

Development and Demonstration of Waste Electrical & Electronic Equipment (WEEE) Prevention and Reuse Paradigms

Action B.6- Promoting and Supporting WEEE Prevention Culture in Greece

Deliverable B6.2- Quick Repair Guide for Electronic Appliances

-Part 1-

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2. Portable Computer-Laptop

2.1. General-Operation Principles

The portable computer-laptop, is a computer of small size and weight that offers the user the benefits of portability and power autonomy. Usually, laptops belong to the 4th generation of computers. The laptop incorporates many innovative technologies at an affordable cost. One of the innovative technologies is the LED or the Light Emitting Diode screen technology. Nowadays, the majority of laptops are equipped with wide screens (16:9), whereas older models were equipped with 4:3 screens. The laptop's screen is integrated in the device and its diagonal length ranges from 29 to 47cm. The interior of a laptop contains the same basic components also found within a desktop.

The laptop battery, either integrated or removable, is rechargeable and connected through wiring to the power supply - laptop charger and through that to the electrical network. The internal construction of the laptop is similar to the desktop; its components receive direct current voltage from the device's battery which receives electrical power from the power supply.

2.2. Indications of Malfunction-Possible Damages

Laptop malfunctions are similar to desktop malfunctions. The only difference lies in the fact that due to the laptop's design for portability the assembly takes up less space. For repairs concerning malfunctions types (see Table 2 below) that require disassembling the laptop, it should be noted that doing so will void the manufacturer's guarantee.

The most common laptop malfunction indications and possible damages are cited in Table 2.

Table 2 Laptop Malfunction Indications & Possible Damages

Malfunction		Possible Damage	
No	Indication	No	Possible Cause
1	Startup failure	1	Power supply malfunction
		2	Power supply socket malfunction
2	Auto-pausing of Operation	3	Overheating
3	Blue screen & Auto-restart function	4	Malfunction and / or Corruption of Operation System's Data/ Software
4	Slow response during operation	5	Hard Drive Malfunction
		6	Malfunction and/or Corruption of Operation System's Data/ Software
5	Noise during startup	7	Accumulation of Dust on the Laptop's Fan
6	Black screen during startup	8	Accumulation of Dust on the Graphic Processing Unit's port of input
7	Beeping sounds during startup	9	RAM Malfunction
		10	Motherboard Malfunction
		11	CPU Malfunction

The above malfunction types and the related possible damages are similar to the ones mentioned in the previous chapter (desktop). Therefore, in this section repair instructions are offered only when the steps that need to be followed are different than the ones described in the previous chapter. For that reason, the same numerical order is maintained.

2.3. Repair Steps

For every laptop malfunction type that is referred to in Table 2 repair instructions are given alongside with pictures, to provide the user with a clear view of the repair process.

The repair instructions are provided following the ascending numerical order of Table 2.

Before proceeding with the repairs, it is essential to remove the power supply cable from the socket for the whole duration of the repair process.

Moreover, keep in mind that for any hardware replacement (i.e. GPU, RAM, CPU), the new part needs to have the same technical specifications as the old one (i.e. type, frequency, latency and voltage for ram memories, CPU socket to connect to the motherboard, GPU socket to connect to the motherboard) meeting the constructor's standards (dimensions, functionality etc.). It is advised, before removing the old/damaged construction part, to take a photo of its connection to the appliance, in order to place the new part accordingly, to prevent any misplacement.

The advised personal protection equipment for home-repairs is the following:

- Safety gloves (preferably reusable) in order to protect the hands from sharp edges.
- Face mask (preferably reusable) in order to avoid inhalation of dust or residues entering the body.
- Safety goggles

The repair instructions for the malfunctions mentioned in Table 2 may be followed at home using common tools. If the owner-user does not want to repair the device at home or for malfunctions not cited in Table 2, a professional certified technician needs to be contacted. Likewise, if the device fails to operate properly following the home-repair, the owner-user may, again, contact a professional certified technician to assist or to execute the repairs. Note that, it is always advised to reach a professional certified technician that specializes in repairing electrical equipment/appliances/apparatus.

