9. Troubleshooting

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Troubleshooting steps

The following hints should help to find the cause of the problem when the circuitry seems to be faulty. Troubleshooting instructions are divided into sections:

1 Phone is totally dead
2 Power does not stay on or the phone is jammed
3 Flash programming does not work
4 Display is not working
5 Plug in SIM card is out of order (insert SIM card)
6 Audio fault
7 Charging fault

First, carry out a through visual check of the module. Ensure in particular that:

a) there are no mechanical damages
b) soldered joints are OK.

General instructions

Most semiconductors are static-discharge sensitive! ESD protection must be taken care of during repair (ground straps and ESD soldering irons). Mjoelner, PA, UEM, UPP, and Flash are moisture sensitive and must be pre-baked prior to soldering, if they have been out of their vacuum package longer than the specified time.

- Connect test jig (MJS-37) to computer with DAU-9S cable or to FPS-8 Flash Prommer with AXS-4 serial cable.
- Make sure that you have PKD-1 dongle connected to computer's parallel port.
- Connect DC power supply to module test jig (MJS-37) with FLC-2 cable.
- Set the MJS-37 supply voltage to 8-12V_{DC}. If the input-voltage exceeds 12V_{DC}, the MJS-37 jig may be damaged.

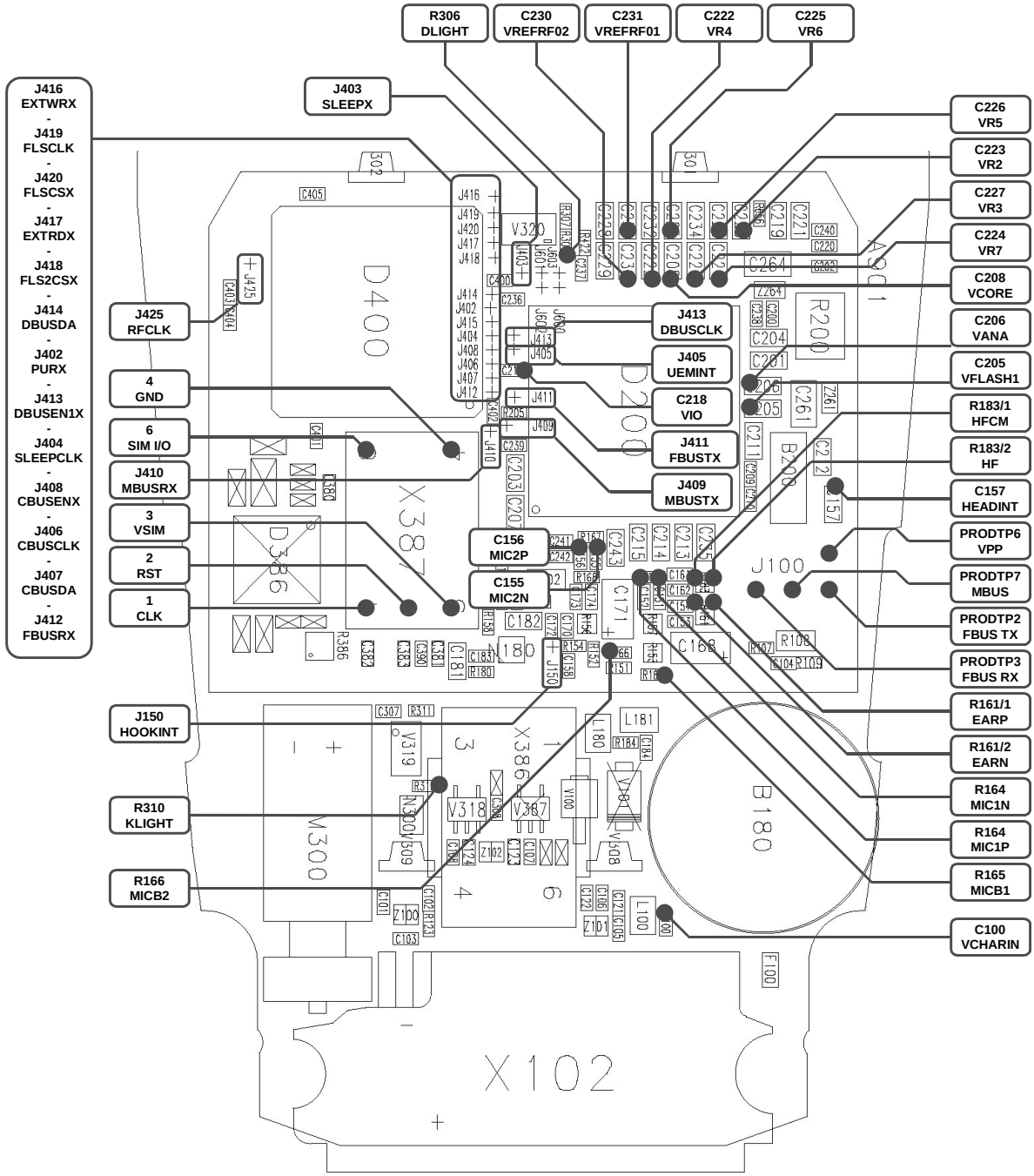
Note: By default the MJS-37 supplies the phone with 4.1V_{DC}. If other output voltages are needed, it is possible to modify MJS-37 to support this by removing R110 and mounting S104. See the MJS-37 schematic for more info.

- When doing BB energy management (EM) calibrations, use JBV-1 jig and DC supply voltage 12 – 15 V.
  - JBV-1's current consumption is ~ 40 mA with 3.9 V supply voltage and ~ 80 mA with 15 V supply voltage.
- Set the phone module to test jig (MJS-37) and start Phoenix service software. Initialize connection to phone (use FBUS driver when using DAU-9S and COM-BOX driver when using FPS-8).

Baseband Troubleshooting

Baseband Testpoints

Baseband testpoint PWB Placement



Fault-Finding Charts

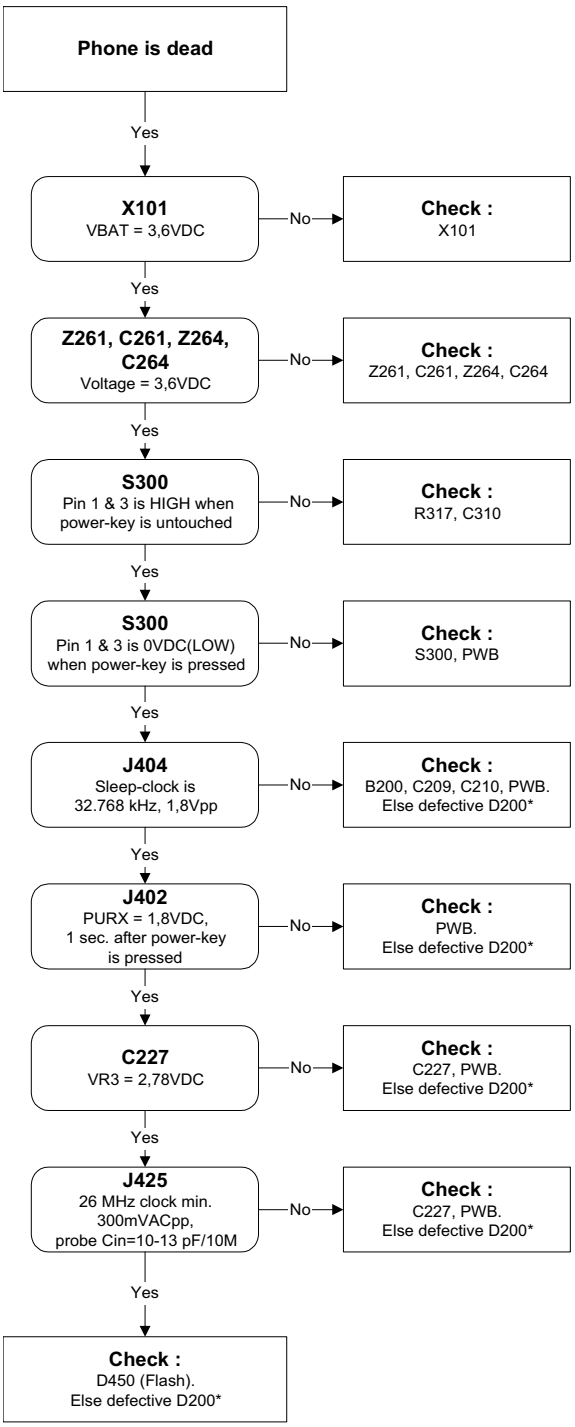
In this section, fault-finding charts are provided for the most common NPM-8 errors.

NOTE : Since both D200 (UEM) and D400(UPP) are underfilled, they cannot be replaced. If either D200 or D400 is defective, the entire PWB has to be discarded.

Phone is dead

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

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



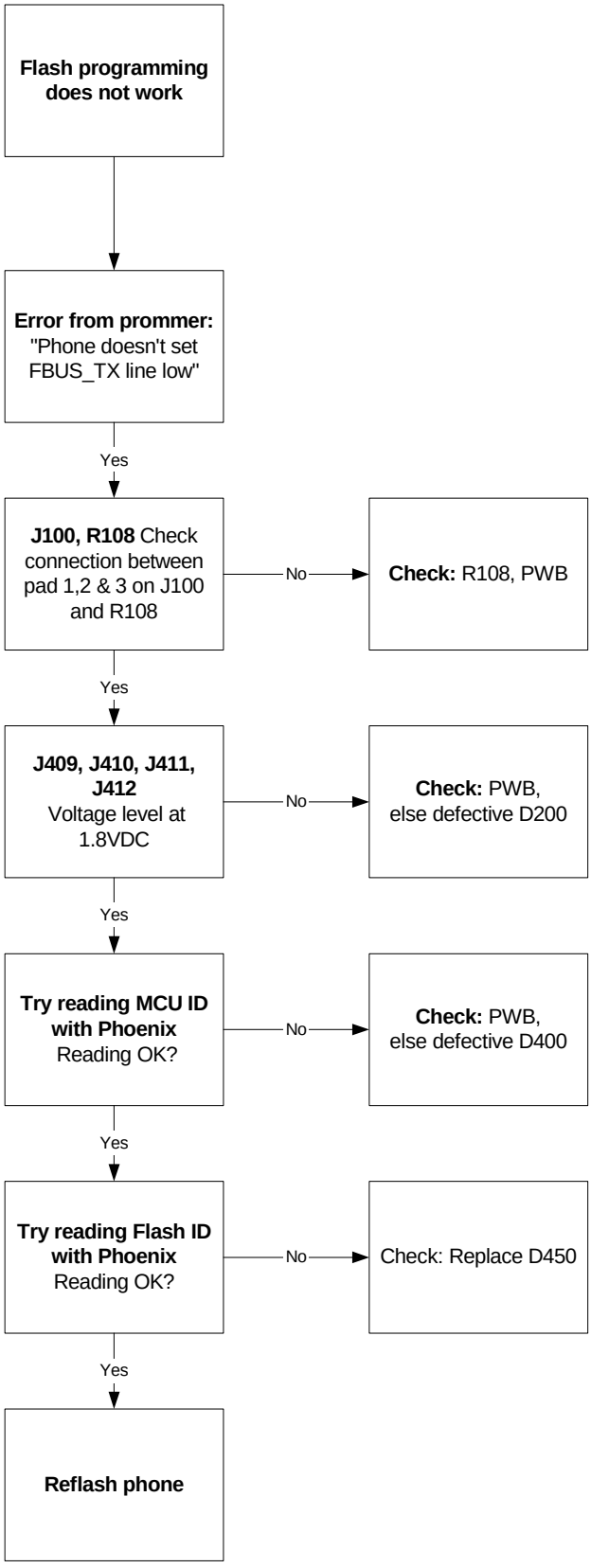
Flash programming does not work

The flash programming can only be done via the pads on the PWB (J100).

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

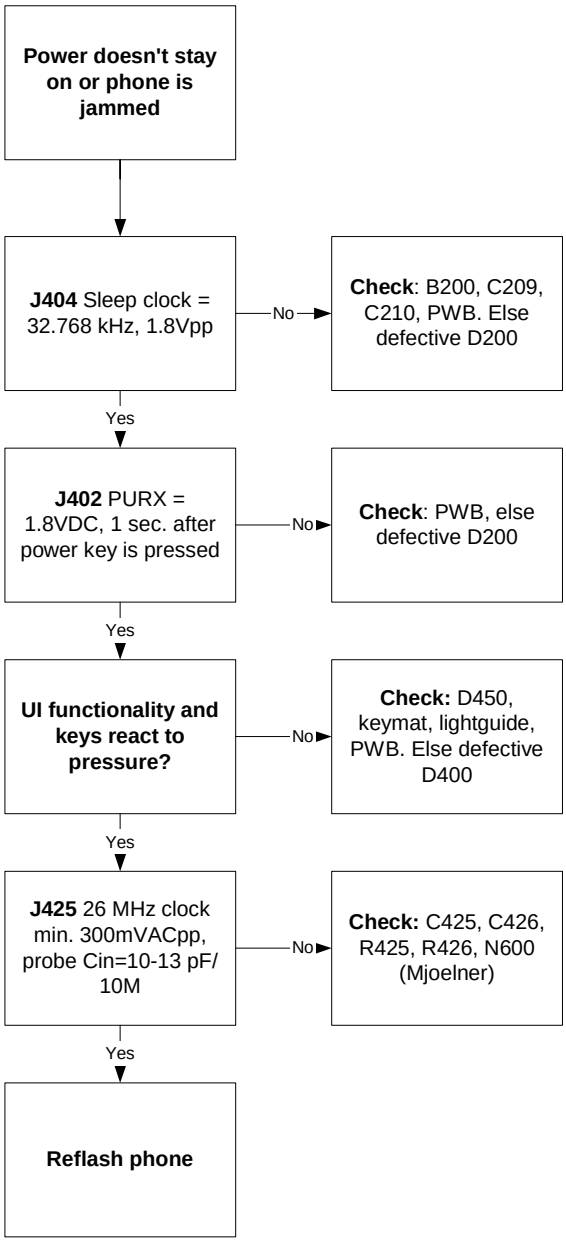
Because of the use of uBGA components, it is not possible to verify if there is a short circuit in control- and address lines of MCU (UPP) and memory (flash).



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.

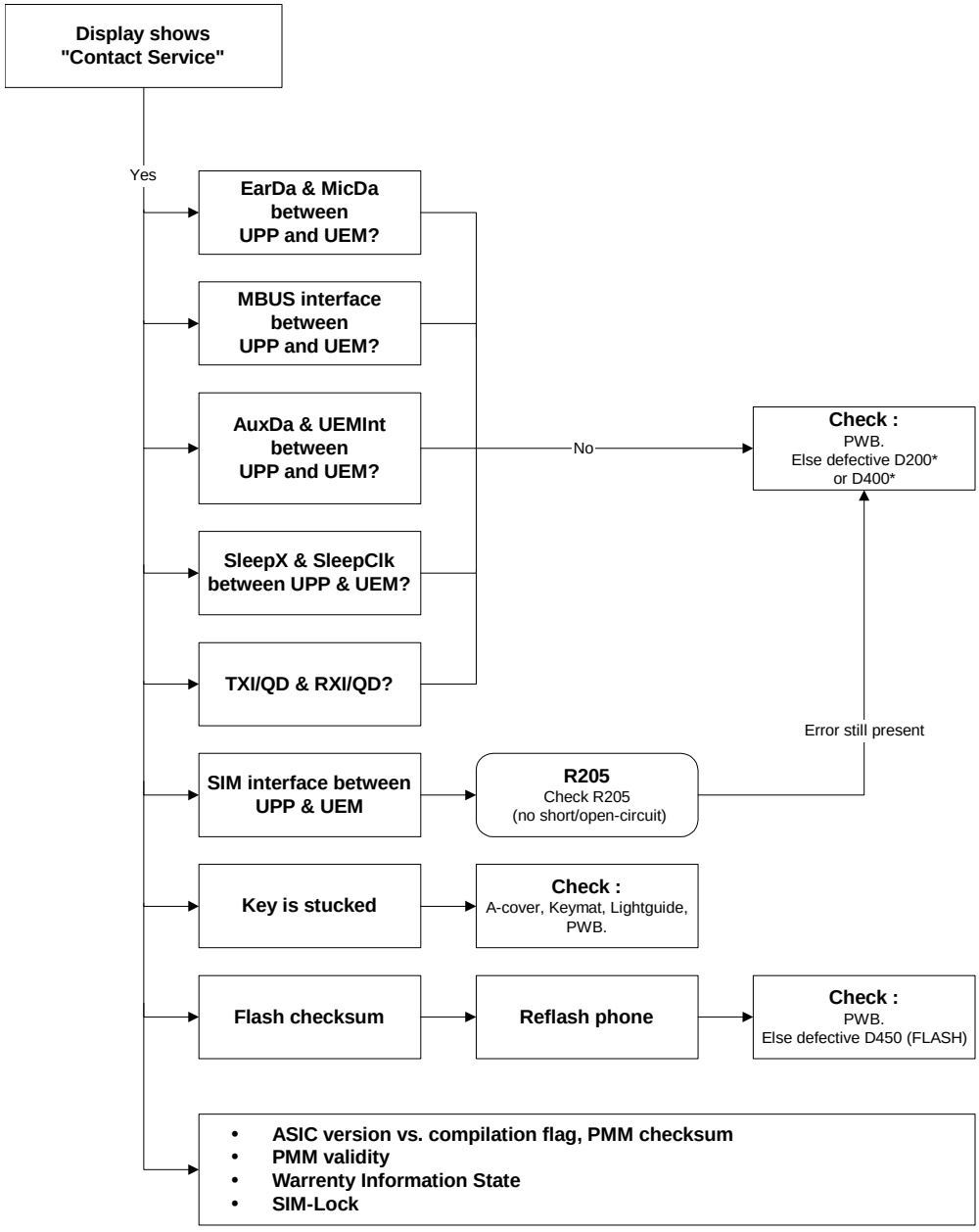
If for some reason the MCU does not service the watchdog register within the UEM, the operations watchdog will run out after approximately 32 seconds. Unfortunately, the service routine cannot be measured.



Display information: "Contact Service"

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

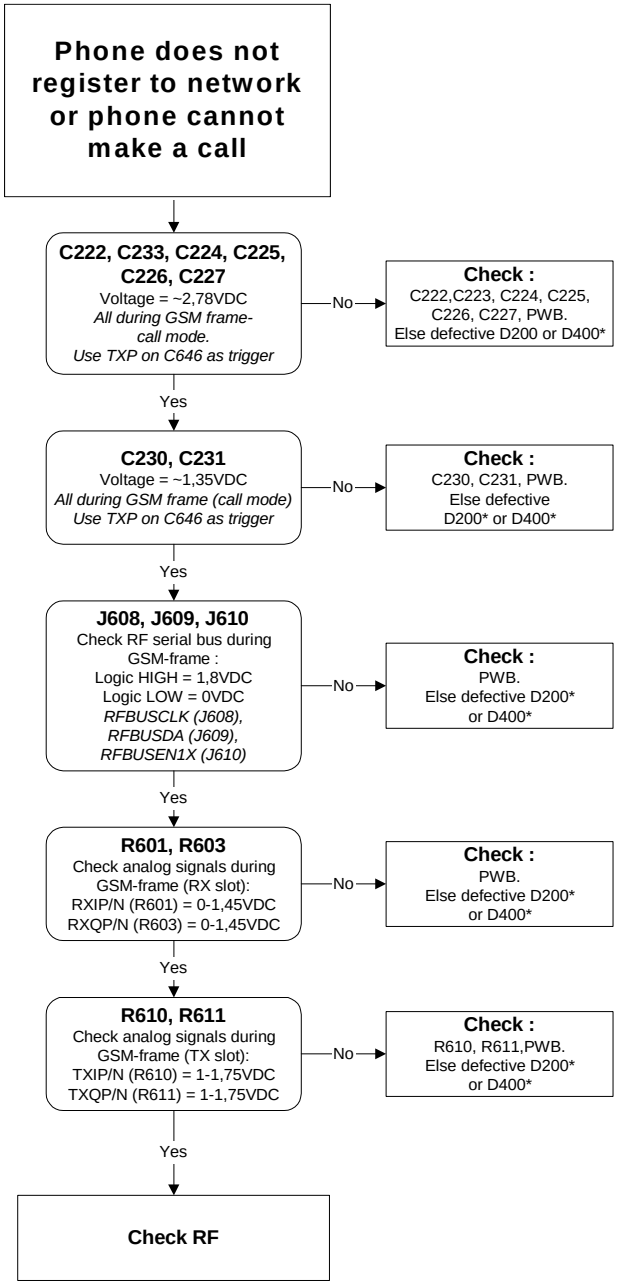
It's individual test cases, so the following list of possible errors has no chronological order. Use common sense and experience to decide where to begin error hunting.



Phone does not register onto 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 are buried in one or more of the inner layers of the PWB.

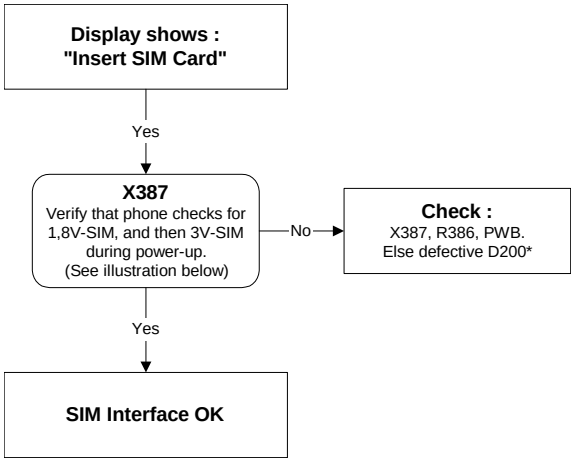
First, check that the SIM LOCK is not causing the error by using a Test-SIM card and connecting the phone to a tester.



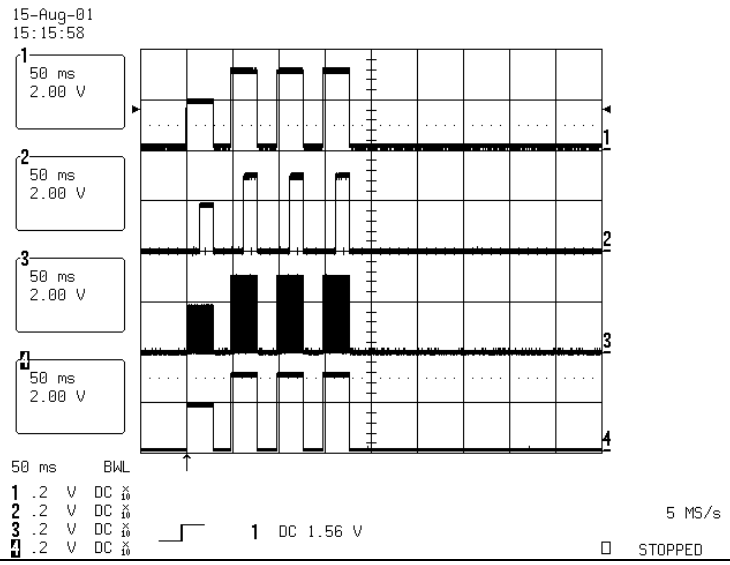
SIM-related faults

Insert SIM card fault

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".

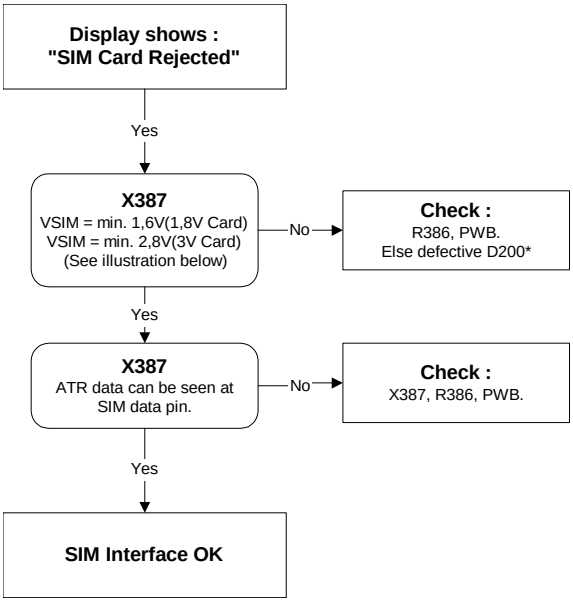


Check for SIM voltage during power-up	
Ch1 : VSIM Ch2 : RESET	Ch3 : CLOCK Ch4 : DATA



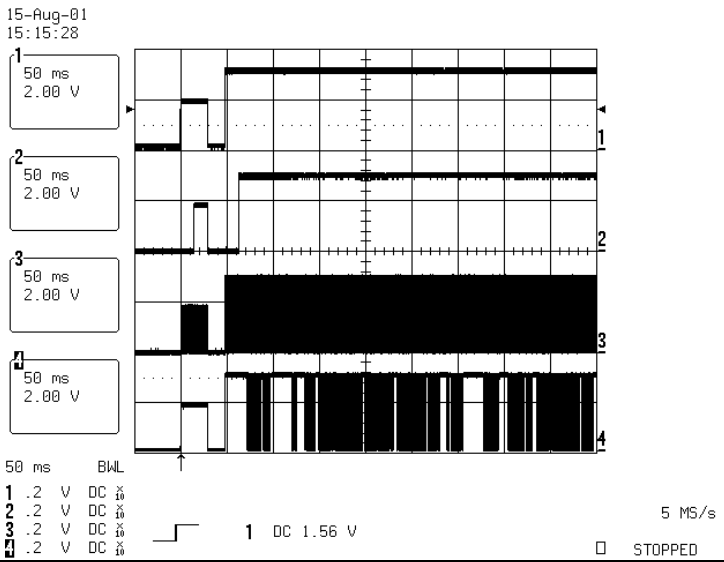
SIM-Card rejected

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.

