

Echo® Acoustic Liquid Handling

THE REVOLUTIONARY ACOUSTIC LIQUID TRANSFER TECHNOLOGY



# Echo®

## LIQUID HANDLERS

### BROCHURE

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# Echo® Liquid Handling Technology

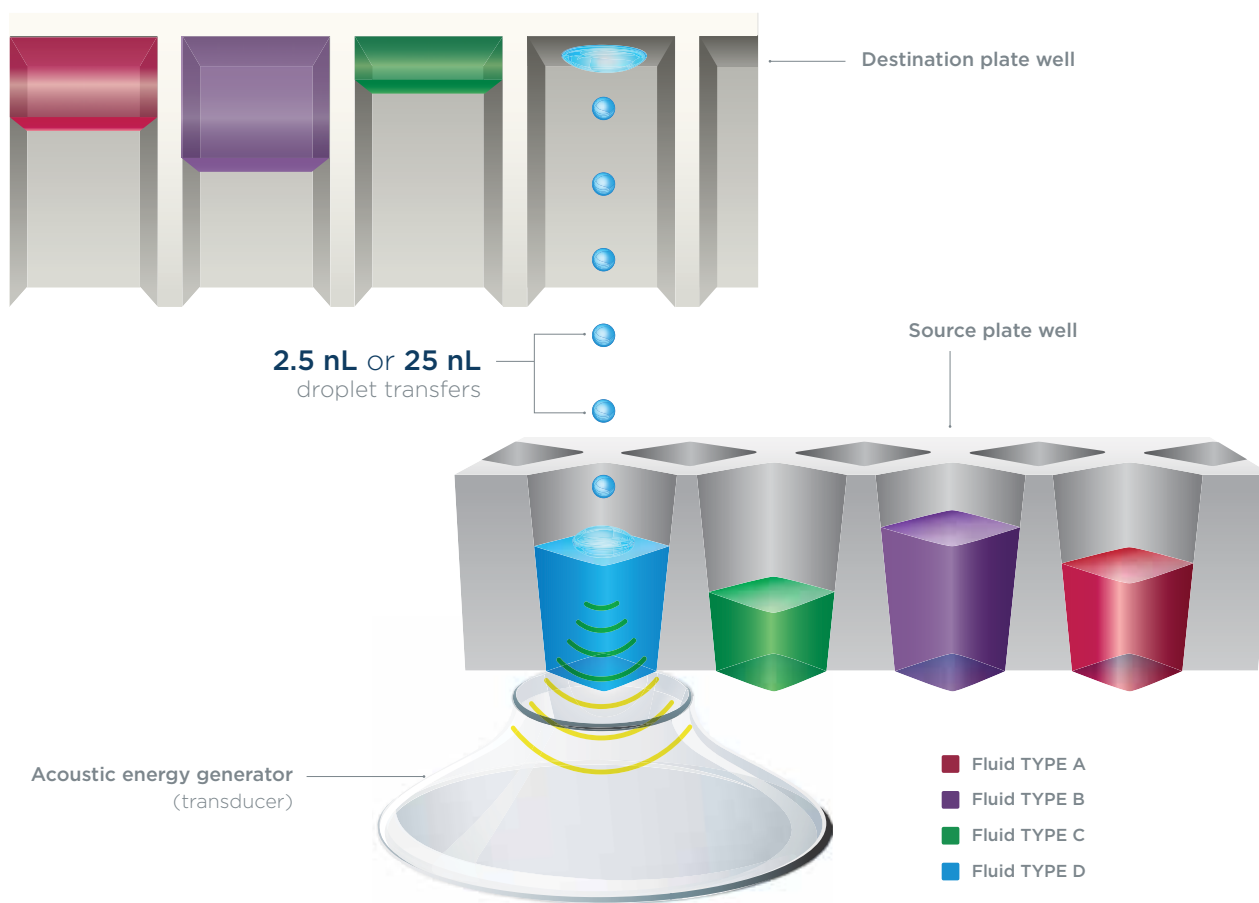
## Precise, Accurate, and Efficient Liquid Transfers Using Sound

The Echo Acoustic Liquid Handling technology revolutionizes life sciences by using sound energy to provide highly accurate, fully automated, non-contact dispensing of fluids. By utilizing the unique Dynamic Fluid Analysis™ from Labcyte, each Echo system is able to determine fluid composition, fluid height, and the power needed to eject a precise volume of fluid into the destination well. This analysis happens in milliseconds – allowing for precise and accurate transfer of nanoliter (nL) droplets into an inverted microplate. Large volume transfers are achieved by transferring several hundred droplets per second.

