MVS® Data Manager Integration

An Example: Executing an MVS Volume Verification
of a Tecan EVO Using EVOware Software

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INTRODUCTION:

This paper describes how to run or call an Artel MVS® (Multichannel Verification System) volume verification from another program or application. The MVS Data Manager system software application can start a batch operation via a command line switch. The following integration example will be for a Tecan EVO platform using EVOware software. The process for other software platforms would be similar. Of note, on the deck of the Tecan EVO is a Sunrise plate reader, a Tecan orbital mixer (Te-shake), and a robotic arm.

The goal of the MVS integration with the Tecan, in this example, is to produce an automated volume verification. The MVS Sample Solutions are dispensed into a 96-well microtiter plate. The plate is moved by the robotic arm to the shaker. After mixing on the shaker, the robotic arm transports the plate to the Sunrise reader. After the Sunrise reader finishes, the EVOware opens the MVS Data Manager software and "funnels" the measured absorbance values through MVS Data Manager to show, on a well-by-well and tip-by-tip basis, the exact volume values dispensed by the liquid handler. In essence, these volume values can be used for liquid handler optimization and/or defining liquid class settings.

The basic steps to integrate Data Manager into another piece of software are:

1. Install the Data Manager software on the system.
2. Set up the Data Manager software to import files from an absorbance-based plate reader.
3. Create and export a batch file in the Data Manager application.
4. Add the verification steps and execute Data Manager in the liquid handling script.

PROCEDURE:

Step 1. *Install the software*

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The Data Manager software must be installed on the same system as the calling application. At least one device (liquid handler) and one plate layout must be defined in Data Manager to be used in the batch script. A plate layout defines the target volumes, number of replicate dispenses, and the tolerance specifications per volume. In the example discussed here, the plate layout is called "EVO_Interim_QC".

Step 2. Setup Data Manager to import absorbance files

For unattended volume verifications, the software needs to import absorbance files. Output files need to be generated from an absorbance-based plate reader. The Magellan component in Tecan EVOware is used to control a Sunrise reader and generate absorbance files for the MVS Calibrator Plate (Calplate) and Baseline plate. To do this, the reader needs to be setup to perform a dual wavelength read at 520 and 730 nm, with the ability to export the data to a file. Please note that Artel suggests that these files are updated once per day or if environmental conditions change. Additionally, it may be helpful to create a separate script to update these files at the start of each day.

A directory needs to be created to store the working files. Create a folder "C:\Batch" and inside that folder create a Temp folder "C:\Batch\Temp". Now create an empty text file in the Temp folder called "data.txt" as a place holder. This "data.txt" file will be the absorbance data file associated with the volume verification of the test volumes and is not associated with absorbance data for the Calplate or Baseline plates.

Copy and rename the corresponding absorbance files that were generated for the Calplate and Baseline plate to the "C:\Batch" location as "calplate.txt" and "baseline_96.txt", respectively.

Start the Data Manager application by clicking on the desktop icon, and from the main menu, select "Options → Preferences" and change the reader type to "None – Import From File", as shown in the next image.

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In the Preferences window, press the "File Options" button. As shown in the next image, proceed to set the appropriate options for the file format that the plate reader software uses to export absorbance data.

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It may be necessary to open the generated calplate.txt and baseline txt files to determine settings (see below). Examining the calplate.txt file below shows that it is tab delimited with row and column labels. A click and drag on the back end of a data line shows that it ends with a tab delimiter.

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Step 3. *Create a Data Manager Batch File*

The Data Manager Batch file can be created using the Batch Manager in the MVS software or manually with a text editor (Refer to Appendix D of the MVS Procedure Guide).

Click the Menu item "Batch → Batch Manager" and press the Add button.

Fill in the Batch ID and Description Fields and add a Calplate, Baseline and Verification to the batch by clicking the appropriate buttons with the same name. More than one verification may be added in one Batch.

Select the Calplate item from the Batch file list and on the right side of the window, click on the Data File field and press the button to browse for your calplate.txt file.

Click on the bar code field and press the button to scan your Calplate bar code. Scan the bar code on the Calplate to load the Calplate information into Batch manager. Note - once the bar code is scanned into the Batch file, the bar code will not have to be scanned again.

Show File Prompt should be set to False. Setting this to True allows the user to browse for a file at run time.

