

1 Tip: 30mL in a Single Aspiration

Contributions by Takeda & AstraZeneca



Abstract

The Mammoth 30mL Automation Tips for the Dynamic Devices Lynx Robotic Liquid Handler enables fast, reliable single-tip large-volume aspiration and dispensing. It shortens run times, improves uniformity, and reduces plastic waste. Engineered for compatibility with Thomson 6- & 24-well plates (or similar), it streamlines method design and improves throughput.

Introduction

Automation engineers often face inefficiencies when transferring 5–30mL volumes, as standard 1–5mL tips require multiple aspiration and dispense cycles that increase protocol time, error, and method complexity. The Mammoth 30 mL Automation Tip enables single-stroke handling of large volumes, improving consistency while reducing cycle times, deck complexity, and plastic waste. This application note provides guidance on labware offsets and highlights workflows where the 30 mL tip improves speed and robustness.

Product Features

1. Designed for large volumes on the Dynamic Devices Lynx LM-series automated liquid handling systems.
2. Aspirate/Dispense range 1.5 mL – 20 mL (30mL nominal tip volume)
3. 5 mL increment graduation marks
4. Sterile, Filtered tip
5. Large-bore tip supporting gentle, high-speed mixing of cells

Materials

- Dynamic Devices Lynx Liquid Handler LM-Series with a 24-channel MCPA or ST pipetting arm with Super Stroke
- Thomson Mammoth 30mL Automation Tips (9453030)
- Thomson deck plate adapter (PROTOTYPE1-1212630-399)
- Thomson 6 Well Plate (931167;931170)
- Thomson 24 Well Plate (931565-G-1X; 931568; 931569-G-1X; 931571)
- Thomson Magnetic Plate tray (PROTOTYPE2-1212605-399)
- Standard reagent reservoirs
- PBS, water or media

Methods

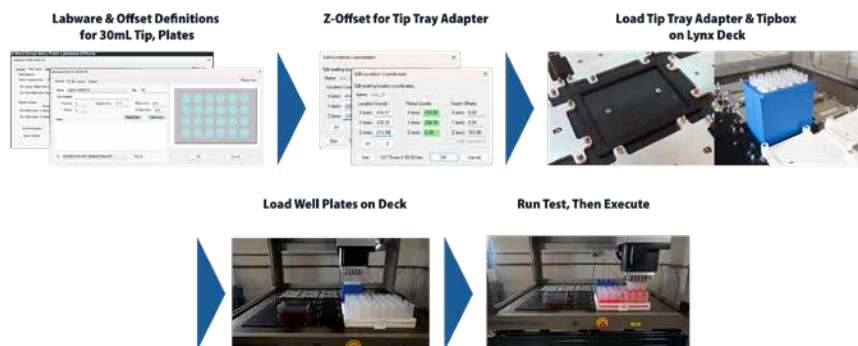


Figure 1 – Workflow overview for defining and testing Mammoth 30 mL Automation Tips and multi-well plates.

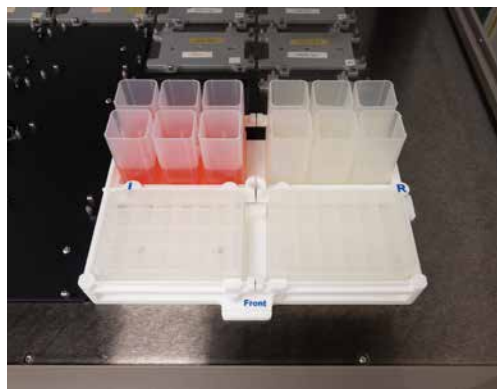


Figure 2 – Mammoth 30 mL Automation tips aspirating liquid from a reservoir in preparation for dispensing to Thomson 6- and 24-well plates.

Labware & Offset Definitions for 30mL Tip, 6-Well and 24-Well plates

1. Open Method Manager 4 (MM4) software, initialize and connect
2. Select “Labware Category” from the Workspace section (Figure 3).
3. Click on the “Tipbox” button (Figure 3) and select new (or copy a previous file template).
4. To define the 30 mL Automation Tip, in the General tab, enter the labware name as “Thomson-30mL_Tip” with 6 columns and 4 rows (Table 1).
5. Enter labware values: Mammoth tip length, width, and Z-clear parameters, as shown in Figure 4-A and Table 1.
6. In the Tip Box Layout tab, select the Tip Type as “LXB-24-5000” with a total tip height of 118.0mm. The offset values are displayed in Figure 4-B and Table 3 for the 24-channel MCPA or ST pipetting arm.
7. Save these parameters.



