Operating Instructions

RAININ

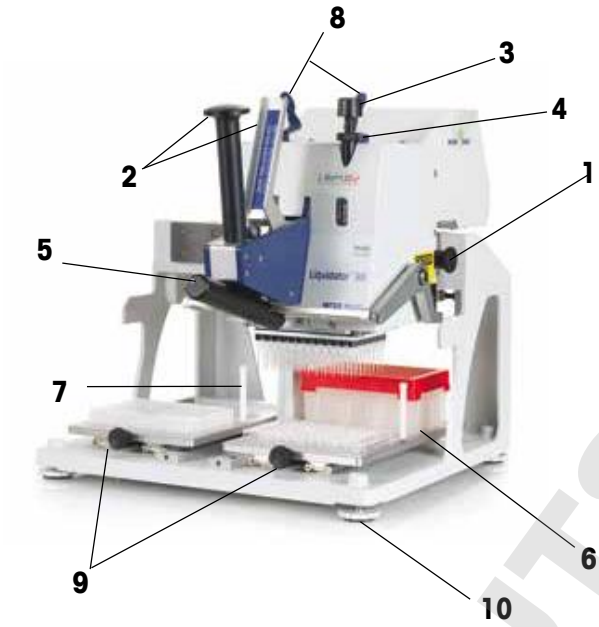
Pipetting 360°

Liquidator™ 96

Manual benchtop pipetting system

METTLER TOLEDO

Liquidator 96 Controls



1. Transport lock
2. Pipetting grip and lever
3. Volume selector
4. Volume lock
5. Tip mounting lever
6. Tip rack position
7. Adjustable height post
8. Tip ejector levers
9. Moveable plate holder
10. Adjustable feet (4)

Notes and Warnings

⚠	Liquidator 96 is for research purposes only. If used for other purposes Rainin will not be liable for resulting damage.
⚠	Always use safe laboratory practices when using Liquidator 96. Do not work directly under the pipetting head. Move it over to have free access to the working place required.
⚠	Never move Liquidator 96 without first locking the pipetting head – see manual for details.
⚠	Pipetting strong acids, bases or other aggressive liquids may damage seals, nozzles, or other parts of Liquidator 96. Avoid allowing any such liquids to contact Liquidator 96 or enter the nozzles. Clean up any contamination or accidental splashes immediately.
⚠	Follow the instructions in this manual for safe long-term operation. Keep the manual close to the instrument for reference purposes. It is the responsibility of the user to follow this instruction manual and to work in accordance with the standard operating procedures and general safety guidelines set up for the particular workplace.
⚠	Do not throw away the large Liquidator 96 shipping box and packaging. This box and packaging will be very useful if you need to transport the instrument to another location or return the instrument for service.

Table of Contents

1.1 Introduction

Ideal for high-throughput applications, Liquidator 96 is a manual benchtop pipetting system with 96 separate channel nozzles in an 8 x 12 microtiter plate standard pattern. Two models are available with the following volume ranges:

LIQ-96-20 0.5–20 µL
LIQ-96-200 5–200 µL

Liquidator 96 operates following the same operational principles as a handheld air-displacement pipette except the pipetting head can be moved along a vertical (z) and a horizontal (x) axis for whole-plate pipetting. The pipetting head will only move in the x axis when it is in the fully up position.

Two plate holders, each with two working positions, move in a horizontal (y) axis and allow a maximum of four different plates with SBS footprint to be used simultaneously.

Adjustable feet at each corner of the base allow you to operate Liquidator 96 in a perfectly level position and provide support to prevent the unit flexing when mounting tips.

The rear positions of the right and left plate holders (right side (6) shown opposite) each retain the specially-designed Liquidator 96 Tip Racks. Liquidator 96 works only with Rainin LTS tips for 96-well pipettes. See page 10 for tip information.

1.2 Unpacking

Follow the steps outlined in the separate publication *9920-363, Unpacking/Repacking Instructions, Liquidator 96*. It is also important to follow these steps for repacking.

Keep the shipping container and packaging for transporting Liquidator 96 to a new location or returning it for service.