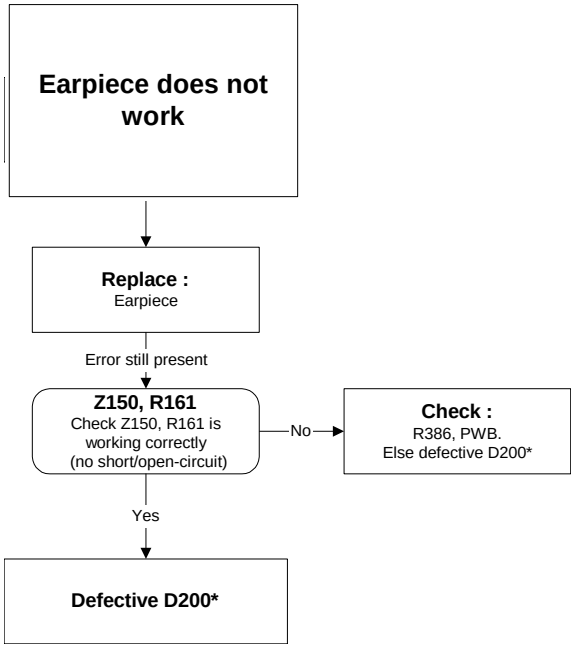


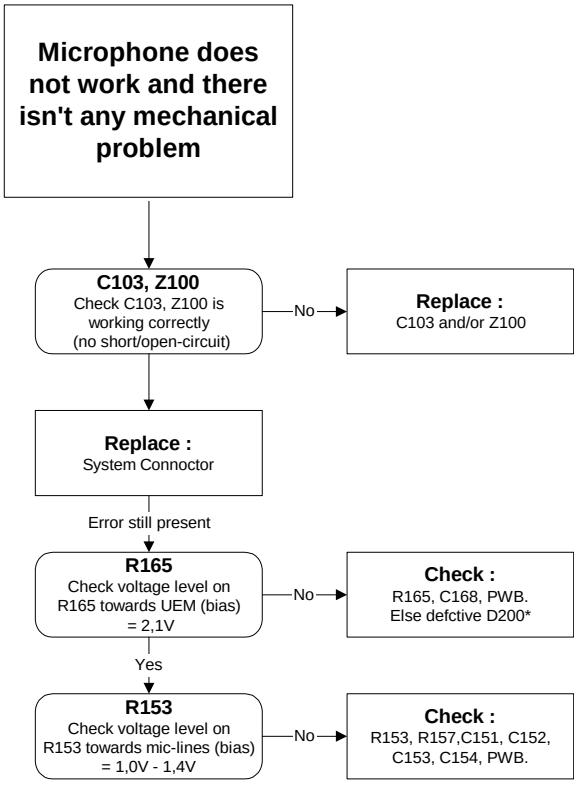
For reference a picture with normal SIM power-up is shown below.

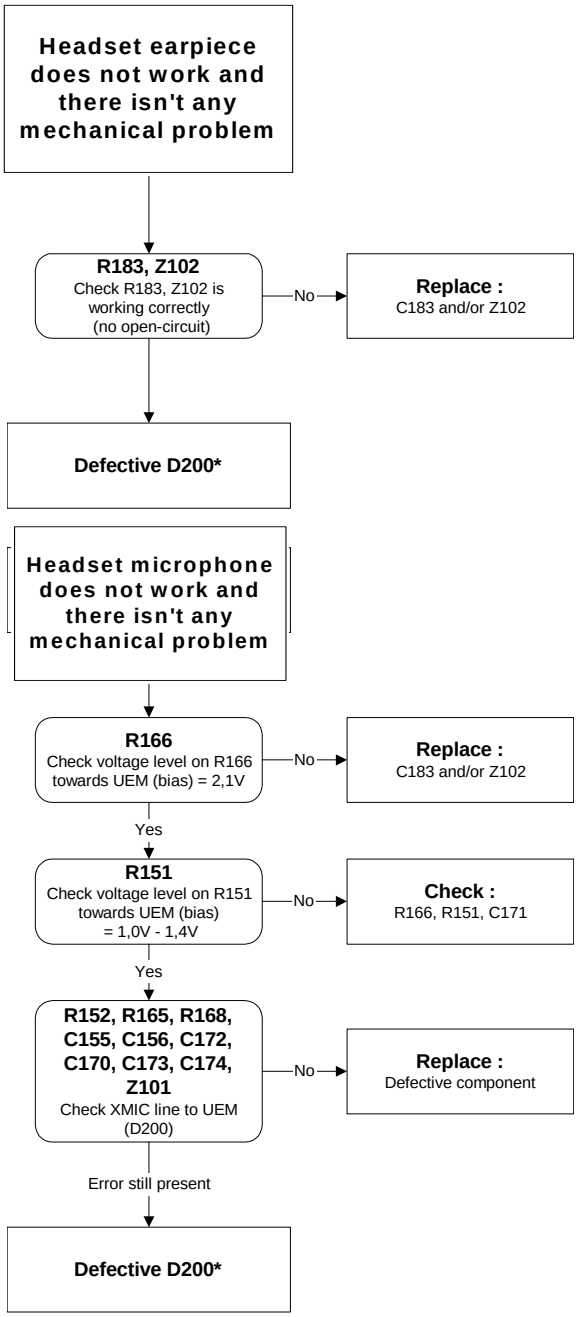
Normal SIM power-up sequence	
Ch1 : VSIM Ch2 : RESET	Ch3 : CLOCK Ch4 : DATA



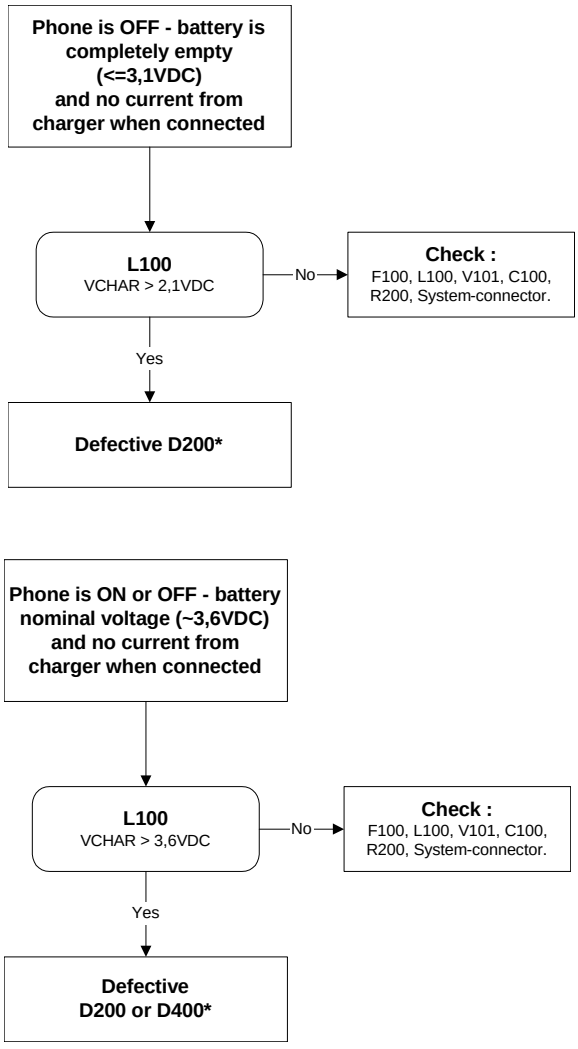
Audio-related faults

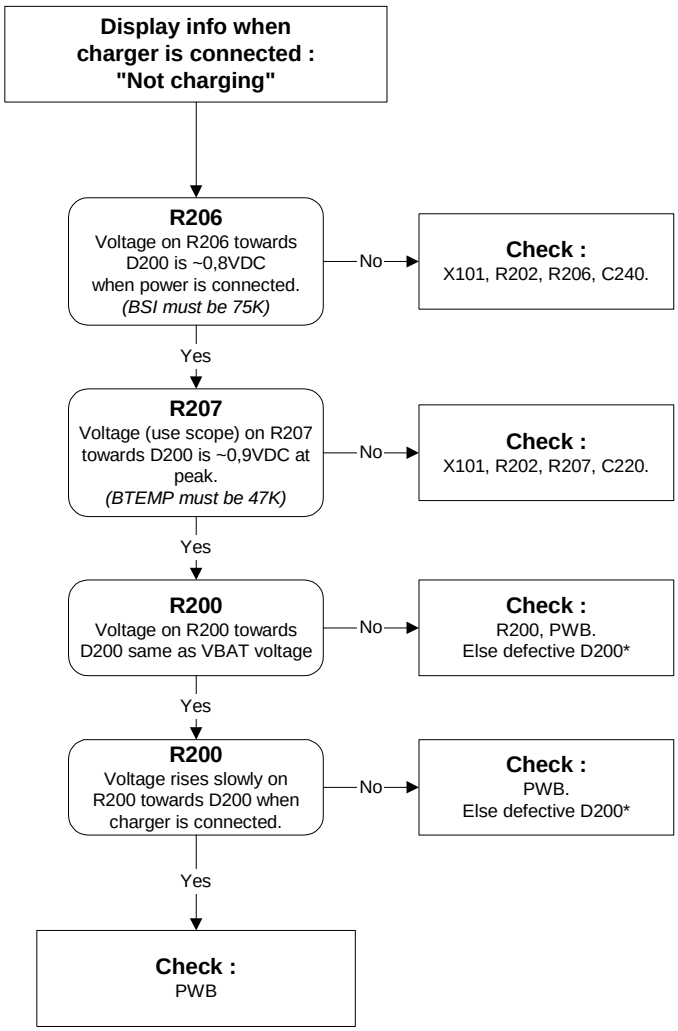






Charging failure





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 should be done with a Spectrum Analyzer with a high impedance probe. (Note: Signal levels can vary — depending on measurement setup — therefore; it is recommended that a known good phone is used as a benchmark for the measurement technique used. Measurements stated in this report were done with a HP85024 high impedance probe.)

Note that the test jigs 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 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 pad. Remember to include the loss in the module test jig when realigning the phone.

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

Apart from key components described in this document, there are several 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.

In the following, both the name GSM and GSM850 will be used for the lower band and both PCS and GSM1900 will be used for the upper band.

General Description of the RF Circuits

In the following general descriptions, different colors are used in the block diagram. The GSM850 signal route is shown in red, the GSM1900 route in green and the common signal lines are shown in blue. Control, supply voltage and unused lines are shown in black.

Receiver Signal Path

The signal from the antenna pad is routed to the Antenna switch (Z700). If no control voltage is present at VANT2 and VANT1, the switch works as a diplexer for the RX signal: the GSM850 signal passes through the switch to GSM RX and the GSM1900 signal passes through the switch to PCS RX.

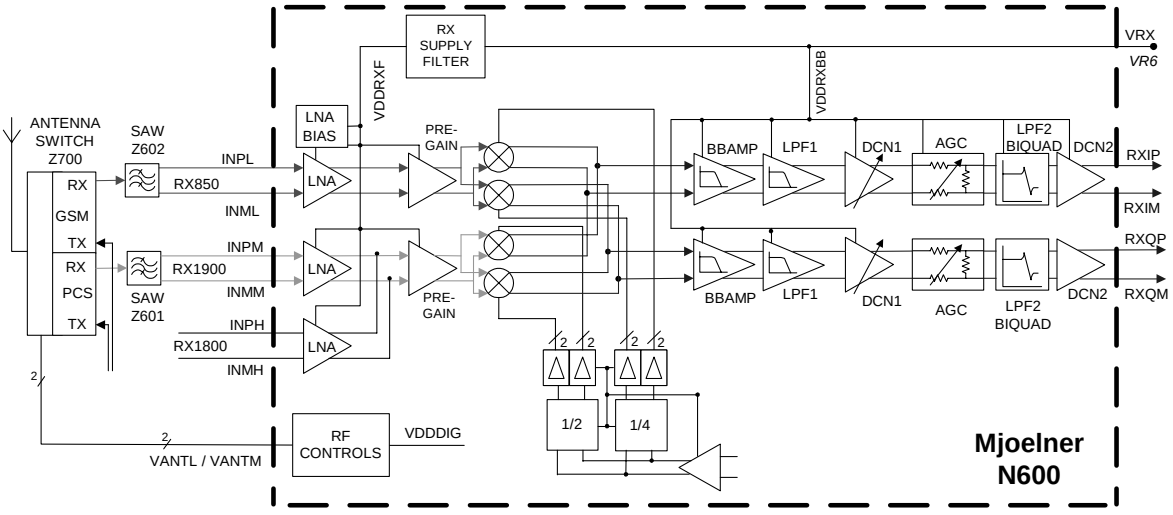


Figure 1: Receiver signal path

From the Antenna switch, the GSM850 signal is routed to the SAW filter (Z602). The purpose of the SAW filter is to provide out-of-band blocking immunity and to provide the LNA in Mjoelner (N600) with a balanced signal. The front end of Mjoelner is divided into an LNA and Pre-Gain amplifier before the mixers.

The output from the mixer is fed to the Baseband part of Mjoelner, where the signals amplified in the BBAMP and low pass filtered 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 centered in DCN2 before being fed to the BB for demodulation.

The GSM1900 signal chain is similar to GSM850, the SAW filter numbered Z601.

Transmitter Signal Path

The I/Q signal from the BB is routed to the modulators for both 850 and 1900 MHz. The output of the modulators is either terminated in a SAW filter (Z603) for GSM850 or a balun (T600) for GSM1900. Both signals are amplified in buffers, which are operated in a soft compression region to suppress some of the AM contents of the signal and to maintain a certain signal level at the PA inputs. The amplitude limited signal is then amplified in the PA (N700). The detector diode (V700), some discrete components, and the Mjoelner IC (N600) make up the transmitter gain control circuitry. In order to establish the right TX output power level, a sample of the signal is taken in a directional coupler (L709 for GSM850 and L704 for GSM1900) and used in the gain control loop. The TX signal from the couplers is fed to the Antenna switch, which is used to select which signal to route to the antenna.

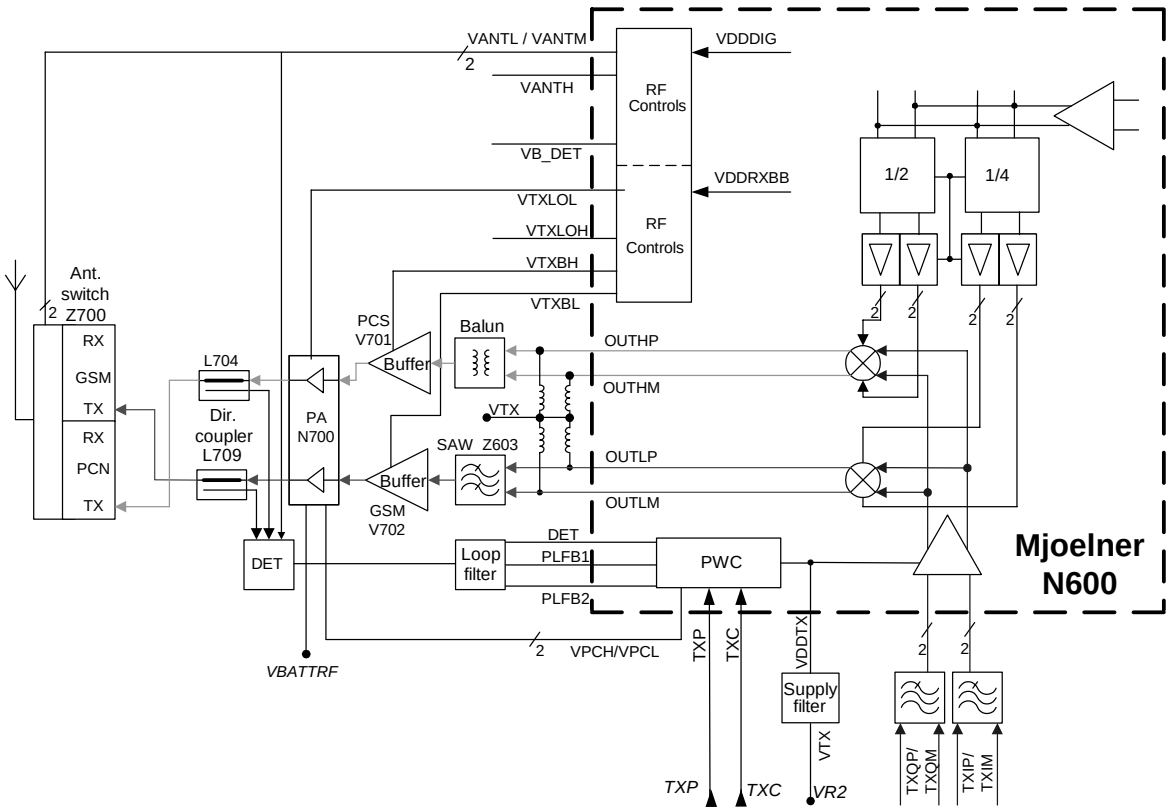


Figure 2: Transmitter signal path

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 GSM and PCS channels, a regular Synthesizer circuit is used. All PLL blocks except for the VCO, reference X-tal, and loop filter are located in the Mjoelner IC.

The reference frequency is generated by a 26MHz Voltage Controlled X-tal Oscillator (VCXO), which is located in Mjoelner. 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 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 loop filter. As mentioned earlier, only the VCO, reference X-tal, and loop filter are external to the Mjoelner IC.

The VCO (N601) is the component that actually generates the LO frequency. Based on the control voltage input, the VCO generates a differential RF output. This signal is fed to the Prescaler and N-divider in Mjoelner; these two blocks will 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 loop filter. By charging/discharging the loop filter, 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 loop filter 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 PCS band. For the GSM band, the PLL is operating at four times the channel frequency. Therefore, divide-by-2 and divide-by-4 circuits are inserted between the PLL output and LO inputs to the PCS and GSM mixers.

The frequency plan is shown in the following table:

Frequency Band	Channel #	System Frequency Band (MHz)	PLL Frequency Band (MHz)
GSM RX	128-251	869.2 - 893.8	3476.8 - 3575.2
TX		824.2 - 848.8	3296.8 - 3395.2
PCS RX	512 - 810	1930.2 - 1989.8	3860.4 - 3979.6
TX		1850.2 - 1909.8	3700.4 - 3819.6

According to the table above, the PLL must be able to cover the frequency range 3296.8 MHz to 3979.6 MHz.

The VCO used in HDbc2 actually consists of four different VCOs, each covering different parts of the PLL frequency range. Added together, the four VCOs cover the full range. In order for the SW to know which VCO to use for a certain channel, a set of three threshold frequencies have to be determined during the alignment procedure.

The coverage area for each VCO is determined by sweeping the PLL frequency range and reading back values from an Out-Of-Range indicator in the VCO for each frequency setting. The coverage areas will overlap each other to ensure coverage of the full frequency range.

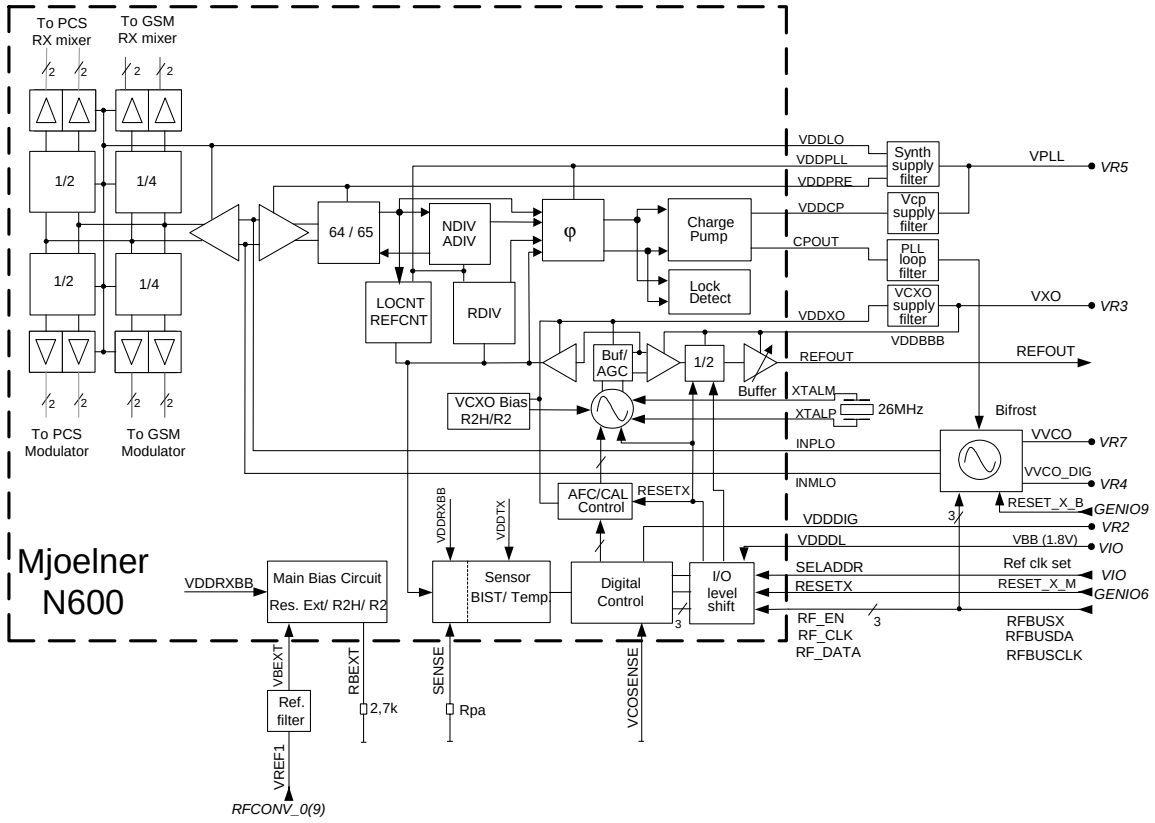


Figure 3: Synthesizer

Key RF Component Placement

N600	Mjoelner RF IC
Z601	PCS RX SAW
Z602	GSM RX SAW
Z603	GSM TX SAW
B600	26 MHz crystal
N601	VCO (3.6 GHz UHF VCO)
N700	Power Amplifier (PA)
Z700	Antenna switch

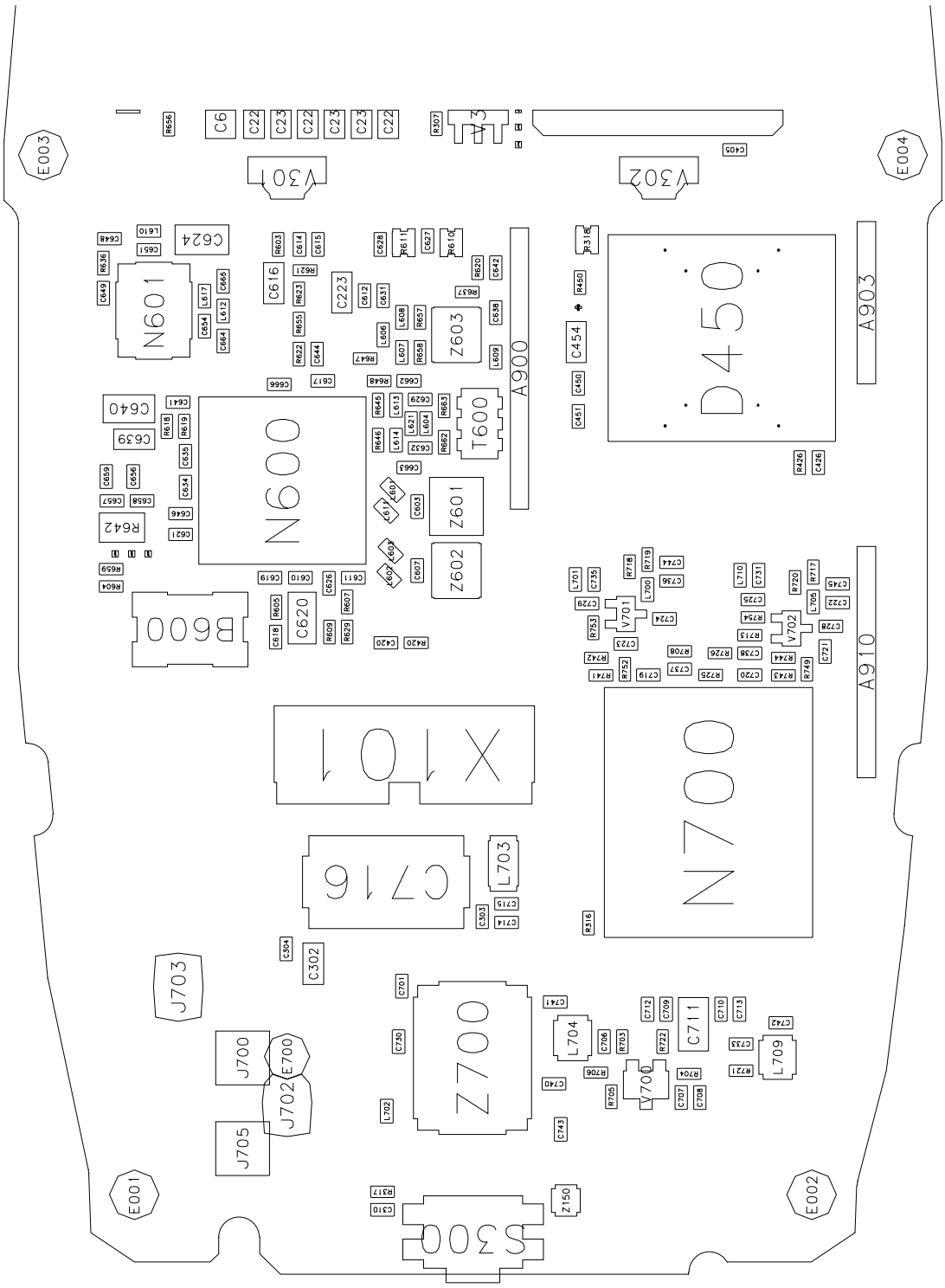


Figure 4: Key component locations

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 HDbc2 phone is shown in the following block diagram:

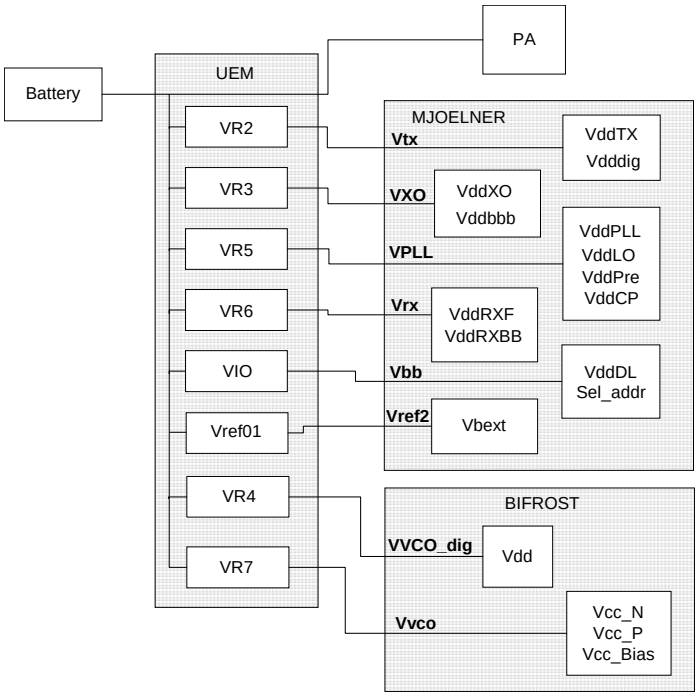


Figure 5: Power supply configuration

The names in **bold** are signal names which are used on the RF schematic pages. Names in the boxes within the Mjoelner and Bifrost (VCO) refer to pin names on the respective ICs (N600, N601).