Figure 3 – Method Manager 4 software setup for Mammoth 30mL Automation Tips. Opening Labware for definitions; Selection of Tip Box; Defining Name of Tip Box “Thomson-30mL_Tip”.

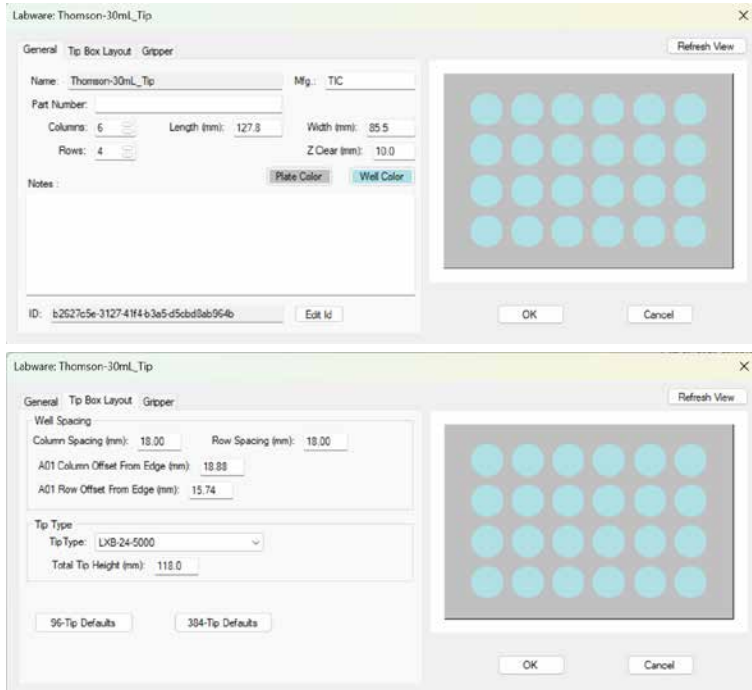


Figure 4 - Mammoth 30mL Automation Tip General Parameters; A. Definitions of labware values for “Thomson-30mL_Tip” using dimension parameters for 24-well layout; B. Tip Box Layout - Definitions of offset for 30 ml tip to ensure proper channel loading and Tip Type “LXB-24-5000”

Labware	Columns	Rows	Length (mm)	Width (mm)	Z Clear (mm)
Mammoth 30mL Automation Tips	6	4	127.8	85.5	10.0

Table 1 – Reference labware values for the “Thomson-30mL_Tip” definition

Defining volumetric aspiration for Mammoth 30mL Automation Tips

Each Mammoth 30mL Automation Tip is connected to 4 adjacent channels on the 24-channel head (Figure 5). Every channel aspirates & dispenses 25% of the volume of one 30mL Automation tip.

1. Open the Aspirate window, enter the appropriate volume from Table 2 (Column 2) into the Pipetting Command section (Figure 6) to have each channel aspirate 25% of total volume desired (Table 2, Column 3). For example, if a volume of 3800µL is entered with a Leading Air Gap of 75µL and a Post Air Gap of 25µL into the pipetting command (Figure 6), a total of 15200µL will be aspirated (3800µL x 4 channels = 15200µL per Thomson tip).
2. Save these parameters.



Figure 5 – Left: View of channels highlighting that one tip will engage with 4 adjacent channels on the 24-channel MCPA or ST pipetting arm; Right: Images of Mammoth 30mL Automation Tips engaged to channels.

Percentage of 30mL tip	Volume (µL) Entered into MM4	Volume Pipetted (µL)
5%	375	1500
10%	750	3000
20%	1500	6000
30%	2250	9000
40%	3000	12000
45%	3400	13600
50%	3750	15000
51%	3800	15200
55%	4100	16400
60%	4500	18000
65%	4900	19600
66%	4950	19800
67%	5000	20000

Table 2 – Reference for volumetric definitions to enter (Column 2) into pipette command to achieve total volume (Column3).

