



ePrep ONE Instrument User Manual

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1. Important Notes

ePrep ONE is a new approach to sample preparation and the various liquid handling and sample preparation processes that are required in Analytical Chemistry laboratories.

Instructions for operation of the ePrep ONE available through several mechanisms. Please see the instructions that are shipped with the ePrep ONE:

- Unpackaging Instructions
- Quick Start
- Ready Reference Guide
- Installation Guide (Software installed on the Computer supplied). Access this Guide from the Home screen - Systems - Quick Start. Scroll through the installation instruction screens.
- Help Topics available throughout the software that are relevant to the part of the Axis software that is being assessed.

In addition, on-line resources and information that includes this manual and updates are available at www.eprep-analytical.com

Instruction translation status: THIS IS THE ORIGINAL VERSION, ENGLISH LANGUAGE, NOT TRANSLATED

Support and Suggestions

ePrep values your feedback and suggestions to make sample preparation better and expand the capabilities of the ePrep ONE platform. Please use support@eprep.com.au to send feedback and suggestions. If possible, include your instrument serial number with your enquiry. The serial number is found on the identification plate on the back of the instrument. We also appreciate notification of errors in the ePrep ONE software and operation at: suggestions@eprep.com.au

For technical assistance and reporting please use :

Call +61 3 9574 3600

Or write 3 Kingston Town Close Oakleigh, Victoria 3166 AUSTRALIA

To learn of the latest news, capabilities and free software updates for ePrep ONE, please check regularly www.eprep-analytical.com

Supplier

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Important Icons used in these instructions.

	Important warning notification for user safety.
	Biohazard potential
	Information and hints for operation.
	Correct hardware and software information
	Cabling information

2. Safety and Preparation for Use

Intended Use

The ePrep ONE is designed to bring automation to the analytical laboratory and offers a paradigm shift in sample preparation techniques for most analytical methods.

ePrep ONE is primarily designed for the Chromatography Laboratory sample preparation and liquid handling operations. It is a stand-alone robotic system for processing liquids for analysis and is intended for offline processing.

Summary

- The system is intended for use by a trained laboratory technician
- Program complex Workflows and be operational in a few minutes
- Change rapidly between workflows, making it convenient to use ePrep ONE whether running a small number of samples or a larger number
- Flexibility on the type of vials and vial racks that are used is possible using Adapter Plates which are specific to the vials and racks being used. Common sample vials and racks are provided for, as well as common analytical instrument autosampler racks.
- Automated syringe exchange system with up to 12 different syringes and tools selectable during a Workflow
- Positive displacement syringe based liquid handling (not pipette) leading to accurate control of volume while dispensing.
- Precise flowrate control and high pressures permitting micro separation, membrane and filtering operation.
- Needle-based sealed vial operation to guarantee sample integrity and safety.
- Integrated Workflow use of Accessories for complete sample preparation processes
- ePrep ONE is a flexible platform that is designed to accommodate new techniques and accessories to expand its capabilities.

ePrep ONE is not intended for medical use.

For Research Use Only. Not for use in diagnostic procedures.

Safety Precautions

WARNINGS

	Boxed ePrep ONE weight approx. 110kg, ePrep ONE instrument approx. 65kg. Precautions must be taken when lifting and carrying. Refer to the Unpacking ePrep ONE instructions for handling details.
	Do not enter the instrument workspace or place any part of your body near moving axes during operation.
	If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Good Laboratory Practice (GLP) should be followed when using ePrep ONE. Refer: 21CFR58, 21CFR58, Directive 2004/9/EC and specific product GLP Directives.
	GLP should be employed when the system is in use. Recommended PPE: Safety glasses, laboratory coat If dealing with toxic chemicals additional PPE may be required as per standard laboratory practice.
	Be aware, dispensing at high flow rates with large volumes can cause a sealed container to become pressurized. This situation or using pre-pressurized containers can lead to liquids being ejected from the hole created in the seal during septa piercing. When using hazardous chemicals please wear appropriate PPE.
	For California residents only: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to https://www.p65warnings.ca.gov/
	Precautions for safe handling of biological specimens are outlined by the Centers for Disease Control and Prevention, http://www.cdv.gov
	ePrep ONE is fitted with an Emergency Stop Button found at the front right side of the instrument. Pressing the button will cut off all power to the instrument. To reinstate power, rotate the emergency button 90° clockwise.
	Only approved accessories and consumables can be used with the instrument. EPrep ONE assumes no liability for the customer's failure to comply with these requirements.
	Connection cables to external equipment should be less than 2m in total length, preferred length is 1.8m

Other Safe Handling Information

- ePrep ONE incorporates many features designed to mitigate the risk of injury to personnel. However, it is sensible and good laboratory practice to treat the machine with caution and not allow body parts or loose clothing to come into close contact with the ePrep ONE when it is operating. Besides the risk of injury, infringement of the machine operating space is likely to cause the workflow to abort.
- Use only approved syringes with the ePrep ONE. These syringes must only be used with the specific needle type supplied with the syringe. The RFID tag used to identify the syringe should not be changed or interfered with.
- When handling syringes and μ SPEd cartridges, care should be taken to avoid injury from the sharp needle.
- ePrep ONE has been produced using paints and other coatings that are highly resistant to chemical attack, but nothing is impervious. Always clean up spills immediately to prevent staining and other damage to the ePrep ONE system and use in a well-ventilated area where aggressive vapors are involved.
- Emergency Stop: is a safety requirement to immediately stop ePrep ONE operation and movement. Ensure the Emergency Stop button on the front right side of the instrument is not obstructed by items placed near to it and is easily accessible.
- ePrep ONE has a battery backup system in case of interruption to the main power supply. Removing mains power to the instrument will not stop the operation of ePrep ONE and render the machine safe. The only way to know the machine is completely disabled is activation of the Emergency Stop button.
- Do not use the EPREP ONE in a potentially explosive environment or with potentially explosive chemicals.
- Operate the EPREP ONE at temperatures between 15 °C and 30 °C.
- When installing the ePrep or other accessories ENSURE mains power leads are not placed in the working area or on top of the drip tray. Hazardous chemicals can damage the mains power leads creating an electrical hazard.

Care and maintenance:

- Do not clean the Computer, or any part of the ePrep ONE instrument using acetone or aggressive solutions.
- Other than onto the approved drip tray, do not allow any liquid to enter the device.

Sample Hazards

When working with laboratory chemicals and biological fluids, good safe laboratory practices must be followed. It is expected that ePrep ONE is operated by personnel who are skilled already in safe laboratory practices.

When using infectious, radioactive, toxic and other solutions which may be a health risk, please observe the safety precautions laid down for your country.

Precautions for safe handling of biological specimens are outlined by the Centers for Disease Control and Prevention, <http://www.cdc.gov>

Regulatory Certifications

INSTRUMENT INSTRUCTIONS

Part Number: 01-01000-01

Name: ePrep ONE Sample Preparation Workstation

Model Number: GL950X

Designed in Australia, assembled in Singapore

Regulatory Conformance

ePrep ONE will be certified to a range of regulatory requirements. Check back to www.eprep-analytical.com for the latest approvals.

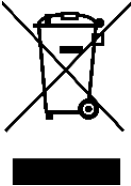
	Conformite Europeenne (CE) EMC compliance for Europe CISPR 11, Classification ISM 1-A
	Federal Communication Commission (FCC) EMC compliance for North America FCC ID: 2AJWG-EPREP-01 Contains FCC ID: T9JRN41-3, IC ID: 6514A-RN413

ISED Canada	Industry Canada (IC) EMC compliance IC ID: 21989-EPREP01
	Regulatory Compliance Mark (RCM) EMC compliance for Australia, AS/NZS 4417.1

RF (Radio Frequency) Exposure compliance distance: 5cm (from Foot) / 20cm (from back panel)

RF (Radio Frequency) Distance de conformite de l'exposition: 5cm (du Pied) / 20cm (A partir du panneau arriere)

Usage, unpackaging, disposal information

	ePrep ONE is to be used indoors only.
	Crossed-out wheeled bin: <ul style="list-style-type: none"> Do not mix waste electrical and electronic equipment (WEEE) with general waste. Please dispose of this product thoughtfully, many of the materials and components can be recycled. Contact your local distributor or nearest WEEE recycling center.

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

This device may not cause interference; and

This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme à la réglementation Canadienne relative aux flux RSS exemptes de licence.

L'opération est soumise aux deux conditions suivantes:

Cet appareil ne doit pas provoquer d'interférence; et

(1) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

Service and Repair

Contact ePrep via www.eprep-analytical.com or your local ePrep service/distributor for guidance on repairs that can be carried out by the user and repairs that require trained service personnel to carry out the work.

Information for the User

Changes or modifications not approved by ePrep ONE could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

3. Introduction to ePrep ONE

Specifications

Model	GL950X, P/N 01-01000-01, ePrep ONE Sample Preparation Work Station		
LIQUID HANDLING AND SAMPLE PREPARATION			
Stated Liquid handling precision and accuracy	• 10µL syringe	Accuracy ±3.0%	RSD 2.0%
	• 100µLsyringe	Accuracy ±1.5%	RSD 1.0%
	• 1mL syringe	Accuracy ±1.0%	RSD 1.0%
	• 10mL syringe	Accuracy ±1.0%	RSD 1.0%
	Values stated are based on manufacturers specifications and determined at 10% of the syringe volume. Greater accuracy and precision may be obtained by calibration of syringes and system.		
	Mechanical: ±50 µm plunger displacement precision		
Carry-over	For multi-use liquid handling tools an integrated wash station is used to control carry over. Carry-over depends on the syringe type, sample characteristics and user-settable parameters in the software. It is also recommended that multiple syringes of the same volume be used if high and low concentrations samples are aliquoted to avoid excessive syringe washing.		
Syringes Volume range (dependent on syringe selected)	Minimum volume: 1 µL with 10 µL Syringe (precision of lower volumes based on operating conditions)		
	Maximum volume: 10+ mL per dispense with unlimited volume achievable using multiple aspirate/dispense cycles		
Flow rates	10 µL syringe	: 1 µL/min - 30 µL/min	
	100 µL syringe	: 1 µL/min - 300 µL/min	
	1,000 µL syringe	: 1 µL/min - 600 µL/min	
	10,000 µL syringe	: 5 µL/min - 750 µL/min	
OPERATIONAL INFORMATION			
Deck Capacity	Total 16 (16P) x 1P deck spaces available. Space is used to accommodate Adapter Plates existing in variable sizes from 1P-6P configurations.		
Laboratory	With sealed vials, a cover is not required. Suggest a well ventilated and climate-controlled environment. If using toxic materials, take appropriate safety precautions.		
Controlling Computer and Software	Microsoft Touch Screen Surface Pro (Supplied) including ePrep ONE Axis rapid Workflow development software (English Only) and lifetime updates		
Connectivity from Computer to Instrument	USB		
Data Security	Multilevel rights controlled by user login. Logging of Date/Time, Output ID, Workflow ID, Process. Report formats in TXT and PDF.		
Wash Station	Deck mounted syringe Wash Station. During wash operation, waste is pumped to a waste reservoir (not supplied) and also replenishes wash solution from an		

	external solution reservoir (not supplied).
Asset Identification	RFID identification on syringes, tools, and racks and (optional) barcode identification on vials.
SYSTEM INFORMATION	
Instrument	
Dimensions (L x W x H)	1370 mm x 694 mm x 743 mm
Weight	65 kg
Voltage	24 V, 221 W, 9.2 A DC Power Pack; 100-240 Volt AC input. Requires country specific IEC C13 power cable (not supplied).
ePrep ONE Connection ports	3 x Serial Comms, 4 x Digital Output, 4 x Digital Input, 4 x Relay
Operating temperature	15-30°C, 0-80% relative humidity
Operating sound level	Typical 80 dB
Compliance	CE, FCC, IC, RCM, RoHS, Safety EN 61010, EMC 61326
Warranty	12 months

Instrument Overview

Designed to bring automation to every laboratory, the ePrep ONE Sample Preparation Workstation offers a paradigm shift in sample preparation techniques for most analytical methods.

- ✓ Affordable Laboratory Automation
- ✓ Analytical Syringe Operation
- ✓ Easy to Use
- ✓ Highly Flexible and Adaptable
- ✓ Automates all the common elements of sample preparation
- ✓ Exceptional Accuracy and Precision even at low volumes



Touch screen Graphical Interface makes Workflow programming simple

The ePrep ONE Sample Preparation Workstation utilizes a suite of innovative technologies to bring automation of sample preparation to every analytical chemistry laboratory. Its independent operation allows flexibility and effectiveness in a laboratory setting. Samples can be prepared in Autosampler Racks, away from analytical instrumentation. Once the preparation is complete, the rack can simply be transferred to the instrument, vastly reducing the complexity of the sample preparation process.

An overview of the ePrep ONE workstation for new users can be seen [here](#).

Packing List - Base Product

INSTRUMENT

ePrep ONE Instrument
24volt power pack
Controlling Computer with ePrep Axis software
USB Type B cable (ePrep ONE to Computer connection)
Underdeck drip tray

INSTALLATION TOOLS

3 x Plate screws
1 x Calibration Probe

ADAPTER PLATES

1 x Wash Station deck plate with installed wash station and tubing
1 x Rear deck plate
3 x Accessories Area Adapter Plates
6 x Adapter Plate for BelArt Racks - also used for calibration
1 x Adapter Plate for Waters 6x8 Rack
1 x special Calibration Adapter plate

RACKS

1 x BelArt 3x7 Rack Tag for 30mL vials
1 x Waters 6x8 for 1.5mL vials

VIALS

100 x 1.5mL vials with caps/septa
10 x 30mL vials with caps/septa

SYRINGES

1 x 100µL ePrep Syringe, 80mm needle
1 x 1mL Syringe, 80mm needle
1 x 10mL Syringe, 80mm needle

SPARES

2 x Septa Piercer
2 x Spare Needle for 100µL Syringe
2 x Spare Needle for 1mL Syringe
2 x Spare Needle for 10mL Syringe

Quick Start Instructions

Note: Country specific IEC C13 Power Cable for power pack not supplied

Register Your Instrument Online

To receive product and software update information, it is important that you register your instrument online. Have your instrument serial number available (found on the name plate at the rear of the instrument) to complete your registration.

Go to <http://support.eprep.com.au/registration>

The registration will enable ePrep to notify you when software updates are available. The Registration details will also be used for future online login to enable software update downloads

Instrument Serial Number

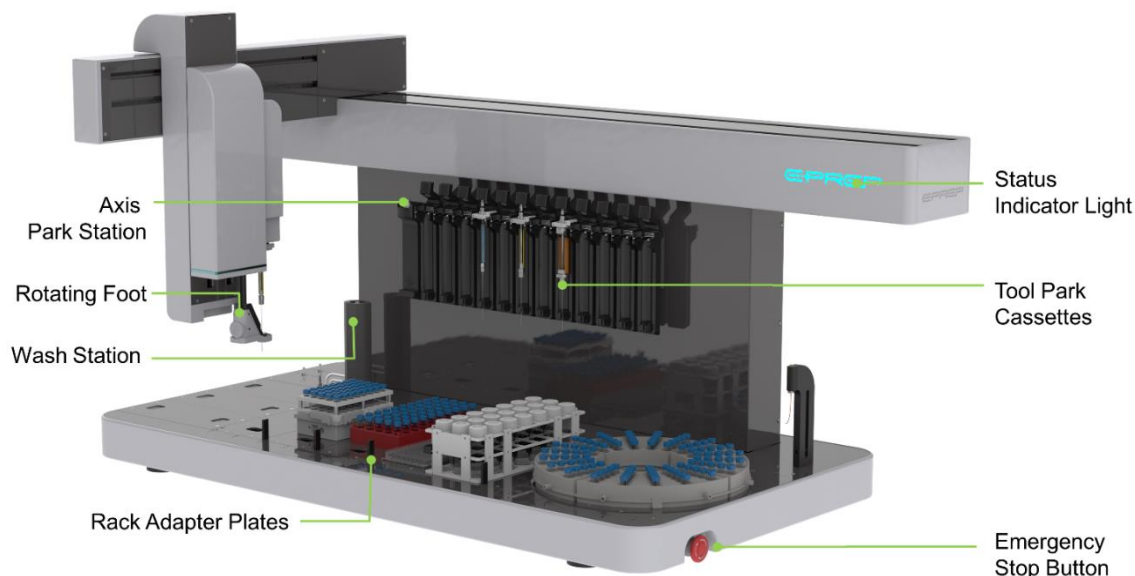
Instrument details including Serial Number can be located on the instrument identification panel on the back of the instrument. Please quote the serial number if logging a service call.

 <p>ePrep automation for every laboratory</p>		<p>ePrep PTY LTD (Australia) Designed in Australia, assembled in Singapore (w) www.eprep.com.au (e) info@eprep.com.au</p>	
<p>ePrep Sample Preparation Workstation</p> <p>Model No: GL950X Part No: 01-01000-01 Serial No: 1000570 Voltage: 24 volt DC, 9.2A</p>		 <p>BACLU LISTED UL 61010-1 CAN/CSA C22.2 No. 61010-1 A0056</p>	
<p>Laboratory Equipment</p> <p>3 Kingston Town Cl Oakleigh VIC 3166 Australia</p>		<p>ISM 1-A</p> <p>FCC ID: 2AJWG-EPREP-01 IC: 21989-EPREP01 Contains FCC ID: T9JRN41-3 Contains IC: 6514A-RN413</p>	

For Research Use Only. Not for use in diagnostic procedures.

DOM: 06/2024

4. Some Important ePrep ONE Definitions



XYZ Axis

The X, Y and Z axes are stepper motor driven with continuous position monitoring. As the robotic arm (P-drive – see below) moves, the actual position is detected and this position is compared with the expected position. At machine start the actual position for each axis has to be established in the software. A software routine moves each axes a few centimeters in either direction to establish the position. Occasionally, when an axis is already at its full extension of travel at machine start up, the axis carriage will be heard impacting the travel limits before reversing direction and will make a grinding noise. Note. this noise maybe alarming but is normal and does not damage the machine.

When power is removed from the machine (flat battery or Emergency Stop activated) the robotic arm (P-drive) may be moved manually.

P-Drive

The P-Drive is the heart of the ePrep ONE system with an array of actuators, motors and sensors incorporated. The P-Drive incorporates a separate microprocessor for controlling and monitoring the various functions. Communication between the P-Drive processor and the main Board in the ePrep ONE is via a series of wires and connections across the Z-Y- X axes transitions.

- Xchange coupling that automatically connects and disconnects to the syringe barrel and to the syringe plunger
- Stepper Motor and encoder to precisely drive the syringe plunger and detect high back pressures and automatically adjust the flowrate
- IR (infrared) sensor that rapidly scans for the presence of vials
- Septum piercer. The syringe needle is not used to pierce septa because of the risk of bending the syringe needle. First the piercer punctures the septum, and the syringe needle goes through the bore of the piercer into the vial. On withdrawal from a septum, the piercer first retracts leaving the needle in the vial and then the needle is withdrawn, wiping the syringe needle on the inside of the septum.



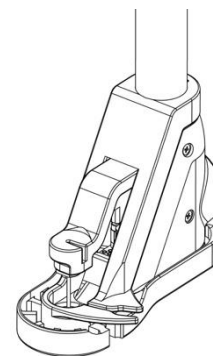
- Rotating foot with vertical movement. This rotates to guide the syringe needle into the septa piercer.
- The foot, through which the piercer and syringe needle pass is movable, and separately controllable in the Z- plane. It is required to push vials as the syringe needle is withdrawn through the septum, otherwise the vials could stay attached.
- At the back of the P-drive is located an RFID reader to detect and receive data on the syringes and tools that are on the Tool Rack
- On the opposite side of the Foot to the needle piercer and fork is an additional RFID reader to sense and read RFID tags on the Vial Racks and Vial Rack Adapter Plates.

Sensor Foot

The sensor foot at the bottom of the P-Drive is a mechanical switch that precisely detects the P-Drive foot touching an external feature.

The Sensor Foot is used for the following functions:

- For safety purposes, to detect incorrectly positioned objects or personnel coming into contact. Activation of the Sensor Foot during operation immediately stops all motion of the machine in the same way as the Emergency Stop. A continuous RED indication will be given by the annunciator on the X-axis.
- At ePrep ONE installation all axes are moved to a range of locations and the Sensor Foot is touched against features on the ePrep ONE deck. The data from this precise calibration process is used in the firmware of the machine to move the axes and components of the ePrep ONE accurately to defined positions.
- Detects the presence and height of vials by touching the vials
- To calibrate the rotation of the foot at the beginning of a workflow. The Sensor Foot rotates against the side of the P-Drive housing.



Controlling Computer and ePrep Axis Software

The ePrep ONE is supplied with a Controlling Computer. Preloaded on this computer is the ePrep Axis software which manages all elements of the monitoring and control of the ePrep ONE. The intensive data communication between the Controlling Computer and ePrep ONE can be done by USB connection.

The ePrep ONE has been designed and tested for operation on this computer. Installing the ePrep Axis software onto an alternative computer or different version of operating system is not approved.



CAUTION: The Controlling Computer as delivered has been configured for operation with the Axis Software and the ePrep ONE. Making changes to this configuration is not recommended to ensure reliable operation of the ePrep ONE functions. For example, changing the Microsoft date format and numerical settings has been shown to impact some software update processes.

Axis Software Overview

Conventional laboratory automation software typically requires the user to have knowledge of programming, in order to create a workflow. The ePrep Axis software, on the other hand, allows the user to create a workflow without any programming know-how. A workflow is created by first selecting a standard task that has already been fully defined in the software. The workflow can then be built up and the complexity increased by adding additional tasks. The parameters for each task can be easily adjusted.

For information on operating the ePrep Axis software see the following guides:

Quick Start Guide

- Ready Reference Guide
- Installation Guide (Software installed on the supplied computer. Access this Guide from the Home screen - Systems - Quick Start. Scroll through the installation instruction screens.
- Help Topics available throughout the software that are relevant to the part of the Axis software that is being assessed
- This Instruction Manual

Syringe Washing - Wash Station

The Wash Station is designed for washing the syringe (internal wash) and the syringe needle (internal and external wash) to prevent cross contamination and also as a means to empty liquids to waste.

A video showing the ePrep ONE wash station in operation can be seen [here](#).

Parameters for washing are controlled through the Axis Software. These parameters are available to be defined either in a specific Wash Task in a Workflow or during set up of the Syringe / Tool parameters for a Task such as Aliquoting, Dilution etc.

There are two concentric chambers in the Wash Station. The inner small inside diameter tube has water or other solvent pumped upwards through the tube. With the syringe needle inserted into this tube there is a high velocity of liquid over the outside of the needle for more effective cleaning.

The Wash station can be used to just clean the outside of the needle or wash the inside of the needle and syringe barrel by pumping the solvent into the syringe during washing. This option and other functions for washing are selected when setting the syringe parameters as a Workflow is created in the Axis software.

As solvent is pumped up through the inner tube it overflows into the outer cavity which is then pumped to a waste receptacle. When a syringe is being purged of any remaining liquid from an operation, the liquid is disposed of directly into the outer cavity of the Wash Station.

Two peristaltic pumps are used in the Wash Station. One pumps the Wash Fluid from the reservoir to the Wash Station and the other pumps the waste from the outer chamber to a Waste bottle.

Tool / Syringe Station

12 stations for syringes and other tools that can be coupled to the P-drive via the ePrep Xchange coupling system.

Each station is designed to hold the syringe/tool in the correct position for engagement by the Xchange coupling system.

On the far-left side of the Tool Rack is a Locking Station that the P-drive returns and connects at the completion of a workflow (after disconnecting all syringes / tools).

The Locking Station is also one of the reference points used to calibrate the ePrep ONE at installation. The correct coupling and decoupling of syringes and tools is the most dimensionally critical aspect of ePrep ONE operation and that the calibration routine checks and corrects for critical position parameters.

Battery Backup System

ePrep ONE is equipped with a 24V DC sealed Lead Acid battery backup system.

The system detects the loss of Mains Power and automatically connects to the Battery Back Up. A fully charged Back Up battery provides approximately 20 minutes of uninterrupted operation of the ePrep ONE following failure or removal of the Mains Power supply.

If depletion of the Back Up Battery is detected while operating under battery power, the workflow will be terminated, the syringe/tool being used will be returned to the Tool Rack and the P-Drive will return and lock onto the Park station.

At resumption of Mains Power, the ePrep ONE will automatically switch back to Mains Power and if a Workflow is in progress will continue the operation. The Back UP Battery will also be recharged.

CAUTION

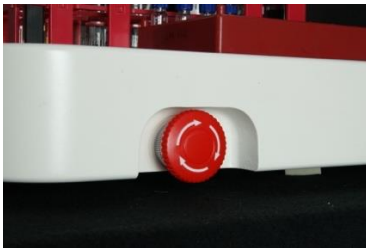
Even with the removal of mains power supply and switching the ePrep ONE OFF at Mains Power, the ePrep ONE will not be disabled and is still capable of moving. There are three ways for an operator to completely disable ePrep ONE from any motion:

- Activate the Emergency Stop
- Trigger the Sensor Foot
- Power switch on the left side rear of the ePrep ONE switched to OFF. Note removing the power cable or switching OFF the Mains power does not disable ePrep ONE as the Back Up Battery will still be active.

Power Supply

Note : the ePrep ONE uses a separate 24V DC 221W, 9.2A DC power pack power supply. Input 100V to 240V AC input.

The Country Specific Mains Power cable is not supplied with the ePrep ONE. Use a standard Country Specific IEC C13 cable.



Note : Ensure the Emergency Stop (eStop) button on the front right side corner is deactivated by turning the button clockwise.

Syringes and Tools

ePrep ONE syringes and tools are fitted with Radio Frequency Identification (RFID) tags. The code programmed onto each RFID tag is specific to the syringe and is used to positively identify that the correct syringe has been used in a workflow. The capability also tracks and records which syringe has been used for specific sample and the history of the syringe.

Only syringes specifically designed for the ePrep ONE may be used on the system with a correctly programmed RFID tag.

For the ePrep ONE to correctly pick up a syringe/tool from the tool rack, the device must be correctly positioned.

- The plunger must be fully down with the Tool retainer Clip sprung fully forward and covering the fully depressed syringe/tool plunger.3shown in the diagram (Fig XX) and pushed all the way back onto the holder. A magnet in the tag holds the syringe back in the correct position.
- The syringe needle cannot be significantly bent, and it must be located within the Vee in the needle holder. There is also a magnet in the holder to hold the needle in position once it has been located correctly by the operator or the ePrep ONE when it returns a syringe/tool to the rack

Adaptor Plates, Vial Racks and Vials



CAUTION

The ePrep ONE is not quite clairvoyant in knowing the exact location of vials that it must extract and deposit samples. The position of the vials must be precisely defined in the software. The ePrep ONE software has been designed to make it as simple as possible for the operator to accurately define the location of vials in the workflow on the deck. It has also been defined to identify errors in placement of resources on the deck of the ePrep ONE. This is made possible by identifying all racks used on the ePrep ONE with an RFID tag specific to the rack. From the RFID tag on the vial rack or Rack Adapter Plate, the ePrep ONE will identify that a defined rack is present on the deck, even if it is in an incorrect location as defined by the operator. It will also sense and identify if there are vials present or not present and will not try and aspirate from or dispense into locations where a vial is not present.

For this level of simplicity and error proofing of ePrep ONE operation it is essential that a few basic guidelines are followed:

1. A correctly programmed RFID tag must be attached to either the Rack or the Adapter Plate
2. If the RFID tag is fixed to the Adapter Plate, the user needs to ensure that the Vial Rack used matches the defined Adapter Plate.
3. Do not be tempted to use a vial rack with an adapter plate that appears to be right size. Check before use.
4. Before starting a workflow, the ePrep ONE software prompts the operator to check that the graphic on the Controlling Computer screen matches the racks and tools that are on the ePrep ONE deck. Be in the habit of always doing this.

The consequences of incorrect definition of racks and vial positions are:

1. Incorrect processing of samples and loss of precious samples
2. Damage to the syringe needle and septa piercer
3. Termination of the workflow due to the head impacting into some element on the ePrep ONE deck (The sensor (bumper) in the foot of the P-Drive of the ePrep ONE is used for a multitude of functions in the operation of the ePrep ONE and will detect collisions with incorrectly positioned items)



The task of defining vial positions accurately is made easy for the operator by using vial racks whose coordinates have been mapped by ePrep ONE and are included in the parameters supplied by ePrep ONE. It needs to be ensured by the user that the correct vial rack has been used and it is being used with the correct Vial Rack Adapter plate for that specific vial rack.

If there is a vial and rack combination that is required to be used and it is not currently available in the ePrep ONE software, please contact ePrep at www.eprep-analytical.com to determine if a new rack can be defined in the software with a suitable adapter plate.

To make the task easier, either the Vial Rack Adapter plate or the vial rack itself are fitted with a specific RFID tag. The ePrep ONE reads the RFID tag at the beginning of a process to confirm the correct vials and racks are in the position specified by the user. If the scan detects that a rack is in an incorrect position or is not present the process will be stopped until the user corrects the error.

As the ePrep ONE processes a series of vials in a particular rack, it will sense if there is a vial missing from where it was defined to be. The software default is to continue onto the next vial in the series and leave the output vial associated with the missing vial and move onto the next process in the workflow.

Software Updates

In the interests of continual improvement, ePrep ONE will be regularly making available free software upgrades. These upgrades will add additional capabilities to ePrep ONE as well as rectifying identified deficiencies in the software. By registering with ePrep ONE notification will be provided on available software updates.

After ensuring the Computer has access to the internet click on Home - Service - Software Updates.

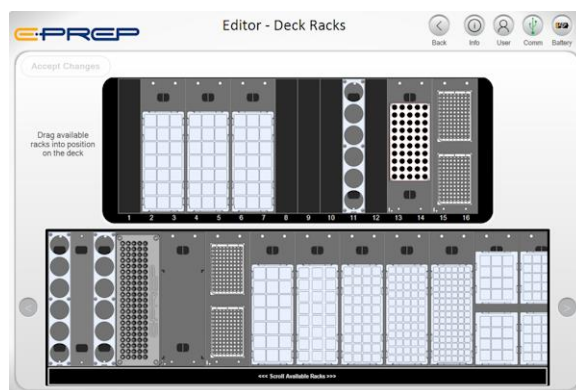
The software will provide guidance through the updates available and how to download and install them.

Checking for updates can either be done through the computer or through:

www.eprep-analytical.com

Options and Accessories

Check at www.eprep-analytical.com for the latest listing of options and accessories



5. Site Requirements, Installation and Commissioning

Please refer to the Installation and Quick Start Guide Pub No. 98-60005. ePrep ONE Computer software for full instructions on Installation and Commissioning of the ePrep ONE.

