

# **PAMS Technical Documentation**

## **NHM-7 Series Transceivers**

# **Troubleshooting Instructions**

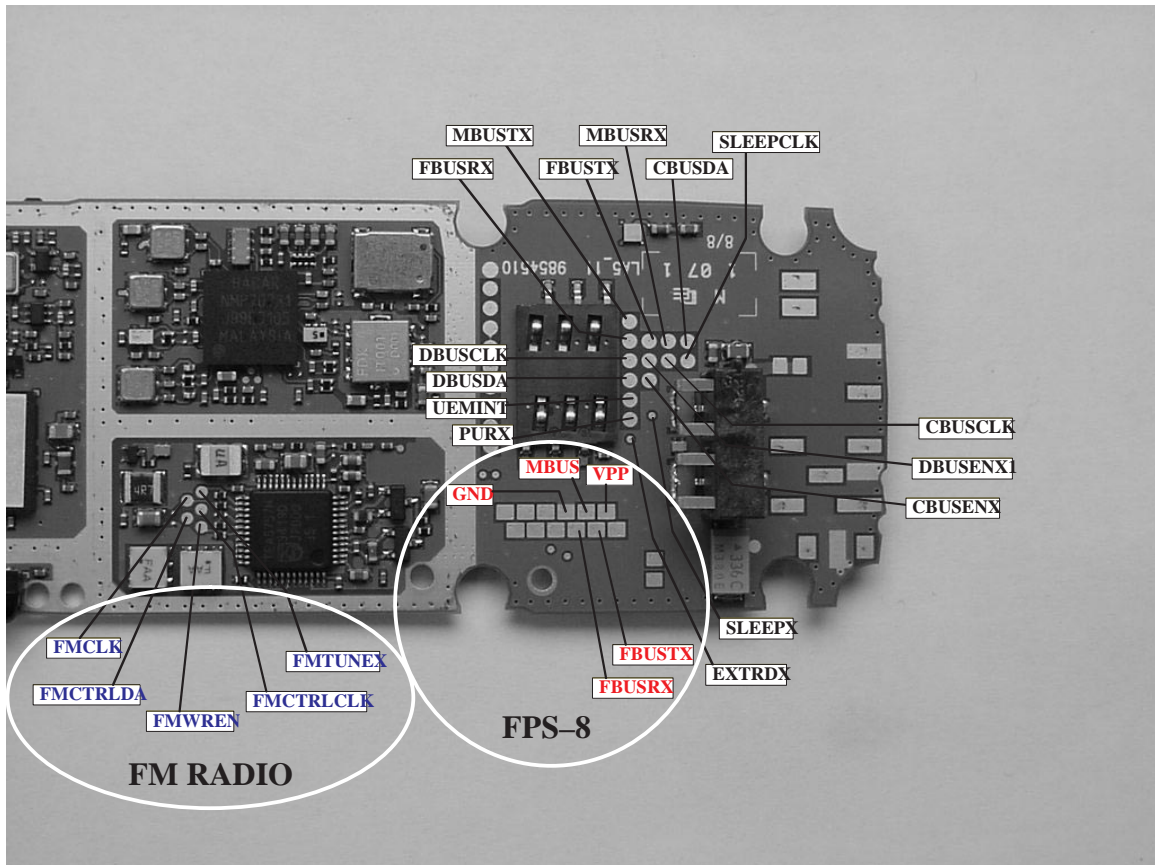
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# Transceiver Troubleshooting

## Baseband Troubleshooting

### PCB Test Points

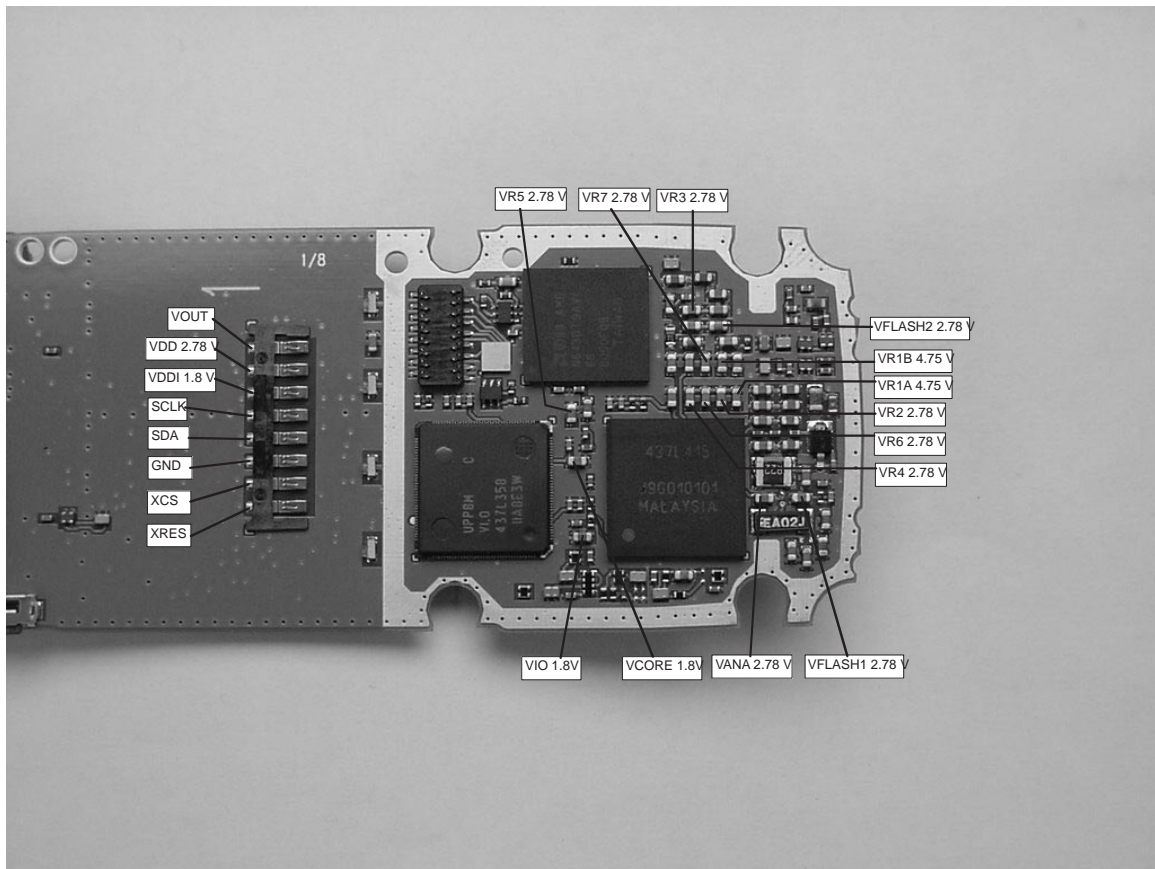


BLACK colored test points are connected to the lines between UEM and UPP where the logic level is 1.8 V.

RED colored test points are connected to the lines from FPS-8 and have 2.7 V logic level.

BLUE test points are connected to FM radio lines and have 1.8 V logic level.

## Measurement Points



## Troubleshooting steps

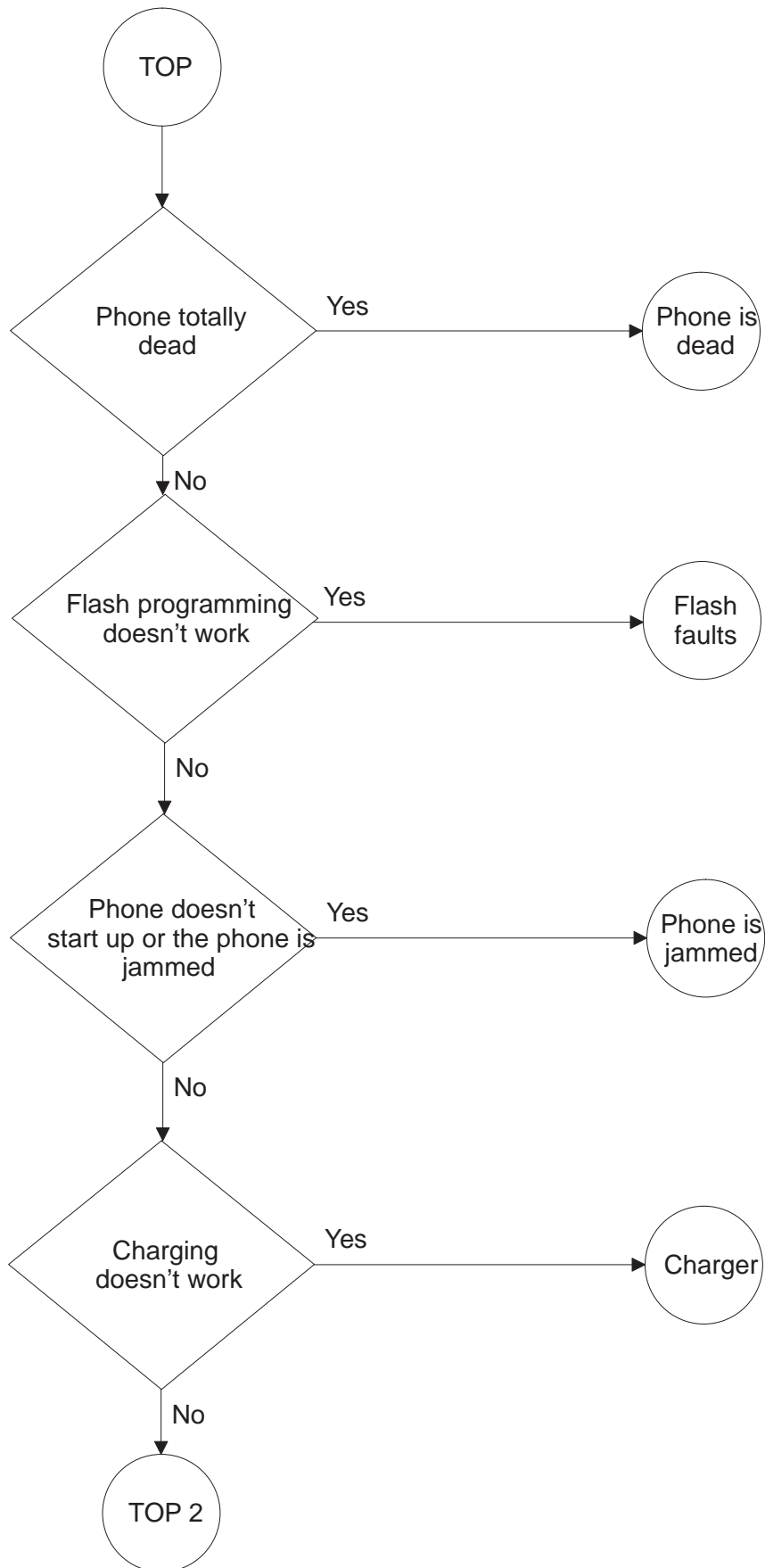
The following hints help to find the problem if the circuitry seems to be faulty. The instructions are divided into following sections:

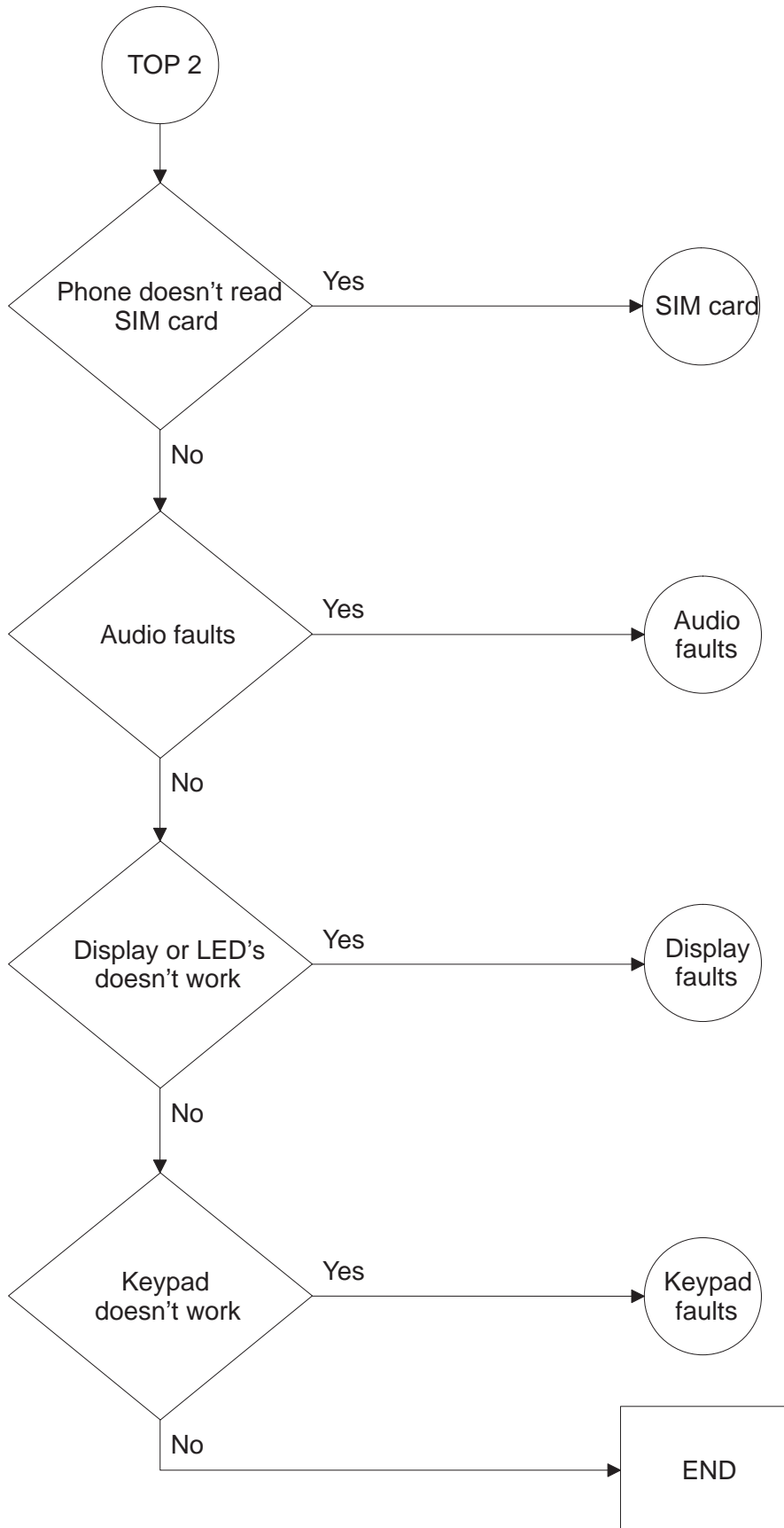
1. Phone is totally dead
2. Flash programming doesn't work
3. Power doesn't stay on or the phone is jammed
4. Charging fault
5. Plug in SIM card is out of order (insert SIM card).
6. Audio fault
7. Display is not working
8. Keypad fault