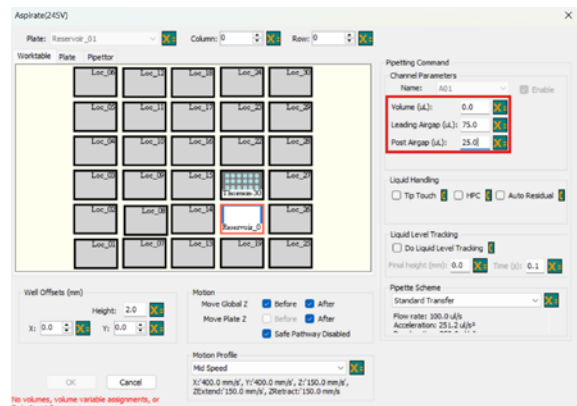


Figure 6 – Aspiration volume entered in Pipetting Command: “Channel Parameters” with a Leading Air Gap of 75µL and a Post Air Gap of 25µL. Volume (µL) entered will be ¼ of total volume to be aspirated.

Defining the offset for Mammoth 30mL Automation Tips

To ensure the Mammoth 30mL Automation Tips are positioned accurately relative to the plate, the offset must be adjusted (Figure 8) to the center of the four adjacent channels (which will be connected to a single 30mL tip).

1. In the Plate Layout tab, enter the correct offset values for 6-well plates (Figure 8 upper) or 24-well plates (Figure 7 lower). Starting reference values (in mm) are also summarized in Table 3.

Note: the offsets from the edges are adjusted to the appropriate distance relative to the A01 reference position.

2. Save these parameters.

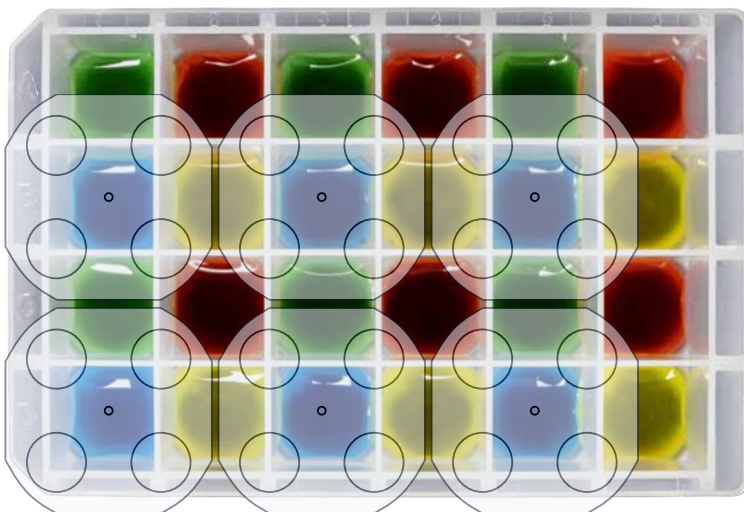


Figure 7 – Top-down view of Mammoth 30mL Automation Tip depicting -8.5mm X/Y offset as it appears for the Thomson 6-well Plate and 24-Well Plate.

Note: These values change for 6-well and 24-well plates and will have to be set and verified for each labware individually. We recommend the following procedure:

1. Load the correct labware definition for the vessel you are using.
2. Use the system's Gantry Robot Utility View to position the pipetting arm to the center of the well and teach X/Y coordinates.
3. Teach the deck with these new tips and define the roaming height,

dispense height, mix height, etc. as variables to use in methods written for the Mammoth 30mL Automation tips.

4. Save parameters and test by performing a dry aspiration/dispense to confirm accuracy.




Labware	Column Spacing (mm)	Row Spacing (mm)	A01 Column Offset from Edge (mm)	A01 Row Offset from Edge (mm)
 Mammoth 30mL Automation Tips	18.00	18.00	18.88	15.74
 6-Well Plate	36.00	36.00	21.40	16.40
 24-Well Plate	18.00	18.00	9.95	6.74

Table 3 – Reference starting Spacing and Offset values for the Mammoth 30mL Automation Tips, 6-well plates, and 24-well plates.