Syringes

Syringe Selection

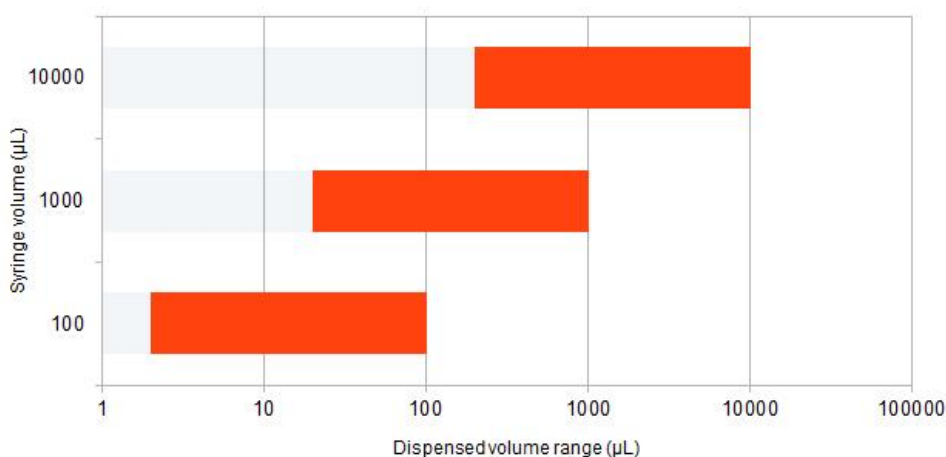
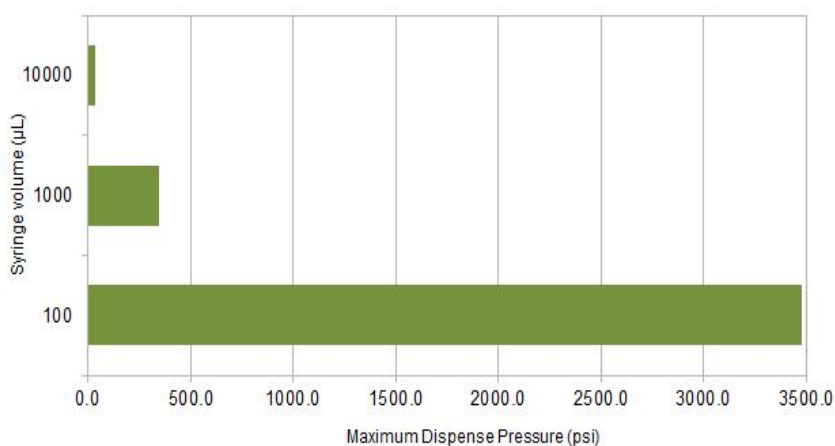
Available ePrep standard syringe volumes: 10 μ L , 100 μ L, 1mL, 10mL

Available ePrep μ SPEed syringe volumes: 500 μ L, 1mL

www.eprep.com.au for ordering information.

The graphs below provide a guideline for selection of 100 μ L, 1mL, 10mL syringe relative to the target dispensed volume. The red bar indicates recommended working range of a syringe volume. Typically, the dispensed volume greater than 10% of the full syringe volume.

Dispensed Volume Range Selection for ePrep Syringes



Precision and Accuracy:

A high level of precision and accuracy can be expected when the correct syringe is used with ePrep ONE. The plunger drive motor has over 1000 steps per syringe volume. The drive is also capable of very accurate plunger position and speed during dispensing.

Carry-over

Sample carryover must be carefully considered in a Workflow. ePrep ONE has set default automated wash

settings into Workflow Tasks. However, the wash settings for different compound classes, that vary in viscosity and stickiness for example, may require changes to these wash settings.

Priming the Syringe

Priming of the syringe can influence both the carryover and precision but over priming will waste reagent and increase the time to complete a workflow. ePrep ONE has set default automated priming into Workflow Tasks. However, for sticky or low viscosity liquids, priming parameters may need to be changed to ensure air bubbles don't form in the syringe barrel.

Default Syringe Parameters

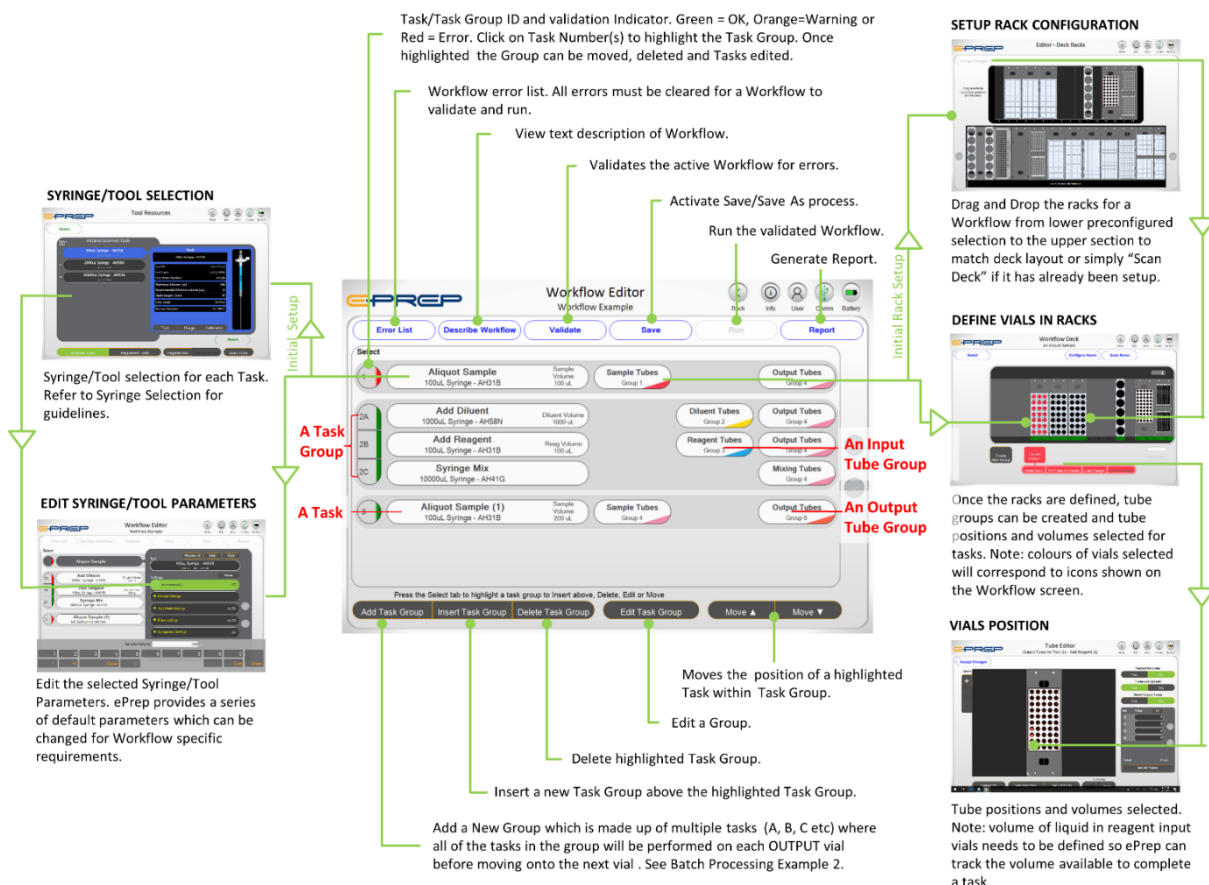
Please request information if required.

6. ePrep AXIS Software

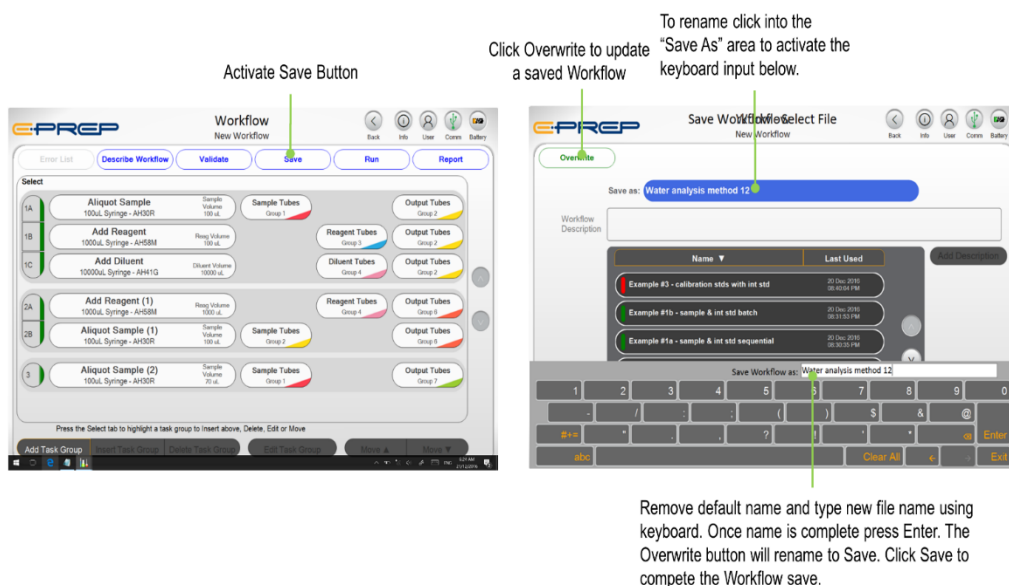
Introduction

ePrep Axis Software is designed to quickly create, save and run laboratory sample preparation workflows. You can view an introductory video of the Axis software [here](#).

Workflow Editor Screens



Saving a Workflow



Elements of a Workflow

A Workflow consists of four elements; 1) The Task Function 2) Syringe or Tool to perform the function 3) Input Vial/Tubes and 4) Output Vial/Tube. Selection of these parameters is shown below.

				
Add Tasks	Syringe/Tool	Syringe/Tool Parameters	Racks & Accessories	Vials
<u>SELECT TASKS</u> Liquid Handling Add Diluent Add Internal Standard Aliquot Sample Add Reagent Variable Dispense Batch Many to Many Make Up To Volume Serial Dispense Serial Dilution Add Surrogate Add Reagent and React Syringe Mix Filtering Filter Samples Micro SPEed µSPEed Equilibrate µSPEed Condition µSPEed Load µSPEed Wash µSPEed Elute	<u>SELECT SYRINGE/TOOLS</u> 100µL Syringe (needle) 1mL Syringe (needle) 10mL Syringe (needle) 500µL µSPEed Syringe 1,000µL µSPEed Syringe 2,500µL Guided Luer Tool (filter syringe)	<u>SELECT SYRINGE PARAMETERS</u> Volume Basic Settings Aspirate Flowrate (µL/sec), Aspirate Pause (sec), Dispense Flowrate, Dispense Pause Wash Setting Mode, Volume, Flowrates Prime Setting Type, Method, Volume, Flowrates <i>Default conditions are pre-programmed</i>	<u>Options</u> Configure Rack Type Configure Rack Position Vortex Shaker Solvent Manifold µSPEed Rack Syringe to Detector Interface	<u>Options</u> Select specific vials in a Rack and volume available in the vial

Tasks

ePrep ONE has preprogrammed Task functions to simplify programming of the instrument. Tasks have been designed to mimic common laboratory processes. Tasks are given names related to the laboratory process they replace.

You can view a quick explanation video of the liquid handling tasks [here](#).

Tools

ePrep ONE Tools include syringes and specific function tools.

Tools are predefined in the ePrep ONE software and therefore only Registered or Predefined Tools can be used with ePrep ONE. ePrep ONE uses RFID tags to identify and record a tool usage.

The User cannot create a Tool class.

Adaptor Plates, Racks and Vials

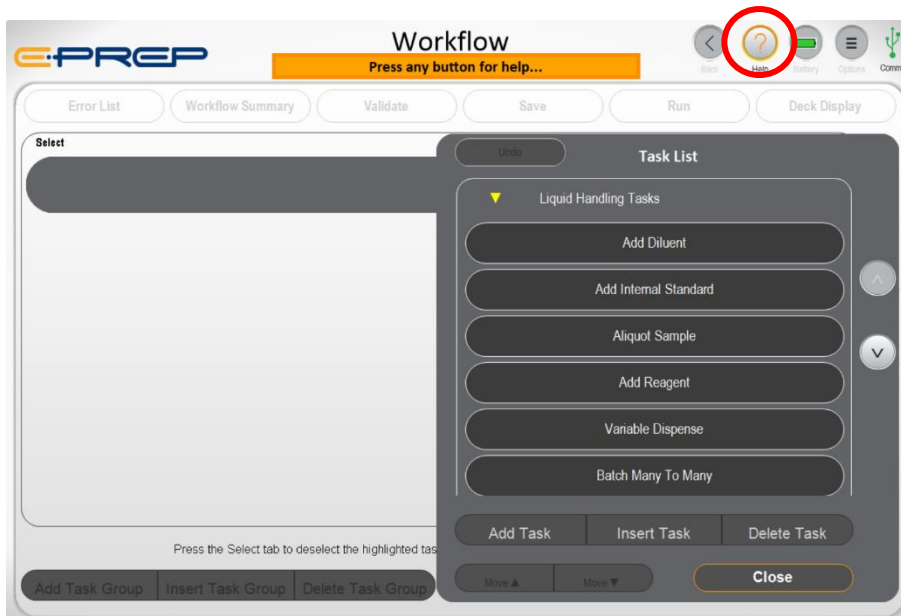
Adaptor Plates and Racks classes are predefined in the ePrep ONE software. Only Registered Adaptor Plate/Racks can be used with ePrep ONE.

Input/Output vial positions within a rack can be defined in the software.

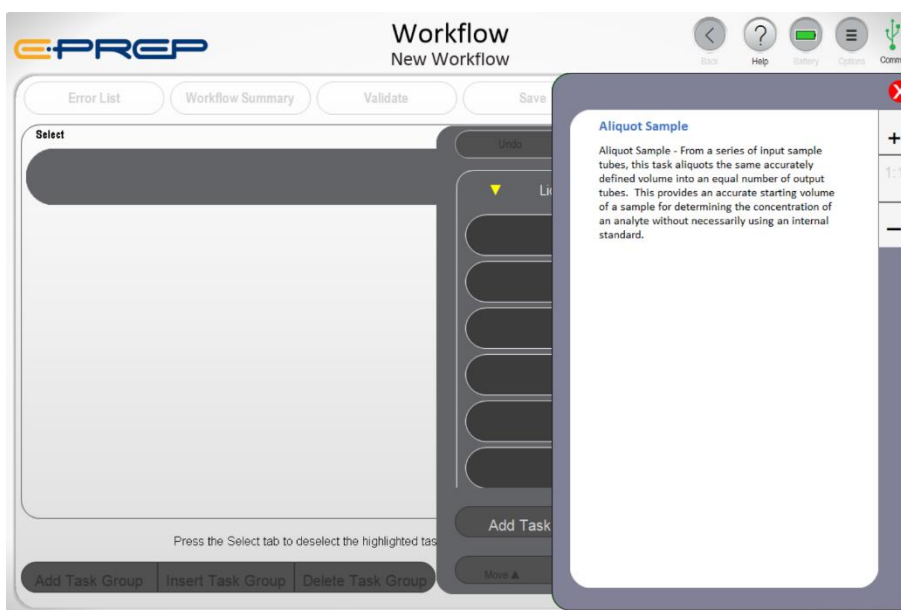
A user cannot create an Adaptor Plate/Rack class.

SOFTWARE OVERVIEW

Help button



The help button is in the top right header bar, click the button and it will blink orange.



Click another button and help will be displayed. In the example above the “Aliquot sample” button was pressed from the task selector.

Selecting the Right Task

ePrep ONE has been preprogrammed with a series of Tasks designed to mimic typical laboratory sample preparation processes. The following table provides a summary of available Tasks their function and use in a sample preparation Workflow

Software offers a list of tasks to suit an application based on the Vial Groups interaction. Each task has its own way to handle the Vials Groups, but most common are transferring Samples and adding various Reagents to the output vials.

[View this YouTube video for detailed explanation of tasks here.](#)

Image	Task name	Description
	Aliquot Sample uSPEed Load Filter Sample PD SPE Load	"1 to 1" liquid transfer
	Add Reagent Add Surrogate Add Diluent Add Internal standard uSPEed Condition/Wash PD SPE Condition/Equilibrate/Wash	"1 to Many" liquid transfer
	Serial Dispense	"1 to Incremental Many" liquid transfer
	Serial Dilute	"1 to Incremental Dilute" liquid transfer
	Batch Many to Many	"Many Vials to Many Vials" liquid transfer
	Syringe Mix Vortex Mix	Mixing liquid by means of Syringe or Vortex Mixer

More information can be found by using Help Button in the software.

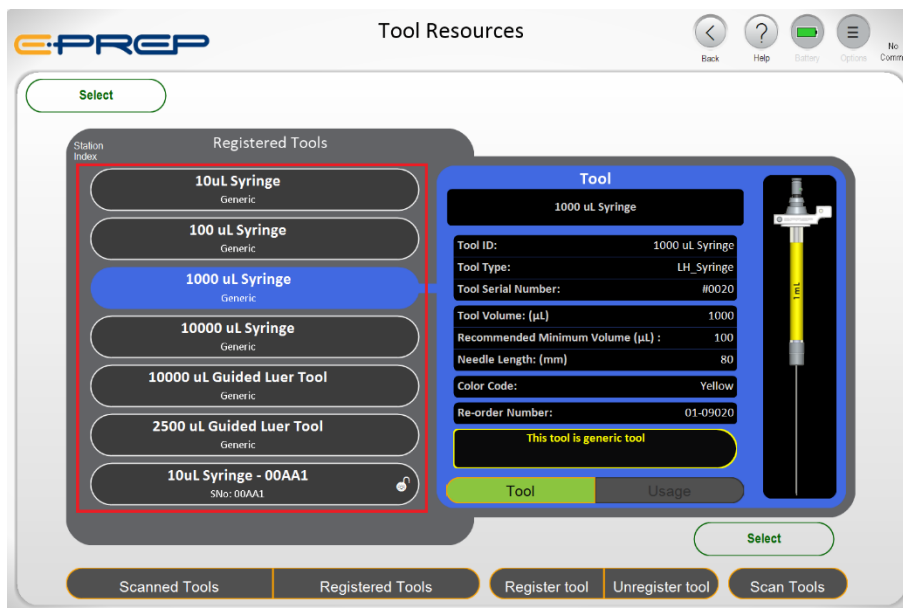
Syringe/Tool Selection

Each task shall have a dedicated tool selected based on the aimed accuracy, volumes to transfer and tools available. The system is supplied with 100uL, 1mL and 10mL Syringes and typical applications for these syringes would be:

- 10mL Adding Diluent and Reagents
- 1mL Medium Volume Sample and Standard Transfer
- 100uL Small Volume Sample and Standards Transfer

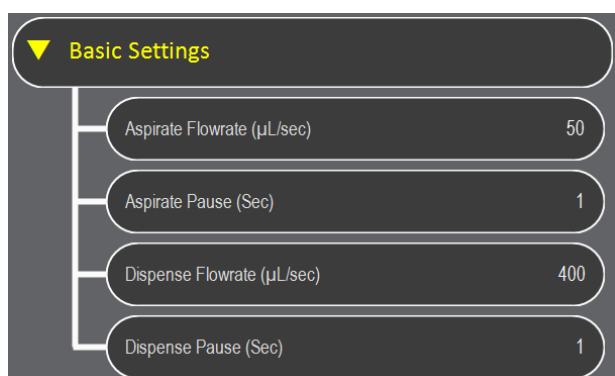
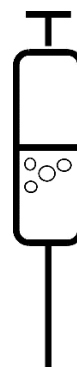
Optional Accessories

- Probe Dispenser Adding Diluent and Reagents in Large Volumes
- 10uL Syringe Very Small Volume Sample and Standards Transfer



Syringe Task Parameters

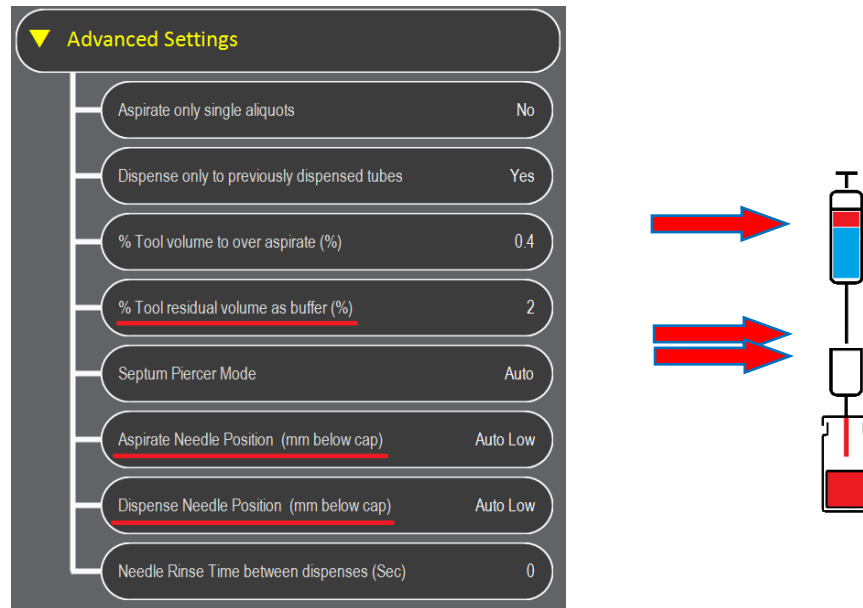
Apart from the Volume to transfer, some Basic Settings can be adjusted to achieve steady liquid aspiration based on the liquid consistency and viscosity.



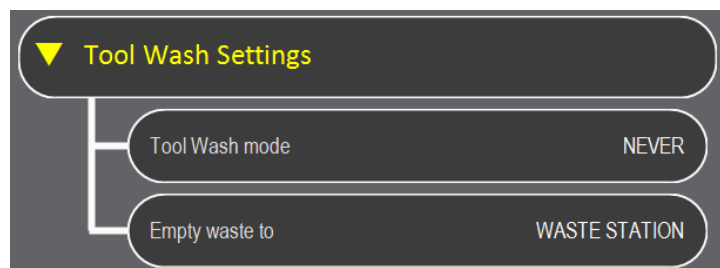
There are Advanced Settings available which offer more options to tune the parameters.

The most important one from this list would be:

- Tool residual volume as buffer
- Aspirate/Dispense Needle position



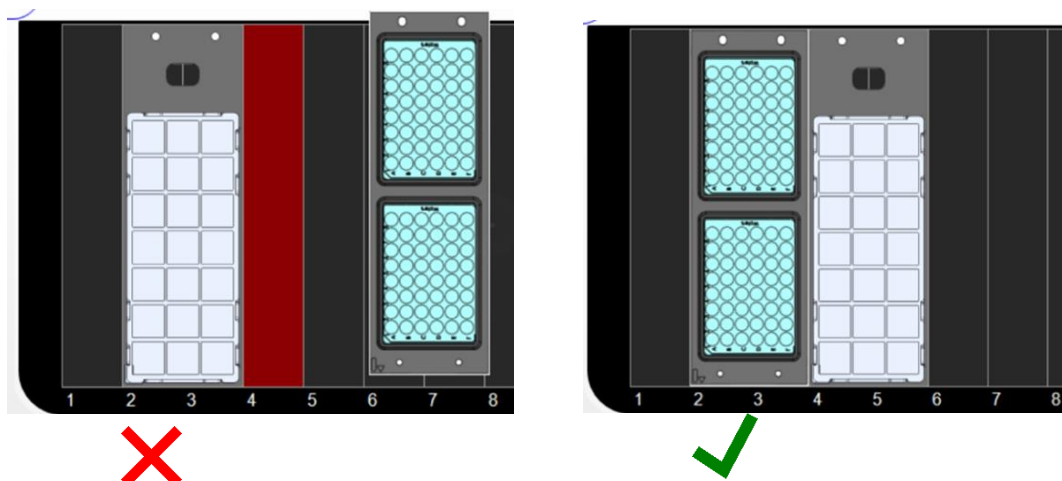
Any tool residual volume will be discarded to a Waste Group assigned in the Tool Wash Settings. In case of the Tool Wash settings set to “NEVER”, such a group still needs to be nominated.



CONFIGURING THE DECK

Deck Setup Considerations

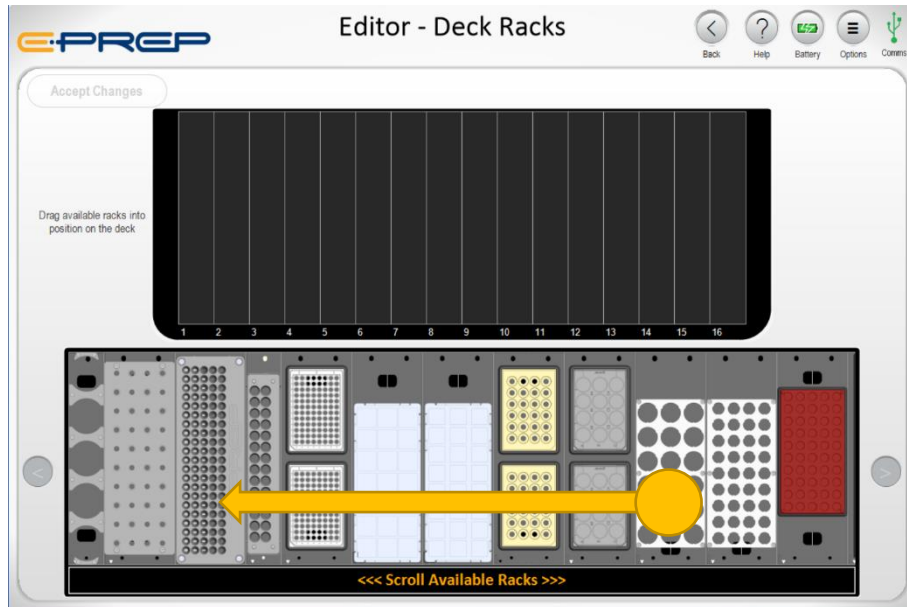
Configure the deck based on the user Racks. Some of the racks might have positioning restrictions based on their geometry and location on the deck.



Scrolling the rack selection window

To scroll the rack selection window:

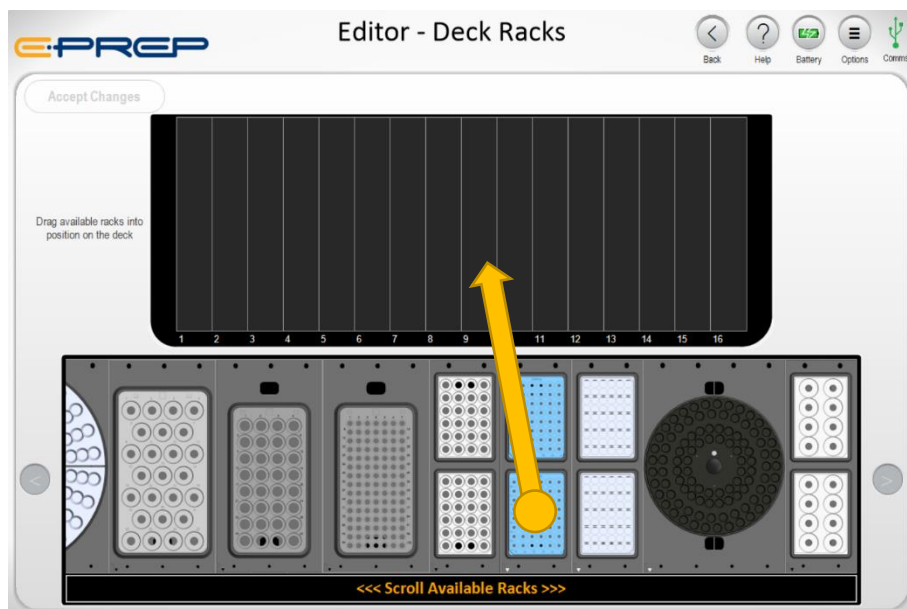
- Click and hold the mouse button on the right side of the window (Yellow circle)
- Drag the window to the left (yellow arrow)

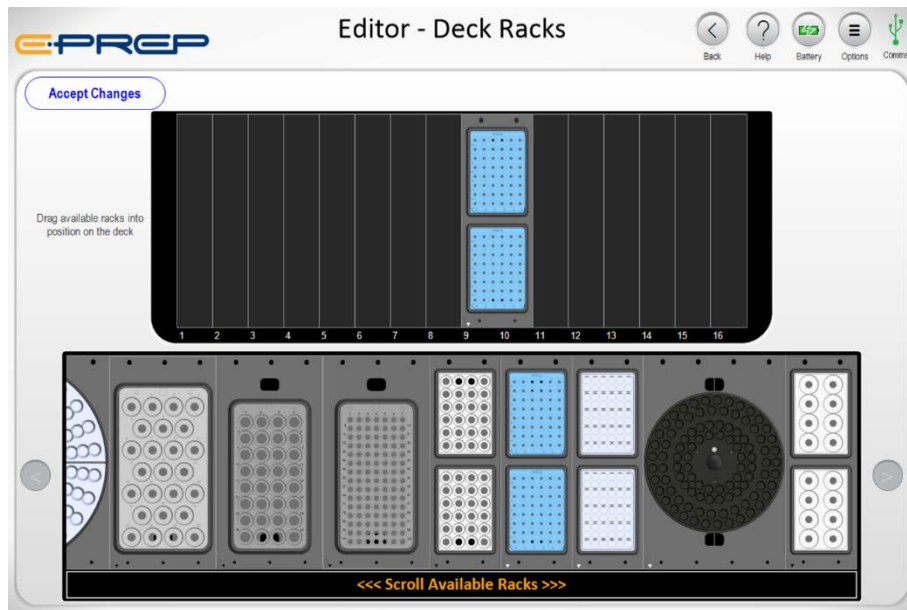


Selecting a Rack

To add the rack to the deck display:

- Click on the rack you wish to use (Yellow circle)
- Drag the rack into the desired location on the deck (Yellow arrow)

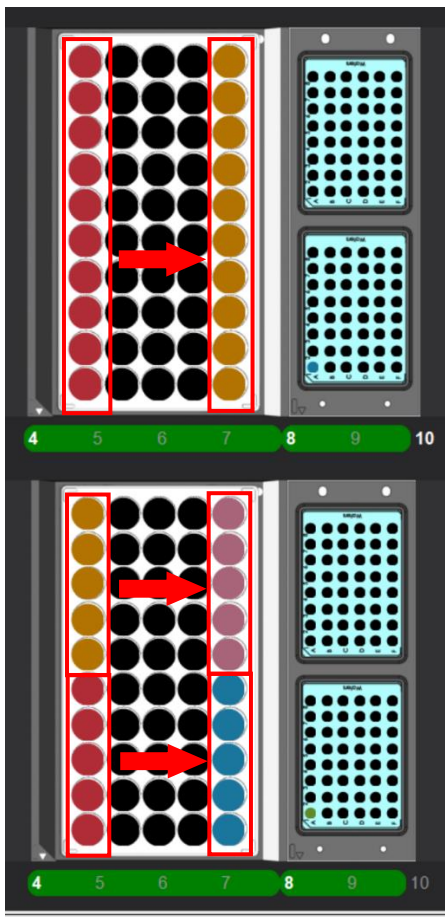
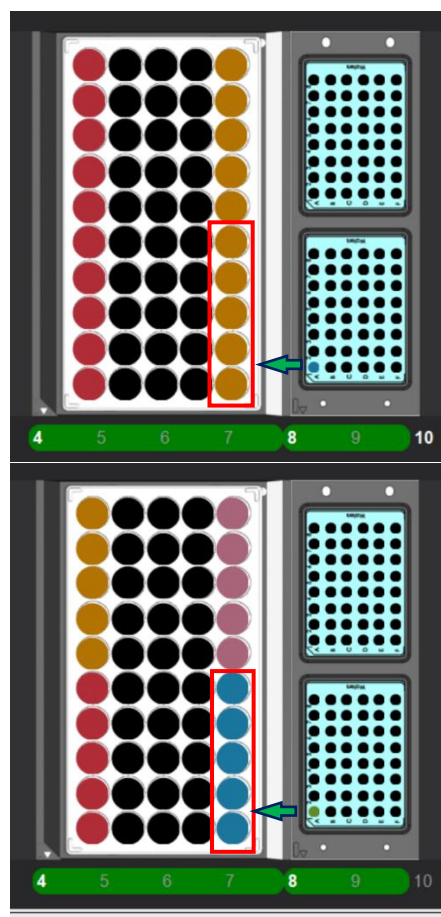




CONFIGURING WORKFLOWS

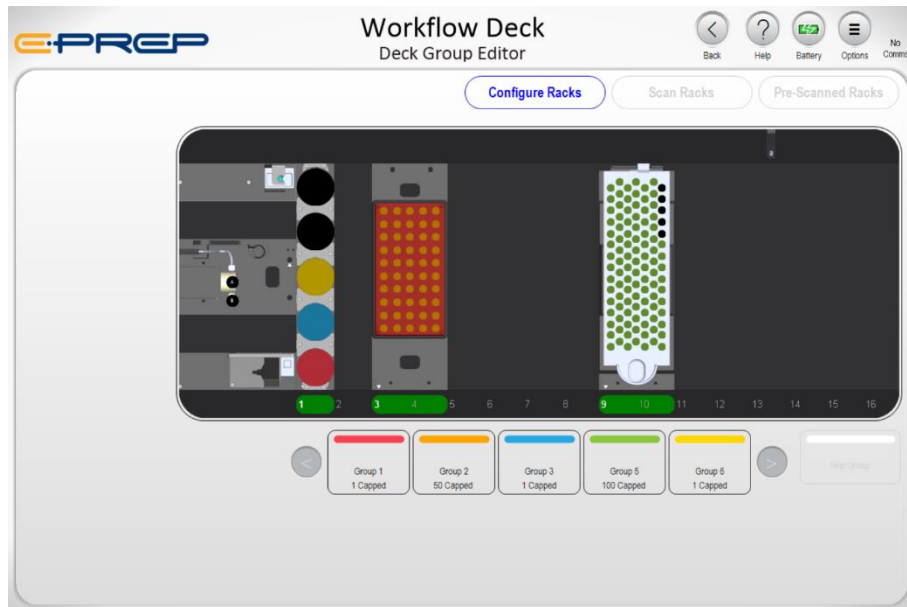
Creating Vial Group Considerations

Liquid transfer is based on Groups interactions. Once a group is defined, it remains the same throughout a workflow and can't be changed in the middle of the run. I typical example would be, if it is required to add an IS to only half of the output vials, the corresponding vial group has to be split and handled separately.