1.3 Unlocking and locking the liquid head

The Liquidator 96 pipetting head incorporates a locking device to prevent uncontrolled movement of the head during movement, say between labs, or from a bench to a laminar flow cabinet.

Unlocking:

Release a locked head as follows: Pull the black knob of the transport lock (1) on the right side of the instrument and turn it about 15° so it stays in the "out" position, sticking out about 1 cm. This allows the pipetting head to move; check free movement by moving the head up and down.

Locking:

The pipetting head must be secured each time Liquidator 96 is moved, even from bench to bench, as follows:

- Move the pipetting head fully to the right or left and down to the end position and hold it in this position.
- Pull the black transport lock knob (1) and turn it about 15° to the "locked" position. When you release it, you will hear the transport lock click into place, indicating that the pipetting head is safely locked. The knob will be in the "in" position (see below).
- Never transport the device without locking the pipetting head first. Any damage to the Liquidator caused by transporting it with the head unlocked is not covered by the warranty.

1.4 Leveling Liquidator 96

Four adjustment feet (10) are provided on the Liquidator 96 base to allow you to level the instrument, and to provide support for tip loading.

- You can determine whether the instrument is level by placing a plate of water on the base, and adjusting the feet so that the surface of the water in the plate is level.
- Or, check the level by moving the liquid head to the center of the horizontal rail. If the head moves toward one side, twist the adjustment feet on that side clockwise to raise and counter-clockwise to lower. Repeat as needed until the head does not move when released.

1.5 Environment

Liquidator 96 should be placed level in a dry and clean place, avoiding direct sunlight or air-conditioner fans. Liquidator 96 can be operated on a bench or in a laminar flow cabinet; the small footprint means you can use it almost anywhere.

The recommended ambient temperature is 20-25° C. Any sudden temperature or humidity changes (such as a draft from an air-conditioner fan, or sunlight from a window) may affect precision. Before operation, allow the instrument to adjust to ambient conditions (temperature and humidity) for at least 24 hours. Equilibrating Liquidator 96 requires more time than for conventional pipettes.

1.6 Height adjustment posts: LIQ-AP-20 and LIQ-AP

You can limit the vertical position of the tips by using adjustment posts specific for each Liquidator: LIQ-AP-20 for the 20 µL model and LIQ-AP for the 200 µL model. By using the appropriate posts, the tip end height is limited to prevent tip ends reaching the bottom of the plate (e.g., to prevent self-sealing or possible destruction of coatings or cell layers). Screw the bottom of the post into the thread in the plate holders. Then, use the adjustment screw at the top end of the post to set the desired height.

1.7 Operation

Liquidator 96 is designed for simple ergonomic operation similar to conventional manual pipettes.

1. Tip mounting (photos show right plate use – left plate is similar)

With the transport lock (1) unlocked, move the pipetting head smoothly up and to its full left or right position. Slide the right (or left) plate holder **fully forward** and place a new Liquidator 96 LTS tip rack onto the rear working position (6).

Make sure that the tip rack is correctly positioned, using the four alignment stubs in the base plate which lock into the channels in the base of the tip rack. See below.

Now move the pipetting head smoothly to its right or left position. Ensure that the tip rack is correctly aligned and the tray as well as the pipetting head are fully in their end positions. Move the pipetting head down so the nozzles enter the tips. The two levers (8) on the tip ejection mechanism move outwards, indicating that the nozzles of the pipetting head are inserted correctly into the tips.

NOZZLES NOT SEATED IN TIPS

NOZZLES FULLY SEATED IN TIPS

Firmly press down on the tip mounting lever (5) to fully mount the tips onto the nozzles. You are mounting 96 tips at the same time, so this requires a specific amount of pressure on the mounting lever. You should feel a distinct "lock" as the tips are mounted firmly to the nozzles. A quick, sharp insertion is recommended for best results (if too much force is required, check for proper alignment of nozzles and tips).

Always watch the tip ejector levers (8) when mounting tips!
These levers indicate proper tip mounting – they move outward when you move the pipetting head downwards onto the tip rack to pick up fresh tips, showing that the nozzles are aligned properly into the tips.