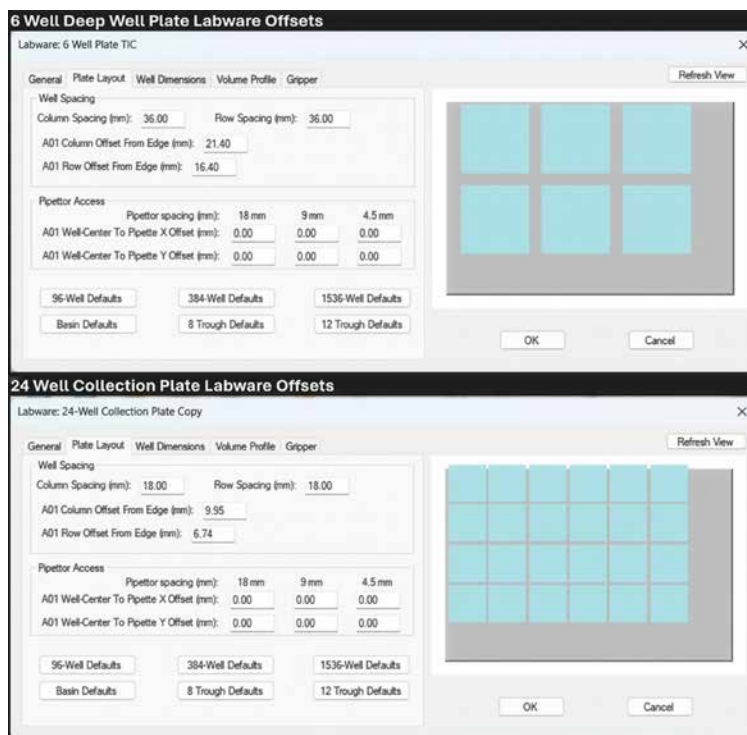
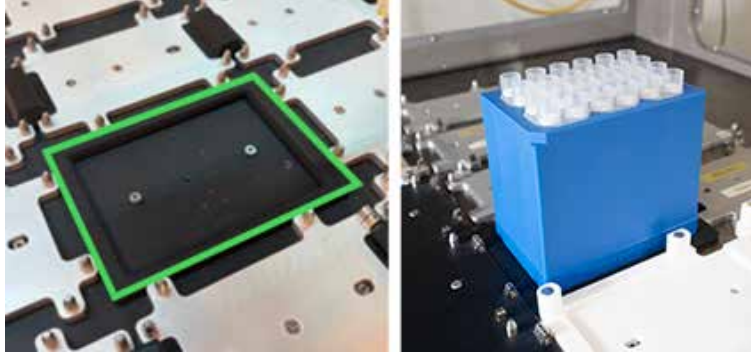


Figure 8 – Labware offsets on “Plate Layout” tab; **Upper.** Offset definition example for 6-well plate; **Lower.** Offset values for 24-well plate.

Define deck position and offset for the Mammoth 30mL Deck Plate Adapter

To ensure that the Mammoth 30mL Automation Tip box is properly positioned on the deck, an adapter (**PROTOTYPE1-1212630-399**) will have to be fitted to the deck and Z-axis values re-taught at the chosen location.



Default

Edit Location Coordinates		
Edit existing location coordinates.		
Name: Loc_21		
Location Coords	Robot Coords	Teach Offsets
X (mm): -414.97	X (mm): -433.85	X (mm): 0.00
Y (mm): -220.26	Y (mm): -204.52	Y (mm): 0.00
Z (mm): -213.86	Z (mm): -0.02	Z (mm): 0.00
<input type="checkbox"/> XY	<input type="checkbox"/> Z	<input type="checkbox"/> Add Labware Z
Size 127.76 mm X 85.50 mm		
OK Cancel		

Offset-Corrected

Edit Location Coordinates		
Edit existing location coordinates.		
Name: Loc_21		
Location Coords	Robot Coords	Teach Offsets
X (mm): -414.97	X (mm): -433.84	X (mm): 0.00
Y (mm): -220.26	Y (mm): -204.39	Y (mm): 0.00
Z (mm): -220.36	Z (mm): -0.29	Z (mm): 101.00
<input type="checkbox"/> XY	<input type="checkbox"/> Z	<input type="checkbox"/> Add Labware Z
Size 127.76 mm X 85.50 mm		
OK Cancel		

Figure 9 – Mammoth 30mL Deck Plate Adapter definitions and offset corrections; **Upper**: images of deck plate adapter and tip box engaged into adapter; **Lower**: Parameters to define offset for the change in Z-axis for the Tip box. “Default” = original parameters for the Lynx deck plate; “Offset-Corrected” = changed Z-axis parameters to account for removal of the Lynx deck plate (6.5mm height).

