

WellMate[®] & WellMate Stacker

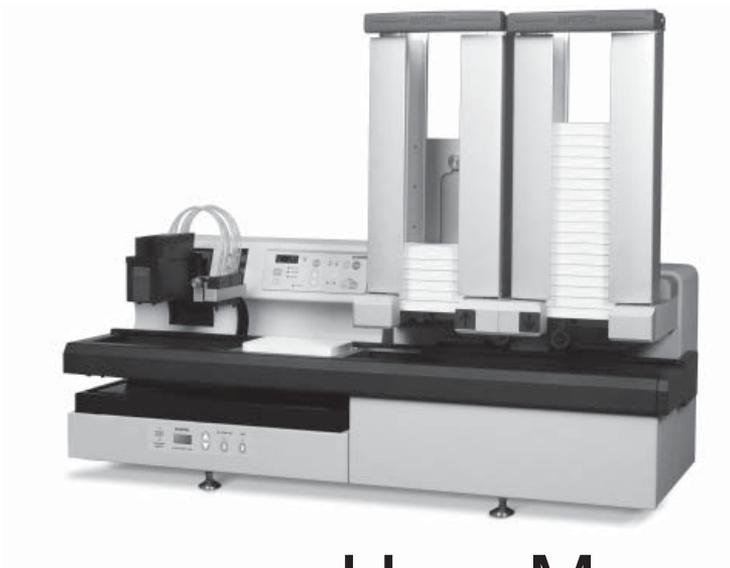


User Manual

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WellMate[®] & WellMate Stacker



User Manual

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A. Introduction

The **WellMate** instrument from Matrix Technologies is a high-speed, small footprint, 8-channel fluid dispenser for 6, 12, 24, 48, 96, and 384-well microplates. It repetitively dispenses samples and reagents into microplates, with high accuracy and efficiency. An optional stacker unit provides higher throughput and walk-away capability.

You can program the **WellMate** unit with dispensing protocols, setting dispense volumes, plate type, and more.

Features and applications of the **WellMate** instrument include:

- Height-adjustable dispense head that accommodates shallow- and deep-well plates and blocks.
- High-resolution, stepper-motor technology that allows fast, accurate dispensing.
- Low-cost, replaceable tubing cartridges.
- Dynamic dispense volume range (1.0µl–2000µl), programmable in 1.0µl increments.
- Easy programming that allows you to select individual plate columns for dispensing.
- Memory-storage capacity for up to 18 files.
- Full RS-232 programming for ease of integration.
- Optional OCX driver interface for integration.
- Removable plate stage that allows easy cleaning of the PTFE coated base.
- Optional stacker unit to process 25 or 50 plates in a single run.

B. Instrument Overview

1. General Description

The **WellMate** instrument dispenses samples and reagents efficiently through use of a peristaltic pump mechanism and a unique, disposable tubing cartridge. Operators can adjust nozzle height to customize use of the instrument for different plate configurations (for example, flat-bottom plates or V-bottom plates).

Your **WellMate** instrument package provides these items:

- Base unit.
- AC power cord.
- Two disposable 8-channel tube assemblies, with silicone-based tubing and polypropylene nozzles.

One each of:

- Standard-bore tubing cartridge, for use with 96-well (shallow or deep well) microplates.
 - Nozzle orifice ID 0.023 in (0.58 mm).
 - Dispenses volumes 20–2000 μ l.
 - Applications include sterile plate filling and dispensing of cellular materials, viscous fluids, and beads.
 - To order replacement 5-pack, use item no. 201-30001.
- Small-bore tubing cartridge, for use with 96- and 384-well (shallow or deep well) microplates.
 - Nozzle orifice ID 0.015 in (0.38 mm).
 - Dispenses volumes 1–200 μ l.
 - Applications include sterile plate filling, dispensing of high vapor pressure fluids, and dispensing of small volumes (1–200 μ l) with enhanced precision.
 - To order replacement 5-pack, use item no. 201-30002.

- Nozzle-height reference scale.
- Nozzle-height spacer guide.
- 7/64-inch Allen wrench (for use in tubing-cartridge adjustment).
- 1/16-inch Allen wrench (for Y-axis arm).
- Universal-microplate removable stage.
- Waste-fluid vessel with tubing.
- Sample Microplate Starter Kit.
- Manual.

You can also purchase the optional **WellMate** Stacker unit, which contains:

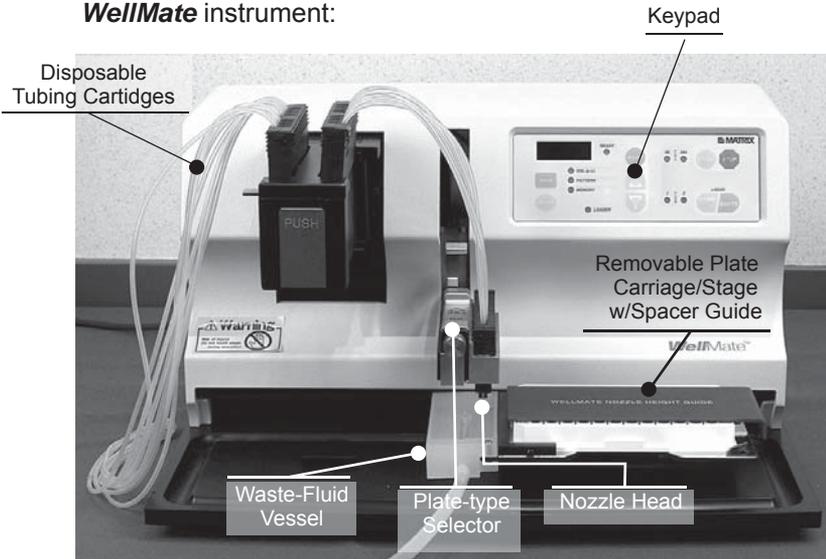
- Power Cord.
- Connection Cable.
- Priming trough with tubing and hardware.
- Chimney support brackets and hardware.
- Stacker base.
- 2 breakaway washers.

You must provide the following:

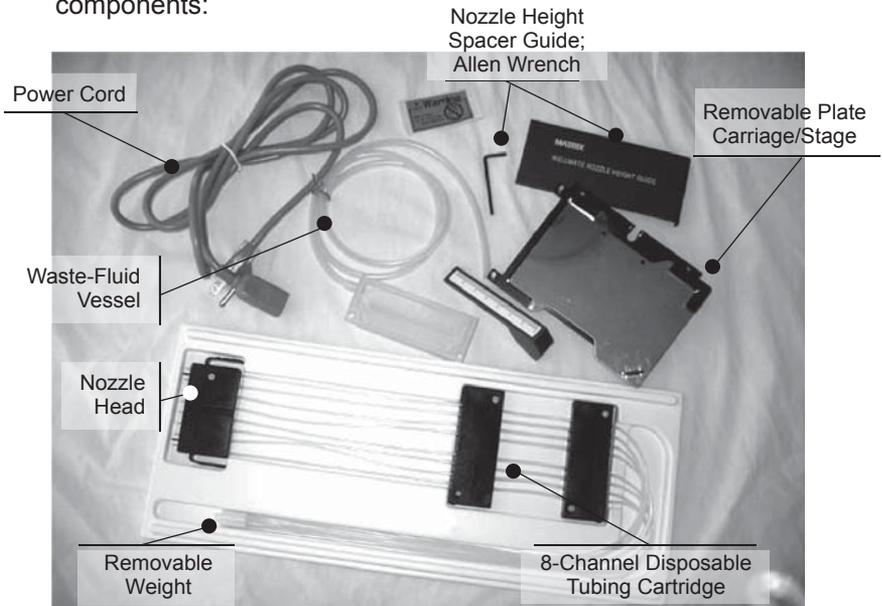
- Container of liquid to be dispensed.
- Liquid vessels (6, 12, 24, 48, 96, or 384-well SBS-format microplates).
- RS-232 Dsub connection cable if you wish to control the instrument from a remote device (To order: Matrix item number 501-30019).
- Container to receive fluid drained from waste-fluid vessel.

Instrument Overview

The following figure shows the primary components of the **WellMate** instrument:

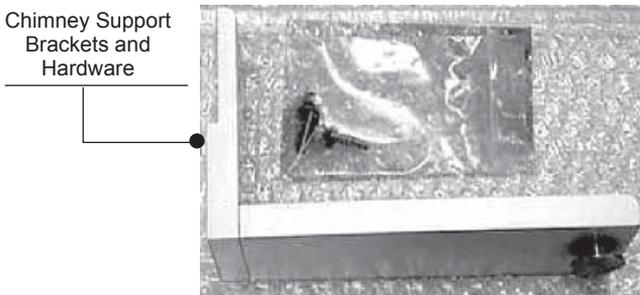
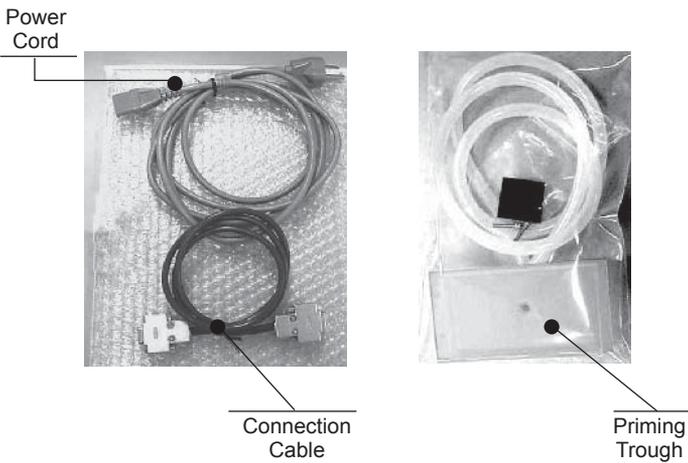


The **WellMate** base unit also comes with the following components:



Note: Only one disposable tubing cartridge appears in the previous photograph; **however, two** disposable tubing cartridges are included in the initial system package: one standard-bore tubing and one small-bore tubing.

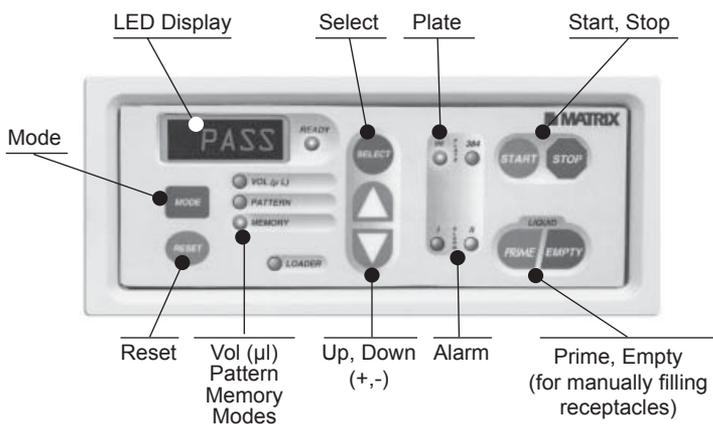
The **WellMate** Stacker package comes with the following components:



2. Keypad and LED Display

The keypad allows the operator to program and execute dispense operations. You can also execute “manual operations” (without using a preprogrammed dispense volume) by pressing and releasing the **PRIME** and **EMPTY** keys on the keypad.

Instructions for using the keypad are described under **Setting up and Running the Instrument** beginning on page 24.



Key and Display Description (clockwise from top left):

LED Display — Displays volume, selected channel, program number, and error-message codes.