- Do not press the tip mounting lever down (5) until the tip ejector levers (8) have moved slightly outwards as you move the pipetting head onto the tip rack.
- As soon as the tip ejector levers (8) have moved outwards completely, the tips are fully mounted and you should release pressure on the tip mounting lever (5).

With the tips fully mounted, move the pipetting head up and the plate holder fully back, and place a vessel containing your liquid sample in the working position in front of the tip rack. After doing so the tips should be directly above the sample vessel.

2. Adjusting pipetting volume

The volume is set with the volume selector (3) and indicated by the volume display (4) which must only be used while the pipetting lever (2) is squeezed.

Do not adjust the volume selector (3) without squeezing the pipetting lever (2).

Selecting volumes is done in a similar way as for Rainin manual pipettes. First unlock the volume lock by twisting it counterclockwise a couple of turns. Adjust the volume a few µL higher than the target, then adjust down to the exact volume to minimize the effects of mechanical backlash. Then twist the volume lock to secure the set volume.

Never force the volume selector beyond its limits – doing so can damage the mechanism.

3. Liquid aspiration

Gently squeeze the pipetting lever (2) until the first stop.

As with a conventional manual pipette, the first stop is an indicator that the set volume is ready to be aspirated; the second stop is the blowout position when dispensing.

Move the pipetting head down slowly until the tip ends are immersed into the liquid to a depth of about 2–4 mm. Allow the lever (2) to slowly move to the "open" position while the liquid is aspirated into the tips. Do not release the lever suddenly, which would aspirate sample too quickly and possibly draw air into the tips. Pre-rinsing – filling and emptying the tips 2 or 3 times – is highly recommended and often leads to better results. This is particularly important when using 20 µL tips. Additionally, aspirating too quickly might pull air bubbles into the liquid, which would negatively affect pipetting accuracy.

When using chilled samples, for best results, chill the tips to the same temperature before use.

When using Liquidator 96, do not begin aspirating from the blowout position unless you are using a reverse pipetting technique. Not only will the incorrect volume be aspirated, liquid might reach the nozzles and cause corrosion of the pipetting pistons. Additionally, when using filter tips, aspirating from the blowout position could flood the filters, requiring fresh tips to be used.

Note: the vertical position of the tips can be limited with the Height Adjustment Post shown on page 3.

When the set volume of the sample is fully aspirated, allow the counterweighted pipetting head to rise clear of the sample, as shown below.

4. Liquid dispensing

Place a 96-well plate on the front tray on the plate holder and move the plate holder fully back for proper alignment.

- Move the pipetting head to position it over the target plate. Carefully and slowly lower the head so that the tip ends are in or close to the wells, but not touching the well bottoms. Use the height adjustment post to limit the travel of the pipetting head.
- Dispense the liquid by slowly squeezing the lever (2) to the first stop. Dispensing too quickly may cause splashing.When reverse pipetting, make sure not to dispense to the blowout position, or the incorrect volume will be dispensed into the wells.

Mixing in the tip can be performed by repeatedly pulling the lever to the first stop and then releasing the lever. Be sure not to pull the lever to the full blowout position during mixing because it will be difficult to fully dispense the entire volume after the final mix.

The blowout stroke removes the residual liquid remaining in the tips. To blowout, squeeze the lever (2) to the second stop.

Sometimes residual beads of liquid might adhere to the tip ends. In this case, perform a wet or dry touch-off or rapid dispense maneuver as detailed below.

- To perform a wet touch-off: after dispensing liquid into a well, touch the tip ends to the liquid within the wells while holding the pipetting lever at the blowout position.
- For a dry touch-off: while holding the pipetting lever at the blowout position, move the 96-well plate holder with your free hand so that the plate well sides touch the tip ends.
- For rapid dispense: slowly dispense until about 10% of the liquid remains in the tip, then with a relatively rapid stroke, dispense all the liquid out of the tips.

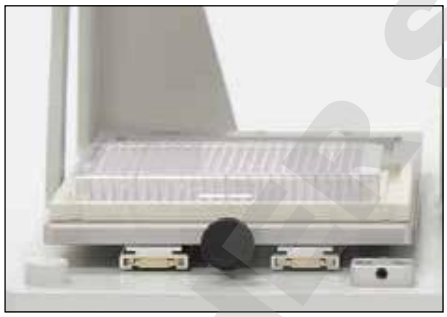
5. Tip ejection

- Move the pipetting head over an empty tip rack and downwards until the tip ends slide into the holes of the rack.
- Squeeze together the two tip ejection levers (8) on top of the pipetting head to eject the tips into the used rack.

