



Efficient Tube Re-arranging Using Titian's Mosaic Automated Tube Sorter Application

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v2.0

INTEGRATING AUTOMATED TUBE SORTERS WITH YOUR SAMPLE MANAGEMENT

Automated tube sorters are lab workhorses that reduce errors and delays in sorting lab samples over manual processes¹. Many labs make use of automated tube sorters to improve turnaround times, especially if they do not have automated stores to pick and place samples.

To use tube sorters most efficiently, they should be linked to your sample management systems and inventory so that:

- All sample movements can be seamlessly tracked and recorded in your inventory and audit trail
- Scientists can easily search for and request the samples they need
- Operators are guided through processes, improving efficiency and minimizing errors
- Lab workflows are easier to manage and report on

THE BENEFITS OF USING MOSAIC'S AUTOMATED TUBE SORTER (ATS) APPLICATION

Titian Software offers an Automated Tube Sorter (ATS) application as part of its Mosaic sample management software product suite. It provides a seamless automated link between tube handlers, such as the BioMicroLab XL series from SPT Labtech, and Mosaic's sample tracking, order processing and audit trail, managed from one interface.

Mosaic' ATS application makes it easy to:

- Order samples remotely and automatically pass this information to the tube sorter to retrieve and segregate tubes
- Know where your samples are, because the ATS application constantly monitors each tube sorter for activity, so samples cannot be moved across racks without Mosaic knowing about it
- Match your tube sorter's actions automatically with your audit trail of events outside the tube sorter, helping to ensure a complete history of each sample
- Free up space in manual stores by compressing partly filled racks of samples



- Search for samples by specific criteria, so that scientists can request a small molecule batch or cell line passage number, or sample management can remove tubes flagged for disposal
- Select sample tubes based on either a remote request or a local inventory search
- Recover quickly from issues like misread barcodes or missing labware
- Investigate the cause of any errors through the detailed log of Mosaic's audit trail
- Free up operator time through efficient automated processing

The ATS application integration with tube sorters is especially useful when sample tubes are not held within an automated sample store that can perform rearrangements for you.

By bringing tube sorting into Mosaic, scientists and sample management operators can continue to use one familiar interface to search for, request, track and manage samples, while inventory and audit trail are automatically updated in real time.

COMPATIBLE AUTOMATED TUBE SORTERS

The Mosaic ATS application integrates with the BioMicroLab XL range from SPT Labtech, including the XL9, XL20, XL100 and XL200.



SUPPORTED OPERATIONS

Mosaic's ATS application provides a number of different sorting methods to help users. These include:

1. Order Processing: tubes requested by Mosaic users are sorted onto separate racks
2. Rack Compression: tubes are sorted into as few racks as possible
3. Empty Tube Removal: this is usually for disposal
4. Tube Collection Segregation: assign each tube to a logical group

Operation is simple as each of these operations follows the same basic sequence of:

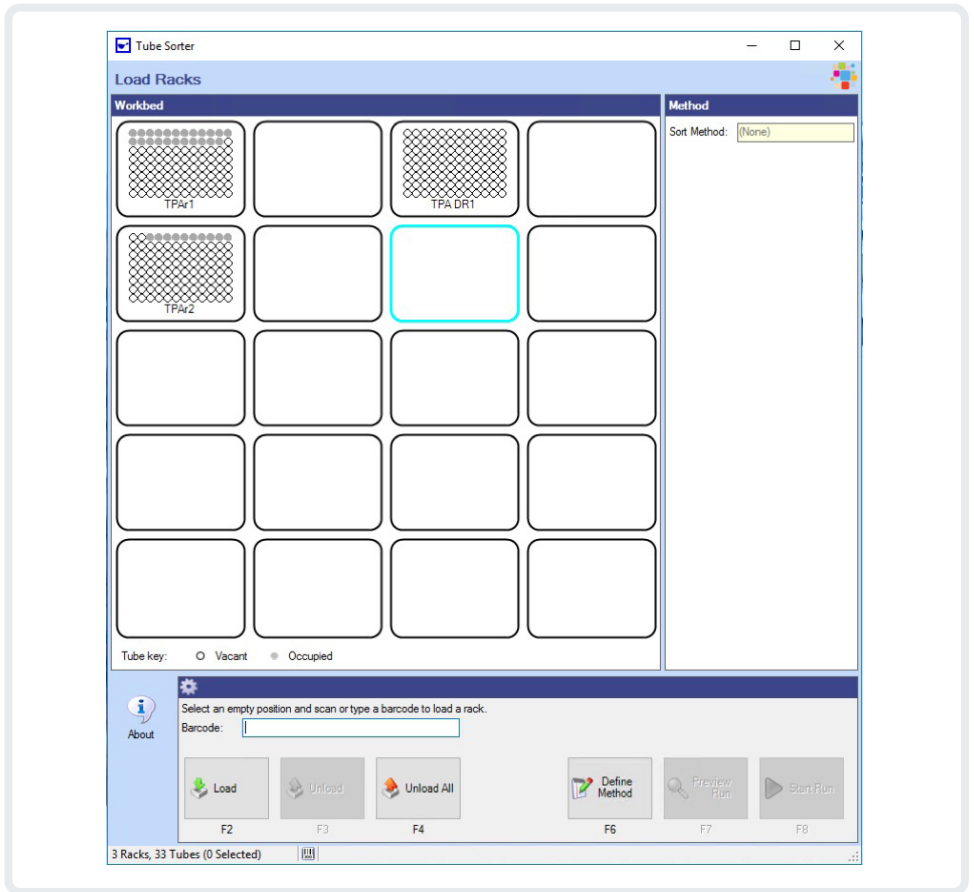
1. Load racks
2. Choose sorting method
3. Specify run settings (rack layout, error handling, etc)
4. Perform run
5. Unload racks

Users are guided through each sequence step by the ATS application, which also automatically produces the worklist of operations for the tube sorter. All actions are automatically logged in Mosaic's audit trail without the need to manually move data files, which avoids introducing errors.

USE CASE 1: ORDER PROCESSING

A scientist's request for sample tubes is captured in a Mosaic order. These samples may be stored in different racks at various locations, together with other tubes that are not required. To carry out the scientist's request, Mosaic checks all the tubes are available and guides the sample management operator straight to their various locations to retrieve the racks. The operator is shown where to load the racks on the tube sorter ready for processing and scans their rack barcodes. Mosaic's ATS application displays the loaded rack contents on screen as confirmation.

