CCS Technical Documentation
NSB-9 Series Transceivers

Troubleshooting Instructions

Issue 1 04/03

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RF Troubleshooting

Introduction

This document describes the methods of RF troubleshooting for Iris NSB-9 transceiver. Fault finding charts of the most common fails are included in this document. Arrows are marked with ✓ (OK) and ✗ (NOT OK), respectively. Measurement equipment is marked as:

DMM Digital Multimeter

OSC Oscilloscope

SA Spectrum Analyzer

Figures of typical signals and voltages at each testpoint are described in Chapter 8.

Location of testpoints are described in Chapters 9 and 10.

EQUIPMENT NEEDED:

NSB-9 module jig MJS-48, power and DAU-9S cables

DC power supply 3.9 VDC >3A

Radio Communication Tester with GSM850/1900 option

Spectrum analyzer and probe with frequency range up to 4 GHz

Digital multimeter (DMM)

Oscilloscope with 10:1 probe

PC with Phoenix software

USEFUL HINTS

Sometimes it is difficult to get reliable measurement results at high frequencies (500...4000 MHz) because of probe properties etc. If measurement results of faulty phone don't correspond to the results shown in this document it may be useful to measure a reference phone and finally, compare the results.

Special attention shall be paid with internal antenna. Visual inspection of antenna module (shape of radiator metal) is needed to verify that antenna is GSM850/1900 antenna - not GSM900/1800 used in similar European product. Both antennas behave very similarly in MJF-32 jig so it may be impossible to distinguish them by doing measurements over air interface.

TROUBLESHOOTING IN CASE OF RF TUNING FAIL

Channel Select Filter Calibration

Calibration is done using internal calibration circuit (UEM sends and receives a test signal to/from Hagar). VCO (G650), RX-bandfilters (Z501, Z551) and TX-filter/balun (Z700, T700) don't have any effect to the Channel Select Filter Calibration. Instead, baseband shall be functional (=VCTCXO G660 is running). Any failure in Hagar, its supply voltages or RX/TX IQ-lines may cause this calibration to be failed.

If baseband works and there are not any visible cause around Hagar (missing or broken components etc.), Hagar shall be replaced at first place.

RX Calibration

The most probably reason for this is lack of gain in receiver chain. Check rx chain according to RX850/1900 fault finding charts. In GSM850 RX, components Z520, V500 and Z501 should be checked. In GSM1900 RX, components Z520, V550 and Z551 should be checked.

If signal seems to pass rx chains with adequate gain, VCO function shall be checked. It is also possible that signal passes rx chain to Hagar and VCO is functional but signal doesn't appear in RX IQ-lines. In this case, Hagar shall be replaced.

RX AM Suppression Calibration

RX AM Suppression Calibration limits (LOPI, LOMI, LOPQ and LOMQ) are so wide that the calibration results can't exceed the limits. Instead, RSSI value measured after tuning may be too high. Also in this case, replacing Hagar may improve the result.

RX Band Filter Response Compensation

If RX Calibration results are ok but this compensation fails, the most probably reason for this is lack of gain (or too big gain) in receiver chain in some frequency. Check rx chain according to RX850/1900 fault finding charts. Retest rx chain also in low and high channels. In GSM850 RX, components Z520 and Z501 should be checked. In GSM1900 RX, components Z520 and Z551 should be checked.

TX Power Level Tuning

The most likely reason for this is lack of gain in transmitter chain. Check tx chain according to TX850/1900 fault finding charts. In GSM850 TX, components Z500, L750, N700 and Z700 should be checked. In GSM1900 TX, components Z500, L750, N700 and T700 should be checked.

If signal seems to pass tx chains with adequate gain, VCO function shall be checked. It is also possible that signal doesn't appear in TX IQ-lines. In this case, baseband shall be checked.

TX IQ Tuning

TX IQ tuning fails, if IQ-spikes in the spectrum can't be tuned low enough. If replacing Hagar doesn't help with this issue, VCO component (G650) and components around it

shall be checked.

TX 850 Troubleshooting

Phoenix commands

RF Controls ⇒ Band GSM 850 TX ⇒ Burst mode

Channel 190 ⇒ TX Power Level 10

TX PA Mode Free ⇒ TX Data Random

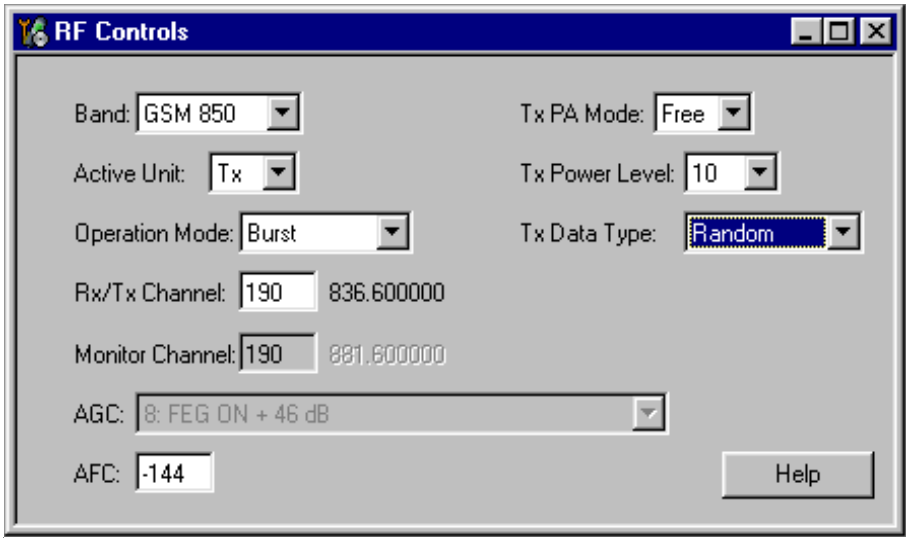
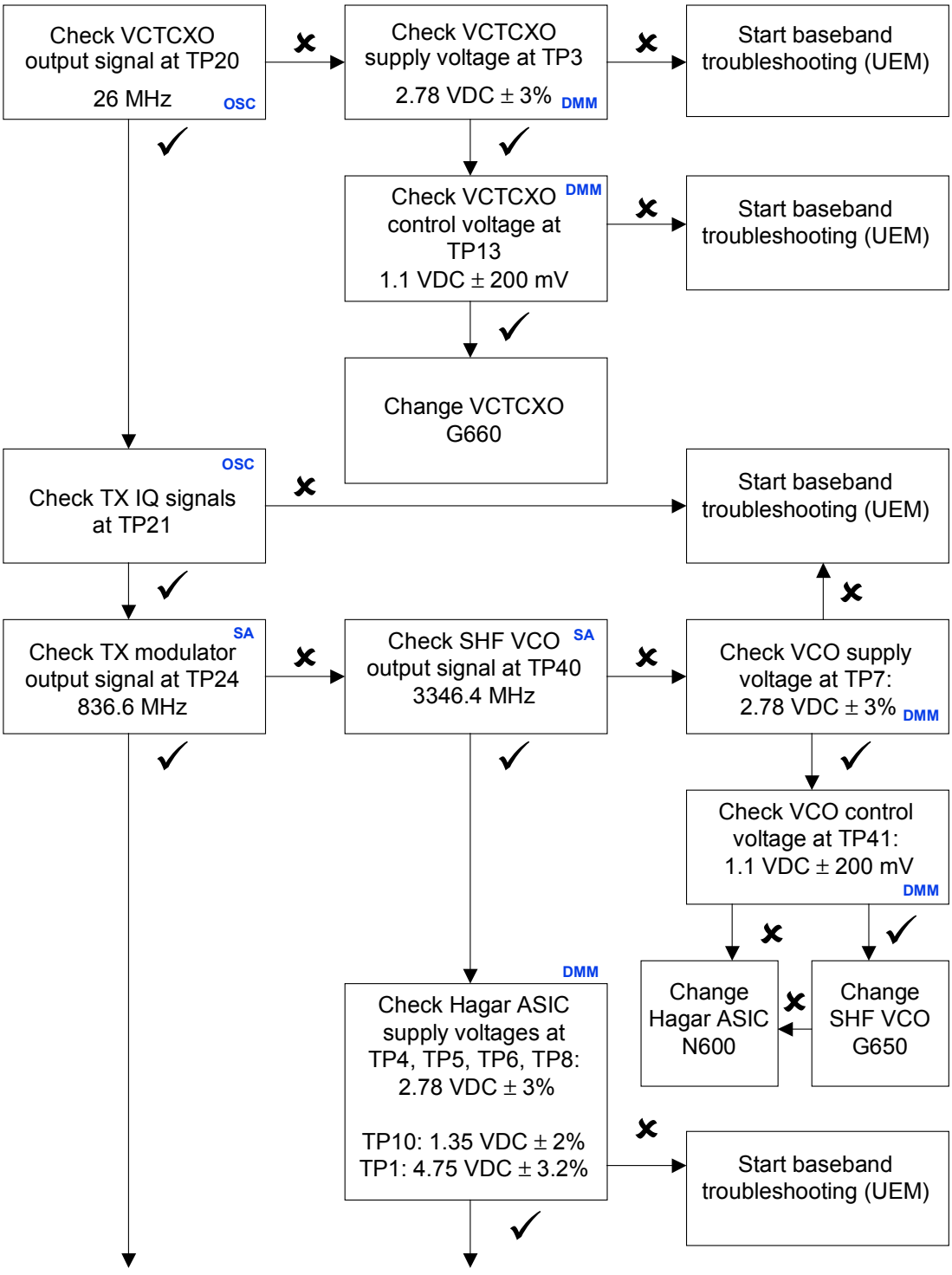
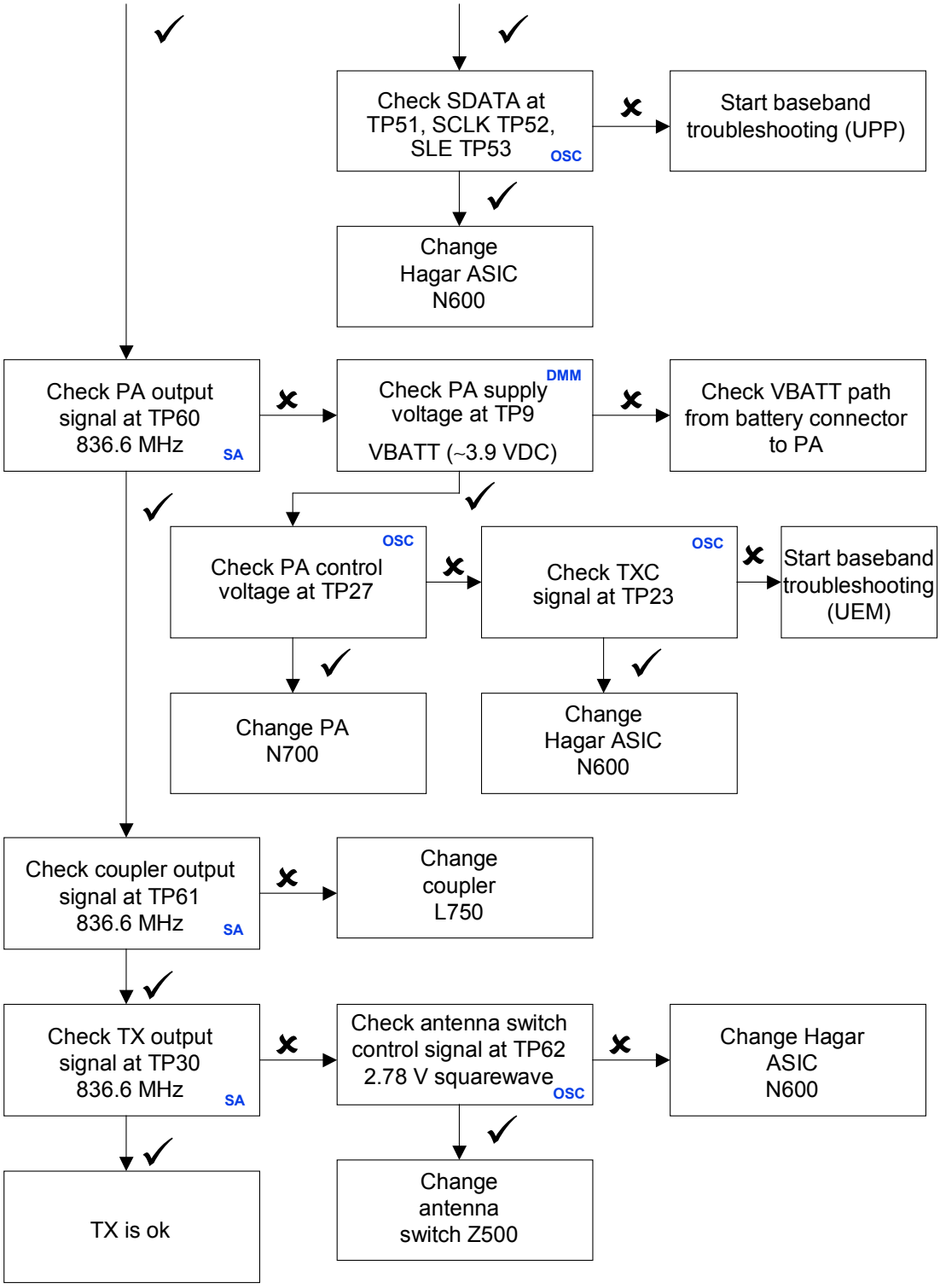


Figure 1: Fault finding chart, TX850





TX1900 TROUBLESHOOTING

Phoenix commands

RF Controls ⇒ Band GSM 1900 TX ⇒ Burst mode

Channel 661 ⇒ TX Power Level 10

TX PA Mode Free ⇒ TX Data Random

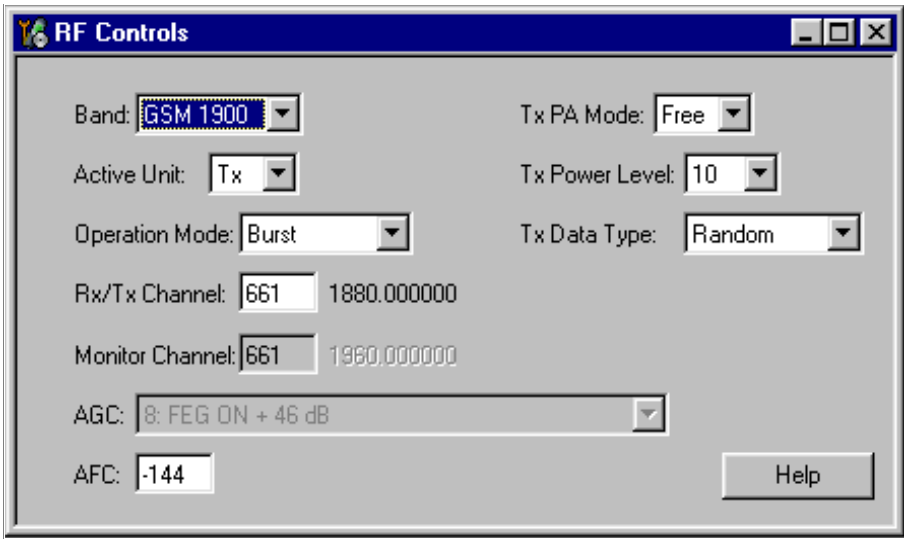
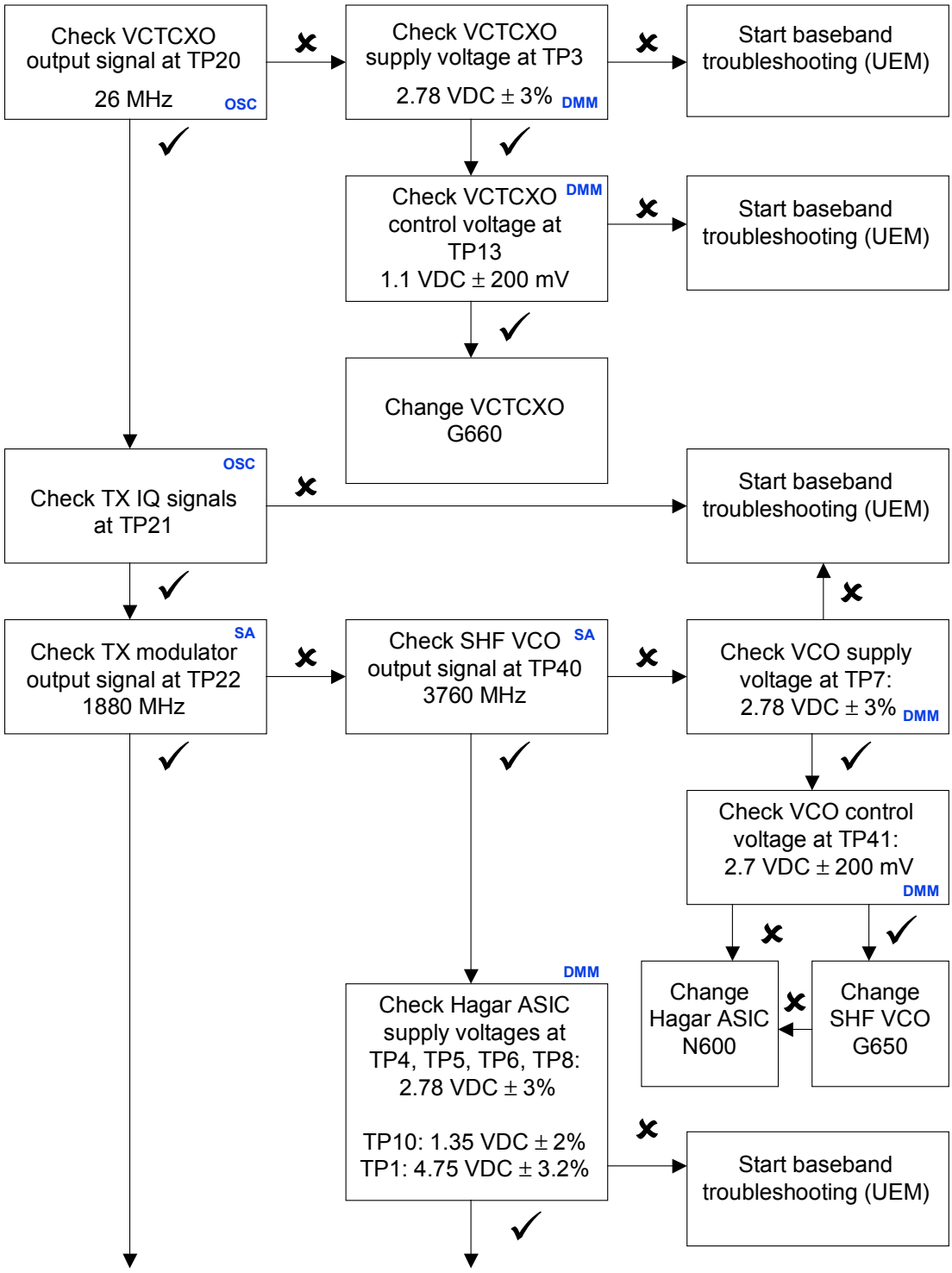
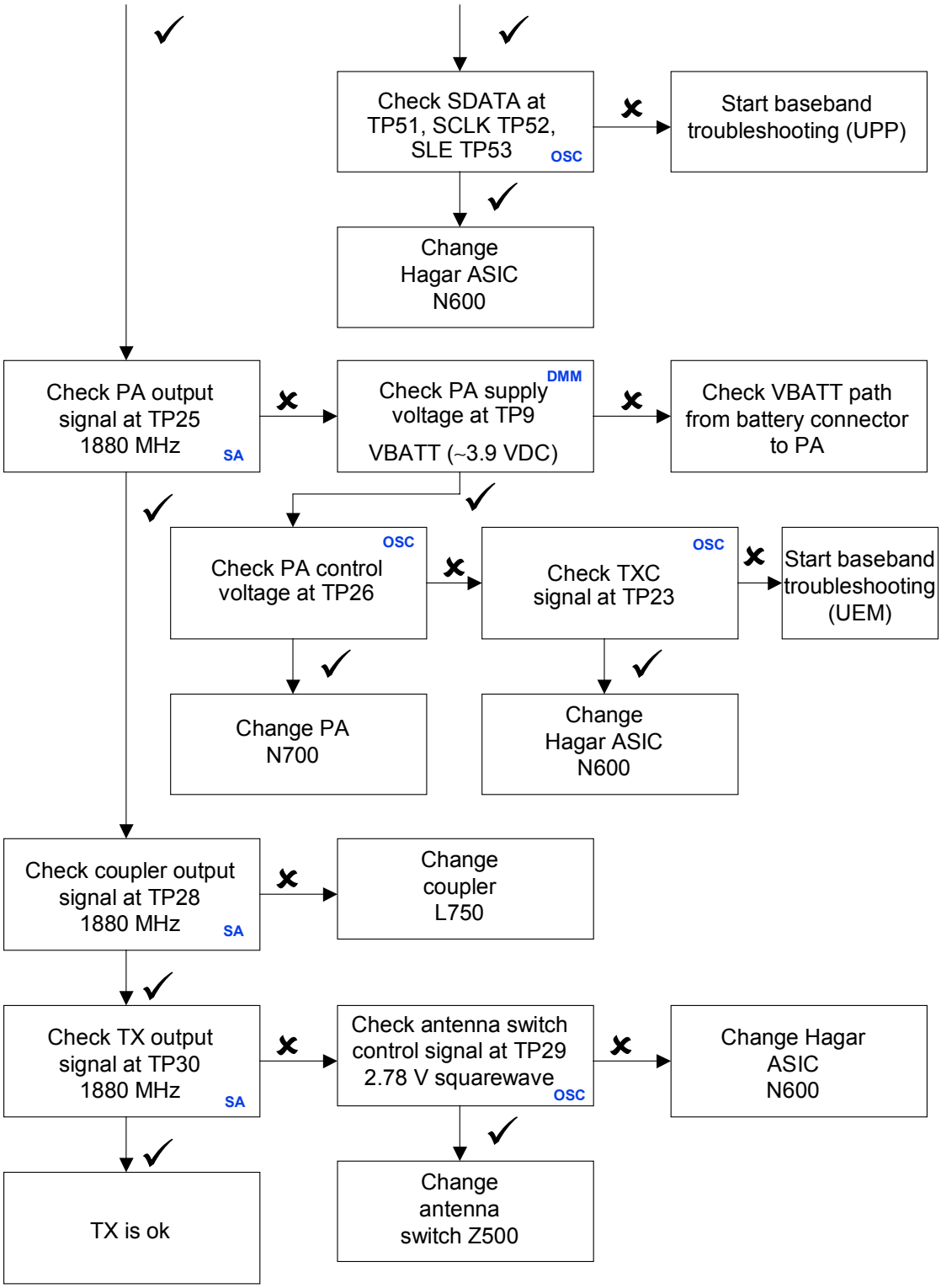


Figure 2: Fault finding chart, TX1900





RX850 troubleshooting

Phoenix commands

RF Controls ⇒ Band GSM 850 RX ⇒ Continuous mode

Channel 190 ⇒ AGC 8 FEG ON + 46 dB

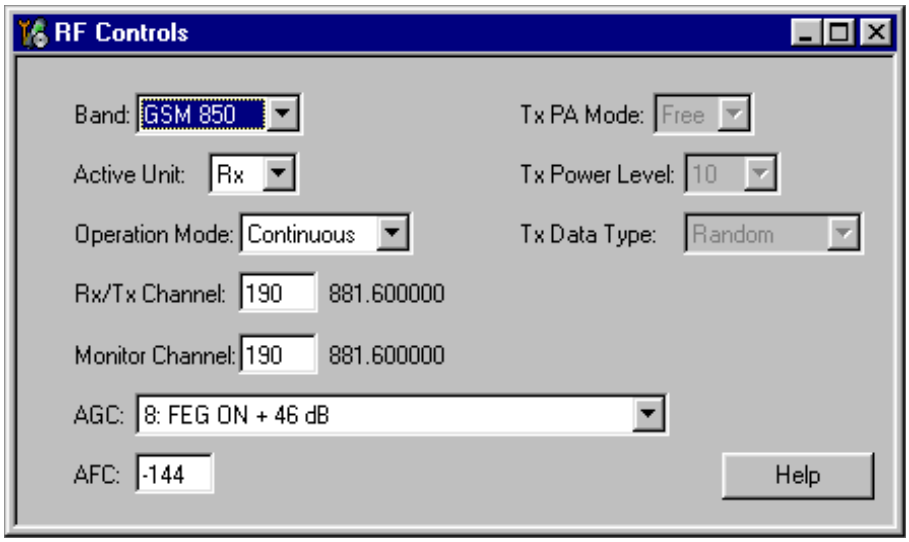
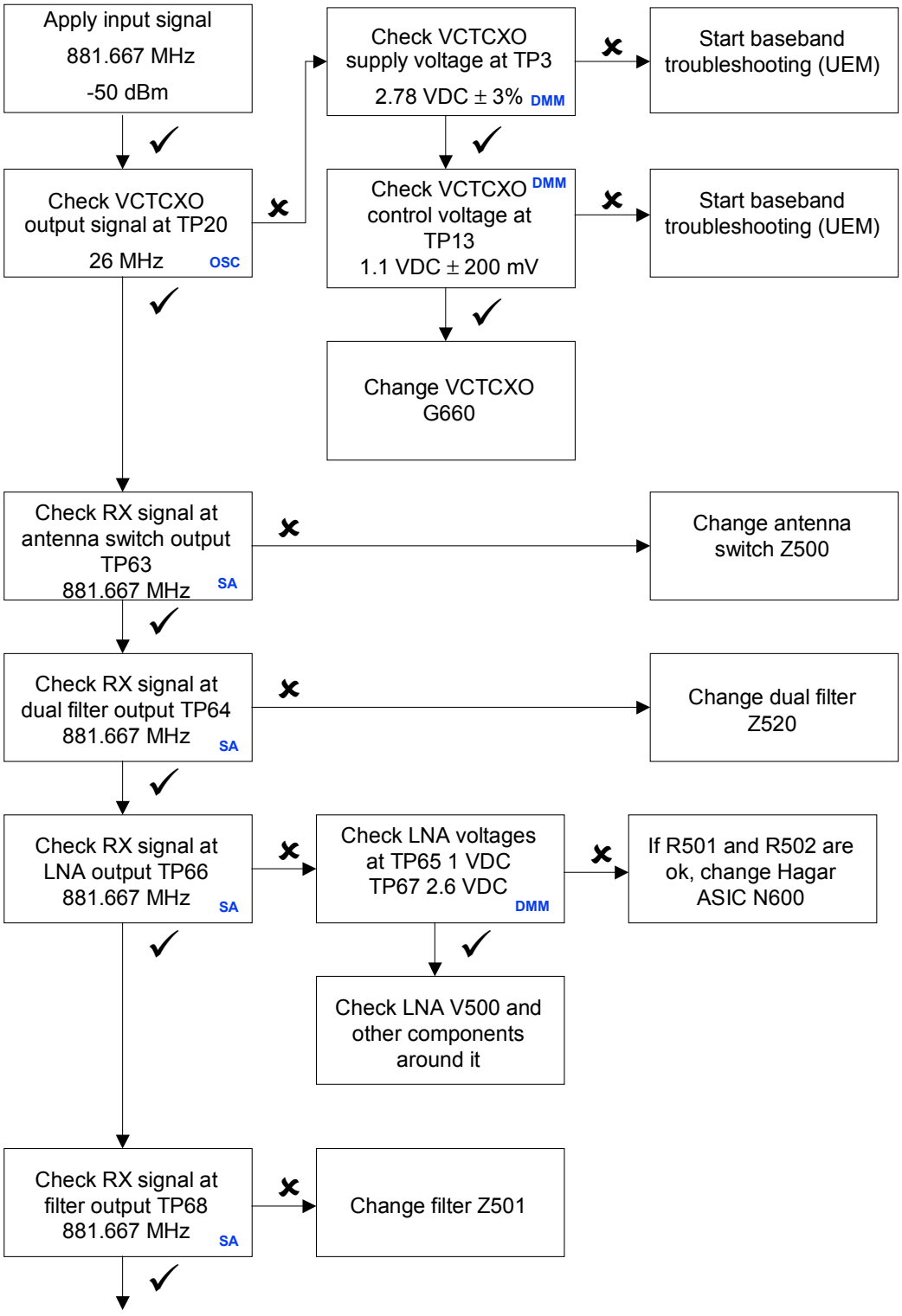
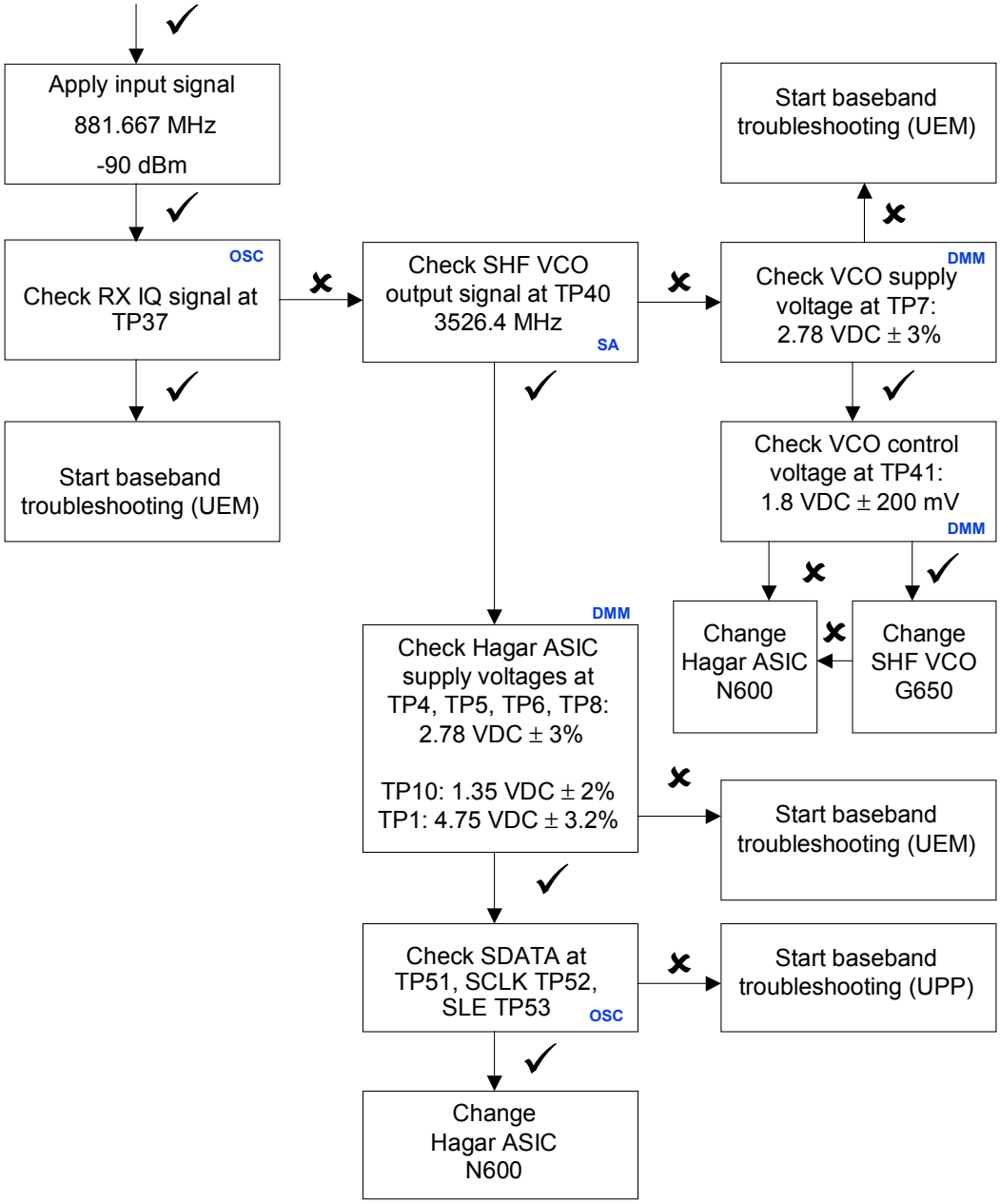


