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Lambda™ Plus

Single-Channel Pipettor

Instruction Manual

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LAMBDA™ PLUS



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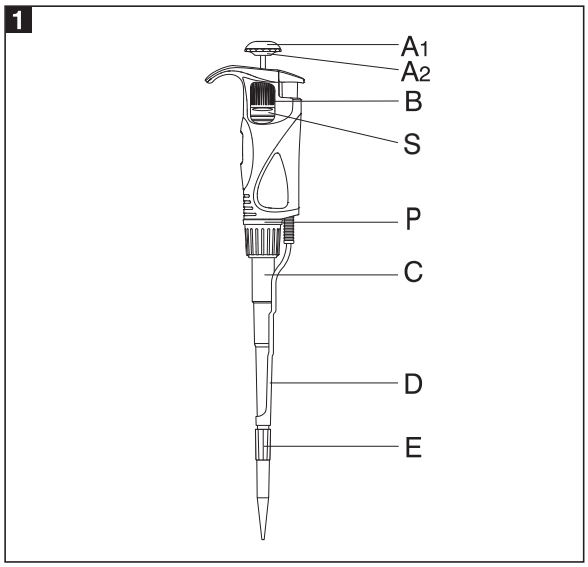
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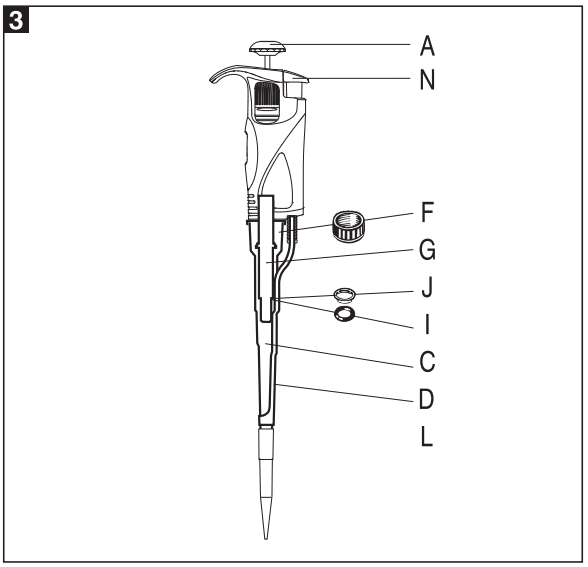
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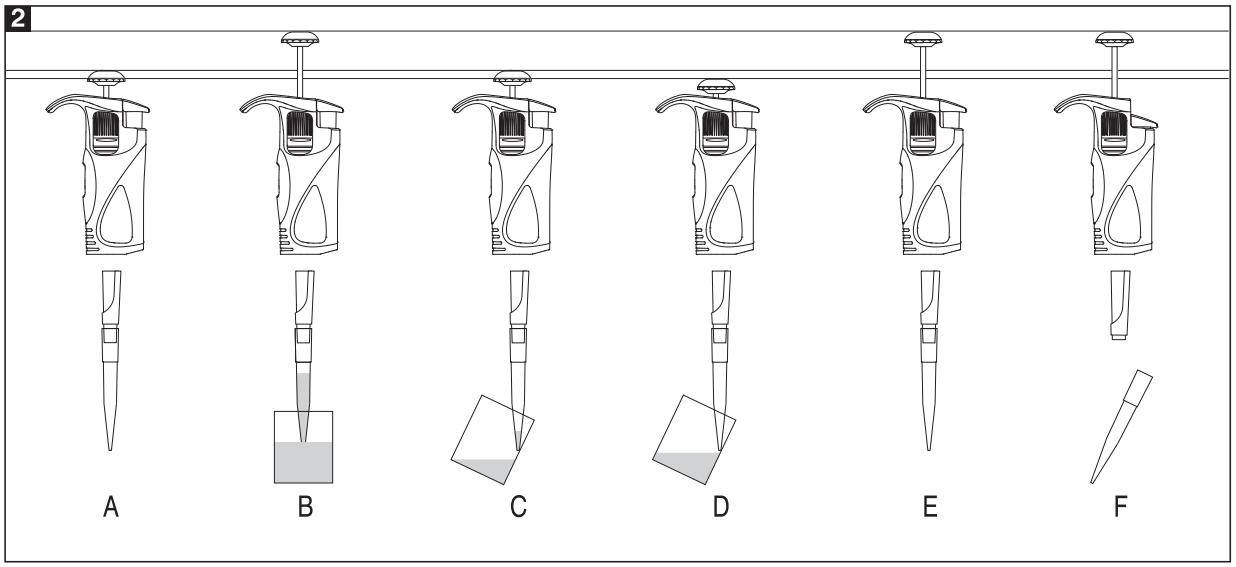
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Single-Channel Pipettor



