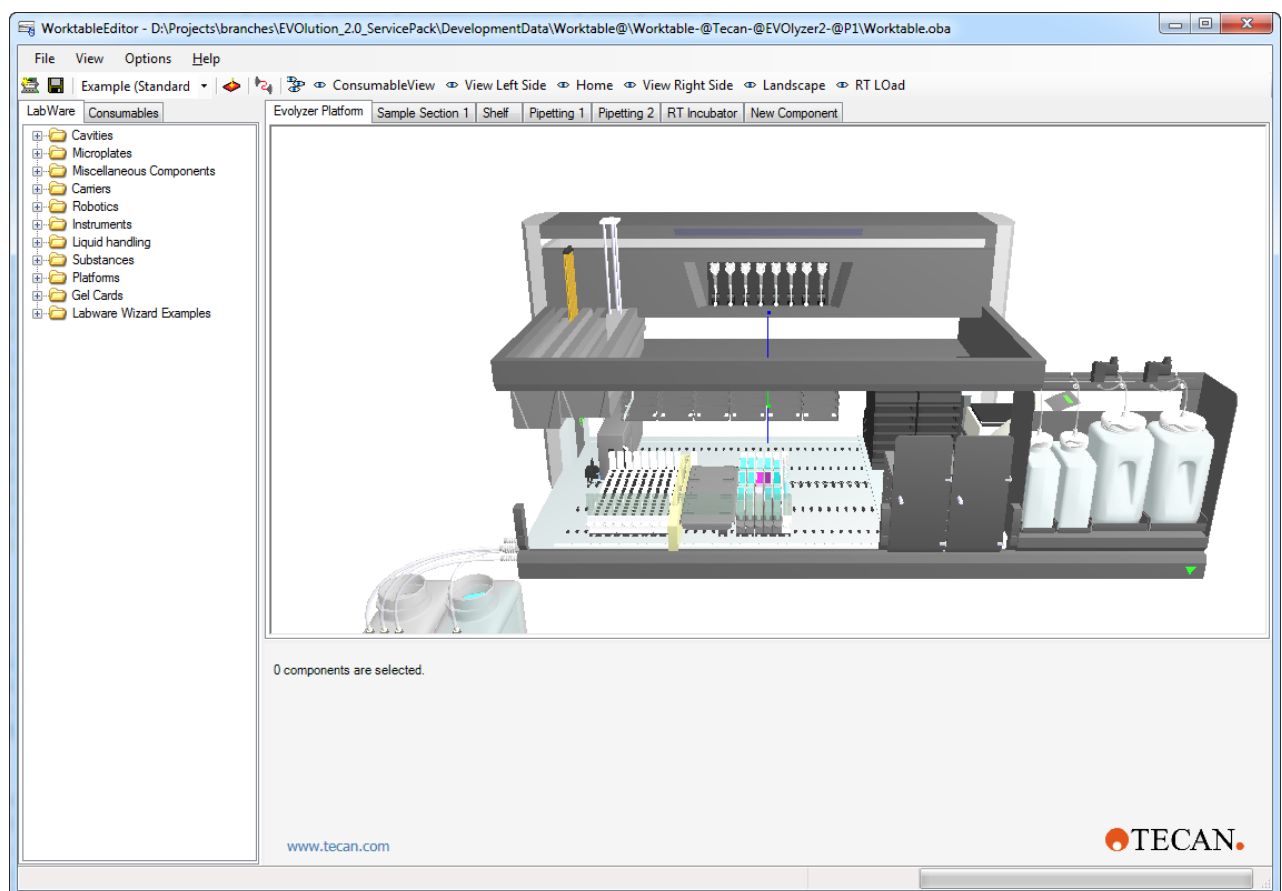


Application Software Manual

Freedom EVOLution™ Software



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1 About This Manual

Purpose of This Manual	This manual describes the Freedom EVOLution SW and provides all information required for its safe operation and maintenance.
Target Group	This manual is intended for giving advice for the safe use of the Freedom EVOLution SW. In particular, application specialists and administrators are addressed.
Scope	This manual is valid for the Freedom EVOLution SW 2.0, 2.1 and 2.2. The information and instructions in this manual enable application specialists and administrators to build configurations for ELISA and similar applications.
Symbols and Conventions	<ul style="list-style-type: none"> ♦ Cross references appear as follows: e.g. “Refer to section 1.1.1,  1-1” – 1.1.1 refers to the corresponding chapter number – The symbol  denotes “page number” – 1-1 refers to the page number, whereas the first number stands for the chapter number (chapter 1 page 1)

Note: The symbols pertaining to safety (WARNINGS and ATTENTIONS are explained in chapter 2 “Safety”,  2-1.

1.1 Reference Documents

What Does the Doc. ID Tell You?	<p>The Doc. IDs listed below are root numbers. Therefore, they do not contain information about the language, document version or the medium (data storage medium, hardcopy, downloadable file, etc.) of the document.</p> <p>Check the scope of the corresponding document to make sure that you are in possession of the correct version.</p>
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Note: The Doc. ID does not represent ordering information. For orders refer to the number on the binder, CD casing, etc.

1.1.1 Manuals Supplied with Freedom EVOLution SW

The following manuals are included in the shipment and considered part of the Freedom EVOLution SW:

Doc ID 394802	Freedom EVOLution SW Application Software Manual
Doc ID 394803	Freedom EVOLution SW Runtime Controller Manual

1.1.2 Other Reference Documents

According to your order configuration and to the applications you plan to run, the following documents contain important information:

Doc ID 393035	Freedom EVOLyzer Operating Manual
Doc ID 393062	Freedom EVO Clinical Operating Manual
Doc ID 392888	Instrument Software Manual
Doc ID 30041769	IFU Sunrise English
Doc ID 30066407	IFU Magellan English
Doc ID 30070290	IFU HydroFlex
Doc ID 30064355	HydroControl Instructions for Use
Doc ID 109011	Columbus / Columbus Pro Washer Instructions for Use
Doc ID I 117 616	WinWash Clinical Instructions for Use

1.2 Trademarks

The following product names and any registered and unregistered trademarks mentioned in this manual are used for identification purposes only and remain the exclusive property of their respective owners:

- ♦ Freedom EVOLution™ is a trademark of Tecan Group Ltd.
- ♦ Freedom EVOLyzer® and Freedom EVO® are in major countries registered trademarks of Tecan Group Ltd.
- ♦ Monovette® is a registered trademark of Sarstedt, Inc.
- ♦ Windows® and Windows XP® are registered trademarks of the Microsoft Corporation in the United States and other countries
- ♦ Pentium® is a registered trademark of the Intel Corporation

1.3 Abbreviations

ASTM	American Society for Testing and Materials. The ISO organization which defined a serial transmission protocol for laboratory data
ELISA	Enzyme-Linked Immunosorbent Assay
IVDD	In Vitro Diagnostic Directive
LI	Loading-interface. A combination of red and green lights and sensors in the worktable which respond to a magnet in the carriers. This allows to guide the user while accessing objects and to detect when a carrier is moved.
LIS	Laboratory Information System
OD	Optical density, the raw data from the reader.
PD	Process Definition, defining all the steps of an assay
PDE	Process Definition Editor, the editor used to create or edit a process definition
SW	Software
XML	Extensible Markup Language

2 Safety

Purpose of This Chapter	This chapter covers only the general introductory safety instructions applicable to the Freedom EVOLution SW. Specific safety instructions of the hardware device are laid down in the respective hardware manual.
Significance of These Safety Instructions	<p>The Freedom EVOLution SW is a pure software product and as such it does not contain any hazardous parts. However, the software is used to control hardware devices and options, which may contain parts that can move with great force and at considerable speed.</p> <p>As a consequence, the safety of users and personnel can only be ensured if the safety instructions in this Application Software Manual as well as the safety instructions of the hardware devices controlled with the software described here are strictly observed and followed.</p> <p>Therefore, all relevant manuals must always be available to all users working with the Freedom EVOLution SW.</p>

2.1 User Qualification

Possible Users	<p>The possible users of the Freedom EVOLution SW are:</p> <ul style="list-style-type: none"> ◆ lab operators ◆ application specialists ◆ administrators
What Users Must Know	<p>The user must be qualified and trained to run the Freedom EVOLution SW. In particular, they must fulfill the following qualifications:</p> <p>All Users</p> <ul style="list-style-type: none"> ◆ They must have a basic knowledge of the Windows operating system. ◆ They must have read and understood the instructions in this Software Manual with regard to the tasks to be fulfilled. <p>Operators (Scientists, Laboratory Personnel)</p> <ul style="list-style-type: none"> ◆ They must have a thorough knowledge of the processes run on the system. ◆ They must be familiar with the good laboratory practice guidelines. <p>Only users that meet the qualifications prescribed here are authorized to run the program described in this Software Manual.</p>
Training Courses	<p>Note: Tecan recommends that operators attend an operator training course.</p> <ul style="list-style-type: none"> • Please ask your nearest Tecan representative about the available courses.

Application Specialist or System Administrator

Special Tasks

For special tasks, such as creating process sequences, teaching carrier positions, changing liquid handling parameters, or running device tests, a more profound knowledge of the system is necessary.

The following additional knowledge must be available to the personnel in charge of these tasks:

- ◆ They must have profound knowledge of the principles of assay functions and validation procedures.
- ◆ They must be familiar with the applicable guidelines and regulations for clinical laboratory environments.
- ◆ They must have a profound knowledge of the application software.
- ◆ They must have knowledge of the basic Setup & Service software functions.
- ◆ They must have received special training from the manufacturer or an authorized instructor.

Note: Depending on the tasks, specific access rights may be necessary with regard to software login.

2.2 Warning Notices Used in the Manuals

The symbols used for safety-related notices have the following significance:

WARNING Symbols



WARNING notices appear as follows:

WARNING

Generally, the triangular warning symbol indicates the possibility of personal injury or even loss of life if the instructions are not followed.

ATTENTION Symbols



ATTENTION notes appear as follows:

ATTENTION

With the general "Read This!" symbol, ATTENTIONS indicate the possibility of equipment damage, malfunctions or incorrect process results, if instructions are not followed.

2.3 Safety of the Overall System

In addition to the safety instructions in this Application Software Manual, the safety instructions in the manuals of the hardware devices must also be observed and followed.



WARNING

Hazards originating from the hardware devices controlled with this software. Mind the safety instructions of all instruments and options which are used in connection with the Freedom EVOLution SW.

2.4 General Safety Rules

Legal Regulations

Legal regulations, such as local, state and federal laws which prescribe the use or application as well as the handling of dangerous materials in connection with the Freedom EVOLution SW must be strictly followed.

Modifications

Modifications to the Freedom EVOLution SW are not permitted. The manufacturer will decline any claim resulting from unauthorized modifications.

3 Product Description

Purpose of This Chapter

This chapter describes the basics of the Freedom EVOLution SW and its components.

3.1 Intended Use

The Freedom EVOLution SW is to be used exclusively by Tecan trained application specialists, for the creation and management of processes that perform pre-analytical sample distribution and assay preparation or ELISA (and similar) test configurations.

3.2 Brief Description

The Freedom EVOLution SW is designed to enable the user to prepare process configurations for pre-analytical sample distribution and assay preparation as well as ELISA and ELISA similar tests on the Freedom EVOLyzer and the Freedom EVO Clinical instrument. These configurations are then processed by the Freedom EVOLution Run Control to perform the actual test run.

Software Components

The Freedom EVOLution SW offers a number of editors and the configuration builder program, needed for the management of test configurations. The output of each editor serves to describe a part of a configuration, e.g. the liquid classes or the worktable used for the corresponding process or test.

Configuration Management

The configuration builder program merges and groups the output files from the editors, and signs them electronically. Due to the electronic signature, it is possible to identify the author of a configuration and to trace changes applied to it.

Scheduling

The Freedom EVOLution SW also supports a table of execution times, and thus enables the user to schedule processes and process steps.

If configured accordingly, the Freedom EVOLution SW measures and stores the duration of every supported job with successful termination (profiling). The durations of new jobs run later are determined with the measured durations as calculation basis (optimization).

The Freedom EVOLution SW, during each run, automatically calculates the optimal Z-travel for all Liquid Handling Arm movements, for all pipetting sequences (dynamic Z-travel). Jobs not involving pipetting sequences use a default travel height.

Further configuration data describing the reader steps in ELISA assays are predefined in the Magellan software. They are also used as input for the configuration builder program.

3.3 Function Diagram

The following diagram shows the Freedom EVOLution SW components, the order in which they should be used, and the outputs they produce. Software components lined up at the same height in the diagram are possibly used in any order, possibly also more than once.

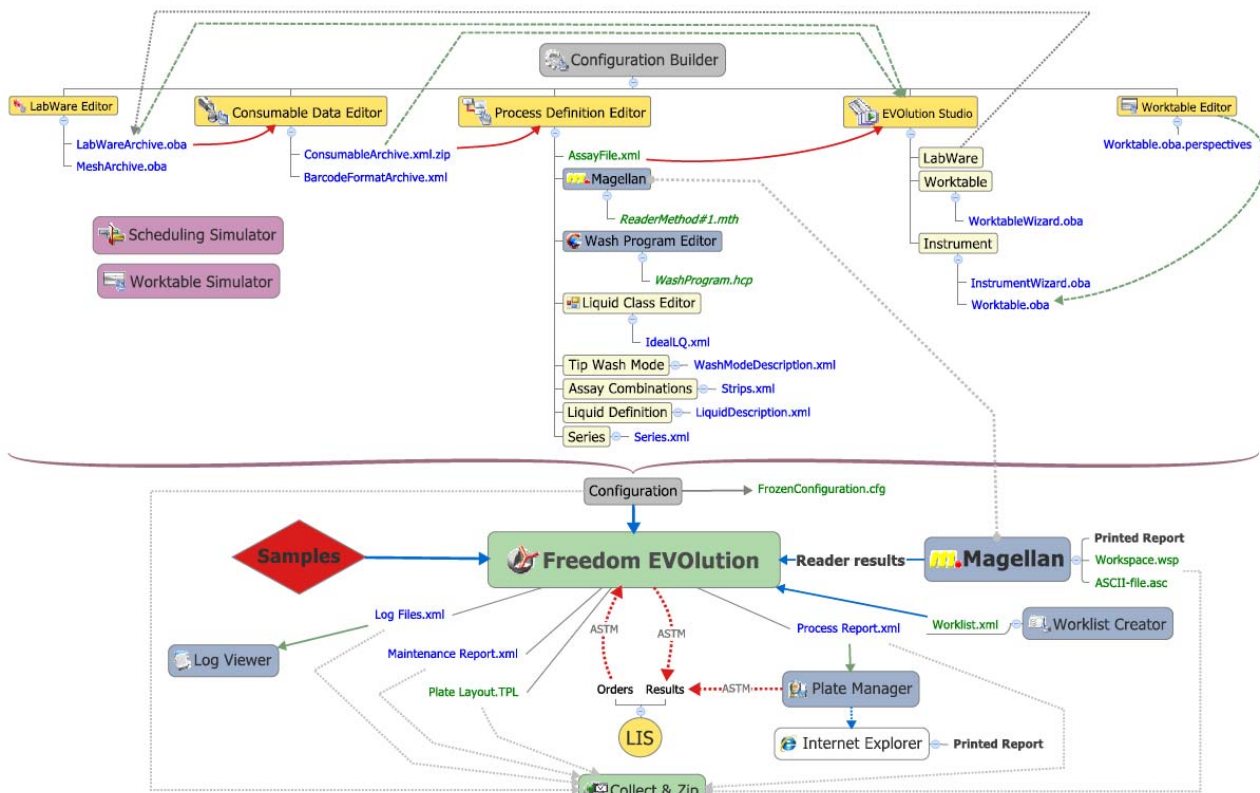


Fig. 3-1 Freedom EVOLution SW function diagram^{a)}

a) For a description, refer to the Freedom EVOLution SW Runtime Controller Manual

3.4 Editors and Utilities

Software Components

The Freedom EVOLution SW consists of the following components:

3.4.1 Overview of Editors

EVOLution Studio

The EVOLution Studio offers three wizards to create or modify labware, instrument or worktable definitions:

- ◆ Labware Wizard
 - The Labware Wizard is designed for the definition of certain labware components, such as tubes and microplates, in an easy way, without the necessity to open them in the Labware Editor.
- ◆ Instrument Wizard
 - The Instrument Wizard simplifies the modification of an existing instrument or the creation of a new instrument.
- ◆ Worktable Wizard
 - The Worktable Wizard enables the user to edit a number of properties of the worktable definition without the necessity of opening the definitions in the more complicated Worktable Editor.

Labware Editor

The labware editor is designed for the definition of functions and geometric properties of all objects on the worktable, including also the possible interactions between them. For example, it describes the carriers and microplates, and also the way in which a microplate can be placed onto a carrier.

Parts of the instrument, such as the liquid handling arm, are also defined in this editor.

Consumable Data Editor

The Consumable Data Editor is used for the definition of all consumables, such as:

- ◆ Diluent
- ◆ Cleaning liquid
- ◆ System liquid
- ◆ Coated microplates
- ◆ DiTis

Worktable Editor

The worktable editor is designed for direct control of the instrument and for collision avoidance.

Process Definition Editor

The process definition editor enables the user to define new and modify existing processes. The process steps (i.e. the so-called jobs) and their interconnection are visualized on the screen.

From the process definition editor the following individual software modules can be opened:

- ◆ Liquid class editor
 - The liquid class editor enables the user to specify, copy and delete liquid classes.
- ◆ Series editor
 - The series editor defines which assays can be run simultaneously.
- ◆ Assay combinations
 - The assay combinations editor allows the user to define combinations of different plates or strips for different assays.
- ◆ HydroControl (wash program editor)
 - The HydroControl wash program editor is used to define wash programs for the HydroFlex Platform (microplate washer).
See 3.4.2 “Wash Program Editor”, 3-4 (EVOlyzer-2).
- ◆ WinWash Clinical (wash program editor)
 - The WinWash program editor is used to define wash programs for the Columbus washer.
See 3.4.2 “Wash Program Editor”, 3-4 (EVOlyzer-1).
- ◆ Magellan (microplate reader software)
 - The Magellan software controls the microplate reader.

3.4.2 Wash Program Editor

The wash program editor controls the microplate washer of the Freedom EVOlyzer instrument.

- ◆ If a HydroFlex platform is used:
 - For the description of the HydroControl Washer Software, refer to the “HydroControl Instructions for Use”.
 - *Note: The HydroControl software in stand-alone mode is only used to calibrate the positions of microplates in the HydroFlex Platform. The positions are represented in the Plate Definition Files (PDFX).*
 - *Note: The wash programs run with Freedom EVOLution SW are defined in the wash program editor that is integrated in the Process Definition Editor.*
- ◆ If a Columbus washer is used:
 - For the description of the WinWash program editor, refer to the “WinWash Clinical Instructions for Use”.

3.4.3 Magellan Software (Reader Data)

The Magellan software controls the microplate reader of the Freedom EVOlyzer instrument.

For the description of the Magellan software, refer to the “Magellan Instructions for Use”.

3.4.4 Configuration Builder

The configuration builder administrates all files needed to configure a process and makes these files available to the Freedom EVOLution Run Control. The file package will be electronically signed in such a way that changes to the configuration can be traced at any time.

3.4.5 Freedom EVOLution Run Control

The Freedom EVOLution Run Control graphic user interface is designed for the operator, for easy control of test runs. It is described in the Freedom EVOLution SW Runtime Controller Manual.

3.4.6 Utilities

Configure Customized Steps Editor

This configuration program is designed for creating optional instructions giving the operator graphical and text information about the startup steps and shutdown steps. These instructions are subsequently displayed to the operator.

Logviewer

The Logviewer is used to view the log files produced by the system. It offers sort and filter options.

Worklist Creator

The Worklist Creator is used to create and modify worklists for samples to be processed. It is described in the Freedom EVOLution SW Runtime Controller Manual.

Plate Manager (SW Version 2.0)

The Plate Manager is used to view and evaluate the process results, i.e. the plate report files. It is described in the Freedom EVOLution SW Runtime Controller Manual.

Report Center (SW Version 2.1)

The Report Center is used to manage the system-generated XML report files. This includes the display of the data in HTML format and the sorting, archiving and export of reports. It is described in the Freedom EVOLution SW Runtime Controller Manual.

Scheduling Simulator

With the Scheduling Simulator, the process schedule can be simulated to analyze the process run.

Worktable Simulator

With the worktable simulator, the worktable definition of an instrument can be simulated without connecting the actual hardware.

Collect and Zip Tool

The Collect and Zip tool helps the user to collect files, zips (compresses and packs) them and optionally sends the data to Tecan for troubleshooting purposes.

3.4.6.1 Editors and Their Output

The following table lists the editors and other software tools and their output. It also provides references to other sections for detailed information on the editors:

Tab. 3-1 Freedom EVOLution SW editors and their outputs

Editor	Output	Output Contents	Reference
Labware Editor	Labware definition	Describes the geometric dimensions of all possible worktable objects (e.g. carriers and microplates) and the possible interactions between them (e.g. the placing of a microplate on a carrier).	See chapter 9 “ Labware Editor ”, ¶ 9-1
EVOLution Studio / Labware Wizard/ Instrument Wizard/ Worktable Wizard	Labware definition Instrument definition Worktable definition	The Labware Wizard, the Instrument Wizard and the Worktable Wizard enable the user to define the instrument, labware components and worktable layout.	See chapter 10 “ EVOLution Studio ”, ¶ 10-1
Consumable Data Editor	Consumables definition	Describes each consumable used in the process, as e.g. liquids, DiTis or coated microplates.	See chapter 12 “ Consumable Data Editor ”, ¶ 12-1
Worktable Editor	Worktable definition	Describes which labware is placed at which position on the instrument deck.	See chapter 8 “ Worktable Editor ”, ¶ 8-1
Process Definition Editor	Process definition	Contains all the process-related steps, e.g. incubation, washing or pipetting steps.	See chapter 7 “ Process Definition Editor, PDE ”, ¶ 7-1
Liquid Class Editor	Liquid classes	Contains all relevant aspiration and dispense parameters for a given liquid.	See chapter 11 “ Liquid Classes Editor ”, ¶ 11-1
Series Editor	Specific XML file: • Series.xml	Contains series definitions.	See chapter 7.3.5 “ Series ”, ¶ 7-46
Assay Combination Editor	Specific XML file: • Strips.xml	Defines possible assay combinations.	See chapter 7.3.6 “ Assay Combinations ”, ¶ 7-48
Wash program editor (HydroControl)	Definition of wash programs	Contains all relevant parameters to wash a microplate on a Hydroflex Platform.	Refer to the “ HydroControl Instructions for Use ”
Wash program editor (WinWash Clinical)	Definition of wash programs	Contains all relevant parameters to wash a microplate on a Columbus washer.	Refer to the “ WinWash Clinical Instructions for Use ”
Magellan	Reader data	Defines the process-related reader methods.	Refer to the “ Magellan Instructions for Use ”

Tab. 3-1 Freedom EVOlution SW editors and their outputs

Editor	Output	Output Contents	Reference
Third-party XML editor	Specific XML files: <ul style="list-style-type: none"> • Durations.xml • MagellanDescription.xml • InitialLoad.xml 	Definition of step durations.	See chapter 14.1 "Configuration Files" , 14-1
Configure Customize Steps Editor	Instruction texts	Optional instructions for the operator on manual interactions at process start and process end.	See section 15.1 "Configure Customized Steps Editor" , 15-1
Scheduling Simulator	Schedule	Process schedule and duration, logfiles.	See section 15.2 "Scheduling Simulator" , 15-2
Collect and Zip Tool	Zip file	Collected data for troubleshooting purposes.	See section 15.4 "Collect and Zip Tool" , 15-16

3.5 Requirements

Note: For latest information on the installation and use of the Freedom EVOlution SW, refer to the ReadMe file on the installation CD.

3.5.1 Computer Requirements



ATTENTION

Using a laptop computer can have a negative effect on performance.

Make sure that the computer hardware fulfills the following requirements:

Hardware

Windows 7 (64-bit):

- CPU Intel Pentium 4 or Athlon CPU 3 GHz or optimum Dual Core or multi processor system 2.33 GHz
- RAM minimum 2 GB, recommended 4 GB
- Hard disk space At least 1 GB of free space is needed for the installation files. At least 5 GB hard disk space for the data files that will be created during the life span of the pipetting instrument during normal operation.

Other required hardware:

- Display: XGA (1024x768) or higher resolution display with 32 bit color. Any graphic card with a RADEON chip (i.e. for hardware acceleration adapted Open GL compatible graphic card) or better than that
- Mouse
- DVD-ROM drive

- ◆ Ports:
 - For communication with the pipetting instrument, 1 USB 2.0 port is required
 - For ASTM communication, 1 RS232 port is required
 - Printer (optional)

Hard disk space

- ◆ Software performance will be seriously affected when the amount of free hard disk space falls below 10% of the total hard disk size.
- ◆ Freedom EVOlyzer instruments with HydroFlex Platform:
 - No additional port is required (HydroFlex Platform is connected via internal USB hub, Sunrise reader is connected via internal USB-to-RS232 converter).
- ◆ Freedom EVOlyzer instruments with Columbus washer:
 - 2 additional RS232 ports are required for Columbus Washer and Sunrise Reader.
- ◆ Freedom EVO Clinical instruments:
 - No additional port is required.

Refer also to your Instrument Software Manual and the ReadMe file, provided with the recent software version, for details on minimal computer requirements.



ATTENTION

General application performance will be seriously affected when the amount of free harddisk space falls below 10% of the total harddisk size.

- ◆ Make sure that there is sufficient harddisk space available on the system.

3.5.2 Operating System

- ◆ Operating system:
 - Windows XP Professional Service Pack 3
 - Windows 7 64-bit Professional



ATTENTION

Unexpected behavior of the system if the Freedom EVOLution SW is run under an operating system other than recommended.

- ◆ The Freedom EVOLution SW has been tested and verified with Windows XP Professional Service Pack 3 and Windows 7 64-bit Professional.
- ◆ Only use the recommended operating system.

Note: For the installation of the Freedom EVOLution SW you need Windows user administration rights on the target computer.

3.5.3 Software Requirements

Make sure that only compatible software versions according to the information in this section are installed on the computer. Please contact your nearest Tecan representative for more information.



ATTENTION

Unexpected behavior of the system if other software components than specified here are installed on the computer.

- ◆ Do not install the QC Pack (Magellan component) and the XFlex (service software for the HydroFlex Platform) on the computer with the Freedom EVOLution/Magellan installation.

Tab. 3-2 Software requirements

Instrument Software	See ReadMe file on CD
---------------------	-----------------------

Installation Prerequisites

Tab. 3-3 Installation prerequisites

Microsoft Internet Explorer	V 7.0 or later
Tecan Magellan	See ReadMe file on CD ^{a)}

a) If Magellan is not installed, an error message will be displayed during the installation of the Freedom EVOLution SW.

Runtime Prerequisites

Runtime prerequisites for the Freedom EVOLution SW are:

- ◆ Microsoft .NET Framework V2.0

Note: This will be installed automatically with the Freedom EVOLution SW setup.

3.5.4 Operational Environment

During system verification at the manufacturer's the Freedom EVOLution SW was able to use all available computing resources during a run.

In particular,

- ◆ active network connections,
- ◆ active antivirus programs, and
- ◆ active firewalls

are known to possibly cause problems in some rare cases.

Therefore, we recommend the user to deactivate such program components during relevant runs.

Although no safety-relevant problems ever occurred, we recommend the user not to use any other program apart from the Freedom EVOLution Run Control during a run. This restriction not only applies to "foreign" programs, but also to the Freedom EVOLution SW editors and to the log file viewer.



ATTENTION

Possible disturbance of the Freedom EVOLution Run Control by other programs.

- ◆ Close all other programs before starting a run.

After program installations, updates or other relevant changes to the system, we recommend the user to repeat the Operation Qualification.



4 Installation

Purpose of This Chapter

This chapter describes how the Freedom EVOLution SW is installed and gives instructions on initial software configuration.

Cross References

List of cross references to information provided in other sections:

Subject	See
Uninstall procedure for the Freedom EVOLution SW	4.7 ,  4-21
Communication Server service	4.7 ,  4-21

4.1 Introduction

Supported Instruments

The following instruments are supported by the Freedom EVOLution SW:

- ◆ Freedom EVOLyzer 100
- ◆ Freedom EVOLyzer 150
- ◆ Freedom EVOLyzer 200
- ◆ Freedom EVO Clinical 100
- ◆ Freedom EVO Clinical 150
- ◆ Freedom EVO Clinical 200

Who Should Install?

The initial installation of the Freedom EVOLution SW must be carried out by a trained application specialist or a system administrator only.

Access Rights to the Freedom EVOLution SW

There are two user groups with right of access to the Freedom EVOLution SW:

Administrator

The administrator has access to all features of the Freedom EVOLution SW.

Application Specialist

The application specialist has access to all features of the Freedom EVOLution SW, except the right to install the Freedom EVOLution SW and cannot create new user.

Lab Operator

The Lab Operator can run the software with a predefined configuration.

Before You Start



ATTENTION

Damage to the system is possible, if installation has been carried out improperly.

- ◆ The initial installation of the Freedom EVOLution SW must be carried out by a Tecan FSE or a system administrator only.

4.2 Before Installation

Prerequisite

The instrument is not connected to the computer yet.

Prepare the system before installing the Freedom EVOLution SW as follows:

- 1 Make sure that you are logged into Windows with administrator rights.
- 2 Set the display properties as follows:
 - in **Display - Properties - Appearance**, select design **Windows Style**
 - in **Display - Properties - Appearance - Effects**, select **Use the following method to smooth edges of screen fonts**, select **Standard**
 - in **Display - Properties - Settings - Advanced - General**, select font resolution: 96 dpi
- 3 If already installed: Stop any running instances of a currently installed Freedom EVOLution SW.
- 4 If already installed: Stop the Communication Server and Logging Server services (from the Control Panel->Administrative Tools->Services).
- 5 If applicable: Uninstall earlier versions of the Freedom EVOLution SW.
If an older version of the Freedom EVOLution SW is installed, the new installation is not performed, and an error message is displayed.
- 6 If applicable: Uninstall the following software packages in the listed order:
 - Instrument Software
 - Tecan PosID-3 driver
 - Tecan Communication System
 - Tecan Logging Server
 - Tecan Common Component

For details on the corresponding SW versions refer to the ReadMe file on the installation CD.

- 7 Freedom EVOLyzer instruments only: Install Tecan Magellan Tracker.
If earlier Magellan software versions are present on the system, uninstall them before installing Magellan Tracker.
- 8 (Optional) Start Magellan and add an Eres Administrator with the name "Admin" (case-sensitive). *Do not forget to note the password.*
- 9 Start MagellanIQ.exe (Magellan installation qualification program) from the installation path specified in the setup program (typically **C:\Program Files\Tecan\Magellan**) in order to check Magellan installation.
*A detailed report shows the summary of all installed components. All report items should have status **Ok**.*

Note: *The installation qualification must be repeated each time new software is installed.*

Note: Freedom EVOLution SW uses the same user management system as other Tecan software products. Therefore, if there are such software packages installed on the computer, there is already an existing user database.

- ◆ Check if there is a file with the name **UserManagement.xml** in **C:\ProgramData\Tecan\TecanUserManagement\v1.1\UserManagement.xml** (depending on the SW versions installed). If this is the case, there is already a user database present on the system.
As a consequence you have already one or several so-called “user-administrators” defined on the system.



ATTENTION

Freedom EVOLution SW cannot be installed, if the user name and password for the “user-administrator” of an existing user management is not available.

- ◆ Make sure to be in the possession of the corresponding access data.

Note: *If the user name and password of the existing installation are not available, you’ll need to uninstall **all** Tecan software packages and then reinstall Magellan and Freedom EVOLution SW.*

The same is the case if you are “locked out” after too many (default: more than 3) unsuccessful tries to login and if you have no spare user account.


4.3 Installing the Freedom EVOLution SW

Prerequisite

The instrument is not connected to the computer yet.

Note: For latest information on the installation and use of the Freedom EVOLution SW, refer to the ReadMe file on the installation CD.

To install the Freedom EVOLution SW, proceed as follows:

- 1 Make sure that the installation preparations as per 4.2 "Before Installation",  4-2 are performed.
- 2 Make sure that you are logged into Windows with administrator rights.
- 3 In Windows, click on **Start, Control Panel, Add/remove software**.
- 4 In the software control panel, click on **Add new program**. The software selection screen appears.
- 5 In the software selection screen, click on **Add program from CD or disk**. Put the software CD into the computer's CD drive. Click on **Continue**.
- 6 If necessary, navigate to the installation directory on the CD.
- 7 In the installation directory on the CD, click on the EVOLutionSetup.exe file. Click on **Open**.

The Setup will automatically install the Freedom EVOLution SW and related components (including Logging and Communication Server).

Note: The entry of your name and company name (Customer Information screen) has nothing to do with the user administration, i.e. this information is not of importance later on.

- 8 If there was no user management installed yet, it will be installed now. A default user with the user name **Admin** and the password **Admin** will be added. You will be prompted to change the password at first login.
Or If there is already a user management installed, you will be prompted to enter the user name and the password of an existing administrator.
 - Enter your administrator user name and password.
- 9 The software installs the new User Management Component. You will be asked to enter the admin password again. If an admin already existed, please login with this credentials. If the Freedom EVOLution Setup has created one, please enter the user **Admin** and the password **Admin**.
The installation is now complete.
- 10 Read the ReadMe file and pay attention to the information given here.
- 11 Run the language-specific setup, if necessary (for languages other than English).

4.4 Installing the HydroControl SW

The HydroControl is the washer software for the HydroFlex Platform (microplate washer). It is only used for the HydroFlex Platform in stand-alone mode.

To adapt or check plate parameters for the HydroFlex washer, the HydroControl frozen solution needs to be installed.

Note: Please install only the HydroControl frozen solution stand-alone software delivered with the EVOlution CD, otherwise you will not have a common user management with the other Tecan software components.

To install the HydroControl frozen solution, proceed as follows:

- 1 Make sure that Tecan Magellan and Freedom EVOlution SW is already installed.
- 2 Create different EVOlution users.
- 3 Run the HydroControl setup.
- 4 Start HydroControl and log in as administrator.
- 5 Add the HydroControl rights to the EVOlution (EVOlyzer) user groups.

4.5 The Application Settings Control

The Application Settings Control allows the user to change the Application Settings of the Freedom EVOLution SW. It extends the Application Settings dialog of the Freedom EVOLution Run Control (administrator rights required).

To start and use the Application Settings Control:

- 1 Open the **C:\Program Files (x86)\Tecan\EVOLution for EVOLyzer 2.0\Program\bin** directory and double-click the file **TecanApplicationSettingsControl.exe**.

After login, the Application Settings Control dialog opens:

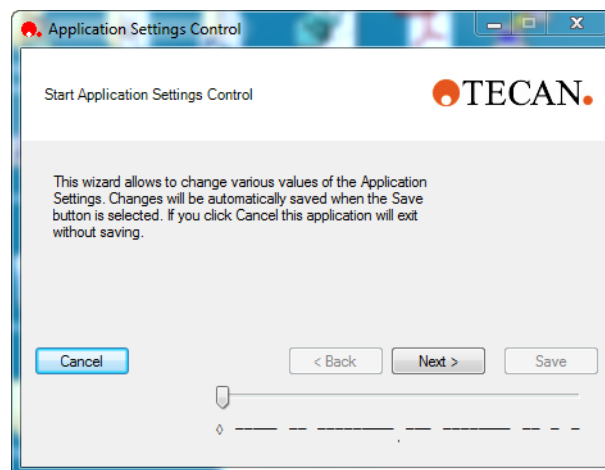


Fig. 4-1 Application Settings Control dialog, example

- 2 In each of the Application Settings Control screens
 - consult the option description
 - change the settings as needed
 - click the **Next** button, to continue

*After clicking **Save**, the settings are saved automatically*

*Or click **Cancel** or click the **X** sign on the right in the window bar, to quit the Application Settings Control without saving your changes.*

In the Application Settings Control the following settings can be done:

Arm Settings

Define whether Arm initialization can be skipped and in what time span it shall be executed.

LiHa Settings

Define whether LiHa arm warm-up needs to be performed or not.

Define the relative LiHa arm detection tolerance.

Maintenance parameters

Define the time (n seconds) to soak cleaning agent.

Define the number of system liquid flush cycles when cleaning the liquid system.

Time (3 seconds) for the washer to initialize. Do not change this setting.

Time (1 second) for the fast wash pump to stop before the washer finishes with priming. Do not change this setting.

Weighing station

Adjust the wash buffer consumption error tolerance for washer operations. For details refer to [4.5.1 "Consumption Error tolerance"](#), ¶ 4-10.

PosID

Select whether positive identification by PosID is enabled or disabled.

Note: This function will be overwritten if **Sample Splitting** is enabled.

If PosID is disabled, select if manual entry of barcode is permissible.

ASTM

Define the port settings.

Note that some of these settings do not become active.

Also refer to section [4.6.4.2 "Port Settings"](#), ¶ 4-17.

Define the communication settings for ASTM.

Note that some of these settings do not become active.

Also refer to section [4.6.4.1 "Communication Settings"](#), ¶ 4-16.

Transmission to LIS

Select the values (read results types) to be transmitted to the LIS when ASTM is active.

It is also possible to transmit further transformation, as long as the transformation name defined in Magellan starts with the token "Transformation", e.g. "TransformationBlankDeducted", "TransformationDividedByTwo", etc.

Shopping list mode

Select whether shopping list mode will be used or not.

- If it will be used, select whether predicted sample counts will be used in batch mode
 - Note: Do not select the function **Use PREDICTED sample counts in Batch mode** when dilution factors are defined in shopping list mode.*
- Also available in Shopping list mode is the activation of optional consumables during initial load. If this is selected, the following options are available:
 - Initially select optional consumables. If this is selected, the software will select the optional consumables in the loading dialog. The user can still deselect the optional consumables in the GUI, if they should not be loaded.
 - Perform volume check for optionally loaded consumables during initial load.

Edit barcode mode

Select if the user can assign a barcode to the selected plate during the load procedure.

Select the barcode input mode for consumables and samples. "Double" means that the barcode must be entered a second time, "Visible" means that the entered value is displayed. Otherwise, the barcode is masked, i.e. only placeholders of the entered characters are displayed.

Paths for persistent labware

Define the path where the data of persistent labware will be saved.

Plan per Sample Section

Select whether the planning is done per sample section or for all sections.

Alert

Enable or disable the acoustic alert signal during reload operations.

Select the type of acoustic alert signal.

Plates

Select if plates should be unloaded via transfer sites if possible. Select if the plate status should be hidden at plate unload.

Worklists

Define the permissible time span for worklists with pending orders.

External Program

Define whether an external program at the end of day maintenance needs to be executed.

Washer feature

Select whether default Priming should be executed at the end of the run. Washer will be primed with system liquid to avoid clogging of the channels.

Sample Splitting

Select the Sample Splitting mode and, in case of "Scan and Load", define the output file (barcode list) destination and format.

Note: This function overwrites the setting for PosID, i.e. the barcode identification will always be enabled when sample splitting is selected.

Fast Mode

Select if Fast Mode is allowed or not. If it is allowed, the pipetting instrument can execute a schedule faster when jobs finish earlier than planned.

Profiling and Optimization

Define whether jobs will continuously be profiled, and whether the collected data will be used for optimizations (dynamic durations).
For details refer to [4.5.2 "Profiling and Optimization"](#), [4-11](#).

Timing Compatibility

Select the corresponding option for the scheduling behavior in connection with earlier releases of the software.

Washer error handling options

Define the error handling mode for the error: 'Not enough wash liquid available'.

In case of "Allow Access" select the value for the user intervention timeout. In case of "Abort Process" the process is aborted immediately. If "Allow Access" is selected and a timeout occurs the process is aborted.

DiTi error handling options

Define the error handling for the two error cases: 'No DiTi fetched' and 'Could not dispose DiTi' and select the value for the user intervention timeout.

Recovery action

Select the recovery action to be executed after a error handling timeout occurred (e.g. for LiHa, defined in Liquid Class Editor: Error handling options).

Options: Default (behavior according to default settings of the corresponding error handler), Skip, Abort (process/run).

Timing constraints

Define whether violations of timing constraints are handled as errors, or whether they cause only warnings.

Define whether constraint violations will be listed as process errors in the process data section of the ProcessReport.xml file.

Magellan errors

Select if pipetting instrument will continue a run despite errors reported by Magellan (this setting will only take effect with unsigned configurations).

Decontamination liquid

Select if the pipetting instrument will or will not stop if there is not enough decontamination liquid or none at all.

Automatic get from operator

Specify how to proceed in case there are not enough plates on the worktable. The two options are "switch to get from operator" and "remove according process".

Plate scan error handling

Define the error handling mode in case of a PosID error during single component scan of a plate as part of the assay execution.

In case of **Allow Access** select the value for the user intervention timeout.

- The behavior in case of a timeout corresponds to the behavior when **Abort Process** is selected.

In case of **Abort Process** the system behaves as follows:

- The plate barcode of the process is not valid: The process is aborted.
- Other plate barcodes on the carrier are not valid: These plates are marked with an error and the process continues.

Layout output

Define whether a layout file for manual recovery will be created and determine the corresponding path.

TPL output

Determine the paths for TPL output, Intermediate output and Converter Backup. Define whether a final TPL file must be created or not.

Output files

Specify the output (report) file format to be generated.

Schedule settings

Export screenshot of the running schedule to an image file for easier error recovery.

When you have changed the settings, click the **Save** button, to save the changed settings and quit the Application Settings Control dialog.

RoMa Speed

Determine the Roma Speed for different positions and axes.

4.5.1 Consumption Error tolerance

The weighing scale measures the remaining wash liquid in the wash bottles. To plan (re)load actions, and to make sure that sufficient buffer liquid is available for the process run, the software calculates the buffer consumption based on a “worst-case scenario”.

The default setting for **buffer consumption error tolerance** (0%) enables the software to calculate the consumption considering the following facts:

- ◆ Each washer has a slightly different prime and rinse consumption.
- ◆ For each wash program, the software calculates a channel change prime, even if the test configuration does not require that.
- ◆ The weighing scale may drift during the time period between the calibrations.

This explains why the calculated buffer consumption may differ from the actual consumption.

Adjusting the Value

In case of expensive buffer liquids you may want to compensate this difference, i.e. to adjust the error tolerance of the weighing station in order to economize wash liquid. Be aware that you perform this setting at your own risk.



ATTENTION

Risk of running out of buffer liquid during process, if **buffer consumption error tolerance** is set below 0%.

- ◆ Only modify the setting if you are limited in wash liquid availability. Reset the setting to 0% if wash liquid is easily available.
- ◆ Regularly check if there is sufficient wash liquid for your application.
- ◆ Be aware of the fact that the weighing scale drift is not compensated any more.
- ◆ Be aware of the fact that the changes affect each assay that uses the corresponding wash bottle position.

To evaluate the setting, proceed as follows:

- 1 Select the wash bottle position with the limited buffer amount.
- 2 Use the assay compositions (also strip compositions) with the lowest residual volume (wash buffer), the most wash buffer changes and the worst-case wash layouts (number of samples).
- 3 Perform several runs (at least 10) of the above mentioned worst-case composition for the selected wash bottle position.
- 4 Exactly follow the volume loading instructions issued by the software.
- 5 Measure the remaining liquid volume in the selected wash bottle after finishing the run(s).
- 6 Note the lowest measured volume (remaining at the end of the runs) from all executed runs and subtract the dead volume (50 ml for the 2 l wash bottles; 200 ml for the 4 l wash bottles) from that volume.

Note: If the variation of the measured remaining volumes at the end of several runs exceeds 100 ml Tecan does not recommend you to change the setting.

- 7 Modify the **buffer consumption error tolerance** of the corresponding wash bottle position by one percent for each 20 ml (for 2 l bottle) or 40 ml (for 4 l bottle) in the **ApplicationSettingsControl** (default is 0%).
Note: The permissible range is +10% to -50% (plus increases - minus reduces the remaining buffer).
- 8 Restore the default error tolerance value (0%) when you change to assays without critical wash liquid amounts.

Example

The following example explains how wash liquid can be economized:

- ◆ At the end of several runs there remains a volume of 300 to 350 ml in the 2 l wash bottle.
- ◆ Subtract the death volume from the lowest measured volume (300 minus 50): 250 ml
- ◆ Change the setting of the **buffer consumption error tolerance** (250 ml/20 ml [represents 1%] = 12.5): -12%
- ◆ After changing the setting, only 60 to 110 ml should be left in the wash bottle; you save approximately 240 ml per run.

4.5.2 Profiling and Optimization

If configured accordingly, the Freedom EVOLution SW features dynamic durations. It measures and stores the duration of every supported job with successful termination (profiling). The durations of new jobs run later are determined with the measured durations as calculation basis (optimization).

Note: If a job produces errors or warnings, its duration data is discarded.

Supported Jobs

The following jobs can be profiled and optimized:

- ◆ Multi aspirate jobs
- ◆ Decontamination jobs
- ◆ Transfer jobs
- ◆ Pipetting jobs
- ◆ Washing jobs

- ◆ Reading jobs

Profiling of pipetting, washing, and reading jobs takes the number of samples into account: for the calculation of these job durations, the system first tries to find profiling entries that match exactly the number of samples actually processed. If no such data are available, the system uses the values measured with a higher number of samples. If these data can not be found either in the archive, the static job durations are used.

Data

The measured data are saved to the Profiling.oba archive file in the SessionData folder. For unsigned configurations, these data are used for optimization in the next run, to determine the job duration. Data measured during an job simulation are not used with real hardware, and data measured during a run on the hardware are not used for simulations.

A second, frozen profiling database can be stored in the Configurations folder of a configuration. If the configuration is signed, the system uses only this database for the duration calculations. If the configuration is not signed, data from both the SessionData and the Configurations folder are used.

However, new profiling data are written exclusively to the profiling database in the SessionData folder. The additional profiling database in the Configurations folder is configuration specific and treated as read-only (frozen).

If no measured data are available for a job, the system uses the static job durations specified in the Process Definition Editor, or in the file Durations.xml.

Settings

The settings for the use of dynamic durations can be specified in the Application Settings Control:

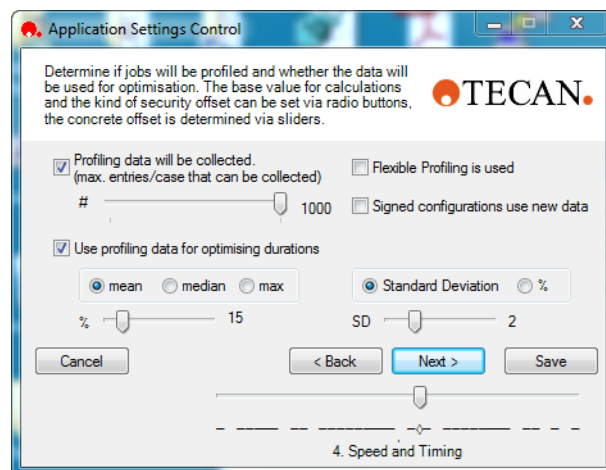


Fig. 4-2 Dynamic Durations Settings in the Application Settings Control

Profiling data will be collected

- ◆ The check box enables or disables job profiling, that is, the storage of the durations of successful jobs. If profiling is disabled here, but optimization is enabled, no new durations will be collected, but the calculation of job durations is still carried out, based on the existing duration data.
- ◆ With the slider, #, the number of measurements can be specified.

Use profiling data for optimizing durations

- ◆ The check box enables or disables the optimization of processes, based on the measured job durations. If **Use profiling data for optimising durations** is disabled here, but **Profiling data will be collected** is enabled, the system

will continue to collect job duration data, but it will use the static job durations as defined in the Process Definition Editor, or in the file Durations.xml.

- ◆ With the option buttons, **mean**, **median**, and **max.**, you can specify the kind of statistical parameter which is used as base value for the calculations.
- ◆ With the slider, **%**, you determine in percent the security offset which is added to the base value.
- ◆ With the slider, **SD**, you determine the number of standard deviations as security offset added to the base value.

Allow scheduled fast mode if jobs finished earlier than planned. If fast mode is selected, the software will continue to the next job if the actual job is done, even if the static duration is not over yet.

4.6 ASTM Interface Setup

4.6.1 Introduction

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Supported records	See section 14.2 , 14-5

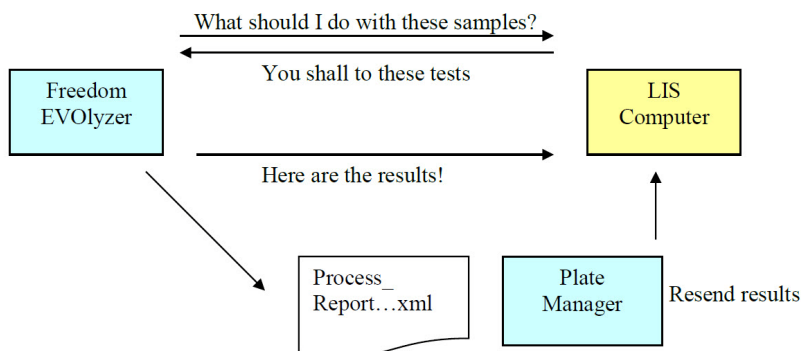
The ASTM Interface for the Tecan instrument with Freedom EVOlution SW is based on the low level protocol as described in ASTM E 1394. It does not support all records and fields of the standard. Refer to cross references above.

4.6.2 Work Principle

The connection is bidirectional which implies that the instrument requests the workorders to execute for each scanned sample ID and that it also sends back results records for each sample ID.

The following block diagram illustrates the data flow:

Freedom EVOlyzer:



Freedom EVO Clinical:

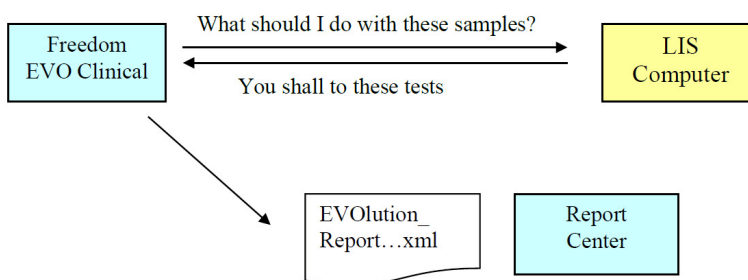


Fig. 4-3 Block diagram

Note: *The instrument with Freedom EVOlution SW is using direct communication via a serial port to connect to the LIS. It is not file based.*

4.6.3 Activating the ASTM Mode

Cross References

List of cross references to information provided in other sections:

Subject	See
Transmission to LIS	4.5 , 4-6
Manually send a result file	4.6.5 , 4-18

To activate the ASTM mode, proceed as follows:

- 1 Select the Workmode **ASTM** in the Run Control under **Application Settings**. Refer to the Freedom EVOLution Runtime Controller Manual.
This setting is global, i.e. all configurations now work with the workmode ASTM.
- 2 Make sure that the serial cable to the LIS is connected to the correct port on the computer.
- 3 In the Application Settings Control, define which values (result types) need to be sent to the LIS.
Refer to cross references above.
- 4 Check communication by manually sending a result file.
Refer to cross references above.

4.6.4 ASTM Interface Settings

4.6.4.1 Communication Settings

Default settings

- ◆ Communication settings:
 - 1 start bit (not editable)
 - 8 char byte size
 - 1 stop bit
 - No parity bit
- ◆ Communication port
 - COM5
- ◆ Baud rate
 - 9600 Baud.

To change these parameters change the field CommSettings="9600" in the ASTM.channel.config as follows:

- 1 Define the communication settings as a string (e.g.:
CommSettings="38400;7;0;N")
 - Baud rate
 - Number of data bits per byte (7 or 8)
 - Stop bit code (0=1 bit; 1=1.5 bit; 2=2 bit)
 - Parity type (N=None; O=Odd; E=Even; N=None; M=Mark; S=Space)

The timeout is set to 30 seconds.

Note: The Freedom EVOLution SW sends **all** sample IDs found in one block when requesting sample orders. The answer must be sent back to Freedom EVOLution SW within 30 seconds.

Note: The ASTM settings in the Application Settings Control are **not** active except for the “Carriage Return” and “Automatic Export of results”. Changes must be made directly in the ASTMchannel.config file.

4.6.4.2 Port Settings

The default port for ASTM communication is COM5. The default baud rate is 9600. These settings can be edited in the LIS.channel.config file, which can be found in the directory:

C:\Program Files (x86)\Common Files\Tecan\Communication\2.3.0\Config

To edit these settings, open the file LIS.channel.config file in a text editor and edit the following section:

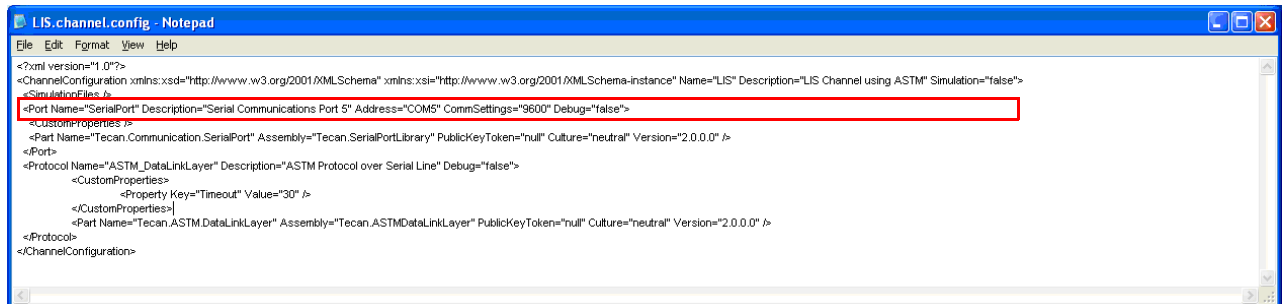


Fig. 4-4 LIS.channel.config file

Note: The port setting and the baud rate is overwritten if the Freedom EVOLution SW is reinstalled.

Note: The ASTM settings in the Application Settings Control are **not** active except for the “Carriage Return” and “Automatic Export of results”.

4.6.4.3 Set Read Result Types

Select the read results types to be sent (for the sample) to the LIS. This setting is done in the Application Settings Control. Refer to section 4.5 “The Application Settings Control”, 4-6.

Note: These settings are global, i.e. they apply to all assays in all configurations.

Note: It is also possible to send arbitrary transformations to the LIS. For this to take effect, the transformation label for the transformation (which is set in the Magellan Software) must start with the token “Transformation” (case sensitive) e.g. “TransformationMyCalculation”, “TransformationODMinusThree”, etc.

4.6.5 Manually Sending a Result File

To manually send a result file, e.g. for testing purposes, proceed as follows:

- 1 Open the LogViewer and unselect all channels except the ATSM branch.
The log files will show if the transmission was successful.
- 2 Open the **Plate Manager** (SW version 2.0), select a file and click **(Re)send**.
Or Open the **Report Center** (SW version 2.1), select a file and choose from the **File** menu either **Send to LIS/LIMS** or **Send to LIS/LIMS and archive**.

*The system will now extract the result data from the corresponding XML file.
It is possible to copy an XML file from a different installation to the output directory and send it for test purposes.*

If the transmission to the LIS failed, the software issues a corresponding error message.

- 3 Evaluate the log file in the LogViewer.
The log file displays elementary errors, e.g. a poor cable connection to the port.

Note: When sending result files manually, pay attention to the following:

- Make sure that the LIS does not accept these test data as real results.
- It is possible to send a result file that has been manually modified.

4.6.6 ASTM/LIS Frequently Asked Questions

The following FAQs may be helpful:

Which names are used to identify the assays in my ASTM driver?

Freedom EVOLution SW uses the assay name, defined in the PDE, to identify the assay (**not** the assay file name, but the assay name). The assay names are case-sensitive. If the host name differs from the Freedom EVOLution assay name then a XML conversion file **ProcessNameList.xml** can handle this.

Note: Make sure not to have several assays with the same name.

Example of a process entry:

```
<MappingEntry AssayName="HBsAg" AnalyzerTestName="905"  
HostName="HBsAg"/>
```

What error codes are sent to the LIS?

Only the distinction between "Warning" or "Fail" is made and sent to the LIS. For further analysis of the errors, refer to the Process Report in the Plate Manager / Report Center.

Are the plate barcodes sent to the LIS?

Yes, from EVOLution 2.0.13 and newer the plate barcode is sent within the Message Header Record of the results, see description of the fields in the Message Header Record.

Are the values for the controls and the standards sent to the LIS?

No

What can I do if I want the Freedom EVOLution SW to deliver results to the LIS but not to ask for requests?

Configure the LIS in such a way that it does not send back any work orders when the Freedom EVOLution SW sends requests.

What can I do if I want the Freedom EVOLution SW to ask for requests from the LIS but not send back results?

Configure the LIS not to accept any results from the Freedom EVOLution SW without generating any error messages on the LIS side and do not select **automatic export of results** in Application Settings Editor.

What happens if there are no work orders in the LIS for a requested patient sample?

The user is informed that work orders are lacking for some samples. The user may manually assign assays to samples in the EVOLution Run Control.

What happens if the LIS requests the Freedom EVOLution SW to perform an assay which is not in the configuration for a sample?

The request for the particular assay is ignored by Freedom EVOLution SW.

I don't want the result data to be automatically sent to the LIS. I want to send them manually. What can I do?

In the Application Settings Control, navigate to "Communication settings for ASTM" and unselect the check box "Automatic Export of Results".

How do I know which COM port is which?

Select **Start>Settings>Control Panel>System>Hardware>Device Manager**. The **Ports** section displays which ports are available.

To find out the assigned port number, use Magellan and the Sunrise Reader communication cable. When starting Magellan, the SW tries to connect to the Sunrise Reader. If it succeeds, it tells you the current COM port number.

Are results from the verification reads sent to the LIS?

No

Can I send the results to the LIS if there is no reader method defined in the assay?

No, a final read is a prerequisite that any results are sent to the LIS.

Why doesn't the host computer receive results?

This can have several causes:

- There is something wrong with the cables and/or connections.
- The port settings are incorrect.
- The results you want to send are not defined in the Magellan method.
- The results you want to send are not selected in the Application Settings Control.
- The final read was never performed.

- The transformation name contains a special character that is not understood by the LIS (checksum not correct). In this case, the SW will try a max of 5 times to transmit only the first sample, afterwards, the communication will be terminated. It can be re-started when the next assay results are available for transmission.
- The name of the transformation does not start with the token "Transformation..."

The Process ...xml report (to be found in the Output directory) contains all the Magellan result types that have been defined in the reader method. You can open the XML file and look under a well section to see them.

- If you do not find the result type you want to send in this section, something in the Magellan method is not defined correctly.
- If you find the result type you want to send in this section but the results are still not sent to the host computer, something with the communication between the Freedom EVOLution SW computer and the LIS host is wrong.

What should be done if the EVOLyzer or EVO Clinical is processing lots of samples and the answer with the orders from the server arrives only after a long waiting time? (How can I change the time out values?)

The time for which the EVOLution SW waits for an answer from the LIS server is set in the LIS.channel.config file, and it can be adjusted. As a default it is set to 30 s. The LIS.channel.config file can be edited with Notepad or with the ChannelConfigurator utility. In either way, Windows Administrator rights are needed to change the file.

The LIS.channel.config file can be found in: **C:\Program Files (x86)\Common Files\Tecan\Communication\2.3.0\Config Folder.**

Prior to EVOLution for EVOLyzer 2.0.13 and EVOLution for EVOClinical 2.1.2 the timeout was hard coded to 15 s.

4.7 Uninstall Procedure



ATTENTION

The uninstall procedure will remove all components of the Freedom EVolution SW, the saved archives, however, will be left intact and are accessible to a re-installed Freedom EVolution SW or a newer version of it.

To uninstall the Freedom EVolution SW:

- 1 Make sure that you are logged into Windows with administrator rights.
- 2 If the Freedom EVolution SW is running in your system, exit the program.
- 3 In Windows , click **Start -Control Panel - Add/remove software**.
- 4 In the software control panel, click **Change/remove program**. The list of installed software appears.
- 5 In the list of installed software, click to select the Freedom EVolution SW.
- 6 Click the Change/remove button, to start the program removal.
- 7 Follow the instructions displayed.

5 Settings Editor¹⁾

Purpose of This Chapter

This chapter describes the Freedom EVolution SW Settings Editor and its functions.

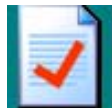


Fig. 5-1 Settings Editor icon

5.1 Introduction

Purpose

The Settings Editor provides the possibility to define different settings for diverse configurations and application profiles intended for application-wide parameters.

Application-wide parameters:

- operating modes
- program features
- hardware configuration

Access Rights

The Settings Editor is indented for product and application specialist requiring the appropriate user rights assignment to login.

¹⁾ Freedom EVolution V2.2 only

5.1.1 GUI Overview

Settings Editor

The Settings Editor user interface has been divided into two sections showing a tree viewer (A) containing the different settings levels on the left and the editing tabs (B) on the right [Fig. 5-2](#), [Fig. 5-2](#).

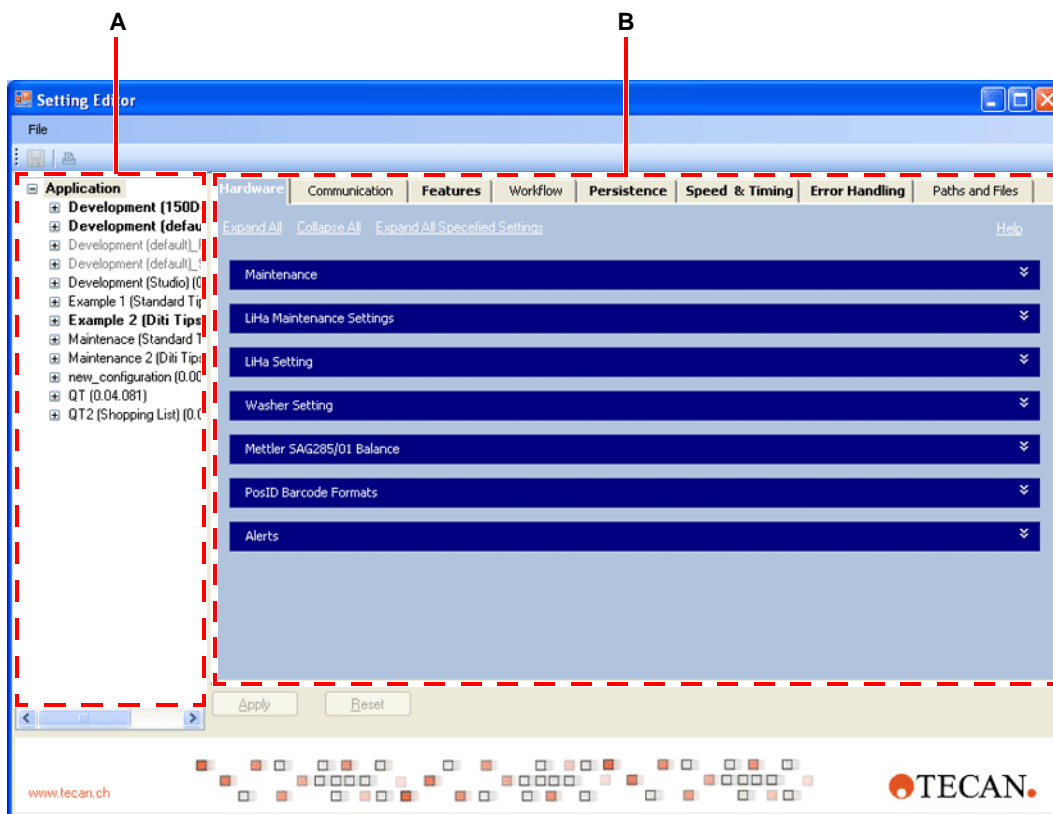


Fig. 5-2 Settings Editor

A Tree Viewer

B Editing tabs

- Structure** The root node **Application** contains nodes representing defined configurations. Configuration node contains profile nodes with specific settings each.
- Levels** A selected a tree node can be viewed or edited. Specify settings made will only apply to the appointed level.
- Defaults** Settings not specified for a certain level are subordinative to the attributes of next higher levels profile.
- Subsets** The **Application** level provides the viewing and changing of settings. Other levels only display a subset of the settings.

5.1.2 Hardware

Each level of the hardware tab described below provides the possibility to change or set the specified settings (**Specify settings for this level**) to default (**Use Default Settings**).

Maintenance

The maintenace tab provides the possibility to specify maintenace settings.

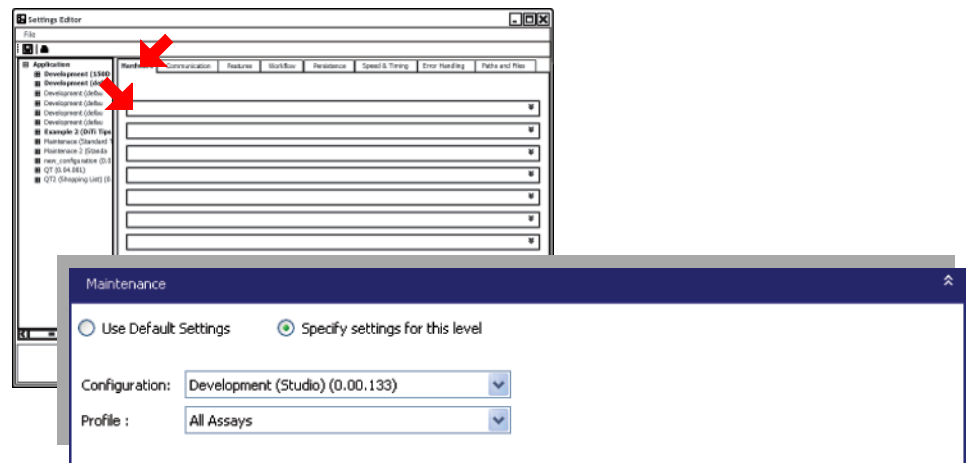


Fig. 5-3 Setting Editor, Maintenance

Configuration:

- Select the required maintenace configuration from the dropdown list.

Note: This configuration has to contain the consumables needed for your maintenace procedure.

Profile:

- Select the required maintenace profile from the dropdown list.
- This maintenace profile defines the loading of consumables necessary for maintenace.

Note: This profile has to define the loading places of the consumables necessary for maintenace.

LiHa Maintenance Settings

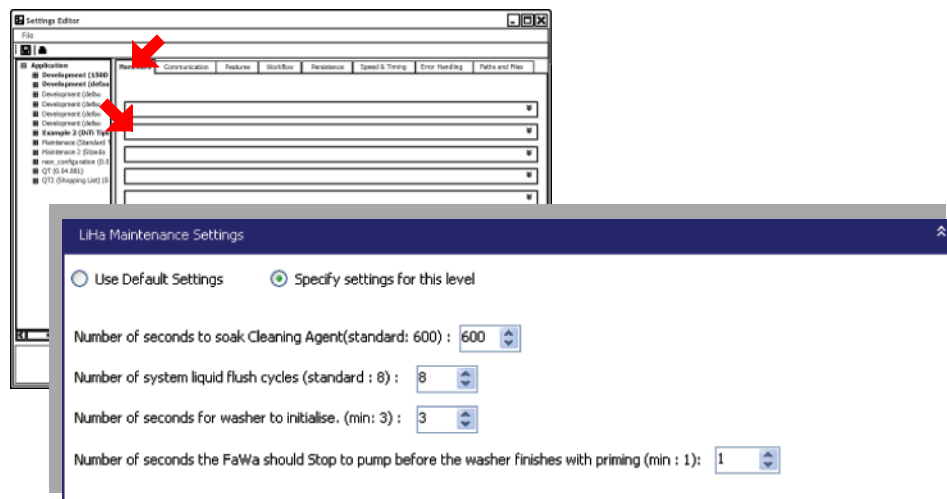


Fig. 5-4 Setting Editor, LiHa Maintenance Settings

Number of seconds to soak Cleaning Agent:

- Define the time [seconds] to soak cleaning agent.

Number of system liquid flush cycles:

- Define the number of system liquid flush cycles required for cleaning the liquid system.

Number of system liquid flush cycles:

- Define the number of system liquid flush cycles when cleaning the liquid system.

Number of seconds for the washer to initialize:

- Define the number of seconds the washer requires to initialize before priming.

Default: 2 seconds

Number of seconds the FaWa should Stop to pump before the washer finishes with priming:

- Define the time [seconds] the FaWa shall stop to pump before the washer finishes with priming.

Default: 1 seconds

LiHa Settings

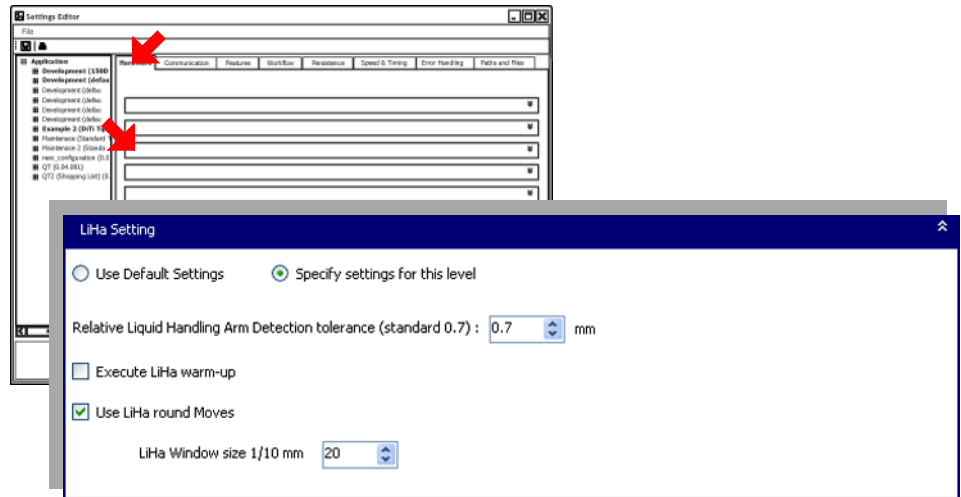


Fig. 5-5 Setting Editor, LiHa Settings

LiHa Arm Detection Tolerance:

- The LiHa arm detection tolerance defines the theoretical distance respectively the volume the system requires to compensate small inaccuracies of instruments, to make sure sufficient liquid is detected.

Note: The detection tolerance edited is automatically added to the assay volume set.

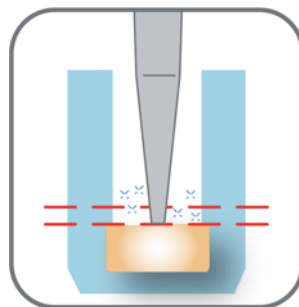


Fig. 5-6 Detection Tolerance

Note: The distance edited determines how much more liquid has to be added.

- $Surface \times height (Detection\ Tolerance) = Volume\ (to\ be\ added)$

Execute LiHa warm-up:

- Tick the **Execute LiHa Warm-up** checkbox if your LiHa is equipped with a previous version of the DCServo board.

Note: New instruments respectively LiHa with brushless DCServo boards do not require a warm-up.

Washer Settings

The washer settings define the tolerance of the of the weighing scale measuring the remaining wash liquid in each bottle. The washer settings provide the possibility to plan load or reload actions to make sure sufficient liquid is available for the process run.

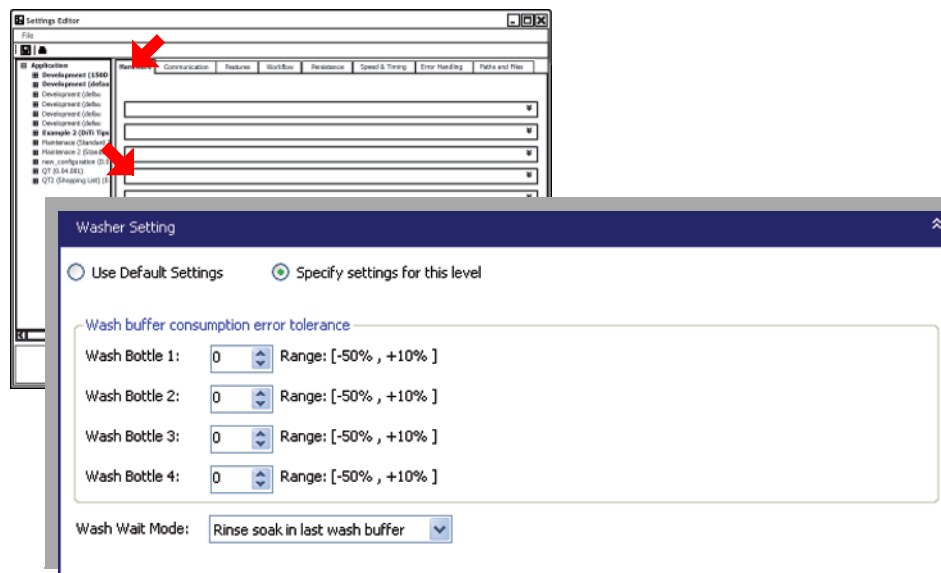


Fig. 5-7 Setting Editor, Washer Setting

Washer buffer consumption error tolerance:

- The washer buffer consumption error tolerance for the wash bottles 1 to 4 (one for each bottle) defines the error tolerance of the wash buffer consumption

Note: The buffer consumption is based on a maximum credible event of low wash liquid calculated by the software.

The default setting for the buffer consumption error tolerance (0%) enables the software to calculate the consumption considering the following facts:

- Each washer has a slightly different prime and rinse consumption.
- For each wash program, the software calculates a channel change prime, even if the test configuration does not require that.
- The weighing scale may slightly drift during the time period between the calibrations.

Note: The calculated buffer consumption may differ from the actual consumption.

Washer Settings Values

The error tolerance of the weighing scale can be adjusted to compensate the difference of the washer buffer consumption error tolerance, in order to economize the use of the wash liquid when operating with expensive buffer liquids.

Note: Use caution when adjusting the error tolerance of the weighing scale.

- Any changes made are at one's own risk.
- Changes made apply to each assay that uses the corresponding wash bottle position



ATTENTION

Risk of running out of buffer liquid. Setting the buffer consumption error tolerance below 0% will lead to lack of liquid during process.

- ♦ Only modify the setting if you are limited in wash liquid availability. Reset the setting to 0% if wash liquid is easily available.
- ♦ Regularly check if there is sufficient wash liquid for your application.
- ♦ The weighing scale drift will not be compensated.

Evaluating Settings

Follow the substeps below to evaluate the settings:

- 1 Select the wash bottle position with the limited buffer amount.
- 2 Use the assay compositions (also strip compositions) with the lowest residual volume (wash buffer), the most wash buffer changes and the worst-case wash layouts (number of samples).

Refer to chapter 7 "Process Definition Editor, PDE", 7-1

- 3 Perform several runs (at least 3) of the above mentioned worst-case composition for the selected wash bottle position.

Refer to the instrument Operating Manual

- 4 Perform the software instructions prompted
- 5 Exactly follow the volume loading instructions prompted by the software.
- 6 Measure the remaining liquid volume in the selected wash bottle after finishing the run(s).

Refer to the instrument Operating Manual

Note: The lowest measured volume (remaining at the end of the runs) from all executed runs and subtract the dead volume (50 ml for the 2 liter wash bottles; 200 ml for the 4 liters wash bottles) from that volume.

Note: If the variation of the measured remaining volumes at the end of several runs exceeds 100 ml Tecan does not recommend you to change the setting.

- 7 Modify the buffer consumption error tolerance of the corresponding wash bottle position by one percent for each 20 ml (for 2 liters bottle) or 40 ml (for 4 liters bottle) in the Settings Editor (default is 0%).

The permissible range is +10% to -50% (plus increases - minus reduces the remaining buffer).

- 8 Restore the default error tolerance value (0%) when you change to assays without critical wash liquid amounts.

Economizing

The following example explains how wash liquid can be economized:

- ◆ After several runs a volume of 300 - 350 ml remain in a 2 liter wash bottle.

Example

- The following example explains how wash liquid can be economized:
- At the end of several runs there remains a volume of 300 to 350 ml in the 2 l wash bottle.
- Subtract the death volume from the lowest measured volume (300 minus 50): 250 ml
- Change the setting of the buffer consumption error tolerance (250 ml/20 ml [represents 1%] = 12.5): -12%
- After changing the setting, only 60 to 110 ml should be left in the wash bottle; you save approximately 240 ml per run.

Wash Wait Mode¶

To prevent the needles of the wash manifold from drying out for the time they are not used in a process, two different modes are available:

- ◆ Rinse soak in last wash buffer:
 - The waste sink is filled with the wash buffer recently used, the manifold is lowered into it and left there until it is needed again by the process. In this mode the washer will, after lowering the needles, rinse them for a configurable period of time (adjustable in durations.xml).
- ◆ No rise soak:
 - No wash wait mode is used.

**Mettler SAG285/
01 Balance¶**

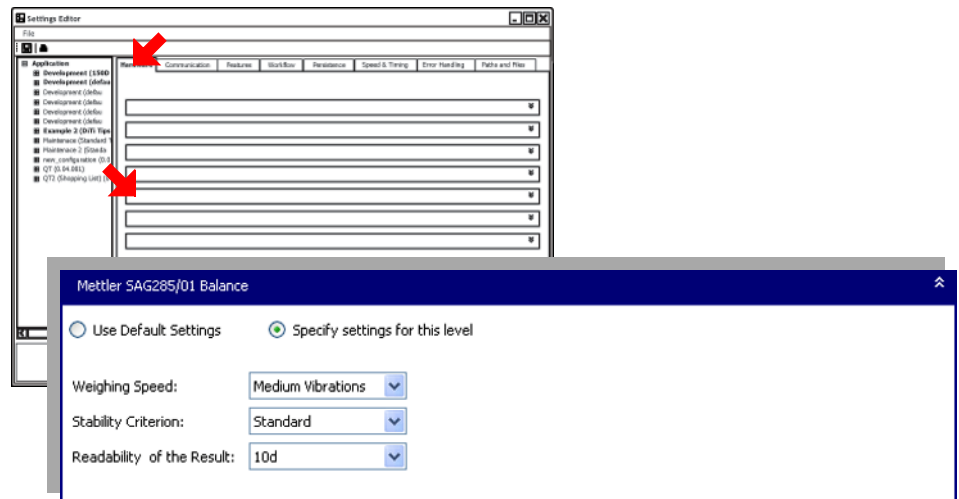


Fig. 5-8 Setting Editor, Mettler SAG285/01 Balance¶

Weighing Speed

Setting of the weighing speed (vibration adapter)

- ◆ **Low Vibrations:** Rapid stabilization, unstable if disturbances appear; setting for stable surroundings.
- ◆ **Medium Vibrations** (factory setting): Average stabilization, insensitive to disturbances; setting for normal surroundings.
- ◆ **High Vibrations:** Slow stabilization, very stable if disturbances appear; setting for unstable surroundings.

Stability Criterion

Several consecutive measured values are compared with one another. The stability criterion is met when the difference is typically less than 0.3 display increments. The weight value is thus released as stable after a relative short or long time.

The following values are possible:

- ◆ **Off:** Only 2 consecutive measured values are compared.
- ◆ **Standard:** 3 consecutive measured values are compared.
- ◆ **Good** (factory setting): 5 consecutive measured values are compared.
- ◆ **Excellent:** 7 consecutive measured values are compared.
- ◆ **Best:** 9 consecutive measured values are compared.

Readability of the Result

Balance setting “Readability of the results” has two entries:

- ◆ **1d** (1d readability): Maximum accuracy (factory setting). That value is used for dispensed volumes ≤ 100 µl. The balance uses two positions after the decimal point. Unit is [mg].
- ◆ **10d** (10d readability): Results are released as stable faster. That value is used for dispensed volumes > 100 µl. The balance uses one position after the decimal point. Unit is [mg].

PosID Barcode Formats

The PosID barcode formats menu provides the possibility to activate the barcode types to be recognized.

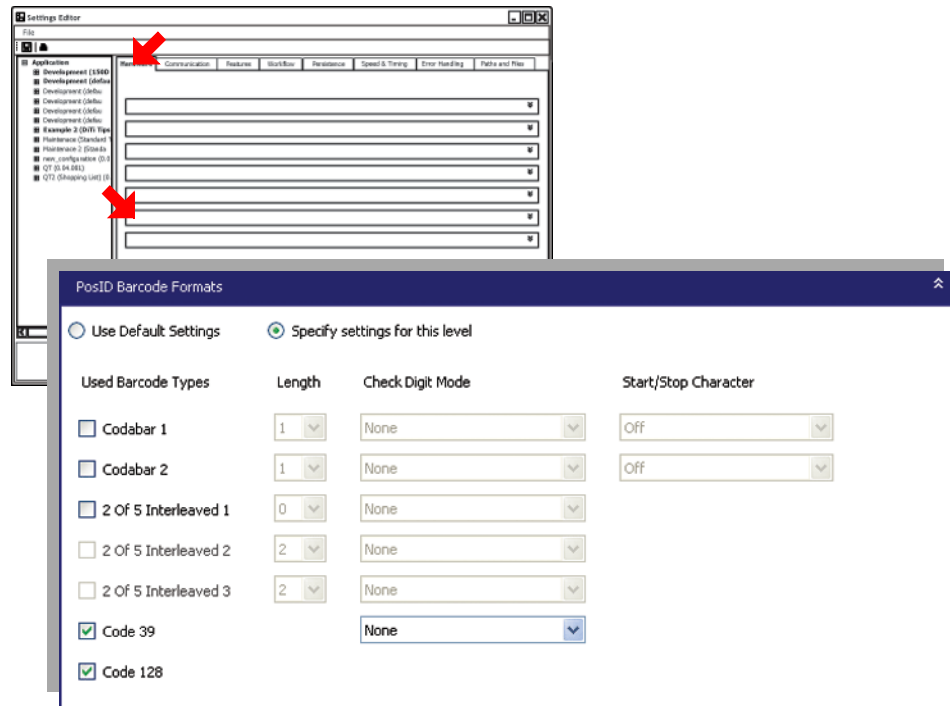


Fig. 5-9 Setting Editor, PosID Barcode Formats

Used Barcode Types:

- The barcode types **Codabar** and **2 of 5 Interleaved** require the following definitions:
 - Length
 - Check digit mode
 - Start/stop character
- The barcode types Codbar and 2 of 5 Interleaved can make difficulties because of their variable length.
 - Perform a respective evaluation with the appropriate criteria.
 - The software enables the possibility to retrieve the correct barcode information from the PosID. Refer to the section "Positive Identification (PosID)" in the corresponding Operating Manual of the instrument.

Alters

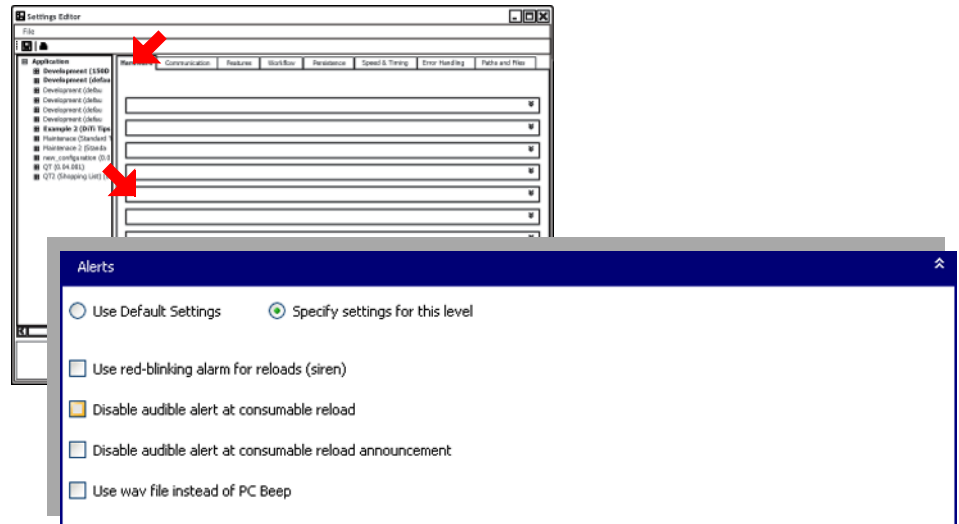


Fig. 5-10 Setting Editor, Alerts

Disable audible alert at consumable reload:

- When checked: The computer audio alert will not sound during the actual reload operation.

Disable audible alert at consumable reload announcement:

- When checked: The computer audio alert will not sound when the reload announcement panel is displayed.

Note: Make sure the (*Duration.xml*) that *AnnouncementCommand* has a duration of at least 4.5 seconds.

- The warning will be logged in the log file.

Use wav file instead of computer audio alert:

- When checked: The file **InstallationData\GUI\sound.wav** will be played instead of the computer audio alert.
- **Use the red blinking alerts for reloading operations (siren):** When checked, reloading operations are indicated with red blinking alerts which are instead of green blinking alerts.

Note: Red blinking additionally enables the audio alert of the instrument.

5.1.3 Communication

ASTM Communication Parameters

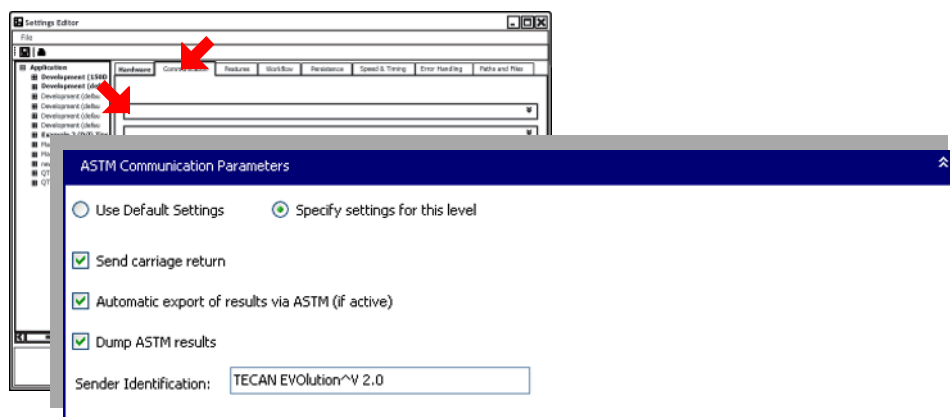


Fig. 5-11 Setting Editor, ASTM Communication Parameters

Send carriage return:

- When checked: An additional <CR> is sent after the ASTM message block:

<STX>(Message)<CR><ETX><CR><LF>

- The normal result transmission format is:

<STX>(Message)<ETX><CR><LF>

Automatic export of results via ASTM (if active):

- When checked: The results are automatically sent via the ASTM just after they were created by the system.
- When not checked: The results have to be sent manually using the report center to be transmitted via the ASTM.

Dump ASTM results:

- When checked: Sends the results (same results as ASTM) to a file:

e.g. <OutputPath>/ASTM_Results_2008-12-31_13-45-56.txt



<OutputPath>/ASTM_Results_YYYY-MM-dd_HH-mm-ss.txt

- YYYY year (i.e. 2008)
- MM month (i.e. 12)
- dd day (i.e. 31)
- HH hour in 24h format (i.e. 13 for 13:00)
- mm minutes (i.e. 45)
- ss seconds (i.e. 56)

ASTM Record Contents

The ASTM Record Content defines which Magellan Data has to be transmitted via ASTM.

Note: The ASTM Record Contents checkboxes have the nomenclature as in the Magellan Software.

- Refer to the Magellan Software Application Manual for further information.

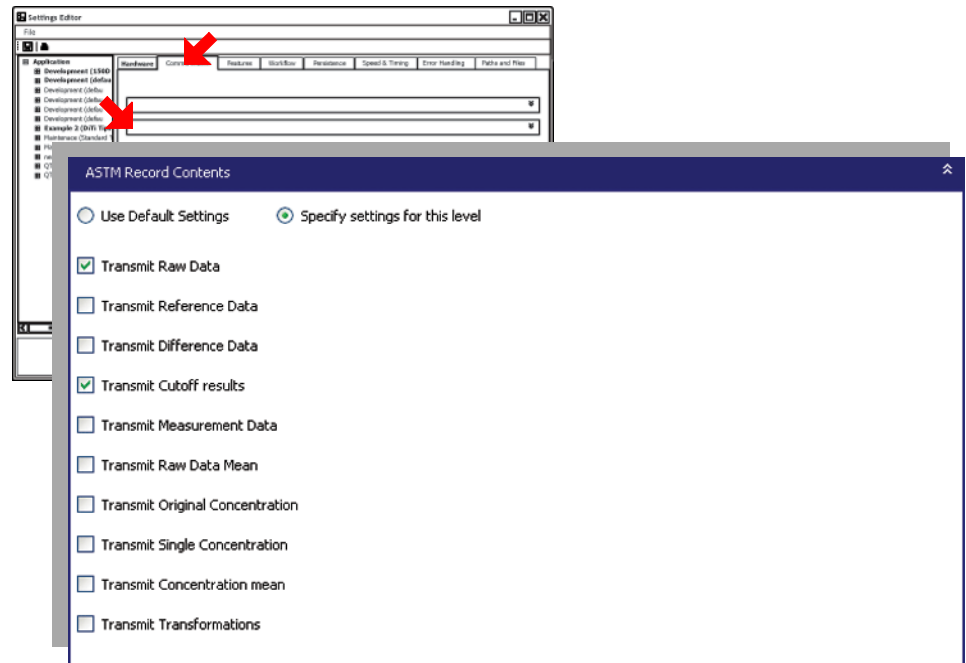


Fig. 5-12 Setting Editor, ASTM Communication Parameters

- When checked: Checkboxes checked define the data to be transmitted.

Note: If no checkbox has been checked, no results will be transmitted.

5.1.4 Features

Work without PosID

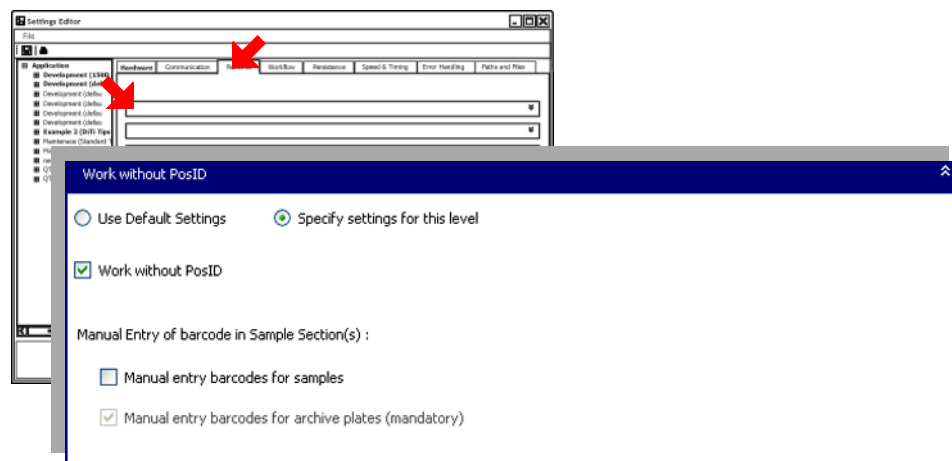


Fig. 5-13 Setting Editor, Work without PosID

Work without PosID:

- When checked: PosID is disabled.

Manual entry barcodes for samples:

- When checked: Manual entry of barcodes in sample sections enabled. Select if manual entry of barcode is allowed for samples.
- When not checked: The barcodes are generated automatically

Note: The checkbox for manual entry of barcodes in the sample sections are only enabled if the **Work without PosID checkbox** has been checked.

Samples Check **Manual entry barcodes for samples**, if manual entry of barcode is allowed for samples.

If not checked, the barcodes are generated automatically.

Archive Plates Check **Manual entry barcodes for samples** when operating with archive plates (manual entry has to be activated).

Plate and sample barcodes are handled in the correspondent [.map] files in the worklist folder.*

**Edit Barcode
Mode**

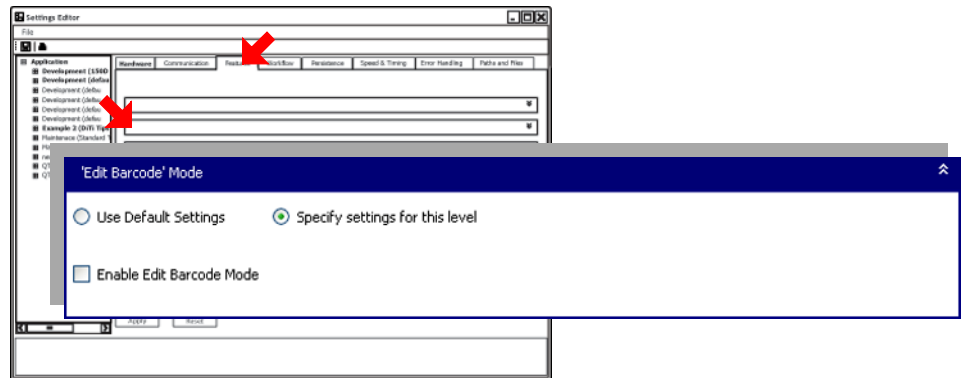


Fig. 5-14 Setting Editor, Edit Barcode Mode

Work without PosID:

- When checked: Edit barcode mode activated. The user is required to assign a barcode to the selected plate during the loading procedure.

Partially used plates:

Partially used plates, require persistence of plates. Plate barcodes have to be known before they are scanned by PosID.

After the barcode has been entered manually, the systems identifies the section of the plate has already been used, and schedules accordingly. The PosID then verifies and approves the barcode entered.

End of Day Summary

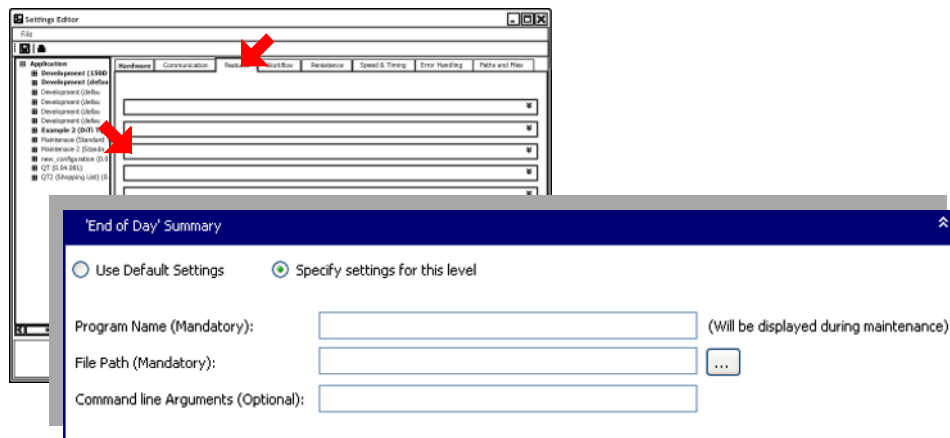


Fig. 5-15 Setting Editor, End of Day Summary

The end of day summary provides the scheduling of a program to be ran after the end-of-day maintenance.

Note: The program will also run if a maintenance step generated an error.

Program Name:

- The name which will be displayed in EVOLution GUI.

File Path:

- Edit the full path to the program to be ran.
- **Edit:** Press to edit the directory path.

Command line Arguments:

- Optional command line arguments for the program defined by **File Path**.

Note: Maintenance.xml in InstallationData\GUI must contain the step "ExecuteExternalProgram" at end of day maintenance.

Report Center

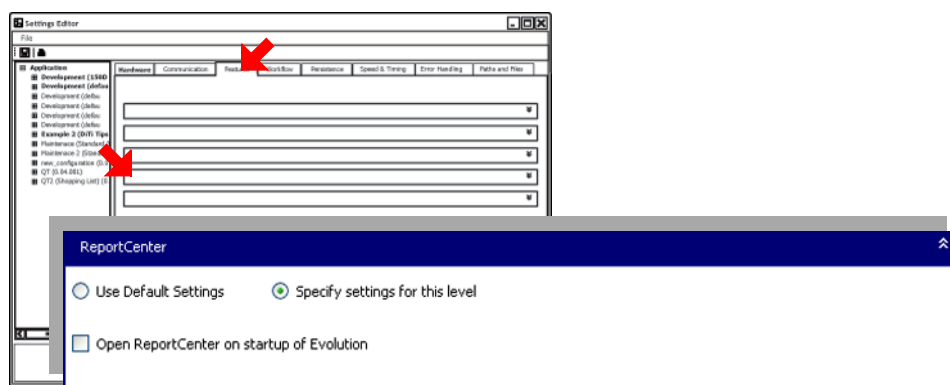


Fig. 5-16 Setting Editor, Report Center

Open the ReportCenter on startup of Evolution

- When checked: The ReportCenter is opened automatically on startup of the Evolution application.

Note: Having the ReportCenter available facilitates accessing if changes have to be made.

Archiving

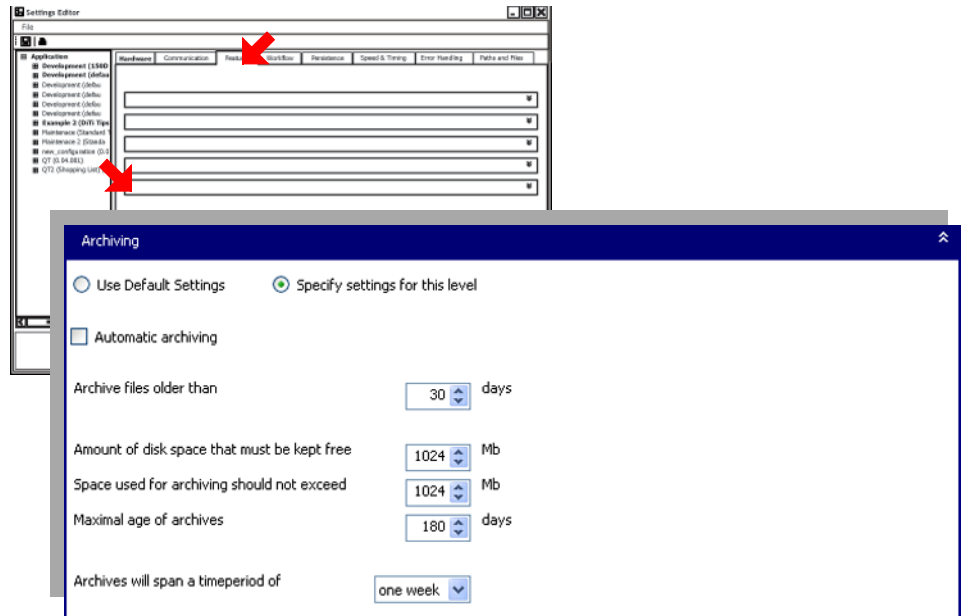


Fig. 5-17 Setting Editor, Archiving

Note: Beta feature - for internal use only.

5.1.5 Workflow

Work Mode

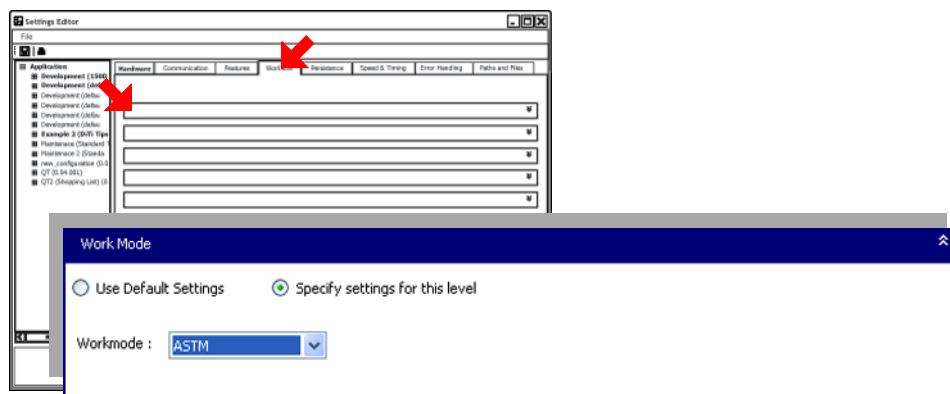


Fig. 5-18 Setting Editor, Workflow

The Work Mode section provides the following work modes.

Workmode:

- ♦ **Batch:** When this work mode is selected, all samples on the worktable are processed with the tests activated under Tests.
- ♦ **Worklist:** When this work mode is selected, the samples on the worktable are processed according to a worklist created with the Worklist Creator. The corresponding worklist must be saved in the folder specified on the Paths tab.
- ♦ **ASTM:** When this work mode is selected, the information concerning the tests to be carried out with the samples on the worktable are inquired from the connected LIMS.

Sample Splitting Mode

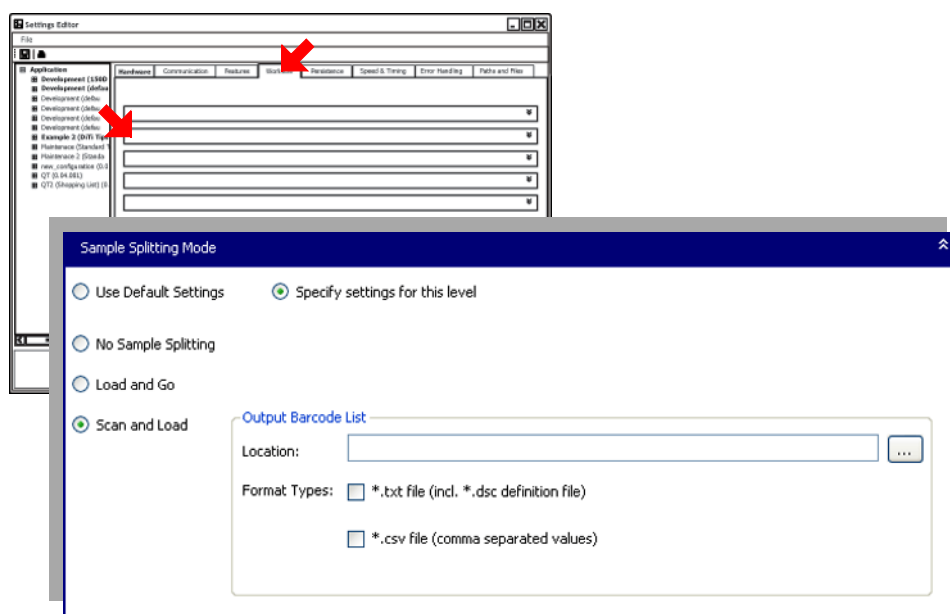


Fig. 5-19 Setting Editor, Sample Splitting Mode

Select the required **Sample Splitting Mode** option:

No Sample Splitting

- Sample splitting using workgroup sections is not possible.

Note: *EVOLutionStudio does not allow the defining of workgroup sections.*

Load and Go

- EVOLution will be forced to run in Batch Mode (i.e. work mode defined above will be ignored).

Note: *Samples as well as destination tubes can be loads at once.*

Scan and Load

- EVOLution will be forced to run in Work List Mode (i.e. work mode defined above will be ignored).

After the source samples have been loaded the software is enabled to print barcodes for destination tubes which are then loaded and scanned.

The **Scan and Load** option provides the definition of the following printing and export properties:

- **Location:** The path to the directory where the barcode definitions will be placed.
- **Edit:** Press to edit.
- **Format Types:**
 - ***.txt file (incl *.dsc definition file):** The barcode data is outputted as a *.txt file with one barcode in each line.
 - ***.csv file (comma separated values):** The barcode data is outputted as a *.csv file.

Shopping List Mode

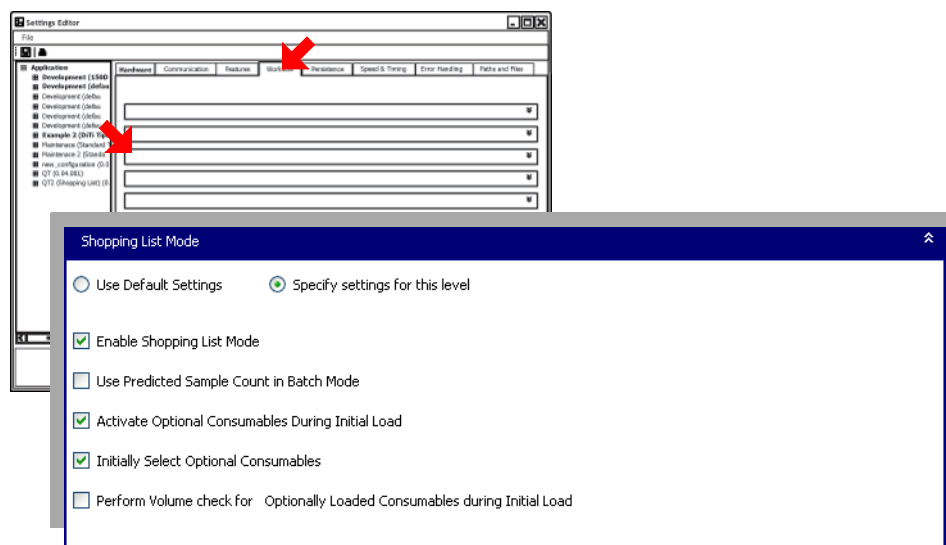


Fig. 5-20 *Setting Editor, Shopping List Mode*

Enable Shopping List Mode

- When checked: Shopping mode will be used.

Note: The following options can only be selected if shopping list mode is enabled:

Use Predicted Sample Count in Batch Mode

- When checked: Predicted sample counts will be used in the batch mode.

Note: Do not select the function **Use Predicted Sample Counts in Batch Mode** when dilution factors are defined in the shopping list mode.

Activate Optional Consumables During Initial Load

- When checked: Loading of optional consumables during a current run activated. Optional consumables defined on a worktable, are able to be loaded during a current run.

Note: If optional consumables are enabled, the following options are available:

Initially Select Optional Consumables:

- When checked: Optional consumables have to be selected in the initial load panel and accordingly expected to be loaded.

Perform Volume Check for Optionally Loaded Consumables during Initial Load:

- When checked: Volume check is performed for optionally loaded consumables during the initial load.

Note: Reloading samples may result in usage of consumables, which are only loaded (ASTM or worklist work mode) if the **Perform Volume Check for Optionally Loaded Consumables during Initial Load**.

Plan per Sample Section

The **Plan per Sample Section** is used if the scheduling of a multiple sample sections at once takes to long.

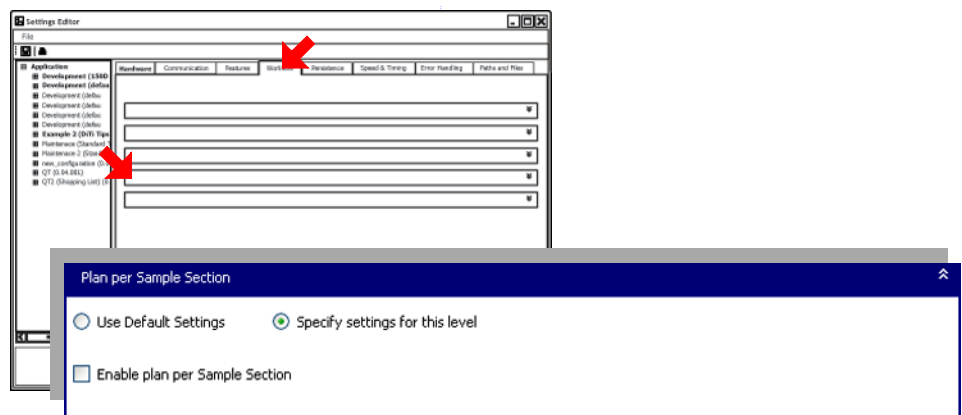


Fig. 5-21 Setting Editor, Plan per Sample Section

Plan per Sample Section

- When checked: **Plan per Sample Section** is enabled.

Note: When **Plan per Sample Section** is enabled and the samples are placed (e.g. 3 sample sections) the schedule for the first sample is planned and started.

- ♦ The schedule for the first sample sections is being executed while the second sample sections is scheduled and added to the run.
- ♦ Finally the schedule for the third sample section is added to the current run.

Unloads

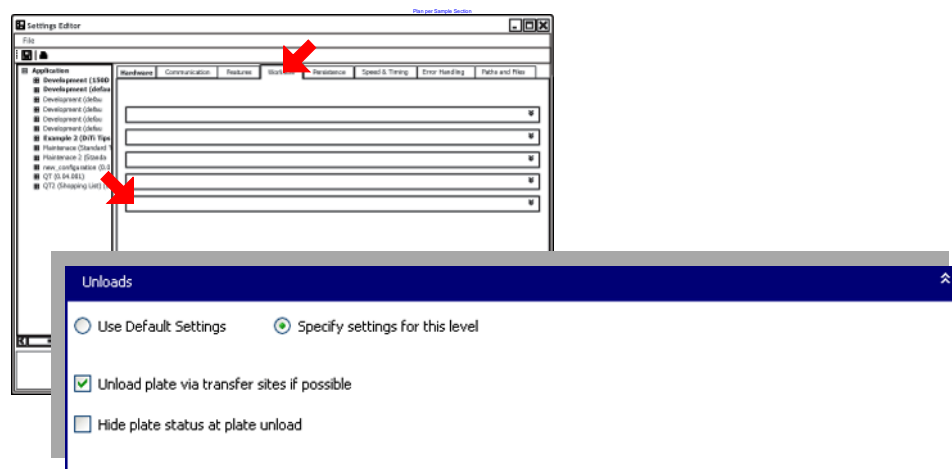


Fig. 5-22 Setting Editor, Unloads

Unload plate via transfer sites if possible

- When checked: The plates are unloaded and transported to the incubators and/ or loading ports at the end of a run.
- When not checked: The plates are unloaded from the shelf directly at the end of the run.

Hide plate status at plate unload

- When checked: The plate status is (e.g. success, failed) is suppressed. The number of wells still available wells is always displayed.

5.1.6 Persistence

Persistence of Consumables

The Persistence of Consumables tab provides settings used for configurations requiring persistent data.

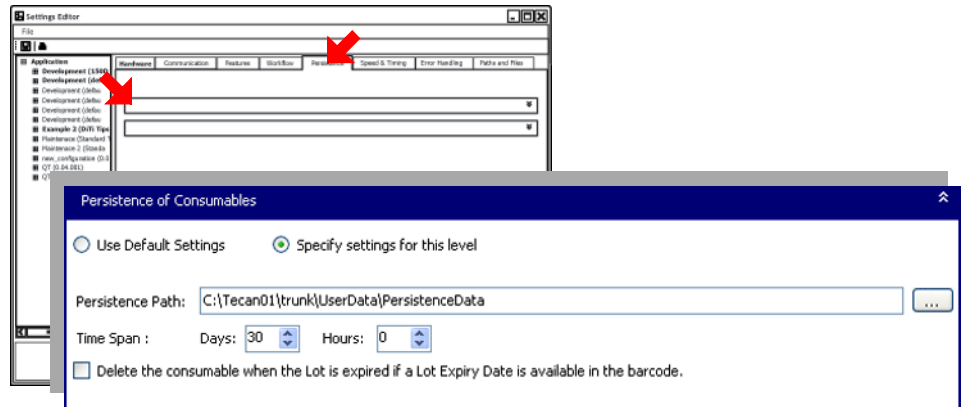


Fig. 5-23 Setting Editor, Persistence of Consumables

Persistence Path:

- Edit the full path to the directory in which persistence data is stored.
Edit: Press to edit the path to the directory.

Time Span:

- Edit the storage time the persistent data is be saved after creation.

Note: Data older than the defined time span is deleted at the beginning of the daily maintenance.

Delete the consumable when the Lot is expired if a Lot Expiry Date is available in the barcodes.

- When checked: The deleting of president data for consumables with the lot expiry date encoded in their barcode is suspended.

Note: Consumables will be deleted when the lot has expired (not after the defined Time Span).

Persistent Worklists

The persistent worklist tab defines how long a work request in a **Worklist** is kept in the system.

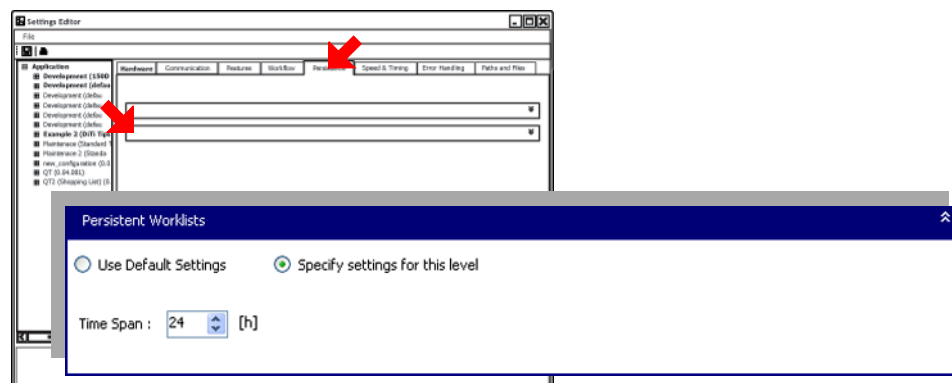


Fig. 5-24 Setting Editor, Persistence Worklist

Time Span:

- Defines how long a work request in a **Worklist** is kept in the system.
- If the sample is not present on the worktable within the defined time span
- it will automatically be moved to a special place where **Worklists** with expired work request are stored.

5.1.7 Speed & Timing

Fast Mode

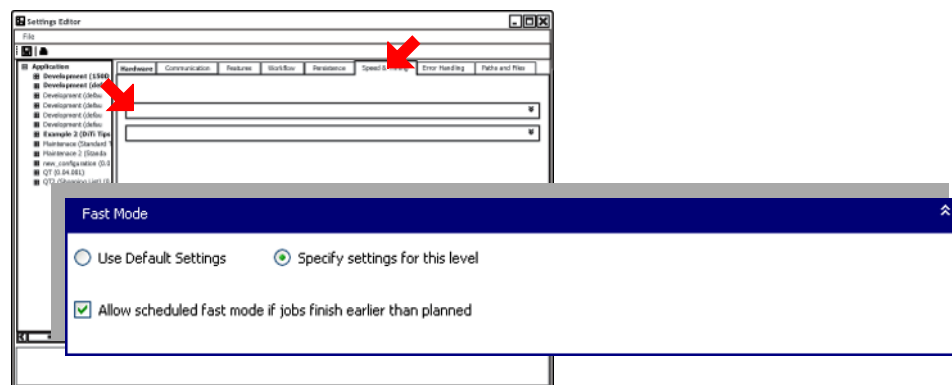


Fig. 5-25 Setting Editor, Fast Mode

Allow scheduled fast mode if jobs finish earlier than planned

- When checked: The pipetting instrument executes a schedule faster when the jobs finish earlier than scheduled.

Timing constraints:

Timing constraints can hinder the next job from being started immediately, leading to none or only slight adjustments of the timing constraint to keep the timing constraint valid.

- Minimum Timing Constraints are defined in the PDE.exe file within each assay.
- By default, timing constraints in the PDE.exe file are set to maximum timing.

Announcement/ preparation constraints (when loading consumables):
The durations are defined in the consumable editor and occurs between the announcement of a reload and the actual reloading procedure.

Note: Use caution when operating with reloads. Reloads may lead to considerably earlier reloading than originally scheduled.

- Note that duration profiling does not have this disadvantage.
- Refer to section “Duration Profiling”, 5-25

Duration Profiling

Freedom EVolution features dynamic durations, measuring and storing the duration of every supported job with successful termination (profiling).

The durations of new jobs running later are determined with the measured durations as calculation basis (optimization).

Note: If a job produces errors or warnings, its duration data is discarded.

Supported Jobs

The following jobs can be profiled and optimized:

- Multi aspirate jobs
- Transfer jobs
- Washing jobs
- Decontamination jobs
- Pipetting jobs
- Reading jobs

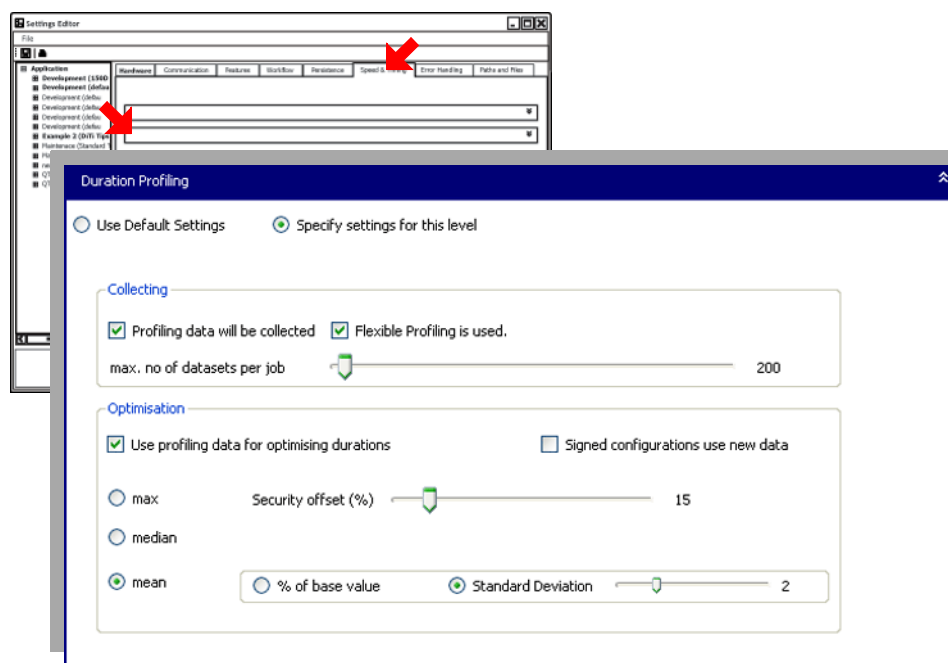


Fig. 5-26 Setting Editor, Duration Profiling

Collecting:

Profiling data will be collected

- When checked: The job profiling is enabled and durations of successful jobs is stored.

- When not checked: Profiling is disabled, as well as optimization (enabled), no new durations will be collected, but the calculation of jobs durations will still be carried out based on the existing duration data.

max. no of datasets per job

- Slider: Defines the number of measurements to be specified.

Optimisation:

Use profiling data for optimizing durations

- When checked: Enables the optimization of processes, based on the measured job durations.
- When not checked: Optimization is disabled, as well as profiling (enabled), using the static job duration defined in the Process Definition Editor or in the Durations.xml file.

Select the required **optimisation** option:

max, median, mean

- Specify the statistical parameters used as base value for the calculations.

Security offset (%)

- Slider: Determine the security offset to be added to the base value [%].

Select the required **Optimisation** deviation option with slider:

% of base value

- ♦ Select the % of base value option to determine the deviation in percent of the base value set with slider.

Standard Deviation

- ♦ Select the standard deviation option to determine the value of standard deviation set with the slider.

Duration Calculation

Profiling of pipetting, washing, and reading jobs takes the number of samples into account: for the calculation of these job durations, the system first tries to find profiling entries that match exactly the number of samples actually processed. If no such data are available, the system uses the values measured with a higher number of samples. If these data can not be found either in the archive, the static job durations are used.

Duration Data

The measured duration data are saved to the Profiling.oba archive file in the SessionData folder. For unsigned configurations, these data are used for optimization in the next run, to determine the job duration. Data measured during an job simulation are not used with real hardware, and data measured during a run on the hardware are not used for simulations.

- A second, frozen profiling database can be stored in the Configurations folder of a configuration. If the configuration is signed, the system uses only this database for the duration calculations.
- If the configuration is not signed, data from both the SessionData and the Configurations folder are used. However, new profiling data are written exclusively to the profiling database in the SessionData folder.

- The additional profiling database in the Configurations folder is configuration specific and treated as read-only (frozen).

5.1.8 Error Handling

PosID Error Handling

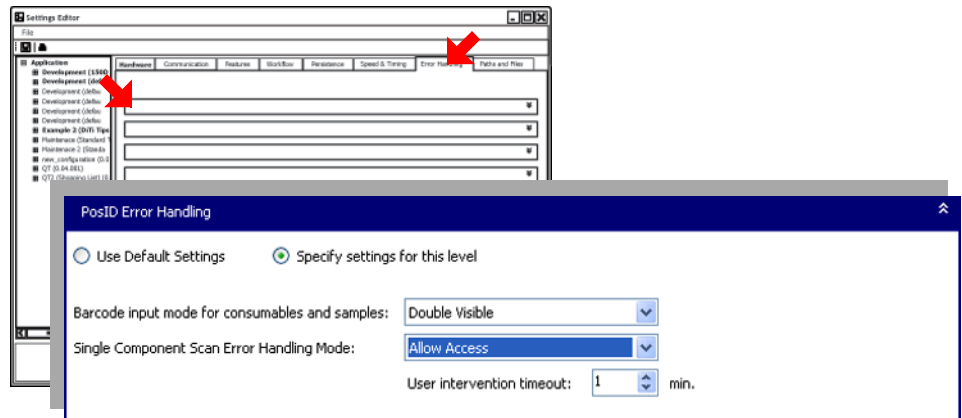


Fig. 5-27 Setting Editor, PosID Error Handling

Barcode input mode for consumables and samples:

- ◆ Select the **barcode input mode for consumables and samples** in case of PosID scan errors occur.
 - Double: Barcode must be entered a second time,
 - Visible: Entered value is displayed.

Note: If the barcode is masked; i.e. only placeholders of the entered characters are displayed.

Single Component Scan Error handling Mode (Plate Scan):

- ◆ Define the error handling mode in case of PosID error during **single component scan error handling mode (plate scan)** of a plate as part of assay execution.
 - Allow Access: Select the value for the user intervention timeout.
 - Abort Process: Following behaviour:
 - The plate barcode of the process is not valid - The process is aborted.
 - Other plate barcodes on the carrier are not valid - These other plates will be marked with error and the process is continued.

Note: If “Allow Access” is selected and a timeout occurs the behaviour is the same like in the case of an “Abort Process”.

