	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	1 / 22

Troubleshooting Guide V3i and V3_05 – Level 3/4

V3i



V3 RAZOR 05



This document was created to assist analyzers troubleshooting Motorola GSM Phones. All Information was collected during the repair in the Repair Entitlement Group Flensburg

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	2 / 22

Contents

Requirements

- System requirements
- Basic information on troubleshooting Motorola GSM Phones
- Advice on working with lead soldering/underfilm

Top Ten defect parts

Troubleshooting Guide

- ALTxx
- AUDxx
- ACCxx
- BATxx
- CHGxx
- CPRxx
- DAPxx
- DIMxx
- DISxx
- FTRxx
- MKPxx
- OPRxx
- SIKxx
- SIMxx
- TONxx

Follow up faults caused by failed repair actions Flash procedures

- Software Update
- Recovering Flash memory in Forced Flash Mode
- Image Flash

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----------------------------	---

	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	3 / 22

Requirements

- System Requirements
- Power Supplies, Oscilloscope, Spectrum Analyzer, Test Set
- Preheater for lead free soldering/solder machine for BGA's
- Microscope
- Repairstudio/Radiocomm
- Field Service Bulletins
- FASTT
- Block diagrams/Schematics
- PinNetFinder FLVIEW
- Basic information on troubleshooting Motorola GSM Phones
- Make sure all contacts are clean, especially the EMU-Connector
- Use newest approved Software
- RESET/MASTERCLEAR can fix some issues
- Do a visual inspection on customer abuse/liquid contamination
- The Processor U800 replacement always requires a Flash IC replacement
- Advice on working with lead free soldering/underfilm
- Use lead free flux
- Use preheater(HAKKO 853)
- Use tool for resolder (PA and U250), part no 19500950 (Pre soldering Fixture)

-

part no 99991966 (Metal stencil GSM Edge) part no 19501966 (Mounting Bracket GSM Edge)

part no 99991964 (Metal stencil for PA) part no 19501964 (Mounting bracket for PA)



Use of preheater

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	4 / 22

Top Ten defect parts

The following is an analysis summery of the V3i and V3_05 repaired during NPI process by the Repair Entitlement Group CSS Flensburg

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	Radio Type:	V3i	•	Defect Part:		•	
1							
	Customer Complain Code:		•				
	Root Cause Code	:	•				
	D				-		
	Repair Level:		•	Category:		_	Search
	281				NO FAULT FOUND		
	222				U700		
	95				PCB		
	88				U250		
	88				U50		
	53				U800		
	41				U900_AUL		
	40				Q960		
	33				RE-FLASH_FLEX		
	31				SW-UPDATE		Clear All
							F . 0
		Search Result]		Top 10 Defect Parts		Exit
1570 rows	a farmed			1074 entries f	iar 170i forund	Version 2.	c
2º	Radio Type:	V3_05	¥	Defect Part:		¥	
	Customer		-				
	Complain Code: Root Cause Code						
		·	<u>•</u>				
	Repair Level:		•	Category:		•	Search
	567				U250		
	94				U50		
	73				U700		
	68				PCB		
	17				U900		
	14				Q960		
	14				U800		
	8				U300		
	7				Y900		
	6				NO FAULT FOUND	· _	
							Clear All
		Search Result		L	Top 10 Defect Parts		Clear All Exit
993 rows	found	Search Result		822 entries fr	Top 10 Defect Parts	Version 2	Exit
993 rows	found	Search Result				Version 2	Exit 6

	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	5 / 22

Troubleshooting Guide

First Step

Please make sure beforehand, that the problem at hand is not a SW related issue that can be solved with a 1FF update and a Master Reset/Clear. In many cases a simple Master Reset can already fix the problem.

The following section is meant to be a help in troubleshooting problems which are already Identified as PCB related

ALT01 Alert – Ring tone, no ALT02 Alert – Ring tone, low ALT03 Alert – Ring tone, noise/distortion Check ALERTP and ALERTM -- both should have around 2.1Vdc

- <u>If not</u> check L1422/L1423/ for broken connection,C1424 for low resistance VR1400/VR1422/VR1423 for shortcut to ground
- check PCB for open tracks from ALERTM to U900-V10 /ALERTP to U900-U8
- you can either use"Repair-Studio" to switch on 1 kHz tone to the alert to check for open tracks, but be careful: You can have 1 kHz and audio in call at ALERTM/ALERTP, but no alert-tone, because the ATLAS is defect!
 <u>if 1kHz is ok</u>, replace Atlas (U900). Please use underfilm for U900.