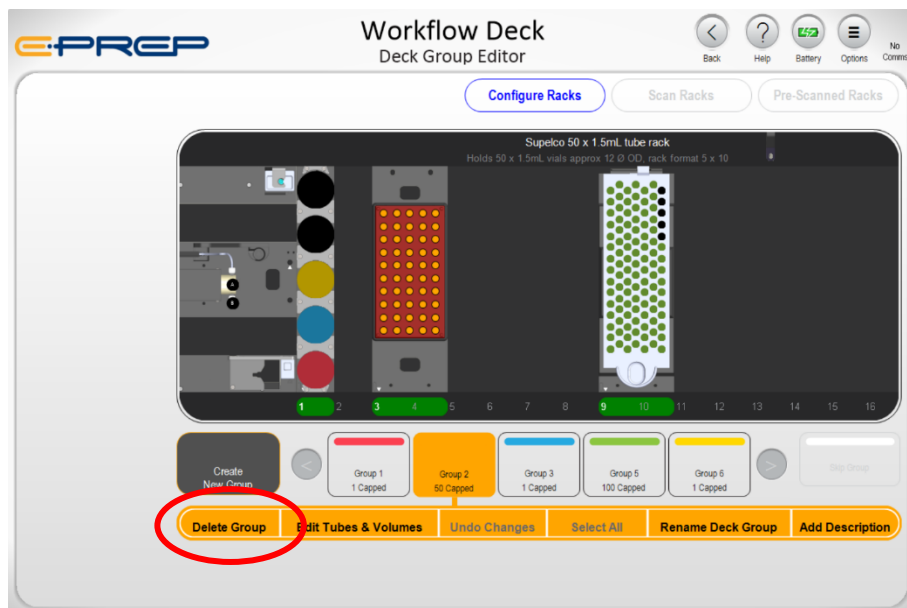


Removing racks from the deck

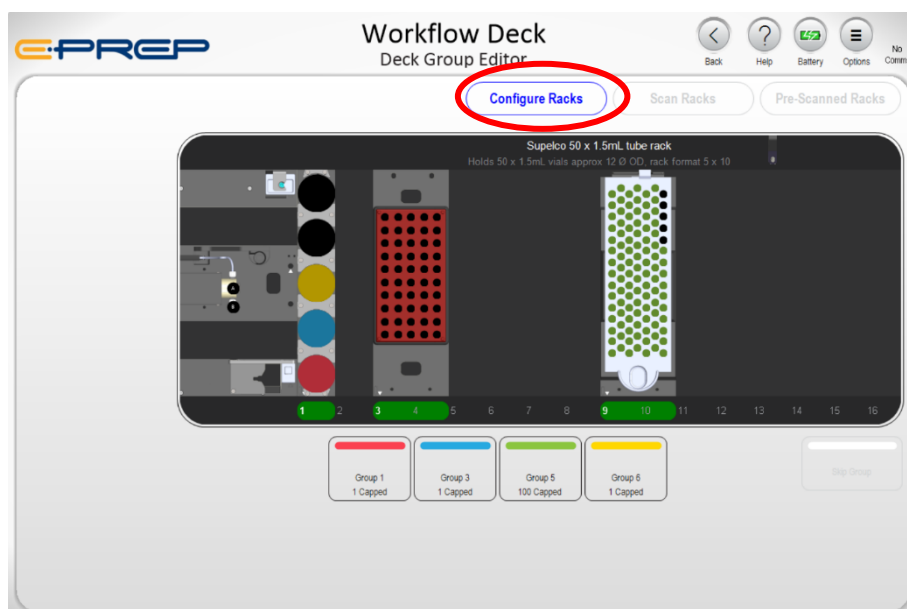
Before racks can be removed from the deck any groups contained inside the rack must be deleted, see example below where we want to remove the red Supelco rack and replace it with the blue Waters rack.



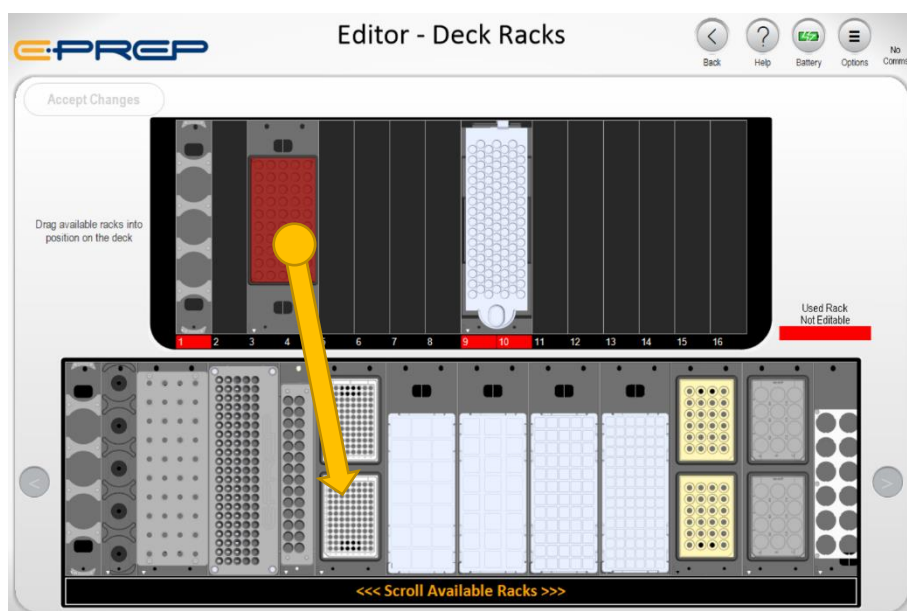
Supelco 5x10 rack (red) contains group 2 (orange)



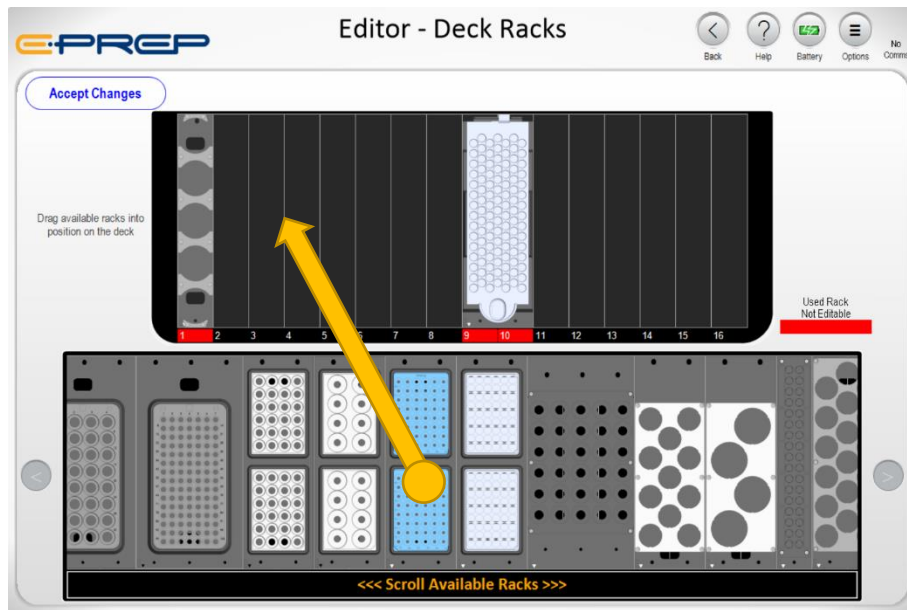
Select group 2 and the pop up ribbon shows below the deck configuration image. Select “Delete group” and then confirm you want to delete the group, the group will be deleted.



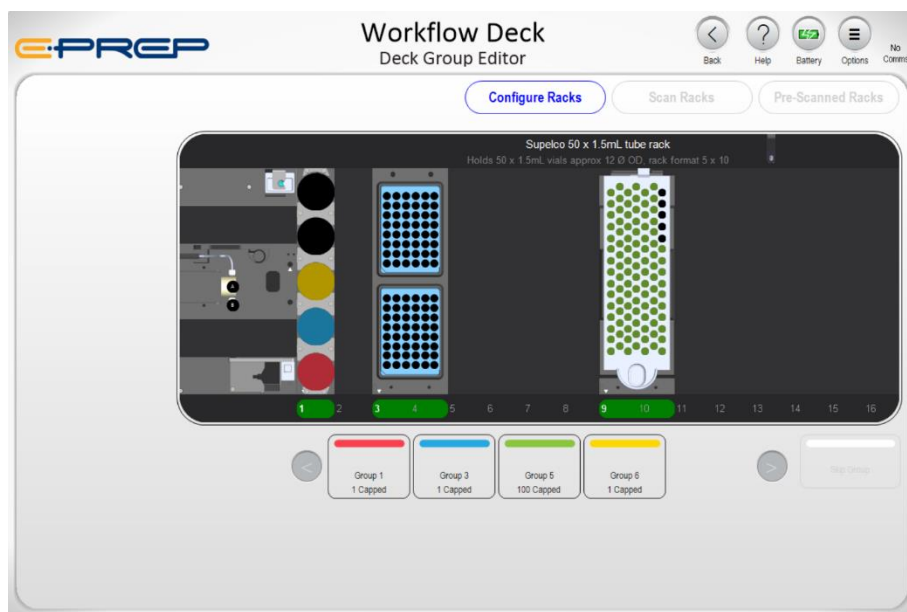
The group will be deleted. Select “Configure Racks”, this will take you to the deck editor.



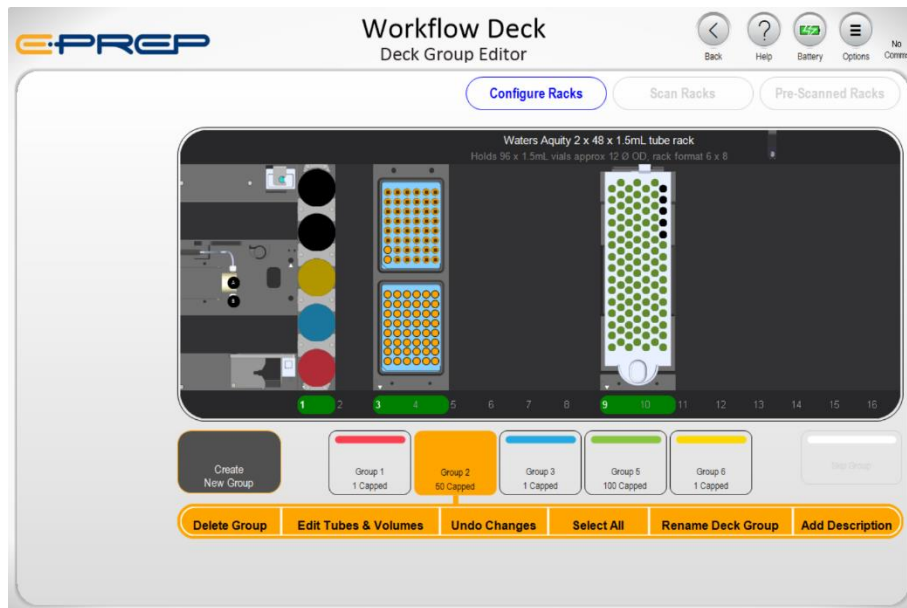
The Supelco rack now shows as removable as there is no red bar below the rack image. Click and drag the rack off the deck.



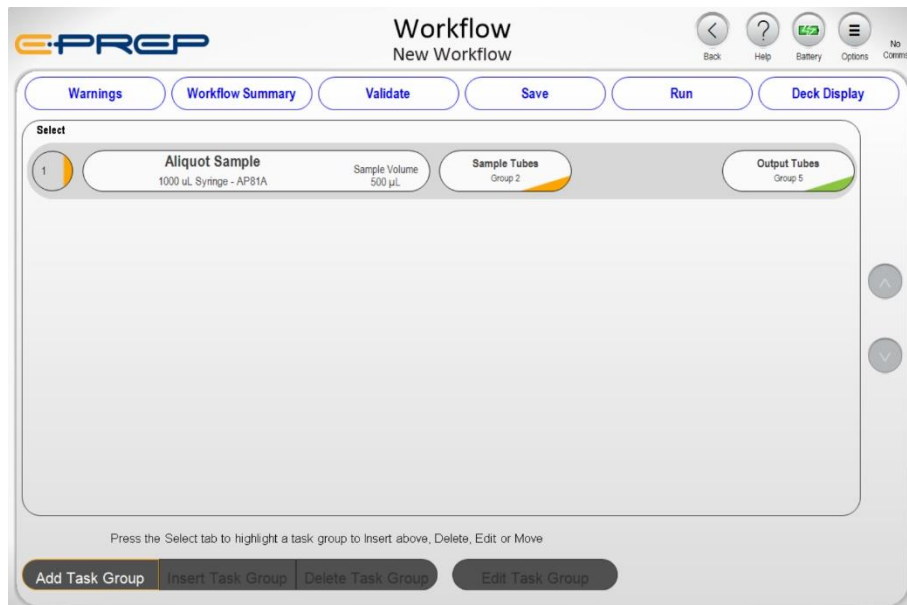
Select the Waters Aquity (blue) rack and place it on the deck as explainer earlier. Once it is placed click “Accept changes”



The rack will be placed on the deck with no groups assigned. You will need to recreate the groups you had configured earlier.



Adjust the group size to match your workflow and then assign the group to the tasks in the workflow editor.



Planning a Workflow – Stepped (Sequential) vs Grouped (Batch) Processing

It is important to understand the difference between Sequential (Serial) and Batch elements of a workflow.

Stepped (Sequential) processing is when all Tasks are completed on the first sample before the workflow continues to the second sample. This could be quite convenient if the sample analysis is urgent because the first vial is completed before sample preparation begins on the second vial. The first vial, once finished, could be removed from the rack and taken directly to the chromatograph for analysis.

Grouped (Batch) processing is where the same Task is performed on all samples before proceeding onto the next task. Batch processing is the fastest way to process a group of samples as it reduces the need for tool change and washing steps between samples. For example,

Sequential processing is normally slower than batch processing as it typically requires tool changing and syringe washing between Tasks. However, for some applications Sequential processing may be required due to kinetics or post sample processing requiring completion of one sample before proceeding to the next.

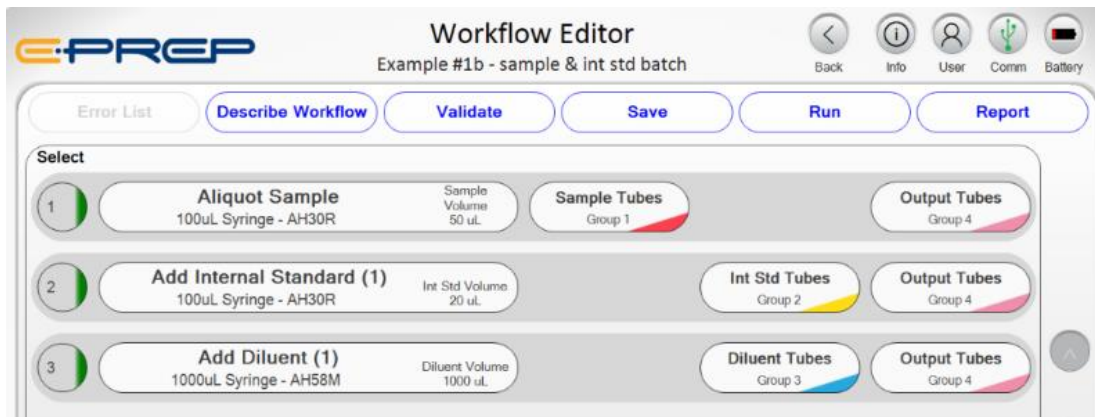
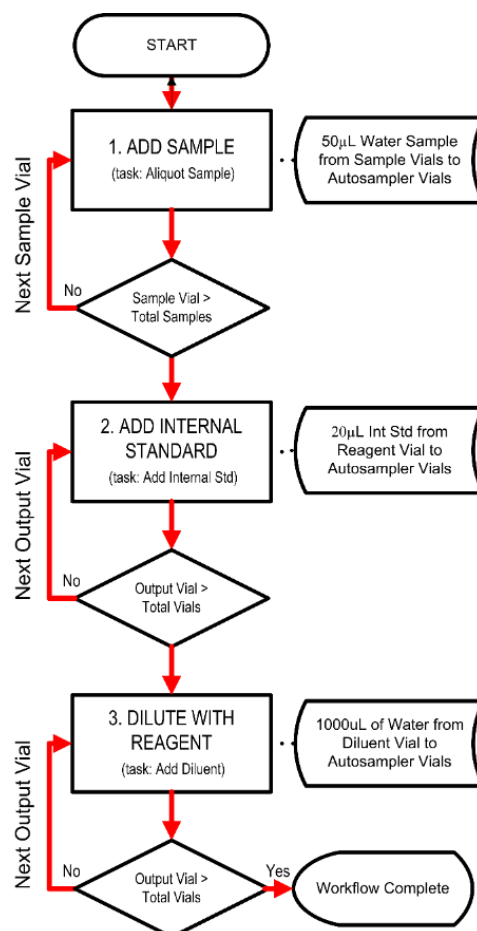
A Workflow may include both Sequential and Batch Tasks.

Sequential and Batch task are identified within a Workflow by grouping Task. A series of grouped Task will be done sequentially.

Grouped (Batch) Workflow

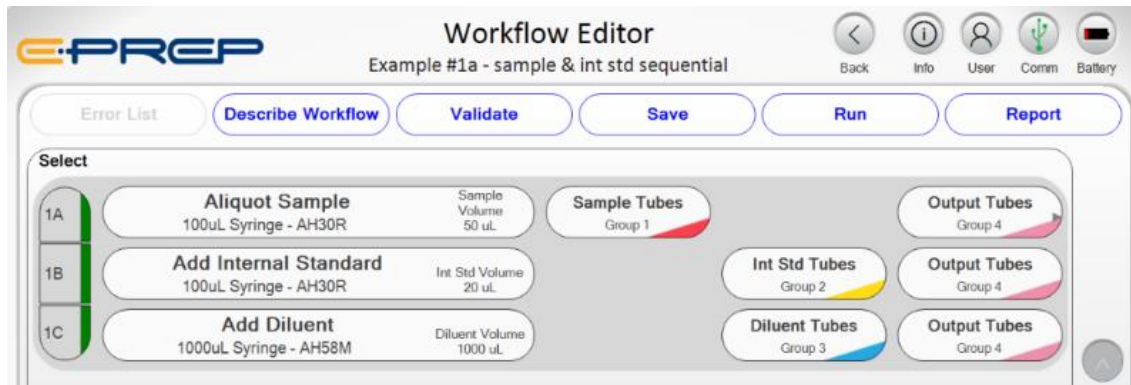
Batch processing is where the same Task is performed on all samples before proceeding onto the next task. Batch processing is the fastest way to process a group of samples as it reduces the need for tool change and washing steps between samples. For example,

Batch Workflows have Task Groups designated by 1-3 and separated by a line. All Samples from Task 1 will be processed before continuing to the Task 2.

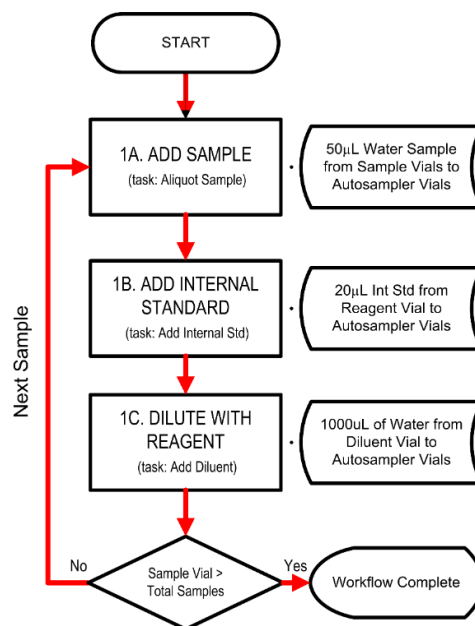


Stepped (Sequential)

Sequential processing is when all Tasks are completed on the first sample before the workflow continues to the second sample. Sequential processing is normally slower than batch processing as it typically requires tool changing and syringe washing between Tasks. However, for some applications Sequential processing may be required due to kinetics or post sample processing requiring completion of one sample before proceeding to the next.



Sequential Workflows have Tasks in one Group designated by 1A-C and has no line separation. System will process Tasks 1A-C on first sample and then will start the "loop" again for the next sample.



General workflow validation

As you work through the process of creating a workflow you will notice the traffic light system showing the validation status of each task number, all red in the image below as lots of information is still required.

E-PREP Workflow New Workflow

Back Help Battery Options No Comm

Errors Workflow Summary Validate Save Run Deck Display

Select

Task Number	Task Name	Compatible Tool	Select Diluent Sources	Select Int Std Sources	Select Sample Tubes	Select Output Tubes
1	Add Diluent	Compatible Tool not selected	Select Diluent Sources	Select Int Std Sources	Select Sample Tubes	Select Output Tubes
2	Add Internal Standard	Compatible Tool not selected	Select Int Std Sources	Select Output Tubes		
3	Aliquot Sample	Compatible Tool not selected	Select Sample Tubes		Select Output Tubes	
4	Make Up To Volume	Compatible Tool not selected	Select Source Tubes	Select Output Tubes		

Press the Select tab to highlight a task group to Insert above, Delete, Edit or Move

Add Task Group Insert Task Group Delete Task Group Edit Task Group

If you click on “Errors” in the header bar you will see a listing of all errors contained in each task. Use this as a guide to the minimum information that is still needed to complete the workflow ready for a run.

E-PREP Workflow Faults and Warnings

Back Help Battery Options No Comm

Errors Warnings Information

1. Add Diluent

- The Diluent Sources are not selected for this task.
- The Output Tubes are not selected for this task.
- LH_Syringe tool not selected.

2. Add Internal Standard

- The Int Std Sources are not selected for this task.
- The Output Tubes are not selected for this task.
- LH_Syringe tool not selected.

3. Aliquot Sample

- The Sample Tubes are not selected for this task.
- The Output Tubes are not selected for this task.
- LH_Syringe tool not selected.

4. Make Up To Volume

- The Source Tubes are not selected for this task.
- The Output Tubes are not selected for this task.

As you fill the required information you will notice the status indicator changes colour from red (error) to either green (complete) or yellow (warning).

E-PRÉP Workflow New Workflow

Back Help Battery Options No Comms

Errors Workflow Summary Validate Save Run Deck Display

Select

1 Add Diluent 10000 uL Syringe Diluent Volume 500 uL Diluent Sources Group 1 Output Tubes Group 2

2 Add Internal Standard Compatible Tool not selected Select Int Std Sources Output Tubes Group 2

3 Aliquot Sample Compatible Tool not selected Select Sample Tubes Select Output Tubes

4 Make Up To Volume Compatible Tool not selected Select Source Tubes Output Tubes Group 2

Press the Select tab to highlight a task group to Insert above, Delete, Edit or Move

Add Task Group Insert Task Group Delete Task Group Edit Task Group Move Move

Once all minimum information has been entered the general workflow validation starts checking more in-depth information. Here you can see there are not enough output tubes, only 16 selected, we have 21 samples. Workflows cannot be run with error messages.

E-PRÉP Workflow New Workflow

Back Help Battery Options No Comms

Errors Workflow Summary Validate Save Run Deck Display

Select

1 Add Diluent 10000 uL Syringe Diluent Volume 500 uL Diluent Sources Group 1 Output Tubes Group 2

2 Add Internal Standard 1000 uL Syringe Int Standard Volume 10 uL Int Std Sources Group 3 Output Tubes Group 2

3 Aliquot Sample 1000 uL Syringe Sample Volume 200 uL Sample Tubes Group 4 Output Tubes Group 2

4 Make Up To Volume 10000 uL Syringe Make Up To 1000 uL Source Tubes Group 1 Output Tubes Group 2

Workflow F

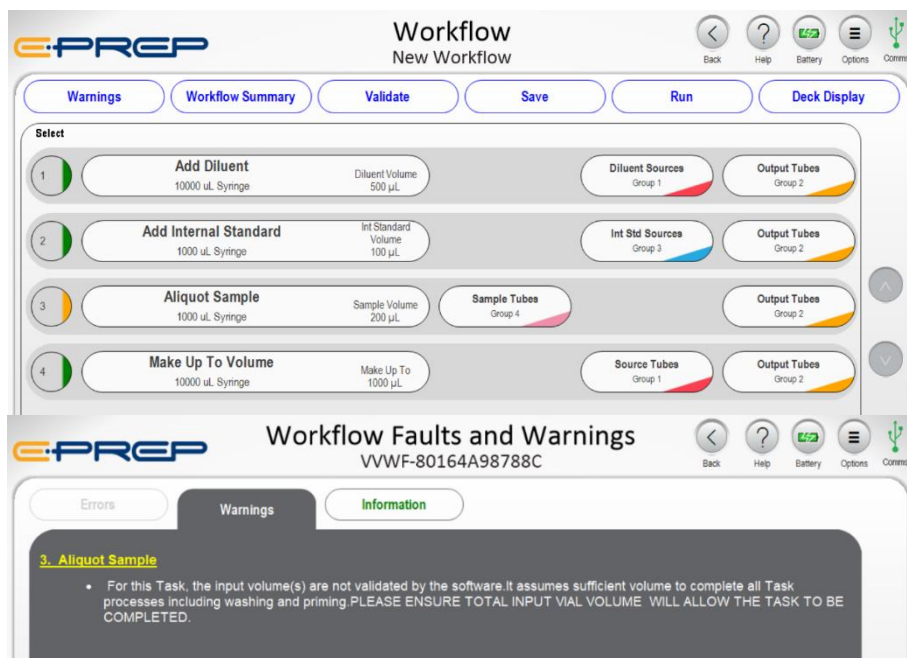
Errors Warnings Information

3. Aliquot Sample

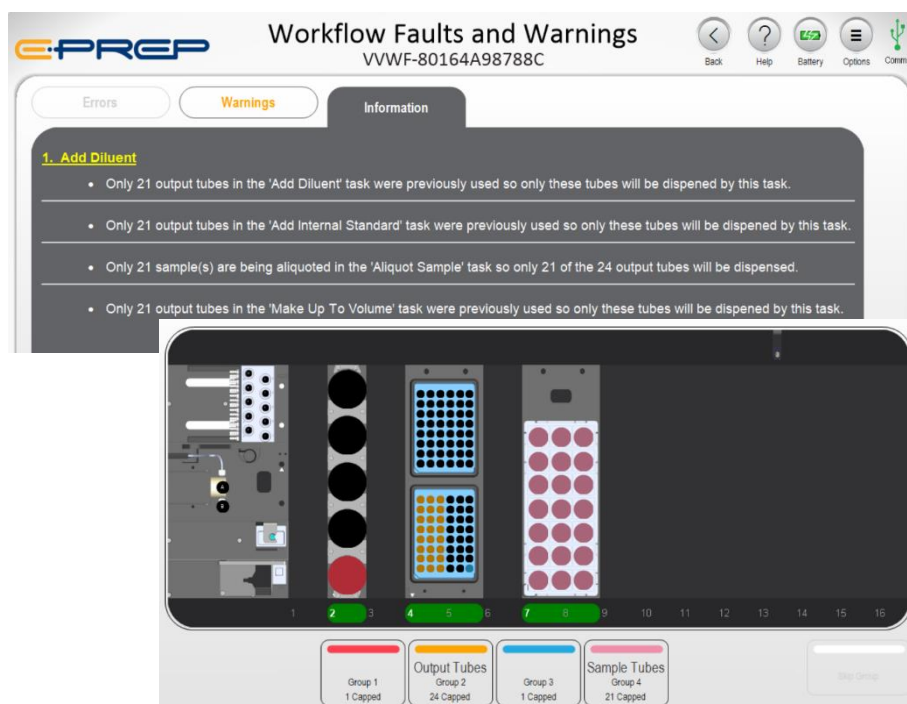
- Insufficient Output Tube(s) to complete this task

Group 1 1 Capped Output Tubes Group 2 16 Capped Group 3 1 Capped Sample Tubes Group 4 21 Capped

Once the output tube error is fixed, we now get a warning message on the aliquot sample task. Since the sample volume is normally unknown or can have large variation inside a workflow run, the software does not validate volumes of samples (aliquot sample, filter sample, SPE load or SPEd load). This warning is just to advise the user that they need to make sure there is sufficient volume to suit the workflow. Workflows can be run with Warning messages.

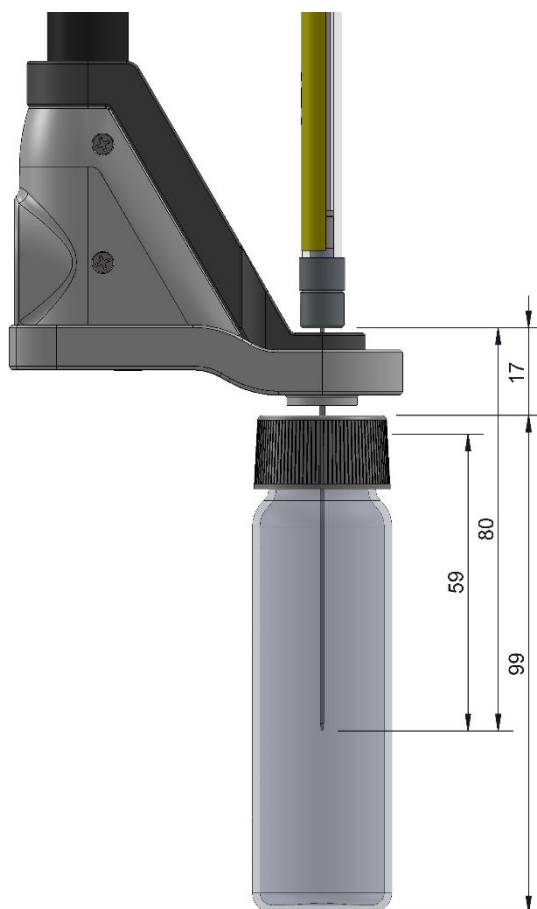


We now have 24 output tubes and 21 sample tubes, more than enough, we also get an information message to alert the user that not all output tubes will be handled



Aspirate/Dispense needle positioning

The ePrep ONE syringe needle length is 80mm, it can enter a vial approx. 60mm below the cap due to the foot and cap/septa thickness. See image below with a 40mL environmental vial.



