

The logo for Titian, featuring the word "titian" in a lowercase, sans-serif font, enclosed within a white, teardrop-shaped graphic element that has a small tail extending to the right.

titian

{ APPLICATION NOTE }

Enhance your Tube Handling with Titian's Mosaic Tube Position Verifier (TPV) Module

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Mosaic Sample Management is Titian Software's comprehensive, customisable, modular software product to control and monitor all aspects of sample storage, preparation and delivery. From small biotech to global pharma, Mosaic helps to provide a seamless, error-free sample supply chain and audit trail.

Mosaic Sample Management is a tailored solution for all sample management requirements, configured through expert consulting services.

Mosaic SampleBank and Mosaic FreezerManagement are Mosaic packages, optimised and pre-configured for rapid deployment:

- FreezerManagement keeps track of samples in freezers and provides a comprehensive audit trail as samples are accessed and aliquoted.
- SampleBank provides full inventory tracking capabilities coupled with sample ordering and workflow management in a simple package. It offers seamless start-up and ongoing performance for busy sample managers.

Mosaic's modular approach means that it is simple to upgrade or extend the software's functionality whenever it is needed.

Introduction

When carrying out your sample management workflows, it's not just the samples that get transferred from one piece of labware to another – the sample containers also move from place to place and their positions may need to be adjusted or consolidated.

Titian Software's Mosaic sample management software offers a Tube Position Verifier (TPV) module as part of Mosaic's overall product suite. The TPV module integrates with a variety of tube rack scanners to enable the comparison of the physical positions of tubes within a rack to the data stored within Mosaic's inventory database. This comparison allows scientists to effortlessly and quickly confirm tube positions after a rack has been dropped or when partially filled racks need to be consolidated together. This document describes a few practical use cases that make TPV an essential part of your Mosaic configuration.

Compatible Rack Scanners

Mosaic's TPV module is compatible with a wide array of market-leading tube rack scanners from manufacturers such as:

- BioMicroLab
- Biosero
- FluidX
- Micronic
- Microscan
- Thermo
- TTP Labtech
- Ziath



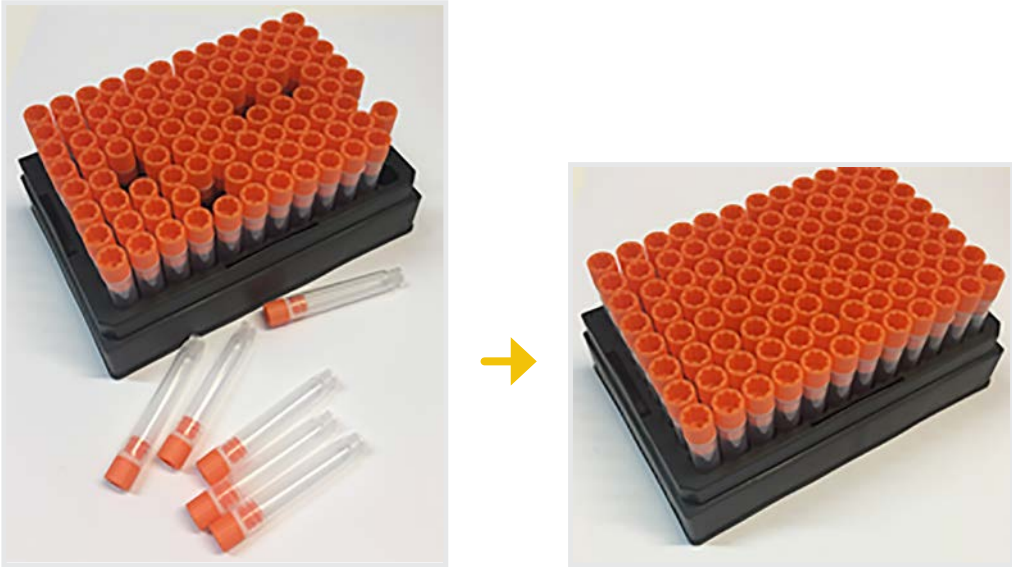
Supported Operations

Mosaic's TPV module supports a range of essential tasks that form part of the overall sample management process:

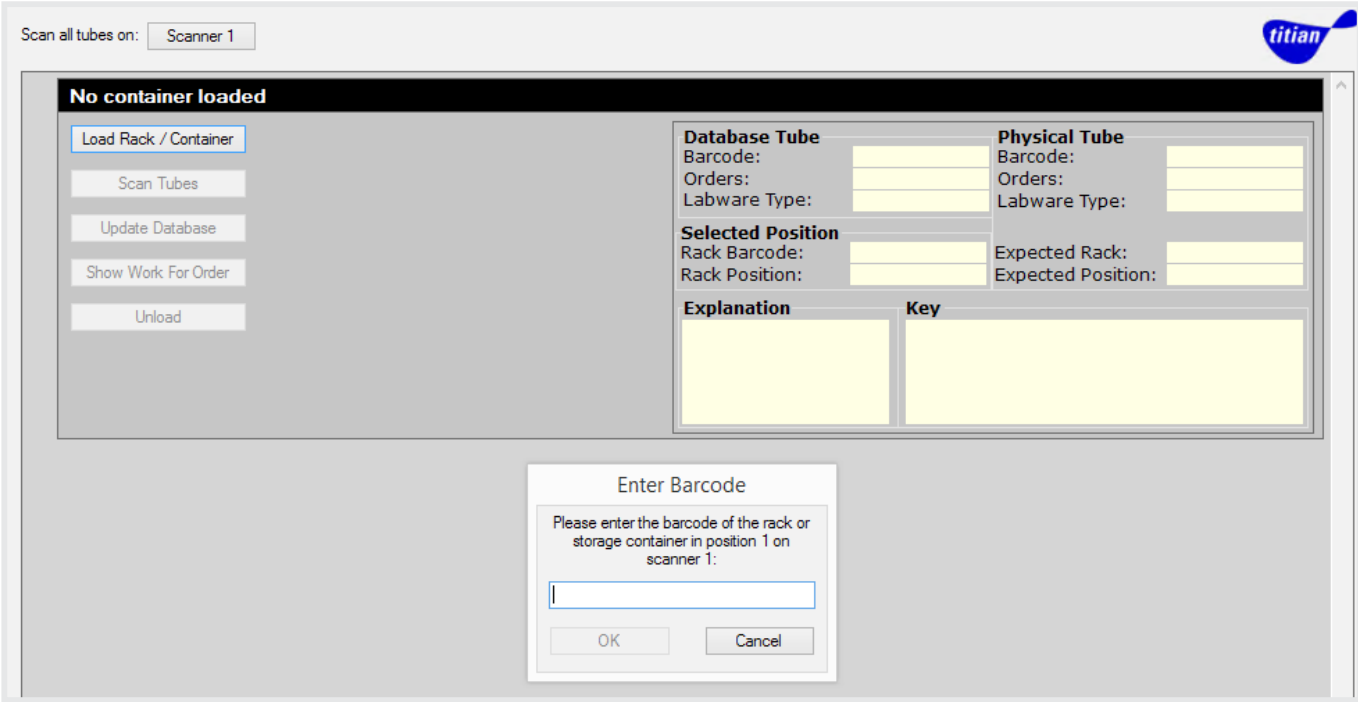
- Registering new tubes/racks
- Tube consolidation within racks
- Identifying tubes for a Mosaic Order
- Verifying rack contents
- Picking/Placing items from and to manual stores
- Scanners with multiple bed positions

Use Case 1: Verifying Rack Contents

For each rack of tubes registered in Mosaic, Mosaic knows the details of the rack and tubes as well as the positional information of all the tubes within the rack. However, if the rack were to get accidentally knocked off the bench or it were to fall over within the freezer, it is a near impossible task to put all tubes that had fallen out back into their correct positions. Mosaic's TPV module makes it easy to verify rack contents.

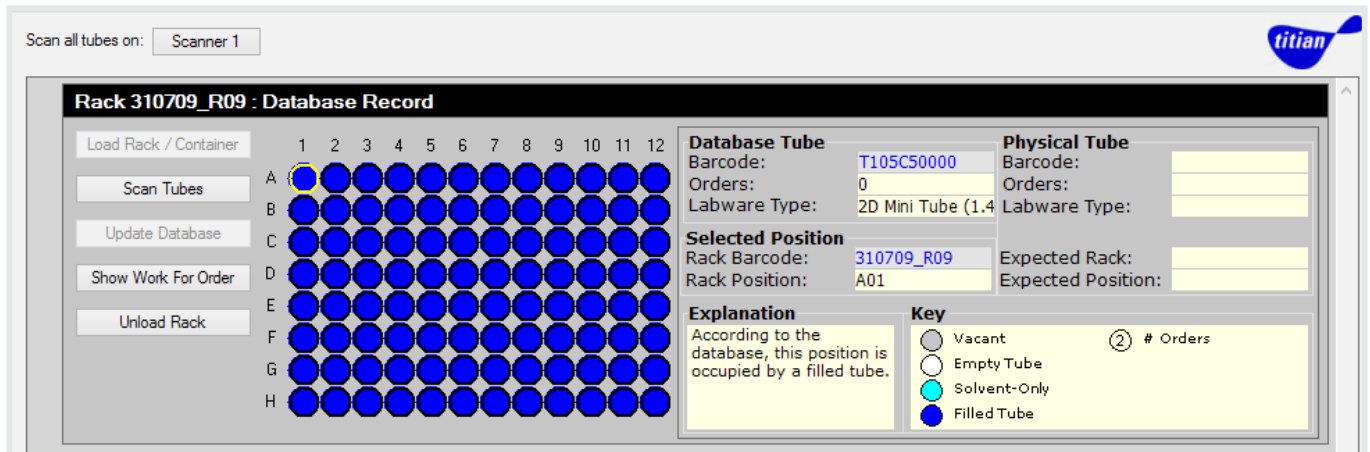


- 1) Pick up the loose tubes and place them back into the rack in **any** position.
- 2) Open the TPV software and click the "Load Rack" button.
- 3) Scan the barcode of the rack and click "OK". *