The alert signal is converted to analog and amplified by the ATLAS, but generated by the Neptune, so if the ATLAS alert audio path is ok there could be a problem with the Neptune not generating the alert signal.



ALT11 Alert – Vibrator, no ALT12 Alert – Vibrator, weak

Turn on vibrator using Repair Studio/ Radiocomm. Measure V_VIB – should be about $2Vdc.V_VIB$ is provided directly by the ATLAS (U900). To verify if the vibrator is defective a simple method is to provide a supply voltage (1Vdc should be enough) via test probes directly on the vibrator G1 (radio in off state!). It should be rotating, if not replace the vibrator G1. Check the diode D_VIB. Otherwise replace ATLAS (U900). Please use underfilm for U900.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	6 / 22



AUDxx Audio problems

First step on every audio related problem is to identify which audio paths are affected. If the audio signals in a loop are ok, there could be an audio problem in a network call. This could be due to an ATLAS or Neptune related defect.

AUD01 Audio – Earpiece, no AUD02 Audio – Earpiece, low

Check HAND_SPKRM at C1014 and HAND_SPKRP at C1015. Both should have around 1.4Vdc offset voltage, if audio-loop is switched on and additional up to 2,7Vpp at 1 kHz, if test-tone is switched on.

- If not check J2 for solder shorts, C1014/1015 for low resistance
- (eventually) check PCB on open tracks from J2 to C1014/U900-T6 and J2 to C1015/U900-R7
- If ok, replace Atlas (U900). Please use underfilm for U900.



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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	7 / 22

AUD07 Audio – MIC, No AUD08 Audio – MIC, Low

Set radio in audio loop using Repair Studio/Radiocomm

- check MIC BIAS1 at C1207 should be around 1,75Vdc
- <u>if not</u> check C1207/1206/1201/1202/1200/1203 for low resistance
- **<u>if ok</u>** check MIC_IN_M at C1206 while blowing into the microphone to see the audio signal caused by the blowing
- <u>if not</u> replace microphone
- **<u>if ok</u>** replace ATLAS (U900) **Please use underfilm for U900.**



ACC07 -- Accessory - Bluetooth module, no Operation

Verify it Bluetooth can be activated and is able to find other Bluetooth devices.

- If not, check oscillator Y301 (26MHz).
- check the BLUE_WAKEB
- replace U300
- If not, replace Neptune (U800)

Note: You can only measure the signals, when Bluetooth is activated.



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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	8 / 22

BAT02 – Battery life short

BAT03 – Battery cant turn on phone CHGxx -Charging problems

TON01 – No Turn On (draws high current)

In probably most cases these problems are caused by an off current. First verify whether there is an off current. If there is an off current, it should be checked whether the device draws current via battery and/or via external connector.

In case of an off current via battery there should be a low resistance (less than ~200 Ohm)/ or a short from BATT_P (J2-Batt) to GND.

To localize the defective part causing the short/ low resistance a simple way is to freeze the board with a coolant-spray, supply a battery voltage from a power supply using micro clamp-type test probes, and see which parts are getting warm. **This is a very basic and essential method to troubleshoot off current / high current consumption failures.**

The power supply (for BATT_P) should be set to 3,7V with current limitation to 2A.We strictly recommend using the Power Supply Unit Current Drain Meter to check the current drain of the PCB.

Shields covering suspected parts should be removed before freezing the PCB.

The PCB should be handled with care. After removing the shields the PCB should be given some time to cool down slowly before freezing it to far below zero to avoid physical stress to the multilayer PCB with lead soldered parts.

In some cases the part, which is getting warm has an internal short itself. After removing this part the off current should be fixed. For verification check off current or measure resistance BATT_P (J2-Batt) to GND.A new part can be placed.

If the short / low resistance remains after replacing the part which getting warm, it should be checked which signals / voltages this part provides. In the most cases this part will provide a supply voltage to other parts which can also get warm due to an internal short.

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To find out a defective part an easy way is to use the Flensburg Layout Viewer to follow the signal (check for SHORT_RESISTORS after which the signals possibly could have a changed name), and remove the parts one after another, until the short is gone.

