

# Impact<sup>2</sup>

# Impact

Operator's Manual



**MATRIX**  
MATRIX TECHNOLOGIES CORP.

**Caution:** Please read entire manual before pipetting

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## ***Congratulations!***

You have purchased the state-of-the-art in precision pipetting. The *IMPACT*® is the first cordless electronic pipettor that "understands" the myriad of liquid handling protocols typically performed in today's laboratory.

Ergonomically designed and balanced to reduce fatigue, the *IMPACT* functions so intuitively, that you may need no more than a quick survey of this manual to use it.

The *IMPACT* allows you to accomplish your liquid pipetting tasks quickly, accurately, and with less risk of developing repetitive motion related injuries that are typical with manual pipettor use. Laboratory results will become more standardized, while less time is expended on tedious bench procedures.

Delivering power, precision, and performance.

***IMPACT<sup>2</sup>*** is the latest word in liquid handling technology.

## ***Before You Begin***

Before using the *IMPACT* or *IMPACT<sup>2</sup>*, verify the contents of your package. The package should contain the following items:

- 1 *IMPACT* or *IMPACT<sup>2</sup>* Pipettor
- 1 Operator's Manual
- 2 Rechargeable Batteries
- 1 AC Power Transformer
- 1 Warranty Card
- 1 Accuracy/Precision Data Sheet
- 1 Coupon for Free Calibration Service

If you are missing any items, contact your Matrix Technologies representative.

*Note: Batteries must be installed and recharged before using the IMPACT. Refer to the following sections in this manual:*

- *Section E.3, Installing/Replacing Batteries*
- *Section E.4, Recharging Batteries*

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## A. INTRODUCTION

The *IMPACT* is lightweight and cordless. It provides the convenience of a manual pipettor, with the programming capabilities of an electronic pipettor. It runs on rechargeable batteries and can be used while recharging. The pipettor also has an automatic shutoff feature to extend battery life.

The *IMPACT* uses a "paced dispense" feature that performs repeat pipetting steps while the trigger is depressed.

The *IMPACT* uses integrated circuit technology to store its programming information. It will hold up to 40 steps in a program. The program information is retained in memory, even if the batteries are fully discharged or removed.

The *IMPACT*<sup>2</sup> is the second generation of the *IMPACT* pipettor family. It is capable of performing all of the same pipetting protocols available with the *IMPACT*, plus a few *NEW* features. The expanded capabilities include:

- Expanded memory for storing up to five pipetting programs. Each program can hold a maximum of 40 steps.
- "Scratch Pad" programming mode which allows for fast and simple program changes that are not stored into memory.
- Enhanced speed control which offers slower aspirating and dispensing of viscous liquids. *Excellent for Gel loading!*
- "EASY" CAL which simplifies in-lab calibration verification by using distilled water.

The *IMPACT* and *IMPACT2* are available in 8-channel and 12-channel formats (see Figure A). An expandable version of the 8-channel format is also available for pipetting samples from test tubes in a rack. It comes in several models to handle fluid volumes from 0.5  $\mu\text{l}$  to 1250  $\mu\text{l}$ . The handles are color-coded for easy identification of different model types (*IMPACT* vs. *IMPACT2*) and different volume ranges. See Section B.4, Specifications.

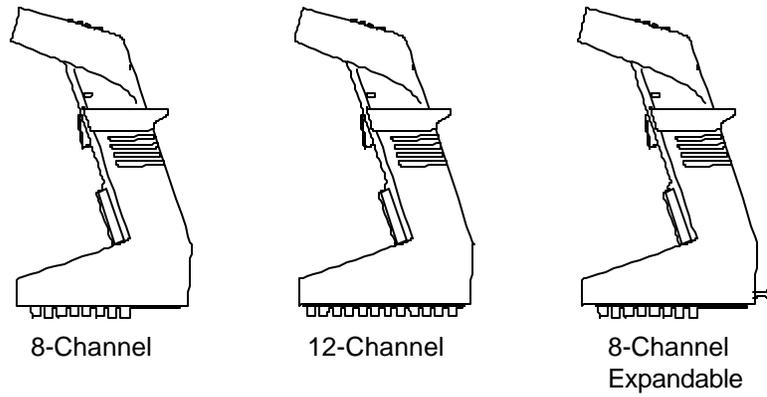
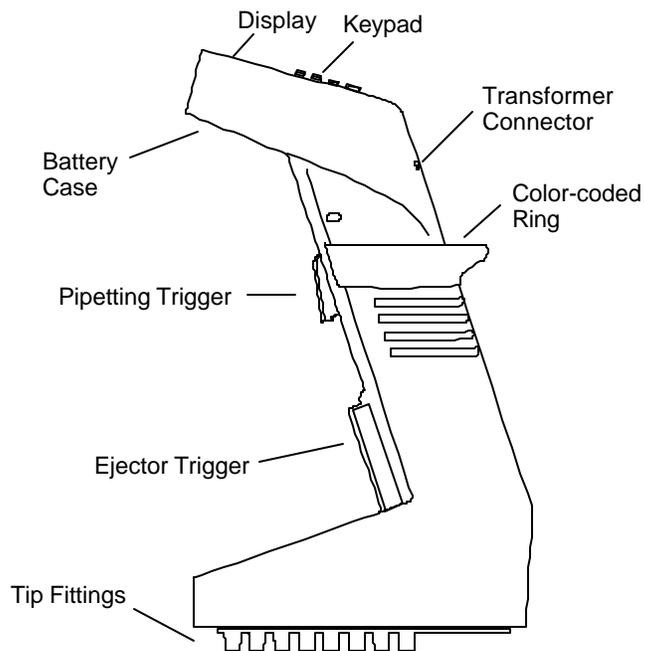


Figure A: *IMPACT* Configurations

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## B. PIPETTOR OVERVIEW

### B.1 General Description



**Figure B.1: Description of Components**

**Keypad.** The keypad contains the operation keys that are used in programming the pipetting sequence and volumes. See Section B.2, Keypad.

**Display.** The display is an LCD screen that shows the pipetting operation (fill, dispense, mix, or purge) and fluid volume for each step in the pipetting program. See Section B.3, Display.

**Battery Case.** The battery case contains two rechargeable nickel cadmium batteries. Batteries are charged for 12 – 14 hours. When fully charged, the pipettor can perform up to 1200 cycles at full stroke. Battery life is extended with automatic shutoff after 10 minutes of inactivity. See Section E.3, Installing/ Replacing Batteries.

**Pipetting Trigger.** The pipetting trigger initiates the pipetting program. It is pressed when the "Run" or "Purge" command appears in the display. A single pipetting step is performed by a quick press and release of the trigger. Repeat pipetting (paced dispense) is performed by pressing and holding the trigger.

*Note: At the end of a paced dispense, the pipet tips should be removed from the fluid before releasing the trigger, to prevent aspiration of fluid.*

**Ejector Trigger.** The ejector trigger is pressed to eject the pipet tips from the pipettor.

**Tip Fittings.** The tip fittings form an airtight seal with the pipet tips to ensure accuracy while pipetting.

*Note: To extend instrument life, Matrix Technologies has equipped all IMPACT and IMPACT<sup>2</sup> pipettors with chemically-resistant (PEEK) tip fittings. This material allows for pipetting of acidic solutions without damage to the tip fittings.*

**Color-coded Ring.** The flanged ring around the pipettor handle is color-coded to identify the pipetting volume of the handle. See Section B.4, Specifications.

**Transformer Connector.** The transformer connector receives the plug from the power transformer for recharging the batteries. The pipettor can be used while it is recharging.



## B.2 Keypad

The keypad contains the operation keys, program keys, and the special function key.

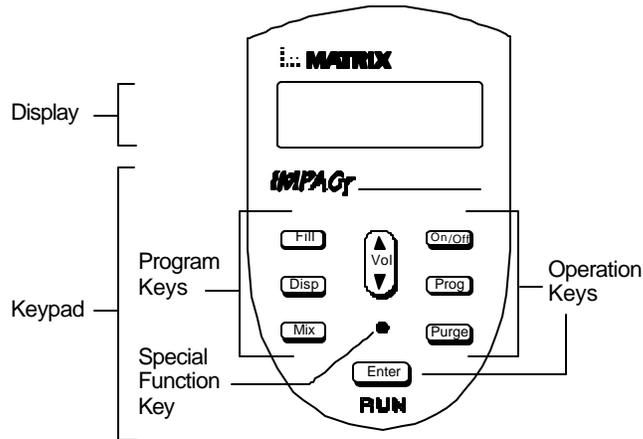


Figure B.2a: *IMPACT* Keypad

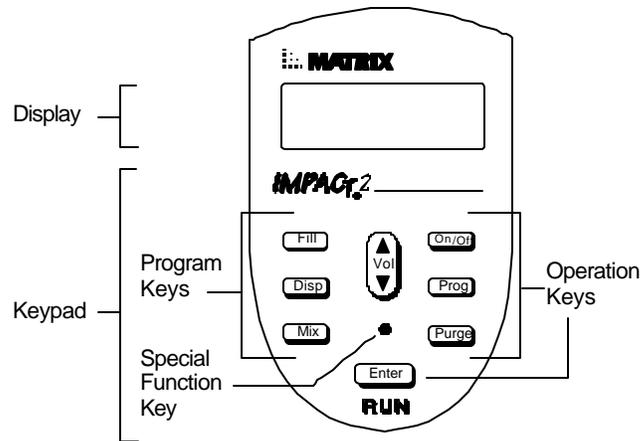


Figure B.2b: *IMPACT2* Keypad

**Operation Keys:**

[On/Off] The On/Off key turns the pipettor on or off. When the pipettor is turned on, it emits a beep tone, flashes "ZERO" on the display, then automatically resets the pistons to zero position. After zeroing, the display shows the first step of the program in the RUN mode.

*Note: If the pipettor is being programmed for the first time, the first step will be the fill operation, with the default fill volume. See Section C.1, Program-ming the IMPACT, for the default settings.*

[Speed] The Speed key controls the rate at which the liquid is aspirated or dispensed. The speed setting can be changed by repeatedly pressing the Speed key.\*

For the *IMPACT*, three speed settings are available:

<u>Speed Setting</u>	<u>Display</u>
SLOW	S ■ F
MEDIUM	S ■ ■ F
FAST	S ■ ■ ■ F

For the *IMPACT<sup>2</sup>*, five speed settings are available:

<u>Speed Setting</u>	<u>Display</u>
SLOW	S
MEDIUM SLOW	S ■
MEDIUM	S ■ ■
MEDIUM FAST	S ■ ■ ■
FAST	S ■ ■ ■ F

The *IMPACT<sup>2</sup>* also features independent speed adjustment. Speed settings can be changed within a stored program or during the execution of a program (see Section C.2.4, Pipetting Speed Adjustment).

