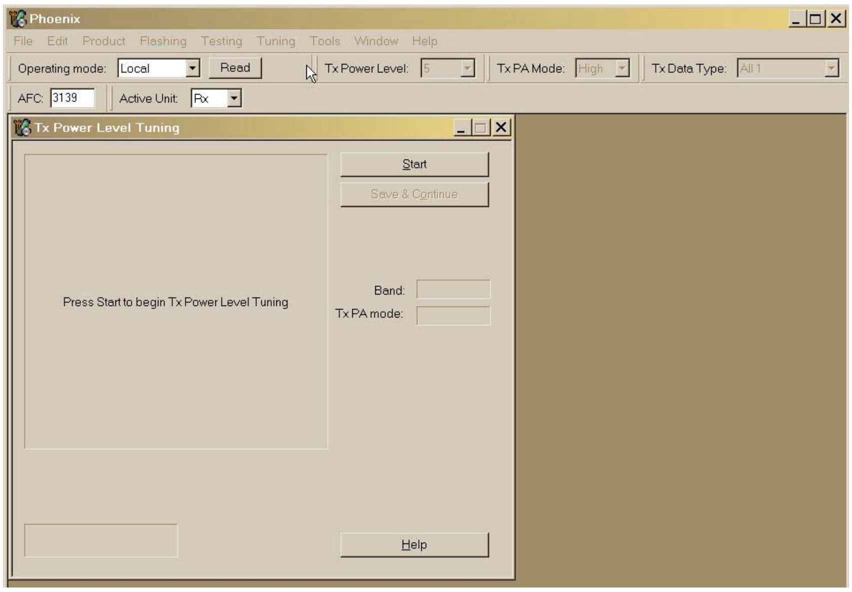
RX Band Filter Response

Normally not needed in repair.