2.3.1 Repairing Startup Issues (power supply)

In order to repair damage No 1, the required equipment includes:

- Screwdriver
- New power supply/laptop charger of the same technical specifications as the damaged/old one.

Malfunction: Startup failure, possibly caused by a damaged power supply. Repair steps:

Step 1: Disconnect the power supply cable from the power supply socket.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that doing so will void the manufacturer's guarantee.

Step 3: Disconnect the damaged power supply.

Step 4: Connect the new power supply.

Step 5: Reassemble the plastic protective shell of the laptop, where the keyboard is integrated.

Step 6: Connect the power supply cable to the power supply socket to the power supply socket.

Step 7: Dispose of the damaged component(s) at the WEEE Sorting Center (SC), or at a collection point of the APPLIANCES RECYCLING S.A., for repair and reuse.

2.3.2 Repairing Startup Issues (power supply socket)

In order to repair damage No 2 the following equipment is required:

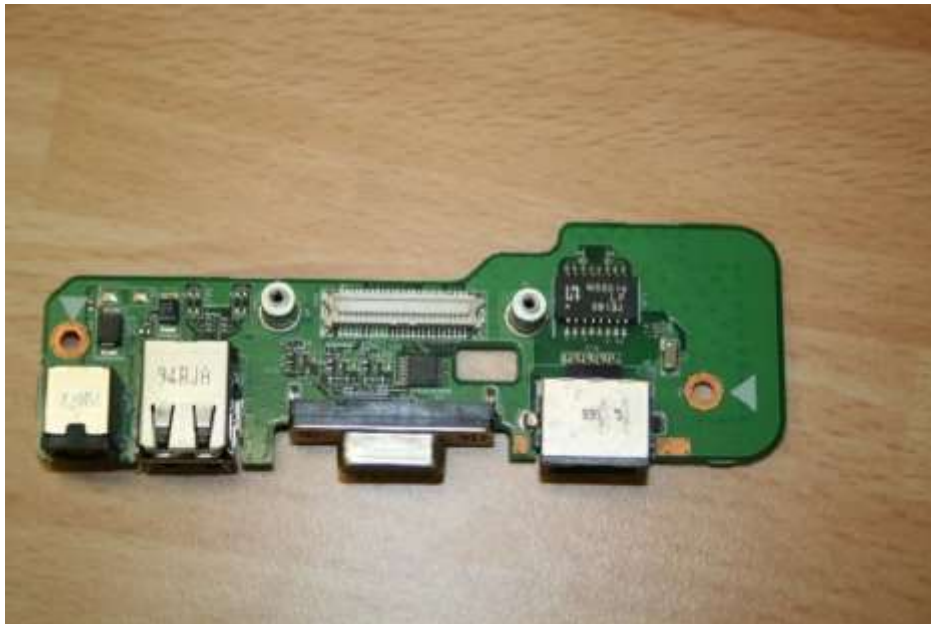
- Screwdriver
- New power supply socket with the same technical specifications as the damaged/old one.

Malfunction: Startup failure, possibly caused by a damaged power supply/laptop charger socket. Repair steps:

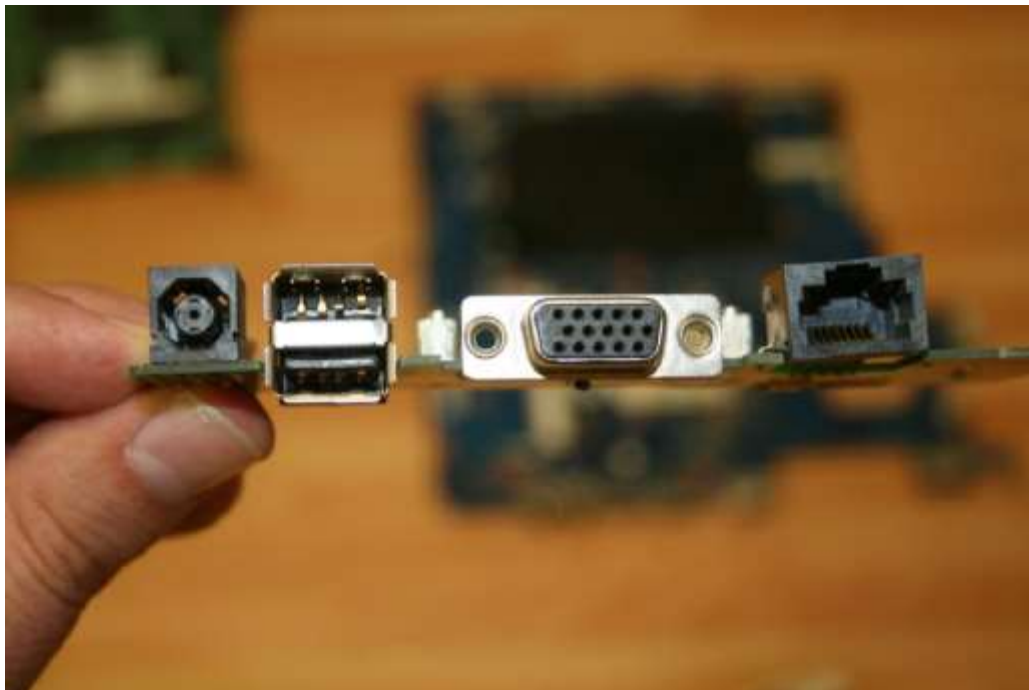
Step 1: Disconnect the power supply from the device.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee will be voided.

Step 3: Remove the damaged socket.



Step 4 Connect the new socket.



Step 5: Reassemble the plastic protective shell of the laptop, where the keyboard is integrated.

Step 6: Connect the device to the power supply.

Step 7: Dispose of the damaged component(s) at the WEEE Sorting Center (SC), or at a collection point of the APPLIANCES RECYCLING S.A., for repair and reuse.

2.3.3 Repairing Auto-pausing of Operation (overheating)

In order to repair damage No 3 the following equipment is required:

- Screwdriver
- Portable electric air hammer
- Thermal conductive paste

Malfunction: Auto-pausing of operation, possibly caused by overheating.

Step 1: Disconnect the device from the power supply.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee will be voided.

Step 3: Use the portable electric air hammer to remove the accumulated dust from the CPU circuit and the GPU. It is advised to do this outdoors or in a well-ventilated area.



Step 4: Disconnect the CPU from the motherboard.



Step 5: Disconnect the GPU from the motherboard and disconnect the wiring connecting it to other parts.



Step 6: Manually apply a pea-sized portion of thermal conductive paste on the micro-circuit (chip) of the central processing unit (CPU).

Step 7: Manually apply thermal conductive paste on the micro-circuit (chip) of the GPU, so that the whole micro-circuit is covered.

Step 8: Reconnect the CPU to the motherboard.

Step 9: Reconnect the GPU to the motherboard and connect the wiring to other components. Note that the assembly needs to be the same as before the repair.

Step 10: Reassemble the plastic protective shell of the laptop where the keyboard is integrated.

Step 11: Connect the device to the power supply.

