

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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1. Desktop-Computer

1.1. General-Operation Principles

The desktop computer is a personal computer for office or home use. It is called a desktop because its screen and other essential operation/construction parts such as the main unit (case, chassis, tower, system unit, or cabinet) are placed on a table/desk. Moreover, in contrast with the portable computer-laptop, the desktop has limited portability, in other words, the appliance cannot easily be transferred from its installation/setup area.

The desktop belongs to the 4th generation of computers (1979 until present) and its use became widespread to the general public due to its remarkable performances and ease of use following the development of Graphical User Interfaces (GUI). Furthermore, the desktop is characterized by low power supply demand and the easy and quick assembly of its construction-operation parts.

Every desktop computer consists of hardware and software. The basic construction-operation parts of the desktop are presented below:

- Central Processing Unit - CPU
- Central Memory - RAM & ROM-BIOS
- Power supply
- Input - Output Devices (keyboard, mouse, screen, speakers etc.)
- Internal - External Reading and Storage Units such as the hard drive, the DVD, SSD (Solid State Drive) etc.
- Graphic Processing Unit – GPU (visualizes information and data on the computer's screen and contains its own processor and memory)
- Sound Card (connects with the computer's speakers or an external amplifier to transfer the computer's sounds)
- Computer Network Card for connecting computers to the router and the internet or a local computer network
- Motherboard (a printed circuit board - PCB - containing the principal components of a computer or other device, with connectors for other circuit boards to be slotted into)
- Accessory appliances such as the printer, scanner, router etc.

From the above construction-operation parts, the central processing unit (CPU), the central memory, the reading and storage units and the motherboard are contained in the case/tower. Moreover, the graphic processing unit (GPU), the sound card and the computer's network card are attached on the motherboard. All of the above referred computer's components receive alternating voltage electric current from the computer's power supply, which is also inside the desktops case/tower. The computer's power supply converts the alternating current of 230 V/50 Hz voltage (EU regular voltage), firstly to a 12V low-voltage alternating

current, then to direct current with a voltage range between 3,3 and 5V, depending on the appliance's specifications. In addition, the power supply has two outputs. The first output is connected to the main processing unit, and the second to the rest of the desktop's components (i.e. motherboard's printed circuit etc.).

1.2. Indications of Malfunction-Possible Damages

The most usual malfunction indications for a desktop computer and the most common underlying issues are listed below (Table 1):

Table 1. Desktop Malfunction Indications & Possible Damages

Malfunction		Possible Damage	
No	Indication	No	Possible Cause
1	Startup failure	1	Power supply malfunction
2	Auto-pausing of operation	2	Overheating
3	Blue screen & Auto-restart function	3	Malfunction and/or corruption of the Operation System's(OS) data/ software
4	Screen lines	4	Graphic Processing Unit(GPU) malfunction
		5	Screen malfunction
5	Slow response during operation	6	Hard drive malfunction
		7	Malfunction and/or corruption of the Operation System's(OS) data/ software
6	Noise during startup	8	Accumulation of dust on the computer's fan
7	Black screen during startup	9	Accumulation of dust on the GPU's input port
8	Beeping sounds during startup	10	RAM malfunction
		11	Motherboard malfunction
		12	CPU malfunction

1.3. Repair Steps

In the following section, repair instructions will be provided for each desktop malfunction issue referenced in Table 1. The instructions are accompanied with pictures of the repair process.

The repair instructions follow the ascending numerical order of Table 1.

It is essential to unplug the desktop computer from the power outlet before attempting to follow any repair instructions and to keep it unplugged throughout the repair process. Moreover, when hardware (i.e. GPU, RAM, CPU) replacement is necessary, the new part needs to be of the same model or specifications (dimensions, functionality etc.) as the old one (i.e. type, frequency, latency and voltage for RAM, CPU socket to connect to the motherboard, GPU socket to connect to the motherboard). It is advised to take pictures of the motherboard assembly, before removing the old/damaged part in order to place the new part properly.

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 1 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 1, 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.

1.3.1 Repairing Startup Issues (power supply)

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

- Screwdriver
- New power supply of the same technical characteristics as the damaged one.

