



# Working Instruction, Electrical

Applicable for T650 and T658

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# 1 Read this first!

## CAUTION

*Keep all contact surfaces clean, no dirt or hand grease!*

*Protect the phone from ESD damages whenever it has been opened by using:*

- *ESD-wristband*
- *ESD-gloves*

## 2 Lead-free soldering

**KEEP ALL CONTACT SURFACES CLEAN OF DIRT AND HAND GREASE!**

**THIS PRODUCT IS MANUFACTURED WITH LEAD-FREE SOLDER AND LEAD-FREE COMPONENTS!**

During electrical repair, it is critical to make sure that no lead is introduced.

This symbol indicates that the product is lead-free.



All lead-free PBA's will be marked with this symbol.



A lead-free work area must be set up completely separated from work areas that are used to make lead repairs.

The lead-free work area must also be clearly labeled with the lead free symbol as shown in the adjacent picture.

The items on this desk must remain lead-free.

They must be adequately labeled to make their lead-free status clearly and easily recognized.



## Lead-free soldering *continued*

LFS (lead-free solder paste) characteristics:

- High melting point (typically 220°C)
- Low wettability
- High surface tension
- Difficult to spread
- Recommended tip temperature = 370°C

**WHEN SERVICING PBA'S THAT HAVE BEEN MANUFACTURED WITH LFS (LEAD-FREE SOLDER PASTE), LFS MUST BE USED. IF NOT, THERE IS A HIGH RISK FOR UNRELIABLE SOLDERING JOINTS.**

Lead-free solder joints are more difficult to inspect because they do not have shiny surfaces like leaded solder joints.

Also, lead-free solder does not flow as well as leaded solder, so some of the solder pad areas may remain exposed.





## 3 BGA equipment reflow profiles

### 3.1 General

This document contains reflow profile recommendations for mobile phones and similar products.

They are just general recommendations and considerations have to be taken for every single product.

The solder paste is secondary but could also affect the parameters.

In this document one alloy is specified:

SnAgCu (Lead free) melting point 217°C

### 3.2 Temperature measurement

At least four probes should be used.

They should be placed on components with the highest and lowest thermal mass.

The probes shall be located in the beginning, in the middle and at the end of the board/panel.

It is recommended that the probes are soldered on the board, but glue and capton tape could also be used, if necessary.

At least one probe shall be placed in the air or on top of a component.

These values are strongly depending on the BGA replacement equipment.

Nozzle type will be chosen after the outer size of the actual component.

Make sure the nozzle does not affect any nearby placed components.

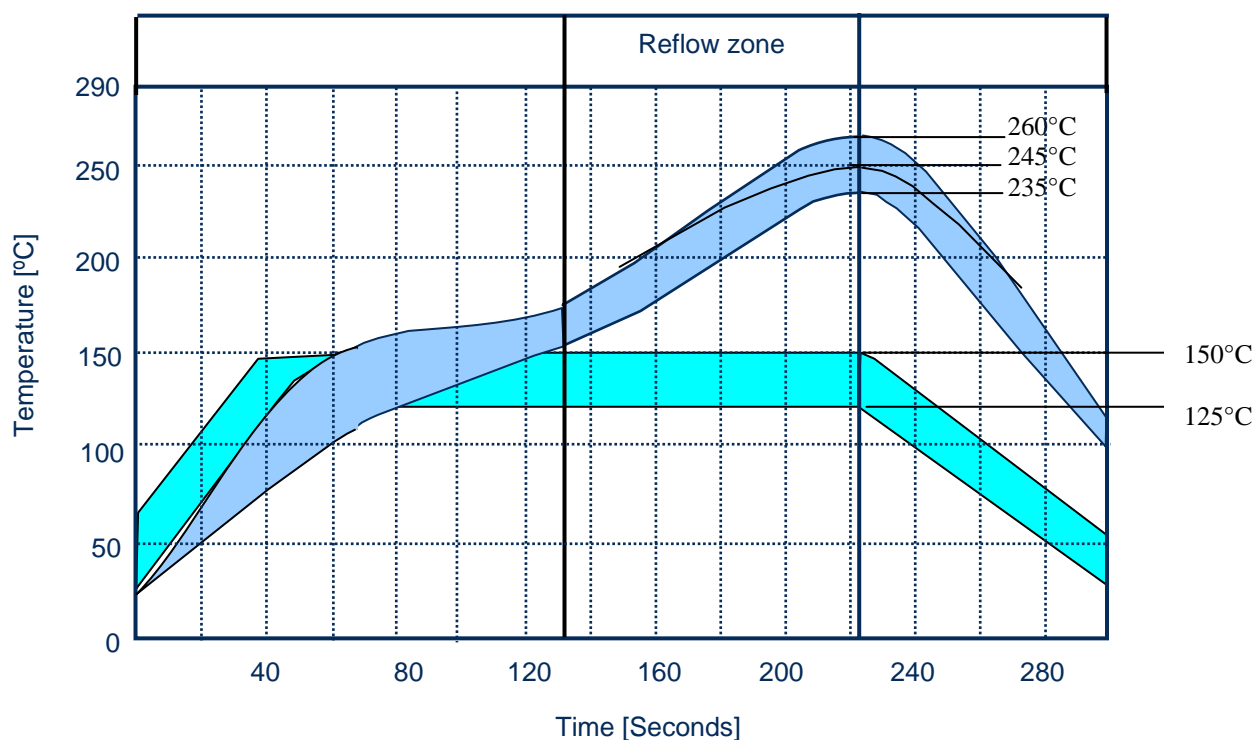
***These values are recommendations and may have to be changed depending on the type of equipment.***

***The maximum temperature for any component must not exceed 250°C.***



### 3.3 Reflow profiles

#### Sn/Ag/Cu (lead-free)



|                         |                            |
|-------------------------|----------------------------|
| Ramp rate               | < 4°C/sec                  |
| Ramp rate cooling zone  | < 6°C/sec                  |
| Time above liquidus     | 60-150 sec                 |
| Minimum temperature     | 235°C                      |
| Maximum temperature     | 245°C or 260°C* for 10 sec |
| Bottom heat temperature | 125°C-150°C                |
| Total time              | Approx. 4-7 min            |

\* The higher temperature in case the board has extremely high  $\Delta T$ .

