6 — BB Troubleshooting and Manual Tuning Guide

(This page left intentionally blank.)

Table of Contents

List of Tables

List of Figures

Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths. The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

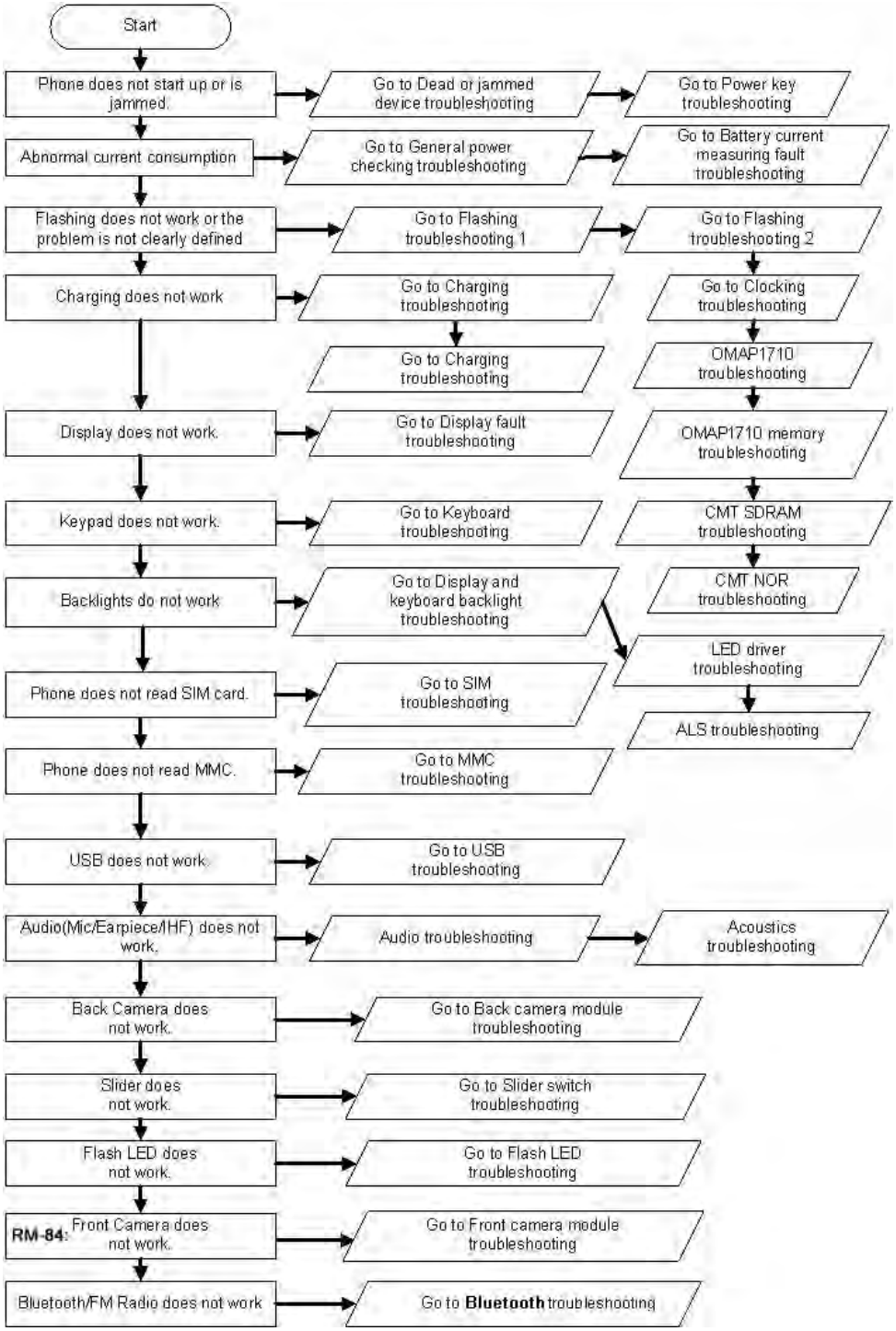
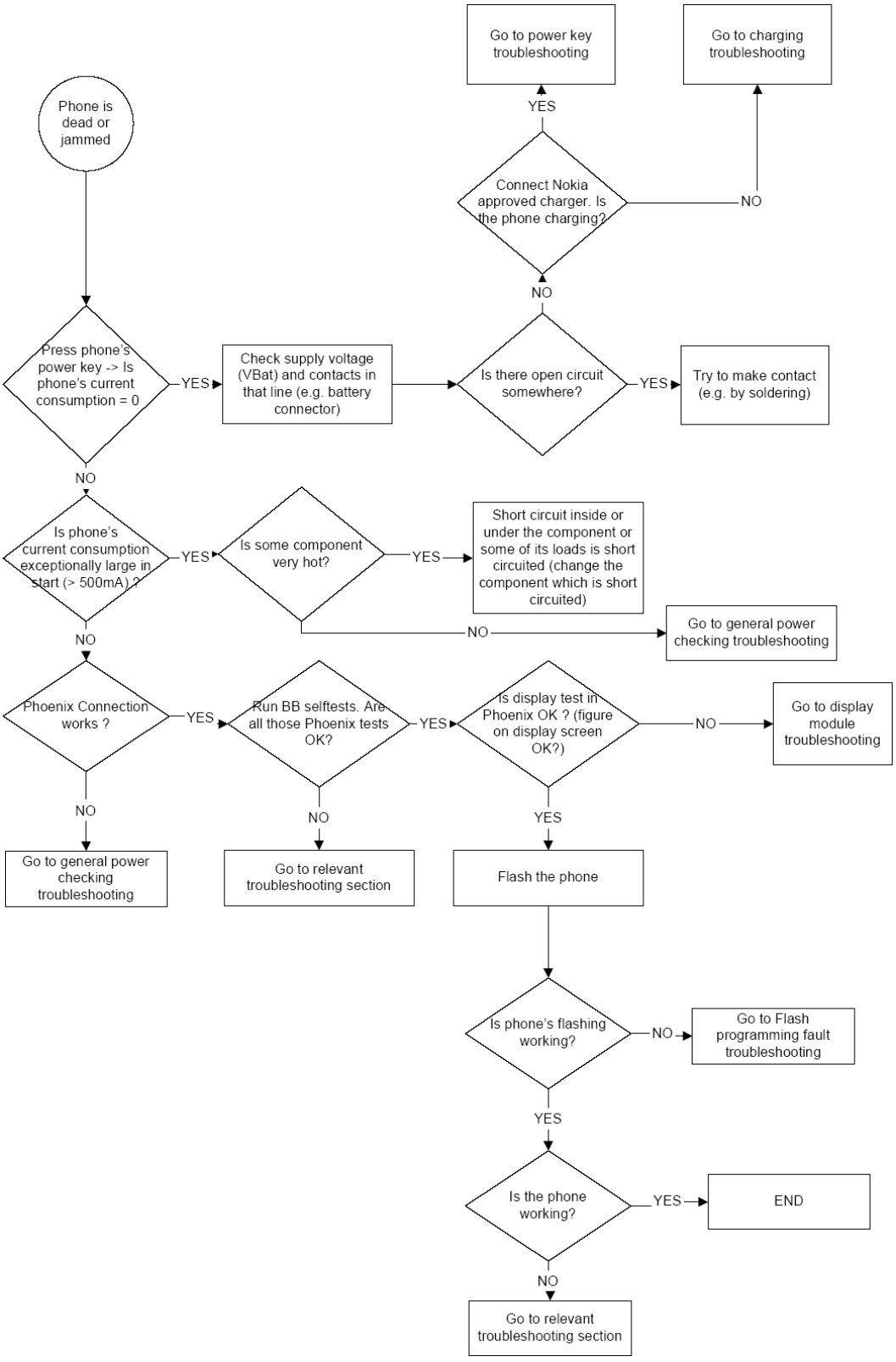
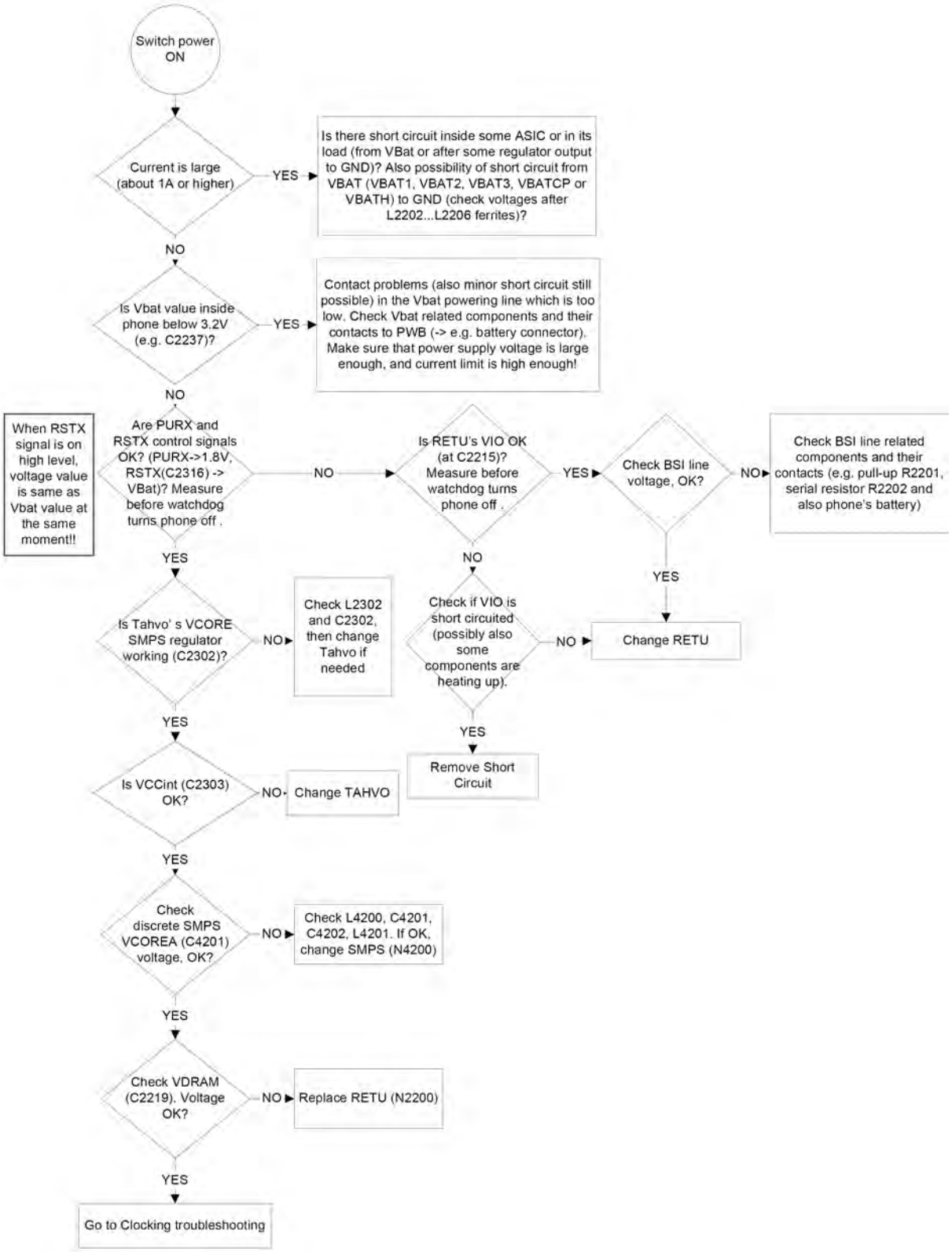