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

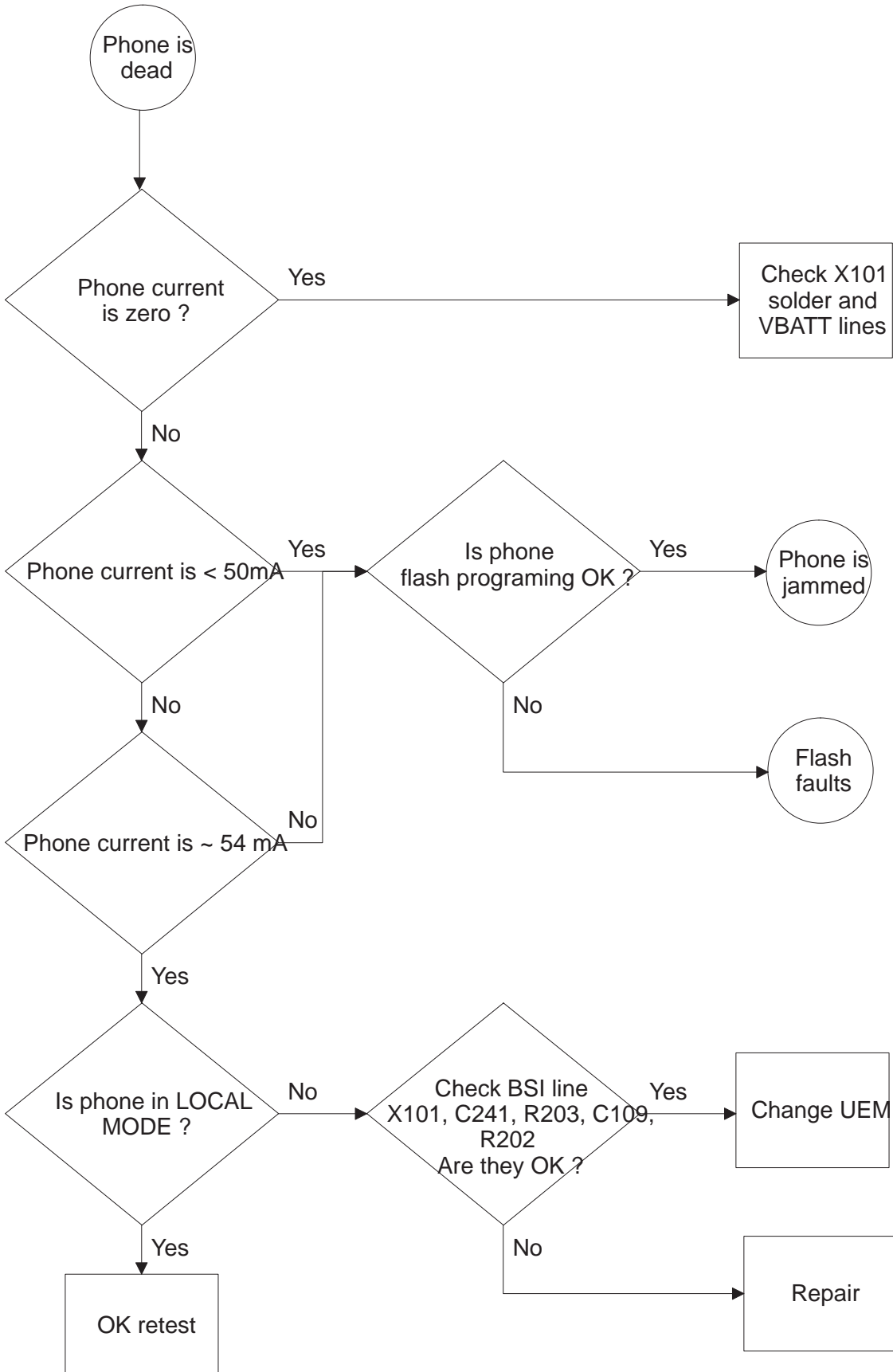
- a) there are not any mechanical damages
- b) soldered joints are OK