Tx Power tuning

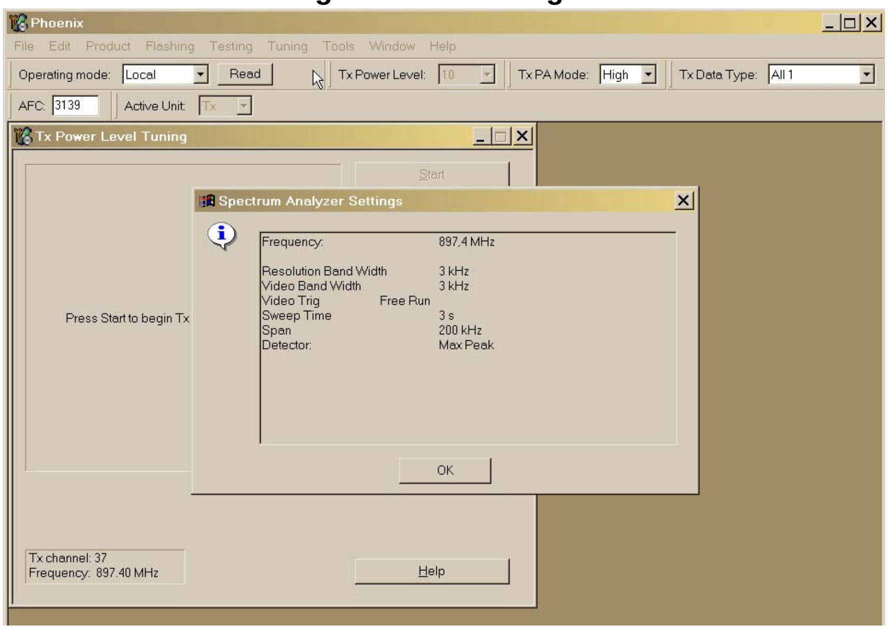
Select Tuning, Tx Power Level Tuning

Figure 52:TX tuning



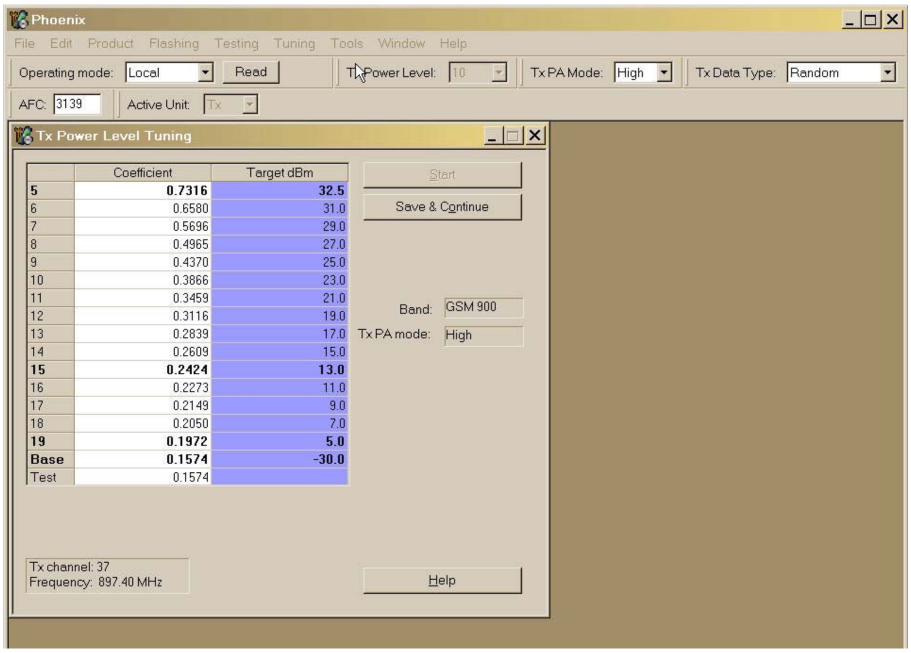
Press start and follow the instructions in the pop-up window

Figure 53:TX tuning



Set the spectrum analyser or GSM tester for the required settings and press “OK” If a GSM tester is used, set the TX data type to random so that the tester can trig on the signal.

Figure 54:TX tuning

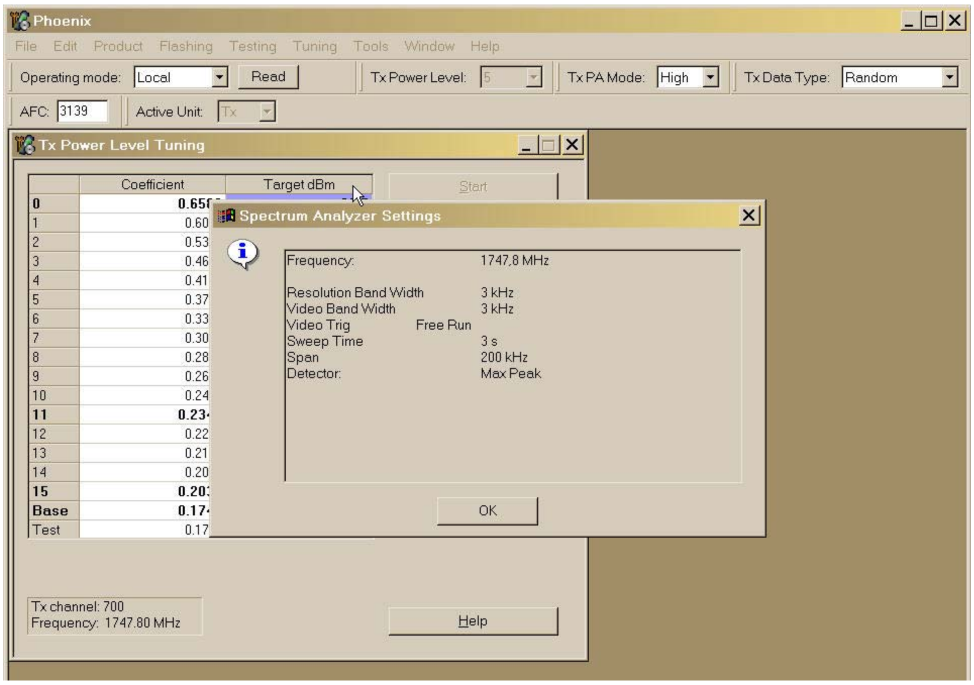


Tune the highlighted values to the wanted power (Use average burst power)

