Disassembly & Troubleshooting Instructions

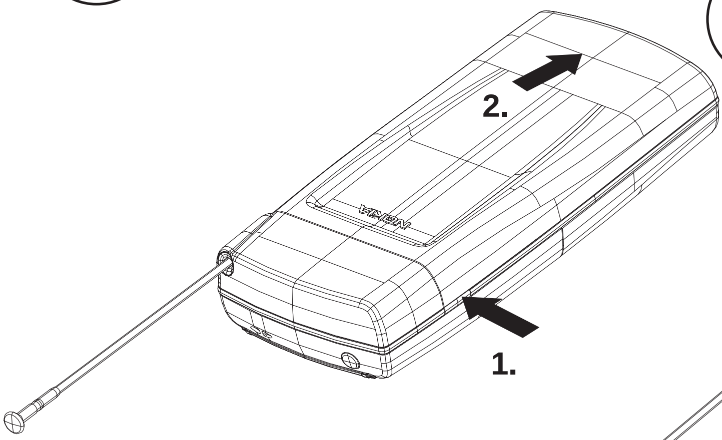
CONTENTS

Disassembly of NSB–6

Remove battery.

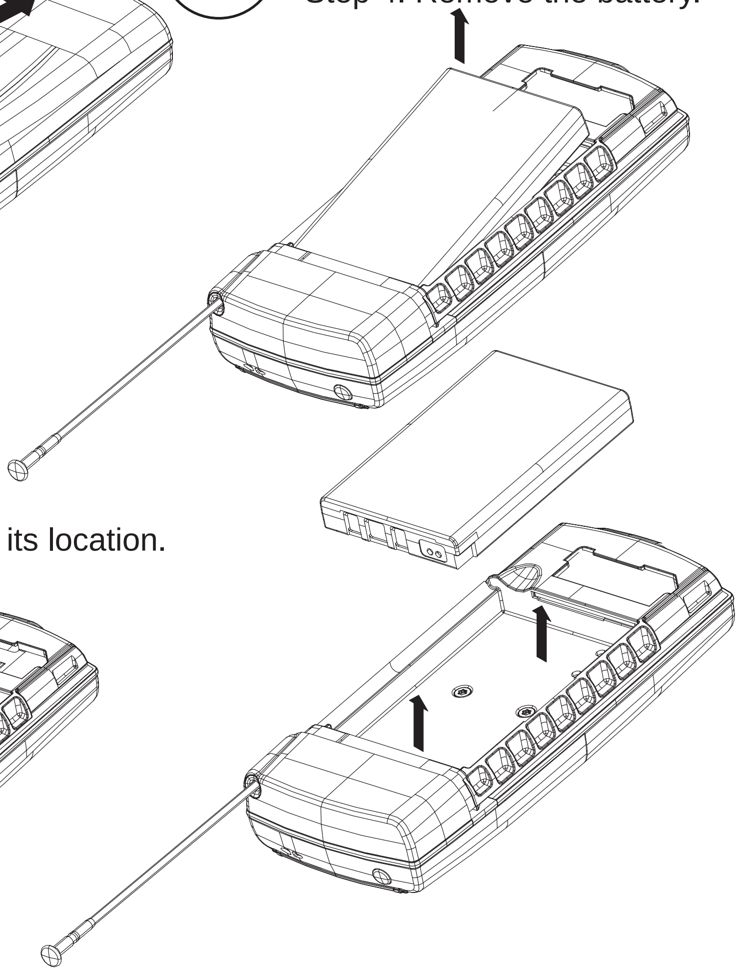
1.

Step 1. Press the button on the side.
Step 2. Slide the cover downwards and the cover will be released.



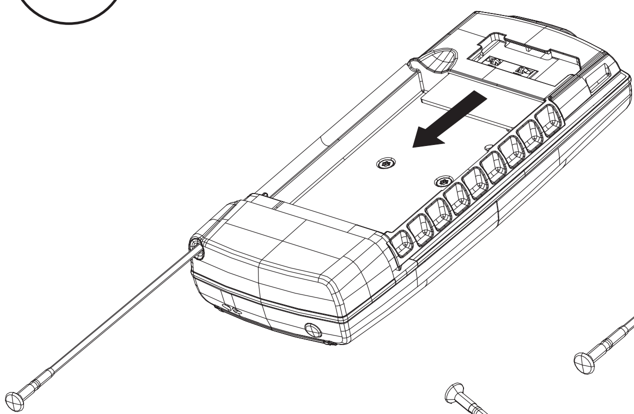
2.

Step 3. Lift the battery first from the lower end.
Step 4. Remove the battery.



3.

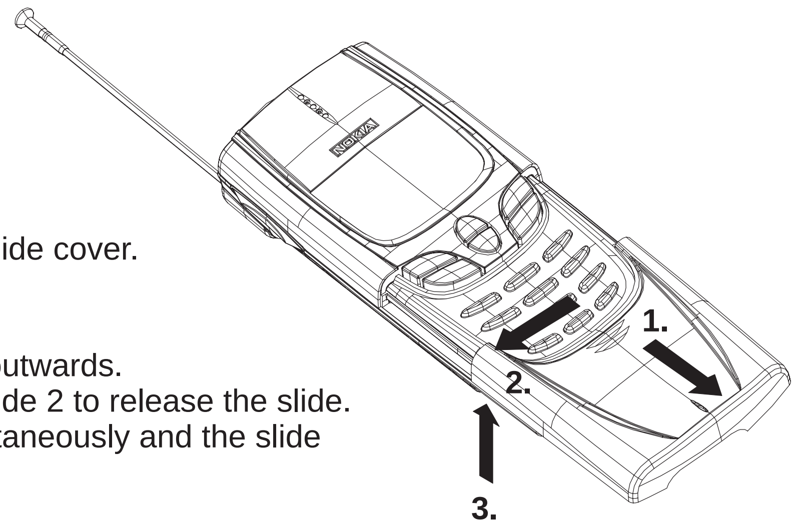
Remove the SIM card from its location.



4.

Remove the slide cover.

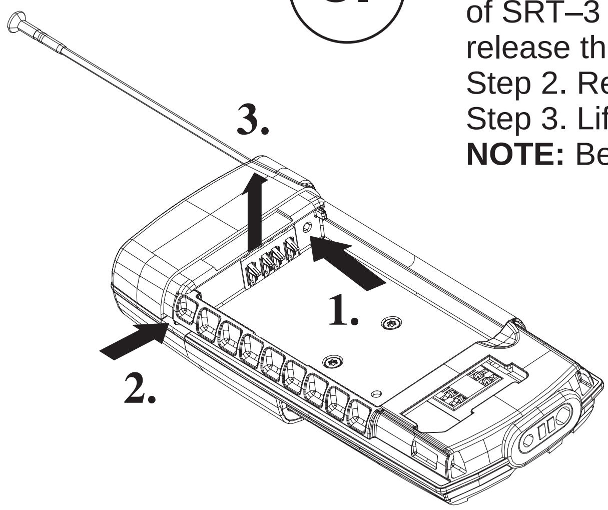
Step 1. Open the slide cover.
Step 2. Push the slide edge outwards.
NOTE: Use only numbered side 2 to release the slide.
Step 3. Lift the slide up simultaneously and the slide will be released.



Remove the antenna.

5.

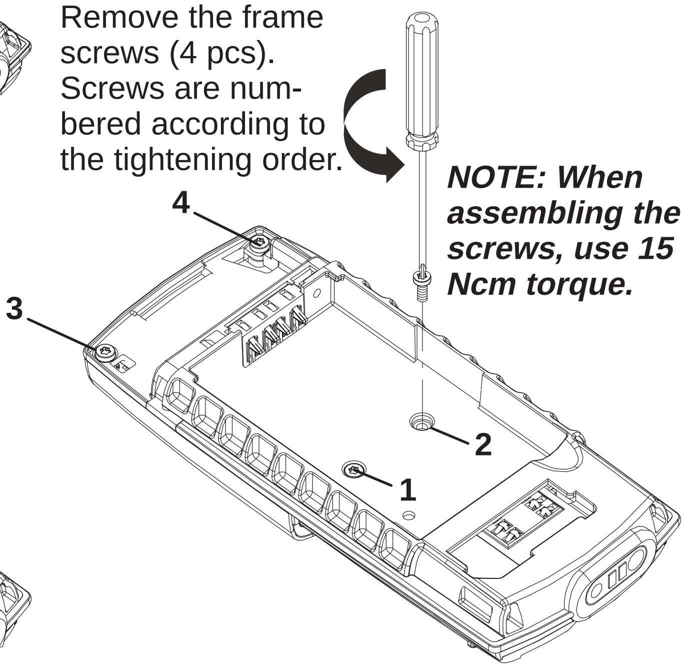
NOTE: Pull out the whip antenna first.
Step 1. To remove the antenna, push with the thin spike of SRT–3 (Battery Connector Extractor Tool) forward to release the snaps.
Step 2. Release snap fixing using screw driver.
Step 3. Lift up the antenna.
NOTE: Be careful not brake the middle frame.



6.

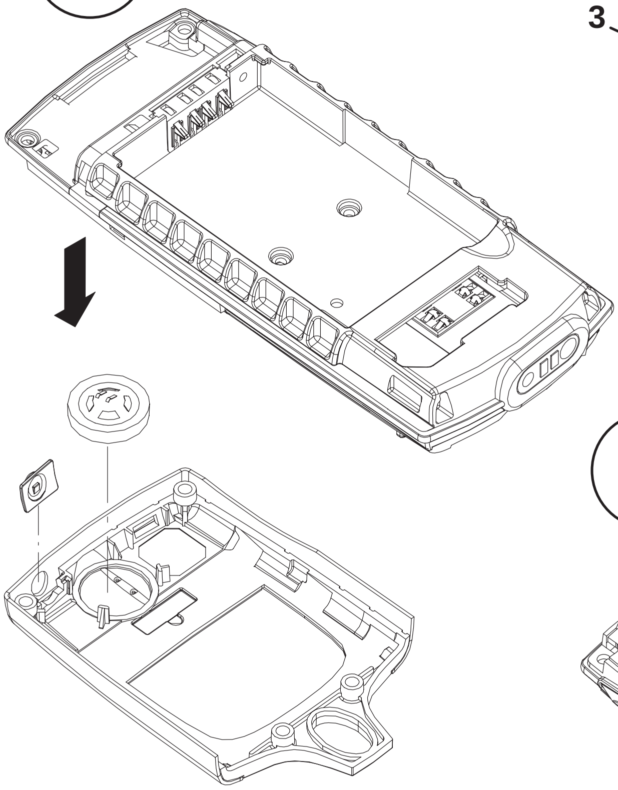
Remove the frame screws (4 pcs). Screws are numbered according to the tightening order.

NOTE: When assembling the screws, use 15 Ncm torque.



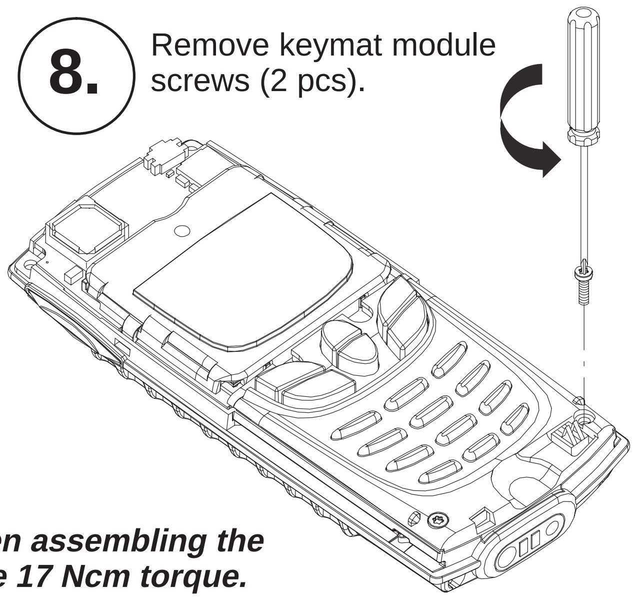
7.

Remove A–cover, speaker and power button.

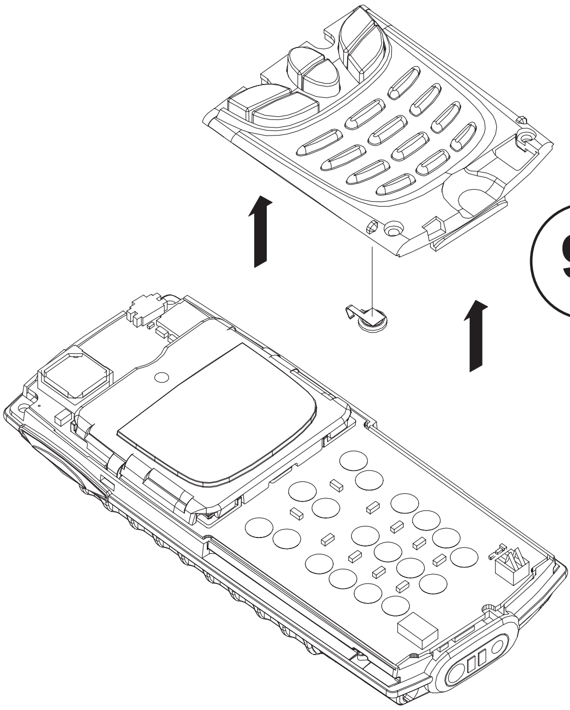


8.

Remove keymat module screws (2 pcs).



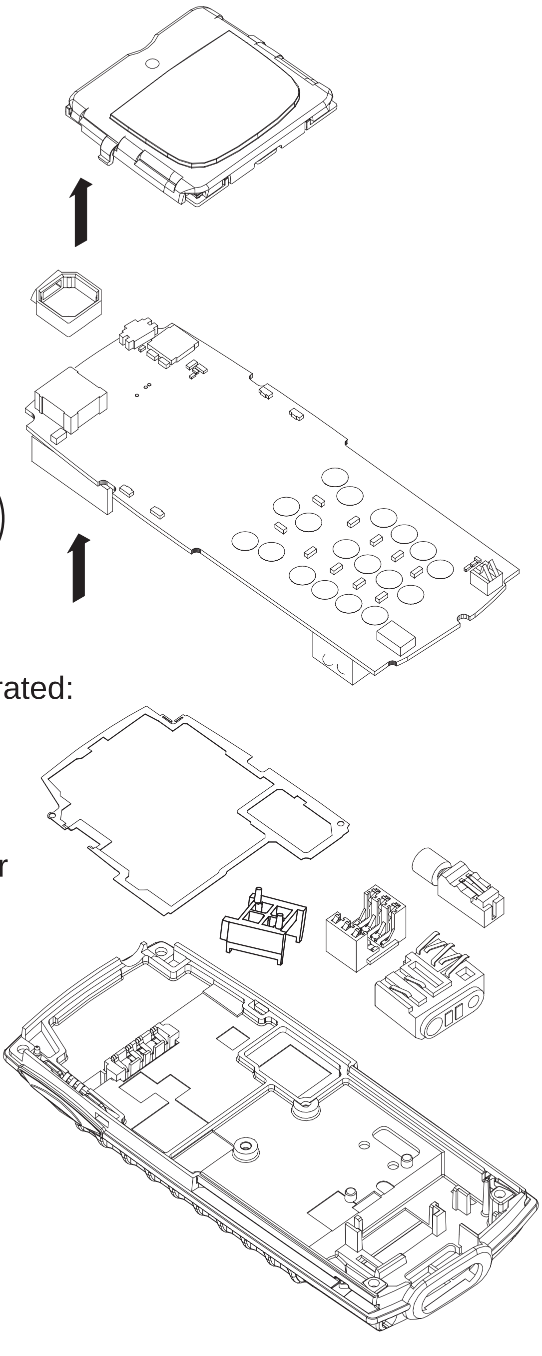
NOTE: When assembling the screws, use 17 Ncm torque.



9.

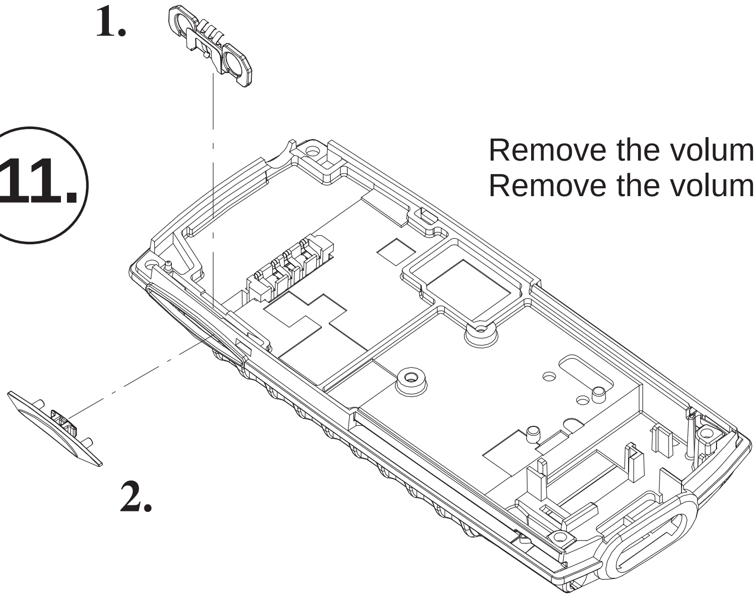
Push SW/slide switch before removing the keymat module. Now remove the keymat module and RTC–battery.
NOTE: Be careful not to damage the SW/slide switch on the PCB.