LiHa Error Handling

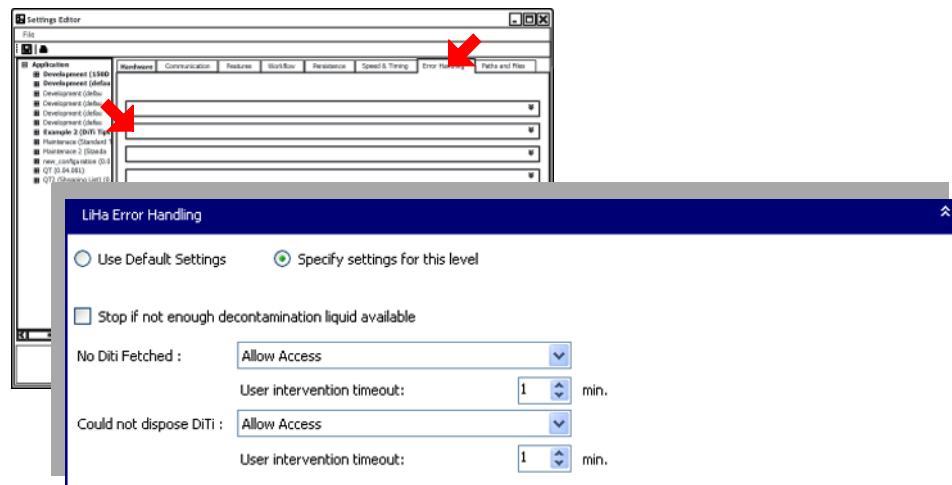


Fig. 5-28 Setting Editor, LiHa Error Handling

Stop if not enough decontamination liquid available

- When checked: Stops the LiHa stops if not enough decontamination liquid is available.
- When not checked: The Liha continues operation regardless how much decontamination liquid is left.

No DiTi checked:

The no DiTi check menu defines the error handling cases for the two error cases.

- ♦ No DiTi fetched
 - Allow Access
 - Retry Fetch Diti
 - Try To Fetch DiTi for 3 times
 - Go to position x
 - Search for DiTi
- ♦ User intervention timeout:
 - Set the user intervention timeout [min].

Note: The behaviour in case the timeout occurs is defined in the **Recovery Actions with Timeouts** section.

- ♦ Could not dispose DiTi:
 - Allow Access
 - Retry Dispose DiTi
- ♦ User intervention timeout:
 - Set the user intervention timeout [min].

Note: The behaviour in case the timeout occurs is defined in the **Recovery Actions with Timeouts** section.

Washer Error Handling

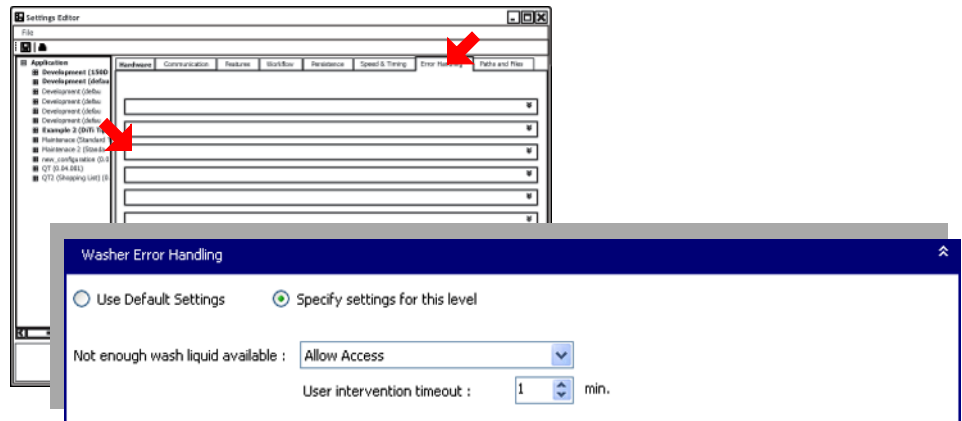


Fig. 5-29 Setting Editor, Washer Error Handling

- ♦ Not enough wash liquid available: Define the error handling mode of the washer consuming wash liquid.
 - Allow Access: If Allow Access is selected and a timeout occurs the process is aborted.
 - Abort Process: In case of Abort Process the process is aborted.
- ♦ User intervention timeout:
 - Set the user intervention timeout [min].

Note: The behaviour in case the timeout occurs is defined in the **Recovery Actions with Timeouts** section.

Recovery Actions with Timeouts

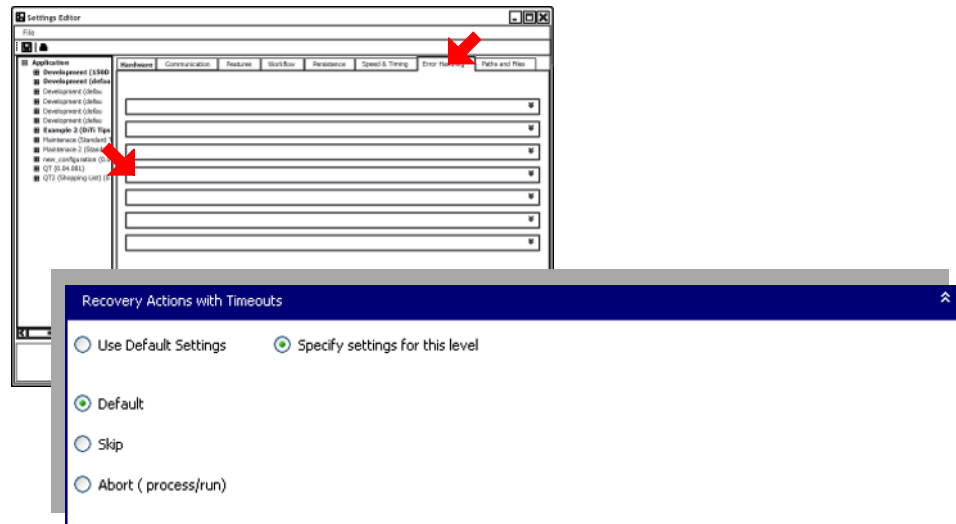


Fig. 5-30 Setting Editor, Recovery Actions with Timeouts

Select the **Recovery Actions with Timeouts** option for the recovery action to be executed after a error handling timeout occurred:

Recovery Actions with Timeouts option:

- **Default:** Behavior according to default settings of the corresponding error handler defined in “LiHa Error Handling”, § 5-28 or in the “Running H/F 1”, § 11-Right.
- **Skip:** Skip erroneous/ affected cavities (LiHa) or plates (Washer, PosID).

Note: The assay is continued to be processed if possible, affected cavities/ plates are marked as erroneous.

- ♦ **Abort (process/run):** Abort the affected process where necessary. If not the completed run is aborted.

**Automatic
Get_From_Oper
ator**

The **Automatic Get_From_Operator** tab provides settings to specify how to handle cases where there are not enough plates on the worktable for the current run.

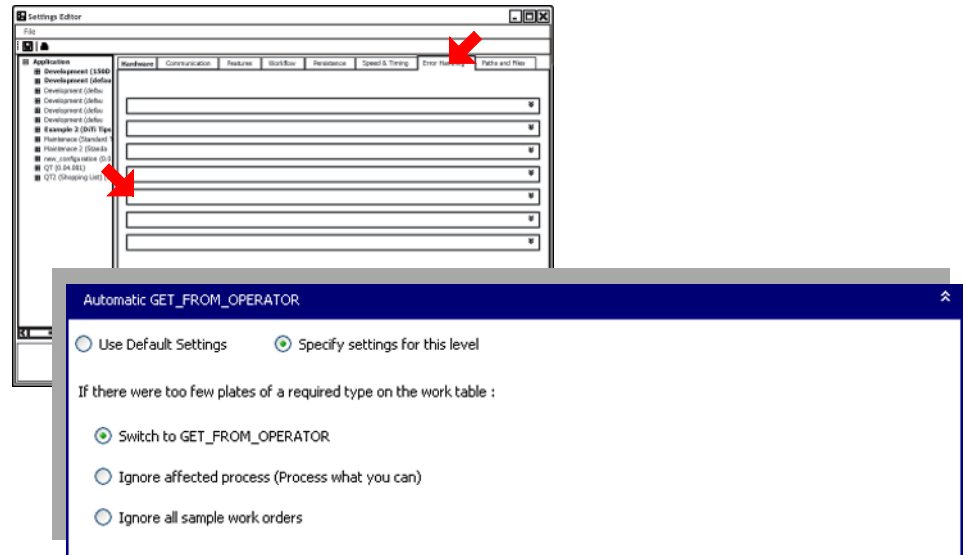


Fig. 5-31 Setting Editor, Automatic Get_From_Operator

If there were too few plates of a required type on the worktable option:

Switch to GET_FROM_OPERATOR

- Select the **GET_FROM_OPERATOR** option to enable the system to request more plates from the operator.

Ignore affected process (Process what you can)

- ♦ Select the **Ignore affected process** to enable the system not to execute affected processes.

Note: The system will execute all process that have a matching plate loaded.

Ignore all sample work orders

- ♦ Select the **Ignore all sample work orders** to enable the system to ignore the entire worklist. No process will be executed.

Timing Constraints

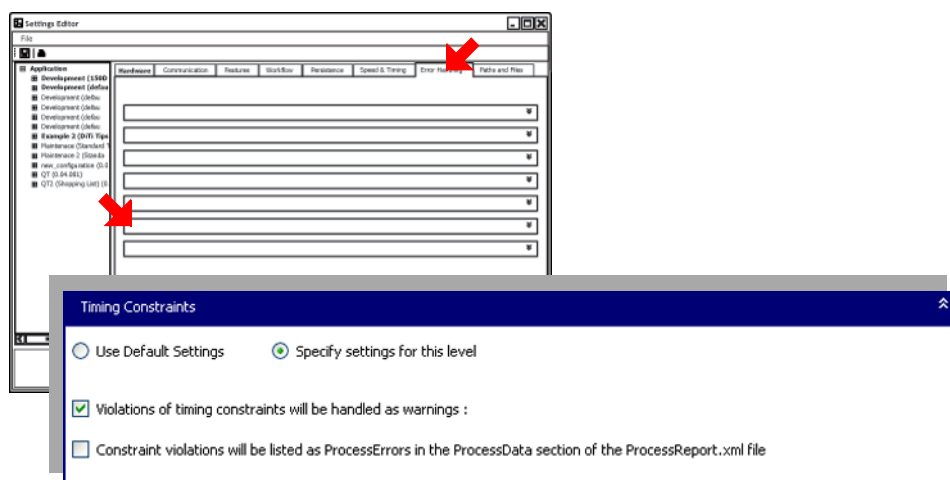


Fig. 5-32 Setting Editor, Timing Constraints

Violations of timing constraints will be handled as warnings:

- When checked: The violations of timing constraints will be considered as warnings and not cause processes to be aborted.
- When not checked: The timing constraint violations (i.e., run took too long) will be considered as processing errors.

Constraint violations will be listed as ProcessErrors:

- When checked: Then violations of timing constraints will once be listed in the process error section of the report.
- When not checked: The violated constraint is mentioned at every cavity in the report.

Reader Error Handling

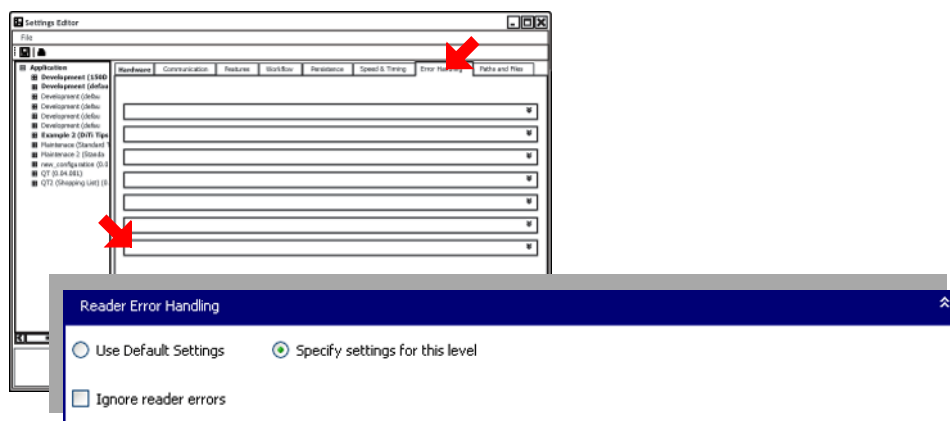


Fig. 5-33 Setting Editor, Reader Error Handling

Ignore reader errors:

- When checked: The execution of assay is continued despite errors reported by Magellan.

Note: This setting will only take effect with unsigned configurations.

The ignore reader error checkbox facilitates operation during setup of assays when using the WorktableSimulator or performing water runs, where cut offs or QC validation criteria are expected to cause errors.

5.1.9 Paths & Files

Report Layout

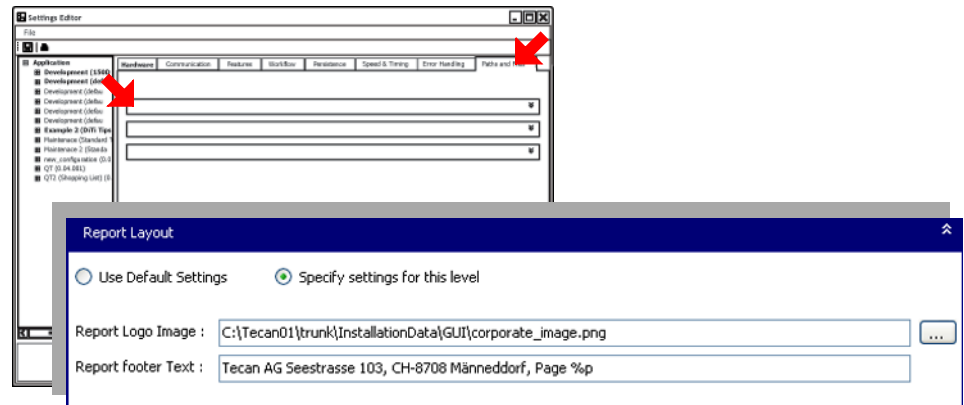


Fig. 5-34 Setting Editor, Report Layout

Report Logo Image:

- Edit the full path to the report logo image file (i.e. which file on your hard drive) will be used on reload, sample reports etc.).
- **...** Edit: Press **...** to edit the directory path.

Report footer text:

- Edit the footer text required for your reports.

Note: To add a page number edit "%p" at the required position. Refer to the example below:

Tecan AG, Seestrasse 103, CH-8708 Männedorf, Page **%p**

Report Formats

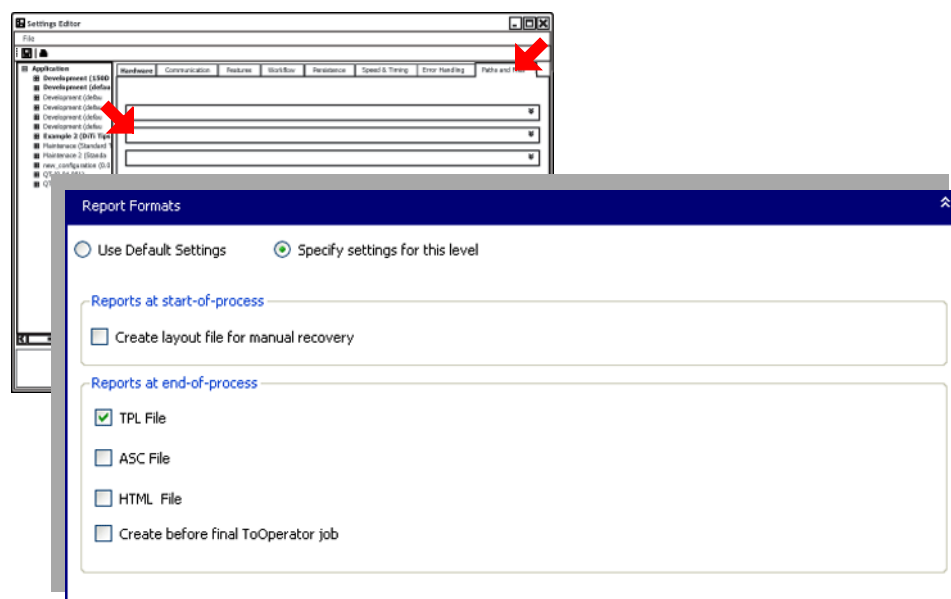


Fig. 5-35 Setting Editor, Report Formats¶

Reports at start-of-process

Create layout file for manual recovery

- When checked: The layout file for manual recovery is created.

Note: The corresponding path must be specified in the Output Paths tab.

- Refer “Output Paths”, ¶ 5-35 for further information

Reports at end-of-process

TPL File

- When checked: A TPL file is created at the end of assay execution. The corresponding file path must be specified on the Output Paths tab.

Note: The conversion description must be part of the configuration>\ConverterConfiguration.

Note: TPL file is never created for sample splitting assays.

ASC File

- When checked: An ASC file is created at the end of an assay execution.

Note: The conversion description must be part of configuration>\ConverterConfiguration.

Note: The corresponding path must be specified in the Output Paths tab.

- Refer “Output Paths”, ¶ 5-35 for further information

Note: ASC file is based on Magellan workspace information only created if the assay contains a final reading step.

Note: The ASC file can never be created for sample splitting assays.

HTML File

- When checked: The report file is converted into an HTML file with interpreted plate validation data at the end of an assay execution.

Note: The conversion description must be part of <configuration>\ConverterConfiguration.

Note: The HTML file will also be generated by the ReportCenter.

Create before final ToOperator job

- When checked: The final TPL file is created before ToOperator job is performed.
- When not checked: An file is created after ToOperator is performed as an intermediate report to generate the TPL file. The final report is compiled at the end of an execution.

Note: The corresponding path for the intermediate output must be specified in the Output Paths tab.

Output Paths

The Output Paths tab provides the editing of pathes where the respective output files are saved.

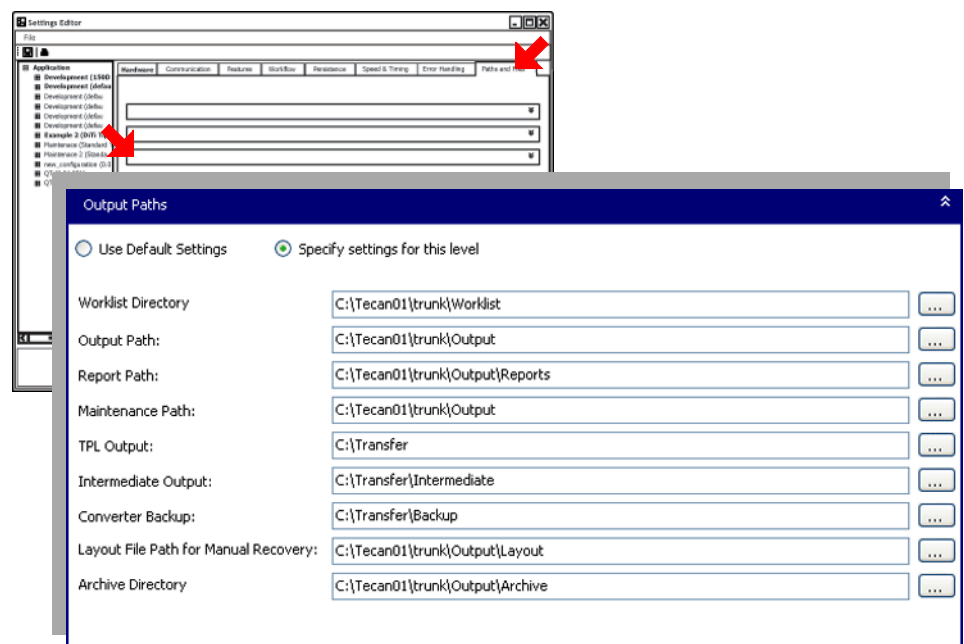


Fig. 5-36 Setting Editor, Output Paths

Edit

- **Edit:** Press to edit the path to the directory.

Worklist Path:

- Edit the path to the directory where the worklists are searched.

Output Path:

- Edit the path to the directory where the output files such as HTML, TPL and ASC are stored. The reports are stored in the subdirectory.

Maintenance Path:

- Edit the path to the directory where the maintenance reports are saved.

TPL Output Path:

- Edit the path to the directory where the TPL output files are stored.

Intermediate Path:

- Edit the path to the directory to where the intermediate report files are stored.

Note: *These report files are required, if creation of TPL file is not the last job in assay.*

Converter Backup Path:

- Edit the path to the directory the converter shall store the backup files of the created TPL files.

Note: *The converter backup path ensures that backup is still available in case another analyzer removes the TPL files from TPL Output path when processing the TPL as input.*

Layout File Path for manual Recovery:

- Edit the path to the directory to where the layout files created when an assay is executed.

6 Working With Freedom EVOLution SW

Purpose of This Chapter

This chapter explains the process definition workflow and offers information on how to create different process configurations.

6.1 User Management

The Freedom EVOLution SW user management is accessed via the Freedom EVOLution Run Control Software and described in the Freedom EVOLution SW Runtime Controller Manual.

6.2 Getting Started

6.2.1 Basics

Run Control

A finalized configuration will be run in the Run Control for the operator. The Run Control calculates the schedule, which can be viewed during the run.

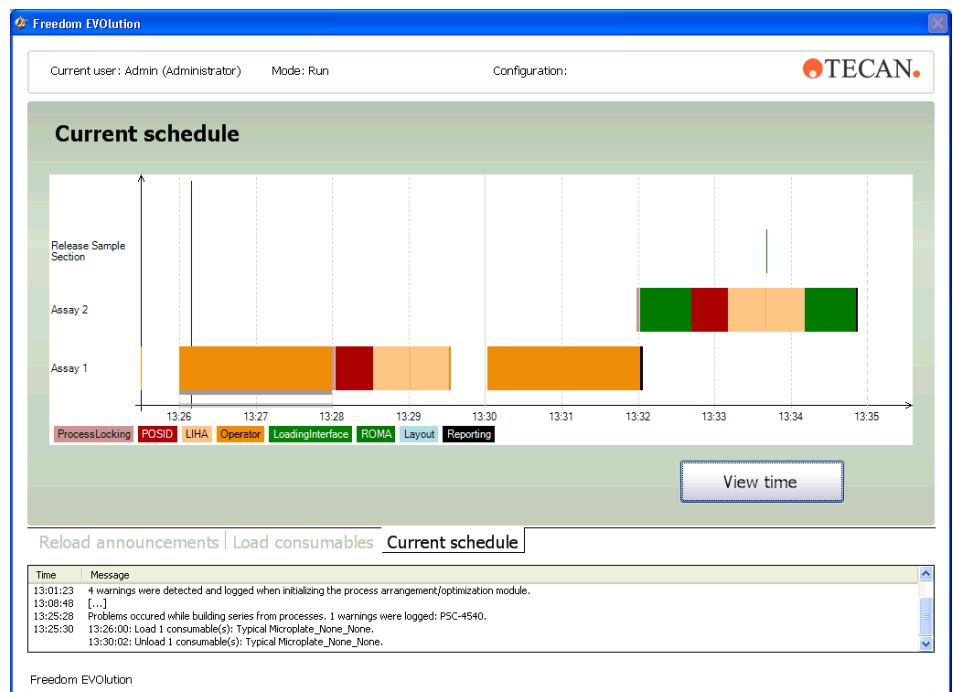


Fig. 6-1 Run Control: Viewing schedule

The Run Control is not covered in this Application Software Manual. Refer to the Freedom EVOLution SW Runtime Controller Manual.

Scheduling Simulator

With the Scheduling Simulator the configuration can be tested before it is actually run on the instrument. It is also used to optimize the process.

What Is the Configuration Builder Used for?

The Configuration Builder combines all necessary data for a configuration. All files of the configuration are packed together and can be electronically signed. A checksum verification prevents the data from being changed after signature.

Note: For valid test results, the configuration should be electronically signed.

Editors

Different software modules (editors), which can be run separately, generate XML files to define:

- ◆ Consumables (e.g. properties, quantity)
- ◆ Labware (e.g. sizes, shapes of containers, instrument modules)
- ◆ Worktable layout on the instrument (e.g. sample loading sections)
- ◆ Process steps (e.g. order, duration, timing constraints)
- ◆ Liquid classes (define properties of different liquids regarding liquid handling)

The XML files can be accessed by the corresponding editor or can be directly opened in an XML editor. This enables the user to enter data for special adjustments without using the Freedom EVOLution editors.

The advantage of this principle is the fact that the system is not a closed configuration, but can be adapted to the needs of the user.

Workflow

As a matter of course, all process-relevant information needs to be defined before a configuration can be run. Since the editors build on each other, definitions which are used by a subsequent editor, must be made first.

Example: To define a worktable layout, the labware to be placed on the worktable must have been defined before.


Note: In many cases, default definitions already exist (e.g. labware definition of a microplate). They can be used as is, or can be modified, accordingly.

Since the process depends primarily on the test kits (assays) to be run, step-by-step instructions for the process definition can not be given here.

In most cases the process configuration can be derived from an existing configuration in the directory **Configuration\ExampleConfiguration**, which is delivered together with the software.

Also process configurations developed in the past can serve as template to define a new configuration.

For more details refer to;

- ◆ The diagram in [6.2.2 “Workflow Overview”](#),  [6-3](#) illustrates the assay definition procedure.
- ◆ The table in [3.4.6.1 “Editors and Their Output”](#),  [3-6](#) explains which editor delivers which output.

6.2.2 Workflow Overview

The diagram suggests a standard workflow for creating a process configuration and gives information on the corresponding file designations and locations:

See [3.3 "Function Diagram"](#),  3-2.

6.3 Navigation and Shortcuts

This section explains the key and mouse functions for navigation and influencing the 3-D view in the EVOLution Studio, the Labware Editor and the Worktable Editor. See 3.3 “Function Diagram”, 3-2.

6.3.1 Keyboard Navigation in the Editors

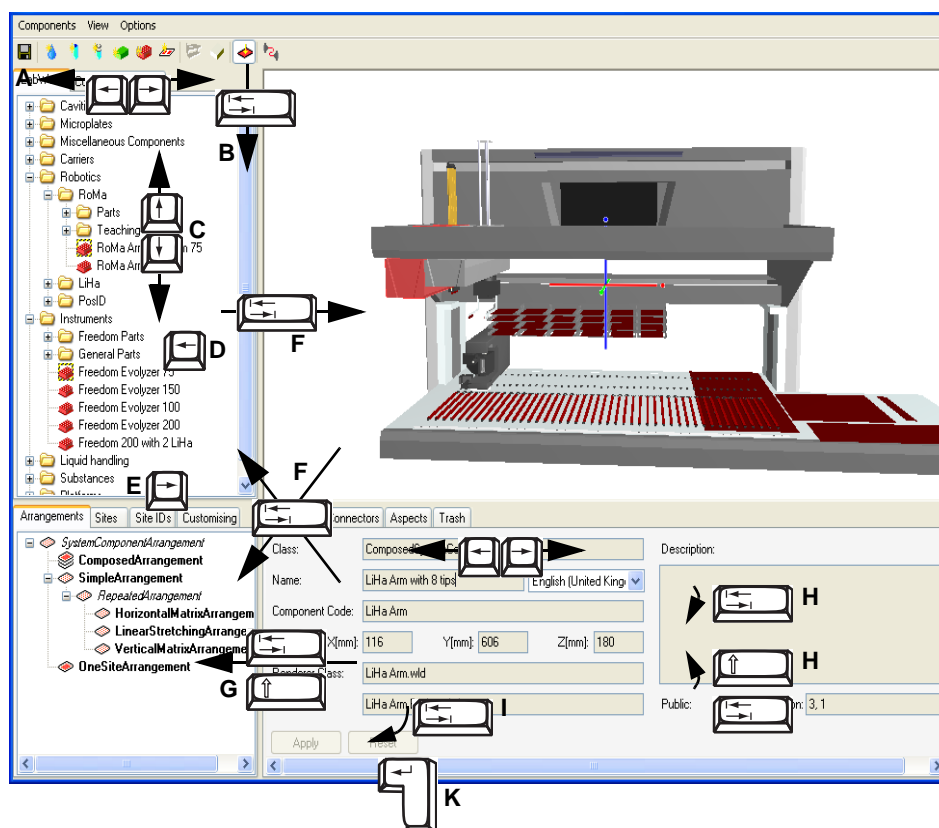


Fig. 6-2 Key navigation in the editors

The table explains the key functions for navigating through the items on the screen.

Tab. 6-1 Navigation with mouse or keyboard

Move	Using the Mouse	Using the Keyboard
A: Select next/previous tab	Click the tab	Press arrow keys Left/Right
B: Move from tabs into the tree view	Click in the tree view	Press TAB key
C: Move to next/previous node in tree view	Click the node	Press arrow keys Up/Down
D: Collapse the highlighted tree node	Click the - box left of the node	Press arrow key Left

Tab. 6-1 Navigation with mouse or keyboard (cont.)

Move	Using the Mouse	Using the Keyboard
E: Expand the highlighted tree node	Click the + box left of the node	Press arrow key Right
F: Move to next screen zone/ from last to first screen zone	Click in the screen zone	Press TAB key
G: Move to previous screen zone	Click in the screen zone	Press SHIFT + TAB key
H: Move to next/previous data field	Click in the data field	Press TAB key or SHIFT + TAB key
I: Move to the Apply/Reset/Cancel button	Move the mouse	Press TAB key or SHIFT + TAB key
K: Press Apply/Reset/Cancel button	Click the button	Press ENTER key
Select a component or site	Click the component or site	-
Select several components or sites together	Press Ctrl key and click the components or sites	-

6.3.2 Navigation in the 3-D View

Tab. 6-2 How to change the 3-D model view

View change:	Using the Mouse	Using the Keyboard
Move model (pan function)	Drag the model while the Shift key is pressed	Shift + Arrow keys
Rotate model	Drag the model while the Alt key is pressed	Rotate around Z-axis: Alt + Arrow key Left/Right Rotate around X-axis: Alt + Arrow key Up/Down
Zoom in/out	Scroll with the mouse wheel backward/forward	Press Alt + Page Up/Page Down keys
Center 3-D model on its point of origin and zoom to fit the window		Press Ctrl + Home key
Center selected component in the 3-D view		Press Home key
Open context menu	Click on the right mouse button	Press Context menu key (Windows keyboard)

6.4 Process Validation

6.4.1 Basic Principle

Validation	<p>The device must be validated in the specific application according to laboratory practice and state-of-the-art before putting into service and after changes. Use of kits or kit components on the pipetting instrument is only allowed after validation by Tecan, the kit manufacturer or operator of the system.</p> <p>For all applications of the Tecan pipetting instrument, the user must ensure that the requirements of each protocol are carefully observed.</p> <p>A systematic approach of risk analysis, validation of critical parameters and system validation should be followed to ensure that the system or combination with kit provides reliable and reproducible performance.</p>
Law and Standards	<p>Make sure that the validation process is executed according to national laws and standards.</p>

6.4.2 Prerequisites for Validation

The process must be designed in such a way that it can be validated successfully. When building the process, pay attention to the following:



ATTENTION

The Freedom pipetting instrument requires accurate positioning of all reagents, samples, racks, and plates on the worktable. The corresponding positions are stored in the pipetting instrument and set up in the Instrument Software.

- ◆ Verify these positions accordingly before executing any program.



ATTENTION

Make sure that your test layout is set up as to detect potential pipetting errors, e.g. by means of integrated controls.

- ◆ Set up the worktable layout so that DiTis are never moved over samples.
- ◆ Make sure that no critical reagents are positioned next to the wash station.

6.4.3 How to Validate the System

Validation Instructions

The process that will be run with Freedom EVOLution SW depends on the corresponding kit, which is not known to Tecan in detail. Therefore, precise validation instructions cannot be given here.

The following section gives general instructions and suggests important validation steps which must follow the design or modification of a process with the Freedom EVOLution SW tools.

6.4.4 General Validation Instructions

**Cross
References**

List of cross references to information provided in other sections:

Subject	Reference
Plate settings	See section 6.8.7 , 6-24

During validation of the system, pay special attention to the following points:

Instrument

- 1 Make sure that the LiHa does not touch any part of the labware or the instrument during the processing of run.
- 2 Make sure that liquid tracking is performed correctly.
- 3 Make sure that liquid detection is performed correctly.
- 4 Make sure that the RoMa correctly grips and moves the plates according to the user's specific definitions and parameters.
- 5 Make sure that the DiTis are picked up correctly and that they are not dropped during movement of the LiHa.

**Microplate
Washer**

- 6 Make sure that the correct manifold type is installed according to the user's specific definitions and parameters.
- 7 Make sure that washing of plates is performed properly, including washer initialization, prime and rinse, and that the correct number of wash cycles is performed according to the user's specific definitions and parameters.
- 8 Make sure that the washer needles do not run dry between the runs or during breaks (> 30 min., e.g. lunch break, etc.). Either activate Rinse soak (Wash wait mode in Application Settings, refer to the Freedom EVOLution Runtime Controller Manual) or rinse the washer clean by means of the "End of day maintenance" (without "Clean inside of fixed tips", refer to the instrument's Operating Manual).
- 9 HydroFlex Platform (microplate washer): If Tween 20 (0.1%) has been used for the washer check: Since the washer is not rinsed at start of day, it may contain a high concentration of detergent. Therefore, rinse the washer with a sufficient amount of assay buffer or deionized water before starting a run and assess the influence on the process (for rinsing in stand-alone mode, refer to the HydroControl Instructions for Use).
- 10 HydroFlex Platform (microplate washer): Check the plate settings (PDFX files) for each type of microplate that is used in the process. Perform the check with the corresponding wash liquid. Refer to cross references above.
- 11 HydroFlex Platform (microplate washer): Microplates that have rows with empty wells (not filled with liquid) before starting a wash procedure could potentially lead to minimal cross contamination. For that reason, the results for such a situation must be validated. This validation step can be omitted in case an internal laboratory procedure ensures that only completely filled rows of microplates are washed on the Hydroflex Platform.

Reader

- 12 Make sure that the microplate reader option to eject the plate after reading is *not* activated.

- 13 Make sure that all applied reader methods and associated assay specific constants can be executed for the selected samples and that the reader methods match the assay description.
- Process**
- 14 Make sure that carry-over or cross-contamination does not affect the assays.
 - 15 Make sure that the correct volumes of the correct liquids are pipetted to the correct locations for the corresponding assays.
 - 16 Make sure that the system combines the correct type of strips in the correct layout.
 - 17 Make sure that the assays which are intended to be pipetted in parallel are actually pipetted in parallel. Also make sure that no additional assays are pipetted in parallel.
 - 18 The system will perform a check to evaluate if the currently defined configuration can be processed on the instrument. Make sure that the corresponding configuration can be started on the instrument.
 - 19 Make sure that the pipetting patterns are valid for the corresponding assays.
 - 20 Make sure that predilutions are correctly performed.
 - 21 Make sure that the reload parameters allow the operator to perform a proper reload.
 - 22 Make sure that the decontamination is correctly defined. This includes duration and correct liquid.
 - 23 Make sure that the applied assays are correctly incubated. This also includes a verification of the shaking option.
 - 24 Make sure that all steps of an assay are performed in the correct order.
 - 25 Make sure that all system actions, including user interventions, are correctly registered and displayed in the process results.
 - 26 Make sure that barcodes, as of types specified by the user, are accepted and correctly handled by the system.
 - 27 Make sure that ASTM transmissions are performed according to the user's specific definitions and parameters.
- Duration**
- 28 Make sure that assay-specific timing constraints are applied and not violated.
 - 29 Make sure that the defined durations are not violated.
 - 30 Make sure that shelf times are monitored, i.e. that consumables are not used longer than permissible, but also that they are not discarded earlier than necessary.

6.5 Locking the System

From the menus of the various editors the Freedom EVOLution SW can be locked without quitting the editor. This prevents the system from unauthorized access. To proceed, authentication of the user is necessary. Refer to the Freedom EVOLution SW Runtime Controller Manual.


6.6 Liquid Handling

Introduction

This section describes the most important aspects of liquid handling, to be used and taken into account when modifying and/or designing processes.

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Clot detection	See section 11.2.4 “Clot Detection” ,  11-4

Rack Configuration

- ◆ The carrier, rack and container data (x, y, z values) in the database must be checked and adapted.
- ◆ Make sure that all coordinates (X, Y, Z) of the racks used have been configured carefully.
- ◆ Make sure that the correct tip types and corresponding LiHa parameters are set correctly in the application software as this affects Z-heights.
- ◆ Setting of Z-heights:

Z-travel

Z-travel is the Z-height above any obstacles.

Z-dispense

Z-dispense is the Z-height from which liquid is dispensed. It should be adjusted to a height from which no droplets can fall into adjacent cavities.

Z-start

Z-start is the Z-height in which liquid level detection is activated.

Z-start must be situated at least 1 mm below the cavity rim and above the liquid level. Z-start can not be above (i.e. outside) the cavity, except for microplates and deep well microplates, for which Z-start is defined 1 mm above the cavity rim.

Z-max

Z-max is the Z-height situated as close as possible to the lowest cavity point without touching the cavity bottom.

Note: *If you use other settings they must be approved by your responsible application specialist.*

Cylindric or rectangular cavities in the racks allow for an optimal liquid tracking. If you are operating with differently shaped racks and activated liquid tracking, the inner diameter and the submerge must be optimized.

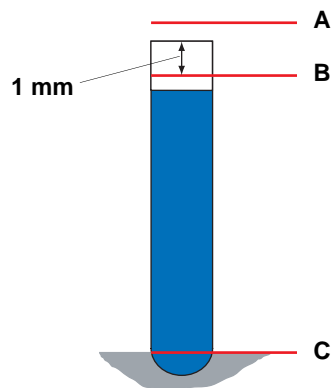


Fig. 6-3 Sample tube Z-heights

A Z-travel

C Z-max

B Z-start, Z-dispense

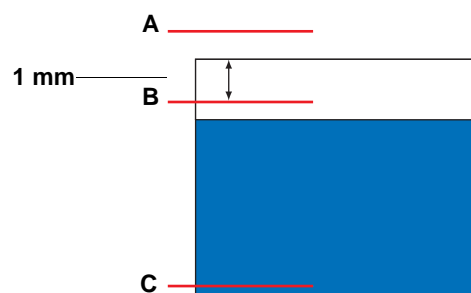


Fig. 6-4 Reagent trough Z-heights

A Z-travel

C Z-max

B Z-start, Z-dispense

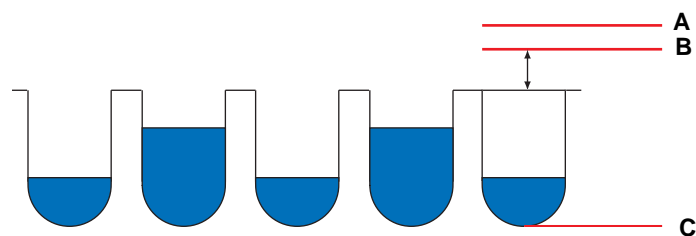


Fig. 6-5 Microplate Z-heights

A Z-travel

C Z-max

B Z-start, Z-dispense

Inner Tube Diameter

The inner tube diameter must be defined with a precision of 0.5 mm. It is used by the software to calculate the movement of the liquid level during aspiration. In critical cases or when the inner tube diameter is not known precisely, it should be set to a (too) low value. This increases indeed the probability for wrongly recognized clots; a large inner diameter, however increases the risk of undetected clots. If the inner diameter is set too large, the liquid level lowers faster than its value calculated by the software, which can lead to aspiration of air!

Minimal Aspiration Volume

The minimal aspiration volume is the smallest volume whose absence can be detected by clot detection. It depends on the inner diameter of the containers used and on the clot limit (minimal aspiration volume [μl] = $\pi * r^2 * \text{clot limit [mm}^3\text{]}$):

Tab. 6-3 Minimal Aspiration Volumes

Container inner diameter in mm	r in mm	h (= clot limit) in mm	minimal aspiration volume in μl
7	3.5	4	154
7.5	3.75	4	177
8	4	4	201
9	4.5	4	254
10	5	4	314
10.5	5.25	4	346
11	5.5	4	380
13	6.5	4	531
13.5	6.75	4	573
14.5	7.25	4	661

Note: Be aware of the fact that only comparably large clots would be detected if the aspirated volume is below the minimal aspiration volume. In this case, the reliability of the clot detection is insufficient.

Aspiration Speed and Delay

In order to obtain optimal pipetting results, the following settings for aspiration speed and delay/waiting time should be considered:

- ♦ Slow aspirating speed between 30 and 200 $\mu\text{l/s}$.

Tab. 6-4 Examples for Aspirating Speed

Pipetted volume	Aspiration speed
10 µl	30 µl/s
100 µl	70 µl/s
500 µl	150 µl/s
750 µl	150 µl/s
1000 µl	200 µl/s

- ◆ Sufficient delay after aspiration between 300 and 1000 ms.
- ◆ When working with viscous samples and solutions like serums or highly concentrated reagents, a delay of ≥ 500 ms must be observed.

Air Gaps

The following table shows the recommended air gap volumes:

Tab. 6-5 Recommended Air Gap Volumes

Tip Type		STAG	LAG	TAG
Standard tip	S	$\Sigma \leq 30\mu\text{l}$		5-20 µl, 10 µl ideal
	M	$\Sigma \leq 30\mu\text{l}$		0 µl
DiTi 200 µl	S	$\Sigma \leq 30\mu\text{l}$		5-20 µl, 10 µl ideal
	M	$\Sigma \leq 30\mu\text{l}$		0 µl
DiTi 1000 µl	S	$\Sigma \leq 30\mu\text{l}$		5-20 µl, 10 µl ideal
	M	$\Sigma \leq 30\mu\text{l}$		10-20 µl

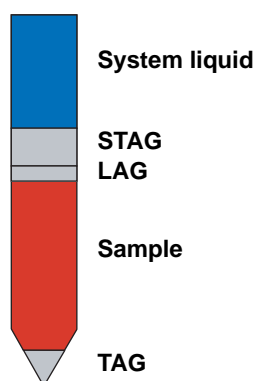


Fig. 6-6 Air gaps in tip

S Single pipetting mode

M Multi pipetting mode

STAG System trailing air gap

TAG Trailing air gap

LAG Leading air gap

Dispense, Breakoff Speed and Delay

In order to obtain optimal pipetting results using the standard pipetting method (free dispense), the following settings are recommended:

- ♦ fast dispense speed is between 250 and 600 µl/s
 ideal dispense speed: ≥ 400 µl/s
- ♦ the breakoff speed is 70% of the dispense speed.
 ideal breakoff speed: ≥ 150 µl/s
- ♦ sufficiently long delay when using viscous samples or solutions like serums or highly concentrated reagents ≥ 200 ms.

Multi Pipetting

The term **Multi Pipetting** designates the pipetting method which aspirates once and then dispenses several aliquots. For this pipetting method, all the rules listed in this section apply. In addition, the following parameters are needed:

- ♦ A **conditioning volume** is needed, to attain for the first aliquot the same conditions as for all the following aliquots.
 The conditioning volume must be ≥ 30 µl. Ideally it has the same volume as one aliquot.
 The conditioning volume is dispensed back into the original container or into the wash station.
- ♦ An **excess volume** is used to attain for the last aliquot the same conditions as for all the preceding aliquots.
 The excess volume must be ≥ 30 µl. Ideally it amounts to 15% of the total volume.
 The excess volume is disposed of into the wash station.

6.7 Overview: Substances, Consumables, Liquid Classes

Substances

Substances are declared in the labware editor, with their name and visualization color. The substances in the labware editor are also used in the Consumable Data Editor.

Substances can have the properties:

public

if the substance is public, it is visible in the worktable editor.

non-public

if the substance is non-public, it is not visible in the worktable editor.

As a rule, substances are not visible (non-public) in the worktable editor, because they are normally used for consumables.

Consumables

Consumables are used in the process definition editor, where for each process step the appropriate consumables are declared. The liquid class a consumable belongs to is also referred to in the process definition editor.

Among others, the following items also belong to the consumables:

- ♦ Substances
- ♦ Microplates
- ♦ Disposable tips (DiTis).

Liquid Classes

Liquid classes are initially declared in the liquid class editor, independently of processes or worktables. With them, the pertaining pipetting directives for each liquid class are declared and stored. This means that, when a liquid is selected in a pipetting job, the SW will automatically fill in the liquid class which has been defined here.

The mapping of liquid name with the liquid class is done in the process definition editor, under **Tools - Liquids - Liquid Definition**:

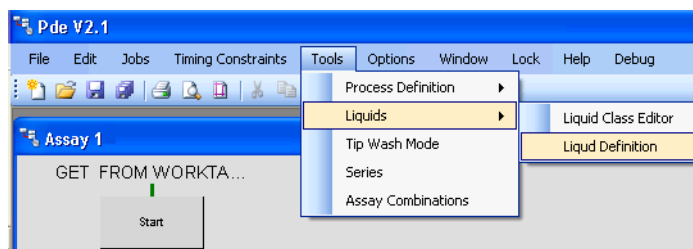


Fig. 6-7 Liquid definition

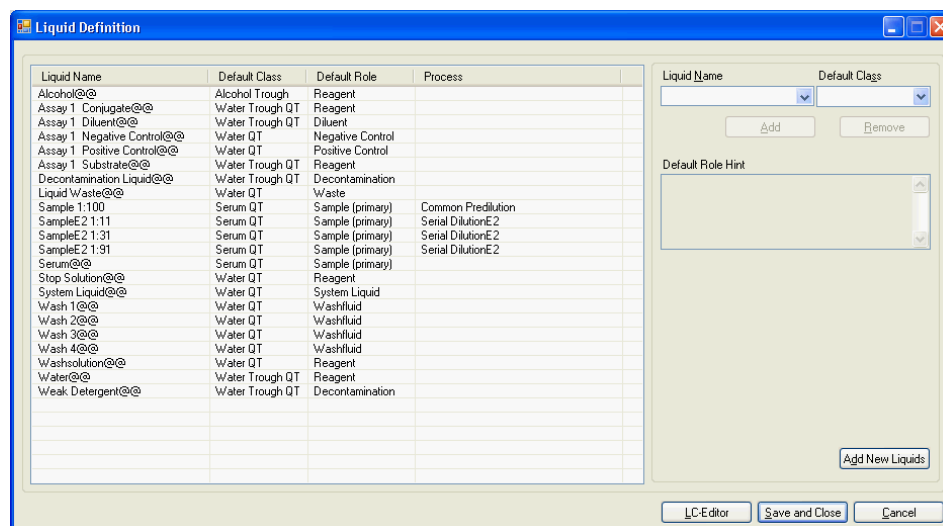


Fig. 6-8 Liquid definition detail


Liquid Roles

The liquid roles indicate the purposes of the liquids in the process. The default roles are defined in the Labware Editor. They can be adapted in the Process Definition Editor. Depending on the editor, the roles are referred to as **Substance Role** or **Liquid Role**.

6.8 How to ...

This section provides tips and hints on how to build configurations which are not pure standard, i.e. which are not simple “from tube to process (destination) plate” configurations.

6.8.1 Processes With Predilution Steps

Predilution is defined in the Process Definition Editor. Refer to chapter [7.10 “Predilution Processes”](#),  7-67.

6.8.2 Define Series

Definition of series with the Series Editor is described in [7.3.5 “Series”](#),  7-46.

6.8.3 Pipette Sample from Plate

This section gives information on how to adapt the configuration when samples are presented in microplates, not in sample tubes.

Prerequisites

The pipetting carrier must be placed within one sample section. It must not overlap adjacent sample sections or protrude from the sample section.

Sample Identification

Since the samples are presented in a microplate, the PosID cannot read the barcodes of the individual samples. Therefore, the sample identification must be defined in a separate file in such a way that the system knows which well on the microplate contains which sample.

Note: *The source plate must have a barcode and it must be read by the PosID for identification.*

The sample identification can be defined in the following ways:

- 1 By using an existing PlateReport*.xml file, which is the output/plate result file of a process. This can be done if the samples are pipetted from an archive plate that was created with the pipetting instrument. The file does not need to be edited by the operator. To make the plate report file available, it needs to be copied manually from the output file location to the worklist file location. The locations can be defined by the operator. Refer to the Freedom EVOLution SW Runtime Controller Manual (Application settings). The Run Control reads the plate report file which was generated as output from the archive plate process and finds all relevant information about sample identification. All warnings and errors that occurred during the archive process will be transferred to the new process in order to provide complete sample tracking.
- 2 By writing a plate map file in an XML editor or in a text editor. This method is used if the plate has not been created with the pipetting instrument in a previous process (see above). A plate map file is an XML file describing which

sample is in which well. The plate map file must also contain the barcode of the microplate in order to link the file to the microplate.

Note: For each microplate an individual plate map file needs to be generated.

A plate map file must have the following format:

```
<PLATE BARCODE = "1236545">  
  
  <SAMPLE BARCODE = "123">  
  <POS>A2</POS>  
  </SAMPLE>  
  
  <SAMPLE BARCODE = "234">  
  <POS>B2</POS>  
  </SAMPLE>  
  
  <SAMPLE BARCODE = "345">  
  <POS>C3</POS>  
  </SAMPLE>  
  
  . . .  
  
  <SAMPLE BARCODE = "456">  
  <POS>H12</POS>  
  </SAMPLE>  
  
</PLATE>
```

Note: The software that evaluates the tags is case-sensitive. The tags must be entered in uppercase letters.

File Naming

The plate map file must be saved with the file extension **.map**, e.g. **Plate234.map**. If one or more wells are not defined in the plate map file, those wells will not be pipetted.

File Location

To make these files available to the Freedom EVOLution SW they must be placed in the **Worklist directory** / folder. The path to this folder is set in the **RunControl / Application Settings**.

Refer to the Freedom EVOLution SW Runtime Controller Manual.

Files of the following formats can coexist in the folder

- ◆ *.xml (worklists)
- ◆ PlateReport*.xml (plate report files)
- ◆ *.map (plate map files)
- ◆ *.tpl (Tecan plate layout pipetting output)
- ◆ *.lgc (pipetting output from e.g. Logic software)

The files are read when the user triggers a sample scan.

Note: The plate barcode must be unique on the worktable. If two plates with the same barcode are placed on the worktable, an error will occur.

- 3 By means of the **Plate Manager** (SW version 2.0), which is a separate tool that allows to create plate map files.
Refer to the Freedom EVOLution SW Runtime Controller Manual.
- 4 By means of the **Worklist Creator** (SW version 2.1), which is a separate tool that allows to create plate map files.
Refer to the Freedom EVOLution SW Runtime Controller Manual.

EVOLution Studio

- 1 Reorganize your sample sections.
Pay attention to the following:
 - At least one section must be large enough to place a plate carrier completely in the section.
- 2 In an extra worktable tab, add a pipetting carrier (same as for sample section with tubes, but use MP carrier).
- 3 Place the type of microplate(s) on it, which acts as sample source plate.

Process Run

- 1 Start as usual.
- 2 Place a MP carrier instead of a tube carrier in the sample section.
If the "load sample" button is pressed, the sections are scanned.

Restrictions

Note: Pay attention to the fact that only samples may be on the microplate, i.e. no controls, etc. can be handled with "pipetting from plate".

6.8.4 Strip Handling

This section gives information on how to adapt the configuration when strip frames are used.

Workflow

The following example suggests a workflow to define a configuration with strip frames.

Basically, the following steps need to be performed:

- 1 Define strips for the assays in the Consumable Data Editor.
- 2 Define a spacer strip (if a 16-channel washer is in use) in the Consumable Data Editor.
This will be needed to make an odd number of strip rows even for the two-row manifold of the washer.
- 3 Define the settings for site groups, strip frames and strip combinations in the Worktable Editor.
- 4 Define the process assay(s) using strips in the Process Definition Editor.
- 5 Define desired combinations of strips for different assays (if the assays are compatible) in the Process Definition Editor.

Consumable Data Editor

To prepare the configuration in the Consumable Data Editor, proceed as follows:

Spacer Strip

Note: If a washer with 16-channel manifold (two rows) is used, the number of strips in a frame must be even. To make an odd number of strips even, a (single row) spacer strip can be added.

- 1 If it does not already exist, the “spacer strip” consumable needs to be defined (in the **Reload Group**, as new group **Strips**) as follows:

Tab. 6-6 Parameters for spacer strip

Parameter	Value
Name:	Spacer Strip
Manufacturer:	Tecan
Specification:	This field is ignored
Synonym:	This field is ignored
Membership Group:	Strips
Membership Kit:	None
Preparation Instruction (Invariant Language): Required	Add instructions
Announce time:	00:02:00 ^{a)}
Prepare time:	00:01:00 ^{a)}

Tab. 6-6 Parameters for spacer strip

Parameter	Value
Strip Labware:	The labware to be used. For an example the default data contains: "Test Strip 1x8 Round Bottom"
Coated:	Activated
Coating Labware:	The labware to be used for the coating. For an example the default data contains: "Coating (blue)"
Tile size of coating:	By default: rows=1, columns=1
Frame Labware:	The labware used to represent the frame. For an example the default data contains: "Microplate Strip Frame"

a) *Announce and prepare time: Refer to cross references above.*

2 Define the strip that is actually used in the kit:

Tab. 6-7 Parameters for strip

Parameter	Value
Name:	This is the name you want to reference in the PDE
Manufacturer:	The manufacturer of the strip
Specification:	This field is optional
Synonym:	This field is ignored
Membership Group:	Strips
Membership Kit:	The kit where the strip belongs to
Preparation Instruction (Invariant Language):	This field is ignored
Announce time:	00:02:00 ^{a)}
Prepare time:	00:01:00 ^{a)}
Strip Labware:	The labware to be used. For an example the default data contains: "Test Strip 1x8 Round Bottom"
Coated:	Activated
Coating Labware:	The labware to be used for the coating. For an example the default data contains: "Coating (blue)"
Frame Labware:	The labware used to represent the frame. For an example the default data contains: "Microplate Strip Frame"

a) *Announce and prepare time: Refer to cross references above.*

- 3 Save the data and exit the Consumable Data Editor.

Process Definition Editor

To prepare the configuration in the Process Definition Editor, proceed as follows:

- 1 In **Tools/Process Definitions/Microplate Layout**, define the plate type to be a strip frame type.
The size of the layout must be 12 in width and 8 in height, even though it is a strip.
- 2 The assignment of sections and groups is done in a similar way as for the definition of regular (non-strip) plates.
This means that if e.g. controls are defined on the first 2 positions of the layout (positions A1 and B1), they will only be pipetted onto the first strip.
- 3 Combinations of strips for different assays: Define in menu **Tools/Assay Combinations**.
For different pipetting steps the time of the step with the longest duration will be used.
Refer to cross references above.
- 4 When defining series proceed in the same way as described for microplates.
Refer to cross references above.
- 5 Save the process and exit the Process Definition Editor.

Configuration Files

When defining combinations of strips and spacer, pay attention to the following:


Compatibility for Different Assays

The following criteria for the compatibility of strip combinations must be fulfilled, otherwise different plates are planned for each strip plate:

- ◆ The number of jobs must be identical. For each step of a process the identical step in the other process must define the same action ("PIPETTING" / "WASHING" / etc.).
- ◆ The incubation temperature and the incubation time must be identical.
- ◆ WASHING: the same program and the same liquid are prerequisite.
- ◆ All timing constraints must be identical (Duration, as well as start/end index).
 - The order in which they are defined is irrelevant.

Additional Information

Pay attention to the following additional information when defining processes with strip frames:


- ◆ The order of the assays on the frame corresponds with the order defined in Strips.xml.
- ◆ Strip assays for parallel sample pipetting (series) must be additionally defined in Series.xml.
Refer to cross references above.
- ◆ A strip assay will not be distributed on several frames, i.e. if there is not enough space on the frame for a second assay, the second assay will be arranged on a new frame.
- ◆ Empty columns will be added to the plate layout if a 16-channel microplate washer is used. In this case, additional spacer strips are added ("spacerStripConsumable" in Strips.xml). These must be single-column type strips.
See ["Spacer Strip"](#),  6-18.
- ◆ If there are no spacer strips defined, the test-specific strips must be of single-column type.
- ◆ Composed pipetting jobs are accepted during strip merging.
Refer to cross references above.

6.8.5 Define Cross-Match Assays

This section gives information on how to adapt the configuration for cross-matching assays.

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Liquid roles	See section 7.2.3 "Pipetting Step" ,  7-6

Prerequisites

When defining a configuration for a cross-match assay, pay attention to the following prerequisites:

- ◆ Each patient has dedicated donors.
- ◆ A patient cannot be a donor at the same time.

Process Definition Editor

To prepare the configuration in the Process Definition Editor, proceed as follows:

- 1 Define the microplate layout by means of the "X" identifier.
All wells that will contain samples.
- 2 Define the liquids with respect to the liquid roles as follows:
Refer to cross references above.
 - Patient: Liquid role "Sample (Primary)"
 - Donor: Liquid role "Sample (Secondary)" or "CrossMatchSpecimen"
- 3 Define "Pipetting" or "Multiple aspirate" steps for the patient samples.
- 4 Define "Pipetting" or "Multiple aspirate" steps for the donor samples.

Note: *The order of the pipetting jobs has no impact on the final plate layout, only on the sequence of pipetting.*

6.8.6 Recommended Job Duration Examples for Pipetting and Washing

For uncomposed jobs, use:

- ♦ Standard Wash Cleaner short
- ♦ Default liquid classes

Tab. 6-8 Job duration examples

Job	Parameter	2 Tip	4 Tip	8 Tip	8-Manifold	16-Manifold
Pipette	Sample 96 x 50 µl (fixed tips)	17:00	09:30	04:30	–	–
	Sample 96 x 100 µl (fixed tips)	17:40	10:00	04:40	–	–
	Sample 96 x 100 µl (DiTis)	23:00	11:30	05:45	–	–
	Sample 96 x 200 µl (fixed tips)		11:00	05:30		
	Archive plate 96 x 750 ul			09:00		
	Controls: 1 control 100ul (single pipetting)	00:30	00:30	00:30		
	Reagent 96 x 50 ul (2 Asp. 6 Disp)	03:00	01:40	01:00		
	Reagent 96 x 100 ul (2 Asp. 6 Disp)	03:30	02:00	01:00	–	–
	Reagent 96 x 50 µl (Stroke# 1) (DiTis)	04:00	02:00	01:00	–	–
	Reagent 96 x 100 µl (Stroke# 2) (DiTis)	05:20	02:40	01:20	–	–
	Reagent 96 x 200 ul (1 Asp. 3 Disp)	06:00	03:00	01:40		
Multi-aspirate	Sample 96 x 20 ul + 200 ul Buffer	–	21:00	10:30	–	–
Wash^{a)}	3 x 400 ul, soak 15s, FinAsp 4s	–	–	–	05:30	02:40
	4 x 300 ul, no soak, FinAsp 4s	–	–	–	05:30	02:30
	4 x 600 ul, soak 20s, FinAsp 2s	–	–	–	06:00	02:40
	5 x 350 ul, soak 30s, FinAsp 4s	–	–	–	06:00	03:30

a) HydroFlex Washer

6.8.7 Adapt HydroFlex Platform to Microplates

The plate parameters, such as plate and well geometry, aspiration position, aspiration mode, etc. are defined by means of the HydroControl software and are stored in a file with the extension PDFX. For each different plate such a file exists. Also refer to the “HydroControl Instructions for Use”.

Note: *To modify or check the plate definition files you need to use the installed HydroControl software for the HydroFlex Platform in stand-alone mode.*

Microplate Used for the Washer Check

The WasherCheck.pdfx, which is used per default for the washer check at start of day represents a transparent Greiner flat-bottom plate with slightly higher aspiration positions to allow dispensing of 350 microliters without aspiration (i.e. the washer’s aspiration needles are still above the liquid level).

Note: *For advanced users only: It is possible to adapt the washer check to the plate type used in the process to make the check more specific. Please consider all relevant subjects if doing so (i.e. use a separate, correctly taught plate definition file, adapt the maintenance configuration wash program steps accordingly, etc.).*

Defining new Plates

If you define microplates that do not already exist in HydroControl, do not change one of the existing files, but use the “Save as” function to create a new file. This prevents the various files from being mixed up later.

Backup of Plate Definition Files

If you made changes to the plate definition files, make sure to save the files in order to enable you to reproduce the settings (e.g. in case of a new installation on the computer, etc.).

The default location of the PDFX files is [Installation drive]:

- ◆ **Windows 7: C:\Users\Public\Documents\Tecan\Pdfx**
- ◆ **Windows XP: C:\Documents and Settings\All Users\Documents\Tecan\Pdfx**



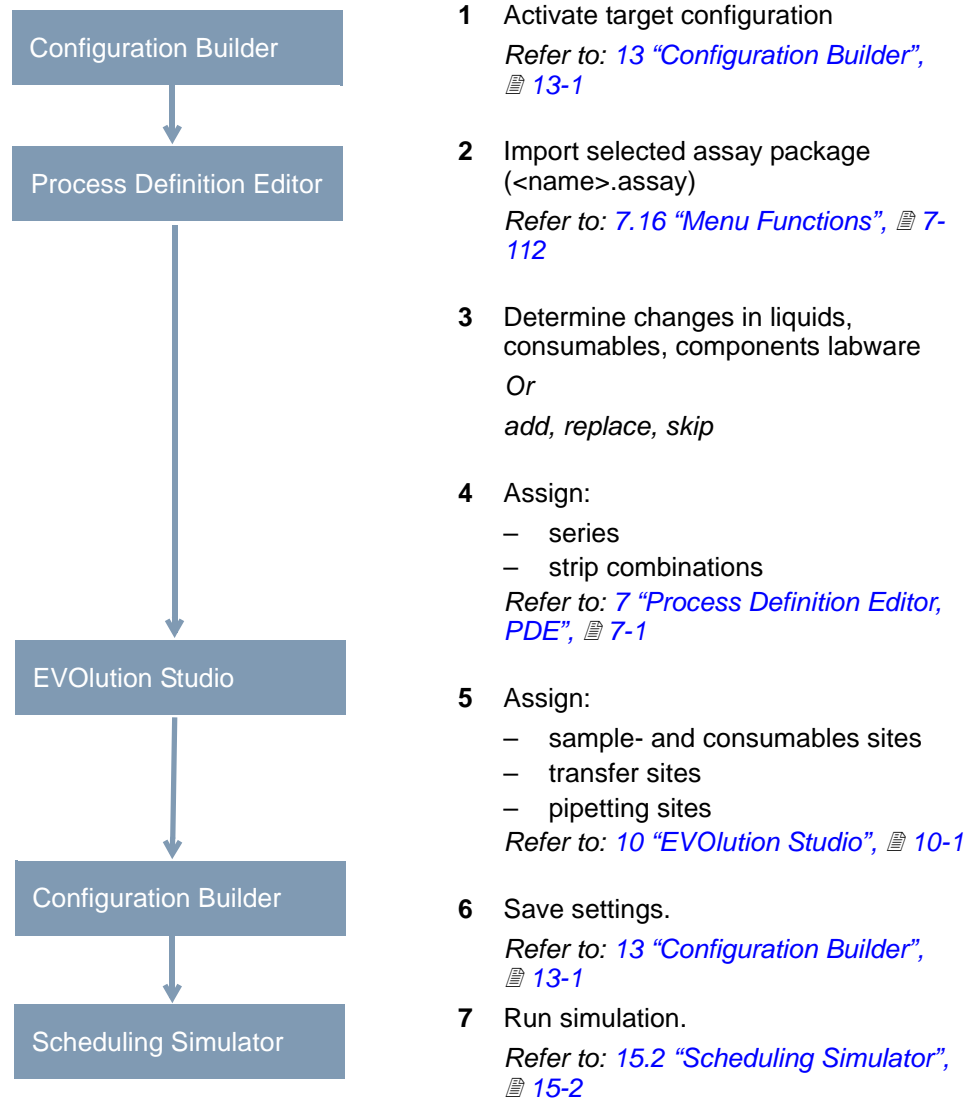
ATTENTION

Lost plate definition data in case of a new installation and missing backup data.

- ◆ The plate definition files are not part of the packed configuration.
- ◆ Save the PDFX files in a separate location.

6.8.8 Import an Assay

The following procedure provides a brief overview of the workflow. Refer to the respective chapters for further information.



- 1 Activate target configuration
Refer to: 13 "Configuration Builder", 13-1
- 2 Import selected assay package (<name>.assay)
Refer to: 7.16 "Menu Functions", 7-112
- 3 Determine changes in liquids, consumables, components labware
Or
add, replace, skip
- 4 Assign:
 - series
 - strip combinations*Refer to: 7 "Process Definition Editor, PDE", 7-1*
- 5 Assign:
 - sample- and consumables sites
 - transfer sites
 - pipetting sites*Refer to: 10 "EVOLution Studio", 10-1*
- 6 Save settings.
Refer to: 13 "Configuration Builder", 13-1
- 7 Run simulation.
Refer to: 15.2 "Scheduling Simulator", 15-2

Fig. 6-9 Import an assay

7 Process Definition Editor, PDE

Purpose of This Chapter

This chapter describes the Freedom EVOLution SW Process definition editor and its functions.



Fig. 7-1 Process Definition Editor icon

7.1 Introduction

This section provides an overview of the purpose of the process definition editor, its significance and the main functions and gives information on the supported process steps.

7.1.1 Brief Description

Purpose

The Freedom EVOLution SW process definition editor enables the user to define new and modify existing processes. A process definition contains all the steps that are part of one process, e.g. incubation steps, washing steps, pipetting steps etc. Each process step can be configured and is visualized in a flow diagram as shown in the figure:

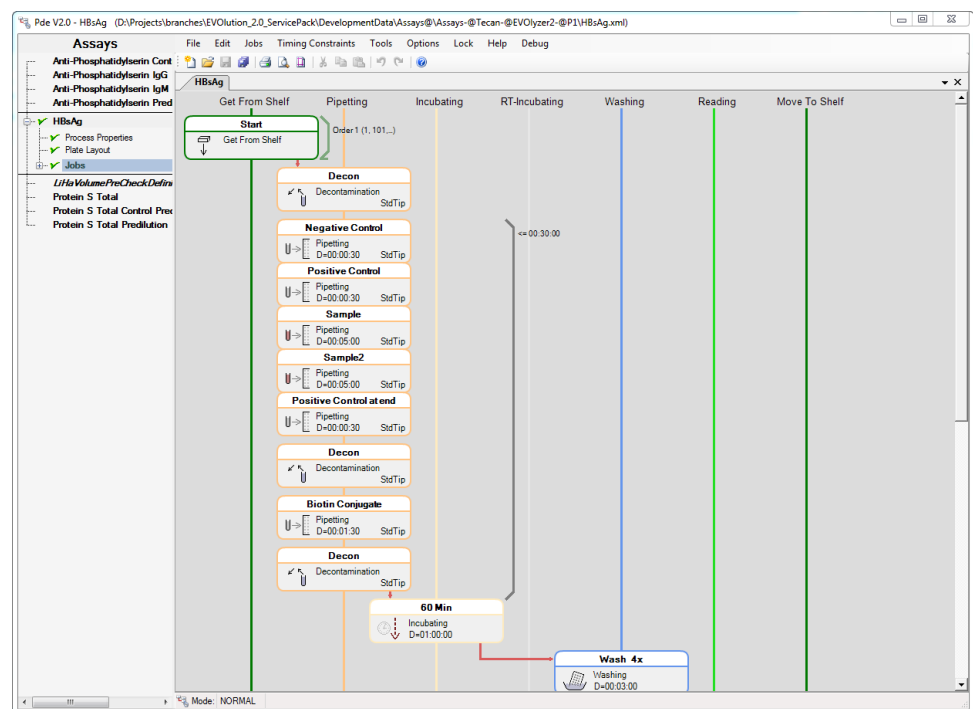


Fig. 7-2 Process Definition Editor main view

During process editing, the program allows

- ◆ launching Magellan, for creating and modifying reader methods.
- ◆ launching the liquid class editor, for creating and modifying liquid classes, and for reference.
- ◆ launching the HydroControl wash program editor (HydroFlex Platform).
- ◆ launching the WinWash Clinical program (Columbus Washer).
- ◆ defining test series.
- ◆ combining plates and strips series.
- ◆ opening and editing several process definitions at the same time.
- ◆ copying process steps from one process definition to another.
- ◆ combining several process steps into one, so that they will be treated by the scheduler as one single step.
- ◆ printing out the process definition as a table.

Overview

The process definition editor shows a graphical representation of a process, with its jobs and timing constraints.

The process definition editor enables the user to define or modify

- ◆ entire processes, i.e. sequences of jobs or action steps.
- ◆ each individual job.
- ◆ timing constraints for each job.

Files

The process definition edited in the process definition editor is stored in a file. The filename can be up to 256 characters long.

7.1.2 Process Steps

- Jobs** A process consists of several possible process steps, so called jobs.
The process definition editor supports the following process steps:
- ◆ Get from operator
 - ◆ Get from shelf
 - ◆ Get from worktable
 - ◆ Pipetting
 - ◆ Multiple aspirate
 - ◆ Decontamination
 - ◆ Pipette to waste
 - ◆ Enable predilution
 - ◆ Activating new liquids
 - ◆ Verification reading
 - ◆ Incubating
 - ◆ RT incubating
 - ◆ Washing
 - ◆ Reading
 - ◆ Incubation delay
 - ◆ Move to shelf
 - ◆ Move to worktable
 - ◆ Move to operator
 - ◆ Teleshaking (V2.2)
 - ◆ Carriershaking (V2.2)
 - ◆ Magnetizing (V2.2)
 - ◆ Sample Splitting (V2.1)

7.1.3 Process View

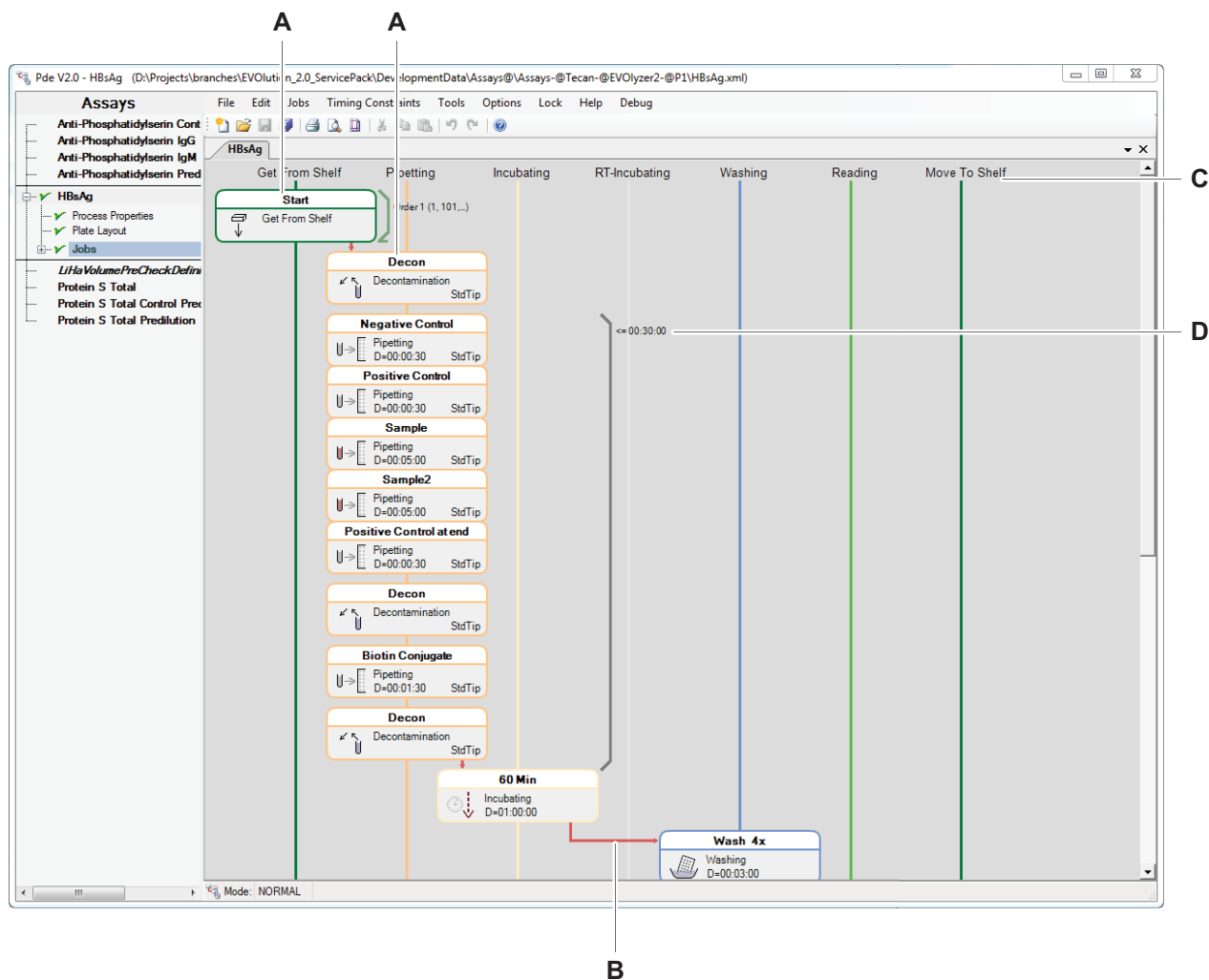


Fig. 7-3 Freedom EVOLution SW Process Definition Editor main view

- A Jobs
- B Visualization of the transfer from one action site to another
- C Job column headers
- D Timing constraint for jobs

7.2 Jobs Overview

In this section, the steps of ELISA tests supported by the Freedom EVOLution SW are described.

7.2.1 Steps Get from .../Move to ...

Each process must start with a Get from Shelf (EVOLution 2.0, not 2.1), a Get from Worktable or a Get from Operator step and must end with a Move to Shelf, a Move to Worktable or Move to Operator step. These steps can not reside anywhere else in the process.

To define one of these steps, the user needs to specify the step name only.

7.2.1.1 Steps Get from Operator/Move to Operator

Process steps that define operator interactions for loading/unloading labware. The operator will be asked during the run to load the plate before corresponding test is started. As soon as the test is finished the operator will be asked to unload the plate.

7.2.1.2 Steps Get from Shelf/Move to Shelf

Loading of plates will be executed during the consumable load when starting a run. Plates will be unloaded after all tests are finished at the end of the run.

Note: If the process ends with Move to Shelf make sure that there are sufficient free sites in the shelf.

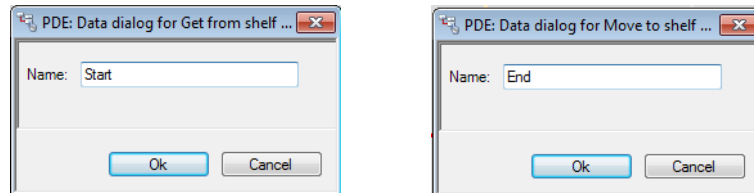


Fig. 7-4 Example Get from Shelf/move to Shelf step property screens

Note: If the process ends with Move to Shelf make sure that there are sufficient free sites in the shelf.

7.2.1.3 Steps Get from Worktable/Move to Worktable

See section [7.2.2 “Steps Get from Worktable/Move to Worktable”](#), 7-5.

7.2.2 Steps Get from Worktable/Move to Worktable

A configuration that contains multiple assays can use carriers on the worktable as start and end positions. The user loads the plates to the carriers on the worktable (not only to the shelves). The operator loads plates to the shelves only in normal mode, in shopping list mode via a transfer site. During the execution, the plates from the carriers on the worktable are used for processing the assays. They are placed back to these carriers, and remain on the worktable.

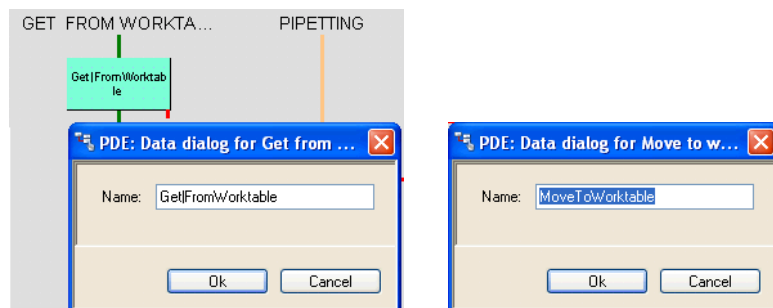


Fig. 7-5 Example get from/move to worktable step property screens

7.2.3 Pipetting Step

The step **pipetting** comprises the distribution of samples and reagents into destination wells in the destination rack.

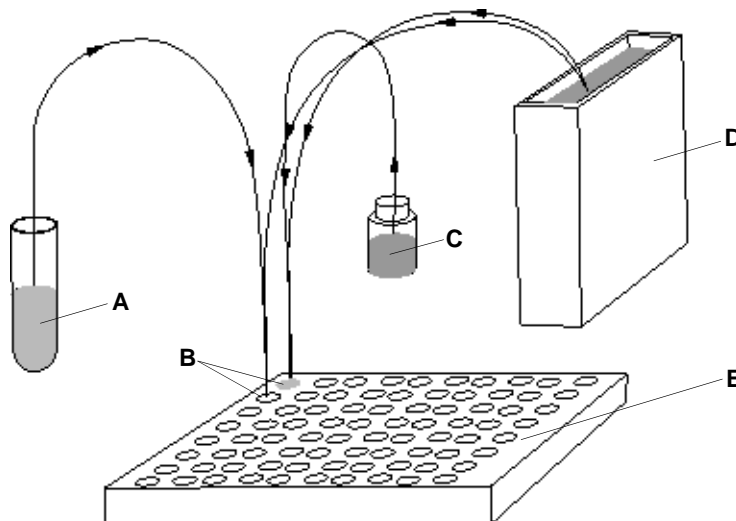


Fig. 7-6 Pipetting step

- | | | | |
|----------|-------------------------|----------|-------------------------|
| A | Sample | D | Liquid 2 (e.g. diluent) |
| B | Destination wells | E | Microplate |
| C | Liquid 1 (e.g. control) | | |

The step **Pipetting** can be set up by defining areas on the microplate, where different types of liquid combinations will be pipetted.

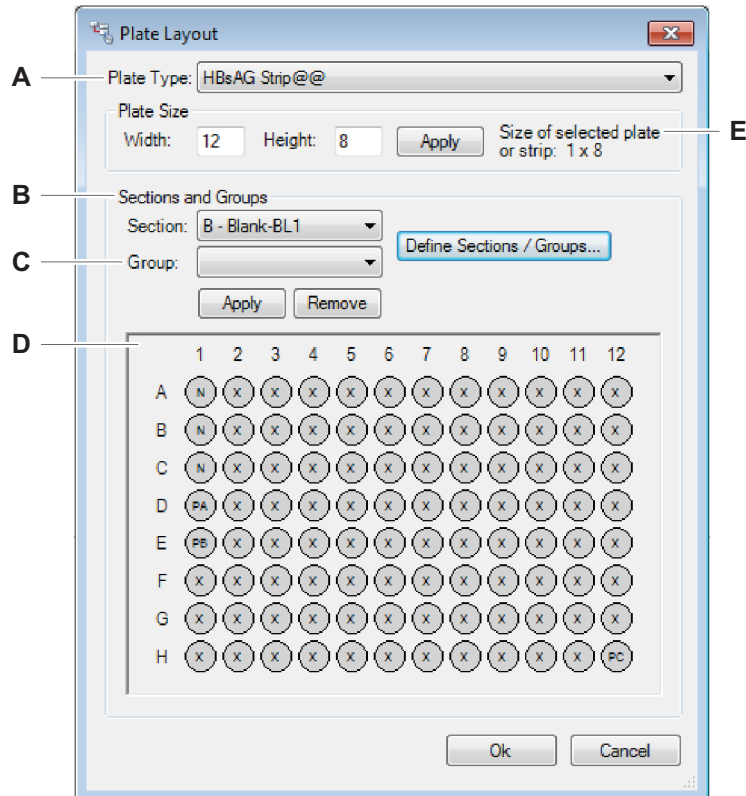


Fig. 7-7 Well function assignment

- A** Number of wells, in rows (**Width**) and columns (**Height**)
- B** **Section:** function of the liquid in the selected well section
- C** **Groups:** used to define replicates, i.e. several wells with the same sample liquid
- D** **A1 .. H12:** microplate wells
- E** **Information:** size of the selected plate

First the user can predefine the microplate layout, assigning a function to each well. In the **Plate Layout** dialog, a graphic representation of the destination microplate is used to define the well type, i.e. which wells will receive sample, controls or blanks etc. Each well can be of a single type only.

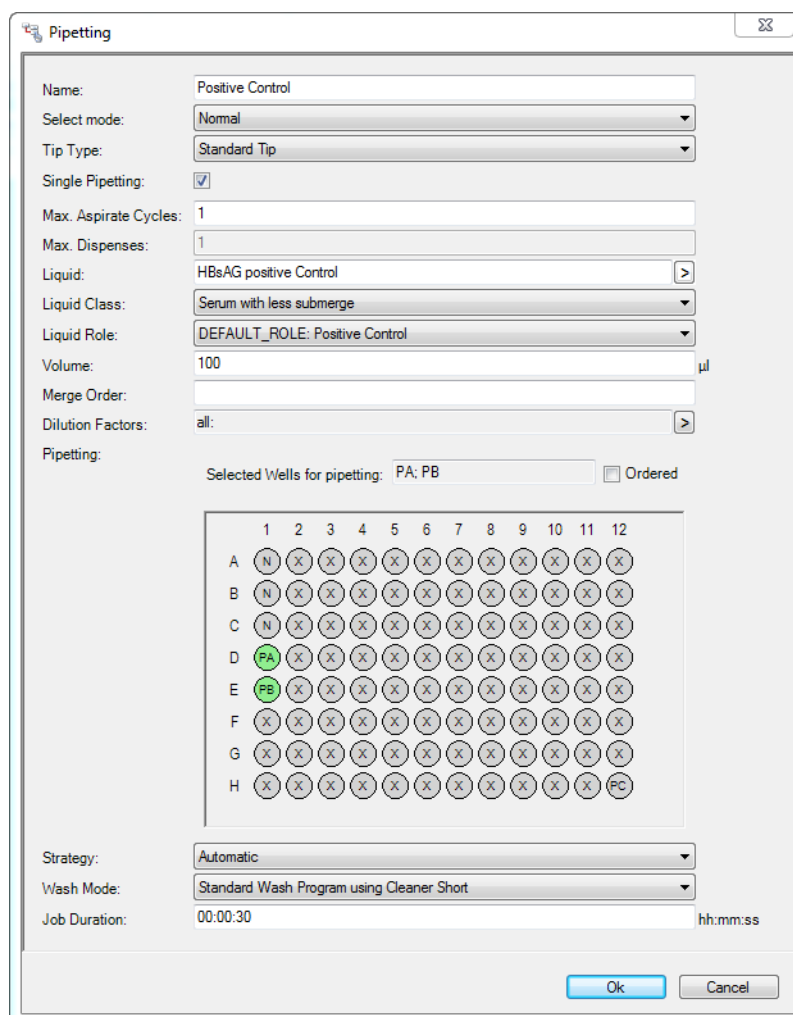


Fig. 7-8 Example pipetting step property screen

Then, in order to define a pipetting step, the user can specify:

- ◆ The job **Name**
- ◆ The command mode **Select mode**
 - Defines the command mode
See [7.2.3.1 “Select Mode”](#), [7-11](#).
- ◆ The **Tip type**
 - Select standard tip or disposable tip with the corresponding tip size depending on the worktable configuration.
- ◆ Check box **Single pipetting** On/Off
 - Single pipetting On means: Only one liquid portion of the target liquid is aspirated and used for one dispense cycle.
 - Single pipetting Off means that a greater liquid portion can be aspirated and used for several dispense cycles into different wells.
- ◆ The **Max. Aspirate Cycles**:
Controls the maximum number of aspirate cycles before the tip is washed or the DiTi is discarded (periodic wash feature).
See [7.2.3.2 “Max. Aspirate Cycles”](#), [7-12](#).

- ◆ The **Max. Dispenses**:
Controls the number of dispense cycles (i.e. strokes) when the total volume for all dispense cycles exceeds the maximum tip volume.
- ◆ The **Liquid**
 - A liquid defined in the Consumable Data Editor and made available with the Liquid Definition dialog.
See chapter 12 “Consumable Data Editor”, 12-1 and section “Liquid Definition”, 7-42 (Liquid Definition will only be available in EVolution SW V2.1, in 2.0.15 removed).
 - Click on the arrow on the right side of the field to display the liquid selection dialog. Select a liquid.

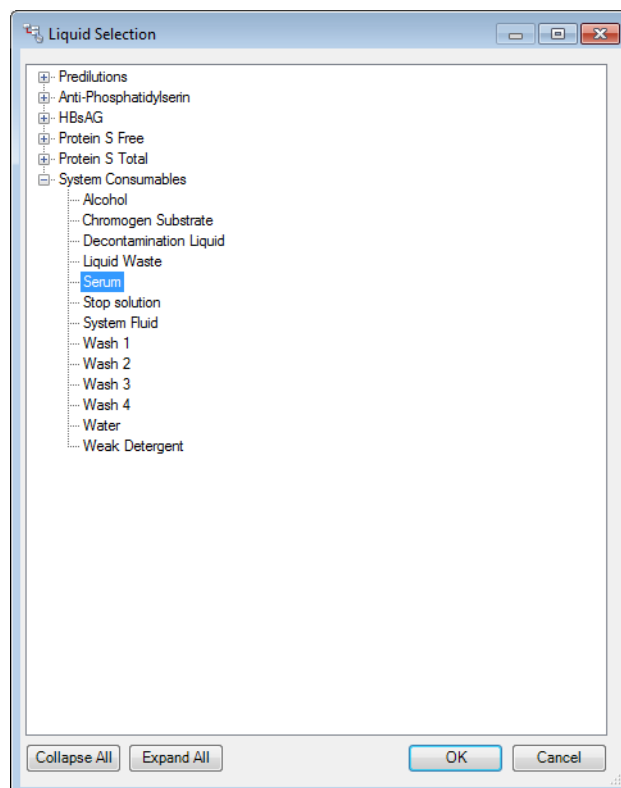


Fig. 7-9 Liquid selection dialog

- ◆ The **Liquid class**
 - The liquid class to use for pipetting. If DEFAULT_CLASS is selected, the liquid class defined in the Liquid Definition dialog is used. Default Liquid Class only when using Liquid Definition (not present in 2.0.15 anymore, but for EVolution V2.1).
- ◆ The **Liquid Role**
 - The liquid role (represents the purpose of the liquid in this step). If DEFAULT_ROLE is selected, the liquid role defined in the Labware Editor is used.
- ◆ The **Volume**
 - The pipetting volume in μl
- ◆ The **Merge Order**
 - The merge order defines the priority of the execution of jobs. A lower merge order has the higher priority. See section 7.2.3.3 “Merge Order”, 7-13.

- ◆ The **Dilution Factors**
 - The available dilution factors are defined in the process dialog. See section 7.12 “Defining Dilution Factors”, 7-100.
 - Click on the arrow on the right side of the field to display the dilution factor dialog. Select the desired factors.

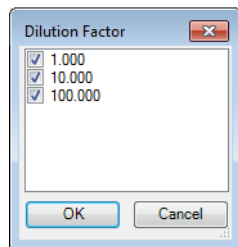


Fig. 7-10 Dilution factor selection dialog

- Note: If all factors are selected the individual numbers will not be listed in the field **Dilution Factors**, but **All** will be displayed.
- ◆ **Pipetting**
 - Check box **Ordered Y/N**
 - If the check box is selected, the well groups are pipetted in the order defined in the plate layout (displayed in the field **Selected wells for pipetting**).
 - Field **Selected wells for pipetting**
 - Displays the order in which the well groups are defined.
- ◆ The **Strategy**
 - Defines the pipetting strategy (direction). See section 7.2.3.4 “Strategy”, 7-18.
- ◆ The **Wash mode**
 - Defines the wash mode. See section 7.3.3 “Tip Wash Mode”, 7-44.
- ◆ The **Job duration**
 - Defines the job duration in hh:mm:ss.

According to the settings in the upper part of the dialog, the following extensions are added to the screen:

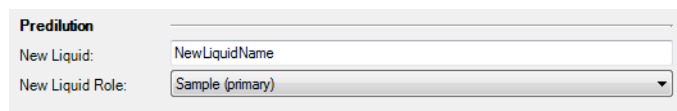


Fig. 7-11 Predilution parameters (only available if a “Predilution” mode is selected)

Decontamination	
Liquid:	Decontamination Liquid >
Liquid Class:	Water trough with less submerge ▼
Liquid Role:	Decontamination ▼
Volume:	250 µl
Soak Time:	2 s
Waste Target:	Waste ▼
Wash Mode:	Standard WashProgram ▼

Fig. 7-12 Decontamination parameters (only available if a “Decontamination” mode is selected)

7.2.3.1 Select Mode

The drop-down list **Select mode** offers the following options:

Normal

Performs simple pipetting step.

Predilution

Predilution pipetting step (The resulting liquid is named and can be used as source liquid in other processes). Define the name and liquid class.

For information on the different predilution modes refer to [7.10 “Predilution Processes”](#), 7-67.

Decontamination

Performs a decontamination step after each tip use. Define the decontamination parameters liquid, liquid class, volume, soak time, waste target and wash mode.

Predilution + Decontamination

Combines the predilution step with decontamination after each tip use.

7.2.3.2 Max. Aspirate Cycles

Purpose The purpose of the periodic wash feature is to speed up pipetting by reducing the number of wash cycles between liquid aspirations (standard tips), i.e. using the tip for several aspirate cycles before washing it.
Same purpose applies for DiTis without discarding the disposable tip after a single aspiration, i.e. using it for several aspirate cycles.

Note: *The feature can be used for single pipetting and multi pipetting jobs.*

Limitations The feature is not available for multiple aspirate steps because of possible cross-contamination.

Range With the default value (**Max. Aspirate Cycles** = 1) the feature is inactive. To enable the feature the value must be > 1 and integer (e.g. 2, 3, 4, etc.). If the entry is not valid, the process can be saved but not executed.
Example:
If you enter a value, e.g. 6, up to 6 aspirate/multi-dispense cycles are possible without tip washing / tip discarding.

Characteristics Please pay attention to the following characteristics of the periodic wash feature:

Note: *If dispenses can be combined for a single aspirate (i.e. same aspirated liquid, same wash mode, same tip type, etc.)*

- *the parameters Single Pipetting / Max. Dispenses are applied as usual.*
- *several aspirate cycles (up to the number defined in **Max. Aspirate Cycles**) are combined (even in the single pipetting case) to a single sequence, which will be executed before the tip is washed or discarded.*

Note: *Combined pipetting steps with different values for **Max. Aspirate Cycles**:*

- *If different pipetting steps are combined (for example because of parallel sample pipetting, parallel reagent pipetting, same merge order in composed job, assay combination, etc.) the system will consider all definitions of **Max. Aspirate Cycles**, i.e. the tip will not exceed the number of aspirate cycles as defined in any step.*

7.2.3.3 Merge Order

Purpose For processes in series the process optimization attempts to merge pipetting steps that dispense the same liquid in such a way that once aspirated liquid can be dispensed to several destinations, even to several plates/strips. With the merge order definition the user can influence this function, e.g. to prevent merging.

Limitations The **Max. Dispenses** value limits the merging function. Only if the sum of all dispense values for the different wells does not exceed the **Max. Dispenses** value is the merging of the two steps possible. On the other hand, aspiration steps can only be merged if the value for **Max. Aspirate Cycles** permits it. Otherwise, individual aspiration/dispense steps for each plate/strip will be scheduled.

Range The merge order is a floating point value and must be equal or higher than the merge order of the previous job.

Note: Jobs without merge order definition have lower priority than jobs with any merge order definition.

If no merge orders are defined at all, the default execution behavior is performed.

When defining merge order definitions, pay attention to the following:

- ♦ The assay must be in a series.
- ♦ Jobs with merge order definitions must be combined as composed jobs.
- ♦ The merge order of a job must be equal or higher than the merge order of the previous job.
- ♦ The number of dispense steps must not exceed the **Max. Dispenses** value.
- ♦ The value for **Max. Aspirate Cycles** needs to be larger than 1 to take advantage of periodic wash (an optimized pipetting sequence). Value = 1 specifies single pipetting with washing between steps.

Default Behavior When no merge orders are defined, the system behaves as shown in the following example:

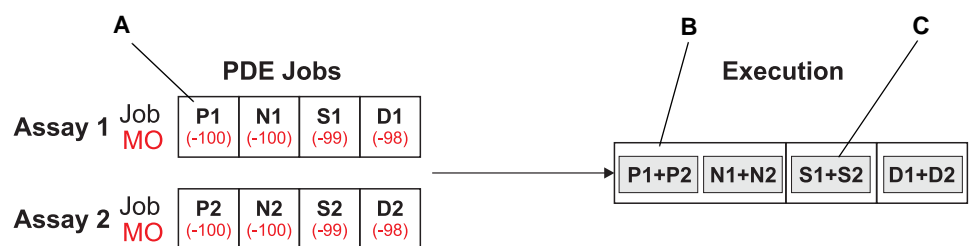


Fig. 7-13 Default behavior without merge order definition

- | | |
|--|-------------------------------|
| A Pipetting job, as defined in the PDE | D Decontamination step |
| B Command, as performed by the system | N Negative control |
| C Gray field indicating one aspirate step for all dispenses | P Positive control |
| | S Sample |
| | MO Merge Order |

Note: The numbers in brackets (for MO) are the default merge order, as assigned by the system. In the examples below, manually entered numbers are displayed without brackets.

Mergable jobs are merged into one command, i.e. if the corresponding liquids (e.g. P1 and P2) are identical the system merges the dispense action into one aspirate action (if permissible by **Max. Dispenses**) or merges aspirate actions before tip washing / DiTi disposal (if permissible by **Max. Aspirate Cycles**).

Merging of Samples

Jobs that dispense samples are merged according to the same rules as reagents. Composed steps that contain more than one sample are merged by default. When merging sample steps, decide whether to use Automatic (source based) sorting or Column by Column (destination based) sorting. Refer to 7.2.3.4 "Strategy", 7-18.

Behavior With Merge Orders

Jobs with the same merge order are merged into one command and if possible aspirates/dispenses are also merged, depending on **Max. Dispenses** and the aspirate liquid.

Examples

The following figure shows an example with a simple merge order definition and a partial merge order definition to illustrate the behavior in these cases:

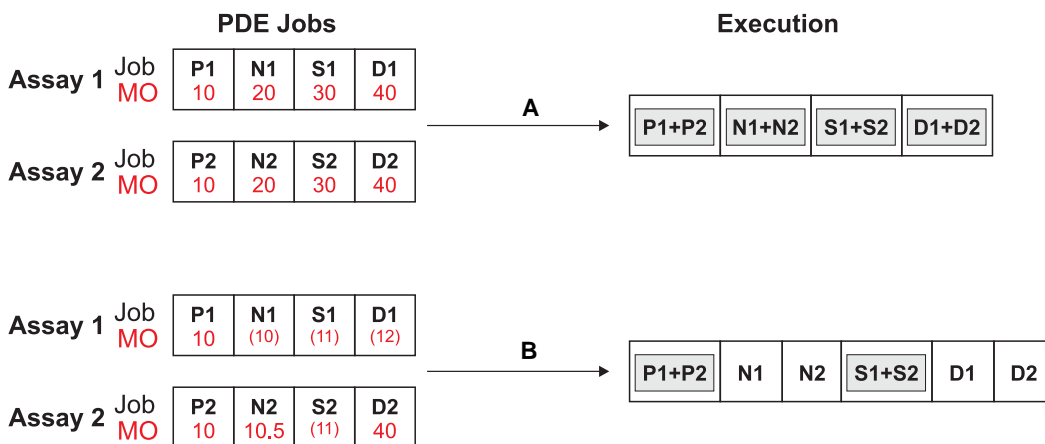


Fig. 7-14 Merge order definition: Examples 1

A P1 and P2 are the same liquid. Each liquid dispenses to 6 wells and 10 µl for each dispense; one tip dispenses to all 12 wells on both plates.

B P1 and P2 are merged, as well as S1 and S2. Merging of N1 and N2 is avoided by partially defined merge orders, even if they are the same liquid. Merging of D1 and D2 is also avoided.

Note: For the significance of the point-separated value (Example B) refer to "Using Point-Separated Values for Merge Order".

The following figure shows a few examples to illustrate the behavior with different merge order definitions:

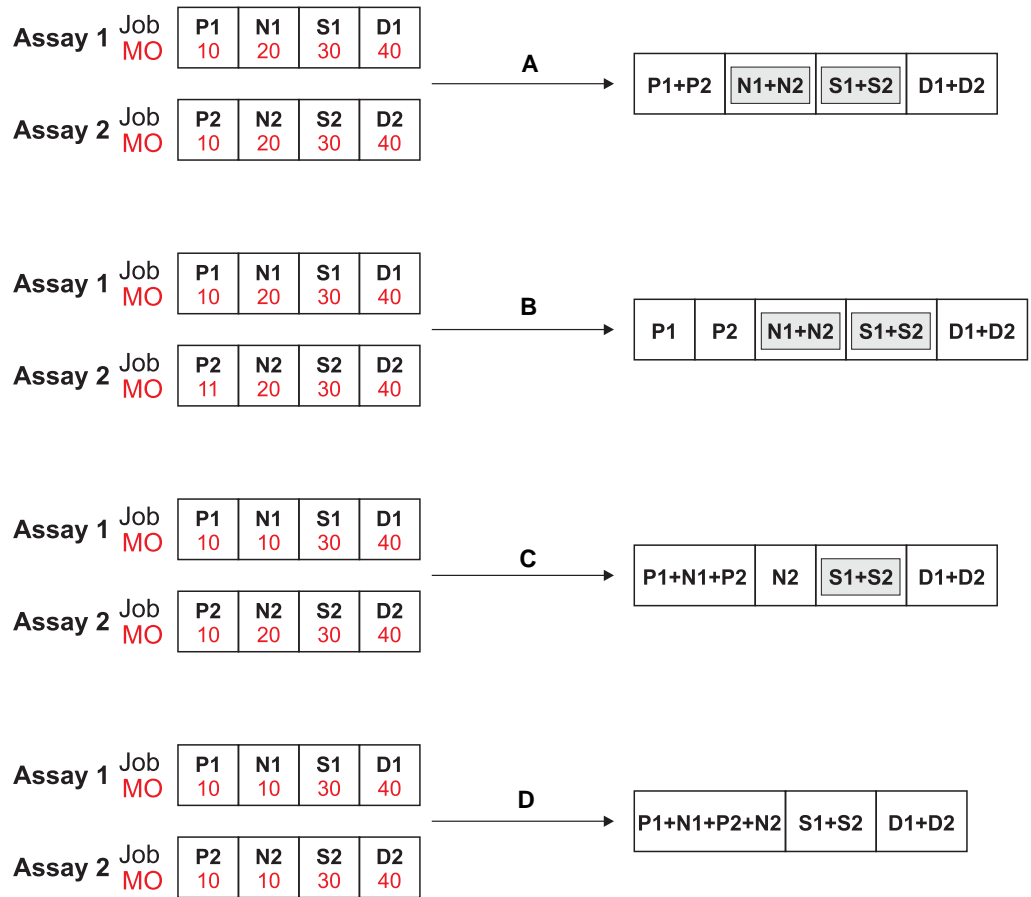


Fig. 7-15 Merge order definition: Examples 2

- A** P1 and P2 are mergable but do not use the same liquid.
- B** The merge order of P2 is $MO_{P1} < MO_{P2} < MO_{N1}$. P2 will be executed between P1 and N1. The aspirate/dispenses are not merged into one tip. The system aspirates and dispenses P1, then aspirates/dispenses P2, then [N1+N2], etc.
- C** $MO_{P1} = MO_{N1} = MO_{P2}$. The jobs P1, N1 and P2 will be merged into one command in the order of appearance.
- D** Here the sample jobs are not mergable. First all pre-sample jobs are executed. Then all samples on plate 1 are dispensed then all samples on plate 2. This behavior may cause a long delay between dispensing the reagents and the samples for assay 2. See below.

Note: To avoid undesirable delays as in example D, point-separated values can be used to group the actions on one plate, i.e. to make the system process one plate after the other.

Using Point-Separated Values for Merge Order

In some cases the sample pipetting commands cannot be merged, e.g. because the **Max. Dispenses** value prevents it (see example D in Fig. 7-15, 7-15).

Merge Orders With Point-Separated Value

If point-separated values are used for the merge orders, jobs with the same number before the point will be ordered in a sequence to avoid undesirable delays on one plate.

The following figure shows an example to illustrate the behavior using merge order definitions with point-separated values.

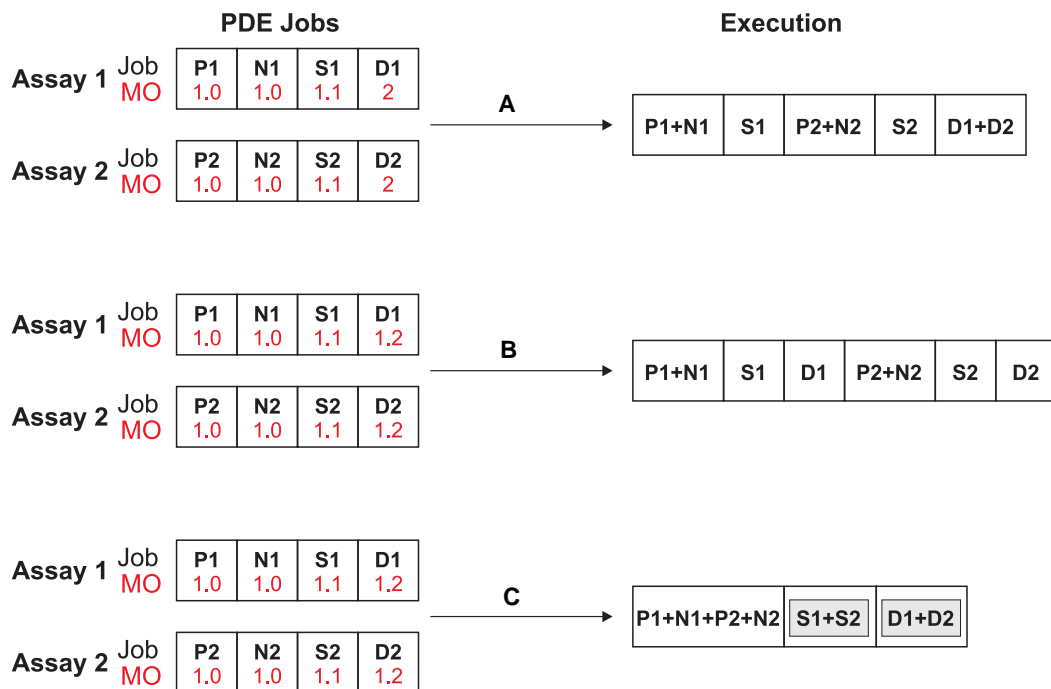


Fig. 7-16 Merge order definitions with point separation: Examples

- A** S1 and S2 are not mergable: All jobs of assay 2 will be appended after the last job of assay 1 with the same number before the decimal point.
- B** S1 and S2 are not mergable: All jobs run in a sequence
- C** Samples S1 and S2 are mergable: They are merged into one tip.

Chaining up Jobs

Jobs with merge orders that only differ slightly, i.e. in the second digit after the point (e.g. 1.01 and 1.02) will be chained up in the same pattern.

In the final optimization stage, the processed wells of the second pattern will be appended right after processed wells of the first pattern.

This feature allows copying plates using all tips even if the source plate contains controls and samples. It also enables fine control of the tip order.

The following examples explain the use of this feature:

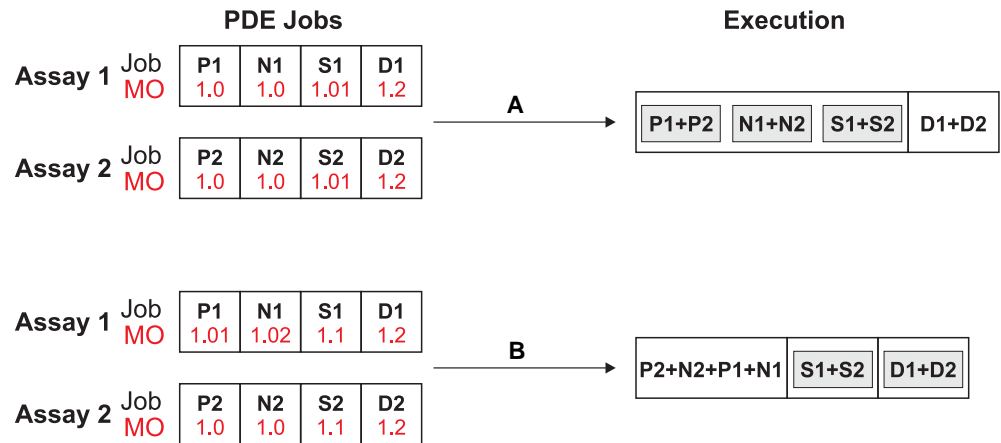


Fig. 7-17 Chaining up jobs: Examples

- A** Merge copy from same predilution plate into same pattern, then add diluent from trough.
- B** P2/N2 are allocated to tips 1 and 2, P1/N1 to tips 3 and 4 (compare with Fig. 7-16, 7-16, example C)

Copying predilution plates using all available tips (A in Fig. 7-17, 7-17)

- ◆ Assign a merge order to the sample pipetting steps that is slightly higher (0.01...0.09) than to other liquids, such as diluted controls.
- ◆ The result can be that the first 2 tips aspirate controls from wells A1 and B1 on the predilution plate, while the remaining 6 tips aspirate sample-specific predilutions from C1 to H1 at the same time.
- ◆ Note that in this way different aspirate volumes are possible.
- ◆ When copying plates and the samples are available in different replicates and/or dilution factors on the predilution plate, you may want to choose the strategy **Column by Column** for the sample-specific steps. This merges sample-specific aspirates and re-orders them based on the destination plate layout (in contrast to this, **Automatic** orders sample pipetting by sample source).
- ◆ This is possible even if several reagents and several sample-specific liquids (replicates and/or different dilution factors) are mixed on the predilution plate, but not if reagents are placed between the samples.

Fine control of tip dispense order when merging complex reagent patterns (B in Fig. 7-17, 7-17)

- ◆ The dispense order in jobs with identical merge order is defined by the system: With the number of assays packed onto a strip plate, or the number of assays in a series the dispense order can vary.
- ◆ By using merge orders that differ slightly, you can force the dispense order and still achieve good optimization.
- ◆ Example: Assuming that in the above case the controls P1, P2, N1 and N2 aspirate different liquids and that you want P1/N1 in tips 1 and 2, P2/N2 in tips 3 and 4.
- ◆ The series definition says that assay 1 is first and assay 2 is second, but you want the controls the other way.

7.2.3.4 Strategy

The drop-down list **Strategy** offers the following options:

Automatic

Pipetting direction from left to right.

Column by column

Pipetting direction top down.

Automatic (Use multiple tips)

Pipetting direction from left to right using several tips simultaneously.

Column by column (Use multiple tips)

Pipetting direction top down using several tips simultaneously.

The examples below explain the settings for the pipetting strategy:

8 Tips and Setting Automatic

	1	2	3	4	5	6	7	8	9	10	11	12
A	a	b	c	d	e	f	g	h	i	j	k	l
B	a	b	c	d	e	f	g	h	i	j	k	l
C	a	b	c	d	e	f	g	h	i	j	k	l
D	a	b	c	d	e	f	g	h	i	j	k	l
E	a	b	c	d	e	f	g	h	i	j	k	l
F	a	b	c	d	e	f	g	h	i	j	k	l
G	a	b	c	d	e	f	g	h	i	j	k	l
H	a	b	c	d	e	f	g	h	i	j	k	l

Setting Automatic

The letters “a” to “l” indicate the order of pipetting steps for samples and e.g. controls that are performed in one move.

Note: The pipetting direction is always from left to right, even if there are less than eight tips.

Refer to the example below for 2 tips (for 4 tips the same applies, accordingly).

Fig. 7-18 Pipetting with 8 tips

2 Tips and Setting Automatic

	1	2	3	4	5	6	7	8	9	10	11	12
A	a	b	c	d	e	f	g	h	i	j	k	l
B	a	b	c	d	e	f	g	h	i	j	k	l
C	m	n	o	p	q	r	s	t	u	v	w	x
D	m	n	o	p	q	r	s	t	u	v	w	x
E	y	z	o	o	o	o	o	o	o	o	o	o
F	y	z	o	o	o	o	o	o	o	o	o	o
G	o	o	o	o	o	o	o	o	o	o	o	o
H	o	o	o	o	o	o	o	o	o	o	o	o

The letters “a” to “z” indicate the order of pipetting steps for samples and e.g. controls that are performed in one move.

Pay attention to the fact that there is a considerable time span between the pipetting steps for the wells A1 and C1. Moreover, the time span for other wells (e.g. E1) is not identical.

Note: Supposed A1 and C1 are controls this may render the results of the assay invalid.

Fig. 7-19 Pipetting with 2 tips

**2 Tips and
Setting Column
by Column**

	1	2	3	4	5	6	7	8	9	10	11	12
A	a	e	i	m	q	u	y	○	○	○	○	○
B	@	e	i	m	q	u	y	○	○	○	○	○
C	b	f	j	n	r	v	z	○	○	○	○	○
D	b	f	j	n	r	v	z	○	○	○	○	○
E	c	g	k	o	s	w	○	○	○	○	○	○
F	c	g	k	o	s	w	○	○	○	○	○	○
G	d	h	l	p	t	x	○	○	○	○	○	○
H	d	h	l	p	t	x	○	○	○	○	○	○

Remedy for this behavior:

Setting Column by column

The letters “a” to “z” indicate the order of pipetting steps for samples and e.g. controls that are performed in one move.

Note: The controls in the wells A1 and C1 are pipetted in succession.

Fig. 7-20 Pipetting with 2 tips/Column by column

Defining the Pipetting Strategy

This section provides hints on the optimization of the pipetting patterns.

Proceed as follows when defining the pipetting strategy:

The basic decision to be made is between **Automatic** and **Column by Column**.

The setting has the following influence:

- ♦ **Automatic** for samples (incl. predilutions of samples) is an aspirate-based (source-based) optimization.
- ♦ **Column by Column** is strict column by column geometric dispense.
- ♦ **Column by Column** for reagents is mainly used on pipetting instruments with less than 8 tips.
- ♦ **Column by Column** for samples (and predilutions of samples) is a dispense-based (destination-based) optimization.

- 1 By default, select **Automatic**.
- 2 Hint: If you not pleased with the resulting a pattern involving several or complex sample pipetting steps, retry with the **Column by Column** setting.

For each of the two basic settings **Automatic** and **Column by Column**, there is a variant **Use multiple tips**.

This is mainly used for reagents: If you do not want the pattern to depend on the number of samples, use a strategy with **Use multiple tips**.

Otherwise, the result can be a single-tip pattern involving a large number of dispenses and several aspirate cycles when there are only few samples.

Note: This is especially the case if you define **Max Aspirate Cycles** (periodic wash).

See 7.2.3.2 “Max. Aspirate Cycles”, 7-12.

7.2.4 Multiple Aspirate Step

For an explanation of the parameters, also refer to section 7.2.3 “Pipetting Step”,
7-6.

Fig. 7-21 Example multiple aspirate step property screen

To define a multiple aspirate step, the user can specify:

- ◆ The job **Name**
- ◆ The command mode **Select mode**
See 7.2.3.1 “Select Mode”, 7-11.
- ◆ The **Tip type**
- ◆ Check box **Single pipetting** On/Off
- ◆ The **Max. Dispenses**
 - Multi aspirate jobs are set to 1, because it is always handled as single dispense
- ◆ Aspiration data for each liquid, in the data grid
 - The liquid name
 - The volume
 - The liquid class
 - The liquid role
- ◆ The **Volume**
- ◆ The **Liquid class**
- ◆ The **Merge Order**
See section 7.2.3.3 “Merge Order”, 7-13.
- ◆ The **Dilution Factors**
See section 7.12 “Defining Dilution Factors”, 7-100.
- ◆ **Pipetting**

- Check box **Ordered** Y/N
- Field **Selected wells for pipetting**
- ♦ The **Strategy**
See section 7.2.3.4 “Strategy”, 7-18.
- ♦ The **Wash mode**
See section 7.3.3 “Tip Wash Mode”, 7-44.
- ♦ The **Job duration**

7.2.5 Decontamination Step

The **Decontamination** step performs decontamination after a series of pipetting steps.

Note: For decontamination after each pipetting step this must be defined in the pipetting job. Refer to 7.2.3.1 “Select Mode”, 7-11.

Fig. 7-22 Example decontamination step property screen

To define a decontamination step, the user can specify:

- ♦ The job name
- ♦ The tip type (can be selected from a drop-down list)
- ♦ The liquid (can be selected from a drop-down list)
- ♦ The liquid class (can be selected from a drop-down list)
- ♦ The liquid role (can be selected from a drop-down list, refer to 7.2.3 “Pipetting Step”, 7-6. The liquid role indicates the purposes of the liquid in the process. Default roles are defined in the Labware Editor.)
- ♦ The volume
- ♦ The soak time
- ♦ The waste target (can be selected from a drop-down list)
- ♦ The wash mode (can be selected from a drop-down list)

7.2.6 Pipette to Waste Step

The **Pipette to Waste** step is used to discard liquid into the waste.

This is useful, e.g. in case of a serial dilution on a microplate. Here, the wells of the last dilution step contain more liquid than the other wells, because there is no subsequent dilution step. These conditions may have an influence on the reader results.

In this case, the excess volume can be aspirated and dispensed to the waste.

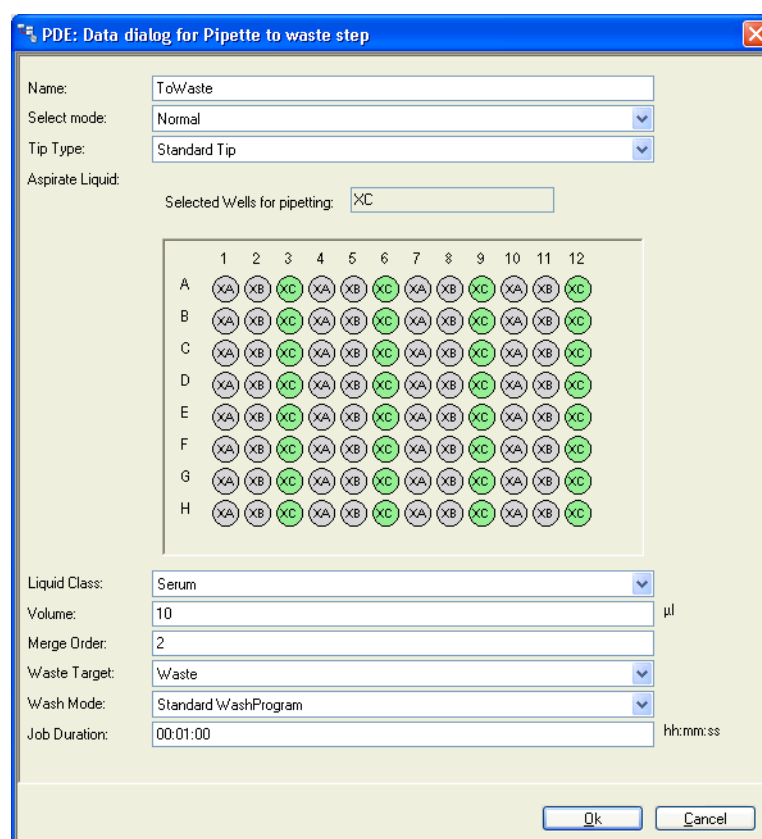




Fig. 7-23 Example pipette to waste step property screen

Note: The pipette to waste step is similar to the pipetting step. Therefore, cross references to details of the pipetting step are made.

To define a pipette to waste step, the user can specify:

- ◆ The job **Name**
- ◆ The command mode **Select mode**
 - Defines the command mode
 - **Normal:** Performs simple pipetting step.
 - **Decontamination:** Performs a decontamination step after each tip use. Define the decontamination parameters liquid, liquid class, volume, soak time, waste target and wash mode.
See [Fig. 7-12 "Decontamination parameters \(only available if a "Decontamination" mode is selected\)"](#), 7-11.
- ◆ The **Tip type**
 - Select standard tip or disposable tip with the corresponding tip size depending on the worktable configuration.

- ◆ **Aspirate Liquid**
 - Field **Selected wells for pipetting**
 - Displays the order in which the well groups are defined.
- ◆ **The Liquid class**
 - The liquid class to use for pipetting. If DEFAULT_CLASS is selected, the liquid class defined in the Liquid Definition dialog is used.
- ◆ **The Volume**
 - The pipetting volume in μl
- ◆ **The Merge Order**
 - The merge order defines the priority of the execution of jobs. A lower merge order has the higher priority.
See section [7.2.3.3 “Merge Order”](#),  7-13.
- ◆ **The Waste Target**
 - Defines the waste location into which the liquid is discarded.
- ◆ **The Wash mode**
 - Defines the wash mode.
See section [7.3.3 “Tip Wash Mode”](#),  7-44.
- ◆ **The Job duration**
 - Defines the job duration in hh:mm:ss.

7.2.7 Sample Splitting Step

The **Sample Splitting** step is used to pipette (split) the contents of a sample source (primary) container into one or several secondary containers, e.g. for different tests. Sample splitting is a feature available for Freedom EVO Clinical (Freedom EVOLution 2.1). Instead of using an empty process for creating a new test, the SampleSplitTemplate is selected in the process definition editor.

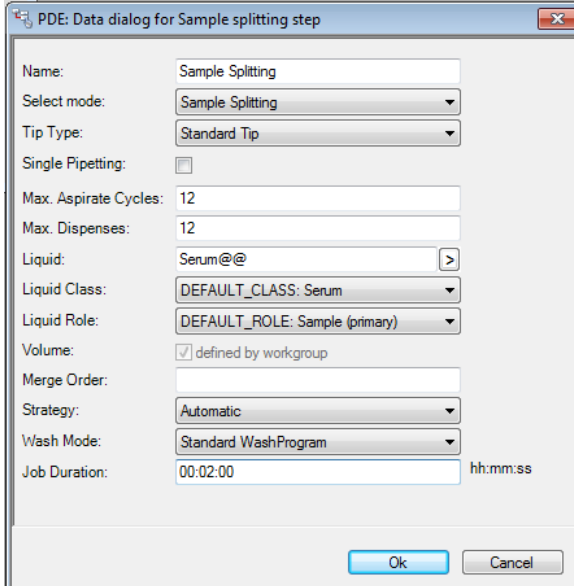


Fig. 7-24 Example sample splitting step property screen

Note: The sample splitting step is similar to the pipetting step. Therefore, cross references to details of the pipetting step are made.

To define a sample splitting step, the user can specify:

- ◆ The job **Name**
- ◆ The command mode **Select mode**
 - Define the command mode:
 - **Sample Splitting:** Defines a sample splitting step; the value for the volume is taken from the workgroup definition.
 - **Sample Splitting + Decontamination:** Defines a sample splitting step; the value for the volume is taken from the workgroup definition; performs a decontamination step after each tip use.
 - **Pipetting:** Defines a sample splitting step; the value for the volume can be entered in the field **Volume**.
 - **Pipetting + Decontamination:** Defines a sample splitting step; the value for the volume can be entered in the field **Volume**; performs a decontamination step after each tip use.

*Also refer to the explanations for the **Volume** field below.*

- ◆ The **Tip type**
 - Select standard tip or disposable tip with the corresponding tip size depending on the worktable configuration.
- ◆ Check box **Single pipetting** On/Off
 - Single pipetting On means: Only one liquid portion of the target liquid is aspirated and used for one dispense cycle.

- Single pipetting Off means that a greater liquid portion can be aspirated and used for several dispense cycles into different wells.
- ◆ The **Max. Aspirate Cycles**:
Controls the maximum number of aspirate cycles before the tip is washed or the DiTi is discarded (periodic wash feature).
See 7.2.3.2 “Max. Aspirate Cycles”, ¶ 7-12.
- ◆ The **Max. Dispenses**:
Controls the number of aspirate cycles (i.e. strokes) when the total volume for all dispense cycles exceeds the maximum tip volume.
- ◆ The **Liquid**
 - A liquid defined in the Consumable Data Editor and made available with the Liquid Definition dialog.
See chapter 12 “Consumable Data Editor”, ¶ 12-1 and section “Liquid Definition”, ¶ 7-42.
 - Click on the arrow on the right side of the field to display the liquid selection dialog. Select a liquid.
- ◆ The **Liquid class**
 - The liquid class to use for pipetting. If DEFAULT_CLASS is selected, the liquid class defined in the Liquid Definition dialog is used.
- ◆ The **Liquid Role**
 - The liquid role (represents the purpose of the liquid in this step). If DEFAULT_ROLE is selected, the liquid role defined in the Labware Editor is used.
- ◆ The **Volume**
 - According to the command mode (see **Select mode** above) the check box **defined by workgroup** or the **Volume** entry field appears.
 - For **Sample Splitting** modes: The check box **defined by workgroup** cannot be unselected. In this case the volume defined for the workgroup applies.
 - If the **Volume** entry field appears: Enter the pipetting volume in µl
- ◆ The **Merge Order**
 - The merge order defines the priority of the execution of jobs. A lower merge order has the higher priority. See section 7.2.3.3 “Merge Order”, ¶ 7-13.
- ◆ The **Strategy**
 - Defines the pipetting strategy (direction).
See section 7.2.3.4 “Strategy”, ¶ 7-18.
- ◆ The **Wash mode**
 - Defines the wash mode.
See section 7.3.3 “Tip Wash Mode”, ¶ 7-44.
- ◆ The **Job duration**
 - Defines the job duration in hh:mm:ss.

According to the settings in the upper part of the dialog, the **Decontamination** extension is added to the screen:

Refer to Fig. 7-12 “Decontamination parameters (only available if a “Decontamination” mode is selected)”, ¶ 7-11.