To reuse empty racks do not eject used tips into the tip rack. Instead, eject into another suitable container (e.g., a used deep well plate).

6. Using the 384-well adapter – LIQ384PA

This adapter holds a 384-well plate, allowing the plate to move into four discrete positions so that all 384 wells can be filled with four passes of the 96-place tip array. To access all the wells the 384-well plate is moved fully into each of the four corners of the adapter.



1. Place the 384-well plate into the adapter and move it fully into one corner.
2. Carefully align the tip ends into 96 of the wells and dispense 96 samples into the wells.
3. Move the 384-well plate to the next corner.
4. Move the tips to the sample vessels and aspirate sample.
5. Dispense into the next 96 wells.
6. Repeat until all wells are filled.

See Section 1.14 for more information on the 384-well adapter

1.8 Clean operation

Liquidator 96 can be operated in a laminar flow cabinet. Prepare Liquidator 96 by wiping its surface with alcohol or a suitable non-toxic and non-corrosive laboratory disinfectant.

Do not expose Liquidator 96 to UV radiation more than necessary, and never overnight. The radiation and ozone generated may damage the finish and compromise sealing.

Do not autoclave any parts of Liquidator 96 and never use autoclaved tips or racks. The tips as well as the racks will shrink slightly during autoclaving, which can damage the nozzles. Pre-sterilized 96-well pipettes LTS tips are available from Rainin.

1.9 Recommendations for pipetting

- Before operation allow the instrument to adjust to ambient temperature and humidity.
- Pre-rinse the tips – i.e. fill and empty 2-3 times with the same liquid – for better accuracy and precision.
- Proper pipetting speed depends on many factors, including the nature of the liquids being pipetted. The optimum operation speed for your sample can be determined with use.
- When pipetting small volumes (e.g. 1-5 µL) into larger volumes, perform the following actions to ensure that the intended volume is delivered to the plate. After dispensing, mix by gently pulling and releasing the lever 4-6 times. Following mixing, pull the lever to the blow-out position, then perform a wet touch-off action as described above.

1.10 Maintenance and safety

When used according to the instructions in the manual, and with a little routine maintenance and regular cleaning, Liquidator 96 will provide years of trouble-free operation. Liquidator 96 surfaces can be cleaned with a soft cloth slightly moistened with water or a mild detergent.

It is important that the user does not try to dismantle the unit, as specified performance can only be guaranteed if the pipetting head is undisturbed from its factory setting.

If using 20 µL tips with the 200 µL Liquidator, do not aspirate more than 20 µL, as sample may then be introduced into the liquid head and cause damage, requiring expensive repair and voiding the warranty.

1.11 Dimensions

1.12 Specifications

LIQ-96-20

Inaccuracy		Precision	
20 µL:	± 1.0%	20 µL:	≤ 0.8%
10 µL:	± 1.2%	10 µL:	≤ 1.0%
2 µL:	± 6%	2 µL:	≤ 5%
1 µL:	± 12%	1 µL:	≤ 10%

LIQ-96-200

Inaccuracy		Precision	
200 µL:	± 1.0%	200 µL:	≤ 0.5%
100 µL:	± 1.0%	100 µL:	≤ 0.8%
20 µL:	± 2.0%	20 µL:	≤ 1.5%
5 µL:	± 5.0%	5 µL:	≤ 3.5%