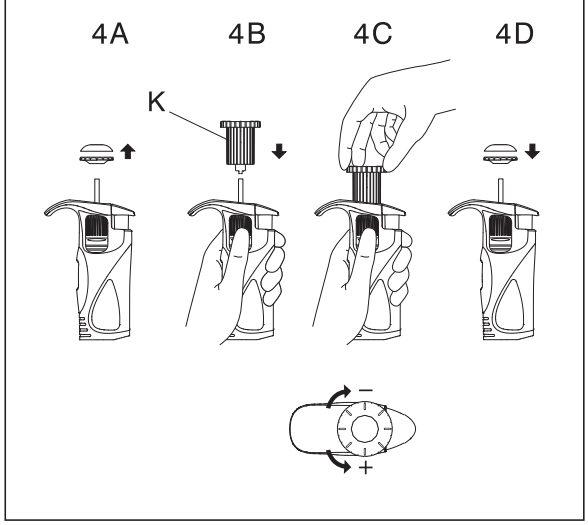




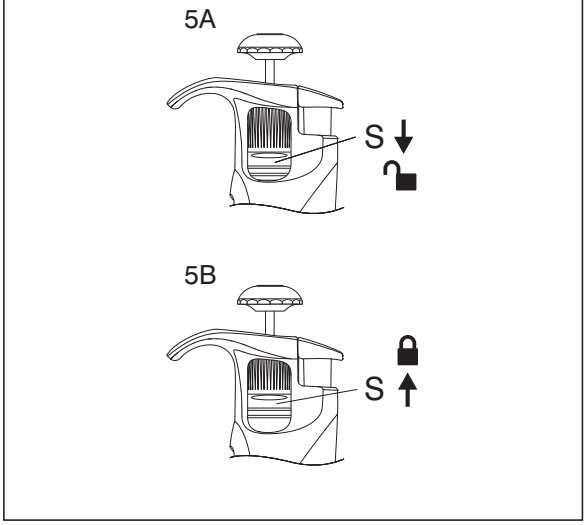
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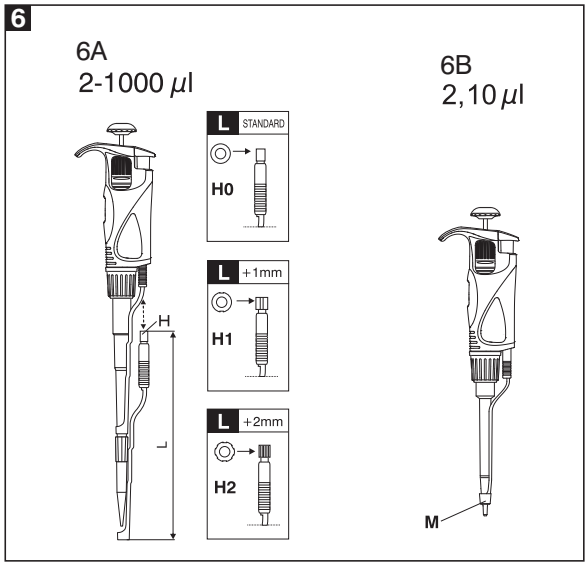
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Lambda™ Plus

Single-Channel Pipettor

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1 - INTRODUCTION

The **Lambda™ Plus** single-channel pipettor is a volumetric instrument designed to measure and transfer liquids precisely and safely. It can accommodate volumes from 0.1 µL to 1000 µL depending on the model.

