

Replacement Parts

Description	Model				
	P20	P100	P200	P1000	P5000
O-Ring	400.013	400.067	400.001	400.003	400.006
Teflon Seal	23359	44604	23350	23374	23118
Shaft	23353	44602	23305	23371	23608
Tip Ejector (S.S.)	23657	44605	23658	23659	N/A
Seal Assembly Holder	23354	44603	23306	*	*
Small Spring	300.010	300.010	300.010	*	*
Sm. Spring Positioner	23871	23871	23871	*	*
Large Spring	300.042	300.004	300.004	*	*
Lg. Spring Positioner	44214	44214	44214	*	*
Shaft Coupling	23654	23654	23654	23654	N/A
Tip Ejector Button	23655	23655	23655	23655	N/A
Plunger Button	23660	44607	23661	23662	23663
Plunger	**	**	**	**	**
Piston	**	**	**	**	**
Filters (100)	N/A	N/A	N/A	N/A	23534
Filters (1000)	N/A	N/A	N/A	N/A	23534/B

*Part of one-piece piston assembly.

**Recalibration is necessary following replacement.
Please contact Rainin Liquid Handling Service Department.

Every PIPETMAN is delivered with certification of calibration (Month/Year/Initials of Technician). PIPETMAN pipettes provide a special indentation for periodic updating of the Calibration Verification sticker.

Limited Warranty

Pipetman™ digital microliter pipettes are warranted against defects in parts and labor for one year from date of purchase. Warranty is valid only if pipettes are not abused (physical, chemical trauma), are used in accordance with the instructions contained in this manual, and are used with Rainin/Gilson disposable tips. Please complete Warranty Registration Card and return to Rainin upon receipt of pipette.

RAININ
INSTRUMENT CO. INC.

MACK ROAD/WOBURN, MA 01801
(617) 935-3050

PI-6

instructions for
PIPETMAN™
continuously
adjustable
digital microliter
pipettes



P-20
P-100
P-200
P-1000
P-5000

RAININ
INSTRUMENT CO. INC.

PIPETMAN™

continuously adjustable
digital pipettes

Description

Five models of PIPETMAN continuously adjustable digital pipettes are available. Each PIPETMAN model is completely adjustable over its volume range, thereby offering the ability to replace over 30 single-volume pipettes for economy and convenience. Together the five PIPETMAN models cover the entire volume range from 1 μ l to 5000 μ l (5ml).

PIPETMAN continuously adjustable digital pipettes are not limited to discrete volume increments such as 5 μ l or 10 μ l, but permit direct accurate setting of intermediate volumes such as 6.6, 133.3, 377, or 2229 μ l. This continuous adjustability is an important advantage, especially for research laboratory applications.

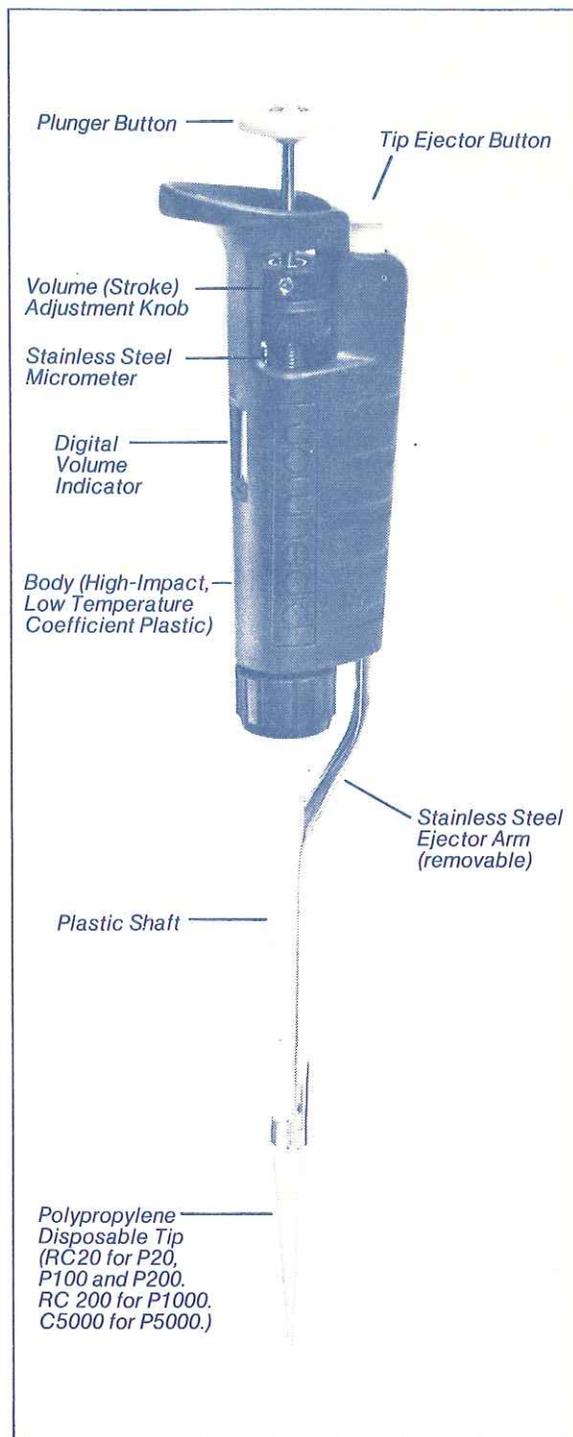
PIPETMAN pipettes are variable-stroke piston pipettes. The stroke is set by adjusting a precisely machined digital micrometer. A digital indicator coupled directly to the micrometer reads the volume setting in microliters. The digital indicator simplifies the volume-setting process and virtually eliminates chances of error in reading volumes.