Most frequent parts with internal shorts causing these kinds of failures are the PA (U50), the ATLAS /U900), the Q960, and the Neptune (U800)

1. Example:

- BAT00 -- radio draws about 250mA in standby, no off current
- U900 are getting warm
- U900 provides BR 3,85V for PA (using Flensburg Layout Viewer)
- GSM-PA is also getting warm (see below)
- U50 itself has an internal short



Defective U50

2. Example:

- BAT02—radio draws about 40mA off current
- Only ATLAS is getting warm (checked with coolant-spray); nothing else
- ATLAS draws off current-> replace ATLAS. Please use underfilm for U900.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	10 / 22

BAT04 – Invalid Battery

- Verify OWB (J3_BATT-2) while PCB is connected to EMU_USB cable. It should be 2.775V.Check also J3 for broken part.
- If it is low, check D1426 and R1200 (4,7k).
- If they are ok check U250 inform to make U250 cold with coolant-spray.U250 could have internal interruptions at product code 03/06 to 27/06!!!!
- If the voltage OWB stays low, it should be a problem with the Neptune (U800).





CHG01 – Does not charge

If the phone seems to charge, but battery meter stays at low level, check whether there is a high current consumption or an off current via battery. If so please follow troubleshooting as described in the **BATxx** section of this document.

If there no off current, check the whole path for the charging current. Make a battery/charger phasing to see, if only the charger current or also the battery-phasing is affected. For a charger current problem only:

Check Q903, Q904, Q905, Q906, R904, R905, R910, J3 for broken contact <u>if ok</u> replaces ATLAS (U900). **Please use underfilm for U900.**



For additional battery phasing problems (for example: battery sense or battery meter) replace ATLAS (U900)

Battery Thermistor problem

Check BATT_Therm at J3-3, it should be 2,7Vdc.If it is not check R990, R991 and C990 for low resistance.

If ok replace the ATLAS (U900) .Please use underfilm for U900

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	11 / 22



CHG02 - No charging indication

If display indicates "Charging not possible" or the phone powers on while plugging in the charger, but is not charging. Then check the USB_ID line at J1_USB-2 with phone powered on by battery. It should be 2, 7Vdc (2,4Vdc is **not** enough!)

- <u>If not</u> check VR950.USB_ID voltage must be 2,7Vdc,if VR950 is removed
- Check voltage at C951-1 (2,7Vdc)
- <u>If ok</u> replace the ATLAS (U900) because the EMU-chip is in ATLAS integrated. Please use underfilm for U900.



- **CPR01 Voice call Can't make**
- **CPR02** Voice call Can't receive call
- **CPR03 Voice call no service**

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	12 / 22

First step in every Call related problem should be to figure out whether there is a receiving problem or a transmitting problem and which bands are affected.

Make sure, that the RF connector (J40_RF) is cleaned (with cleaner or alcohol) before making a phasing/call-processing test or if the test fails!

No TX GSM900 (850/1800/1900)

Let radio transmit on GSM900 using Repair Studio/Radiocomm.

- Check RF_OUT_1 at C15
- <u>If ok</u> in size and form (if unsure compare to good radio) check J40

If the power is only a few dB below at J40, then follow the repair-steps.

- if TX at J40 is not ok check PA input (LB_TX_IN) at C57
- if TX_EN_IN is good, following signals should be present:
- BP_3,75Vdc at C72
- RF_OUT_1
- If RF_OUT_1 is not ok, then change PA (U50)
- If TX_EN_IN was not present, change U250_SYNTH

Important!! U250 could have internal interruptions at product code 03/06 to 27/06.



No RX GSM900 (850/1800/1900)

Inject a RF from Test Set. Check RF_OUT_1 at C15.

There no other test points to measure the RX-signal, because the signals are directly go to U250_SYNTH.

So you can only check the signals from U250_SYNTH.

- VCO_REG at C155
- RF_REG at C154
- PERIPH_IO_REG at C227
- RF_REG at C151
- RX850 at R50

Many TX-RX failures are problems with U250_SYNTH.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	13 / 22

To change U250 you should work with the tool for resolder.

Important!!U250 could have internal interruptions at product code 03/06 to 27/06.



Note: For AFC phasing the receiver is used. So, if there is any RX fail, the AFC phasing on that frequency band also fails. If the RX phasing is kobo only AFC phasing fails, a bad crystal is most likely cause.