7.2.8 Enable Predilution Step

The **Enable Predilution** step defines inter-process constraints, i.e. a step in a predilution process can be delayed until it will be enabled by a second process using the **Enable Predilution** step.

Example

The figure shows an example of two processes using samples from the same tube. However, the liquid A (e.g. serum) must be pipetted first in order not to stir up the sediment B (e.g. red blood cells).

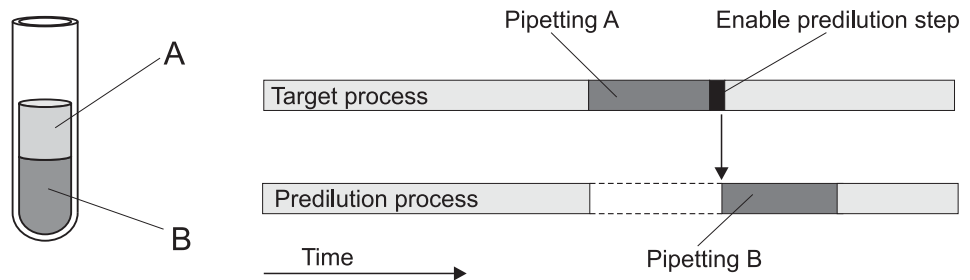


Fig. 7-25 Example for using the **Enable predilution** step

Explanation of the example in the figure: The target process uses the liquid A and the predilution process uses the sediment B. The **Enable Predilution** step in the target process forces the liquid A to be pipetted first by constraining the pipetting step in the predilution process.

Note: The step **Enable Predilution** can only be used to constrain specific predilution processes that are used by the corresponding target process.

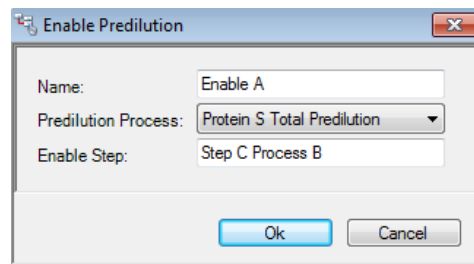


Fig. 7-26 Example **Enable Predilution** property screen

The step **Enable predilution** is defined by the following parameters:

- ◆ Job name
- ◆ Predilution process
 - Name of the predilution process (select from the list)
- ◆ Enable step
 - Step name of the corresponding predilution process.

The step defined here is disabled until the current process enables the step.

7.2.9 Activating New Liquids Step

The **Activating New Liquids** step is used to have influence on the time at which a new liquid from a predilution process will be used by a succeeding process when steps are added to the predilution process. Furthermore, this step makes the new liquid accessible again in case you use the predilution within the assay itself and there are succeeding steps.

There are two different behaviors:

- ◆ Default behavior:
 - The destination assays will use the new liquid that existed before the additional step.
 - If there are additional steps after a predilution process, the new liquid is not accessible for the LiHa any more.
- ◆ The **Activate Liquids** step overrides the default behavior:
 - The destination assays will use the new liquid that existed after the additional step.
 - The new liquid will be accessible for the LiHa again after a succeeding step.

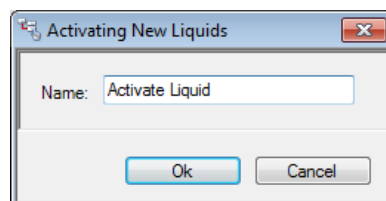


Fig. 7-27 Example activate liquids step property screen

To define this step, the user needs to specify the step name only.

7.2.10 Verification Reading Step

The process step **Verification Reading** allows checking whether a liquid was dispensed properly into the destination wells (dispense check). Verification is accomplished by means of an OD measurement in the plate reader, based on a chemical color reaction between the dispensed reagents or between reagent and plate coating. This step can only be performed if the kit includes such a color reaction.



ATTENTION

Prevented process start

When defining a reader method in Magellan, the option **Move plate out after measurement** must not be checked. The process cannot start.



ATTENTION

Collision when the RoMa accesses the reader tray while shaking is on.

Make sure that the option shake plate **Outside** is deactivated. Refer to the “Magellan Instructions for Use”.

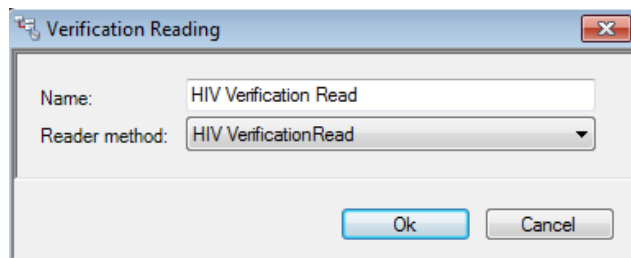


Fig. 7-28 Example verification reading step property screen

The parameters for this procedure step are:

- ♦ Job name
- ♦ Name of the reader method

To ensure that the verification reading step works properly, pay attention to the following:

- ♦ The plate layout defined in Magellan software must match the plate layout in Freedom EVOLution SW.
- ♦ Cutoff values in Magellan software must be defined.
- ♦ The “good” samples must be labeled with the string which begins with the token “PASS” (in the column **Label** in Magellan software), e.g. “PASSLowerCriteria”, “PASS1”, etc.



ATTENTION

Misinterpretation of the verification reading results.

If the plate layout does not match or if the “PASS” label is missing, Freedom EVOLution SW cannot interpret the reader results.

7.2.11 Incubating Step

Heated incubation allows for the preservation of controlled environmental conditions, mainly with respect to temperature and light; e.g., for temperature-sensitive reactions during an ELISA.

This step allows incubation at room temperature and also at temperatures of up to 46 °C (depending on the hardware actually connected). It can be executed with or without shaking. The Incubating step is performed in the incubator (MIO).

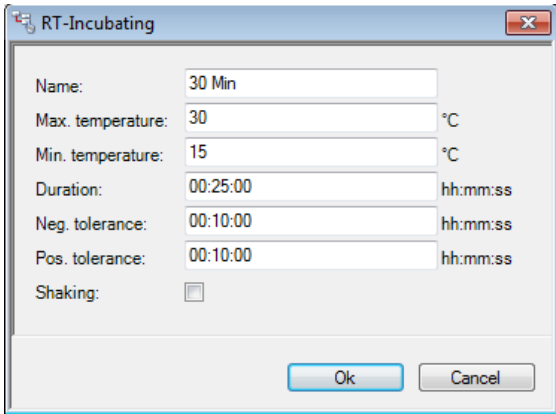
Fig. 7-29 Example incubating step property screen

The step **Incubating** is defined by the following parameters:

- ◆ Job name
- ◆ Target temperature
- ◆ Negative (temperature) tolerance
- ◆ Positive (temperature) tolerance
- ◆ Duration (incubation time)
- ◆ Negative (time) tolerance
- ◆ Positive (time) tolerance
- ◆ Shaking (on/off)

7.2.12 RT-Incubating Step

The step **Rt-incubating** performs room temperature incubation of the microplate.



Name:	30 Min
Max. temperature:	30 °C
Min. temperature:	15 °C
Duration:	00:25:00 hh:mm:ss
Neg. tolerance:	00:10:00 hh:mm:ss
Pos. tolerance:	00:10:00 hh:mm:ss
Shaking:	<input type="checkbox"/>

Fig. 7-30 Example RT incubating step property screen

The step **Rt-incubating** is defined by the following parameters:

- ◆ Job name
- ◆ Maximum temperature
- ◆ Minimum temperature
- ◆ Duration (incubation time)
- ◆ Negative (time) tolerance
- ◆ Positive (time) tolerance

When this step is used without shaking, incubation will be performed in the loading ports (RT-incubators).

7.2.13 Washing Step

The step **Washing** performs microplate plate washing.

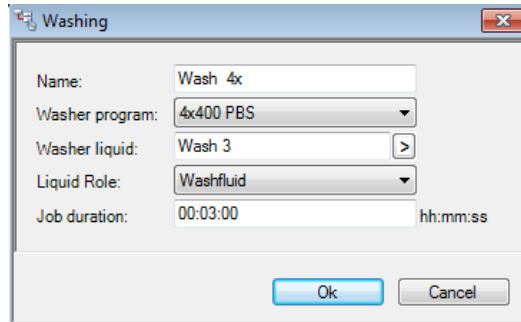


Fig. 7-31 Example washing step property screen

For each washing job in the software, the following parameters can be specified:

- ◆ Job name
- ◆ Washer program (can be selected from a drop-down list)
- ◆ Washer liquid to be used (can be selected from the liquid selection dialog)
- ◆ Liquid role, refer to [7.2.3 "Pipetting Step"](#), [7-6](#).
- ◆ Washing job duration in hh:mm:ss

Note: Durations must be determined by the user. They define a maximum time that must be reserved for executing a process step.

All further parameters for the washing job are described in the software documentation of the corresponding washer:

- ◆ HydroFlex Platform (microplate washer)
 - For a description of the HydroControl program editor, refer to the HydroControl Instructions for Use.
- ◆ Columbus Washer
 - For a description of the WinWash program editor, refer to the WinWash Clinical Instructions for Use.

7.2.14 Reading Step

The step **Reading** performs the measurement with the Sunrise reader.



ATTENTION

Prevented process start

When defining a reader method in Magellan, the option **Move plate out after measurement** must not be checked. The process cannot start.



ATTENTION

Collision when the RoMa accesses the reader tray while shaking is on.

Make sure that the option shake plate **Outside** is deactivated.

Refer to the "Magellan Instructions for Use".

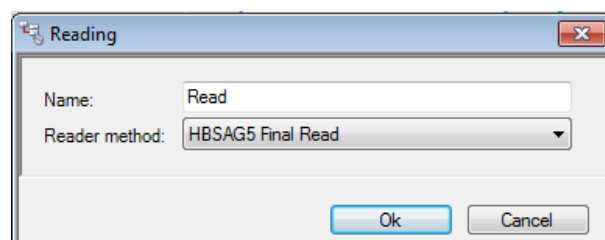


Fig. 7-32 Example reading step property screen

The reading step is defined by the following parameters:

- ◆ Job name
- ◆ Reader method to be used



ATTENTION

With each reader step by the Sunrise reader, an output file is created (workspace) in the Freedom EVolution system. The Freedom EVolution output file (PlateReport) also contains all the information from this workspace. However, there is one exception: Magellan software does not provide the content for the entry **Audit Trail**. This means, the entry **Audit Trail** in the PlateReport is always empty.

7.2.15 Incubation Delay Step

The step **Incubation Delay** causes the microplate to remain on the site, e.g. for short-time incubation, instead of moving the plate into the RT incubator. This saves RoMa moves and, thus, increases system performance.

Note: The same effect could be achieved with long durations for a handling step, however, this would occupy the RoMa and have a negative influence on the system performance.

While the plate stays on the site, the LiHa and the RoMa can perform other steps.

Note: The position of the plate with the Incubation Delay is then occupied and no other plate can be scheduled there until it is removed. It is handled by the software, but might influence the schedule and throughput.

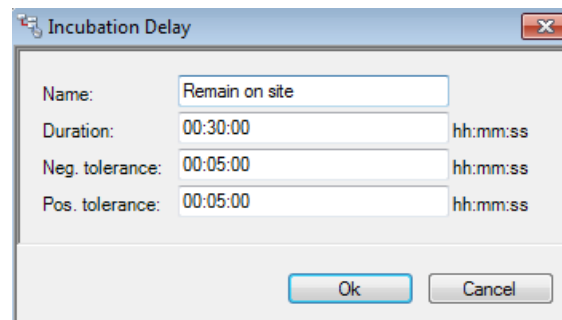


Fig. 7-33 Example incubation delay step property screen

The step **Incubation Delay** is defined by the following parameters:

- ◆ Job name
- ◆ Duration (delay time)
- ◆ Negative (time) tolerance
- ◆ Positive (time) tolerance

7.2.16 Teleshaking Step

The step **Teleshaking**¹⁾ shakes the microplate in a defined mode.

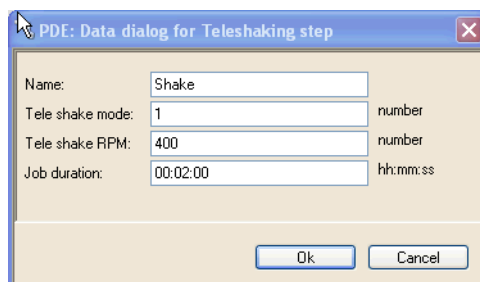


Fig. 7-34 Example teleshaking step property screen

The step **Teleshaking** is defined by the following parameters:

- ◆ Job name
- ◆ Tele shake mode
Defines the direction (N = North, E = East, W = West, S = South) of the shaking movements.
 - 0 = Shaking off
 - 1 = N > W > S > E
 - 2 = N > E > S > W
 - 3 = NE > SW
 - 4 = NW > SE
 - 5 = N > S
 - 6 = E > W
- ◆ Tele shake RPM
Defines the shaking speed in revolutions per minute.
 - Range: 20 to 2000
- ◆ Job duration (shaking time)

1) Teleshaking is only available with V2.2 for Qwalys.

7.2.17 Carrier Shaking Step

The step **Carriershaking**¹⁾ shakes (rotates) the vials in the rotating vial carrier.

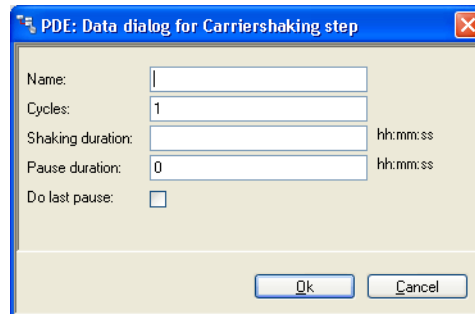


Fig. 7-35 Example carrier shaking step property screen

The step **Carriershaking** is defined by the following parameters:

- ♦ Job name
- ♦ Number of cycles
 - Defines the number of cycles for intermittent shaking. If no intermittent shaking is used, enter “1”.
- ♦ Shaking duration (shaking time)
- ♦ Pause duration
 - Defines the duration of the pause between shaking cycles. If no intermittent shaking is used, enter “0”.
- ♦ Check box **Do last pause**
 - Defines if the last pause after intermittent shaking is scheduled.
 - If checked: The last pause is scheduled.
 - If not checked: Proceed directly after shaking.

1) Carrier Shaking step is only available with V2.2 for Qwalys.

7.2.18 Magnetizing Step

The step **Magnetizing**¹⁾ performs magnetizing of the samples by putting them onto the carrier with magnets.

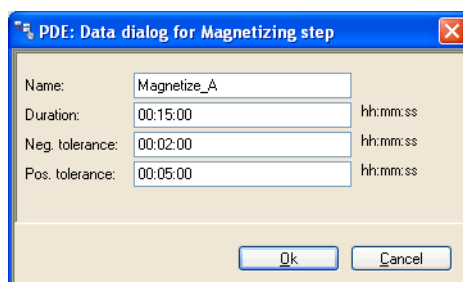


Fig. 7-36 Example magnetizing step property screen

The step **Magnetizing** is defined by the following parameters:

- ◆ Job name
- ◆ Duration (magnetization time)
- ◆ Negative (time) tolerance
- ◆ Positive (time) tolerance

7.2.19 Diagast Reading Step

The step **Diagast-reading** performs the measurement with the Diagast reader.

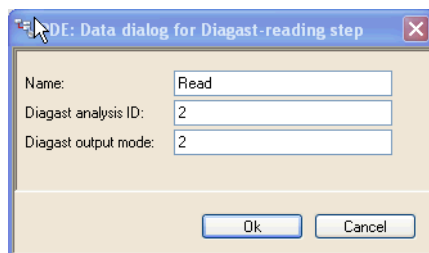


Fig. 7-37 Example Diagast reading step property screen

The step **Diagast-reading**²⁾ is defined by the following parameters:

- ◆ Job name
- ◆ Diagast analysis ID
Defines which pre-programmed reading method is used.
 - Range: 1 to 4 (numbers correspond to pre-programmed reader methods)
- ◆ Diagast output mode
Defines the Microdom output mode
 - 0 = None
 - 1 = Dialog
 - 2 = Log file
 - 3 = Dialog and log file

1) Magnetizing is only available with V2.2 for Qwalys.

2) Diagast Reading is only available with V2.2 for Qwalys.

7.3 The Tools Menu

The Tools menu offers all functions needed for the configuration of plates, liquids, wash modes etc.

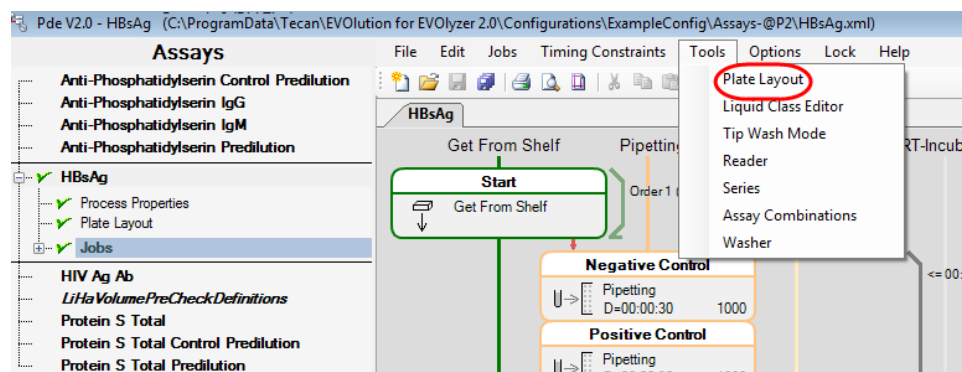


Fig. 7-38 Tools menu

7.3.1 Process Definitions

The microplate layout for a ELISA process is specified in two dialogs:

- ◆ The **Tools - Process Definitions- Layout Definitions** dialog
- ◆ The **Tools - Process Definitions - Microplate Layout** dialog.

In the **Process Definitions - Layout Definitions** dialog, the user can specify the well sections and groups used for the microplate in his ELISA process.

In the **Process Definitions - Microplate Layout** dialog, the well sections and groups for a microplate will be assigned to the appropriate wells.

**Layout
Definitions**

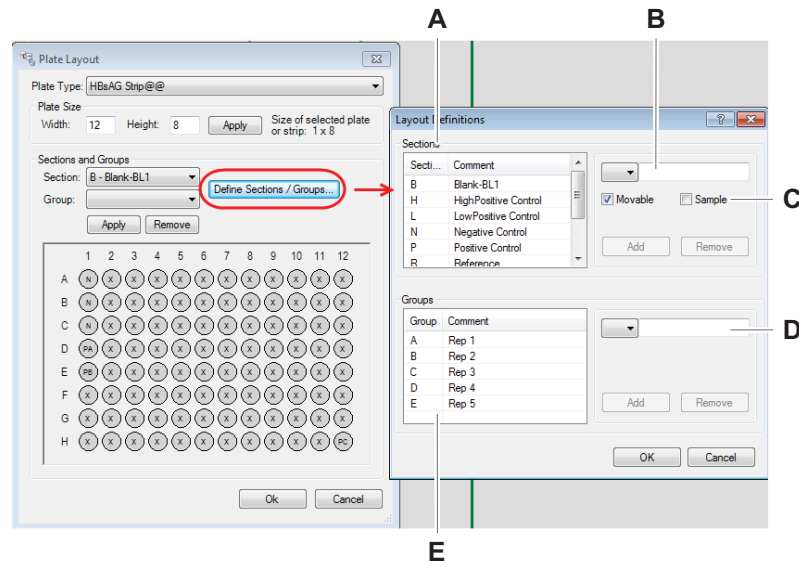


Fig. 7-39 Microplate *layout definitions* dialog

- A** List of pre-defined well sections, with section letter and comment
- B** Fields for the definition of new well sections
- C** Options
- D** Fields for the definition of new well groups
- E** List of pre-defined well groups, with group letter and comment

Field Sections

The field **Sections** displays the identifiers for well sections and offers the following options:

Sample

Select the check box to define the well section as sample section.

Movable

If the check box is unselected, the corresponding section (e.g. end control) position is static.

Select the check box to assign the section to have a dynamic position, i.e. the section (e.g. end control) will be moved to a position after the last sample in case the number of samples does not fill the whole plate.

Field Groups

The field **Groups** displays the group letter.

The groups offer an additional possibility, apart from the identifier, to differentiate and trace liquids in the software. Each group letter defines a group of different liquids, e.g. sample replicates.

**Microplate
Layout**

In the **Tools - Process Definitions- Microplate Layout** dialog, the user can assign the pre-defined well sections and groups to the microplate used in the test:

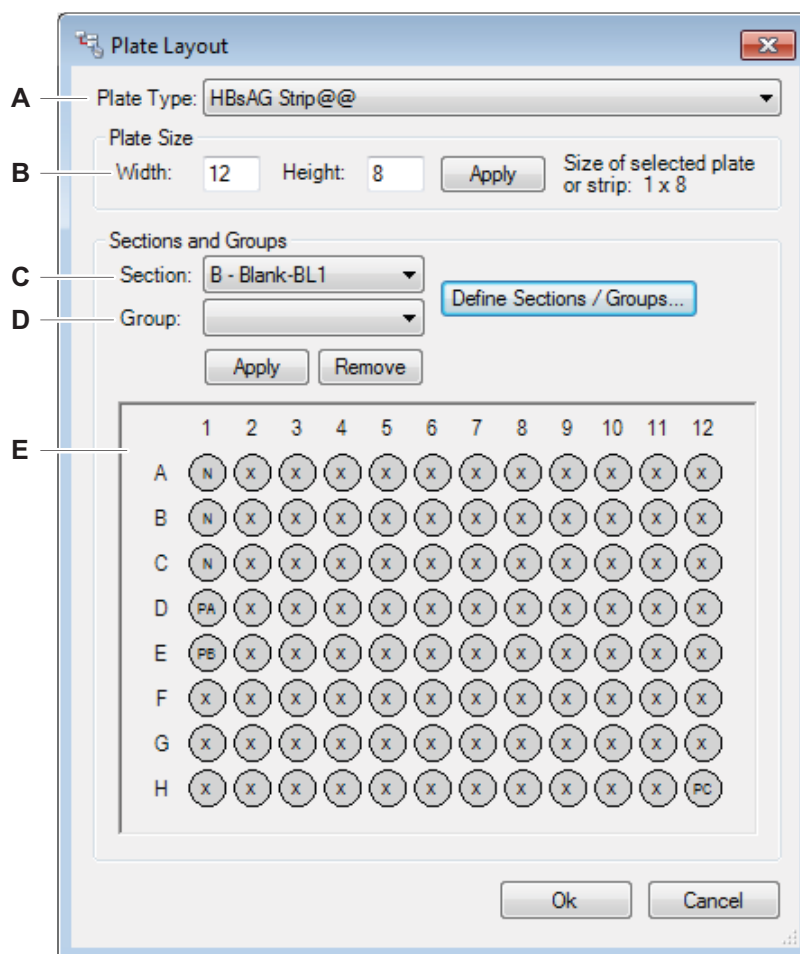


Fig. 7-40 Microplate layout

- A** Plate type list
- B** Specification of the well rows and columns on the microplate
- C** List of pre-defined well sections. Here a section is selected, to assign it to the wells selected in the well matrix.
- D** List of pre-defined well groups. Here a group is selected, to assign it to the wells selected in the well matrix.
- E** Well matrix: click single wells, rows or columns to select the wells before attributing a group and a section to them.

Note: The layout for samples, controls and standards must be congruent with the layout defined in Magellan, otherwise the reading method will not work.

7.3.2 Liquids

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Liquid Class Editor	See chapter 11 "Liquid Classes Editor", 11-1

The options under the Liquids menu comprise

- ♦ the Liquid Class Editor.
- ♦ the Liquid Definitions dialog (Liquid definitions dialog was removed with V2.0.15).

Liquid Class Editor

Liquid Classes

Each liquid class is a set of liquid handling parameters. It specifies speeds, air gaps, detection modes, conductivity etc. of a liquid used in the ELISA process. For a detailed description of the Liquid Classes Editor, refer to cross references above.

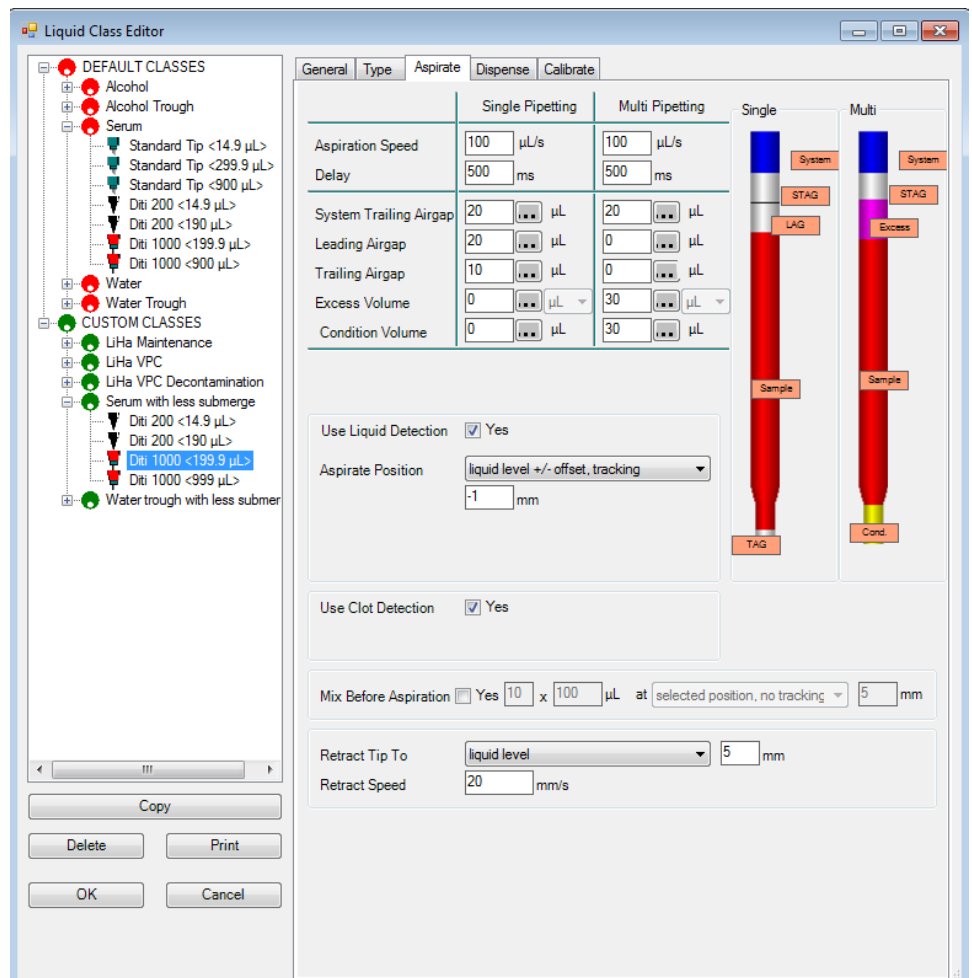


Fig. 7-41 Aspirate tab of the Liquid Classes Editor

Liquid Definition

In the **Tools > Liquids > Liquid Definition** dialog, the default liquid class can be specified for each available liquid. Choosing the default class in a pipetting job will then make use of the correct liquid class (Liquid definitions dialog was removed with V2.0.15).

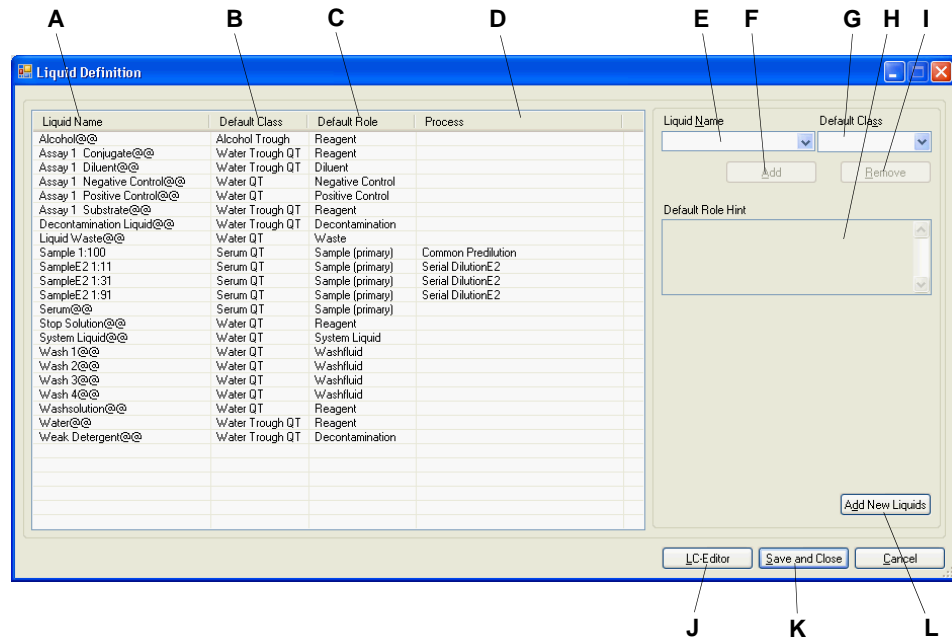


Fig. 7-42 Liquid definition dialog

- | | |
|--|---|
| A List of liquid names | G Drop-down list with liquid classes |
| B Default liquid class | H Explanation to the default liquid role |
| C Default liquid role | I Remove button |
| D Predilution process (if applicable) | J Link to Liquid Class Editor |
| E Drop-down list with liquid names | K Save and Close button |
| F Add button | L Add New Liquids button |

To add a liquid to the list:

- 1 Select the liquid from the drop-down list.
- 2 Select the liquid class from the drop-down list.
- 3 Click on **Add**.

To remove a liquid from the list, select the liquid and click on **Remove**.

Add New Liquids button

Whenever a predilution process is defined, the created liquid is automatically added to the list of liquid definitions. The **Liquid Name** is the name of the liquid specified in the predilution process and **Process** is the name of the predilution process.

However, if a predilution process is copied from a different configuration, it does not automatically appear in the list. In this case, you will need to click on the **Add New Liquids** button and select the file that defines the predilution, to add it to the list.

To keep the changes, leave the dialog by clicking on **Save and Close**, otherwise click on **Cancel**.

7.3.3 Tip Wash Mode

The **Tools - Tip Wash Mode** tool enables the user to define wash modes.

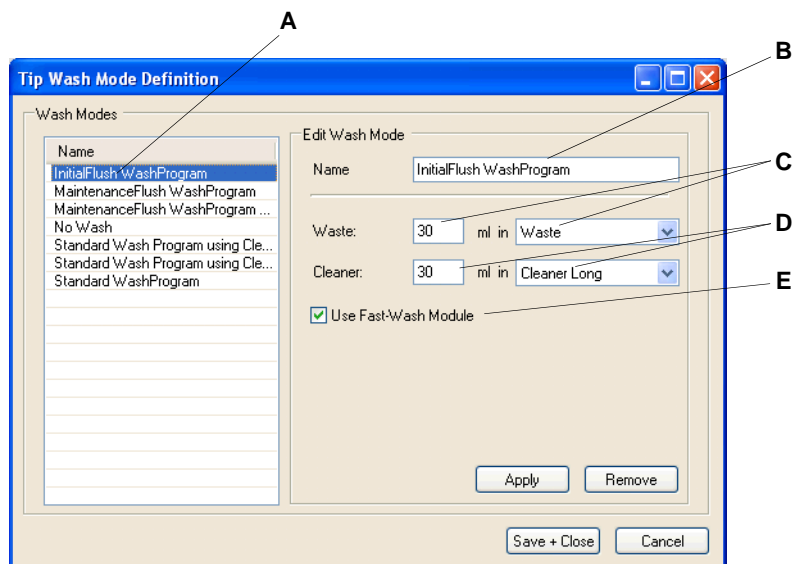


Fig. 7-43 Tip wash modes

- | | |
|---|---|
| A List of defined tip wash modes | C Waste volume and waste container |
| B Name of the wash mode. Type a new name and click the Add button, to create a new wash mode. | D Cleaner volume and container |
| | E Option Fast Wash Mode |

To define a new tip wash mode, proceed as follows:

- 1 Select an existing tip wash mode.
- 2 Enter the name of the new tip wash mode in the field **Name**.
- 3 Enter the corresponding parameters.
- 4 Click on **Apply**.

The new tip wash mode is added to the list.

Note: With DiTis the FaWa is never used (except for the initial flush wash mode).

7.3.4 Reader

The **Tools - Reader** menu item calls up the Magellan dialog for definition of new reader methods.

This dialog is wizard-guided and self-explanatory.

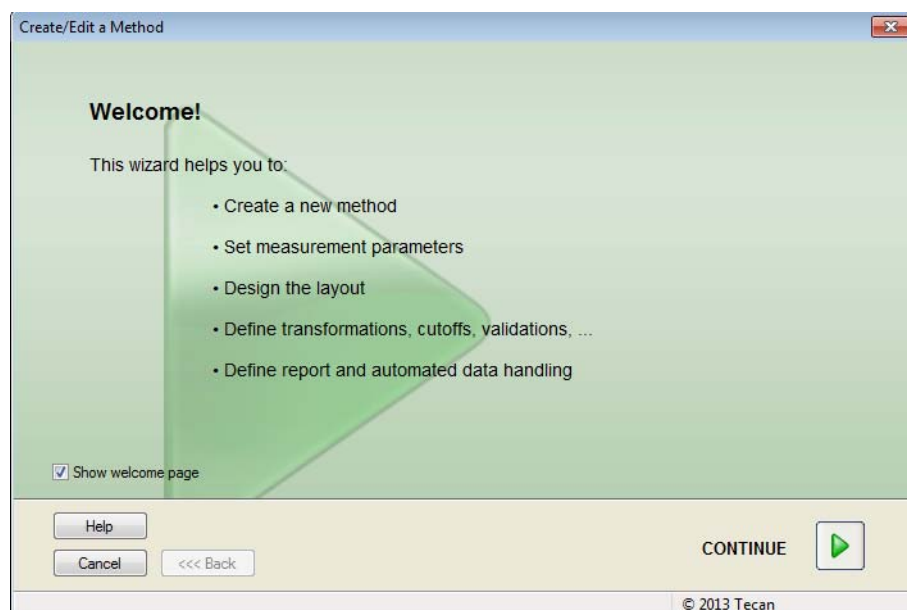


Fig. 7-44 Reader method definition


7.3.5 Series

A series is a specification of the assays that can be run simultaneously. A series can contain a process only once (e.g. an HIV-HVC series is possible, but an HIV-HIV series is not). The enumeration of such assays is stored in the file **series.xml**. The series specification is part of the configuration and is electronically signed.

Prerequisites for Defining Series

The assays for which series can be built must be compatible. Assays not compatible for series will be excluded from the series.

Note: Only samples can be synchronized for building series, means defining series is only for parallel sample pipetting.

- To synchronize reagents refer to [7.13 "Parallel Reagent Pipetting"](#),  7-101

Prerequisites to be met

Make sure the following prerequisites have been met for sample-pipetting in each assay:

- Single pipetting must not be checked or MaxAspirateCycles must be greater than 1
- All assays must be pipetted with multipipetting
- The assays must use the same sample liquid ("Serum")
- The liquid class must be identical
- There must be sufficient pipetting sites available on the worktable
- The job durations must be identical

Troubleshooting

- 1 Click the right mouse button on a job in the **Scheduling Simulator** and select **Show Commands** in the context menu.

Note: The reason might be displayed in the upper part of the text output.

- Look for the keyword *excluded*.
- 2 Check the Tecan/Planning/ProcessBuilder channel and it's sub-channels for warnings / errors In the **LogViewer**.
 - 3 To keep the changes, leave the dialog by clicking on Save and Close, otherwise click on Cancel.

Series Editor

The **Tools > Series** menu item calls up the Series Editor. This is a dialog with a list of all available process definition files in the **Assay** folder.

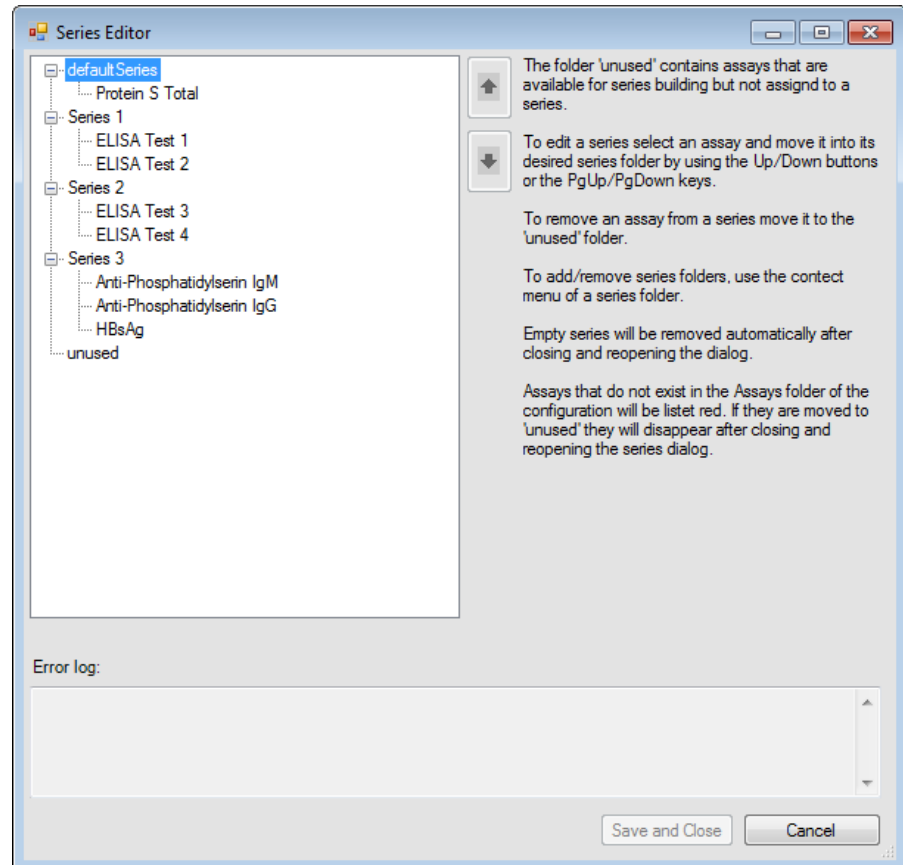


Fig. 7-45 Series editor

To edit the series definitions, proceed as follows:

- ◆ Select the process definition files with a mouse click and then, by clicking on the **up and down arrows (or pressing the Page Up / Page Down keys)**, move them up or down, to have them included in or excluded from the series definitions.
*The process definition files not used in a series section (excluded files) are present in the section **unused**.*

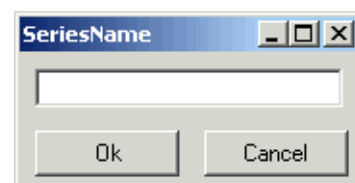


Fig. 7-46 Dialog SeriesName

- ◆ To add a new section for a series, click on a section name with the right mouse button. Enter a name in the dialog **SeriesName** on click on **Ok**.
- ◆ To delete a section, click on the section name with the right mouse button. Select the option delete.

Note: Only empty sections can be deleted.

To keep the changes, leave the dialog by clicking on **Save and Close**, otherwise click on **Cancel**.

7.3.6 Assay Combinations

Assay Combination Editor

The **Tools > Assay Combinations** menu item allows to define combinations of different plates or strips for different assays. This is a dialog with a list of all available process definition files in the **Assay** folder.

There is a tab for **Strip Combinations** and for **Plate Combinations**.

Note: Strip and Plate Combinations can not have identical names.

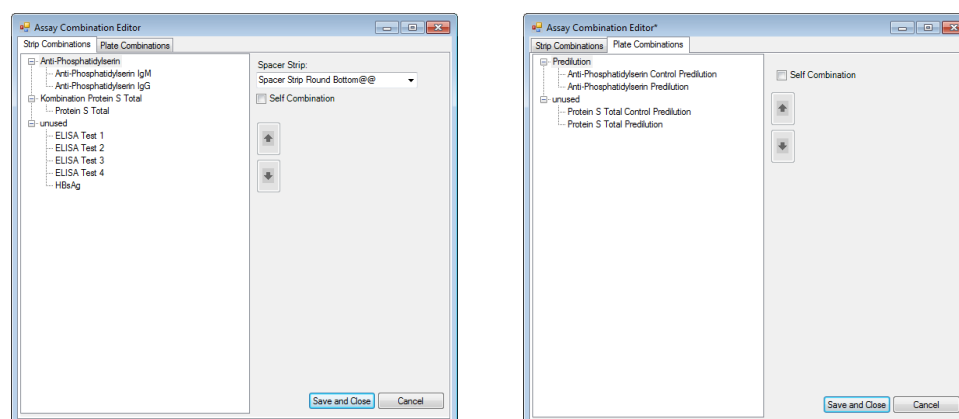


Fig. 7-47 Assay combination editor

To edit the definition of combinations, proceed as follows:

- ♦ Select the process definition files with a mouse click and then, by clicking on the **up and down arrows (or pressing the Page Up / Page Down keys)**, move them up or down, to have them included in or excluded from the combination.

*The process definition files not used in a combination (excluded files) are present in the section **unused**.*

Check box **Self Combination**

If this check box is selected an assay/process can be combined with itself.

*If **Self Combination** is allowed a process with the name "X" can be combined on the same plate with other processes of this name "X".*

With assays this does not occur, since only one process per scheduling/sample scan is permissible.

*For predilutions, however, it can be advantageous to allow **Self Combination** when the exclusive predilution box is checked, e.g. two predilution plates can be merged on one target plate.*

List box **Spacer Strip (tab Strip Combinations only)**

Defines a consumable that can be added in such a way that the quantity of strips results in an even number.

To keep the changes, leave the dialog by clicking on **Save and Close**, otherwise click on **Cancel**.

7.3.7 Washer

Depending on the type of microplate washer installed on the instrument, the corresponding wash program editor will be used.

7.3.7.1 HydroFlex Platform (Microplate Washer)

The **Tools > Washer** menu launches the HydroControl wash program editor, where wash programs can be created and edited.

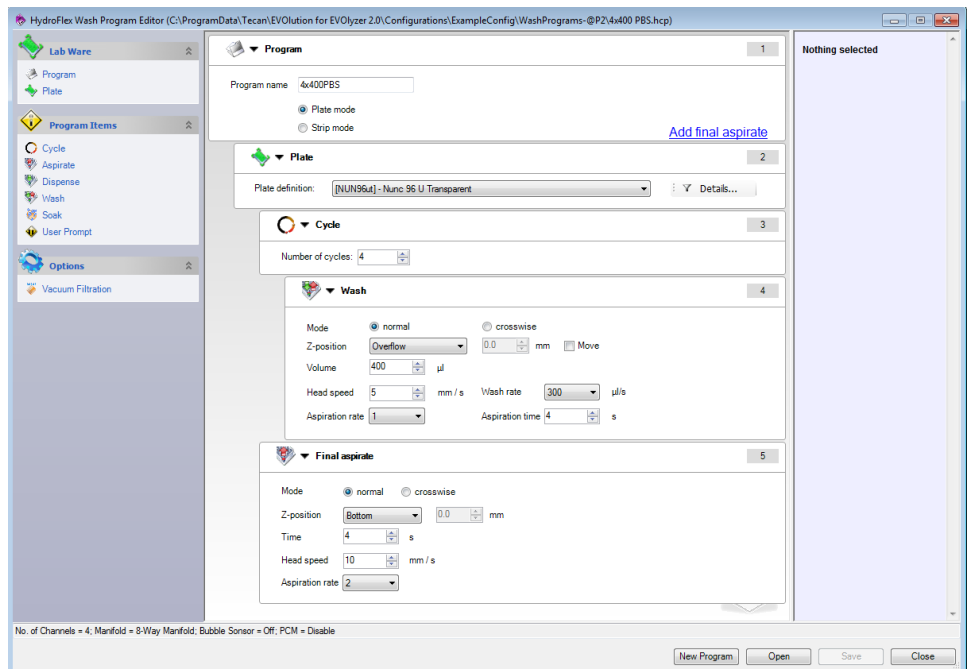


Fig. 7-48 HydroControl wash program editor

For a description of the HydroFlex wash program editor, refer to the HydroControl Instructions for Use.

7.3.7.2 Columbus Washer

The **Tools > Washer** menu launches the WinWash Clinical editor, where wash programs can be created and edited.

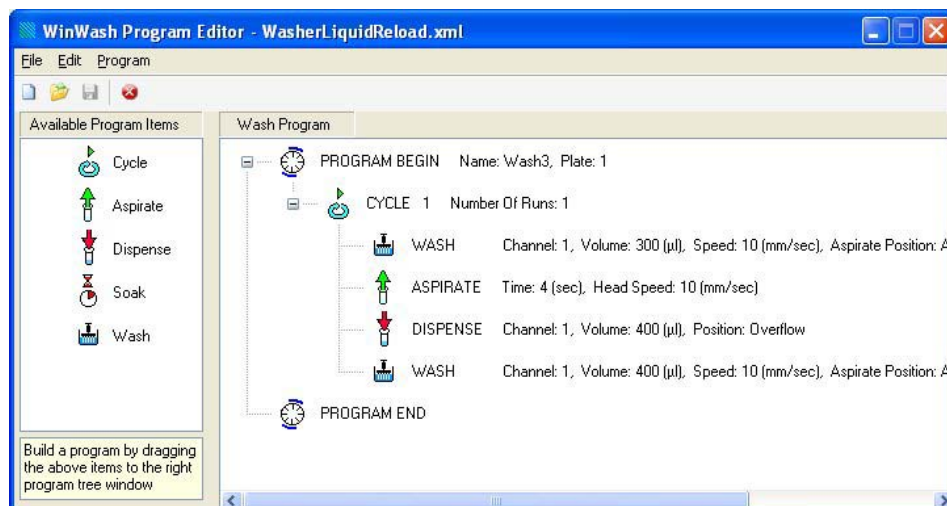


Fig. 7-49 WinWash program editor

For a description of the WinWash Clinical editor, refer to the WinWash Clinical Instructions for Use.

7.4 The Options Menu

The menu **Options** contains the following items:

- ◆ Actions
 - Intention space
 - Defines the distance between the vertical lines on which the jobs are represented in the PDE main view (range 90 to 160).
- ◆ Jobs
 - Show merge order
 - Shows or hides merge order information in the process view.
 - Show tip type
 - Shows or hides tip type information next to the job in the process view.
 - Show incomplete warning
 - Shows or hides a warning dialog if the job parameters are not completely defined when the job is saved.
 - Shows or hides an alert if the automatic stroke count conversion was active.
- ◆ Timing constraints
 - Does not show any user-relevant information.
- ◆ Print settings
 - Defines margins on the printout and font sizes for header and footer.

7.5 Job Management

Available Jobs

The jobs that can be created and defined in the Process Definition Editor are listed in 7.1.1 “Brief Description”, 7-1.

In the process definition editor main screen, they are each represented in a column with the corresponding header designation.

7.5.1 Appending a New Job

To append a new job:

- 1 Click anywhere on the light gray background of the process definition editor main view, to make sure that no process step is selected.
Or press the **ESC** key, to make sure that no process step is selected.
- 2 Click the **Jobs** menu, to open it. In the **Jobs** menu, click **Insert**. The job submenu is displayed.

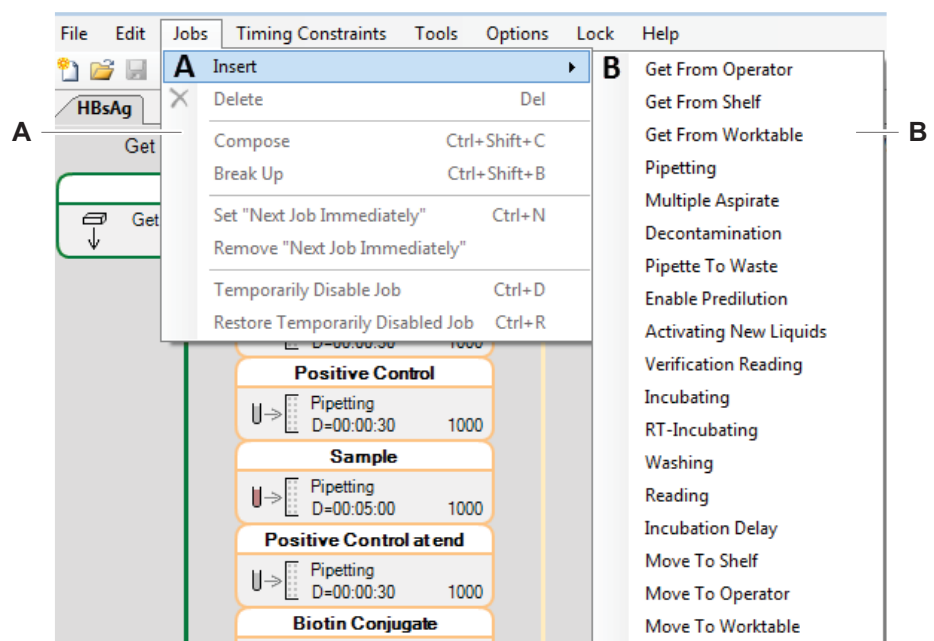


Fig. 7-50 Jobs menu with submenu

A Jobs menu

B Submenu

Or right-click anywhere in the process definition editor main view. The context menu opens. Click **Insert Job** in the context menu. The job submenu is displayed.

- 3 Click in the submenu to select the kind of job you intend to append. The corresponding step property screen opens.
- 4 In the step property screen, fill in the job properties as required.
- 5 Click **Ok** in the step property screen, to return to the process definition editor main view. The newly created job is appended to the job sequence.

7.5.2 Inserting a New Job

To insert a new job:

- 1 In the process definition editor main screen, click the job before which a new job must be inserted. The selected job appears in aquamarine color.
- 2 Click the **Jobs** menu, to open it. In the **Jobs** menu, click **Insert**. The job submenu is displayed.
Or right-click anywhere in the process definition editor main view. The context menu opens. Click **Insert Job** in the context menu. The job submenu is displayed.
- 3 Click in the submenu to select the job you intend to insert. The corresponding step property screen opens.
- 4 In the step property screen, fill in the job properties as required.
- 5 Click **Ok** in the step property screen, to return to the process definition editor main view.

7.5.3 Modifying Job Properties

To modify the properties of a single job:

- 1 Double-click on the job symbol in the graphic view.
Or press the **ENTER** key after selecting a job.
The corresponding step property screen is displayed.
- 2 Click and type in the step property screen, to fill in the required values.
- 3 Click **Ok** to close the step property screen.

7.5.4 Deleting a Job

Note: *If the last job in a process is preceded by jobs with a timing constraint, it can not be deleted.*

To delete a job from a process:

- 1 In the process definition editor main view, click the job you are going to delete. The job symbol is highlighted in aquamarine color.
Or press the **Ctrl** key and click each of several jobs you are going to delete. The job symbols are highlighted in aquamarine color
- 2 Press the **Delete** key, to delete the selected job(s). The job(s) are deleted, and the job immediately before the deleted jobs is highlighted in aquamarine color.
Or click the **Jobs** menu. Click **Delete** in the menu, to delete the selected job(s). The job(s) are deleted, and the job immediately before the deleted jobs is highlighted in aquamarine color.
Or right-click in the main view, to display the context menu. Click **Delete** in the menu, to delete the selected job(s). The job(s) are deleted, and the job immediately before the deleted jobs is highlighted in aquamarine color.

7.5.5 Composing Jobs

A sequence of LiHA jobs can be composed as an expanded single job called composed job. Pipetting patterns in composed jobs facilitate optimizing by the system (e.g. less tips will be idle).

What can be composed: Any sequence of LiHA steps: Pipetting, Multiple_Aspirate, Decontamination, Pipette_To_Waste

To compose several jobs:

- 1 Click the jobs you intend to compose with left mouse-clicks while the **Ctrl** key is pressed. The selected jobs are highlighted in aquamarine color.
- 2 Click the **Jobs** menu, to open it. The **Jobs** menu opens.
Or right-click anywhere in the process definition editor main view. The context menu opens.
- 3 In the menu, click **Compose**. The jobs are composed and represented as contiguous rectangles.

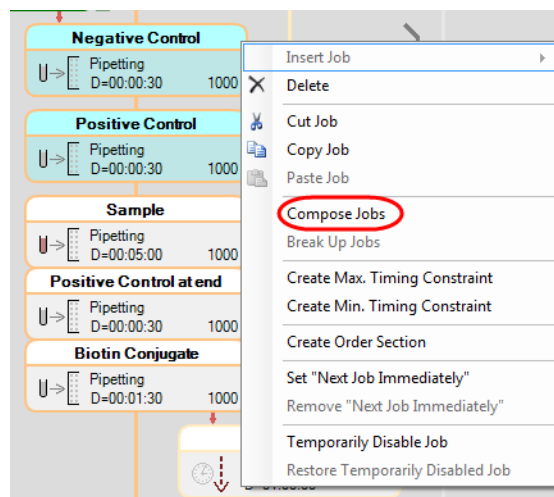


Fig. 7-51 Jobs compose command

Note: The durations for composed jobs are usually added up.

- Refer to the section [15.2 “Scheduling Simulator”](#), § 15-2 for detailed information. Click the respective LiHa job with the right mouse button and select “Show Commands” from the appearing context menu.

When jobs are composed, the system will try to assign multiple jobs into one “tip-assignment”.

The following example explains the behavior:

Supposed there is a 4-tip instrument, the first composed job uses 2 tips and the second job another 2 tips. The system performs both jobs at the same time with all 4 tips. But this can only be done if the two jobs are compatible.

Compatible means:

- ◆ Both jobs use the same type of tip (Standard, DiTi 1000, DiTi 200)
- ◆ Both jobs are either defined as single or multi-pipetting
- ◆ Both wash modes are identical in fast wash use (both use it or both do not use it)
- ◆ Both job modes are identical in using the “decontamination after each tip use” feature
- ◆ None of the jobs does not use the liquids created by the other job

If the jobs are merged as described above the volume with which the tips are washed is determined by choosing the maximum wash volume of the corresponding job.

If composed jobs cannot be merged as described above, they are still scheduled as if they were a single job and are executed without pauses in between. If they are executed in a time shorter than the sum of all durations, the system will pause at the end of the composed jobs, not in between.

For a detailed description how a composed job is executed by the system

Refer to the section [15.2 “Scheduling Simulator”](#),  [15-2](#) for detailed information.

- ◆ Click the respective LiHa job with the right mouse button and select "Show Commands" from the appearing context menu.

7.5.6 Breaking up Jobs

The composed jobs can be selected individually, and the group can be broken up again.

To break up a group of composed jobs:

- 1 Press the **Ctrl** key and click the symbols of the composed jobs you intend to break up. The selected job symbols are displayed in aquamarine color.
- 2 Click the **Jobs** menu, to open it. The **Jobs** menu opens.
Or right-click anywhere in the process definition editor main view. The context menu opens.
- 3 In the menu, click the **Break up jobs** entry. The job group is broken up, and the jobs are represented as separate rectangles.

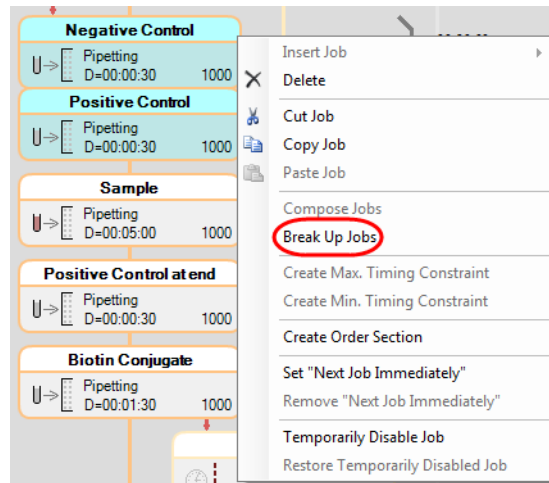


Fig. 7-52 Jobs break up command

7.5.7 Set Next Job Immediately

If an assay contains one or more jobs with the **Set Next Job Immediately** option activated, the system creates a schedule in which there are no gaps between the jobs with the option activated and the succeeding jobs.

Some jobs, like **Get from Operator**, contain gaps by definition. These gaps will still be present intentionally.

If between two PDE jobs the system inserts a number of technical jobs (like ROMA plate transfers), all these jobs, including the two original PDE jobs, have no gap between them.

Combining several assays onto the same strip frame or plate is possible only if both assays have the same set of steps and timing constraints.

To activate **Set Next Job Immediately**:

- 1 Click to select the job for which you wish to activate **Set Next Job Immediately**.
Or press the **Ctrl** key and click the symbols of several jobs for which you intend to activate **Set Next Job Immediately**. The selected job symbols are displayed in aquamarine color.
- 2 In the Jobs menu, click to select the **Set Next Job Immediately** option. The link between the jobs changes its color to brown and is marked with a brown square, to represent the active option.

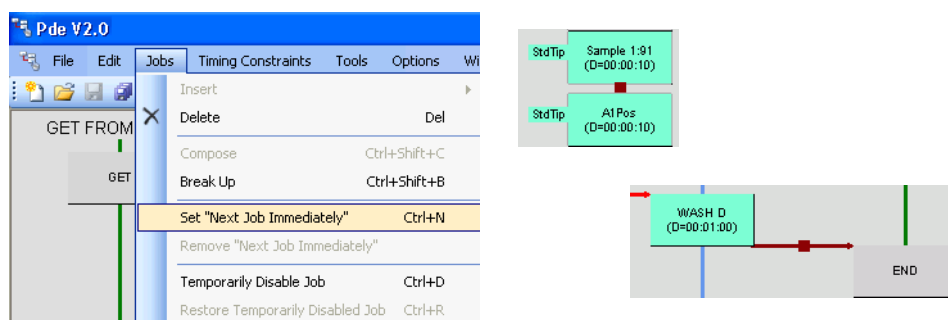


Fig. 7-53 Command set next job immediately and representations

7.5.8 Remove Next Job Immediately

To remove the **Set Next Job Immediately** option from a job:

- 1 Click to select the job for which you wish to remove **Set Next Job Immediately**.
Or press the **Ctrl** key and click the symbols of several jobs for which you intend to remove the **Set Next Job Immediately**. The selected job symbols are displayed in aquamarine color.
- 2 In the **Jobs** menu, click to select the **Remove Next Job Immediately** entry. The link between the jobs changes back to red, and the brown square representing the active option is removed.

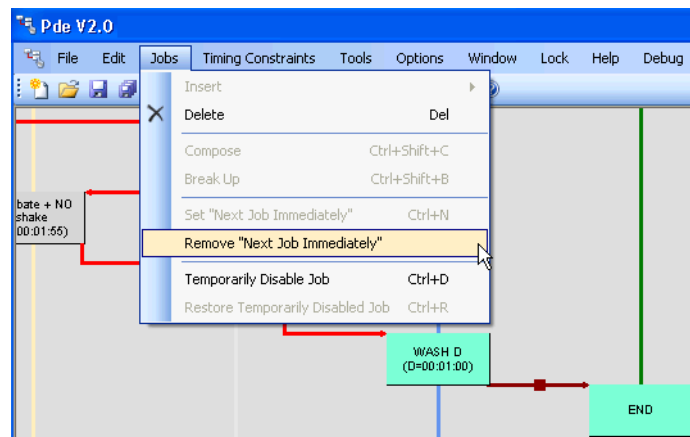


Fig. 7-54 Command remove next job immediately

7.5.9 Temporarily Disable Job

This command disables one or more jobs temporarily. It works, however, only with unsigned assays.

To disable one or more jobs temporarily:

- 1 Click to select the job that you wish to disable temporarily.
Or press the **Ctrl** key and click the symbols of several jobs that you intend to disable temporarily. The selected job symbols are displayed in aquamarine color.

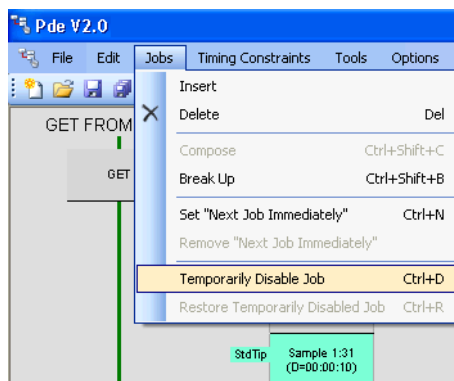


Fig. 7-55 Command temporarily disable job

- 2 In the **Jobs** menu, click to select the **Temporarily Disable Job** entry. The symbol for the job changes its color to gray.

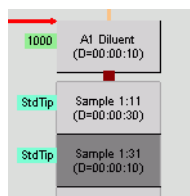


Fig. 7-56 Temporarily disabled job

7.5.10 Restore Temporarily Disabled Job

To restore or re-enable one or more temporarily disabled jobs:

- 1 Click to select the job from which you wish to remove the **Temporarily Disable Job** property.
Or press the **Ctrl** key and click the symbols of several jobs from which you wish to remove the **Temporarily Disable Job** property. The selected job symbols are displayed in aquamarine color.
- 2 In the **Jobs** menu, click to select the **Restore Temporarily Disabled Job** entry. The symbol for the job changes its color back to aquamarine, and the job is re-enabled.

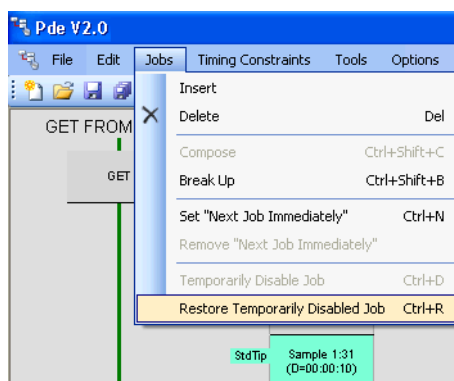


Fig. 7-57 Command restore temporarily disabled job

7.6 Printing a Process Definition

Process definitions can be printed out in table layout. The table will contain the following details:

Table Header with:

- ♦ process name
- ♦ process definition version number

Column Headers:

The column headers shows the process step names.

Table Body:

The table body contains all parameters defined in the process definition editor. The timing constraints defined are written across the affected process step columns.

Table Footer:

The table footer shows the following data:

- ♦ print date and time
- ♦ the user printing out the process definition
- ♦ the process definition file name
- ♦ the process definition editor version number
- ♦ the creation date and time of the process definition
- ♦ the date and time of the most recent change
- ♦ the current page number
- ♦ the total page number.

Process: SeriesOptimizer_ComposedPipettingNew
Version: 1.0

Timing Constraint	GET FROM SHELF	PIPETTING	PIPETTING	PIPETTING	PIPETTING	WASHING
Action	Start	DiluentPipetting_100	Before_NegControl_1.01	SamplePipetting_75.1	After_PositiveControl_1.02	Wash02
Job Name						
	tipType: Diti 200	tipType: Diti 200	tipType: Diti 1000	tipType: Diti 1000	tipType: Diti 1000	Washer program: Method1
	SinglePipetting: No	SinglePipetting: No	SinglePipetting: No	SinglePipetting: No	SinglePipetting: No	Washer liquid: Wash Buffer A.000
	StrokeCount: 3	StrokeCount: 3	StrokeCount: 1	StrokeCount: 1	StrokeCount: 1	Job duration: 00:03:40 hh:mm:ss
	Ditrwaste: Diti Carrier	Ditrwaste: Diti Carrier	Ditrwaste: Diti Carrier	Ditrwaste: Diti Carrier	Ditrwaste: Diti Carrier	
	Liquid: V 3.0 Diluent@C Diag@1234	Liquid: V 3.0 Control, negative@C Diag@123456	Liquid: Serum@@	Liquid: V 3.0 Control, @C Diag@123456	Liquid: Water Trough	
	LiquidClass: Water	LiquidClass: Water Trough	LiquidClass: Serum	LiquidClass: Water Trough	LiquidClass: Water Trough	
	Volume: 100 µl	Volume: 10 µl	Volume: 75 µl	Volume: 20 µl	Volume: 20 µl	
	Ordered: No	Ordered: No	Ordered: No	Ordered: No	Ordered: No	
	Tubes: No	Tubes: No	Tubes: No	Tubes: No	Tubes: No	
	Pipetting: B.N.P.X	Pipetting: N.X	Pipetting: X	Pipetting: X	Pipetting: X.P	
	WashMode: Standard WashProgram	WashMode: Standard WashProgram	WashMode: Standard WashProgram	WashMode: Standard WashProgram	WashMode: Standard WashProgram	
	Job duration: 00:03:00 hh:mm:ss	Job duration: 00:03:00 hh:mm:ss	Job duration: 00:17:00 hh:mm:ss	Job duration: 00:17:00 hh:mm:ss	Job duration: 00:17:00 hh:mm:ss	

Created: 20/10/2004 13:40:23
Last Change: 29/09/2004 12:21:32
Printed: 17/11/2004 23:58:30

C:\Programme\Tecan\Biosolve\DevelopmentData\Assets\Series Optimise_ComposedPipettingNew.rml File Version: 1.0.0

Page: 1 of 3

Fig. 7-58 Sample printout in print preview

7.7 Timing Constraints

Description

Timing constraints are rules for the maximum duration within which one process step or a group of several steps must be processed (e.g. “pipetting onto a microplate and transfer of this microplate to the incubator must be performed within 50 minutes”). Timing constraints can also be nested. The Freedom EVOLution SW process definition editor supports the creation and definition of timing constraints for each job, or for a group of several jobs.

Duration

The maximum duration is the time between the start of the first job in the restrained group and the start of the first (not restrained) job following after the restrained group (e.g. 50 minutes between the pipetting start and the incubation start).

The duration entered by the user can be:

- ♦ a **Max. time constraint**, where the maximum possible duration is \leq the duration entered
- ♦ a **Min. time constraint**, where the minimum accepted duration is \geq the duration entered

Representation

In the process definition editor graphical view, timing constraints are represented by black brackets on the right-hand side of the affected jobs. To the right of each bracket, the maximum duration for the time restraint is indicated in “hh:mm:ss” format.

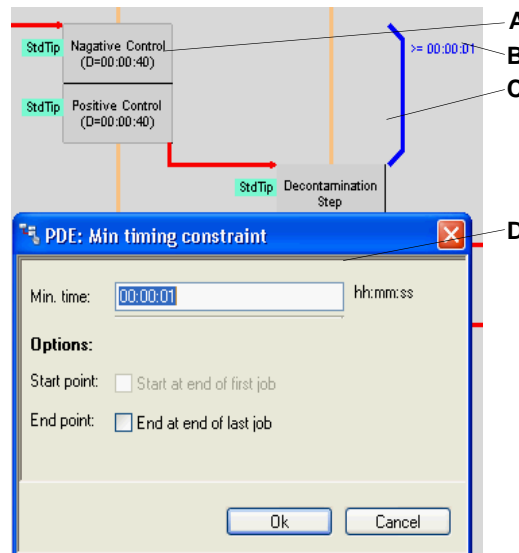


Fig. 7-59 Example timing constraint property screen

- | | | | |
|----------|--|----------|---|
| A | Job affected by a timing constraint | C | Selected bracket symbol for the timing constraint |
| B | Indication of timing constraint duration | D | Timing constraint definition dialog |

7.7.1 Creating a Timing Constraint

To create a timing constraint:

- 1 Click the job, or Control-click several jobs, for which you intend to introduce a timing constraint. The jobs are highlighted in aquamarine color.
- 2 Click the **Timing Constraints** menu, to open it. The **Timing Constraints** menu opens.
Or right-click anywhere in the process definition editor main view. The context menu opens.
Or press **Ctrl T**. The timing constraints dialog opens directly. Continue with step 4 of this procedure.
- 3 In the **Timing Constraints** menu, click one of the **Create Max./Min. Timing Constraint** entries. The timing constraints dialog opens.
Or in the context menu, click one of the **Create Max./Min. Timing Constraint** entries. The timing constraints dialog opens:

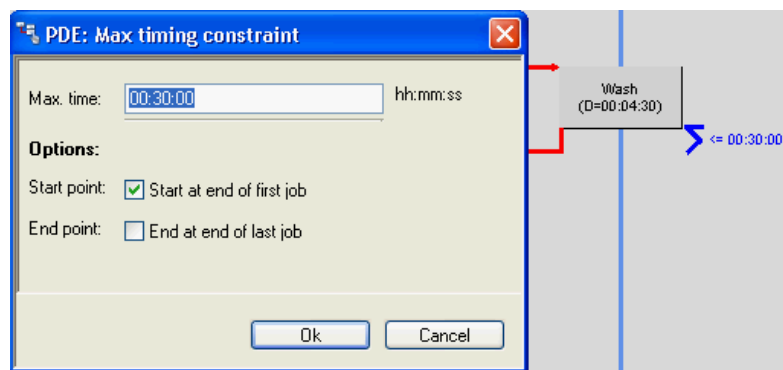


Fig. 7-60 Timing constraint property dialog

- 4 Click the text box in the timing constraints dialog, to enter the duration of the timing constraint.
- 5 Click the option boxes to select the starting and/or end point for the timing constraint.
- 6 Click **Ok**, to return to the process definition editor main view. The new timing constraint is displayed as a bracket, enclosing all jobs affected by the timing constraint. The bracket form reflects of what kind the timing constraint is.

7.7.2 Modifying a Timing Constraint

To modify a timing constraint:

- 1 Double-click the bracket representing the timing constraint you are going to modify. The selected bracket turns blue, and the timing constraints dialog opens.
- 2 Click the text box in the timing constraints dialog and type in a new time, to change the duration of the timing constraint (use the format: hh:mm:ss).
- 3 Click the option boxes to select the starting and/or end point for the timing constraint.
- 4 Click **Ok**, to return to the process definition editor main view. The changed duration for the timing constraint is displayed to the right of the bracket symbol.

7.7.3 Deleting a Timing Constraint

To delete a timing constraint:

- 1 Click the bracket representing the timing constraint you are going to delete. The selected bracket turns blue.
- 2 Right-click the bracket. The context menu opens.
Or click the Timing Constraints menu.
- 3 In the menu, click to select the **Delete** entry.
- 4 The timing constraint is deleted, and the process definition editor main view is displayed again.

7.8 Defining Assay Processing Priorities

Description

This function enables you to define prioritized processes by specifying order sections in a deterministic manner. These definitions affect the execution order in the schedule, which is calculated by the Scheduling Simulator or the Run Control. The order sections are characterized by a name and a number for the priority (order). The system schedules order sections with identical names (e.g. Order 1) in such a way that the section with the lowest number (e.g. 1) is executed before sections with higher numbers (e.g. 2).

Representation

In the process definition editor graphical view, order sections are represented by green brackets on the right-hand side of the affected jobs. To the right of each bracket, the name of the order section is displayed.

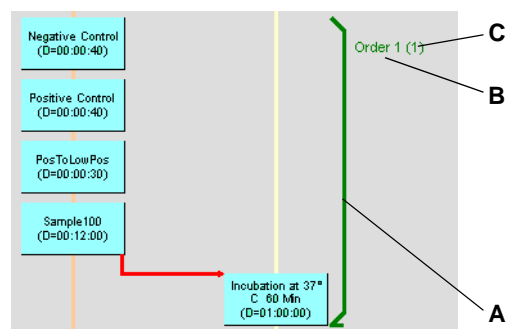


Fig. 7-61 Display of order section

- A Bracket
B Order section name
C Priority (order)

The bracket also indicates if the prioritized section starts/ends at the beginning or end of a job (same representation as for timing constraints).

7.8.1 Creating an Order Section

Prerequisites

To define order sections, the following conditions must be fulfilled:

- ◆ At least one job must be selected.
- ◆ The selected jobs must be consecutive.
- ◆ If the first job is part of a composed job, it must be the first or last job of the composed job.
- ◆ If the last job is part of a composed job, it must be the first or last job of the composed job.

Note: Order sections with the same name must be defined in at least two processes to make the function active.

To define order sections, proceed as follows:

- 1 Click the job, or Control-click several jobs to select a range of (consecutive) jobs in the PDE.

Note: If two or more jobs are selected, the order in which the jobs are selected does not matter. The system always uses the topmost job as the start point and the bottommost job as the end point of the order section.

- 2 Select the menu item **Create Order Section** (or the corresponding item in the context menu).

Note: For simplicity reasons only the **Basic** dialog is displayed here. With the **Advanced** setting, which is only used by developers, the lower section **Advanced** in the dialog is displayed. Do not change any settings here.

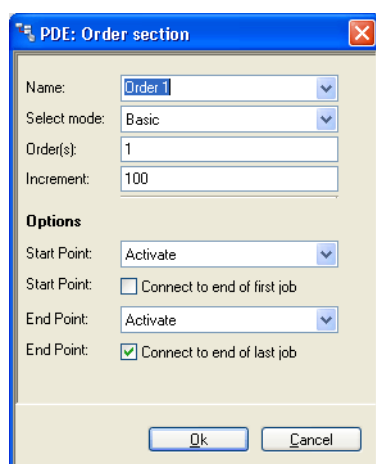


Fig. 7-62 Order section dialog

- 3 Click in the combo box **Name**, then select the name of an existing order section or enter a name for the order section.

*The default **Name** for the first order section is Order 1; the next order section will be numbered automatically Order 2, etc.*

- 4 Click in the pull-down list **Select mode** and select **Basic** from the pull-down list.
- 5 Click in the text box **Order(s)** to define the priority.
 - e.g. 1 will be the first section to be scheduled, 2 the second, etc.
 - A sequence of numbers separated by a semicolon defines priorities for several plates (each number for one plate), e.g. "1;2" means 1 for the first plate and 2 for the second plate.
- 6 Click in the text box **Increment** to define the number that will be added to the priority (order) in case a process is scheduled consecutively on several plates (e.g. if the number of samples exceeds the capacity of the plate).
 - Example (for **Increment** value 100 and **Order(s)** 1;2):
 - The order sections of jobs for the first plate have the priority (order) 1 and for the second plate 2.
 - Those for the 3rd plate will have 101 and for the 4th plate 102.
 - Those for the 5th plate will have 201 and for the 6th plate 202, etc.

This ensures that the jobs will be correctly scheduled even if several plates must be processed.

- 7 In the Options section, select
 - Start Point: The pull-down list contains all available jobs in the process. If not already defined by having marked the corresponding job, select the job at which the order section starts.
 - Check box Connect to end of first job
 - Not selected: By default the scheduler connects to the beginning of the first job.
 - Selected: The scheduler connects to the end of the first job.
 - End Point: The pull-down list contains all available jobs in the process. If not already defined by having marked the corresponding job, select the job at which the order section ends.
 - Check box Connect to end of last job
 - Not selected: The scheduler connects to the beginning of the last job.
 - Selected: By default the scheduler connects to the end of the last job.

If the jobs in the order section are part of a composed job the system gives the appropriate default settings for these check boxes and the user may not be able to select the option any more (check box grayed).
- 8 Click **Ok** to return to the process definition editor main view. The new order sections is displayed as a green bracket, enclosing all jobs of the section.

Note: *The resulting orders can be visualized in the Scheduling Simulator. Check the resulting schedule after having defined the order sections. If the schedule does not meet your requirements, modify the order sections/priorities and reschedule.*

7.8.2 Modifying an Order Section

To modify an order section:

- 1 Double-click the bracket representing the order section you are going to modify. The selected bracket turns blue, and the order section dialog opens.
- 2 Modify the corresponding parameters and click **Ok**.

7.8.3 Deleting an Order Section

To delete an order section:

- 1 Click the bracket representing the order section you are going to delete. The selected bracket turns blue.
- 2 Right-click the bracket. The context menu opens.
Or click the Timing Constraints menu.
- 3 In the menu, click to select the **Delete** entry.
- 4 The order section is deleted, and the process definition editor main view is displayed again.

7.9 Modifying Process Name or Version

To modify the process name or version, double-click on the gray background of the PDE main window.

A dialog opens, where the process name and version can be changed:

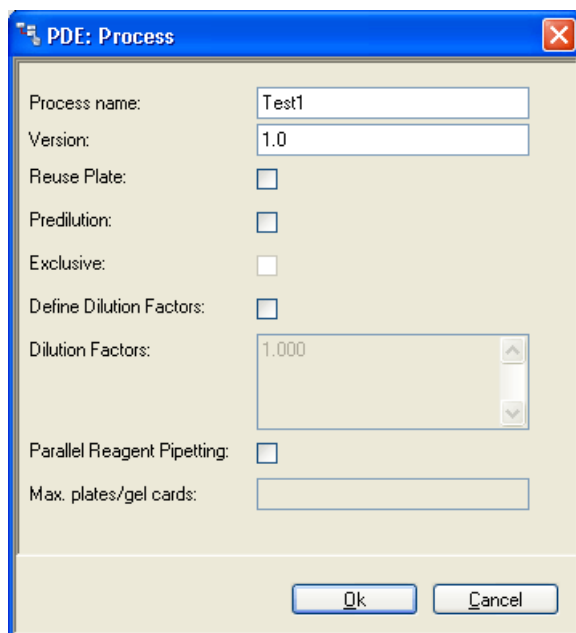


Fig. 7-63 Process name and version dialog

Note: Pay attention to the following: The **Process name** given here (i.e. not the file name) defines the process and will be referenced within the complete configuration. Therefore, this name must be unique.

Note: Since EVOLution 2.0.15 Process name is no longer used.

7.10 Predilution Processes

When to Define Predilution Processes

If the concentration of samples or controls is too high to be directly used in the ELISA process, a predilution process can be introduced.

In this case, the samples or controls are not pipetted directly from the supplied tubes or microplates to the ELISA process plate, but are pipetted into one or several separate plates where the substances are mixed with a diluent.

There are different dilution modes, sequences and combinations. These are explained in the present section.

How to Define Predilution

Predilution processes can be performed by defining a process as predilution process as explained in 7.10.3 “Defining Predilution Processes”, 7-72.

7.10.1 Predilution Modes

7.10.1.1 Common/Exclusive Predilution

In the event of two different ELISA assays using the same diluted sample, the following decisions must be made:

- ◆ How many predilution processes must be created?
- ◆ How are the predilution processes and the assays linked together?

The **Exclusive** flag on the process dialog (refer to Fig. 7-71 “Process dialog”, 7-72) defines if a common or an exclusive predilution will be performed.

Note: The definition is valid for all dilution liquids provided by a dilution process.

Common Predilution

In this example, the **Exclusive** flag is not set. All assay processes using the same dilution use dilutions supplied by the same predilution process.

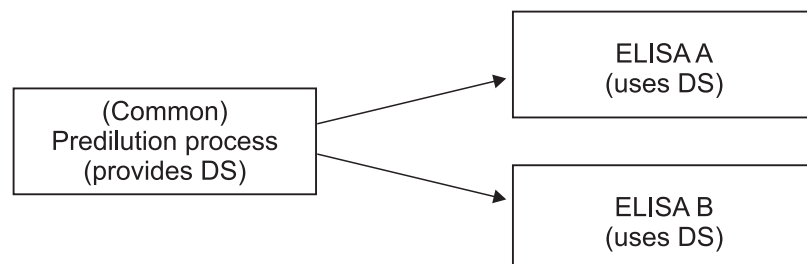


Fig. 7-64 Common predilution

DS Diluted sample

Exclusive Predilution

In this example, the **Exclusive** flag is set. Each assay process uses a dilution from a dedicated predilution process, even if the same dilution is required.

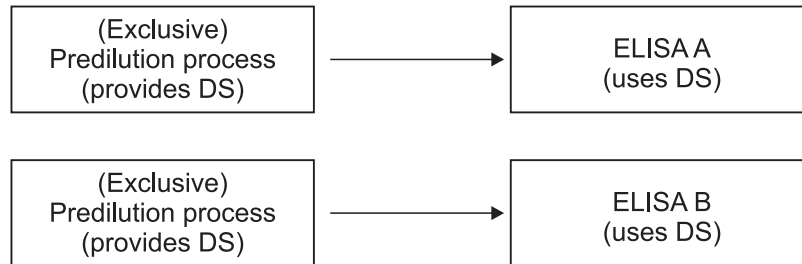


Fig. 7-65 Exclusive predilution

DS Diluted sample

Combination of Common and Exclusive Predilution

A combination of common and exclusive predilutions for two ELISA processes is also possible.

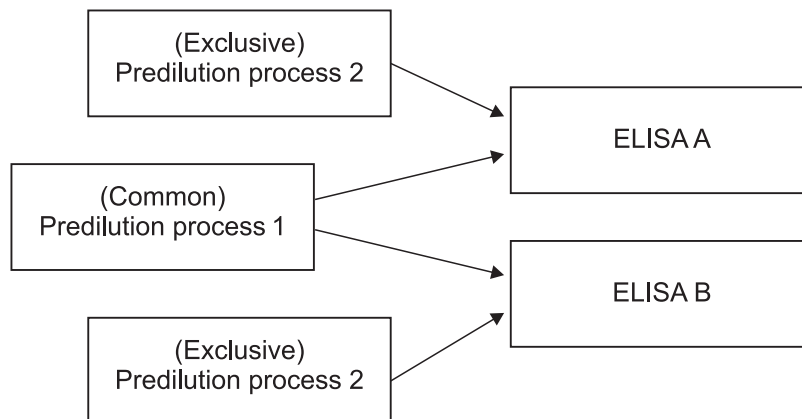


Fig. 7-66 Combination of predilution processes

Several Plates for the Same ELISA Process

In case the number of samples exceeds the capacity of one process plate, several plates are required. In this case, even with common predilution, a predilution process for each destination plate must be generated.

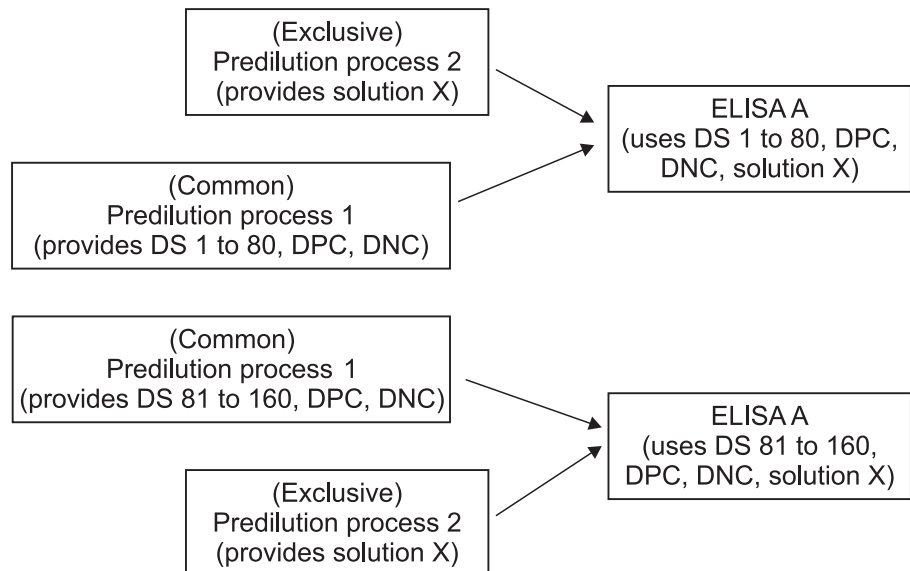


Fig. 7-67 Two process plates for one ELISA process

DS Diluted sample

DPC Diluted positive control

DNC Diluted negative control

Note: The second predilution plate has an identical layout and, as a consequence, the controls are duplicated.

7.10.1.2 Series and Predilution Processes

Predilution processes and series can be combined under certain circumstances. The following explanations focus on samples only because mainly samples are diluted in this way.

Note: For building series the processes must be compatible. Pay attention to the prerequisites described in section 7.3.5 “Series”, § 7-46.

Common Predilution

If the ELISA processes use diluted samples from a common predilution process and if the liquid is identical for both ELISA processes, the diluted sample is pipetted to both processes. The sample pipetting steps can be integrated to a series.

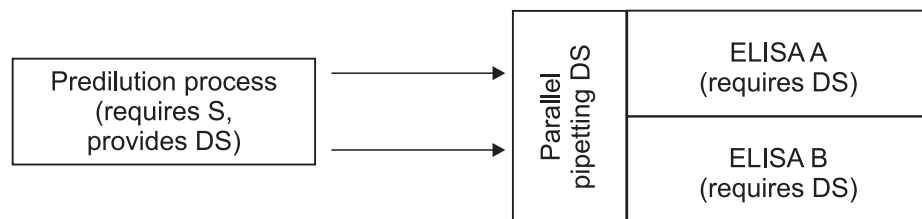


Fig. 7-68 Series/common predilution

DS Diluted sample

S Sample

Exclusive Predilution

If the ELISA processes use diluted samples from an exclusive predilution process, the diluted sample is pipetted to one process only. A series of the ELISA processes is not permissible.

A series of the predilution processes, however, can be generated.

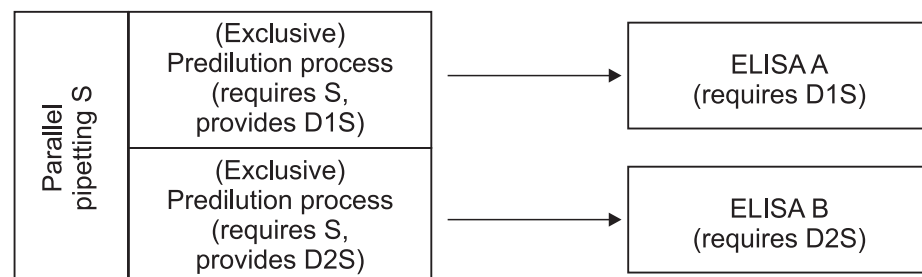


Fig. 7-69 Series/exclusive predilution

DS Diluted sample

S Sample

Series of Predilution Processes With Different Provided Dilutions

If the ELISA processes use different dilutions of sample, a series of ELISA processes is impossible, however, a series of the predilution processes can be generated.

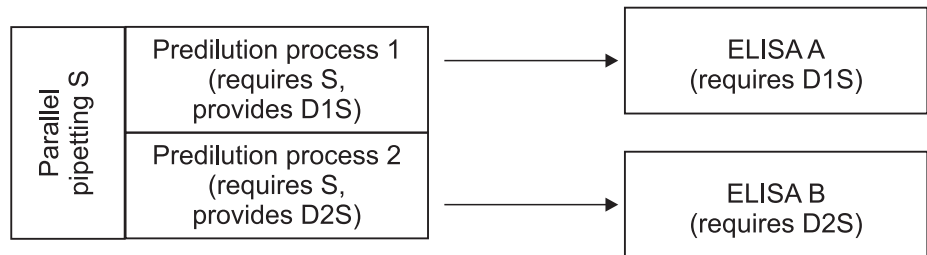


Fig. 7-70 Series/different predilutions

DS Diluted sample

S Sample

7.10.2 Special Features and Restrictions

When defining predilution processes, pay attention to the information given in this section.

Common Predilution

In case of common predilutions, if samples are reloaded and a second worklist is generated for the new assays, a second predilution process will be generated and executed.

Predilution Volumes

The Freedom EVolution SW does not validate the defined predilution processes for preparing sufficient dilution volumes for subsequent assays. It is the responsibility of the application specialist to provide for sufficient dilution volumes for all ELISA processes using the corresponding dilution.

Unstable Predilutions

Unstable liquids from predilution processes are not supported.

Timing Constraints

As a workaround, you can define timing constraints in the PDE from the start of the job performing predilution to the start of the "MOVE TO SHELF" job or to the start of the "MOVE TO OPERATOR" job.

7.10.3 Defining Predilution Processes

Cross References

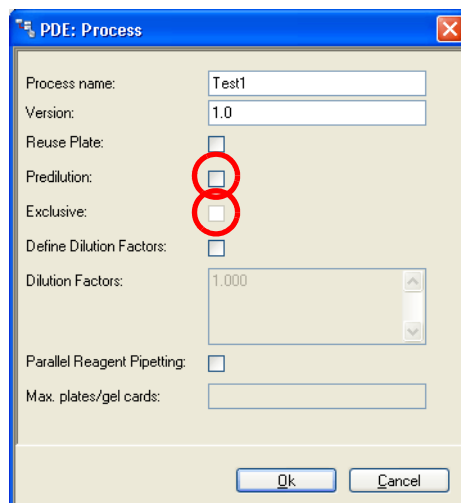
List of cross references to information provided in other sections:

Action	Reference
Common predilution	See section 7.10.1.1 , 7-67

Note: *Predilutions can be processed into deep well plates in the same way as into microplates.*

A dilution is defined in a predilution process. Dilutions can be used by other predilution processes. An ELISA assay uses the diluted liquids as source in another process.

To define a process as predilution process, proceed as follows:



- 1 Click **File > New** in the process definition editor menu.
Or Call up the process dialog of an existing process by clicking **File > Properties**.
- 2 Name the process.
- 3 Select the check box **Predilution**.
- 4 If the predilution process should not be used as common predilution for different assays, define it as **Exclusive**.

Fig. 7-71 Process dialog

For details about common predilutions refer to cross references above.

7.10.3.1 Predilution Within an Assay Itself

Usually, you will need separate predilution processes for your assays as described above.

However, you can also create all required predilutions within the assay itself without using external predilution processes. This can be an advantage if you have enough spare wells on your microplate or deep well plate.

To do so, deselect the **Predilution** check box.

Proceed as described in chapter [7.10.7 “Serial Dilutions”](#), [7-83](#).

Note: *Predilution liquids created within assays can not be accessed by other processes, they are implicitly “Exclusive”.*

7.10.4 Liquid Definition¹⁾

When you define predilution processes, all provided liquids will automatically be inserted into the **Liquid Definition** dialog. All predilution liquids shown in this dialog can be used as source liquids for **PIPETTING** or **MULTIPLE ASPIRATE** steps.

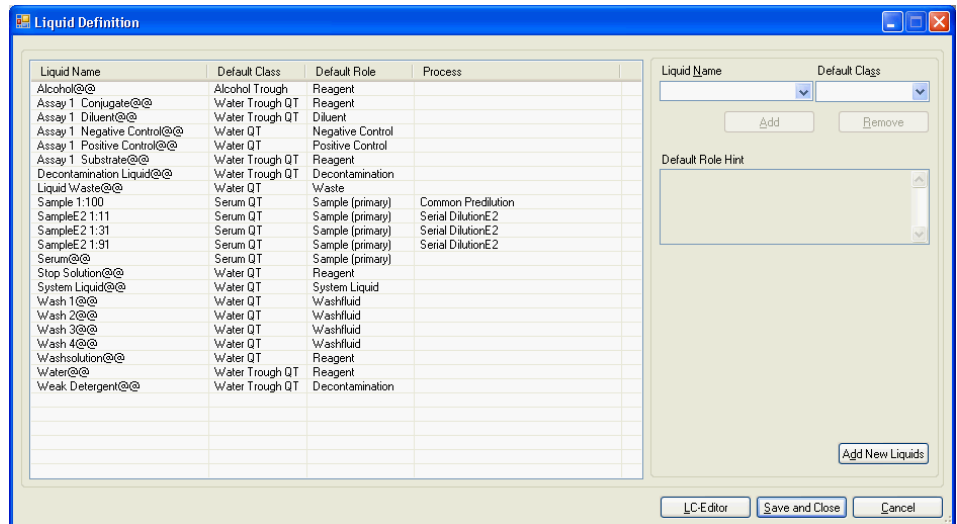


Fig. 7-72 Liquid Definition dialog

To add liquids created by a predilution process in a different configuration:

- 1 Click on the button **Add New Liquids**.
 - If you copy a predilution process from one configuration into another one, you need to open the “Liquid Definition” dialog and import the predilutions defined by the process.
 - In the file dialog select the XML file containing the predilution process. All liquids provided by the process will be added to the list of available liquids. Refer to the left side of Fig. 7-72 “Liquid Definition dialog”, 7-73: The name and the liquid class (extracted from the predilution process) are listed together with the name of the predilution process which provides this liquid.
- 2 Pay attention to the following:
 - The dialog can be used to check which predilution liquid is created by which predilution process.
 - If you define a new predilution liquid in a **PIPETTING** or in a **MULTIPLE ASPIRATE** step, you may need to save the predilution process before the new predilution liquid is listed in **Liquid Definitions**.
 - If you remove predilution processes from the configuration, you need to edit **Liquid Definitions** manually to remove the obsolete entries.

1) Not available and needed for Freedom EVOLution 2.0.15.

7.10.5 Layout Definition

Some decisions about the layout of the predilution process depend on the layout of the destination process.

If the destination process contains replicates, it must be decided whether the replicates can be prepared and pipetted from one cavity or if each replicate should be pipetted from an exclusive cavity.

Especially for predilutions performed exclusively for one process, the predilution process does not require more samples in the layout than the destination process.

7.10.5.1 Control/Standard/Sample Replicates From a Common Cavity

The figure below shows an example layout of a predilution and a destination plate.

For the destination plate:

- ◆ The positive control is defined as a duplicate.
- ◆ The negative control is defined as single control.
- ◆ The sample cavities are defined as replicates.

Because all duplicates of control and replicates of sample are pipetted from the same source cavity for each control/sample, the number of used cavities in the predilution layout will be reduced during process execution. If more sample cavities than necessary are defined they will be ignored.

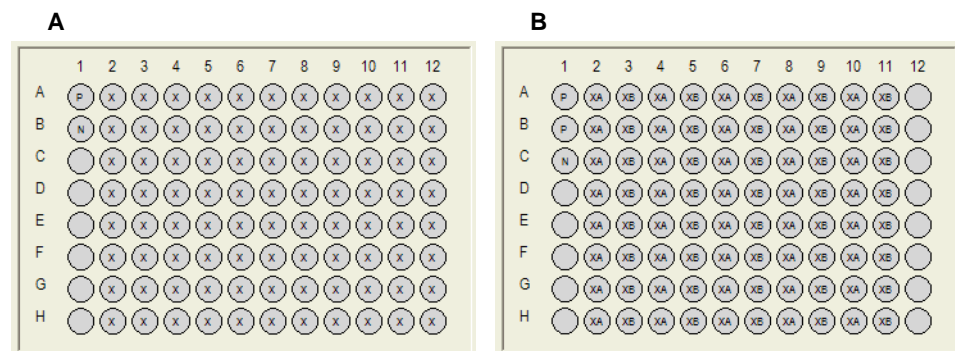


Fig. 7-73 Predilution/destination plate layout

- A** Defined layout of the predilution plate: Each control is defined as single control. Each sample is diluted in a single cavity.
- B** Defined layout of the destination plate: The positive control is defined as duplicate. The samples are defined as replicates (XA, XB).

The predilution liquids are defined in one cavity each. During the destination process pipetting step, the diluted liquid is transferred from the single cavity to the two duplicate cavities of the destination plate.

Pipetting of Controls

As explained in the figure below, the predilution step names the diluted control in the cavity “P”, e.g. “Pos Control 1:10”. In the pipetting process step of the destination process, the diluted control is transferred into two cavities of the destination plate.

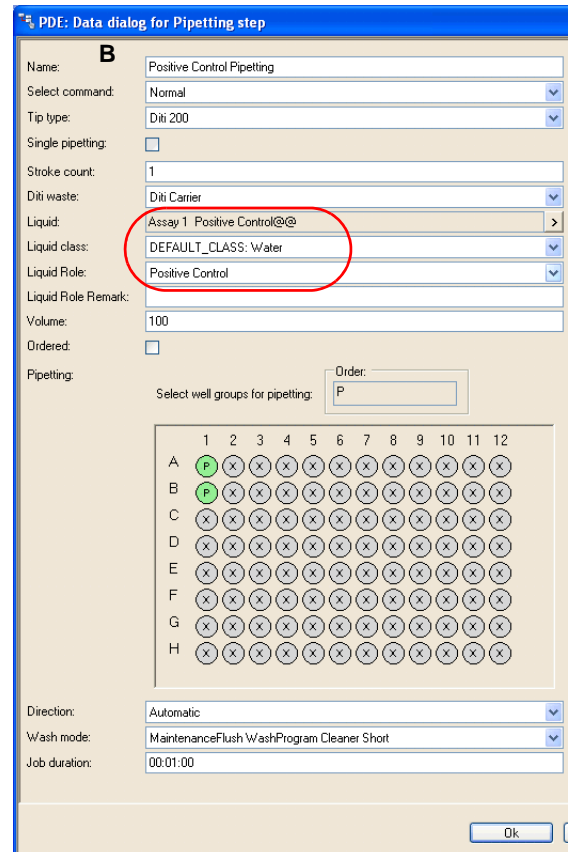
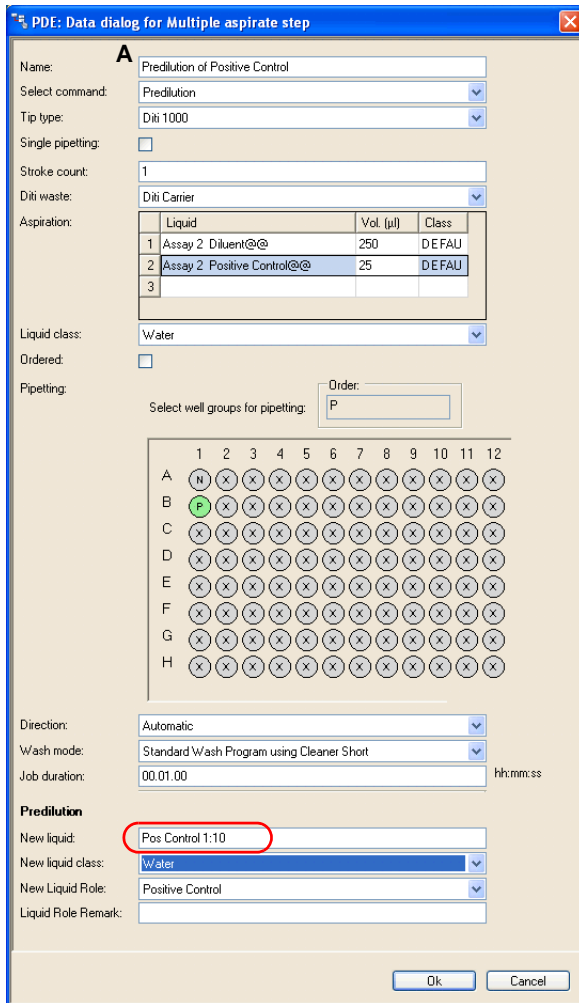


Fig. 7-74 Positive control

A Predilution step of the positive control (predilution process)

B Pipetting step of the diluted positive control to both replicates of the control (destination process)

Pipetting of Samples

The same applies to the samples. In the predilution step, the diluted sample is named as “Sample 1:10”, for example. In the pipetting step of the destination process, the diluted samples are transferred to the to the duplicate cavities “XA” and “XB” cavities of the destination plate.

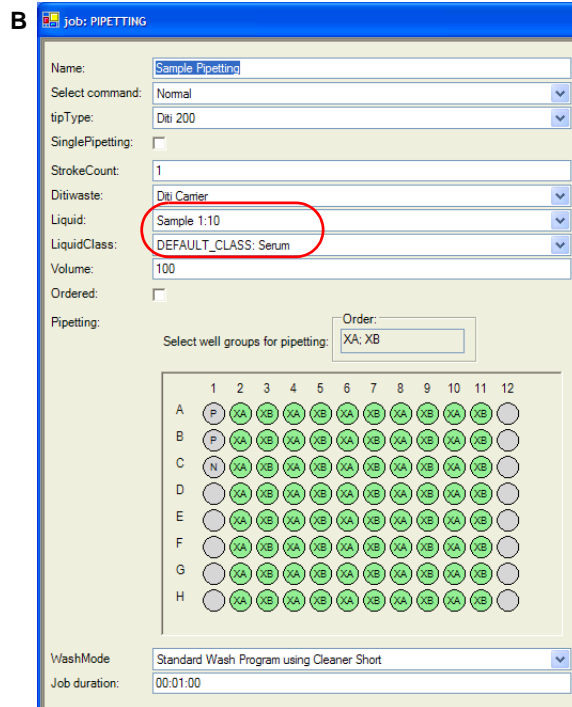
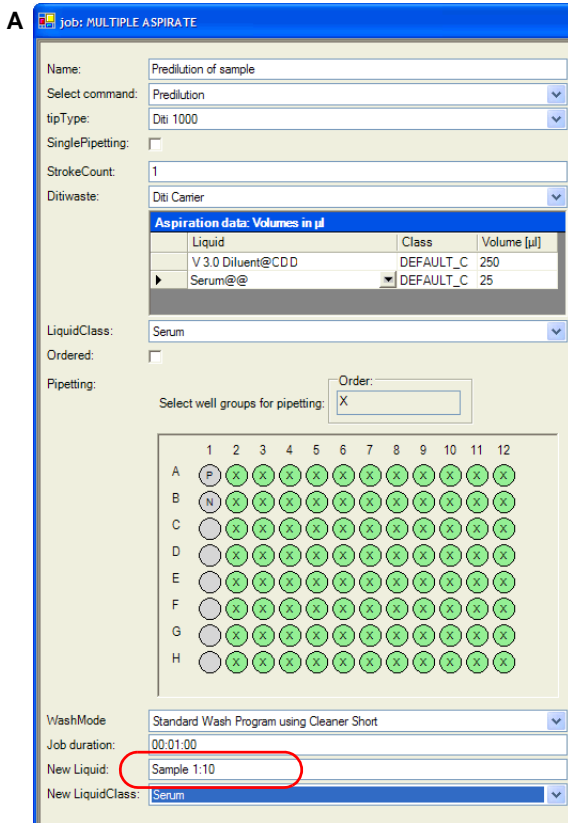


Fig. 7-75 Sample

A Predilution step of the sample predilution process

B Pipetting step of the diluted samples to the replicate cavities (XA, XB)

7.10.5.2 Control/Standard/Sample Replicates From Dedicated Cavities

If the destination process contains a duplicate, the liquid for each of the duplicates can be prepared in a dedicated cavity. The diluted liquid from the first cavity is transferred to the destination cavity of the first duplicate, the dilution from the second cavity to the second duplicate destination cavity.

The predilution process and destination process define section groups for each replicate of control or sample. In contrast to standard handling, define layout groups for each replicate.

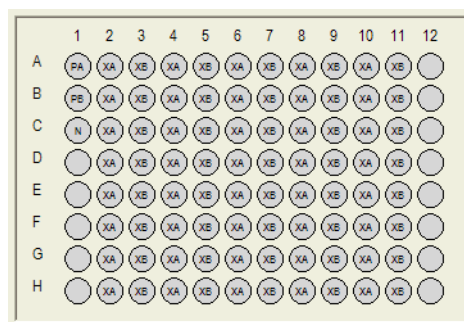


Fig. 7-76 Identical layout of predilution and destination plate

Note: In cases where dilutions for duplicates are prepared in dedicated cavities also the controls must be defined in layout groups.

To be able to name each liquid differently, for each group a single step must be defined when creating the dilution. The source of a predilution step is identical for each step of all groups of a section. The steps differ in the target cavity and the name of the created dilution. The handling of samples and controls does not differ in predilution and destination process steps.

The figures below show an example how predilution of two positive control replicates can be implemented in separate steps.

Two process steps of the dilution process which are required to prepare the two diluted positive control liquids required for the duplicates in the destination process:

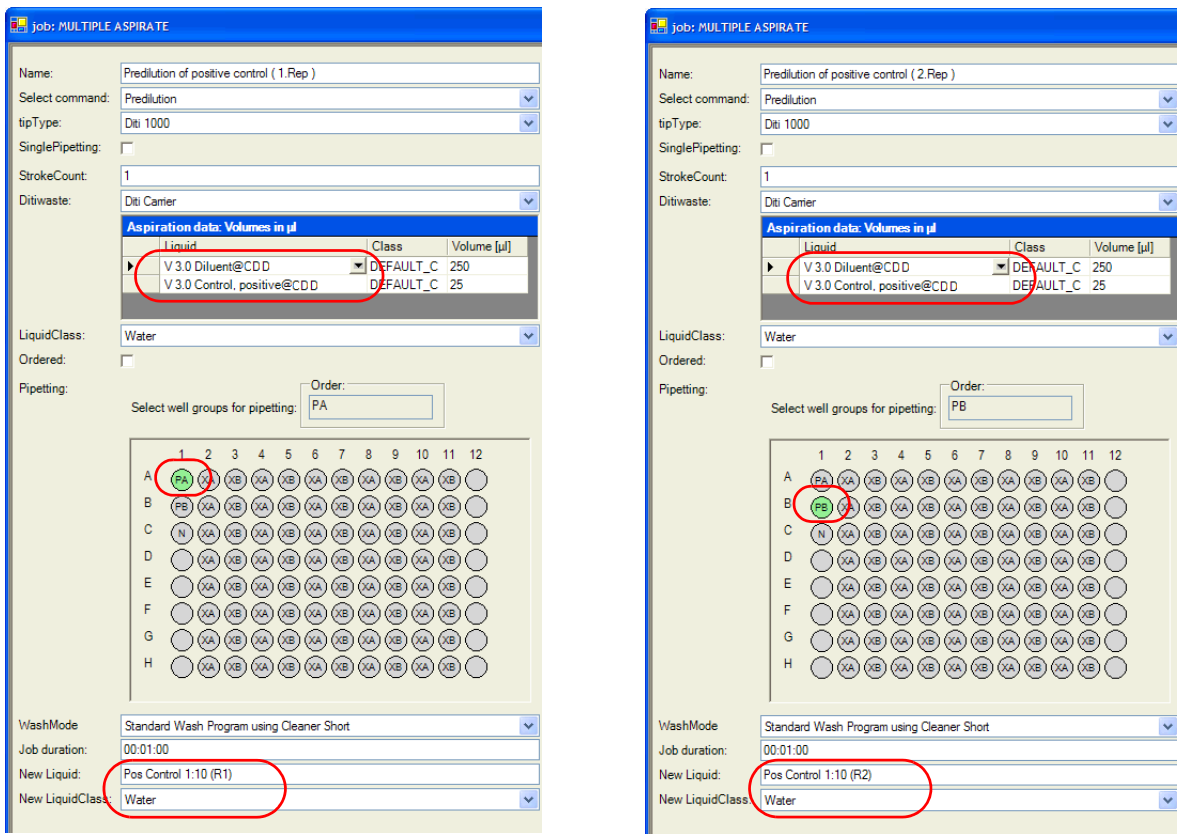


Fig. 7-77 Two process steps for dilution of positive control liquids

To ensure that each duplicate is pipetted from its dedicated predilution, for each duplicate one step in the destination process is required. The step uses the named dedicated dilutions as source.

The figure shows two destination process steps which transfer the dedicated named diluted positive controls to the duplicates of the destination process.

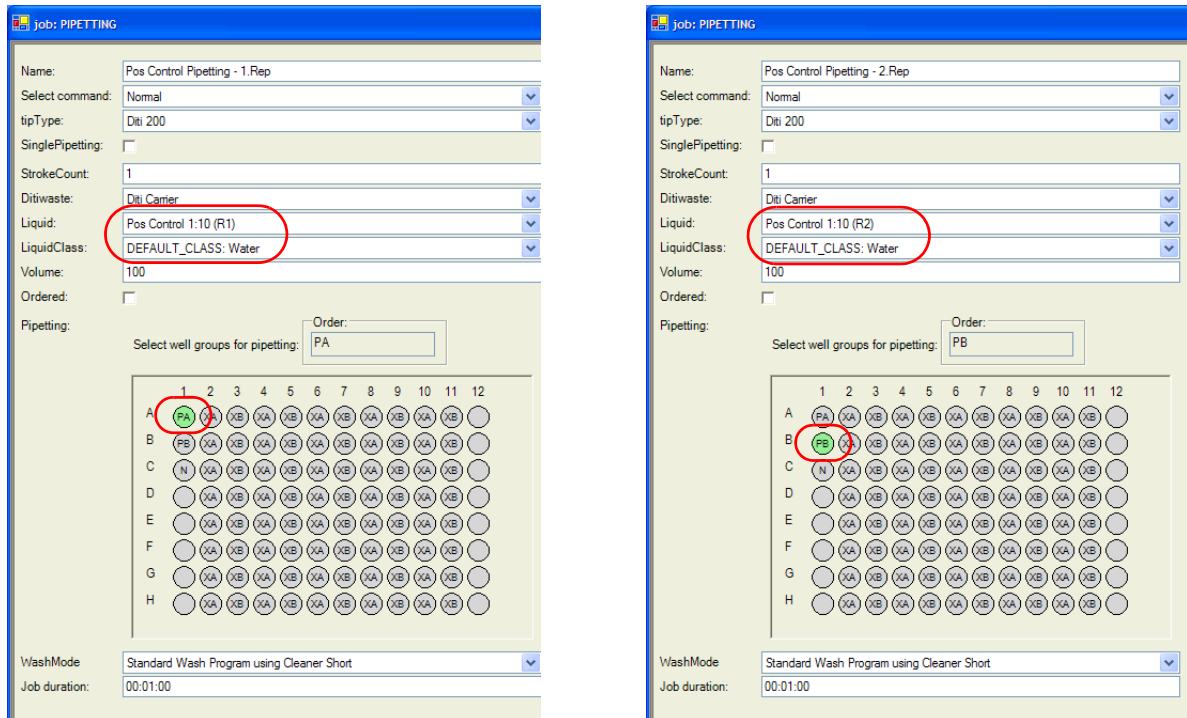


Fig. 7-78 Two destination process steps

7.10.6 Single Ratio Predilutions

A single ration predilution can be performed using multi-aspirate steps or by defining a number of individual steps to dilute the liquid in the cavity.

This section describes details on the definition of the predilution process with regard to the number of steps, specifics of the steps, etc.

There are the two variants

- ◆ MULTIPLE ASPIRATE steps
- ◆ PIPETTING steps

The explanations in this section use the identical layouts with duplicates of samples and positive control, but single cavity of negative control (see B in Fig. 7-73, 7-74).

To simplify the definitions, all predilution liquids are pipetted from a common predilution cavity (see chapter 7.10.5.1, 7-74).

If dedicated dilutions are requested, extend the described processes using the information of chapter 7.10.5.2, 7-76.

7.10.6.1 Dilution Using MULTIPLE ASPIRATE Steps

With multiple aspiration steps, the diluent and the control/standard/sample can be aspirated in a single step. The liquids are aspirated one after the other into the same tip and are dispensed together into the cavity of the predilution plate. In the destination process, the dilutions are pipetted into the destination plate by standard pipetting steps.

Predilution Process

Dilutions for positive, negative controls, standards, and sample can be performed on the same predilution plate (see 7.10.5 “Layout Definition”, 7-74). For each control/sample, one step is defined in the predilution process.

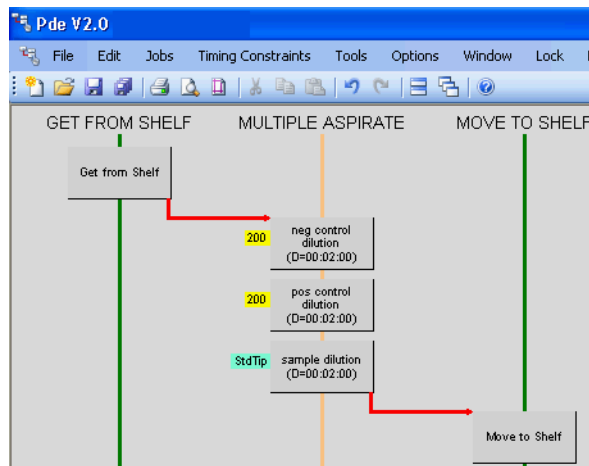


Fig. 7-79 Predilution process using MULTIPLE ASPIRATE steps

Note: The **Get From Shelf** and **Move To Shelf** actions may be replaced by **Get From Operator** and **Move To Operator**, respectively.

In the first case, the predilution plate is got from/moved to the shelf, in the second case, the operator has to load/unload the predilution plate on demand.

A combination of shelf and operator action is possible, but plates loaded by the operator should not be moved to the shelf (since a free space on the shelf may not be available at all times).

PDE: Data dialog for Multiple aspirate step

Name: pos control dilution

Select mode: Predilution

Tip Type: Diti 200

Single Pipetting:

Max. Dispenses: 1

Aspiration:

	Liquid	Vol. (µl)	Class	Role
1	Assay 1 Diluent...	250	DEFAULT_...	DEFAULT_ROLE: Diluent
2	Assay 1 Positive...	25	DEFAULT_...	DEFAULT_ROLE: Positive C...
3				

Liquid Class: Water

Merge Order:

Dilution Factors:

Pipetting:

Selected Wells for pipetting: P Ordered

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

Strategy: Automatic

Wash Mode: Standard Wash Program using Cleaner Short

Job Duration: 00:02:00

Predilution

New Liquid: P1 - Diluted PositiveControl 1:10

New Liquid Class: Water

New Liquid Role: Diluent

PDE: Data dialog for Multiple aspirate step

Name: sample dilution

Select mode: Predilution

Tip Type: Standard Tip

Single Pipetting:

Max. Dispenses: 1

Aspiration:

	Liquid	Vol. (µl)	Class	Role
1	Assay 1 Dilue...	200	Water	DEFAULT_ROLE: Diluent
2	Serum@@@	20	DEFAULT_...	DEFAULT_ROLE: Sample (prima...
3				

Liquid Class: Serum

Merge Order:

Dilution Factors:

Pipetting:

Selected Wells for pipetting: X Ordered

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

Strategy: Automatic

Wash Mode: Standard Wash Program using Cleaner Short

Job Duration: 00:02:00

Predilution

New Liquid: P1 - Diluted Sample 1:10

New Liquid Class: Serum

New Liquid Role: Sample (primary)

Fig. 7-80 Example of Multiple-Aspirate predilution steps for positive control and samples

Transfer to Destination Plate

Define the destination process as usual, but use the dilution liquids as source of sample and/or controls.

Refer to the following pipetting step of diluted sample:

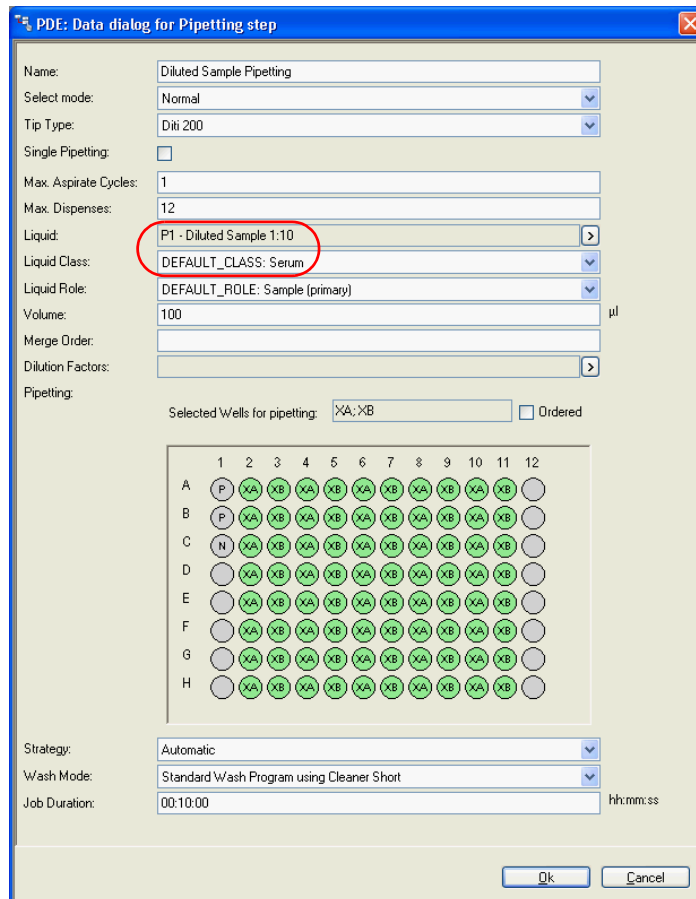


Fig. 7-81 Sample pipetting step of destination process (using diluted sample)

7.10.6.2 Dilution Using PIPETTING Steps

If simple PIPETTING steps are used to define the predilution, the diluent is distributed in one step, the control/standard or sample will be added in additional PIPETTING steps. As in the case before, the dilutions are pipetted into the destination plate by standard pipetting steps within the destination process.

Predilution Process

As in the case before, dilutions for positive, negative controls, standards, and sample can be performed on the same predilution plate (see 7.10.5 “Layout Definition”, 7-74).

In most cases, the diluents can be distributed to cavities of control and sample in the same step.

This is true if all liquids require the same amount of diluents. Otherwise, individual diluent distribution steps must be performed for controls and samples.

As next steps, PIPETTING steps for controls and samples are added to the predilution process.

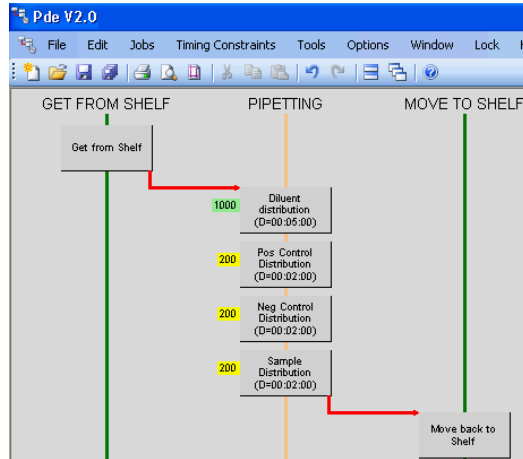


Fig. 7-82 Predilution process using PIPETTING steps

Please note that only the control and sample steps define a predilution step. Name the liquid for later use in the destination process. The diluent pipetting step remains a normal pipetting step and, therefore, does not name the liquid.

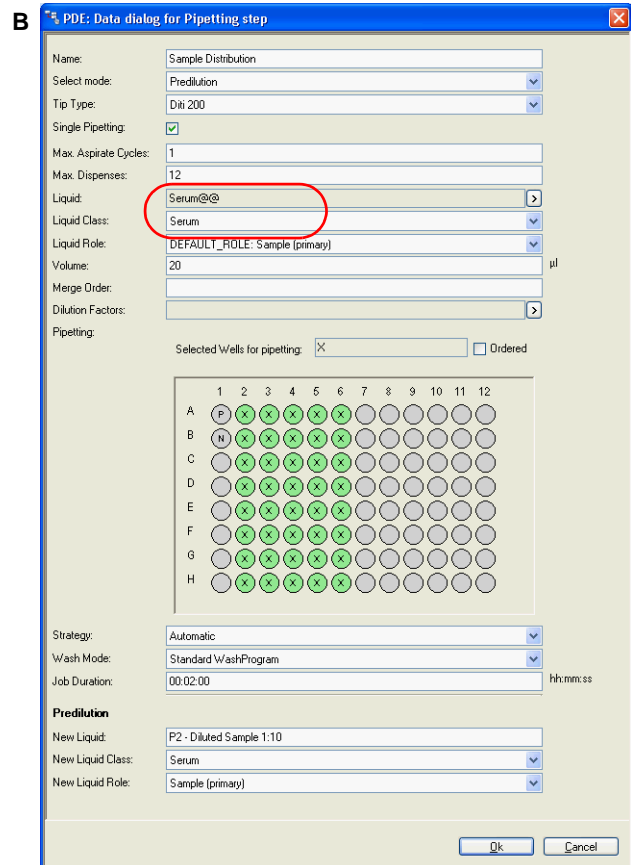
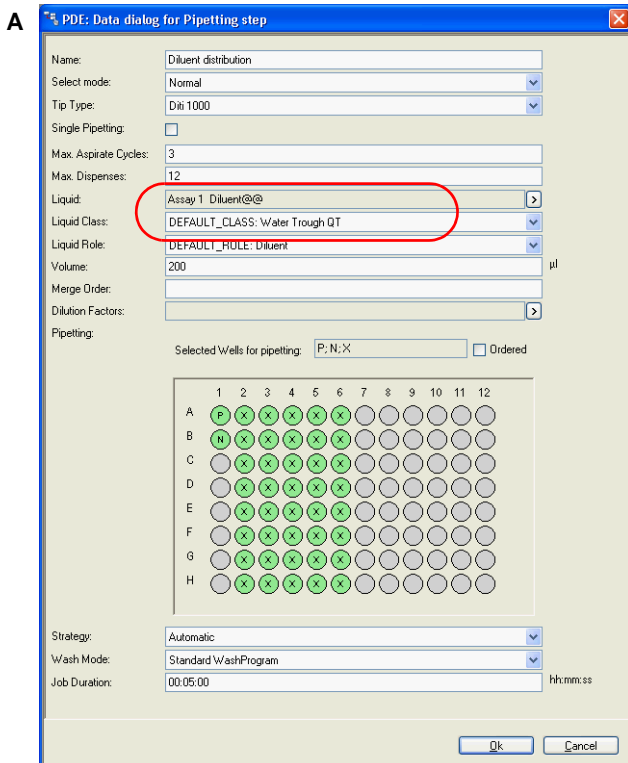


Fig. 7-83 Pipetting steps

A Normal pipetting step of diluent distribution

B Example of control/sample pipetting step using PIPETTING action

Transfer to Destination Plate

The transfer of the dilutions is defined in the same way as in the case before (for an example see [Fig. 7-81](#), [Fig. 7-81](#)).

7.10.7 Serial Dilutions

A serial dilution defines a sequence of cascaded dilutions. The result of the first dilution step is used as source for the next dilution step, and so on. For example, if each step defines a dilution ratio of 1:10, the succeeding steps define ratios of 1:100, 1:1000, etc.

Serial dilutions can be performed in two different ways.

- ◆ Define all steps of a sequence in such a way that all replicates (layout groups A, B, C,...) are on the same plate. For example, if 4 steps are required and samples of 96 patients need to be diluted, 4 plates are required, and each plate contains 4 steps of 24 samples only.
- ◆ Each step of a sequence is performed on individual plates for all samples/controls/standards. For example, if 4 steps are required and samples of 96 patients need to be diluted, again 4 plates are required, but each plate contains all 96 samples in a specific dilution ratio.