*\*NOTE: IMPACT<sup>2</sup> speed settings are changed through the Special Function key (see Special Function key section on page 11) or by using the volume key (see Section C.2.4, Pipetting Speed Adjustment).*

The current speed setting is always shown at the bottom of the display. These settings can be selected and changed at any time before a program step is performed.

[Prog] The Program key on the *IMPACT<sup>2</sup>* enables you to store up to five separate programs in memory for future recall. Each program can hold up to 40 steps. Programs are stored in reserved program location numbers 1 – 5. Program “0” is used as a “scratch pad” where temporary programs can be written, run, and overwritten easily. Program “0” is considered to be an “open” program (see Section C.2, Programming the *IMPACT<sup>2</sup>*).

*IMPACT<sup>2</sup>*  
only

[Purge] The Purge key enters a purge prompt anytime during a pipetting operation to abort the program. By pressing the Purge key, then pressing the trigger, you can dispense any remaining liquid from the pipet tips and return to the beginning of the program.

The Purge key is also used to enter the purge step into a program.

*Note: If there is insufficient liquid for a final dispense step, the pipettor emits a beep tone and automatically displays the purge prompt.*

**RUN** The RUN mode performs the operation that is displayed, such as fill, dispense, mix, or purge. When "Run" appears in the display, you can activate the RUN mode by pressing the trigger. At the end of a pipetting sequence, the pipettor emits a triple beep tone and returns to the beginning of the program. The pipettor remains in RUN mode until you program a new pipetting sequence.

**Program Keys:**

- [Fill] The Fill, Dispense, and Mix keys program the pipetting operations. By pressing one of these keys,
- [Disp] you can enter the programming mode of the *IMPACT*. The "Run" prompt disappears from the display and the appropriate operation appears with a flashing "Vol" prompt. Fill, dispense, or mix volumes can be programmed by pressing the Volume key. Also, the number of mix cycles can be programmed by pressing the Mix key twice.
- [Mix]

**Automatic blowout.** At the end of a *final* dispense step, the pipettor automatically expels any remaining liquid from the pipet tips with a short burst of air (blowout). The pistons then reverse direction and return to zero position.

*Note: If you press and hold in the trigger during the final dispense step, the pipettor performs the automatic blowout and holds its position until you release the trigger. This delay allows you sufficient time to remove the tips from the liquid to prevent aspiration of liquid, as the pistons return to zero position.*



The Volume key controls the quantity of liquid to be aspirated or dispensed. The volume can be entered when the "Vol" prompt appears.

Pipetting volume can be incremented quickly by continuously depressing the Volume key. Short, quick, depressions of the Volume key will increase or decrease the volume by its smallest increment. Longer depressions of the Volume key will increase or decrease the volume in larger increments. Three levels of volume increments are available to achieve the desired volume (see Table C.1, Default Programming Volumes).

*IMPACT<sup>2</sup>  
only*

The Volume key can also be used to change pipetting speeds within a stored program or during the execution of a program (see Section C.2.4, Pipetting Speed Adjustment).

[Enter] The Enter key stores the program in memory. After each step is programmed, the Enter key is pressed once to accept the step. After the final step is programmed, the Enter key is pressed twice to denote the end of the program. The pipettor verifies the end of the program with a triple beep tone.

### Special Function Key:

The Special Function key is the small hole below the Volume key. It can be activated with a pipet tip. By repeatedly pressing the Special Function key, you can display four functions: Beep Tone (TONE), Paced Dispense Speed (PACE), Calibration (CAL), and Pipetting Speed—*IMPACT*<sup>2</sup> only (SPd). To exit the Special Function key at any time, press the Enter key.

**TONE** The beep tone signals the completion of one or more steps, or signals a warning:



- *Single beep tone*: end of pipetting step; insufficient dispense volume, purge required.
- *Double beep tone*: operation or program key is not active in current mode; illegal programming step attempted. See Section E.1, Troubleshooting.
- *Triple beep tone*: end of pipetting sequence; end of programming sequence.

The single beep tone, signaling the end of a pipetting step, can be turned ON or OFF. All other beep tones cannot be turned off. Press the Special Function key once to display "TONE" and its current setting. To change the setting, press the Volume key. If the beep tone is turned ON, the beep tone symbol "" appears at the bottom of the display.

*Note: For paced dispensing, the beep tone should be turned on, to prepare you for each dispense step.*

**PACE** The pace controls the speed of repeat pipetting (paced dispensing), FAST or SLOW. Press the Special Function key twice to display "PACE" and its current setting. To change the setting, press the Volume key.

**Paced Dispense.** When you use the paced dispense feature, the pipettor dispenses the programmed volume at the specified pace (fast or slow). Immediately after each dispense step, the pipettor emits a single beep tone (if beep tone is on) to prepare you for the next dispense step. See Section C.5, Operating Procedures.

**CAL** The calibration of the pipettor is factory set for distilled water at room temperature. If you are pipetting fluids with significantly different specific gravities or temperatures, use this setting to recalibrate the pipettor. See Section D, Calibration.

**SPd** Once in the special function mode, adjust the pipetting speed by pressing the Volume key. Five speed settings are available:  
*IMPACT<sup>2</sup>*  
*only*

<u>Speed Setting</u>	<u>Display</u>
SLOW	S
MEDIUM SLOW	S ■
MEDIUM	S ■ ■
MEDIUM FAST	S ■ ■ ■
FAST	S ■ ■ ■ F

The current speed setting is always shown at the bottom of the display. These settings can be selected and changed at any time before a program step is performed.

### B.3 Display

The pipettor display is a dynamic LCD screen. It displays the current operation, volume prompt (if you are entering a program), pipetting volume, low battery indicator (appears if battery charge is low), beep tone symbol (if the beep tone is on), pipetting speed, and program number (*IMPACT<sup>2</sup>* only).

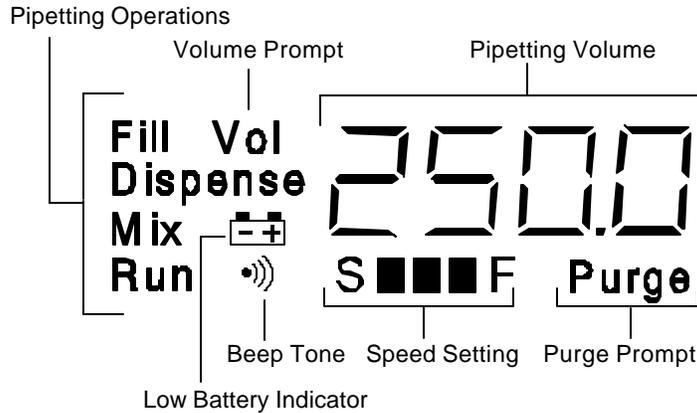


Figure B.3a: *IMPACT* Display

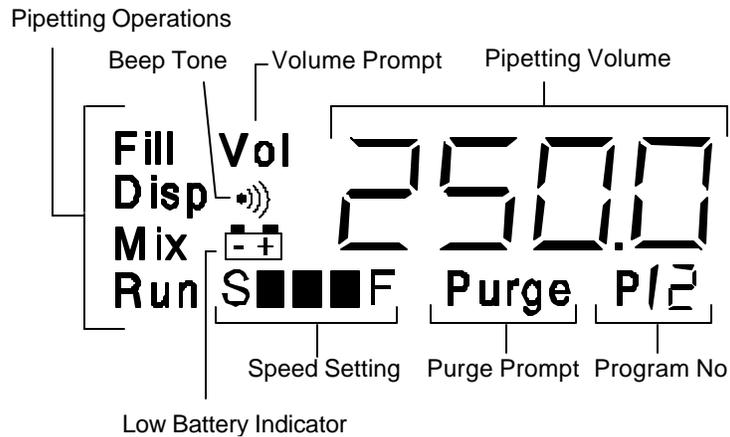


Figure B.3b: *IMPACT<sup>2</sup>* Display

## B.4 Specifications

### Pipettor Type

Model	Handle Color
IMPACT	White
IMPACT <sup>2</sup>	Gray

### Handle Specifications

Handle Size	Handle Type	Volume Range	Color Ring	Accuracy* (±)	Precision** (±)
12.50 µl	12-channel	0.50-12.50 µl	Red	2.5%/0.15 µl	2.0%/0.15 µl
125.0 µl	12-channel	2.0-125.0 µl	Yellow	2.0%/1.0 µl	1.2%/0.8 µl
250.0 µl	12-channel	5.0-250.0 µl	Blue	2.0%/1.5 µl	0.8%/1.2 µl
850 µl	12-channel	15-850 µl	Orange	1.5%/4.0 µl	0.6%/2.5 µl
12.50 µl	8-channel	0.50-12.50 µl	Red	2.5%/0.15 µl	2.0%/0.15 µl
125.0 µl	8-channel	2.0-125.0 µl	Yellow	2.0%/1.0 µl	1.0%/0.6 µl
250.0 µl	8-channel	5.0-250.0 µl	Blue	2.0%/1.5 µl	0.7%/1.0 µl
1250 µl	8-channel	15-1250 µl	Green	1.5%/6.0 µl	0.6%/3.0 µl

*Note: For Accuracy and Precision, values shown are expressed as a percent (%) deviation or microliter (µl) value. When applied to desired volume, the greater of the two values will always apply.*

*\*Both values represent the deviation from the mean.*

*\*\*Percentage values are expressed as the coefficient of variation. Microliter values are expressed as the standard deviation.*

### Available Power Sources

Catalog No.	Country	Power Source
6096	England	240 V, 50 Hz
6097	Japan	100 V, 50 Hz



*PIPETTOR OVERVIEW*

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6098	USA	120 V, 60 Hz
6099	Europe	230 V, 50 Hz

## B.5 Hazards and Precautions

There are no known hazards associated with the *IMPACT* when it is operated in accordance with the instructions in this manual. However, you should be aware of situations that can result in serious injury.

*Note: Do not perform troubleshooting procedures on the internal components unless instructed by Matrix Technologies service personnel.*



**WARNING!** Ensure that the power transformer is connected to a power receptacle that provides voltage and current specified by Matrix Technologies. Use of an incompatible power receptacle can cause shock and fire hazard.