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

Step 1: Disconnect all the cables from the rear part of the computer's case and switch off the power supply.



Step 2: Disassemble the external metallic protective case.



Step 3: Disassemble the power supply from the frame of the computer and disconnect the cables connecting it to other parts.



Step 4: Connect the new power supply (assemble in the frame-skeleton of the computer and connect the connection cables with all the construction parts). Attention should be given assembly is the same as before the repair.



Step 5: Reassemble the metallic protective case.



Step 6: Reconnect all the cables on the rear part of the computer and switch on 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.



1.3.2 Repairing Auto-pausing of Operation (overheating)

In order to repair damage No 2 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 all the wires from the rear part of the computer's case and switch off the power supply.



Step 2: Disassemble the external protective metallic shell from the computer's case.



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: Disassemble the GPU, the CPU and the Network Card, from the corresponding inputs on the rear part of the computer's frame.

Step 5: Disassemble the motherboard, from the computer's frame.

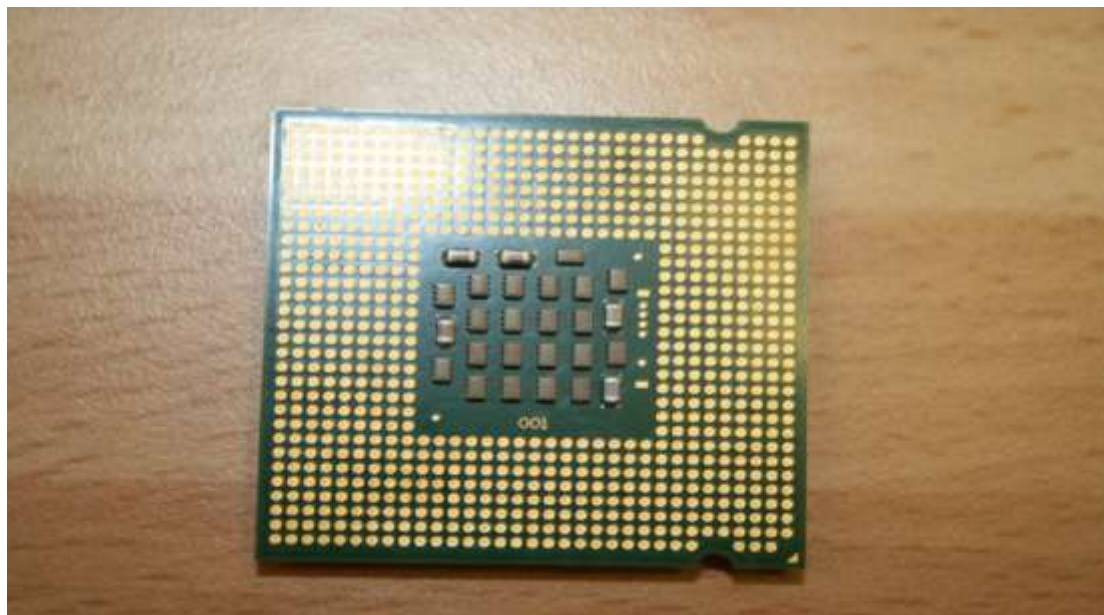
Step 6: Disconnect the CPU's card from the motherboard.



Step 7: Disconnect the GPU's card from the motherboard and disconnect the cable that connects the GPU with other components.



Step 8: Manually apply a pea-sized portion of thermal conductive paste on the micro-circuit (chip) of the central processing unit (CPU).



