SERVICE MANUAL
Service and maintenance guide for the Multiplate® system
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Please note that the Multiplate® platform and reagents are not FDA cleared for in vitro diagnostic use and therefore for research use only.
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1 General Notes

This service manual is a guide for service technicians and persons who are authorised by the manufacturer to carry out maintenance procedures on the Multiplate® system.

Knowledge of the contents of the Multiplate® user manual is a precondition.

The Multiplate® software is operated using the Windows® XP operating system.

The systems are provided in Windows® XP Home Edition and Windows® XP Professional Edition.

The manufacturer’s warranty will become void in the case of any modification of the equipment carried out by persons who have not been authorised to do so by the manufacturer. Internal Multiplate® parts may only be replaced by qualified servicing staff.

Caution – do not allow liquids to penetrate into the equipment. Do not spill liquids onto the Multiplate® equipment.

The manufacturer’s warranty will become void if third party software is installed or used on the Multiplate® without the specific approval of the manufacturer.

Multiplate must be operated from an electrical source (power socket) with an earthing equipment conductor (for further details see User manual I, V.2.0, chapter 3).

The Multiplate® system must be switched off and disconnected from the power source before carrying out any maintenance procedures within the Multiplate® housing.

2 Administrator user

In order to change system settings and install peripherals, e.g. printer or software, a Windows® system log-on as administrator user is required.

For Multiplate® systems operated with Windows® XP Home the administrator user name is admin, for systems operated with Windows® XP Professional the administrator user name is administrator.

The default password for both systems is admin.
3 Data back-up

Measurement data can be backed up by saving the contents of the “Data” directory onto a USB memory stick (USB hard drive).

The “Data” directory is located under:

\(\text{C:}\backslash \text{Documents and Settings}\backslash \text{multiplate}\backslash \text{Multiplate}\backslash \text{Data}\)

![Figure 3.1: Screenshot: Data folders](image)

4 General information on removing and replacing Multiplate® system components

⚠️ The Multiplate® system must be switched off and the equipment disconnected from the power source prior to carrying out all maintenance procedures on the interior of the Multiplate® equipment.

Authorised service technicians may replace the following components:

1. Sensor cable sockets
2. Fan for electronic measuring equipment
3. RAM
4. Motherboard fan
5. Fuses
6. Fuse housing
7. Hard disk drive (HDD)
8. Power supply unit (PSU)

⚠️ If any component of the Multiplate® device has to be replaced please inform the manufacturer about the new component and its lot number and the serial number of the Multiplate® device.

The replacement of any other electronic parts requires corrective maintenance at the manufacturer’s site.
5 Replacing Multiplate® system components

The Multiplate® system is subject to a continuous improvement process, to date there are three different types of the device. Type 1 (SN 000001 - 000074) differs from type 2 by a new housing design, which leads to a different opening method (see chapter 5.2). Furthermore the housing fan of type 1 is located on the outside (see chapter 5.4). Type 3 is equipped with an improved housing. In the course of these changes the ventilation was modified. The fan, which used to sit at the front of the housing, was replaced by two fans inside the housing. These are placed in the new metal shielding, which now consists of a cover and a separating plate (see chapter 5.5.1.1 respectively 5.5.1.2).

5.1 Cleaning and disinfecting the equipment

Clean the synthetic surfaces of the Multiplate® equipment with a cloth moistened with a mild detergent. Do not use detergents containing solvents; avoid spilling liquid into openings in the housing.

The following disinfectants are recommended for cleaning the preheating area:

- Terralin® Liquid
- Mikrozid® Liquid
- Mikrozid® AF
- Mikrozid® cloths
- Sagrosept® cloths

5.2 Removal of the housing cover

The two model series (housing type 1 and 2) have different opening procedures.

Models up to SN 000074 (housing type 1): 3 M 3x6 screws at the back

Models from SN 100075 onwards (housing type 2 respectively 3): four M 3x6 screws - two on the right and two on the left side

Parts: Housing cover
        4 countersunk screws with hexagon socket (2 mm)

Tools: Allen key (2 mm)

Preparing the workspace:
1. Place the Multiplate® instrument onto a firm, even surface.
2. Spread out a clean, soft underlay (e.g. foam mat or cloth) to the left of the Multiplate® to avoid scratching the aluminium preheating area.
3. Remove the mains plug, monitor, sensor cables, test cells and the reagent rack from the instrument.

To remove the cover, unscrew the 3 or 4 countersunk screws (depending on the model series) using the Allen key provided in the spare parts set. Be careful not to discard the screws, since they will be required for reassembling the equipment.
The housing cover may now be lifted (see Figure 5.1).

Figure 5.1: Removal of the housing cover

The housing cover must now be placed to the left with its upper surface on the soft, clean underlay (see Figure 5.2)

Figure 5.2: Turning over the housing cover correctly (Multiplate® system: housing type 2)

5.3 Replacing sensor cable sockets

Parts:  Mini boards with sensor cable jacks  
        Mini ribbon cables  
        2 Phillips screws  

Tools:  Philips screwdriver  

If sensor cable sockets are dysfunctional and/or contacts are corroded, the socket must be replaced in order to ensure accurate measurements.
The sensor cable sockets are screwed to the inner surface of the cover over the mini boards. The mini boards are also connected via the mini ribbon cable to the measuring boards (see Figure 5.3, red marking).