### 3.4 REWORK BGA

Process for changing the modules is highly advanced rework and it **shall** only be carried out by well trained repair technicians/operators.

Every module **shall** have dedicated heat profiles that should be tested in every BGA reworking station individually with dedicated heat profiling board (complete SMT assembled PWB) with thermocouples.

Heat profile **shall** be done according solder paste manufacturers specification and it **shall** be according components maximum temperature.

#### Target group

Target group for this document are repair process engineers which have understanding of following standards: IPC-A-610 D, IPC J-STD-001 D (preferably they are certified specialists).

#### Heat Profile

Heat profile in this document always refers to the heat curve which is measured on the board with thermocouples and do not refer BGA rework stations setting which can vary depending on the machine type and individual machine.

Heat profile specifications are defined in the table 2-1 This profile differs from the SEMC mass production heat profile. Reason for this is that mass production oven heating and zone separation capability is considerably better than in BGA rework stations. In mass production oven there can be 10 separate zones that can be adjusted individually and heat capacity allows introducing soak zone and more controlled peak temperature than BGA rework machine. Soak zone in mass production oven is needed in order to have minimum delta T before reaching peak zone. This is needed to have as small delta T as possible when solder is above liquidus point. Soak zone is not possible to be introduced in BGA rework station. Soak zone is not needed either because purpose is only reflow one component and delta T is not issue in this process.

#### Thermocouples

Type K thermocouples are most commonly used in the electronics industry. Type K thermocouples should be used when profiling the modules.

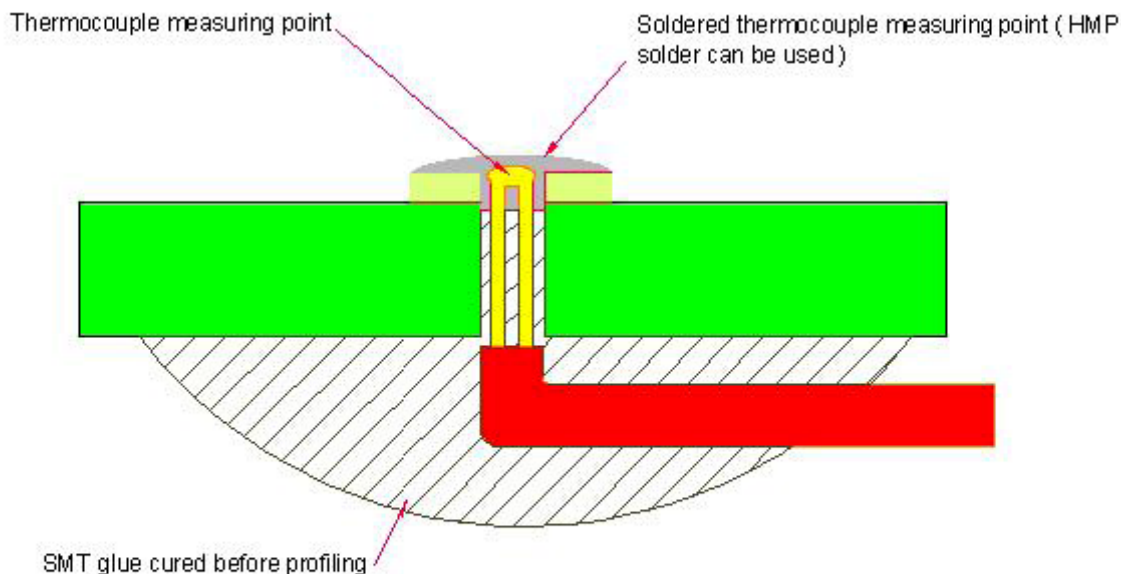
The method of attaching the thermocouple to the assembly to be profiled can be specific to the assembly and situation as well as preference of the user

Adhesives shall be used to secure the thermocouple to the assembly. This usually results in a positive physical connection of the thermocouple junction to the assembly. Drawbacks are the possibility of the adhesive failing during the heating process, removal at the conclusion of the profile. Caution should be taken to use the minimum amount of adhesive since adding thermal mass can affect the results of the profile. HMP (high melting point solder) solder that is preferred when attaching thermocouples in ordinary SMT components can be used to solder thermocouple tip to the pad but it dissolves to the lead free bump and do not have high melting point features when profiling is executed.



### Thermocouple attachment.

Primary thermocouple should be attached from back side of the board on the drilled hole (precision drill, drill bit 0,4mm) as **figure 2-2** illustrates. If pad on the board is small the hole should be drilled of center of the pad so it is possible to solder thermocouple tip on the pad. Thermocouples has are usually hard to solder due the poor wetting characteristics and additional flux and underside heating should be used during this operation.



**Figure 2-2**

### Process flow for module replacement

Heat module by using BGA rework machine and applicable heating profile and applicable nozzle for the module.

When profile reaches end of the peak zone (just before cooling) remove module by using dental hook.

Remove solder PWB pads by using soldering iron, gel flux, soldering wick. Underside heating unit is required when performing cleaning. This minimizes the possibility to lift pads of from the PWB.