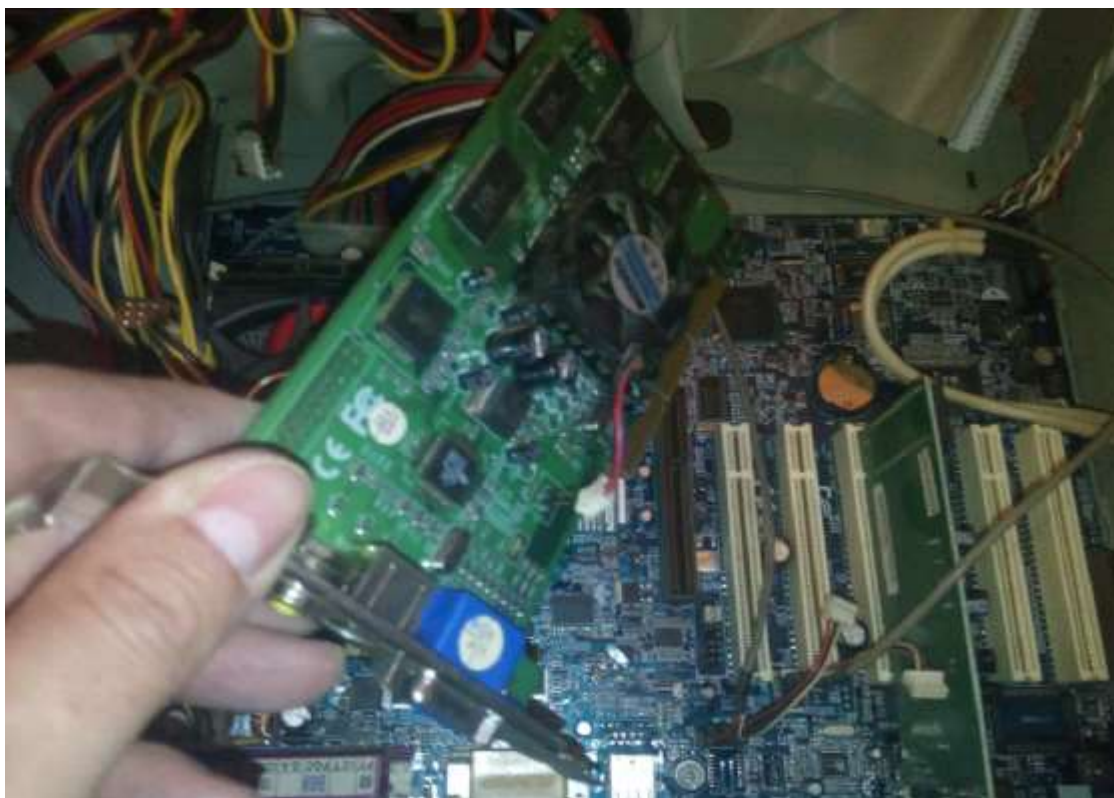
Step 9: Manually apply thermal conductive paste on the micro-circuit (chip) of the GPU, so that the whole micro-circuit is covered.



Step 10: Reattach the CPU to the motherboard.



Step 11: Reattach the GPU to the motherboard and reconnect the wires connecting it to other parts. The assembly needs to be the same as before the repair.



Step 12: Reattach the motherboard to the frame of the computer and reconnect the wires to other components. The assembly needs to be the same as before the repair.

Step 13: Reattach the inputs to the GPU, the CPU and the network card on the rear part of the frame.

Step 14: Reassemble the external metallic protective case.



Step 15: Reconnect all the wires on the rear part of the computer and switch on the power supply.



1.3.3 Repairing “Blue Screen”

In order to repair damage No 3 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.