SELECT — When **PATTERN** mode is selected, allows you to cycle through channels (individual tubes) to toggle them on or off for dispense. When **MEMORY** mode is selected, allows you to first load and then save a program in memory.

PLATE Type LEDs — Indicates which plate type (96 or 384-well) is currently selected.

START and STOP — Allows you to start and stop the run of a program. Also, you press STOP to stop the program when an error occurs and an alarm sounds. After you press STOP, the operation (dispense) of the currently selected channel will finish and then the operation will end.

PRIME and EMPTY — Allows you to manually aspirate supply agents into channel tubing (PRIME) or manually dispense agents currently in the channel tubing (EMPTY). You must press and hold the key for as long as you want the fill or empty operation to continue.

ALARM — LED lights up when error occurs; audio signal also sounds and LED display shows error code.

UP and DOWN Arrows — **VOL** mode, allows you to increase or decrease dispense volume. **PATTERN** mode, allows you to select or deselect individual channels for dispense. **MEMORY** mode allows you to choose a program number for a program.

VOL (μL) — Allows you to set dispense volumes.

PATTERN — Allows you to set columns (wells) to be filled during a dispense.

MEMORY — Stores up to 18 sets (programs) of dispense volumes and selected dispense channels: 9 programs for 96-well plates (including 6, 12, 24, and 48 well plates) and 9 programs for 384-well plates.

RESET — Allows you to restart a program after you have stopped the program run. When you press RESET, the stage returns to its starting position. Also, when the VOL mode is selected, you can press RESET to increment the dispense volume setting by 200 μL at a time.

MODE — Allows you to select the three modes (VOL, PATTERN, and MEMORY) one at a time, to set a program's parameters.

3. Stacker Unit



Stacker base unit: Attaches to the standard **WellMate** unit to accommodate stacker chimneys. Used in conjunction with the **WellMate** instrument to automate the liquid dispensing and plate handling process.

Optical plate sensors: Allows the stacker unit to run until the stacker chimney is empty, then stops the run.

Stacker chimneys: Tall chimneys accommodate up to 50 standard height plates, short chimneys accommodate up to 25 standard height plates. Both will accommodate shallow plates, deep well plates, blocks or tube racks up to 3.5 in or 89 mm. Interchangeable with the PlateMate® Plus system.

Built in waste reservoir: Drains waste fluid.

4. Specifications

Table 1. WellMate Specifications

Power supply	AC 100–240V, 50/60Hz 40VA
Dimensions (HxWxd)	14.75* x 11.5 x 8.5 in (37.5 x 30 x 21.6 cm) (*Allow at least 3 more inches [7.62 cm] in width for extension of tubing and ~6 more inches [15.24 cm] in depth for extensions of power cord and waste-fluid tubing.).
Weight	24 lbs (10.89 kg)

Table 2. Standard-bore Tubing Cartridge Specifications (item no. 201-30001)

Description	8-channel, pre-sterilized, standard-bore disposable tubing cartridge. Inner diameter nozzle orifice = 0.023 in (0.58 mm).
Recommended dispense volumes	20µl to 2000µl.
Recommended uses	With 6, 12, 24, 48, or 96-well (shallow- or deep-well) plates, for: <ul style="list-style-type: none"> • Sterile plate filling • Dispensing of volumes 20–2000µl • Dispensing of cellular materials • Dispensing of viscous fluids
Dispense accuracy/precision	+/-2.0% or 1.0µl
Precision limit	1000 96-well microplates processed with 100µl dispense volume

Table 3. Small-bore Tubing Cartridge Specifications (item no. 201-30002)

Description	8-channel, pre-sterilized, small-bore disposable tubing cartridge. Inner diameter nozzle orifice = 0.015 in (0.38 mm)
Recommended dispense volumes	1µl to 200µl
Recommended uses	With 96-well or 384-well (shallow- or deep-well) plates, for: <ul style="list-style-type: none"> • Sterile plate filling • Enhanced dispense precision • Dispensing of high vapor pressure fluids
Dispense accuracy/precision	+/- 2.0% or 0.25µl < 20µl
Precision limit	1000 96-well microplates processed with 100µl dispense volume

Table 4. Stainless Steel PTFE-coated tip Tubing Cartridge Specifications (item no. 201-30003)

Description	8-channel, pre-sterilized, stainless steel PTFE-coated tip tubing cartridge
Recommended dispense volumes	2µl to 2000µl
Recommended uses	With 6,12,24,48, 96 or 384-well (shallow- or deep-well) plates, for: <ul style="list-style-type: none"> • Sterile plate filling • Dispensing of viscous fluids • Dispensing of volumes 2-2000µl
Dispense accuracy/precision	+/- 2.0% or 0.25µl 2.0% or 0.25µl
Precision limit	1000 96-well microplates processed with 100µl dispense volume.

**Table 5. WellMate Stacker Unit Specifications
(item no. 201-20001)**

Description	Stacker base unit with plate sensors and built-in waste reservoir; two chimney sizes available, 50 or 25 plates (501-30005 or 501-30006)
Power Supply	Input Voltage 100V AC or 240V AC Consumption 50/60 Hz -40VA
Measurements	Width 31.06 in (78.89 cm) Depth 12.65 in (32.13 cm) Height with Tall Stackers = 40 in (101.6 cm)* Height with Short Stackers = 28 in (71.12 cm)*
Weight	60 lbs (27.22 kg)
Plate Type	96 and 384-well plates; shallow and deep well Capacity: 25 standard-height plates 50 standard-height plates

**Allow at least 2 inches clearance if unit is placed in a containment hood.*

5. Hazards/Precautions

Note the following hazards and precautions for setup, operation, and maintenance of the **WellMate** instrument:

Operator protection

- Always unplug the unit from the power outlet before you perform any service or maintenance task that does not require power.
- Do not touch nozzles or the stage when the unit is operating.

Base-unit protection

- Use only dilute detergent cleaning solutions to clean the unit. Do not clean the keypad with bleach solutions or other solvents. To clean the unit, first remove the tubing assembly from the instrument. Then use a bleach solution (2%) or an aqueous-based cleaner to clean surfaces. Rinse solution completely from surface.
- If liquid leaks out of the tubing onto the stage or onto any other part of the instrument, stop the operation immediately and then wipe off the liquid.

Tubing-cartridge protection

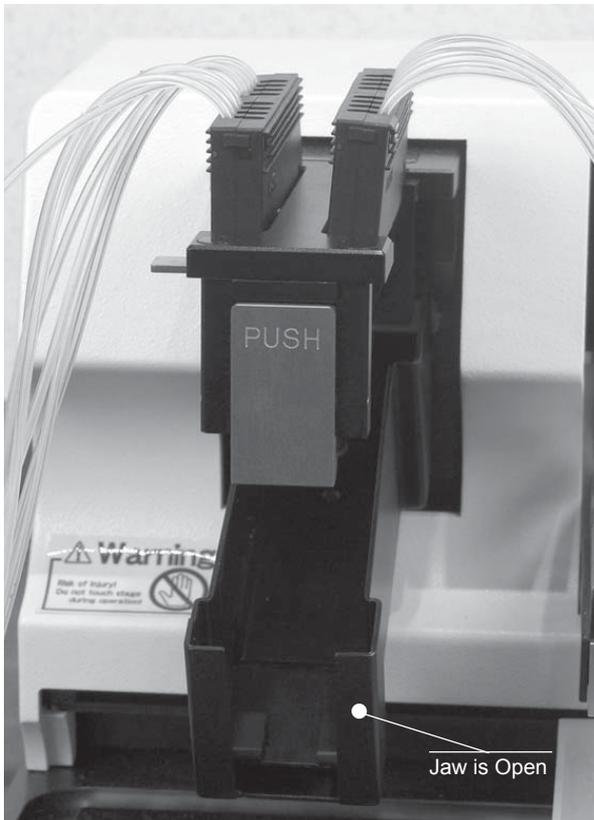
- Inspect the nozzles and nozzle tips regularly to ensure that the tips are not clogged and that there is no debris in the nozzles. Clean them regularly following the procedures described on page 39.
- Be careful not to bend the nozzles.

C. Configuring the Device

1. Install the Tubing Cartridge

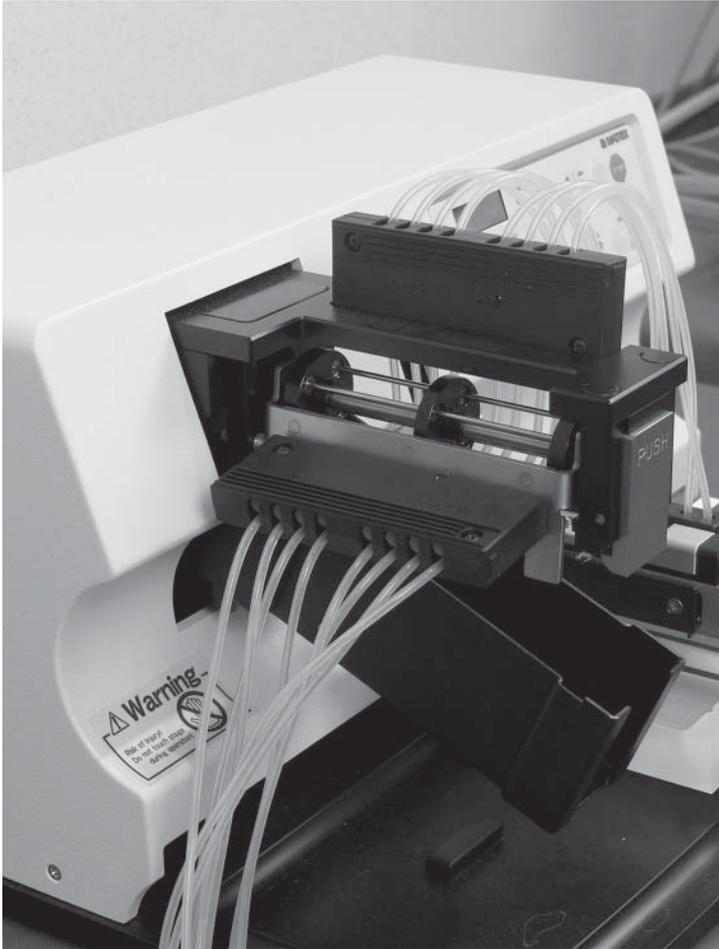
To install a tubing cartridge:

1. When installing the tube set, make sure that the adjustment screws are accessible. To do this, have the screws on the top half when you lay out the tube set so the adjustment screws will be toward the middle of the pump when presented on the machine.
2. **Push** the blue **PUSH** button on the front of the tube holder to open the mechanism.

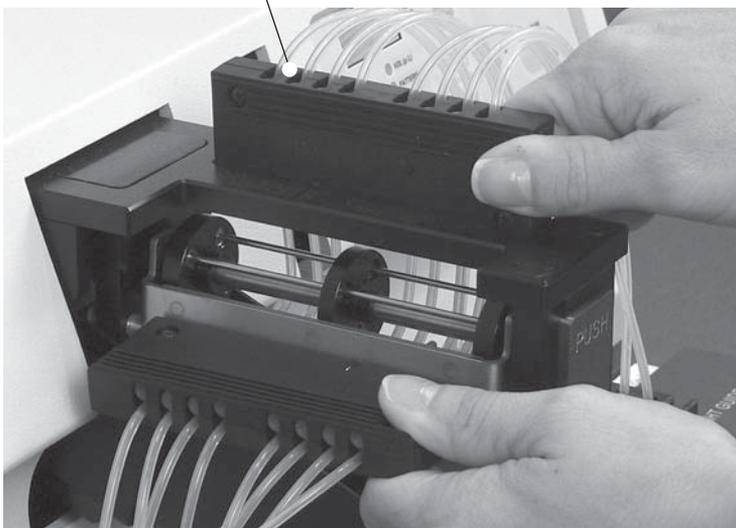


Configuring the Device

3. When installing the tubing, place the left-hand tube holder onto the arm first. Then place the other holder into position. Rotate the arm so the tubing is set into position.

