

Pipetman[®]

continuously adjustable
digital microliter pipettes

8 pipettes for volume
ranges from
0.1 μ L to 10 mL

P-2

P-10

P-20

P-100

P-200

P-1000

P-5000

P-10ML

Pipetman P-200 shown



RAININ
® INSTRUMENT CO., INC.

PIPETMAN®

continuously adjustable digital pipettes

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Technical Assistance: 800-543-4030

Call this toll free number for technical consultation and product information for Pipetman, other Rainin pipettes, and disposable tips.

Or use e-mail: tech.service@rainin.com

Pipetman is a US-registered trademark of Rainin Instrument Company, Inc. Microman is a trademark of Gilson Inc. Pipetman pipettes are manufactured under U.S. Patent Nos: 5,413,006 and 5,650,124. Other U.S. and international patents pending. Copyright 1982-2000, Rainin Instrument Company, Inc., Woburn, MA 01801, USA.

Description

Eight models of Pipetman continuously adjustable digital pipette cover the entire volume range from 0.1 μL to 10 mL. The P-200-M8 eight-channel Pipetman is also available, with a volume range of 20–200 μL , for convenience when using 96-well plates.

Pipetman pipettes are not limited to fixed volume increments — 5 μL or 10 μL . They can be set to any volume, e.g. 6.6, 133.3, 377, 2228 μL .

Piston stroke is set by adjusting a micrometer coupled directly to a digital volume indicator, which reads in microliters. The digital volume indicator simplifies volume setting and virtually eliminates calculation errors.

All Pipetman models have a highly polished stainless steel piston, patented polyethylene seal, and neoprene compression o-ring. Pipetman models require no routine lubrication for long, trouble-free service.

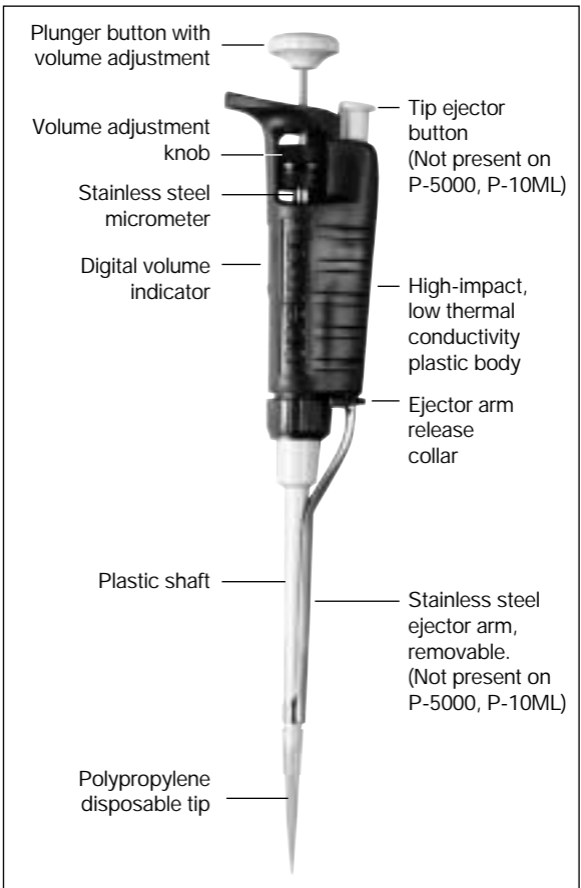


Figure 1 Pipetman P-200

A stainless steel tip ejector is provided with all models except P-5000 and P-10ML, for safe disposal of used tips. The ejector can be removed by pulling on the plastic collar on the ejector arm. Reattachment is quick and easy.

Autoclaving

The shaft and tip ejector are autoclavable: 121°C, 1 bar, 15–20 minutes. (P-5000, P-10ML do not use tip ejectors.)

Volume Indicator

The digital volume indicator is read from top to bottom. For P-2, P-10, P-20, P-100, and P-200, black digits indicate microliters and red digits tenths and hundredths of microliters. For P-1000 and P-5000, red digits indicate milliliters and black digits microliters. For P-10ML, black digits indicate milliliters and red digit tenths of a milliliter.