Clean PWB after solder removal by using isopropyl alcohol

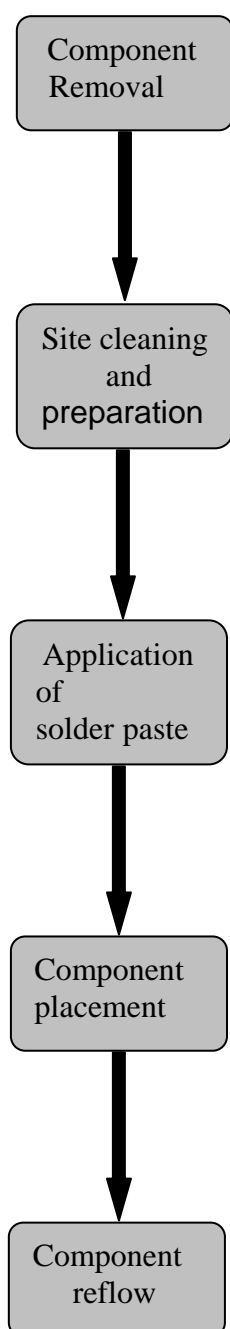
Apply gel flux to the PWB module area

Place the module to the board by using BGA rework station.

Reflow the module with BGA rework station by using applicable heat profile and nozzle.

### Inspection instructions for replacement of the module

Inspection of the replaced module should be carried out according to IPC-610D BGA inspection guidelines. X-ray can be used as and indicator. For more detailed investigations in problem situations dye and pried method and micro sectioning can be carried out.

**3.5 Process Flow BGA**

## 4 Shield fence instruction

This instruction shows how to cut and bend the shield can fence to be able to replace components under the fence.  
Use a sharp-edged pliers to cut the fence.  
Use Shield fence pliers NTZ 112 537 to bend the fence.



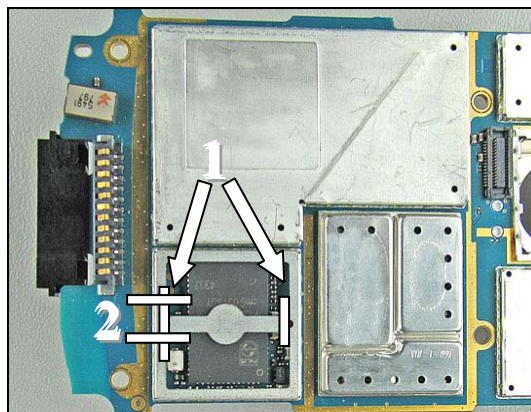
**MAKE SURE THAT CUTTING PLIERS IS SHARP-EDGED TO PREVENT DAMAGING THE SHIELD CAN FENCE.**

Remove the shield can lid, use a dentist hook.

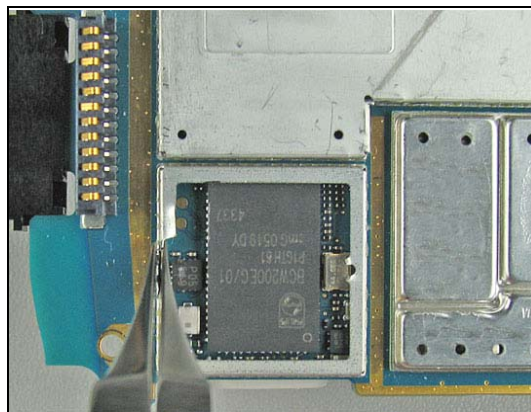
Remove the pick up area according to the white lines with a cutting plier. (1)

This pick up area is only used when machine mounting and there is no need to put it back again.

Cut the shield can fence according to the white lines with a cutting plier. (2)



Bend carefully the shield fence with a shield fence plier.  
Replace the components.

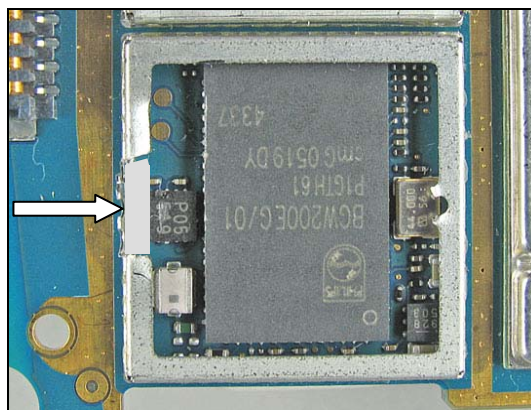


Replace the components.

Bend carefully back the shield fence.

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a "click" sound.



## 5 Replacement of components

### EQUIPMENT

- Dentist hook
- Shield fence pliers NTZ 112 537
- Hot air soldering equipment
- Soldering iron
- BGA repair equipment
- Pair of tweezers
- Soldering cleaning wiper (tin wick)
- Solder paste lead-free (SN 96% AG 3.5% Cu 0.5 %)
- Flux, RMA no-clean flux
- Cutting pliers
- Shield fence pliers NTZ 112 537

### CAUTION

***Keep all contact surfaces clean, no dirt or hand grease!***

***Protect the phone from ESD damages whenever it has been opened by using:***

- ***ESD-wristband***
- ***ESD-gloves***
- 

### MECHANICAL INSTRUCTIONS

For all the following part replacements, disassemble and assemble the phone as described in *Working Instruction 3/00021-1/FEA 209 544/118*.

## 5.1 B2100 Crystal 32,768 kHz

### ***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

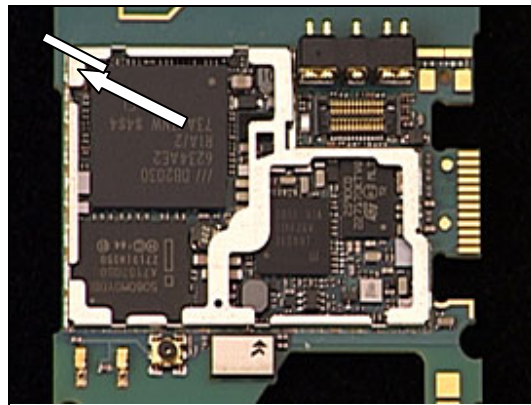
Replace the Crystal 32,768 kHz.

Use Hot air device.