1. In the Devices tab, enter the Gantry Robot Utility View and on the worktable, select the location where you will place your Mammoth 30mL Deck Plate Adapter (Figure 9)
2. Right click “Edit Location” and select “Yes”
3. From the Tip type drop-down, select “Thomson-30mL_Tip”, then select “OK”
4. Teach this location by subtracting the height of the Lynx deck plate (6.5mm) from the Z parameter under the “Location Coords” (Figure 9, “Offset-Corrected” example) and select OK
5. Select save and “Yes” for these parameters
6. Remove the existing Lynx deck plate at the position corresponding to where the Deck Plate Adapter will go (for example, Location 21 in Figure 9)
7. Position the Mammoth 30mL Deck Plate Adapter into the corresponding location as in Figure 9 (Upper Left)
8. Place the Mammoth 30mL Tip Box into the Deck Plate Adapter on the deck (Figure 9, Upper Right)
9. This can be repeated for other positions on the deck where tips are to be used

Defining labware for Tips, 6-well and 24-well plates

For each labware, we recommend testing colored water or PBS to ensure the tips aspirate and dispense to the proper positions.

1. On the MM4 worktable, load the tip box “Thomson-30mL_Tip”
2. Load the tip definition, and tip positions to be used (Figure 10)
3. Ensure the “Motion Profile” as “Mid Speed” or “Mid Speed Slow Enter/Exit”
4. Fill a high-profile reservoir with 300 mL of colored water or PBS, and place on the deck in the desired position

Figure 10 – Tip Box configuration. **Top** – Location on deck and basic workspace design. **Bottom** – Tip Box configuration defined to the number of tips desired (example shows four tips being used channels in rows A-D, columns 3-6).

Defining Labware for Gripper Arm

When working with the Thomson 6-well plates with the integrated lid, a gripper arm can be used to de-lid, lid and tamp down the lids (Figure 11). As shown in Figure 12 (and Table 4), ensure the “plate lid” box is checked, then enter the definitions of Flange height, Lid bottom and Lid height into the Gripper tab on the 6-well plate labware definition.

When performing a lid/de-lid procedure, define the source and destination location(s) of the plate to be lidded/de-lidded and enter the parameters for Grip offsets in the “Grip” tab and Ethernet Gripper Parameters as in Figure 12 and Table 5. Utilize the “Mid Speed” setting in the Motion profile. For tamping down the lid, utilize the workflow set in Figure 12 as a general example protocol; precise values will have to be defined for the Thomson 6-well plate and integrated lid. This will ensure proper setting of the integrated lid to maintain a proper seal.

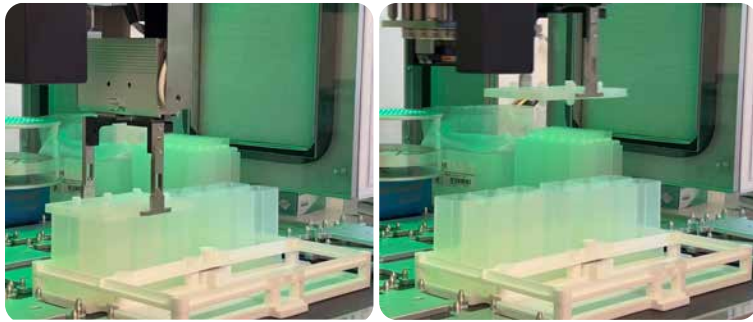


Figure 11 – Lid/de-lid/Tamp procedure with Labware settings for Gripper use with Integrated lid of Thomson 6-well Plate. Upper panel – Gripper Lidding/De-lidding the integrated lid on 6-well plate.

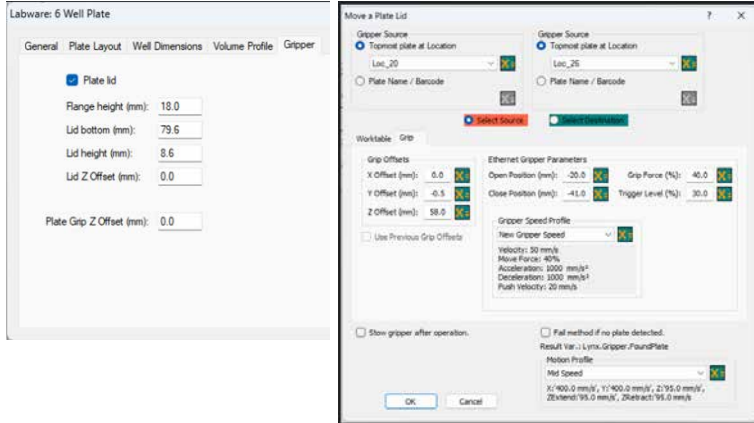


Figure 12a – Left – Parameters for the Gripper section of 6-well plate labware. Right – Gripper parameters for operation of de-lidding, lidding and transport to different deck locations.