Note: Currently, it needs to be defined in the PDE, which variation must be performed.

The first variant is useful if each dilution ratio is required (aspirated) in the following steps. But this requires a sufficient amount of pipetting sites (5 in the example above). If plates must be exchanged in between, the room temperature incubation time of the first sample on destination plate may already be exceeded while the last samples are still missing. In any case, large differences in room temperature incubation time must be taken into account.

The second variant should be performed if only the liquids of the last dilution step are of interest. In this case, the number of required pipetting sites at a time is reduced to two. The room temperature incubation time on the destination plate is reduced to a minimum.

Serial Dilution Sequence on One Plate

If all steps of a serial dilution are performed on one plate, quite often the number of samples which can be placed on a layout of the predilution plate will be much smaller than on the destination plate. This is especially true if only the liquids of the last dilution step are of interest.

During processing, the appropriate number of processes will be generated. If sample and controls were defined on the same destination plate, unnecessary dilutions of controls would be performed in the additional predilution processes. For that reason it makes sense to define separate processes for the samples and the controls, if the number of samples on the destination plate is larger than the number on the predilution plate.

On the assumption that there are 4 steps in the serial dilution, 2 processes should be defined (one for the samples and one for positive and negative controls). As destination process we use the test layout with sample duplicates. 40 samples can be placed on the destination plate. If you use a "common" cavity as source for both duplicates, you will need 2 predilution processes for samples.

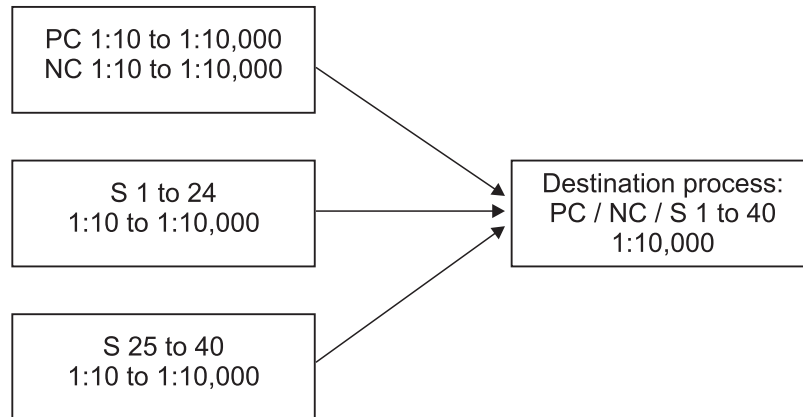


Fig. 7-84 Serial dilution on one plate

Possible definitions of the predilution processes are described in the following sections.

7.10.7.1 Dilution Using MULTIPLE ASPIRATE Steps

The diluent and the control/standard/sample are aspirated in one command for each step of the serial dilution. The liquids are diluted in the tip and then dispensed together to the cavity of the predilution plate.

In the destination process, the dilutions with the highest dilution ratio are pipetted into the destination plate by standard pipetting steps.

Predilution Process (of Samples)

Each dilution step is performed as a MULTIPLE ASPIRATE step. The layout only contains samples. We define 4 groups, each of it describing one predilution ratio (see Fig. 7-86, 7-85). Remind that the source of a step is the result of the preceding step.

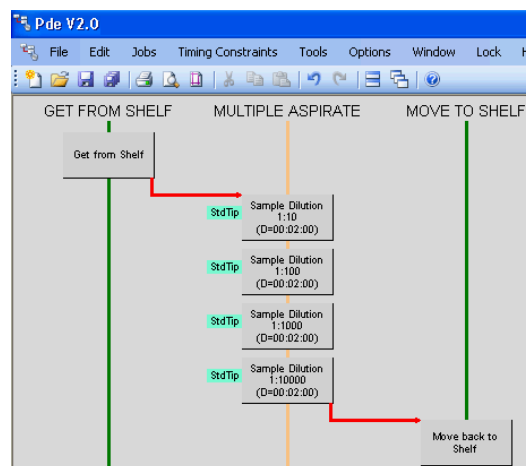


Fig. 7-85 Serial dilution process for samples using MULTIPLE ASPIRATE steps

All steps of the dilution sequence are performed on one plate.

PDE: Data dialog for Multiple aspirate step

Name: Sample Dilution 1:10
 Select mode: Predilution
 Tip Type: Standard Tip
 Single Pipetting:
 Max. Dispenses: 1

Aspiration:	Liquid	Vol. (µl)	Class	Role
1	Assay 1 Diluent@.	200	Water	DEFAULT_ROLE: Diluent
2	Serum@@	20	Serum	DEFAULT_ROLE: Sample (pri
3				

Liquid Class: Serum
 Merge Order:
 Dilution Factors:
 Pipetting: Selected Wells for pipetting: XA Ordered

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

Strategy: Automatic
 Wash Mode: Standard Wash Program using Cleaner Short
 Job Duration: 00:02:00

Predilution
 New Liquid: Diluted Sample 1:10 (S1)
 New Liquid Class: Serum
 New Liquid Role: Sample (primary)

PDE: Data dialog for Multiple aspirate step

Name: Sample Dilution 1:10000
 Select mode: Predilution
 Tip Type: Standard Tip
 Single Pipetting:
 Max. Dispenses: 1

Aspiration:	Liquid	Vol. (µl)	Class	Role
1	Assay 1 Diluent@.	200	DEFAULT_CLASS : Water...	DEFA
2	Diluted Sample 1:1000 (S1)	20	DEFAULT_CLASS : Serum	DEFA
3				

Liquid Class: Serum
 Merge Order:
 Dilution Factors:
 Pipetting: Selected Wells for pipetting: XD Ordered

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

Strategy: Automatic
 Wash Mode: Standard Wash Program using Cleaner Short
 Job Duration: 00:02:00

Predilution
 New Liquid: Diluted Sample 1:10000 (S1)
 New Liquid Class: Serum
 New Liquid Role: Sample (primary)

Fig. 7-86 Serial dilution steps of sample dilution using MULTIPLE ASPIRATE steps

The example shows the first and last step of the dilution sequence.

Predilution Process (of Controls)

Each dilution step is performed as a MULTIPLE ASPIRATE step. The layout contains both positive and negative controls. Again, we define 4 groups, each of it describing one predilution ratio (see Fig. 7-88, 7-87). Remind that the source of a step is the result of the preceding step.

If you want to enforce that each dilution step is performed for all controls prior to the next step, split the jobs (see B in Fig. 7-87, 7-86).

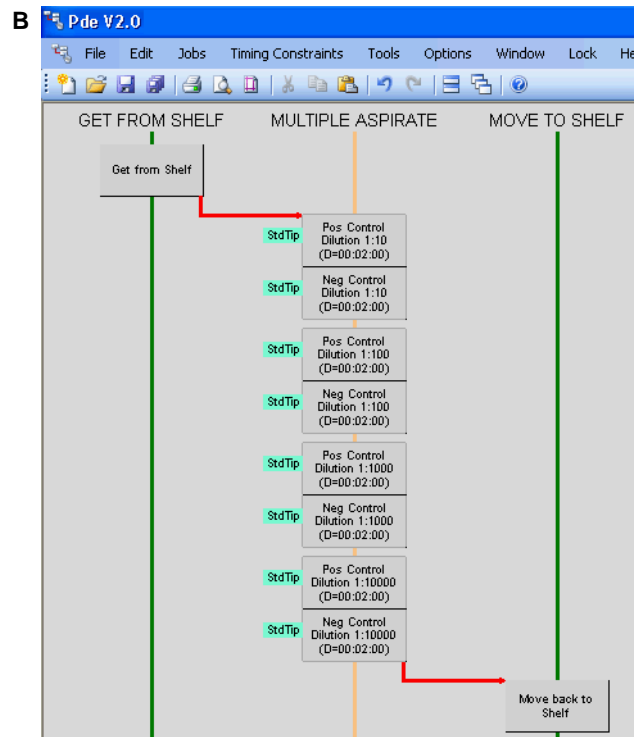
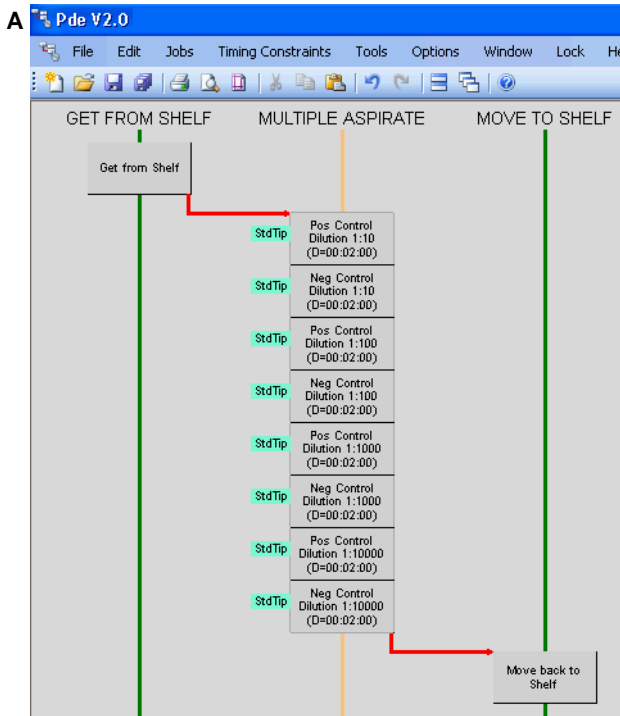


Fig. 7-87 Serial dilution processes for controls

A All steps are defined as composite. The pipetting sequence will be defined by the Process Builder.

B Pipetting steps of one dilution ratio are grouped together to force the system to perform one dilution step for all controls before the next dilution ratio is performed.

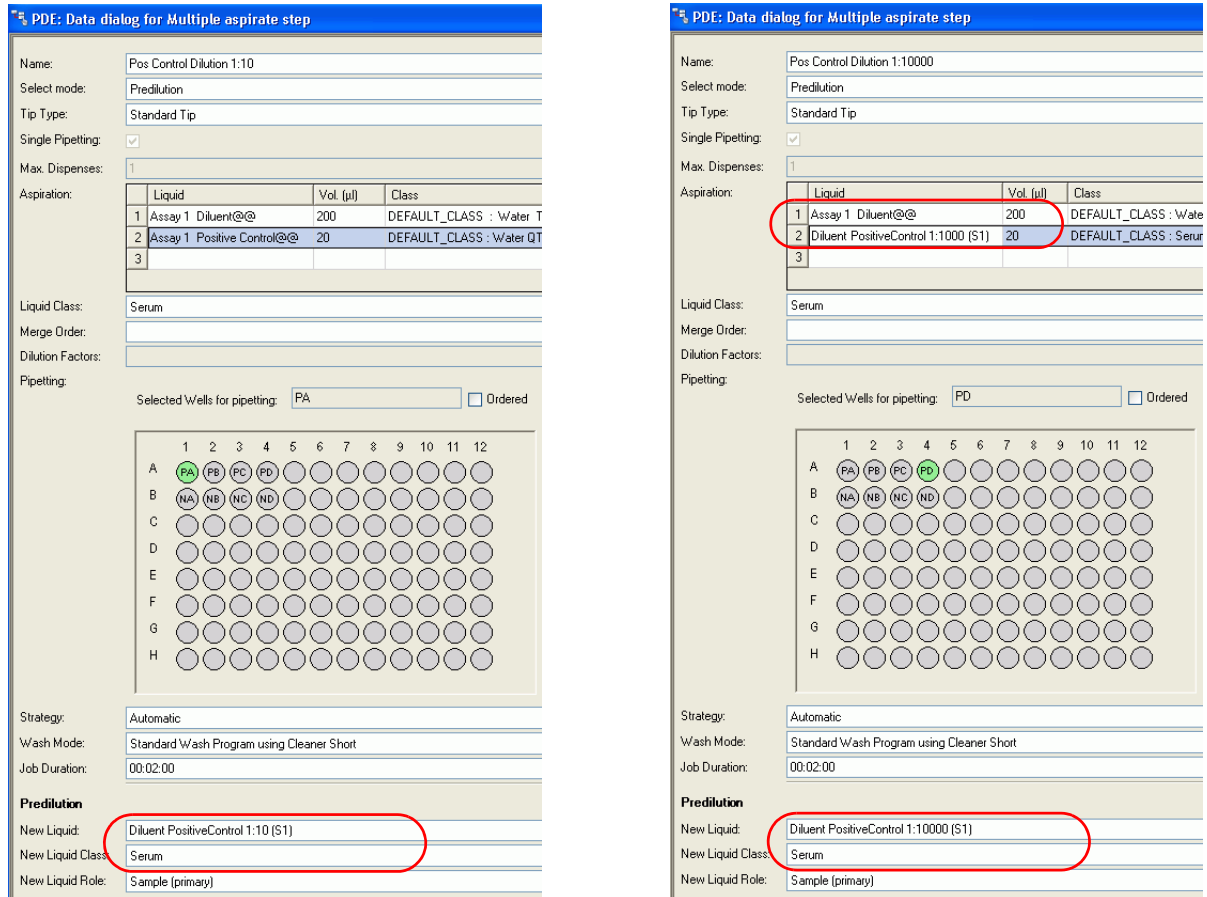


Fig. 7-88 Serial dilution steps of positive control dilution using MULTIPLE ASPIRATE steps

The example shows the first and last step of the dilution sequence.

Transfer to Destination Plate

Define the destination process as usual, but use the dilution with the highest ratio as source of samples.

The following figure shows an example for the pipetting step of diluted samples:

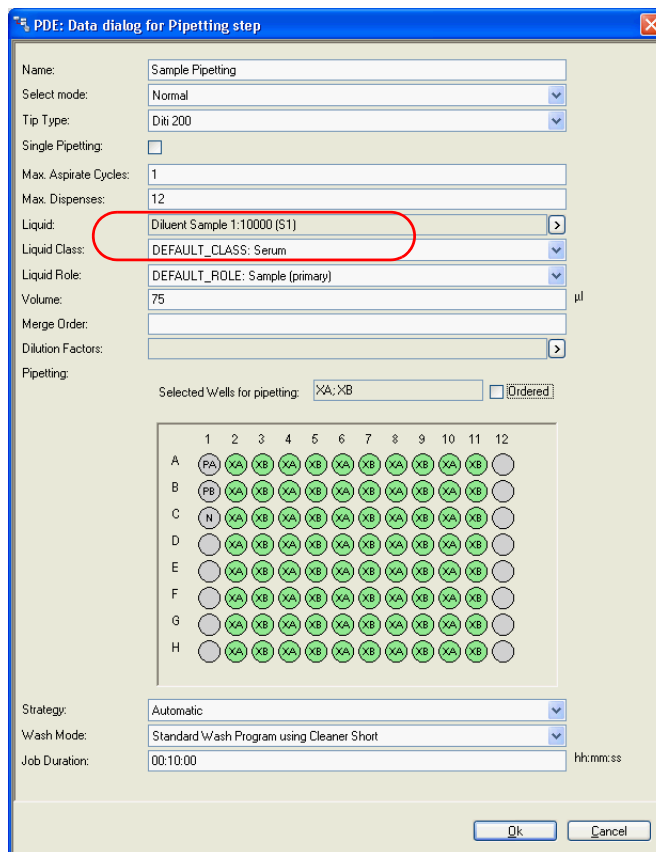


Fig. 7-89 Sample pipetting step of destination process (using diluted sample with highest dilution ratio)

7.10.7.2 Dilution Using PIPETTING Steps

If simple PIPETTING steps are used to define the predilution, the diluent is distributed in one step, the control/standard or sample will be added in additional PIPETTING steps.

- ◆ If the diluent volume is identical for each dilution step, diluent can be distributed in one action for all dilution steps (distribute to all groups on layout) (refer to “Diluent Pipetting for all Dilution Steps at Once”, 7-89).
- ◆ Otherwise, a dilution distribution step must be defined for each dilution step (refer to “Diluent Pipetting for Each Dilution Step Separately”, 7-90).

As in the case before, the dilutions are pipetted into the destination plate by standard pipetting steps in the destination process.

Predilution Process (of Samples)

Again you need to define two processes, one for the samples and one for the controls. The layout of the predilution process does not differ from the layout using MULTIPLE ASPIRATE steps as described in 7.10.7.1, 7-84.

Diluent Pipetting for all Dilution Steps at Once

In a first step the diluent is distributed to cavities of all dilution steps.
 After the PIPETTING step for diluent, we have to define the sequence of pipetting steps for the serial dilution of the sample.

Note: The diluent pipetting is defined as normal pipetting step. Consequently, the diluent as such has no name of its own.

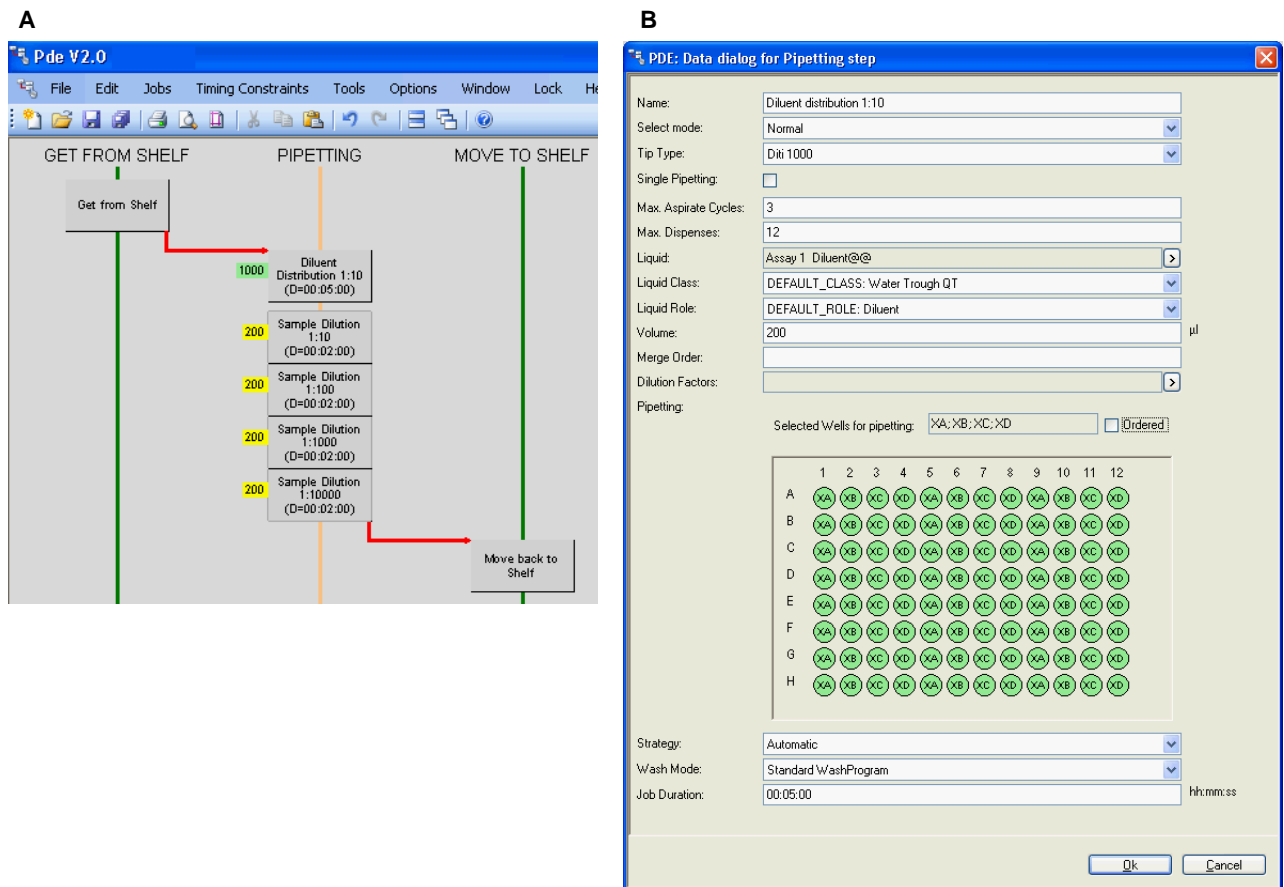


Fig. 7-90 Serial dilution process for sample (at once)

- A Serial dilution process for sample using PIPETTING steps
- B Diluent is dispensed to cavities of all dilution steps

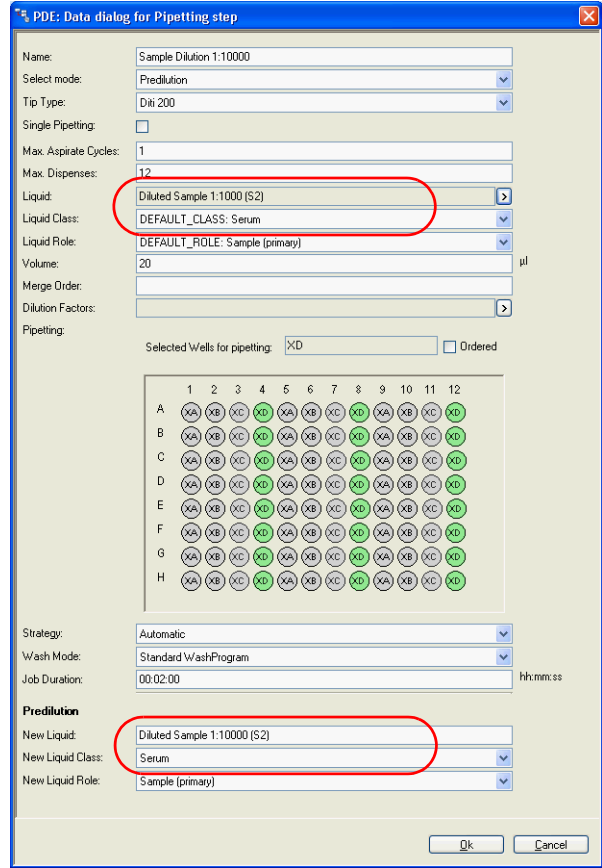
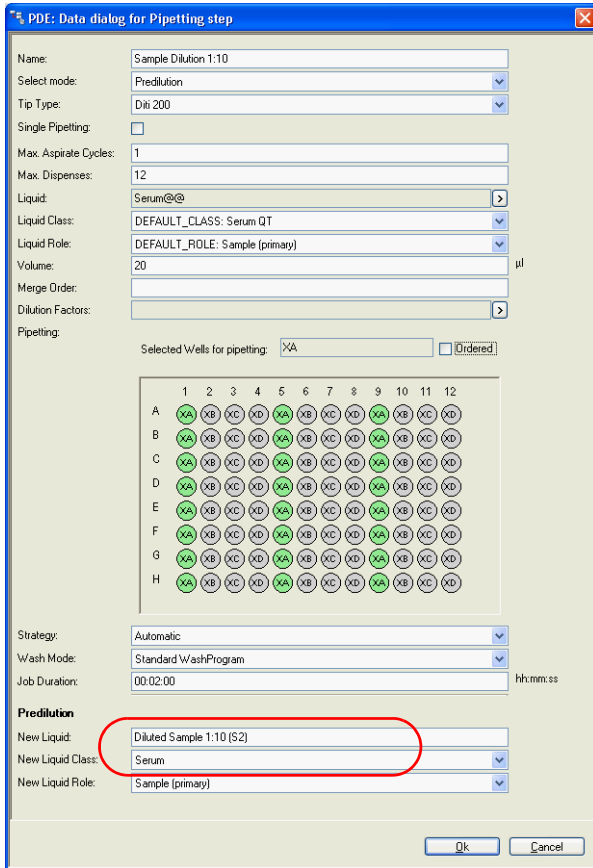


Fig. 7-91 Serial dilution steps of sample dilution using PIPETTING steps

The example shows the first and last step of the dilution sequence.

Diluent Pipetting for Each Dilution Step Separately

If the diluent volumes differ for each dilution step or if the step needs to be performed directly before the sample is distributed, define a dilution step for each sample section group.

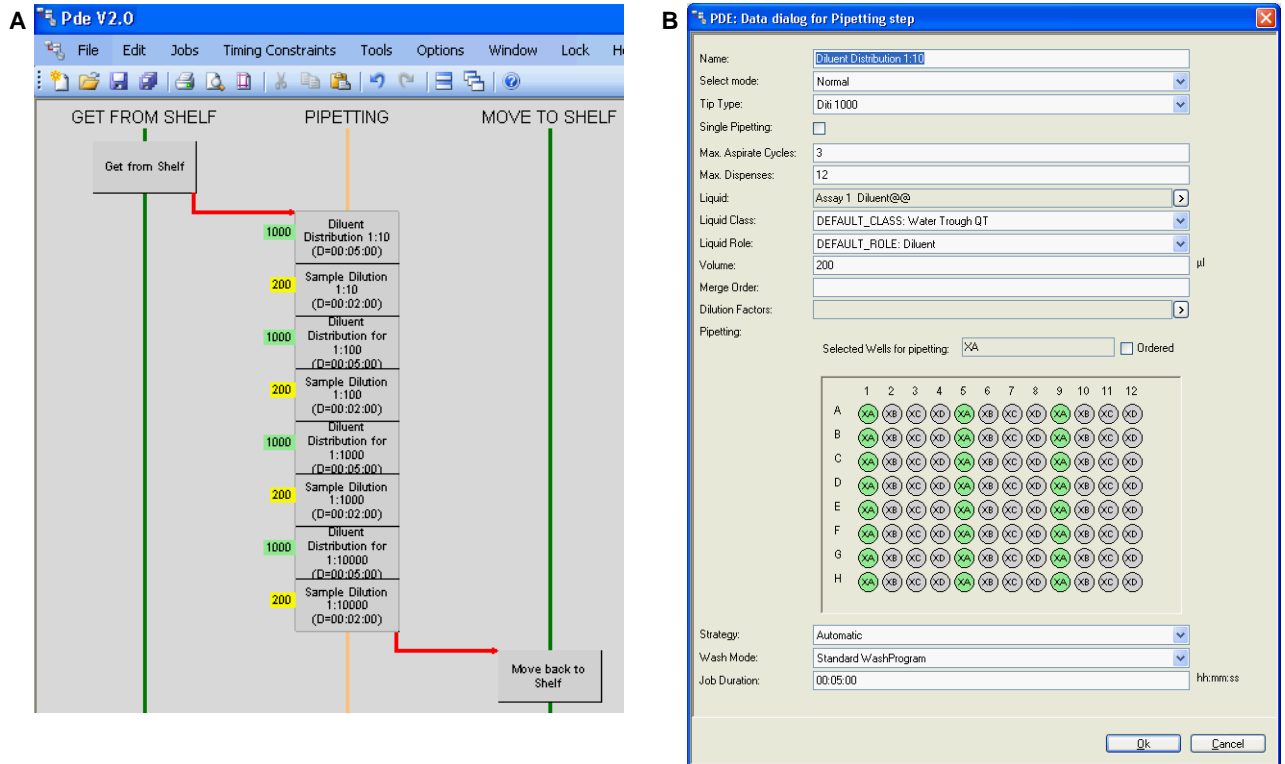


Fig. 7-92 Serial dilution process for sample using PIPETTING steps

- A Diluent is defined separately for each dilution step
- B Example of diluent pipetting to prepare diluted sample 1:10

The pipetting steps of sample do not differ from the example above.

Predilution Process (of Controls)

Analogous to sample predilution as described in “Predilution Process (of Samples)”, 7-84 a process can be defined for the controls.

The layout is identical with the one using MULTIPLE ASPIRATE steps.

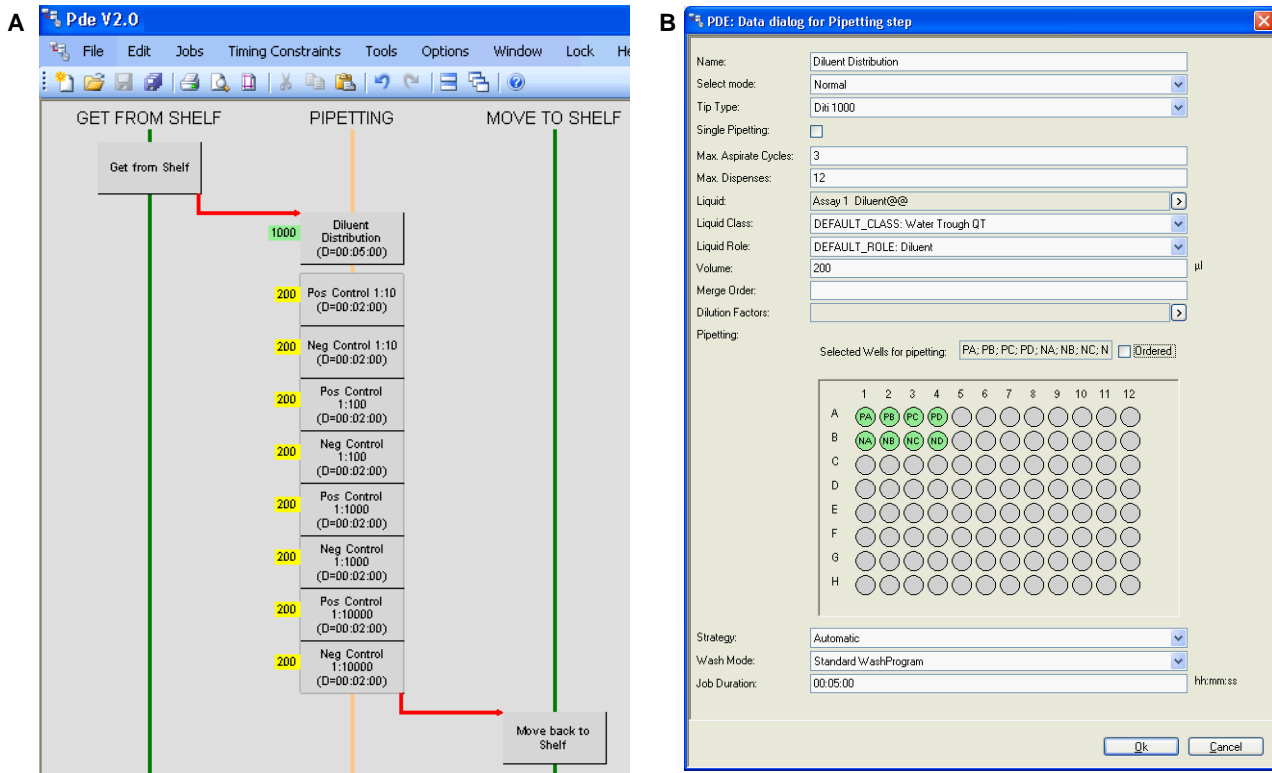


Fig. 7-93 Serial dilution process for controls using PIPETTING steps

- A Serial dilution process for controls using PIPETTING steps B Diluent is dispensed to cavities of all dilution steps

If different diluent pipetting steps are required, mix them with the control steps as already described for samples (refer to “Diluent Pipetting for Each Dilution Step Separately”, 7-90).

Transfer to Destination Plate

Define the destination process as usual, but use the dilution with highest ratio as source of samples.

Fig. 7-89, 7-88 shows an example for the pipetting step of diluted samples. Using MULTIPLE ASPIRATE or PIPETTING steps has no influence on this step.

Serial Dilution Over a Number of Plates

Each step of the serial dilution is performed on one plate. The number of required plates is identical with the number of dilution steps in serial dilution.

A process is defined for each dilution step. A process uses the dilutions of the “preceding” process.

Because each step is performed on one plate, sample and controls can coexist on one plate. The layout of each plate is identical. It is defined by the destination layout and the decision whether to pipette diluted duplicates from the same dilution cavity.

If the latter is the case, the predilution layout is the one defined in 7.10.6 “Single Ratio Predilutions”, 7-78.

On the assumption that there are 4 steps in the serial dilution, you need to define 4 predilution processes (one for each dilution step, each process contains sample and control dilution steps). As destination process we use the test layout with sample duplicates. 40 samples can be placed on the destination plate.

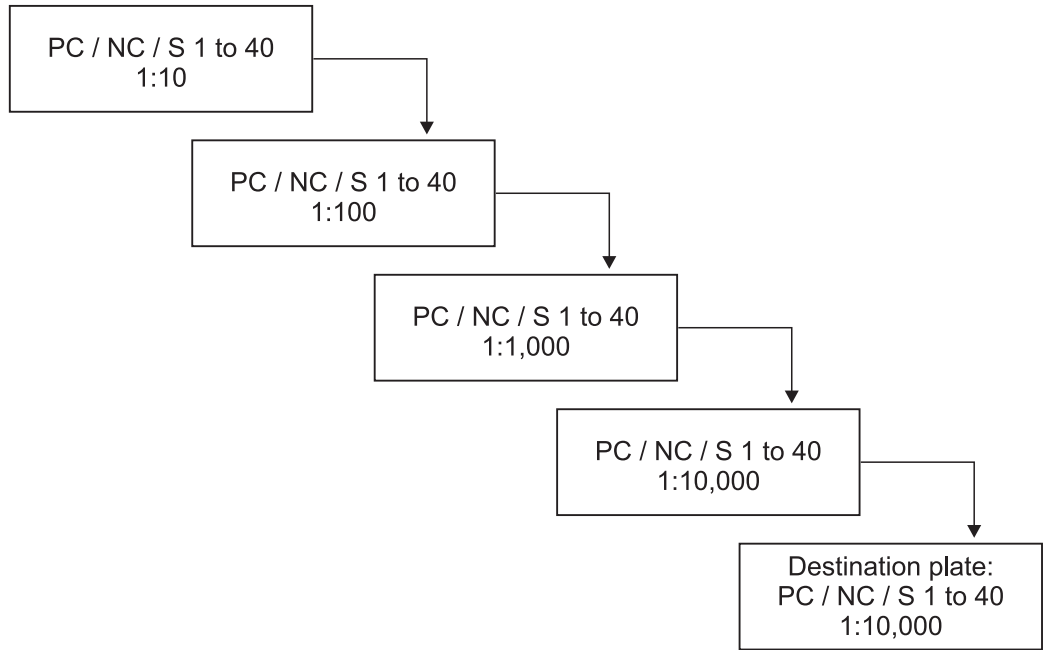


Fig. 7-94 Example for 4 dilution processes

Each of the four processes defines the same sequence of pipetting steps, only the sources differ from one process to the next one.

Dilution Using MULTIPLE ASPIRATE Steps

As explained in earlier sections the dilutions can be performed using MULTIPLE ASPIRATE or PIPETTING steps. The following example uses common cavities for the predilution processes.

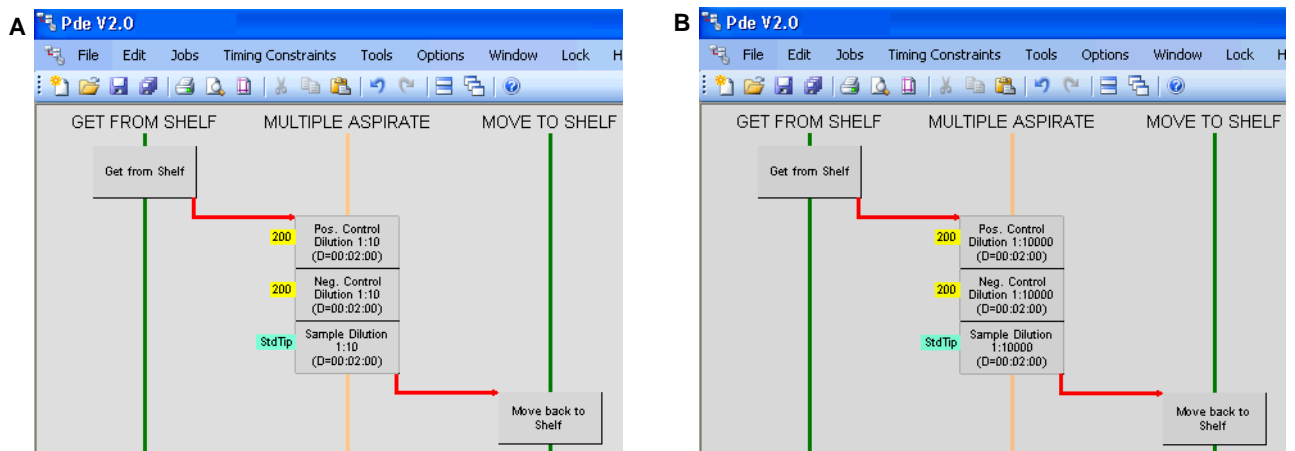


Fig. 7-95 Example of processes from serial dilution with each step performed on one plate using MULTIPLE ASPIRATE

A The process defines the first dilution step

B The process defines the last dilution step

The diluent and the control/standard/samples need to be aspirated in a single step. The liquids are mixed in the tip and are dispensed together to the cavity of the predilution plate.

In the destination process the dilutions are pipetted into the destination plate by standard pipetting steps.

Predilution Process

Though all positive, negative controls, standards, and samples can be performed on the same plate, the following figures will focus on the samples only. The important point is to recognize that a process is limited to one dilution ratio.

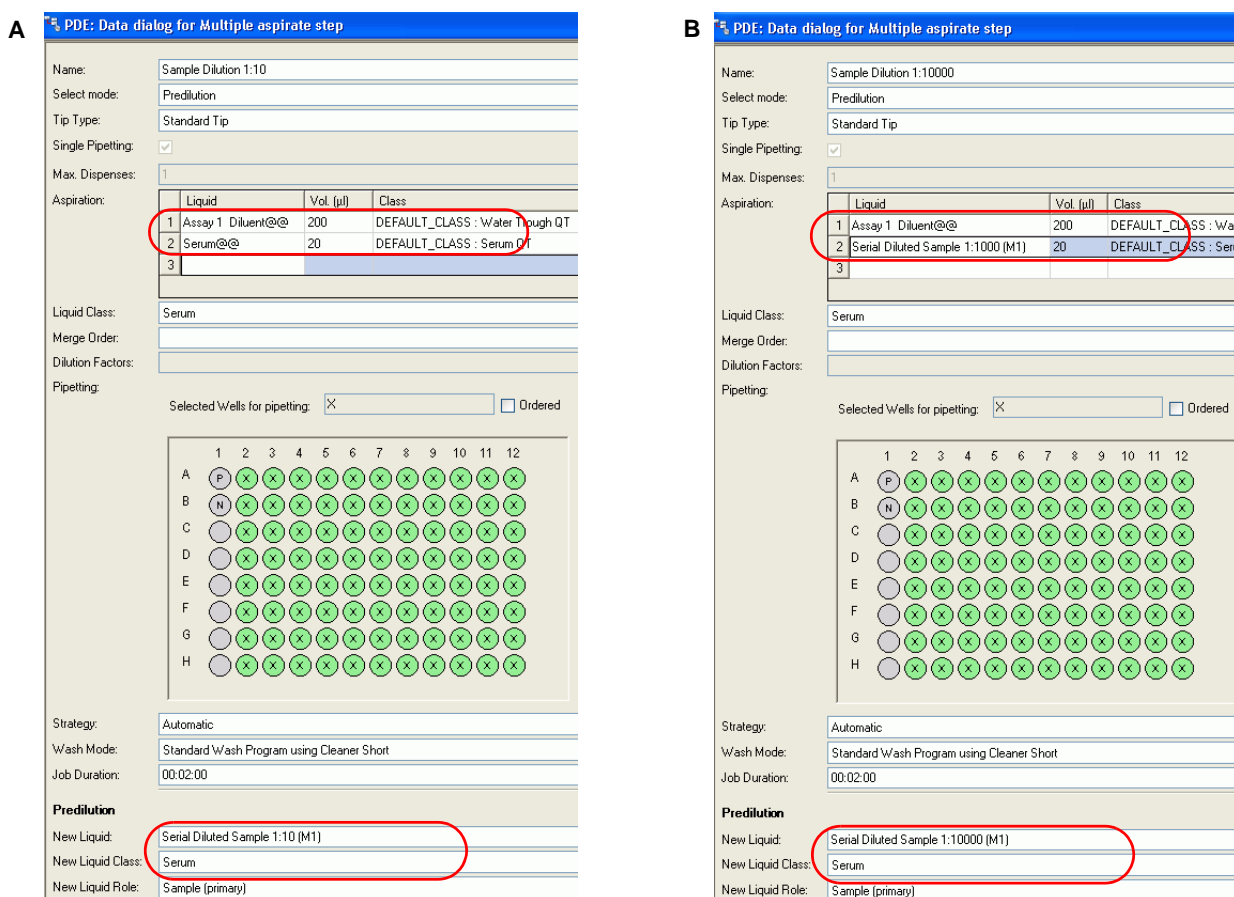


Fig. 7-96 Sample pipetting steps of serial dilution with each step performed on one plate using MULTIPLE ASPIRATE

A The job defines the first sample dilution step

B The job defines the last sample dilution step

Transfer to Destination Plate

Define the destination process as usual, but use the dilutions from last process (“multi serial dilution step 4” in the example) with highest ratio as source of samples and controls.

Fig. 7-89, Fig. 7-88 shows an example for the pipetting step of diluted samples.

Dilution Using PIPETTING Steps

If simple PIPETTING steps are used to define the predilution, the diluent is distributed in one step, the control/standard or sample will be added in additional PIPETTING steps.

- ◆ If the diluent volume is identical for each dilution step, diluent can be distributed in one action for all dilution steps (distribute to all groups on layout) (refer to [“Diluent Pipetting for all Dilution Steps at Once”](#), ¶ 7-89).
- ◆ Otherwise, a dilution distribution step must be defined for each dilution step (refer to [“Diluent Pipetting for Each Dilution Step Separately”](#), ¶ 7-90).

As in the case before, the dilutions are pipetted into the destination plate by standard pipetting steps in the destination process.

Predilution Processes

This pipetting scheme can be defined as a combination of the examples described earlier in this section.

Since you prepare dilution steps for several plates, you need to define 4 processes, each of it preparing one dilution ratio. The result of the processes is analogous to the results described in section 7.10.7.2 [“Dilution Using PIPETTING Steps”](#), ¶ 7-88.

All details of the process are analogous to a process which defines only one dilution step. This is described in section 7.10.6.2 [“Dilution Using PIPETTING Steps”](#), ¶ 7-81.

7.10.8 Intermediate Processing

What is “Intermediate Processing”?

Predilution processes usually contain only the following typical steps:

- ◆ **GET_FROM_SHELF / GET_FROM_OPERATOR**
- ◆ **PIPETTING**
- ◆ **MULTIPLE_ASPIRATE**
- ◆ **MOVE_TO_SHELF / MOVE_TO_OPERATOR**

However, the software allows you to perform “Intermediate Processing”, which means that predilution processes can also contain all actions possible in standard assays.

For example, you can include **WASHING** or **INCUBATING** steps in the predilution process.

7.10.8.1 Using New Liquids (Default Behavior)

What happens if you include additional steps like **WASHING** or **INCUBATING** into a predilution process?

If the definition of a new predilution liquid precedes an additional step in a predilution process, the destination assays will use the new liquid that existed before the additional step.

The following figure shows an example:

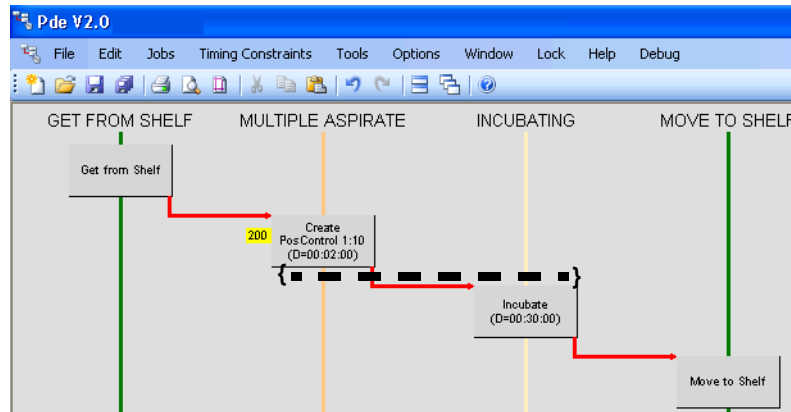


Fig. 7-97 The destination process will use the new liquid between the MULTIPLE_ASPIRATE and the INCUBATING step

{--} The new liquid will be used between last liquid definition step and the following one

Note: This behavior is often desired for steps like **WASHING** (i.e. wash predilution from plate after use), but not for **INCUBATING**.

Note: In general, new liquids will be used directly after the last PIPETTING or MULTIPLE_ASPIRATE step that defines a new liquid.

When creating and using the predilution within the destination assay itself (refer to section 7.10.3.1 “Predilution Within an Assay Itself”, 7-72):

If the definition of a new liquid precedes an additional step, you will not be able to use it afterwards. Additional steps make the new liquids inaccessible for the LiHa device.

The following figure shows an example of a serial dilution which includes an intermediate step:

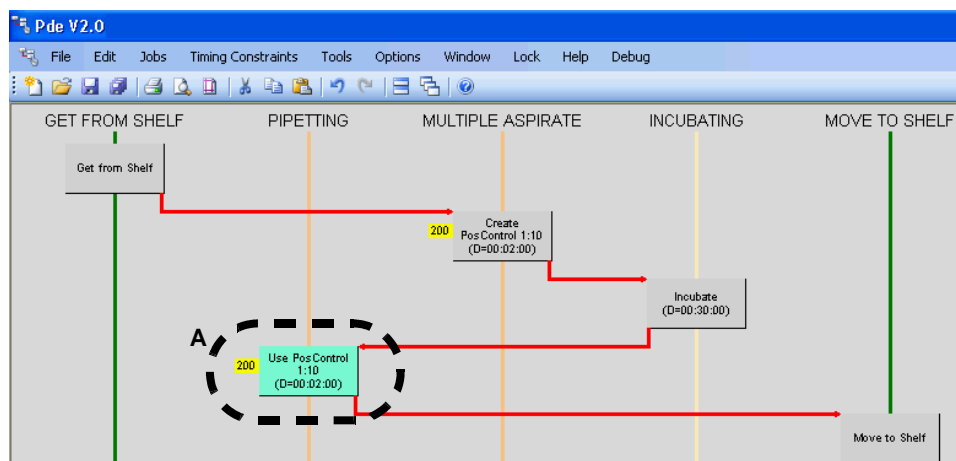


Fig. 7-98 The new liquid will not be accessible after the intermediate step

A The pipetting step will fail because the intermediate step makes the liquid inaccessible for the LiHa

7.10.8.2 Using New Liquids after Additional Steps

The action **Activate Liquids** is intended to override the default behavior that is described in section 7.10.8.1 “Using New Liquids (Default Behavior)”, 7-95.

This action has two effects, which are described in the following.

If the definition of a new liquid precedes an additional step in a predilution process, use **Activate Liquids** to define when the new liquid(s) must be used in destination assays.

The following figure shows an example:

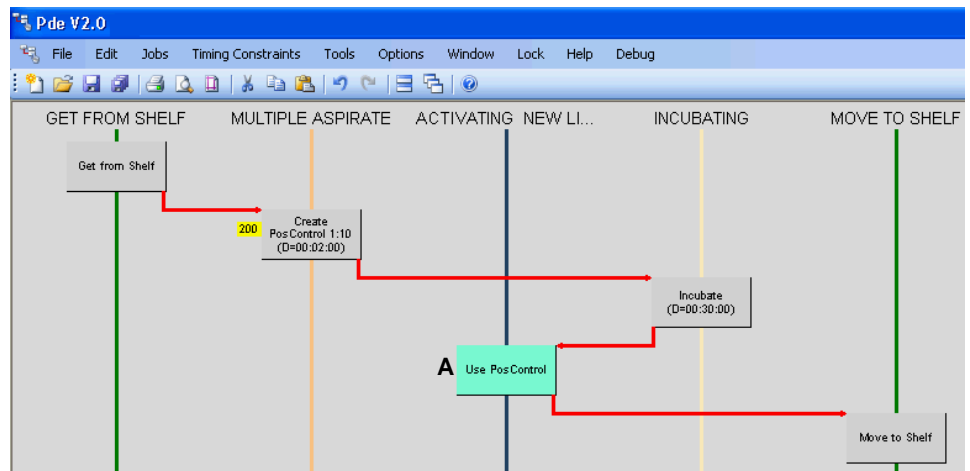


Fig. 7-99 Properly incubated predilution

A The destination assay will aspirate the new liquid(s) after **INCUBATING** but before **MOVE_TO_SHELF**

When creating and using the liquid(s) within the destination assay itself (refer to section 7.10.3.1 “Predilution Within an Assay Itself”, 7-72):

If the definition of a new liquid precedes an additional step, use **Activate Liquids** to enable the liquid to be used in later steps. This action makes the new liquids accessible for the LiHa device again.

The following figure shows an example for a serial dilution which includes an intermediate step:

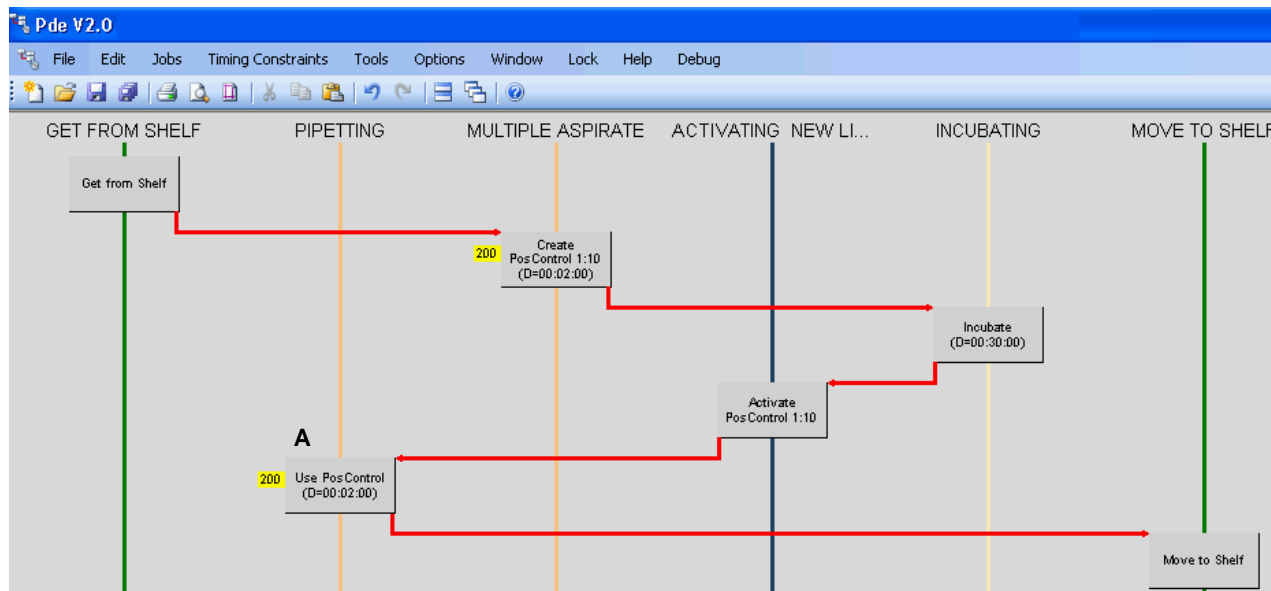


Fig. 7-100 Liquid accessible again

- A The step "Use PosControl 1:10" can access the liquid that was created in step "Create PosControl 1:10" because there is an activating step after the intermediate step

7.11 Reuse Plate

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Coating tiles	See section 12.2.1.1 , 12-2

A process can be defined in such a way that microplates can be reused later.

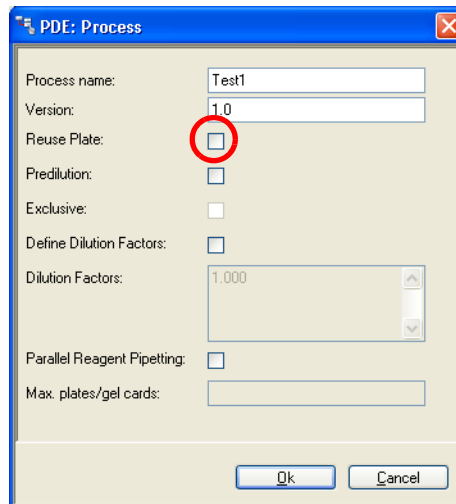
Purpose

The following examples demonstrate the purpose of reusing microplates:

- ♦ Unused wells of a predilution plate can be used in further processes. In this case the plate will be reused by a different process in succession.
- ♦ Microplates (e.g. expensive, coated plates) which have not been used up completely can be reused later, i.e. the unused wells on the plate can be processed.
 - Normally the process for a reused plate does not differ much from the first process or is identical. Usually, wash and non-wash processes cannot be mixed.

Note: *If wash jobs are defined in the processes, only wells which have not been washed yet can be reused.*

To define a process that is enabled to reuse plates, proceed as follows:



- 1 Click **File > New** in the process definition editor menu.
Or Call up the process dialog of an existing process by clicking **File > Properties**.
- 2 Name the process.
- 3 Select the check box **Reuse Plate**.

Fig. 7-101 Process dialog / allow reusing plates

Note: *In case of plates with partially different coatings (coating tiles) the size and location of the coating tiles must be defined, since only unused coating tiles, which represent a certain pattern of coatings, can be processed on a reused plate.*

Define the size of the coating tiles in the Consumable Data Editor. Refer to cross references above.

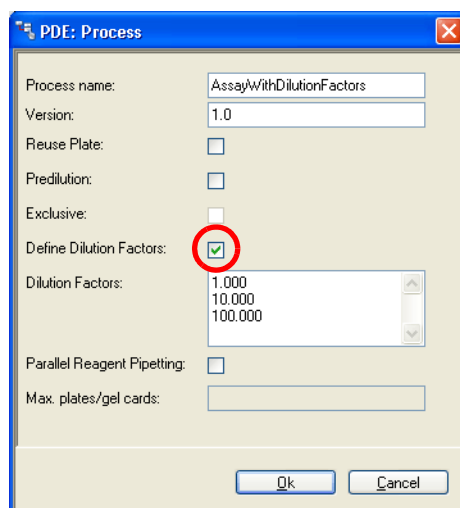
7.12 Defining Dilution Factors

Purpose This feature enables you to pipette a sample for different dilutions within the same assay to different wells (1 well per factor and sample or more in case of replicates) and to select which pipetting steps are applied to which dilution factors (wells).

Conditions *Note: Pay attention to the following:*

- The dilution factors must be supported by the assay.
- This feature cannot be used together with cross-match assays.

To define dilution factors for a process, proceed as follows:



- 1 Open the corresponding process dialog.
- 2 Select the check box **Define Dilution Factor**.
- 3 Enter the dilution factors in the field **Dilution Factors**.

Fig. 7-102 Process dialog / Define dilution factors

Note: When defining dilution factors, pay attention to the following:

- Enter a number, text strings are not permissible.
- By default the standard dilution factor is 1.000. If this factor is deleted from the list, the factor defined in the first line will be the standard factor for this process.

Note: If dilution factors are defined, do not select **Use PREDICTED sample count in Batch Mode** in shopping list mode.

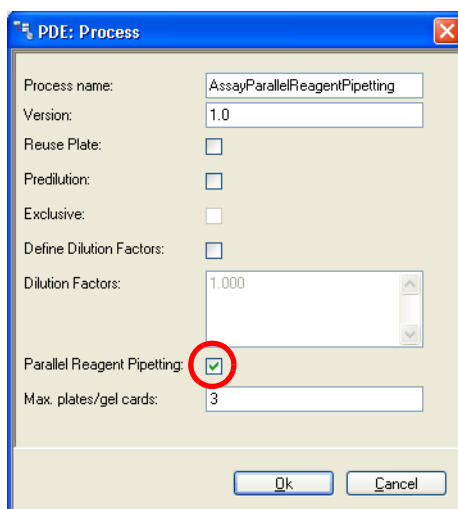
7.13 Parallel Reagent Pipetting

Purpose The main purpose of this feature is speeding up LiHa steps, such as pipetting, multiple aspirate and decontamination. The system attempts to optimize LiHa steps by combining them with compatible steps. With this, execution times will be minimized if, during one run, an assay is processed several times on different plates.

Note: *Parallel pipetting of the same reagent over plates/gel cards of different assays is not possible except in composed steps.*

Function If an assay is processed on several plates, the system groups these processes to execute them in parallel. Each LiHa step will then be executed for a group of plates simultaneously in such a way that aspirate cycles and possibly decontamination or DiTi waste durations are minimized. When parallel reagent pipetting is enabled, the user can enter a number to define the maximum number of processes that may run in parallel in this assay.

To enable parallel reagent pipetting, proceed as follows:



- 1 Open the corresponding process dialog.
- 2 Select the check box **Parallel Reagent Pipetting**.
- 3 Enter the number in the field **Max. plates/gel cards**.
Or leave the field empty.

Note: *If the user does not enter a maximum, no limit will be used and the limitation will always be the number of pipetting sites.*

Fig. 7-103 Process dialog / Enable parallel reagent pipetting

The system schedules and executes the resulting processes with the synchronized jobs. The result will be a schedule with parallel processes.

Note: *Sometimes the optimization may result in schedules that are too complex for the scheduler. In these cases the optimization will be canceled and a new schedule without parallel pipetting will be calculated.*

Note: *If you enable **Parallel Reagent Pipetting** for Gel cards, make sure that the plate layout orientation is horizontal (e.g. width: 6 wells / height 1 well). With a vertical orientation the function does not work. For the layout definition, see [7.3.1 "Process Definitions"](#), [7-38](#).*

7.14 Process Templates

The PDE offers the possibility to save a process as a template and to create a new process from a template.

7.14.1 Creating a Template

To create a template, proceed as follows:

- 1 Create a new process.
Or Open an existing process.

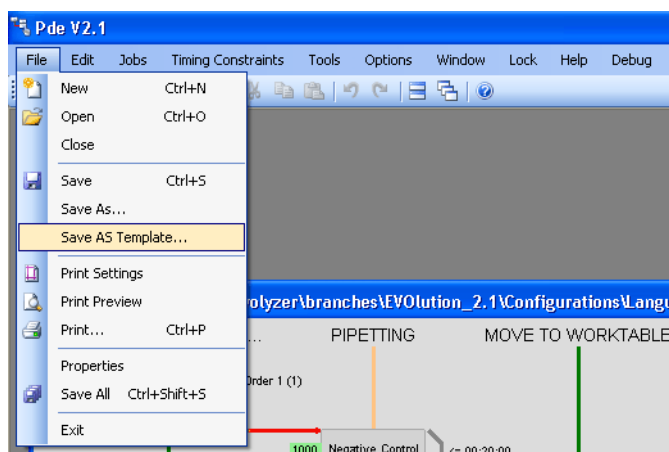


Fig. 7-104 Menu item File

- 2 From menu item **File**, select **Save As Template**.
- 3 Enter the template file name and save the template.
*The default directory for user templates is **../User Data/Process Templates**.*

7.14.2 Creating a Process From a Template

To create a process from a process template, proceed as follows:

- 1 From menu item **File**, select **New**.

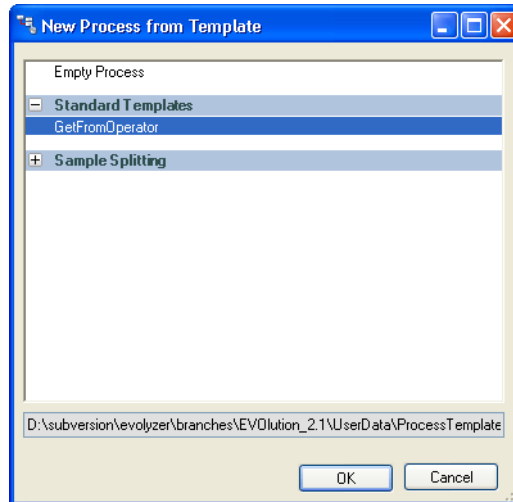


Fig. 7-105 New process from template dialog

- 2 Select a process template from the template list.
The new process from template dialog shows all templates stored in
 - **..\User Data\Process Templates** (user defined templates)
 - **..\Program\Xml\Process Templates** (system templates)
- 3 Click on **OK**; the standard process properties dialog opens.

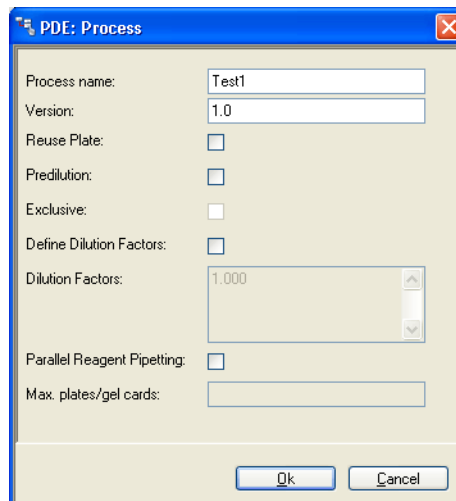


Fig. 7-106 New process dialog

- 4 Complete the dialog and click on **OK**.
A new process is created which contains the steps from the template.

7.15 Operating Sequence

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Create process from template	See section 7.14.2, 7-103
Predilution processes	See section 7.10, 7-67
Reuse plates	See section 7.11, 7-99
Define dilution factors	See section 7.12, 7-100
Parallel reagent pipetting	See section 7.13, 7-101
Explanation file MagellanDescription.xml	See section 14.1.3, 14-3

To create a new process in the process definition editor:

- 1 Start up by double-clicking the **Process definition editor** icon on the desktop.
Or click the **Pde.exe** entry in the Windows **Start - Programs** menu. The login dialog is displayed.



Fig. 7-107 Process Definition Editor icon

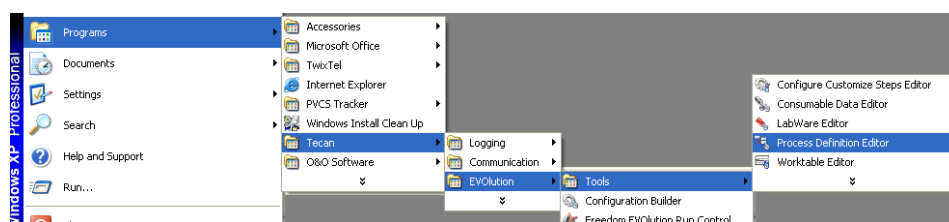


Fig. 7-108 Process Definition Editor in start menu

- 2 Type user name and password in the login dialog and click **Login**, to log in.
- 3 In the process definition editor file menu, click **File > New**.
- 4 In the **New Process from Template** dialog, select **Empty Process** and click on **Ok** to create a new process without any definitions.
Or Select one of the existing templates from the **New Process from Template** dialog and click on **Ok** to create a new process with the desired definitions.
Refer to cross references above.

5 The new process dialog appears:

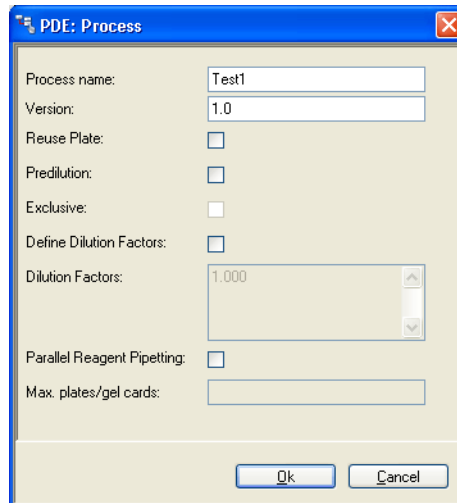


Fig. 7-109 New process dialog

6 Fill in the name and version of the new process and click on **Ok**. The process editing space turns a light gray.



ATTENTION

The process name you enter here must later also be used in the worklist creator (the corresponding Process Definition file can have a different name).

Note: Pay attention to the following: The **Process name** given here (i.e. not the file name) defines the process and will be referenced within the complete configuration. Therefore, this name must be unique.

Check box Predilution/Exclusive

The process can be defined as predilution process.
For information on predilution processes refer to cross references above.

Check box Reuse Plate

The process can be defined in such a way that microplates which have not been used up completely can be reused later.
For information on reuse of plates refer to cross references above.

**Well Function
Definitions**

Note: The layout for samples, controls and standards must be congruent with the layout defined in Magellan, otherwise the reading method will not work.

- 7 In the **Tools** menu, click the **Process Definitions- Layout Definitions** entry. The **Layout Definitions** dialog appears:

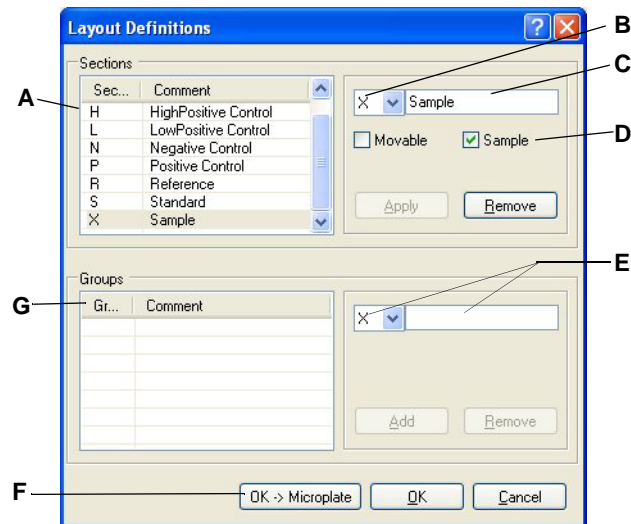


Fig. 7-110 Well function definition dialog

- | | |
|---|---|
| <p>A Well functions list</p> <p>B Field for new section letter, predefined by the file MagellanDescription.xml</p> <p>C Field for new comment (well function), predefined by the file MagellanDescription.xml, but can be modified here.</p> <p>D Movable: for the declaration of movable sections</p> | <p>E Fields for new group letter and comment</p> <p>F Button Microplate, click to open the Plate Layout dialog</p> <p>G Well groups list, for defining replicates, i.e. several occurrences of the same sample.</p> |
|---|---|

- 8 To define a well function, click the **Down arrow** on the right in the **Sections** screen zone and select a letter from the list, e.g. **X** for **Sample**. The letters are predefined by the file **MagellanDescription.xml**. Refer to cross references above.

*If possible, use standard letters, as e.g. **X** for **Sample** or **N** for **Negative Control**.*

- 9 Click the text field to the right of the list, to enter a comment for the new well function, e.g. **Standard**. The comments are predefined in the file **MagellanDescription.xml**, but can be modified here.
- 10 Click the **Apply** button underneath the list field, to add the new entry to the list of well functions. The new definition is added to the list.
- 11 Repeat steps 8 through 10 for each well function you want to define.
- 12 To define groups for replicates, click the **Down arrow** on the right in the **Groups** section and select a letter from the list
- 13 Click the text field to the right of the list and enter a comment for the replicate group.
- 14 Click the **Add** button underneath the list field, to add the new entry to the list of groups. The new definition is added to the list.
- 15 Repeat steps 12 through 14 for each group you want to define.

Groups Definitions

**Microplate
Layout**

- 16 Click the **Ok** button in the function and group definition dialog.
- 17 Click the **OK -> Microplate** button in the **Layout Definitions** dialog. The plate layout dialog is displayed.

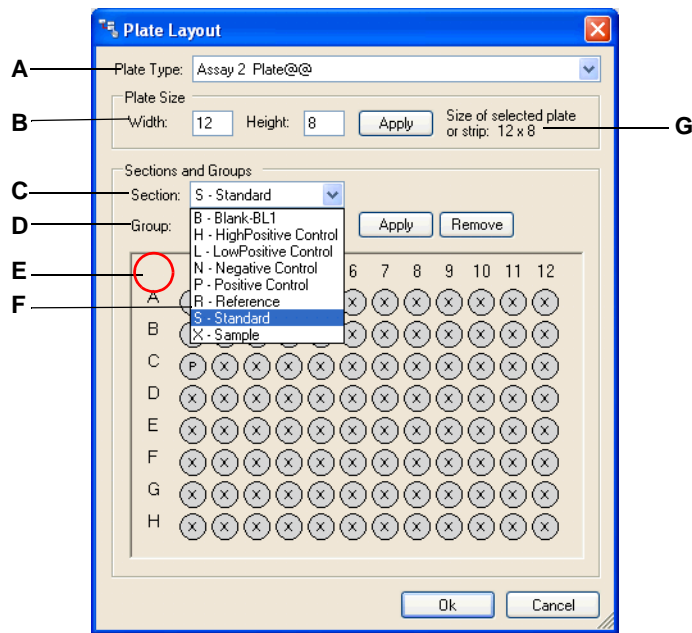


Fig. 7-111 Plate layout dialog

- | | |
|--|--|
| <p>A Plate type selection</p> <p>B Number of wells, in rows (Width) and columns (Height)</p> <p>C Section: defines the section a selected well belongs to, in accordance with the liquid contained in the</p> <p>D Groups: used to define replicates, i.e. several wells with the same sample liquid</p> <p>E Area to mark all wells (with mouse)</p> <p>F A1 .. H12: microplate wells</p> <p>G Information: size of selected plate well</p> | <p>D Groups: used to define replicates, i.e. several wells with the same sample liquid</p> <p>E Area to mark all wells (with mouse)</p> <p>F A1 .. H12: microplate wells</p> <p>G Information: size of selected plate well</p> |
|--|--|

Note: Click in the upper left corner (E) to mark all wells on the MP layout.

- 18 Specify the plate type and size by typing in the **Width** and **Height** fields.
- 19 Click the **Apply** button, to apply the specifications. A dialog pops up, warning you that changing the plate size deletes all previous plate data.



Fig. 7-112 Warning message

- 20 Click **Yes** in the dialog. The wells on the plate are represented graphically in the plate layout dialog.
- 21 In the matrix of wells, click the wells belonging to one and the same section or group, to select them. The selected wells are highlighted in green.

Tab. 7-1 Well Selection in the Function and Group Definition Dialog

To select/deselect:	Click on:	Effect:
Single wells	Single wells	The clicked well is selected. Selected wells are deselected. All other wells are not affected by the selection.
One whole row	The row letter	The selection state of the well in column 1 is toggled, and all wells in this row take on the same selection state as the well in column 1.
One whole column	The column number	The selection state of the well in row 1 is toggled, and all wells in this column take on the same selection state as the well in row 1.
All wells	Upper left corner (left of column 1 and above row A)	The selection state of well A1 is toggled, and all wells take on the same selection state as well A1.

- 22 In the **Sections and Groups** screen zone, click to select a section or group for the selected wells.
- 23 Click the **Apply** button, to confirm the assignment of a group or section to the selected wells.

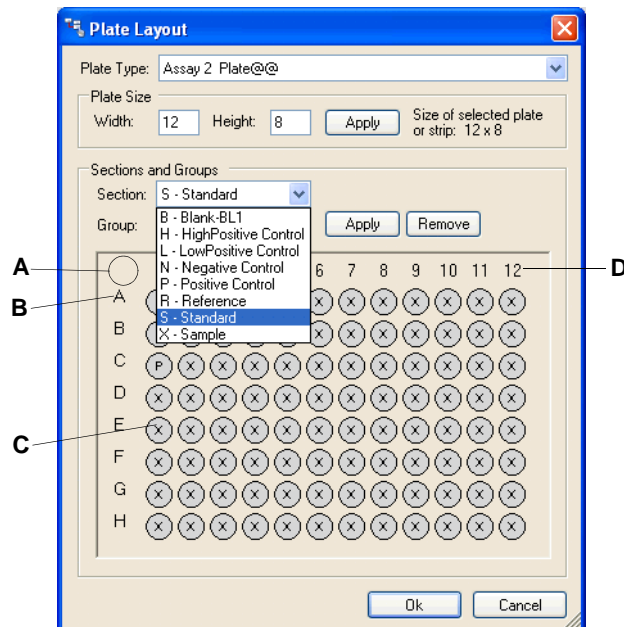


Fig. 7-113 Well function assignment

- A** Clickable space for the selection/deselection of all wells
- B** Row letters, clickable for the selection/deselection of entire rows
- C** Well, clickable for selection/deselection
- D** Column numbers, clickable for the selection/deselection of entire columns

**Job Creation,
Job Definition**

- 24 Repeat steps 21 through 23 for each group of wells to which you want to assign functions and groups.
- 25 Click **Ok** in the plate layout dialog.
The plate layout dialog is closed.
- 26 Right-click in the light gray space, to open the **context menu** and click **Insert**.
Or from the Jobs menu, click to select **Insert**.
- 27 In the appearing submenu, click to select the job you want to insert in the process.

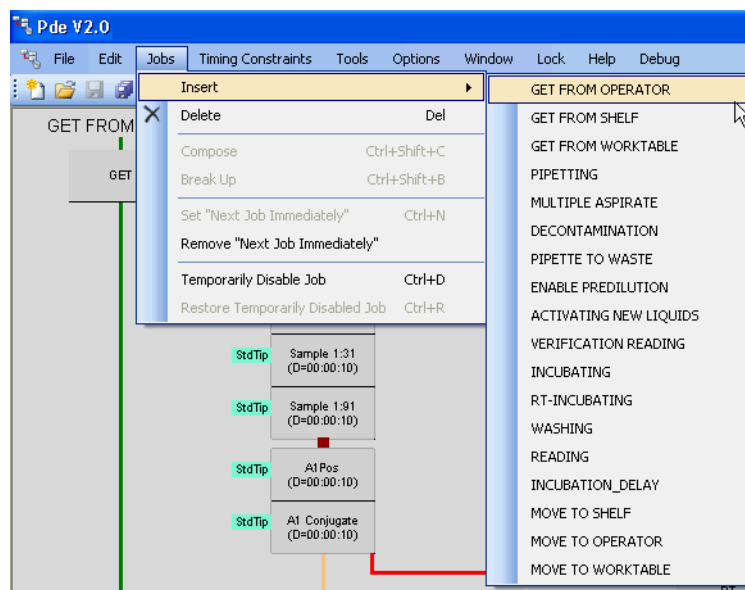


Fig. 7-114 Jobs > Insert menu and submenu

The corresponding step property screen is displayed, prompting you to enter the job name and details.

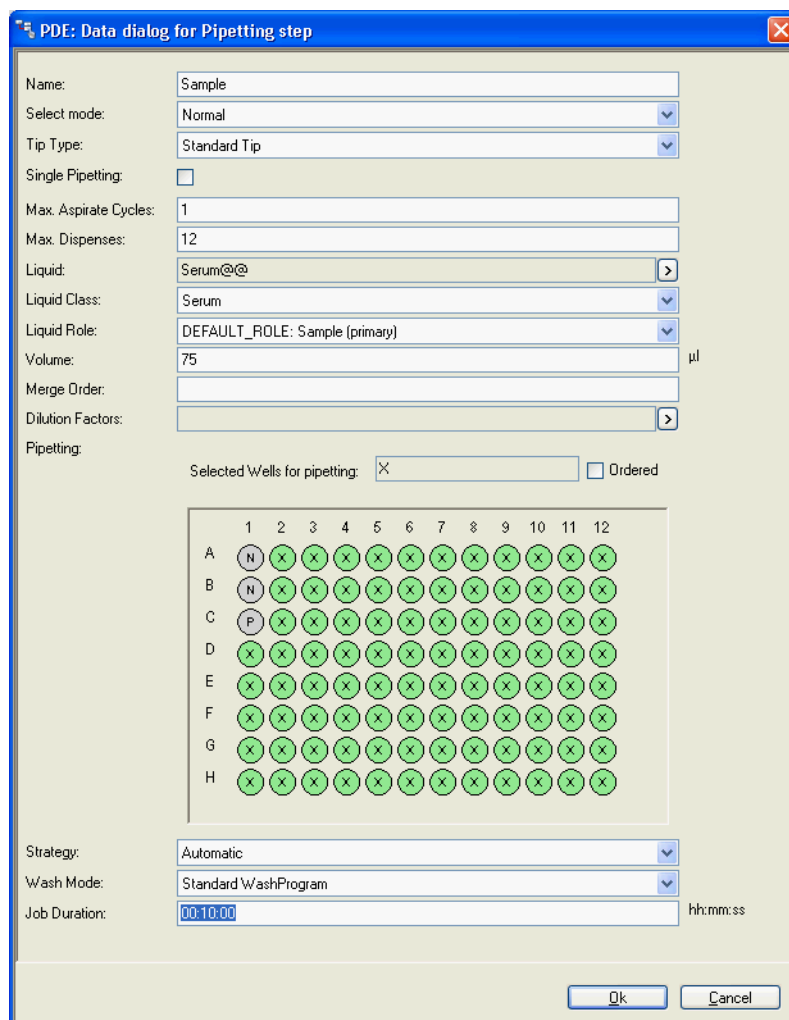


Fig. 7-115 Example job detail dialog

- 28 Fill in the job details as required and configure the job properties.
- 29 Repeat steps 26 through 28 for each job you want to insert in the new process.

Timing Constraints

Steps 30 through 33 deal with establishing timing constraints. If no timing constraints are needed, continue with step 34.

- 30 Click to select a job. The selected job symbol turns aquamarine.
Or press the **Ctrl** key and click several jobs, to select them together. The selected job symbols turn aquamarine.
- 31 Right-click on a job symbol, to open the context menu. In the context menu, click one of **Create Max./Min. Timing Constraint** to create a new timing constraint. The **Max.** or **Min. Timing Constraint dialog** opens.
Or in the **timing constraints** menu, click **Create Max./Min. Timing Constraint**, to create a new timing constraint. The **Max.** or **Min. Timing Constraint dialog** opens.

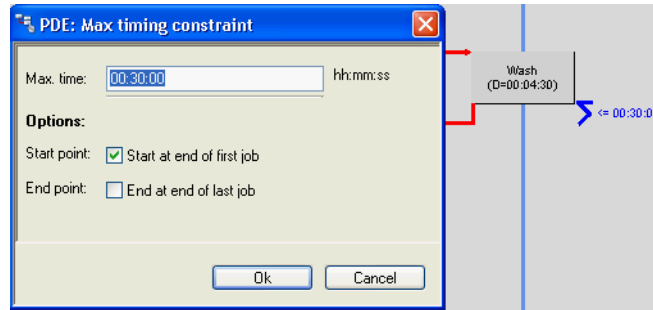


Fig. 7-116 Timing constraint property dialog

32 Enter the maximum or minimum duration for the timing constraint and click **Ok** in the dialog box. The job(s) for which the timing constraint is valid are marked with a bracket symbolizing the timing constraint.

Note: When defining timing constraints pay attention to the fact that the time specified here must include the RoMa actions.

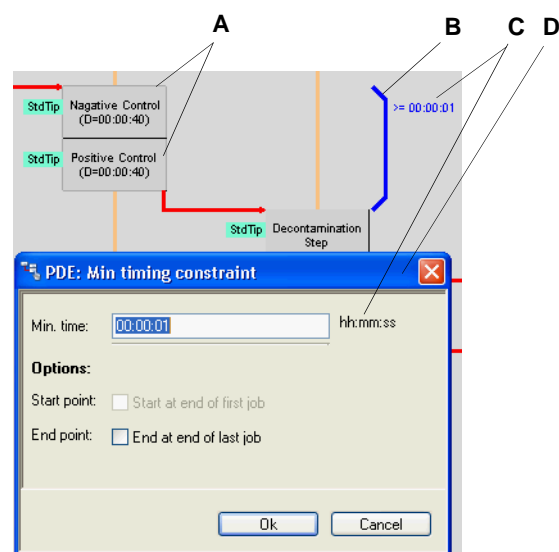


Fig. 7-117 Example timing constraint property screen

- A Job affected by the timing constraint
- B Selected bracket symbol for the timing constraint
- C Indication of timing constraint duration
- D Timing constraint definition dialog

33 Repeat steps 30 through 32 for each timing constraint you want to insert in the new process.

34 Click the **File** menu.

35 In the **File** menu, click the **Save** entry, to save the edited process in a file.

7.16 Menu Functions

7.16.1 Export/ Import (only with Freedom EVOLution 2.0.15 for Freedom EVOLyzer 2)

The export/ import function provides the exporting and packing of a process definition assay for importing.

The assay sets are exported as a single assay package file [*.assay]. An assay package contains:

- ◆ Consumables
- ◆ Labware
- ◆ Liquid classes
- ◆ Tip wash modes
- ◆ Reader methods
- ◆ Wash programs
- ◆ Wash plate definitions
- ◆ Predilution assays

Note: Assay packages do not contain profiles or instrument definitions for worktable loading. Assay packages do not contain assay combinations and series.

7.16.2 Export Assays

Exporting

- 1 Select the assays to be exported.
Multiple files can be exported at the same time.
- 2 Click the right mouse button and select **Export Processes** from the context menu.

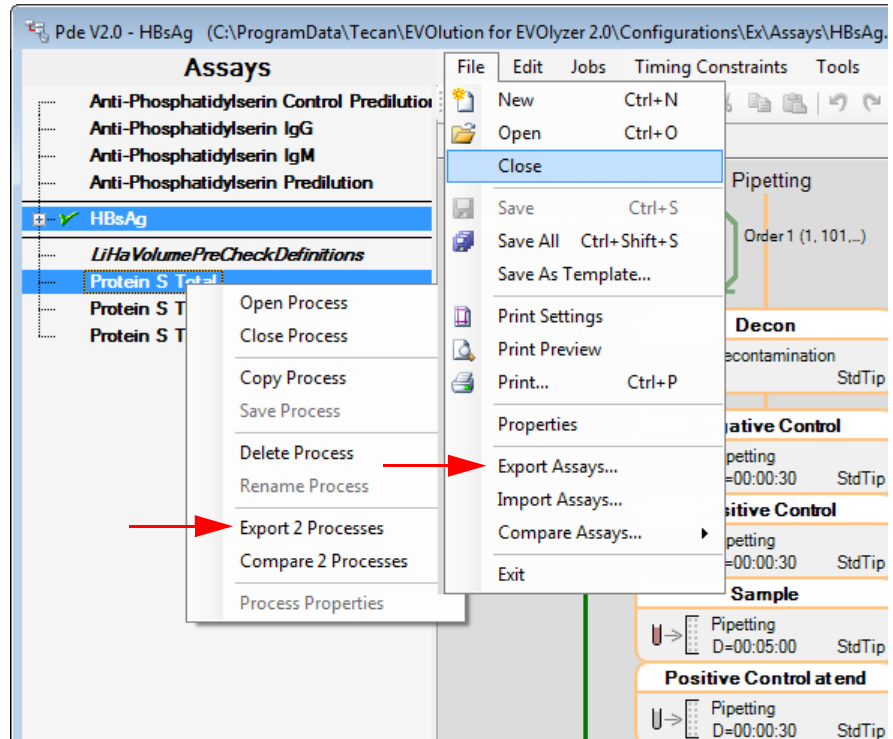


Fig. 7-118 Export processes

- 3 Save the assay package file [*.assay] to the appropriate directory.
Default directory: C:\ProgramData\Tecan\EVolution for EVolyzer 2.0\SessionData\AssayPackages

7.16.3 Import Assay

Importing

- 1 Click **Import Assays** from the drop down menu **File**.

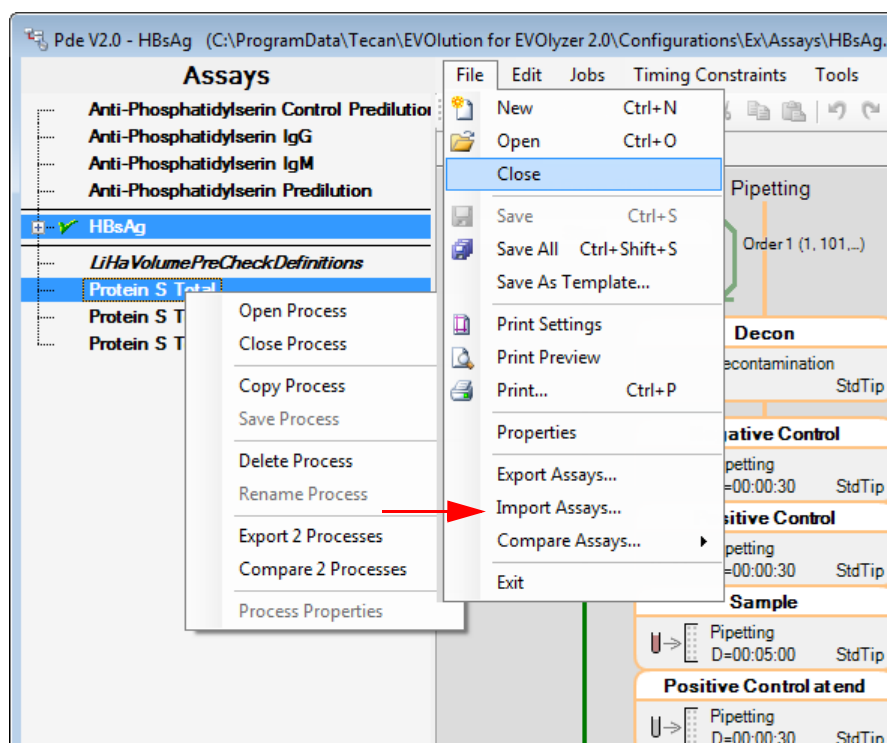


Fig. 7-119 Import processes

- 2 Select the appropriate assay package file to be imported.
By default all assays of the exported package are selected.

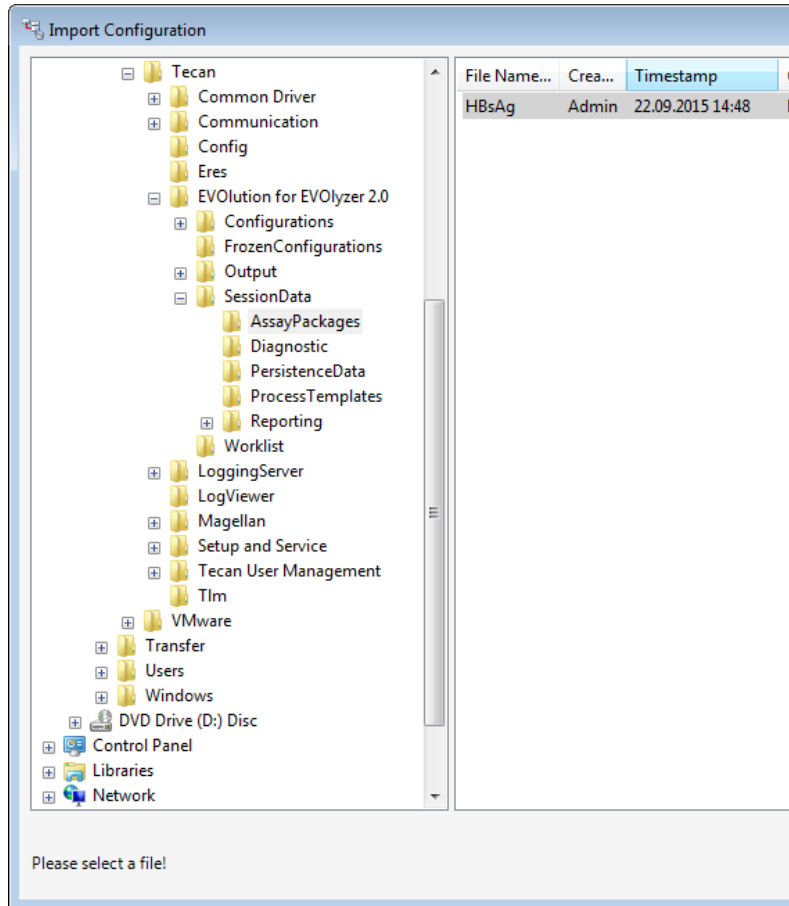


Fig. 7-120 Import configuration

- 3 Select the import variant option.
- 4 Select the assays to be imported.

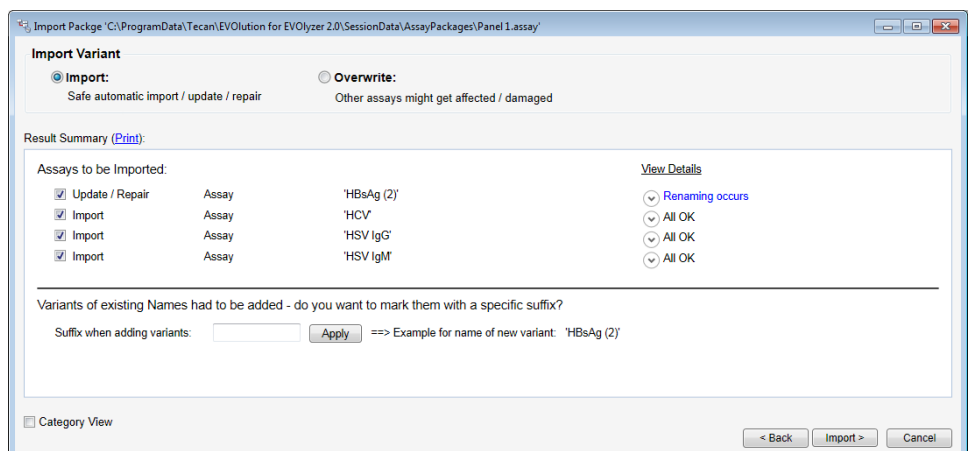


Fig. 7-121 Import package

Note: If a file with the same name already exists, **add variant** section is displayed in the dialog.

- Specify a suffix when adding variants. The same suffix will be used for all variants being added.

In case of same content the options **Skip**, **Replace** or **Add** are available.

- Skip** Selected content of the imported assay package is skipped and will not be available in the target configuration.
- Replace** Selected content of the imported assay package is overwritten in the target configuration and affected assays might change by selecting this option. Consider changes and differences before selecting **Replace**.
- Add** Selected content of the assay package is added to the target configuration with the suffix as defined in **add variant**. (Default: unique number).

This is the recommended option.

5 Click **Import**.

6 Click **Finish**.

The following procedure provides a brief overview of the workflow. Refer to the respective chapters for further information.

Note: Replacing elements can have an impact on existing assays in target configuration, which may need a revalidation.

7.17 Worklist

7.17.1 Definition

A worklist is a collection of one or more work requests stored in a file.
A worklist contains work requests as an association of a sample with one or more assays.

Formats The file extension **.xml** or **.twl** stored in the respective directory are interpreted as worklists.

7.17.2 XML Worklist Format

The Standard Worklist Format contains the following:

- ◆ Header
- ◆ Root Node
- ◆ Sample Request Node
- ◆ Assay Request Node

Header

```
<?xml version="1.0" encoding="utf-8"?>
```

Root Node

The root node follows immediately the header node. It contains 1 or more sample request nodes.

```
<worklist xmlns="worklist.xsd">
...
</worklist>
```

Sample Request Node

The sample request node is embedded in the root node. It contains 1 or more assay request nodes.

```
<request barcode="sample001">
...
</request>
```

Assay Request Node

The assay request node is embedded in the sample request node. It does not contain any other node.

```
<assay>Assay1</assay>
```

**Example
Worklist**

```
<?xml version="1.0" encoding="utf-8"?>
<worklist xmlns="worklist.xsd">
  <request barcode="sample001">
    <assay>Assay1</assay>
    <assay>Assay2</assay>
  </request>
  <request barcode="sample002">
    <assay>Assay3</assay>
    <assay>Assay2</assay>
    <assay>Assay2</assay>
  </request>
</worklist>
```

**Example
Worklist with
Dilution Factors**

```
<?xml version="1.0" encoding="Windows-1252"
standalone="no"?>
<worklist xmlns="worklist.xsd">
<request barcode="01-01">
<assayrequest>
<assay>Test A3</assay>
<dilutionfactor value="1.000"/>
</assayrequest>
</request>
<request barcode="01-02">
<assayrequest>
<assay>Test A3</assay>
<dilutionfactor value="1.000"/>
<dilutionfactor value="10.000"/>
</assayrequest>
</request>
</worklist>
```

**Example
Worklist with
Expiration date**

```
<?xml version="1.0" encoding="utf-8"?>
<worklist xmlns="worklist.xsd">
  <request barcode="sample01"
expirydate="633011071104656250">
    ...
  </request>
  ...
</worklist>
```

7.17.3 Result Output Formats

ProcessReport*.xml: See C:\Program Files (x86)\Tecan\EVOLution for
EVOLyzer 2.0\Program\Xml\Schemata

ASTM: See [14.2 "ASTM Interface"](#), [14-5](#).

*.TPL: See attachment.

8 Worktable Editor

Purpose of This Chapter

This chapter describes the Freedom EVOLution SW worktable editor and its functions.



Tecan.WorktableEditor
.exe

Fig. 8-1 Worktable Editor icon

8.1 Introduction

Purpose

The worktable editor is designed for specifying the instrument worktable layout, i.e. for describing which labware is placed at which position on the instrument worktable and for direct control of the instrument.

The labware used in the Worktable Editor comprises all the labware built in the Freedom EVOLution SW Labware Editor.

The main purpose in >2.0 is troubleshooting, simulation of instrument movements; hardware connection is possible (no collision avoidance!), so newly created labware can be checked and verified.



ATTENTION

Workflow incompatibility.

If the Worktable Editor is used to modify worktables that have originally been created with EVOLution studio, the changes will be lost when the worktable is reopened in EVOLution Studio.

- ◆ Do not reopen the worktable definitions in EVOLution Studio after modifying them with the Worktable Editor.

Note: The worktable editor uses individual **instances** of labware objects, i.e. the changes made to any labware object affect only the individual instance of an object.

The labware editor, on the other hand, is used to display and modify **types** of labware, i.e. the changes made to any labware object affect all occurrences or instances of this object, in the labware editor and in the worktable editor.

- For example, if in the labware editor you position a microplate onto a tray in a shelf, this modification will affect all trays of the same kind and these trays will all be carrying microplates. If, however, the microplate is positioned on a tray in the worktable editor, this change affects only the individual tray.

Worktable Layout

The worktable layout specification includes:

- ◆ The worktable size (number of grid positions)
- ◆ For all objects on the worktable:
 - Number
 - Object type
 - Worktable positions

- ◆ The definition of sections reserved for objects which:
 - Are added to the system at a later stage or
 - Are moved to new positions on the worktable
- ◆ The definition of sample sections (number of grid positions)

The resulting worktable layout is saved to a file (*.oba). This file is then used by the process definition editor and the configuration builder, which combines all definition files into one configuration file for the entire test.

Teaching

With the worktable editor, it is also possible:

- ◆ To verify the positions of carriers and labware
- ◆ To calibrate the x, y, and z-positions of the LiHa and the RoMa

Worktable

The worktable is the basic physical worktable where carriers with racks and containers are placed. Carriers placed on the instrument worktable have a fixed position (i.e. their position is the same in every possible application).

Screen Zones

The following figure shows the Worktable Editor screen:

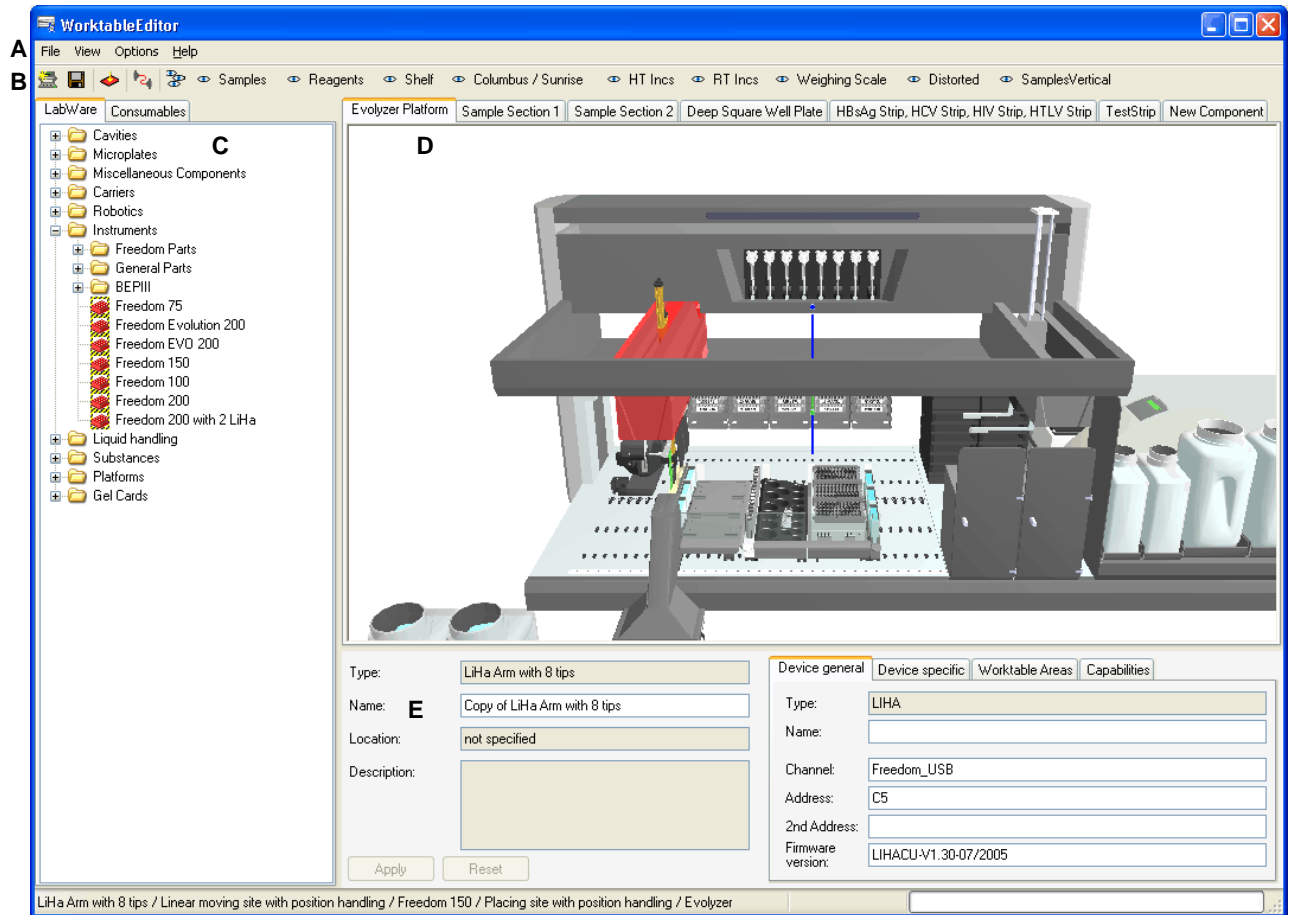


Fig. 8-2 Worktable Editor screen zones

- A** Menu bar
- B** Quick access buttons to functions and views
- C** Tree view for worktable design and worktable object selection, with tabs for labware and consumables
- D** Graphical worktable view, for worktable overview and selection
- E** Properties view, containing the properties of the selected part or worktable object, for modification or information

8.2 Worktable Editor Concepts

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Labware in the worktable editor	See Fig. 8-2 , Fig. 8-3 , C

8.2.1 Labware

Definition

Labware comprises all objects on the worktable, e.g. carriers and microplates. Devices as e.g. RoMa, LiHa, PosID, reader and incubator are also considered parts of the worktable. In the Freedom EVOLution SW, labware is defined in the labware editor and is then available for the worktable configuration in the worktable editor (see cross references above).



ATTENTION

Together with the software, a number of “fixed components” are delivered, e.g. the robotic manipulator arm (RoMa), or the PosID. They are, however in **frozen** state, i.e. they can not be modified.

8.2.2 Capabilities

The **Capabilities** list in the **Properties** section shows properties and capabilities that can be assigned to a selected component:

Properties:

Properties are attributes belonging to the selected components, e.g. **Reader**; **Sunrise**.

Capabilities

Capabilities denote the possible interactions of a component with another component or with the operator/supervisor, e.g.

- Moving; with RoMa,
- Barcode Reading; with PosID or
- MicroplateStorage;for all kinds of MP
- Interacting;with operator

Some capabilities are specific to a component, e.g.

- Incubation;42°C or
- Shaker; On

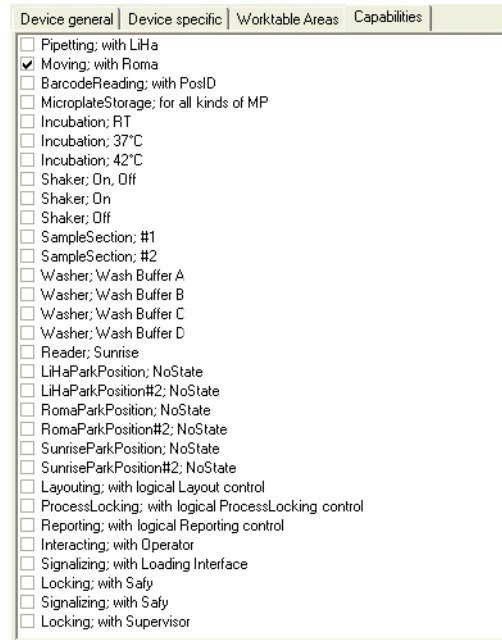


Fig. 8-3 Capabilities list

8.2.3 Consumables

Definition

The term *consumables* denotes all the items that are consumed during a process run, e.g.:

- ◆ Liquids that can be filled in the cavities (e.g. microplates, tubes etc.)
- ◆ Substances which always are contained in their specific cavities (e.g. positive and negative control)
- ◆ Objects placed on the worktable or on carriers, racks etc., like coated microplates
- ◆ Disposable tips, DiTis

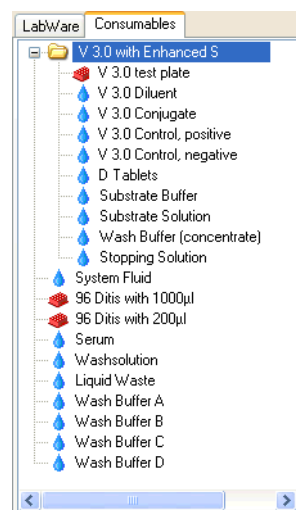


Fig. 8-4 Consumables tree view in the Worktable Editor

8.2.4 Worktable Areas

Definition

Worktable areas are locations above the worktable which a device (e.g. the Robotic manipulator arm, RoMa) occupies when moving (e.g. to the shelf), without danger of collisions. Such areas must be programmed for the devices which move more or less freely across and over the worktable, i.e. for:

- ◆ Robotic manipulator arm, RoMa
- ◆ Liquid handling arm, LiHa
- ◆ Positive Identification, PosID (areas calculated automatically)
- ◆ The operator (areas calculated automatically)

Purpose

The worktable areas are used for collision avoidance and control. The RoMa move paths are calculated by worktable areas.



ATTENTION

When setting up or modifying worktable areas, keep these areas as small as possible, i.e. large enough to prevent collisions, but small enough to keep throughput and process speed satisfactory.

Example

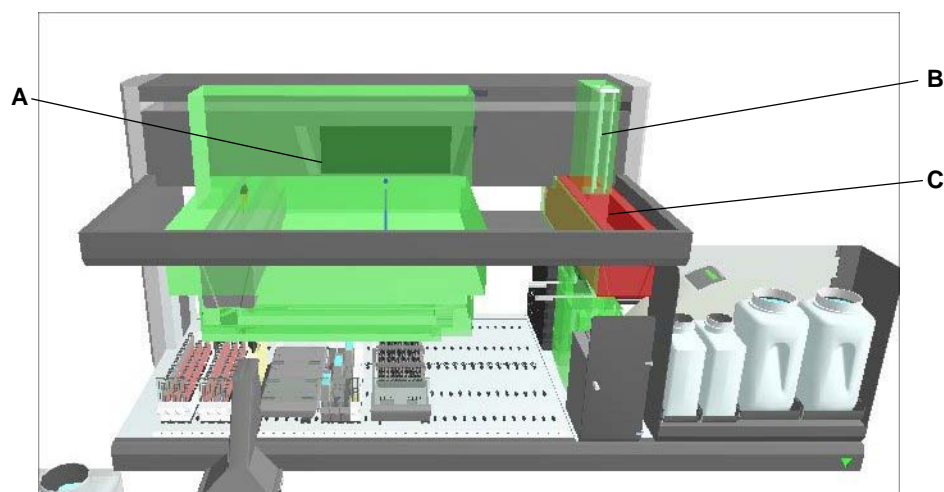


Fig. 8-5 Worktable areas, examples

A Green visualization of the worktable area used by the RoMa when accessing the shelves

B Green visualization of the worktable area used by the RoMa when accessing the RT incubator

C Selected device, i.e. RoMa, whose worktable areas are visualized

Features

Colors

The worktable areas are displayed in various colors, depending on their state:

- ♦ An area highlighted in **red** color has been selected by a mouse-click and is in selected state. Its properties are shown in the properties screen (lower right).
- ♦ Areas in **green** are areas which do not collide with other components.
- ♦ Areas in **yellow** show where the collision occurs.
- ♦ Areas in **orange** color are areas which collide with at least one component.
- ♦ Areas in **blue** are extensions from an area to a site group. They are created automatically when a new component with a site group (e.g. an incubator) is placed on the worktable and its area is adjusted.

Export, Import

Worktable areas can be exported by clicking the **Export** button in a component's **Properties - Worktable Areas** section. All areas of this device are then saved to an xml file, and can later be imported again (e.g. for a newly positioned device) by pressing the **Import** button.

8.2.5 Bridges

Bridges are auxiliary areas, which connect two areas (e.g. the RoMa's Park area with its Incubator area). Proper areas define the space a device occupies while interacting with another device. Bridges connect such areas and are themselves also areas.

Note: *The bridges are calculated automatically by specifying one end and the other end of the bridge.*

8.2.6 Extensions

Extensions are worktable areas which are occupied by a device when accessing single sites in an array of sites. E.g. by the LiHa when accessing a tube on a tube rack for pipetting, or by the RoMa when accessing a microplate in an incubator. Once the worktable area for the array of sites has been declared (e.g. the area for the tube rack, the microplate carrier or the incubator), the worktable sub-areas or extensions can be calculated and established automatically.

Note: *To generate the extensions, the topmost sites below the device must be grouped.*

Extensions are visualized in blue color.

8.3 Functionality

8.3.1 The Toolbar

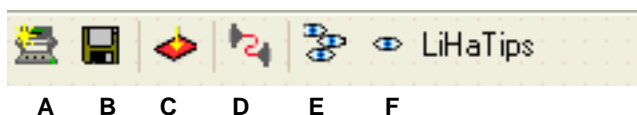


Fig. 8-6 Toolbar

- | | | | |
|----------|-----------------------|----------|----------------------------|
| A | Button New Worktable | D | Button Hardware Connection |
| B | Button Save Worktable | E | Button Manage perspective |
| C | Button Show sites | F | Specific saved perspective |

The worktable editor toolbar contains buttons for all functions contained also in the File, View, and Options menus.

8.3.2 The Menus

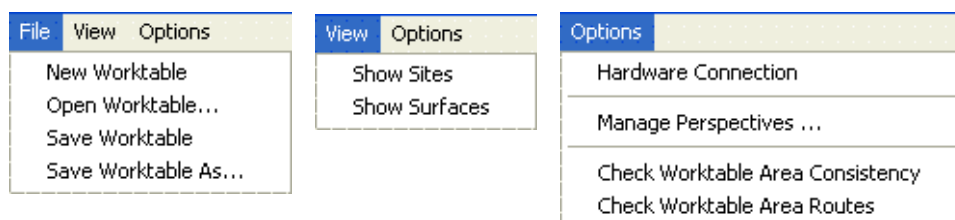


Fig. 8-7 Components menu and view menu

The **File** menu items allow for:

- ◆ the creation of new worktables
- ◆ loading a worktable
- ◆ the saving of a worktable
- ◆ the saving of a worktable under a new name

The **View** menu contains the functions:

- ◆ **Show Sites.** When this function is activated, the sites on a worktable or labware object are highlighted in red.
- ◆ **Show Surfaces.** When this function is activated, only the surfaces of worktable and labware are shown.

The **Options** menu contains the functions:

- ◆ **Hardware Connection.** When this function is activated, the computer running the worktable editor connects to the instrument it controls.

Note: *There is no collision avoidance implemented.*

- ◆ **Manage Perspectives.** Clicking this button allows you to save the current view (perspective) of the worktable and labware under a name and to load a perspective saved earlier. If a perspective is saved, it is displayed as new button in the toolbar and can be activated by clicking the button.

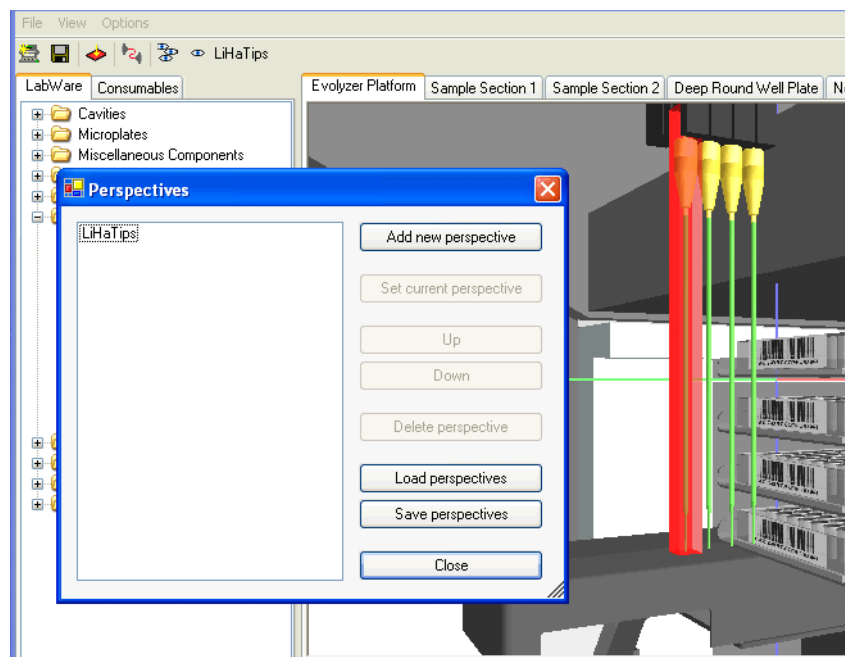



Fig. 8-8 Manage perspectives

- ◆ **Check Worktable Area Consistency.** This function checks if all worktable areas are consistent to each other and displays a corresponding message. In case of an inconsistency, the message displayed describes the inconsistency.
- ◆ **Check Worktable Area Routes.** This function checks the worktable area routes and displays a corresponding message. In case of an inconsistency, the message displayed describes the inconsistency.

8.3.3 Navigation in the Worktable Editor

Navigation in the Worktable Editor by means of keyboard and mouse is described in [6.3 "Navigation and Shortcuts"](#),  6-4.

8.3.4 The Labware View

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Description of drag and drop	See section “View Interactivity” , ¶ 9-26
Graphical view zone	See Fig. 8-2 , ¶ 8-3, D

Purpose

The labware view offers all possible labware objects contained in the labware archive which is defined as public. The objects are categorized in folders, in an hierarchical tree view. The tree contains also substances which are always set up in their own special cavities (e.g. positive and negative control). In this tree view, there is no context menu.

8.3.5 The Consumables View

The consumables view offers all possible consumable objects and substances contained in the consumables archive, categorized in folders, in an hierarchical tree view. In this tree view, there is no context menu.

8.3.6 Component Movement

Move Robotic Arm into a Worktable Area

To move a component to a certain area, the area can be right-clicked to open the context menu. When in the context menu the **Move** command (e.g. **Move RoMa** or **Move LiHa**) is selected, the component in question moves to this area.

Move Robotic Arm to a Target Component

If a robotic arm (e.g. the RoMa) is to be moved to a target component (e.g. a microplate), the target component can be right-clicked, and in the context menu the command **Move RoMa**, **Scan PosID** or **Move LiHa** can be selected. The robotic arm is then moved to the required position. Likewise, when a tube rack or carrier is selected, the context menu offers the option **Scan PosID**. After this option has been clicked, the PosID moves in position to scan the selected component (this feature is possible with PosID 2 only).

Move RoMa with Microplate

For such RoMa movements, appropriate RoMa worktable areas are needed, including the worktable area extensions.

To have the RoMa transport a microplate to a certain destination, first move it to the microplate with the **Move RoMa** command. Then select the target site to which the microplate must be moved. Right-click the target site, and from the context menu select **Bring RoMa**. The RoMa transports the microplate to the selected site.

Move Devices

When a robotic device is selected in the graphic component view, under the **Device Specific** tab a set of move tools is available. By clicking the appropriate arrow buttons, the device can be moved a corresponding distance in arrow direction. Instead of using the arrow buttons, values for the device specific

coordinates can be entered in the corresponding fields. Then, when the **Set values** button is clicked, the device moves to the location specified.



ATTENTION

The coordinate values entered under the **Device Specific** tab are checked for plausibility. So, when a coordinate outside the range of a device is specified, it is changed to the nearest valid value. When invalid characters are entered, an error message is displayed.

8.3.7 Worktable Area and Collision Visualization

Visualization of Worktable Areas

In a preconfigured worktable, the areas are also preconfigured. When the worktable is changed, the worktable areas must also be adapted.

To visualize the worktable area occupied by a certain component, proceed as follows:

- 1 In the graphical component view, click the component to select it. The selected component appears highlighted in red.
- 2 In the component's properties section (screen lower right), click the **Worktable Areas** tab. The list of worktable areas for the selected component is displayed.
- 3 In the list of worktable areas, click the check box to the left of the area you are going to visualize. The worktable area is visualized in green color in the graphic view.

It is possible to click several check boxes in the areas list, to visualize several areas at a time.

Note: To move a component to a certain area, the area can be right-clicked to open the context menu. When in the context menu the **Move** command (e.g. **Move RoMa** or **Move LiHa**) is selected, the component in question moves to this area.

Prerequisite: The component must be in an area before the action is started.

Note: Double-clicking on a worktable area selects the component the worktable area belongs to.

Hide Worktable Area

- 4 To hide a worktable area in the graphic component view, right-click the area. It is displayed highlighted in red color, its properties are shown in the **Properties** section, and the context menu opens.
- 5 In the context menu, select **Hide Worktable Area**. The area is no longer shown in the graphic component view, and the **Properties** section is empty.
Or use the **Worktable Areas** property page of the device in question and click the check box to uncheck the worktable area shown.

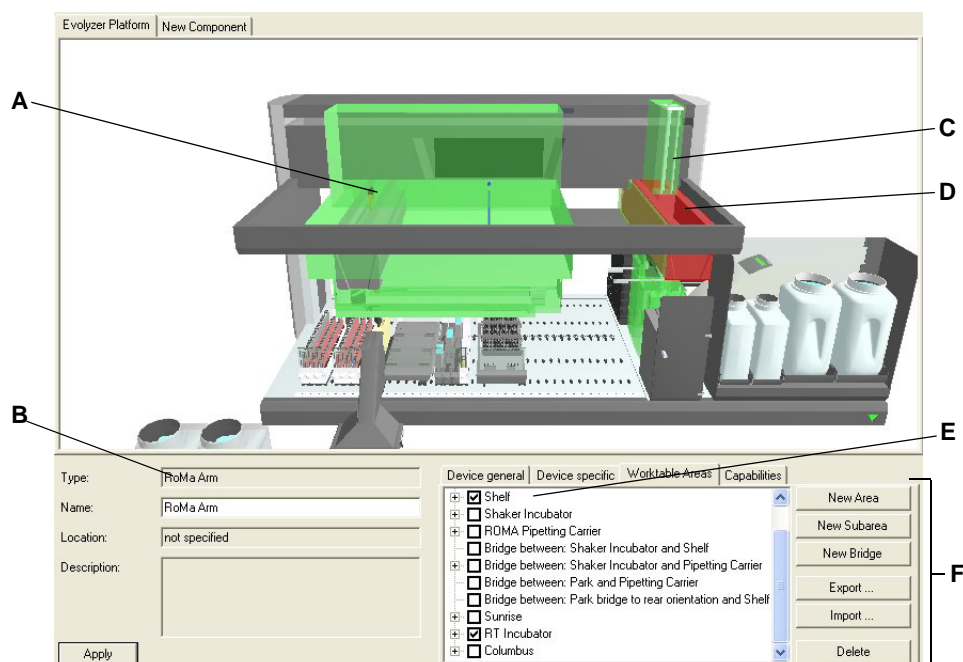


Fig. 8-9 Worktable areas, examples

- | | |
|--|--|
| <p>A Green visualization of the worktable area used by the RoMa when accessing the shelves</p> <p>B Data field showing the selected component's name, type and location</p> <p>C Green visualization of the worktable area used by the RoMa when accessing the RT incubator</p> | <p>D Selected device, i.e. RoMa, whose worktable areas are visualized</p> <p>E List of possible worktable areas for the selected component</p> <p>F Buttons for the management of worktable areas</p> |
|--|--|

Note: In the tab **Worktable Areas**, extensions are marked with => next to the check box.

Collision Visualization

To visualize possible collisions between the worktable areas of two competing devices, proceed as follows:

- 1 In the graphical component view, click a device to select it. The selected device appears in red.
- 2 In the **Properties** section, click the **Worktable Areas** tab. The list of worktable areas for the selected device is displayed.
- 3 In the list of worktable areas, click to select a worktable area or sub area. The selected area appears highlighted in green or blue color, in the graphic component view.
- 4 In the graphic component view, click the worktable area to select it. The worktable area appears in red, and possible overlappings with the areas of a competing device appear in yellow. In the **Properties** view, the area coordinates are displayed. On the left-hand side the area name, the component involved and the field for possible collisions are shown.
- 5 In the **Properties** section, click the Update button. The screen is updated, and possible collisions are shown by a red **Collisions** text field. In the graphic component view, the collisions are also highlighted in red.

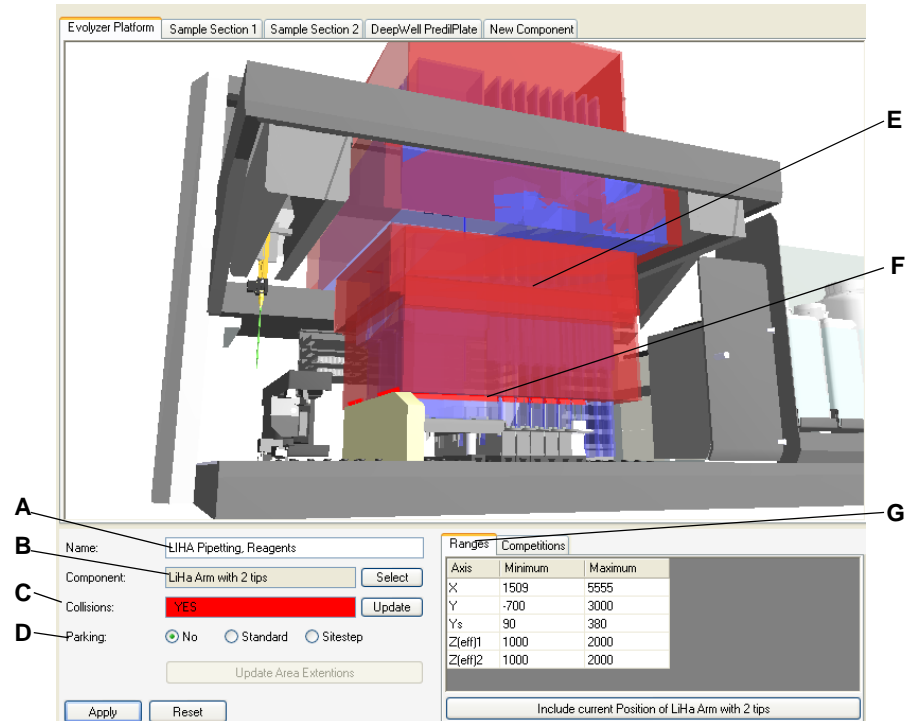


Fig. 8-10 Collision visualization

- | | | | |
|----------|---------------------------------------|----------|---------------------------|
| A | Worktable area name | D | Parking options |
| B | Involved component occupying the area | E | Selected worktable area |
| C | Collision indicator field | F | Current collisions |
| | | G | Worktable area properties |

6 To conclude, right-click the worktable area and, from the context menu select **Hide Area**, to hide the area.

To visualize possible collisions between the worktable areas of two components, proceed as follows:

- 1** In the graphical component view, click the first device to select it. The selected device appears in red.
- 2** In the component's properties section (screen lower right), click the **Worktable Areas** tab. The list of worktable areas for the selected component is displayed.
- 3** In the list of worktable areas, click the check box(es) to the left of the area(s) you are going to visualize. The worktable area(s) are visualized in green, blue or orange color in the graphic view.
- 4** Repeat steps **1** to **3** of this procedure for a second component. All selected areas are now visualized in green, blue or orange color and possibly overlapping.
- 5** In the graphic component view, click one of the worktable areas shown, to select it. The worktable area appears in red, and possible overlappings with other areas appear in yellow.

- 6 In the properties section (screen lower left), click the **Competitions** tab. A list of the worktable areas occupied by the second device is displayed. The areas which are simultaneously occupied by both components (collisions) are marked with a check in the check box to the left of the area name.

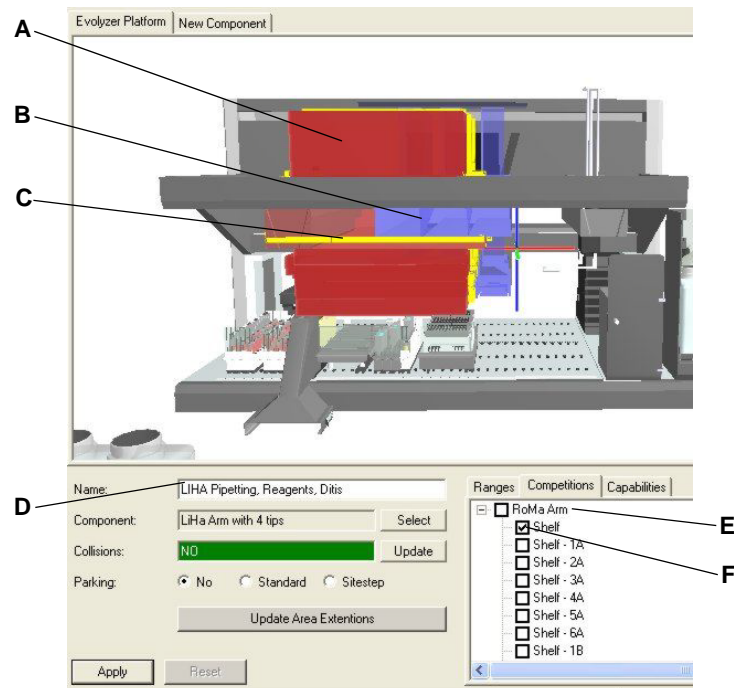


Fig. 8-11 Collision visualization

- A** Selected visualization (red) of the worktable area occupied by the LiHa when pipetting
- B** Visualization (blue) of the worktable areas occupied by the RoMa when accessing shelves
- C** Competing areas (yellow)
- D** Selected device, i.e. LiHa
- E** List of worktable areas for the second component (RoMa)
- F** RoMa worktable areas colliding with LiHa areas, marked with a check

8.4 Component Properties

This section describes for each device its properties under each tab in the **Properties** section (lower right screen zone).