Sample values, volume ranges, and smallest increments for each Pipetman model are shown below:

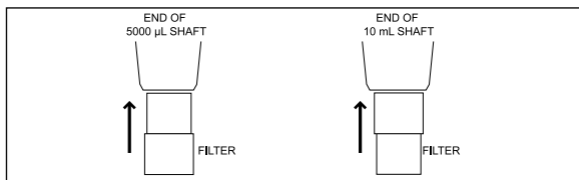
P-2	P-10	P-20	P-100	P-200	P-1000	P-5000	P-10ML	
1	0	1	0	1	0	1	0	Red Digits Black Digits
2	7	2	7	2	7	2	7	
5	5	5	5	5	5	5	5	
1.25µL	7.5µL	12.5µL	75µL	125µL	0.75mL	1.25mL	7.5mL	

Pipetman Model	Range (µL)		Smallest Increment µL
	Adjustable	Recommended	
P-2	0 to 2	0.1 to 2	0.002
P-10	0 to 10	0.5 to 10	0.02
P-20	0 to 20	2 to 20	0.02
P-100	0 to 100	10 to 100	0.2
P-200	0 to 200	50 to 200	0.2
P-1000	0 to 1,000	100 to 1,000	2.0
P-5000	0 to 5,000	500 to 5,000	2.0
P-10ML	0 to 10,000	1 mL to 10 mL	20.0

Safety Filter, P-5000 and P-10ML

Models P-5000 and P-10ML use a safety filter in the end of the shaft to help prevent liquid entering the shaft and contacting the piston, should the plunger be allowed to snap up during aspiration. This is particularly important using large volumes. If the filter gets wet, replace it.

For P-5000 insert the small diameter into the shaft; for P-10ML insert the large diameter into the shaft. Part numbers are 6190-164 (pack of 100) and 6190-165 (pack of 1000).



Operation

There are two ways of setting volume on Pipetman pipettes: with the volume adjustment knob, or by turning the plunger button. Both give exactly the same results.

Volume Setting using Plunger Button

- 1a. Hold Pipetman in one hand. With thumb and forefinger, turn the plunger button counterclockwise until the volume indicator is $\frac{1}{3}$ revolution above the desired setting, then turn slowly clockwise until the desired volume shows on the indicator.

Volume Setting using Volume Adjustment Knob

- 1b. Hold Pipetman in one hand. With the other hand, turn the volume adjustment knob counterclockwise so the volume indicator is $\frac{1}{3}$ revolution above the desired setting, then turn slowly clockwise until the indicator shows the desired volume.
2. ALWAYS dial down to the desired volume. This prevents mechanical backlash from affecting accuracy. If you pass the desired setting, turn the dial $\frac{1}{3}$ revolution higher than desired and reset the volume. The friction ring prevents unintentional volume changes.
3. Attach a new disposable tip to the pipette shaft. Press only enough to make a positive airtight seal.
4. Press the plunger to the FIRST STOP. This part of the stroke is the volume displayed on the indicator.
5. Holding Pipetman vertically, immerse the tip into the sample to the proper depth; see page 5.
6. Allow the pushbutton to return slowly to the UP position. Never let it snap up!
7. Pause briefly to ensure that the full volume of sample is drawn into the tip.
8. Withdraw the tip from the sample liquid. If any liquid remains on the outside of the tip, wipe it carefully with a lint-free tissue, avoiding the tip orifice.
9. To dispense sample, touch the tip end against the side wall of the receiving vessel and depress the plunger slowly to the first stop.
Wait: 1 second* (P-2, P-10, P-20, P-100, P-200)
1-2 seconds* (P-1000)
2-3 seconds* (P-5000, P-10ML)
* Longer for viscous solutions.
Then press the plunger to the SECOND STOP (bottom of stroke), expelling any residual liquid in the tip.
10. With the plunger fully pressed, withdraw Pipetman from the vessel carefully, tip against the vessel wall.

11. Allow the plunger to return to the up position.
12. Discard the tip by depressing the tip ejector button. A fresh tip should be used for each sample to prevent sample carryover.