1.13 Ordering information

Cat. No.	MT-Order No.	Description
LIQ-96-20	17014207	0.5–20 µL 96-channel Manual Pipetting System
LIQ-96-200	17010335	5–200 µL 96-channel Manual Pipetting System
Service Plans		
LIQ-SVC	17010622	Annual Service Plan
LIQ-SVC4	17010753	4-Year Service Plan
LIQ-SVC4-B	17011290	4-Year Service Plan B
LIQ-C-A	17011103	LIQ 96 CalPM Plan A
LIQ-C-B	17011104	LIQ 96 CalPM Plan B
Accessories		
LIQ-AP-20	17014270	Height adjustment posts for LIQ-96-20
LIQ-AP	17010396	Height adjustment posts for LIQ-96-200
LIQ-MAG1	17011288	Magnetic bead separator plate, 24 posts
LIQ-MAG2	17011289	Magnetic bead separator plate, 96 round posts
LIQ-384PA	17010394	384-well adapter plate stage – white
LIQ-384PA-B	10710791	384-well adapter plate stage – black
LIQ-20PA	17011118	20 µL Tip adapter plate stage – white*
LIQ-20PA-B	17011119	20 µL Tip adapter plate stage – black*

*One of these stages must be used w/ 20 µL tips

BioClean Racked Tips for 96-well pipetting			Max Volume
LQR-200	17010645	96-well pipetting tips, Racked	200 µL
LQR-200S	17010647	96-well pipetting tips, Racked, Sterile	200 µL
LQR-200F	17010646	96-well pipetting tips, Filter, Racked	200 µL
LQR-20	17011185	96-well pipetting tips, Racked*	20 µL
LQR-20S	17011186	96-well pipetting tips, Racked, Sterile*	20 µL
LQR-20F	17011117	96-well pipetting tips, Filter, Racked*	20 µL
BioClean Stacked Tips for 96-well pipetting			
LQS-200	17010648	96-well pipetting tips, Stacked	200 µL
LQS-200S	17010649	96-well pipetting tips, Stacked, Sterile	200 µL
LQS-20	17011187	96-well pipetting tips, Stacked*	20 µL
LQS-20S	17011287	96-well pipetting tips, Stacked, Sterile*	20 µL
SBS footprint polypropylene reusable reservoirs			
LR-R1-PB-5	17012602	Non-sterile low profile 96 pyramidal bottoms, 5-pack	
LR-R1-PB-5-S	17012603	Sterile low profile 96 pyramidal bottoms, 5-pack indiv. wrap	
LR-R2-PB-5	17012604	Non-sterile standard profile 96 pyramidal bottoms, 5-pack	
LR-R2-PB-5-S	17012605	Sterile standard profile 96 pyramidal bottoms, 5-pack indiv. wrap	
LR-R1-8V-5	17012608	Non-sterile low profile 8-channel V-bottom, 5-pack	
LR-R1-8V-5-S	17012609	Sterile low profile 8-channel V-bottom, 5-pack indiv. wrap	
LR-R2-8V-5	17012606	Non-sterile standard profile 8-channel V-bottom, 5-pack	
LR-R2-8V-5-S	17012607	Sterile standard profile 8-channel V-bottom, 5-pack indiv. wrap	
LR-R1-12V-5	17012612	Non-sterile low profile 12-channel V-bottom, 5-pack	
LR-R1-12V-5-S	17012613	Sterile low profile 12-channel V-bottom, 5-pack indiv. wrap	
LR-R2-12V-5	17012610	Non-sterile standard profile 12-channel V-bottom, 5-pack	
LR-R2-12V-5-S	17012611	Sterile standard profile 12-channel V-bottom, 5-pack indiv. wrap	
Deepwell plates, mats, tube strips, cap strips			
LR-P2-96P-5	17012623	Non-sterile 2.2 ml 96-deepwell plate, 5-pack	
LR-P2-96P-5-S	17012624	Sterile 2.2 ml 96-deepwell plate, indiv. wrap, 5-pack	
LR-P2-96-M-5	17012625	Non-sterile silicone sealing mat fits 96-deepwell plate, 5-pack	
LR-P2-96-M-5-S	17012626	Sterile silicone sealing mat fits 96-deepwell plate, 5-pack indiv. wrap	
LR-T-96-5	17012627	Non-sterile 1.2 ml racked microtube strips (8x12), 5-pack	
LR-T-96-5-S	17012628	Sterile 1.2 ml racked microtube strips (8x12), 5-pack	
LR-T-CS8	17012629	Non-sterile microtube strip caps (8), Box of 300	
LR-T-CS8-S	17012630	Sterile microtube strip caps (8) 25 bags of 12 strips	
LIQ-96-ADP	17012767	Aluminum 96-well PCR plate holder	