The PIPETMAN mechanism incorporates a highly polished stainless steel piston, patented Teflon seal, and neoprene compression O-ring. It requires no routine lubrication or maintenance for long, trouble-free service.

The comfort-contoured PIPETMAN body is made of high-impact chemical-resistant plastic. It has a low temperature coefficient, so PIPETMAN models may be held in the hand for prolonged periods without affecting sample volume repeatability.

A stainless steel tip ejector is provided with all PIPETMAN models except the P-5000. The tip ejector permits safe, non-contact disposal of used tips. If not desired for any reason, the ejector can be easily removed by pulling downward on the metal ejector arm. (See picture on page 12.) It can be quickly replaced in a similar manner.

The plastic shaft and stainless steel tip ejector are both autoclavable at 121° C.



"PIPETMAN" is a trademark of Gilson Medical Electronics.
Copyright © 1982. Rainin Instrument Company, Woburn, MA 01801 USA

Recommended Volume Ranges

Model P-20 is adjustable from 0 to 20 μl in 0.1 μl increments. The vernier scale on the volume indicator is calibrated in 0.02 μl increments. Recommended volume range is 1-20 μl .

Model P-100 is adjustable from 0 to 100 μl in 1.0 μl increments. The vernier scale on the volume indicator is calibrated in 0.2 μl increments. The P-100 should be used for sampling between 10 μl and 100 μl for greatest precision.

Model P-200 is adjustable from 0-200 μl in 1.0 μl increments. The vernier scale on the volume indicator is calibrated in 0.2 μl increments. The P-200 should be used for sampling between 20 μl and 200 μl for greatest precision.

Model P-1000 is adjustable from 0 to 1000 μl in 10 μl increments. The vernier scale is calibrated in 2.0 μl increments. For greatest precision, the P-1000 should be used for sampling between 200 μl and 1000 μl . It is possible to pipet volumes below 200 μl , but percentage errors and variance increase, especially below 100 μl as the stroke of the piston in these ranges is very short.

Model P-5000 is adjustable between 0 and 5000 μl in 10 μl increments. The vernier scale is calibrated in 2.0 μl increments. For greatest precision, the P-5000 is recommended for use between 1000 μl and 5 milliliters. It is possible to pipet volumes below 1000 μl , but percentage errors and variance increase, particularly below 500 μl for the reason noted above.

P-5000 Safety Filter

The P-5000 is supplied with a small safety filter which is inserted into the end of the shaft. This filter retards the entry of liquid into the shaft and piston in event the plunger is accidentally allowed to snap back during the filling procedure. This is particularly important when working with large volumes. If the filter is wet it should be replaced with a new filter. (See Sample Splash, Page 10.)

Performance Specifications

Each PIPETMAN unit is factory calibrated and carefully checked gravimetrically before shipment using distilled water and an analytical balance. When used in accordance with the pipetting procedure outlined below and with Gilson-Rainin tips, PIPETMAN will perform within the following tolerances:

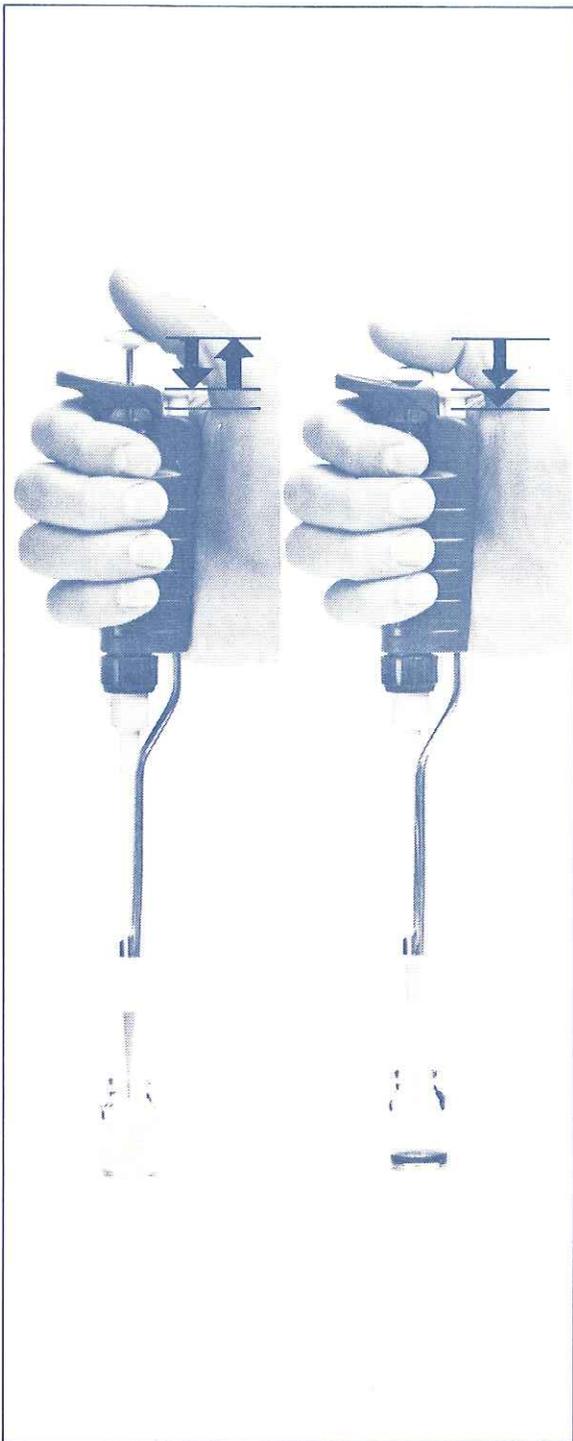
Model	Accuracy*	Reproducibility** std. dev.
P-20	< 0.1 μl @ 1-10 μl < 1% @ 10-20 μl	< 0.04 μl @ 2 μl < 0.05 μl @ 10 μl < 0.06 μl @ 20 μl
P-100	< 0.3 μl @ 10-35 μl < 0.8% @ 35-100 μl	< 0.10 μl @ 20 μl < 0.12 μl @ 50 μl < 0.15 μl @ 100 μl
P-200	< 0.5 μl @ 20-60 μl < 0.8% @ 60-200 μl	< 0.15 μl @ 25 μl < 0.25 μl @ 100 μl < 0.3 μl @ 200 μl
P-1000	< 3 μl @ 100-375 μl < 0.8% @ 375-1000 μl	< 0.6 μl @ 250 μl < 1.0 μl @ 500 μl < 1.3 μl @ 1000 μl
P-5000	< 12 μl @ 0.5 - 2.0 ml < 0.6% @ 2.0 - 5.0 ml	< 3 μl @ 1.0 ml < 5 μl @ 2.5 ml < 8 μl @ 5.0 ml

* Aqueous solutions, tips prerinsed once.

** 30 samples using a new tip for each sample.

Operation

- 1) Set the desired volume by holding the PIPETMAN body in one hand and turning the volume adjustment knob until the correct volume shows on the digital indicator. The friction o-ring of the volume adjustment knob "cold flows" in order to lock the volume securely. For best volume setting precision, always approach the desired volume by dialing downward (at least one-third revolution) from a larger volume setting.



- 2) Attach a new disposable tip to the shaft of the pipette. Press on firmly with a slight twisting motion to insure a positive, airtight seal.