To exchange the sensor cable sockets, first remove the mini ribbon cables (see Figure 5.4), which are glued to the boards, by pulling the plugs gently upwards until the glue loosens.

The screws on the mini boards can now be loosened using the Phillips screwdriver provided in the spare parts set (see Figure 5.5a, arrows) and the boards, including the sensor cable sockets, can be lifted from the housing cover. The screws are thus released from the spacer bolts (see Figure 5.5b, arrows).
The new mini board can now be inserted in the same way as the old one. The screws and spacer bolts can be re-used.

First, position the screws in the holes drilled in the mini board for this purpose. When inserting the mini board, make sure that it is the correct way round, i.e. with the two resistors on the underside of the mini board facing the measuring board. It is also important, when reassembling, to ensure that the sensor cable sockets are in a straight position and that the screws are entering the spacer bolts. Tighten the screws and connect the new mini ribbon cable to the measuring board and the mini board. It is important to ensure that in each case all ten pins on the board are incorporated inside the plug. If no further procedures are to be carried out on the equipment, replace the cover onto the chassis and fasten tightly with the screws (see chapter 5.11).

If, after replacing the mini boards, problems arise when carrying out the electronic control, i.e. the channel is outside the reference range or errors are reported, check, whether the plugs of the mini ribbon cable of the defective channel sit properly on the boards (mini and measuring board). If the problem persists, please contact the manufacturer.

5.4 Replacing the housing fan

5.4.1 Procedure for housing types 1 und 2

**Parts:**
- Fan (ADDA AD0412LB)
- 4 Phillips countersunk screws M3x12

**Tools:**
- Phillips M3 screwdriver

In instruments with serial numbers below 000074, the fan is situated outside the chassis (housing type 1); in instruments with serial numbers from 100075 upwards, the fan is situated inside the chassis (housing type 2). It is attached from the outside by four countersunk screws (see Figure 5.6).

To remove the fan, loosen the screws and pull out the fan cabling. The plug for the fan cabling is attached by a drop of hot-melt adhesive to the boards. In order to remove the plug, pull gently until the plug separates from the adhesive.

If the fan is situated outside the chassis, the plug must also be removed from the cables in order to be able to pull the cable through the fan opening. This is done by pressing in the hollows on the sides of the plug with a small, pointed screwdriver. The cables may now be removed from the plug.

Figure 5.6: Position of the housing fan (housing type 2); the fan is located in the front left area of the housing
The fan must be inserted so that the air blows out of the housing, i.e. with the labelling to the wall of the housing. The cable must exit the fan downwards. Please note the correct polarity when wiring the new fan (see Figure 5.7):

The red cable must be attached to the +12V pole of the circuit board. The polarity must not be inverted when installing a new fan.

**Check that the new fan works properly:**

Having installed and connected the new fan, now connect the Multiplate® to the power source and switch on. Do not touch any of the electronic parts inside the chassis. The push-button should light up, the fan should rotate and create an air stream.

Close the system using the “shut down” command in the log-in window. If no further procedures are to be carried out on the equipment, replace the chassis cover and fasten tightly with the screws (see chapter 5.11)

### 5.4.2 Procedure for housing type 3

**Parts:**  
Fan (Revoltex® Air Guard, 60 x 60 x 20mm)  
4 Phillips countersunk screws

**Tools:**  
Phillips screwdriver

Before changing the housing fans sitting on the separation plate on Multiplate® systems housing type 3, cover and separation plate have to be demounted (see chapter 5.5.1.2).
Next the fan cables have to be separated from the other cables by removing the cable tie (see Figure 5.8, red arrow).

Now the cable of the fan, which is to be changed, can be unplugged (see Figure 5.8, white arrow and Figure 5.9).

After unplugging the fan cable the separation plate can be removed completely from the housing (see Figure 5.10).

Afterwards the broken fan can be demounted by loosening the screws on the rear of the separation plate (see Figure 5.11).

Fix the new fan on the separation plate along the lines of the old one. Please follow the information in chapter 5.11.2, when putting the plate back into the housing.

Plug the fan cable to the power cable on the mainboard and bind the cables with the cable tie (see Figure 5.12).

**Controlling the correct function of the new fan:**

After assembling the new fan, connect the Multiplate® with a power source and switch on the instrument. Don’t touch any electronic parts inside the Multiplate® chassis.

The power push button has to light up and the fan must start to rotate and blow the air in the direction of the computer.
Shut down the system via the command “Shut Down” from the Log on screen. If no more work needs to be done, mount the cover plate as described in chapter 5.11.2, put back the housing cover and tighten the screws (see chapter 5.11).

### 5.5 Replacing the RAM

To replace the RAM, first remove the housing cover as described in chapter 5.2. The metal shielding (see chapter 5.5.1.1) respectively cover plate (see chapter 5.5.1.2) must also be removed since the RAM is situated underneath it.

#### 5.5.1 Removal of the metal shielding

##### 5.5.1.1 Procedure for housing types 1 and 2

**Parts:**
- metal shielding
- 7 countersunk M3x6 screws (SN 000001 to SN 000074)
- 4 countersunk crosshead M3x6 screws (from SN 100075 onwards)
- 2 knurled thumb wheels with M4 screw nuts

**Tools:**
- Phillips M3 screwdriver

In order to detach the metal shielding (from SN 100075 onwards) 4 countersunk crosshead screws must be removed. One screw is located on each side and two on the rear of the chassis (see Figure 5.13, arrows).