1.14 Using the 384-well adapter

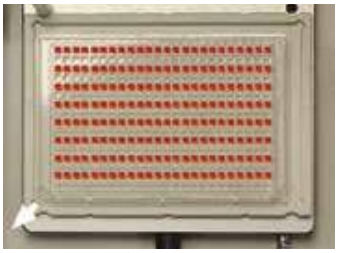
This adapter holds a 384-well plate and allows the plate to move into four discrete positions so that all 384 wells can be filled with four passes of a 96-place tip array. To access all the wells, the 384-well plate is moved fully into each of the four corners of the adapter.

1. Place the adapter into the working position and place the 384-well pate fully right and to the bottom, as shown by the white arrow.

2. Aspirate sample, then move the pipetting head over the 384-well plate and dispense into 96 of the wells, as shown here.

Well number A1 (top left) is filled

3. Move the 384-well plate fully left and to the bottom then aspirate the next samples. Move the pipetting head over the 384-well plate and dispense into the next 96 wells as shown.



Well number A2 is filled

4. Move the 384-well plate fully left and to the top, then aspirate the next samples. Move the pipetting head over the 384-well plate and dispense into the next 96 wells as shown.

Well number B2 is filled

5. Move the 384-well plate fully right and to the top, then aspirate the next samples. Move the pipetting head over the 384-well plate and dispense into the remaining 96 wells as shown.

Well number B1 is filled

1.15 Limited Warranty and Limitation of Liability

a.) Seller warrants the merchandise to conform to specifications. Under no circumstances shall Seller be responsible for alleged nonconformities with respect to any merchandise which has been used for purposes or in any manner for which it was not intended, or any merchandise which has been customized or modified without Seller's prior written consent, or damaged or misused. As Buyer's exclusive remedy in the event of breach of warranty, Seller shall repair or replace, as its option, any nonconforming merchandise or parts thereof for a period of one (1) year after delivery. All claims must be made in writing to the Seller. Any claims not made within the period specified above shall be deemed waived and released.

b.) THE PROVISIONS OF THE FOREGOING WARRANTIES ARE IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL (INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT). SELLER'S LIABILITY ARISING OUT OF THE MANUFACTURE, SALE OR SUPPLYING OF A PRODUCT OR ITS USE OR ITS DISPOSITION, WHETHER BASED UPON WARRANTY, CONTRACT, TORT OR OTHERWISE, SHALL NOT FOR ANY REASONS EXCEED THE AGGREGATE PURCHASE PRICE PAID BY BUYER FOR SUCH PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFITS, LOSS OF DATA OR LOSS OF USE) ARISING OUT OF THE MANUFACTURE, SALE, SUPPLY, USE, MARKETING, RESALE OR OPERATION OF THE MERCHANDISE, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR LOSSES.

1.16 Liquidator 96 online

METTLER TOLEDO's website features information about Liquidator 96, including an on-demand webinar. Listed below is a list of pages that include Liquidator 96 product or application information (current at time of printing).

- **www.mt.com/liq96**
  Includes a promotional video and two other videos describing filling a 96-well plate and a 384-well plate.

- **www.mt.com/liq96-ARSL**
  Includes a case study on how Liquidator 96 helps speed efficiency in genotyping.

- **www.mt.com/liquidator-ccdb**
  Includes four videos and a white paper describing how Liquidator 96 is used in the Canadian Centre for DNA Barcoding for sample preparation, PCR and cycle sequencing.

- **www.mt.com/pipettes**
  Includes a link to an on-demand Liquidator 96 webinar. Also includes a link to the Liquidator 96 product information.

Appendix A: Liquid Head – Setting Head and Tray Stops

A.1 Introduction

If you need to realign the Liquidator 96 head or plate trays there is a simple 2-stage procedure: first set the right or left liquid head stop position, then set the tray front stop position.

The following procedures describe adjusting the right-side plate tray: the procedure is similar for the left-side tray.

You'll need a fresh rack of Rainin 96-well tips and the following tools from the supplied toolkit, shown in Figure A1:

A Long hex driver with ball-end, 2.5 mm
B Open ended wrench, 8 mm
C Hex L-key, 4 mm

Figure A1: Tools required

A.2 Setting the Right Stop

The right and left stops are located at the rear of the liquid head behind the liquid head rail.

