Programme's After Market Services
NME–3 Series Transceivers

Troubleshooting

Issue 1 10/99

CONTENTS

Introduction

This document gives a comprehensive guide to NME–3 faultfinding.

NOTE: The first thing to do is carry out a through visual check of the modules and ensure that:

a) There is no mechanical damages at the units

b) Soldered joints are o.k.

c) check which unit is broken HS or Radiounit

NOTE: Make sure that the system is installed as specifided in the AS documentations. (Power supply connected to the unit, IGNS high, Handset conneced,...)

The following hints should make it easier to find the cause of the problem when the product seems to be faulty. This trouble shooting instruction is divided into the following sections:

1. Which Unit is broken
2. RU failures
3. HS failures

Which Unit is broken

To check which unit is broken, the following steps should be performed:

Have a look at the failure describtion, if it doesn't already indicate which unit is broken, follow the procedure descibed below:

if there is a handset audio problem, connect the HS to a reference Radiounit and check if the problem is still there.

if the the system is not working at all then follow the steps described below:

– Connect the HS to 8V
– check if the current consumption is O.K.
– check if the Nokia Hands are shown
– If both things are O.K. connect the HS to a reference Radiounit and check if it works without problems
– In this case it is most likely a Radiounit problem, in all other cases it is most likely a Handset problem
– **Important NOTE:** After repair of one unit it allways have to be checked that the combination of both units is working !!!

Radiounit failures

This chapter describes how to find failures in the Radiounit:

Radiounit doesn’t Powerup

Connect the Radiounit to +12V while ignition sense is switched off and look to see if the Leds are turned ON for a short time

- If they don’t turn on at all,
  - check the current consumtion, if it is about 300– 400uA the wakeup logic should be checked, if it is much less or more there is a Problem in the powersupply
  - Check the status of all voltages
  - Check the status of the wakeup logic
- If the Leds stay on,
  - Check the digital part
  - Check powerdown logic
- If the LEDs go off as specifed and current is O.K.:
- Try to wakeup the radiounit by turning Ignition sense ON,
  - if the Leds stay on go to the next step
  - if they don’t stay on or don’t turn on at all check the Ignition circuit
- Try to wakeup the radiounit by pressing the powerbutton of the HS,
  - if the Leds stay on go on, try flashing the unit
  - if they don’t stay on or don’t turn on at all check the Powerbutton circuit

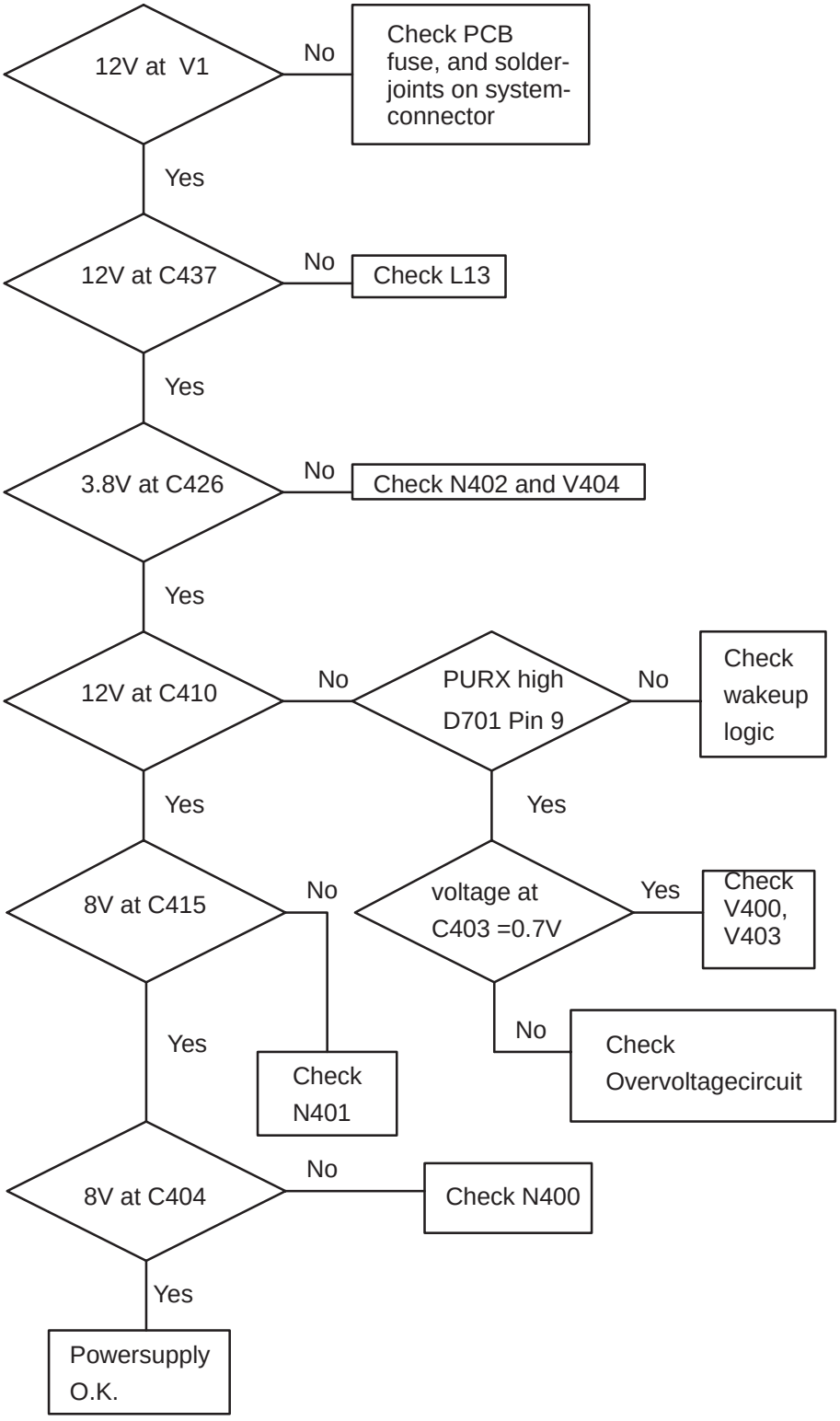


Figure 1. Check the voltages and powersupply

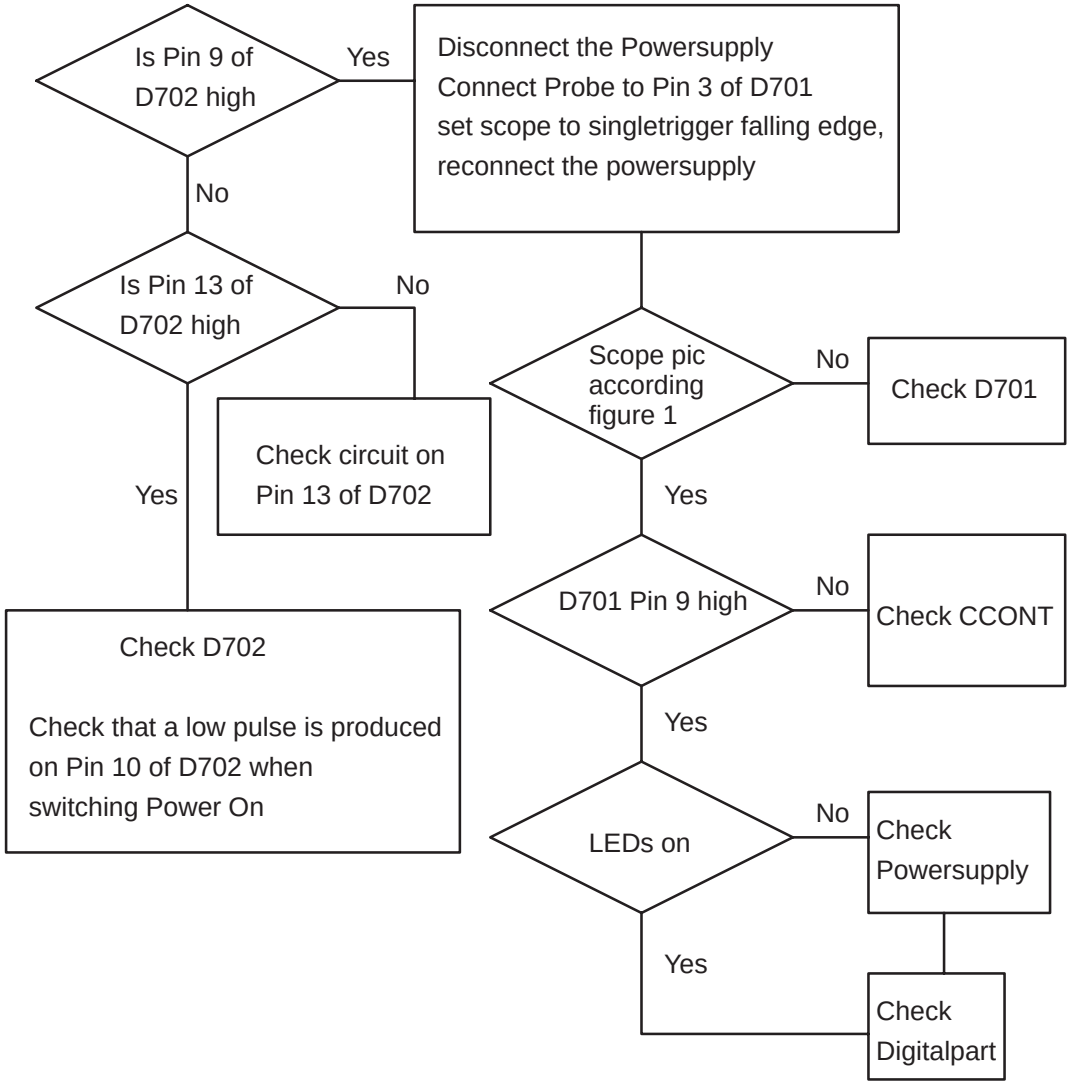


Figure 2. check wakeup circuit

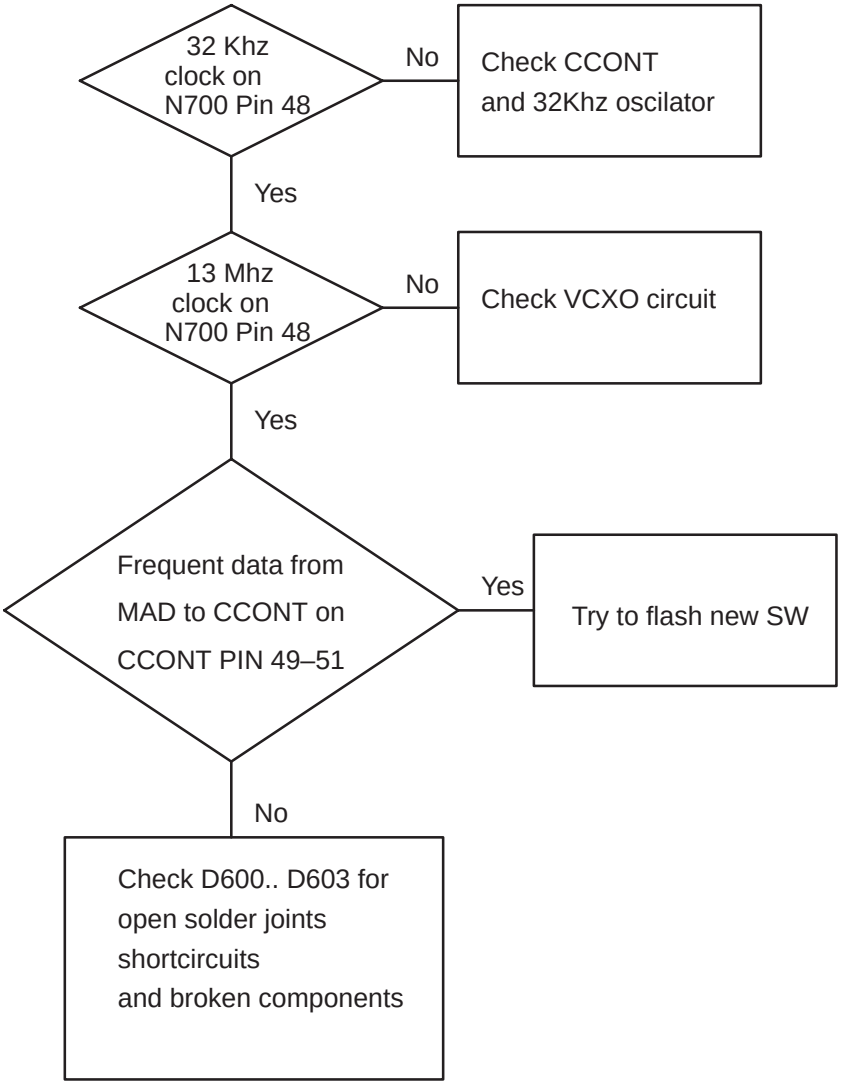


Figure 3. check digital part

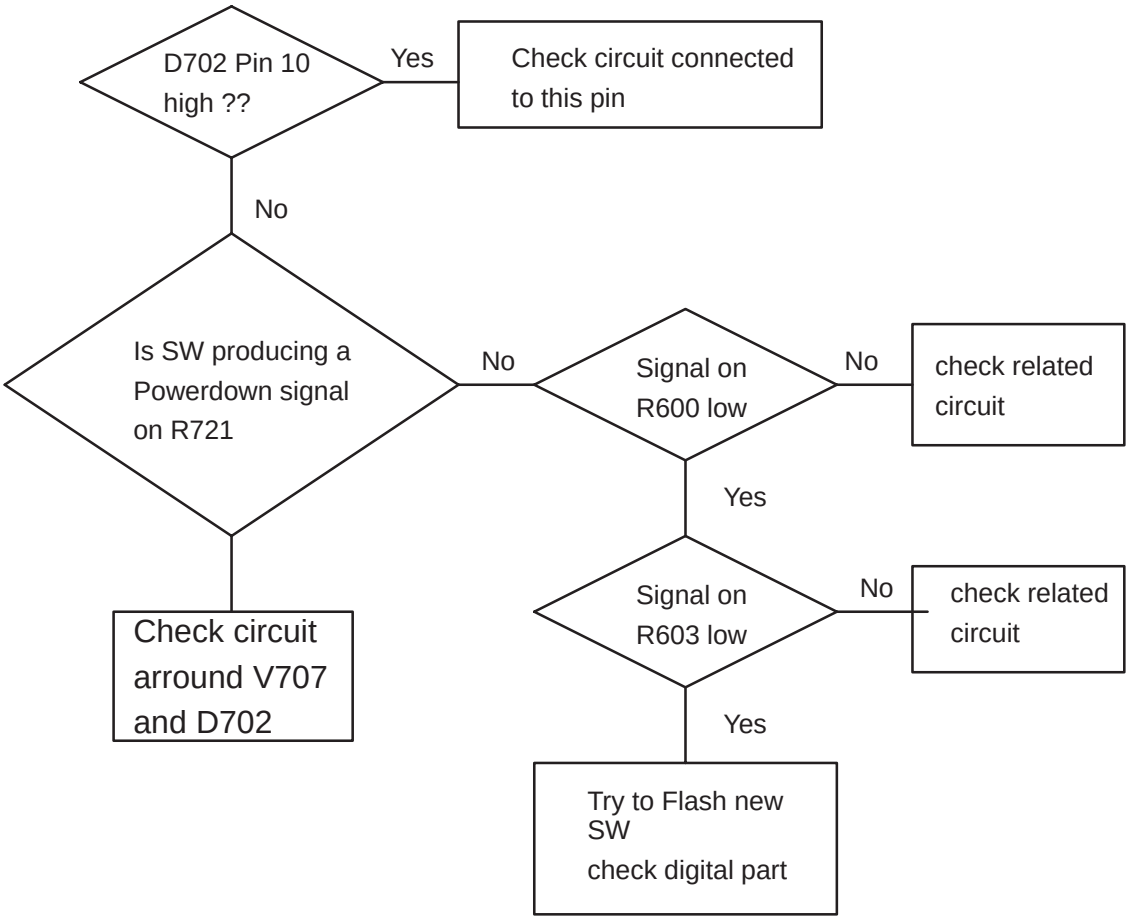


Figure 4. Check Powerdownlogic

Flashing not possible

The flash programming can be done via system connector X1.
In production, the first programming is done applying 12V flashvoltage to TP610. In aftersales the Flashvoltage is generated by an on board regulator.

The main differences between production flashing and aftersales flashing are :

a) FLASH programming voltage is produced in a different way.
b) Signal routings are different.

The fault finding diagrams for production flash programming are shown in figures 5 and 6.
The fault finding diagrams for aftersales flash programming are shown in figures 7 and 8.

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 don't find
– MCU flash Vpp error

In cases that the flash programming doesn't succeed there is a possibility to check short circuits between the memories and the MCU (MAD2).
This test is useful to do, when the fault information is: MCU doesn't boot, Serial clock line failure or Serial data line failure.

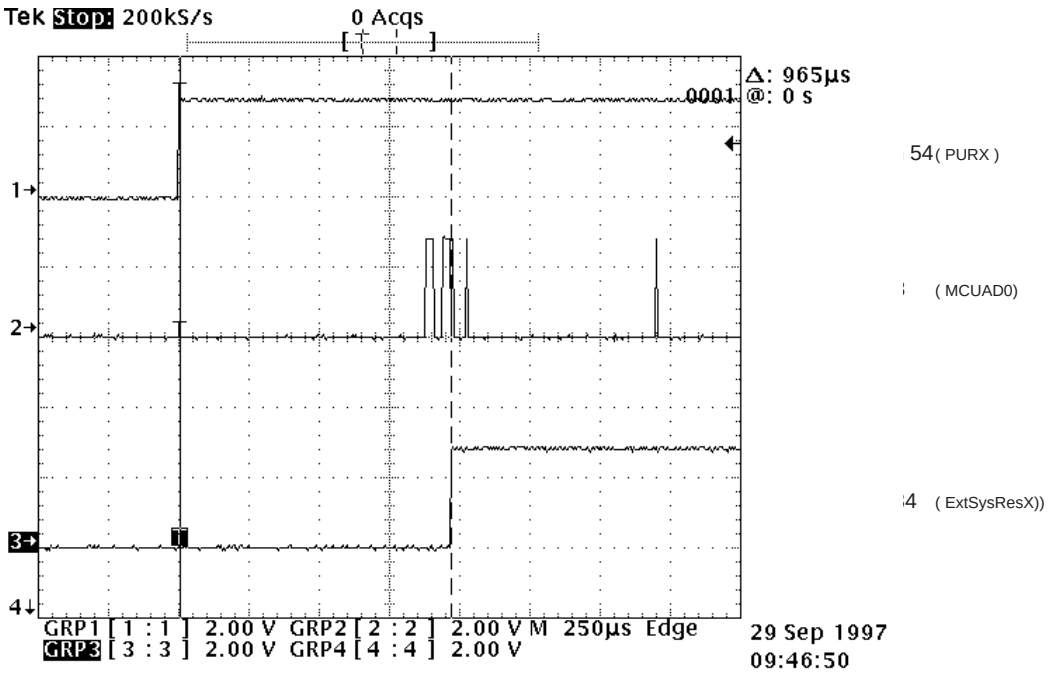
The test procedure is following:

1. Connect the short circuit wire between the test points J229 and J230.
2. Switch power on to start selftest
3. If the voltage level in D600 PIN 134 is 2.8 V (”1”), the interface is OK. If there is a short circuit, the voltage level in D600 PIN 134 stays low and 32kHz square wave signal can be seen in the lines which are already tested.

Selftest behaviour can be seen on the next page.

Note *this test can be found only short circuits, not open pins.*

Also upper data lines (15:8) of flash circuit D602 are not included to this test.


Tek Stop: 200kS/s
0 Acqs
Δ: 965µs
@: 0 s
0001
1→
2→
3→
4↓
GRP1 [1 : 1] 2.00 V GRP2 [2 : 2] 2.00 V M 250µs Edge
GRP3 [3 : 3] 2.00 V GRP4 [4 : 4] 2.00 V
29 Sep 1997
09:46:50
54(PURX)
(MCUAD0)
4 (ExtSysResX))

Production Flash Programming Failure (1)

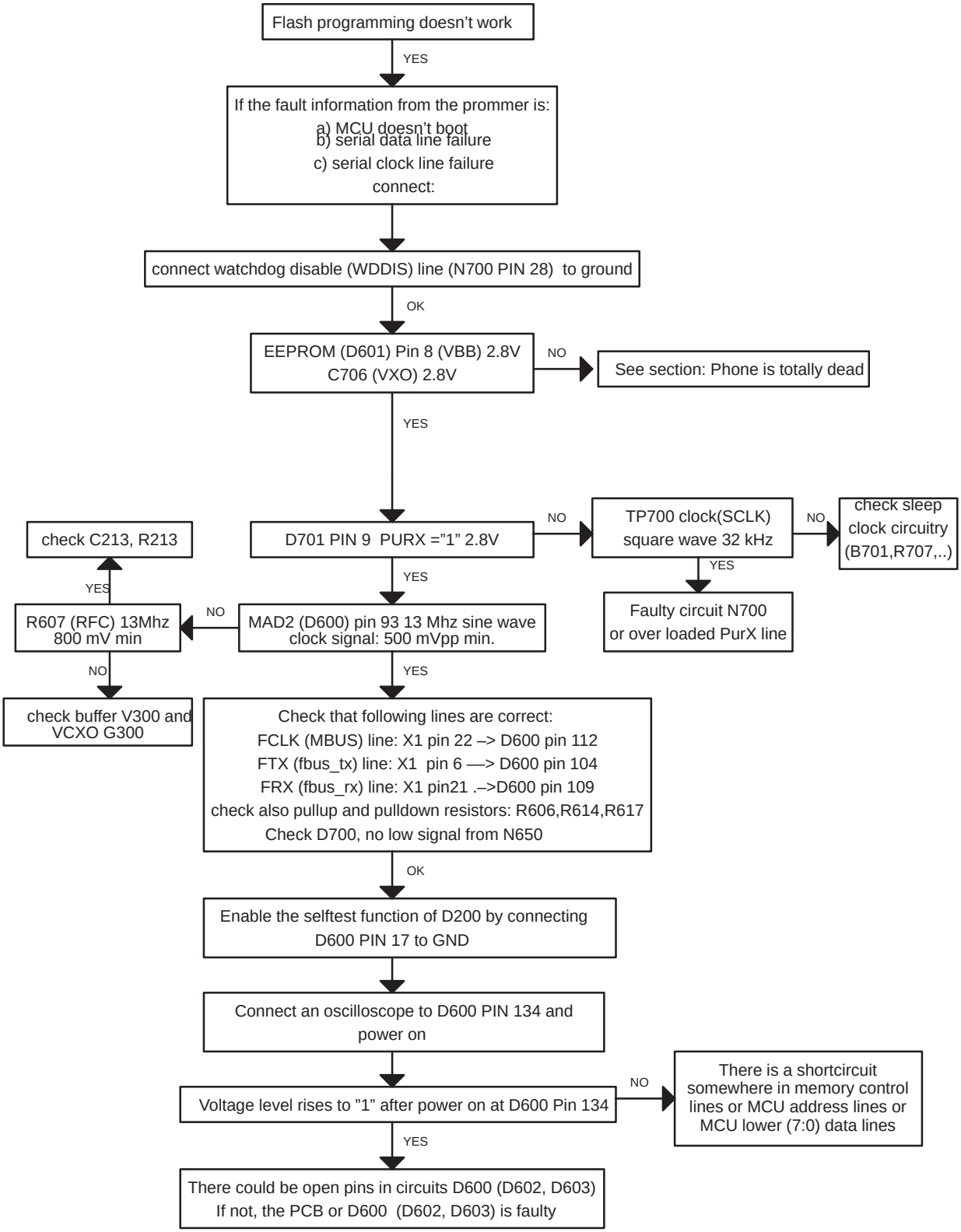


Figure 5.