Figure 1 Main troubleshooting tree

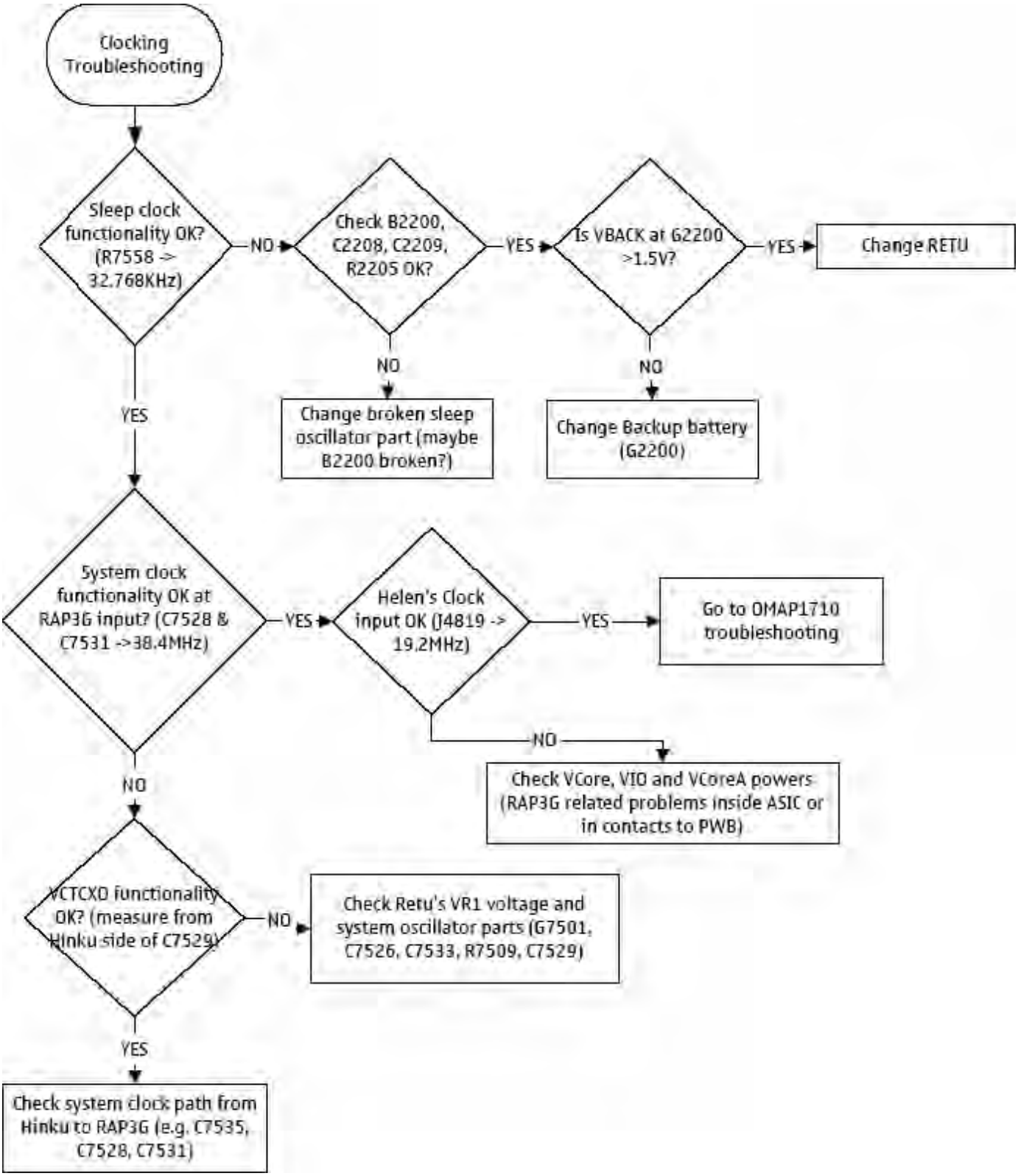
Dead or jammed device troubleshooting



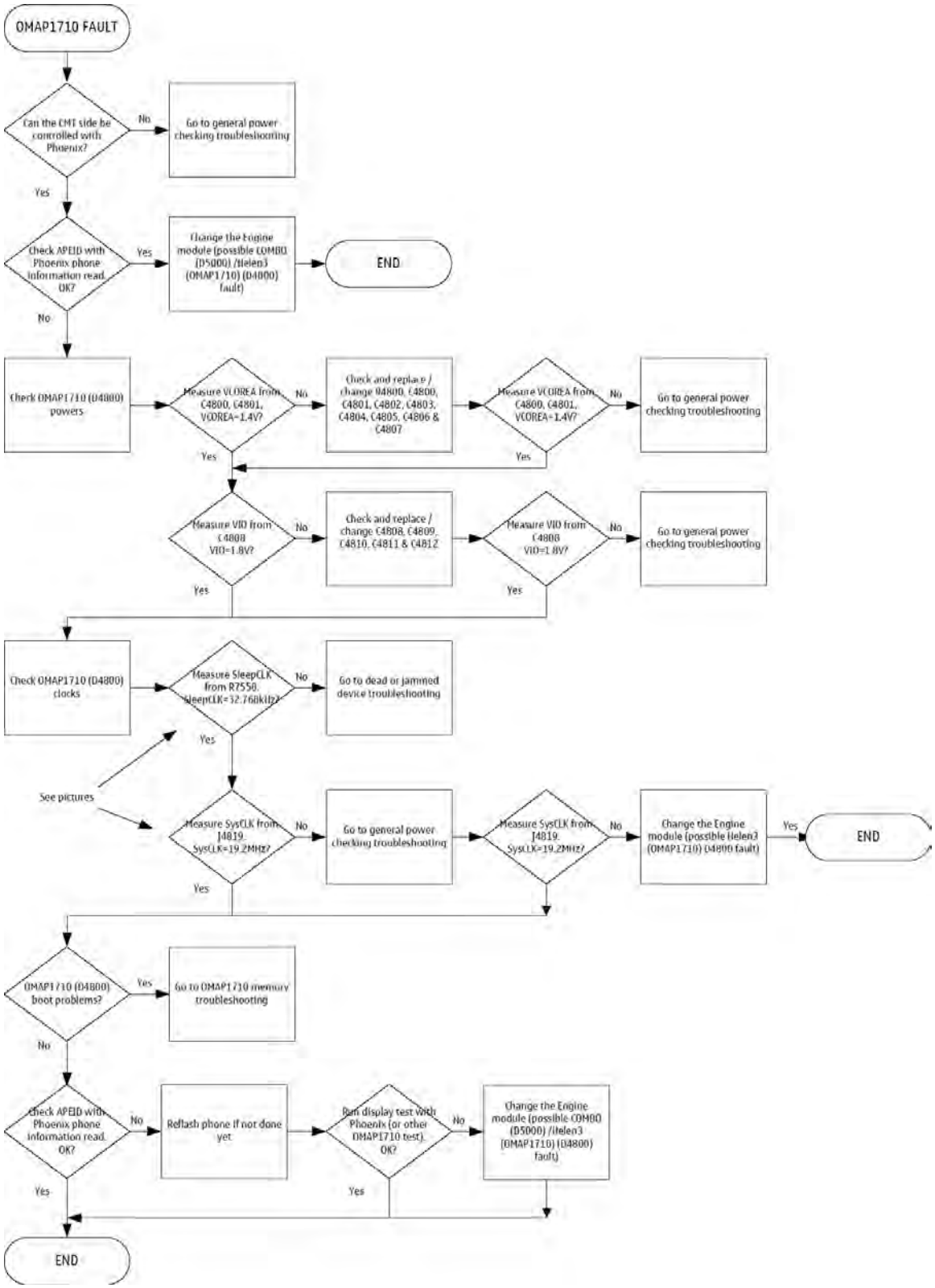
General power checking troubleshooting



Clocking troubleshooting



OMAP1710 troubleshooting



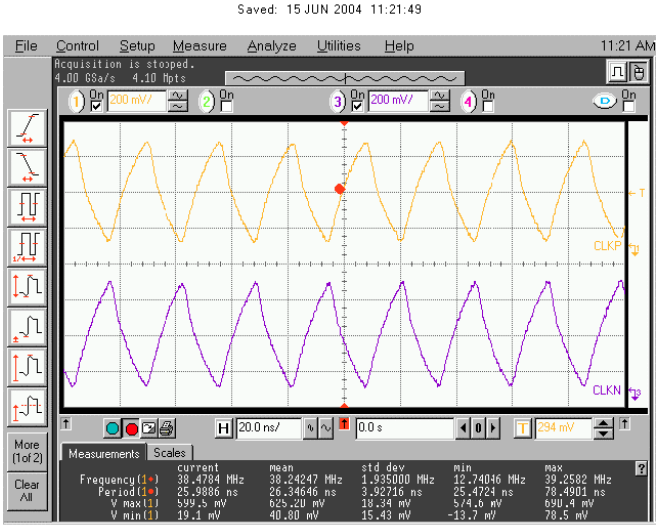


Figure 2 SysCLK from C7528 & C7531

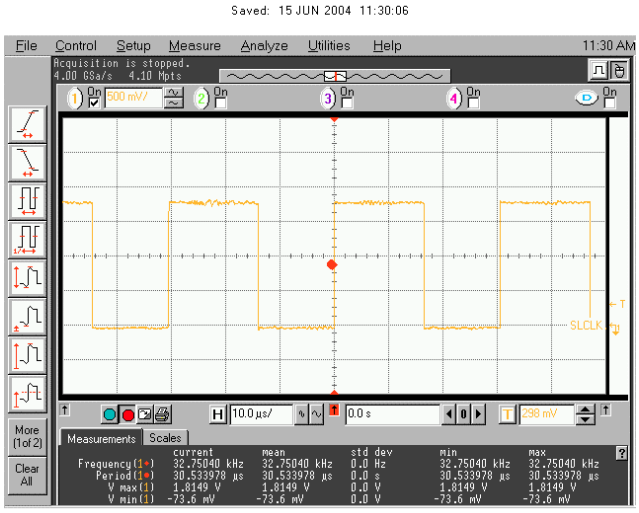
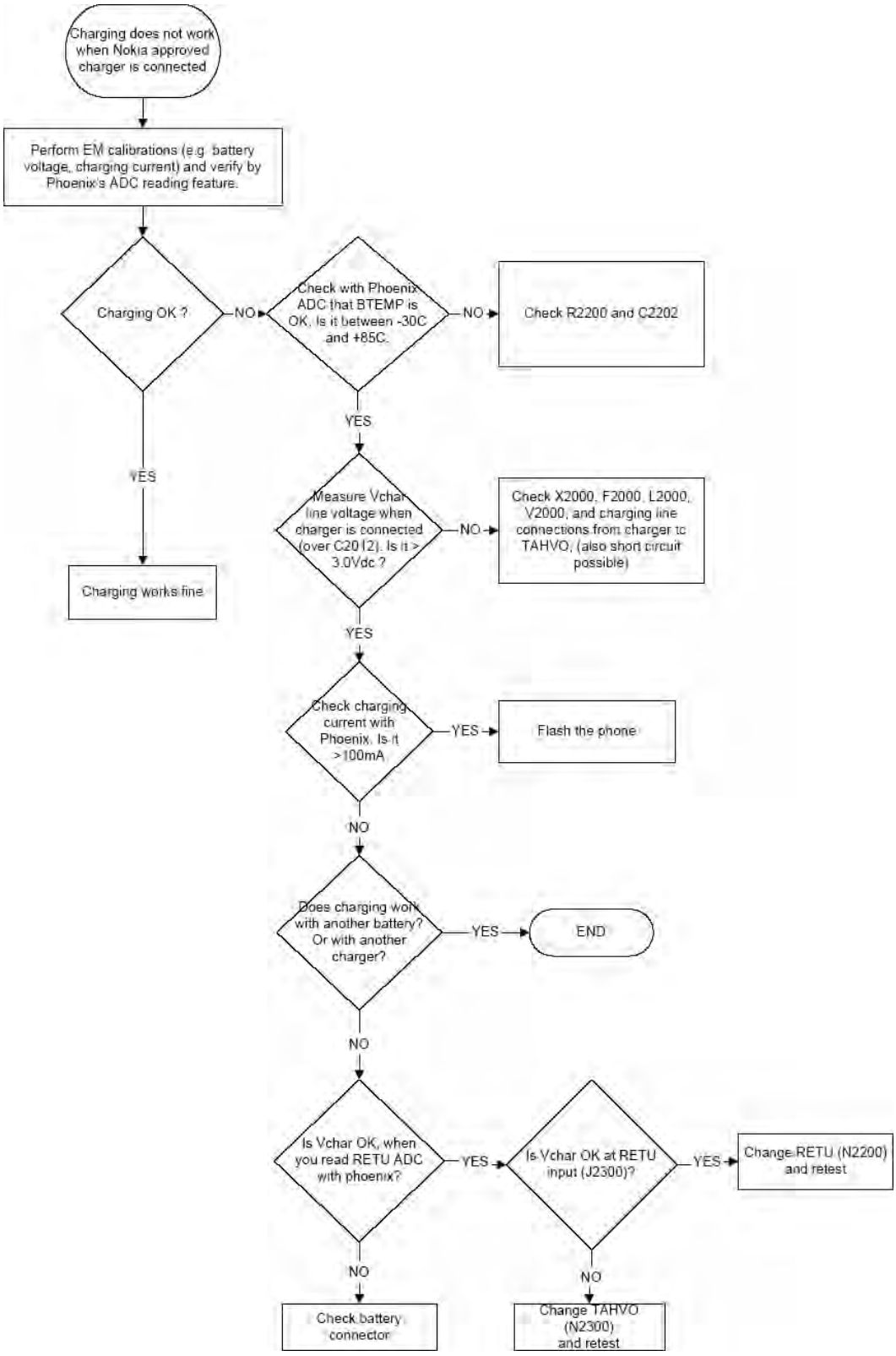
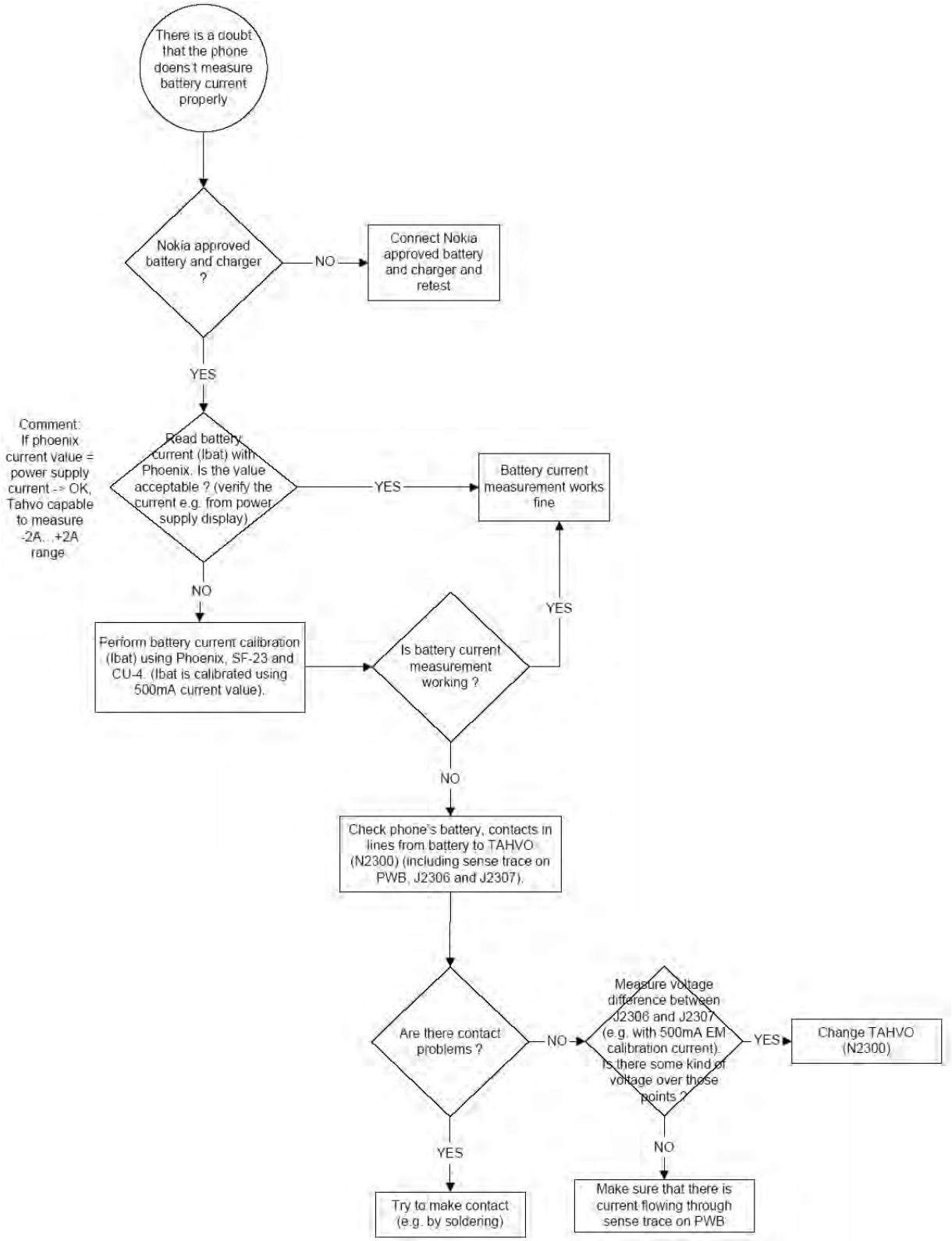


Figure 3 SleepCLK from R7558

Charging troubleshooting



Battery current measuring fault troubleshooting



Flash programming fault troubleshooting

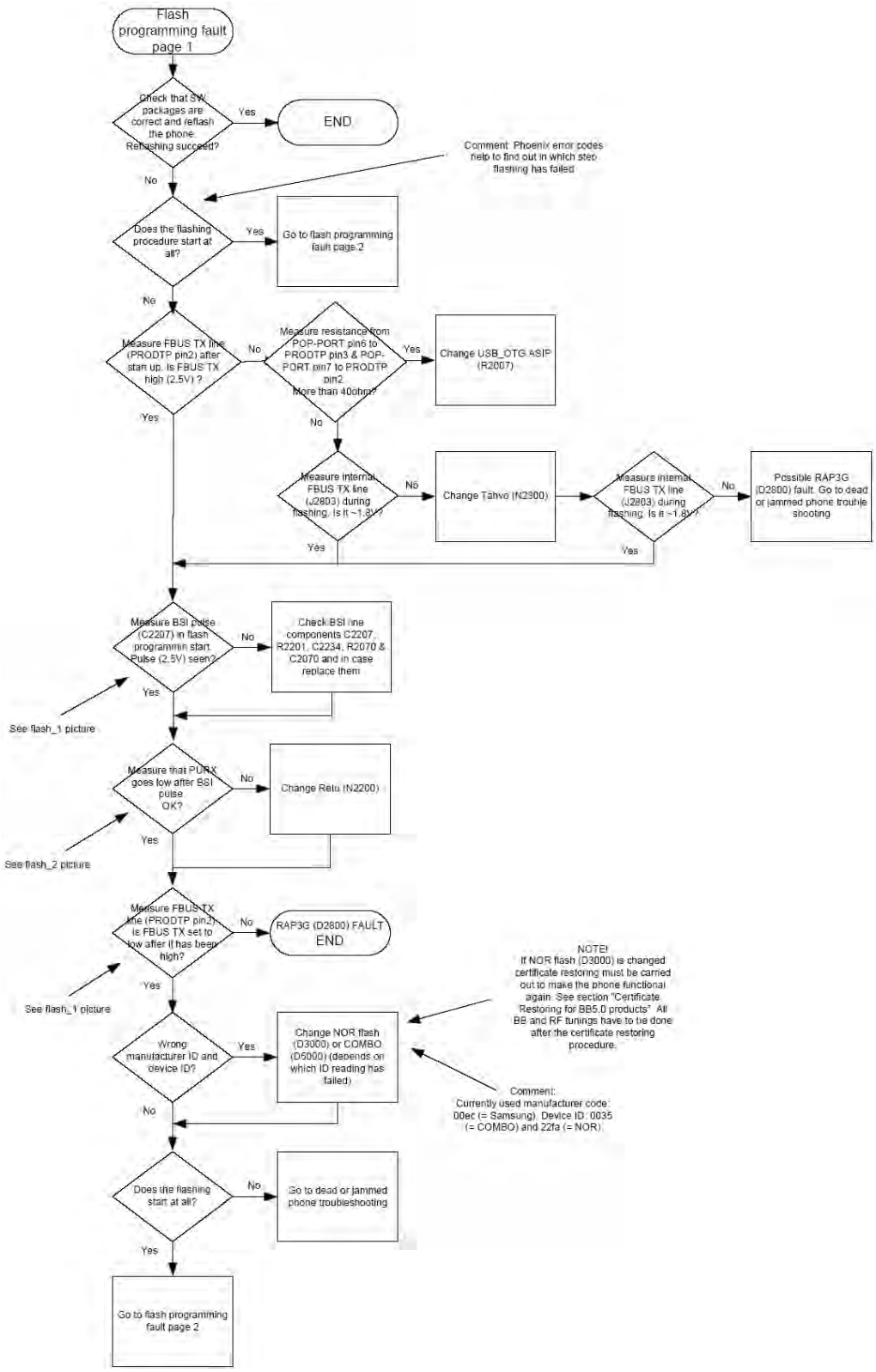


Figure 4 Flash programming fault troubleshooting 1/2

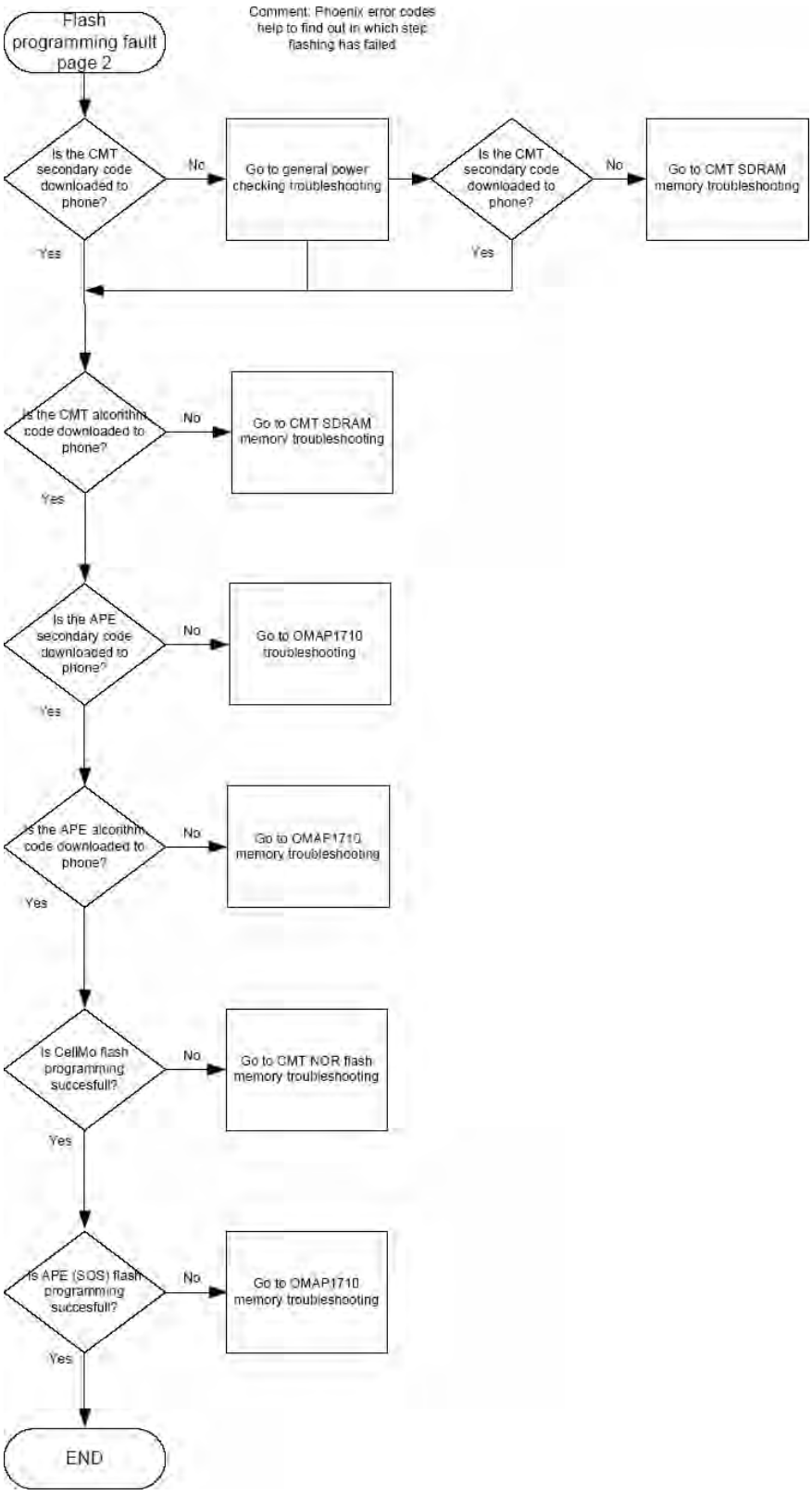


Figure 5 Flash programming fault troubleshooting 2/2

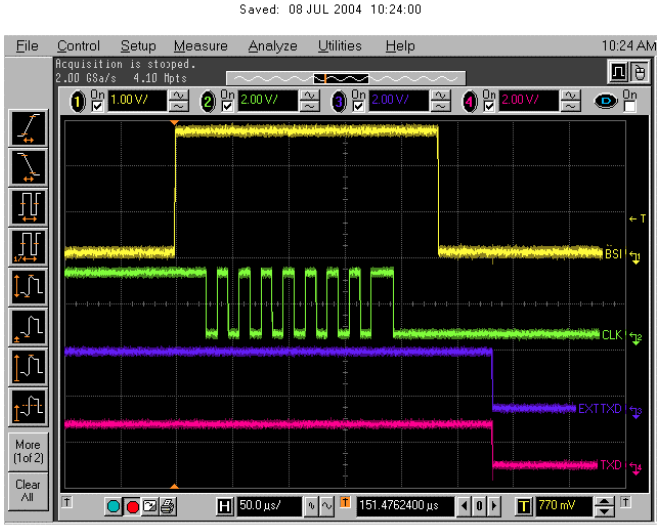


Figure 6 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.

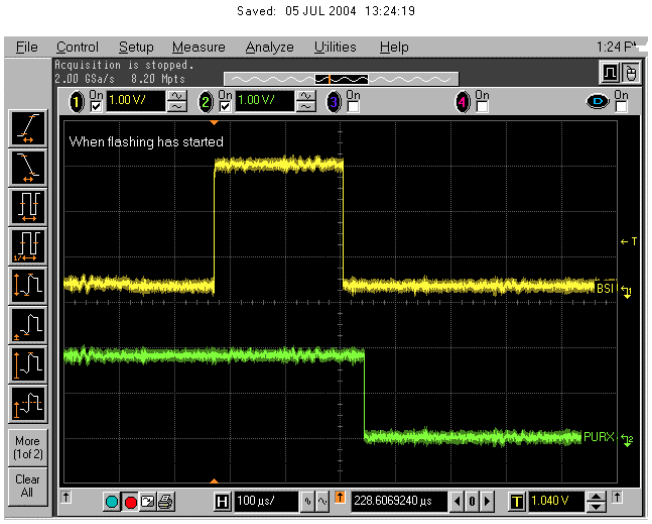
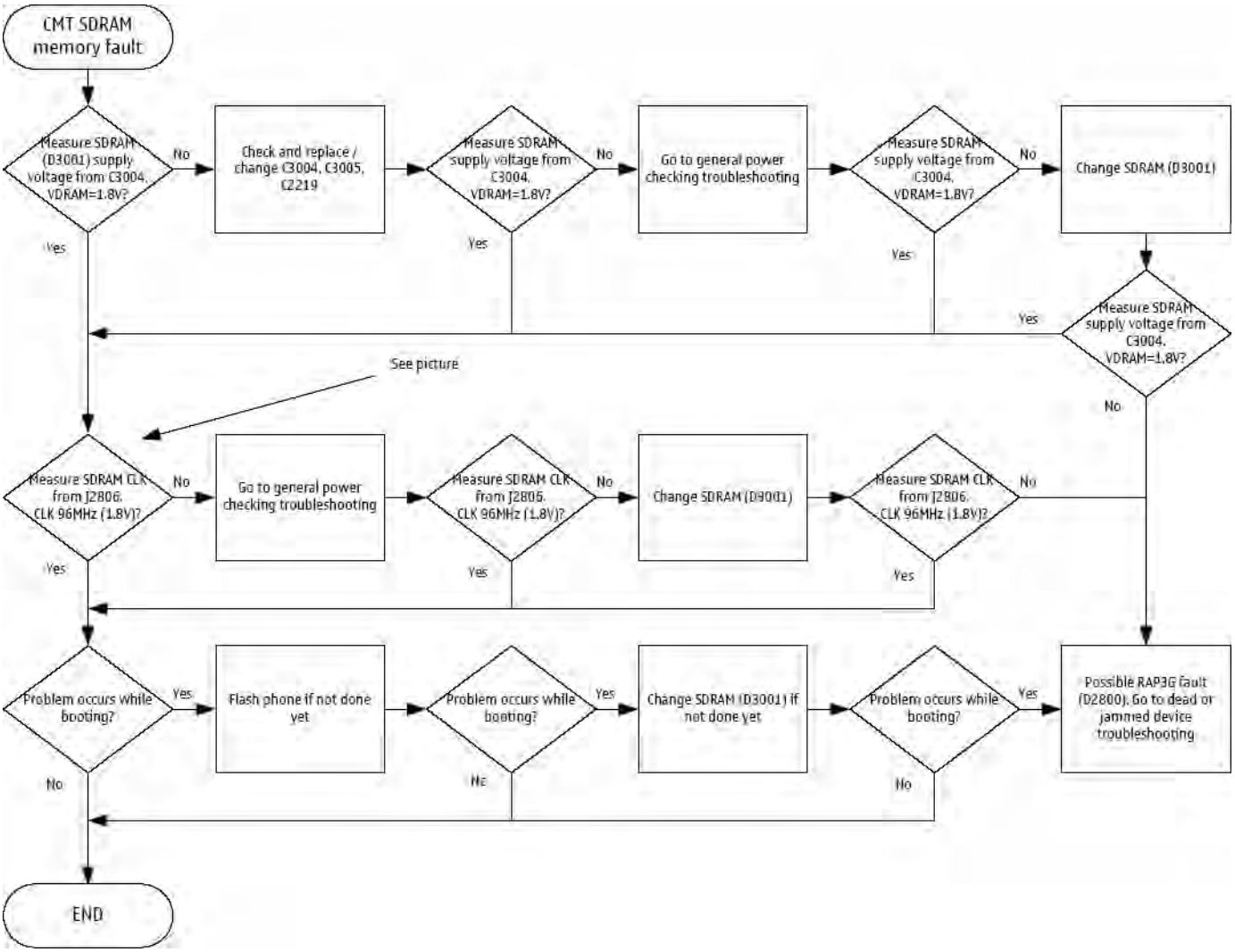