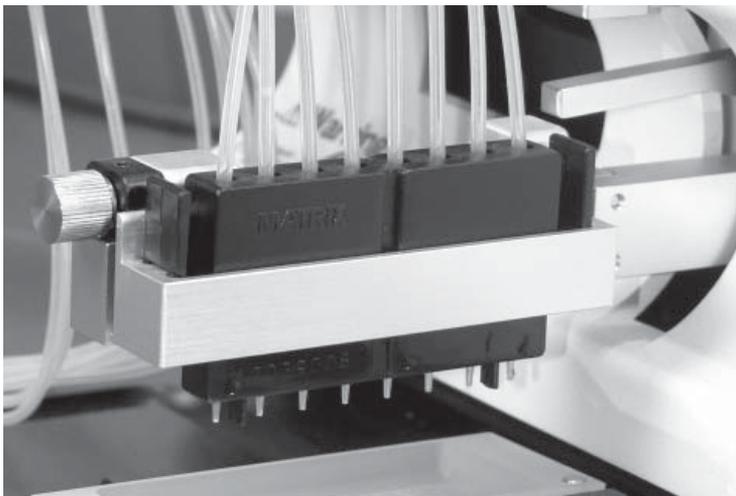


Adjustment screws
are towards middle
of pump



4. Push the cover on the pump mechanism to the closed position.

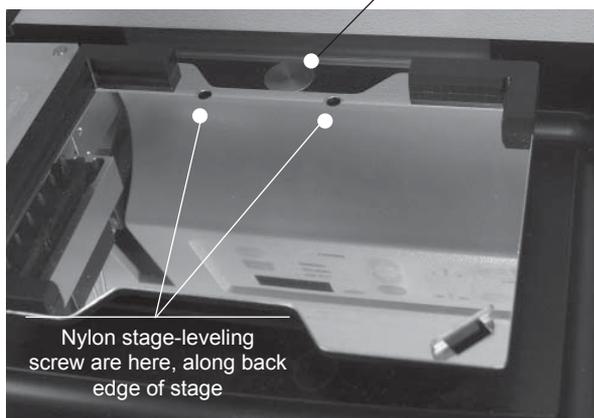
5. Insert the nozzle tip head as shown in the following:



2. Attach the Removable Plate Carriage/Stage

1. Tilt the plate carriage/stage so that its front edge is slightly higher than its back edge. Slide the notch in the plate carriage piece up under the spring-loaded plunger. Push the stage in gently and firmly until the two posts on either side of the back edge of the stage slide completely into the slots on the base unit. Move the stage manually to the end of its rightward movement.

Spring-loaded plunger is here behind removable plate carriage/stage



2. If the stage is not level with the nozzle tips, first try pushing the stage toward the back of the unit to ensure that it is pushed in completely. If it is still not level, slide the stage under the nozzle tips, and put a weight on the left (your left) side of the stage. Then use a flathead screwdriver to adjust the left nylon screw in the middle back of the stage, tightening the screw to push the stage down. Do the same with the right side of the stage, adjusting the right hand nylon screw. Check visually to ensure that the distance between the stage top and the bottom of the front nozzle tip is equal to the distance between the stage top and the bottom of the back nozzle tip; that is, bottoms of nozzle tips and stage top are parallel from front to back.

If you are using 384-well plates and the stage is not level with the nozzle tips, the nozzles might not be properly targeted with all the columns in the plate. Slide the stage left and right. Then use a flathead screwdriver to adjust the nylon screws as described above.

3. Attach the Waste-Fluid Vessel

Align the two holes on the top edge of the waste-fluid vessel over the posts extending upward from the flange on the left side of the plate carriage, and drop the waste-fluid vessel over the posts. Place the open end of the tube into a receptacle that sits below the surface of the instrument base.

CAUTION: Ensure that the open end of the tubing remains above any liquid in the receptacle; if it is immersed, the vessel will not drain properly.

The first of the following two photos shows the waste-fluid vessel detached from the plate carriage. It is very easy to remove and replace the vessel. The second photo shows the waste-fluid vessel in place next to the plate carriage.

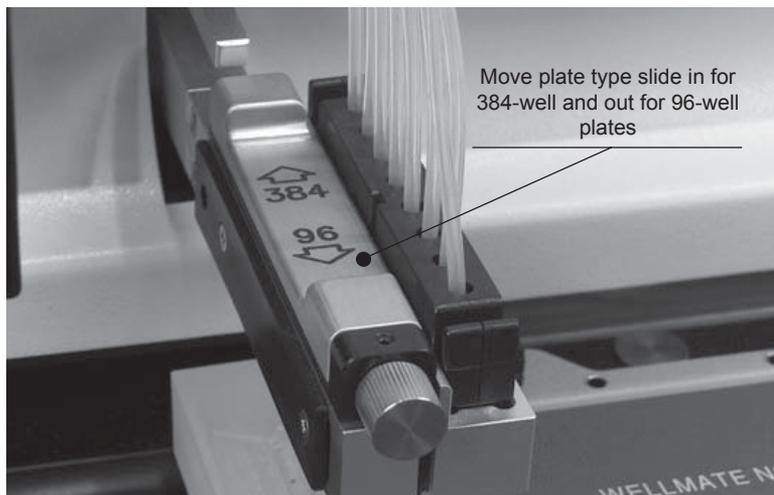




4. Set Up Plates

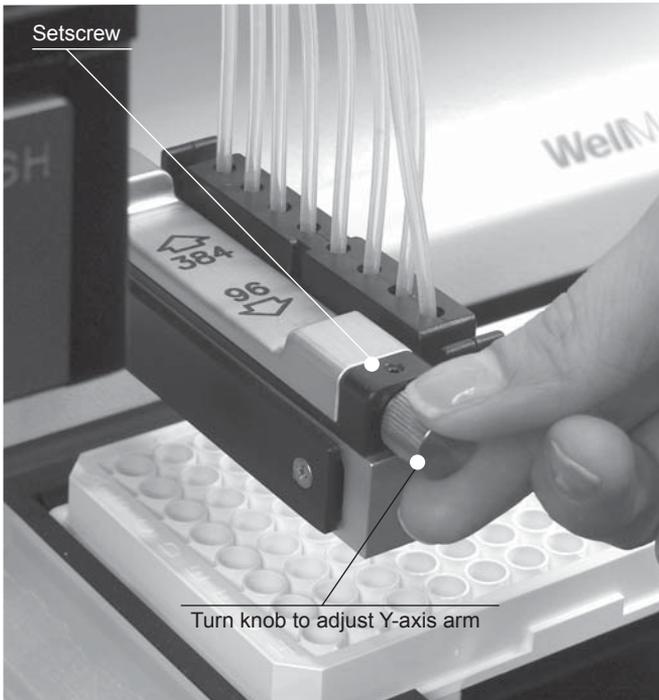
For each type of plate you plan to use, set up a sample plate as follows:

1. Set the plate type by moving the plate type slide in toward the machine for 384-well plates and out and away from the machine for 96-well plates.



2. Move the nozzle head down until it is just above the openings of the first column of wells in the plate.
3. Visually check to see that the nozzle tips are straight and centered over the wells. If the tips are not centered, adjust the front to back position by turning the knob on the Y-axis arm.

Note: Use the 1.5 mm Allen wrench that is provided to tighten the setscrew after Y-axis adjustment.



4. Raise the nozzle tips. Put the nozzle height spacer guide on top of the microplate and then push the lever on the nozzle tips arm down until the two black standoffs on the tip holder rest on top of the spacer guide. This sets an ideal nozzle height for dispensing.



5. **Optional:** Peel the covering off the adhesive tape on the back of the nozzle-height reference scale and attach it to the instrument, to the left of the plate-type lever. When you have set the tips for a particular plate to the height you want to dispense from, mark the reference scale for that plate and height.

Nozzle height reference scale



5. Install Stacker Base Unit (optional)

Note: The **WellMate** unit requires EPROM chip version 3.11 or higher. Contact your Matrix representative to install the **EPROM** chip.

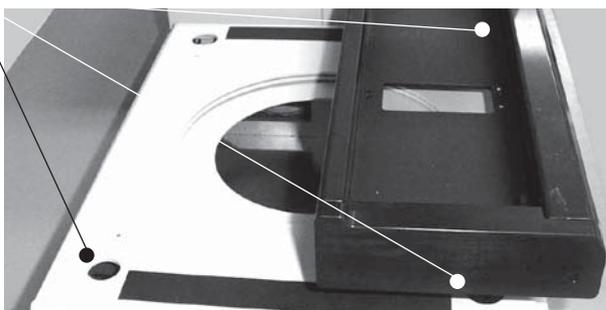
Use the following procedure to install the **WellMate** Stacker Base Unit.

1. Remove the plate stage and fluid reservoir from the **WellMate** Dispenser.



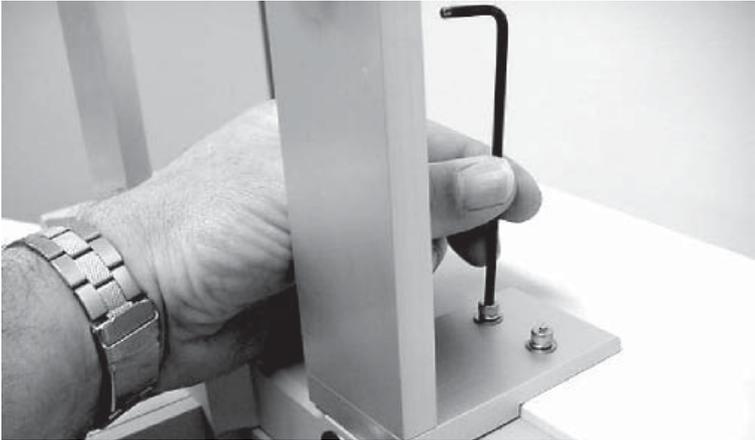
2. Place the **WellMate** instrument onto the stacker base unit in the space provided. The four rubber feet on the bottom of the **WellMate** instrument should be placed in the 4 holes of the stacker platform. See the following figure.

Location for rubber feet of
WellMate instrument

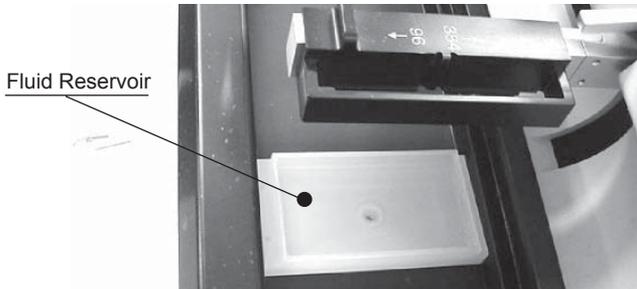


Configuring the Device

3. Attach the Chimney support brackets to the base of the stacker unit in the space provided. Each bracket comes with 2 Allen hex key screws.