Production Flash Programming failure (2)

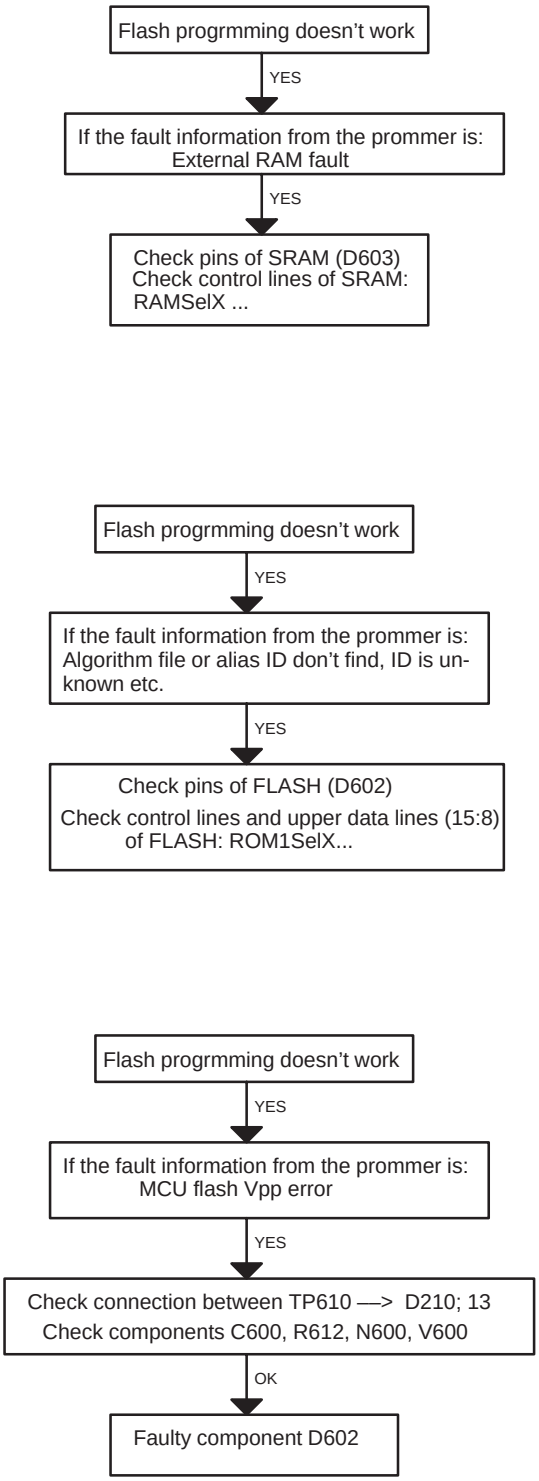


Figure 6.

Aftersales Flash Programming failure (3)

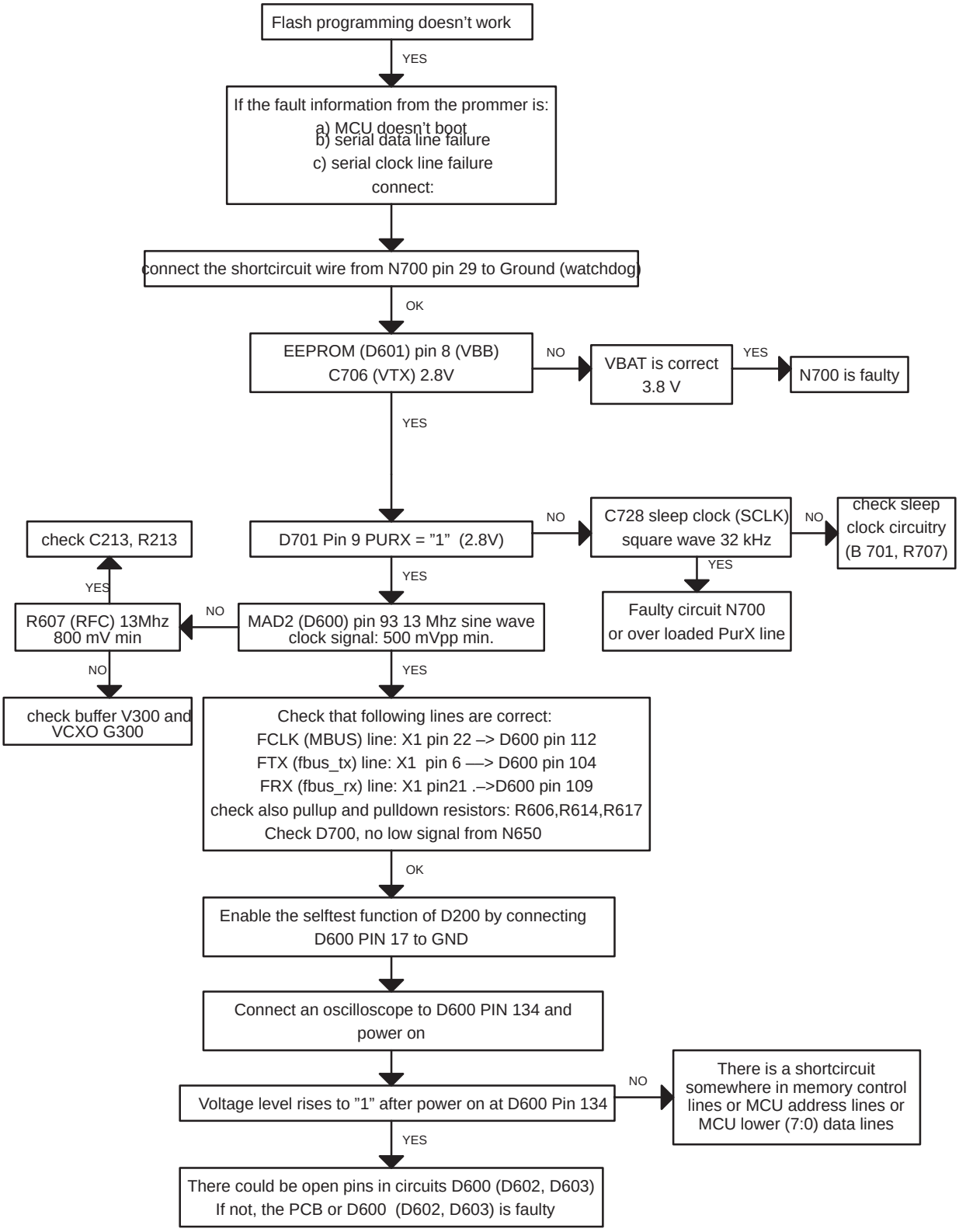


Figure 7.

Aftersales Flash Programming failure (4)

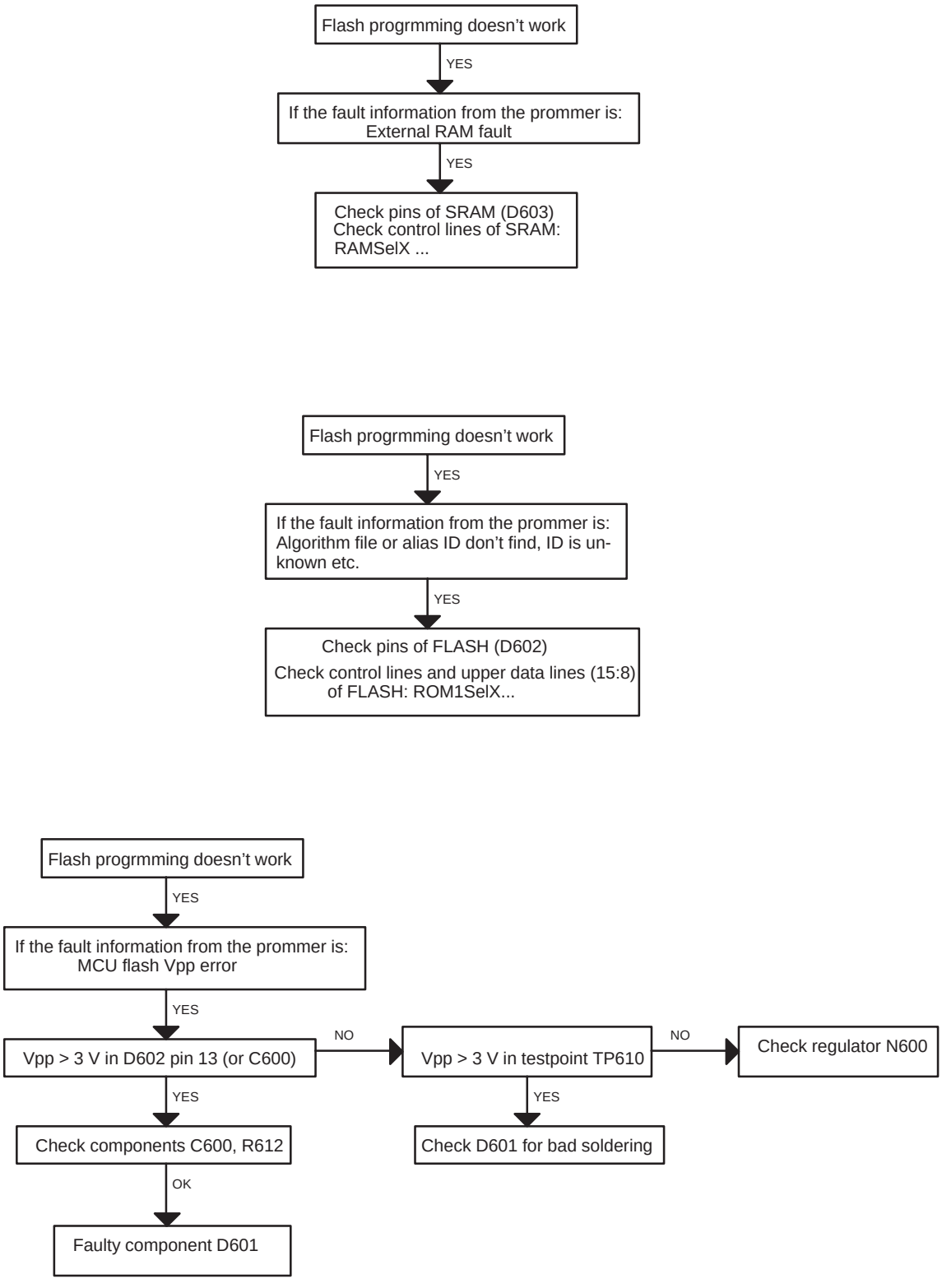


Figure 8.

Phone doesn’t Power On

This is described in section 2.2.1

Phone doesn’t Power Off

Press Powerbutton, and check if Powerdown pulse is produced on R 721,

if it isn’t check Powerbutton circuit, if it is produced check circuit around D702 according to Figure 5.

Set Auto power off to 45 seconds, switch Ignition Off, look if a message Power will switch of if not used comes up after some seconds. If not check Ignitionsensecircuit

If yes check if the powerdownpulse is produced on R721, if it is check circuit arround D702 according to figure 2.

If no pulse is produced check the connection from R721 to D600 !!

Handset not recognized

Connect a probe to R606, and check if the line is high and carrying HS signals, if it check the resistor and the MAD D600.

If yes follow the M–Bus signal to the connector.

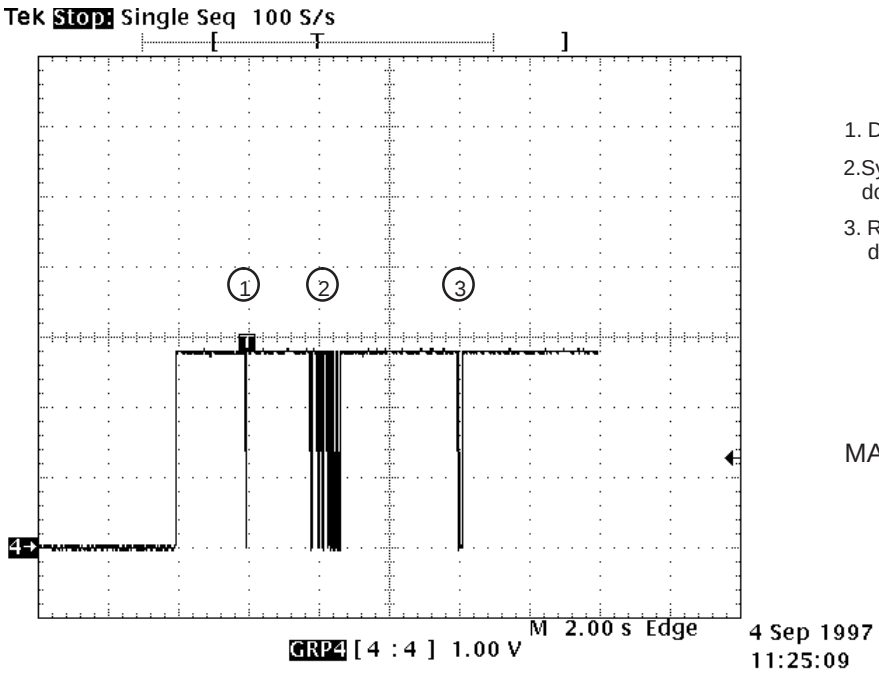
Phone doesn’t register to network or phone doesn’t make a call

If the phone doesn’t register to the network or the phone doesn’t make a call, the reason could be either the baseband or the RF part.
The phone can be set to wanted mode by WinTesla service software and determinate if the fault is in RF or in baseband part (RF interface measurements).

The control lines for RF part are supplied by both the System Asic (MAD2;D600) and the RFI (Cobba; N800). MAD2 handles digital control lines (like synthe, TxP etc.) and Cobba handles analog control lines (like AFC, TxC etc.).

The DSP software is constructed so that operation states of DSP (MAD2) can be seen in external flag (DSPXF) output pin (D600 pin 91).

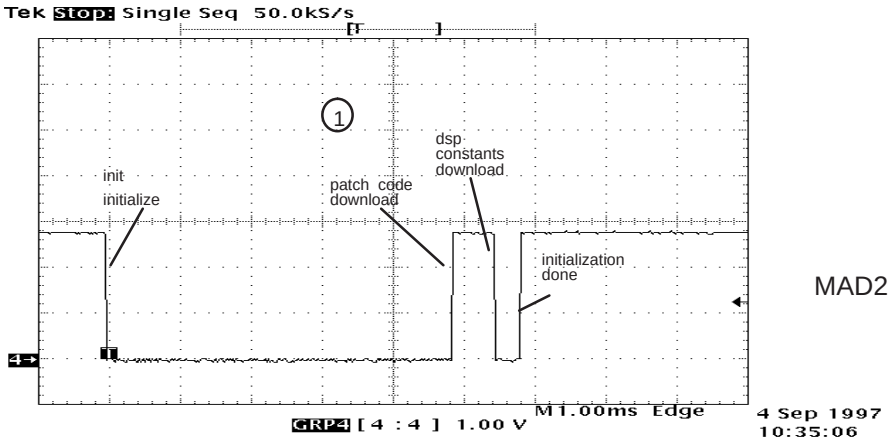
After power up, DSP signals all completed functions by changing the state of the XF pin (see figure 9 for complete timing and figure10 for detailed timing).



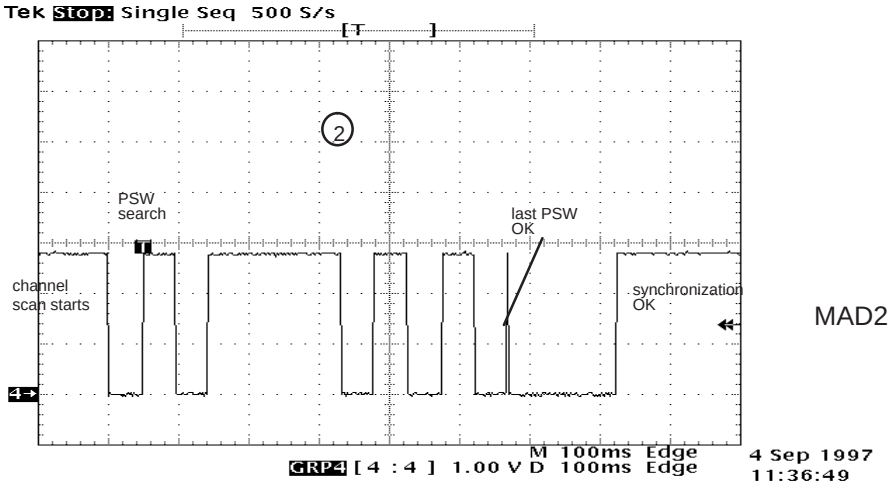
1. DSP initialization done
2. Synchronization to network done
3. Registrarition to network done.

MAD2 pin 91 (DSPXF)

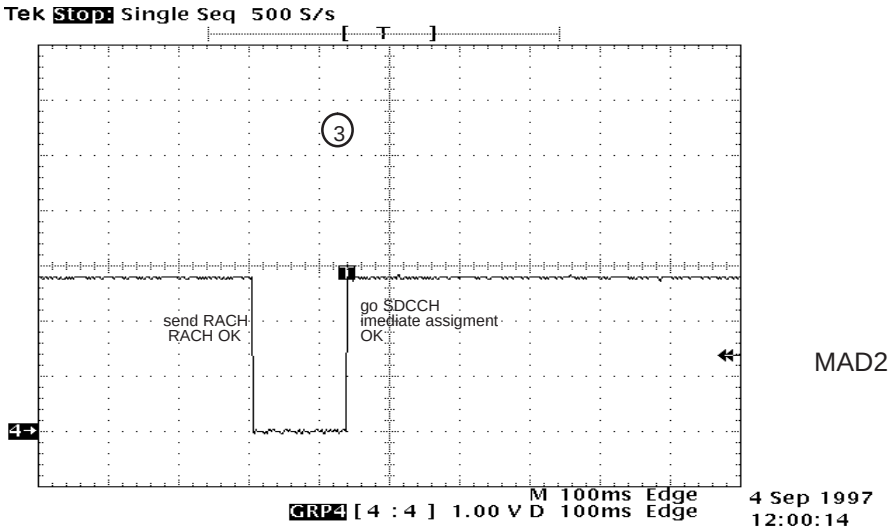
Figure 9.



MAD2 pin 91 (DSPXF)



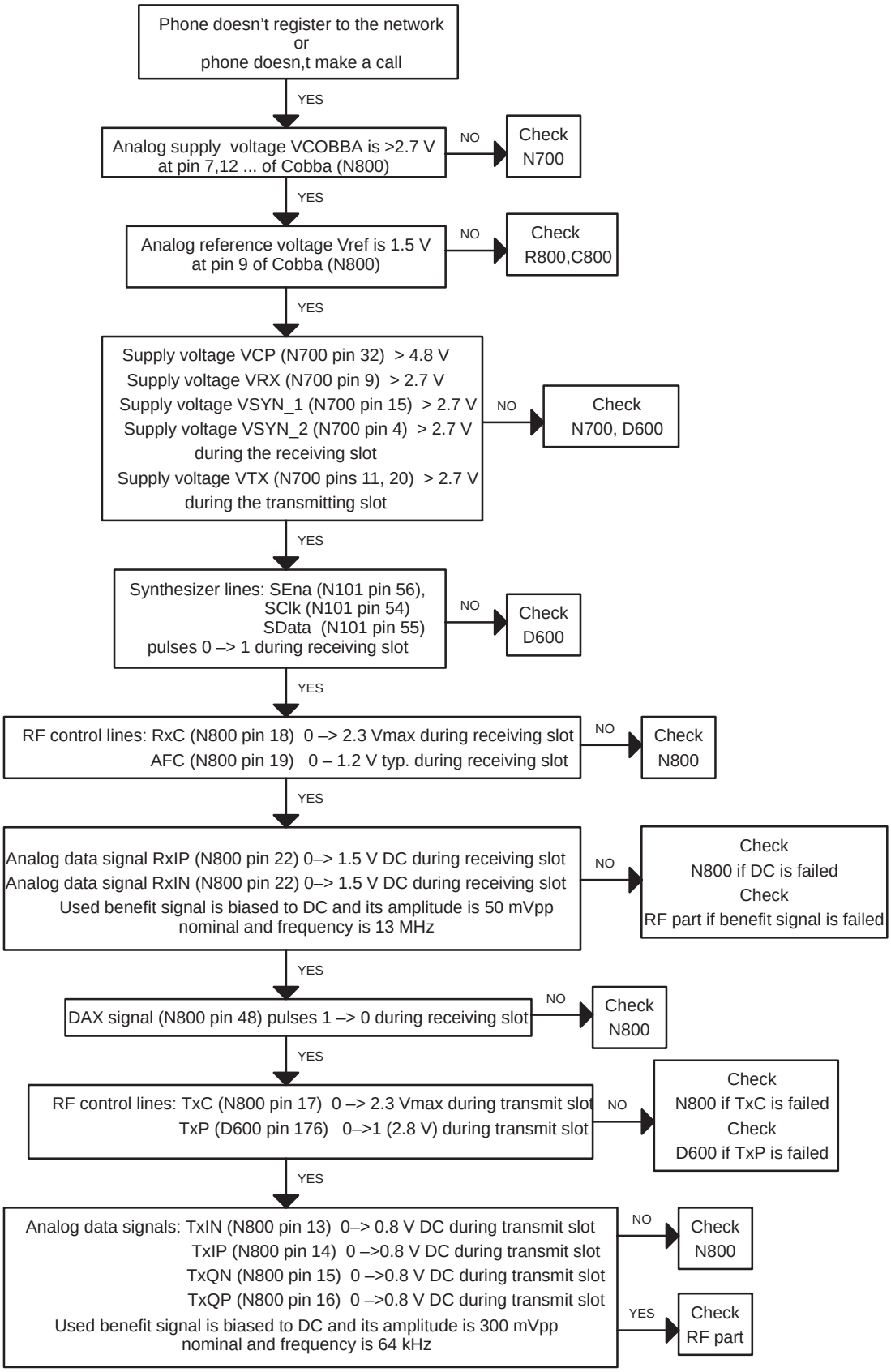
MAD2 pin 91 (DSPXF)



MAD2 pin 91 (DSPXF)

Figure 10.