10.



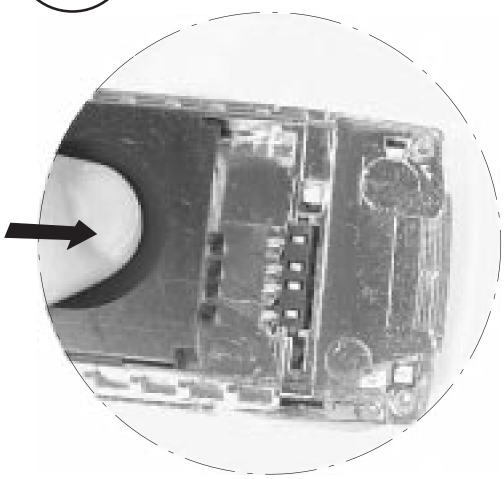
Parts can be separated:
– lcd module
– PCB
– buzzer rubber
– metal gasket
– bottom connector
– SIM connector
– Twin Rip
– vibra

11.

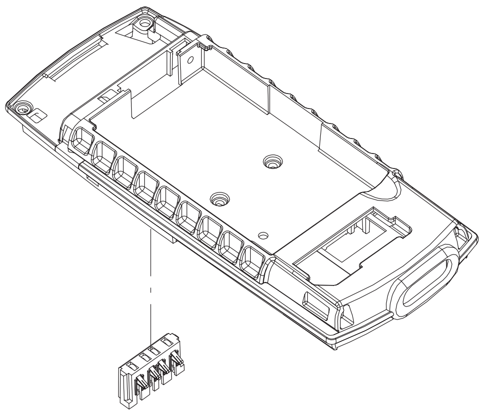


Remove the volume switch 1.
Remove the volume key 2.

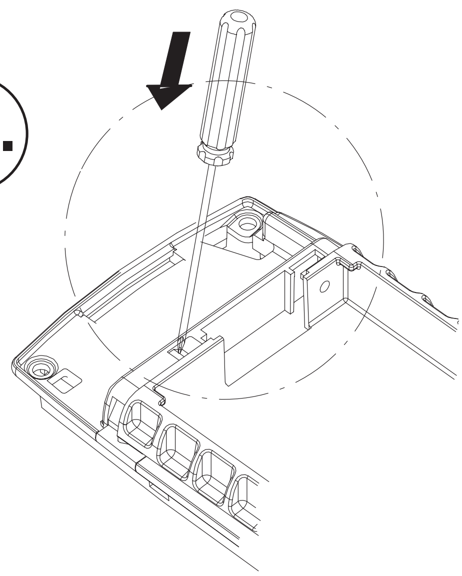
12.



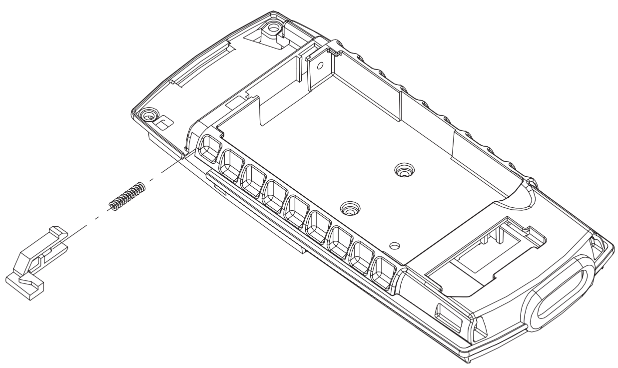
Turn the phone around.
Press down battery conector springs using Battery Connector Extractor Tool.
Battery connector will be released.



13.



Release the latch snap.
Remove the latch and latch spring.



Transceiver Troubleshooting

Baseband Troubleshooting

Because of the underfilling of the MAD and combo memory, it is impossible to change those.

PCB Test Points

Reference	Signal	Note
C213	RFC	MAIN CLOCK (13MHz) HAGAR (N505) –> MAD (D200)
J100*	PWM	CHARGE CURRENT CONTROL CCONT (N100) –> CHAPS (N101)
J101	FBUSTX	FBUS TRANSMITTED DATA MAD (D200) –> SERVICE INTERFACE
J102	FBUSRX	FBUS RECEIVED DATA SERVICE INTERFACE –> MAD (D200)
J103	MBUS	ONE WIRE TWO DIRECTION SERIAL BUS (9600 BIT/S) MAD (D200) <–> SERVICE INTERFACE
J104	CCONT CSX	CCONT (N100) CHIP SELECT MAD (D200) –> CCONT (N100)
J121#	DATA_A	SIM DATA CCONT (N100) <–> SIM CARD READER (X302)
J122#	SIMIO/O_C	SIM IO CONTROL CCONT (N100) <–> SIM CARD READER (X302)
J223	CCONT INT	CCONT (N100) INTERRUPT MAD (D200) –> CCONT (N100)
J226	VCXOPWR	26MHz SYSTEM CLOCK CONTROL MAD (D200) –> VCXO (G830)
J227	PURX	POWER UP RESET CCONT (N100) –> MAD (D200)
J228	SLEEPCLK	SLEEP CLOCK (32kHz) CCONT (N100) –> MAD (D200)
J230	GND	GROUND
J234*	HAGAR _RESET_X	HAGAR (N505) RESET MAD (D200) –> HAGAR (N505)
J235	ROM1SELX	FLASH CHIP SELECT MAD (D200) –> COMBO MEMORY (D210)
J236	RAMSELX	RAM CHIP SELECT MAD (D200) –> COMBO MEMORY (D210)
J237	SYNTHDATA (SDATA)	HAGAR (N505) SERIAL DATA MAD (D200) –> HAGAR (N505)
J239	DSPXF	NOT CONNECTED
J240	MCURDX	MCU READ MAD (D200) –> COMBO MEMORY (D210)

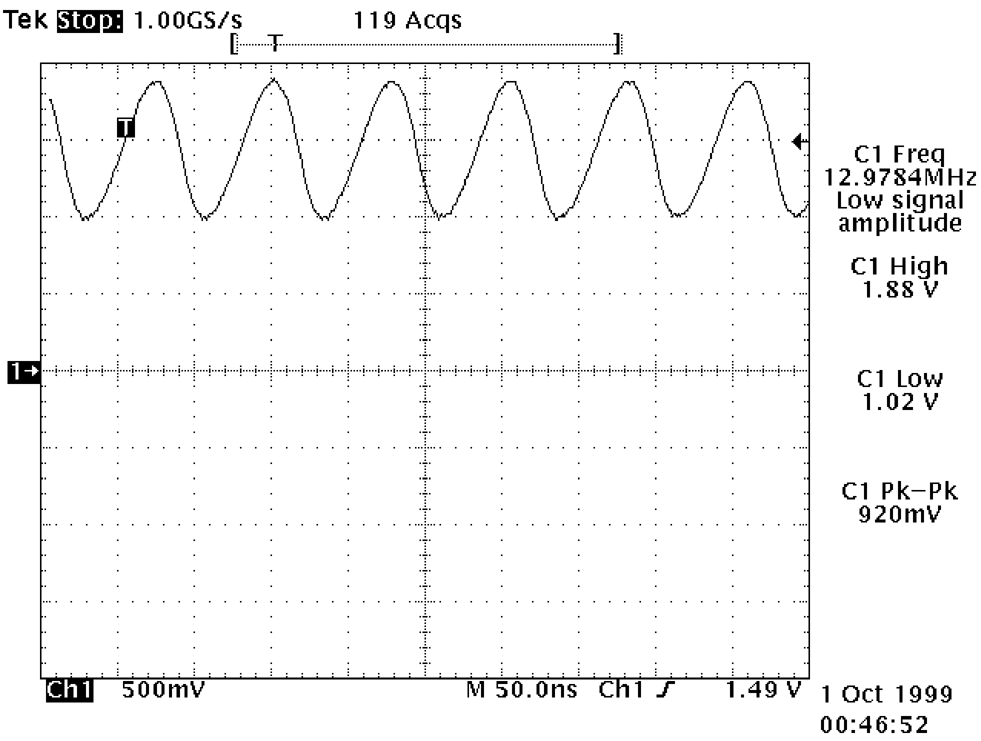
Reference	Signal	Note
J241	MCUWRX	MCU WRITE MAD (D200) –> COMBO MEMORY (D210)
J242	MCUAD1	MCU ADDRESS LINE 1 MAD (D200) –> COMBO MEMORY (D210)
J245* R205#	SCLK	HAGAR (N505) SERIAL CLOCK MAD (D200) –> HAGAR (N505)
J250	COBBA CSX	COBBA (N250) CHIP SELECT MAD (D200) –> COBBA (N250)
J251	COBBA SDA	COBBA (N250) SERIAL BUS DATA MAD (D200) <–> COBBA (N250)
J252	COBBA CLK	COBBA (N250) SERIAL BUS CLOCK MAD (D200) –> COBBA (N250)
J253	PCMRXDATA	AUDIO RECEIVED DATA COBBA (N250) –> MAD (D200)
J254	PCMDCLK	AUDIO DATA CLOCK (512KHz) MAD (D200) –> COBBA (N250)
J255	PCMSCLK	AUDIO SYNC CLOCK (8kHz) MAD (D200) –> COBBA (N250)
J255	ESYSRESETX	COMPOMEMORY (D210) ENABLE MAD (D200) –> COMBO MEMORY (D210)
J256	PCMTXDATA	AUDIO TRANSMITTED DATA MAD (D200) –> COBBA (N250)
J257	CCUT (MCUGE- NIO0)	CHARGE CUT MAD (D200) –> CHAPS (N101)
J258*	BUTTON_CTRL (MCUGENIO1)	HEADSET BUTTON DETECTION CON- TROL MAD (D200) –> XMICP
J259	MCUGENIO2	NOT CONNECTED
J260	EXTMCUDA0	MCU DATA LINE 0 MAD (D200) <–> COMPOMEMORY (D210)
J299* R745#	TXP	TRANSMITTER POWER CONTROL MAD (D200) –> RF
L200	MIC	MIC BIAS VOLTAGE, 2.1V IF NO MIC V250 –> MIC
N310 PIN 13	KBD LIGHT	KEYPAD LED LIGHT CURRENT UI–SWITCH (N310) –> KEYPAD BACK- LIGHT LEDS
N310 PIN 14	KBDLED_ADJ	KEYPAD BACKLIGHT BRIGHTNESS AD- JUSTMENT R311 –> UI–SWITCH (N310)
N310 PIN 16	VIBRA_CTRL	VIBRA DRIVE UI–SWITCH (N310) –> VIBRA (M300)
N310 PIN 19	VIBRA	VIBRA CONTROL PWM MAD (D200) –> UI–SWITCH (N310)
N310 PIN 3	BUZZER	BUZZER CONTROL PWM MAD (D200) –> UI–SWITCH (N310)

Reference	Signal	Note
N310 PIN 6	BUZZER_CTRL	BUZZER DRIVE UI–SWITCH (N310) –> BUZZER (B301)
N310 PIN 7	KBLIGHTS	KEYPAD AND DISPLAY BACKLIGHT CON-TROL MAD (D200) –> UI–SWITCH (N310)
N310 PIN 8	LCDLED_ADJ	LCD BACKLIGHT BRIGHNESS ADJUST-MENT R310 –> UI–SWITCH (N310)
N310 PIN 9	LCD LIGHT	LCD LED LIGHT CURRENT UI–SWITCH (N310) –> DISPLAY BACK-LIGHT LEDS
N400 PIN 4	IRONX	IRDA (N400) SHUTDOWN MAD (D200) –> IRDA (N400)
N401 PIN 4	IRDA POWER	2.8V N401 –> IRDA (N400)
R118	PWRONX	POWER ON BUTTON POWER BUTTON (S330) –> CCONT (N100)
R206	SENA	HAGAR (N505) CHIP SELECT MAD (D200) –> HAGAR (N505)
R211	VPP	FLASH PROGRAMMING VOLTAGE N220 –> COMPOMEMORY (D210)
R277	EAD	ACCESSORY DETECTION XMICP –> CCONT (N100)

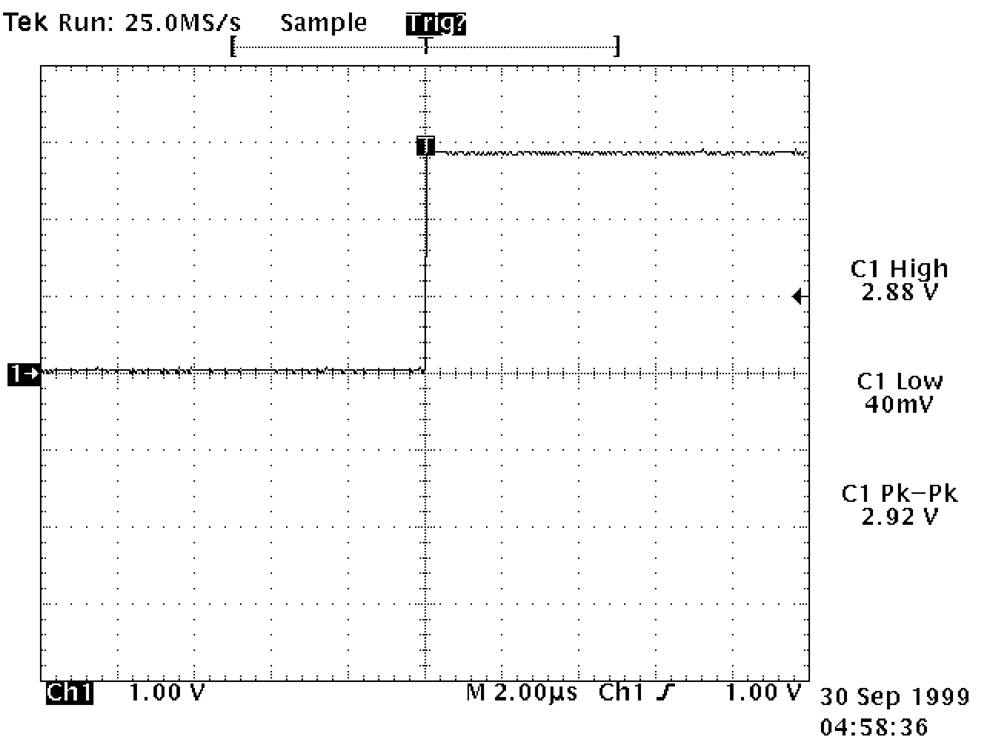
*Not in NSB–6.
#Only in NSB–6.

PCB Test Point Pictures

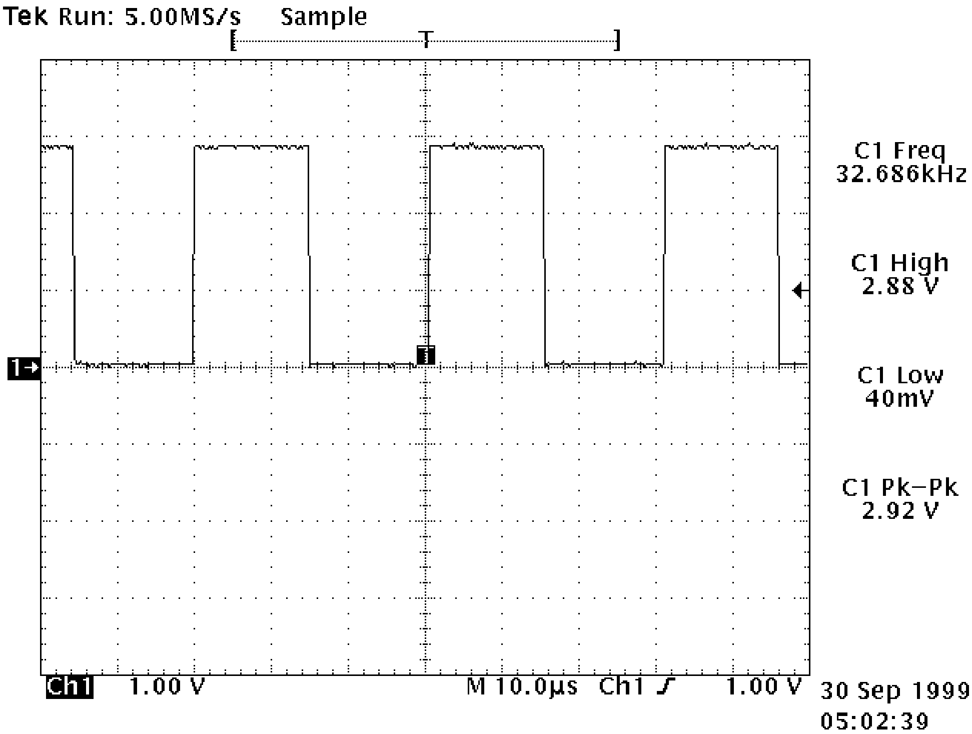
C213, RFC in normal operation



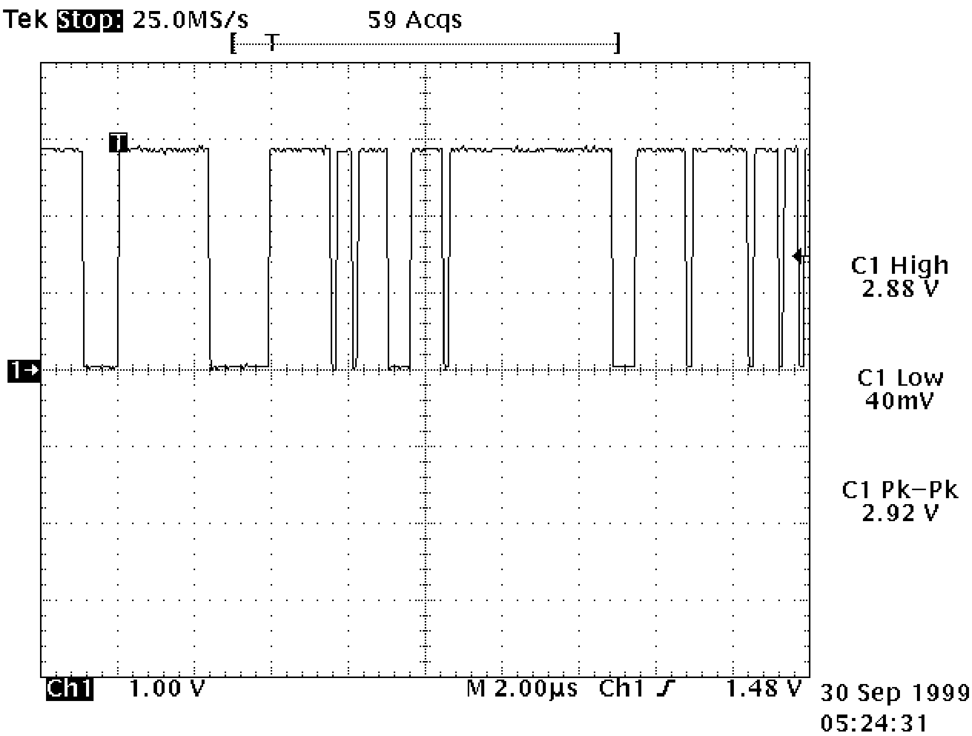
J227, PURX (levels)