![Figure 5.13: Location of the screws on the outside of the metal shielding](image)

The metal shielding is also fastened on the inside of the chassis with two knurled thumb wheels (see Figure 5.14, arrows) which can be loosened by hand. The metal shielding can then be lifted out by pulling on the red straps.
5.5.1.2 Procedure for housing type 3

Parts:
- Cover plate (see Figure 5.15, blue arrow)
- Separation plate (see Figure 5.15, red arrow)
- 2 Phillips countersunk screws M3x6
- 2 screw nuts M4

Tools:
- Phillips screwdriver
- Hexagon socket key

Loosen the two countersunk screws on the rear of the device (see Figure 5.16, arrows), before demounting the cover plate.
Now the cover plate can be lifted from the separation plate. The components of the computer are now accessible. To ease access, the separation plate can also be demounted. Therefore the screw nuts, which fix the separation plate to the bottom of the housing, have to be unscrewed (see Figure 5.17 and Figure 5.18, arrows).

The separation plate can now be vertically lifted out of the housing (see Figure 5.19).

Please note that the separation plate is still attached to the device by the fan cable.
5.5.2 Replacing the RAM

**Parts:** RAM (specifications provided by the manufacturer)

The RAM is situated at the front of the motherboard (see Figure 5.20, red box). The IDE (Integrated Device Electronics) cable must be pulled out gently before it is possible to remove the RAM (see Figure 5.20, arrow).

The RAM is released by pressing the two levers on either side of the motherboard (see Figure 5.21, arrows) and then lifting it up.

When inserting the RAM, it is important to ensure that it is positioned correctly (see Figure 5.22). Push the RAM carefully into its slot until the levers lock into place.
The monitor can now be connected to the Multiplate® which may then be connected to the power supply and switched on. Do not touch any electronic parts inside the chassis.

The monitor will show whether the Windows operating system is starting up. If so, shut down the system via the command “shut down” on the log-in screen and remove the power cable from the Multiplate®.

If no further procedures are to be carried out on the equipment, proceed as shown in chapter 5.11.

### 5.6 Replacing the motherboard fan

**Parts:**
- Motherboard fan
- 4 Phillips countersunk screws

**Tools:**
- Phillips M3 screwdriver

The motherboard is situated underneath the metal shielding and the fan (see Figure 5.23, arrow) lies on top of it.
First loosen and remove the four screws on the fan using the Phillips screwdriver provided (see Figure 5.24, arrows).

Be careful not to discard the screws, they will be needed for installing the new fan.

Next, unplug the three-pin Molex connector (see Figure 5.25). The fan may now be removed.

When inserting the new fan, please ensure that it is the correct way up, i.e. with the manufacturer’s label uppermost (see Figure 5.24).

Once the previously removed screws have been inserted into the new fan and fastened, the Molex plug can be attached (see Figure 5.26).

Care must be taken to observe the correct polarity: the order of colours from left to right is: black, red, yellow.

If no further procedures are to be carried out on the equipment, proceed as shown in chapter 5.11.
5.7 Replacing the fuses (1 A or 6 A)

There are three different types of fuse housings. The first used black one (see Figure 5.27a), the translucent one (see Figure 5.27b) and the currently used one (see Figure 5.32). Replacing the fuses is the same procedure for the first black type and the second translucent type, but varies for the currently used type. In the following both procedures are described.

5.7.1 Replacing fuses (former versions: black and translucent fuse housings)

Parts: Fuses 1 A or 6 A

![Fuse housing](image)

Figure 5.27: Fuse housing; a: first black type; b: second translucent type

In order to replace fuses, the cable harness which lies above the motherboard (see Figure 5.28, arrow), must first be lifted out of the way to bring the fuse housing into view. It may be necessary to remove cable binders.

![Cable harness](image)

Figure 5.28: Cable harness with fuse housing attached (arrow)

The 1 A fuse is located in the fuse housing attached to the red cable; the 6 A fuse is in the fuse housing attached to the yellow cable (see Figure 5.29 and Figure 5.30).

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To simplify the description of the procedure only pictures of the second translucent type of fuse holders are used in this chapter.
Figure 5.29: Previous fuse housings; yellow cable with 6 A fuse (yellow arrow); red cable with 1 A fuse (red arrow)

Figure 5.30: Fuses inside their housing; a: 6 A; b: 1 A

The two ends of the fuse housing screw into each other and are easily unscrewed to open (see Figure 5.31a, arrows). The old fuse can now be removed and replaced with a new one (see Figure 5.31b).

Figure 5.31a: Fuse housing after opening; b: Removing the fuse

⚠️ When replacing the fuse, please ensure that the 6 A fuse is in the housing attached to the yellow cable and the 1 A fuse is in the housing attached to the red cable.

Once the fuses have been replaced, screw the fuse housing back together, fasten the cable binders around the cable harness if necessary and push the latter back into its previous position so that the metal shielding can be easily repositioned and screwed down firmly.

If no further procedures are to be carried out on the equipment, proceed as shown in chapter 5.11.
5.7.2 Replacing fuses (current version of fuse housings)

Figure 5.32: New fuse housings; yellow cable with 6 A fuse (yellow arrow); red cable with 1 A fuse (red arrow)

Note: On currently mounted motherboards the fan was replaced by a cooling element (see Figure 5.32, white arrow).

The new black fuse housings are easily accessible.
Open the fuse housing by unscrewing it using a coin (see Figure 5.33) or a screw driver.