Figure 3: Fault finding chart, RX850





RX1900 Troubleshooting

Phoenix commands

RF Controls ⇒ Band GSM 1900 RX ⇒ Continuous mode

Channel 661 ⇒ AGC 8 FEG ON + 46 dB

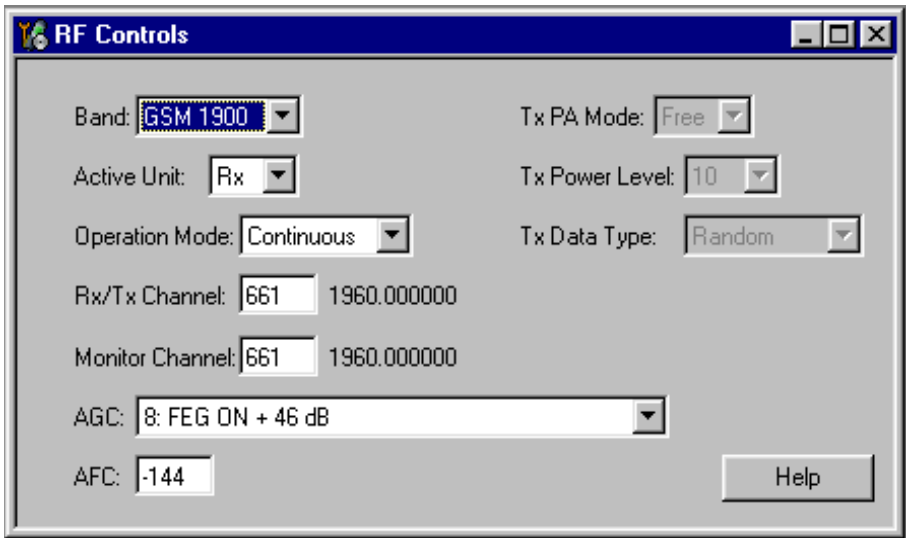
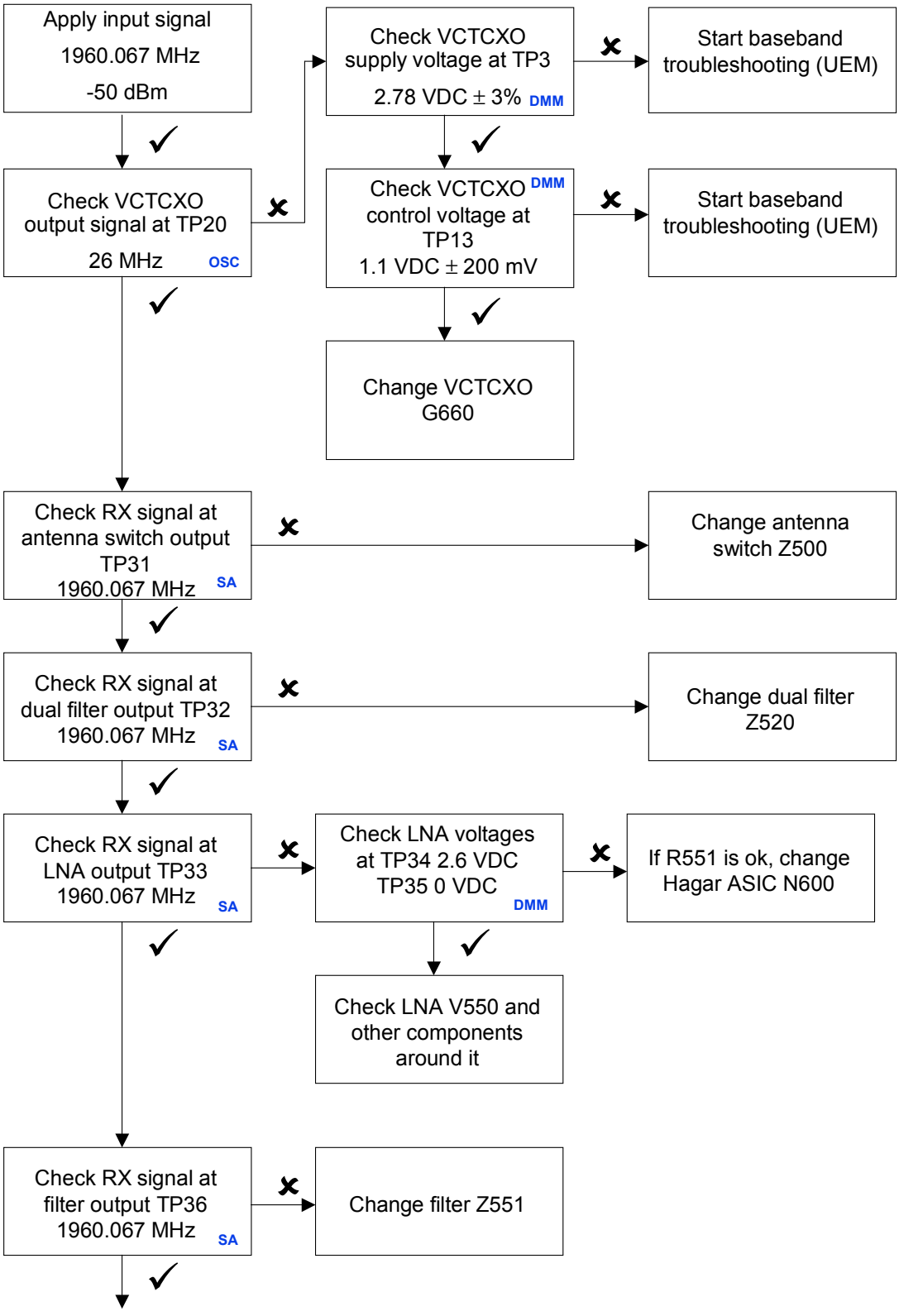
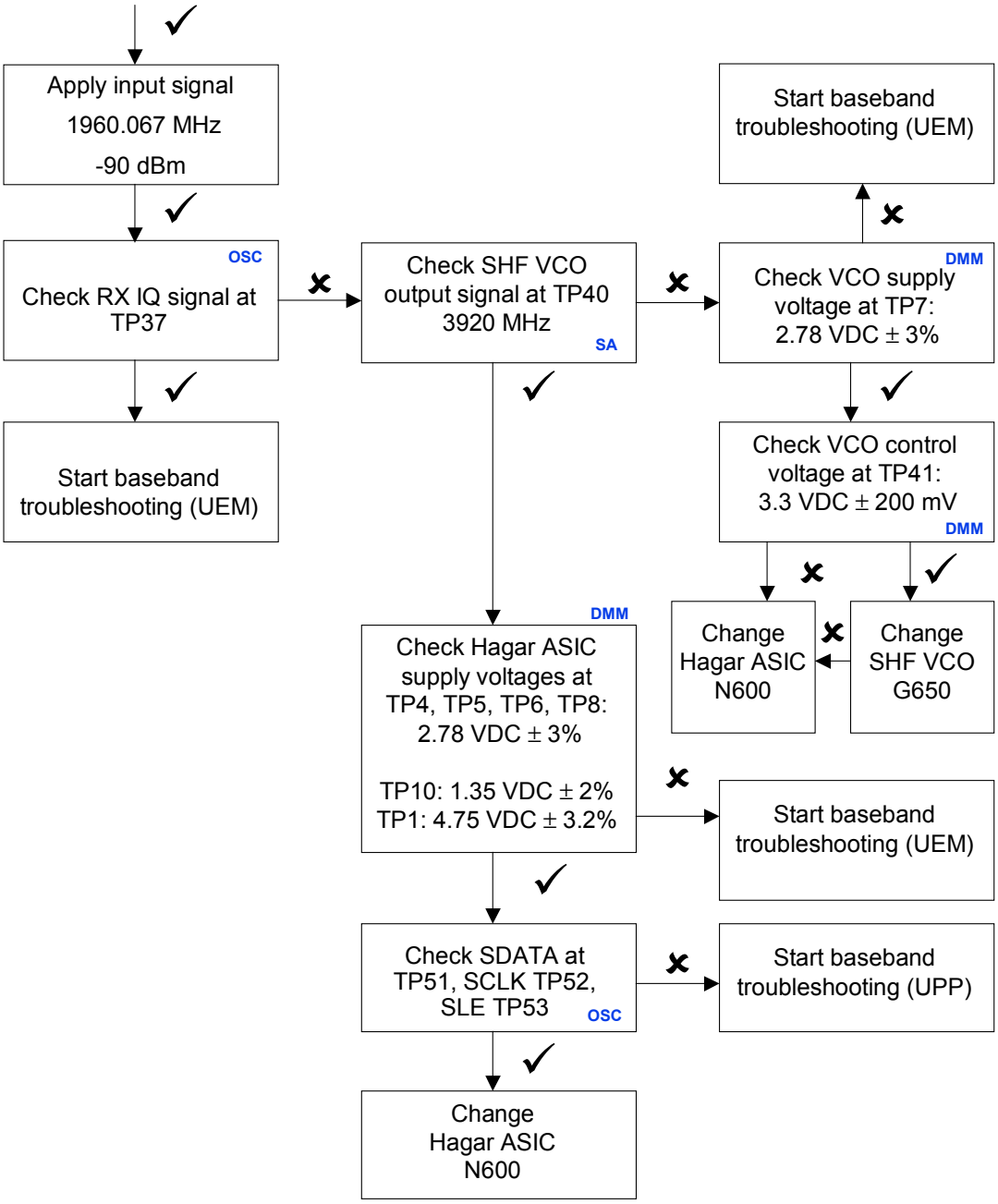