Supply name RF	Supply name UEM	Min	Typ	Max	Unit
VTX	VR2	2.64	2.78	2.86	V
VXO	VR3	2.64	2.78	2.86	V
VVCO_DIG	VR4	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

The following diagram illustrates measuring points at the UEM (D200).

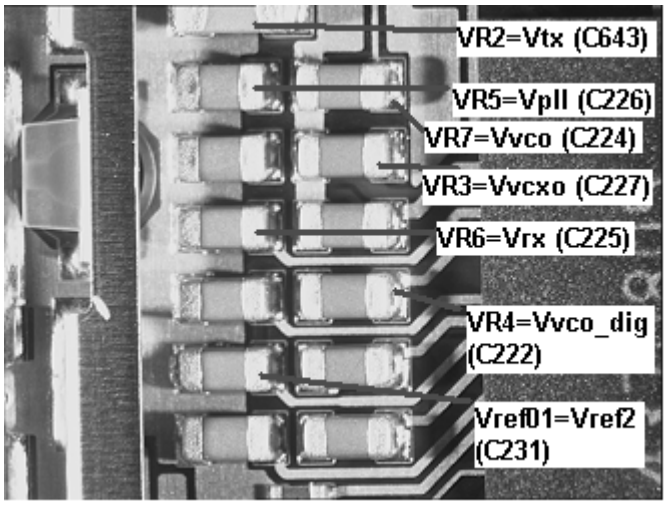


Figure 6: Supply points at the UEM (D200)

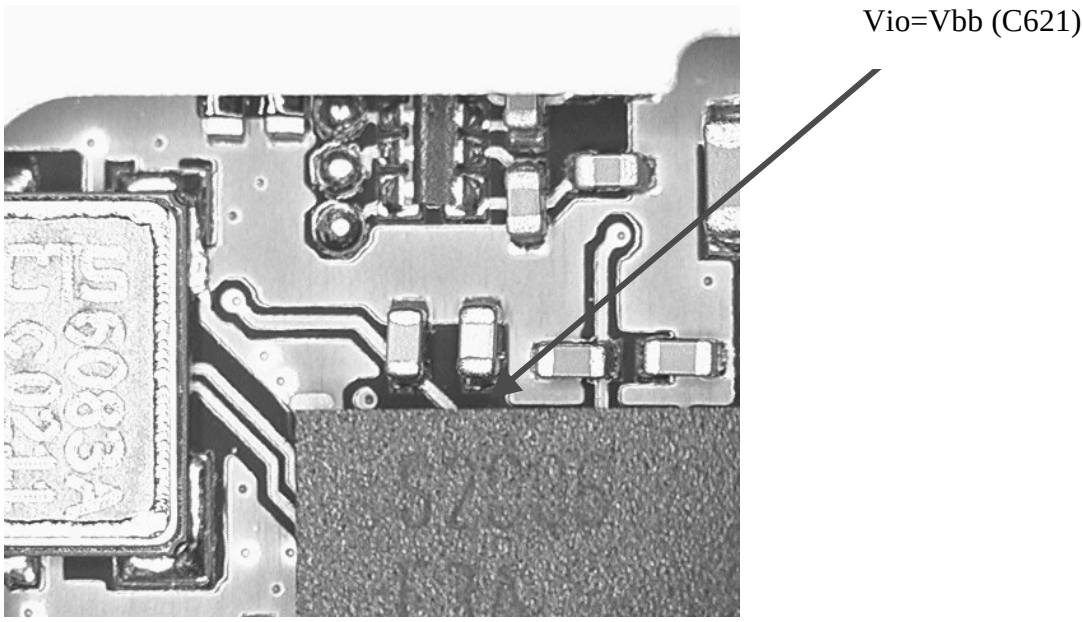


Figure 7: Supply point at the Mjoelner (N600)

Receiver

General Instructions for GSM850 RX Troubleshooting

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

Start Phoenix and establish connection to the phone.

Select File

Scan for Product Ctrl-R

Select Maintenance

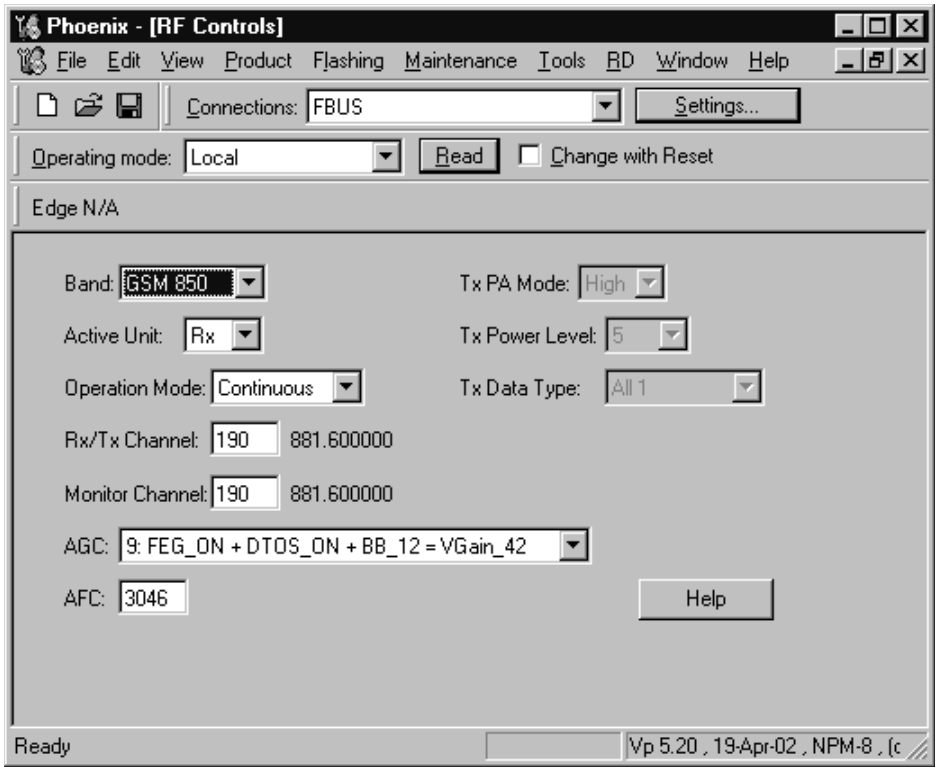
Testing

RF Controls

Select:

Band	Active Unit	Operation Mode	RX-TX Channel	AGC
GSM850	RX	Continuous	190	9

The setup should now look like this:



Troubleshooting Chart for GSM850 Receiver

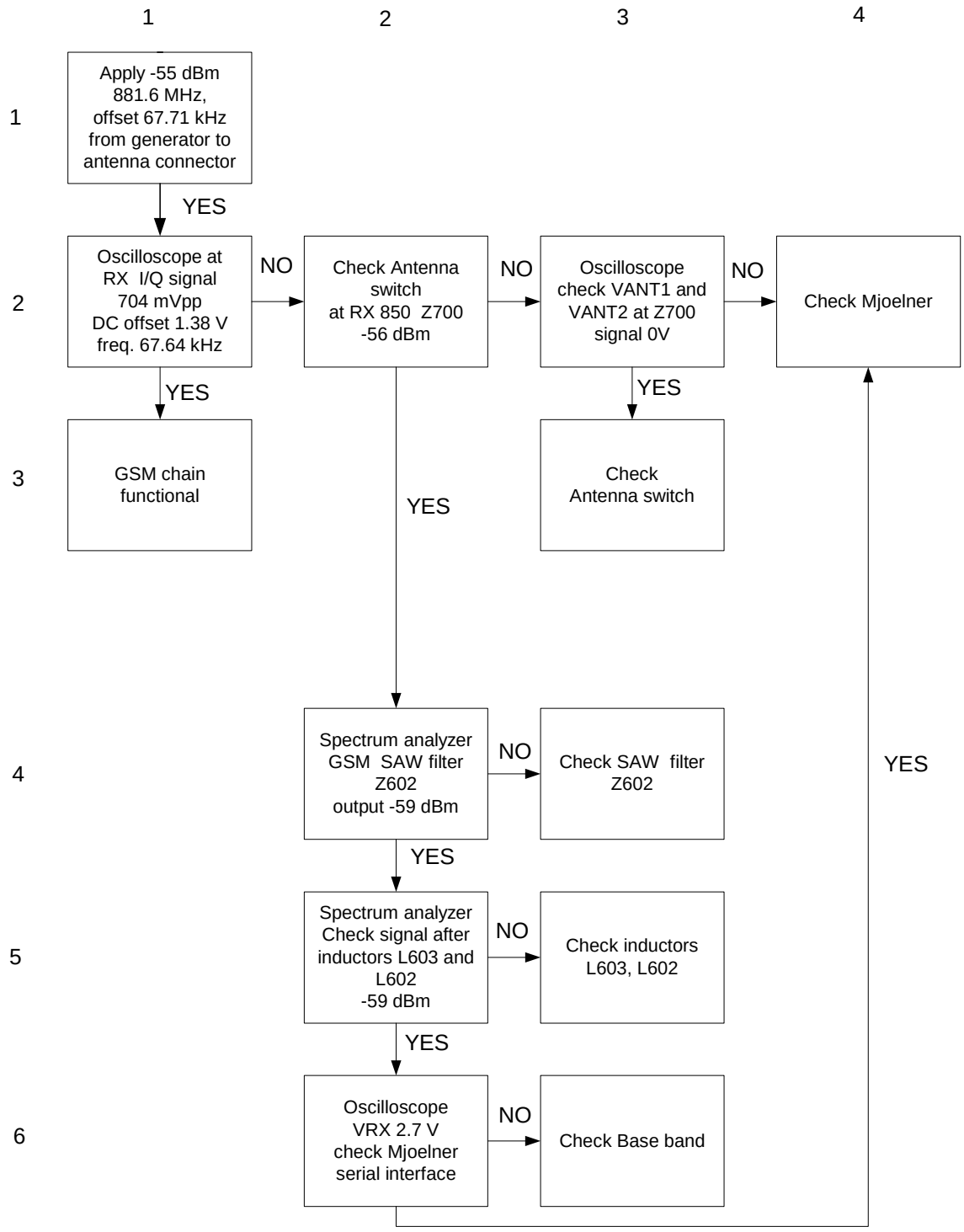


Figure 8: GSM850 receiver troubleshooting chart

By measuring with an oscilloscope at RXIP or RXQP on a working GSM850 receiver, the following picture should be seen.

Signal amplitude peak-peak 704 mV

DC offset 1.38 V

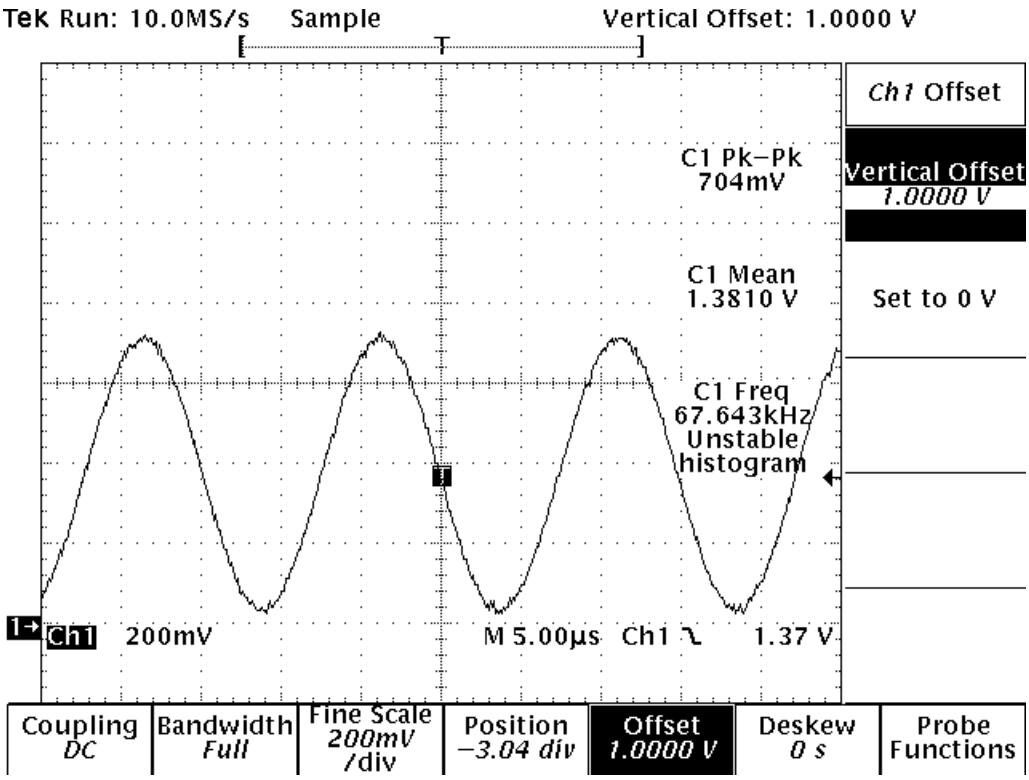


Figure 9: RX850 I/Q signal waveform

General Instructions for GSM1900 RX Troubleshooting

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

Start Phoenix and establish connection to the phone.

Select File

Scan for Product Ctrl-R

Select Maintenance

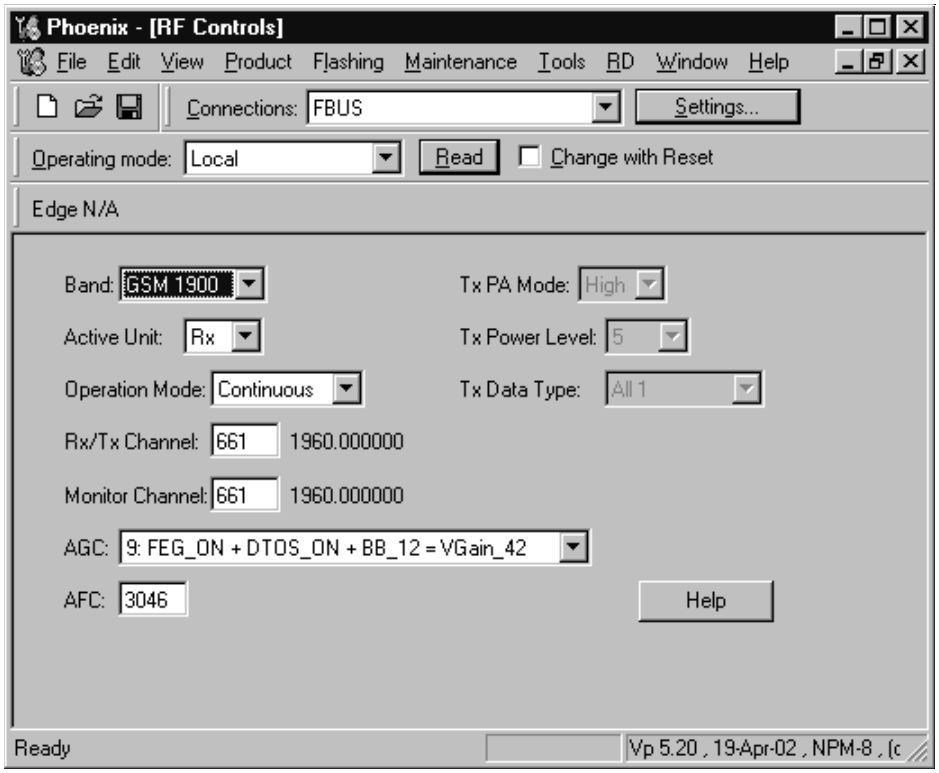
Testing

RF Controls

Select:

Band	Active Unit	Operation Mode	RX/TX Channel	AGC
GSM1900	RX	Continuous	661	9

The setup should now look like this:



Troubleshooting Chart for PCS Receiver

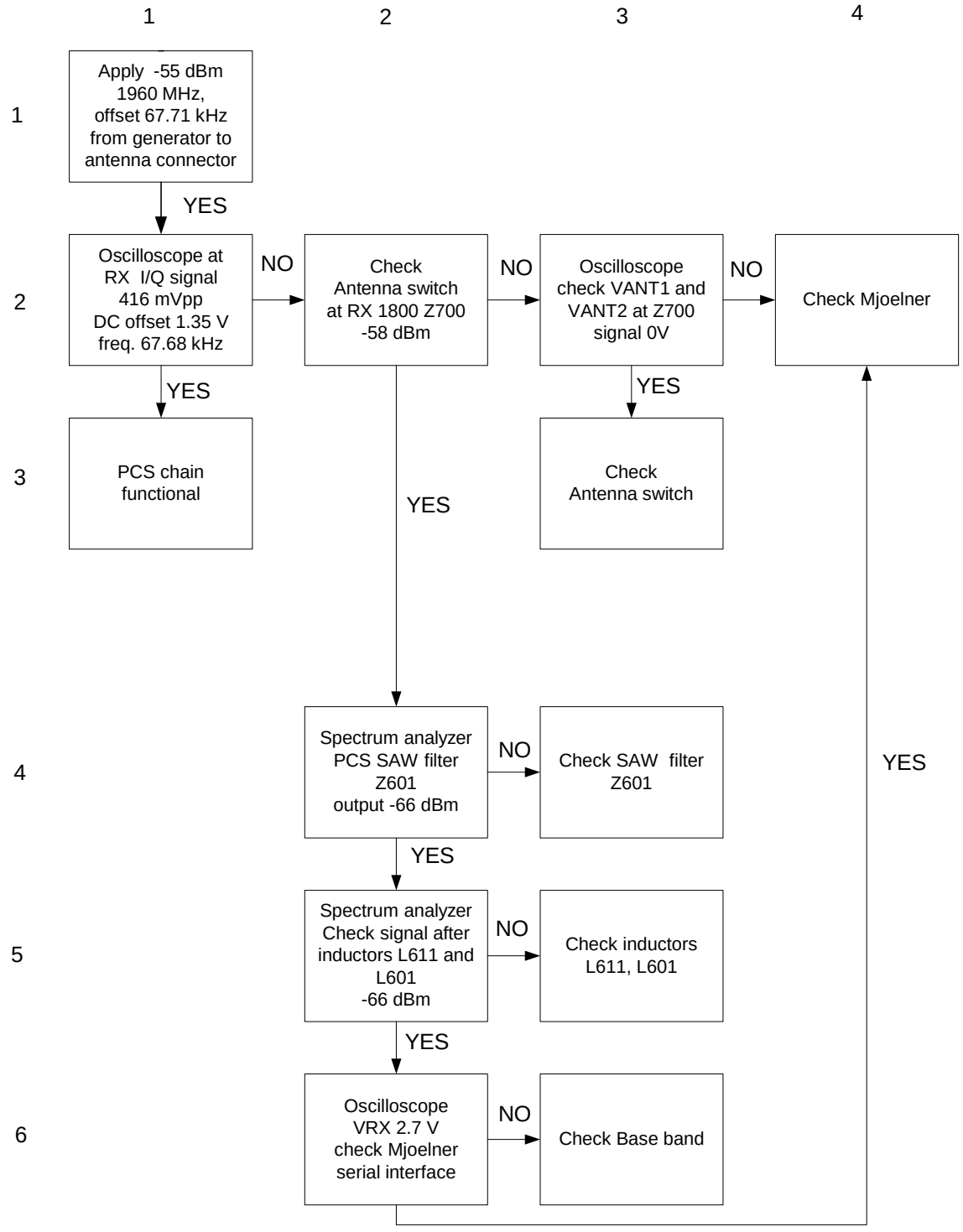


Figure 10: GSM1900 receiver troubleshooting chart

By measuring with an oscilloscope at RXIP or RXQP on a working GSM1900 receiver, the following picture should be seen.