Figure 7 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

CMT SDRAM memory troubleshooting



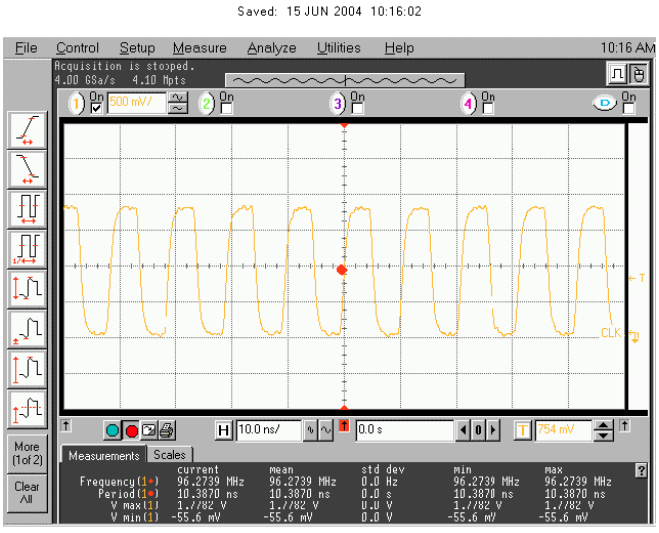
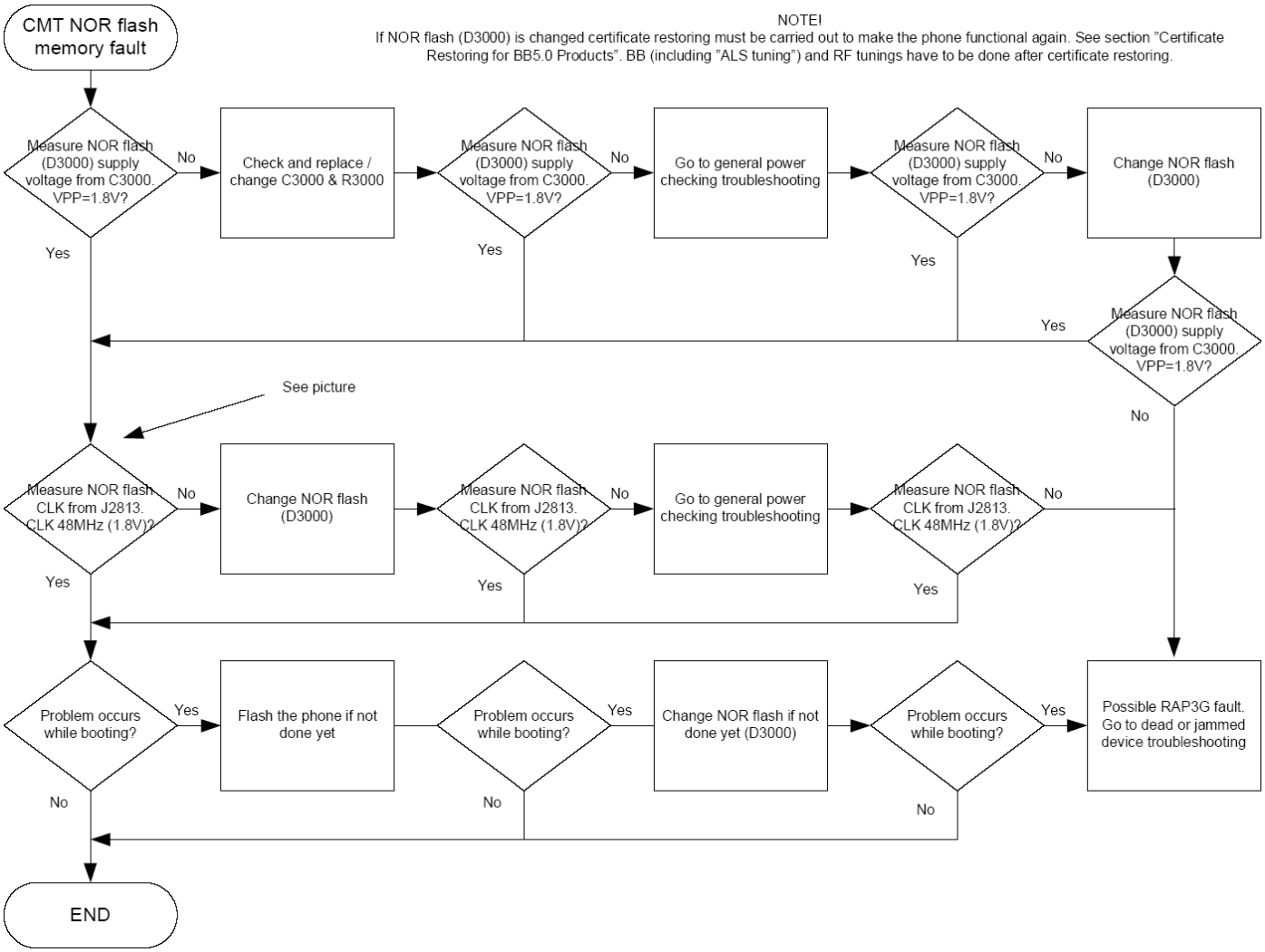


Figure 8 CMT SDRAM CLK from pin J2806

CMT NOR flash fault troubleshooting



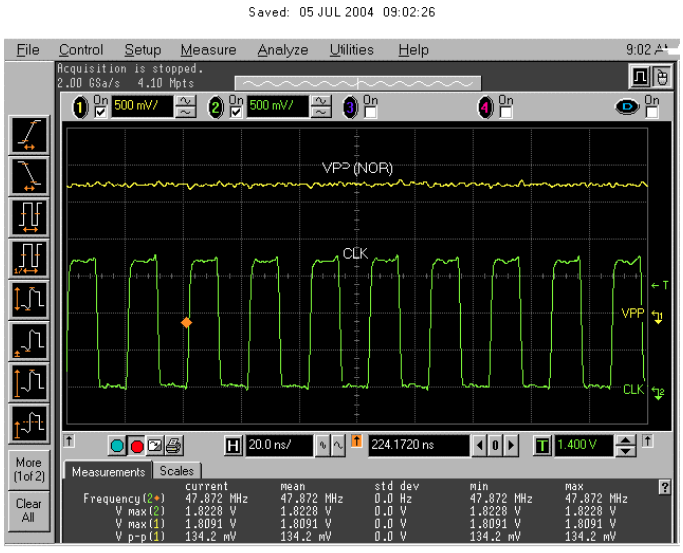
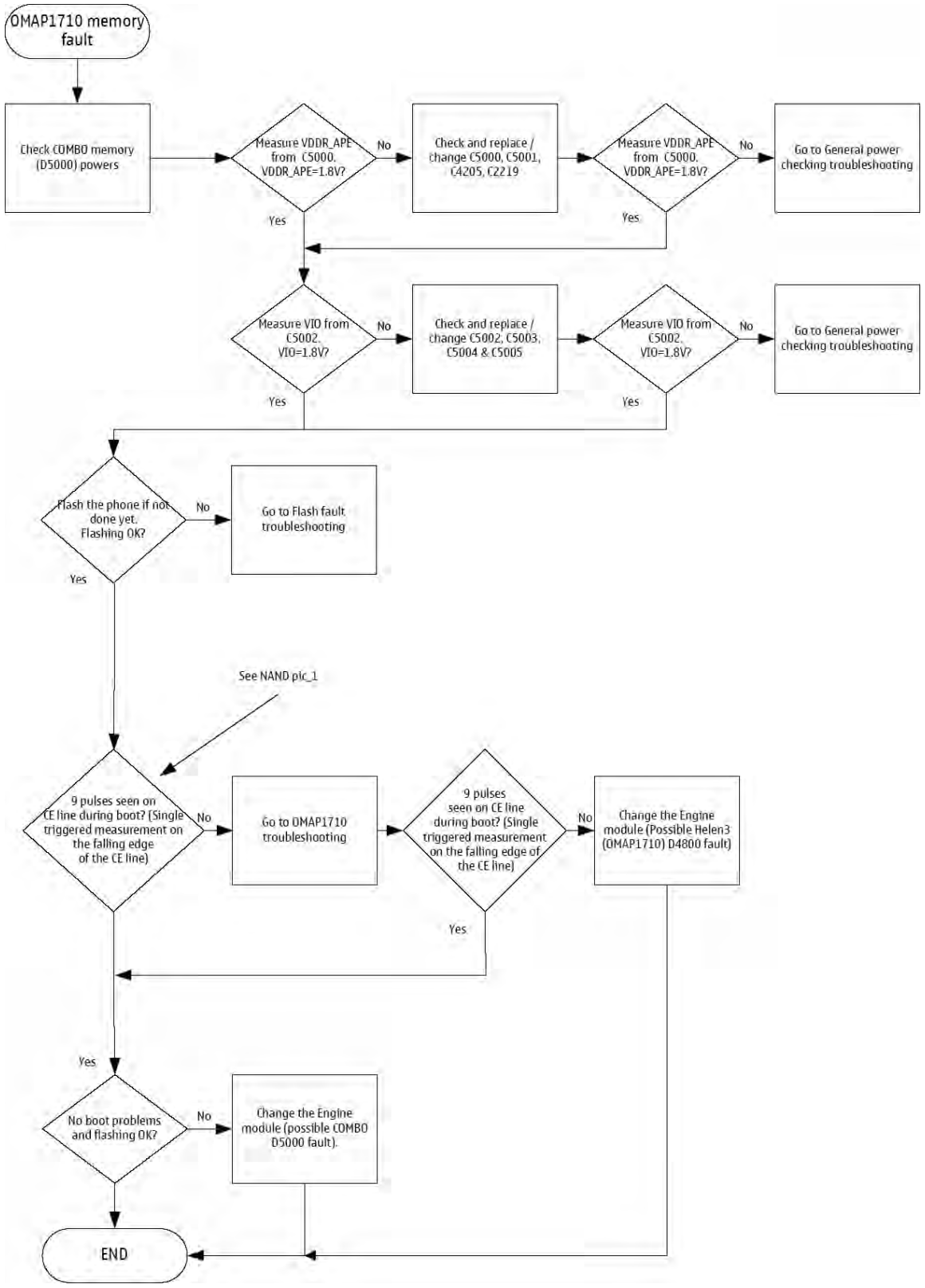
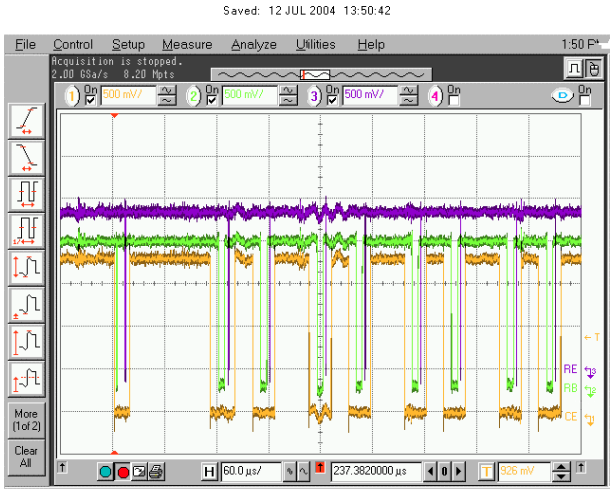


Figure 9 NOR CLK from J2813

OMAP1710 memory troubleshooting



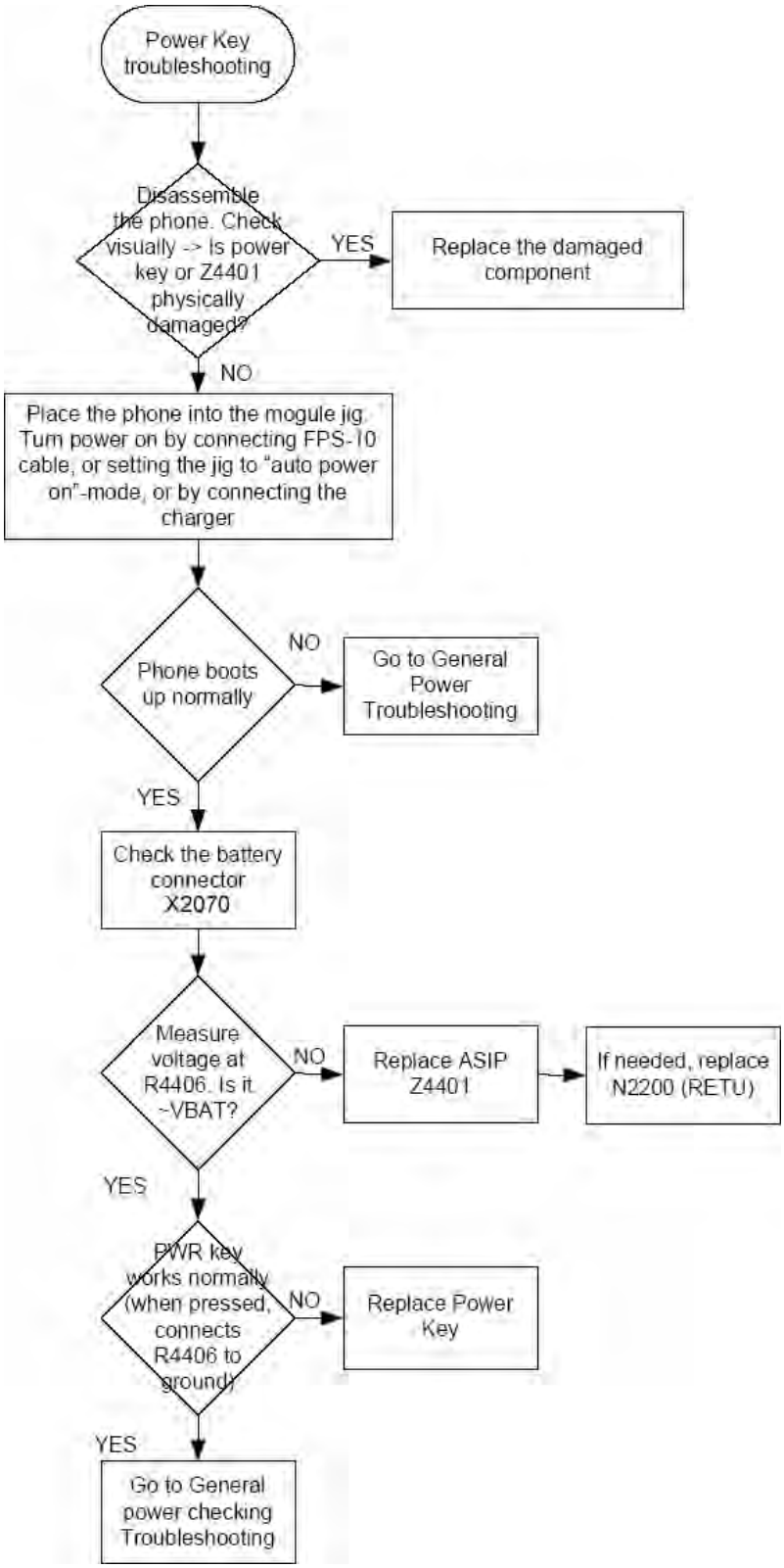


Legend

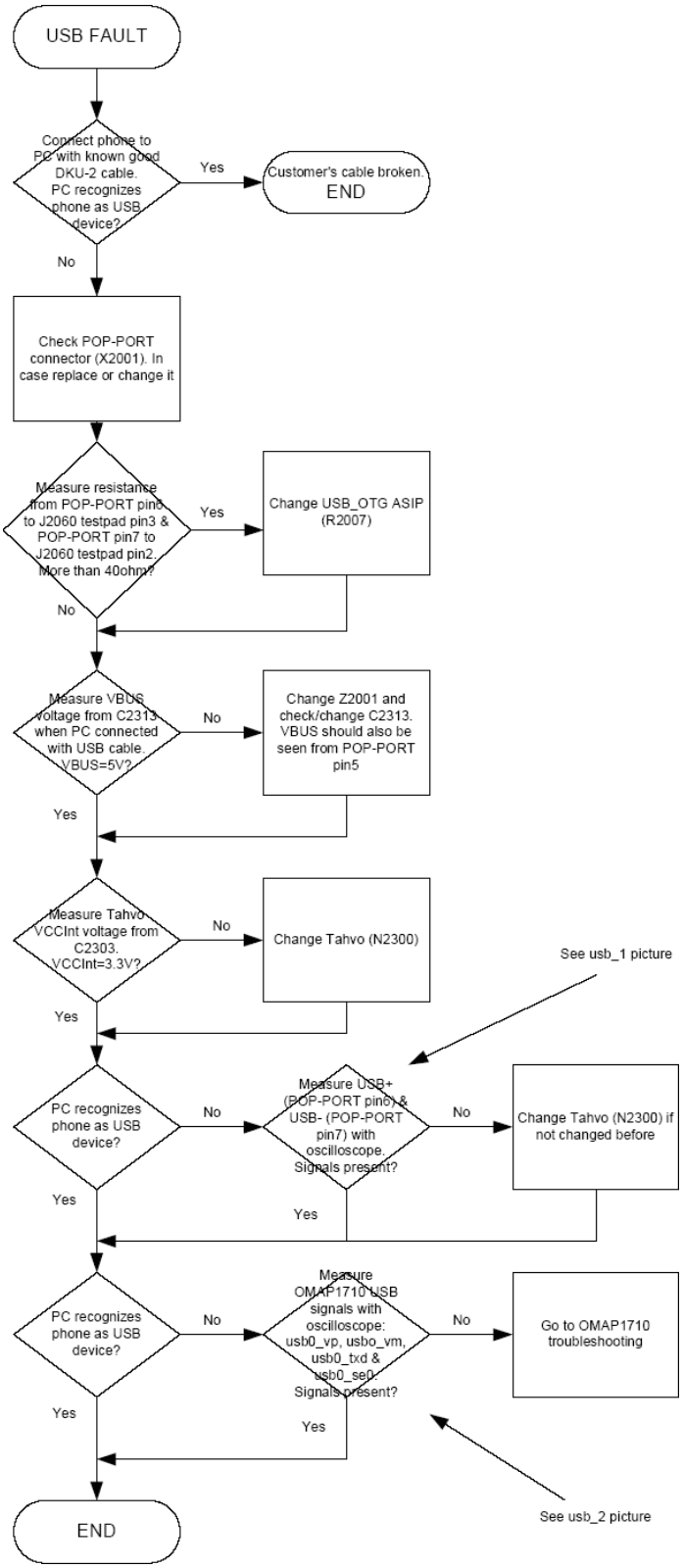
Take single trig measurement on the falling edge of the CE signal (=J5001).

Figure 10 COMBO NAND in boot pic 1.

