



Use of a Stand-Alone Beckman Coulter Echo[®] with Titian's Mosaic Software

Mark Doring & Arthur Yarwood
Titian Software Ltd

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INTRODUCTION

Acoustic transfer instrumentation has been at the forefront of liquid handling technology for the life sciences since 2004. The ability to reliably transfer nanolitre quantities of DMSO and aqueous solutions has enabled the scientific community to perform research on a scale not previously achievable. Successfully developed by Labcyte and Beckman Coulter Life Sciences, this unique technology applies to a wide variety of scientific uses – from drug discovery to cancer research to genomics – and continues to expand as innovative techniques are developed in the industry.

The advantages of new technology come with the challenge of bringing new instruments and new information flows into your existing sample management system. Beckman Coulter Life Sciences and Titian Software enjoy a collaborative partnership which provides robust solutions when integrating acoustic instrumentation with Titian's Mosaic sample management software. Titian brings its extensive experience of integrating laboratory instrumentation and robotics to ensure that it is easy for customers make best use of their investment in acoustic technologies.

As the Titian-Beckman Coulter relationship continues to grow, methodologies are designed in tandem to produce a reliable, versatile and intuitive integration between these two platforms – making Mosaic the clear choice for nanolitre sample management.

THE BENEFITS OF ACOUSTIC LIQUID HANDLING

The Beckman Coulter Echo® liquid handler has transformed research by using sound energy to provide highly accurate, fully automated, non-contact dispensing of fluids. The Echo can transfer nanolitre volumes of a variety of solutions from any acoustic compatible microplate well or Brooks Life Sciences' AcoustiX™ tube, to any destination well. This greatly facilitates sample management processes. The Echo's flexible sample transfer capabilities range from simple reformatting operations, through creating dose-response curves for potency determination, to assembling complex assays – all while minimising reagent costs and sample waste.





The advantages of Echo's acoustic approach include:

- Non-contact, contamination free liquid transfers
- Fast, accurate and precise liquid transfers on a nanolitre scale
- Handles a wide variety of solutions (DMSO, aqueous buffers, etc.)
- Preserves sample integrity and viability during transfer
- No pipette tip requirements:
 - Reduces operating costs and waste
 - Eliminates time and effort associated with tip changing
 - Saves robotic work cell space (no tip boxes storage needed)
- A choice of sample sources (acoustic friendly microplates or tubes)

CONSIDERATIONS WHEN INTEGRATING NEW EQUIPMENT WITH SAMPLE MANAGEMENT

Bringing in new instrumentation gives sample management professionals the physical tools that they need, but the new data streams that these instruments provide need to be handled correctly.



Some of the issues to manage are:

- Incorporating the new technology into existing sample management workflows
- Understanding and programming the new instrument
- Processing multiple data files of various types
- Ensuring data integrity when transferring files between multiple systems
- Managing the distribution of information contained in these files
- Reliably updating spreadsheets and macros to incorporate the new data and create reports
- Updating internally developed, custom sample management solutions, so these can manage the new technology efficiently
- Ensuring IT can support internal systems (often a challenge for smaller research labs)
- How to provide workflow updates where they are needed
- How to spot, audit and investigate data anomalies

Sample management professionals need a proven partner who can provide a robust system to address these issues.

COMBINING THE POWER OF MOSAIC WITH YOUR ACOUSTIC WORKSTATION

Titian's Mosaic sample management software is the perfect solution for managing and tracking both large, complex and/or high throughput sample orders as well as smaller, more varied workflows. Using Mosaic to integrate Beckman Coulter's Echo workstation makes it is easy for sample management groups to create and manage workflows best suited to the acoustic platform in a user-friendly and intuitive manner.

Using Mosaic to manage the Echo reduces the number of steps operators need to carry out to initiate a run. The work performed by the Echo is then logged by Mosaic, results are automatically processed, and the inventory accurately updated to complete the sample management workflow. Traceability is maintained in Mosaic's comprehensive audit trail.



