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SerialMate™

Operation Manual



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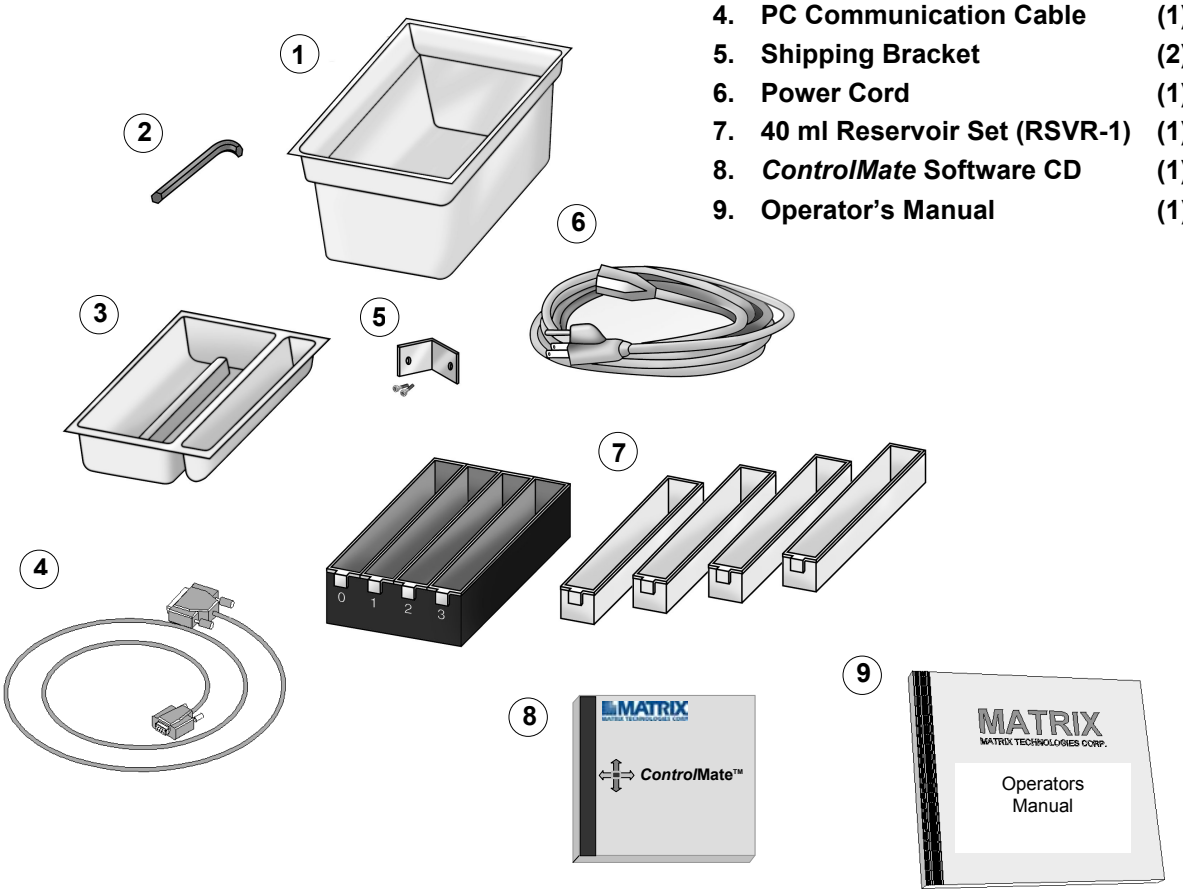
1 INTRODUCTION

THANK YOU ...

... for purchasing the Matrix Technologies multichannel automated pipetting workstation, ***Serial***Mate™. We are proud to send you our flexible 8/12 or 16/24 channel automated workstation, which is capable of performing various routine liquid manipulations. It is an intelligent alternative to tedious and potentially error-prone manual pipetting operations. Now, applications such as reagent addition, serial dilution, microplate replication and sample dilution can be easily performed.

Please carefully inspect the shipping box for the standard parts and accessories. Packed with your new ***Serial*Mate**, you will find: a power cord with a 3-prong adapter; a reservoir set consisting of one reservoir frame, eight 40mL reservoirs (trays) and one cover, two waste boxes, two 140mL reservoirs, one 3.0mm Allen wrench, one CD copy of ***Control*Mate**™ software and this Operation Manual. For accessory part number and ordering information, please refer to Section 8.1.

1. **Pipet Tip Waste Container (2)**
2. **Allen Wrench (3.0 mm) (1)**
3. **140 ml Reservoir (RSVR-2) (2)**
4. **PC Communication Cable (1)**
5. **Shipping Bracket (2)**
6. **Power Cord (1)**
7. **40 ml Reservoir Set (RSVR-1) (1)**
8. ***ControlMate* Software CD (1)**
9. **Operator's Manual (1)**



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1.1 ABOUT THIS OPERATION MANUAL

In order to use your new ***Serial***Mate properly and safely, we urge you to become familiar with the contents of this Operation Manual. Due to changing technologies and product enhancements, this manual may be changed without notice. However, should you wish to receive product updates on the ***Serial***Mate, please contact your local sales representative.

We have made a great effort to ensure this document is accurate and comprehensive. However, should you discover an error or omission, please contact your local distributor or the Matrix Technologies Corporation of Hudson, New Hampshire, immediately.

Matrix Technologies will not be responsible for any damage or claims of loss suffered as a result of use of this equipment in any application or in any manner other than that for which it was originally and expressly designed.

Any transfer of all or any part of this manual to a third party without permission is prohibited.

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1.2 TERMINOLOGY USED IN THIS MANUAL

Program Mode Types

MODE 1	Row by Row Dispense
MODE 2	Multiple Row Dispense
MODE 3	Serial Dilution
MODE 4	Sample Dispense or Transfer

MTP	Microtiter plate – 96-well or 384-well (microplate).
DWP	Sample microtube rack - 96-well. Deep well block - 96-well or 384-well.
RSVR	Reservoir.
RSVR-1 or R1	Standard 40mL reservoir (4-chamber).
RSVR-2 or R2	Standard 140mL reservoir (2 chamber).
ASSAY	The dispense or discharge location.
Tips	In this document, this term always refers to pipet tips.
Tip touch	After aspiration or dispense operations, touching the pipet tip to the side of the container wall will result in enhanced precision and measurement accuracy.
Source/Destination column	The **source** column is the column location from which the liquid is aspirated. The **destination** column is the column location to which the liquid is dispensed. Source and destination columns can be individually selected for each transfer.

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96M	8/12 channel 220 µl pipetting head
96S	8/12 channel 30 µl pipetting head
384S	16/24 channel 30 µl pipetting head
D96	Deep well microtiter plate – 96 well (same as SMT)
P96	Microtiter plate – 96 well (same as MTP)

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2 OVERVIEW

2.1 GENERAL DESCRIPTION

The ***Serial***Mate Automated Microplate Pipetting System is a flexible, multichannel, automated pipetting workstation, capable of performing various routine liquid manipulations. In either the 8/12 or 16/24 channel mode, operations such as reagent addition, serial dilution, microplate replication and sample dilution can be easily accommodated.

Using air displacement technology and Matrix's filtered or non-filtered disposable automation research tips (D.A.R.T.'s™), the ***Serial***Mate provides fast, flexible and precise automated liquid delivery while ensuring zero carryover thereby greatly reducing the risk of contamination.



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2.1.1 System Components

(Refer to System Components diagram on page 7)

a. ***Liquid crystal touch panel*** - With the exception of the Abort command, all modes, commands and data input are accomplished using the touch panel. The instructions and prompts are in dialog format. **During a program run, a single touch on the panel pauses the instrument. To resume operation, touch the panel again.**

b. ***Abort button*** - When the operation must be stopped immediately, press the large red Abort button positioned prominently on the front of the unit to halt operations. The second time the Abort button is pressed, the operation is terminated. (Refer to Section 6.2, *Emergency Procedures,* for additional information)

c. ***Nozzle assembly*** - Contains 12 or 24 tip nozzles (depending on nozzle assembly type) for loading and holding pipet tips. Liquids are drawn and discharged as the piston plungers move up and down. The ***Serial***Mate is equipped with 12 or 24 pistons and O-rings.

d. ***Liquid level sensor*** - Detects liquid in a standard reservoir when using disposable pipet tips. An air pressure sensor mounted on one center channel detects any liquid prior to aspiration. This feature controls the depth to which tips are lowered when aspirating reagents. Reducing residual liquid from the exterior pipet tip wall enhances accuracy and minimizes carry-over. The reagent liquid level is automatically monitored by the system. **Potentiometer VR4 on the main PC board controls level sensor sensitivity.**

e. ***Tip rack*** - The tip rack is placed in position 1 of the ***Serial***Mate unit. The 8- or 12-channel and 16- or 24-channel configuration may be selected by orienting the tip racks accordingly.

f. ***Reservoirs*** - Both the 40mL reservoir (RSVR-1) and the 140mL reservoir (RSVR-2) are used for storing liquids on the instrument and normally placed in position 2 on the ***Serial***Mate as illustrated in Section 4.2.2 and 4.2.3.

g. ***Plate shaking module*** - This unit provides orbital motion, allowing for maximum amplitude of 2.5mm and a frequency range of 0-25 cycles per second. Shaking duration is easily controlled and can be incorporated into any program. Duration can be set from 0 to 3600 seconds. Shaking occurs at the *end* of a program. To adjust the shaker module, contact your Matrix technical representative for shaker speed adjustment procedures. Potentiometer VR1 controls shaker amplitude and frequency on the main PC board.

h. ***The power switch*** - In operating the main unit, the first step is to turn on the power switch. Built-in battery backup (with a life expectancy of three years) preserves program memory when the power is turned off.

Note: Ensure that the nozzle assembly shipping bracket is removed prior to turning the unit on.

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i. ***Adjustable leveling feet*** - 4 screw-down/up type feet ensure that the unit can be accurately leveled on any solid, flat surface.

j. ***Safety cover (not shown)-*** With this *optional* safety feature, ensure that the cover is closed before executing files. ***Serial***Mate is not operational when the cover is open, however, writing and editing files can still be done.

k. ***Waste boxes (not shown)***- Used tips are ejected into these disposable receptacles, which are normally placed on position 5 of the ***Serial***Mate. Used tips can also be returned to the tip rack.

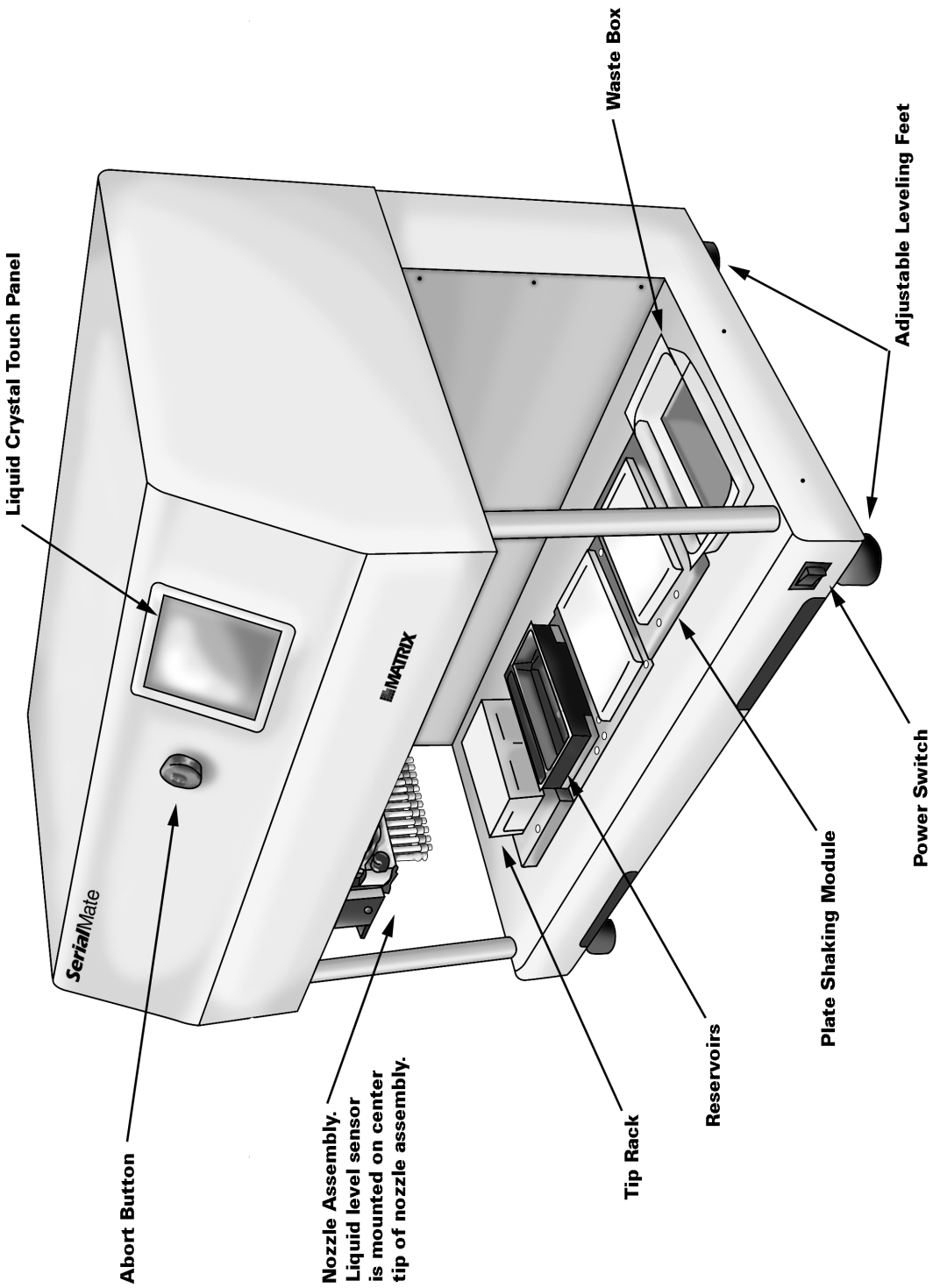
l. ***RS232C connector (not shown*** - For use when operating the ***Serial***Mate remotely, using any Windows-based PC. Refer to Section 8.0, *Software,* for more information.

m. ***Power receptacle & fuse box (not shown*** - Found on the back panel of the ***Serial***Mate unit where the power cord is plugged in.

For a list of ***Serial***Mate accessories and supplies, please refer to Section 8.1 of this Manual.

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System Components Diagram



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2.1.2 *Serial*Mate Features and Benefits

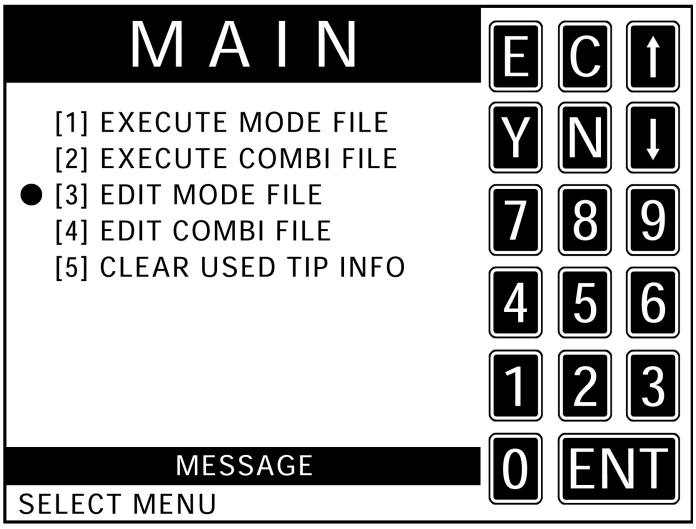
- The tip replacement feature prevents carry-over and contamination in both aspiration and dispense operations.
- Side tip touch operation improves the accuracy and precision of the procedure while minimizing carry-over.
- Dispense amounts can be customized for your application volumes from 5 to 220µl in 1µl increments or 0.1 to 30µl in 0.1µl increments, providing optimal precision across a wide volume range.
- All program modes, commands and variables can be accessed and adjusted from the touch panel.
- The system memory holds 9 single mode files and up to 20 linked or combination files.
- Disposable waste boxes allow contaminated (used) tips to be discarded safely.
- Buzzer alerts the user when all tips in the rack have been used.
- The liquid surface sensor monitors the amount of liquid in the reservoir. A buzzer sounds and the program halts, warning the user that reagent is running low.
- Liquid level detection ensures that a minimal portion of the tip is exposed to liquid, minimizing carry-over.
- Microplate shaking station allows for on-board microplate mixing.
- The four program modes can be run individually or linked together for multi-method capability.
- Two microplates or sample tube racks can be handled simultaneously.
- 8/12-channel or 16/24-channel pipetting offers the ability to easily alternate microplate format.
- RS-232 control allows computer interface capability for remote operation.

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2.1.3 User Interface

The ***Serial***Mate user interface consists of a touch panel on the upper right front of the unit that activates the liquid crystal display (LCD). From this touch panel all program modes and variables can be easily accessed and adjusted.

To pause a program, simply press the touch panel during a run. Touching it a second time resumes the program.



2.1.4 Touch Panel Keypad

With the exception of the Abort command, all modes, commands and data input operations are accomplished using the touch panel. The instructions and prompts are in dialog format. The following keys operate the ***Serial***Mate programs.

E	**Escape**: To return to the previous menu display or to delete an input value.
C	**Clear**: To delete selected input value.
⇑⇓	**UP/DOWN**: To move the cursor to select a menu or input data.
Y/N	**Yes/No**: To respond to system prompts
0 – 9	To input values or select an option. In some cases, these values may be used as an alternate to the ⇑⇓ keys to select programs or options.
ENT	**Enter**: To select a menu item or following a value input. This key is used throughout programming to confirm selections and to advance the cursor.

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2.2 OVERVIEW OF OPERATION

2.2.1 Laboratory Applications

Some of the possible laboratory applications for the ***Serial***Mate are outlined below:

- Preparation for enzyme immunoassays (EIA):
  - Enzyme immunoassays in the ultra-micro-liter volume range.
  - Rotavirus antigen, antibodies against toxoplasma gondii, antibodies against adenoviruses.
  - Double antibody sandwich assay for determining AFP, TSH, HGH, IgE, Lipid A antibodies, DNA antibodies, potato viruses, antibodies against bovine leucosis viruses.
- Preparation for agglutination reactions with subsequent quantitative photometric analyses:
  - Blood group determinations in the ABO and Rh systems.
  - Coombs-reactive antibodies.
  - Latex agglutination tests.
- Application in cell cultivation:
  - Hybridoma screening in working with cell cultures.
  - Cell seeds, cell cloning.
  - Changing the nutrient medium of cell cultures.
- Dosing the scintillation solution in microplate LSC.
- Dosing and transfer steps in PCR.
- Simple reagent (liquid) addition.
- Serial dilution across 8/12 or 16/24 columns for sensitivity analysis.
- Plate-to-plate replication.

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2.2.2 Enhancing Performance

The ***Serial***Mate uses air displacement to aspirate and dispense liquid. The pistons, which are connected to a common drive motor, create a vacuum in the pipet tips to aspirate liquid. The piston/O-ring arrangement forms an airtight seal to ensure pipetting accuracy. The piston movement is sensitive to fractions of a microliter.

The precision of this sensitive device is affected by a series of variables. These include the degree to which the pipet tips are able to be wet, which is dependent on the viscosity of the pipetted liquid, the dimensional accuracy of the tip orifice, piston speed and delay time. Therefore, please keep the following in mind when using the ***Serial***Mate.

Pipetting Time

Liquid is pipetted with vacuum pressure generated by the pistons. This technique requires dwell time to equalize air pressure in the pipet tips during pipetting. Pipetting time is highly dependent upon the properties of the liquid factors. It is necessary to allow some dwell time during pipetting operations, particularly for smaller volumes and viscous liquids.

Pipetting Speed

Reducing piston speed can increase precision. Optimum precision can be obtained by using the appropriate piston speed for the volume of liquid to be pipetted, as follows:

Volume Range	Piston Speed
>50µL	1
25-50µL	2
5-24µL	3-5

Rinsing

If dry tips are used, more time is required to saturate the dry air with moisture. Vapor pressure increases above the pipetted liquid inside a dry tip. As a result, dry tips may cause liquid to be driven out, compromising accuracy. To avoid this, use the mix option prior to a programmed aspiration to equalize the air in the tips before pipetting the liquid. Proper vapor pressure will be maintained even if the device is left idle with filled tips for a prolonged period.

Tip Immersion

It is important to ensure that pipet tips are properly immersed in liquid before aspirating. Tips should be immersed just below the level of the liquid and the depth should be consistent throughout the pipetting cycle. This will prevent air from being aspirated into the tips as well as avoid extra liquid adhering to the outside of the tip.

The liquid level sensing feature will allow for consistent tip immersion throughout a program (see *Liquid level sensor* description in Section 2.1.1).

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Performance Level

With standard EPROM based software, the ***Serial***Mate can be expected to achieve the following performance levels:

Pipetting Throughput	**96-Well Plate Axis Position**		**384-Well Plate Axis Position**	
Pipetting Mode	8-channel	12-channel	16-channel	24-channel
Reagent addition to one plate (no tip change)	50 sec.	32 sec.	3 min. 30 sec	2 min. 20 sec.
Plate Replication (with tip change between rows)	4.5 min.	3.0 min.	7 min. 45 sec.	5 min. 10 sec.
Serial Dilution (3 mix cycles per row)	1.75 min.	1.5 min.	3 min.	2 min. 40 sec.

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2.3 SPECIFICATIONS AND REQUIREMENTS

2.3.1 Product Specifications

a.	Sample volume	0.1 to 30 µL - programmable in 0.1µL increments 5.0 to 220 µL - programmable in 1.0 µL increments (Depending on nozzle assembly type)
b.	Containers	Microtiter plate - 96-well or 384-well Sample microtube rack - 96-well Deep well block - 96-well or 384-well Standard 40mL reservoir set (rack of 4) Standard 140mL reservoir Waste boxes
c.	Dispense speed	1 - 5 speed settings (1 = fastest; 5 = slowest) Speed Setting (µL/sec) for full vol (30 or 200µL) 1 = 3.2 (fastest) 2 = 1.6 3 = 1.1 4 = 0.80 5 = 0.65 (slowest)
d.	Dispense functions	Mode 1: Row by Row Dispense Mode 2: Multiple Row Dispense Mode 3: Serial Dilution Mode 4: Sample Dispense/Transfer
e.	Plate shaker	Built-in function available in position 4 only, this provides microplate shaking to mix solutions in microwells.
f.	Control panel	Liquid crystal touch-panel. Dialog-type input for programming mode operations.
g.	Main unit weight	Approximately 80 pounds (35 kilograms)
h.	Dimensions	Width: 28.3 inches (720 millimeters) Height: 21.7 inches (550 millimeters) Depth: 17.3 inches (440 millimeters)

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i. Environmental requirements:

Operational environment	Indoor use only
Temperature:	+15°C ~ +40° C for operation
Relative Humidity:	<85% at +30° C.
Altitude:	Up to 2,000 meters or 1.5+ miles
Supply voltage fluctuations:	AC 100 ~ 240 V ±10%
Installation category:	II
Pollution degree:	2

j. Power requirements: AC 100 ~ 240 V ±10%, 50/60Hz, 100VA

k. Fuse: Time-lag type. Voltage: 250V, 2A

2.3.2 Accuracy and Precision Specifications

a. Accuracy:
0.1 to 30 µL nozzle assembly: ± 2.0% or 0.3 µL
5.0 to 220 µL nozzle assembly: ± 2.0% or 1.0 µL

b. Precision:
0.1 to 30 µL nozzle assembly: ± 1.7% or 0.3 µL
5.0 to 220 µL nozzle assembly: ± 1.0% or 0.5 µL

Values shown are expressed as a percent deviation or microliter value. When applied to desired volume, the greater of the two values will always apply. Percentage values are expressed as the coefficient of variation. Microliter values are expressed as the standard deviation.

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2.4 PRECAUTIONS AND SAFETY

If you have questions about any aspect of operating the ***Serial***Mate safely that are not answered in this manual, please contact Matrix Technologies Corporation at the number listed in the front of this Manual.

Use common sense and exercise extreme caution at all times.

- Locate, unscrew and remove shipping bracket that prevents nozzle head assembly from moving.
- Prior to an actual operation, perform a "warm up" operation without any containers in position areas.
- Return nozzle unit to the "home" position when the machine is turned off. Be certain that all parts of your body are out of the nozzle movement range because it will seek "home" as soon as the power is turned on.
- Those *Serial*Mate units equipped with safety covers are not operational when the safety covers are open. Ensure these covers are closed before attempting to execute files.
- To avoid possible electrical shock, never touch the ***Serial***Mate plug with wet hands.
- To avoid serious injury, never put your hand (or any part of your body) into the machine when it is moving.
- Never touch a pipet tip without wearing gloves.
- Be careful to avoid errors when placing containers in position and entering operation commands. Such errors can lead to liquid being discharged at inappropriate or hazardous locations or to a dangerous splashing of the liquid.
- Use only Matrix Technologies pipet tips, as other tips may result in a lack of precision. Using a tip more than once can also cause a loss of dispense precision and increase the risk of error.
- Before operating the ***Serial***Mate, remove any extraneous items from the position stages.
- Do not use ***Serial***Mate near open flame or in an area of high temperatures or humidity.
- Do not pierce the liquid crystal touch panel on the front of the ***Serial***Mate unit. In the unlikely event that the liquid within the touch panel should get into your mouth or in your eyes, rinse immediately for at least 15 minutes and seek prompt medical attention.
- The ***Serial***Mate contains components of iron, aluminum, stainless steel and other metals, avoid using solvents or reagents that might corrode these components.

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3 INSTALLATION

3.1 UNPACKING THE *Serial*Mate

The ***Serial***Mate weighs approximately 100 pounds. To avoid personal injury or damage to the equipment, transport the unit with a gurney or carry with a partner. Always hold the ***Serial***Mate from the bottom; never lift the unit by the doors or top.

1. To safely remove the ***Serial***Mate unit from the shipping crate, lift the instrument and packing material out of the box and place it on a stable, flat, horizontal surface free of vibration and out of direct sunlight. Retain shipping container and all packing materials.

2. Remove the accessories and attachments as illustrated on page one. Contact your sales representative or Matrix Technologies should a part be missing.

3. Locate and remove, with the 3.0mm Allen wrench provided, the two shipping brackets located near nozzle head assembly. Keep these brackets in a safe place in case future shipping is ever required.

4. Never place a heavy or hot object on top of the unit. Instrument failure may result.

5. Do not remove the back cover of this unit, attempt disassembly or any alterations. Doing so could result in personal injury or equipment damage.

6. Keep the rear panel of the ***Serial***Mate at least 5 to 10cm from any wall or obstruction to allow for adequate ventilation. Internal mechanisms may overheat and result in malfunction.

7. Allow the unit to adjust to room temperature before proceeding.

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3.2 INSTALLING THE *Serial*Mate

1. Ensure the unit is on a flat, stable horizontal surface and adjust the leveling feet until the unit is level.

2. Connect the AC power cord to the instrument and to the wall receptacle.

   NOTE: Do not connect the instrument to line power until it has reached room temperature and any condensation has evaporated.

   NOTE: Ensure that the line voltage and frequency rating for the instrument conforms to your facility's power supply.

3. Locate, unscrew and remove shipping bracket prior to first operation.

4. Before turning on the power be sure no hands are in the working area. The nozzle unit will move to its "home" position and thus may present a risk of injury.

5. Locate the power switch on the front of the unit and switch it on. The LCD touch panel becomes active and displays the Main Menu.

   NOTE: If the display is not active or returns an error message, turn the power switch off, disconnect the device from line power and check the fuses. (Refer to Section 7.0, *Troubleshooting,* for details.)

6. Press the Enter key (ENT) to continue. The instrument displays the Main program menu. (Refer to Section 4.1, *Setting and Orienting Containers,* for details.)

7. To operate the machine more reliably, before the first procedure of the day, run a warm-up operation using water only to test your program variables.

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4 INSTRUMENT SETUP

4.1 SETTING AND ORIENTING CONTAINERS

There are five specific placement positions (locations) for the container types used in various ***Serial***Mate aspiration/dilution operations. They are:

Position 1 - Tip rack.

Position 2 - Reservoirs - either RSVR-1 or RSVR-2.

Position 3 - MTP or DWP.

Position 4 - MTP or DWP.

Position 5 – Waste box.