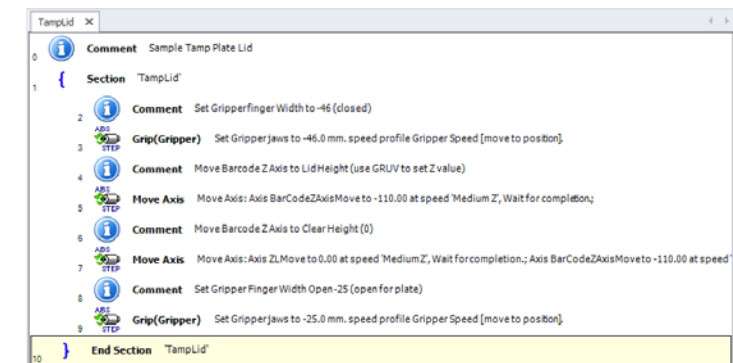


Figure 12b - Example Tamplid workflow – user will define the settings for integrated lid on 6-well plate.

Flange height (mm)	Lid Bottom (mm)	Lid Height (mm)	Lid Z Offset (mm)	Plate Grip Z Offset (mm)
18.0	79.6	8.6	0.0	0.0

Table 4 – Gripper labware definitions for Gripper on 6-well plate with integrated lid

X Offset (mm)	Y Offset (mm)	Z Offset (mm)	Open Position (mm)	Close Position (mm)	Grip Force (%)	Trigger Level (%)
0.0	-0.5	58.0	-20.0	-41.0	40.0	30.0

Table 5 - Gripper parameters for movement of integrated lid.

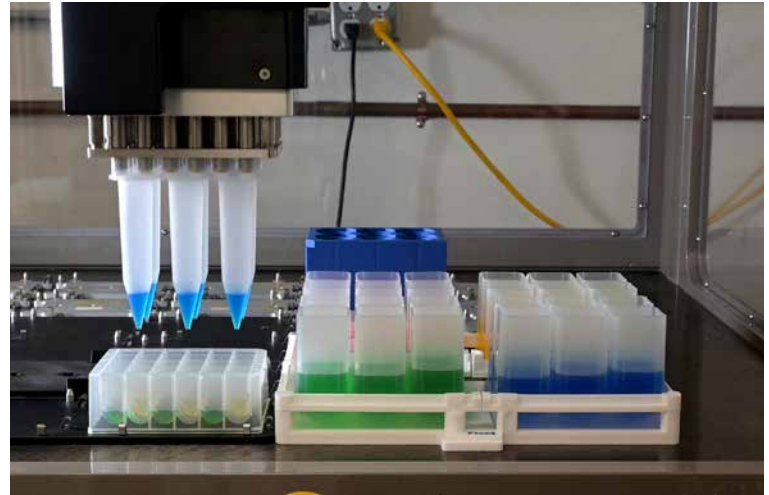


Figure 13 – Multi-dispensing to Thomson 24-well plate using the Mammoth 30mL Automation Tip. Dispense pattern for 24-well filter plates (Figure 12) - note that the tips will dispense in every other well as a group

Multi-dispensing for 6-well and 24-well plates

1. Place a Thomson 6-well plate with liquid (water, media, etc.) onto deck and add to workspace (Figure 13).
2. Edit Plate dispense parameters for the appropriate definitions for labware (Figure 14).
3. Place 24-well plate(s) (PN 931565-G-1X; 931568; 931569-G-1X; 931571) onto desired deck position.
 - Note:** Continue using “mid speed slow enter/exit” pipetting schema
4. Aspirate total volume of reagent.
 - Note:** Include post-air gap to prevent droplet formation (25-50µl).
5. Dispense volume into 24-well plate quadrant sequentially (Figure 14).

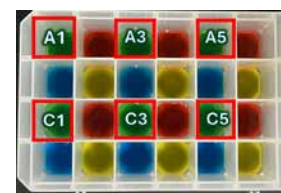
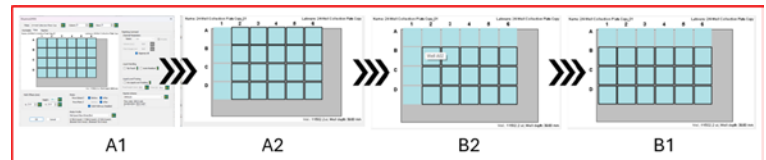


Figure 14: Dispensing pattern into 24-well plate; Top: An example of a clockwise multi-dispense pattern starting at well A1->A2->B2->B1; Bottom: Example of wells (same color) that will dispense together when 6 tips are used. (Green color in wells A1, A3, and A5 with C1, C3 and C5 all dispense together).