Tune the base level to –25dBm

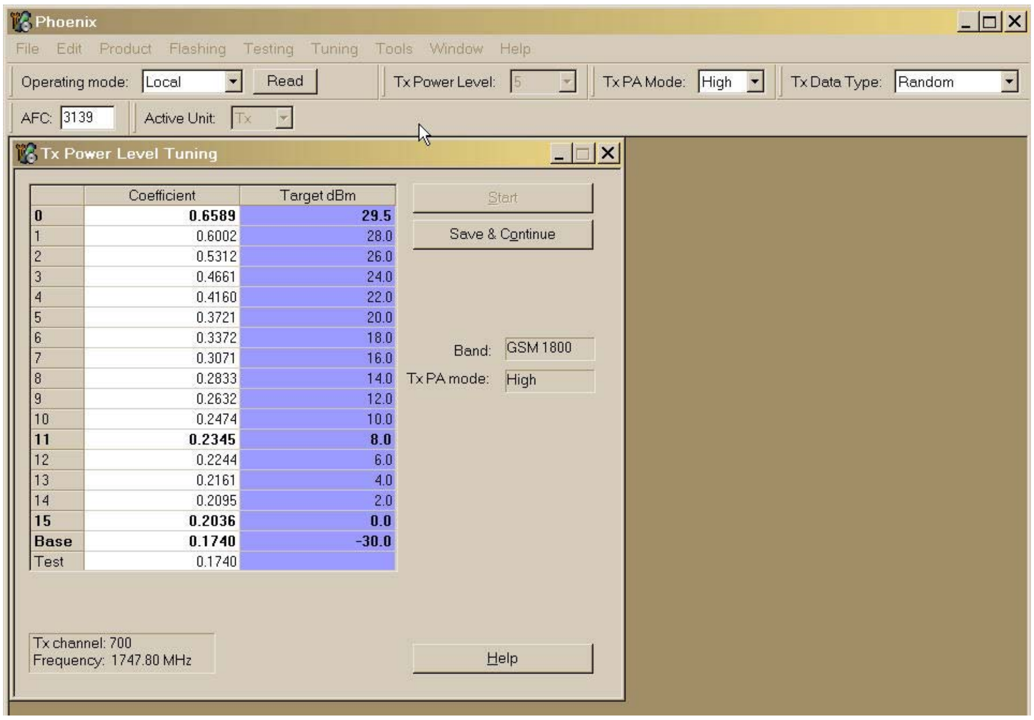
When done press Save&Continue and Phoenix will automatically shift from lowband to highband. At the same time the intermidiate values are calculated, but that is first seen next time you start a tuning.

Figure 55:TX tuning



Set the spectrum analyser or GSM tester for the required settings and press “OK” . If a GSM tester is used, set the TX data type to random so that the tester can trig on the signal.

Figure 56:TX tuning



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

Tune the base level to –25dBm.

When done press Save&Continue. The intermediate results are then calculated.

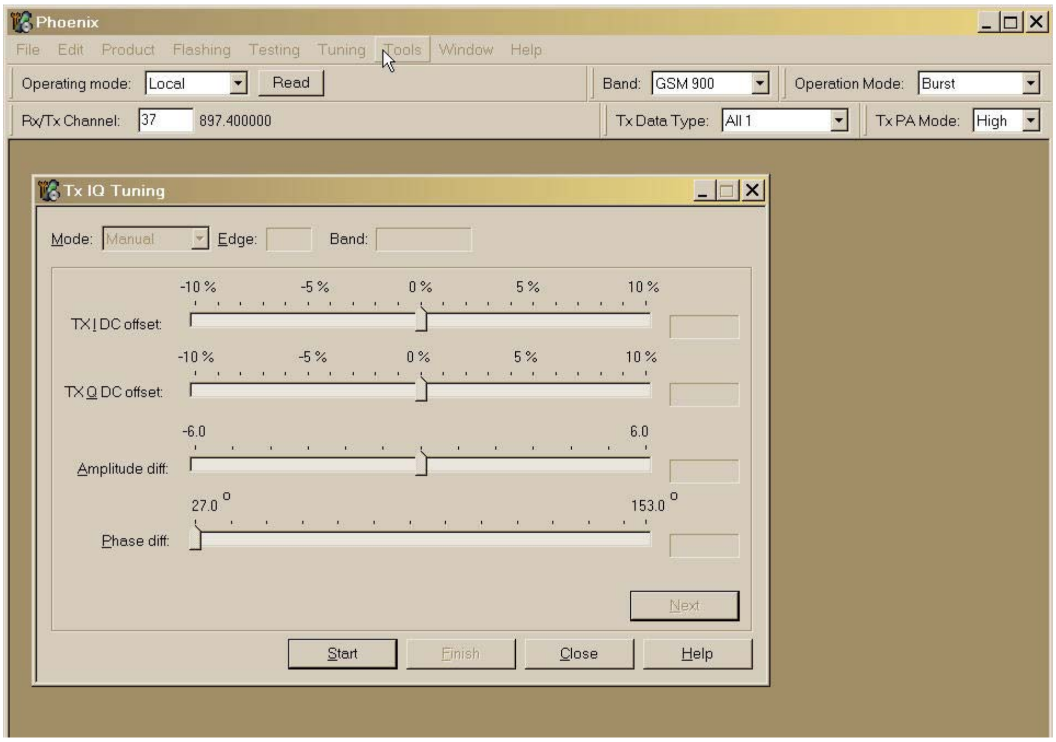
The procedure has to be followed. First low band tuning and then high band tuning. You do not need to change anything.