Tab Device General

The tab **Device general** contains the following general component information for each component, when it is selected:

Type

Contains the device type, e.g. RoMa, PosID, RT Incubator or Sunrise.

Name

Contains a user-definable name for the device. The **Name** field can be empty, if only one type exists.

Channel

Sets the communication channel for the communication server.

Address

Device hardware address.

2nd Address

Second device hardware address, if applicable.

Firmware version

The device firmware version.

Note: Each **Type - Name** combination and each **Channel Address - 2nd Address** combination must be unique for the worktable definition.

Tab Simulation

This tab contains the field where you can control the automatic generation of barcodes for new or copied components during a simulation run.

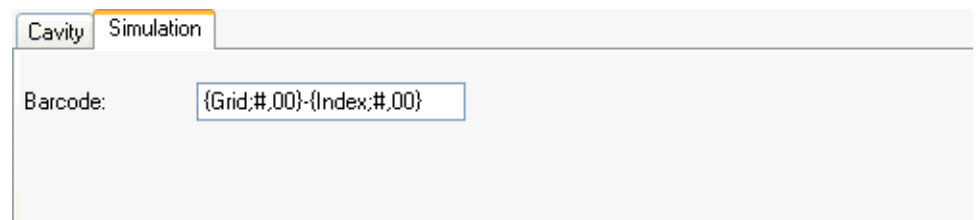


Fig. 8-12 Barcode Generation for Simulations

For example, if during the simulation of an assay the user is prompted to load samples, he drags and drops a copy of a sample carrier to the worktable in the Worktable Simulator. When he creates the copy, the new sample carrier is automatically given a new barcode. For proper working of the simulation, it is essential that such barcodes are unique.

The software displays a Simulation Tab for the following labware:

- ◆ Carriers
- ◆ Consumables
- ◆ Microplates
- ◆ Racks
- ◆ Tubes.

Barcode Generation

In the Barcode field, the user can enter his template for the creation of new barcodes, for example:

{CarrierID}/{Grid;#,00}0000

{..}

A pair of curly brackets encloses each macro with its formatting instructions, for example the carrier id or the grid number.

Carrier ID, Grid

In the first place within the brackets stands the macro. The following macros are available:

- {Grid}: the number of the grid where the carrier stands
- {Index}: the index of the place in/on a carrier
- {CarrierID}: the three digits before the slash (/) in a carrier barcode
- {Port}: the number of a loading port or RT incubator
- {Slot}: the slot number in a loading port or RT incubator
- {Shelf}: the place in a shelf.

Choose a macro depending on the place where a carrier will be when it appears for the first time in the simulator. For example, if a plate first appears in a shelf, use the {Shelf} macro.

Formatting the Barcodes

The macros can be used in the form listed above. However, if necessary, they can be used with formatting instructions, for example:

{Grid;#,00}0000

Tab. 8-1 Formatting commands for barcodes

Instruction	Purpose
;	separator between macro and formatting instructions
#	instruction to represent the grid number as a number, that is in number format
00	represent the grid number as a two-digit number, possibly with a visible leading zero
,	separator between formatting instructions
0000	expressions outside the curly brackets will be reproduced in the barcode as constants, without modification.
***	If the reagent containers are defined as having no barcode, you must enter the string "***" in the barcode field. The software interprets this string as "no barcode available".

The formatting instructions serve mainly the purpose, to keep a certain number of digits. With the possibility of formatting the barcodes, complex barcode formats can be generated, agreeing with the definitions in the BarcodeFormatEditor.

The number of digits for {CarrierID} and {Shelf} is fixed, so there will be no need for formatting instructions.

8.4.1 Robotic Manipulator Arm, RoMa

Tab Device Specific	<p>The Device Specific tab contains the tools to move the RoMa along each of its axes, as well as the Command field, where a command can be typed and sent to the device by clicking the Send Cmd button. The command is then executed, and the answer is displayed in the Answer field.</p>
Tab Worktable Areas	<p>The robotic manipulator arm RoMa has typically got the following worktable areas (example):</p> <ul style="list-style-type: none"> ◆ ROMA Park <ul style="list-style-type: none"> – with: Park bridge to rear orientation <ul style="list-style-type: none"> • with: Park rear orientation ◆ ROMA Park2 ◆ Shelf <ul style="list-style-type: none"> – with areas 1A through 6A, for shelf row 1 – with areas 1B through 6B, for shelf row 2 – with areas 1C through 6C, for shelf row 3 – with areas 1D through 6D, for shelf row 4 ◆ Shaker Incubator <ul style="list-style-type: none"> – with areas 1 through 6 for the slots ◆ ROMA Pipetting Carrier <ul style="list-style-type: none"> – with area near the site for rear location on carrier – with area near the site for middle location on carrier – with area near the site for front location on carrier ◆ Bridge between: Shaker Incubator and Shelf ◆ Bridge between: Shaker Incubator and Pipetting Carrier <ul style="list-style-type: none"> – with Connection to pipetting Area ◆ Bridge between: Park and Pipetting Carrier ◆ Bridge between: Park bridge to rear orientation and Shelf ◆ Sunrise <ul style="list-style-type: none"> – with area for Reader site #1 ◆ RT Incubator <ul style="list-style-type: none"> – with area Turn to bridges – with areas 1 through 6 for the slots ◆ Columbus <ul style="list-style-type: none"> – with area for Y Shift <ul style="list-style-type: none"> • with area for Turn – with area for Washer site #1
Tab Capabilities	<p>The RoMa has got the capability:</p> <ul style="list-style-type: none"> ◆ Moving with RoMa. <p>Capability: Moving with RoMa</p> <p>The following components must have the capability Moving with RoMa:</p> <ul style="list-style-type: none"> ◆ The microplate sites on carriers ◆ The sites in incubators ◆ The microplate site on the reader tray ◆ The site in the washer tray ◆ The sites in the shelf

Note: As a principle, all sites where a microplate will be placed have the capability **Moving with RoMa**. The capability can be de-activated for some sites, e.g. for performance reasons.

8.4.2 Liquid Handling Arm, LiHa

The Freedom EVOLution SW, during each run, automatically calculates the optimal Z-travel for all Liquid Handling Arm movements, for all pipetting sequences (dynamic Z-travel). For this, no user intervention or action is required. Jobs not involving pipetting sequences use a default travel height.

Tab Device Specific

The **Device Specific** tab contains the tools to move the LiHa or each of its tips along each of its axes, as well as the Command field, where a command can be typed and sent to the device by clicking the **Send Cmd** button. The command is then executed, and the answer is displayed in the **Answer** field.

Tab Worktable Areas

The liquid handling arm typically has the following worktable areas:

- ◆ LIHA Park
- ◆ LIHA Park2
- ◆ LIHA Sample and Washstation
 - PosID avoidance
 - Connection to Park
 - with Vertical Part of Connection
 - Connection to Park2
 - Wash Station
 - Grid 1 through Grid 8
 - LiHa Pipetting, Reagents, DiTis
 - Diti Pick 200: occupied while picking up DiTis from the DiTi Rack
 - Pipetting: occupied while pipetting above carrier, troughs
 - Diti Waste: occupied while throwing off the DiTis
 - Rear Location: occupied while pipetting above carrier
 - Middle Location: occupied while pipetting above carrier
 - Front Location: occupied while pipetting above carrier
 - Grid 17: occupied while pipetting above trough
 - Grid 18: occupied while pipetting above trough
 - Grid 19: occupied while pipetting above trough

Tab Capabilities

The liquid handling arm has the capability:

- ◆ Pipetting; with LiHa

Capability: Pipetting with LiHA

The following components must have the capability Pipetting with LiHa:

- ◆ the liquid handling arm, LiHa
- ◆ the microplate sites on carriers

Note: Tubes and troughs do not need this capability, its presence is self-evident for the system, because these containers are filled with consumables.

8.4.3 Positive Identification, PosID

Tab Device Specific	Under this tab, the Create Worktable area button is available, as well as the Command field, where a command can be typed and sent to the device by clicking the Send Cmd button. The command is then executed, and the answer is displayed in the Answer field.
Tab Worktable Areas	<p>The PosID has typically the following worktable areas, all occupied by the PosID when scanning racks and carriers:</p> <ul style="list-style-type: none"> ◆ PosID Sample Section 1 (Grids e.g. 1 through 4) <ul style="list-style-type: none"> – Grid 1: Strip Rack 16 mm with Face Plate – Grid 1: Strip Rack 13 mm with Face Plate – Grid 1: Strip Rack 10 mm with Face Plate – Grid 2: Strip Rack 16 mm with Face Plate – Grid 2: Strip Rack 13 mm with Face Plate – Grid 2: Strip Rack 10 mm with Face Plate – Grid 3: Strip Rack 16 mm with Face Plate – Grid 3: Strip Rack 13 mm with Face Plate – Grid 3: Strip Rack 10 mm with Face Plate – Grid 4: Strip Rack 16 mm with Face Plate – Grid 4: Strip Rack 13 mm with Face Plate – Grid 4: Strip Rack 10 mm with Face Plate ◆ PosID Sample Section 2 (Grids e.g. 5 through 8) <ul style="list-style-type: none"> – Grid entries analogous to Sample Section 1, for grids 5 through 8 ◆ PosID Grid 9 ◆ PosID Grid 11 <ul style="list-style-type: none"> – Grid 11, Carrier for 3 landscape microplates, with Face Plate ◆ PosID Reagent Section 1 (Grids e.g. 17 through 19) ◆ Grid 17, Trough Rack with Face Plate ◆ Grid 18, Trough Rack with Face Plate, #2 ◆ Grid 19, Trough Rack with Face Plate, #3 ◆ PosID Reagent Section 2 (Grid e.g. 20) ◆ PosID Grid 22
Tab Capabilities	<p>The PosID has the capability:</p> <ul style="list-style-type: none"> ◆ BarcodeReading; with PosID. <p>Capability BarcodeReading; with PosID</p> <p>The device PosID has the capability BarcodeReading; with PosID.</p>

8.4.4 RT Incubator

Tab Capabilities

The RT incubator has no capabilities of its own.
The sites in the RT incubator have the capabilities:

- ◆ Moving; with RoMa
- ◆ Incubation; RT.

The RT incubator sites must be grouped by selecting them and using the context menu command **Group Sites**.

8.4.5 Heated Incubator / Shaker

Tab Capabilities

The heated incubator/shaker has no capabilities of its own.
The sites in the heated incubator/shaker have the capabilities:

- ◆ Moving; with RoMa
- ◆ Incubation; 37 °C
- ◆ Incubation; 40 °C
- ◆ Incubation; 42 °C
- ◆ Shaker; On
- ◆ Shaker; Off

Note: Only one out of the three incubation capabilities is possible at a time. The same applies to the shaker capabilities.

The heated incubator/shaker sites must be grouped by selecting them and using the context menu command **Group Sites**.

8.4.6 Sunrise

Tab Device Specific

Under the tab Device Specific, for the Sunrise reader, two buttons are accessible. They serve to trigger the movement of the Sunrise microplate tray, however, only for the worktable software model, not for the physically present Sunrise reader.

Button Tray Out

Opens the Sunrise left upper flap and moves the Sunrise microplate tray out, into position to receive a microplate.

Button Tray In

Moves the Sunrise microplate tray in, into position to read a microplate and closes the Sunrise left upper flap.

Note: *When a microplate is in the tray (connected), then after opening the reader its position is in the front left corner, as it is in the physical hardware.*

Tab Worktable Areas

The Sunrise reader has the following worktable areas:

- ◆ Park Standard
Worktable area occupied by the Sunrise reader when it is in Park position.
- ◆ Park Sidestep
Worktable area occupied by the Sunrise reader when it is in Park sidestep position.
- ◆ Tray moving
Worktable area occupied by the Sunrise reader when its tray is moving in or out.
- ◆ Tray outstanding
Worktable area occupied by the Sunrise reader when its tray is out.

Tab Capabilities

The Sunrise reader has no capabilities of its own.

Sunrise Reader Tray

The Sunrise reader tray has the capabilities:

- ◆ Reader; Sunrise
- ◆ Moving; with RoMa

8.4.7 Columbus

Tab Device Specific

Under the **Device Specific** tab, the following buttons are accessible. They serve to trigger the movement of the Columbus microplate tray and Columbus tips, however, only for the worktable software model, not for the physically present Columbus device.

Button Start Rinse

Pressing this button starts the rinse of the selected channels.

Button Start Prime

Pressing this button starts the prime of the selected channels.

Button Start Washing

Pressing this button starts the washing of the selected channels.

Button Stop

Pressing this button stops the current action.

Button Switch Off

Pressing this button switches off the Columbus washer. The Columbus tray is released and moves a short distance in.

Tab Worktable Areas

There are no worktable areas for the Columbus washer.

Tab Capabilities

The Columbus washer has no capabilities of its own.

8.4.8 Washer Fluid Weighing Machine

Tab Device Specific

This screen contains the **Command** field, where a command can be typed and sent to the device by clicking the **Send Cmd** button. The command is then executed, and the answer is displayed in the **Answer** field.

Tab Capabilities

The Weighing Machine has no capabilities that need to be declared here.

8.4.9 Washer Fluid Bottle

Tab Capabilities

The Washer Fluid Bottle has no capabilities that need to be declared here.

Tab Wash Channel

Under this tab there is one data field, where the wash channel for the fluid bottle (small or large) have to be specified.

Note: *It is not allowed to have the same wash liquid type in a large and a small bottle simultaneously, i.e. it is allowed to use the same wash fluid in either the two small or in the two large bottles, but not in mixed bottle sizes.*

8.5 Sending Commands to the Hardware

General

To send commands to a device, proceed as follows:

- 1 Open the Worktable Editor.
- 2 Make sure that the Tecan Communication Server is running.
- 3 Load a worktable.
- 4 Click the menu **Options - Hardware Connection**, to activate the hardware connection.
- 5 In the graphical component view, click e.g. the RoMa, to select it. The RoMa appears highlighted in red color.
- 6 In the **Properties** section, click the **Device specific** tab. The device specific section opens.

Reading Firmware Version

- 7 In the **Device Specific** section, in the **Cmd** field, type **RFV** as command.
- 8 In the **Device Specific** section, click the **Send Cmd** button. The command is sent to the instrument.

*In the **Answer** field, the firmware version information of the RoMa is displayed.*

Initializing

To initialize the arms, proceed as follows:

Pay attention to the general information on sending commands given above.



ATTENTION

Damage to the instrument, if the arms are initialized incorrectly.

- ♦ Strictly follow the instructions given here when initializing the LiHa and the RoMa.
- ♦ Do not initialize the RoMa alone.

- 1 Double-click on the LiHa to select it.
Selected device changes color to red.

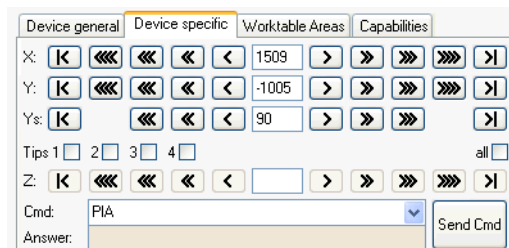


Fig. 8-13 Device specific tab

- 2 In the **Device specific** tab, enter **PIA** (in capital letters) in the **Cmd** line and click on **Send Cmd**.
The LiHa is initialized.

- 3 Send the command **BMX2** to the LiHa.
The power of the X-axis is switched off.
- 4 Check if the LiHa can be manually moved in X-direction.
- 5 Move the RoMa manually to a position where it can move freely in all axes.
- 6 Double-click on the RoMa to select it.
- 7 In the **Device specific** tab, send **PIA** to initialize the RoMa.
- 8 Double-click on the LiHa to select it.
- 9 In the **Device specific** tab, send **PIX** to reinitialize the LiHa X-motor.

Moving a Device

To move a device with single commands, proceed as follows:

- 1 Initialize the device as described above.
- 2 Use the controls in the **Device specific** tab to move the device.
The device moves according to the control buttons clicked. Its movement is also visible in the graphic component view.
Or Enter coordinate values in the corresponding data fields and click the **Set values** button. The device moves according to values entered. Its movement is also visible in the graphic component view.

9 Labware Editor

Purpose of This Chapter

This chapter describes the Freedom EVolution SW labware editor and its functions.



Fig. 9-1 Labware Editor icon

9.1 Introduction

Purpose

The labware editor enables the user to define the functions and geometric properties of all objects on the worktable, also including the possible interactions between them. E.g. it describes the carriers and microplates, and also the way in which a microplate can be placed onto a carrier. It is, however, restricted to descriptions of fixed, connected components.

Note: The labware editor is used to display and modify **types** of labware, i.e. the changes made to any labware object affect all occurrences or instances of this object, in the labware editor and in the worktable editor.

The worktable editor, on the other hand, is used to put up a worktable with all the objects required and uses individual **instances** of labware objects.

- For example, if in the labware editor you position a microplate onto a tray in a shelf, this modification will affect all trays of the same kind and these trays will all be carrying microplates. If, however, the microplate is positioned on a tray in the worktable editor, this change affects only the individual tray.

Devices as e.g. RoMa, LiHa, PosID, reader and incubator are also considered parts of the worktable and are thus also defined in the labware editor.

The resulting labware definition is saved to a file.

After installation, the Labware editor already contains the most frequently used labware components, so they need not be defined by the user.

Among these predefined components are e.g.:

- ♦ Liquid handling arm
- ♦ Robotic manipulator arm
- ♦ 96-well microplate
- ♦ 96-well microplate 19 mm
- ♦ 13 mm tube rack
- ♦ 16 mm tube rack



ATTENTION

The components delivered together with the software are in **frozen** state. If they are copied, the copies can be modified. Components that can be modified are marked by a “construction site” black-yellow bar:

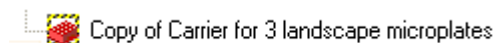


Fig. 9-2 Component, marked as editable

Screen Zones

The following figure shows the Labware Editor screen:

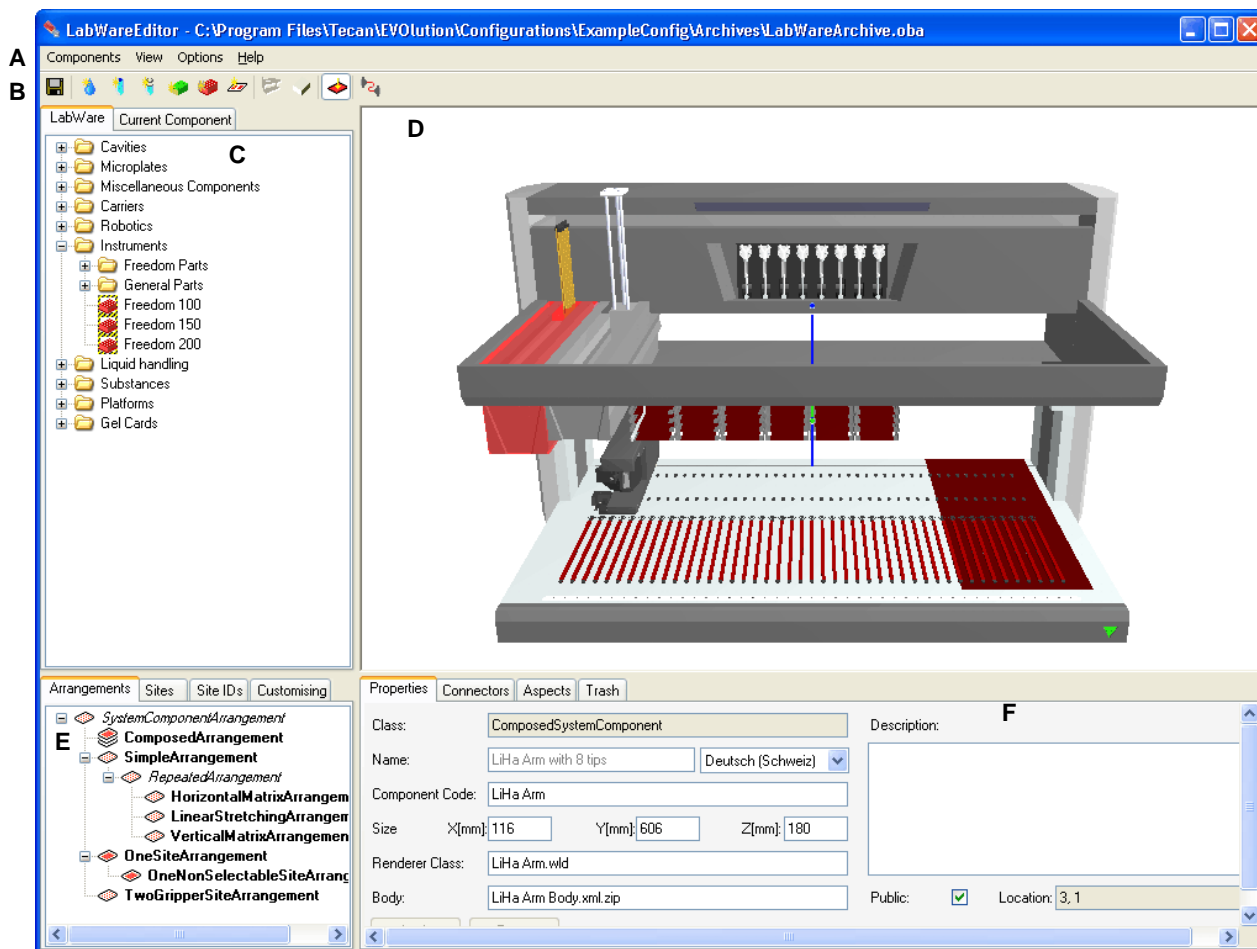


Fig. 9-3 Labware Editor screen zones

- A** Menu bar
- B** Quick access buttons to functions and views
- C** Tree view for component design and selection, with tabs for component states
- D** Graphical component view, for component overview and selection
- E** Tree view of templates for components, sites, customizations etc.
- F** Description window, containing the properties, connectors and aspects for the selected component, for modification or information

9.2 Labware Editor Concepts

9.2.1 System Components

Definition

All labware objects, including devices and substances, are system components. In the software, they are represented by 3-D renderings.

System components can contain other system components, e.g. a carrier for 3 microplates can contain a microplate, which contains wells.

Sites and Components

System components can have places or **sites** allotted for the placement of other system components, e.g. the carrier for 3 microplates has got three sites where microplates can be placed. The toplevel site, which is not placed on any system component, is the **platform** upon which the whole instrument is placed.

Arrangements and Components

In order to simplify the creation of a number of repetitive sites, e.g. the 96 sites for the wells on a microplate, the **arrangement** has been implemented as a site-managing tool. Arrangements allow for the specification of arrays of sites and then create the required number of sites automatically.

Connectors and Components

A system component can sometimes be placed in more than one way onto another system component. E.g. the microplate can be positioned on the carrier unrotated or rotated by 180°. The software uses a **connector** to describe the exact way in which one component is placed on the other.

Aspects and Components

Aspects are groups of component data relevant for other components or devices. E.g. the microplate is described by a group of data (dimensions) which must be transmitted to the RoMa, so that the RoMa can handle the microplate. Or a well is described similarly in an aspect for the LiHa, by data like dimensions and Z-dimensions.

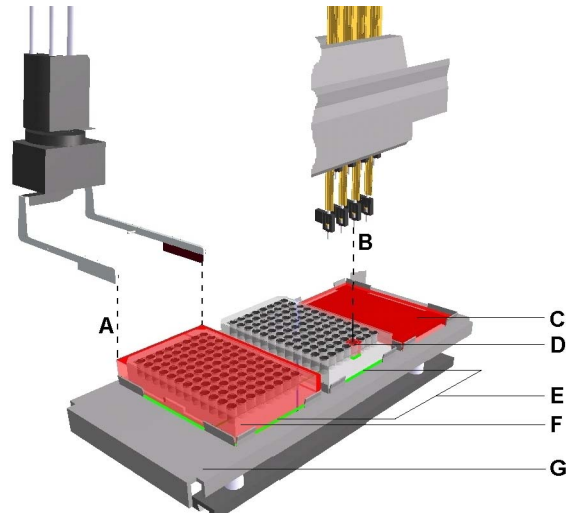


Fig. 9-4 Example: Structures of the system components *carrier, microplate and well*

- | | |
|--|---|
| <p>A Microplate aspect for RoMa (not visualized in graphic view)</p> <p>B Microplate well aspect for LiHa</p> <p>C Site for microplate</p> <p>D Simple system component cavity, well</p> | <p>E Connectors (not visualized in graphic view)</p> <p>F Composed system component microplate</p> <p>G Composed system component carrier</p> |
|--|---|

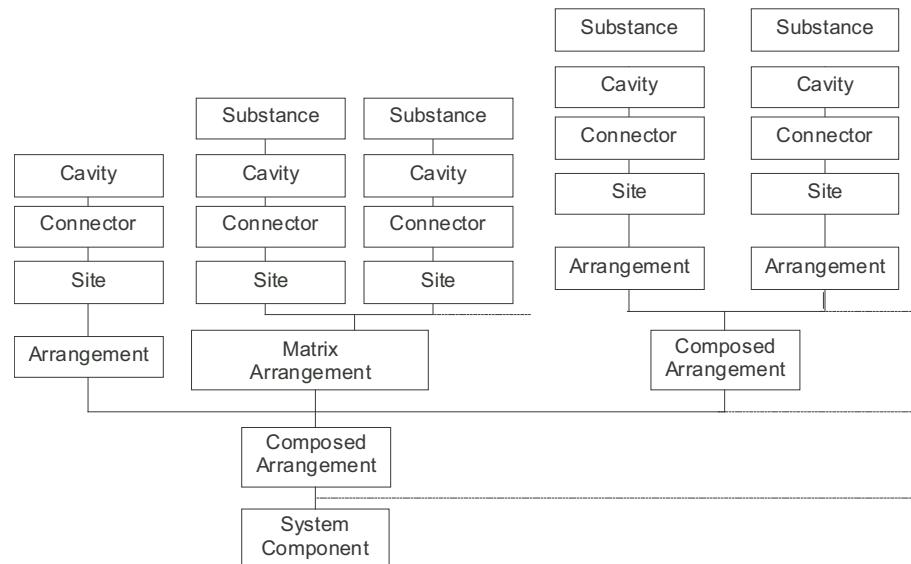


Fig. 9-5 Basic structure of labware

Component Status

The system components are shown in a tree view, in the upper left screen zone.

The Labware Tab

The system components shown under this tab can have the **status frozen** or the **status under construction**. Frozen components can not be modified anymore, they can, however, be moved to another folder in the tree view. Components under construction are marked with a black-yellow “construction site” bar.

The Current Component Tab

Under this tab, the selected system component and its arrangements, sites, connectors and aspects are shown in a tree view. All items in the tree view are selectable by double-clicking, to display (and possibly edit) their properties under the component **Properties** tab.

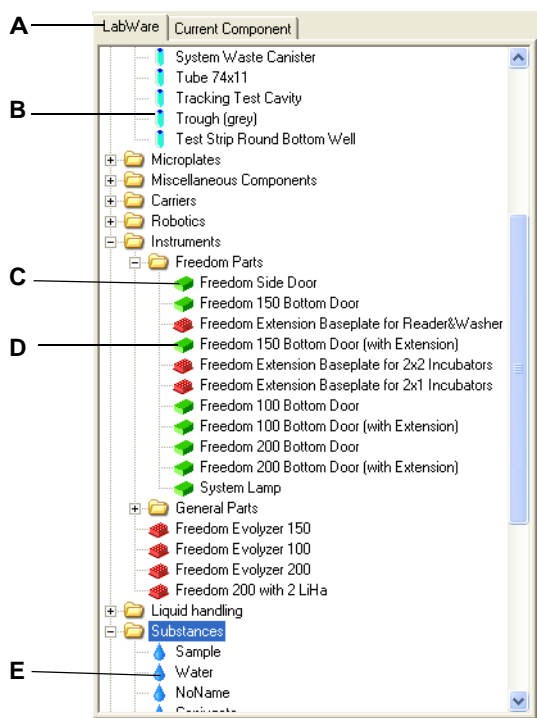


Fig. 9-6 System component tree view

- | | |
|--|---|
| A Tabs for component overview/structure | D Composed system components (red symbols) |
| B Cavities (blue symbols) | E Substances |
| C Simple system components (green) | |

System components are either of the **simple** or **composed** type:

Simple System Components

Simple system components are worktable objects, onto or into which no other worktable object can be placed. They have no sites (areas to which another system component can connect) and no arrangement (site manager).

Examples for simple system components are:

- DiTis
- Standard tips
- Barcode flags

- Cavities with liquid/substances
- Microplate wells
- Troughs
- Tubes, etc.

Simple system components have the properties name, component code, size (i.e. length x width x height) and renderer class.

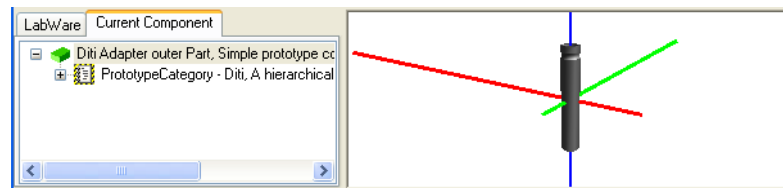


Fig. 9-7 Simple system component example: Without sites/arrangement

Composed System Components

Composed system components are worktable objects, onto or into which other worktable objects can be placed. So they can have an **arrangement** and thus also **sites**. In this case, the software builds a **connector** between a component and the composed system component it is placed on. Examples for composed system components are:

- Microplates
- Racks
- Carriers
- Devices as e.g. RoMa or LiHa

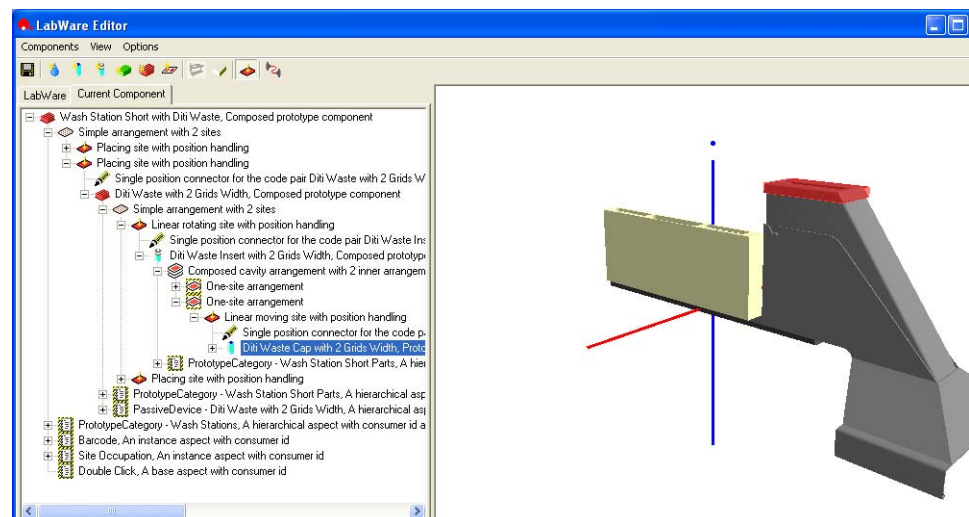


Fig. 9-8 Composed system component example: With arrangements and sites

Composed system components have the same properties as simple components.

9.2.2 Arrangements

Definition

An arrangement is generally a number of sites. A composed system component (e.g. a tube rack) has one arrangement, and this arrangement can contain sites (e.g. the locations for the tubes) or other arrangements.

An arrangement containing several other arrangements is named a **composed arrangement**.

Position Handling

The data specifying a component's position (X-, Y-, Z-coordinates and Euler angles) can be entered either:

- ♦ In the arrangement properties (Site without position handling), or
- ♦ In the site properties (Site with position handling).

Matrix Arrangements

If a composed arrangement contains a great number of regularly situated sites (e.g. the arrangement for the wells in a 96 microplate), a horizontal matrix arrangement can be used.

E.g. by defining for the microplate a matrix arrangement of 8 rows and 12 columns, the array of 96 sites for the wells is created automatically in the software.

The microplate has got one composed arrangement containing two arrangements:

- ♦ A one-site arrangement, for the positioning of a lid
- ♦ A horizontal matrix arrangement with 96 sites for the wells

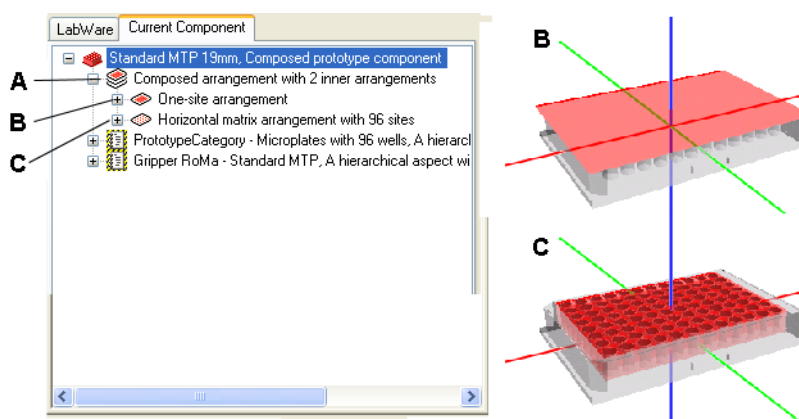


Fig. 9-9 Arrangements for a microplate

- A** Composed arrangement with 2 inner arrangements
- B** one-site arrangement, for the positioning of a lid
- C** horizontal matrix arrangement with 96 sites for the wells

A horizontal matrix arrangement contains a number of sites (e.g. for wells or tubes), simple components or cavities.

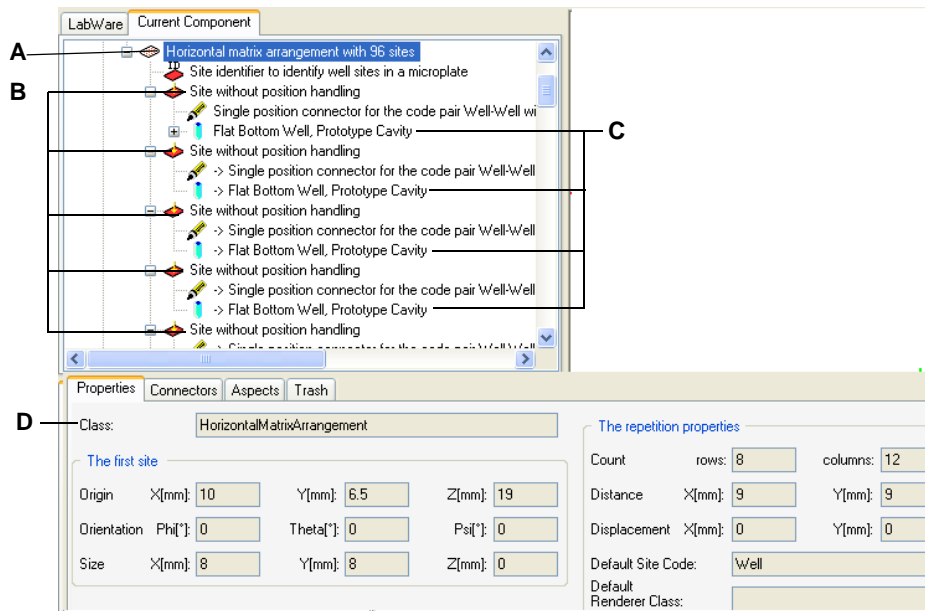


Fig. 9-10 Horizontal matrix arrangement

- A** Horizontal matrix arrangement
- B** Sites
- C** Cavities (wells)
- D** Property sheet for the horizontal matrix arrangement
- E** Declaration of the matrix number of rows and columns, point of origin, displacement and site code

Linear Stretching Arrangements

Linear stretching arrangements change their size by expanding (stretching) or contracting. Examples: the RoMa gripper base and the LiHa Y-slider.

9.2.3 Sites

A site is an area on a system component to which another system component can connect, or on which another system component can be positioned.



ATTENTION

The toplevel entity in the Labware editor is the **platform**, on which an instrument will be positioned. It consists of sites. The platform can be selected in the Worktable editor by right-clicking in the graphical component view without any component selected, and clicking the context menu option **Select Platform**.

Examples

Examples for sites are:

- ♦ a standard microplate carrier has three sites on which microplates can be placed.
- ♦ a microplate has a site on which a lid can be placed.
- ♦ a RoMa has a site on the gripper finger. When a plate is gripped, the sites on the gripper fingers are connected to the microplate.

Site Types

There are three types of sites:

System component site (A):

Site without position handling, for system components.

Linear moving site (B):

A linear moving site moves along one axis. Example: the RoMa Z arm is connected to such a site.

Linear rotating site (C):

A linear rotating site can be rotated around one axis. Example: the RoMa head is connected to such a site.

Placing site (D):

Normal site on which another worktable object can be placed (e.g. the inside of a RoMa gripper finger).

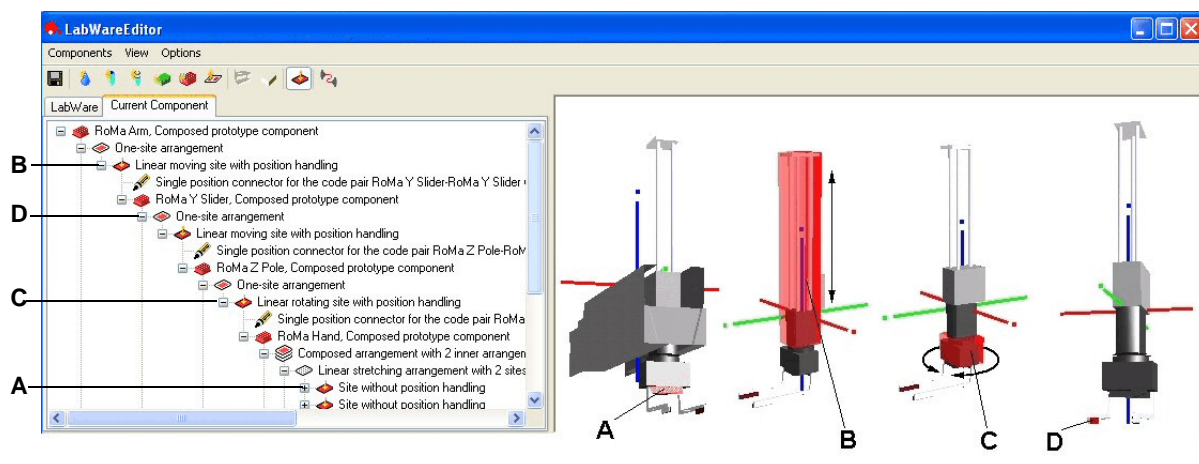


Fig. 9-11 Examples for site types

The system component site (A) is a site without position handling, sites B, C and D are sites with position handling.

Note: Defined gripper sites (Placing site) on microplates will not be visible in the Worktable Editor.

Component and Site

One composed component has one arrangement (manager of sites). The arrangement contains sites or other arrangements (in this case, it is a **composed arrangement**).

To simplify the creation of sites, a grid of sites can be specified as **horizontal matrix arrangement** (e.g. for 1536 microplates). When creating a horizontal matrix arrangement, the point of origin and dimensions of the first site and a displacement distance can be specified. Then one site is dragged and dropped onto the arrangement, and the array of sites is created by the software.

In this case, it is the arrangement that takes care of the position handling, not the individual site.

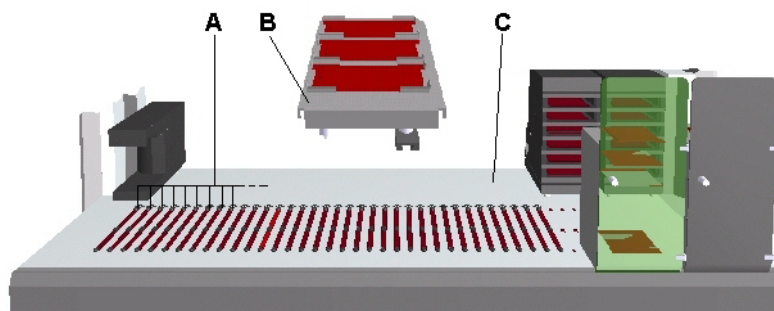


Fig. 9-12 Worktable and other components

- | | | | |
|----------|-------------------------------------|----------|-----------------------------------|
| A | Sites on worktable (grid positions) | C | System component worktable |
| B | System component carrier | | |

9.2.4 Site Identifiers

Definition

Site identifiers are locators which translate the site index into the site name and vice versa.

E.g. the three sites of the **Carrier for 3 landscape microplates** have in their site properties the array indices from 0 through 2, but are addressed by the software as **front-middle-rear** site. Similarly, the wells on a 96well microplate have array indices from 0 through 95, but are addressed by the software by the common matrix expressions, as e.g. **D4** or **G11**.

Site identifiers are attributed by dragging and dropping them from the template view (lower left) onto the arrangement of sites in the tree view.

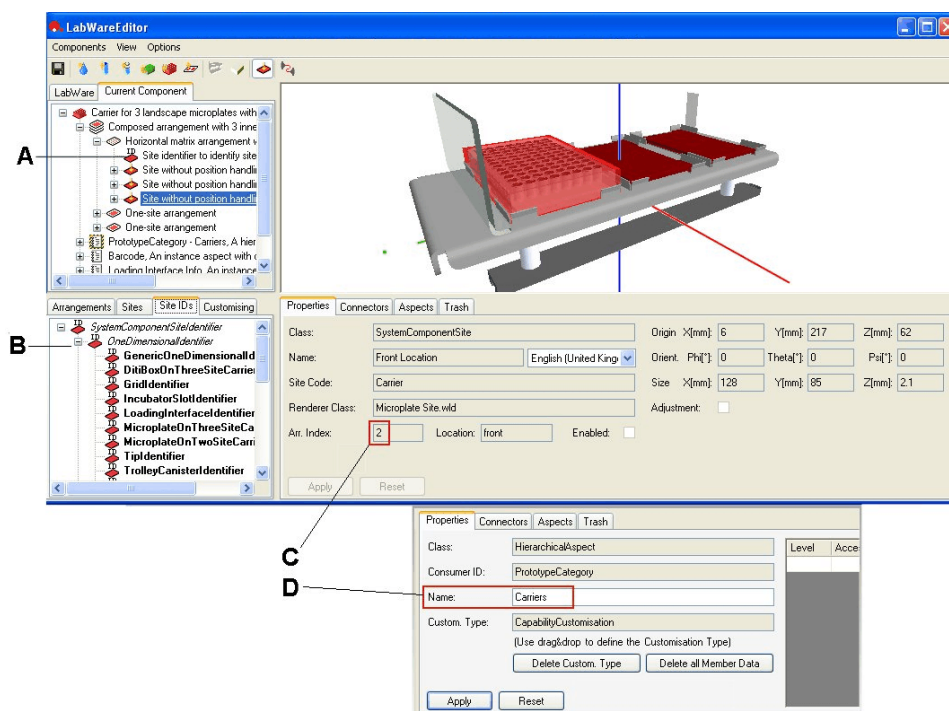


Fig. 9-13 Sites and site identifiers

- A Site identifier in the component tree view
- B Site identifier templates
- C Array index for the front microplate site of the carrier
- D Hierarchical aspect "Carrier" properties

Site Identifier Dimensions

The site identifiers are ordered in accordance with the distribution of the sites on the component carrying them:

- ♦ Three-dimensional site identifiers are used, when the array of sites has three dimensions, i.e. rows, columns and layers.
- ♦ Two-dimensional site identifiers are used, when the array of sites has the two dimensions **rows** and **columns**. E.g. the 96 sites for the wells on a microplate are arranged in 8 rows and 12 columns, as are also the DiTis in a DiTi rack.
- ♦ One-dimensional site identifiers are used when the array of sites has only rows, but no columns. E.g. the microplates on a 3 microplate carrier are arranged in one row of three microplate sites, or the tips on the LiHa are arranged in one row of four or eight tips.

- ◆ Zero-dimensional site identifiers are used when there is only one site, but neither a row nor a column of sites. E.g. the microplate top site or the site for the RoMa teaching tool occur only once.

9.2.5 Connectors

Definition

Connectors describe a component's position on another component and if necessary also the paths on which one component approaches the other or withdraws from it (e.g. RoMa movements).

Connectors always describe the pair relationship between a mother component (e.g. a carrier) and a daughter component which is positioned on/in the mother component (e.g. a microplate). The designation of this pair relationship is expressed with the **Site code** of the mother component and the **Component code** of the daughter component, e.g. Carrier-Microplate.

When e.g. a microplate is placed on a carrier, a connector is created, to describe that the microplate can now be held by the carrier.

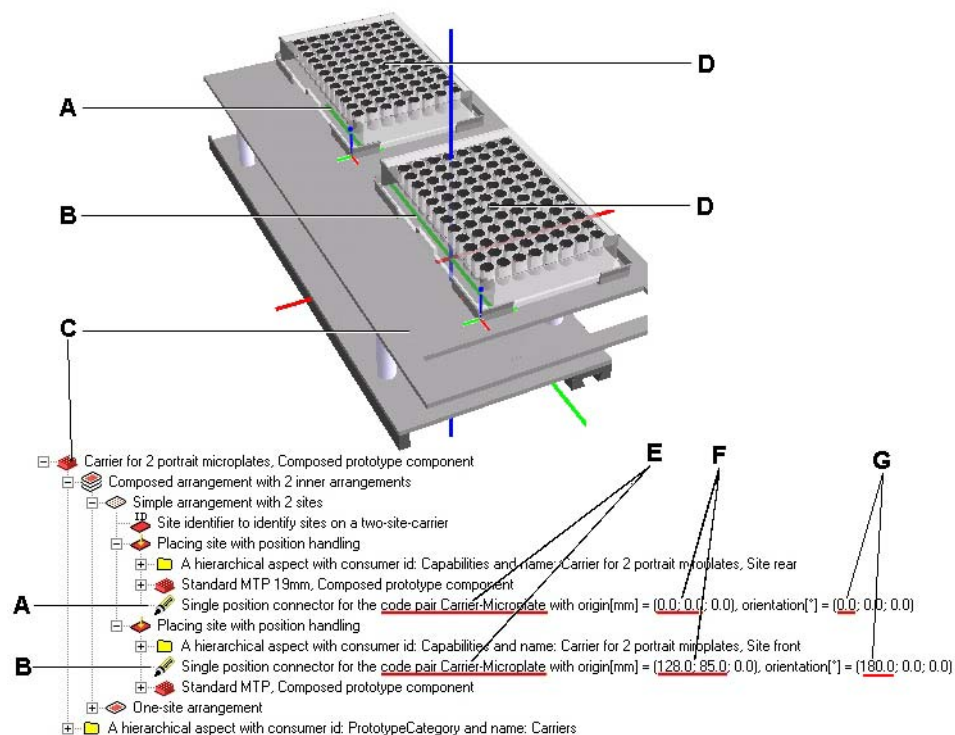


Fig. 9-14 Examples for connectors

- | | | | |
|----------|---|----------|----------------------------------|
| A | Connector between carrier and microplate (virtual in 3-D view) | C | Mother component: Carrier |
| B | Connector between carrier and microplate, rotated by 180° (virtual in 3-D view) | D | Daughter components: Microplates |
| | | E | Pair relationships (underlined) |
| | | F | Points of origin (underlined) |
| | | G | Rotation by 180° (underlined) |

The connector is also the marker for a permissible or legal connection of two components (relevant for the worktable editor).

When a component is dragged onto another, selected, component (from the component tree view into the graphic view), the software checks whether a connector exists for the current component pair. If up to this time no connector has been created yet for the current component pair, a dialog appears, where the connector type can be specified. Then the connector is created by the software.

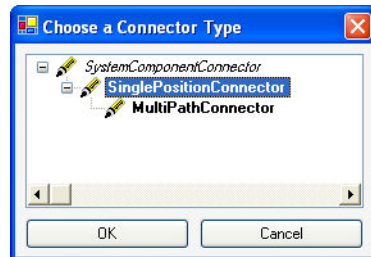


Fig. 9-15 Connector specification dialog



ATTENTION

For each component pair, the connector must be specified only once (i.e. the first time one of the components is placed on the other). Afterwards, the software always uses this connector.

Connector Types

The following connectors can be attributed to sites:

Single position connector

Describes the placement of a component on a site, when no description of the approaching path to the site is necessary.

Multiple path connector

Describes the placement of a component on a site, when several approaching paths to the site are possible.

Note: Connectors are only visible in the software when they are actually used, i.e. are created and shown when a component is put on top of another.

Example Connector Properties

The connector properties in the following illustration describe the positions of two microplates on a carrier. The second microplate is rotated by 180°.

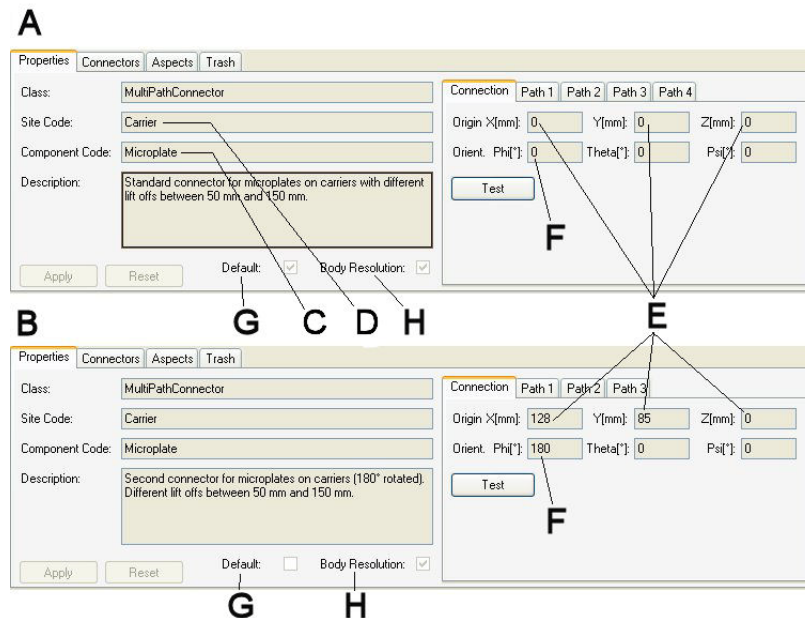


Fig. 9-16 Examples for connector properties

- | | |
|---|--|
| <p>A Properties of the unrotated microplate</p> <p>B Properties of the rotated microplate</p> <p>C Specification of the component occupying a site</p> <p>D Specification of the site occupied by the component</p> | <p>E Changes of coordinates due to rotation</p> <p>F Rotation by 0°/180°</p> <p>G Connector of unrotated microplate is the default</p> <p>H Option: the component's shape is used/not used for collision detection</p> |
|---|--|

One and the same site code can be reused for any site intended for the same system components. The identical site code must be used for every site where a certain component can be placed.

E.g. the site code **Carrier** can be used for a number of locations where a microplate can be positioned. It can be used for:

- ◆ the sites on a carrier for 2 landscape microplates
- ◆ the sites on a carrier for 3 landscape microplates
- ◆ the topmost site for a microplate on a loading port
- ◆ the topmost site for a microplate on an RT incubator



ATTENTION

When an identical site code is used for two different sites, the same connectors will be used for the two sites, with the same paths.

The Site code **Carrier** can, however, not be used for the inner sites of an incubator or loading port, because these sites must be approached by the RoMa on a different path. The RoMa approaches carriers from above (vertical movement axis), whereas it approaches the inner incubator sites from the front (horizontal movement axis).

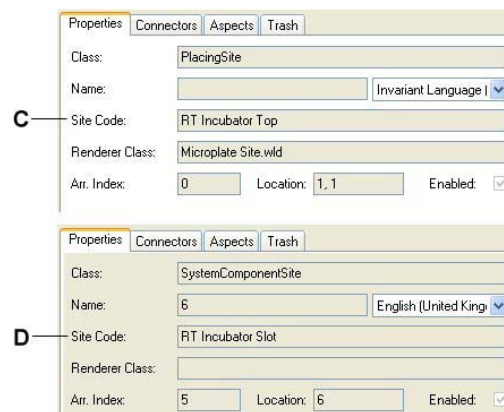
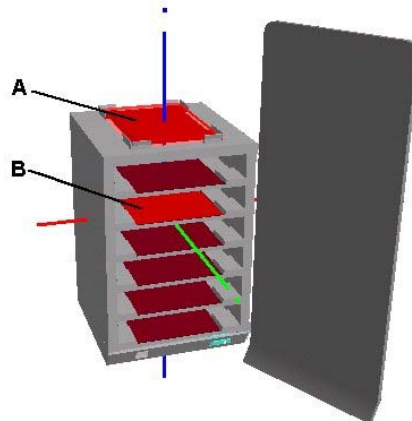


Fig. 9-17 RT incubator sites with site codes

- A** Top site, with site code **Carrier**
- B** Inner site with site code **RT Incubator Slot**
- C** Site property, site code for topmost microplate site on RT incubator, with vertical RoMa approaching path
- D** Site property, site code for inner microplate site in RT incubator, with horizontal RoMa approaching path

Connectors are visualized only in the component tree view and under the **Connectors** tab in the properties view.

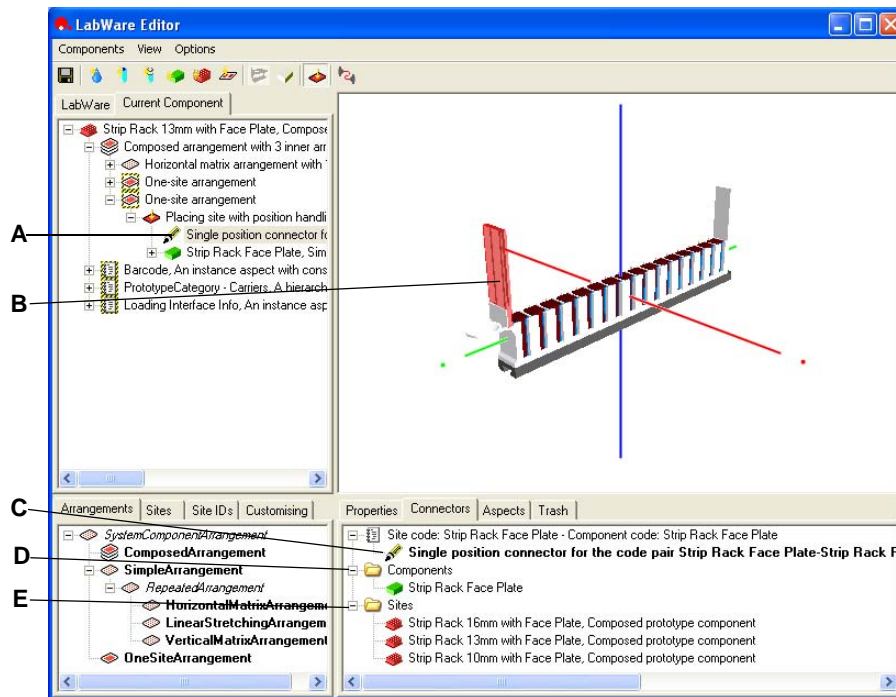


Fig. 9-18 Connector visualization

- A** Connector as part of a site of the current component
- B** Graphical visualization (highlighting) of the connector selected in the tree view (A)
- C** Connector template, ready for drag & drop to a site in the component tree view (A).
- D** **Components** folder, showing all component(s) using this connector.
- E** **Sites** folder, showing the site(s) using this connector.

The pragmatic way to attribute a connector to a component pair is to enter the **Component code** and the **Site code** in the component properties and then to look under the **Connectors** tab for the suitable connector.

9.2.6 Aspects

Cross References

List of cross references to information provided in other sections:

Action	Reference
Current component and all the aspects associated with it	Fig. 9-21 "Aspects" , Fig. 9-20
Aspects and the components containing them	Fig. 9-62 "Example aspects and context menu" , Fig. 9-53

Definition

Aspects are sets of parameters for a simple or a composed component, that are relevant for another component or device, to fulfill its task in the ELISA test. Aspects can be created and modified in the data table in the properties view.

Example

E.g. a microplate is described by an aspect for the RoMa. This aspect describes the microplate as a grippable object, i.e. its dimensions, to the RoMa. The component tree view in the upper left shows the current component and all the aspects associated with it:

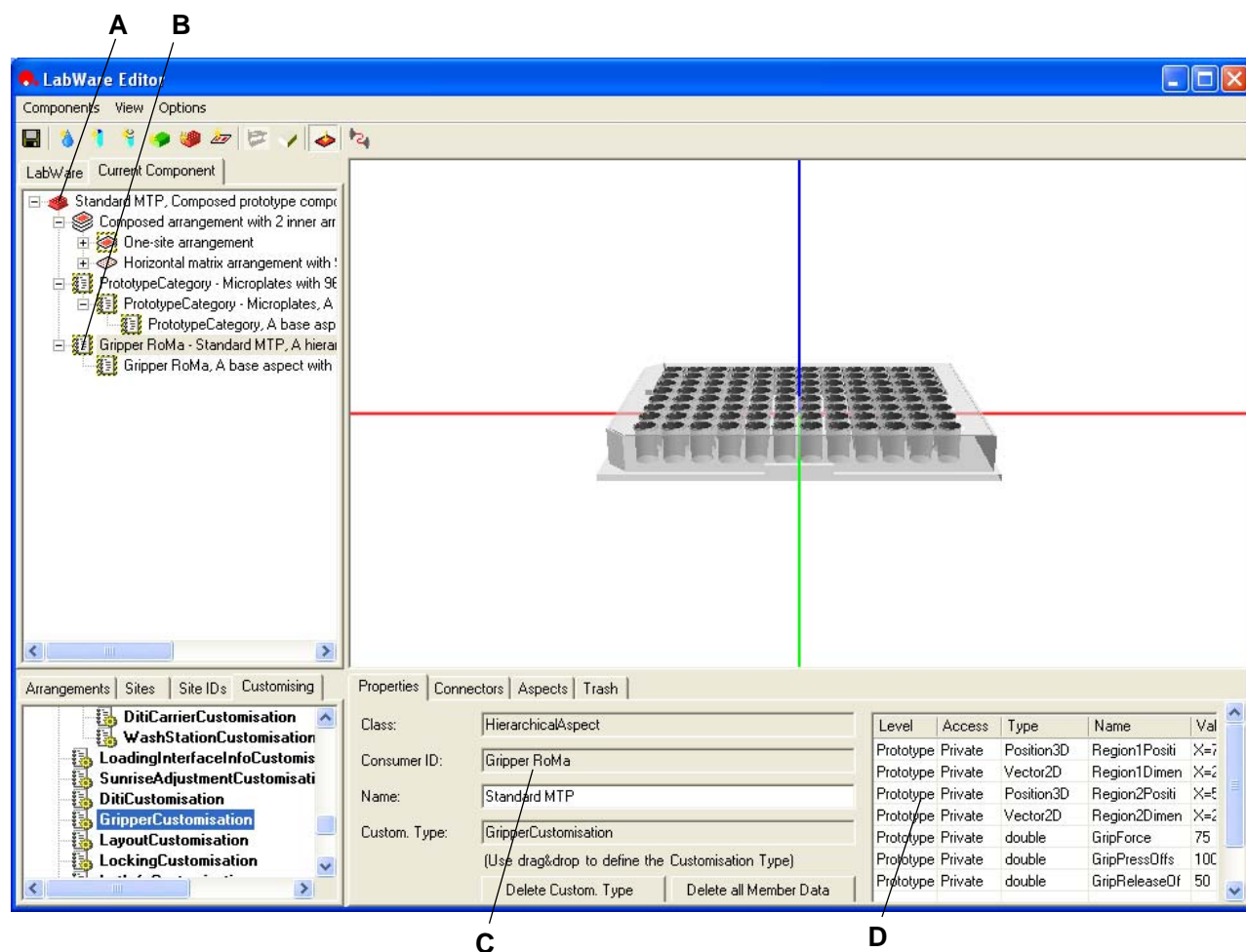


Fig. 9-19 Microplate aspect **grippable object** for RoMa

- A** Component standard microplate
- B** Selected aspect **Grippable object** describing the component **Standard microplate**
- C** Consumer ID **Gripper RoMa**
- D** Editable microplate parameters for RoMa

The description (aspect) for the same microplate for the LiHa is reduced to the description of the wells. So this aspect contains the well dimensions, the Z-dimensions and the well location on the microplate.

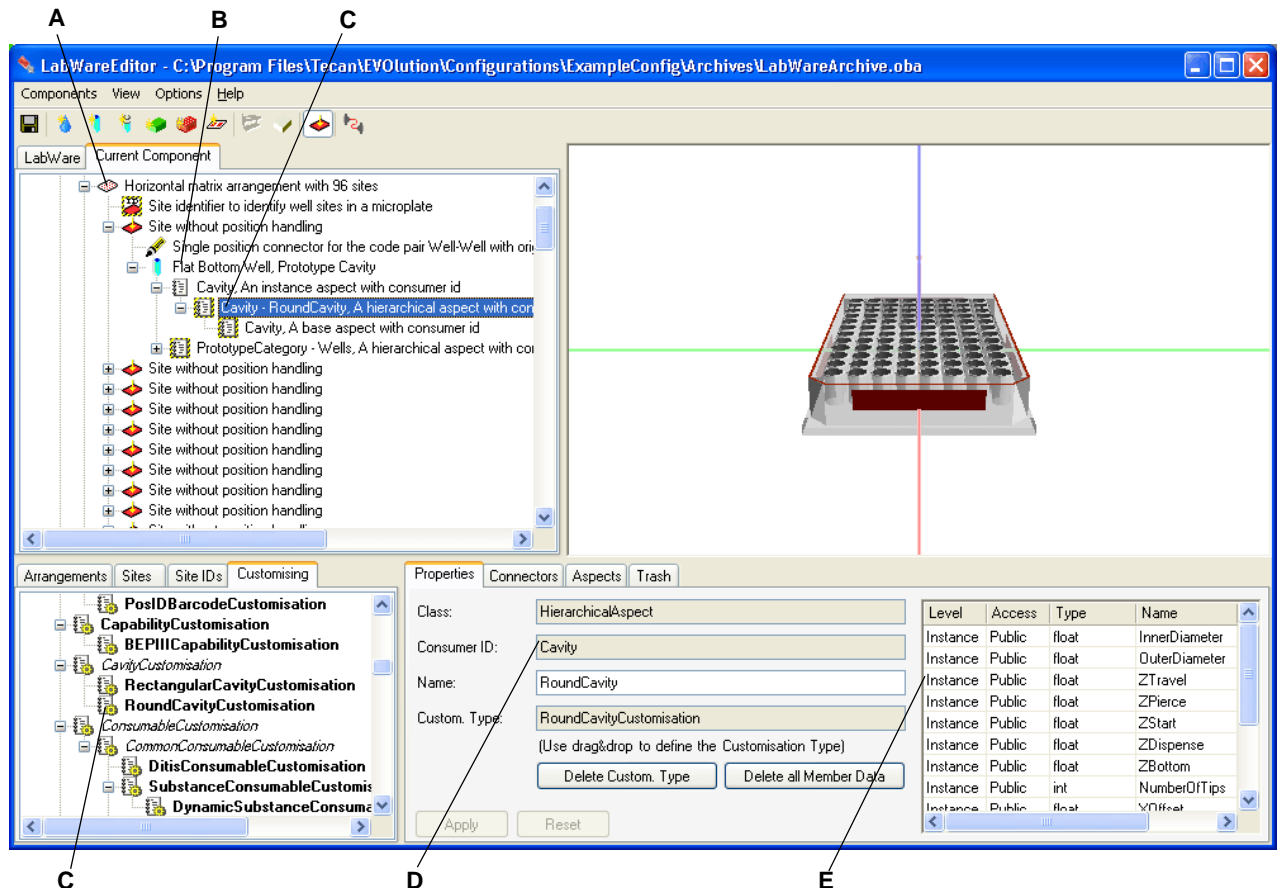


Fig. 9-20 Aspect flat bottom well for LiHa

- A Component **Standard Microplate**
- B Component **Flat Bottom Well** as part of the microplate
- C Template aspect describing the component **Flat Bottom Well**
- D Consumer ID **Cavity**
- E Editable well parameters for LiHa (unless the component is frozen)

The aspect for the well contains the following LiHa-relevant parameters:

- Inner diameter
- Outer diameter
- Z-travel
- Z-pierce
- Z-start
- Z-dispense
- Z-bottom
- Number of tips
- X-Offset
- Y-Offset
- Opening type

The Z-values are in mm, and are absolute values. The 0-point is the tube rim.

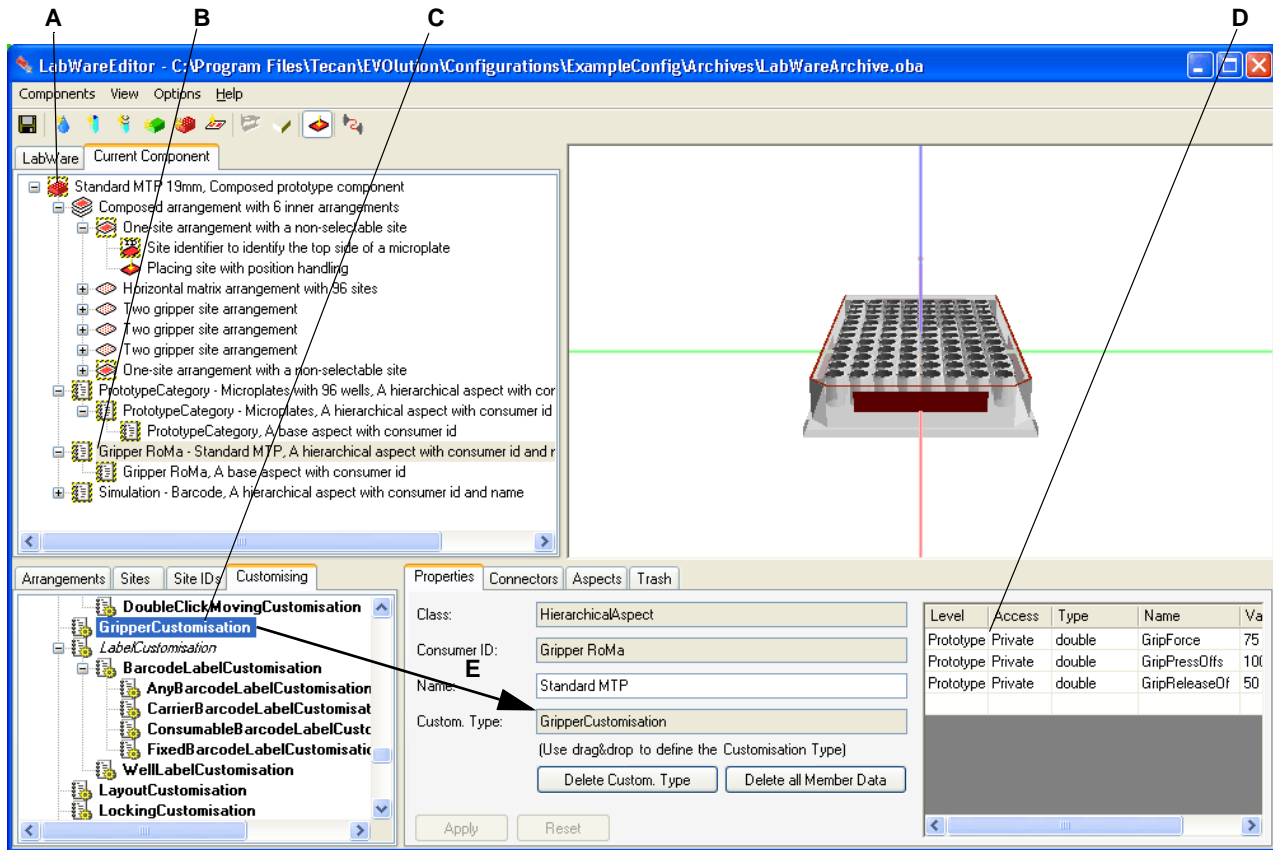


Fig. 9-21 Aspects

- A** Current component with attributed aspects (yellow folder symbols)
- B** Aspect in the component tree view, describing the microplate to the RoMa
- C** Customization templates
- D** Microplate parameters relevant for the RoMa
- E** Drag and drop of a customization template to the aspect properties, to define the customization type

The component tree view in the upper left shows the current component and all the aspects associated with it.

The **Aspects** view in the lower right shows all available aspects, and under each aspect the components, to which the aspects has been attributed (refer to cross references above). The **PrototypeCategory** aspect is used by the software to build the component tree view in the upper left screen zone.

Base Aspects

Base aspects are basic component properties that are - if need be - communicated to other, interacting components.

Dependent Aspects

Dependent Aspects are added automatically to newly created components or cavities. They are database information about the classes a component belongs to.



ATTENTION

If you need more information about aspects, consult the programmer with whose help you usually create new components and their dynamics.

9.2.7 Customizations

Definition

A customization is a piece of executable code (e.g. a function) that describes the behavior (e.g. “calculate volume”) or properties (e.g. Z-values of a well) of a system component, and is used to specify the component’s **aspects**.

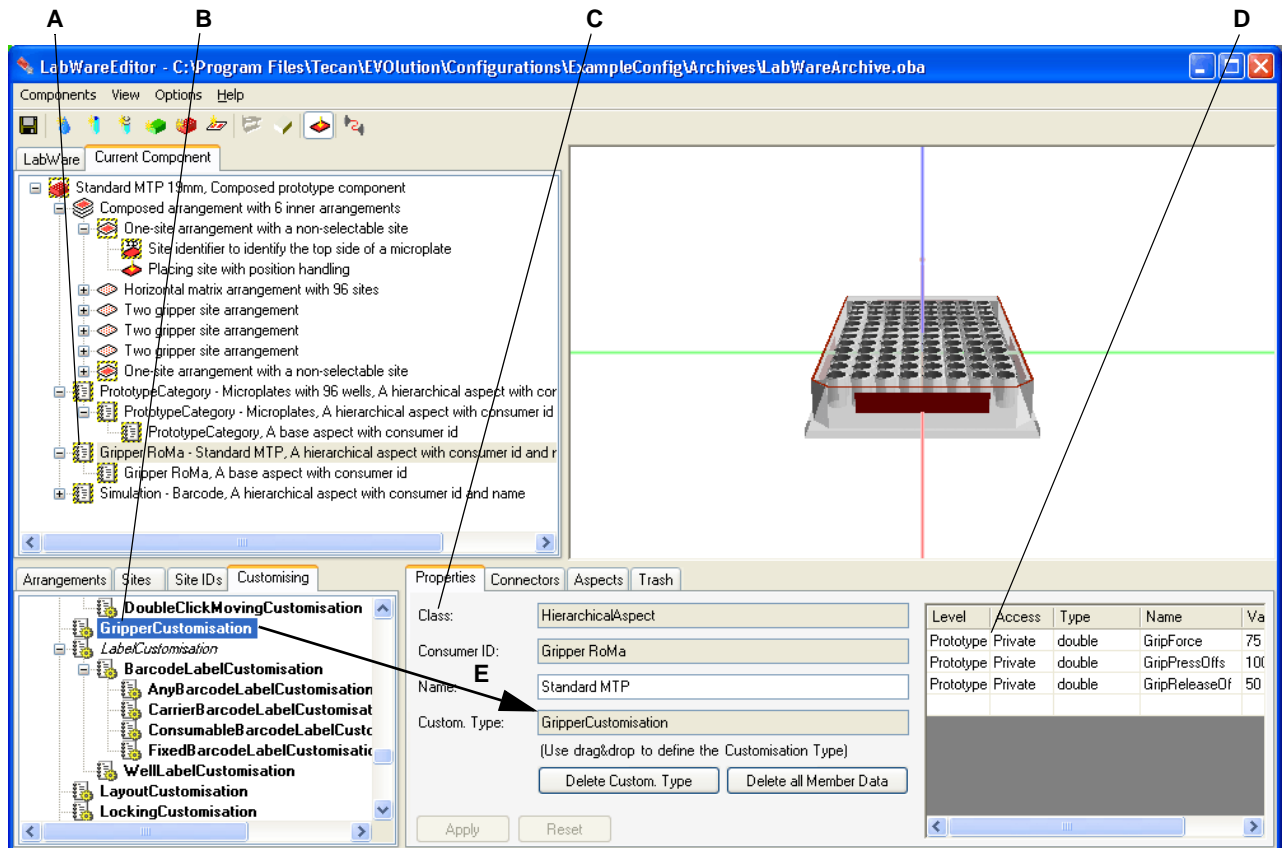


Fig. 9-22 Aspect and customization

- A** Aspect in the component tree view
- B** Customization templates
- C** Properties sheet displaying properties of the selected aspect (A)
- D** Parameter table
- E** Drag and drop of a customization (template) to the aspect properties, to define the customization type

9.2.8 Devices

Definition

Devices are addressable components of the Tecan pipetting instrument or additional options that can communicate with the pipetting instrument’s main microprocessor (*Te-CU*), e.g. robotic arms, *PosID*, etc.

Devices also belong to the labware. The data of such components need hardly ever be modified in the Freedom EVOLution SW.

Sites on Devices

The RoMa e.g. has got one site on the gripper finger (touching microplates), and many more for the simple parts or components which together make up the RoMa.

9.2.9 Coordinate System

Axes of the coordinate system in the Freedom EVOLution SW main view:

- ◆ Z = height = blue
- ◆ X = length = red
- ◆ Y = width = green

The same applies to axes in the **point of origin** of any component (on another component).

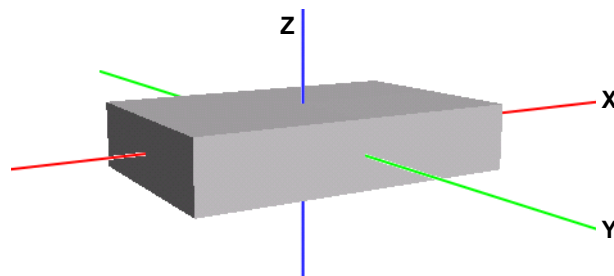


Fig. 9-23 Freedom EVOLution SW coordinate system

One corner of each component is its point of origin. The command **Show Coordinate System** in the context menu shows the selected component's point of origin.

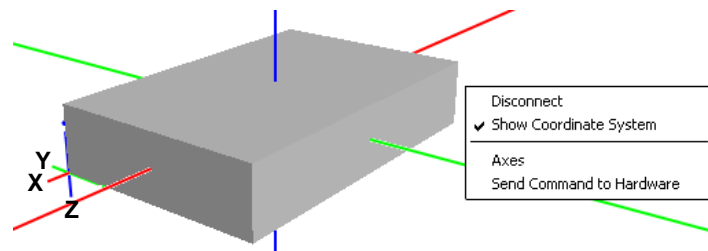


Fig. 9-24 Component point of origin

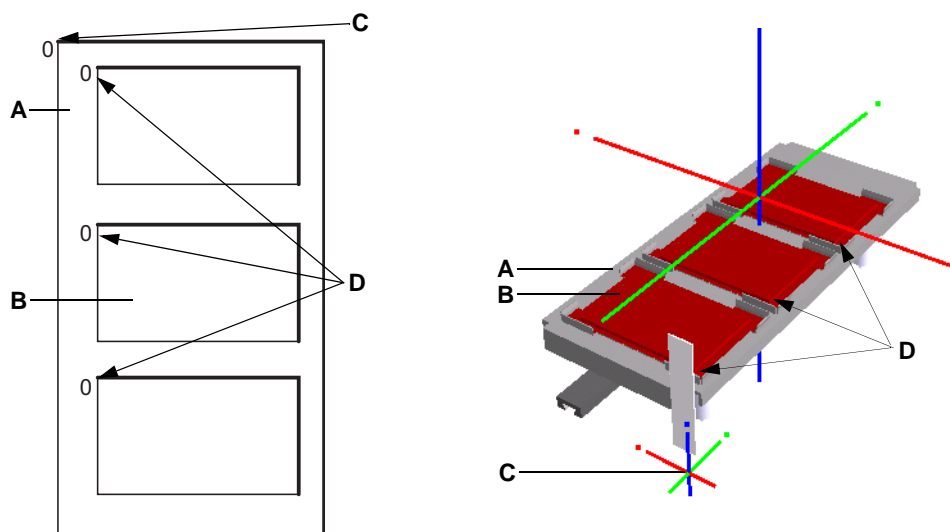


Fig. 9-25 Principle of a carrier

- | | | | |
|----------|-----------------------------|----------|---------------------------------|
| A | Carrier | C | Carrier's point of origin |
| B | Microplate, microplate site | D | Points of origin of microplates |

Offset of the point of origin of the mother system component (e.g. carrier) to the system component on the mother system component (e.g. microplate on the carrier).

9.3 Functionality

9.3.1 The Toolbar



Fig. 9-26 Toolbar

- | | | | |
|----------|------------------------|----------|---------------------|
| A | Save all Archives | G | New Platform |
| B | New Substance | H | Symbol Rendering |
| C | New Cavity | I | Box Rendering |
| D | New Composed Cavity | J | Show Sites |
| E | New Simple Component | K | Hardware Connection |
| F | New Composed Component | | |

The Labware editor toolbar contains buttons for all functions contained also in the component menu and the view menu.

9.3.2 The Menus

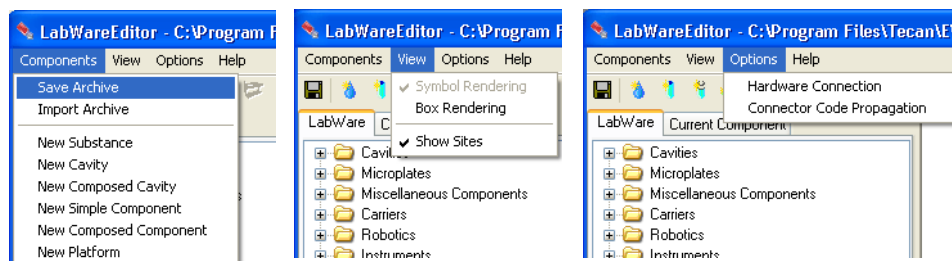


Fig. 9-27 Components, view and options menu

The **Components** menu items allow for

- ◆ saving of the archive in the database
- ◆ the creation of:
 - new substances
 - new cavities
 - new composed cavities
 - new simple components
 - new composed components.
 - a new platform

The **View** menu items allow for:

- ◆ **Symbol rendering:** detailed visualization of a component, with some constructional detail. This view requires a file containing a 3-D model of the component (*.wld file), with its path and filename entered in the **Properties** view under **Renderer class**.

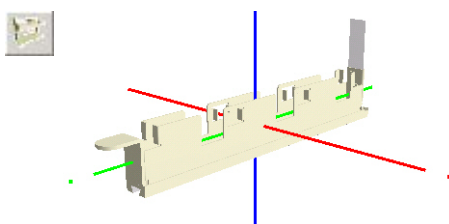


Fig. 9-28 Command button, symbol rendering of trough rack

- ◆ **Box rendering:** visualization of a component as a gray box or cuboid, without details. If no 3-D model (*.wld file) is available for a component, the component is also visualized as a gray box or cuboid. The box surfaces can be selected, and their dimensions are shown in the component's **Properties** view.

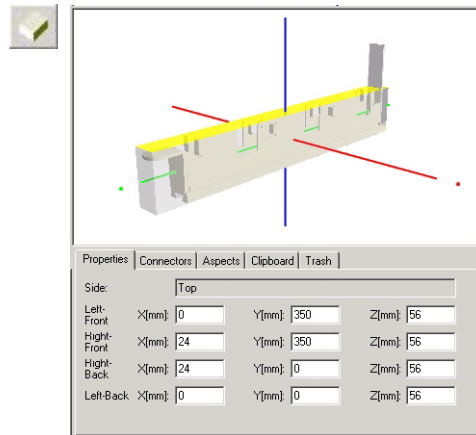


Fig. 9-29 Command button, box rendering of trough rack

- ◆ **Show sites:** visualization of the component's sites, colored in dark red. A selected site is rendered in brighter red color.

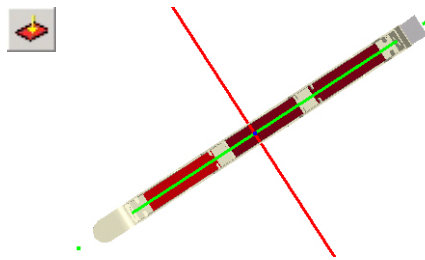


Fig. 9-30 Command button, trough rack site visualization

The **Options** menu items allow for

- ◆ Hardware Connection
 - Connects the Labware Editor to the pipetting instrument (only used by developer)
 - When modelling moving devices the devices can be moved directly from the Labware Editor (Items **Axes** and **Send Command to Hardware** in the context menu of the 3-D view).
- ◆ Connector Code Propagation
 - Activates or deactivates the following function (Activated: Menu item ticked):
 - During modifications of the component or site code all suitable connectors are found and the corresponding entries are adapted automatically.

The function does only apply to code modifications of the concerned connectors and not to other components and sites with an identical code.

9.3.3 Navigation in the Labware Editor

Navigation in the Labware Editor by means of keyboard and mouse is described in 6.3 “Navigation and Shortcuts”, 6-4.

9.3.4 The Component Tree View

Purpose

The component tree view shows all existing system components, their structure and their status (**frozen/under construction**).

View Interactivity

If a component is selected under the **Labware** tab, it becomes the **Current Component**, and its visualization is shown in the graphical component view. Its properties are shown in the properties view.

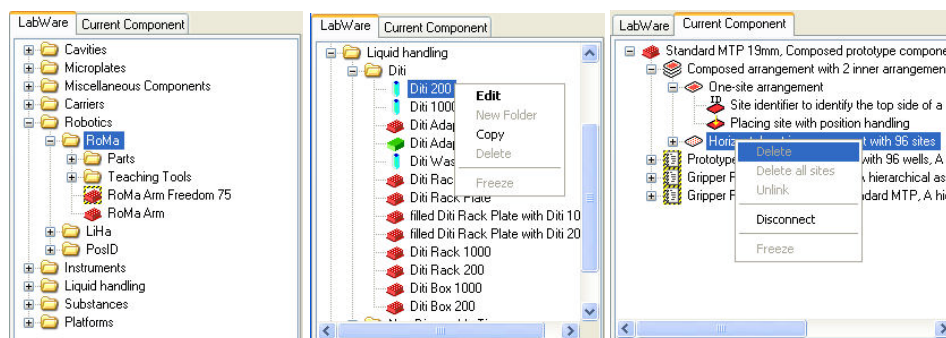


Fig. 9-31 Component tree view

Tabs

The tabs available in the component tree view are used to switch in the tree view between different design states of components:

Tab Labware

Purpose: selection of existing components (with left click), for editing, copying, freezing or deletion with the context menu commands, or for modification in the **Current Component** screen (with left double-click).

Context menu: contains the commands **Edit**, **New Folder**, **Copy**, **Delete**, **Freeze**, which work on the selected component.

View Interactivity

From the **Labware** tree view, a component (e.g. a microplate) can be dragged and dropped onto the current component (e.g. a microplate carrier) displayed in the graphic component view. Both components are then connected by the default connector and shown in the graphical component view.

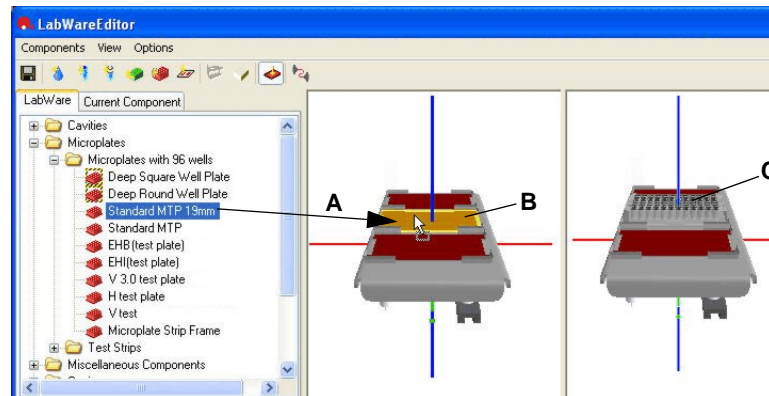


Fig. 9-32 Drag-and-dropping a component to a site

- A** Dragging the microplate
- B** Selected site for dropping the microplate (highlighted)
- C** Dropped microplate

Context Menu:

- Command **Edit** for editing the selected component
- Command **New Folder** for creating new folders in the tree view
- Command **Copy** for components: a copy is inserted automatically, with the name **copy of n**.
- Command **Freeze** for conserving a validated component (write protection)
- Command **Delete** for deleting the selected component.



ATTENTION

When the labware archive is saved after the deletion of a labware item, the item will not be available in the worktable editor.

- ◆ When a worktable containing this item is loaded, the worktable editor issues a warning message and loads the worktable with all its components - except the deleted component and other items that had been placed on it.

Tab Current Component

Purpose: tree view of the structure of the component selected under the **Labware** tab.

Context menu:

- Command **Delete**: for deleting a component
- Command **Delete all sites**: for deleting all sites in the selected matrix arrangement
- Command **Unlink**: for unlinking the selected aspect from its component.
- Command **Disconnect**: for disconnecting the selected site/system component

View Interactivity

When a component or site is clicked in this tree view, the corresponding part in the graphical component view on the right appears highlighted.

Similarly, when a component or site is selected in the graphical component view, the tree view on the left expands and shows the selected component highlighted.

9.3.5 The Graphical Component View

Cross References

List of cross references to information provided in other sections:

Subject	Reference
Pan, zoom 3-D view	6.3 "Navigation and Shortcuts" , 6-4
Move control dialog	Fig. 9-36 "Move control dialog, e.g. for the RoMa arm" , 9-30

Purpose: The graphical component view visualizes the component selected in the **Labware** tree view on the left with double-click or the **Edit** command in the context menu.

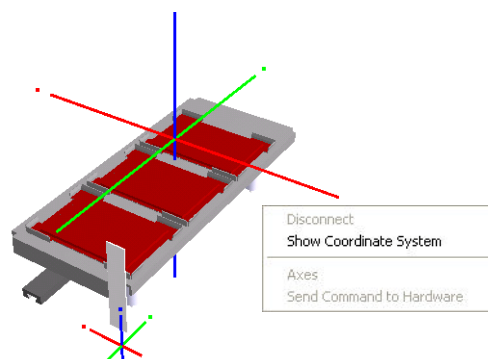


Fig. 9-33 Graphical component view

Functionality

3-D View

The 3-D view can be panned, zoomed, etc. Refer to cross references above.

Components

Individual components in a configuration can be moved as follows: When the corresponding moving site (linear moving or rotating site) has been selected in the component tree view, in its property sheet a slider is displayed. When the slider is operated with the mouse or arrow keys, the selected component moves within the configuration shown.

A component can also be moved by selecting **Axes** in the context menu. Then a move control dialog is displayed. Refer to cross references above.

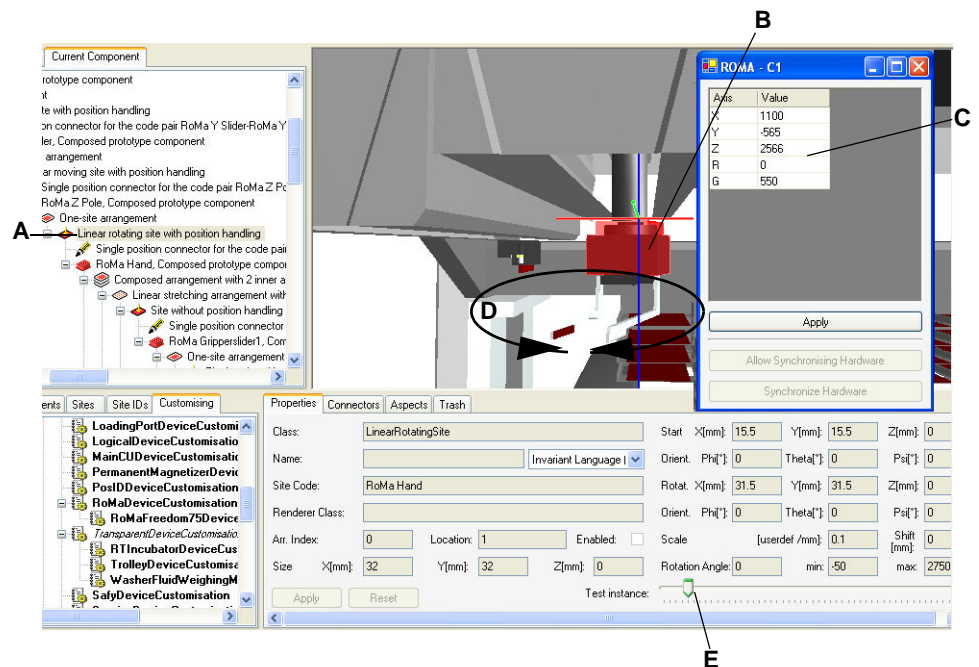


Fig. 9-34 Moving a component in the graphical component view

- A** Selected site
- B** Selected site highlighted in red
- C** Move control dialog
- D** Component/site movement
- E** Slider for move control

View Interactivity

When a component, site or connector is clicked in this tree view, the corresponding part in the graphical component view on the right appears highlighted. Similarly, when a component is selected in the graphical component view, the tree view on the left expands and shows the selected component highlighted. Several sites or components can be selected together by pressing the **Ctrl** key while clicking the sites of components.

Context Menu

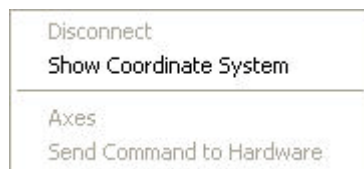


Fig. 9-35 Graphical component view context menu

The context menu offers the following functions:

- ◆ **Disconnect:** remove the selected part from the graphical view and the component tree view.
- ◆ **Show Coordinate System:** shows the X-, Y- and Z-axes through the point of origin of the selected component.
- ◆ **Axes:** pops up a move control dialog for the selected component. After entering values for the Y-, Z-, R- and G-axis, the graphical representation adjusts to the new coordinates:

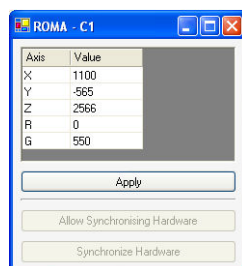


Fig. 9-36 Move control dialog, e.g. for the RoMa arm

Using the move control dialog:

- when clicking **Apply**, the graphical representation of the robotic arm adjusts to the current coordinates entered in the move control dialog.
- when clicking **Allow Synchronising Hardware**, the move commands are sent to the connected pipetting instrument.
- when clicking **Synchronize Hardware**, the move commands with the current parameters are sent immediately.

9.3.6 The Template Tree View

Purpose: this view presents the templates for:

- ♦ Arrangements
- ♦ Sites
- ♦ Site IDs
- ♦ Customizations

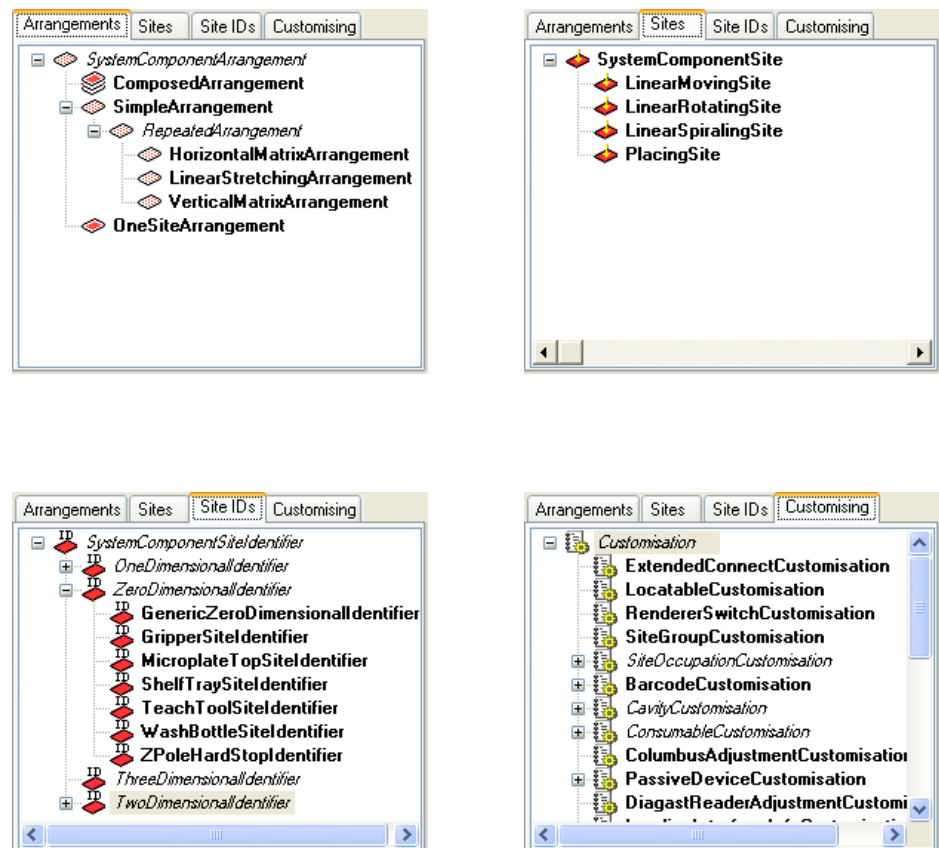


Fig. 9-37 Template tree view

Functionality

The objects in the tree views are ready for drag and drop actions:

- ♦ arrangements can be dropped on components in the component tree view,
- ♦ sites and site IDs can be dropped on arrangements in the component tree view
- ♦ customizations can be dropped in the data field **Custom. type** in the aspects' **Properties** view.

Note: All these objects can be modified only after they have been dropped and selected in the component tree view and the aspects' properties view respectively. The templates can not be changed in the template view.

Note: Entries in italics are abstract classes, for the hierarchical tree representation. They are not selectable for drag and drop operations.

9.3.7 The Properties View

Purpose: To view and modify the properties of the component selected in the **Current Component** tree view on the left.

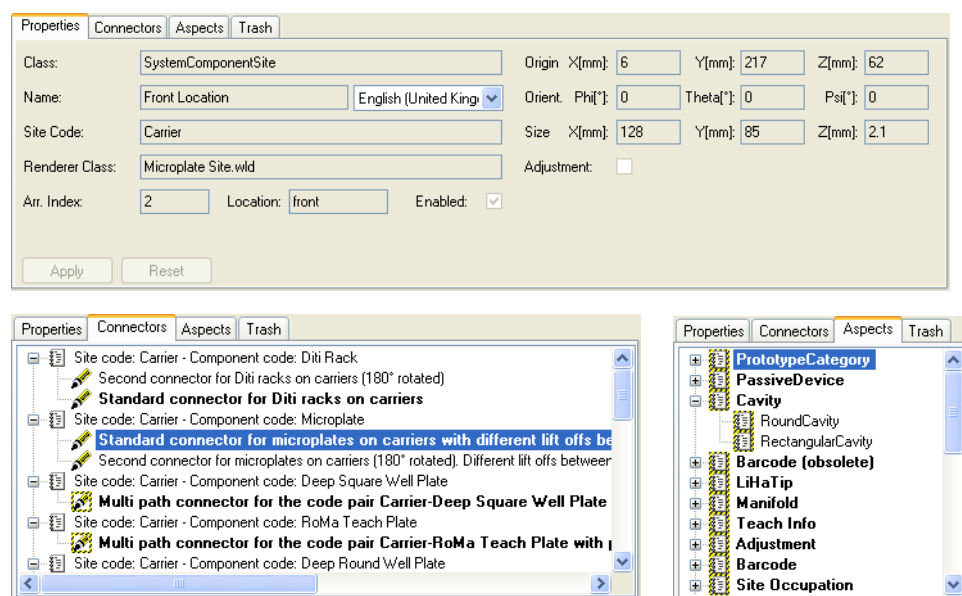


Fig. 9-38 Properties view

The properties view offers the following tabs:

Properties Tab

In the **Properties** sheet, the data for the selected component can be entered and modified. When the user attempts to select a new component in the tree view, after modifying the current component's properties, without saving, he will be prompted to save the modified component or cancel and lose the changes.

Context Menu

The context menu contains the commands:

- **Undo:** undo the latest edit action in the field with the cursor in it.
- **Cut:** cut marked text from a data field (move to Windows clipboard).
- **Copy:** copy marked text in a data field (copy to Windows clipboard).
- **Paste:** paste the text from the Windows clipboard at cursor position.
- **Delete:** delete marked text in a data field.
- **Select all:** select the entire text in the data field with the cursor in it.

Buttons in the Properties section

Apply Button

Click to apply the changes made in the component properties.

Reset Button

Click to undo the changes made to a component's properties and remain in the **Properties** section.

Cancel Button

Click to undo your changes and quit editing the component properties.

Slider

If in the graphical component view, a moving part of a component is selected (e.g. the RoMa gripper, the pipetting instrument's side access door, or the load station door), a slider is displayed in the component **Properties** section (screen lower right).

By dragging the slider mark with the mouse along its scale, the selected moving part can be moved in the 3-D view (e.g. the RoMa gripper can be rotated, or the Load station door can be opened and closed).

To operate the slider with the keyboard, first move to the slider by pressing the **TAB** key several times, then move the slider with the arrow keys, or the **Home** and **End** keys.



ATTENTION

When a component has been modified but not saved yet, the window title in the title bar is marked with an asterisk (*).

- ♦ When at this time the user selects another component for editing or attempts to quit editing, he is prompted to save or cancel his changes, or to reset the component properties.

Connectors Tab

Under this tab, a tree view of connectors that can possibly be attributed to the selected site in the component tree view is displayed.

Context Menu

The context menu contains the commands:

- **Create new connector:** creates a new connector. If necessary, a selection dialog for the connector type opens.
- **Delete:** to delete a connector.

Aspects Tab

Under this tab, the available aspects are displayed in a tree view, and new aspects can be created.

Context Menu

Accordingly the context menu contains the commands:

- **Create new base aspect:** creates a new base aspect in the lower right screen, which then will be available for attribution by drag and drop to a component in the component tree view.
- **Create new dependent aspect:** creates a new dependent aspect in the lower right screen, which then will be available for attribution by drag and drop to a component in the component tree view.
- **Delete:** deletes an aspect and moves it to the trash.

Trash Tab

Contains the components that have been deleted (disconnected) in the component tree view. They can be taken back by drag and drop.

9.3.8 Managing Components

The screens for component management are the **Labware** tree view and the **Current Component** tree view:

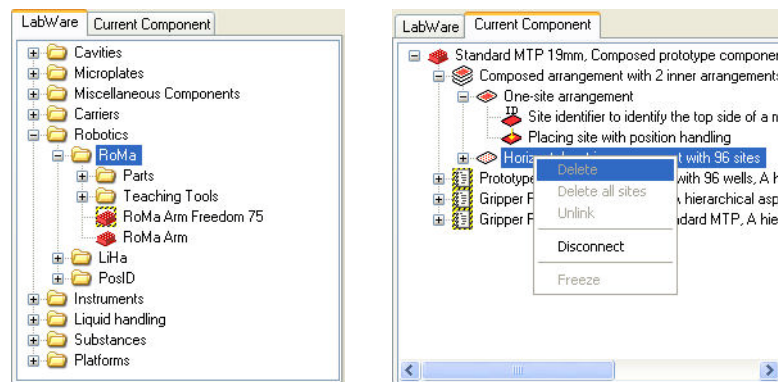


Fig. 9-39 Screens for component management

9.3.8.1 Combining Components

In the **Labware** or **Current Component** tree view, a component (e.g. a microplate) can be dragged and dropped onto the current component (e.g. a microplate carrier) displayed in the graphic component view. Both components are then shown in the graphical component view and connected by the default connector.

One possible placing site:

If on the current component there is only one possible site for placing the dragged component (e.g. a barcode flag is dropped on a 3 microplate carrier) the dragged component can be dropped anywhere on the component graphic and will be placed automatically.

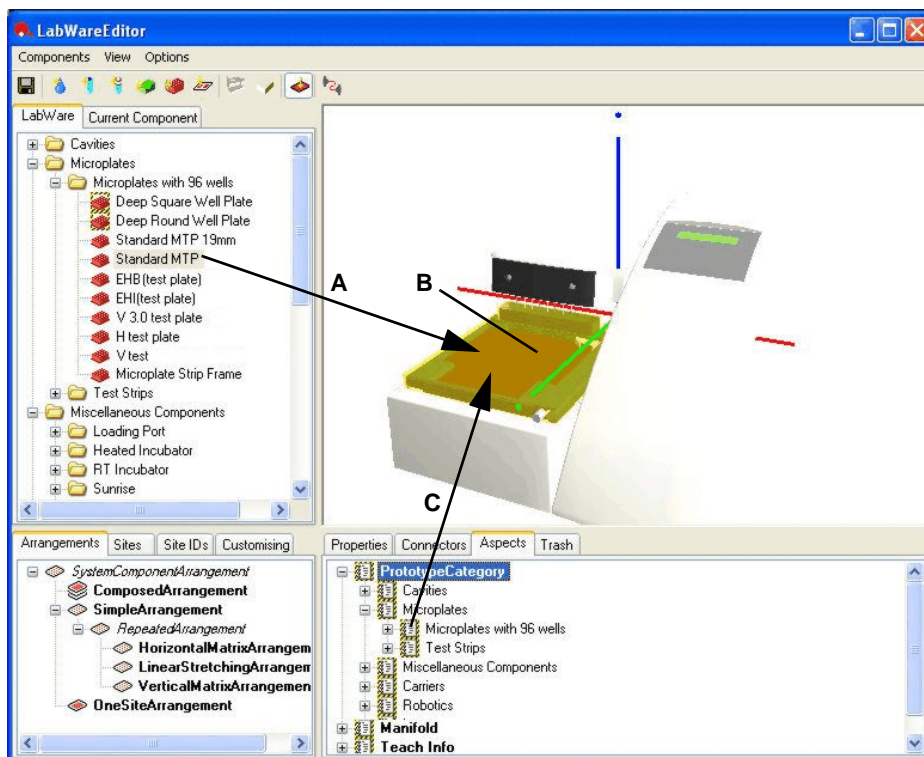


Fig. 9-40 Combining components with only one possible site

- A** Drag and drop from the **Labware** component tree view
- B** Possible site where the dragged component can be dropped onto the current component
- C** Drag and drop from the **Aspects** tree view.

Several Possible Placing Sites:

If on the current component there is more than one possible site for placing the dragged component (e.g. when a microplate is dropped onto a 3 microplate carrier), the dragged component must be placed on the appropriate site before dropping it. The site where the component will be dropped is highlighted.

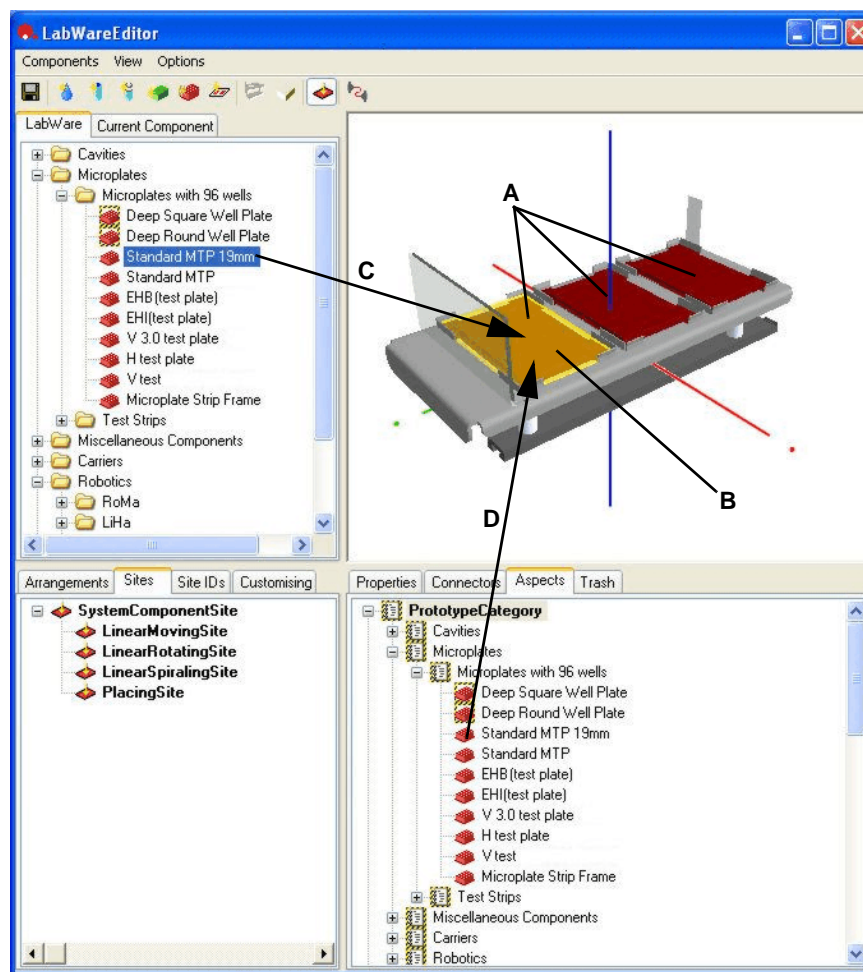


Fig. 9-41 Combining components with several possible sites

- | | |
|---|--|
| <p>A Three possible sites where the dragged component can be dropped</p> <p>B Selected site for component placement</p> | <p>C Drag and drop from the Labware component tree view</p> <p>D Drag and drop from the Aspects tree view.</p> |
|---|--|

Note: Make sure to drag and drop a component that, together with the current component, results in a sensible combination of components. The software does not carry out a plausibility test on the combination.

9.3.8.2 Creating a Component

To create a new component:

- 1 In the **Components** menu, click the **New Composed Prototype** item
Or click the **New Composed Component** button in the toolbar.

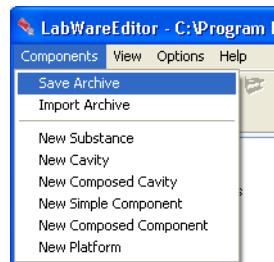


Fig. 9-42 File menu and new composed component button in the toolbar

In the graphical component view (upper right), the graphical representation for a new component is displayed.

*In the component tree view (upper left), below the **Not yet categorised components** folder, the new entry, **no name**, is displayed to the left of the composed component icon.*

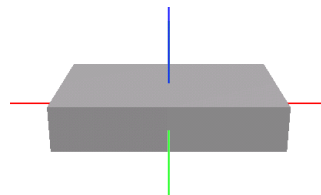


Fig. 9-43 Graphical representation for a new component

- 2 In the component tree view (upper left), double-click the **Current Component** tab. The tree view shows an entry for the new component.

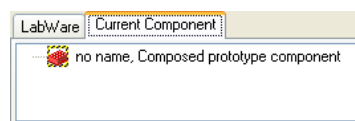


Fig. 9-44 Tree view entry for a new component

Note: *The name of the selected component can not be changed in the Current Component tree view. To rename the selected component, use the **Properties** screen on the right-hand side.*

- 3 Click the **no name, Composed prototype component** item in the component tree view, to select it.
- 4 Click the **Properties** tab (lower right), to open the properties screen.

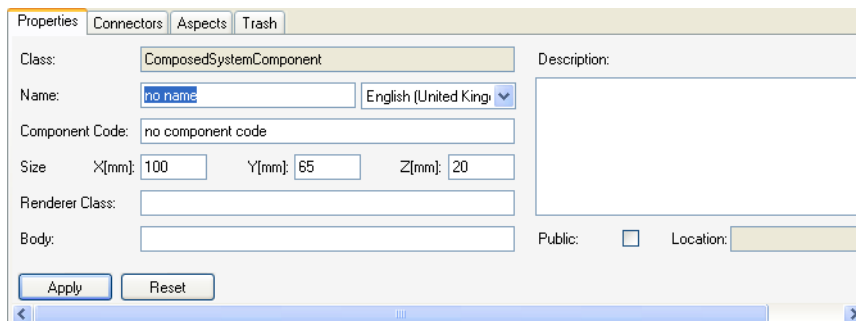


Fig. 9-45 New component properties screen

5 Type in the data field **Name**, to fill in a name for the component. This name will also be used in the component tree view (upper left).

6 In the **Language** field, select a suitable language for component name display and component treatment.

*The available languages are organized in a tree structure, the toplevel of which is **indifferent language**. Components, sites and substances have the language property, but not aspects, arrangements or connectors.*

7 In the data field **Component Code**, fill in a suitable code for the component. This code will be used for the connector description.

8 In the data fields under **Size**, fill in values for the rack's **length**, **width** and **height**.

9 In the field **Renderer class**, fill in the filename of a suitable graphic file for the visualization of the rack, if such a file is available. The graphical representation of the rack will be updated after the **ENTER** key has been pressed, or the **Apply** button has been clicked.

Depending on the rack type, one of the following graphic files can be sufficient for rack visualization:

- Strip Rack 13mm.wld
- Strip Rack 16mm.wld
- Trough Rack.wld
- Microplate 96.wld.

10 In the field **Body file**, fill in the file name of the appropriate file containing the overall measurements of the rack used for collision detection.

11 For the Body resolution entry, either select **Yes** or **No**.

*Body resolution: for each component on the worktable or on/in another component, collision detection is calculated using the body file. However, after carrying out the collision detection for the overall microplate shape, it is superfluous to do also a collision detection calculation for each of the 96 wells in the microplate (system performance). With the body resolution for the wells set to **NO**, collision detection for them is switched off, and collision detection is calculated only for the component one level above the wells in the component tree view, i.e. only for the overall microplate shape.*

12 Type in a descriptive text in the text field under **Description**.

13 Press the **ENTER** key

Or click the **Apply** button, to save the data you supplied. The graphical representation of the rack is updated.

9.3.8.3 Copying a Component

Components can be copied in the component tree view (upper left).

To copy a system component:

- 1 Click the component to be copied in the component tree view, to select it. The component is highlighted.
- 2 Right-click in the component tree view, to open the context menu.
- 3 Click the context menu command **Copy**.
- 4 A copy of the selected component is inserted in the tree view, with the name **Copy of n**.

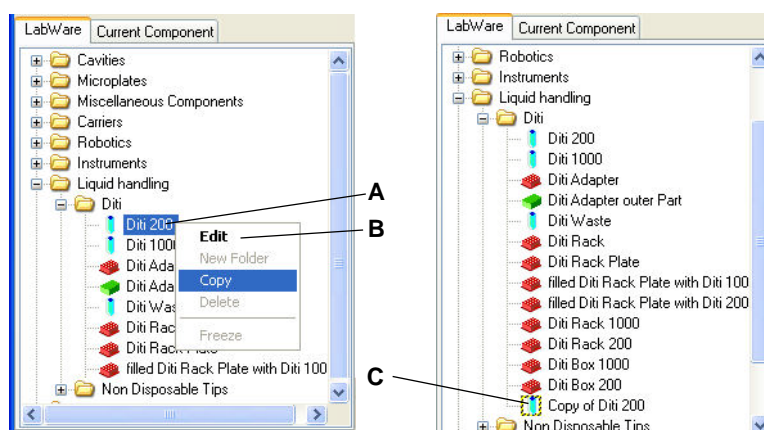


Fig. 9-46 Copying a component in the tree view

- | | |
|---|--|
| <p>A Component selected for copying</p> <p>B Context menu</p> | <p>C Copy of the selected component</p> |
|---|--|

9.3.8.4 Modifying a Component

Components can be modified in their property views (lower right).

To modify a component:

- 1 Click the component in the component tree view (upper left) or the graphical component view, to select it. The component appears highlighted.
- 2 In the component's property sheet (lower left), type in the data fields to change the component's properties.
- 3 Click the **Apply** button in the component's property sheet, to apply your changes.

9.3.8.5 Deleting a Component

When a component is deleted, its connectors are also deleted from the database. When a component is disconnected it is only removed from the component tree view and the graphical component view.



ATTENTION

The **Delete** command removes components from the system, so they will no longer be available.

- ♦ Make sure that you will never again need the component to be deleted.
- ♦ Make sure that the component in question is not in use elsewhere.
- ♦ Make sure that a recent backup of the labware editor files, so as to be able to restore erroneously deleted components or files.

The command **Delete** is available from the context menu, under the tabs **Current Component** and **Labware**. It deletes the selected component from the tree view it was selected in, unless it has the status **frozen**.

9.3.8.6 Replacing a Component

To replace the current component:

- 1 In the component tree view, under the tab **Labware** or **Current Component**, double-click the component which you want to use as the current component.
- 2 The selected component is shown in the graphical component view and in the component tree view, under the **Current Component** tab.

To replace a component positioned on another component:

- 1 In the graphical component view, click the component, to select it. The component appears highlighted.
- 2 Right-click in the graphical component view, to open the context menu.
- 3 In the context menu, click to select the **Disconnect** command. The selected component is removed from the graphical component view and from the component tree view.
- 4 In the component tree view, under the **Current Component** tab, select the replacement component and drag and drop it onto the component in the graphical component view. The dropped component appears in the graphical view and in the component tree view.

9.3.8.7 Disconnecting a Component

The context menu command **Disconnect** removes the selected component instance from the component tree view and from the graphical view. The component is, however, still available in the component tree view, under the tabs **Labware** and **Current Component**.

Also, when the **Disconnect** command is executed on a selected site in the component tree view, the component situated on that site is removed.

Note: *This command is only applicable to a daughter component added to the current component, but not the current component itself. To remove the current component from the **Current Component** tree view and from the graphical view, another component must be selected as the current component.*

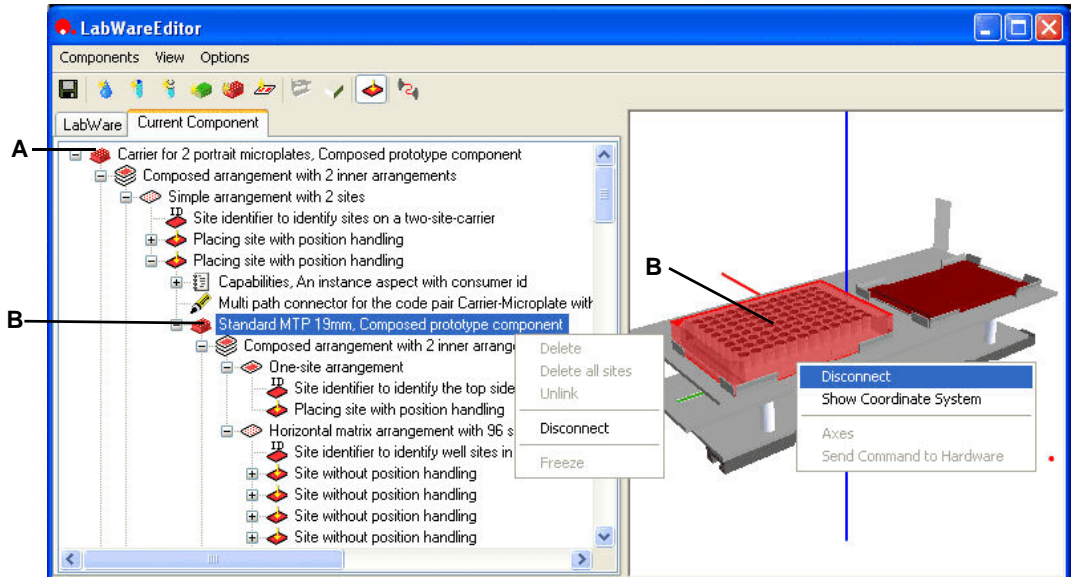


Fig. 9-47 Context menu command disconnect

A Mother component in **Current Component tree view**

B Selected (highlighted) daughter component, being disconnected by the menu command

9.3.9 Managing Arrangements

The principal screens for the management of arrangements are the **Current Component** tree view and the arrangement templates tree:

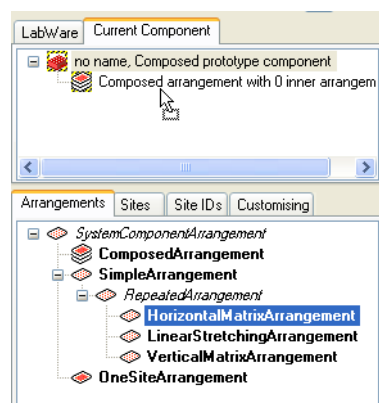


Fig. 9-48 Screens for arrangement management

9.3.9.1 Creating an Arrangement

To create an arrangement:

- 1 Make sure that in the component tree view under **Current Component** there is a composed system component under construction, i.e. without any arrangement yet, or with a composed arrangement.
- 2 In the templates tree view (lower left) click the **Arrangements** tab, to open the arrangements tree view.
- 3 Click to drag and drop an appropriate arrangement or matrix template onto the component or arrangement in the component tree view. An arrangement or matrix of the selected type is created in the component tree view.

Note: The arrangement or matrix is not immediately visible in the graphical component view. Only when sites are added to it in the **Current Component** view, the sites will be visible as red areas.

9.3.9.2 Modifying an Arrangement

To modify an arrangement:

- 1 In the **Current Component** tree view, click the arrangement or matrix you are going to modify. It is highlighted in the component tree view.
- 2 In the properties screen (lower right), click the **Properties** tab, to open the arrangement or matrix property sheet.
- 3 Type in the arrangement's data fields, to modify the arrangement.or matrix.

Note: Certain matrix arrangement properties can not be changed, once the matrix with its sites has been created. To change these properties, you have to remove the sites from the matrix in question. The fixed elements are the following:

- number of rows
- number of columns
- matrix arrangement
- number of sites.

4 In the properties screen, click the **Apply** button, to apply your changes to the arrangement or matrix.

9.3.9.3 Deleting an Arrangement

Note: Arrangements and their contents (sites and components on them) can only be deleted in components that have been copied, i.e. whose write-protection has been removed.

Note: Arrangements and their contents (sites and components on them) can only be deleted from bottom to top, i.e.:

- first the components or cavities on the sites in the arrangement must be deleted
- then the sites themselves can be deleted
- then the arrangement can be deleted.
- These three steps must possibly be run recursively from bottom to top, until the arrangement in question can be deleted.

Note: The **Disconnect** command is executed on the site containing a cavity or component, to remove this cavity or component from the site.

To delete an composed or simple arrangement:

- 1 Expand the **Current Component** tree view, to display the arrangement you are going to delete.
- 2 In the **Current Component** tree view, click the site or component or cavity furthest down below the arrangement you are going to delete.

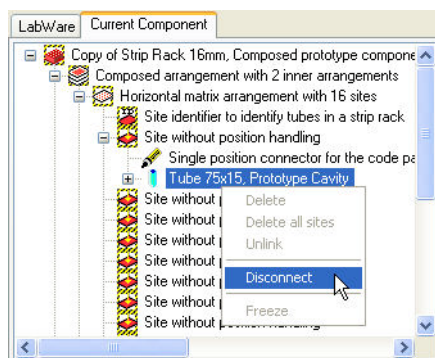


Fig. 9-49 Arrangement deletion: Disconnecting the component/cavity

- 3 Right-click in the tree view, to open the context menu.

- 4 Click to select the **Disconnect** item in the context menu. The disconnected component or cavity is removed from the **Current Component** tree view and from the graphical component view.
- 5 In the **Current Component** tree view, click the arrangement containing the site(s) which are now furthest down below the arrangement you are going to delete.

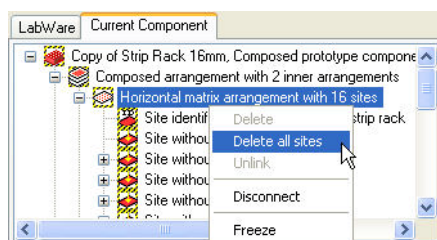


Fig. 9-50 Arrangement deletion: Deleting all sites

- 6 Right-click in the tree view, to open the context menu.
- 7 Click to select the **Delete all Sites** item in the context menu. The deleted site(s) is/are removed from the **Current Component** tree view and from the graphical component view.
- 8 In the **Current Component** tree view, click the arrangement furthest down below the arrangement you are going to delete.

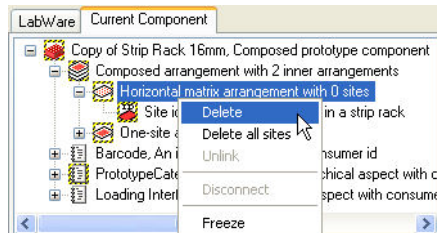


Fig. 9-51 Arrangement deletion: Deleting an arrangement

- 9 Right-click in the tree view, to open the context menu.
- 10 Click to select the **Delete** item in the context menu. The arrangement is removed from the tree view.
- 11 If, moving upwards in the component tree view, you have not yet reached the arrangement you are going to delete, repeat steps 2 through 10 analogously, until the intended arrangement is deleted.

9.3.9.4 Replacing an Arrangement

Note: If, to replace another arrangement, an arrangement is dragged and dropped onto a component, the newly added arrangement replaces the originally used arrangement. The replaced arrangement is moved to the **Trash** list (lower right).

To replace an arrangement:

- 1 In the **Labware** tree view, double-click the component to which the arrangement belongs, to make it the current component.
- 2 Click the **Current Component** tab, to open the current component tree view.
- 3 In the current component tree view, click to expand the tree view until the arrangement to be replaced is visible in the tree.
- 4 In the template screen (lower left) click the **Arrangements** tab, to open the arrangement template tree.
- 5 Click the replacement arrangement in the template tree view, to drag and drop it onto the component or arrangement it will belong to. The replacement arrangement is shown in the current component tree view, and the originally used arrangement is moved to the **Trash** list in the properties screen (lower right).