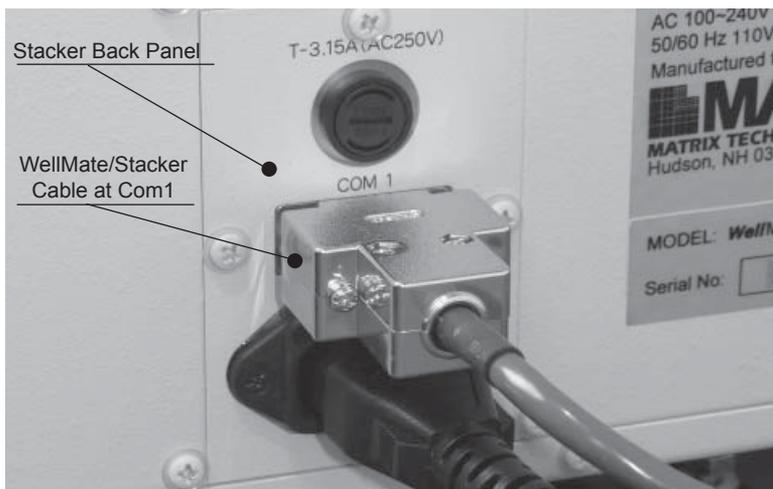


4. Once the screws are in place, but not completely tightened, put the stacker chimney in place. While it is in place, tighten the hex screws.
5. Attach the tubing to the fluid reservoir.
6. Insert the fluid reservoir and screw it in place.



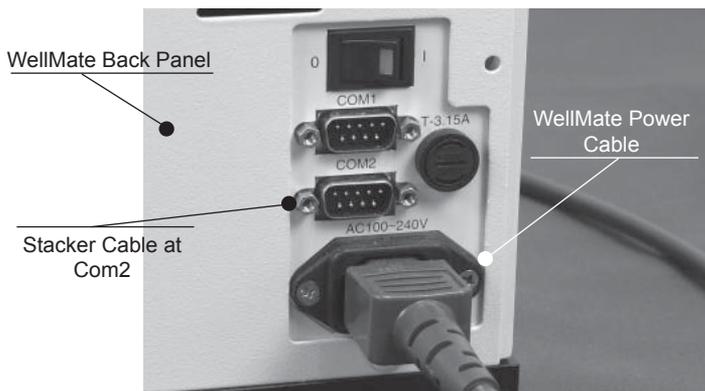
Note: Be sure that the waste reservoir lies flat on the bottom of the track. If it is not properly seated flat, it will interfere with the plate stage movement.

7. Connect the stacker base to the **WellMate** with the connection cable provided. The stacker unit will use the COM 1 port (see following figure) while the **WellMate** uses the COM 2 port.



6. Attach the Power Cord

Plug the power cord into the power-cord receptacle on the back of the **WellMate** unit.



The stacker is now installed. Go to page 31 to set up and operate the stacker.

D. Setting up and Running the Instrument

Turn the instrument on by pressing the power switch on the back of the instrument to **ON**.

You will need to prime the tubing cartridge whenever you install a different cartridge on the instrument.

Note: The tubing cartridge is already calibrated when you receive it; you do not need to calibrate it.

You can then create, load and save programs and operate the instrument programmatically **OR** operate the instrument manually. You can also adjust tip-to-well alignment by adjusting the X-axis stage position and you can change the dispensing speed setting.

This section describes those priming, programming, operation and adjustment tasks.

1. Prime the Tubing Cartridge

Whenever you change the tubing cartridge, you will need to prime it. The first time you use the instrument, you will need to prime the tubing set.

To prime the tubing cartridge:

1. Put the supply ends of the channel tubes in a receptacle containing dH₂O or dispense medium.
2. Ensure that the waste-fluid vessel is below the dispensing end of the channel tube and that the open end of the waste-fluid tubing is in a receptacle, with the end of the tubing **ABOVE** any liquid in that receptacle.
3. Lower the nozzle tips so that they are at the correct dispensing height above the waste-fluid vessel or a plate on the stage.

4. Press and hold the **PRIME** key until a continuous flow moves through all the channel tubes. See page 38 for instructions on programming a timed prime.

Note: Prime new tube sets for 1 to 2 minutes with water before using them for dispensing. This initial priming helps to break in the new tube set and stretch out the tubes where they contact the roller head.

2. Create, Load, and Save a Program in Memory

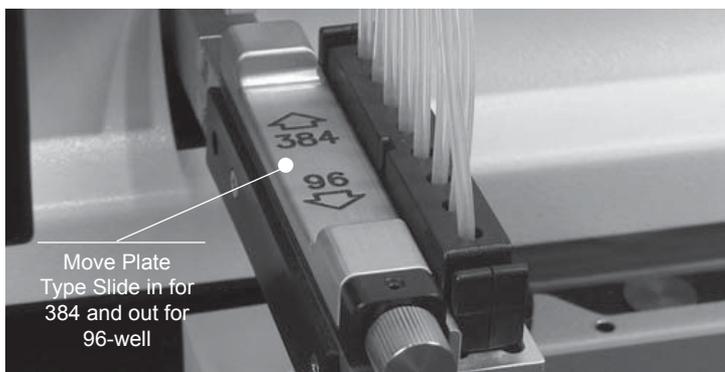
You can construct and save up to 18 programs (9 for 6- to 96-well plates and 9 for 384-well plates) that allow you to easily adjust dispense volume and column use.

To program a dispense sequence to fill a plate, you will:

- Select a plate type (96 or 384).
- Set the dispense volume.
- Select columns (wells) to be filled in the dispense operation.
- Load the program into memory and save it.

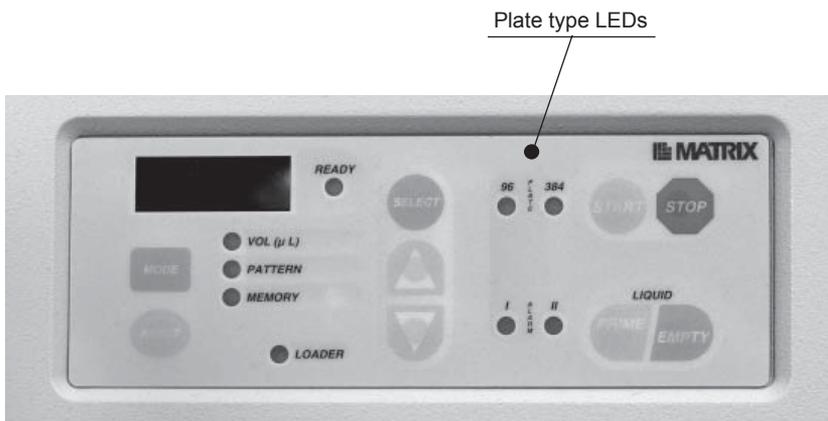
1. Select the plate type:

Set the plate type by moving the plate type slide to accommodate the plate you will be using.



Setting up and running the Instrument

Verify that the plate type LED for your plate lights up on the keypad. For 6, 12, 24, 48 or 96-well plates, make sure the 96 LED is illuminated; for 384-well plates, make sure the 384 LED is illuminated.



2. Set the dispense volume:

- Press **MODE**. The VOL (μ L) LED lights up.
- Press the **UP** and **DOWN** arrows to increase or decrease volume (the current volume appears in the LED display).

Note: To increase the dispense volume in increments of 200 μ l, press **RESET**.

3. Select the dispense pattern (which plate columns are to be filled):

- Press **MODE**. The PATTERN LED lights up. The two leftmost digits in the display show the column (for example, 01 for column 1). The third display digit, on the right of the display, is 0 or 1. A "0" indicates that this column is not selected to dispense; a "1" indicates that this column is selected to dispense.

- b. To change the current selection of the column used from on to off or off to on, press **SELECT**. The digit will be toggled to the other value, either “0” or “1”.
 - c. Press the **up** or **down** arrow to move to another column.
 - d. Continue to press **SELECT** to toggle dispense on or off for each column.
4. Save the program:
- a. Press **MODE**. The MEMORY LED lights up.
 - b. Press the **up** or **down** arrow to move to the program number you want to save this program to. If you are using a 96-well plate, program numbers 1–9 appear, one at a time, in the display. If you are using a 384-well plate, numbers 11–19 appear in the display.

When the program number you want to use appears in the display, press **SELECT**. “LoAd” appears in the display. Press **SELECT** again. “SAVE” appears in the display.

- c. Press **START**. PASS appears on the display.
- d. Press **MODE**. The programmed dispense volume will appear on the display.
- e. Press **START** to run the program.

3. Run a Program From Memory

1. Ensure that the supply ends of the channel tubes are in the container with the agent to be dispensed.
2. Ensure that the waste-fluid vessel is in place and that the waste-fluid tube is placed in a waste liquid container, with the open tube end ABOVE any waste liquid in the container.

Setting up and running the Instrument

3. Place the plate in the plate carriage.
4. Verify that the READY light and the correct LED for your plate type are lit on the keypad.
5. Test that the nozzle-tips height is correct by using the nozzle-height guide.
6. Press the **MODE** key twice; the MEMORY LED is lit. Then select the program you want to run.
7. Press **SELECT**. LoAd appears in the LED display.
8. Press **START**. The program dispense volume appears in the LED display.
9. Press **START**. The program begins running.
10. Press **STOP** if you need to stop the program. Press **START** if you want to restart from the point where the program stopped; press **RESET** to restart the program from the beginning.
11. When you are finished with the dispensing operations, return the agent remaining in the tubes to the supply receptacle or other container. Then rinse the tubing first with water and then with alcohol to dry the tubing, or perform the appropriate cleaning action (see the maintenance information in the next section).
12. When you have finished using the instrument, leave the tubing in a resting position: unfold the left-hand side of the tubing assembly.

3. Program Lock Feature Instructions

1. Follow the steps above for creating the program.
2. Save and lock the program.
 - a. Press **MODE**. The memory LED lights up.
 - b. Press the **up** or **down** arrow to move to the program number you want to save the program to. If the 96 LED is illuminated, program numbers 1-9 appear, one at a time in the display. If the 384 LED is illuminated, numbers 11-19 appear in the display.
 - c. When the program number you want to use appears in the display, press **SELECT**. “LoAd” appears on the display.
 - d. Press **SELECT** again. “save” appears on the display.
 - e. Press **START**. PASS will appear on the display.
 - f. Press the **PRIME** button. “----“ will appear on the display. Press the **UP** or **DOWN** arrow to input the 4-digit password. (“0000” is not accepted) press the PRIME button to select the number for each digit.
 - g. Once the 4-digit password is set, press **START** to lock the program with the password. The program is now locked.
3. To run a locked program:
 - a. Select program number.
 1. Press **MODE** until the memory LED is illuminated.
 2. Use the **UP** or **DOWN** arrows to select the desired program number.

Setting up and running the Instrument

3. Press **SELECT**. “LoAd” appears on the display.
- b. Press **START**. The volume set for that program will appear on the display.
- c. Press **START** again, this will run the selected program.