All **Lambda™ Plus** single-channel pipettors feature a digital counter which shows the pipetting volume. The set volume is visible in the window on the handle. Volumes are set by either turning the pipetting pushbutton (Fig. 1A2) or the adjustment knob (Fig. 1B) in the correct direction. The pipettor design allows the user to lock the volume setting by sliding the locking ring upwards (Fig.1S). The symbols printed on the handle show which position is locked and unlocked. The volume range of each model is shown on the pipetting pushbutton (Fig. 1A1).

Lambda™ Plus single-channel pipettors are produced in 6 models, covering the volume range from 0.1 µL to 1000 µL.

Model	Volume range [µL]
2	0.1 - 2
10	0.5 - 10
20	2 - 20
100	10 - 100
200	20 - 200
1000	100 - 1000

2, 10	Measurement and transfer of micro-volumes, DNA sequencing and enzyme-assay applications.
20, 100, 200, 1000	Measurement and transfer of general aqueous solution, acids and bases

Liquids are aspirated into disposable tips attached to the pipettor shaft. Disposable tips ensure maximum safety and eliminate the possibility of cross-contamination of the liquid samples.

To protect the user from contaminated tips, the **Lambda™ Plus** single-channel pipettor is fitted with a built-in tip ejector (Fig. 1D).

The ejector length can be adjusted to accommodate virtually every type of tip available on the market. When using narrow tubes, it may be necessary to remove the tip ejector. This is done simply by pulling down.

Adjusting of the Tip Ejector Length

- in 2-1000 µL Pipettors (Fig. 6A).

The "H“ spacers, included with each pipettor, allow the ejector length to be adjusted by +1mm or +2mm. An ”H0” spacer is fitted as standard. The outside shape of the spacer identifies the adjustment.

- in 2 and 10 µL Pipettors (Fig. 6B)

The 2 µL - 10 µL pipettors may require the use of an ejector cap "M" to efficiently eject certain brands of pipettor tips. Simply place the cap, supplied with the pipettor, on the bottom of the pipettor shaft and slide the cap upwards until it surrounds the bottom of the tip ejector. The **Lambda™ Plus** single-channel pipettor is a high quality instrument which offers excellent accuracy and precision.

The accuracy and precision (repeatability) of liquid volume depends on the quality of pipettor tips used. The values for accuracy and precision shown in the table below were obtained using **Corning®** tips. Only these tips guarantee correct operation of the pipettors and ensure accuracy and precision of liquid sampling.

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Single-Channel Pipettor

Model	Volume [µL]	Accuracy [%]	Precision [%]
2	0.2	± 12.0	± 6.0
	1.0	± 2.7	± 1.3
	Max 2.0	± 1.5	± 0.7
10	Min 0.5	± 4.0	± 2.8
	5.0	± 1.0	± 0.6
	Max 10.0	± 0.5	± 0.4
20	Min 2	± 3.0	± 1.5
	10	± 1.0	± 0.5
	Max 20	± 0.8	± 0.3
100	Min 10	± 1.6	± 0.80
	50	± 0.8	± 0.24
	Max 100	± 0.8	± 0.20
200	Min 20	± 1.2	± 0.60
	100	± 0.8	± 0.25
	Max 200	± 0.6	± 0.20
1000	Min 100	± 1.6	± 0.40
	500	± 0.7	± 0.20
	Max 1000	± 0.6	± 0.15

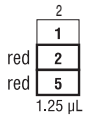
The accuracy and precision are obtained gravimetrically using **Corning** tips, performing at least 10 measurements of distilled water at a temperature of 20±1°C, according to EN ISO 8655 standard.

The design enables the user to recalibrate the pipettor themselves according to the rules described in section 8.