*Note: If your rack scanner can scan the 1D barcode on the side of the rack, or you are using a rack with the 1D code represented as a 2D code on the bottom of the rack, you don't need to scan the rack barcode.

- 4) The module displays what Mosaic currently knows about the rack. We know that this is incorrect because some tubes fell out and have been placed randomly back into the rack.



Scan all tubes on:

Rack 310709_R09 : Database Record

Load Rack / Container:

Buttons: Load Rack / Container, Scan Tubes, Update Database, Show Work For Order, Unload Rack

	1	2	3	4	5	6	7	8	9	10	11	12
A	●	●	●	●	●	●	●	●	●	●	●	●
B	●	●	●	●	●	●	●	●	●	●	●	●
C	●	●	●	●	●	●	●	●	●	●	●	●
D	●	●	●	●	●	●	●	●	●	●	●	●
E	●	●	●	●	●	●	●	●	●	●	●	●
F	●	●	●	●	●	●	●	●	●	●	●	●
G	●	●	●	●	●	●	●	●	●	●	●	●
H	●	●	●	●	●	●	●	●	●	●	●	●

Database Tube
Barcode: T105C50000
Orders: 0
Labware Type: 2D Mini Tube (1.4)

Physical Tube
Barcode:
Orders:
Labware Type:

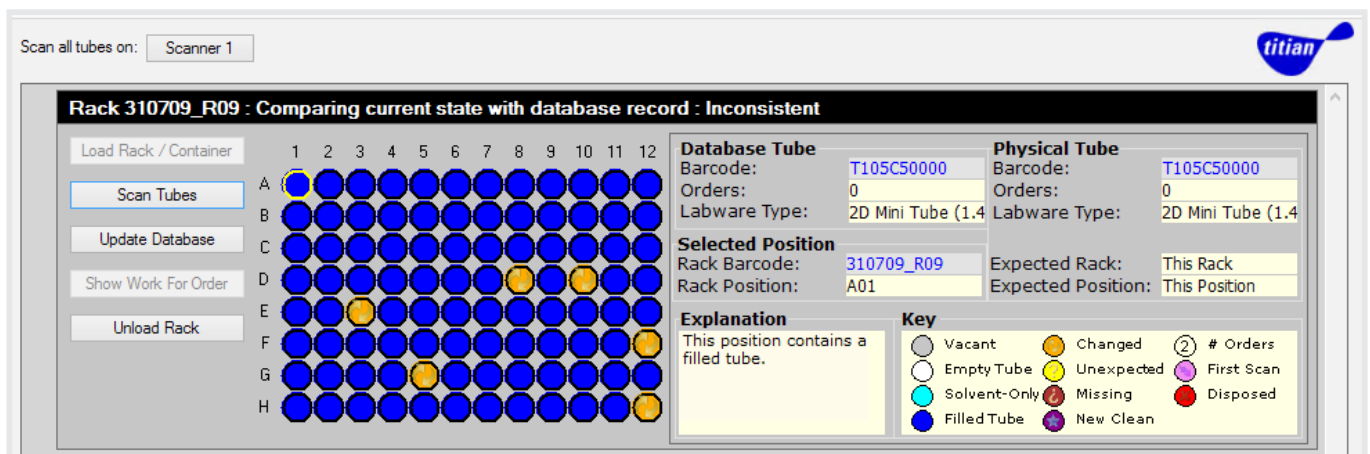
Selected Position
Rack Barcode: 310709_R09
Rack Position: A01

Expected Rack:
Expected Position:

Explanation
According to the database, this position is occupied by a filled tube.

Key
● Vacant (2) # Orders
○ Empty Tube
● Solvent-Only
● Filled Tube

- 5) Now place the rack on the scanner and click on the “Scan Tubes” button. The scanner reads all the tubes within the rack and displays the results on the screen. Here the module informs the user that the current positions of the tubes in the rack are inconsistent compared to what is recorded in the database as indicated by an orange circle. These are the tubes that fell out and were put back into the rack.