9.3.10 Managing Sites

9.3.10.1 Creating a Site

Sites are attributed to arrangements by dragging and dropping them from the sites template view (lower left) to the Current Component view (upper left).

To create a site or site matrix:

- 1 Make sure that in the component tree view under **Current Component** there is a composed system component under construction, i.e. with an arrangement or with a composed arrangement.
- 2 In the template screen, click the **Sites** tab, to open the site template tree view.
- 3 In the site template tree view, click the appropriate site type, to drag and drop it onto the arrangement in the current component tree view. The new site is added to the component tree view and to the graphical component view.

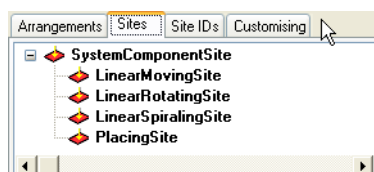


Fig. 9-52 Sites templates, available for assignment by drag and drop

9.3.10.2 Modifying a Site

Note: Be aware that the position of a site (coordinates) can be handled in the site properties, but also in the matrix arrangement the site belongs to, or in the arrangement.

To modify a site:

- 1 Click the site in the **Current Component** tree view, to select it.
- 2 In the properties screen (lower right), click the **Properties** tab, to open the site property sheet.
- 3 Type in the site property sheet, to modify the site.
- 4 In the site property sheet, click the **Apply** button, to apply your changes.

9.3.10.3 Deleting a Site

Note: Sites can only be deleted as a whole group from an arrangement. Furthermore, sites are not deleted when there are cavities or components connected to them.

To delete the sites managed by an arrangement:

- 1 Click the arrangement containing the site(s) in the **Current Component** tree view, to select it.
- 2 Right-click in the tree view, to open the context menu.
- 3 In the context menu, click the **Delete all sites** command, to delete all sites in the arrangement. The sites are deleted immediately and removed from the component tree view and the graphic component view, to the **Trash** list in the properties screen (lower right).

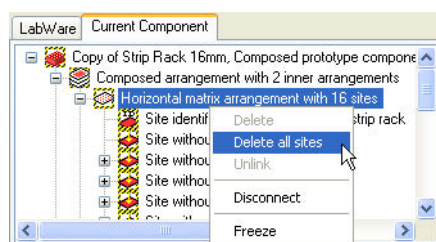


Fig. 9-53 Delete all sites command

9.3.10.4 Replacing a Site

To replace a site:

- 1 Expand the **Current Component** tree view to display the arrangement containing the site(s).
- 2 From the templates screen (lower left), click the replacement site to drag and drop it on the target arrangement. The dropped site is added to the arrangement in the component tree view, the replaced site is moved to the **Trash** list (lower right).

9.3.10.5 Disconnecting a Site

When the **Disconnect** command is executed on a site symbol in the **Current Component** tree view, the system component situated on that site is disconnected.

9.3.11 Managing Connectors

9.3.11.1 Creating a Connector

When a system component is attributed to a site, a suitable connector is created automatically.

- If only one connector type can be attributed to the system component, a default connector is added automatically to the component, without dialog.
- If several connector types can be attributed to the system component, a connector type selection dialog pops up. In the dialog, the type for the new connector can be selected.

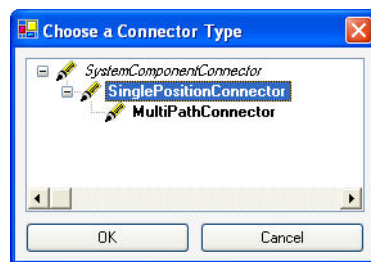


Fig. 9-54 Connector types

9.3.11.2 Modifying a Connector

To modify connectors for system components or single position connectors:

- 1 In the component tree view, click the connector to be modified, to select it.
- 2 In the properties screen (lower right), click the **Properties** tab.
- 3 Edit the connector properties as required. If you are modifying a multi path connector, refer to section below.
- 4 In the Properties screen, click the **Apply** button, to apply your changes.

Multi Path Connectors

Note: The properties view of a multi path connector allows for the declaration of the various ways the component can approach the site or withdraw from it.

Connection Tab: Modifying Component Position on a Site

Under the **Connection** tab in the connector property screen (lower right), the component position on the site is specified.

To change the component's position on the site:

- 1 In the **Current Component** tree view, click the multi path connector you are going to modify.

- 2 In the properties screen (lower right) under the **Connection** tab, type to edit the component position on the site.
- 3 In the properties screen, click the **Apply** button, to confirm your changes.
- 4 If you intend to test the component's position on the site, click the **Test** button. The component occupying its position on the site is visualized in the graphical component overview, allowing for a visual check of the component's position on the site.

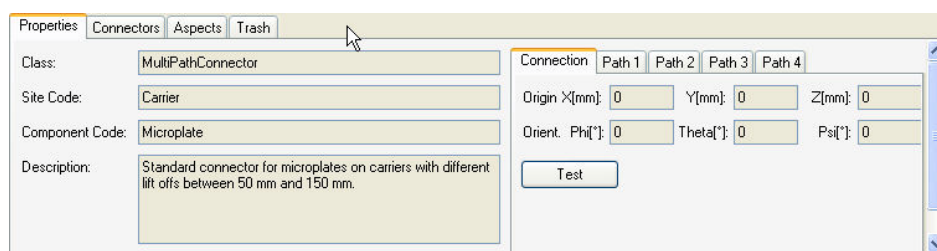


Fig. 9-55 Multi path connector properties: Connector tab

Path Tab: Modifying Component Path Towards/Away from a Site

Under the **Path** tab, the changing positions during the component's approach (**coming**) to the site are listed by their X-, Y-, and Z-coordinates and the Euler angles. Each line in the table corresponds to one position on the approach path. The positions during the component's withdrawal are listed in the **outgoing** table.

To change a position in the component's approach path or withdrawal path:

- 1 In the **Current Component** tree view, click the multipath connector to be changed, to select it.
- 2 In the properties screen (lower right), click the **Path** tab, to open the path table.
- 3 In the path table, click a field with the coordinate you are going to change. The write cursor is placed in the field.
- 4 Type in the selected field, to change the coordinate.
- 5 For testing the new position in the **coming** or **outgoing** path, click in the table line (position specification) to be tested. The line is selected, and the arrow in the table margin marks the selected line.
- 6 Click the **Test** button. The selected component position is visualized in the graphical component view.
- 7 Repeat steps 3 through 6 for further adjustments of the component's path.

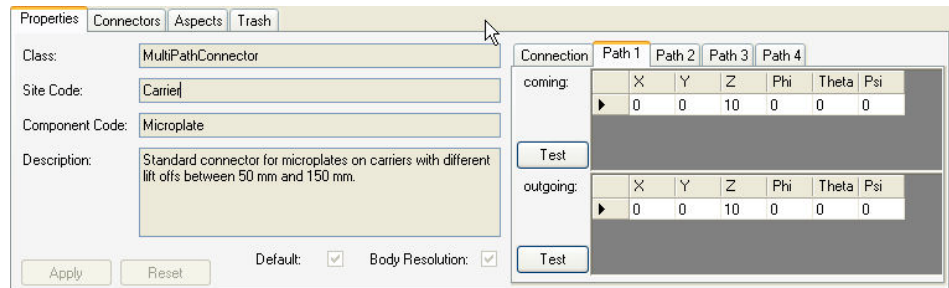


Fig. 9-56 Multi path connector properties: Path tab

New Path Tab: Creating a Component Path Towards/Away from a Site

Under the **New Path** tab, a new path for the component's approach to the site can be entered by enumerating the positions on the path.

To create a new path for a component:

- 1 In the **Current Component** tree view, click the multipath connector for which a new path must be specified, to select it.
- 2 In the properties screen (lower right), click the **New Path** tab, to open the path table.
- 3 In the path table, click a field in the line with the * symbol in the left table margin, to enter a coordinate for the path. The write cursor is placed in the field.
- 4 Type in the selected field, to specify the coordinate.
- 5 Repeat steps 3 and 4, until all coordinates are specified.
*To advance from one field to the next and from one line to the next, press the **TAB** key on your keyboard, to move back one field or line, press **SHIFT + TAB**.*
- 6 For testing the new position in the **coming** or **outgoing** path, click in the table line (position specification) to be tested. The line is selected, and the arrow in the table margin marks the selected line.
- 7 Click the **Test** button. The selected component position is visualized in the graphical component view.
- 8 To add a new position (table line) to the path, click a field in the last table line marked with the * symbol and carry out steps 3 through 7 for the new position.
- 9 To delete erroneous or superfluous lines, select them and press the **Delete** key. The selected line is immediately removed from the table, without user confirmation.
- 10 Repeat steps 3 through 8 as required for further adjustments of the component's path.

Note: The values in the position table are saved automatically, even without pressing the Apply button.

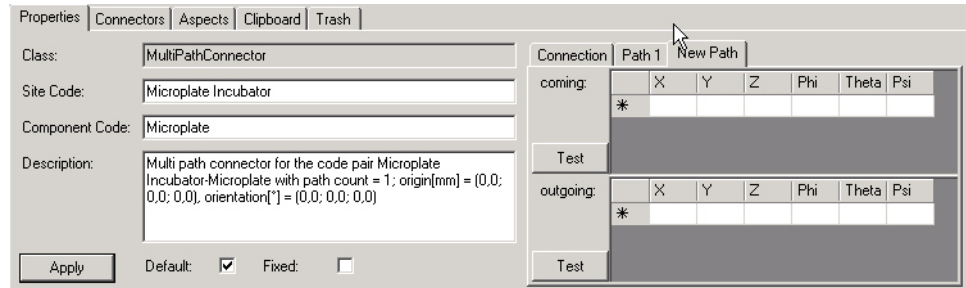


Fig. 9-57 Multi path connector properties: New path tab

Testing a Multi Path Connector

An existing path for the approach of a component to a site can be tested by selecting one of the specified positions (clicking in the left table margin) and then pressing the **Test** button. Then the component accessing the selected position is visualized in the graphical component overview.

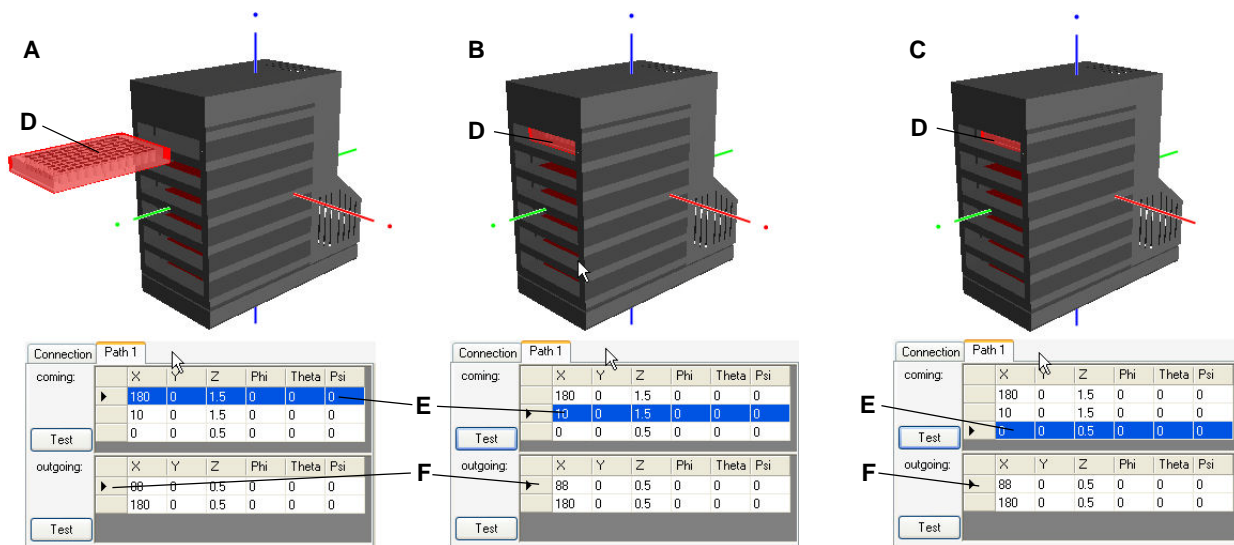


Fig. 9-58 Multi path test

- A** Test of first position on component approach path
- B** Test of second position on component approach path
- C** Test of third position on component approach path
- D** Component approaching the site
- E** Tested position specification for the component accessing the site
- F** Left table margin, for selecting a position specification

List of Possible Connectors

The properties screen section, under the **Connectors** tab, shows all connectors that can be attributed to the selected daughter component:

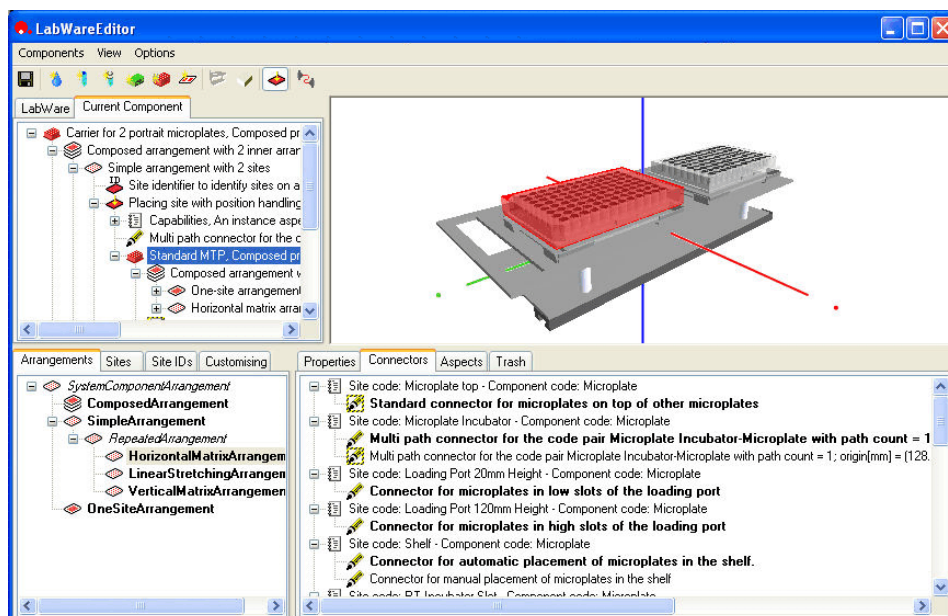


Fig. 9-59 Possible connectors for the selected component

E.g. in the case of a standard microplate placed on a carrier, the following possible connectors are listed:

- ◆ Connector for microplates in high slots of the loading port
- ◆ Connector for microplates in low slots of the loading port
- ◆ Multi path connector for the code pair Microplate Incubator-Microplate with path count
- ◆ Standard connector for microplates on carriers
- ◆ Second standard connector for microplates on carriers (180° rotated)
- ◆ Standard connector for microplates on top of other microplates.

Among these, the two **standard connectors for microplates on carriers** describe the microplate's placement on the carrier.

9.3.11.3 Deleting a Connector

Connectors are inserted and deleted automatically by the software:

- ◆ When a component is positioned on a site, a default connector is added to the **Current Component** tree view.
- ◆ When a component is disconnected, its connectors are deleted from the **Current Component** tree view.

9.3.11.4 Replacing a Connector

The default connector describing the standard position is created per default when a component is positioned upon another by drag and drop. This connector can be replaced by another connector, describing a different position (e.g. the **Second standard connector for microplates on carriers**).

To replace a connector:

- 1 In the **Current Component** tree view click the + symbols next to the components and sites, to display the connector to be replaced.
- 2 Click the connector you are going to replace, to select it.
- 3 In the properties view (lower right), click the **Connectors** tab. a tree view of the possible connectors for the affected component pair is displayed.
- 4 In the tree of available connectors, click a connector, to drag and drop it on the affected site in the **Current Component** tree view. The existing connector is replaced by the dropped connector. In the graphical component view, the position of the affected component changes as the case may be.

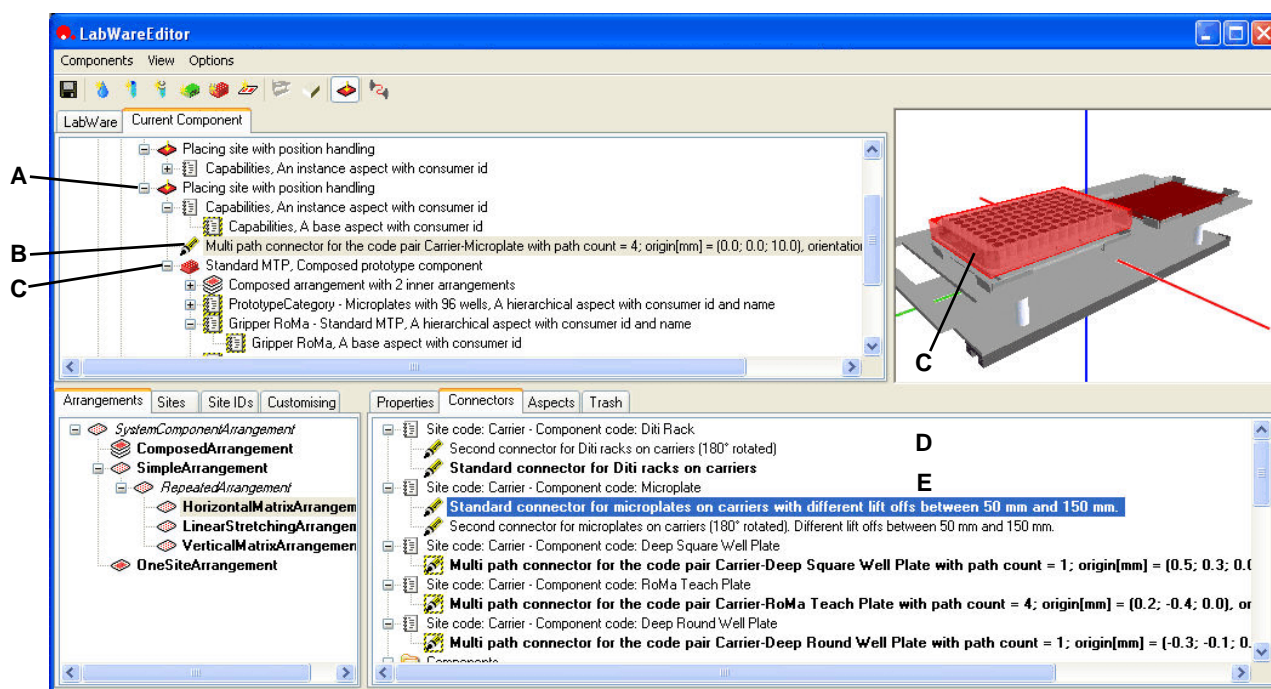


Fig. 9-60 Example: Connector replacement by drag and drop

- | | |
|--|---|
| <p>A Site carrying the component (microplate), destination for the drag and drop operation</p> <p>B Connector describing the component (microplate) position on the site (carrier)</p> | <p>C Component (microplate) whose position on the site is described by the connector</p> <p>D List of possible connectors for the affected components (carrier and microplate)</p> <p>E Connector replacing the standard connector (B)</p> |
|--|---|

9.3.12 Managing Aspects

The principal screens for the management of aspects are the **Current Component** tree view and the **Aspects** tab in the properties screen.

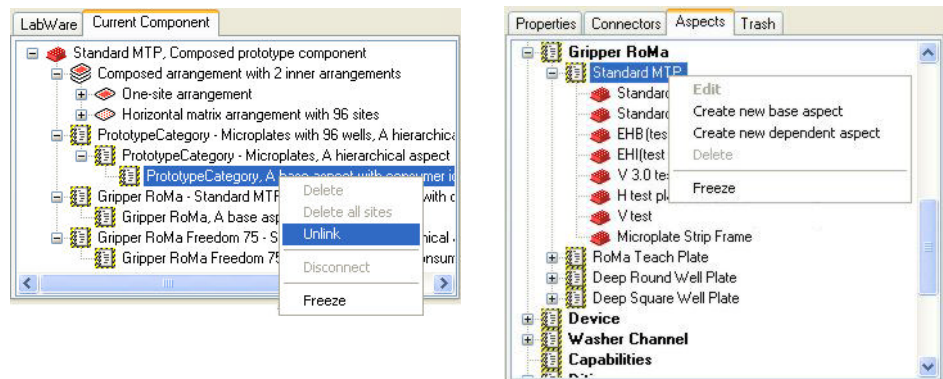


Fig. 9-61 Managing aspects, screens

The tree view under the **Aspects** tab displays an overview of all existing aspects (folder symbols) and of the components having these aspects.

9.3.12.1 Creating a New Aspect

To create a new aspect:

- 1 Click the **Aspects** tab in the lower right screen zone, to open the **Aspects** screen.
- 2 If you intend to create a new dependent aspect (depending on an existing aspect), right-click on the existing superordinate aspect to open the context menu.

Or select the superordinate aspect and right-click anywhere in the Aspects view, to open the context menu.

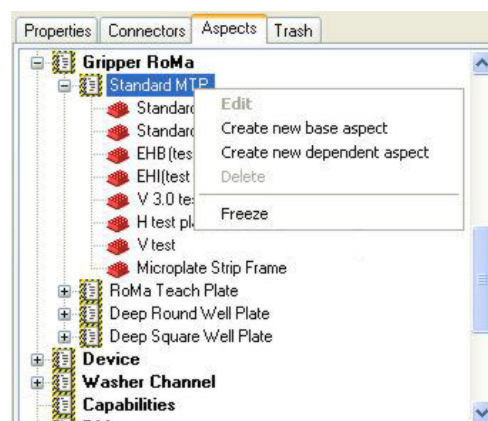


Fig. 9-62 Example aspects and context menu

- 3 Click **Create new dependent aspect** in the context menu.
Or click **Create new base aspect** in the context menu, to create a new base aspect.

The new aspect is created and appears as a new empty folder in the aspects hierarchy.

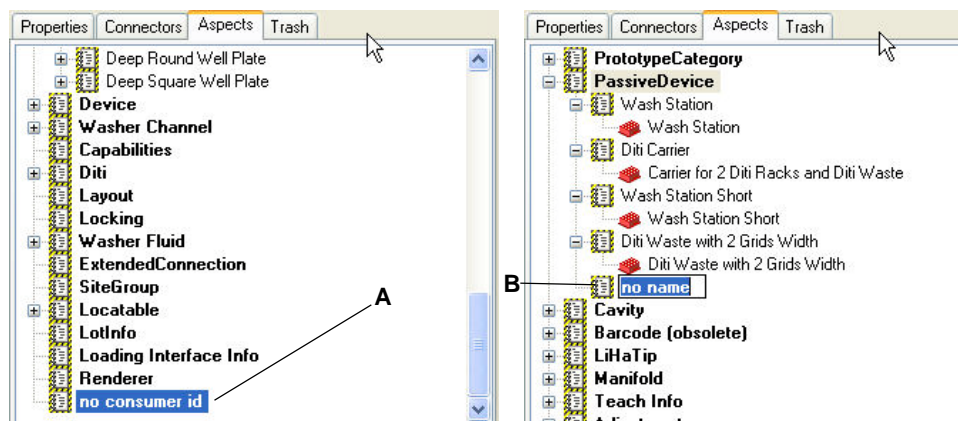


Fig. 9-63 New aspects

A New base aspect

B New dependent aspect (under the superordinate aspect **Passive Device**)

- 4 Slowly click the newly created aspect name, to rename the aspect. The aspect designation remains highlighted, with the writing cursor at its end.
- 5 Type an appropriate aspect name. The initial aspect name is overwritten.
- 6 Press the **ENTER** key, to confirm renaming the aspect.
- 7 Continue by filling in the aspect details following the steps required for modifying an aspect.

Customization Templates

Templates for the aspect details are called customizations. They are available for drag and drop, from the template zone, **Customize** tab (lower left screen), to the **Custom. type** field in the properties zone (lower right screen).

9.3.12.2 Modifying an Aspect

To modify an aspect:

- 1 Click the aspect in the component tree view, to select it.
- 2 Click the **Aspects** tab in the properties screen (lower right), to display the aspect properties.
- 3 If in the customizations list under the **Customising** tab, a template for the aspect value table is available, drag and drop the customization to the **Custom. type** field in the properties view.

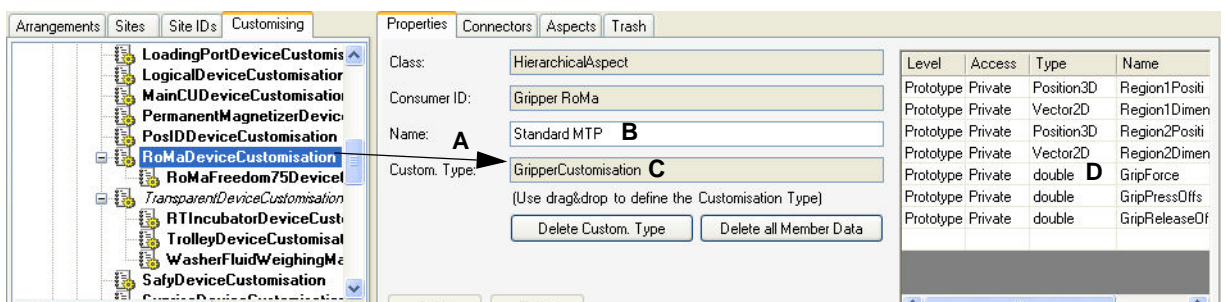


Fig. 9-64 Customization drag and drop

- | | |
|--|--|
| <p>A Drag and drop of a customization to the component</p> <p>B Editable Name field</p> | <p>C Destination for the drag and drop action</p> <p>D Value table</p> |
|--|--|

- 4 Click in the table fields in the aspect property screen, to edit the name or the value table of the selected aspect. The value table is updated, showing the values.
- 5 Click the **Apply** button, to apply your modifications
Or click the **Reset** button, to discard your modifications. A confirmation dialog is displayed.

9.3.12.3 Adding an Aspect to a Component

To add an aspect to a component:

- 1 In the **Aspects** tree in the properties screen (lower right), click the aspect, to drag and drop it on the component in the component tree view. The aspect is added to the component tree view, hierarchically below the component it was added to. Under the **Aspects** tab, the component with the newly attributed aspect is shown below the aspect's folder.

Note: Under the **Aspects** tab in the properties screen all aspects are listed, and also the components having these aspects. To drag and drop an aspect, make sure you drag and drop the folder symbol, not the component having this aspect.

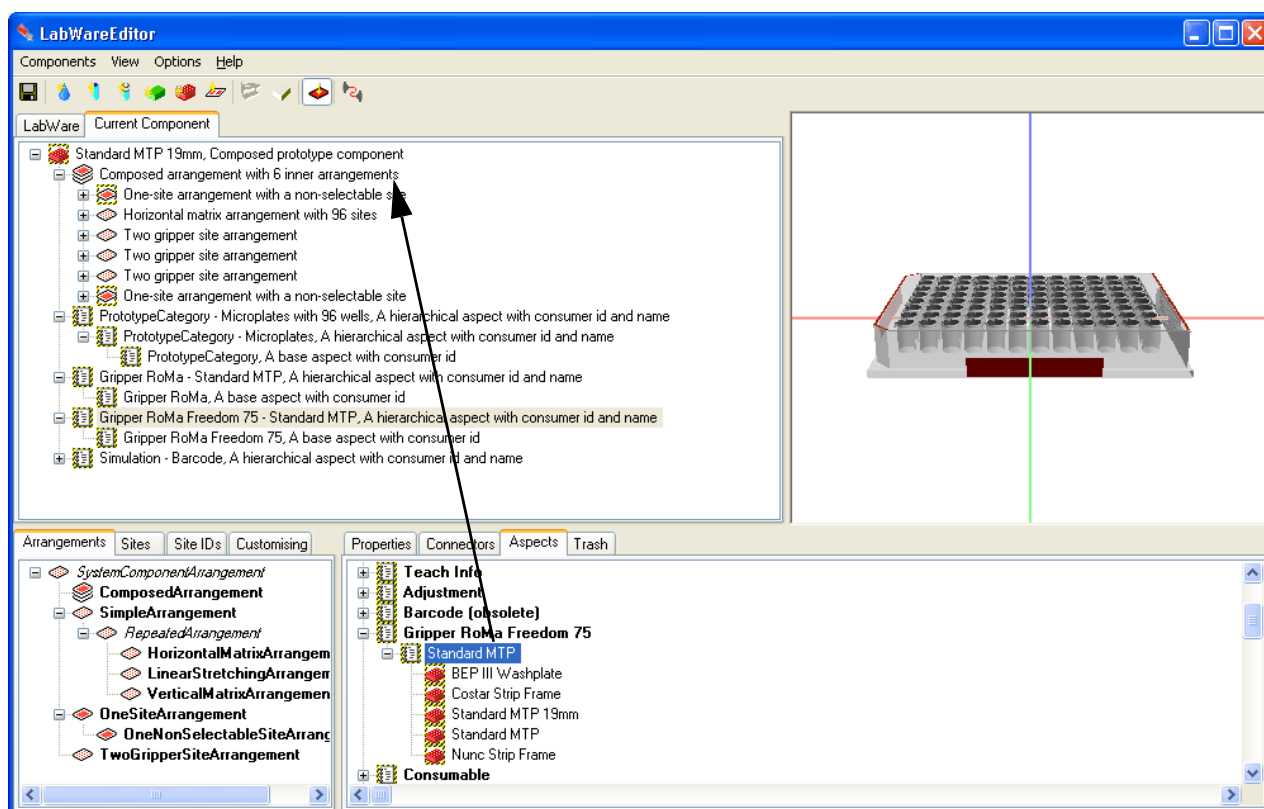


Fig. 9-65 Adding an aspect to a component

9.3.12.4 Unlinking an Aspect

To unlink an aspect from a component:

- 1 In the component tree view, click the aspect you intend to unlink, to select it.
- 2 Right-click in the component tree view, to open the context menu.
- 3 Click the **Unlink** item in the context menu. In the component tree view, the selected aspect is removed from the component. In the properties view under the **Aspects** tab, the component is removed from below the aspect's folder symbol.

9.3.13 Managing Customizations

9.3.13.1 Creating a Customization

Customizations are coded on demand by Tecan software engineers and can therefore not be created by the Freedom EVOLution SW user.

9.3.13.2 Modifying a Customization

Customizations are coded on demand by Tecan software engineers and can therefore not be modified by the Freedom EVOLution SW user.

9.3.13.3 Using Customizations

Customizations are templates for the aspect details table. They are ready to be dragged and dropped, from the template zone, **Customize** tab (lower left screen), to the **Custom. type** field in the properties zone (lower right screen).

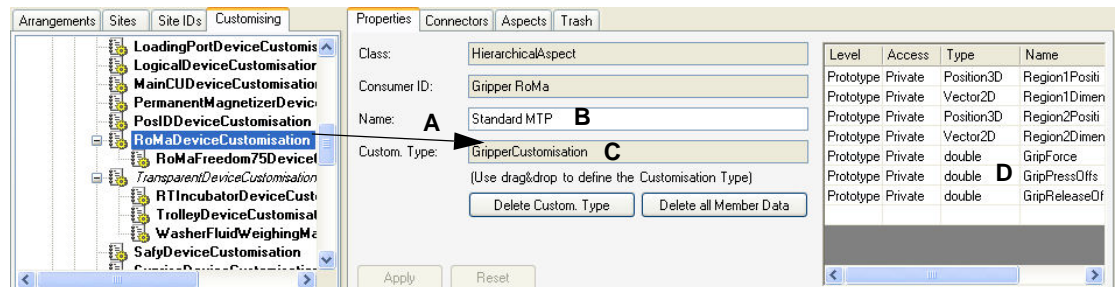


Fig. 9-66 Customization drag and drop

- A Drag and drop of a customization to the component
- B Editable **Name** field
- C Destination for the drag and drop action
- D Editable **value table**

9.3.13.4 Deleting a Customization

To delete a customization:

- 1 Make sure the aspect with the customization in question is selected.
- 2 Click the **Properties** tab, to visualize the aspect properties.

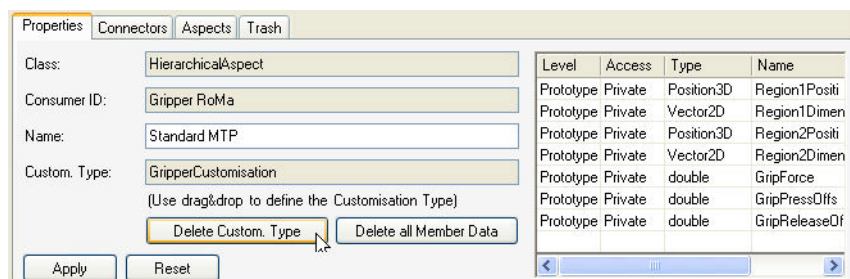


Fig. 9-67 Deleting a customization type

- 3 Click the **Delete Custom. Type** button, to delete the customization.
- 4 Click the **Apply** button, to apply your change.

9.4 Operating Sequence

9.4.1 General Operating Step Sequence

Creating a new system component in the labware editor involves the following steps:

- 1 Create a new component.
- 2 Fill in the new component's properties.
- 3 Apply the properties to the new component.
- 4 Drag a new composed arrangement and drop it on the new component.
- 5 Drag a simple arrangement (or another composed arrangement) and drop it on the composed arrangement.
- 6 Drag the appropriate site identifier and drop it on the arrangement.
- 7 Drag a site and drop it on the arrangement.
- 8 Fill in the site properties required.
- 9 Repeat steps 5 through 8 for all arrangements required.

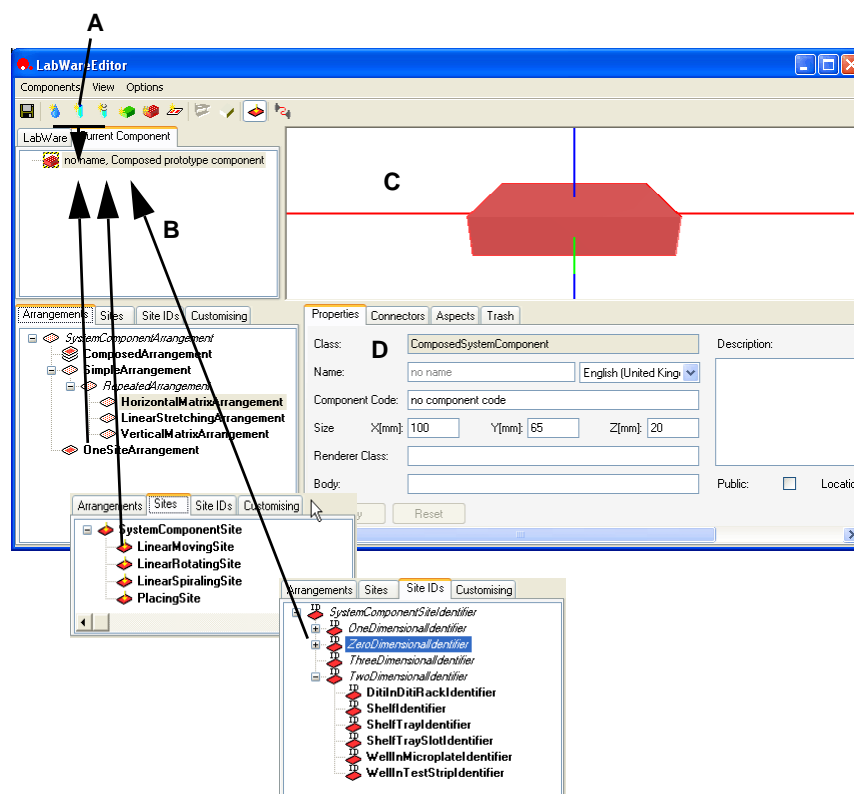


Fig. 9-68 General operating steps

- | | |
|---|--|
| <p>A Buttons for creating new components or cavities</p> <p>B Drag and drop from the templates lists to the new component</p> | <p>C Component visualization, showing each modification immediately</p> <p>D Component/matrix/cavity properties window</p> |
|---|--|

9.4.2 Startup

To launch the labware editor,

- 1 click the program icon in the Windows start menu or in the Explorer.



Fig. 9-69 Labware Editor program icon

9.4.3 Example: Building a Cavity

To build a new cavity:

- 1 In the **Components** menu, click the **New Cavity** item
Or click the **New Cavity** button in the toolbar.

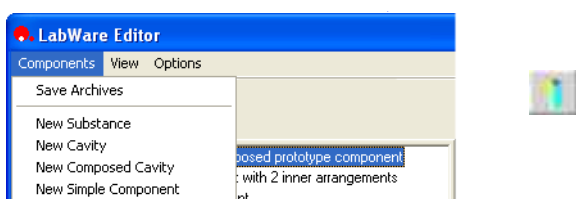


Fig. 9-70 File menu and new cavity button in the toolbar

In the graphical component view on the right, the graphical representation for a new cavity is displayed, and in the component tree view, below the **Not yet categorised components** folder, the new entry, **no name**, is displayed to the left of the blue cavity icon.

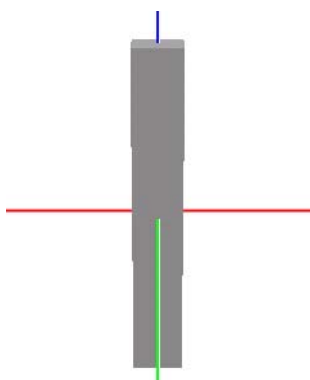


Fig. 9-71 Graphical representation for a new cavity

- 2 In the tree view on the upper left-hand side, click the **Current Component** tab. The tree view shows an entry, **no name, Prototype Cavity**.

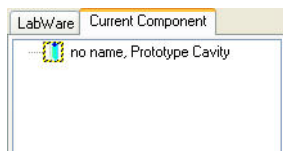


Fig. 9-72 Tree view entry for a new cavity

- 3 Click the **no name, Prototype Cavity** item in the tree view.
- 4 Click the **Properties** tab in the lower screen half on the right, to open the properties screen.

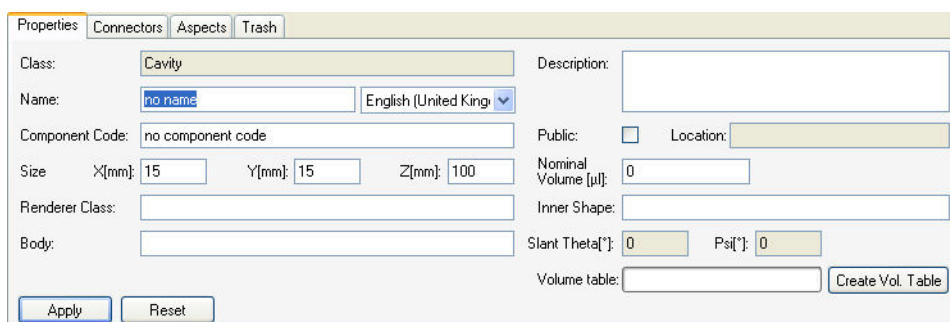


Fig. 9-73 New cavity properties screen

- 5 Type in the data field **Name**, to fill in a name for the cavity. This will also be the name for the cavity in the component tree view.
- 6 In the data field **Component Code**, fill in a suitable code for the cavity.
- 7 In the data fields under **Size**, fill in values for the cavity's **length, width and height**.
- 8 In the field **Renderer class**, fill in the filename of a suitable graphic file for the visualization of the cavity, if such a file is available. The graphical representation of the cavity will be updated after the **ENTER** key has been pressed.

Depending on the cavity type, one of the following graphic files can be sufficient for the cavity visualization:

- Well Flat Bottom 12mm.wld
- Tube 100x15.wld
- Tube 75x12.wld
- Tube 75x15.wld
- Trough.wld.

- 9 In the field **Body File**, fill in the file name of the appropriate file containing the overall measurements of the cavity used for collision detection.
- 10 Type in a descriptive text in the text field under **Description**.
- 11 Press the **ENTER** key

Or click the **Apply** button, to save the data you supplied. The graphical representation of the cavity is updated.

The cavity you designed will now be ready for use in the model of a suitable rack.

9.4.4 Example: Building a Tube Rack

Introduction

This section provides a step-by-step instruction about how to create a tube rack in the software.

Dimensions

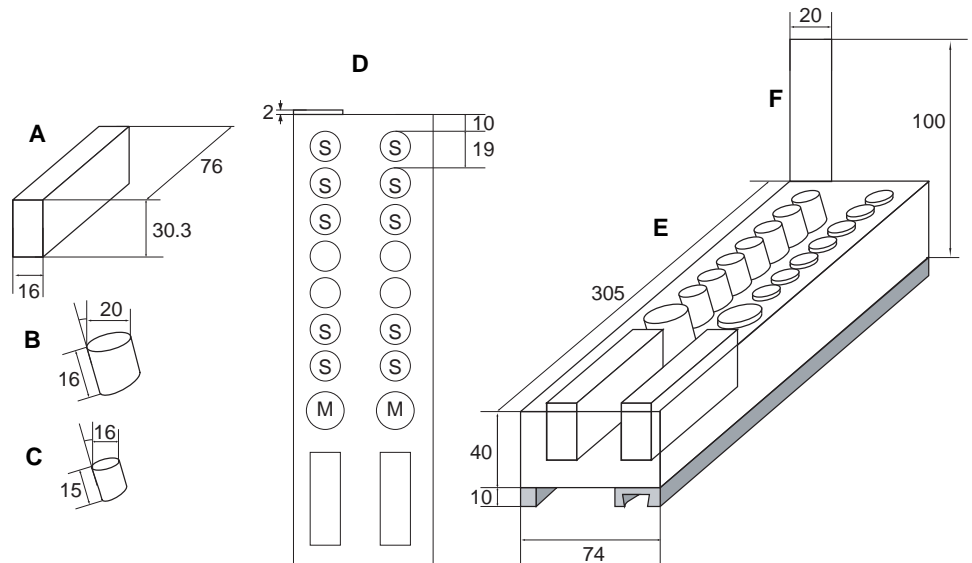


Fig. 9-74 Carrier, rack and containers

A Cavity: trough 16 x 76 x 30.3

B Tube hole 20 x 20 x 16

C Tube hole 16 x 16 x 15

D Top view of rack

E 3-D view of rack

F Barcode flag

The creation of this tube rack entails the following steps:

- ◆ Creating the trough 16 x 76 x 30.3
- ◆ Creating the rack
- ◆ Arranging the troughs on the rack
- ◆ Arranging the tube sites on the rack
- ◆ Adding the barcode flag

9.4.4.1 Building the Trough 16 x 76 x 30.3

To build the trough for the rack:

- 1 In the **Components** menu, click the **New Cavity** item
Or click the **New Cavity** button in the toolbar.

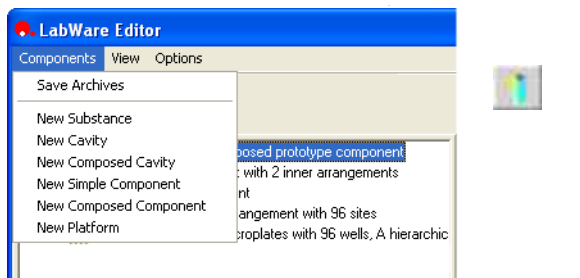


Fig. 9-75 File menu and new cavity button in the toolbar

In the graphical component view on the right, the graphical representation for a new cavity is displayed, and in the component tree view, below the **Not yet categorised components** folder, the new entry, **no name**, is displayed to the left of the blue cavity icon.

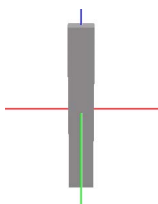


Fig. 9-76 Graphical representation for a new cavity

- 2 In the tree view on the upper left-hand side, click the **Current Component** tab. The tree view shows an entry, **no name, Prototype Cavity**.

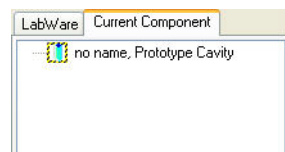


Fig. 9-77 Tree view entry for a new cavity

- 3 Click the **no name, Prototype Cavity** item in the tree view.
- 4 Click the **Properties** tab (lower right), to open the properties screen.
- 5 In the properties screen, type **Trough 16 x 76 x 30.3** in the data field **Name**, as name for the new trough. This will also be the trough's name in the component tree view.
- 6 In the data field **Component Code**, fill in **Trough** as component code for the cavity.
- 7 In the data fields under **Size**, fill in values for the trough dimensions:
 - **length: 16 mm**
 - **width: 76 mm**
 - **height: 30.3 mm.**

- 8 In the field **Renderer class**, fill in the filename **Trough.wld** for visualization purposes, if such a file is available. The graphical representation of the trough will be updated after the **ENTER** key has been pressed.
- 9 In the field **Body file**, fill in the file name of the appropriate file containing the overall trough measurements used for collision detection.
- 10 Type in a descriptive text in the text field under **Description**.
- 11 Press the **ENTER** key
Or click the **Apply** button, to save the data you supplied. The graphical representation of the trough is updated.

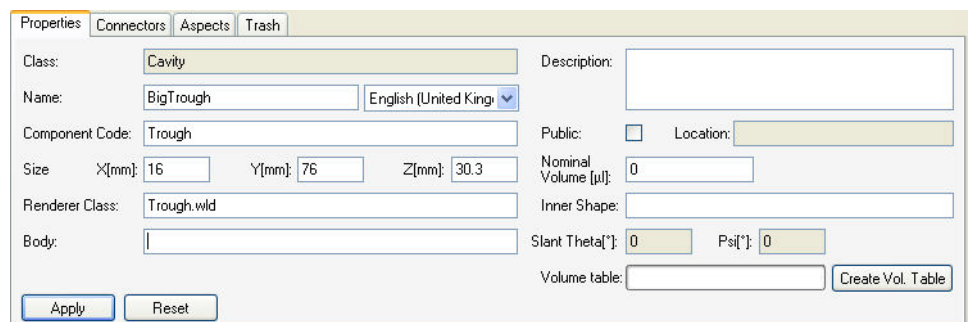


Fig. 9-78 New trough properties screen

Adding the Trough Aspect

- 12 Make sure that in the component tree view the **Current Component** is displayed.
- 13 In the properties view (lower right), click the **Aspects** tab.
- 14 Under the **Aspects** tab, find the **Cavity** folder and click its + symbol to open it.
- 15 Click the **RectangularCavity** aspect underneath the **Cavity** folder, to drag and drop it on the BigTrough entry in the component tree view.

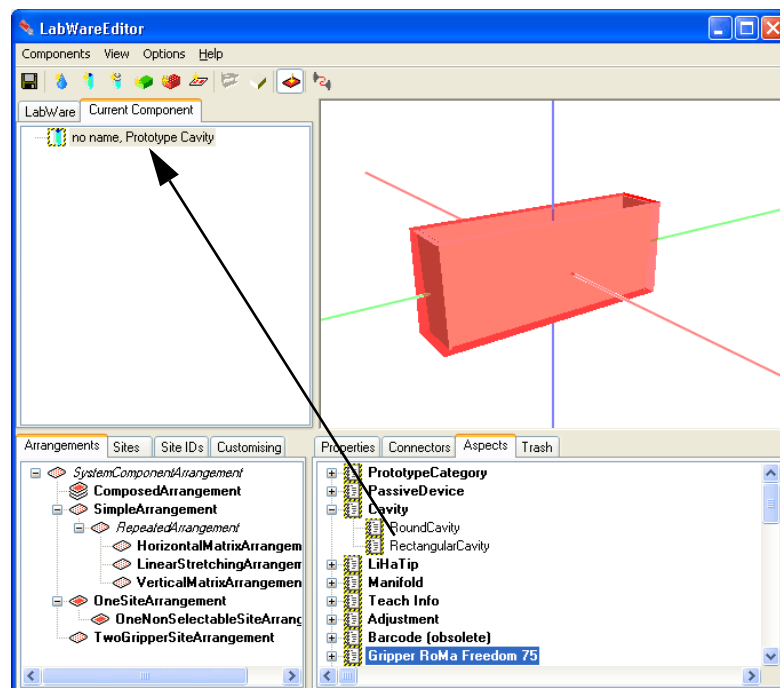
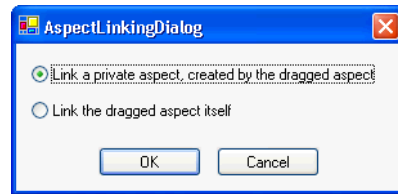


Fig. 9-79 Dragging and dropping an aspect



The *AspectLinkingDialog* appears.

- Select **Link a private aspect, created by the dragged aspect**.
- Click **OK**.

Fig. 9-80 *AspectLinkingDialog*

In the component tree view, the aspect is added to the *BigTrough* entry, and in the properties view, the entry *BigTrough* is added to the *Trough* aspect.

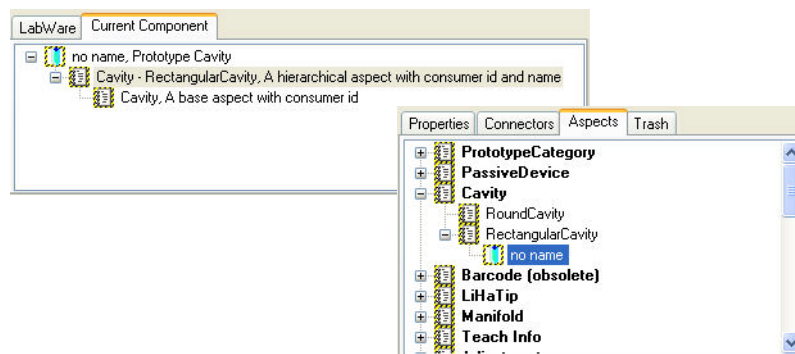


Fig. 9-81 *Updated component tree view and properties view*

After the *BigTrough* has been created, its *Trough* aspect must be adjusted.

Adjusting the Trough Aspect

- 16 Make sure that in the component tree view the *BigTrough* is displayed, and that its aspect is selected.

The *Properties* view (lower right) displays the *RectangularCavity* aspect, with its parameter table.

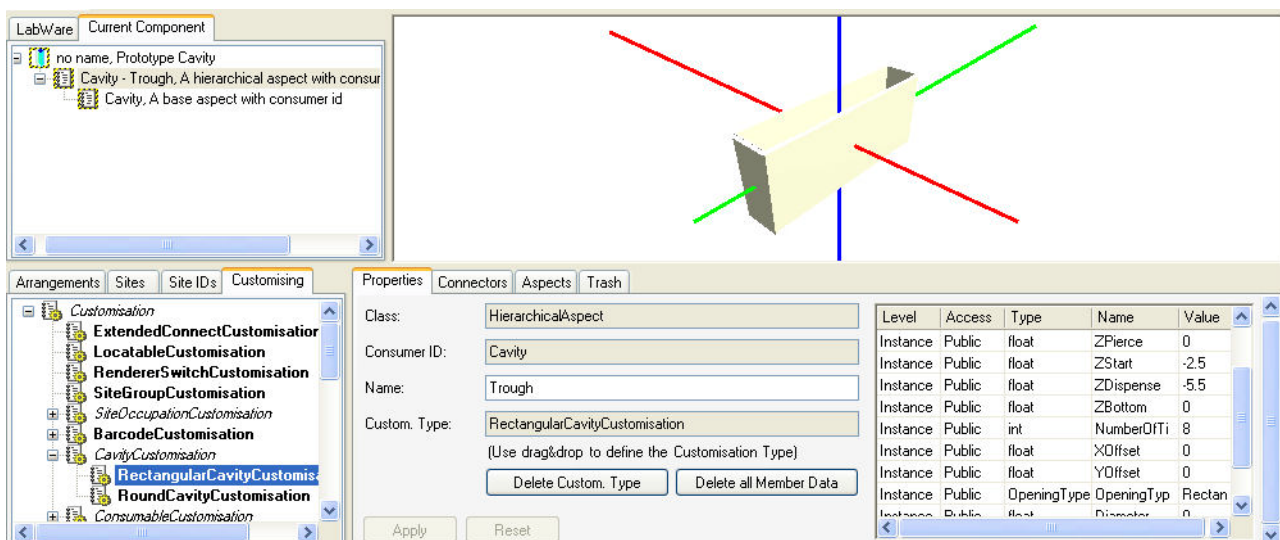


Fig. 9-82 *Trough aspect properties*

**Categorizing
the New Trough**

- 17 In the **Properties** view, click and type in the **Value** field of each parameter, to correct the parameter, according to the rack data sheet.
Every correction is saved automatically as soon as the cursor leaves the data field.
- 18 To move the BigTrough component from the **Not yet categorized** category to the **Cavity** category in the component tree view, find and open the **PrototypeCategory** folder under the **Aspects** tab in the properties screen (lower right).
- 19 Below the **PrototypeCategory** folder, find the **Cavities** aspect (folder symbol).
- 20 Click the **Cavities** aspect, to drag and drop it on the **BigTrough** entry in the component tree view.

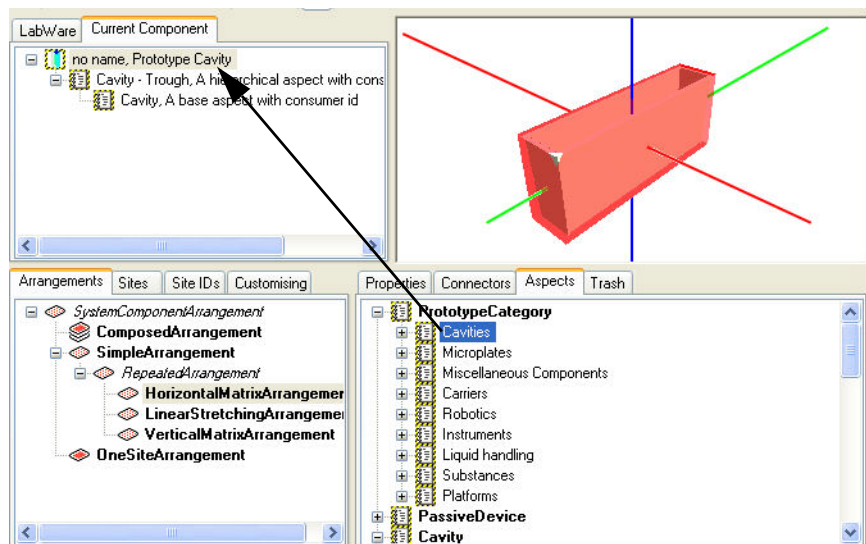


Fig. 9-83 Dragging and cropping the cavities aspect

In the component tree view, the aspect is added to the **Current Component**, i.e. **BigTrough** (A).

In the properties view, the **BigTrough** entry is added to the **PrototypeCategory** aspect **Cavities** (B).

Also in the component tree view, under the **Labware** tab, the **BigTrough** is now categorized under **Cavities** (C).

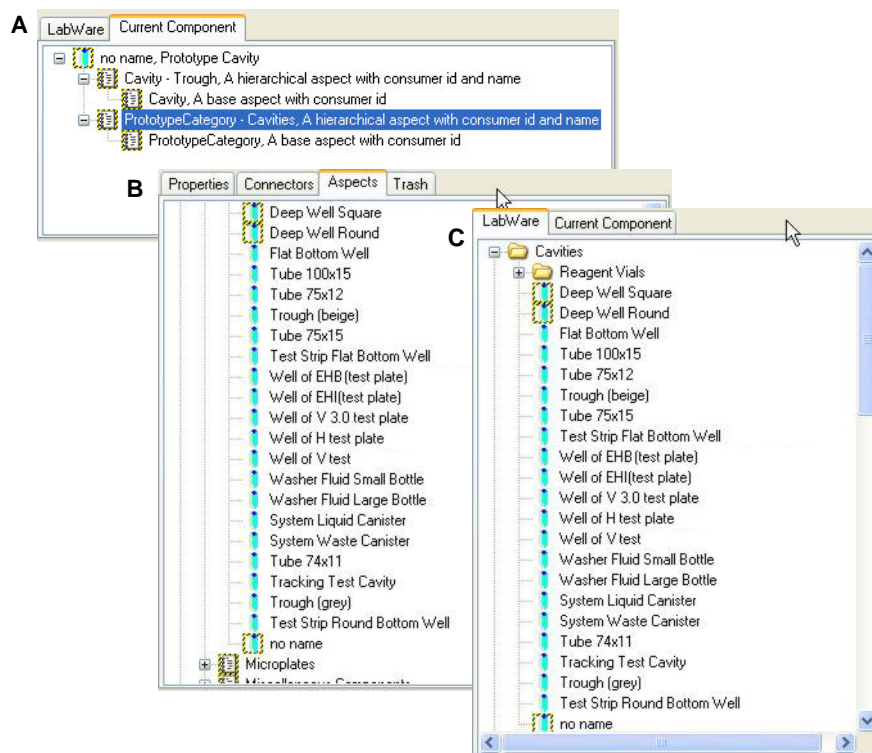


Fig. 9-84 Updated component tree view and properties view

21 In the **Components** menu, click the **Save Archives** item, to save the new trough.

9.4.4.2 Building the Rack

The rack required will need the following parts:

- ◆ Rack body, to indicate the dimensions on the worktable
- ◆ Two sites for the placement of the troughs, with two troughs assigned to them
- ◆ One (slanted) site for the placement of the larger tube
- ◆ One site for the placement of the larger tube cover
- ◆ 7 (slanted) sites for the placement of the tubes
- ◆ 7 sites for the placement of the tube covers

To build the rack:

Keep a data sheet with the rack measurements ready.

Creating the Component

- 1 In the **Components** menu, click the **New Composed Prototype** item
Or click the **New Composed Component** button in the toolbar.

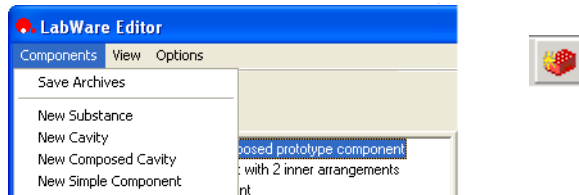


Fig. 9-85 File menu and new composed component button in the toolbar

In the graphical component view (upper right), the graphical representation for a new component is displayed.

*In the component tree view (upper left), below the **Not yet categorised components** folder, the new entry, **no name**, is displayed to the left of the composed component icon.*

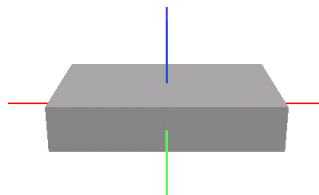


Fig. 9-86 Graphical representation for a new component

- 2 In the component tree view (upper left), click the **Current Component** tab. The tree view shows an entry for the new component.

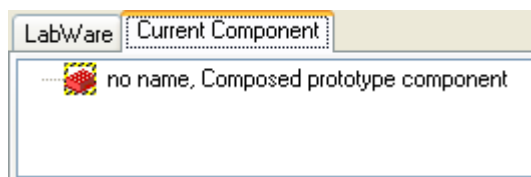


Fig. 9-87 Tree view entry for a new component

Basic Component Data

- 3 Click the **no name, Composed prototype component** item in the component tree view, to select it.
- 4 Click the **Properties** tab (lower right), to open the properties screen.

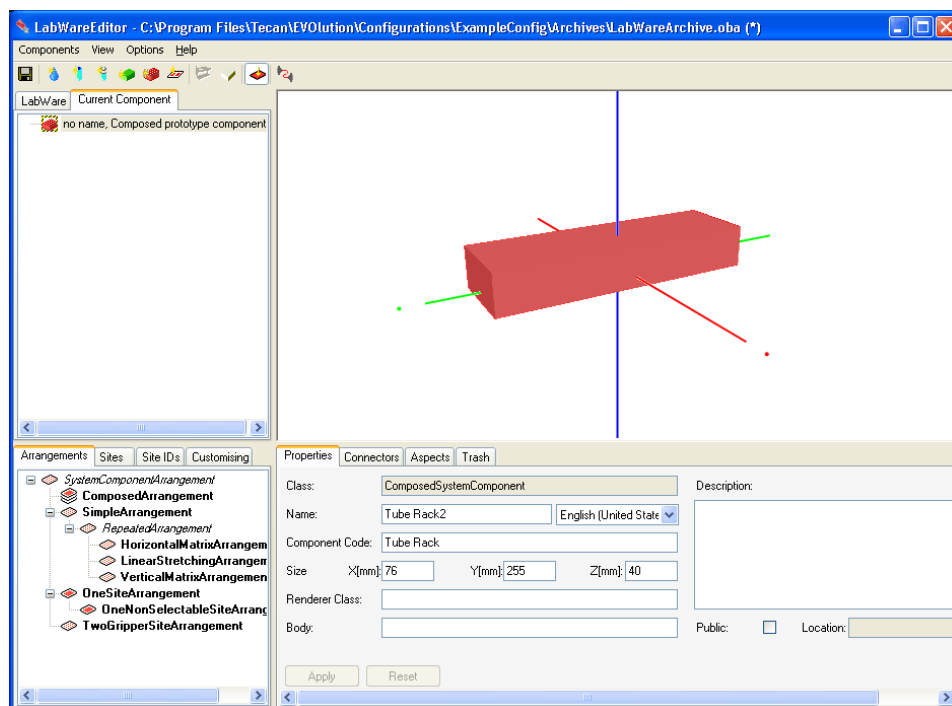


Fig. 9-88 New component properties screen

- 5 Type in the data field **Name**, to fill in a name for the component. This name will also be used in the component tree view (upper left).
- 6 In the data field **Component Code**, fill in a suitable code for the component. This code will be used for the connector description.
- 7 In the data fields under **Size**, fill in values for the rack's **length**, **width** and **height**.
- 8 In the field **Renderer class**, fill in the filename of a suitable graphic file for the visualization of the rack, if such a file is available. The graphical representation of the rack will be updated after the **ENTER** key has been pressed.

Depending on the rack type, one of the following graphic files can be sufficient for rack visualization:

- Strip Rack 13mm.wld
- Strip Rack 16mm.wld
- Trough Rack.wld
- Microplate 96.wld.

- 9 In the field **Body file**, fill in the file name of the appropriate file containing the overall measurements of the rack used for collision detection.
- 10 Type in a descriptive text in the text field under **Description**.
- 11 Press the **ENTER** key
Or click the **Apply** button, to save the data you supplied. The graphical representation of the rack is updated.

Creating the Composed Arrangement

- In the lower left screen section, click the **Arrangements** tab, and then the **ComposedArrangement** item, to drag and drop it on the new system component in the component tree view (upper left). The item **Composed arrangement with 0 inner arrangements** is added to the tree view.

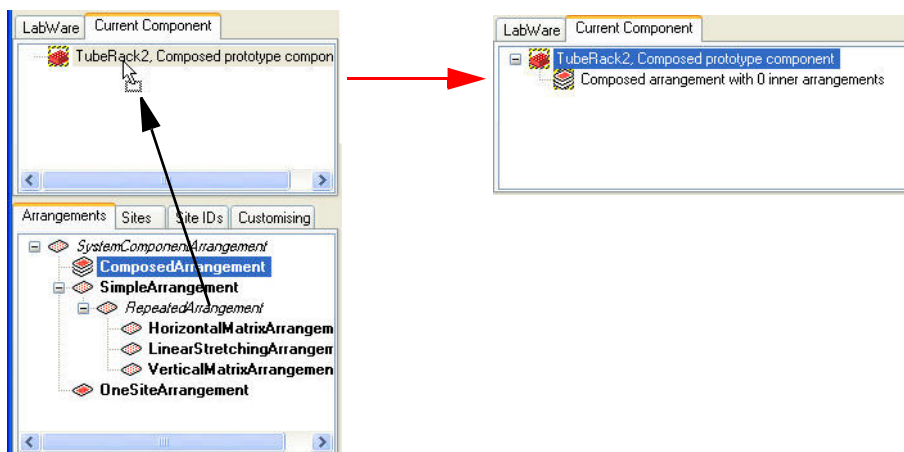


Fig. 9-89 Creating the composed arrangement

**Creating a Matrix Arrangement:
Tubes 75 x 15**

- In the lower left screen, click the **HorizontalMatrixArrangement** item, to drag and drop it on the **Composed arrangement** entry in the upper left tree view. The item **Horizontal matrix arrangement with 0 sites** is added to the tree view.

The arrangement or matrix is not immediately visible in the graphical component view. Only when sites are added to it in the Current Component view, the sites will be visible as red areas.

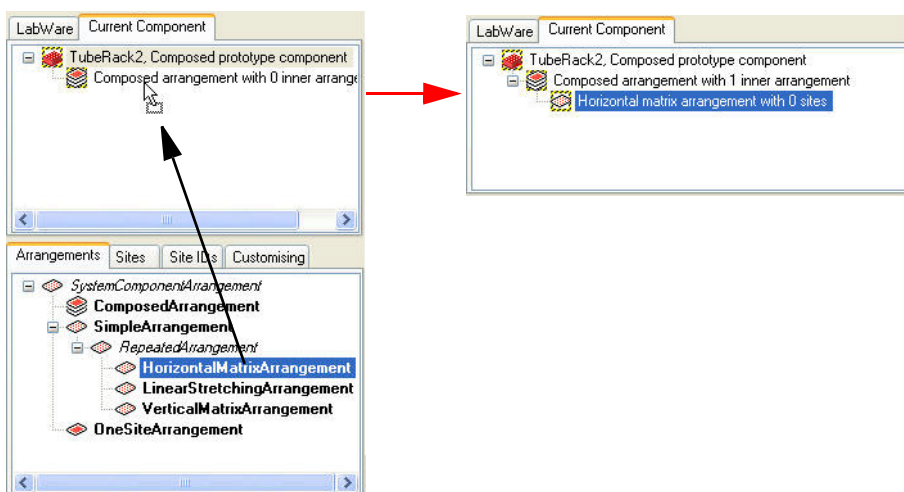


Fig. 9-90 Create horizontal matrix arrangement

Matrix Properties

- In the components tree view, click the new item. **Horizontal matrix arrangement with 0 sites**, to select it.
- In the lower right screen, click the **Properties** tab.
- In the lower right screen in the section **The first site**, fill in the values for the dimensions (**Origin, Orientation and Size**) of the first site in the matrix.

17 In the section **The repetition properties** fill in the values for the matrix (**Distance**, **Displacement** and **Default site code**).

*The X- and Y-offsets refer to the **inner diameter** of the cavity.*

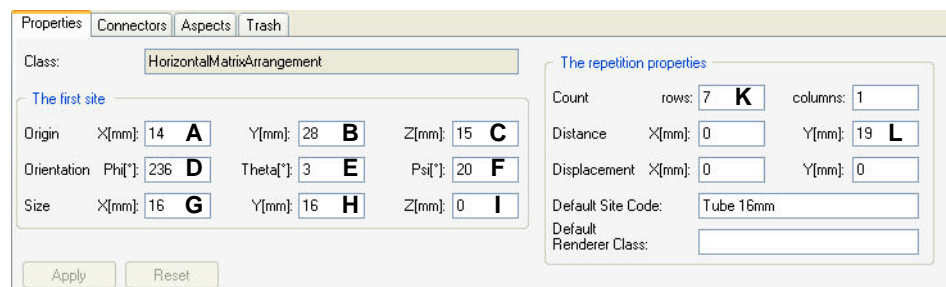
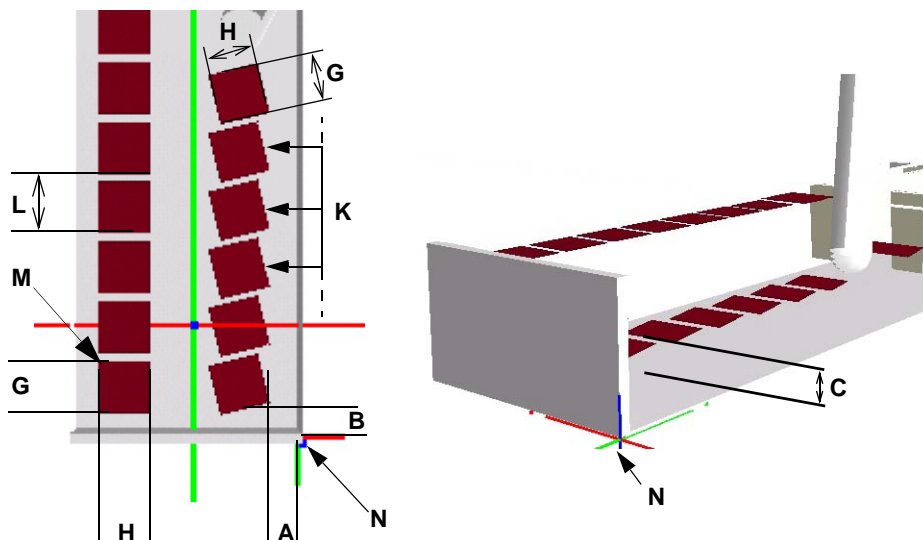


Fig. 9-91 Tube rack properties

Fig. 9-92 Horizontal matrix arrangement properties

- | | |
|--|---|
| A Site origin in X | G Site width |
| B Site origin in Y | H Site length |
| C Site height in Z | I Site height |
| D Rotation angle (around Z-axis), for obtaining a biased site (refer to cross references above) | K Number of matrix rows |
| E Rotation angle (around X-axis) | L Site displacement in Y direction |
| F Rotation angle (around Z-axis) | M First site on the rack |
| | N Rack point of origin |

18 In the lower left screen, click the **Sites** tab.

19 Under the **Sites** tab, click the **SystemComponentSite** item, to drag and drop it on the **Horizontal matrix arrangement with 0 sites** object in the component tree view (upper left).

*The tree entry is changed to **Horizontal matrix arrangement with n sites** (*n* is the number of sites, depending on the number of matrix rows and columns). For each site, an entry **Site without position handling** is added to the tree view.*

**Creating a
One-Site
Arrangement:
Barcode Flag**

- 20 If the sites are not displayed in the graphical component view, click the **Show sites** button in the top toolbar. The newly created sites are shown as red rectangles.
- 21 Click the **Apply** button, to apply your modifications.
- 22 Click the **Save Archives** entry in the **Components** menu, to save all your changes.
- 23 In the lower left screen, click the **Arrangement** tab, to display the tree view of arrangement templates.
- 24 Drag and drop the **OneSiteArrangement** item onto the **Composed Arrangement** entry in the upper left tree view. The entry **One-site arrangement** and a sub-entry, **Placing site with position handling**, is added to the tree view.
- 25 Click the **Aspects** tab in the lower right screen section. The aspects tree view opens.
- 26 In the aspects tree view, double-click the **PrototypeCategory** folder, to open it. The tree view expands.
- 27 In the **PrototypeCategory** tree, double-click the **Miscellaneous components** folder, to open it. The tree view expands.
- 28 In the **Miscellaneous components** folder, click the barcode flag symbol, to drag and drop it to the item **Placing site with position handling** in the component tree view (upper left). A highlighted representation of a barcode flag is shown in the graphic view, however its position is not correct yet.

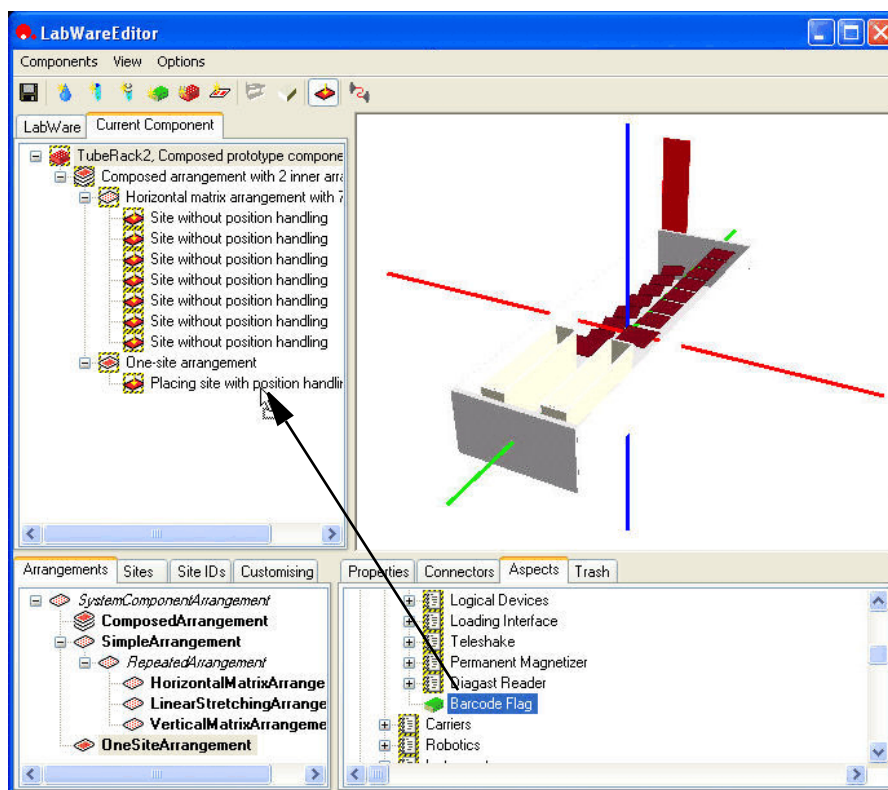
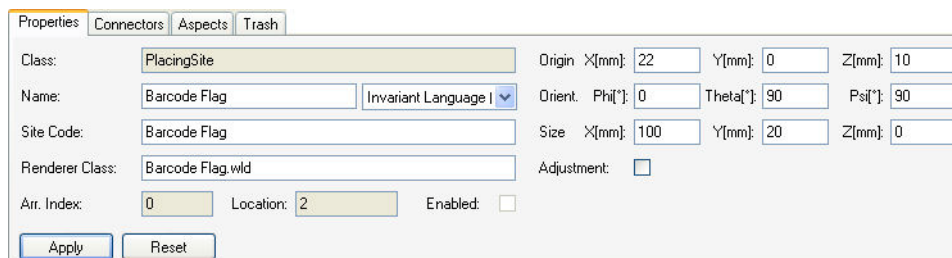


Fig. 9-93 Creating the barcode flag

- 29 Make sure that in the components tree view the entry **Placing site with position handling** is highlighted.
- 30 In the lower right screen, click the **Properties** tab. The site properties are displayed.
- 31 In the **Origin** and **Size** data fields under the **Properties** tab, fill in the appropriate values for the barcode flag site.



Properties	Connectors	Aspects	Trash
Class:	PlacingSite		Origin X[mm]: 22 Y[mm]: 0 Z[mm]: 10
Name:	Barcode Flag	Invariant Language 1	Orient. Phi[*]: 0 Theta[*]: 90 Psi[*]: 90
Site Code:	Barcode Flag		Size X[mm]: 100 Y[mm]: 20 Z[mm]: 0
Renderer Class:	Barcode Flag.wld		Adjustment: <input type="checkbox"/>
Arr. Index:	0	Location: 2	Enabled: <input type="checkbox"/>
[Apply] [Reset]			

Fig. 9-94 Barcode flag site properties

- 32 In the **Orient.** (orientation) data field row, fill in 90° in the **psi** and **theta** data fields, to rotate the arrangement for the barcode flag.

Note that the values for the three orientation angles are applied one after another:

- **phi**: rotates the component clockwise around the Z-axis.
- **theta**: rotates the component clockwise around the new X-axis
- **psi**: rotates the component clockwise around the new Z-axis

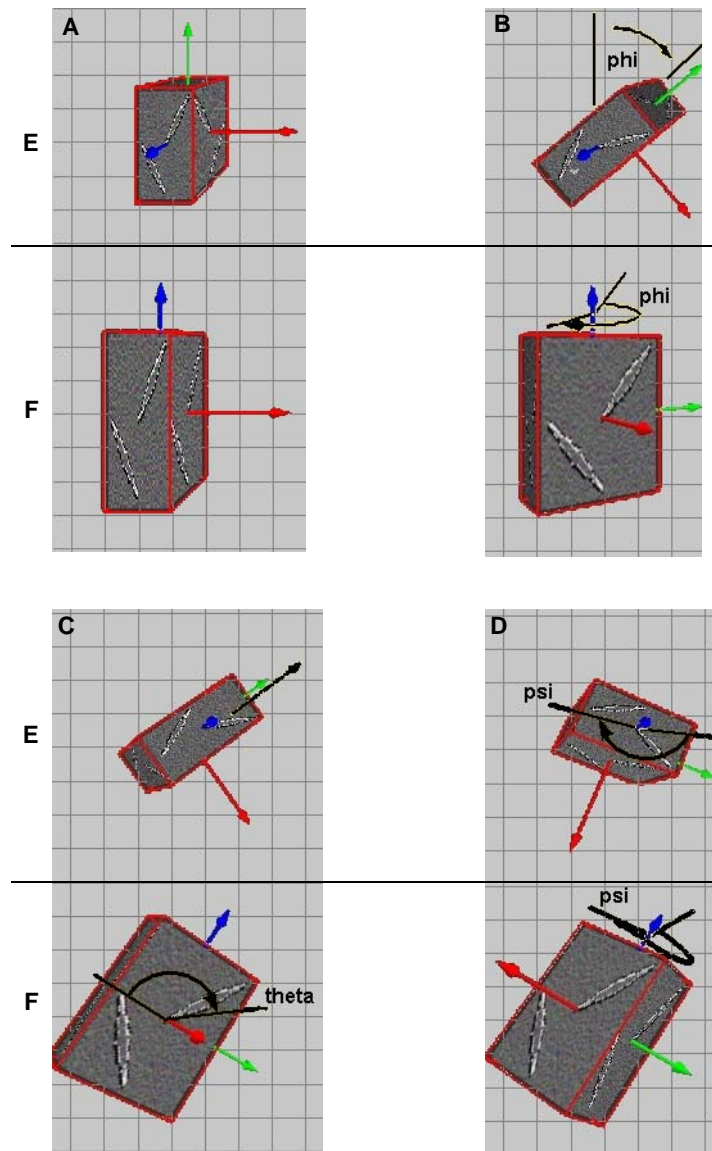


Fig. 9-95 Orientation angles Phi, Theta, and Psi

- | | | | |
|----------|---|----------|--|
| A | Start position | D | Rotation around the new Z-axis (blue) by psi |
| B | Rotation around the Z-axis (blue) by phi (black arrows) | E | Top views |
| C | Rotation around the new X-axis (red) by theta | F | Front views |

33 Click the **Apply** button, to save your modifications. The barcode flag symbol is rotated and moved to the correct position.

**Creating a
One-Site
Arrangement:
Tube 100 x 20**

- 34** To create the one-site arrangement for the Tube 100 x 20, follow steps [23](#) and [24](#) of this procedure.
- 35** Make sure that in the component tree view the new item **one-site arrangement**, is selected

Adding Aspects to the Tube Rack

- 36 To adjust the site for the Tube 100 x 20, follow steps 14 through 22 of this procedure, working on the one-site arrangement instead of the horizontal matrix arrangement.
- 37 Click the **Aspects** tab in the properties screen. The aspects tree view is displayed.
- 38 In the aspects tree view, double-click the **PrototypeCategory** folder, to open it.
- 39 In the **PrototypeCategory** folder, click the **Carriers** aspect (folder), to drag and drop it on the tube rack entry in the component tree view. The aspect is added to the system component in the component tree view:

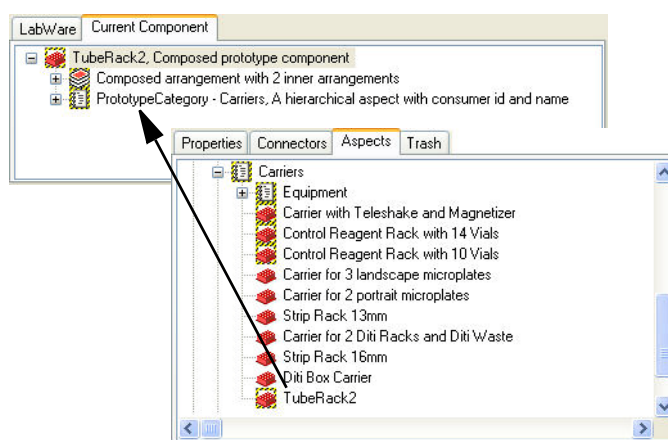


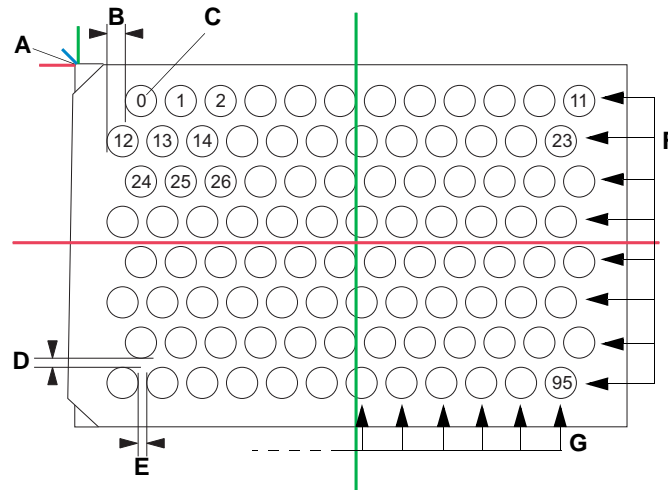
Fig. 9-96 Adding an aspect

9.4.4.3 Testing the New Tube

To test the new tube rack, or any newly designed component, test its connectors.

The connectors' Z-heights must be found empirically.

Example: Properties for the Horizontal Matrix Arrangement for Microplates



Properties Connectors Aspects Trash

Class: **C** HorizontalMatrixArrangement

The first site

Origin X[mm]: 10 Y[mm]: 6.5 Z[mm]: 19

Orientation Phi[*]: 0 Theta[*]: 0 Psi[*]: 0

Size X[mm]: 8 Y[mm]: 8 Z[mm]: 0

Apply Reset

The repetition properties **F** **G**

Count rows: 8 **E** columns: 12 **D**

Distance X[mm]: 9 **B** Y[mm]: 9

Displacement X[mm]: 5 Y[mm]: 0

Default Site Code: Well

Default Renderer Class:

Fig. 9-97 X-, Y-offset (distance) of the first cavity on the microplate

- | | |
|---|---------------------------------|
| A Microplate point of origin | D Distance in Y |
| B Displacement in X | E Distance in X |
| C First cavity on the microplate, with array index 0 | F Rows (A through H) |
| | G Columns (1 through 12) |

9.5 Files and Folders

All the files and folders vital for the labware editor are by default installed and stored under **C:\ProgramData\Tecan\EVOLution for EVOLyzer 2.0\Configurations\Example\Archives**.

Note: The harddisk location for the Labware editor software and data can be chosen during installation. Software and data can therefore be in a location differing from the default location.

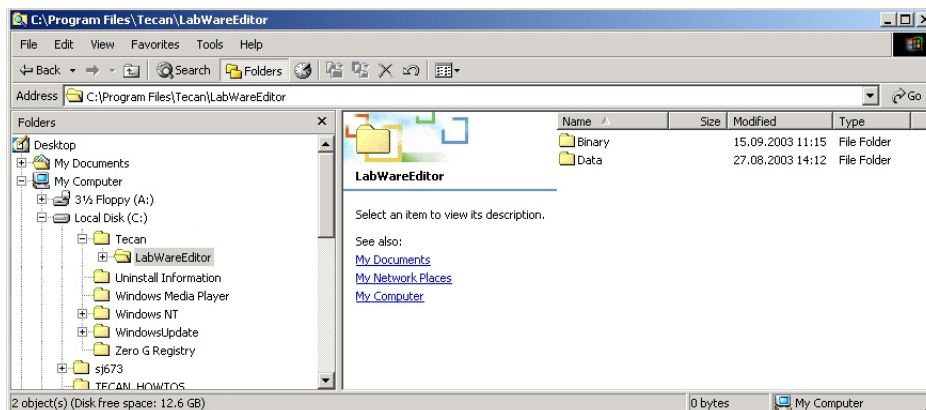


Fig. 9-98 Labware Editor folders in file system

10 EVOLution Studio

Purpose of This Chapter

This chapter describes the EVOLution Studio, which offers additional editors and wizards.

10.1 Introduction

Purpose

The EVOLution Studio comprises the following easy-to-use wizards to create or modify a number of items in an intuitive way:

- ◆ Labware Wizard
 - Is used to create or modify labware components, such as sample tubes, etc.
- ◆ Instrument Wizard
 - Is used to create or modify an instrument configuration.
- ◆ Worktable Wizard
 - Is used to define elements that are placed on the instrument worktable and their location in sample sections, consumables sections, etc.

10.1.1 Limitations



ATTENTION

Workflow incompatibility.

If the worktable you want to modify was not created with the EVOLution Studio, pay attention to the following:

- ◆ Worktables created with the Worktable Editor of Freedom EVOLution/ EVOlyzer SW version 1.9 and lower will be renamed as a backup file and a new empty instrument and worktable will be available.
- ◆ Worktables created or modified with the Worktable Editor of Freedom EVOLution SW version 2.0 will be overwritten if saved within the EVOLution Studio environment.

Note: The EVOLution Studio supports only shopping list mode. For standard mode use the Worktable Editor.

10.1.2 General Appearance

Screen Zones

The screen of the EVOLution Studio is divided into the following general screen zones:

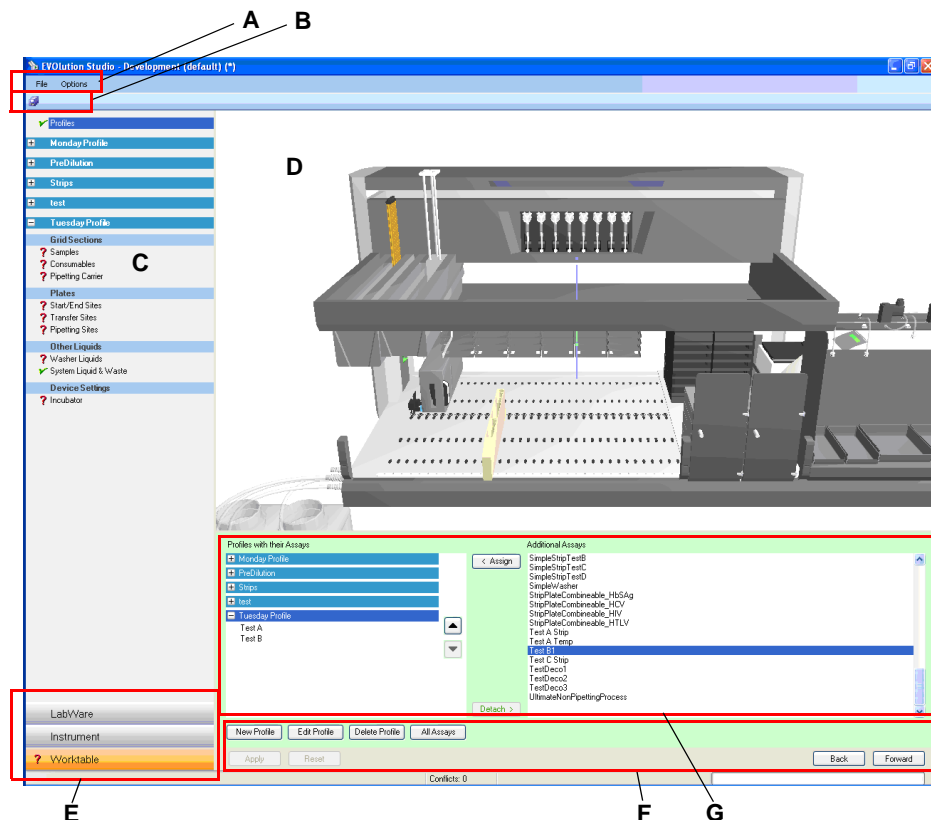


Fig. 10-1 The EVOLution Studio screen

- | | |
|----------------------------------|------------------------------------|
| A Menu bar | E Tabs for Wizard selection |
| B Command icon bar | F Command buttons |
| C Tree view | G Properties field |
| D 3-D visualization field | |

Menu Bar

Menu File

Depending on the selected wizard the menu contains different items.

Menu Options

Depending on the selected wizard the menu contains different items.

10.2 Labware Wizard

Purpose The Labware Wizard is used to modify or create new labware components, such as bottles, tubes, microplates, etc.

10.2.1 Introduction

What Is the Labware Wizard? The Labware Wizard is an easy-to-use tool with 3-dimensional visualization of the labware component that is modified or created with this wizard. The Wizard is designed in such a way that it can be used intuitively, i.e. there is no need to learn much theory about creating shapes from the scratch.

How Does It Work? The inner and outer shapes of the labware components can be modified by simply adding sections, such as a bottleneck, to the component by dragging such sections into the 3-D image with the mouse. Typical characteristics of labware components, such as flat or round bottom, can be easily assigned to the outer shape or to the cavity inside the labware component. Different properties can be assigned to the labware components or its individual sections by modifying the numerical values in the corresponding property field.

What Else Does the Wizard? In addition to this, the Labware Wizard offers the following functions:

- ♦ The graphic appearance of the labware components in terms of material or color can be adjusted in a wide range to meet the users preferences.
- ♦ The volume capacity and the liquid fill level can be simulated for each cavity and is also visualized in the 3-D view.
- ♦ The sites, e.g. carriers, into which the labware components can be placed are also defined in the Labware Wizard.
- ♦ The position of labware components on the carriers can be adjusted.
- ♦ The liquid handling arm parameters can be determined.

Starting the Labware Wizard

To start the Labware Wizard, proceed as follows:

- 1 Double-click on **EVolution Studio** in you installation directory... \Tools to start the EVolution Studio.
- 2 Log on as administrator or application specialist.
- 3 Select the tab **Labware** to change to the Labware Wizard.

Screen Elements

The following screen elements are specific to the Labware Wizard:

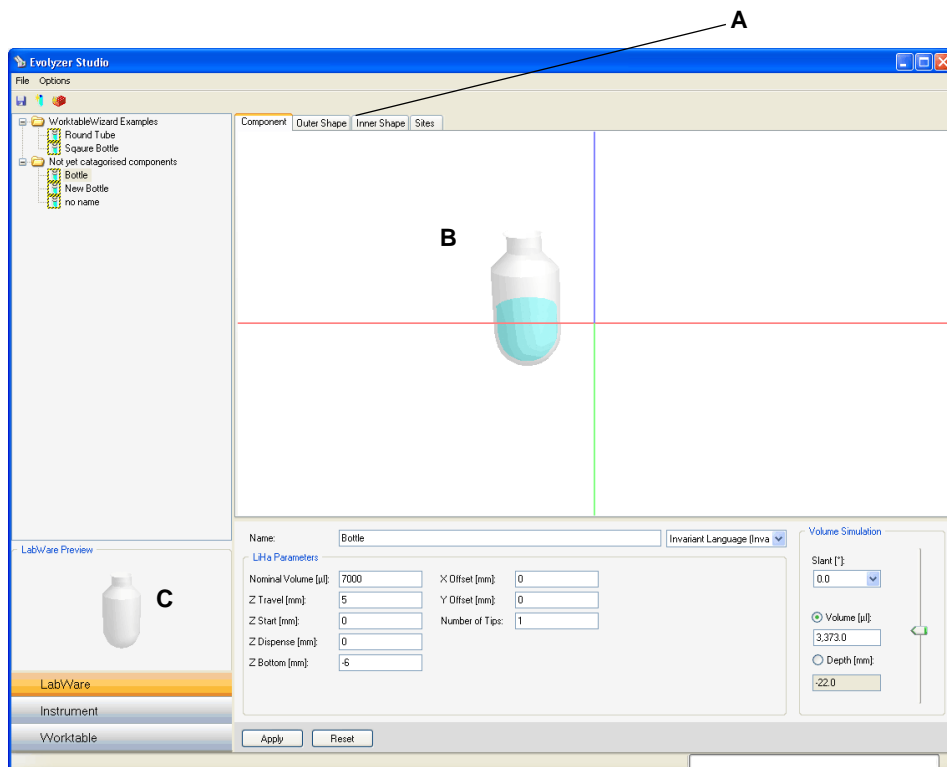


Fig. 10-2 The Labware Wizard screen

A Property tabs

C Preview field

B 3-D visualization field

Menu Bar

Menu File

The menu contains the following items:

- New Cavity
 - Allows to create a new labware component, such as a tube or bottle.
- New Microplate
 - Allows to create a new Microplate.
- Save
 - Saves all definitions made in the EVOLution Studio.

Menu Options

The menu contains the following options:

- Lock
 - Locks the application.
- Quality of Transparency
 - Adjusts the image quality of the 3-D animation. Select from the following options, according to the available computer speed:
 - Simple (fastest)
 - Good
 - Best (slowest)

**Command
Icons**

New Cavity

Same as menu item **New Cavity**.

New Microplate

Same as menu item **New Microplate**.

Save

Same as menu item **Save**.

Working With Labware Wizard

**General
Procedure**

To select and open an item, proceed as follows:

- 1 Click on an item in the labware tree view to display the preview in the preview field.
- 2 Double-click on an item to open it. The labware item is displayed in the 3-D visualization field.

The opened item can be modified in this view. See section [10.2.3 "Modifying a Labware Component"](#), ¶ 10-12.

Navigation in the EVolution Studio

Navigation in the EVolution Studio by means of keyboard and mouse is described in section [6.3 "Navigation and Shortcuts"](#), ¶ 6-4.

10.2.2 Description of Property Tabs

**Cross
References**

List of cross references to information provided in other sections:

Subject	Reference
Modify labware components	See section 10.2.3 , ¶ 10-12
Create new labware components	See section 10.2.4 , ¶ 10-13

This section describes the property tabs and the parameters that can be modified in these tabs.

For information on how to generally modify or create new labware components, refer to cross references above.

10.2.2.1 Tab Component

Cross References

List of cross references to information provided in other sections:

Subject	Reference
LiHa parameters, Z-values	See section 11.2.9 , 11-4
Define connected carriers	See section 10.2.2.4 , 10-11

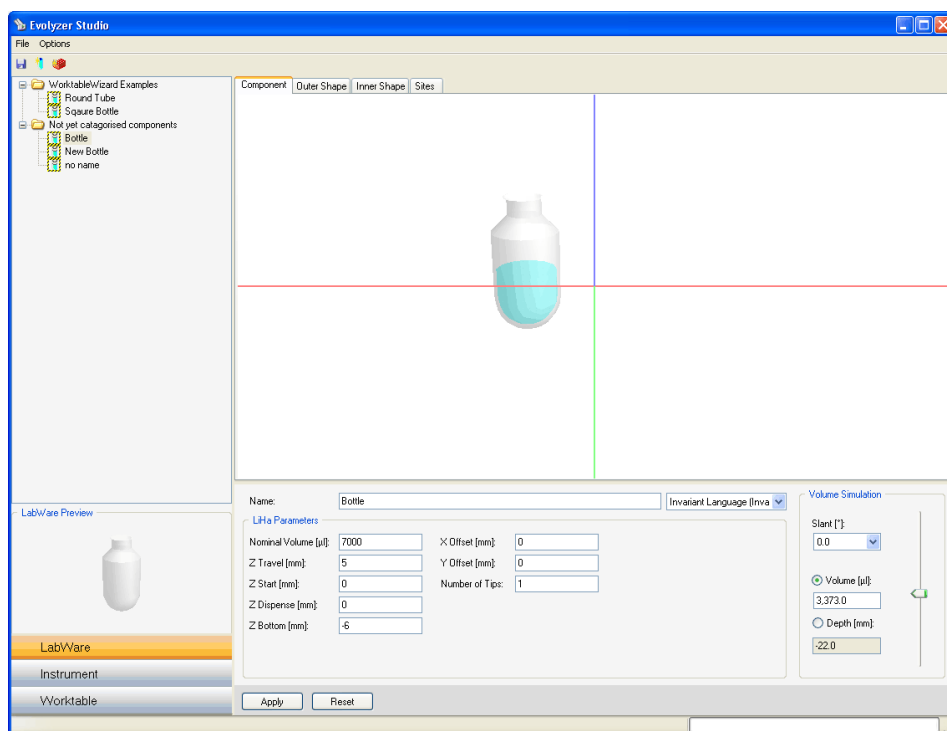


Fig. 10-3 Labware Wizard, tab component

Name (Language)

The text field defines the name of the labware component. The name can be entered in different languages, which can be selected in the pull-down list on the right of the text field.

In the localized version of the software (Run Control) the name will be displayed in the corresponding language.

If the language is defined as **Invariant Language**, the name will always remain the same, irrespective of the selected language.

Field LiHa Parameters

Nominal Volume [µl]

Defines the rated volume of the cavity.

Z-values [mm]

Define the Z-values (LiHa parameters)

- The following LiHa parameters are described in the Liquid Class Editor. Refer to cross references above.
 - Z-travel
 - Z-start
 - Z-dispense
 - Z-bottom

X-Offset

Defines the offset of the tip from the cavity axis in X-direction.

Y-Offset

Defines the offset of the tip from the cavity axis in Y-direction.

Number of Tips

Defines the number of tips that can access the labware component at the same time.

Field Volume Simulation

Simulates a liquid in the cavity of the labware component.

Slant [°]

The pull-down list shows possible angles for the deviation from the vertical position of the labware component. The availability of angles depends on the carrier the component is connected to. This is defined in the tab **Sites**, refer to cross references above.

Volume [µl]

The option button enables you to enter a volume for the simulation. The value for the fill level (**Depth**) is then calculated automatically.

Depth [mm]

The option button enables you to enter a depth, which represents the fill level of the cavity for the simulation. The value for the volume is then calculated automatically.

10.2.2.2 Tab Outer Shape

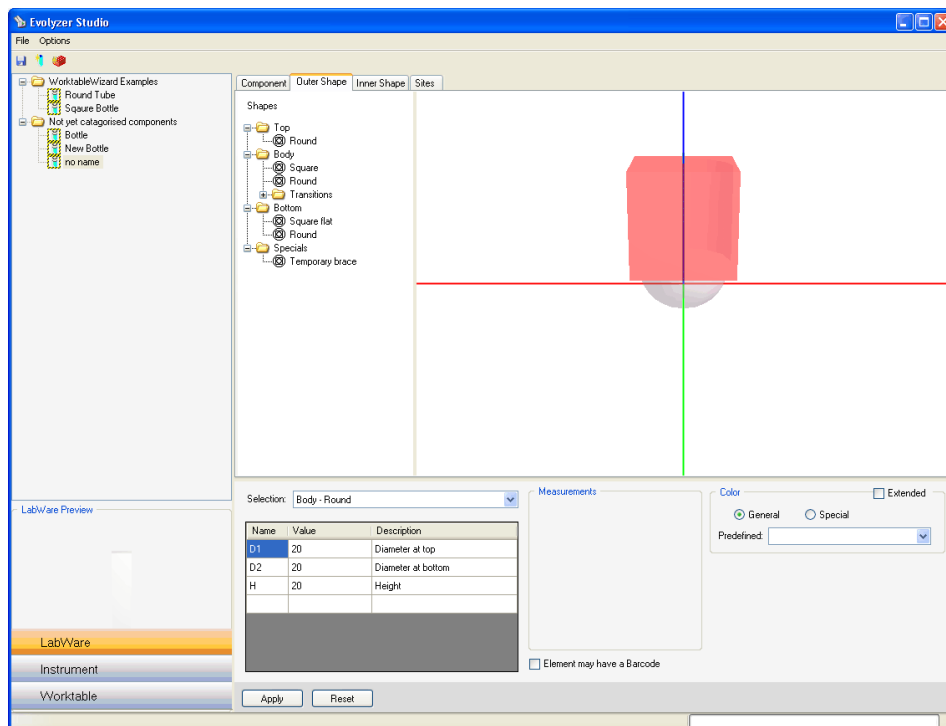


Fig. 10-4 Labware Wizard, tab outer shape

Tree View

The tree view on the left of the image shows the available elements for the creation of the individual sections of the outer shape of the labware component.

Properties Field

Selection

The pull-down list contains all sections of the object.

Select the section in the list if the selection in the 3-D view is difficult (e.g. if the section represents a small part, such as a rim on a bottle).

Table With Dimensions

The table shows the dimensions of the section.

Enter the data in the column **Value** to modify the dimensions of the section.

Color Options

Extended

The check box makes additional color options accessible. See “[Extended Color Options](#)”, 10-9.

General

Option button selected: The color definition applies to the complete object.

Special

Option button selected: The color definition applies to an individual section of the object.

Predefined

The pull-down list offers a number of predefined colors for the representation of the object.

Extended Color Options

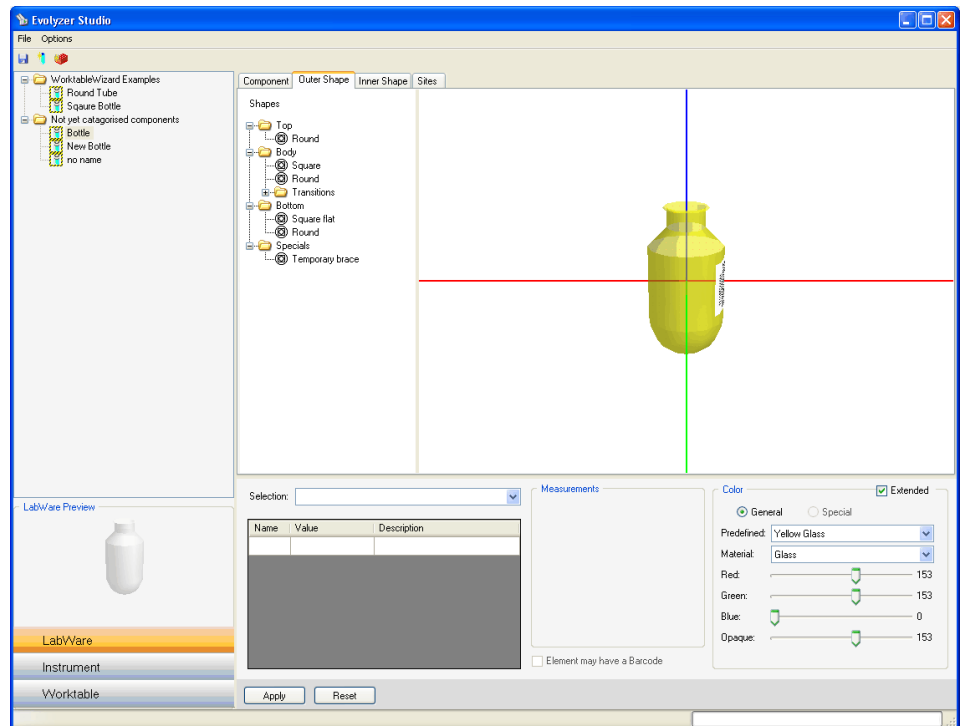


Fig. 10-5 Labware Wizard, tab outer shape, extended color options

If the check box **Extended** is selected, the following additional color options for the appearance of the labware components are available:

Material

The pull-down list defines the appearance of the labware component in such a way that it looks like being made of certain materials, such as glass, plastics, etc.

Red

The slider defines the red component for custom color definitions. The value is displayed on the right of the slider.

Green

The slider defines the green component for custom color definitions. The value is displayed on the right of the slider.

Blue

The slider defines the blue component for custom color definitions. The value is displayed on the right of the slider.

Opaque

The slider defines the appearance regarding opaqueness of the object. The value is displayed on the right of the slider.

10.2.2.3 Tab Inner Shape

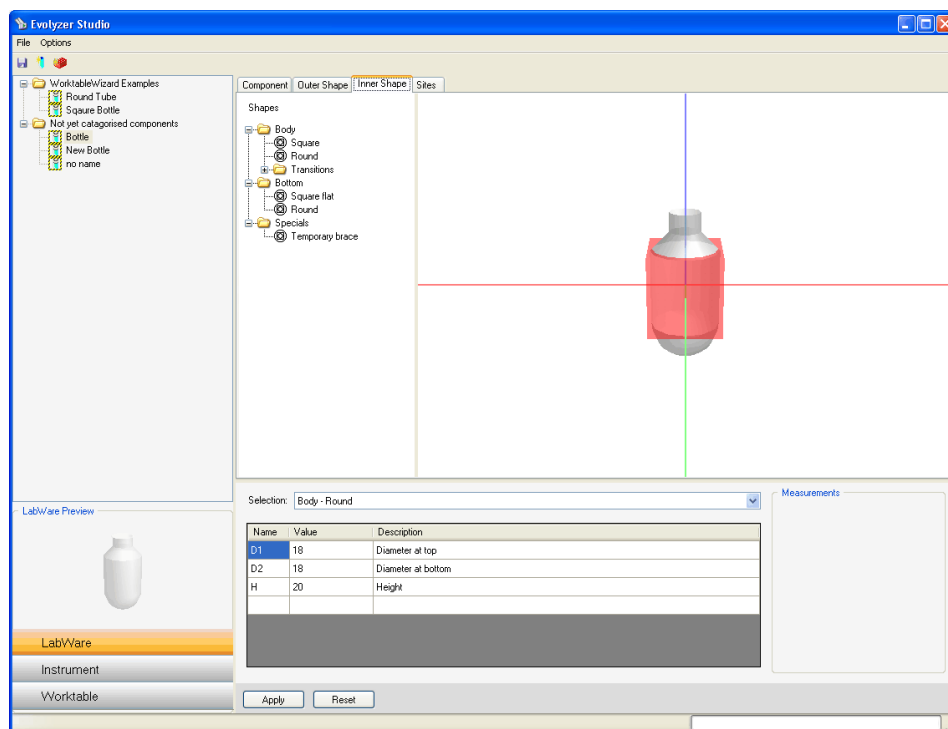


Fig. 10-6 Labware Wizard, tab inner shape

Tree View

The tree view on the left of the image shows the available elements for the creation of the individual sections of the inner shape of the labware component.

Properties Field

Selection

The pull-down list contains all sections of the object.

Select the section in the list if the selection in the 3-D view is difficult (e.g. if the section represents a small part, such as a rim on a bottle).

Table With Dimensions

The table shows the dimensions of the section.

*Enter the data in the column **Value** to modify the dimensions of the section.*

10.2.2.4 Tab Sites

This tab defines which carrier will be used for the defined labware component and how the labware component is positioned on the sites of the carrier.

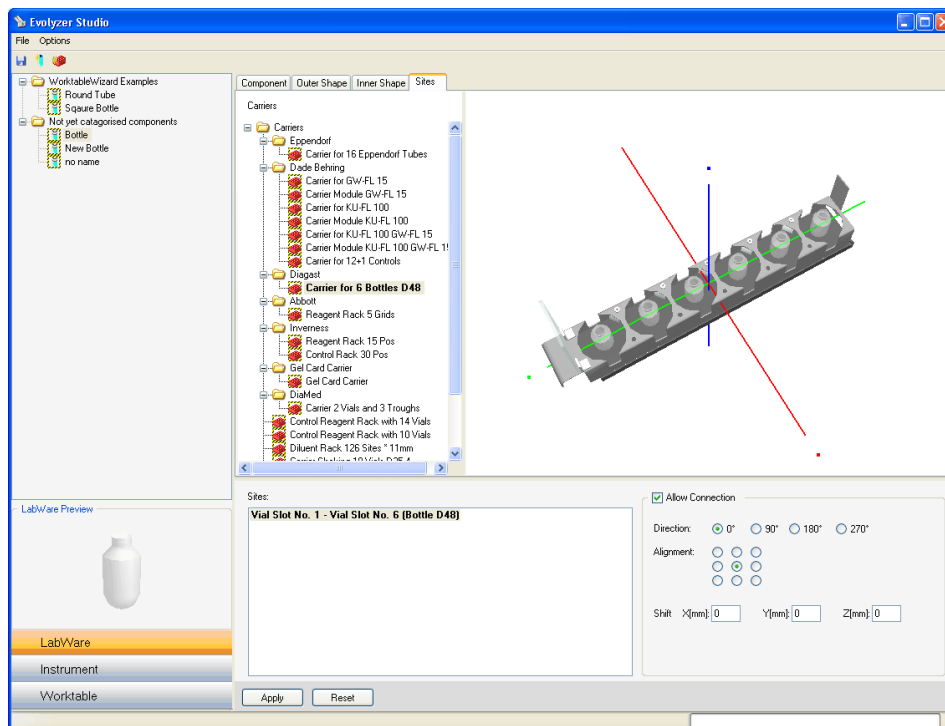


Fig. 10-7 Labware Wizard, tab sites

Tree View

The tree view on the left of the image shows the available carriers of your system.

Sites

Displays the selected site groups of the carrier.

Allow Connection

The check box defines if the labware component can be used on the selected site group of the carrier.

Direction

The option buttons define the rotational position of the labware component on the site. This is useful to align specific elements, e.g. a barcode label, to the site of the carrier.

Alignment

The option buttons define where the labware component is positioned on the site, i.e. in which direction the component touches the site wall. The option button in the middle aligns the component in the center of the site.

Shift

Defines the offset of the labware component from the site in X-, Y- and Z-direction, relative to the selected alignment.

10.2.3 Modifying a Labware Component

To modify an existing labware component, proceed as follows:

- 1 Double-click on an item in the labware tree view to open it. The labware item is displayed in the 3-D visualization field.

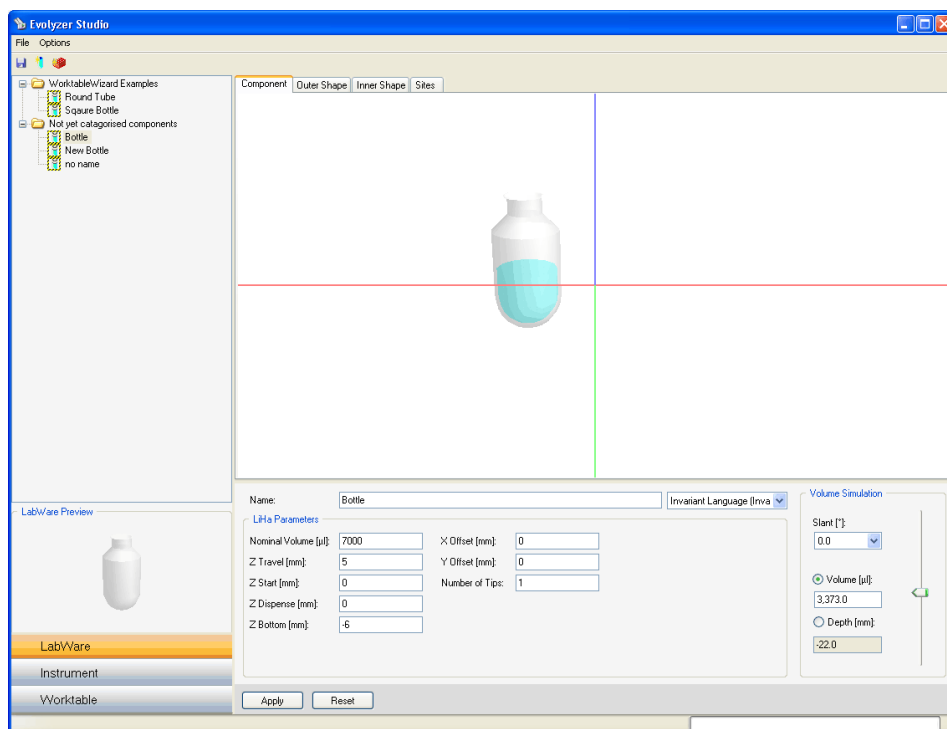


Fig. 10-8 Labware Wizard, modifying objects

- 2 Select the property of the labware you want to edit by clicking on the tab **Outer Shape, Inner Shape or Sites**.
- 3 Select the section of the labware component you want to edit.
- 4 Edit the values in the properties field, as required.
- 5 Click on the button **Apply** to save the item.
Or Click on the button **Reset** to abort the changes on the item.
- 6 Select the menu **File > Save** or click on the corresponding command icon to save the component.

10.2.4 Creating a New Labware Component

To create a new labware component, proceed as follows:

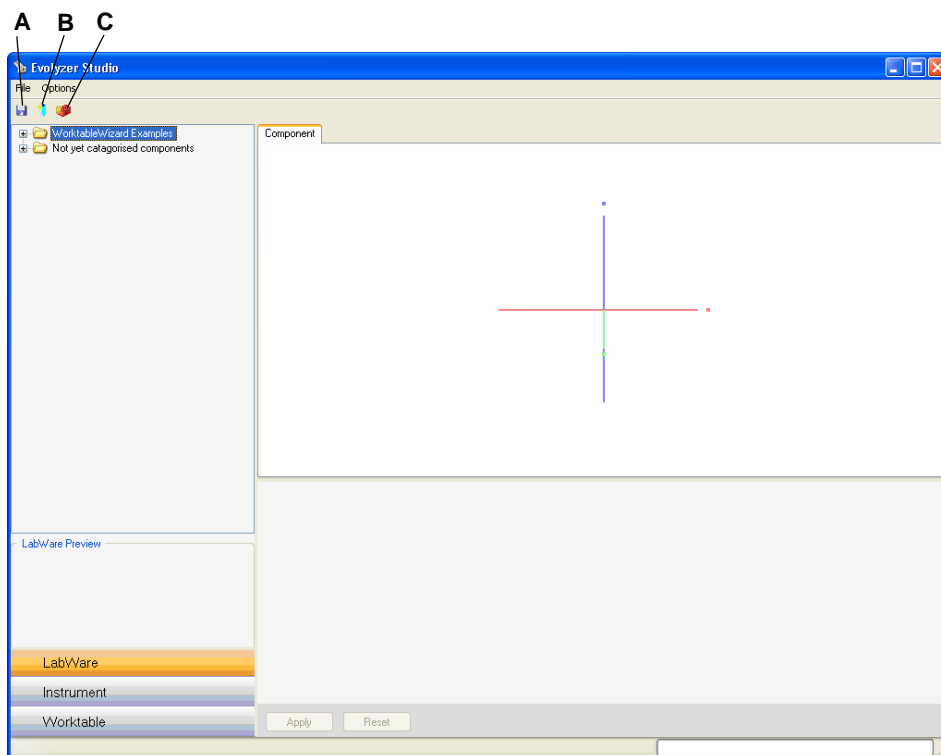


Fig. 10-9 EVolution Studio start screen

- 1 Select the menu **File > New Cavity** or click on the corresponding command icon (B) to create single cavities, such as bottles or tubes.
Or Select the menu **File > New Microplate** or click on the corresponding command icon (C) to create multi-well labware, such as a microplate.
*The tabs **Outer Shape**, **Inner Shape** and **Sites** appear.*
- 2 Go to the tab **Outer Shape**.

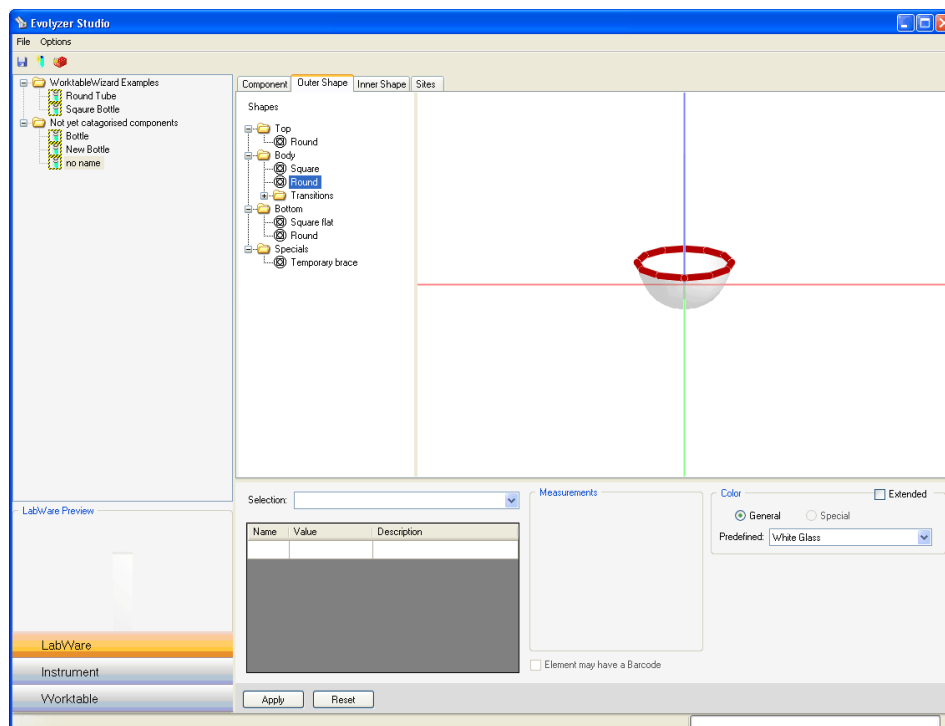


Fig. 10-10 Labware Wizard, creating objects

- 3 Drag the desired section (e.g. Bottom/Round) of the labware component with the mouse into the 3-D visualization field.
- 4 Connect further sections to the shape until the labware component is complete.
- 5 Click on the button **Apply** to accept the changes to the item.
Or Click on the button **Reset** to abort the changes on the item.
- 6 Go to the tab **Inner Shape**.
- 7 Create the appropriate inner shape.
- 8 Edit the values in the properties field, as required.
- 9 Go to the tab **Component** and enter the required data.
- 10 Select the menu **File > Save** or click on the corresponding command icon (A) to save the component.

10.3 Instrument Wizard

Purpose The Instrument Wizard simplifies the modification of an existing instrument or the creation of a new instrument.

10.3.1 Introduction

What Is the Worktable Wizard?

The Worktable Wizard is an easy-to-use tool with 3-dimensional visualization of the instrument. It is used to define an instrument and to perform basic settings of the instrument.

Starting the Instrument Wizard

To start the Instrument Wizard, proceed as follows:

- 1 Double-click on **EVolution Studio** in you installation directory... \Tools to start the EVolution Studio.
- 2 Log on as administrator or application specialist.
- 3 Select the tab **Instrument** to change to the Instrument Wizard.
*The wizard displays **Instrument Type** in the tree view and an empty visualization screen (unless there is an already existing configuration).*
The red question mark to the left of the item indicates that the necessary definitions are not completed yet.
- 4 Select **Scan connected Instrument** or a specific instrument type in the list.

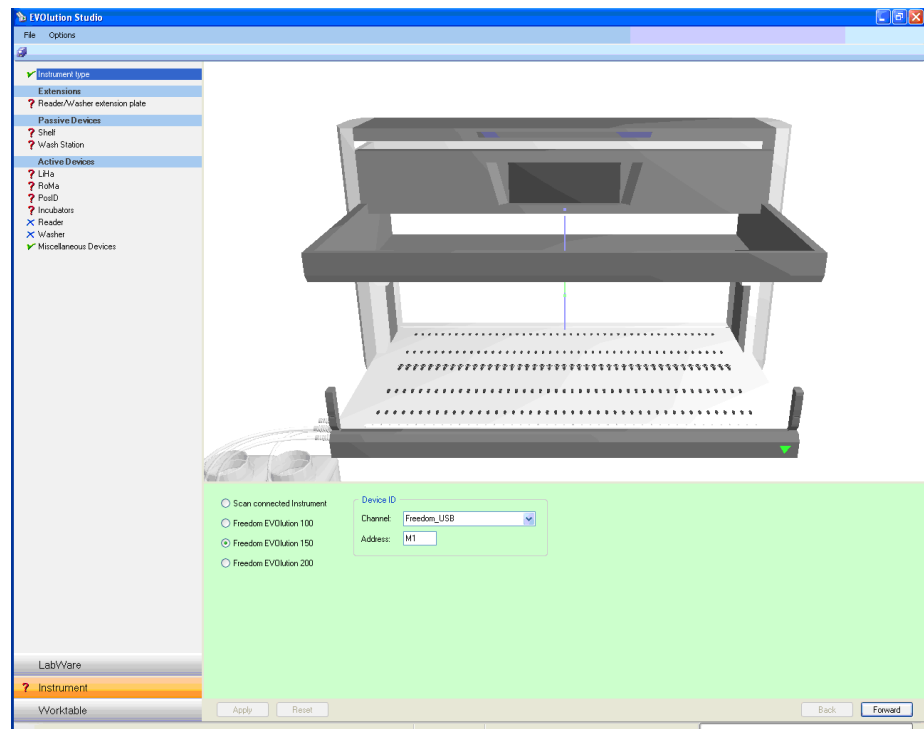


Fig. 10-11 The Instrument Wizard screen

- 5 To proceed with the wizard, click on the button **Forward**.

The wizard shows the instrument base unit (without attached devices) in the 3-D view.

*If **Scan connected Instrument** has been selected, the wizard connects to the instrument and reads all required configuration information. After successful retrieval the system shows the instrument of the current configuration in the 3-D view.*

The tree view shows all available instrument modules. The modules that could be retrieved automatically are marked with a green tick symbol. Modules that require manual configuration are marked with a red question mark to the left of the item.

- 6 To proceed with the wizard, click on the button **Forward**.

Or Select the instrument modules that are marked with a red question mark and configure the corresponding items.

- 7 Click on the button **Apply** to save the configuration.

*Or Click on the button **Reset** to abort the changes on the configuration.*

- 8 Configure all instrument modules as described above.

The green tick to the left of the item indicates that the necessary definitions are completed.

If an exclamation mark to the left of the item is displayed, the corresponding instrument module issued an error. Check the error message to clarify the problem.

Note: The last wizard page is the **Summary** page. It provides information about the valid status of the configured instrument.

Note: When modifying the instrument, pay special attention to the following:

- *If the Worktable Wizard has already been used, go back into the Worktable Wizard and update your worktables, where appropriate.*

10.4 Worktable Wizard

Purpose The Worktable Wizard simplifies the creation of worktables and the subsequent association of assays and placement of consumables on a particular worktable.

10.4.1 Introduction

Cross References

List of cross references to information provided in other sections:

Action	Reference
Define instrument	See section 10.3 , 10-15
Limitations of compatibility	See section 10.1.1 , 10-1

What Is the Worktable Wizard?

The Worktable Wizard is an easy-to-use tool with 3-dimensional visualization of the instrument and the elements on the worktable. It is used to edit a profile or to create new profiles and to assign the corresponding assays to the profiles.