- replace Y201

DAP11 – Data Application – cannot upgrade software OPR03 – Operation – Error Message

Make sure, that you have adjusted 5Vdc on your power supply for the EMU-cable. Watch the display when entering the flash-mode. If an error message appears, do following action:

- for "corrupt code error": make a Reflash, when failed Flash (U700) is defect
- for "code SEG error": Flash (U700) is defect. A reflash is not successful!

Otherwise go to the **TONxx** section on this document.

DIM01 -- Display Main – no display DIM08 – Display Main – no backlight DIM09 – Display Main – Low/Dim backlight DIS01 – Display Secondary – no display DIS07 – Display Secondary – no backlight DIS08 – Display Secondary – Low/Dim backlight DAP10 – Data Application – poor picture quality

Make sure that the problem is not located in the Flip Assembly, by testing PCB with a good one and do an optical check of J2_KBD. Make a **reflash /flex with a 1FF-File** at first.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	14 / 22

The following supply voltages for the Flip Assembly should be present:

- ATI_RESETB_2,7V at C801
- V_BOOST_5V at C 936
- REG_3V at C33
- CLK_32KHZ_2_7V at CLK_32KHZ_2_7V-1
- VBUCK_FLIP_1,875V at C970
- VBUS _5V at C13

The voltages can be ok without a flip connected, but can break down, if a flip is plugged in, although the flip is ok!

If ok check:

- Q960 for broken part
- IO_REG_2,7Vdc at C830 generated by Q960
- VRBB 4 for broken part
- R_LCD 1-6 solder short
- R_LCD 2-6 solder short
- U 1401 for defective part

If all of these are ok, it should most likely be a problem with Neptune (U800)



	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	15 / 22

DIM01 – Display Main – no display MKP01 – Main Keypad – no Function/hangs TON01 – Turn on/off – No turn on Make a **reflash /flex with a 1FF-File** at first.

Flip detect problem

Units with a flip detect problem will show following symptoms:

- no power on via battery
- no main display via EMU connector supply
- CLI display is not switching on open/close flip
- No keypad function

Check PERIPH_IO_REG at U1401-5 – should be 2,7Vdc (High)

- check HS_INT at U1401-4 should be 2,7Vdc, when flip is closed
- If ok, replace Neptune (U800)

MKP01 - Main Keypad - no function/hangs

SIK01 – Side Keys – no function

Due to the keypad matrix architecture with 8 rows in 4 columns it is quite useful to verify which keys (if not all) are affected. By knowing which keys are not working, it is possible to find out which row or column is affected. You can either use Ohm Meter to check the resistance to GND for verification, which line is affected. By using the FL Viewer it can be tracked which filters the signal passes until it reaches the Neptune.

Check: - FI

- FL 1401
- VRBB1
- J2_KBD for loose pins or solder short

If the keypad connector/Filters are ok it's probably a problem with the Neptune (U800).



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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	16 / 22

SIM01 – Sim card – check card/insert SIM

The most problems of V3i SIM card are caused by a tombstoned part R 805 near Neptune.

Measurement on the SIM interface is a little bit difficult, as not all signals will be present until a SIM card and a battery are inserted. As far as I know there is still no SIM feature implementation in Repair Studio or Radiocomm. In the most cases it should be possible to figure out which part is defective by simply using the Ohm Meter to measure the following signals to GND:

- VSIM at E 909-1, C 828-1

If far less then 30 kOhm to GND, it could be a defective ATLAS (U900)

- SIM_DIO at R 1210-2,VR 1412-1
- SIM_RST at R 805-2,C 1208-2
- SIM_CLK at R1201-1

<u>If</u> any of these has far less then 30 kOhm to GND, it could be a defective Neptune (U800). Before replacing the Atlas (U900) or the Neptune (U800) make sure that none of the associated capacitors or resistors has low resistance to GND.

The VSIM can also be checked with the oscilloscope. First put the probe to the test point (C828-1) and then switch on the phone (by switching the output of the power supply). After a few seconds the VSIM (2,7Vdc) should appear for about one second.



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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	17 / 22

TON01 – No Turn On

Verify if radio doesn't turn on (assembled with display). If it does, but doesn't enumerate via EMU-Connector at RSD/Repair Studio there should be a problem with the USB connection. In some cases a 1FF SW reflash in FORCED FLASH MODE (by connecting EMU Connector to radio while "*" and "#" are pressed) can fix the issue.