**CAUTION!** Use only the power transformer supplied by Matrix Technologies. Use of an incompatible power transformer can damage the pipettor.

**CAUTION!** Always turn off the power and unplug the power transformer before cleaning the exterior. Fluid seepage can damage internal components.

**CAUTION!** Do not immerse the unit in liquid. Fluid seepage can damage internal components.

**CAUTION!** Do not autoclave the entire unit. Extreme heat can damage the display and other electronic components.

*Note: For autoclaving specific portions of the pipettor, refer to the Autoclaving Procedures, or call Matrix Technologies, Technical Service Department, for instructions.*

**CAUTION!** Do not clean the keypad with bleach solution or other solvents. Caustic cleaning solutions can damage the keypad.

**CAUTION!** Avoid excessive charging of the batteries when the pipettor is not in use. Excessive charge to the batteries will shorten the battery life and may damage the batteries.

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## C. PROGRAMMING AND OPERATION

Programming the *IMPACT* and *IMPACT<sup>2</sup>* is fast and easy. Pipetting steps and volume are entered in the sequence that they will be performed, then the program is saved to memory. This program will stay in memory (even if the pipettor is turned off, or the battery runs low) until you change it. Up to 40 programming steps can be entered and stored in the *IMPACT* pipettor. Five programs, each capable of holding 40 steps, can be entered and stored in the *IMPACT<sup>2</sup>*.

### C.1 Programming the *IMPACT*

To enter a pipetting program:

- 1. Turn on pipettor.** Press the green [On/Off] key to turn on the pipettor. The pipettor will beep once and flash "ZERO" on the display while resetting the pistons to zero position. The first step of the current program is displayed.

*Note: If the pipettor is being programmed for the first time, the first step will be the fill operation, with the default fill volume displayed (see the following table).*

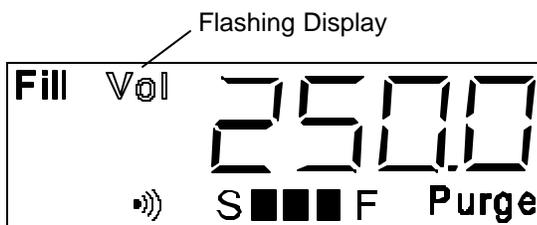
Handle Volume	Fill Volume	Dispense Volume	Mix Volume	Volume Increment (slow → fast)		
12.50	10.00	10.00	5.00	0.05	0.10	0.50
125.0	100.0	100.0	50.0	0.1	0.5	5.0
250.0	250.0	50.0	50.0	0.5	5.0	25.0
850	850	100	100	1	5	50
1250	1250	100	100	1	5	50

**Table C.1: Default Programming Volumes\***

*\*All volumes shown are in microliters ( $\mu$ l).*

2. **Select pipetting operation.** Enter the programming mode by pressing the [Fill] or [Mix] key.

For example, to begin programming with a filling operation, press the [Fill] key. The display shows "Fill" with a flashing "Vol" prompt:



*Note: The displayed volume defaults to the last volume programmed for the selected operation, or to the default volume for the pipettor, if it is being programmed for the first time.*

**Fill.** The [Fill] key programs the pipettor to aspirate a volume of liquid. A single fill step can be programmed for fluid transfers, or a combination of fill steps can be programmed for dilutions or supernatant collection.

**Dispense.** The [Disp] key programs the pipettor to dispense a volume of liquid. The dispense volume can be the entire fill volume, or a smaller increment for repeat pipetting. You only have to program the dispense volume once for repeat pipetting. The pipettor will dispense the volume each time the trigger is pressed (or repeatedly during a paced dispense) until the fill volume is reached, or until insufficient volume remains.

**Mix.** The [Mix] key programs the pipettor to perform a combination of fills and dispenses. You can program a mix volume or mix cycle (single fill and dispense). You can press [Mix] once to program a mix volume, or twice to program a mix cycle. Mix cycles from 1 to 9 are available on the *IMPACT*; mix cycles from 2 to 9 are available on the *IMPACT<sup>2</sup>*. The default setting is three mix cycles.

Listed below are some programming considerations for the mix operation:

- If the program begins a mix cycle from zero position, it will complete the cycle with an automatic blowout, then display "ZERO." Press the trigger to return the pistons to zero position.
- If the program begins a mix cycle above zero position (volume is greater than zero), the fluid is dispensed, and the mix cycle begins. The mix cycle will end at the same volume it started with. Also, the mix operation will remain in the display so it can be repeated (useful for serial dilutions). To end the mix operation, press the [Purge] key, then press the trigger.

**Purge.** The [Purge] key programs the pipettor to purge the fluid. This step can be entered as a program step, or it can be pressed anytime while pipetting to terminate the program and dispense the remaining liquid.

*Note: If the program ends at a volume greater than zero, and the last step is not a mix cycle, the "Purge" prompt automatically appears. Also, the pipettor emits a beep tone to warn you that some fluid remains. Press the trigger to dispense the remaining fluid and return to the beginning of the program.*

Examples of pipetting programs with different mix steps are shown in Section C.4, Programming Examples.

- 3. Enter volume.** Enter the desired volume for [Fill], [Disp], or [Mix] by pressing the up or down side of the [Vol] key. If the [Vol] key is pressed and released quickly, the volume changes by its smallest increment of measure (for example, 0.5  $\mu$ l for the 250  $\mu$ l pipettor); if the [Vol] key is pressed and held, then the volume change occurs with larger increments (see Table C.1, Default Programming Volumes, for volume increment).

*Note: The [Purge] key does not use a volume; therefore, if you have entered a purge step, continue to the next step.*

- 4. Confirm programming step.** Press [Enter] to confirm the programming step. The display flashes all of the operation keys to prompt you for the next programming step:



- 5. Select next pipetting operation.** Repeat steps 2 to 4 until all programming steps have been entered.
- 6. Save program and exit.** When the display flashes all operation keys, press [Enter] to save the program and exit the programming mode. The pipettor emits a triple beep tone to signal the end of the programming sequence. The first step in the program is displayed. "Run" is displayed in the lower left corner to indicate that the new program is ready to be run. Go to Section C.3 for Reviewing the Program, or Section C.5 for Operating Procedures.

## C.2 Programming the *IMPACT*<sup>2</sup>

### C.2.1 Program Selection

To create and store programs in the *IMPACT*<sup>2</sup>:

1. Select the program number by pressing the [Prog] key, then press the [Vol] key until the desired program number is displayed.
2. Press and hold the [Prog] key, while simultaneously pressing the Special Function key to enter the programming mode. The prompt "Prog" will appear on the display.
3. Begin entering your new program (see Section C.1, Programming the *IMPACT*, for programming instructions).

*NOTE: When programming mode is active, the Speed setting and Beep Tone symbols will blink.*

After you have pressed the [Enter] key to save and exit the program, your new program will be stored under the selected program number. The program number will be displayed for two seconds. (The first step of the newly written program is displayed).

This program is ready to be run.

### C.2.2 Program Recall

To recall a stored program:

1. Press the [Prog] key, then the [Vol] key to select the desired program number.
2. Press the [Enter] key to activate the displayed program.

### C.2.3 Scratch Pad Mode (Program 0)

While providing ample program storage, the *IMPACT*<sup>2</sup> also offers a “scratch pad” or open programming mode. This mode is identified by “P/O,” which appears in the program section of the display (refer to the *IMPACT*<sup>2</sup> display on page 12). This feature enables you to quickly change pipetting protocols without affecting previously stored programs.

To use the “scratch pad” mode: From the start of any program, simply begin entering a new protocol (selecting a pipetting operation as described on page 16). This new protocol can now be used, and will remain active until a stored program is retrieved. “P/O” appears in the program ID section of the display to indicate that the (O)pen programming mode, or “scratch pad” mode, is active.

### C.2.4 Pipetting Speed Adjustment

The *IMPACT*<sup>2</sup> offers unique speed control that is function based, enabling speeds for Fill, Dispense, Mix or Purge to be independently programmed. Also, speeds within any of the five stored programs can be independently set and stored as an integral part of the pipetting protocol. Pipetting speed is easily changed at the start of each pipetting function.

To change pipetting speed during the execution of a program: Press the [Vol] key to select the speed for each pipetting function (Fill, Dispense, Mix, or Purge).

This newly set speed will remain active with each function even if the pipettor is turned off. Speed settings within any of the five stored programs will also remain in memory with the program functions until changed by the operator.



### C.3 Reviewing the Program

After you have programmed your pipettor, you may want to review the programming steps:

1. **Set pipettor for RUN mode.** Ensure that the pipettor is in the RUN mode ("Run" appears in the lower left corner of the display). If the display is flashing all pipetting operations, you are still in the programming mode; press [Enter] to save the program and exit.
2. **Begin program.** Run the program without using pipet tips or aspirating fluid. Press the trigger for each step in the program.
3. **Observe display.** At each step of the program, observe the display. If necessary, re-enter the programming sequence.

Listed below are a few helpful hints for reviewing your program:

- If your program is complex and contains several steps, you may want to write the steps on paper before entering the program steps (or use a copy of the programming worksheet at the end of this manual). Check off each step as you review the program.
- If your program is intended for paced dispensing, review the program again, with the trigger depressed until the last step. Check the dispense pace to ensure that you can keep up with the dispense steps.



### C.4.3 Serial Dilutions

**Example:** Transfer 100  $\mu\text{l}$  to the first column of a plate previously filled with reagent. Mix 200  $\mu\text{l}$  for 2 cycles. Transfer 100  $\mu\text{l}$  to the second column and repeat the mix step. Follow this procedure for the rest of the plate.

[Fill]  $\left[ \begin{array}{c} \text{Vol} \\ \downarrow \end{array} \right] (100) [\text{Enter}]$   
 [Mix]  $\left[ \begin{array}{c} \text{Vol} \\ \downarrow \end{array} \right] (200) [\text{Mix}] \left[ \begin{array}{c} \text{Vol} \\ \downarrow \end{array} \right] (2) [\text{Enter}] [\text{Enter}] \bullet \gg$

That's the entire program! The mix step always returns to the volume at which it started (100  $\mu\text{l}$ ); therefore, the pipettor continues the mix step indefinitely, until you press the [Purge] key to end the program. In this example, the mix cycle is programmed for 2 cycles (default is 3 cycles).