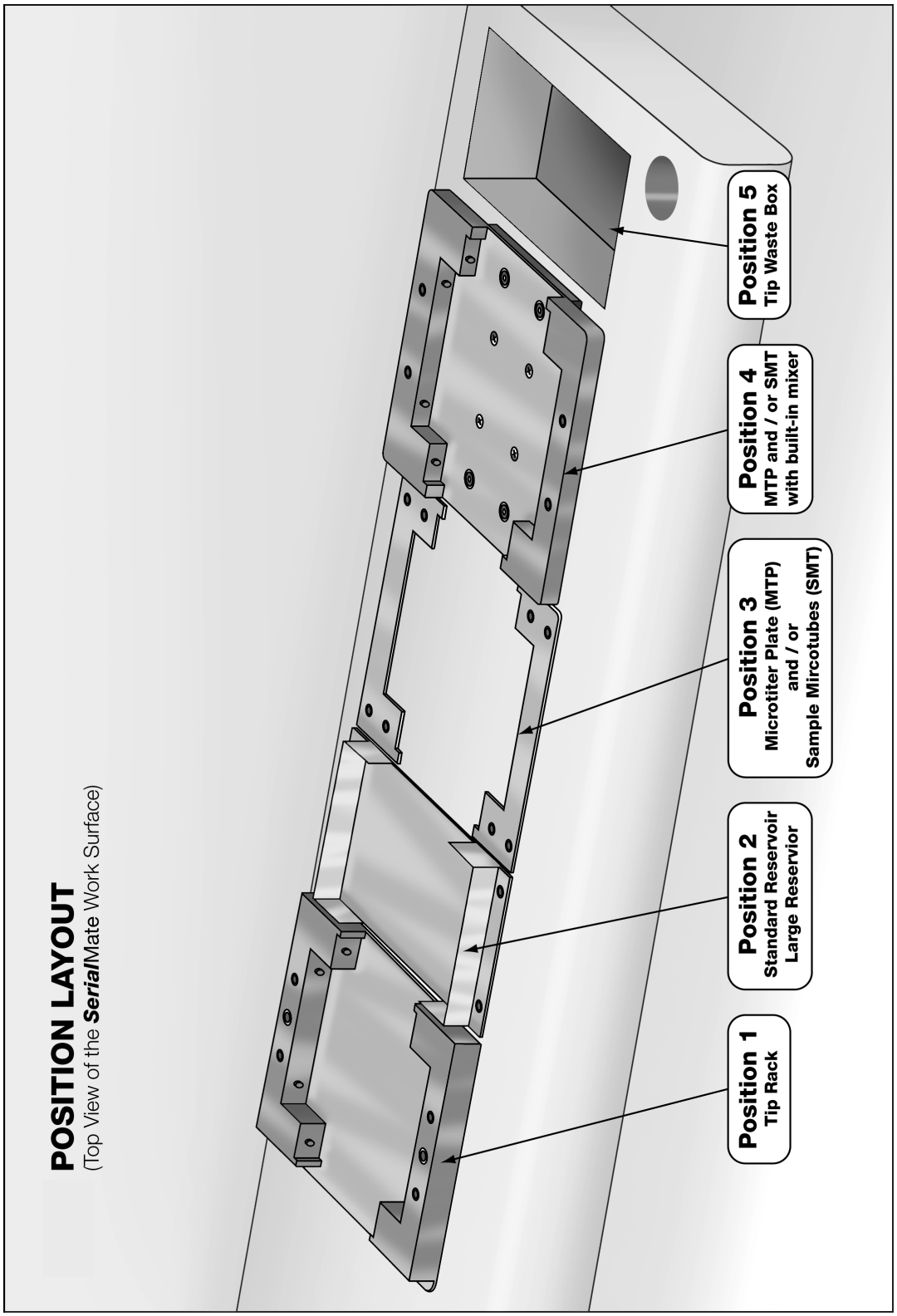
It is important to know where each type of container is placed to avoid instrument damage.

Please also note the orientation of the containers within their appropriate positions on the ***Serial***Mate unit. Two options are offered to the user: 8 or 16 wells deep by 12 or 24 wells wide and 12 or 24 wells deep by 8 or 16 wells wide. The operator is reminded to double check the installation of the well plates, the reservoirs and the tip racks.

The diagrams on the following pages illustrate the location of the various container types and their positions in either orientation.

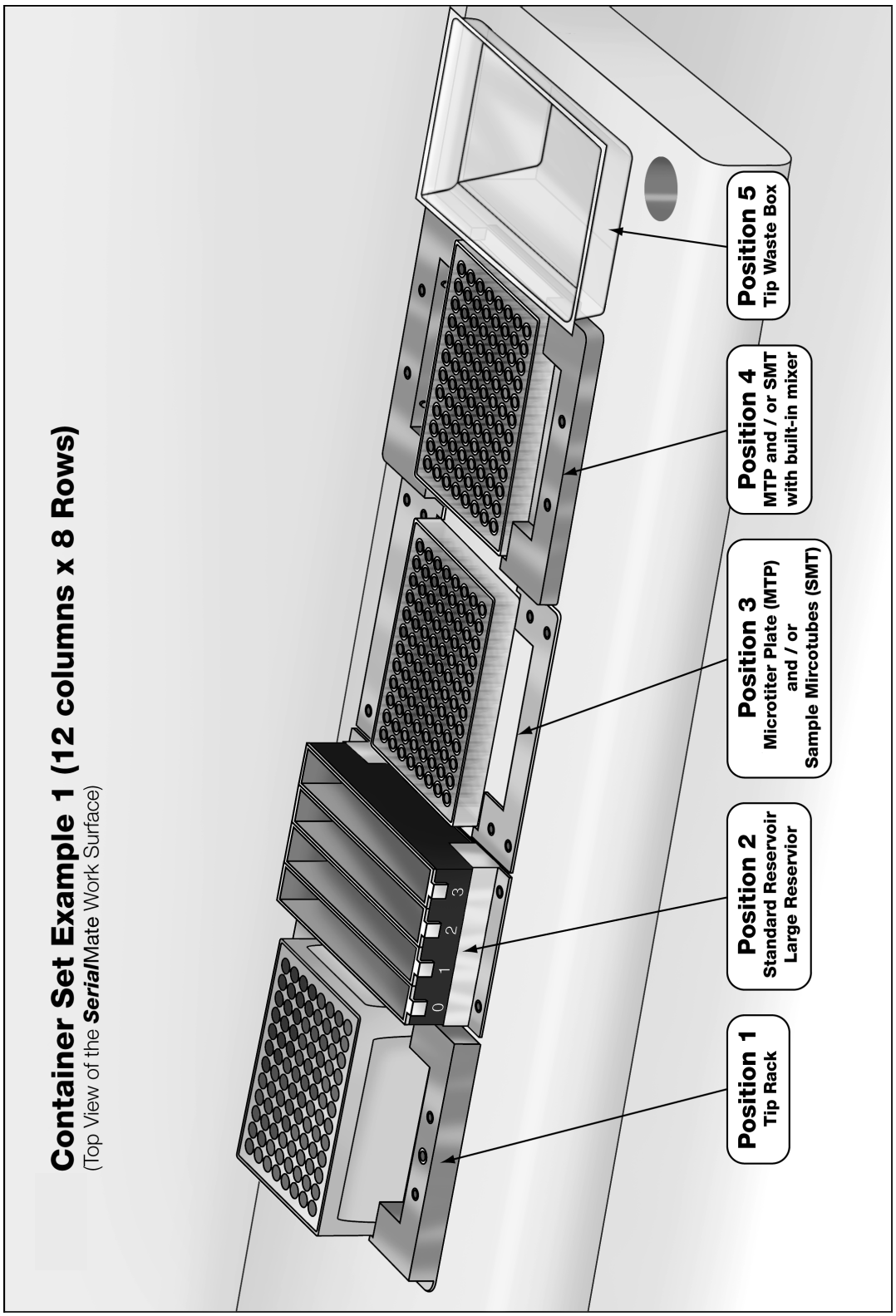
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4.1.1 Position Layout



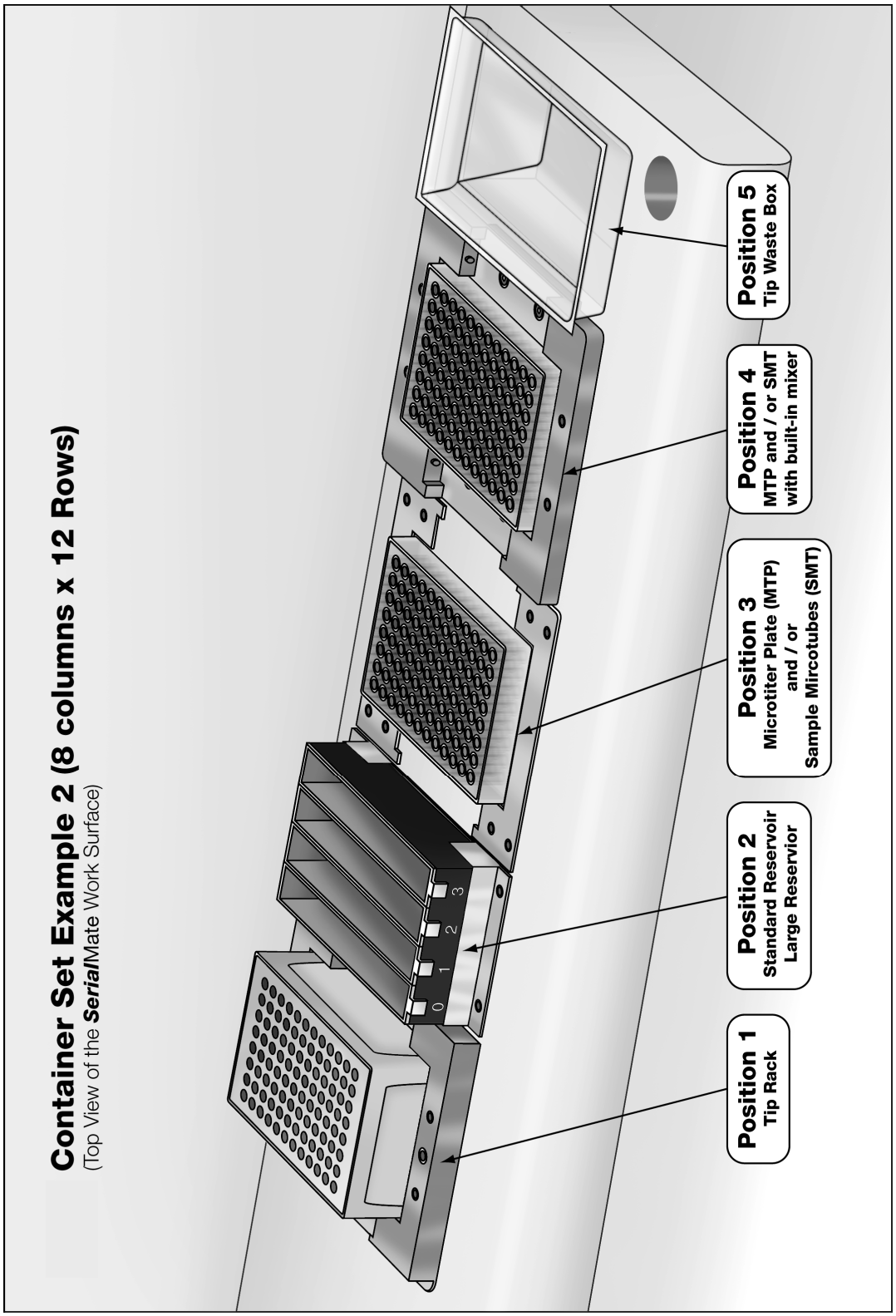
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4.1.2 Container Set Example 1



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4.1.3 Container Set Example 2



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4.2 CHANGING THE NOZZLE ASSEMBLY

Any ***Serial***Mate base unit can accommodate any of the following assemblies below:

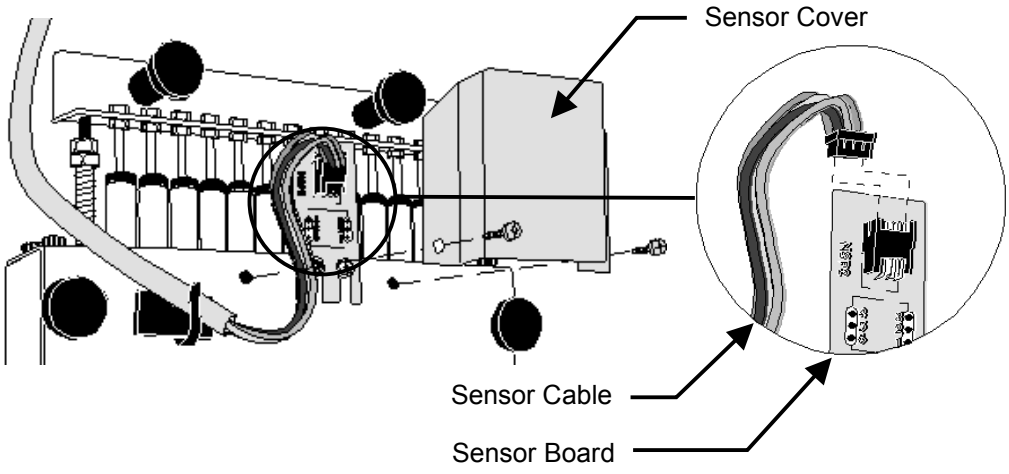
Catalog No.	Nozzle Assembly	Plate Compatibility
44444-180	8/12 channel 30 µL Nozzle Assembly	96-well
44444-181	16/24 channel 30 µL Nozzle Assembly (Includes tip rack base) **Note**: Liquid-level sensing is not included in this assembly	384-well
44444-182	8/12 channel 220 µL Nozzle Assembly DW (Deep Well)	96-well
44444-225	8/12 channel 220 µL Nozzle Assembly for use with shallow-well plates	96-well

Use the following procedure to change the nozzle assembly.

Note: If you are using the *Control*Mate software to operate the ***Serial***Mate, configure the pipettor head setting from the Add-in menu in *Control*Mate. See Section 9.4.2.2, *Change Pipettor Head*.

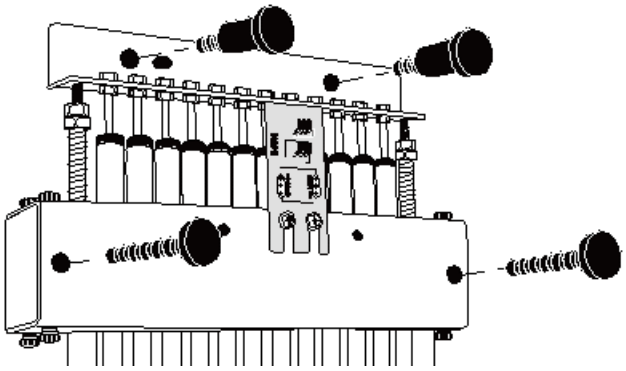
Warning! To avoid potential injury, ensure that the ***Serial***Mate power is off when placing hands anywhere within ***Serial***Mate operating area.

1. Using a Phillips screwdriver, remove the liquid level sensor cover and unplug the sensor cable from the sensor board.



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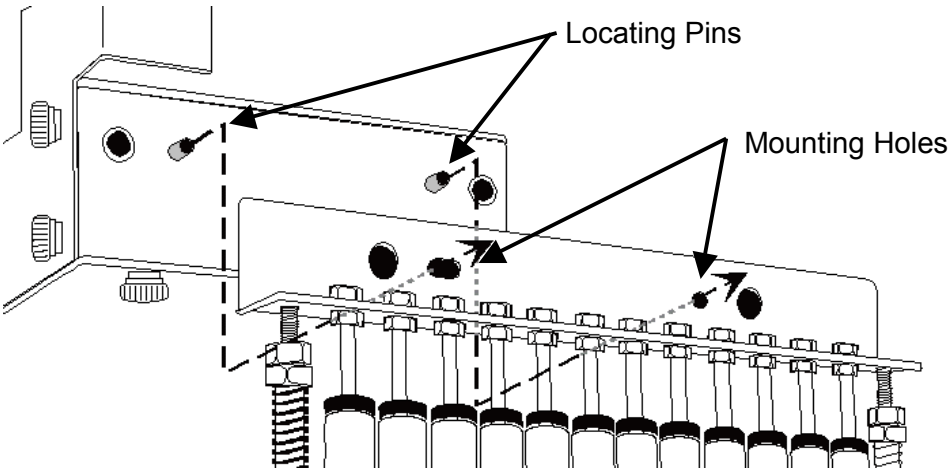
2. Unscrew and remove the four (4) black knurled knobs holding the nozzle assembly.



3. Carefully remove the existing nozzle assembly.

4. Store nozzle assembly in a clean, protective environment.

5. Install the new nozzle assembly by lining up the mounting holes in the nozzle assembly with the locating pins on the lead screw assembly.



6. Reinstall the four (4) black knurled knobs finger tight.

7. Reconnect the sensor cable to the sensor board on the new nozzle assembly and replace the sensor cover.

   Note: The 24 channel 30µL nozzle assembly does not support liquid level detection. Secure the level sensor wire using the wire clip supplied on the nozzle head

After changing the nozzle assembly, continue to Section 4.3, *Mechanical Settings*, to align the nozzles to the tip rack.

Note: If EPROM replacement is needed, perform the procedure in Section 4.4, *EPROM Replacement*, before adjusting the mechanical settings.

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4.3 MECHANICAL SETTINGS

The Mechanical Settings Mode in the ***Serial***Mate EPROM software serves a critical role in ensuring accurate pipetting. The pipet tips must be properly aligned to fit securely on the nozzle head, thus preventing the tips from falling off and preventing air leaks during pipetting. The Mechanical Settings Mode provides the operator with the ability to properly align the four nozzle heads to the various stage positions on the ***Serial***Mate. Once optimized, these positions are stored in memory on the ***Serial***Mate for one nozzle type.

The EPROM software has limited memory; therefore, the mechanical settings that can be stored are limited to one set of tip loading height, bottom height, and return height for a nozzle head. For example, if the tip settings are optimized for the 220µL x 96-well nozzle head, then the tip settings must be adjusted if the nozzle head is changed to the 30µL x 96-well nozzle head. Also, the reservoir and waste box settings are limited to one tip size; therefore, when the tip size is changed, the reservoir and waste box settings must also be changed—or at least, checked.

This document provides step-by-step instructions for adjusting tip positions for each nozzle assembly, reservoir and waste box, and microplate types. The sections are organized as follows:

- Section 4.3.1 shows how to access the mechanical position option through the ***Serial***Mate LCD screen.
- Section 4.3.2 describes how to control the motor movements using the keys on the ***Serial***Mate keypad.
- Sections 4.3.3 to 4.3.16 describe and illustrate the optimal tip positions for each nozzle assembly and tip sizes.

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4.3.1 Accessing Machine Setting Option

Note: If you cannot access the Mechanical Settings Option, check the dipswitch settings on the main PC board. SW1 should be set to ON. All other dipswitches should be set to OFF. See the diagram below:

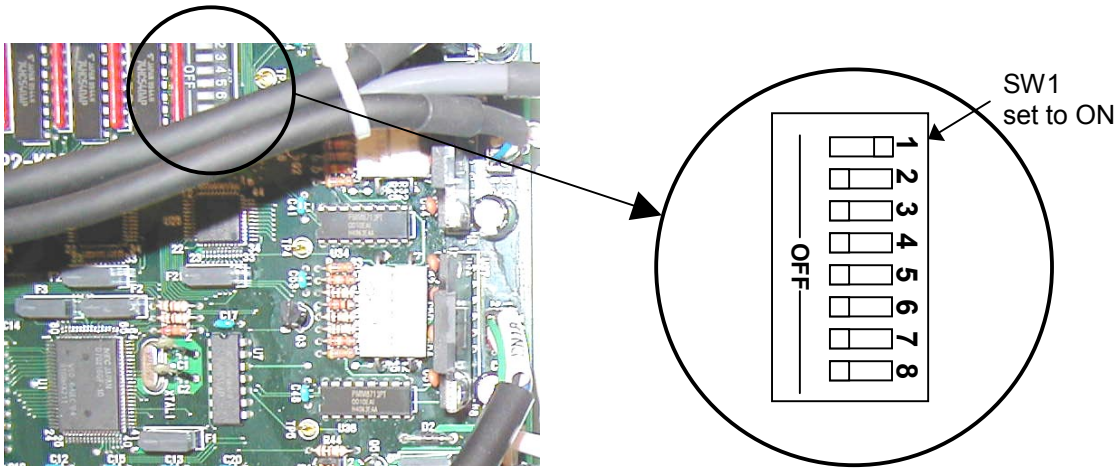
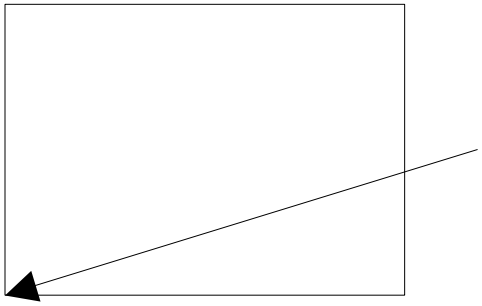


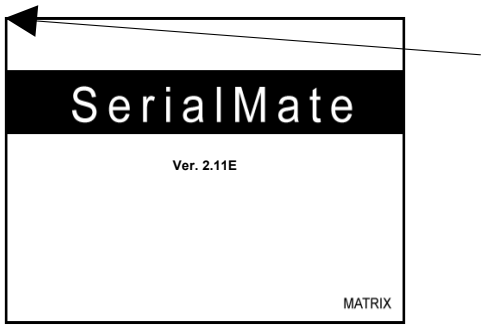
Figure 1: Dipswitch Settings on Main Board

1. To enter the Mechanical Settings mode, press the lower left corner of the touch display (look for the faint square pattern) and turn on the power.

   Remove your finger when you hear the beep.

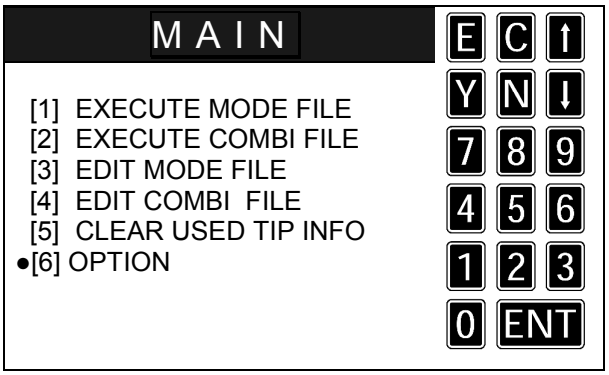


2. After the title screen is displayed, press the upper left corner of the touch display repeatedly until you hear a beep.



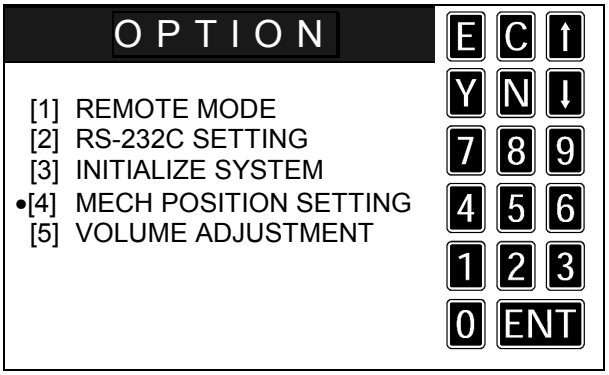
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3. From the Main menu, select [6] OPTION and press [Enter].



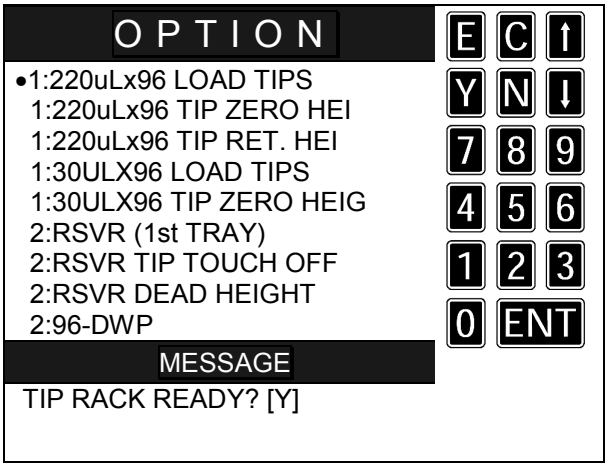
The OPTION menu displays computer settings, mechanical settings, and volume adjustment.

4. Select [4] MECH POSITION SETTING in the option menu and press [Enter].



OPTION MENU:
The mechanical position settings are listed in the order that they should be performed. For example, the first setting is tip-loading height for the 220µL x 96 channel nozzle head.

The first number indicates the position number on the ***Serial***Mate for the setting (for example, Position-1 holds the tip rack; Position-2 holds the reservoir, etc.).



The first setting is followed by the tip zero height (distance to the bottom of the well) and tip return height (distance above the tip holder before ejecting the tips). The setting is repeated for the next nozzle head, then continues to Position-2 for tip positioning over the reservoir.

You can press [E] to exit this option at any time; however, when returning to this option, you will need to advance through each setting from the start to reach the desired setting.

The procedures in sections 4.3.3 to 4.3.16 follow the order of the settings as they appear in the Option menu.

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4.3.2 Calibration Keys For Machine Setting

The nozzle assembly movements are positioned mechanically via the ***Serial***Mate keypad. The ***Serial***Mate numeric keypad controls the X and Z directional axes of the nozzle assembly. Other keys move to previous or next program queries and accept or reject data entries.

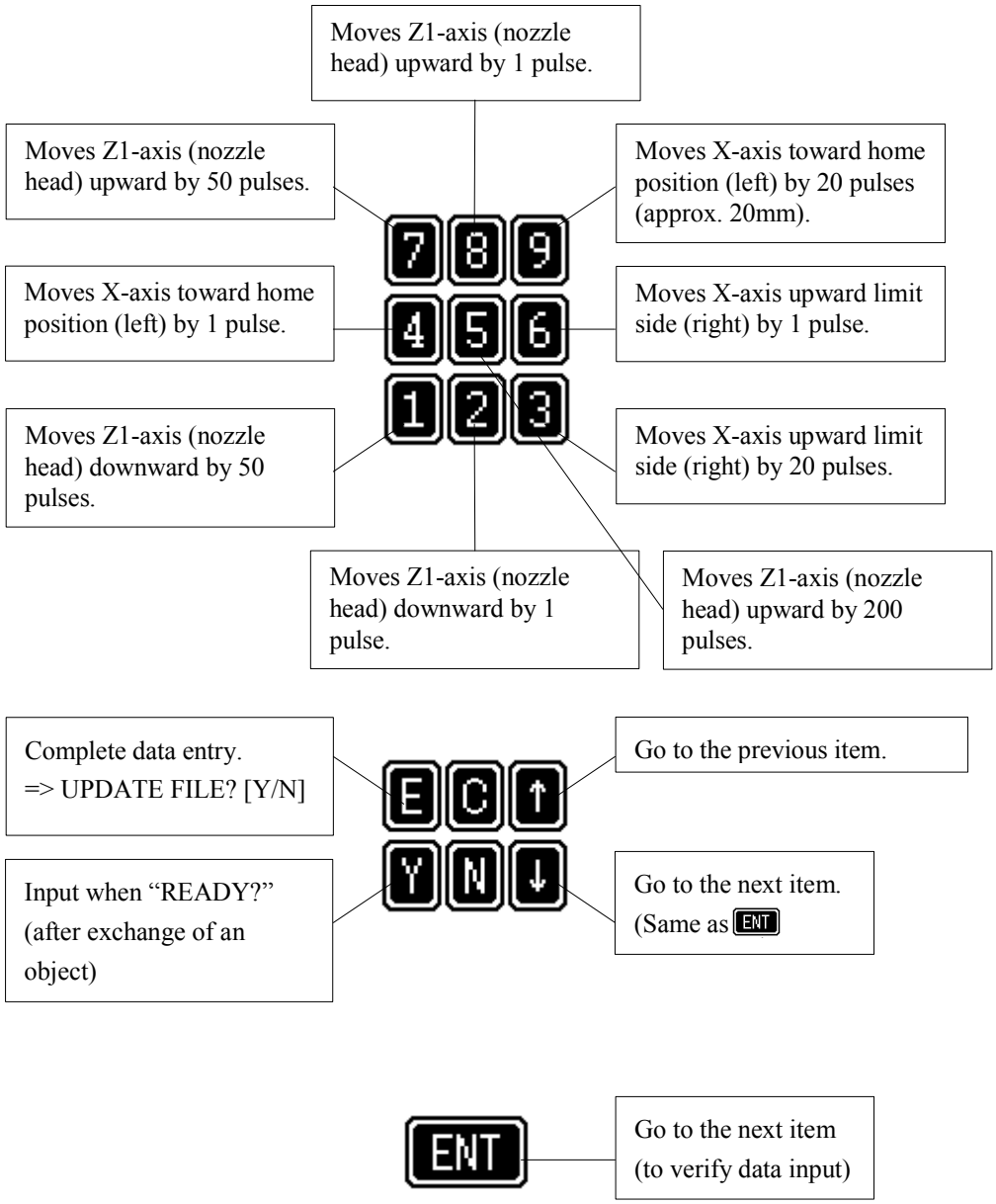


Figure 2: Tip Positioning Using Keypad

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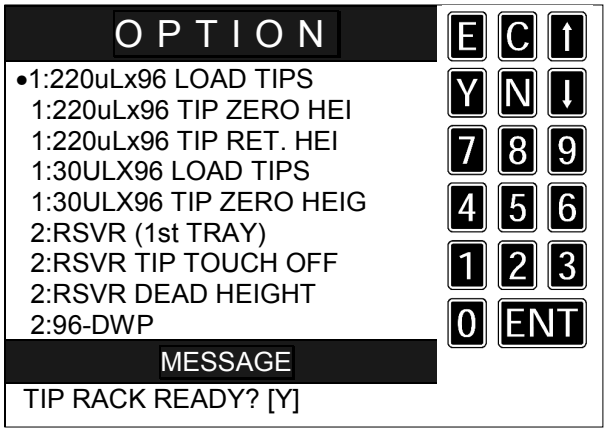
4.3.3 220 µL x 96 Nozzle Assembly

➢ Install the 220 µL x 96 (12 channel) nozzle assembly onto the ***Serial***Mate main unit and use the 220 µL x 96 tip rack. See Section 4.2, Changing the Nozzle Assembly.

Note: If you need to bypass this section to change other settings in the Option menu, leave the tip rack out of position 1 and advance through the list of options until you reach the option that needs to be changed. Since the tip rack must be removed for some of the options, you can save time by leaving the rack out at the beginning.

Setting Tip Loading Height

1. Select [Y] on the screen display ***before*** inserting the tip rack in position 1.



Note: Although the system prompts you to insert the tip rack, leave the tip rack out initially to prevent the nozzles from crashing into the tips because of a previous setting.

The system positions the nozzle assembly over the first row of tips to set up the adjustment for tip loading.

2. Press [7] on the keypad to raise the nozzle assembly, then insert the tip rack.

3. Press [1] and slowly lower the nozzle down to the tip loading position, as shown in the figures below.

As you move the nozzle head, the X and Z values showing the current nozzle position are displayed above the message bar. You can record these values on the ***Serial***Mate Mechanical Settings Verification Form for future reference.



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4. Visually inspect the front and side of the nozzles while lowering them to the row of tips. Move the nozzles laterally to center them over the tips.