Power key troubleshooting



USB interface troubleshooting



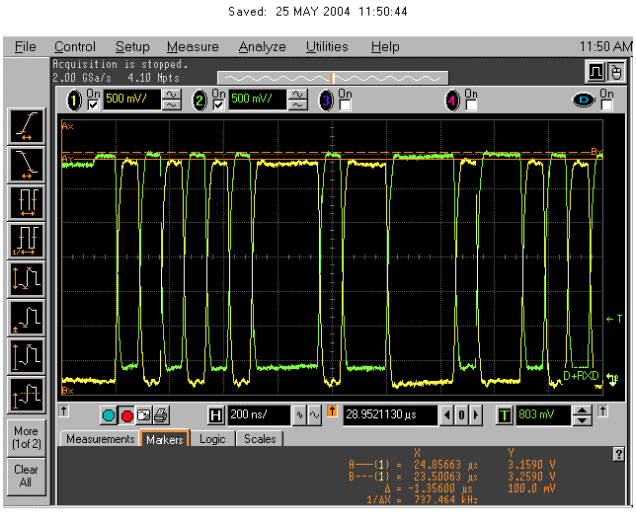
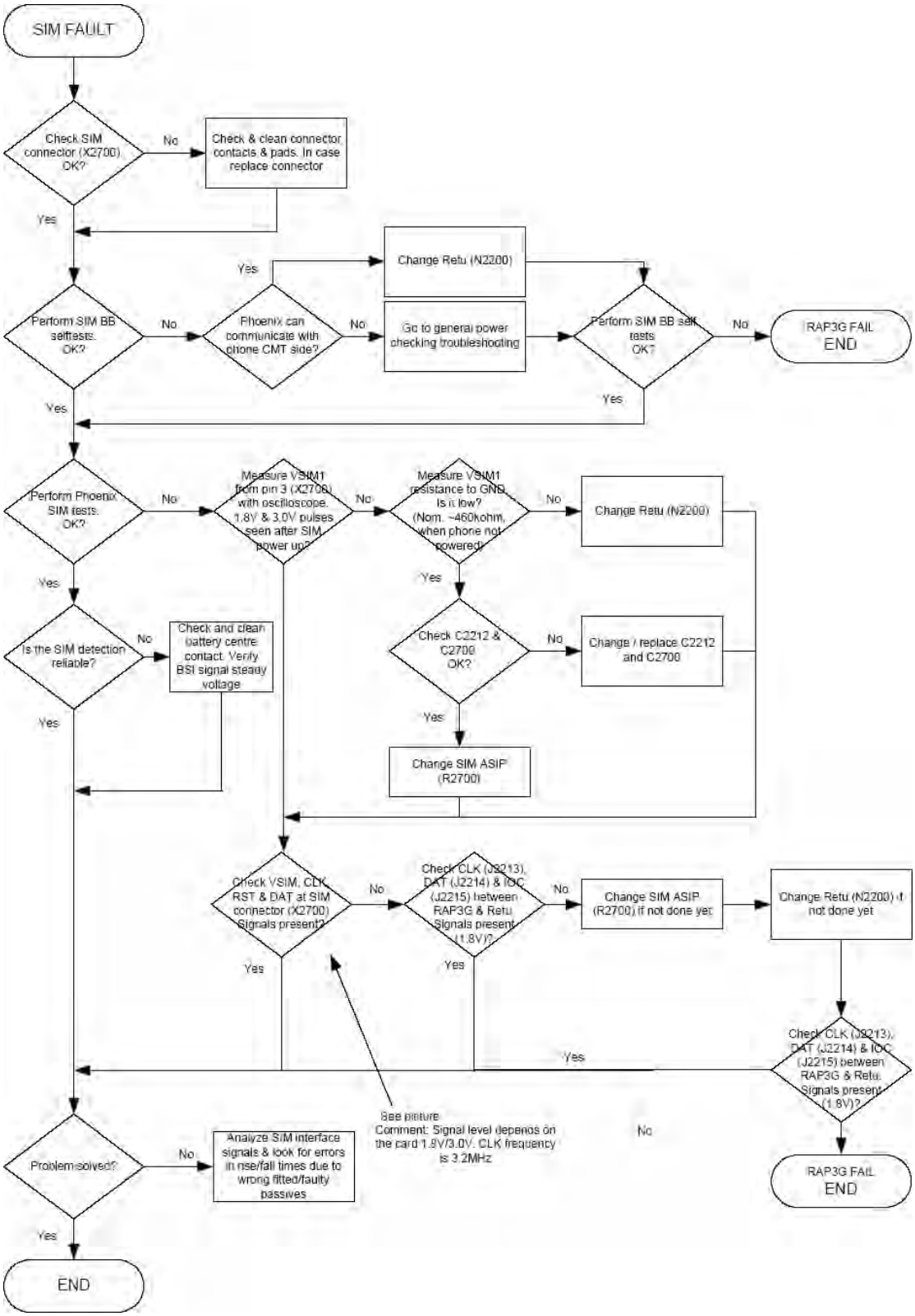
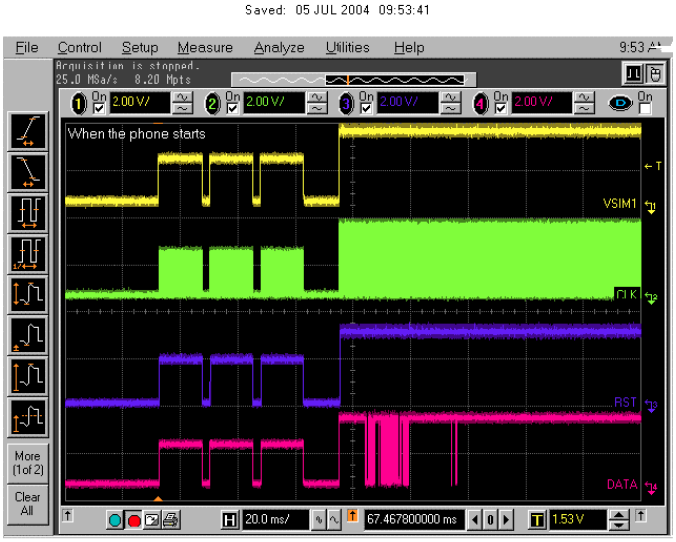


Figure 11 USB 1: D-TXD (POP-PORT pin6) and D+RXD (POP-PORT pin7) voltage levels when USB connected.

Figure 12 USB 2: Take single triggered measurement on the rising edge of the Helen usb0_txen (J4813) line.

SIM card troubleshooting



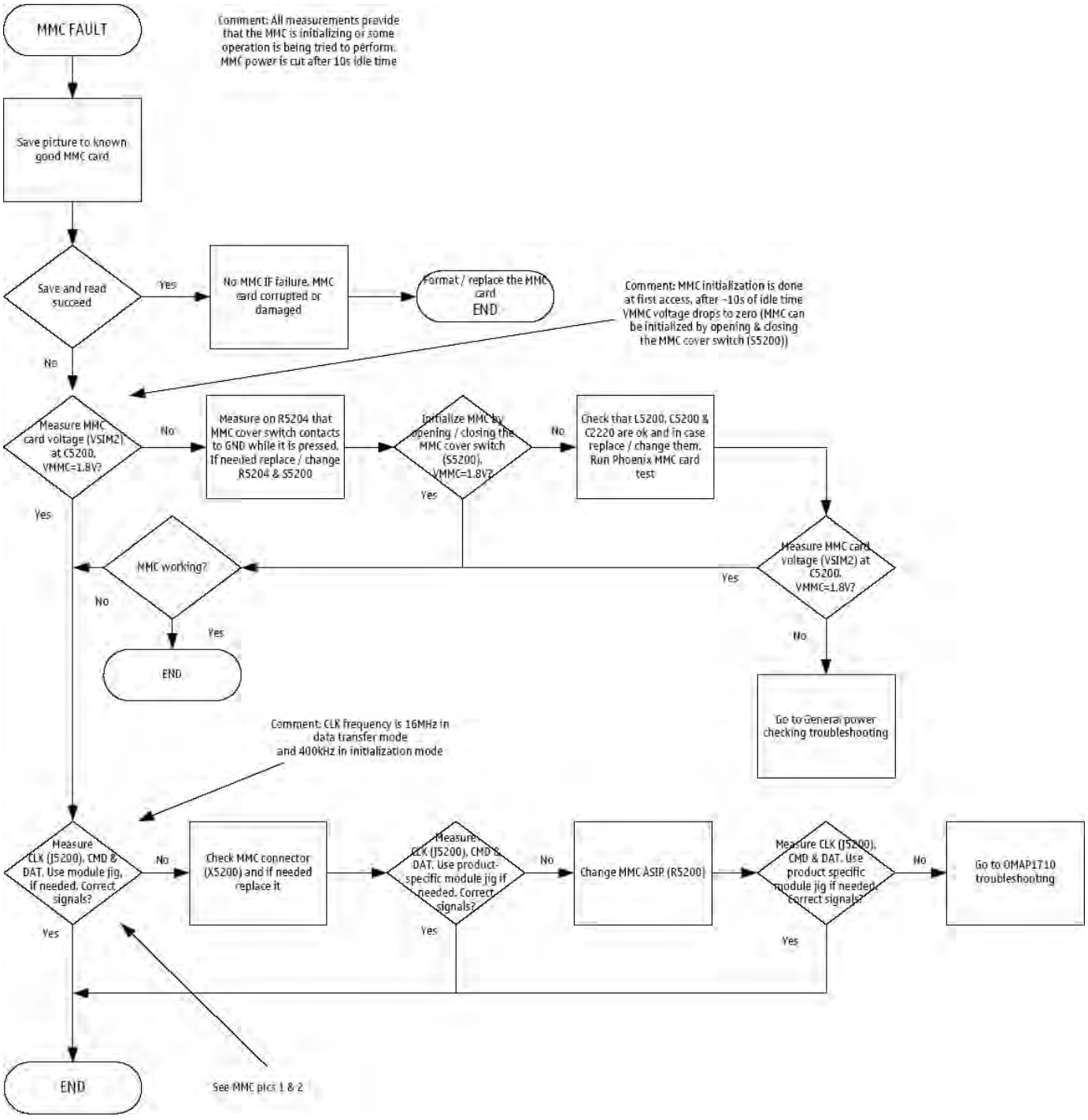


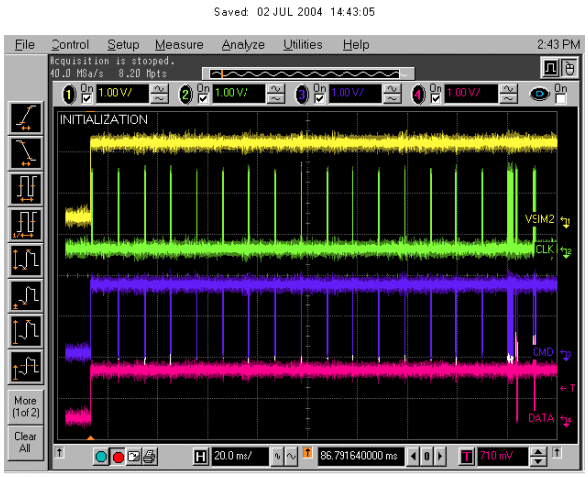
Legend

SIM CLK frequency = 3.2MHz (Take single triggered measurement in boot on the VSIM1 line).

Figure 13 SIM interface signals

MMC troubleshooting

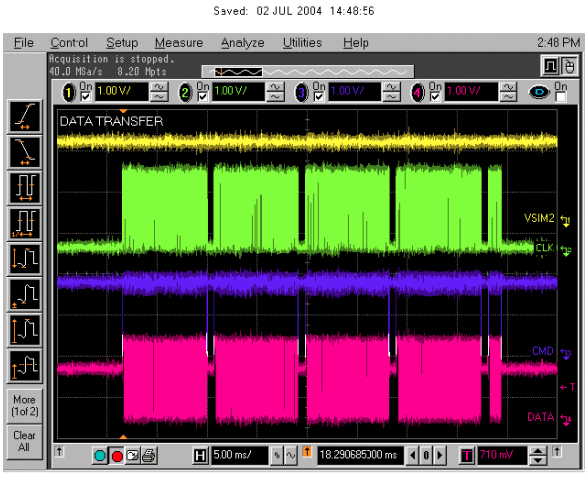




Legend

Take singe trig measurement on the rising edge of the DAT signal.

Figure 14 MMC card initialization



Legend

Take single trig measurement on the rising edge of the DAT signal.

Figure 15 Data transfer

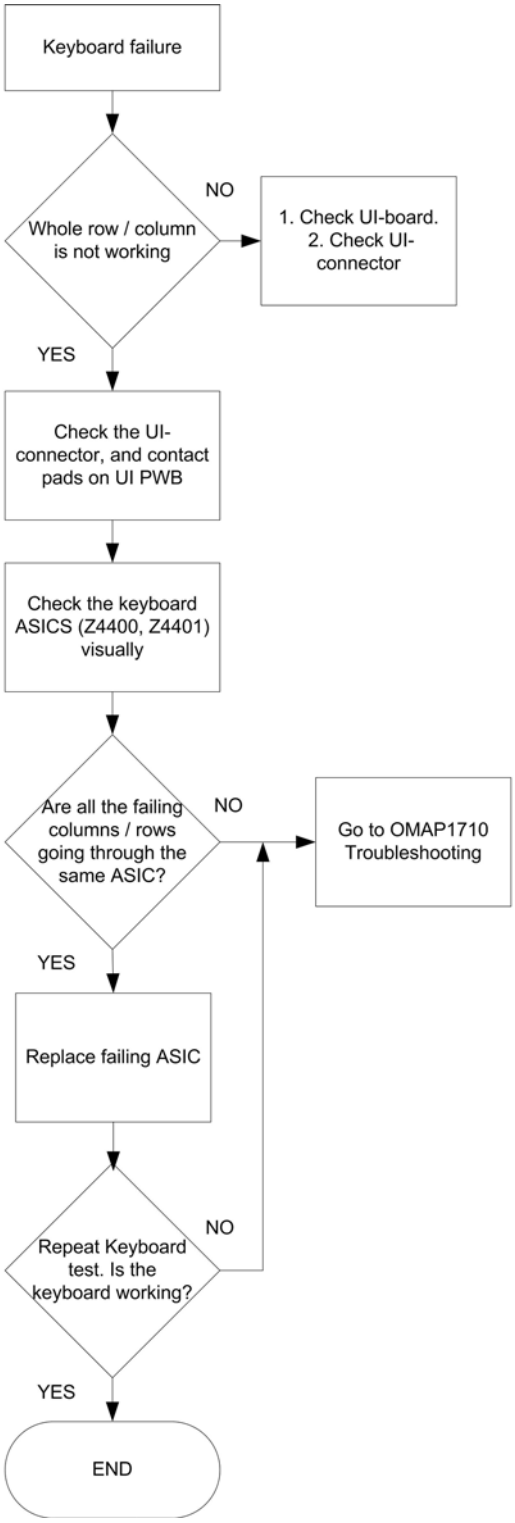
Keyboard troubleshooting

Context

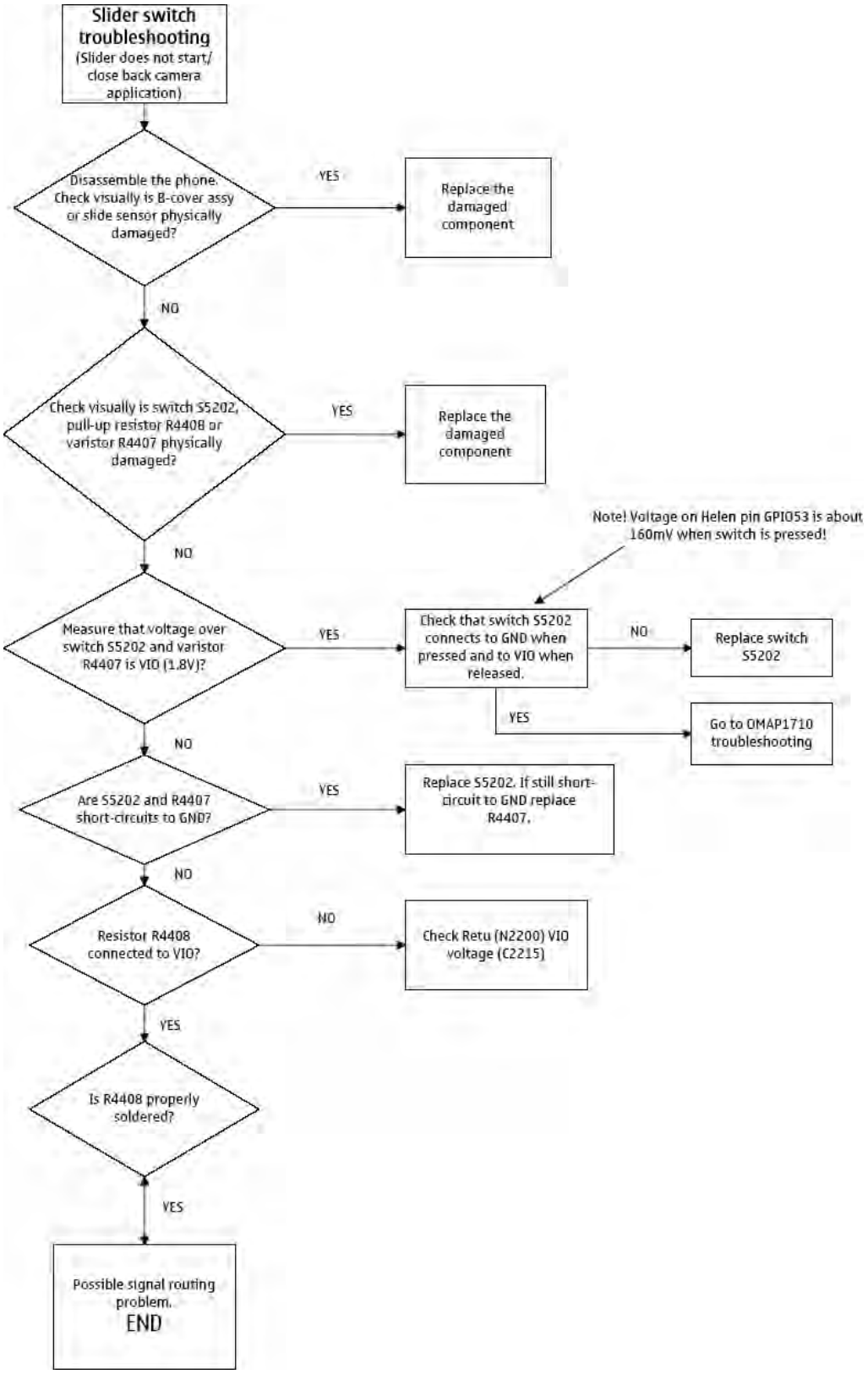
There are two possible failure modes in the keyboard module:

- One or more keys can be stuck, so that the key does not react when a keydome is pressed. This kind of failure is caused by mechanical reasons (dirt, rust).
- Malfunction of several keys at the same time; this happens when one or more rows or columns are failing (shortcut or open connection). For a more detailed description of the keyboard and keymatrix, see section Keyboard (Page).

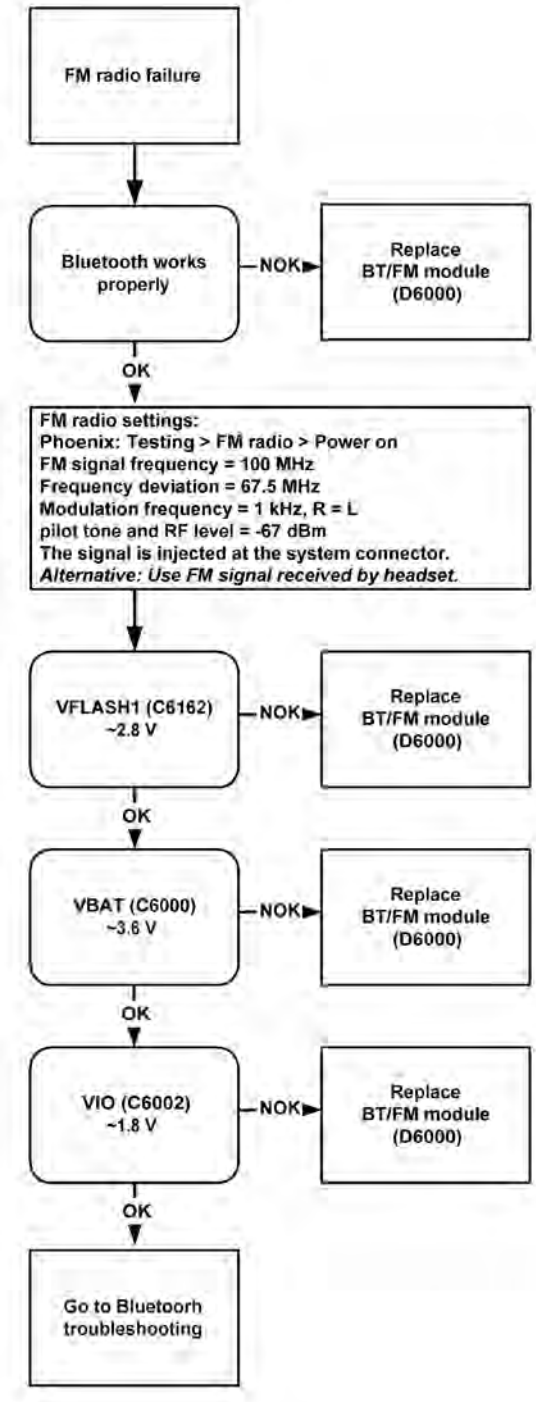
If the failure mode is not clear, start with the Keyboard Test in Phoenix.



Slider switch troubleshooting



FM radio troubleshooting



Certificate restoring for BB5.0 products

Context

After replacing a defective flash memory component in BB5.0 products, Certificate Restoring must be carried out to make the phone functional again.

Certificate restoring for BB5.0 products is basically the same process as IMEI / ESN Rebuild for DCT-4 generation products.

All tunings (RF & Baseband, UI) must be done after replacing the flash IC.

The procedure for Certificate Restoring when Flash IC has been replaced:

- Flash the phone with the latest available software (Use FPS-8 or FPS-10, USB Flashing does not work for a dead BB5.0 phone).
- Create a request file.
- Send the file to Nokia by e-mail.
- When you receive a reply from Nokia, carry out Certificate Restoring.
- Tune the phone completely (Note: SX-4 Smart Card is needed).
- If phone resets after a certificate restore, reflash the phone again.

