



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

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## INTRODUCTION

Smooth drug discovery workflows and a robust audit trail both require that labware movements are tracked around the lab, in addition to recording the transfers of substance from container to container. Labware, such as sample tubes, is usually barcoded which makes recording movements between locations easy and convenient when combined with a tube rack reader.

There are also times when it is useful to compare the physical positions of sample tubes within a rack to the locations stored in your 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 to use freezer space more efficiently.

## BENEFITS OF USING A RACK READER

Sample tube rack readers, or rack scanners, are usually 2D barcode readers that can read an entire rack of tubes at a time. They form the backbone of many sample storage and tracking systems as they provide fast identification of 2D coded and racked tubes without the need to scan the tube barcodes individually.

Additional benefits often include:

- simultaneous reading of rack linear 1D barcodes, for easy robotic integration
- ability to read barcodes from cold environments
- ability to read any 2D barcoded tube, not limited to one manufacturer
- compact and easy to position anywhere

## BENEFITS OF INTEGRATING RACK READERS WITH YOUR SAMPLE MANAGEMENT SOFTWARE

Integrating tube rack readers with your sample management software makes it easy to track samples through the sample management workflow. Data from integrated readers



is passed automatically to your inventory, without errors. This also means you can quickly compare the physical positions of sample tubes in a rack with the data stored in your inventory database, and update it if necessary. This helps you to recover after a rack has been dropped, or when you need to consolidate partly filled racks to optimise freezer space.

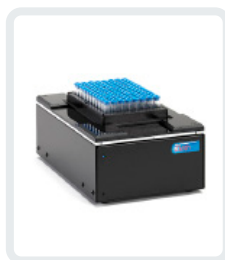
Titian Software's Mosaic sample management software offers a Tube Position Verifier (TPV) application as part of Mosaic's overall product suite. The TPV application integrates with a variety of rack readers on the market.

This document describes a few practical use cases that make the TPV application an essential part of your Mosaic configuration.

## COMPATIBLE DEVICES

Mosaic's TPV application is compatible with a wide array of market-leading tube rack readers including:

- AltemisLab AlteRead™ series
- Azenta Life Sciences Camera-Based Readers
- Hamilton ID Readers
- Micronic DR series
- Omron Microscan
- SPT Labtech SampleScan™ series
- Thermo Scientific VisionMate™ series
- Ziath DataPaq™ series



## SUPPORTED OPERATIONS

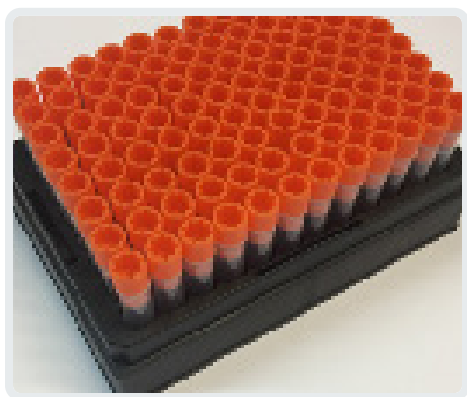
Mosaic's TPV application integrates tightly with rack readers to support a range of essential tasks that form part of the overall sample management process:

- Verifying rack contents
- Tube consolidation within racks
- Picking/Placing tubes from and to manual storage
- Registering new tubes/racks
- Identifying sample tubes for a Mosaic Order

## USE CASE 1: VERIFYING RACK CONTENTS

When racks of tubes are registered in Mosaic, Mosaic records the details of the rack and sample tubes as well as the positional information of all the tubes within the rack. However, if the rack was accidentally knocked off the bench or it fell over within the freezer, it is a near impossible task for a user to put all tubes that had fallen out back into the correct positions matching their inventory locations.

Mosaic's TPV application makes it easy to verify and update rack contents, for example: to recover after a rack has been dropped.



Rack DG22050996CH96S150R003 : Comparing current state with database record : Inconsistent

Load Rack / Container

Scan Tubes

Update Database

Show Work For Order

Unload Rack

12

1 2 3 4 5 6 7 8 9 10 11 12

A

B

C

D

E

F

G

H

Database Tube

Barcode: DG22050996CH96S150R3T044

Orders: 0

Labware Type: ValidationTube

Selected Position

Rack Barcode: DG22050996CH96S150R003

Rack Position: D08

Changed

The database shows a tube in this position, but the position now contains a different tube.