Phone register failure



Receiver faults

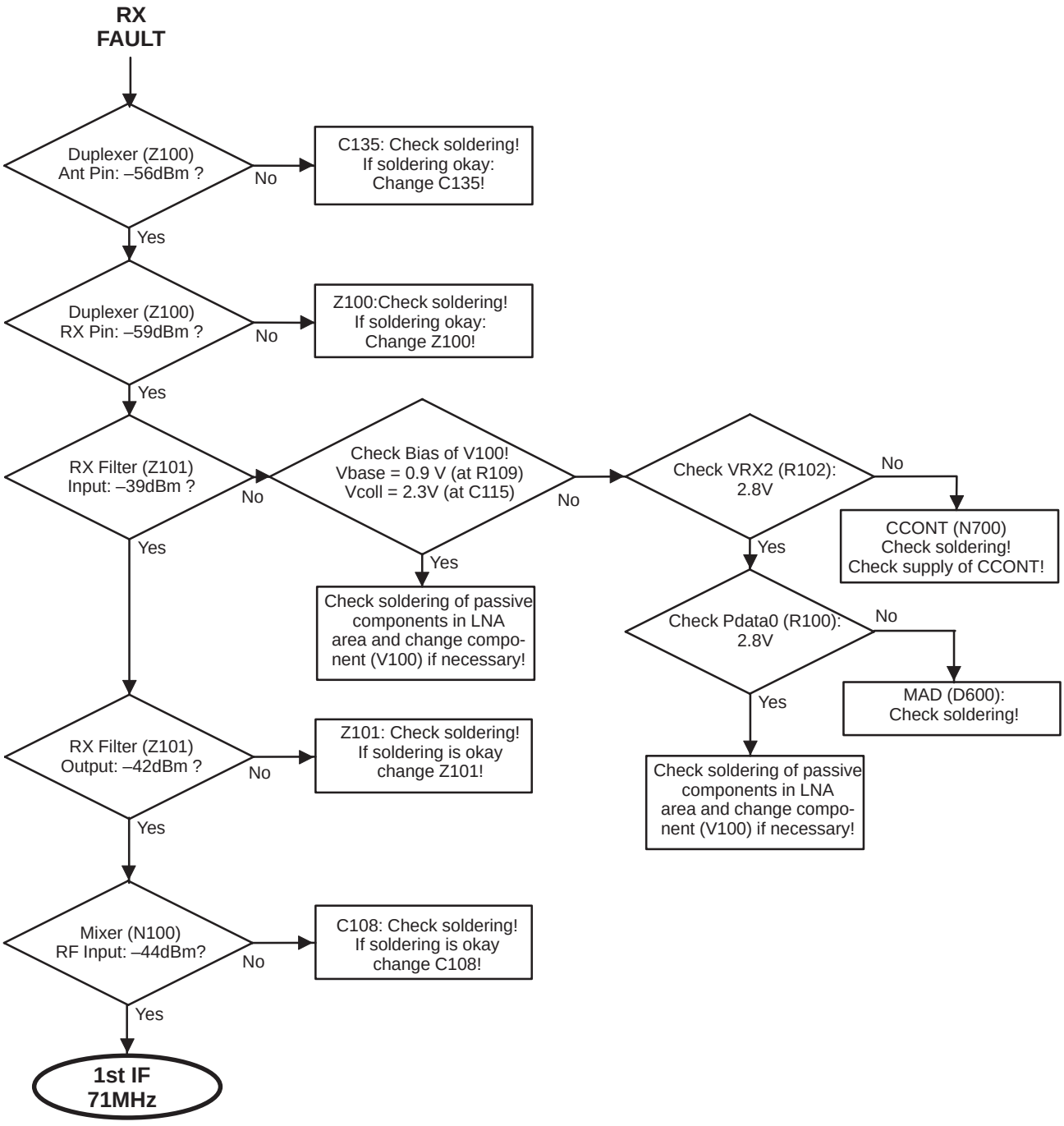
This section gives an overview of the strategies used to hunt failures and defects in the receiver path of the radio unit. Tracking of receiver errors is best done by following the RX signal path and tracking the signal applied to the antenna port with a probe and a spectrum analyzer. The following steps should be done prior to the signal tracking:

– Apply test signal generated by CMD55 to antenna port.
  Frequency: 947 MHz
  Level: –55dBm
– Set radio unit to local mode with Wintesla.
– Choose RF Controls from Wintesla Testing menu.
– Perform the following settings:
  Set RX continuous mode
  Set Cont. mode channel 60
  Tick front end on.

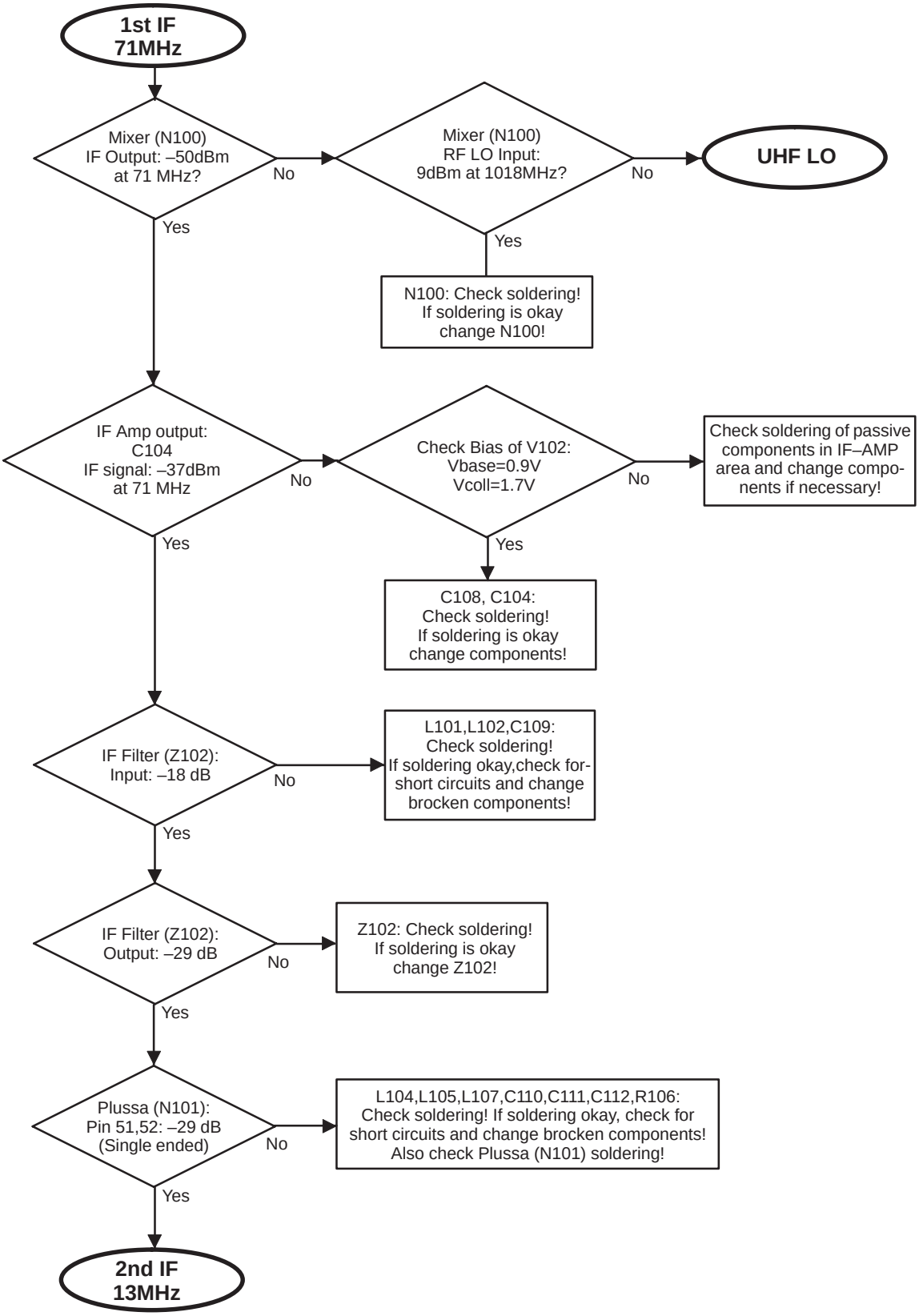
The test signal should then be tracked through the rx signal path by following the procedures given in the figures below.

The RF levels given in the following flow charts were measured with a Hewlett Packard RF probe. When measuring the levels with a different probe the resulting levels may be different. The most important thing to check is wether there is a signal present or not.

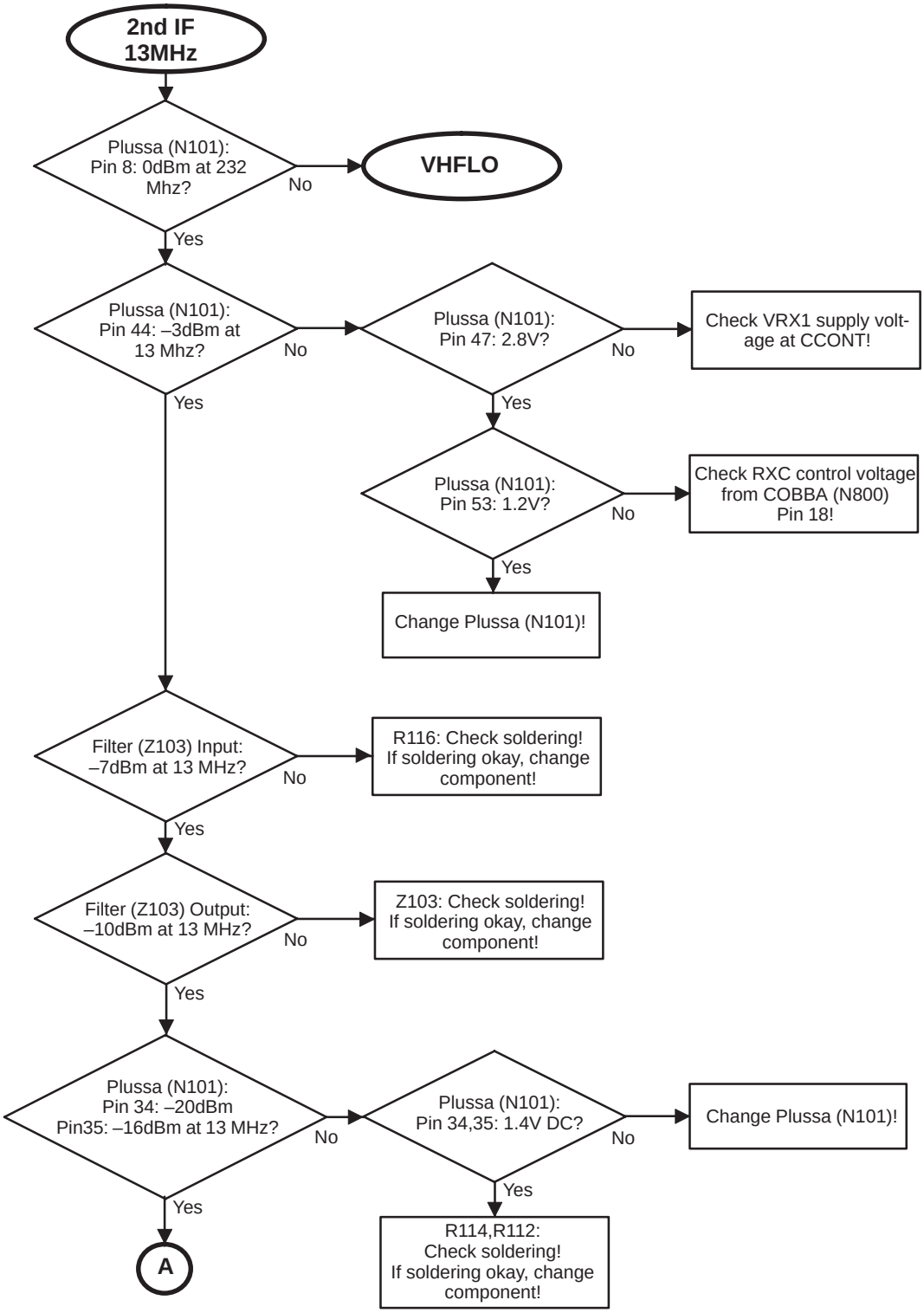
Receiver Fault (1)



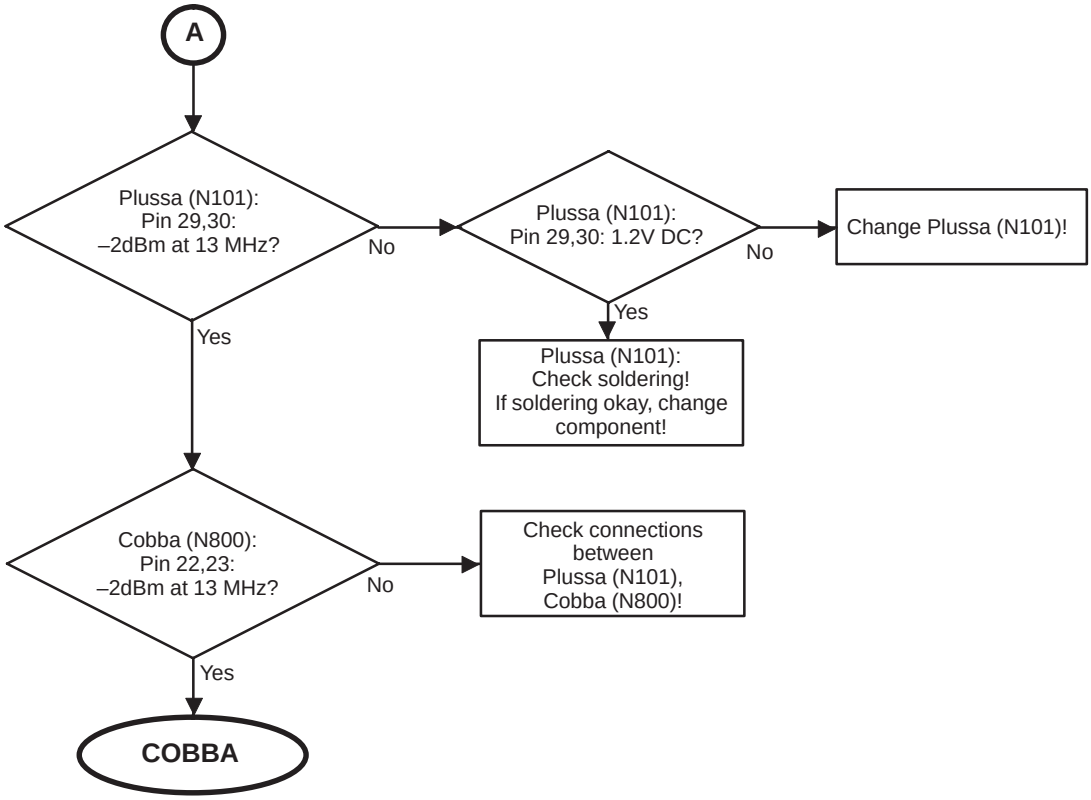
Receiver Fault (2)



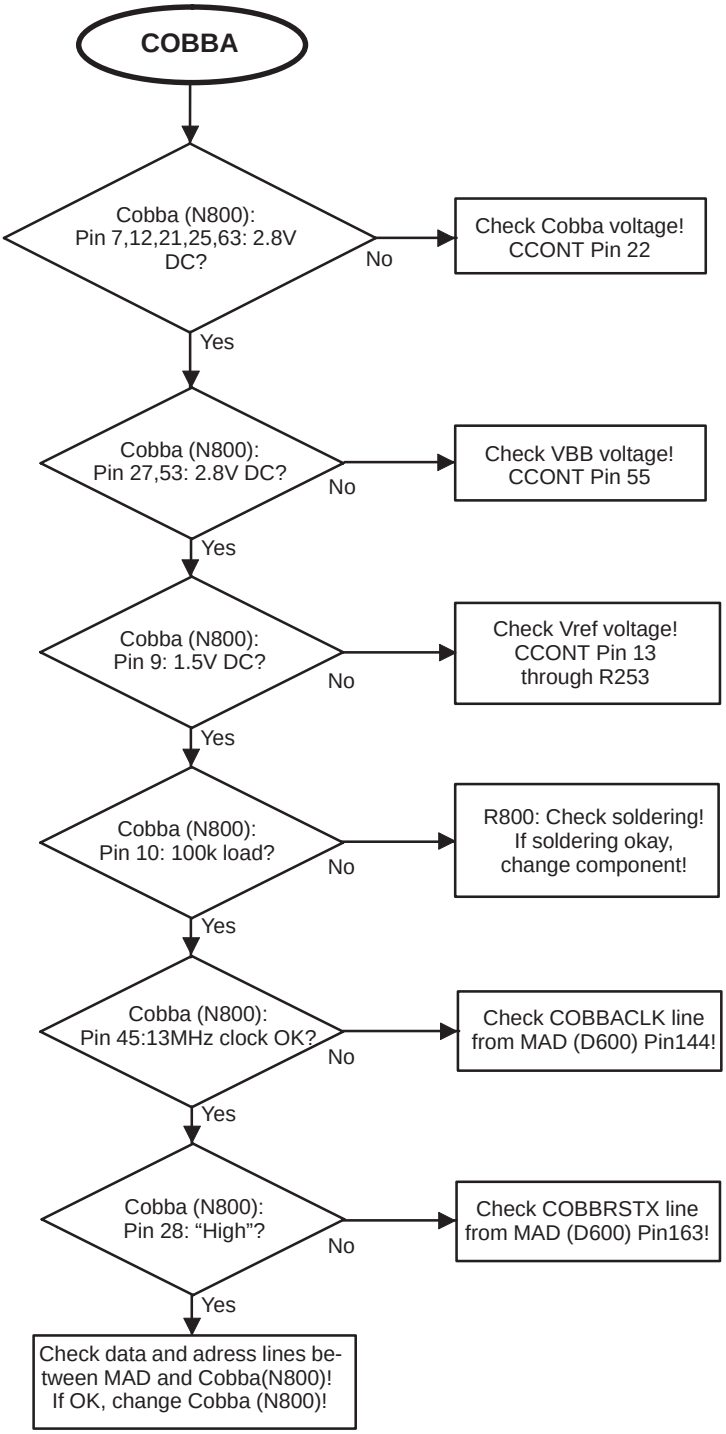
Receiver Fault (3)



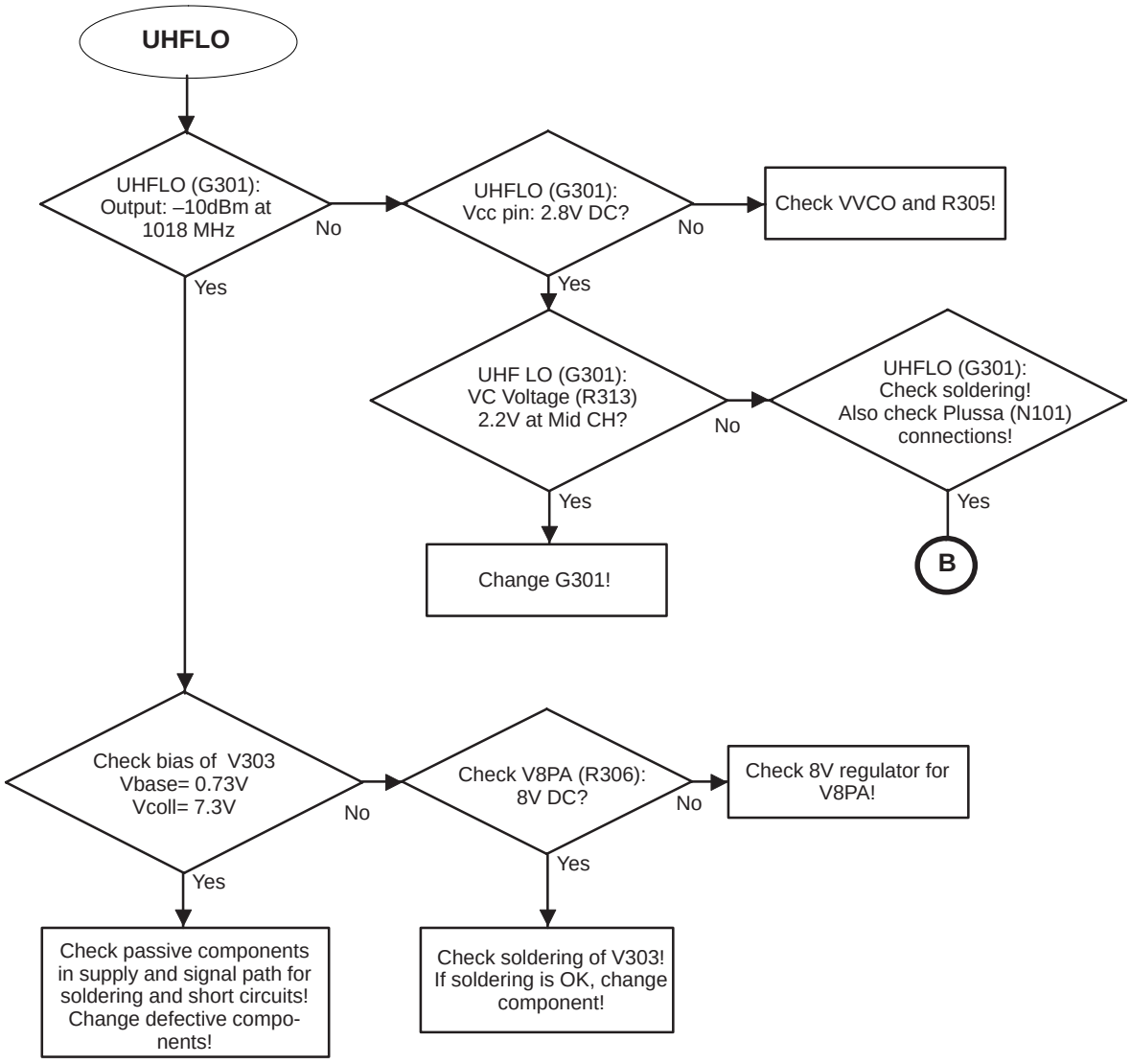
Receiver Fault (3a)



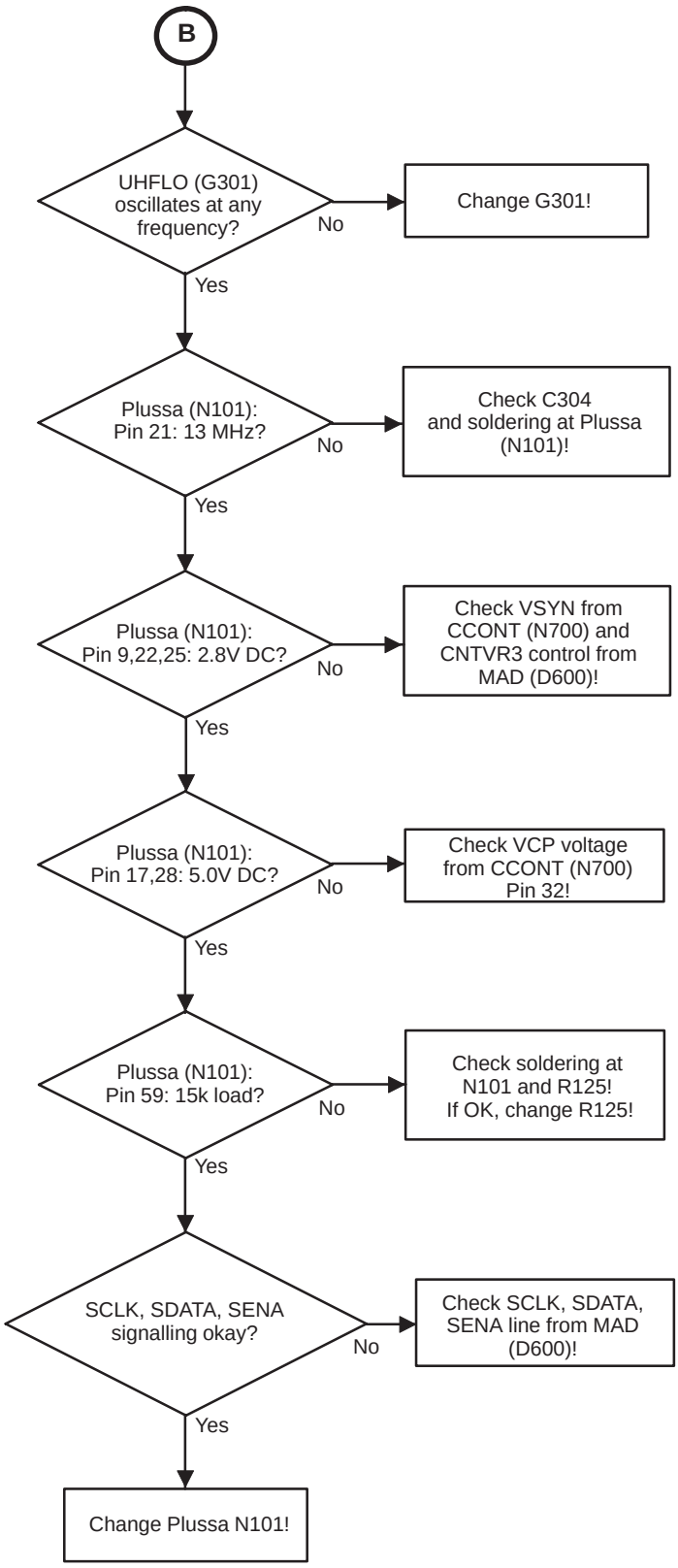
Receiver Fault (4)