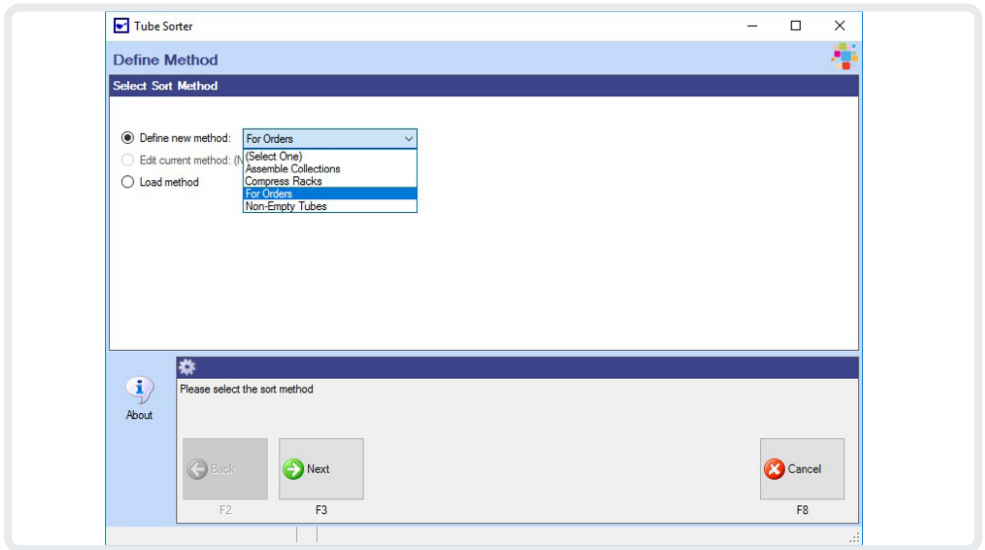




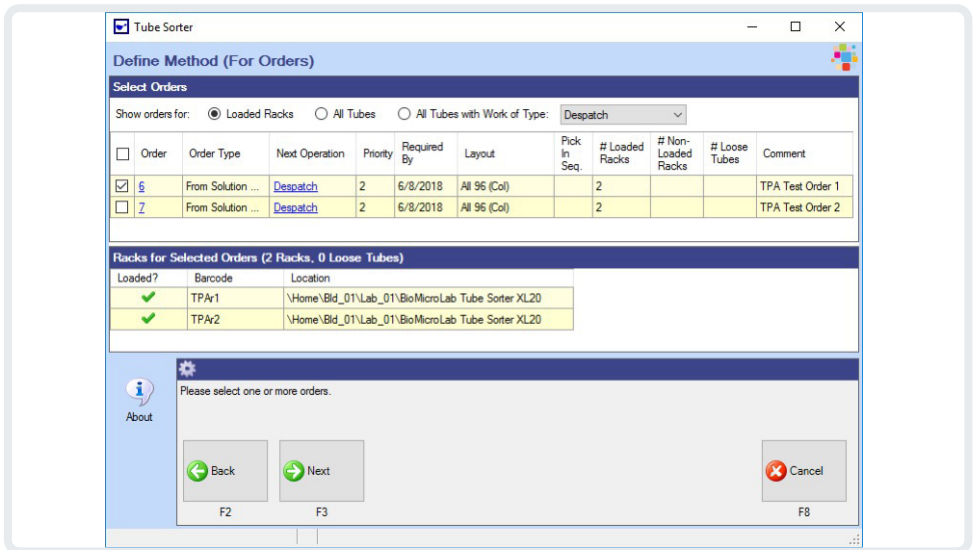
Mosaic's ATS application automatically writes the worklist of instructions the tube sorter needs to cherry pick the required sample tubes and consolidate these into separate racks, often to match a specific layout defined by the scientist.

For the operator, the next step is to choose the sorting method by clicking on the "Define Method" button. Selecting 'For Orders' instructs the tube sorter that it needs to cherry pick selections from multiple racks into the final layout.



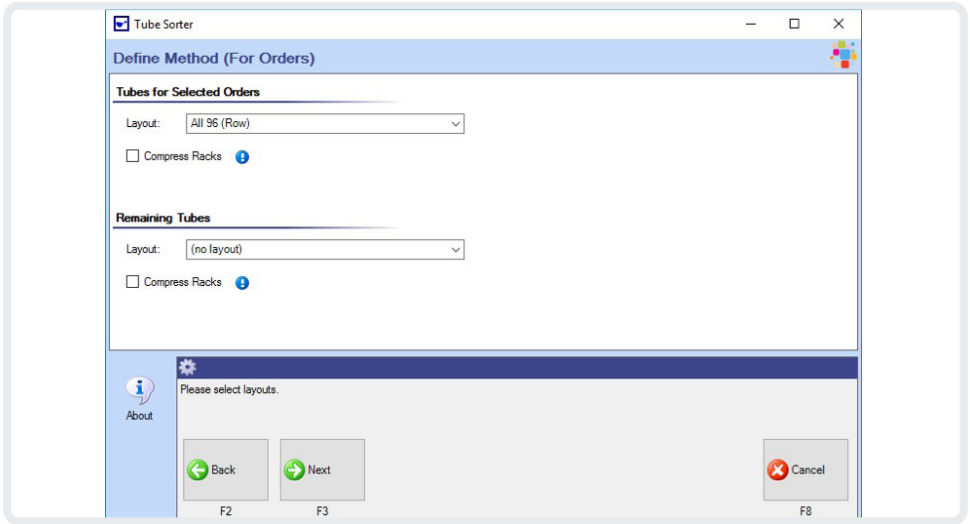


The operator can see all tube racks that contain tubes for the selected order(s) along with their location(s).