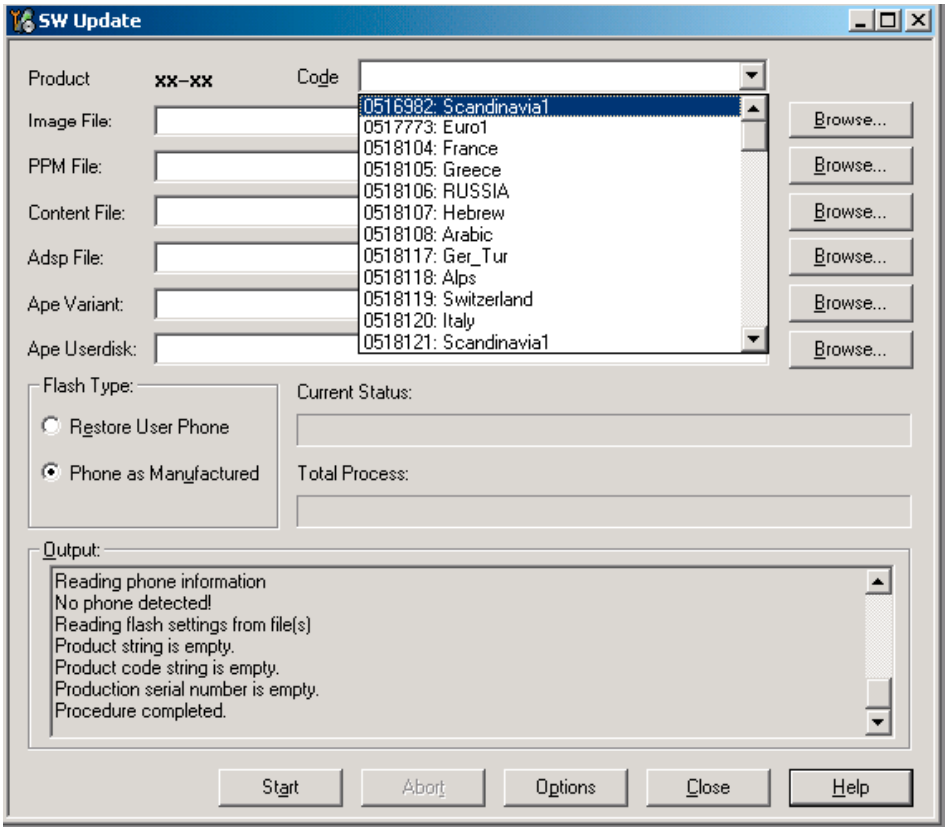
Required equipment and setup:

- *Phoenix* service software v 2004.39.7.70 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5.0 testing and tuning features)
- External smart card reader (Only when FPS-8 is used, FPS-10 has an integrated smart card reader)
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

Note: CU-4 must be supplied with +12V from external power supply in all steps of Certificate Restoring.

Steps

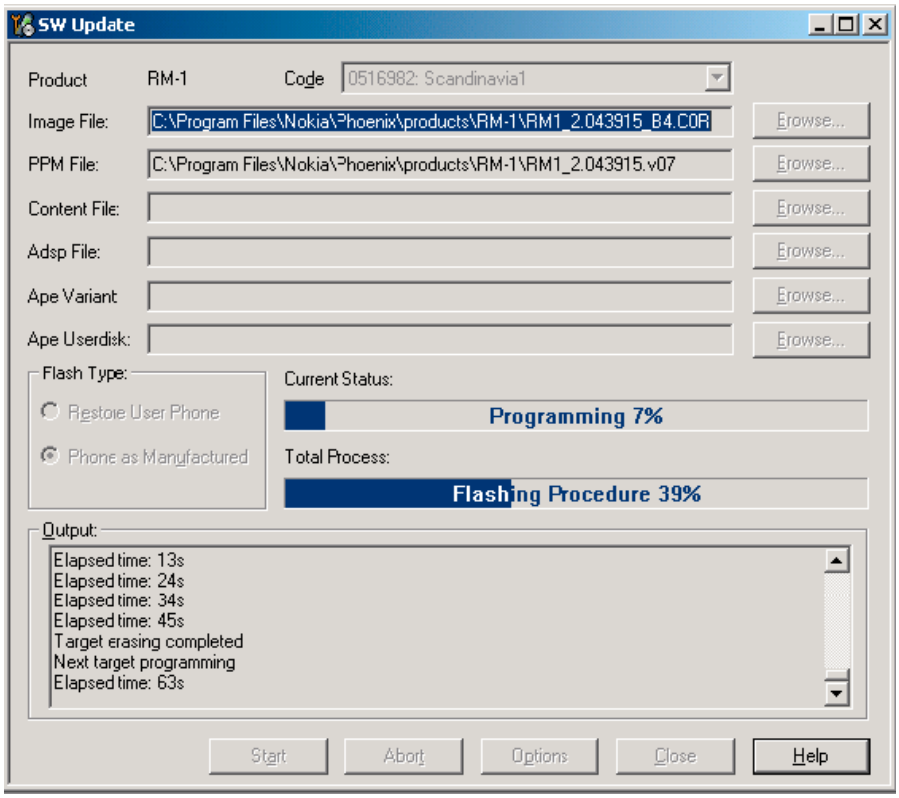
1. Program the phone software.
   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.
   ii Update the phone MCU software to the latest available version.
   If the new flash is empty and the phone cannot communicate with *Phoenix*, the procedure in this case is a “Dead Phone Flash” described below.
   iii Choose the product manually from *File* → *Open Product* , and click OK.
   Wait for the phone type designator (e.g. “RM-1”) to be displayed in the status bar.
   iv Go to *Flashing* → *SW Update* and wait until *Phoenix* reads the product data as shown in the following picture.



Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to Phone as Manufactured.

v To continue, click Start.

Progress bars and messages on the screen show actions during phone programming, please wait.



Programming is completed when *Flashing Completed* message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose *File* → *Close Product* .

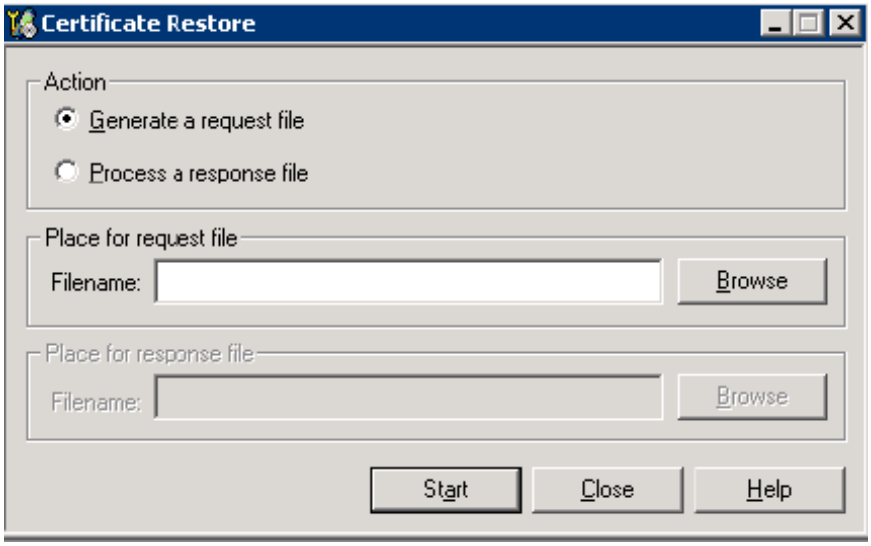
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 Control Unit from an external power supply.

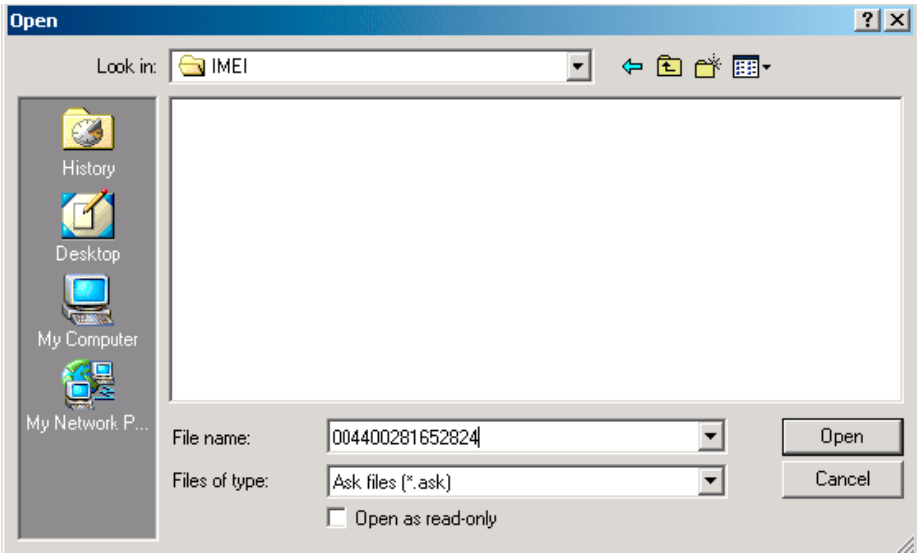
i To connect the phone with Phoenix, choose *File* → *Scan Product* .

ii Choose *Tools* → *Certificate Restore* .

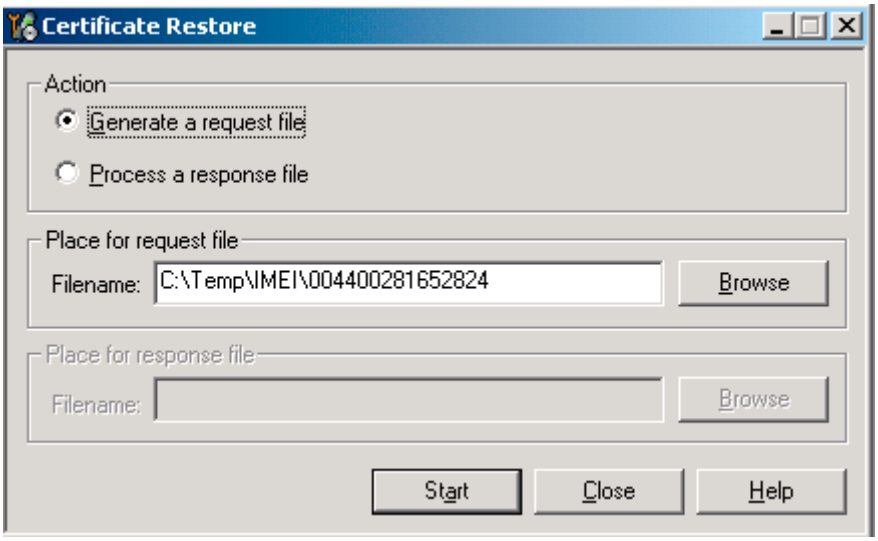
iii To choose a location for the request file to be saved, click Browse.



iv Name the file so that you can easily identify it, and click Open.



The name of the file and its location are shown.



v To create the *Request* file, click Start.

vi When the file for Certificate Restore has been created, send it to Nokia as an e-mail attachment.

3. Restore Certificate.

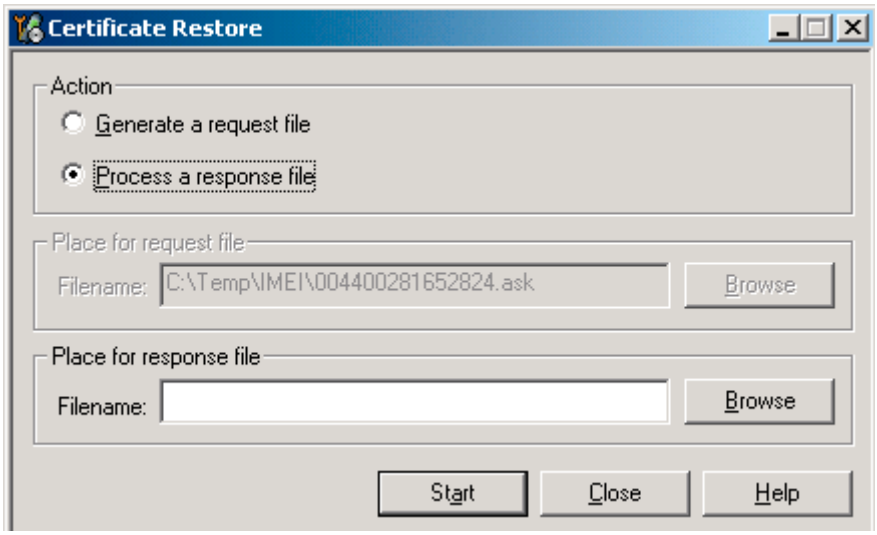
For this procedure, you must supply +12 V to CU-4 Control Unit from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

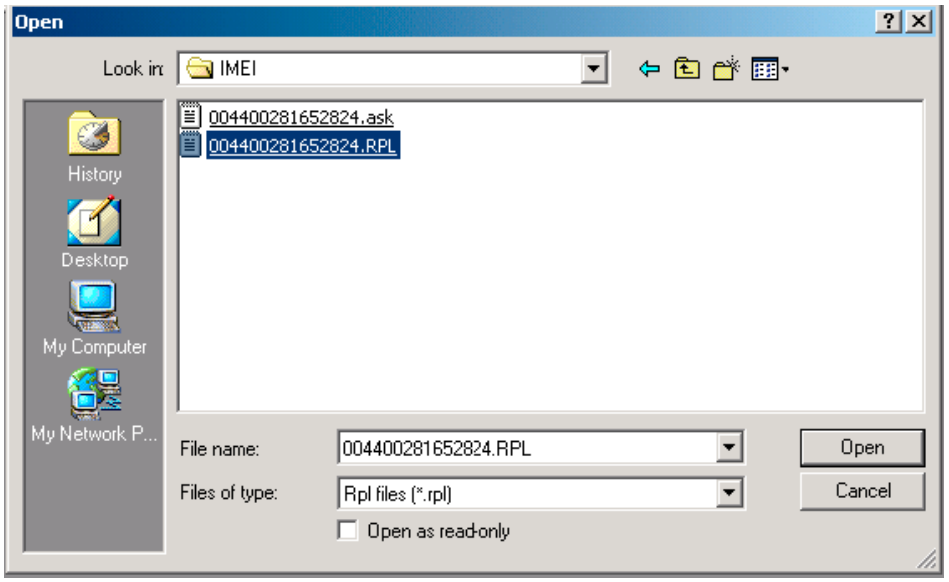
iii Choose *File* → *Scan Product* .

iv From the Tools menu, choose Certificate Restore and select Process a response file in the *Action* pane.



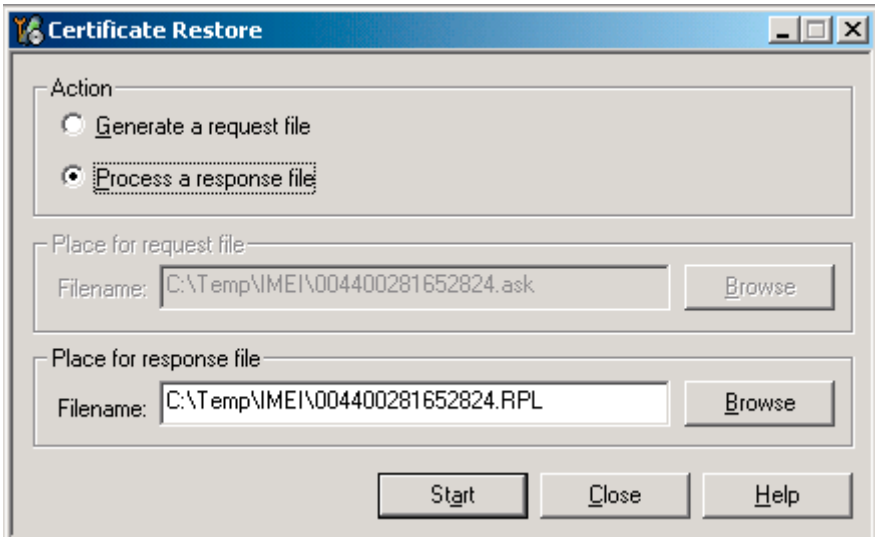
v To choose the location where response file is saved, click Browse.

vi Click Open.



The name of the file and the path where it is located are shown.

vii To write the file to phone, click Start.



Next action

After a successful rewrite, you must retune the phone completely by using Phoenix tuning functions.

Note: CARRY OUT ALL TUNINGS (BASEBAND, RF, UI)!

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

Display is in a normal mode when the phone is in active use.

Display is in a partial idle mode when the phone is in the screen saver mode.

The operating modes of the display can be controlled with the help of Phoenix.

Table 1 Display module troubleshooting cases

Display blank	There is no image on the display. Display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or part of the image can be missing. If part of image is missing change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.

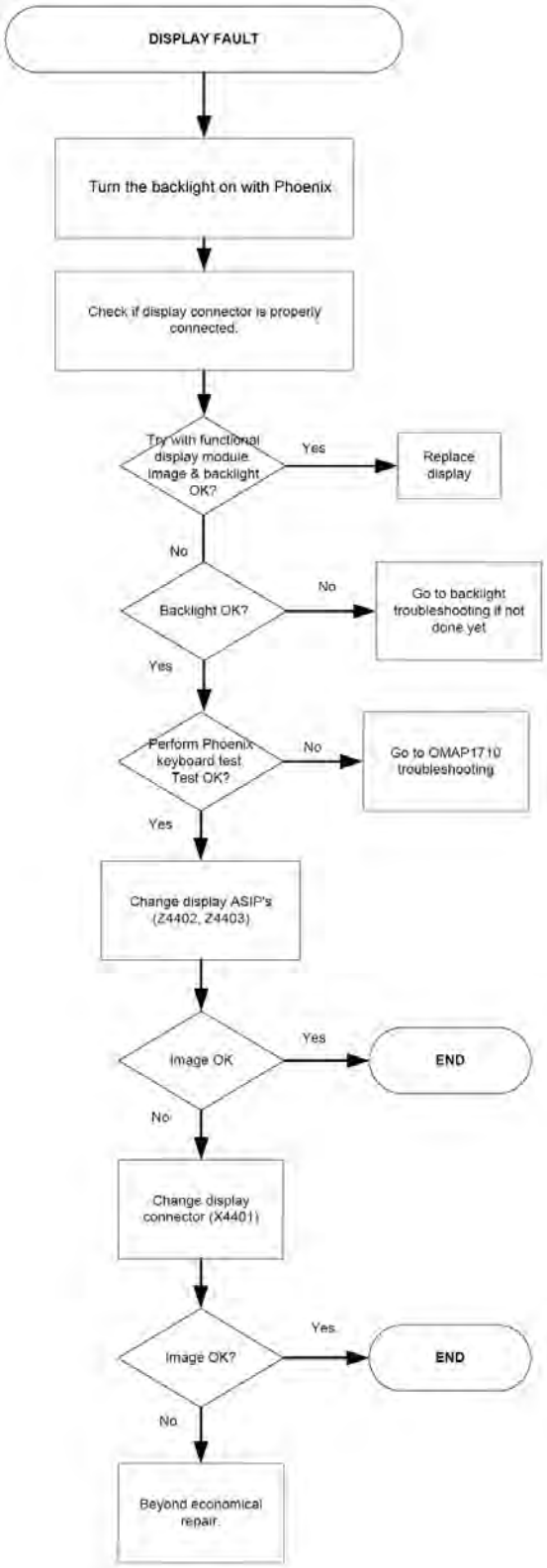
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. Backlight is also controlled automatically by the ambient light sensor. This means that in case the display is working (image OK) but the backlight is not, follow the Display and keyboard backlight troubleshooting (Page 1–38).
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the table below.

Table 2 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions.

Display fault troubleshooting



Display and keyboard backlight troubleshooting

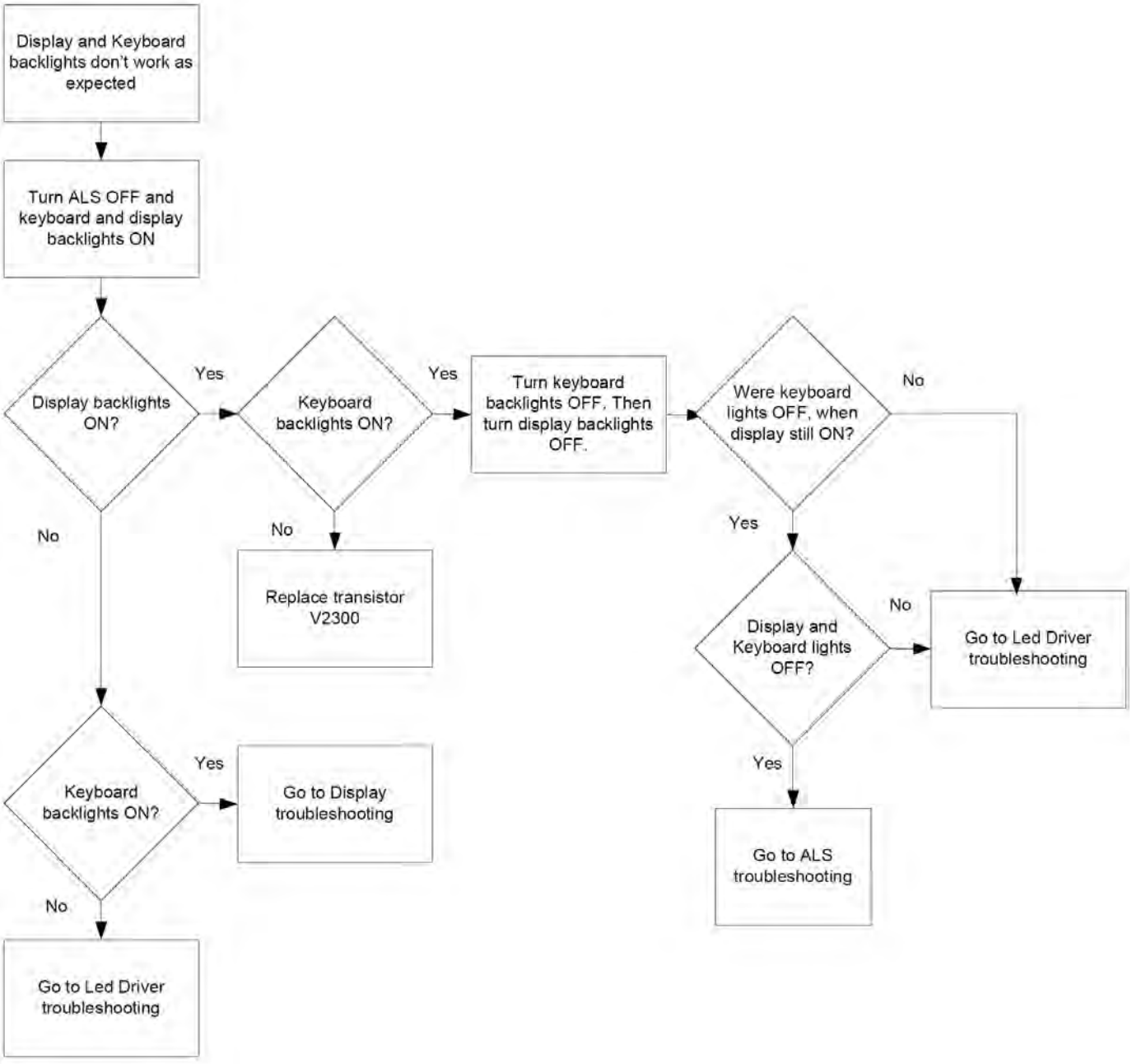
Context

The device has one LED driver that provides current for both display and keyboard backlights.