Note: Models P-20, P-100, and P-200 use RC-20 YELLOW TIPS
 Model P-1000 uses RC-200 BLUE TIPS
 Model P-5000 uses C-5000 WHITE TIPS

- 3) Depress the plunger to the FIRST POSITIVE STOP. This part of the stroke is the calibrated volume displayed on the digital micrometer.
- 4) Holding the PIPETMAN vertically, immerse the disposable tip into the sample liquid to a depth of:
 1-2 mm RC-20 (P-20, P-100, P-200)
 2-4 mm RC-200 (P-1000)
 3-6 mm C-5000 (P-5000)
- 5) Allow the pushbutton to return SLOWLY to the Up position. *Never permit it to snap up.*
- 6) Wait 1 to 2 seconds to insure that full volume of sample is drawn into tip.
- 7) Withdraw tip from sample liquid. Should any liquid remain on outside of the tip, wipe carefully with a lint-free cloth taking care not to touch the tip opening.
- 8) To DISPENSE SAMPLE, place tip end against side wall of the receiving vessel and depress plunger slowly to the FIRST STOP.
 WAIT: 1 second* RC-20 (YELLOW TIPS)
 1-2 seconds* RC-200 (BLUE TIPS)
 2-3 seconds* C-5000 (WHITE TIPS)
 Then depress plunger to SECOND STOP (bottom of stroke), expelling any residual liquid in tip.
 *Longer for viscous solutions.
- 9) With plunger fully depressed, withdraw PIPETMAN from vessel carefully with tip sliding along wall of vessel.
- 10) Allow plunger to return to TOP POSITION.
- 11) DISCARD TIP by depressing tip ejector button smartly. A fresh tip should be fitted for each sample to prevent carryover between samples.

Pre-Rinsing Recommended

When pipetting some solutions (especially serum, protein-containing solutions, and organic solvents) a significant film may be retained on the inside wall of the tip, resulting in an error that may be 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 a second time and using this quantity as the sample.* Successive samples from this same tip will exhibit good reproducibility (low variance).

This procedure is RECOMMENDED IN ALL PIPETTING operations, especially when critical reproducibility is required. In short, intertip and intratip variances will be minimal for any solution if prerinsing is practiced.

Reversed Mode Pipetting

Another method for avoiding error due to film retention is known as reversed mode pipetting. In this method, the sequence of operations in the pipetting process is reversed, as follows:

1. Affix a fresh disposable tip to the PIPETMAN shaft.
2. Depress pushbutton COMPLETELY to the second stop.
3. Immerse tip in liquid and return pushbutton to the full Up position. Pause 1-2 seconds (or longer with very viscous liquids) to allow the liquid column to reach equilibrium in the tip.
4. Wipe any excess liquid from outside of tip, without touching the orifice.
5. To dispense, rest the end of the tip against the receiving vessel wall and depress the pushbutton to the first stop. Hold this position 1-2 seconds, or long enough for the liquid column to again reach equilibrium.
6. Remove tip from receiving vessel without blowing out remaining liquid.
7. Return excess sample in tip to sample container, if desired, and discard used tip.

Pipetting Liquids of Varying Density

Compensation for solutions of density much different from water is possible with the PIPETMAN by setting the digital micrometer slightly higher or lower than the required volume. The amount of compensation must be determined empirically.

For example, when using a P-20 PIPETMAN to pipet 10 μl of CsCl solution, you determine gravimetrically (or by some other means) that the volume delivered is 8.5 μl (≥ 5 samples). Try setting the digital micrometer to 11.5 μl . Then repeat the measurements. If the volumes delivered are still not sufficiently close to 10 μl , make another slight micrometer adjustment, depending on the direction of the error.

Extremely dense or viscous liquids, or liquids with a high vapor pressure, may not be suitable for air displacement pipetting. For these liquids use the Microman™ positive displacement pipette.

Pipetting Guidelines & Precautions

- **Consistency** in all aspects of pipetting procedure will contribute significantly to optimum reproducibility. Therefore attention should be given to:
 - 1) SPEED and SMOOTHNESS during depression and release of the pushbutton
 - 2) PRESSURE on the pushbutton at first stop
 - 3) IMMERSION DEPTH
 - 4) MINIMAL ANGLE from vertical axis
- If an **air bubble** is noted within the tip during intake, dispense the sample to original vessel, check tip immersion depth, and pipet more slowly. If an air bubble appears a second time, discard the tip and use a new one.

● **Prevent liquids from being drawn into the PIPETMAN shaft** with possible resultant damage by observing the following precautions:

- 1) Pipet very slowly, holding the PIPETMAN not greater than 20° from the vertical axis.
- 2) Never invert or lay the PIPETMAN on its side with liquid in the tip.
- 3) Use the special Safety Filters supplied with the P-5000 instrument and C-5000 tips.

● **Temperature Considerations**

PIPETMAN pipettes are calibrated to deliver samples within the specified accuracy limits at 22°C ± 5°C. PIPETMAN models can be successfully used for liquids up to 70°C and down to 0°C with good accuracy and reproducibility.

When pipetting hot or cold liquids, the PIPETMAN instrument itself should be maintained within the 22°C ± 5°C range. Pipetting should be performed normally, but without excessive delays which may allow time for significant heat transfer between the liquid in the tip and the column of air above it. For best accuracy and precision, pipette tips should not be pre-rinsed with hot or cold solutions.