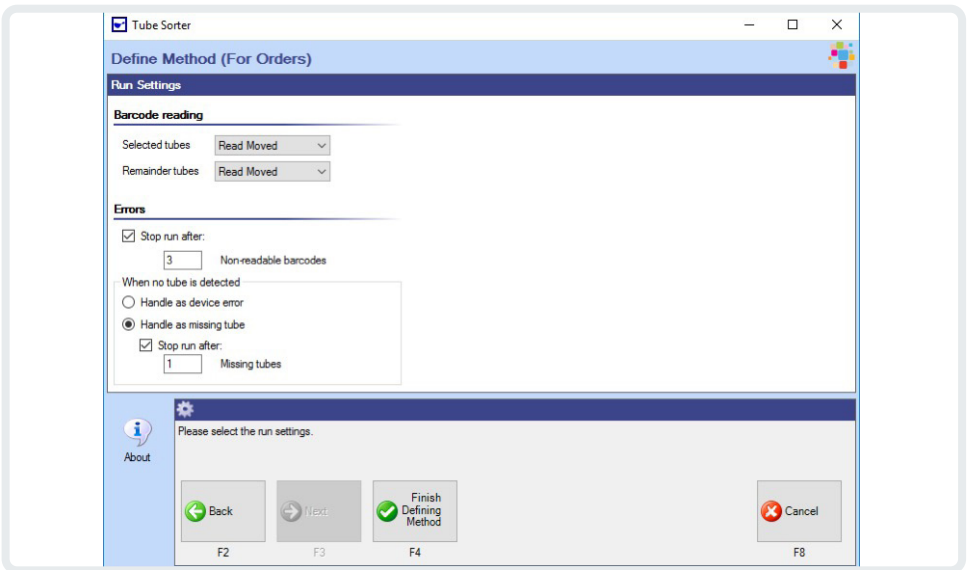


The operator can select the layout of the destination racks tubes will be picked into. The default is the layout specified in the Mosaic order, but this can be overridden if necessary. The operator can also choose to compress tubes that remain in the source racks.



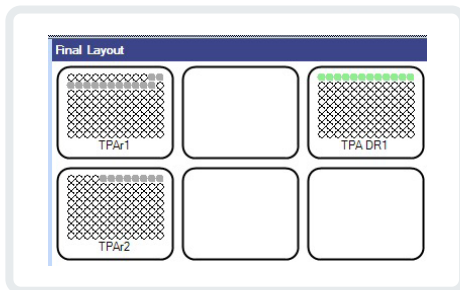


Finally, the operator defines 2-D tube reading and error handling preferences. This allows the operator to decide whether a run continues when an error is encountered, and how many errors can be tolerated before a run is stopped. The most common problems usually stem from human error and involve missing labware in a location.