Figure 2 Operating Pipetman

Tip Selection

- Tips must seal properly on the shaft to assure an air-tight seal and avoid leaks or poor accuracy.
- Tips must be soft and flexible so that the shaft is not scratched or worn prematurely.
- Tips must be free from microscopic flash and particulates. Flash gives poor precision and accuracy.
- The tip orifice must be the correct size, and orifice size and geometry must be consistent from tip to tip. Otherwise, accuracy and precision will be affected.
- Interior and exterior surfaces must be clear, smooth, and hydrophobic to avoid retention of liquid. Too much retention results in poor accuracy and reproducibility.

Specified performance is guaranteed only when Rainin disposable tips are used as recommended. Rainin cannot accept responsibility for poor performance resulting from the use of tips by other manufacturers.

Rainin tips are molded from premium-grade virgin polypropylene plastic. Samples from each lot of tips are inspected microscopically to ensure that every lot meets Rainin's high standards.

Tip Immersion Depth

The recommended depth for tip insertion into the sample for each Pipetman model is shown in the table below.

<u>Pipetman Model</u>	<u>Volume Range</u>	<u>Immersion Depth</u>
P-2	0.1 - 2 μ L	1 - 2 mm
P-10	0.5 - 10 μ L	1 - 2 mm
P-20	2 - 20 μ L	2 - 3 mm
P-100	10 - 100 μ L	2 - 3 mm
P-200	50 - 200 μ L	2 - 4 mm
P-1000	1000 - 1000 μ L	2 - 4 mm
P-5000	500 - 5000 μ L	6 - 10 mm
P-10ML	1 mL - 10 mL	6 - 10 mm

Tip immersion depth is important. If exceeded, the volume measured will be inaccurate, possibly out of specification. Tip angle is also important. Hold the pipette vertically, or within 20 degrees of vertical.

Pipetting Guidelines & Precautions

Consistency in all aspects of pipetting procedure will significantly contribute to optimum reproducibility. Use a:

1. Consistent pickup/dispense rhythm while pipetting.
2. Consistent speed and smoothness when you press and release the pushbutton.
3. Consistent pushbutton pressure at the first stop.
4. Consistent immersion depth.
5. Minimal angle ($< 20^\circ$ from vertical).

Prevent liquids from being drawn into the Pipetman shaft by taking the following precautions:

1. Use Rainin aerosol-resistant tips, with an internal filter which acts as a barrier to aerosols and liquids.
2. Never invert or lay Pipetman down if liquid is in the tip.
3. Pipette slowly, holding Pipetman $< 20^\circ$ from vertical.
4. For Models P-5000 and P-10ML Pipetman, use the special safety filters supplied.

Pre-Rinsing Recommended

Some solutions (e.g. serum, protein-containing solutions, and organic solvents) can leave a film on the inside tip wall, resulting in an error larger than the tolerance specified. Since this film remains relatively constant in successive pipettings with the same tip, excellent precision may be obtained by refilling the tip and using the refilled volume as the sample. Successive samples from this same tip will exhibit good reproducibility (low variance).

Reverse Mode Pipetting

Another way of reducing error due to film retention is reverse mode pipetting; the operating sequence is reversed:

1. Mount a disposable tip on the pipette shaft.
2. Press the pushbutton fully to the second stop.
3. Immerse the tip in liquid and return the plunger slowly to the full up position. Wait a moment for the liquid column to reach equilibrium in the tip.
4. Wipe any excess liquid from the outside of the tip without touching the orifice.
5. To dispense, rest the end of the tip against the vessel wall and press the plunger to the first stop. Hold this position a few seconds, or long enough for the liquid column to reach equilibrium again.
6. Remove the tip from the receiving vessel without blowing out the remaining liquid.
7. Return excess sample in the tip to the original sample container, if desired. Discard the used tip.

Pipetting Liquids of Varying Density

Pipetman lets you compensate for solutions of density much different from water, by setting the volume slightly higher or lower than that required. The compensation amount must be determined empirically.

E.g., if pipetting 10 μL of CsCl solution, you determine that the volume delivered is actually 8.5 μL (≥ 5 samples). Try changing the volume setting to 11.8 μL and repeat the measurements. If the volumes delivered are still not close enough to 10 μL , make another slight volume adjustment until the measurements are as desired.