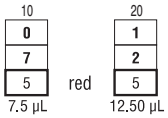
2 - SETTING THE VOLUME

Setting the volume of the aspirated liquid can be done either using the pipetting pushbutton (Fig. 1A2) or by the adjustment knob (Fig. 1B). The volume display shown by the counter has three digits. These should be read from top to bottom. The lowest counter dial shows a scale which allows volume setting in the minimum graduation range. Examples of the black and red digits:

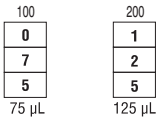
Pipettor **2**
Red figures at the bottom = 1/100 µL
Increment = 0.002 µL



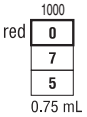
Pipettor **10, 20**
Red figures at the bottom = 1/10 µL
Increment = 0.02 µL



Pipettor **100, 200**
Black figures only = 1 µL
Increment = 0.2 µL



Pipettor **1000**
Red figures at the top - mL
Increment = 2 µL



To set the required volume, use the lower section of the pipetting pushbutton (Fig. 1A2) or the adjustment knob (Fig. 1B), to increase or reduce the volume. The volume adjustment can only be performed when the locking ring is set in the lower position (Fig.5A).

When the desired volume is set, the locking ring should be moved to the upper position (Fig. 5B). All volume setting procedures should end in the the reduction of volume setting from a position just above the desired level to that level. As further examples:

- When moving from a high volume setting to a lower value, the pushbutton or adjustment knob should be rotated at normal speed, clockwise, to take the setting just above the desired level. It should then be further rotated very slowly till the desired volume is shown on the digital volume display.
- In the event that you overshoot the desired setting, repeat the procedure by increasing the volume to a position just above the desired volume and then once again, slowly adjust clockwise to the desired level.
- When moving from a low volume setting to a higher value, the pushbutton or adjustment knob should be rotated at normal speed, counterclockwise, to take the setting to a position just above the desired level. Then slowly reverse the rotation clockwise and adjust back until the desired volume is shown on the digital display.
- Once again, in the event that you overshoot the desired setting, repeat the procedure by increasing the volume to a position just above the desired volume and then slowly adjust clockwise to the desired level.
- Following volume adjustment, move the locking ring to the upper position, to lock the knob and prevent accidental volume change.

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3 - ASPIRATING AND DISPENSING LIQUIDS

Place a tip on the shaft of the pipettor. See Section 6 for the appropriate tip. Press the tip on firmly using a slight twisting motion. This will ensure an airtight seal.

Important: Never aspirate liquids into the Lambda™ Plus single-channel pipettor without a tip attached.

Aspiration

Press the pushbutton to the first positive stop, (Fig. 2A). Holding the pipettor vertically, immerse the tip into the sample liquid. The depth to which the tip is immersed in the sample liquid depends on the model.

Model	Immersion depth (mm)
2	≤ 1
10	≤ 1
20, 100	2 – 3
200 1000	2 – 4

Release the pushbutton slowly and smoothly to aspirate the sample, (Fig. 2B). Wait one second and then withdraw the tip from the liquid. If the pipet tip is not immersed to the recommended depth or if the pipetting pushbutton is rapidly released, air may enter the disposable tip.

Avoid touching the orifice of the tip.

Dispensing

- Place the end of the tip against the inside wall of the vessel at an angle of 10° to 40°.
- Press the pushbutton smoothly to the first stop (Fig. 2C). Wait one second.
- Press the pushbutton to the second stop to expel any remaining liquid (Fig. 2D).
- Keeping the pushbutton depressed to the very end, remove the pipettor by drawing the tip against the inside surface of the receiving vessel.
- Release the pushbutton to its starting position (Fig. 2E).
- Eject the tip by pressing the tip ejector button (Fig. 2F). Remember to change the tip whenever a different kind of liquid is to be sampled.

4 - PRE-RINSING

When pipetting liquids of higher viscosity or lower surface tension than water (e.g. sera or organic solvents), a film of liquid is formed on the inside wall of the pipet tip. This film can create an error. As the film remains relatively constant in successive pipetting operations with the same tip, this error can be eliminated by forming the film before transferring the first sample. This is done by aspirating a sample and dispensing it back into the same vessel. Now, as the film is already formed, all of the following samples will have better accuracy and repeatability.

This pre-rinsing operation should be repeated when the volume to be aspirated is changed or when a new tip is used.