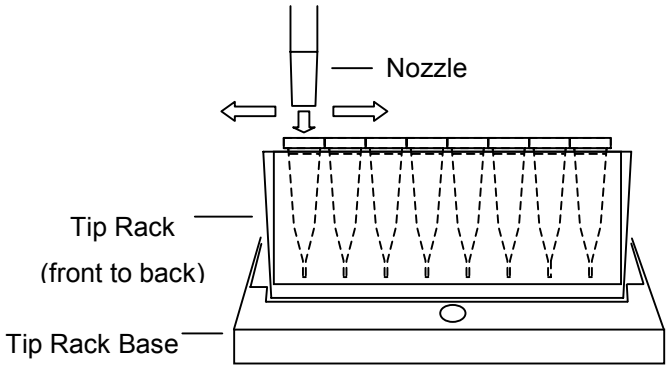


Figure 3: Setting 220 µL x 96 Tip Loading Position

Note: If necessary, loosen and adjust the tip rack base (use 3.0 mm Allen wrench to loosen base screws) to make sure that the tip rack is correctly aligned with the nozzle assembly.

To ensure that the nozzles are firmly seated into the tips, lower the nozzles until the upper shaft lifts above the nozzle block.

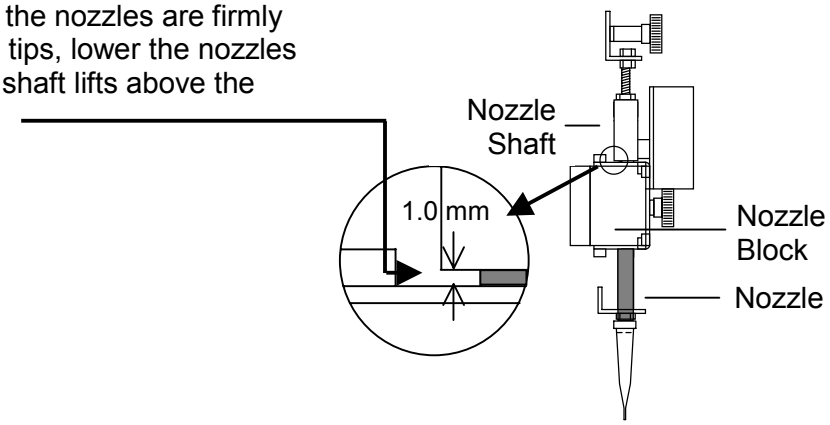


Figure 4: Setting 220 µL x 96 Tip Loading Position

Note: As the nozzle assembly is moved down, the nozzles are stopped by the tips. The nozzle pressure on the tips increases and a gap soon appears between the nozzle shaft and nozzle block (see inset). The nozzle can be seen in this gap.

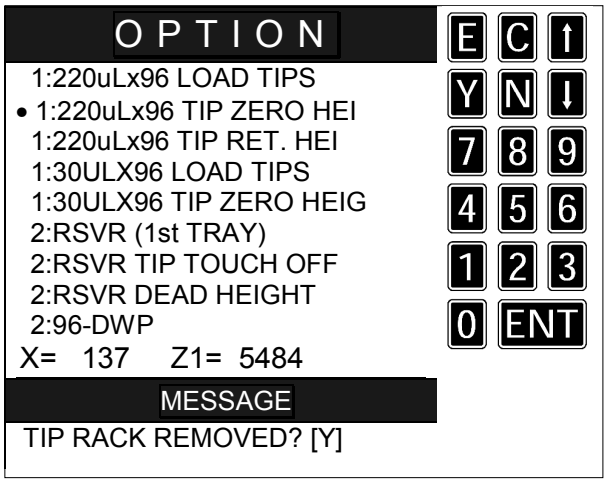
To ensure that the fit is secure without adding undue stress to the motor, raise the nozzle slightly to close this gap to approximately 1.0 mm.

5. Press [Enter] when you are done. The nozzle assembly moves up and the next option is indicated.

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Setting Bottom (or Zero) Position

1. **Remove the tip rack** and select [Y] on the screen display.



   The nozzle assembly is lowered until the tips are close to the bottom of the platform.

2. Use the numeric keypad to adjust the tips until they are slightly above the bottom of the platform.

   As you move the nozzle head, the X and Z values showing the current nozzle position are displayed above the message bar. You can record these values for future reference.

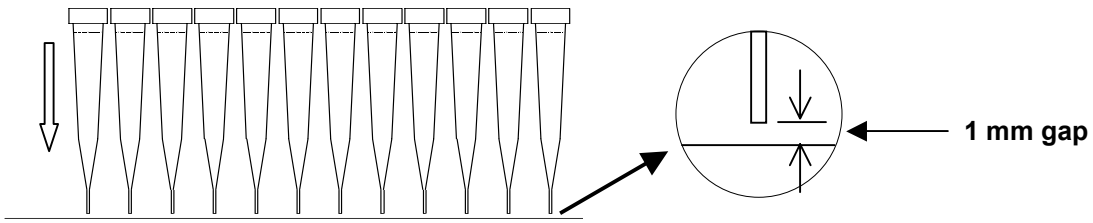


Figure 5: Setting 220 µL x 96 Bottom Position

> **Caution:** Adjust the tips carefully; avoid moving the tips into the bottom of the platform frame or you will change the alignment of the tips and may bend the tips.

3. Press [Enter] when you are done. The nozzle assembly moves up and the next option is indicated.

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Setting Tip Return Height

1. Place the tip rack back onto position 1 in the same orientation that was used previously to load the tips from the tip rack. Press. [Y] to the screen prompt “Tip rack returned?”.

   The nozzle assembly is lowered to a safe position above the tip rack.

2. Lower the nozzle assembly until the tips are approximately halfway into the tip rack (for example, Z1=3700).

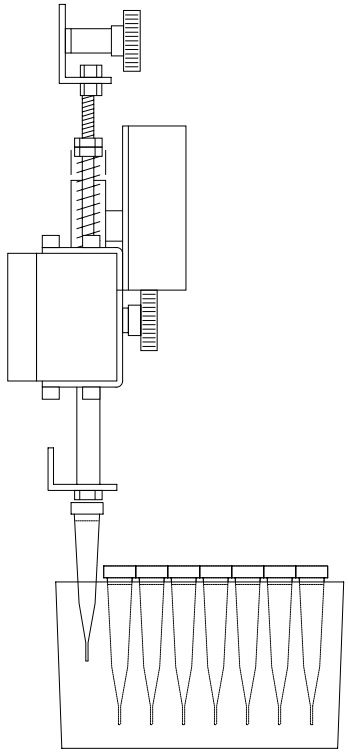


Figure 6: Setting 220 µL x 96 Tip Return Height

3. Press [Enter]. The nozzle assembly ejects the tips and moves back to home position above position 1.

   Note: Confirm (not set) that all the tips are ejected properly.
   - X-axis position is already set.
   - Z1-axis is fixed at the setting in Step 2.

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4.3.4 30 µL x 96 Nozzle Assembly (optional)

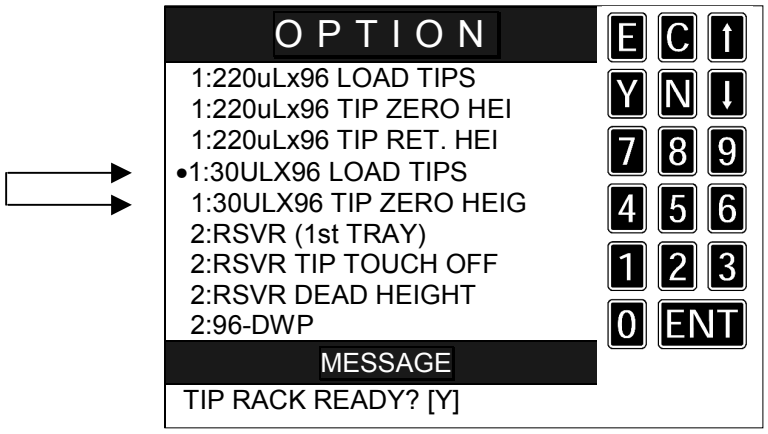
This section is required only if you plan to use the 30 µL x 96 (12-channel) nozzle assembly (see Matrix catalog number 44444-180).

1. Replace the nozzle assembly with the 30 µL x 96 nozzle assembly. See Section 4.2, Changing the Nozzle Assembly.

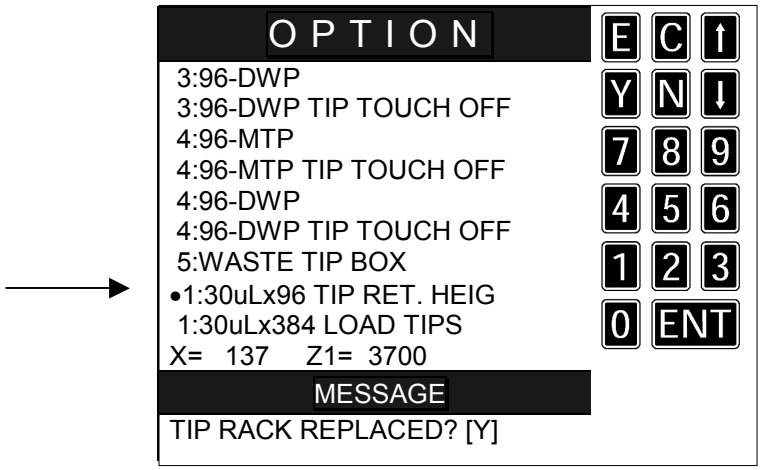
2. Use the appropriate tip rack for the 30 µL x 96 nozzle assembly and standard (96-well) rack base.

Note: Remember to leave the tip rack out until ***after*** you have responded to the "Tip rack ready?" prompt and moved the nozzles up.

3. Repeat the steps in Section 4.3.3, *220 µL x 96 Nozzle Assembly*, to adjust the mechanical settings for the 30 µL x 96 nozzle assembly.



Note: Tip return height for the 30 µL x 96 nozzle assembly is adjusted after the Waste Tip Box option. Refer to Section 4.3.12, *30 µL x 96 Nozzle Assembly (Tip Return Height)*.



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4.3.5 Reagent Reservoir

The reagent reservoir settings described in this procedure are for the 4-chamber reservoir (see Matrix catalog number 44444-177).

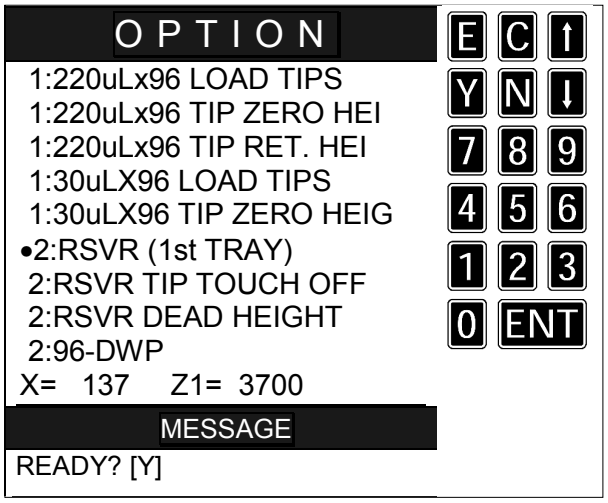
- Insert the first row of pipet tips directly from the tip rack. Use the pipet tips that you will be using with this reagent reservoir.

> **Important:** Reservoir position and heights for all tips and nozzle head combinations are created and stored in this section; therefore, it is important to manually load the tips intended for use with the reagent reservoir. If you change the nozzle assembly, then you must also change the reagent reservoir settings for the tips that correspond to the new nozzle assembly.

Note: If you plan to use 30µL x 384 pipet tips, manually insert the 30µL tip and set the tip position for the reagent reservoir at this time—***before*** continuing to the section for setting the tips for the 30 µL x 384 nozzle assembly, which appears later in the menu.

Setting Standard Position

1. Ensure that the tips are loaded on the nozzle head.



2. Select [Y] at the “Ready?” prompt.

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3. Regardless of the tips to be used, move the nozzle assembly until the tip is centered above reservoir well 1 (see following figure). Align the tip to be level with the top of the reservoir.

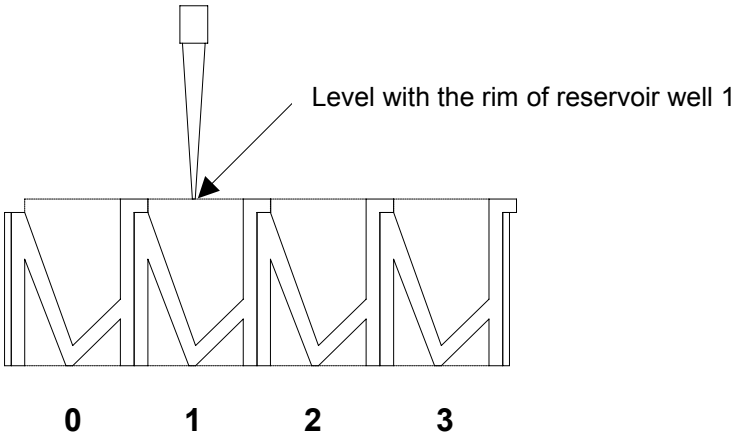


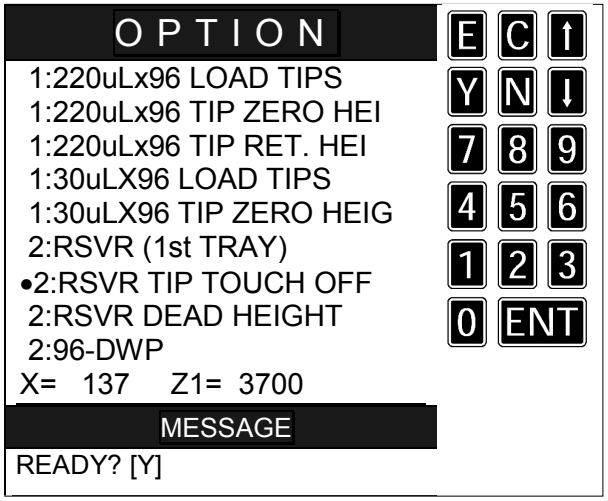
Figure 7: Setting Standard Position for Reservoir

Note: When the liquid level sensing option is used, the sensor begins to look for liquid at this setting. As the liquid in the reservoir is used, the nozzle assembly automatically moves lower into the reservoir well (to the reservoir bottom position) to find liquid.

4. Press [Enter] when you are done. The nozzle assembly moves back to home position.

Setting tip touch-off

1. Ensure that a tip is inserted into the first nozzle tip closest to you.



2. Select [Y] at the “Ready?” prompt.

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3. Use the numeric keypad to move the nozzle assembly until the tip is positioned to the left of reservoir well 1 (see the following figure).

   Align the tip to be slightly below the level of the reservoir and barely touching the wall of the reservoir.

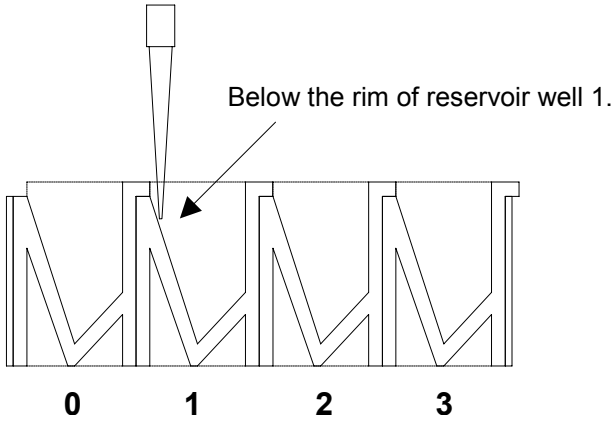


Figure 8: Setting Tip Touch-Off for Reservoir.

4. Press [Enter] when you are done. The nozzle assembly moves down into the reservoir well for the next setting.

Setting Bottom (or Zero) Position

1. Use the numeric keypad to move the nozzle assembly down until it is at the bottom of the reservoir. Ensure that the tip is centered at the lowest point in the reservoir by moving the tray slightly, side-by-side.

2. Raise the nozzle assembly approximately 1-2 mm from the bottom of the reservoir (depending on the evaporation rate of the liquid). Lift the reservoir to ensure that the tip is set slightly above the bottom of the well.

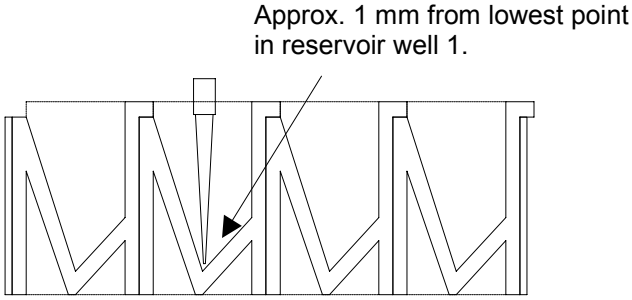


Figure 9: Setting Bottom Position for Reservoir

Note: The Bottom Position is the lowest point at which the level sensor determines that the reservoir is empty and needs replenishing.

3. Press [Enter] when you are done. The nozzle assembly is raised to zero height above position 2.

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4.3.6 96-Well DWP (Deep Well Plate), Position 2

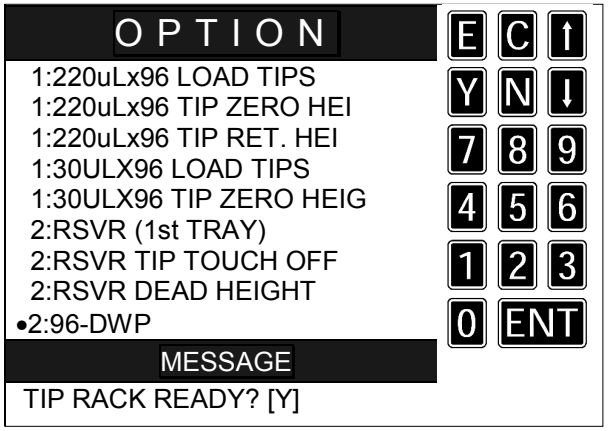
Stage position 2 on the ***Serial***Mate can be used for reservoirs or for the Deep Well Plate.

- If you plan to use a 96 channel Deep Well Plate, insert the plate into position 2 and carefully follow the instructions in this section.
- If you need to go through this section (it cannot be bypassed) to continue to the next section , leave position 2 empty or with a reservoir and accept all default answers in this section.

Important: If the 24/30µL nozzle head is in use, remove all plates from stage 3 and 4 to avoid crashing the tips.

Setting Standard Position

1. Select [Y] on the screen display when you are ready for the first adjustment.



2. Press [1] on the numeric keypad to move the nozzle head down until the tips are well within the first row of wells (see following figure). Adjusts the tips laterally until they are in the center of the wells. (The X-axis will be fixed at this position.)

Ensure that the tips are centered in the wells by moving the deep well plate from side to side.

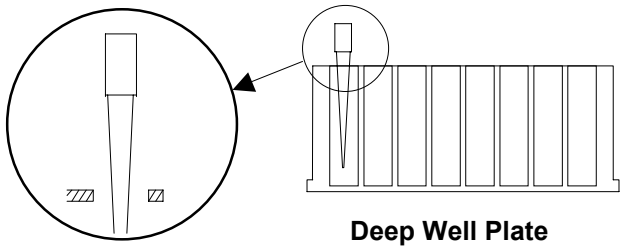


Figure 10: Setting 1st Standard Position for Deep Well Plate

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3. Raise the nozzle head until it is level with the rim of the deep well plate.

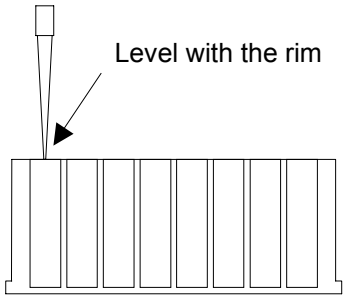


Figure 11: Setting 2nd Standard Position for Deep Well Plate

Note: The X-axis horizontal position should not require adjustment, as this setting was established in the previous step.

Setting Tip Touch-off Position

1. Hold the deep well plate to the left side of the Position 2 while setting the tip touch-off position.

2. Lower the tip below the rim of the plate approximately 1-2 mm (see the following figure).

3. Move the tips to the left until they touch the side of the wells.

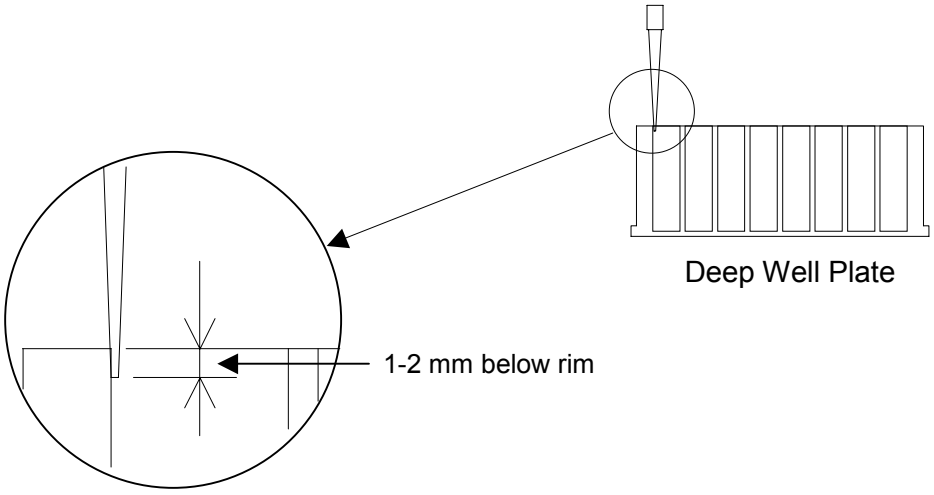


Figure 12: Setting Tip Touch-off for Deep Well Plate

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4.3.7 96-Well MTP (Microtiter Plate), Position 3

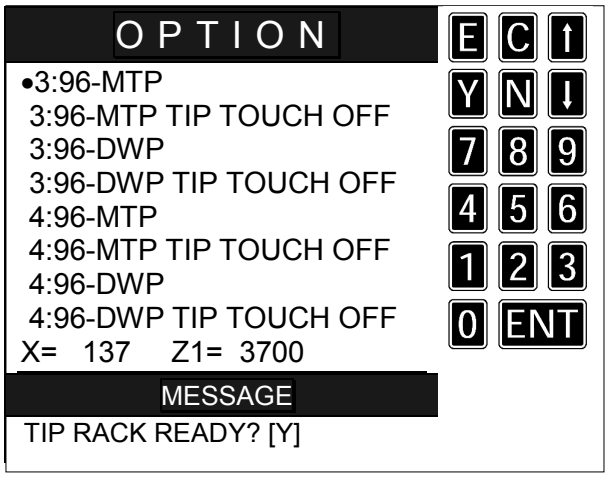
Stage position 3 on the ***Serial***Mate can be used for Microtiter or Deep Well Plates.

- If you plan to use a 96 channel Microtiter Plate, insert the plate into position 3 and carefully follow the instructions in this section.
- If you need to go through this section (it cannot be bypassed) to continue to the next section , leave position 3 empty and accept all default answers in this section.

Important: If the 24/30µL nozzle head is in use, remove all plates from stage 3 and 4 to avoid crashing the tips.

Setting Standard Position

1. Select [Y] on the screen display when you are ready for the first adjustment.



2. Use the numeric keypad to move the tip to the center of the well and level with the upper rim of the MTP. Verify that the tips are in the center of the well by moving the MTP left and right by hand.

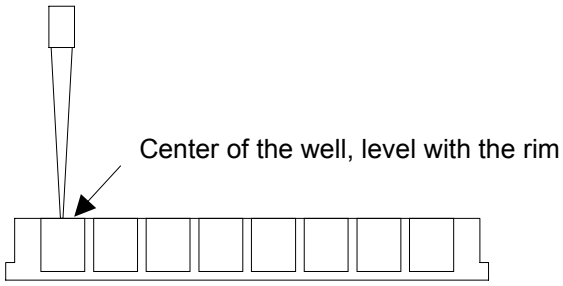


Figure 13: Setting Standard Position for Microtiter Plate

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Setting Tip Touch-off Position

1. Hold the microtiter plate to the left side of the Position 2 while setting the tip touch-off position.
2. Lower the tip below the rim of the plate approximately 1.5 mm (see the following figure).
3. Move the tips to the left until they touch the side of the wells.

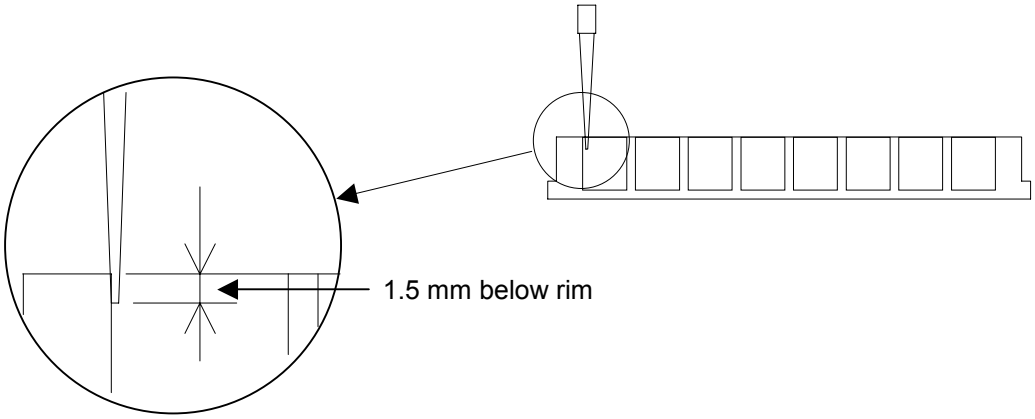


Figure 14: Setting Tip Touch-off for Microtiter Plate

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4.3.8 96-Well DWP (Deep Well Plate), Position 3

1. Insert the Deep Well Plate into position 3.
2. Repeat the steps in Section 4.3.6, *96-Well DWP (Deep Well Plate), Position 2*

4.3.9 96-Well MTP (Microtiter Plate), Position 4

1. Insert the Microtiter Plate into position 4.
2. Repeat the steps in Section 4.3.7, *96-Well MTP (Microtiter Plate), Position 3*.

4.3.10 96-Well DWP (Deep Well Plate), Position 4

1. Insert the Deep Well Plate into position 4.
2. Repeat the steps in Section 4.3.6, *96-Well DWP (Deep Well Plate), Position 2*

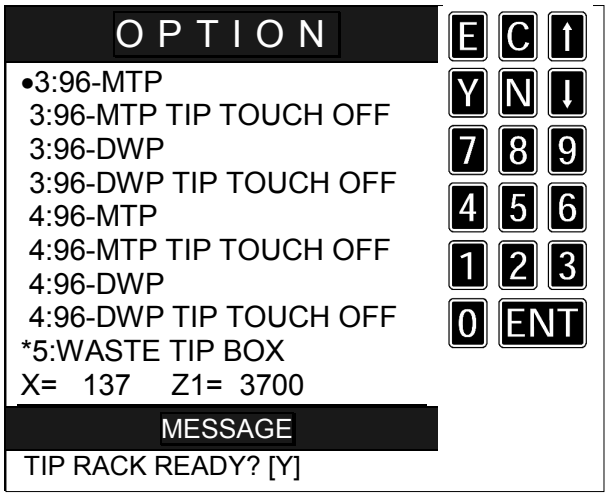
Important: If the 24/30µL nozzle head is in use, remove all plates from stage 3 and 4 to avoid crashing the tips.

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4.3.11 Waste Tip Box

The Waste Tip Box setting determines the nozzle position for ejecting tips into the tip waste box.

1. Ensure that tips are on the nozzle assembly and press [Y] to the screen prompt.



2. Use the numeric keypad to move the tips to the center of the waste tip box, approximately 38mm from the right side.

Set the tip height above the rim of the waste box to allow plenty of room for disposing of used tips.

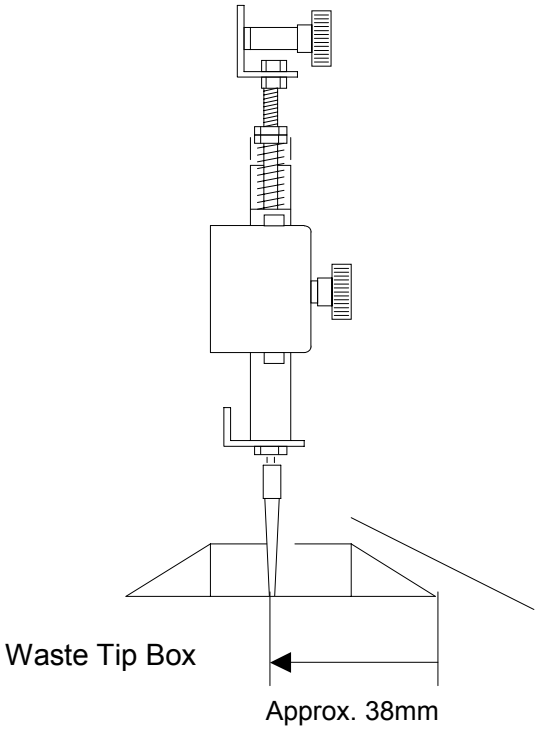


Figure 15: Setting Tip Position for Waste Tip Box

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4.3.12 30 µL x 96 Nozzle Assembly (Tip Return Height)

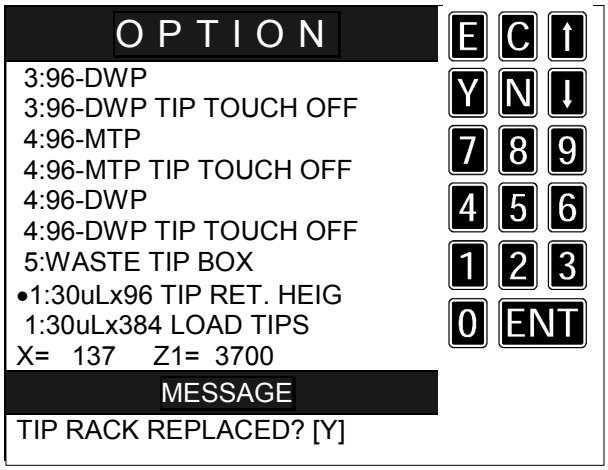
This section is a continuation of tip positioning for the 30 µL x 96 nozzle assembly.

1. **Return the original tip rack** that was used for setting the tip load height for the 30 µL x 96 nozzle assembly. Ensure that the tip rack is in Position 1 and in the same orientation that was used previously for 30 µL x 96 tip loading.