Signal amplitude peak-peak 416 mV

DC offset 1.35 V

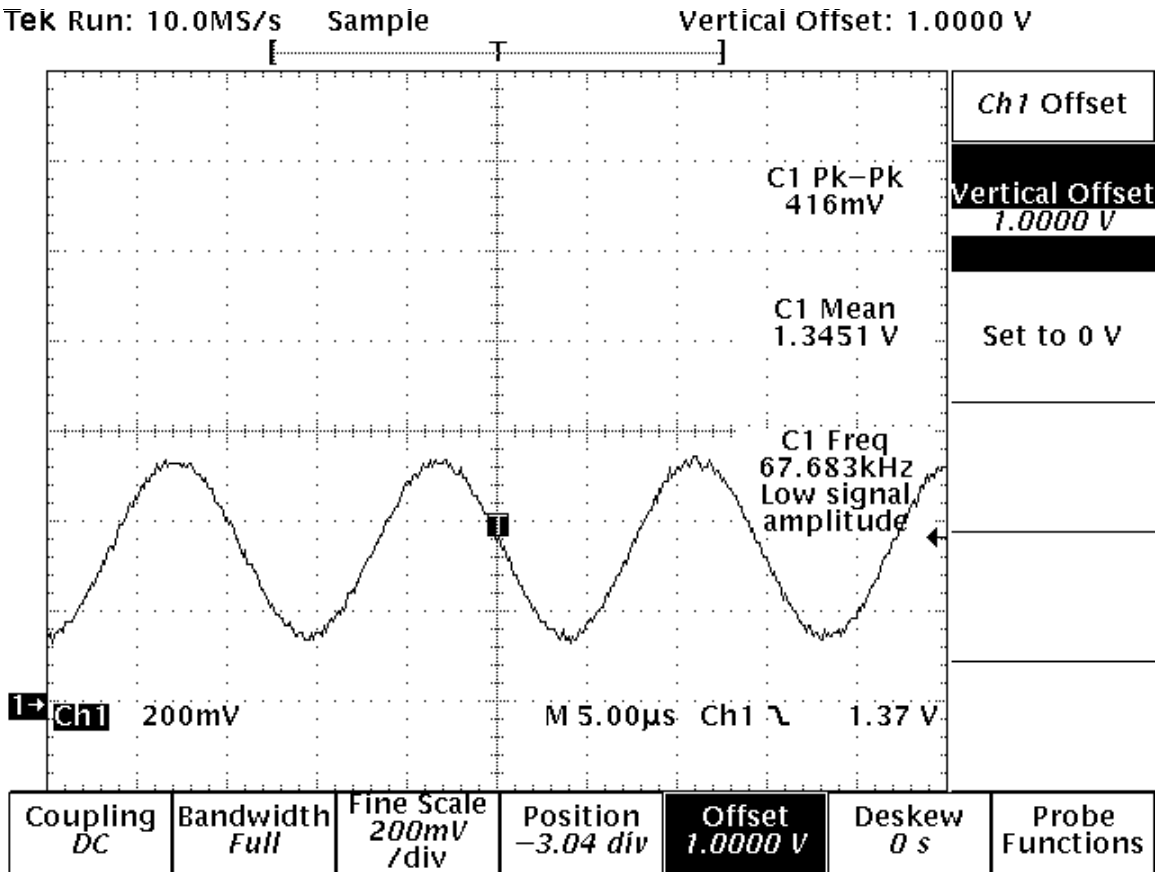


Figure 11: RX1900 I-Q signal waveform

Measurement Points in the Receiver

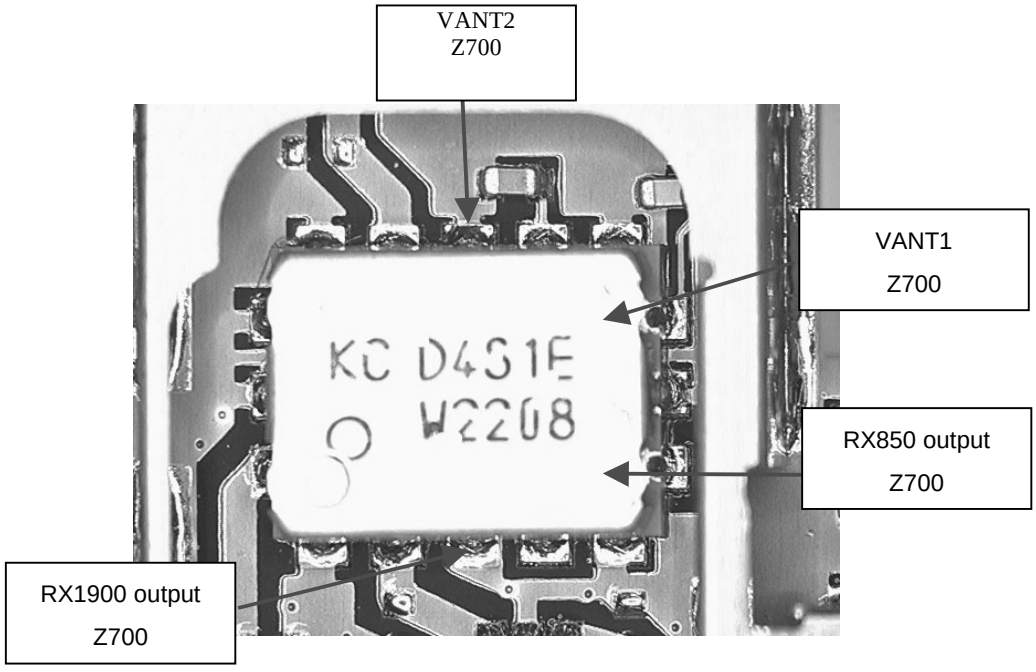


Figure 12: RX measurements point at the Antenna switch - Z700

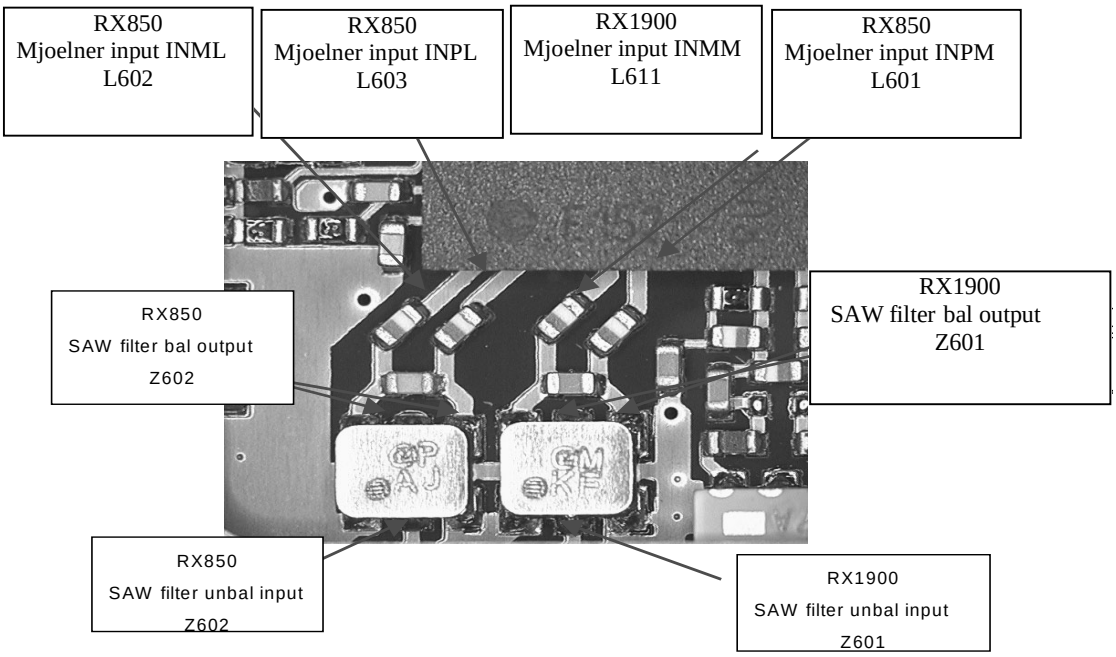


Figure 13: Measurement points at the RX filters — Z601-Z602

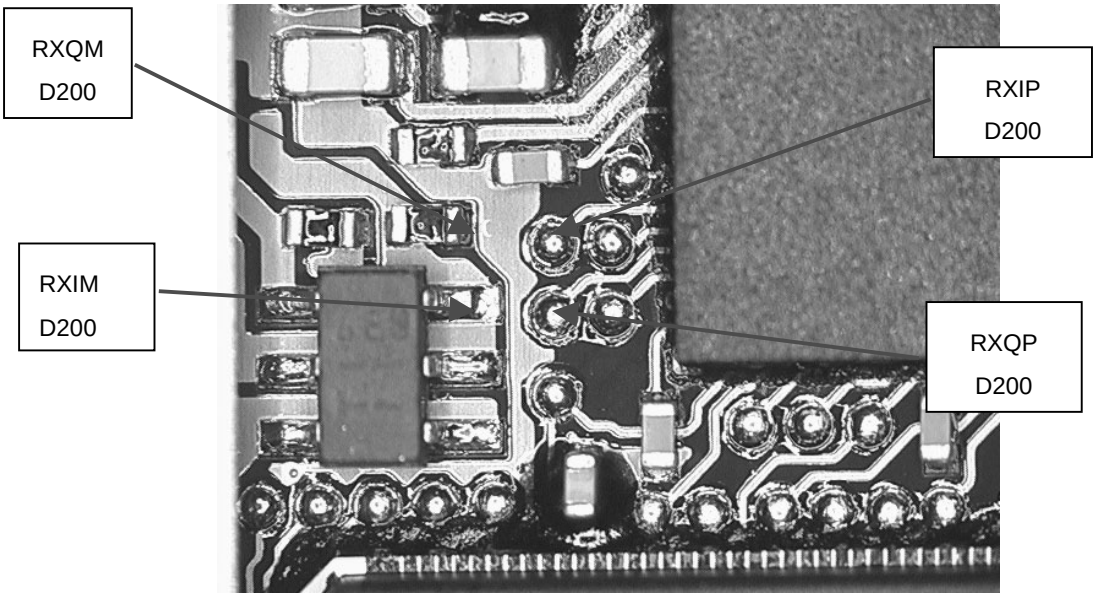


Figure 14: RX I/Q Signals Base Band shielding can

Transmitter

Measurement Points for the Transmitter

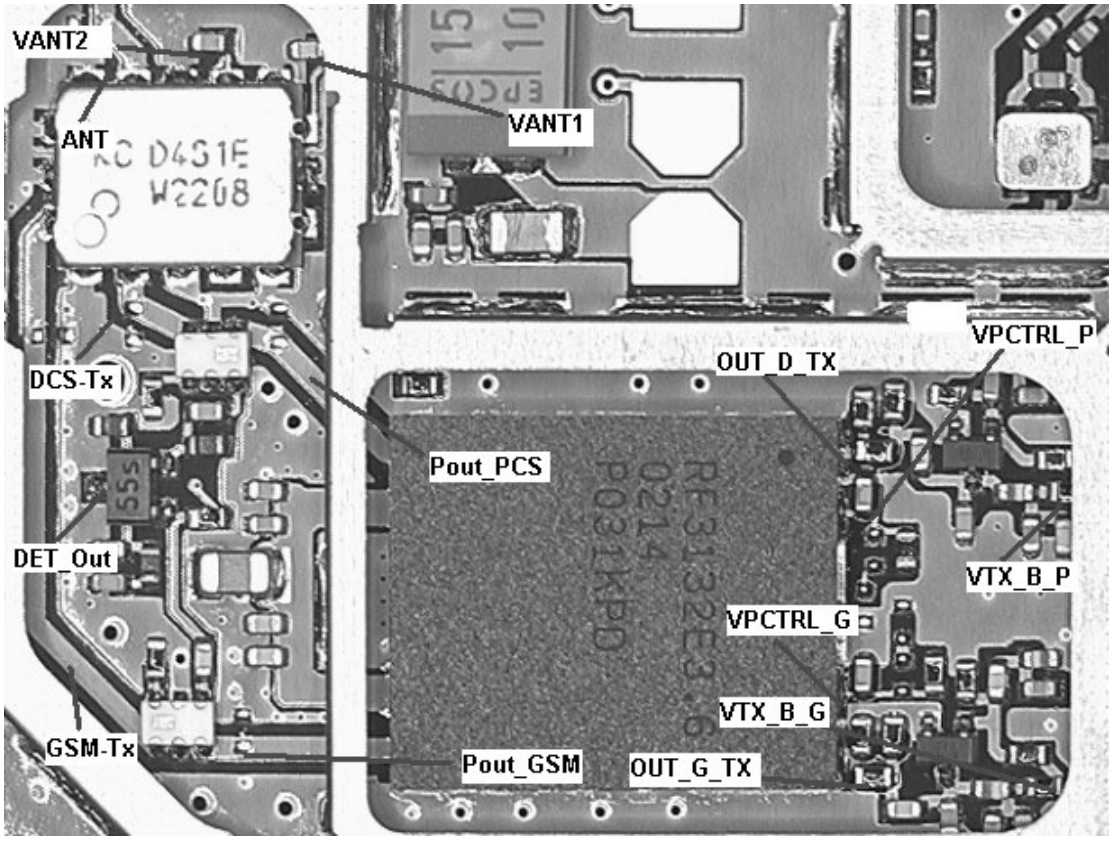


Figure 15: Measurement points in the PA N700 shielding can

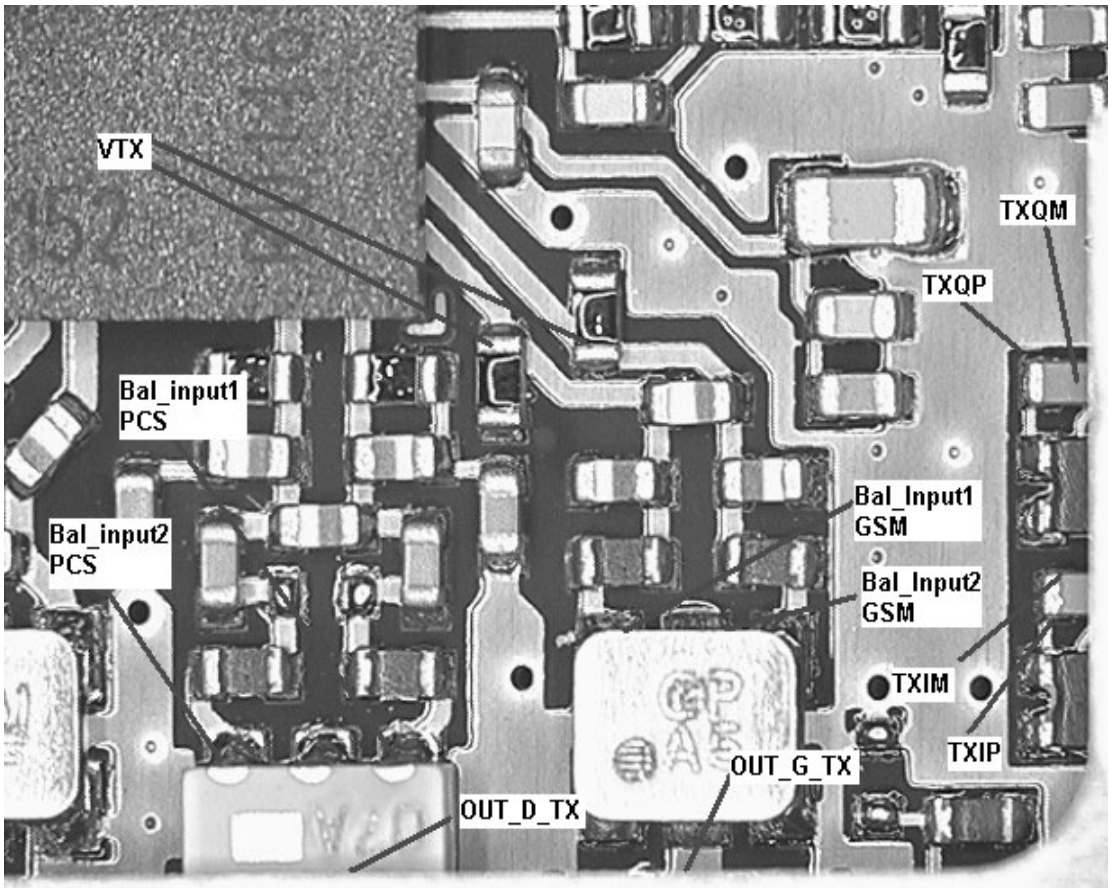


Figure 16: TX measurement points in the PA (N700) shielding can

General Instructions for GSM TX Troubleshooting

Apply a RF cable to the test jig's RF connector to allow the transmitted signal to act as normal. The RF cable should be connected to measurement equipment with at least a 10 dB attenuator, or the test equipment may be damaged.

Start Phoenix-Service-Software and:

Establish a connection to the phone e.g. FBUS or MBUS.

Select File

Choose Product

Enigma

Select: Maintenance

Testing

RF Controls

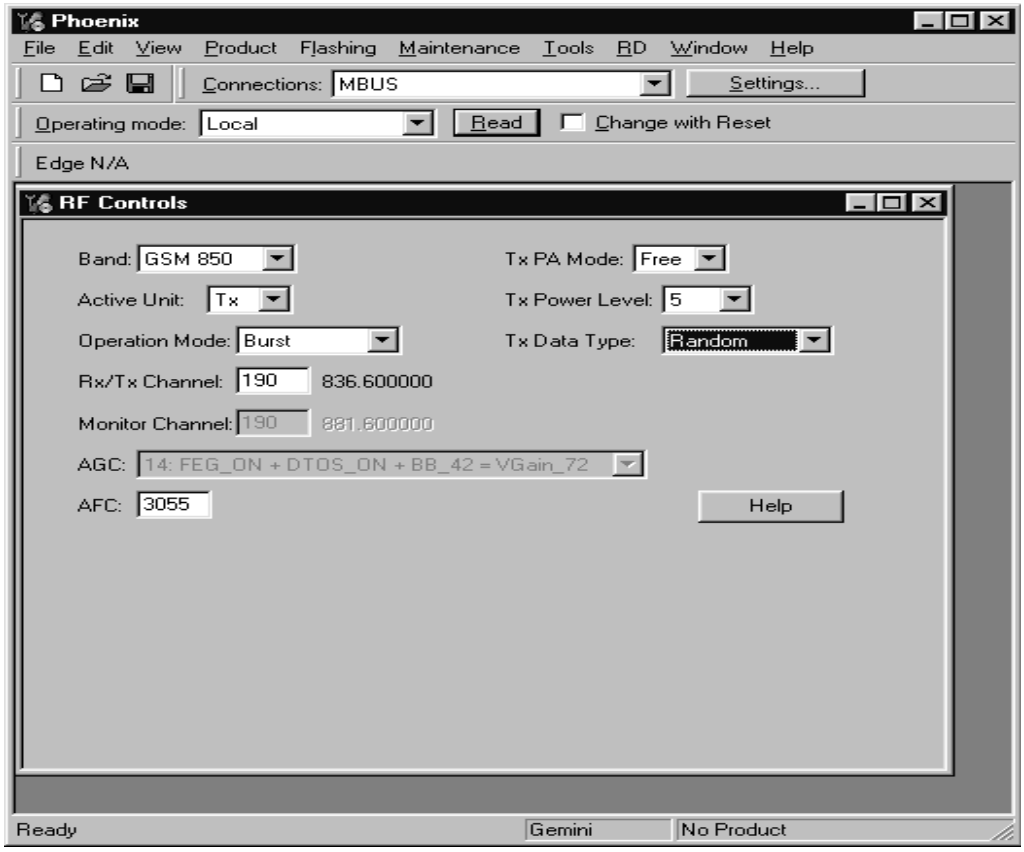
Band: GSM850

Active Unit: TX

Tx Power Level: 5

Tx Data Type: Random

Your screen should look like:



Measure the output power of the phone; it should be around 32.0 dBm. Remember the loss along the end launch connector in the test jig; which is around 0.3 dB.

Troubleshooting Chart for GSM850 Transmitter

Troubleshooting the Output Power

Use a high impedance probe for the spectrum analyzer measurements in the following chart. Since the signal is bursted, set the trace to maxhold.

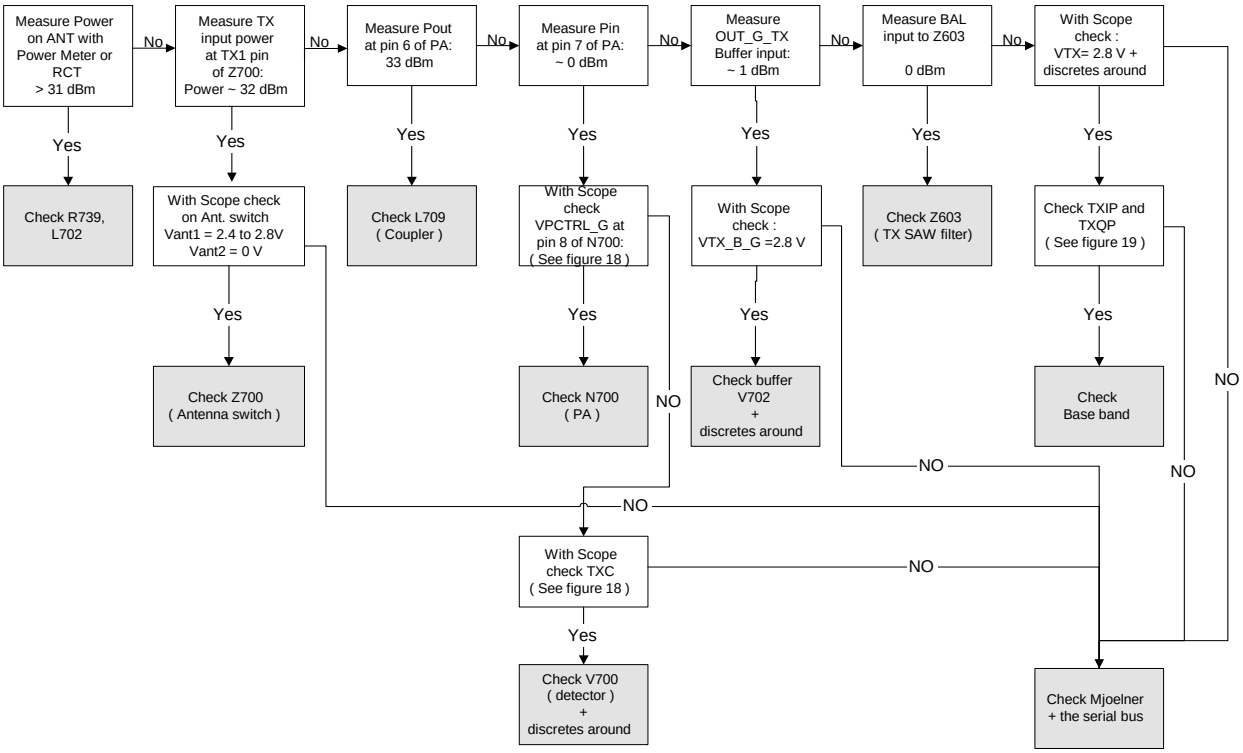
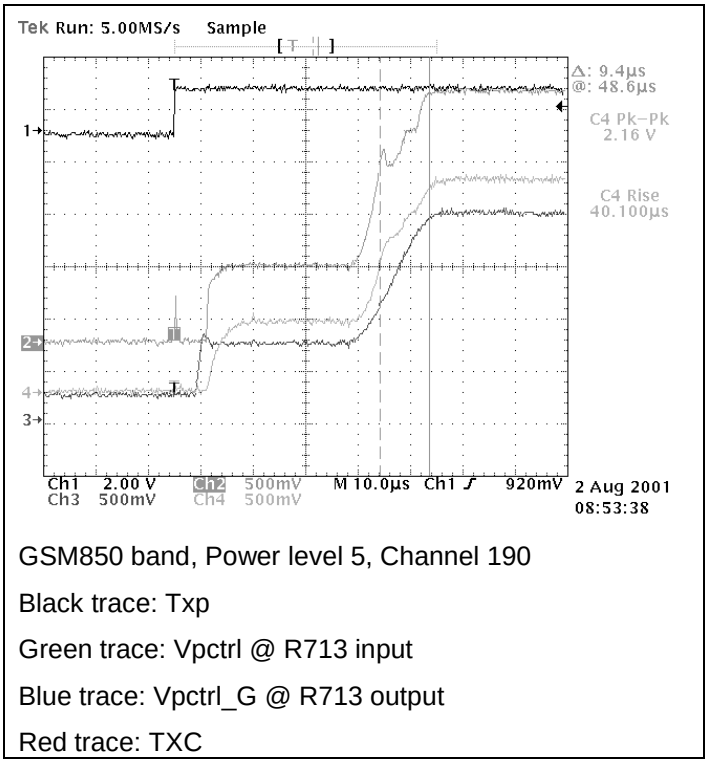


Figure 17: GSM850 transmitter troubleshooting chart



GSM850 band, Power level 5, Channel 190

Black trace: Txp

Green trace: Vpctrl @ R713 input

Blue trace: Vpctrl_G @ R713 output

Red trace: TXC

Figure 18: TXP, VPCTRL_G & TXC

Troubleshooting the Modulation

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

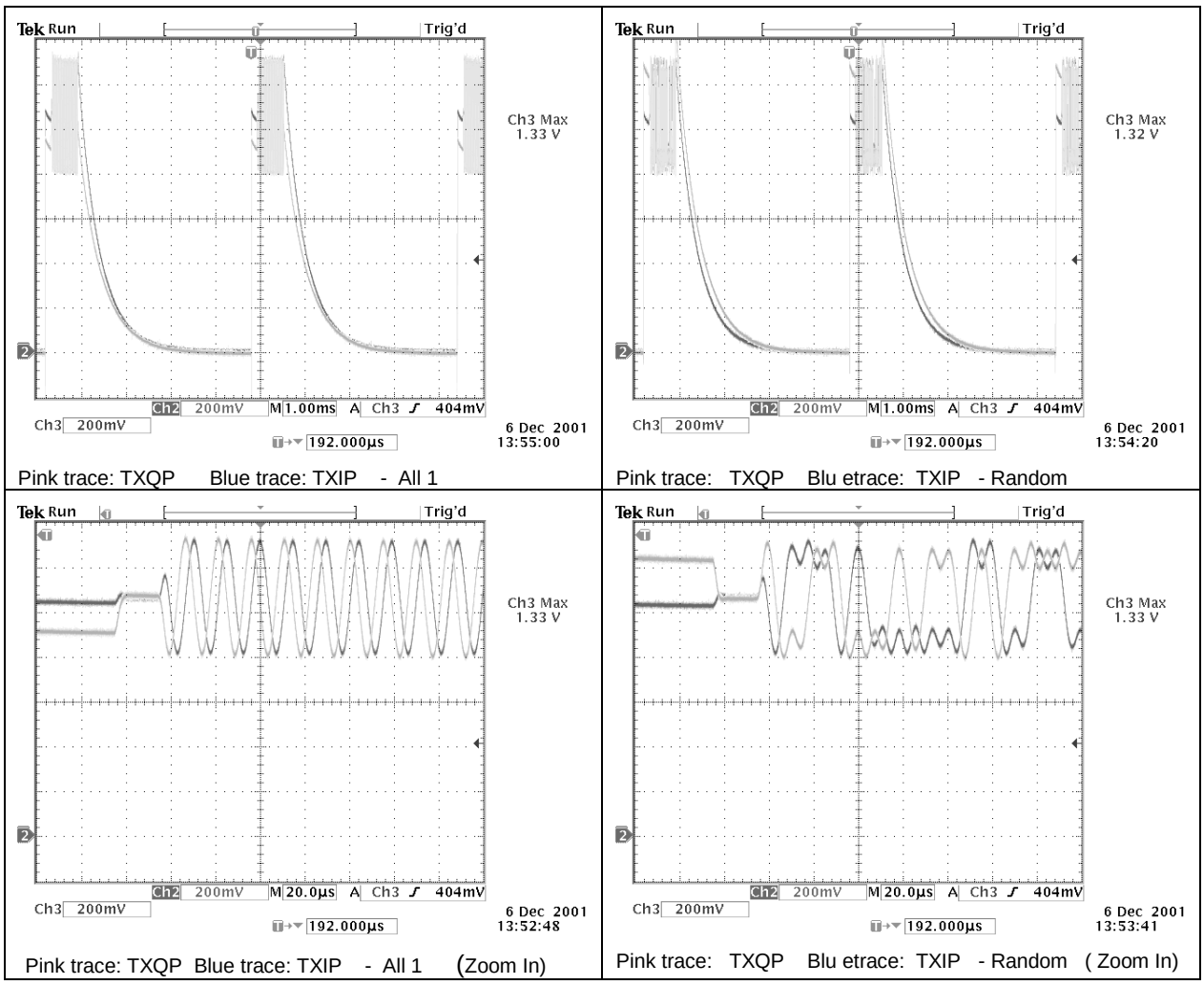


Figure 19: TX I/Q waveforms

I/Q signals look almost the same regardless if modulation is by "1" or by "0". There is no significant difference between TXIP and TXIM. The same is valid for TXQP and TXQM.