Very dense liquids may not be suitable for air displacement pipetting. Use Microman[®] positive displacement pipettes for these liquids.

Temperature Considerations

Warm or cold liquids can be measured with good precision by using a consistent pipetting rhythm. This will help minimize any differences in heating or cooling effects within the pipette. Use a new tip each time for best accuracy and precision when measuring samples with temperatures greatly different from ambient, and do not pre-rinse. You will get best results if there is no delay between picking up the sample and dispensing it.

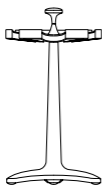
Acids and Corrosives

After pipetting concentrated acids or highly corrosive solutions you should disassemble Pipetman and inspect and clean (if necessary) the piston, shaft, and seal assemblies.

Extensive contact with corrosive fumes may corrode the piston. This will result in premature seal wear and may require refinishing or replacement of the piston. Exposure of internal Pipetman components to corrosive fumes can be reduced by using aerosol-resistant tips. These tips have an internal filter which acts as an aerosol barrier.

Pipetman Storage

After use, store Pipetman in a clean, safe place. Pipetman is a precision instrument and should be treated with the level of care appropriate for laboratory instrumentation. Three types of pipet hanger are available to hold your Pipetman conveniently when not in use.



CR-7: Free-standing carousel holds 7 Pipetman pipettes.



HU-M3: Set of three magnetic Hang-Ups™ for mounting on ferrous surfaces. Package includes adhesive disks for non-ferrous surface mounting.



HU-S3: Three Hang-Ups attached to a clamp which fits onto a shelf.

Troubleshooting and Repairs

Pipetman pipettes give excellent performance and long-term service. Use these procedures in the case of physical or chemical damage. P-2 and P-10 models have small, fragile components that can be broken or mislaid.

Sample Splash (liquid inside the mechanism)

1. Remove the tip ejector, if fitted (see page 9).
2. Unscrew the shaft coupling nut holding the shaft to the pipette body.
3. Holding Pipetman upside down, remove the shaft and inspect the seal assembly and piston for contamination. The piston should be shiny and free of corrosion. Clean with distilled water or isopropyl alcohol. Dry with a lint-free tissue and reassemble after inspecting the interior of the shaft for contaminants.
4. If staining and/or corrosion of the piston is evident (due to previously dried sample material), do not use the pipette. Return to Rainin for service (see page 10).

Never grease any Pipetman components, except for P-10ML pre- S/N N05803D, which use a grease seal.

Leaks, Inaccurate Sampling

1. **Loosened shaft.** Tighten coupling by hand.
2. **Split or cracked shaft.** Remove the tip ejector and inspect the shaft for fracture or split end. Replace if necessary. If the shaft was dropped, remove it and the seal assembly to see if the piston is bent. If so, return the instrument: call Service, 800-662-7027.
3. **Worn seal and/or o-ring.** Dismantle Pipetman as described in "Sample Splash". Replace the seal and o-ring, referring to the drawing on page 12 or 13. All models (except older P-10ML) use a polyethylene seal and o-ring. Pull off the old seal and o-ring, position the new seal and o-ring on the piston as shown in the drawing, and reassemble Pipetman.
4. **Bent plunger.** Call Service, 800-662-7027.
5. **Damaged friction ring.** Call Service, 800-662-7027.
6. **Improper reassembly.** Remove the tip ejector and shaft. Check the position of the internal assemblies, especially the seal, against the illustrations.

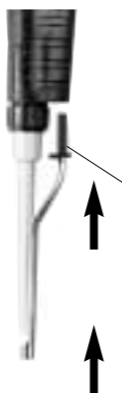
Consult the publication "*Pipetman Care and Maintenance*" (AB-14) for more information. Get this free publication by calling 800-543-4030 or download from Rainin's website: <http://www.rainin.com/papers.html>

Removing/Replacing Tip Ejector Arm



Tip Ejector Arm Removal

1. Press tip ejector button.
2. Pull arm from handle using ejector arm release collar.



Tip Ejector Arm Replacement

1. Press tip ejector button.
2. Hold Pipetman in one hand and the tip ejector arm in the other hand.
3. Align the plastic shaft at the end of the tip ejector with the rod inside the handle.
4. At the same time place the tip ejector opening over the end of the Pipetman shaft.
5. Push the plastic collar into the handle until the tip ejector is securely in place.