Figure 5.33: Opening the fuse housing

Draw the cap including the fuse from the fuse housing (see Figure 5.34b). The fuse can now be removed easily (see Figure 5.34c). Replace the fuse and screw the cap back onto the housing.

If no further procedures are to be carried out on the equipment, proceed as shown in chapter 5.11.
5.8 Replacing the fuse housing (former translucent version)

Parts:    Fuse housing
          screw locking

Tools:    Small screwdriver (2 mm)

If a fuse housing gets damaged, it must be replaced. Proceed as for replacing a fuse (see chapter 5.7 “Replacing the fuses (1 A or 6 A)”).

After the fuse has been removed from the housing, push the plastic housing back along the cable until the terminal connector (see Figure 5.35) becomes visible. The terminal connector can be removed by taking out the screw (see Figure 5.35, arrow) with the small screwdriver and the fuse housing can then be pulled off.

Figure 5.35: Terminal connector

The new housing can now be pushed onto the cable and the terminal connector screwed back onto the end of the cable. Before tightening the screw, apply screw locking onto the thread (see Figure 5.36).

Figure 5.36: Applying screw locking

⚠️ Make sure that the cable insulation does not get caught between the screw and the cable wires and cause disruption of electrical contact and power transmission.

Follow the same steps to replace the other side of the fuse housing. The fuse can now be inserted. When the two halves of the housing have been screwed back together, proceed as described in chapter 5.7 “Replacing the fuses (1 A or 6 A)”.

5.9 Replacing the hard disk drive (HDD)

5.9.1 Preparation prior to replacement

All data (Multiplate® software, measured data etc.) is stored on the HDD, therefore it is essential to back up your measured data before removing the HDD. In order to do this, copy the “Data” folder onto an external data storage medium. Alternatively, the faulty HDD can also be sent back to the manufacturer; your data will then be saved onto a storage medium and sent back to you.

When ordering a new HDD from the Multiplate® manufacturer please provide the serial number of your Multiplate® system. This number will enable important equipment data to be pre-installed onto the new HDD for you.
5.9.2 Installing the HDD

5.9.2.1 Procedure for housing types 1 and 2

Parts:
- New HDD including IDE and power cables
- 4 Phillips screws

Tools:
- Phillips M3 screwdriver

In order to remove the HDD, disconnect the IDE (see Figure 5.37, blue arrow) and the power cables (see Figure 5.37, red arrow).

Next, remove the four screws attaching the HDD to the housing using a Phillips screwdriver. Two of the screws are situated on the rear of the chassis (see Figure 5.38) and the other two are to be found inside the chassis (see Figure 5.37, white arrows).

The HDD can now be lifted out of the housing. The new HDD already has power and IDE cables attached. The IDE has a different type of cable but the plugs are identical.

Position the new HDD in the chassis with the text uppermost and plug the IDE cable (see Figure 5.39a, blue arrow) and the power cable (see Figure 5.39b, red arrow) into the corresponding slots in the same way as the old HDD.
Now attach the HDD to the chassis using the screws which were previously removed (see Figure 5.40, arrows).

The IDE cable must not cover the fan on the mainboard (see Figure 5.40, red arrow).

If no further procedures are to be carried out on the equipment, proceed as shown in chapter 5.11.

5.9.2.2 Procedure for housing type 3

Note: There are two different types of hard disk drives mounted in Multiplate® systems housing type 3. The formerly used one is equipped with an IDE cable, whereas the currently mounted HDD has a SATA (Serial Advanced Technology Attachment) cable. The replacement procedures only differ in the cabling. In the following both procedures are described.

5.9.2.2.1 HDD type IDE

Parts:
- New hard disk drive (HDD) including tray, IDE and power cables
- 2 Phillips screws

Tools:
- Phillips M3 screwdriver

In Multiplate® systems housing type 3 the HDD is mounted vertically (see Figure 5.41, white arrow).
Unplug IDE and power cables before demounting the HDD (see Figure 5.41, blue respectively red arrow). The HDD is screwed to the housing by a HDD tray. The two crosshead screws fixing the HDD tray to the housing have to be loosened. These screws sit on the rear of the housing (see Figure 5.42, arrows).

Now the HDD including the tray can be lifted out of the device. Place the tray with the premounted new HDD into the housing. Please make sure that the labelling is facing the mainboard. Afterwards fix the HDD tray to the housing (see Figure 5.42, arrows). The new HDD already has IDE (see Figure 5.41, blue arrow) and power cables (see Figure 5.41, red arrow) attached, so you just have to plug them into the corresponding slots in the same way as the old HDD.

If no more work needs to be done, proceed as shown in chapter 5.11.
5.9.2.2.2 HDD type SATA

Parts: New hard disk drive (HDD) including tray and SATA cable
       2 Phillips screws

Tools: Phillips M3 screwdriver

Also the HDD type SATA is mounted vertically in Multiplate® systems housing type 3 (see Figure 5.43, white arrow).

![Figure 5.43: HDD type SATA in the Multiplate® (housing type 3)](image)

Before demounting the HDD unplug the SATA cable from the mainboard (see Figure 5.43 and Figure 5.44a, blue arrow). First unlock the latch at the plug. Afterwards unplug the power cable from the HDD (see Figure 5.43 and Figure 5.44b, red arrow). As the power plug is glued to the socket, it may be helpful to cautiously cut into the glue dot to loosen the plug.