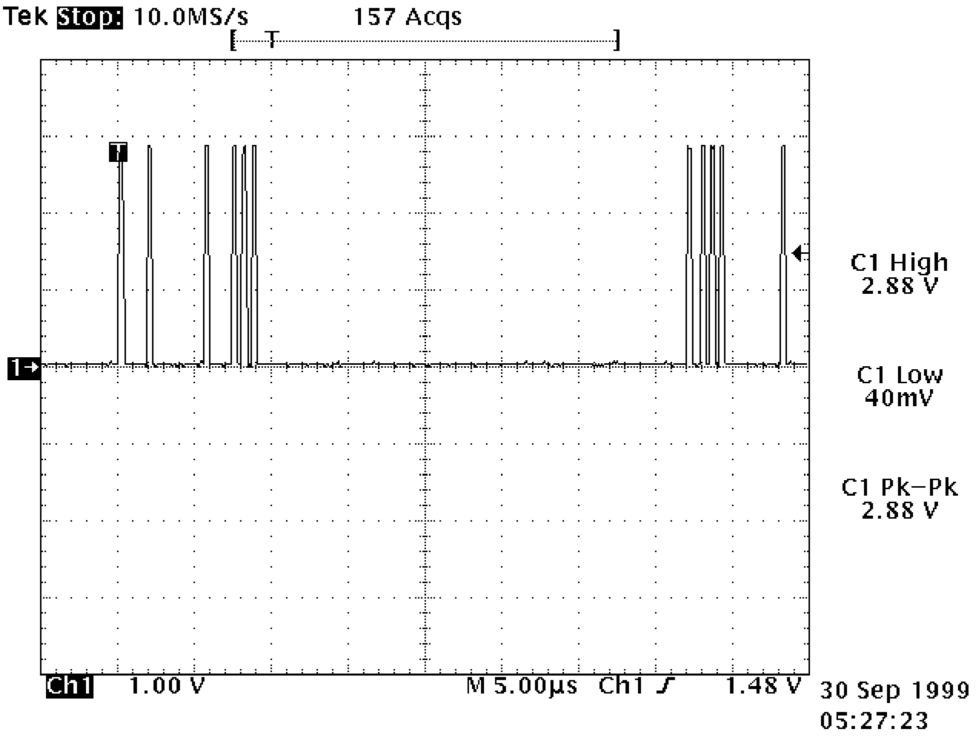
J228, SLEEPCLK



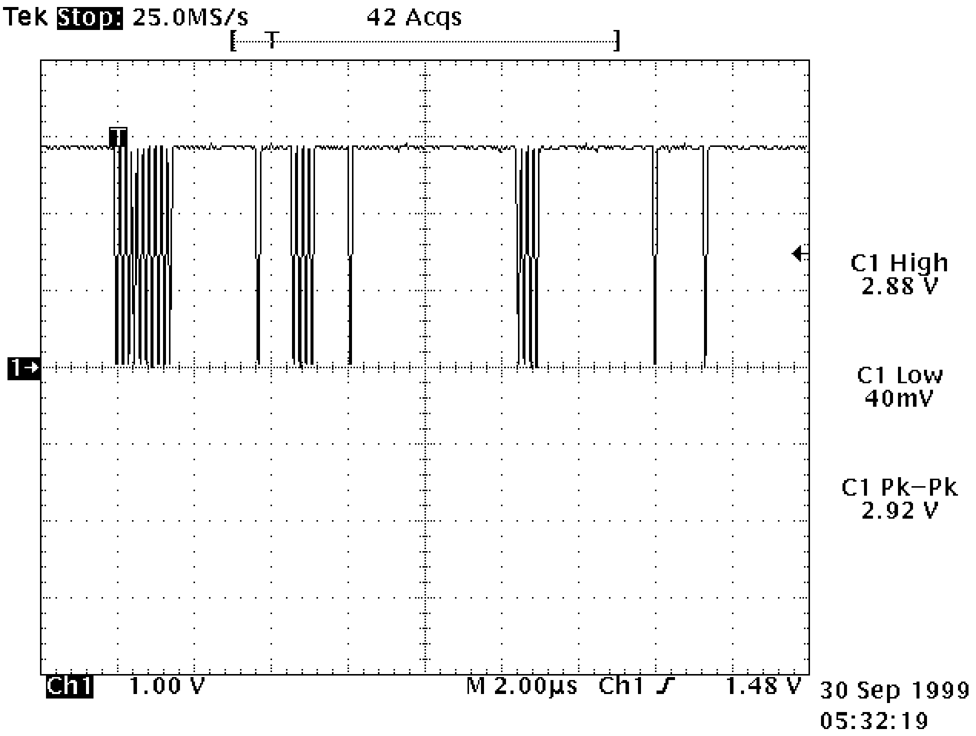
J236, RAMSELX



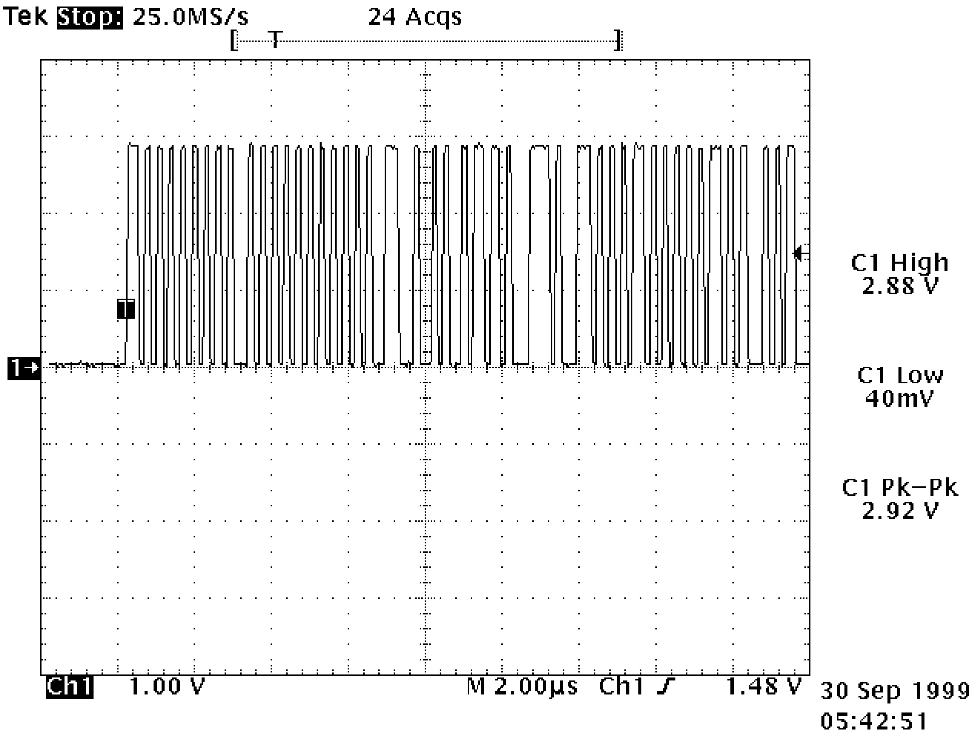
J237, SYNTHDATA



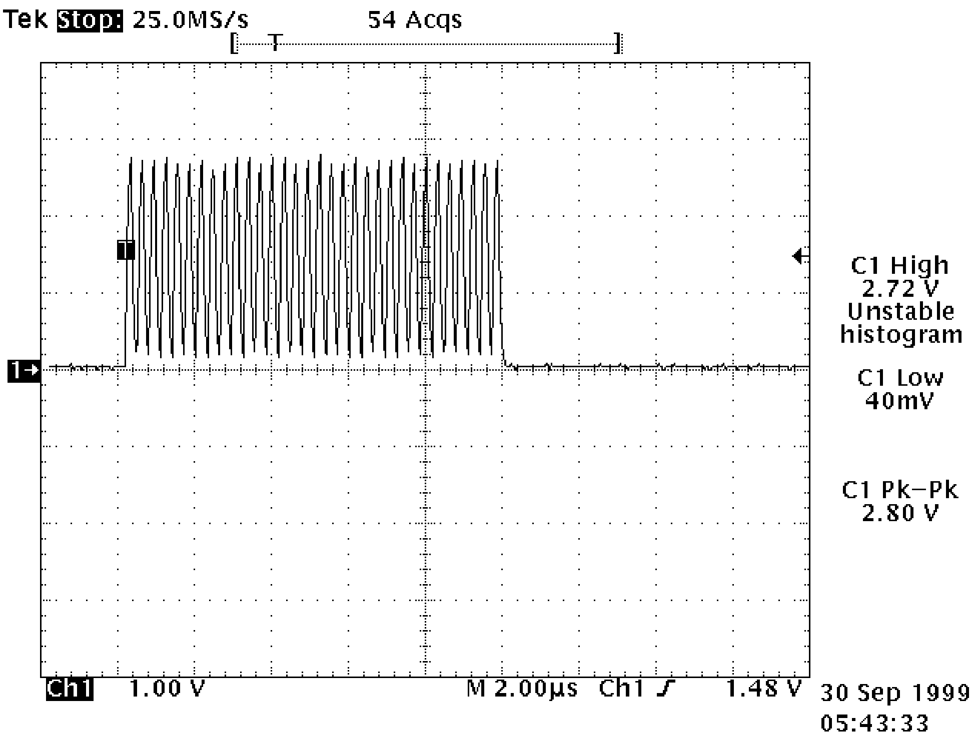
J241, MCUWRX



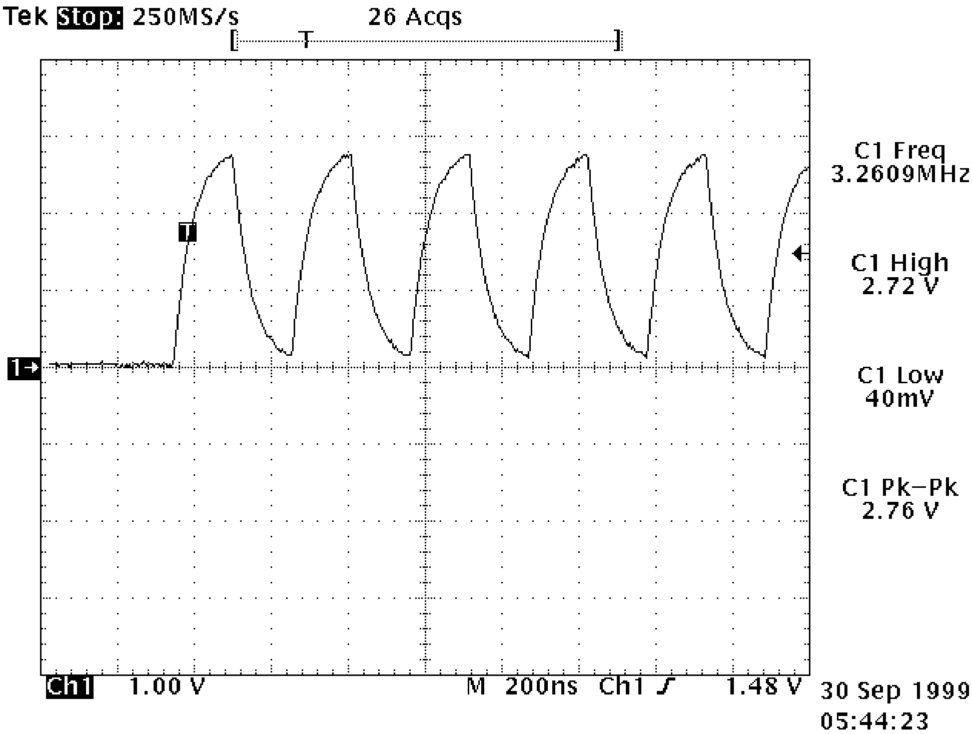
J242, MCUAD1



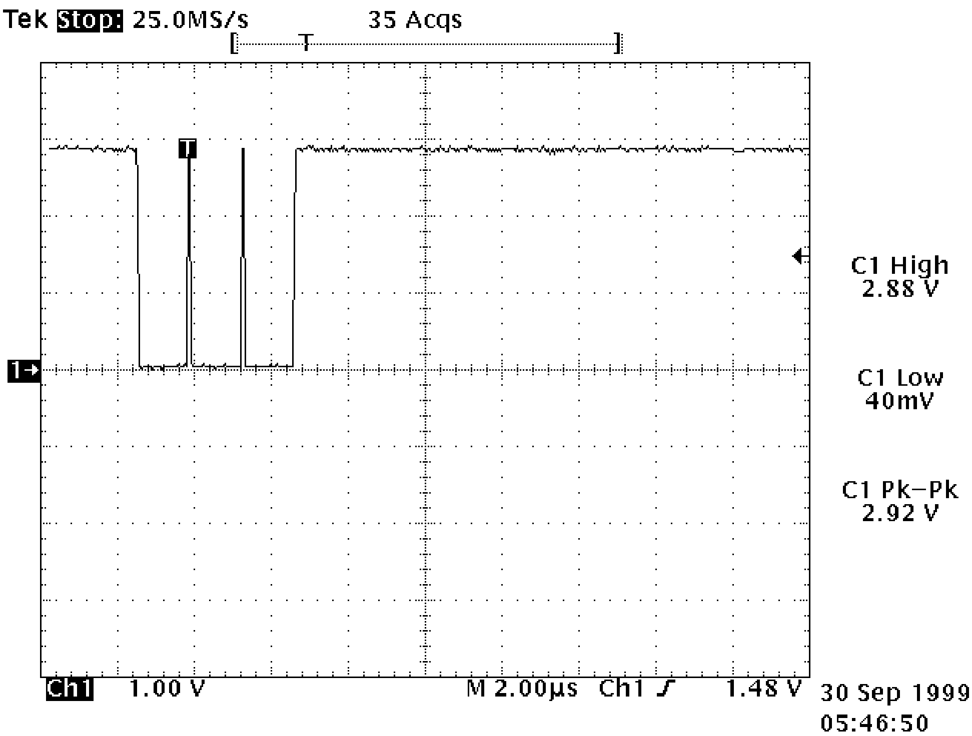
J245, SCLK



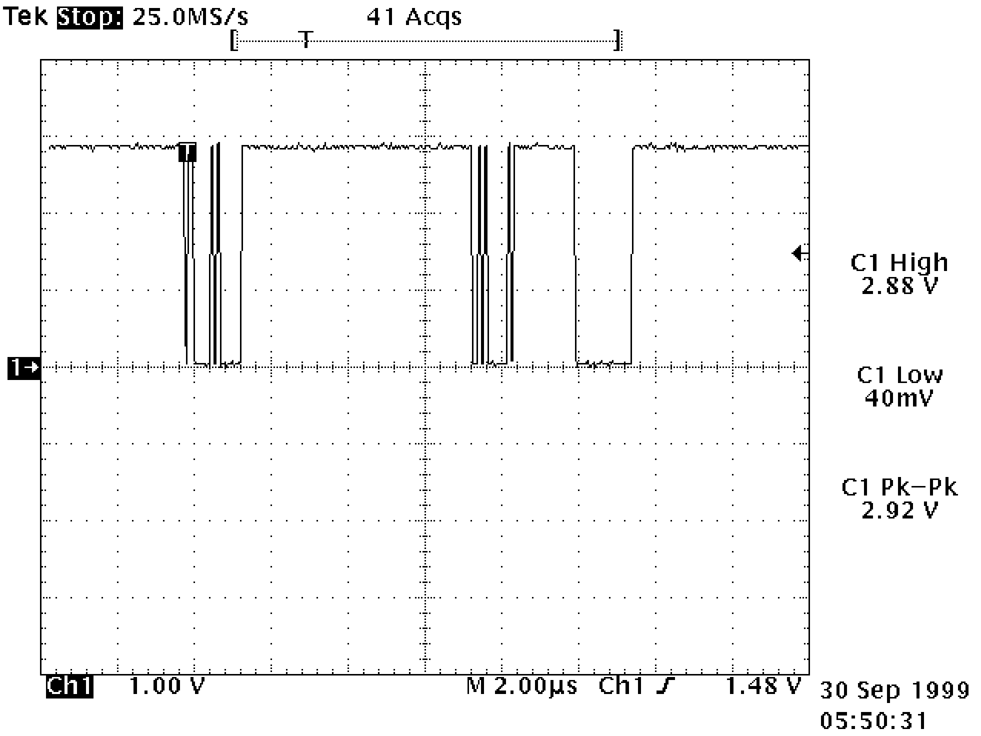
J245, SCLK (DIFFERENT TIME SCALE IN OSCILLOSCOPE)