### Echo® Acoustic Droplet Ejection



**FIGURE 1:** Precise amount of acoustic energy is supplied to the fluid creating a single drop



**FIGURE 2:** Transducer rapidly moves between wells on the source plate while destination plate also moves - allowing rapid transfer from any well to any well for multiple fluid types

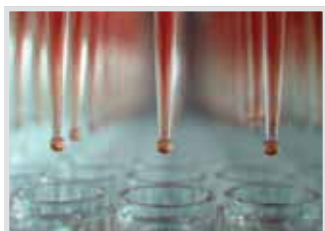
# The Echo Acoustic Advantage

## Non-contact Transfers... No Tips... No Cross-contamination... No Carryover

Acoustic liquid handling avoids issues that can arise from the use of traditional tip-based systems including sample adhering to the tips, lower precision at nL volumes, and the need for tip disposal.

### Comparing Liquid Handling Technologies

#### Traditional LIQUID HANDLERS



- Use motors to aspirate and dispense
- Treat every sample the same
- Slow transfer of liquids from any well to any well
- Use pipette tips or pins to which liquids or sample can adhere
- Potential carryover risks
- Use tips that create waste or pins that require extensive washing

#### Echo® LIQUID HANDLERS



- Use acoustic energy to perform transfers
- Treat every sample individually
- Rapid transfer liquids from any well to any well
- Use acoustic energy so that nothing contacts the sample during transfer
- No carryover
- No tips, nothing to wash or throw away



#### Environmentally-friendly

- No disposable tips
- No wash fluid
- No hazardous liquid waste



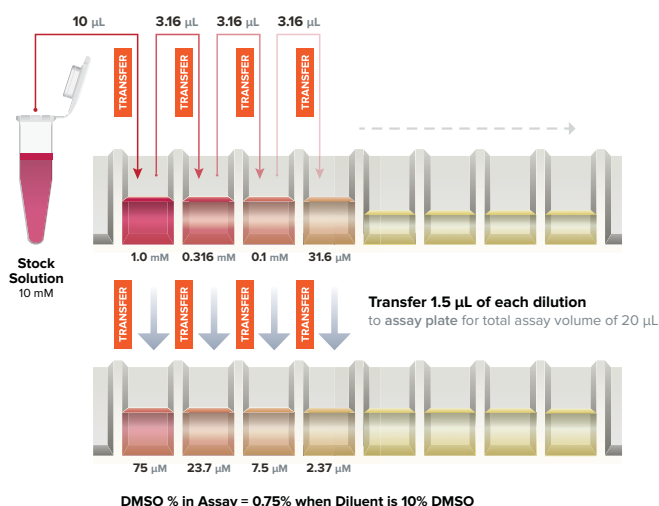
# Traditional vs. Echo Liquid Handling Workflow

## Simplify Your Workflow — Eliminate Steps While Increasing Data Quality

Highly precise nL transfers make it possible to streamline workflows by eliminating steps. Standard laboratory tests such as standard curves performed with the Echo Liquid Handler require less sample, avoid propagation of pipetting errors, and eliminate unnecessary transfer steps.

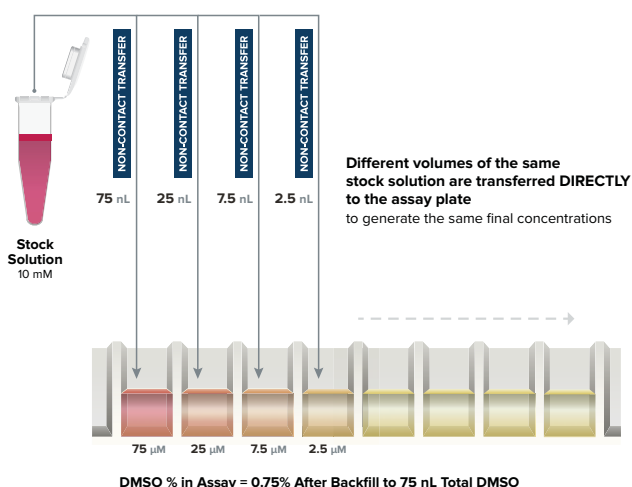
### TRADITIONAL SERIAL DILUTION WORKFLOW

- ▶ Sample loss may occur on tips
- ▶ Potential for leachates and cross-contamination from tips
- ▶ Compounding errors may occur with the serial nature of the transfer