I/Q tuning

Select Tuning, Tx IQ tuning, TX Data Type “random” for a GSM tester like CMU200 or 1/0 for SPA measuring.

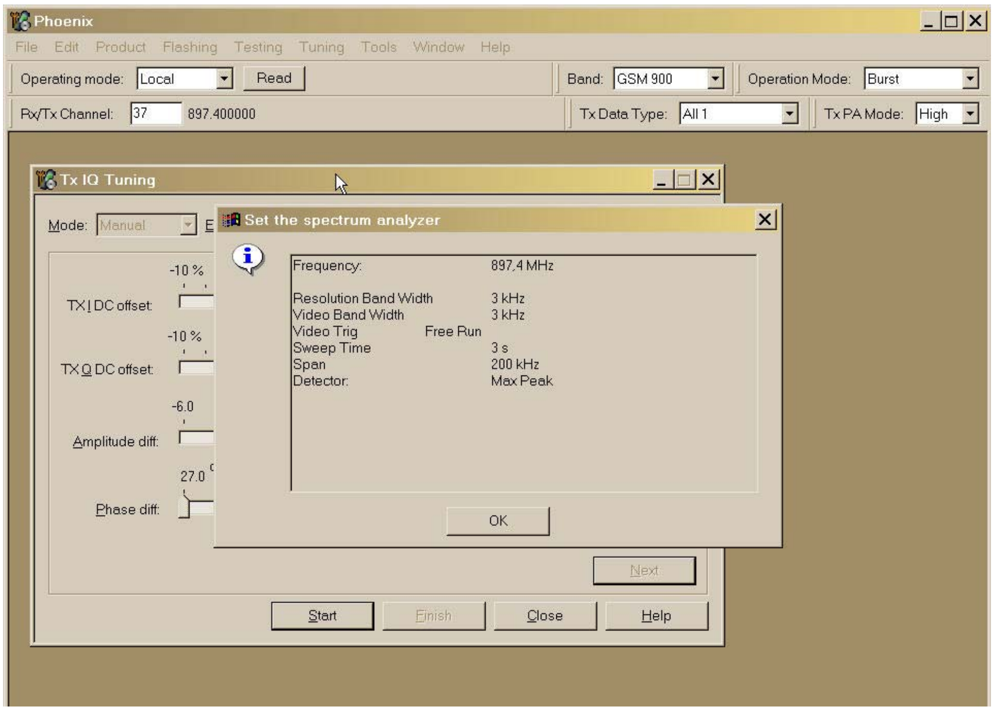
CMD55 shows the same as a spectrum analyzer when I/Q tuning is selected. CMU200 shows the carrier and sideband supression directly as figures in the modulation mode.