### Main troubleshooting tree

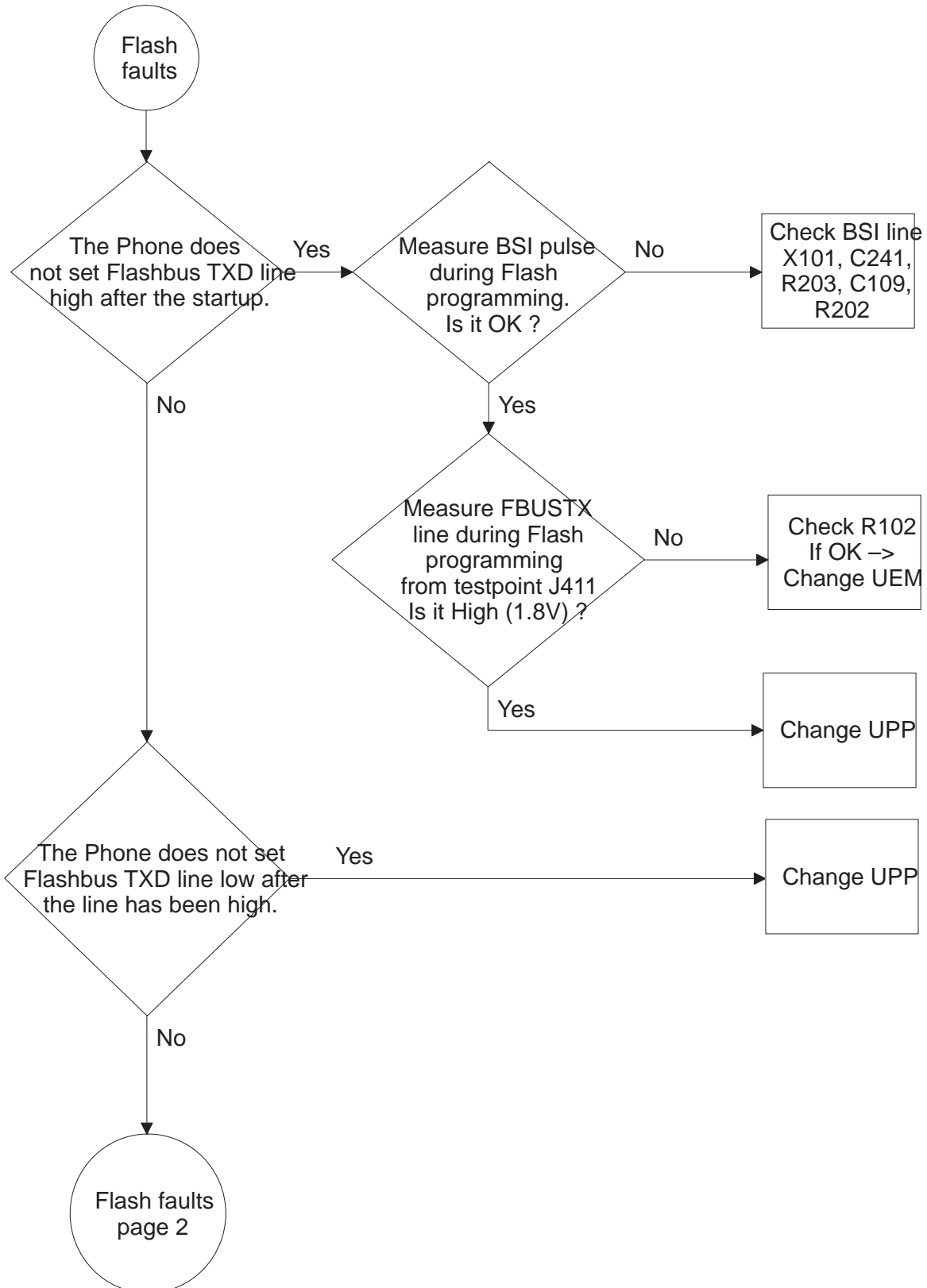




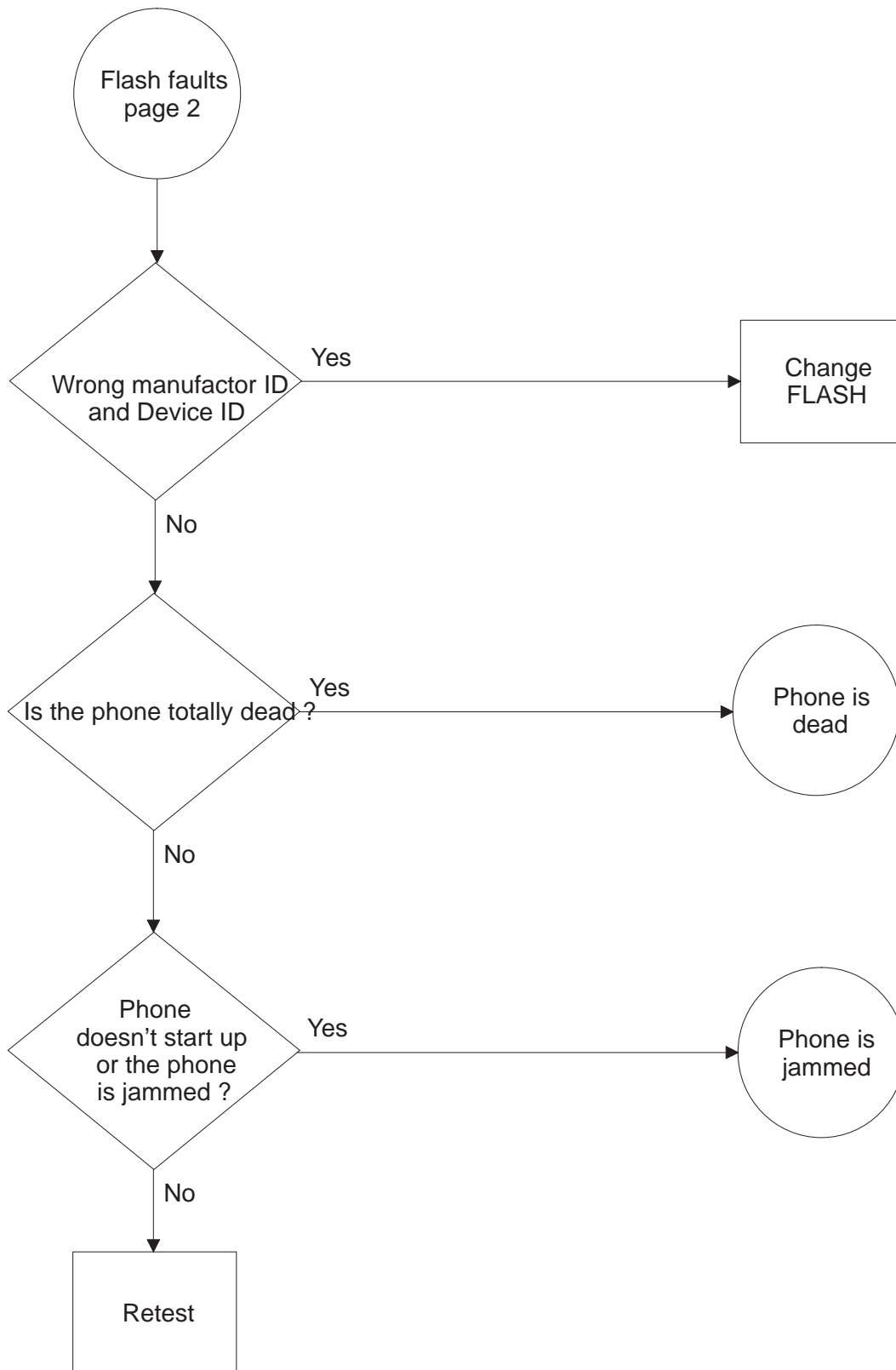
### Phone is dead



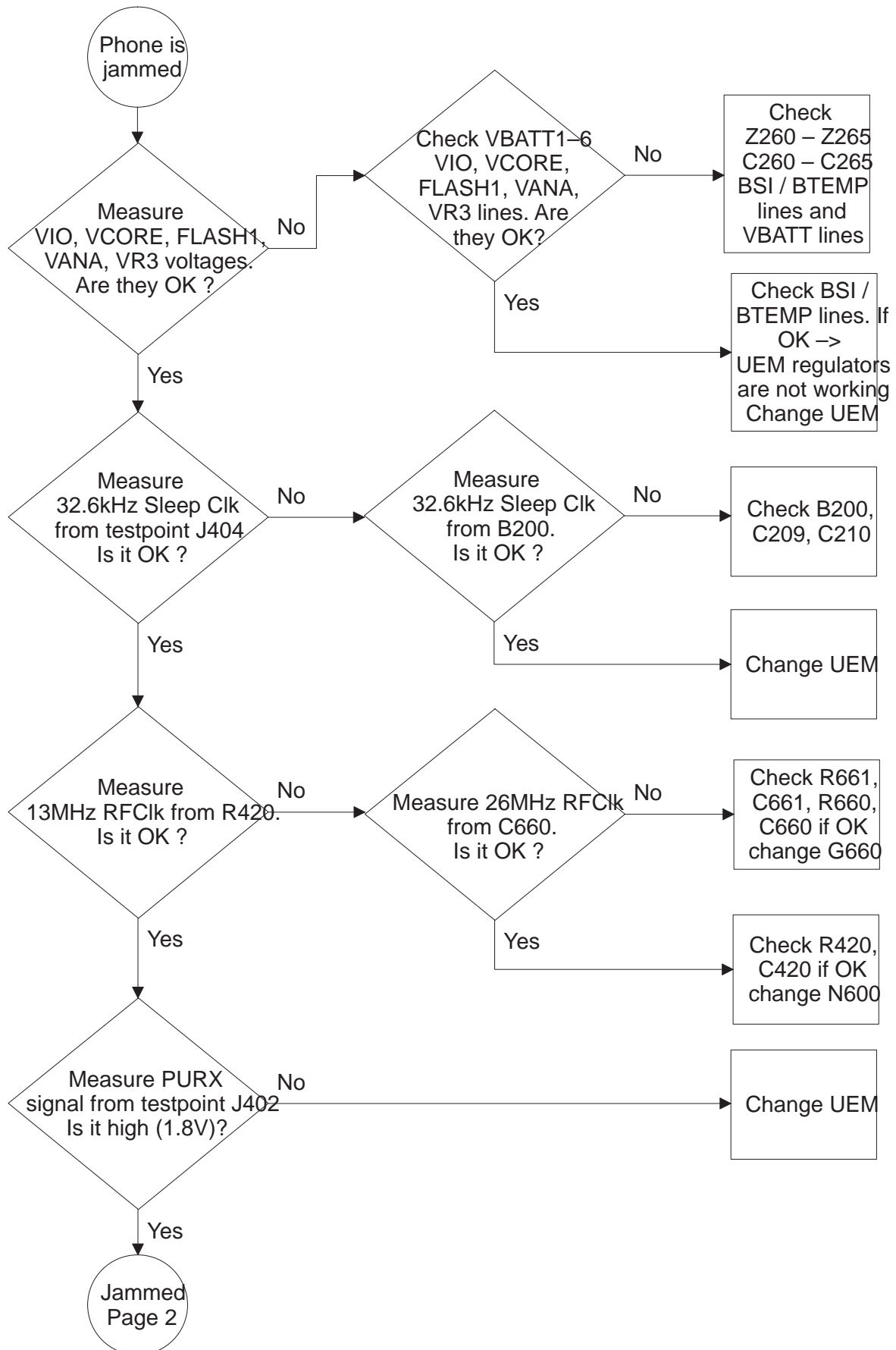
### Flash programming doesn't work

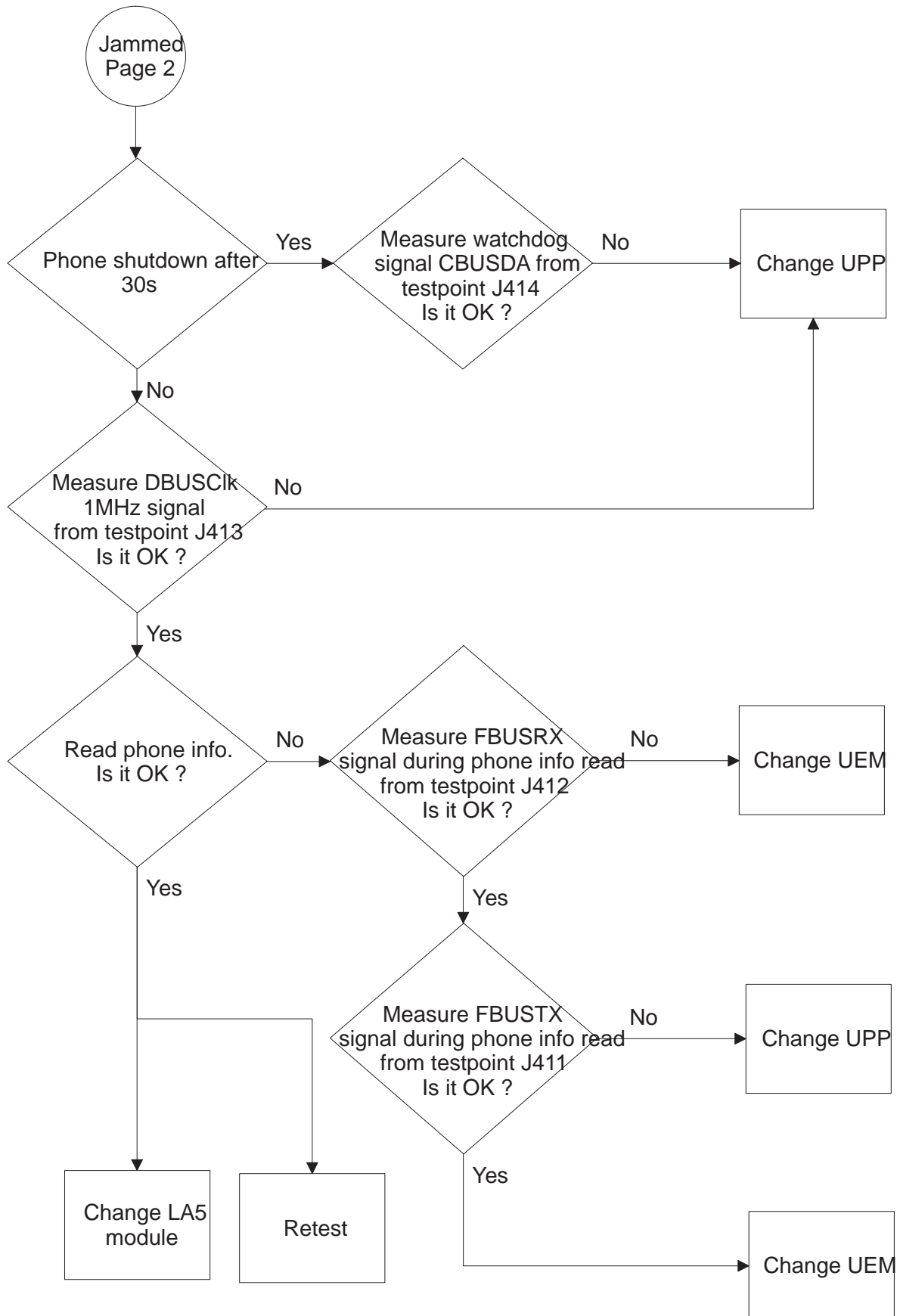




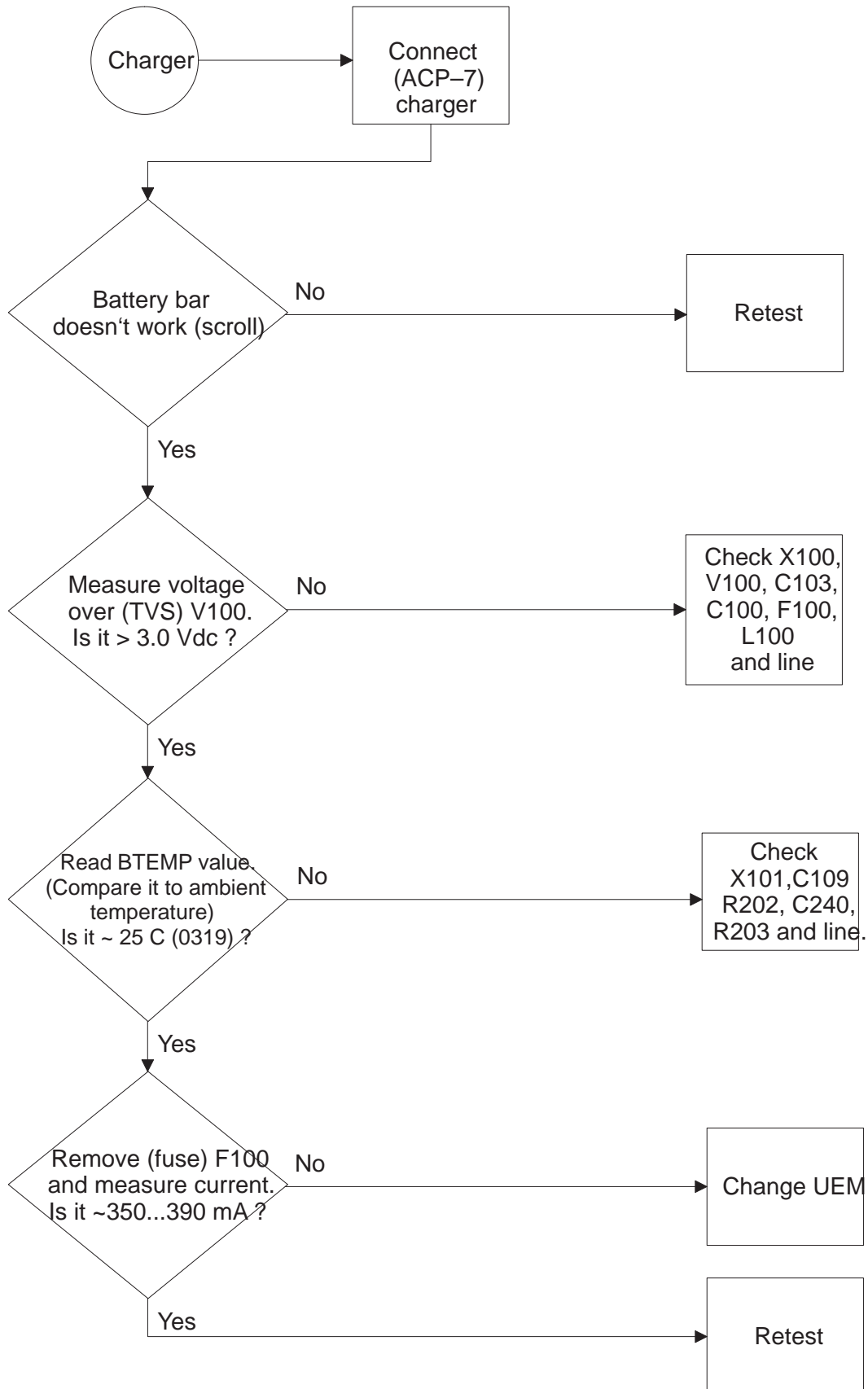