Figure 4: Fault finding chart, RX1900





Figures of signals and voltages in testpoints

Figure 5: TP20: 26 MHz VCTCXO output signal

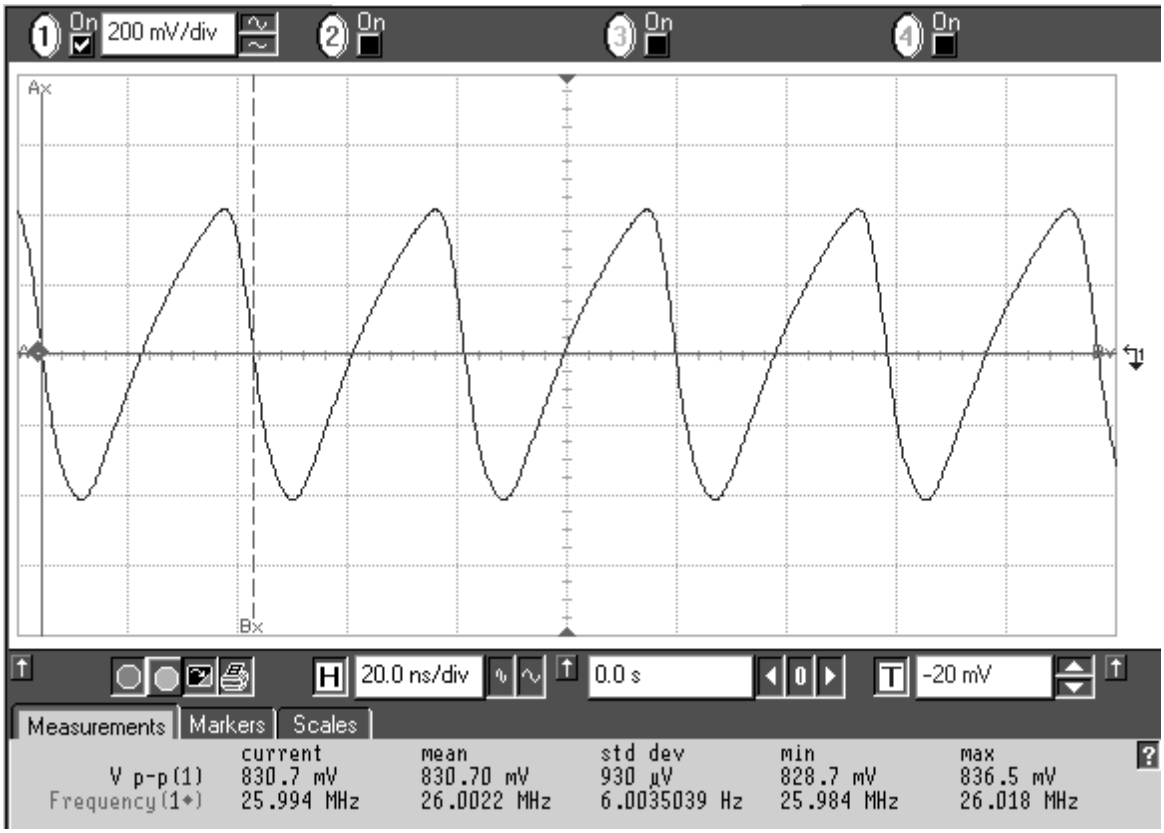


Figure 6: TP21: TX I/Q signal

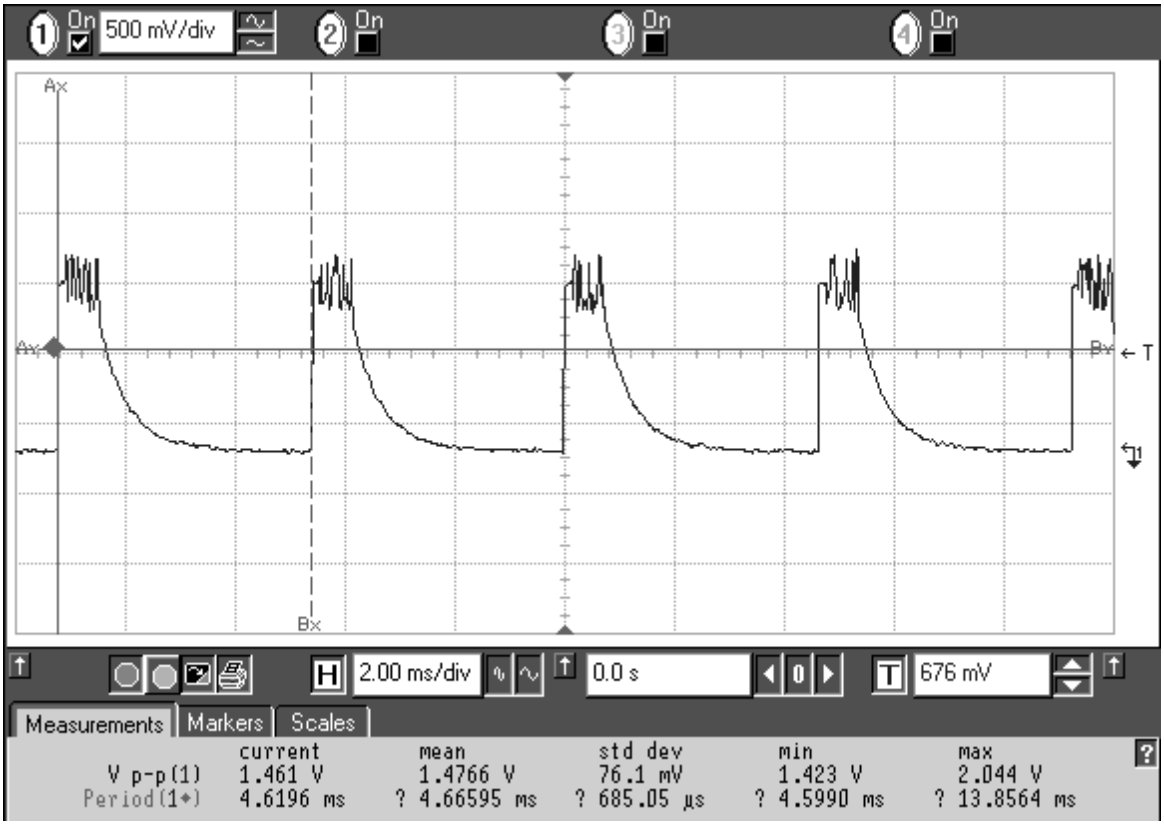


Figure 7: TP22: TX1900 modulator output signal

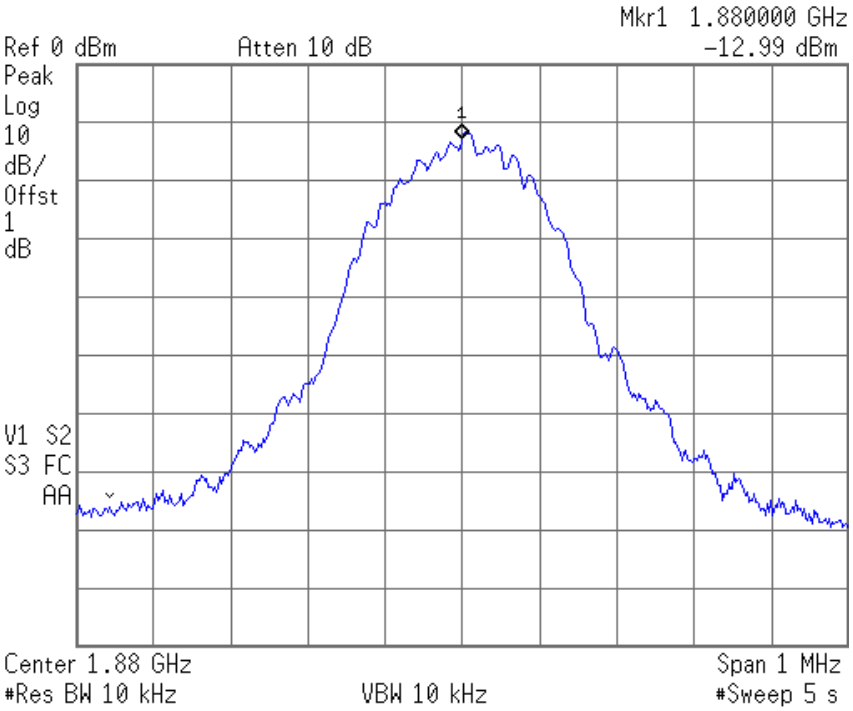


Figure 8: TP23: TXC signal from UEM ASIC

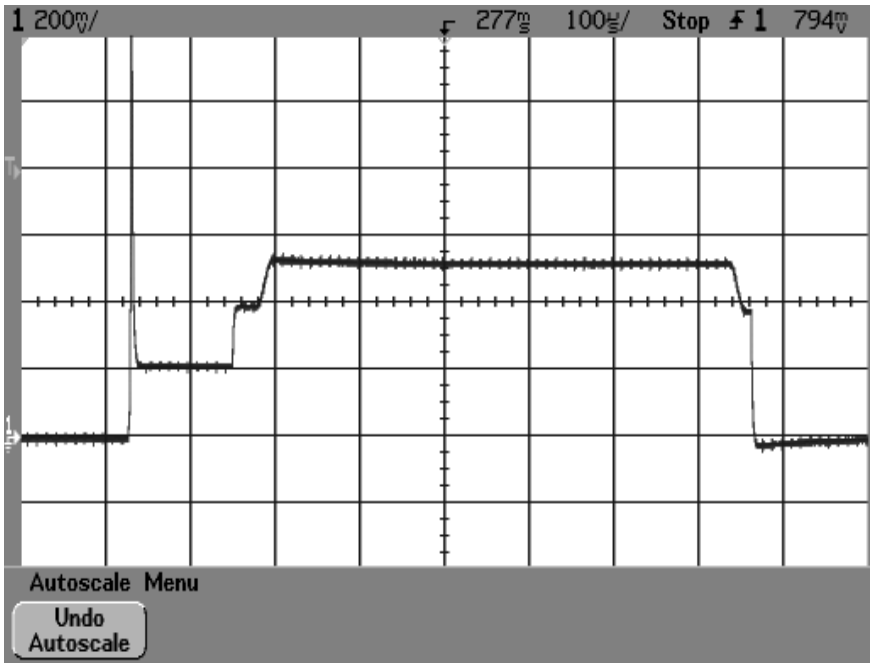


Figure 9: TP24: TX850 modulator output signal

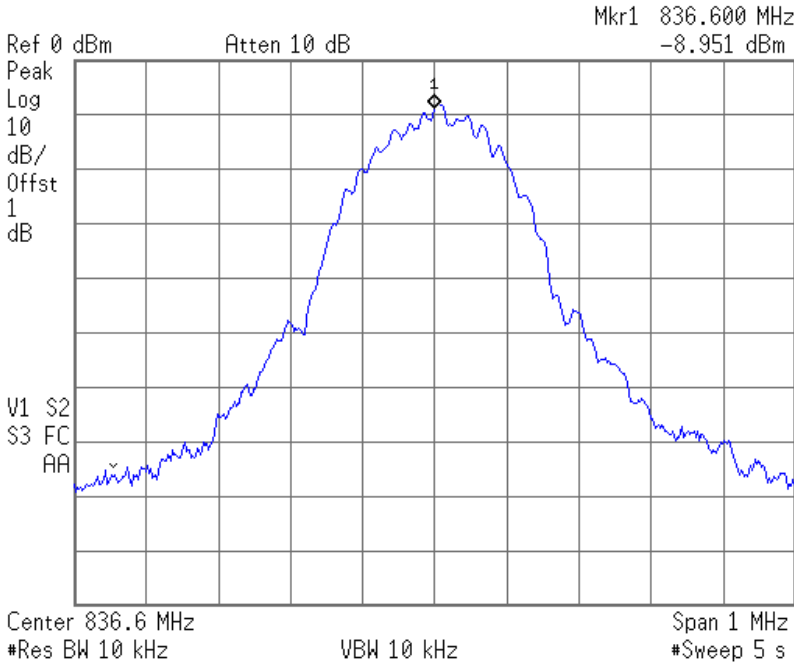


Figure 10: TP25: TX1900 PA output signal

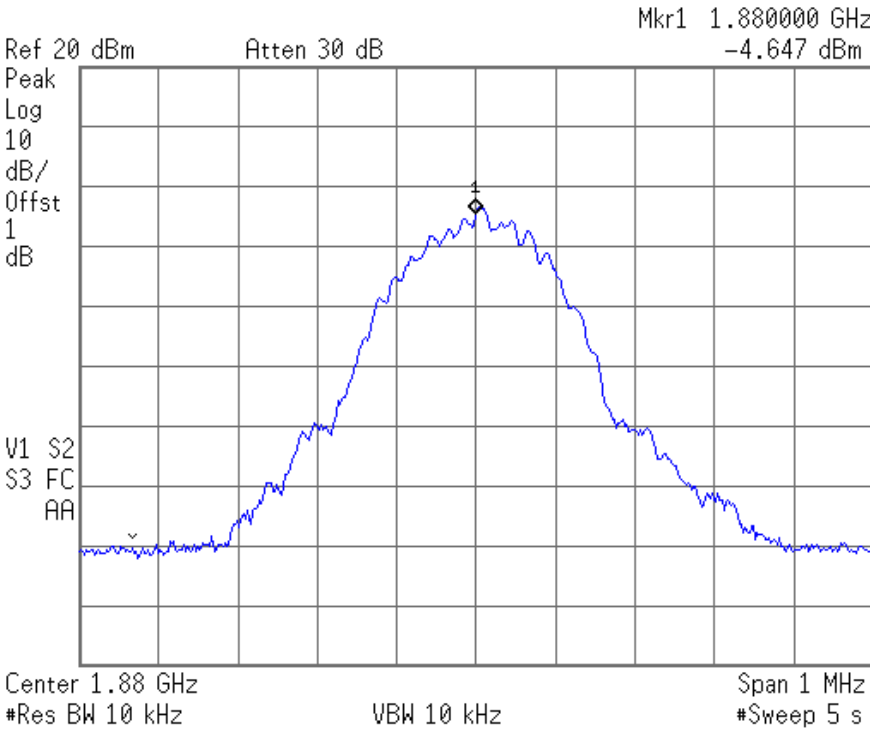


Figure 11: TP 26: TX1900 PA power control signal

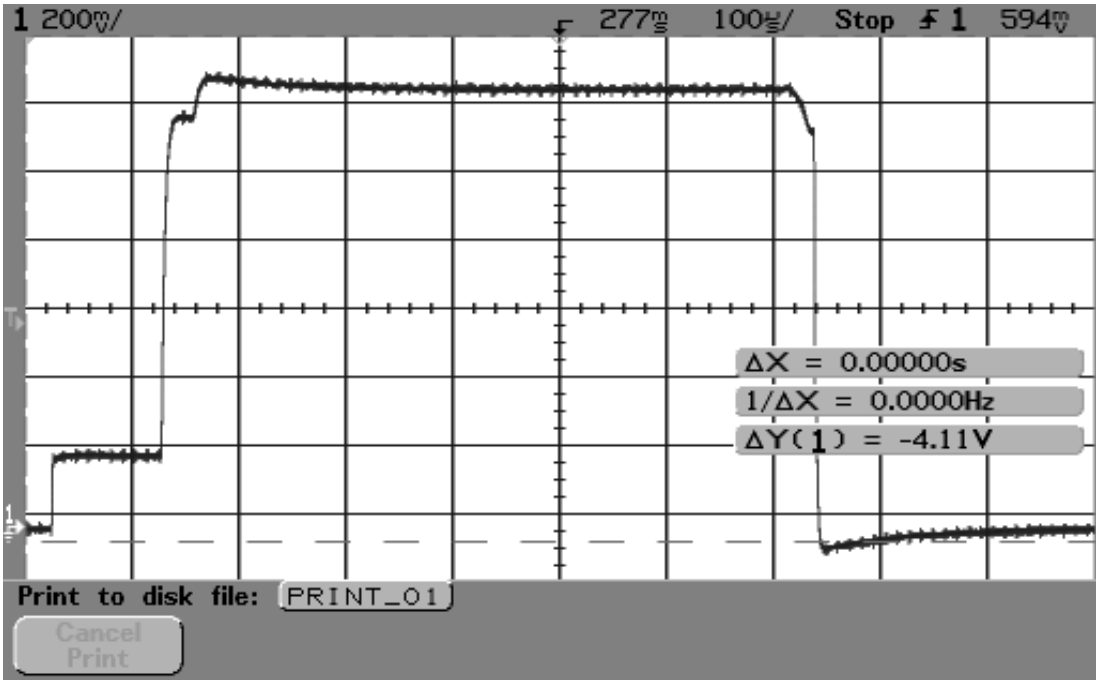


Figure 12: TP27: TX850 PA power control signal

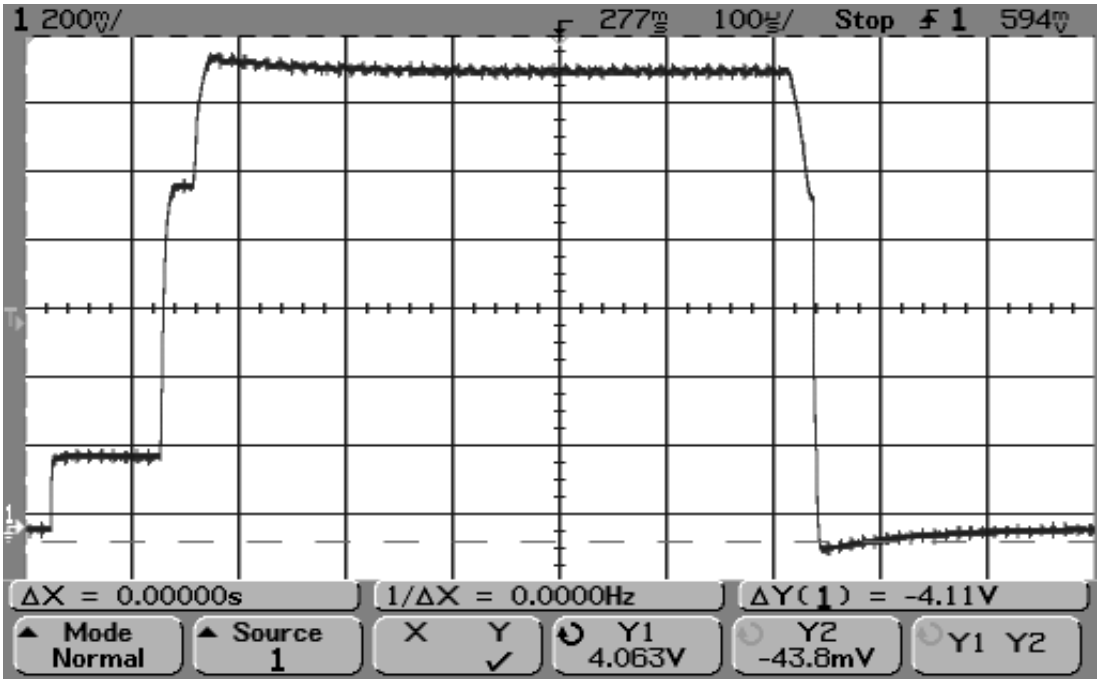


Figure 13: TP 28: TX1900 signal at coupler output

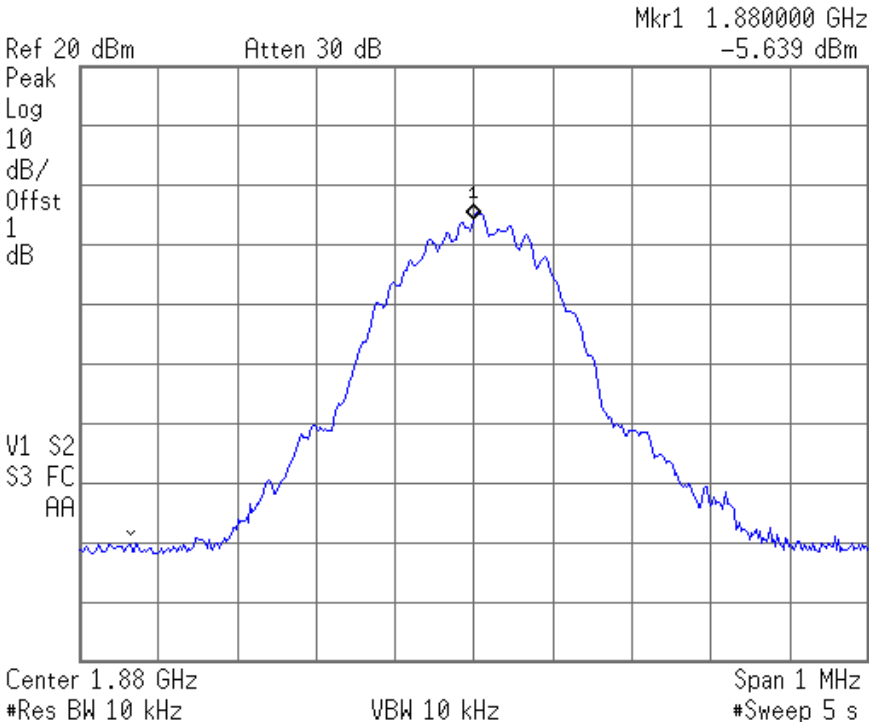


Figure 14: TP29: Antenna switch control signal in TX1900 mode

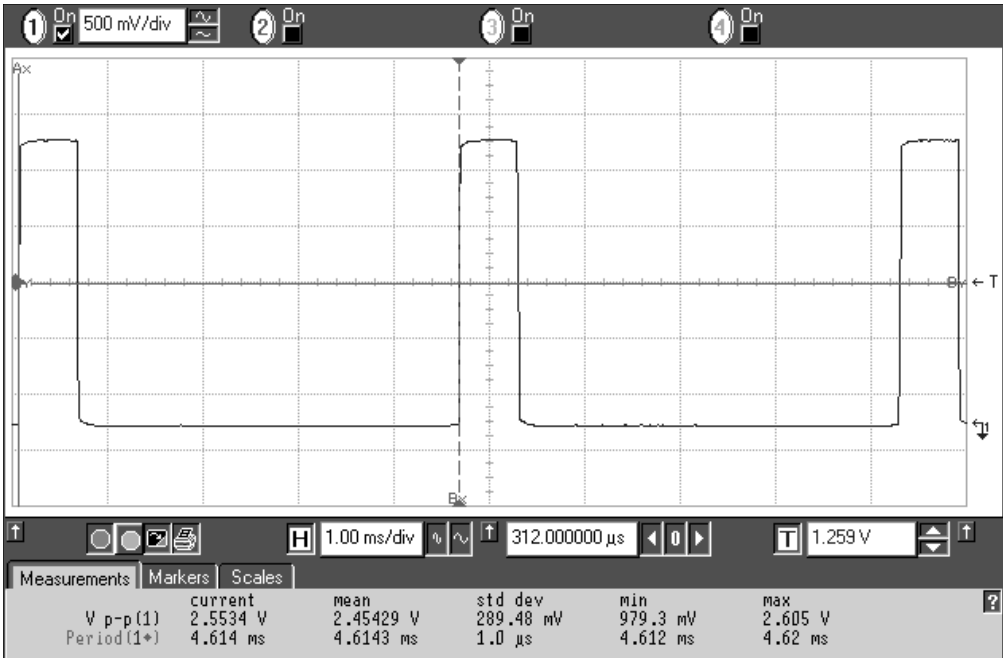


Figure 15: TP30: TX850 signal at antenna pad

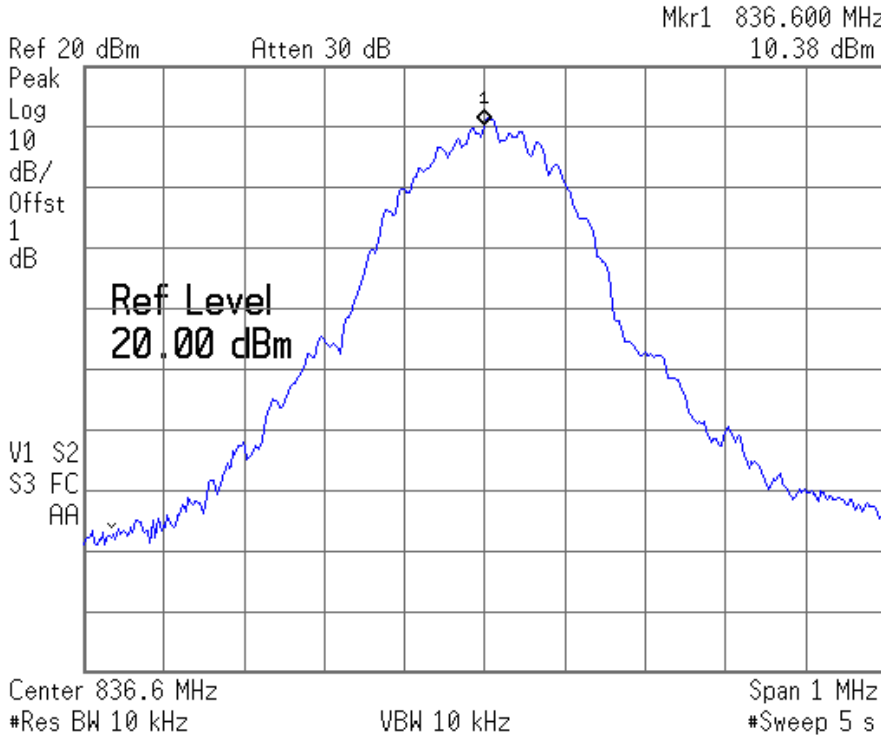


Figure 16: TP30: TX1900 signal at antenna pad

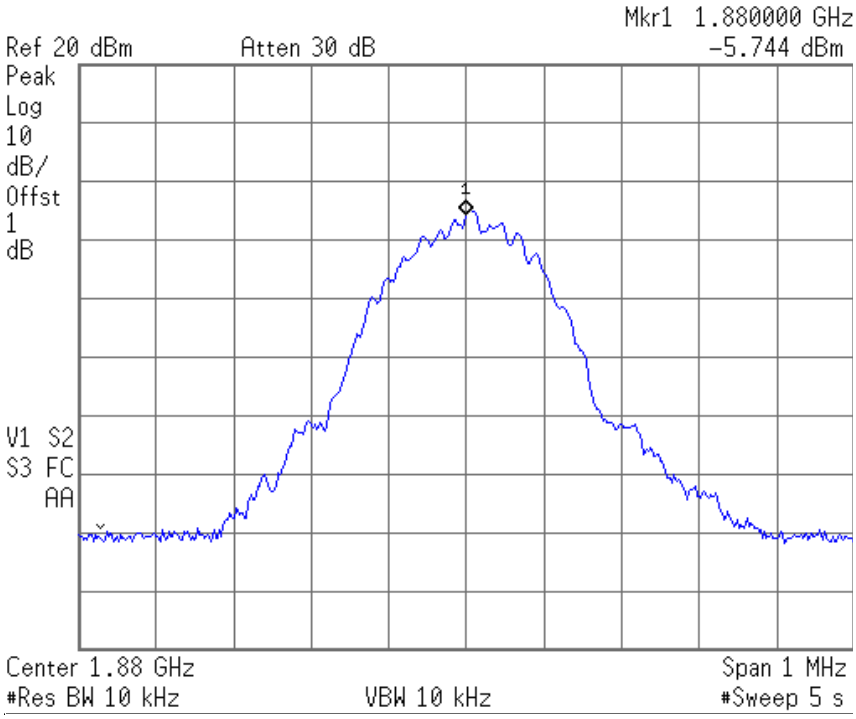


Figure 17: TP31: RX1900 signal at antenna switch output

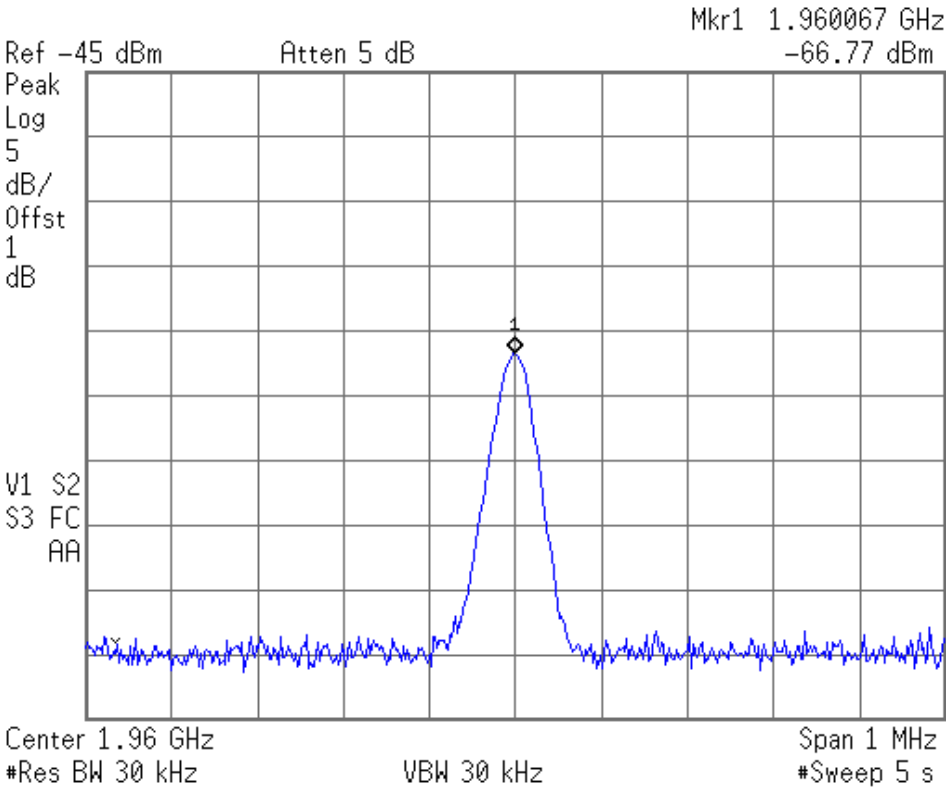


Figure 18: TP32: RX1900 signal at dual SAW filter output

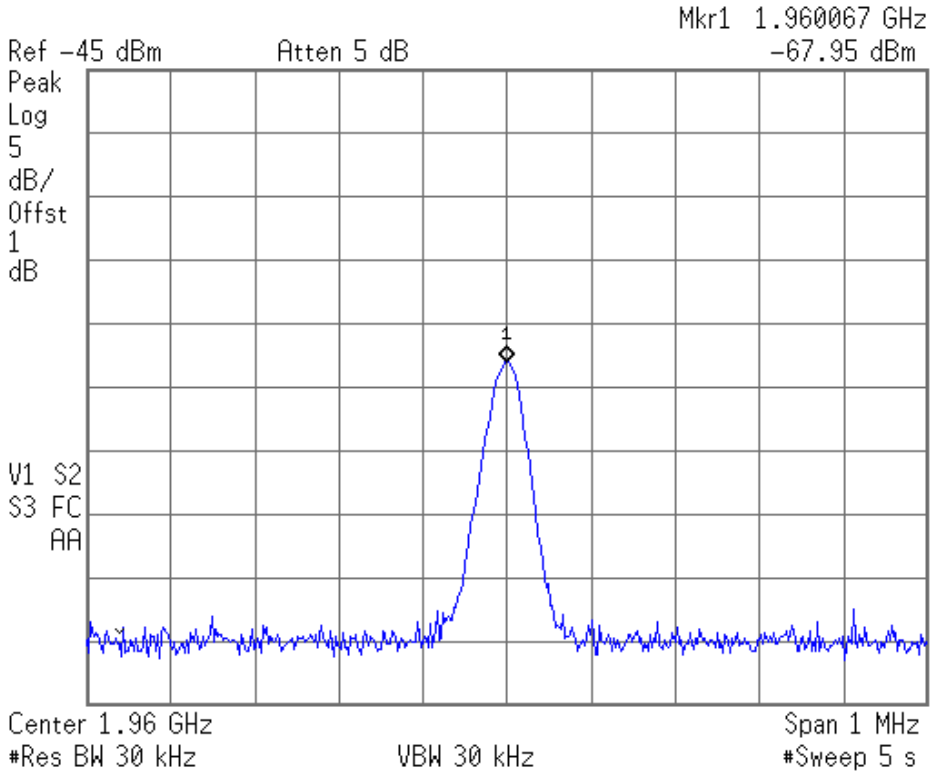


Figure 19: TP33: RX1900 signal at LNA output

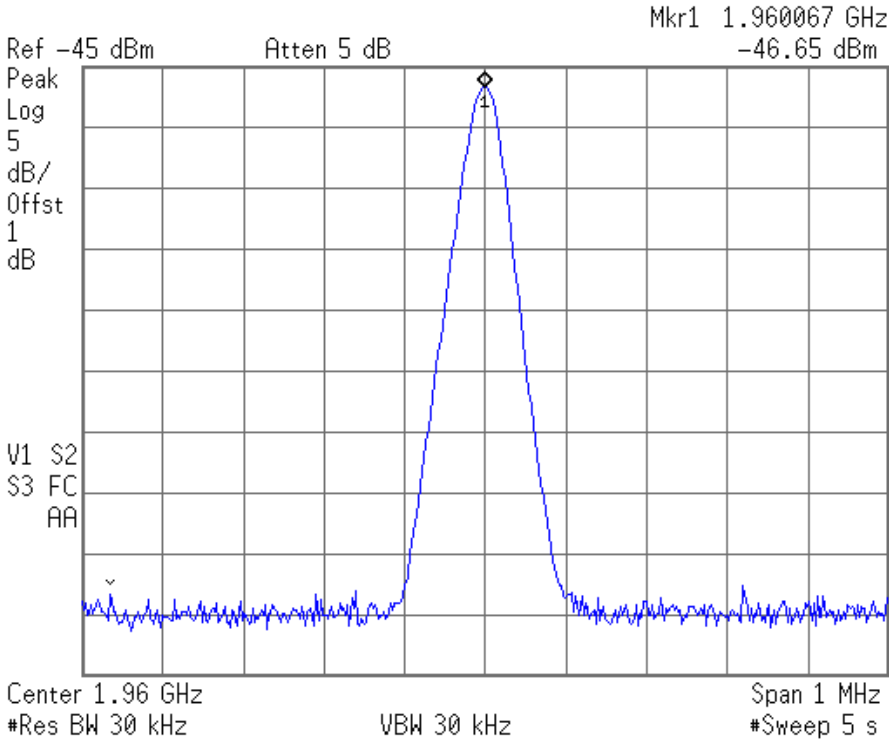


Figure 20: TP34, TP35: RX1900 LNA control signals (Burst mode)

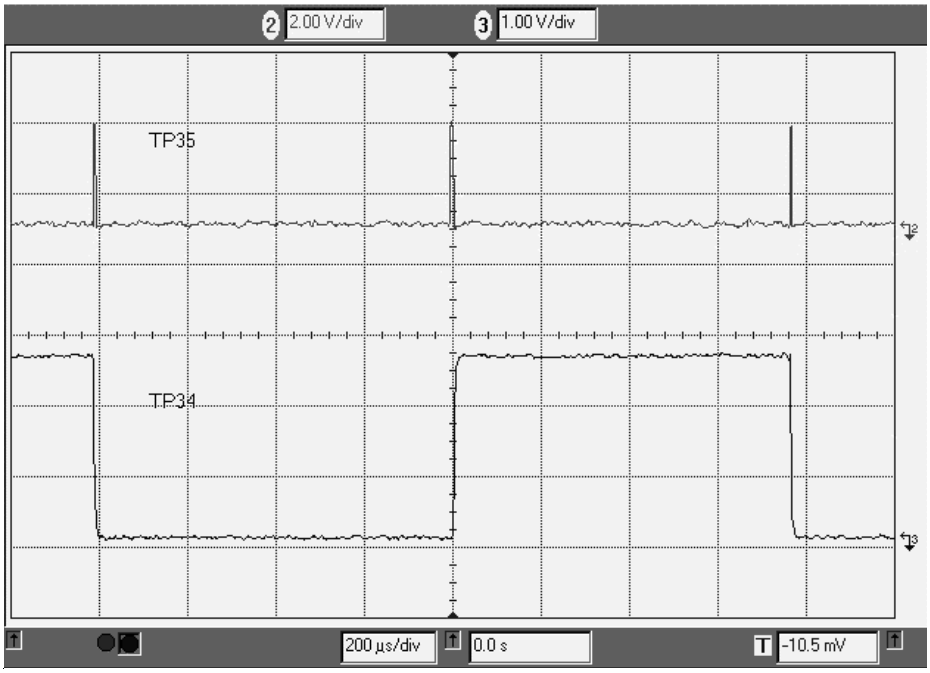


Figure 21: TP36: RX1900 signal at 2nd band filter output

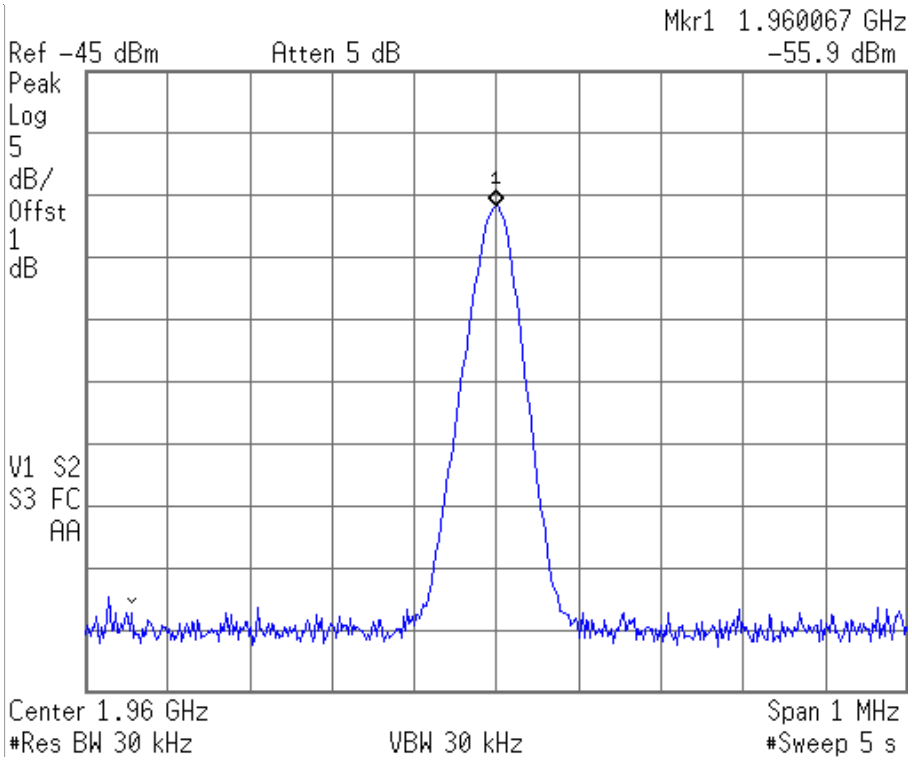


Figure 22: TP37: RX IQ signal (Burst Mode)

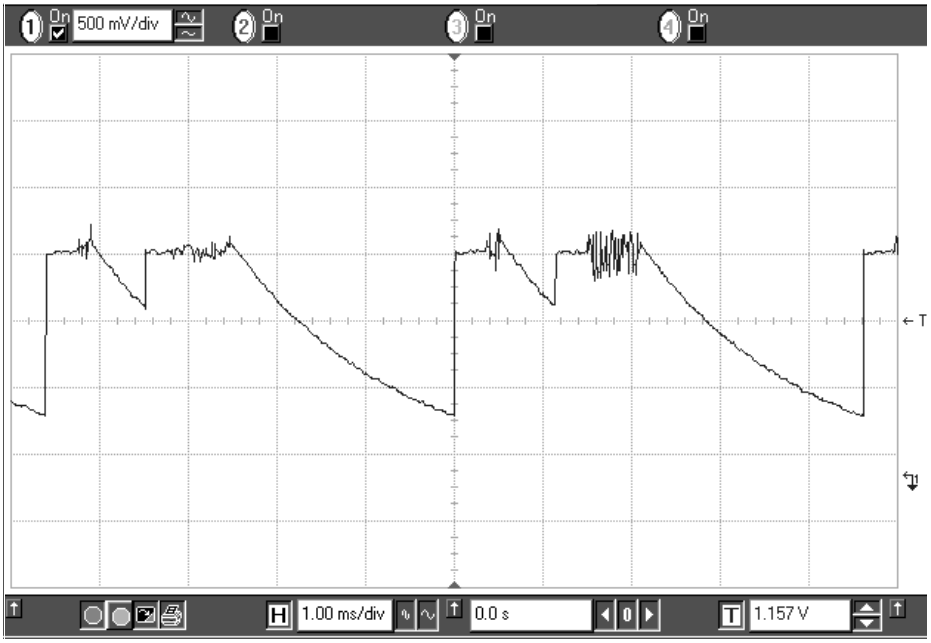


Figure 23: TP37: RX IQ signal (GSM850, Continuous Mode, Signal level -90 dBm)

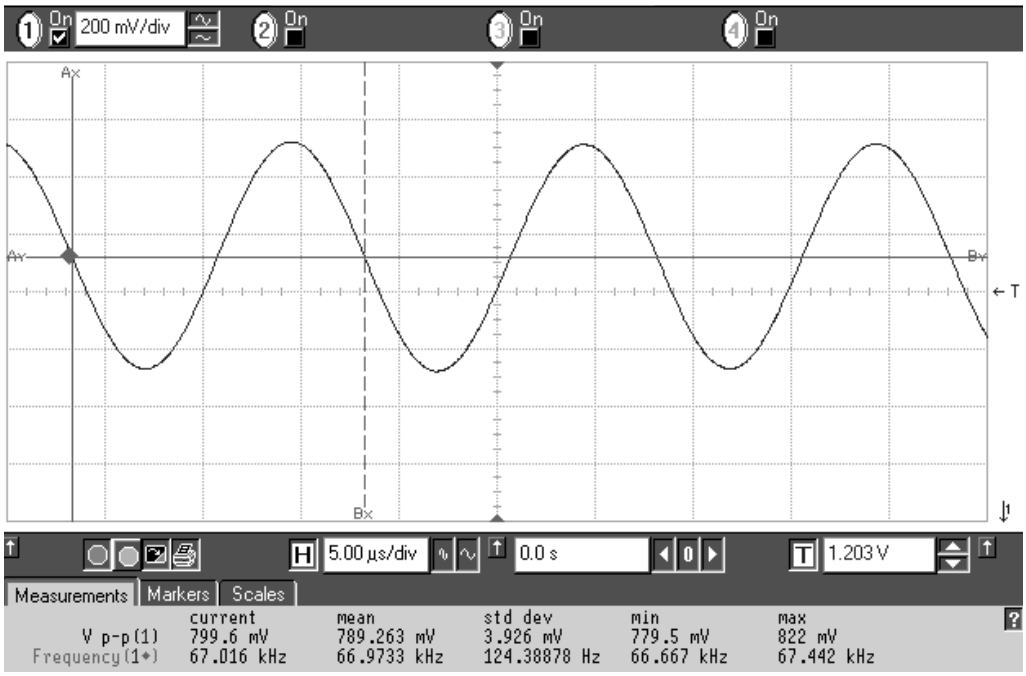


Figure 24: TP37: RX IQ signal (GSM1900, Continuous Mode, Signal level -90 dBm)