![Figure 5.44a: SATA connector in mainboard socket; b: Power plug in HDD socket; c: SATA-HDD with unplugged power cable](image)

To demount the HDD proceed as described in chapter 5.9.2.2.1 “HDD type IDE”.

The new HDD is already equipped with the SATA cable, so you just have to plug it into the corresponding socket on the mainboard in the same way as the previous HDD. Also plug the power cable into the HDD socket and fix it with a glue dot.

If no more work needs to be done, proceed as shown in chapter 5.11.
5.10 Replacing the power supply unit

The replacing procedure of the power supply unit (PSU) depends on the type of mainboard incorporated. As by now three different types of mainboards (Via Epia, Intel D945, Intel D510MO) have been mounted, there are three different ways to replace the PSU. When ordering a new PSU from the Multiplate® manufacturer please provide the serial number of your Multiplate® system to make sure, that the new PSU is configured appropriately.

5.10.1 Procedure for mainboard “Via Epia”

Parts: New PSU incl. HDD-tray

Tools: Phillips M3 screwdriver

Before changing the PSU (see Figure 5.45, blue arrow) the HDD, which is mounted on top of the PSU, has to be removed (see Figure 5.45, red arrow). Proceed as described in chapter 5.9.2.1. In this case only the power cable (4-pin power connector, see Figure 5.45, 1) not the IDE cable of the HDD has to be detached.

After demounting the HDD the remaining cables of the PSU have to be unplugged (see Figure 5.45):

- Connection to the internal periphery (two 4-pin power connectors, see also Figure 5.46a)
- Connection to the mainboard (20-pin main power connector, see also Figure 5.46b)

Figure 5.45: PSU (blue arrow) with HDD on top (red arrow) and mainboard “Via Epia”

Figure 5.46a: Two 4-pin power connectors of the PSU; b: Main power connector on the mainboard
Remove cable binders by cautiously cutting them open. Push the latch at the main power connector (see Figure 5.46b, arrow), while unplugging it.

Demount the PSU by loosening the three countersunk crosshead screws on the rear of the housing (see Figure 5.47).

Place the new PSU into the housing. As the power socket has to stick out of the rear part of the housing the front part of the PSU has to be lifted slightly. Fix the PSU using the old screws.

Figure 5.47: Screws which fix the PSU to the housing

Now reinstall the HDD. Afterwards connect the main power connector to the mainboard. Also reattach the power supply to the HDD and the internal periphery. As the 4-pin power connectors are hard to plug make sure that no pin is pushed out of the plastic holder.

⚠️ The cables must not cover the fan on the mainboard (see Figure 5.45, white arrow).

If no more work needs to be done, proceed as shown in chapter 5.11.

### 5.10.2 Procedure for “Intel” mainboards

**Parts:** New PSU  
**Tools:** Phillips M3 screwdriver

“Intel” mainboards are installed in combination with a SATA HDD, which is mounted vertically. Before detaching the PSU the power supply of the HDD has to be unplugged (see Figure 5.48, Figure 5.49, 1 and Figure 5.51, 1).

As described in chapter 5.9.2.2.2 “HDD type SATA” the SATA connector is glued to the HDD socket (see Figure 5.48). Cautiously cut into the glue dot to loosen the plug.

Figure 5.48: Power plug glued to HDD socket
5.10.2.1 Mainboard type “Intel D945”

The remaining cables of the PSU have to be unplugged (see Figure 5.49) before demounting it:

2. Connection to the internal periphery (two 4-pin power connectors)
3. Connection to the mainboard (main power connector (3a) and 4-pin connector (3b), see also Figure 5.50)

Remove cable binders by cautiously cutting them open. Unplug the 4-pin connector as well as the main power connector by pushing the latch at each connector (see Figure 5.50, arrow).

To uninstall and install the PSU proceed as described in chapter 5.10.1 “Procedure for mainboard “Via Epiia”“. Afterwards connect the power supply of the PSU to the mainboard (main power and 4-pin connector), to the HDD (SATA connector) and to the internal periphery (two 4-pin power connectors). As the 4-pin power connectors are hard to plug make sure that no pin is pushed out of the plastic holder.

⚠️ The cables must not cover the fan on the mainboard (see Figure 5.49, white arrow).

If no more work needs to be done, proceed as shown in chapter 5.11.
5.10.2.2 Mainboard type “Intel D510MO”

The remaining cables of the PSU have to be unplugged (see Figure 5.51) before demounting it:

1. Connection to the internal periphery (two 4-pin power connectors)
2. Connection to the mainboard (24-pin main power connector, see also Figure 5.52)

Remove cable binders by cautiously cutting them open. Push the latch at the main power connector (see Figure 5.52, arrow), while unplugging it.

To disassemble and reassemble the PSU proceed as described in chapter 5.10.1 “Procedure for mainboard “Via Epiia””. Afterwards connect the power supply of the PSU to the mainboard (main power connector), to the HDD (SATA connector) and to the internal periphery (two 4-pin power connectors). As the 4-pin power connectors are hard to plug make sure that no pin is pushed out of the plastic holder.

⚠️ The cables must not cover the cooling element on the mainboard (see Figure 5.51, white arrow).