### Phone is jammed

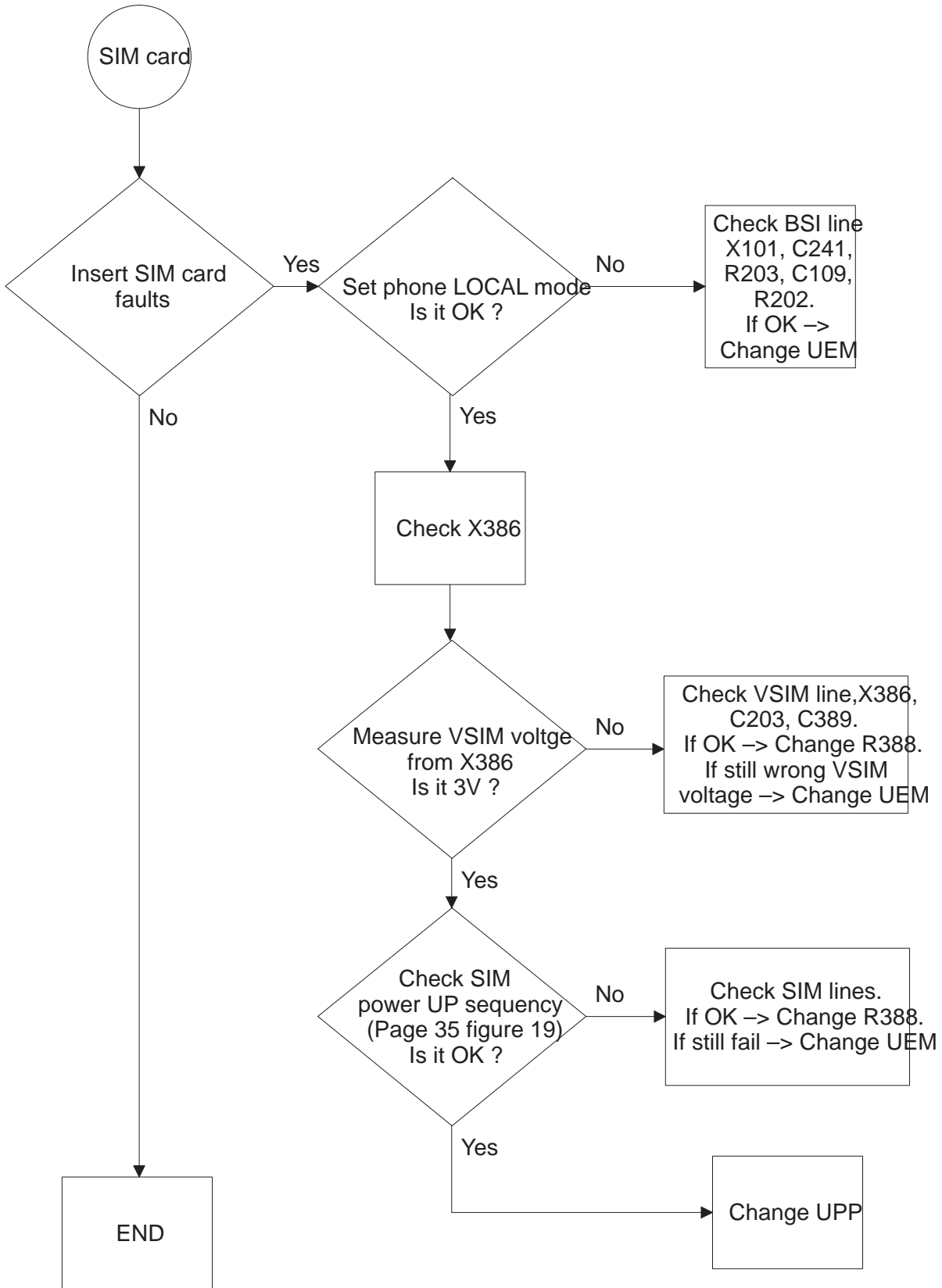




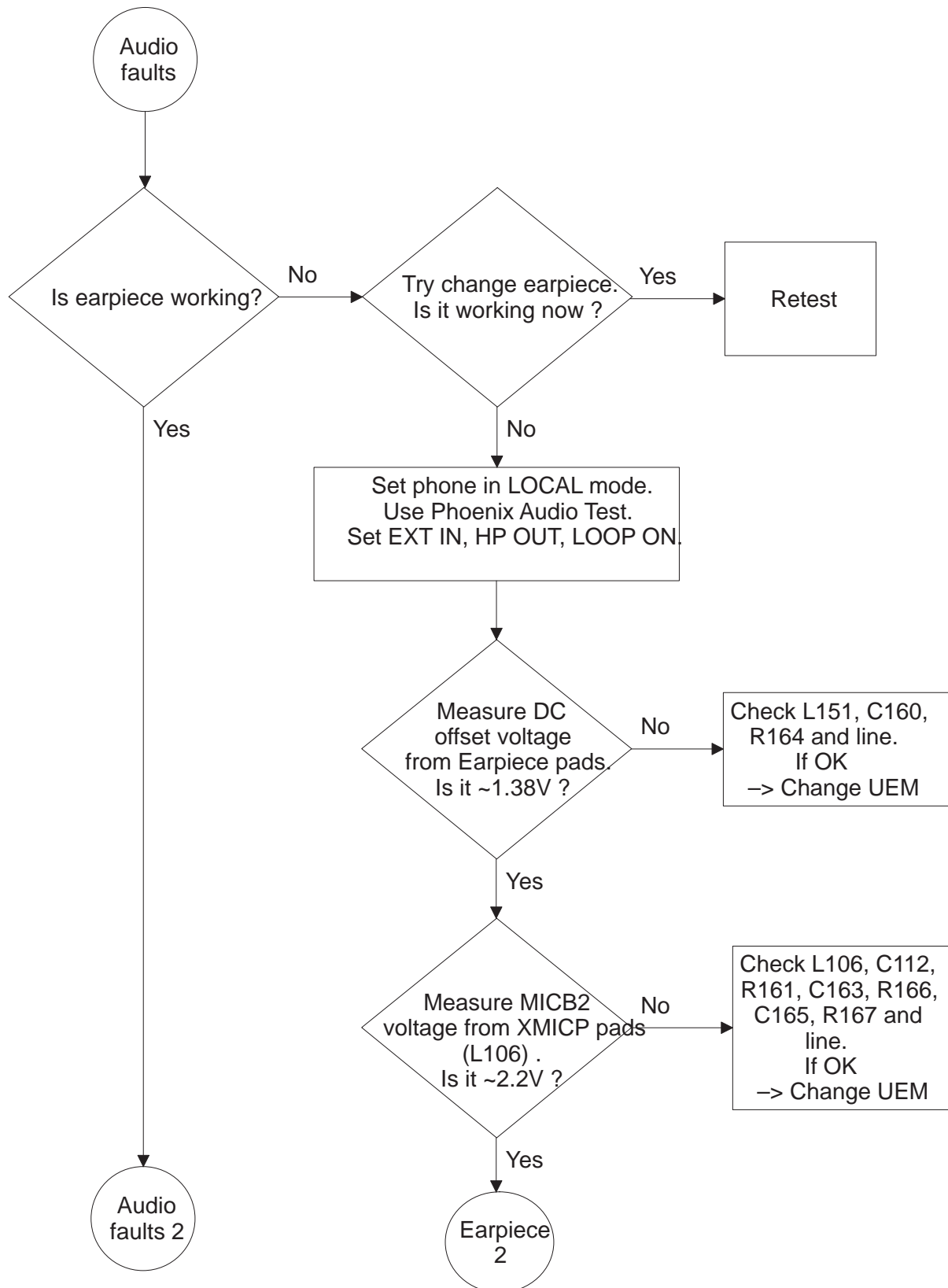
### Charging fault

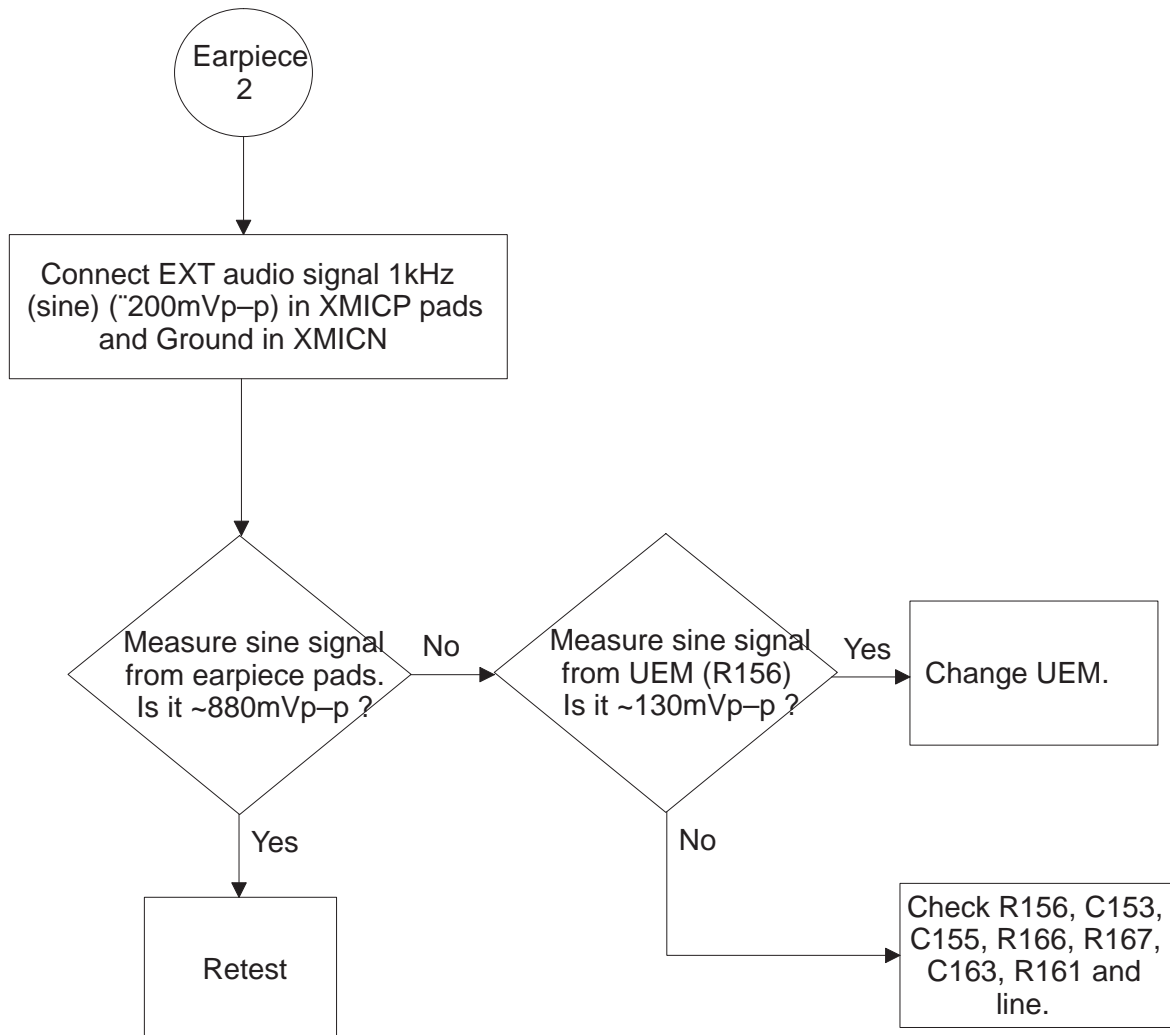


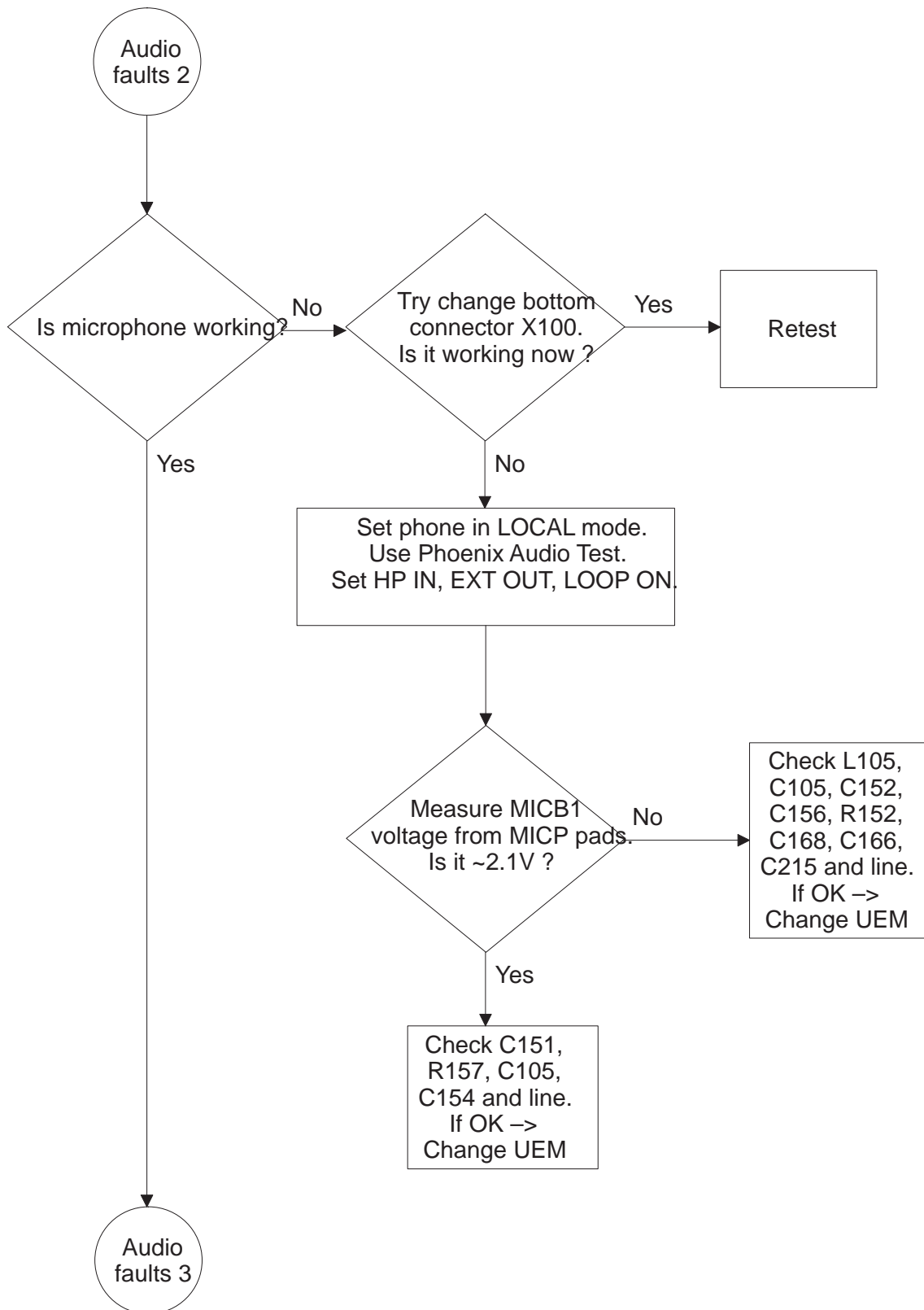
### SIM card is out of order (insert SIM card)