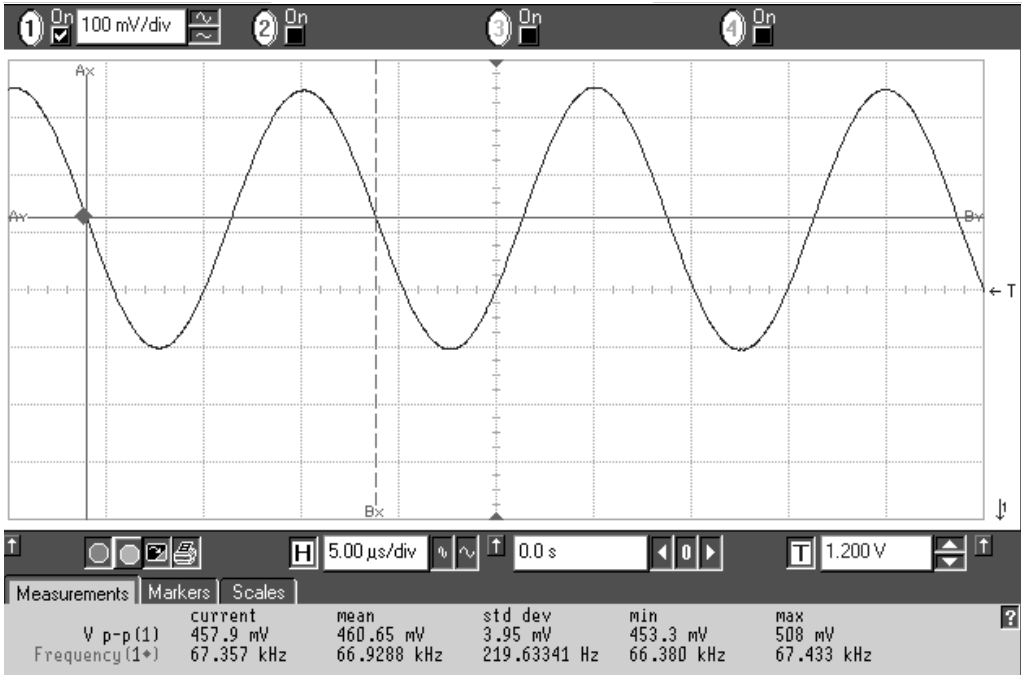


Figure 25: TP40: SHF VCO output signal in TX850 mode

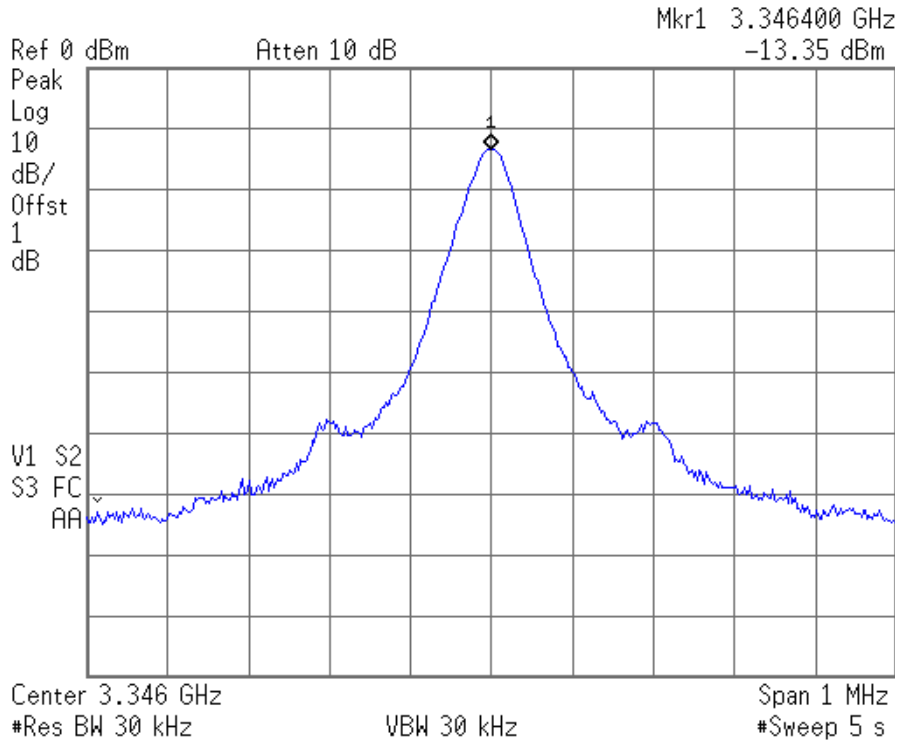


Figure 26: TP40: SHF VCO output signal in TX1900 mode

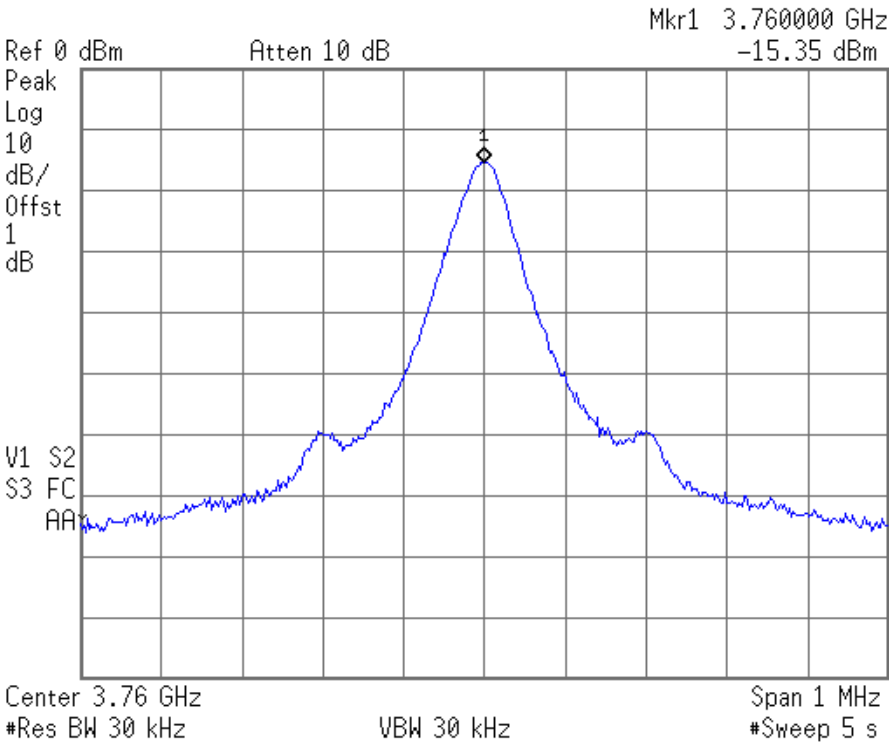


Figure 27: TP40: SHF VCO output signal in RX850 mode

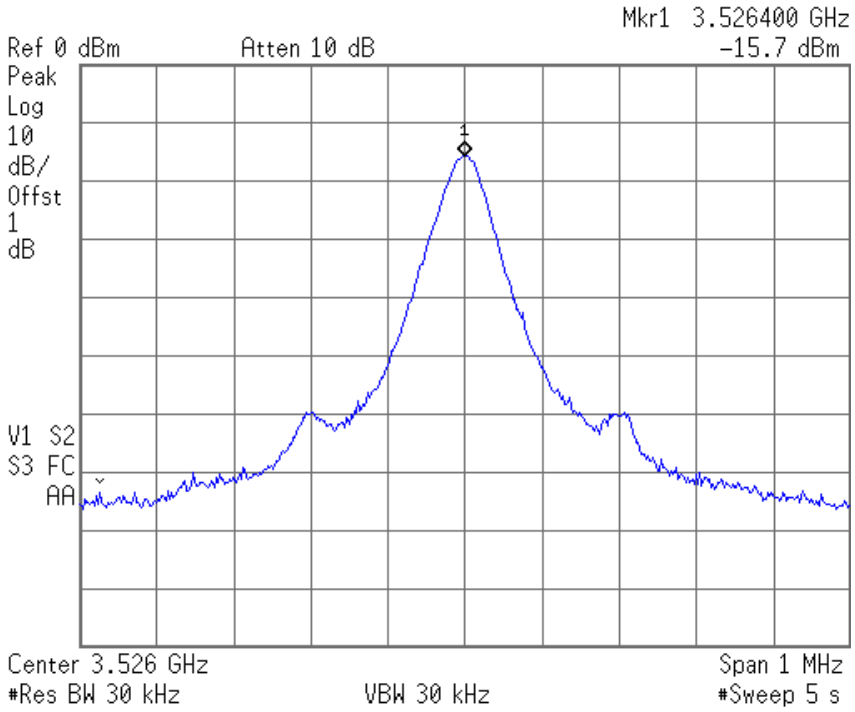


Figure 28: TP40: SHF VCO output signal in RX1900 mode

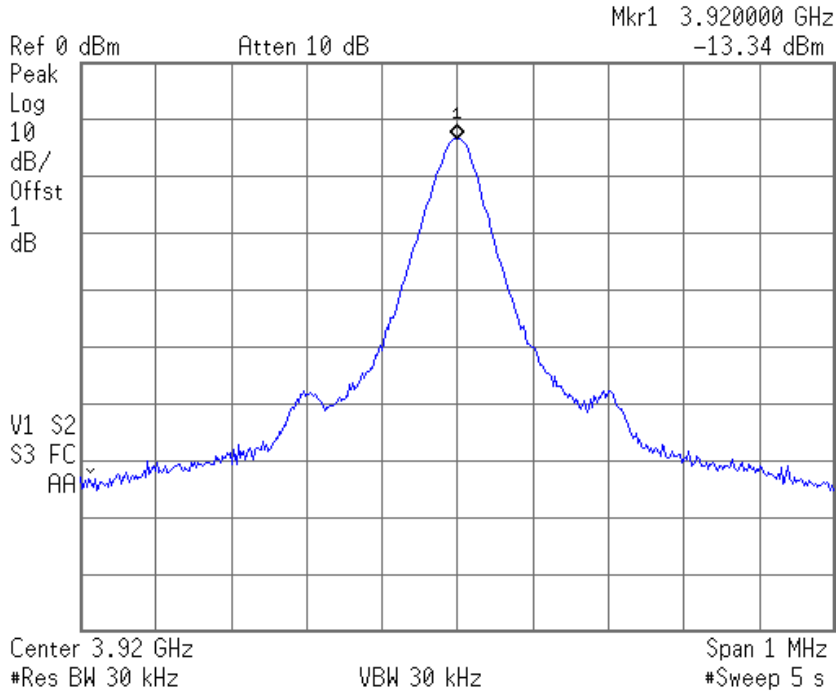


Figure 29: TP51,52,53: SDATA, SCLK and SLE signals in GSM850/1900 mode

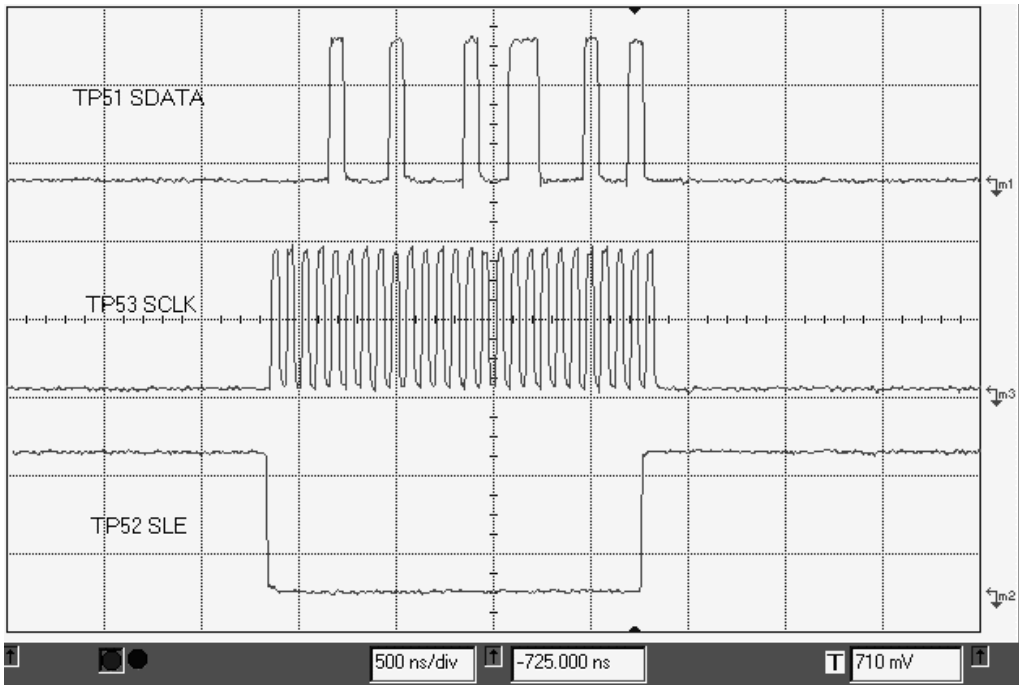


Figure 30: TP60: TX850 PA Output Signal

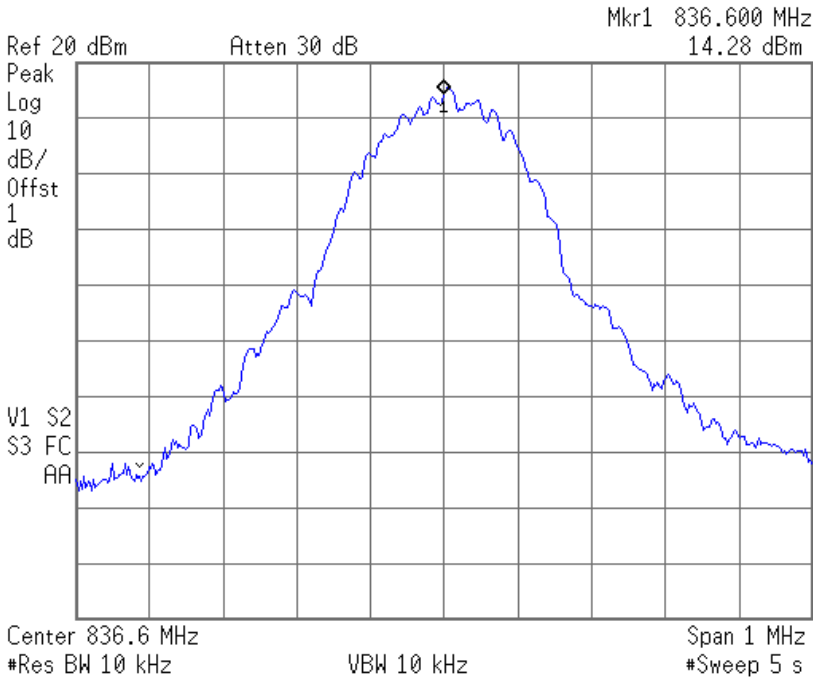


Figure 31: TP61: TX850 signal at coupler output

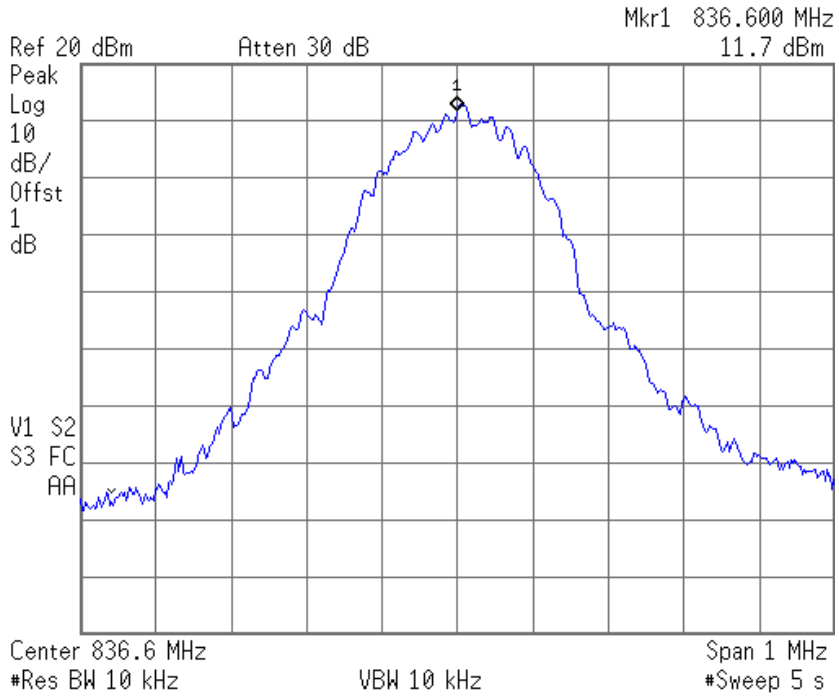


Figure 32: TP62: Antenna switch control signal in TX850 mode

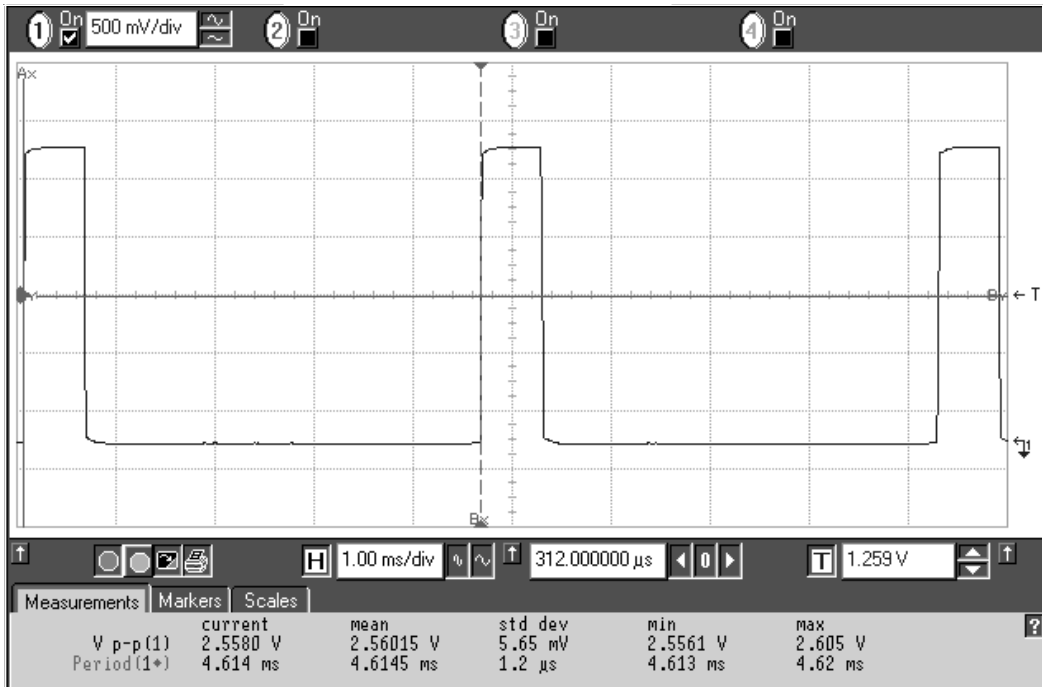


Figure 33: TP 63: RX850 signal at antenna switch output

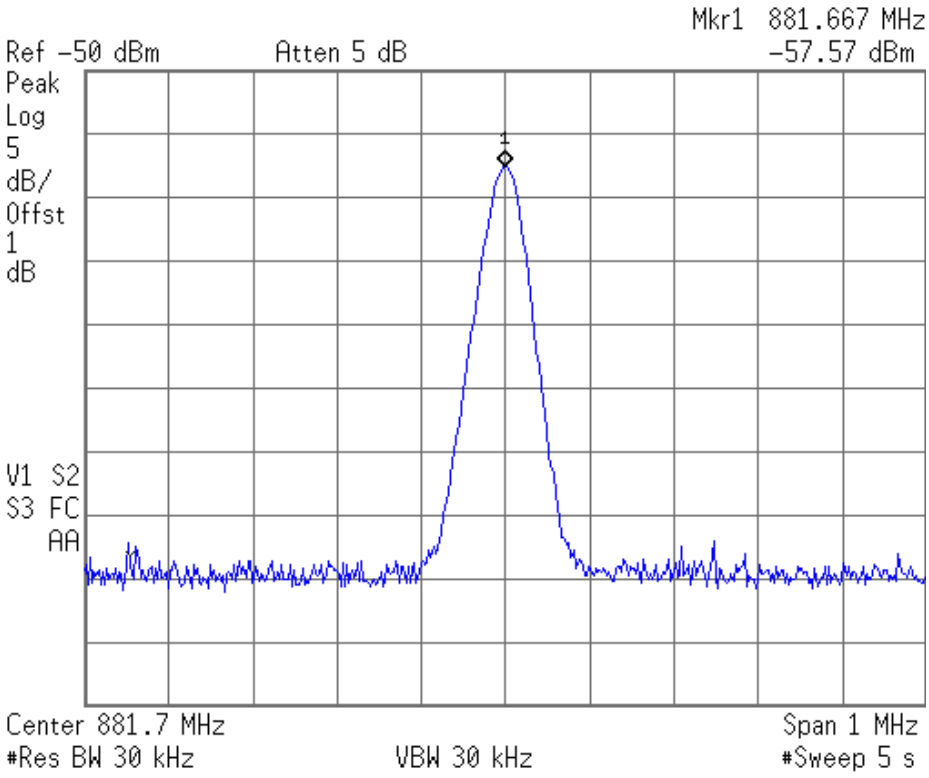
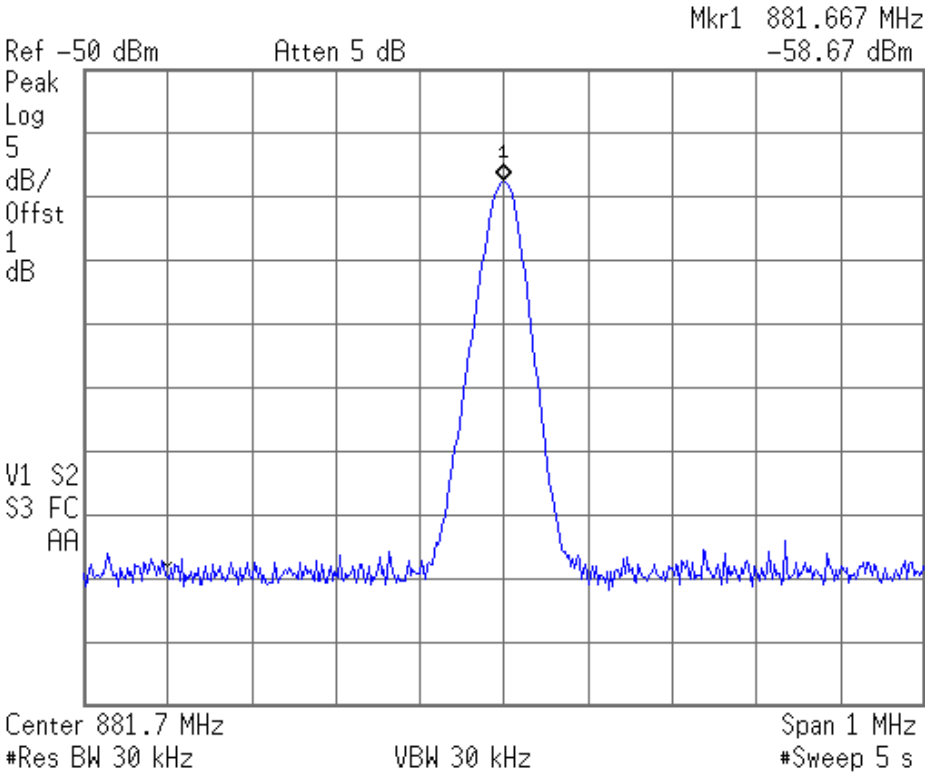


Figure 34: TP 64: RX850 signal at dual SAW filter output



TP 65, 67: RX850 LNA control signals (Burst mode)

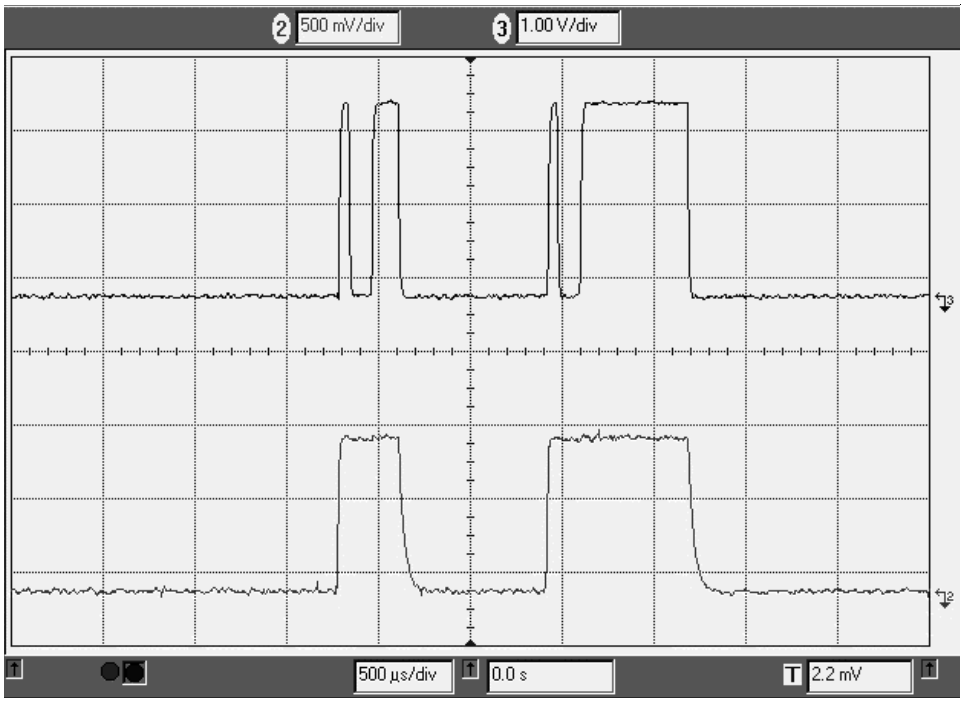


Figure 35: TP 66: RX850 signal at LNA output

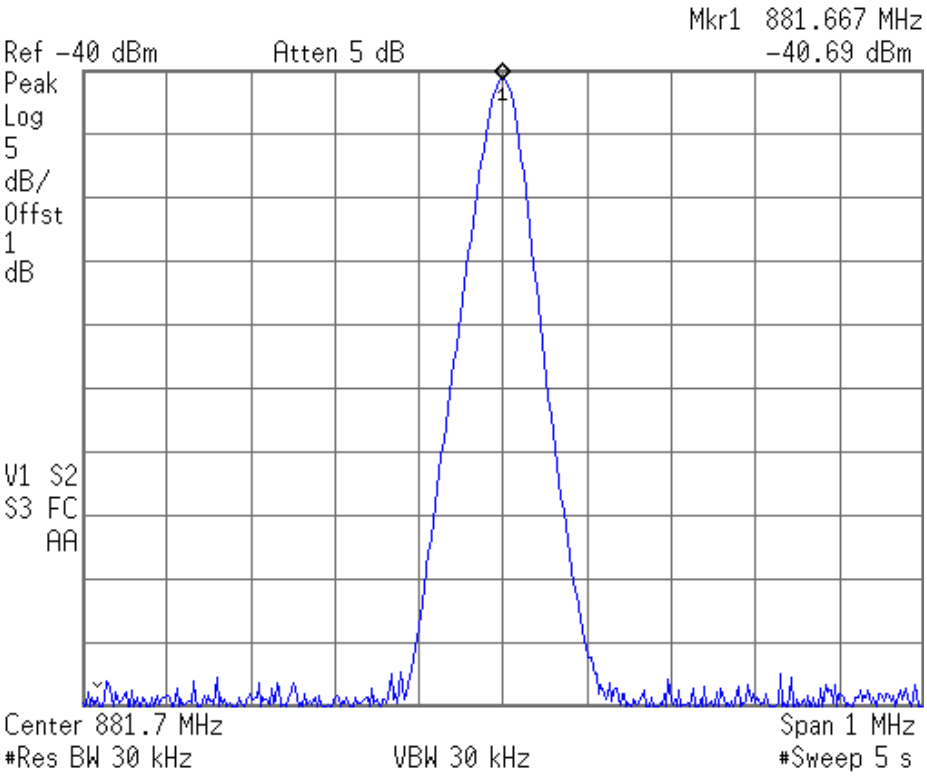
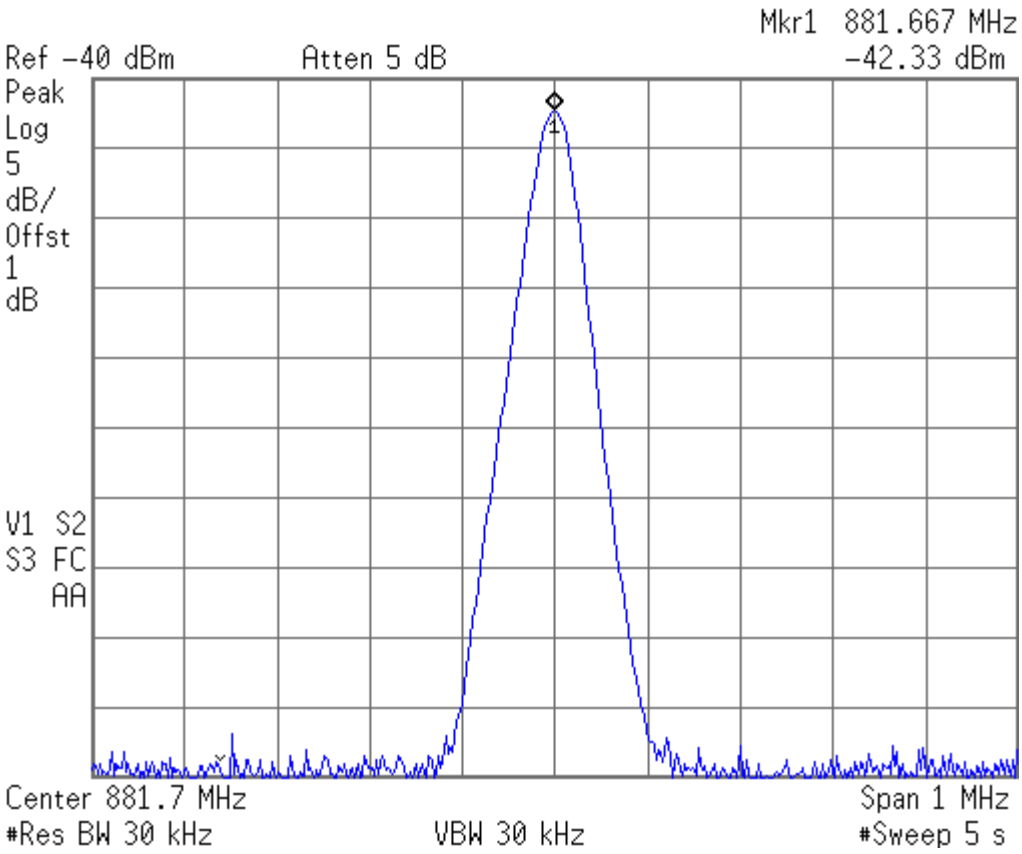


Figure 36: TP68: RX850 signal at 2nd band filter output



FM Radio Troubleshooting

Introduction

This document describes the methods of FM radio troubleshooting for Iris NSB-9 transceiver.

EQUIPMENT NEEDED

NSB-9 module jig MJS-48, power and DAU-9S cables

DC power supply 3.9 VDC >3A

Digital multimeter (DMM)

Audio Analyzer

Oscilloscope with 1 MHz 1:1 probe

PC with Phoenix software

Headset (HDB-4 or HDS-3)

FM RADIO SCHEMATICS

Figure 37: Input signal connection to antenna (headset cable)

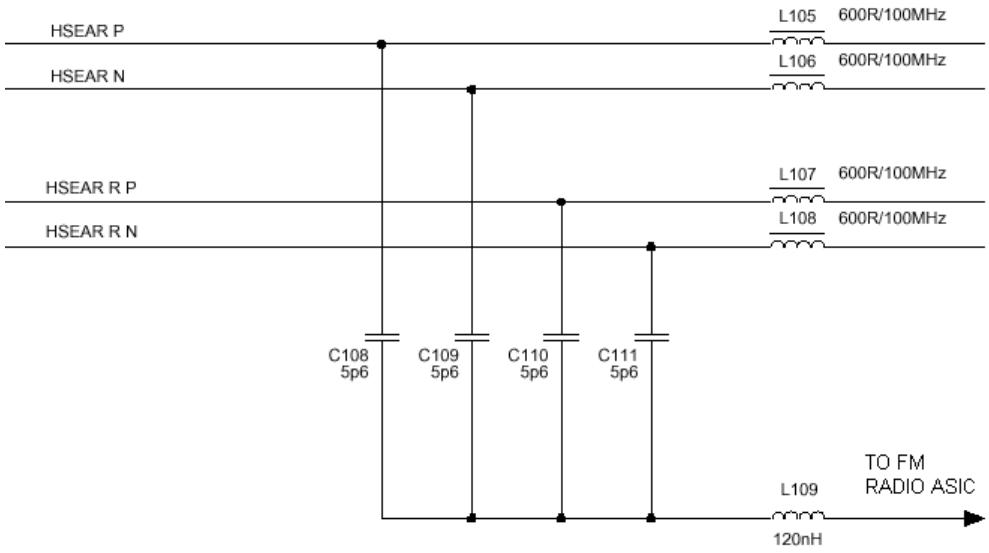


Figure 38: Input signal single to differential conversion

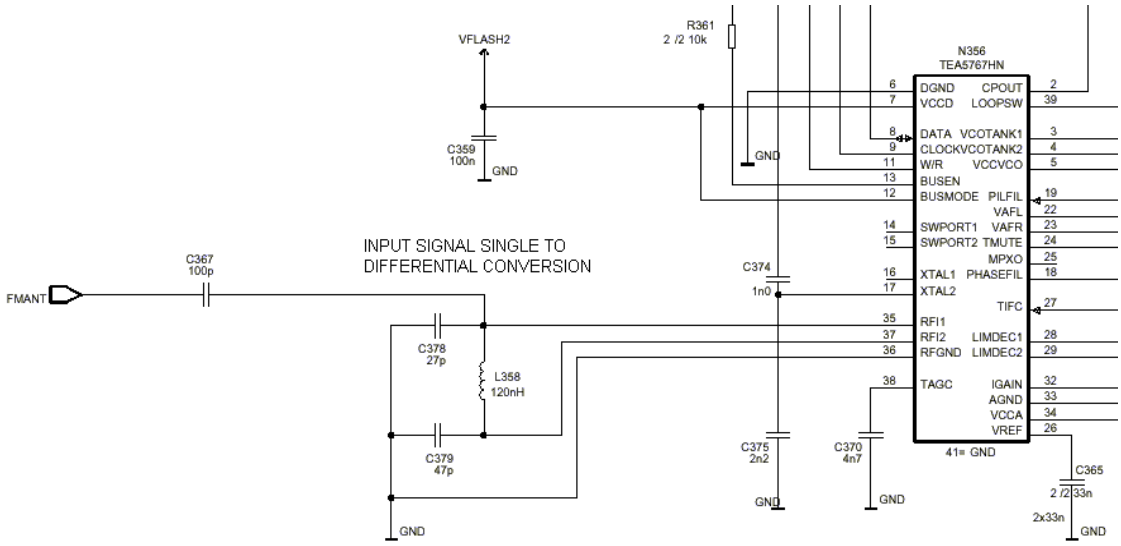


Figure 39: VCO components

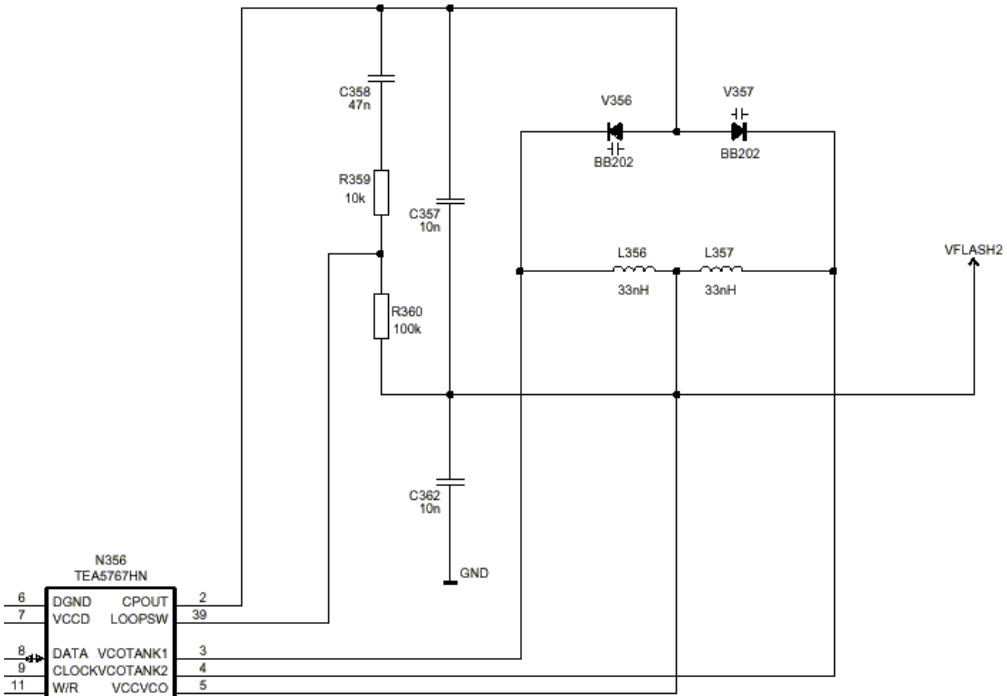


Figure 40: Connection to UPP

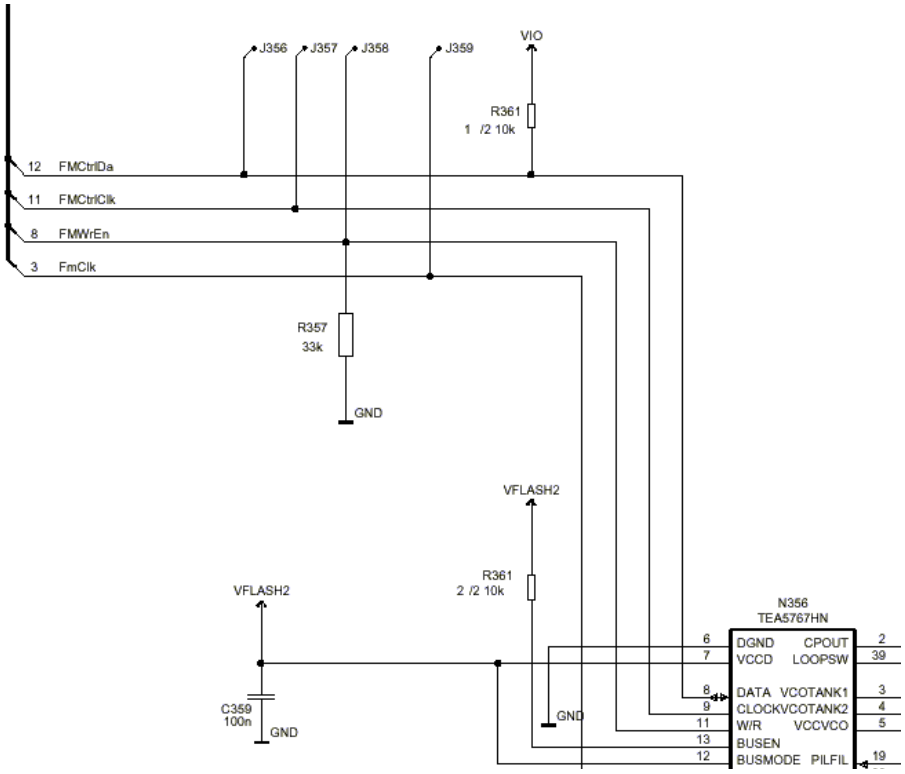
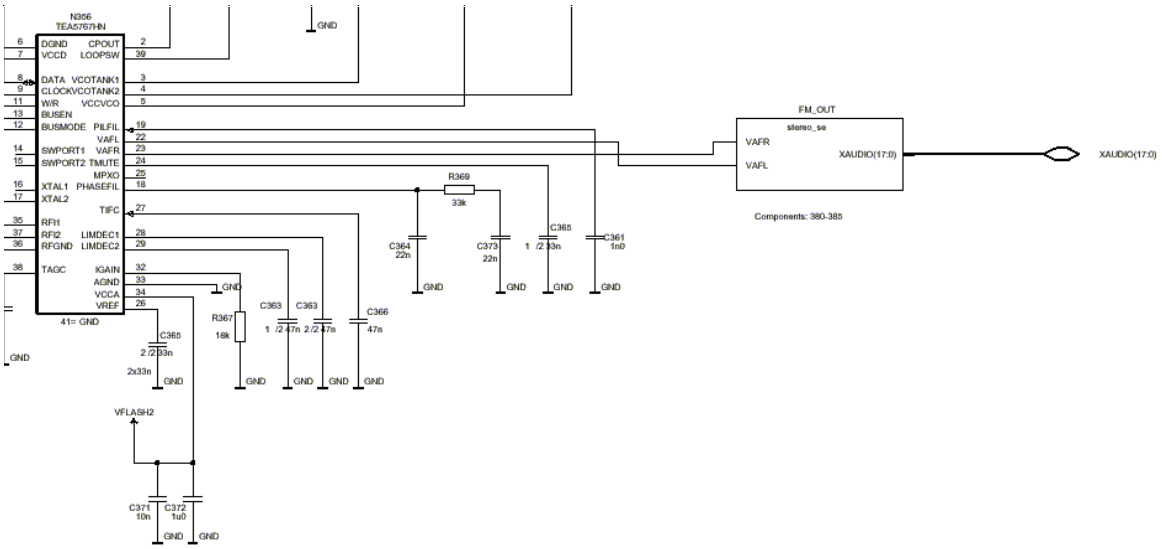


Figure 41: Audio signal output



FM Radio layout

Figure 42: Components

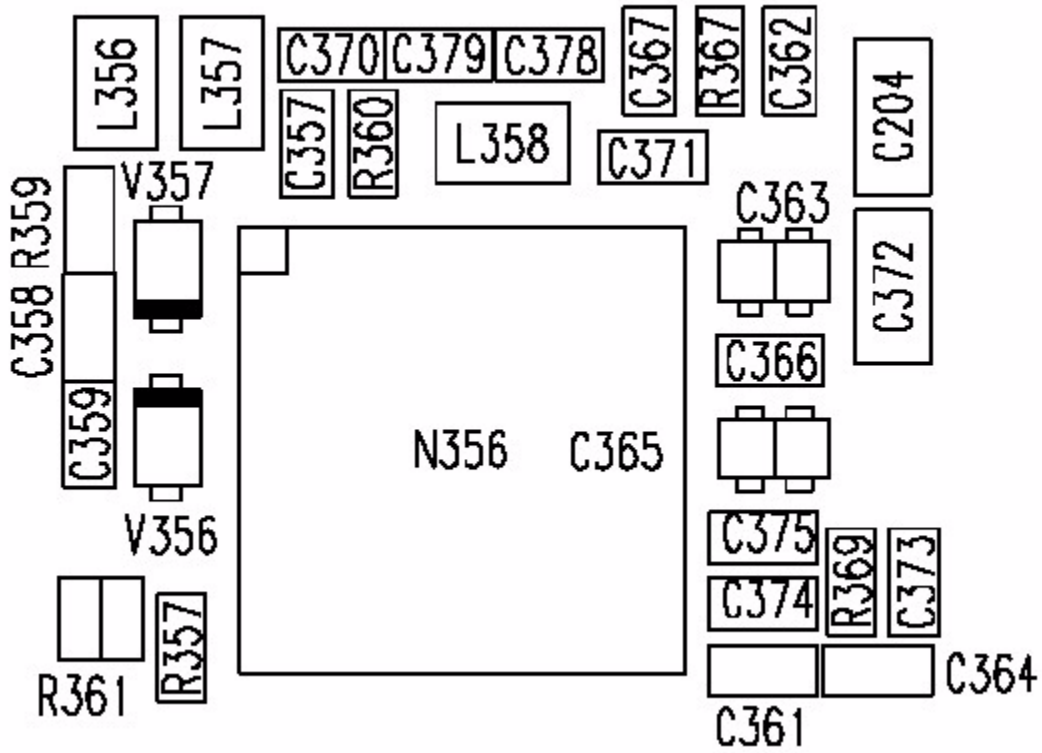


Figure 43: Components on PWB

Note! Components L105, L106, L107, L108, L109, C108, C109, C110, C111, R164, R165, R166, R167, R170 and R171 are not shown in the picture. Components are placed near audio amplifier N150.