Scan all tubes on:

Rack 310709_R09 : Comparing current state with database record : Inconsistent

Load Rack / Container:

Buttons: Load Rack / Container, Scan Tubes, Update Database, Show Work For Order, Unload Rack

	1	2	3	4	5	6	7	8	9	10	11	12
A	●	●	●	●	●	●	●	●	●	●	●	●
B	●	●	●	●	●	●	●	●	●	●	●	●
C	●	●	●	●	●	●	●	●	●	●	●	●
D	●	●	●	●	●	●	●	●	●	●	●	●
E	●	●	●	●	●	●	●	●	●	●	●	●
F	●	●	●	●	●	●	●	●	●	●	●	●
G	●	●	●	●	●	●	●	●	●	●	●	●
H	●	●	●	●	●	●	●	●	●	●	●	●

Database Tube
Barcode: T105C50000
Orders: 0
Labware Type: 2D Mini Tube (1.4)

Physical Tube
Barcode: T105C50000
Orders: 0
Labware Type: 2D Mini Tube (1.4)

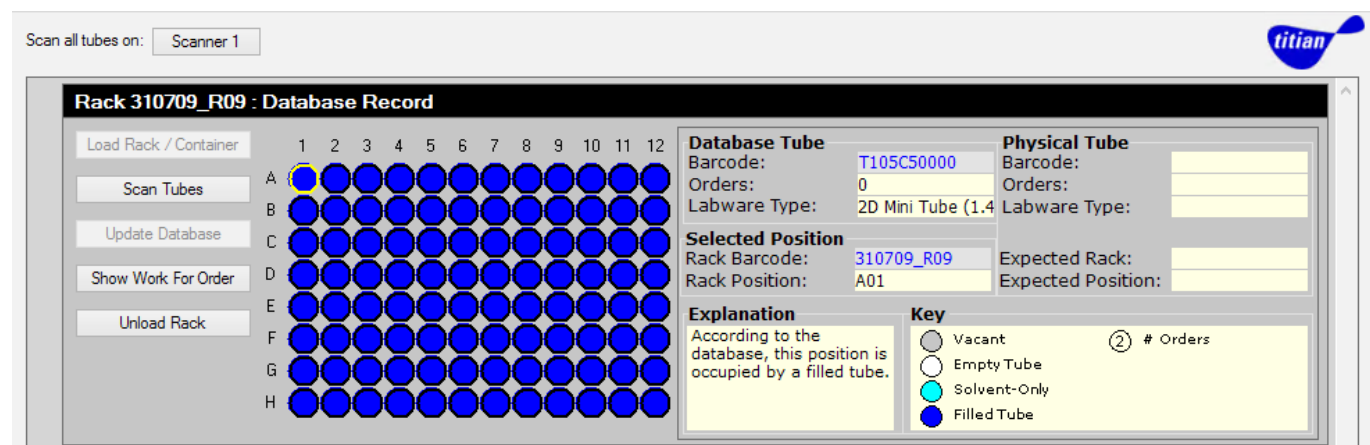
Selected Position
Rack Barcode: 310709_R09
Rack Position: A01

Expected Rack: This Rack
Expected Position: This Position

Explanation
This position contains a filled tube.

Key
● Vacant (2) # Orders
○ Empty Tube
● Solvent-Only
● Filled Tube
● Changed
● Unexpected
● Missing
● New Clean
● First Scan
● Disposed

- 6) The user then simply clicks the “Update Database” button to update Mosaic’s database with the new positions of these six tubes. The rack map refreshes to show that the database is now consistent with the data from the scan.



Scan all tubes on:

Rack 310709_R09 : Database Record

Load Rack / Container:

Buttons: Load Rack / Container, Scan Tubes, Update Database, Show Work For Order, Unload Rack

	1	2	3	4	5	6	7	8	9	10	11	12
A	●	●	●	●	●	●	●	●	●	●	●	●
B	●	●	●	●	●	●	●	●	●	●	●	●
C	●	●	●	●	●	●	●	●	●	●	●	●
D	●	●	●	●	●	●	●	●	●	●	●	●
E	●	●	●	●	●	●	●	●	●	●	●	●
F	●	●	●	●	●	●	●	●	●	●	●	●
G	●	●	●	●	●	●	●	●	●	●	●	●
H	●	●	●	●	●	●	●	●	●	●	●	●

Database Tube
Barcode: T105C50000
Orders: 0
Labware Type: 2D Mini Tube (1.4)

Physical Tube
Barcode:
Orders:
Labware Type:

Selected Position
Rack Barcode: 310709_R09
Rack Position: A01

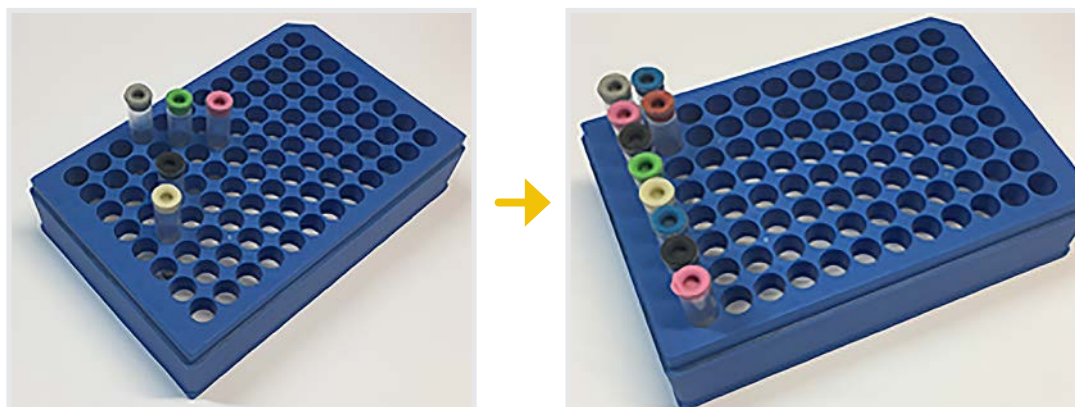
Expected Rack:
Expected Position:

Explanation
According to the database, this position is occupied by a filled tube.

Key
● Vacant (2) # Orders
○ Empty Tube
● Solvent-Only
● Filled Tube


Use Case 2: Rack/Tube Consolidation

Another common lab scenario is to re-arrange and consolidate tubes from two partially filled racks into a single rack. Again Mosaic's TPV module makes it easy to update the inventory.



- 1) Open the TPV software and click the "Load Rack" button, then scan the barcode of the rack you want to consolidate all the tubes into and click "OK". *See Note on page 2.

Scan all tubes on:



No container loaded

<p>Load Rack / Container</p> <p>Scan Tubes</p> <p>Update Database</p> <p>Show Work For Order</p> <p>Unload</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Database Tube</td> <td style="width: 50%;">Physical Tube</td> </tr> <tr> <td>Barcode: <input type="text"/></td> <td>Barcode: <input type="text"/></td> </tr> <tr> <td>Orders: <input type="text"/></td> <td>Orders: <input type="text"/></td> </tr> <tr> <td>Labware Type: <input type="text"/></td> <td>Labware Type: <input type="text"/></td> </tr> <tr> <td colspan="2">Selected Position</td> </tr> <tr> <td>Rack Barcode: <input type="text"/></td> <td>Expected Rack: <input type="text"/></td> </tr> <tr> <td>Rack Position: <input type="text"/></td> <td>Expected Position: <input type="text"/></td> </tr> <tr> <td>Explanation</td> <td>Key</td> </tr> <tr> <td><input type="text"/></td> <td><input type="text"/></td> </tr> </table>	Database Tube	Physical Tube	Barcode: <input type="text"/>	Barcode: <input type="text"/>	Orders: <input type="text"/>	Orders: <input type="text"/>	Labware Type: <input type="text"/>	Labware Type: <input type="text"/>	Selected Position		Rack Barcode: <input type="text"/>	Expected Rack: <input type="text"/>	Rack Position: <input type="text"/>	Expected Position: <input type="text"/>	Explanation	Key	<input type="text"/>	<input type="text"/>
Database Tube	Physical Tube																		
Barcode: <input type="text"/>	Barcode: <input type="text"/>																		
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Selected Position																			
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Rack Position: <input type="text"/>	Expected Position: <input type="text"/>																		
Explanation	Key																		
<input type="text"/>	<input type="text"/>																		

Enter Barcode

Please enter the barcode of the rack or storage container in position 1 on scanner 1:

OK Cancel

- 2) As before the module displays what it currently knows about this rack (again we know that this is incorrect because we have rearranged these five tubes to sit in column 1. We have also added some tubes from a different rack).

- 3) Click on the “Scan Tubes” button. The scanner reads all the tubes within the rack and displays the results on the screen. Again the module informs the user that the current positions of the tubes in the rack are inconsistent compared to what is recorded in the database as indicated by the coloured icons.

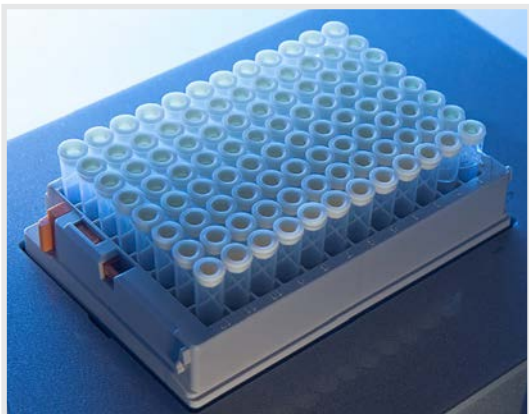
- The red icons are where Mosaic expects there to be tubes (however we moved these into column 1)
- The yellow icons are tubes that are not expected to be in those positions, the first five (A1-E1) are the tubes we moved and the remaining ones (F1-B2) are the tubes we added from a different rack.