By default, the aspirate and dispense needle positions are set to "AUTO", this will automatically calculate the maximum penetration and place the needle as close as possible to the bottom of the vial.

As shown in the hardware training, if the sample is solid the aspirate needle position may need to be changed to avoid the tip being immersed into the solid sample.

Likewise, you may need to aspirate liquid after a liquid/liquid extraction where the solvents physically separate and sit one on top of another. You may want to aspirate the liquid from the bottom, AUTO will be OK for this; or you may want to aspirate liquid from the top, in this case you will need to adjust the needle position to correspond with the liquid levels in the sample vial.

Adjusting the dispense needle position can reduce the likelihood of cross contamination or the need for washing. It is always best to try and prepare the output tubes so that the sample is the last liquid to be added but sometimes this is not possible.

When adding very small amounts of liquid it is always best to have the needle tip in liquid already contained in the output tube. This ensures the entire dispensed volume is contained in the liquid in the vial and does not end up on the underside of the septa as the needle is removed from the vial.

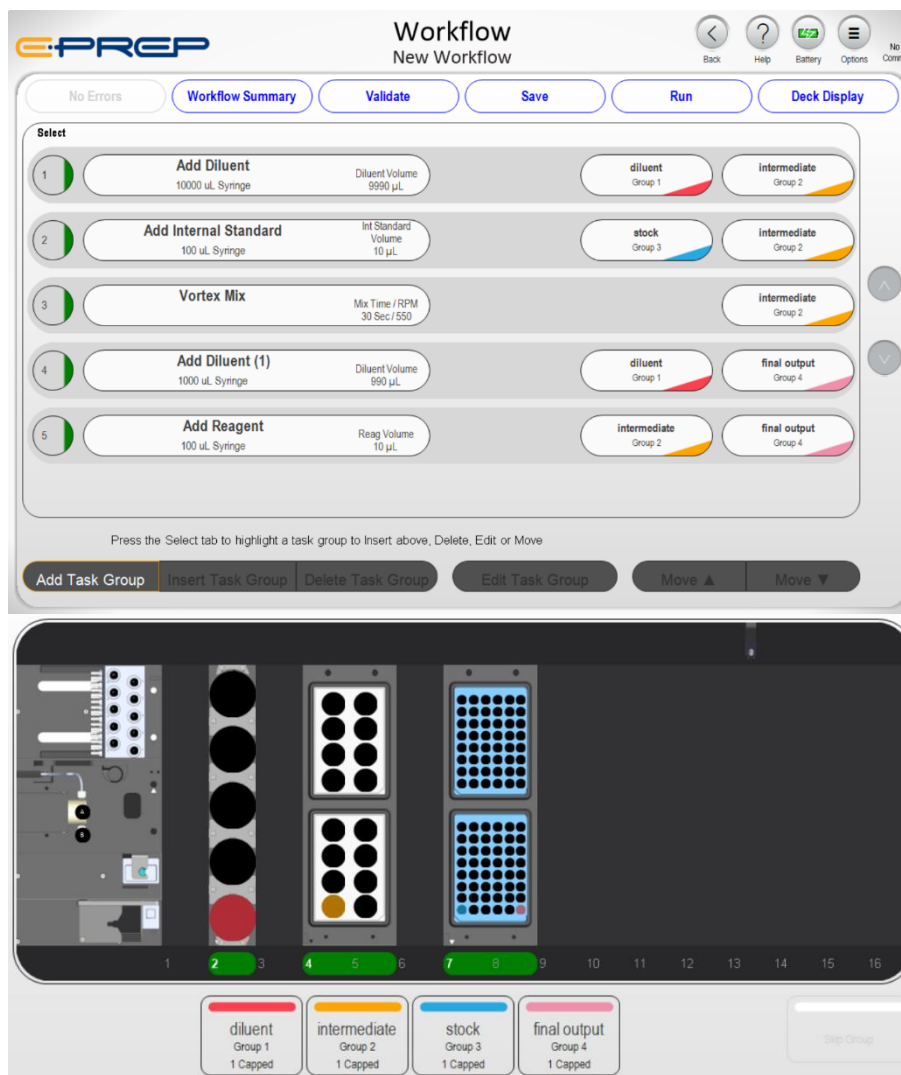
Intermediate vials

Sometimes intermediate vials will be required inside the workflow. Intermediate vials overcome the following issues:

- 1) When large dilution ratios are needed and dispense accuracy cannot be compromised
- 2) When many source liquids must be combined into one mixed standard for dispensing varying volumes to make up a standards calibration set
- 3) When sample must be pre-treated and further processed before being dispensed into the final output tube

Below are graphic representations of these scenarios

- 1) Large dilution ratio 1:100,000



2) Mixed standards set

e-PREP Workflow Editor
mixed standards set

Back Help Battery Options No Comm

No Errors Workflow Summary Validate Save Run Deck Display

Select

- 1 Add Diluent
10000 uL Syringe Diluent Volume 9990 uL
diluent Group 1 intermediate Group 2
- 2 Batch Many To Many
100 uL Syringe Batch Volume 10 uL
stocks Group 3 intermediate Group 2
- 3 Vortex Mix
Mix Time / RPM 30 Sec / 550
intermediate Group 2
- 4 Add Diluent (1)
1000 uL Syringe Diluent Volume 500 uL
diluent Group 1 final outputs Group 4
- 5 Variable Dispense
100 uL Syringe
intermediate Group 2 final outputs Group 4
- 6 Make Up To Volume
1000 uL Syringe Make Up To 1000 uL
diluent Group 1 final outputs Group 4

Press the Select tab to highlight a task group to Insert above, Delete, Edit or Move

Add Task Group Insert Task Group Delete Task Group Edit Task Group Move Move

e-PREP Workflow Editor
mixed standards set

Back Help Battery Options No Comm

No Errors Workflow Summary Validate Save Run Deck Display

Select

- 1 Add Diluent
10000 uL Syringe Diluent Volume 9990 uL
- 2 Batch Many To Many
100 uL Syringe Batch Volume 10 uL
- 3 Vortex Mix
Mix Time / RPM 30 Sec / 550
- 4 Add Diluent (1)
1000 uL Syringe Diluent Volume 500 uL
- 5 Variable Dispense
- 6 Make Up To Volume
1000 uL Syringe Make Up To 1000 uL

Tool:

Restore All Undo Erase

100 uL Syringe
Generic 100 uL Syringe

Task Name Task Notes

Settings:

Variable Dispense Volumes

- Dispense Volume [Tube 1] (uL) 10
- Dispense Volume [Tube 2] (uL) 25
- Dispense Volume [Tube 3] (uL) 50
- Dispense Volume [Tube 4] (uL) 100
- Dispense Volume [Tube 5] (uL) 200

Basic Settings

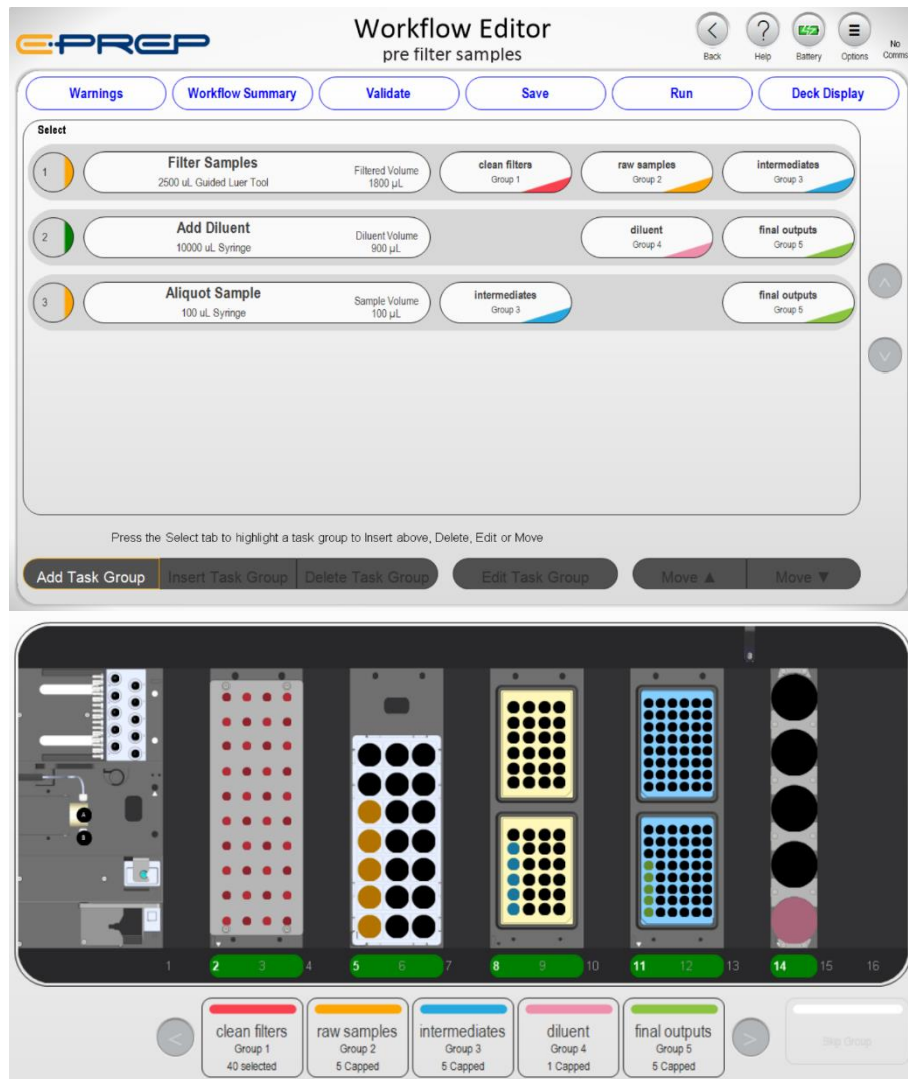
Expand All Collapse All Close

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

diluent Group 1 1 Capped intermediate Group 2 1 Capped stocks Group 3 10 Capped final outputs Group 4 5 Capped

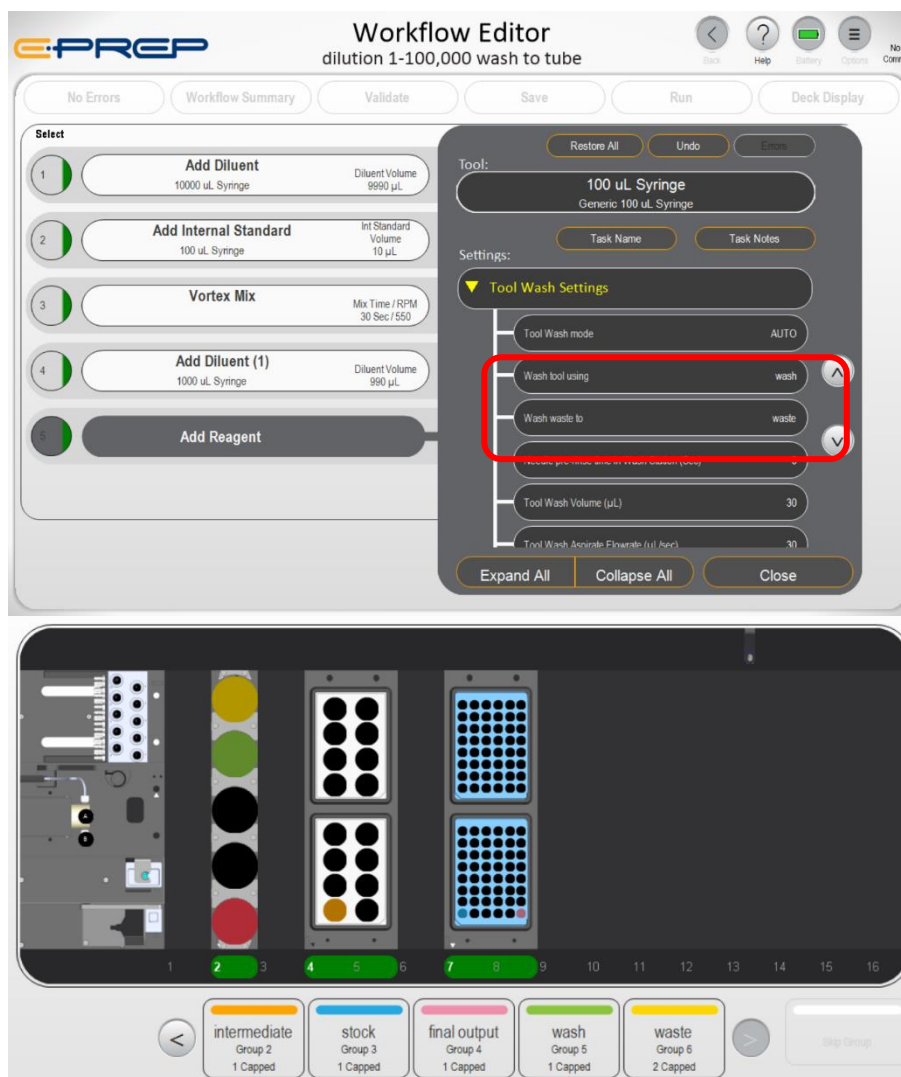
Stop Group

3) Pre-filter samples



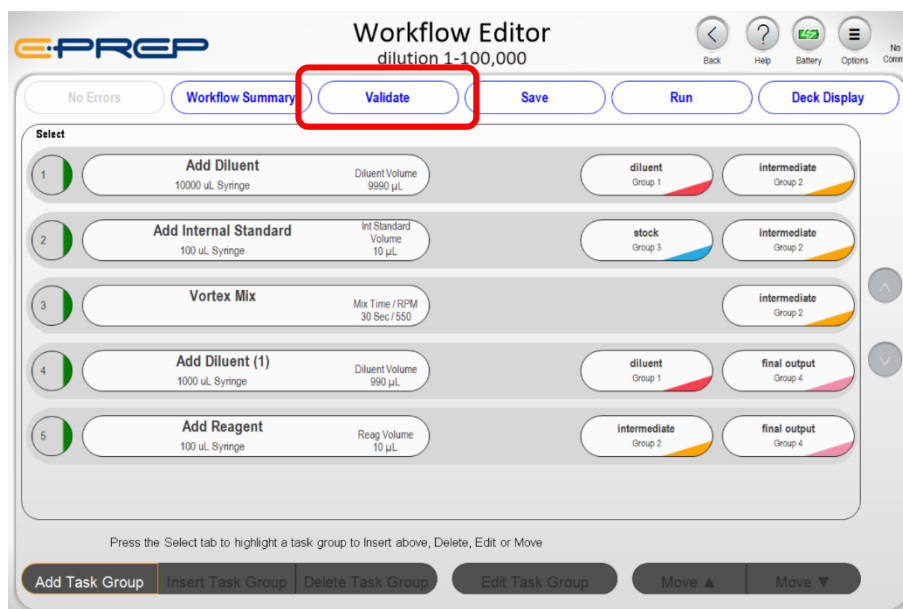
Washing from vial-to-vial

The wash station is capable of running low concentration alcohols less than 30%. If more aggressive wash solvents must be used the syringe can be washed using a source and waste container. To do this simply change the “Wash tool using” option inside the wash settings from “Wash station” to a pre-defined source group. Once this has been changed you will need to also select an appropriate “Wash waste to” group. See graphics below.

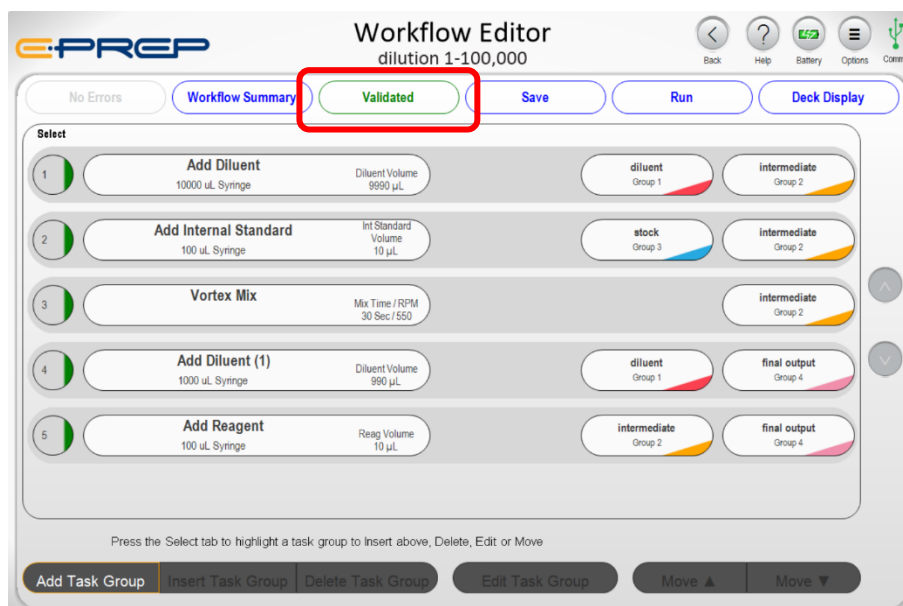


Volume Validation

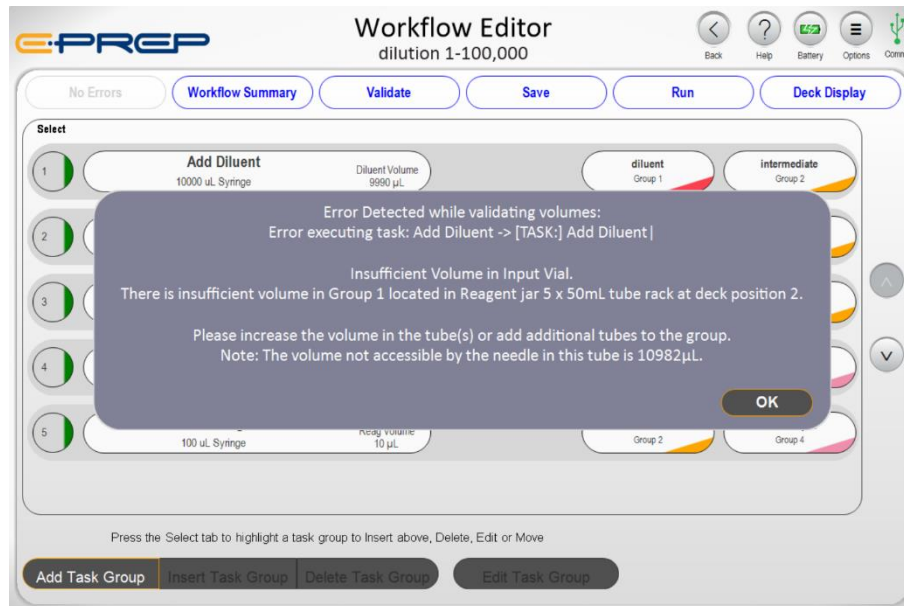
Before a workflow can be run the volume validation must be performed. This can either be performed manually during the workflow creation by clicking the “Validate” button or will automatically run just before the workflow is run from the workflow selector or from inside the workflow editor. An ePrep ONE instrument must be connected to the computer for the volume validation to run as some parameters from the instrument are used during the process.



Once the volumes validation has been run the “Validate” button will go green and the text will change to “Validated”



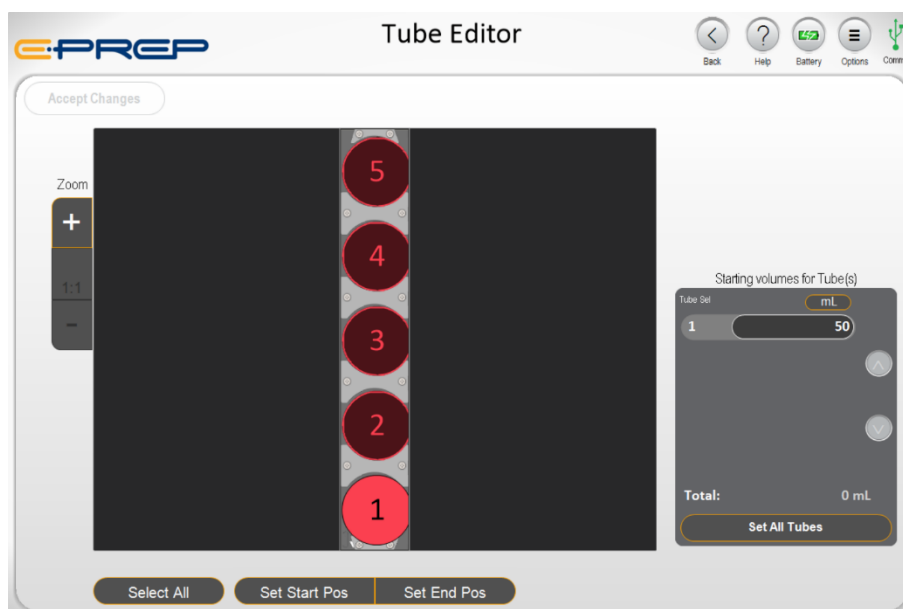
The volume validation will analyse the workflow using the settings and volumes that have been entered into the workflow and ensure sufficient source liquids and empty vial space is available. It is critical that the volumes entered into the workflow represent the physical configuration of the deck layout. If the volume validation fails a message is displayed showing which task has the error, the group that is causing the error and the tube dead volume, this volume is unreachable by the ePrep ONE system considering physical and workflow parameters.



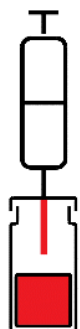
Some factors that will impact the volume validation result

- 1) The starting volume of liquid sources (reagent, diluent, internal standard, surrogate).

NOTE: Samples (aliquot sample, filter sample, PD SPE load, μ SPEd load) are not analysed during the volume validation, this is because, quite often the incoming sample volume is unknown and can have large variation within a workflow run.



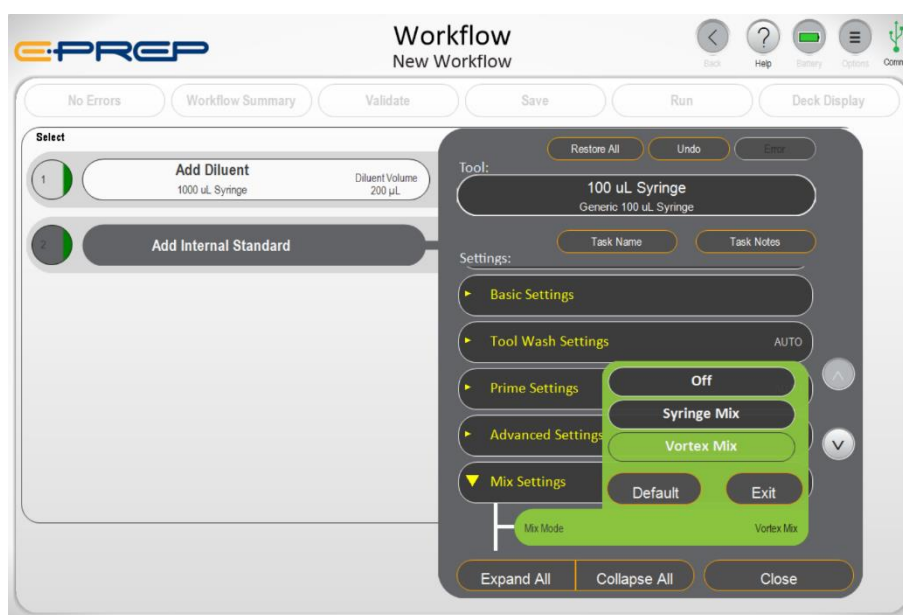
- 2) Aspirate needle position. If the aspirate needle position is set above the level of the liquid after some liquid has been removed from the vial this will throw a volume validation error at the task where the low volume is encountered. Setting a needle penetration depth higher than the maximum will have no impact as the needle penetration will automatically be limited to maximum by the software.
- 3) Insufficient source tubes in the group. The tube dead volume displayed in the error message needs to be considered when calculating the required volume for a workflow.



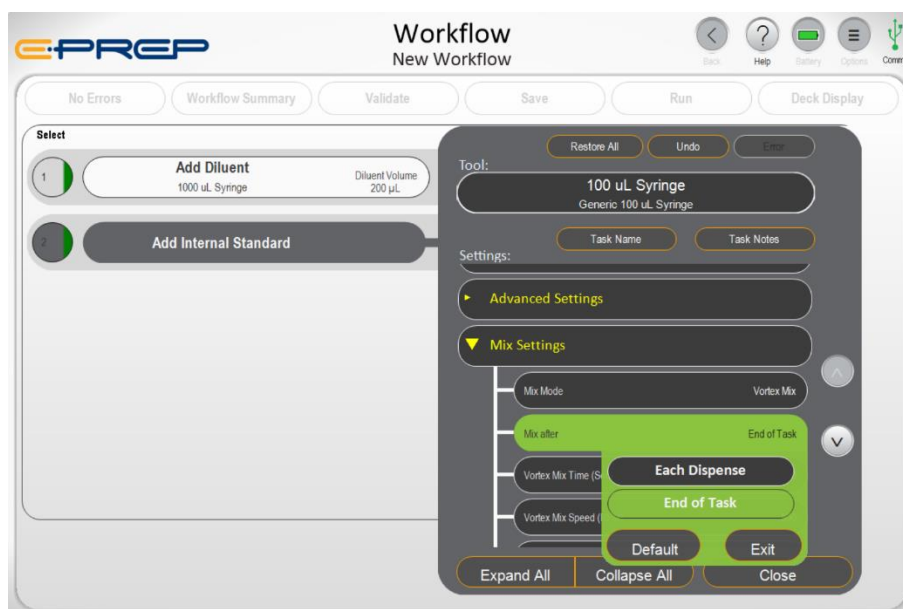
- 4) Source tube depth. Can have a similar effect as aspiration needle position. With increasing vial depth, once we reach maximum needle penetration, we have an increasing tube dead volume. This dead volume will be displayed in the error message.
- 5) Output tube free space. The output tube volume is also validated. For example, if the output tube capacity is 1.5mL and the workflow has a pre-set starting volume of 500µL or 500µL has already been dispensed to the tube it will not be possible to dispense any more than 1mL more to this tube. Doing so will generate a similar volume validation error as shown above.
- 6) Washing from vial-to-vial volumes are also validated, both the wash source and the wash waste tubes need to have sufficient volume/space for the set wash parameters.
- 7) Other things to consider when calculating the required volume for a workflow:
 - a. If the prime method is set to "TO TUBE (first to waste)" the prime volume is lost from the source tube.
 - b. If the prime method is set to "TO WASTE" the prime volume multiplied by the number of prime cycles is lost from the source tube.
 - c. The Residual volume is also lost from the source vial.

Vortex mixing

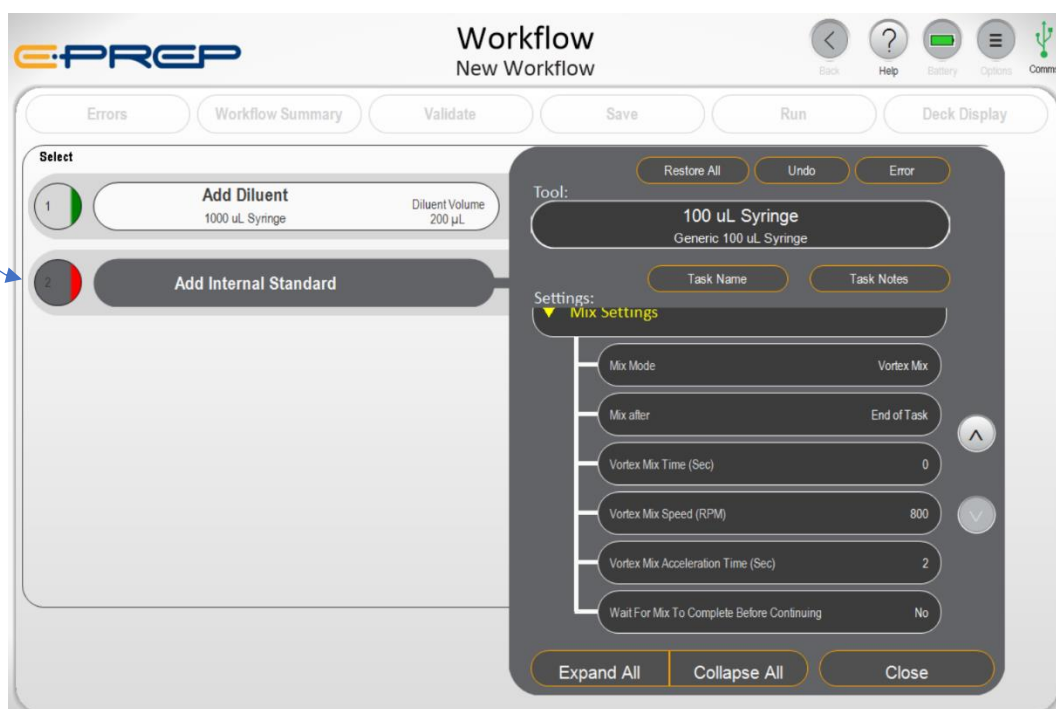
The vortex mixer can be configured in 2 ways, either inside the liquid handling tasks, or as a task in its own right. To configure the vortex mixer the system must have previously scanned the vortex mixer accessory. Once the vortex mixer is available for selection; to configure it inside a liquid handling task simply select it from the "Mix settings/Mix mode"



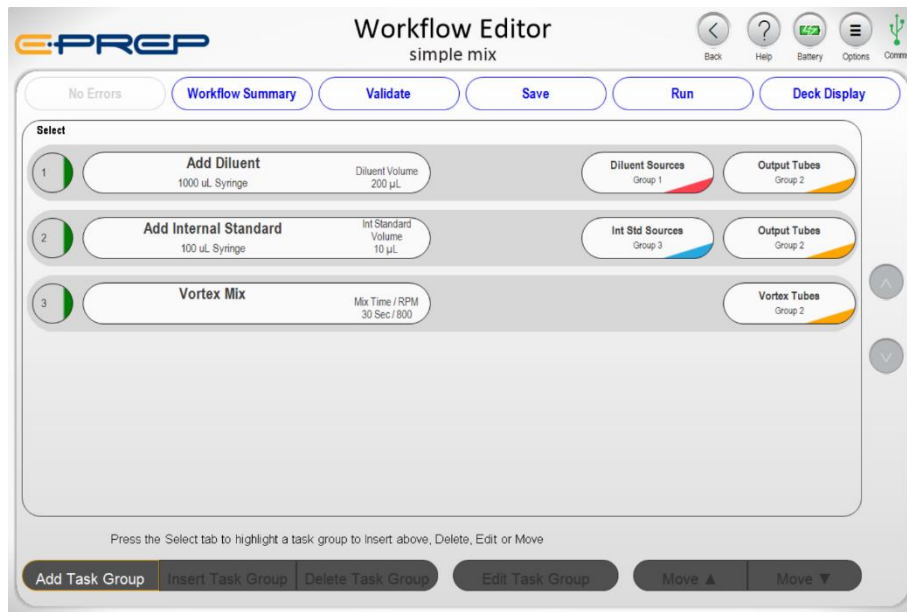
By default the "Mix after" setting will mix after "Each dispense". This can be changed to mix at the "End of task".