Figure 57:i/Q tuning



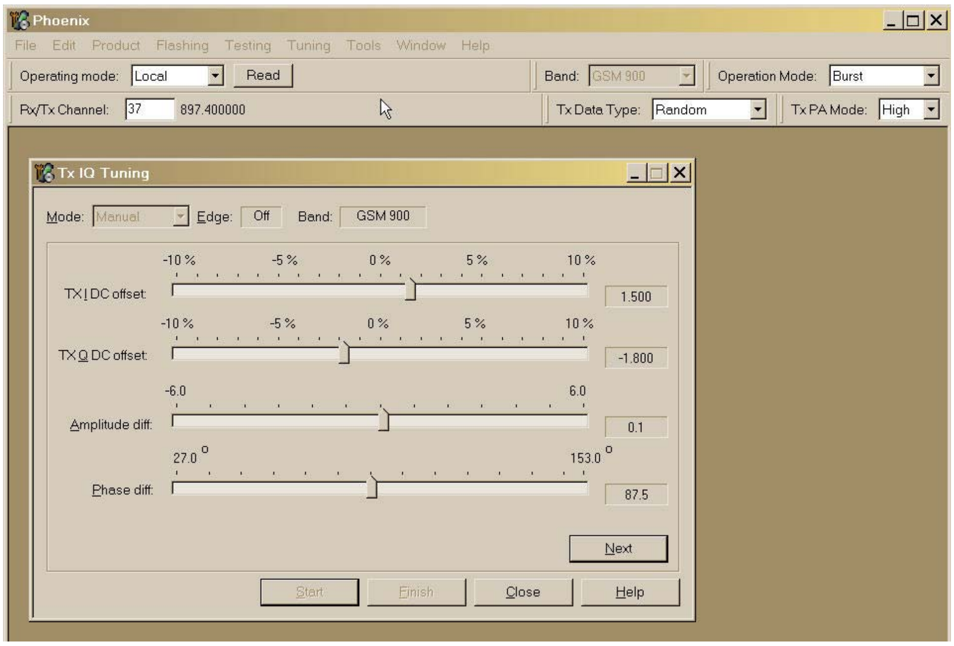
Press Start

Figure 58:I/Q tuning



Set the spectrum analyser or GSM tester for the required settings and press “OK”

Figure 59:I/Q tuning



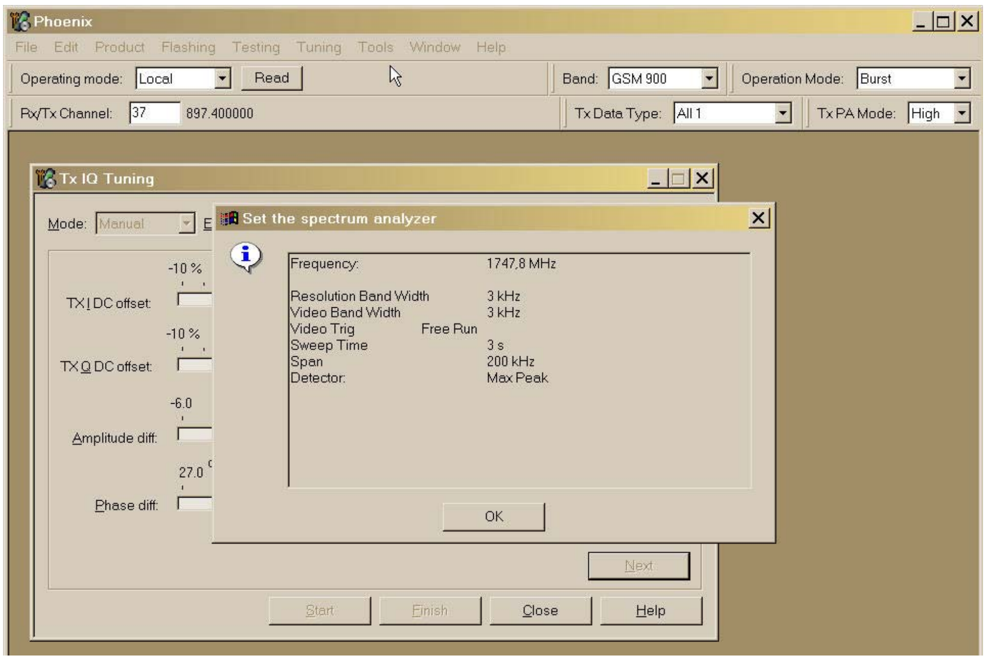
Begin tuning with data from selected place.

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

Tune Amplitude and phase to lowest sideband.