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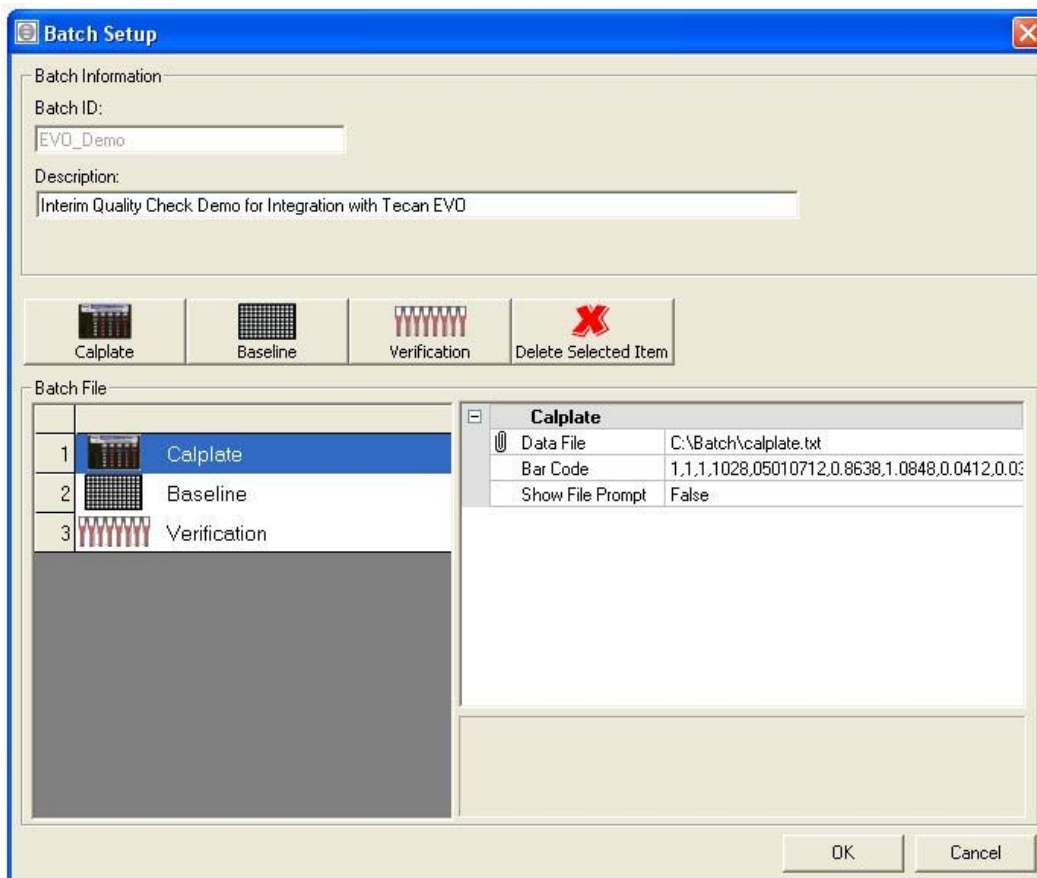
Select the Baseline item, and then on the right side select the Plate Type you are working with. The example described herein is with a 96-well microtiter plate, which is why the baseline file is named "baseline_96.txt".

Click on the Data File field and press the button to browse for the baseline_96.txt file.

Click on the Baseline Bar Code field and press the button to scan the bar code on the bottle of Baseline solution.