### ECHO DIRECT DILUTION WORKFLOW

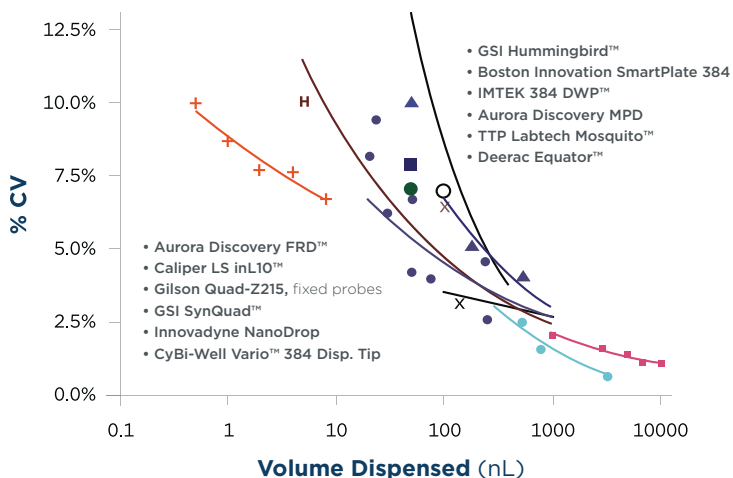
- ▶ Solutions are **NEVER IN CONTACT** with a pipette tip
- ▶ Eliminates any potential for both leachates and cross-contamination
- ▶ Sample is transferred **DIRECTLY** to the assay wells



**FIGURE 3:** Comparison of Traditional SERIAL DILUTION vs. Echo liquid handling DIRECT DILUTION workflows

## Traditional Liquid Handlers

Optimal precision at different volumes

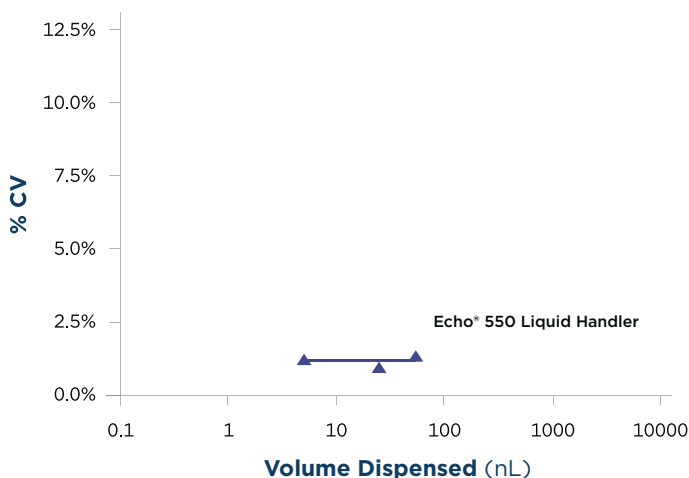


SOURCE: Comley J, Nanolitre Dispensing, *Drug Discovery World*, Summer 2004, 43-54

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## Echo® Liquid Handlers

Precision for low nanoliter transfers is unmatched



**FIGURE 4:** Precision, accuracy, and consistency comparison of traditional vs. Echo liquid handling

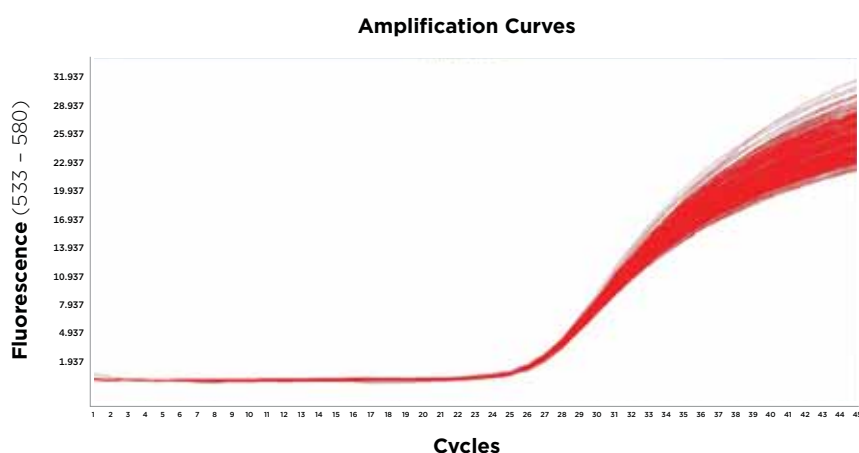
# Assay Miniaturization *without* Compromise

## Reduce Assay Volumes, Not Performance

Successful miniaturization of assays requires consistent transfer of nL and  $\mu$ L volumes of assays reagents and samples. Echo Liquid Handlers deliver small volumes of reagents with no contamination enabling assay miniaturization to previously unattainable volumes.

## Assay Miniaturization

- ▶ Low volume sample, reagent, and compound addition
- ▶ Keeps final concentration of DMSO low
- ▶ Comparable results to traditional assay volumes
- ▶ Consistent results

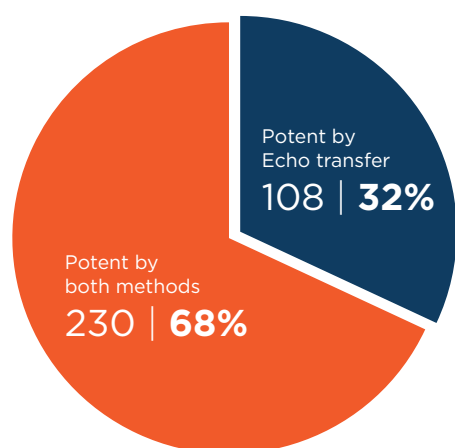


## Precise Transfers in nL Increments

Sample transfer integrity is important for successful data generation. With highly precise and accurate non-contact transfers, the Echo® 525 Liquid Handler introduces no cross-contamination during transfer of reagents or DNA.