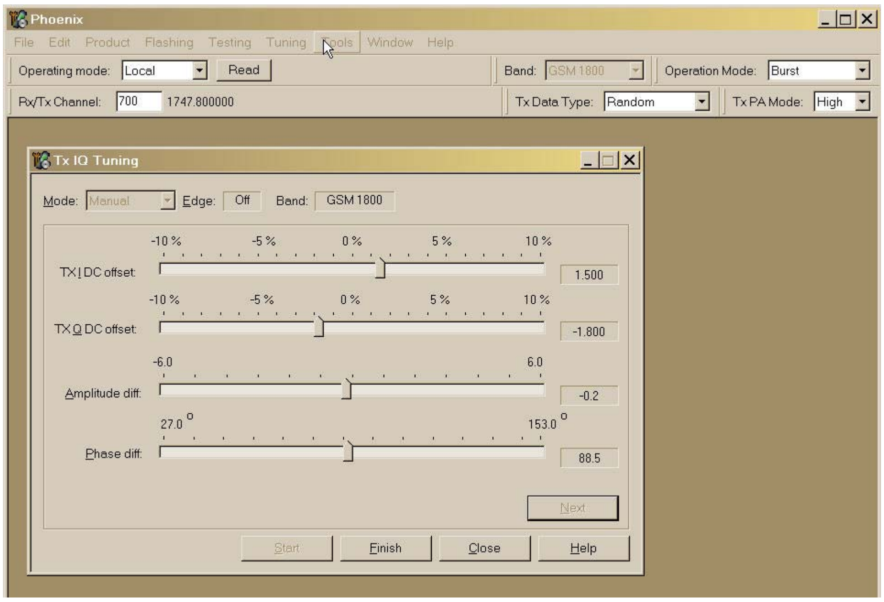
When satisfied with the result, press Next. (The sidebands should hardly be visible).Or for CMU200 the supression should be better than -40dBc.

Figure 60:I/Q tuning



Set the spectrum analyser or GSM tester for the required settings and press “OK”

Figure 61:I/Q tuning



Press Start to begin tuning with data from selected place.

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

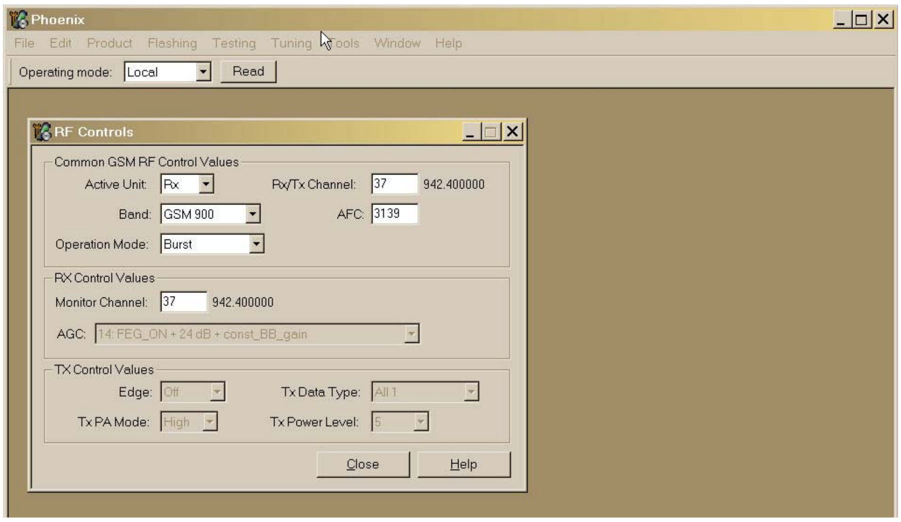
Tune Amplitude and phase to lowest sideband.

When satisfied with the result, press Finish. (The sidebands should hardly be visible).

RF control

The purpoase is 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. If you want to tune or calibrate at other channels or levels than the default for that function, you can activate RF control at the same time and change the wanted parameters.

Figure 62:RF controls



Autotune (RH-53 with CMU200)

File adjustments

Edit the file RH_53_tunings.ini and save it in the product folder under Phoenix with the right name. It defines the target values for the tunings which need targets or can be a general one that only needs small updates for the values that might change (e.g. the base target).

Edit the file autotune_RH-53.ini and save it in the product folder under Phoenix with the right name.