If the PIPETMAN instrument is maintained at a temperature outside the 22°C ± 5°C range, accurate measurements will require compensatory setting (as described above for varying density).

● **Acids/Corrosives**

When pipetting concentrated acids or solutions of a highly corrosive nature (e.g., halide salts), it is suggested that the PIPETMAN be disassembled after use and the piston, shaft, and seal assemblies inspected, washed if necessary, and reassembled. Extensive contact with corrosive FUMES may stain or corrode the piston. This will inevitably result in premature seal wear, and may require refinishing or replacement of the piston.

● **Proper Tips**

PIPETMAN instruments should be used only with Rainin/Gilson disposable tips recommended for this purpose. Rainin Instrument Company cannot guarantee the precision, accuracy, or integrity of PIPETMAN pipettes if they are used with improperly designed or manufactured tips.

Rainin/Gilson tips are available in a variety of packaging formats, including autoclavable and presterilized racks.

Trouble-Shooting/Repairs

PIPETMAN pipettes are ruggedly constructed to provide exceptional performance and long-term service without requiring either lubrication or routine maintenance. However, the following procedures are suggested in the event of physical damage or exposure of the PIPETMAN mechanism to chemical solutions:

(Refer to photographs on following pages.)

● **Leakage, Inaccurate Sampling, Abnormal Stroke**

Probable Causes:

- 1) Loosened Shaft — tighten coupling by hand.
- 2) Split or Cracked Shaft — remove Tip Ejector and inspect shaft for fracture or split end. Order appropriate shaft directly. If a P-20 or P-100 shaft is damaged remove shaft and seal assembly to see if piston is bent. If so, return instrument for service.
- 3) Chemical Damage to Piston — see Sample Splash.
- 4) Bent Plunger — Pull plunger button straight up to remove. Roll plunger on flat surface to locate bend. Remove bend. Reassemble pipette.
- 5) Improper Reassembly — Remove Tip Ejector and Shaft and check position of internal assemblies against detailed drawings.
- 6) Ejector Interferes with Tips — If there is no gap between the tip and the end of the Ejector Arm then the Tip Ejector is loose. Refer to the photos for proper technique to reposition Ejector Arm. If the Arm slips frequently it may be removed and the upper end crimped slightly to provide a tighter fit.

● **Sample Splash**

In case of suspected accidental entry of liquids into the PIPETMAN pipetting mechanism:

- 1) Remove Tip Ejector by pulling downward on metal arm.
- 2) Unscrew the Shaft Coupling holding shaft to body.
- 3) Holding the PIPETMAN upside down, remove the shaft and inspect the Seal Assembly and stainless-steel piston for contamination. Clean with distilled water or suitable solvent if contaminant is still wet and no corrosion is evident. Dry and reassemble after inspecting interior of shaft for contaminant.

- 4) If staining and/or corrosion due to previously dried sample material is evident, do not use the instrument. Return it to Rainin for service.

NEVER grease any components of the PIPETMAN.

Service Information

Service includes repair, cleaning, and recalibration. Calibration is certified to original specifications. Instruments will perform as well as an equivalent new instrument unless otherwise noted. Determination of warranty status rests solely with Rainin's Liquid Handling Service Department. A quotation will be provided prior to repair if specifically requested. Please follow these steps:

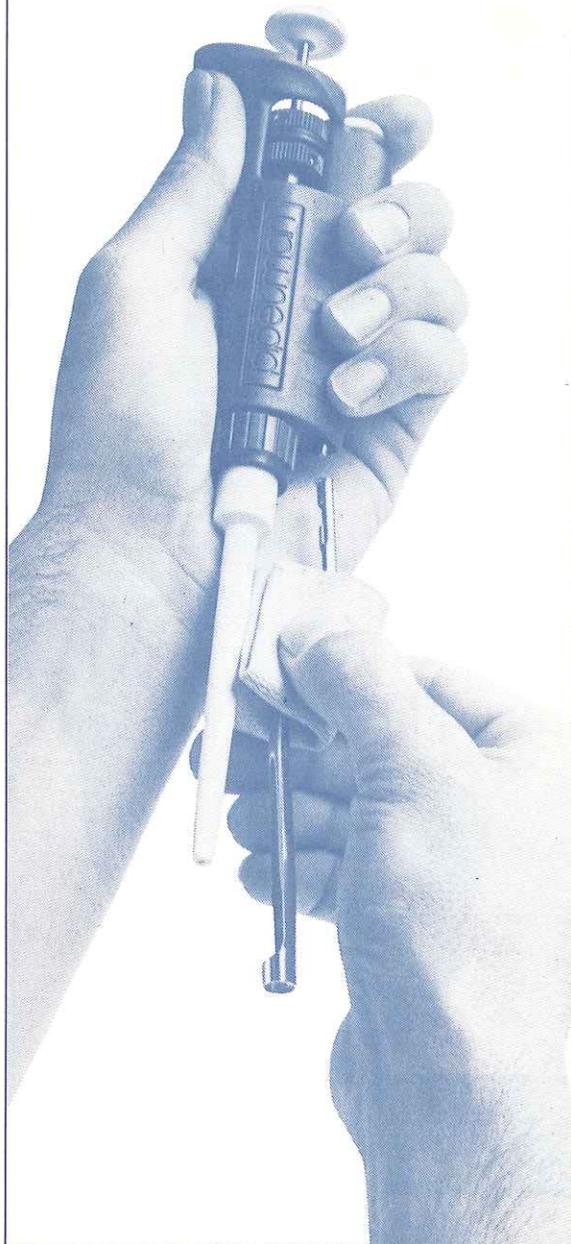
- 1) Decontaminate instruments completely before shipping. Instruments exhibiting measurable radioactivity will be returned unopened.
- 2) Provide shipping and billing address, name and phone number of principal user.
- 3) Enclose Purchase Order to cover repair cost with the instrument.
- 4) Indicate problems or service required.
- 5) Package securely.
- 6) Ship via UPS or other traceable and insurable means to:

RAININ INSTRUMENT CO.
Liquid Handling Service Dept.
Mack Road
Woburn, MA 01801

For further information direct inquiries to Liquid Handling Service Dept., 8:30 a.m. to 5:00 p.m. EST (M-F), at (617) 935-3050.

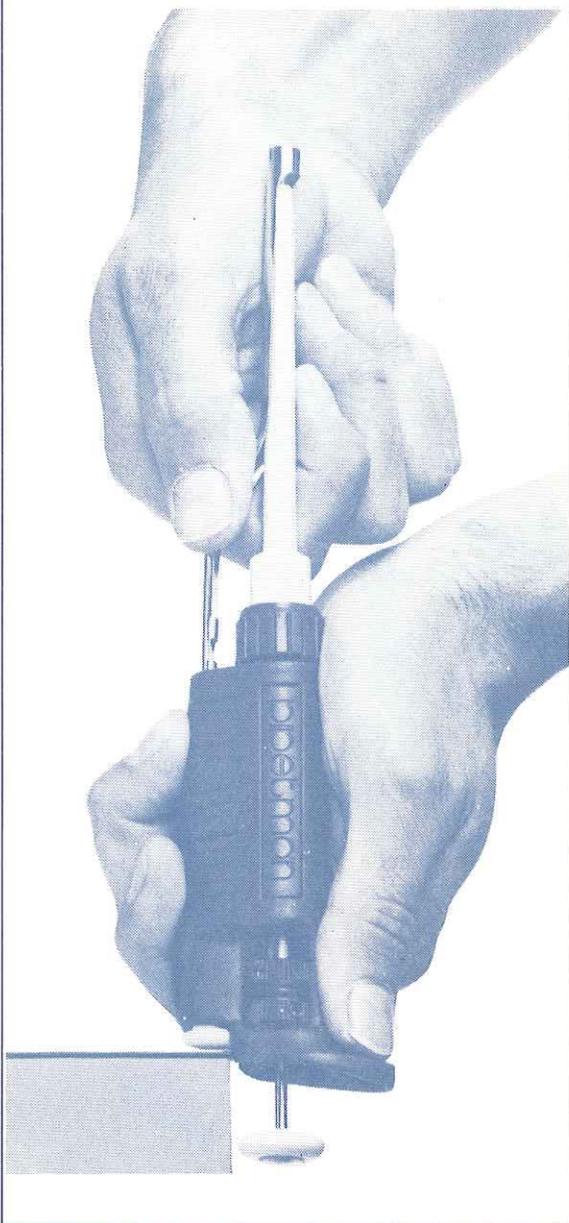
Removing the tip ejector arm

Depress tip ejector button, then pull tip ejector arm down from the handle of the instrument.