Show Shaker Prompt should be set to False if the shaking step is being controlled by the liquid handler software. For example, in the example herein, shaking is performed by the shaker on the deck of the Tecan EVO. Show File Prompt should be set to False.
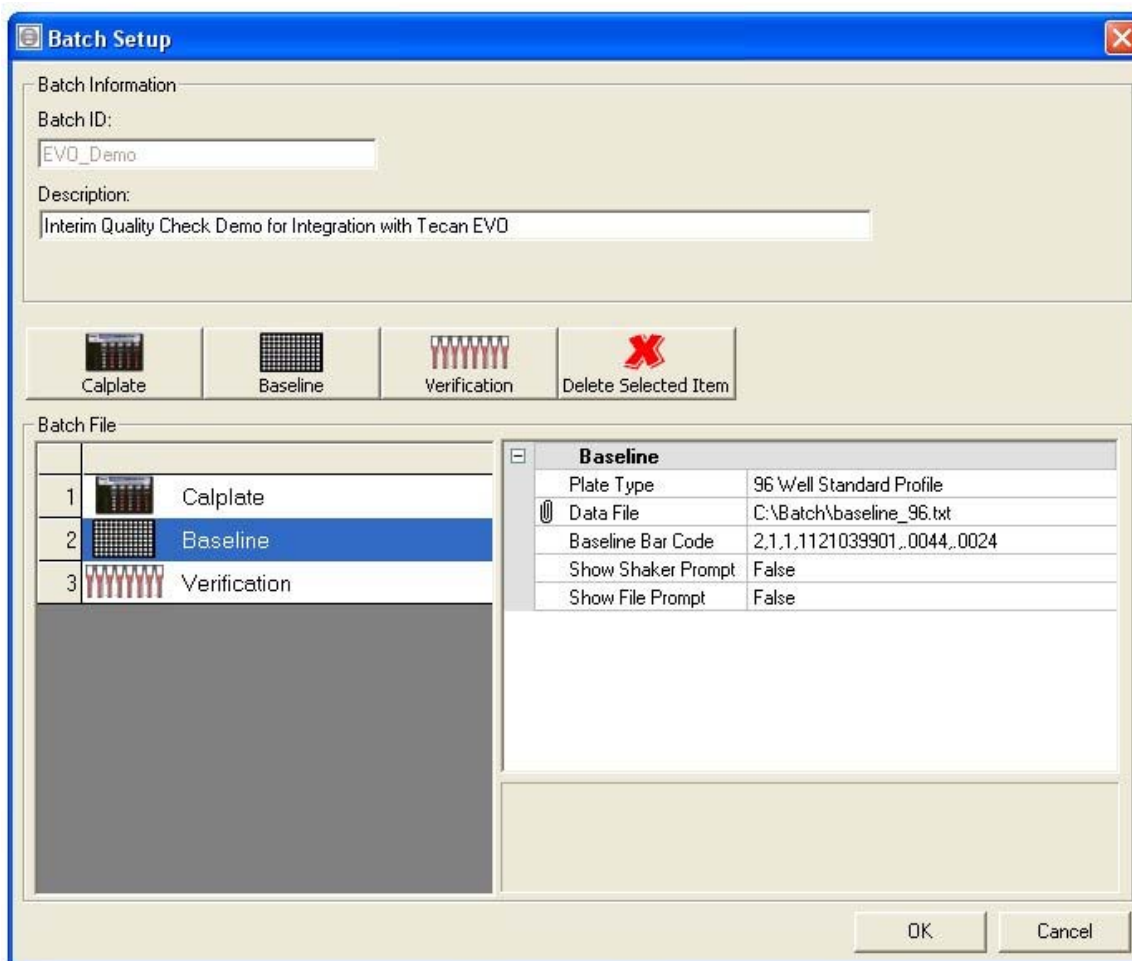
Select the Verification item, and then on the right side select the Device ID (liquid handler) and select the Layout ID and Plate ID to be used during the volume verification process. In our

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example, the "TecanEVO" is the device, "EVO_Interim_QC" is the plate layout, and the microtiter plate employed is a 96-well Corning microtiter plate (Model 3631).

Click on the Plate 1 Data File field and press the button to browse for your place holder data.txt file created earlier. As noted in the previous image, the data.txt file is the name of the absorbance file generated by the plate reader and should contain raw absorbance files for the MVS Sample Solutions dispensed into the microtiter plate.

Click on the Range A Bar Code field and press the button to scan the bar code on the bottle of Range A solution.

Click on the Diluent Bar Code field and press the button to scan the bar code on the bottle of Diluent solution.

Show Shaker Prompt should be set to False if the mixing step is being controlled by the liquid handler software. Show File Prompt should be set to False.

