

Simplifying Hamilton Liquid Handler Workstation Integrations using Mosaic Software's JFM Application

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v1.0

INTRODUCTION

The challenge for today's lab is to connect various automation platforms with sample management software so that the essential work done by these systems can be viewed and managed as part of the whole screening cycle. The wide range of lab equipment makes effective tracking of samples and data more difficult as there are multiple data handover points between systems.

Each time these data handover points are managed manually, it is difficult to avoid introducing errors. However, automating the handover is challenging as each lab's equipment differs, and bespoke integrations are expensive and time-consuming to create and maintain.

Titian Software and Hamilton provide a tried and tested integration interface between Titian's Mosaic sample management software and Hamilton's Microlab Vantage automated liquid handler by using Mosaic's Job Fulfilment Module (JFM) with a bespoke driver. The combination seamlessly connects instrument control with the workflow management, sample tracking, audit trail and inventory updates required for a smooth sample management process.

HAMILTON AUTOMATED LIQUID HANDLING PLATFORMS

Hamilton provides solutions for fully automated life science workflows that include state-of-the-art robotic liquid handling platforms, automated sample stores and consumables. Their liquid handling workstations provide consistent results for assays, ranging from low throughput pipetting protocols to high-throughput systems with integrated sample storage.

Hamilton's Microlab Vantage offers the next generation of liquid handling automation, with enhanced performance, increased walk-away time, and optimisation capabilities to ensure that any lab has the best instrument for current and future needs.



Key features of Hamilton's Microlab Vantage are:

- Allowing labs to optimise storage, device integration and transport space without sacrificing deck space
- The ability to process more samples in less time without the risk of error or variability
- Pipette tip locking and alignment the ensures the highest accuracy during liquid handling steps
- Modular architecture for easy customisation or upgrading
- Flexible deck layout to incorporate tools and accessories

TITIAN'S MOSAIC SOFTWARE AND JOB FULFILMENT MODULE

Titian's Mosaic sample management software is trusted by a worldwide customer base, from small biotech to global pharma, to track and manage every step of the lifecycle of their samples.

Mosaic's workflow mimics the physical business processes that are performed on samples in a customer's laboratory – including capturing all sample processing operations in a variety of ways. The most secure way to manage the data handover between Mosaic software and lab automation is to directly integrate them using a bespoke driver.

Titian's Mosaic Job Fulfilment Module (JFM) application provides a standardised Application Programming Interface (API) specifically for integrating bespoke drivers. It gives instrument vendors and customers control of integration and protocol design, while still receiving Mosaic sample orders, workflow instructions and inventory updates. It also dramatically reduces the need for user intervention and eliminates potential sources of error.

Integrating a bespoke driver with Mosaic's JFM interface brings you the following benefits in addition to fast and accurate dispensing:

- Real time, verified data exchange that automates inventory updates
- Capture of all sample processing actions in Mosaic's CFR 21 Part 11 compliant audit trail
- Automatic creation of work lists calculated from Mosaic's inventory to ensure accuracy