**FIGURE 5: Real-time qPCR data showing transfer uniformity using the Echo Liquid Handler.** Source plate Echo Qualified 384-well Polypropylene Plus Microplate to a 384-well assay plate. 1  $\mu$ L puc19 in 0.1 %TE per well was transferred. Roche 1536 DNA Green Master reagent following the standard protocol and data was read on a Roche LightCycler® 480.

## 32% MORE Active Compounds Found



In a screen of 975 compounds, Bristol-Myers Squibb found 108 more hits when using the Echo Liquid Handler<sup>1</sup>.

## 259x MORE Potent

AstraZeneca demonstrated better compound potency when transferring directly with an Echo Liquid Handler versus using a serial dilution process<sup>2</sup>.

| Compound Number | Echo® Liquid Handler<br>IC <sub>50</sub> ( $\mu$ M) | Traditional Liquid Handler<br>IC <sub>50</sub> ( $\mu$ M) |
|-----------------|-----------------------------------------------------|-----------------------------------------------------------|
| 4               | 0.003                                               | 0.146                                                     |
| 5               | 0.002                                               | 0.553                                                     |
| 6               | 0.007                                               | 0.973                                                     |
| 7               | 0.003                                               | 0.778                                                     |
| 8               | 0.004                                               | 0.445                                                     |
| 9               | 0.052                                               | 0.170                                                     |
| 10              | 0.064                                               | 0.817                                                     |
| 11              | 0.486                                               | 3.03                                                      |

<sup>1</sup> Spicer, T. *et al.*, *Pharmacological evaluation of different compound dilution and transfer paradigms on an enzyme assay in low volume 384-well format*. Poster presented at Drug Discovery Technology, August 2005, Boston, MA.

<sup>2</sup> Barlaam, B.C. *et al.*, U.S. Patent 7,718,653, 2010.

# The Echo Workflow Advantage

## Re-imagine the Way You Do Science and Research

Acoustic fluid transfer enables researchers to push their research and science in new directions. The Echo Liquid Handler with the Access™ Laboratory Workstation provides a new level of speed and flexibility – allowing researchers to investigate scientific questions in new ways.



### MAXIMIZE Lab Budget

- Miniaturize assays
- Conserve sample and reagent
- Eliminate tip costs
- Reduce workflow steps



### INCREASE Data Quality

- Minimize assay reruns
- Eliminate pipetting variances
- Eliminate sample loss on tips
- No cross-contamination
- No bio-active leachates from tips