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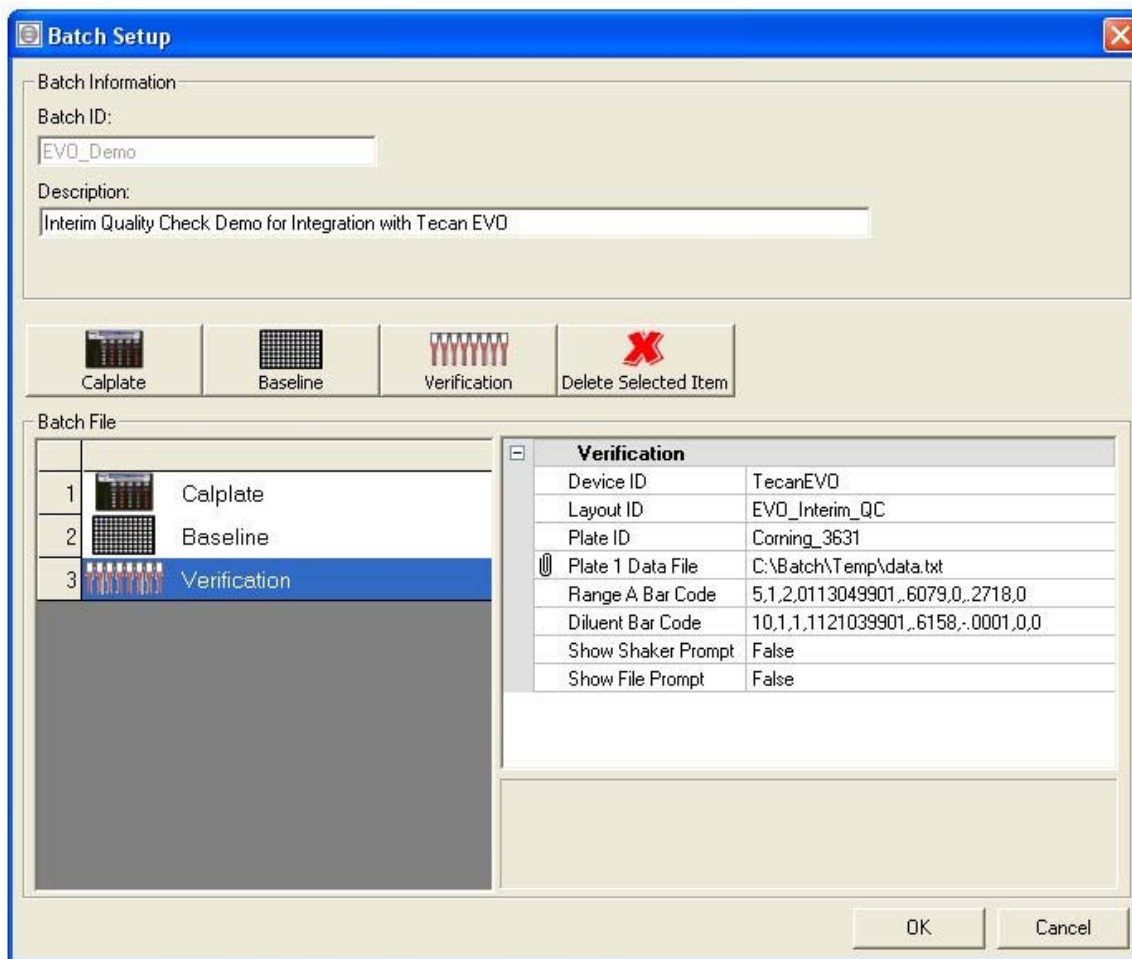
Export the Batch file as xml to C:\Batch\EVO_Demo.xml.
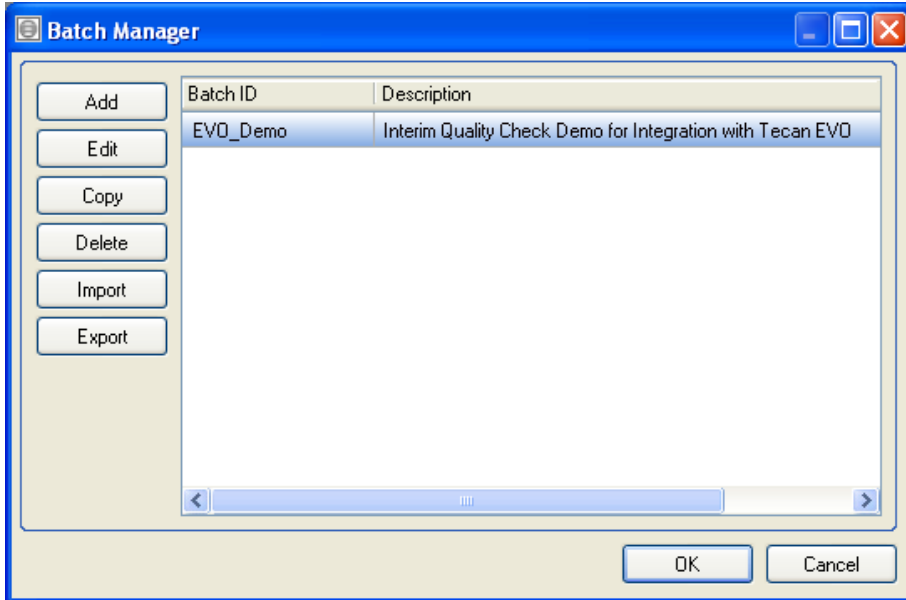
Step 4. *Add verification steps and execute Data Manager*

Add the steps to the liquid handler script to prepare the microplate and data file.
- Dispense solutions in accordance with the Layout ID referenced in the Batch file.
- Mix the solutions in the plate (i.e. with the on-deck shaker).
- Perform a dual wavelength absorbance read at 520 and 730 nm, and export the data to C:\Batch\Temp as data.txt.

The Magellan in EVOware exports files in the format "Date_Time.asc". Prior to executing Data Manager, the .asc file has to be renamed so it can be used by Data Manager.