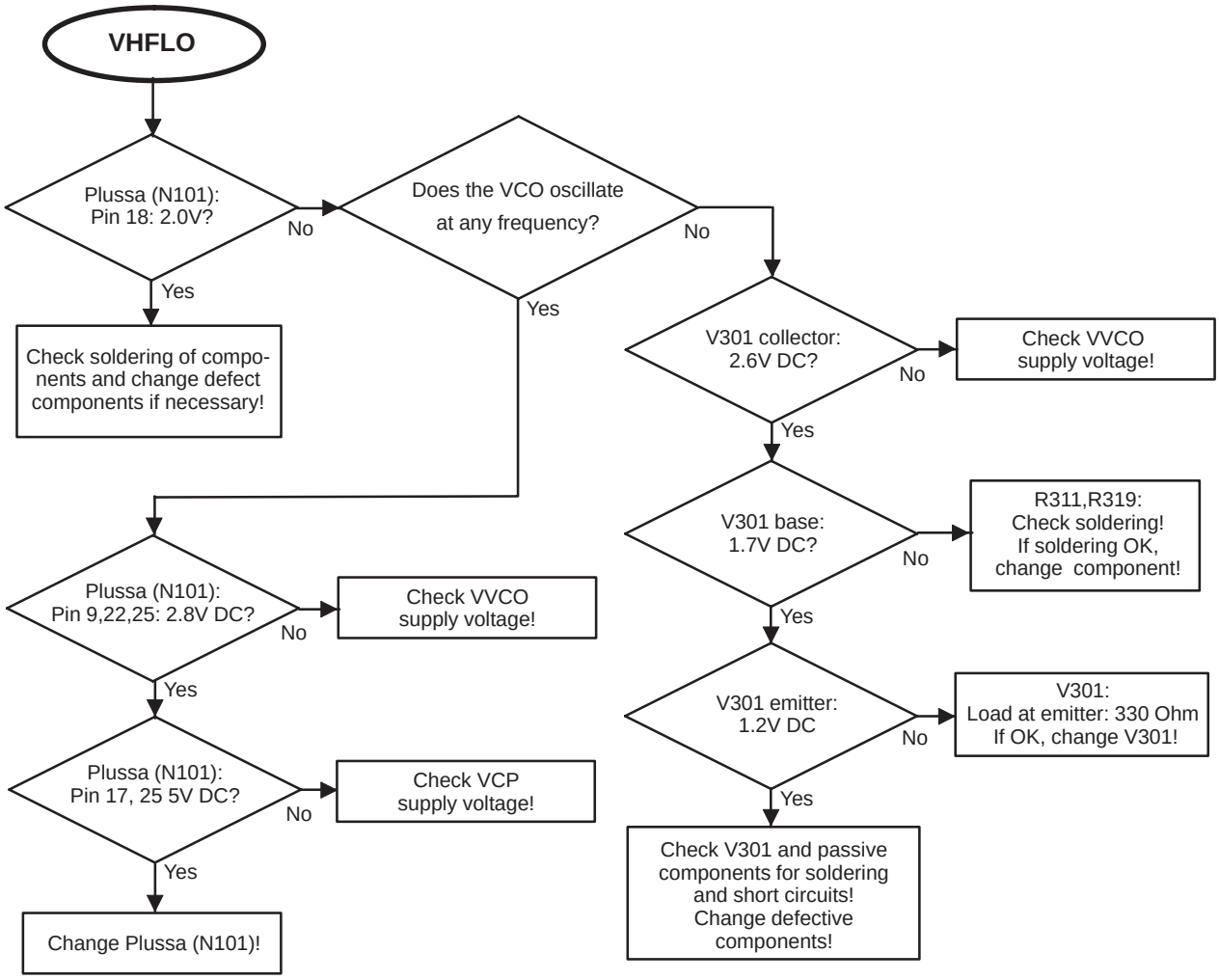
Receiver Fault (5)



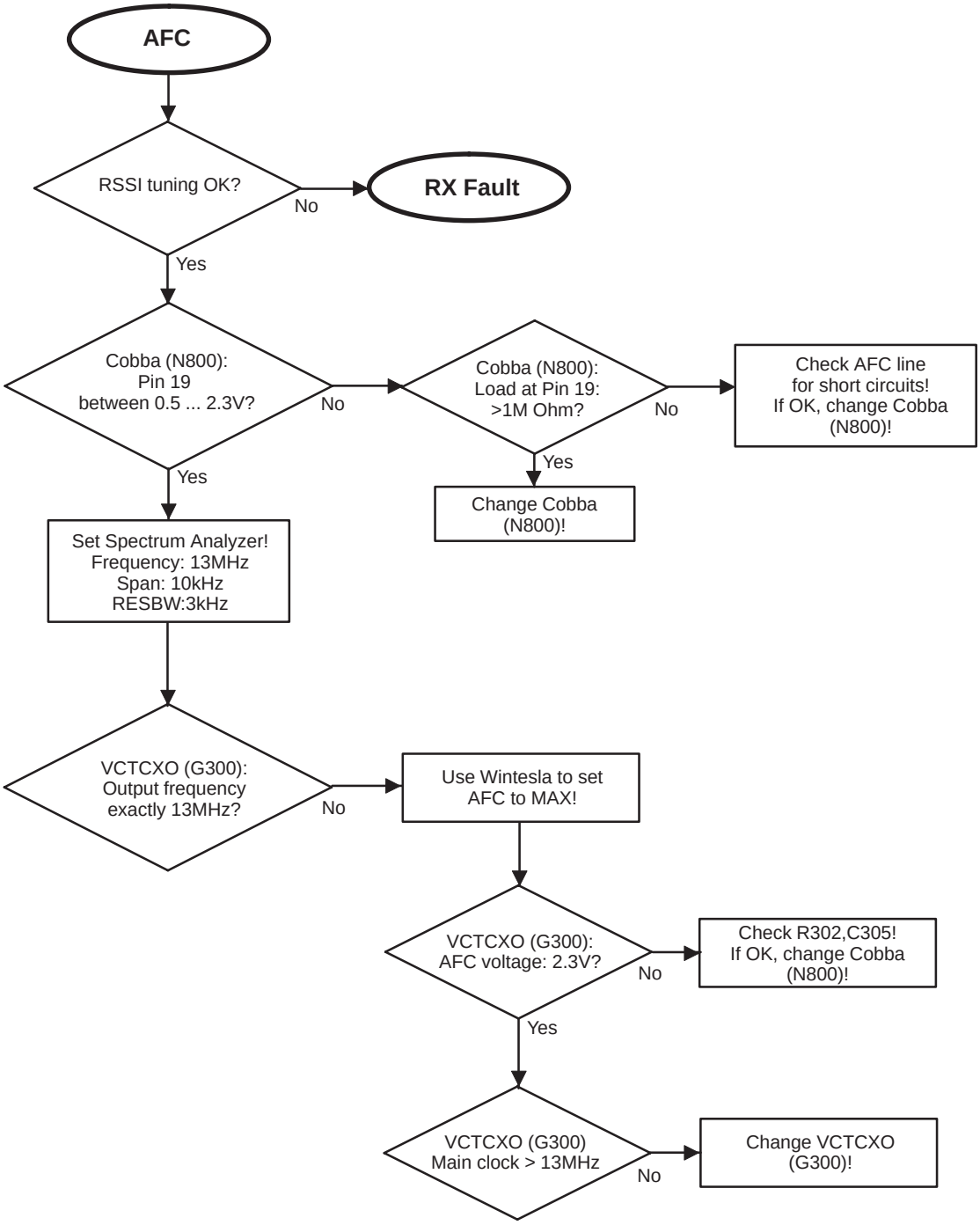
Receiver Fault (5a)



Receiver Fault (6)



Receiver Fault (7)



Transmitter faults

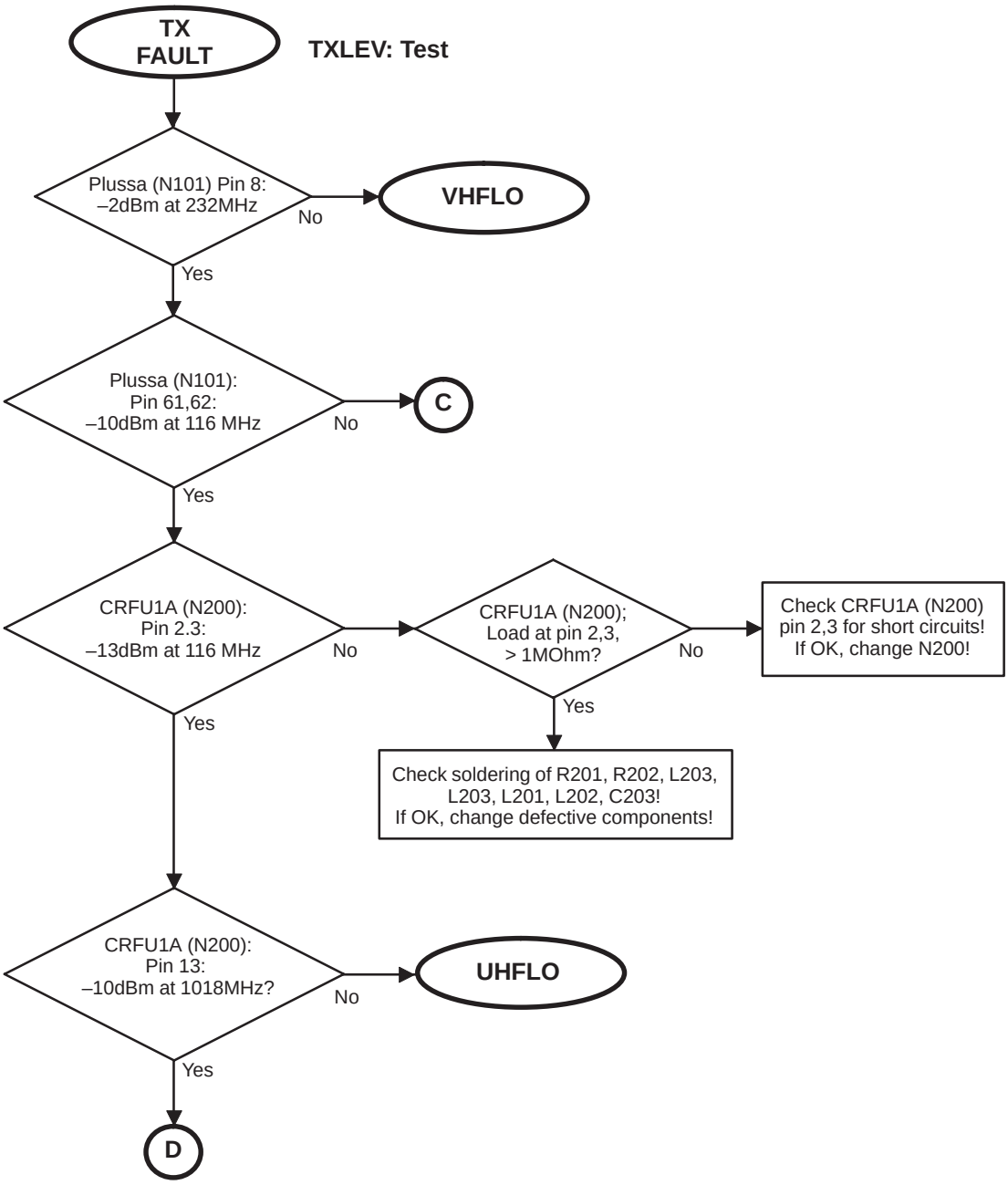
The following chapter gives an overview of the principles helpful to hunt errors in the transmit path of the radio unit. The best possibility to look for the root cause of a transmitter malfunction is to track the transmit signal through the transmitter path starting at the RF–BB interface to the antenna port.
The following settings should be done using Wintesla prior to the examination of the transmitter path:

– Set radio unit to local mode.
– Choose RF Controls from Wintesla menu.
– Set TX level to TEST.
– Set TX continuos mode.
– Set cont. mode channel 60.

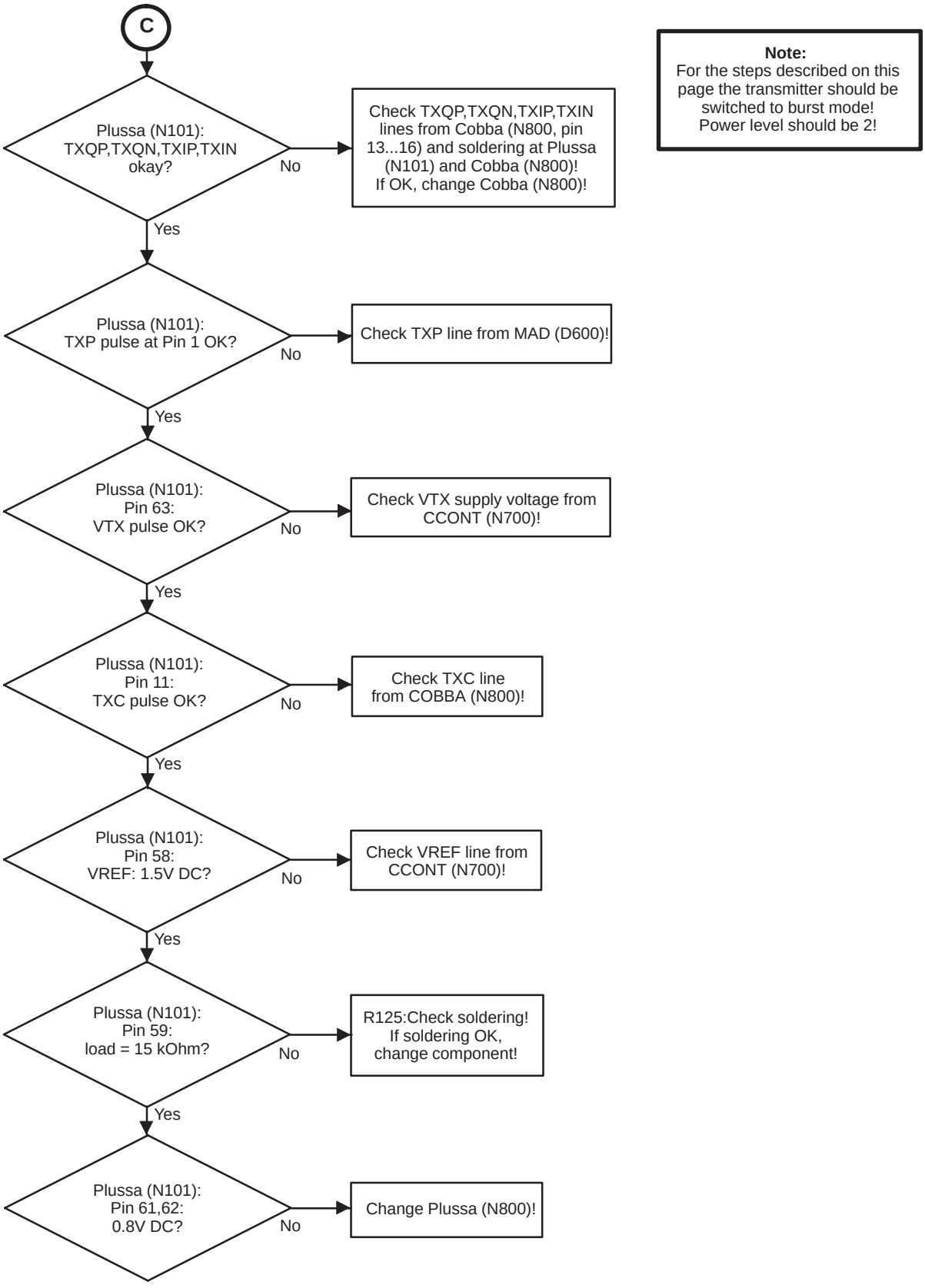
The test signal can now be tracked from the TX–IQ inputs of the Plussa to the antenna connector.

Note *The transmitter should under no circumstances be operated in continuos mode on any other then the TEST level. If a higher power level is needed for error hunting the transmitter has to be switched to burst mode.*

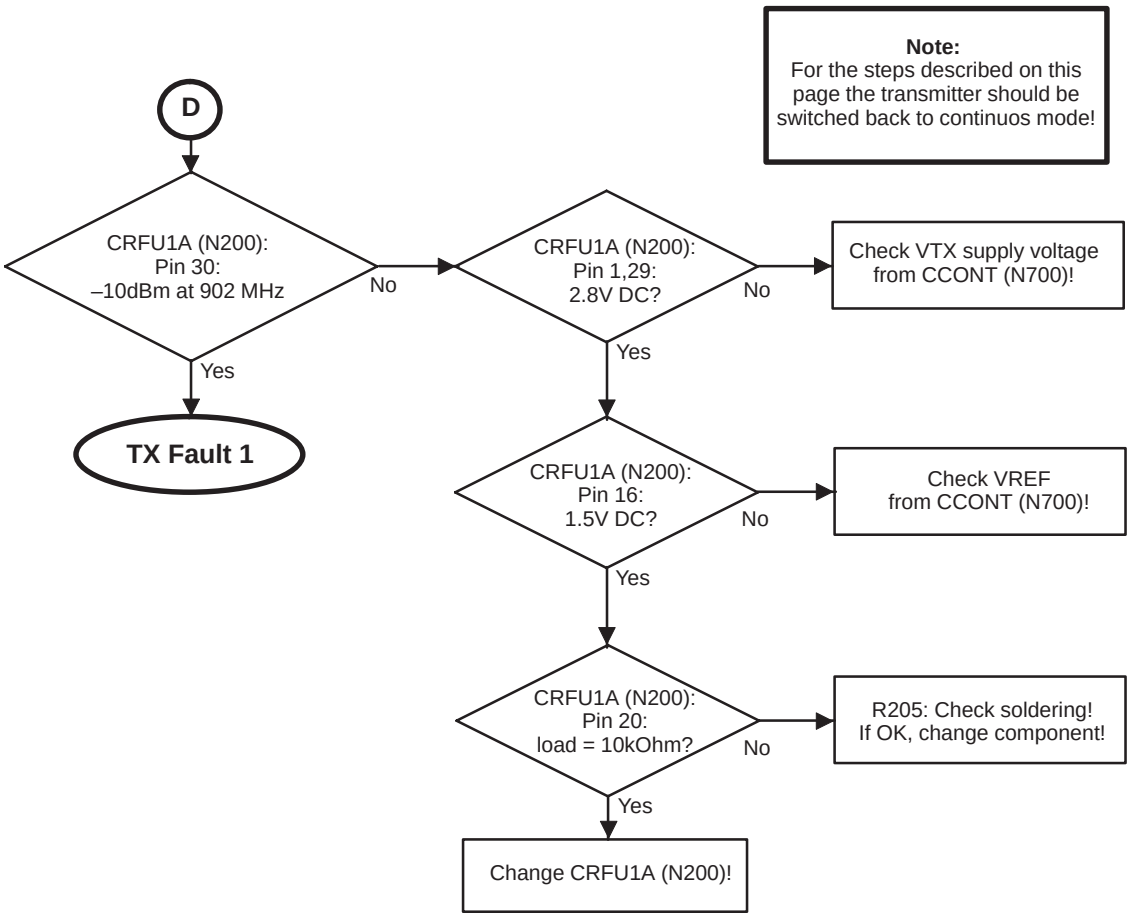
Transmitter Fault (1)



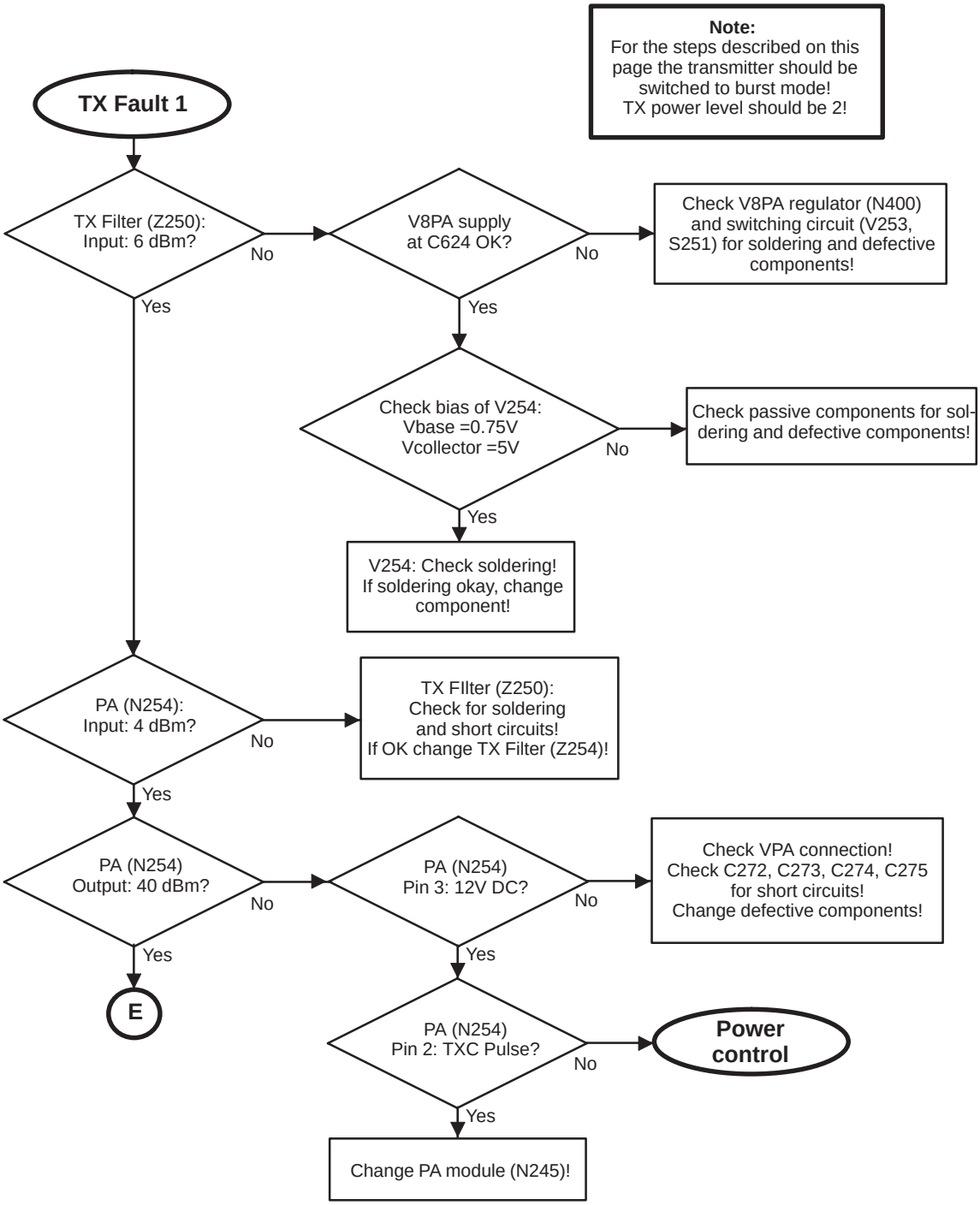
Transmitter Fault (1a)



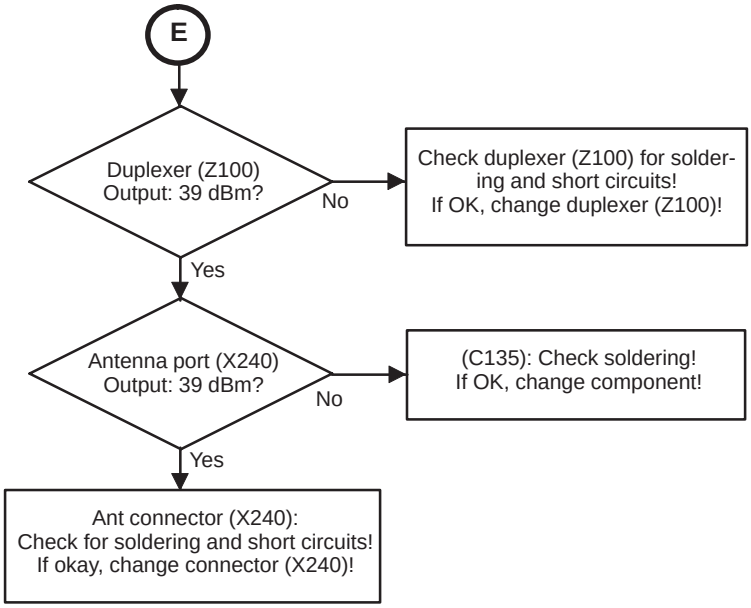
Transmitter Fault (1b)