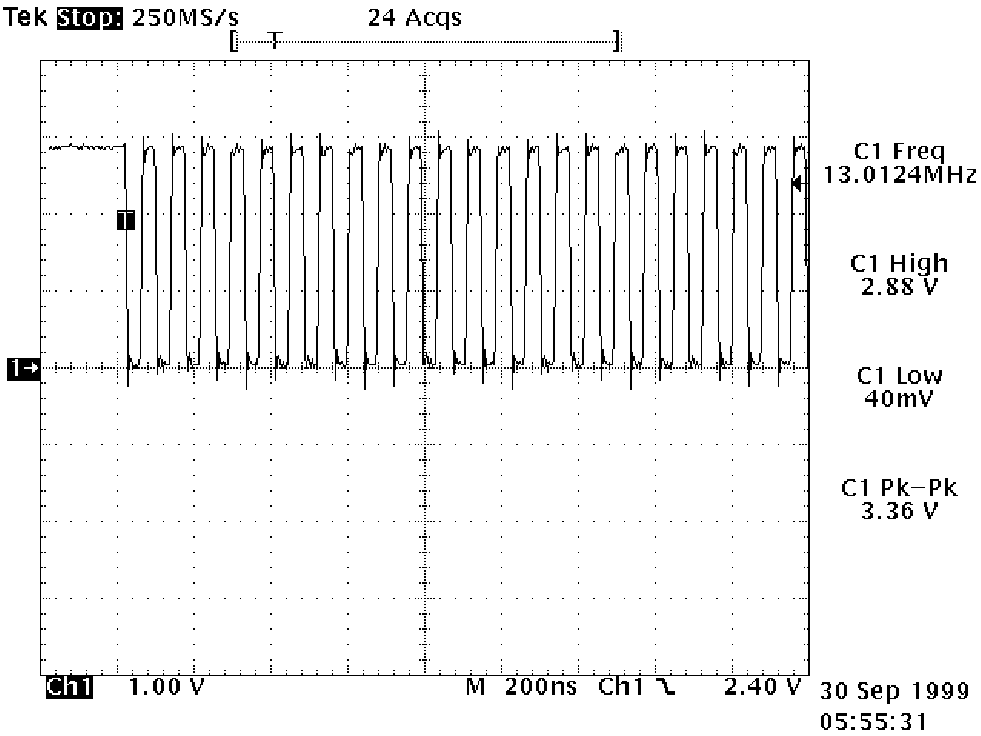
J250, COBBA (CSX)



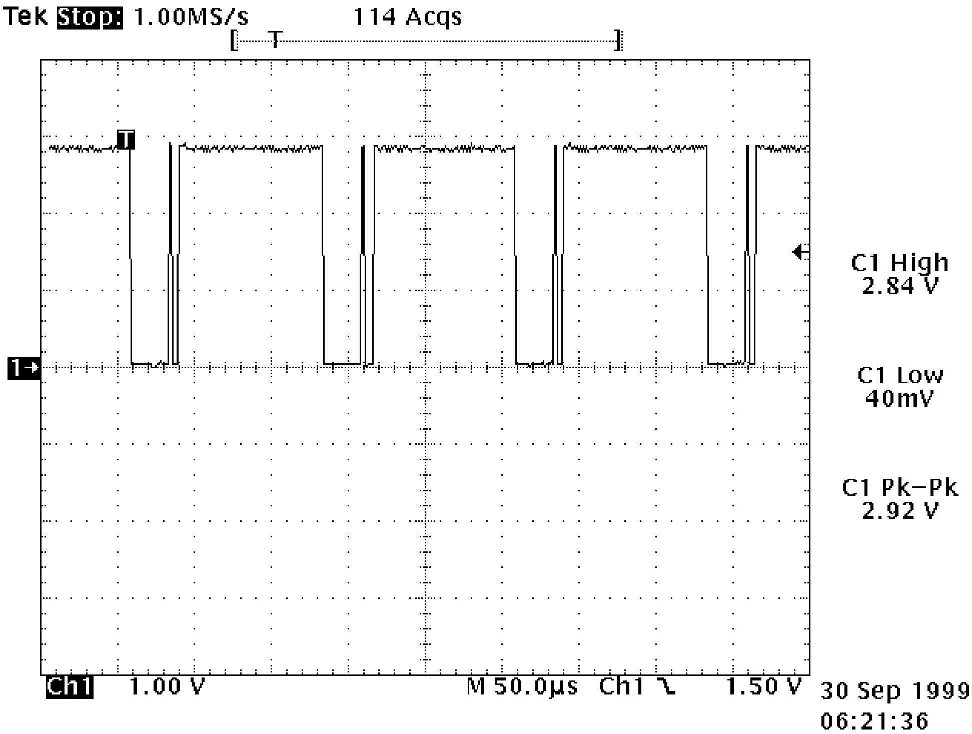
J251, COBBA(SDA)



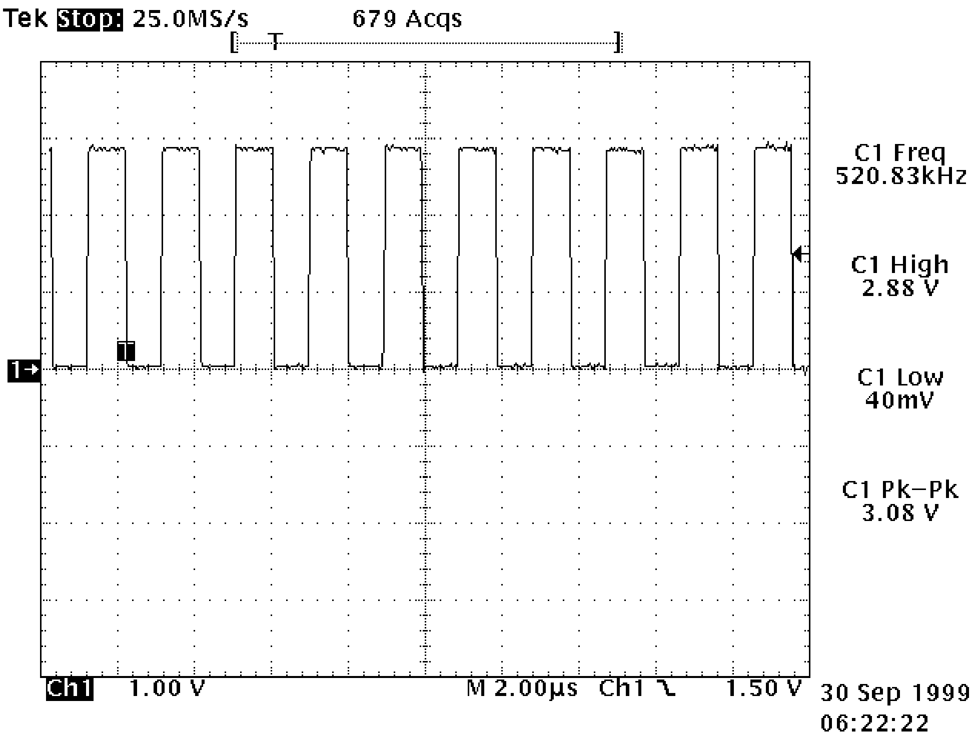
J252, COBBA(CLK)



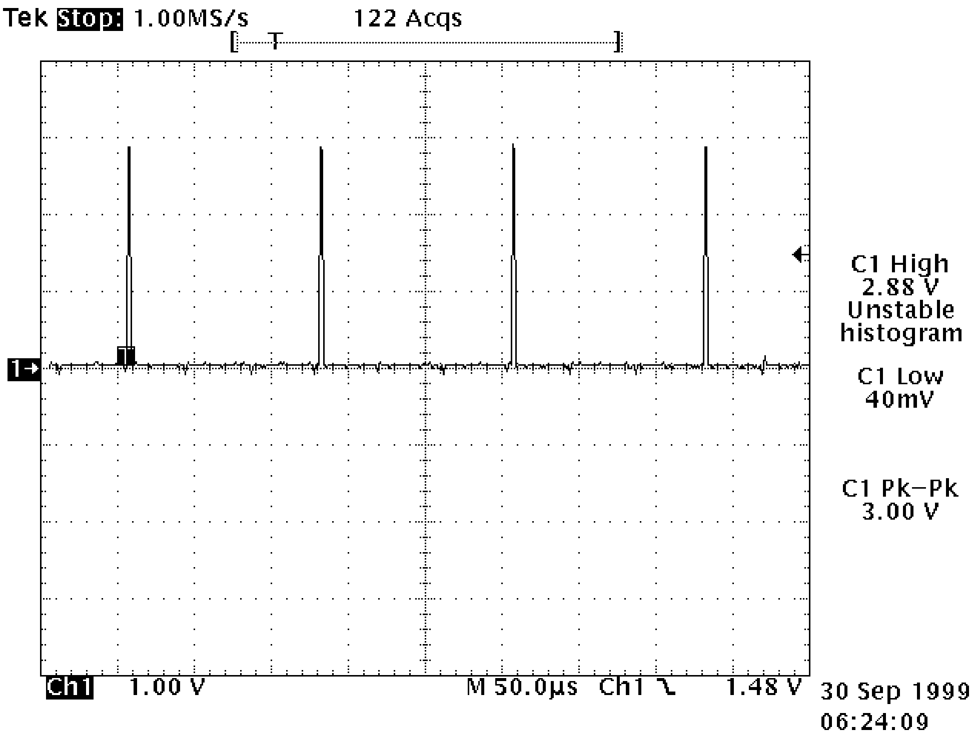
J253, PCMRXDATA, WinTesla Audiotest, Loop ON, Input and Output Internal



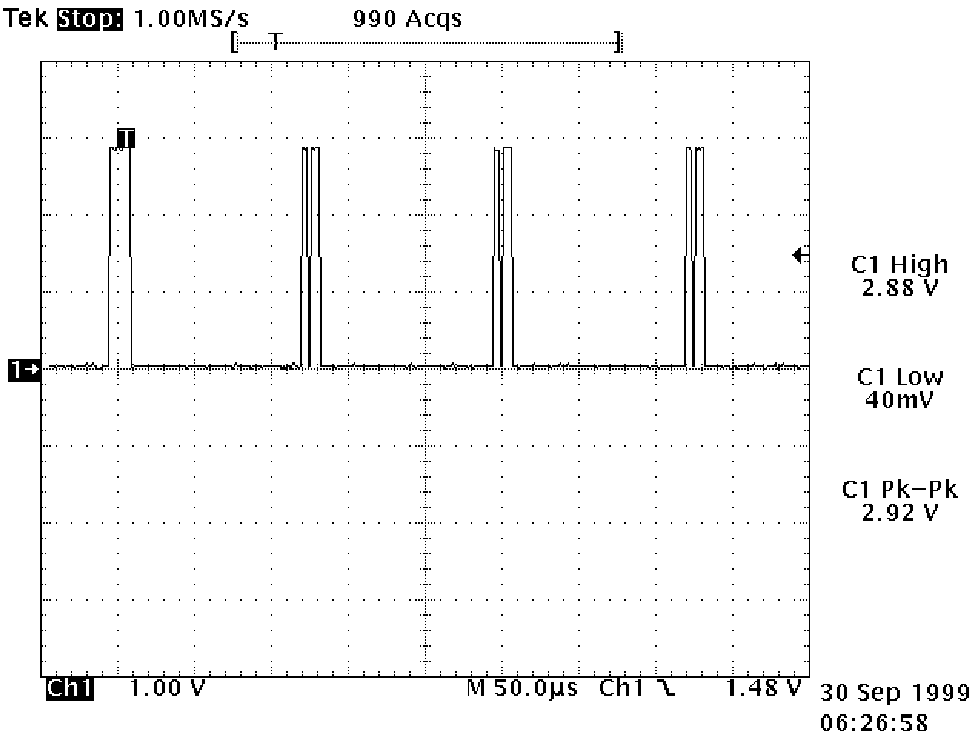
J254, PCMDCLK



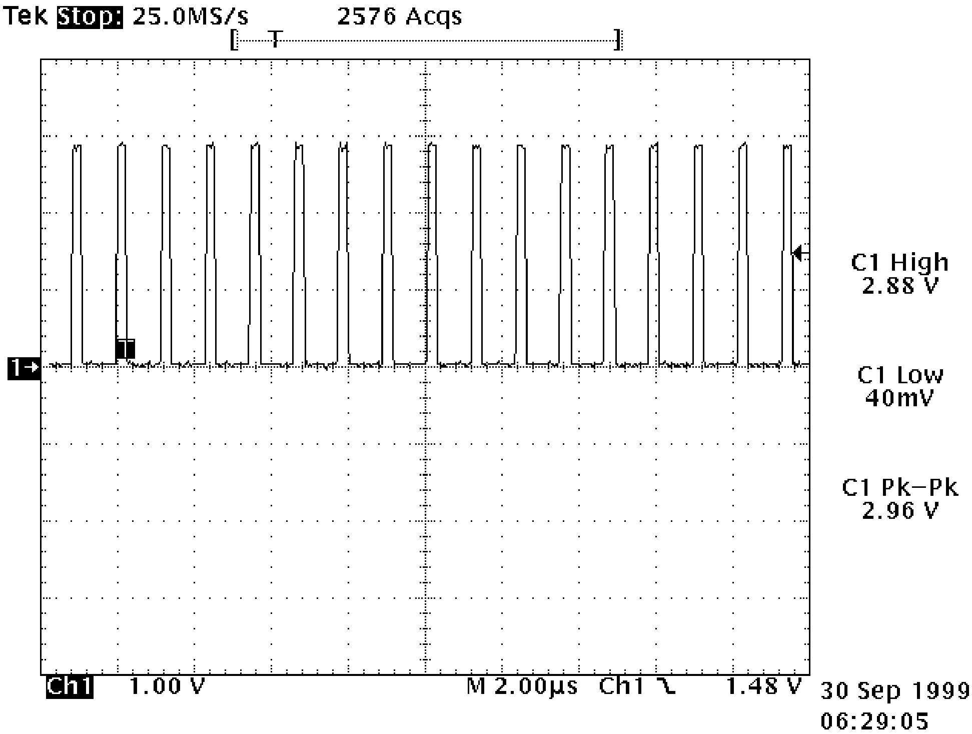
J255, PCMSCLK



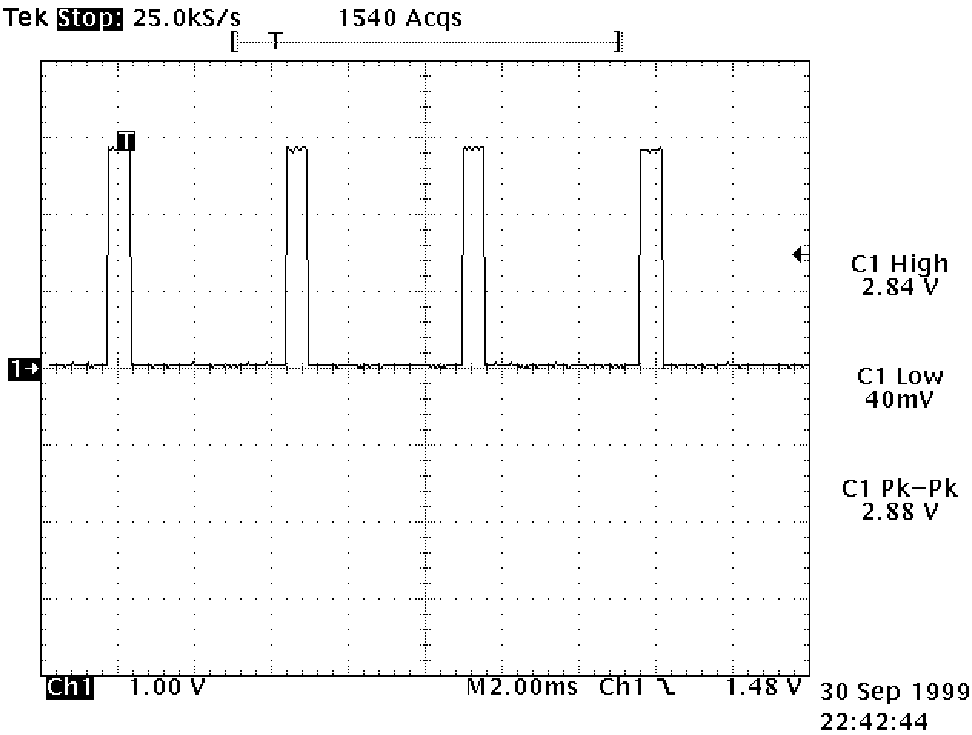
J256, PCMTXDATA, WinTesla Audiotest, Loop ON, Input and Output Internal