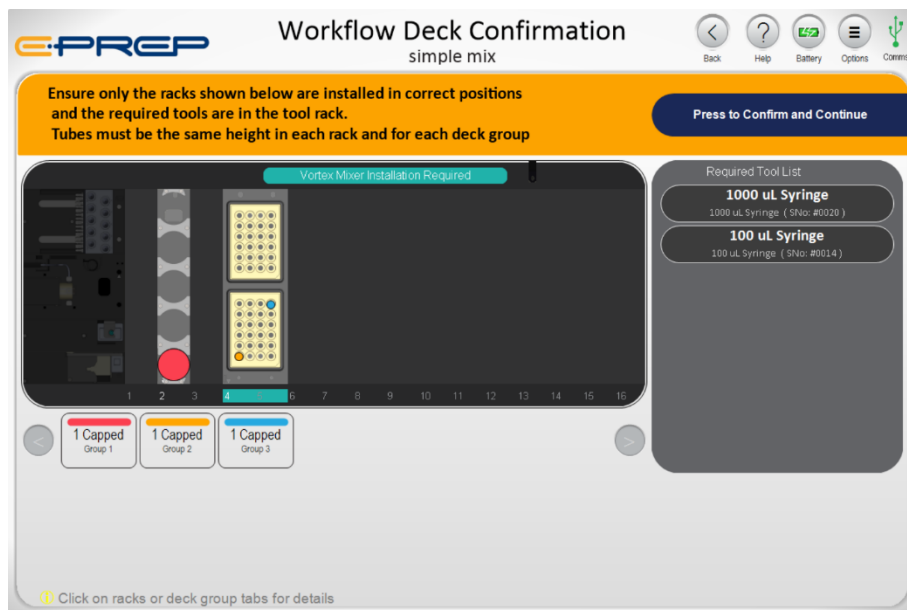
- The default mix RPM will be automatically populated depending on the rack selected, this may need some fine tuning depending on the liquid viscosity and levels inside the vials.
- An error is generated in the general workflow validation until the mix time has been set, see red bar to the left side in the image below.
- An extended acceleration time can be useful for agitating solid particles into suspension to assist with sample extraction.
- By default, the system will not “wait for mix to complete before continuing” this maximises the ePrep ONE utility. This setting allows the system to continue running the workflow whilst the vortex mixer is running. If the system needs to access the vials on the vortex mixer whilst it is mixing, the system will run up to this point and then hold over the top of the vial until the mixing is complete. Setting this option to “Yes” will make the system pause for the entire mix time.
- If a pause task is added after the vortex mix task and “wait for mix to complete before continuing” is set to “No” the pause time will start as soon as the vortex mixer starts running. If a pause time is required to let sample settle after a vortex mix the “wait for mix to complete before continuing” setting should be set to “Yes”.



To configure the vortex mix as a separate task simply add the task from the “Vortex mixing tasks” list and configure.



Once the vortex mixer has been configured it will be shown as a requirement on the deck confirmation page, see light blue highlight in the image below.



Solvent manifold

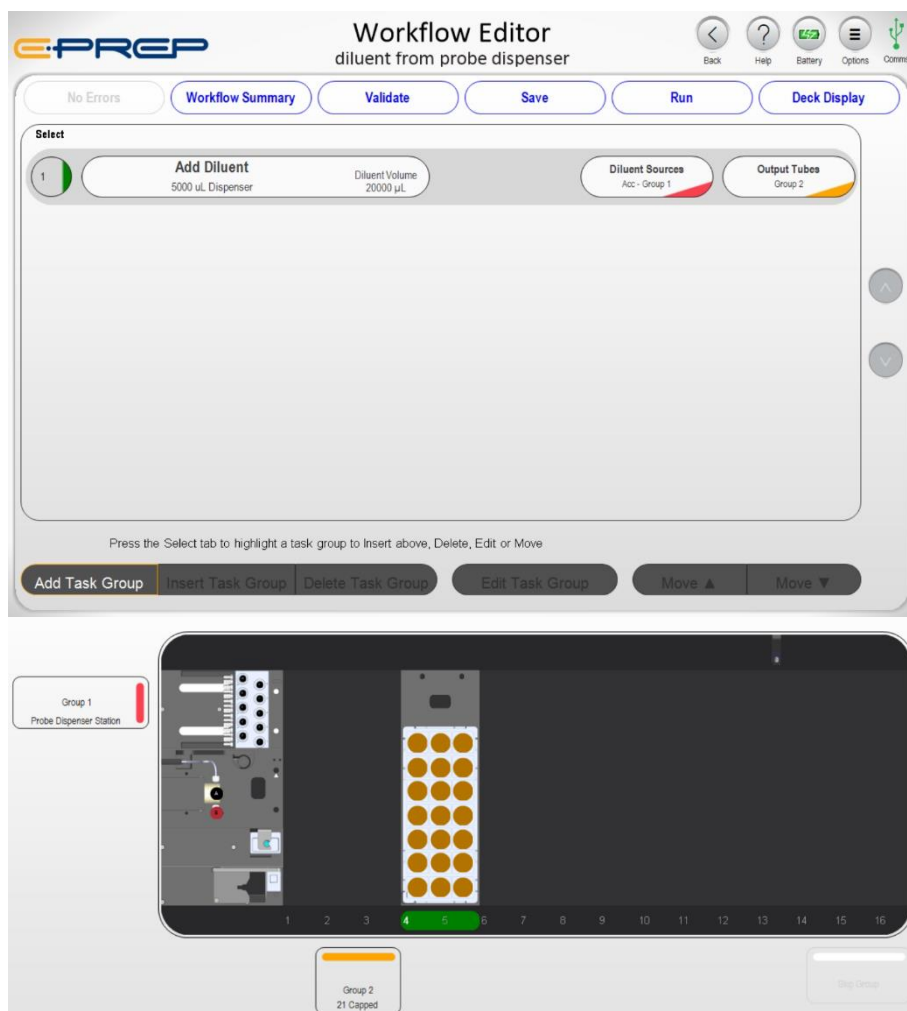
The solvent manifold can be used as a bulk solvent source or as a wash and waste location. First create a group at the solvent manifold and enter a starting volume for the group. Once created the group is selectable depending on the type of syringe being used and the flow direction.

- Some solvent manifold ports are only capable of flowing liquid in one direction
- The solvent manifold has several port configurations to suit different syringe types:
 - standard (needle) syringes
 - luer slip syringes
 - SPEed syringes



Probe dispenser

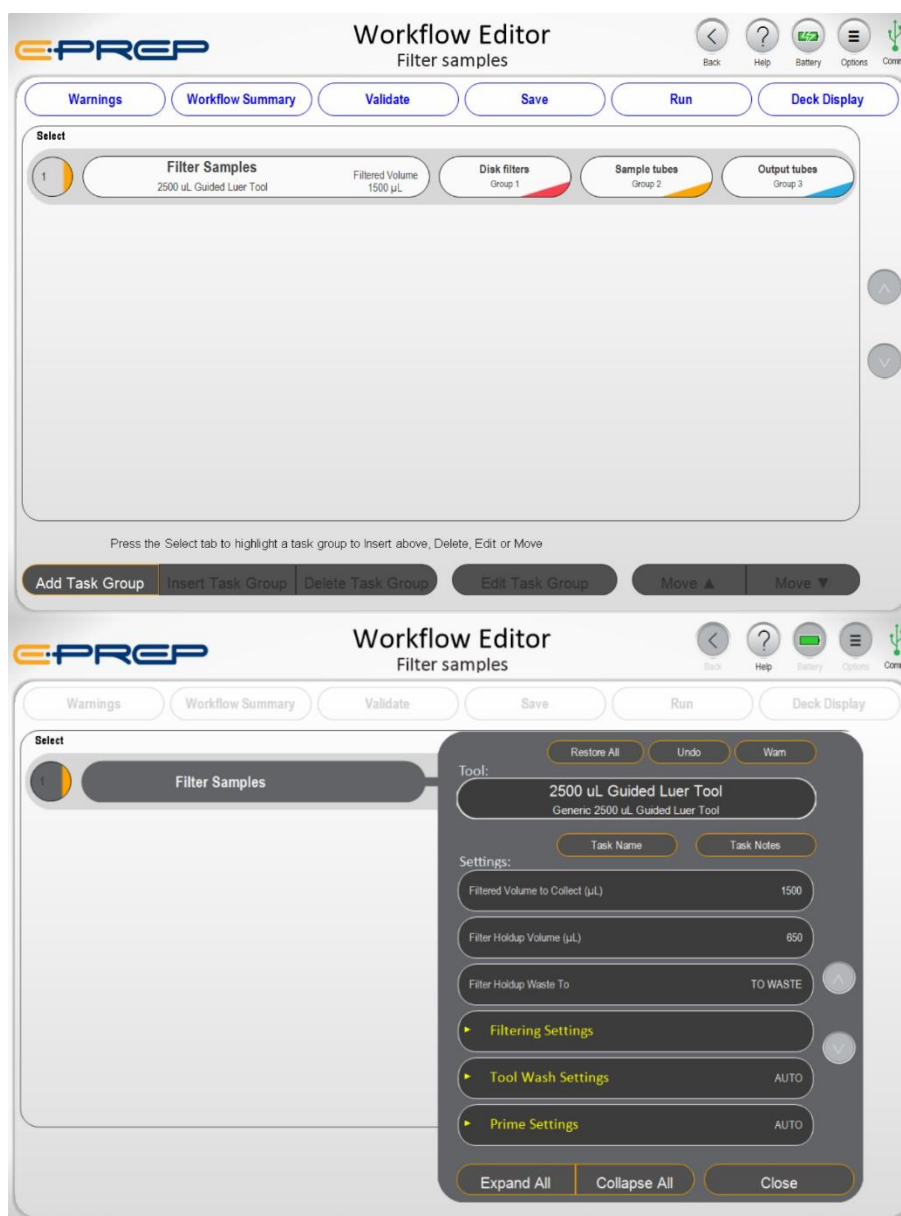
The probe dispenser is an external syringe pump that is located in the accessories area. It uses large bore tubing inlet and outlet tubing with a port selection valve. 2 source ports are available for different liquids. The outlet of the probe is a short version of the needle used on standard ePrep ONE syringes so it can be used with sealed vials. To use the probe dispenser, select an appropriate liquid handling task and select the “5000uL dispenser” tool. As with the solvent manifold, create a group at the probe dispenser and select this group as the source in the task

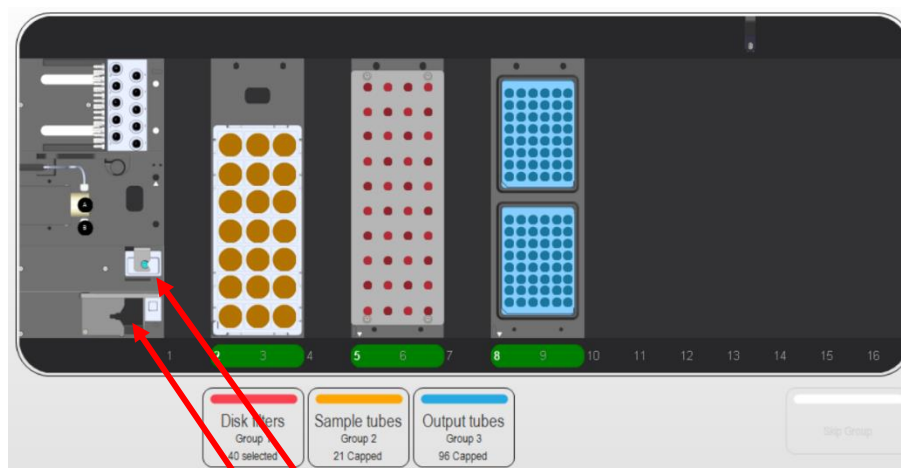


Filtering

Standard disc filters can be used on the ePrep ONE. The filters are fitted with a short dispensing needle and are placed into a rack designed to fit 12 to 30mm disc filters. The filter task requires the aspiration needle station and the filter disposal station to be fitted to the ePrep ONE deck in the accessories area. The filter task performs the following actions:

- 1) Pick up the special 2.5mL luer slip syringe from the tool rack
- 2) Pick up the aspiration needle from the aspiration needle station
- 3) Wash the tool using the set wash source and waste
- 4) Prime the syringe with the sample
- 5) Fill the syringe with sample
- 6) Park the aspiration needle back at the aspiration needle station
- 7) Pick up the filter from the storage rack
- 8) Prime the filter holdup volume with the set amount of sample to the set waste location
- 9) Pierce the output tube vial and dispense the set volume of sample
- 10) Discard the filter at the filter disposal station

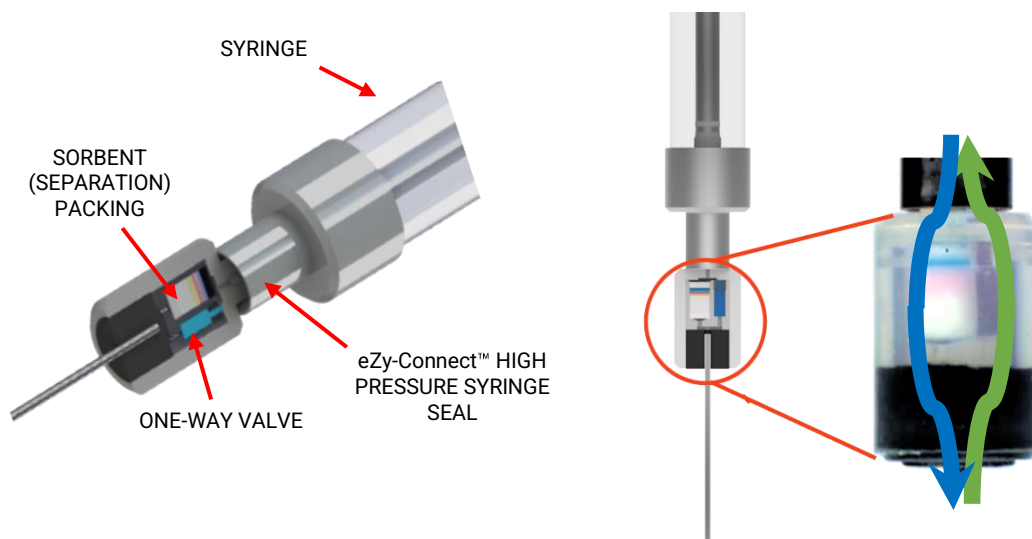




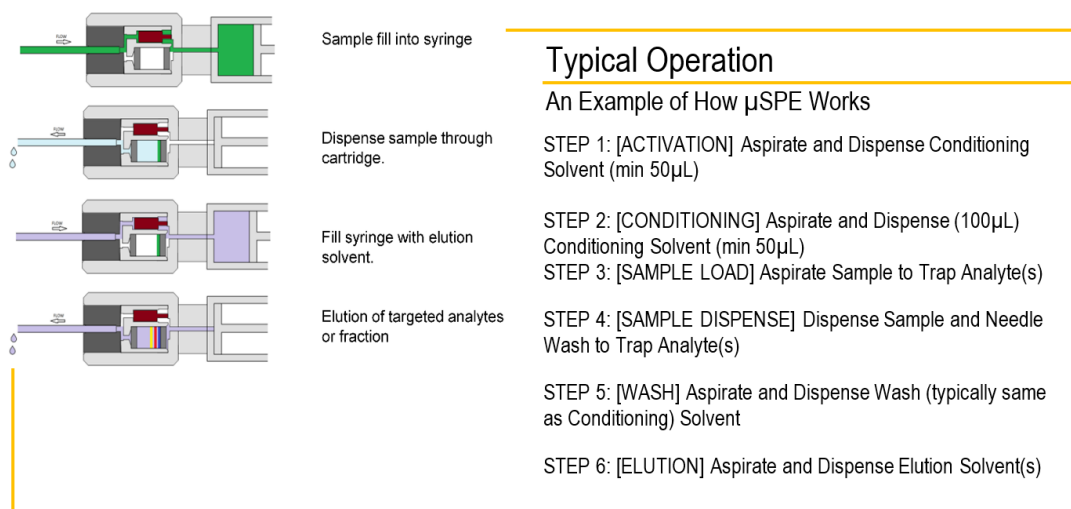
Aspiration needle station
Filter disposal station

SPEed conventional positive displacement SPE

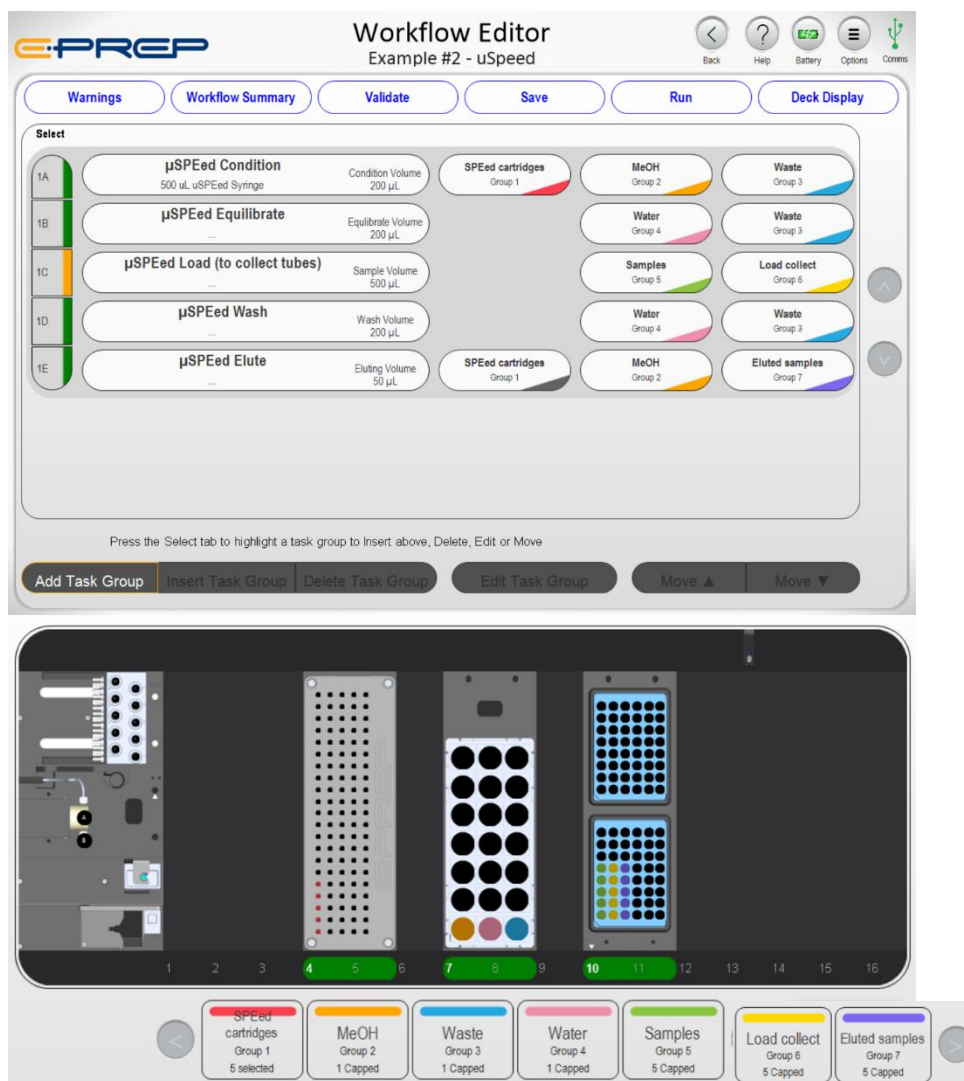
ePrep ONE have our own, proprietary SPE technology that incorporates the benefits of using small ($\leq 3\mu\text{m}$) particles as the extraction bed, single direction flow across the bed, a needle to allow the use of closed sample vials to closed output vials and high precision flow rates. All these features make the SPEed technology perfect for automation. See below images showing the main features:



The typical SPE workflow will include the following steps



This is extremely easy to achieve on the ePrep ONE with many collection options available for each part of the process. Since each task must be performed to each sample in a sequence, we will use the sequential programming mode. A basic SPEed workflow would be configured as follows, this is included in the software as a pre-built example:



The software is also capable of using closed SPE cartridges with short dispense needles pre-fitted (as with filtering). The workflow creation would be the same as above. The main difference being, the standard SPE cartridges do not have a valve and therefore liquid cannot be aspirated while the cartridge is attached. For each aspiration the cartridge is placed back into the storage rack and the system either aspirates through the aspiration needle (as with filtering) from a source tube or uses the solvent manifold as the source for bulk conditioning, equilibration, wash or elution solvents.



2.5mL luer tool with aspiration needle attached, ready for aspiration



2.5mL luer tool with standard sealed SPE cartridge attached, ready for dispensing

Digital IO and relays

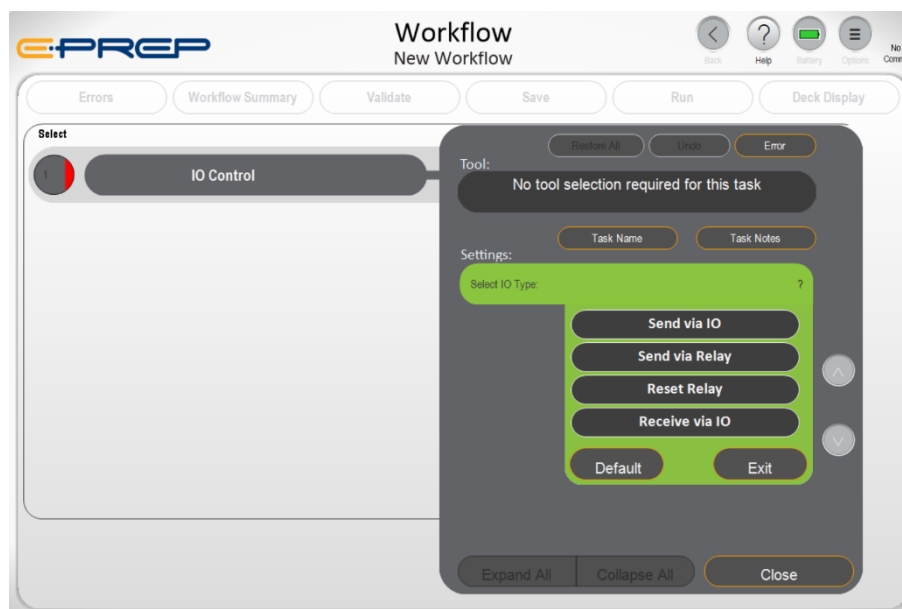
The ePrep ONE comes equipped with the following hardware to interact with external equipment

- 4 x contact closure relays, see KB022 for hardware details
- 4 x solid state digital outputs, see KB011 for hardware details
- 4 x solid state digital inputs, see KB011 for hardware details

The information below demonstrates how to configure this hardware through the software.

Add the IO Control task from the Digital IO Tasks list and then select the type of control you would like to use:

- “Send via IO” is used for triggering an external device by sending an electronic signal through the output port of the digital IO interface
- “Send via Relay” is used for triggering an external device by changing the state of a contact closure relay. All relays have a normally open and normally closed wiring option, choose the correct type depending on the external device requirement
- “Reset Relay” is used for returning the relay back to its original state if the timer function is not used inside the “Send via Relay” options
- “Receive via IO” is used for receiving a signal from an external device. The ePrep ONE will halt at this task until the required signal is received. This is good for acknowledgment that the external device is ready or has completed its set action.



If “Send via IO” is selected the following options are displayed:

- Send signal through digital IO: select the port you wish to use for the control signal. This must correspond to the physical configuration of the hardware. If port 3 is selected the external device must be connected to digital output port 3.
- Time to hold IO signal: this is the number of milliseconds the control signal will be held. Check the user manual of the external device to make sure the signal condition is suitable.

If “Send via Relay” is selected the following options are displayed:

- Send signal through Relay No: select the relay you wish to use for the control signal. This must correspond to the physical configuration of the hardware. If relay 3 is selected the external device must be connected to the common and either the normally closed or normally open lines of relay 3.
- Time to reset Relay signal state: this is the number of milliseconds the control signal will be held. Check the user manual of the external device to make sure the signal condition is suitable. Entering a value of 0 will mean the relay is held in the desired state indefinitely. The relay must either be reset by using the “Reset Relay” option or by power cycling the ePrep ONE once the workflow is complete.

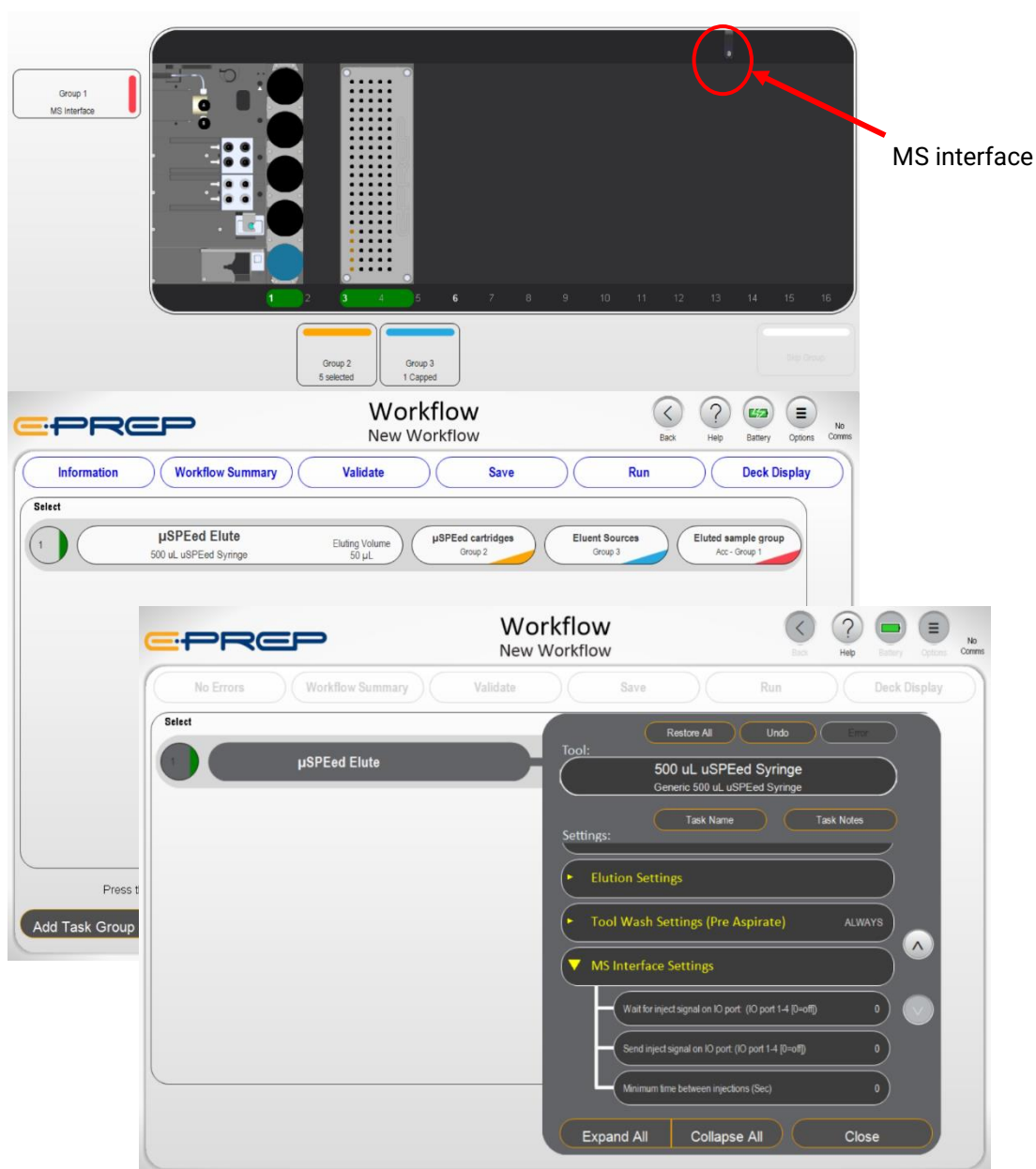
If “Reset Relay” is selected only one option is displayed:

- Send signal through Relay No: select the relay that needs to be reset as discussed in the previous section.

If “Receive via IO” is selected the following options are displayed:

- Wait for Signal delay: this adds a delay between receiving the signal and continuing the workflow. The external device may need some time to settle after sending the ready signal
- Wait for signal on IO port: select the input port you wish to use for the control signal. This must correspond to the physical configuration of the hardware. If input port 3 is selected the external device must be connected to digital input port 3.
- Expected signal state received: enter the expected signal state received by the ePrep ONE from the external device. Check the user manual of the external device to make sure the signal condition is suitable.

Some sample handling tasks (aliquot sample, SPEed elute, spSPE (syringe push-true SPE) elute), when used with certain output locations enable the digital IO options inside the task settings. If, for example, the MS interface is selected as the output group for the SPEed elute task the digital IO options are displayed under “MS Interface Settings”.



These options are the same as described earlier with the addition of

- Minimum time between injections: this sets a timer to allow some time for the external device to stabilise if needed. Setting this to zero will run one injection after another or wait for a ready signal from the external device if configured.