General instructions for PCS TX troubleshooting

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

Start Phoenix-Service-Software and:

Establish a connection to the phone e.g. FBUS.

Select File

Choose Product

Enigma

Select: Maintenance

Testing

RF Controls

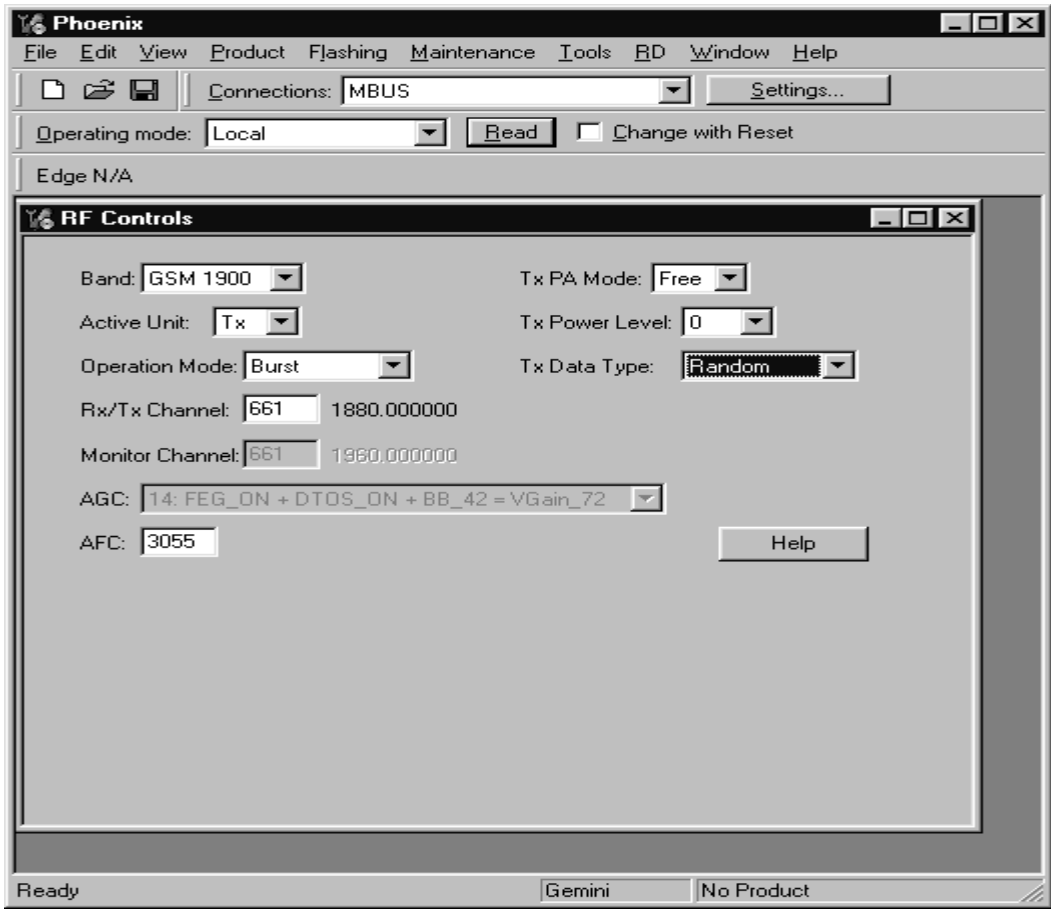
Band: GSM1900

Active Unit: TX

Tx Power Level: 0

Tx Data Type: Random

Your screen should look like:



Measure the output power of the phone; it should be around 29.5 dBm. Remember the loss in the test jig; around 0.7 dB.

Troubleshooting chart for PCS transmitter

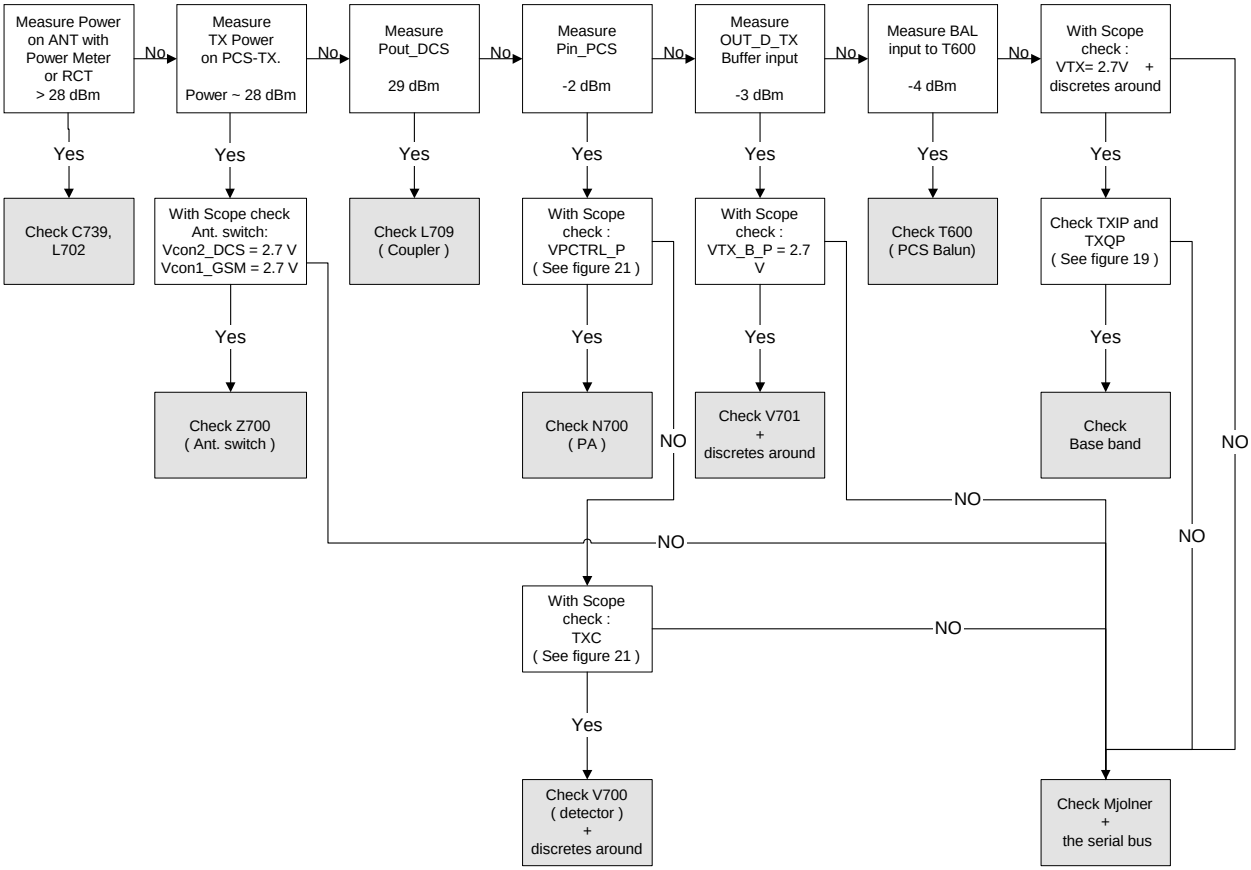


Figure 20: GSM1900 transmitter troubleshooting chart

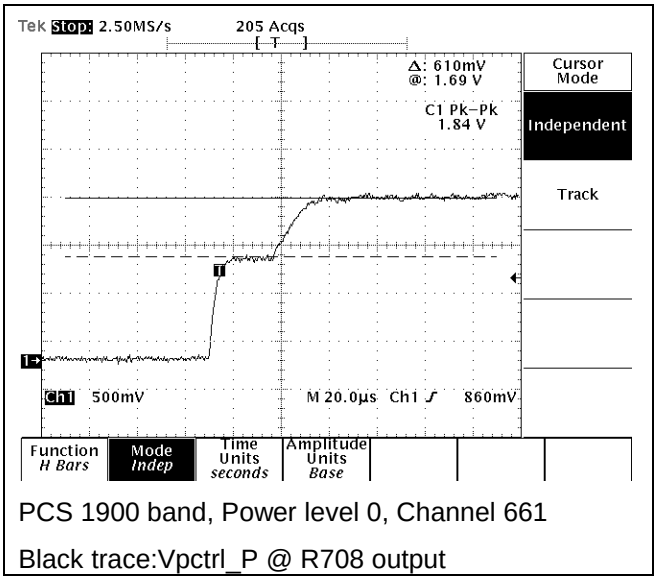


Figure 21: VPCTRL_P

*** TXIQ signals look the same in PCS and GSM.*

Synthesizer

There is only one PLL synthesizer generating Local Oscillator frequencies for both RX and TX in both bands (PCS and GSM). The VCO frequency is divided by two for PCS operation or by four for GSM operation inside the Mjoelner IC.

General Instructions for Synthesizer Troubleshooting

Start the Phoenix-Service-Software and

Select: Product NPM-8NX

Select: Maintenance

Testing

RF Controls

Band	GSM1900
Active Unit	RX
Operation Mode	Continuous
RX/TX Channel	661

It is not possible to measure the output of the VCO (N601) directly as this component is placed underneath a shielding can without detachable lid. However with spectrum analyzer and high impedance probe it is possible to get an indication if the VCO outputs the correct frequency. To do this probe R656 – the frequency should be 3920 MHz and the power should be around –50 dBm.

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 Base Band. 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)

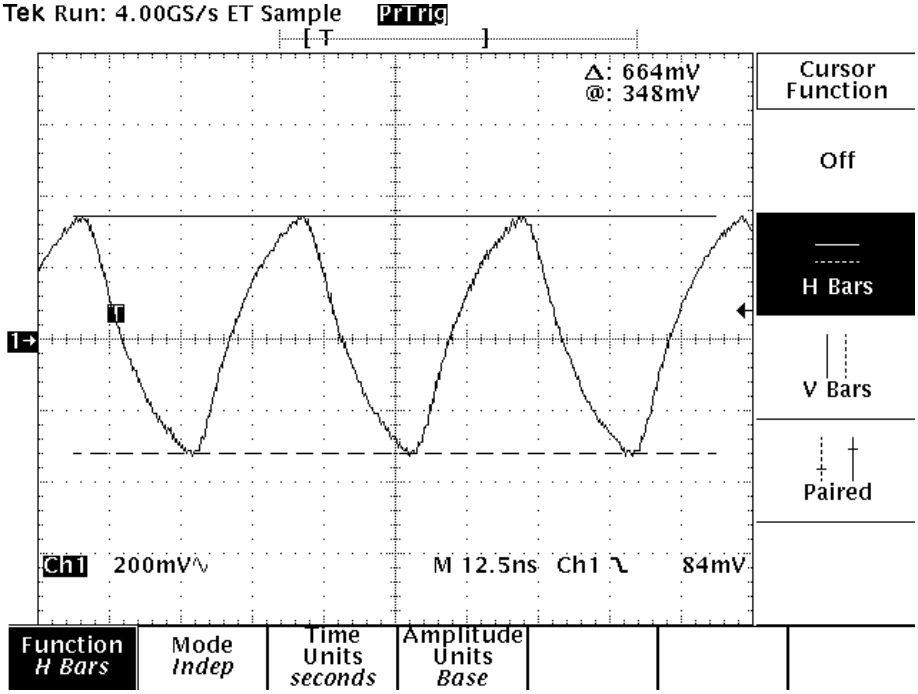


Figure 22: VCXO 26 MHz waveform

VCO

The VCO is generating frequencies in the range of 3296.8 MHz – 3979.6 MHz 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 by 2 or 4 so that they can generate all channels in GSM and PCS respectively. Frequency of the VCO is controlled by a DC-voltage (Vctrl) coming from the loop filter. The loop filter consists of the components R618, R619 and C639-C641. Range of the Vctrl when the PLL is running (locked) is 0.4V – 2.4V. Even if the PLL is not in locked state (Vctrl out of range) there is some frequency at the output of the VCO (N601) which is between 3 and 4 GHz. This is of course only true if the VCO is working and if the VCO power supply is present (2.7V).

The VCO actually consists of four different internal VCO´s. Each of these internal VCO`s cover separate parts of the total frequency range. In order for the VCO to know which internal VCO to use for a certain frequency a calibration procedure must be used before the VCO is used. The calibration procedure determines three threshold values, which should be stored in the phones permanent memory.

To run the VCO calibration: Start the Phoenix-Service-Software and

Select: Product NPM-8NX

Select: Maintenance

Tuning

VCO Calibration

Calibrate

Update PMM (Only if the old values can be deleted)

The result of the calibration will be:

Three Threshold values

Min. and max. frequencies for VCO1, ... , VCO4

The following relation must apply to the three thresholds:

Threshold 1 < Threshold 2 < Threshold 3 and for the VCO edge-frequencies the following must be satisfied:

VCO1,min < 3296 MHz

VCO1,max – VCO2,min > 50MHz

VCO2,max – VCO3,min > 50MHz

VCO4,max – VCO4,min > 50MHz

VCO4,min > 3980 MHz

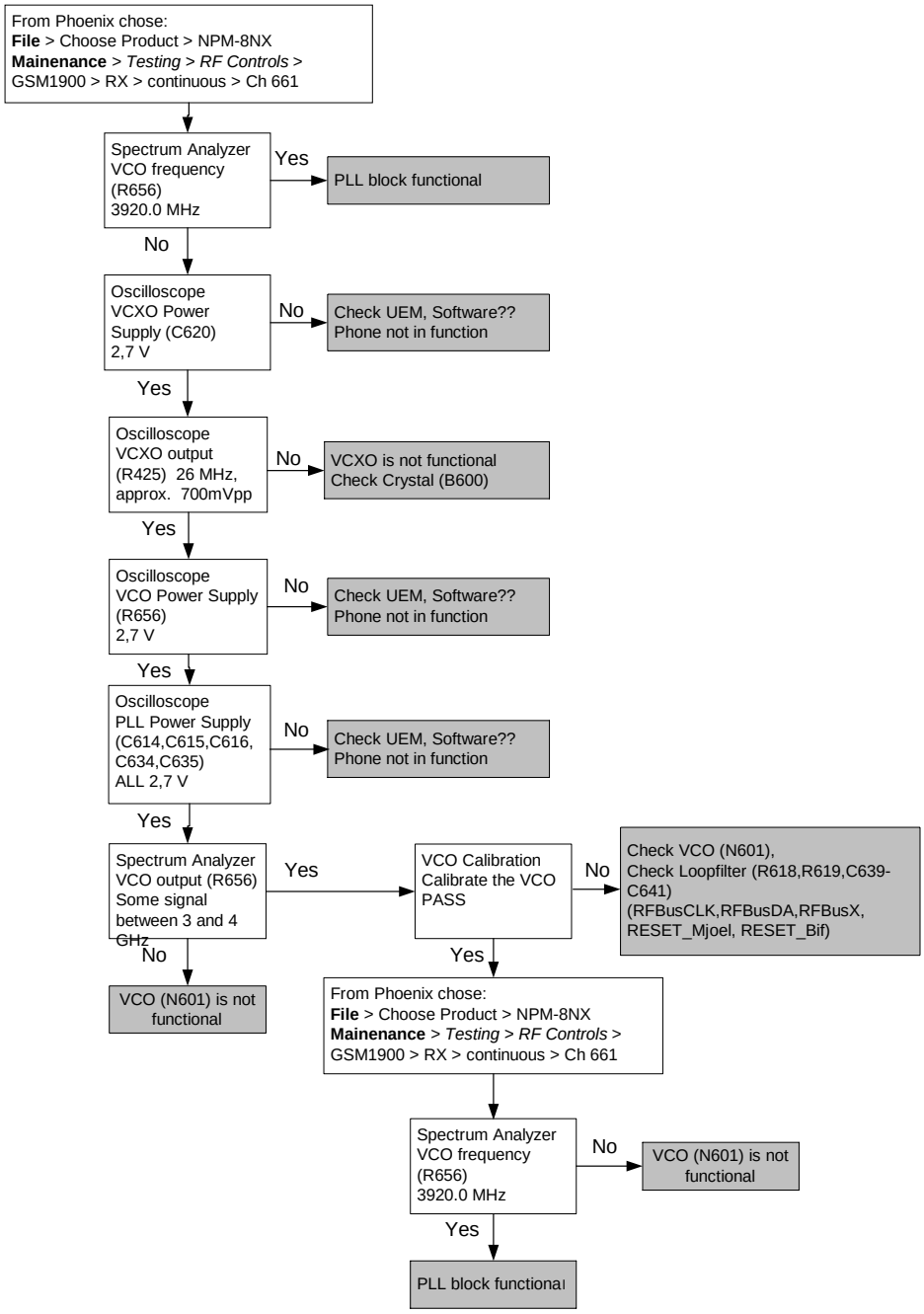


Figure 23: PLL troubleshooting chart

Troubleshooting Chart for PLL Synthesizer

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

Turn on the phone and check

VCXO Power supply (C620) = 2.7V

VCXO output (R425 – end **not** connected to C425) is 26MHz and approx. 700mVpp

If this is not the case, check the reference crystal (B600), Mjoelner (N600), R425, R426, C425, and C426.

