TECAN.

Operating Manual for Resolvex A200

Resolvex™ A200

RESOLVEXCONTROL

Operating Manual

TECAN.

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1 Safety

Anyone intending to use the Resolvex A200 should first read the entire manual before operating the device. There is considerable danger to an operator that does not understand the potential hazards associated with this product.

⚠ **Warning**: "This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer, and Bisphenol A, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov."

1.1 Intended Use

The Tecan Resolvex A200 device will be used to perform solid phase extraction of analytes from various liquid sample types as a stand-alone module or coupled to a larger system for sample preparation. The device is intended to be used in a professional laboratory setting to perform various solid phase extraction procedures using positive pressure application to filter/extraction plates to prepare samples for downstream analysis (*e.g.* LC/MS, HPLC).

1.2 Chemical, Fire, Biological and Radiological Safety Considerations

Many reagents and samples used with the Tecan Resolvex A200 can pose chemical, fire, biological and radiological hazards. The user must always understand the potentially hazardous effects of all the materials he/she works with. To prevent personal injury and/or equipment damage, we recommend that the user always wear personal protective equipment following GLP (Good Laboratory Practice). Consult your company's safety expert for guidance.

The Tecan Resolvex A200 units are manufactured from aluminum, stainless steel, and plastics. Always clean up spills or overflow immediately to prevent any damage to the equipment.

1.3 Decontamination Procedure

Wipe or rise as necessary all surfaces exposed to biological contaminants with a decontamination reagent in accordance with the biological material safety class as appropriate.

For the safety of Tecan Field service and/or Repair Depot Employees due to unknown substances used, the equipment should be flushed (includes solvent tubing), thoroughly cleaned and decontaminated before any service activity by Tecan. A certificate of decontamination (P/N 200-05-PRO-T01) is required as evidence of such decontamination.

1.4 Applicable Symbols

Symbol	Definition
 Tecan SP, Inc. 14180 Live Oak Avenue, Baldwin Park, CA 91706 USA	Indicates the manufacturer
	Indicates the need for the user to consult the instructions for use
	Indicates the date when the unit was manufactured
REF	Indicates the manufacturer's catalogue/part number
SN	Indicates the manufacturer's serial number so that a specific unit can be identified
	Indicates the range of humidity to which the unit can be safely exposed
	Indicates the temperature limits to which the unit can be safely exposed
	Indicates the date after which the product is not to be used
	WEEE Symbol
	China RoHS label
	CE Mark
	CSA Label
	UKCA Mark

1.5 Warning Symbols

The following warning symbols are to alert the user of the risks (of death, injury, or physical reactions) that may arise if the unit is used or misused.

Symbol	Definition
	Indicates the need for the user to consult the instructions for use for important cautionary information such as warnings and precautions that cannot, for a variety of reasons, be presented on the unit itself
	Indicates a warning of a closing motion of mechanical parts of equipment. Care should be taken to avoid injury to hands when in the vicinity of equipment with closing mechanical parts.
	Biological Risk
	Message to read before proceeding

1.6 Disposal

1.6.1 Introduction

Follow laboratory procedures for biohazardous waste disposal according to national and local regulations.

This chapter provides instructions for how to lawfully dispose of waste material accumulating in connection with the Tecan Resolvex A200 device.

CAUTION

OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS

1.6.2 Disposal of Packing Material

The packing material consists of recyclable and non-recyclable materials. If you do not intend to keep it for future use, e.g. for transport and storage purposes, please dispose of the packing material according to local regulations.

1.6.3 Disposal of Operating Material

WARNING

BIOLOGICAL HAZARDS CAN BE ASSOCIATED WITH THE WASTE MATERIAL (MICROPLATE) OF THE PROCESS RUN ON THE TECAN Resolvex A200 DEVICE TREAT THE USED MICROPLATE, OTHER DISPOSABLES, AND ALL SUBSTANCES USED IN ACCORDANCE WITH GOOD LABORATORY PRACTICE GUIDELINES. INQUIRE ABOUT APPROPRIATE COLLECTING POINTS AND APPROVED METHODS OF DISPOSAL IN YOUR COUNTRY, STATE, OR REGION.

1.6.4 Disposal of the Unit

If you have any questions concerning the disposal of the device, please contact your local Tecan customer support.

Pollution degree	2 (IEC/EN 61010-1)
Method of disposal	Contaminated waste

ATTENTION

DIRECTIVE 2012/19/EU ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

NEGATIVE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE TREATMENT OF WASTE.

- **DO NOT TREAT ELECTRICAL AND ELECTRONIC EQUIPMENT AS UNSORTED MUNICIPAL WASTE.**
- **COLLECT WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT SEPARATELY.**

WARNING

DEPENDING ON THE APPLICATIONS, PARTS OF THE TECAN Resolvex A200 DEVICE MAY HAVE BEEN IN CONTACT WITH BIO-HAZARDOUS MATERIAL.