2. Insert the first row of pipet tips directly from the tip rack.

Note: Since this procedure returns tips to the rack, the tips must be on the nozzles, and the first row of the tip rack must be empty.

3. Press. [Y] to the screen prompt "Tip rack returned?".



4. Lower the nozzle assembly until the tips are approximately halfway into the tip rack (for example, Z1=3700).

5. Press [Enter]. The nozzle assembly ejects the tips and moves back to home position above position 1.

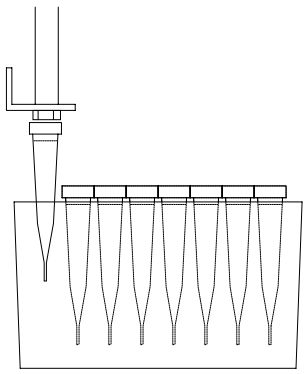


Figure 16: Setting 30 µL x 96 Tip Return Height

Note: Confirm (not set) that all the tips are ejected properly.

- X-axis position is already set.
- Z1-axis is fixed at the setting in Step 2.

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4.3.13 30 µL x 384 Nozzle Assembly

This section is required only if you plan to use the 30 µL x 384 (24-channel) nozzle assembly (see Matrix catalog number 44444-181).

1. Replace the existing nozzle assembly with the 24-channel nozzle assembly. See Section 4.2, Changing the Nozzle Assembly.

2. Replace the rack base with the optional rack base that accommodates the 384 tip rack. See the figure below.

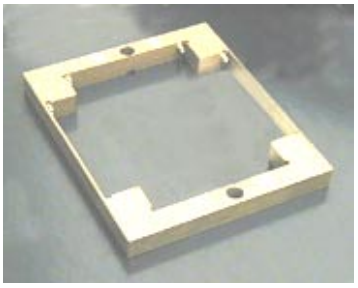


Figure 17: Rack Base for 384 Tip Rack

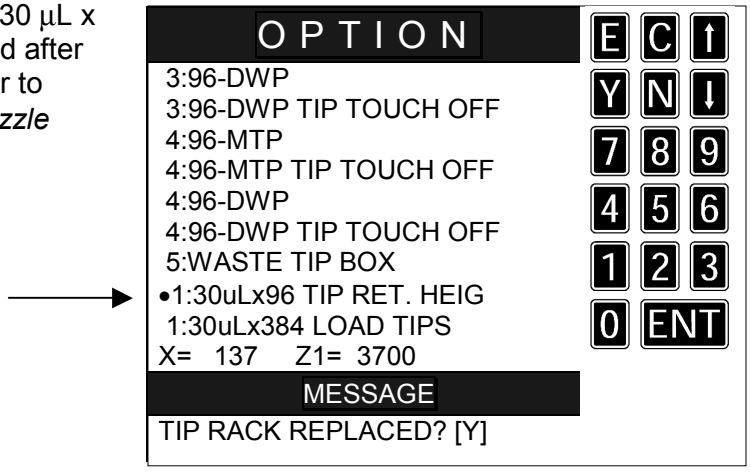
Note: For all rack bases, the pins should always be positioned toward the back of the instrument.

3. Use the appropriate tip rack (Matrix Catalog number 5311 or 5312).

Note: Remember to leave the tip rack out until ***after*** you have responded to the "Tip rack ready?" prompt to prevent a collision between the nozzle and the tips that may occur because of previous, incompatible, tip load settings.

4. Repeat the steps in Section 4.3.3, *220 µL x 96 Nozzle Assembly*, to adjust the mechanical settings for the 30 µL x 384 nozzle assembly.

Note: Tip return height for the 30 µL x 384 nozzle assembly is adjusted after the Waste Tip Box option. Refer to Section 4.3.16, *30 µL x 384 Nozzle Assembly (Tip Return Height)*.



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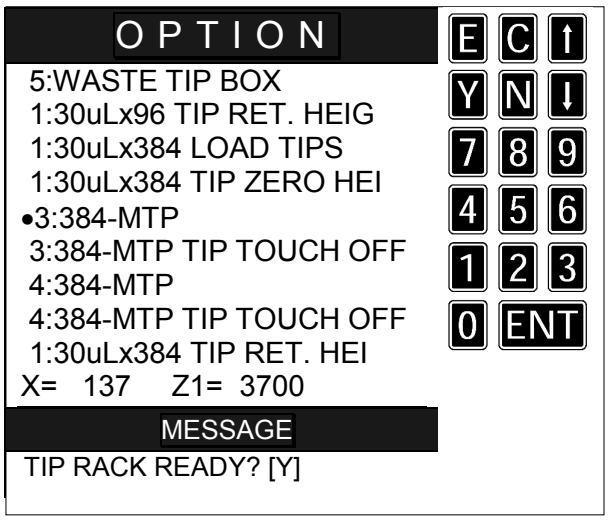
4.3.14 384-Well MTP (Microtiter Plate), Position 3

1. Insert the 384-well microtiter plate into position 3.

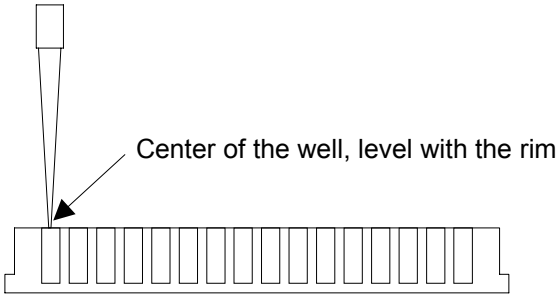
Note: This setting uses the reagent reservoir setting that was determined earlier. If you did not used the tips for the 384-well plate to adjust the reagent reservoir setting, return to Section 4.3.5, *Reagent* Reservoir, and determine the tip settings with the correct tips.

Setting standard position

1. Select [Y] on the screen display when you are ready for the first adjustment.



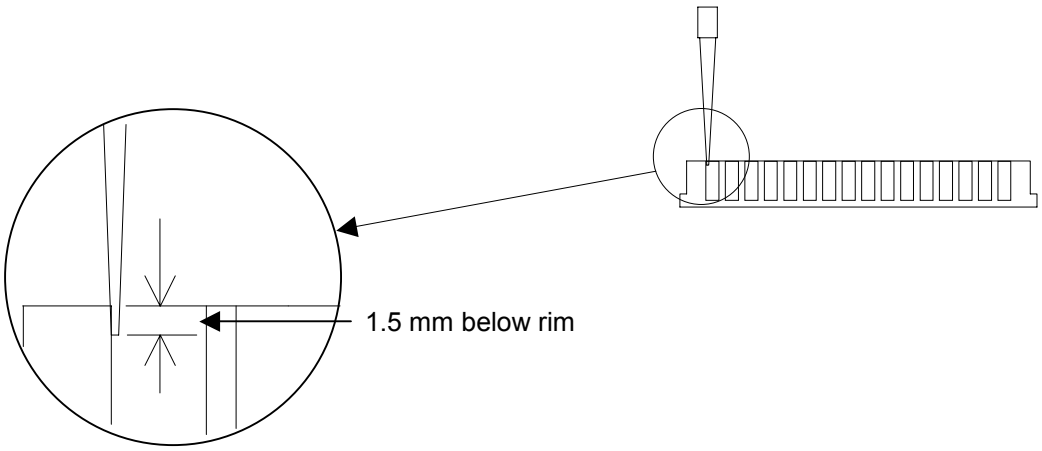
2. Use the numeric keypad to move the tip to the center of the well and level with the upper rim of the MTP.



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Setting Tip Touch-off Position

1. Hold the microtiter plate to the left side of the Position 2 while setting the tip touch-off position.
2. Lower the tip below the rim of the plate approximately 1.5 mm (see the following figure).
3. Move the nozzles to the left until they start to touch the side of the wells.



4.3.15 384-Well MTP (Microtiter Plate), Position 4

1. Insert the Microtiter Plate into position 4.
2. Repeat the steps in Section 4.3.14, *384-Well MTP (Microtiter Plate), Position 3*.

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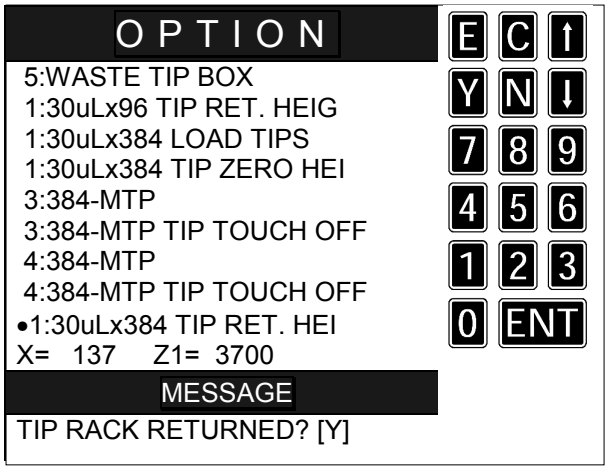
4.3.16 30 µL x 384 Nozzle Assembly (Tip Return Height)

This section is a continuation of tip positioning for the 30 µL x 384 nozzle assembly.

1. Return the original tip rack that was used for setting the tip heights of the 30 µL x 384 nozzle assembly. Ensure that the tip rack is in Position 1 and in the same orientation that was used previously for 30 µL x 384 tip loading and tip touch-off

Note: Since this procedure returns tips to the rack, the tips must be on the nozzles, and the first row of the tip rack must be empty.

2. Press. [Y] to the screen prompt "Tip rack returned?".



3. Lower the nozzle assembly until the tips are approximately halfway into the tip rack (for example, Z1=3700).

4. Press [Enter]. The nozzle assembly ejects the tips and moves back to home position above position 1.

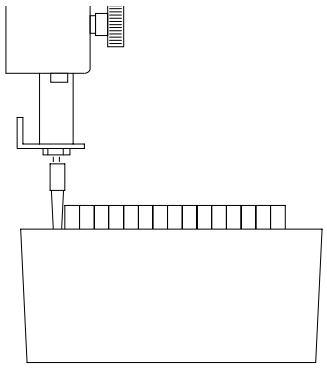


Figure 18: Setting 30 µL x 384 Tip Return Height

Note: Confirm (not set) that all the tips are ejected properly.

- X-axis position is already set.
- Z1-axis is fixed at the setting in Step 2.

This procedure completes the mechanical settings option. After the last step, the program returns to the main Option menu.

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4.4 EPROM REPLACEMENT

EPROM (Erasable Programmable Read-Only Memory) is programmable read-only memory (PROM) that can be erased and re-used. Erasure is caused by shining an intense ultraviolet light through a window that is designed into the memory chip. (Although ordinary room lighting does not contain enough ultraviolet light to cause erasure, bright sunlight can cause erasure. For this reason, the window is usually covered with a label when not installed in the computer.)

Tools Required:

- Phillips screwdriver
- IC chip removal tool

Note: This procedure is not required if the EPROM version is 2.09 or higher. To check the version, turn the instrument on. The version number will be displayed on the touch panel after initialization.

Warning! Turn off the ***Serial***Mate before continuing to prevent serious injury to yourself or to the instrument!

1. Using the Phillips screwdriver, remove the rear panel from the instrument
2. Using the chip puller, remove EPROMs labeled "**U12**" and "**U14**" from the main circuit board.

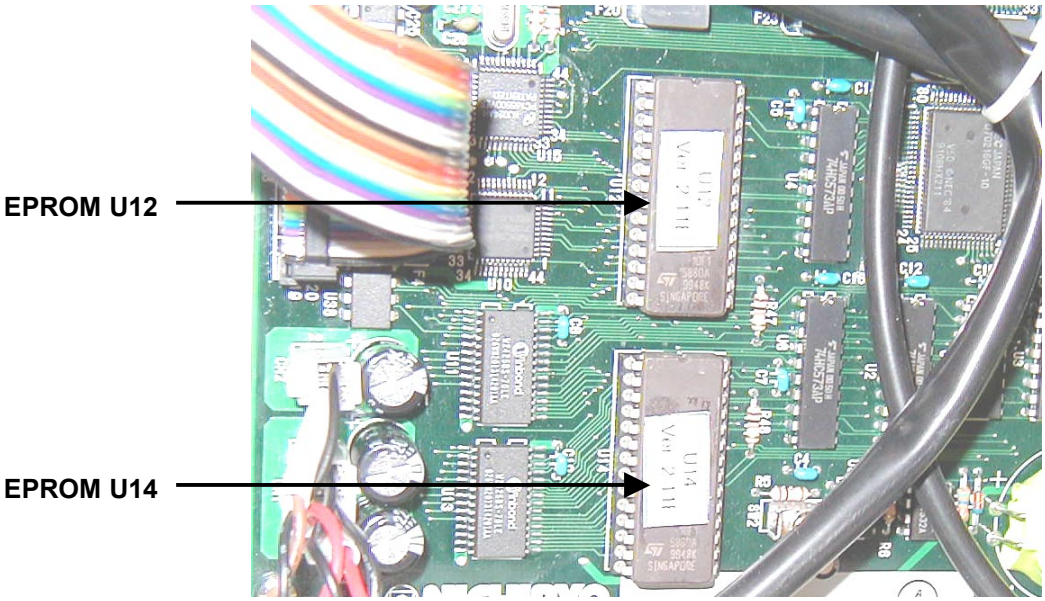


Figure 19: EPROMS on Main Circuit Board

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3. Carefully install the new EPROMs. **Ensure EPROMs are aligned properly** (see following figure).

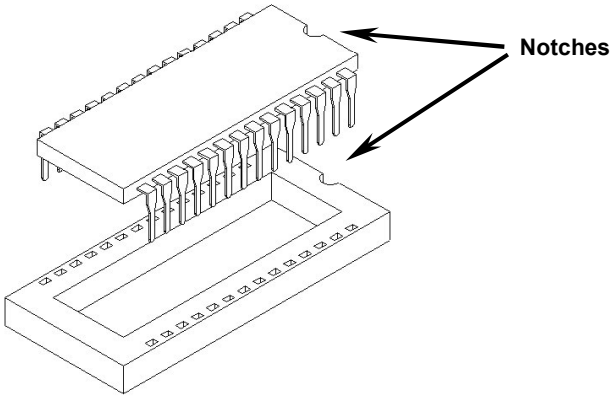


Figure 20: EPROM Alignment

4. Replace the cover and turn on the power to the ***Serial***Mate.

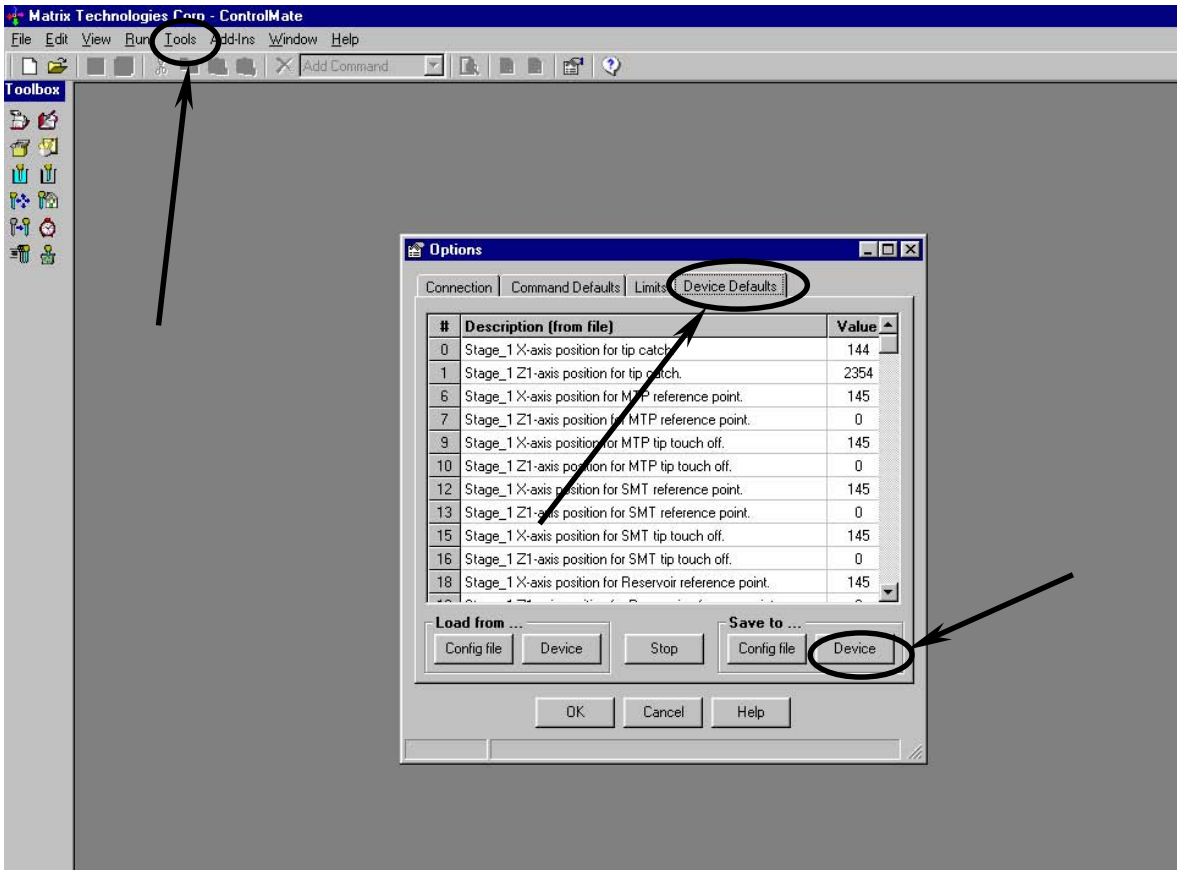
5. Using the computer, copy the original "serialmate.ini" file found in **C:\Program Files\ControlMate\serialmate.ini** to a separate directory in the computer. This file will be required when changing back to the previously installed nozzle assembly.

Caution: Failure to copy the original "serialmate.ini" file will result in the loss of mechanical settings for the Standard nozzle assembly.

6. Copy the "serialmate.ini" file from the deep well parameters disc to. **C:\Program Files\ControlMate** directory. When asked to overwrite existing file, click **"Yes"**.

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Note: This parameter file is required every time this nozzle assembly is first installed.



7. Turn on the ***Serial***Mate and set the system for remote operation.

a. Run the ***Control***Mate software.

b. In **Tools\Options\Device Defaults** press **Save to… Device**.

The ***Serial***Mate is now ready for operation.

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4.5 LIQUID LEVEL SENSITIVITY

Liquid level sensing may need to be adjusted in the following situations:

- If filter tips are being used
- If there is a change in the viscosity or vapor pressure of the liquid being used

To change this sensitivity, adjust the potentiometer (**VR4)** on the secondary circuit board to the right of the main circuit board (see following figure).

1. Remove the back panel of the instrument with a small Phillips screwdriver.

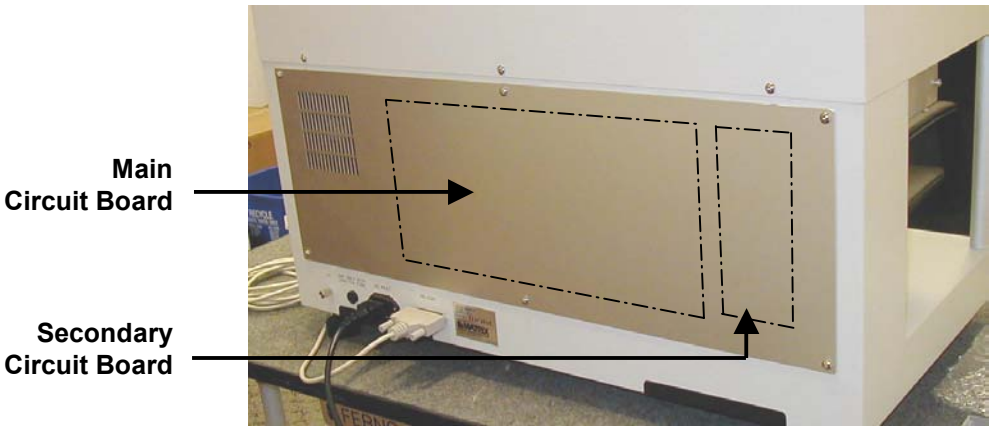


Figure 21: Back Panel of *Serial*Mate

2. Turn the potentiometer counterclockwise to increase the liquid-level sensitivity or clockwise to decrease the sensitivity.

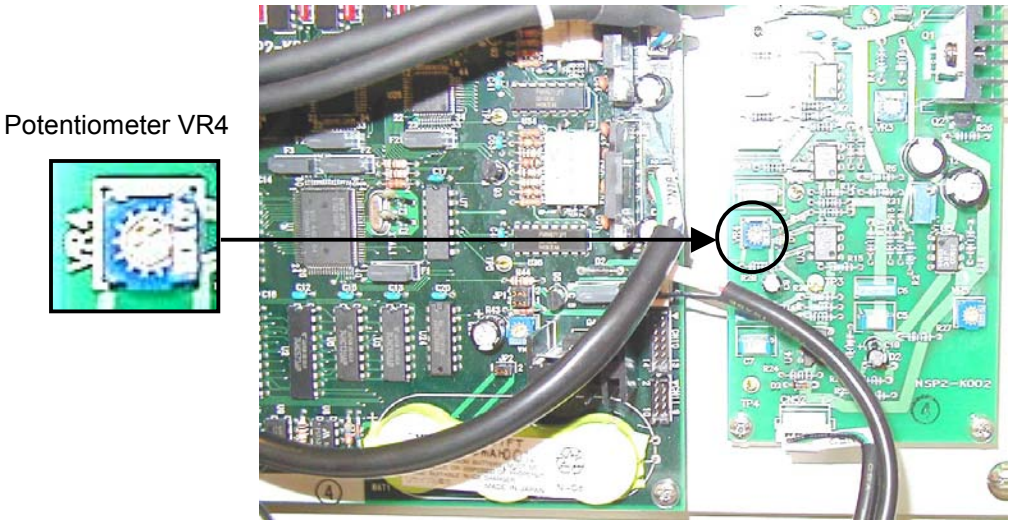


Figure 22: Potentiometer VR4 on Secondary Circuit Board

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4.6 ORBITAL SHAKER SPEED

To change the speed of the orbital shaker, adjust the potentiometer, **VR1**, on the main board.

1. Remove the back panel of the instrument with a small Phillips screwdriver.

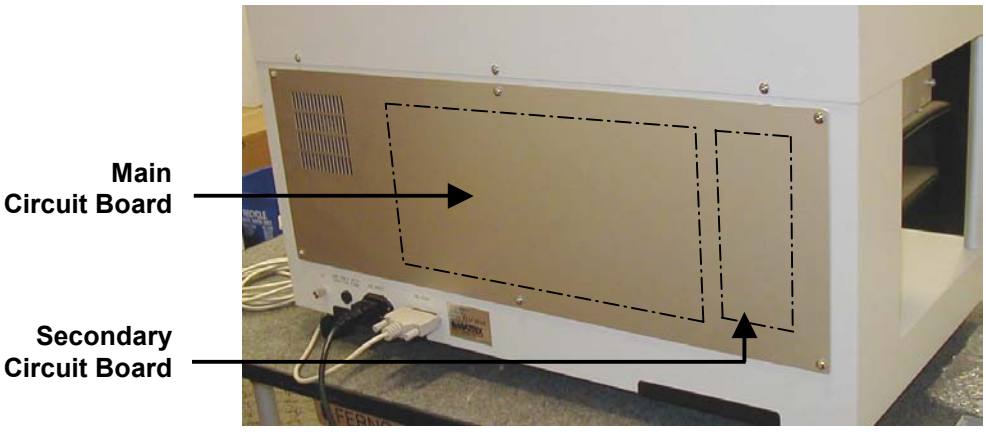


Figure 23: Back Panel of *Serial*Mate

2. Turn the potentiometer counterclockwise to increase shaker intensity or clockwise to decrease the intensity.

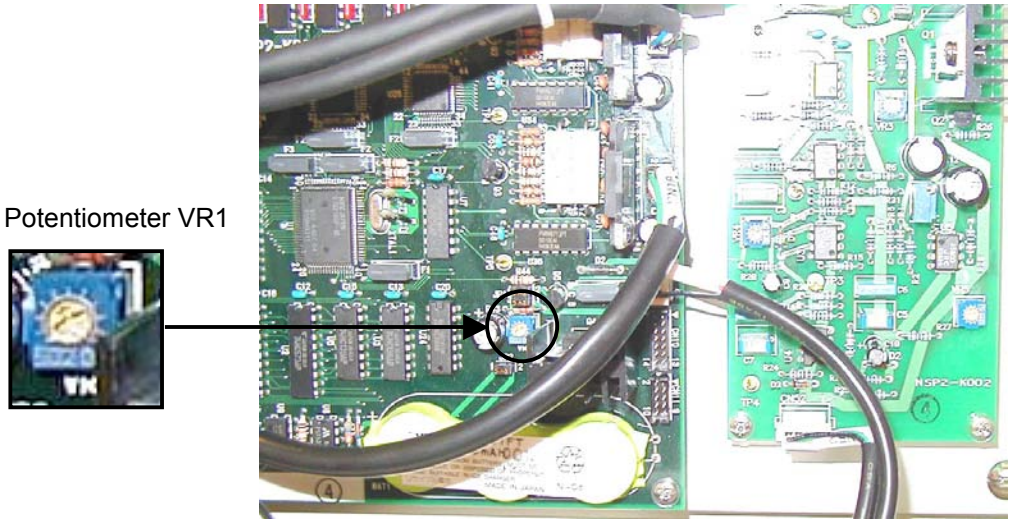
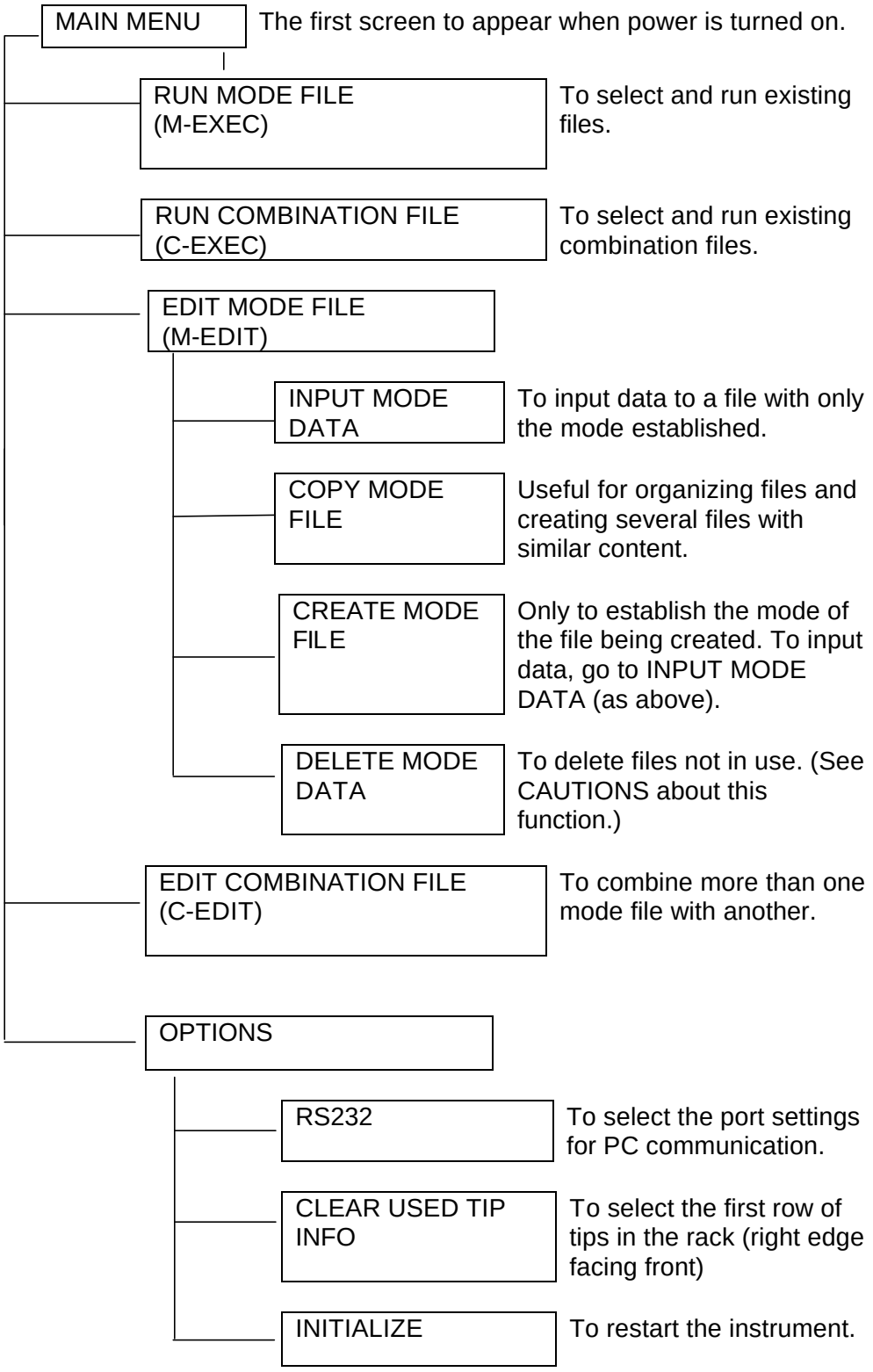


Figure 24: Potentiometer VR1 on Main Circuit Board

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5 PROGRAMMING AND OPERATION

5.1 SET-UP MENU TREE



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5.2 EXPLANATION OF MODES

The ***Serial***Mate can perform a wide range of dispense/dilution operations by creating and combining any of the following four mode types.

MODE 1:	Row by Row Dispense
MODE 2:	Multiple Row Dispense
MODE 3:	Serial Dilution
MODE 4:	Sample Dispense / Transfer

Mode 1: Row by Row Dispense – This mode performs simple liquid dispense into one or two dispense containers simultaneously. This mode aspirates and dispenses liquid in a "neat" transfer mode, therefore, aspirate (ASP) volume = (DISP) dispense volume.

Mode 2: Multiple Row Dispense – This mode performs a series of incremental dispense operations. With a single aspiration of the liquid, ***Serial***Mate dispenses multiple aliquots across one or two dispense containers.