Figure A2: Liquid head right stop

Move the liquid head fully to the right until you reach the right stop.

Pull the right-side tray fully forward and place the fresh rack of tips into the rear plate. Carefully

lower the liquid head until the nozzles almost engage the tips.

Then, viewing from the front, check the left-right position of the nozzles in relation to the tips. The nozzles should be centered directly over the tips.

If they are in the correct position, go to section **A.3 Setting the Front Stop**

If they are not correctly centered left and right, then the right head stop needs to be adjusted.

Here is a very exaggerated view of non-aligned nozzles:

Figure A3: Non-aligned nozzles (exaggerated view)

To adjust the right head stop, first loosen (turn counter-clockwise) the lock nut with the 8 mm open ended wrench. Loosen it about half a turn.

Figure A4: Loosen the lock nut

Using the hex L-key, make very small adjustments to the right head stop screw. After each small adjustment recheck the nozzle position in relation to the tips as described earlier.

Note: Turning the stop screw counter-clockwise will position the head further left, and turning the stop screw clockwise will position the head further to the right.

Figure A5: Adjusting the right stop

When you are satisfied that the nozzles are correctly aligned left and right over the tips, hold the right-stop screw in position with the hex L-key and tighten (turn clockwise) the lock nut with the open ended 8 mm wrench.

Figure A6: Tightening the lock nut

A.3 Setting the Front Stop

Move the liquid head fully to the right until you reach the right stop.

Pull the right-side tray fully forward and place the fresh rack of tips into the rear plate.

Slowly lower the liquid head until the nozzles almost engage the tips, then, viewing from the right side, check the forward-backward position of the nozzles in relation to the tips. They should be centered directly over the tips.

If they are not fully centered forward and backward, then the right front tray stop screw needs to be adjusted.

Figure A7: Front tray stop

Note: With the tip tray fully forward the front stop screw is hidden from view.

Using the 2.5 mm hex driver, make very small adjustments to the front tray stop screw. Turning the tray stop screw counter-clockwise will position the tray further forward, and turning the stop screw clockwise will position the tray further back.

Figure A8: Hex driver engaging front tray stop screw

After each small adjustment, recheck the nozzle positions in relation to the tips as described earlier. Continue making small adjustments until the nozzles are centered over the tips

A.4 Left-side adjustments

Repeat sections A.2 and A.3 as necessary for the left head stop and the left tray. Prior to making any adjustments on the left tray rear stop, remember to move the liquid head fully to the left until you reach the left stop.

Note: For the left head stop, loosening the stop screw (turning counter-clockwise) will position the head further to the right, and tightening it (turning clockwise) will position the head further to the left. Otherwise the procedure is identical for the left side settings.

Once you have made these adjustments, the nozzles and tips will be aligned and loading tips should be smooth and effortless.

A.5 Adjusting the Rear Stop

Setting the rear stop on both trays is primarily useful when working with 384-well plates. This procedure allows you to accurately align the tray so that the tips locate the 384 wells in each of the 384-well plate adapter's four positions.

The example will show the procedure for the right tray and will use only one tip for clarity: the procedure for the left tray is similar.

A.5.1 Checking the rear stop

Move the liquid head fully to the right until you reach the right stop.

Place a 384-well tray onto the front right tray without the plate adapter. Push the tray all the way back until it hits the rear stop.

Mount one tip to the nozzle at the left front corner of the liquid head as shown here.

Figure A9: Mounting one tip

Lower the liquid head to see where the tip makes contact with the 384-well plate. It should touch the plate centrally in the space between the four wells at the left front corner, wells P1, P2, O1 and O2, as shown in the figure below.