### ACCELERATE Productivity

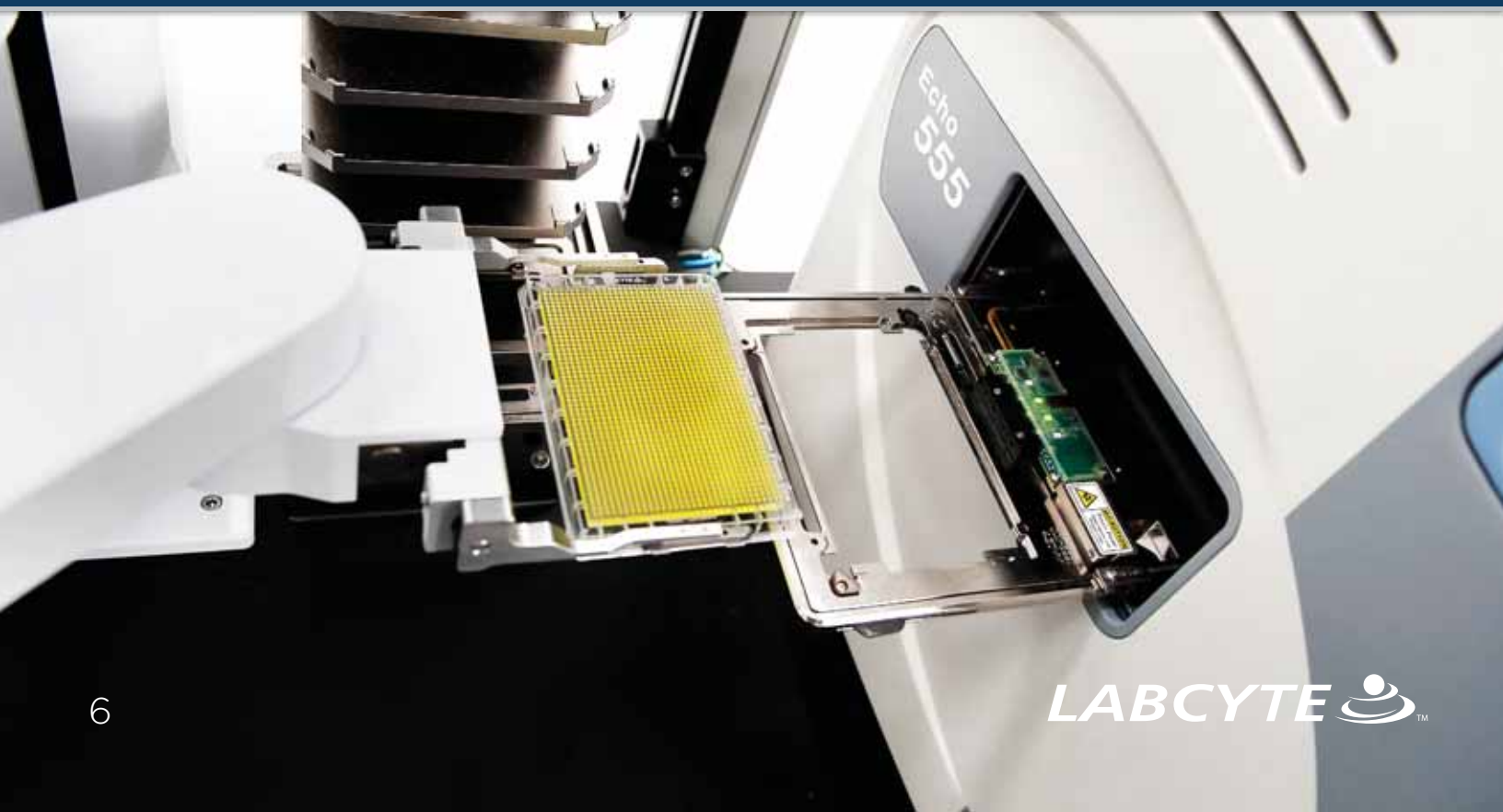
- Design, test, and optimize assays rapidly
- Easily create multiple reagent combinations in one plate
- Transfer multiple fluid types and concentrations from a single plate



### AUTOMATE Complex Assays

- Transfers with low CV and high accuracy
- Transfer multiple reagents combinations quickly
- Cherry pick rapidly  
*(transfer from any well to any well)*

Any-well-to-any-well capability enables creation of BOTH simple and complex assays



# Echo Liquid Handler Models

## Revolutionary Liquid Handling Using Sound

Designed for a range of throughput and applications, all Echo Liquid Handlers utilize Dynamic Fluid Analysis for reliable, accurate fluid transfer of a wide range of fluids. Any-well-to-any-well capability enables creation of both simple and complex assays.

|                                                |                                           |                                         |
|------------------------------------------------|-------------------------------------------|-----------------------------------------|
| <b>Echo® 525</b><br>for higher volume transfer | <b>Echo® 550</b><br>for medium throughput | <b>Echo® 555</b><br>for high throughput |
|------------------------------------------------|-------------------------------------------|-----------------------------------------|



| TRANSFER VOLUME     |               |               |
|---------------------|---------------|---------------|
| 25 nL – 5 µL        | 2.5 nL – 2 µL | 2.5 nL – 2 µL |
| HTS SCREENING       |               |               |
|                     | ✓             | ✓             |
| COMPOUND MANAGEMENT |               |               |
|                     | ✓             | ✓             |
| SYNTHETIC BIOLOGY   |               |               |
| ✓                   | ✓             |               |
| GENOMICS            |               |               |
| ✓                   | ✓             | ✓             |
| CELL-BASED ASSAYS   |               |               |
| ✓                   | ✓             | ✓             |
| BIOCHEMICAL ASSAYS  |               |               |
| ✓                   | ✓             | ✓             |
| PROTEOMICS          |               |               |
|                     | ✓             | ✓             |