5. Overwrite a Locked Program

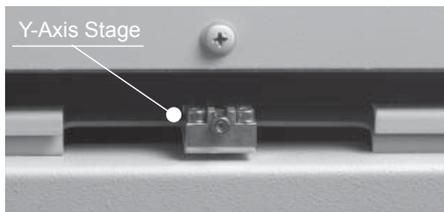
1. Press **MODE** until the memory LED is illuminated.
2. Select the desired program number using the **UP** and **DOWN** arrows.
 - a. Press **SELECT** “LoAd” appears on the display.
 - b. Press **SELECT** again, **PASS** appears on the display if the program is locked.
 - c. Press **PRIME** button. “----“ appears on the display.
 - d. Use the **UP** or **DOWN** arrows to input the 4-digit password for that program. Pressing **PRIME** to select the number for each digit.
 - e. Once the password is on the display, press **START** to unlock the program.
 - f. If the password is correct, **SAVE** appears on the display.
 - g. Press **MODE** to select the volume and pattern to overwrite the program.
 - h. If the password for that program is incorrect, then the display does not change. Go through the steps again to re-enter the correct password.
 - i. Repeat steps to lock the program.

6. Set Up and Operate Stacker Base Unit

1. Turn the **WellMate** unit and the **WellMate** stacker base unit on.
2. Align the 96-well plate.
 - a. Turn the **WellMate** off and place a 96-well plate onto the plate shuttle. Keep the **WellMate** stacker powered on throughout this procedure.
 - b. Pull out the nozzle bar to the 96 plate position.
 - c. Press the **Start** and **Stop** keys simultaneously and turn on the **WellMate**. “POS” will show on the **WellMate** display.
 - d. Press the **Start** key. “96” should show on **WellMate** display. Verify that the “96” plate type light is illuminated.
 - e. Press the **Start** key. The plate shuttle should move until column 7 of the plate is under the dispense nozzle.
 - f. Check alignment of the nozzle over the wells.

If the horizontal alignment is off, press the **up** or **down** key to adjust the X-axis stage position under the nozzles.

If the vertical alignment is off, align the Y-axis stage position by turning the 2.5 mm Allen wrench clockwise (moves the entire **WellMate** unit backward) or counter-clockwise (moves the entire **WellMate** unit forward). See the following figure.



Note: In addition to the Y-axis stage adjustment, you can also use the Y-axis adjustment knob (see page 18 for Y-axis arm adjustment).

- g. When you have finished aligning the 96-well plate under the nozzles, press the **Reset** button. The stage shuttle will move to its home position under the right stacker.

3. Align the 384-well plate.

- a. Replace the 96-well plate with a 384-well plate. Push in the dispense nozzle arm and verify that the “384” indicator light on the **WellMate** is illuminated.
- b. Press the **START** button. The plate shuttle should move until column 13, row set 1 of the plate is under the dispense nozzle.
- c. Press the **UP** or **DOWN** key to adjust the stage position under the nozzles.
- d. Align the Y-axis stage position with an Allen wrench.
- e. When you have finished aligning the 384-well plate row set 1 under the nozzles, press the **RESET** button. The plate shuttle should move until column 13, row set 2 of the plate is under the dispense nozzle.
- f. Press the **UP** or **DOWN** key to adjust the stage position under the nozzles.

- g. When you have finished aligning the 384-well plate under the nozzles, press the **RESET** button. The stage shuttle will move to its home position under the right stacker.
4. Turn the **WellMate** unit off, then turn it on.

The **WellMate** stacker is ready for use. When you press **START** during manual operation, the first plate in the stacker will be moved to the dispense position.

7. Operate the Instrument Manually

To operate the instrument manually:

1. Select the plate type.

Set the plate type by moving the plate type slide in toward the machine for 384-well plates and out away from the machine for 96-well plates.

Verify that the plate type LED for your plate (96 or 384) lights up on the keypad.

2. Put a plate or other receptacle on the stage.
3. Adjust the nozzle height to the correct height by using the nozzle height spacer guide.
4. Set the dispense volume:
 - a. Press **MODE**. The VOL (μL) LED lights up.
 - b. Press the **UP** and **DOWN** arrows to increase or decrease volume (the current volume appears in the LED Display).
- Note:** To increase the dispense volume in increments of $200\mu\text{l}$, press **RESET**.
5. Select the dispense pattern (which plate columns are to be filled):

- a. Press **MODE**. The PATTERN LED lights up. The two left-most digits in the display show the column (for example, 01 for column 1). The third display digit, on the right of the display, is 0 or 1. A “0” indicates that this column is not selected for dispense; a “1” indicates that this column is selected for dispense.

If you wish to change the current selection of the column use from on to off or off to on, press **SELECT**. The digit will be toggled to the other value, either 0 or 1.

- b. Press the **UP** or **DOWN** arrow to move to another column.
 - c. Continue to press **SELECT** to toggle dispense on or off for each column.
6. Press the **PRIME** key to draw the agent into the tubes and ensure that liquid flows freely through all tubing in a continuous flow.
 7. When you are finished with the dispensing operations, press the **EMPTY** key to return the agent remaining in the tubes to the supply receptacle or other container. Then rinse the tubing first with water and then with alcohol to dry the tubing, or perform the appropriate cleaning action (see the maintenance information in the next section).
 8. When you have finished using the instrument, leave the tubing in a resting position: unfold the left-hand side of the tubing assembly.

8. Adjust the X-Axis Stage Position for WellMate Unit

This feature allows the operator to “teach” the stage position for dispensing. Use this feature to fine-tune the desired plate position for dispensing to occur.

Note: Liquids tend to adhere to the walls of small tubing (such as tube sets for 384-well plate), especially when dispensing smaller volumes (9 μ l or less). To minimize the amount of liquid retained in the tubing, make sure that the Y-axis arm positions the tips directly over the middle of the wells (see page 18 for Y-axis arm adjustment) and the height gauge is used to set the nozzle over the plate.

1. Put a 96-well plate on the stage. Select plate type 96 (on the nozzle holder) and then turn off the instrument.
2. Press the **START** and **STOP** keys simultaneously and turn on the instrument.
3. Press **START**. Verify that the plate type LED on the display and the plate selector are both set to plate type 96.
4. Press **START**. The stage will move automatically so that column 7 is under the nozzle tips.
5. Press the **UP** and **DOWN** arrow keys to adjust the stage position until the tips are aligned in the wells as you want them to be. (The LED display will show a volume range from -300 to +300).
6. Press **RESET**, select plate type 384 (on the nozzle holder) and verify that the 384 LED is illuminated.
7. Replace the 96-well plates with a 384-well plate and press **START**. The 384-well plate will move to column 13.
8. Press the **UP** and **DOWN** arrow keys to adjust the stage position until the tips are aligned with the wells.
9. Press **RESET** when you have finished the adjustment and then turn off the instrument.

9. Adjust the Dispensing Speed

Please note, the tubing cartridge specifications are set using the highest speed (S-1)

1. Press the **PRIME** and **EMPTY** keys simultaneously and turn on the instrument.
2. Press **SELECT** to cycle through the three pump-speed choices as they appear in the LED Display. The choices are:

S-1 = High speed (This is the normal setting).

S-2 = Medium speed

S-3 = Low speed

3. When the speed you want to use shows in the display, turn off the instrument, and on again.

10. Additional Functions

The following functions are accessible through a special program mode (available with **WellMate** EPROM version 3.5 or higher):

- **Pump Pause (PP):** to initiate a pause after the dispense in-between each column.
- **Pump Count (PC):** to check or clear the pump count feature.
- **Timed Prime (PT):** to set the duration of time the pump motor runs when the prime button is pressed.
- **Back Step (BS):** to initiate a back step of the pump motor after the dispense and before the Pump Pause.

Note: This feature is useful when dispensing fluids that may form droplets at the end of the tip nozzles, or when dispensing viscous fluids.

To use this program mode:

1. While holding down the **MODE** button, press the **SELECT** button.
2. Press the **SELECT** button again to select the mode you want to program (PP, PC, PT, BS). Use the arrow buttons to set the parameters for the selected function. After you have set the program, press the **SELECT** button to save the setting.

Note: If you press **MODE** while in the function, you will exit without saving the setting and return to the previous display.

Pump Pause (PP): The pause duration is set in milli-second intervals. For example, 0.01-99.99 seconds are available for pausing the pump between dispense columns.

Setting up and running the Instrument

- a. Use the **UP** or **DOWN** arrows to select the duration of the pause. The default pause duration is set to .01 milliseconds.
- b. Press the **SELECT** button to save your setting.

Pump Count (PC): The number on the display represents how many revolutions the pump has made.

- a. Press the **SELECT** button to clear the pump count.
- b. Press the **SELECT** button again, when “sure” is displayed.

Note: If the count exceeds 9999, the count is displayed in exponential form, such as “10E3” for 10,000 revolutions or “12E4” for 123,456 revolutions.

Timed Prime (PT): The prime duration is set in real time seconds from 1-9999.

- a. Select the time (for example, 20 for 20 seconds) using the **UP** or **DOWN** arrows
- b. Press the **SELECT** button to save the time.

When the prime button is pressed under normal operation (and the timed prime is not zero), the system will count down the time for priming (for example, 20 seconds) rather than requiring you to hold down the prime button.

Back Step (BS): The back step volume is set in 100 nanosecond units. For example, 0.1 – 20.0µl are available for back stepping the pump motor after dispense and before pausing the pump.

- a. Use the **UP** or **DOWN** arrows to select the duration of the back step. The default back step is set to 0.0µl.
- b. Press the **Select** button to save your setting.

E. Tubing Cartridge Maintenance and Recalibration

This section describes how to care for the tubing cartridge and then also how to recalibrate the cartridge if you wish to do so.

Note: Recalibration is generally not necessary. The tubing cartridges that come with your system have already been calibrated. That calibration will generally last until the precision limit for the tubing cartridge (1000 dispenses of 100µl each into a 96-well plate) has been reached. In most cases, particularly if all of the channels in the cartridge are no longer meeting precision specifications, you will simply want to replace the disposable cartridge with a new cartridge.

To optimize performance and extend the life of your tubing assembly, refer to the Helpful Hints section on page 43.

1. Clean the Tubing Assembly

Table 6. Care and Maintenance of Tubing Assembly

Task	How Often?	Procedure
Rinse tubing	After each sample.	Use dH ₂ O to rinse the tubing assembly each time you change samples. Then rinse the tubing with alcohol to remove water.
Wash tubing	At end of day's use or between solutions.	Use a mild detergent solution or 10% bleach solution to clean the tubing. Then rinse it with fresh water and finally with alcohol.
Autoclave tubing if desired	As needed. No more than 3x	At 120° C for 20 minutes
Replace tubing	As needed.	Obtain a new tube assembly cartridge and install as you did the earlier set.
Clean nozzle tips	As needed.	Inspect the nozzle tips for signs of clogging or debris. Clean them with water and then rinse them with alcohol.

2. Recalibrate the Tubing Cartridge If Necessary

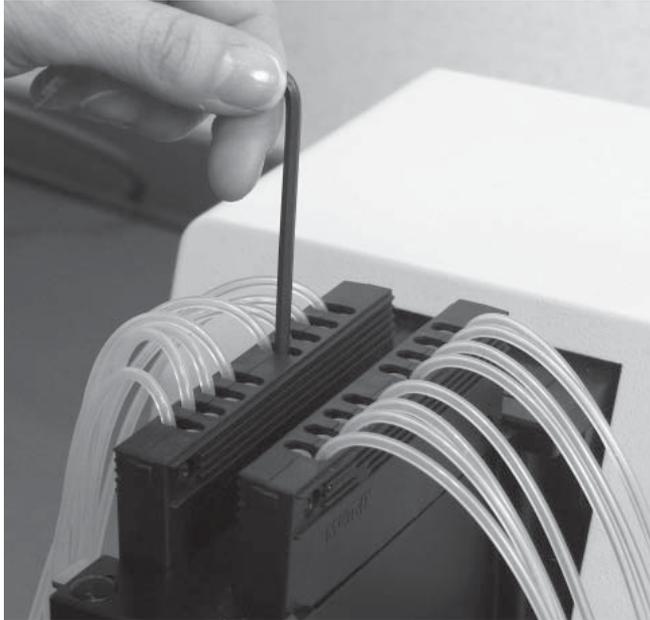
Note: The tubing cartridges to be recalibrated must be allowed to equilibrate to lab-room conditions for at least 2 hours prior to calibration.