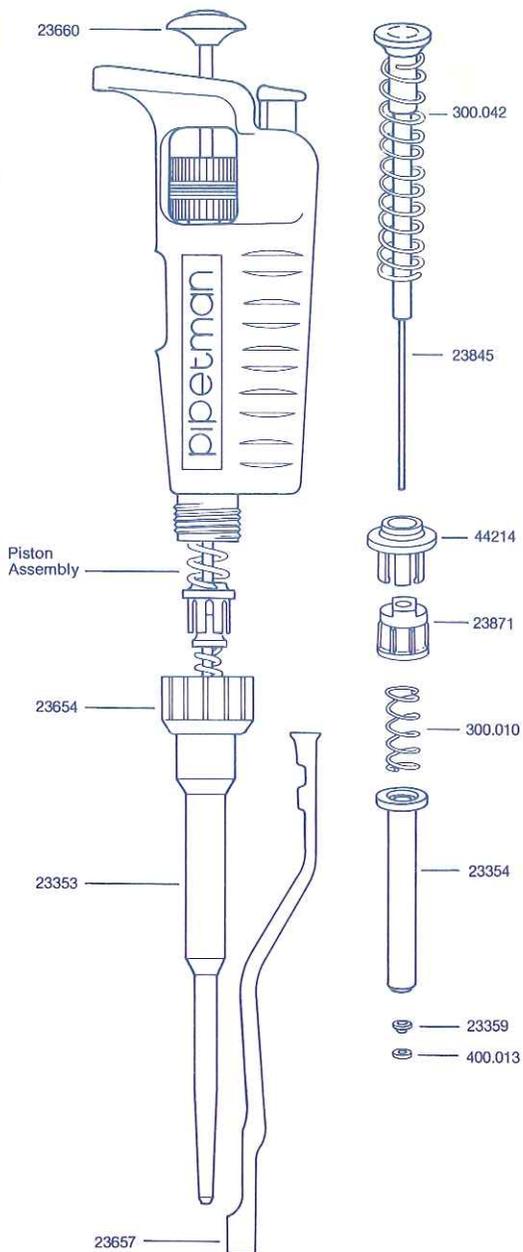


Replacing the tip ejector arm

Hold the instrument upside down with the tip ejector button depressed *against* the edge of the table and the plunger hanging *over* the edge. Place the upper end of the ejector arm onto the post inside the instrument handle and depress. Make sure the ejector arm is pushed into the handle enough to insure that the tips will fit properly onto the end of the shaft.