Scanned Tube

Barcode: DG22050996CH96S150R3T096

Orders: 0

Labware Type: ValidationTube

Substance Name:

Expected Rack: This Rack

Expected Position: H12

Key

○ Vacant

○ Empty

○ Solvent-Only

● Filled

● Changed

○ Unassigned

● Missing

● New

⌚ Orders

⌚ First Scan

● Disposed

Load Rack / Container

Scan Tubes

Update Database

Show Work For Order

Unload Rack

123456789101112

A												
B												
C												
D												
E												
F												
G												
H												

Database Tube

Barcode: DG22050996CH96S150R3T044

Orders: 0

Labware Type: ValidationTube

Selected Position

Rack Barcode: DG22050996CH96S150R003

Rack Position: D08

Filled

This position contains a filled tube.

Scanned Tube

Barcode: DG22050996CH96S150R3T044

Orders: 0

Labware Type: ValidationTube

Substance Name:

Expected Rack: This Rack

Expected Position: This Position

Key

Vacant
 Changed
 Orders

Empty
 Unexpected
 First Scan

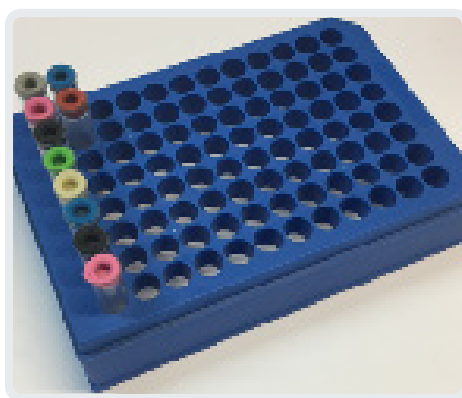
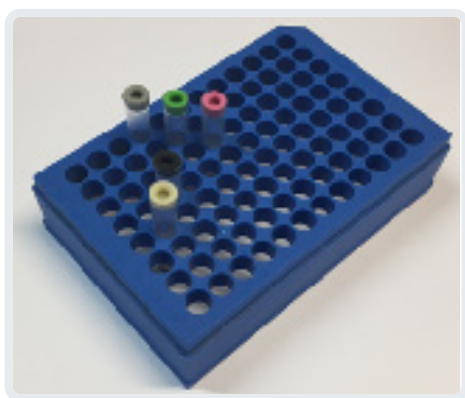
Solvent-Only
 Missing
 Disposed

Filled
 New

## USE CASE 2: RACK/TUBE CONSOLIDATION

One recognised way to improve lab sustainability is to optimise freezer storage. Regularly consolidating sample tubes held across partly filled racks into one rack frees up space, but these updates also need to be accurately reflected in the inventory.

Mosaic's TPV application makes it easy to rearrange racks and update the inventory without having to scan and update the database entry for each tube.



Tubes can be placed in the rack in any position. The rack barcode is checked to call up the information Mosaic has stored on that rack. The user selects "Scan Tubes" and the rack reader scans all the tube barcodes and passes the data to Mosaic. Any discrepancies are highlighted in the Mosaic interface:

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



Rack A000000633Z : Comparing current state with database record : Inconsistent

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	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
B	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
C	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
D	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
E	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
F	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
G	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
H	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

**Database Tube**  
Barcode: -  
Orders: -  
Labware Type: -  
**Selected Position**  
Rack Barcode: A000000633Z  
Rack Position: A01  
**Unexpected**  
The database shows this position as vacant, but the position now contains a tube.

**Scanned Tube**  
Barcode: A000000634Z  
Orders: N/A  
Labware Type: Matrix 1.4mL Tube  
Substance Name:  
Expected Rack: A000000632Z  
Expected Position: This Position

**Key**  
Vacant: Grey circle  
Empty: White circle  
Solvent-Only: Cyan circle  
Filled: Blue circle  
Changed: Yellow circle  
Unexpected: Orange circle  
Solvent-Only: Cyan circle  
Filled: Blue circle  
Orders: Purple circle with 'O'  
First Scan: Purple circle with 'S'  
Missing: Red circle  
Disposed: Red circle with 'X'

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.

Rack A000000633Z : Comparing current state with database record : Consistent

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	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
B	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
C	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
D	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
E	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
F	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
G	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
H	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue

**Database Tube**  
Barcode: A000000634Z  
Orders: 0  
Labware Type: Matrix 1.4mL Tube  
**Selected Position**  
Rack Barcode: A000000633Z  
Rack Position: A01  
**Filled**  
This position contains a filled tube.

**Scanned Tube**  
Barcode: A000000634Z  
Orders: A000000634Z  
Labware Type: Matrix 1.4mL Tube  
Substance Name:  
Expected Rack: A000000632Z  
Expected Position: This Position

**Key**  
Vacant: Grey circle  
Empty: White circle  
Solvent-Only: Cyan circle  
Filled: Blue circle  
Changed: Yellow circle  
Unexpected: Orange circle  
Solvent-Only: Cyan circle  
Filled: Blue circle  
Orders: Purple circle with 'O'  
First Scan: Purple circle with 'S'  
Missing: Red circle  
Disposed: Red circle with 'X'

Using Mosaic’s TPV application makes the consolidation process extremely quick, which means samples are only out of storage for a short space of time, thus minimising sample degradation.