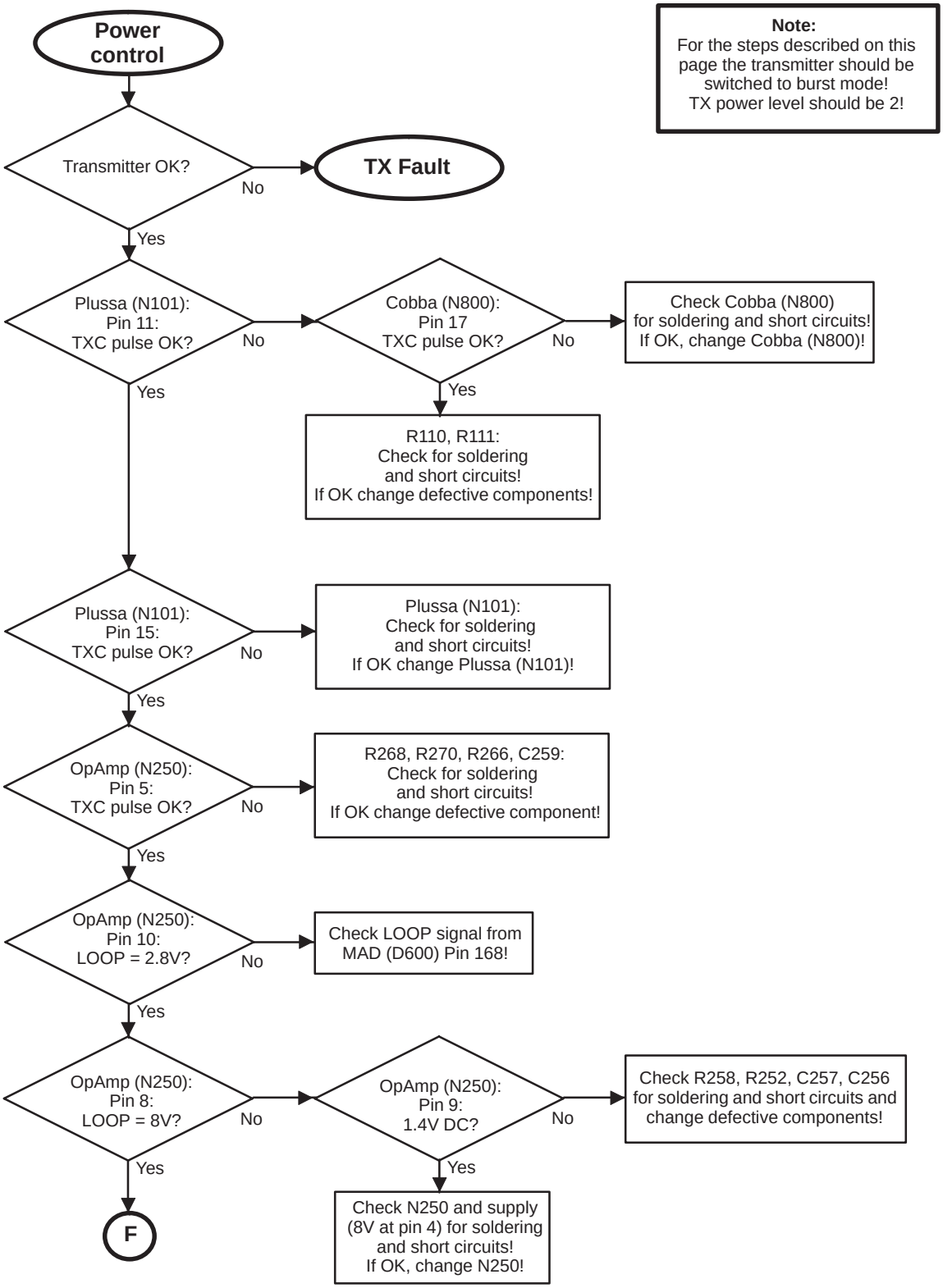
Transmitter Fault (2)



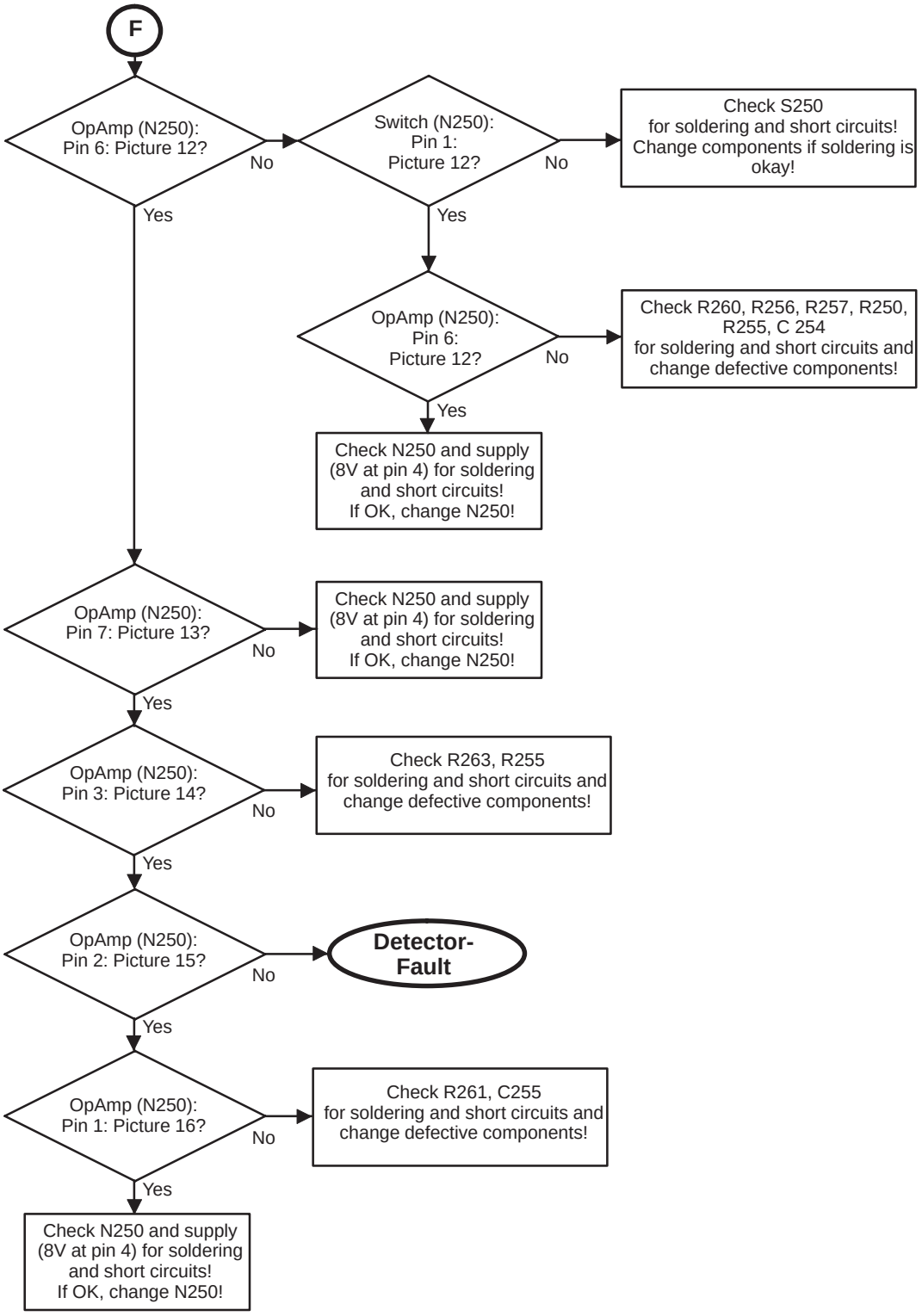
Transmitter Fault (2b)



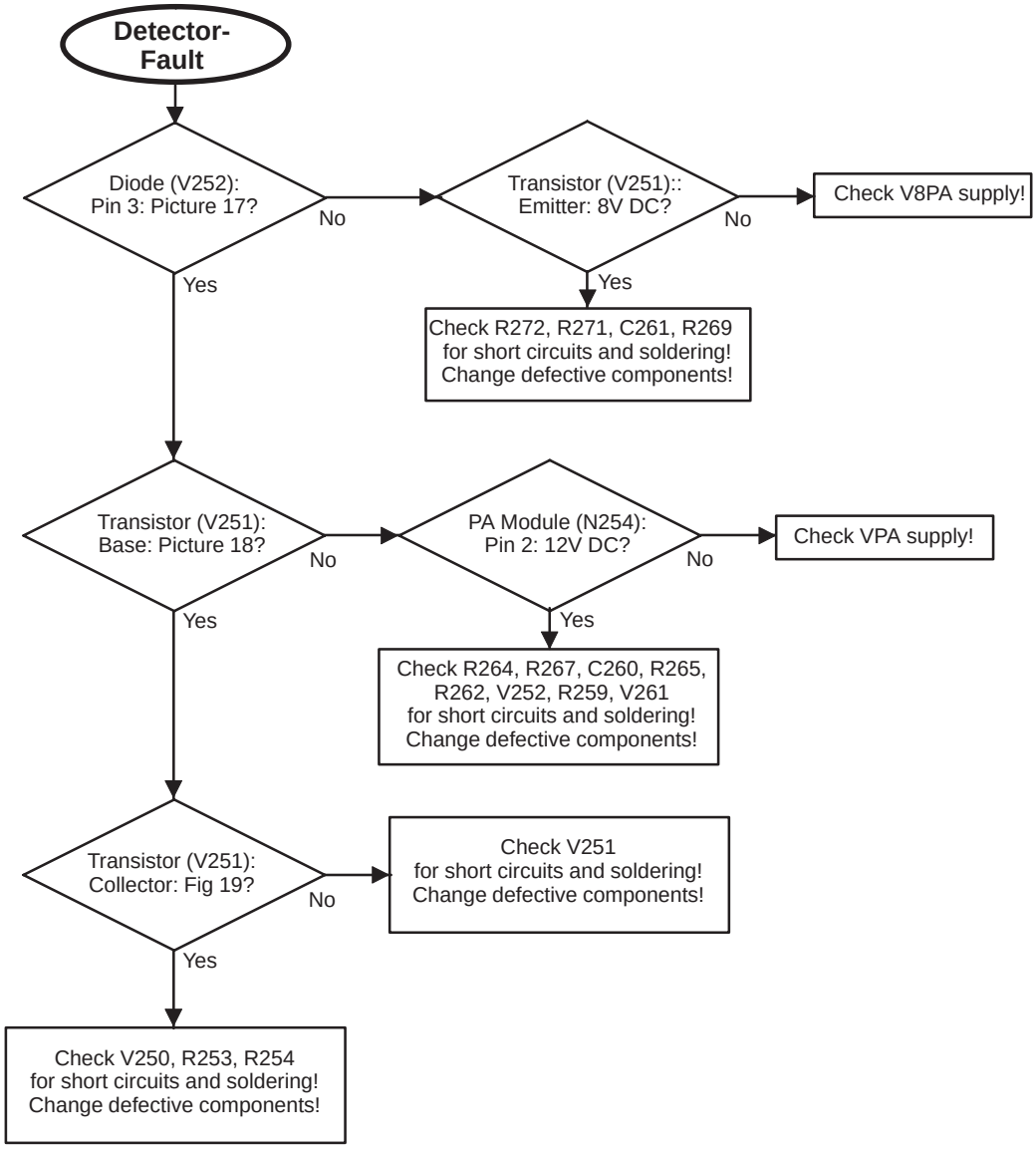
Transmitter Fault (3)



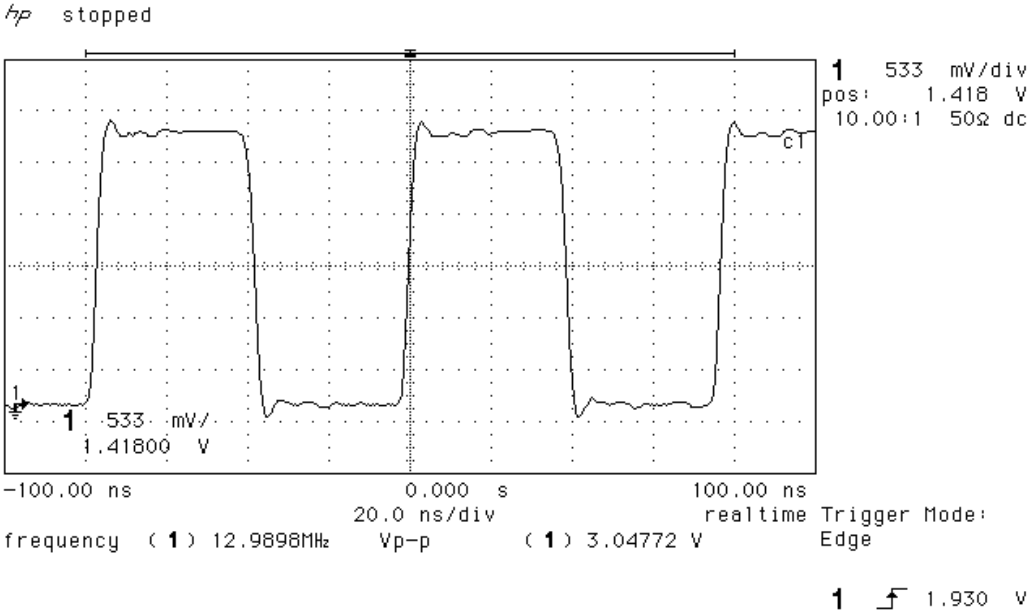
Transmitter Fault (4)



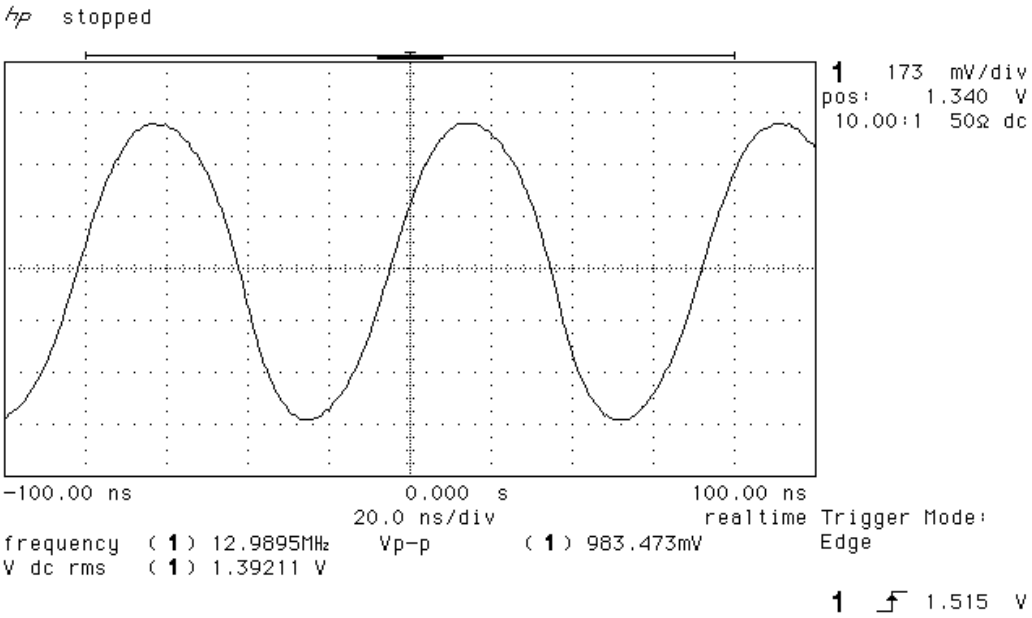
Transmitter Fault (5)