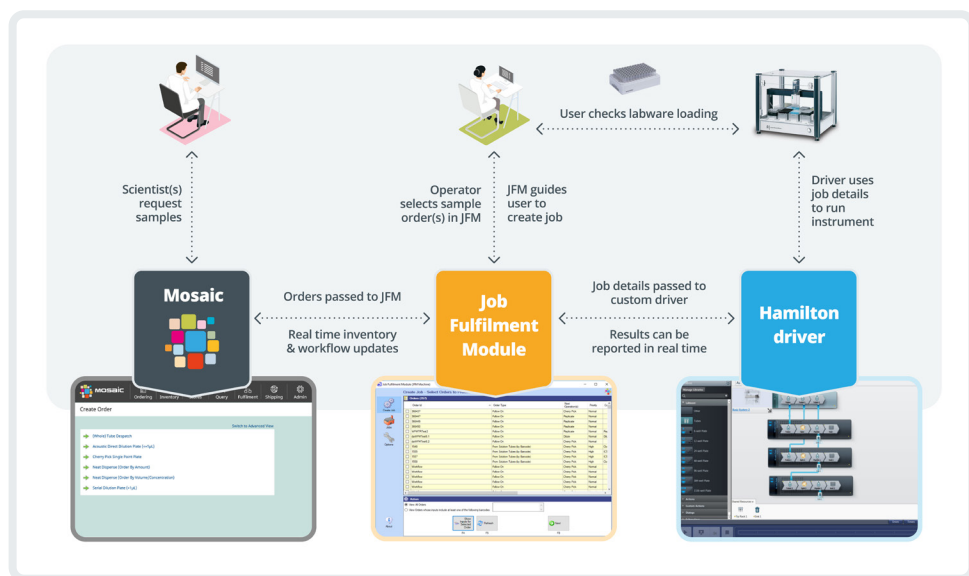


- Error free pipetting with advanced tip usage and tracking
- Integration with multi-stage workflows involving other lab instrumentation
- The same Mosaic interface laboratory users are already familiar with

TITIAN MOSAIC JFM AND HAMILTON MICROLAB VANTAGE INTEGRATION

Mosaic's JFM application communicates directly with the Microlab Vantage using a custom driver created by Hamilton. This feeds processing job parameters into Microlab Vantage for execution and returns results to Mosaic's inventory and audit trail.

The diagram below describes the integration high level architecture:



The high level process for the integration is as follows:

1. An operator uses the JFM desktop application to select a Mosaic Order to fulfil
2. JFM creates an XML Job specification containing all the Order parameters, including specifying labware types, source wells, destination wells, transfer types, standard and controls, and many more. The XML Job specification can include specific instructions which vary per order template or assay, such as whether to seal plates.
3. The Hamilton driver uses a web service to get the JFM job specification.
4. The operator fulfils the job while the Hamilton driver controls the Hamilton Vantage, including running the liquid handling steps specified in the JFM job
5. Hamilton's custom driver updates the Mosaic inventory as the workflow executes on the automated platform.

BENEFITS OF THE MOSAIC JFM-MICROLAB VANTAGE INTEGRATION

Using Mosaic's JFM application to manage the Microlab Vantage means operators only need to carry out a handful of steps to initiate a workflow. Mosaic then logs this work in the audit trail, automatically processes results, and updates the inventory to complete the sample management workflow. Traceability is maintained in a comprehensive audit trail.

The JFM application's standardised API ensures that updates are passed from the Microlab Vantage through to Mosaic in real time. This means:

- Scientists don't have to wait for the end of a liquid handling run to look at their plate map
- New runs can be created while the current one is in progress
- Multiple orders or requests can be batched and processed in the same run
- The inventory of any intermediate plates involved in serialisation and dose response protocols are registered and tracked in Mosaic
- Material transfers are captured by Mosaic exactly as they are physically performed. This results in an accurate plate inventory, both in terms of volumes and concentrations, as well as provision of a precise audit trail
- Any transfer errors reported by the liquid handler are highlighted in the inventory and only affect the explicit wells and any subsequent doses dependent on them



When JFM is used to couple advanced liquid handling workstations, such as Hamilton's Microlab Vantage, with Mosaic software the user is given a powerful platform for managing daily operations, keeping track of sample movements, and meeting the research goals of the laboratory.

WORKFLOW PROCESSES SUPPORTED BY MOSAIC JFM

Mosaic's JFM application supports many workflow processes that are common to liquid handlers, including:

- Serialise and acoustic dose response
- Replicate (plate stamp)
- Cherry Pick
- Standards and controls addition

JFM also caters for combined workflows with multiple steps, incorporating many workflow fragments into a single job (e.g. Cherry Pick > Serialise > Add Controls and Standards > Replicate).