Figure 44: FM radio testpoints

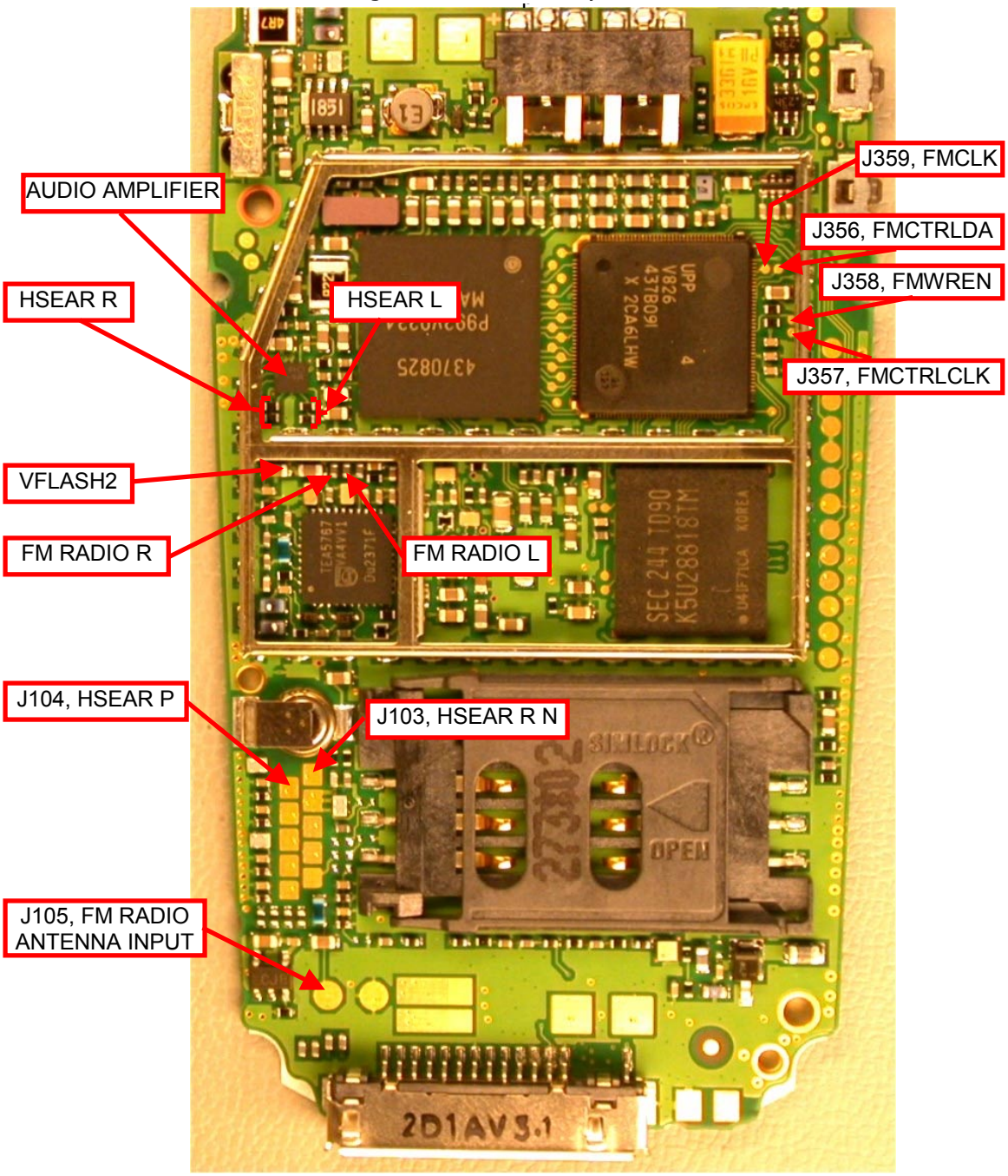
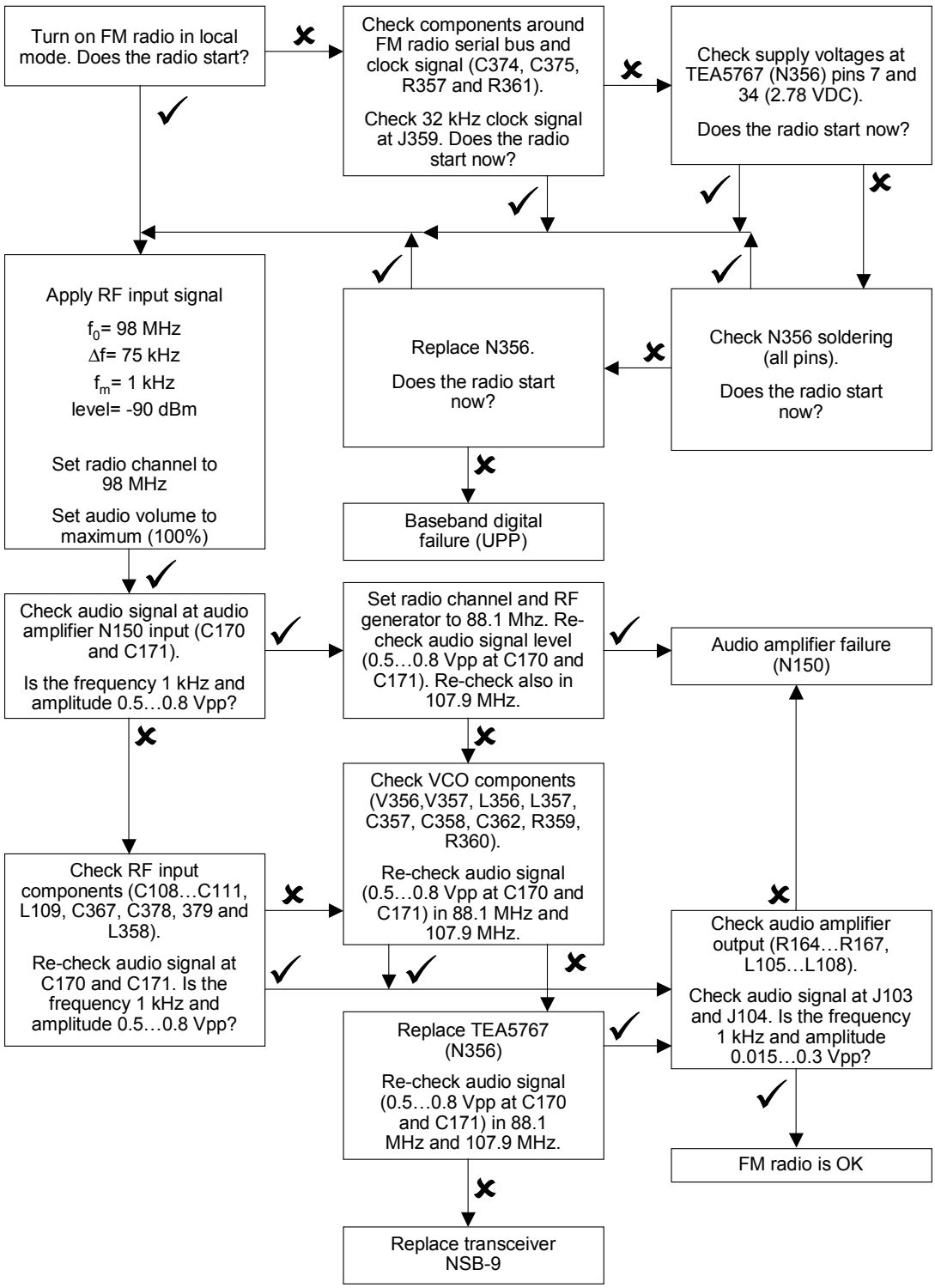
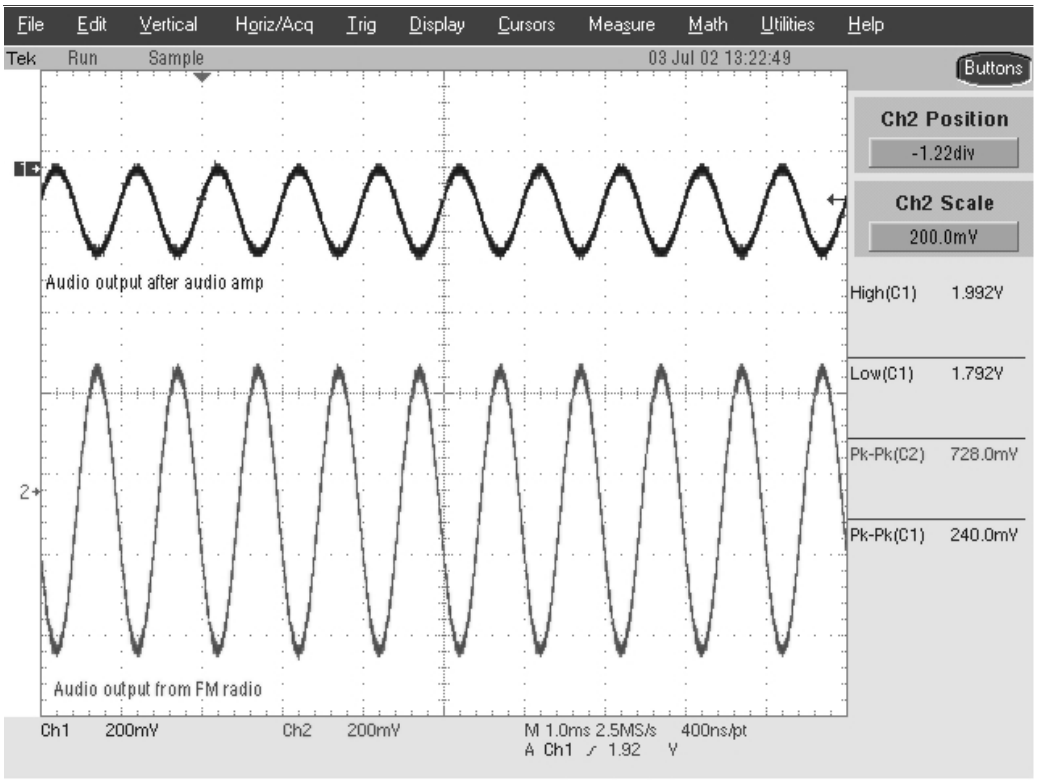


Figure 45: FM radio fault finding chart



REFERENCE MEASUREMENT RESULTS

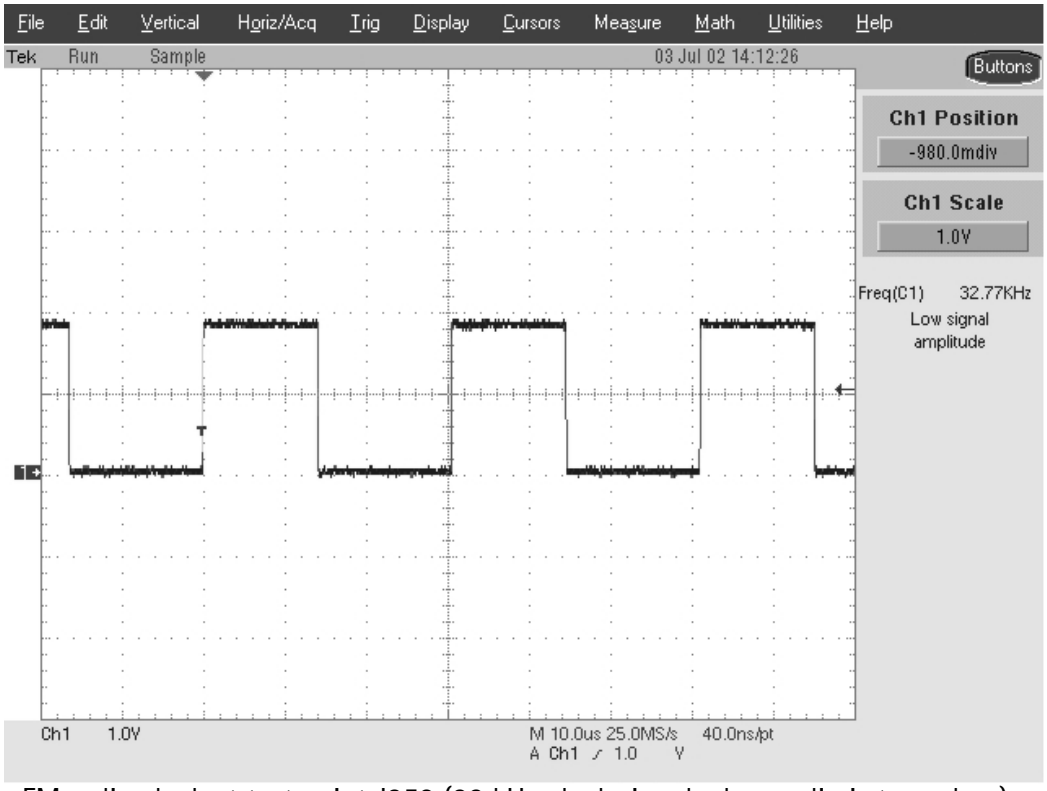
Figure 46: Audio output signal



Signal 1: Audio output signal at PWB test points J103 and J104 (FM test signal, audio volume 100%)

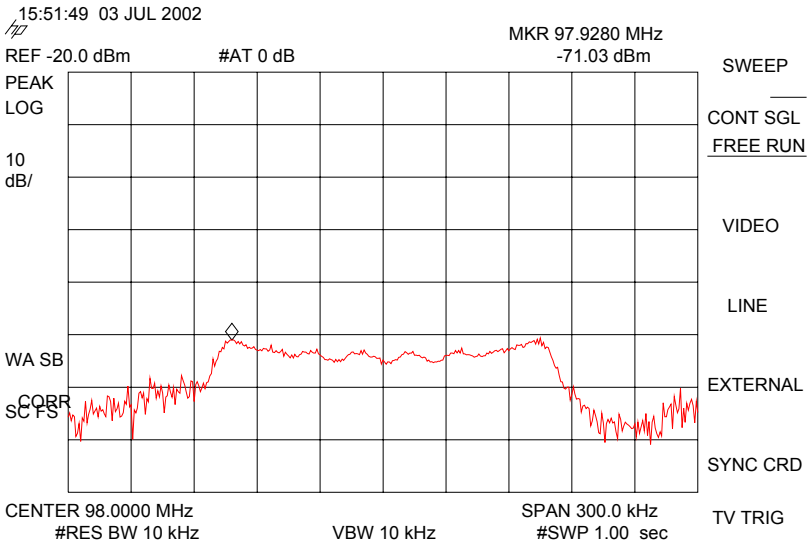
Signal 2: Audio output at FM radio pins 22 and 23 (same signal as in C170 and C171)

Figure 47: Reference clock signal from UPP



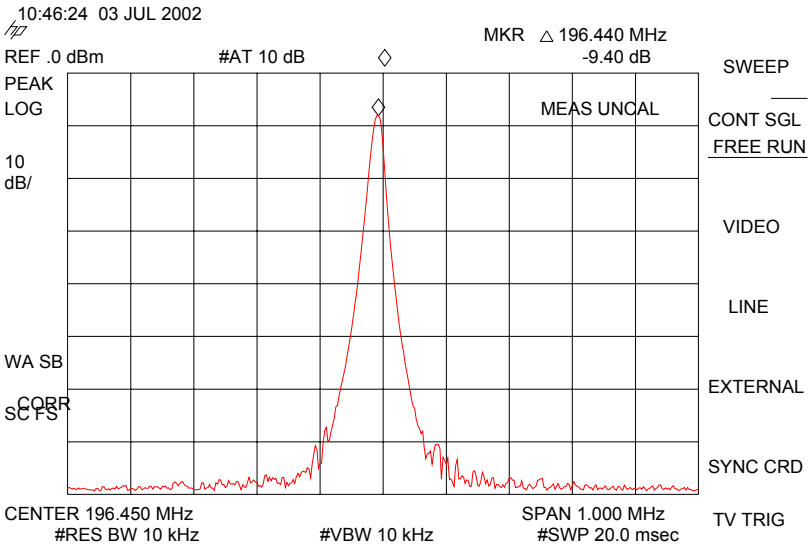
FM radio clock at test point J359 (32 kHz clock signal when radio is turned on)

Figure 48: RF input signal



FM modulated test signal at FM radio ASIC pin 37, at the other end of L358

Figure 49: VCO signal



VCO frequency at FM radio pins 3 and 4, at the other ends of V356 and V357

Baseband Troubleshooting

PWB Test points

Figure 50: Flash programming testpoints

Figure 51: Baseband testpoints

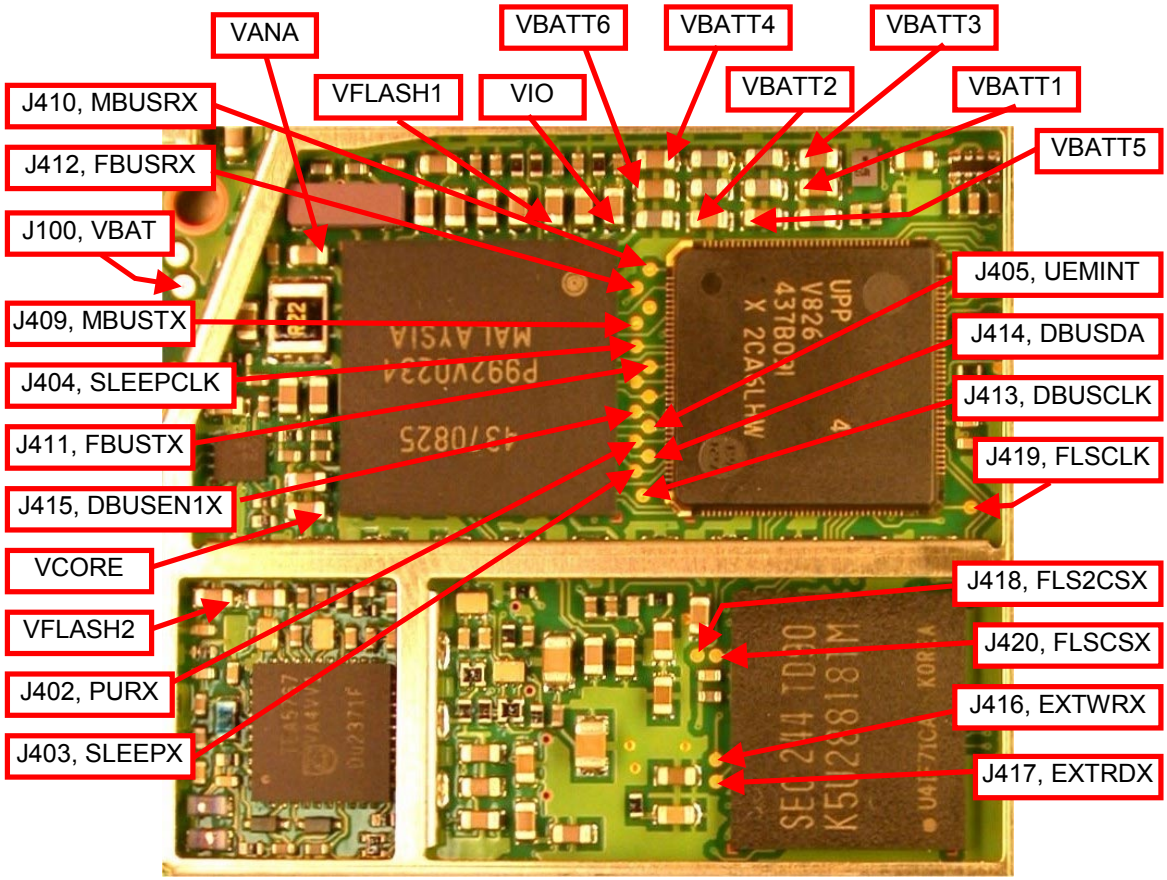


Figure 52: SIM testpoints

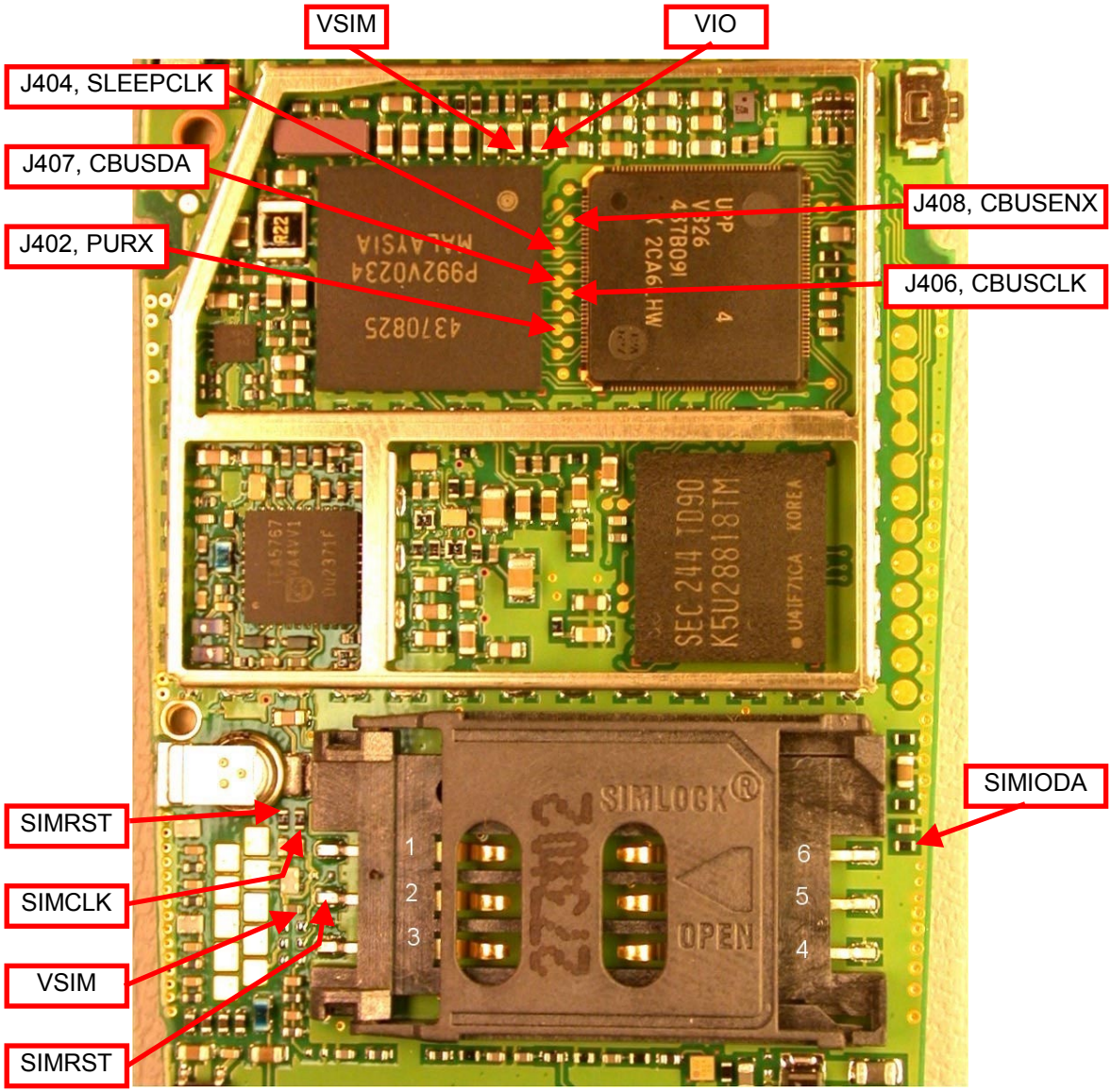
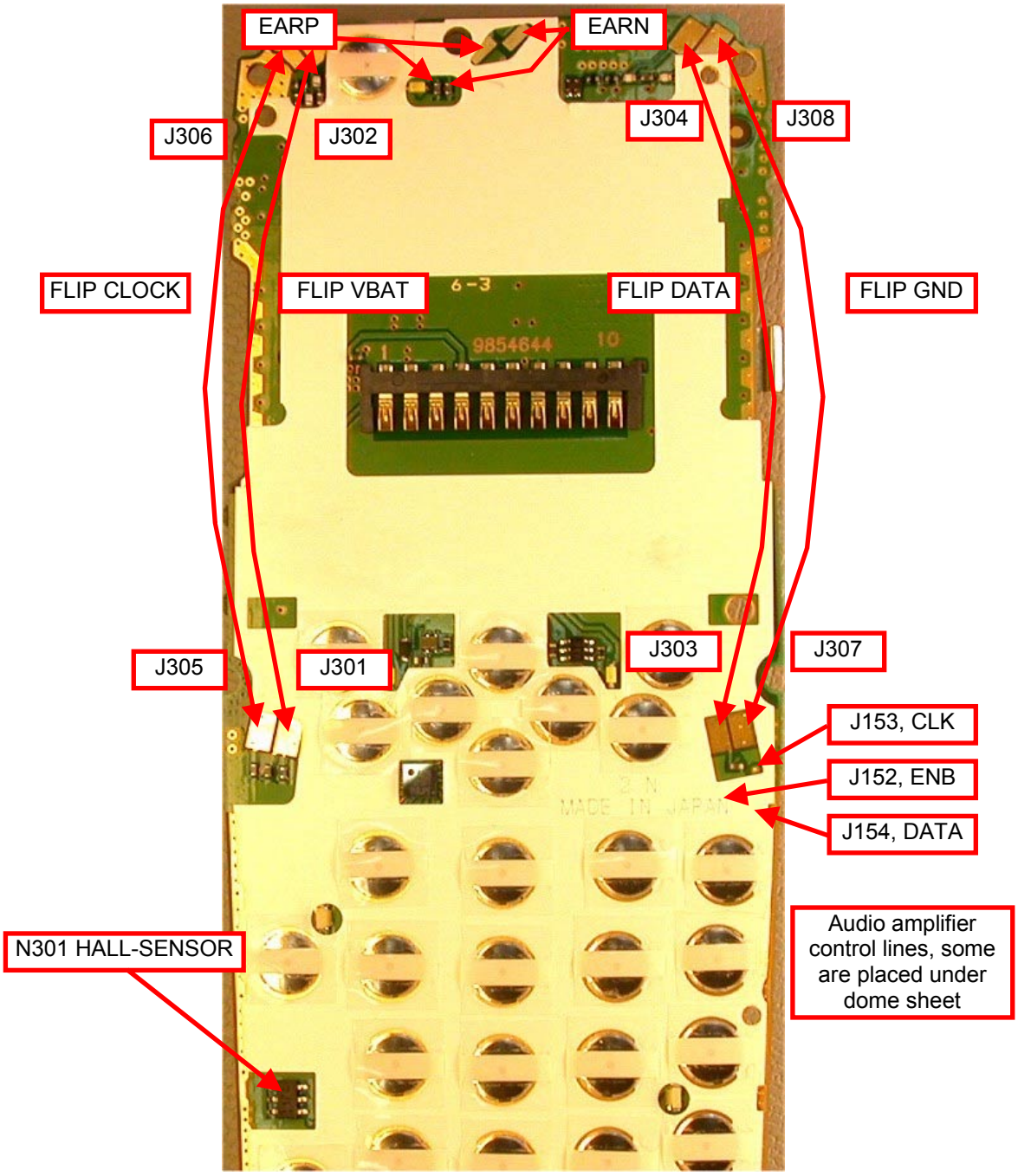
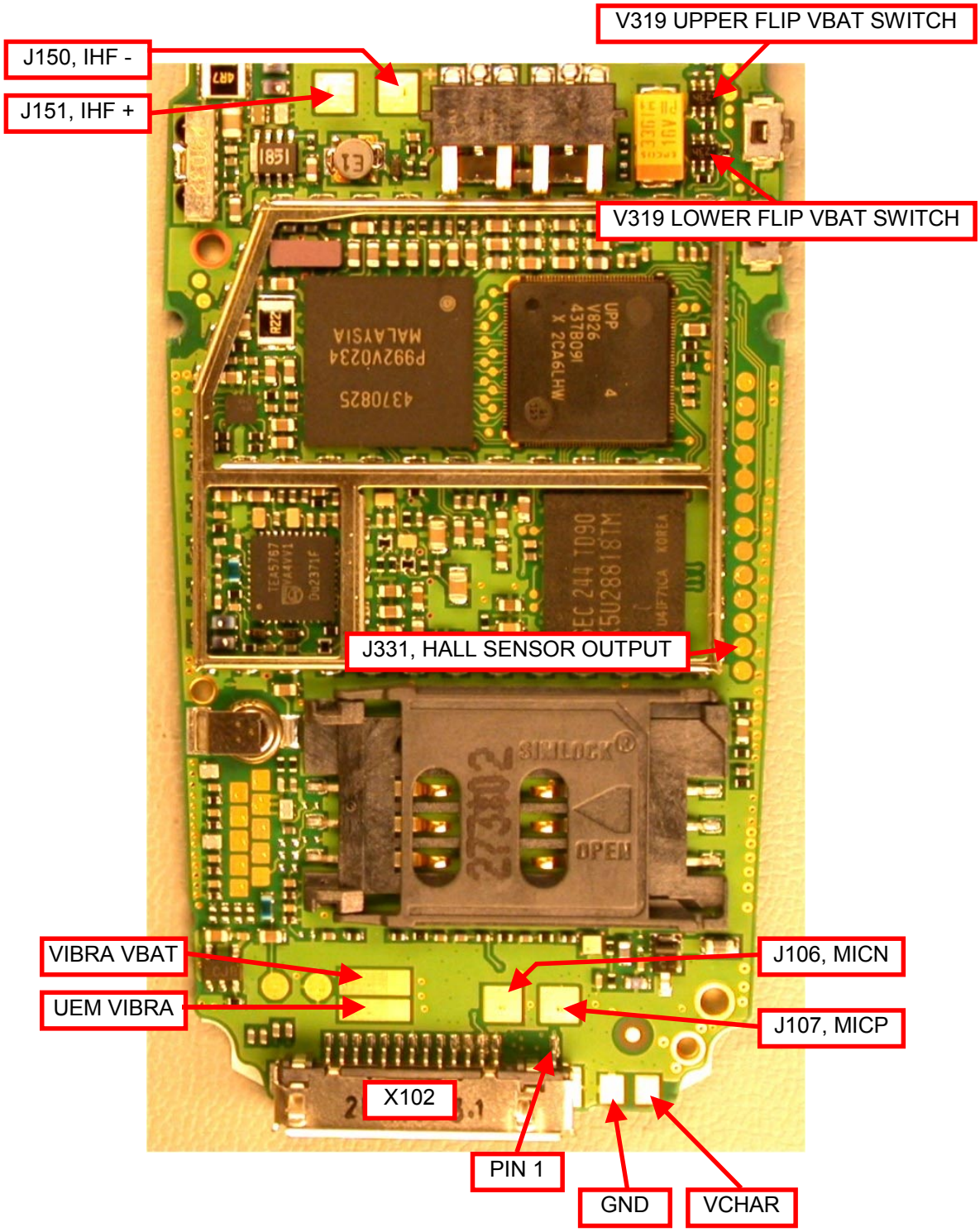
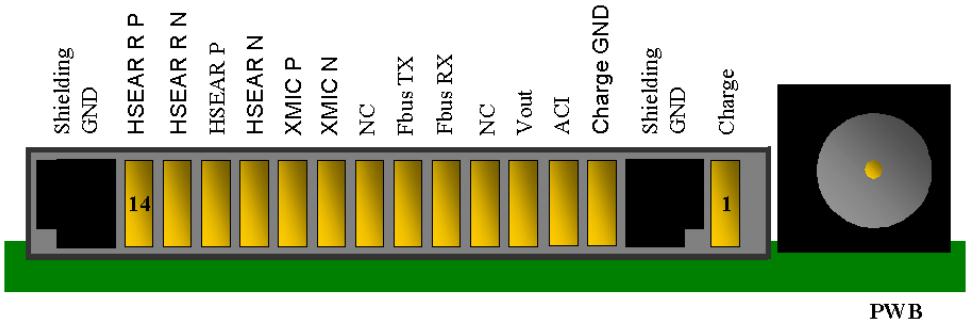


Figure 53: Miscellanous testpoints







Signal Name	Function	Test Point	Signal Characteristics	Notes
FBUS_TX	Flash programming data and phone control	PRODTP2	2.8-0V, digital signal	From phone to prommer or PC
FBUS_RX	Flash programming data and phone control	PRODTP3	2.8-0V, digital signal	From prommer or PC to phone
MBUS	Flash programming clock and phone control	PRODTP7	2.8-0V, digital signal, clocks up to 6.5MHz	Bidirectional phone control
BSI	Flash programming startup signal,battery size indicator, local mode switch, SIM card detection	Battery connector and J101	2.8-0V, analog AD-converter and digital signal	2.8V pulse when flashing starts, approx. 1.0V in normal mode and 0V in local mode
VPP	Flash programming voltage	PRODTP6	1.8V, up to12V during flash programming	Internal programming voltage 1.8V , external 12V
VR1A	Power supply for Hagar PLL charge pump	C600	4.75 V	
VR2	Power supply for TX modulator	C706	2.8 V	
VR3	Power supply for VCTCXO	C662	2.8 V	Controlled by SLEEPX signal
VR4	Power supply for Hagar	C601	2.8 V	
VR5	Power supply for Hagar	C603	2.8 V	
VR6	Power supply for Hagar	C605	2.8 V	
VR7	Power supply for VCO	R652	2.8 V	

Signal Name	Function	Test Point	Signal Characteristics	Notes
VSIM	Power supply for SIM card	C390/conn.	1.8 or 3.0V	Level depend on SIM card type
SIMRST	SIM reset	C387/conn.	digital signal	Level depend on SIM card type
SIMIODAO	SIM data	C386/conn.	digital signal	Level depend on SIM card type
SIMCLKO	SIM clock	C388/conn.	3.25 MHz digital clock signal	Level depend on SIM card type
SLEEPX	Sleep mode control	J403	1.8-0V, digital signal	
PURX	Power up reset	J402	1.8-0V, digital signal	
SLEEPCLK	Sleep clock	J404	1.8-0V, 32 kHz digital clock signal	

Signal Name	Function	Test Point	Signal Characteristics	Notes
VBATTO_1	Power supply for VANA,VR3,VR4 and VR7 regulators	C260	= VBAT	
VBATTO_2	Power supply for VFLASH1,VFLASH2 and VSIM regulators	C261	= VBAT	
VBATTO_3	Power supply for VCORE regulator	C262	= VBAT	
VBATTO_4	Power supply for VR1A,VR1B and VR2 regulators	C264	= VBAT	
VBATTO_5	Power supply for VR5 and VR6 regulators	C263	= VBAT	
VBATTO_6	Power supply for VIO regulator	C265	= VBAT	
RFCLK	System clock for baseband	C420	13 MHz analog signal	Requirement > 0.3 Vpp
RF_BUSDA	Hagar control serial data	J2	0 -1.8V, digital signal	
RF_BUSCLK	Hagar control serial clock	J3	0 -1.8V, 13 MHz digital clock signal	