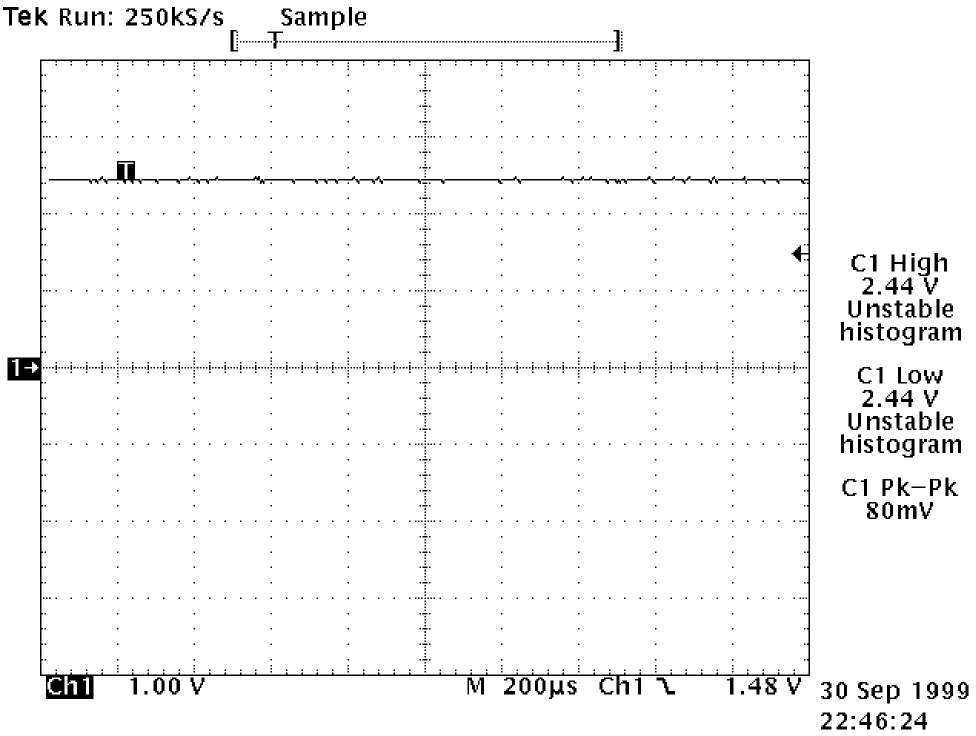
J260, EXTMCUDA0



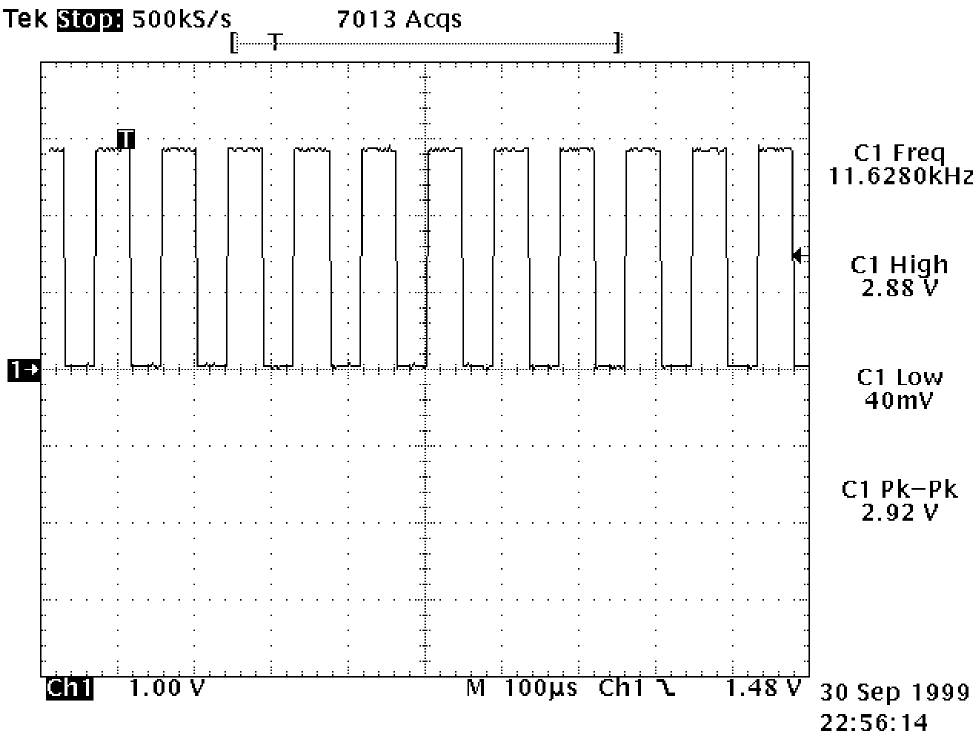
J299, TXP, WinTesla RF Control, TX, Burst, Tx level 14, Data Type Cont



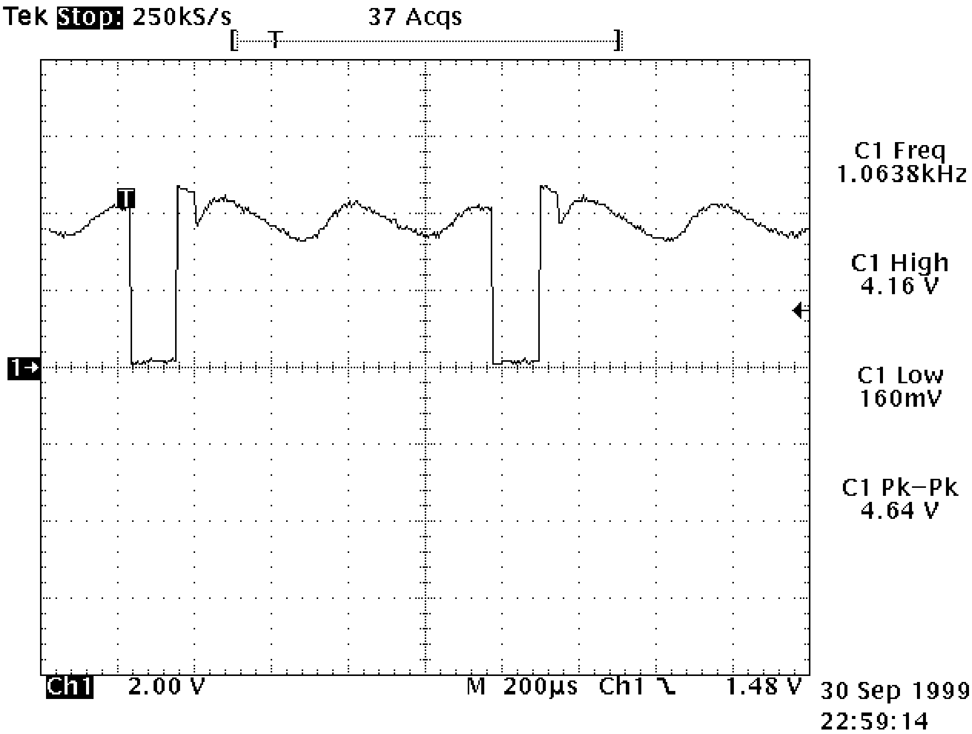
L200, MIC, no mic connected



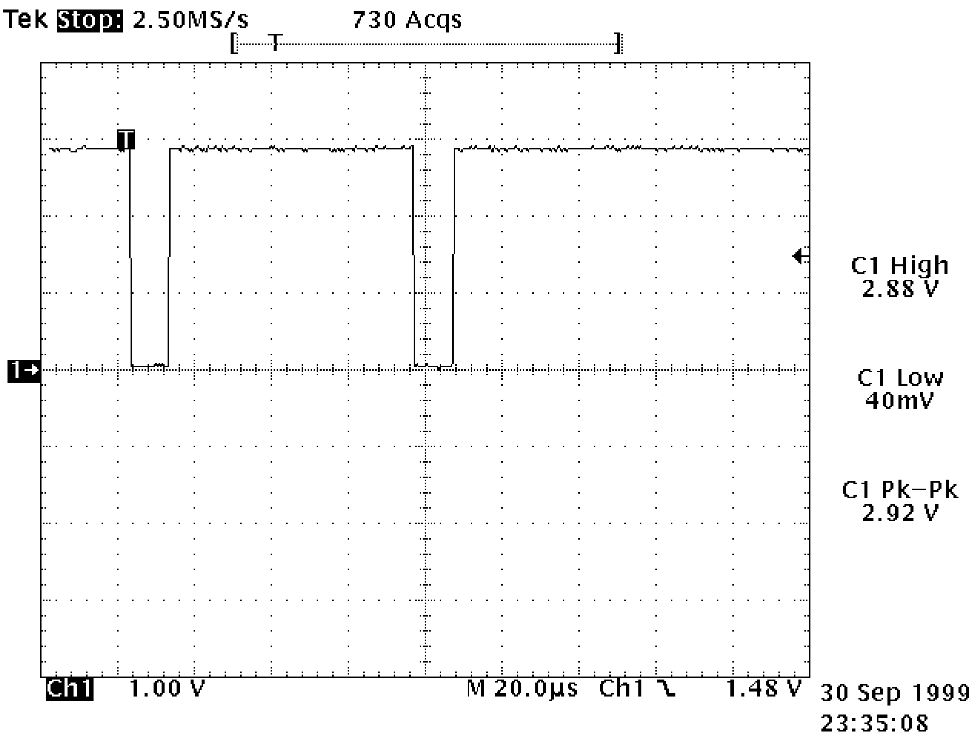
N310 PIN 19, Vibra, activated from keypad



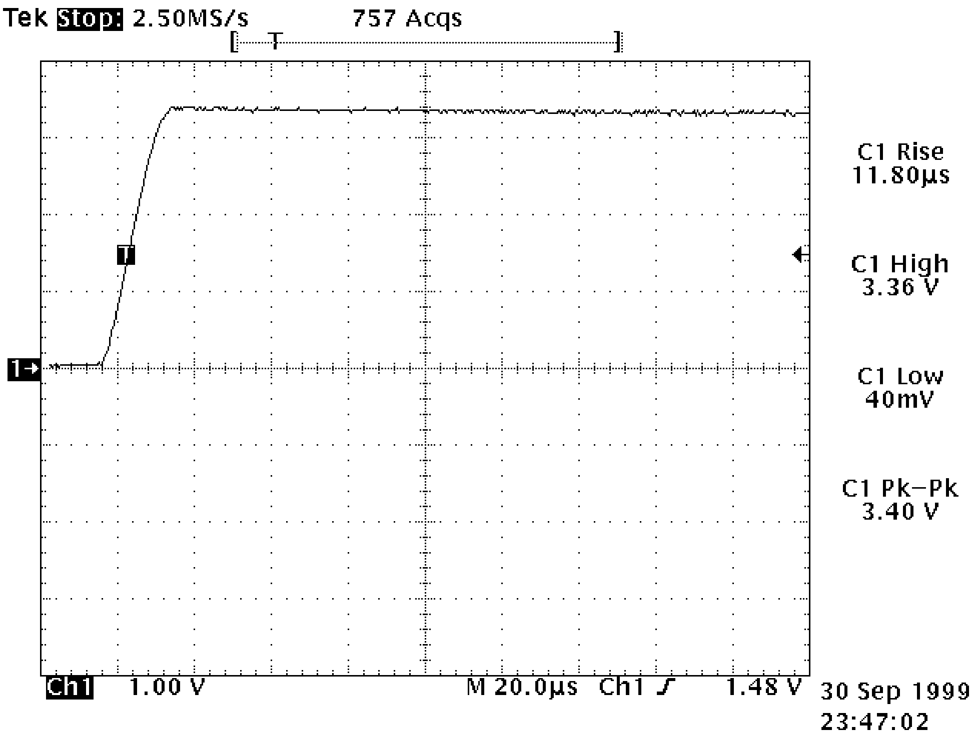
N310 PIN 6, BUZZER_CTRL



R206, SENA



R211, VPP, WinTesla Self Test, MCU Eeprom interface



Testing

The MCU software enters a local mode at start–up if suitable resistors are connected to the BTEMP and BSI lines.
NOTE! Baseband doesn't wake up automatically when the battery voltage is connected. Power must be switched on by

pressing the Power key or

inserting a waking pulse BTEMP line or

connecting a charger

In the local mode the baseband can be controlled through MBUS or FBUS connections by a PC–locals software. Baseband internal connections are tested with selftests if possible.

Parameters cannot be set accurate enough by design because of component tolerances. Due to use of 5% resistor values, the channels of the CCONT A/D converters need to be aligned in the production phase. Within battery voltage tuning the MCU software reads the A/D reading from CCONT at 4.1V and stores this reading to emulated EEPROM memory as a reference point. Another reference point is created by assuming that while the input voltage is zero, A/D reading is also zero. Now the slope is known and A/D readings can be calibrated. Calibration is included in VBATT A/D reading task.

Troubleshooting

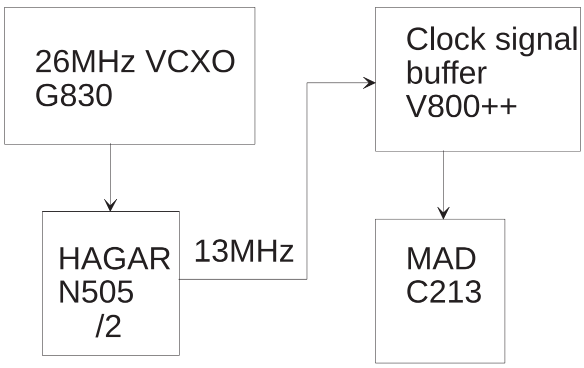
Troubleshooting instructions are divided into following sections:

How to check/fix the system/sleep clock.
How to check/fix the power supplies.
Contact service case.
How to check/fix the SIM faults.
How to check/fix the Audio faults.
How to check/fix the charger faults.

The first thing to do is to carry out a thorough visual check of the module. Make sure that:

– there are no mechanical damages
– solder joints are OK

Before changing anything ALL SUPPLY VOLTAGES AND SYSTEM CLOCK / SLEEP CLOCK should be checked.



System Clock

Check the signal from the C213 Layout picture B signal RFC, should be like in SYSTEM CLOCK picture.

IF NOT

Check the signal from the RF side buffer input C829. If there is signal, check the R829,R834,R830,V800, C834 and L800

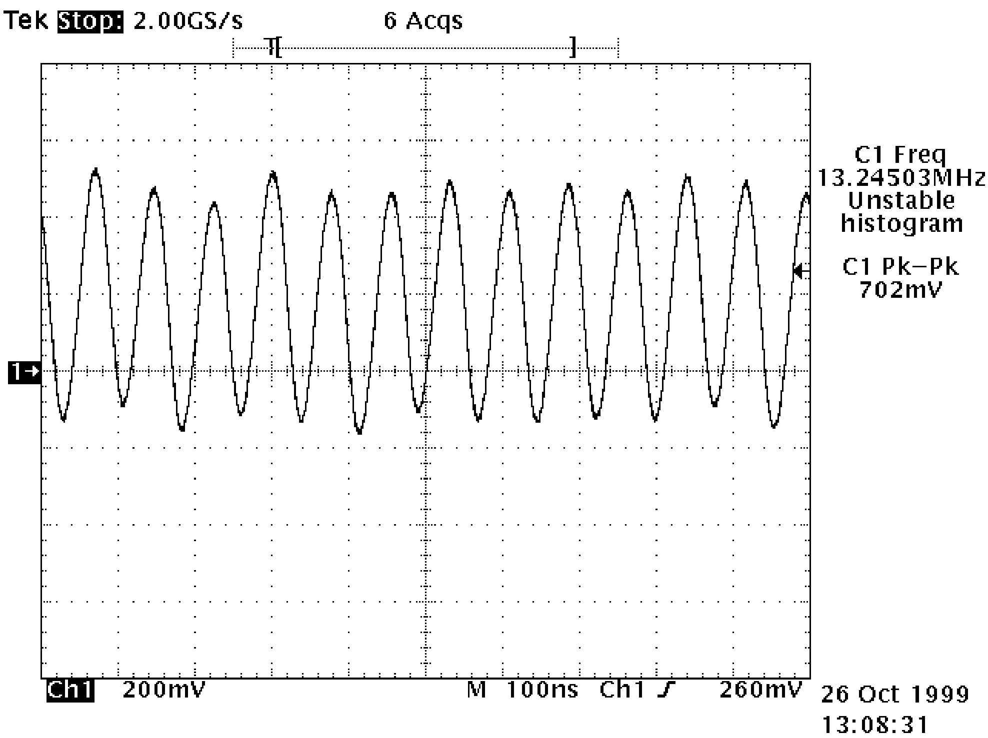
IF THERE ISN'T

Check the signal from the RF side oskilator VCXO G830 output fron C833. There should be 26MHz signal.

IF IS → Change the Hagar N505

IF THERE ISN'T

Change the VCXO G830



System clock picture.