Step 1: Start the computer

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

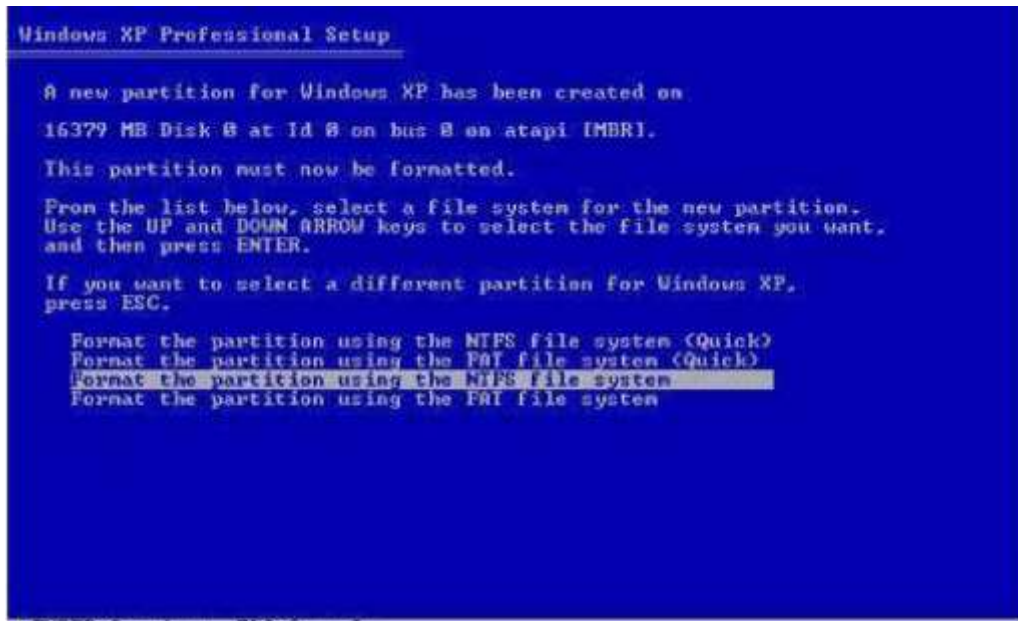


Step 3: Back-up files from the computer's hard drive to the external disk.

Step 4: After creating the backup files, disconnect the portable 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 of 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.

1.3.4 Repairing “Screen Lines” (GPU-Graphics Processing Unit)

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

- Screwdriver
- New GPU with the same technical characteristics and functionality as the damaged one.

Malfunction: screen lines, possibly caused by malfunction of the GPU.

Step 1: Disconnect all the wires from the rear part of the computer's case and switch off the power supply.



Step 2: Disassemble the external protective metallic case of the computer.

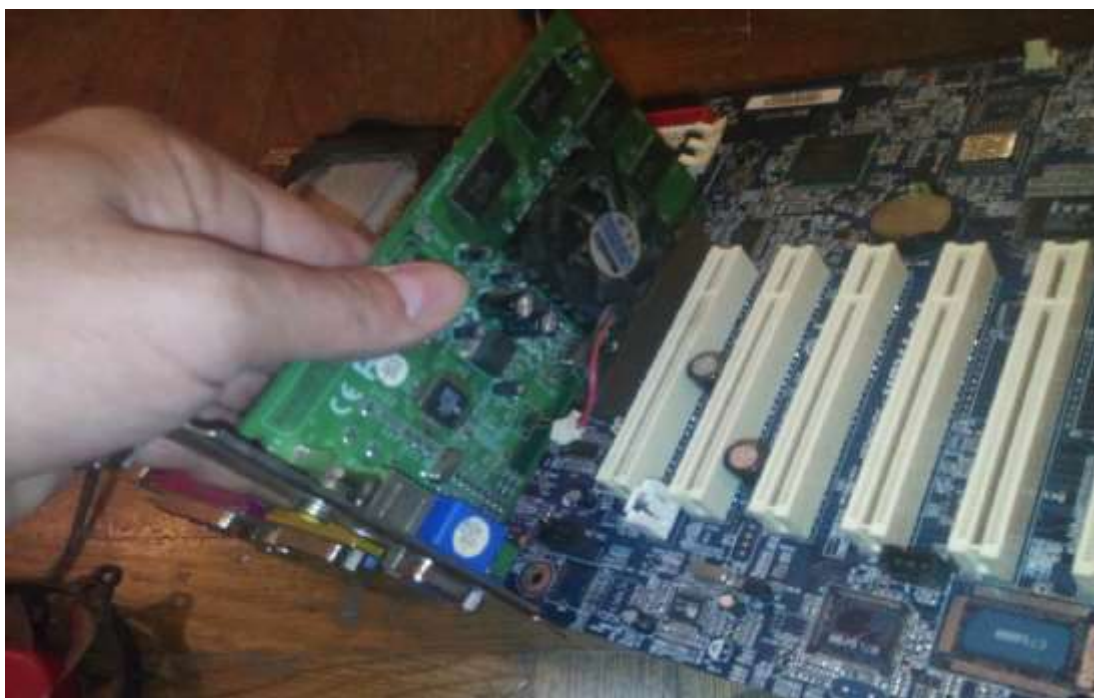


Step 3: Disassemble the damaged GPU from the rear part of the computer's frame.