5 - DENSE AND VISCOUS LIQUIDS

Lambda™ Plus single-channel pipettors specifications of accuracy and precision are based on pipetting distilled water. Handling of liquids with physical qualities of density, viscosity and surface tension which differ substantially from water may need gravimetrically checked compensation of the volume setting. Normally the degree of error resulting from heavy or viscous liquids is negligible if pipetting is done slowly and carefully. It is most important to give the liquids some time to react to the change of pressure by holding the pipettor tip in its position for at least 2 sec. after the aspiration and the blow out stroke.

If in extreme cases, this method of operation does not result in accurate values, a compensation may be achieved as follows:

Weigh the liquid pipettor when the **Lambda™ Plus** single-channel pipettor is set to the nominal value. Then calculate the set-off from the nominal value:

Correction, value = 2 x nominal. val. - $\frac{m}{\gamma}$

m *- weight of the sample*

γ *- density of liquid*

Check this operation once again and correct if necessary. Note the corrected value for further pipetting of the same kind of liquid.

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6 - CORNING® PIPET TIPS

Corning tips are made from high performance polypropylene and their quality guarantees the precision and accuracy associated with the **Lambda™ Plus** single-channel pipettor. Strict control is maintained throughout the manufacturing process to ensure the highest quality.

The accuracy and precision figures for the **Lambda™ Plus** single-channel pipettors are only guaranteed when **Corning** tips are used. The use of inferior quality tips will seriously degrade the performance of the **Lambda™ Plus** single-channel pipettor.

Pipet tips used for volumes between 0.1 µL and 10 µL are used with Model 2 and 10.

Pipet tips used for volumes between 1 µL and 200 µL are used with Models 20, 100 and 200.

Pipet tips used for volumes between 100 µL and 1000 µL are used with Model 1000.

7 - RECOMMENDATIONS

Observing the following recommendations will ensure maximum possible accuracy and precision of liquid sampling.

- Make sure to operate the **Lambda™ Plus** single-channel pipettor slowly and smoothly.
- The depth of immersion in the sample liquid should be the minimum necessary and should remain constant during aspiration.
- The **Lambda™ Plus** single-channel pipettor should be held in a vertical position.
- Change the tip when volume setting is changed or when a different liquid is to be aspirated.
- Change the tip if a droplet remains on the end of the tip from the previous pipetting operation.
- Each new tip should be pre-rinsed with the liquid to be pipetted.
- Liquid should never enter the **Lambda™ Plus** single-channel pipettor shaft. To prevent this:
  - Press and release the pushbutton slowly and smoothly.
  - Never turn the pipettor upside down.
  - Never lay the pipettor on its side when there is liquid in the tip.
- Never force the volume setting beyond its recommended limits.
- When pipetting liquids with temperatures different from the ambient temperature, it is recommended to pre-rinse the tip several times before use.
- Do not pipettor liquids with temperatures above 70°C.
- When pipetting acids or corrosive solutions which emit vapors, it is recommended to disassemble the shaft and rinse the piston and seal with distilled water after finishing the pipetting operation.

8 - RECALIBRATION

Lambda™ Plus single-channel pipettors are calibrated gravimetrically, using **Corning** tips and distilled water, at a temperature of 20±1°C, according to EN ISO 8655 standard.

If during pipettor operation you find that the accuracy error (the difference between the real aspirated volume and the preset volume) exceeds the permissible value given in the table in section 1, the pipettor recalibration procedure should be carried out.

Before starting the recalibration it is necessary to check whether the following requirements have been met during error determination:

- the ambient temperature, and the temperature of the pipettor, tips and water was identical
- the density of the liquid used is close to that of distilled water
- a balance with appropriate sensitivity has been used

Volume checked [µL]	Balance sensitivity [mg]
0.1 - 10	≤ 0.001
10 - 100	≤ 0.01
> 100	≤ 0.1

- mg/µL conversion factor has been taken into account
- the requirements shown in sections 3 and 7 have been met

If the above conditions are satisfied and the accuracy error for selected volume given in section 1 exceeds the permissible value, the pipettor recalibration procedure should be carried out.

The recalibration can be performed within one full turn of the key to the right or to the left only.

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Recalibration conditions:

Ambient temperature, the temperature of the pipettor, tips and liquid should be within the range 20-25°C and stabilized during weighing within ±0.5°C.