Measurement Points for the PLL

Measurement Points at the VCXO

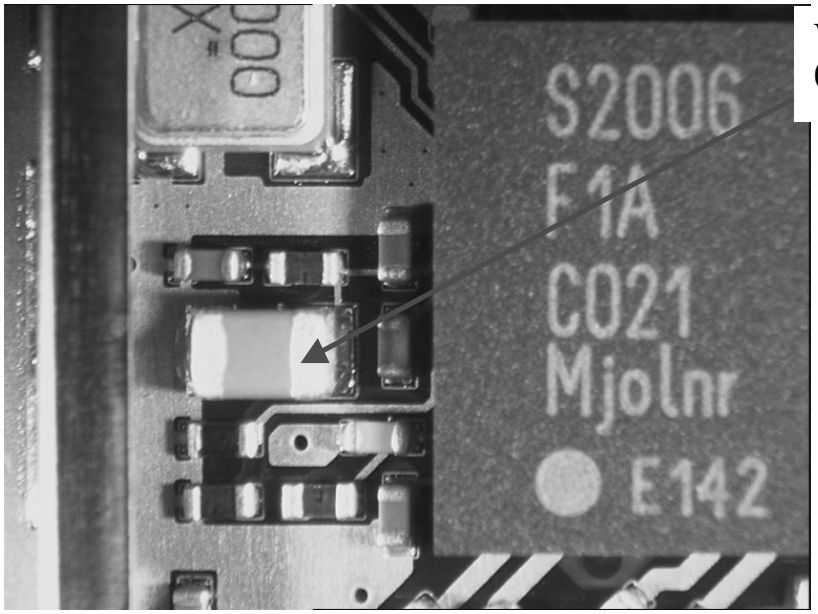


Figure 24: Measurement point for VCXO supply

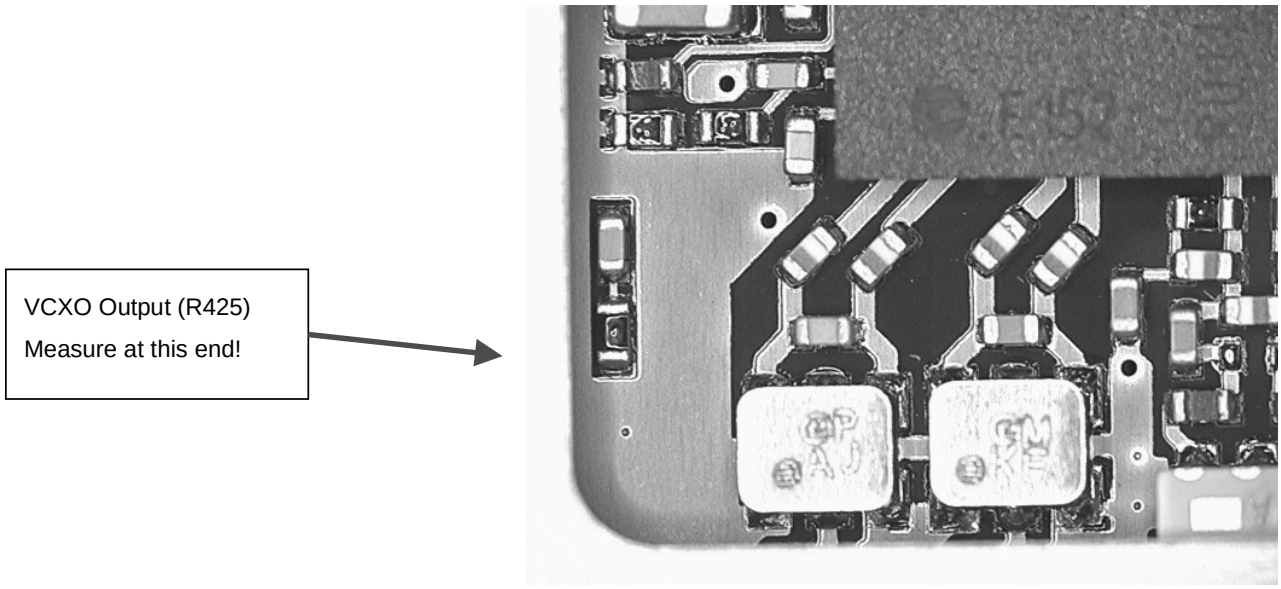


Figure 25: Measurement point for VCXO output

Measurement Points at the PLL/VCO

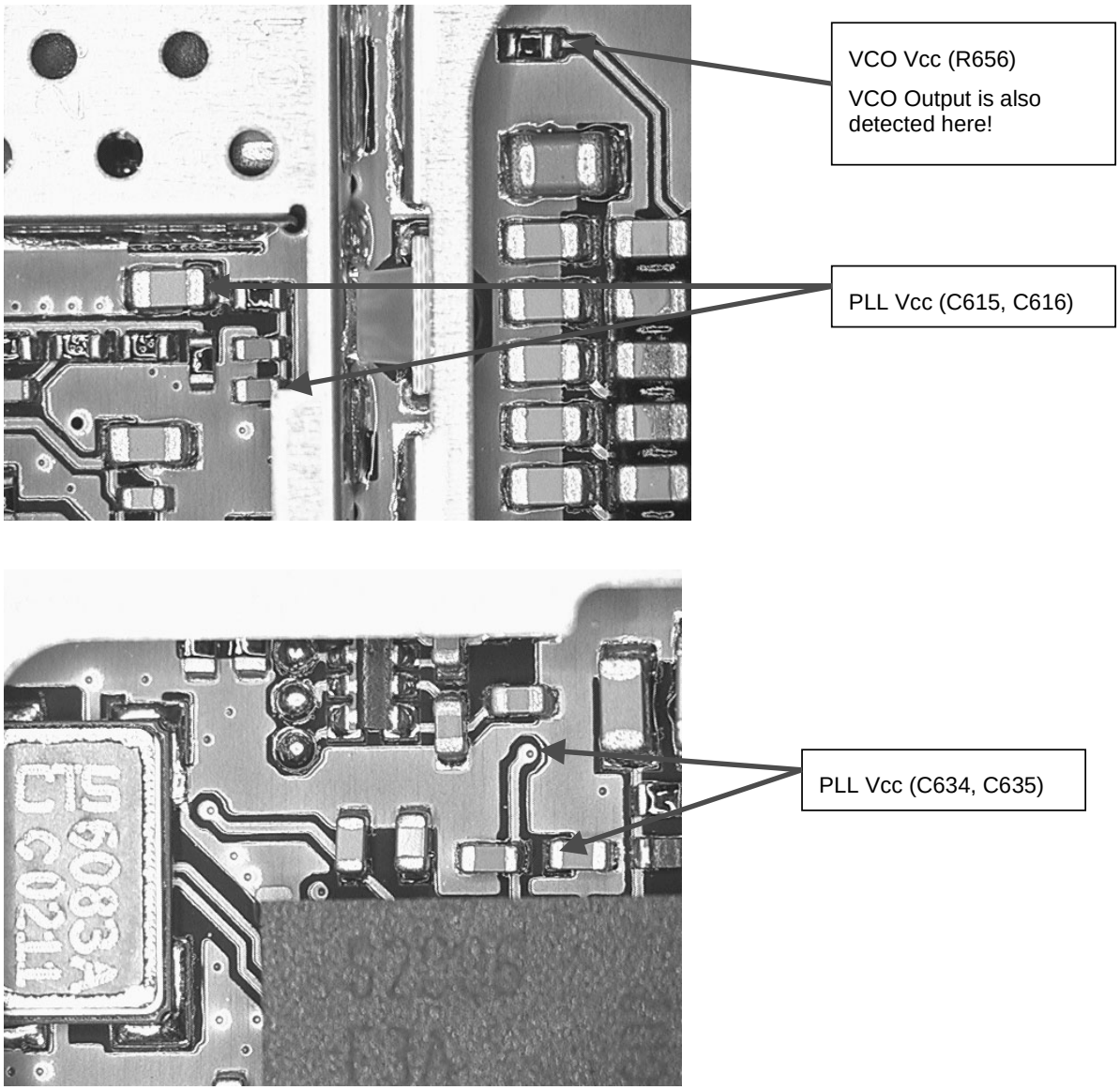


Figure 26: Measurement point for PLL

Frequency Lists

GSM850

Ch	TX	RX	VCO TX	VCO RX	Ch	TX	RX	VCO TX	VCO RX	Ch	TX	RX	VCO TX	VCO RX
128	824.2	869.2	3296.8	3476.8	170	832.6	877.6	3330.4	3510.4	210	840.6	885.6	3362.4	3542.4
129	824.4	869.4	3297.6	3477.6	171	832.8	877.8	3331.2	3511.2	211	840.8	885.8	3363.2	3543.2
130	824.6	869.6	3298.4	3478.4	172	833	878	3332	3512	212	841	886	3364	3544
131	824.8	869.8	3299.2	3479.2	173	833.2	878.2	3332.8	3512.8	213	841.2	886.2	3364.8	3544.8
132	825	870	3300	3480	174	833.4	878.4	3333.6	3513.6	214	841.4	886.4	3365.6	3545.6
133	825.2	870.2	3300.8	3480.8	175	833.6	878.6	3334.4	3514.4	215	841.6	886.6	3366.4	3546.4
134	825.4	870.4	3301.6	3481.6	176	833.8	878.8	3335.2	3515.2	216	841.8	886.8	3367.2	3547.2
135	825.6	870.6	3302.4	3482.4	177	834	879	3336	3516	217	842	887	3368	3548
136	825.8	870.8	3303.2	3483.2	178	834.2	879.2	3336.8	3516.8	218	842.2	887.2	3368.8	3548.8
137	826	871	3304	3484	179	834.4	879.4	3337.6	3517.6	219	842.4	887.4	3369.6	3549.6
138	826.2	871.2	3304.8	3484.8	180	834.6	879.6	3338.4	3518.4	220	842.6	887.6	3370.4	3550.4
139	826.4	871.4	3305.6	3485.6	181	834.8	879.8	3339.2	3519.2	221	842.8	887.8	3371.2	3551.2
140	826.6	871.6	3306.4	3486.4	182	835	880	3340	3520	222	843	888	3372	3552
141	826.8	871.8	3307.2	3487.2	183	835.2	880.2	3340.8	3520.8	223	843.2	888.2	3372.8	3552.8
142	827	872	3308	3488	184	835.4	880.4	3341.6	3521.6	224	843.4	888.4	3373.6	3553.6
143	827.2	872.2	3308.8	3488.8	185	835.6	880.6	3342.4	3522.4	225	843.6	888.6	3374.4	3554.4
144	827.4	872.4	3309.6	3489.6	186	835.8	880.8	3343.2	3523.2	226	843.8	888.8	3375.2	3555.2
145	827.6	872.6	3310.4	3490.4	187	836	881	3344	3524	227	844	889	3376	3556
146	827.8	872.8	3311.2	3491.2	188	836.2	881.2	3344.8	3524.8	228	844.2	889.2	3376.8	3556.8
147	828	873	3312	3492	189	836.4	881.4	3345.6	3525.6	229	844.4	889.4	3377.6	3557.6
148	828.2	873.2	3312.8	3492.8	190	836.6	881.6	3346.4	3526.4	230	844.6	889.6	3378.4	3558.4
149	828.4	873.4	3313.6	3493.6	191	836.8	881.8	3347.2	3527.2	231	844.8	889.8	3379.2	3559.2
150	828.6	873.6	3314.4	3494.4	192	837	882	3348	3528	232	845	890	3380	3560
151	828.8	873.8	3315.2	3495.2	193	837.2	882.2	3348.8	3528.8	233	845.2	890.2	3380.8	3560.8
152	829	874	3316	3496	194	837.4	882.4	3349.6	3529.6	234	845.4	890.4	3381.6	3561.6
153	829.2	874.2	3316.8	3496.8	195	837.6	882.6	3350.4	3530.4	235	845.6	890.6	3382.4	3562.4
154	829.4	874.4	3317.6	3497.6	196	837.8	882.8	3351.2	3531.2	236	845.8	890.8	3383.2	3563.2
155	829.6	874.6	3318.4	3498.4	197	838	883	3352	3532	237	846	891	3384	3564
156	829.8	874.8	3319.2	3499.2	198	838.2	883.2	3352.8	3532.8	238	846.2	891.2	3384.8	3564.8
157	830	875	3320	3500	199	838.4	883.4	3353.6	3533.6	239	846.4	891.4	3385.6	3565.6
158	830.2	875.2	3320.8	3500.8	200	838.6	883.6	3354.4	3534.4	240	846.6	891.6	3386.4	3566.4
159	830.4	875.4	3321.6	3501.6	201	838.8	883.8	3355.2	3535.2	241	846.8	891.8	3387.2	3567.2
160	830.6	875.6	3322.4	3502.4	202	839	884	3356	3536	242	847	892	3388	3568
161	830.8	875.8	3323.2	3503.2	203	839.2	884.2	3356.8	3536.8	243	847.2	892.2	3388.8	3568.8
162	831	876	3324	3504	204	839.4	884.4	3357.6	3537.6	244	847.4	892.4	3389.6	3569.6
163	831.2	876.2	3324.8	3504.8	205	839.6	884.6	3358.4	3538.4	245	847.6	892.6	3390.4	3570.4
164	831.4	876.4	3325.6	3505.6	206	839.8	884.8	3359.2	3539.2	246	847.8	892.8	3391.2	3571.2
165	831.6	876.6	3326.4	3506.4	207	840	885	3360	3540	247	848	893	3392	3572
166	831.8	876.8	3327.2	3507.2	208	840.2	885.2	3360.8	3540.8	248	848.2	893.2	3392.8	3572.8
167	832	877	3328	3508	209	840.4	885.4	3361.6	3541.6	249	848.4	893.4	3393.6	3573.6
168	832.2	877.2	3328.8	3508.8						250	848.6	893.6	3394.4	3574.4
169	832.4	877.4	3329.6	3509.6						251	848.8	893.8	3395.2	3575.2

PCS1900

Ch	TX	RX	VCO TX	VCO RX	Ch	TX	RX	VCO TX	VCO RX	Ch	TX	RX	VCO TX	VCO RX
512	1850.2	1930.2	3700.4	3860.4	612	1870.2	1950.2	3740.4	3900.4	712	1890.2	1970.2	3780.4	3940.4
513	1850.4	1930.4	3700.8	3860.8	613	1870.4	1950.4	3740.8	3900.8	713	1890.4	1970.4	3780.8	3940.8
514	1850.6	1930.6	3701.2	3861.2	614	1870.6	1950.6	3741.2	3901.2	714	1890.6	1970.6	3781.2	3941.2
515	1850.8	1930.8	3701.6	3861.6	615	1870.8	1950.8	3741.6	3901.6	715	1890.8	1970.8	3781.6	3941.6
516	1851	1931	3702	3862	616	1871	1951	3742	3902	716	1891	1971	3782	3942
517	1851.2	1931.2	3702.4	3862.4	617	1871.2	1951.2	3742.4	3902.4	717	1891.2	1971.2	3782.4	3942.4
518	1851.4	1931.4	3702.8	3862.8	618	1871.4	1951.4	3742.8	3902.8	718	1891.4	1971.4	3782.8	3942.8
519	1851.6	1931.6	3703.2	3863.2	619	1871.6	1951.6	3743.2	3903.2	719	1891.6	1971.6	3783.2	3943.2
520	1851.8	1931.8	3703.6	3863.6	620	1871.8	1951.8	3743.6	3903.6	720	1891.8	1971.8	3783.6	3943.6
521	1852	1932	3704	3864	621	1872	1952	3744	3904	721	1892	1972	3784	3944
522	1852.2	1932.2	3704.4	3864.4	622	1872.2	1952.2	3744.4	3904.4	722	1892.2	1972.2	3784.4	3944.4
523	1852.4	1932.4	3704.8	3864.8	623	1872.4	1952.4	3744.8	3904.8	723	1892.4	1972.4	3784.8	3944.8
524	1852.6	1932.6	3705.2	3865.2	624	1872.6	1952.6	3745.2	3905.2	724	1892.6	1972.6	3785.2	3945.2
525	1852.8	1932.8	3705.6	3865.6	625	1872.8	1952.8	3745.6	3905.6	725	1892.8	1972.8	3785.6	3945.6
526	1853	1933	3706	3866	626	1873	1953	3746	3906	726	1893	1973	3786	3946
527	1853.2	1933.2	3706.4	3866.4	627	1873.2	1953.2	3746.4	3906.4	727	1893.2	1973.2	3786.4	3946.4
528	1853.4	1933.4	3706.8	3866.8	628	1873.4	1953.4	3746.8	3906.8	728	1893.4	1973.4	3786.8	3946.8
529	1853.6	1933.6	3707.2	3867.2	629	1873.6	1953.6	3747.2	3907.2	729	1893.6	1973.6	3787.2	3947.2
530	1853.8	1933.8	3707.6	3867.6	630	1873.8	1953.8	3747.6	3907.6	730	1893.8	1973.8	3787.6	3947.6
531	1854	1934	3708	3868	631	1874	1954	3748	3908	731	1894	1974	3788	3948
532	1854.2	1934.2	3708.4	3868.4	632	1874.2	1954.2	3748.4	3908.4	732	1894.2	1974.2	3788.4	3948.4
533	1854.4	1934.4	3708.8	3868.8	633	1874.4	1954.4	3748.8	3908.8	733	1894.4	1974.4	3788.8	3948.8
534	1854.6	1934.6	3709.2	3869.2	634	1874.6	1954.6	3749.2	3909.2	734	1894.6	1974.6	3789.2	3949.2
535	1854.8	1934.8	3709.6	3869.6	635	1874.8	1954.8	3749.6	3909.6	735	1894.8	1974.8	3789.6	3949.6
536	1855	1935	3710	3870	636	1875	1955	3750	3910	736	1895	1975	3790	3950
537	1855.2	1935.2	3710.4	3870.4	637	1875.2	1955.2	3750.4	3910.4	737	1895.2	1975.2	3790.4	3950.4
538	1855.4	1935.4	3710.8	3870.8	638	1875.4	1955.4	3750.8	3910.8	738	1895.4	1975.4	3790.8	3950.8
539	1855.6	1935.6	3711.2	3871.2	639	1875.6	1955.6	3751.2	3911.2	739	1895.6	1975.6	3791.2	3951.2
540	1855.8	1935.8	3711.6	3871.6	640	1875.8	1955.8	3751.6	3911.6	740	1895.8	1975.8	3791.6	3951.6
541	1856	1936	3712	3872	641	1876	1956	3752	3912	741	1896	1976	3792	3952
542	1856.2	1936.2	3712.4	3872.4	642	1876.2	1956.2	3752.4	3912.4	742	1896.2	1976.2	3792.4	3952.4
543	1856.4	1936.4	3712.8	3872.8	643	1876.4	1956.4	3752.8	3912.8	743	1896.4	1976.4	3792.8	3952.8
544	1856.6	1936.6	3713.2	3873.2	644	1876.6	1956.6	3753.2	3913.2	744	1896.6	1976.6	3793.2	3953.2
545	1856.8	1936.8	3713.6	3873.6	645	1876.8	1956.8	3753.6	3913.6	745	1896.8	1976.8	3793.6	3953.6
546	1857	1937	3714	3874	646	1877	1957	3754	3914	746	1897	1977	3794	3954
547	1857.2	1937.2	3714.4	3874.4	647	1877.2	1957.2	3754.4	3914.4	747	1897.2	1977.2	3794.4	3954.4
548	1857.4	1937.4	3714.8	3874.8	648	1877.4	1957.4	3754.8	3914.8	748	1897.4	1977.4	3794.8	3954.8
549	1857.6	1937.6	3715.2	3875.2	649	1877.6	1957.6	3755.2	3915.2	749	1897.6	1977.6	3795.2	3955.2
550	1857.8	1937.8	3715.6	3875.6	650	1877.8	1957.8	3755.6	3915.6	750	1897.8	1977.8	3795.6	3955.6
551	1858	1938	3716	3876	651	1878	1958	3756	3916	751	1898	1978	3796	3956
552	1858.2	1938.2	3716.4	3876.4	652	1878.2	1958.2	3756.4	3916.4	752	1898.2	1978.2	3796.4	3956.4
553	1858.4	1938.4	3716.8	3876.8	653	1878.4	1958.4	3756.8	3916.8	753	1898.4	1978.4	3796.8	3956.8
554	1858.6	1938.6	3717.2	3877.2	654	1878.6	1958.6	3757.2	3917.2	754	1898.6	1978.6	3797.2	3957.2
555	1858.8	1938.8	3717.6	3877.6	655	1878.8	1958.8	3757.6	3917.6	755	1898.8	1978.8	3797.6	3957.6
556	1859	1939	3718	3878	656	1879	1959	3758	3918	756	1899	1979	3798	3958
557	1859.2	1939.2	3718.4	3878.4	657	1879.2	1959.2	3758.4	3918.4	757	1899.2	1979.2	3798.4	3958.4
558	1859.4	1939.4	3718.8	3878.8	658	1879.4	1959.4	3758.8	3918.8	758	1899.4	1979.4	3798.8	3958.8
559	1859.6	1939.6	3719.2	3879.2	659	1879.6	1959.6	3759.2	3919.2	759	1899.6	1979.6	3799.2	3959.2
560	1859.8	1939.8	3719.6	3879.6	660	1879.8	1959.8	3759.6	3919.6	760	1899.8	1979.8	3799.6	3959.6
561	1860	1940	3720	3880	661	1880	1960	3760	3920	761	1900	1980	3800	3960

Ch	TX	RX	VCO TX	VCO RX	Ch	TX	RX	VCO TX	VCO RX	Ch	TX	RX	VCO TX	VCO RX
562	1860.2	1940.2	3720.4	3880.4	662	1880.2	1960.2	3760.4	3920.4	762	1900.2	1980.2	3800.4	3960.4
563	1860.4	1940.4	3720.8	3880.8	663	1880.4	1960.4	3760.8	3920.8	763	1900.4	1980.4	3800.8	3960.8
564	1860.6	1940.6	3721.2	3881.2	664	1880.6	1960.6	3761.2	3921.2	764	1900.6	1980.6	3801.2	3961.2
565	1860.8	1940.8	3721.6	3881.6	665	1880.8	1960.8	3761.6	3921.6	765	1900.8	1980.8	3801.6	3961.6
566	1861	1941	3722	3882	666	1881	1961	3762	3922	766	1901	1981	3802	3962
567	1861.2	1941.2	3722.4	3882.4	667	1881.2	1961.2	3762.4	3922.4	767	1901.2	1981.2	3802.4	3962.4
568	1861.4	1941.4	3722.8	3882.8	668	1881.4	1961.4	3762.8	3922.8	768	1901.4	1981.4	3802.8	3962.8
569	1861.6	1941.6	3723.2	3883.2	669	1881.6	1961.6	3763.2	3923.2	769	1901.6	1981.6	3803.2	3963.2
570	1861.8	1941.8	3723.6	3883.6	670	1881.8	1961.8	3763.6	3923.6	770	1901.8	1981.8	3803.6	3963.6
571	1862	1942	3724	3884	671	1882	1962	3764	3924	771	1902	1982	3804	3964
572	1862.2	1942.2	3724.4	3884.4	672	1882.2	1962.2	3764.4	3924.4	772	1902.2	1982.2	3804.4	3964.4
573	1862.4	1942.4	3724.8	3884.8	673	1882.4	1962.4	3764.8	3924.8	773	1902.4	1982.4	3804.8	3964.8
574	1862.6	1942.6	3725.2	3885.2	674	1882.6	1962.6	3765.2	3925.2	774	1902.6	1982.6	3805.2	3965.2
575	1862.8	1942.8	3725.6	3885.6	675	1882.8	1962.8	3765.6	3925.6	775	1902.8	1982.8	3805.6	3965.6
576	1863	1943	3726	3886	676	1883	1963	3766	3926	776	1903	1983	3806	3966
577	1863.2	1943.2	3726.4	3886.4	677	1883.2	1963.2	3766.4	3926.4	777	1903.2	1983.2	3806.4	3966.4
578	1863.4	1943.4	3726.8	3886.8	678	1883.4	1963.4	3766.8	3926.8	778	1903.4	1983.4	3806.8	3966.8
579	1863.6	1943.6	3727.2	3887.2	679	1883.6	1963.6	3767.2	3927.2	779	1903.6	1983.6	3807.2	3967.2
580	1863.8	1943.8	3727.6	3887.6	680	1883.8	1963.8	3767.6	3927.6	780	1903.8	1983.8	3807.6	3967.6
581	1864	1944	3728	3888	681	1884	1964	3768	3928	781	1904	1984	3808	3968
582	1864.2	1944.2	3728.4	3888.4	682	1884.2	1964.2	3768.4	3928.4	782	1904.2	1984.2	3808.4	3968.4
583	1864.4	1944.4	3728.8	3888.8	683	1884.4	1964.4	3768.8	3928.8	783	1904.4	1984.4	3808.8	3968.8
584	1864.6	1944.6	3729.2	3889.2	684	1884.6	1964.6	3769.2	3929.2	784	1904.6	1984.6	3809.2	3969.2
585	1864.8	1944.8	3729.6	3889.6	685	1884.8	1964.8	3769.6	3929.6	785	1904.8	1984.8	3809.6	3969.6
586	1865	1945	3730	3890	686	1885	1965	3770	3930	786	1905	1985	3810	3970
587	1865.2	1945.2	3730.4	3890.4	687	1885.2	1965.2	3770.4	3930.4	787	1905.2	1985.2	3810.4	3970.4
588	1865.4	1945.4	3730.8	3890.8	688	1885.4	1965.4	3770.8	3930.8	788	1905.4	1985.4	3810.8	3970.8
589	1865.6	1945.6	3731.2	3891.2	689	1885.6	1965.6	3771.2	3931.2	789	1905.6	1985.6	3811.2	3971.2
590	1865.8	1945.8	3731.6	3891.6	690	1885.8	1965.8	3771.6	3931.6	790	1905.8	1985.8	3811.6	3971.6
591	1866	1946	3732	3892	691	1886	1966	3772	3932	791	1906	1986	3812	3972
592	1866.2	1946.2	3732.4	3892.4	692	1886.2	1966.2	3772.4	3932.4	792	1906.2	1986.2	3812.4	3972.4
593	1866.4	1946.4	3732.8	3892.8	693	1886.4	1966.4	3772.8	3932.8	793	1906.4	1986.4	3812.8	3972.8
594	1866.6	1946.6	3733.2	3893.2	694	1886.6	1966.6	3773.2	3933.2	794	1906.6	1986.6	3813.2	3973.2
595	1866.8	1946.8	3733.6	3893.6	695	1886.8	1966.8	3773.6	3933.6	795	1906.8	1986.8	3813.6	3973.6
596	1867	1947	3734	3894	696	1887	1967	3774	3934	796	1907	1987	3814	3974
597	1867.2	1947.2	3734.4	3894.4	697	1887.2	1967.2	3774.4	3934.4	797	1907.2	1987.2	3814.4	3974.4
598	1867.4	1947.4	3734.8	3894.8	698	1887.4	1967.4	3774.8	3934.8	798	1907.4	1987.4	3814.8	3974.8
599	1867.6	1947.6	3735.2	3895.2	699	1887.6	1967.6	3775.2	3935.2	799	1907.6	1987.6	3815.2	3975.2
600	1867.8	1947.8	3735.6	3895.6	700	1887.8	1967.8	3775.6	3935.6	800	1907.8	1987.8	3815.6	3975.6
601	1868	1948	3736	3896	701	1888	1968	3776	3936	801	1908	1988	3816	3976
602	1868.2	1948.2	3736.4	3896.4	702	1888.2	1968.2	3776.4	3936.4	802	1908.2	1988.2	3816.4	3976.4
603	1868.4	1948.4	3736.8	3896.8	703	1888.4	1968.4	3776.8	3936.8	803	1908.4	1988.4	3816.8	3976.8
604	1868.6	1948.6	3737.2	3897.2	704	1888.6	1968.6	3777.2	3937.2	804	1908.6	1988.6	3817.2	3977.2
605	1868.8	1948.8	3737.6	3897.6	705	1888.8	1968.8	3777.6	3937.6	805	1908.8	1988.8	3817.6	3977.6
606	1869	1949	3738	3898	706	1889	1969	3778	3938	806	1909	1989	3818	3978
607	1869.2	1949.2	3738.4	3898.4	707	1889.2	1969.2	3778.4	3938.4	807	1909.2	1989.2	3818.4	3978.4
608	1869.4	1949.4	3738.8	3898.8	708	1889.4	1969.4	3778.8	3938.8	808	1909.4	1989.4	3818.8	3978.8
609	1869.6	1949.6	3739.2	3899.2	709	1889.6	1969.6	3779.2	3939.2	809	1909.6	1989.6	3819.2	3979.2
610	1869.8	1949.8	3739.6	3899.6	710	1889.8	1969.8	3779.6	3939.6	810	1909.8	1989.8	3819.6	3979.6
611	1870	1950	3740	3900	711	1890	1970	3780	3940					

Alignment

HDbc2 Manual Align with Phoenix

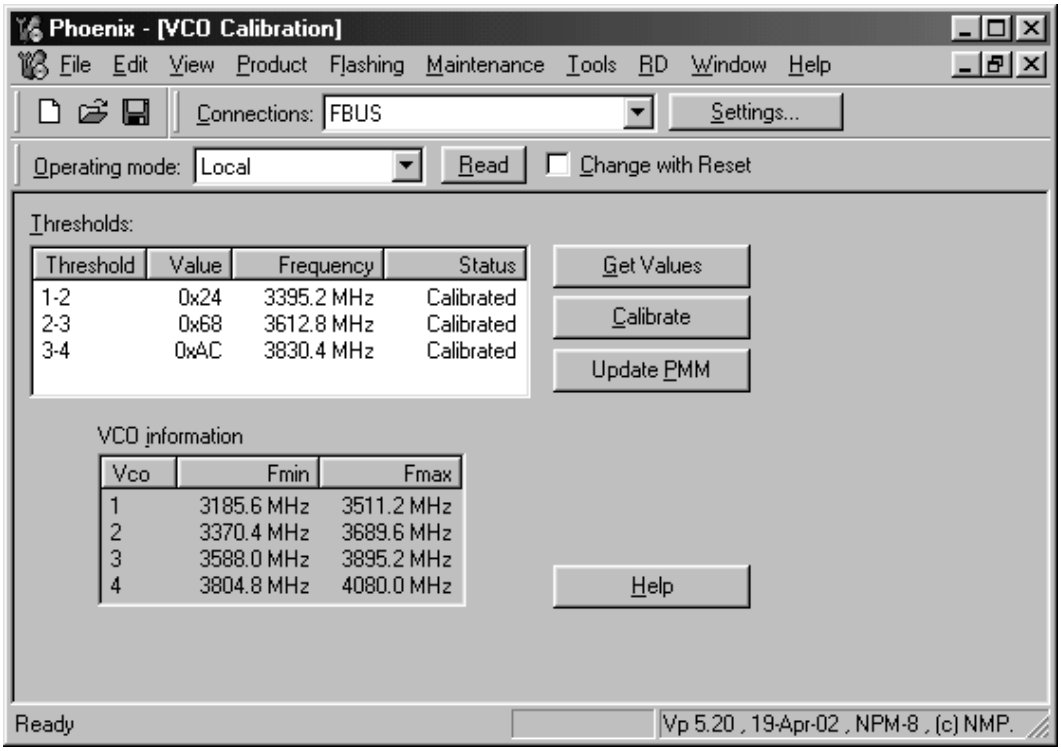
In Phoenix, select connection FBUS and Product Enigma. If you power up the board before selecting FBUS, it works without any error messages. Use Test jig or other device for RF and bus connection. Attenuation in test jig RF connector alone is 0.3dB for 850 and 0.7dB for 1900. Use a RCT (radio communication tester), spectrum analzyer, or another suitable device for tuning or testing the phone. The default channels are 190 for GSM850 and 661 for GSM1900. **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 different in the various tuning procedures. Always look at 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.