Step 4: Disconnect the damaged GPU from the motherboard. Disconnect the wires attaching it to other parts.



Step 5: Connect the new GPU to the motherboard and reconnect the wires to other parts. The assembly needs to be the same as before the repair.



Step 6: Reattach the new GPU to the input port on the rear part of the computer's frame.

Step 7: Reassemble the external metallic case.



Step 8: Reconnect the wires on the rear part of the computer and switch on the power supply.



Step 9: 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.



1.3.5 Repairing "Screen Lines"

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

- Spare computer screen
- New computer screen

Malfunction: Screen lines, possibly caused by a damaged screen.

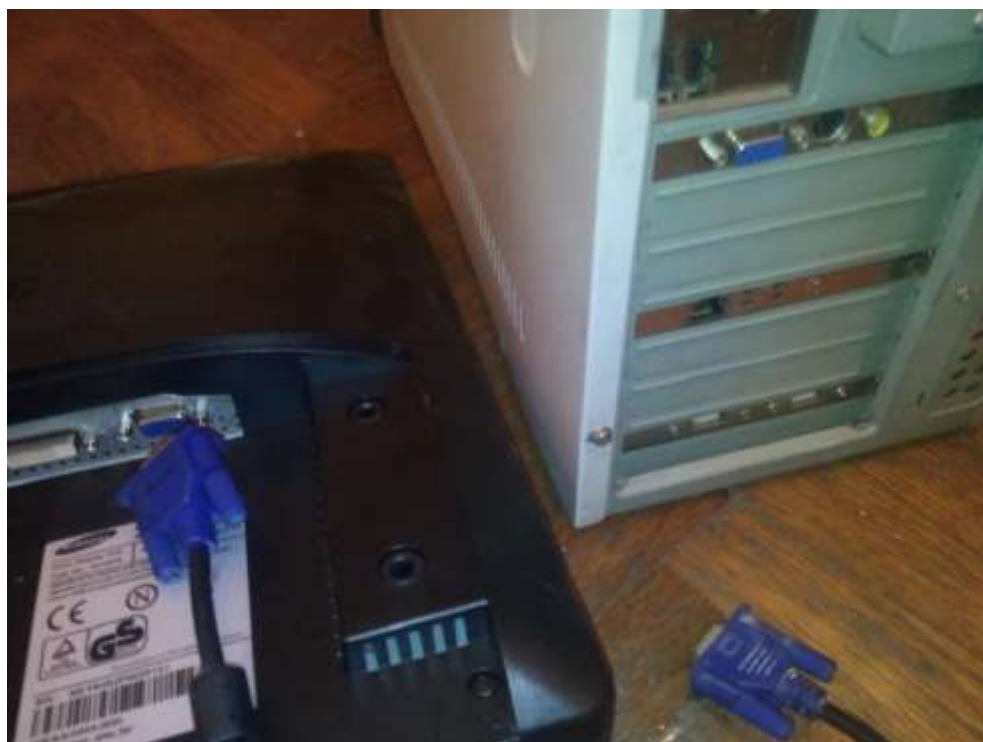
Step 1: Disconnect the screen power supply cable from the screen.



Step 2: Disconnect cable connecting the screen to the computer.



Step 3: Connect the cable from step 2 to the spare screen and the computer.



Step 4: Connect the wire referred in step 1 to the spare screen's power supply plug.



Step 5: Start the computer using the spare screen.

Step 6: Absence of screen lines on the spare screen.

Step 7: Shutdown the computer.

Step 8: Connect the new screen and repeat steps 3 and 4.

Step 9: 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.

1.3.6 Repairing Slow response during operation (hard drive malfunction)

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

- Screwdriver
- Hdsentinel Software
- Portable hard drive to create back-up files
- New hard drive

Malfunction: Slow response during operation, possibly caused by a hard drive malfunction.

Step 1: Start the computer

Step 2: Connect to an internet network

Step 3: Download and install 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: Back-up files.

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

Step 8: Shutdown the computer.