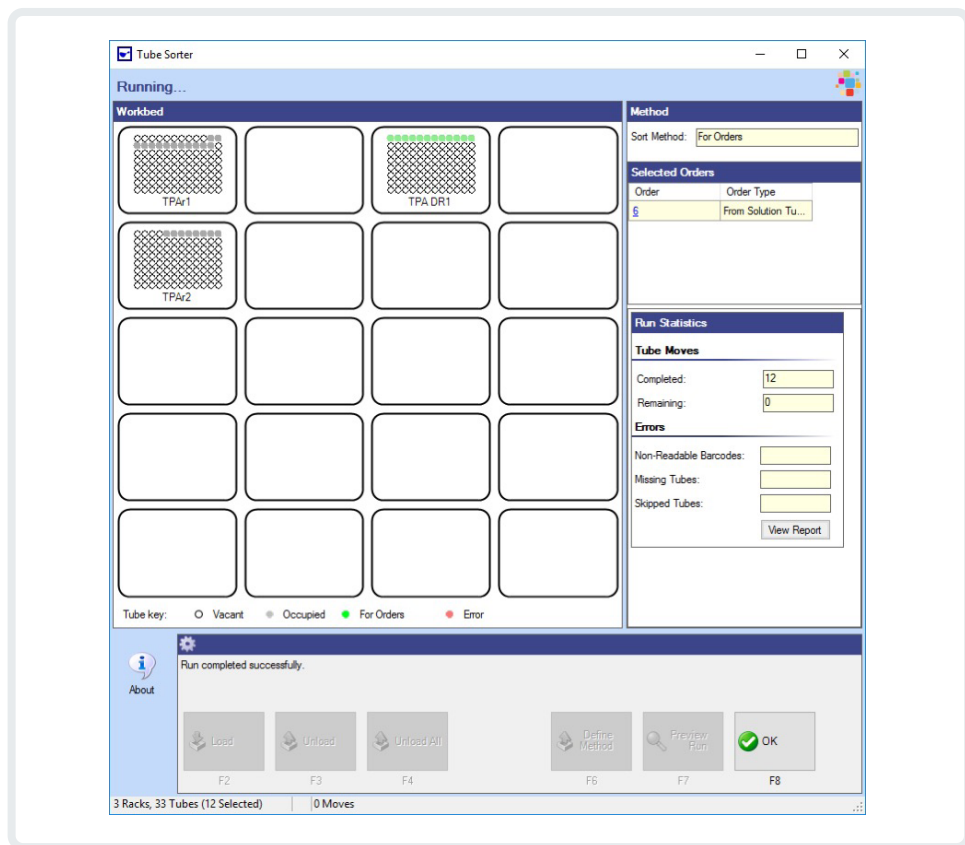


Once the parameters are defined, the operator may preview the run to check what the final sorting result will look like.

If the operator is not happy with the preview, they can redefine the run method until they are happy with the projected result.



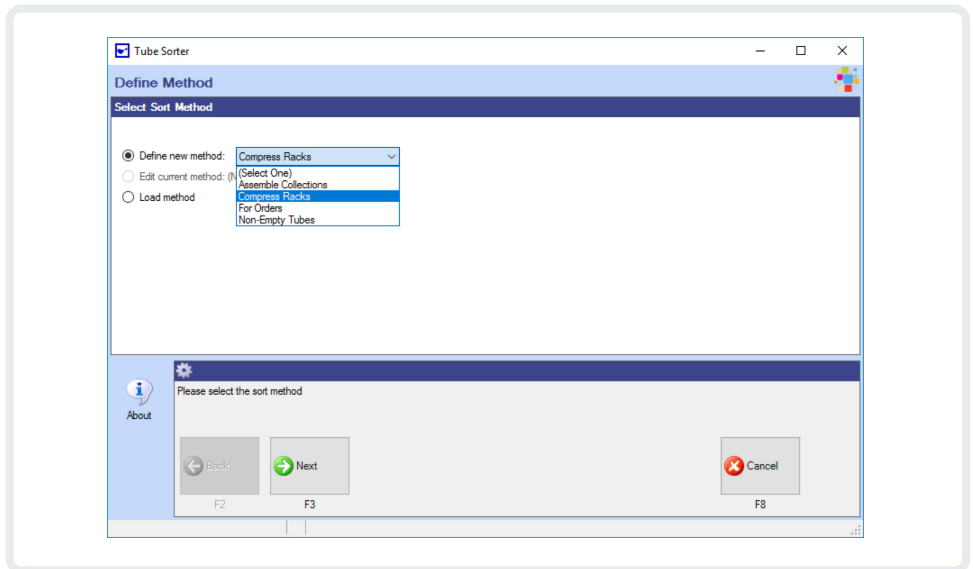
During the run, the ATS application automatically updates tube locations as each tube is moved. When the run is completed the successful transfers are shown. If there were any errors encountered (e.g. incorrect tube, tube not found), these are also displayed.



USE CASE 2: RACK COMPRESSION

The process for compressing and consolidating tube racks using the ATS application is similar.