7. REPORTING

Workflow reports

Each time a workflow is run the system generates a report to capture all activities performed during the workflow run. To access the reports



Select "System" and then "Reports" and click on "Workflow Reports"



Select the report of interest

E-PREP Workflow Reports Viewer
[WFR1784] int std add dil probe

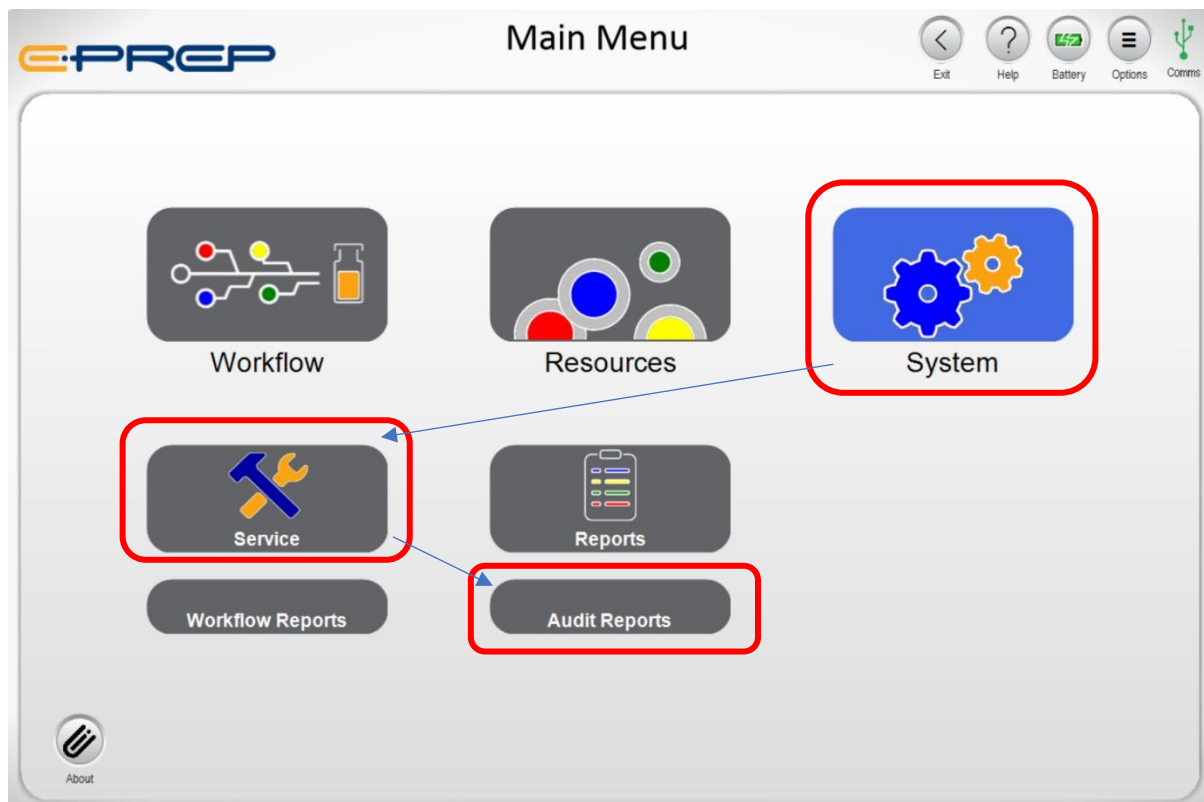
Export to CSV Export Tab Delimited

Reference	Time Stamp	Task ID	Tool ID	ToolWash	ToolPrime	Input_ID	Input_Barcode	Ass_ID	Ass
WFR17840000	30/May/2022 4:23:49 PM	Add Internal Standard	#0014 (100 uL Syrmoe)	4 x 30 uL	4 x 15 uL			Rack 1, Tube 1	
WFR17840001	30/May/2022 4:25:28 PM	Pre Park Wash	#0014 (100 uL Syrmoe)	4 x 30 uL					
WFR17840002	30/May/2022 4:26:34 PM	Add Diluent	#0150 (5000 uL Dispenser)		2 x 2500 uL			Rack 19, Tube A	

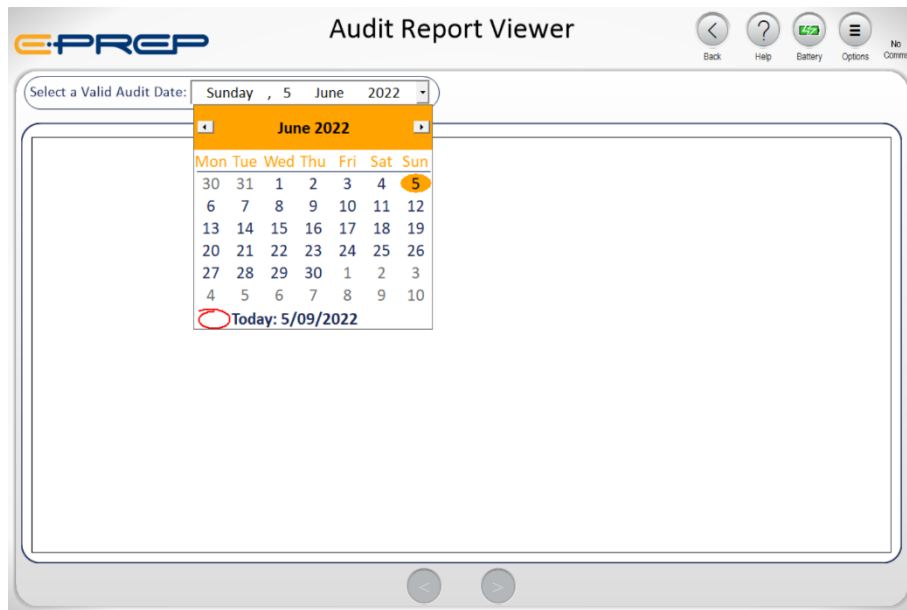
The workflow report is displayed. This can be exported to CSV for manipulation using Excel or other spreadsheet tool.

Audit Reports

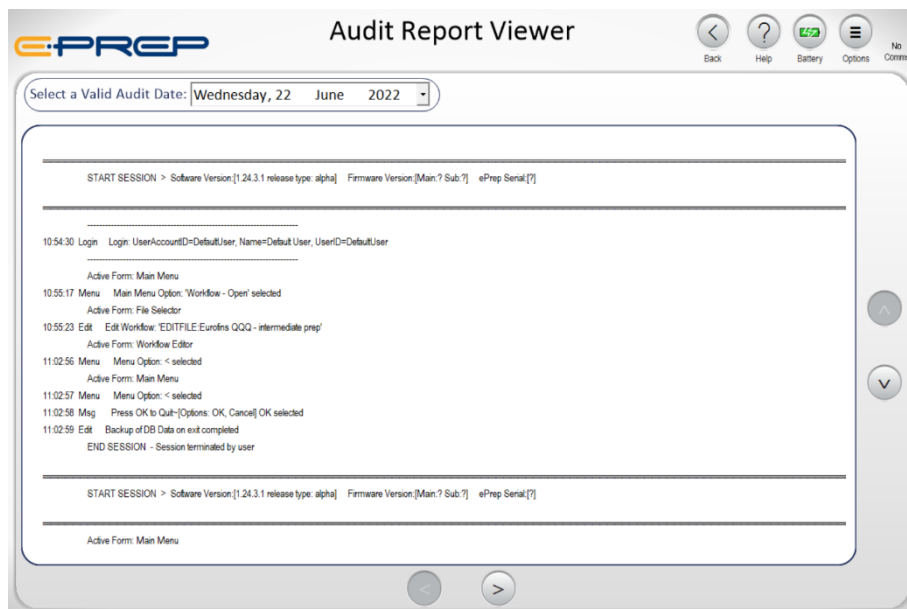
Each time the software is used an Audit report is generated. The Audit report captures all of the user input and button presses and on screen prompts. This is good for tracability.



Select "System" and then "Reports" and click on "Workflow Reports"



Select the date of interest



The Audit report is displayed, you can scroll or click and drag to view the details. Currently this cannot be printed from inside the software.

8. TROUBLESHOOTING

Collecting Workflow Troubleshooting Information

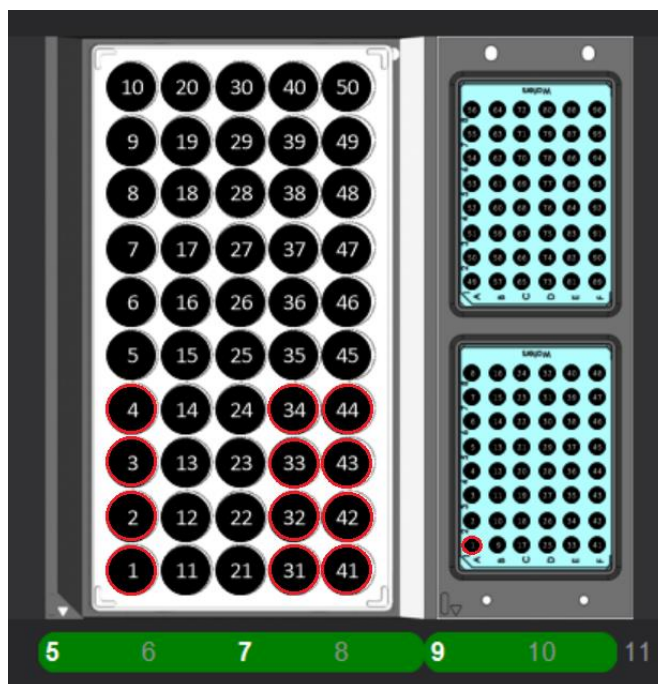
If a Workflow Issue or error occurs, supply the following information to your ePrep representative:

- 1) A detailed description of the fault
- 2) Photo of the System Setup when the error occurred
- 3) Screenshot or photo of the on-screen error message
- 4) The following Workflow files:
 - a. C:\ProgramData\ePrep\Audit\Audit YYYY MM DD.txt
 - b. C:\ProgramData\ePrep\Workflows\Filename.XML
 - c. C:\ProgramData\ePrep\Debug\InitData.txt
 - d. C:\ProgramData\ePrep\Debug\RunData.txt
 - e. C:\ProgramData\ePrep\Debug\Debug YYYY MM DD.txt
 - f. C:\ProgramData\ePrep\Debug\Commands\DebugCommands YYYY MM DD.txt

9. EXERCISES

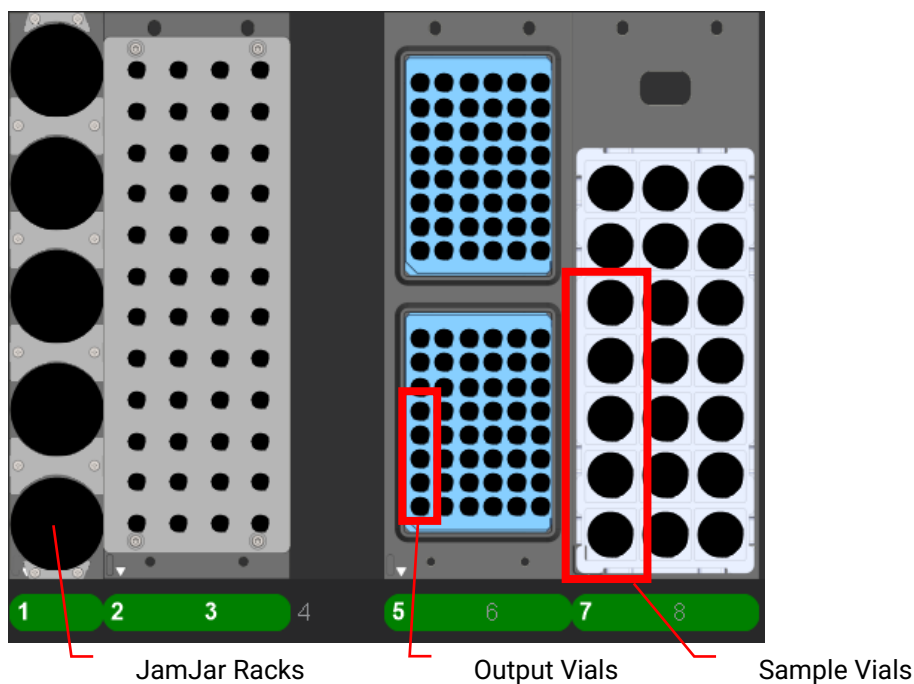
Exercise #1 – Vial Groups

- Transfer 1mL of sample from Wheaton Rack Vials 1-4 to 31-34 and 41-44 with 2sec Aspirate Pause.
- Add 35uL of IS into vials 41- 44 with Single Aliquots and Wash after every dispense to minimise carryover.
- Validate and Save the Workflow
- RUN the workflow if you have a Demo Dongle
- Send Workflow “Troubleshooting” Files to your ePrep Representative to complete the exercise.



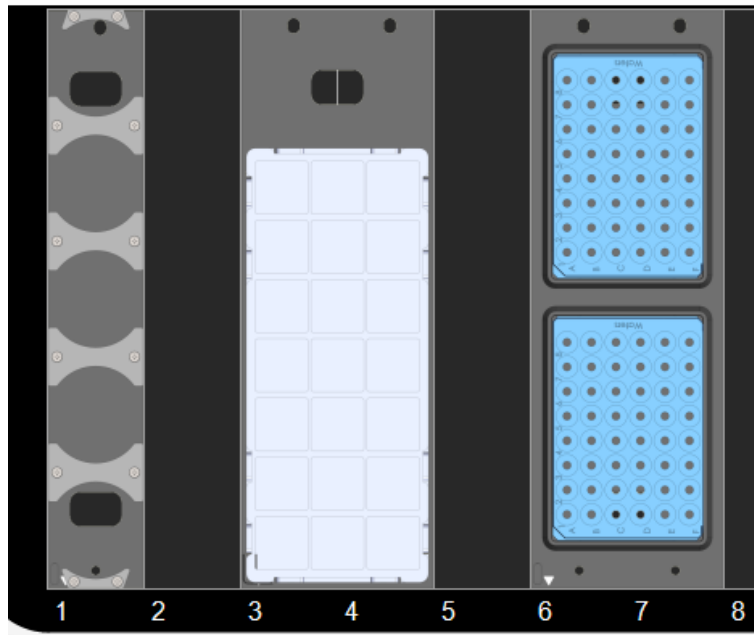
Exercise #2 – Adding Filtering

- Add 10mL of Reagent into 30mL Sample Vials in BelArt Rack using Reagent Jar Rack as a source
- Filter 1000uL of Sample from the 30mL Vials into a 1.5mL Vial in the Waters Rack
- Validate and Save the Workflow
- RUN the workflow if you have a Demo Dongle
- Send Workflow “Troubleshooting” Files to your ePrep Representative to complete the exercise.



Exercise #3 – Intermediate Vial to Output

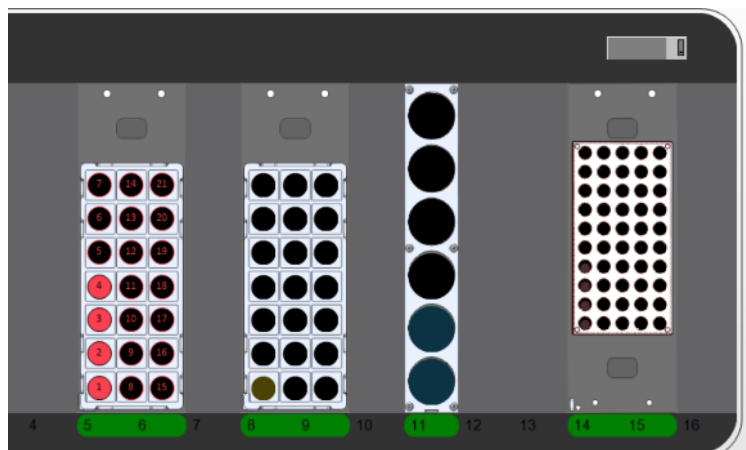
- Add 1250uL of Diluent from Reagent Jar into 1.5mL Intermediate Vial
- Aliquot 100uL Sample from 30mL BelArt Vial to 1.5mL Intermediate Vial
- Vortex for 20 sec
- Add 1000uL from 1.5mL Intermediate Vial to 1.5mL Waters Output Vial
- Add 250uL Internal Standard for 30mL BelArt Vial to 1.5mL Waters Output Vial
- Vortex for 30sec
- Validate and Save the Workflow
- RUN the workflow if you have a Demo Dongle
- Send Workflow “Troubleshooting” Files to your ePrep Representative to complete the exercise.



Exercise #4 – Batch (Grouped) vs Sequential Stepped Workflows

Create a) Batch (Grouped) Workflow and b) Sequential (Stepped) Workflow for:

- Add 1000uL of Diluent from Reagent Jar into 1.5mL Supleco Vial
- Aliquot 50uL Sample from 4 x 30mL BelArt Vial to 1.5mL Supleco Vial
- Add 20uL Internal Standard from a 30mL BelArt Vial to 1.5mL Supleco Vial
- Vortex for 60 sec
- Validate and Save the Workflow
- RUN the workflow if you have a Demo Dongle
- Send Workflow “Troubleshooting” Files to your ePrep Representative to complete the exercise.



Exercise #5 – Calibration Standards for Environmental Method

Create your own deck layout

- Calibration Standard
 - 2 x Stock Stds and 1 x Int Std. To be made up to 1.5mL vials in an Agilent Autosampler Rack G1313-44512
 - Std #1 – Stock #1 100ppm, Stock #2 20ppm, Int Std =250ppm
 - Std #2 – Stock #2 200ppm, Stock #2 50ppm, Int Std =250ppm
 - Std #3 – Stock #3 300ppm, Stock #2 100ppm, Int Std =250ppm
 - Std #4 – Stock #4 400ppm, Stock #2 150ppm, Int Std =250ppm
 - Std #5 – Stock #5 500ppm, Stock #2 200ppm, Int Std =250ppm
- Stock Solutions
 - Stock #1 = 2000ppm in 4mL Vial
 - Stock #2 = 1000ppm in 4mL Vial
 - Internal Standard #1 =1000ppm in 4mL Vial
- Select your own deck Vials
- Hint: include needle dip by adjusting needle position and use “Make Up to Volume” task.
- Don’t forget to Vortex mix
- Validate and Save the Workflow
- RUN the workflow if you have a Demo Dongle
- Send Workflow “Troubleshooting” Files to your ePrep Representative to complete the exercise.

Exercise #6 – uSPEed Workflow

Create your own deck layout

Application is looking for trace levels of a target drug in a Human Urine extract. There are 10 x 10mL of samples. A point standard needs to be included. Standards and Samples need to include an internal standard. Standards and Samples need to be filtered and then the target compounds concentrated using uSPEed with the output eluted into a 300uL vial insert.

- Add 100uL of 100ppb drug standard to 2.5mL Blank Human Urine Extract
- Add 50uL of Internal Standard to all standards and samples
- Vortex Mix
- Filter Sample and Standards
- uSPEed Cartridges
 - Activate – 2 x 100uL Methanol (0.1% Formic Acid)
 - Condition – 2 x 100uL 0.1% Formic Acid
 - Load – 500uL Standards, Sample [25mm Needle Depth, Asp 25uL/sec (1.5mL/min) & Disp 8.33uL/sec (500uL/min)]
 - Wash – 50uL 0.1% Formic Acid [Asp 25uL/sec (1.5mL/min) & Disp 16.77uL/sec (1mL/min)]
 - Elute into 300uL vial insert– 50uL Methanol (0.1% Formic Acid) [25mm Needle Depth, Asp 25uL/sec (1.5mL/min) & Disp 16.77uL/sec (1mL/min)]
- Validate and Save the Workflow
- RUN the workflow if you have a Demo Dongle
- Send Workflow “Troubleshooting” Files to your ePrep Representative to complete the exercise

10. Main Menu and Icons

Main Menu Options	
	Options to create a new Workflow, Edit a saved Workflow and Run a saved Workflow.
	Options to Register Racks, Tools and Accessories in the software database. This area is particularly useful when adding previously unregistered assets. Enables ePrep ONE scanning and user definition of Tools, Racks and Accessory assets for Workflow integration.
	Options for instrument calibration, software operational settings, user administration and operation/workflow reports
	Exit software or Return to previous menu depending on the screen context .
	Contextual help information available throughout the software.
	Enables user login and options to change user details such as password.
	Indicates computer USB connection to ePrep ONE. When connected USB is established icon will display USB icon. When communication is not
	Battery charge level indicator. Will display power icon when computer is It is recommended that during running of an ePrep ONE Workflow that the computer is connected to the mains
	Information about installed Software and Firmware versions. This information is important for communication Faults and Software Bug. System also uses this information for automatic updates.

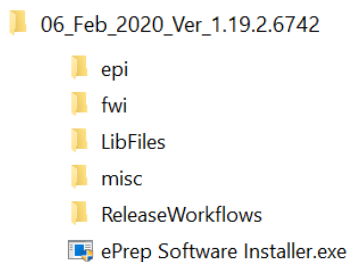
11. Updating the ePrep ONE Software

ePrep ONE software update installation instructions are a guide to installation of a new version of software downloaded from the support.eprep.com.au website.

Follow the steps below to complete the installation:

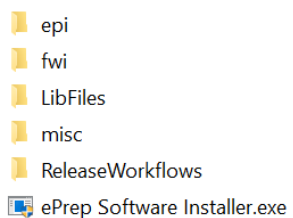
STEP #1

To perform the software upgrade, the installation package (as an .exe file) is used.



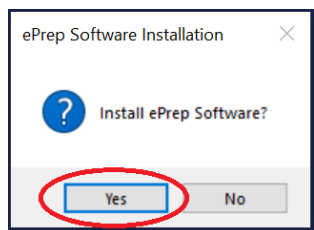
STEP #2

Double click the "ePrep Software Installer.exe".



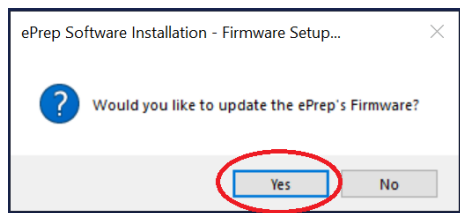
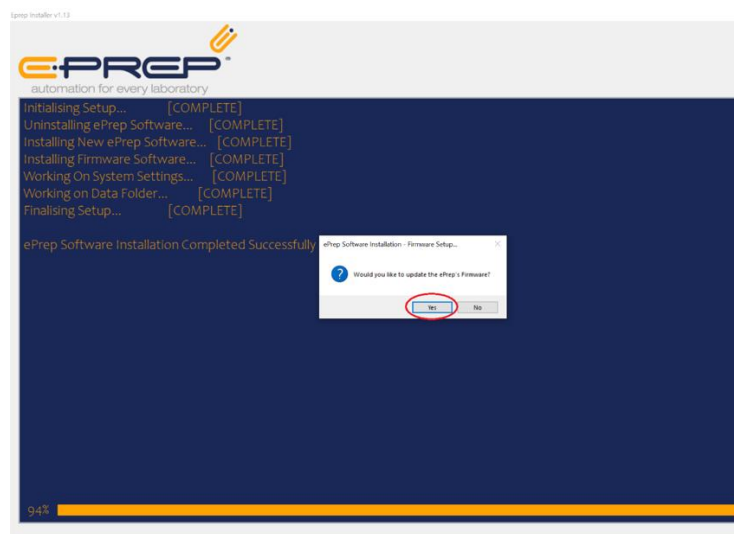
STEP #3

"Install ePrep Software?"
Select "Yes".



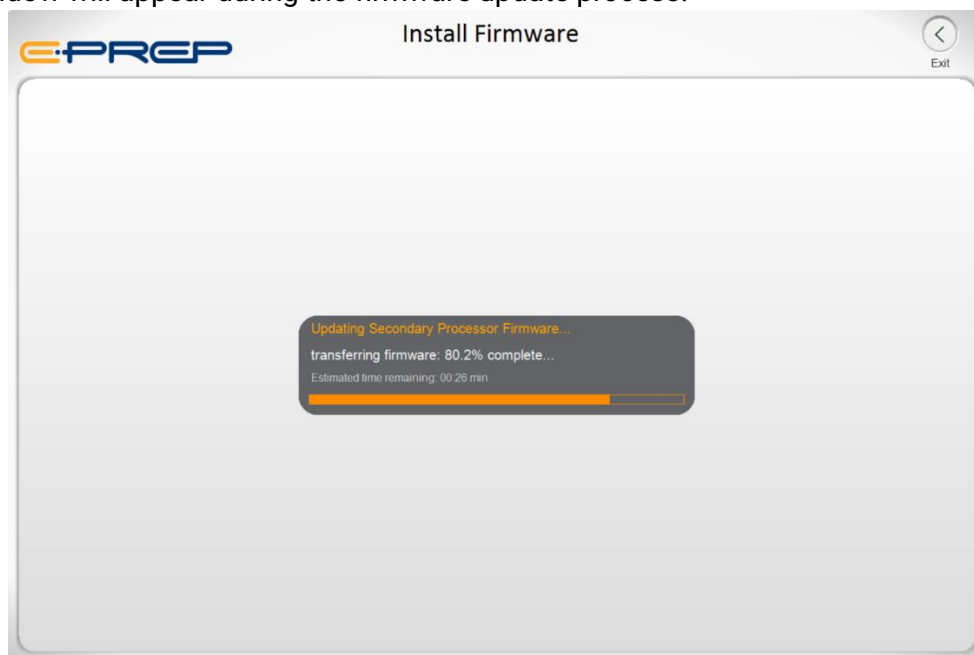
STEP #4

“Would you like to update the ePrep’s firmware?”
Select “Yes”



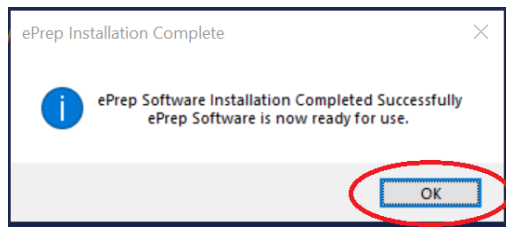
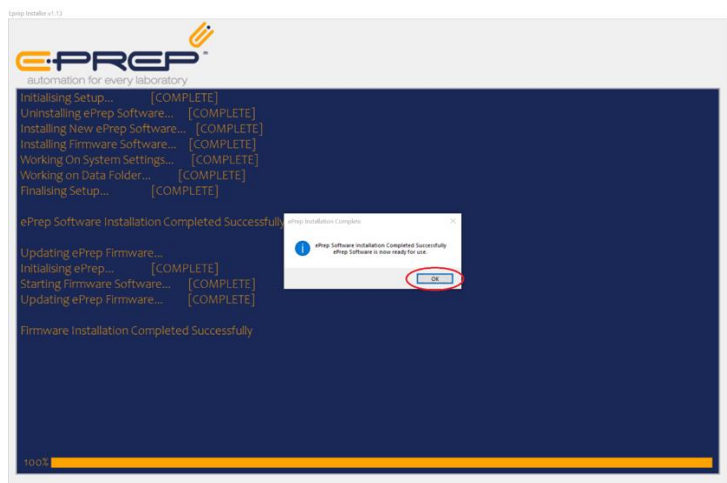
STEP #5

The next window will appear during the firmware update process.



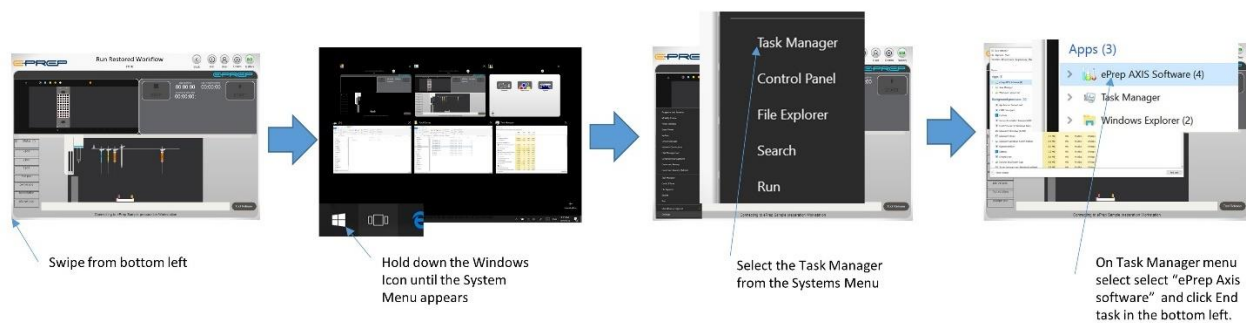
STEP #6

After the firmware update is finished, the software is installed. The screen will show the status of the installation.
Select “OK”.



The ePrep software has been successfully installed.

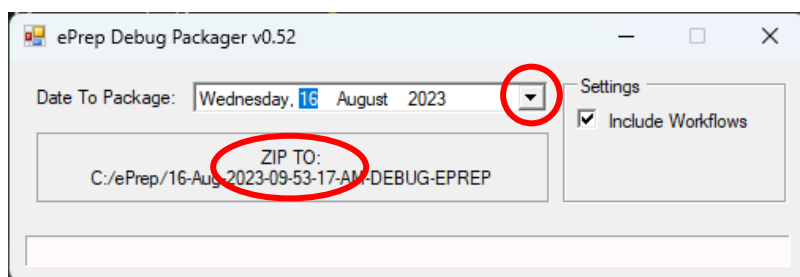
Force Closing ePrep Software



Workflow (software) Issues - Debug files

If an error in the operation of the ePrep ONE was to occur, it is advantageous to provide the relevant Workflow, Log and Debug files when reporting the fault. These files are used to study and rerun the Workflow on ePrep's test-bed instruments. To quickly identify the issue provide the following information:

- 1) A detailed description of the fault
- 2) Photo of the System Setup when the error occurred
- 3) Screenshot or photo of the on-screen error message
- 4) Provide the software debug package, this is created as follows:
 - a. Navigate to C:\ePrep and run the ePrepDebugPackager.exe. This will create a ZIP package of the necessary file we need to investigate issues.
 - b. Select the date by using the dropdown selector, we prefer to have the workflow included in the package as this can give clues to the cause of software issues, then click the "ZIP TO:" button.



- c. The packager will create a ZIP file with the date and time in the same C:\ePrep folder. This needs to be sent with the error report and photos to the ePrep support team support@eprep.com.au.

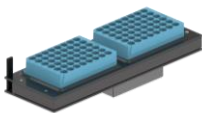
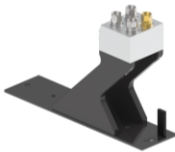
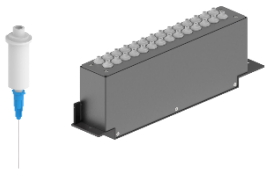
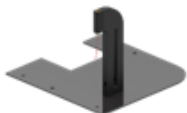
Syringe Wash Calculations

	100µL Syringe	1mL Syringe	10mL Syringe
Default Wash Volume (µL)	30	100	800
Default Wash Cycles	4	3	2
Default Wash Aspiration Rate (µL/sec)	30	70	175
Default Wash Dispense Rate (µL/sec)	250	400	500
Carry Over in Syringe Full Volume (%)			
Initial	100	100	100
No Wash	14%	4.20%	1.26%
Wash #1	1.96%	0.1764	0.0159%
Wash #2	0.274%	0.00741	0.00020%
Wash #3	0.03.8%	0.00031	0.000
Wash #4	0.00538%	0.00001	0.000
Wash #5	0.00075%	0.000	0.000
Wash #7	0.00011%	0.000	0.000

12. ACCESSORIES and OPTIONS

A range of devices are available for the ePrep ONE to expand the system's capabilities. Some items are supplied standard with the ePrep ONE and others are optional. Check at www.eprep.com.au for the latest information on accessories that are available for the ePrep ONE.

Please refer to the following instructional information supplied with the Accessory.

Part No	Description	Use
01-04100	Vortex Mixer 	Vial Mixing for 1.5mL -30mL vials to ensure homogeneity during the Workflow.
01-04163	Syringe Filter Kit 	Syringe filter rack enables the operation of luer syringe filters on the ePrep. The rack holds 40 x 12mm to 36mm diameter commercial syringe filters. The use of this rack requires the luer enabling kit which includes a station for storage of the syringe aspiration needle and a disposal station for removing and discarding of used filters.
01-04205 Needle Syringes 01-04207 Luer Syringe 01-04210 μSPEed Syringes	Reagent Manifold 	When larger reagent or solvent volumes are required the Solvent Manifold can be used to deliver liquids from bulk solvent bottles stationed alongside the ePrep. The Solvent Manifold comes in three configurations: Version #1 for Needled Syringes, Version #2 for Guided Luer Syringes and Version #3 for μSPEed Syringes.
01-04300	Probe Dispenser Kit 	The Probe Dispenser can be used for preparation tasks requiring rapid dispense of large volume diluent or reagent.
01-04161	μSPEed Cartridge Rack 	The μSPEed Cartridge Rack is available where the use of μSPEed cartridge is required. The rack can hold up to 96 cartridges and can be fully integrated with ePrep Workflow.
01-04184	Syringe Push-Thru SPE rack 	The ePrep uses Syringe-Push SPE cartridges. These cartridges have a female Luer inlet and male Luer outlet connections. These enable the cartridges to be used for “robotic” operation on the ePrep, allowing them to be picked up by a Luer syringe and moved around the deck as required. The use of this rack requires the luer enabling kit which includes a station for storage of the syringe aspiration needle and a disposal station for removing and discarding of used filters
01-12005	eDirect™ Detector Interface 	The ePrep-to-Detector Interface can transfer prepared samples directly to a switching valve, a detector, or an external device such as a Mass Spectrometer.