Mode 3: Serial Dilution – This mode performs a serial dilution across one or two assay containers. The dilution operation can be programmed to include varying degrees of mix cycles, volumes and row designations.

Mode 4: Sample Dispense / Transfer – This mode transfers test samples from a sample container to a destination container, changing tips between each transfer. Source and destination columns can be individually selected for each transfer. Use this feature for plate-to-plate replication.

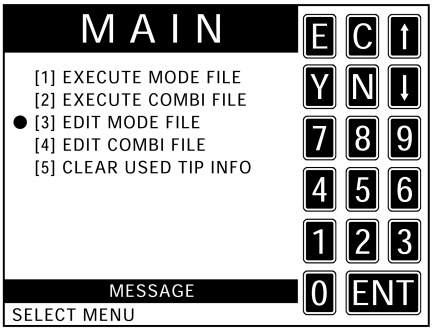
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5.3 FILE CREATION

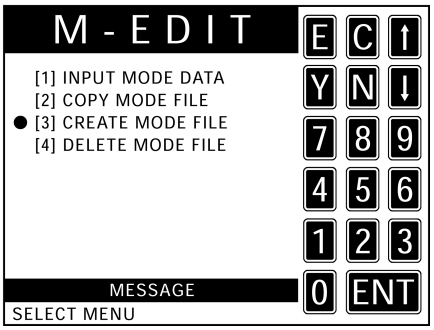
5.3.1 Creating a Mode File (The "data container")

Create Mode File Procedure

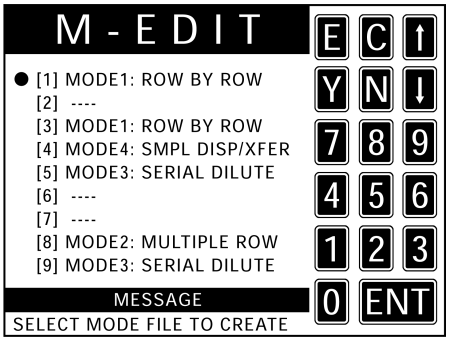
a. From the MAIN MENU, move the cursor with the ⇑⇓ keys to "[3], Edit A Mode File" then touch the Enter key. The EDIT screen will appear.



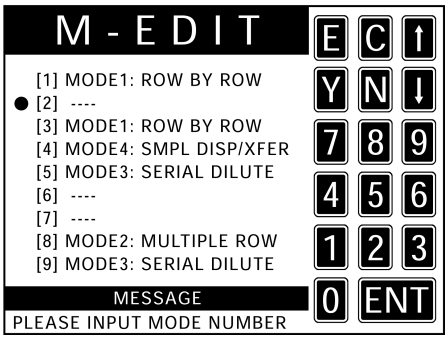
b. From the EDIT screen, select "[3] Create Mode File" and touch the Enter key.



c. Using the ⇑⇓ keys, move the cursor to an empty storage location and touch the Enter key. The screen will prompt you to select a mode file to create. Over-writing is also possible at this point.



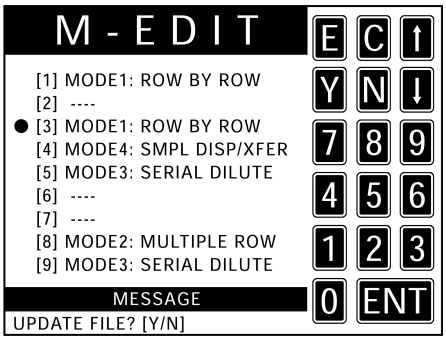
d. Enter a mode number from 1 to 4. (Refer to Section 4.3 for an explanation of modes.) Touch the Enter key. The default is "1: Row by Row."



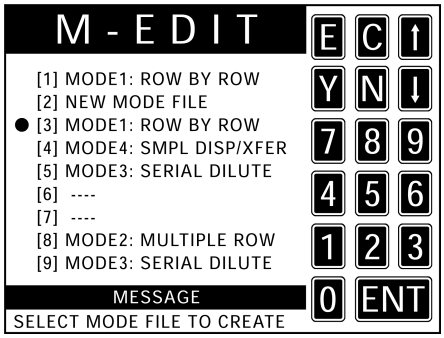
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Create Mode File Procedure

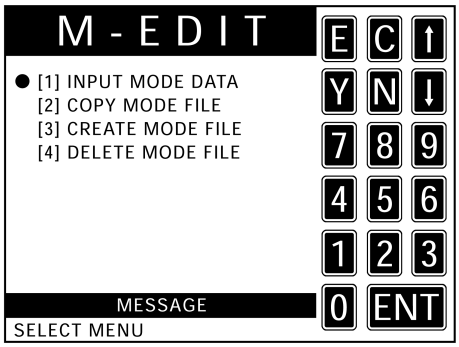
a. At the screen message, “Update file? Y/N,” confirm your mode selection, by pressing the Yes key. To change mode selection, press the No key.



b. Verify that your new selection has been added to the menu.



c. If the new file is complete, touch the Enter key to escape and return to the Main-Edit screen. If it is incomplete, continue as in previous steps, adding new mode files to empty storage locations.



The operation is complete. At this point, you have created the "data container" into which you will put the file information. See Section 5.3.2, Editing a Mode File, to begin entering your data.

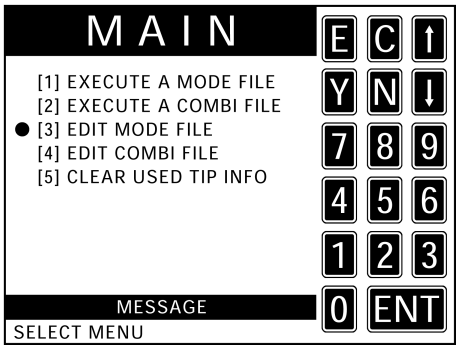
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5.3.2 Editing a Mode File

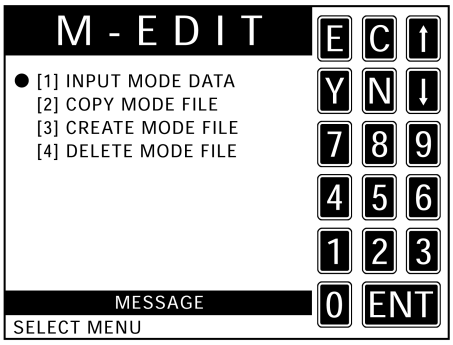
This section describes adjusting and/or entering the program data into your newly created "data container." If you are editing a previously written program, start from the Main Menu and choose the Edit Mode File option, or continue here from your work in Section 5.3.1.

Mode Data Input

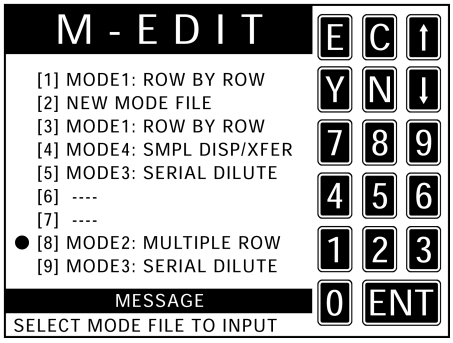
a. From the Main Menu, move the cursor with the ⇑⇓ keys to "[3] Edit Mode File" then touch the Enter key. The Edit screen will appear.



b. From the EDIT screen, move the cursor to "[1] Input Mode Data" and touch the Enter key.



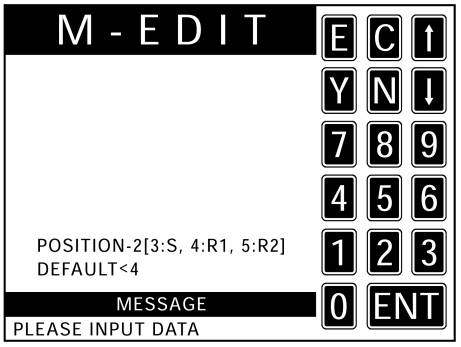
c. Using the ⇑⇓ keys, move the cursor to the file you wish to edit. Touch the Enter key.



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Mode Data Input

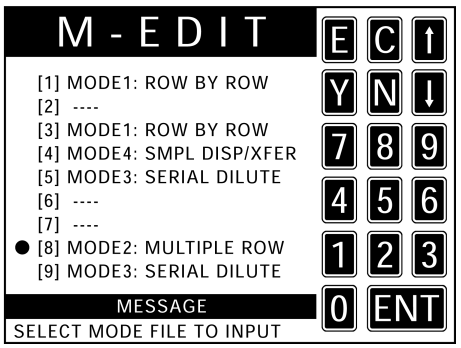
d. Now the input dialog begins. Please refer to Sections 5.3.2.1 to 5.3.2.4 for data input sequences, options and input samples.



Note: Several steps separate this step (d) from the next step (e).

e. After completing all required input, screen will display the message "Save file? [Y/N]"

f. Select “Yes” and the file will be saved. You will be returned to the EDIT screen.



The mode data has been entered, and the file is complete and stored.

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5.3.2.1 Mode Data Sequences

All of the screens and displays you will encounter when you input data for **a mode sequence** have been compiled in this chart. Remember, each mode performs simple dispense of reagent into 1 or 2 microplates or sets of sample preservation microtubes simultaneously. Use this as a template to help you edit or input your mode file. Refer to Section 1.2 for explanations of abbreviations or terminology used herein. Touch the Enter key (ENT) to confirm all selections.

Mode 1: Row by Row Dispense Sequence

Step #	Screen Message	Data Requested	Explanation
1.	TIP? (1:96M, 2:96S, 3:384S)	Select a number from 1 to 3	Designates the *tip size* to be used. Tip sizes are: 1:96M = 96-well tips, medium 2:96S = 96-well tips, small 3:384S = 384-well tips, small
2.	RETURN TIPS TO RACK? (Y/N)	Select Yes or No.	If **Yes**, returns the tips back to the tip rack. If **No**, ejects the tips in the Waste Box.
3.	NO. OF CHANNELS? (8/12 OR 16/24)	Select number 8, 12, 16 or 24 (depending on nozzle assembly type).	Designates the *number of channels* (nozzles) to be used. If 8 channels are selected, microplates and tip rack should be oriented sideways, facing front. If using 12 channels, orient lengthwise.
4.	POS. 2? (6:D96*, 9:R1, 10:R2) (Option 6 available only if using 12 ch. head and deep well block on position 2)	Select 6*, 9, or 10	Designates the *container type* to be placed in position 2. Container types are: 6:D96 = Deep-well block, 96 ch* 9:R1 = Reservoir, 4-chamber 10:R2 = Reservoir, 2-chamber

* Not available if 384 tips selected in Step 1.

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Mode 1: Row by Row Dispense Sequence

Step #	Screen Message	Data Requested	Explanation
5.	POS. 3? (5:P96, 6:D96, 7:P384**)	Select number 5, 6, or 7**.	Designates the *container type* to be placed in position 3: 5:P96 = Microtiter plate, 96 ch. 6:D96 = Deep well block, 96 ch. 7:P384=Microtiter plate,384 ch**
6.	POS. 4? (5:P96, 6:D96, 7:P384**)	Select number 5, 6, or 7**.	Designates the *container type* to be placed in position 4: 5:P96 = Microtiter plate,96 ch. 6:D96 = Deep well block,96 ch. 7:P384=Microtiter plate,384 ch**
7.	PISTON SPEED? (1-5)	Select numbers 1 to 5.	Designates the speed of the piston during aspiration or dispense steps. 1 is fastest 5 is slowest
8.	NOZZLE RISING SPEED (1-5)	Select numbers 1 to 5.	Designates the speed of the nozzle. 1 is fastest 5 is slowest
9.	ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after aspiration.
10.	DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after dispense.
11.	MIX ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix aspiration.
12.	MIX DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix dispense.
13.	ASP POSITION? (2-4)	Enter aspiration position, 2, 3, or 4	Designates the stage position where the aspiration will occur.

**Available if 384 tips selected in Step 1.

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Mode 1: Row by Row Dispense Sequence

Step #	Screen Message	Data Requested	Explanation
14.	ASP RSVR TRAY? (0, 1; 0-3) (Designates which reservoir location to use) OR (If Option 6 selected in Step 4)	Enter the well position for the reservoir tray, 0 to 3.	Designates the well position for the reservoir tray: 0 = reservoir well 0 1 = reservoir well 1 2 = reservoir well 2 3 = reservoir well 3
	ASP WELL NO.? (1-8) (Designates which row to use)	Enter the row position for the deep well plate, 1 to 8.	Designates which row position to use for the deep well plate. **Note:** Uses 12 channel orientation only.
15.	LIQUID LVL SENSING? (Y/N) (Available only if reservoir is used)	Select Yes or No.	If **Yes** during aspiration, the *pressure sensor* will automatically detect the liquid surface in a reservoir. Skip next step (ASP height), it is not needed with the liquid level sensor. If **No** during aspiration, continue to step 15b to set aspiration height for reservoir.
15b.	ASP HEIGHT? (mm)	Enter a number from 1 to 9999 (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	When aspirating liquid, this sets the distance the tip will descend from upper edge of container. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm) **Note:** This step is not needed if liquid level sensing is on.
16.	AIR BLOWOUT VOLUME? (µL)	Enter a volume from 0–70µL (for 220µL heads) from 0–7µL (for 30µL heads)	Designates amount of air to intake *before aspirating* the liquid. This air volume is expelled following the dispense to blowout all aspirated liquid.

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Mode 1: Row by Row Dispense Sequence

Step #	Screen Message	Data Requested	Explanation
17.	POST ASP AIRGAP? (0-5; 0-3)	Enter a volume from 0 to 5µL. (for 220µL heads) from 0–3µL (for 30µL heads)	Designates amount of air drawn in *after aspiration*, ensuring no liquid leaks during tip movement.
18.	MIX CYCLES AT ASP? (0-20)	Select a number from 0 to 20.	Sets the *number of mix cycles* needed prior to aspiration. 0 = No mixing 1-10 = Mixes all wells of source containers 11-20 = Stirs *only first row* of wells in each source container. **Note:** In this case, the actual mix cycles will be the number entered MINUS 10. For example, if you enter 15, the wells in the first row will be mixed only 5 times.
18b	MIX VOLUME AT ASP? (µL)	Enter a volume from 5 to 220µl or 0.1 to 30µl, depending on nozzle type.	Sets the mix volume used prior to aspiration.
19.	TIP-TOUCH AT ASP? (Y/N)	Select Yes or No.	Executes *tip touch* to sidewall of container after aspiration to remove residual liquid.
20.	MIX CYCLES AT DISP? (0-10)	Select a number from 0 to 10.	In dispense destination container, this sets number of mix cycles to occur *after dispensing*. 0 = None 1 – 10 = Each time
20b	MIX VOLUME AT DISP? (0.0)	Enter a volume from 5 to 220µl or 0.1 to 30µl, depending on nozzle type.	Sets the mix volume used after dispense.
21.	TIP-TOUCH AT DISP? (Y/N)	Select Yes or No.	Executes tip touch to side wall of container *after dispense* to remove residual liquid.

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Mode 1: Row by Row Dispense Sequence

Step #	Screen Message	Data Requested	Explanation
22.	NO. OF ASSAY POS.? (1-2)	Select 1 or 2.	Designates the *quantity* of dispense destination containers (assay plates).
23.	ASSAY-1 DISP POS.? (3-4)	Select position 3 or 4.	Designates the *position of the* first dispense container (assay plate).
24.	DISP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	Designates *tip height* for dispensing. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm)
25.	(ASSAY PLATE 1:) WELL - 1 DISP VOL.? (µL)	Select 0 or a volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	Sets the *dispensing volume* for the first row of wells used for dispensing. If you select 0, no dispensing will occur in that row.

Repeat previous step for each subsequent row of Assay Plate 1.

Note: If you selected two assay positions in step 22, continue to the next step; otherwise, go to step 30.

26.	ASSAY-2 DISP POS.? (2-4) (Depends on the next available position)	Select a number from 2 to 4.	Designates the *position number* of the second dispense container. **Note:** If the reservoir is used, only positions 3 and 4 will be available.
27.	REPT USE SAME TIPS? (Y/N)	Select Yes or No.	**Yes** continues the use of same tips as for the first assay position. To change tips between dispense operations, choose **No**.
28.	DISP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	Designates *tip height* for dispense. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm)

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Mode 1: Row by Row Dispense Sequence

Step #	Screen Message	Data Requested	Explanation
29.	(ASSAY PLATE 2:) WELL-1 DISP VOL.? (µL)	Select 0 or a volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	Designates *dispensing volume* for the first row of wells in the *second* dispensing operation. If you select 0, dispensing will not occur in that row.
	Repeat this step for each subsequent row of Assay Plate 2.		
30.	SHAKING SEC? (0-3600)	Select a length of time from 0 to 3600 seconds.	Sets microplate *shaking duration*. Shaking station is located on Position 4 only.
31.	USED TIPS IN NEXT MODE? (Y/N)	Select Yes or No.	If this mode file will be executed as part of a combination file, select **Yes** to continue using same tips. Select **No** to change tips between modes.

After the last step, return to Section 5.3.2, *Editing a Mode File*, to save the file.

> IMPORTANT!
>
> To complete and save this data, return to page 58 (Section 5.3.2, step “e”) and perform the remaining data input steps.

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5.3.2.2 Mode 2: Multiple Row Dispense

All of the screens and displays you will encounter when you input data for **Mode 2: Multiple Row Dispense** have been compiled in this chart. Remember, this mode performs a series of dispense operations. With one aspiration it can dispense reagent into 1 or 2 microplates or sample preservation microtubes. Use this as a template to help you edit or input your mode file. Refer to Section 1.2 for explanations of abbreviations used herein. Touch the Enter key (ENT) to confirm all selections.

Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
1.	TIP? (1:96M, 2:96S, 3:384S)	Select a number from 1 to 3	Designates the *tip size* to be used. Tip sizes are: 1:96M = 96-well tips, medium 2:96S = 96-well tips, small 3:384S = 384-well tips, small
2.	RETURN TIPS TO RACK? (Y/N)	Select Yes or No.	If **Yes**, returns the tips back to the tip rack. If **No**, ejects the tips in the Waste Box.
3.	NO. OF CHANNELS? (8/12 OR 16/24)	Select number 8, 12, 16 or 24 (depending on nozzle assembly type).	Designates the *number of channels* (nozzles) to be used. If 8 channels are selected, microplates & tip rack should be oriented sideways, facing front. If using 12 channels, orient lengthwise.
4.	POS. 2? (6:D96*, 9:R1, 10:R2) (Option 6 available only if using 12 ch. head and deep well block on position 2)	Select 6*, 9, or 10	Designates the *container type* to be placed in position 2. Container types are: 6:D96 = Deep-well block, 96 ch* 9:R1 = Reservoir, 4-chamber 10:R2 = Reservoir, 2-chamber
5.	POS. 3? (5:P96, 6:D96, 7:P384**)	Select number 5, 6, , or 7**.	Designates the *container type* to be placed in position 3: 5:P96 = Microtiter plate, 96 ch 6:D96 = Deep well block, 96 ch. 7:P384= Microtiter plate, 384 ch.**

* Not available if 384 tips selected in Step 1.

**Available if 384 tips selected in Step 1.

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Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
6.	POS. 4? (5:P96, 6:D96 7:P384**)	Select number 5, 6, or 7**.	Designates the *container type* to be placed in position 4: 5:P96 = Microtiter plate, 96 ch 6:D96 = Deep well block, 96 ch. 7:P384= Microtiter plate, 384 ch.**
7.	PISTON SPEED? (1-5)	Select numbers 1 to 5.	Designates the speed of the piston during aspiration or dispense steps. 1 is fastest 5 is slowest
8.	NOZZLE RISING SPEED (1-5)	Select numbers 1 to 5.	Designates the speed of the nozzle. 1 is fastest 5 is slowest
9.	ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after aspiration.
10.	DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after dispense.
11.	MIX ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix aspiration.
12.	MIX DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix dispense.
13.	ASP POSITION? (2-4)	Enter aspiration position, 2, 3, or 4	Designates the plate position during aspiration.
14.	ASP RSVR TRAY? (0, 1; 0-3) (Designates which reservoir location to use) OR (If Option 6 selected in Step 4)	Enter the well position for the reservoir tray, 0 to 3.	Designates the well position for the reservoir tray: 0 = reservoir well 0 1 = reservoir well 1 2 = reservoir well 2 3 = reservoir well 3

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Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
	ASP WELL NO.? (1-8) (Designates which row to use)	Enter the row position for the deep well plate, 1 to 8.	Designates which row position to use for the deep well plate. **Note:** Uses 12 channel orientation only.
15.	LIQUID LVL SENSING? (Y/N) (Available only if reservoir is used.)	Select Yes or No.	If **Yes** during aspiration, the *pressure sensor* will automatically detect the liquid surface in a reservoir. Skip next step (ASP height), it is not needed with the liquid level sensor. If **No** during aspiration, continue to step 15b to set aspiration height for reservoir.
15b	ASP HEIGHT? (mm)	Enter a number from 1 to 9999 (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	When aspirating liquid, this sets the *distance* the tip will descend from upper edge of container. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm) **Note:** This step is not needed if liquid level sensing is on.
16.	AIR BLOWOUT VOLUME? (µL)	Enter a volume from 0–70µl (for 220µl heads) from 0–7µl (for 30µl heads)	Designates *amount of air to intake* before aspirating the liquid. This air volume is expelled following the dispense to blow out all aspirated liquid.
17.	POST ASP AIRGAP? (0-5; 0-3)	Enter a volume from 0 to 5µl (for 220µl heads) from 0–3µl (for 30µl heads)	Designates *amount of air drawn in after aspiration* ensuring no liquid leaks during tip movement.

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Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
18.	MIX CYCLES AT ASP? (0-20)	Select a number from 0 to 20.	Sets the *number of mix cycles* needed prior to aspiration. 0 = No mixing 1-10 = Mixes all wells of source containers 11-20 = Stirs *only first row* of wells in each source container. **Note:** In this case, the actual mix cycles will be the number entered MINUS 10. For example, if you enter 15, the wells in the first row will be mixed only 5 times.
18b	MIX VOL. AT ASP? (µL)	Enter a volume from 5 to 220µl or 0.1 to 30µl, depending on nozzle type.	Sets the mix volume used prior to aspiration.
19.	TIP-TOUCH AT ASP? (Y/N)	Select Yes or No.	Executes *tip touch* to side wall of container after aspiration to remove residual liquid.
20.	NO. OF ASSAY POS.? (1-2)	Select number 1 or 2.	Designates the *number* of dispense destination containers (assay plates).
21.	ASSAY-1 DISP POS.? (3-4)	Select position 3 or 4.	Designates the *position of the* first dispense container (assay plate).
22.	1ST ASP VOLUME? (µL)	Enter an aspiration volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	Designates the *aspiration volume* for the first dispense container.
23.	INC. DISP VOLUME? (µL)	Enter a dispense volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	Designates the incremental dispense volume.

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Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
24.	DISP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	Designates *tip height* for dispense. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm)
25.	TIP-TOUCH AT DISP? (Y/N)	Select Yes or No.	Executes *tip touch* to side wall of container after dispense to remove residual liquid.
26.	WELL TO START DISP? (1-8), (1-12), (1-16), OR (1-24)	Select a number from 1–8 or 12 (for 8/12 nozzle) or 1–16 or 24 (for 16/24 nozzle)	Designates *location of the first row of* wells in the first series of dispense operations; which will continue to the *right* of that designated first row of wells.
27.	WELL TO END DISP? (-8), (-12), (-16), OR (-24)	Select a number from 1–8 or 12 (for 8/12 nozzle) or 1–16 or 24 (for 16/24 nozzle)	Designates *location of the last row of* wells in the first series of dispense operations.
28.	DISP WASTE TO RSVR? (Y/N) **Note:** To avoid contamination, purge tips (N).	Select Yes or No.	If **Yes**, the liquid remaining in tips will be discharged into designated reservoir when processing of the microplate or other container is complete. If **No**, the liquid will be discarded *along with the tips*.
29.	RSVR TRAY FOR WASTE? (0-3) (Only if reservoir selected in step 4)	Select a number from 0 to 3.	If liquid is to be kept, this step designates the *reservoir* into which liquid will be dispensed.
30.	ASSAY-2 DISP POS.? (3-4)	Select Position 3 or 4.	Designates the *position of the* second dispense container.
31.	REPT USE SAME TIPS? (Y/N)	Select Yes or No.	"Yes" continues use of same tips as for first dispense container. To change tips, select "No."

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Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
32.	1ST ASP VOLUME? (µL)	Enter an aspiration volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	Designates the *aspiration volume* for the first dispense container.
33.	INC. DISP VOLUME? (µL)	Enter a dispense volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	Designates the incremental dispense volume.
34.	DISP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	Designates *tip height* for dispense. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm)
35.	TIP-TOUCH AT DISP? (Y/N)	Select Yes or No.	Executes *tip touch* to side wall of container after dispense to remove residual liquid.
36.	WELL TO START DISP? (1-8), (1-12), (1-16), OR (1-24)	Select a number from 1–8 or 12 (for 8/12 nozzle) or 1–16 or 24 (for 16/24 nozzle)	Designates *location of the first row of* wells in the first series of dispense operations; which will continue to the *right* of that designated first row of wells.
37.	WELL TO END DISP? (-8), (-12), (-16), OR (-24)	Select a number from 1–8 or 12 (for 8/12 nozzle) or 1–16 or 24 (for 16/24 nozzle)	Designates *location of the last row of* wells in the first series of dispense operations.
38.	DISP WASTE TO RSVR? (Y/N)	Select Yes or No.	If "Yes," the liquid remaining in tips will be discharged into designated reservoir when processing of the microplate or other container is complete. If "No," the liquid will be discarded *along with the tips*.

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Mode 2: Multiple Row Dispense

Step #	Screen Message	Data Requested	Explanation
39.	RSVR TRAY FOR WASTE? (0-3)	Select a number from 0 to 3.	If liquid is to be kept, this designates the *reservoir* into which liquid will be dispensed.
40.	SHAKING SEC? (0-3600)	Select a length of time from 0 to 3600 seconds.	Sets microplate *shaking duration*. Shaking station is located on Position 4 only.
41.	USED TIPS IN NEXT MODE? (Y/N)	Select Yes or No.	If this mode file will be executed as part of part of a Combination File, select "Yes" to continue using same tips. Select "No" to change tips between modes.

After the last step, return to Section 5.3.2, *Editing a Mode File*, to save the file.

> IMPORTANT!
>
> To complete and save this data, return to page 50 (Section 5.3.2, step “e”) and perform the remaining data input steps.

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5.3.2.3 Mode 3: Serial Dilution

All of the screens and displays you will encounter when you input data for **Mode 3: Serial Dilution** have been compiled in this chart. Remember this mode performs your designated number of dilution operations in the order you designate and in the amount you specify. Use this as a template to help you input your mode file. Refer to Section 1.2 for explanations of abbreviations or terminology used herein. Touch the Enter Key (ENT) to confirm all selections.

Mode 3: Serial Dilution

Step #	Screen Message	Data Requested	Explanation
1.	TIP? (1:96M, 2:96S, 3:384S)	Select a number from 1 to 3	Designates the *tip size* to be used. Tip sizes are: 1:96M = 96-well tips, medium 2:96S = 96-well tips, small 3:384S = 384-well tips, small
2.	RETURN TIPS TO RACK? (Y/N)	Select Yes or No.	If Yes, returns the tips back to the tip rack. If No, ejects the tips in the Waste Box.
3.	NO. OF CHANNELS? (8/12 OR 16/24)	Select number 8, 12, 16 or 24 (depending on nozzle assembly type).	Designates the *number of channels* (nozzles) to be used. If 8 channels are selected, microplates & tip rack should be oriented sideways, facing front. If using 12 channels, orient lengthwise.
4.	POS. 2? (6:D96*, 9:R1, 10:R2) (Option 6 available only if using 12 ch. head and deep well block on position 2)	Select 6*, 9, or 10	Designates the *container type* to be placed in position 2. Container types are: 6:D96 = Deep-well block, 96 ch* 9:R1 = Reservoir, 4-chamber 10:R2 = Reservoir, 2-chamber
5.	POS. 3? (5:P96, 6:D96)	Select number 5 or 6.	Designates the *container type* to be placed in position 3: 5:P96 6:D96

* Not available if 384 tips selected in Step 1.

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Mode 3: *Serial Dilution*

Step #	Screen Message	Data Requested	Explanation
6.	POS. 4? (5:P96, 6:D96, 7:P384**)	Select number 5, 6, or 7**.	Designates the *container type* to be placed in position 4: 5:P96 = Microtiter plate,96 ch. 6:D96 = Deep well block,96 ch. 7:P384=Microtiter plate,384 ch**
7.	PISTON SPEED? (1-5)	Select numbers 1 to 5.	Designates the speed of the piston during aspiration or dispense steps. 1 is fastest 5 is slowest
8.	NOZZLE RISING SPEED (1-5)	Select numbers 1 to 5.	Designates the speed of the nozzle. 1 is fastest 5 is slowest
9.	ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after aspiration.
10.	DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after dispense.
11.	MIX ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix aspiration.
12.	MIX DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix dispense.
13.	AIR BLOWOUT VOLUME? (µL)	Enter a volume from 0–70µL (for 220µL heads) from 0–7µL (for 30µL heads)	Designates amount of air to intake *before aspirating* the liquid. This air volume is expelled following the dispense to blowout all aspirated liquid.
14.	POST ASP AIRGAP? (0-5; 0-3)	Enter a volume from 0 to 5µL. (for 220µL heads) from 0–3µL (for 30µL heads)	Designates amount of air drawn in *after aspiration* ensuring no liquid leaks during tip movement.
15.	ASP POSITION? (2-4)	Enter aspiration position, 2, 3, or 4	Designates the plate position during aspiration.