## USE CASE 3: UPDATING RACKS AND TUBE LOCATIONS TO AND FROM STORAGE

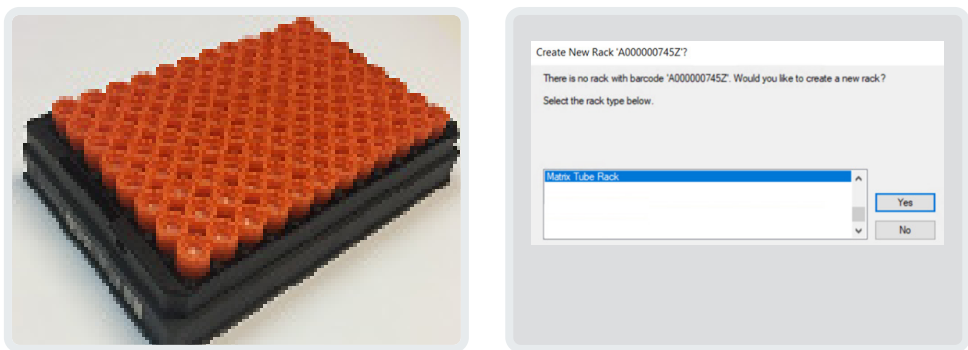
Manual freezers are used in most labs, but their drawback is that items can be removed without updating your inventory, especially if the updating process is time consuming. Mosaic’s TPV application integrates easily with rack readers to make the process as simple as placing the rack on the reader to have its location automatically updated in the Mosaic database.

Alternatively, individual tubes can be cherry picked from the store can be placed into a new rack, which is then scanned to update the tube locations.

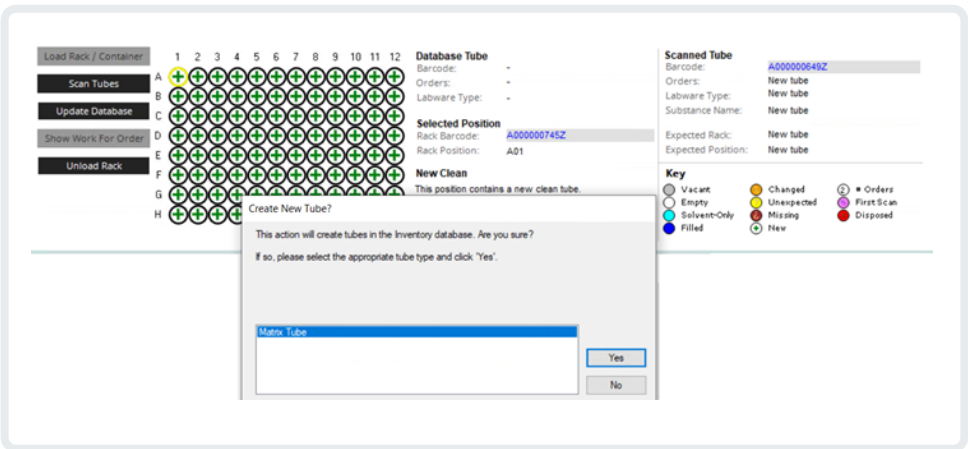


# USE CASE 4: REGISTERING NEW TUBES/RACKS

A common job in sample management is to register new racks of empty tubes into inventory so these can be stored ready for use in future sample preparation workflows. This can be time consuming and tedious. Integrating a rack scanner with Mosaic speeds up the process. Mosaic’s TPV application automatically alerts the user when it spots a new rack barcode. If the rack is not already registered in Mosaic’s inventory, the user is asked to select the type of rack and scan it.



The scanner reads the 2D codes on the base of the tubes and the TPV application checks whether these tubes are known to Mosaic. If not, the user simply clicks “Update Database” to create these clean empty tubes in Mosaic’s database.



## SUMMARY

Titian Software's TPV application integrates a variety of rack scanners to help you to easily and efficiently record or update locations of tubes as they move through your sample management workflows.

The TPV application enables users to easily:

- Register new tubes/racks
- Quickly consolidate sparsely populated racks
- Easily recover after dropping a rack
- Log items in and out of a manual store

By bringing rack readers into the Mosaic interface, scientists and sample management operators can continue to use one familiar interface to request samples and update their locations. Tube and rack locations are automatically updated in real time and a full audit trail is logged for every sample movement.

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

## 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 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.

#### **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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