Step 9: Disconnect all the wires from the rear part of the computer and switch off the power supply.



Step 10: Disassemble the external metallic protective case.



Step 11: Remove the hard drive from the motherboard, and disconnect the wires connecting it to other parts.



Step 12: Attach the new hard drive to the motherboard and reconnect the wires attaching it to other parts of the computer. The assembly needs to be the same as before the repair.



Step 13: Assemble the external metallic protective case of the computer.



Step 14: Reconnect all the wires on the rear part of the computer and switch on 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.



1.3.7 Repairing Slow response during operation (software)

In order to repair damage No 7, 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 a malfunction and/or Corruption of Operation System's Data/ Software

Follow the steps referred in section 1.3.3 Repairing "Blue Screen" of the present guide.

1.3.8 Repairing Noise during startup

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

- Screwdriver
- Lubricant oil for small-sized appliances
- Portable electric air hammer

Malfunction: Noise/Disturbance during startup, possibly caused by accumulation of dust on the computer's fan. It is advised to do this repair outdoors or in a well ventilated area.

Step 1: Disconnect all cables from the rear part of the computer, and switch off the computer's power supply.



Step 2: Disassemble the external metallic protective case of the computer.



Step 3: Use the portable electric air hammer to remove any dust accumulated on the computer's fan.



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

Step 5: Reassemble the metallic protective case of the computer.



Step 6: Reconnect all the cable to the rear part of the computer and switch on the computer's power supply.



1.3.9 Repairing "Black Screen" (dust)

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

- Screwdriver
- Portable electric air hammer

Malfunction: Black Screen Indications during startup, possibly caused by accumulation of dust on the Graphic Processing Unit's port of input.

Step 1: Disconnect all wires from the rear part of the computer and switch off the computer's power supply.

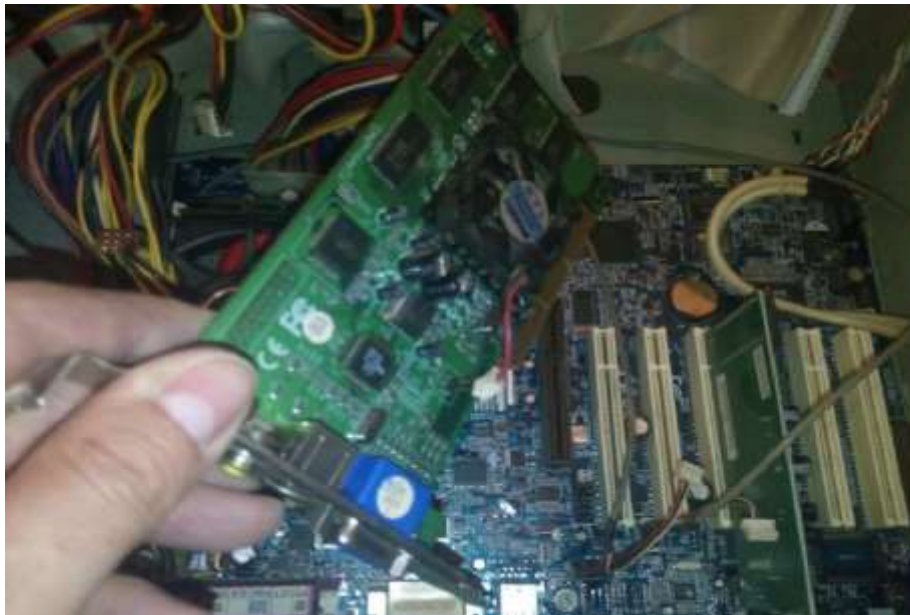


Step 2: Disassemble the external metallic protective case of the computer.



Step 3: Disconnect the GPU from its input on the rear part of the computer's frame.

Step 4: Disconnect the GPU from the motherboard and disconnect the wires connecting to other parts.



Step 5: Use the portable electric air hammer to remove any dust accumulated on the GPU's port of input. It is advised to do this outdoors or in a well ventilated area.



Step 6: Reconnect the GPU to the motherboard and connect the wires to the other parts of the computer.



Step 7: Attach the GPU to the socket of the rear part of the computer's frame.