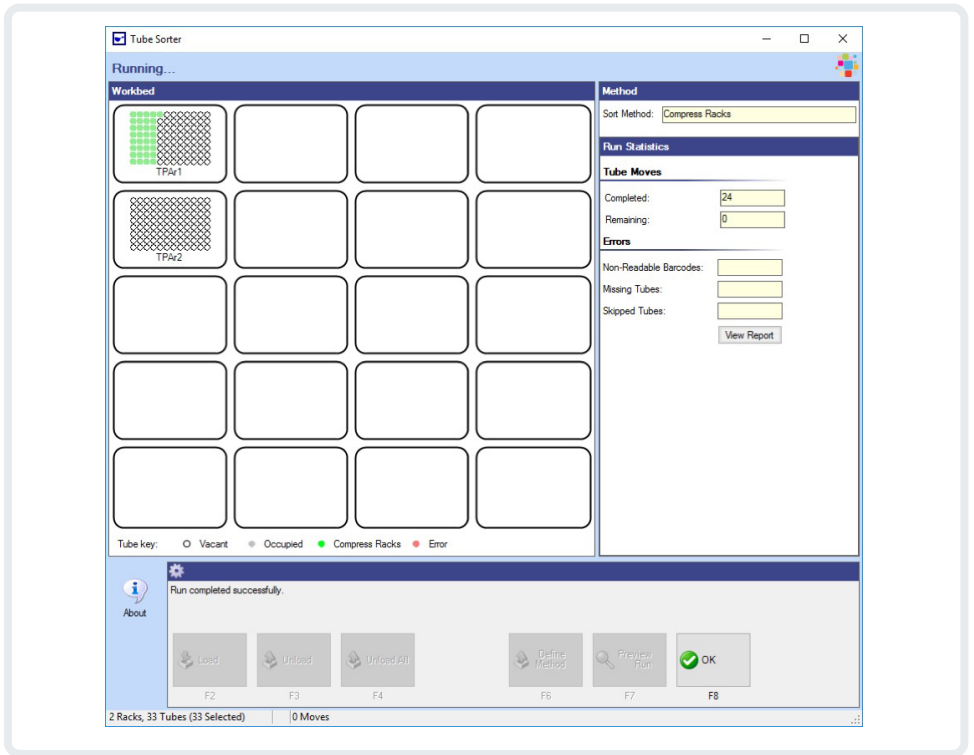
Once racks of tubes are picked, loaded onto the tube sorter and the rack barcodes scanned, the operator selects the 'Compress Racks' sorting method.



Again, the operator can select a final rack layout and 2-D tube reading and error handling preferences before starting the run.

During the run, the application will update tube locations as each tube is moved. After the run is completed the successful tube transfers are indicated. If there were any errors encountered, these are also displayed as well as logged in the audit trail.

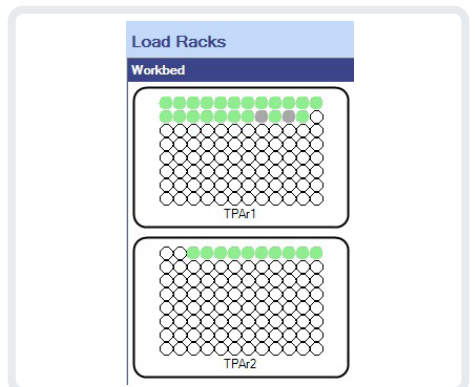




USE CASE 3: EMPTY TUBE REMOVAL

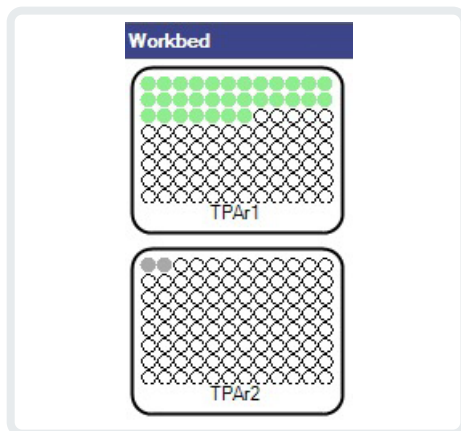
The ATS application can be used to remove empty tubes to maintain maximum capacity in the storage rack.

Racks of tubes are loaded onto the tube sorter picking bed and the rack barcodes scanned. Empty tubes are displayed as grey circles.



The operator selects the 'Non-Empty Tubes' sorting method, and then defines the layouts of the final racks and 2-D tube reading and error handling preferences before starting the run.

The completed Picked layouts are shown here:

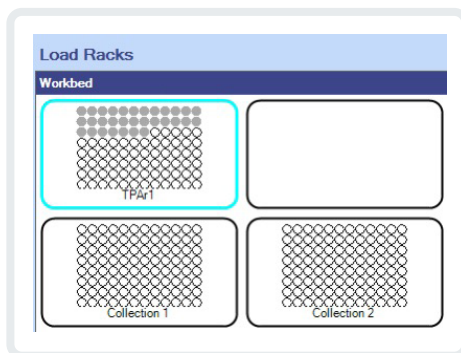


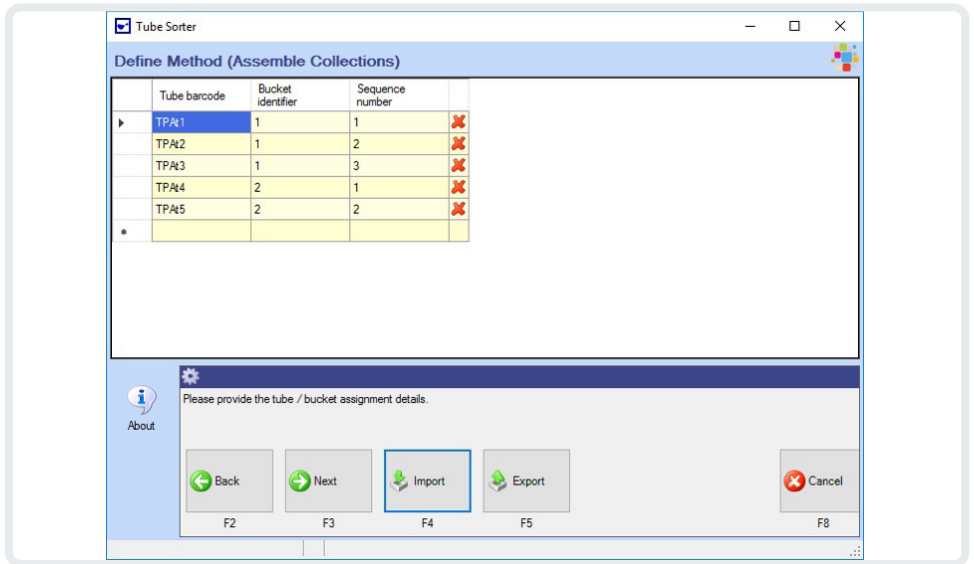
USE CASE 4: TUBE COLLECTION SEGREGATION

A similar process is used to segregate defined collections of tubes, for instance to store them at different temperatures or to separate out controlled substances, when appropriate.

Mosaic's ATS application guides the operator through locating racks of tubes, loaded them onto the tube sorter and scanning the rack barcodes. The operator will also be guided to add empty racks to contain the segregated tube collections.

For this process, the operator selects the 'Assemble Collections' sorting method, which allows them to enter details of the required segregation grouping details. These details can be imported from a text file.





During the run, the ATS application will update tube locations as each tube is moved. After the run is completed the successful tube transfers are indicated. If there were any errors encountered, these are also displayed as well as logged in the audit trail.

SUMMARY

Titian Software's Mosaic ATS application, in combination with automated tube sorters, provides an effortless and efficient method for managing and sorting samples stored in 2D barcoded tubes and racks. This is especially useful where no automated store is available for arraying and tracking your valuable sample collections.

This seamless integration means:

- Your Mosaic inventory is automatically updated in real time and a full audit trail is logged for every sample movement
- One interface connects scientists and sample management operators, so one or many tube sorters can be managed efficiently



- Scientists can search for and request samples using criteria they are familiar with, rather than tube IDs
- Mosaic's workflow management and operator guidance minimizes any errors and streamlines error handling

An additional benefit is that Titian works in partnership with tube sorter vendors to continually evolve the ATS application, so it is responsive to customer requirements and the development of new tube sorter types and software.

REFERENCES

1. Ucar *et al*, Greater Efficiency Observed 12 Months Post-Implementation of an Automatic Tube Sorting and Registration System in a Core Laboratory, *J Med Biochem* v35(1), Jan 2016 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5346795/>)



ABOUT TITIAN SOFTWARE

Titian is the industry leader in providing sample management software for the Life Sciences. Using our Mosaic software, our customers see significant benefits in terms of throughput, response times, error rate reduction, sample conservation and cost savings due to markedly reducing the labour associated with managing sample collections. We also use our experience of integrating laboratory instrumentation and robotics into our systems to ensure that our clients 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 hardware vendors continues to ensure that new applications are made available on a timely basis to fulfill 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.

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After 16 years as a medicinal chemist at Roche, Paul Kay moved to Organon (later Merck) where he specialized in compound management and automation systems for 10 years. He joined Titian in 2011 as a business application consultant.

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