| Echo Liquid Handler Specifications |                                                                                                                                                                                                                                                     |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical</b>                  | AC 100-120V, 50/60 Hz, 10 A<br>or AC 200-240V, 50/60Hz, 5 A                                                                                                                                                                                         |
| <b>Weight</b>                      | 128 kg (283 lbs)                                                                                                                                                                                                                                    |
| <b>Dimensions</b>                  | 53.9 cm width x 68.3 cm depth x 92.5 cm height<br>(21.2 x 26.9 x 36.4 inches)                                                                                                                                                                       |
| <b>Working envelope</b>            | Additional 25.4 cm (10 inches) on top, 2.5 cm (1 inch) on sides, 15.24 cm (6 inches) at front, 30.5 cm (12 inches) at back                                                                                                                          |
| <b>Operating temp</b>              | 21°C ± 5°C (70°F ± 9°F)                                                                                                                                                                                                                             |
| <b>Air</b>                         | Filtered, oil-free, dry air<br>• 552 kPa (80 PSI) min<br>• 1034 kPa (150 PSI) max                                                                                                                                                                   |
| <b>Vacuum</b>                      | <ul style="list-style-type: none"> <li><b>House supply:</b><br/>Minimum 200 Torr (266 mbar, 22 in. Hg)</li> <li><b>Standalone vacuum with surge tank:</b><br/>Min. pump speed 2.0 m³/hr, minimum pressure 100 Torr (133 mbar, 26 in. Hg)</li> </ul> |
| <b>Coupling fluid</b>              | 1 µL water + 50 µL algicide                                                                                                                                                                                                                         |
| <b>Coupling fluid temp</b>         | 22.1°C ± 0.9°C (71.8°F ± 1.6°F)                                                                                                                                                                                                                     |
| <b>Transfer volume</b>             | <ul style="list-style-type: none"> <li><b>Echo 555 and 550:</b><br/>2.5 nL – 2 µL</li> <li><b>Echo 525:</b><br/>25 nL – 5 µL</li> </ul>                                                                                                             |
| <b>Source microplates</b>          | <ul style="list-style-type: none"> <li><b>Echo 555 and 550:</b><br/>384- and 1536-well</li> <li><b>Echo 525:</b><br/>384-well, 6-well reservoir</li> </ul>                                                                                          |
| <b>Destination</b>                 | <ul style="list-style-type: none"> <li><b>Echo 555 and 550:</b><br/>Any SBS-format microplate (24-3456 wells or slide holder ≤16 mm in height)</li> <li><b>Echo 525:</b><br/>Most SBS-format microplates</li> </ul>                                 |
| <b>Barcode reader options</b>      | Short side and/or long side                                                                                                                                                                                                                         |
| <b>DMSO hydration survey</b>       | Echo 555 and 550 only                                                                                                                                                                                                                               |

# Significantly Improving Genomics Workflows

## Enabling Researchers to Push Their Science in New Directions

Echo Liquid Handler overcomes traditional barriers in genomic research by dramatically reducing sample and reagent volume requirements, enabling laboratories to maximize their working budgets while improving processes and data quality.

### GENOMIC RESEARCH

#### SYNTHETIC BIOLOGY



#### Increase Efficiency and Speed While Reducing Costs

Echo Liquid Handlers integrated into an Access Laboratory Workstation provide a high-throughput, fully automated system pooling oligonucleotides for assembling constructs, and spotting colonies. Whether using the Gibson Assembly® or In-Fusion® cloning method, tipless acoustic liquid handling reduces costs, waste, and time.

#### SEQUENCING



#### Low Cost, Highly Efficient Library Preparation

Echo Liquid Handlers enable library preparation in low microliter or nanoliter volumes for a range of sequencing methods including Sanger and next-generation sequencing (NGS). Drastically cut reagent costs, save samples, and eliminate steps — all while improving library quality.

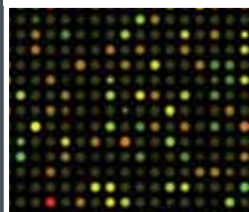
#### EPIGENETICS



#### Enabling High-Throughput Epigenetic Screening

Cost-effective, high-throughput epigenetic screening is made possible using the Echo Liquid Handler and the Access Laboratory Workstation. With precise and accurate nL volume transfers, you can miniaturize assays in high-density formats with no loss of assay performance.

#### GENE EXPRESSION

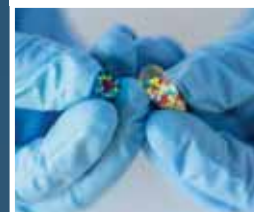


#### Cost Effective, High Throughput RT-qPCR

Eliminate costly and laborious preparation steps to enable high-throughput RT-qPCR analysis of endogenous gene expression. The Echo Liquid Handler combined with one-step reagents improve detection systems, and automated plate handling makes cost-effective, high-throughput RT-qPCR a reality.

### TRANSLATIONAL

#### PRECISION MEDICINE



#### From Personalized Medicine Towards Precision Medicine

Labcyte has partnered with innovative researchers who are working to evolve personalized medicine from a treatment based on behaviors observed from a tested population, to one based on a tested individual — this enables precise screening of potential therapies in a high-throughput, cost-effective manner.

For a complete list of Echo liquid handling applications, please visit our web at [www.labcyte.com/applications](http://www.labcyte.com/applications).

Gibson Assembly® is a registered trademark of Synthetic Genomics, Inc.  
In-Fusion® is a registered trademark of Clontech Laboratories, Inc.