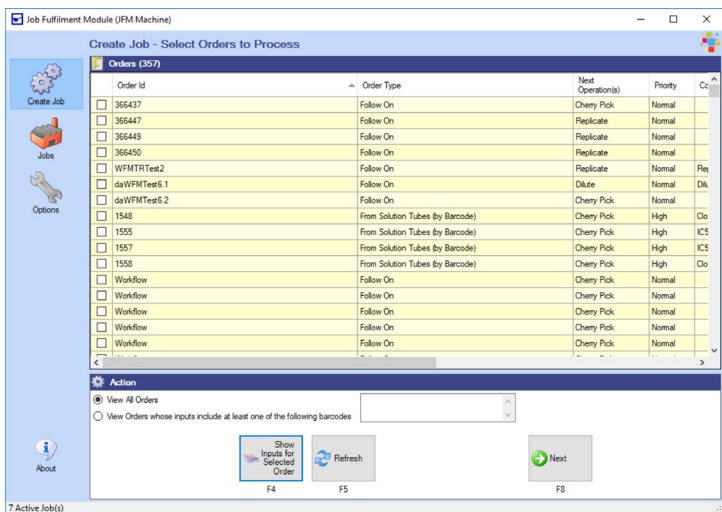
Whether all these processes are available to the user will depend on whether the Hamilton driver and the liquid handling platform can support them. These details should be confirmed with Hamilton as the provider of the driver.

EXAMPLE: MOSAIC JFM ORDER FULFILMENT

Once the JFM liquid handler integration is complete, lab operators can set up and use the Microlab Vantage following Mosaic guidance as they would for any other Mosaic directly integrated system

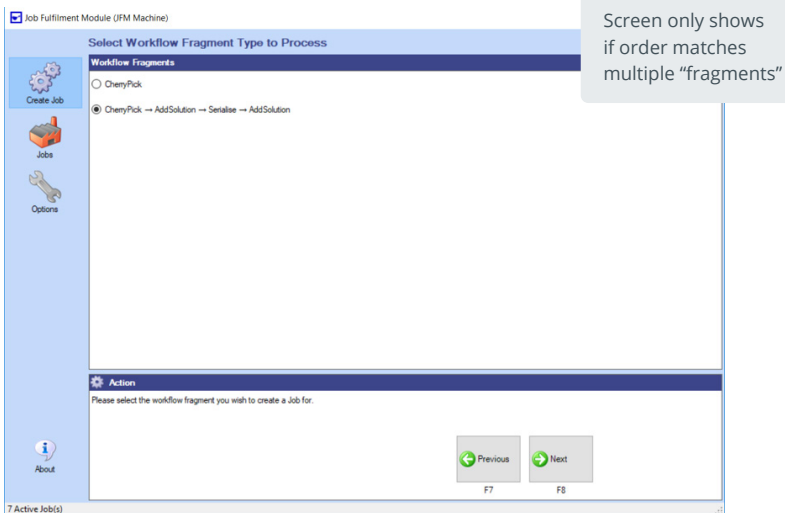
The operator opens the JFM application to see which liquid handling orders can be run on that machine. This view is similar to other Mosaic liquid handling applications.