### ***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

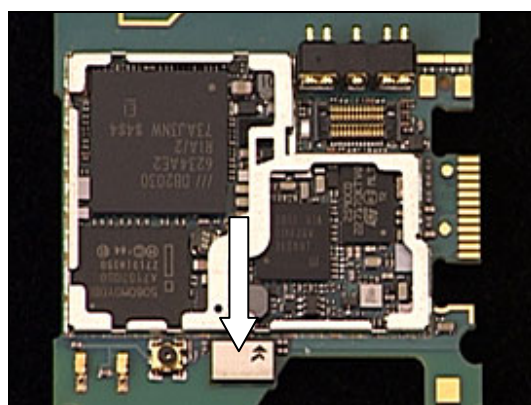
Press on all sides of the lid until you hear a “click” sound.



## 5.2 B8200 Microphone

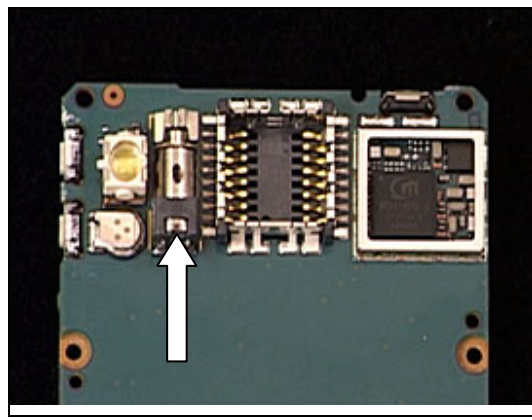
Replace the Microphone.

Use Hot Air station.



### 5.3 B8500 Vibrator

Replace the Vibrator.  
Use BGA repair equipment.



### 5.4 C4126 Capacitor Ceramic 470,0 nF +/-10% 6,3 V

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

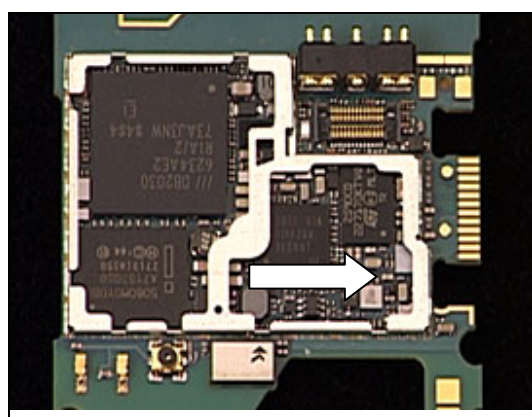
Replace the Capacitor.

Use Hot air.

***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

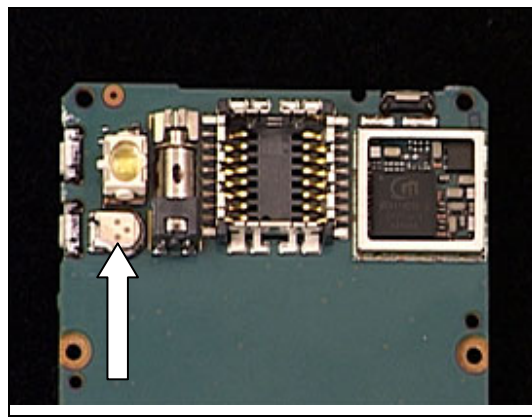
Press on all sides of the lid until you hear a “click” sound.





## 5.5 C8528 Backup battery

Replace the Backup battery.  
Use a soldering iron.



## 5.6 D2304 USB Tranciever

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

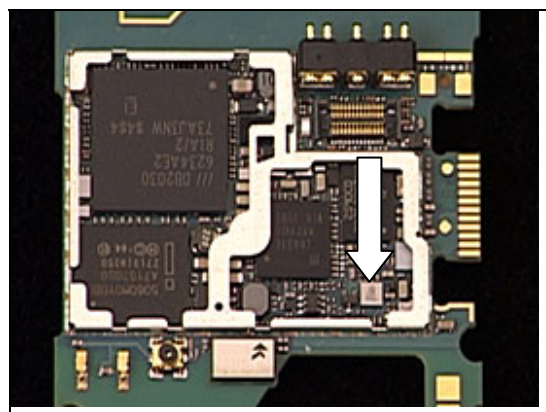
Replace the USB Tranciever.

Use BGA repair equipment.

***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.





## 5.7 D8500 Camera ISP

### ***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

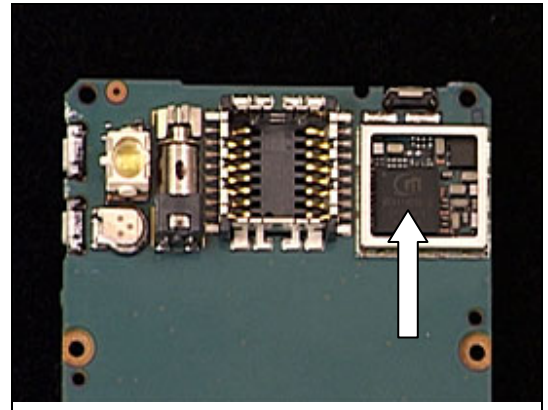
Replace the Camera ISP.

Use BGA repair equipment.

### ***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



## 5.8 N2000 Vincenne2

### ***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

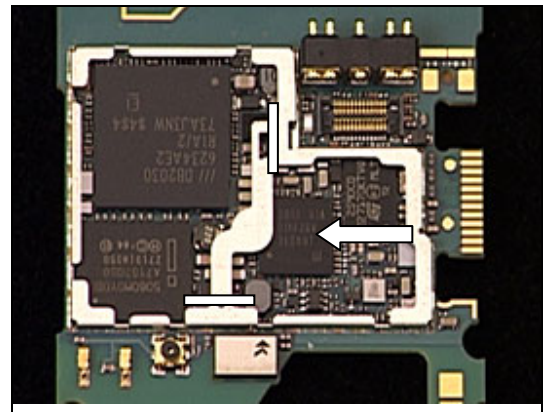
Replace the Vincenne2.

Use BGA repair equipment.