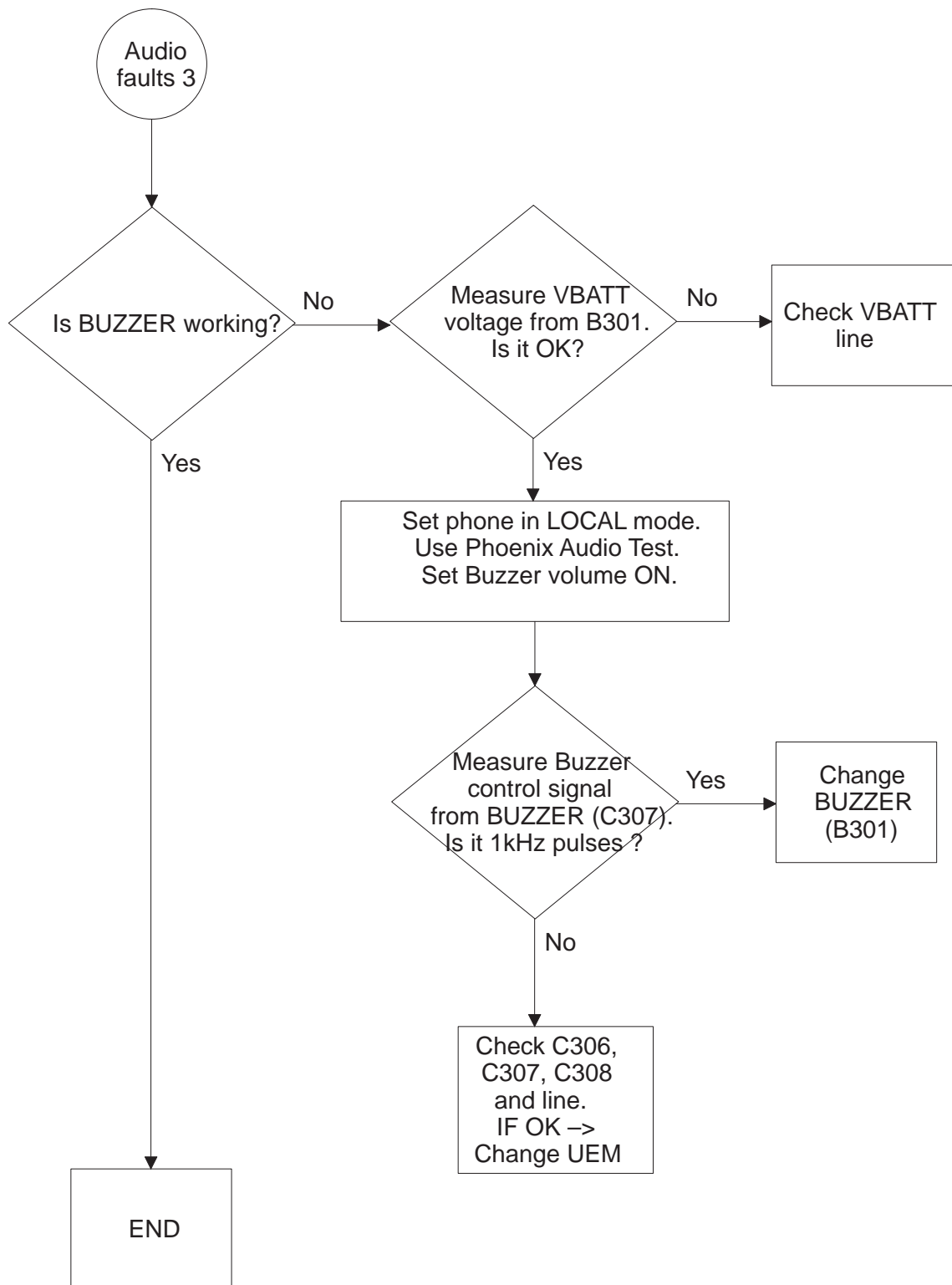
## Audio fault



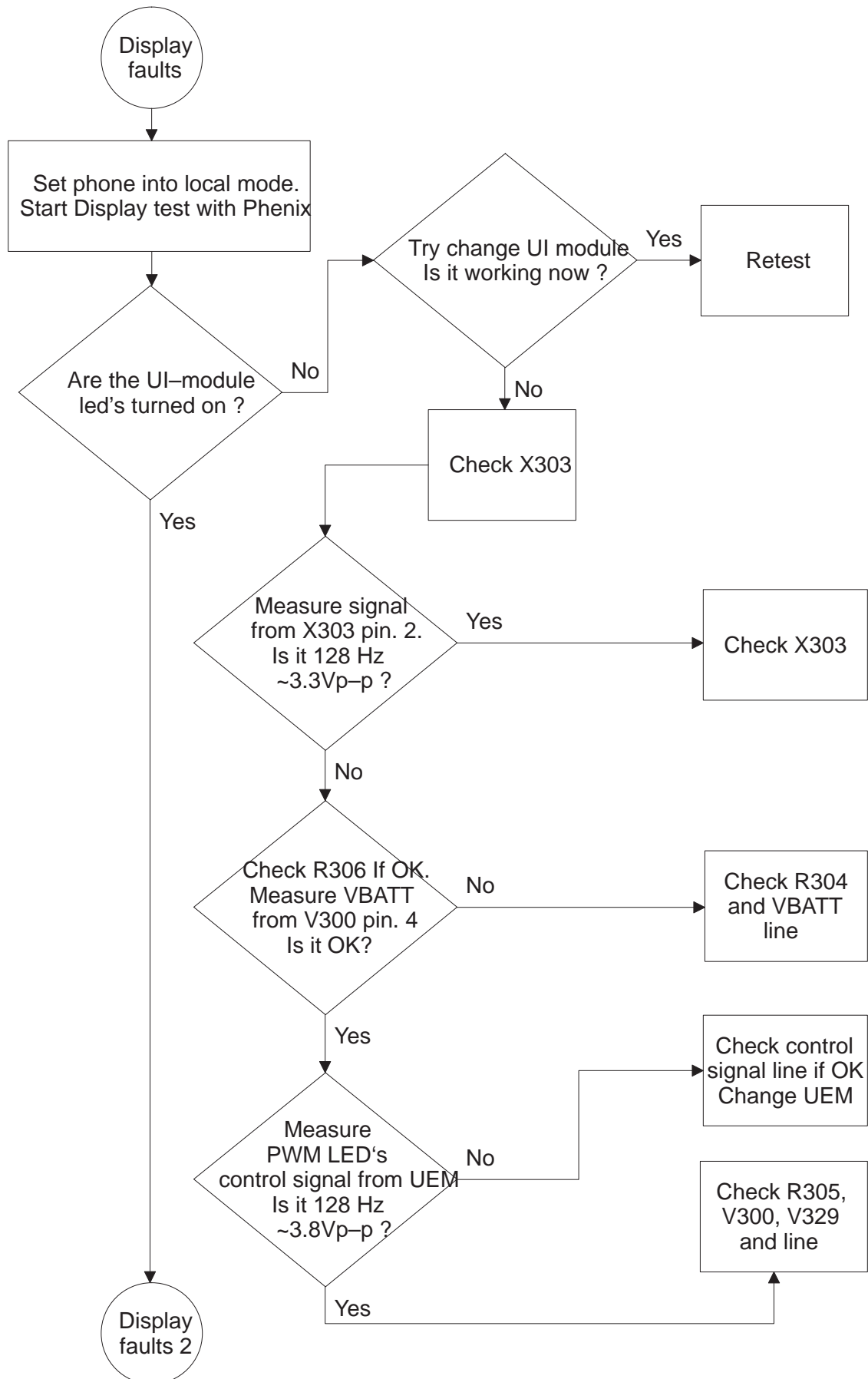


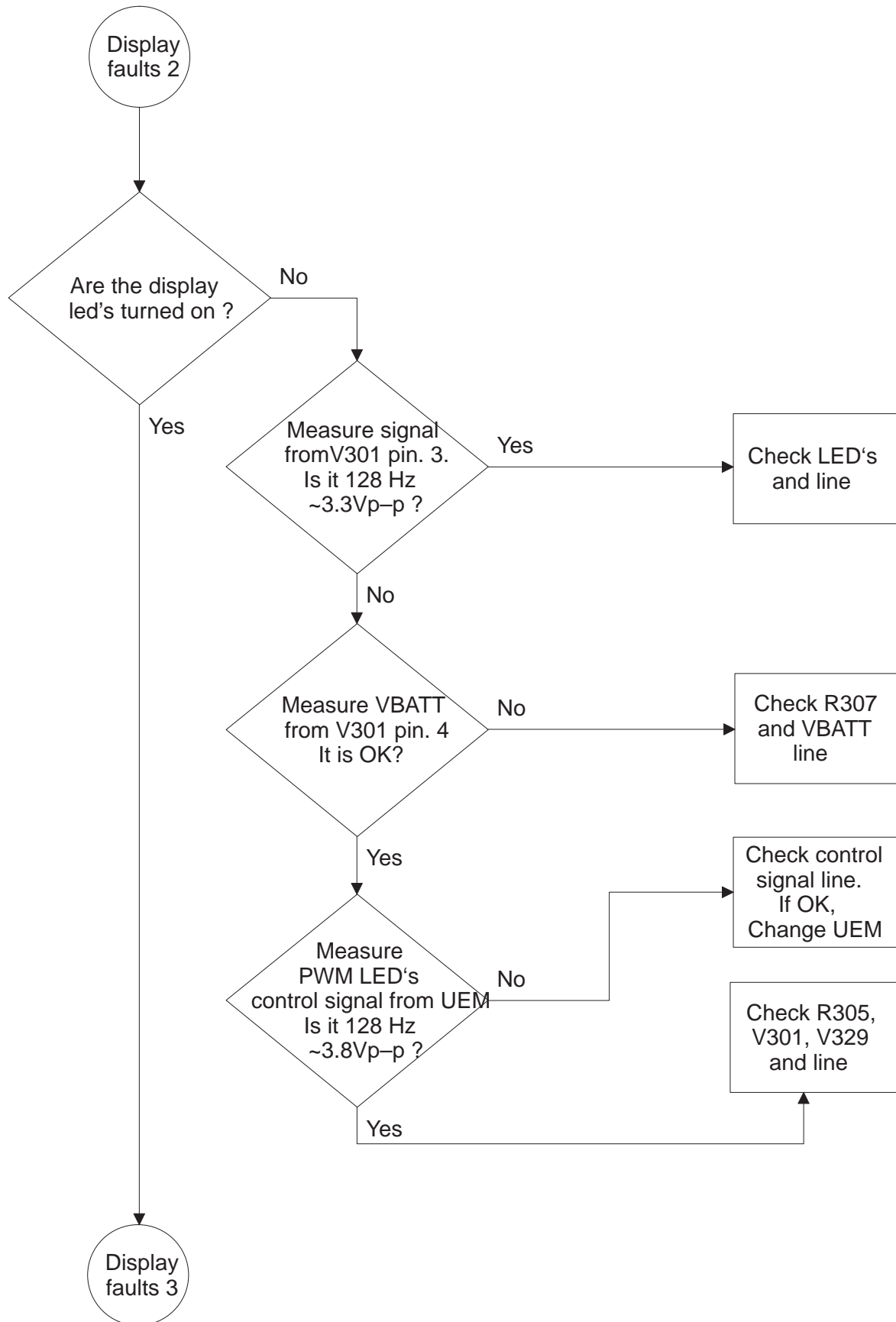


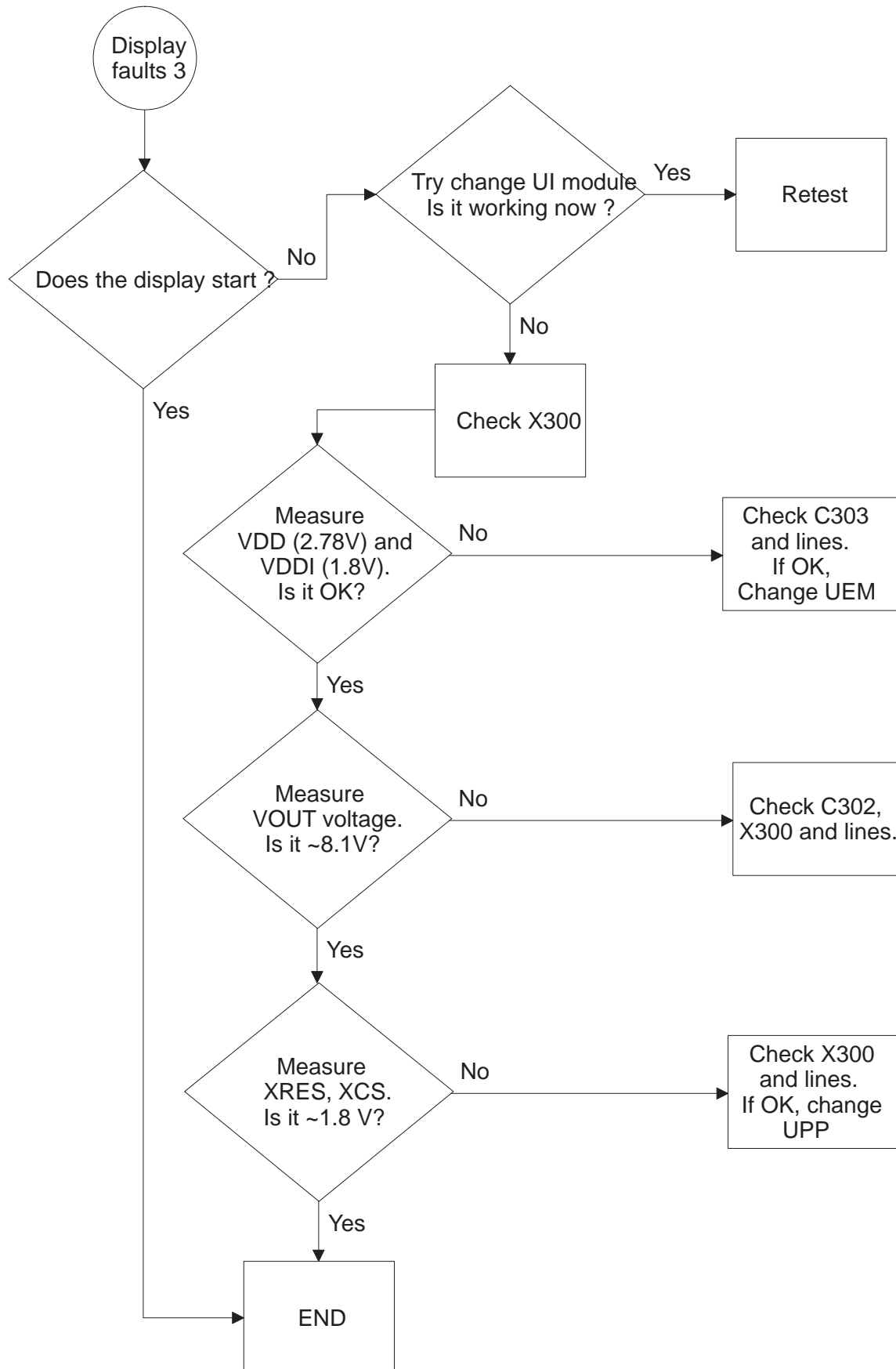




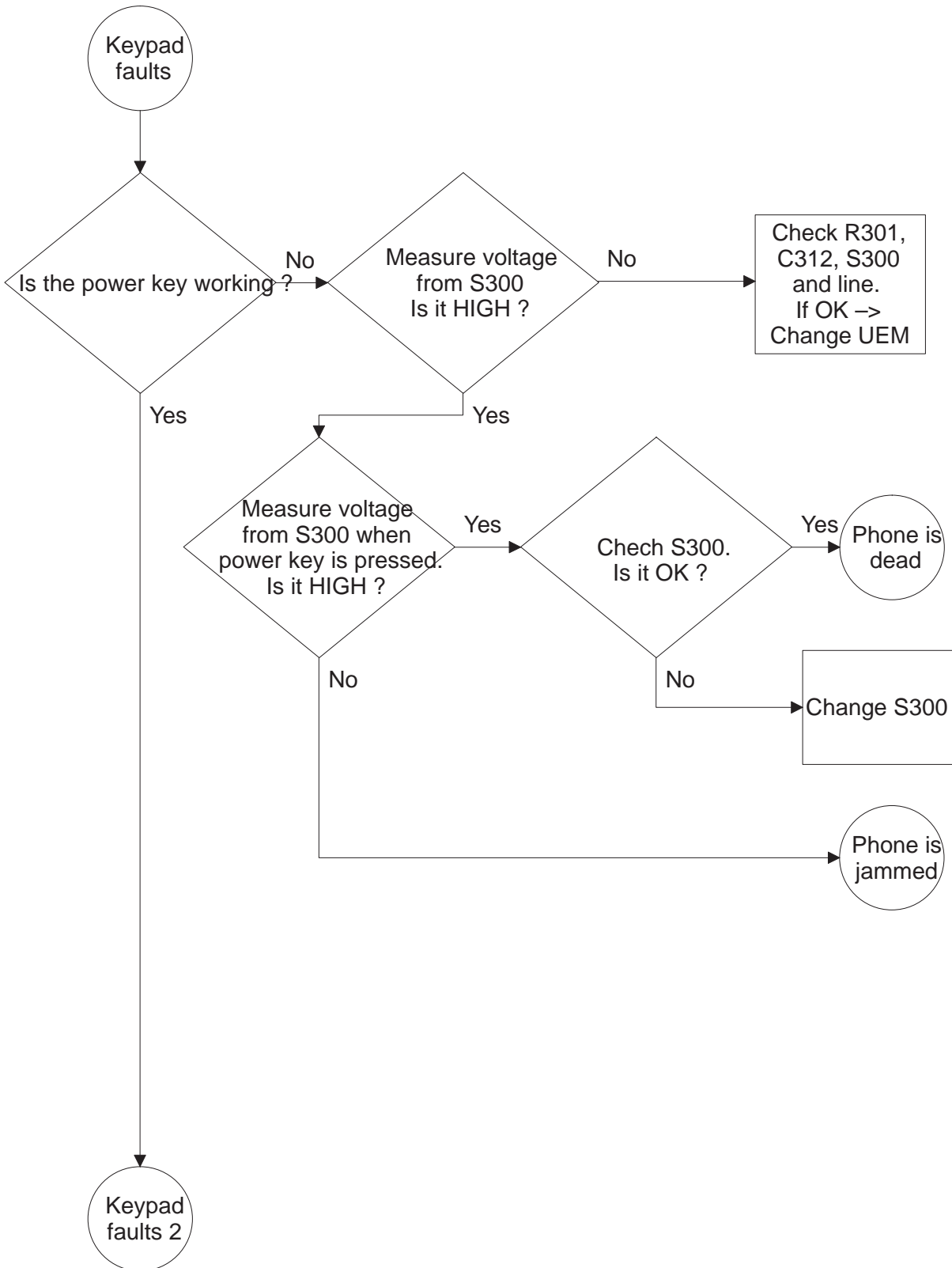
## Display fault

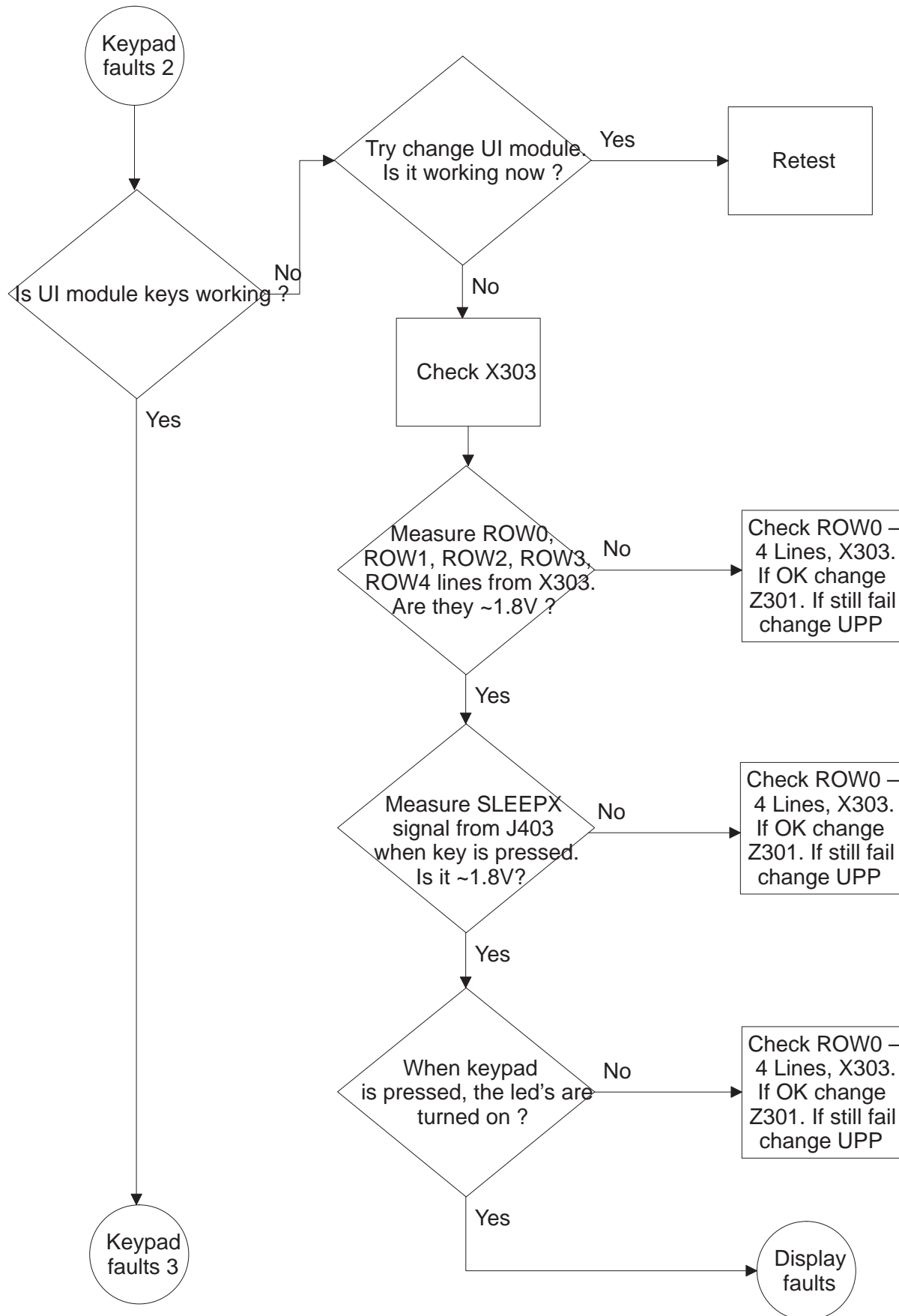


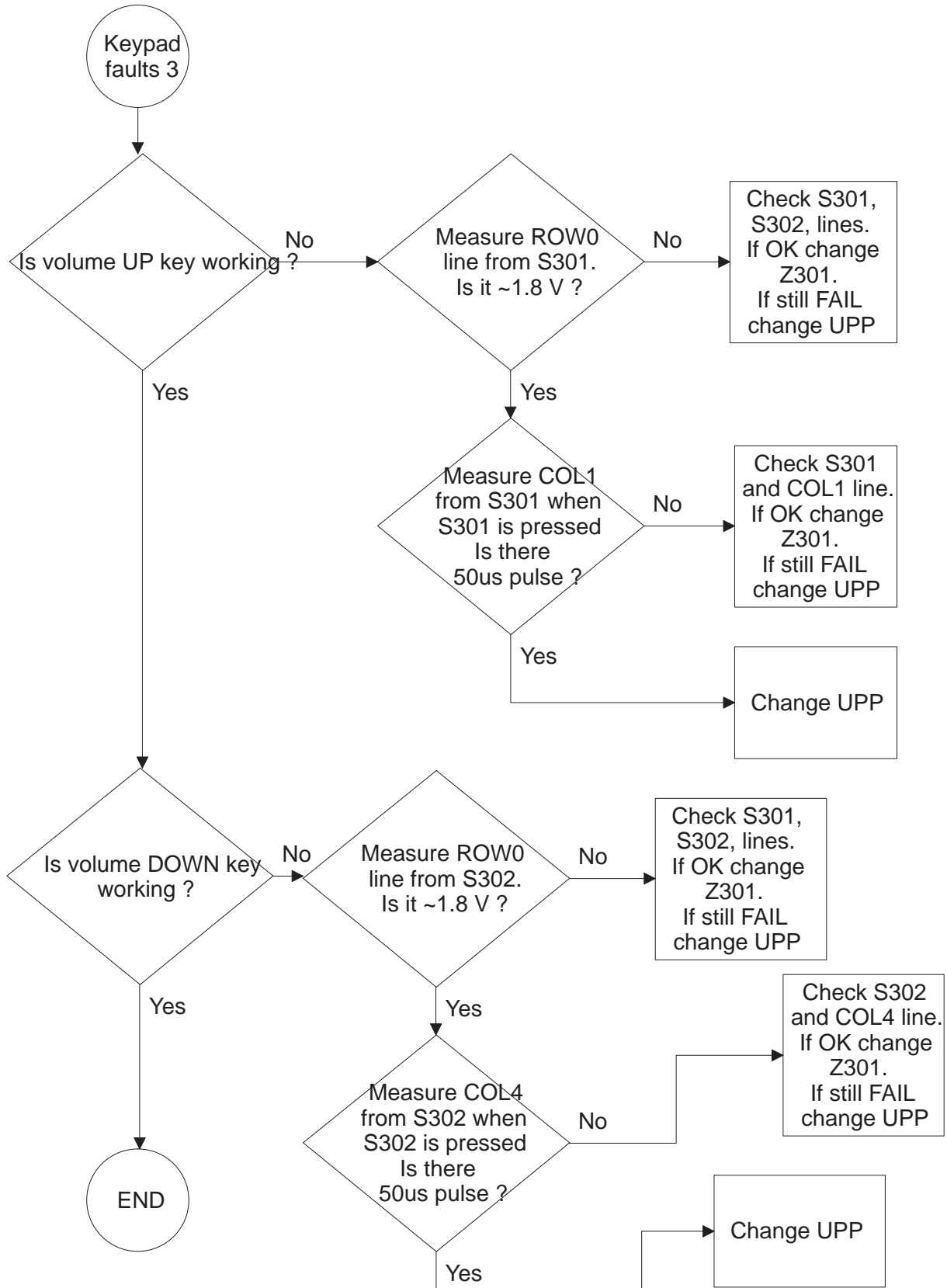




### Keypad fault







## RF Troubleshooting

### Introduction

Measurements should be done using spectrum analyzer with high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels) and oscilloscope with a 10:1 probe (DC-voltages and low frequency signals).

The RF-section is build around one RF-ASIC (HAGAR N600). Before changing HAGAR, please check following things: Supply voltages are OK and serial communication coming from baseband to HAGAR.

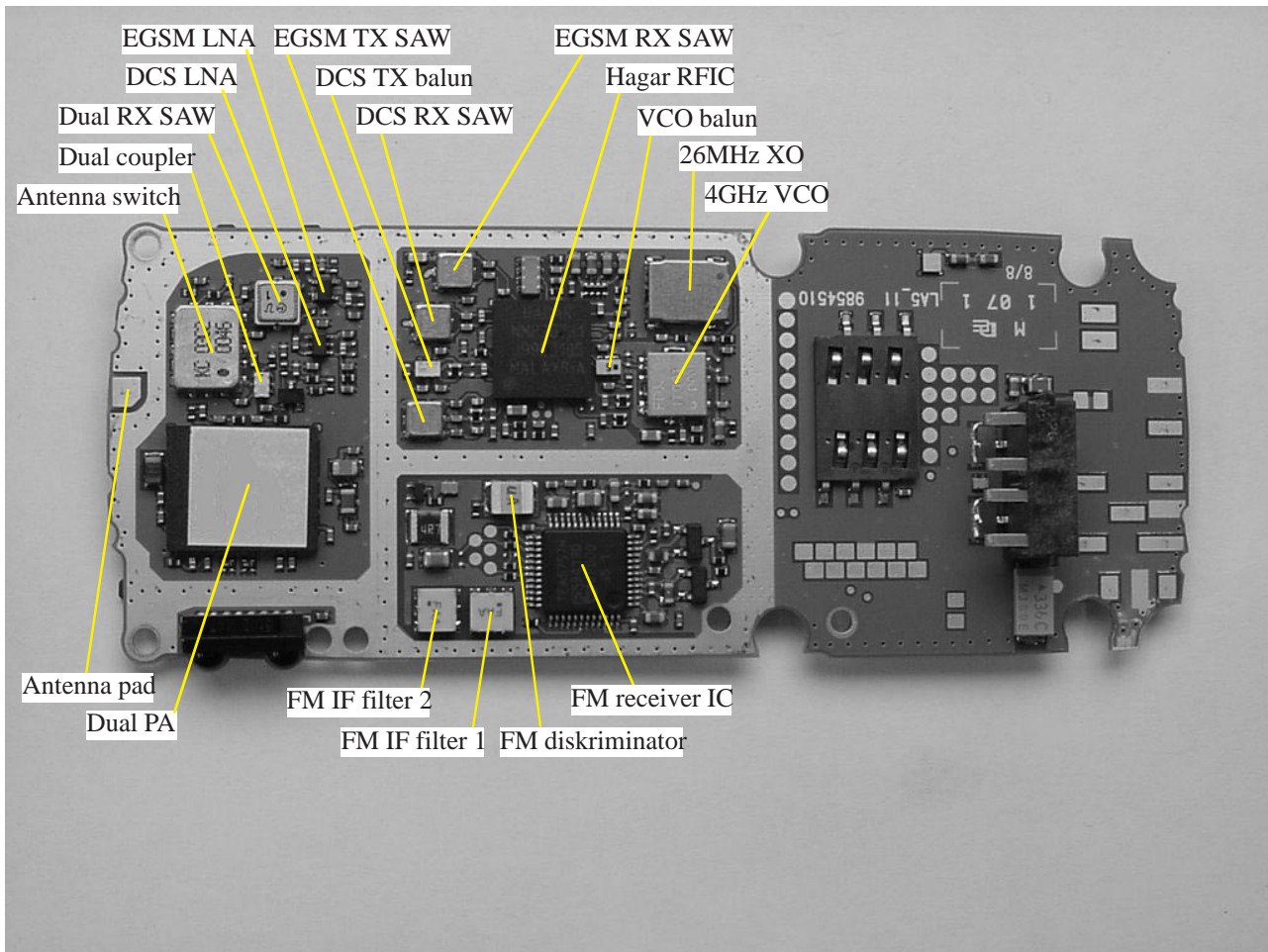
Please note: Grounding of the PA module is directly below PA module making it difficult to check or change. **Most RF semiconductors are static discharge sensitive!** So ESD protection must be taken care of during repair (ground straps and ESD soldering irons). HAGAR and PA are moisture sensitive and must be pre-baked prior to soldering.