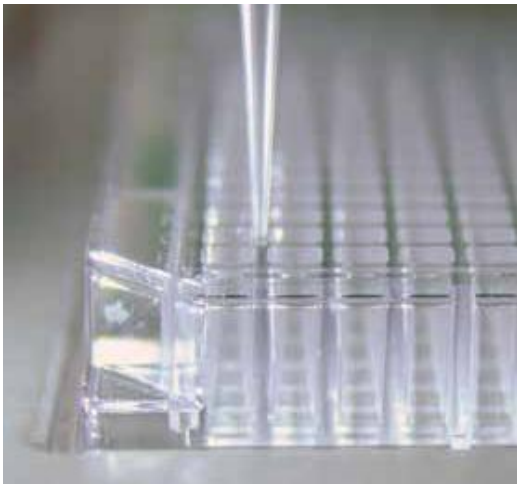


Figure A10: Proper location of tip between the four wells in the left corner of the plate

If the tip is correctly in this position, the tray is correctly aligned and you do not need to make any adjustments to the right tray.

If the tip end is offset to the left or right, you will need to go back and re-adjust the left and right stops as outlined above (Note: this step should not be necessary unless the adjustment was not done correctly.)

If the tip end is offset to the front or back, you will need to adjust the Rear stop as shown in the next section.

A.5.1 Adjusting the rear stop

The rear top is located at the back of the tray. You will need to pull the tray fully forward to see the stop, then reaching behind the tray, use the long hex driver, 2.5 mm to loosen or tighten the stop. Engage the hex driver in the screw head as shown below.

Figure A11: Rear stop

Push the right tray back until it reaches the stop.

Remove the 384-well plate and put the 384-well plate adapter into the tray.

Then place the 384-well plate onto the adapter.

Push the 384-well plate into the top right corner of the adapter and slowly bring the liquid head down until the tip reaches the plate.

Adjust the rear stop by turning the screw counterclockwise to move the tray back, or clockwise to move the tray forward, until the tip fits over the center of well P1, as shown below.

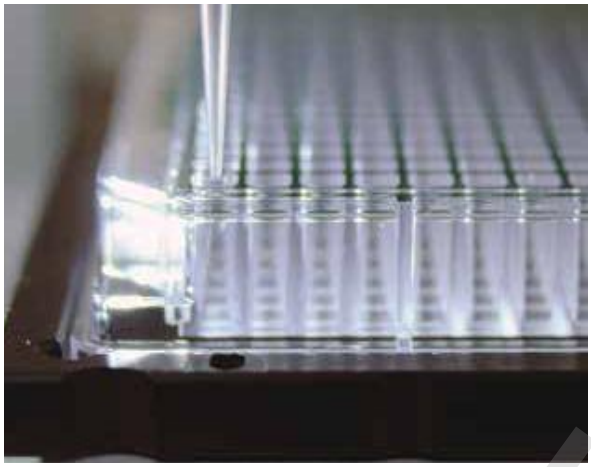


Figure A12: Tip correctly positioned over well P1

Once the tip is correctly centered in well P1, all tips will fit their wells properly: at this pont the rear stop is adjusted correctly and should be left alone.

For a quick check you can move the 384-well plate to the top left position, bring the liquid head slowly down and see that the tip fits properly over well P2, as shown below.

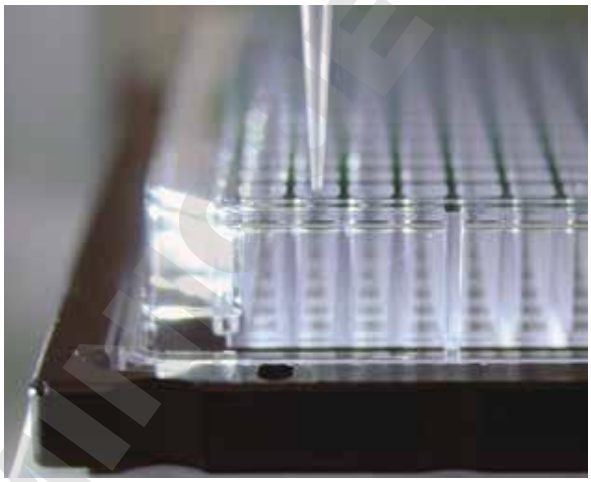


Figure A13: Tip correctly positioned over well P2

Once the tray is correctly positioned you should repeat the above instructions for the left tray.

Prior to making any adjustments on the left tray rear stop, remember to move the liquid head fully to the left until you reach the left stop.

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