- 4) The user then clicks the “Update Database” button to update Mosaic’s database with the new positions of these tubes and the rack map refreshes to show that the database is now consistent with the data from the scan.

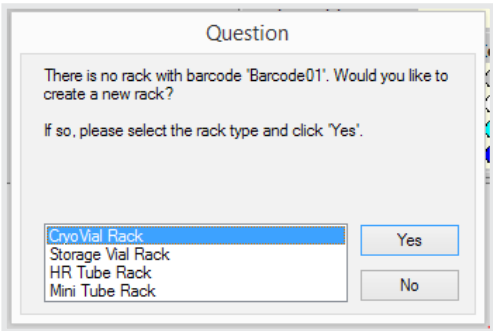
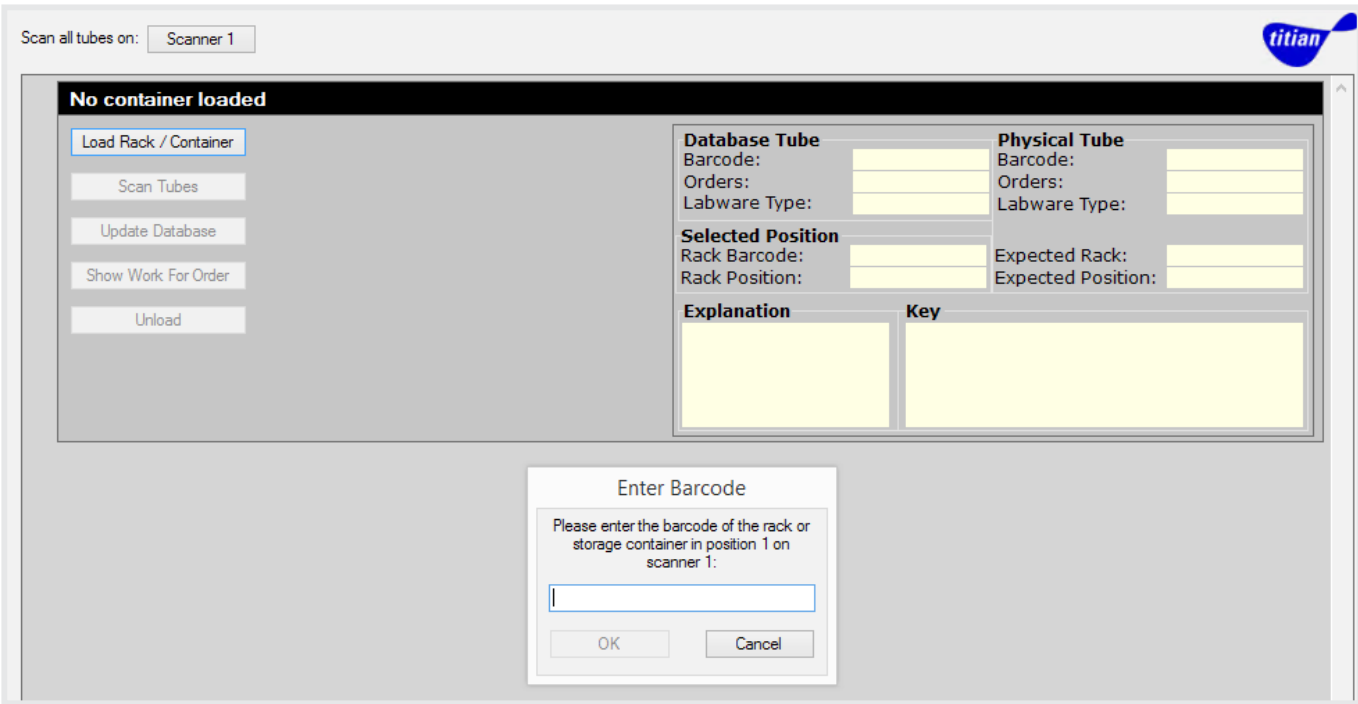


Use Case 3: Registering New Tubes/Racks

Often a laboratory wants to store racks of empty tubes that are already registered in its inventory for use in future sample preparation workflows. This can be easily achieved using Mosaic’s TPV module as described below.