2.3.4 Repairing “Blue Screen”

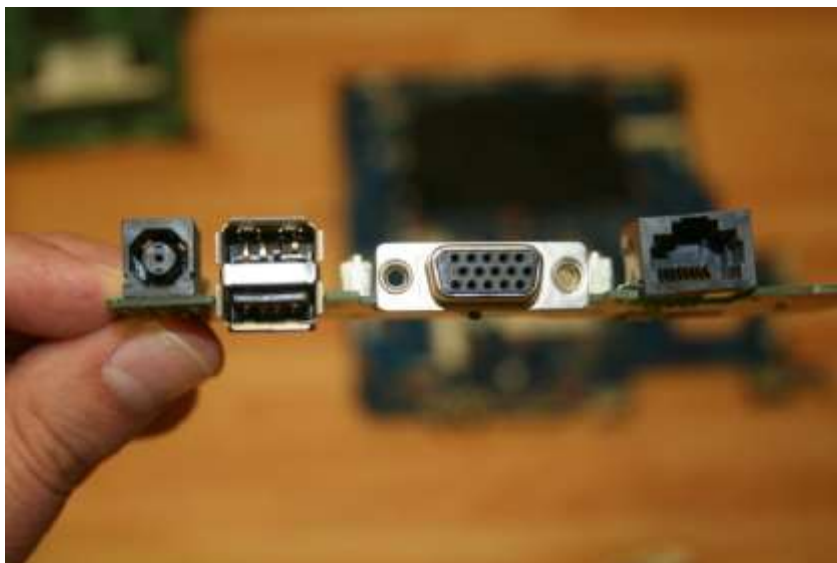
In order to repair damage No 4, the following equipment is required:

- Portable storage device - CD with the new Operating System software
- External hard drive to back-up files

Malfunction: Blue Screen & Auto-Restart, possibly caused by a malfunction and/or corruption of Operating System's (OS) data/ software. Repair steps:

Step 1: Start the computer.

Step 2: Connect the external hard drive to the USB port.

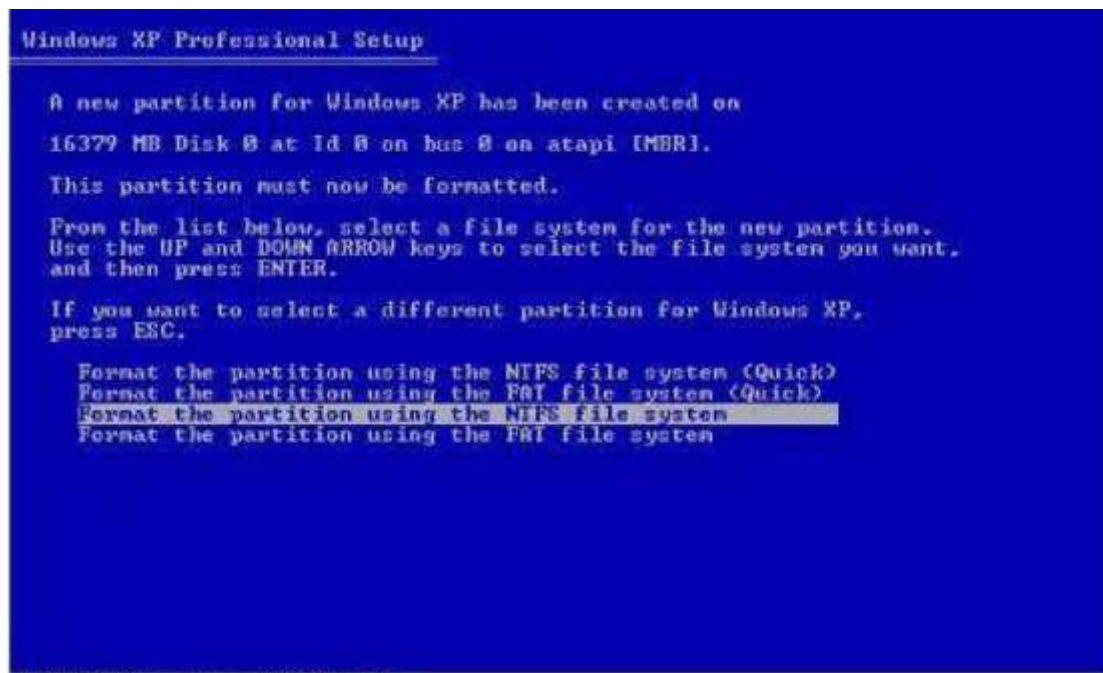


Step 3: Back-up files from the computer's hard drive to the external drive.

Step 4: After creating the backup files, disconnect the external hard drive from the computer.