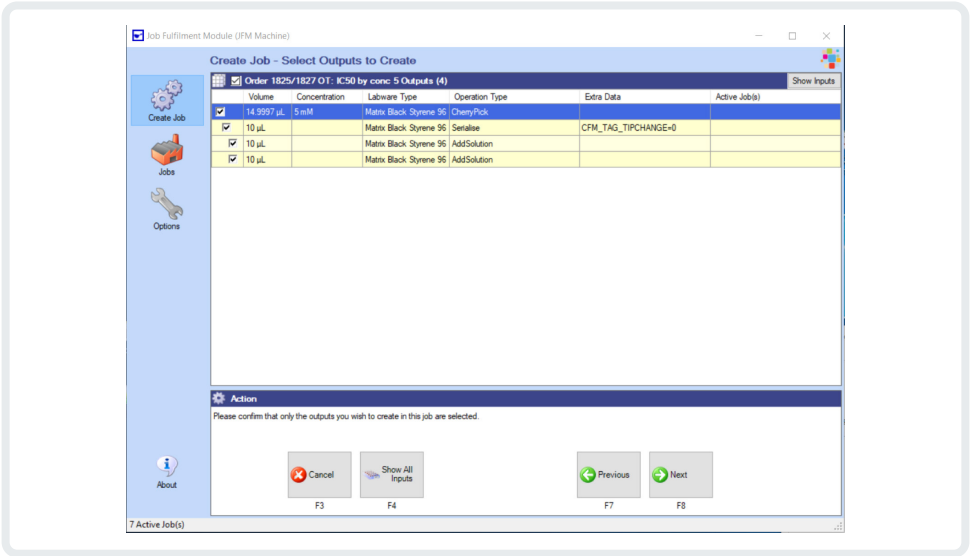


The operator:

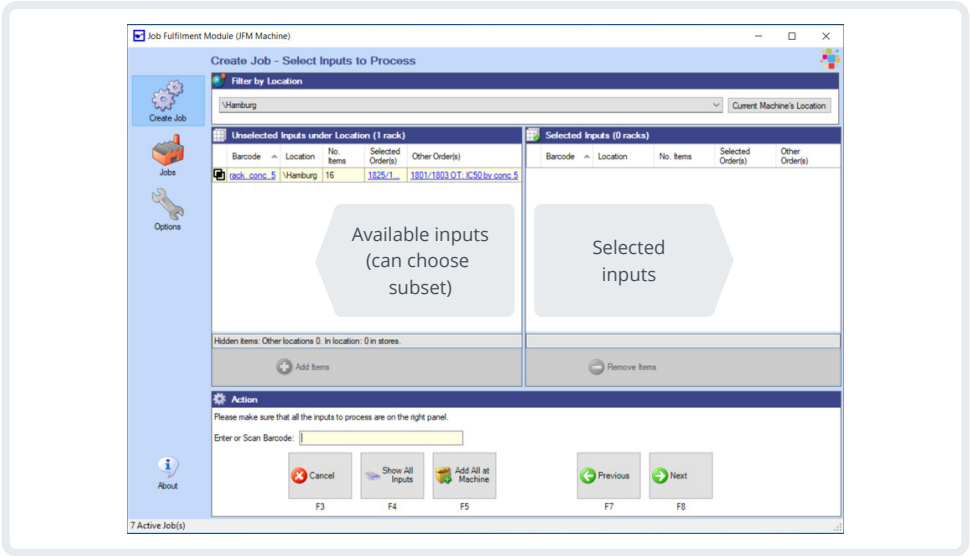
1. selects which Order to process and possibly which Workflow Fragment to use.



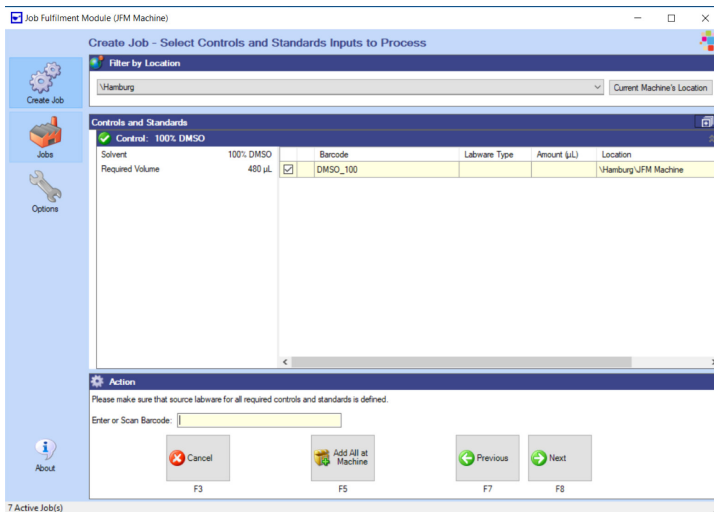
2. selects which output labware to use (this may be an order deliverable or an intermediate plate/rack)



3. selects which input labware items to include (this normally includes all inputs, but there is an option to select labware items)