**Available if 384 tips selected in Step 1.

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Mode 3: Serial Dilution

Step #	Screen Message	Data Requested	Explanation
16.	NO. OF ASSAY POS? (1-2)	Select 1 or 2.	Designates the *quantity* of dispense destination containers (assay plates).
17.	ASSAY-1 ASP TRAY OR WELL (0-3)	Select position: 0 to 3 (reservoir) 1 - 8/12 (plate) 1 - 16/24 (plate)	Designates the *position of the* first aspiration container (assay plates or reservoir). If assay plate selected in step 15, select positions 1-8 or 12, or position 1-16 or 24
18.	LIQUID LVL SENSING? (Y/N) (Available only if reservoir is used.)	Select Yes or No.	If **Yes** during aspiration, the *pressure sensor* will automatically detect the liquid surface in a reservoir. Skip next step (ASP height), it is not needed with the liquid level sensor. If **No** during aspiration, continue to step 15b to set aspiration height for reservoir.
18b.	ASP HEIGHT? (mm)	Enter a number from 1 to 9999 (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	When aspirating liquid, this sets the distance the tip will descend from upper edge of container. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm) **Note:** This step is not needed if liquid level sensing is on.
19.	MIX CYCLES AT ASP? (0-20)	Select a number from 0 to 20.	Sets the *number of mix cycles* needed prior to aspiration. 0 = No mixing 1-10 = Mixes all wells of source containers 11-20 = Stirs *only first row* of wells in each source container. **Note:** In this case, the actual mix cycles will be the number entered MINUS 10. For example, if you enter 15, the wells in the first row will be mixed only 5 times.

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Mode 3: *Serial Dilution*

Step #	Screen Message	Data Requested	Explanation
19b	MIX VOL. AT ASP? (µL)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Sets the mix volume used prior to aspiration.
20.	ASSAY-1 ASP VOLUME (µL)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Designates the aspiration volume for the first sample container.
21.	TIP-TOUCH AT ASP? (Y/N)	Select Yes or No.	Executes *tip touch* to side wall of container after aspiration to remove residual liquid.
22.	ASSAY-1 DISP POS.? (3-4)	Select position 3 or 4.	Designates the *position of the* first dispense container.
23.	MIX CYCLES AT ASSAY? (0-10)	Select a number from 0 to 10.	Sets the *number of mix cycles* needed after dispense. 0 = No mixing 1-10 = Mixes all wells of source containers 11-20 = Stirs *only first row* of wells in each source container. **Note:** In this case, the actual mix cycles will be the number entered MINUS 10. For example, if you enter 15, the wells in the first row will be mixed only 5 times.
24.	MIX VOLUME AT ASSAY? (µL)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Sets the mix volume used prior to dispense.
25.	ASSAY DISP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	Designates the *tip height* for dispensing. Example: MTP <100 (from top surface DWP <400 of plate, tip moves down xx mm)

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Mode 3: *Serial Dilution*

Step #	Screen Message	Data Requested	Explanation
26.	ASSAY ASP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	When aspirating liquid this sets the *distance the tip will descend* from the upper edge of the container. Example: MTP <100 (from top surface DWP <400 of plate, tip moves down xx mm)
27.	VOLUME TO NEXT WELL? (µL)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Selects the *volume of liquid* to be carried to the next row of wells in the dilution series.
28.	TIP-TOUCH AT ASSAY? (Y/N)	Select Yes or No.	Executes *tip touch* to side wall of container after aspiration to remove residual liquid.
29.	WELL TO START ASSAY? (1-8)	Select a number from 1 to 8 (for 8/12 nozzle) from 1 to 16 (for 16/24 nozzle)	Designates *location of the first row of* wells in the first series of dispense operations; which will continue to the *right* of that designated first row of wells.
30.	WELL TO END ASSAY? (-8), (-12), (-16), OR (-24)	Select a number from 1 to 8 (for 8/12 nozzle) from 1 to16 (for 16/24 nozzle)	Designates *location of the last row of* wells in the first series of dispense operations.
31.	PURGE VOLUME? (µL)	Select 0 or volume from 5 to 220µl or 0.1 to 30µl (depending on nozzle assembly type).	This refers to the amount of liquid to be removed from the last row in a dilution series. If the *same volume of liquid* is desired in each well, input that number here, as in the previous step. If a different amount is desired, change the volume now.
32.	DISP WASTE TO RSVR? (Y/N)	Select Yes or No.	If **Yes**, the liquid remaining in tips will be discharged into designated reservoir when processing of the microplate or other container is complete. If **No**, the liquid will be discarded *along with the tips*.
33.	RSVR TRAY FOR WASTE? (0-3)	Select a number from 0 to 3.	If liquid is to be kept, this designates the *reservoir* into which liquid will be dispensed.

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Mode 3: *Serial Dilution*

Step #	Screen Message	Data Requested	Explanation
Repeat steps 17 to 33 for next assay position.			
34.	SHAKING SEC? (0-3600)	Select a length of time from 0 to 3600 seconds.	Sets microplate *shaking duration*. Shaking station is located on Position 4 only.
35.	USED TIPS IN NEXT MODE? (Y/N)	Select Yes or No.	If this mode file will be executed as part of part of a Combination File, select **Yes** to continue using same tips. Select **No** to change tips between modes.

After the last step, return to Section 5.3.2, Editing a Mode File, to save the file.

> IMPORTANT!
>
> To complete and save this data, return to page 50 (Section 5.3.2, step “e”) and perform the remaining data input steps.

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5.3.2.4 Mode 4: Sample Dispense / Transfer

All of the screens and displays you will encounter when you input data for **Mode 4: Sample Dispense/Transfer** have been compiled in this chart. Remember this mode transfers test samples from a microplate or sample preservation microtube to a microplate or sample preservation microtube *on the assay side*. Use it as a template to help you edit or input your mode file. Refer to Section 1.2 for explanations of abbreviations used herein. Touch the Enter key (ENT) to confirm all selections.

Mode 4: Sample Dispense / Transfer

Step #	Screen Message	Data Requested	Explanation
1.	TIP? (1:96M, 2:96S, 3:384S)	Select a number from 1 to 3	Designates the *tip size* to be used. Tip sizes are: 1:96M = 96-well tips, medium 2:96S = 96-well tips, small 3:384S = 384-well tips, small
2.	RETURN TIPS TO RACK? (Y/N)	Select Yes or No.	If **Yes**, returns the tips back to the tip rack. If **No**, ejects the tips in the Waste Box.
3.	NO. OF CHANNELS? (8/12 OR 16/24)	Select number 8, 12, 16 or 24 (depending on nozzle assembly type).	Designates the *number of channels* (nozzles) to be used. If 8 channels are selected, microplates & tip rack should be oriented sideways, facing front. If using 12 channels, orient lengthwise.
4.	POS. 2? (6:D96*, 9:R1, 10:R2) (Option 6 available only if using 12 ch. head and deep well block on position 2)	Select 6*, 9, or 10	Designates the *container type* to be placed in position 2. Container types are: 6:D96 = Deep-well block, 96 ch* 9:R1 = Reservoir, 4-chamber 10:R2 = Reservoir, 2-chamber
5.	POS. 3? (5:P96, 6:D96, 7:P384**)	Select number 5 or 6, or 7**.	Designates the *container type* to be placed in position 3: 5:P96 = Microtiter plate, 96 ch. 6:D96 = Deep well block, 96 ch. 7:P384=Microtiter plate, 384 ch**

* Not available if 384 tips selected in Step 1.
**Available if 384 tips selected in Step 1.

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Mode 4: *Sample Dispense / Transfer*

Step #	Screen Message	Data Requested	Explanation
6.	POS. 4? (5:P96, 6:D96, 7:P384**)	Select number 5, 6, or 7**.	Designates the *container type* to be placed in position 4: 5:P96 = Microtiter plate, 96 ch. 6:D96 = Deep well block, 96 ch. 7:P384=Microtiter plate, 384 ch**
7.	PISTON SPEED? (1-5)	Select numbers 1 to 5.	Designates the speed of the piston during aspiration or dispense steps. 1 is fastest 5 is slowest
8.	NOZZLE RISING SPEED (1-5)	Select numbers 1 to 5.	Designates the speed of the nozzle. 1 is fastest 5 is slowest
9.	ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after aspiration.
10.	DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after dispense.
11.	MIX ASP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix aspiration.
12.	MIX DISP DELAY TIME? (sec.)	Enter the time in seconds.	Designates the delay time after mix dispense.
13.	ASP POSITION? (3-4)	Enter aspiration position 3 or 4	Designates the plate position during aspiration.
14.	ASP HEIGHT? (mm)	Enter a number from 1 to 9999 (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	When aspirating liquid, this sets the distance the tip will descend from upper edge of container. Example: MTP <100 (from top surface of DWP <400 reservoir, tip moves down xx mm) **Note:** This step is not needed if liquid level sensing is on.

**Available if 384 tips selected in Step 1.

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Mode 4: *Sample Dispense / Transfer*

Step #	Screen Message	Data Requested	Explanation
15.	AIR BLOWOUT VOLUME? (µL)	Enter a volume from 0 to 70µL (for 220µL heads) from 0 to 7µL (for 30µL heads)	Designates *amount of air to intake* before aspirating the liquid. This air volume is expelled following the dispense to blow out all aspirated liquid.
16.	POST ASP AIRGAP? (0-5; 0-3)	Enter a volume from 0 to 5µL. (for 220µL heads) from 0 to 3µL (for 30µL heads)	Designates *amount of air drawn in after aspiration* ensuring no liquid leaks during tip movement.
17.	MIX CYCLES AT ASP? (0-20)	Select a number from 0 to 20.	Sets the *number of mix cycles* needed prior to aspiration. 0 = No mixing 1-10 = Mixes all wells of source containers 11-20 = Stirs *only first row* of wells in each source container. **Note:** In this case, the actual mix cycles will be the number entered MINUS 10. For example, if you enter 15, the wells in the first row will be mixed only 5 times.
17b	MIX VOL. AT ASP? (µL)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Sets the mix volume used prior to aspiration.
18.	TIP-TOUCH AT ASP? (Y/N)	Select Yes or No.	Executes *tip touch* to side wall of container after aspiration to remove residual liquid.
19.	DISP POSITION? (3-4)	Select a number from 3 to 4.	Designates the position of the dispense container.
20.	DISP HEIGHT? (mm)	Select a number from 0 to 9999. (1 = 0.1 mm) Example: 100 = 10mm 400 = 40mm	Designates *tip height* for dispense. Example: MTP <100 (from top surface DWP <400 of plate, tip moves down xx mm)

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Mode 4: *Sample Dispense / Transfer*

Step #	Screen Message	Data Requested	Explanation
21.	MIX CYCLES AT DISP? (0-10)	Select a number from 0 to 10.	In dispense destination container, this sets number of mix cycles to occur *after dispensing*. 0 = None 1 – 10 = Each time
20b	MIX VOLUME AT DISP? (0.0)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Sets the mix volume used after dispense.
22.	TIP-TOUCH AT DISP? (Y/N)	Select Yes or No.	Executes tip touch to side wall of container *after dispense* to remove residual liquid.
23.	TRANSFER VOLUME? (µL)	Enter a volume from 5 to 220µL or 0.1 to 30µL, depending on nozzle type.	Designates the liquid volume to be aspirated and dispensed.
24.	WELLS TO BE DONE? (1-8)	Select a number from 1 to 12 (for 8/12 nozzle) from 1 to 24 (for 16/24 nozzle)	Designates the number of rows of wells to dispense into.
25.	1ST SAMPL COLUMN?	Select a number from 1 to 12 (for 8/12 nozzle) from 1 to 24 (for 16/24 nozzle)	Designates the first *source row* number where aspiration will occur. Use this same process to input all subsequent *source row* numbers in Steps 29-50.
26.	1ST ASSAY COLUMN?	Select a number from 1 to 12 (for 8/12 nozzle) from 1 to 24 (for 16/24 nozzle)	Designates the first *dispense row* number. Use this same process to input all subsequent *source row* numbers.

Repeat sample & and assay column data for all wells.

27.	SHAKING SEC? (0-3600)	Select a length of time from 0 to 3600 seconds.	Sets microplate *shaking duration*. Shaking station is located on Position 4 only.

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After the last step, return to Section 5.3.2, *Editing a Mode File,* to save the file.

IMPORTANT!

To complete and save this data, return to page 50 (Section 5.3.2, step “e”) and perform the remaining data input steps.

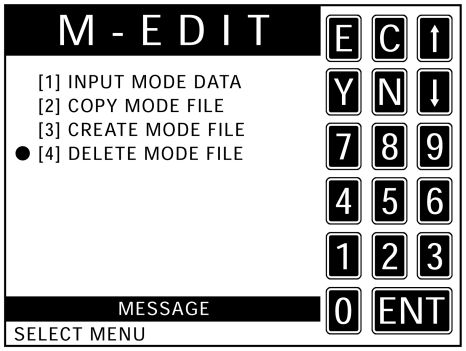
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5.3.3 Deleting a File

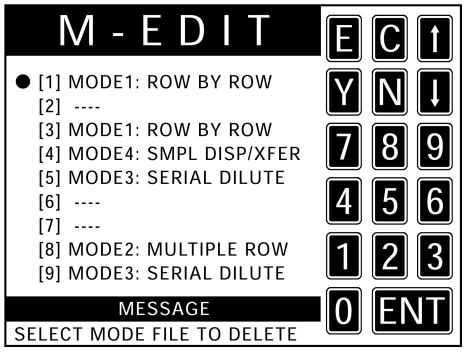
(Deleting program data from your "data container.")

a. From the Main Menu, move the cursor with the ⇑⇓ key to “Edit Mode File” and touch the Enter key.

b. From the EDIT screen, select “Delete Mode File,” and touch the Enter key.



c. Move the cursor to the file you wish to delete and touch the Enter key.



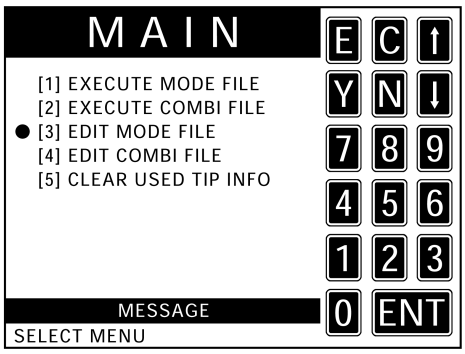
d. The message "Delete File? [Y/N]" will be displayed. Press “Y” to delete the file.

e. The deleted file will then become "unregistered" and deletion of the file is complete. See Section 5.5 for *Cautions Regarding Editing Combination Files.*

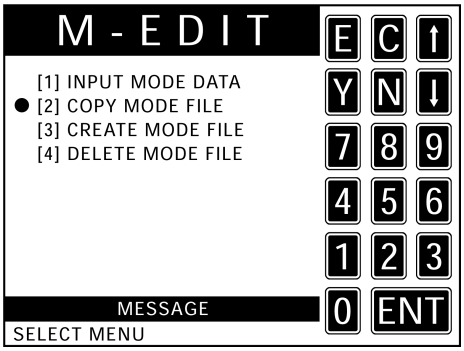
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5.3.4 Copying a File

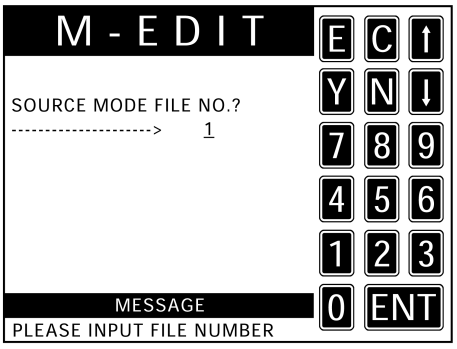
a. From the Main Menu, move the cursor with the ⇑⇓ key to select "[3] Edit Mode File" and touch the Enter Key.



b. From the Edit screen, select "[2] Copy Mode File" and touch the Enter Key.

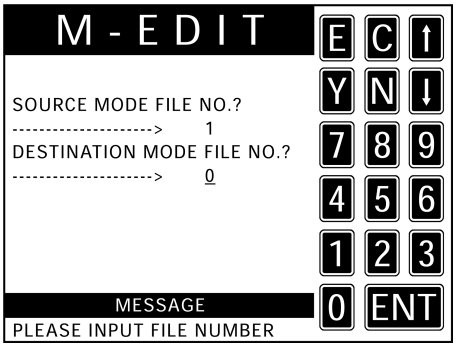


c. You will now be asked for the source file number (the file you wish to copy). Input the number and touch the Enter Key. It is important that you remember this file number!



d. You will now be asked for the number of the destination file. This is the number of the file you wish to copy the data to. Touch the Enter Key.

e. The screen will display the message "Do you want to copy? [Y/N] Touch "Y."



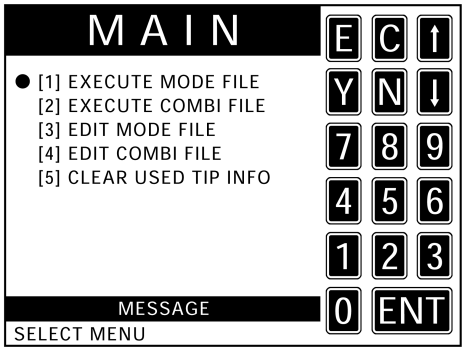
Caution: You can copy over an existing file. If you do, the new data will replace the old and the previous file will be lost.

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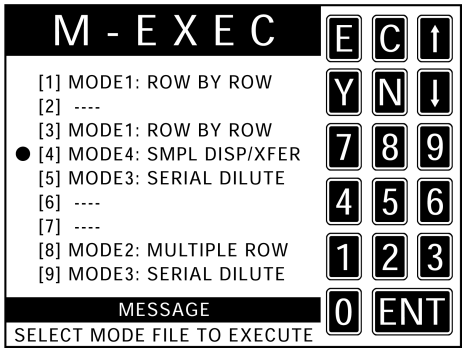
5.4 FILE EXECUTION

This operation will run an existing file to perform dispense and dilution operations.

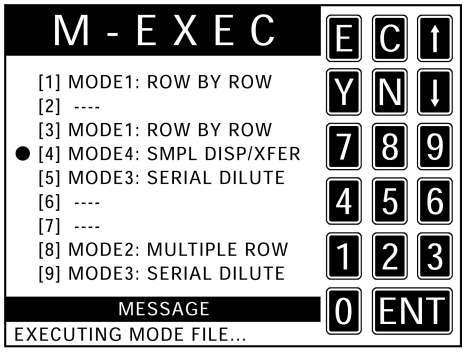
a. From the Main Menu, select "[1] Execute Mode File" and touch the Enter key.



b. Now move the cursor or press the number of the file you wish to run and touch the Enter key.



c. Once that data has been input, the screen will display the message "Executing Mode File," and the operation will begin.



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5.5 COMBINATION FILES

The ***Serial***Mate can easily create, combine, edit and delete nine (9) mode files and register those combinations in a maximum of 20 files.

Cautions when Editing Combination Files

A combination file is a group of mode files. If any of the mode files making up the combination file are deleted, the combination file will no longer function. When editing or deleting mode files be certain to confirm *in advance* that the mode file you wish to delete is not in an active combination file.

When creating combination files, the following situations will cause an error:

a. If an unregistered mode file (one for which data does not yet exist) is designated as part of a combination file.

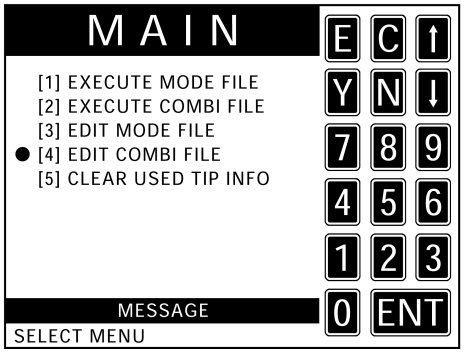
b. If the number of nozzles (channels) used by various mode files differs from file to file, i.e. one file designates the use of 8 channels and another file designates use of 12 channels.

c. If the mode files designate different containers to be used at various stages. For example, if a file designates a microplate at position 3, it cannot run in combination with a file that indicates a sample microtube in the same position. Refer to Section 4.1, *Setting and Orienting Containers.*

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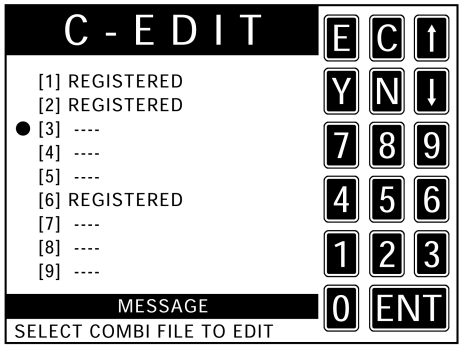
5.5.1 Creating a Combination File

a. From the Main Menu, select "[4] Edit Combination File" and touch the Enter key.

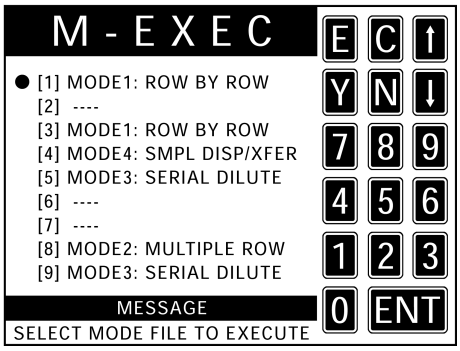


b. Now select an unregistered (empty) file number and touch the Enter key.

Note: You may also select a registered file and over-write it. Once overwritten, the original file is lost and can not be retrieved.



c. Now input the numbers associated with the mode files you wish to use in the combination file. Up to 40 mode files can be combined in one combination file.



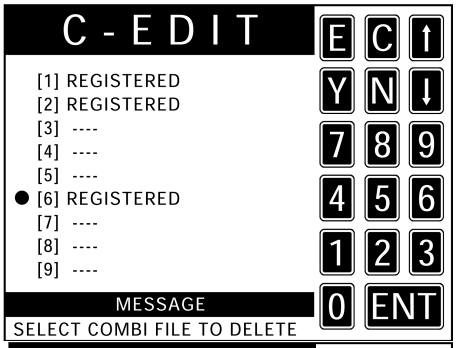
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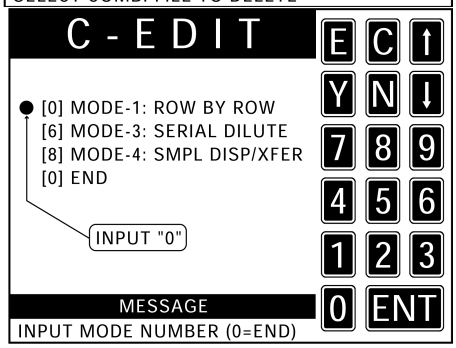
5.5.2 Deleting a Combination File

a. From the Main Menu, select “[4] Edit Combination File” and touch the Enter key. This calls up a list of registered combination files.

b. Move the cursor to the combination file you wish to delete and touch the Enter key.

c. Now move the cursor to the file at the top of the screen and touch "0" to indicate the end.





d. The screen will display the message, "Save file? [Y/N]" Touch "Y" to save.

e. When the list of registered combination files reappears, the file will have been deleted.

f. Confirm that the number of the deleted file has shifted to unregistered and the screen shows a dashed line where the file name had previously appeared.

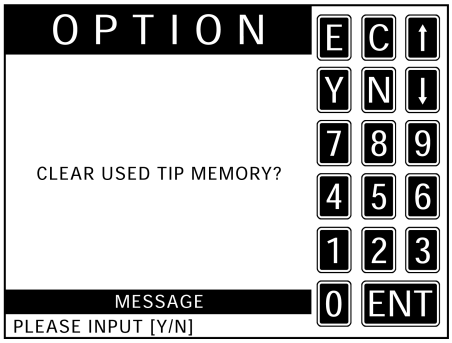
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5.6 CLEAR USED TIP MEMORY

In order to prevent contamination and to use pipet tips with greatest efficiency, the ***Serial***Mate maintains a consistent memory of information related to tip usage. Using the option "Clear Used Tip Memory" at the beginning of each operation deletes previous tip use information from memory. After using Clear Used Tip Memory, the ***Serial***Mate will begin the next operation using the first row of a new tip rack.

a. From the Main Menu, select "Clear Used Tip Memory" and touch the Enter key.

b. The screen will display the message “Clear Used Tip Memory?” Select "Y.”



c. When the Main Menu reappears, the tip initialization is complete.

Remember - when a file is run after clearing used tip memory, the tips in the *first row* (right edge) will be used.

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5.7 FOUR PRACTICE MODE OPERATIONS

The following test programs are offered as practice operations for the new operator to become familiar with the diverse capabilities and functions of the multichannel, automatic sampling system ***Serial***Mate.

Mode 1: Row by Row Dispense

Using 12 channels, dispense 100µl into the container (96-well microplate) at position 3, and 50µl in the container at position 4.

Caution: Using 12 channels, one 96-well microplate will require 8 dispensing operations. Accordingly, orient the microplate lengthwise to front.

Mode 2: Multiple Row Dispense

Using 8 channels, dispense in series 15µl into a 96-well microplate at position 4. Use a large reservoir.

Caution: Using 8 channels, one 96-well microplate will require 12 dispensing operations. Remember to orient the sample microtube sideways to front.

Mode 3: Serial Dilution

Using 12 channels, dilute by taking 75µl of sample from the fist row of sample microtubes, and dispense it in the first row of a 96-well microplate. Next, take 25µl of diluted sample to the next row to dilute further, take this to the 4th rows, and perform this operation for two plates simultaneously.

Mode 4: Sample Dispense / Transfer

Using 12 channels, dispense 50µl of sample taken from the sample microtubes on position 3 to 96-well microplate on position 4.

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6 MAINTENANCE

6.1 REGULAR INSPECTIONS

Item	Cycle	Action
Container type	Before start	Confirm proper containers are set on correct position areas.
Setting containers	Before start	Ensure proper reagent and amounts are in correct reservoirs.
Warm-up	At start	Perform operation without containers in position areas.
Verify movement accuracy	Once weekly	Operate with empty containers and confirm that the tip enters properly into mouth of each container. If not, factory values need to be re-set. Contact Matrix Technologies.
Leak test	Once weekly	After aspirating liquid, pause the instrument and confirm the liquid level in the tips. Allow the ***Serial***Mate to sit paused for approximately 5 minutes and then observe the level in the tips again to ensure there is no leak. Problems are caused by wear on the nozzle, piston, O-rings & seal rings. Contact Matrix Technologies if a leak is observed.

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6.2 MAINTENANCE

If a liquid is spilled during use, wipe it up immediately. If the machine is operating, stop the operation and wipe it up before continuing.

The internal rechargeable batteries in the ***Serial***Mate unit are expected to last for two to three years. When the system is turned on, these batteries are automatically recharged. However, when they are weak or have "died," the factory value settings may be lost and the unit may no longer operate properly. The factory values will need to be re-set. Please contact Matrix Technologies.

6.3 VOLUME ADJUSTMENT - CALIBRATION

The ***Serial***Mate is factory calibrated for distilled water at 20°C. When pipetting liquids of significantly different specific gravity or temperature, the calibration feature may be used to achieve greater accuracy.

To prepare for calibration, ensure that the pipet and tip are at room temperature. Using an analytical balance, first obtain the actual value of the programmed volume at factory calibration. The programmed volume (Vp) used is typically the maximum volume (for example 220µl for the 220µl pipet), but is not limited to this volume.

Refer to the ***Serial***Mate Maintenance Manual for more details on adjusting the calibration settings.

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7 TROUBLESHOOTING

7.1 INSTRUMENT ERRORS

Error Message	Cause	Action Required
Replace with new tip rack. New tip rack in place?	All the tips in the rack have been used.	Install new tip rack and touch the Enter key.
Home sensor response.	Motor step out.	Turn off power once, then turn it on again and resume operation.
Limit sensor response.	Nozzle movement is obstructed by foreign object.	Remove foreign object.
Home sensor not responding.	The sensor itself has failed.	Follow steps 2 or 3 above.
Eject sensor not responding.	- Motor step out. - Ejector movement is obstructed by foreign object. - The sensor itself has failed.	- Turn off power once, then turn it on again and resume operation. - Remove foreign object.
Fixed elements of mode file abnormal.	Attempting to specify and execute an unregistered file.	Select a registered file instead.
Replenish liquid. Replenish liquid yet?	No liquid in reservoir or the sensor cannot detect it as the volume is too small.	Add liquid to the reservoir and touch the Enter key.
Liquid surface detection failure.	The sensor reacted prior to liquid surface detection because the tip was already wet when taken from the rack.	Use new, dry tips.
ABORT	The ABORT button was pressed.	Press ABORT button again – nozzles return to home position and the program running is ended.
Eject sensor response.	Motor step out.	Turn off power once, then turn it on again and resume operation.
Close the cover.	For those models with a safety cover.	Close the cover. File execution will resume instantly.
Column No. Error.	Limit switch activation detected.	Verify that the containers are set properly.

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7.2 SOFTWARE ERRORS

Error Message	Cause	Action Required
Mode file command limit exceeded	Exceeded 3000 line file restriction	Reduce some steps in the program.
Part file error	Selected improper EPROM version and head combination in Add-In section	Correct EPROM and head settings in Add-In section.
Mechanical Settings Option not accessible	Dipswitch SW1 is off	Reset SW1 to on position. See Section 4.5.1, *Accessing Machine Setting Option*, for instructions.
Command icons do not appear	• Insufficient RAM in the computer • Files shared from another version of *Control*Mate software (possibly on the network)	• Increase RAM in the computer • Disconnect computer from the network. Uninstall and remove all *Control*Mate files, then reinstall the software to remove interference from shared files. You can connect to the network after installation is complete.
Program validates but doesn't run.	• Instrument not in remote mode • RS232 cable not connected	• Set the instrument to Remote Mode. See Section 9.1, *Remote Operation Mode*, for instructions. • Ensure that the cable connections are securely fastened.

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7.3 EMERGENCY PROCEDURES

ABORT

Press ABORT button on front of unit. This will completely stop all machine operations. A red light will come on. The message at the bottom of the touch panel will read "ABORT."

Make sure appropriate steps have been taken for safety of the operation: hands and all foreign objects have been removed and the (optional) safety covers are closed. To release the halt, press the ABORT button again.

When the ABORT button has been pressed for the second time, the red light will go out and the nozzle unit will resume movement. The unit will dispose of the current tip by either putting it back in the tip rack or disposing of it in the waste box as designated in the mode file. Then the nozzle unit will return to its home position.

There is no way to resume a file once ABORT has been pressed.