### ***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

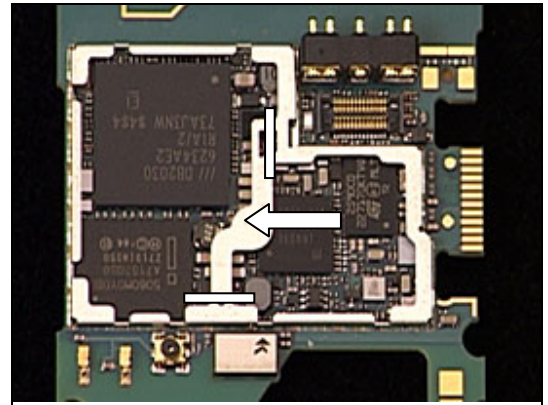
Press on all sides of the lid until you hear a “click” sound.





## 5.9 N3101 N-Channel MOSFET and Schottky Barrier Diode

Replace N-Channel MOSFET  
Use hot air device



## 5.10 N4100 1W OPAMP Pb-free version

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

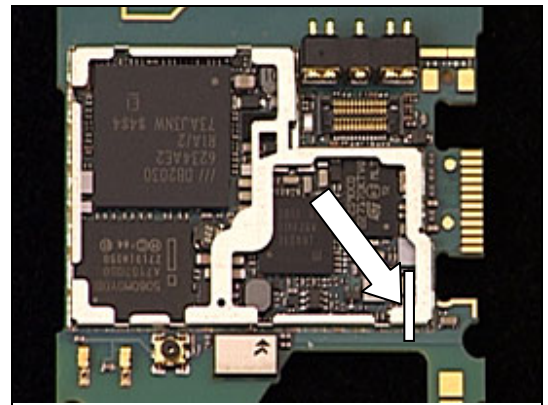
Replace the 1W OPAMP.

Use Hot air device.

***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



## 5.11 N4202 ASIC Tjatte3

### ***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

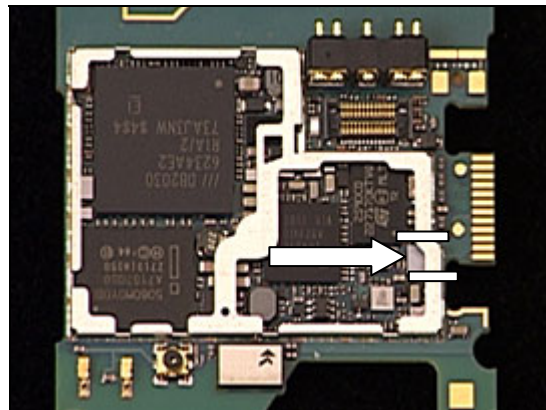
Replace the ASIC Tjatte3.

Use Hot Air equipment.

### ***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

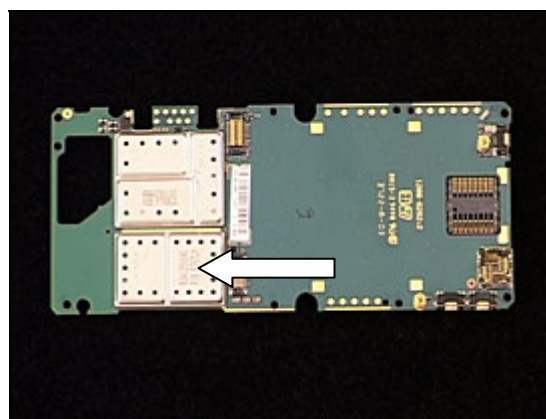
Press on all sides of the lid until you hear a “click” sound.



## 5.12 N8000 Marlin module

Replace the Marlin module.

Use BGA repair equipment.



### 5.13 N8020 Module Bluetooth

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

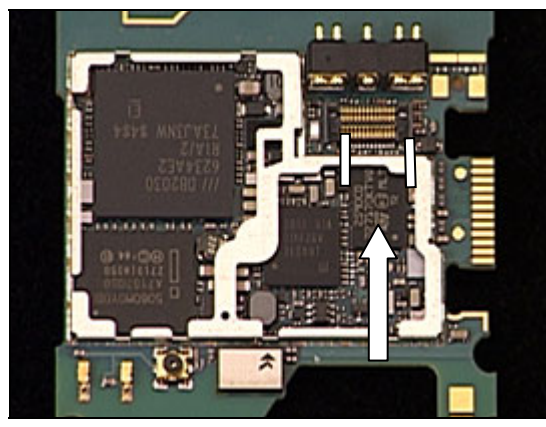
Replace the Module Bluetooth.

Use BGA repair equipment.

***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



### 5.14 N8100 IC

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

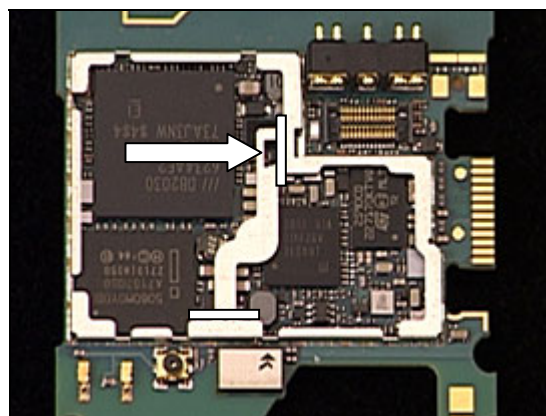
Replace the IC.

Use Hot air device.