The key benefits to this integration are:

- Mosaic provides operator guidance to carry out sample processing requests and create automated runs using the Echo
- Scientists can order assay plates knowing that the inventory amounts are automatically tracked and updated
- Results are processed and distributed automatically. No manual file editing or copying steps!
- The exact volume transfers reported by the Echo are automatically captured in the Mosaic inventory and in the audit trail, so that results data matches the physical outcome rather than a theoretical ideal
- All intermediate plates used by the Echo workstation are tracked in Mosaic inventory and in the audit trail, so any transfer failures here can be pinpointed
- Survey volumes of source plate wells are used to automatically update the Mosaic inventory
- Any Echo transfer failures are tracked and visibly highlighted in Mosaic inventory, and email reports are generated of any transfer errors during the automatic results file import
- Transfers of controls and standards are reported and updated in the Mosaic inventory

Mosaic also supports most Beckman Coulter software applications for a stand-alone Echo, including: Echo Cherry Pick (ECP), Echo Reformat (EPR), Echo Dose-Response (EDR), and Echo Plate Audit (EPA)

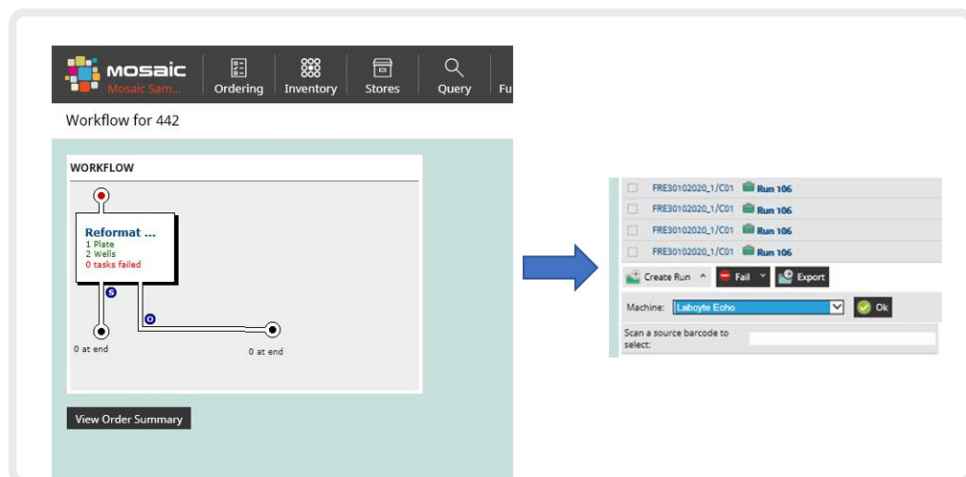
CREATING ECHO RUNS USING MOSAIC

Integrating the Echo workstation with your Mosaic sample management software makes it easy for laboratory staff to create protocols for the Echo, as they can continue to use the same Mosaic interface used for other automation. They simply request the substances, volumes and plate layout required.

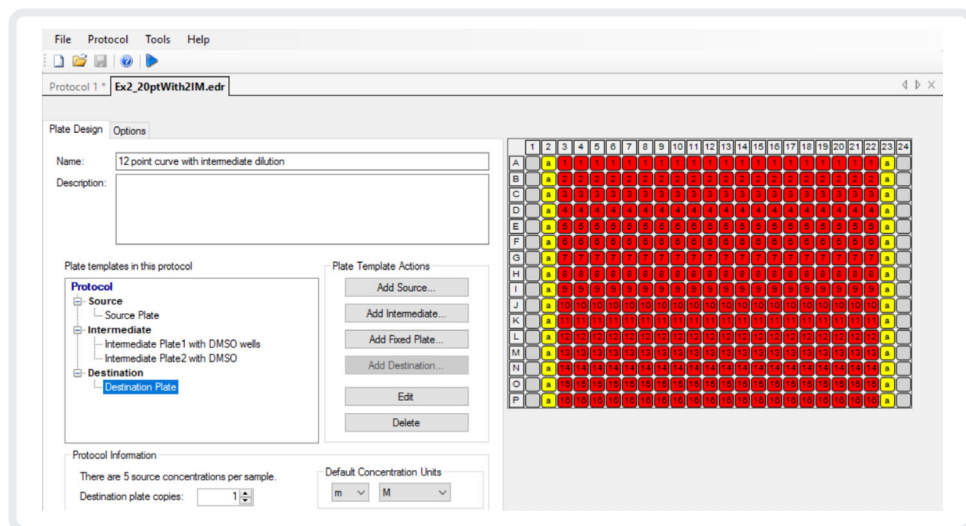
To carry out the sample processing steps using the Echo, the operator will:



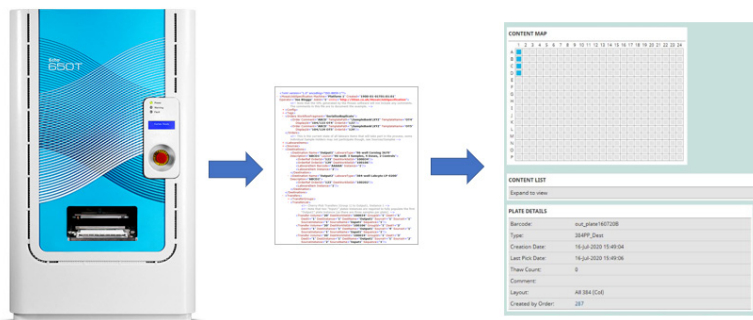
1. Select the order workflow step in Mosaic (e.g. Cherry Pick from a source plate)
2. Select the desired input labware and output plates
3. Choose a liquid handler (e.g. the LAB-ECHO), and create the Run



4. Once the Run is created, the operator exports a source picklist for the Echo to use
5. Switch to the relevant Labcyte Echo application (EDR, ECP, EPR, etc.) and then setup or open an Echo protocol. Import the source picklist previously saved and start the Echo Run



6. Once the Echo transfers are complete, the newly created Echo XML report files are converted into a report which is automatically uploaded by Mosaic. Source plate volume information is refreshed according to the Echo plate survey, and inventory data for the source and destination plates is updated as well.



MANAGING ERROR TRACKING

The Echo liquid handler is able to detect if a particular well failed to transfer during a run, for instance due to air bubbles. These transfer errors only affect the explicit well(s) and any subsequent doses dependent on them. Mosaic logs and highlights any Echo transfer errors by marking them as “Suspect” in the Mosaic inventory and audit trail. Any failures can also be highlighted in Despatch notes and filtered from export to downstream assay screening systems like ActivityBase or GeneData to improve data quality.

Plate B000000071

CONTENT MAP

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A																								
B																								
C																								
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A10 SAMPLE

Position:	A10
Substance Type:	Small Molecule
CompoundBatch:	d4c2-b1
Name:	
ID:	
Sample Amount:	5 µL (Suspect)
Available Amount:	5 µL (Suspect)
Concentration:	0.078125 mM
Solvent:	100.0 % DMSO
Total Thaw Count:	0
Filled Date:	27/07/2020 12:49:26
Parents:	B000000071@A09
Children:	B000000071@A11
Last Transfer Pipettor:	Bravo
Last Transfer Time at Instrument:	27/07/2020 12:49:24