Open a new file in a text editor and add the line:

    rename C:\Batch\Temp*.asc data.txt

Save the file as C:\Batch\renamedata.bat

The place holder file data.txt should be deleted from the location at C:\Batch\Temp\

Note - in this example, the C:\Batch\Temp location should not be used for any other files with the .asc extension because the file is being renamed using a *wildcard*.

In EVOware add an "Execute Application" step and browse for the renamedata.bat file.
Add another "Execute Application" step and browse for the MVS.exe file.

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Before pressing OK, append a command line switch locating your MVS batch file.
It should look like:

C:\Program Files\Artel\MVS22\mvs.exe –C:\Batch\EVO_Demo.xml

If the MVS Data Manager Version is not 2.2 the file path will be C:\...\...\MVSxx\MVS.exe, where xx indicates MVS version. For example, xx = 23 for MVS Data Manager version 2.3.

To run the liquid handling script multiple times, another Batch file is needed to remove the data.txt file from the Temp folder.
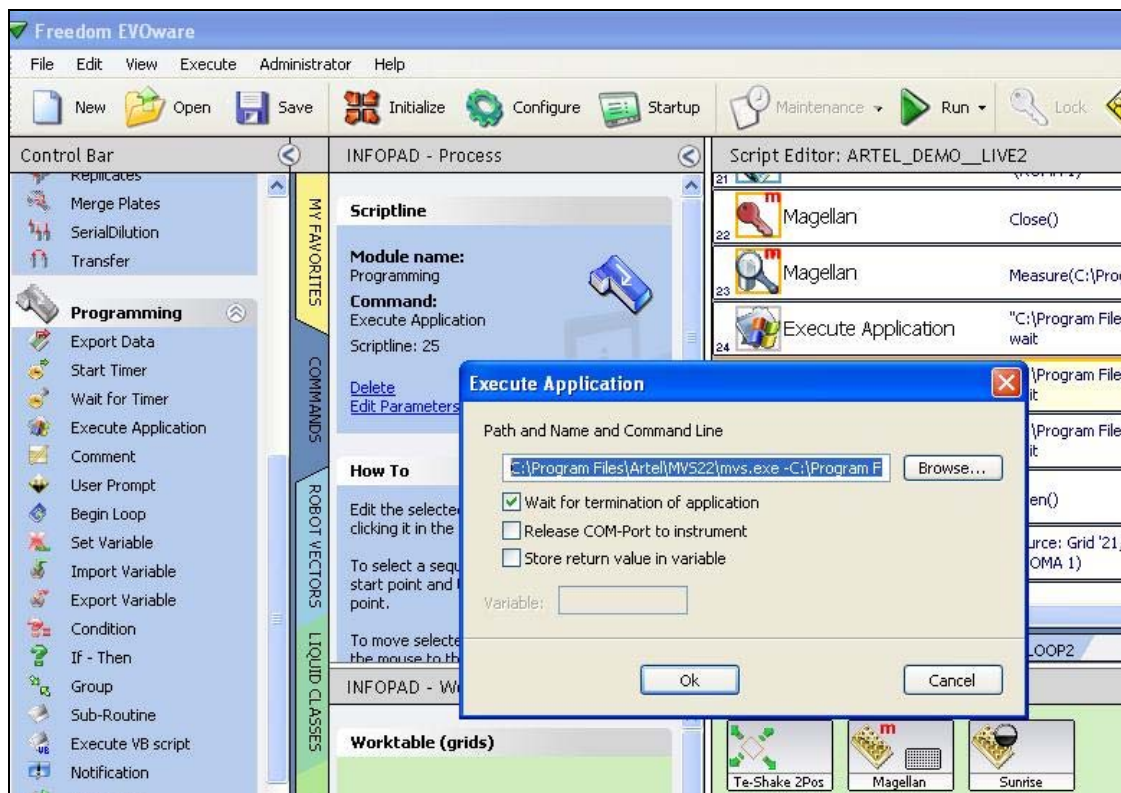
Open a new file in a text editor and add the line:

del C:\Batch\Temp\data.txt

Save the file as C:\Batch\removedata.bat

If it is desired to save the raw absorbance data, add a line to copy the file to another location before it is renamed in the rename data Batch file.

In EVOware add an "Execute Application" step and browse for the removedata.bat file.

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CONCLUSION:

Data Manager software, which controls the MVS, is capable of executing volume verification experiments within other software programs or applications. The procedure described herein pertains, but is not limited to, the Tecan EVOware software. This application may be used to integrate in-process volume verification for most software-driven liquid handlers.

NOTES:

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