Use a gravimetric test or optical scanning with a plate reader to determine whether a particular channel needs to be recalibrated.

1. Turn on the **WellMate** unit and set the volume to 50 μ l.
2. Verify that the dispense mode is set for (ten) columns of dispense, with 1-10 ON and with 11-12 OFF.
3. Weigh a tube and tare out the scale. Use this tube to collect the dispensed volume of each channel during the calibration sequence. Zero the scale between readings.

Note: There is a purge before each dispense cycle of the **WellMate**. It is important NOT to collect this drop in the tube as you perform the following operation. Allow the drop to fall prior to putting the tube under the nozzle.

4. Remove all tubes from the supply water, except channel 1, and make sure that this channel is still primed. Hold a tube under the channel 1 nozzle. Press the **START** key. Proceed to collect each of the (10) dispensed shots in the tube.
5. Weigh the water in the tube. The target weight of the **liquid** is **498 mg–502 mg**. If the weight is not within these limits, use the **7/64-inch** Allen wrench to turn the adjustment screw for the channel tube (on the supply side of the tubing).



A clockwise turn will **DECREASE** the volume dispensed.

A counter-clockwise turn will **INCREASE** the volume dispensed.

Each **FULL Revolution** of the screw will adjust the volume level by approximately 8 mg for the ten shots dispensed (or 0.8 mg/dispense).

6. Repeat the previous step until three consecutive weights are within the gravimetric range stated above. Do this with all eight channels. Record results.
7. Fill the supply container with the appropriate medium for your plate reader.
8. Make sure that the plate carriage is properly in position on the unit. Insert a plate in the carriage and position the nozzle tips to correctly dispense into the plate.

Tubing Cartridge Maintenance and Recalibration

9. Select a program to fill the whole plate to the appropriate volume and press the **START** key to begin the dispense.
10. After the dispense operation has finished, insert the filled plate into the plate reader for evaluation.
11. After the plate has been read, evaluate the results. If any CVs for ANY row are greater than the specifications for the tube set, the tube set will need to be adjusted for that channel. Adjust the calibration by turning the adjustment screws as described earlier.
12. After all calibration is completed, rinse the tubing by putting the tube ends in a container holding distilled water and press and hold the **PRIME** key until enough liquid has passed through the tubing to clear it.
13. Repeat the rinse cycle using alcohol to remove all water from the line.

F. Helpful Hints

- Liquid tends to adhere to the walls of small tubing (such as tube sets for 384-well plate), especially when dispensing smaller volumes (9 uL or less). To minimize the amount of liquid retained in the tubing, make sure that the Y-axis arm positions the tips directly over the middle of the wells and the height gauge is used to set the nozzle over the plate. See Y-axis arm adjustment on page 18.
- When using a new tube set, prime the tubing for 5-10 minutes with water before using the set for testing. This initial priming helps to break in the new tube set and stretch out the tubes where they contact the roller head.
- Prolonged use of a tube set, especially if it is used constantly and not allows to “rest,” can cause results to vary over time. Possible reasons include: accumulation of bubbles in the tubing because the tubes were not fully purged; general wear over time.
- Continuous use of a tube set may also cause droplets to form outside the tips. You can reduce this problem by periodically checking the tips and gently removing any droplets with a sterile cloth. The greater the dispense volume or more frequent the dispenses, the more often the tips should be checked.
- Tube sets containing liquid and left idle for a long time can collect bubbles in the tubing. Purge the tube set, run air through the tubes, then prime with liquid.
- Tube sets that are not used for an extended period of time should be released from the roller head. Open the clamp lever to the rest position or take the tubing cartridge off the roller head completely.
- Persistent droplets that form outside one or more tips during dispenses may be caused by tip flash (flaw in the tip). This problem can cause inaccurate results. The tube set should be replaced.
- For optimal dispense precision (especially with 384 well plates), set the nozzle height over the plate to 2.0 mm or less.

G. Troubleshooting

Note: If you do not find the answer to your question in the following table, contact your equipment provider. See page 65 for details on contact information.

Table 7. WellMate Troubleshooting: Issues and Solutions

Error	Issue	Solution
E001	Stage doesn't move OR doesn't home.	Press STOP to cancel the alarm. Press RESET to return to operation status.
E002	(384-well plates) Stage doesn't return after reaching end position OR limit sensor remains on after stage returns to start position.	Press STOP to cancel the alarm. Press RESET to return to operation status.
E003	Plate type changes during dispense operation.	Plate selector arm was likely bumped into the wrong position. Press STOP to cancel the alarm. Check the plate type setting and reset it if necessary. Press RESET to return to operation status.
E004	Stage does not move to underneath the Pump while pump mechanism was activating. Error also occurs if home sensor or stage motor is not working.	Fix the stage to move underneath the pump while operating OR adjust the home sensor
E006	Cover on pump mechanism was opened while adjusting x-axis stage position.	Do not open the pump cover while adjusting x-axis stage position.
E099	At first, "o" (open) command was not transmitted. There is no effective command e.g."K" The wrong format for command. The data of command is out of limit.	Check the connecting cable between the units and PC. Use the correct command. Use the correct format for command.

C001	PRIME or EMPTY key has been pressed while stage is not at home position.	<p>Press STOP to cancel the alarm.</p> <p>Press RESET to return the stage to home position.</p> <p>Press PRIME or EMPTY to continue the operation.</p>
E005	Jaw opened during operation.	<p>Tubing safety bar is open. Raise it until it is in the closed position.</p>
	Liquid is dispensing on crosshairs between wells.	<p>Check to see whether stage top is parallel to nozzle tips. If not, ensure that plate carriage is properly engaged on the two pins at the back of the unit.</p> <p>Use a flathead screwdriver to adjust the nylon screws to level the carriage.</p> <p>Also, the mechanism on the bottom of the stage might not be activating, meaning the device is in an incorrect plate mode. Press the stage toward the back of the instrument.</p> <p>Verify needles are at correct height by using nozzle-height spacer guide.</p> <p>Ensure that nozzles are clean.</p> <p>See section D number 5, adjusting the X-axis position.</p>
	Plugged nozzle	<p>Remove nozzle head from arm holder, place into container of water or alcohol with supply end of tubing. Using the PRIME and EMPTY keys, flush water or alcohol back and forth through tubing to remove debris.</p>

Table 8. Stacker Troubleshooting: Issues and Solutions

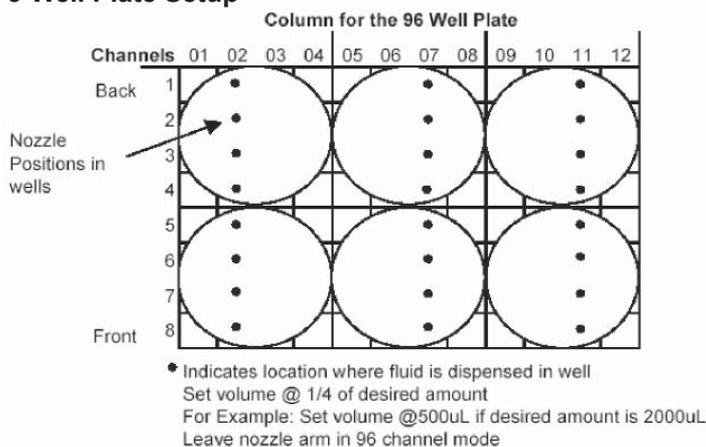
Error	Issue	Solution
E101	Plate stage on the WellMate is not at home position.	Turn off WellMate and Stacker unit. Make sure the plate stage on the WellMate is all the way to the right in its home position.
E103	Sensor is reporting that the right plate stage is not at the starting lift position.	Make sure that the right plate stage is in the correct position. Turn the stacker unit off, move the plate shuttle to access the right plate stage, and make sure the breakaway washer and screw are set correctly.
E104	Sensor is reporting that the left plate stage is not at the starting lift position.	Make sure that the left plate stage is in the correct position. Turn the stacker unit off, move the plate shuttle to access the left plate stage, and make sure the breakaway washer and screw are set correctly.
E105	A plate is on the right stage while the stage is lifting up.	Remove the plate from the right stage.
E106	A plate is on the left stage while the stage is lifting up.	Remove the plate from the left stage.

H. Appendices

1. Plate Setup

The following graphics and tables illustrate the plate setup for 6, 12, 24, and 48 well plates.

6-Well Plate Setup

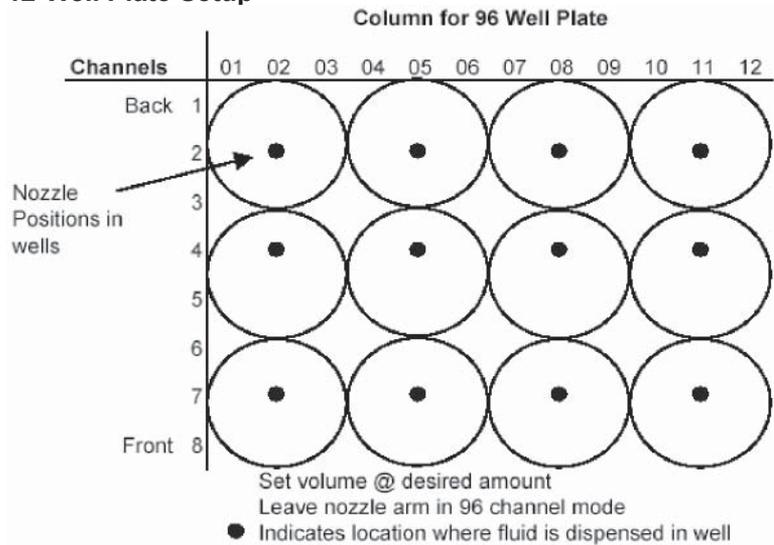


How to program the WellMate for 6 Well Plates

Activated Columns	
Column Number	ON(1)/OFF(0)
01	0
02	1
03	0
04	0
05	0
06	0
07	1
08	0
09	0
10	0
11	1
12	0

Activated Channels	
Channels	Connected/Disconnected
Back 1	C
2	C
3	C
4	C
5	C
6	C
7	C
Front 8	C

12-Well Plate Setup



How to program the WellMate for 12 Well Plates

Activated Columns	
Column Number	ON(1)/OFF(0)
01	0
02	1
03	0
04	0
05	1
06	0
07	0
08	1
09	0
10	0
11	1
12	0

Activated Channels		
Channels	Connected/Disconnected	
Back 1		D
2		C
3		D
4		C
5		D
6		D
7		C
Front 8		D

24-Well Plate Setup

Column for the 96 Well Plate

Channels	1	2	3	4	5	6	7	8	9	10	11	12
Back	1	●		●		●		●		●		●
	2											
Nozzle Positions in wells	3	●		●		●		●		●		●
	4											
	5											
	6	●		●		●		●		●		●
Front	7											
	8	●		●		●		●		●		●