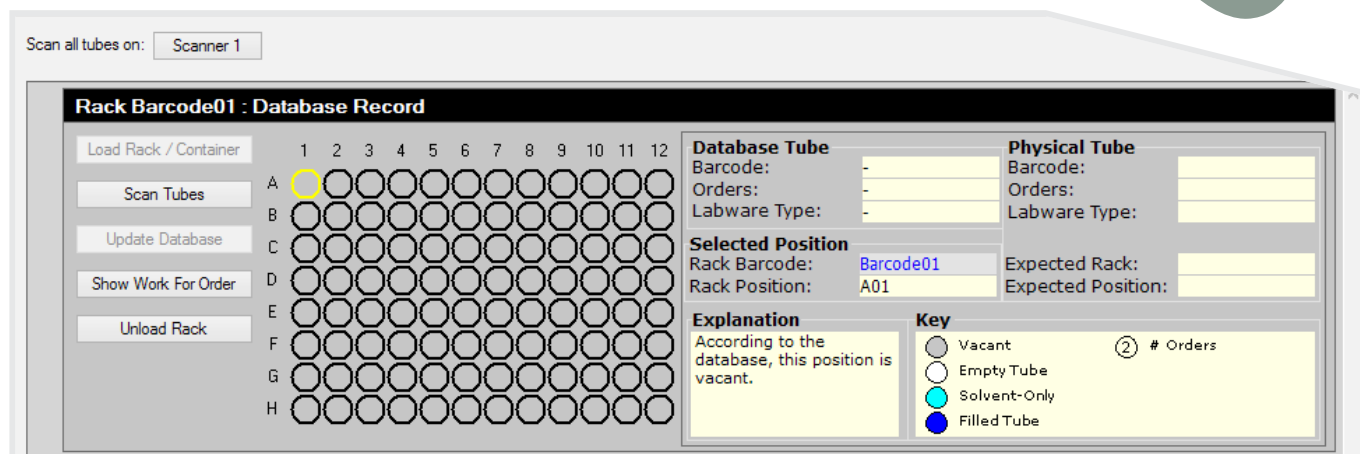


- 1) Open the TPV software and click the “Load Rack” button, then scan the barcode of the rack of empty tubes you want to register.
*See Note on page 2.

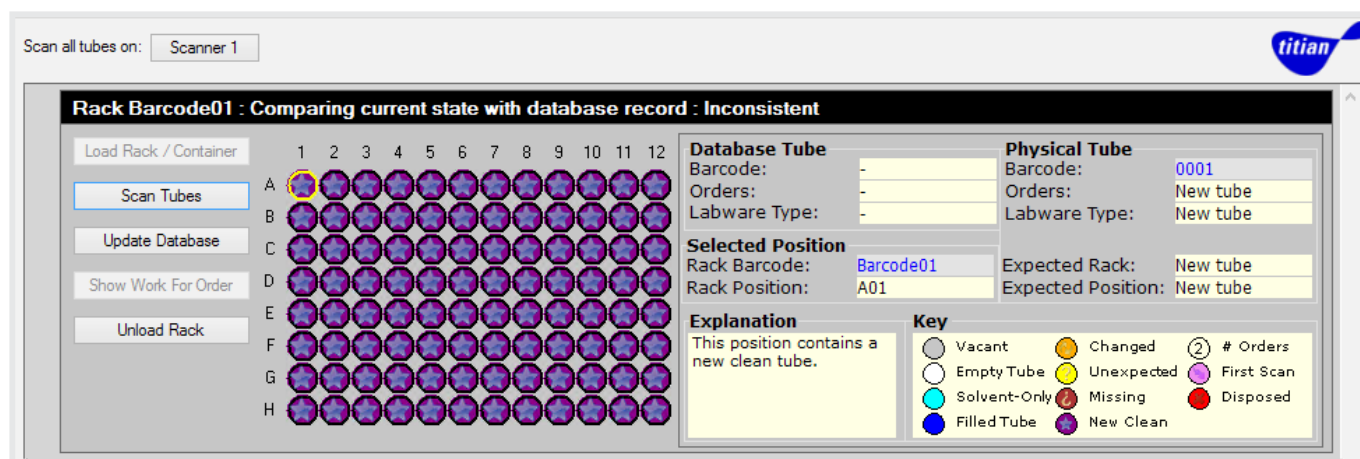


- 2) Because the rack is not registered in Mosaic’s inventory you will be prompted to select the rack type, chose a rack type then click “Yes”.