***BEND CAREFULLY BACK THE SHIELD FENCE.***

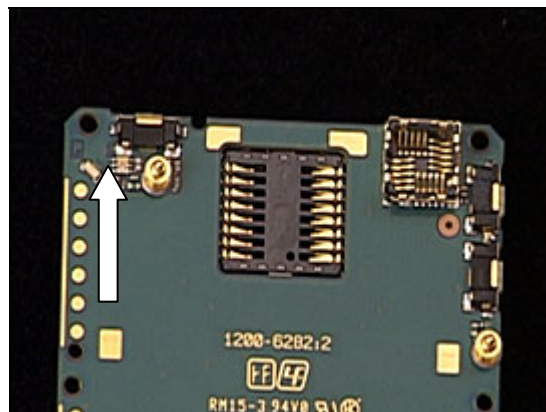
Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



## 5.15 N8500 Light Sensor

Replace Light Sensor.  
Use Hot air device



## 5.16 N8503 Voltage regulator 2,8V

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

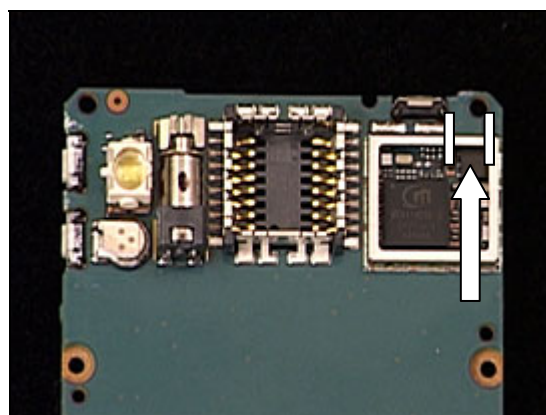
Replace the Voltage regulator 2,8V.

Use BGA repair equipment.

***BEND CAREFULLY BACK THE SHIELD FENCE.***

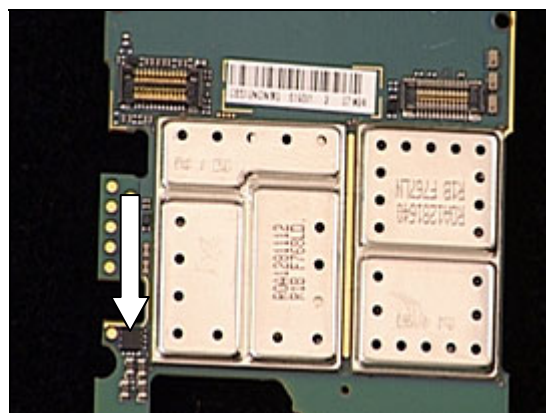
Put back a **new** shield can lid.

Press on all sides of the lid until you hear a "click" sound.



## 5.17 N8506 IC ESD Protection

Replace the IC ESD Protection.  
Use Hot Air station.

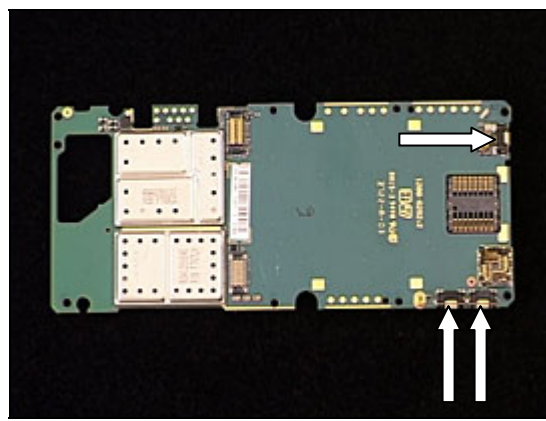


## 5.18 S8501, S8502, S8503 Side push switch

Replace Side key switches.  
Use Hot air device.

Install new Side key switches.  
Use Soldering Iron

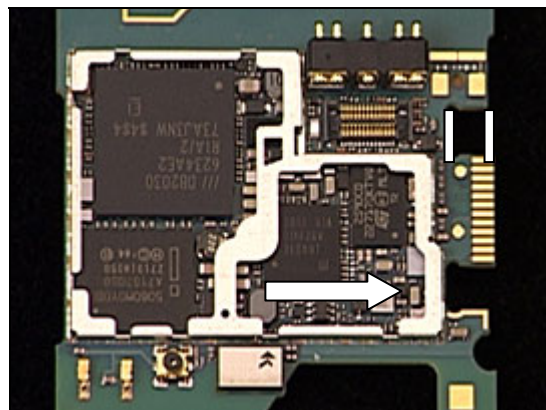
**NOTE:** Use as little flux as possible to place the new part. Make sure flux does not get on the component body.





## 5.19 V2201 Diode, Shottky Barrier

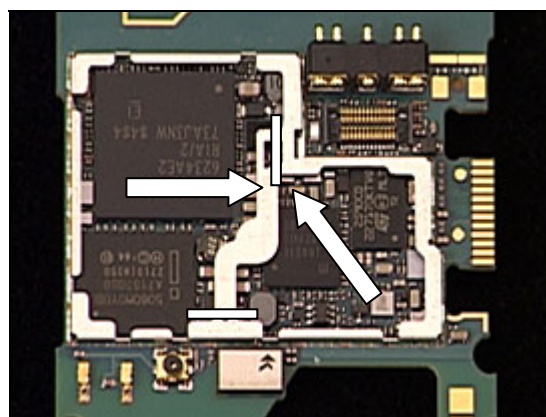
Remove the shield can lid.  
 Use a dentist hook.  
 Replace Diode, Shottky Barrier.  
 Use hot air device.  
 Put back a **new** shield can lid.  
 Press on all sides of the lid until you hear a “click” sound.



## 5.20 V2202, V2203 P-Channel MOSFET

***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.  
 Use a dentist hook  
 Cut the fence according to the white lines.  
 Follow the shield fence instruction  
 Replace the P-Channel MOSFET.  
 Use hot air device.  
***BEND CAREFULLY BACK THE SHIELD FENCE.***  
 Put back a **new** shield can lid.  
 Press on all sides of the lid until you hear a “click” sound.



## 5.21 V2204, V2305 Zenner Diode, 15V

### ***FOLLOW THE SHIELD FENCE INSTRUCTION. (4)***

Remove the shield can lid.

Use a dentist hook

Cut the fence according to the white lines.