Set volume @ desired amount
 Leave nozzle arm in 96 channel mode

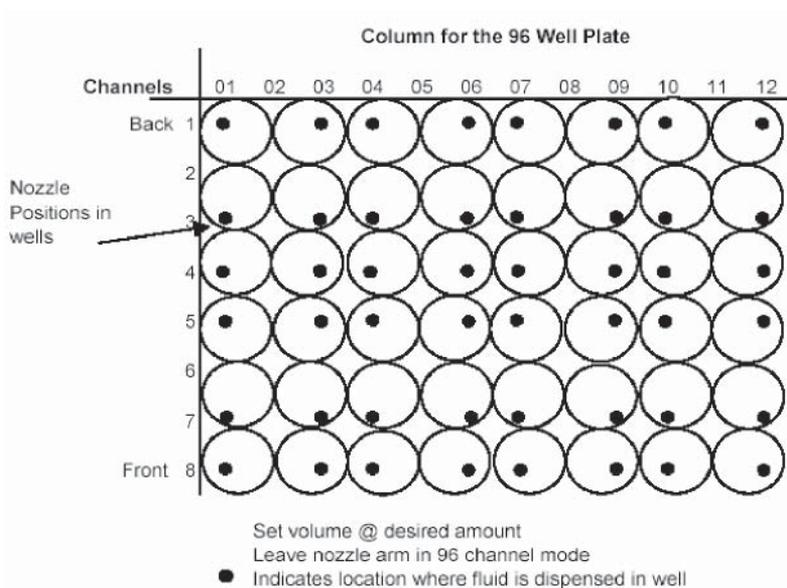
● Indicates location where fluid is dispensed in well

How to program the WellMate for 24 Well Plates

Activated Columns	
Column Number	ON(1)/OFF(0)
01	1
02	0
03	1
04	0
05	1
06	0
07	0
08	1
09	0
10	1
11	0
12	1

Activated Channels		
Channels	Connected/Disconnected	
Back	1	C
	2	D
	3	C
	4	D
	5	D
	6	C
Front	7	D
	8	C

48-Well Plate Setup



How to program the WellMate for 48 Well Plates

Activated Columns	
Column Number	ON(1)/OFF(0)
01	1
02	0
03	1
04	1
05	0
06	1
07	1
08	0
09	1
10	1
11	0
12	1

Activated Channels	
Channels	Connected/Disconnected
Back 1	C
2	D
3	C
4	C
5	C
6	D
7	C
Front 8	C

2. Chemical Compatibility

The following chemicals have been tested and approved for use with the **WellMate** tubing cartridges. Please be advised that some of these chemicals may damage the **WellMate** housing, base plate, or stage, and to use caution when using these chemicals. If you have questions about the use of any chemicals with your **WellMate** instrument, please contact your equipment provider.

Table 4. Chemical Compatibility

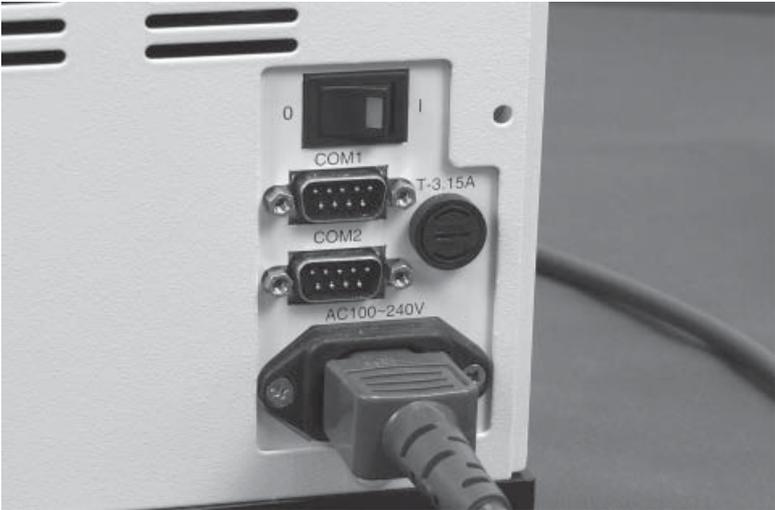
Chemical	Conc.	Temp. (° C)	Result
Acetone	—	20	■
		56	■
Benzyl alcohol	—	20	■
		100	■
Chloroform	—	20	▲
Diacetone alcohol	—	20	■
		168	■
Dimethyl formamide	—	100	■
DMSO	100%	20	■
Acetic acid, conc	—	20	■
		100	●
<p>NOTES:</p> <p>■ = No limit to use of tubing under these conditions.</p> <p>▲ = Tubing can only be used in a limited range of applications, with that range partly depending on type of stress tubing is subjected to. There are pronounced differences in usability depending on whether exposure to the chemical is temporary or permanent and whether tubing is completely immersed in the medium or has only partial contact with it.</p> <p>● = The tubing should not be used under these conditions.</p>			

Appendices

Chemical	Conc.	Temp. (° C)	Result
Acetic anhydride	—	20	■
Ethanol	—	20	■
		78	▲
Hydrofluoric acid	5%	20	•
Glycol	—	20	■
Glycerol	—	100	■
Hexane	—	20	▲
Saline solution	10%	20	■
Methanol	—	65	■ (1)
			▲ (1)
Sodium chlorate	20%	20	■
Phosphoric acid	30%	20	■
	50%		
Hydrochloric acid	10%	20	■
		80	•
Sulfuric acid	10%	20	■
Detergent solution	1%	20	■
Hydrogen peroxide	10%	20	■
	30%		
NOTES:			
■ = No limit on use.			
▲ = Caution: not appropriate for some uses.			
• = Do not use.			
(1) Two grades of ELASTOCIL® tubing were tested with each chemical; those 2 grades are: R401/60 standard mix and R800/80 highly filled mix. Compatibility of the 2 grades with each of the chemicals listed is the same EXCEPT for compatibility with methanol; for standard, compatibility is ■; for highly filled, compatibility is ▲.			

3. RS-232 ASCII Commands for Remote Device Activation

To send commands to the **WellMate** instrument from a remote device, provide a Dsub-connector RS-232 cable (to order from Matrix: use item number 501-30019) and a Windows computer. Connect the cable from the COM 1 port on the back of the **WellMate** instrument to your computer.



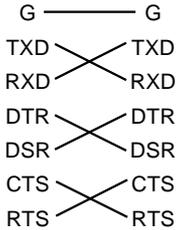
This section lists

- Serial port communication specifications
- RS-232 commands
- Communication error messages
- Sample RS-232 commands

Serial Port Communication Specifications

1. 9600 bps. STOP 1, PARITY-EVEN, X NONE, BITS-7, ALL ASCII

2. Serial Cable Configuration



3. Essential Message Format

SXT ##### EXT

SXT (02H): Start of message

EXT (03H): End of message

Any message not included in SXT and EXT should be ignored as noise.

4. Transmission Protocol

a. Transmit → Correct receive

← ACK

b. Transmit → Incorrect receive

← No response

2 seconds delay

Re-transmit → Correct receive

← ACK

c. Transmission error with repeated “no response” is to be judged by the transmitting side.

d. PC does not return “ACK” against “R” transmission from **WellMate**.

5. Common Message

a. Positive Response STX ACK ETX

ACK (06H)

Table 9 lists the ASCII commands you can send from the PC to the **WellMate** instrument.

Table 10 lists communication error messages.

Some sample commands follow Table.

Table 9. RS-232 Commands

Syntax	DATA	Function	Comment
A		Restart after the pause and the error.	Resumes from the point where pause or error occurred.
ACK		Positive response	
BSR		Reads the Back Step Volume	Returns a four character string 0000 through 9999. Volume is in 100 nanoliter units.
BSW	xxxx	Sets the Back Step Volume.	Must be a four character string 0000 through 9999. Volume is in 100 nanoliter units.
C		COM CLOSE	Terminates RS-232 commands.
FC		Fill a plate.	Equivalent to pushing the start button
FP	ppb	Fills a plate using the program pp stored in memory If b is '1' the program pp is copied to program 00 for pp < 10 and to program 10 for pp > 10	For 96 well plates pp must be 00 For 384 well plates pp must be 10 through 19

Appendices

Syntax	DATA	Function	Comment
O		COM OPEN	Open is not allowed during a plate-filling operation; instrument must be idle.
P±xxxxx	xxxxx	Pump action: + = dispense; - = pump motor runs in reverse	Programs volume to dispense into plate (+) or returned to supply container (-). NOTE: 0.025xxxxx = value in µl; e.g., P+04000 = 100µL to be dispensed
P0		Pump: Move to the original position (4 different positions) in the dispensing way.	This action is to be done prior to every plate-filling sequence. It ensures pump head is at Start position.
P1		Pump action: Start dispensing	Continue pump action until P3 command is executed.
P2		Pump action: Start pumping in reverse direction (to supply)	Reverses pump motor action. Used for extracting fluid left in tubing back into supply container.
P3		Stop pump action.	Stops the pump motor. Only effective for P1 & P2 commands.
PAL	pp	Loads program 00 or 10 from pp depending on pp See PAW	
PAR	pp	Read a volume & pattern from memory	pp - program to write to (00 19) return format: vvvvx... x, x count depends on pp. See PAW

Syntax	DATA	Function	Comment
PAS	pp	Stores program 00 or 10 to pp, depending on pp See PAW	
PAW	ppvvvvv...x	Write a volume & pattern to memory. Length of x depends on pp	pp - program to write to (00 19) vvvvv - volume (00001 - 20000) x - 12 '1' & '0' for programs 00–09 24 '1' & '0' for programs 10–19 ex: PAW0100005110110110110
PCR		Reads the internal pump count	Returns a seven character string 0000000 through 2684354
PCW	xxxxxxx	Sets the internal pump count	Must be a seven character string 0000000 through 2684354
PPR		Returns the pump pause value xxxx	Returns a 4 digit number 10 msec units
PPW	xxxx	Sets the pump pause value	4 digit number in 10 msec units
PS	Xxxxx Possible values = 0400–20000.	Pump: Set pump speed Lowest number represents the fastest speed; highest number represents the slowest speed.	Pulses per sec/range Standard (normal) pump operating speed = PS00492.

Appendices

QA		Query: Is stage at home position?	0 = Stage not at home 1 = Stage at home
Syntax	DATA	Function	Comment
QB		Query: Is stage at start position? (384-well plate position, left-most position for stage)	0 = Stage not at start 1 = Stage at start
QC		Query: is plate type set to 96 or 384 mode?	0 = 96 mode 1 = 384 mode
QD		Query: Is jaw on pump mechanism open?	0 = closed 1 = open
QX		Query: What is column (well) position?	Queries for ASCII packet that identifies the column (well) location. Only effective for XW command that last moved X-axis.
R		RESET: Initializing each axis	Used to reset all motor axes.
S		Pause all motion	Pause occurs after current operation has finished.
TTD		Disable tweaktable	
TTE		Enable tweaktable	
TTQ		Returns the enable/ disable status of the tweaktable	Returns a '0' if the tweaktable is disabled and a '1' if the tweaktable is enabled
TTR	vv	Read tweaktable	vv - Volume Return format: cctttt...tttt, cc count of tttt See TTW for format of tttt

TTS	x	Selects which tweaktable to use	A '0' will select the Canned tweaktable and a '1' will select the User tweaktable
Syntax	DATA	Function	Comment
TTT		Returns the tweaktable type	Returns a '0' if the Canned tweaktable is selected and a '1' if the User tweaktable is selected
TTW	vvccttt... tttt	Write tweaktable data for 1 volume to WellMate	vv - Volume, cc count of tweaks, tttt - tweak data, first character is a sign (+/-) last three are decimal digits
W	xxx Possible values: 002-999	Wait time: (xxx * 10) mSEC	Min. delay time = .002 (20mSEC) Wait time = time that the system waits between executing column dispenses (P1 commands). Must build in wait time to avoid dispenses on crosshairs between wells.
X0		Stage: Move to X home position	Stage homes.
X1		Stage: Move to starting sensor (left-most) position	Stage moves to its left-most position, which is the 384 offset position.
X2		Stage: Move to dispensing position to waste-fluid reservoir (overflow)	Position used for executing a PRIME operation; command must always precede P0 command.