Troubleshooting discrete components (resistors, inductors and capacitors) is done by checking component soldering. Capacitors can be checked for shortening and resistor values using an ohmmeter, but remember in-circuit measurements are evaluated with caution.

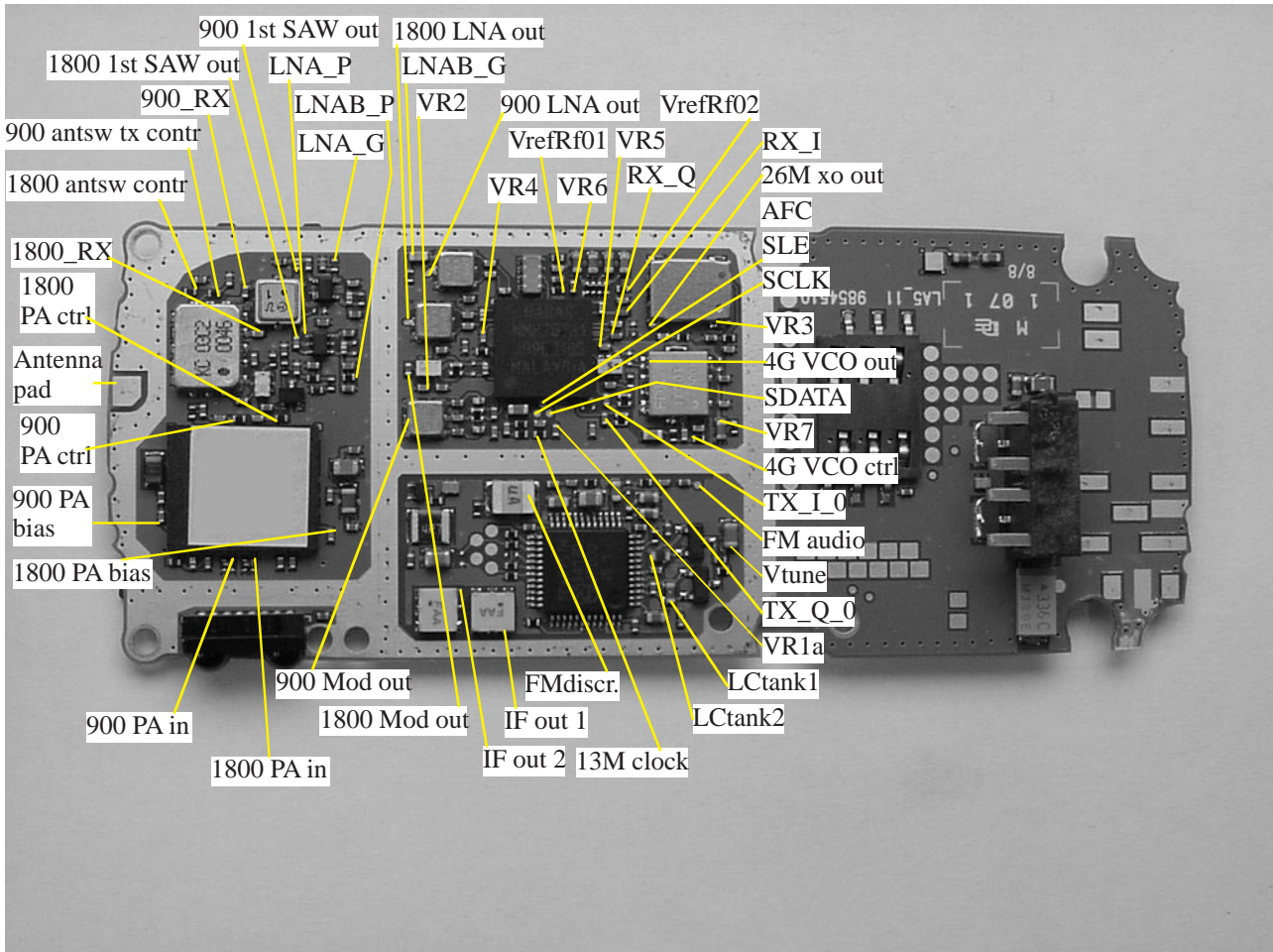
Remember that all measured voltages or RF levels in this document are rough figures. Especially RF levels vary due to different measuring equipment or different probe grounding used . When using RF probe it is good to use metallic tweezers to connect probe ground to PWB ground as close to measurement point as possible.



## RF Key Components



## PCB Test Points



## Transmitter

### General instructions

Connect test jig to computer with DAU9S cable or to FPS-8 Flash Prommer with XCS-4 modular cable.

Make sure that you have PKD-1 dongle connected to computers parallel port.

Connect DC power supply to module test jig with FLC-2 cable.

NOTE: When repairing or tuning transmitter use external DC supply with at least 3A current capability. Set the DC supply voltage to 3.9V and set the jumper connector on test jig to "bypass" position.

Connect RF-cable to the module test jig (MJS-46) RF connector and to measurement equipment or at least 10dB attenuator, otherwise the PA may be damaged. Normally spectrum analyzer is used as measurement equipment.

NOTE: Normally Spectrum analyzer maximum input power is +30dBm. It is recommended to use 10dB attenuator on Spectrum analyzer input to prevent damage.

Set the phone module to test jig and start Phoenix service software.

Initialize connection to phone. (use FBUS driver when using DAU9S and COMBOX driver when using FPS-8)

Select product from the menu: File → Choose product → NHM-7

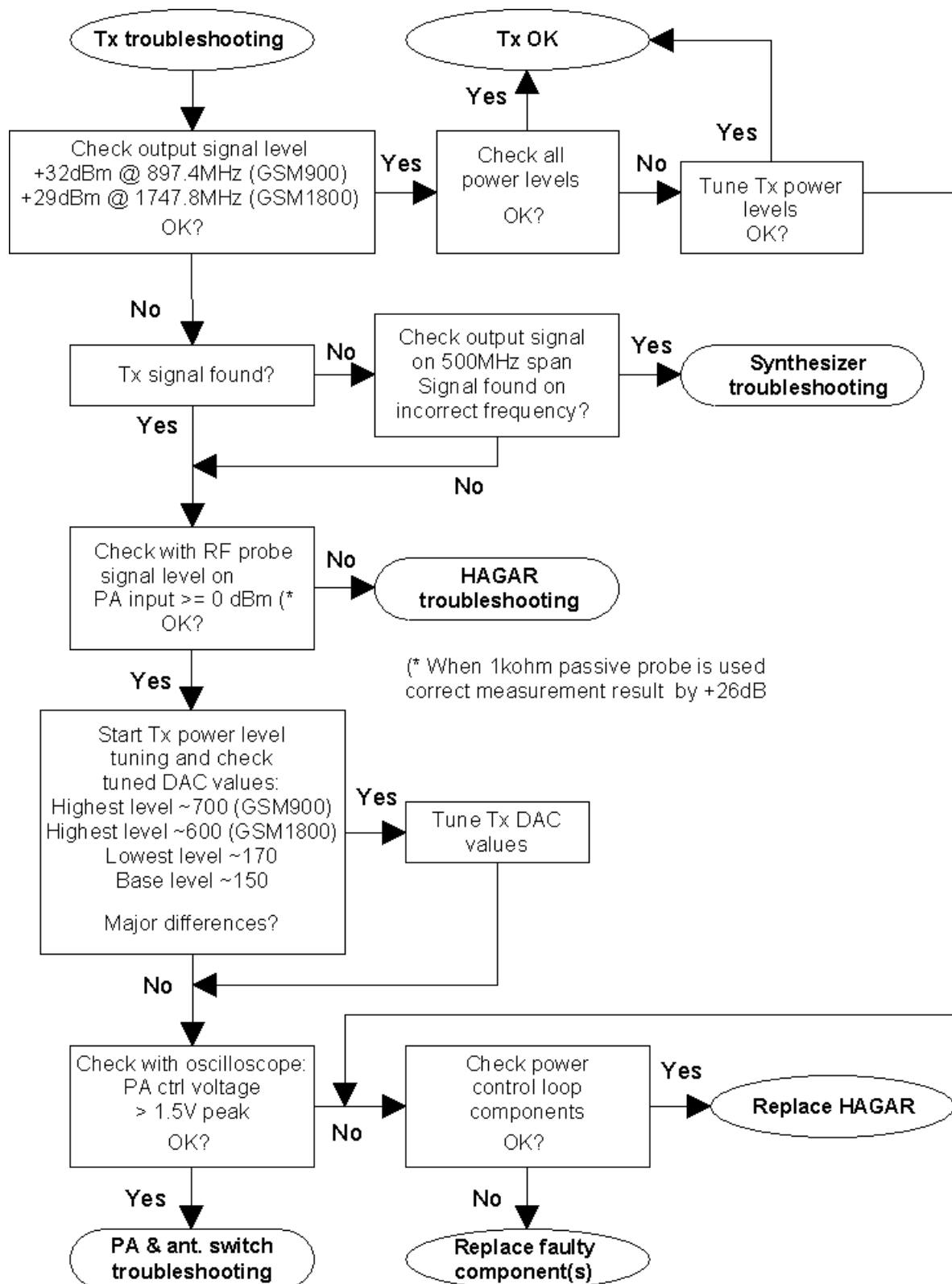
From toolbar set operating mode to "Local".

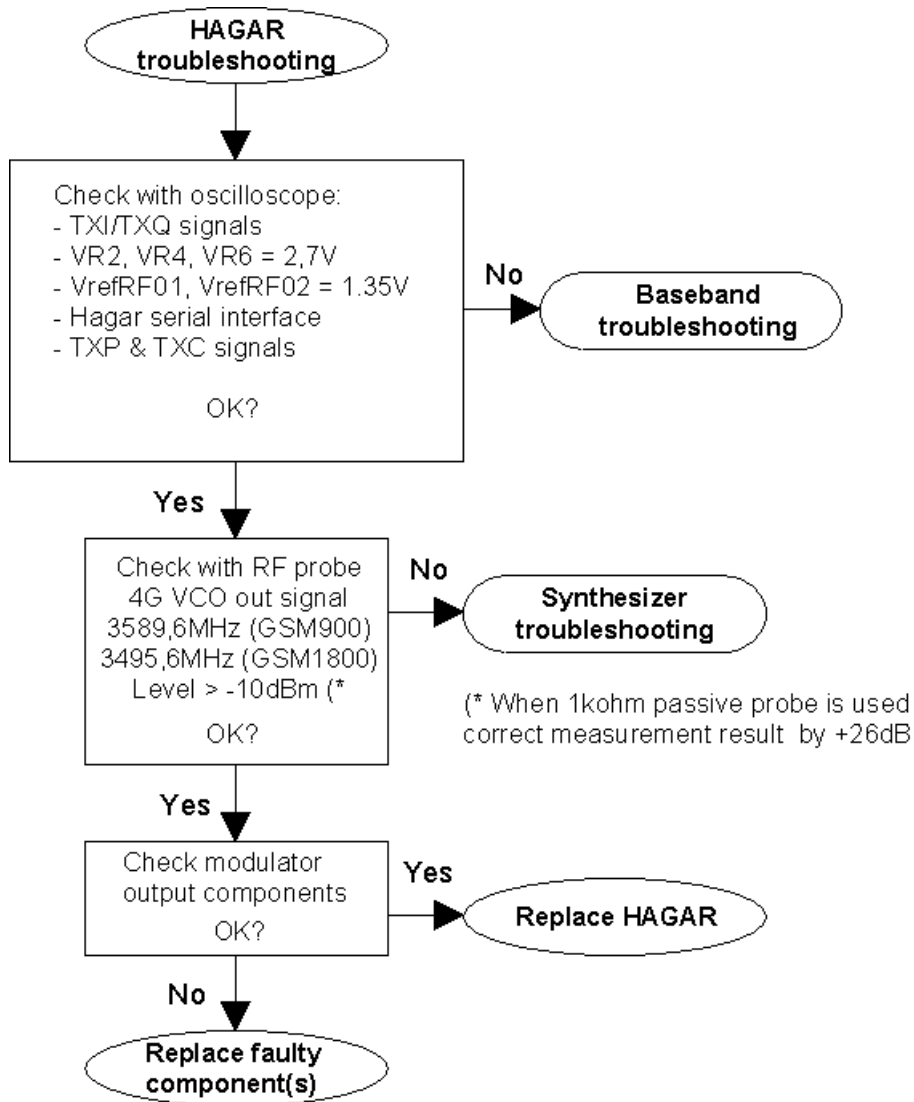
Activate RF controls window from the menu:  
Maintenance → Tuning → RF Controls

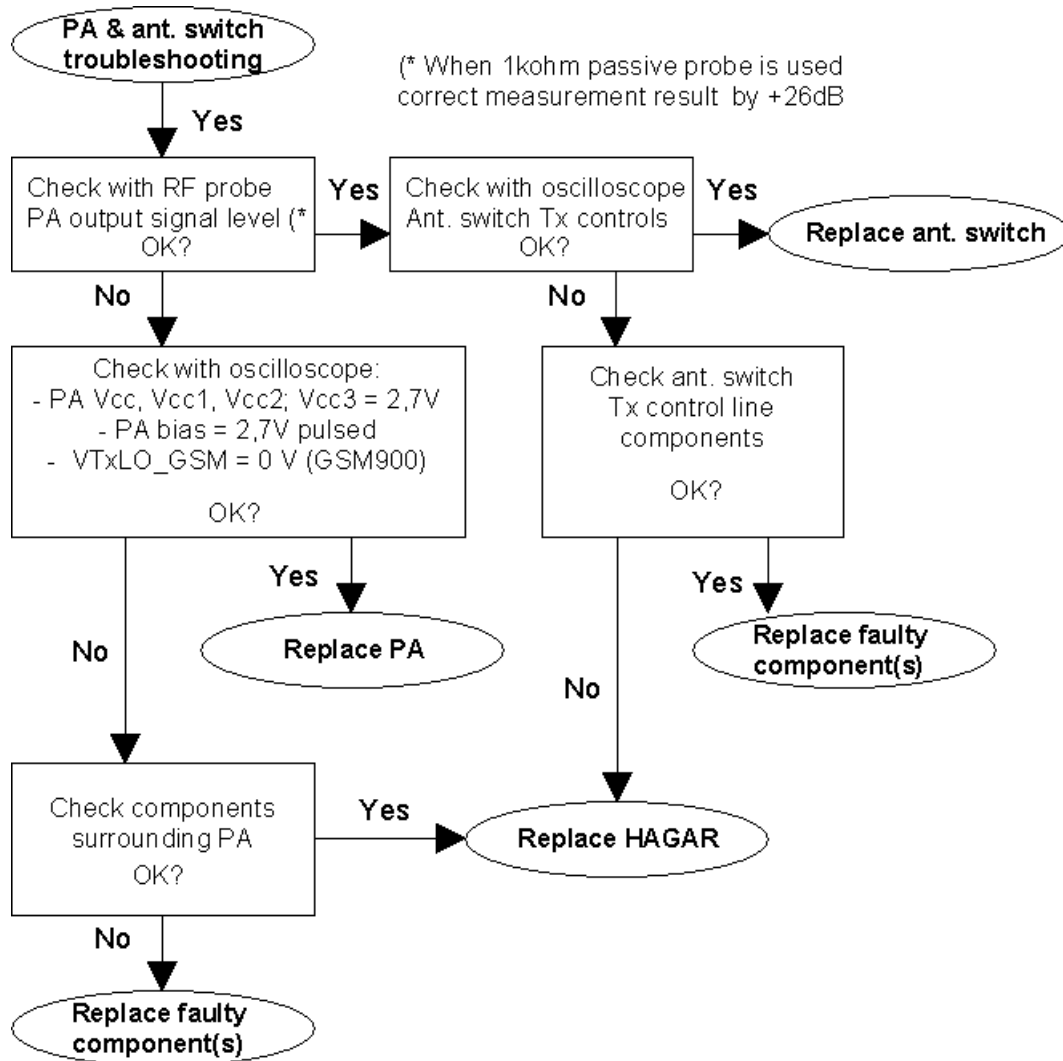
From the RF controls window:

- Select band "GSM900" or "GSM 1800" (Default = "GSM900")
- Set Active unit to "Tx" (Default = "Rx")
- Set Operation mode to "Burst" (Default = "Burst")
- Set Tx data type to "Random" (Default = "All1")
- Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band (Defaults)
- Set Tx PA mode to "Free" (Default)
- Set power level to 5 (Default = 19) on GSM900 or to 0 (Default = 15) on GSM1800