Change the Baselevel init values so that the expected base coefficient is among them. It is not absolutely needed but it speeds up the tuning. Larger steps can be used but with lower accuracy.

Eventually, change also the Coeff init values if the tuning deviates too much from the target.

The lowest coefficient must be very close to 0. Check how the power tuning goes and try with some changes.

In case of edge capability, copy from RH-12 and make some changes. RH-12 is for Gemini engine, RH-53 is for Mjoelner engine.

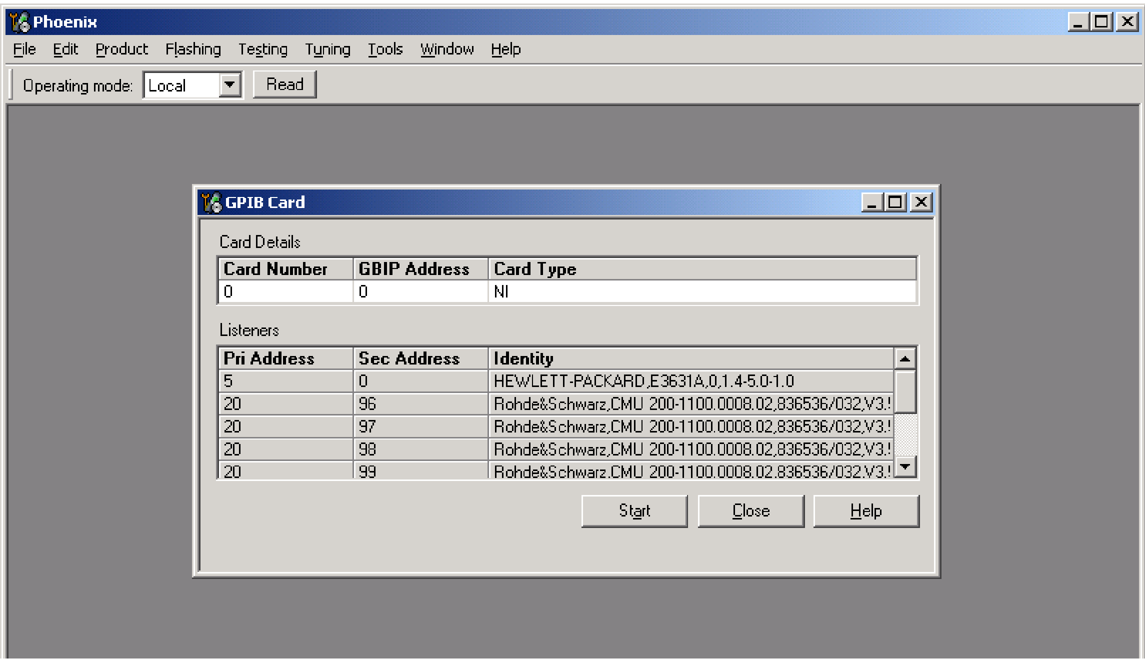
For autotuning, please see also TB “Autotuning function in Phoenix”.

Phoenix setup

In Phoenix tools-options-gpib card select the type of card used.

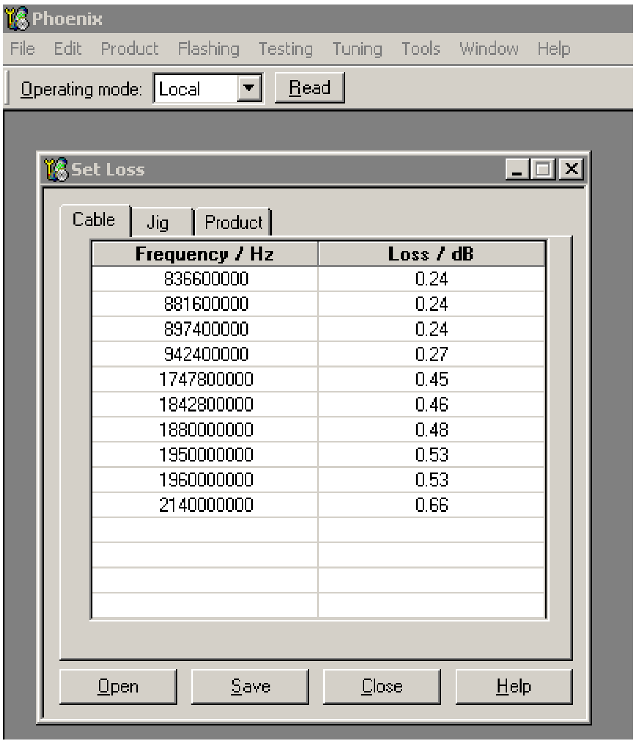
Press start to check if the equipment can be found.