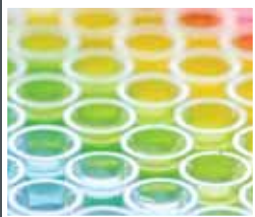
# Complete Drug Discovery Workflow with ONE Instrument

## Enables Miniaturization with Unparalleled Throughput and Accuracy

Reagents, compounds, and samples used throughout the drug discovery process are transferred efficiently and accurately with Echo Liquid Handlers. With various throughput options and fluid transfer capabilities, you can use the Echo system at all steps of the drug discovery process.

### DRUG DISCOVERY

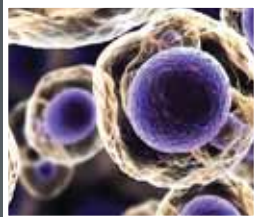
#### HTS / SECONDARY SCREENING



#### Discover the Right Drugs with Improved Transfer Performance

Many scientific publications have shown that discoveries made using the Echo Liquid Handler would have been impossible with traditional methods — thanks in part to direct dilution and the elimination of pipette tip-related issues such as compounds adhering to the surface of pipette tips.

#### CELL-BASED ASSAYS



#### Biologically Relevant Assays with Unmatched Data Quality

Cell-based assays offer a biologically relevant model to predict the response in an organism. The increasing demand for this in-depth analysis is pushing scientists to dramatically improve assay throughput while reducing operating costs. Labcyte addresses these needs with integrated solutions for liquid handling and automation designed for cell-based assay screening.

#### BIOCHEMICAL ASSAYS



#### Simplify Assay Workflows with Precise Reagent Transfers

Buffer formulations are often complex in order to maintain protein stability in long-term storage. This complexity presents challenges for traditional liquid handling methods to transfer reagents without loss of material. Echo Liquid Handlers incorporate Dynamic Fluid Analysis technology into the liquid transfer process that ensures reagents are transferred without loss of material and regardless of the storage buffer complexity.

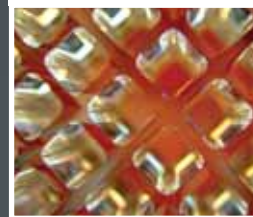
#### ADME-TOX



#### Enable Cost-Effective, Earlier Safety Screening

ADME-Tox assays are critical to the drug discovery process to help determine the viability of a drug candidate. Echo Liquid Handlers' non-contact acoustic transfer and ability to perform direct dilutions eliminate the potential for sample loss on tips, error propagation during serial dilutions, and compound precipitation — removing drug elimination due to false negatives.

#### COMBINATION SCREENING



#### Increase Efficiency and Speed While Reducing Costs

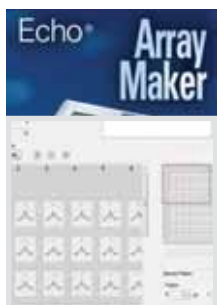
Drug combination screening using the Echo Liquid Handler has revolutionized the approach to the assessment of synergistic effects of drug combinations on disease. The any-well-to-any-well fluid transfer and the Echo Combination Screening application software make high-throughput, 2-way dose-response matrix studies a reality.

# Echo® Software Applications

## For Quick and Reliable Liquid Handling Task Management

Labcyte has a suite of Echo Software Applications to assist researchers in creating liquid handling protocols for specific applications. Each Echo application is designed around a specific liquid handling workflow and uses a combination of wizards and graphical interfaces to simplify the creation of plate formats, liquid transfer routines, and output files. Researchers can quickly create a variety of protocols off-line for the Echo Liquid Handler and use built-in simulators to validate every transfer before running live. The suite of Echo software applications enables the Echo Liquid Handler to quickly and efficiently accomplish any liquid handling task.

**Echo®  
Array Maker**



### Acoustically Transfer Samples and Reagents

Graphically design custom patterns and formats as well as transfer protocols that utilize them

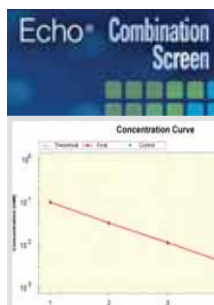
**Echo®  
Cherry Pick**



### File-Driven Transfers from Any Well to Any Well

Uses information in pick lists to transfer from any source well to any destination format

**Echo®  
Combination Screen**



### Design Complex Combination Screening Layouts

A graphical interface to visually combine dose-response curves, controls, and single concentration transfers

**Echo®  
Dose-Response**



### Eliminate Carryover, Improve Results with Direct Dilution

Simplifies protocol creation for dose-response using direct dilution with a wizard-based interface

**Echo®  
Plate Audit**



### Analyze, Monitor Sample Libraries w/ Acoustic Analysis

Visualize, track, and compare the characteristics of samples within or across plates

**Echo®  
Plate Reformat**



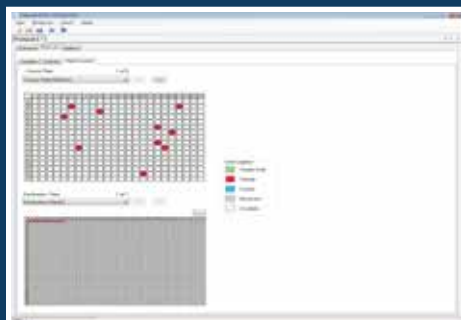
### Design, Develop, and Assemble Assays

Design custom layouts used to assemble assays or reformat and replicate screening libraries

## Intuitive Protocol Design for Echo Liquid Handlers

Echo software applications use familiar terminology, interactive graphics and wizards to provide a research-friendly environment for protocol creation and editing – this drastically reduces the learning curve and hands-on time.

