

ECHO LIQUID HANDLER



DISCOVERY
in motion.



IMPACTING SCIENCE WITH SOUND



Unlike traditional liquid handlers, the Echo system uses sound energy to precisely transfer liquid without contact or using pipette tips, nozzles or tubing. Designed for diverse applications in scientific research, the Echo Liquid Handler combines the innovative technologies of Acoustic Droplet Ejection and Dynamic Fluid Analysis to accurately and reliably transfer a wide range of fluids. Across many scientific disciplines including drug discovery, genomics, synthetic biology, and functional studies, Echo systems provide these benefits:

- Improved data quality with lower risk of cross-contamination and carryover when compared to the use of pipette tips.
- Precise, low-volume liquid transfers to miniaturize assays, reduce reagent costs, and conserve precious samples
- High-throughput “any-well to any-well” transfers to rapidly execute highly complex, multi-component assays and experiments



Echo 650 Series

Liquid Handlers

For Low Volume Applications

Echo 650 Series Liquid Handlers represent our most flexible line of instruments for high-throughput, acoustic transfer of samples and reagents in volumes as low as 2.5 nanoliters (nL). Echo 655T and 650T Liquid Handlers offer the ability to transfer from acoustic sample tubes as well as from Echo Qualified 384 and 1536-well Microplates. Echo 650 and 655 Liquid Handlers transfer from Echo Qualified 384 and 1536-well Microplates and can be upgraded to transfer from acoustic sample tubes. With improved fluidics handling for simpler maintenance, better robotics integration, support for transfer from sample tubes, and quieter operation, the Echo 650 Series builds on the long and successful history of Echo acoustic liquid handling technology. The Echo 650 series Liquid Handler supports transfer from Echo Qualified 384-well Microplates and 6-well Reservoirs.



Acoustic Sample Tubes

The Brooks Life Sciences FluidX AcoustiX Sample tubes transform workflows by enabling acoustic dispensing directly from tubes. The AcoustiX Tube preserves sample integrity by allowing samples to be accessed individually – ideal for applications that require subsets of large libraries to be accessed frequently.



Echo 525

Liquid Handler

Acoustic Solutions for Genomics and Biologics

The Echo 525 Liquid Handler transfers aqueous samples and reagents rapidly in a stream of 25 nL droplets. This enables reliable and accurate results for workflows that require larger transfer volumes. Designed specifically for biochemical and genomics assays, the Echo 525 Liquid Handler delivers unparalleled accuracy and precision to improve assay reliability and data quality. The Echo 525 Liquid Handler supports transfer from Echo Qualified 384-well Microplates and 6-well Reservoirs.



Model	Transfer Throughput	Source
Echo 655T	High throughput	Echo Qualified Sample Tubes and Microplates
Echo 650T	Medium throughput	Echo Qualified Sample Tubes and Microplates
Echo 655	High throughput	Echo Qualified Microplates
Echo 650	Medium throughput	Echo Qualified Microplates

Echo for Regulated Laboratories

Regulatory-ready, Echo Liquid Handlers enable regulated laboratories to take advantage of all the benefits of acoustic liquid handling. Each system is supplied with state-of-the-art software to secure, track, and audit Echo system protocols. Each system is also supported by IQ/OQ services from the time of installation by our field support team.



Part 11 Compliance Manager

Part 11 Compliance Manager locks down and tracks all Echo Liquid Handler use, including protocol changes and output files using state-of-art security algorithms.

Innovative Technology with Unparalleled Performance

Echo Liquid Handlers rely on patented technologies and novel methodologies to change how liquid handling is used in applications throughout life science. With Dynamic Fluid Analysis the Echo Liquid Handler enables researchers to transfer a broad spectrum of fluid types with a degree of flexibility and reliability not possible with traditional liquid handling technologies.