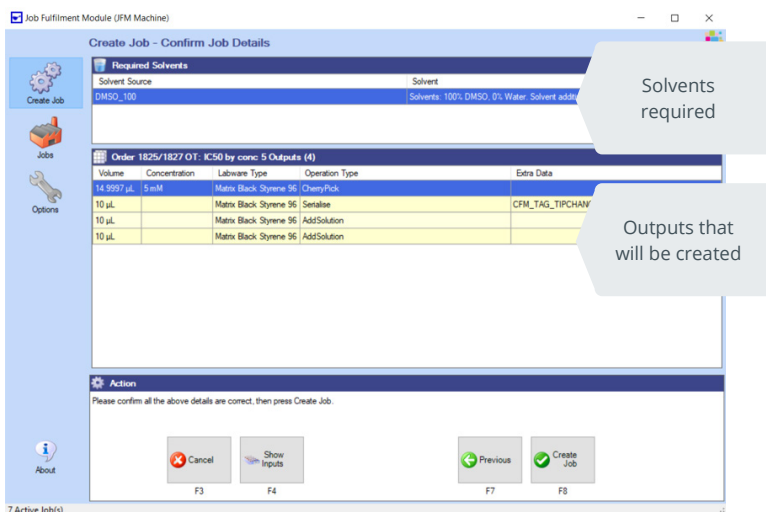
4. selects where to place assay standards and controls



5. selects the tips to use

Note: the JFM application can analyse the required transfers and determine which tip layouts can be used with a multi-channel block head pipettor.

6. Finally, the operator confirms the job details and creates the job.



Once finished, these selections are converted into an XML description which is submitted to the custom driver. From here, the protocol can be passed to an experience operator to create, or the protocol can be created automatically.

When this protocol is run, data from the liquid handler is automatically passed back to Mosaic to keep the inventory and audit trail up to date.

SUMMARY

Titian and Hamilton have collaborated to provide the life science user with a high quality, effective solution to easily incorporate the advanced Vantage liquid handling workstation into your workflows and enable an end to end flow of sample management data.

For your scientists and instrument operators, using Mosaic's JFM application to integrate the Microlab Vantage means:

- Inventory data is automatically synchronized, avoiding time consuming manual file transfers
- Inventory is extremely accurate because the precise volume transfer and plate survey data provided by liquid handlers is automatically captured
- Every sample preparation step is tracked in a comprehensive audit trail, including the capture of intermediate plates, standards and controls
- Liquid handling error information is logged in the audit trail
- There is no need for users to learn different interfaces for each liquid handler. They simply specify the transfers they want in Mosaic and rest is handled by Mosaic
- Human error is minimised

Titian Mosaic sample management software combined with Hamilton's automated liquid handling platforms provide complementary functionalities for enabling your research capabilities. Both companies produce superior products which continue to lead the industry in their respective areas. Together, the combination is truly synergistic with each focusing on its own strengths to work interdependently with the other.



ABOUT TITIAN SOFTWARE

Titian Software is the industry leader in providing sample management software for the life sciences.

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 HAMILTON

Hamilton is a leader in innovative automated liquid handling and automated sample storage solutions. Hamilton's application specific solutions, small devices and consumables are used in industries ranging from forensic chemistry to next generation sequencing. Our products are characterized by proven quality and outstanding performance, backed by over 50 years of engineering and manufacturing expertise in innovative design. Hamilton is also a committed partner to hundreds of instrument and device manufacturers around the world.



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Toby Winchester spent 17 years at Pfizer, first as a senior scientist and then as sample logistics manager supporting diverse SAR project requirements. He joined Titian Software in 2011 and is now product manager for automation integrations and Mosaic SampleBank.

ROGER MARTIN

Roger Martin worked for GlaxoSmithKline for 33 years. Originally a medicinal chemist working as a research chemist, he later transitioned to cheminformatics and then R&D IT, specialising in compound management software. He joined Titian Software in 2012 where he is a technical application consultant.

CHLOE CARTER

Chloe Carter has been writing for technology and life science companies for 25 years.

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