- <u>If not</u>, visually check EMU Connector for mechanical defects or contamination on contacts, bad soldered pins or solder shorts.
- Check the DP_RXD line at VR921A-1 (J1_USB-3) and DM_TXD line at VR922A-1 (J1_USB-4) with an Ohm Meter to GND to make sure, that there is no short to GND or an open track.
- Check VR 921A, VR922A, R920 and R921 for high resistance
- If ok replace ATLAS (U900). Please use underfilm for U900.
- If not ok, replace Neptune (U800)

The USB interface is located in the Neptune, but the data bus is switched through by the EMU-chip (EMU-chip was integrated in U900)

If the radio doesn't turn on, but draws high current (>500mA)

- Please follow troubleshooting instructions as described in the **BATxx** section of this document.

Note:

- Watchdog

In case the phone draws current but switches off after a few seconds, you can force the phone not to switch off, by setting the **Watchdog C902**.By just solder across C 902-1 and C 947-1 (PERIPH_IO_REG 2,775Vdc) the WATCHDOG signal will be pulled to HIGH (PERIPH_IO_REG 2,775Vdc) and the ATLAS will not switch off its power regulators. You will then be able to measure all the voltages or to do a thermal troubleshooting by using coolant-spray.

Note:

Make sure to remove solder short after repair!!!!

- "power switch"

The second way to check the voltages is to use a switch in the plus line of your power supply. You can put the probe to the test points of each voltage and view the voltages appearing for a short time (half a second) during each switching action.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	18 / 22



If radio draws no current at all (also not for a short time) it's most likely a problem with the 32.768 KHz clock generated by Y900

- replace Crystal Y900
- If unsuccessful, replace ATLAS (U900). Please use underfilm for U900.



Note:

If the current drain is in normal range (40mA to 230mA) but cannot connect to Repair Studio/RSDlite (USB device error) then look at U250 for product code (03/06 to 27/06), or use coolant spray to freeze U250. If the phone connects to Repair Studio/ RSDlite then replace U250.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	19 / 22

If the current consumption is in normal range (40mA to 230mA)

Try doing a 1FF SW reflash in FORCED FLASH MODE. If radio enters the forced flash mode or starts in flashmode by itself the main supply voltages for the logic section should be ok – Most likely the trouble can be found in the logic section (Neptune/Flash).

For "critical error xx xx" go to the **<u>DAPxx</u>** section of this document.

If unsuccessful, a flash log file generated by Repair Studio/RSD can be viewed. There

You will find the reason for the flash operation failure. However, this information can be ignored, as in almost every case the next steps will be

- replacing Flash U700
- replace Neptune U800
- replace ATLAS U900

If the phone enters flash mode by itself as "S Blank Neptune" at Repair Studio/RSDlite, The **Neptune** cannot recognize any flash:

- freeze U250 with coolant spray, if it is starting up now, then change U250
- replace Flash (U700) if unsuccessful additionally
- replace Neptune (U800)

TON03 - Turn on/off - auto power down in standby

If phone stores panic: DSM_MEASUREMENT_ERROR there is most properly a problem with the 32.768 KHz clock, which is needed for the whole radio when in deep sleep mode. Replace Y900, test radio with a network SIM card and let radio enter deep sleep mode.

- if radio still powers down, replace ATLAS (U900)

Follow up faults caused by failed repair actions

Quite a lot of repairs which were sent to Level 4 service have a second fault, which is caused by an unsuccessful repair attempt.

We strictly recommend to a visually check the PCB for skewed or tombstone parts, solder shorts or heat bubbles in PCB after every soldering action. Especially small parts which are located close to shields can easily be misplaced during removal or setting of the shields. We found that some parts seem to be more heat sensitive then others.U250, U300 and the MIC are heat sensitive.

Also we found many badly reworked PA's (U50).

Please use the tool for resolder the PA, also for U250.

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	20 / 22

The key-differences between V3i and V3_05 are:

- no external card reader on V3_05
- no RTC battery on PCB for V3_05, is integrated in Flip
- another Bluetooth Chip on PCB
- for V3_05 was Class 1, Partnr. 4888735Y01
- for V3i was Class 2, Partnr. 5189447N02

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	21 / 22

Flash procedures for V3i

Note: To using all 1FF files phone switch only in Flashmode when a Display is connected.