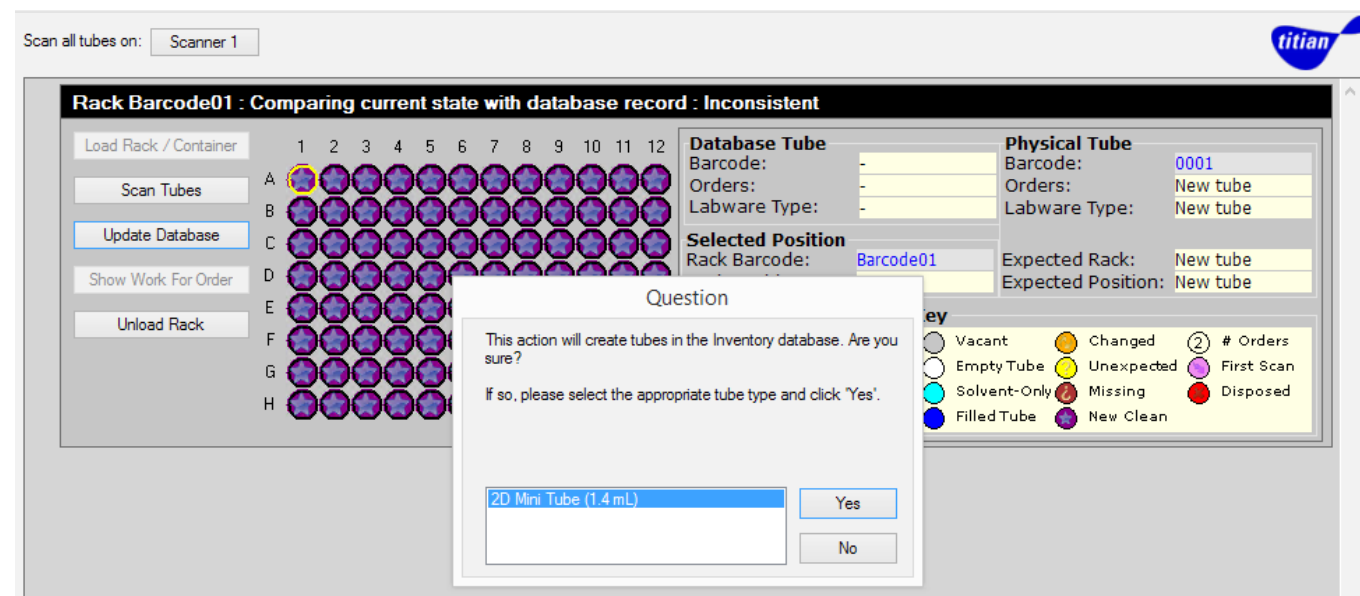
- 3) Loading the rack will display the existing information from Mosaic Inventory (In this case, a rack with vacant positions).



- 4) Click the "Scan Tubes" button. The scanner reads the 2D codes on the base of the tubes and the software checks whether these tubes are known to Mosaic. Here the tubes are not known to Mosaic and are therefore new. The rack map refreshes and shows each position in purple with a star icon that we can see from the onscreen key means new and clean.



- 5) Click "Update Database" to create these clean empty tubes in Mosaic's database. The module asks you to confirm the type of tube to be created. Select a tube type and click "Yes".



- 6) The tubes are created and the module displays a new rack map showing each rack position in white, meaning each is an empty tube.

Scan all tubes on:

Rack Barcode01 : Comparing current state with database record : Consistent

Load Rack / Container	1	2	3	4	5	6	7	8	9	10	11	12
A	○	○	○	○	○	○	○	○	○	○	○	○
B	○	○	○	○	○	○	○	○	○	○	○	○
C	○	○	○	○	○	○	○	○	○	○	○	○
D	○	○	○	○	○	○	○	○	○	○	○	○
E	○	○	○	○	○	○	○	○	○	○	○	○
F	○	○	○	○	○	○	○	○	○	○	○	○
G	○	○	○	○	○	○	○	○	○	○	○	○
H	○	○	○	○	○	○	○	○	○	○	○	○

Database Tube

Barcode: 0001

Orders: 0

Labware Type: 2D Mini Tube (1.4

Selected Position

Rack Barcode: Barcode01

Rack Position: A01

Explanation

This position contains an empty tube.

Physical Tube

Barcode: 0001

Orders: 0

Labware Type: 2D Mini Tube (1.4

Expected Rack: This Rack

Expected Position: This Position

Key

○ Vacant	○ Changed	② # Orders
○ Empty Tube	○ Unexpected	○ First Scan
○ Solvent-Only	○ Missing	○ Disposed
○ Filled Tube	○ New Clean	

Summary

Titian Software's Mosaic TPV module supports your sample management workflows by helping you to easily and efficiently record or update locations of tubes as they are removed from a store, moved around various racks for processing and then placed back into a store.....and everything in between.

Mosaic TPV module users are able to easily:

- Register new tubes/racks
- Consolidate sparsely populated racks
- Identify tubes required for an Order
- Verify the contents of a rack and update as necessary
- Pick/Place items from a manual store

About Titian Software



Titian Software is the industry leader in providing sample management software for 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 Software, our development efforts never stop as we continue to advance Mosaic sample management software 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 modules 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 author

Tim Stroud

After 15 years as a scientist at Pfizer, Tim Stroud moved to MedImmune for 3 years to specialise in managing laboratory automation. He joined Titian Software in 2014 as a business application consultant.

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