Sleep Clock

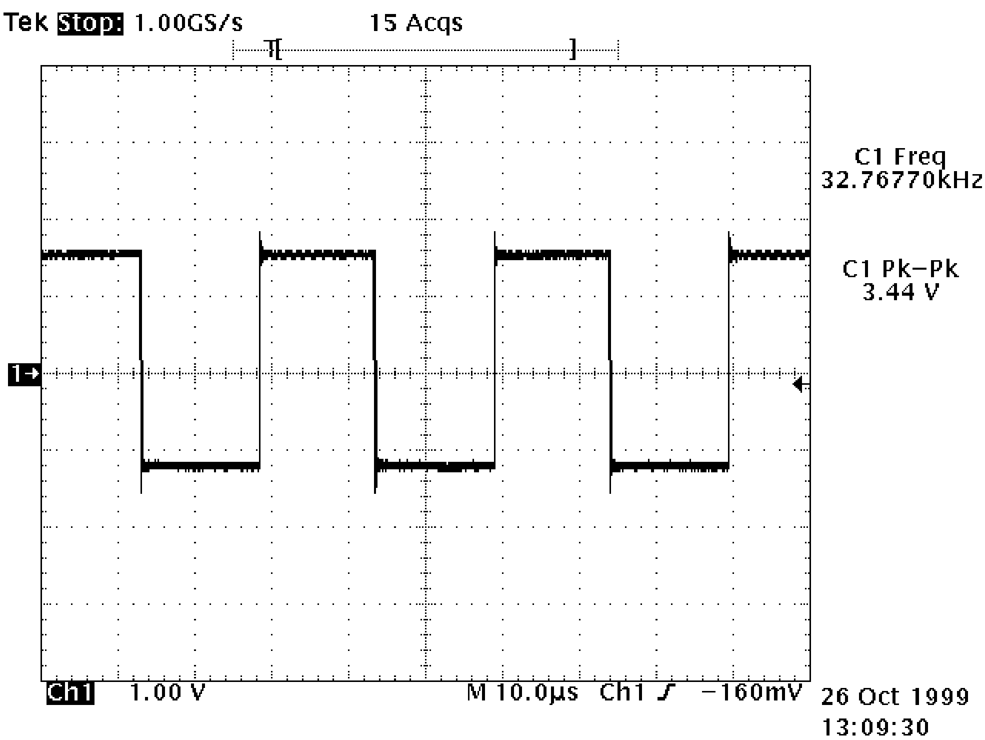
Check the signal from the J228 Layout picture B signal Clk 32kHz, should be like in SLEEP CLOCK picture.

↓ IF NOT

Check R100, R154, R102, C102, C101, C113 and B100

↓ IF OK

Change the CCONT N100

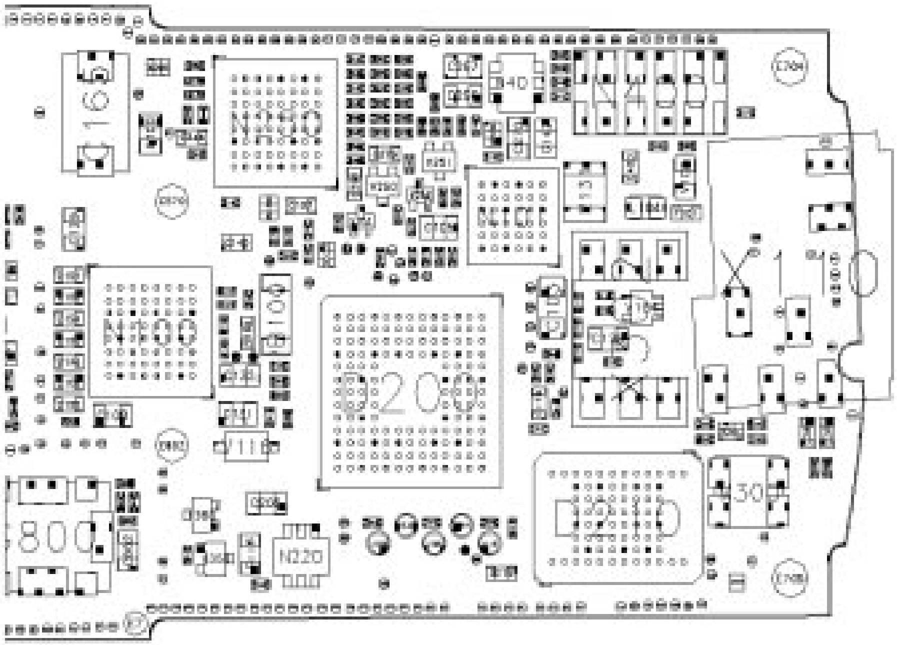


Sleep clock picture.

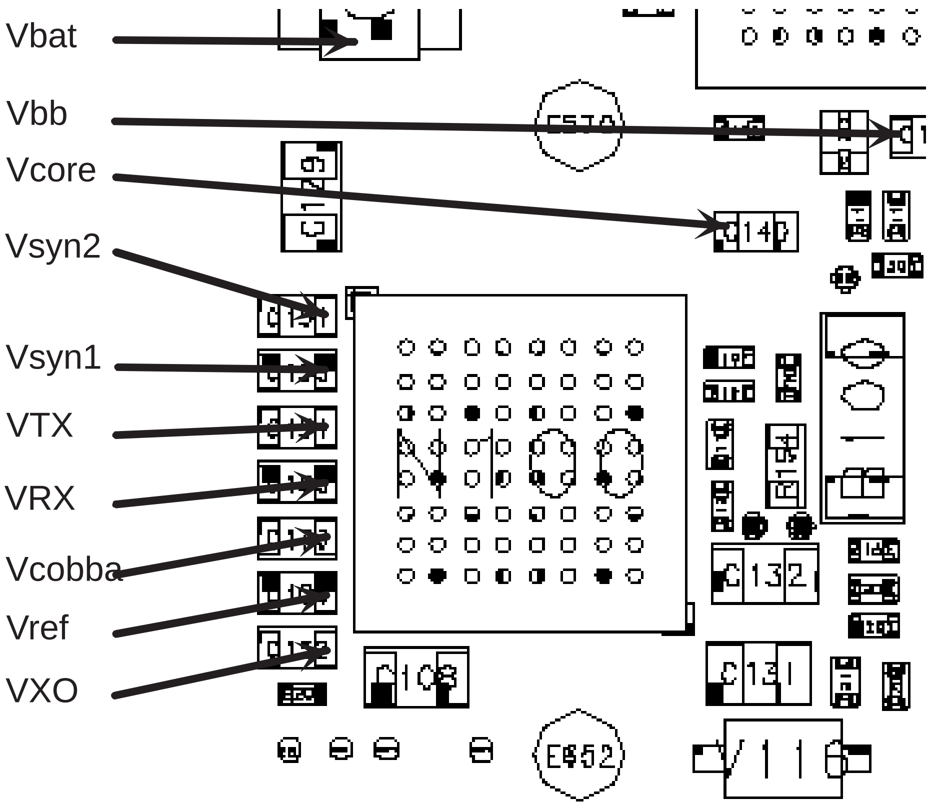
Power Supplies

Measure power supplies. Test points are shown in layout picture A.

Layout example shown here is NSM–2.



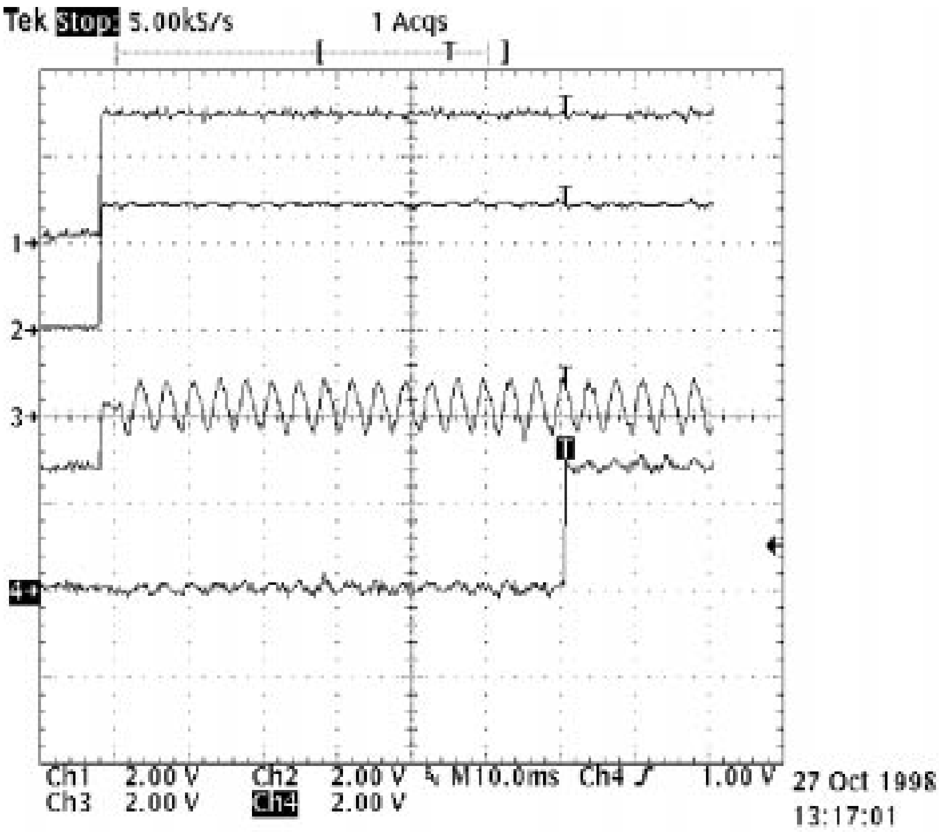
A



Vbb	= 2.7V – 2.87V
Vcore	= 1.3V – 2.65V
Vcobba	= 2,67V – 2.85V
Vref	= 1.48V – 1.523V
Vbat	= 3.11V – 4.2V
VXO	= 2,67V – 2.85V
VRX	= 2,67V – 2.85V
VTX	= 2,67V – 2.85V
Vsyn1	= 2,67V – 2.85V
Vsyn2	= 2,67V – 2.85V

Power up sequence test:

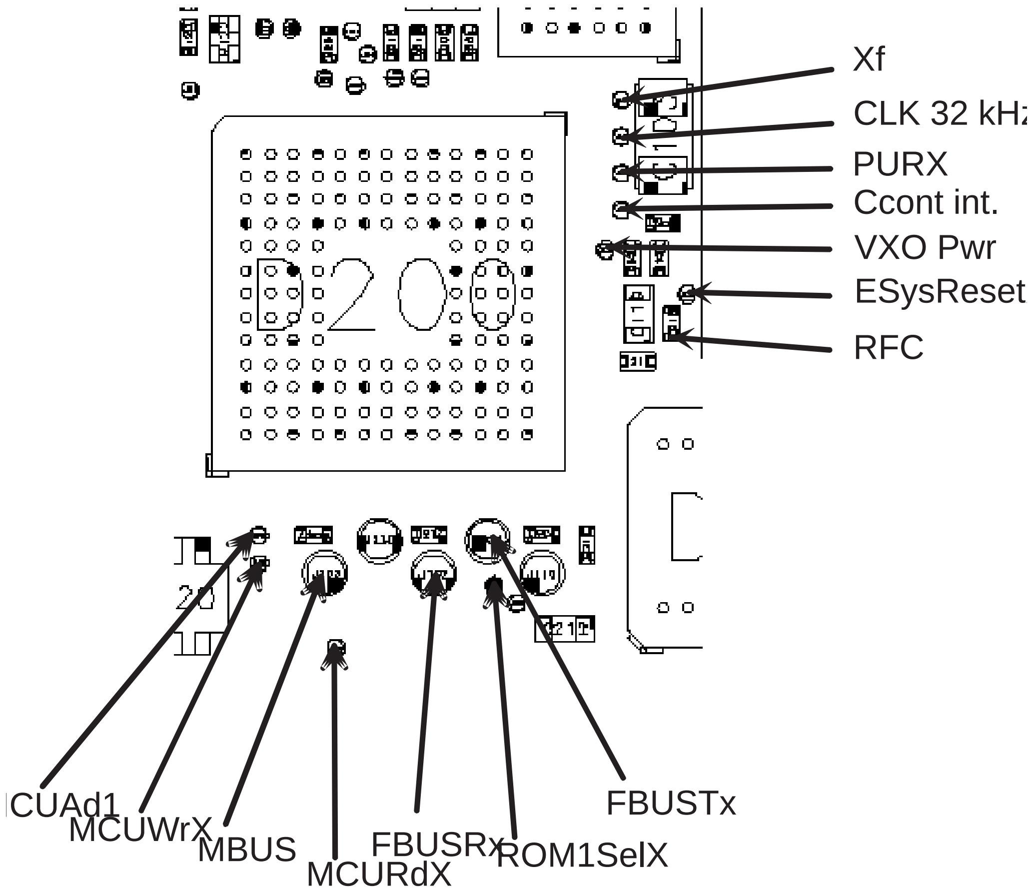
Cconts digital parts keep MAD in reset by keeping PURX down for a delay of 62ms.



Here is shown the start up sequence picture.

Ch1 = Vbb
Ch2 = VXO
Ch3 = SleepClk
Ch4 = PURX (see picture B)

B


Xf
CLK 32 kH
PURX
Ccont int.
VXO Pwr
ESysReset
RFC
CUAd1
MCUWrX
MBUS
MCURdX
FBUSRx
ROM1SelX
FBUSTx

Phone is totally dead

The phone doesn't take current at all when the power switch is pressed or when the watchdog disable pin (X001 pin 11) is grounded. Make sure that the battery voltage you use is within the specification, i.e. 3.11 .. 4.2 V. If the voltage is lower, hardware of CCONT (N100) prevents power on.

IF battery voltage is inside the specification Change the Ccont.

Flash programming fails

The flash programming can be done via panel connector X001 or via dedicated PCB pads. In production, the first programming is done via panel connector. After this, the panel connector is cut away, thus the programming must be done via PCB pads visible through the shield under the battery. The main difference between these is that FLASH–programming voltage is produced differently. The fault finding diagrams for flash programming is shown in the start up sequence picture.

In flash programming error cases the flash prommer can give some information about a fault. The fault information messages could be:

– MCU doesn't boot
– Serial clock line failure
– Serial data line failure
– External RAM fault
– Algorithm file or alias ID not found
– MCU flash Vpp error

Power doesn't stay on or phone is jammed

If this kind of fault has come after flash programming, there are most probably open joints in ICs. Solder the joints of ICs. Normally the power will be switched off by CCONT (N100) after 30 seconds if the watchdog of the CCONT can not be served by software. This updating can be seen with an oscilloscope at CCONTCSX (J104). In normal case there is a short pulse from "1" to "0" every 8 seconds. The power off function can be prevented by connecting WDDIS (R118 edge side head) to ground.

Because of the underfill, check the supply voltages, clock signals and power up sequence. If power on sequence fails, there are some open connections under MAD or compomemory. If all seems to be correct, it is best way to erase the flash memory and try to put new software to phone.

Contact Service on the phone display

This fault means that software is able to run and thus the watchdog of CCONT (N100) can be served. Selftest functions are run when power is switched on and software is executed from flash. If any of the selftests fails, a "contact service" text is shown on display.