**Echo® Cherry Pick**



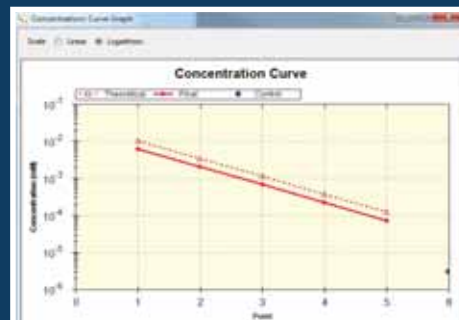
Rapid Hit Picking, Sample Pooling, and More

**Echo® Plate Reformat**



Simple or Complex Assay Designs

**Echo® Combination Screen**



Combine Curves of Any Format in 2D and 3D

# Access™ Laboratory Workstation

## Ready-to-Go Robotic Systems for Echo Liquid Handlers

The Access Laboratory Workstation combines the revolutionary performance of the Echo Liquid Handler with automated plate handling and integrated devices into walk-away systems tailored for a range of applications. Access Laboratory Workstations are modular, flexible, solutions that easily scale when needed.

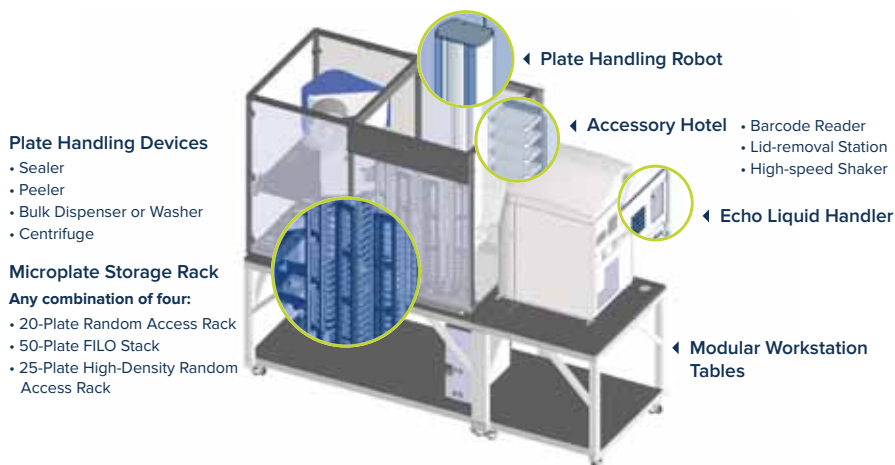


## Improving Throughput and Reproducibility

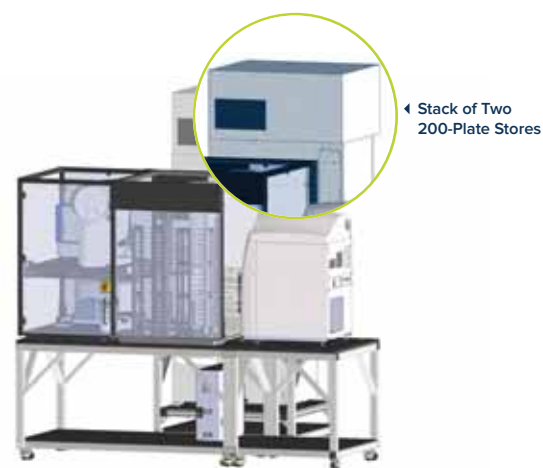
Access Laboratory Workstations multiply the benefits of the Echo platform by improving overall assay throughput and reproducibility. With the ability to integrate a variety of devices and the modularity to scale when needed, each workstation offers the flexibility required by frequently-changing assay requirements.

### CONFIGURATION OPTIONS (for a complete list of configurations, visit [www.labcyte.com](http://www.labcyte.com))

#### Assay-Ready Plate Preparation



#### High-Throughput Gene Expression



## TEMPO™ – Dynamic Scheduling for Labcyte Automation Systems

Tempo Automation Software offers a research-friendly interface for scheduling Access Laboratory Workstation protocols. In a dynamic fashion, Tempo software manages all tasks — including sample management, plate handling, liquid handling, detection, and LIMS updates without custom programming or scripting.



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