Prerequisites

To use the Worktable Wizard, an instrument must be defined. Refer to cross references above.

Limitations

The compatibility of worktables created with the Worktable Editor is limited. Refer to cross references above.

What Else Does the Wizard?

In addition to this, the Worktable Wizard offers the following functions:

- ◆ Sample sections can be defined
- ◆ Consumable sections can be defined
- ◆ Pipetting sections can be defined
- ◆ Workgroups and workgroup sections for sample splitting can be defined
- ◆ Sites can be defined as start/end, transfer or pipetting sites
- ◆ Other liquids can be defined
- ◆ Device settings can be done

Starting the Worktable Wizard

To start the Worktable Wizard, proceed as follows:

- 1 Double-click on **EVolution Studio** in you installation directory... \Tools to start the EVolution Studio.
- 2 Log on as administrator or application specialist.
- 3 Select the tab **Worktable** to change to the Worktable Wizard.

10.4.2 Editing or Creating a Worktable

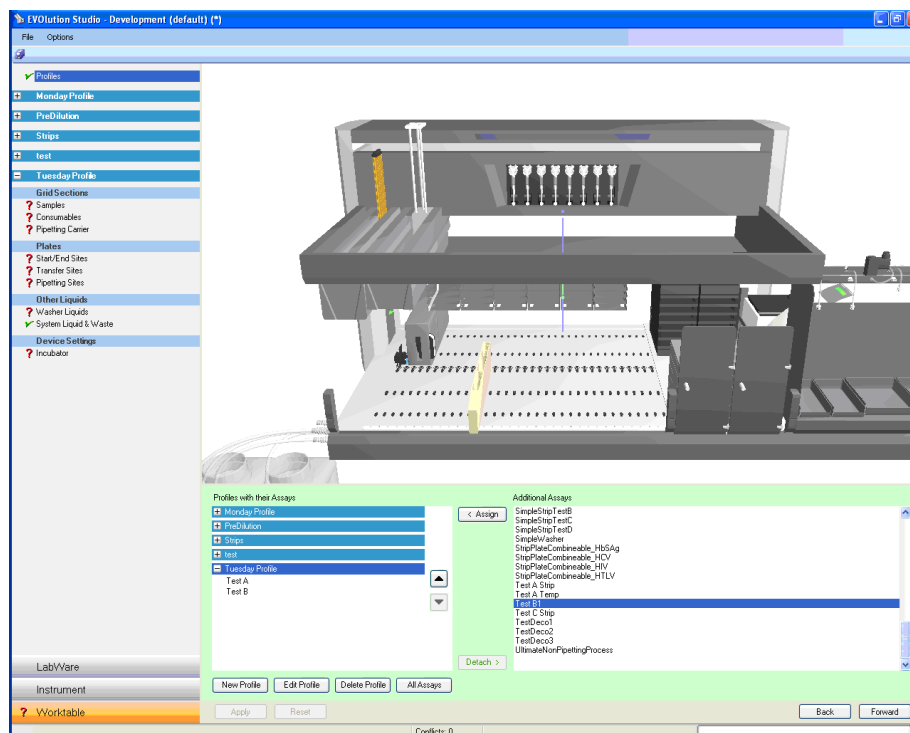


Fig. 10-12 The Worktable Wizard screen

To edit an existing profile, select the profile and click on the button **Edit Profile**.
To delete the profile, select the profile and click on the button **Delete Profile**.

To create a new profile, proceed as follows:

- 1 click on the button **New Profile**.
The system adds a new profile and displays it as shown in the example above (Tuesday Profile).
- 2 To add or remove an assay from the profile, select the assay and click on the button **Assign** or **Detach**.
- 3 To move all available assays to the selected profile, click on the button **All Assays** (option will remain active).
Note: This function automatically places all newly created assays in this profile.
*To disable the function select the active profile (marked in **bold**) and click on the button **All Assays** again.*
- 4 Click on the button **Apply** to save the profile.
Or Click on the button **Reset** to abort the changes on the profile.
- 5 To proceed with the wizard, click on the button **Forward**.

Note: The system calculates the worktable areas after each change to the profile.

10.4.3 Defining Sample Sections

This section describes how to define grid positions and labware for the sample sections.

To define sample sections, proceed as follows:

- 1 Double-click the corresponding profile.
- 2 In the tree view, select **Grid Sections > Samples**.
The red question mark to the left of the item indicates that the necessary definitions are not completed yet.
- 3 To create a new sample section, click on the button **New**.

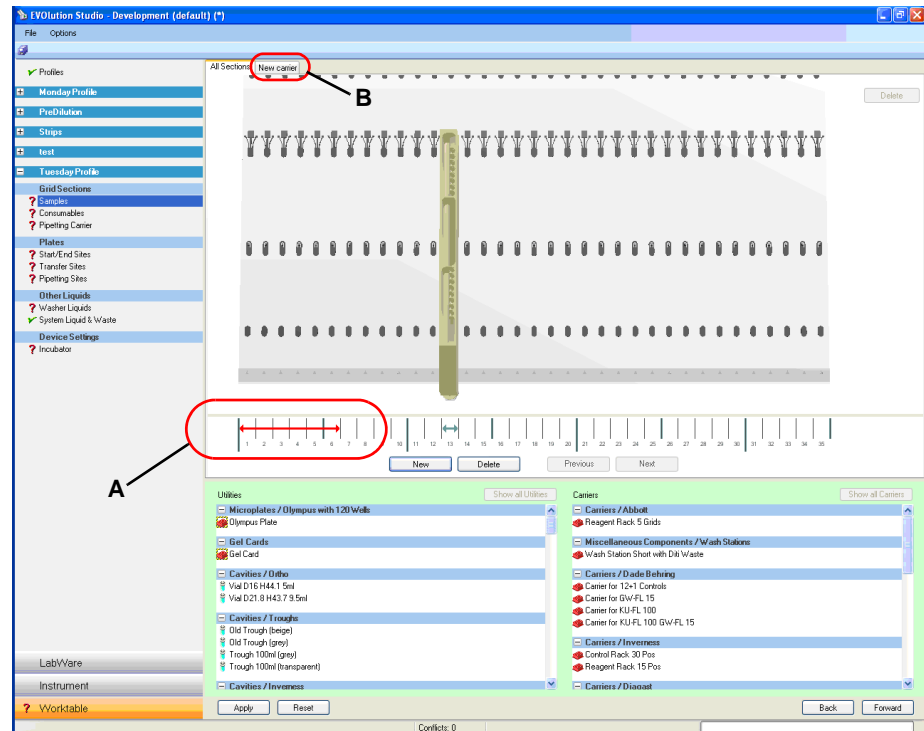


Fig. 10-13 New sample section

The wizard places an arrow (6 grid positions wide) on the grid position indicator in front of the worktable (A). The arrow is red to indicate that the corresponding section is selected.

The wizard creates an new tab (B) to display information on the new section.

- 4 Move the arrow to the desired grid position (click on the mid position and drag) and resize it (click on either end of the arrow and move) to match the desired width of the sample section.
- 5 Select a carrier (e.g. carrier for tubes, for microplates, etc.) from the list box **Carriers**.
- 6 Drag and drop the carrier to place it in the selected sample section.
The wizard creates an new tab and names it after the carrier that was placed in the section.
- 7 Select the new tab.

The wizard displays the carrier.

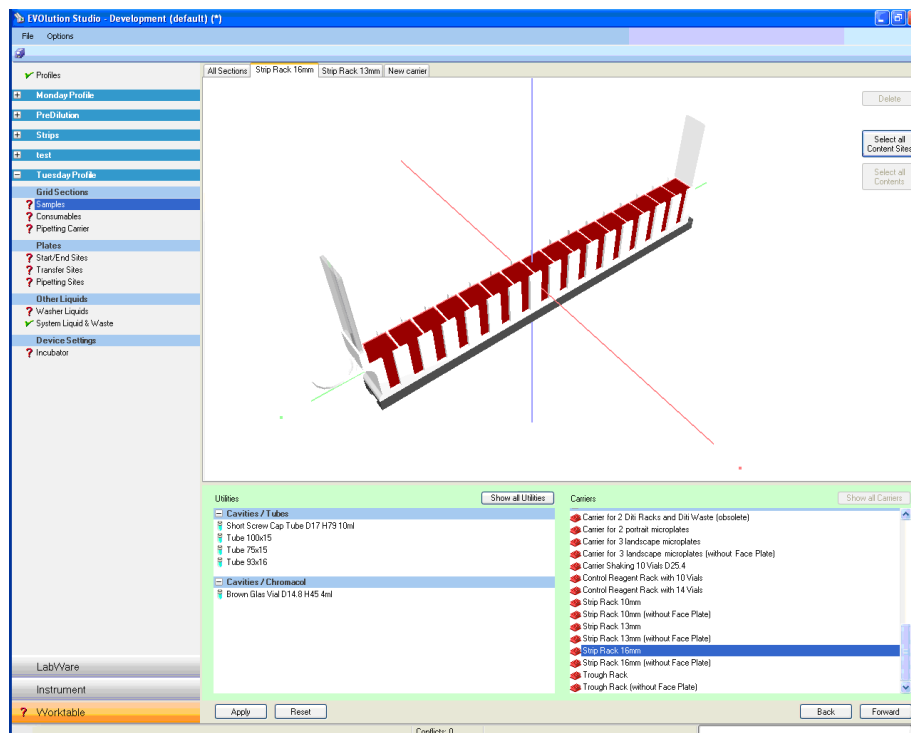


Fig. 10-14 Carrier in the sample section

- 8 Click on **Select all Content Sites**.
- 9 Select a cavity (e.g. strip rack, microplate, etc.) from the list box **Utilities**.
- 10 Drag and drop the cavity to place into in the carrier.
The wizard places the tubes into the carrier and fills them up with liquid.
- 11 Repeat the steps 5 to 10 until the required number of carriers in the sample section is created.
- 12 Click on the button **Apply** to save the profile.
*Or Click on the button **Reset** to abort the changes on the profile.*
- 13 Repeat the complete section to create several sample sections.
The green tick to the left of the item indicates that the necessary definitions are completed.
- 14 To proceed with the wizard, click on the button **Forward**.
- 15 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.4 Defining Consumables

This section describes how to define grid positions and labware for the consumable sections.

To define consumable sections, proceed as follows:

- 1 Double-click the corresponding profile.
- 2 In the tree view, select **Grid Sections > Consumables**.
The red question mark to the left of the item indicates that the necessary definitions are not completed yet.
- 3 To create a new consumable section, click on the button **New**.

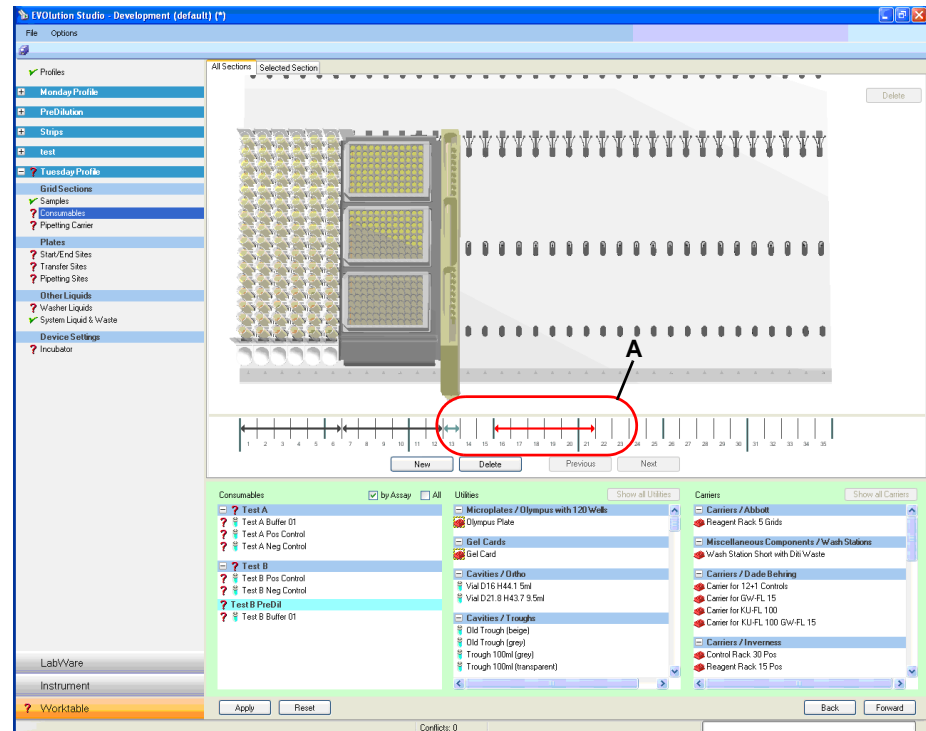


Fig. 10-15 New consumable section

The wizard places an arrow (6 grid positions wide) on the grid position indicator in front of the worktable (A). The arrow is red to indicate that the corresponding section is selected.

- 4 Move the arrow to the desired grid position (click on the mid position and drag) and resize it (click on either end of the arrow and move) to match the desired width of the consumables section.
- 5 Select a carrier (e.g. carrier for reagents, etc.) from the list box **Carriers**.
- 6 Drag and drop the carrier to place it in the selected section.
- 7 Select a consumable (e.g. buffer, positive control, negative control, etc.) from the list box **Consumables**.
- 8 Drag and drop the consumable to place it on the corresponding carrier.
- 9 Repeat the steps 5 to 8 until all required consumables are placed on the worktable.

10 Click on the button **Apply** to save the profile.

Or Click on the button **Reset** to abort the changes on the profile.

The green tick to the left of the item indicates that the necessary definitions are completed.

Note: If the consumable is not associated with a cavity, the labware needs to be placed on the carrier, followed by the substance.

11 To proceed with the wizard, click on the button **Forward**.

12 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.5 Defining Pipetting Sections

This section describes how to define grid positions and labware for the pipetting sections.

To define pipetting sections, proceed as follows:

1 Double-click the corresponding profile.

2 In the tree view, select **Grid Sections > Pipetting Carrier**.

The red question mark to the left of the item indicates that the necessary definitions are not completed yet.

3 To create a new pipetting section, click on the button **New**.

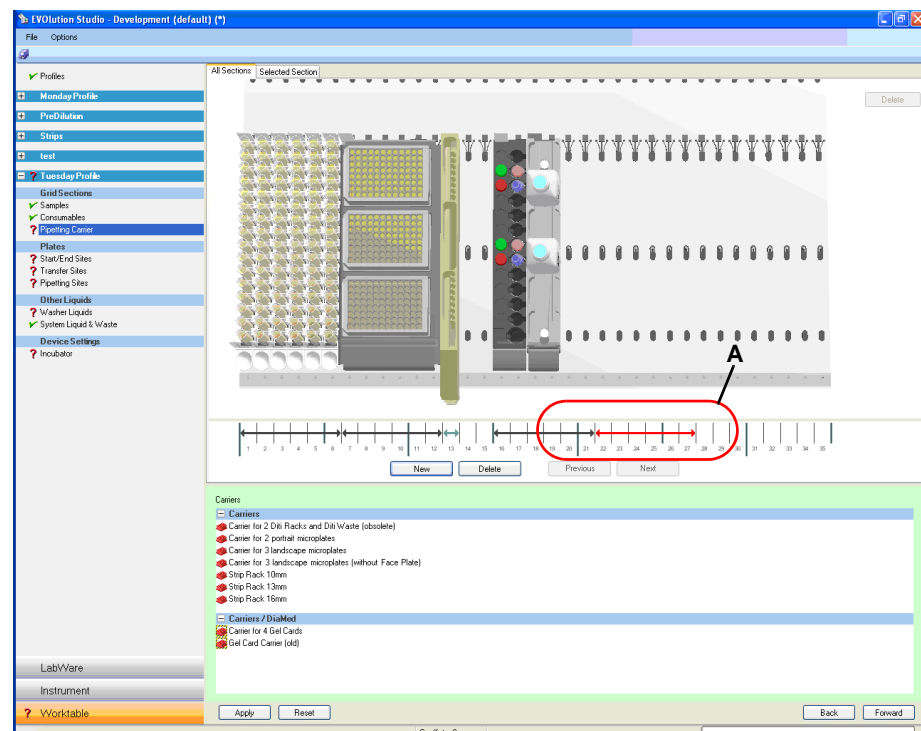


Fig. 10-16 New pipetting section

The wizard places an arrow (6 grid positions wide) on the grid position indicator in front of the worktable (A). The arrow is red to indicate that the corresponding section is selected.




- 4 Move the arrow to the desired grid position (click on the mid position and drag) and resize it (click on either end of the arrow and move) to match the desired width of the pipetting section.
- 5 Select a carrier (e.g. carrier for microplates, etc.) from the list box **Carriers**.
- 6 Drag and drop the carrier to place it in the selected section.
- 7 Repeat the steps 5 to 6 until all required consumables are placed on the worktable.
- 8 Click on the button **Apply** to save the profile.
 Or Click on the button **Reset** to abort the changes on the profile.
The green tick to the left of the item indicates that the necessary definitions are completed.
- 9 To proceed with the wizard, click on the button **Forward**.
- 10 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.6 Sample Splitting

This section describes how to edit or create a profile for sample splitting (pipetting of liquid from a primary container to one or several secondary containers).

Cross References

List of cross references to information provided in other sections:

Action	Reference
Add/edit workgroups	See section 10.4.6.1 ,  10-24
Define sample section	See section 10.4.3 ,  10-19
Define workgroup section	See section 10.4.6.2 ,  10-25

Note: Before adding/editing workgroups, sample sections and workgroup sections, a sample splitting template must be selected (new process) and the corresponding process steps must be defined.
 Refer to cross references above.

Defining a sample splitting profile in EVolution Studio involves the following general steps:

- 1 Add/edit the workgroups.
Refer to cross references above.
- 2 Define one or more sample sections.
Refer to cross references above.
- 3 Define one or more workgroup sections.
Refer to cross references above.

10.4.6.1 Creating Workgroups

This section describes how to add/edit workgroups for sample splitting.

To add or edit workgroups, proceed as follows:

- 1 Click on the corresponding workgroup (A).
- 2 Enter a volume (B).
- 3 Open the list of assay templates by clicking on the arrow (D) and link the corresponding sample splitting template (C) to the workgroup.
- 4 To create a new workgroup, click on the button **New Workgroup**.

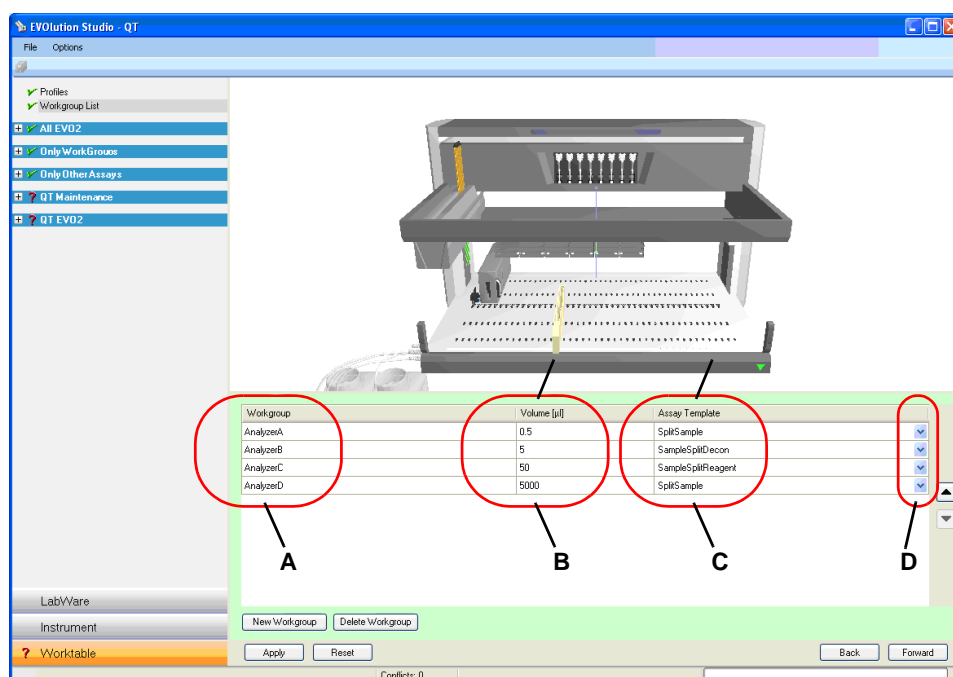


Fig. 10-17 Workgroup definition

- 5 Click on the button **Apply** to save the profile.
Or Click on the button **Reset** to abort the changes on the profile.
The green tick to the left of the item indicates that the necessary definitions are completed.
- 6 To proceed with the wizard, click on the button **Forward**.
- 7 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.6.2 Defining Workgroup Sections

This section describes how to define grid positions and labware for the workgroup sections.

Cross References

List of cross references to information provided in other sections:

Action	Reference
Edit carrier	See section 10.4.3, 10-19

Note: Workgroup sections share features of both sample sections and pipetting sections. However, unlike a sample section, the workgroup section defines a destination of a liquid transfer, and, unlike a pipetting section, the workgroup section defines a starting point for worklist planning.

To define workgroup sections, proceed as follows:

- 1 Double-click the corresponding profile.
- 2 In the tree view, select **Grid Sections > Workgroups**.
The red question mark to the left of the item indicates that the necessary definitions are not completed yet.
- 3 To create a new workgroup section, click on the button **New**.

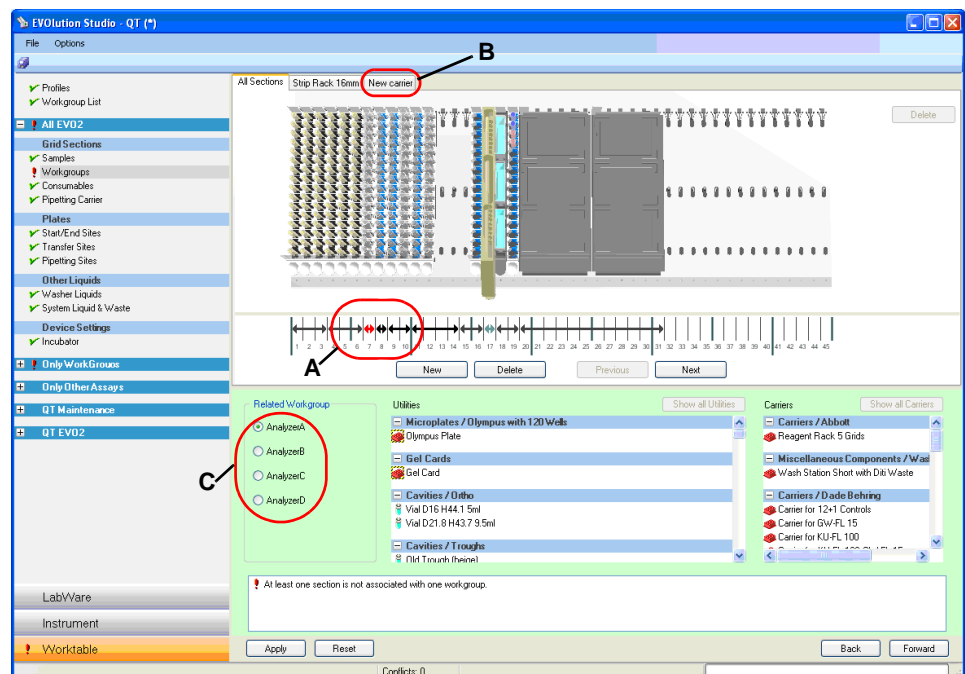


Fig. 10-18 New workgroup section

The wizard places an arrow (6 grid positions wide) on the grid position indicator in front of the worktable (A). The arrow is red to indicate that the corresponding section is selected.

The wizard creates a new tab (B) to display information on the new section.

- 4 Move the arrow to the desired grid position (click on the mid position and drag) and resize it (click on either end of the arrow and move) to match the desired width of the workgroup section.
- 5 Select the related workgroups (C) for the section.
Within a profile, a workgroup can only be linked to one workgroup section.
- 6 Select a carrier (e.g. carrier for tubes, for microplates, etc.) from the list box **Carriers**.
- 7 Drag and drop the carrier to place it in the selected workgroup section.
The wizard creates a new tab and names it after the carrier that was placed in the section.
- 8 Select the new tab.
- 9 Edit the carrier as described for the sample sections.
Refer to cross references above.
- 10 Click on the button **Apply** to save the profile.
*Or Click on the button **Reset** to abort the changes on the profile.*
The green tick to the left of the item indicates that the necessary definitions are completed.
- 11 To proceed with the wizard, click on the button **Forward**.
- 12 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.7 Defining Site Properties

This section describes how to define start / end, transfer and pipetting sites. These properties determine how microplates enter and leave the system.

- 1 Double-click the corresponding profile.
- 2 In the tree view, select **Plates > Start/End Sites** to define the start and end positions for the microplates.
The red question mark to the left of the item indicates that the necessary definitions are not completed yet.

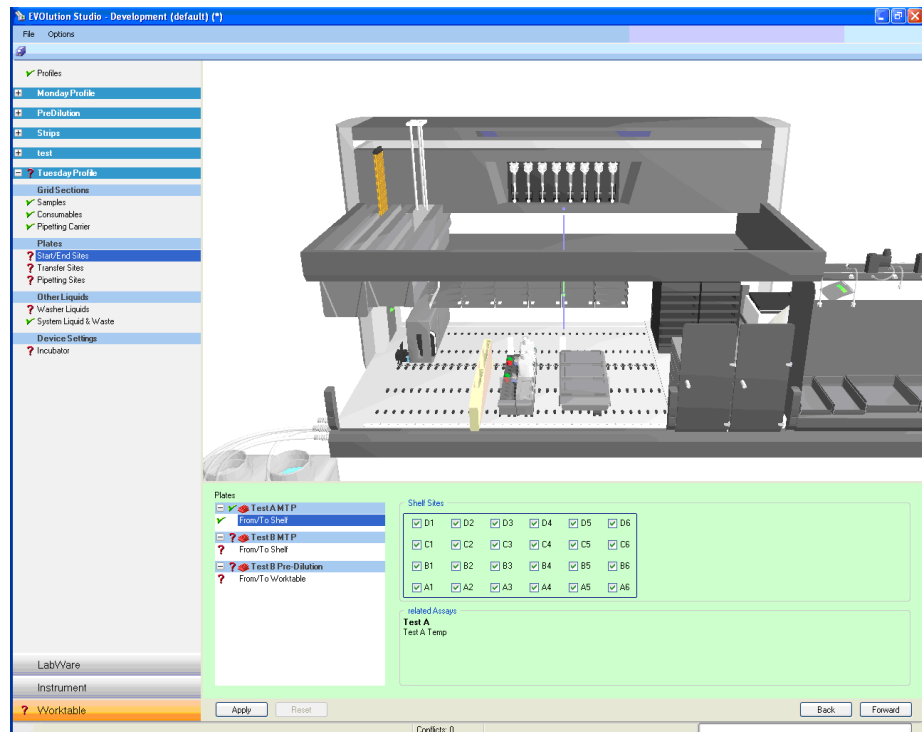


Fig. 10-19 Site properties (shelf)

- 3 Select a microplate in the list box **Plates**.
- 4 Check the suggested positions in the field (**Shelf Sites, RT Incubator Sites or Pipetting Sites, see below**) and correct (tick the desired sites), if necessary.
- 5 Click on the button **Apply** to save the profile.
Or Click on the button **Reset** to abort the changes on the profile.
The green tick to the left of the item indicates that the necessary definitions are completed.
- 6 In the same way, define the transfer positions. In the tree view, select **Plates > Transfer Sites**.
The wizard displays the corresponding sites, similar to Fig. 10-19 “Site properties (shelf)”, 10-27.
- 7 Proceed as described in step 3 to 5.
- 8 In the same way, define the pipetting positions. In the tree view, select **Plates > Pipetting Sites**.
The wizard displays the corresponding sites, similar to Fig. 10-19 “Site properties (shelf)”, 10-27.
- 9 Proceed as described in step 3 to 5.
- 10 To proceed with the wizard, click on the button **Forward**.
- 11 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.8 Defining Other Liquids

This section describes how to define other liquid, such as system liquid, wash liquids, etc.

- 1 Double-click the corresponding profile.
- 2 In the tree view, select **Other Liquids > Washer Liquids** to define the use of wash liquids in the system.

The red question mark to the left of the item indicates that the necessary definitions are not completed yet.

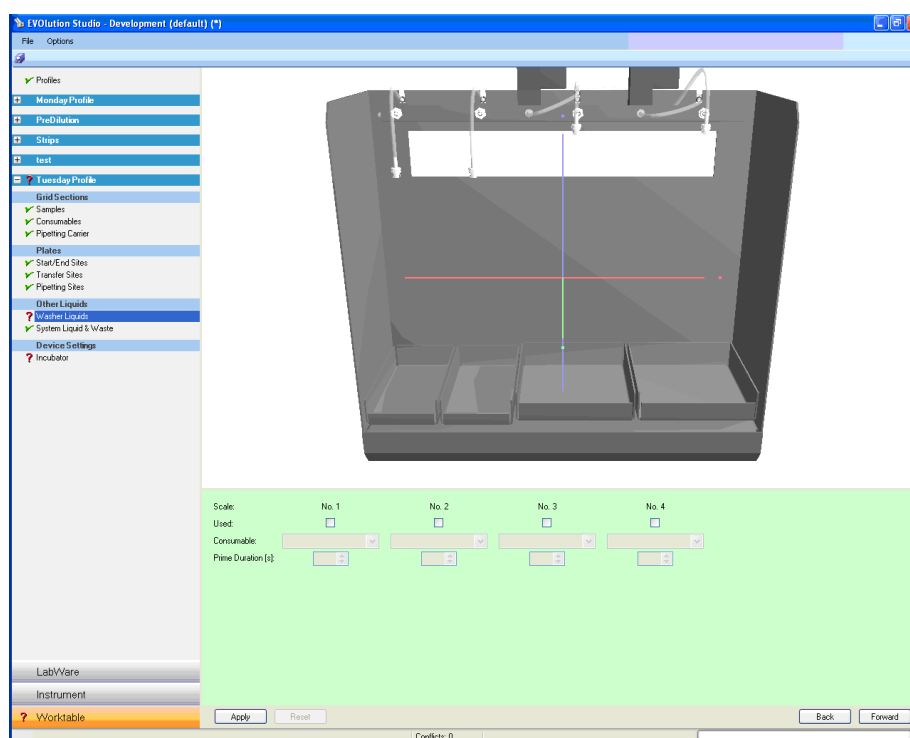


Fig. 10-20 Other liquids (washer liquids)

- 3 Select the corresponding check box to activate the required channels.
- 4 Select the consumable name for each active channel.
- 5 Accept the default prime duration or edit it, accordingly.
- 6 Click on the button **Apply** to save the profile.
*Or Click on the button **Reset** to abort the changes on the profile.*
The green tick to the left of the item indicates that the necessary definitions are completed.
- 7 In the tree view, select **Other Liquids > System Liquid & Waste**.
The wizard shows system liquid and the waste container. Normally, the default settings can be taken over.
- 8 To proceed with the wizard, click on the button **Forward**.
- 9 If you want to check the definitions in the previous screen, click on the button **Back**.

10.4.9 Device Settings

This section describes how to modify certain device settings. Currently, only the incubators are available.

- 1 Double-click the corresponding profile.
- 2 In the tree view, select **Device Settings > Incubators** to define the use of wash liquids in the system.

The red question mark to the left of the item indicates that the necessary definitions are not completed yet.

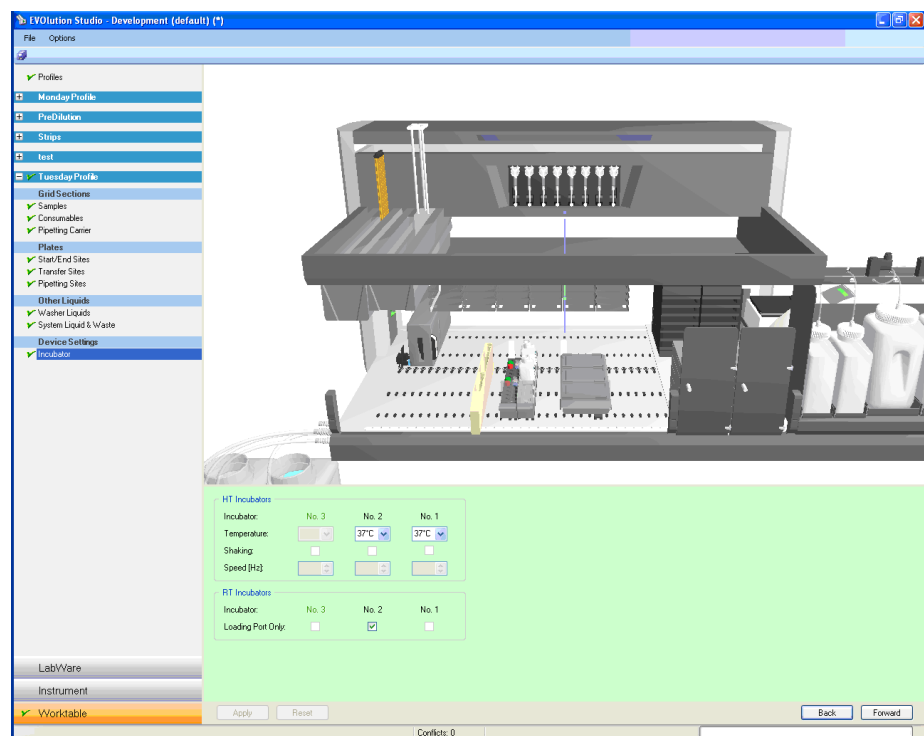


Fig. 10-21 Incubator settings

- 3 Select the temperature of the heated incubators.
- 4 Mark the check box for the room temperature incubators, if you like to use it as loading port for microplates (only possible if defined earlier).
- 5 Click on the button **Apply** to save the profile.

*Or Click on the button **Reset** to abort the changes on the profile.*

The green tick to the left of the item indicates that the necessary definitions are completed.

- 6 To proceed with the wizard, click on the button **Forward**.
- 7 If you want to check the definitions in the previous screen, click on the button **Back**.

11 Liquid Classes Editor

Purpose of This Chapter

This chapter describes the Freedom EVOLution SW liquid classes editor and its functions.

11.1 Introduction

Purpose

The Liquid classes editor enables the user to specify, copy and delete liquid classes. It can be started in the Process definition editor, clicking **Tools - Liquid - Liquid Class Editor**. The resulting liquid class definitions for all scripts are saved to a single file.

A liquid class is a set of liquid handling parameters. It specifies speeds, air gaps, detection modes, etc.

The liquid classes editor contains the following default liquid classes, compiled by the Tecan liquid handling specialists.

- ◆ Water
- ◆ Serum
- ◆ Water_Trough
- ◆ Alcohol
- ◆ Alcohol_Trough



ATTENTION

Undesired influence on process results.

The liquid classes **Alcohol** and **Alcohol_Trough** are intended for maintenance procedures only and have, therefore, not been tested for precision and accuracy.

Liquid Classes Editor Main View

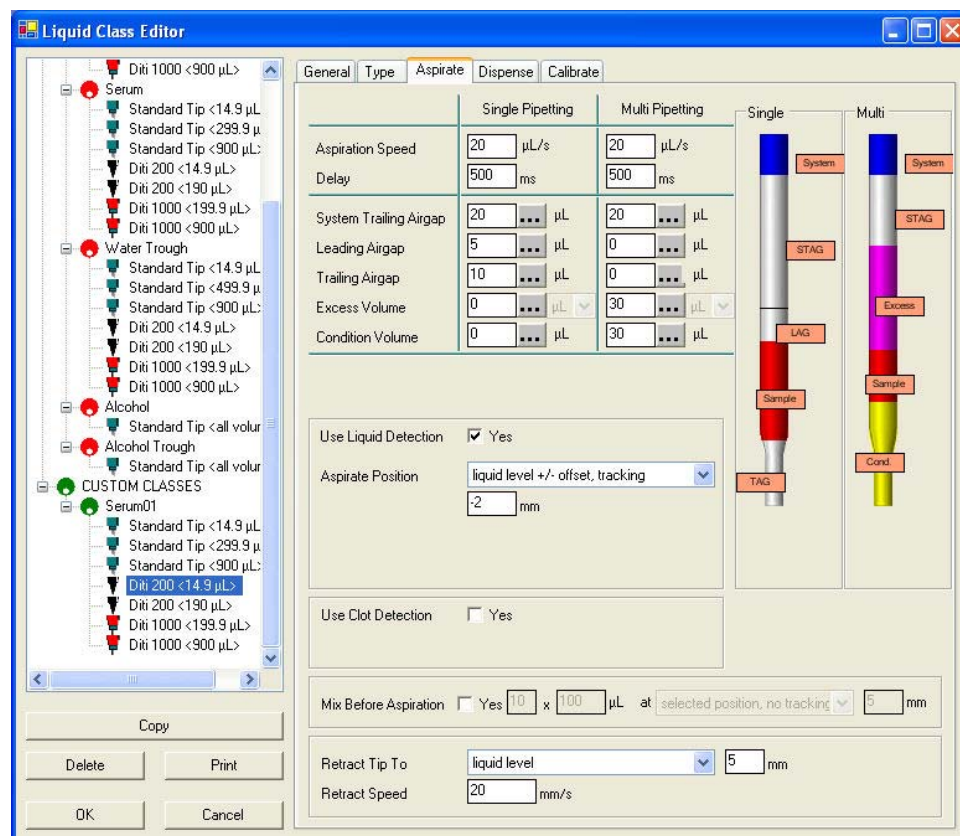


Fig. 11-1 Aspirate tab of the Liquid Classes Editor

The left side of the window shows a tree view of standard liquid classes (red symbols) and the custom liquid classes which have been user-defined (green symbols).

When an item in the liquid classes list is selected, the details view on the right-hand side displays one or more parameter pages.

11.2 Liquid Class Concepts

Refer also to the Tecan Liquid Handling Guide, Doc ID 391 780.

11.2.1 Liquid Classes

Liquid classes are sets of properties defining each a theoretical model of one type of liquid. Identified by a generic name (e.g. 'Serum', 'Buffer', 'Ethanol' etc.), they include all default *liquid handling parameters* required to process liquids of one specific type.

Each liquid class is divided into subclasses.

A subclass is characterized by the tip type and volume range for which its parameters are defined. During script runtime, the system selects the liquid class and subclass that best matches the liquid class name, the currently used tip type and the pipetting volume.

11.2.2 Pipetting Modes

Single Pipetting

The *pipetting mode* in which an individual aspiration is performed for every destination position.

Multi Pipetting

The the pipetting mode which aspirates once and then dispenses several aliquots.

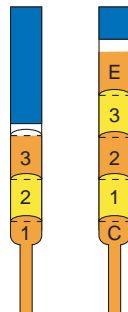


Fig. 11-2 Multi pipetting, conditioning and excess volumes

1, 2, 3 Aliquots

E Excess volume

C Conditioning volume

11.2.3 Liquid Detection

Liquid Level detection is required to allow the software to check the actual volume in a source and can also be used e.g. to ensure minimal tip contamination by limiting the tip immersion depth.

11.2.4 Clot Detection

A program function issuing a message if the difference between the liquid levels measured before and after sample aspiration does not correspond to the calculated difference of level, indicating clots attached to the tip.

11.2.5 Tracking

The pipetting tip's moving up or down to follow the liquid level during aspiration and dispense operations.

11.2.6 Calibration

The diluter movement for pipetting steps is calculated from the net volume specified in the pipetting script.
Calibration ensures that the specified net volumes are dispensed accurately by using a factor for the expected volume.

11.2.7 Mixing

Mixing is a process achieved by aspirating and dispensing liquid.

11.2.8 Retract

The process of pulling a tip back up after aspiration or dispensing.

11.2.9 Z-dimensions

X/Y/Z-movement

The left-right (X), front-back (Y), and up-down (Z) motions of the arms.

Z-dispense

The height of the point of the tip at which liquid can be dispensed.

Z-max

The lowest possible position the tip is allowed to reach. During a "search liquid command" the instrument will search for liquid from Z-start down to Z-bottom. If the tip reaches Z-bottom without finding liquid, the instrument reacts according to the liquid detection error mode selected.

Z-start

The height of the tip at which the *ILID* is switched on during a “search liquid command”.

Z-travel

The height at which the tip moves from one X/Y-position to another. Moves which cross different racks always use the highest Z-travel defined.

11.2.10 Parameters

Parameter List The following parameters are associated with a liquid class:

Tab. 11-1 Liquid Class Parameters

Parameter name	Description	Parameter value range
Aspiration speed	Speed used to aspirate the liquid	0.01 to 1000 µl
Delay	Delay after aspiration	0 to 30.000 s
System trailing air gap (STAG)	Air gap between the system liquid and sample	0 to 1000 µl
Leading air gap (LAG)	Air gap after the sample	0 to 1000 µl
Excess volume	Extra volume aspirated after the sample	0 to 1000 µl
Discard to waste	Discarding the excess or conditioning volume to waste	0 to 1000 µl
Back to aspiration	Discarding the excess or conditioning volume to the place it was aspirated from	0 to 1000 µl
Replace after	The number of times the excess volume is to be used before its replacement	0 to 9999
Conditioning volume	Extra volume aspirated before the sample	0 to 1000 µl
Use liquid detection	Use of liquid detection for aspiration	Yes/No
Aspirate position	Indicates where to position the probe for aspiration	ZMax +/- offset, with tracking ZMax +/- offset, no tracking L.level +/- offset, with tracking L.level +/- offset, no tracking % L.level +/- offset, with tracking % L.level +/- offset, no tracking

Tab. 11-1 Liquid Class Parameters (cont.)

Parameter name	Description	Parameter value range
Offset	Probe offset from the position (see Aspirate position above) Submerge is an offset below the liquid level. Recommendation: For tubes a submerge of 2 mm must be selected. For deep well microplates a submerge of 1 mm must be selected	-100 to +100 mm (negative values increase the submerge depth)
X:	Specifies whether to aspirate in center of the vessel, or on the side, or alternate	center, left, right, left/right, right/left
Use clot detection	Use of clot detection when aspirating	Yes/No
Mix before aspirating	Mixing the liquid before aspirating it	Yes/No
... X ... µl	Number of times for mixing, volume	0 to 100, 0 to 1000 µl
at ... , ... mm	Position for mixing, offset of the selected position	Selected position, no tracking, Selected position, with tracking, ZMax +/- offset, no tracking ZMax +/- offset, with tracking offset: Integer, -100 to 100 mm
Retract tips to ..., offset	Specifies where to retract after aspiration, offset from the selected position	Ztravel, ZDispense, Zstart, Current position, Liquid level Offset: -100 to 100 mm
Retract speed	Speed to be used when retracting	0.1 to 1000 mm/s
Detection mode	Single or double detection. If double detection is used, the software tries twice and compares the results. Recommendation: the mode Detect twice with separate tips with retract must be selected. The mode "Detect with odd/even tips twice" must not be selected , as there is the possibility of crosstalk and clot detection being less reliable.	
Liquid conductivity	Defines the conductivity of the liquid used. Recommendation: use the highest setting possible, i.e. very good . In tubes with gel or in monovettes with plunger, the liquid level detection can be rendered difficult. In these cases, liquid conductivity can be set to good . Do not use the setting 'Bad' if not necessary!	Bad/Good/Very good

Tab. 11-1 *Liquid Class Parameters (cont.)*

Parameter name	Description	Parameter value range
Detection speed	The speed with which liquid detection is performed	
Double detect distance	The threshold used to generate a liquid detection error in case of double detection, if the two detection results do not match.	
Clot detection - Detection speed	The speed used for clot detection	
Clot limit	The limit used in clot detection to generate a clot error. Recommendation: the clot limit must be set to 4 mm.	

11.3 Functionality

11.3.1 The Liquid Classes Tree View

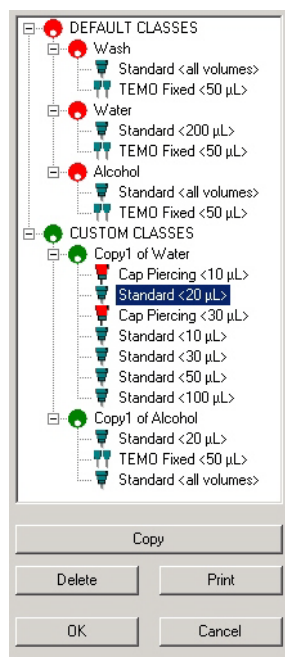


Fig. 11-3 Liquid classes tree view

Purpose:

In the Liquid classes tree view, liquid classes and sub classes can be selected for copying, deletion, printing and editing.

Each liquid class is divided into subclasses. Subclasses are displayed by clicking the + symbol in front of a liquid class or double-clicking the liquid class name. The + symbol then changes to a - symbol. Clicking the - symbol hides the subclasses again.

A subclass is characterized by the tip type and volume range for which its parameters are defined.

Buttons:

The command buttons **Copy**, **Delete** and **Print** below the tree view start these functions for the selected liquid class:

Button Copy

- The **Copy** command inserts a copy of:
 - the selected liquid class (default or custom), in the **Custom Classes** tree. A dialog prompts the user for a new liquid class name.

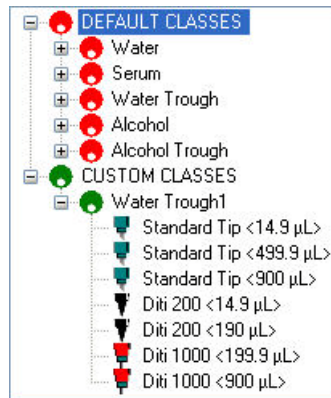


Fig. 11-4 Copied liquid classes in the tree view

Note: You can not change the properties of the predefined standard liquid classes. However, you can copy a predefined standard liquid class and then change the copy in the custom classes tree.

- the selected sub liquid class as last sub-class entry below the liquid class, using the same name as the original. If there are duplicate sub classes in the liquid classes tree, each time a sub class is selected, a warning is displayed:

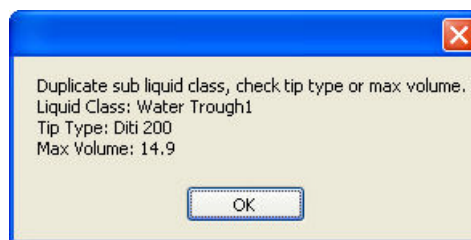


Fig. 11-5 Sub liquid class duplicate warning

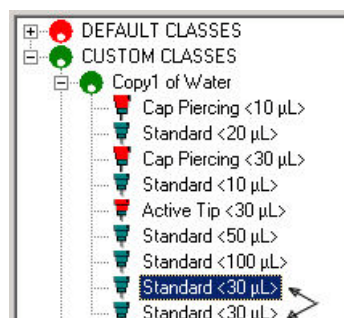


Fig. 11-6 Sub liquid class original and copy

Buttons OK and Cancel

- The buttons **OK** and **Cancel** close the liquid classes editor:
 - **OK**: saves all modifications and closes the liquid classes editor
 - **Cancel**: closes the liquid classes editor without saving any modifications.

11.3.2 Liquid Classes, General Information

When a liquid class in the tree view is selected, the screen half on the right displays general information about the liquid class:

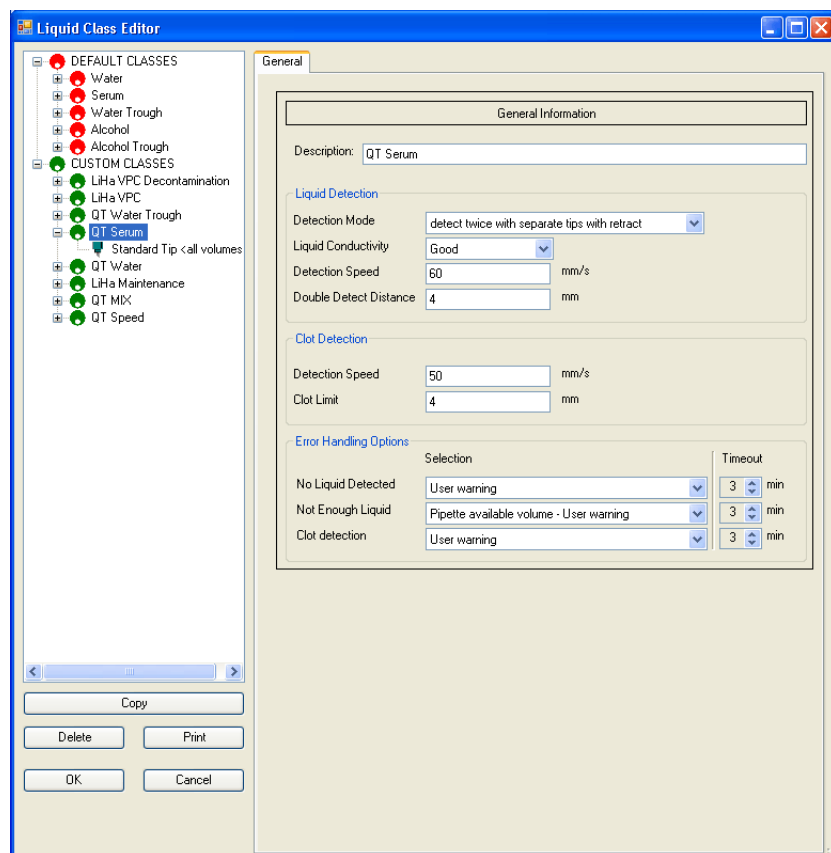


Fig. 11-8 General information

The system uses the parameters entered here for all subclasses of the selected liquid class.

LiHa Error Handling

For each liquid class, the user can specify the handling of possible LiHa errors. The errors and their handling can be specified as follows:

Tab. 11-2 LiHa error handling

Error	Handling Options
No Liquid Detected	Retry once then skip affected cavities Retry once then abort process User warning ^{a)}
Not Enough Liquid	Skip affected cavities Abort process User warning ^{a)} Pipette available volume Pipette available volume - User warning ^{a)}
Clot Detection	Dispense back and skip affected cavities User warning

a) User warnings alert the user of the error and offer options on how to proceed. See [Tab. 11-3 "LiHa error handling, user warning options"](#), [# 11-13](#).

When one of the listed LiHa errors occurs, it is displayed in the ticker-list, specifying:

- ◆ the time when the error occurred
- ◆ the user-selected error handling
- ◆ the position of the affected cavity/the tips affected by the error

Manual Intervention

If the selected error handling requires manual intervention:

- ◆ The system will notify the user with a message.
- ◆ After the user has confirmed the system message, he is prompted with a second message box to perform the action.
 - If the user does not confirm the message within the time-out specified, the system performs the fail condition. If he confirms the message, there is no time-out.
- ◆ The corresponding lights of the loading interface start blinking in red, and if applicable, the door locks open.
- ◆ The user performs the necessary actions and then closes the message panel.
- ◆ The lights of the loading interface switch back to steady red light, and the status lamp switches to green. The door locks are closed again.

If the selected error handling does not require manual intervention, the system notifies the user in the ticker-list and performs the error handling specified.

For existing configurations, each liquid class must be selected once in the Liquid Class Editor. By this action, the default values for LiHa Error Handling are stored for each liquid class.

User warnings offer the following error handling options:

Tab. 11-3 LiHa error handling, user warning options

Error	User Warning Options	Time-Out
No Liquid Detected	Refill Allows the user to refill the cavity and continue. Access is controlled through use of the loading interface (grid control). All cavities of the carrier which is removed to allow the refill will be marked with a warning flag.	Skip affected cavities.
	Skip Affected Cavities Processing continues omitting the affected cavities. Aspirate positions are marked with a warning and the corresponding destination positions are marked as error.	
	Abort The Process is aborted. All destination cavities for the particular process are marked as error (In situations where merged strips are active, processing of the unaffected assays continues.)	
Not Enough Liquid	Refill Same as in case of No Liquid Detected (see above).	Skip affected cavities.
	Skip Affected Cavities Same as in case of No Liquid Detected (see above).	
	Abort Same as in case of No Liquid Detected (see above).	
	Pipette available volume The remaining liquid (i.e. the liquid that does not suffice the target pipetting volume) is dispensed into the cavity after the last correct dispense, subsequent cavities are skipped. This option only works <ul style="list-style-type: none"> • if the source container is accessed with a single tip (in case of multiple tip access the target cavity is skipped). • in a sample splitting process (in other processes the target cavities are skipped). 	

Tab. 11-3 LiHa error handling, user warning options

Error	User Warning Options	Time-Out
Clot Detection Error	<p>Allow Access Here the user is allowed to access the instrument (the front door locks are opened) and remove the clot with a tissue or other suitable cleansing material.</p>	The process is aborted.
	<p>Abort The Process is aborted. All destination cavities for the particular process are marked as error. (In situations where merged strips are active, processing of the unaffected assays continues).</p>	
DiTi Not Fetched (see Application Settings Control)	No user interaction possible.	NA
DiTis Still Mounted	<p>Allow Access User is requested to manually remove the Disposable Tip. (If the error remains, then this suggests that either the adapter cone needs tightening or there is a hardware problem.)</p>	Infinite retry until situation is corrected. Dialog will be presented multiple times.
	Abort	The run is completely aborted.

11.3.3 The Types Tab

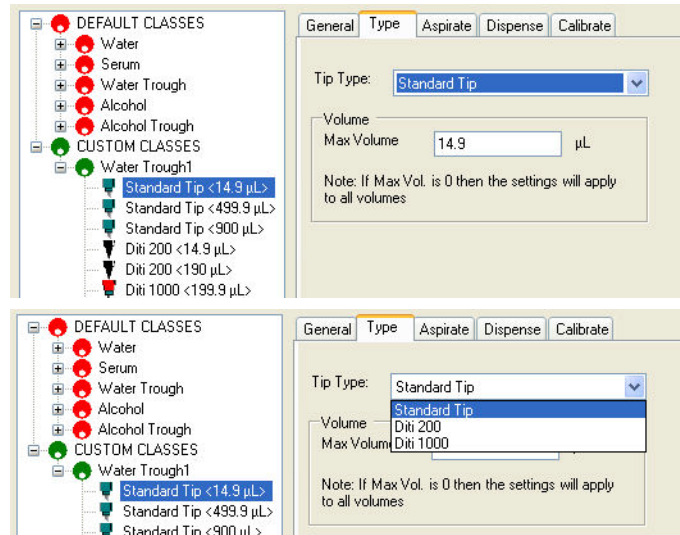


Fig. 11-9 Tip type parameters for liquid classes

Purpose:

Under the **Types** tab, the tip type can be selected, and the maximum volume for the tip type can be defined.

The tree entry for the modified class changes immediately after a change under the **Types** tab.

The data changed here are saved to file when the **OK** button is clicked. To leave the liquid class editor without saving your changes, click **Cancel**.



ATTENTION

When determining (in dependence of the desired volume specified) which tip type to use for pipetting, the system starts with the smallest volume and analyzes tip volumes in ascending order. For this reason, a tip type with unlimited volume must be defined, in order to cover all possible volumes. This is achieved by specifying a tip type with volume "0".

The tree entry for the modified class changes immediately after a change under the **Types** tab.

The data changed here are saved to file when the **OK** button is clicked. To leave the liquid classes editor without saving the changes, click **Cancel**.

11.3.4 The Aspirate Tab

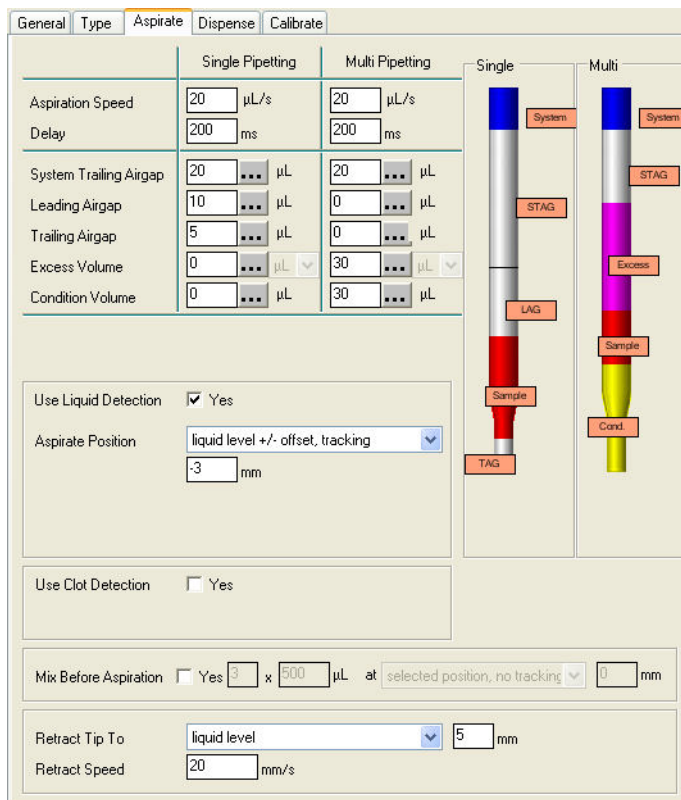


Fig. 11-10 The Aspirate tab

Purpose

In the **Aspirate** screen, the aspiration parameters of the selected liquid class are specified and the volumes in the tip are visualized.

Buttons

The buttons with the tree dots on them open a parameter-prompt list where values can be entered:

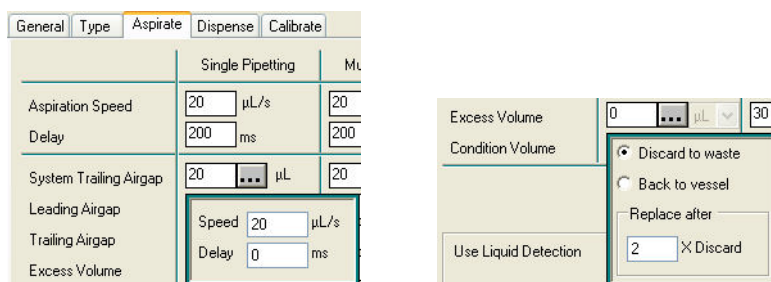


Fig. 11-11 Parameter prompt lists

On the graphic visualization of the aspiration volumes, the mouse cursor changes to cross hairs. The long name for the volume under the cursor, together with the volume in μl , is shown in a tooltip.

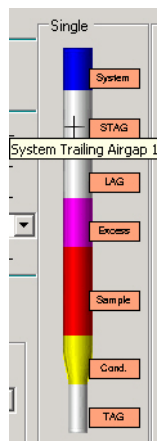


Fig. 11-12 Aspirate screen: Visualization with tooltip

The following volumes are visualized in the **Aspirate** screen:

System: System Liquid

STAG: System Trailing Air Gap

The system trailing air gap is used to prevent contamination by ensuring that the system liquid cannot come into contact with the liquid being aspirated.

LAG: Leading Air Gap

The air of the leading air gap is dispensed together with the net volume which you specify in the Dispense command. The resulting tip blowout leads to more accurate pipetting, but may also lead to foam.

Excess: Excess Volume

The volume of excess liquid which is aspirated together (not separated by an air gap) with the liquid to be distributed. It is not dispensed anywhere, but discarded to waste (or a special position) after use, and serves to minimize dilution of the reagents by the system liquid.

Sample: Pipetted Liquid

Sample represents the pipetted liquid.

Cond.: Conditioning Volume

The volume of excess liquid which is aspirated together with the liquid to be distributed and immediately discarded (usually in the source container) before the dispense process starts. It serves to create a controlled state of the system.

A conditioning volume can be used to maximize pipetting accuracy by ensuring that the liquid meniscus at the end of the tips is the same shape after aspirating as it will be after dispensing. The conditioning volume is discarded directly after aspirating.

TAG: Trailing Air Gap

The trailing air gap is used to prevent liquid dripping from the tips when the arm moves. In addition, it ensures that the liquid meniscus is not dragged away from the end of the tip during fast arm movements.

The trailing air gap is aspirated at the Z-position specified with **Retract tip to**. Otherwise the trailing air gap is aspirated with the tips in the air.

11.3.5 The Dispense Tab

	Before Start	After Stop
Piezo Delay	0 ms	0 ms
Diluter Delay	0 ms	0 ms

Use Liquid Detection Yes

Dispense Position: z-dispense +/- offset, with tracking
50 mm X: left
Y: rear

Tip Touching: move tips left
Speed: 5 mm/s
Delay after touching: 50 ms

Mix after dispense: Yes 50 x 50 uL at z-max +/- offset, no t 50 mm

Retract Tips to: z-dispense 50 mm
Retract Speed: 50 uL/s

Fig. 11-13 The *Dispense* tab

Purpose

In the **Dispense** screen, the dispense parameters of the selected liquid class can be specified by typing into the data fields and/or clicking the arrows near the lists.

11.3.6 The Calibrate Tab

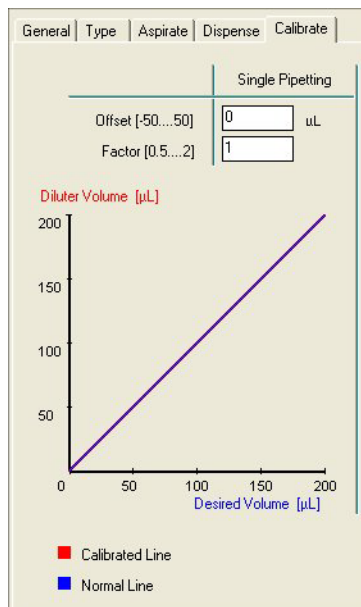


Fig. 11-14 The *Calibrate* tab

These parameters ensure that the specified net volumes are dispensed accurately. The curve in the dialog box shows graphically the current settings for single pipetting.

The following expression is used to calculate the diluter movement from the net volume specified in the pipetting script:

$$\text{Calibrated diluter movement} = (\text{net volume} * \text{factor}) + \text{offset}$$

11.4 Operating Sequence

11.4.1 Global Parameters

The Freedom EVOLution SW uses these parameters for all subclasses of the selected liquid class.

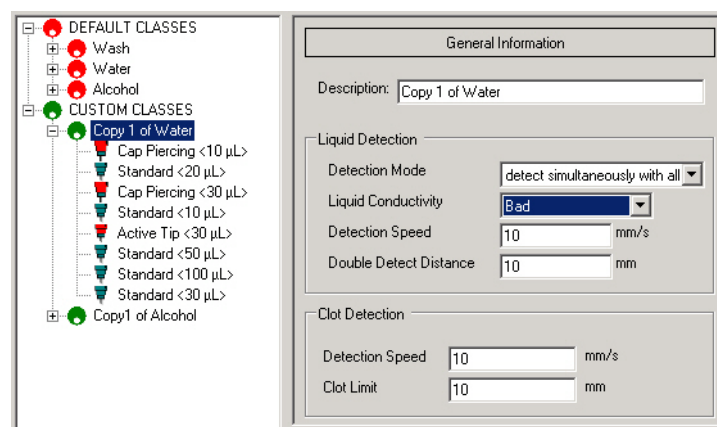


Fig. 11-15 Global parameters for liquid classes

To specify the liquid class parameters:

- 1 Specify the **Name** of the liquid class.
- 2 Specify the **Liquid Detection** parameters.

You can specify:

- The detection speed
- The liquid conductivity. The following sensitivity settings are recommended:
 - Very good conductivity: serum, DNA solution, buffer
 - Good conductivity: tap water
 - Bad conductivity: DMSO, ethanol, distilled water
- The double distance (only necessary when a detection mode with double detection is chosen). The double distance is the distance by which the tips retract (move upwards) before carrying out liquid level detection for the second time.
- The detection mode

Note: You can activate or disable the specified liquid level detection for aspirating and/or dispensing with the **Use Liquid Detection** check boxes on the **Aspirate** and **Dispense** tabs.



ATTENTION

In diagnostics, for security reasons, the following detection mode must be used for all cavities and containers (sample tubes, etc.):

- ◆ **Detecting twice with separate tips, with retract**
- ◆ Refer to the definitions in the default liquid classes

- 3 Specify the **Clot Detection** parameters. You can specify the **Detection Speed** and the **Clot Limit**.

11.5 Liquid Classes for Fixed Tips and DiTis

11.5.1 Type Parameters (Fixed Tips and DiTis)

The Freedom EVolution SW uses these parameters to select the best suited subclass for a specified tip type and pipetting volume.

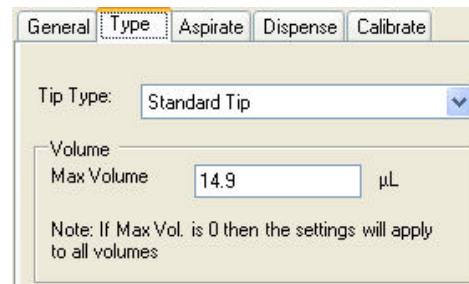


Fig. 11-16 Type parameters for liquid classes

To specify the type parameters for fixed tips or DiTis:

- 1 Click the list box arrow, to select the **Tip Type**.
The following tip types are available:
 - Standard
 - DiTi 200
 - DiTi 1000
- 2 Specify the maximal volume in the **Max. Volume** field.

11.5.2 Aspirate Parameters (Fixed Tips and DiTis)

The Freedom EVOLution SW uses these parameters when aspirating or mixing. The illustrations at the top right of the dialog box show graphically the current settings for single and multi pipetting. **Sample** stands for the pipetted volume.

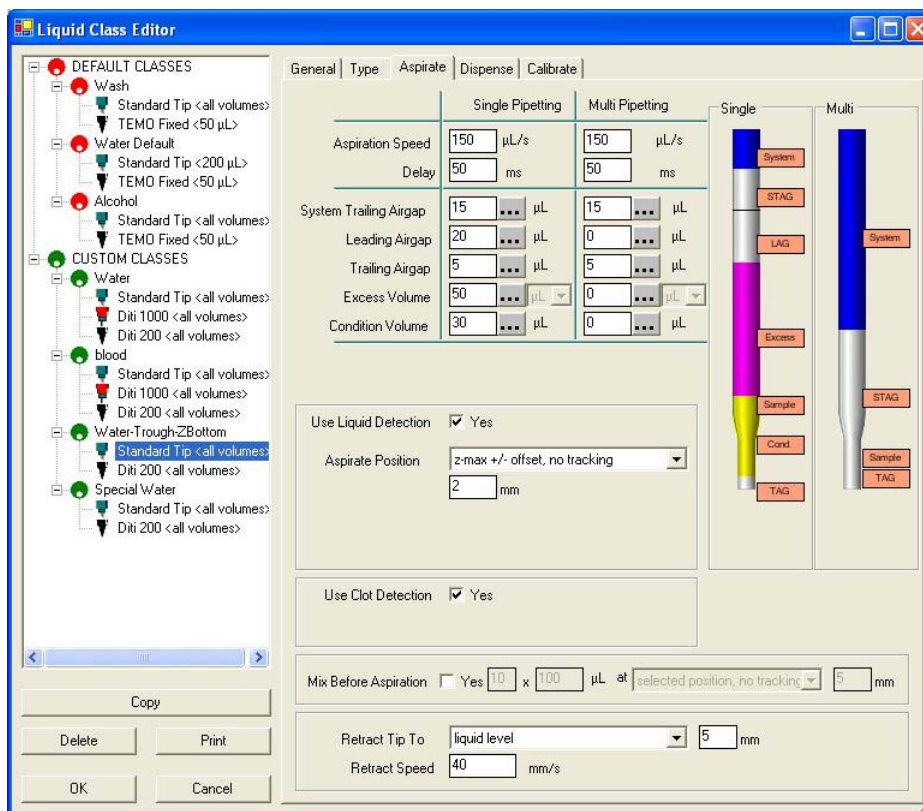


Fig. 11-17 Aspirate parameters for fixed tips and DiTis

To specify the aspirate parameters:

- 1 Make sure the liquid class you intend to modify is selected in the liquid class tree view.
- 2 Click the **Aspirate** tab.
- 3 Type in the **Aspiration Speed** field, to specify the Aspiration Speed for the liquid.
- 4 Specify the **Delay** after aspiration of the liquid.

5 Specify the volume of the **System Trailing Air Gap**.

The Freedom EVolution SW uses the aspiration speed specified for the leading air gap also for the system trailing air gap.

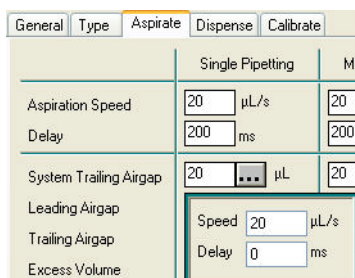


Fig. 11-18 Specifying aspiration speed and delay for air gaps

- 6 Click the text box near **Leading Air Gap**, and type to specify the volume of the leading air gap.
- 7 Click the button with three dots, to specify aspiration speed and delay after aspiration for the leading air gap.
- 8 Specify the volume of the **Trailing Air Gap**.
- 9 Click the button with three dots, to specify aspiration speed and delay after aspiration for the trailing air gap.
- 10 Specify the **Excess Volume** (in μL or %).
- 11 Click the button with three dots, to select the position to use for discarding the excess volume (**Discard to waste** or **Back to vessel**).
- 12 Specify a digit in the **Replace after** field to discard the excess volume after re-using it several times (e.g. to save costs). This only applies if excess volume > 0 and if you are using multi-pipetting.

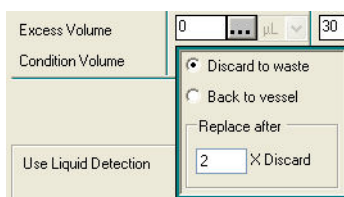


Fig. 11-19 Specifying discard position and reuse of excess volume

- 13 Specify the **Conditioning Volume**.
- 14 Click the button with three dots, to select the position to use for discarding the conditioning volume (**Discard to waste** or **Back to vessel**).
- 15 Click to check the **Use Liquid Detection** check box if you want to activate liquid level detection.

*The Freedom EVolution SW uses the detection mode, liquid conductivity, detection speed and double distance settings which you defined in the **General Information** dialog for the liquid class.*

- 16 Click the down arrow in the **Aspirate Position** list box, to specify the Z-position and the offset of the tips when aspirating.

A negative value for the offset lowers the tips. You can only choose a Z-position relative to the liquid level if you have activated liquid level detection.

If you choose an aspirate position with tracking, the tips move downwards as the liquid level drops in the wells during aspiration. This option can be used e.g. to ensure minimal tip contamination by limiting the tip immersion depth.

- 17 Click to check the **Use Clot Detection** check box to activate Clot Detection.
The Freedom EVolution SW uses the Detection speed and Clot Limit which you defined in the General Information dialog for the liquid class.
- 18 Click to check the **Mix before Aspiration** check box if you want the Freedom EVolution SW to mix the liquid before aspirating it. You can define the number of mix cycles, the mix volume (max. 2500 µl), the Z-position and the offset. A negative value for the offset lowers the tips.
- 19 Click the down arrow in the **Retract Tips to** list box, to specify the Z-position and offset to which the tips should retract (move upwards) after aspirating.
A negative value for the offset lowers the tips. You can only choose a Z-position relative to the liquid level if you have activated liquid level detection.
- 20 Type in the data field near **Retract Speed**, to specify the required retract speed.

11.5.3 Dispense Parameters (Fixed Tips and DiTis)

The Freedom EVolution SW uses these parameters when dispensing or mixing.

	Single Pipetting	Multi Pipetting
Dispense Speed	600 µL/s	600 µL/s
Breakoff Speed	150 µL/s	400 µL/s
Delay	200 ms	200 ms
Trailing Airgap after each Dispense	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
Trailing Airgap after last Dispense	0 µL	0 µL

Use Liquid Detection Yes

Dispense Position: z-dispense +/- offset, no tracking
0 mm

Mix after dispense Yes 10 x 100 µL at selected position, no tracking 5 mm

Retract Tips to: z-dispense 0 mm

Retract Speed: 50 mm/s

Fig. 11-20 Dispense parameters for fixed tips and DiTis

To specify the dispense parameters:

- 1 Make sure the liquid class you intend to modify is selected in the liquid class tree view.
- 2 Click the **Dispense** tab.
- 3 In the **Aspiration Speed** field, specify the aspiration speed for the sample.
- 4 In the **Dispense Speed** fields, specify the maximum dispense speed.
- 5 In the **Breakoff Speed** fields, specify the final dispense speed (breakoff speed).
- 6 In the **Delay** field, specify the delay after dispensing.
- 7 Check the **Trailing Air Gap after each Dispense** check box, to automatically aspirate a trailing air gap after each dispense operation in order to avoid droplets forming on the tip. The trailing air gap parameters are specified under the **Aspirate** tab.
- 8 If you want to activate liquid level detection, check the **Use Liquid Detection** check box.
The Freedom EVolution SW uses the detection mode, liquid conductivity, detection speed and double distance settings which you defined in the General Information dialog for the liquid class.
Liquid Level detection during dispensing can be used e.g. to ensure that the tips are immersed in the liquid during dispensing.
- 9 Click the **Dispense Position** list box, to select the Z-position and the offset of the tips when dispensing.
A negative value for the offset lowers the tips. You can only choose a Z-position relative to the liquid level if you have activated liquid level detection.
If you choose a dispense position with tracking, the tips move upwards as the liquid level rises in the wells during dispensing. This option can be used e.g. to ensure minimal tip contamination by limiting the tip immersion depth.
- 10 Type in the **Speed** field, to specify the tip touching speed.
- 11 Check the **Mix after Dispense** box if you want to mix the liquid after dispensing it.
- 12 Fill in the data fields following **Mix after Dispense**, to define
 - the number of mix cycles,
 - the mix volume (max. 2500 µl),
 - the Z-position,
 - the offset (a negative value for the offset lowers the tips).
- 13 In the **Retract Tips to** list box, specify the Z-position.
- 14 In the data field following the **Retract Tips to** list field, specify the offset to which the tips should retract after dispensing.
A negative value for the offset lowers the tips. You can only choose a Z-position relative to the liquid level if you have activated liquid level detection.
- 15 In the **Retract Speed** data field, specify the required retract speed.

11.5.4 Calibration Parameters (Fixed Tips and DiTis)

The Freedom EVolution SW uses these parameters to ensure that the specified net volumes are dispensed accurately. The two curves in the dialog box show graphically the current settings for single and multi pipetting.

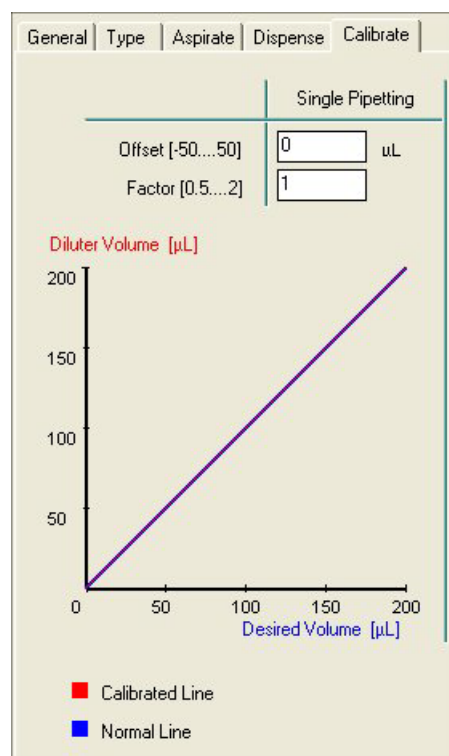


Fig. 11-21 Calibration parameters for fixed tips and DiTis

To set the calibration parameters for a liquid class:

- 1 In the **Offset** fields, specify the offsets to be applied for single pipetting.
- 2 In the **Factor** fields, specify the calibration factors to be applied for single pipetting.

The Freedom EVolution SW uses the following expression to calculate the diluter movement from the net volume specified in the pipetting script:

$$\text{Calibrated diluter movement} = (\text{net volume} * \text{factor}) + \text{offset}$$

12 Consumable Data Editor

Purpose of This Chapter

This chapter describes purpose and use of the Consumable Data Editor.



Fig. 12-1 Consumable Data Editor icon

12.1 Introduction

Purpose

The Consumable Data Editor is used to specify consumables, such as substances, microplates, disposable tips, etc., and to define their identification and handling in the process (e.g. how the consumables should be reloaded).

Typical consumables are e.g.:

- ◆ Diluent
- ◆ Cleaning liquid
- ◆ System liquid
- ◆ Coated microplates
- ◆ Strip frames
- ◆ DiTi racks
- ◆ Disposable tips (DiTis)

Consumables

Consumables are used in the Worktable Editor and in the Process Definition Editor, where for each process step the appropriate consumables are declared. The liquid class a consumable belongs to is also referred to in the process definition editor.

Consumable substances can have their own cavity (e.g. positive or negative control). These substances exist only in their specific cavities.

Barcode Formats

The barcodes, which are used for consumable identification, can be checked for uniqueness. Moreover, the barcode information can be split into sections, which can be evaluated individually.

12.2 Functionality

12.2.1 Consumable Data Editor Main View

The Consumable Data Editor main view displays a tree view of consumables (the consumable archive) on the left screen side, and a property sheet for the selected consumable on the right-hand side, as well as a toolbar for the handling of consumable descriptions and barcode formats.

12.2.1.1 Tab Consumables

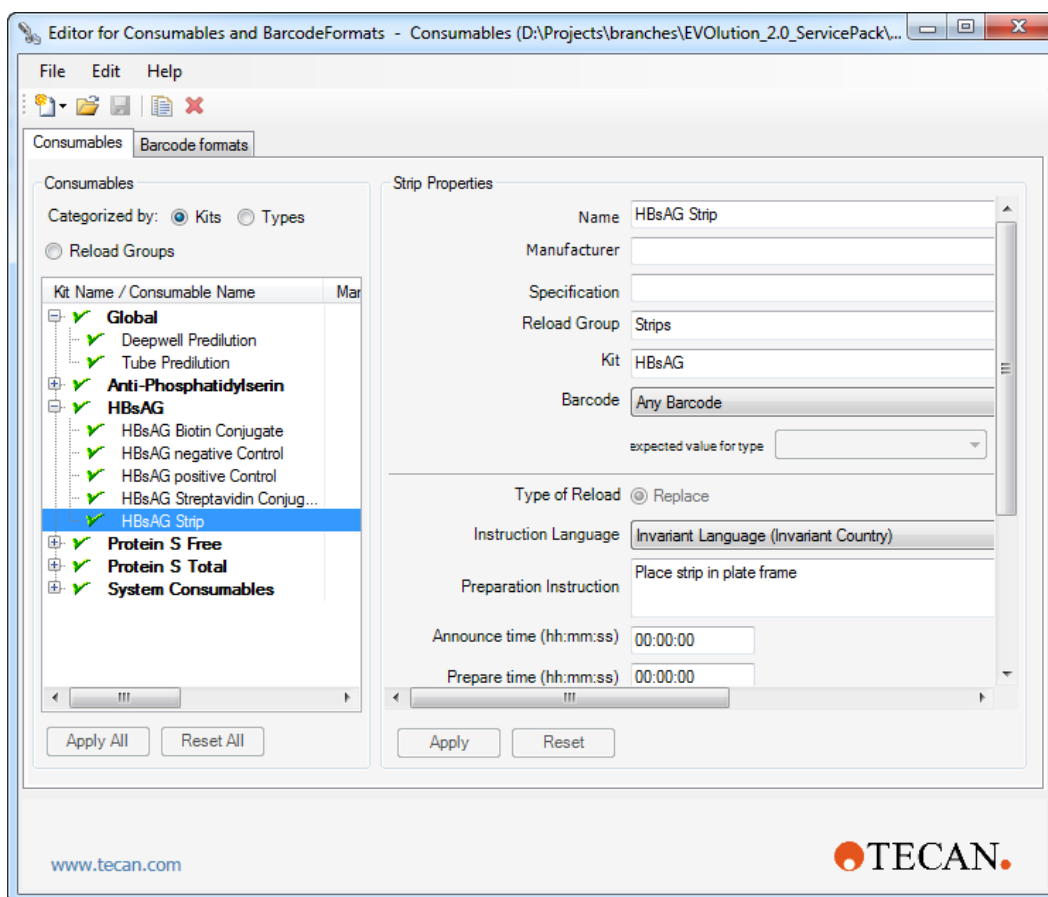


Fig. 12-2 Consumable Data Editor: Tab Consumables

Property Sheet

The property sheet defines the name, manufacturer specifications and the membership of the consumable.

Barcode Format

Barcode

Defines the barcode format the consumable identification barcode is checked against.

Refer to section [12.2.1.2 "Tab Barcode formats"](#), [12-8](#).

Apart from the user-defined formats the following options can be selected:

- No barcode
 - The barcodes are not checked for uniqueness.

- Any barcode
 - The barcodes are checked for uniqueness at the moment, i.e. during the current run.
- Any unique barcode
 - The barcodes are checked for uniqueness forever; i.e. over a long period of time.

Note: *Data are stored on the harddisk of the system; for cleanup refer to the Freedom EVOLution SW Runtime Controller Manual (Application settings).*

expected value for type

Displays the range of expected values for the barcode section “type”, if this is defined in the barcode format.

Options

Depending on the type of consumable, different options are available. The available options are described in the tool tips.

Microplate Properties (Options)

Reload Options

Type of Reload:

Refill: Container is refilled (the same barcode is expected).

Replace: Container is replaced by a filled container (a different barcode is expected).

Preparation instruction

Contains a text field that will be displayed when the announcement for a reload is issued. The text can be classified language-specific, i.e. it will be displayed in the user interface language, or language-unspecific (invariant language).

Announce time (hh:mm:ss)

Defines the time the announcement for a reload is issued before the call of the reload action takes place.

The announcement also displays the “Preparation Instruction”.

- The announce time must be larger than 00:00:00 and larger than the prepare time.

Prepare time (hh:mm:ss)

Defines the time necessary to prepare the consumable to be reloaded.

The prepare time will be scheduled in the process run. The system assumes that the operator is not available for other actions during this time.

- The prepare time can be 00:00:00 or larger.



ATTENTION

Process will not be scheduled if the announce time is equal or shorter than the prepare time.

Make sure that the announce time is always longer than the prepare time.

Microplate Labware

Defines the microplate type.

Select if the plate is coated or not with the option buttons:

- Coated
- Non Coated

Coating Labware (coated plates only)

Defines the coating type.

Coating Tiles

Tile size of coating (coated plates only)

Defines the size of a repetitive coating pattern (tile) on the microplate.

This is important if the plate is intended to be reused. In this case the next unused tile will be processed, i.e. if one well of a tile has already been used the whole tile is considered to be used.

Select the tile size by defining the number of rows and columns the coating stretches over.

The figure shows an example of a plate with tile size two rows and four columns.

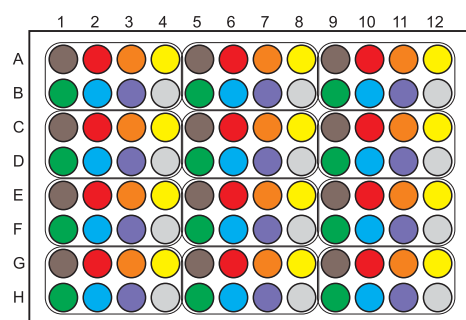


Fig. 12-3 Example of plate with coating tiles

Note: A uniformly coated plate is defined with one row and one column since there is no repetitive pattern across several wells.

Check box/entry field ShelfTime

The time in which a substance can be used.

The shelf time is counted from the time when the consumable is requested to be loaded. If the shelf time expires during a run the plate will be invalidated.

- Activate the function in case of unstable substances (select check box)
- For uncritical substances unselect the check box
- Enter the value in the format d.hh:mm:ss (number of days, hours, minutes, seconds).

Scan Before Usage

When this option is checked, the plate is scanned before any pipetting starts.

Substance Properties (Options)

List of cross references to information provided in other sections:

Cross References

Subject	Reference
Handling of substances with special cavities in the Worktable Editor	See section 8.3.4 , 8-10

Note: There are substances which can exist in various types of cavities, e.g. serum. Other substances have their special cavities (e.g. positive and negative control) and exist only in these cavities.

This special property, **Has own Cavity**, can be set in the substance properties dialog.

Fig. 12-4 Substance properties dialog

A *Has own Cavity* setting

B *Selection list for the specific cavity for a substance*

Reload Options

Type of Reload:

Refill: Container is refilled (the same barcode is expected).

Replace: Container is replaced by a filled container (a different barcode is expected).

Preparation instruction

Contains a text field that will be displayed when the announcement for a reload is issued. The text can be classified language-specific, i.e. it will be displayed in the user interface language, or language-unspecific (invariant language).

Announce time (hh:mm:ss)

Defines the time the announcement for a reload is issued before the call of the reload action takes place.

The announcement also displays the "Preparation Instruction".

- The announce time must be larger than 00:00:00 and larger than the prepare time.

Prepare time (hh:mm:ss)

Defines the time necessary to prepare the consumable to be reloaded.

The prepare time will be scheduled in the process run. The system assumes that the operator is not available for other actions during this time.

- The prepare time can be 00:00:00 or larger.



ATTENTION

Process will not be scheduled if the announce time is equal or shorter than the prepare time.

Make sure that the announce time is always longer than the prepare time.

Substance Labware

Name of the substance: Has influence on the color the substance is shown in the Worktable Editor.

Substance Role

Additional tag that classifies the role the substance plays in the process. The value displayed in this field is given in the Labware Editor. The contents of this field cannot be changed in the Consumable Data Editor.

Substance Role Hint

Additional remark field. The contents of this field cannot be changed in the Consumable Data Editor.

Substance Role Remark

Additional remark field. The data entered here is for information only; it has no influence on the process.

Cavity Setting

- **Has own cavity:**
 - If the consumable is replaced together with the container
- **No specialized cavity:**
 - If the consumable is defined as liquid only

Cavity Labware

Name of the cavity or container (only active if substance "Has own cavity", see **Substance Labware**).

*The selection of a cavity automatically sets the value for **Cavity Volume**.*

Initial Load Allowed

When this option is checked, the consumable is requested during initial load.

Check box/entry field ShelfTime

The time in which a substance can be used.

The shelf time is counted from the time when the consumable is requested to be loaded. If the shelf time expires during a run the system will generate a reload (for all consumables except microplates).

- Activate the function in case of unstable substances (select check box)
- For uncritical substances unselect the check box
- Enter the value in the format d.hh:mm:ss (number of days, hours, minutes, seconds).

Note: *For consumables that are checked for uniqueness forever the monitoring of the shelf time will extend over several runs.*

Check box Initial Load allowed

Determines if the substance can be placed on the worktable from the beginning:

- For uncritical substances select the check box.
- Deactivate the function in case unstable substances; the substance will be loaded when needed only.

Cavity Volume

Defines either the maximum volume in a container or the number of items, e.g. DiTis in a DiTi rack, that is available.

*If a labware in **Cavity Labware** is selected, the values are taken over from the labware definition.*

Reload level

Defines at which level (in terms of a remaining volume or number of items) the system is allowed to schedule a reload.

Note: *This only applies if the option “Reload early” is selected.*

- For expensive substances set this parameter to a low level to enable the system to consume the substance completely.
- For uncritical substances, such as water, buffer, disposable tips, etc. set this parameter higher to give the scheduler a greater freedom to place the reload.
- Wash liquids only: The **Force Reload Level** must always be set to “0” (otherwise the default reload level – the “Balance error tolerance” will not work as intended).

Volume Precheck

Defines if the volume in the container is checked before the consumable is used.

- Check box **Enabled** activates the precheck.
- Check box **Decontaminate** causes the system to decontaminate after each precheck procedure.

12.2.1.2 Tab Barcode formats

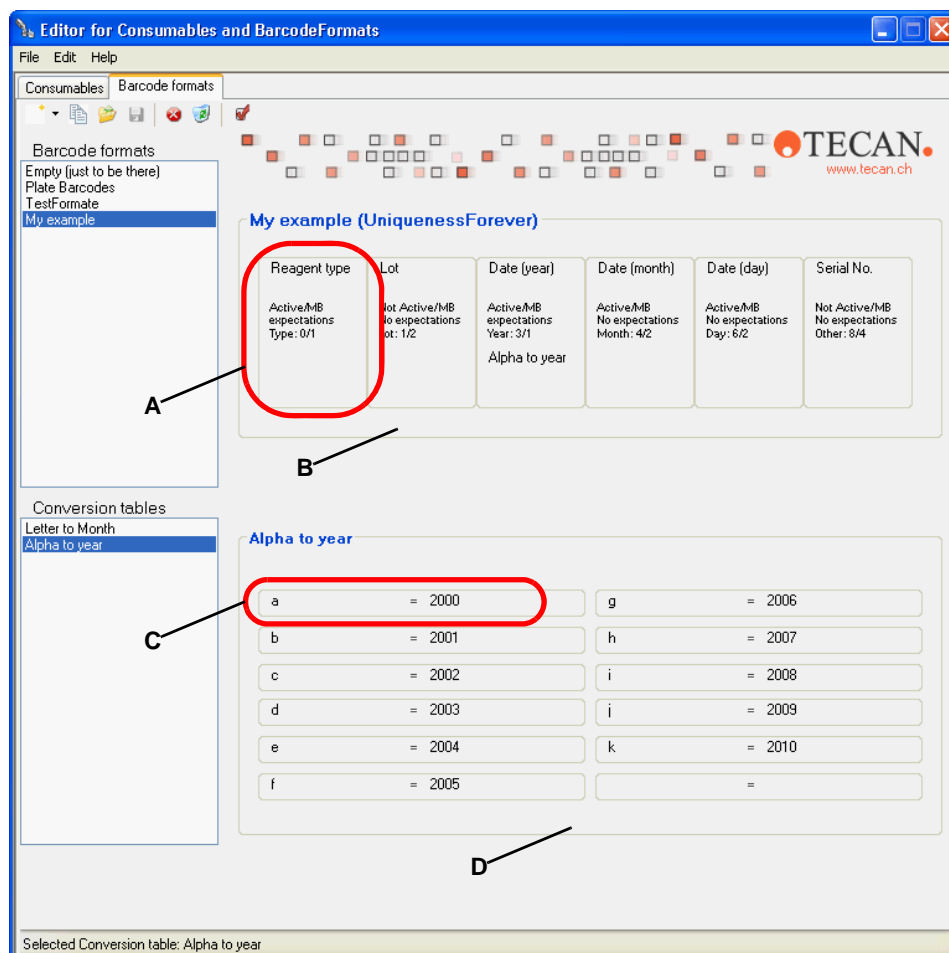


Fig. 12-5 Consumable Data Editor: Tab Barcode formats

- | | |
|--|---|
| A Properties of a barcode section | C Conversion field |
| B Frame around barcode sections | D Frame around conversion fields |

Barcode Formats

The tab displays the barcode formats on the upper left side and the barcode format properties on the right side.

On the lower part the tab displays the name and contents of the conversion tables.

When defining a new barcode format, the following options can be selected:

- ◆ NoUniqueness
 - The barcodes are not checked for uniqueness, i.e. several barcodes with identical information will be accepted.
- ◆ UniquenessAtMoment
 - The barcodes are checked for uniqueness during the current run, i.e. consumables with identical barcode will be rejected.
- ◆ UniquenessForever
 - The barcodes are checked for uniqueness over a long period of time.

Note: Data are stored on the harddisk of the system; for cleanup refer to the Freedom EVolution SW Runtime Controller Manual (Application settings).

Double-click on the frame around the barcode sections (see [Fig. 12-5](#), [Fig. 12-8](#)) to change the name of the barcode format.

Barcode Masking

A barcode consists of one coded string of characters.

The barcode masking feature enables the user to split the character string into sections, which can be evaluated and handled differently.

The editor for barcode formats offers the following section types:

- ◆ Type
- ◆ Lot
- ◆ Expiry date (year, month, day)
- ◆ Other

The figure shows an example of a split string from a barcode.



Fig. 12-6 Example of barcode masking

The editor for barcode formats offers the following features:

- ◆ The start position of a section within the character string can be defined.
- ◆ The length of a section can be defined.
- ◆ The section data can be evaluated or used for logging only.
- ◆ The individual sections can be checked for expected values. Out-of-range values will generate an error message.
- ◆ The data of a section can be converted into a new value (e.g. value “a” for the year in the example above can be converted into “2000” according to a definable conversion table).

To modify the barcode format, double-click on a barcode section (see [Fig. 12-5](#), [Fig. 12-8](#)).

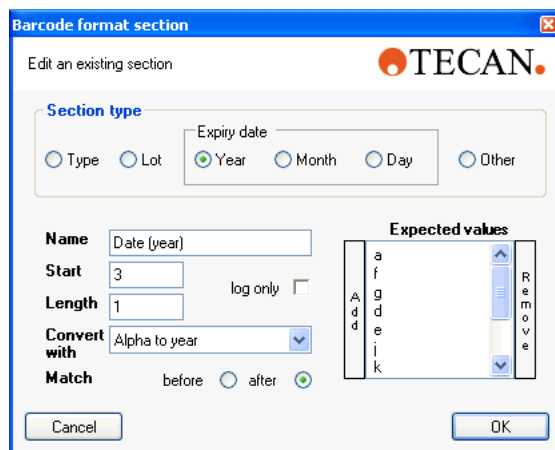


Fig. 12-7 Barcode section properties

Field Section type

The option buttons define the section type.

Note: For the expiry date the year must always be defined before (on the left of) the month and day, even if the start character within the barcode string comes after the other sections.

Name

Defines the name of the barcode section as displayed in the tab **Barcode formats**.

Note: The name defined here will appear in the plate report.

Start

Defines the character at which the barcode section starts. Note that 0 (zero) is the first character in the string.

Length

Defines the length of the barcode section expressed in number of characters.

Log only

The check box defines if the barcode section is evaluated and logged in the plate report or only logged in the plate report (check box marked).

Convert with

The list box defines the conversion table with which the read values are converted.

Note: The converted data will appear in the plate report.

For no conversion select **Nothing** in the list of conversion tables (deactivates the option buttons for **Match**).

Match

The option buttons define if the data are checked against the expected value before or after the conversion.

– before

- The barcode section data, as read, will be compared with the expected values.

– after

- The barcode section data will be converted according to the conversion table and then be compared with the expected values.

Expected values

Defines which values of the corresponding barcode section are admissible. Other values than those listed here will be rejected.

- Click on **Add** and enter a value to add a value to the list of expected values.
- Mark an entry and click on **Remove** to delete a value from the list.

Conversion Table

The example in [Fig. 12-5](#), [Fig. 12-8](#) shows a conversion of the letters “a” to “k” to the numbers “2000” to “2010”.

A maximum of 12 entries can be listed in the conversion table.

To modify the conversion table, double-click on a conversion field.



Fig. 12-8 Conversion table entry

Enter the value to be converted in the **From** field and the target value in the **To** field.

Skip from entry to entry with the buttons **<<Previous** or **Next>>**.

Leave the dialog with the button **Finish**.

Double-click on the frame around the conversion fields (see [Fig. 12-5](#), [Fig. 12-8](#)) to change the name of the conversion table.

12.2.2 The Toolbar

The following buttons are available for the management of consumables descriptions:

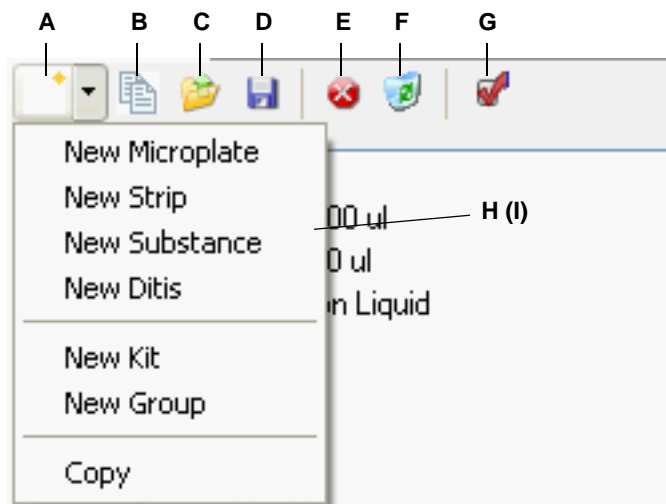


Fig. 12-9 Consumable Data Editor toolbar (Consumables tab)

- | | | | |
|----------|---------------|----------|---|
| A | New button | F | Delete button |
| B | Copy button | G | Accept recent changes button |
| C | Open button | H | New consumable menu |
| D | Save button | I | New barcode format definition (Barcode formats tab) |
| E | Cancel button | | |

New button

Click to create a new consumable description or barcode format definition.

Copy button

Select an item and click on the **Copy** button to create an editable copy of the consumable description or barcode format definition.

Open button

Click to open an archive.

Save button

Click to save a changed or new consumable description or barcode definition to the archive.

Save is also used to save the changes on each page.

Cancel button

Click to cancel editing the consumable description or barcode format displayed.

Delete button

Click to delete the selected consumable description or barcode format.

Accept recent changes button

Click to save the changes on each page.

New consumable menu (Consumables tab)

Menu item to open the dialog for defining a new consumable.

New barcode format menu (Barcode formats tab)

Menu item to open the dialog for defining a new barcode format.

12.2.3 Context Menu

**Tree Structure
Context Menu**

In the consumables archive tree structure on the left, the context menu can be called up with a right mouse click. It contains the commands:

- ◆ **New Group**
 - Click to create a new Reload group. The command works only if the **Reload group** item in the tree view is selected.
- ◆ **New Kit**
 - Click to create a new Kit. The command works only if the **Kit** item in the tree view is selected.
- ◆ **Delete**
 - Click to delete the item selected in the consumables archive tree view. The command works only if an item of the lowest tree-hierarchy level is selected for deletion. Folders with contents (marked with +) can not be deleted).

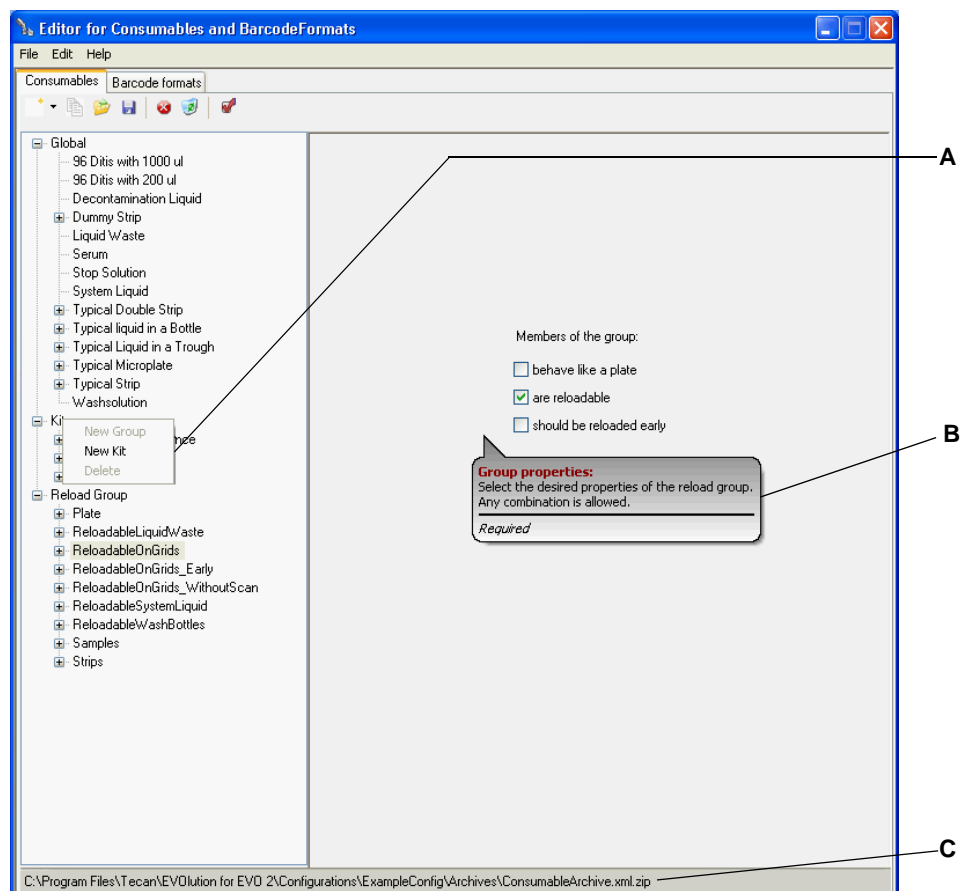


Fig. 12-10 Context menu and example for new copy of a reload group

- A** Context menu in the consumables archive tree view
- B** Tool tip
- C** Path to the consumables archive

12.2.4 Operating Sequence

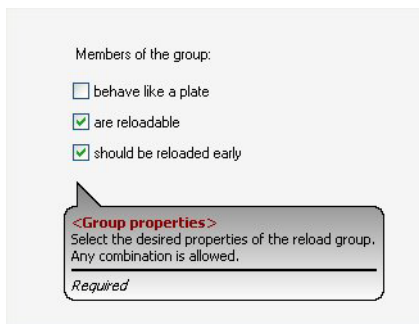
Group/Kit Definition

To define a new kit or reload group

- 1 Click the **Down arrow** near the **New** button, to open a list of consumables that can be created. In the list, click the **New Kit** or **New Group** entry. A new item is created, and its (empty) properties sheet is displayed on the right-hand side. In the tree view, the new kit or group name, e.g. **New empty Kit 8a8de23@undefined@undefined** or **New empty Group 4d32b33** is displayed.
- 2 In the tree view, slowly click the new consumable name twice. The name is displayed in reverse colors, and a write-cursor appears.
- 3 Type to overwrite the highlighted name.

Note: The names of new kits or groups can be changed only as long as they are empty.

- 4 On the right-hand side, fill in the detail data sheet for the new group or kit. When on the left-hand side a group is selected, the group properties are displayed on the right:



Members of the group:

- behave like a plate
- are reloadable
- should be reloaded early

<Group properties>
Select the desired properties of the reload group.
Any combination is allowed.

Required

Fig. 12-11 Reload group properties

Reload Rules

The following rules apply when planning a reload:

- 1 A reload is planned only if the quantity on the worktable is not sufficient for the schedule.
- 2 A reload can be carried out if the subsequent consumption could not take place without this reload (the available quantity is too small).
- 3 Furthermore, a reload can be carried out as soon as the entire quantity on the worktable is lower than the Reload Level specified in the Consumable Data Editor.
- 4 If a reload is due, then it is placed:
 - as early as possible (i.e. as soon as the reload level or a lower level is reached, or
 - as late as possible (immediately before the job consuming more than available of the consumable).

Configuration

The setting **Early** or **Late** reload is configured in the Consumable Data Editor as follows:

- 1 Click the consumables group for which you intend to make the setting.
- 2 Click the check box **Should be reloaded early**, if this applies to the group in question. The groups have the following standard settings:
 - ReloadableOnGrids = late
 - ReloadableOnGrids_Early = early
 - ReloadableWashBottles = early.

*With substances which are refilled, **early** is often convenient, as nothing is discarded.*

Consumables Definition

To define a new consumable:

- 1 Click the **New** button to create a new consumable definition. The detail view on the right-hand side shows the properties sheet for a new substance.
 - Or* click the **Down arrow** near the **New** button to open a list of consumables that can be created. In the list, click the consumable you intend to create. The detail view on the right-hand side shows the (empty) properties sheet for the new consumable.
 - Or* In the tree view of consumables on the left, click to select a consumables definition, then click on the **Copy** button to create an editable copy of the selected consumable description. The detail view on the right-hand side shows the (copied) properties sheet for the new consumable.

Note: *The displayed properties sheet differs, depending on the type of consumable which is defined (substance, strip, microplate or DiTis).*

- 2 Fill in the detail data sheet for the new consumable.
- 3 Consumable substances with their own cavity (e.g. positive or negative control) exist only in their specific cavities. If applicable, switch this setting on in the substance properties.
- 4 In the appearing dialog, select the appropriate cavity.

Barcode Format Definition

To define a new barcode format:

- 1 Click the **New** button to create a new barcode format definition. The detail view on the right-hand side shows the properties sheet for the barcode format.
 - Or* click the **Down arrow** near the **New** button and select **New barcode format**.

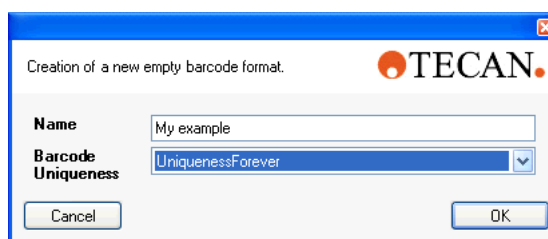


Fig. 12-12 New barcode format dialog

Decide on the barcode handling (**Barcode Uniqueness**).

Note: *Uniqueness forever: Data are stored on the harddisk of the system.*

Or Select an existing barcode format, then click on the **Copy** button to create an editable copy of the barcode format.

- 2 Fill in the detail data sheet for the new barcode format.
- 3 If a conversion is desired, create a new conversion table.

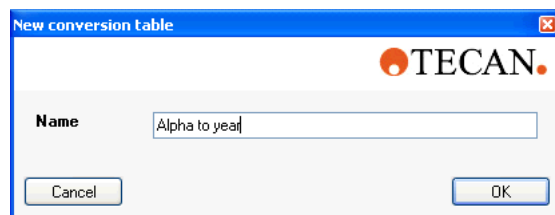


Fig. 12-13 New conversion table dialog

Or Copy an existing conversion table and modify it.

12.2.5 Consumable Data Editor Help

Direct Help

Direct help is always available in the Consumable Data Editor. Simply letting the mouse cursor hover over an object on the screen displays specific help in a popup bubble.



ATTENTION

You can position the mouse pointer on a data field, to learn whether filling in this field is optional or mandatory (only the fields **Manufacturer**, **Specification** and **Synonym** are optional).

13 Configuration Builder

Purpose of This Chapter This chapter describes the configuration builder software tool, its function and use.

13.1 Introduction

The configuration builder software tool is used to group all ELISA test configuration files to one single configuration. At the end of this merging process, the configuration file can be signed electronically.

All files that are part of a configuration are stored with their paths and checksums, so they can be found by every application in the EVOLution suite.

Functions

The configuration builder has the following functions:

- ◆ Build configuration files, merging all definition (XML) files belonging to a configuration.
- ◆ Modifying configuration files which have not been signed electronically
- ◆ Electronically sign configuration files (optional).
- ◆ Viewing and administrating electronically signed configuration files
- ◆ Compare configurations

Configurations

The configuration builder output is a configuration file (*.cfx) listing the following definitions and definition files. The contents of this list are to be understood as examples for directories and file names. These can differ, depending on user input.

Process Definition:

Filename: HCV Pipetting.xml

Directory: \Assays\

File Source: Process Definition Editor

Worktable Definition:

Filename: Worktable.oba

Directory: \Worktable\

File Source: Worktable Editor

Labware Definition

Filename: LabWareArchive.oba

Directory: \Archives\

File Source: Labware Editor

Series Definition:

Filename: Series.xml

Directory: \Configurations\

File Source: Process Definition Editor, menu **Tools -Series**

Table of Durations (Execution Times)

Filename: Durations.xml
Directory: \Configurations\
File Source: Text or XML editor

Liquid Description

Filename: LiquidDescription.xml
Directory: \Configurations\
File Source: Process Definition Editor, menu **Tools -Liquids-Liquid Definition**

Magellan Reader Methods

Filename: HIV ELISA.mth
Directory: \ReaderMethods\
File Source: Magellan

Manual Startup or Shutdown Steps

Filename (example): StartupSteps.xml
Directory: \GUI\
File Source: Configure Customize Steps

13.1.1 Configuration Builder Main View

In the window title bar and at the top of the window, the configuration program displays information about the currently loaded configuration.

Tree View

The tree view contains subjects represented by folders. Each subject has got one or more file system paths for the configuration file(s) belonging to the subject. The subjects can contain other subjects and/or a list of the required files.

List View

The list view shows the current subject and the files associated with it, and also their file status.

Status Line

The status line indicates whether the configuration is signed or unsigned and whether the configuration contains checksum faults.

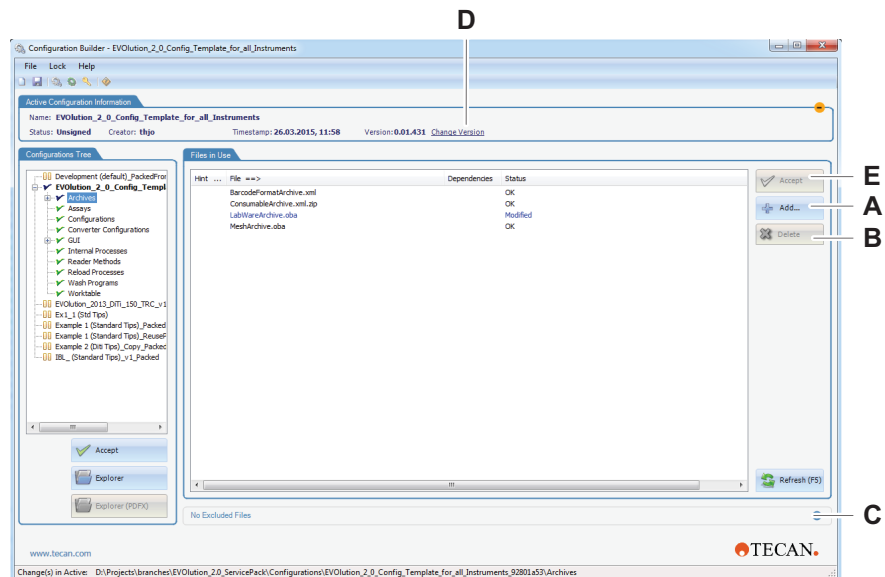


Fig. 13-1 Configuration Builder main view

- A Add...:** click to add a file to the selected subject. A file selection dialog opens.
- B Delete:** Click to delete the selected file(s) from the selected subject. The selected list entry is deleted.
- C Add/Exclude new files:** click to open the dialog which offers the files that can be added to the subject or removed from it.
- D Change version:** click to increase the version of the active configuration in a dialog.
- E Accept:** Click to have the system calculate a checksum for the selected list entry.

13.2 Functionality

13.2.1 Configuration Builder Menu

The File Menu

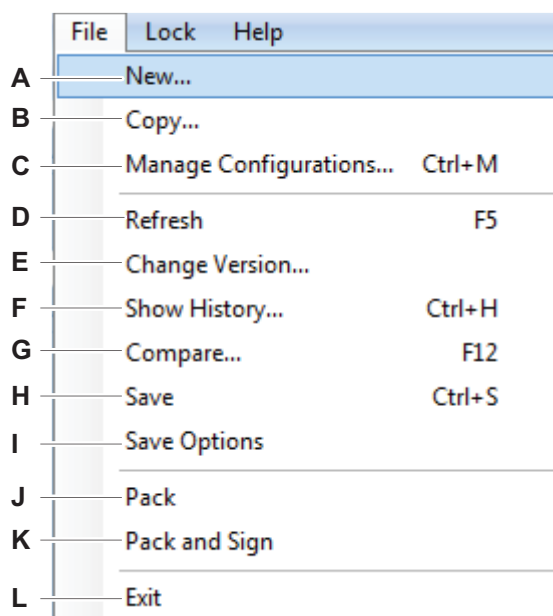


Fig. 13-2 Configuration Builder **File** menu

- | | |
|--|--|
| <p>A New...: click to start editing a new, empty configuration file. All needed files must be added manually, in the appropriate place. This procedure is not recommended.</p> <p>B Copy...: Click to copy the currently active configuration file to a new file-name.</p> <p>C Manage Configurations...: click to activate another configuration or to import/export configurations.</p> <p>D Refresh: click to (re-)check if the active configuration is valid, i.e. that all files have proper checksums. This is recommended after saving changed files in editors.</p> <p>E Change Version...: click to increase the version number for the active configuration.</p> <p>F Show History...: click to display the configuration history.</p> | <p>G Compare...: click to compare configurations and/or assay packages. Content and files of it are compared and detail view of the comparison is shown (no changes can and will be done).</p> <p>H Save: click to display the options you have for saving the configuration: Safe Mode should always be enciphered.</p> <p>I Save Options: click to pack all files into one configuration file. Use for distribution for development purposes.</p> <p>J Pack: click to pack all files into one configuration file. Use for distribution for development purposes..</p> <p>K Pack and Sign: click to pack all files into one file and to sign this file. Use for distribution for validation needs.</p> <p>L Exit: click to exit the configuration builder program</p> |
|--|--|

13.2.2 Configuration Builder Toolbar



Fig. 13-3 Configuration Builder toolbar

- | | |
|--|--|
| <p>A New: click to create a new unpacked configuration</p> <p>B Save: click to save the active configuration</p> <p>C Manage Configurations: click to open the Configurations Manager dialog</p> | <p>D Validate: click to validate the active configuration</p> <p>E Pack and sign: click to pack the active configuration into one file and sign this file electronically</p> <p>F Help: click to obtain online help.</p> |
|--|--|

13.3 Building and Managing Configurations

13.3.1 Building Configurations



ATTENTION

When building a new configuration, it is strongly recommended to start from an existing functional configuration or from the **ExampleConfig** configuration, to ensure that all internal files are existing and correct.

Unsigned configurations will be marked as such in the plate report file at the end of running a process.



ATTENTION

If additional files are needed, they can be copied from the directory **\Program Files\Tecan\EVolution\InstallationData** to the current configuration and then adapted to the requirements. The **C:\Program Files (x86)\Tecan\EVolution for EVolyzer 2.0\InstallationData** directory contains all possible Labware for all files and default files.

During a run, the system first searches the configuration for the files needed. If they can not be found, the file is taken from the **\Program Files\Tecan\EVolution\InstallationData** directory.

Modes

Building or changing a configuration is carried out on an intact system running in design mode or test mode. This means that the runtime system for this worktable can be run with unsigned, invalid configurations.

A new configuration is built starting with a minimal configuration template file and refining, completing and correcting the configuration.

Versions

During this development process, new files are added to the configuration, and added files are modified. For the modified files, new checksums must be added, which leads to increasing of the version number.

Storage

When a configuration is valid (i.e. when all its checksums are correct), it can be packed into a Config file either as a signed or an unsigned configuration. In this process, all the files referred to, including the configuration file itself, are optionally encrypted and stored in an archive.

13.3.2 Configuration Manager

Managing configurations comprises the following tasks:

- ♦ Importing packed **ConfigArchive** configurations
- ♦ Selecting the configuration which will be used by the editors (Labware editor, Worktable editor etc.)
- ♦ Maintenance of the catalog of known (i.e. selectable) configurations.

For these tasks, the configuration manager is started by clicking the **File - Manage configurations** menu entry.

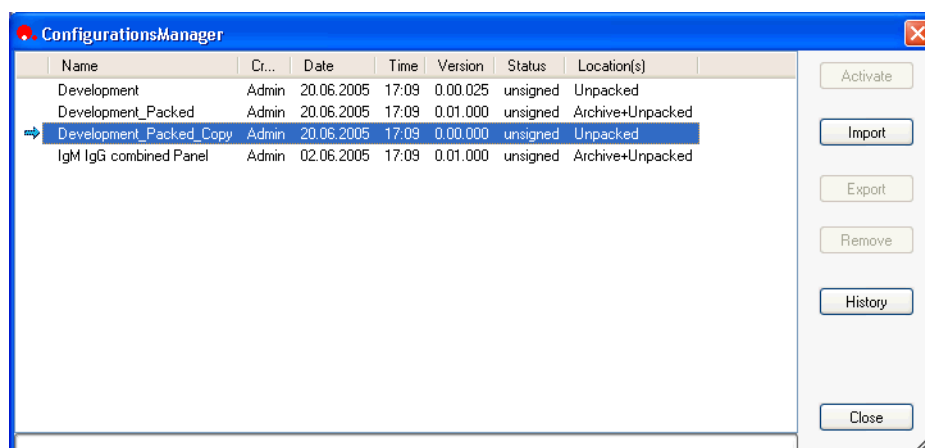


Fig. 13-4 ConfigurationsManager main view

- | | |
|--|--|
| <p>A Activate: click to activate the selected and highlighted configuration.</p> <p>B Import: click to import a configuration. A file selection dialog is displayed.</p> <p>C Export: click to export the selected and highlighted configuration to any directory.</p> | <p>D Remove: click to delete a configuration.</p> <p>E History: click to display the configuration history in a new window.</p> <p>F Close: click to close the configuration manager dialog.</p> |
|--|--|

Buttons

The buttons of the **ConfigurationsManager** have the following functions:

Activate

Activates the selected configuration:

- Unpacked configurations will be activated from their original location.
- Packed configurations will be unpacked and copied to the folder **\\Program Data\Tecan\Freedom EVOLution for EVOLyzer 2\Configurations**.

Import

Note: Packed or unpacked configurations can be imported.

Imports configurations into the corresponding folder:

- Unpacked configurations will remain in the original folder and are referenced.

- Packed configurations will be copied into the folder **C:\ProgramData\Tecan\EVOLution for EVOLyzer 2.0\FrozenConfigurations.**

Export

Exports the selected configuration to the desired location.

Remove

Removes the selected configuration from the list.

Note: Unpacked configuration files will not be deleted from their location, whereas packed configuration files will be deleted.

History

Calls up the configuration history.

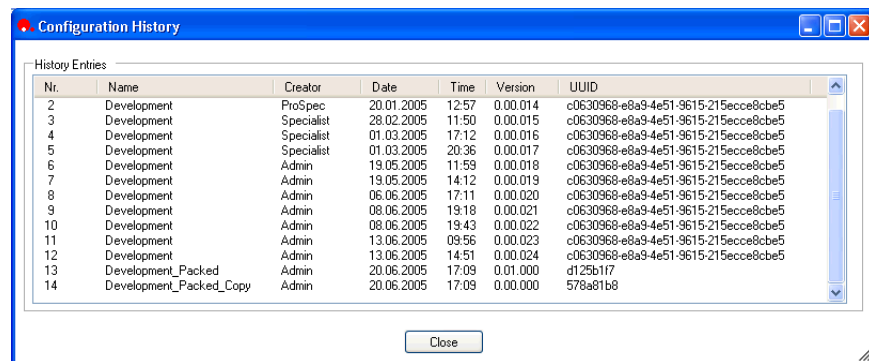


Fig. 13-5 Configuration history, example

The **Configuration History** shows the

- ♦ name of the configuration.
- ♦ creator of the configuration.
- ♦ creation timestamp (date and time.)
- ♦ version number of the configuration (x.yy.zzz):
 - z is incremented when a modified configuration is saved.
 - y is incremented when a configuration is packed and signed; z will be reset to 000 [x is only used if y overflows (>99)].
- ♦ UUID (Universal Unique Identification).
 - This is an internal unique identification, which is generated automatically.
- ♦ product version (the software version installed when defining the configuration).

Close

Closes the dialog.

Catalog File

A catalog file is an encrypted XML file containing a list of configurations which can be edited exclusively with the configuration builder. The file is a protection against unauthorized file copying into the configuration directory. The catalog file is represented in the configuration builder in the form of a table of contents. In this table, the user can select a configuration and load it as active configuration into the worktable.

Loading a Configuration

To load a configuration:

- 1 If necessary, consult the history data about the available configurations. Refer to Fig. 13-5 "Configuration history, example", 13-7.

- 2 In the configuration manager, in the list of available configurations, click the desired configuration, to select it.
- 3 On the right-hand side, click the **Activate** button, to activate the selected configuration. The configuration is marked by a green arrow.
When a new configuration is loaded as active configuration, it is unpacked and copied to the configuration directory. Signed configurations are additionally given read-only status for protection.

13.3.3 Configuration File Signature

The signature can be added to configuration files only by application specialists and administrators. The signature contains a checksum and the username. The runtime system can work with both signed and unsigned configurations.

Electronic File Signature

The electronic signature serves the following purposes:

- ♦ The runtime module recognizes that the configuration originates from the configuration builder.
- ♦ The user signing the configuration must authenticate himself and is therefore traceable.
- ♦ Signed configurations can be viewed in the configuration builder, to view which files are part of the configuration. Signed configurations can, however, not be modified.
- ♦ If the configuration file is modified after it has received the electronic signature, it is rejected by the runtime system. Signed configurations can, however, be copied with **Copy - Active** in the main window. Then a new, unsigned configuration is created which can be edited.

Tab. 13-1 Configuration File Access

File Access	Signed Configuration Files	Unsigned Configuration Files
Read access	Yes	Yes
Write access	No	Yes

13.3.4 Reading Configurations

A configuration can only be displayed in detail when it is the active configuration. However, the following basic information about inactive configurations can be consulted by means of the catalog file:

- ♦ User ID
- ♦ archive name
- ♦ version
- ♦ creation date
- ♦ status (signed/unsigned).

ATTENTION

A signed configuration can not be modified any more.



14 Data Formats

Purpose of This Chapter

This chapter describes the additional Freedom EVOLution SW configuration files and their functions. These configuration files are required by the configuration builder, and are combined to one configuration for a complete process or test.

14.1 Configuration Files

14.1.1 Introduction

The configuration file shown here is required by the configuration builder module. As it is stored in XML format, it can be displayed and edited in any third-party XML editor, or even in a text editor.