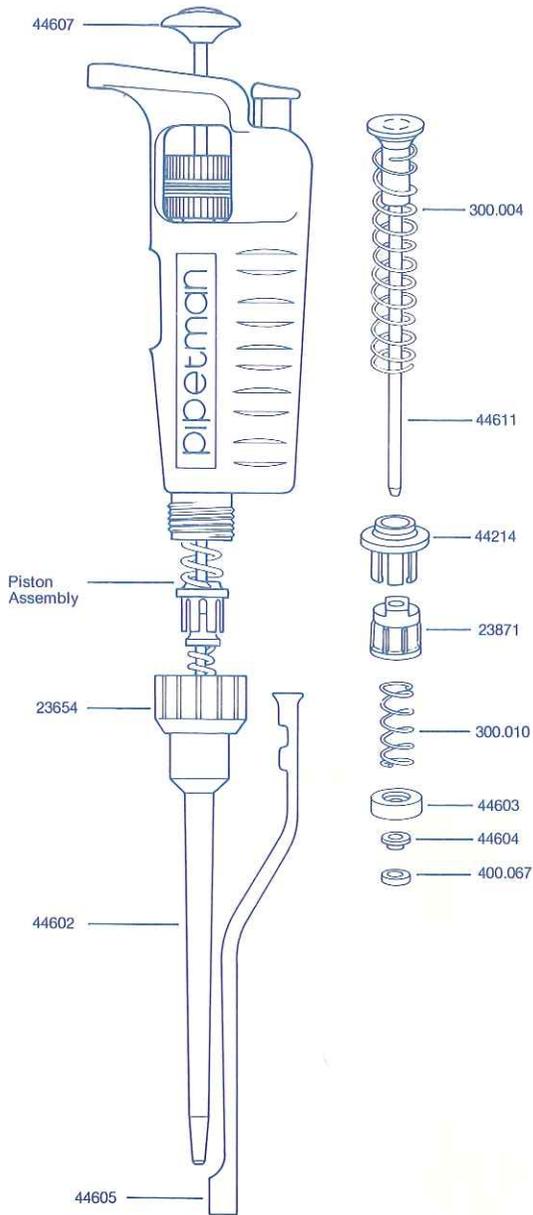


Model P-20



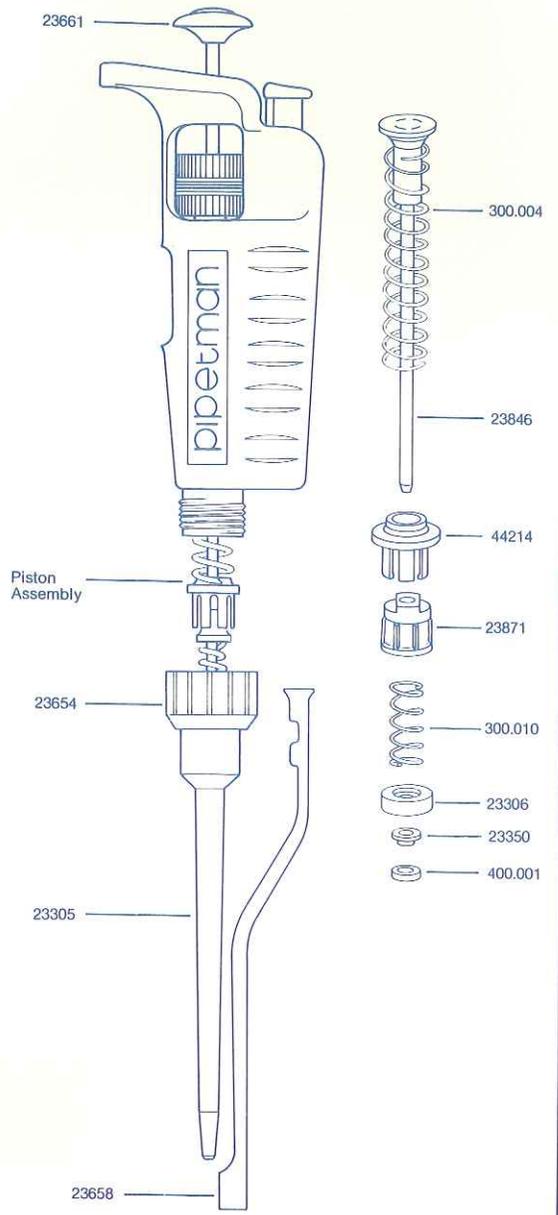
P-20 complete
Shown 1/2 actual size

Model P-100



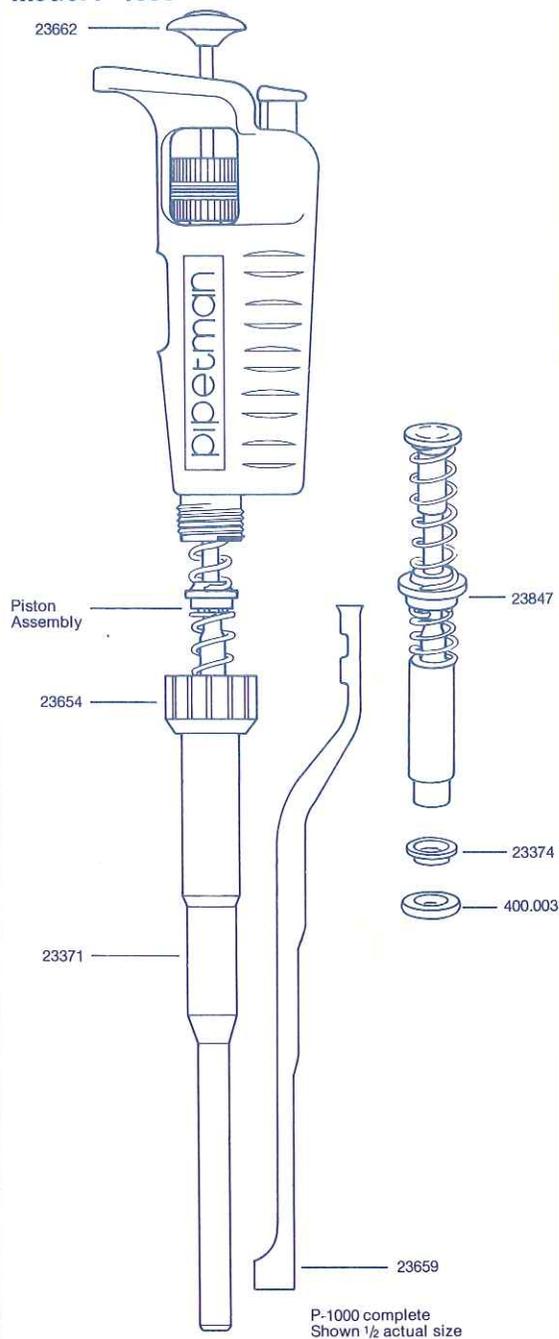
P-100 complete
Shown 1/2 actual size

Model P-200



P-200 complete
Shown 1/2 actual size

Model P-1000



Model P-5000