01-04502 60 position 01-04504 30 position	30 and 60 Position Magnetic Stirrers 	On deck, stirring of samples is possible using the 30 or 60 position magnetic stirrer. Applications include: environmental soil samples, pharmaceutical tablet dissolution or viscous samples.
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Tested and Proven Consumables

There are consumables such as septa and vials which have been used extensively on the ePrep ONE and therefore are recommended to use without any issues. There are also some consumables which can cause problems, and these will be listed here also.

Consumable	Description and Supplier	Comment	Recommended
8mL vials with black caps	Chemglass Life Sciences (USA) CG-4904-09 Vial Cap/Septa: Chemglass Life Sciences (USA) 15-425 Black Open Hole PP Cap, w/PTFE/Silicone Septa, 0.065 (CV-80655015)	Tried and tested and work with the ePrep ONE	✓
8mL Vials with green caps	Vial Chemglass Life Sciences CG-4904-09	The green caps/septa supplied standard with the Chemglass Life Sciences CG-4904-09 vials are not suitable for use on the ePrep ONE. These septa have a polypropylene layer on the top face of the septa, which cause needle blockage.	✗
4mL vials, 14 x 45, Clear, Cap 13-425, 100pkt	Agilent p/n : 5183-4331		✓
12mL vials, 19 x 65, Clear, Cap 15-425, 100pkt	Agilent p/n 5183-4332		✓
22mL vials , 23 x 85, Clear, Cap 20-400, 100pkt	Agilent p/n 5183-4333		✓

40mL vials, 28 x 95, Clear, Cap 24-424, 100pkt	Agilent p/n 5183-4334		
Polypropylene vial caps 13-425, PP Cap & PTFE/Silicone Septa, 100pkt	Agilent p/n 5183-4305		
Polypropylene vial caps 15-425, PP Cap & PTFE/Silicone Septa, 100pkt	Agilent p/n 5183-4306		
Polypropylene vial caps 20-400, PP Cap & PTFE/Silicone Septa, 100pkt	Agilent p/n 5183-4307		
Polypropylene vial caps 24-414, PP Cap & PTFE/Silicone Septa, 100pkt	Agilent p/n 5183-4308		
Vials Caps 24-414, red, open top, PTFE/sil, 1000pk	Agilent p/n 5191-5620		
Vials Caps 24-414, green, open top, PTFE/sil, 1000pk	Agilent p/n 5191-5621		

13. Optimization and Troubleshooting

In order to use the ePrep ONE automated system to its greatest effect, several optimization steps must be considered to improve the accuracy and precision of the system. An understanding of how the syringe needle, sample and vial interact along with the effects sample viscosity and plunger speed all influence the accuracy and precision.

Operational Terms and Definitions

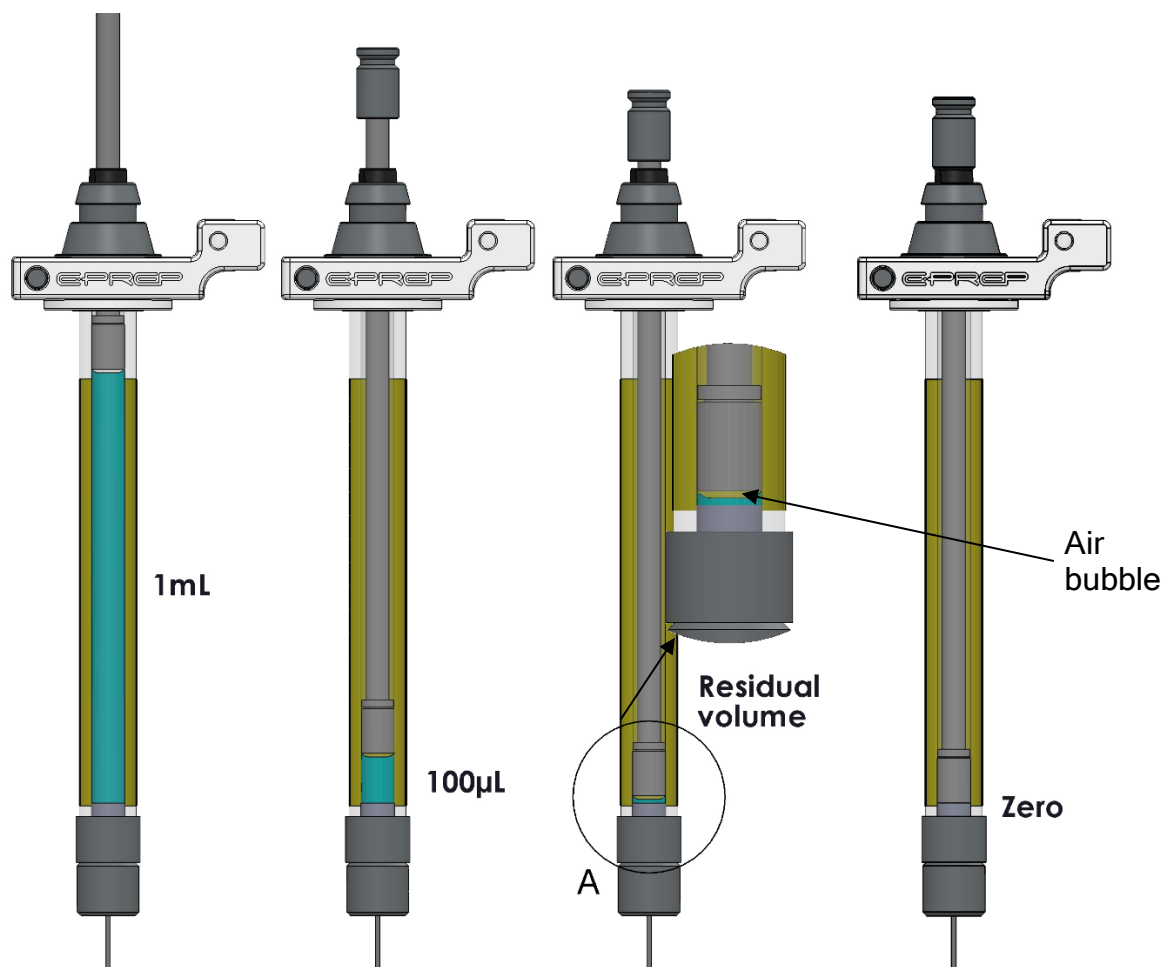
Term	Description
Plunger Zero Position	Plunger Zero position is used by ePrep ONE as a reference point for all movements.
Prime	Aspirate and dispense cycles used to ensure needle is filled with sample before aliquoting.
Syringe Wash	Internal washing of barrel and needle between sample to avoid carryover. ePrep ONE uses default Wash settings developed from aqueous sample zero carry over
Minimum Dispensed Volume	Recommended minimum dispense volume for an analytical syringe is 10% of its capacity (eg. 25µL of a 250µL syringe). Accuracy at 10% is normally stated as $\pm 1\%$. With ePrep ONE, you can dispense less than 10% with care.
Over Aspiration (Backlash Compensation)	Plunger Compensation allows the plunger to travel just beyond the selected volume, and then travel back to the selected volume position. This removes motor backlash, any flex in the plunger tip, and cavitation volume caused by the needle restriction.
Air Bubbles	Occasionally, air bubbles may appear in a ePrep ONE syringe. They are typically removed by priming and are only really an issue if the air bubble volume is greater than the needle volume. Nonetheless, a feature of the ePrep ONE is a parameter called Residual Volume and this is turned ON in ePrep ONE by default. This feature will further ensure a bubble (if present) will not affect the accuracy of the dispensed volume.
Residual Volume	Residual Volume is used when dispensing small volumes to eliminate zero position effects and for persistent air bubbles. It is ON by default in ePrep ONE meaning the plunger moves to leave a small volume of liquid (residual) in the syringe after dispensing the Specified Volume. The residual liquid will then be subsequently dispensed to waste and will be seen as a separate step.
Needle Droplets	Surface tension will cause droplet formation and wetting of the syringe needle during dispensing of liquid (see diagram below). This droplet will cause inaccuracies in the actual volume dispensed, particularly when dispensing low volumes and also provides a potential for cross contamination.
XCHANGE®	ePrep patented system for automated syringe and tool exchange.

Air bubbles in the syringe

Because the syringe is held vertical with the needle tip facing downwards it is very easy to have air bubbles in the syringe between the plunger tip and the liquid. These air bubbles can come about due to many factors:

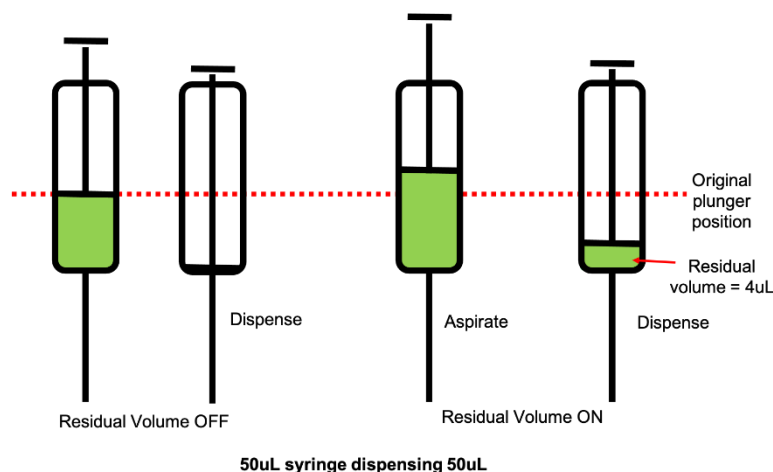
- Needle tip not immersed in liquid during aspiration
- Incorrect priming parameters
- Leaking syringe plunger
- Leaking syringe needle seal
- Aspiration speed set to high
- Gas contained in the liquid being released under aspiration vacuum pressure

The ePrep ONE has been shown to have excellent dispensing accuracy and precision even when air bubbles are present in the syringe. This is because of the residual volume parameter that is included in most task options. The residual volume prevents the plunger travelling to the zero position during the final liquid dispense, this avoids dispensing any air that may be trapped between the plunger and the liquid. Once the dispense is complete the system travels to the waste position and finally dispenses the residual volume by driving the syringe to the zero position. By default, this residual volume is set to 2% but can be adjusted between 0 and 4%. See KB020 for more information.



Residual Volume Explained

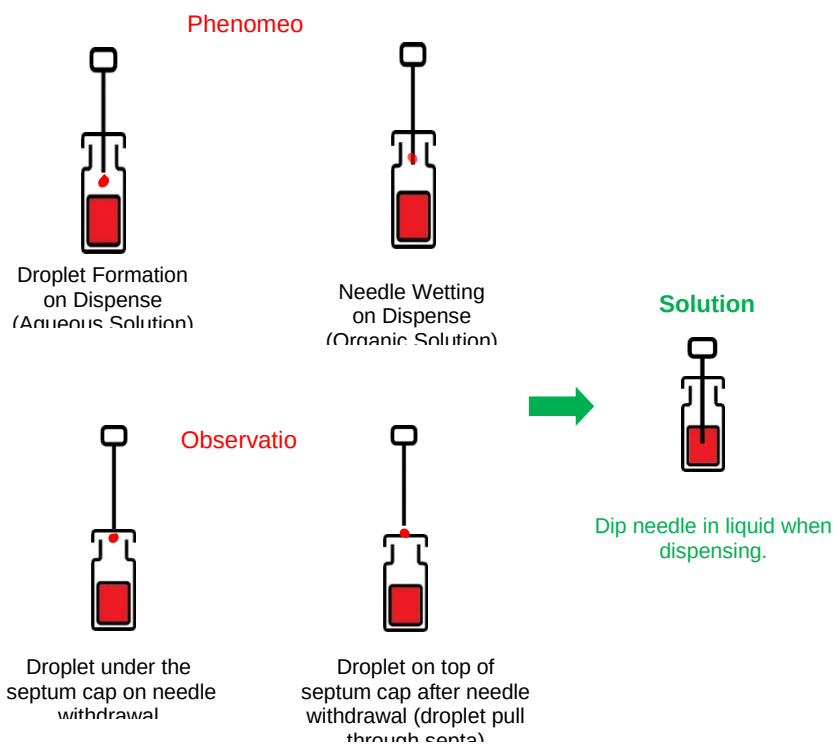
Residual Volume is turned on by default in ePrep ONE and should always be turned ON when dispensing small volumes to eliminate zero position effects and persistent large air bubbles.



Dipping the Needle in Liquid when Dispensing to Remove Needle Droplets

When aliquoting small volumes, always dip the needle in liquid when dispensing to remove surface tension droplets which form at the needle tip on dispensing. The droplets can range in volume from 0.1-5µL, which can cause significant errors when dispensing small volumes.

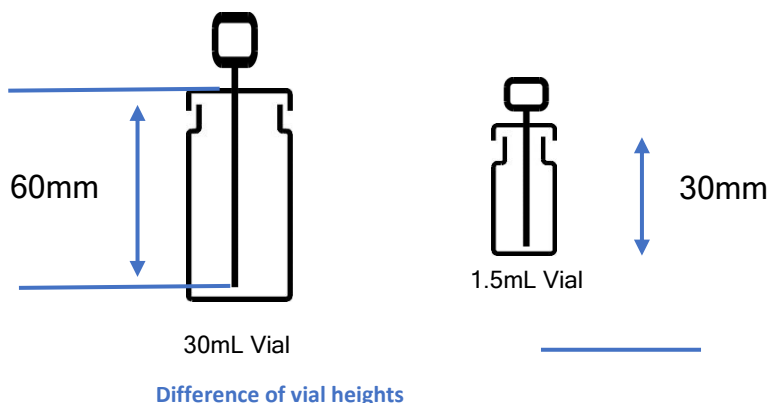
Note: The software is set 'Auto Low' dispense volume by default. This is around 2mm from the base of the vial or the lowest point the needle can reach. Ensure there is enough liquid is in the vial to cover this point to allow for needle dipping.



IMPORTANT: You may need to change the order of your Workflow to add diluent to the vial first before adding small volume steps.

Note: How ePrep ONE calculates needle depth

To correctly identify the depth required to eliminate needle droplet formation care must be taken with the



needle distances required for each different vial. The system measure is from the top of the vial and so care must be taken to ensure that solvents are dispensed correctly when setting up a workflow. Instead of setting a distance the needle needs to go below the cap, an option for “Auto Low” is available which should determine automatically how low the needle can safely go into the vial.

Minimum Dispensed Volume

Dispensed Volume should be $\geq 10\%$ of the Syringe Volume. Choose a syringe where the dispensed volume is $\geq 10\%$ of the syringe volume. digiVOL will aliquot $< 10\%$, but a warning will be displayed to the user. With careful technique, (eg. dipping of needle during dispense), volumes between 5%-10% of the syringe volume may be possible with the digiVOL

Dispense Position in a Vial

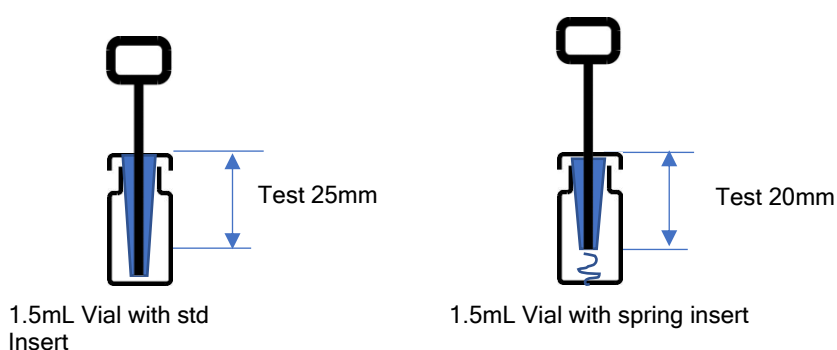
Default dispense parameters (ie. fast dispense near septum cap) can cause an airlock at the bottom of a vial insert resulting in liquid flowing over the insert. It is recommended that the needle is positioned close to the bottom of the insert and flowrate reduced (as default) to avoid this.

Speed of Dispense

Dispense speeds should be kept below 60uL/sec and possibly slower if liquids have a tendency to foam (eg. biological fluids).

Depth of Needle Insertion

Care should be taken when using 1.5mL Vial Insert to ensure the needle does not touch the bottom of the insert during aspiration. This is particularly critical with spring base inserts due to decrease in vial length. If the needle is set too deep the needle can jam against the bottom of the insert, blocking sample aspiration.

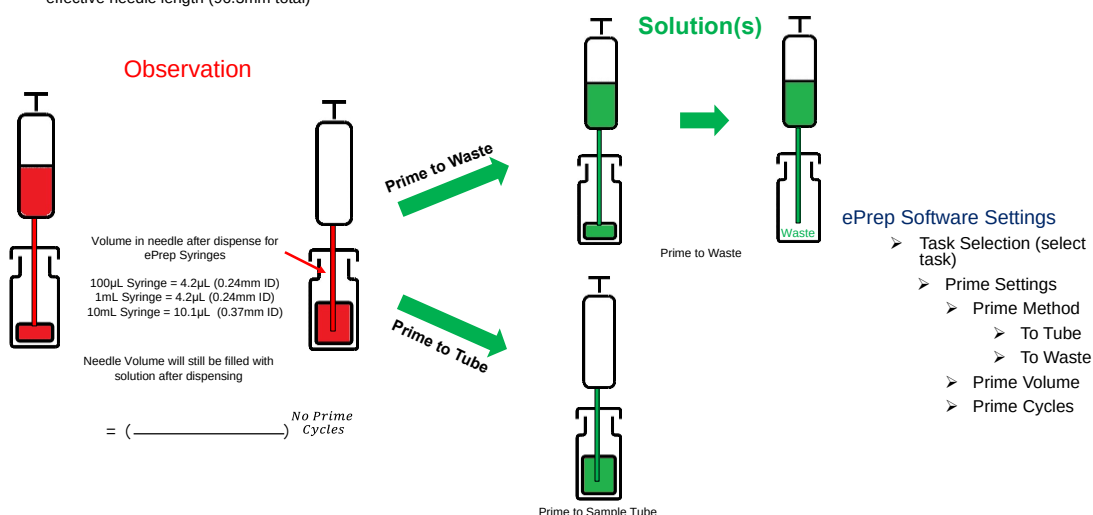


Syringe Washing - Needle Considerations

For ultimate accuracy, the volume in the needle should be considered particularly when syringe mixing is used. ePrep ONE syringes have an 80mm effective needle length. Needle volume and the need for adequate washing and priming is explained in the diagram below and a detailed explanation video can be seen [here](#).

Volume of Needle Consideration in Carryover

For ultimate accuracy, the volume in the needle should be considered particularly when syringe mixing is used. ePrep syringes have an 80mm effective needle length (96.3mm total)



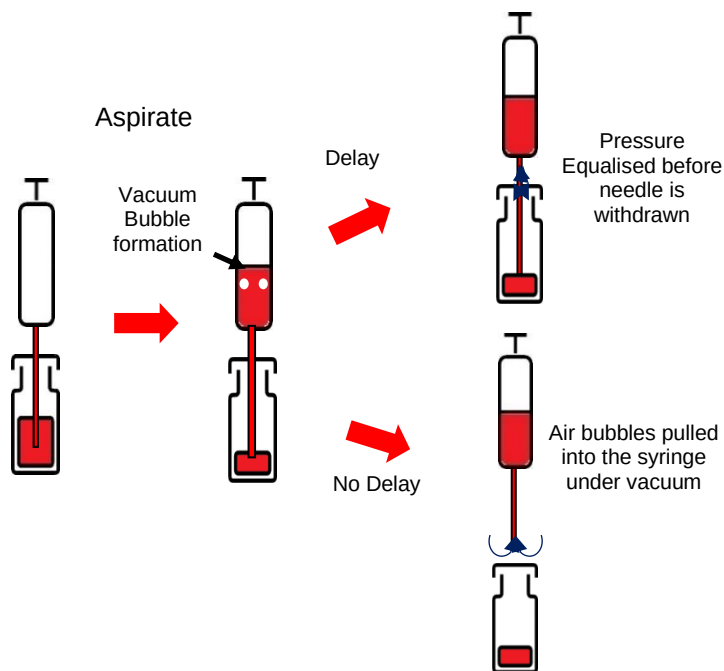
Plunger Speed and Pausing

Cavitation comes about from the aspirate speed being too great for the amount of liquid that can be drawn through the needle. Factors influencing cavitation are liquid viscosity, liquid boiling point, needle inside diameter, blockages and aspirate speed. The liquid voids seen in the syringe barrel is not generally air it is a vacuum or evaporated liquid (in the case of volatile solvents), in which case when the aspiration stops and the pressure in the syringe is allowed to equilibrate to atmospheric pressure, the void will disappear. If it does not disappear, it is likely to be air from a leaking syringe.

If cavitation occurs, reduce the aspiration speed and/or include a pause at the end of the aspirate to allow the liquid to catch up to the plunger and the pressure in the syringe to equilibrate. ePrep ONE is programmed with default speeds for each syringe volume but the user should observe aspirate and dispense operations at setup to ensure speeds are correct and adjust them if necessary.

On dispense if there is a clicking noise and uneven plunger movement, the pressure is too high and dispense rate too fast. The ePrep ONE will adjust the dispense speed down until it is able to dispense without stalling the plunger motor.

In addition, a piercer is used to pierce a vial septa and then the needle is inserted through the piercer into the vial. The gap between the needle and piercer is designed to equalise pressure between the inside and outside of the vial. If the plunger speed is too fast a pressure imbalance will cause errors.



Needle Depth and Residual Volume

ePrep ONE accounts for a number of parameters when checking and validating the volume of liquid available in a vial. These include:

1. The volume entered into the volume editor is the tubes starting volume.
2. The volume that can be used from the tube depends on the following parameters:
 - a. Height of the tube (an in some cases the thickness of the base of the tube)
 - b. The needle length (different for a syringe, SPEed, filter etc)
 - c. The position of the needle in the tube – (user selectable or default minimum offset from tube bottom)

These parameters are used to calculate the volume that can actually be aspirated from the tube. In some simple cases the calculation can be done reasonably simply as long as the unextractable dead volume is considered.

Troubleshooting Other

Observations

Care of syringe, needle and septa are essential to maintain precision and accuracy when using the ePrep ONE. The following observations point to possible issues with the syringe:

- 1) Erratic Results – ie. Internal Standard analytical results vary greatly
- 2) Observe excessive airbubbles in the syringe barrel
- 3) Liquid behind the plunger gas-tight tip
- 4) Needle drips liquid on removal from a vial
- 5) Observed carryover.

Possible Source

- Partial or complete needle blockage is typically due to septa coring lodging in the needle.
- Poor Teflon needle seal in the front fitting resulting from deformed or missing hub spring.
- Outgassing of the liquid under vacuum or leaks through the PTFE seals when liquid aspiration speeds are too high.
- The plunger tip is worn, allowing liquid to leak past the plunger on dispensing, particularly at pressure.
- The vial is not venting through the piercer/needle gap correctly on dispensing pressurising the vial. This can occur if there is damage or blockage to the piercer or a large volume of liquid is being dispensed at a high flowrate.
- An insufficient or incorrect solvent is used for syringe washing between samples.
- Cooled liquids at a temperature below the operating temperature of the syringe cause dimensional changes in the PTFE seals and leaks past the seals.
- Cross contamination from the septa piercer through which the syringe needle passes on the ePrep ONE.

Troubleshooting and Additional Information

A. Needle Blockage

Blocked needles are typically caused by pieces of septa cored during vial piercing. ePrep ONE syringes use needles optimised for minimal septa piercing force, minimum septa coring and minimum restriction of sample on aspiration. However, incorrect septa selection and/or needle tip damage can result in the needle partially or fully blocking.

Solution:

- i. Check syringe at the start of the Run
 - a. Manually pump the syringe in solution and check aspiration rates. This would be a good practice before you start runs at the beginning of the day on all syringes
 - b. If flow looks restricted, the needle will need to be cleared.
 - c. If flow looks restricted, the needle will need to be cleared.
- ii. Use the following process to clear the needle :
 - a. remove the needle from the syringe. insert a stylet wire through the needle to clear the blockage. Stylet wires can be found in spare needles of the same type.
 - b. Refit the needle onto the syringe, ensuring compression spring is in place
 - c. Retest
- iii. Use approved septa and ensure the needle tip is not damaged. If the syringe is dropped or has hit a hard object, check it is not damaged.

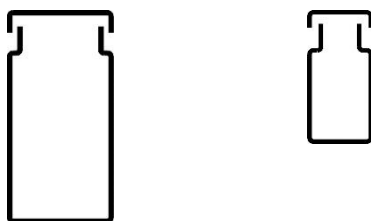
B. Septa Selection

Not all vial septa are the same and care should be taken when choosing vial septa for use on the ePrep ONE.

ePrep ONE has been designed for sealed vial operation. An ePrep ONE syringe needle should “tear” NOT “cut” the vial septa during the piercing operation. By tearing the septa, the needle will be effectively wiped, and the vial will reseal after it is withdrawn.

ePrep ONE syringe needles are polished on the tip and combined with a pliable vial septum provide reliable operation.

There are some vial septa which are problematic and should not be used with the ePrep ONE. **Vial septa to avoid include:** Hard Silicone – which tends to cut/core leading to needle blockages or do not reseal after piercing; Polyethylene/PTFE/Butyl – which typically don’t reseal after needle piercing



Hard or brittle septa can result in coring, causing the syringe needle to block. Use suitable soft septa only. As well as needle blockage, septa material can be displaced into a sample vial, this septa material can absorb analytes from the solution, also causing low recoveries.

Solution:

- a) Septa has good flexibility, which tears rather than coring on needle piercing.
- b) A needle can be manually pushed through the septa and checked for signs of rubber material inside the tip of the needle.
- c) Do not use septa with Polyolefin coatings as these will block the septa.
- d) Where possible, pre-slit septa are recommended, except if the vial is required to seal under some pressure (as is the case in Purge and Trap systems).

C. Excessive AirBubbles

Syringes in ePrep ONE have a vertical orientation. Because of the needle, a small airbubble equivalent to the needle volume may be left in the syringe after priming. This should not affect the dispensed volume. Also the ePrep ONE over-compensates for this by leaving a small residual volume (2% approx.) in the syringe after dispensing.

If excessive airbubbles or erratic results are observed, the airbubble may be greater than the sum of needle and residual volume resulting in the syringe under dispensing. The amount dispensed can vary between aliquots if the needle is partially blocked.

Solution:

- a) Check needle for blockage.
- b) Check needle seal, spring and cover nut is tightened.
- c) Check syringe, particularly plunger tip for wear
- d) Reduce aspiration speeds if required.
- e) Increase the residual volume as the last resort.

D. Needle Replacement

- a) Unscrew front cover nut and spring, remove needle.
- b) Slide spring and cover nut over the needle
- c) Carefully insert the replacement needle into the front of the syringe. Care should be taken not to damage the syringe Teflon insert when locating and inserting the needle
- d) Screw nut onto the front screw of the syringe barrel.

E. Checking Needle Seal

The PTFE needle seal (in plunger in barrel syringes) is located between the needle hub and needle shank (part of the needle inserted into the syringe barrel). If the seal is damaged or missing, air can leak into the syringe on aspiration and liquid can leak on dispense.

F. Liquid Aspiration Speeds and Pause

For viscous or volatile liquids, ePrep ONE aspiration speeds should be reduced to eliminate vacuum/air leak through the plunger and needle seals. ePrep ONE software is programmed with default aspiration speeds suitable for liquids with a viscosity and BP similar to water. These will need to be adjusted for some liquids.

Solution:

- a) Reduce aspiration speeds if required.
- b) Increase pause time to allow the syringe to fill

G. Plunger Jamming

The ePrep ONE is programmed by default to wash syringes before and after each use. For some problematic sample and reagent types, additional washes should be programmed into the ePrep ONE workflow and/or manual washes before use should be considered.

H. Cross Contamination from Needle Piercer

When a needle is withdrawn through a vial septa, the piercer guide is withdrawn first followed by the needle so that liquid on the needle is wiped by the septa.

If there is still air and pressure that has not equilibrated in the syringe, residual liquid can be ejected from the needle tip contaminating the needle piercer and top of the vial.

To prevent this a "Dispense Pause" of 1 – 5 sec should be included in the program to allow time for the pressure in the syringe to equilibrate with the atmospheric air pressure before the needle is withdrawn from the vial.

In appropriate Tasks in the ePrep ONE software a needle piercer wash function is included. Look in "Tool Wash Settings" for "Wash Piercer After Tool Wash"

ePrep Syringe Volume Calibration

For laboratories requiring instrument / syringe dispensed volume checking to comply with SOP and Quality Assurance requirements, ePrep ONE suggests the following approved gravimetric procedure.

A 5 decimal place analytical balance should be used, for low volume (low weight) measurements. From the gravimetric weight convert to volume via the liquid density adjusted for temperature of the measurement.

There are three pre-installed workflows in the software which will simplify this task. The three workflows have been created for 10% volume dispense from each of 100, 1,000 and 10,000µL syringes. It is important to ensure that when the needle exits from the vial, it does so with the needle tip immersed in the liquid. In this way, there will be no drop remaining on the end of the needle tip which could affect accuracy of the dispensed volume (see section 10). Therefore, for the workflows for the 100 and 1,000µL syringes, 350µL of water is first added to each of the vials before the 10% volume addition is started. The pre-addition of water is not necessary for the 10,000µL (10mL) workflow because 10% of the full volume of the syringe will dispense 1mL of water into each of the vials which will cover the end of the needle and remove any drop which might have remained on needle exit.

There is an option to check the volume of all three syringes using the same workflow. The first syringe in the workflow is the 10mL syringe. The addition of 1,000µL with this syringe ensures the needle is submerged in the water on exit after the dispense. There is a pause after the first task with an on-screen prompt reminding the user to weigh and record the weight of each of the ten vials. After the workflow is continued by the operator through selection of the Continue button, the 1,000µL syringe and then 100µL syringe are processed. After water has been added to all 10 vials, for each syringe, a prompt again appears reminding the operator to weigh the vials. This workflow is quicker to complete than individually running the three separate workflows and is recommended if all three syringes require volume checking.

The default setting used to dispense the 10% volume is multi dispense mode. Therefore, rather than aspirate the 10% volume 10 times and then dispense this volume into the 10 individual vials, the workflows will aspirate the full volume of the syringe and then dispense in multi dispense mode. For example, for the 1000µL syringe, the full syringe volume is aspirated and then 100µL is dispensed from 1000µL to the 900µL mark, and then for the next vial from the 900µL to the 800µL mark and so on. This mode gives a better representation of the syringe as the volume is dispensed across the complete length of the syringe barrel.