### C.4.4 Simple Dilutions

**Example:** Prepare 1:10 dilution with a 10  $\mu\text{l}$  sample volume.

[Fill]  $\left[ \begin{array}{c} \text{Vol} \\ \downarrow \end{array} \right] (90) [\text{Enter}]$   
 [Fill]  $\left[ \begin{array}{c} \text{Vol} \\ \downarrow \end{array} \right] (20) [\text{Enter}]$   
 [Fill]  $\left[ \begin{array}{c} \text{Vol} \\ \downarrow \end{array} \right] (10) [\text{Enter}]$   
 [Purge] [Enter] [Enter]  $\bullet \gg$

The first fill volume is for the diluent (90  $\mu\text{l}$ ), followed by an air-gap (20  $\mu\text{l}$ ), and finally by the sample volume (10  $\mu\text{l}$ ). The purge step will dispense the total volume.

### C.4.5 Supernatant Collection

**Example:** Aspirate 100  $\mu\text{l}$  from 8 rows of a microtiter plate and discard the total volume.

[Fill]  (100) [Enter]

[Fill] [Enter]

[Fill] [Enter]

[Fill] [Enter]

[Fill] [Enter]

[Fill] [Enter]

[Fill] [Enter]

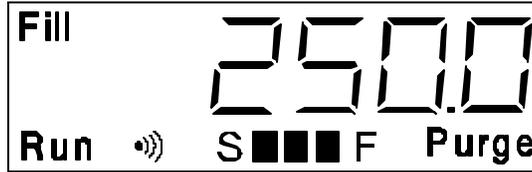
[Fill] [Enter]

[Purge] [Enter] [Enter] 

This program is performed with the 850  $\mu\text{l}$  handle. All 100  $\mu\text{l}$  fill volumes are collected in the same tips. When completed, the total volume is discarded with the purge step.

## C.5 Operating Procedures

After you have programmed your pipettor, you are ready to begin pipetting. The display should show the first program step, with the "Run" prompt showing in the lower left corner:



The following steps describe a basic program for pipetting reagent into a microtiter plate. The pipettor is programmed as follows:

[Fill]  (250) [Enter]

[Disp]  (30) [Enter] [Enter] 

1. **Attach pipet tips.** When you are ready to begin pipetting, attach the pipet tips to the pipettor.
2. **Aspirate liquid.** Immerse the pipet tips into the liquid to be aspirated, then press the trigger to aspirate 250  $\mu\text{l}$ .
3. **Dispense liquid.** Position the pipet tips over the first column of wells in the microtiter plate, and press the trigger to dispense 30  $\mu\text{l}$ . At the completion of the dispense step, the pipettor emits a single beep tone (if the beep tone is on).
4. **Repeat dispense step.** Repeat the previous step for the rest of the columns in the microtiter plate. At the completion of the eighth dispense, the pipettor emits a double beep tone (if the beep tone is on, otherwise it emits a single beep tone) and displays the "Purge" prompt. There is insufficient volume for another 30  $\mu\text{l}$  dispense, and the pipettor signals for a purge step.
5. **Discard remaining liquid.** Position the pipet tips over a waste container and press the trigger to purge the remaining liquid. The pipettor emits a triple beep tone to signal the end of the program, then returns to the first step of the program.
6. **Eject tips.** Press the ejector trigger to eject the used pipet tips.

**Paced Dispense.** Step 4 can also be performed as a paced dispense. Instead of pressing the trigger for each dispense step, press and hold the trigger to automatically dispense each volume. Immediately after each dispense step, the pipettor emits a single beep tone (if the beep tone is on), prompting you to prepare for the next dispense step. To stop a paced dispense, release the trigger before the end of the last dispense step.

*Note: For paced dispensing of small volumes, set the pace to SLOW. Ensure that you have fully released the trigger before the end of the last dispense step to prevent an additional, unwanted dispense step.*

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## D. CALIBRATION

The *IMPACT* and *IMPACT*<sup>2</sup> are factory-calibrated for distilled water at 20°C. For easy calibration, using distilled water, the *IMPACT*<sup>2</sup> pipettor features an “EASY” CAL mode (see Section D.2, Calibrating the *IMPACT*<sup>2</sup>). When pipetting liquids of significantly different specific gravities or temperatures, however, the Calibration (CALC) feature may be used for both the *IMPACT* and *IMPACT*<sup>2</sup> pipettors to achieve greater accuracy (see Section D.1, Calibrating the *IMPACT*).

To prepare for calibration, ensure that the pipettor and tips are at room temperature. When calibrating the pipettor, select only one channel to pipet with. Using an analytical balance, first obtain the actual value of the programmed volume at factory calibration. The programmed volume ( $V_p$ ) used is typically the full volume of the pipettor (for example, 250  $\mu$ l for the 250  $\mu$ l 8-channel pipettor), but is not limited to this volume.

## D.1 Calibrating the *IMPACT*

### D.1.1 Volume Measurement

To measure the actual value of the programmed volume:

1. Fill the programmed volume ( $V_p$ ), then dispense the entire volume into a container on the analytical balance.
2. Read the weight on the analytical balance. Repeat this procedure ten times.

*Note: Use a clean and dry pipet tip with each pipetting cycle. When filling the liquid, immerse the pipet tip approximately ¼ inch (approx. 0.6 cm) below the liquid surface. When dispensing the liquid, touch the side of the container to ensure a complete dispense.*

3. Determine the average weight of the programmed volume and convert it to volume. To convert to volume, correct the weight for specific gravity and temperature.

If you are weighing water, use one of the correction factors below:

<u>Temperature</u>	<u>Correction Factor</u>
20°C - 22.5°C	1.003
23°C - 25°C	1.004

The resulting volume is the corrected actual volume. If the pipettor is correctly calibrated, the programmed volume should equal the actual volume (within the specifications of the pipettor).



### D.1.2 Pipettor Calibration

To calibrate the pipettor:

1. Calculate display volume of the pipettor:  $D_v = \frac{V_p}{V_a} \times C_p$

$V_p$  = Programmed Volume

$V_a$  = Corrected Actual Volume (corrected for temperature)

$C_p$  = Calibration Point (each pipettor handle has its own calibration point, see the table below)

$D_v$  = Display Volume

Handle Size	Calibration Point (µl)	Factory Calibration Steps
12.50 µl	10.00	268
125.0 µl	100.0	483
250.0 µl	200.0	375
850 µl	700	882
1250 µl	1000	845

**Table D.1.2: Calibration Specifications**

2. Enter the CALC mode on the pipettor by pressing the Special Function key (use a pipet tip to press the key) until the "CALC" function flashes on the display, followed by the calibration point.
3. Press the [Vol] key to enter the Display Volume ( $D_v$ ) calculated above.
4. Press the [Enter] key to set the calibration point. The display shows 'CAL' then "SET" to confirm the new calibration point, and returns to the current pipetting program.

## CALIBRATION

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**Example:** Calibrate a 1250 µl 8-channel pipettor.

Water temperature = 24°C

Programmed Volume ( $V_p$ ) = 1000 µl

Average of Actual Volume = 990 µl

Corrected Actual Volume ( $V_a$ ) = 990 x 1.004 = 994 µl

Calibration Point ( $C_p$ ) = 1000

$$D_v = \frac{V_p}{V_a} \times C_p$$

$$D_v = \frac{1000 \mu\text{l}}{994 \mu\text{l}} \times 1000$$

$$D_v = 1006$$

## D.2 Calibrating the *IMPACT*<sup>2</sup>

*IMPACT*<sup>2</sup> users can calibrate their pipettors with distilled water using the “EASY” CAL mode or with other liquids using the original “CAL” mode (displayed as “CALC” on the *IMPACT*<sup>2</sup>).

### D.2.1 “EASY” CAL Mode

*IMPACT*<sup>2</sup> users can quickly calibrate their pipettor by using the unique “EASY” CAL feature. “EASY” CAL has been developed for fast, easy, in-lab verification and/or calibration using distilled water at room temperature (20-22.5°C).

1. Weigh out ten aliquots of distilled water on an analytical balance, using one pipetting channel. The programmed dispense volume must correspond to the calibration point for that pipettor (for example, 200 µl for a 250 µl pipettor). Refer to Table D.1.2, Calibration Specifications, for proper calibration points.

*Note: Ensure that the distilled water used is at room temperature (20-22.5 °C). An internal correction factor of 1.003 is used by the pipettor to convert weight (gm) to volume (ml).*

2. Calculate an average for the ten readings of distilled water obtained from the balance. If the resulting average weight is within your accuracy specifications, no further calibration is required. If the average weight does not meet expected performance, enter the “EASY” CAL mode to quickly re-calibrate the *IMPACT*<sup>2</sup>.
3. Enter the “EASY” CAL mode by pressing the Special Function key (using a pipet tip) until “EASY” flashes, then press the [Enter] key to display the calibration point.
4. Use the [Vol] key to adjust the displayed calibration point until it matches the average weight obtained in step 2. Store this number by pressing the [Enter] key. The new calibration setting is confirmed by the “CAL” and “SET” messages on the display.

5. Verify this new calibration setting by repeating Steps 1 and 2.

### D.2.2 “CALC” Mode

To calibrate the *IMPACT*<sup>2</sup> pipettor for liquids other than water, use the original CAL mode (displayed as “CALC” on the *IMPACT*<sup>2</sup>):

1. Measure the programmed volume (see Section D.1.1, Volume Measurement).
2. Calculate the display volume of the pipettor (see step 1 in Section D.1.2., Pipettor Calibration).
3. Enter the CAL mode on the pipettor by pressing the Special Function key (using a pipet tip) until “EASY” appears on the display.
4. Press the [Vol] key to display “CALC” (pressing the [Vol] key again will return you to the “EASY” mode).
5. Press the [Enter] key to display the calibration point.
6. Press the [Vol] key to enter the Display Volume ( $D_v$ ) calculated in Section D.1.2., Pipettor Calibration.
7. Press the [Enter] key to set the calibration point. The display shows “CAL” then “SET” to confirm the new calibration point, and returns to the current pipetting program.

### D.3 CALVIEW

CALVIEW displays the pipetting stroke (number of steps) used to reach the calibration point. This value allows you to confirm the calibration during pipetting. To activate CALVIEW, enter the CAL mode using the Special Function key. When the calibration point is displayed, press the [Fill] key. The number of steps is displayed. Press any key to exit CALVIEW.