Follow the shield fence instruction

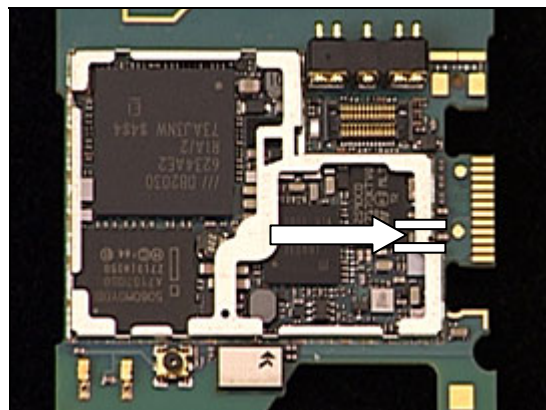
Replace the Zenner Diode.

Use Hot air device.

### ***BEND CAREFULLY BACK THE SHIELD FENCE.***

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



## 5.22 V2504 Diode Shottky 0,28 V

Remove the shield can lid.

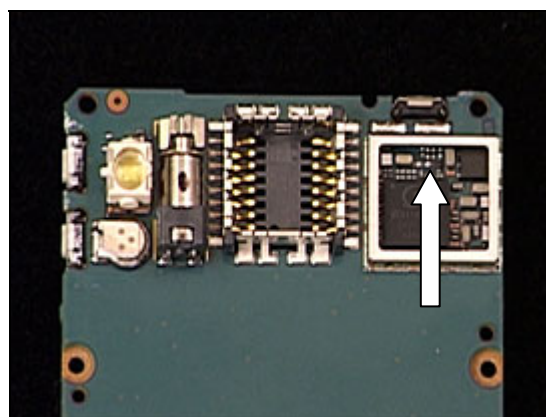
Use a dentist hook.

Replace Diode Shottky 0,28V.

Use Hot air device.

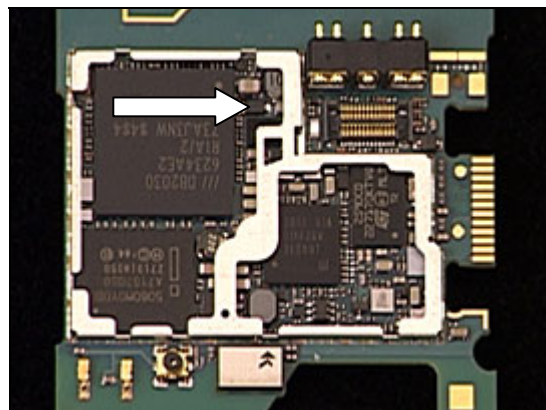
Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



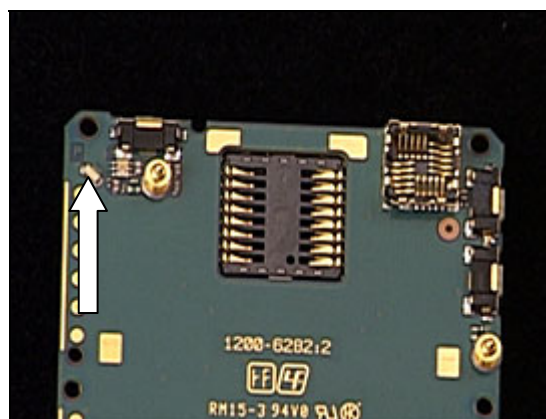
## 5.23 V8100 Diode, Shottky, Pb Free

Remove the shield can lid.  
 Use a dentist hook.  
 Replace Diode, Shottky, Pb Free.  
 Use hot air device.  
 Put back a **new** shield can lid.  
 Press on all sides of the lid until you hear a “click” sound.



## 5.24 V8503 LED Red Side fire

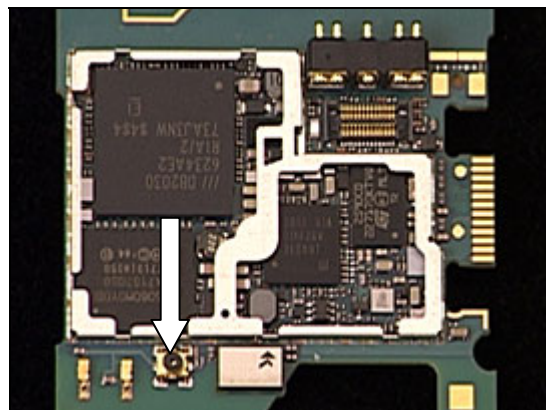
Replace LED Red Side fire.  
 Use soldering iron.





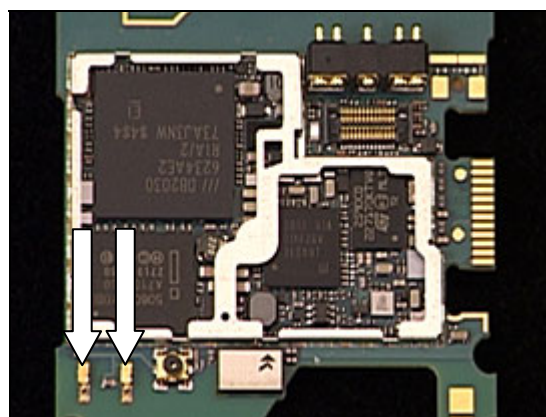
## 5.25 X6000 Antenna switch

Replace Antenna switch.  
Use Hot air device.



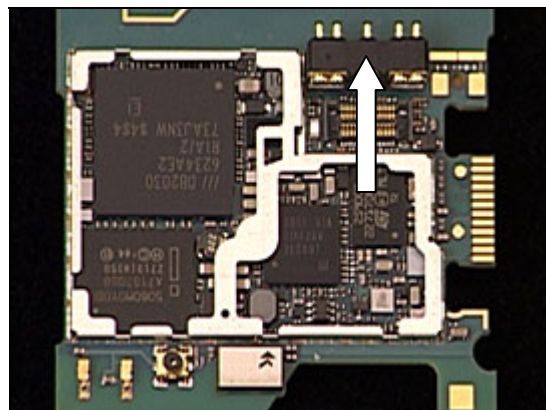
## 5.26 X8000 Conn Leaf Spring Antenna conn

Replace Conn Leaf Spring Antenna conn.  
Use Hot air device.