Step 8: Reassemble the external metallic protective case of the computer.



Step 9: Reconnect all wires to the rear part of the computer and switch on the computer's power supply.



1.3.10 Repairing Startup beeping sound (RAM memory issues)

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

- Screwdriver
- New Central Memory-RAM

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

Step 1: Disconnect all the cables from the rear part of the computer and switch off the computer's power supply.



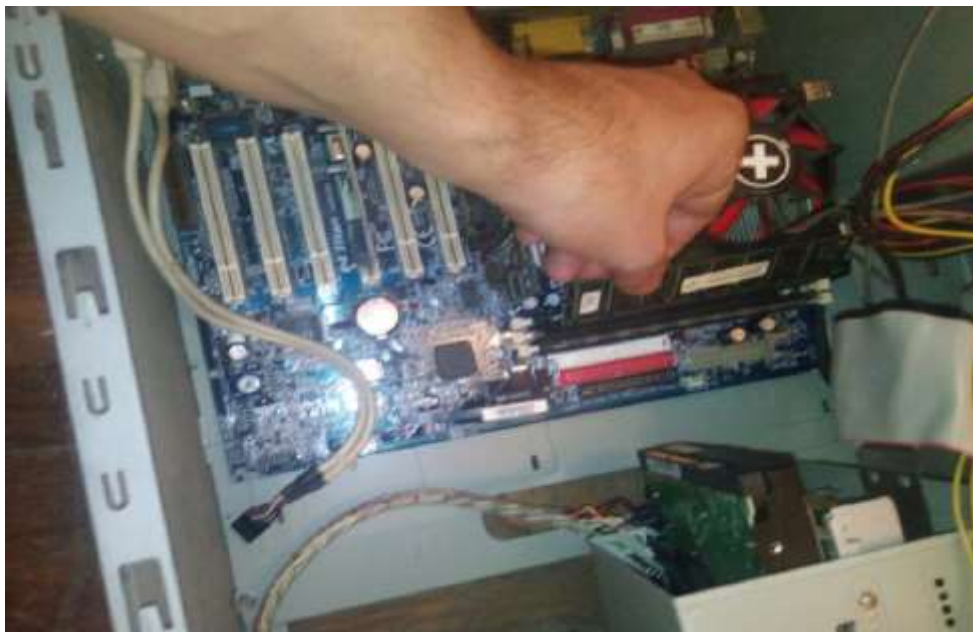
Step 2: Disassemble the external protective case of the computer.



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 external metallic protective case of the computer.



Step 6: Reconnect all the cables to the rear part of the computer and switch on the computer's power supply.



1.3.11 Repairing Startup beeping sound (motherboard)

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

- Screwdriver
- New Motherboard

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

Step 1: Disconnect all cables from the rear part of the computer and switch off the computer's power supply.



Step 2: Disassemble the external metallic protective case of the computer.



Step 3: Disconnect the GPU, the CPU, and the network card from their sockets on the rear frame of the computer. Disconnect all wires to other parts.

Step 4: Disconnect all the components that are connected to the motherboard (GPU, CPU, network card, hard drives, graphics card, sound card, etc.)



Step 5: Remove the motherboard from the frame of the computer and disconnect the wires to other components.



Step 6: Connect the new motherboard to the frame of the computer and connect the wires to other components.



Step 7: Attach the other components (GPU, CPU, network card, hard drives, graphics card, sound card, etc.) to the motherboard. The assembly needs to be the same as before the repair.

Step 8: Connect the GPU, the CPU, and Network Card cables to their sockets at the back of the computer. Also, connect all remaining wires between parts. The assembly needs to be the same as before the repair.

Step 9: Reassemble the external metallic protective case of the computer.



Step 10: Connect all the cables at the back of the computer, and switch on the computer's power supply.



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

In order to repair damage No 12, the required equipment is the following:

- screwdriver
- new CPU

Malfunction: 'Beeping' sound during startup, possibly caused by CPU's malfunction.

It is advised to follow the steps of section 1.3.10, on how to repair malfunction No 10. Note that the new CPU needs to have the same specifications as the damaged one. After completing the repair process, 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.