Clock Signals

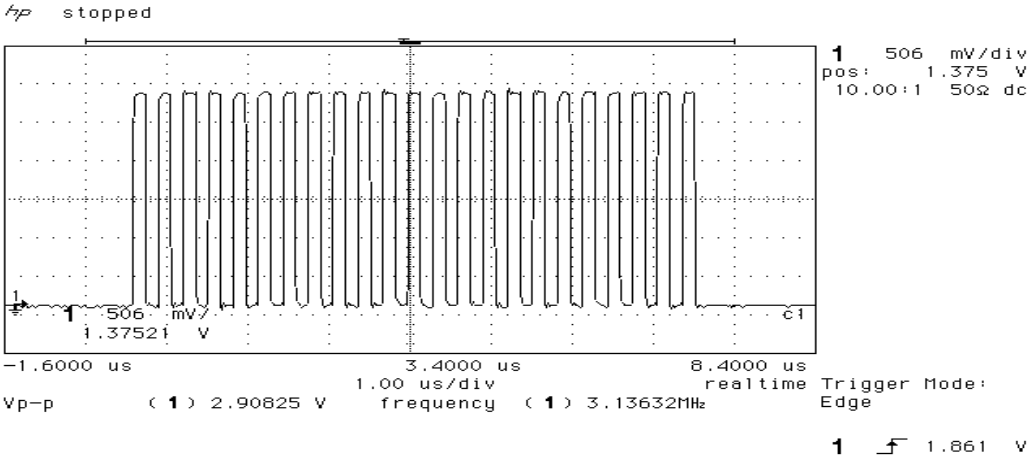


Picture 1. COBBACLK – signal

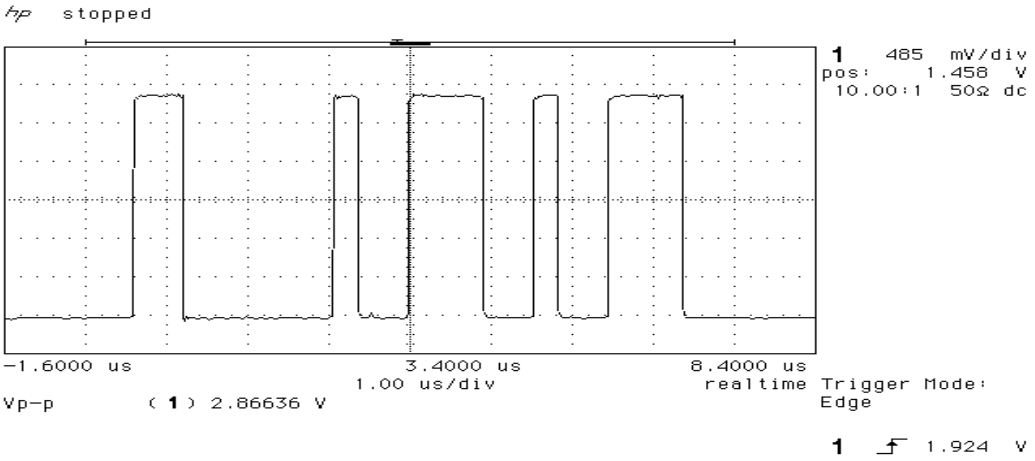


Picture 2. 13 MHz Main clock – signal

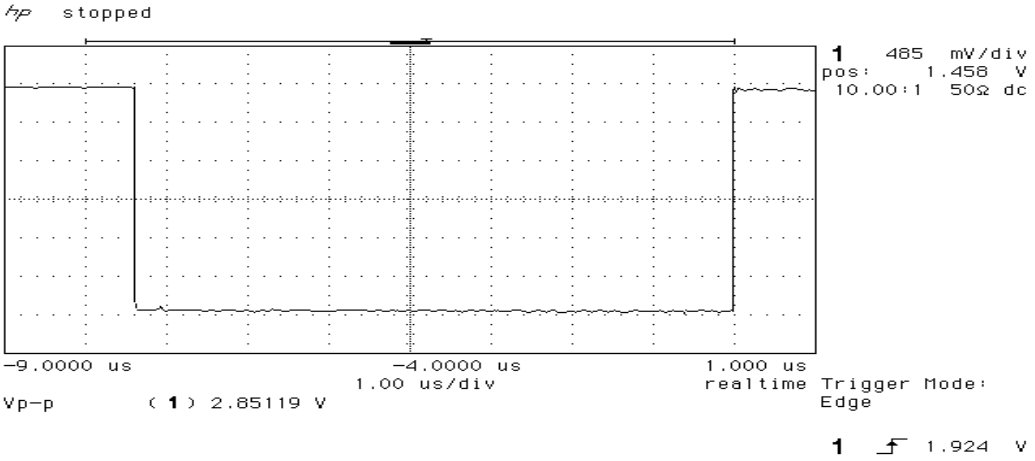
Synthesizer Signals



Picture 3. SCLK – signal

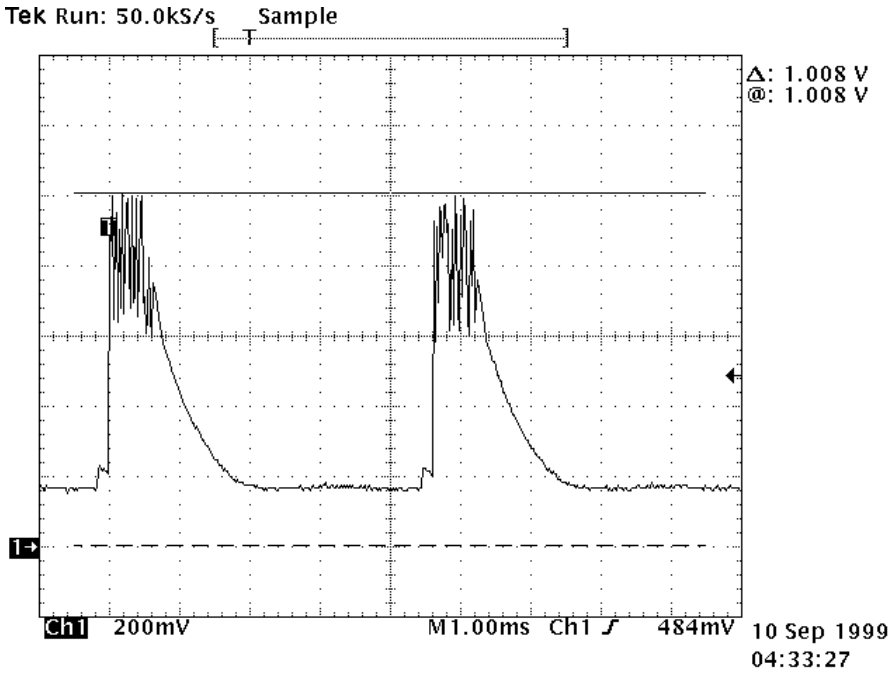


Picture 4. SDATA – signal

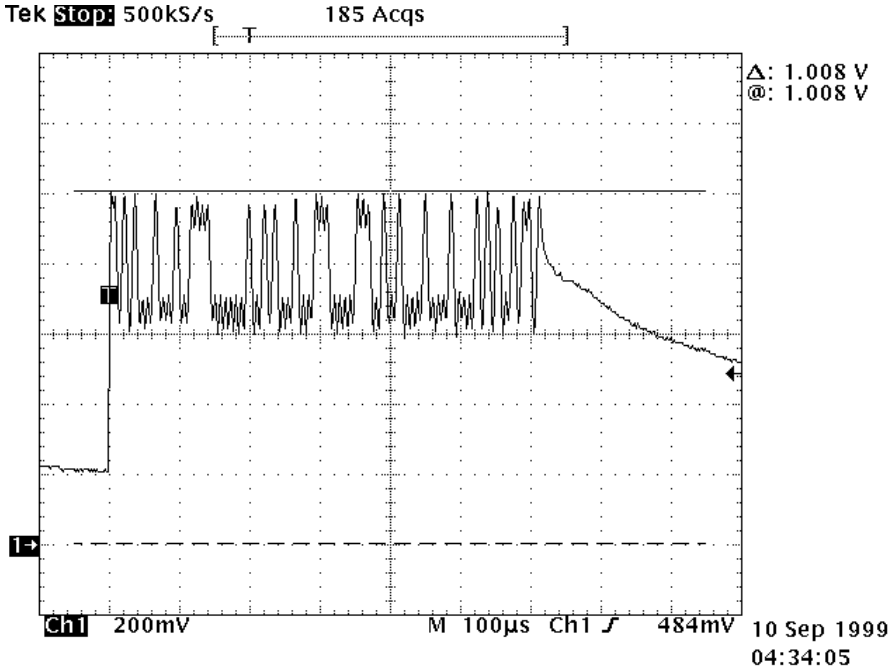


Picture 5. SENA1 – signal

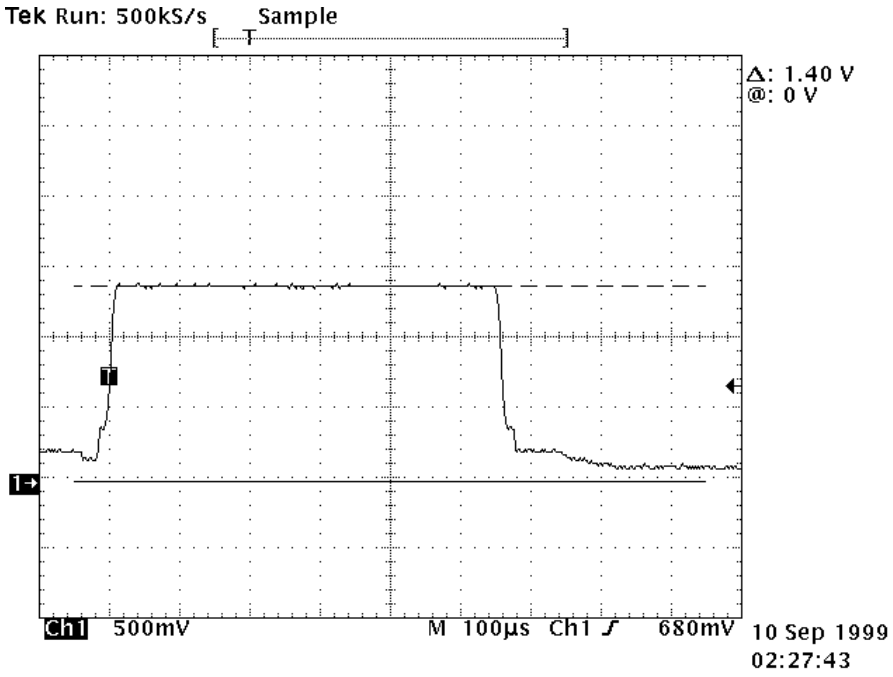
Transmitter Signals



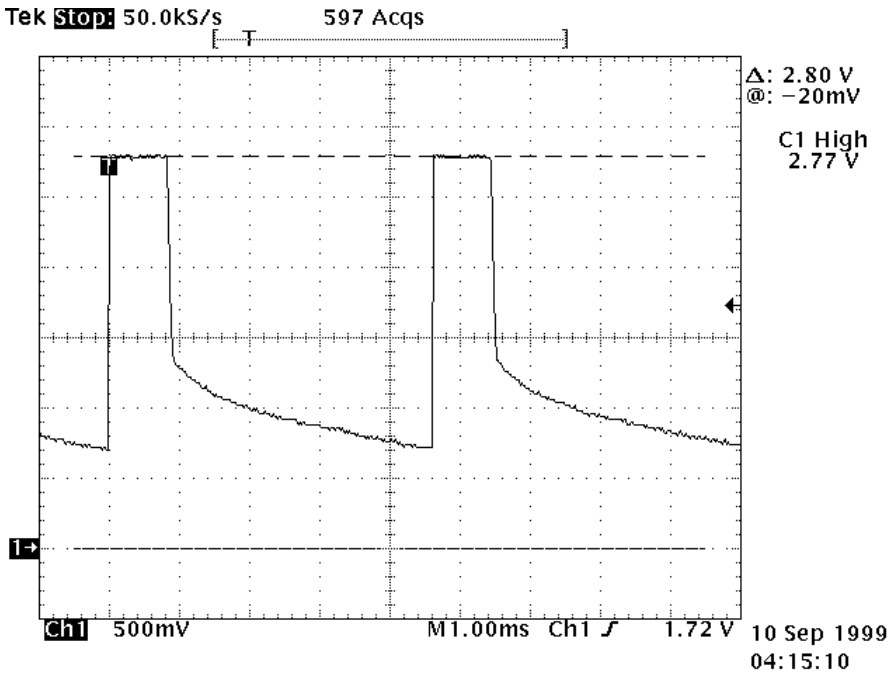
Picture 6. TXQP, TXQN, TXIP and TXIN – signal



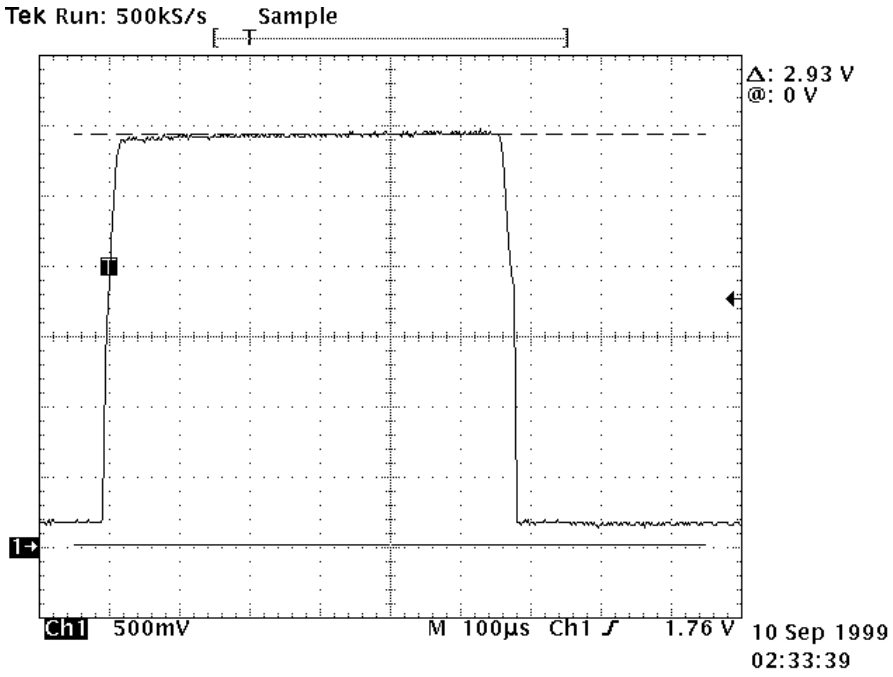
Picture 7. TXQP, TXQN, TXIP and TXIN – signal (single burst)



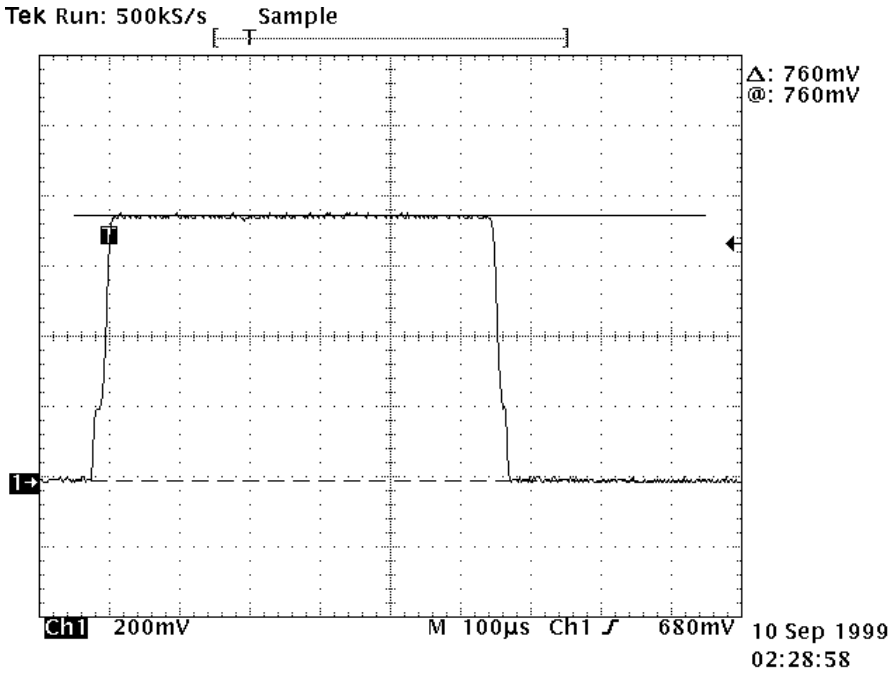
Picture 8. TXC – signal at Plussa Pin 5, Pin 15



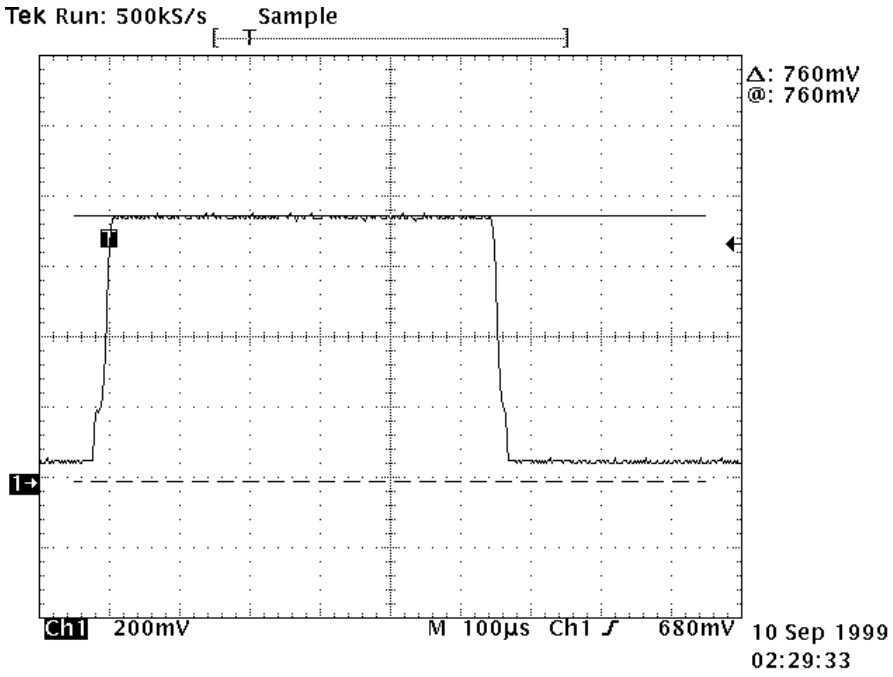
Picture 9. VTX – signal



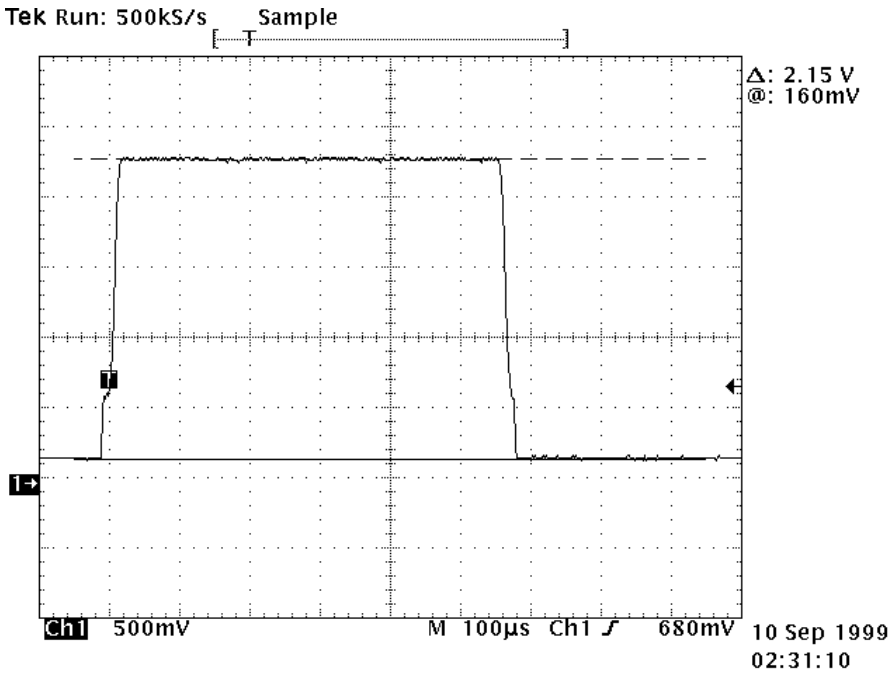
Picture 10. Vapc – signal (TXLEV2)