VCO Calibration



Select Maintenance, Tuning, VCO Calibration

Lowest Fmin freq must be less than 3296 MHz

Highest Fmax frequency must be greater than 3980 MHz

1) Get Values

2) Calibrate

3) Update PMM

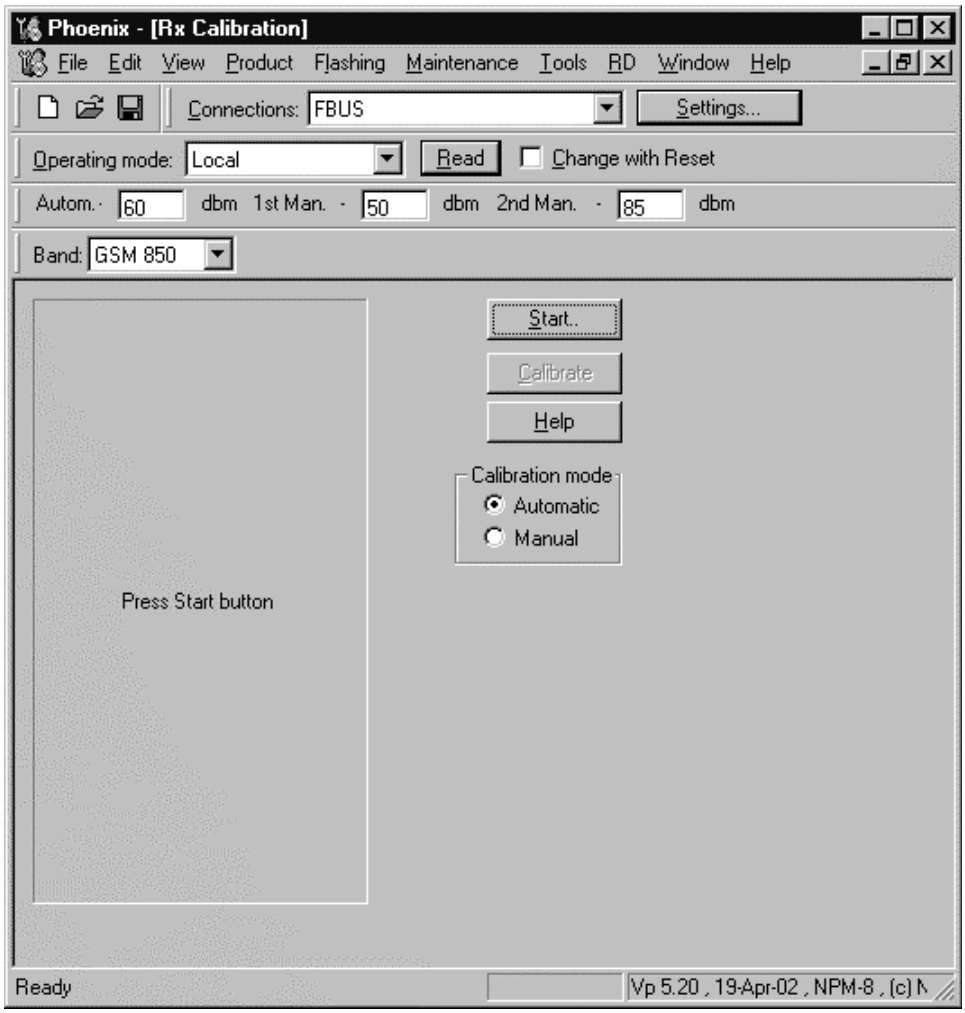
End by closing the window

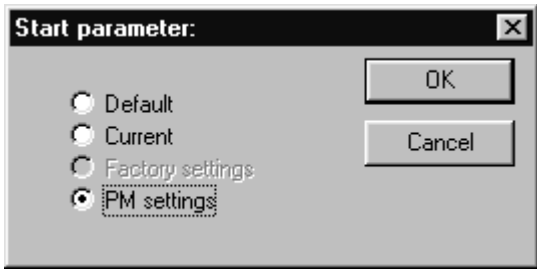
RX Calibration

Select Maintenance, Tuning, RX Calibration

Select Band GSM850. Note that GSM850 must be calibrated before PCS1900.

The result should be as shown

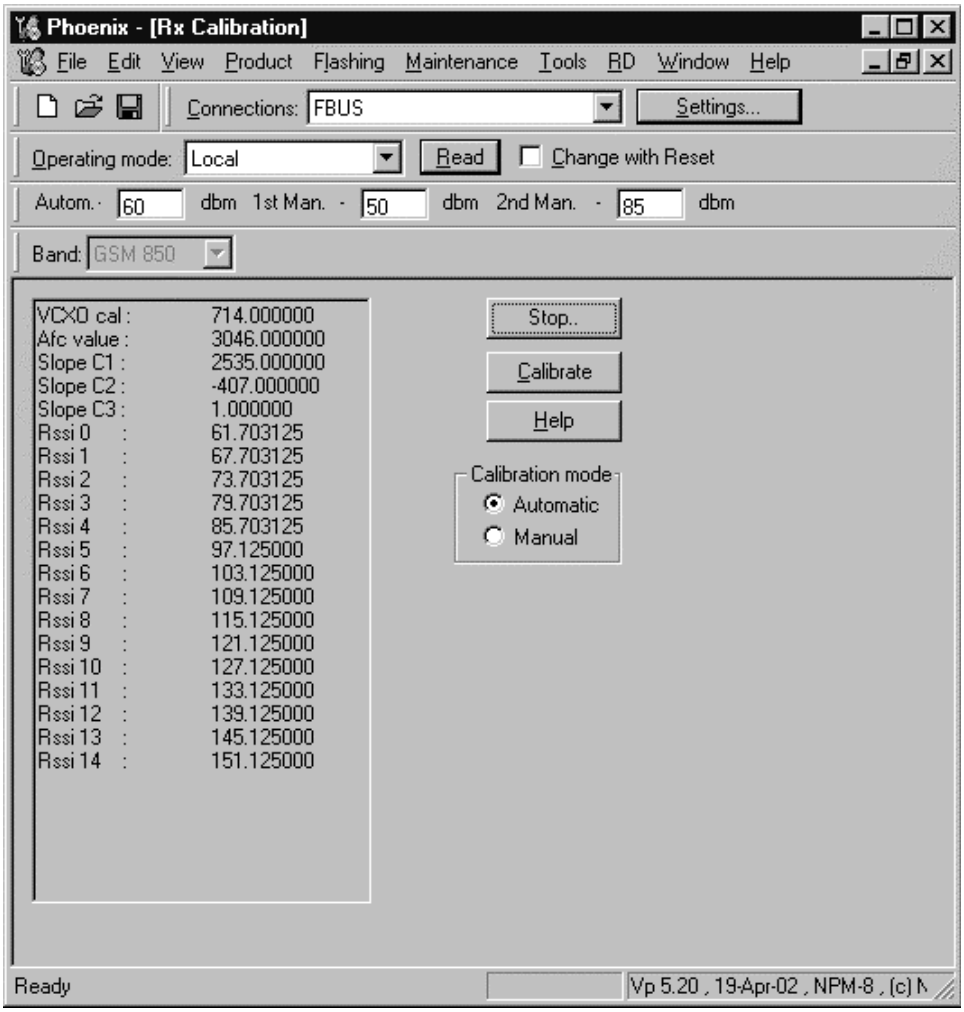


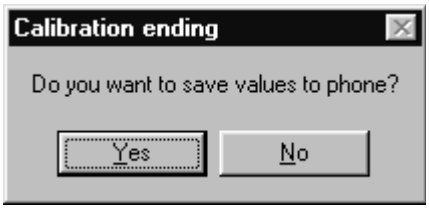


Select Automatic, set to 60dBm in small Autom. window in top bar

Start and select PM settings in the start parameters that pops up

OK



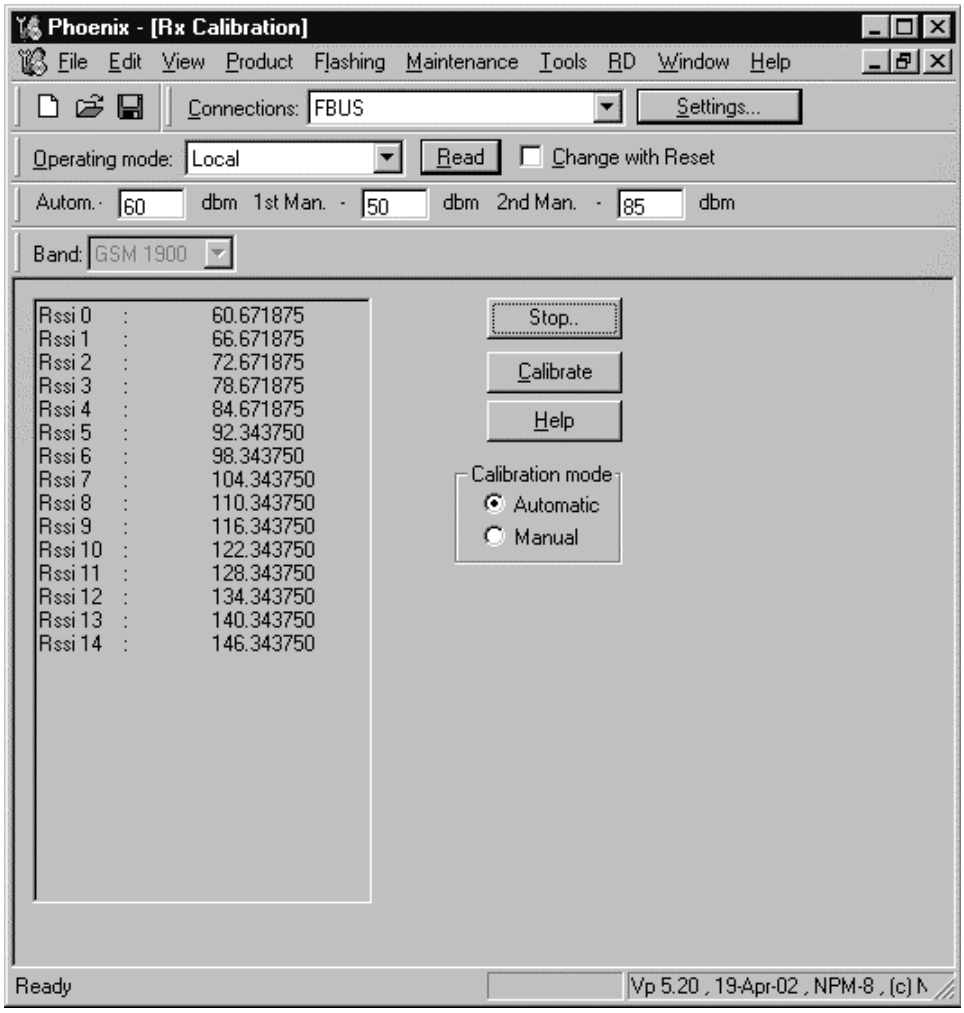


The existing data in the phone is shown

Calibrate, and the new data is shown

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

Select GSM1900 in the top bar and repeat at channel 661



The existing data in the phone is shown

Calibrate, and the new data is shown

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

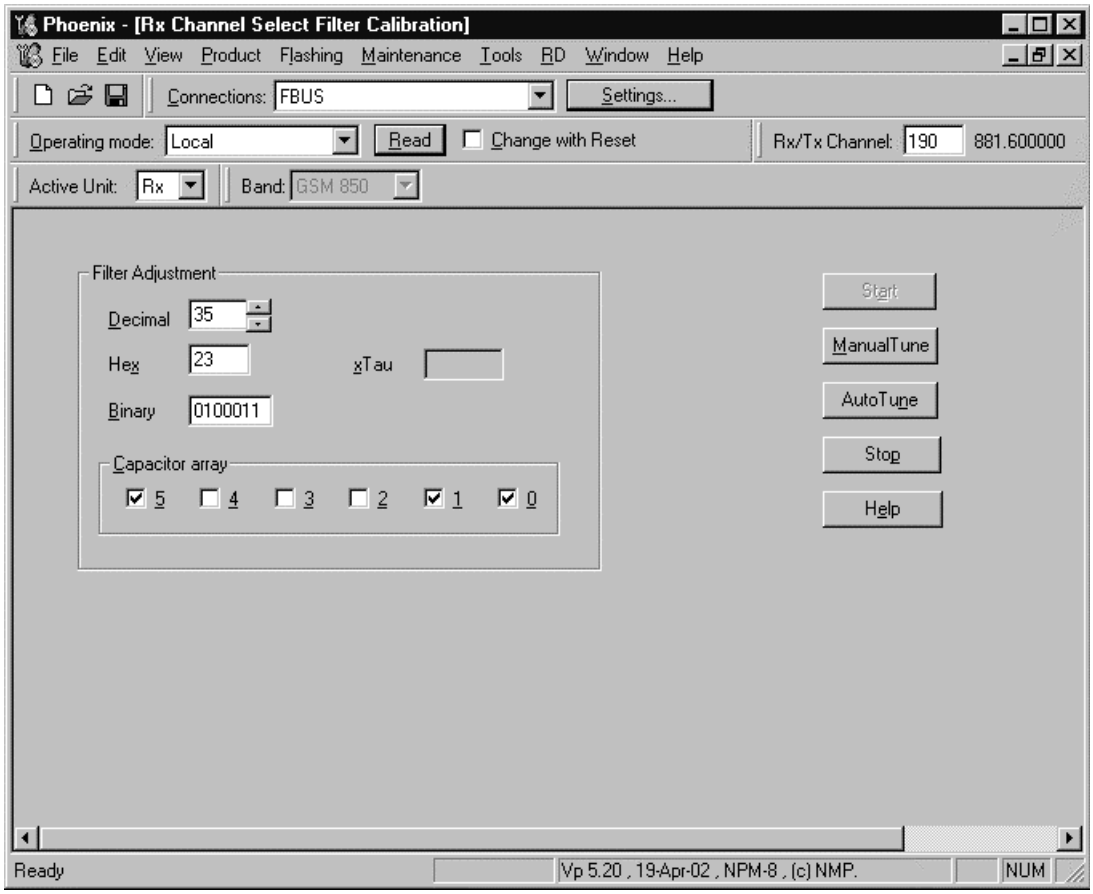
RX Channel Select Filter

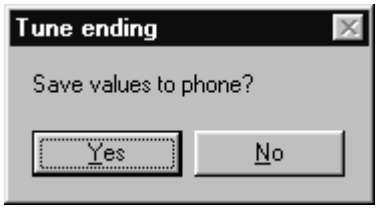
Select Maintenance, Tuning, Rx Channel Select Filter Calibration

Next, select to load values from the phone or not.

Press AutoTune

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





Note: This calibration requires no input signal

RX Band Filter Response

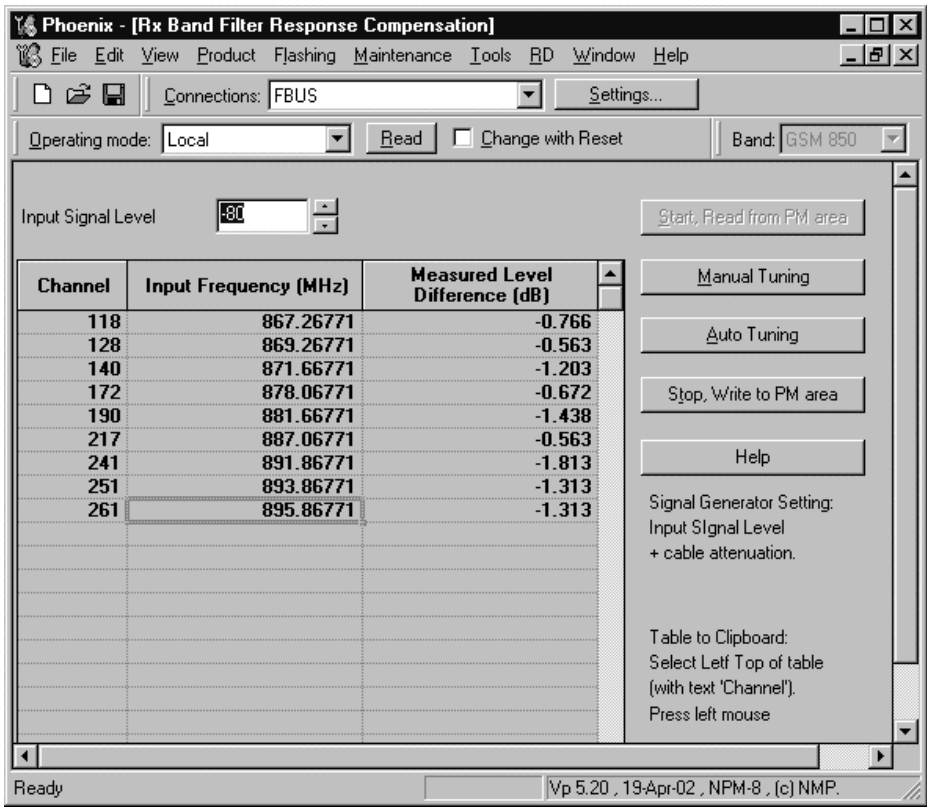
Select Maintenance, Tuning, Rx Band Filter Response Compensation

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

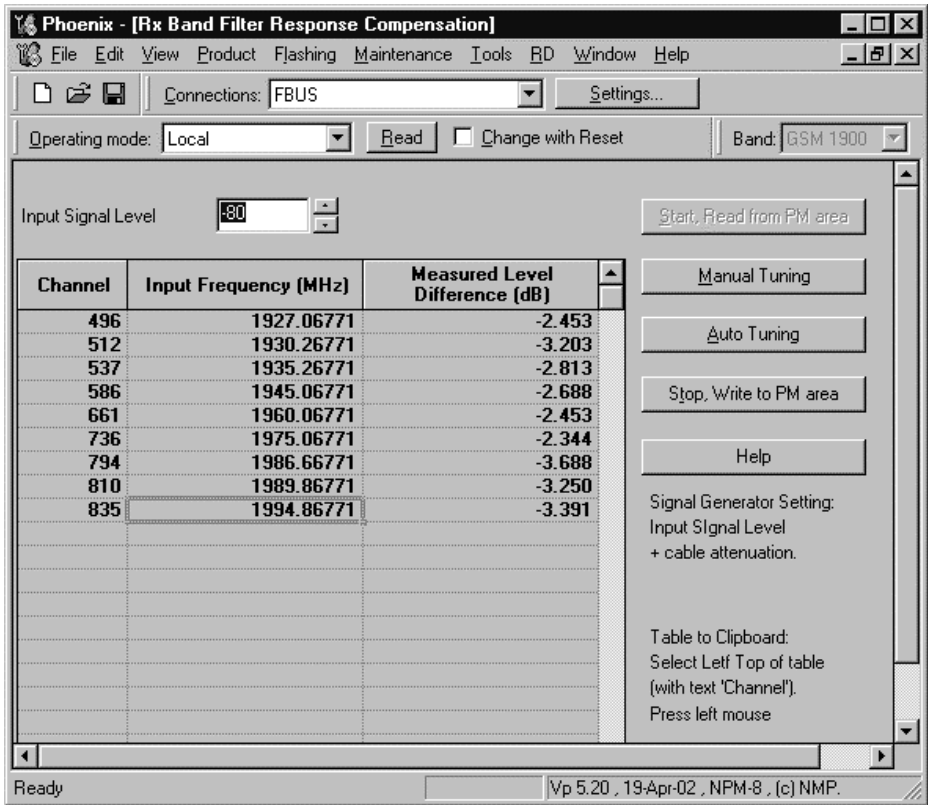
Press Manual Tuning

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

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



Repeat for GSM1900



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 use Auto Tuning (Dwell should be around 10ms).

Tx Tuning

Phoenix menu: Select Maintenance, Tuning,Tx Power Level Tuning

Settings and considerations for tuning with a spectrum analyzer:

A DC block and at least 10 dB attenuator should be used on the RF input port to protect the spectrum analyzer.

The burst power should be measured, so a span of 0 Hertz is used.

Span: 0 Hertz

Resolution Bandwidth 1 MHz

Video Bandwidth 1 MHz

Sweeptime 10 msec

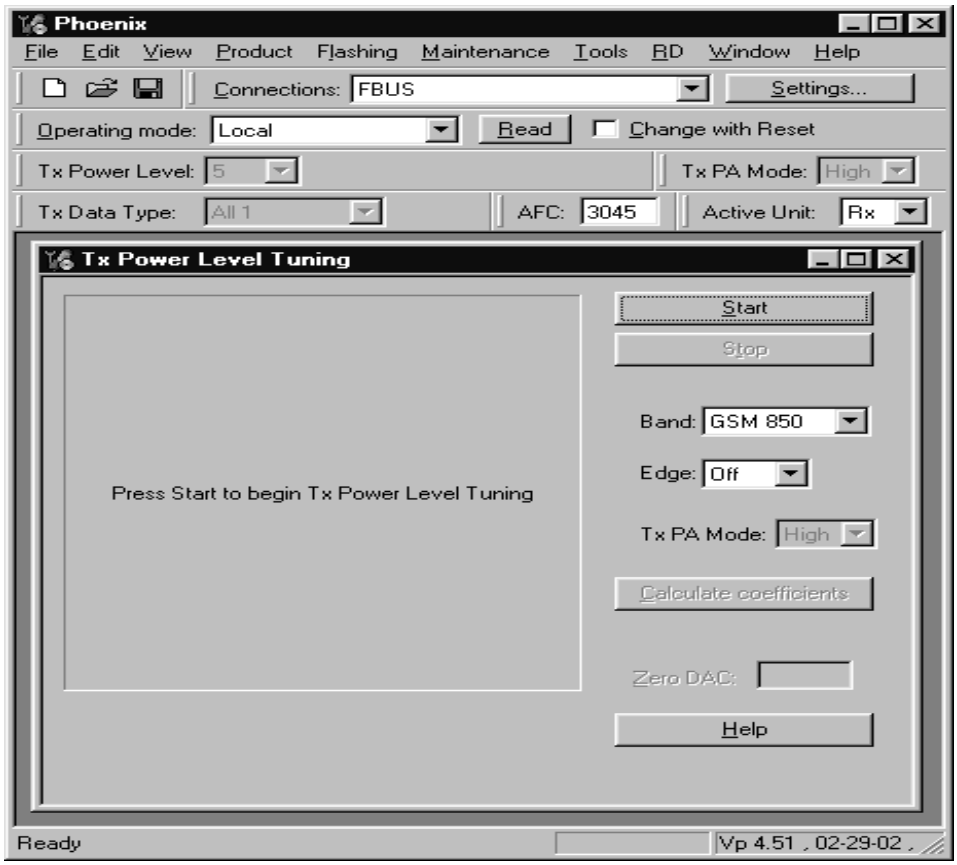
RF Attenuation: 30 dB

Reference level: If you set this to 40 dBm, you can tune both the low band (target output power of 32.0 dBm for power level 5) and highband (target output power of 29.5 dBm for power level 0) at the maximum output levels. The reference level must be reduced to the 0 dB level when tuning the base level.

Trigger: Video. Set the level to 0 dbm. This must be lowered when you are setting the base level (Base level target output power of -30 dBm). If you don't lower the video trigger level to below –30 dBm when tuning the base level, the spectrum analyzer will not be triggered when you are tuning the base level.

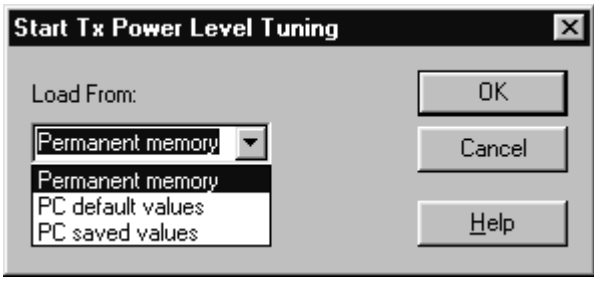
Center Frequency: 836.6 MHz (For GSM 850 band, channel 190 is used for Tx output power tuning). For GSM 1900, Center frequency is 1880 MHz (mid Channel 661) for Tx output power tuning.

TX Power Tuning GSM850



Select edge off, band GSM850

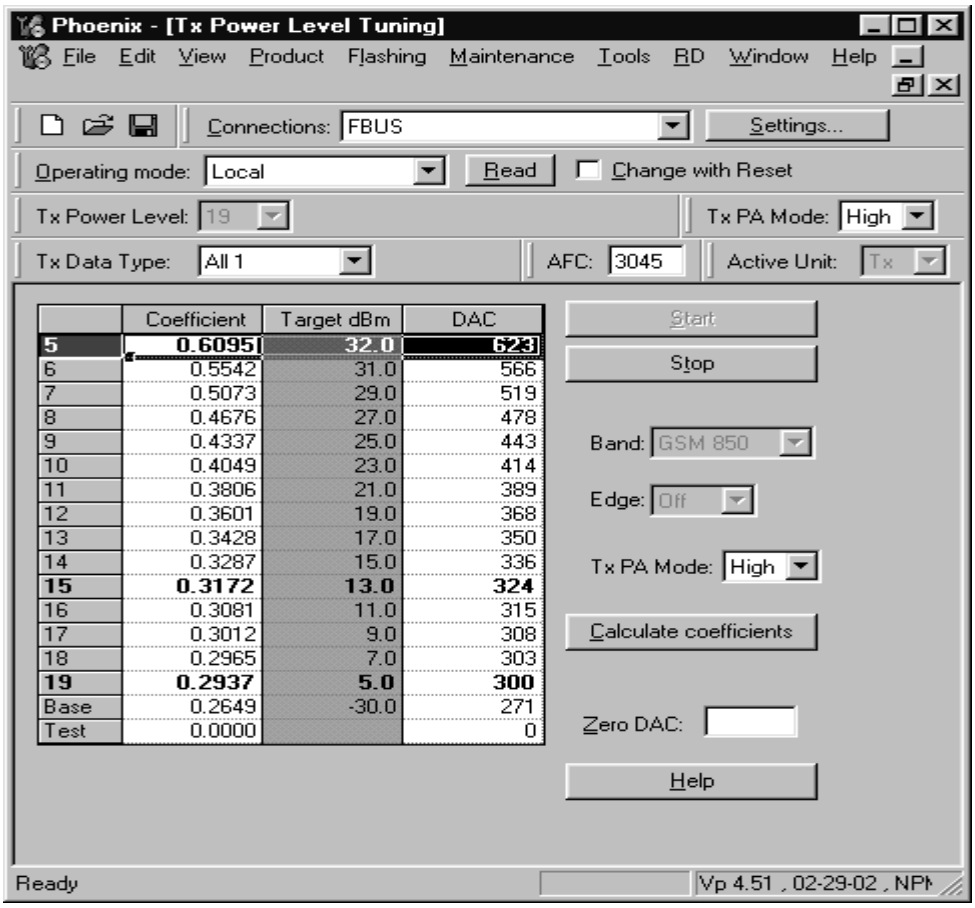
Press Start.



Select from where to load values. Permanent memory is the values that are stored in the phone's memory. PC default values are the default values in the computer used to tune the phones. A set of properly tuned coefficient values can be saved to the PC. The PC saved values can be used to tune multiple phones using the same set of values.