Signal Name	Function	Test Point	Signal Characteristics	Notes
CBUSCLK	Serial clock	J406	1.8-0V, 1MHz digital clock signal	Controlled by MCU
CBUSDA	Serial data input/output	J407	1.8-0V, digital signal	Controlled by MCU

CBUSENX	CBUS selection and enable	J408	1.8-0V, digital signal	Controlled by MCU
VIO	Power supply for LCD, UPP and flash memory	C207	1.8V	
VFLASH1	Power supply for LCD, IR and flash memory	C205	2.8V	
VANA	Power supply for UEM (AD, RF and audio codecs)	C206	2.8V	
VCORE	Power supply for UPP	C208	1.0-1.8V programmable	1.8 V used in NHM-4, initial value is 1.5V
DLIGHT	DC/DC converter control	Converter pin8	~VBAT	

Signal Name	Function	Test Point	Signal Characteristics	Notes
RESET	Hagar reset	J1	0 -1.8V, digital signal	
RF_BUSEN1	Hagar chip select and latch enable	J4	1.8-0V, digital signal	
XRES	LCD reset	X300/2	1.8-0V, digital signal	
SI	LCD serial data input	X300/3	0 -1.8V, digital signal	
SCI	LCD serial clock input	X300/6	0 -1.8V, 3.25 MHz digital clock signal	
XCS	LCD chip select	X300/5	1.8-0V, digital signal	
EXTRDX	Flash memory read enable	J417	1.8-0V, digital signal	
FLSCSX	Flash memory chip select	J420	1.8-0V, digital signal	
FLSCLK	Flash memory clock in burst mode	J419	0 -1.8V, ~35 MHz digital clock signal	Burst mode only when read
EXTWRX	Flash memory write enable	J416	1.8-0V, digital signal	

Signal Name	Function	Test Point	Signal Characteristics	Notes
VBAT	Battery voltage for UEM, power amplifier, DC/DC converter, IR, audio amp, keyboard leds and vibra	Battery connector	3.6V	3.1V – 4.2V
BTEMP	Battery temperature, test mode switch	Battery connector and J102		
FBUSRX	FBUS from UEM to UPP	J412	0 -1.8V, digital signal	
FBUSTX	FBUS from UPP to UEM	J411	1.8-0V, digital signal	
UEMINT	Interrupt request for UPP	J405	0 -1.8V, digital signal	
DBUSDA	DBUS clock	J414	0 -1.8V, digital signal	Controlled by DSP
DBUSCLK	DBUS data input/output	J413	0 -1.8V, 13 MHz digital clock signal	Controlled by DSP
DBUSEN1X	DBUS selection and enable	J415	1.8-0V, digital signal	Controlled by DSP
MBUSRX	MBUS from UEM to UPP	J410	1.8-0V, digital signal	
MBUSTX	MBUS from UPP to UEM	J409	1.8-0V, digital signal	

Troubleshooting steps

The following hints help to find the problem if the circuitry seems to be faulty. The instructions are divided into following sections:

1. Phone is dead

2. Flash faults

3. Phone is jammed

4. Charging fault

5. Sim card fault

6. Audio faults

7. Display faults

8. Keypad fault

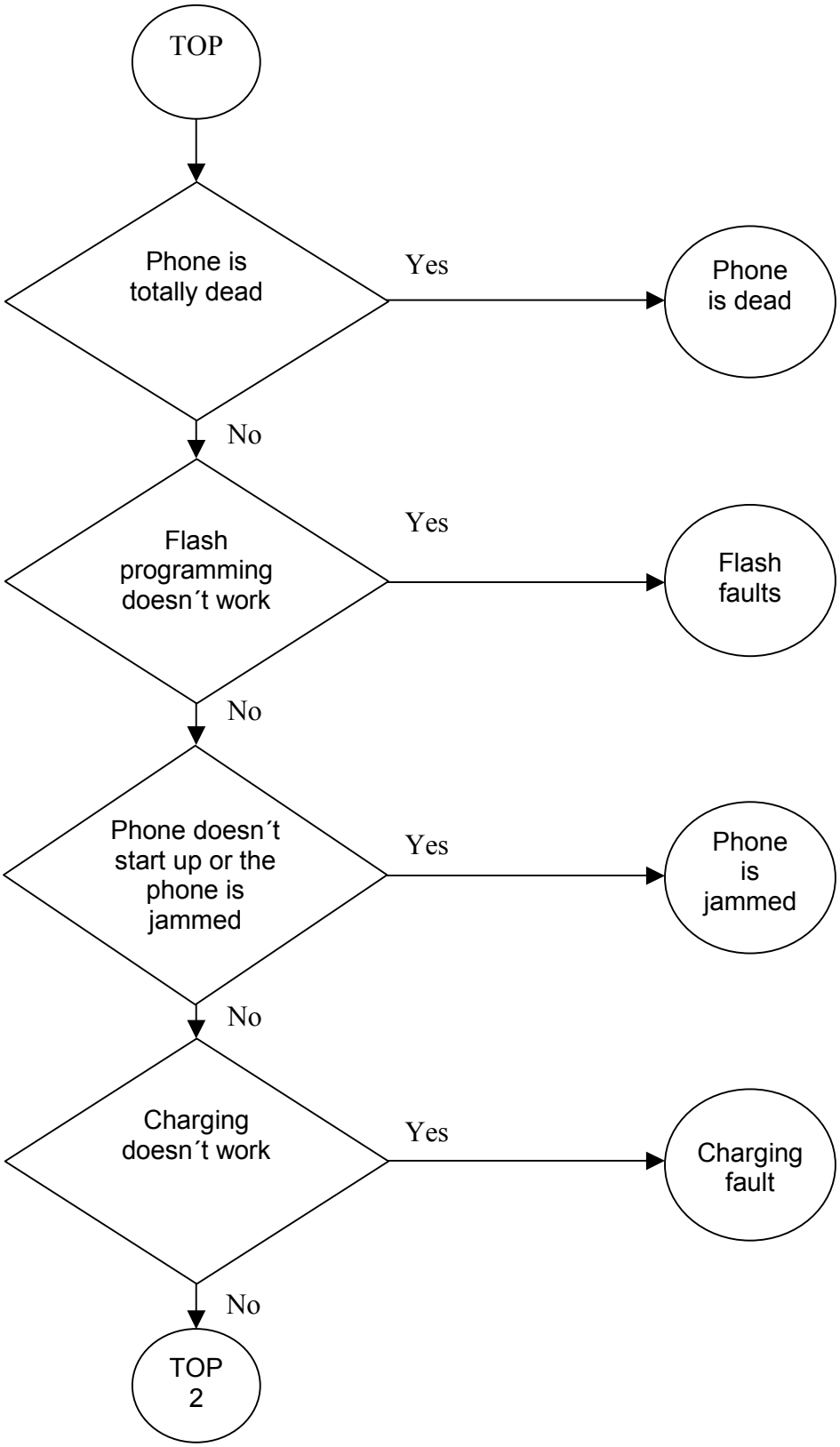
9. FM-radio faults

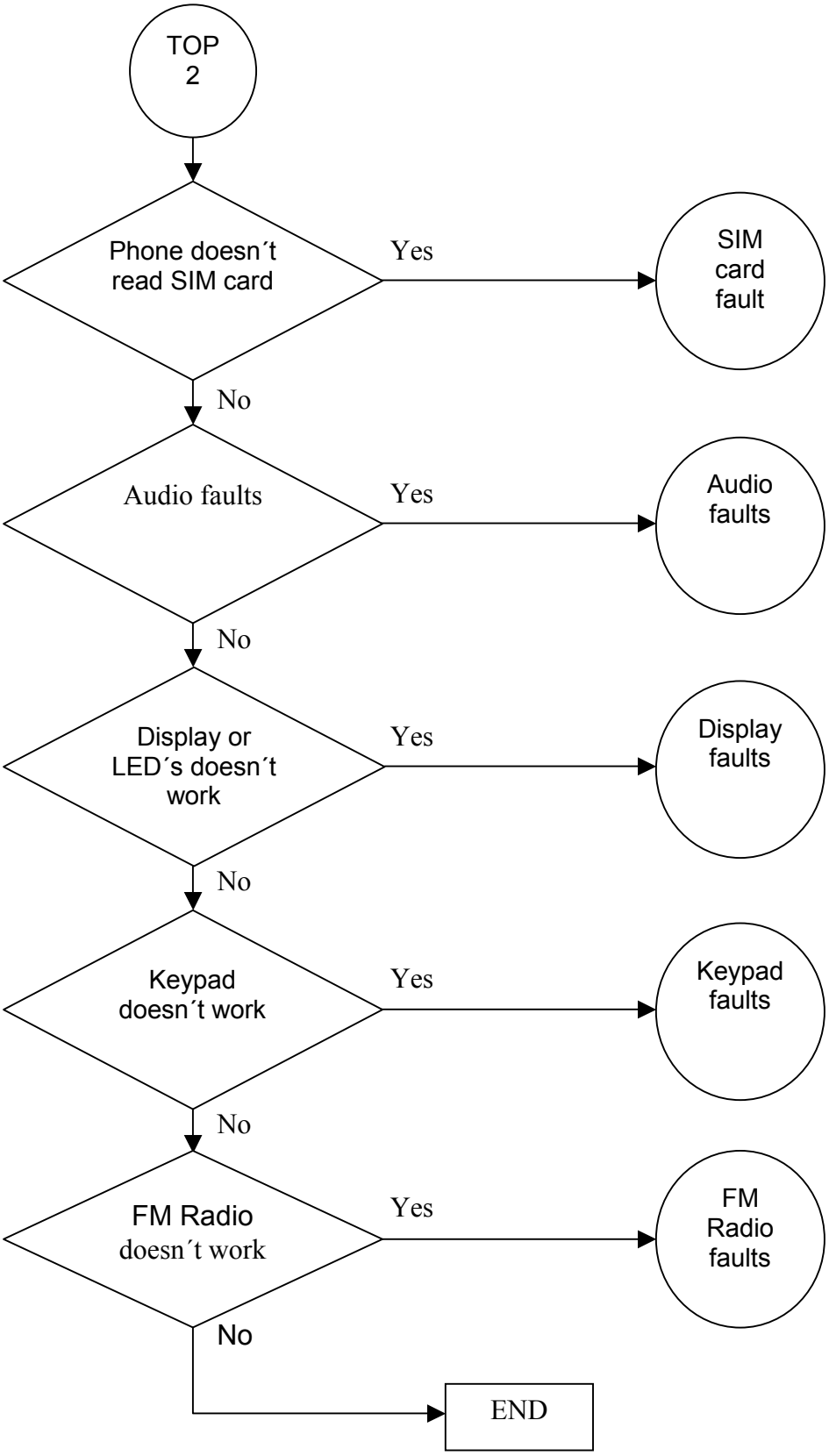
The first thing to do is to carry out a thorough visual check of the module. Ensure in particular that:

1. there is no any mechanical damages

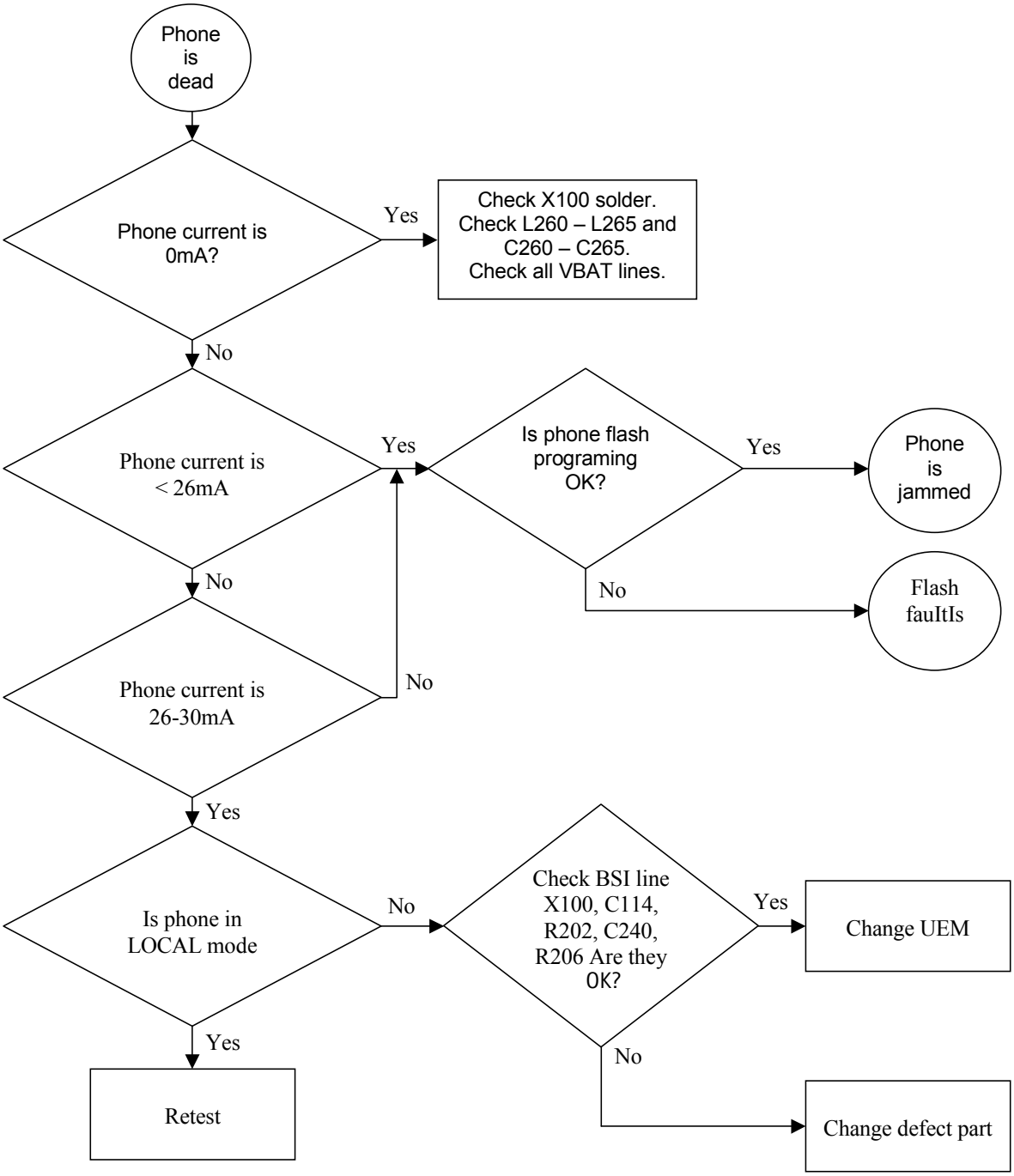
2. soldered joints are OK

Main troubleshooting tree

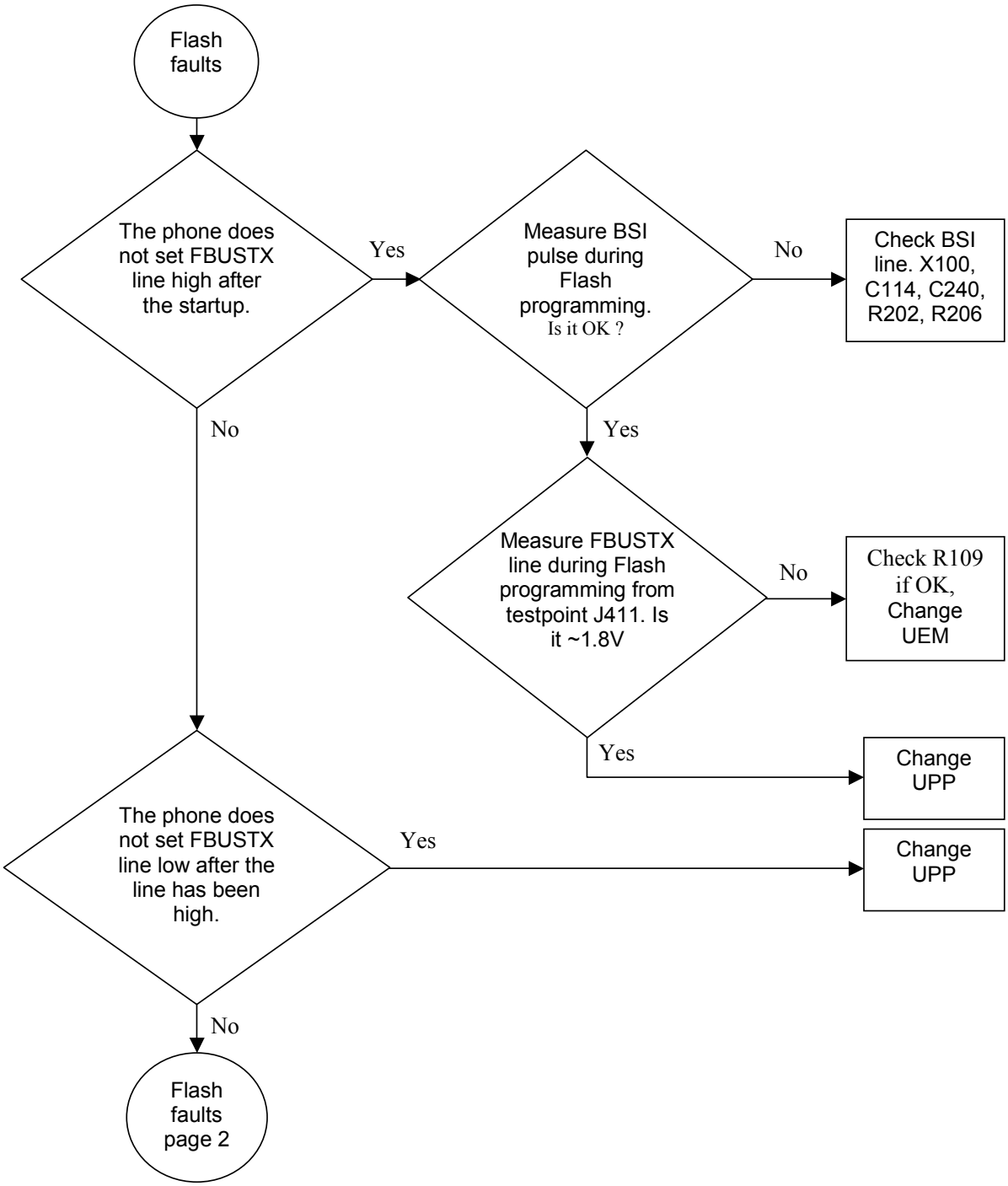


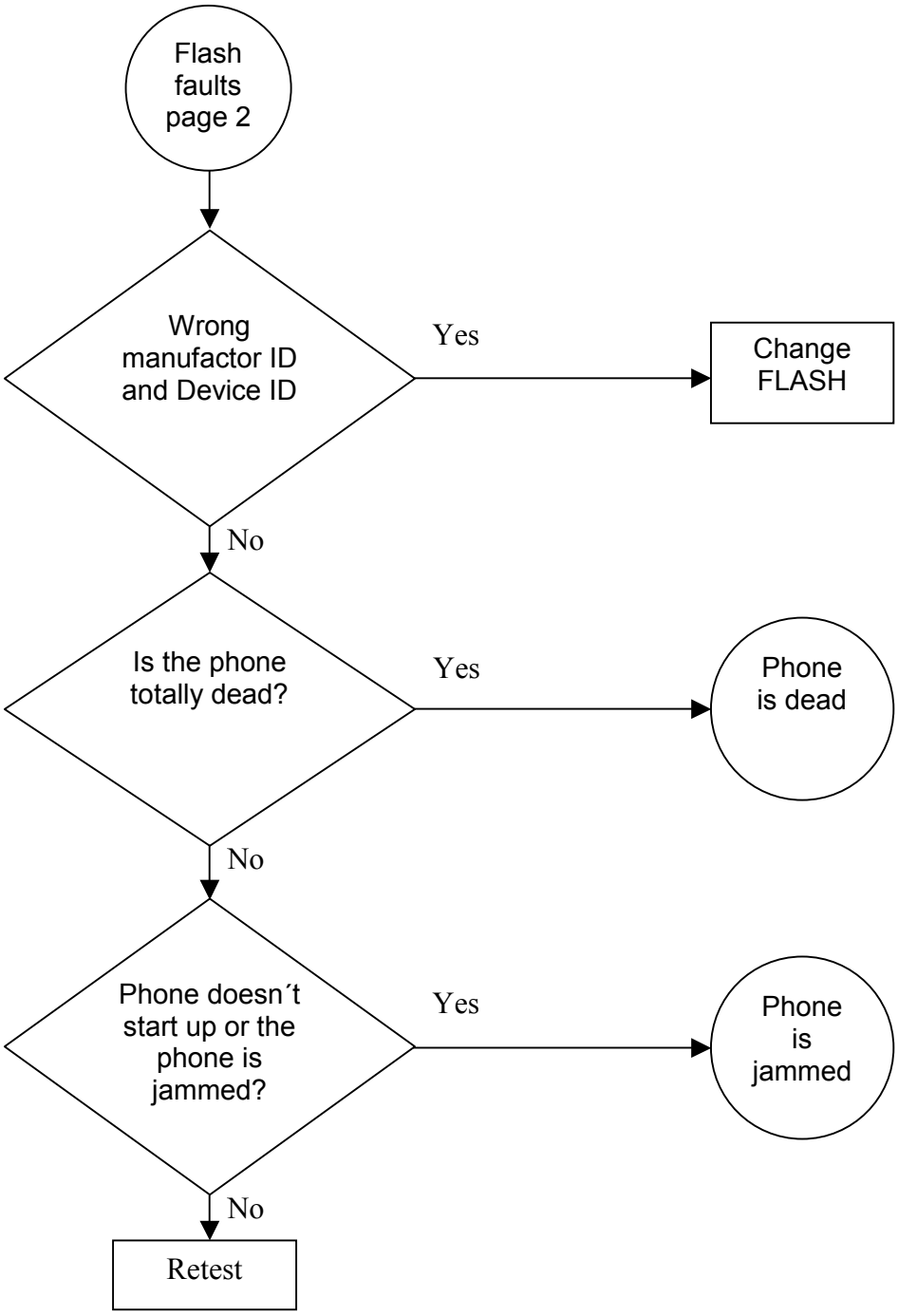


Phone is dead

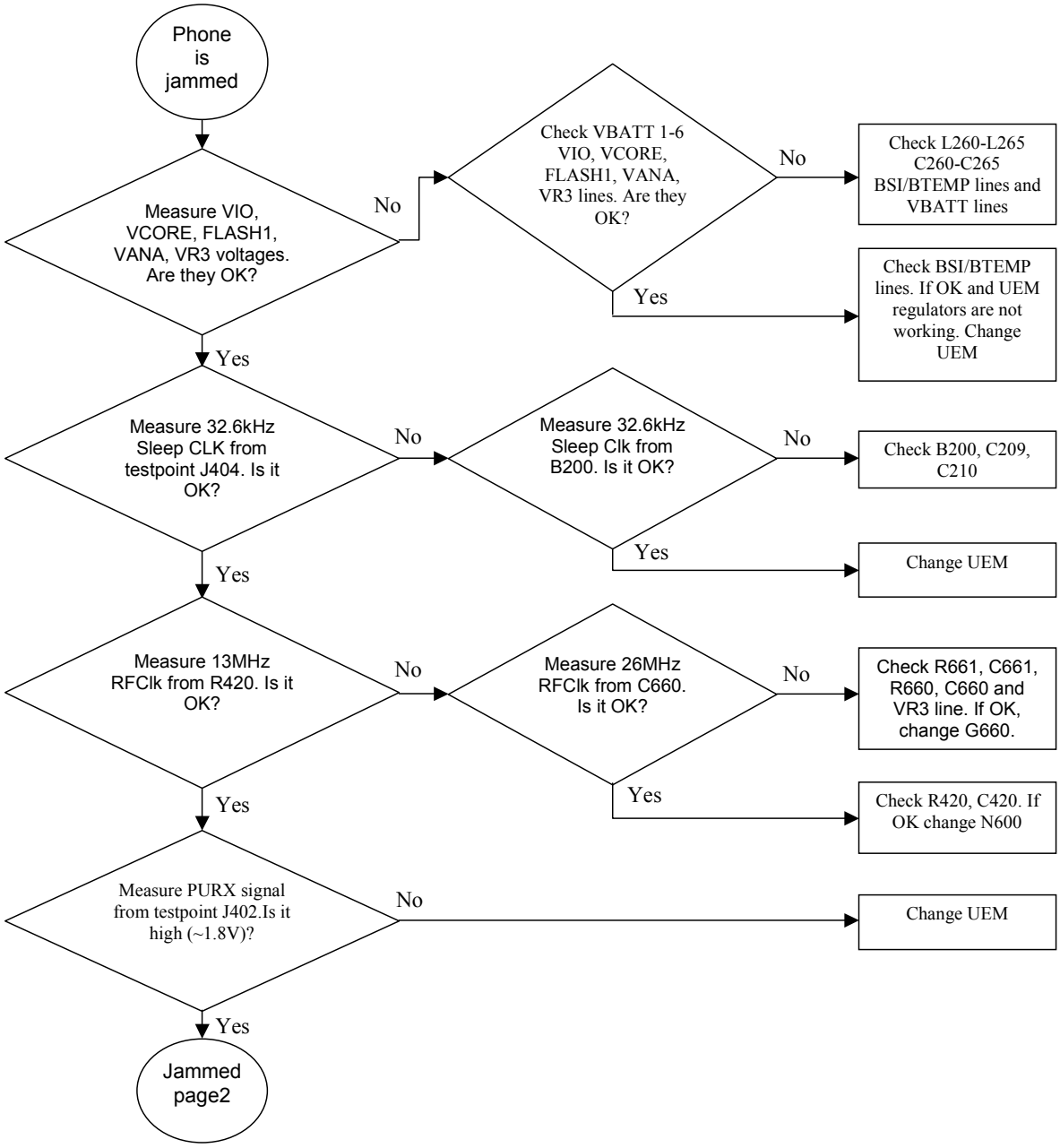


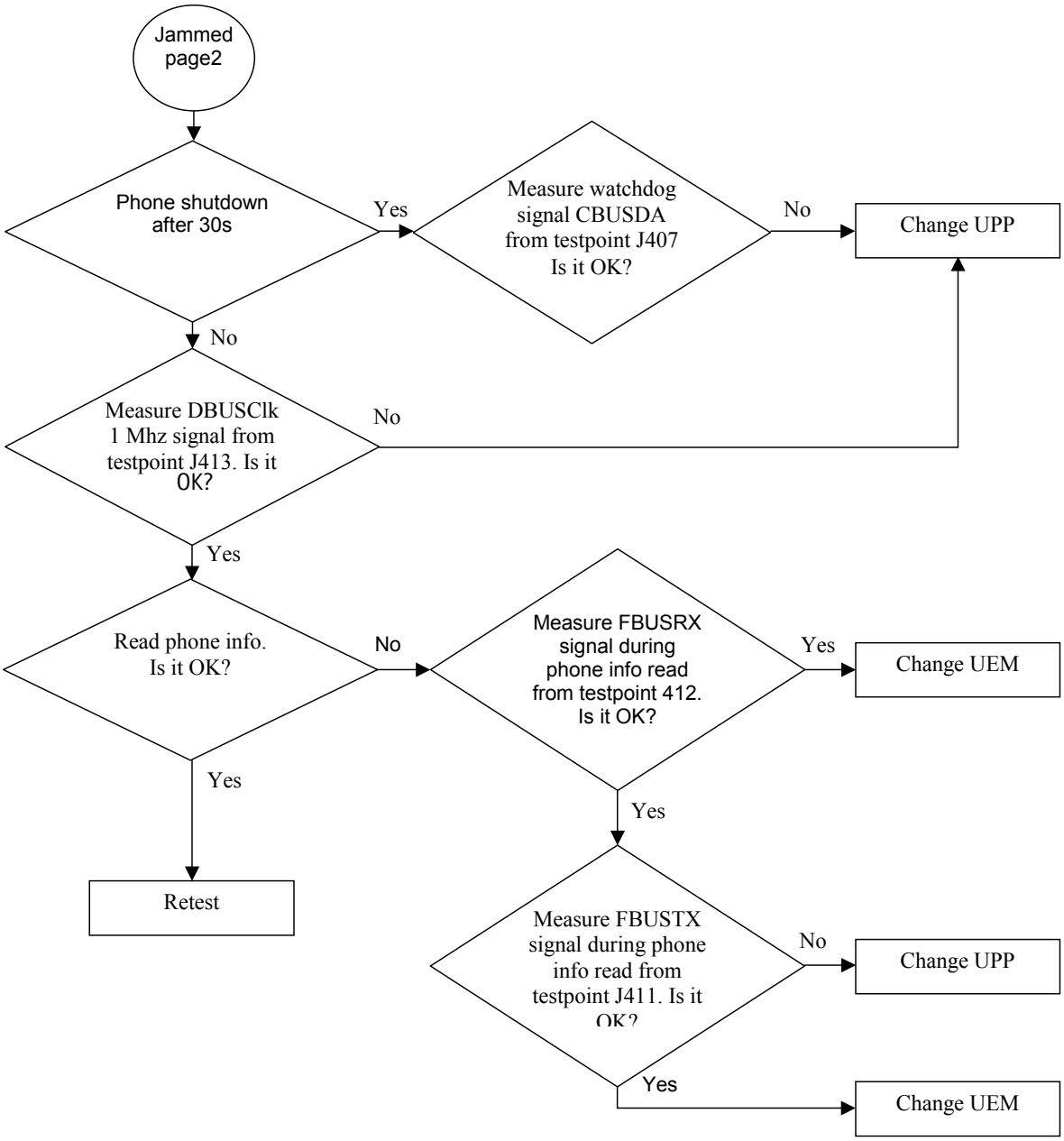
Flash faults



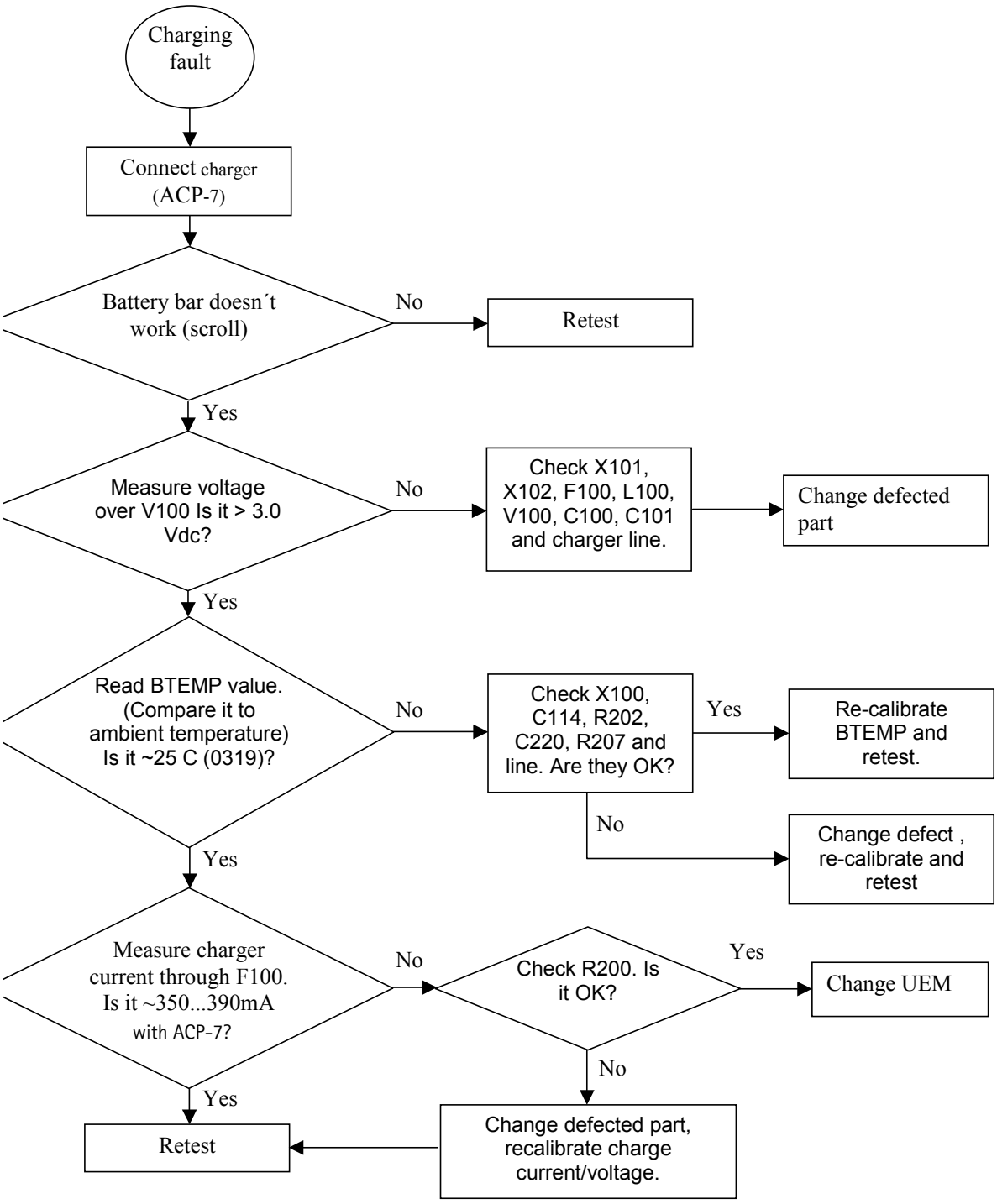


Phone is jammed

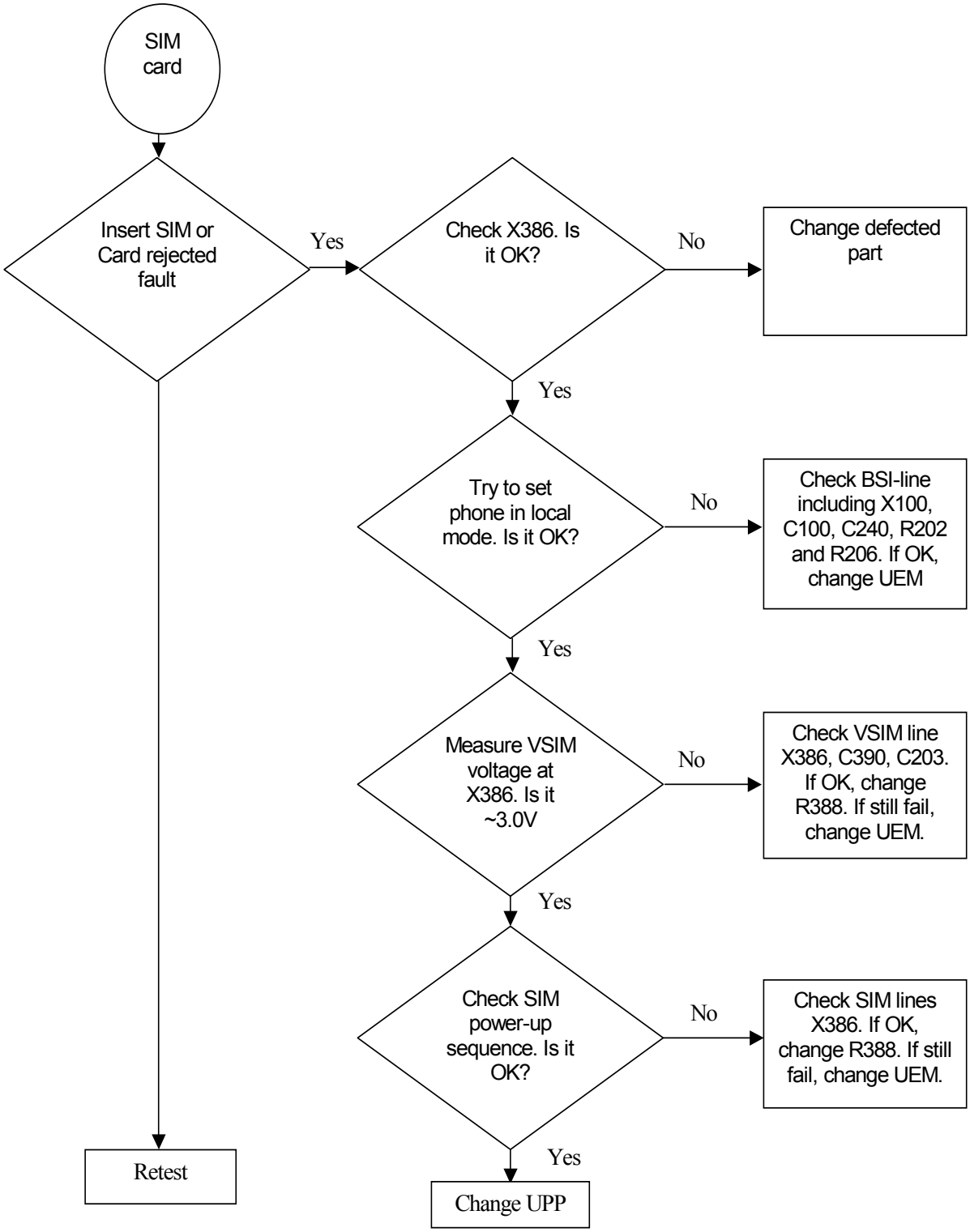




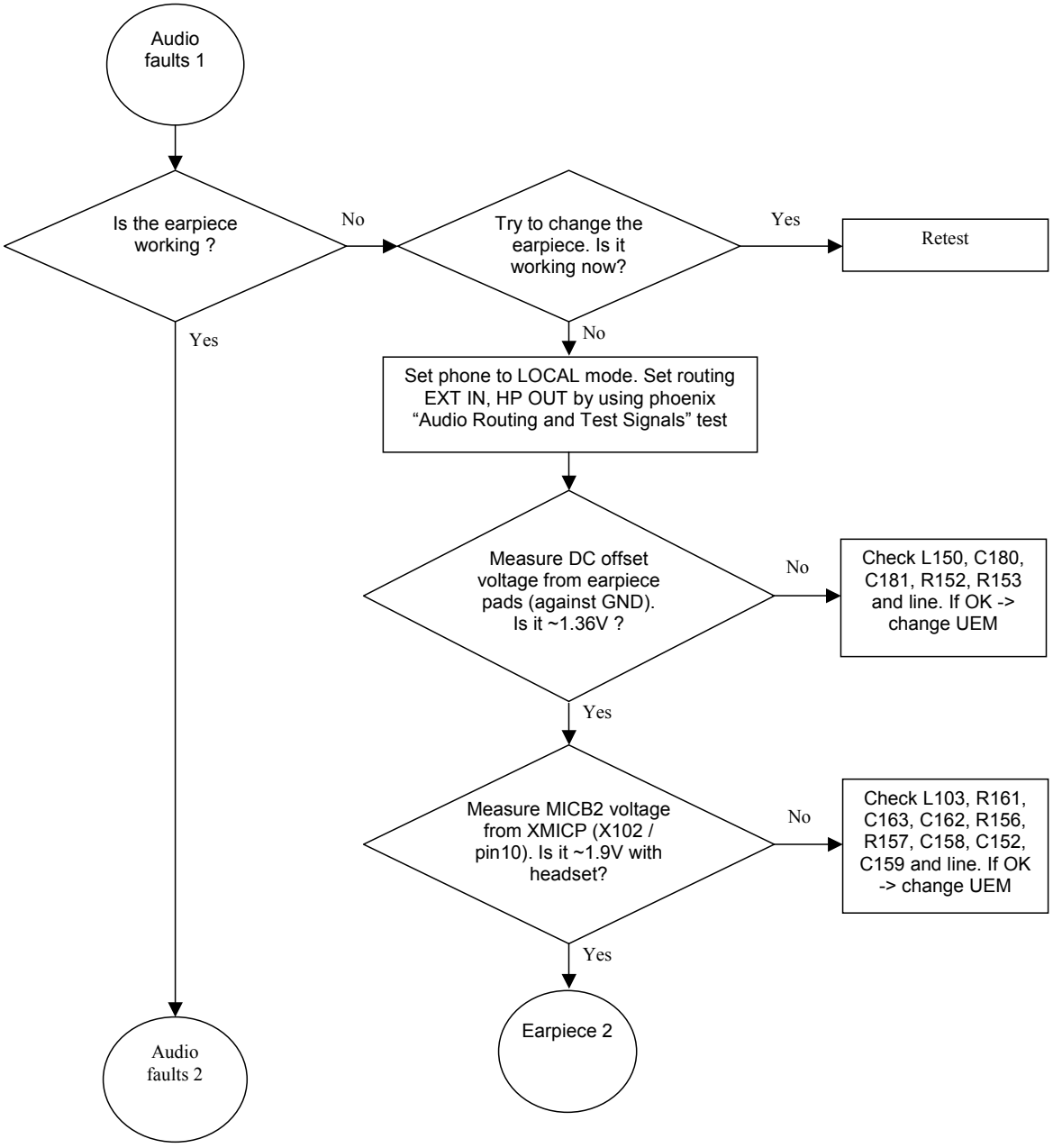
Charging fault

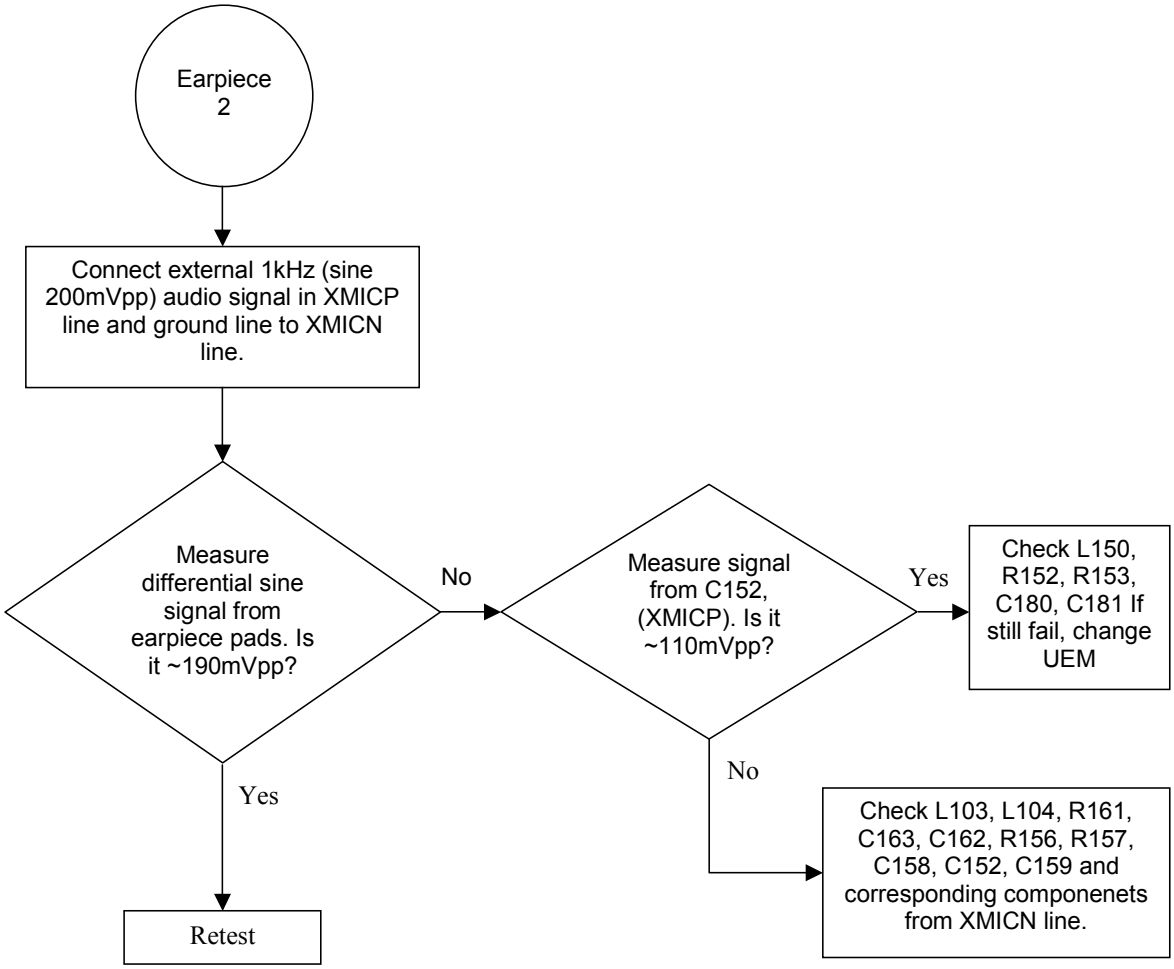


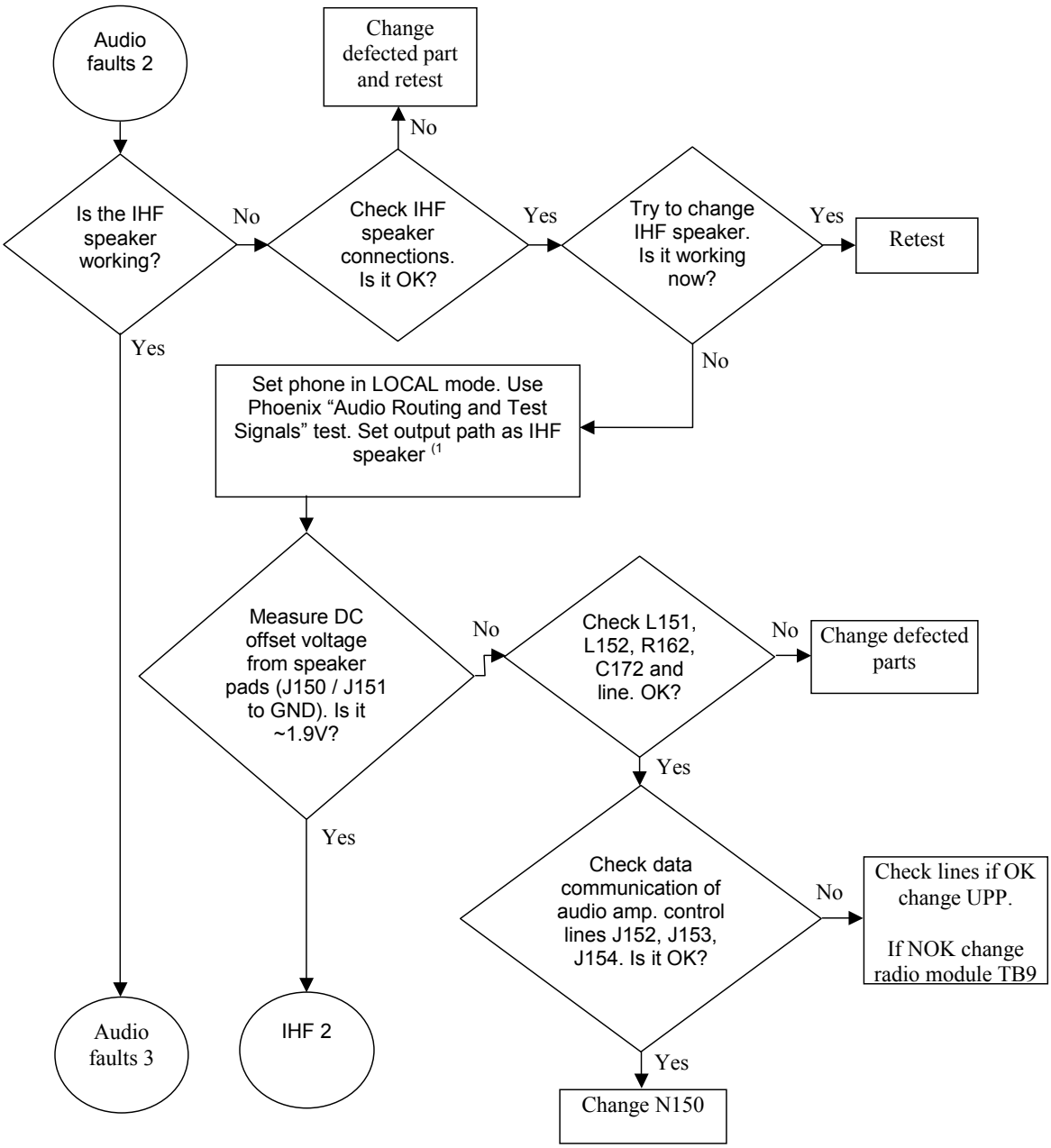
SIM card fault



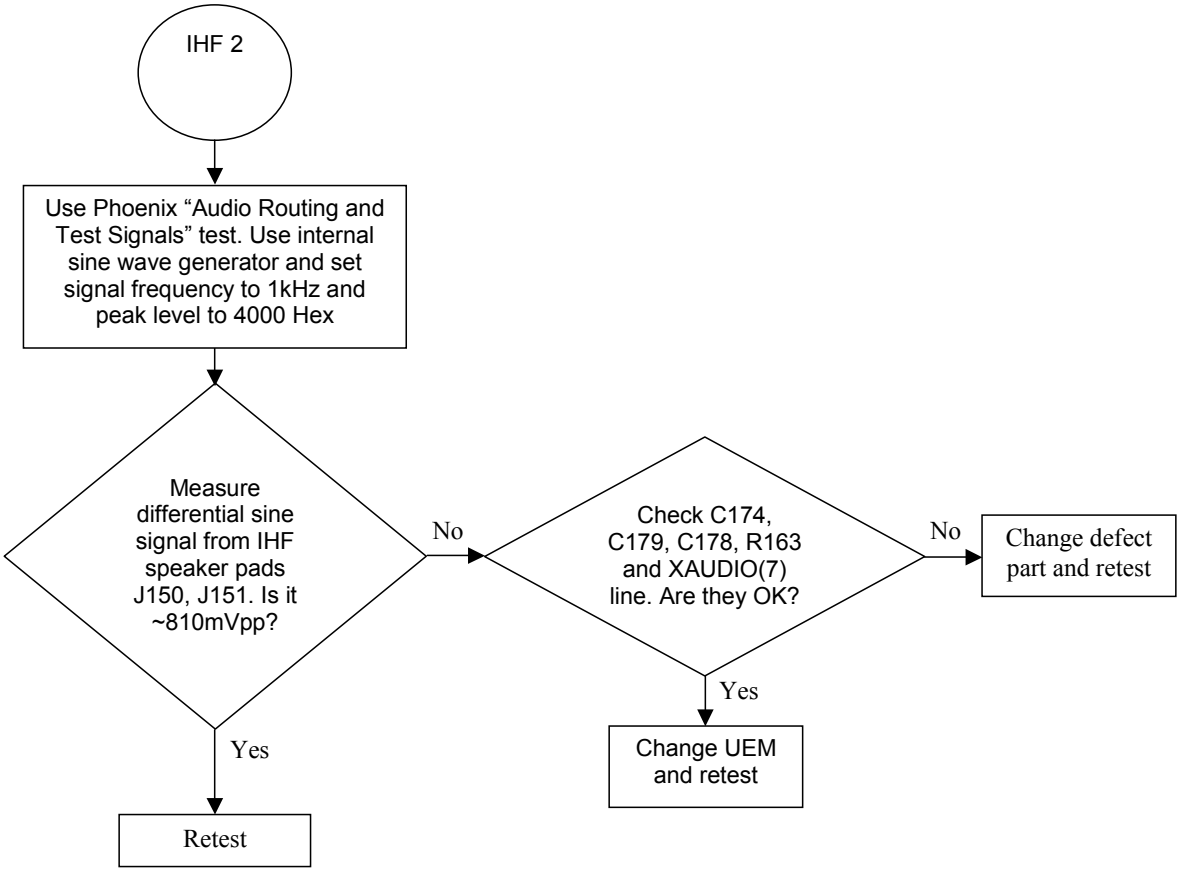
Audio faults

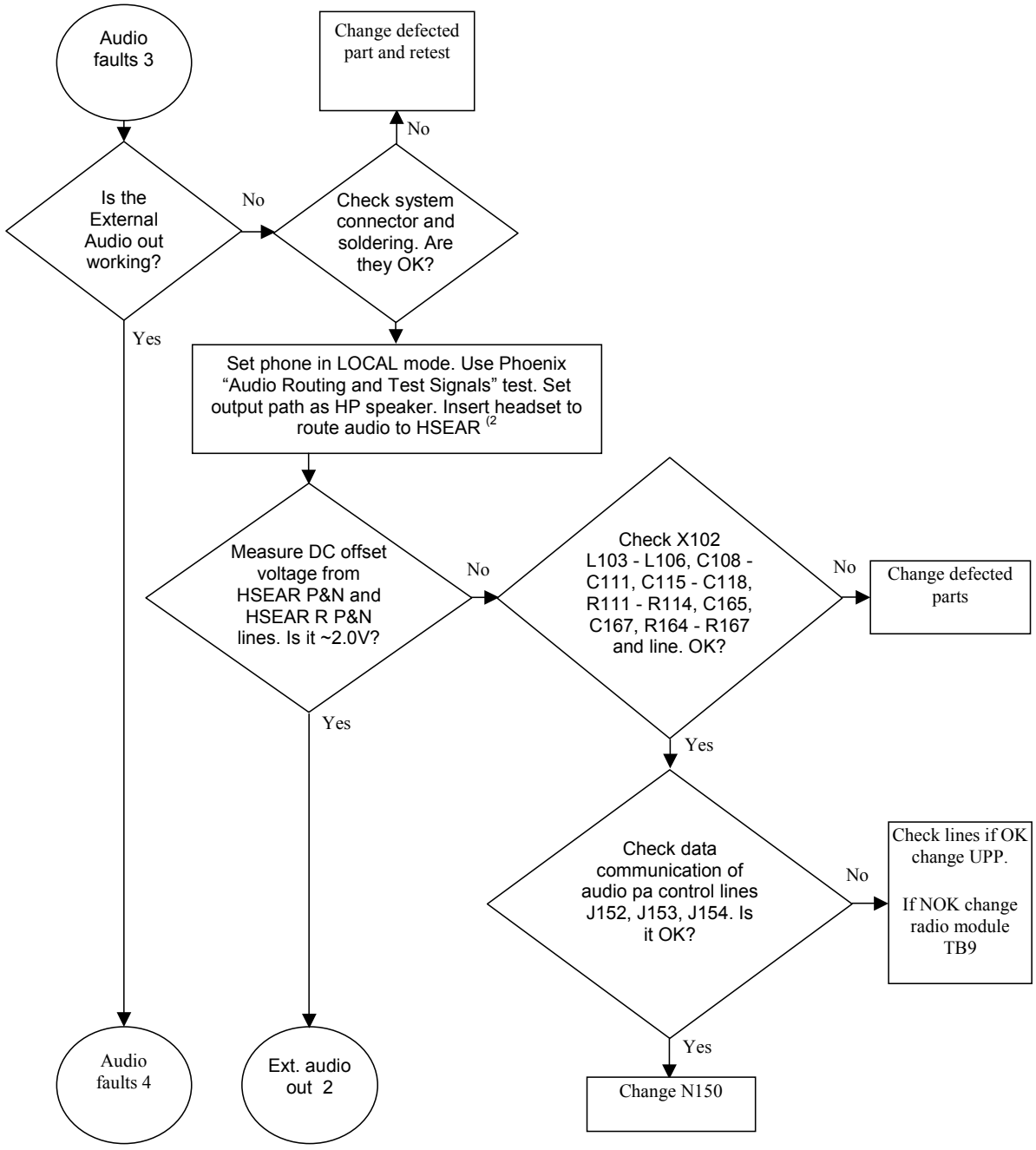




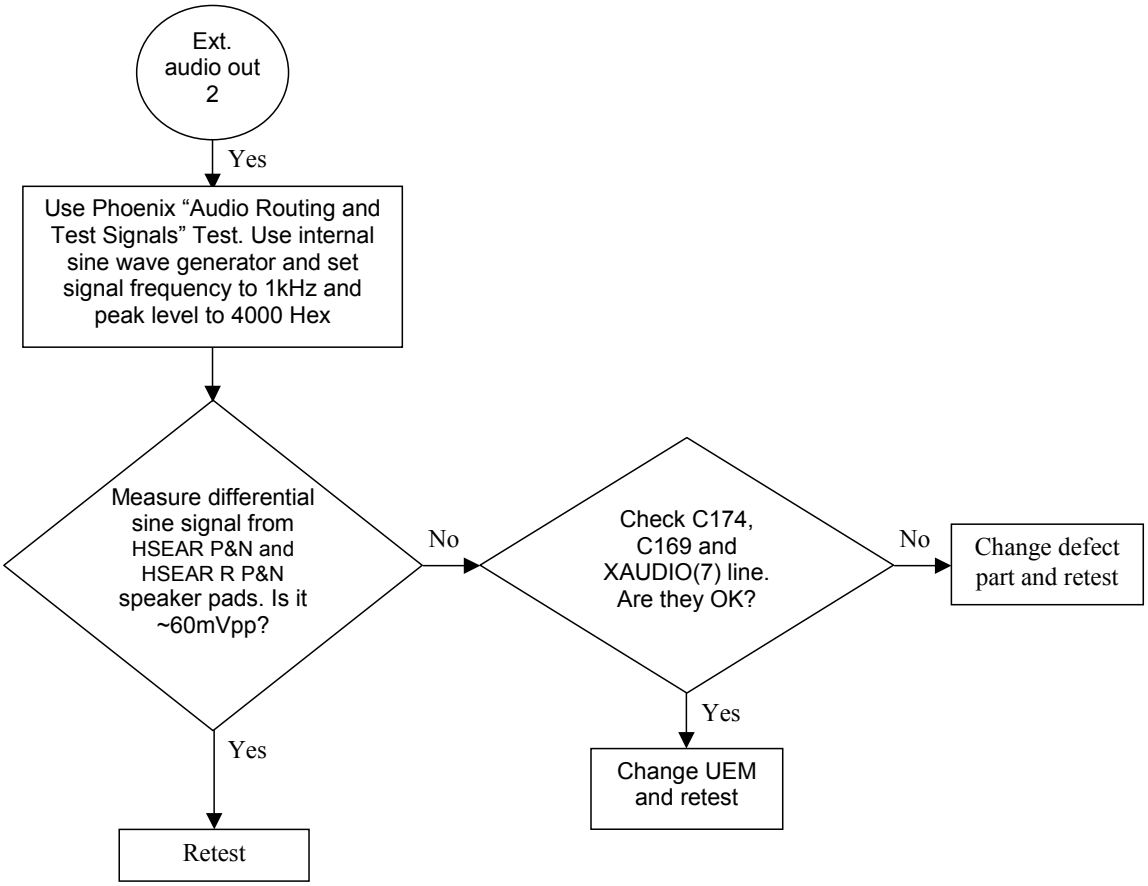


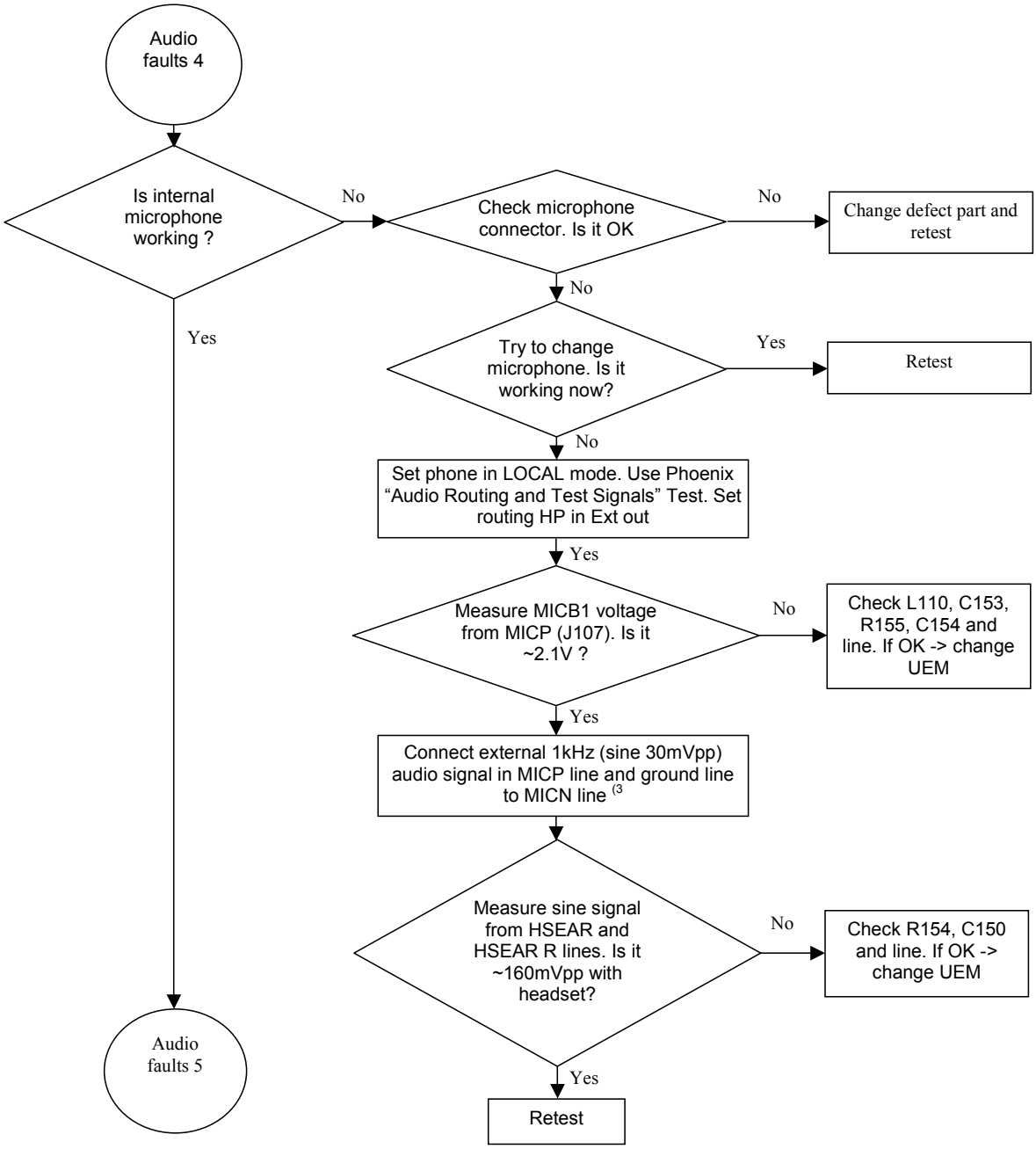
1) If not working set first "All outputs off" and after that "IHF speaker"


IHF 2
Use Phoenix “Audio Routing and Test Signals” test. Use internal sine wave generator and set signal frequency to 1kHz and peak level to 4000 Hex
Measure differential sine signal from IHF speaker pads J150, J151. Is it ~810mVpp?
No
Check C174, C179, C178, R163 and XAUDIO(7) line. Are they OK?
No
Change defect part and retest
Yes
Change UEM and retest
Yes
Retest

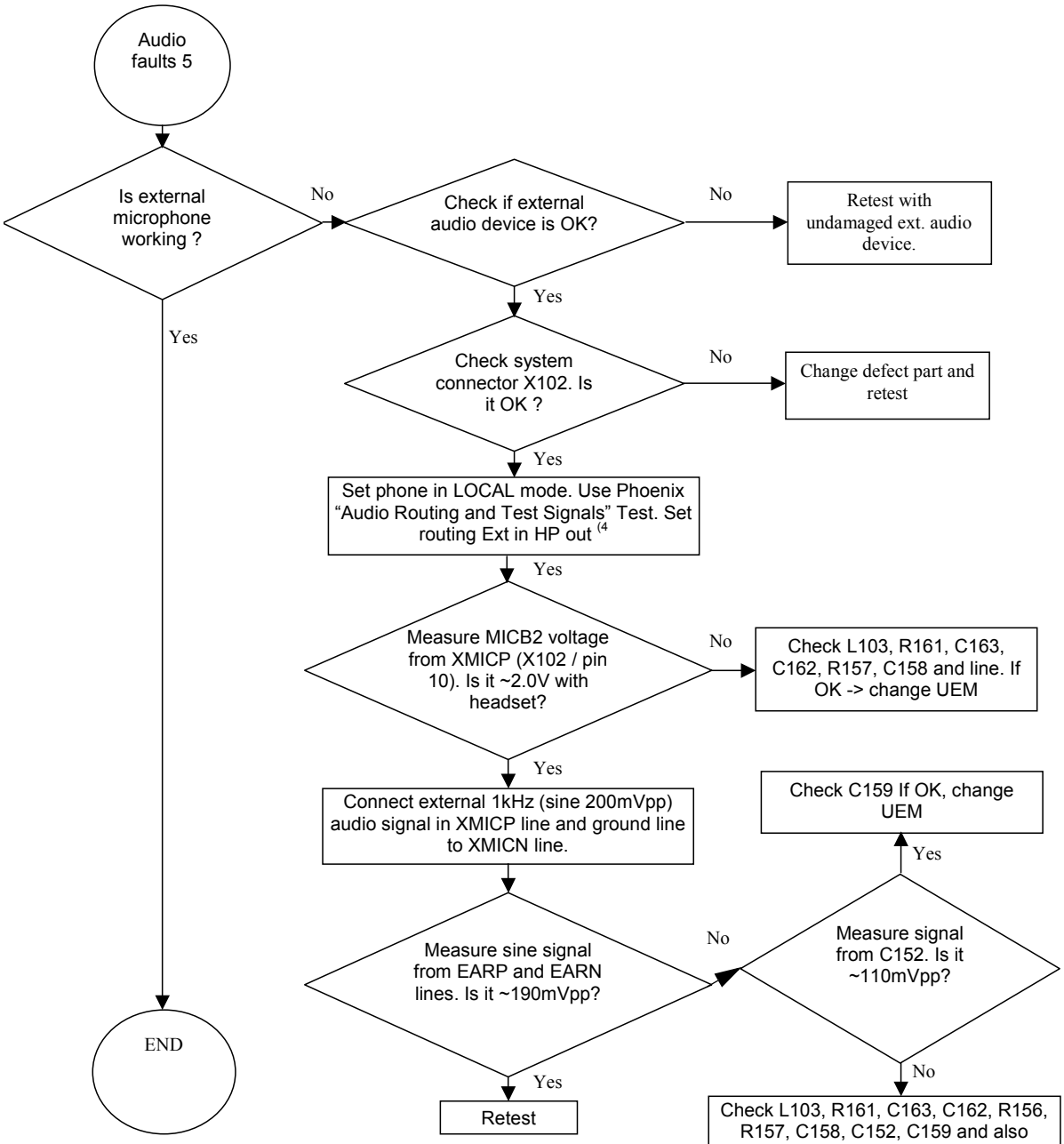


2) If not working set first "All outputs off" and after that "HP speaker", after that insert headset again