### D.4 CALRESET

CALRESET allows you to return to the factory calibration. To reset the calibration, enter the CAL mode using the Special Function key. When the calibration point is displayed, press the [Purge] key. The display flashes “FACT,” “CAL,” then “SET” and the pipettor

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resets to factory setting (see Table D.1.2, Calibration Specifications, for the factory calibration steps).

## D.5 Recommendations for Accurate Pipetting

*IMPACT* and *IMPACT*<sup>2</sup> pipettors are factory calibrated to deliver accurate volumes with distilled water at 20°C. By using the calibration procedures described in Sections D.1, Calibrating the *IMPACT*, and D.2, Calibrating the *IMPACT*<sup>2</sup>, you can pipet liquids of different specific gravity with a high degree of accuracy and reproducibility. For optimal pipetting results, refer to the following recommendations:

- When using factory calibration, the liquid to be pipetted should not contain specific gravity and vapor pressure that is significantly different from distilled water.
- When pipetting liquids with low vapor pressure and/or high surface tension, pre-wet the pipet tips with the liquid to reduce possible loss of accuracy.
- Before aspirating any liquid, fully immerse pipet tips into the liquid to prevent aspiration of air. Tips should be immersed approximately ¼ inch (approx. 0.6 cm) below the liquid.
- When accurate dispensing of several increments of liquid are needed, discard the last increment. The cumulative percentage of error from previous increments exists on the last volume.
- Pipet viscous liquids at the slowest speed to ensure accurate pipetting.
- During the dispensing of a liquid, touch the tip against the side of the receiving container to prevent any liquid from remaining on the tip.
- If you cannot touch the tip against the receiving container, dispense the liquid at the fastest speed for crisp liquid delivery.

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## E. TROUBLESHOOTING AND MAINTENANCE

### E.1 Troubleshooting

Listed below are possible procedural and system problems, as well as recommended solutions. If you cannot resolve the problem, call Matrix Technologies, Technical Service Department.

**No power to the pipettor.** Batteries are incorrectly installed.

- *Recheck the orientation of the batteries, they should match the diagram in the battery case.*

**Double beep tone  occurs.** An illegal programming step is being entered, such as programming two fills that exceed the maximum fill volume.

- *Recheck your programming sequence. Ensure that you are not attempting to fill above the maximum fill volume of the pipettor, or attempting to dispense more than the total fill volume.*

**“ERR\_1” is displayed.** This error message signifies one of the following conditions:

- The pipettor cannot complete an automatic blowout. The batteries are significantly drained of power, causing the motor to stall.

*Recharge the batteries immediately.*

- The motor is defective or the flex circuit assembly is damaged.

*Contact Matrix Technologies, Technical Service Department.*

**The motor sounds rough and aspiration is very slow.**

- The *IMPACT*<sup>2</sup> has been set to the slowest speed.

*Verify the speed setting, the slowest speed setting normally causes the motor to run very slowly and louder than usual.*

## E.2 Cleaning

The *IMPACT* requires very little maintenance. The exterior of the pipettor can be cleaned periodically with a soft cloth moistened with methyl alcohol.

**CAUTION!** DO NOT AUTOCLAVE entire unit or clean the keypad with bleach solution or other solvents. Extreme heat can damage the display and other electronic components. Caustic cleaning solutions can damage the keypad.

*Note: For autoclaving specific portions of the pipettor refer to the Autoclaving Procedures, or call Matrix Technologies, Technical Service Department, for instructions.*

*Note: Avoid prolonged exposure to ultraviolet light. The handle housing may become discolored or damaged.*

### E.3 Installing/Replacing Batteries

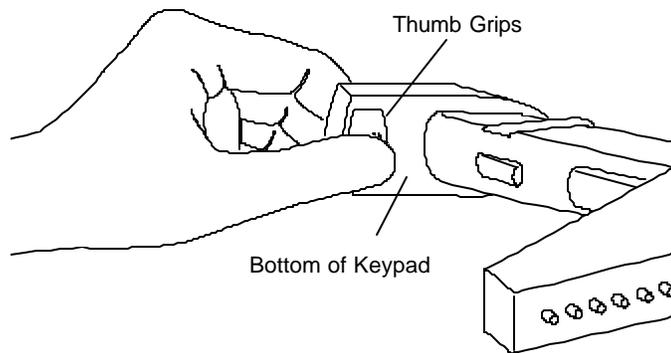
Your *IMPACT* pipettor is shipped with batteries packaged separately. Before using the pipettor, install the batteries and recharge them for 12 – 14 hours. Use the following procedure to install the batteries, then continue to Section E.4, Recharging Batteries.

Under normal use, the batteries can be recharged approximately 400 times. When they can no longer hold their charge, the batteries must be replaced. Replacement batteries can be purchased through Matrix Technologies.

The following procedure describes installation, or replacement, of the batteries:

*Note: If you are replacing batteries, ensure that the pipettor is turned off before removing the battery case.*

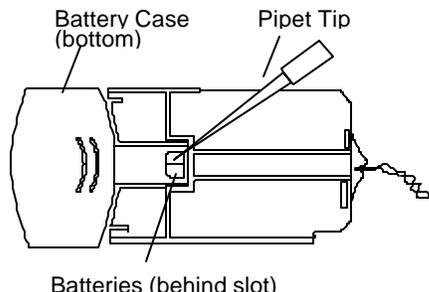
- 1. Remove battery case.** Position your thumb over the thumb grips (see Figure E.3a) and brace your fingers against the front of the keypad. Apply firm pressure to the panel with the thumb grips to release the latch. Carefully slide the battery case out of the pipettor, allowing sufficient slack for the attached wires.



**Figure E.3a: Removing Battery Case**

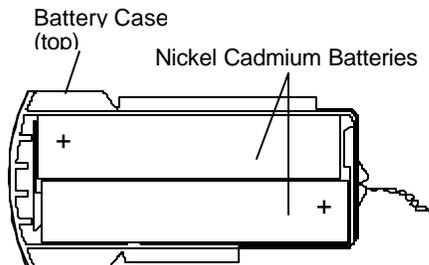


- 2. Remove batteries.** Press a pipet tip against either battery through the slot in the bottom of the battery case to remove the batteries.



**Figure E.3b: Removing Batteries**

- 3. Install new batteries.** Insert new batteries by placing the positive end into the battery case first, then the negative end. Ensure that the batteries are in the correct orientation (see Figure E.3c, or diagram in the battery case).



**Figure E.3c: Installing Batteries**

- 4. Return battery case to pipettor.** Carefully insert the battery case into the pipettor. The case will click when the latch is securely attached to the handle.

*Note: If the case does not close easily, ensure that the wires are not obstructing the opening.*

- 5. Recharge batteries.** Recharge the new batteries before using the pipettor (see Section E.4, Recharging Batteries).

## E.4 Recharging Batteries

The *IMPACT* and *IMPACT<sup>2</sup>* use two nickel cadmium rechargeable batteries, located in a battery case under the keypad. The batteries are charged while they are in the pipettor by using the power transformer included in the package. You can operate the pipettor while it is recharging; or you can operate it solely with the power transformer (without batteries). When fully charged, the pipettor will perform over 1200 cycles at full stroke. The batteries can be recharged approximately 400 times. To extend battery life, the pipettor will turn off automatically if it is not used within ten minutes.

*Note: Spare batteries and external battery chargers can be ordered through Matrix Technologies.*



Battery charge is low when the battery symbol appears on the display. The pipettor will continue to function, but should be recharged at the earliest convenient time.

Use the following steps to recharge the batteries:

- 1. Attach transformer.** Attach the cable end of the transformer into the pipettor. The plug receptacle is above the color ring. Plug the transformer into the electrical outlet.
- 2. Recharge batteries.** Recharge the batteries for 12-14 hours to ensure a full charge. After the batteries have been recharged, unplug the pipettor from the transformer. The pipettor is now ready for use.

*Note: Batteries hold their maximum charge if they are fully discharged before recharging again. However, overnight recharging is acceptable if the pipettor is in normal use during the day.*

**CAUTION!** *Avoid excessive charging of the batteries when the pipettor is not in use. Excessive charge to the batteries will shorten the battery life and may damage the batteries.*

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## F. APPENDICES

### F.1 Additional Pipetting Examples

#### F.1.1 Sample Transfers

**Example #1:** Transfer 100  $\mu\text{l}$  and mix 200  $\mu\text{l}$  for 2 cycles immediately after transfer.

[Fill]  (100) [Enter]

[Purge] [Enter]

[Mix]  (200) [Mix]  (2) [Enter] [Enter] [Enter] 

When a purge is programmed before a mix cycle, the pipet tips are emptied and mixing occurs *automatically* without pressing the trigger. At the end of the mix, "ZERO" flashes in the display. Remove the pipet tips from the liquid and press the trigger to return the pistons to zero position.

**Example #2:** Mix 250  $\mu\text{l}$  for 3 cycles, then transfer 150  $\mu\text{l}$ .

##### Option 1

[Mix]  (250) [Enter]

[Fill]  (150) [Enter]

[Disp]  (150) [Enter] [Enter]  [Purge] [Enter] [Enter] 

##### Option 2

[Fill]  (150) [Enter]

OR [Mix]  (250) [Enter]

Option 1 requires an additional trigger press at the end of the mix to zero the pistons (remove tips from liquid before zeroing).

*Note: The mix cycle default is 3 cycles and does not need to be programmed — unless it was changed in a previous program.*

Option 2 minimizes the number of trigger presses and executes a dispense by using the [Purge] key. First, fill the assigned volume of liquid, then leave the tips in the liquid and execute the mix step. Finally, transfer 150  $\mu\text{l}$  by using the purge step.

*Note: The mix step always returns to its starting volume; therefore, the volume will be 150  $\mu\text{l}$  at the end of the mix step.*

### F.1.2 Incremental Pipetting

**Example:** Fill 250  $\mu\text{l}$  and dispense 45  $\mu\text{l}$  in the first column of the microtiter plate. Reduce each subsequent column by 5  $\mu\text{l}$  for a total of 8 columns. Discard the remainder.

[Fill] <input type="text" value="Vol"/> (250) [Enter]	→	[Disp] <input type="text" value="Vol"/> (25) [Enter]
[Disp] <input type="text" value="Vol"/> (45) [Enter]		[Disp] <input type="text" value="Vol"/> (20) [Enter]
[Disp] <input type="text" value="Vol"/> (40) [Enter]		[Disp] <input type="text" value="Vol"/> (15) [Enter]
[Disp] <input type="text" value="Vol"/> (35) [Enter]		[Disp] <input type="text" value="Vol"/> (10) [Enter]
[Disp] <input type="text" value="Vol"/> (30) [Enter]		[Purge] [Enter] [Enter] •

A purge step is entered as the last step in the program to limit the dispense step to eight columns; otherwise, the pipettor would dispense 10  $\mu\text{l}$  until it was empty.