Step 5: Restart the computer while holding the Ctrl, Alt, Del keys.

Step 6: Type the command "format" to delete the OS from the computer.



Step 7: When the deletion of the OS is complete, insert the CD in the CD drive to upload and install the new OS.

Step 8: Install the new OS software.

Step 9: When the installation is complete, repeat steps 2 to 4, and transfer the backed-up files to the computer.

Step 10: Shut down the computer.

2.3.5 Repairing Slow computer response (hard drive)

In order to repair damage No 5, the following equipment is required:

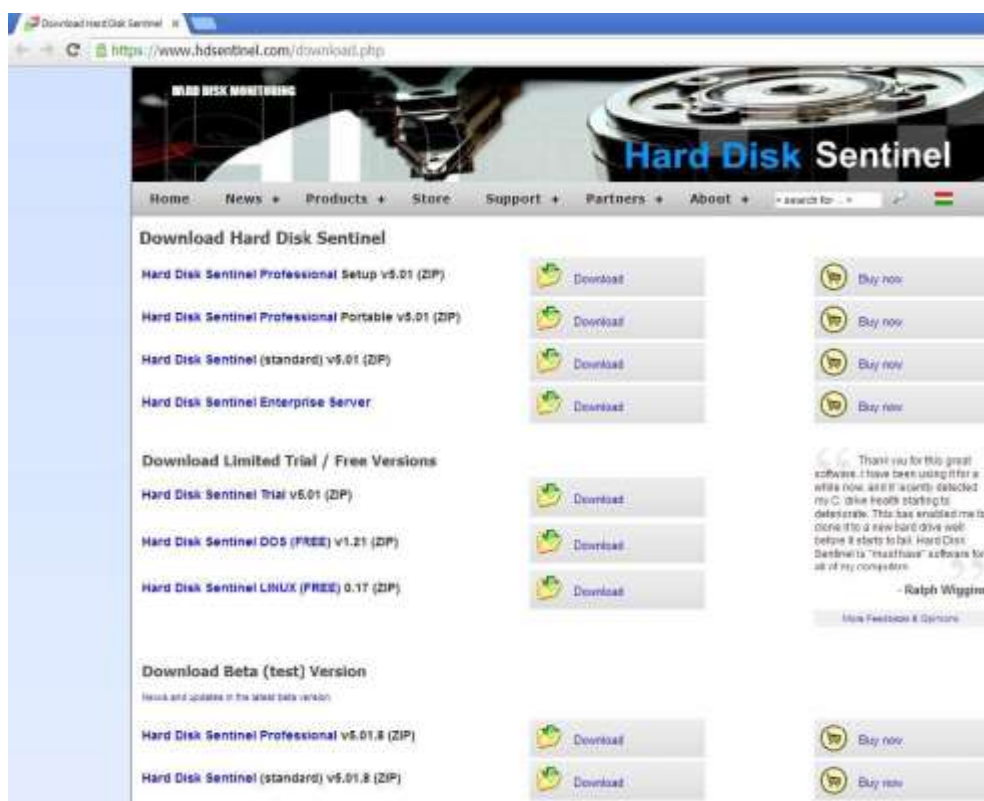
- Screwdriver
- Hdsentinel software
- External hard drive to create back-up files
- New hard drive

Malfunction: Slow Response during operation, possibly caused by a hard drive malfunction. Repair steps:

Step 1: Start the computer.