These four workflows pre-installed in the software are named:

- Syringe Volume Check – 100uL @ 10%
- Syringe Volume Check – 1,000uL @ 10%
- Syringe Volume Check – 10,000uL @ 10%
- Syringe Volume Check – all three syringes @10%

Materials and Conditions:

1. 5 decimal point analytical balance
2. Deionized/degassed water
3. New vials for every run
4. Thermometer
5. Gloves for handling vials when volumes are less than 50uL
6. Procedure
7. Measure the water temperature
8. Weigh each empty (or with water pre-added as described in workflow) vial (at least 10 vials)
9. Run workflow and ensure the following parameters are selected:
10. At least 10 output vials per volume
11. % Tool volume to over aspirate = 0.2%
12. Ensure needle is dipped in liquid on dispense / exit
13. Dispense flowrate maximum = 20uL/sec
14. Weigh each vial post workflow (for vials containing liquid before 10% volume dispense, the initial volume weight will also need to be recorded)

Repeat procedure for each vial.

ePrep Instrument / Syringe Volume Check Record

ePrep ONE

BALANCE & EQUIPMENT

ANALYST INFORMATION

Asset No:

Asset No:

Name:

ePrep ONE

Brand/Model:

Date:

Serial No:

Serial:

Signed:

Syringe

Volume (μL):

Other:

Checked

Target Volume (μL)	
Temperature of Water (°C)	

Replicate Number	Initial Weight (vial + pre-dispensed water if required)	Final Weight	Dispensed Weight (g)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Mean Dispensed Weight (g)	
Calculated Mean Dispensed Volume (μL) (Mean weight ÷ Water density at recorded temperature)	
Standard Deviation of 10 weighings	
Relative Standard Deviation (RSD) = (SD / Mean Weight) x 100	
Accuracy (%) – Recorded Volume / Target Volume) x 100	
Pass/Fail Result	

Calculated Mean Volume: Refer Standards, calculated using Mean Weight and Density at Used Temperature
Acceptance Result: Typical PASS/FAIL criteria accuracy between 99-100% of target volume and repeatability
 RSD < 1%

Appendix - Ensuring There is Enough Volume in Containers – Volume Validation

For containers aliquoting liquid to other containers, it is important to ensure the input container has enough liquid to cover supply to all output containers. So, for example if 5mL of a solvent is to be added to multiple containers as an extracting solvent and the input container is filled to the maximum volume of 50mL, you might initially think there would be enough volume to supply 10 output containers. However, the ePrep ONE won't be able to access the complete container volume of the input container. There will be a certain volume (named the 'Dead Volume') of the 50mL container which won't be accessible due to factors such as the standard 80mm needle length of the syringe, cap thickness and penetration of the needle into the container amongst other factors. In this case, the available volume in the 50mL jar is calculated at 37mL, so therefore a full solvent container (of 50mL) is able to supply seven extracting output containers (with aliquots of 5mL each) with solvent before the syringe in the task proceeds to the contents of a second input container in the group.

The 'Validation' button (located above the Workflow tasks) will check the volumes required in the workflow and report an error if there is insufficient liquid in any of the input containers. See Tables below for vial volumes.

Table: **ePrep ONE syringe needles (80mm)** - dead and available volume of common vials with the ePrep ONE.

Description	Vial volume (mL)	Needle Length (mm)	Available Volume -5% factor (mL)	Dead Volume +5% factor (mL)
1.5mL GC vial	1.5	80	1.15	0.31
4mL vial	4	80	3.31	0.54
20mL enviro tube	20	80	17.40	1.77
30mL enviro tube	30	80	22.34	6.82
40mL enviro tube	40	80	21.77	17.99
50mL Jam Jar	50	80	37.07	11.56
20mL HS metal cap, 22.5 OD	20	80	14.62	4.85
8mL x 60h vial	8	80	7.04	0.62
10mL HS metal cap, 22.5 OD	10	80	8.44	1.18
6mL vial, 22 OD x 40.5 H	6	80	4.74	1.06
MT plate 96 well	0.3	80	0.17	0.13
15mL centrifuge dipper tube	15	80	4.01	11.35
15mL centrifuge tube	15	80	5.37	9.84
50mL centrifuge tube	50	80	18.78	31.83

Table: ***μSPEed Needle (50mm)*** – dead and available volume of common vials with the ePrep ONE.

Description	Vial volume (mL)	Needle Length (mm)	Available Volume -5% factor (mL)	Dead Volume +5% factor (mL)
1.5mL GC vial	1.5	50	1.15	0.31
4mL vial	4	50	1.84	2.17
20mL enviro tube	20	50	6.46	13.90
30mL enviro tube	30	50	8.66	21.98
40mL enviro tube	40	50	8.09	33.15
50mL Jam Jar	50	50	24.49	25.50
20mL HS metal cap, 22.5 OD	20	50	5.50	14.96
8mL x 60h vial	8	50	2.77	5.36
10mL HS metal cap, 22.5 OD	10	50	5.15	4.82
6mL vial, 22 OD x 40.5 H	6	50	3.78	2.12
MT plate 96 well	0.3	50	0.17	0.13
15mL centrifuge dipper tube	15	50	0.92	16.27
15mL centrifuge tube	15	50	0.92	14.77
50mL centrifuge tube	50	50	2.76	49.58

Table: ***Filter Aspiration Needle (62mm)*** – dead and available volume of common vials with the ePrep ONE.

Description	Vial volume (mL)	Needle Length (mm)	Available Volume -5% factor (mL)	Dead Volume +5% factor (mL)
1.5mL GC vial	1.5	62	1.15	0.31
4mL vial	4	62	3.52	0.31
20mL enviro tube	20	62	11.93	7.83
30mL enviro tube	30	62	12.55	15.46
40mL enviro tube	40	62	12.55	26.93
50mL Jam Jar	50	62	23.02	21.86
20mL HS metal cap, 22.5 OD	20	62	9.15	10.92
8mL x 60h vial	8	62	4.96	3.22
10mL HS metal cap, 22.5 OD	10	62	8.80	0.78
6mL vial, 22 OD x 40.5 H	6	62	4.74	1.06
MT plate 96 well	0.3	62	0.17	0.13
15mL centrifuge dipper tube	15	62	1.34	14.30
15mL centrifuge tube	15	62	2.70	12.80
50mL centrifuge tube	50	62	9.17	42.48

14. Maintenance Guide

Faults

Fault/Issue	Issue	Explanation and Action
USB Comms won't connect or reconnect		Issue typically occurs when Instrument Comms doesn't disconnect properly during power failure or unexpected disconnection of the Control Computer. Steps to correct: <ol style="list-style-type: none"> 1. Press the software Comms Button. Comms button will display USB symbol if successful connection is made. 2. Disconnect the USB cable and reconnect the cable to the Computer. Comms button will display USB symbol if successful connection is made. 3. Cycle the instrument power to reset Comms .Comms button will display USB symbol if successful connection is made.
Tube Groups Disappear on Saving		Tube Groups must be assigned to a task before saving. Tube group not assigned to a task will be deleted on saving.
Undetected Tubes or Tube Groups		ePrep ONE uses both ultrasonic and touch detection for determining tube/vial placement. To ensure the correct detection of vials use only the caps and septa supplied with the vials. Ensure all vials, caps and septa in a single rack are the same height and vial/cap type. If the ePrep ONE fails to detect a particular vial, ensure the rack dimensions are correct for the vial size being used and the vials are closely located in the center of the rack position.
Validation Over volume Error - Input Vial		The volume entered for an input volume is the total volume liquid place in the vial NOT the vial volume. ePrep ONE automatically accounts for the useable volume (ie. allowing for needle depth etc) to determine if sufficient input liquid is available for a Workflow. ePrep ONE calculates the expected volume required from all nominated input vials required to complete the Workflow. If the User selected volumes of the input vials is less than calculated required volume, a validation error will be signaled. To overcome this error; 1) increase the volume of liquid in the input vial 2) select more than one vial for the Group (if allowed for the task) or 3) add additional task steps with alternate vials.
Validation Over volume Error - Output Vial		If the total volume to be dispensed in to single Output Tube exceeds the defined system volume of that tube (eg. Microtiter Plate), a validation error will be signaled. Steps to correct: Ensure a volume is not set for the Output Tube. If a volume is set, ePrep ONE will assume that the set volume already exists will add this to any dispensed volume in its calculation. Reduce the total dispensed volume so it does not exceed the defined volume
Syringe trapped Air Bubbles		Trapped Air Bubbles can be caused by: Empty Wash station reservoir High viscosity liquids Incorrect aspiration and dispensing speeds Partially blocked needle (see also Blocked Needles) Needle seal damaged Leaking syringe plunger Increase the pause time at end of the aspirate cycle.
Blocked Needle		Blocked needles are typically caused by pieces if septa cored during vial piercing. ePrep ONE syringes use needles optimised for minimal septa piercing force, minimum septa coring and minimum restriction of sample on aspiration. However hard brittle septa can result in coring causing the syringe needle to block. Steps to correct: Use conventional soft septa on vials Ensure the needle tip is not damaged. Burrs on the needle caused by the needle hitting a hard object can cause septum coring.
Unexpected reduced		If septa material is damaged or cored and particles of analytes are displaced

recovery of some compounds	into a sample vial, this septa material can extract analytes from the solution, causing low recoveries. Ensure syringe needles, septa piercer are in good condition and the correct grade of a soft septa is used.
Droplets remain on the syringe needle during dispense.	Droplets can formed at the needle tip when dispensing small volumes at low flowrates. These droplets can lead to reproducibility errors and sometimes the appearance of liquid above the septum and on the ePrep ONE piercer. Steps to correct: 1) When possible, dispense small volumes into liquid already in the Output Vial ie. Add the diluent to the vial first. 2) Dispense liquids as fast as possible 3) Pause after dispense to allow the droplet time to dislodge.
Sensor hit error on adjoining rack	Some rack combinations may foul the ePrep ONE forked foot if place adjacent to each other. Ensure high racks are never be placed immediately left of a low rack/vials.
Software Lockup	If the ePrep ONE software locks up (ie. All keystrokes are no responsive) the following procedure should be used to close ePrep ONE software: 1) Select Task Manager form the Task Bar menu 2) Click on ePrep ONE software from the Task List 3) Click End Task 4) Restart the ePrep ONE Software
Observation of Sample Carryover	Carry over is typically caused by insufficient wash and/or priming of the syringe before the next sample. Steps to correct: 1) Increase the syringe wash after each sample. It is better to use additional small volume wash cycles than a single large volume wash cycle to minimise carryover. 2) Increase the number of prime cycles before sample aspiration. 3) Prime to waste to ensure carryover sample is not recycled into next sample vial.
My vial rack is not listed	Rack definitions must be predefined in ePrep ONE's software for them to be suitable for use with the ePrep ONE. The ePrep ONE software uses the rack and Mat definition to determine X and Y coordinates of vials when setting up and running a Workflow. Contact ePrep if your rack definition is not listed.
Needle length will not reach the bottom of the vial	ePrep ONE syringes use an 80mm long needle and μ SPEed cartridges use 50mm long needles. The ePrep ONE senses the height of the septa cap and for aspiration from a vial will automatically insert the needle as far as possible without colliding with the septa cap or bottom of the vial. Effective vial penetration for an 80mm needle is 56mm below the septa cap and 25mm for μ SPEed cartridges. When the volume of the vial has been correctly defined, the ePrep ONE software will automatically determine the volume available to be aspirated given the needle penetration into the vial. When selecting volumes to be aspirated from particular vials, be aware of the volume that cannot be reached below the maximum penetration of the needle into a vial.
Workflow did not aliquot all samples correctly	If a Workflow does not visually or chromatographically aliquot all samples correctly, the following possible causes should be checked: Check for needle blockage Check set input vial volumes are correct and allowance for needle depth penetration has been considered. Ensure sufficient mixing of sample after aliquots
ePrep ONE stopped with syringe/tool still engaged.	If the ePrep ONE has stopped or been stopped for any reason with the syringe still connected: Turn ePrep ONE power off and rotate the foot away from the syringe needle Turn the ePrep ONE power on Open the ePrep ONE software and enter a Workflow Run. With the syringe held tightly in one hand, press the Release Tool button at the bottom right of the run screen with the other hand to eject the tool. Replace the syringe on the tool rack
Sample Mixing	Use syringe mixing or vortex mixing once sample aliquots are complete to ensure output vial is homogeneous before sampling,
Duplicate and Triplicate samples	Sample task is a one input vial to one output vial. To achieve duplicate and triplicate samples, duplicate the task series in a second task group.

Syringe Washing	Syringe washing is an often-overlooked parameter, and when optimised, can significantly lower carryover. You will need to experiment with your syringe washing and sample priming routines, however 3-5 sample primes (sometimes called pumps), and three washes from the flowing Wash Station before and after injection give reasonably good results. If the sample is particularly viscous, you may need to use a viscosity delay, to allow time for the viscous sample to rise up into the syringe and avoid variable volumes being injected.
Can we use our own computer with windows 10 to control the system	The software is supplied with a Control Computer with the application installed which runs on Windows 10. is an application which can be installed on windows 10+.
What is the max volume of the sample can prepare?	The ePrep ONE deck versatile and is setup to handle different rack types. Depending on the type of vial and rack you are using the maximum number of samples varies. We have currently configured our ePrep ONE to hold 105 samples using 40 mL glass vials / 1.5 mL GC vials. Can I ask what type of vials and racks did you plan to use?
What is the minimum volume can the equipment prepare within our tolerance?	The ePrep ONE uses syringes to dispense aliquots of samples. Currently they have a 10uL, 100uL, 1000uL and 10mL syringe. See specifications for precision and accuracy values
Can the equipment tolerate all organic solvents?	ePrep ONE have tested using methanol, DCM, acetone and hexane. The instrument appears to handle solvent well using the reagent station. The wash station however is more suited to water due to the peristaltic pumps. Because ePrep ONE uses Analytical Syringes with needle sealed vial are typically used reducing exposure of solvents to the instrument environment.
Can ePrep ONE tolerate water, inorganic acids or bases?	Water and weak et to test inorganic acids and bases shouldn't be a problem.
Preparing a standard solution from raw chemical, can the auto diluter do the sequential dilution? E.g. we put 5 mg of sample to a vial. Can the diluter prepare 50 ppb to 10 ppm calibration curve?	The ePrep ONE can be used to sequentially prepare calibration curves from a stock solutions. Workflows can also be setup to create mixed standards. We have not verified this in Sydney yet but the options in the software make it quite easy to do.

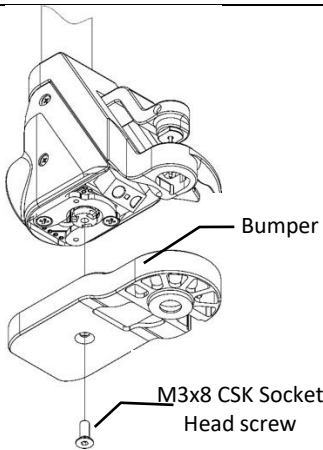
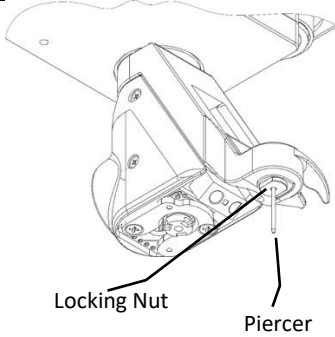
<p>We have 50 ppm solution, can ePrep ONE system prepare 3 ppm solution calculated by itself or can we input the dilution factor to let it work for us?</p>	<p>ePrep ONE software has a serial dilution function which allows for a sample preparation of a series of standards. Additionally, there are add diluent functions which allow you to add varying amounts of solvent.</p>
<p>Workflow Times (Indicative)</p>	<p>WORKFLOW 1 - 10uL of internal standard from 1 x Input Vial to 20 x Output Vials (1.5mL) containing 1mL sample and Mix on Dispense (Default Parameters) - Wash Syringe between Vials (Default Parameters) Workflow Run Time = 24 minutes</p> <p>WORKFLOW 2 - 1mL of sample form 20 x Input Vials (1.5mL) to 20 x Output Vials (1.5mL) (Default Parameters) - Wash Syringe between Vials (Default Parameters) Workflow Run Time = 21 minutes</p> <p>WORKFLOW 3 Task Group #1 - 10uL of internal standard from 1 x Input Vial to 20 x Output Vials (1.5mL) (Default Parameters) Task Group #2 - 1mL of sample form 20 x Input Vials (1.5mL) to 20 x Output Vials (1.5mL) and Mix on Dispense (Default Parameters) - Wash Syringe between Vials (Default Parameters) Workflow Run Time = 34 minutes</p>

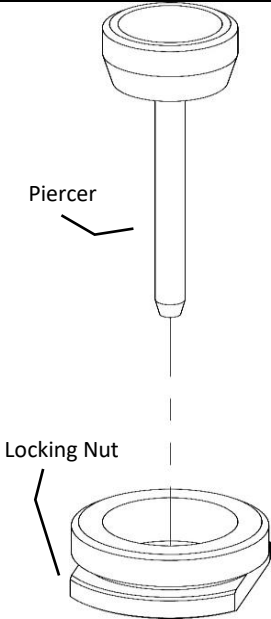
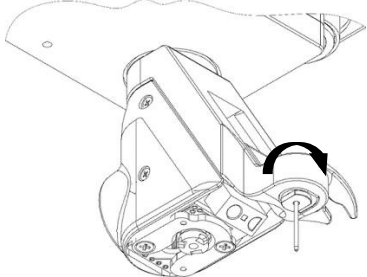
Instrument Recalibration

Step	Image	Description
1	<p>Calibration Probe Storage</p>  <p>Wash Station</p> <p>Calibration probe storage position</p> <p>Calibration Probe is kept on its deck position next to the Wash Station for storage.</p>	
2	<p>Calibration Probe</p>  <p>Hex End</p> <p>Screw Thread End</p> <p>Locate the Calibration Probe found in the ePrep Accessories Box.</p>	
3	<p>Remove the Sensor Retaining Screw</p>  <p>Sensor retaining screw</p> <p>Hex end of the Calibration Probe</p> <p>Use the Hex end of the tool to undo the Sensor Retaining Screw at the base of the ePrep Rotating Foot. Hold the Bumper so that it does not fall off when the screw is removed.</p>	Using the Screw Hex end of tool to undo the screw at the base of the ePrep ONE
4	<p>Install Calibration Probe</p>  <p>Screw end of the Calibration Probe</p> <p>Replace the screw with the Calibration Probe and firmly screw it into the threaded hole, ensuring the foot sensor remains in position. WARNING: Do not over-tighten.</p>	Once the screw has been removed, turn the Calibration Probe/ Screw Hex Tool over and firmly screw it into the threaded hole the screw was removed from ensure that the foot bumper remains in position

5	<p>Opening Calibration Procedure</p>  <p>Calibration Button</p> <p>Deck calibration process can be started from the "Calibrate Deck" button found in System > Service menu</p>	<p>Open the Calibrate Deck option on the ePrep ONE Software through System>Service>Calibrate Deck</p>
6	<p>Check Installation of Calibration Probe</p>  <p>If required the software will ask if the Calibration Probe has been correctly installed.</p>	<p>Check the Calibration Probe is installed correctly and Click on YES.</p>
7	<p>Check Installation of Calibration Plates</p>  <p>Check the Adapter Plates are installed correctly. On the software Main Screen click on <u>System > Service > Calibrate</u> to open the Calibrate Deck option. Software will ask if Plates are positioned correctly.</p>	<p>Check the Vial Adaptor Plates are installed correctly.</p>
8	<p>Trigger Calibrate Deck</p>  <p>Calibrate Deck Button</p> <p>Click on "Calibrate Deck", ePrep will move the Calibration Probe to allocated positions on the deck and tool rack to record instrument calibration data. Full calibration takes around 10 minutes.</p>	<p>Click on Calibrate Deck. ePrep ONE will move the Calibration Probe on the P-Drive to allocated positions on the deck. This process will take approximately 5 minutes and the positions will be recorded to provide accurate instrument calibration.</p>
9		<p>When complete calibration dialogue will display "Calibration updated successfully". Calibration data is automatically written to the instrument EPROM to be used during operation.</p>

Changing the Piercer

Step	Photo	Image	Description
1			Unscrew the Calibration Probe/ Screw Hex Tool from its position beside the Wash Station
2		 Bumper M3x8 CSK Socket Head screw	Using the Screw Hex end of tool to undo the screw at the base of the ePrep ONE Foot
3			Remove the Bumper from the foot
4		 Locking Nut Piercer	Using a spanner loosen the Retaining Nut holding the old Piercer

5			Remove the old piercer from the Foot
6			Remove the Piercer from the Locking Nut and install a new Piercer into it. Refit the new Piercer taking care not to cross thread the Retaining Nut during tightening.
7			<p>Install the Locking Nut holding the Piercer back into the Piercer Holder and tighten the Locking Nut using 6mm spanner in the direction shown in the image.</p> <p> Before using the spanner, feed the Locking Nut into the Piercer Holder thread manually to void damaging the thread.</p>
8			Remove a Syringe from the Tool Holder and insert the needle through the top of the Foot and through the Piercer.

9

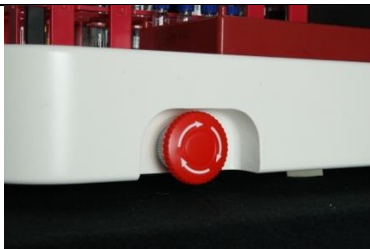
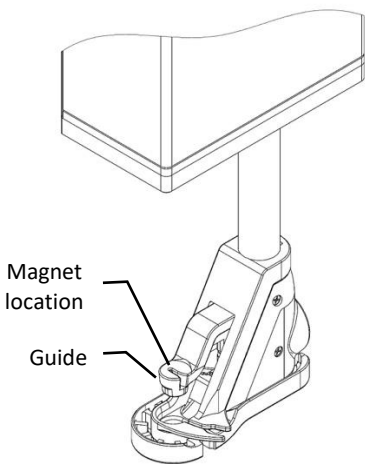


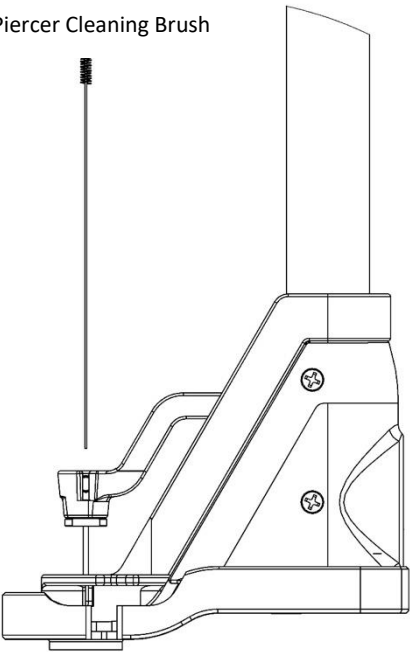
Ensure the needle can smoothly pass through the piercer. Tighten the Retaining Nut.

Do not overtighten.

10		Replace the Sensor Bumper
11		Recheck passing the Syringe Needle through the Foot and Piecer.

Cleaning the Piercer

Step	Image	Description
1		Press the Emergency Stop button while the ePrep ONE Workstation is in parked position.
		When the ePrep ONE Power is OFF, the Piercer can be easily exposed. Ensure Piercer is not bent.
2		Blow any potential dust from the Guide, Magnet and inside the Piercer using a Compressed Air Can.

<p>3</p>	<p>Piercer Cleaning Brush</p>  <p>The diagram illustrates a side view of a mechanical assembly, likely a piercer. A long, thin brush with a dark bristle head is shown being inserted into a vertical opening of the device. The device has a complex, angular design with various components and screws visible.</p>	<p>Dip the Piercer Cleaning Brush in IPA (iso-propyl alcohol) and push it back and forth through the Piercer at least x5 times with the bold end going first as shown in the image.</p>
<p>4</p>		<p>Repeat Step 2 and blow any potential dust from the Guide, Magnet and inside the Piercer.</p>

Syringe Care and Needle Replacement

Syringe Specifications Removable Needle: 5-120 °C

Syringe Use

- Always inspect the syringe before use.
- Avoid unnecessary movement of the plunger when the syringe is dry.
- Never force the plunger

Syringe Cleaning

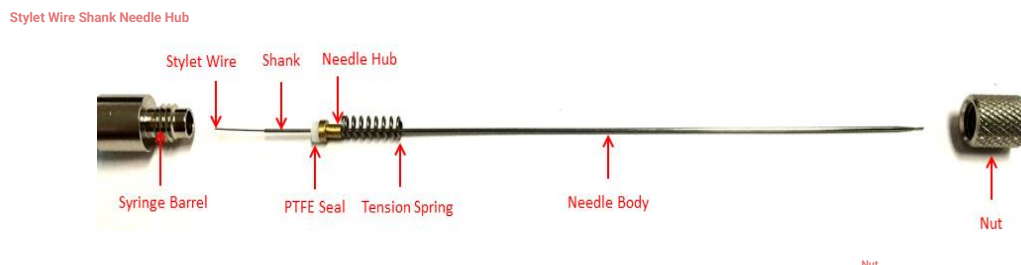
- Syringe cleaning agents will usually depend on the contaminating material. Methanol, methylene chloride, acetonitrile and acetone are commonly used solvents for cleaning
- After the syringe has been cleaned, rinse the syringe with acetone, remove plunger and air dry. Rinse with acetone and air dry to store.
- Do not immerse the entire syringe in solvent as this may damage the adhesive used to bond parts of the syringe
- Clean externally by wiping with a tissue
- Avoid cycling the plunger when the syringe is dry

Needle Care

- Check the needle for burrs prior to use. Use a fine emery board or carborundum to remove burrs.
- To unblock needles,
 - Remove the needle from the syringe and gently push the supplied stylet wire through the needle
 - Blockages can be removed by removing the plunger and fill the syringe with solvent using another syringe. Re-insert the plunger and gently push solvent through needle. Never force the plunger. Excessive pressure may crack the syringe barrel.

Needle Replacement

It will be necessary to replace the needle if the needle is bent or blocked. The following two diagrams show the position of the needle relative to the nut, spring, and syringe barrel. Be sure to remove the stylet wire prior to installing the new needle. The wire should be kept as it is handy to remove blockages from the needle.



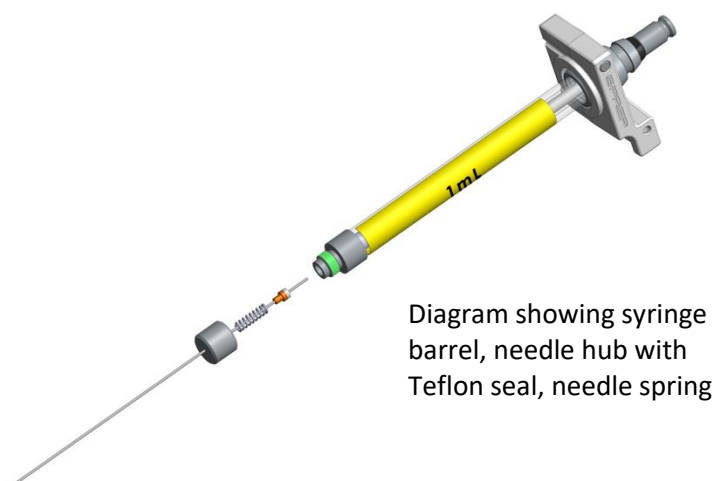


Diagram showing syringe barrel, needle hub with Teflon seal, needle spring

If needles become bent while used on the ePrep ONE platform investigate the cause. Likely causes are: dirty or bent piercer, incorrect needle fitted to the syringe, spring located between the needle seal and the syringe, incorrect positioning of vials, improper functioning of the needle guide and foot of the ePrep ONE.

To replace needles; unscrew front cover nut and spring, remove needle. Carefully insert replacement needle into the front of the syringe, slide spring and cover nut over the needle and screw nut onto the front screw of the syringe barrel.

The needles for ePrep syringes are a special 80mm length. Do not substitute alternative needles which will cause incorrect operation of the ePrep ONE.

Syringe Storage

To protect against breakage, store the syringe in its original packaging or on a syringe rack. Always thoroughly clean the syringe before storage.

Shipping

DO NOT return any syringe to ePrep unless requested to do so by an authorized ePrep representative.

DO NOT return any syringe that has been used with radioactive, infectious or hazardous materials.

Any syringe being returned must be clearly marked with a Return Authorization Number, which is available from your ePrep representative.

Preventative Maintenance

It is recommended an inspection of the machine is carried out annually by a competent instrument technician. Please discuss a preventative maintenance plan with your local ePrep representative.

15. SPARES AND REPLACEMENT PARTS

For a full list of replacement parts, see www.epre-analytical.com or contact ePrep

Syringes with Needles

Part No.	Code	Description
01-09014	100µL EPREP Syringe	100 µL 80mm 26g Cone Removable Needle EPREP Teflon Tip Syringe
01-09020	1mL EPREP Syringe	1 mL 80mm 26g Cone Removable Needle EPREP Teflon Tip Syringe
01-09026	10mL EPREP Syringe	10 mL 80mm 26g Cone Removable Needle EPREP Teflon Tip Syringe

Replacement Needles

01-09803	Replacement Needle for 10-25 µL Syringe, 80mm/Cone (PKT 2)
01-09807	Replacement Needle for 25 µL - 500 µL Syringe, 80mm/Cone (PKT 2)
01-09811	Replacement Needle for 1mL Syringe, 80mm/Cone (PKT 2)
01-09815	Replacement Needle for 5-25mL Syringe, 80mm/Cone (PKT 2)

Detachable Needles with µSPEed Connection

01-10990	µSPEed Hub Needles (Pkt 10)
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Replacement Piercer

01-09795	Piercer for ePrep (Pkt 2)
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µSPEed Syringes

Part No	Code	Description
01-09083	500 µL µSPEed EPREP Syringe	500 µL µSPEed EPREP Syringe
01-09087	2.5mL µSPEed EPREP Syringe	2.5mL µSPEed EPREP Syringe

Disk Filter Luer Syringe

01-09086	2.5mL ePrep Syringe, Luer
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16. Glossary of Terms

Term	Description
μSPEd Cartridges	μSPEd cartridges offer a unique opportunity to revolutionise micro SPE and micro fractionation. Using a one-way check valve, the sample is aspirated through the cartridge and dispensed on to the top of a sorbent bed.
Accessories	A range of devices are available for the ePrep ONE to expand the system's capabilities. Some items are supplied standard with the ePrep ONE and others are optional. Check at www.eprep.com.au for the latest information on accessories that are available for the ePrep ONE.
Adaptor Plate (Mat)	The task of defining vial positions accurately is made easy for the operator by using vial racks whose coordinates have been mapped by ePrep ONE and are included in the parameters supplied by ePrep. It just needs to be ensured by the user that the correct vial rack has been used and it is being used with the correct Vial Rack Adapter plate for that specific vial rack.
Batch (Task Group)	Batch processing is where the same Task is preformed on all samples before proceeding onto the next sample. Batch processing is the fastest way to process a group of samples as it eliminates the tool change and washing steps between samples.
P-Drive	The P-Drive is the heart of the system with an array of actuators, motors and sensors incorporated. The P-Drive incorporates a separate microprocessor for controlling and monitoring the various functions.
Rack RFID Tag	ePrep uses RFID Tag identification to check validity and location of tube/vial racks on the deck. RFID Tags are placed on the rack or a Adapter Plate post depending on the rack configuration.
Sensor Foot	The sensor foot at the bottom of the P-Drive is a mechanical switch that precisely detects the P- Drive foot touching an external feature.
Sequential	Sequential or serial processing is when Tasks to complete a full workflow on a the first sample are finished before starting the same Tasks on the second sample. Sequential processing is normally slower than batch processing as it typically requires tool changing and syringe washing between Task.
Task	A set of predefined actions that make up a sample preparation workflow. A Task typically contains a tool, tool parameters, rack and accessory definitions and allocation of input and output vial/tubes
Tool Station	12 stations for syringes and other tools that can be coupled to the P-drive via the ePrep Xchange coupling system. Each station is designed to hold the syringe/tool in the correct position for engagement by the Xchange coupling system.
Tools	ePrep ONE syringes and tools are fitted with Radio Frequency Identification (RFID) tags
Validation (Workflow)	Workflow validation examines different characteristics of a workflow to locate issues that might prevent the workflow from Running
Vial/Tube	A tube/vial is a glass or plastic vessel for storage and manipulation of liquids. The range of vials that can be used with ePrep is only restricted to fitting in a defined rack
Wash Station	The Wash Station is designed for washing syringe needles to prevent cross contamination and also as a means to empty syringes to waste.
Workflow	Process ways in which a sample is treated prior to its analysis
XCHANGE®	ePrep's patented system for automated syringe and tool exchange.

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