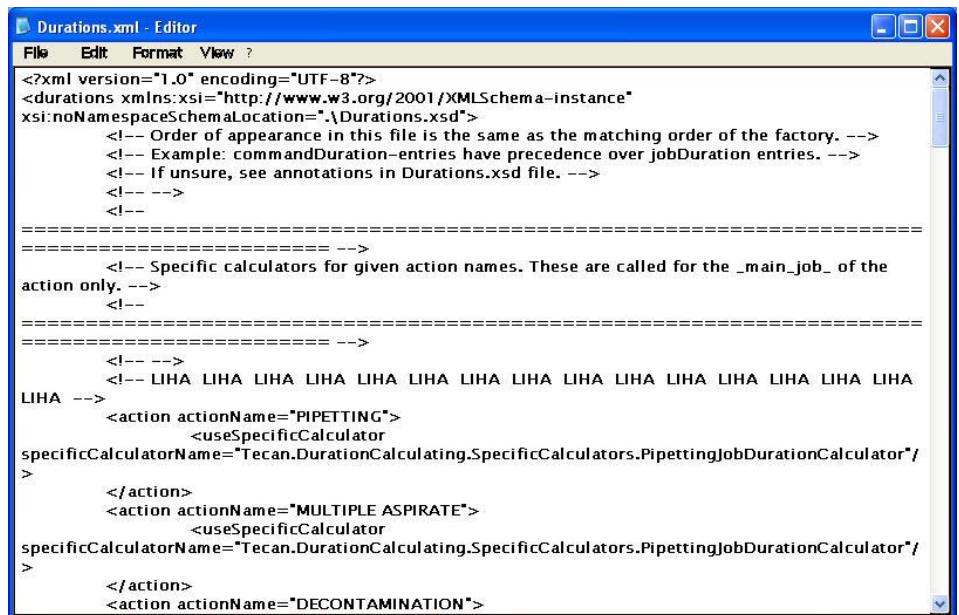


Fig. 14-1 Example of an XML file in a text processor

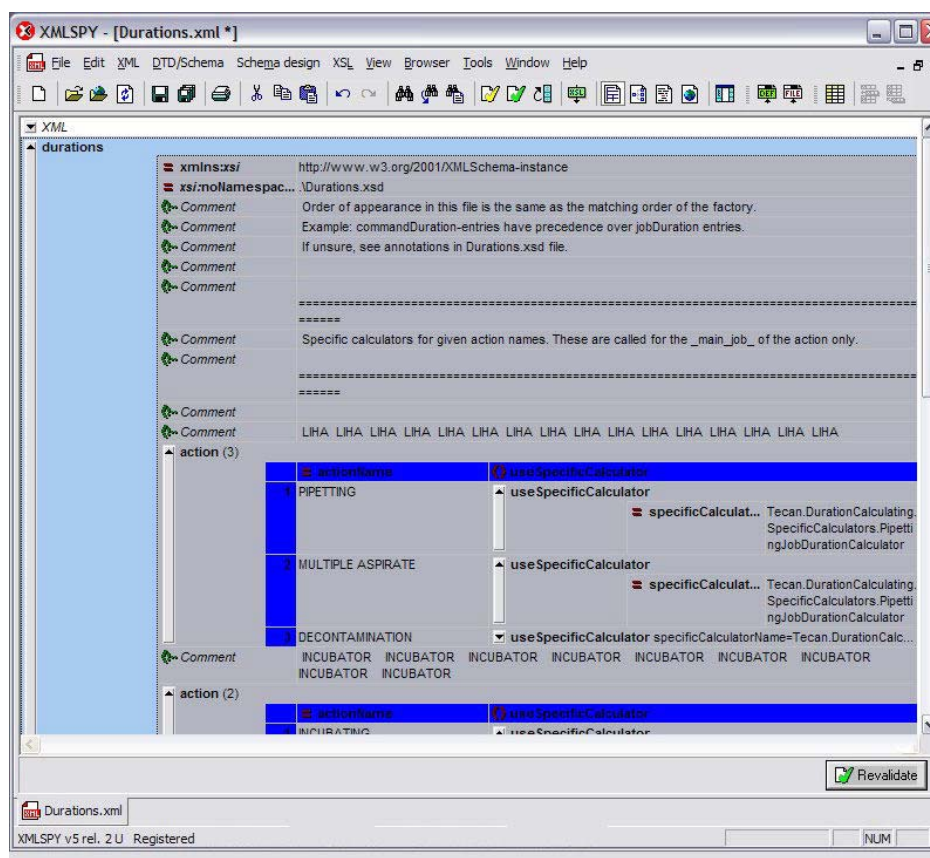


Fig. 14-2 Example of an XML file in an XML editor

Explanation of the Files

14.1.2 Durations

Purposes of the two Files

There are two configuration files used to specify the durations. One file is deployed with the installation and updated with new releases of the software. As the settings specified in this file called “DefaultDurations.xml” can be overwritten by the other file. The other file, called Durations.xml can be used for user-defined adaptations. Upgrades of the software will have no effect on that file.

Locations

- The files are located as follows:
- ◆ Durations.xml: **C:\ProgramData\Tecan\EVOLution for EVOLyzer 2.0\Configurations\<Name>\Configurations\Durations.xml.**
 - ◆ DefaultDurations.xml: **C:\Program Files (x86)\Tecan\EVOLution for EVOLyzer 2.0\InstallationData.**

Function

The XML files are used for the definition of durations: When scheduling the process runs, the system must know the maximal durations for manual user actions and actions performed by the robotic arms. These values are stored in an XML structure. The duration that must be calculated for each action is read by the system during the scheduling process.

Note: *If these times are chosen too long, the system will wait after each of the actions until the specified time has been reached, before continuing. However, if they are chosen too short, the system will calculate a schedule which cannot be executed correctly.*

The durations of the following actions must be communicated to the system:

- ◆ Re-Load
 - The user replaces an empty reagent. If this time varies for the different reagents, they should be listed separately.
- ◆ Plate Transfer Command
 - The maximal duration of a RoMa transfer

Time Format The time format in this file must be entered as follows:
 1 second = **PT1S**
 1 minute = **PT1M**

14.1.3 Magellan Description File

Location The file MagellanDescription.xml is located inside the configuration in the folder
**C:\ProgramData\Tecan\EVOLution for EVOLyzer
 2.0\Configurations\<Name>\Configurations\MagellanDescription.xml**

Function The XML file **MagellanDescription.xml** describes which sections are available in Magellan and which letter code Magellan uses to identify these sections. For normal use, no changes need to be made in this file. If additional sections are created in Magellan, however, the MagellanDescription.xml file must be adapted accordingly.
 Contact the Tecan service department for instructions on how to make these changes.

14.1.4 Strips

On the system, several assays which work with strip plates instead of microplates can also be combined to one process.

The file Strips.xml contains the specifications, necessary for such a combination:

- ◆ The strips that can be combined in one process. The same definition is also made in the Process Definition Editor, in Tools > Assay Combinations > Strip Combinations. If the attribute **selfCombination** is true, assays of the same name can be combined with themselves onto a single plate or stripframe.
- ◆ Possibly a spacer strip must be inserted (if a washer with 16-manifold is used).

Location The file Strips.xml is located inside the configuration in the folder
**C:\ProgramData\Tecan\EVOLution for EVOLyzer
 2.0\Configurations\<Name>\Configurations\Strips.xml**

Function The file defines strips and spacer strips for configurations that use strips in frames instead of complete microplates.

Moreover, the file defines possible combinations of strips, i.e. whether or not the strips are compatible for different assays.

Note: *The strips will only be combined for different assays, if the combination is plausible for the system. If there are incompatibilities, such as a different number of jobs, different incubation times, etc. the strips will not be combined, even if the combination is entered in the file.*

Plate Based Assays

The file Strips.xml can also contain entries for plate-based assays. For these entries, the xml-element **plateCombination** is used instead of **stripCombination**.

It can reference predilution processes, not only destination assays.


In the file, the attribute **selfCombination** can be used. When this attribute is defined as true, assays of the same name can be combined with themselves onto a single plate or stripframe.

Assays using washing steps can be mixed with assays without washing steps in the same combination. The resulting plate layout is then as if all assays would use washing steps. This applies to a sequential re-use of a plate, not, however, to general merging of assays.

Example

The example configuration installed along with the Freedom EVOLution SW contains a file Strips.xml, with comments defining the elements and attributes.

Editor

To edit the files, use the **Assay Combination Editor** as described in section [7.3.6 "Assay Combinations"](#),  7-48.

14.1.5 Example Files

Example files, corresponding to an example configuration, are contained in the **C:\ProgramData\Tecan\EVOLution for EVOLyzer 2.0\Configurations\ExampleConfig\Configurations** folder.

A complete repository of all possible Labware files and default files is contained in the **C:\Program Files (x86)\Tecan\EVOLution for EVOLyzer 2.0\InstallationData** directory. This directory is not visible in the Configuration Builder. If additional files are needed for a configuration, they can be copied from this directory to the current configuration and then adapted to the requirements.

14.2 ASTM Interface

Purpose of This Section

This section describes the communication parameters for the ASTM interface.

The ASTM Interface for the Freedom EVOLution is based on the low level protocol as described in ASTM E 1394. It does not support all records and fields of the standard. Instead it supports the following records and corresponding fields.

14.2.1 Supported Records

The following tables specify the supported records and explains the corresponding fields.

14.2.1.1 Message Header Record

Tab. 14-1 Message header record

Field Name	Transmitted from Freedom EVOLution SW	Received by Freedom EVOLution SW	Description/ Comment
Record Type	H	H	
Delimiters	!^&	!^&	The Freedom EVOLution SW always uses these delimiters and does not recognize other characters.
Message Control ID	Not supported	Optional, not evaluated	
Access Password	Not supported	Optional, not evaluated	
Sender Name	TECAN EVOLution^V 2.0	Optional, not evaluated	Sender Name can be defined in Application Settings Control.
Sender Address	Not supported	Optional, not evaluated	
Reserved	Not supported	Optional, not evaluated	
Sender Telephone	Not supported	Optional, not evaluated	
Characteristics of Sender	Not supported	Optional, not evaluated	
Receiver ID	Not supported	Optional, not evaluated	

Tab. 14-1 Message header record

Field Name	Transmitted from Freedom EVOlution SW	Received by Freedom EVOlution SW	Description/ Comment
Comment	Plate barcode	Optional, not evaluated	Barcode of the plate used to carry out the test. Empty if plate was not scanned or if it could not be retrieved.
Processing ID	Not supported	Optional, not evaluated	
Version Number	Not supported	Optional, not evaluated	
Date and Time of Transmission	YYYYMMDDhhmmss	Optional, not evaluated	

14.2.1.2 Patient Record

Tab. 14-2 Patient Record

Field Name	Transmitted from Freedom EVOlution SW	Received by Freedom EVOlution SW	Description/ Comment
Record Type	P	P	
Sequence Number	See ASTM E 1394	See ASTM E 1394	
Practice Patient ID	Not supported	Barcode of the sample	This field (as well as all the following) is optional when the Freedom EVOlution SW is receiving Patient records.

14.2.1.3 Order Record¹⁾
Tab. 14-3 Order Record

Field Name	Transmitted from Freedom EVOLution SW	Received by Freedom EVOLution SW	Description/Comment
Record Type	O	O	
Sequence Number	See ASTM E 1394	See ASTM E 1394	
Specimen ID	Barcode of the sample	Barcode of the sample	This field is required.
Specimen ID	Not supported	Optional, not evaluated	When the Freedom EVOLution SW sends this record it contains the barcode of the sample. When receiving, this field can be set, but is not evaluated.
Assay Identification(s)	The assay performed in the form ^^assay	List of assays to be performed in the form: ^^assay1\^^assay2 ...	
Dilution Factor Identification	The dilution factor is attached to the assay in the form ^^^assay^1.000	The dilution factors are attached to the assay in the form ^^^assay^1.000\^^^assay^2.000...	

1) When Freedom EVOLution SW sends the O-Record as part of a result-transmission, the list of assays always contains only a single assay (Example 1). When receiving orders it accepts multiple O-records with a single assay request (Example 2), as well as a single request with multiple assay requests.

14.2.1.4 Result Record

Tab. 14-4 Result Record

Field Name	Transmitted from Freedom EVOLution SW	Received by Freedom EVOLution SW	Description/ Comment
Record Type	R	n.a.	A result record is never sent to the Freedom EVOLution SW.
Sequence Number	See ASTM E 1394	n.a.	
Test ID	The Assay identification starting together with the type of result in the form ^^AssayID^^Result Type .	n.a.	The available types are ^{a)} : <ul style="list-style-type: none"> • Raw Data • Measurement Data • Reference Data • Difference Data • Original Concentration • CutOff • Single concentration • Mean concentration
Dilution Factor Identification	Dilution factor is attached to the assay in the form ^^^assay^1.000	n.a.	Dilution factors are attached to the assay in the form ^^^assay^1.000\^^^ assay^2.000...
Data/M Measurement	The data corresponding to the Result Type.	n.a.	
Units	The units of the measurement (if applicable) as it is in the Magellan output	n.a.	
Reference Ranges	Not supported	n.a.	
Flags	Not supported	n.a.	
Nature of Abnormality	Not supported	n.a.	
Status	Not supported	n.a.	
Date of Change in Instrument Values	Not supported	n.a.	
Sample Status	“Pass” or “Fail”	n.a.	See , 14-9 for criteria for “Pass” and “Fail”.
Unused field		n.a.	

Tab. 14-4 Result Record (cont.)

Field Name	Transmitted from Freedom EVOLution SW	Received by Freedom EVOLution SW	Description/ Comment
Operator ID	This is the operator who was logged in, when the result was transmitted	n.a.	
Date/Time Test Started	Format as described in footnote ^{b)} .	n.a.	
Date/Time Test Completed	Format as described in footnote ^{b)} .	n.a.	
Instrument ID	Serial number of the instrument	n.a.	

a) The result types to be transmitted are activated in the Application Settings Control.

b) All time stamps sent from Freedom EVOLution SW have the format:
<YYYY>-<MM>-<DD>T<HH>:<MM>:<SS>.<TTTTTT>+<XX:YY>

Criteria for “Pass” and “Fail”

The sample status is calculated in the following way:

- 1 If there are any QC validation criteria in any (verification or final read) reader method, and one of the single criteria fails, then the status is “Fail”.
- 2 If the process status is “Failure” then the status is “Fail”.
- 3 If the plate-status is “error” then the status is “Fail”.
- 4 If the plate-status is “success” and the sample status is “success”, then the status is “Pass”.
- 5 If none of the above applies then the status is calculated as an OR operation between plate status and sample status where “success” is 0 and “error”, “warning” or “failure” is 1. This results in 1 = “Fail” and 0 = “Pass”.

14.2.1.5 Terminator Record

Tab. 14-5 Terminator Record

Field Name	Transmitted from Freedom EVOLution SW	Received by Freedom EVOLution SW	Description/ Comment
Record Type	L	L	
Sequence Number	See ASTM E 1394	See ASTM E 1394	
Termination Code	Not supported	Optional, not evaluated	

14.2.1.6 Request Information Record

Tab. 14-6 Request Information Record

Field Name	Transmitted from Freedom EVOLution SW	Received by Freedom EVOLution SW	Description/ Comment
Record Type	Q	n.a.	A request information is never sent TO the Freedom EVOLution SW.
Sequence Number	See ASTM E 1394	n.a.	
Specimen ID/ Start of Range	Barcode of the patient	n.a.	Ranges are not supported.
Universal TestID	^^^ALL	n.a.	Freedom EVOLution SW never queries for specific tests.

14.2.2 Transmitting Queries, Responses and Results

14.2.2.1 Query (for Request) Format

When sending a query, the Freedom EVOLution SW will start with a header record, followed by a query record for each barcode and will be terminated by a terminator record. It will always query for **all** available tests.

Note: Freedom EVOLution SW will query requests for all samples in one ASTM message and one record per sample.

Example: (Tx is EVOLution, Rx is the host)

```

Rx: <ACK>
Tx: <STX>1H|\^&|||TECAN EVOLution^V 2.0|||20131001140742<CR><ETX>5E<CR><LF>
Rx: <ACK>
Tx: <STX>2Q|1|000354|^|^ALL<CR><ETX>57<CR><LF>
Rx: <ACK>
Tx: <STX>3Q|2|000408|^|^ALL<CR><ETX>59<CR><LF>
Rx: <ACK>
Tx: <STX>4Q|3|000415|^|^ALL<CR><ETX>59<CR><LF>
Rx: <ACK>
Tx: <EOT>
    
```

14.2.2.2 Accepted Response Format

When receiving a response to a query, the Freedom EVolution SW accepts each order in a single order record (Example 1) or multiple tests within a single order record (Example 2).

Example 1: (Rx is the host , Tx is the Freedom EVolution SW)

```
Tx: -ENQ-
Rx: <ACK>
Tx: -STX-1H|\^&|||P|20031208184103-CR--ETX-C6-CR--LF-
Rx: <ACK>
Tx: -STX-2P|1|11220738|11220738|11220738-CR--ETX-7B-CR--LF-
Rx: <ACK>
Tx: -STX-3O|1|11220738|11220738|^^^Anti-HBs II qualit-CR--ETX-FB-CR--LF-
Rx: <ACK>
Tx: -STX-4O|2|11220738|11220738|^^^Anti-HCV-CR--ETX-A1-CR--LF-
Rx: <ACK>
Tx: -STX-5L|1|N-CR--ETX-09-CR--LF-
Rx: <ACK>
Tx: -EOT-
```

Example 2: (Rx is the host , Tx is the Freedom EVolution SW)

```
Tx: -ENQ-
Rx: <ACK>
Tx: -STX-1H|\^&|||P|20031208184103-CR--ETX-C6-CR--LF-
Rx: <ACK>
Tx: -STX-2P|1|11220738|11220738|11220738-CR--ETX-7B-CR--LF-
Rx: <ACK>
Tx: -STX-3O|1|11220738|11220738|^^^Anti-HBs II qualit\^^^Anti-HCV -CR--ETX-1B-CR--LF-
Rx: <ACK>
Tx: -STX-4L|1|N-CR--ETX-09-CR--LF-
Rx: <ACK>
Tx: -EOT-
```

14.2.2.3 Result Format

Where available, Freedom EVolution SW will transmit the result records corresponding to the result types selected in the Application Settings Control.

Example: (Rx is the Freedom EVolution SW, Tx is the host)

```

<ENQ>
Tx: -ACK-
Rx: <STX>1H|\^&|||TECAN EVolution^V 2.0|||20060405174530<CR><ETX>E3<CR><LF>
Tx: -ACK-
Rx: <STX>2P|1|933/000214<CR><ETX>B0<CR><LF>
Tx: -ACK-
Rx: <STX>3O|1|933/000214|933/000214|^ ^^ Anti-Cardiolipin IgG<CR><ETX>D3<CR><LF>
Tx: -ACK-
Rx: <STX>4R|1|^ ^^Anti-Cardiolipin IgG^^^Measurement
Data|0.124|||Pass||LabOper|2006-04-05T15:21:21.0106657+02:00|2006-04-
05T15:45:26.1230972+02:00|107<CR><ETX>E6<CR><LF>
Tx: -ACK-
Rx: <STX>5R|1|^ ^^Anti-Cardiolipin IgG^^^Reference Data|0.068|||Pass||LabOper|2006-
04-05T15:21:21.0106657+02:00|2006-04-05T15:45:26.1230972+02:00|107<CR><ETX>F7<CR><LF>
Tx: -ACK-
Rx: <STX>6R|1|^ ^^Anti-Cardiolipin IgG^^^Difference
Data|0.056|||Pass||LabOper|2006-04-05T15:21:21.0106657+02:00|2006-04-
05T15:45:26.1230972+02:00|107<CR><ETX>51<CR><LF>
Tx: -ACK-
Rx: <STX>7R|1|^ ^^Anti-Cardiolipin IgG^^^CutOff|negative|||Pass||LabOper|2006-04-
05T15:21:21.0106657+02:00|2006-04-05T15:45:26.1230972+02:00|107<CR><ETX>6E<CR><LF>
Tx: -ACK-
Rx: <STX>0P|2|933/000213<CR><ETX>AE<CR><LF>
Tx: -ACK-
Rx: <STX>10|1|933/000213|933/000213|^ ^^Copy COALIZA Anti-Cardiolipin
IgG<CR><ETX>CF<CR><LF>
Tx: -ACK-
Rx: <STX>2R|1|^ ^^Anti-Cardiolipin IgG^^^Measurement
Data|0.095|||Pass||LabOper|2006-04-05T15:21:21.0106657+02:00|2006-04-
05T15:45:26.1230972+02:00|107<CR><ETX>EB<CR><LF>
Tx: -ACK-
Rx: <STX>3R|1|^ ^^Anti-Cardiolipin IgG^^^Reference Data|0.089|||Pass||LabOper|2006-
04-05T15:21:21.0106657+02:00|2006-04-05T15:45:26.1230972+02:00|107<CR><ETX>F8<CR><LF>
Tx: -ACK-
Rx: <STX>4R|1|^ ^^Anti-Cardiolipin IgG^^^Difference
Data|0.006|||Pass||LabOper|2006-04-05T15:21:21.0106657+02:00|2006-04-
05T15:45:26.1230972+02:00|107<CR><ETX>4A<CR><LF>
Tx: -ACK-
Rx: <STX>5R|1|^ ^^Anti-Cardiolipin IgG^^^CutOff|negative|||Pass||LabOper|2006-04-
05T15:21:21.0106657+02:00|2006-04-05T15:45:26.1230972+02:00|107<CR><ETX>6C<CR><LF>
Tx: -ACK-
Rx: <STX>6L|1<CR><ETX>3B<CR><LF>
Tx: -ACK-
Rx: <EOT>

```

ASTM Syntax

Tx = Transmit Data
Rx = Receive Data

Control Codes

STX = start of text
ETX = end of text
EOT = end of transmission
ENQ = enquiry
ETB = end of transmission block
ACK = acknowledge

LF = line feed
CR = carriage return
NAK = negative acknowledge

Layer Operands

H = Header
P = Patient
Q = Request Information
O = Order
R = Result
L = Terminator

Delimiters

| = field separator
\ = repetition separator
^ = component separator
& = escape

15 Utilities

Purpose of This Chapter

This chapter describes various utilities that can be used in connection with the Freedom EVOLution SW.

15.1 Configure Customized Steps Editor

Purpose

The Configure Customize Steps is used to create user messages telling the operator what initial and final steps must be performed before and after a test run.

15.1.1 Startup and Shutdown Steps

The startup and shutdown steps, visible to the operator before and after a test run, are configured in the following dialog:

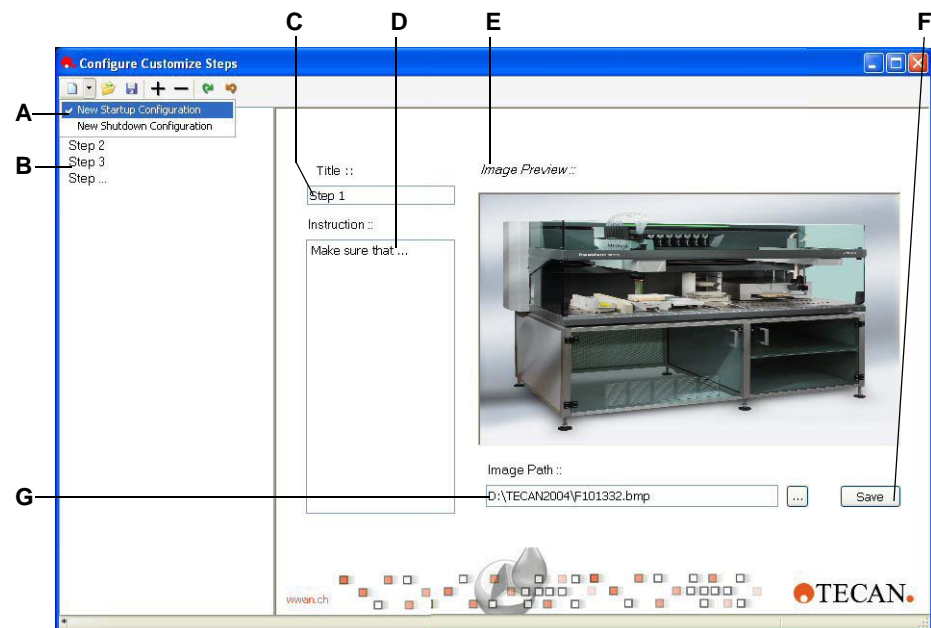


Fig. 15-1 Configuration of startup steps

- | | |
|---|--|
| <p>A Menu New, selection of Startup or Shutdown Step definition</p> <p>B List of existing steps</p> <p>C Step title field</p> <p>D Step description</p> | <p>E Picture illustrating the step</p> <p>F Save button, for saving the current step</p> <p>G Picture file path</p> |
|---|--|

When saving customized Start up or Shutdown steps, the files must have the fix names "StartupSteps.xml" or "ShutdownSteps.xml". These files have to be included in the **\Configurations\...\GUI** directory using the Configuration Builder program.

Additionally, the file **C:\Program Files\Tecan\EVOLution for EVOlyzer 2.0\InstallationData\GUI\SynchronStartUpSteps_SL_ScannedSampleCount.xml** has to be copied into the configuration, GUI folder, and added to the configuration in the Configuration Builder. The paragraph concerning the startup steps has to be enabled (commented out). The same is valid for the **SynchronShutdownSteps.xml**, in the same folder.

15.2 Scheduling Simulator

Purpose

The Scheduling Simulator allows to load an existing configuration and to simulate the assays contained in the configuration without the necessity of being connected to an instrument, the Worktable Simulator or the LogViewer. It calculates the schedule and serves to simulate a process in order to verify its consistency.

15.2.1 The Scheduling Simulator Screen



Fig. 15-2 Scheduling Simulator screen areas

- A** Menu/command icons
- B** History
- C** Simulated schedule
- D** Information display

Tabs in the History Area

Check Consistency

Displays warnings, errors and information of the consistency check.

Build Processes

Displays warnings, errors and information of the built process.

Scheduling

Displays the tree view of the schedule.

Note: *The displayed tabs change automatically during a simulation. If errors occur while the process is built, the corresponding tab will remain displayed.*

15.2.2 Menus and Icons

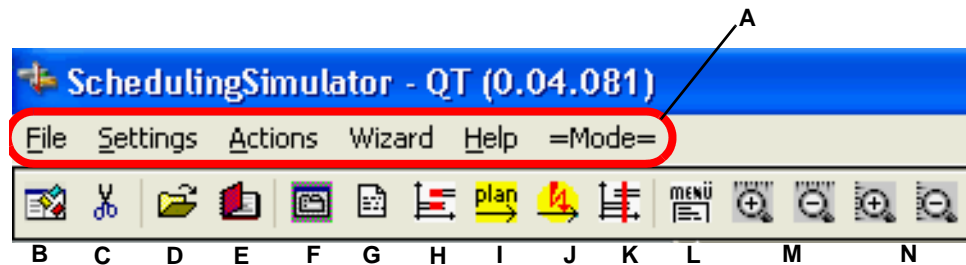


Fig. 15-3 Scheduling Simulator screen menu and icon bar

Menu Bar

The menu bar (A) contains the following items:

- ◆ Menu item **File**
 - **Load Assays**; same as “Icon D”
 - Loads a new assay (process).
 - **Load Worklist**; same as “Icon E”
 - Loads a worklist.
 - **Quit**
 - Exits the Scheduling Simulator.
- ◆ Menu item **Settings**
 - **Configure Scheduler**; same as “Icon F”.
 - Defines (advanced) parameters of scheduler. Only for troubleshooting purposes.

Menu item Actions

- **Component.Plan**
 - Only for troubleshooting purposes.
 - **Handle Runtime Error**; same as “Icon J”.
 - Only for troubleshooting purposes.
 - **Set Time Freeze**; same as “Icon K”.
 - Calls up the time freeze dialog.
 - **Delete selection + subtree**
 - **Clear Text Window**; same as “Icon G”.
 - Clears the information display.
- ◆ Menu item **Wizard**
 - **New Simulation**
 - Discards the current schedule and starts the wizard again for a new simulation. Also see 15.2.4.1 “The Scheduler Wizard”, 15-6.
 - **Add Samples**
 - Opens the dialog to specify the time for adding samples.
 - ◆ Menu item **Help**
 - Only for troubleshooting purposes.
 - ◆ Menu item **Mode**
 - Only for troubleshooting purposes.

**Command
Icons**

The icons in the command bar have the following significance:

Icon B

Loads a new configuration.

Icon C

Cuts nodes; deletes the process that is marked in the history.
If the first node is marked in the history, the application will be reset.

Icon D

Loads a new assay (process).

Icon E

Loads worklist.

Icon F

Defines parameters of scheduler. Only for troubleshooting purposes.

Icon G

Clears the information display.

Icon H

Displays conflict details in the information display.

Icon I

Recalculates (plans) and displays the schedule according to the selected parameters.

Icon J

Handles runtime errors. Only for troubleshooting purposes.

Icon K

Calls up the time freeze dialog.

Icon L

Calls up the job context menu.

Icons M

Zoom in and out in horizontal direction.

Icons N

Zoom in and out in vertical direction.

15.2.3 Simulation Modes

The Scheduling Simulator can simulate processes in various modes. The desired modes are set in the Application Settings Control. Refer to section [4.5 “The Application Settings Control”](#), ¶ 4-6.

The available simulation modes are the following:

- ♦ If you have enabled automatic durations (see **Use profiling data for optimizing durations**, [Fig. 15-4](#), ¶ 15-6), the job durations in the Scheduling Simulator will be computed based on the profiling data obtained earlier within the run control.
 - Submode 1: If the Worktable Simulator is running when you start the Scheduling Simulator, then the durations obtained during simulation runs (Run Control and Worktable Simulator) will be used. Refer to section [15.3 “Worktable Simulator”](#), ¶ 15-12.
 - Submode 2: If the Worktable Simulator is not running, then the Scheduling Simulator will use durations obtained during runs on the real hardware using the Run Control.

- ◆ The setting **Shopping List Mode** in the Application Settings Control will influence scheduling as follows:
 - In case of the standard mode (shopping list mode disabled), only those plates will be assumed to be loaded initially which are placed within the main tab in the Worktable Simulator. You will only be able to run strip plate based processes which start with **Get From Operator**.
 - If shopping list mode is enabled the Scheduling Simulator will simulate the results of the initial shopping list plate load in the Run Control. That means that plates will automatically be placed in the corresponding locations. Reagents must still be put into the main tab within the Worktable Editor.

15.2.4 Running Simulations

15.2.4.1 The Scheduler Wizard

The Scheduling Simulator is a wizard that guides you through the steps necessary to simulate a process.

To run a simulation, proceed as follows:

- 1 Start the Scheduling Simulator.

The Scheduler Wizard appears.

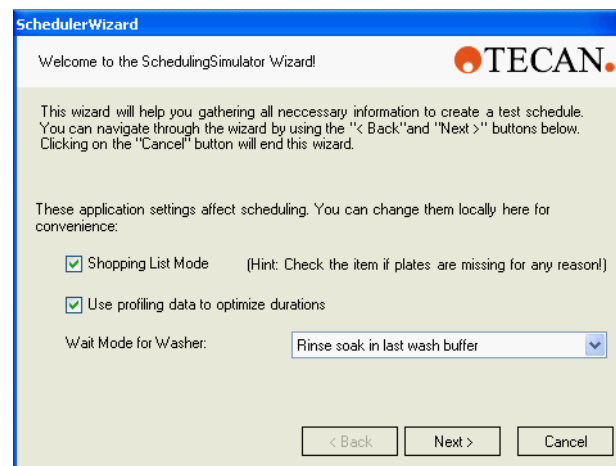


Fig. 15-4 Welcome screen

- 2 Select the mode for the simulation by means of the check boxes and the drop-down list.
 - For information on the influence of these parameters refer to section [4.5 “The Application Settings Control”](#), [4-6](#) and to the Freedom EVOLution SW Runtime Controller Manual.

The application settings for the process in real mode will not be affected by the settings made here in the Scheduling Simulator.

- 3 Click on **Next**.

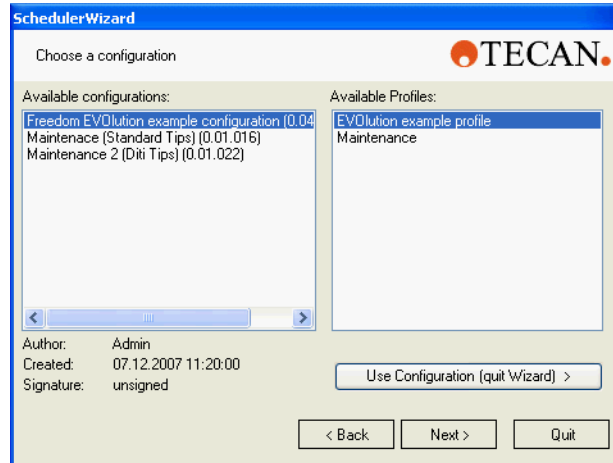


Fig. 15-5 Choose configuration screen

- 4 Select a configuration from the **Available configurations** field.
- 5 Choose the desired profile from the **Available Profiles** field.
- 6 Click on **Next**.

Note: The system will load the configuration only after you press the **Finish** button on the last wizard page.

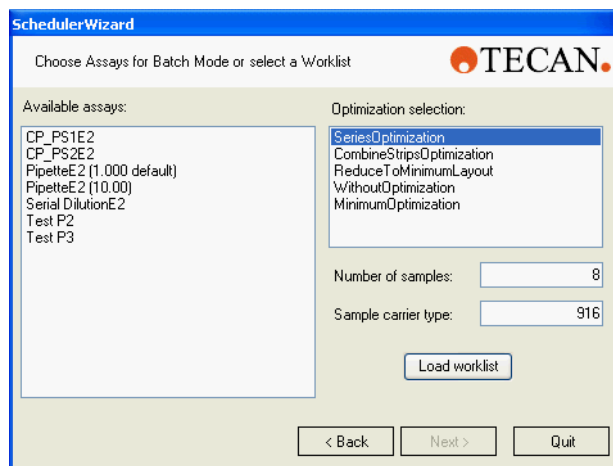


Fig. 15-6 Choose assay screen

- 7 Select one or several assays from the **Available assays** field.
Or To load a worklist click on **Load worklist** and select the corresponding worklist.

In this case, the worklist defines the number of samples and the assays assigned to it. The settings in the worklist overwrite the settings in this screen.

- 8 Optional step: Select the optimization type in the **Optimization selection** field.

Note: The Freedom EVOLution Run Control automatically optimizes the schedule according to the options in the field **Optimization selection**. If the highest optimization level (**SeriesOptimization**) cannot be scheduled, the next lower level will be tried. In contrast to the Freedom EVOLution Run Control, the Scheduling Simulator is not able to perform this step automatically. For that reason, the optimization level can be set manually.

- 9 Enter the number of samples.
- 10 If your worktable definition does not allow you to place a carrier of type 916 (barcode type) into the sample sections, please define a different barcode for this carrier. Otherwise, you will receive an error message from the component responsible for barcode handling.
- 11 Click on **Next**.

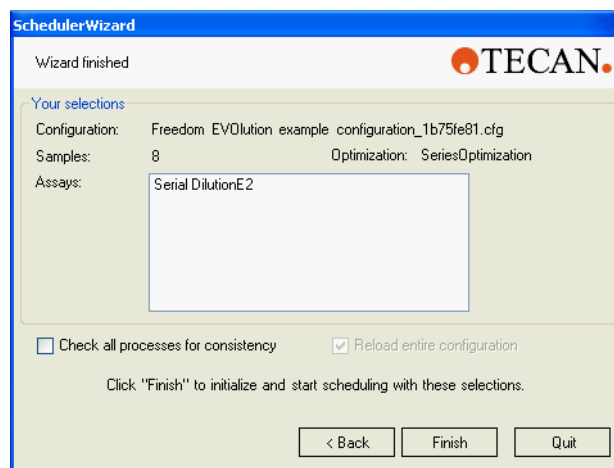


Fig. 15-7 Finish screen

- 12 Mark the check boxes, as required.
 - Check box **Check all processes for consistency**
 - Performs consistency check.
Note: If changes are made to the configuration files the processes need to be rechecked.
 - Check box **Reload entire configuration**
 - Reads complete configuration again.
- 13 Check the entries and click on **Finish**.
The system loads and checks the configuration.

Note: All screens of the Scheduler Wizard allow to go back to the previous screen (click on **<Back**) or to abort the wizard (click on **Quit**).

15.2.4.2 Scheduler Functions

After the Scheduler Wizard is finished, the schedule is displayed in the simulated schedule area of the Scheduling Simulator screen:

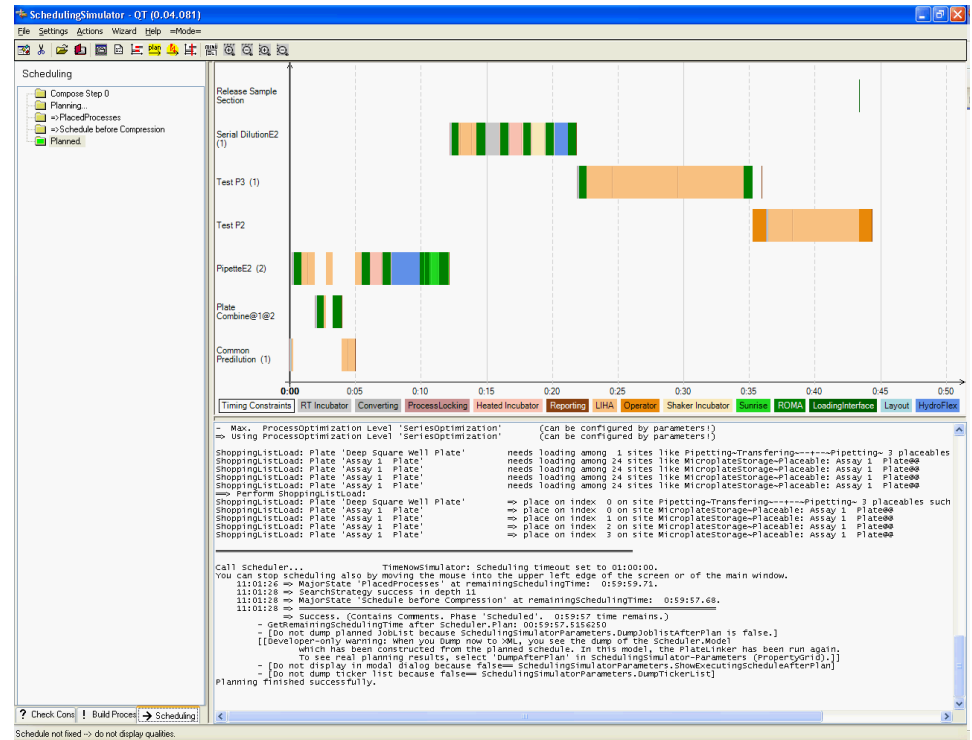


Fig. 15-8 Scheduling Simulator screen

Note: To view the schedule in an earlier stage of the simulation, click on the corresponding line in the history.

To call up the general functions in the Scheduling Simulator screen, refer to 15.2.2 “Menus and Icons”, 15-4.

Comprehensive Interpretation of the Schedule

The following features allow for a more comprehensive interpretation of the scheduled processes:

- ◆ Display of pipetting patterns:
 - Pipetting patterns defined in the PDE can get quite complex (composed jobs, pipetting across multiple plates, replicates, dilution factors, merge orders, etc.). To view the pipetting pattern, right-click the assay name in the schedule display. Choose **Show process layout** from the menu.
 - The resulting display offers tooltips for each used well, showing barcode values and dilution factors.
 - To view information on a specific pipetting job, right-click any LIHA job in the schedule display. Choose **Show Commands** from the menu.
- ◆ Display of consistency warnings:
 - If a process name in the screen area “simulated schedule” is marked in blue, warnings are available.
 - The warnings are displayed in the tab **Check Consistency** in the screen area “history”.
 - Click on an error or warning in the list to have the detailed log message displayed in the screen area “information display (D in [Fig. 15-2](#), [Fig. 15-2](#))”.
- ◆ Display of timing constraints:
 - Display of assay processing priorities and predilution relationships:
 - In in the screen area “simulated schedule (C in [Fig. 15-2](#), [Fig. 15-2](#))”, click on the bottom left legend entry **Timing Constraints**.
 - Assay processing priorities will be displayed as green arrows,
 - predilution substance flow by blue arrows,
 - other timing constraints by gray arrows.
 - Detailed display of timing constraints within a specific process:
 - Click on the process name in the screen area “simulated schedule (C in [Fig. 15-2](#), [Fig. 15-2](#))”.
 - Both displays mentioned above can be shown at the same time.
 - Move the mouse cursor to any arrow to view a description (tooltip). Related arrows will be highlighted.

Note: Some context menu items show more advanced information and serve for troubleshooting purposes only.

15.2.4.3 Adding Samples

To simulate the scanning of new samples on the pipetting instrument, select **Add Samples** from the wizard menu. You will have to enter the time when new samples have to be added and scanned in the Freedom EVOLution SW, then the wizard will guide you through the rest of the process.

Note: *Add Samples* is essentially the same as setting **Time Freeze** and loading processes (refer to 15.2.4.5 “Loading Additional Processes”, 15-11). You can also first define **Time Freeze** (refer to 15.2.4.4 “Time Freeze”, 15-11) and then select **Add Samples** from the wizard menu.

15.2.4.4 Time Freeze

If you like to add an assay (process) and schedule it in such a way that the schedule already existing or a part of it is not recalculated, you may set a “time freeze”.

Note: *This function can be used, e.g. to simulate the time for a sample reload procedure.*

For this, proceed as follows:

- 1 Double-click on the desired spot in the time axis in the simulated schedule.
*This calls up the **Set time when samples are to be added** dialog:*

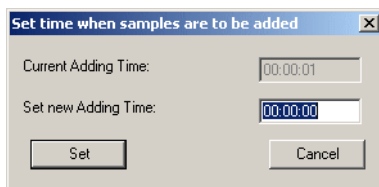


Fig. 15-9 Set time freeze dialog

- 2 Accept the time displayed in the field **Current Adding Time** or enter desired time in the field **Set new Adding Time** (format hh:mm:ss).
- 3 Click on **Set**.

A line parts the simulated schedule in two halves. The assays on the left side of the line will not be scheduled anew. The start point for scheduling is on the line; all processes on the right side of the line will be scheduled.

15.2.4.5 Loading Additional Processes

After setting “time freeze” you can load additional processes to be scheduled:

- 1 Select menu Item **File>Load Assay** or click on icon Load a new assay (process) (D in Fig. 15-3 “Scheduling Simulator screen menu and icon bar”, 15-4).
The new processes will be situated on the right of the time freeze line.
- 2 To recalculate the schedule, select menu Item **Actions>Recalculate (plan)** schedule or click on icon “Plan” (G in Fig. 15-3 “Scheduling Simulator screen menu and icon bar”, 15-4).

The assays on the left side of the time freeze line will be left unchanged.

15.3 Worktable Simulator

Purpose The Worktable Simulator is a software which fully replaces (simulates) the physical pipetting instrument. In appearance, it is similar to the Worktable Editor.

15.3.1 Functions

Configuration The simulator loads the active configuration and allows the user to simulate the assays contained in the configuration without the necessity of being connected to an instrument. So when designing, testing and simulating several processes, the user needs not change any hardware and needs not care about any hardware-related adjustments or problems.

Note: *When the active configuration is changed in the Freedom EVOLution SW while the Worktable Simulator is running, the differences between the two configurations (e.g. differing devices) can cause problems for the simulation, perhaps it will not work as expected and fail.*

- *Select the required configuration in the Configuration Builder before starting the Worktable Simulator. Do not change it while the Worktable Simulator is running.*
- *After changing the configuration in the Freedom EVOLution SW, re-start the Worktable Simulator.*

The Freedom EVOLution SW uses the same channel for the communication with both the pipetting instrument and the Worktable Simulator. This also means that the Worktable Simulator answers to commands from the Freedom EVOLution SW in the same way as the pipetting instrument.

User Interaction The user interactions with the physical pipetting instrument can also be simulated in the Worktable Simulator software. For example, to load samples, the user can - in the Worktable Simulator software - open the Samples tab and drag and drop the sample carrier onto the worktable.

Barcodes The use and handling of barcodes is very dynamic during a run. For simulation purposes, barcodes must be realistic, i.e. unique. If the command to scan barcodes is sent to the Worktable Simulator software, it uses automatically generated, unique barcodes and sends them to the *Freedom EVOLution SW*. The rules for the creation of the barcodes can be specified in the Worktable Editor, in the **Simulation** properties tab. Likewise, if you copy for example a sample carrier, the copy is given a new barcode by the Worktable Simulator. Thus conflicts caused by identical barcodes are prevented throughout.

Liquid Detection The Worktable Simulator also simulates liquid detection: it uses the data for the liquid volume and surface height and moves the LiHa accordingly. If the liquid volume is changed manually in the Worktable Simulator, the new height is calculated and used for the liquid detection simulation, and the new volume can even provoke a reload.

15.3.2 The Worktable Simulator Screen

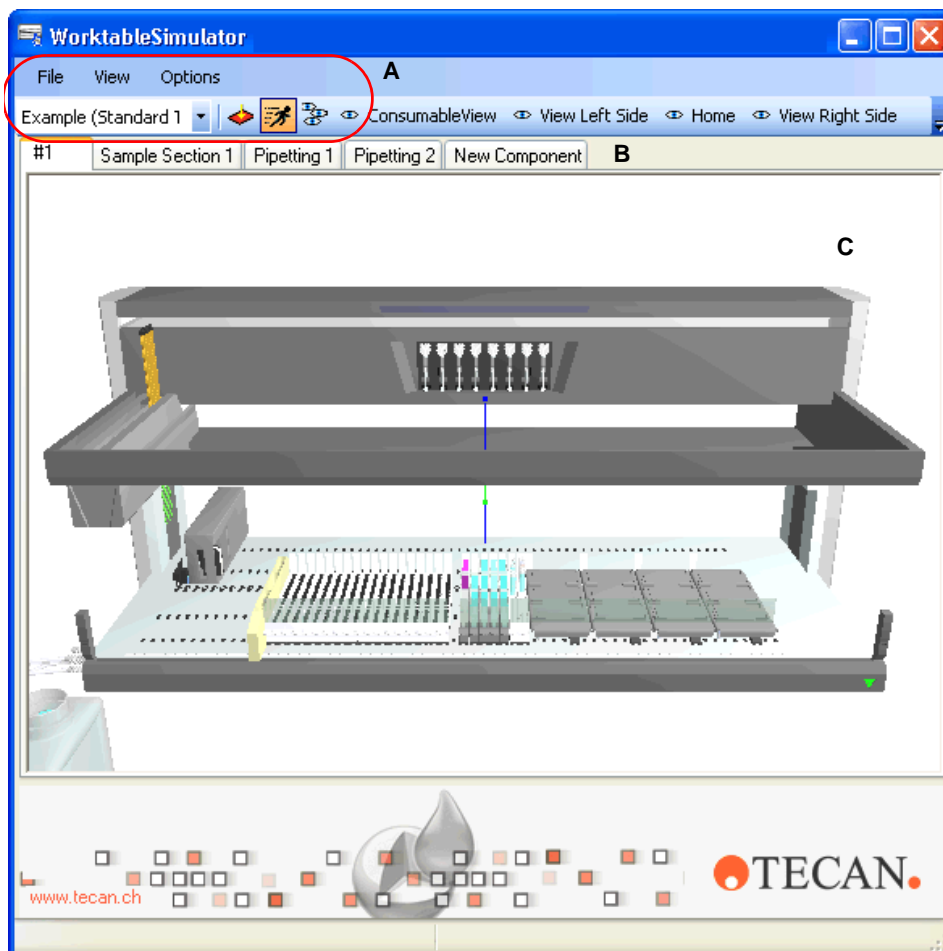


Fig. 15-10 Worktable Simulator main view

A Menu/command icons
B Tabs with the labware

C Visualization of process run

15.3.3 Menus and Icons



Fig. 15-11 Worktable Simulator screen menu and icon bar

Menu Bar

The menu bar (A) contains the following items:

- ◆ Menu Item **File**
 - **Save Instance As ...**
- ◆ Menu Item **View**
 - **Show Sites**
 - Mark the sites in red color.
 - **Fast Animation**
 - Accelerates the simulation animation.
 - **Manage Perspectives**
 - Calls the dialog for the saving and re-loading of perspectives.
- ◆ Menu Item **Options**
 - **Quality of Transparency**
 - Controls the quality of the graphic view:
 - **Simple (fastest)**
 - **Good**
 - **Best (slowest)**

List Box

The list box (B) allows to select the profile.

Command Icons

The icons in the command bar have the following significance:

Icon C

Show sites.

Icon D

Run the process.

Icon E

Manage perspectives. The functions for the management of perspectives are the same as in the Freedom EVOLution SW. The file which stores the user defined perspectives is used by both, the Worktable Simulator and the Freedom EVOLution SW, so the same user defined perspectives are available in both programs.

Icon F

Icon for a user defined and saved perspective.

Icon G

Name of the user defined perspective.

15.3.4 Running Simulations

To run a simulation, proceed as follows:

- 1 Start the Configuration Builder, to activate the configuration you wish to simulate.
The Configuration Builder appears.
- 2 Click to select the desired application, then click on **Activate**, to activate it.
The configuration is activated.
- 3 Double click the program WorktableSimulator.exe in the directory **C:\Program Files (x86)\Tecan\EVOLution for EVOLyzer 2.0\Program\bin**, to start it.
The Worktable Simulator main view opens.
- 4 To run assays in the Worktable Simulator, open the Freedom EVOLution Run Control.
- 5 In the Freedom EVOLution Run Control, click on the **Start run** option, then click on the green arrow, to start the run.
The run of the selected assays is simulated and visualized in the worktable simulator.
- 6 If during the run, the run time control prompts you to load samples, click on the corresponding tab in the Worktable Simulator software.

Note: If in the next step, instead of simply **moving** the sample carrier in the “sample” tab to the worktable (drag and drop), you want to **copy** it:

- Left-click on the carrier,
 - Press the **Control** key down and keep it pressed
 - Drag the sample carrier to the worktable tab, to display the screen with the worktable
 - Drop the sample carrier onto the worktable
 - Release the Control key. Now you have placed a copy of the sample carrier on the worktable. In the “samples” tab, the original sample carrier is still available for a later loading of samples.
- 7 Drag the sample carrier to the worktable tab. The screen with the worktable is displayed.
 - 8 Drop the sample carrier onto the worktable.

15.4 Collect and Zip Tool

This section describes the Collect and Zip tool, which is used to collect and compress files for troubleshooting purposes.

15.4.1 Introduction

What is Collect and Zip?

The Collect and Zip tool helps you to collect files, zips (compresses and packs) them and optionally sends the data automatically to Tecan.

The data can include:

- ◆ Current configuration
- ◆ EVOLution output and log files
- ◆ Log files of used devices

The collected and compressed data serves for troubleshooting purposes, i.e. Tecan may ask you to provide this data in order to assist you in solving problems with your EVOLution installation.

How to Send the Data

The data can be sent via e-mail, either directly from your Freedom EVOLution installation, or from a different computer, in case your Freedom EVOLution installation is not connected to a mail server.

15.4.2 Using the Tool

How to Use the Tool

To use the Collect and Zip tool, proceed as follows:

- 1 Start the Collect and Zip tool from **Tecan > EVOLution > Collect and Zip**.

The following window appears:

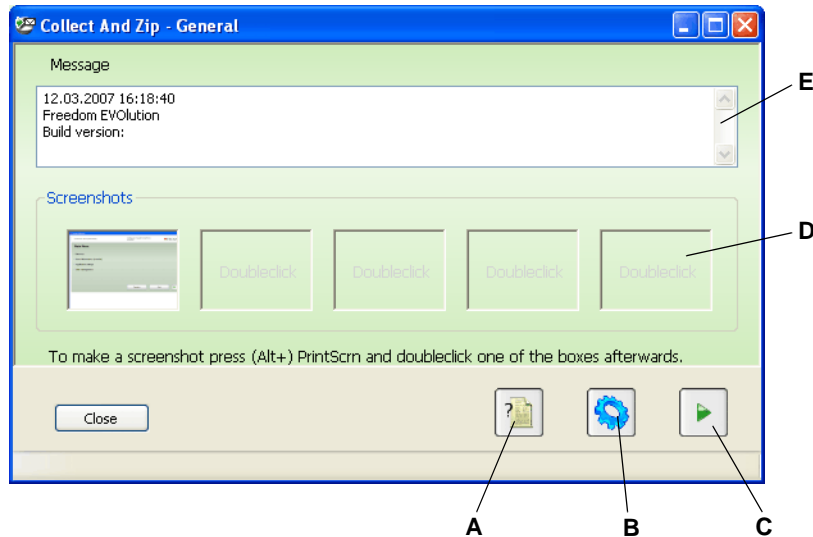


Fig. 15-12 Collect and Zip - General window

- | | |
|--|-----------------------------------|
| A Help button | C Next button |
| B Configuration settings button (see 15.4.3, 15-20) | D Screenshot insertion box |
| | E Message field |

- In the **Message** field, enter the name of your company and describe the problem.
- If you like to add screenshots, use the keyboard function Print Screen to catch the whole screen or alternatively Alt + Print Screen to catch the active window only, then double-click one of the boxes.

The box shows a small image (thumbnail) of the corresponding screen. If you like to see the full image, click on the box. The **Screenshot Viewer** window appears.



Fig. 15-13 Screenshot Viewer window

- Click on the button **Close** to return to the **General** window.
This window also enables you to delete the image by clicking on the button **Delete**.

- To proceed, click on the **Next** button.
The following window appears:

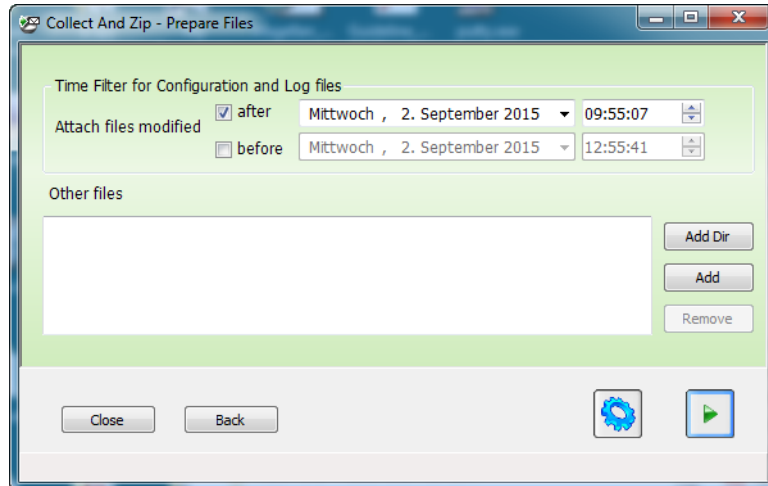


Fig. 15-14 Collect and Zip - Prepare Files window

- Going back to earlier windows is possible at any time (**Back** button).
- 6 If you want to attach the configuration and the log files check the box and set a date in the field **Configuration and Log files**.
Each file that has been modified after that date will be included (attachment types with a deactivated date/time filter will not be affected by this, see 15.4.3 “Configuring the Tool”, 15-20).
 - 7 Click on the **Add Dir** or **Add** button to include additional files.
You can also add them using the drag & drop function.
 - 8 To proceed, click on the **Next** button.
The following window appears:

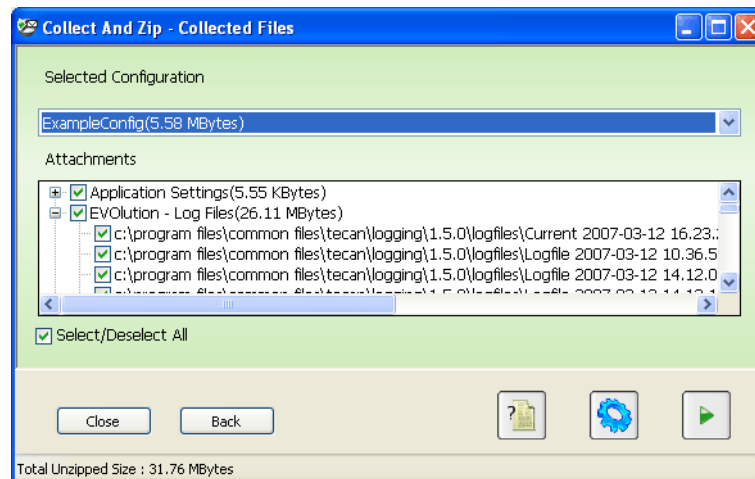


Fig. 15-15 Collect and Zip - Collected Files window

- 9 In the **Collected Files** window, select the required configuration.
The current configuration is selected by default.
- 10 In the field **Attachments**, deselect the files you do not want to be included.
Selecting/deselecting a category will affect all files in this category. The size and last write date are shown at the end of each file.

- 11 To proceed, click on the **Next** button.

The following window appears:

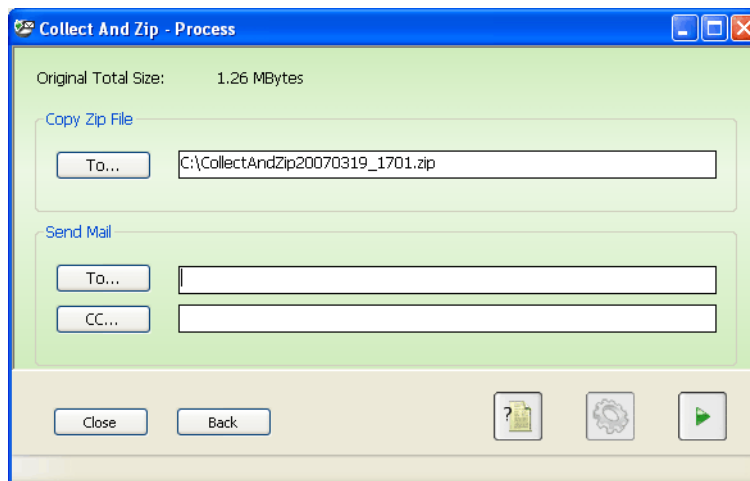


Fig. 15-16 Collect and Zip - Process window

At the top you can see the total size of the included files. A default path is suggested for saving the zip file.

- 12 Click on the **To...** button in the field **Copy Zip File** or simply write into the text box to change the path.
- 13 To send the zip file to Tecan, enter an e-mail address.

NOTE: Microsoft Outlook needs to be installed for this.

- Use the **To...** And **CC...** buttons to add e-mail addresses. Several e-mail addresses must be separated by a semicolon (;).

If both e-mail address fields are empty the files will only be zipped, not sent. Also see “[Sending the Data by Means of Another Computer](#)” below.

- 14 To proceed, click on the **Next** button.

The Microsoft Outlook e-mail dialog with the corresponding message contents and attachment is displayed.

*If there is no MAPI (Messaging Application Programming Interface) installed on your system, an error message appears to explain the problem. Confirm the message and delete the e-mail addresses in the **Process** window (in this case only the ZIP file will be generated).*

- 15 Check the e-mail for completeness and send it.

Sending the Data by Means of Another Computer

If your system is not linked to a mail server you may send the data by means of another computer with e-mail connection. Save the ZIP file to a portable medium (e.g. a memory stick) or a network drive and send the file as attachment.

15.4.3 Configuring the Tool

Opening the Configuration Window

Click on the Configuration settings button in one of the Collect and Zip windows (see Fig. 15-12 “Collect and Zip - General window”, 15-17) to open the **Configuration** dialog.

Note: When you first start Collect and Zip and the PathCollector plug-in exists, the paths will be automatically collected.

- Changes in this window are only necessary if the application could not find each path or if you like to add a new category.

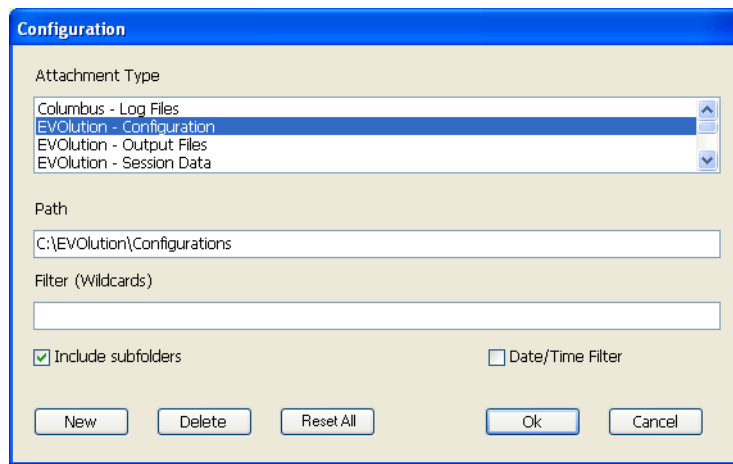


Fig. 15-17 Configuration window

Configuration Settings

Explanation of Settings

The configuration window allows for the following settings:

Field Path

Shows the location where the files are stored.

Field Filter (Wildcards)

The entries in this field correspond to file names/types, while an empty field means “all files” (no filter).

*Example: *.txt collects only files that end with .txt, no matter what is at the beginning. Different filters must be separated by a semicolon (;).*

Files are collected if they match at least one of the filters.

Check box Include subfolders

Is used to determine whether subfolders are included or not.

Check box Date/Time Filter

Attachment types with activated date/time filter will only include files that have been modified after the selected date (date and time are chosen in the window **Prepare files**, see 15.4.2 “Using the Tool”, 15-16).

Button New

Used to add a new attachment type. Click on the button and fill in the fields.

Button Delete

Used to delete unnecessary attachment types.

The configuration cannot be deleted.

Button Reset All

Resets all path settings to factory default.

With this button the path collector fills the configuration with default values, i.e. customized settings will be overwritten.

Note: The button **Reset all** is disabled if the PathCollector plug-in cannot be found.

**How to Change
the
Configuration**

To configure the Collect and Zip tool, proceed as follows:

- 1** Select an item in the list **Attachment Type** to show its properties.
- 2** Modify the corresponding properties (see [“Explanation of Settings”](#) above).
- 3** Click on **Ok** to save the settings and close the window.
Or Click on **Cancel** to close the window without saving.

16 FDA 21 CFR Part 11 Compliance

The United States Food and Drug Administration (FDA) issued a set of regulations in 1997 that outlines its criteria for acceptance of electronic records, electronic signatures and handwritten signatures (referred to as 21 CFR Part 11). The regulations state the conditions under which the FDA considers electronic signatures and electronic records to be trustworthy, reliable and equivalent to traditional handwritten signatures on paper. The criteria were provided in response to industry requests. In this manner, it defines the conditions under which an organization must operate to meet its record keeping and record submission requirements when it uses electronic records and signatures rather than paper records and handwritten signatures.

The preamble to the 21 CFR Part 11 rule states that “the use of electronic records as well as their submission to the FDA is voluntary”. However, where an organization does decide to use electronic records and electronic signatures, the requirements must be met in full for all relevant electronic records. Organizations that wish to operate under 21 CFR Part 11 must take the steps described in this appendix to ensure complete compliance.

16.1 Related Documentation

The following publications from the FDA contain useful information on the 21 CFR Part 11 regulations:

- ♦ *21 CFR Part 11, Electronic Records; Electronic Signatures; Final Rule;* Department of Health and Human Services, Food and Drug Administration, March 20, 1997
- ♦ *Guidance for Industry – 21 CFR Part 11 – Electronic Records & Electronic Signatures – Maintenance of Electronic Records*
- ♦ *Guidance for Industry – 21 CFR Part 11 – Electronic Records & Electronic Signatures – Glossary of Terms*

16.2 Purpose of This Appendix

This appendix discusses the major requirements of the 21 CFR Part 11 regulations and details the technical features which have been implemented in the Tecan Freedom EVOLution SW to help Tecan customers to reach compliance. It also indicates which steps the Tecan customers must carry out to achieve compliance.

The main part of this appendix discusses the relevant issues in the 21 CFR Part 11 regulations rule by rule and identifies how Freedom EVOLution SW helps to ensure compliance with the regulations and what Tecan customers must do to achieve compliance. Refer to the FDA website and FDA publications for the full text of the regulations.

The regulations primarily require analytical laboratories to consider the following points:

- ♦ The use of validated equipment and computer systems,
- ♦ Secure retention of electronic records to instantly reconstruct analyses,

- ◆ System and data security, data integrity and confidentiality through limited authorized system access,
- ◆ Secure electronic signatures for closed and open systems,
- ◆ Digital signatures for open systems.

Implementing the new regulations will significantly affect the instrumentation, work processes and people in laboratories that set out to be compliant. The current process of generating signatures must be evaluated (Who has to sign what, why and when?). New procedures must be developed within companies and laboratories to limit the access to systems and data (Who can do what?). Computer systems used for implementation may need to be updated or replaced to ensure correct functionality. Finally, the manner of using and handling user names and passwords for legally binding signatures may have to change.

Key topics covered by the regulations are:

Validation: Validation of the system that creates and maintains electronic records to ensure accuracy, reliability, consistent intended performance and the ability to discern invalid or altered records.

Controlled system access: Limiting system access to authorized individuals only.

Trace files: The usage of secure, computer-generated, time-stamped trace files (older process data and log files must be archived and must not be deleted).

System controls: Operational system procedures (to enforce the correct sequencing of steps and events).

Accurate and complete copies: Procedures to ensure that only authorized individuals can use the system, electronically sign a record, access the operation or computer system, input or output device, alter a record or perform the operation at hand.

Protected systems and records:

- ◆ The ability to create accurate and complete copies of records – the system must allow the creation of accurate and complete copies of the electronic records in human-readable as well as in electronic form for inspection and review by the FDA.
- ◆ The protection of records, for example by an appropriately applied system of access privileges or rights in the Microsoft Windows file system and/or network directories to enable accurate and ready
- ◆ The ability to retrieve process data and log files throughout the required retention period of the records.

Adequate training: Sufficient education, training and experience for persons who develop, maintain and use the electronic systems.

16.3 Definitions and Acronyms

The following explains key terms which are used in this section of the manual and/or are used in the FDA documentation on the CFR Part 11 regulations.

ASCII

American Standard Code for Information Interchange. A standard for assigning numerical values to the set of letters in the Roman alphabet and typographic characters.

Authenticated access, authority checks

Systems used to establish and verify as conclusively as possible that a person logging in to the network is who he or she claims to be. According to the FDA, “*authority checks*” should be designed to “*ensure that only authorized individuals can use the system, electronically sign a record, access the operation or computer system input or output device, alter a record or perform operations*”.

Biometrics

In the context of computer security, this refers to authentication techniques that rely on measurable physical characteristics that can be automatically checked, such as fingerprints, speech or retinal patterns. Freedom EVOLution SW does not support biometric methods to verify an individual’s identity.

Checksum

A checksum is a computed value which depends on the contents of a block of data. The checksum is re-computed for the received data and compared with the checksum sent with the data. If the two values are the same, the recipient of the data can be confident that the data was received correctly. Freedom EVOLution SW uses a checksum system which is based on the CRC algorithm to protect important files. The checksum is used to detect corrupted or otherwise altered data. It is also able to detect whether files have been modified outside of Freedom EVOLution SW by another program or process.

Closed system

An environment in which system access is controlled by persons who are responsible for the content of electronic records that are on the system. Freedom EVOLution SW is a closed system.

CRC

A Cyclic Redundancy Check is a computed value which is used to detect corrupted or otherwise altered data.

Data integrity

Validity of data and its relationships. In order for electronic records to be trustworthy and reliable, the links between raw data, meta-data and results must not be compromised or broken. Without data integrity, it is not possible to reliably regenerate a previous result.

Digital signature

An electronic signature based upon cryptographic methods of originator authentication, computed by using a set of rules and a set of parameters such that the identity of the signer and the integrity of the data can be verified.

Disabled account

A user account that has its access turned off so that it is not usable until such time as access is granted again.

Electronic record

Any combination of text, graphics, data, audio, pictorial or other information representation in digital form that is created, modified, maintained, archived, retrieved or distributed by a computer system.

Electronic signature

A computer data compilation of any symbol or series of symbols executed, adopted or authorized by an individual to be the legally binding equivalent of the individual’s handwritten signature.

Encryption

Translation of data into a secret code in order to make the data secure.

FDA

Food and Drug Administration (US regulatory authority).

File

A collection of data records stored as a unit with a single name.

Handwritten signature

The scripted name or legal mark of an individual handwritten by that individual and executed or adopted with the present intention to authenticate writing in a permanent form. The act of signing with a writing or marking instrument such as a pen or stylus is preserved. The scripted name or legal mark, while conventionally applied to paper, may also be applied to other devices that capture the name or mark.

Inactivity disconnect or locked session

This is a computer session that freezes or logs off automatically when no data has been input for a period of time.

Integrated data organization system, logical security or internal logic

Data management planning and configuring that combines the diverse applications used by a company with the operating system in such a way that authentication and authorization are achieved most efficiently and effectively.

Login or login credentials (user name or user ID)

Identification methods that make a computer system recognize users so they can begin computer sessions, usually based on user names and passwords.

Meta Data

Important for reconstructing a final report from raw data. Meta data includes integration parameters and calibration tables.

Open system

An environment in which system access is not controlled by persons who are responsible for the content of electronic records that are on the system. This is not applicable to Freedom EVOLution SW. Freedom EVOLution SW is a closed system and is not designed for an open system.

Operating system

The operating system is the most important program that runs on a computer. It performs basic tasks such as recognizing input from the keyboard, sending output to display screens, keeping track of files and directories, controlling access to files and directories and controlling peripherals such as printers.

Passwords

Ideally, a password is something nobody can guess.

Permissions or privileges

These are security codes that define or restrict which users can read, write and execute the associated files, directories or programs. Some departments only need to look at data, some need to input data or run programs and others may not need to look at the data at all.

Private data

Personal directories on a file server which are only accessible by the owner of the data.

Programs

An organized list of instructions that causes a computer to behave in certain predetermined ways.

Raw Data

Data which has not yet been analyzed.

Security mechanisms

This refers to techniques for ensuring that data stored in a computer cannot be read or compromised. Most security measures involve encryption or passwords.

Server

A computer or device on a network that manages network resources. A *file server* stores files, a *print server* manages printers, a *network server* manages network traffic and a *database server* processes database inquiries.

Service release or service pack

Defect-fix releases of an operating system that address serious issues or defects reported against a previous release. Service releases often address security issues which have arisen during the use of the software. Generally speaking, you should install the operating system service release specified for the Freedom EVOLution SW to ensure maximum system security.

Shared desktop, account or login

Shared desktops, accounts or logins can violate the principle of no repudiation. If the trace files do distinguish between individuals using such shared network resources, an electronic signature is not valid.

Tecan customer

Company or organization which uses pipetting instruments and/or other equipment which is manufactured by Tecan.

User name, User ID

A unique code used together with a password to identify a user.

Validation of a computer system

Confirmation by examination and provision of objective evidence that computer system specifications conform to user needs and intended uses, and that all requirements can be consistently fulfilled.

16.4 Recommendations

The following lists points to be considered to ensure compliance with 21 CFR Part 11.

Access security determines who is allowed to log in to a system locally or from a network and puts mechanisms in place that prevent unauthorized persons from gaining access to the computer system. For example, the Microsoft operating systems Windows 2000, NT and XP provide several different types of access privileges or rights that can be granted or denied to specific users or groups of users.

System administrator: The person responsible for maintaining a multi-user computer system and managing the security of the computer network.

Trace files: 21 CFR Part 11 requires trace files to be generated independently of the equipment operator. They must record all activities related to creating, modifying and deleting records on the system. The user organization must develop procedures for the data integrity and long-term archiving of trace files with data retrieval throughout the legally required retention period.

Configuration settings: An overall organizational structure defining how permissions or privileges are configured for the computer system, with settings which may e.g. allow one user to only read a file while another person can execute the file and a third person can write new data into it.

Consider whether all signatures which are used now are really needed from a regulatory point of view.

Create an infrastructure which will allow smooth implementation of the regulations.

Create awareness of the regulations among all employees, especially regarding their accountability for electronic signatures.

Decide whether to use full electronic records and signatures or hybrid systems (records in electronic and paper format). Report all decisions in your process records.

Develop an implementation plan for the user organization and the laboratory.

Develop procedures for limiting system access to authorized individuals.

Form a task group with members from the information technology department (if existing), quality assurance personnel and laboratory staff.

Establish procedures for limiting system access to authorized individuals.

Identify all work or activities in the organization or laboratory that will fall under 21 CFR Part 11.

Look at all of the equipment in the laboratory and develop a plan for making it comply with CFR 21 Part 11.

Provide functional specifications for computerized systems in the laboratory.

Train personnel in the user organization and in the laboratory on the application and consequences of the regulations.

Validate new computer systems. Follow the equipment qualification approach with design qualification, installation qualification, operational qualification and performance qualification.

16.4.1 Assigning and Using Freedom EVOLution SW User Names

User names in Freedom EVOLution SW are unique. To allow laboratory personnel to be uniquely identified by auditors, Tecan customers must provide each of them with his or her own Freedom EVOLution SW user name. The same user name must not be used by groups of users. In addition, Tecan customers must not reassign user names for use by different employees, for example if a change of staff takes place or if an employee leaves the company. In such cases, the user name should be disabled and no longer used.

Tecan customers must instruct their employees not to reveal their user name and password combinations or to share them with other employees, and to log out before allowing another employee to use Freedom EVOLution SW or if they plan to leave the running system unattended.

16.5 Security Features in the Software Which Assist 21 CFR Part 11 Compliance

16.5.1 Closed Systems

Freedom EVOLution SW is a closed system and access to Freedom EVOLution SW requires a combination of user name and password for unique identification. Freedom EVOLution SW cannot be used without a valid user name and password. The Tecan User Management system also require the user's full name to be specified when the user account is created.

This mechanism provides both the ability to carry out authority checks and the ability to sign and/or authorize electronic records. Each user is traceable and accountable for his or her actions, process data and configuration changes.

To maximize security, the Freedom EVOLution SW access control mechanisms are independent of the access control mechanisms in the Microsoft operating system. Accordingly, user accounts and passwords for the operating system and for the Freedom EVOLution SW system are managed separately. Freedom EVOLution SW user accounts are managed with the Tecan User Management system. User accounts for the Microsoft operating system are managed using standard Microsoft tools and procedures.

16.5.2 Freedom EVOLution SW User Levels

There are three user levels in Freedom EVOLution SW:
Operator, Application Specialist and Administrator.

Lab Operator has rights to:

- ◆ Start a process rung
- ◆ Perform maintenance (see Freedom EVOLution SW Runtime Controller Manual)
- ◆ Handle errors during process

Application Specialist: Same rights as Lab Operator but with additional rights to:

- ◆ Edit the configuration of the pipetting instrument
- ◆ Edit the configurations of carriers and labware
- ◆ Edit the liquid classes for pipetting
- ◆ Define processes
- ◆ Modify the application settings (see Freedom EVOLution SW Runtime Controller Manual)

Administrator: Same rights as Application Specialist but with additional rights to:

- ◆ Create and disable/re-enable users
- ◆ Configure the options in the Tecan User Management system

16.5.3 Tecan User Management System


The Tecan User Management system, which is used by Freedom EVOLution SW and other Tecan software components, has the following main features:

- ◆ All changes relating to user management require Freedom EVOLution SW Administrator access rights.
- ◆ All changes relating to user management are recorded in the log files.
- ◆ User accounts are automatically disabled following a configurable number of consecutive failed attempts to enter the correct user name and password combination. The disabled account can only be reactivated again by the Freedom EVOLution SW Administrator.
- ◆ Freedom EVOLution SW does not allow more than one person to use the software simultaneously.
- ◆ Users are automatically logged out after a specified time during which no keyboard or mouse-click activities have been detected.
- ◆ User passwords expire after a configurable number of days. The user must then choose another password. The new password must be different from the old password.
- ◆ Passwords must contain a specified minimum number of characters.
- ◆ Passwords can be forced to contain numeric digits.
- ◆ Passwords cannot be reused.
- ◆ User names and user name and password combinations are unique within the system and cannot be assigned more than once.
- ◆ The Freedom EVOLution SW Administrator provides a temporary password when setting up a user. When the new user first logs on to the system, he or she is forced to change the password immediately. This ensures that no one other than the individual user knows the particular user name and password combination.
- ◆ If a user forgets his/her password, the Freedom EVOLution SW Administrator does not have access to the user's password. The Freedom EVOLution SW Administrator is only able to reset the password and provide a new temporary password.
- ◆ If the Freedom EVOLution SW Administrator forgets his or her password, no one has access to the password.

16.5.4 Checksums

Freedom EVOLution SW uses a checksum system which is based on a CRC algorithm to protect configuration and log files. The checksum is a computed value which is used to detect corrupted or otherwise altered data. It is also able to detect whether files have been modified outside of Freedom EVOLution SW by another program or process. The checksum is stored in the file header.

A warning is shown if an attempt is made to load a file with an incorrect or missing checksum. The user can then choose to load the file or cancel. In the latter case, Freedom EVOLution SW aborts with the exception of script files. In this case, the file is not loaded but Freedom EVOLution SW remains running. An entry is written to the log file each time an incorrect or missing checksum is found.

Note: A user with Freedom EVOLution SW Administrator rights can enable or disable the incorrect checksum warning using the Configuration Builder (see [13 "Configuration Builder"](#),  13-1). To comply with the FDA regulations, this feature must not be disabled.

16.5.5 Electronic Signatures

The Freedom EVOLution SW security features ensure that the currently logged in user can be uniquely identified. Furthermore, Freedom EVOLution SW users should be instructed never to leave the running system unattended without first logging out or locking the application.

To ensure full compliance with 21 CFR Part 11, the Freedom EVOLution SW uses a checksum to protect the data.

See [16.5.4 "Checksums"](#), ¶ 16-8.

16.5.6 Log Files

The log file contains information on configuration changes and other data which have been created, edited or saved. It documents pipetting and records user actions and changes to parameter values, etc.

The log files are written to a specified directory (default location <install_path>\Program Files\Common Files\Tecan\Logging\...) and are protected with checksums which are stored in each file.

Each entry in the log file specifies the date and time, the name of the currently logged in user and the file name. The log file can be viewed with the LogViewer or a plain text editor.

All changes relating to user management are recorded in the log file.

16.5.7 Backing Up Files

Tecan provides a tool that facilitates the collection of data and enables the user to prepare the corresponding data package.

See [15.4 "Collect and Zip Tool"](#), ¶ 15-16.

The tool, however, does not provide for automatic backup of data. It is at the responsibility of the user to set up appropriate backing up procedures to provide for data security and complete data tracing.

16.6 Part A - General Provisions

16.6.1 § 11.1 Scope

The structure of this section of the manual is based on *21 CFR Part 11, Electronic Records; Electronic Signatures; Final Rule*; Department of Health and Human Services, Food and Drug Administration, March 20, 1997 and discusses the key points in each of the relevant sections, giving information on the steps which are required to attain FDA compliance.

16.6.1.1 § 11.1(a) Criteria

Compliance Freedom EVOLution SW

The features implemented in Freedom EVOLution SW that deal with electronic records and electronic signatures are described in detail in the following sections and in [16.5.5 “Electronic Signatures”](#), [16-9](#).

Compliance Tecan Customer

Tecan customers must develop a procedure to establish criteria under which electronic records, electronic signatures and handwritten signatures executed on electronic records are considered to be trustworthy, reliable and generally equivalent to paper records and handwritten signatures.

16.6.1.2 § 11.1(b) Records In Electronic Form

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed. See also [16.5.6 “Log Files”](#), [16-9](#).

If required, users with Freedom EVOLution SW Administrator or Application Specialist rights can configure Freedom EVOLution SW to use other directories (including network directories) for the output files. Refer to the Freedom EVOLution SW Runtime Controller Manual.

Compliance Tecan Customer

Tecan customers must develop a procedure to document which records in electronic form are created, modified, maintained, archived, retrieved or transmitted and where the records are stored on the computer system. This does not apply to paper records that are transmitted by electronic means.

16.6.1.3 § 11.1(c) Electronic Signatures

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses electronic signatures on data and configuration files. See [16.5.5 “Electronic Signatures”](#), [16-9](#) for more information.

Compliance Tecan Customer

Tecan customers must develop a procedure to identify where electronic signatures and their associated electronic records are equivalent to handwritten signatures.

16.6.1.4 § 11.1(d) Electronic Records

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed. See also [16.5.6 “Log Files”](#), ¶ 16-9.

If required, users with Freedom EVOLution SW Administrator or Application Specialist rights can configure Freedom EVOLution SW to use other directories (including network directories) for the output files.

Refer to the Freedom EVOLution SW Runtime Controller Manual.

Compliance Tecan Customer

Tecan customers must specify where electronic records are used instead of paper records.

16.6.1.5 § 11.1(e) Computer Systems

Compliance Freedom EVOLution SW

As an important tool for quality assurance, Tecan has developed detailed guidelines and rules for all phases of hardware and software development and testing.

Compliance Tecan Customer

Tecan customers must name the computer systems (hardware and software) and the documents which will be made available for FDA inspections.

16.6.2 § 11.2 Implementation

16.6.2.1 § 11.2(a) Required Records

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed. See also [16.5.6 “Log Files”](#), ¶ 16-9.

If required, users with Freedom EVOLution SW Administrator or Application Specialist rights can configure Freedom EVOLution SW to use other directories (including network directories) for the output files.

Refer to the Freedom EVOLution SW Runtime Controller Manual.

Compliance Tecan Customer

Tecan customers must keep copies of all records which are required for FDA inspections and establish reliable procedures to make all technical processes comprehensible and understandable.

16.6.2.2 § 11.2(b) Submitted Records

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed. See also [16.5.6 “Log Files”](#), ¶ 16-9.

If required, users with Freedom EVOLution SW Administrator or Application Specialist rights can configure Freedom EVOLution SW to use other directories (including network directories) for the output files.

Refer to the Freedom EVOLution SW Runtime Controller Manual.

Compliance Tecan Customer

Tecan customers must keep copies of all records which are required for FDA inspections and provide reliable procedures to make all technical processes comprehensible and understandable.

16.6.2.3 § 11.2(b) Requirements

Compliance Freedom EVOLution SW

As an important tool for quality assurance, Tecan has developed detailed guidelines and rules for all phases of hardware and software development and testing.

Compliance Tecan Customer

Tecan customers must develop a procedure to ensure compliance with all FDA requirements.

16.6.2.4 § 11.2(b) Identification

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed.

Compliance Tecan Customer

Tecan customers must specify the records which will be made available for FDA inspections.

16.7 Part B - Electronic Records

16.7.1 § 11.10 Control of Closed Systems

§ 11.10 describes controls for closed systems (systems to which access is controlled by persons responsible for the content of the electronic records on that system). These controls include measures designed to ensure the integrity of system operations and information stored in the system. It also addresses the security of closed systems.

16.7.1.1 § 11.10(a) Validation of System

☒ Hardware and software

Compliance Freedom EVOLution SW

Software verification

Tecan provides objective evidence that the design outputs of a particular phase of the software development life cycle meet all of the specified requirements for that phase. Software verification looks for consistency, completeness and correctness of the software and its supporting documentation as it is being developed and provides support for a subsequent conclusion that the software is validated.

As an important tool for quality assurance, Tecan has developed detailed guidelines and rules for all phases of hardware and software development and testing.

Software testing is one of many verification activities which are carried out to confirm that software development output meets its input requirements. Other verification activities include various static and dynamic analyses, code and document inspections, walkthroughs and other techniques.

Supported hardware

See [3.5.1 "Computer Requirements"](#), [3-7](#) for a list of supported hardware.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for validating the system. The purpose of validation is "... *to ensure accuracy, reliability, consistent intended performance and the ability to discern invalid or altered records*". This applies to both new and existing systems.

☒ Database

Compliance Freedom EVOLution SW

Tecan does not use a database in its Freedom EVOLution SW.

Compliance Tecan Customer

Tecan customers must develop and implement a validation procedure if they want to make a connection between the Tecan software and a database.

☒ **Network**

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed. See also [16.5.6 “Log Files”](#), [16-9](#).

If required, users with Freedom EVOLution SW Administrator or Application Specialist rights can configure Freedom EVOLution SW to use other directories (including network directories) for the output files.

Refer to the Freedom EVOLution SW Runtime Controller Manual.

Compliance Tecan Customer

Tecan customers must develop and implement a validation procedure for their computer network. This includes managing user access and other security aspects, data backups and archiving.

☒ **Validation master plan**

Compliance Freedom EVOLution SW

As an important tool for quality assurance, Tecan has developed detailed guidelines and rules for all phases of hardware and software development and testing. The guidelines also cover validation and verification of product requirements.

21 CFR Part 11 contains rules for both closed and open computer systems.

Freedom EVOLution SW is a closed system and is not designed for an open system.

Compliance Tecan Customer

Tecan customers must develop and implement a master plan to validate the complete system with all instruments and instrument connections.

☒ **Installation qualification**

Compliance Freedom EVOLution SW

This does not lie in the scope of the Freedom EVOLution SW.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for installation qualification. This can be done e.g. by setting up and then validating a Freedom EVOLution SW script.

Installation qualification may also be connected with user management and rules on who can install what, when and where.

☒ **Operational qualification**

Compliance Freedom EVOLution SW

This does not lie in the scope of the Freedom EVOLution SW.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for routine operational qualification for all persons using the Tecan equipment.

This can be done e.g. by using a “control” or “standard” during pipetting or by performing dedicated validation runs.

☒ **Control procedures**

Compliance Freedom EVOLution SW

Freedom EVOLution SW does not provide direct support for control procedures.

Compliance Tecan Customer

Tecan customers must develop and implement control procedures.

☒ **Detecting invalid and/or altered records**

Compliance Freedom EVOLution SW

See [16.5.4 “Checksums”](#), ¶ 16-8.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for documenting invalid and/or altered records.

16.7.1.2 § 11.10 (b) Ability to Generate Accurate and Complete Copies of Records.

☒ **Storage of instrument control, pipetting sequence, data acquisition and data evaluation parameters together with trace files and raw data**

Compliance Freedom EVOLution SW

See [16.5.6 “Log Files”](#), ¶ 16-9.

See [16.5.5 “Electronic Signatures”](#), ¶ 16-9.

Compliance Tecan customer

Tecan customers must develop and implement a procedure to store and archive the process data and the log files created by Freedom EVOLution SW and protect them against accidental or intentional modification, falsification or deletion. This is a pre-requirement for reliable and trustworthy records that withstand scrutiny from regulators. The trace files associated with the records must also be retained.

Tecan customers must establish rigorous and systematic archiving and backup procedures to ensure that electronic records generated by Freedom EVOLution SW are stored in such a manner that they can be retrieved and used over an extended period of time.

In some cases, the records must be kept for 10 years or longer. Due to the expected technical changes in hardware and software over such time spans, this requires consideration of issues such as the appropriate choice of storage media, file formats, etc.

The regulations refer to the use of electronic records and signatures, not to which records need to be retained or for how long.

☒ **Versioning of data and all associated meta data (including automatic versioning of re-integrated results)**

Compliance Freedom EVOLution SW

See [16.5.6 “Log Files”](#), ¶ 16-9.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure to store and archive the process data and the log files created by Freedom EVOLution SW and protect them against accidental or intentional modification, falsification or deletion.

☒ **Trace files of all data**

Compliance Freedom EVOLution SW

See [16.5.6 “Log Files”](#), ¶ 16-9.

Compliance Tecan Customer

The integrity and completeness of the electronic records relies on the customer’s assignment of Microsoft Windows access rights for the PC and the computer network and on data backup and archiving procedures.

Tecan customers must set appropriate access privileges for the local and network files and directories to ensure that records can only be deleted or modified by authorized persons.

☒ **Protection of data with checksums**

Compliance Freedom EVOLution SW

See [16.5.4 “Checksums”](#), ¶ 16-8.

Compliance Tecan Customer

No action required.

16.7.1.3 § 11.10 (c) Protection of records

☒ **Data Archiving Processes and Procedures for Long-term Data Storage**

Compliance Freedom EVOLution SW

See [16.5.7 “Backing Up Files”](#), ¶ 16-9.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure to store and archive the process data and the log files created by Freedom EVOLution SW and protect them against accidental or intentional modification, falsification or deletion.

In some cases, the records must be kept for 10 years or longer. Due to the expected technical changes in hardware and software over such time spans, this requires consideration of issues such as the appropriate choice of storage media, file formats, etc.

☒ **Protection of directories used to store process data and log files to ensure that they are only accessible to authorized persons**

Compliance Freedom EVOLution SW

Freedom EVOLution SW uses specified directories to store process data and the log files. A default directory structure is created for these files when Freedom EVOLution SW is first installed. See also [16.5.6 “Log Files”](#), ¶ 16-9.

If required, users with Freedom EVOLution SW Administrator or Application Specialist rights can configure Freedom EVOLution SW to use other directories (including network directories) for the output files. Refer to the Freedom EVOLution SW Runtime Controller Manual.

Compliance Tecan Customer

The integrity and completeness of the electronic records relies on the customer’s assignment of Microsoft Windows access rights for the PC and the computer network and on data backup and archiving procedures.

Tecan customers must set appropriate access privileges for the local and network files and directories to ensure that records can only be deleted or modified by authorized persons.

☒ Access to process data and log files after a number of years

Compliance Freedom EVOLution SW

No action required.

Compliance Tecan Customer

Tecan customers must establish rigorous and systematic archiving and backup procedures to ensure that electronic records generated by Freedom EVOLution SW are stored in such a manner that they can be retrieved and used over an extended period of time.

In some cases, the records must be kept for 10 years or longer. Due to the expected technical changes in hardware and software over such time spans, this requires consideration of issues such as the appropriate choice of storage media, file formats, etc.

16.7.1.4 § 11.10 (d) Limiting System Access to Authorized Individuals

☒ Microsoft operating system

Compliance Freedom EVOLution SW

See [16.5.1 “Closed Systems”](#), ¶ 16-7.

See [16.5.3 “Tecan User Management System”](#), ¶ 16-8.

Compliance Tecan Customer

Tecan customers must develop and implement user management procedures for their employees to control access to the Freedom EVOLution SW and the Microsoft operating system.

The access control mechanisms should be designed to prevent unauthorized persons from gaining access to, altering or deleting records in the system or carrying out unauthorized functions within the system.

Access security is typically ensured with a number of behavioral controls or policies that are backed up and enforced by appropriate security mechanisms implemented on the company’s information systems.

Access control determines who is allowed to log on to a system locally or from the network. The Microsoft operating systems offers several different types of access privileges that can be granted or denied to specific users or groups of users.

Under consideration of typical work practices in analytical laboratories, we recommend a system of access privileges on a task basis - not only to ensure confidentiality, but also to eliminate human mistakes or accidental loss of data.

It is insufficient to only restrict system access to a group of individuals without differentiating their responsibilities, knowledge or position. In this case, users could inadvertently modify system settings in a way that affects the integrity or security of the records.

☒ Different Levels of Access Based On User Responsibilities

Compliance Freedom EVOLution SW

See [16.5.2 “Freedom EVOLution SW User Levels”](#), ¶ 16-7.

Compliance Tecan Customer

See [16.4.1 “Assigning and Using Freedom EVOLution SW User Names”](#), ¶ 16-6.

16.7.1.5 § 11.10 (e) Use of Computer-generated, Time-stamped trace files

☒ Trace files are used to record the activities of Freedom EVOLution SW users as well as data transfers (who, what, when)

Compliance Freedom EVOLution SW

See 16.5.6 “Log Files”, 16-9.

See 16.5.5 “Electronic Signatures”, 16-9.

Compliance Tecan Customer

The integrity and completeness of the electronic records relies on the customer’s assignment of Microsoft Windows access rights for the PC and the computer network and on data backup and archiving procedures.

Tecan customers must set appropriate access privileges for the local and network files and directories to ensure that records can only be deleted or modified by authorized persons.

Tecan customers must develop and implement a procedure to store and archive the process data and the log files created by Freedom EVOLution SW and protect them against accidental or intentional modification, falsification or deletion.

☒ Trace files of all integration and re-integration processes

Compliance Freedom EVOLution SW

See 16.5.6 “Log Files”, 16-9.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure to store and archive the process data and the log files created by Freedom EVOLution SW and protect them against accidental or intentional modification, falsification or deletion.

☒ Information in trace files includes the instrument’s serial number

Compliance Freedom EVOLution SW

See 16.5.6 “Log Files”, 16-9.

Compliance Tecan Customer

No action required.

☒ Trace files when data is transferred to and from a database

Compliance Freedom EVOLution SW

Tecan does not use a database in its Freedom EVOLution SW.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for recording data transfer from and to the database if they make a connection between the Tecan software and a database.

☒ Trace files must be protected from accidental or intentional modification or deletion

Compliance Freedom EVOLution SW

See 16.5.4 “Checksums”, 16-8.

Compliance Tecan Customer

The integrity and completeness of the electronic records relies on the customer's assignment of Microsoft Windows access rights for the PC and the computer network and on data backup and archiving procedures.

Tecan customers must set appropriate access privileges for the local and network files and directories to ensure that records can only be deleted or modified by authorized persons.

☒ Trace file aspects of data migration to new Freedom EVOLution SW version or operating system version

Compliance Freedom EVOLution SW

Although Freedom EVOLution SW migration does not delete existing process data and log files, Tecan customers are recommended to perform backup procedures and then to archive this information before migration.

After archiving, the files can be deleted from the Freedom EVOLution SW directories.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for storing and transferring data from one operating system to another when operating system versions are changed.

16.7.1.6 § 11.10 (f) Use of Operational System Checks to Enforce Permitted Sequencing of Steps and Events

☒ Correct sequential operation of the system

Compliance Freedom EVOLution SW

The system performs a consistency check at the beginning of each run.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure to verify the correct sequential operation of the system (pipetting sequences and scripts, appropriate instrument operating procedures for each of the tasks which will be carried out).

16.7.1.7 § 11.10 (g) Use of Authority Checks

☒ Ensure that only authorized individuals can use the system, electronically sign a record, access the operation or computer system, input or output device, alter records or perform other operations

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

See [16.5.3 "Tecan User Management System"](#),  16-8.

Compliance Tecan Customer

Tecan customers must develop and implement user management procedures for their employees to control access to the Freedom EVOLution SW and the Microsoft operating system.

21 CFR part 11 rules require the use of procedures and controls to limit access to the system to authorized individuals and the use of authority checks to ensure that only authorized individuals can use the system and carry out specified functions within the system.

16.7.1.8 § 11.10 (h) Use of Device Checks to Determine the Validity of the Source of Data Input

☒ Device checks

Compliance Freedom EVOLution SW

See 16.5.6 “Log Files”, 16-9.

Compliance Tecan Customer

Tecan customers must develop and implement a procedure for keeping records of device checks from Freedom EVOLution SW and all of the laboratory equipment involved in the respective activity or process. They must store records of serial numbers, instrument numbers and version numbers of all devices and record any device changes and replacements.

16.7.1.9 § 11.10 (i) Determine that Employees have the Education, Training and Experience to Perform the Assigned Tasks

☒ Provide evidence that persons who develop, maintain or use electronic record/electronic signature systems have the education, training and experience to perform their assigned tasks

Compliance Freedom EVOLution SW

Tecan ensures that all staff is suitably qualified with respect to their education, job training and experience to perform their assigned tasks.

Compliance Tecan Customer

Tecan customers must ensure that their employees have the necessary education, training and experience to perform the assigned tasks.

For computer security measures to be effective, the users involved in implementing and using them must be trained. This training will need to cover full-time, temporary/part-time and contract staff that use the computers in your organization. It may also need to cover service and maintenance engineers undertaking repairs or modifications to computerized equipment or software. Furthermore, since technology can provide the means to access applications remotely via a modem or a remote connection, special arrangements may be necessary to minimize the impact that this can have, especially in a regulated environment.

The training should involve using the security measures such as passwords and their maintenance, but also general awareness of computer security issues.

☒ Job descriptions, training plans, documented training on computerized systems

Compliance Freedom EVOLution SW

Tecan ensures that all Tecan staff is suitably qualified with respect to their education, job training and experience to perform their assigned tasks.

Compliance Tecan Customer

Tecan customers must implement procedures to provide regular user training.

16.7.1.10 § 11.10 (j) Written Policy that Holds Individuals Accountable and Responsible for Their Actions

Written policy that holds individuals accountable and responsible for actions initiated using their electronic signatures in order to deter record and signature falsification:

Compliance Freedom EVOLution SW

No action required.

Compliance Tecan Customer

Tecan customers must develop and implement a set of policies on employee responsibility and reliability.

16.7.1.11 § 11.10 (k) Use of Appropriate Controls Over Systems Documentation

Control distribution of, access to and use of system operation and maintenance documentation

Compliance Freedom EVOLution SW

Tecan provides extensive documentation with each software version.

Compliance Tecan Customer

Tecan customers must distribute the supplied software documentation and make it available to all Freedom EVOLution SW users. Tecan customers must implement procedures to provide regular user training.

16.7.2 § 11.30 Controls for Open Systems

§ 11.30 specifies controls for open systems, including the controls required for closed systems in Sec. 11.10 and additional measures such as document encryption and the use of appropriate digital signature standards to ensure record authenticity, integrity and confidentiality.

16.7.2.1 § 11.30 Controls for Open Systems

Open systems

Compliance Freedom EVOLution SW

This is not applicable to Freedom EVOLution SW. Freedom EVOLution SW is intended for a closed system and not designed for an open system.

Compliance Tecan Customer

No action required.

16.7.3 § 11.50 Signature Manifestations

§ 11.50 requires signature manifestations to contain information associated with the signing of electronic records. This information must include the printed name of the signer, the date and time when the signature was executed and the meaning (such as review, approval, responsibility and authorship) associated with the signature. In addition, this information is subject to the same controls as electronic records and must be included in any human readable forms of the electronic record (such as electronic display or printout).

16.7.3.1 § 11.50 (a) Signature Manifestation

☒ Signed electronic records

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#), [16-7](#).

See [16.5.5 "Electronic Signatures"](#), [16-9](#).

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),
[16-6](#).

16.7.3.2 § 11.50 (a) Printed Name of Signer

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#), [16-7](#).

See [16.5.5 "Electronic Signatures"](#), [16-9](#).

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),
[16-6](#).

16.7.3.3 § 11.50 (a) Date and Time of Signature

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#), [16-7](#).

See [16.5.5 "Electronic Signatures"](#), [16-9](#).

Compliance Tecan Customer

No action required.

16.7.3.4 § 11.50(a) Meaning Associated with Signature

Compliance Freedom EVOLution SW

See [16.5.5 "Electronic Signatures"](#), [16-9](#).

Compliance Tecan Customer

No action required.

16.7.4 § 11.70 Signature/ Record Linking

§ 11.70 requires that electronic signatures and handwritten signatures executed on electronic records must be linked to their respective records to ensure that signatures cannot be excised, copied or otherwise transferred to falsify an electronic record by ordinary means.

☒ **User-specific log on in case more than one person works on a system**

Compliance Freedom EVOLution SW

Freedom EVOLution SW does not allow more than one person to use the software simultaneously.

Users can log out without leaving Freedom EVOLution SW. The same or a different user can then log in to Freedom EVOLution SW again. See [6.5 “Locking the System”](#), ¶ 6-8.

Users are automatically logged out after a specified time during which no keyboard or mouse-click activities have been detected.

Compliance Tecan Customer

Tecan customers must instruct their employees not to share their user name and password combinations with other employees, and to log out before allowing another employee to use Freedom EVOLution SW or if they plan to leave the running system unattended (see [6.5 “Locking the System”](#), ¶ 6-8).

☒ **Specify measures to prevent violation of the signature uniqueness**

Compliance Freedom EVOLution SW

Freedom EVOLution SW is a closed system and access to Freedom EVOLution SW uses a combination of user name and password for unique identification. Freedom EVOLution SW cannot be used without a valid user name and password.

Freedom EVOLution SW does not allow more than one person to use the software simultaneously.

If an attempt is made to copy a signature from one file to another, this is detected by Freedom EVOLution SW’s CRC checksum feature.

See [16.5.1 “Closed Systems”](#), ¶ 16-7.

See [16.5.5 “Electronic Signatures”](#), ¶ 16-9.

Compliance Tecan Customer

See [16.4.1 “Assigning and Using Freedom EVOLution SW User Names”](#), ¶ 16-6.

☒ **User-specific automated inactivity time out in case more than one person works on a single system**

Compliance Freedom EVOLution SW

Freedom EVOLution SW does not allow more than one person to use the software simultaneously.

Users are automatically logged out after a specified time during which no keyboard or mouse-click activities have been detected.

Compliance Tecan Customer

No action required.

16.8 Part C - Electronic Signatures

16.8.1 § 11.100 General Requirements

§ 11.100 requires that each electronic signature must be unique to one individual and must not be reused by or reassigned to anyone else. Before an organization establishes, assigns, certifies or otherwise sanctions an individual's electronic signature, the organization must verify the identity of the individual.

16.8.1.1 § 11.100 (a) Uniqueness

☒ Uniqueness of electronic signatures

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

See [16.5.5 "Electronic Signatures"](#),  16-9.

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

☒ Procedures and controls to make sure that electronic signatures are never reassigned to anyone else

Compliance Freedom EVOLution SW

See [16.5.3 "Tecan User Management System"](#),  16-8.


Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

16.8.1.2 § 11.100 (b) Verify Identity

☒ Verify the identity of an individual

Compliance Freedom EVOLution SW

Freedom EVOLution SW is a closed system and access to Freedom EVOLution SW uses a combination of user name and password for unique identification. Freedom EVOLution SW cannot be used without a valid user name and password. Also see [16.5.3 "Tecan User Management System"](#),  16-8.

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

16.8.1.3 § 11.100 (c) Legally Binding Signature

☒ **Persons using electronic signatures verify it as the legally binding equivalent of the handwritten signature**

Compliance Freedom EVOLution SW

Freedom EVOLution SW is a closed system and access to Freedom EVOLution SW uses a combination of user name and password for unique identification. Freedom EVOLution SW cannot be used without a valid user name and password. Also see [16.5.3 “Tecan User Management System”](#), [16-8](#).

Compliance Tecan Customer

See [16.4.1 “Assigning and Using Freedom EVOLution SW User Names”](#), [16-6](#).

16.8.2 § 11.200 Electronic Signature Components and Controls

§ 11.200 requires that electronic signatures not based on biometrics must employ at least two distinct identification components such as a name and password. In addition, when an individual executes a series of signings during a single period of controlled system access, the first signing must be executed using all electronic signature components and the subsequent signings must be executed using at least one component designed to be used only by that individual. When an individual executes one or more signings not performed during a single period of controlled system access, each signing must be executed using all of the electronic signature components. Electronic signatures not based on biometrics are also required to be used only by their genuine owners and administered and executed to ensure that attempted use of an individual's electronic signature by anyone else requires the collaboration of two or more individuals. This would make it more difficult for anyone to forge an electronic signature. Electronic signatures based upon biometrics must be designed to ensure that such signatures cannot be used by anyone other than the genuine owners.

16.8.2.1 § 11.200(a) Non-biometric Signatures

Compliance Freedom EVOLution SW

See [16.5.1 “Closed Systems”](#), [16-7](#).

Compliance Tecan Customer

Tecan customers must follow their company rules for using non-biometric signatures.

16.8.2.2 § 11.200(a) Employ At Least Two Distinct Identifications

Compliance Freedom EVOLution SW

See [16.5.1 “Closed Systems”](#), [16-7](#).

Compliance Tecan Customer

No action required.

16.8.2.3 § 11.200(a) Series of Signings During Continuous System Access

Compliance Freedom EVOLution SW

Freedom EVOLution SW requires the user to log in with name and password at startup (first signing). For each following signing only entry of the user's password is required.

See [16.5.5 "Electronic Signatures"](#),  16-9.

Compliance Tecan Customer

No action required.

16.8.2.4 § 11.200(a) Signing During Non-continuous System Access

Compliance Freedom EVOLution SW

Freedom EVOLution SW requires the user to login with user name and password when signings are performed during non-continuous system access.

- ◆ When closing Freedom EVOLution SW and starting the software again.
- ◆ When actively logging out of Freedom EVOLution SW without closing the program.
- ◆ When automatically being logged out of Freedom EVOLution SW after the defined idle time.

Compliance Tecan Customer

No action required.

16.8.2.5 § 11.200(a) Genuine Owner of Signature

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

16.8.2.6 § 11.200(a) Administered Signature

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

16.8.2.7 § 11.200(b) Biometric Signatures

Compliance Freedom EVOLution SW

Freedom EVOLution SW does not use biometric signatures.

Compliance Tecan Customer

Not applicable.

16.8.3 § 11.300 Controls for Identification Codes and Passwords

§ 11.300 describe that electronic signatures based upon the use of identification codes in combination with passwords must use controls to ensure security and integrity.

16.8.3.1 § 11.300(a) Maintaining Uniqueness

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

See [16.5.3 "Tecan User Management System"](#),  16-8.

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

16.8.3.2 § 11.300(b) Check Identification

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

See [16.5.3 "Tecan User Management System"](#),  16-8.

Compliance Tecan Customer

See [16.4.1 "Assigning and Using Freedom EVOLution SW User Names"](#),  16-6.

16.8.3.3 § 11.300(c) Loss Management

Compliance Freedom EVOLution SW

This section is not applicable to Freedom EVOLution SW since the Tecan User Management system does not use tokens, cards or other devices to bear or generate identification codes.

Compliance Tecan Customer

No action required.

16.8.3.4 § 11.300(d) Prevent Unauthorized Use

Compliance Freedom EVOLution SW

See [16.5.1 "Closed Systems"](#),  16-7.

See [16.5.3 "Tecan User Management System"](#),  16-8.

Compliance Tecan Customer

Tecan customers must develop and implement procedures to disable the user name and password when an employee leaves the company.

Tecan customers must name an authority that should be notified if an attempt is made to get unauthorized access to the system.

As part of the regular system maintenance activities, the Freedom EVOLution SW Administrator should routinely and regularly check the Freedom EVOLution SW log files for attempts get unauthorized access to the system. In addition, it is recommended to enable the feature in the Tecan User Management system to automatically notify a specified person by email if an attempt is made to get unauthorized access.

16.8.3.5 § 11.300(e) Periodic Testing

Compliance Freedom EVOLution SW

This section is not applicable to Freedom EVOLution SW since the Tecan User Management system does not use tokens, cards or other devices to bear or generate identification codes.

Compliance Tecan Customer

Not applicable.

16.9 Freedom EVOLution SW Installation Checklist

This section contains a checklist of the major tasks that need to be carried out to help the system to become compliant with the 21 CFR Part 11 regulations. It is divided into things that need to be done before, during and after installation of the software.

16.9.1 Before Installing Freedom EVOLution SW

Designate an experienced system administrator to set up the PC and the PC network.

The system administrator must develop a secure and effective way of remembering his or her password.

If you plan to install Freedom EVOLution SW in a network environment (LAN), take appropriate configuration steps when installing the Microsoft operating system and the network server(s).

If you plan to store Freedom EVOLution SW data on a network, you must assign appropriate access privileges to the network directories.

Archive and clear existing Microsoft Application, Security and System logs.

For network domain servers, disable the Guest account.

For network domain users, set the same account policies as on the local PCs:

- ◆ Set the “Enforce password history” password policy to “12 passwords remembered”.
- ◆ Set the “Maximum password age” password policy to 30 days.
- ◆ Set the “Minimum password age” password policy to 5 days.
- ◆ Set the “Minimum password length” password policy to 5 characters.
- ◆ Set the “Account lockout threshold” account lockout policy to 3 invalid logon attempts.

Activate password-protected screen savers.

16.9.2 Installing Freedom EVOLution SW

Install the Freedom EVOLution SW according to the installation instructions supplied with the software. In some countries, the Freedom EVOLution SW must be installed by an authorized Tecan Field Service Engineer. Contact your local Tecan distributor for more information.

16.9.3 After Installing Freedom EVOLution SW

Ensure that the Microsoft Application, Security and System logs are set to “Do not overwrite events (clear log manually)”.

Increase the default size for the Microsoft Application, Security and System logs.

Ensure that the following procedures are implemented to address sections of the 21 CFR Part 11 regulations, including (but not necessarily limited to):

- ◆ Provide suitable education, training and practical experience to personnel.
- ◆ Ensure that individuals are held accountable and responsible for their actions when using the pipetting system and the Freedom EVOLution SW.

- ◆ Verify the identity of each individual who is permitted to work with Freedom EVOLution SW.
- ◆ Create separate Freedom EVOLution SW user accounts using the Tecan User Management system for all persons who are authorized to use Freedom EVOLution SW.
- ◆ Create separate PC and/or PC network user accounts using standard Microsoft tools and procedures for all persons who are authorized to use Freedom EVOLution SW.
- ◆ Implement appropriate controls over distribution, use of and access to data and log files.
- ◆ Configure the log file functions in the Freedom EVOLution SW settings to document the pipetting and to record user inputs.
- ◆ Implement systems to prevent and detect unauthorized modification of data and log files.
- ◆ Notify the FDA that electronic signatures are intended to be equivalent to handwritten signatures.

Ensure that the following steps are also carried out:

- ◆ Regularly archive and clear the Microsoft Application, Security and System logs.
- ◆ Regularly check the Microsoft Security log to detect unauthorized access to the PC.
- ◆ Ensure that users are logged out from Freedom EVOLution SW when the PC is unattended.

17 Customer Support

Purpose of This Chapter	This chapter informs you how to contact us in case help is needed. It lists addresses and telephone numbers of the manufacturer’s representatives.
How to get Help	Tecan and its representatives maintain a fully trained staff of technical specialists around the world. For any technical question, contact the nearest Tecan representative.
Feedback on This Manual	If you have any comments on this Application Software Manual or suggestions for improvement, please send them by e-mail to docfeedback@tecan.com . In your e-mail, please specify the manual name, the document ID and the manual version. This information is shown at the bottom of each printed page and on the first page of the help file (context-sensitive help of software products).

17.1 Contacts

Addresses Contact your local distributor or one of the addresses below. Also see our homepage on the web: www.tecan.com

Country/Region	Address	Telephone/Telefax/E-mail	
Asia	Tecan Asia Pte Ltd. 18 Boon Lay Way, #10-106 TradeHub 21 Singapore 609966 Singapore	Phone Fax E-mail	+65 6444 1886 +65 6444 1836 tecan@tecan.com.sg
Australia New Zealand Pacific Islands	Tecan Australia Pty Ltd 21 / 3 Westside Avenue Port Melbourne Vic 3207 Australia	Phone Phone Fax E-mail	Toll Free: 1300 808 403 +61 3 9647 4100 +61 3 9647 4199 helpdesk-aus@tecan.com
Austria	Tecan Austria GmbH Untersbergstrasse 1a 5082 Grödig Austria	Phone Fax E-mail	+43 6246 8933 256 +43 6246 72770 helpdesk-at@tecan.com
Belgium	Tecan Benelux B.V.B.A. Businesspark E19 Battelsesteenweg 455B 2800 Mechelen Belgium	Phone Fax E-mail	+32 15 709 054 (en) +32 15 709 055 (fr) +32 15 421 612 helpdesk.benelux@tecan.com
China	Tecan (Shanghai) Trading Co., Ltd. Room 1802, 1803, 1804 and Room 205, HongJia Tower, 388 Fushan Road, Pudong New Area, Shanghai, P.R.China	Phone Fax E-mail	+86 21 2206 32 06 +86 40 0821 38 88 +86 21 2206 52 60 helpdesk-cn@tecan.com

France	Tecan France S.A.S.U 6, Avenue du Château de Gerland F-69007 Lyon France	Phone Fax E-mail	+33 820 88 77 36 +33 4 72 76 04 99 helpdesk-fr@tecan.com
Germany	Tecan Deutschland GmbH Werner-von-Siemens-Straße 23 74564 Crailsheim Germany	Phone Fax E-mail	+49 1805 8322 633 or +49 1805 TECAN DE +49 7951 9417 92 helpdesk-de@tecan.com
Italy	Tecan Italia, S.r.l. Via Brescia, 39 20063 Cernusco Sul Naviglio (MI) Italy	Phone Fax E-mail	+39 800 11 22 91 +39 (02) 92 72 90 47 helpdesk-it@tecan.com
Japan	Tecan Japan Co., Ltd. Kawasaki Tech Center 580-16, Horikawa-cho, Saiwai-ku Kawasaki, Kanagawa 212-0013 Japan	Phone Fax Phone E-mail	+81 44 556 7311 (Kawasaki) +81 44 556 7312 (Kawasaki) +81(0) 6305 8511 (Osaka) helpdesk-jp@tecan.com
Netherlands	Tecan Benelux B.V.B.A. Industrieweg 30 NL-4283 GZ Giessen Netherlands	Phone Fax E-mail	+31 20 708 4773 +31 183 44 80 67 helpdesk.benelux@tecan.com
Scandinavia	Tecan Nordic AB Taljegårdsgatan 11B 431 53 Mölndal Sweden	Phone Fax E-mail	+46 317 54 40 00 +46 317 54 40 10 helpdesk@tecan.se
Spain Portugal	Tecan Ibérica Instrumentación S.L. Edificio Mapfre C/ de la Marina 16 - 18, Planta 11a C-1 E-08005 Barcelona Spain	Phone Fax E-mail	+34 93 40 91 237 +34 93 330 87 00 helpdesk-sp@tecan.com
Switzerland	Tecan Schweiz AG Seestrasse 103 8708 Männedorf Switzerland	Phone Fax E-mail	+41 44 922 82 82 +41 44 922 89 23 helpdesk-ch@tecan.com
United Kingdom	Tecan UK Ltd. Theale Court 11-13 High Street Theale, Reading, RG7 5AH United Kingdom	Phone Fax E-mail	+44 118 930 0300 +44 118 930 5671 helpdesk-uk@tecan.com
USA	Tecan US, Inc. 9401 Globe Center Drive, Suite 140, Morrisville, NC 27560 USA	Phone Fax Phone E-mail	+1 919 361 5200 +1 919 361 5201 Toll Free in the US: +1 800 TECAN US or +1 800 832 2687 helpdesk-us@tecan.com

USA
(Tecan Systems)

Tecan Systems, Inc.
2450 Zanker Road
San Jose, CA 95131
USA

Phone

+1 408 953 3100

Toll Free:

+1 800 231 0711

Fax

+1 408 953 3101

E-mail

tecan-sy@tecan.com

18 Glossary

Purpose of This Chapter

This chapter contains a glossary to explain terms and expressions used in this Application Software Manual.

Accuracy

The degree of conformity of a measure to a standard or true value (difference between expected value and actual value, divided by the expected value multiplied by 100%).

Additive

A liquid (e.g. reagent, diluent) taken from a *Container* on the worktable and added to several or all *Samples/Standards/Controls/Blanks* in order to cause or influence a reaction.

Additive distribution

A *distribution* which adds an *additive* to *destination* containers which have already received liquid during a previous *distribution* or are going to receive liquid in a *follow-up distribution*.

Application

Generally refers to a software package with a specific purpose, for example RIA, EIA etc.

Assay

A diagnostic test procedure

Blank

A position in a *destination rack* which does not receive *sample* but only the *additive(s)*. It is used to determine the background signal in the detection or measurement system (e.g. a photometer).

Capabilities

Capabilities denote the possible interactions of a component with another component or with the operator.

Carrier

A carrier is a mount for *microplates* or other *racks*. It is positioned on the worktable or on devices like the *Te-MO* or the *Te-Link*.

Carry over

Residue of sample liquid that remains in a tip after rinsing at the end of a pipetting cycle. Such residue is "carried over" to the next cycle. Where no carry over is admissible, *disposable tips (DiTis)* must be used.

Cleaner

The well in which a tip is positioned in order to wash both its interior and exterior surfaces, by dispensing *system liquid* through the tip.

Coefficient of variation

A statistical representation of the precision of a test.
The function: standard deviation / mean x 100%.

Consumables

labware and substances which are consumed during a run, e.g. DiTis, reagents, plates, etc.

Container

Any vessel placed on or under the worktable and containing a liquid or other chemical, e.g. one well in a microplate, a sample tube or a system liquid tank.

Control

A liquid containing a known concentration of the substance which is to be tested. Used to determine (high/low/cutoff) limits and/or as reference for quality control. The properties of the control are well known and stable.

Cross matching

The crosswise matching of one or more cross matching specimen (donor samples) with one or more samples (patient).

Destination

The *rack* holding the *container(s)* into which liquid is dispensed.

Destination rack

see destination

Device

An addressable component of the Freedom EVOLution SW or additional option which can communicate with the *Te-CU*, e.g. arm, diluter, *PosID*, etc.

Diluter

Precision pump used for aspirating and dispensing exactly defined volumes of liquid by means of a motor driven syringe.

Disposable tip

Tip used for one single aspiration/dispensation cycle and discarded afterwards. Used when it is absolutely necessary that no residues from one sample are carried over to the next. See also *Carry over*.

Distribution

One or a sequence of *pipetting cycles* defined together with the appropriate liquid handling parameters.

DiTi

see *disposable tips*

Fixed tip

General term for a tip that can be screwed to a pipetting device (e.g. LiHa). Unlike a *disposable tip* it is rinsed after each pipetting cycle and can be reused.

Flush

The procedure which rinses the total *liquid system* with the purpose of removing air pockets or exchanging the *system liquid*. It is executed only at the beginning or the end of a *distribution*.

Follow-up distribution

A *distribution* which uses as source a position filled in a previous distribution.

Free dispense

Dispensing without the tip touching the liquid.

Global liquid

A liquid used for several tests. It is in a defined position on the worktable.

Incubation

The preservation of controlled environmental conditions; e.g., for culturing microorganisms.

Incubation Device

Subsystem, consisting of a heating block and a control circuit, that is used for heating up samples and keeping them at a defined temperature.

Labware

The parts and devices which make up the worktable

Laser scanner

Scanner (e.g. LS Series Laser Scanner) used to scan substrates in standard glass arrays, membrane arrays, gel on glass, etc. for sample imaging. Sample images are then processed further, e.g. for quantification or spot finding.

LiHa

see *liquid handling arm*

Liquid handling arm (LiHa)

A component of the pipetting instrument mounted to the X-slide containing and holding the pipetting tips.

Liquid role

An additional tag for a liquid, which defines the purpose of the liquid in an assay step. Used as identifier and can be logged.

Liquid system

All instrument modules and parts which contain or directly influence liquid (tubing, diluters, valves, tips, etc.).

Local liquid

A liquid used for one test only, and which is placed into a test-specific (transportable) reagent rack.

Microplate

A plate of standardized size, comprising 96, 384 or 1536 containers (wells).

Multichannel pipetting head

Pipetting head with 96 or 384 channels through which liquid can be aspirated/dispensed simultaneously.

Pipetting cycle

A sequence of *Steps* which is repeated in identical or closely similar manner.

Pipetting mode

Describes the main method by which a liquid can be distributed: either by *single pipetting* or *multi pipetting*.

Plunger

The piston in a *Syringe* or a channel of a *multichannel pipetting head*. It aspirates liquid by moving in one direction and dispenses it when moving in the opposite direction.

PosEval

Position Evaluation. A software feature enabling the operator to control the X/Y/Z position of a robotic arm via keyboard arrow (cursor) keys.

PosID

see *Positive Identification*

Position

The physical coordinates of the pipetting tip at a given location on the worktable. It is expressed as X, Y and Z mm from the initialization position.

Position Evaluation

see *PosEval*

Positive Identification (PosID)

Moveable barcode reader used to read the barcode labels on tubes, racks and carriers.

Precision

see *Coefficient of Variation (CV%)*.

Rack, Rectangular Rack

A physical arrangement of *containers* whose dimensions are uniform, e.g. a microplate. Each row and column has the same number of containers and the distances between rows or columns are uniform.

Reader

Microplate reader, e.g. Sunrise absorbance reader, Safire, or ULTRA Evolution.

Reference tip

Special tool that can be fixed to a pipetting device (e.g. LiHa or Te-MO). Used to exactly adjust the device in the various axes. Reference tips can not be used for pipetting.

Replicate

Replicates are repetitions of the same liquid at different positions.

Robotic manipulator arm

Component which picks up and moves objects within the working area of the instrument.

RoMa

see *robotic manipulator arm*

Run

A sequence of processes on the instrument started by the user.

Sample

Specimen of the substance (e.g. blood, serum, urine etc.) to be analyzed by means of a *Test*.

Series

A number of assays which are allowed to be processed together.

Setup

The implementation of the hardware on an instrument (e.g. tip type, number of diluters per channel, etc.) and the assignment of basic settings (e.g. permissible X-range of a specific instrument, size of installed syringes on a diluter, etc.). This is usually done during the installation of a new instrument.

Standard tip

A Tecan standard tip is a special type of fixed tip that has predefined characteristics. There are various models of standard tips (with/without coating, various volumes).

Step

A sub-procedure or an element of a *distribution*.

Standard

A liquid containing a defined concentration of the substance to be tested. Used to create a standard curve by which concentration of the analyte in the *Samples* can be determined. The properties of the standard are well known and stable.

Submerge

The distance the tip will travel downward after liquid is detected. This parameter is programmed by the operator to avoid aspirating bubbles or debris at the liquid surface.

Substance role

More universal name for "Liquid role".

See *liquid role*

Syringe

Part of the *diluter*. A glass cylinder with a motor-driven *plunger* that aspirates/ dispenses the required quantity of liquid.

System liquid

A liquid which fills the *liquid system* and is used as wash fluid and /or can be added to several or all *samples* analogously to the *additive*.

Test

A sequence of actions that is performed automatically and gives a result that is automatically measured.

Testkit

An assembly of liquids and consumables necessary to make an assay.

Tip

A needle-like device that can be mounted to a pipetting device for aspirating/ dispensing liquid. The following tip types are used with Tecan instruments:

- standard tip
- disposable tip
- fixed tip

Tube

Small round glass *container* which holds the substance to be analyzed. Tubes are often marked with a barcode label so that they can be distinguished from one another.

Wash

Aspirating system liquid from the diluent reservoir and dispensing it through the system into the wash position, to clean the inside and the outside of the pipetting tip.

Wash station

Generally referred to as the physical combination of a *cleaner* position and a *waste* position.

Washer

Microplate strip washer, such as HydroFlex Platform or Columbus PW 96/PW 384.

Waste

The position in the wash/waste carrier into which a tip is placed for washing its interior. The system liquid is dispensed through the tip and then into the outer cavity of the wash /waste carrier. From there, waste liquid flows off through the waste tubing to the waste container.

Well

One of the containers in a *microplate*.

Worklist

A collection of one or more work request stored in a file.

Work request

The association of a sample with one or more assays.

Worktable

Part of the instrument where the carriers are placed for access by the robotic arm.