Ext.
audio out
2
Yes
Use Phoenix “Audio Routing and Test Signals” Test. Use internal sine wave generator and set signal frequency to 1kHz and peak level to 4000 Hex
Measure differential sine signal from HSEAR P&N and HSEAR R P&N speaker pads. Is it ~60mVpp?
No
Check C174, C169 and XAUDIO(7) line. Are they OK?
No
Change defect part and retest
Yes
Change UEM and retest
Yes
Retest

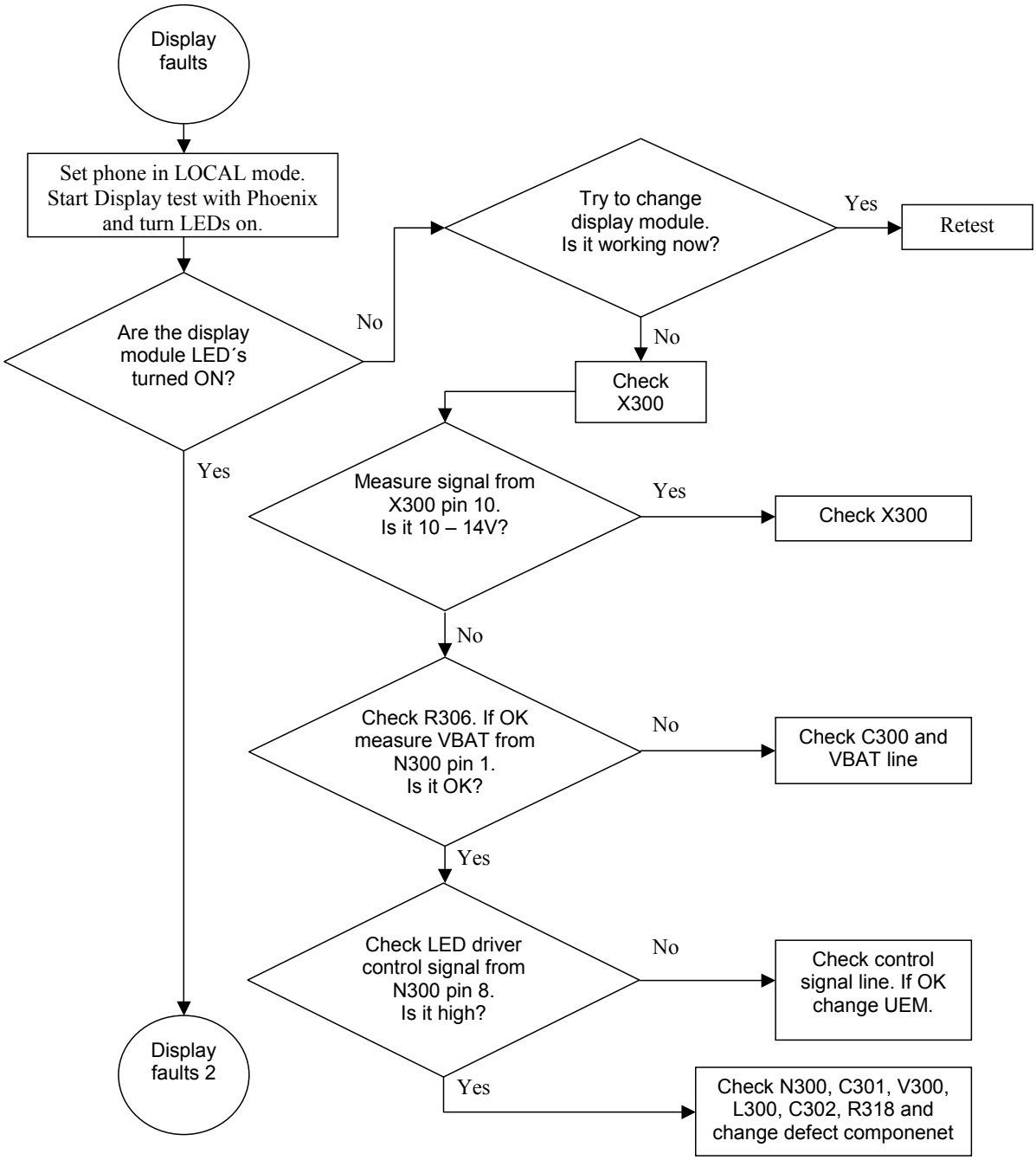


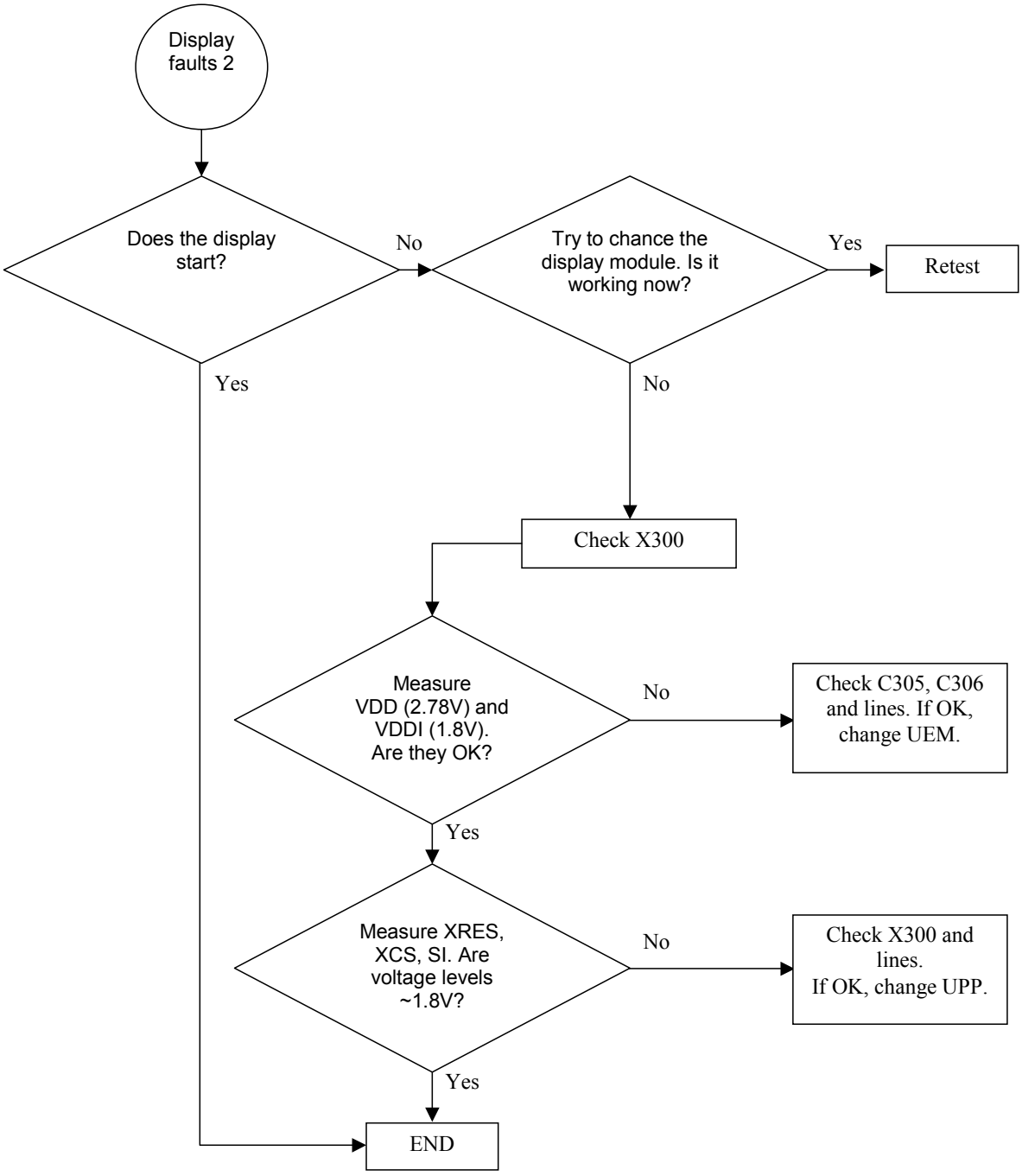
3) If you don't get such a small signal out from signal generator, use resistor network to attenuate signal



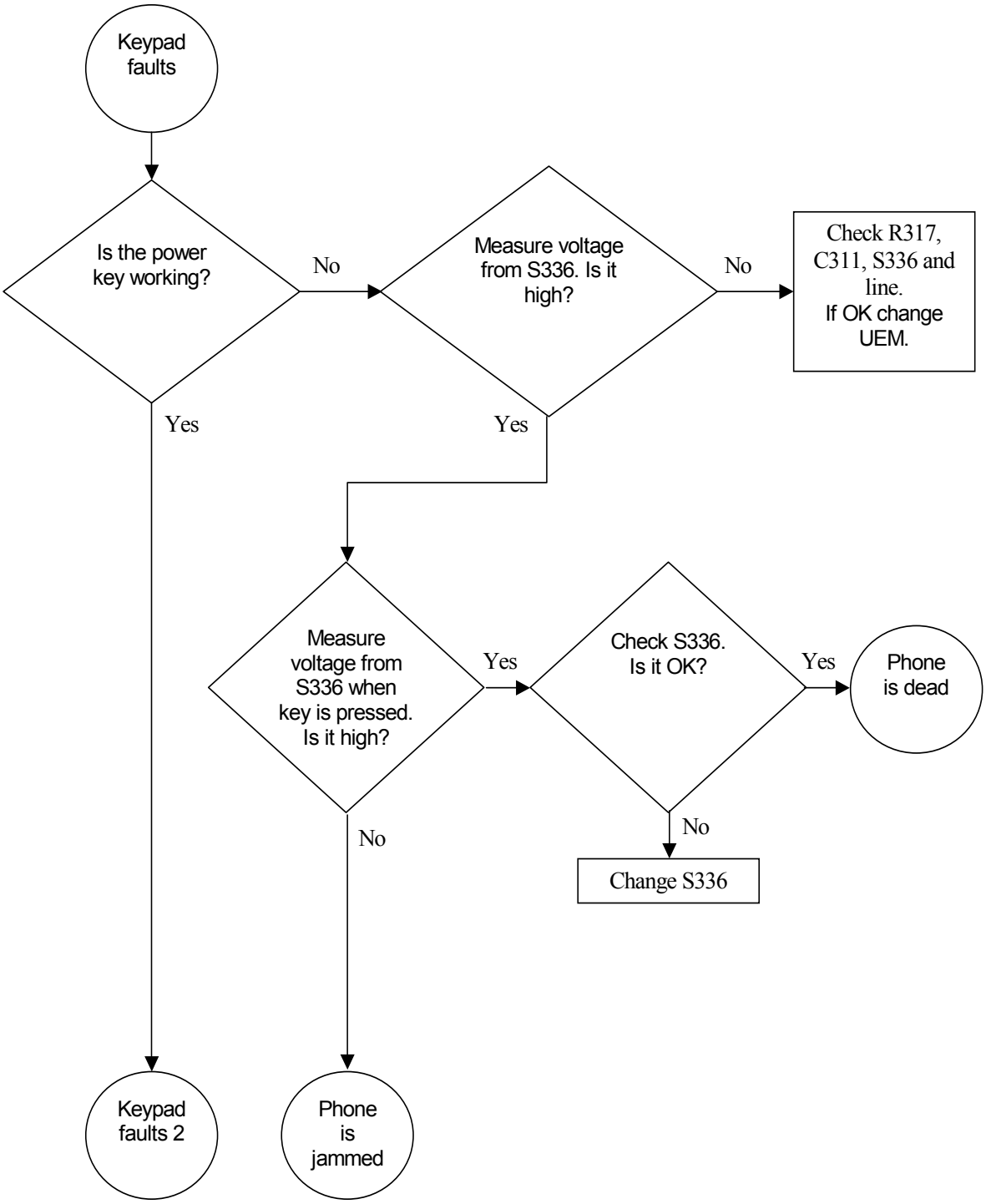
4) If not working set "Loops Off" and after that "Ext in HP out" again

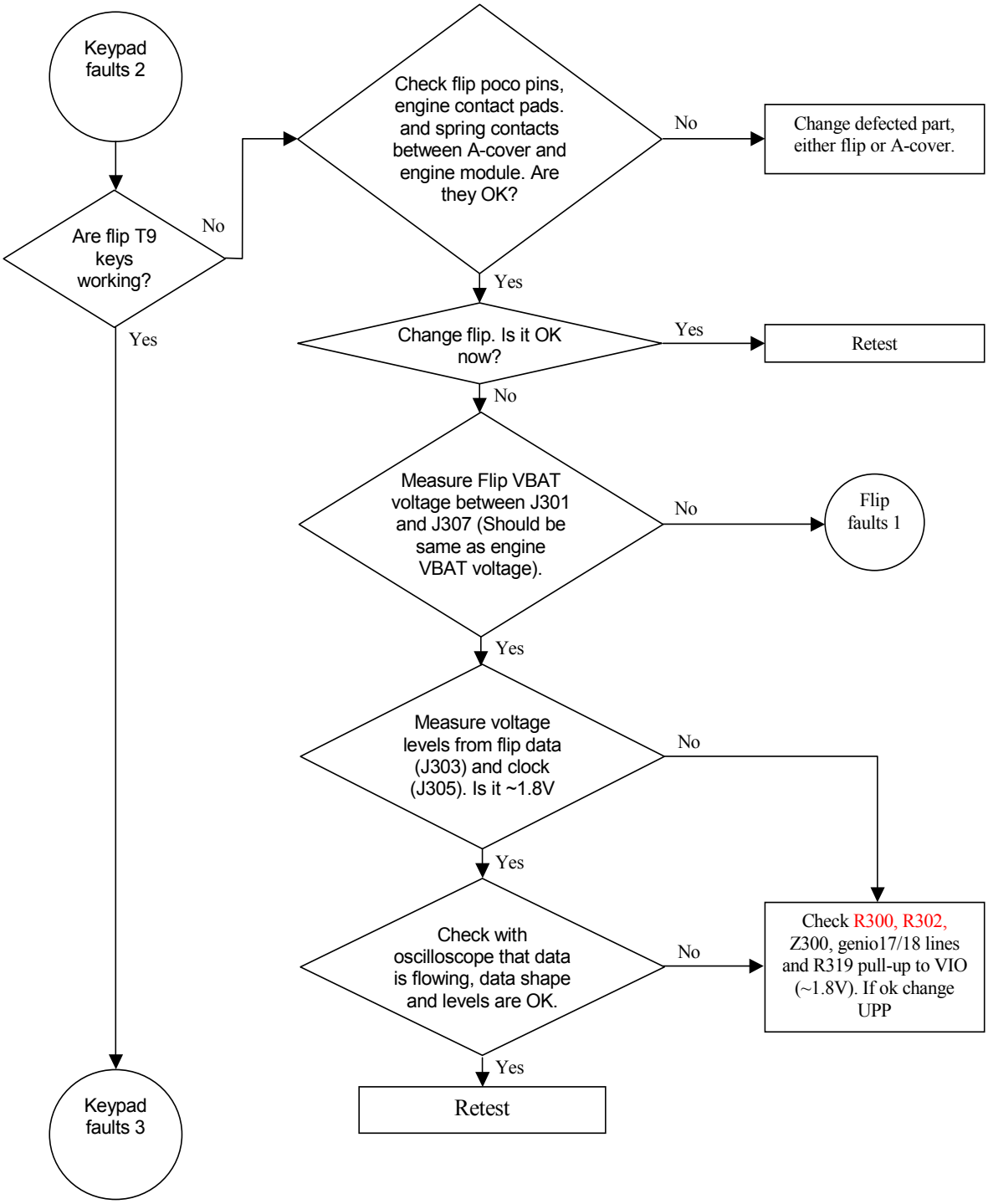
Display faults

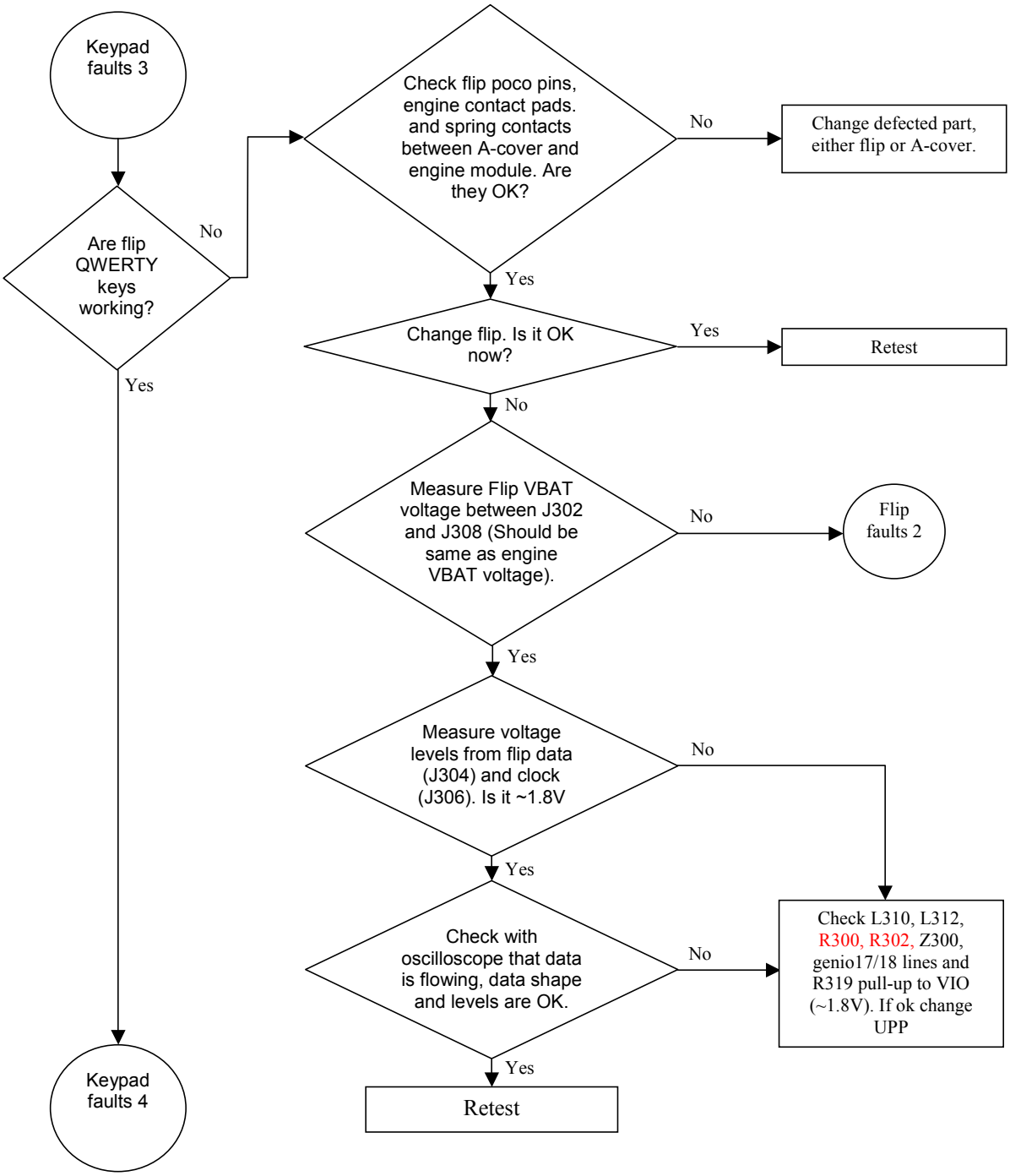


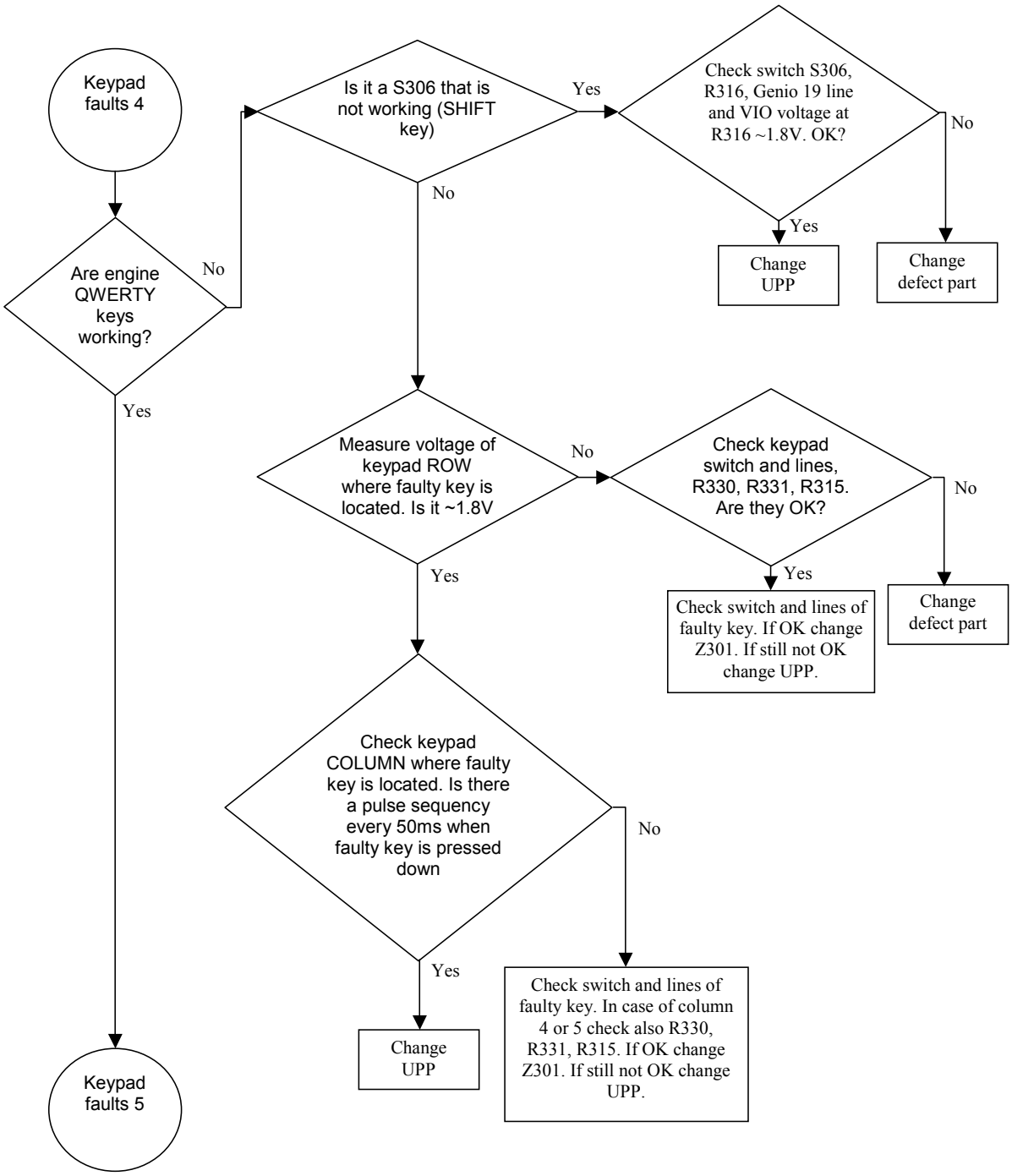


Keypad faults

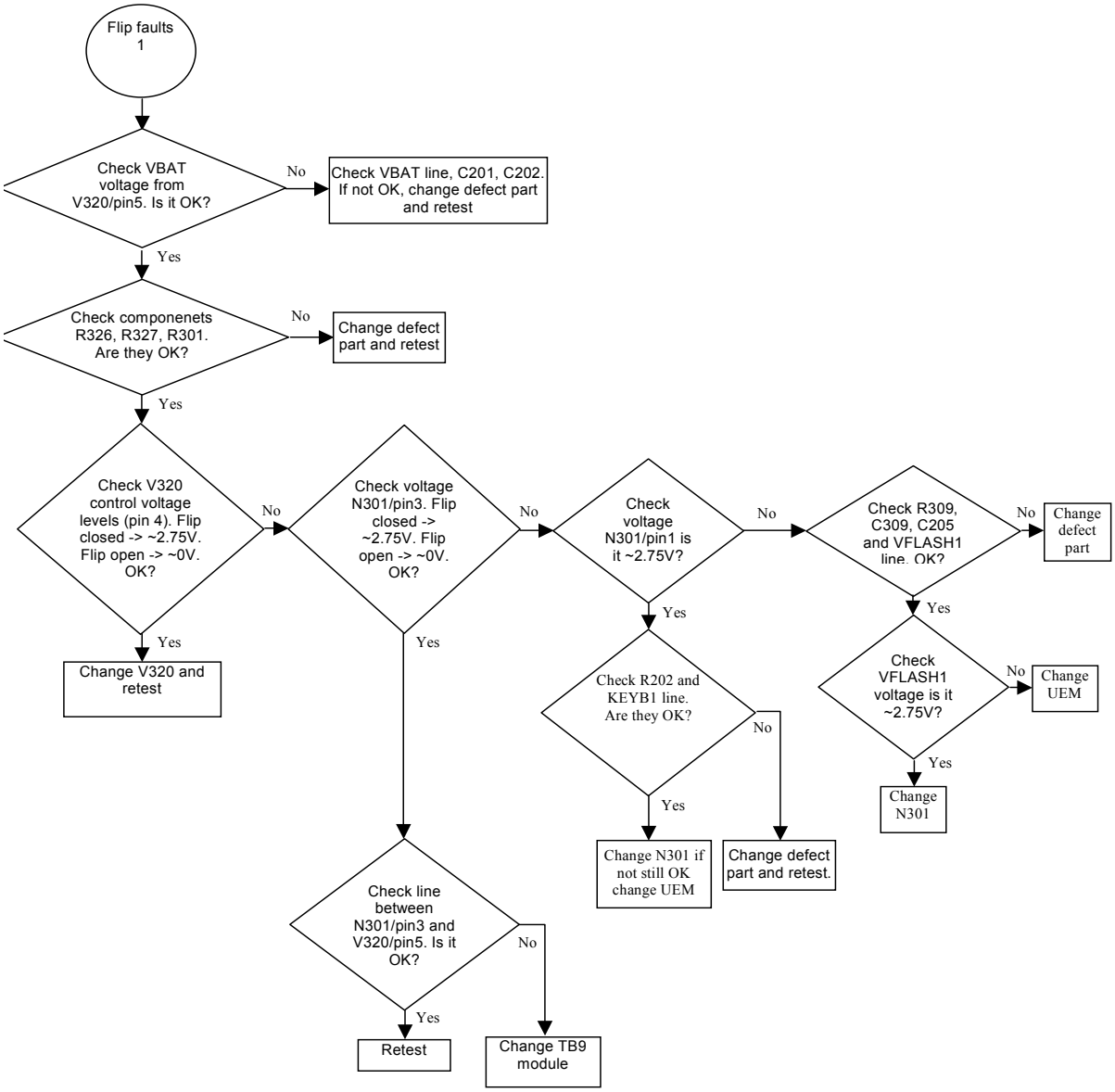


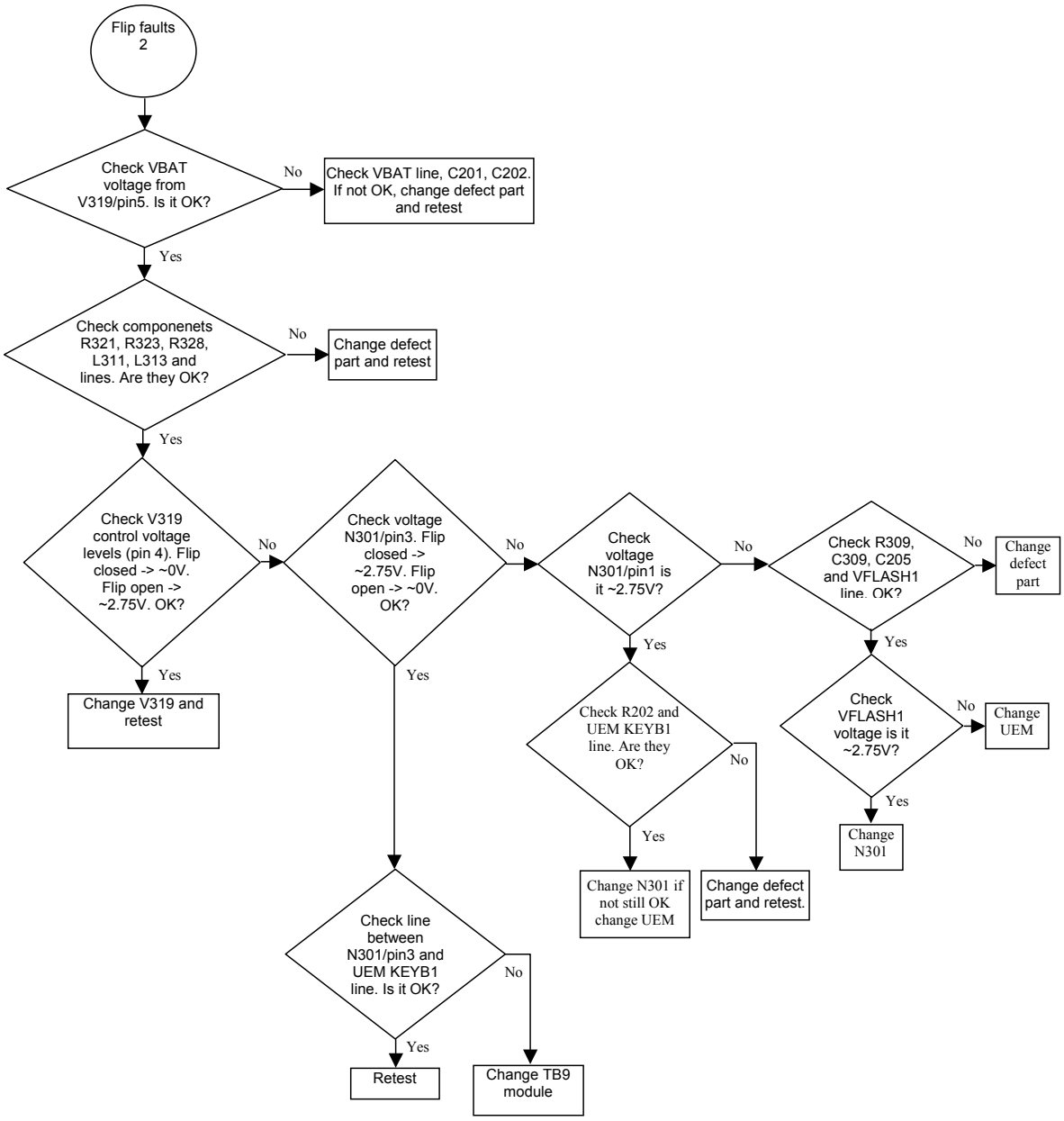






Flip faults




Flip faults 2
Check VBAT voltage from V319/pin5. Is it OK?
No
Check VBAT line, C201, C202. If not OK, change defect part and retest
Yes
Check componenets R321, R323, R328, L311, L313 and lines. Are they OK?
No
Change defect part and retest
Yes
Check V319 control voltage levels (pin 4). Flip closed -> ~0V. Flip open -> ~2.75V. OK?
No
Yes
Change V319 and retest
Check voltage N301/pin3. Flip closed -> ~2.75V. Flip open -> ~0V. OK?
No
Yes
Check voltage N301/pin1 is it ~2.75V?
No
Yes
Check R202 and UEM KEYB1 line. Are they OK?
No
Yes
Change N301 if not still OK change UEM
Change defect part and retest.
Check R309, C309, C205 and VFLASH1 line. OK?
No
Change defect part
Yes
Check VFLASH1 voltage is it ~2.75V?
No
Change UEM
Yes
Change N301
Check line between N301/pin3 and UEM KEYB1 line. Is it OK?
No
Yes
Retest
Change TB9 module

FM Radio doesn't work

See page 35, FM Radio troubleshooting.