



Multichannel Pipette User Manual

MARSHALL

Product Description

Multi-Channel Pipette are handheld , adjustable volume,general purpose micropipettes for sampling and dispensing of accurate liquid volumes,They operate on the air displacement principle(i.e.an air interface) and use detachable,disposable tips or tip bands.

Multi-Channel Pipette are available as either 8 or 12 channel models with a tip ejector system. Each model can be supplied in either of two volume ranges covering a total of 5 to 300ul.The two volume ranges are:

PIPETTE MATERIALS

Multi-Channel Pipette are made of mechanically durable and chemically resistant materials.

Operating Cap	PA	Tip ejector	PA
Operating Button	PA	Tip cones	PC
Handle	PA	Pipette body	PA
Tip ejector pusher	PA	Tip ejector plate	PC

DESCRIPTION OF TIPS

Our Tips are recommended for use with the Multi-Channel Pipette.

They are made of natural colour polypropylene, generally regarded as the only contamination free material suitable for tips. Our Tips are also autoclavable (121°C).

DIGITAL DISPLAY (Fig.1)

The adjusted delivery volume is clearly indicated by a digital display on the pipette handle.

Pipette Operation

SETTING THE DELIVERY VOLUME(Fig.2)

The delivery volume is set using the operating button on the top of the pipette.To increase the delivery volume turn the operating button counterclockwise.To decrease turn it clockwise.

Ensure that the desired delivery volume clicks into place and that the digits for the volume are completely visible on the handle display.

Do not use force to try to set volumes outside of the pipett's specified volume range!

TIP EJECTION (Fig.3)

To help eliminate the risk of comtamination,each pipette is fitted with a tip ejector system.

The tip ejector system consists of a softtouch tip ejector and specially designed gearing mechanism.

To release the tip, point the pipette at suitable waste receptacle and press the tip ejector with your thumb.

Pipetting Techniques

Figures 4-6:

A = Ready position

B = First stop

C = Second stop

FORWARD TECHNIQUE(Fig.4)

Ensure that clean tips are firmly pushed onto the tip cones of the pipette.

The operation of the pipette is controlled by the operating button. For the best possible accuracy:

Operate the button slowly and with steady speed at all times, particularly when working with liquids having high viscosity. Never let the operating button snap back. When working with serum or biological fluids prime the tips with the liquid before pipetting. This is done by filling and emptying the tips.

Hold the pipette vertically (10 degrees maximum from vertical) during the liquid intake. For maximum hand control, hold the pipette tightly in the hand with the "Grippy" resting on the index finger.

Fill a clean reagent reservoir with the liquid to be dispensed.

1. Depress the operating button to the first stop.
2. Dip the tips just under the surface of the liquid in the reservoir (2-3mm) and slowly release the operating button. Withdraw the tips from the liquid touching them against the edge of the reservoir to remove excess liquid.
3. Deliver the liquid by gently depressing the operating button to the first stop. After a delay of about one second, continue to depress the operating button all the way down to the second stop. This action will empty the tips.
4. Release the operating button to the ready position. If necessary, change the tips and continue with the pipetting.

REVERSE TECHNIQUE (Fig.5)

The reverse technique is suitable for dispensing liquids having high viscosity or a tendency to foam easily. The technique is also recommended for dispensing very small volumes. Fill a clean reagent reservoir with the liquid to be dispensed.

1. Depress the operating button all the way down to the second stop.
2. Dip the tips just under the surface of the liquid in the reservoir (2-3mm) and slowly release the operating button.

This action will fill the tips. Withdraw the tips from the liquid touching them against the edge of the reservoir to remove excess liquid.

3. Deliver the preset volume by gently depressing the operating button to the first stop. Hold the operating button at the first stop. Some liquid will remain in the tip and should not be included in the delivery.
4. The remaining liquid is either discarded with the tips or pipetted back into the container.

REPETITIVE TECHNIQUE (Fig.6)

The repetitive technique offers a rapid and simple procedure for repeated delivery of the same volume. Fill a clean reagent reservoir with the liquid to be dispensed.