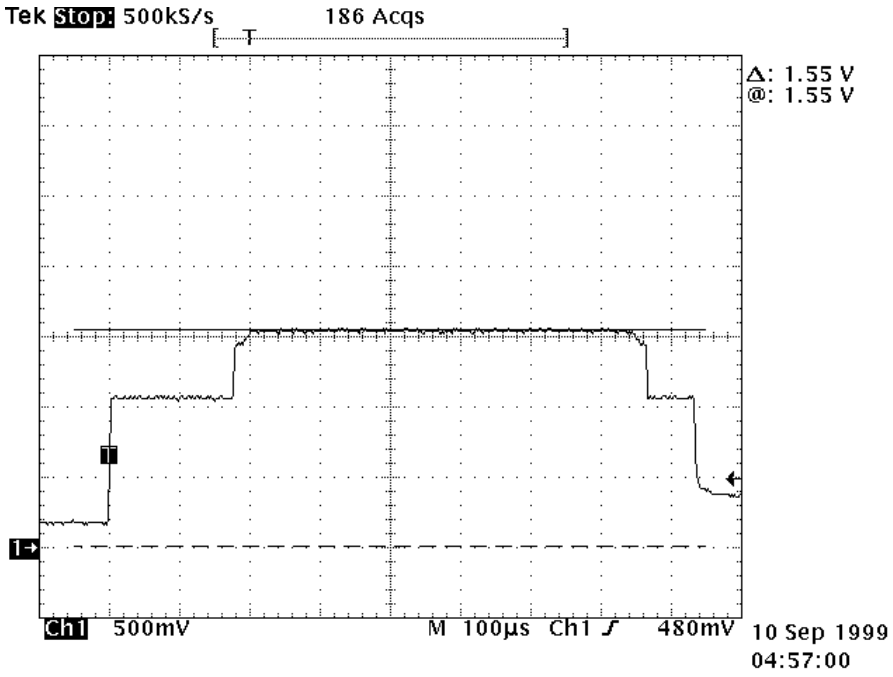
Picture 11. OPAMP (N250) Pin 5



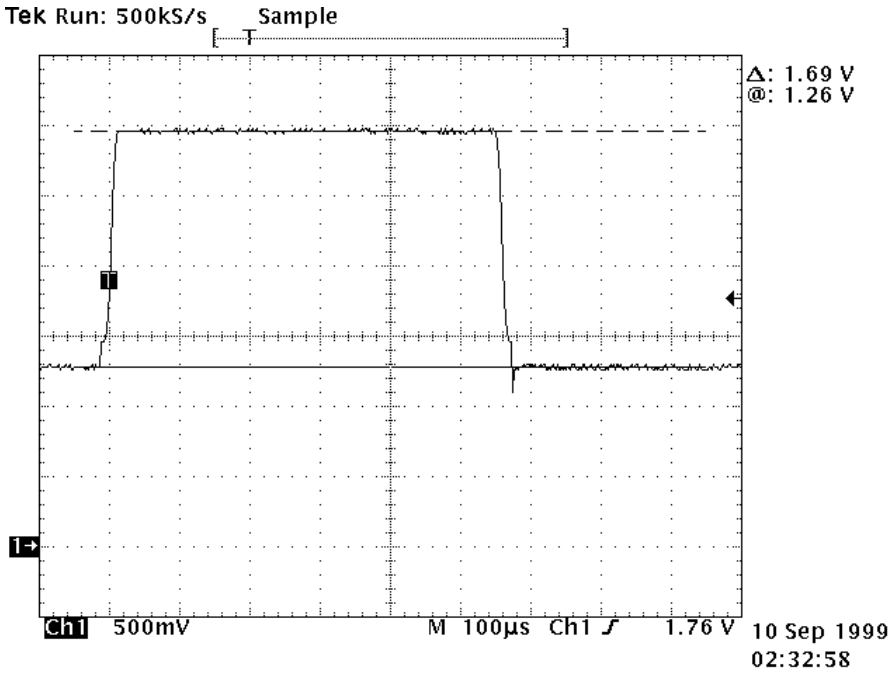
Picture 12. OPAMP (N250) Pin 6



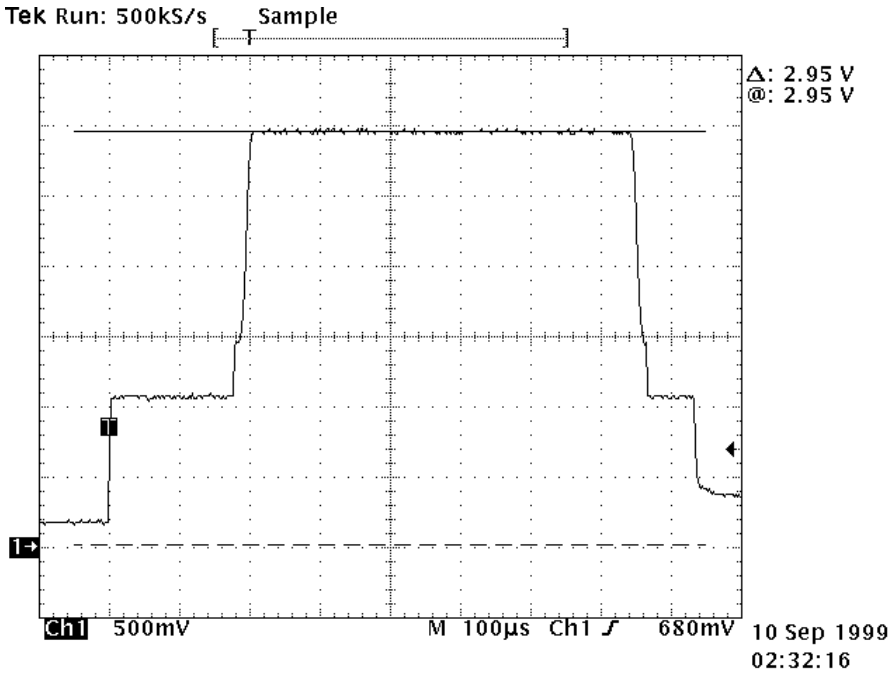
Picture 13. OPAMP (N250) Pin 7



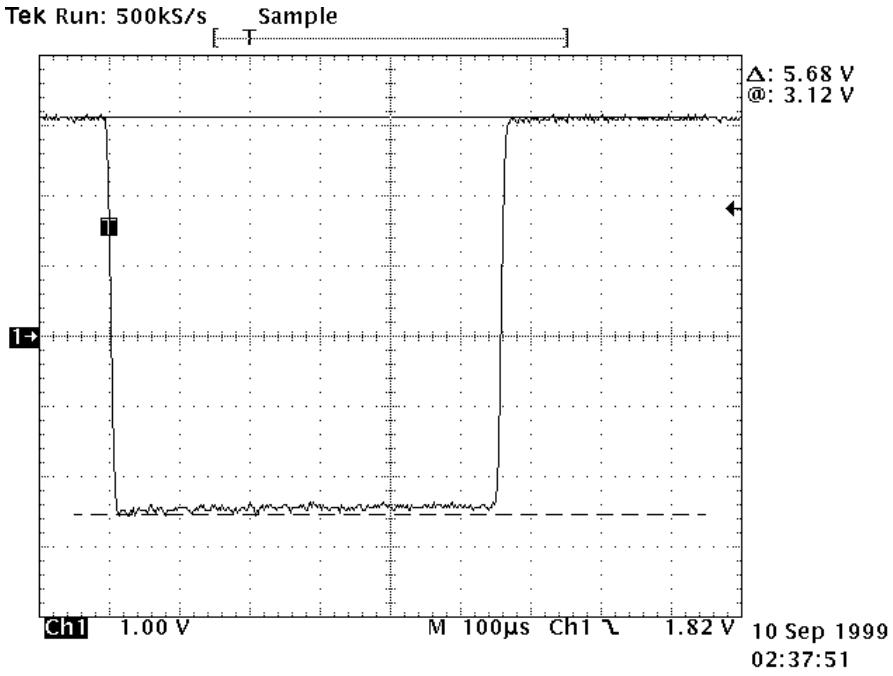
Picture 14. OPAMP (N250) Pin 3



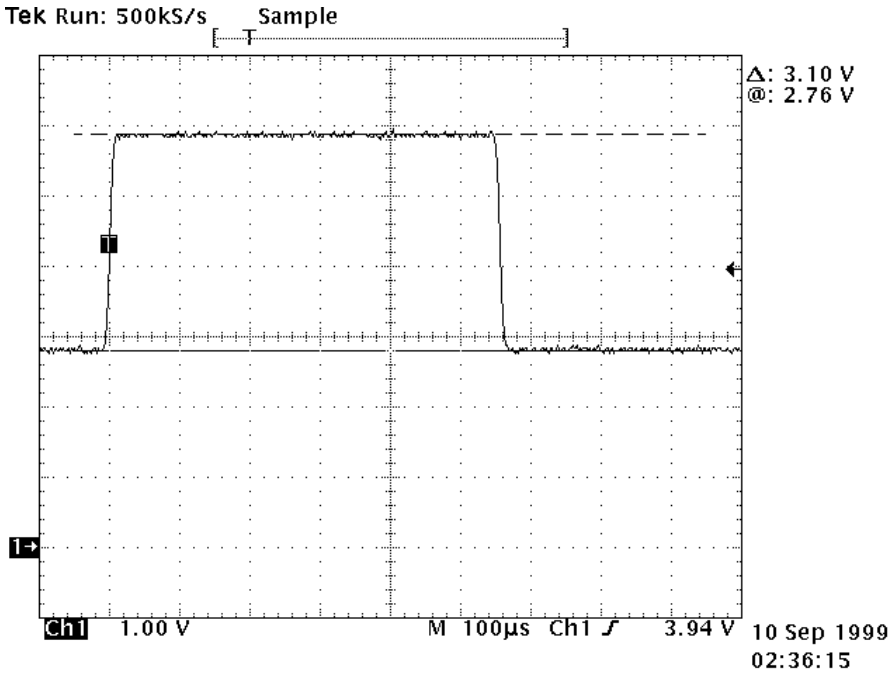
Picture 15. OPAMP (N250) Pin 2



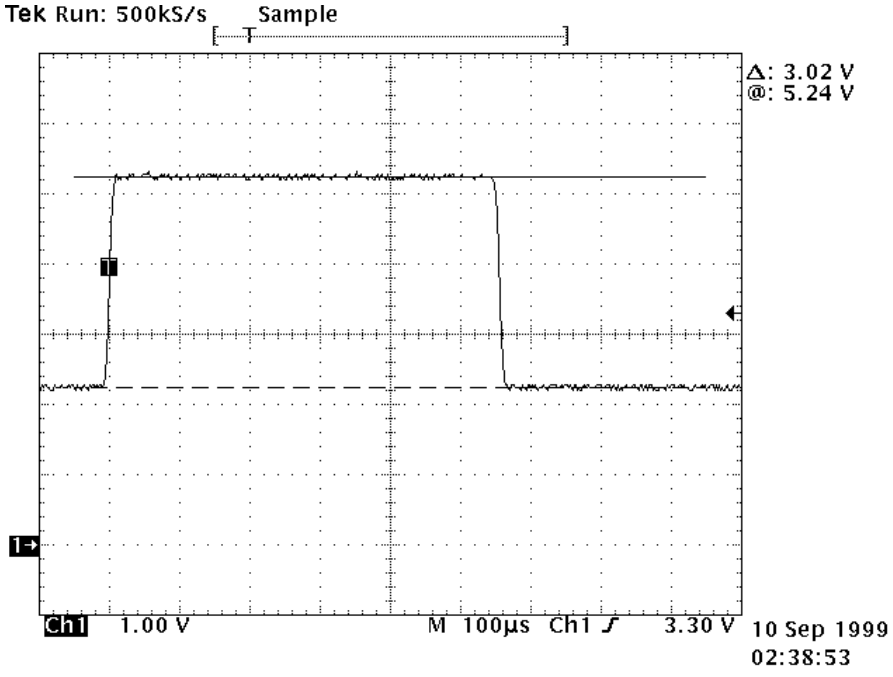
Picture 16. OPAMP (N250) Pin 1



Picture 17. Signal at detector diode input



Picture 18. Signal V251 base



Picture 19. Signal V251 emitter

AMC not working

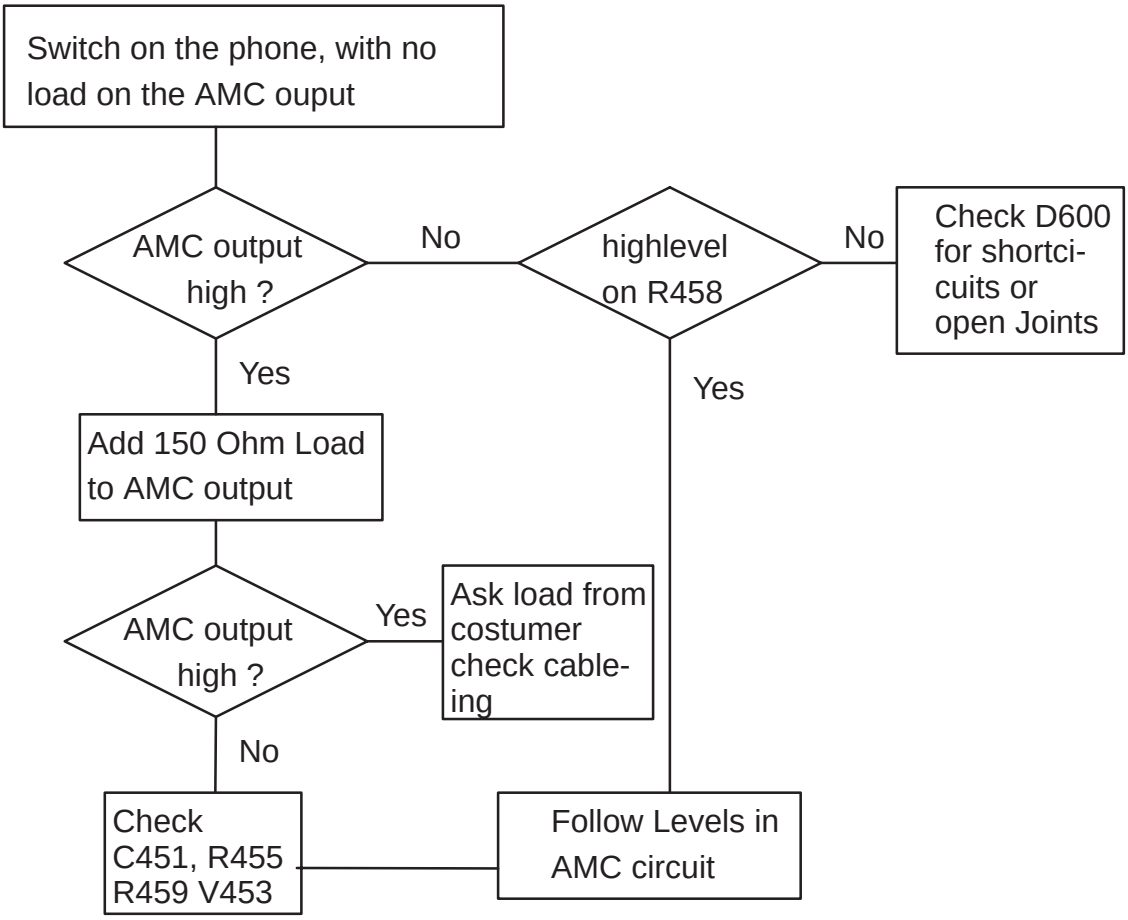


Figure 11. AMC not working

Car Radio Mute not working

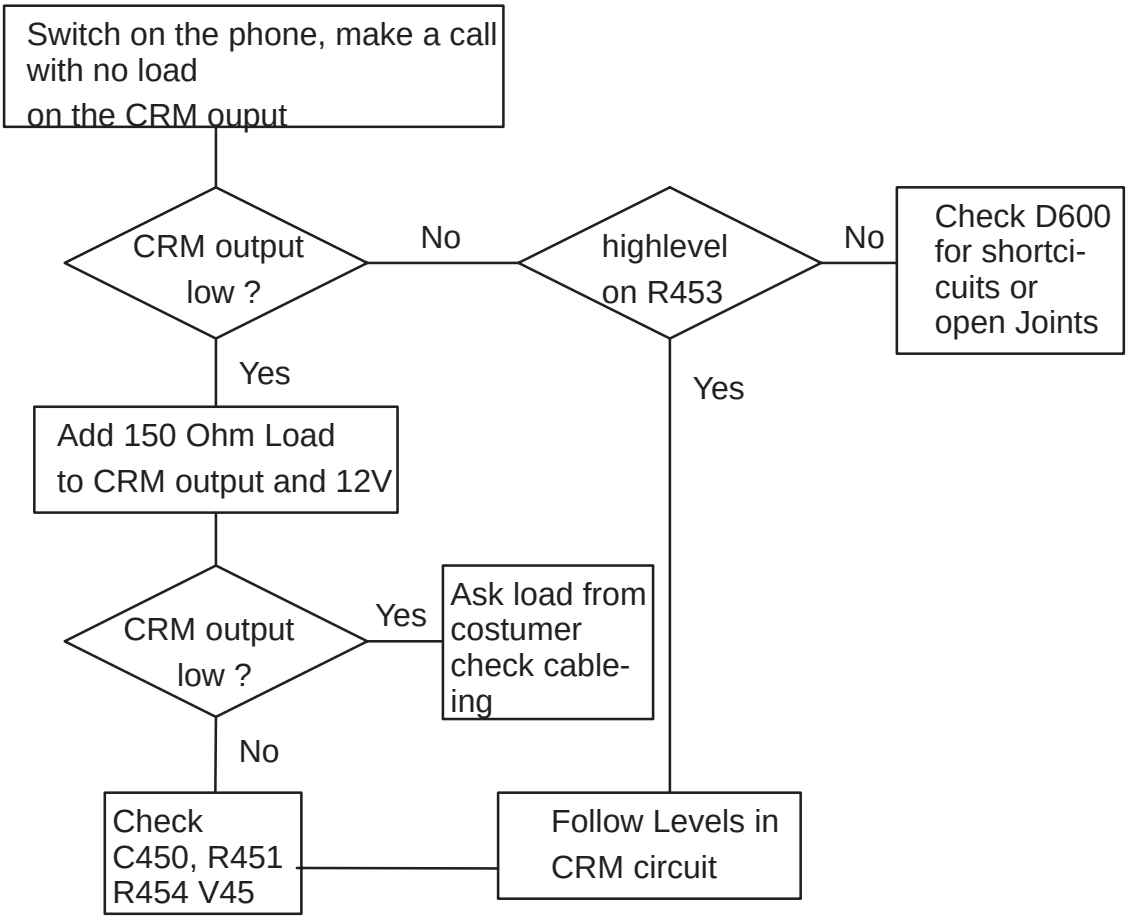


Figure 12. CRM not working

Backlight dimming not working

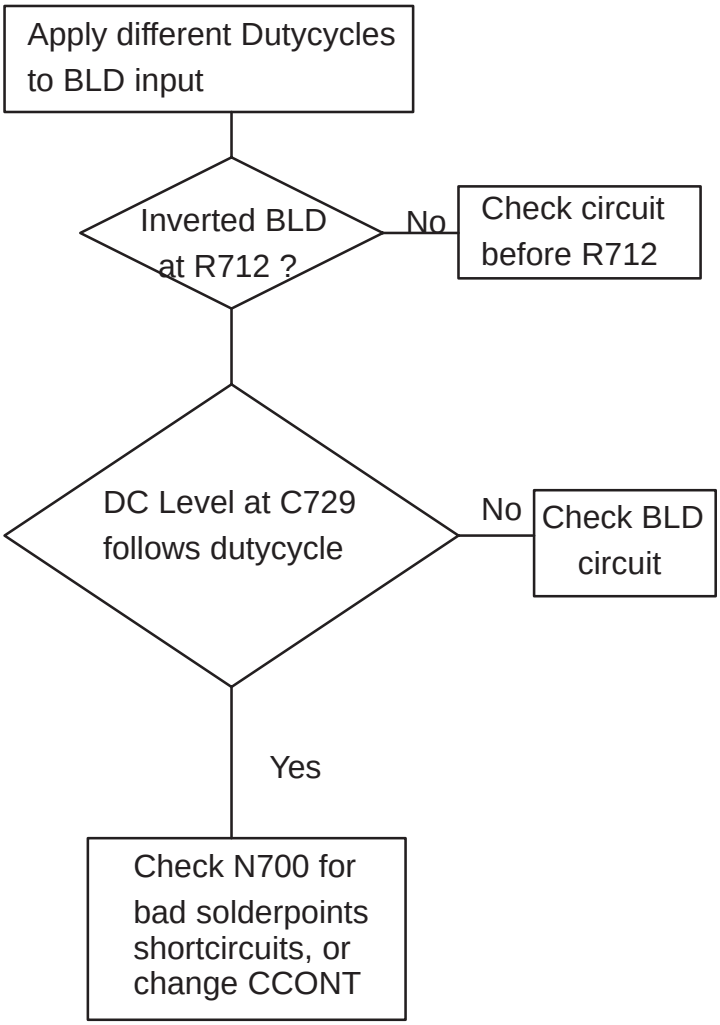


Figure 13. Backlight dimming not working

Audio failure Handsetmode

Setup a call to a GSM–Tester

If uplink is broken use testbox to feed a audiosignal into the circuit, and follow the signal to the COBBA.

If it is O.K. till here, check the PCM interface on PIN 49..52 of N800.

Check N800,D600 for broken solderjoints shortcircuits, or change components

If downlink is broken send a testsignal from the GSM–Tester to phone and follow the signal from COBBA till the Connector.

If no signal comes out of N800 check PCM interface and act as decribed above.

If both links are broken, start the investigation on the N800 side as described

Audiofailure Handsfreemode

First steps:

Check that 8V DC are on the HF–Micinput, when no load is connected.

Check that a 4V DC Offset voltage is at the outputs are on N502

PIN 7, PIN8

If not check the Offset voltage generation (R522, N502)

Check that a 4V DC Offset voltage is at the outputs of N501PIN 1, Pin 7

If not check the Offset voltage generation (R522, N502)

If these checks are passed make a call to the CMD 55.

If there is an uplink failure, feed a signal into the HF–Microphone input, and follow the signal to N800.

If it is O.k. check N800, D600 and the PCM interface

If there is a downlink failure, send a audio signal from the tester to the phone, and follow the signal from the Cobba to the outputs for Lineout and HF speaker.

If no signal comes out of N800 check N800, D600 and the PCM interface

Failure in Data interface

Put the data loopback adapter to the D9 connector and use Win–tesla to control the RS232 outputpins and read the RS232–Inputs.

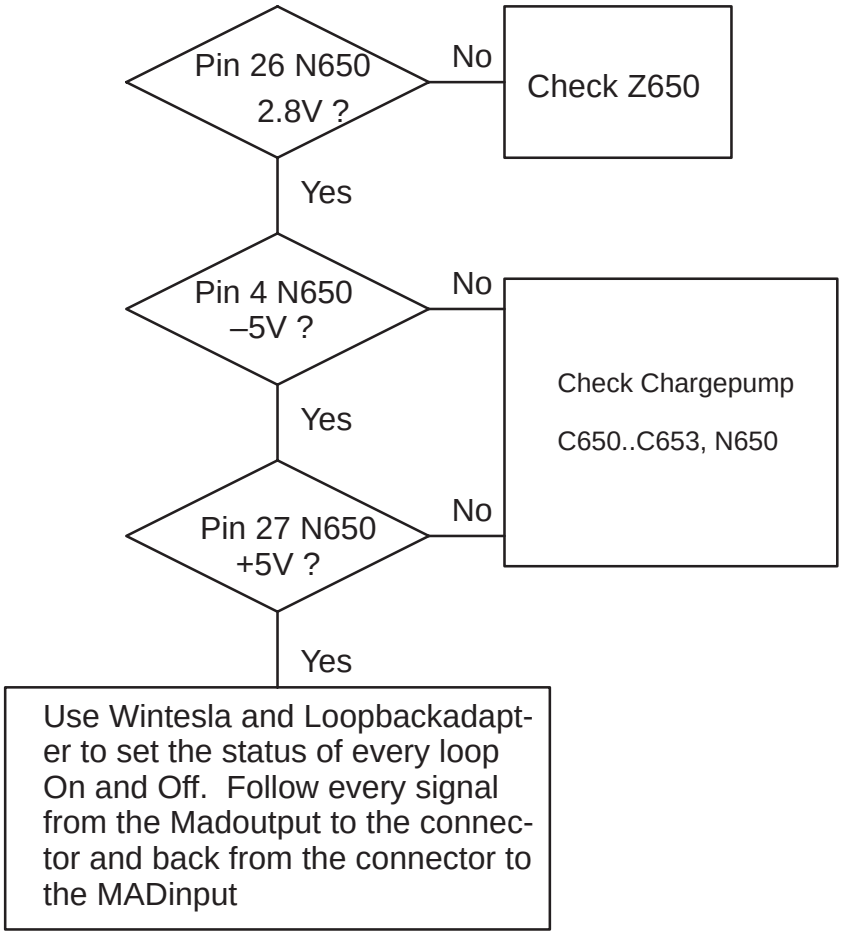


Figure 14. Failure in RS232 interface

SIM–Card not recognized

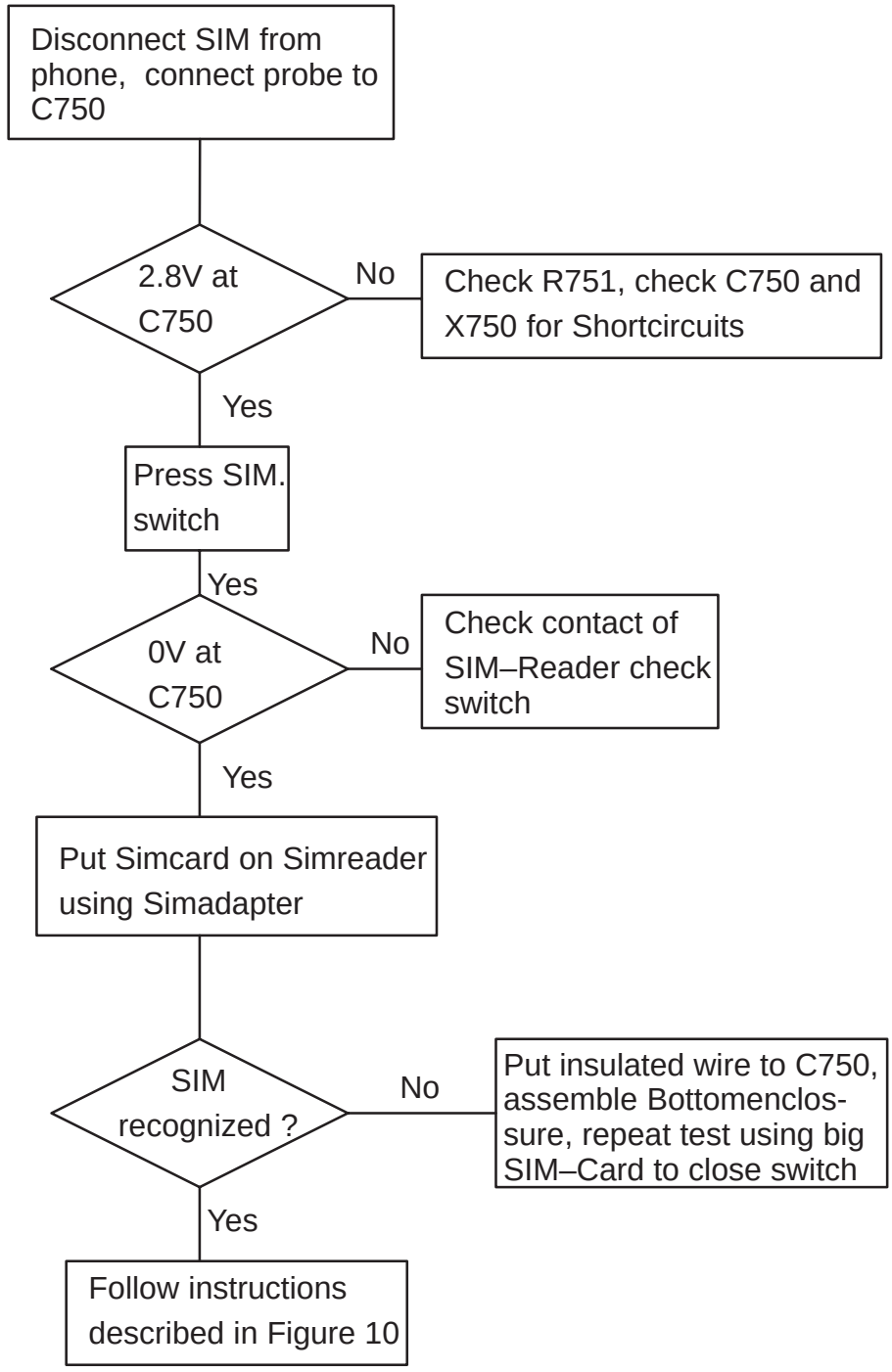


Figure 15.

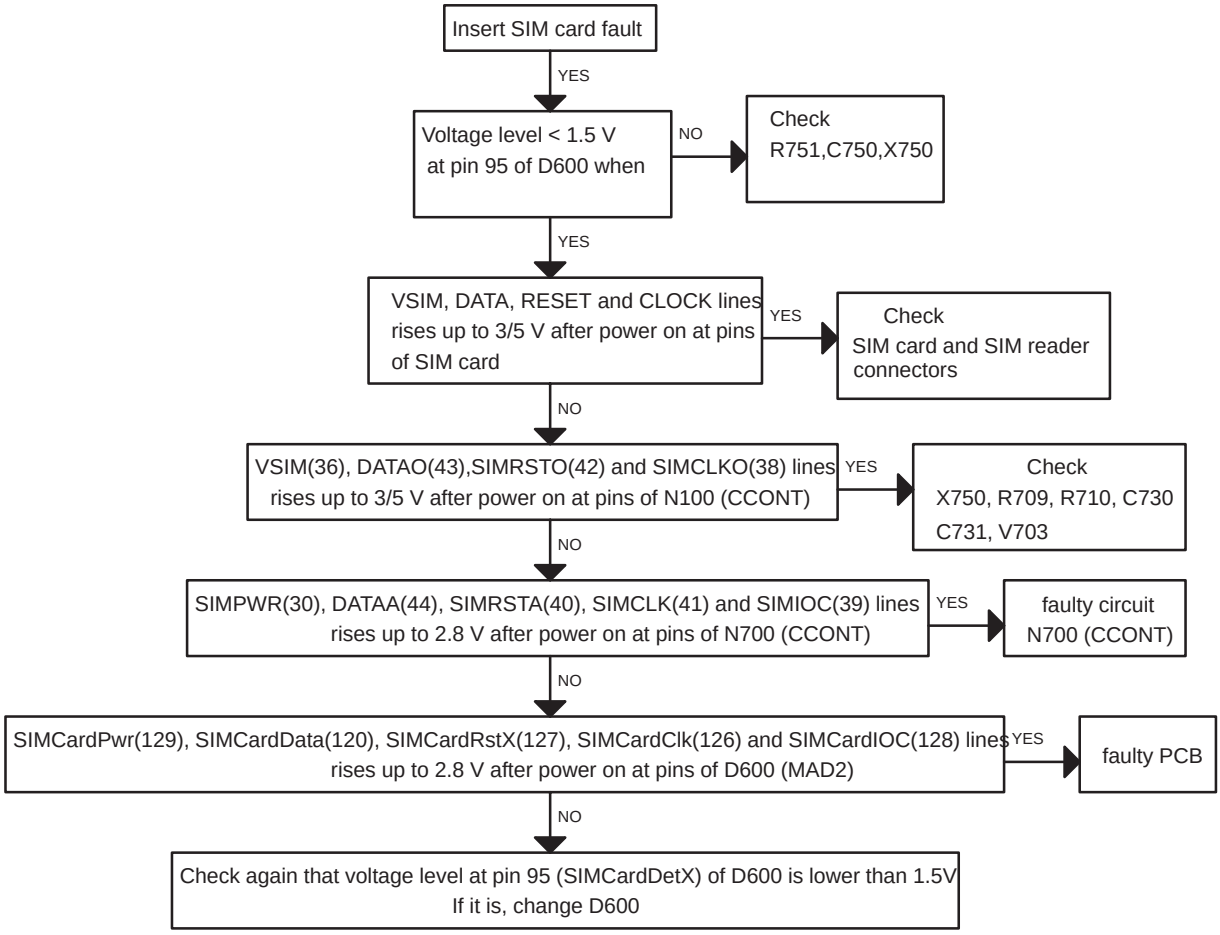
The hardware of the SIM interface from MAD2 (D600) to the SIM connector (X750) can be tested without the SIM card.

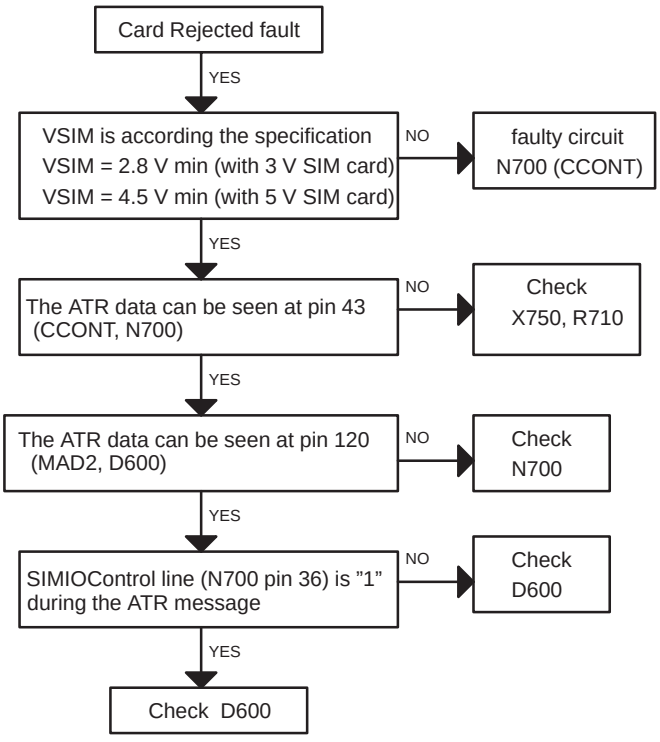
You have to close the SIM–Switch by using the SIMCard adapter with a SIM–Card. When the power is switched on, the Sim interface is started once at 3V and once at 5V. Check with a storage osciloscope, that VSIM,RSTand DATA rise up to 3V and 5V for some short time, and that there is 3V/5V Clocksignal on the Clock Pin. To Trace the signals you should switch the phone on and off several times.