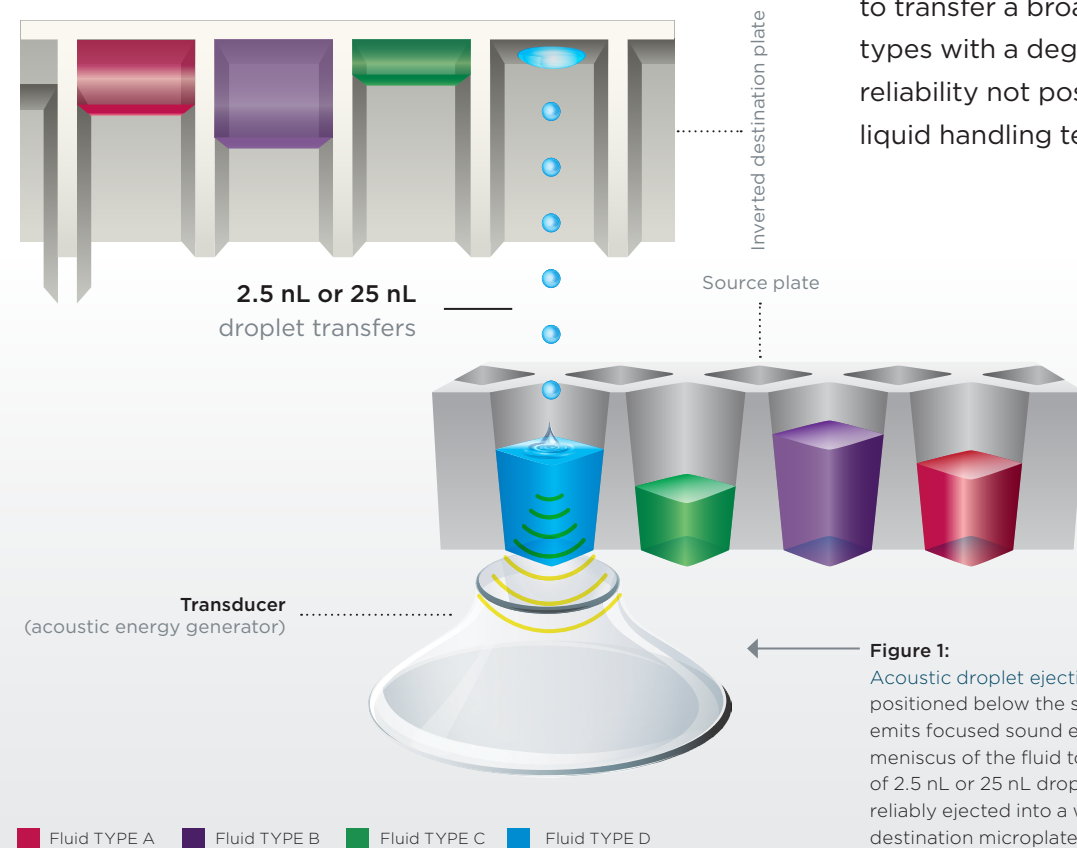


Figure 1: Acoustic droplet ejection - The transducer is positioned below the source microplate well and emits focused sound energy repeatedly to the meniscus of the fluid to be transferred. A stream of 2.5 nL or 25 nL droplets (model dependent) is reliably ejected into a well of an inverted destination microplate.

Dynamic Fluid Analysis On-the-Fly Adjustments to changing fluid properties

Using Dynamic Fluid Analysis, Echo Liquid Handlers use sound energy to determine fluid composition, fluid height, and the power needed to eject a precise volume of fluid into a destination well. Dynamic Fluid Analysis adjusts transfer parameters in real-time to compensate for changes in fluid height (volume) and fluid properties without recalibration.

- Real-time adjustment to changing fluid types or volumes without user intervention
- Accurate and precise transfer of complex reagent sets



Acoustic Droplet Ejection Technology for non-contact fluid transfer

Echo Liquid Handlers rely on Acoustic Droplet Ejection, an innovative automated liquid handling technology that focuses ultrasonic energy at the meniscus of a fluid to eject small droplets of liquid from a source well to a destination well.

- Gentle enough to safely transfer cells, samples and reagents
- Precise and accurate transfers in streams of 2.5 nL or 25 nL droplets
- Non-contact transfer of a broad spectrum of fluid types using sound

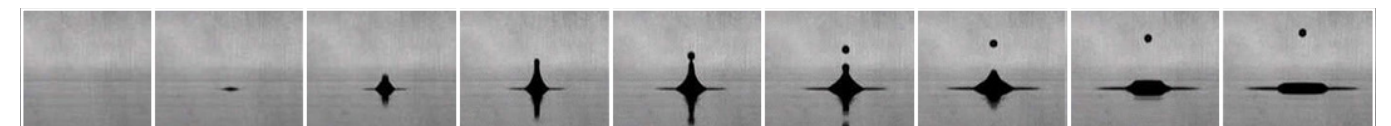


Figure 2: Stroboscopic imaging of Acoustic Droplet Ejection, showing production of a single droplet of fluid.



Direct Dilution for a more reliable dilution of samples and reagents

With the ability to transfer low nanoliter volumes, Echo Liquid Handlers can produce dose-response and standard curves free of the errors typically found using traditional tip-based liquid handlers and serial dilution. Echo Liquid Handlers create a series of dilutions by directly transferring decreasing volumes of stock sample to individual assay wells. Since each concentration point along the dilution curve is created individually, instead of serially, the risk of propagating errors (carryover) along the curve is eliminated — a significant improvement to data quality.