If no more work needs to be done, proceed as shown in chapter 5.11.
5.11 Attaching metal shielding and housing cover

5.11.1 Procedure for housing types 1 and 2

Parts: Metal shielding and corresponding screws:
- 7 Screws (up to SN 000074)
- 4 Phillips countersunk M3x6 screws (from SN 100075 onwards)
- 2 knurled thumb wheels with M4 screw nuts

Housing cover with corresponding screws:
4 hexagon socket countersunk head screws (2 mm)

Tools: Phillips M3 screwdriver
Allen key (2 mm)

Screw the metal shielding back onto the housing using the screws previously removed. Place the cover back onto the chassis and screw it tight using the screws previously removed.

Various replacement screws are available in the spare parts set (item number: MP0850).

After completing repairs, please carry out electrical and liquid control on all channels in order to ensure that the Multiplate® is functioning correctly.

5.11.2 Procedure for housing type 3

Parts: Cover and separation plate and corresponding screws:
- 2 Phillips countersunk M3x6 screws
- 2 screw nuts M4

Housing cover with corresponding screws:
4 hexagon socket countersunk screws (2 mm)

Tools: Phillips M3 screwdriver
Hexagon socket key
Allen key (2 mm)

Attach the separation plate with the screw nuts to the housing. When mounting the separation plate back into the housing, be sure to lead the cables through the notch in the separation plate, so they won’t be trapped. Put the cover plate on the separation plate and fix it to the rear of the housing with the two crosshead screws. Afterwards place the cover back onto the housing using the screws previously removed.

Various replacement screws are available in the spare parts kit (item number: MP0850).

After completing repairs, please carry out electrical and liquid control on all channels in order to ensure that the Multiplate® is functioning correctly.
6 Installing software updates

Multiplate® software is continuously being amended and updates of revised software versions are therefore issued at regular intervals.

6.1 Prerequisites for update installation

1. Multiplate® software version V2.01.3, or a later version, must already be installed.
2. The new Multiplate® software “Multiplate.exe” must be copied onto a USB stick.
3. A liquid control set (REF MP0720) and 5 test cells must be provided.

6.2 Installing the new Multiplate® software version

6.2.1 Registration as “multiplate” user

The default settings for user registration are:

User name:  multiplate
Password:  multiplate

Following registration, the existing software version (old software version) will automatically start up and must therefore be closed manually.

6.2.2 Connecting USB stick to Multiplate®

1. Insert the USB stick into the USB socket on the right hand side of the Multiplate®. Windows® automatically recognises the newly connected “removable medium”.
2. Open the removable medium in Windows® Explorer.

6.2.3 Copying software update from USB stick

1. Make sure that no “Multiplate.exe” files are active in the system. All active “Multiplate.exe” files must be closed!
2. Copy the “Multiplate.exe” file from the USB stick (new Multiplate® software version) into the “Multiplate” folder following the path: C:\Documents and Settings\multiplate\Multiplate (see Figure 6.1). DO NOT use any other path for software update.

Figure 6.1: Destination file pathway for the update file “Multiplate.exe”

Note: Copying files: Click onto file to be copied with the right mouse. Select “copy” command by clicking the left mouse. Open the destination folder and press the right mouse. Select the command “paste” with the left mouse. The copied file appears in the destination folder.
3. Confirm that the existing “Multiplate.exe” file (old software version) will be overwritten.

⚠️ Make sure to overwrite the previous “Multiplate.exe” file so that the existing configuration data (e.g. calibration data, reference ranges, pipetting programmes) remain in use after the update. DO NOT remove the existing Config folder.

4. Open the new “Multiplate.exe” file with a double click. The new software version will open. Existing configuration files will be automatically adapted and taken over. The initial start-up will take a little longer because a new data container is being set up.

6.2.4 Moving pipetting programme files (*.mptest)

In the Multiplate® software version V2.03.11, the pipetting programmes are stored according to language. Existing pipetting programmes may be moved into a folder corresponding to the language setting in the user interface (e.g. English, Spanish etc.).

For updates of software version V2.02.11 and onwards please proceed to chapter 6.2.5.

For software versions up to and including V2.02.10, please carry out the following steps:

1. Close the Multiplate® software
2. Open up the following path:
   
   ➔ C:\Documents and Settings\multiplate\Multiplate\Config\Pipette

3. Mark all the existing files with the add-on “*.mptest” and copy them into the relevant language folder (see Figure 6.2).

   ![Figure 6.2: Transferring pipetting programme files into the relevant language folder](image)

6.2.5 Carrying out the liquid control

Once the software update has been installed, a liquid control (see chapter 8.7 “Liquid control”) must be carried out on all five channels (either level 1 or level 2) to ensure that the installation was successful and that the equipment is functioning normally.

If the results of the liquid control are within the normal range, the Multiplate® system is ready for use with the new software version.

If you require assistance with carrying out the software update, please contact the manufacturer.
## Troubleshooting