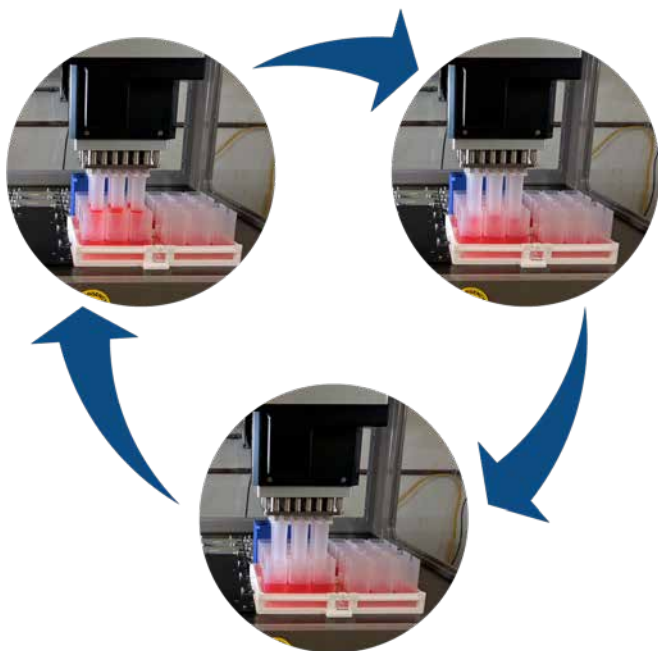


Figure 15: High speed gentle mixing of samples using Mammoth 30mL Automation Tips in 6-well plate.

Parameters for 6-Well Plate Mixing Cycle

1. Load the 6-well labware definitions
2. Place 6-well plate(s) (PN 931167; 931170) onto desired deck position
3. Aspirate liquid from the reservoir (Figure 15).
4. Dispense liquid into desired well(s) of the 6-well plate.
5. From the same well(s), re-aspirate at 3000 μ L/s for three mix cycles (bottom-to-top offset of 3mm from well base).

Note: Aspirate at least ½ of the total volume in the well for thorough mixing.

Discussion

Single-stroke handling (1.5–20mL) reduces run time and improves reproducibility

Fewer aspiration cycles for volumes above 5mL reduce cell settling and improve consistency during deck operations

Reduced plastic waste by replacing up to 24 standard tips with 6 high-capacity tips

Easy Lynx integration with compatible accessories, intuitive software setup, and minimal user training

Conclusion

The Thomson Mammoth 30mL Automation Tip enables reliable, single-stroke handling of large liquid volumes on the Dynamic Devices Lynx platform, eliminating multi-aspiration cycles that slow high-volume workflows. With proper labware offsets and volumetric settings, users achieve consistent dispensing, effective mixing in 6-well plates, and efficient multi-dispense operation in 6- and 24-well formats, reducing plastic consumption and simplifying method development. The tip is well suited for reagent additions, buffer exchanges, dilutions, and plate filling where volumes exceed standard tip capacity but do not require bulk dispensers, helping teams improve

throughput and streamline automated bioprocessing and cell-culture workflows.

Acknowledgements

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Troubleshooting Tips

Issue	Likely Cause	Solution
Tips cannot clear the tip box after loading step	Z height is low	Reteach deck/labware definitions and increase Z-roaming height. Be sure to use the Thomson 30mL Tip Tray Adapter for Lynx Robots for tip loading locations
Tips leak as soon as tips leave liquid surface	Too much volume for stroke length capacity	Decrease volume selection of PAG or TAG – volume has exceeded capacity of plunger; contact OEM
Tips fell off shortly after loading	Z height for tip loading depth is too shallow	Increase or decrease tip loading height variable to just above filter
Tips cannot clear the tip box after loading step	Z height is low	Ensure system has “super stroke” P-frame. Contact OEM.
Tips are not ejecting during “Eject Tip” step	Ejection plate does not fully eclipse mandrel tip.	Contact OEM

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