### F.1.3 Serial Dilutions

**Example:** Transfer 50  $\mu\text{l}$  to the first column of a plate, mix 100  $\mu\text{l}$ . Follow this procedure for exactly 4 columns.

[Fill]  (50) [Enter]  
 [Mix]  (100) [Enter]  
 [Mix] [Enter]  
 [Mix] [Enter]  
 [Mix] [Enter]  
 [Purge] [Enter] [Enter] •

This program requires a specified number of steps; therefore, each mix step is entered, and the program is ended with a purge step. Since the subsequent mix steps use the same volume, the volume does not need to be entered each time.

### F.1.4 Simple Dilutions

**Example:** Prepare a 1:21 dilution with a 10 µl sample volume. Dispense the total volume into a column and mix immediately.

[Fill]  (200) [Enter]

[Fill]  (20) [Enter]

[Fill]  (10) [Enter]

[Purge] [Enter]

[Mix]  (150) [Enter] [Enter] 

This program contains an air-gap (20 ul) and mix step at the end. The mix step begins immediately after the purge, without pressing the trigger. Then the pipettor empties the pipet tips and displays "ZERO." Remove the tip from the liquid, and press the trigger to return the pistons to zero position.

*Note: Whenever a purge step is immediately followed by a mix step, mixing will occur automatically, without pressing the trigger.*

### F.2 Chemical Compatibility

With the *IMPACT* family of pipettors, operators can confidently pipet acidic solutions or stopping agents without damaging the pipet tip fittings. All pipettors are equipped with chemically-resistant tip fittings which can withstand the corroding effects of any acidic solution. Also, the *IMPACT* tip fittings can be wiped with a bleach solution (5% sodium hypochlorite) for decontamination.

## F.3 Customer Service

### F.3.1 Warranty

The *IMPACT* and *IMPACT*<sup>2</sup> are warranted to the original purchaser by Matrix Technologies Corp. to be free of defects in materials and workmanship for a period of twelve (12) months from the date of purchase, providing that it has been operated according to the instructions, not abused or misused, that the serial number has not been removed, and that the instrument has not been disassembled (except for autoclaving). No other warranty is expressed or implied. Upon receipt of your pipettor, please complete and return the warranty card.

No *IMPACT* or *IMPACT*<sup>2</sup> shall be returned without a prior Return Goods Authorization from Matrix Technologies Corp. Should a unit need to be returned, insurance and shipping charges must be paid by the purchaser. Both the *IMPACT* and *IMPACT*<sup>2</sup> with packaging have been determined capable of withstanding normal shipping hazards. If an instrument needs to be repaired, please return it to Matrix Technologies Corp. in its original shipping carton.

### F.3.2 Customer Service

To obtain repairs or replacements within the terms of the warranty, contact Matrix Technologies Corp., Customer Service Department:

**Matrix Technologies Corp.**

44 Stedman Street

Lowell, Massachusetts 01851

**800-345-0206**

(508) 454-5690

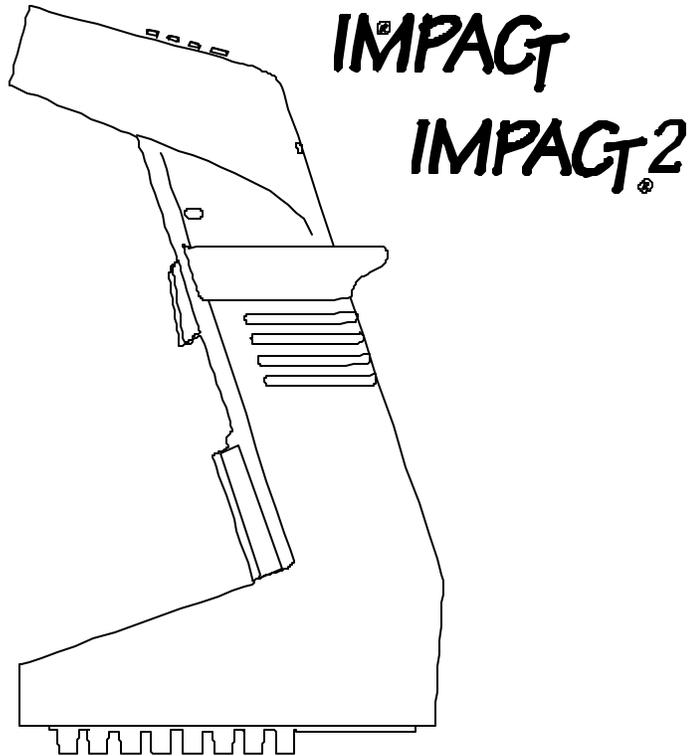
Fax (508) 458-9174



March 1996

# AUTOCLAVING PROCEDURES

*for IMPACT Pipettors*



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## INTRODUCTION

The *IMPACT* family of pipettors have been specifically designed for serviceability. This design concept enables the user to service instruments with relative ease. Under certain circumstances where on-site service is not feasible, the instrument may need to be returned to Matrix Technologies for repair.

In cases where pipettors have been exposed to biohazardous materials, autoclaving internal components may be required. Matrix Technologies provides the following Autoclave Kit:

**Autoclave Kit** (Part No. 9997)

12 replacement cross tubes

1 wooden applicator

O-ring lubricant

12 o-rings

Perform the following procedures for proper autoclaving of *IMPACT* components.

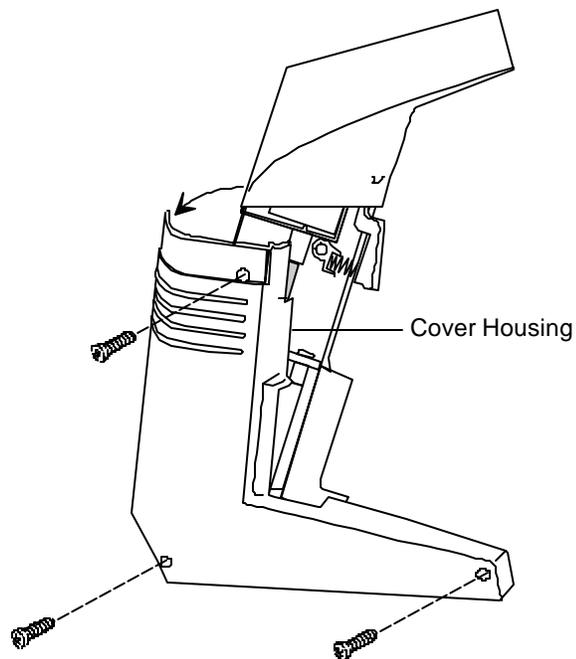


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## PIPETTOR DISASSEMBLY

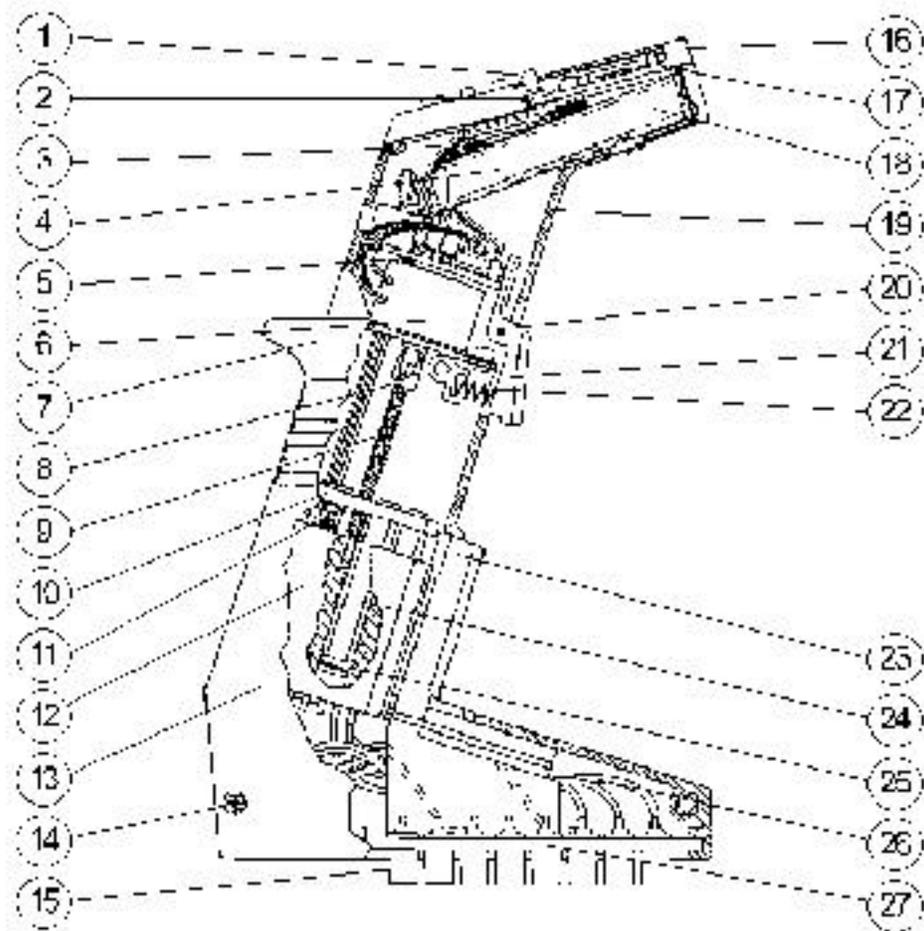
*NOTE: Follow standard laboratory practices for using or servicing equipment that is exposed to biohazardous material.*

1. Remove the color ring by gently prying loose one of the edges near the handle trigger.
2. Use a Phillips screwdriver to remove all three housing screws.
3. Carefully remove the plastic cover housing and observe the layout of the internal parts.