Figure 3 Tip Ejector Arm

Removing the Tip Ejector Arm:

1. Press and hold the tip ejector button fully down.
2. With the other hand, pull the ejector arm out of the Pipetman using the plastic ejector arm release collar.

Replacing the Tip Ejector Arm:

1. Press and hold the tip ejector button fully down.
2. Hold Pipetman in one hand and the tip ejector arm in the other hand.
3. Align the plastic collar at the end of the tip ejector with the rod inside the handle.
4. At the same time place the tip ejector opening over the end of the Pipetman shaft.
5. Push the plastic collar into the handle until the tip ejector is securely in place. Make sure that tips will fit properly on the shaft.

Service, Calibration and Repair

Rainin maintains its own Pipette Repair and Calibration facilities in the following locations:

Rainin Service Center

Rainin Road, Woburn, MA 01801, USA

Tel: 800-662-7027 Fax: 781-935-7631

Rainin Service Center

5400 Hollis St., Emeryville, CA 94608, USA

Tel: 800-662-7027 Fax: 510-652-4403

It is recommended to use only genuine Gilson/Rainin replacement parts such as seals and shafts. Genuine replacement parts are available in the U.S. only from Rainin.

It is **NOT** necessary to recalibrate the pipette after changing the seal or shaft.

Recalibration of the pipette is only necessary when the piston is replaced, and should only be done by qualified factory-trained personnel in the appropriate facility.

Contacting Rainin

Technical Information:

Phone: 800-543-4030

Fax: 781-938-1152

Email: tech.service@rainin.com

Pipette Service:

Phone: 800-662-7027

Fax: 781-935-7631

Email: service@rainin.com

Direct Order Line:

Phone: 800-4-RAININ (800-472-4646)

Fax: 781-938-1152

Email: pipets@rainin.com

Web: <http://www.rainin.com>

Office Phone Numbers:

Massachusetts Office: 781-935-3050

California Office: 510-654-9142

Performance Specifications

Accuracy and precision specifications for Pipetman are defined in this manual as follows:

Accuracy is the closeness of a measured volume to the true volume as specified by the volume setting of the pipette. Also known as "mean error".

Precision is the scatter of individual measurements around the mean of a large number of replicate measurements of the same volume. Also known as "standard deviation".