1. Depress the operating button all the way down to the second stop.
2. Dip the tips just under the surface of the liquid in the reservoir (2-3mm) and slowly release the operating button.

This action will fill the tips. Withdraw the tips from the liquid touching them against the edge of the reservoir to remove excess liquid.

3. Deliver the preset volume by gently depressing the operating button to the first stop. Hold the operating button at the first stop. Some liquid will remain in the tip and should not be included in the delivery.
4. Continue pipetting by repeating the steps 2 and 3.

Maintenance

When the Multi-Channel Pipette is not in use make sure it is safely stored in a vertical position, preferably on a Stand.

SHORT TERM CHECKING

The pipette should be checked at the beginning of each day for dust and dirt on outside surfaces of the pipette. Particular attention should be paid to the tip cones. Solvents should not be used for cleaning the pipette.

LONG TERM MAINTENANCE

If the pipette is used daily it should be checked at least twice a year. The servicing procedure is as follows:

1. Unscrew the two screws on the tip ejector plate and remove it.
2. Unscrew the eight screws (four screws in 12-channel model) on the body assembly cover and remove it.
3. Remove the tip ejector with the spring.
4. Depress the operating button all the way down. Remove the tip cone holder with the tip cones.
5. Clean the pistons and O-rings with a dry napless cloth and grease them slightly with grease (included in the package).
6. Reassemble the pipette.

In the event of a malfunction clean the pipette and send it to the our company representative. Please, enclose a complete list of liquids which have entered the pipette.

Calibration

All PIPETTE are factory calibrated and adjusted to give the volumes as specified with distilled or deionized water. Normally, the pipettes do not need adjustment, but they are constructed to permit recalibration and adjustment for liquids of different temperature and viscosity.

DEVICE REQUIREMENTS AND TEST CONDITIONS

An analytical balance must be used. The scale graduation value of the balance should be chosen according to the selected test volume of the pipette:

Volume range	readable graduation
under 10ul	0.001mg
10-100ul	0.01mg
above 100ul	0.1mg

Test liquid: Water, distilled or deionized, "grade 3" water conforming ISO 3696. Tests are done in a draft-free room at a constant ($\pm 0.5^\circ\text{C}$) temperature of water, pipette and air between 20°C to 25°C . The relative humidity must be above 55%. Especially with volumes under 50ul the air humidity should be as high as possible to reduce the effect of evaporation loss. Special accessories, such as the evaporation trap, are recommended.

CHECKING THE CALIBRATION

One of the middle channels of the pipette is checked with the maximum volume (nominal volume) and with the minimum volume or 10% of maximum volume, whichever is higher. E.g. Multi-Channel Pipette 0.5-10ul is tested at 10ul and 1ul. A new tip is first pre-wetted 3-5 times and a series of ten pipettings are done with both volumes. A pipette is always adjusted for delivery (Ex) of the selected volume. Measuring volumes taken from balance if not allowed. If the calculated results are in the limits, the calibration of the pipette is correct.

Procedure:

1. Do 10 pipettings with the minimum volume.
2. Do 10 pipettings with the maximum volume.
3. Calculate the accuracy (A) and precision(cv) of both series.
4. Compare the results to the limits in the Table 1.

If the results are in the limits of Table 1, then the calibration of the pipette is correct.

Otherwise the pipette must be adjusted and checked again.

Channel	Volume Range	Test Volume	Accuracy %	Precision %
8	0.5-10ul	10	1.50%	1.50%
		5	2.50%	2.50%
		1	4.00%	4.00%
8	5-50ul	50	1.00%	0.50%
		25	1.50%	1.00%
		5	3.00%	2.00%
8	50-300ul	300	0.70%	0.25%
		150	1.00%	0.50%
		50	1.50%	0.80%
12	0.5-10ul	10	1.50%	1.50%
		5	2.50%	2.50%
		1	4.00%	4.00%
12	5-50ul	50	1.00%	0.50%
		25	1.50%	1.00%
		5	3.00%	2.00%
12	50-300ul	300	0.70%	0.25%
		150	1.00%	0.50%
		50	1.50%	0.80%

ADJUSTMENT (Fig.7)

Adjustment is done with the service tool.