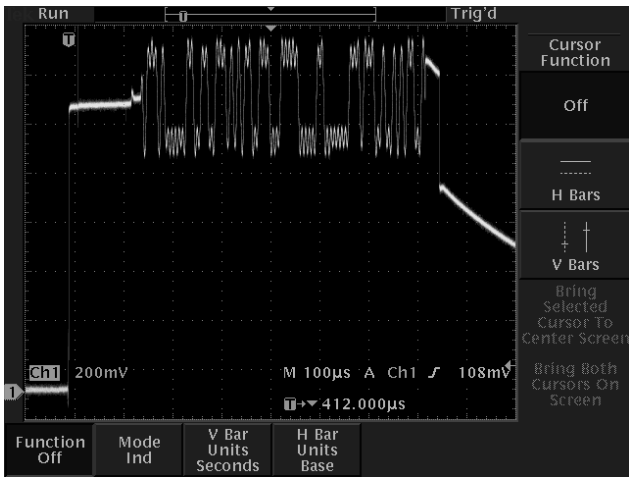
### Transmitter troubleshooting diagram



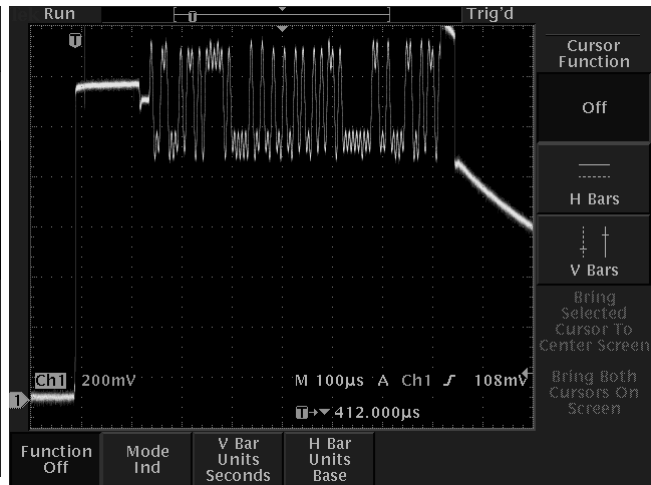




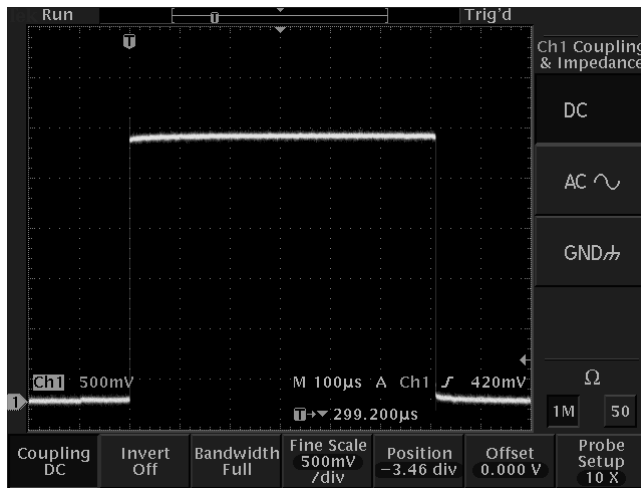
**Transmitter signals**



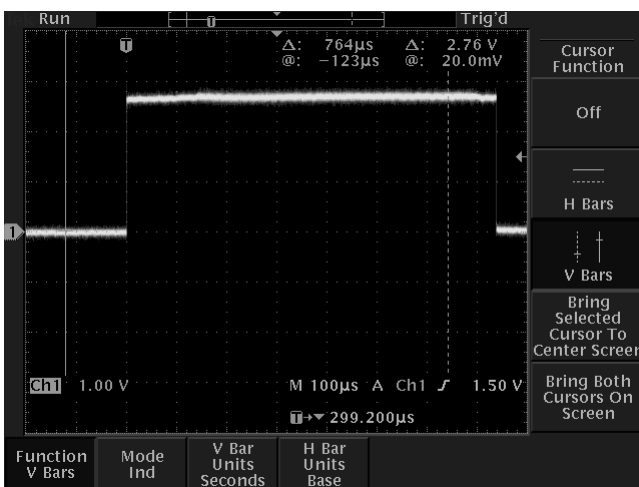
**TX\_I\_0, Tx on, Random data, Burst mode**



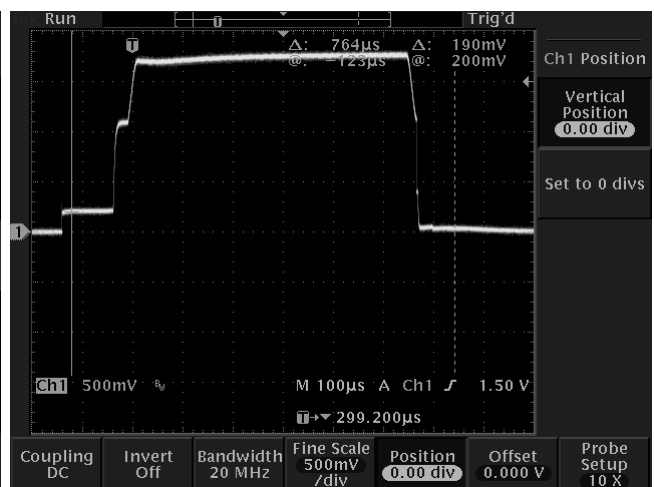
**TX\_Q\_0, Tx on, Random data, Burst mode**



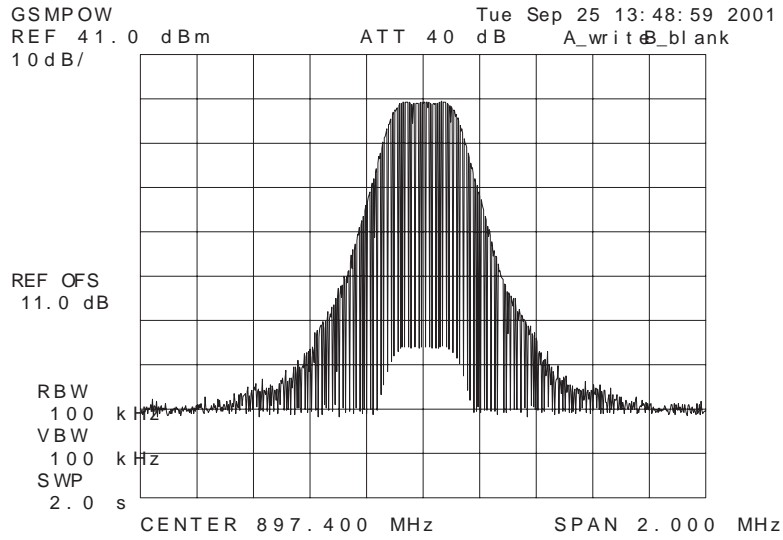
**900/1800 antsw tx contr, Tx on, Burst mode**



**900/1800 PA bias, Tx on, Burst mode**



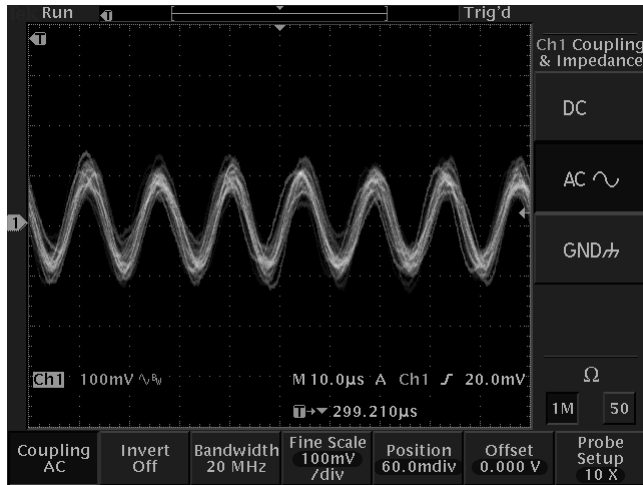
**900/1800 PA ctrl, Tx on, Burst mode, High power level**



Tx out signal, 900 band, burst mode, channel 37



## Receiver



<p>"RX_I" and "RX_Q"</p> <ul style="list-style-type: none"> <li>- Local mode, continuous mode, "FEG ON +46 dB"</li> <li>- RF amplitude to antenna -102 dBm</li> <li>- RF generator frequency 67,71 kHz above assigned RF channel freq</li> </ul>
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<p>900 LNA out</p> <ul style="list-style-type: none"> <li>- RF-level at antenna port eg. -50 dBm</li> <li>- RX continuous mode (local mode)</li> <li>- difference between AGC -settings "FEG on" and "FEG off" roughly 25 dB (using 250 ohm passive RF-probe)</li> </ul>	<p>1800 LNA out</p> <ul style="list-style-type: none"> <li>- RF-level at antenna port eg. -50 dBm</li> <li>- RX continuous mode (local mode)</li> <li>- difference between AGC -settings "FEG on" and "FEG off" roughly 30 dB (using 250 ohm passive RF-probe)</li> </ul>
<p>900 LNA Vcc</p> <ul style="list-style-type: none"> <li>- RX continuous mode (local mode)</li> <li>- 2,6 V DC voltage "FEG ON"</li> <li>- 0 V DC voltage "FEG OFF"</li> </ul>	<p>1800 LNA Vcc</p> <ul style="list-style-type: none"> <li>- RX continuous mode (local mode)</li> <li>- 2,6 V DC voltage "FEG ON"</li> <li>- 0 V DC voltage "FEG OFF"</li> </ul>
<p>900 LNA bias</p> <ul style="list-style-type: none"> <li>- RX continuous mode (local mode)</li> <li>- 2,6 V DC voltage "FEG ON" and "FEG OFF"</li> </ul>	<p>1800 LNA gs</p> <ul style="list-style-type: none"> <li>- RX continuous mode (local mode)</li> <li>- 2,6 V DC voltage "FEG OFF"</li> <li>- 0 V DC voltage "FEG ON"</li> </ul>
<p>900 mod out</p> <ul style="list-style-type: none"> <li>- TX on local mode</li> <li>- example power measured with 1 kOhm passive RF-probe -22 dBm</li> </ul>	<p>1800 mod out</p> <ul style="list-style-type: none"> <li>- TX on local mode</li> <li>- example power measured with 1 kOhm passive RF-probe -20 dBm</li> </ul>

## Synthesizer

### General instructions

Connect test jig to computer with DAU-9S cable or to FPS-8 Flash Prommer with XCS-4 modular cable.

Make sure that you have PKD-1 dongle connected to computers parallel port.

Connect DC power supply or FPS-8 to module test jig with FLC-2 cable.

Set the DC supply voltage to 3.9V and set the jumper connector on test jig to "bypass" position.

Set the phone module to test jig and start Phoenix service software.

Initialize connection to phone. (use FBUS driver when using DAU-9S and COMBOX driver when using FPS-8)

Select product from the menu: File -> Choose product ->NHM-7

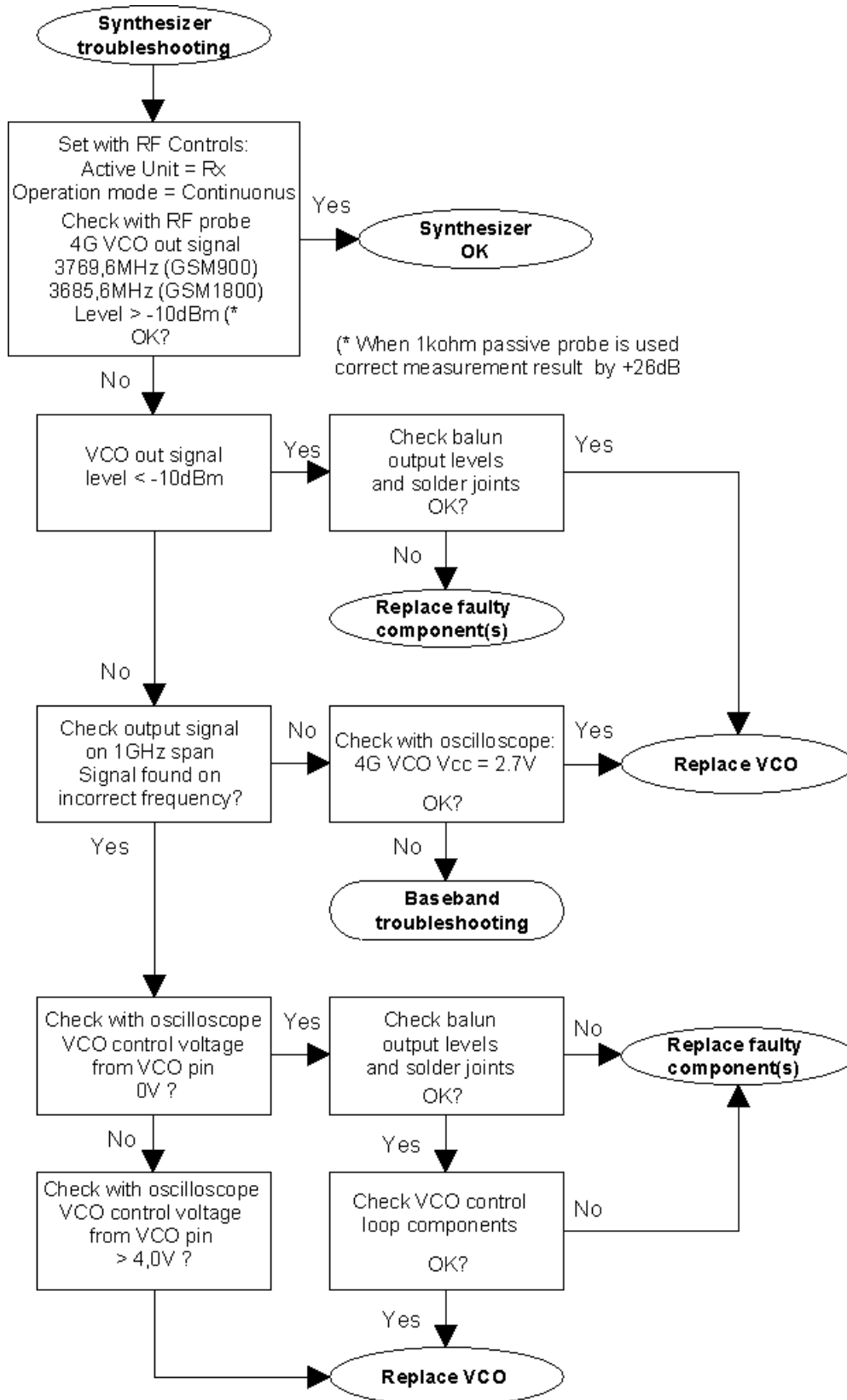
From toolbar set operating mode to "Local".