- Measurements should be conducted using distilled water
- Balance sensitivity should be suitable for the volume to be measured

Recalibration procedure:

- Set the dose volume depending on the pipettor volume according to the following table:

Model	Range of the pipettor volumes [µL]	Preset volume [µL]	Permissible volumes [µL]	Volume change ΔV for full turn of the calibration key [µL] (24 increments)
2	0.1 - 2	0.2	0.176 - 0.224	0.06
10	0.5 - 10	0.5	0.48 - 0.52	0.33
20	2 - 20	2	1.94 - 2.06	0.63
100	10 - 100	10	9.84 - 10.16	2.50
200	20 - 200	20	19.76 - 20.24	6.30
1000	100 - 1000	100	98.4 - 101.6	25.00

- Perform 5 aspirations, weigh each one and calculate the average value of the aspirations
- Calculate average aspirated volume in µL multiplying the average aspiration amount [mg] by the distilled water density coefficient [µL/mg], which depends on temperature and pressure according to the following table:

Temperature [°C]	Pressure [kPa]		
	95.0	101.3	105.0
20	1.0028	1.0029	1.0029
21	1.0030	1.0031	1.0031
22	1.0032	1.0033	1.0033
23	1.0034	1.0035	1.0036
24	1.0037	1.0038	1.0038
25	1.0039	1.0040	1.0040

If the average aspirated volume exceeds the permissible value, the following should be done:

- Remove the pipetting pushbutton (Fig. 4A),

  Warning: The pipetting pushbutton consists of 2 parts: the lower volume-setting section (Fig. 1A2) and the upperbutton (Fig. 1A1). After removal of the pushbutton, both parts will separate.

- Holding the volume setting knob to protect it against rotation, insert the calibration key into the cuts of the calibration screw (Fig. 4B),
- Turn the key clockwise to reduce the aspirated volume, or counterclockwise to increase the volume. One full turn of the calibration key changes the pipettor aspiration volume by the amount given in the table (Fig. 4C),
- Take out the key and fix the pipetting pushbutton (Fig. 4D). The pipetting pushbutton should be fixed by placing the lower section on the arbor first (Fig. 1A2) and then the button (Fig. 1A1).

Determine the average aspirated volume. The average volume should be within the permissible range shown in the table. If the volume exceeds the values stated, the recalibration procedure should be repeated.

When pipetting liquids with physical properties considerably different from those of water, follow the rules as described in section 5.

9 - TROUBLESHOOTING

If you notice an improper pipettor operation, identify the cause and eliminate the fault. To do this, follow the instructions in the sequence provided. Replacement of parts should be required only occasionally and should not occur under normal pipettor use.

Droplets of liquid remain in the pipet tip.

Possible cause The tip is emptied too fast.

Action *Decrease the speed of pressing the pipettor pushbutton.*

Possible cause The tip wettability has increased due to extensive use.

Action *Replace the tip with a new one.*

Droplets of air appear in the liquid aspirated into the tip.

Possible cause The pipet tip immersion is too shallow.

Action *Immerse the tip deeper according to the instructions.*

Possible cause The pipet tip is incorrectly pressed onto the pipettor shaft.

Action *Press the pipet tip firmly.*

Possible cause The tip is damaged or worn out due to extensive use.

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Action — Replace the tip with a new one.

The pipettor incorrectly aspirates the liquid or liquid drops out from the tip.

Possible cause — The pipet tip is incorrectly pressed onto the pipettor shaft.

Action — *Press the pipettor tip firmly.*

Possible cause — The shaft nut is loose (Fig. 3F).

Action — *Tighten the shaft nut.*

Possible cause — The sealing surface of the shaft is cracked or scored.

Action — *Remove the tip ejector. Unscrew the shaft nut, inspect the shaft and the piston assembly. Replace the damaged parts (see Section 12). When reassembling the pipettor, the nut should be hand tightened.*
In the models 2, 10 and 20, the damage of the shaft may also cause a damage of the piston assembly. Replace the damaged parts (see Section 12).
When reassembling the pipettor, the nut should be hand tightened.