1. Place the service tool into the openings of the calibration nut at the top of the handle.
2. Turn the service tool clockwise to increase, or counterclockwise to decrease the volume.
3. After adjustment check the calibration according to the instructions above.

FORMULAS FOR CALCULATING RESULTS

Conversion of mass to volume

$$V = (w+e) \times Z$$

V = volume (ul)
 w = weight (mg)
 e = evaporation loss (mg)
 Z = conversion factor for mg/ul conversion

Evaporation loss can be significant with low volumes. To determine mass loss, dispense water to the weighing vessel, note the reading and start a stopwatch. See how much the reading decreases during 30seconds (e.g. 6 mg=0.2mg/s). Compare this to the pipetting time from taring to reading. Typically pipetting time might be 10 seconds and the mass loss is 2mg (10s x 0.2mg/s) in this example. If an evaporation trap or lid on the vessel is used the correction of evaporation is usually unnecessary. The factor Z is for converting the weight of the water to volume at test temperature and pressure. A typical value is 1.0032ul/mg at 22°C, and 95 kPa. See the conversion table on page 10.

Accuracy (systematic error)

Accuracy is the difference between the dispensed volume and the selected volume of a pipette.

$$A = \bar{V} - V_0$$

A = accuracy
 \bar{V} = mean volume
V = nominal volume

Accuracy can be expressed as a relative value:

$$A\% = 100\% \times A / V_0$$

Precision (random error)

Precision refers to the repeatability of the pipettings. It is expressed as standard deviation (s) or coefficient of variation (cv)

$$S = \sqrt{\frac{\sum_{i=1}^n (V_i - \bar{V})^2}{n-1}}$$

s = standards deviation

\bar{V} = mean volume

n = number of measurements

cv is the relative value of standard deviation.

$$cv = 100\% \times s / \bar{V}$$

Package

The Multi-Channel Pipette are shipped in a custom made, cardboard package.

The package contains the following items:

1. Multi-Channel Pipette
2. Instruction Manual
3. Tube of Grease
4. Service Tool
5. Samples of Tips

Troubleshooting

The following table is a guide to possible problems and their solutions.

Fault	Possible reason	Solution
Leakage	Tip incorrectly attached	Attach firmly
	Foreign bodies between tips and tip cones	Clean tip cones thoroughly and attach new tips
	Foreign bodies between O-rings and pistons	Clean and grease O-rings and the pistons in the cylinders. Use grease
	Insufficient amount of grease on pistons and O-rings	Grease accordingly
Inaccurate dispensing	O-rings damaged	Change the O-rings
	Incorrect operation	Follow instructions carefully
	Tips incorrectly attached	Attach firmly
Inaccurate dispensing with certain liquids	Calibration altered e.g. caused by misuse	Recalibrate according to instructions
	Unsuitable calibration. Many high viscosity liquids require recalibration	Recalibrate with the liquids in question