Activate RF controls window from the menu:  
Maintenance -> Tuning -> RF Controls

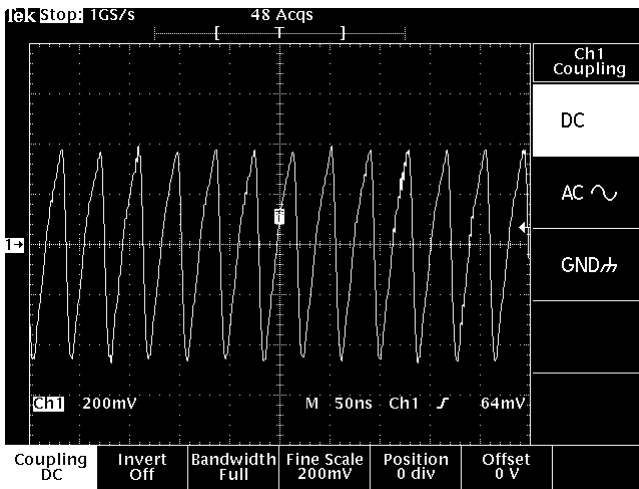
From the RF controls window:

- Select band "GSM900" or "GSM 1800" (Default = "GSM900")
- Set Active unit to "Rx" (Default = "Rx")
- Set Operation mode to "Continuous" (Default = "Burst")
- Set Rx/Tx channel to 37 on GSM900 band or 700 on GSM1800 band (Defaults)

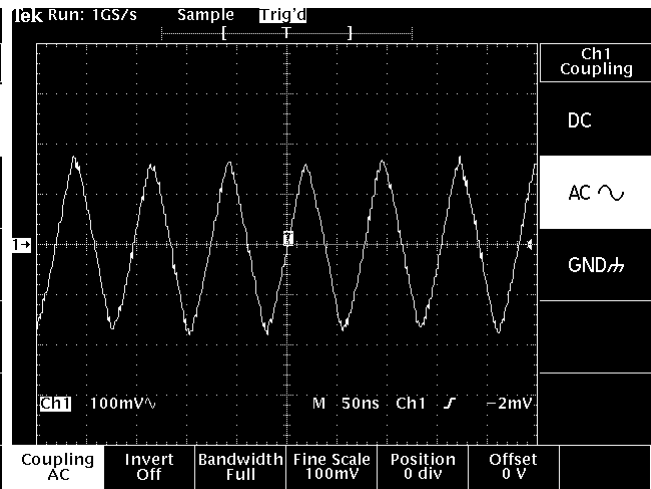
### Synthesizer troubleshooting diagram



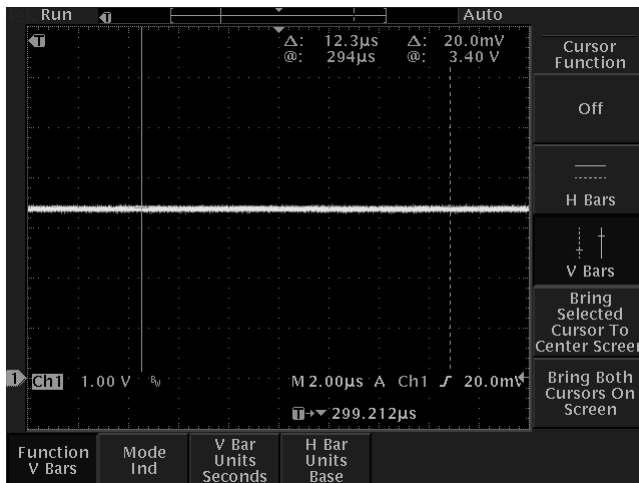
## Synthesizer signals



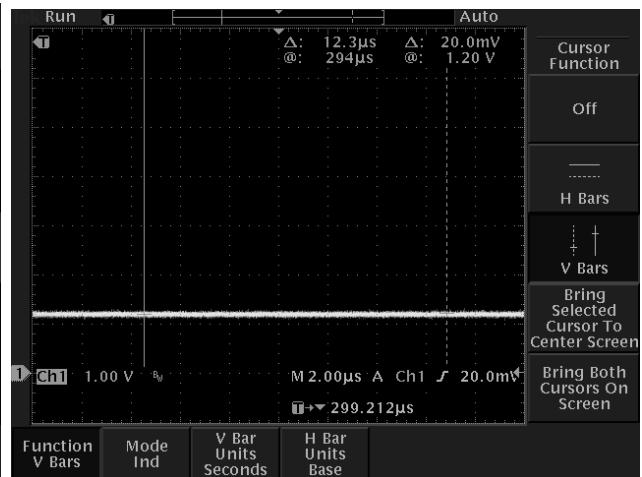
**26MHz XO out**



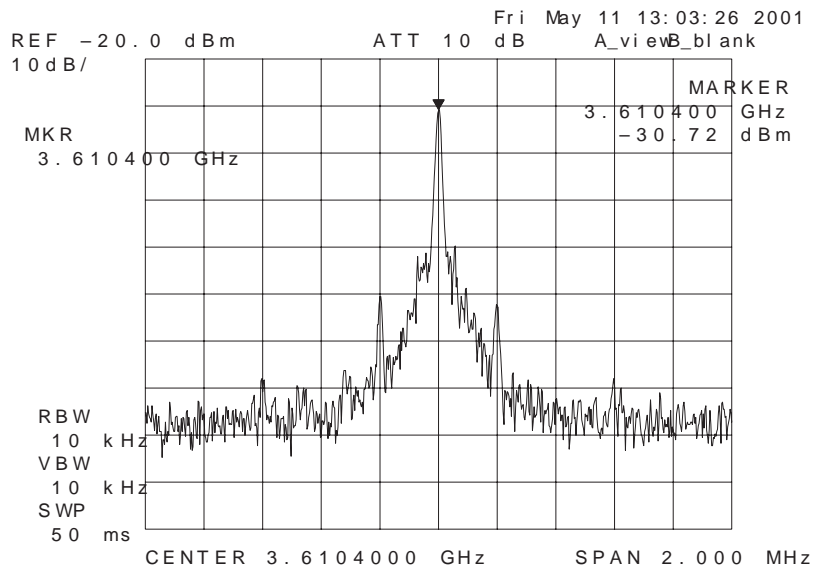
**13MHz clock**



**4GHz VCO ctrl**  
 900 RX, channel 124, continuous mode

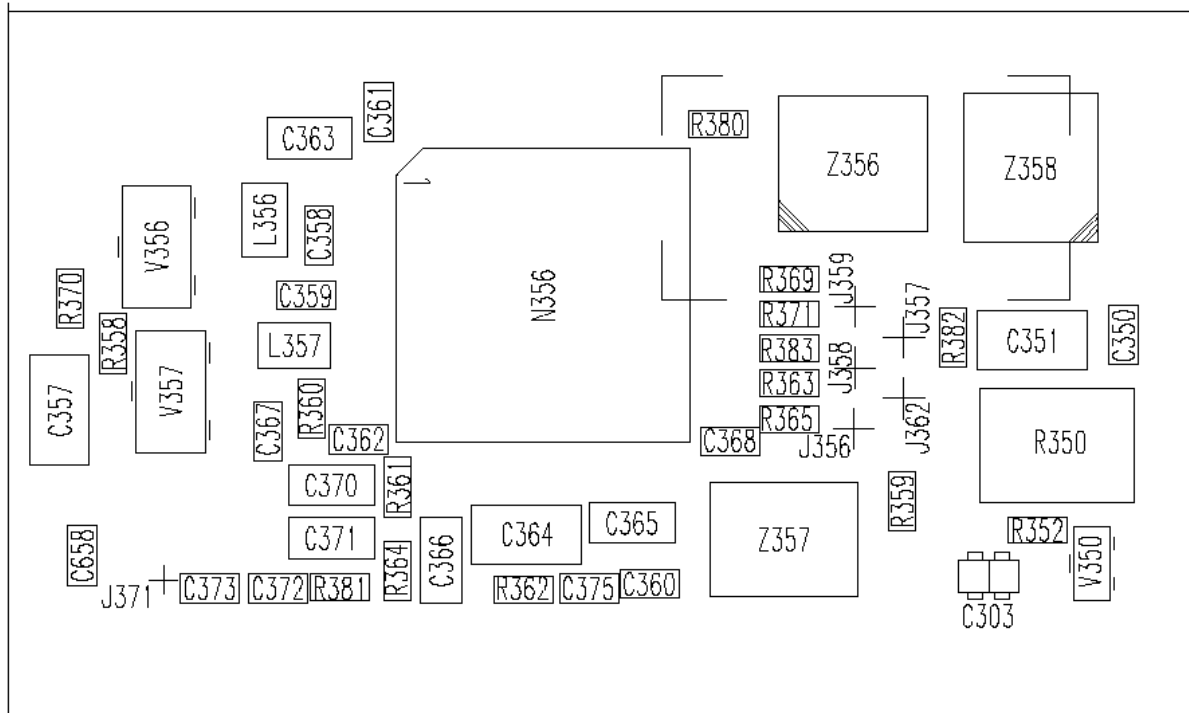


**4GHz VCO ctrl**  
 1800 TX, channel 512, continuous mode



**4GHz VCO output, 1800 band, RX on, continuous mode**

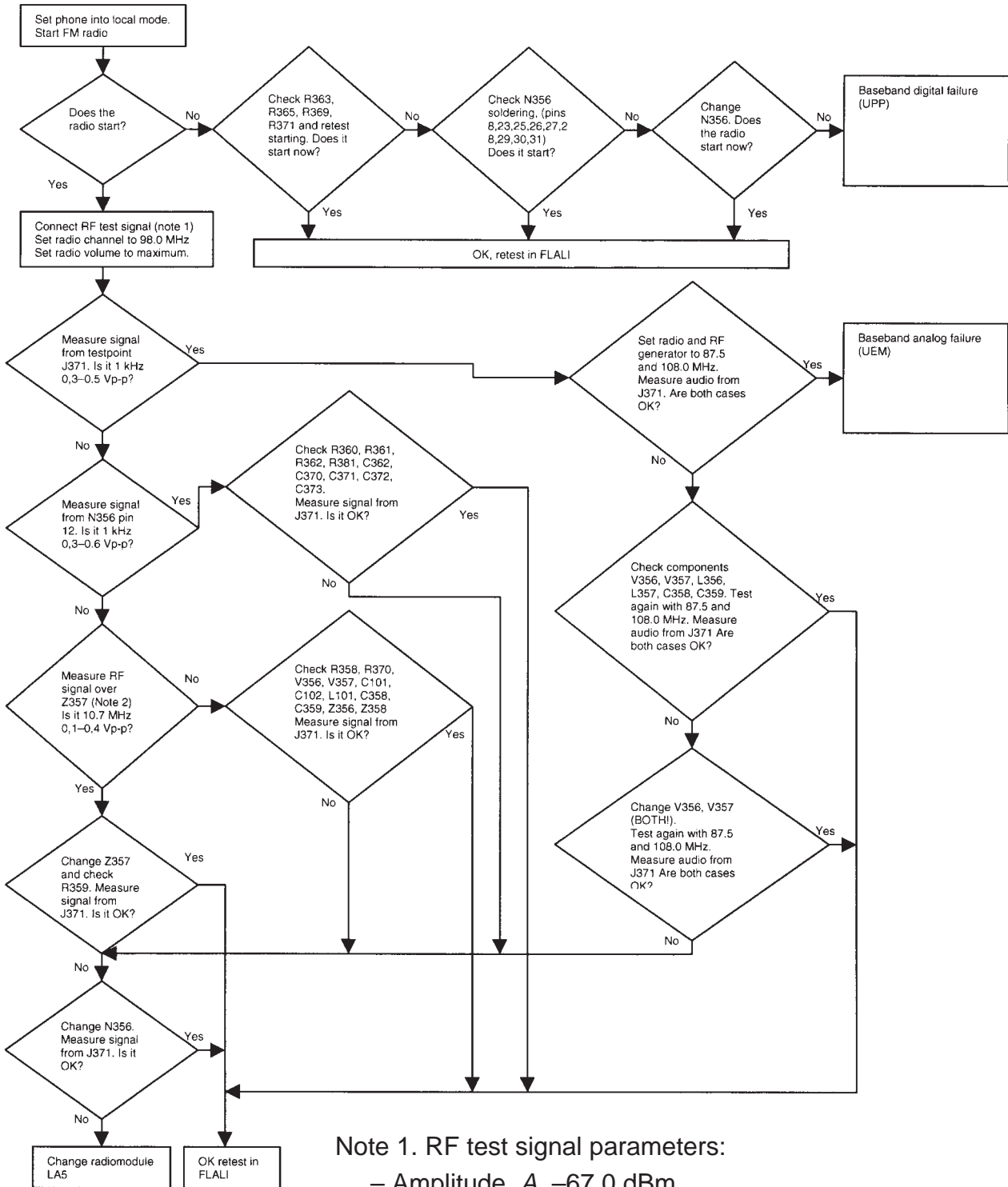
## FM Radio troubleshooting



FM Radio component layout

Components L101, C101 and C102 are not shown in picture. Components are placed in baseband section.

### FM Radio troubleshooting diagram

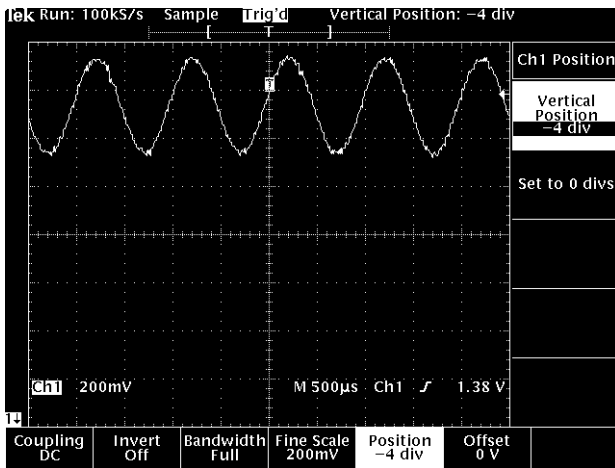


**Note 1. RF test signal parameters:**

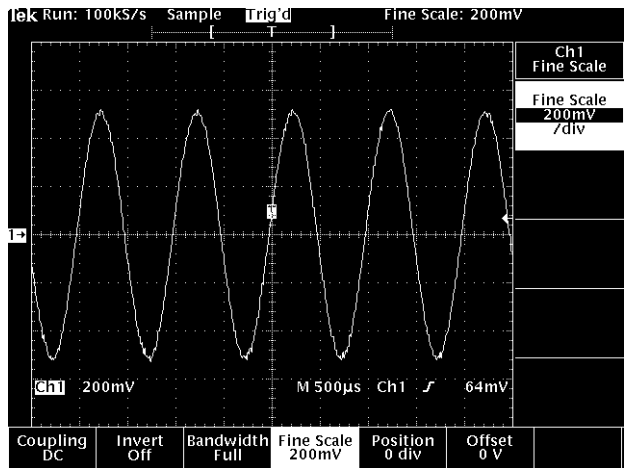
- Amplitude,  $A$ , -67.0 dBm
- Carrier frequency,  $f_c$ , 98,000 MHz
- Deviation,  $\Delta f$ , 75 kHz
- Modulating frequency  $f_m$ , 1,000 kHz (RF generator internal)

**Note 2.** Use 10x probe. Compare measured RF signal level to a known good product.

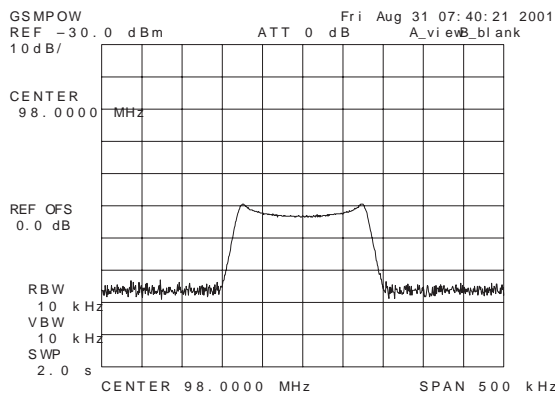
### FM Radio signals



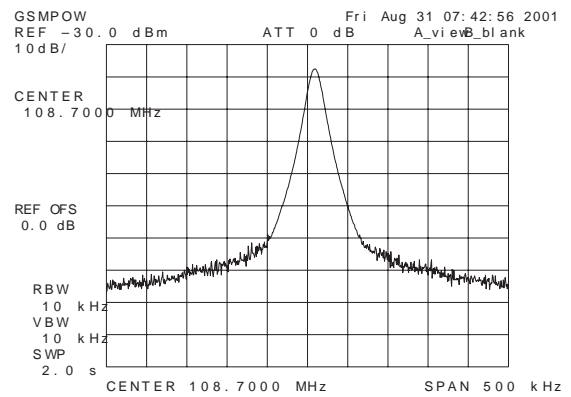
Audio out from PCB test point – with FM test signal.



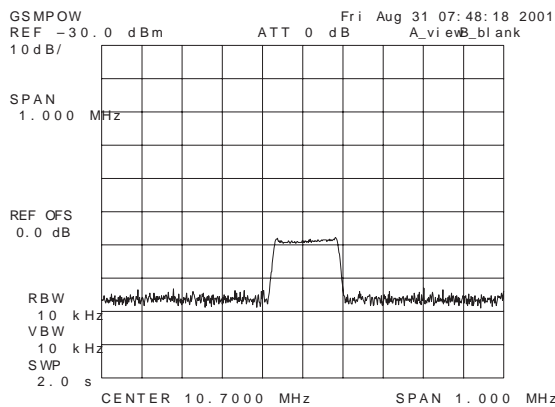
Audio out from test jig connector – with FM test signal, volume 100%.



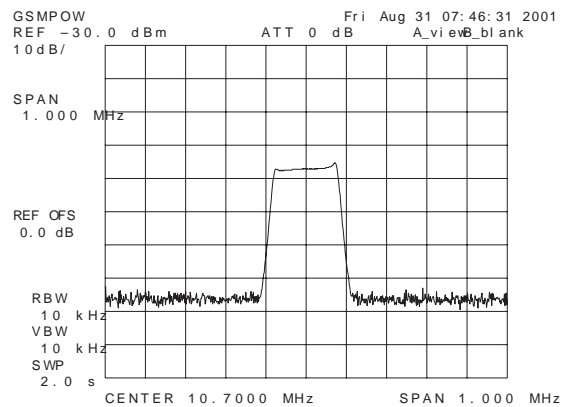
LC tank 1 – with FM test signal.



LC tank 2 – with FM test signal.



IF out 1 – with FM test signal.



IF out 2 – with FM test signal.