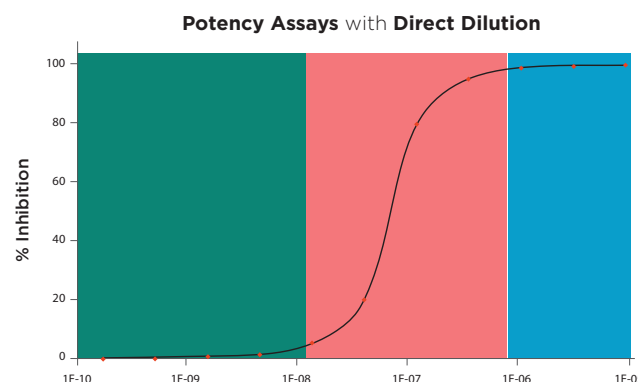
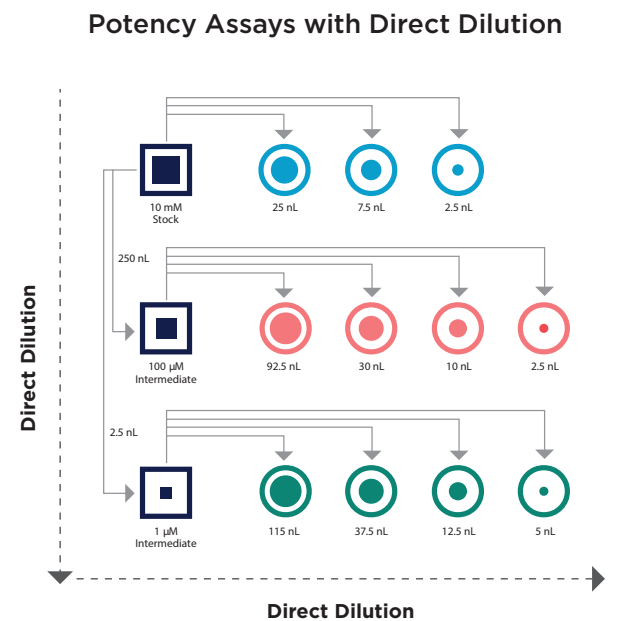


Figure 3: Example of an 11-point curve created using direct dilution. The image on the top shows how the desired concentrations are created by transfers directly from the stock sample and two intermediate dilutions of the stock sample. The resulting IC_{50} curve is shown on the bottom.

Rapid Combinatorial Transfers for superior throughput flexibility

Simultaneous movement of the acoustic transducer and destination plate during transfer enables Echo Liquid Handlers to transfer from any source well to any destination well faster than traditional liquid handling technologies that require time to transport samples and to change tips between transfers.

- Pool and normalize samples, reagents, and primers by transferring different volumes from a collection of source plate wells
- Cherry pick screen 'hits' in minutes for secondary screening
- Quickly create combinations of samples and reagents in varying concentrations
- Define transfer regions to create custom layouts
- Compress libraries into interleaved patterns or separate quadrants
- Offset transfers to any position in a well

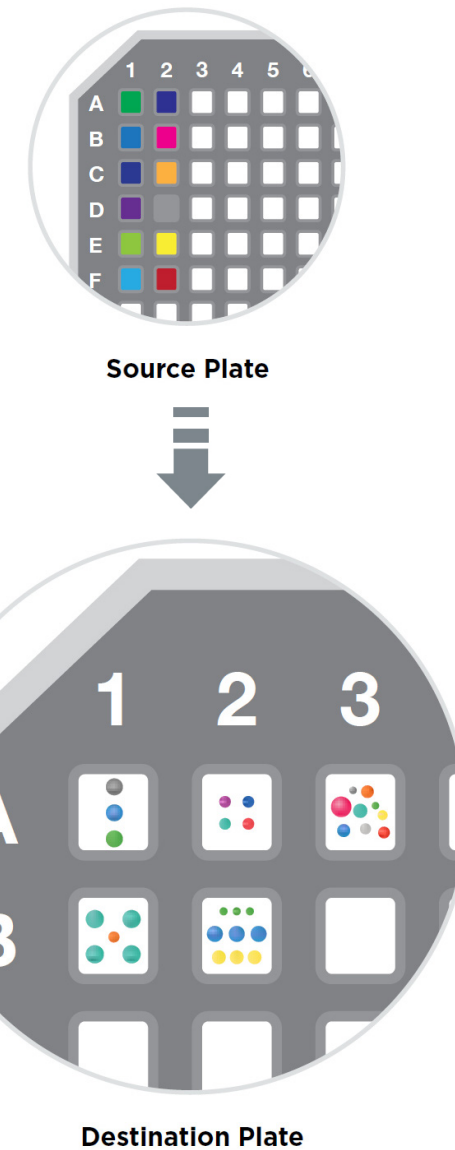


Figure 4: Examples of rapid cherry picking, sample pooling, and combination screening from any source well to any destination well, at any volume.