XS	xxxx Possible values: 00400–20000	Stage: Set stage speed Lowest number represents the fastest speed; highest number represents the slowest speed.	Pulses per sec./range. Standard (normal) operating speed = XS01685.
Syntax	DATA	Function	Comment
XW	xx	Stage: Move to “xx” column (well) position	Moves to specified column. Values: for 96-well plate, 01–12; for 384-well plate, 01–24.
XW	xx+/-yyy	Stage: Move to “xx” column (well) and offset “yyy” from the center of the well	y (1 pulse) = 0.0375mm

Table 10. Communication Error Messages

Error	Description
E01	Stage is not at home position. Command X0 cannot execute until stage is at home. Also, error occurs if home sensor or stage motor is not working.
E02	Stage is not at start (left-most) position. Command X1 cannot execute until stage is in start position. Also, error occurs if start sensor or stage motor is not working.
E03	Plate type selector was moved, switching plate type, while commands were being transmitted. Do not move selector while commands are being transmitted. Also, error occurs if plate type sensor is not working.
E04	Cover on pump mechanism was opened while pump-action commands were activated. Lift safety bar until it is in its closed position.
E99	Did not packet command correctly (wrong format for command); e.g., W 12 does not contain enough digits for the wait time command format.

Sample RS-232 commands

The following sample commands dispense 100µL into a 384-well microplate. Comment lines appear with asterisks at the beginning and end of the line.

In the following commands:

- Tx = Transmitted command from PC to **WellMate** instrument.
- Rx = Response from **WellMate** instrument to PC.
- Each “ACK” is an acknowledgement that a command has been received.

Query: Is stage at home position?

```
Tx      . QA .
Rx      ACK
Rx      . A1 .
Tx      ACK
Rx      . OK .
Tx      ACK
```

Move stage to position with column offset one pulse and then query stage position after XW command has been sent.

```
Tx      . XW12-001 .
Rx      ACK
Rx      . OK .
Tx      ACK
Tx      . QX .
Rx      ACK
Rx      . XW12-001 .
Tx      ACK
Rx      . OK .
Tx      ACK
```

Appendices

Response to command QA, which was sent after COM close command was sent, is error E99.

Tx	. C .
Rx	ACK
Rx	. OK .
Tx	ACK
Tx	. QA.
Rx	ACK
Rx	. E99 .
Tx	ACK

COM open and COM close commands sent.

Tx	. O .
Rx	ACK
Rx	. 2. 1, A1, B0, C1, D0, XW00+000 .
Tx	ACK
Rx	. OK .
Tx	ACK
Tx	. C .
Rx	ACK
Rx	. OK .
Tx	ACK

COM open command sent.

Tx	. O .
Rx	ACK
Rx	. 2. 1, A1, B0, C1, D0, XW00+000 .
Tx	ACK
Rx	. OK .
Tx	ACK

Initializing

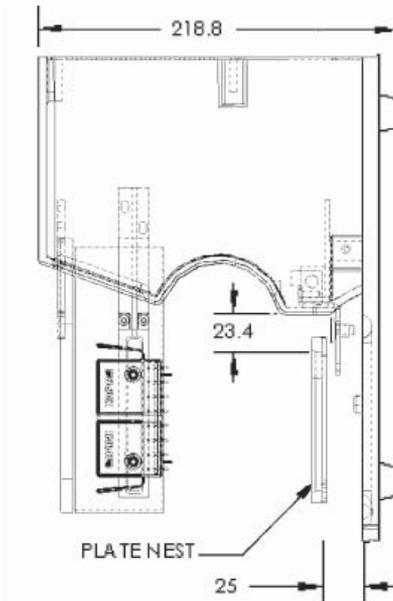
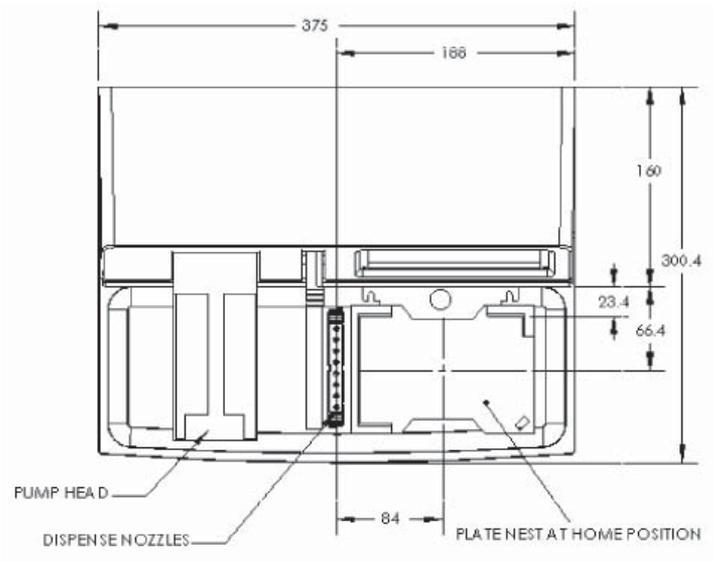
Tx	. R .
Rx	ACK
Rx	. R .

***Dispense into the reservoir and 384-well microplate; dispense vol. = 100µL. Wait 20mSEC before pump motor turns on and pump moves in dispense direction. NOTE: 0.025xxxxx = value inµl;**

e.g., P+04000 = 100µL to be dispensed into plate. *

Tx	.X0X2P0XW01W002P+04000XW02W002 P+04000XW03W002P+04000XW04W002 P+04000XW05W002P+04000XW06W002 P+04000XW07W002P+04000XW08W002 P+04000XW09W002P+04000XW10W002 P+04000XW11W002P+04000XW12W002 P+04000XW13W002P+04000XW14W002 P+04000XW15W002P+04000XW16W002 P+04000XW17W002P+04000XW18W002 P+04000XW19W002P+04000XW20W002 P+04000XW21W002P+04000XW22W002 P+04000XW23W002P+04000XW24W002 P+04000X1XW24W002P+04000XW23W002 P+04000XW22W002P+04000XW21W002 P+04000XW20W002P+04000XW19W002 P+04000XW18W002P+04000XW17W002 P+04000XW16W002P+04000XW15W002 P+04000XW14W002P+04000XW13W002 P+04000XW12W002P+04000XW11W002 P+04000XW10W002P+04000XW09W002 P+04000XW08W002P+04000XW07W002 P+04000XW06W002P+04000XW05W002 P+04000XW04W002P+04000XW03W002 P+04000XW02W002P+04000XW01W002 P+04000X0.
Rx	ACK
Rx	. OK .
Tx	ACK

4. WellMate Schematic



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5. Customer Service

Your comments and suggestions for improving the performance and versatility of the instrument are always welcome and appreciated. We also appreciate your comments and suggestions for improving this manual.

If you have any questions about your **WellMate** instrument, contact your equipment provider. If your instrument was provided by a distributor not listed here, contact that distributor.

(If you need to return the instrument for any reason, see the instructions provided in the Warranty on page 66 of this manual.)

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Warranty

Warranty

Record the serial number for your **WellMate** instrument here:

WellMate instrument	
----------------------------	--

The **WellMate** instrument is warranted against defects in material and workmanship for one year from the date of shipment. Parts subject to normal wear, such as tubing sets, are excluded.

Do not try to service or repair a **WellMate** instrument under warranty before first contacting your equipment provider. See page 65 for contact information.

If service is required after the warranty period, it is still advisable to consult with your equipment provider before performing the service task, especially when the repair may be technically sophisticated or difficult.

If you need to return the instrument or parts of the instrument to your equipment provider for any reason, follow this procedure:

1. Contact your equipment provider and obtain return approval, a return authorization number, and a return authorization (RA) form. (The form will be sent to you.)

CAUTION: Fill out the RA form completely. Ensure that the completed RA form is included in the return package. Do NOT return the instrument or its parts without this completed form.

2. Do not return any of the accessories unless you believe there is a problem with one of them.
3. Package the instrument in its original packing materials. All equipment being returned to the equipment provider for any reason must be shipped

in the original shipping containers and packaging. If you do not have the original shipping containers and package, you must purchase them. See the price list on the Matrix Technologies website at **www.matrixtechcorp.com** or contact your equipment provider.

4. Ship the returned material by 2-day air service.

The contents of this manual may change as new features and accessories are added. Your comments and suggestions for improving the performance of the instrument and the usefulness of this manual are appreciated.

Packing List

The following items have been provided with your **WellMate** system. Contact your equipment provider if items are missing.

- Base unit
- AC power cord
- Two disposable 8-channel tube assemblies, with silicone-based tubing and polypropylene nozzles.

One each of:

- Standard-bore tubing cartridge, for use with 96-well (shallow or deep well) microplates.
 - o Nozzle orifice ID 0.023in (0.58mm).
 - o Dispenses volumes 20–2000 μ L.
 - o Applications include sterile plate filling and dispensing of cellular materials, viscous fluids, and beads.
 - o To order replacement 5-pack, use item no. 201-30001.
- Small-bore tubing cartridge, for use with 96- and 384-well (shallow or deep well) microplates.
 - o Nozzle orifice ID 0.015in (0.38 mm).
 - o Dispenses volumes 1–200 μ L.
 - o Applications include sterile plate filling, dispensing of high vapor pressure fluids, and dispensing of small volumes (1–200 μ L) with enhanced precision.
 - o To order replacement 5-pack, use item no. 201-30002.
- Nozzle-height reference scale
- Nozzle-height spacer guide
- 7/64-inch Allen wrench (for use in tubing-cartridge adjustment)
- 1/16-inch Allen wrench (for Y-axis arm)
- Universal-microplate removable stage
- Waste-fluid vessel with tubing
- **WellMate/WellMate Stacker** manual
- Sample Microplate Starter Kit

List of Replacement Parts and Accessories

You can purchase additional tubing assemblies as well as other replacement parts and accessories for the **WellMate** instrument. See the latest price lists, contact your equipment provider, or check the product list on the Matrix Technologies website at www.matrixtechcorp.com.

Item	Description	Unit
201-10001	WellMate Microplate Dispenser	Each
201-20001	WellMate Stacker Base Unit	Each
*501-30005	Removable Stacker Chimney, Tall (2 required)	Each
*501-30006	Removable Stacker Chimney, Short (2 required)	Each
201-30001	8-channel standard bore disposable tubing cartridge, pre-sterilized	5 per Case
201-30001	8-channel small bore disposable tubing cartridge, pre-sterilized	5 per Case
201-30003	8-channel PTFE-coated stainless steel tip cartridge, reusable, pre-sterilized	Each
4954	Automation friendly universal polystyrene lid, clear, sterile for 96 & 384 well plates	80/case
4955	Automation friendly universal polystyrene lid, black, sterile for 96 & 384 well plates	80/case

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WellMate® & WellMate Stacker



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