### Tabelle 1: Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Black screen, Windows® operating system fails to start up and/or</td>
<td>1. RAM error</td>
<td>Replace RAM</td>
</tr>
<tr>
<td>- continuous or intermittent beep or</td>
<td>2. Problem remains after</td>
<td>Contact manufacturer</td>
</tr>
<tr>
<td>- no beep, but flashing of the power push button</td>
<td>replacing RAM</td>
<td></td>
</tr>
<tr>
<td>Multiplate® software is active, but commands cannot be carried out</td>
<td>1. Software error</td>
<td>Close Multiplate® software, shut down the computer, disconnect the equipment from the power source for at least one minute, then switch on again.</td>
</tr>
<tr>
<td>(e.g. auto pipette or start test)</td>
<td>2. Problem remains after</td>
<td>Contact manufacturer</td>
</tr>
<tr>
<td>Circuit board temperature is outside the specified range, even though</td>
<td>Fan is not rotating</td>
<td>Replace fan</td>
</tr>
<tr>
<td>the GAIN in the “Service -&gt; device settings” menu is correct;</td>
<td>Fan is rotating</td>
<td>Contact manufacturer</td>
</tr>
<tr>
<td>- After switching on the instrument the following text appears on the</td>
<td>HDD error</td>
<td>Contact manufacturer</td>
</tr>
<tr>
<td>screen: “Disk boot failure” or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- “Disk boot failure, insert system disk and press enter”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Instrument shuts down automatically</td>
<td>Power supply error</td>
<td>Contact manufacturer</td>
</tr>
<tr>
<td>- Instrument cannot be switched on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument does not warm up</td>
<td>1. Fuse error</td>
<td>Replace both fuses (1 A and 6 A)</td>
</tr>
<tr>
<td>Multiplate® cannot be found</td>
<td>2. Problem remains after</td>
<td>Contact manufacturer</td>
</tr>
<tr>
<td>Instrument does not stir</td>
<td>fuses have been changed</td>
<td></td>
</tr>
</tbody>
</table>
8 Annual maintenance

Biohazard:
Multiplate® equipment comes into contact with potentially infectious material and must therefore be cleaned regularly using one of the disinfectants described in chapter 5.1: “Cleaning and disinfecting the equipment” prior to commencing with maintenance.

List of all tasks to be carried out as part of annual maintenance (please fill in the form in Appendix A):

- Operating conditions
- Visual checks of:
  - fan when in use
  - jack portions of the sensor cables (crystallization of liquids or contamination with blood)
  - power push button lamp (LED)
- Replacement of all sensor cables
- Electronic controls
- Quality control of measurement temperature
- Quality control of stirring actuation
- Liquid controls
- Validation of the electronic pipette

8.1 Operating conditions
The device should be set up on a stable, level surface, paying attention to the following conditions:

- Ensure that there is a gap of at least 10 cm on all sides between the device and other pieces of equipment or walls.
- The ventilation apertures must not be obstructed. Check visually whether the apertures are blocked with dust.
- Ensure that there is free access to the power button when operating the device.
- To avoid the risk of explosion, do not operate the system whilst exposed to inflammable liquids or gases.

8.2 Visual checks

8.2.1 Fan
Place both hands on either side of the front of the cover. A current of warm air should be felt on the left hand side, where the fan is situated (housing version 1 and 2).

8.2.2 Sockets of sensor cables (crystallization of liquids or contamination with blood)
First, remove the sensor cables in order to allow a clear view of the sensor cable sockets. Examine each of the sockets from above and check whether there are any deposits; if so, please contact the manufacturer.
8.2.3 Push-button lamp

When the device is running, the push-button should light up. If it fails to do so, please contact the manufacturer.

8.3 Replacing sensor cables

Remove the sensor cables from the instrument and replace with a new set in all five channels.

Then carry out electronic control as described in chapter 8.4.

8.4 Electronic control

![Sensor cable in socket](image)

The electronic control is called up and started via the sub-item “Electronic control” in the “Multiplate” menu. First, ensure that the sensor cables are in the sockets (see Figure 8.1) and that the instrument has reached the running temperature of 37°C.

Print out the results of the electronic control. If any channels are outside the reference range, please contact the manufacturer.

Please take note of the instructions on carrying out the electronic control which can be found in the user manual.

8.5 Quality control of the measurement temperature

**Equipment required:** QC kit “device temperature” (item number: REF MP0810)

In order to ensure that the measurement temperature control is correctly carried out, the Multiplate® must be switched on and the software must have been active for at least 30 minutes before commencing with the check.

![Screenshot: Temperature of the measurement area](image)

First, enter the measurement area temperature displayed on the main menu (see Figure 8.2, red box) in the chart “Quality control of the measurement temperature” (see Appendix A).

In order to display the temperatures of the measurement area sensors, select the sub-item “Show device temperatures” (see Figure 8.3) in the “Service” menu item.

A window appears as shown in Figure 8.4.
Enter the temperatures of measurement sensors 1-3 in the chart “Quality control of the measurement temperature” (see Appendix A).

The temperature must now be validated externally using the QC kit “device temperature” (see Figure 8.5).

**Procedure:**

1. Insert the 5 test pieces firmly into all 5 channels (see Figure 8.6a) and allow approx. 5 minutes for them to warm up.
2. Insert the thermometers provided into the test pieces in channels 1-5 (see Figure 8.6b) and turn them on.

3. The thermometers will beep on completion of the measurement and the results will appear on the digital display.
4. Enter the results in the chart “Quality control of the measurement temperature” (see Appendix A).

The temperature quality control is satisfactory if all temperatures entered in the chart are within the specified range (36.0°C-38.0°C).

If the QC result is not satisfactory, please refer to chapter 7, “Troubleshooting”, or contact the manufacturer.
8.6 Quality control of stirring actuation

In order to carry out the quality control of the stirring actuation correctly (both visually and with the stroboscope), the Multiplate® must be switched on and the software must be active for at least 30 minutes before commencing with the procedure.