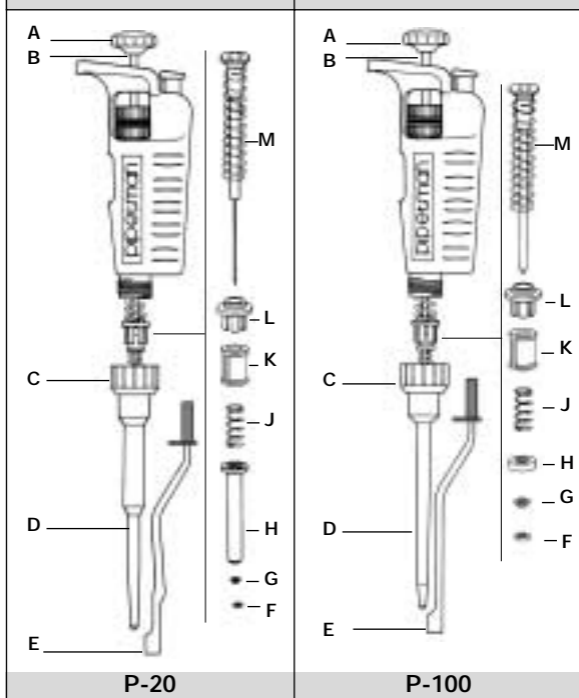
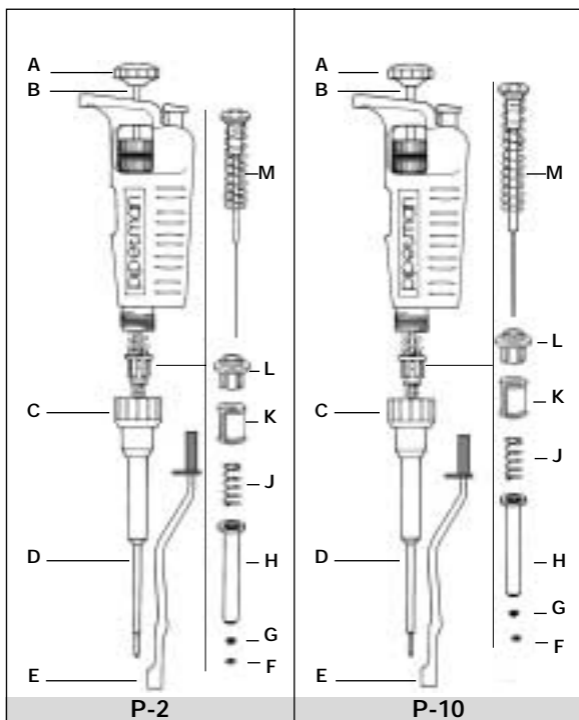
Each Pipetman is factory calibrated and carefully checked gravimetrically before shipment using distilled water and an analytical balance. Water temperature and ambient conditions are stabilized at $21.5^{\circ}\text{C} \pm 1^{\circ}\text{C}$. Volumetric corrections are made for both the density of water and evaporation where applicable. Consult the Rainin publication "Procedure for Evaluating Pipette Accuracy and Precision" (AB-15) for further information, or download a copy from Rainin's website:

<http://www.rainin.com/papers.html>

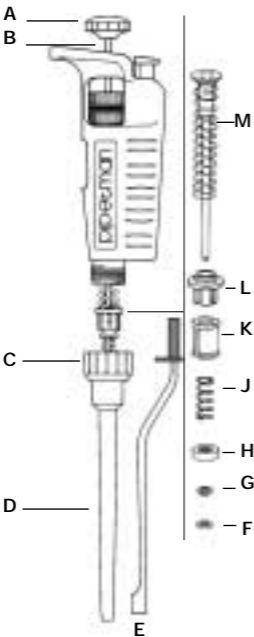
When used in accordance with the pipetting procedures in this manual and with Rainin tips, Pipetman pipettes will perform to the following specifications.

Model	Volume μL	Increment μL	Accuracy (mean error)		Precision (repeatability)	
			Relative %	Absolute μL	Relative %	Absolute μL
P-2	0.2	0.002	12	0.024	6	0.012
	1.0		2.7	0.027	1.3	0.013
	2.0		1.5	0.030	0.7	0.014
P-10	1	0.02	2.5	0.025	1.2	0.012
	5		1.5	0.075	0.6	0.03
	10		1	0.1	0.4	0.04
P-20	2	0.02	7.5	0.15	2	0.04
	5		3	0.15	0.9	0.045
	10		1.5	0.15	0.5	0.05
	20		1	0.2	0.3	0.06
P-100	10	0.2	3.5	0.35	1	0.1
	50		0.8	0.4	0.24	0.12
	100		0.8	0.8	0.15	0.15
P-200	50	0.2	1.0	0.5	0.4	0.2
	100		0.8	0.8	0.25	0.25
	200		0.8	1.6	0.15	0.3
P-1000	100	2	3	3	0.6	0.6
	500		0.8	4	0.2	1
	1000		0.8	8	0.15	1.5
P-5000	500	2	2.4	12	0.6	3
	2500		0.6	15	0.2	5
	5000		0.6	30	0.16	8
P-10ML	1mL	20	5	50	0.6	6
	5mL		1	50	0.2	10
	10mL		0.8	80	0.16	16

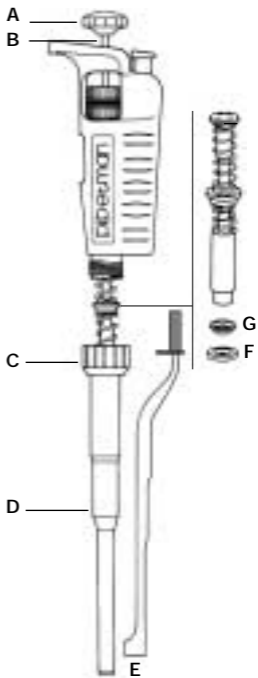
Specifications are subject to change without notice.