Keyboard backlights are turned ON only in dark conditions. This is controlled by the Ambient Light Sensor (ALS). Also the brightness of the display is adjusted by the ambient light sensor.

You can enable/disable ALS with the help of Phoenix service software.

Display brightness can be adjusted manually, if ALS is disabled. If the ambient light sensor is enabled, it adjusts the display brightness automatically.



ALS troubleshooting

Context

- If a phototransistor is broken, replace it with a typical phototransistor.
- The phototransistor has to be also replaced, if calibration values are lost by some other reason (e.g. after replacing the NOR memory chip D3000).
- If the phototransistor is changed, the calibration value in the phone memory has to be changed to the default value '1'.
- Make sure that you have completed Display and keypad backlight troubleshooting (Page 1–38) first before starting ALS troubleshooting.

Here are some hints for ALS troubleshooting; the following troubleshooting diagram refers to these:

- Phoenix LED control tool also shows you luminance. The correct luminance in darkness is <20lx, and in office environment 100-2000lx. The luminance value depends strongly on the light source and the angle of the phone, so these values are only a rough guideline.
- LED driver control voltage measurement points can be found from LED driver troubleshooting (Page 1–41) section. When backlight brightness is set to 100%, both GENOUT-signals are low, and enable PWM is 100%.
- *Phoenix* has an ambient light sensor calibration tool for changing calibration values. The pull-up resistor calibration is done first:
  a Cover the light guide (upper part of the A Cover).
  b Click *Start Write* .
  c Manually change the ambient light sensor value to the default value. There is no special tool for this, but you have to perform calibration normally and then set the Co-efficient result to *1* before writing it to the phone memory.

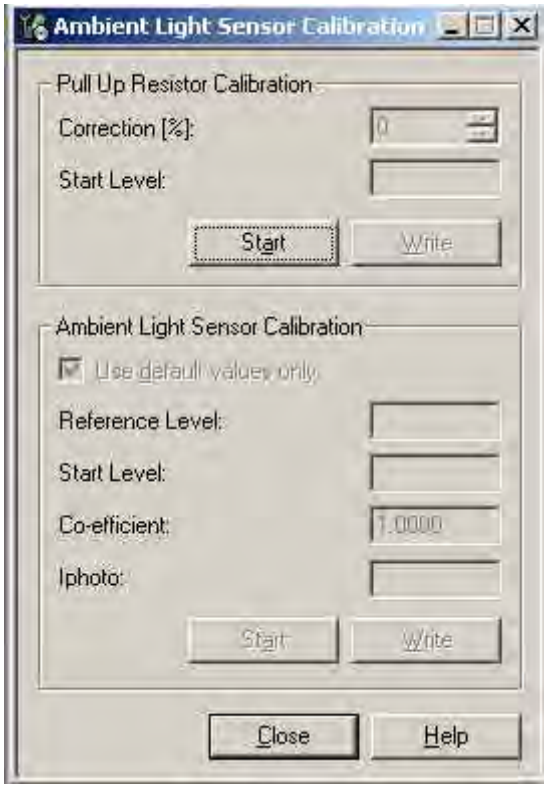
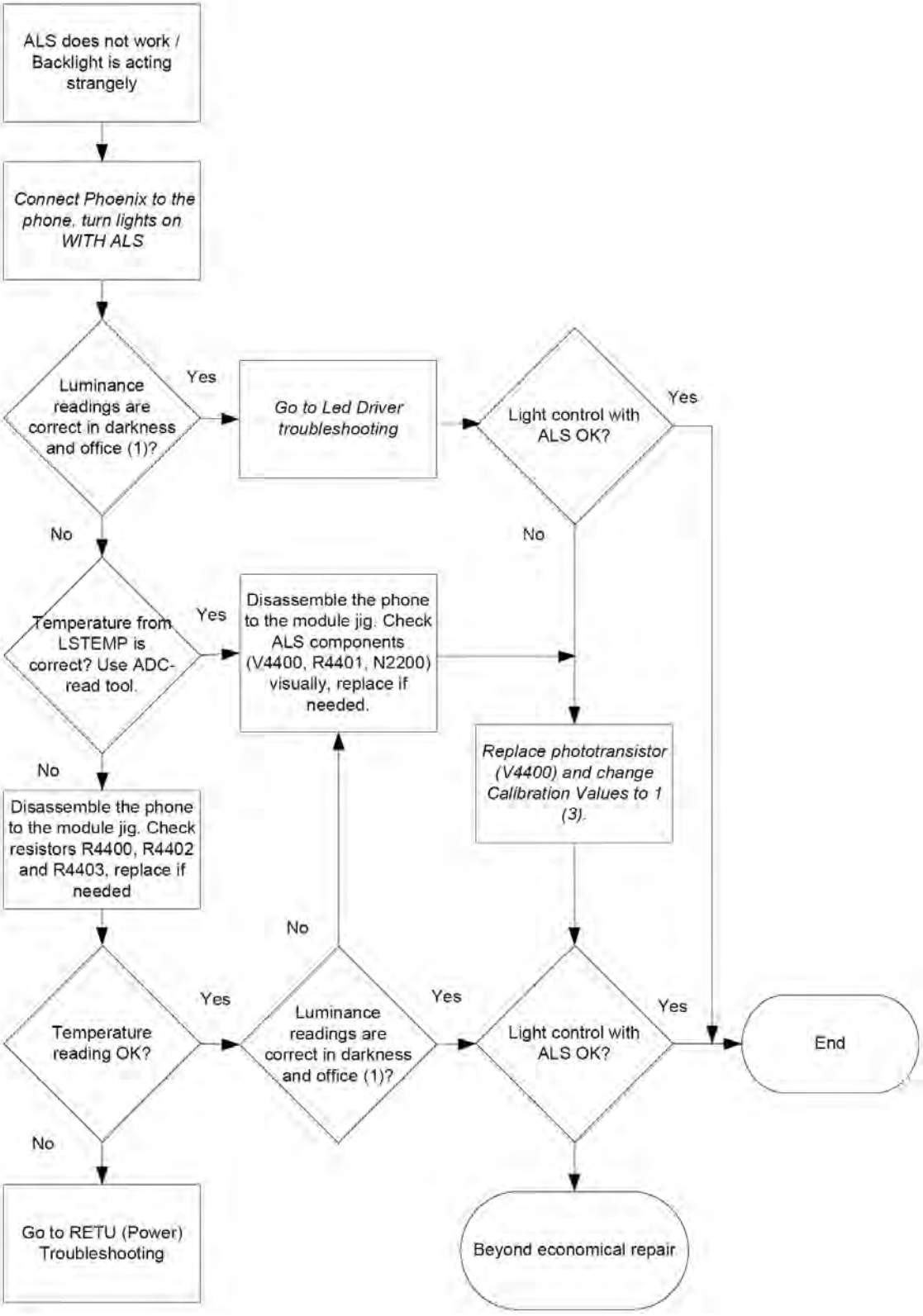
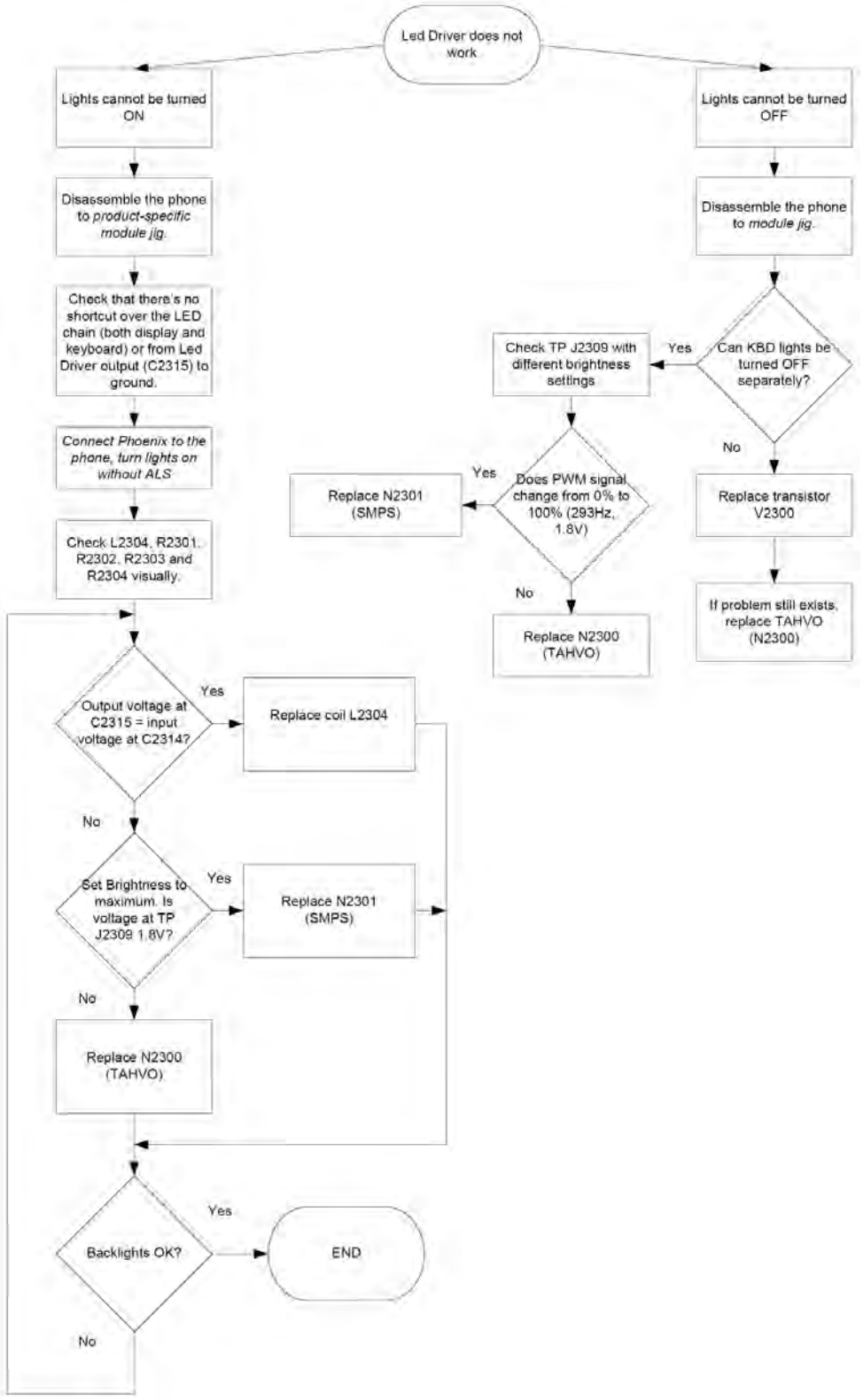


Figure 16 *Ambient Light Sensor Calibration* window



LED driver troubleshooting



Bluetooth troubleshooting

Introduction to Bluetooth troubleshooting

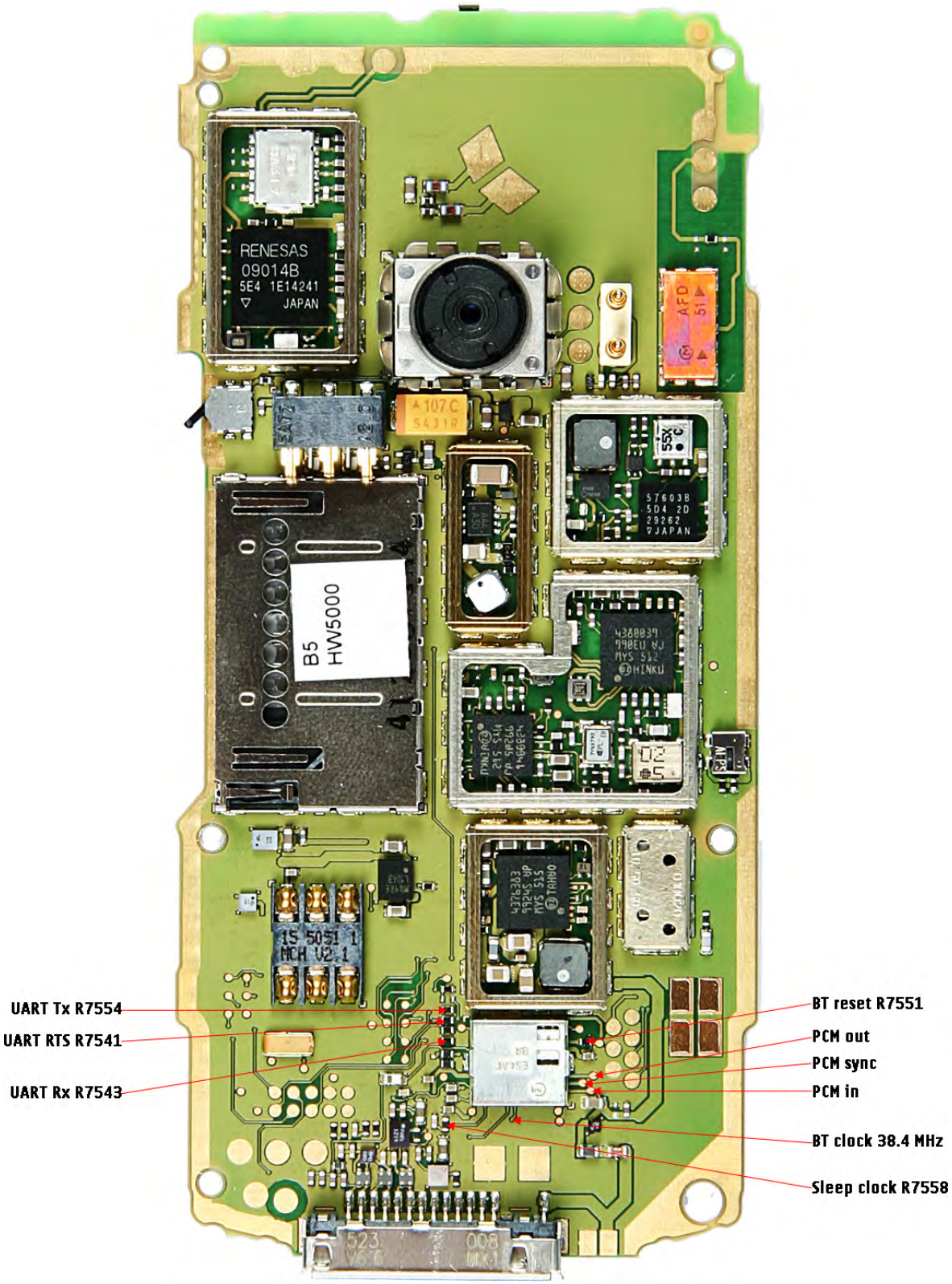
There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see the following section for details on BT antenna HW and mechanics)
Malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Location of the BT antenna

Bluetooth test points



Bluetooth settings for Phoenix

Steps

1. Start *Phoenix* service software.
2. From the File menu, choose Open Product, and then choose the correct type designator from the Product list.
3. Connect the phone to a docking station in the local mode.
4. Choose *Testing* → *Bluetooth LOCALS* .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the Counterpart BT Device Address line. This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click Run BER Test.

Results

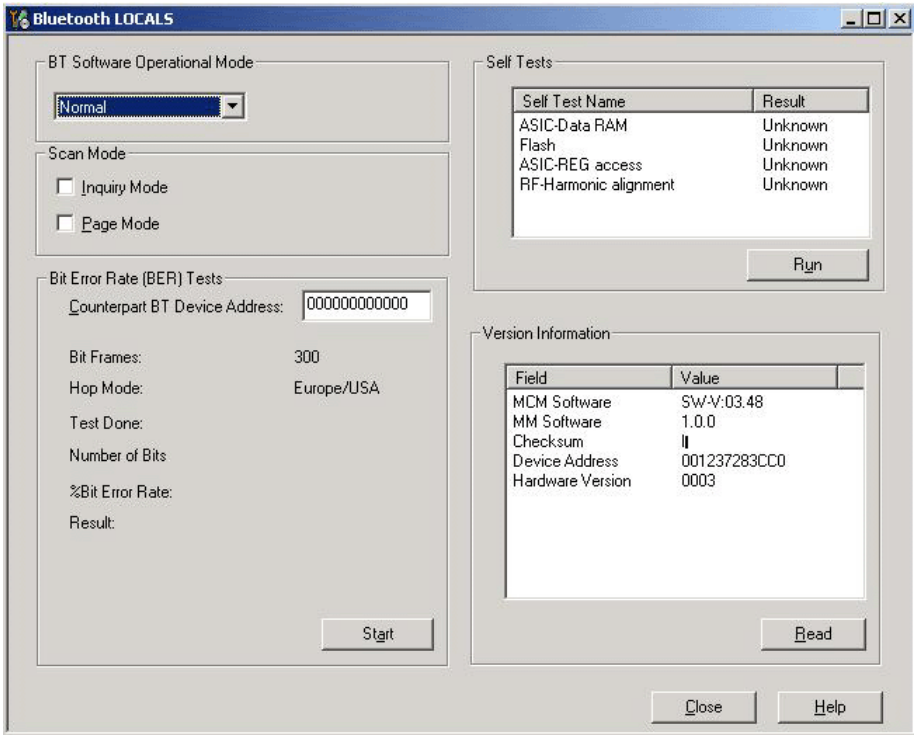


Figure 17 *Phoenix* settings for Bluetooth troubleshooting

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. From the File menu, choose Open Product, and then choose the correct type designator from the Product list.
3. Connect the phone to a docking station in the local mode.
4. Choose *Testing* → *Self Tests* .
5. In the *Self Tests* window check the bluetooth check box.