PAUSE

When a file is running, the entire touch panel serves as a PAUSE key, so the ***Serial***Mate can be paused by simply touching the panel. When the panel is touched a second time, the operation will resume immediately.

TURN OFF POWER

When the power is turned off or power failure occurs, the operation will halt immediately. When power is resumed, the nozzle head unit will seek home position. To run another file, follow the normal procedure.

If the power is turned off when tips are still on the nozzle, they must be removed manually. Remember - never touch a tip without protective gloves.

Even when the power is turned off the tip information will remain in memory (see Section 5.6, *Clear Used Tip Memory*). Therefore when the file is resumed, ***Serial***Mate will use the next row of tips.

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8 RESOURCES AVAILABLE

8.1 ACCESSORIES AND PART NUMBERS

Matrix Part Number	Description	
44444-005	***Serial*Mate Base Unit**	
44444-005CE	***Serial*Mate Base Unit** (Including safety cover)	
44444-235	**Safety Cover Kit** (CE marking option)	
44444-099	***Serial*Mate Operator's Manual**	
44444-161	Shipping Bracket (removable)	
44444-173 44444-174	**AC Power Cord**	115v (USA) 250v (Europe)
	Nozzle Head Assembly Kits	
44444-180	8/12 channel 30µL Nozzle	
44444-181	16/24 channel 30µL Nozzle (Including tip rack base)	
44444-182	8/12 channel 220µL Nozzle DW	
44444-225	8/12 channel 220µL Nozzle	
	Nozzle Head Assembly Upgrade Kits	
44444-380	Upgrade Kit for 8/12 channel 30µL Nozzle	
44444-381	Upgrade Kit for 16/24 channel 30µL Nozzle (Including tip rack base)	
44444-382	Upgrade Kit for 8/12 channel 220µL Nozzle (deep well)	
44444-383	Upgrade Kit for 8/12 channel 220µL Nozzle	
44444-177	**Reservoir Kit:** (RSVR-1)	(4) 40mL autoclavable reservoirs. (1) reservoir holder (1) reservoir lid
44444-178	(12) 40mL Autoclavable Reservoir Replacements (For use with kit about)	
44444-176	2-Chambered Reservoir (RSVR-2)	150mL disposable reservoir (50/case)
44444-179	(20/case) Pipet Tip Waste Containers	
	***Serial*Mate Disposable Automation Research Tips (D.A.R.T.'s):**	
	250µl:	
5540		non-sterile, bulk, 1000 /case
5541		non-sterile, racked, 96 tips per rack, 20 racks/case
5542		sterile, racked, 96 tips per rack, 20 racks/case

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5545	220µl:	filter-tips, sterile, 96 tips per rack, 20 racks/case	
	30µl/384 well plates:		
5311		Non-sterile, racked, 384 tips per rack, 10 racks per case	For 16/24 channel 30µL Nozzle (44444-181)
5312		Sterile, racked, 384 tips per rack, 10 racks per case	
	220µl deep well plates:		
5561		Non-sterile, racked, 96 tips per rack, 10 racks per case	For 8/12 channel 220µL Nozzle. DW (44444-182)
5562		Sterile, racked, 96 tips per rack, 10 racks per case	
	30µl/96 well plates:		
5571		Non-sterile, racked, 96 tips per rack, 10 racks per case	For 8/12 channel 30µL Nozzle (44444-180)
5572		Sterile, racked, 96 tips per rack, 10 racks per case	
See Matrix Catalog for detailed list and specific part numbers.		ScreenMates™ Brand Products for high throughput screening, including microplates, deep well blocks and microtubes.	

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8.2 HELP LINE / WEBSITE

In the United States:

Telephone: (603) 595-0505
Toll Free: (800) 345-0206
Fax: (603) 595-0106
Website: www.apogentdiscoveries.com

In Europe:

Telephone: +44 (0) 1625 529863
Freefone: 0800 389 4431
Fax: +44 (0) 1625 530457
Website: www.apogentdiscoveries.com

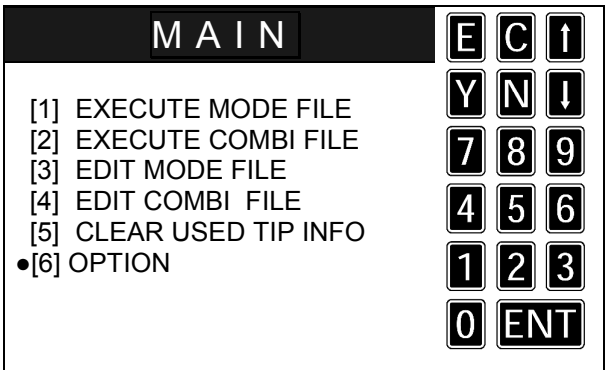
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9 SOFTWARE REFERENCE

9.1 REMOTE OPERATION MODE

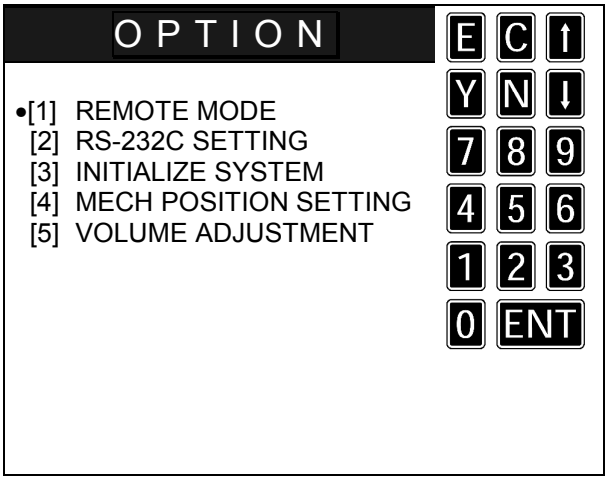
The device must be in Remote Operation Mode in order for *Control*Mate™ to communicate with it. To set this mode:

1. From the Main menu, select [6] OPTION and press [Enter].p



   The OPTION menu displays computer settings, mechanical settings, and volume adjustment.

2. Select [1] REMOTE MODE in the option menu and press [Enter].



The ***Serial***Mate can now be controlled from the computer.

Note: To disconnect remote operation mode, see Section 9.4.2.1, Cancel Remote Operation.

9.2 CONTROLMATE OVERVIEW

ControlMate™ is a windows-based PC application that provides a graphical programming interface for creating and executing device and module control programs. The commands can be logically structured according to the control requirements. The application provides a standard method by which control programs are created; the configuration defines the device module in use.

Command Groups

ControlMate™ has two groups of commands. The command groups are:

- Intrinsic
- Module Specific

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Child Dialogues

Actions within ControlMate™ are presented as child dialogues. Each dialogue has specific tasks. The child dialogues available are:

- Options
- Sequence File Editor
- Toolbox
- Print Preview
- File Validation
- File Execution
- Clipboard Viewer
- Edit and Run Locks
- Password Validation

9.2.1 The Main Application Window

The main application window provides function dialogs in the form of child windows. The main operations of the windows are carried out by either selecting an option from the menu bar at the top of the window or by clicking on a toolbar icon.

Information relating to status, open files and auto correction mode is displayed on the status bar at the bottom of the screen.

Toolbar Icons:

-  New sequence file
-  Open existing sequence file
-  Show/Hide toolbox window
-  Save the current sequence file
-  Save all open sequence files
-  Cut the highlighted command onto the clipboard
-  Copy the highlighted command onto the clipboard
-  Paste the contents of the clipboard below the current command node
-  View the clipboard contents
-  Delete the currently highlighted command
- 

Add a new command below the current command node
-  Print preview
-  Validate the current sequence file
-  Execute the current sequence file
-  Configuration and default options
-  This help page

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9.3 SEQUENCE FILES

9.3.1 Sequence File Editor

The sequence file editor dialogue window is used to create or amend sequence file programs.

The dialogue contains a number of frames:

- File Header
  The file header contains the fields specific to the whole sequence file.
- Command Tree
  The command tree represents the program sequence. Sequence files are executed from the top to the bottom of this tree structure. The tree structure is used to add, delete and select commands.
- Command Settings
  The command settings frame is used to change specific command field values.
- Status Bar
  The status bar provides information relating to the sequence file that is currently open.

Sequence File Editor: File Header

The file header contains the fields that are specific to the whole sequence file.

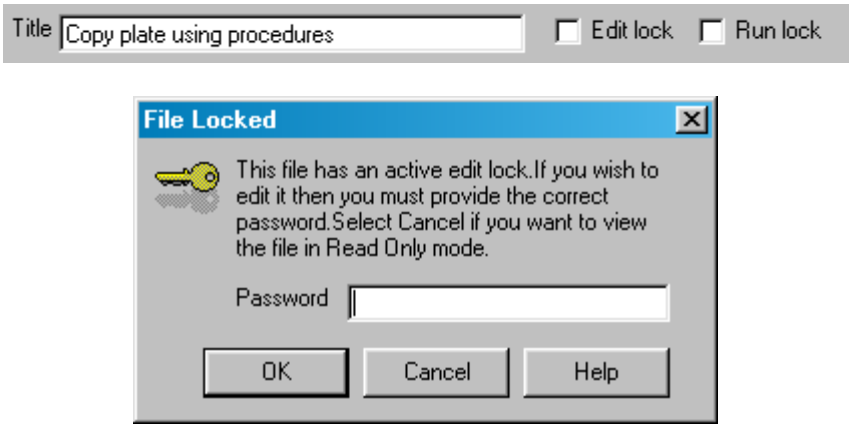


Fields

- *Title*
  A text entry used to label the file for captions and reports.
- *Edit Lock*
  Used to set a password on the file to control access for editing. Checking this field will display the Edit Lock dialogue window.
- *Run Lock*
  Used to set a password on the file to control access for execution. Checking this field will display the Run Lock dialogue window.

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Edit and Run Locks



The edit and run lock dialogues are used to control access to sequence file editing and execution on a file level basis. Once a lock has been set, the correct password is required to enable access to all file functions. This means that it is possible to create sequence files and then set an edit lock to prevent a file from being changed. This is useful for example, in creating file templates where the new files are created based on existing ones.

When setting a run lock the lock dialogue will prompt for a password and then prompt for confirmation of the password. If the two password entries do not match then the lock is not set.

Note: Passwords are case sensitive.

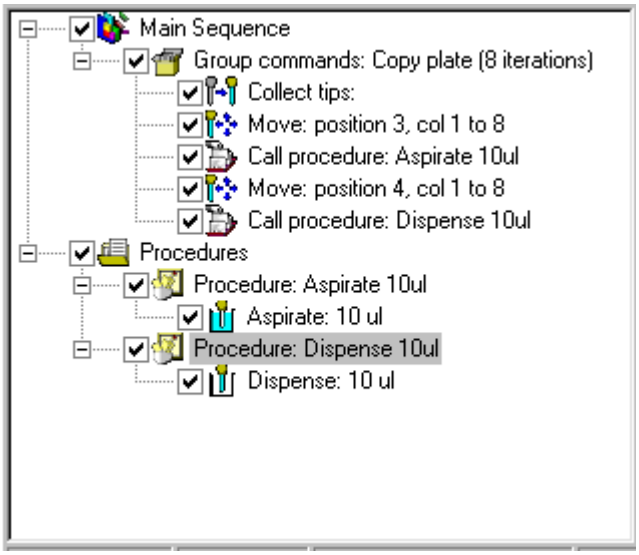
Password Validation

Sequence files that have an edit or run lock set will cause this dialogue box to be displayed whenever the file is opened within the sequence file editor (if edit lock set) or file execution (if run lock set). The dialogue will prompt for a password. If an incorrect password is entered, file access via the lock is not granted. This means that in the case of an edit lock, the file cannot be edited or in the case of a run lock, cannot be executed on the device.

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Sequence File Editor: Command Tree

The command tree represents the program sequence. Sequence files are executed from the top to the bottom of this tree structure. Commands can be manipulated in the tree structure in a number of different ways.



- *Adding a new command*
  Commands are added to the tree (or command) structure by either clicking the required command icon on the Command Toolbox dialogue or by selecting the required command from the drop down menu on the main application toolbar. Commands are added directly underneath the highlighted command.
- *Deleting an existing command*
  Existing commands can be deleted from the command structure by highlighting the required command and then either pressing the *Delete* key on the keyboard or by clicking on the delete icon ✕ on the main application toolbar.
- *Moving a command*
  Commands can be moved to a new position in the sequence structure using the "drag and drop" method. To move a command, highlight it, then while keeping the left mouse button pressed, drag it to the new position and then release the mouse button. Commands are moved below the one indicated as the new position. An alternative to dragging commands to new positions would be to use the Cut, Copy and Paste buttons, which uses the clipboard to move or copy commands.
- *Execution selection of commands*
  Commands can be selectively included or excluded from execution. To prevent a command from executing, check the box beside the icon of the required command in the tree structure. Checking (or unchecking) a group command will cause the child commands of that command to be checked (or unchecked).

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Toolbox

The command toolbox contains all of the intrinsic and module specific commands that can be used to create sequence files for the current device installation.

To add a command from this toolbox, highlight the command in the command tree after which the new command is to be added and then click on the icon of the command required. If the command is added at the incorrect position, it can be moved to the required location within the command tree.

The command toolbox can be dragged and positioned anywhere within the *Control*Mate window environment. It can also be 'docked' by positioning it against the side of the application window (left, right, top or bottom). If the toolbox is not docked then it will 'float' over the top of other window dialogues to ensure that the command icons are always visible.

The size of the command icons can be set to either *small* (default) or *large*. Use the View menu to do this. From this menu, it is also possible to choose to display text captions associated with each command icon, using the *Toolbox Text* option.

Cut, Copy and Paste

Commands in the command tree can be cut, copied to or pasted from the clipboard. This is useful when creating or editing sequence files and speeds up the process of reusing commands rather than deleting them and recreating them manually.

If the current command is a group command such as main sequence, command group or procedure, then all child commands will follow the same action as their parent.

- *Cut*
  To cut a command, highlight it and then click this button on the toolbar.
- *Copy*
  To copy a command to the clipboard, highlight it and then click this button on the toolbar.
- *Paste*
  To paste a command from the clipboard, highlight the command after which the new command is to be pasted, then click this button on the toolbar.

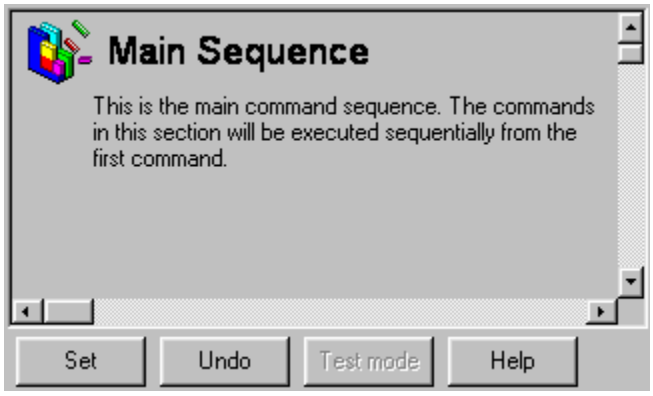
Clipboard Viewer

The clipboard viewer displays the current contents of the command clipboard. This is useful when using the Cut, Copy and Paste features of the command tree within the sequence file editor window.

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Sequence File Editor: Command Settings

The command settings frame is used to change specific command field values.



Command Buttons

- *Set*
  This refreshes the screen and updates the tree structure with the changes made. The changes are not saved to file until a save file option has been selected. Values are checked for validation against the rules (which can be set via the Tools – Options dialogue) before they are written to the tree structure. Any validation errors are displayed in a frame below the command setting frame and the icon in the tree structure is displayed overlaid with a red cross to indicate invalidity.
- *Undo*
  This will change the settings back to the original values prior to the current edit.
- *Test mode*
  This allows the values for the command to be tested on the device by restricting the editor to the current comamnd only. Any changes made are then sent directly to the device. This is useful, for example, for the testing of heights and positions. To return from this mode select the button again (it will now show *Edit Mode* as a caption).
- *Help*
  Displays help for the respective command.

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Sequence File Editor: Status Bar

The status bar provides information relating to the sequence file currently open.



Panels

- *Module*
  This panel displays the respective device module name to which the commands relate.
- *Changed Status*
  This shows the current edit status of the file and displays whether or not any changes have been made.
- *Sequence Validation*
  This panel indicates whether the entire sequence has been checked for validation and whether the validation has passed or failed. The sequence validation looks at the command relationships rather than the individual limit values of commands. This is useful for determining total volume levels, etc. throughout the sequence. Sequence validation is carried out via either File Validation or File Execution.
- *Command Validation*
  This provides status on the validation of individual commands, for example, an incorrect height value may have been entered.
- *Last Run Information*
  The duration and date of the last run (if applicable) for the respective file is displayed in this panel. Determining run time is useful for workload planning.

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9.3.2 Creating Sequence File

9.3.2.1 SerialMate Programming

There are a few simple steps to follow when creating sequence files for the SerialMate™ device. To achieve successful liquid transfer the following rules must be observed:

- The Collect Tips command must be used at the start of any sequence. The position of the command depends on the type of transfer taking place. If the same sample is being transferred to all rows within a plate then the command can exist at the start of the program. If the transfer involves handling different samples from different wells then the Collect Tips command must be placed within the transfer loop (normally as the first command within a Command Group command).

- A move pipettor command must precede each Aspirate and Dispense command.

- If dispensing specific volumes then the total volume dispensed cannot exceed the total volume aspirated.

- The start column and end column fields in the Move Pipettor command can be used to set the pipetting head position at different rows within a plate. This reduces the number of commands required when performing tasks such as serial dilution or an incremental dispense to multiple columns. If this incremental row movement is required then remember to place the Move command (or a call to a Procedure containing a Move command) within a Command Group that has a loop value greater than 1.

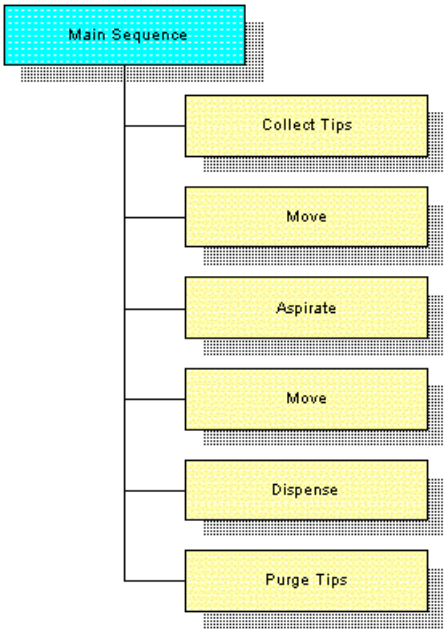
The rules above are checked whenever the File Validation or File Execution options are selected.

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Some sample sequence file schematic diagrams are shown below.

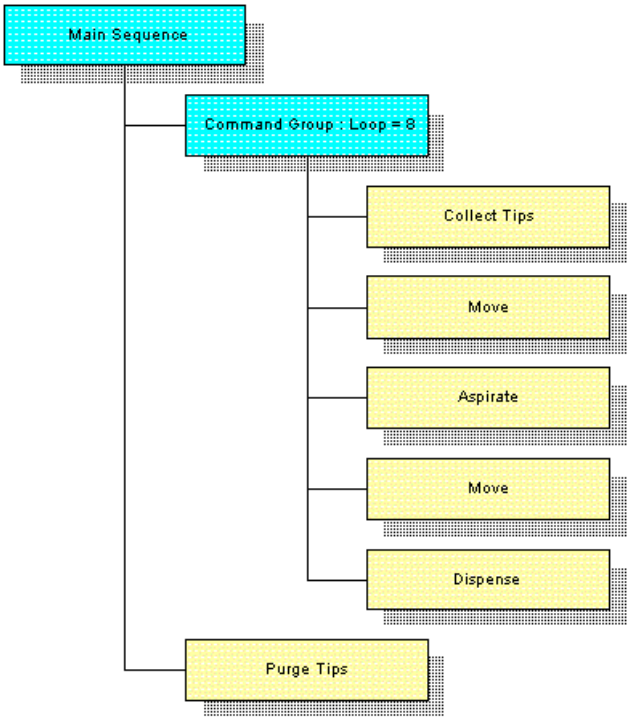
Single Copy

Copies 1 row from a reservoir or plate to another row (either in the same plate or on a different plate).



Multi Copy

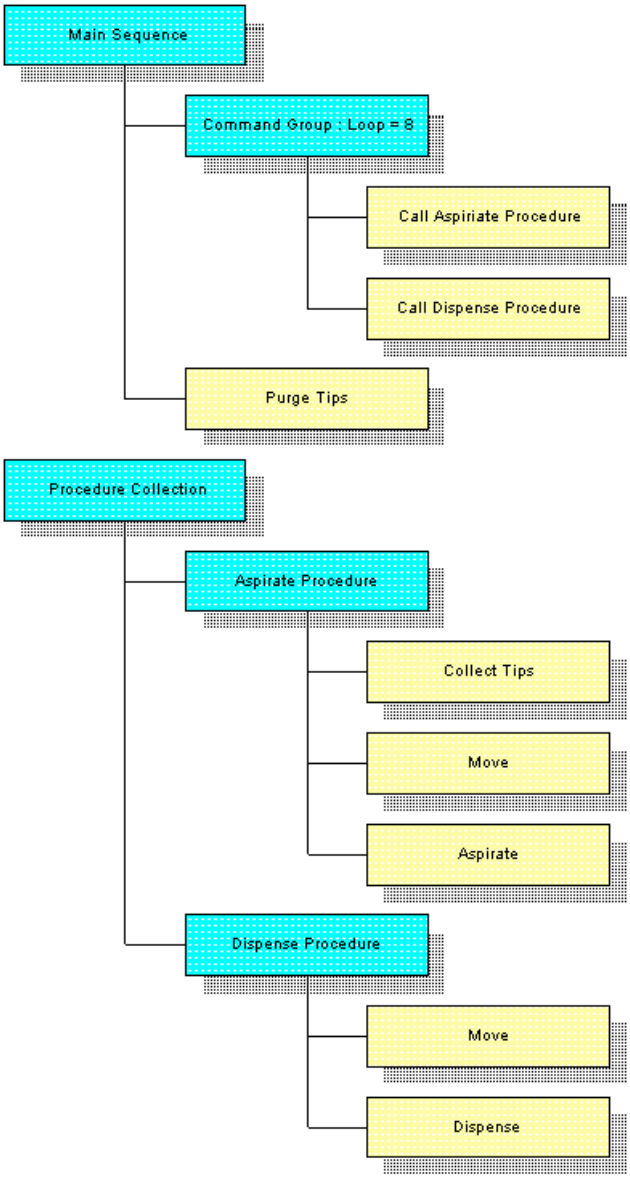
Copies an entire plate to another plate.



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Multi Copy Using Procedure Calls

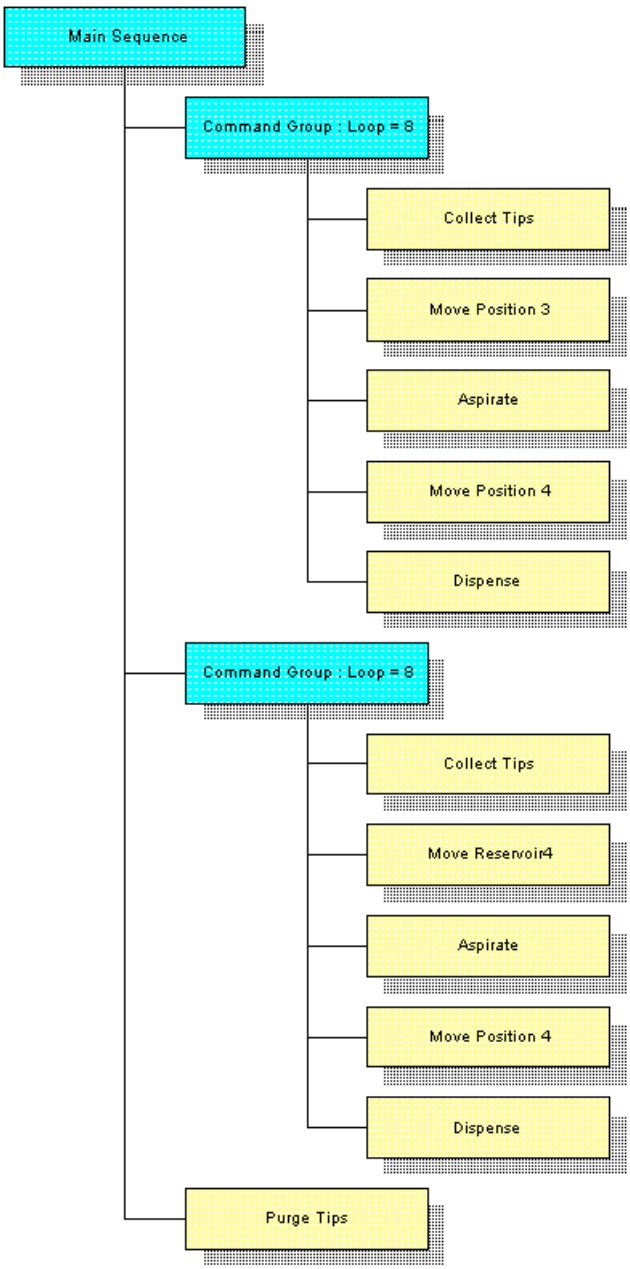
Copies an entire plate using procedure calls to aspirate and dispense.



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Dilution

Creates a dilution by first copying the source plate and then diluting the destination.



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9.3.2.2 Intrinsic Commands

The intrinsic commands are specific to ControlMate™ rather than to a module. The commands are normally associated with the control of program flow and annotation.

The intrinsic commands available are:

- Main Sequence
- Procedure Collection
- Procedure Call-out
- Group Command
- Notepad
- Procedure
- Valve Control
- Execute External Application

The intrinsic commands are described below:

Main Sequence

The main sequence represents the main command sequence. It is called once during file execution and is processed from the top down. You must select the main sequence checkbox in the command tree in order to execute the entire file.

Procedure Collection

The procedure section contains all of the procedures which exist within the current sequence file. The procedure section is not executed during file execution. Procedures contained within this section can be called either within the current file main sequence structure (internal call) or from another file (external call).

Call Procedure

The call procedure command allows the inclusion of a selected procedure within the main sequence file. This allows for the creation of standard procedures. For example, commands for aspirating or dispensing an entire plate could be called from other programs without having to redefine the parameters. This reduces the time needed to create sequence files.

The call procedure command allows procedures to be included either from the library of procedures within the current sequence file or from another sequence file.

Fields

- *In this file*
  Populates the *Sub Routine* field with the procedures within the current sequence file.
- *In a different file*
  Populates the *Sub Routine* field with procedures from another sequence file.
- *File*
  Displays the selected filename (if calling a procedure from a different file).

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- *Path*
  Displays the file path (if calling a procedure from a different file).
- *Sub Routine*
  Allows the selection of a sub routine to be called.

Command Buttons

- *Select*
  Causes the sequence file selection dialogue to be displayed to allow the selection of a sequence file containing the procedure to be called.

Group Commands

A command group represents a collection of commands. This is useful when creating sequence files by structuring commands based on their use, for example a group command could represent the copying of samples from a block, another could represent the dilution of a block.

Fields

- *Title*
  Allows the entry of a text value that represents a name for the group.
- *Loop*
  Allows the setting of a value that represents the number of iterations that the group is to be processed. Command execution will proceed to the command following the group once the loop has been processed the number of times specified by this value.

Notepad

The notepad is used to create a note entry within the sequence file. This is useful for documenting the reason for command values, positioning and for future reminders of device configurations for specific sequence files, etc. The content of the notepad has no effect on the sequence file during file execution.

Procedure

A procedure contains a group of commands that are executed whenever the procedure is called from a main sequence structure. The call can be made from the current sequence file (internal call) or from another sequence file (external call). During file execution, any commands contained within a called procedure will be executed as if they existed within the main program structure.

This allows for the creation of standard procedures. For example, commands for aspirating or dispensing an entire plate could be called from other files without having to redefine the parameters. This reduces the time needed to create sequence files.

Fields

- *Name*
  A text field that can be used to represent the name of the procedure. If the text entered is the same as another in the procedure collection then an index value is appended to the text.

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Valve Control

Allows a VALCO multi position actuator to be directly controlled within a file sequence. The file sequence pauses whilst the actuator selects the required valve position before continuing with execution.

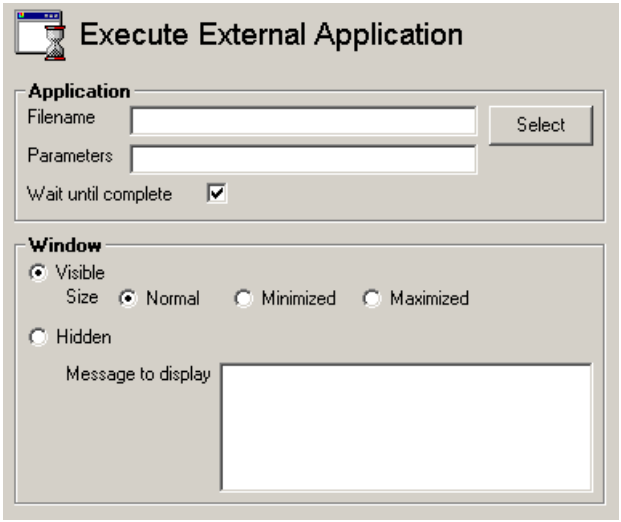
Fields

- *Type*
  The VALCO actuator model type.
- *Serial Port*
  The RS232 serial port to which the actuator is attached.
- *Switch ID*
  The specific actuator device id. This may not have been set. If a single actuator is used then VICI recommend that the id is not set, in this case choose '*None*'. If a device id has been set and a number of actuators are attached to the RS232 serial port then it is possible to set the position for all actuators simultaneously by selecting the '*All*' value.
- *Valve position*
  Use this field to determine which valve position to make current.
- *Direction*
  The movement from the current position to the desired position requires the actuator rotating the valves. Use this field to determine the direction of rotation '*Clockwise*' or '*Counter clockwise*'. It is possible to allow the actuator itself to determine the quickest direction automatically by selecting the '*Quickest*' value.