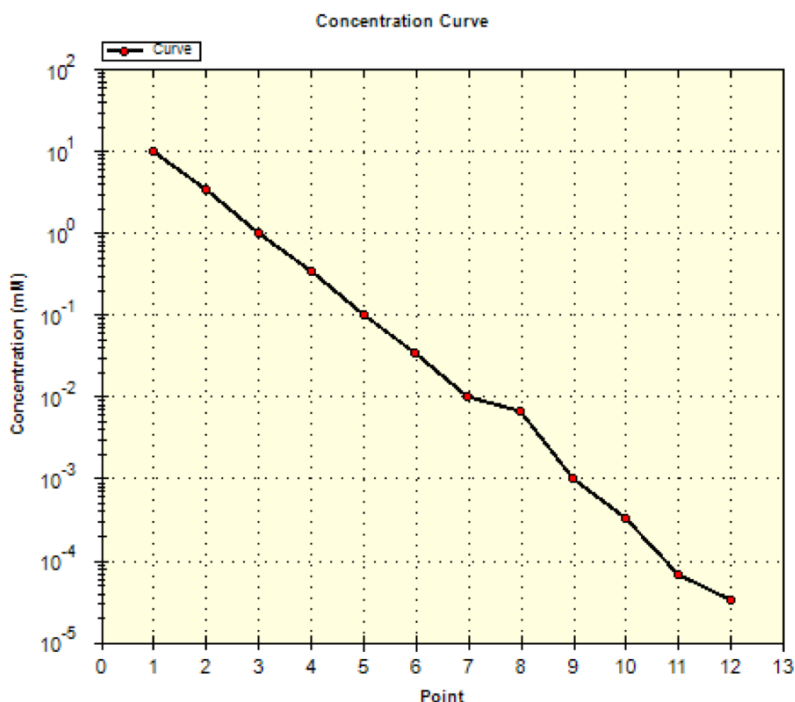
Edis Sample

MANAGING ECHO DOSE-RESPONSE PROTOCOLS

Integrating a standalone Echo instrument using Mosaic still gives users the flexibility to create protocols, especially with Echo Dose-Response (EDR) protocols. The operator defines the transfers they want performed when creating a protocol..

Using Mosaic to manage the EDR protocol brings the following benefits:

- Mosaic registers and tracks the inventory of any intermediate plates involved in dose-response protocols, so any transfer failures here can be pinpointed
- Mosaic captures the material transfers exactly as they are physically performed, reflecting the discrete 2.5nL volumes that the Echo liquid handler can transfer. This results in an accurate plate inventory, both in terms of volumes and of concentrations, as well as a precise audit trail.



SUMMARY

Using Mosaic sample management software to integrate your Echo acoustic liquid handler into your workflow provides a range of benefits complimenting the accurate nanolitre dispensing. These include error-free, pick list creation, volume tracking and automated data processing, resulting in auditable inventory updates.

Mosaic's tight coupling with the Echo, through APIs and automated processing of the result files, means that users can:

- Easily and seamlessly add Beckman Coulter Echo workstations to Mosaic sample management workflows
- Provide on time delivery of requested substances, with the outputs defined, in the order that the scientists are looking for
- Maintain a highly accurate inventory by capturing volume transfer information on-the-fly without any user interaction. Data updates are carried out live, which removes any delays in downstream processing or analysis
- Track every sample preparation step via Mosaic's comprehensive audit trail, to capture data for quality security processes
- Capture liquid handling error information

An additional benefit is that Titian works in partnership with Beckman Coulter to continually evolve Mosaic, so it is responsive to customer requirements and the development of new liquid handler functions and software.



ABOUT TITIAN SOFTWARE

Titian Software is the industry leader in providing sample management software for the life sciences. Using Mosaic software, our customers see significant benefits in terms of their throughput, response times, error rates, labor costs as well as in sample conservation. Titian have done this by producing an application that can process multiple requests with varying sources, and labware output formats. It can easily be run by any operators, instead of tying up an automation expert to write new protocols. We also use our extensive experience in interfacing laboratory instrumentation and robotic systems with our software to ensure that customers make best use of their investment in research and development technologies.

At Titian, our development efforts never stop as we continue to advance Mosaic toward higher levels of efficiency and practicality for the user. The ongoing collaborative relationship between Titian and liquid handling hardware suppliers continues to ensure that new applications are made available on a timely basis to fulfil our customer's research goals. We pride ourselves on taking into account customer feedback for all of our Mosaic applications to drive our product to be the best it can be. It's all part of Titian's commitment to providing innovative solutions that make life easier for sample management professionals.

ABOUT THE AUTHORS

ARTHUR YARWOOD - Fascinated by mathematics and programming, Arthur spent 11 years at Sony, specialising in tools programming, asset management and databases. He joined Titian in 2012 and is now a team leader and project manager on Mosaic.

MARK DORING - Mark Doring worked for Schering Plough for 25 years as a biochemist in new lead discovery, focusing on high throughput screening assay performance, development and compound preparation with an emphasis on automation and informatics. He joined Titian Software in 2015 as a business application consultant.

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info@titian.co.uk

www.titian.co.uk

UK Tel:

+44 20 7367 6869

USA Tel:

+1 508 366 2234