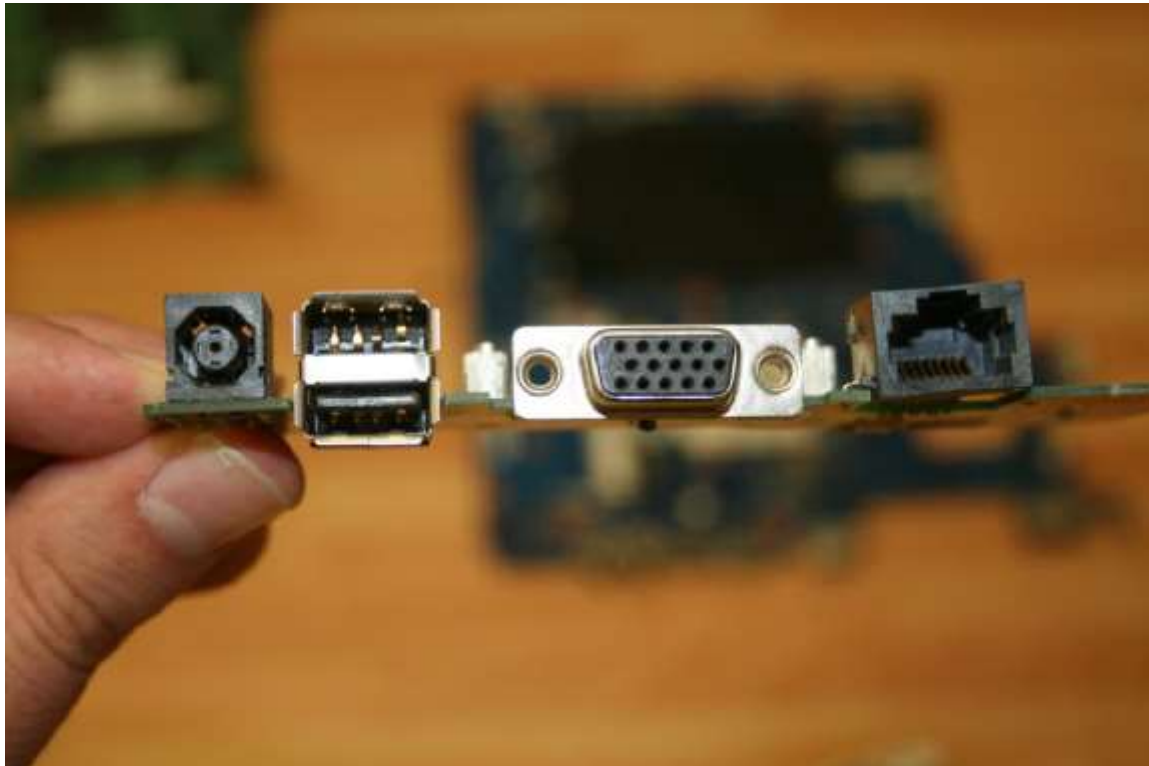
Step 2: Connect to an internet network.

Step 3: Download and setup the Hdsentinel software from the following link: <https://www.hdsentinel.com/download.php>. This software assesses the responsiveness of the hard drive.



Step 4: Install the Hdsentinel software and check the responsiveness of the computer's hard drive. If the response speed exceeds 97% then the hard drive operates normally. If the response speed is below 97%, it is an indication of an internal hard drive malfunction. The steps to replace the damaged hard drive are the following:

Step 5: Connect the external hard drive to the computer's USB port.



Step 6: Create back-up files.

Step 7: After the back-up process is complete, safely disconnect the external hard drive from the computer.

Step 8: Shutdown the computer.

Step 9: Disconnect the device from the power supply.

Step 10: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee is automatically voided.

Step 11: Disconnect the damaged hard drive from the motherboard and disconnect the wires connecting it to other components.



Step 12: Connect the new hard drive to the motherboard and reconnect the wires to other components. Note that the assembly needs to be the same as before the repair.



Step 13: Reassemble the plastic protective shell of the laptop where the keyboard is integrated.

Step 14: Connect the laptop to the power supply.

Step 15: Dispose of the damaged component(s) at the WEEE Sorting Center (SC), or at a collection point of the APPLIANCES RECYCLING S.A., for repair and reuse.

2.3.6 Repairing Slow computer response (software)

In order to repair damage No 6, the following equipment is required:

- Screwdriver
- Portable storage device - CD with the new operating system software
- External hard drive, to create back-up files

Malfunction: Slow response during operation, possibly caused by malfunction and/or corruption of operation system's data/ software.