8.6.1 Visual check of stirring

Equipment required: QC kit “stirring actuation” (item number: REF MP0820)

Procedure:

1. Fill the preheating tube with 0.9% NaCl solution by using the disposable pipette.
2. Insert the tube into one of the preheating positions in the preheating area for at least 10 minutes. Make sure, that the NaCl solution is fresh.
3. Insert the empty cuvettes from the QC kit into all 5 channels and fill each one with 600 μl of warm 0.9% NaCl solution.
4. Place a stirring bar into each of the 5 cuvettes and evaluate the stirring process using the chart “Quality control of stirring actuation” in Appendix A.

The quality control is satisfactory if every box in a row of the chart has been filled in with “yes”. If not, repeat the visual quality control on the affected channel using another cuvette or stirring bar. If the second attempt fails, please contact the manufacturer.

8.6.2 Check of stirring actuation using stroboscope (optional)

Equipment required: QC kit “stirring actuation” (item number: REF MP0820) Stroboscope with adjustable light frequency

Procedure:

1. Fill the preheating tube with 0.9% NaCl solution by using the disposable pipette.
2. Insert the tube into one of the preheating positions in the preheating area for at least 10 minutes. Make sure, that the NaCl solution is fresh.
3. Insert the empty cuvettes from the QC kit into all 5 channels and fill each one with 600 μl of warm 0.9% NaCl solution.
4. Place a stirring bar into each of the 5 cuvettes.
5. Turn on the stroboscope (power) and set frequency at 850 rpm.
6. Hold the stroboscope vertically over the cuvette and adjust the light frequency until the stirring bar is “motionless” or “barely rotating”.

7. The frequency displayed (rpm) indicates the stirring frequency of the stirring circuit board. This is identical for all channels.

8. Evaluate the stirring process using the chart “Quality control of stirring actuation” in Appendix A. The stirring quality control is satisfactory if every box in a row of the chart has been filled in with “yes” and the frequency lies within the specified range. If not, please contact the manufacturer.

8.7 Liquid control

Carry out Level 1 and Level 2 liquid controls for all channels as recommended in the instruction leaflet (item number: REF MP0720) and print out the results.

If the results are outside the specified range, please contact the manufacturer.

8.8 Electronic pipette validation

There are three options available for carrying out the recommended annual validation of the electronic pipette:

1. The customer receives a new pipette from the manufacturer and returns the used one to the manufacturer.

2. The customer returns the used pipette to the manufacturer’s where it will be tested, calibrated and then returned to the customer. In the meantime, the customer is provided with a backup pipette.

There is a charge for both options. For further information, please contact the manufacturer.

3. Perform locally a validation procedure with the Pipette Control Unit (PCU; item number: REF MP0840) according to the PCU user manual.
A Appendix

1 Operating conditions / Visual Checks

<table>
<thead>
<tr>
<th>S/N of multiplate®</th>
<th>□ Yes</th>
<th>□ No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Fan working (if housing type 1 and 2)?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>Sockets of sensor cables free of deposit?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>Gap of at least 10 cm on all sides of the device?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>Apertures free of dust? (remove if applicable)</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>No flammable liquids and/or gases within the surrounding area of the device?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
<tr>
<td>Power Button illuminated when device is running?</td>
<td>□ Yes</td>
<td>□ No</td>
</tr>
</tbody>
</table>

2 Sensor Cables

<table>
<thead>
<tr>
<th>Old sensor cables removed and replaced with new set?</th>
<th>□ Yes</th>
<th>□ No</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOT of set used</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 Electronic Control

<table>
<thead>
<tr>
<th>Channel</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Channel 3</th>
<th>Channel 4</th>
<th>Channel 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Control ok?</td>
<td>□ Yes</td>
<td>□ No</td>
<td>□ Yes</td>
<td>□ No</td>
<td>□ Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 Quality Control Of The Measurement Temperature

<table>
<thead>
<tr>
<th>valid range</th>
<th>Temperature in the main menu</th>
<th>Measurement area sensor 1</th>
<th>Measurement area sensor 2</th>
<th>Measurement area sensor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>[36°C-38°C]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>valid range</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Channel 3</th>
<th>Channel 4</th>
<th>Channel 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>[36°C-38°C]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 Quality Control Of Stirring Actuation

Temperature in the main menu [36°C-38°C]

<table>
<thead>
<tr>
<th>Channel</th>
<th>Stirring bar rotates</th>
<th>Stirring bar rotates without striking the cuvette wall</th>
<th>RPM (if applicable) [850-970]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Channel 2</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Channel 3</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Channel 4</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Channel 5</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

6 Liquid Control

<table>
<thead>
<tr>
<th>LOT of Liquid Control</th>
<th>Expiry Date of Liquid Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel</td>
<td>Level 1 within specified range</td>
</tr>
<tr>
<td>Channel 1</td>
<td>Yes</td>
</tr>
<tr>
<td>Channel 2</td>
<td>Yes</td>
</tr>
<tr>
<td>Channel 3</td>
<td>Yes</td>
</tr>
<tr>
<td>Channel 4</td>
<td>Yes</td>
</tr>
<tr>
<td>Channel 5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

7 Electronic Pipette Validation

S/N

Electronic pipette validated in-house with PCU [REF MP0840] □ Yes □ No

or

Electronic pipette sent to manufacturer [MP0871] □ Yes □ No
Result of annual maintenance

Device successfully passed annual maintenance

☐ Yes  ☐ No

Performed by: ______________________  Approved by: ______________________
Date: ______________________  Date: ______________________
Signature: ______________________  Signature: ______________________

multiplate®