- **MAKE SURE TO TREAT THIS MATERIAL ACCORDING TO THE APPLICABLE SAFETY STANDARDS AND REGULATIONS.**
- **DECONTAMINATE ALL PARTS BEFORE DISPOSAL.**

1.7 Laboratory Practices

⚠ **Warning**: Extreme care should be exercised when handling flammable solvents to prevent physical damage to the laboratory and to prevent injury to the users. Material Safety Data Sheets (MSDS) should be available, studied, and carefully followed before using any of the chemicals. Suitable education or training in the handling of chemicals is highly recommended.

2 Product Overview

The Tecan Resolvex CONTROL Software is a MS Windows® application that is used to control the Tecan Resolvex A200 device which has been designed to facilitate the automated processing of Resolvex columns by means of dispensing solvents at different solvent volumes and dispensing speeds as well as applying automated pressure profiles to the columns to push solvents and samples through the sorbent beds of the Resolvex columns.

The Tecan Resolvex A200 for positive pressure Solid Phase Extraction (SPE) offers state-of-the-art operation for SPE of individual columns containing sorbent beds of a few milligrams. The Resolvex A200 is self-adjusting to column height, allowing it to accommodate different size columns without the need for special adapters or accessories.

Resolvex A200

2.1 Major Components

2.1.1 Touch Screen Computer

The touch screen computer along with the Resolvex CONTROL software provide the interface to the machine.

2.1.2 Positive Pressure Manifold

The positive pressure manifold, pneumatic clamping system and dual air flow paths allow for assays with repeatable pressure profiles. The up and down motion of the manifold is achieved by means of a pneumatic cylinder that exerts enough force that loss of limbs is possible. Do not try to adjust objects under the manifold while it is in motion. Doing so could result in a crushed finger or hand. If an object is trapped in a clamped manifold do not try to adjust it with one's fingers, first remove the clamping force before making adjustments.

2.1.3 Safety Light Curtain

The safety light curtain detects the presence of objects crossing its boundary to prevent the air manifold from inadvertently crushing an outside object (such as a finger) when operating the machine. The default state of the light curtains is in a muted state. That is to say they will detect objects in their field but not engage the safety systems. Detected objects cause the deck lighting to change to the color of red. When the safety system is engaged the deck lighting turns to the color green and remains green while a potentially hazardous situation is present. Should the light curtain field be obscured while the deck lighting is green, the safety system will activate and the dangerous pneumatic system pressure will be dumped rendering the manifold harmless. The safety light curtain is a back up to safe practices and operators of the equipment should not put themselves in harm's way while the manifold is in motion.

2.1.4 Safety Gas Release

A further safety system that releases all dangerous pneumatic pressure when power is removed from the device either by using the power button or by disconnecting power from the back of the unit.

2.1.5 Dual Syringe Pumps

The dual syringe pumps provide increased dispensing speeds over previous generation products for high volume sample preparation applications. The pumping action is implemented in parallel and identical solvents must be connected to each pump port. Port 1 of each pump is reserved for solvent output and is connected directly to the solvent manifolds above the deck of the unit.

2.1.6 Motion Controlled Eight Port Dispense Head

The dual axis motion controlled eight port dispense head allows for parallel dispensing of solvents in either four or eight wells simultaneously. This is accomplished by means of a four port solvent manifold connected to the output of each pump. Critical to the machines ability to accurately dispense is the tubing that runs between the four port solvent manifold and the eight port dispense head.

2.1.7 Dispense head pump coupling

Looking at the eight port dispense head from the front of the Resolvex A200, the left four ports are coupled to the bottom pump and the right four ports are coupled to the top pump.

2.2 Construction

The Resolvex A200 is constructed primarily of stainless steel and anodized aluminum. Other materials include silicone rubber, polyethylene, polypropylene and polycarbonate. The Touchscreen PC is not solvent resistant.

3 Location Preparation and Installation

3.1 Site Preparation

Before the Resolvex A200 can be installed, the location of the unit needs to be prepared properly.

3.2 Ventilation

The Resolvex A200 unit should be placed in a laboratory and operated where there is proper ventilation or from inside a chemical fume hood when volatile solvents are used. Alternatively a 4" (101.6 mm) I.D. snorkel can be fitted on the fan output and plumbed into and existing ventilation system. The Resolvex A200 is also available in a Proteomics version. Please refer to Section 14 for additional information and warnings regarding its setup and use for the Proteomics version.

⚠ **Warning**: Extreme care should be exercised when handling flammable solvents to prevent physical damage to the laboratory and to prevent injury to the users. Material Safety Data Sheets (MSDS) should be available, studied, and carefully followed before using any of the chemicals. Suitable education or training in the handling of chemicals is highly recommended.

3.3 Electrical Requirements

100-240VAC @ 120W MAX for the provided AC-DC power converter.

Resolvex A200 input power is 24VDC, 5A MAX.

3.3.1 EMC Statement

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 and CISPR 11/EN 55011. 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.