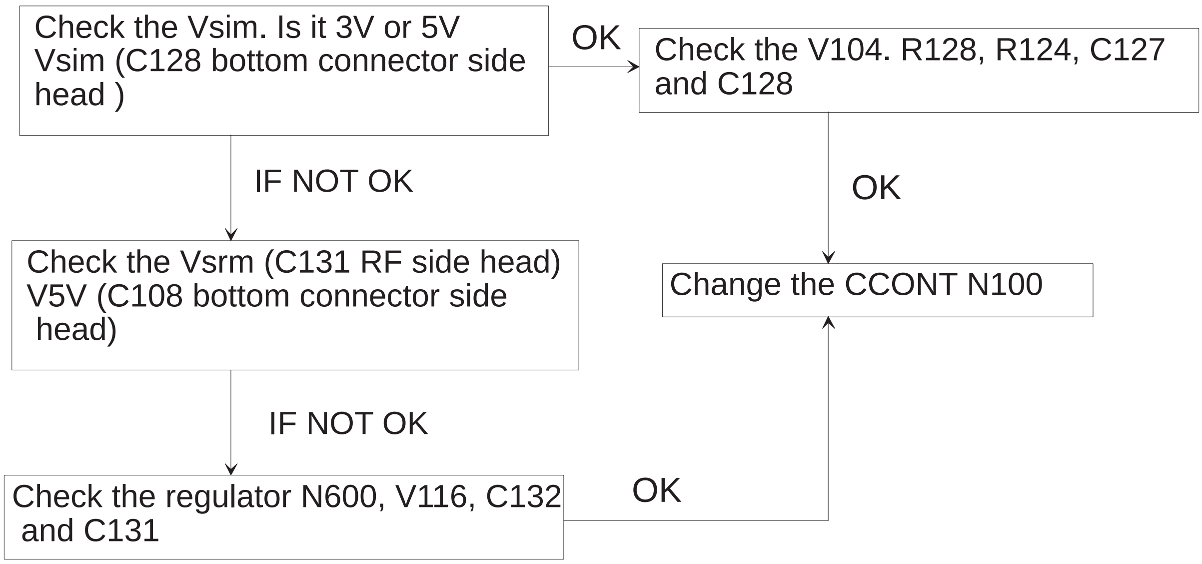
MCU self tests are devided to those executed while power up (start up tests) and ones that can be executed with connected PC. The tests and included items are as follows:

1. MCU ROM checksum
Calculates 16 bit checksum out of Flash code and compares it to one found in Flash.
Items being checked are:
MAD2 <—> Flash data and address lines, CE0,CE1, WE, BYTE, Vcc, GND, Flash internal functionality
2. MCU RAM interface
3. MCU RAM component
4. MCU EEPROM interface
5. MCU EEPROM component
6. RTC battery
7. CCONT interface
8. A/D converter
9. SW reset
A. Power off
B. Security data
C. EEPROM tune checksum
D. PPM checksum
E MCU download DSP
F. DSP alive
G. COBBA serial
H COBBA parallel
I. EEPROM checksum
K. PPM validity

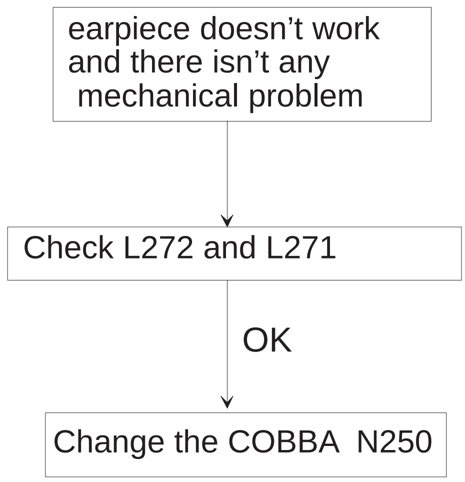
SIM related faults

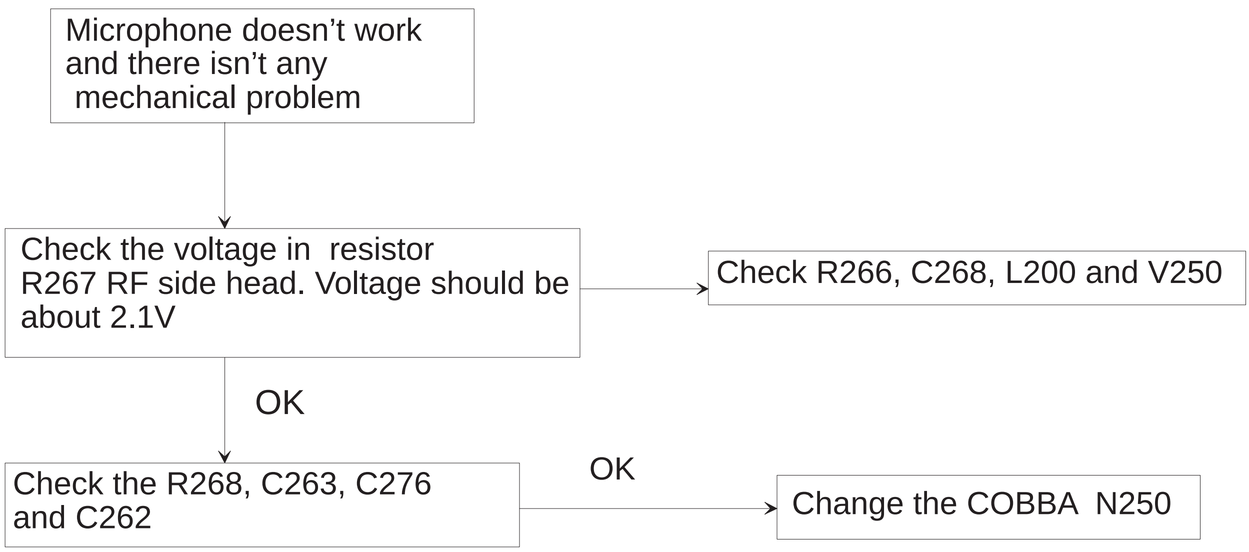
The hardware of the SIM interface from MAD2 (D200) to the SIM connector (X302) can be tested without a SIM card. When the power is switched on and the BSI line is grounded by a resistor, all the used lines (VSIM, RST, CLK, DATA) rise up to 5 V four times. Thus “Insert SIM card” faults can be found without SIM card.

The fault information “Card rejected” indicates that ATR message (the first message is always sent from card to the phone) is sent from card but the message is somehow corrupted, data signal levels are wrong etc. or factory set values (stored to the emulated EEPROM) are not correct.



Audio faults





Headset earpiece doesn't work and there isn't any mechanical problem

Check R 257,R256, R270, L303, L304, C303, C304, C296, C297, R218 and R219

OK

Change the COBBA N250

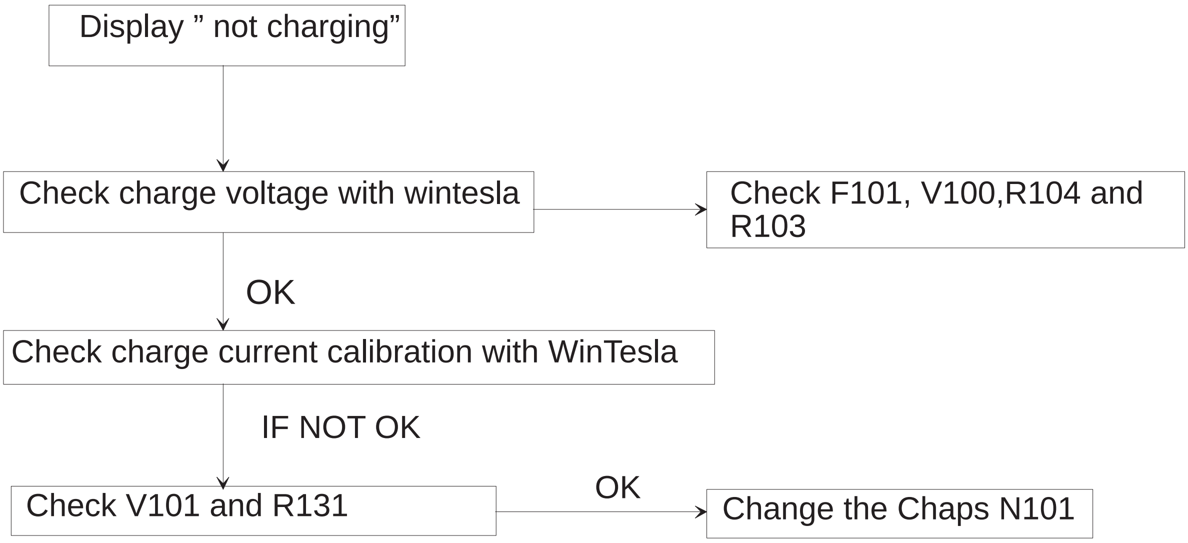
Headset earphone doesn't work and there isn't any mechanical problem

Check R 257,R256, R270, L303, L304, C303, C304, C296, C297, R218 and R219

OK

Change the COBBA N250

Charging fault



RF Testpoints (reference pictures at the back of the binder after schematics diagrams)

RX

DC levels (oscilloscope)

Point	Signal	Component	Comment	Picture
RX1	RXIP and RXQP	R530	I/Q signals (67 kHz) from Hagar to COB-BA.	1
RX2	RXIP and RXQP	C522 and C523	Same that RX1 but before AGC state	2
RX3 RX4	EGSM LNA ctrl DCS LNA ctrl	C611 / V907 C642 / V905	~2.8 V burst controls LNA ON/OFF	3
RX5	Rxref	C534 / R533	DC 1.2 V from COBBA to Hagar	na
RX6	VREF_2	C564 / R563	DC 1.5 V from CCONT to Hagar	na
RX7	Vlna	C562	DC 2.8 V from CCONT to Hagar	3
RX8	Vrxrf	C557	DC 2.8 V from CCONT to Hagar	na
RX9	Vsynte	C561	DC 2.8 V from CCONT to Hagar	na

RF levels (spectrum analyzer)

Point	Signal	Comp.	Comment
RX10	925 … 960 MHz	Z600	Second saw–filter EGSM output to baluuns, (–44dBm) (check level from reference engine)
RX11	1930…1990 MHz	Z600	Second saw–filter DCS output to baluuns, (–41dBm) (check level from reference engine)
RX12	925 … 960 MHz	Z620	First saw–filter EGSM output to LNA, (–55dBm) (check level from reference engine)
RX13	1930…1990 MHz	Z620	First saw–filter DCS output to LNA, (–58dBm) (check level from reference engine)

TX

DC levels

Point	Signal	Component	Comment	Picture
TX1 TX19	VPCTRL_P VPCTRL_G	C714 / R744 C711 / R745	PA Power control DCS PA Power control GSM	4
TX2	Vdd1	C755 / L755	Battery voltage to PA Vbatt 3.3 … 4.8 V	5
TX18 TX16	TXVGSM TXVDCS	C746 C747	~2.5 V pulse controls antenna switch	6
TX6 TX7	TXVdet DET0	C731 / R730 R764 / R763	Operating voltage to TX detector 2.8 V burst and detected TX level to HAGAR	7
TX8	TXQ	C540	TX Q signals from baseband to Hagar (+ – 67 kHz, DC level 1.2 V, swing level 1.32 V)	8
TX9	TXI	C541	TX I signals from baseband to Hagar (+ – 67 kHz, DC level 1.2 V, swing level 1.32 V)	8
TX10	TXC	R792 / C792	TX power control voltage from baseband to Hagar 0…2.2 V burst	4

RF levels

Point	Signal	Component	Comment
TX12	RX and TX	Z670 / ant.	Final TX frequency and level, (32,5 dBm, EGSM / lev 5) (29,5 dBm, EGSM / lev 0) (check level from reference engine)
TX14 TX20	PA output GSM PA output DCS	C758 C743	PA output signal *) (check level from reference engine)

TX13 TX21	Antsw input GSM Antsw input DCS	Z670, TX1 GSM Z670, TX2 DCS	Antsw input signal (check level from reference engine)
TX15	PA input DCS	C 734	about 2 dBm (check level from reference engine)
TX17	PA input EGSM	C710/C751	about 1 dBm (check level from reference engine)
TX22	PWR detector input	V730 input	Depends on band, (14 dB below TX output) (check level from reference engine)
TX23	EGSM SAW input	Z700 / C701	about 5 dBm (check level from reference engine)

*) Not measureable if PA shield is on.

VCO

DC levels

Point	Signal	Component	Comment	Picture
VCO1	VCC	C804	2.64 V DC VCO operating voltage	9
VCO2	Vchp	C783	4.7 V DC from reg. N600 to VCO	9
VCO3	VCP	N600 pin 6	5.0 V DC from CCONT to reg. N600	9
VCO4	VC	R802 / G800	0.5 V … 4.2 V burst DC from Hagar to VCO	9

RF levels

Point	Signal	Component	Comment
VCO5	3520…3980 MHz	G800 / C788	VCO signal needs 4 GHz spectrum analyzer.*) level ~0dBm (check level from reference engine)

*) RF input signal of PA and VCO operating voltages can be used to check VCO condition if only 3 GHz spectrum analyzer is availlable.

VCTCXO

DC levels

Point	Signal	Component	Comment
VXO1	Vtcxo	C831	VCTCXO operating voltage from CCONT DC 2.8 V
VXO2	AFC	C836	AFC from COBBA to VCTCXO DC 0.046…2.254 V

RF levels

Point	Signal	Component	Comment	Picture
VXO3	26 MHz	G830 / C833	Clock signal from VCTCXO to Hagar	10
VXO4	13 MHz	V800 / R834	RFC from Hagar to MAD	10

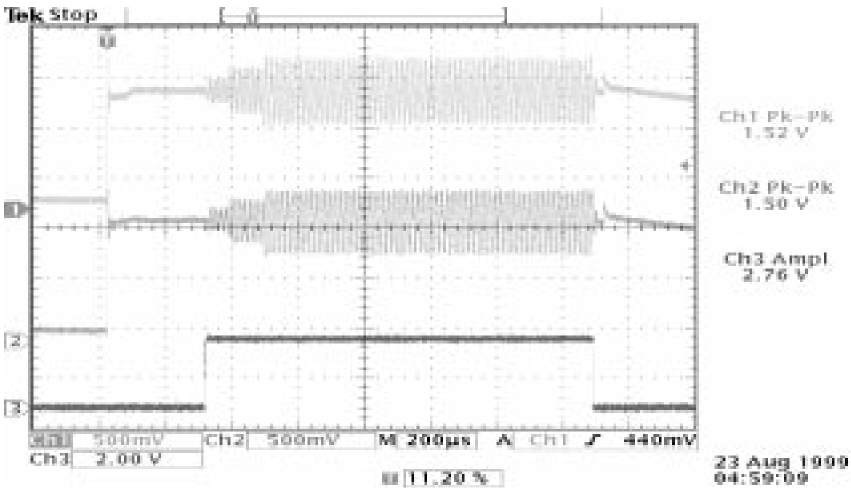
Other checking points

SCLK R205
SENA R206
SDATA J237

Pictures from RF measurement points

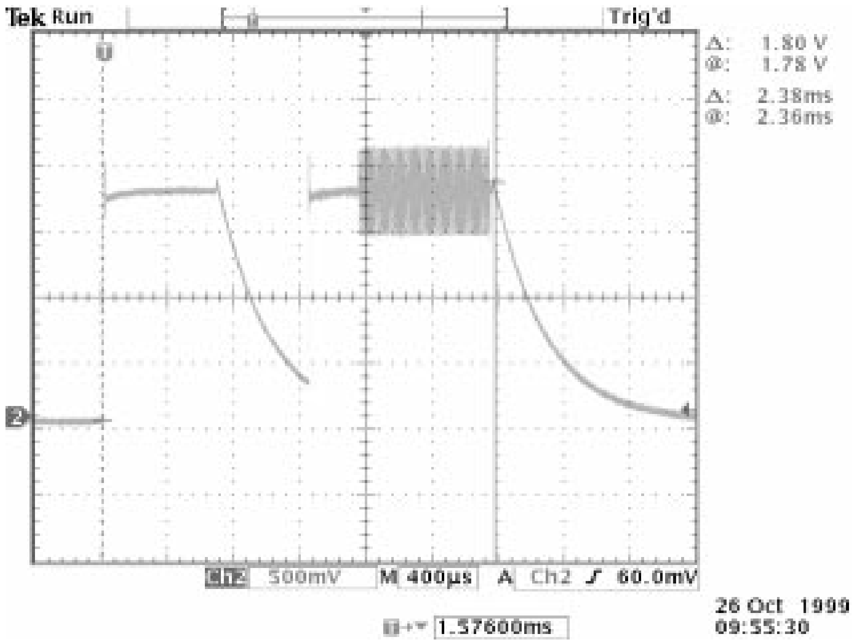
Picture 1. RX I/Q from Hagar to baseband

Pin = –58dBm, Fin = 947,06771MHz (RSSI Reading ≈ –60dBm)
Channel 1: RX1 RXIP R530
Channel 2: RX1 RXQP R530
Channel 3: RX3 LNA_G V907
Note the premonitoring steps at the beginning of the burst.