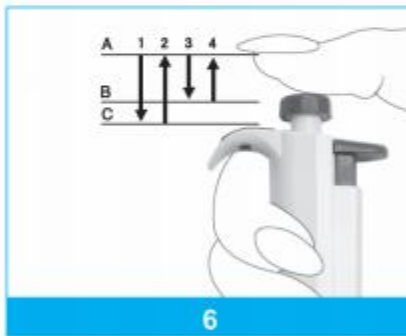
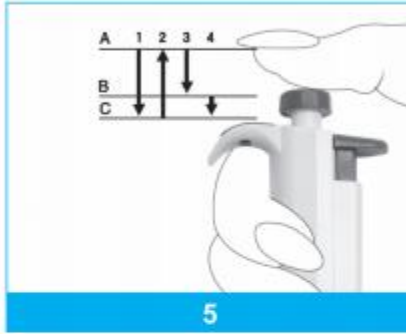
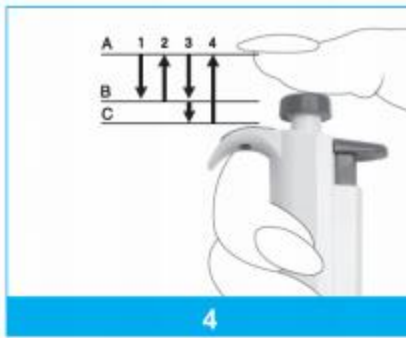
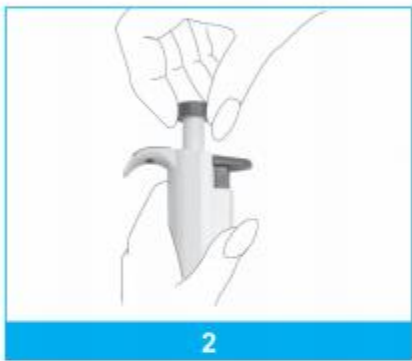
CAUTION!

The PIPETTE is designed to allow easy in lab service. If you would prefer to have us of your local representative for service, please make sure that the pipette has been decontaminated before you send it to us.

Also, please note that the postal authorities in your country may prohibit or restrict the shipment of contaminated material by mail.

Conversion table

Temperature °C	Air pressure hPA (mbar)					
	800	853	907	960	1013	1067
15	1.0018	1.0018	1.0019	1.0019	1.0020	1.0020
15.5	1.0018	1.0018	1.0019	1.0020	1.0020	1.0021
16	1.0019	1.0020	1.0020	1.0021	1.0021	1.0022
16.5	1.0020	1.0020	1.0021	1.0022	1.0022	1.0023
17	1.0021	1.0021	1.0022	1.0022	1.0023	1.0023
17.5	1.0022	1.0022	1.0023	1.0023	1.0024	1.0024
18	1.0022	1.0023	1.0024	1.0024	1.0025	1.0025
18.5	1.0023	1.0024	1.0025	1.0025	1.0026	1.0026
19	1.0024	1.0025	1.0025	1.0026	1.0027	1.0027
19.5	1.0025	1.0026	1.0026	1.0027	1.0028	1.0028
20	1.0026	1.0027	1.0027	1.0028	1.0029	1.0029
20.5	1.0027	1.0028	1.0028	1.0029	1.0030	1.0030
21	1.0028	1.0029	1.0030	1.0030	1.0031	1.0031
21.5	1.0030	1.0030	1.0031	1.0031	1.0032	1.0032
22	1.0031	1.0031	1.0032	1.0032	1.0033	1.0033
22.5	1.0032	1.0032	1.0033	1.0033	1.0034	1.0035
23	1.0033	1.0033	1.0034	1.0035	1.0035	1.0036
23.5	1.0034	1.0035	1.0035	1.0036	1.0036	1.0037
24	1.0035	1.0036	1.0036	1.0037	1.0038	1.0038
24.5	1.0037	1.0037	1.0038	1.0038	1.0039	1.0039
25	1.0038	1.0038	1.0039	1.0039	1.0040	1.0041
25.5	1.0039	1.0040	1.0040	1.0041	1.0041	1.0042
26	1.0040	1.0041	1.0042	1.0042	1.0043	1.0043
26.5	1.0042	1.0042	1.0043	1.0043	1.0044	1.0045
27	1.0043	1.0044	1.0044	1.0045	1.0045	1.0046
27.5	1.0044	1.0045	1.0046	1.0046	1.0047	1.0047
28	1.0046	1.0046	1.0047	1.0048	1.0048	1.0049
28.5	1.0047	1.0048	1.0048	1.0049	1.0050	1.0050
29	1.0049	1.0049	1.0050	1.0050	1.0051	1.0052
29.5	1.0050	1.0051	1.0051	1.0052	1.0052	1.0053
30	1.0052	1.0052	1.0053	1.0053	1.0054	1.0055



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