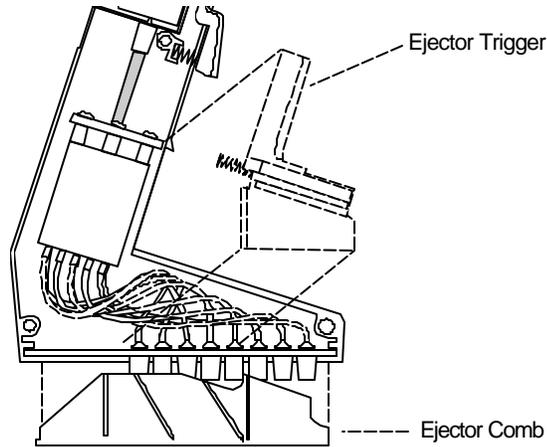
**Figure 1: Removing Cover Housing**

PIPETTOR DISASSEMBLY



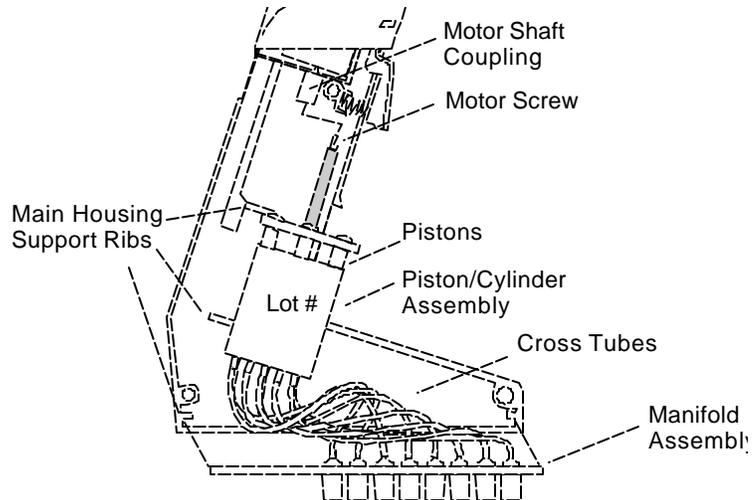
<b>Item</b>	<b>Description</b>	<b>Item</b>	<b>Description</b>
1.	keypad	15.	tip fitting
2.	main board	16.	console cover
3.	flex circuit	17.	console display
4.	battery box	18.	batteries
5.	driver board	19.	main housing
6.	motor	20.	trigger hinge pin
7.	color ring	21.	handle trigger
8.	motor coupling	22.	handle trigger spring

4. Remove the plastic ejector trigger with spring and slide the aluminum ejector comb off of the tip fittings (see Figure 3).



**Figure 3: Removing Ejector Trigger and Ejector Comb**

5. Remove the piston/cylinder assembly by pulling the motor screw down from the motor shaft coupling and out of the main housing. Also, remove the manifold assembly by firmly lifting it out of the main housing support ribs (see Figure 4).

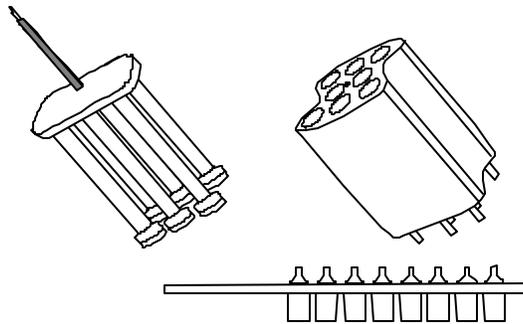


**Figure 4: Removing Piston/Cylinder and Manifold Assemblies**

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## AUTOCLAVING

1. Remove the piston assembly from the cylinder.
2. Remove and discard the cross tubes into a biohazardous container.
3. Remove the o-rings (only if necessary, see section “Replacing O-rings”) and discard them into a biohazardous container.
4. Place all components (see Figure 5) into the autoclave and autoclave at 121 °C for 20 minutes.



**Figure 5: Components to be Autoclaved**

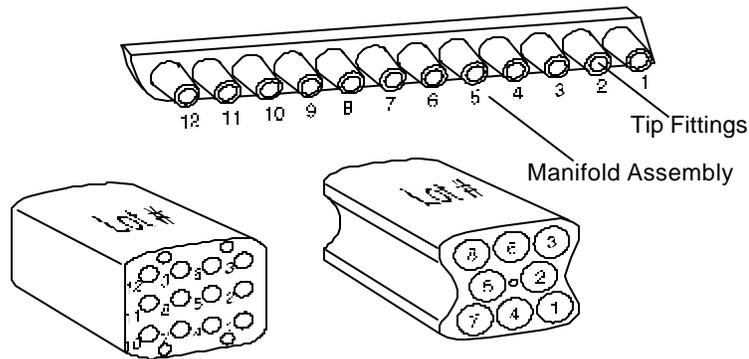
5. After autoclaving, place all parts on a paper towel. The cylinder should be inverted to allow for run-off of excess water. Allow the parts to dry for approximately one hour.

## PIPETTOR REASSEMBLY

After autoclaving, and once all of the components have completely dried, the unit is ready for relubrication and reassembly.

### Cross Tube Replacement

Refer to the following table for proper connection of cross tubes from the tip fittings to the cylinder positions.



850, 250, 125, and 12.5 ul Cylinder

1250 ul Cylinder

	Number of Pipetting Channels	Tip Fitting Positions											
		1	2	3	4	5	6	7	8	9	10	11	12
850 ul Cylinder Type	12	1	2	3	4	5	6	7	8	9	10	11	12
	8	1	3	4	6	7	9	10	12	-	-	-	-
	6	1	2	3	10	11	12	-	-	-	-	-	-
	5	1	2	3	10	11	-	-	-	-	-	-	-
1250 ul Cylinder Type	8	1	2	3	4	5	6	7	8	-	-	-	-
	6	1	3	4	6	7	8	-	-	-	-	-	-
	5	1	3	4	5	7	-	-	-	-	-	-	-

**NOTE: IF THE CROSS TUBE ORIENTATION BETWEEN THE CYLINDER AND TIP FITTINGS IS NOT CORRECT, REASSEMBLY OF THE PIPETTOR WILL BE IMPAIRED.**

## O-ring Replacement

O-rings do not require replacement after autoclaving; however, the o-rings may require replacement if liquids have been overfilled into the cylinder of the pipettor. In this case, the o-rings should be removed prior to autoclaving. Spare o-ring packs are available through Matrix Technologies for all pipettor volumes.

### 1. Remove old o-rings

- **1250 ul, 850 ul, 250 ul Pipettors:** O-rings can be removed from the pistons by squeezing one side of the o-ring and lifting it out of the o-ring groove on the piston. Once removed, the o-rings should be discarded as biohazardous waste.
- **125 ul, 12.5 ul Pipettors:** O-rings from these pipettors are located in the cylinder. To remove the o-rings, unscrew the four screws that hold the cylinder cap to the cylinder (see Figure 6). Once removed, the o-rings should be discarded as biohazardous waste.

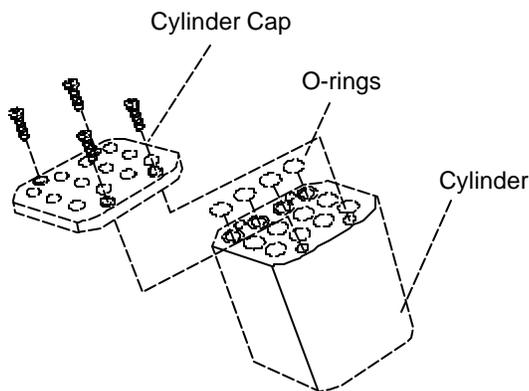


Figure 6: Removing O-rings

### 2. Install new o-rings

After the old o-rings have been removed and all components have been autoclaved, the new o-rings may be installed. Before installing the o-rings, apply a thin coat of lubricant to each o-ring, using the o-ring lubricant supplied in the Autoclave Kit.

## Relubrication

- **1250 uL, 850 uL, 250 uL Pipettors:** Use the wooden applicator and O-ring lubricant supplied in the Autoclave Kit to apply a thin layer of lubrication approximately 0.5 inches (approx. 1.3 cm) down into each piston hole that requires it. Spread the lubricant evenly along the inner wall of each piston by using a circular motion with the wooden applicator (see Figure 7).

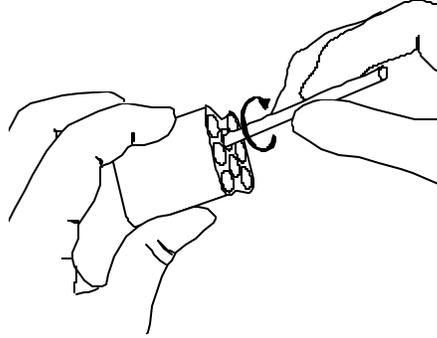


Figure 7: Relubricating 1250 - 250 uL Pipettors

- **125 uL, 12.5 uL Pipettors:** Spread the lubricant directly onto the pistons, approximately 0.5 inches (approx. 1.3 cm) from the bottom of each piston (see Figure 8)

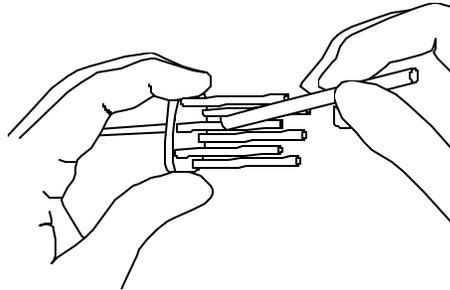
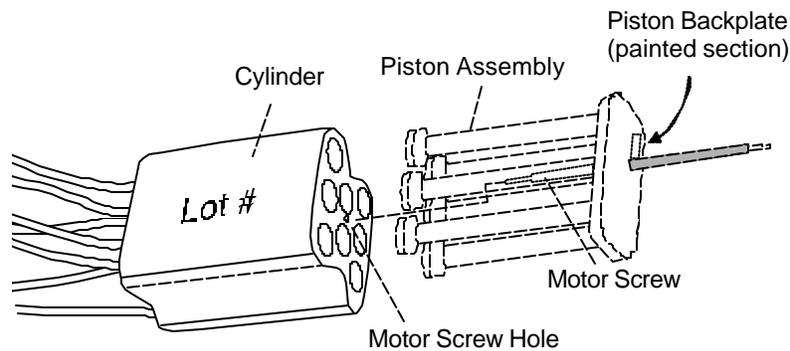


Figure 8: Relubricating 125 - 12.5 uL Pipettors

## Reassembly

1. Reinsert the piston assembly into the lubricated cylinder. Ensure that the motor screw engages into the hole in the center of the cylinder (see Figure 9).