6. To run the tests, click Start.

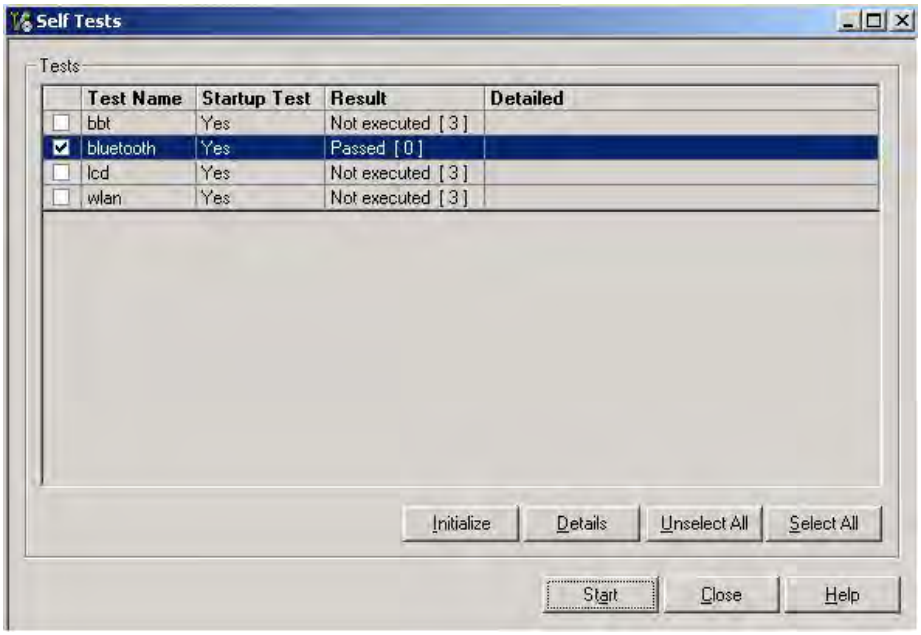
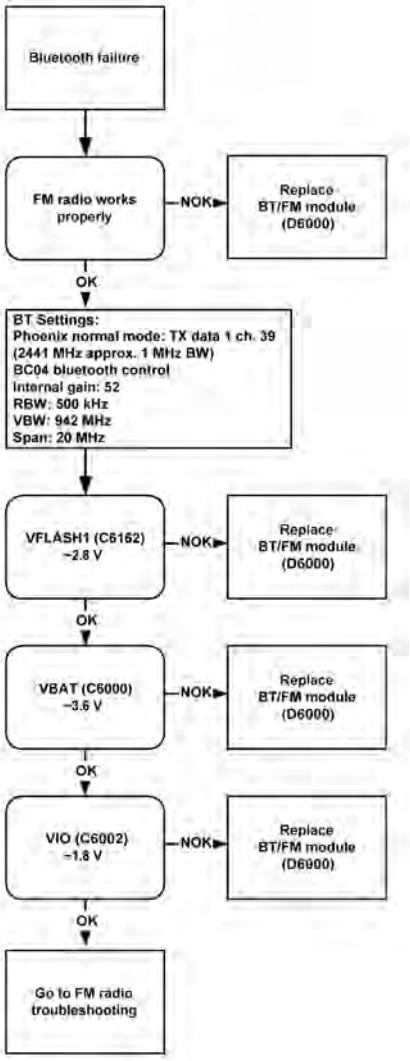
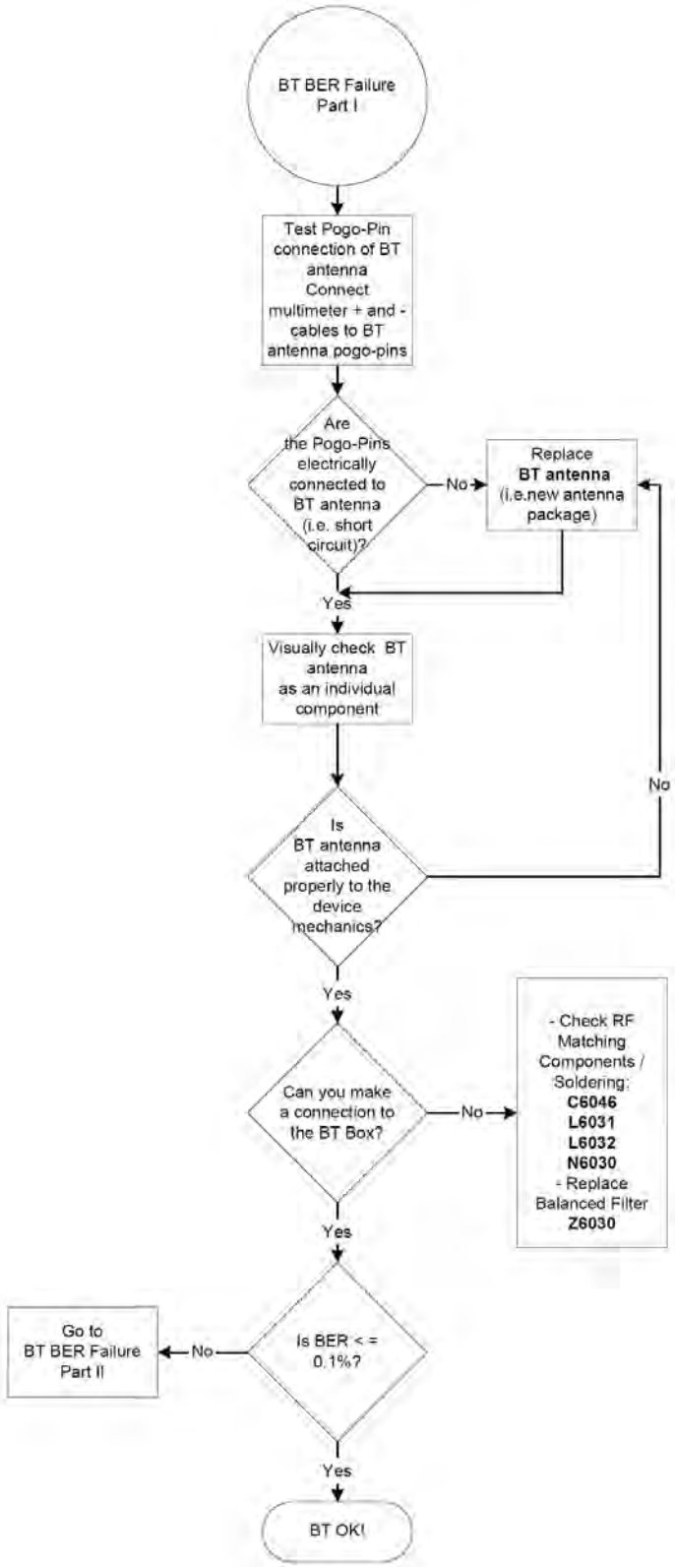


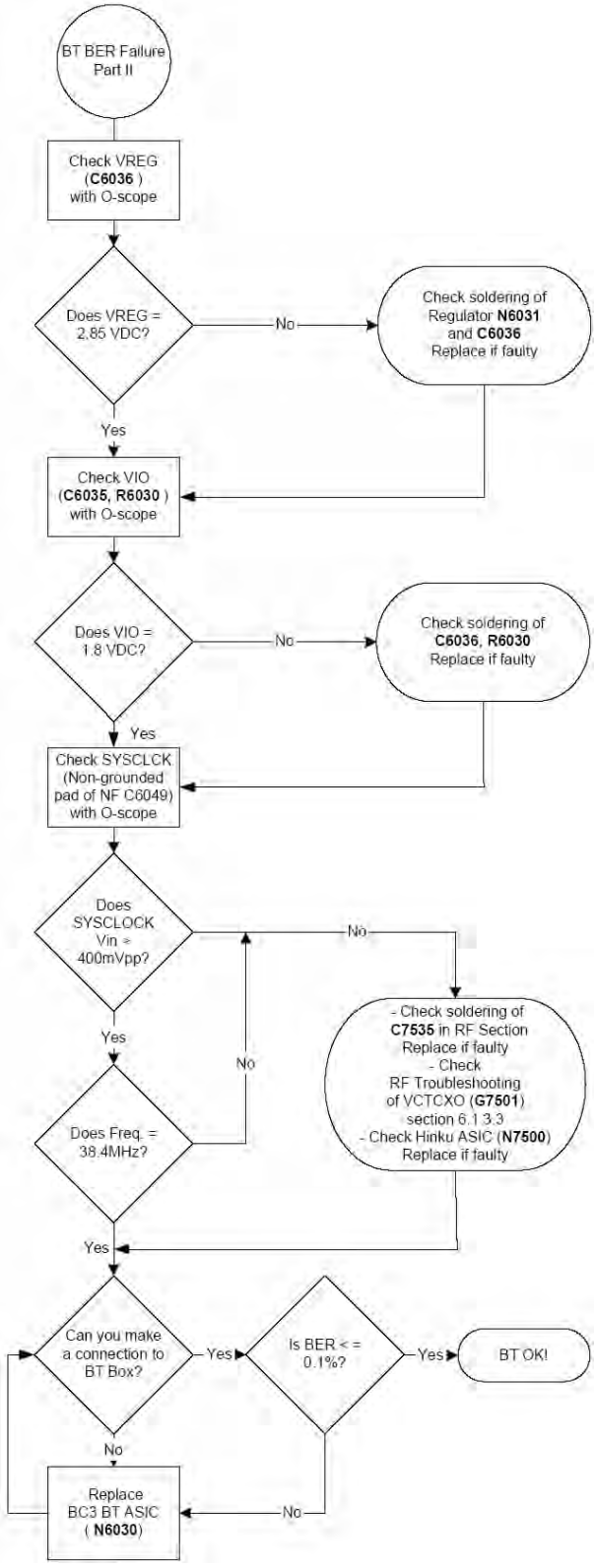
Figure 18 Bluetooth self tests in *Phoenix*

Bluetooth troubleshooting

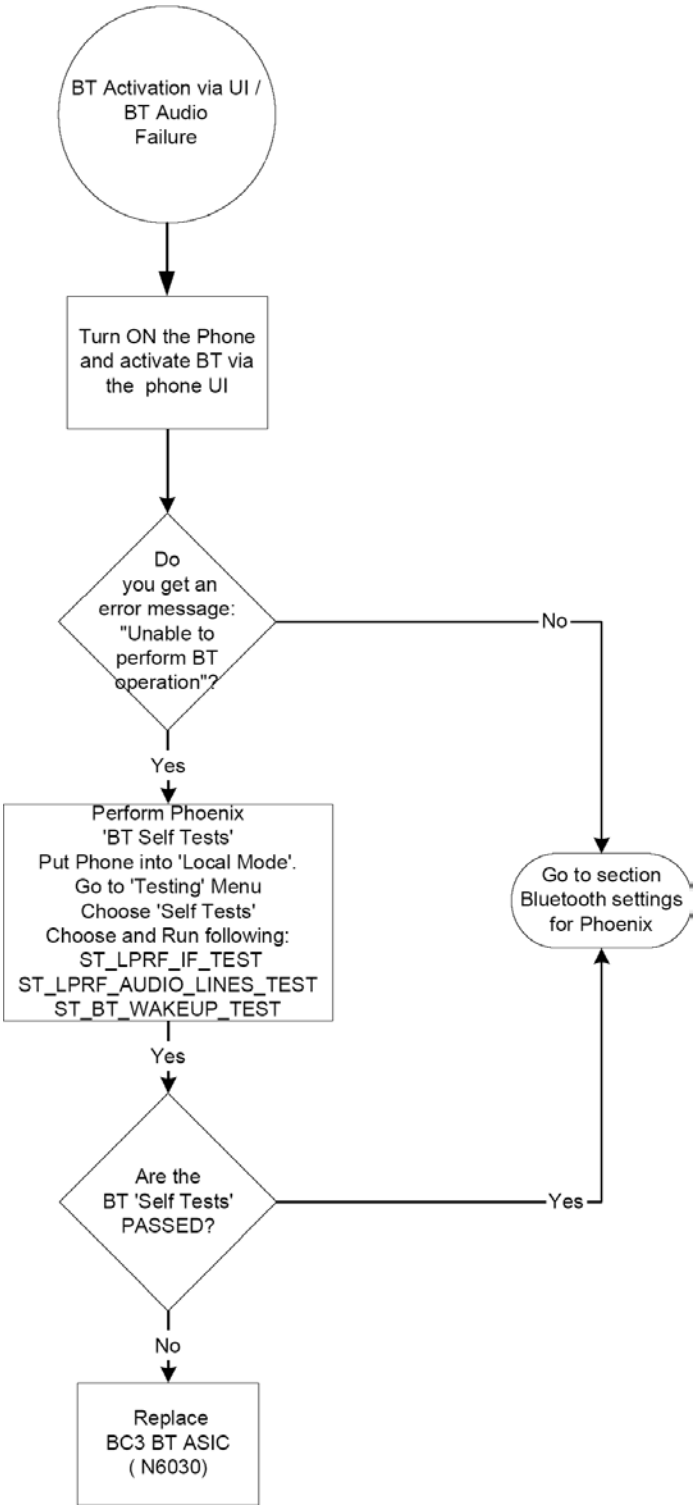


Bluetooth BER failure troubleshooting





BT audio failure troubleshooting



Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	B2100 (OUT/ GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

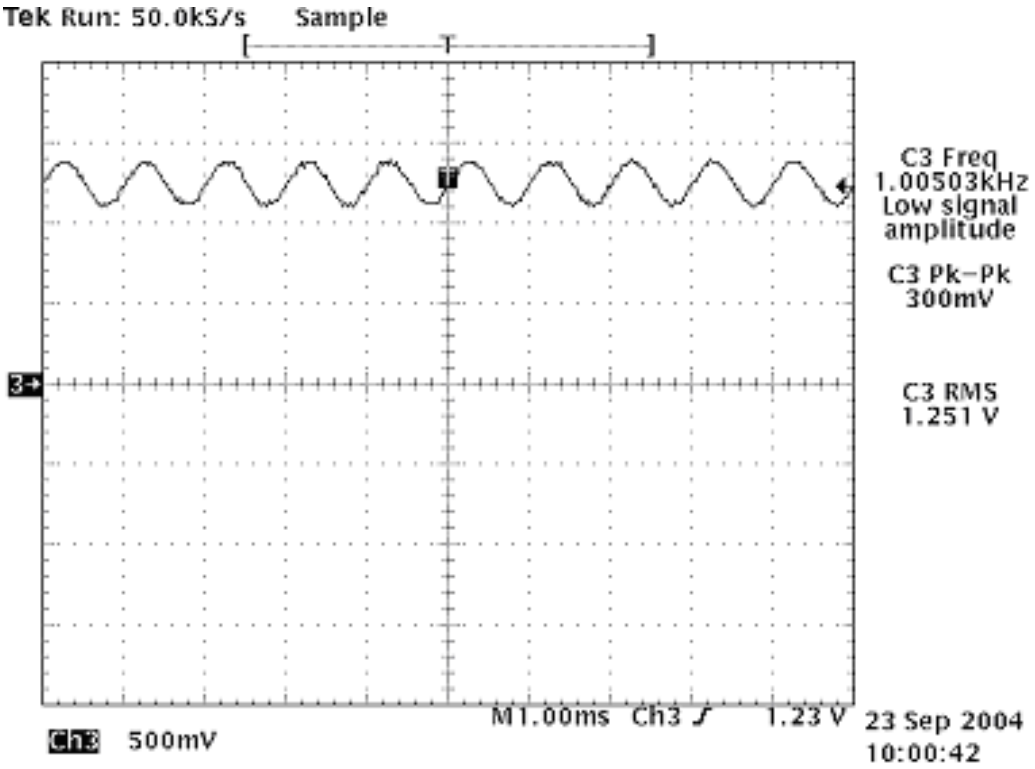
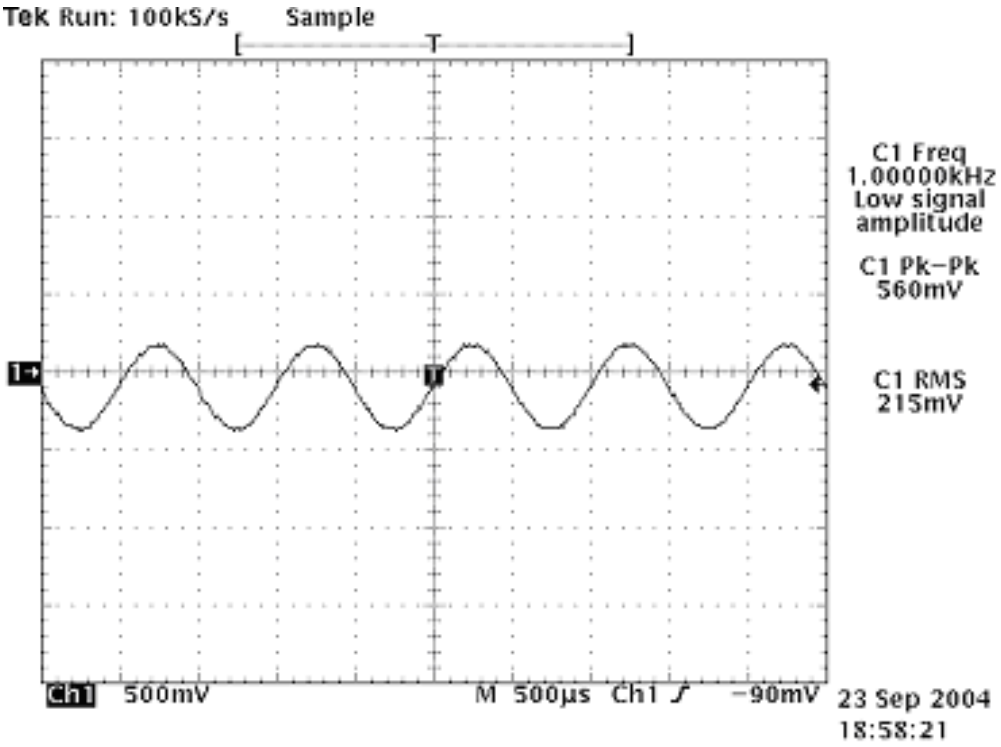


Figure 19 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



Legend

If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 20 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

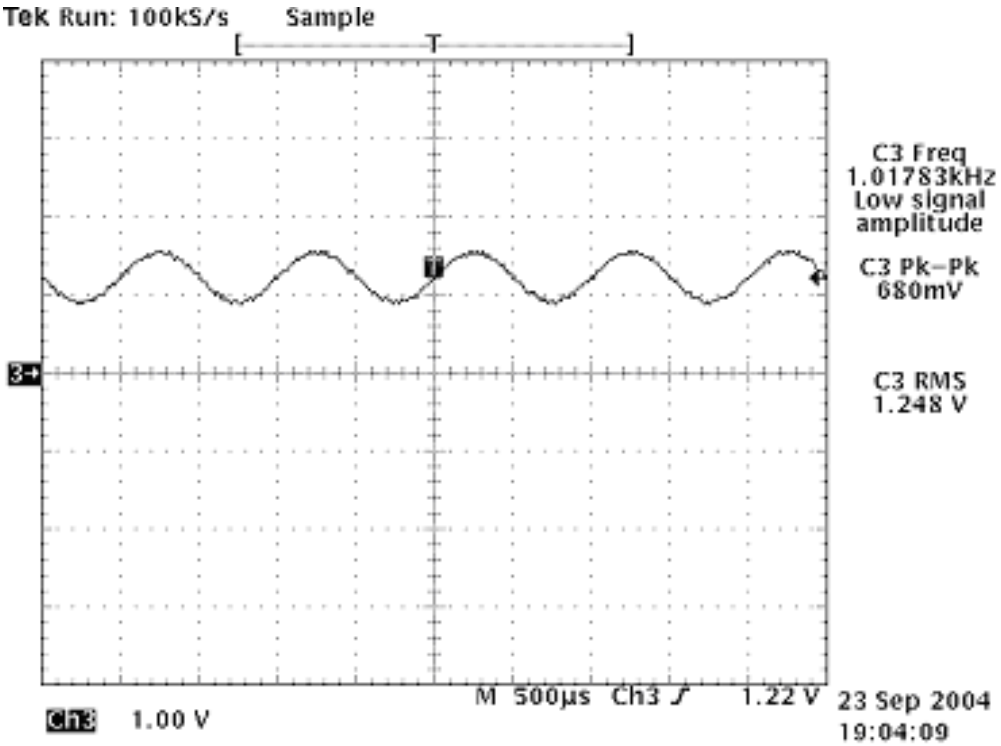
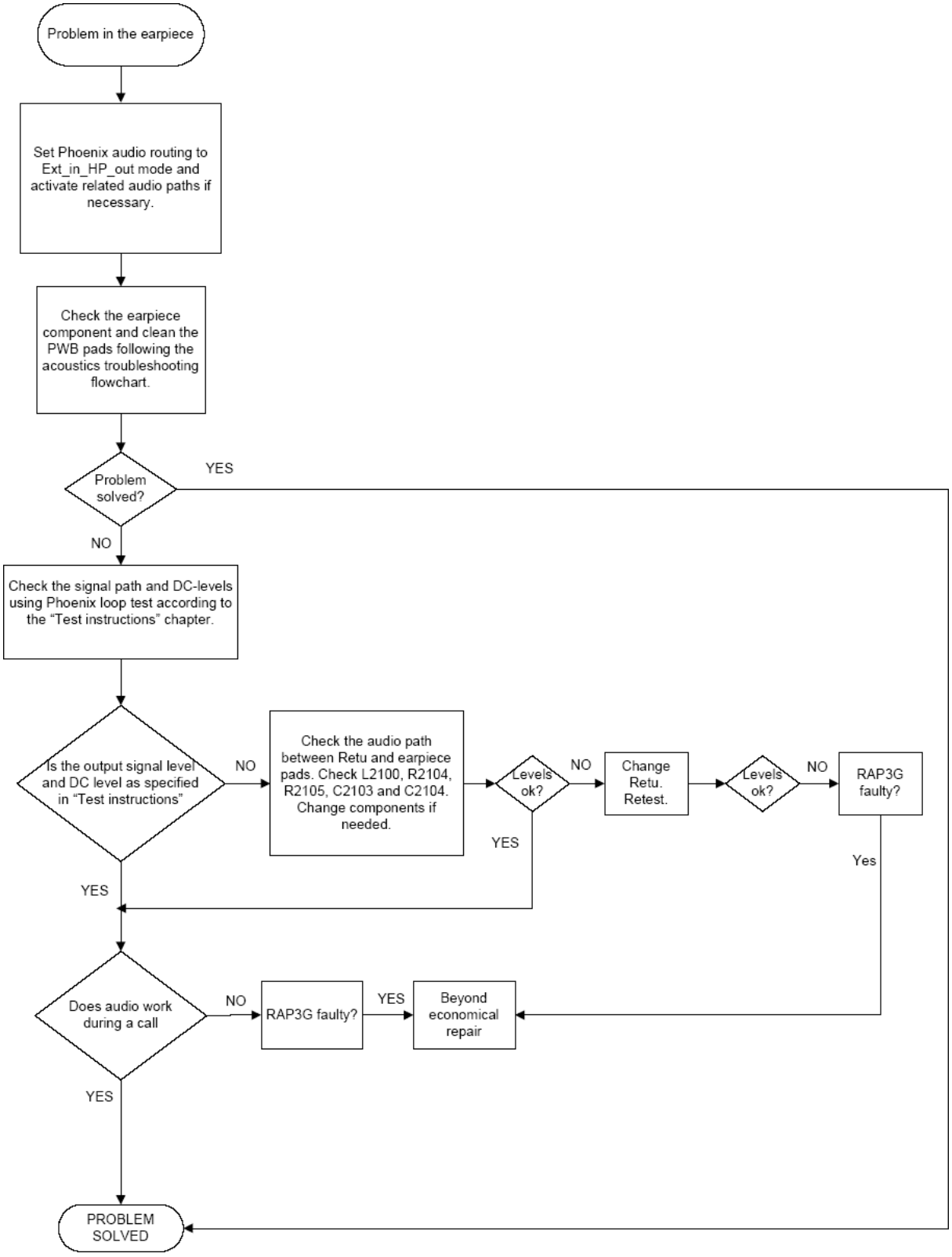