Thus ”Insert SIM card” faults can be found without SIM card.

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

SIM Card failure





2 Handset failures

This section describes faults by active components and trace defects, serial resistances, interconnections etc..

When you get a defective HS then first connect the HS to 8V and check if the Nokia hands are shown in the display. In this case you can be sure that main parts of the HS are running (MCU and oscillator, 5V and 3V power supply, reset circuit, LCD circuit), if not go to section 3.1.

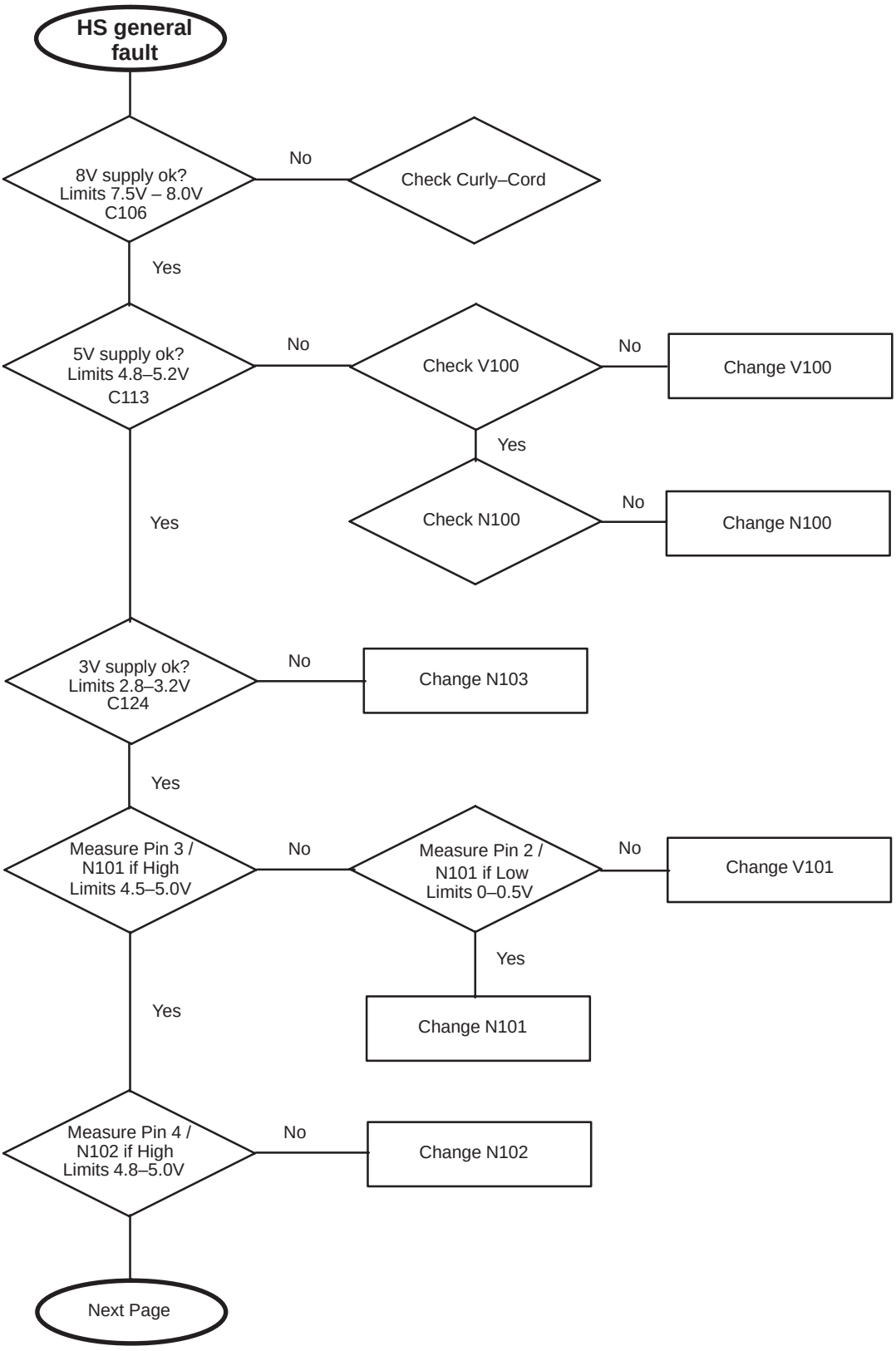
If no further information is shown on the LCD when connected to the reference RU, then there is a problem with the HS MBUS circuit, goto section 3.2.

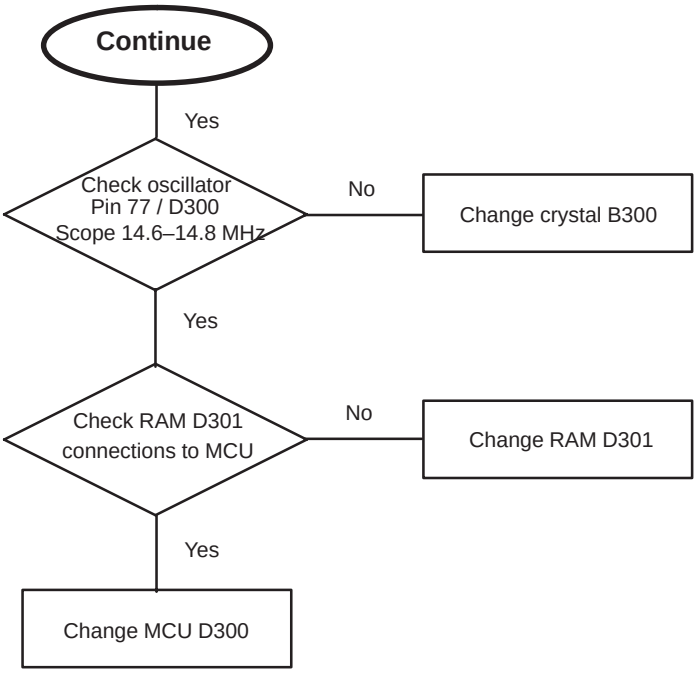
When there is some further information on the LCD when connected to the reference RU you can be sure that the MBUS circuit is working and you can go to other failures like

1. Audio failure
2. LCD failure
3. Sim Interface failure
4. Keypad failure
5. Backlight dimming failure
6. Hall sensor failure
7. Power key failure

These are described separately at the end of the section

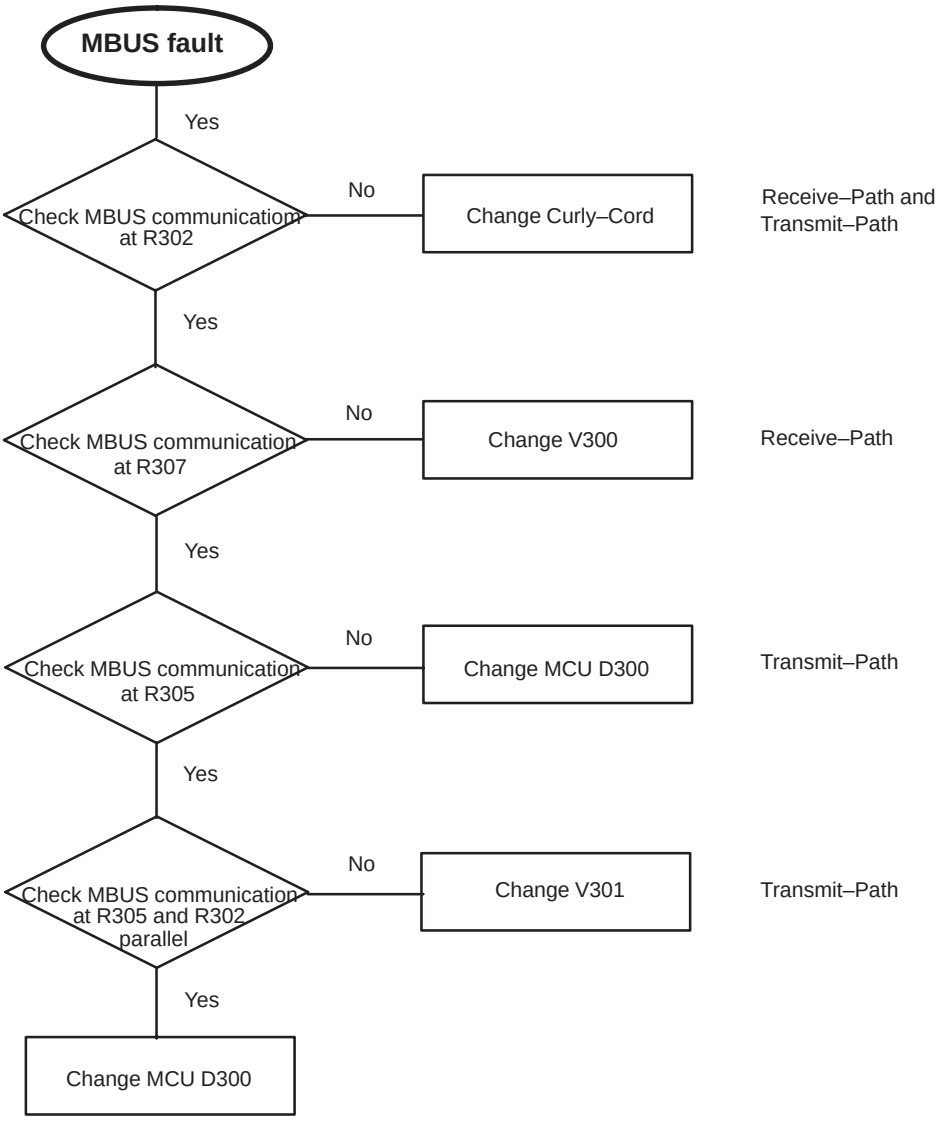
HS general fault




Continue
Yes
Check oscillator
Pin 77 / D300
Scope 14.6–14.8 MHz
No
Change crystal B300
Yes
Check RAM D301
connections to MCU
No
Change RAM D301
Yes
Change MCU D300

MBUS fault

Connect the Handset to a Radiounit and switch on the equipment. Between the MBUS messages are times without datatransfer consider these measurements.



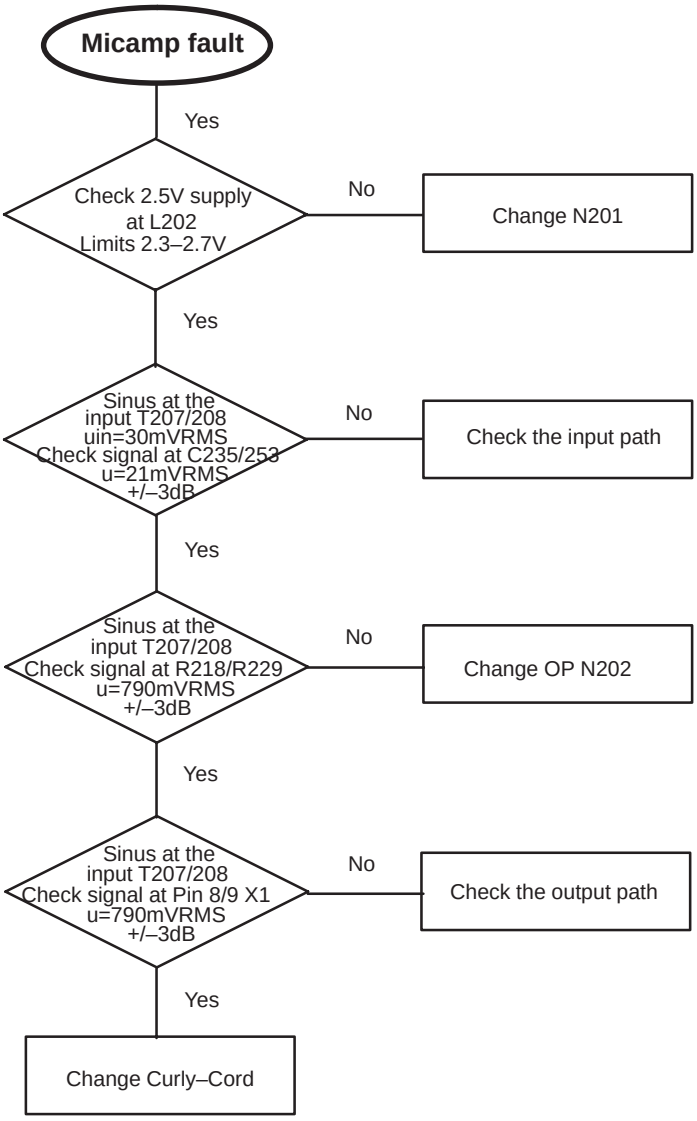
Audio fault

1 Microphone path fault

For checking the microphone path connect the handset to an radiounit and connect this equipment to an power supply and an CMD55. Set the CMD55 for audio in the echomode and make a speech test.

With a microphone path fault the first step is to check the microphone, therefore change the complete microphone and boot and then check the microphone path again.

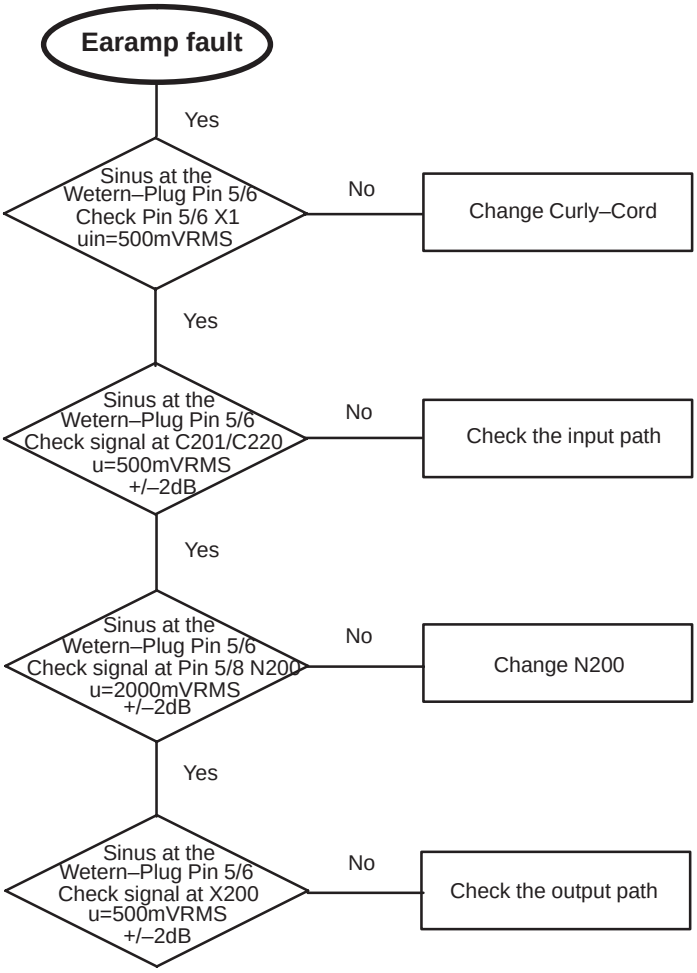
If it doesn‘t work check the complete microphone amplifier stage.



Earpiece path fault

For checking the earpiece path connect the handset to an radiounit and connect this equipment to an powersupply and an CMD55. Set the CMD55 for audio in the echomode and make a speech test.

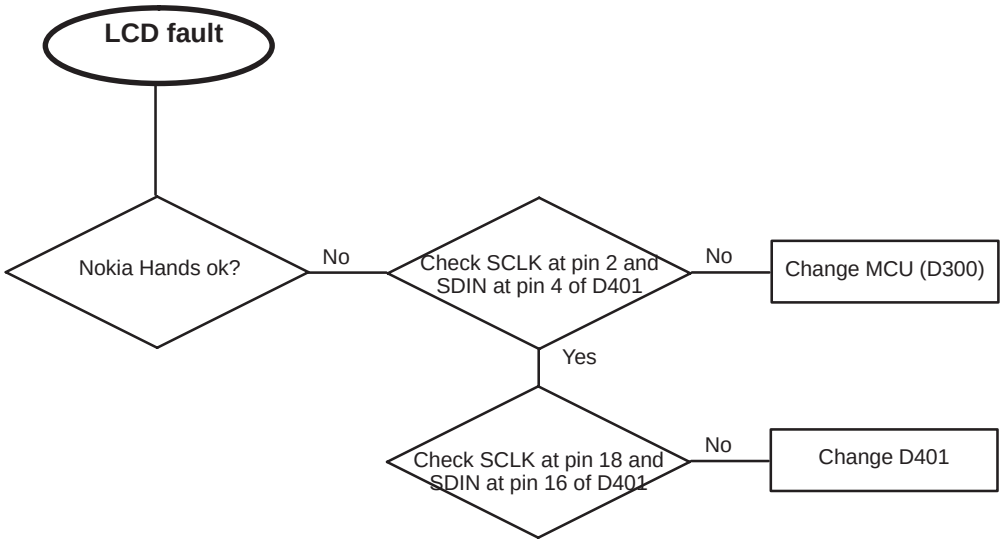
With an earpiece path fault the first step is to check the earpiece resistance is between 26 and 36 ohms. If not then change the complete B–cover with earpiece. Then check the earpiece path again.



LCD fault

If there is an LCD fault first check what kind of failure it is. If there are missing lines or rows, missing pixels or permanently on pixels you have to change the LCD module, because these failures are related to the module itself.

When you connect the HS to 8V power supply and there are no Nokia Hands on the display you have to perform the following steps.



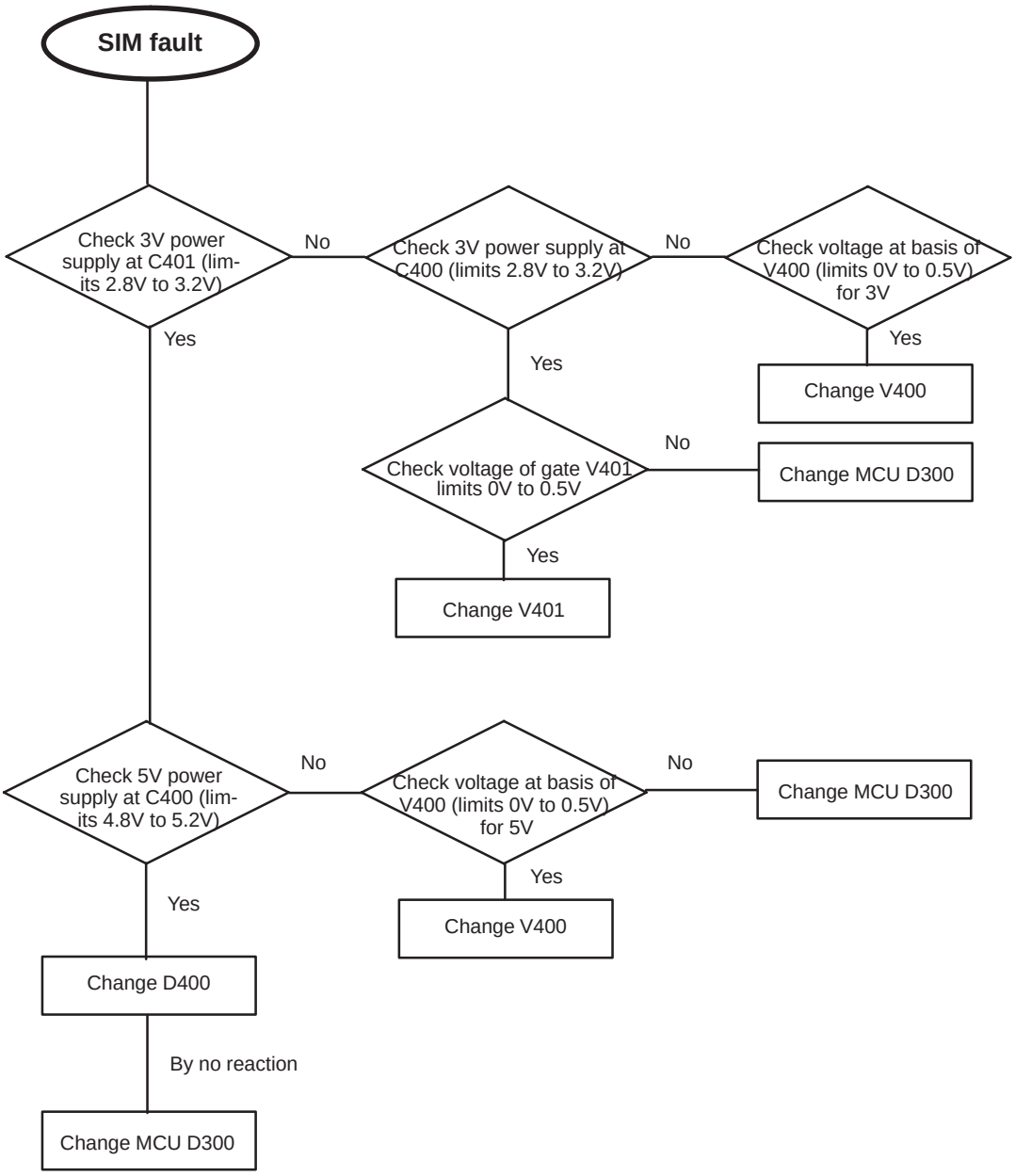
SIM interface fault

For testing of the SIM interface use the Wintesla and also the HCI functions of the Handset. You can use these functions to switch on the 3V and 5V power supply for the SIM interface and to set the SIM_CLK and SIM_data line to low and high level.

If you don‘t have the possibility to set the HCI functions (R&D software) you can only test the functionality of the SIM–door switch by WinTesla and the general power supply for the SIM card.

When you get a Handset with SIM failure first connect it to an RU and put in a Test–SIM, to check if SIM switch is working. If SIM card is not recognized the failure is related to the SIM switch, otherwise to the rest of the SIM interface.

Before error hunting also check the mechanics of the SIM reader and the SIM door for damage or dirt on the contacts. After this goto the following procedure.


SIM fault
Check 3V power supply at C401 (limits 2.8V to 3.2V)
No
Check 3V power supply at C400 (limits 2.8V to 3.2V)
No
Check voltage at basis of V400 (limits 0V to 0.5V) for 3V
Yes
Change V400
Yes
Yes
Check voltage of gate V401 limits 0V to 0.5V
No
Change MCU D300
Yes
Change V401
Check 5V power supply at C400 (limits 4.8V to 5.2V)
No
Check voltage at basis of V400 (limits 0V to 0.5V) for 5V
No
Change MCU D300
Yes
Yes
Change V400
Change D400
By no reaction
Change MCU D300

Keypad fault

First check with WINTESLA which keys are not working. Then change keymat and repeat test. If anything is ok keymat was defective otherwise check connections from MCU to keypad matrix.

If all connections are ok check diodes and pullup resistors for keypress interrupt. If ok change the MCU (D300).

BLD fault

First check which kind of failure you have, is complete keypad and/or LCD illumination not working or only a part of the illumination not working.

If complete keypad illumination is not working measure voltage at base (Pin2/V422). If voltage is approximately 4.4V then change V422, if not change MCU D300.

If complete LCD illumination is not working measure voltage at base (Pin2/V423). If voltage is approximately 4.4V then change V423, if not change MCU D300.

If only one part of the keypad or LCD illumination is not working check the 3 diodes of the common part.

Hall sensor fault

For checking the hall sensor connect the handset to an radiounit and connect this equipment to an powersupply and an CMD55. Setup a call. Then check the handset and the handsfree mode via the cradle. If the audio switch handset/handsfree is working then change the cradle.Also check the level at the hallsensor output N400 is low when the handset is in the cradle. If not change the hallsensor. Is the hallsensor working then change the MCU D300.

Power key fault

When the power key is not working first check the curly cord. If curly cord is ok change power key button else check the passive hardware circuit.