Reduce Plastic Waste and Lower Your Lab Costs

Millions of metric tons of plastic waste are generated by life science research laboratories each year. The majority of this waste is from single-use plastics, like pipette tips. Echo Liquid Handlers eliminate the dependency on pipette tips, significantly reducing lab waste and disposal costs.

Reduce Assay Volumes, Not Performance

Successful miniaturization of assays requires highly reproducible and accurate transfer of nanoliter and microliter volumes of assays, reagents and samples. Echo Liquid Handlers deliver small volumes of reagents, enabling assay miniaturization to previously unattainable levels.

Assay Miniaturization

- Enables low-volume sample, reagent and compound addition
- Minimizes final DMSO concentration
- Generates comparable or improved results
- Delivers consistent performance

Precise Transfers in nL Increments

Sample transfer integrity is important for successful data generation. With highly precise and accurate non-contact transfers, the Echo Liquid Handler enables rapid addition of reagents and nucleic acids.

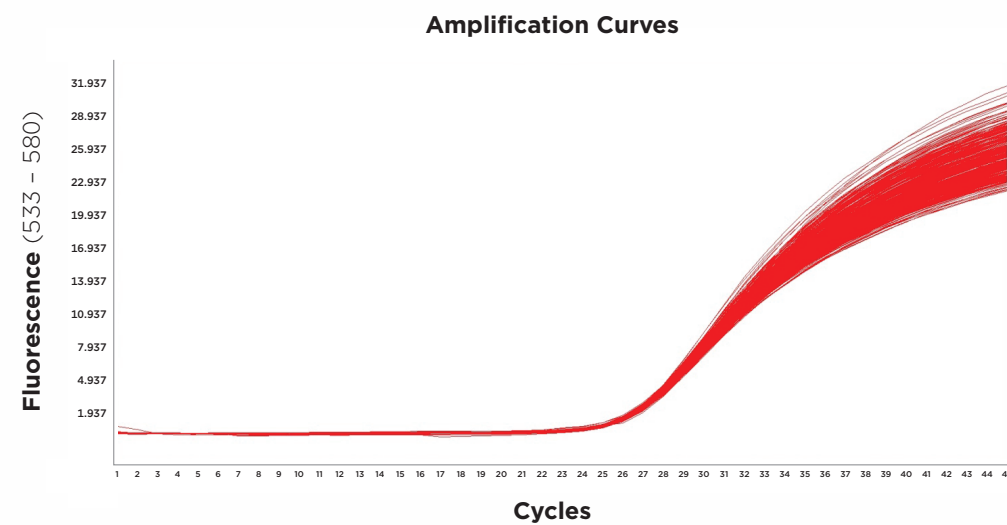
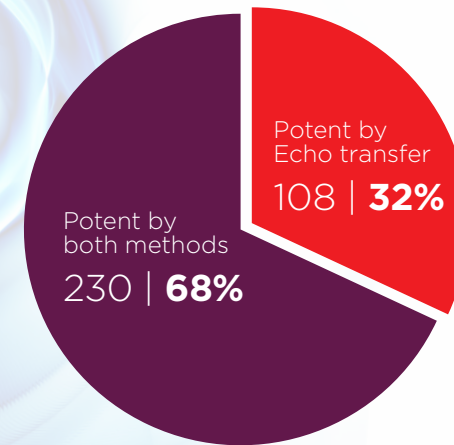


Figure 3: Real-time qPCR data showing transfer uniformity using the Echo Liquid Handler. Source plate Echo Qualified 384-well Polypropylene Plus Microplate to a 384-well assay plate. 1 μ L puc19 in 0.1 %TE per well was transferred. Roche 1536 DNA Green Master reagent was used following the standard protocol 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.¹

259x More Potent

AstraZeneca demonstrated more accurate compound potency when transferring directly with an Echo Liquid Handler versus using a serial dilution process.²

Compound number	Echo Liquid Handler IC ₅₀ (μ M)	Traditional Liquid Handler IC ₅₀ (μ 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	0.17
10	0.064	0.817
11	0.486	3.03

1. 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.
2. Barlaam, B.C. et al., U.S. Patent 7,718,653, 2010.