Figure 21 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

Internal earpiece troubleshooting

Before you begin

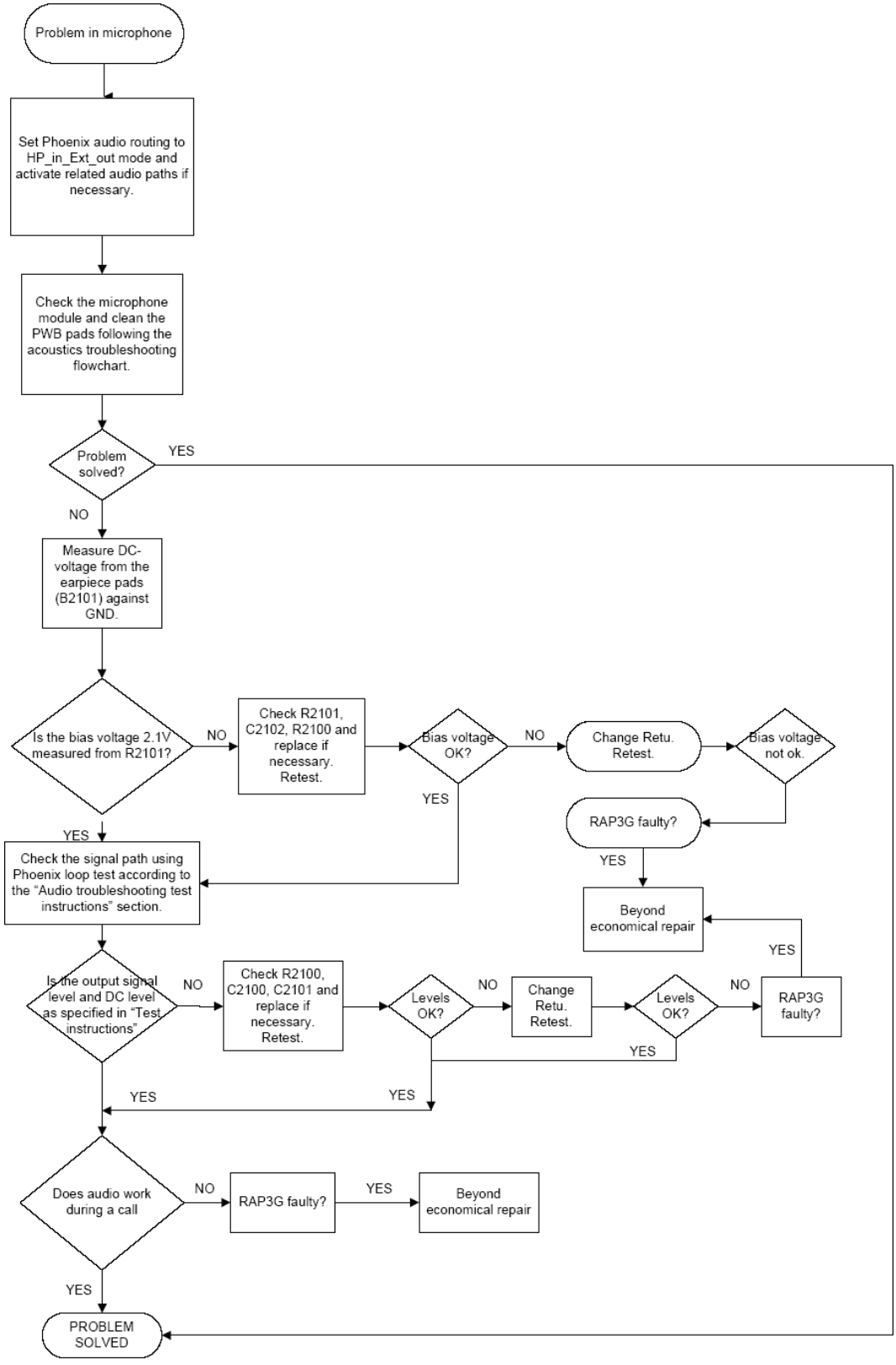
Familiarize yourself with the Audio troubleshooting test instructions (Page 1–49).



Internal microphone troubleshooting

Before you begin

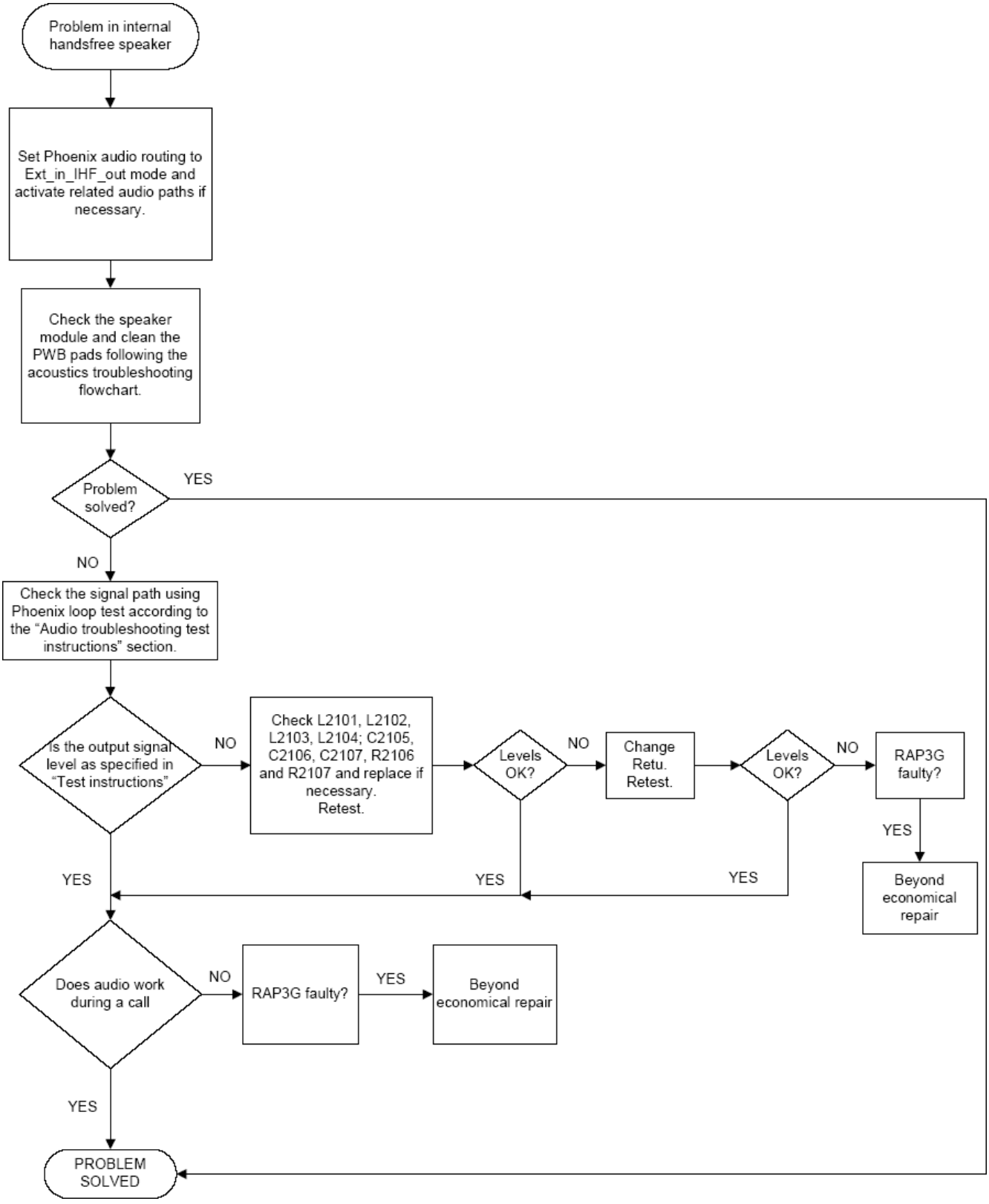
Familiarize yourself with the Audio troubleshooting test instructions (Page 1–49).



IHF troubleshooting

Before you begin

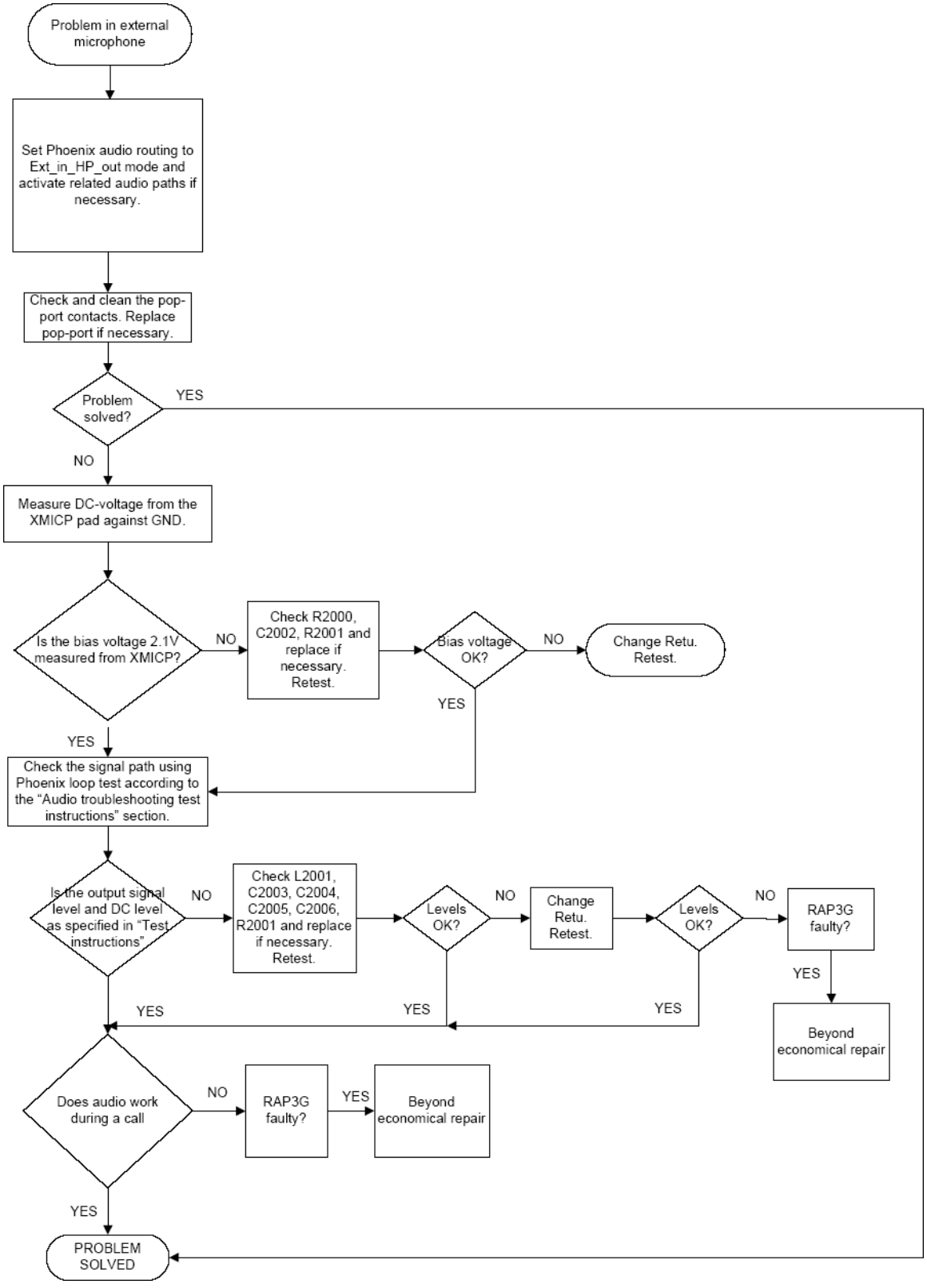
Familiarize yourself with the Audio troubleshooting test instructions (Page 1–49).



External microphone troubleshooting

Before you begin

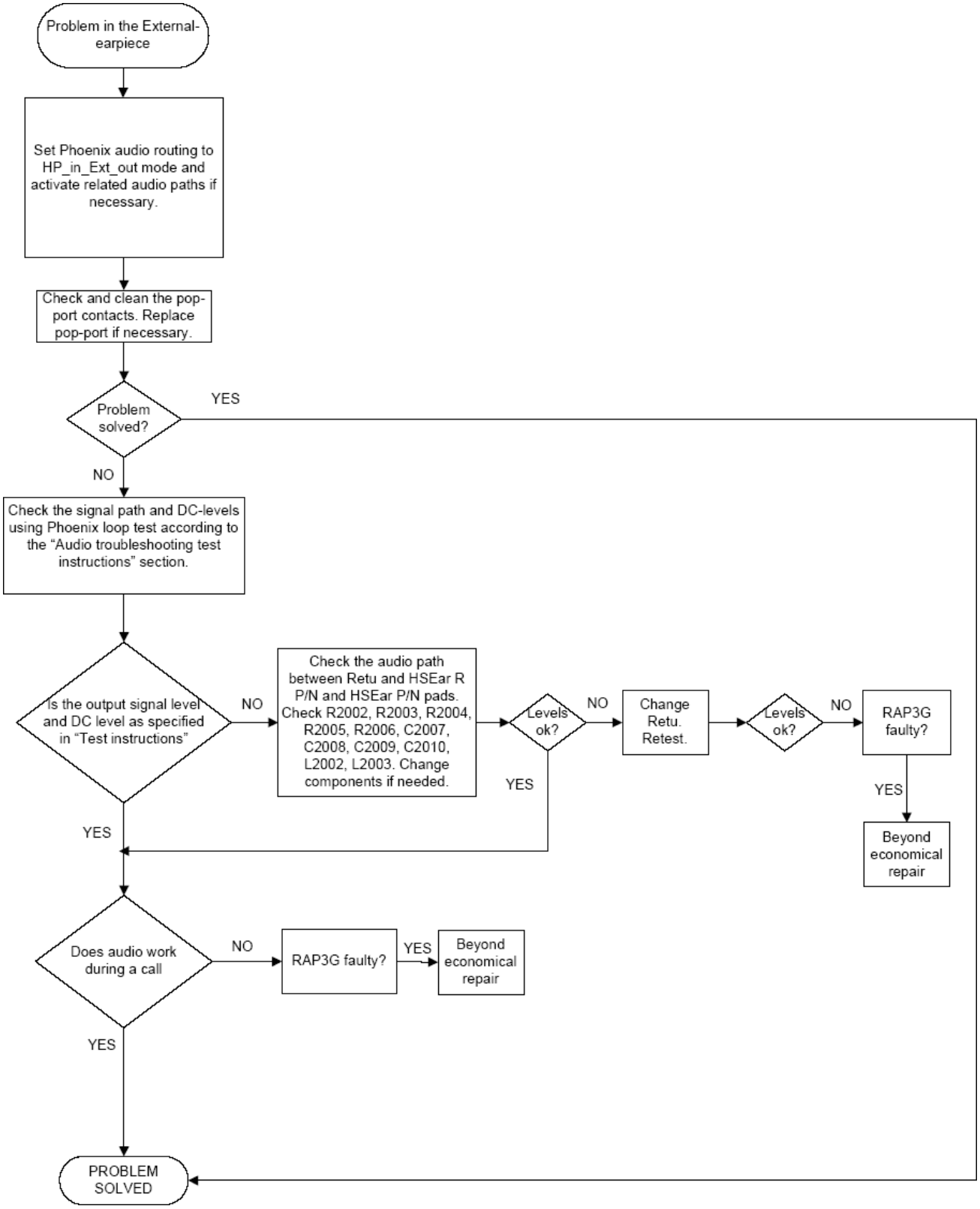
Familiarize yourself with the Audio troubleshooting test instructions (Page 1–49).



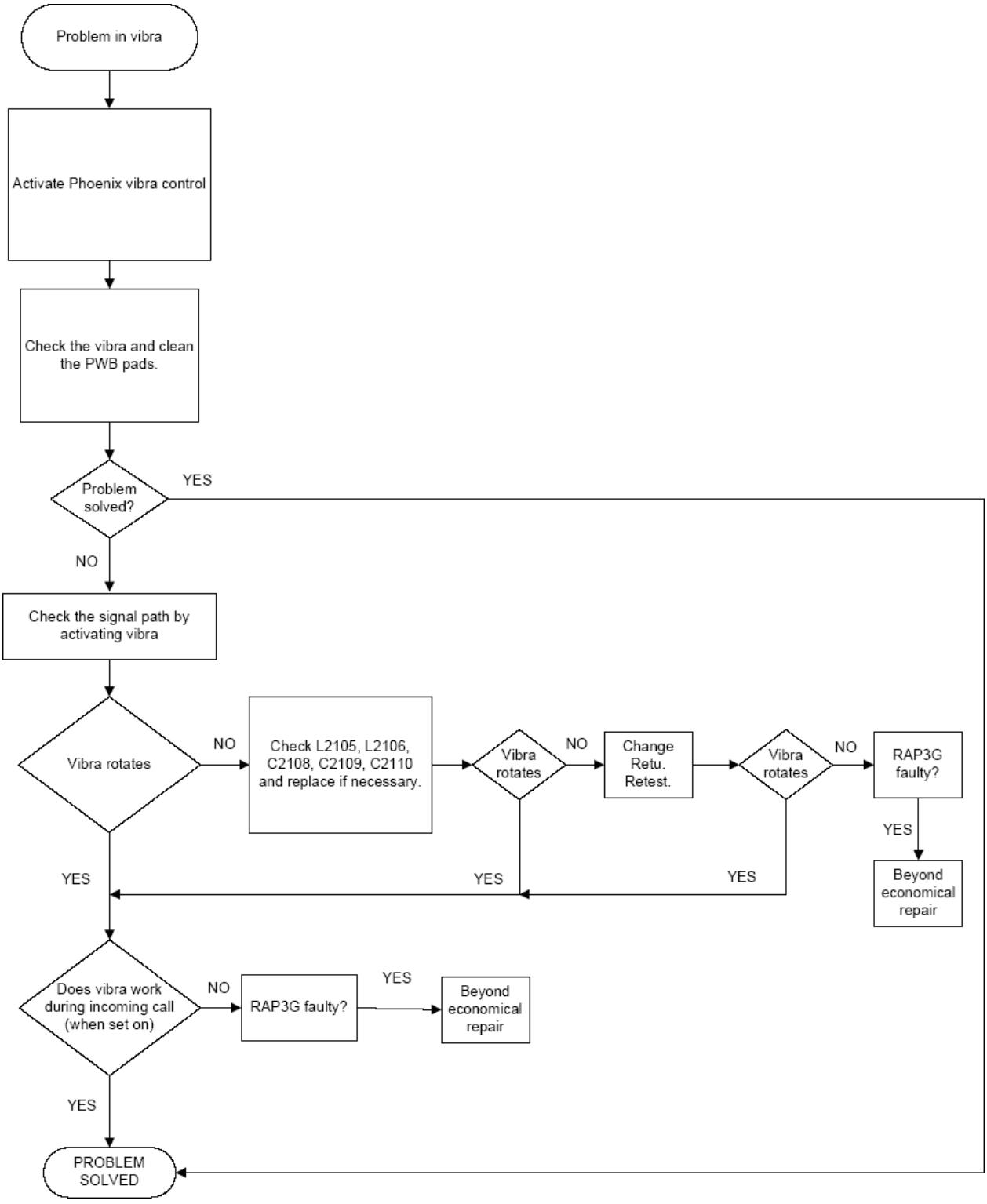
External earpiece troubleshooting

Before you begin

Familiarize yourself with the Audio troubleshooting test instructions (Page 1–49).



Vibra troubleshooting



Baseband manual tuning guide

Energy management calibration

Before you begin

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose *File* → *Scan Product* .
4. Choose *Tuning* → *Energy Management Calibration* .
5. To show the current values in the phone memory, click Read, and check that communication between the phone and CU-4 works.
6. Check that the CU-4 used check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click Calibrate.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click Write to store the new calibration values to the phone permanent memory.

Table 3 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	30
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
IBAT (ICal) Gain	7750	12250

9. Click Read and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click Write and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.