Follow the steps referred in section 2.3.4. Repairing "Blue Screen".

2.3.7 Repairing Noise during startup (dust)

In order to repair damage No 7, the following equipment is required:

- Screwdriver
- Portable Electric Air Hammer
- Lubricant oil for small devices

Malfunction: Noise/Disturbance during startup, possibly caused by accumulation of dust on the laptop's fan.

Step 1: Disconnect the laptop from the power supply.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee will be voided.

Step 3: Use the portable electric air hammer to remove any accumulated dust on the internal fan of the laptop.



Step 4: Apply a small amount of lubricant oil for small-sized appliances on the motor shaft of the rotor in the fan's interior.

Step 5: Reassemble the plastic protective shell of the laptop, where the keyboard is integrated.

Step 6: Reconnect the laptop to the power supply.

2.3.8 Repairing "Black Screen" (dust)

In order to repair damage No 8, the following equipment is required:

- Screwdriver
- Portable electric air hammer

Malfunction: Black Screen during startup, possibly caused by accumulation of dust on the graphic processing unit (GPU) socket.

Step 1: Disconnect the laptop from the power supply.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee will be voided.

Step 3: Disconnect from the motherboard the GPU and disconnect its connection wire from other components.



Step 4: Utilize the portable electric air hammer to remove any accumulated dust from the interface between the GPU and the motherboard.



Step 5: Reconnect to the motherboard the GPU and connect its connection wire to the other components. Be careful, the connectivity needs to be the same as before.

Step 6: Reassemble the plastic protective shell of the laptop, where the keyboard is integrated.

Step 7: Reconnect the device to the power supply.

2.3.9 Repairing “Startup beeping sound (RAM memory issues)”

In order to repair damage No 9, the required equipment is the following:

- Screwdriver
- New Central Memory-RAM

Malfunction: ‘Beeping’ sound during startup, possibly caused by a RAM malfunction.

Step 1: Disconnect the device from the power supply.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee will be voided.

Step 3: Disconnect the damaged RAM from the motherboard and release the clamps on each side of the socket.



Step 4: Connect the new RAM to the motherboard and connect the clamps on each side making sure they click and lock in place.



Step 5: Reassemble the plastic protective shell of the laptop, where the keyboard is integrated.

Step 6: Reconnect the device to the power supply.

2.3.10 Repairing startup beeping sound (motherboard)

In order to repair damage No 10, the following equipment is required:

- Screwdriver
- New Motherboard

Malfunction: 'Beeping' sound during startup, possibly caused by a motherboard malfunction.

Step 1: Disconnect the device from the power supply.

Step 2: Disassemble the plastic protective shell of the laptop, where the keyboard is integrated. Note that, by doing so, the manufacturer's guarantee will be voided.

Step 3: Disconnect all the components that are connected to the motherboard (GPU, CPU, network card, hard drives, graphics card, sound card, etc.)

Step 4: Disconnect the motherboard from the frame of the laptop.



Step 5: Connect the new motherboard to the frame-skeleton of the computer and connect the wiring to other components. The assembly needs to be the same as before the repair.

Step 6: Connect the motherboard to all the components (GPU, CPU, network card, hard drives, graphics card, sound card, etc.). Note that the assembly needs to be the same as before the repair.

Step 7: Reassemble the plastic protective shell of the laptop, where the keyboard is integrated.

Step 8: Reconnect the laptop to the power supply.

2.3.11 Repairing Startup beeping sound (CPU-Central Processing Unit)

In order to repair damage No 11, the following equipment is required:

- Screwdriver

- New CPU

Malfunction: 'Beeping'' Sound During startup, possibly caused by CPU's malfunction.

It is advised to follow the steps of section 2.3.10, on how to repair damage No 10. Be careful
Note that the new CPU must have the same technical specifications as damaged one. After completing the repair, dispose of the damaged component(s) at the WEEE Sorting Center (SC), or at a collection point of the APPLIANCES RECYCLING S.A., for repair and reuse.