Figure 63:Phoenix-GPIB card



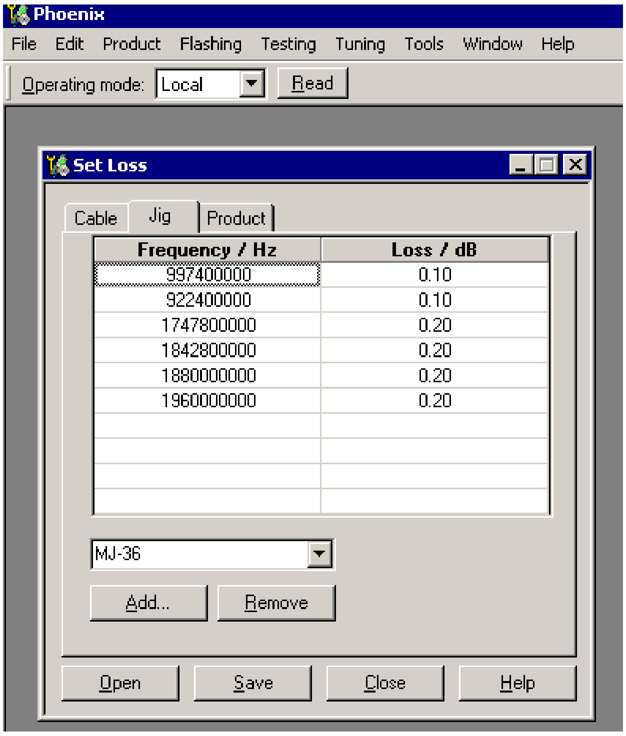
With a PKD-1NS dongle the loss in cables and jigs has to be set, and the jig type must be defined to the product. When that is done the PKD-1 donkle can be used, and the losses can not be changed with that dongle.

Figure 64:Set loss



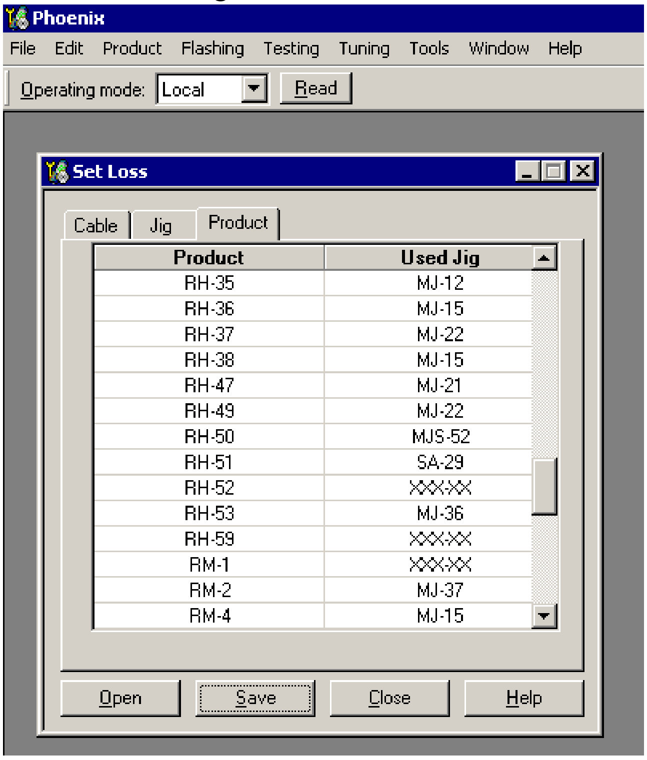
Select or add a jig and define the losses

Figure 65:Set loss 2



Make sure the product has the right type of jig. (At the moment new products like RH-54 can not be added)

Figure 66:Set loss 3



Note! CMU200:

Remember that CMU200 is left as it was set in the autotune. Attenuation settings are at 0.