Possible cause — Damage to the piston or seal due to prolonged use with the solvents or caustic liquids.

Action — *Disassemble the pipettor as described above. Replace the piston, seal and O-ring (see Section 12). Rinse the inside of the shaft in distilled water and dry. Lubricate the seal and O-ring with the lubricant, included with each pipettor. Following piston replacement, a calibration procedure is required.*
Note: The parts of 2 and 10 pipettor should be lubricated evently with a minimum amount of lubricant.

Possible cause — The pipettor is reassemled improperly.

Action — *Disassemble the pipettor and reassemble it, observing the proper sequence of steps (Fig. 3).*

Possible cause — No lubricant on the sealing elements.

Action — *Remove the tip ejector. Unscrew the shaft nut, remove the shaft, piston assembly, seal and O-ring. Rinse the removed parts in distilled water and dry thoroughly. Lightly lubricate the inside surfaces of the seal and the O-ring with the included lubricant. Reassemble the pipettor in the reverse order.*

Possible cause — Contamination of the inside of the pipettor caused by extensive aspiration of solvents or caustic liquids or because liquid got inside the pipettor.

Action — *Remove the tip ejector. Unscrew the nut, remove the shaft, piston assembly, seal and O-ring. Rinse the removed parts with distilled water and dry thoroughly. Lightly lubricate the inside surfaces of the seal and the O-ring with the lubricant. Reassemble the pipettor in the reverse order.*

If you find an increase in the pipetting force, which could happen after repetitive autoclaving of the pipettor:

Action — *Remove the tip ejector. Unscrew the shaft nut, and then remove the shaft, piston assembly, seal and O-ring. Rinse the removed parts in distilled water and dry. Lubricate the internal surfaces of the seal and O-ring with lubricant that has been included with each pipettor. Reassemble the pipettor in the opposite order.*
Note: All parts of the pipettor can be autoclaved (see Section 10).

If the problem continues after carrying out the above steps, contact your **Corning** representative.

Before returning the pipettor, please ensure that the pipettor is completely free of any chemical, radioactive or microbiological contamination which could pose a threat during transport and repair. As far as it is possible, clean the pipettor.

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10 - CLEANING AND STERILIZATION

Cleaning

External surfaces of the pipetting pushbutton, the ejector pushbutton, the handgrip, the shaft nut and the adjustment knob may be cleaned using a cloth dampened in isopropyl alcohol. The remaining parts removed from the pipettor during pipettor disassembly may be washed with distilled water or isopropyl alcohol.

Sterilization:

The pipettor can be sterilized in an autoclave at 121°C for 20 minutes. After sterilization, the pipettor should be dried and cooled to room temperature.

It is recommended to:

- unscrew the shaft nut slightly prior to sterilization and re-tighten after autoclaving,
- set the locking ring in lower (unlocked) position prior to sterilization,
- sterilize the pipettors in autoclave with an initial vacuum and drying cycle.

The precision of the results should not alter if the pipetting process and autoclaving are carried out as described in this manual. Because a slight change in the accuracy of the dosage may occur, it is recommended to:

- check the calibration of the pipettor after the initial first, third and fifth autoclaving cycles and then after every 10 autoclaving cycles.

11 - PIPETTOR KIT

The materials are delivered in this kit include:

- Pipettor
- Instruction manual
- Calibration key
- Ejector length adjustment spacers
- Ejector cap (for pipettor models 2, 10)
- Identification labels
- Lubricant
- Color identification rings

12 - SPARE PARTS

The spare parts indicated in Fig.1, 3, 4, 5 and 6 that is:

A: Pipetting pushbutton A1: Pushbutton A2: Knob
B: Adjustment knob
C: Shaft
D: Ejector
F: Shaft nut
G: Piston assembly
H: Spacer
I: O-ring
J: Seal
K: Calibration key
M: Ejector cap
N: Ejector pushbutton
P: Identification ring
S: Locking ring

Please contact Corning Customer Service to inquire about availability of spare parts. Model of pipettor and name of the part required should be specified.

The replacement of the plunger requires conducting the calibration procedure according to section 8.

To find your nearest service center and for technical support, visit http://www.corning.com/lifesciences

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