*NOTE: To correctly orient the piston and cylinder assembly, ensure that the lot number of the cylinder is facing up and the painted section of the piston backplate is facing down. Also, care should be taken to keep the o-rings from being pinched when inserting the pistons into the cylinder.*

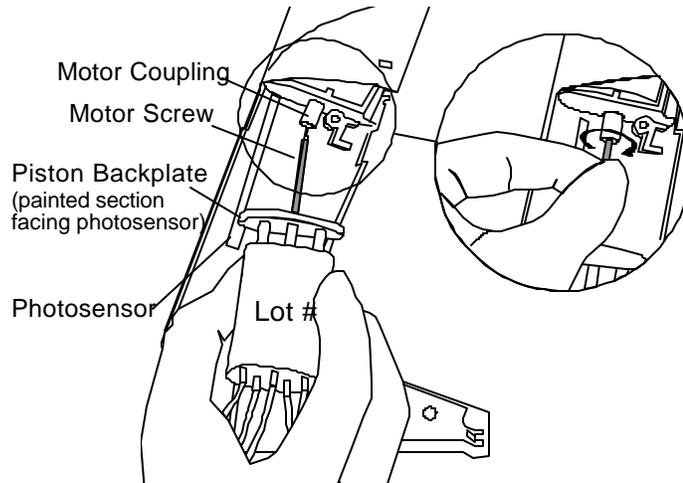


**Figure 9: Assembling Piston and Cylinder**

2. Carefully insert the flat end of the motor screw into the hole of the motor coupling. This can be accomplished by holding the piston/cylinder assembly at a slight angle while inserting the motor screw into the hole of the motor coupling (see Figure 10).



Slowly spin the motor screw until the flat end of the motor screw is fully engaged into the motor coupling hole (see Figure 10). The cylinder can now be seated between the plastic ribs in the main housing.



**Figure 10: Installing Piston/Cylinder Assembly**

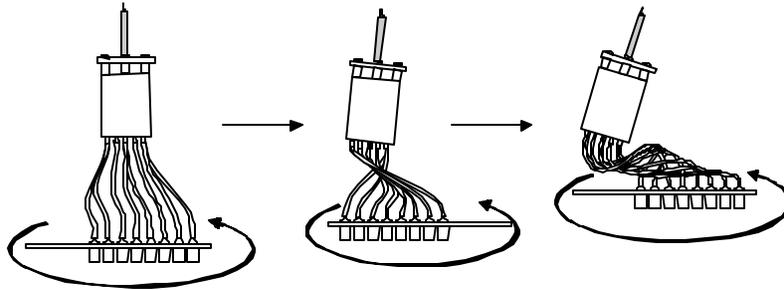
*NOTE: The lot number on the face of the cylinder should be facing toward you and the painted section of the piston backplate should be facing the photosensor. The painted section is used by the photosensor to track the location of the pistons.*

3. After installing the piston/cylinder assembly, install the manifold assembly into the main housing.

## PIPETTOR REASSEMBLY

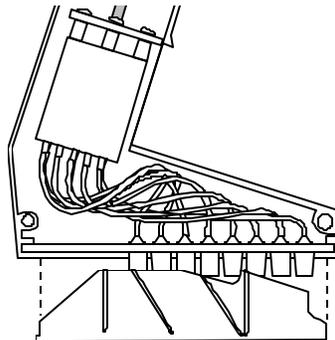
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To keep the tubing free from ejector contact, rotate the manifold plate and tubing one complete turn counterclockwise (see Figure 11). Insert the manifold assembly into the main housing support ribs.



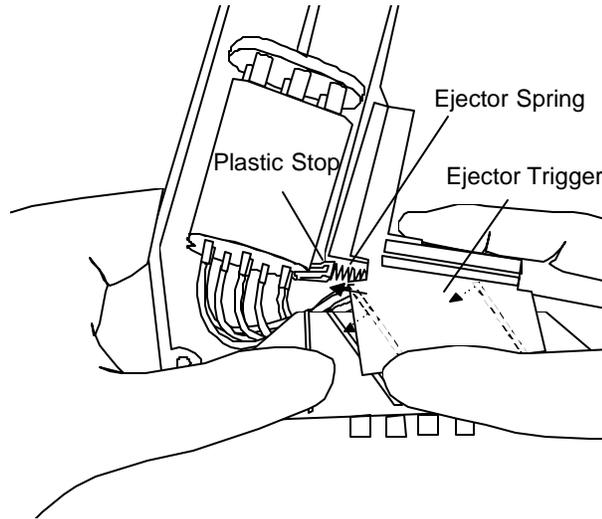
**Figure 11: Rotating Manifold Assembly**

4. Slide the ejector comb over the tip fittings with the slots on the back of the comb exposed (see Figure 12).



**Figure 12: Attaching Ejector Comb**

5. Hold the ejector comb in place while inserting the ejector trigger (see Figure 13). Place the end of the ejector spring against the plastic stop and compress the spring while positioning the ejector trigger over the aluminum ejector comb (the ribs on the ejector trigger should mate with the slots on the aluminum ejector comb).



**Figure 13: Inserting Ejector Trigger**

*NOTE: Be careful not to pinch the crosstubes when inserting the ejector trigger.*

Test the ejector trigger to ensure that the ejector comb moves down when the trigger is pressed (hold the ejector comb firmly in place while testing the trigger).

6. Place the cover housing onto the main housing and fasten the three screws.
7. Re-attach the color ring.

The pipettor is now ready for use.



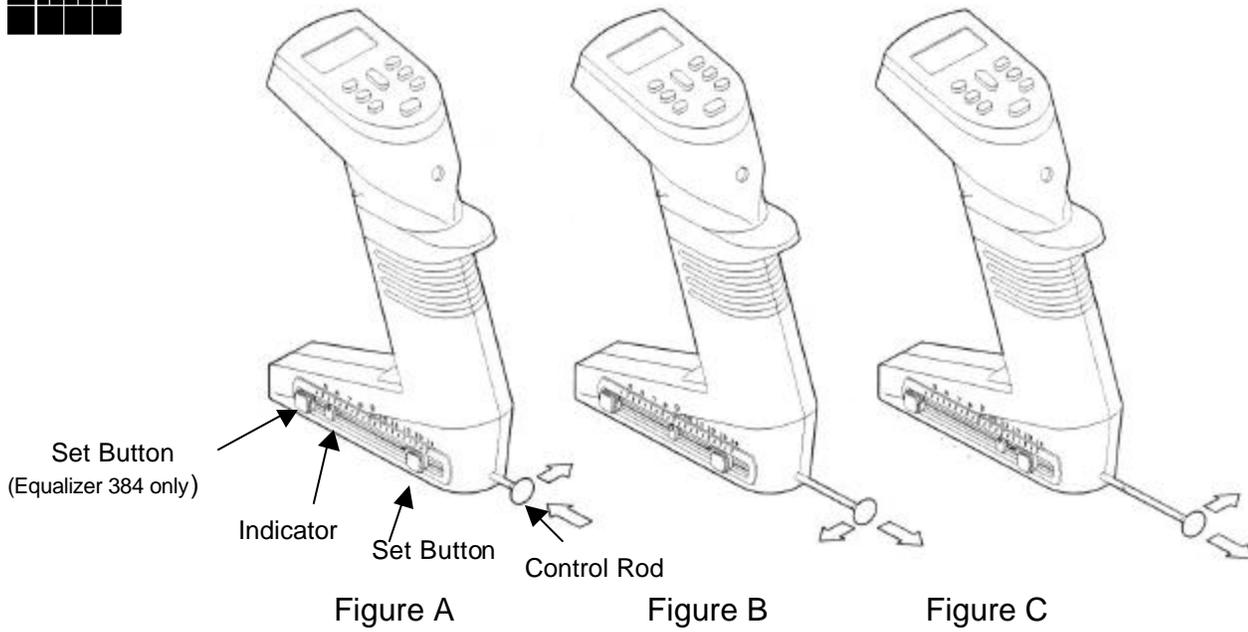
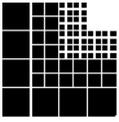
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## **IMPACT<sub>2</sub> STORED PROGRAMS**

Use the following worksheet to determine the pipetting steps for each program number, then keep it handy as a reference. The page is perforated so that it can be removed and easily viewed while pipetting.

Date	Program No.	Program Description
	<b>1</b>	
	<b>2</b>	
	<b>3</b>	
	<b>4</b>	
	<b>5</b>	

← *Tear at the perforation to remove this page.*



The Matrix Impact and Impact<sup>2</sup> Equalizer allows the Tip to Tip spacing of the pipettor to change. This allows pipeting into or between vessels of varying center to center configurations. The set button(s), indicator and control rod all work together to change the distance between the tips (see figure A).

To attach tips, the control rod should be in position such that the indicator is set at 9 mm (figure B). In the case of the Equalizer384 (the Equalizer with two set buttons), tips arranged in racks of 384 can be attached when the indicator is set at the 4.5 mm mark. Once tips are attached, follow the steps below to change the pipettor to a new tip spacing.

#### **Matrix Equalizer:**

1. Depress the set button using your thumb or finger.
2. While depressing, slide the set button to the desired tip-to-tip spacing marker on the window. Release the set button to lock the spacing.
3. Using the control rod, slide the tips into the desired position. The indicator in the window will also move and will nest into the set button when the desired position is achieved.

#### **Matrix Equalizer384:**

1. To set the tip spacing for the vessel with the widest spacing, depress the outer set button (the button closest to the control rod) using your finger or thumb.
2. While depressing, slide the set button to the desired tip-to-tip spacing marker on the window. Release the set button to lock the spacing.
3. Check the spacing by using the control rod to slide the tips into position. The indicator in the window will also move and will nest into the set button when the desired position is achieved.
4. For the vessel with the tightest spacing (from 4.5mm - the spacing for 384 well plates), depress the other set button using your thumb or finger and repeat steps 2 and 3.
5. In the case of 8 channel Equalizer384 pipettors, when pushing or pulling the control rod past the 9 mm position, if pressure is applied to the back side of the control rod (see figure B), a detent will be noticeable. This will indicate the 96 well or tip mounting position. Conversely, by applying pressure to the front side of the control rod (see figure C), the detent can be by-passed for smoother slide operation.

Note: For maximum accuracy when adjusting the spacing of the tips from a compressed position to an expanded position it is recommended that the control rod be actuated beyond the desired spacing and then compressed to the desired dimension. This will maximize the spatial accuracy between the individual tips.

Important: Do not attempt to slide the set button(s) without depressing. Moving the set button(s) without first disengaging will cause premature wear on the mechanism.

Important: Do not attempt to disassemble the unit. Please contact our Technical Services Department at 800-345-0206 for all service related issues.