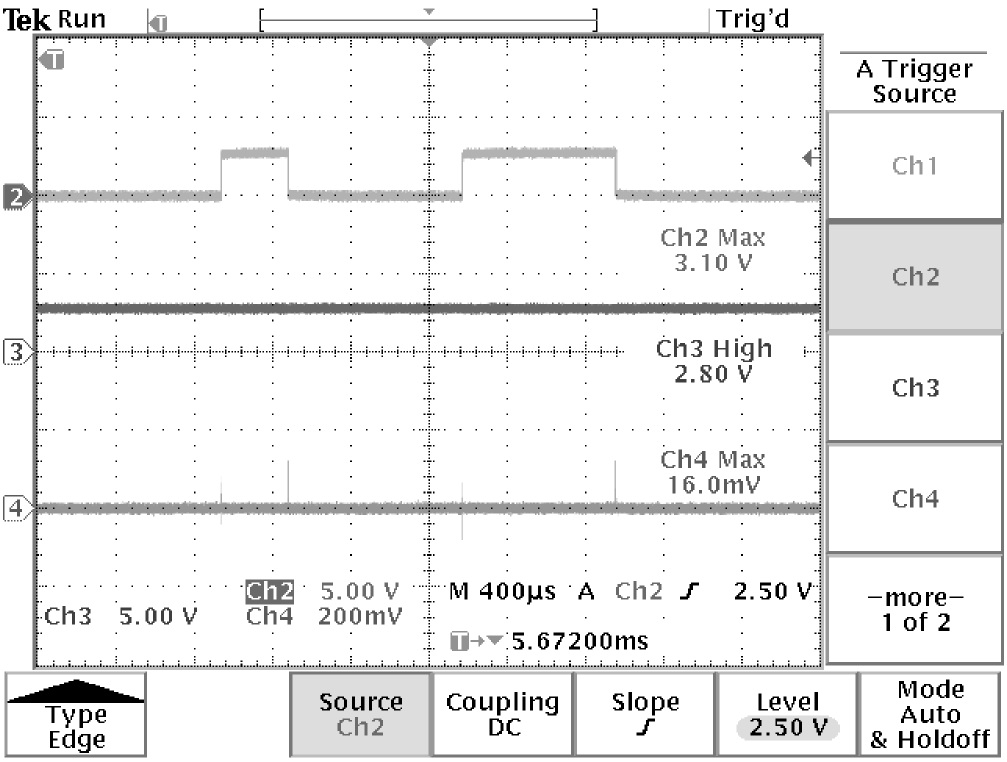
Picture 2. RX I/Q before AGC

Pin = –50dBm, Fin = 947,06771MHz
Channel 1: RX2 C522



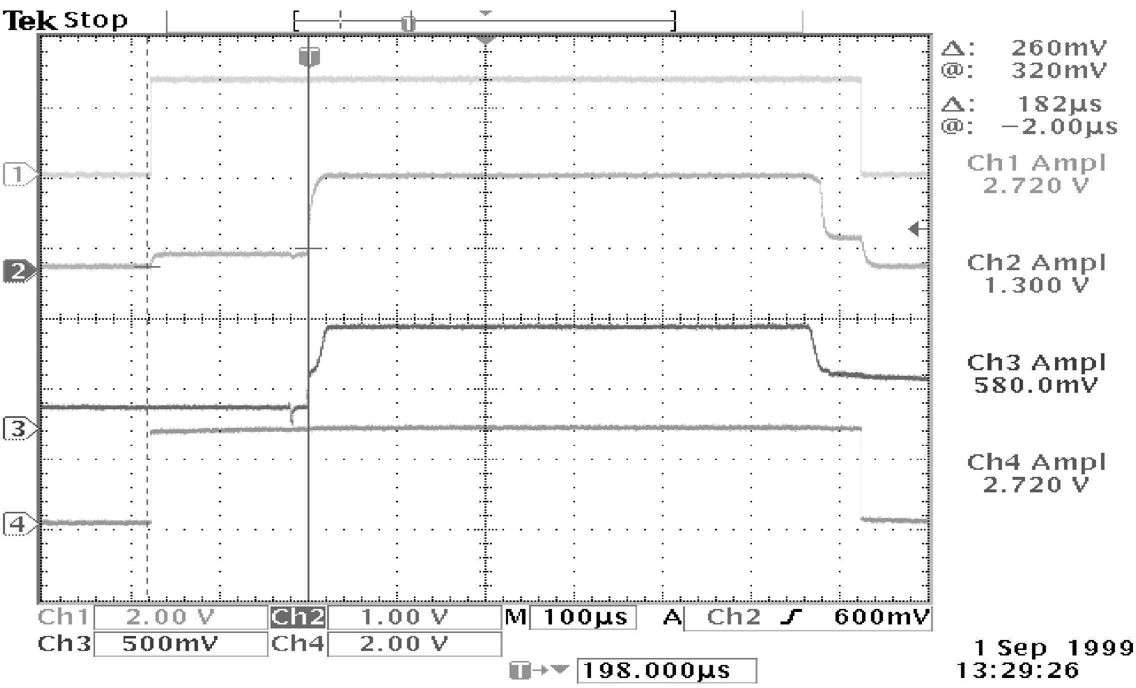
Picture 3. LNA control

Channel 2:	RX3, base of V907, (equals RX4, base of V905 in upperband mode)
Channel 3:	RX7: Vlna,
(Channel 4:	RX4 base of V905)



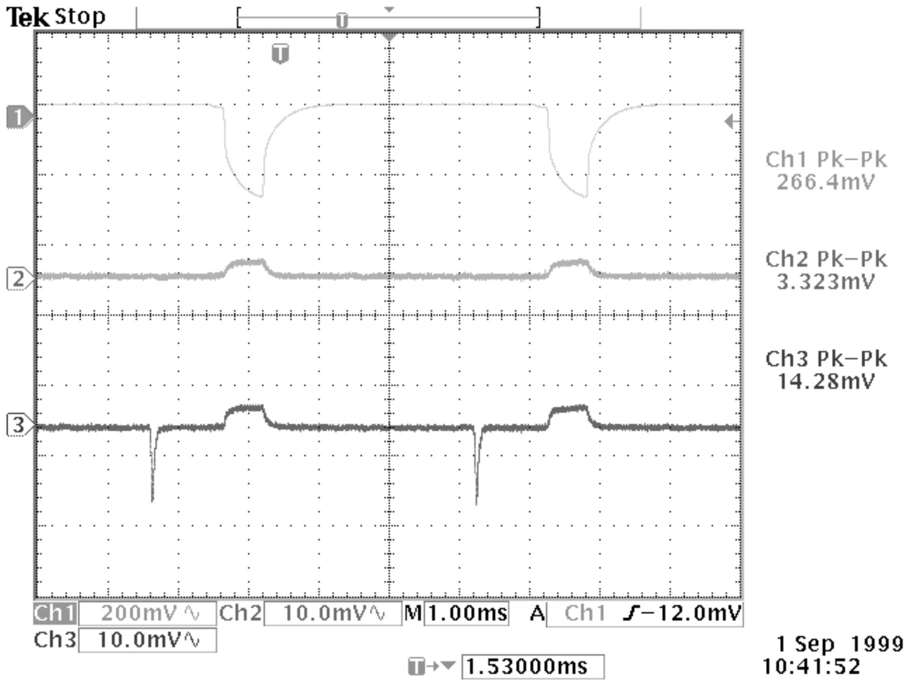
Picture 4. PA selection and control

Condition:	EGSM TX, burst mode powerlevel 10
Channel 1:	TX3 TXP, J519
Channel 2:	TX19 C711, VPCTRL_G, (equals TX1 C714, VPCTRL_P, in upperband mode)
Channel 3:	TX10 C792, TXC EGSM, (equals TX10, C792, TXC DCS in upperband mode)
Channel 4:	TX4 C722, VtxB EGSM, (equals TX5, C752, VtxB DCS in upperband mode)



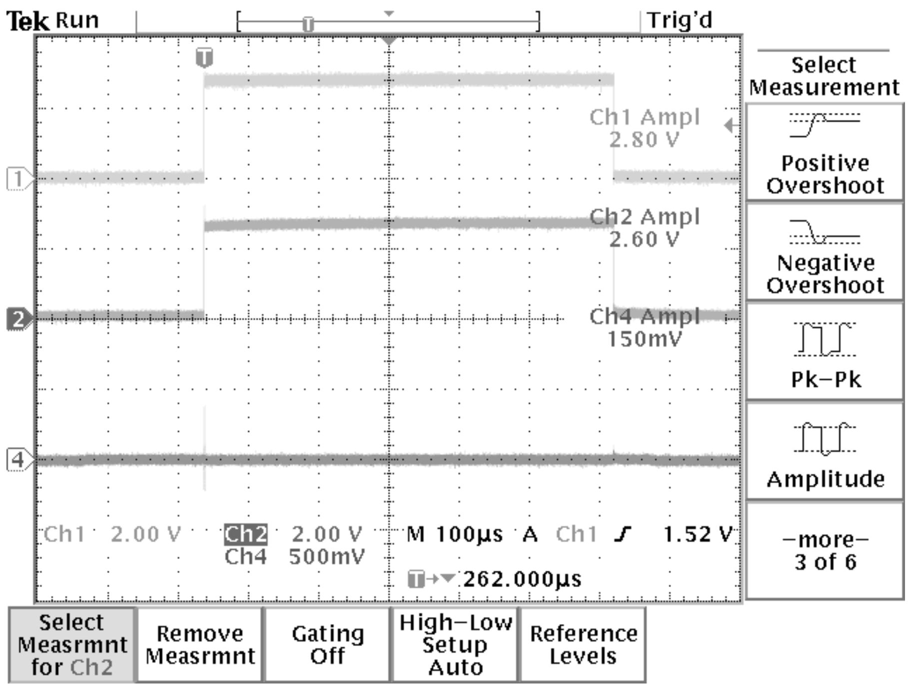
Picture 5. VBATT during TX burst

Condition: EGSM TX, burst mode powerlevel 5
Channel 2: VCO1 , c (VCO) C805
Channel 3: VCO4, Vc (VCO) C803
Channel 1: TX2, VBATT



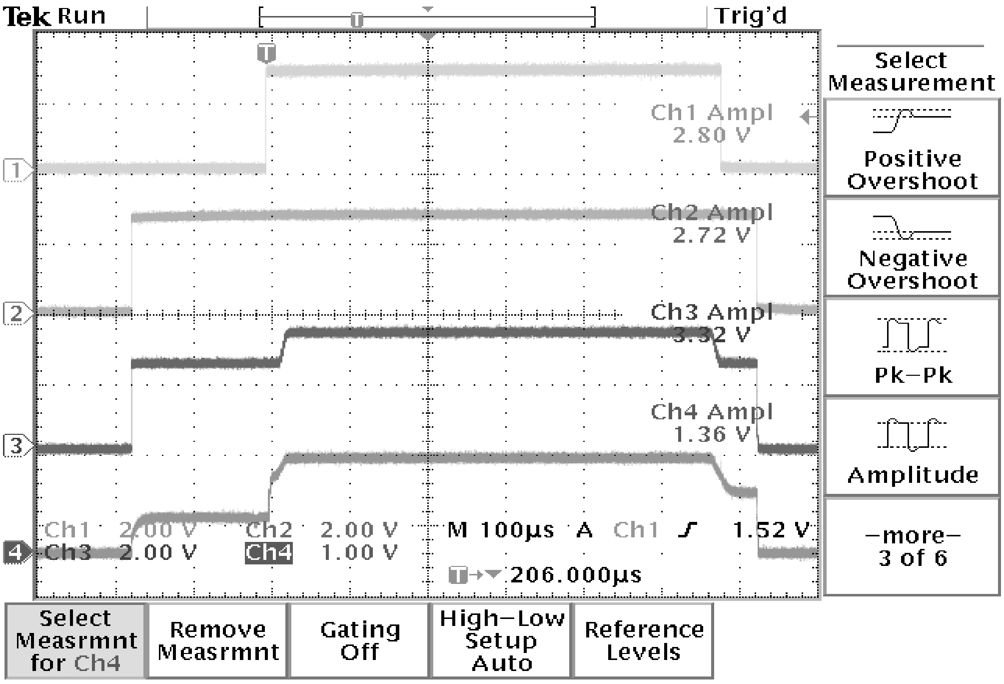
Picture 6. Switch control

Channel 1: TX3: TXP, J519,
Channel 2: TX10: C746, TXVGSM (equals TX16: C747, TXVDCS in upperband mode)
(Channel 4: TX16: C747, TXVDCS)



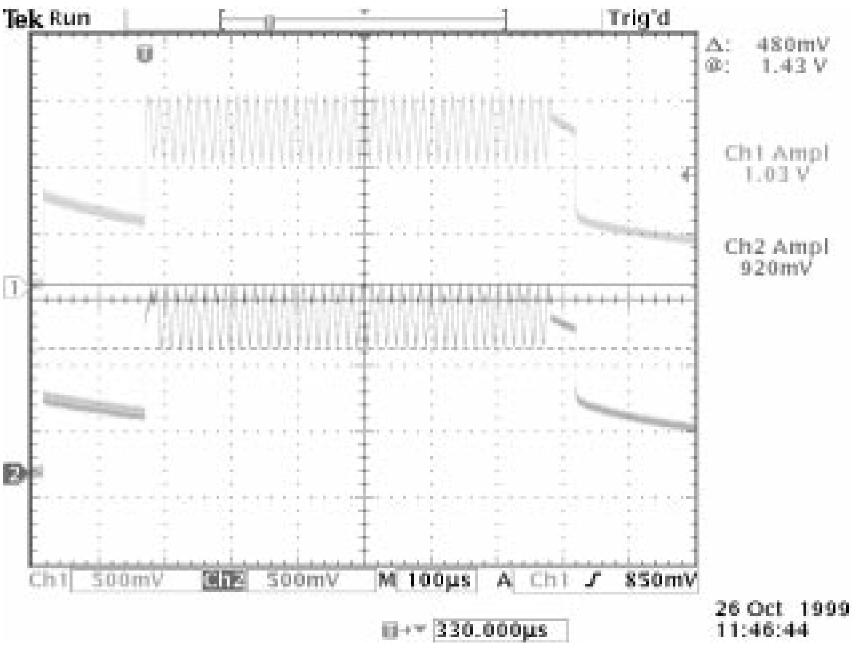
Picture 7. Power detector control

Condition:	EGSM TX, burst mode powerlevel 10
Channel 4:	TX11: C790, DET0,
Channel 3:	TX7: C761, DET0,
Channel 2:	TX6: R754, TXVDET,
Channel 1:	TX3: TXP, J519,



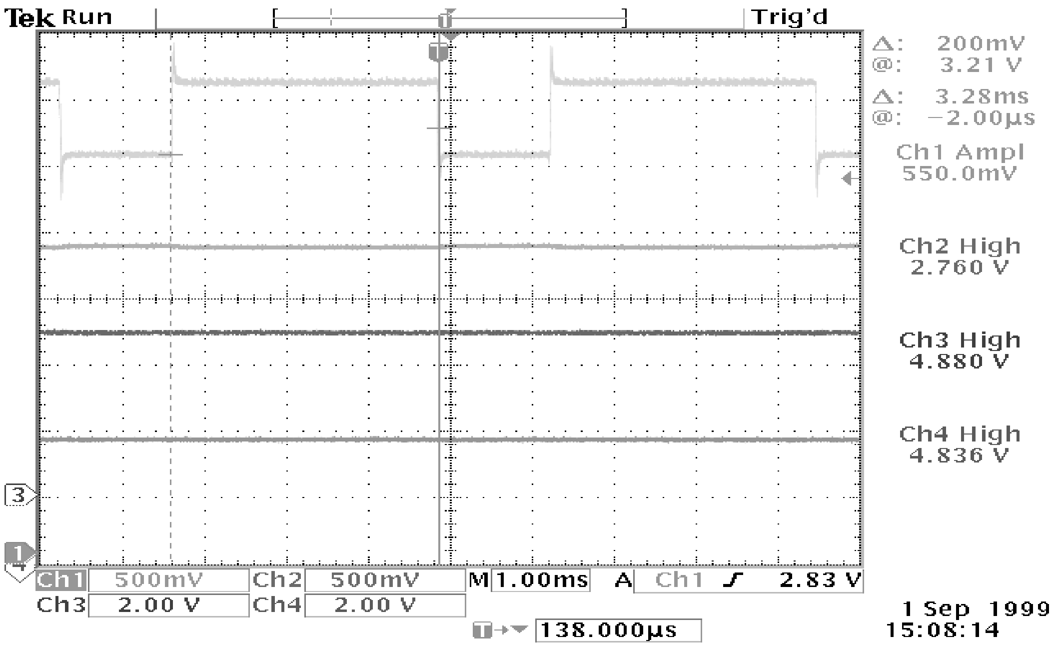
Picture 8. TX IQ signals

Channel 1: TX8 TXQN
Channel 2: TX9 TXIN
(TX burst mode Cont1)



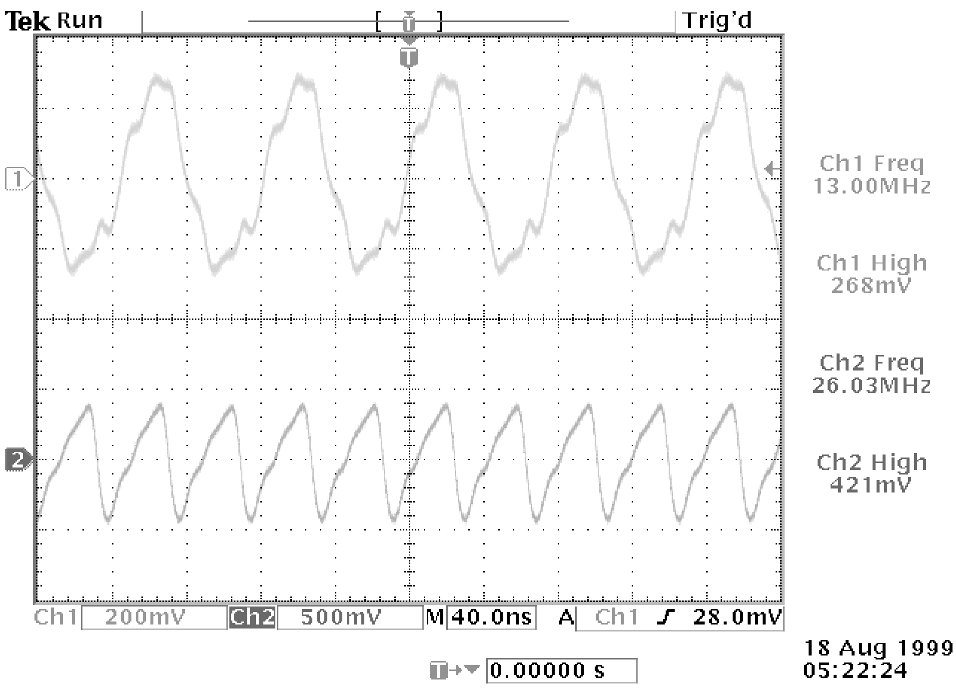
Picture 9. VCO, operating voltages

Conditions: DCS RX in burst mode, RX ch810, Monitoring ch512
Channel 1: VCO4 C803,Vc
Channel 2: VCO1 C805, Vcc
Channel 3: VCO3 N600, Vin
Channel 4: VCO2 C782, Vchp



Picture 10. Clock signals, VCTCXO, RFC

Channel 1: VXO3 L800, RFC
Channel 2: VXO4 R833, VCTCXO_out



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