Click OK.

(Note: power level 5 should be tuned to 32.0dBm)



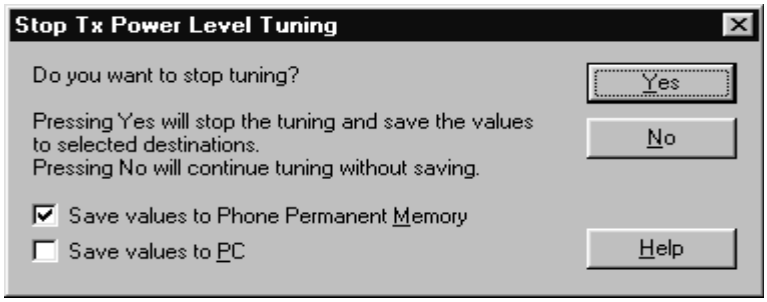
Select the modulation 1, 0 or random in Tx Data Type. Select random if a GSM tester is used. Then it can be synchronised to the burst.

Select Tx PA Mode High. Note that Low PA Mode tuning is not to be used.

First power tuning should be setting base level to –30dBm.

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

Push 'calculate coefficients' soft key to compute tuning coefficient for power levels that are not tuned manually or with the tester. (These are the coefficients that are not in bold).



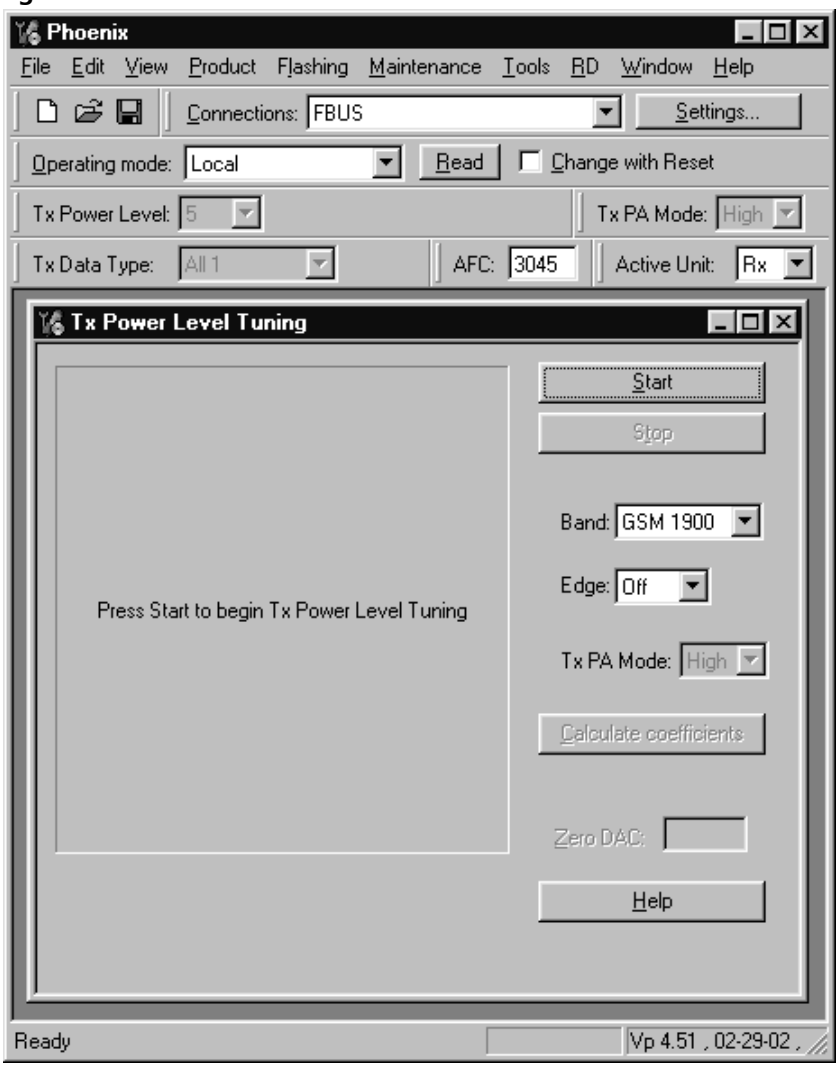
Push 'stop' soft key to finish tuning power levels.

If you are satisfied with the coefficients and the power output tuning, then check the box "Save to the phone permanent memory".

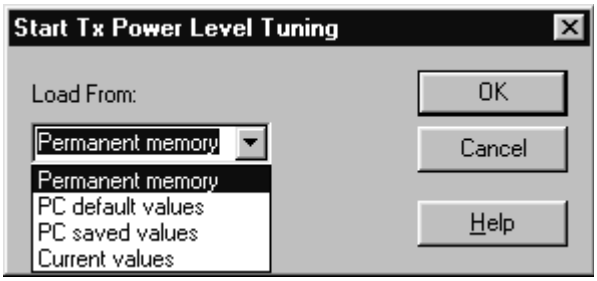
You can also save the table to the PC, by checking the box "Save value to PC" so that you can load it to another phone. Or you can select not to do anything by removing both ticks.

The only way to end the tuning session is by clicking 'Yes' soft key. This ends the tuning regardless of whether you save the values to the phone permanent memory, to the PC, or neither.

TX Power Tuning PCS1900



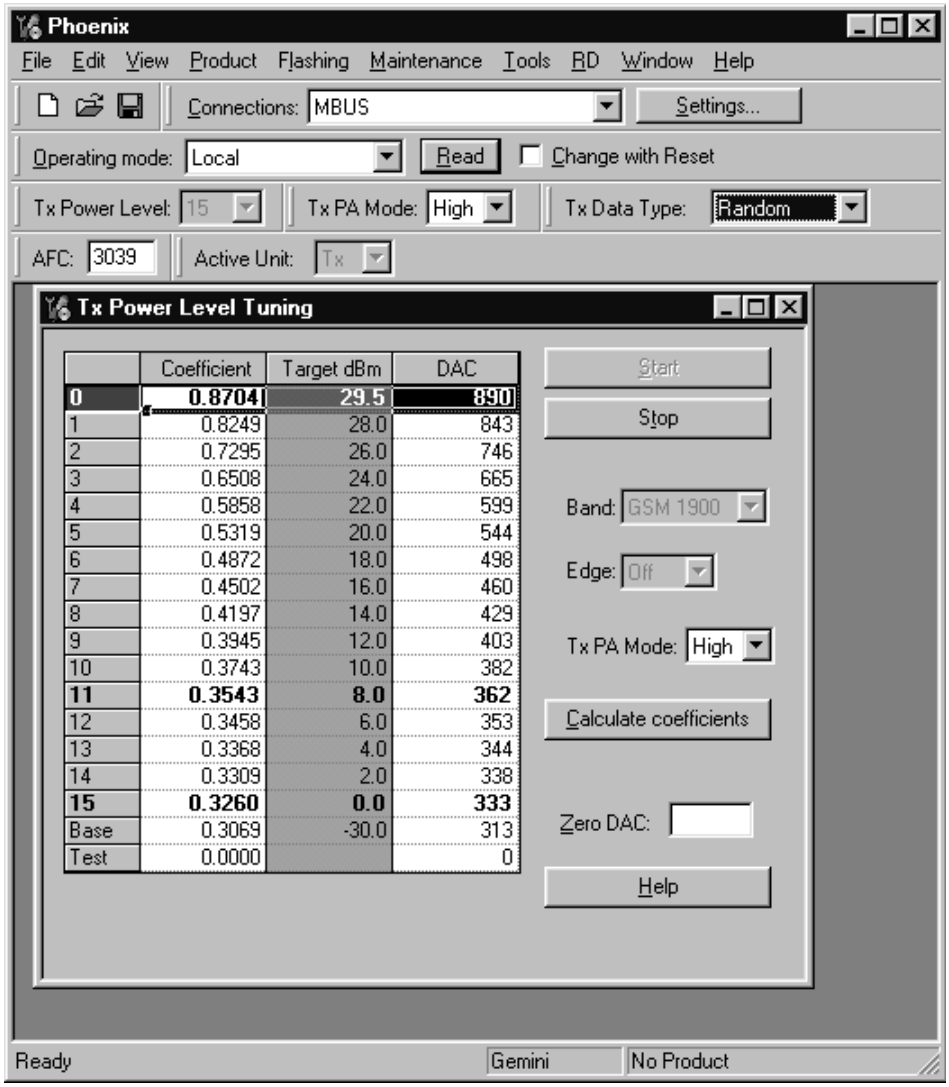
Select edge off, band GSM 1900 (PCS)



Press Start and select from where to load values. Permanent memory is the values that are stored in the phone's memory. PC default values are the default values in the computer used to tune the phones. A set of properly tuned coefficient values can be saved to the pc. The PC saved values can be used to tune multiple phones using the same set of values.

Click OK.

(Note: power level 0 should be tuned to 29.5dBm)



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.

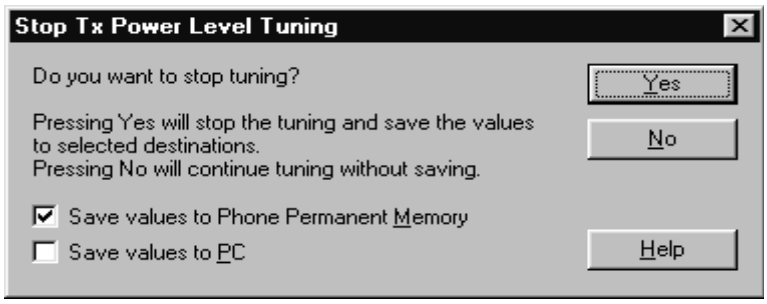
Select Tx PA Mode High.

First, tune base level to –30dBm.

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

Push 'calculate coefficients' soft key to compute tuning coefficient for power levels that are not tuned manually or with the tester. (These are the coefficients that are not in bold).

Push 'stop' soft key to finish tuning power levels.



If you are satisfied with the coefficients and the power output tuning, then check the box "Save to the phone permanent memory".

You can also save the table to the PC, by checking the box "Save values to PC", so that you can load it to another phone. Or you can select not to do anything by removing both ticks.

The only way to end the tuning session is by clicking 'Yes' soft key. This ends the tuning regardless of whether you save the values to the phone permanent memory, to the PC, or neither.

TX I/Q Tuning

Phoenix Menu: Select Maintenance, Tuning, Tx IQ tuning

Settings for spectrum analyzer for I/Q tuning:

Same center frequencies are used for GSM 850 (Ch190 = 836.6 MHz) and 1900 (Ch661 = 1880 MHz) as in Tx output power tuning.

Span 200 kHz

RBW 10 kHz

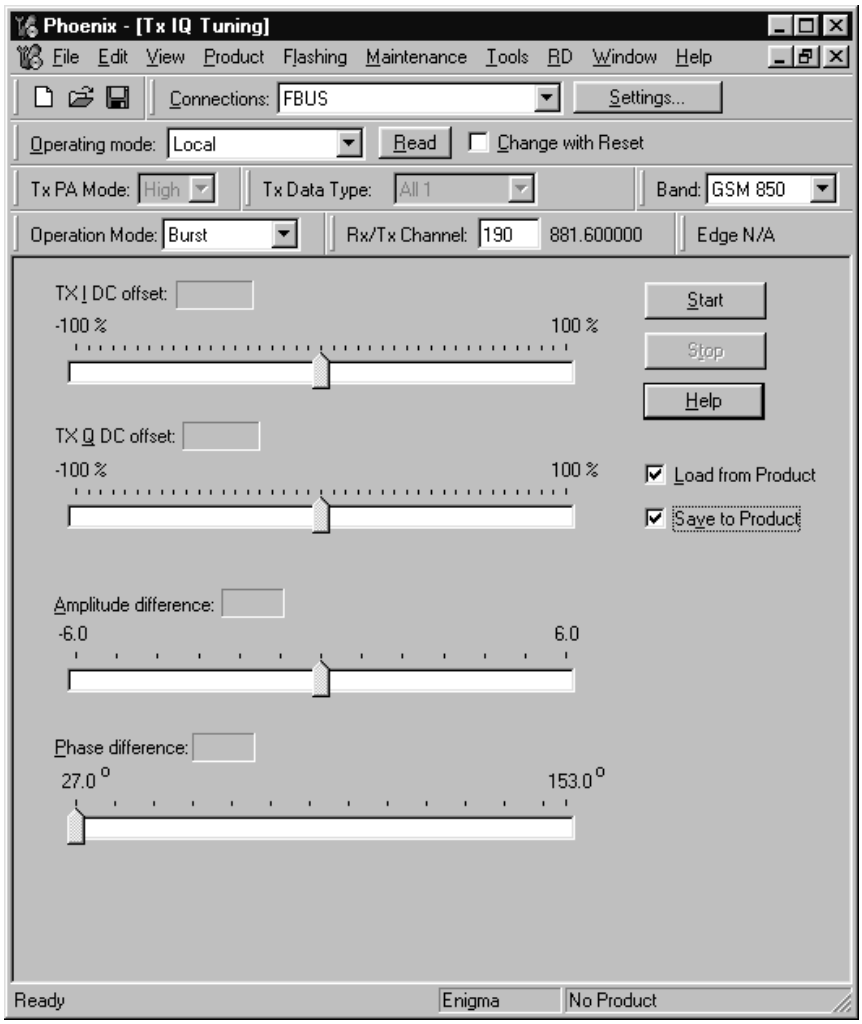
VBW 1 kHz

Sweeptime .5 seconds

RF attenuation 20 dB

Reference level 30 dBm

Trigger: free run



Select where to get values. Normally select Load From Product

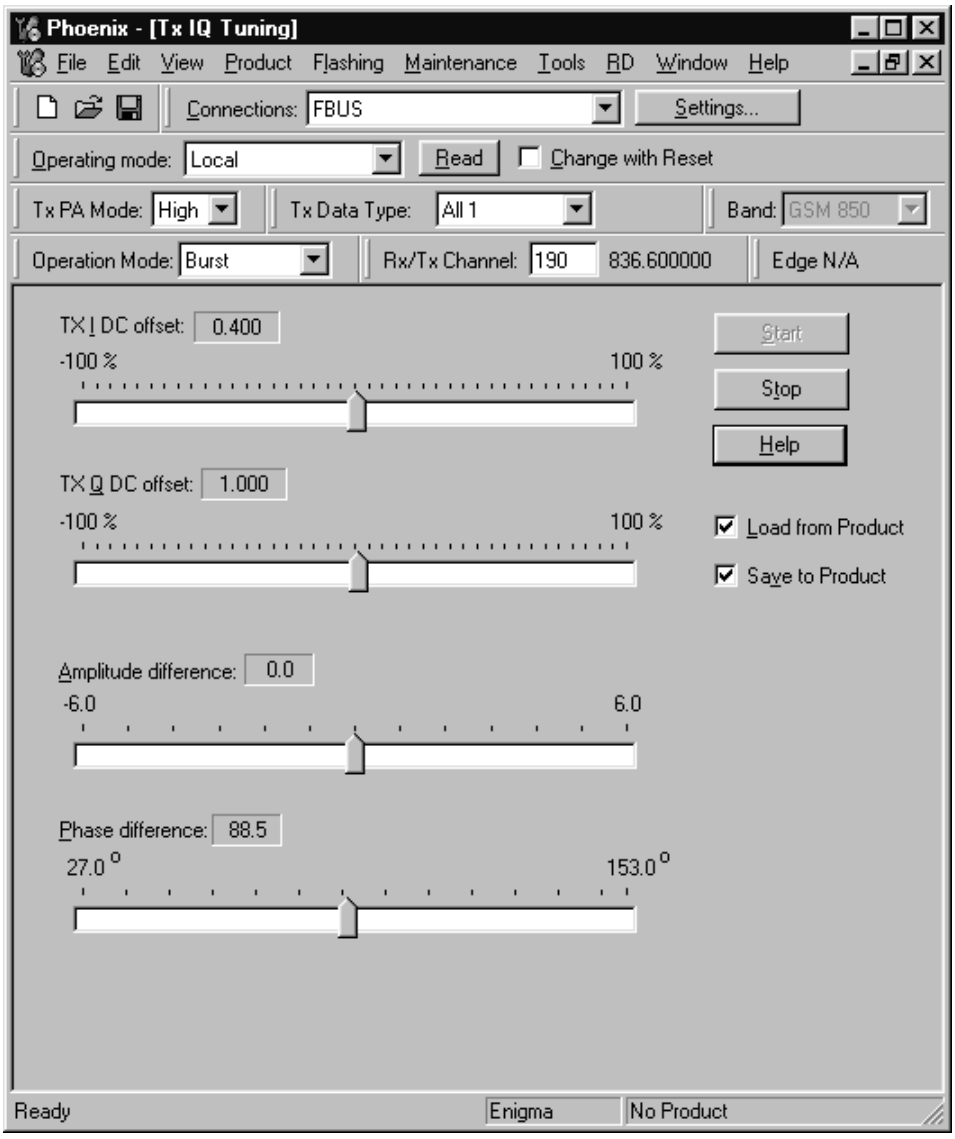
Push “Start” soft key.

Tune I and Q DC offset values to reduce the carrier frequency to a minimum. Use Side arrows or +, -. Carrier must be at least –30 dBc. Typically carrier supression is better than –40 dBc.

Tune Amplitude and phase difference to reduce the lowest sideband frequency. The side-band must be reduced at least –35 dBc. Typically sideband supression is better than –40 dBc.

Check the IQ tuning values meet the specifications for both 1 and 0 data types

.



Remember to check the box "Save to Product" if you want to save the tuning values to the phone.

Push "Stop" softkey. This ends tuning and saves the values to the phone if you have selected the "save to product" box.

Same procedure is used for PCS1900 as for GSM. Channel will be 661, as shown in the following diagram, with some typical tuning values.

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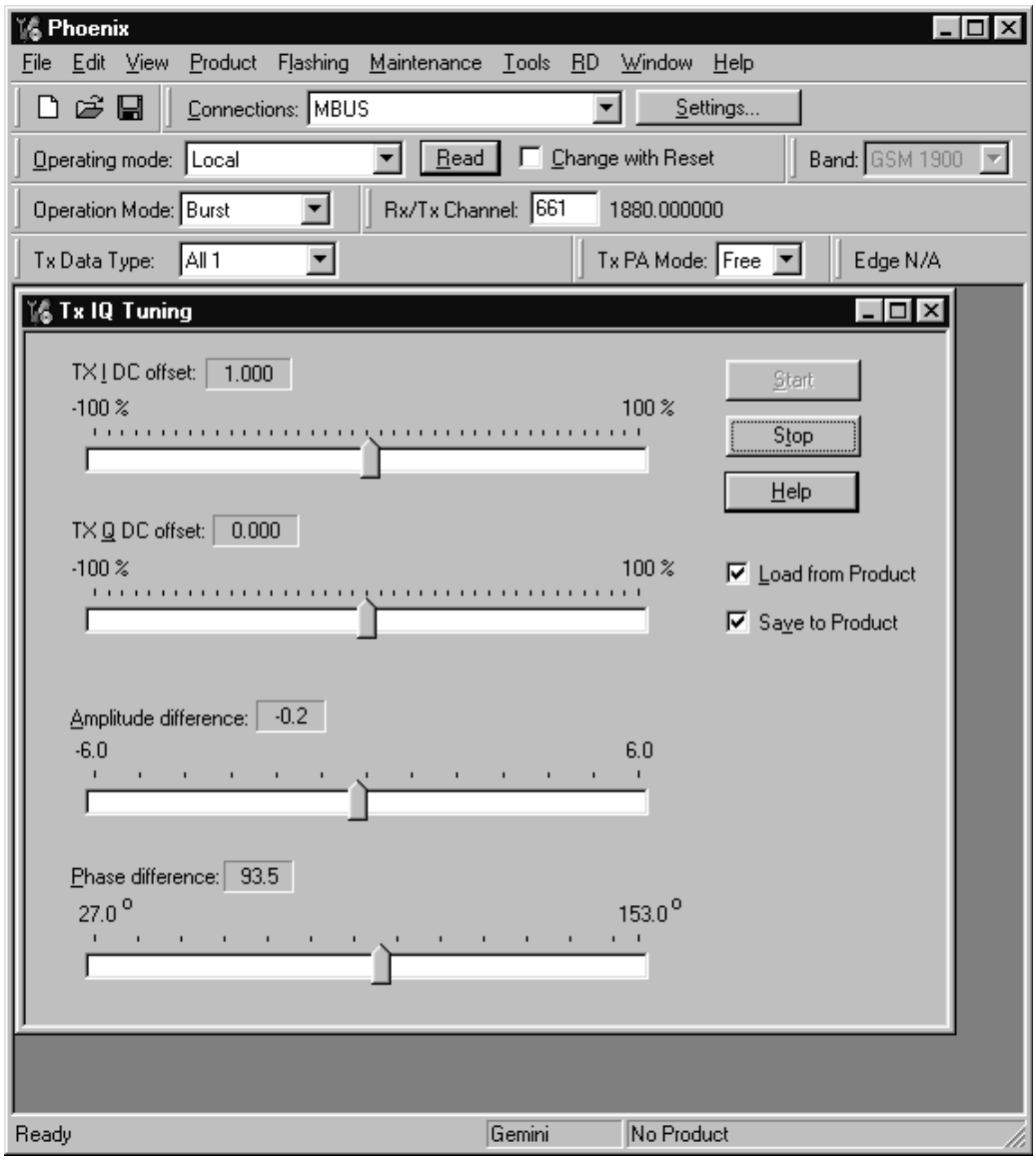

RF Control

Phoenix menu: Select Maintenance, Testing, RF Controls

It is meant to check the receiver or transmitter without going in a call. It works very much like a call, but you have control via the PC, and not via the tester. The GSM850 TX PA mode should be set to High.

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.

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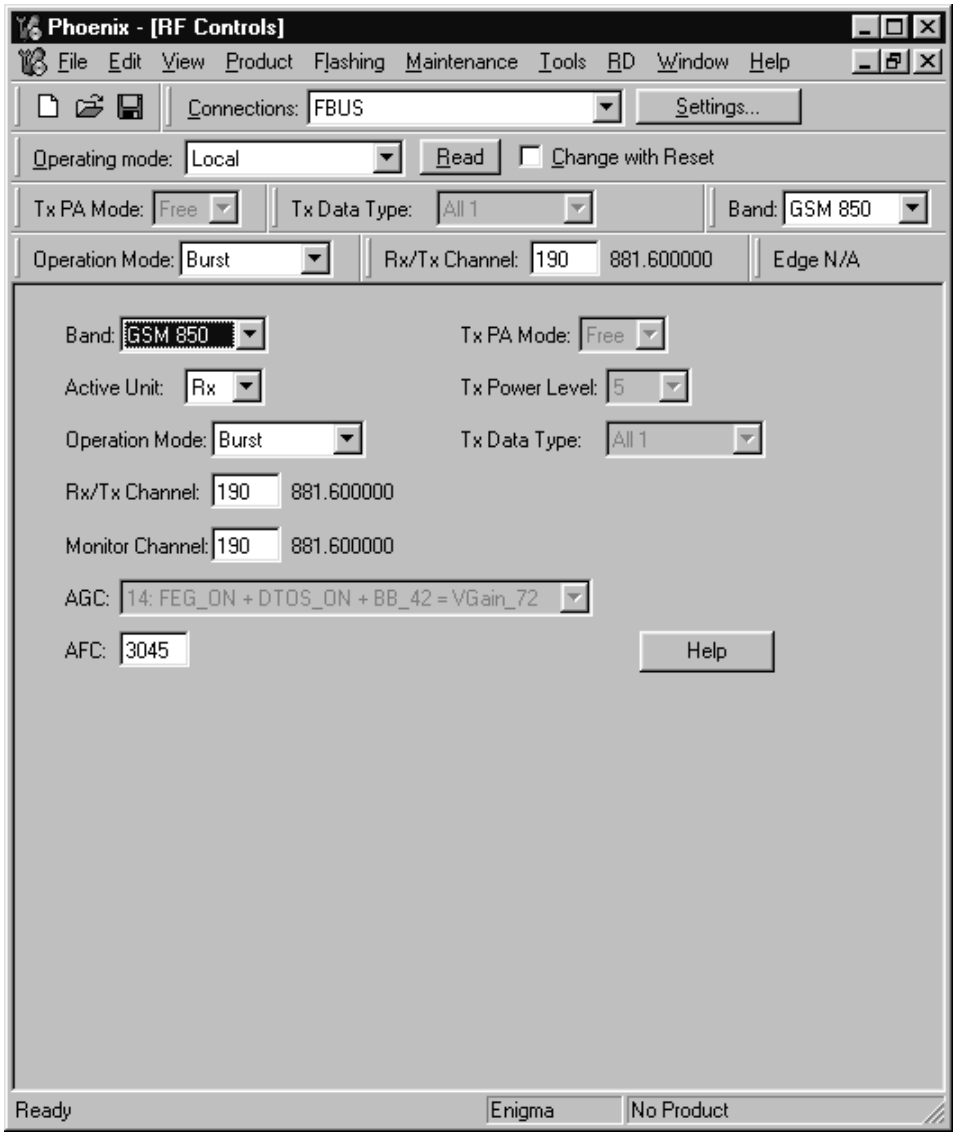

Call Testing

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

Set the communications tester to manual test. Switch the phone to normal if it was in local mode. Remember to have a test simcard in the phone.

After the phone has registered to the communications tester, a call can be made. 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 pushing the button.