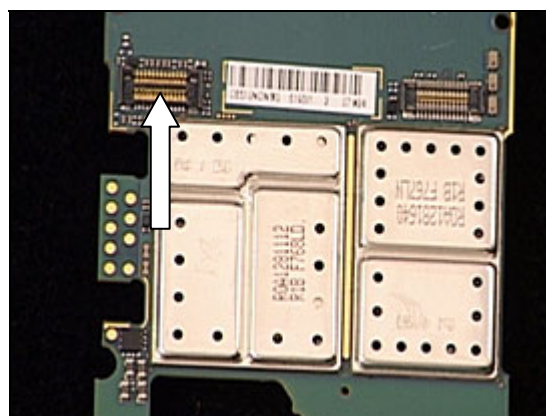
## 5.27 X8500 Battery Connector

Replace the Battery connector.  
Use BGA repair equipment.



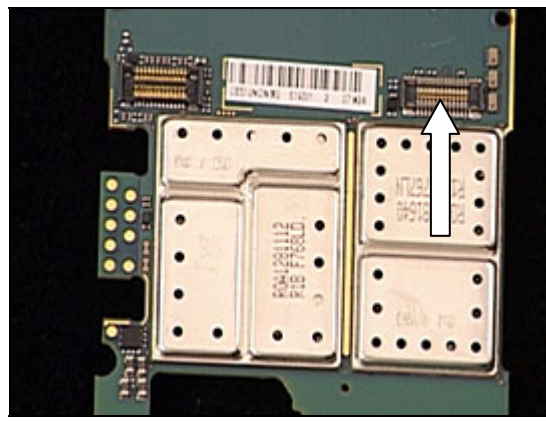
## 5.28 X8501, X8503 26pin BtB

Replace the 26pin BtB connector.  
Use Hot air device.



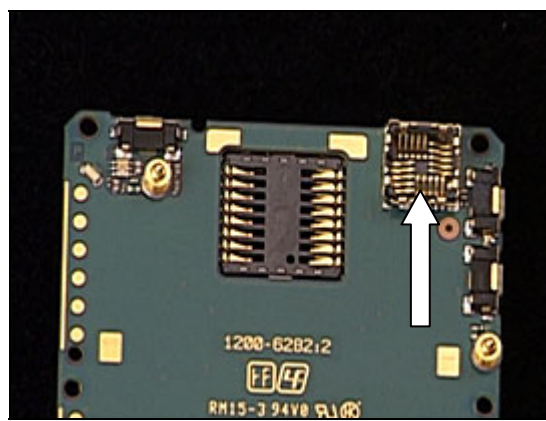
## 5.29 X8502 26pin BtB

Replace the 26pin BtB connector.  
Use Hot air device.



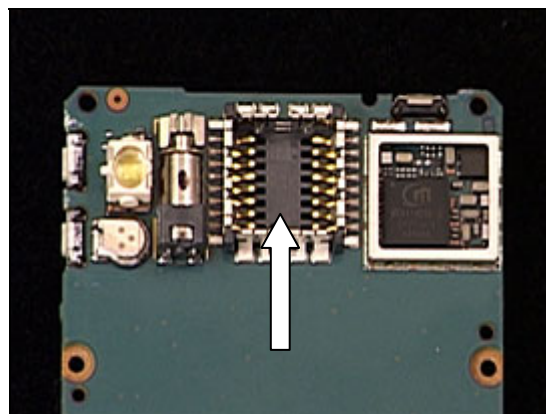
## 5.30 X8505 Vga Socket

Replace the Vga socket.  
Use BGA repair equipment.



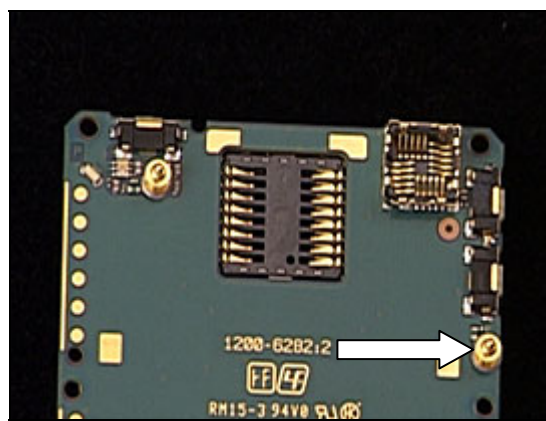
### 5.31 X8504 Camera Socket 3MPixel

Replace the Camera Socket 3MPixel.  
Use BGA repair equipment.



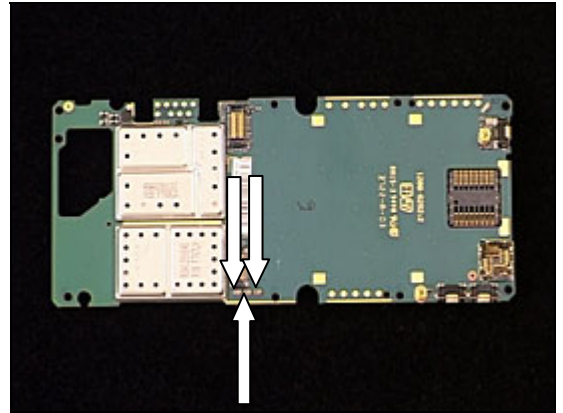
### 5.32 X8506 Pogopin connector

Replace the Pogopin connector.  
Use Hot air device.



**5.33 Z3100, Z3101, Z3102****Filter 400.0 MHz KNA16400**

Replace Filter.  
Use a soldering iron.



## 6 Revision history

| Rev. | Date       | Changes / Comments        |
|------|------------|---------------------------|
| A    | 2007-08-16 | Initial release           |
| B    | 2007-09-03 | Added V2203, V2305, N8506 |
| 3    | 2008-06-11 | Changed Camera sockets    |