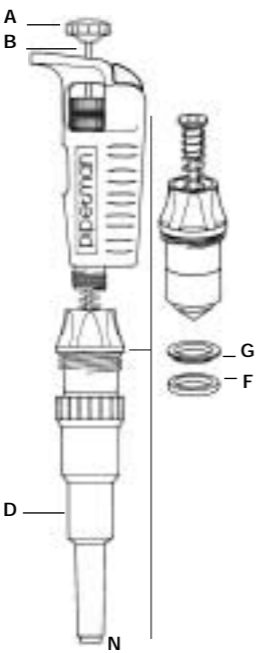
Part numbers are listed on the back page. The plunger and plunger button in these diagrams are for dual-adjustment Pipetman, and cannot be used on older Pipetman models. For convenience, old-style part numbers are also listed on the back page.



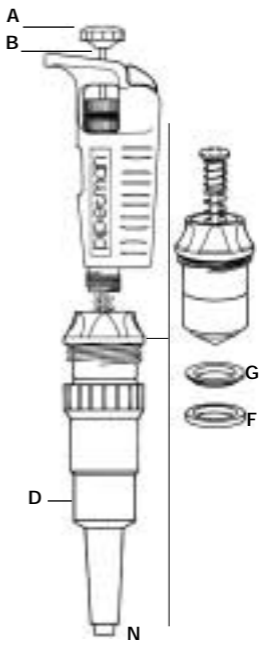
P-200



P-1000



P-5000



P-10ML

Replacement Parts

	Part	Model							
		P-2	P-10	P-20	P-100	P-200	P-1000	P-5000	P-10ML*
A	Plunger button	844781	844782	844783	844784	844785	844786	844787	861281
B	Plunger rod**	44761	44761	44761	44761	44761	44761	44761	44761
C	Shaft coupling	23654	23654	23654	23654	23654	23654	n.a.	n.a.
D	Shaft	44816	44819	23353	44602	23305	23371	23608	61263
E	Tip ejector	44829	44829	23657	44605	23658	23659	n.a.	n.a.
F	O-ring	400071	400071	400013	400067	400001	400003	400006	400025
G	Seal	44815	44818	23359	44604	23350	23374	23118	61828
H	Seal assy holder	44817	44817	23354	44603	23306	†	†	†
J	Small spring	300066	300066	300047	300047	300047	†	†	†
K	Small spring positioner	23871	23871	23871	23871	23871	†	†	†
L	Large spring positioner	44214	44214	44214	44214	44214	†	†	†
M	Large spring	300042	300042	300042	300004	300004	†	†	†
N	Filters (100)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	6190-164	6190-164
N	Filters (1000)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	6190-165	6190-165

* This column is for P-10ML after S/N N05806D.

For P-10ML pre-S/N N05803D — same as listed above except:

Plunger rod: 23861, Shaft: 6192-016, O-ring: 6192-015, Seal: n.a.

** Replacing the plunger rod will require recalibration of the instrument.

Rainin is the only organization authorized to calibrate Pipetman pipettes.

Please call 800-662-7027 for information.

† Part of one-piece piston assembly.

For Old-Style Pipetman Models only:

	P-2	P-10	P-20	P-100	P-200	P-1000	P-5000	P-10ML
Plunger button	44823	44824	23660	44607	23661	23662	23663	61223
Plunger rod	23861	23861	23861	23861	23861	23861	23861	23861

Call 800-543-4030 for a free copy of "Pipetman Care and Maintenance" (AB-14) and "Procedure for Evaluating Pipette Accuracy and Precision" (AB-15) or download them from Rainin's website at the URL:

<http://www.rainin.com/papers.html>

Limited Warranty

See the enclosed Limited Warranty and Limitations of Liability Statement. Please complete and return the Warranty Registration Card on receipt of your pipette.



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