Note: It is very important to do a restart after every flash process! Otherwise the phone will start up in flash mode again.

Software update

Following steps are necessary to update the Software to the latest approved Software:

- unlock phone (if subsidy locked)
- flash customer specific 1FF superfile (example: DC One File Flash:
 R479_G_08.B4.85R_PDS005_LP0039_DRM0101_VSTGERMAN206_JPJAVA_G_08_V3I_06_00_03R_SE7721AXXF10
 CF_1FF.SBF
- after restart:
- take out of "in Factory" if necessary
- perform a Master Reset/Master Clear

Recovering Flash Memory in Forced Flash Mode

If the phone doesn't start because of corrupted software it might be possible to recover it:

- connect phone to EMU – cable while pressing "*" and "#"

The phone should start in flash mode now: S Flash Neptune

- flash1FFsuperfile(example:DCOneFileFlash:
 - R479_G_08.B4.85R_PDS005_LP0039_DRM0101_VSTGERMAN206_JPJAVA_G_08_V3I_06_00_03R_SE7721AXXF10 CF_1FF.SBF
 - after restart:
 - perform a Master Reset/Master Clear

If the phone doesn't start in flash mode or as: S Blank Rainbow Neptune, there is a problem. Please follow the troubleshooting instructions as described in the TON01 section of the Troubleshooting-Guide.

Image flash

Following steps are necessary to flash a phone with blank (new) flash memory:

- connect phone to EMU-cable
- phone will start in flash mode as S Blank Neptune
- flash image file (example: image file: R 479_G-08.B4.2AI_GNPO_2_RFDI_LP0003_DRM0101_GMPSLQA000AA03B_image
- after restart:
- write and save Primary Subsidy, Secondary Subsidy and Service Password
- write and save IMEI
- write and save Serial Number and Bluetooth- address
- upgrade: flash latest approved costumer software as 1FF file
- after restart:
- take out of "In Factory"
- perform a Master Reset/Master Clear
- do a complete phasing/call processing

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	Doc. No:	TSG_V3i/V3_05
Motorola GmbH, CSS Center, Mobile Devices	Date:	04.09.2006
Title: Troubleshooting-Guide V3i / V3_05	Page:	22 / 22

Flash procedures for V3_05

Note: To using all 1FF files phone switch only in Flashmode when a Display is connected! Note: It is very important to do a restart after every flash process! Otherwise the phone will start up in flash mode again.

Software update

Following steps are necessary to update the Software to latest approved Software:

- unlock phone (if subsidy locked)
- flash customer specific 1FF superfile (example: DC One File Flash: R4515_G_08.BD.43R_PDS005_LP0039_DRM0101_JPJAVA_G_08_R4515_06_00_02R_SE6770AXXF1081_1FF.S BF
- after restart:
- take out of "in Factory" if necessary
- do Master Reset/Master Clear

Recovering Flash Memory in Forced Flash Mode

If the phone doesn't start because of corrupted software it might be possible to recover it:

connect phone to EMU - cable while pressing "*" and "#"

The phone should start in flash mode now: S Flash Neptune

- flash1FFsuperfile(example:DCOneFileFlash: R4515_G_08.BD.43R_PDS005_LP0039_DRM0101_JPJAVA_G_08_R4515_06_00_02R_SE6770AXXF1081_1FF.S
- after restart:
- do Master Reset/Master Clear

If the phone doesn't start in flash mode or as: S Blank Rainbow Neptune, there is a problem. Please follow troubleshooting instructions as described in the TON01 section of the Troubleshooting-Guide.

Image flash

Following steps are necessary to flash a phone with blank (new) flash memory:

- connect phone to EMU-cable
- phone will start in flash mode as S Blank Neptune
- flash image file (example: image file:
- R 4515_G-08.BD.22I_RFDI_LP0003_DRM0101_GMTV3xx050AA03F_image after restart:
- write and save Primary Subsidy, Secondary Subsidy and Service Password
- write and save IMEI
- write and save Serial Number and Bluetooth- address
- upgrade: flash latest approved costumer software as 1FF file
- after restart:
- take out of "In Factory"
- perform a Master Reset/Master Clear _
- do a complete phasing/call processing

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