Execute External Application

Allows an external application to be called during sequence file execution. This may be used, for example, to execute an application which controls an alarm, or sends and E-mail message to an administrator or starts Microsoft Excel etc.

The fields allow whether to wait for an application to finish (i.e. the application's window is closed) before continuing with the sequence file execution or to continue immediately. It is also possible to set the way in which the applications window is displayed or even not to display the window at all.



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Fields

- *Filename*
  The full path and filename of the application to execute. Use the *Select* button to choose the file from a file selection dialogue window.
- *Parameters*
  Additional parameters which are passed to the application when it is loaded. For example, if the application being called is 'C:\Windows\Notepad.exe' then the *parameters* field may contain the name of a file to open when *Notepad* starts.
- *Wait until complete*
  Use this field to indicate whether sequence file execution is paused until the application finished or when it's dialogue window is closed. Unchecking this field will load the specified application and then immediately continue with sequence file execution leaving the application running.
- *Visible*
  Select this option if the application is to display a dialogue.
- *Size - Normal, Minimized or Maximized*
  These fields will be available for selection if Visible is selected. Only one field can be selected and indicates the initial window size the application dialogue is use.
- *Hidden*
  Selecting this field deselects the *Visible* and all associated fields. The use of this field will indicate that the application is to be loaded without showing any window dialogue. This is useful for example if the application requires no user interaction and reduces 'screen clutter'.
- *Message to display*
  Selecting the *Hidden* field will enable this field. It is optionally used to display a message window to inform a user that the selected application is running or for any other information that may be relevant.

9.3.2.3 Module-Specific Commands

The module specific commands for the SerialMate™ device relate to the control of the pipetting head and the liquid handling parameters.

The following commands are available:
(See following pages for description)

- Aspirate
- Dispense
- Move Pipettor
- Home Pipettor
- Collect Tips
- Pause
- Purge Tips
- Speed Control
- Plate Shaker

The following Add-In commands are also available:
(See Section 9.4.2, *Add-ins*, for description.)

- Cancel Remote Operation
- Change Pipettor Head

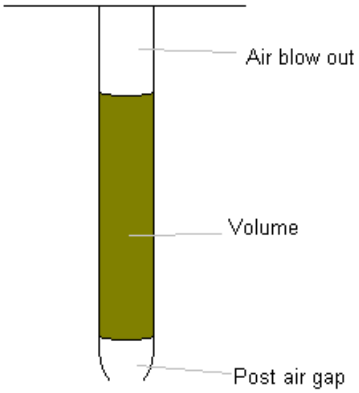
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The module-specific commands are described below:

Aspirate Command

Aspirates a volume. The SerialMate™ uses air displacement to aspirate and dispense liquid. Its 12 pistons, which are connected to a common drive motor, create a vacuum in the pipetting tips to aspirate liquid.

It is important to set a pre-aspirate air gap (air blow out) and post air gap volume in order to ensure accuracy in aspirating and dispensing and to prevent tip leakage.



The piston / O-ring arrangement forms an airtight seal to ensure pipetting accuracy. The piston movement is sensitive to a fraction of a microliter. The precision of this sensitive device is affected by a series of variables. These include the degree to which the pipet tips are able to be wet, which in itself is dependent on the viscosity of the liquids being pipetted, the dimensional accuracy of the tip orifices and the piston speed and delay time.

Liquid is pipetted through the vacuum and pressure generated by the pistons, which requires dwell time for equalizing air pressure in the pipet tips. Pipetting time depends on the properties of the liquid and other factors. It is necessary to allow some delay time during pipetting operations particularly for smaller volumes and viscous liquids.

Fields

- *Pre mix and Cycles*
  If dry tips are used, more time is required to saturate the dry air with moisture, while vapor pressure increases above the liquid, inside the tips. As a result, dry tips may cause liquid to be driven out. This can affect accuracy. To avoid this, use the mix option prior to a programmed aspiration to equalize the air in the tips before pipetting the liquid. Proper vapor pressure will be maintained even if the device is left idle with filled tips for a prolonged period.
- *Volume*
  The liquid volume to be aspirated.
- *Air blow out*
  Sets the pre-aspirate air gap volume, see the diagram above. This ensures that air

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pressure equilibrium exists in the tips and also ensures that cross sample contamination now exists should tips be reused.

- *Level sense*
  Uses the liquid level sensing functionality of the tips to avoid extra liquid adhering to the tip and potentially affecting measurement.
- *Tip touch*
  This action causes the tips to be brushed against the top of the well after aspiration to remove liquid, which may adhere to the side or bottom of the tips.
- *Post air gap*
  This introduces an air gap at the end of the tip to ensure that sample does not leak during tip movement.
- *Dwell Times*
  The mix and aspirate dwell times are used to specify a period of time over which to leave the tips in the sample for equalizing air pressure in the pipet tips.

Dispense Command

Dispenses a measured volume or all of the liquid in the tips. The SerialMate™ uses air displacement to aspirate and dispense liquid. Its 12 pistons, which are connected to a common drive motor, create a vacuum in the pipetting tips to aspirate liquid. The post air gap set in the aspirate command is automatically accounted for and replaced after any dispense. This ensures that liquid does not leak from the tips during pipetting head movement.

Liquid is pipetted through the vacuum and pressure generated by the pistons, which requires dwell time for equalizing air pressure in the pipet tips. Pipetting time depends on the properties of the liquid and other factors. It is necessary to allow some delay time during pipetting operations particularly for smaller volumes and viscous liquids.

Fields

- *Dispense all*
  If checked this will dispense all liquid in the tips. The Air blow out and post air gap volumes set in the aspirate command are automatically accounted for.
- *Tip touch*
  This action causes the tips to be brushed against the top of the well after dispensing to remove and sample which may adhere to the side or bottom of the tips.
- *Post mix and Cycles*
  This will ensure that any sample dispensed is successfully mixed within a well. This is particularly useful for dilution operations and ensures a consistency in the resulting sample.
- *Volume*
  The liquid volume to be dispensed. This field is not available if the ‘Dispense all’ checkbox is checked.
- *Dwell Times*
  The mix and dispense dwell times are used to specify a period of time over which to leave the tips in the sample for equalizing air pressure in the pipet tips.

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Move Pipettor Command

This command moves the pipetting head in preparation for an aspirate or dispense command.

Fields

- *Plate type*
  Specifies the plate type which is situated at the target location. Different plate types have different settings for the other fields within this command.
- *Orientation*
  If a microplate is chosen in the plate type field, then the user will have the option of choosing whether to process the plate by columns (8 channels) or by rows (12 channels). If a reagent reservoir is chosen, then the orientation is fixed by the program and can not be changed.
- *Position*
  Sets the stage position. The stage positions are numbered from 1 to 4 across the device bed from the left.
- *Start column*
  Specifies the first column on the plate or reservoir from which to aspirate or dispense.
- *End column*
  Specifies the end column on the plate or reservoir from which to aspirate or dispense. If this value is set to one that is greater than the start column and the command exists in a command group which has a loop counter greater than 1 then the device will process the columns by incrementally increasing the column number in each loop pass. This is useful when copying or diluting an entire plate.
- *Height*
  This specifies the height at which the tips should travel in order to aspirate or dispense the liquid. The higher the value the further down the tips move.

Home Pipettor Command

Occasionally it is necessary to return the pipetting head to the home position during file execution. This is normally done in conjunction with a pause command. The normal sequence would be to issue the move home command and then set a pause. This is useful when a plate or reservoir must be replaced during program execution.

Fields

- *Eject Tips*
  If checked will cause the tips to be ejected before the pipetting head is moved to the home location.
- *Location*
  Specifies the eject position, only displayed if eject tips field is checked.

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Collect Tips Command

This command must exist at least once before an aspirate command is issued. The command can exist within a Command Group to ensure that new tips are collected prior to each aspirate, for example when copying a number of different rows and sample types from a plate. Tips are collected from the next available tip location in the tip rack. The SerialMate™ device will keep track of tips used within the tip rack and will chose the next unused set.

Fields

- *Eject to*
  Specifies the location at which any loaded tips are ejected before collecting new tips.
- *Track usage*
  This sets an internal counter that determines when tips should be changed within a loop.
- *Change after (n) uses*
  This determines the internal tip change counter. This field is only displayed if the Track usage check box has been checked.

Pause Command

Inserting a pause command into a program causes the device to stop processing according to the pause parameters. Once the pause limit has been reached, the program continues at the next step within the sequence.

There are two types of pauses. These are:

- Time based.
- Infinite - requiring a user to specify when to resume.

Fields

- *Duration*
  This causes the device to pause for a set timed interval.
- *Seconds (duration)*
  This specifies the time interval over which to pause if the Duration checkbox has been checked.
- *Wait for user*
  This pauses the device indefinitely and requires the user to press the touch panel on the device in order to resume.
- *Sound alarm*
  Sounds the internal device buzzer for a set duration.
- *Seconds (alarm)*
  determines the interval by which to sound the internal buzzer if the sound alarm is checked.

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Purge Tips Command

In situations where the volume dispensed is less than the volume aspirated excess liquid will remain in the tips after dispensing. Using the Purge Tips command will insert a command into the program structure to either eject the tips immediately or to determine the action required to purge the excess liquid at the end of processing.

The command requires a purge location to be specified.

Fields

- *Purge Now*
  Causes the tips to be purged immediately using the reservoir location specified. It is not possible to purge immediately to the waste location during program execution.
- *Purge at run end*
  Sets the location for purging excess liquid at the end of processing. The purge location can be the waste location or a reservoir.
- *Purge to waste*
  If purge at end of processing is set then this field will be made available for selection. It sets the parameter to purge to the waste location.
- *Purge to reservoir*
  Sets a reagent reservoir location in which to purge excess liquid.
- *Type*
  Sets the reagent reservoir type. This field is not shown if the purge location is set to the waste location.
- *Position*
  Sets the column within the reagent reservoir. This field is not shown if the purge location is set to the waste location.

Speed Control Command

Piston and vertical speeds can be adjusted using the Speed Control command. To change a motor speed, click the check box for respective motor and then use the slider to set the required speed. The number under the slider indicates the current numerical value of the speed setting. The lower the number the faster the motor action.

Reducing piston speed can increase precision; use a speed of 4 (as below), to keep the percentage of CV low. Optimum precision can be obtained by using the appropriate piston speed for the volume of liquid to be pipetted, as follows:

Volume Range	*Piston Speed*
> 50 µl	1
25-50 µl	2
5-24 µl	3-5

Plate Shaker Command

Sets a duration by which the plate at position 4 is shaken to ensure good sample mixing and to further ensure that any liquid adhering to the side of a well falls to the well bottom.

Depending on the EPROM installed in the SerialMate™ device, the action is carried out either at the end of the file execution sequence (EPROM versions 1.xx) or at the position in the sequence at which the command is placed (EPROM versions 2.xx).

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9.3.3 Previewing Sequence File

The print preview dialog menu is used to view and produce a printed report of the current sequence file. The name of the current sequence file is shown in a panel at the foot of the main application window.

Toolbar Buttons:

- *First Page*
  Displays the first page of the report.
- *Previous Page*
  Displays the previous page.
- *Next Page*
  Displays the following page.
- *Last Page*
  Displays the last page of the report.
- *Print*
  Sends the report to the selected printer.
- *Printer Setup*
  Allows the user to change the printer properties.
- *Help*
  This help page.

9.3.4 Processing Sequence File

9.3.4.1 File Validation

Command values and relationships are checked for errors using the File Validation option. Any individual field errors and relationship errors are listed. It is possible to highlight an error and then display the command in the sequence file editor window in order to make corrections.

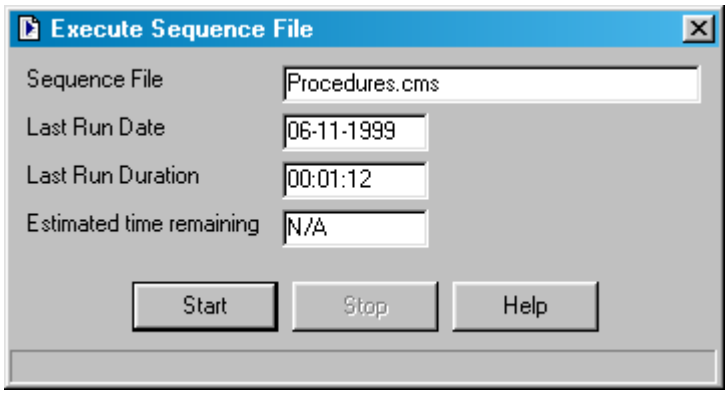
Command Buttons

- *OK*
  Closes the dialogue window.
- *Show*
  Jumps to the highlighted command in the sequence file editor window.
- *Help*
  This help page.

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9.3.4.2 File Execution

The File Execution dialogue controls the *Serial*Mate™ device using the sequence file from the current Sequence File Editor window. The name of the file for the current window is shown on the status bar at the foot of the main application window.



Fields

- *Sequence File*
  Name of the file in the current Sequence File Editor dialogue.
- *Last Run Date*
  Date the file was last executed on the device.
- *Last Run Duration*
  The duration of the last execution for this file.
- *Estimated time remaining*
  An estimation of the amount of running time left for the current execution. This is based on the current duration with reference to the Last Run Duration.

Command Buttons

- *Start*
  Start processing the sequence file.
- *Stop*
  Pause or Abort File Execution.
- *Help*
  This help dialogue.

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9.4 SETUP AND DEFAULT OPTIONS

9.4.1 Options

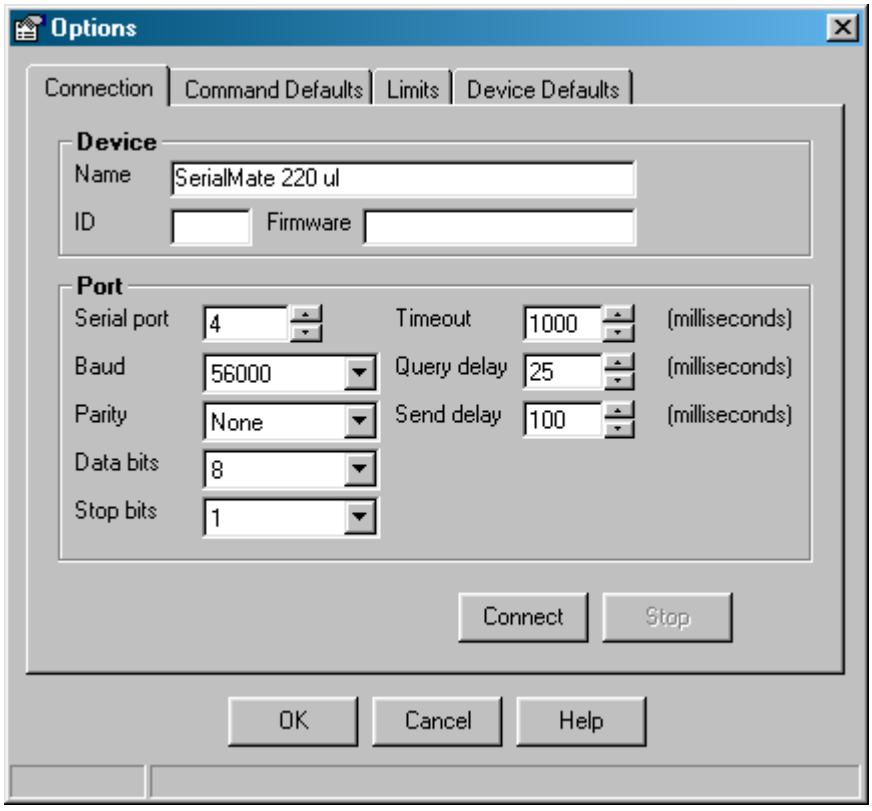
The Options dialogue is used to set the default parameters for a number of options within the *Control*Mate™ application. The Options dialogue is found in the Tools menu or by pressing on the main application toolbar.

The options are grouped into a number of sections.

- Connection
  To set default parameters for serial communication with the device.
- Command Defaults
  To set the default field values for the module specific commands.
- Limits
  To set the range limit values for the fields within the module specific commands.
- Device Defaults
  To set the device default parameters for axis and stage positioning.

9.4.1.1 Connection

The *Serial*Mate™ device is connected to the serial port. The parameters that enable communication with the device can be set on this dialogue. It is also possible to test the serial connection by clicking the Connect command button on the Tools-Options menu. This will interrogate the device and determine the EPROM version number. A warning message will be displayed if the parameters have not been correctly defined, if the device is not connected, switched on and in Remote Operation mode.



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Fields

- *Name*
  The device name.
- *ID*
  The unique device id. DIP switches set on the motherboard within the device determine the ID. The value of these switches is interpreted when the Connect command button is clicked. Valid values are in the range of 0 to 31 inclusive.
- *Firmware*
  The EPROM version number.
- *Serial Port*
  Use this field to set the serial communication port number. Range values are from 1 to 256; however, the most common value for most systems is 1.
- *Baud*
  Use this field to set the communication speed, this must match the DIP switch setting on the device motherboard. The most common value is 9600.
- *Parity*
  Use this field to specify the parity used for serial communication. Default value is "None."
- *Data Bits*
  Default value is 8.
- *Stop Bits*
  Default value is 1.
- *Timeout*
  Use this to set a value which determines a period of time, in milliseconds, that communication commands will wait before determining that there is no response from the device. No response can signify a connection or device problem. Changing this value affects the way that the File Execution function works. Too small a value may increase the number of timeouts generated. Too high a value increases the time taken to process sequence files on the device. The range of values is from 25 milliseconds to 5000 milliseconds (5 seconds).
- *Query Delay, Send Delay*
  Use this to change the delay between commands issued to the *Serial*Mate™ device. The lower the value the faster the response to query type commands, for example when querying for emergency stop status. However, too low a value may cause the response sent from the device to be lost. If the device is situated in a noisy environment or in a location that is not close to the PC then increasing this value would provide a better means of eliminating noise and interference that may exist on the serial interface cable.

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Command Buttons

- *Connect*
  Clicking on this button will communicate with the device. All device ID's in the range of 0 to 31 will be used to attempt to query the device for a response. If one is received then the device will be asked for its firmware version number. You must ensure that:
    - The device is connected to the serial communication port on this computer.
    - The fields described above have been correctly set up.
    - The device is switched on.
    - The device is in Remote Operation Mode.
- *Stop*
  This action will cancel the *Connect* action.

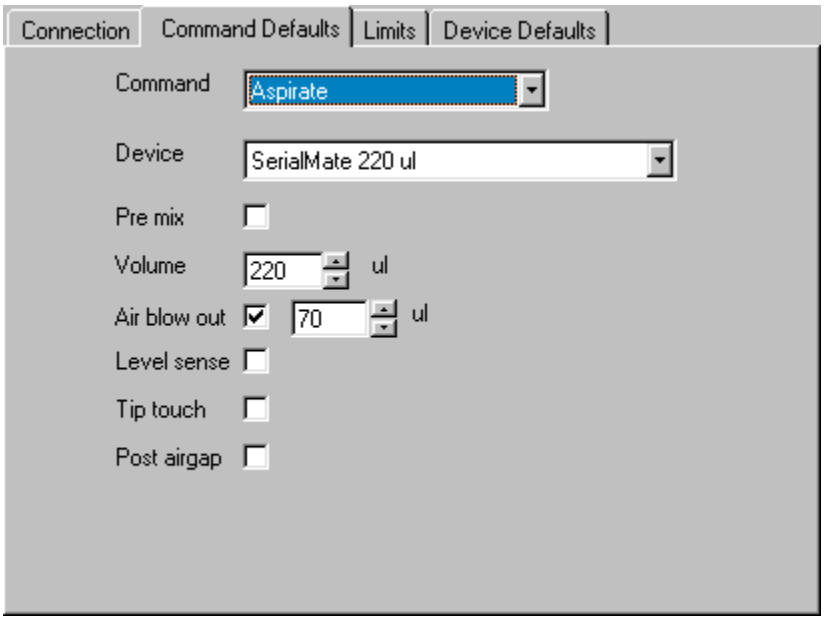
Serial Communication (RS232)
RS-232C is a long-established standard ("C" is the current version) that describes the physical interface and protocol for relatively low-speed serial data communication between computers and related devices. It was defined by an industry trade group, the Electronic Industries Association (EIA), originally for teletype devices.
RS-232C is the interface that your computer uses to talk to and exchange data with your modem and other serial devices. Somewhere in your PC, typically on a UART chip on your motherboard, the data from your computer is transmitted to an internal or external modem (or other serial device) from its Data Terminal Equipment (DTE) interface. Since data in your computer flows along parallel circuits, and serial devices can handle only one bit at a time, the UART chip converts the groups of bits in parallel to a serial stream of bits. As your PC's DTE agent, it also communicates with the modem or other serial device, which, in accordance with the RS-232C standard, has a complementary interface, called the Data Communications Equipment (DCE) interface.

EPROM
EPROM (erasable programmable read-only memory) is programmable read-only memory (PROM) that can be erased and re-used. Erasure is caused by shining an intense ultraviolet light through a window that is designed into the memory chip. (Although ordinary room lighting does not contain enough ultraviolet light to cause erasure, bright sunlight can cause erasure. For this reason, the window is usually covered with a label when not installed in the computer.)

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9.4.1.2 Command Defaults

The command defaults tab sets the default field values for the module specific commands. This means that any values entered against command fields here will be used as initial values when the respective command is added to a sequence file in the Sequence File Editor dialogue.



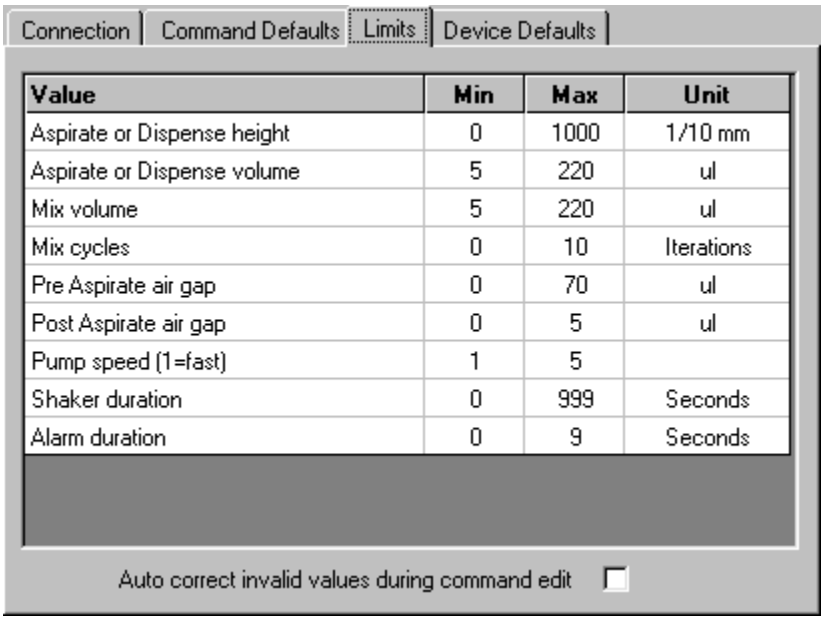
Fields

- *Command*
  This drop down box allows the selection of available module specific commands.

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9.4.1.3 Limits

The fields within the module specific command set have to be validated against a minimum and maximum value for the respective field. This options tab allows the setting of those values. The values are used whenever commands are changed in the Sequence File Editor dialogue or during File Validation.



Fields:

- *Value*
  This represents the field type.
- *Min*
  This is used to set the minimum value allowed.
- *Max*
  This is used to set the maximum value allowed.
- *Unit*
  This represents the field unit of measurement, if applicable.
- *Auto correct values during command edit*
  When checked, this box enables the auto correction of values which fail command validation in the Sequence File Editor dialogue. The values used will be from the respective setting in the list above. The following rules apply:
    - If a field value is below the limit minimum value, then the limit minimum value is used.
    - If a field value is above the limit maximum limit value, then the limit maximum value is used.

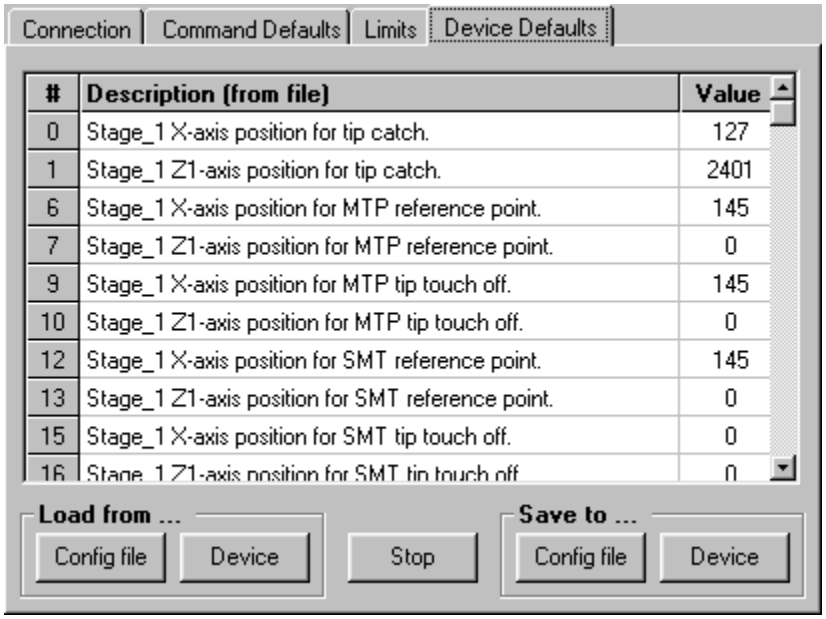
  The main application window displays the current status of this field on the status bar at the foot of the window.

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9.4.1.4 Device Defaults

The heights and offsets for the different axis on the *Serial*Mate™ device determine how far the pipetting head travels in order to operate. This options tab allows the setting of these offsets. Any changes made in this tab can be downloaded to the device, which will then use these values as default whenever a mode file is executed (either manually or via *Control*Mate™).

The device defaults are set during the initial setup of the device. If you need to make changes to these settings, please contact your Matrix Service Representative. If you change the type of consumables (plates, reservoirs, tips, etc.) that you are using with the SerialMate, you will most likely need to make changes to the device defaults.



Fields

- #
  This represents the status register memory location on the device. This value is pre-set on the device and can not be changed.
- *Description*
  This is the register title.
- *Value*
  Use this field to set the required default value. For vertical registers (Z-axis), the greater the value the lower the pipetting head moves down. For horizontal registers (X-axis), the greater the value the further right the pipetting head moves.

Command Buttons

- *Load From Config File*
  This action causes the values in the grid to be replaced with those from the application configuration file.
- *Load From Device*
  This action causes the values in the grid to be replaced with those uploaded from the register memory on the device.

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- *Stop*
  This will stop any loading or saving action with the device.
- *Save To Config File*
  This action will write the values in the grid into the application configuration file.
- *Save To Device*
  This action will download the values in the grid into the register memory on the device.

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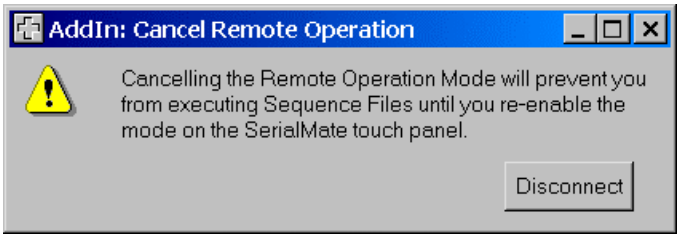
9.4.2 Add-ins

The Add-ins menu provides two functions:

- Cancel Remote Operation
- Change Pipettor Head

9.4.2.1 Cancel Remote Operation

This function disconnects the ***Serial***Mate from the computer. It can be selected by clicking the Add-Ins menu on the main application toolbar.

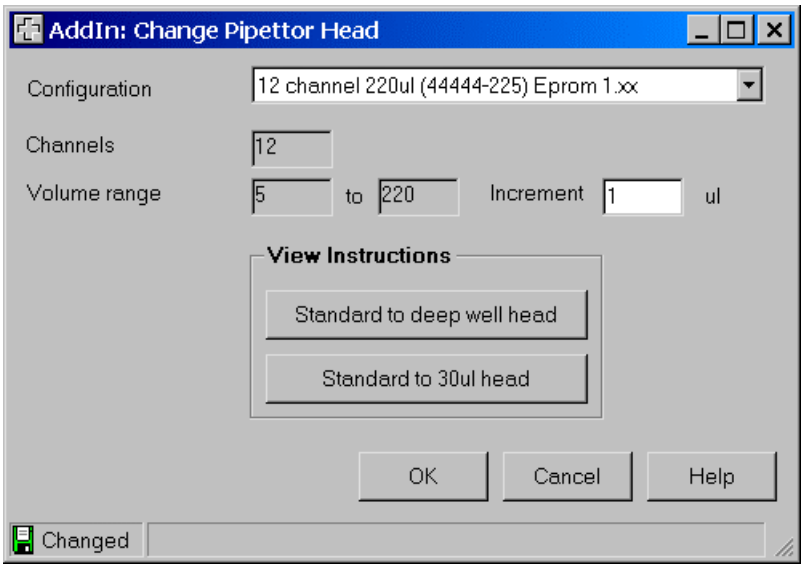


To reconnect the ***Serial***Mate to the computer, see Section 9.1, Remote Operation Mode.

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9.4.2.2 Change Pipettor Head

Prior to changing the pipettor head, use this function to configure *Control*Mate to use the correct pipettor head settings.



Fields

- *Configuration*
  This drop down box allows the selection of available nozzle assemblies. Note the EPROM version that supports the selected nozzle assembly.
- *Channels*
  This field indicates the number of channels that are used in the selected nozzle assembly.
- *Volume range*
  This field indicates the volume range that is supported by the selected nozzle assembly
- *Increment*
  This field indicates the incremental volume unit that will be use on the selected nozzle assembly.

Command Buttons

- *View Instructions*
  The text buttons are linked to the help files that provide instructions on changing the nozzle assemblies.
- *OK*
  Closes the dialogue window. Any changes made in this window are indicated in the Status Bar.
- *Cancel*
  Cancels the changes made in this window.
- *Help*
  This help page.

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