3.3.2 Detachable Mains Power Cord

Warning: The power supply for the unit is equipped with a detachable mains supply cord. This cord was selected specifically for use with this unit's power supply. Replacing this cord with a similar cord that has inadequate power rating can pose a fire hazard. If this cord needs to be replaced, contact a Tecan sales representative to get an adequately rated replacement part.

3.4 Gas Requirements

The Tecan Resolvex A200 operates using compressed air or nitrogen both to seal the columns and to displace liquid and must also be within 60" (1524mm) of the installation site.

Warning: It is essential to use a gas source that is free of moisture, particulates, and hydrocarbons to prevent sample contamination and general fouling of the manifold.

The optimum gas supply 5.5 bar (80 PSI) is achieved by a regulator positioned between the gas source and the unit. This unit is supplied with an installation kit which includes 8 feet of 1/8" ID (1/4" OD) polyethylene tubing and connectors to 1/8" NPT or 1/4" NPT.

Pressure Range: Flow 4.1 bar (60 PSI) Min. – 7.0 bar (100 PSI) Max.

Optimum conditions: 5.5 bar (80 PSI), 7.1 m^3/h (400 SCFH) Max. (22C, 14.69 PSIA)

Warning: Gas pressure must not exceed 7.0 bar (100 PSI). Exceeding this pressure may result in damage to the unit.

The installation of an inline pressure regulator, to properly display the line pressure going into the unit and to regulate the inlet line pressure, is highly recommended. If multiple pieces of equipment are connected on the same line, it is encouraged to add an easily accessible shut-off valve to each of the units, should disconnection be required.

Warning: Full flow range cannot be achieved if the gas pressure range is between 4.1 bar (60 PSI) to 5.45 bar (79 PSI).

The values on the Y-axis of a pressure profile graph represents the percentage of the incoming air pressure. The unit is calibrated to operate with an optimum gas supply of 5.5 bar (80 PSI). If the pressure of the gas supply drops below 5.5 bar (80 PSI), the pressure profile will be inaccurate above the input pressure.

If 5.5 bar (80 PSI) cannot be guaranteed, then a lower regulated pressure should be provided such that the input pressure does not vary.

3.5 Weight and Dimensions

Unit's weight is approximately 84 lbs./38.3 kg.

Unit's dimensions are approximately 14.9" (378mm) W x 21.3" (542mm) D x 23.6" (600mm) H.

Shipping weight of the Resolvex A200 in its crate is approximately 255 lbs./116 kg.

Shipping crate dimensions 25.5" (648mm) W x 45.8" (1162mm) L x 34.5" (876mm) H.

3.6 Table/Bench and Space Requirements

For the Resolvex A200 to function properly, adequate spacing and table support is required. The minimum space required is the space for the Resolvex A200 plus any solvent bottles. For hood operation with Solvent Bottle Staircase and the included Solvent Lines, a minimum space is recommended: 28.0” (711mm) W x 20.0” (508mm) D x 25.0” (635mm) H. For standalone snorkel operation with Solvent Bottle Staircase and the included Solvent Lines, a minimum space is recommended 28.0” (711mm) W x 30.0” (762mm) D x 25.0” (635mm) H. A flat, stable and table to support the Resolvex A200 weight (listed above) plus any accessories.

3.7 Environmental Conditions

The Resolvex A200 is intended for indoor use only with an ambient surrounding temperature range of 15°C to 32°C (59°F to 90°F).

The relative humidity (non-condensing) should be 20% to 80%.

3.8 Unpacking

Good safety practices should be performed when handling, moving, and unpacking the shipping boxes.

3.8.1 Lifting

Lift the Resolvex A200 out of the carton and place it in the selected location. Take care when lifting the unit and ensure that it is held on both sides. The unit is heavy (greater than 18kg - 40 lbs, see above) and may require two people to lift it.

3.8.2 Supplied Parts

The Resolvex A200-96 and Omics are shipped with the 253-5457 Accessory Kit which contains the following items. NOTE: The Omics unit comes with the additional 30189741 KIT UPGRADE PROTEOMICS

QTY.	Part Number	DESCRIPTION
1	253-5168	A200 WASTE CONTAINER ASSY
1	253-0040	ACCESSORY KIT, IN LINE REGULATOR
1	253-0090	BOTTLE STAIRCASE
1	253-0103	SEAL COLUMN CONSTINUENT 10G
1	253-2707	CONSUMABLE ACCESSORY KIT (Containing)
5	253-0036	96-WELL BARRIER, 1.6" INSERTS, 5 PACK
2	253-5359	PLATE 96 DEEP WELL PP. 1.2ML 5/PK
2	253-0037	WASTER DISPOSAL SPACER
1	278-0035	SEAL COLUMN REMOVABLE 96 PL. ASSY.
1	278-0060	96 WELL PRE-SLIT SILICONE MAT, 10 PACK (PRE-PACKAGED)
1	30174237	PLATE NBE ATLAS 96 WELL 5MG _1/EA (Used for installation only)
1	253-2709	A200 BOTTLE KIT ASSEMBLY (Containing)
8	253-5288	1L BOTTLE
3	253-1108	250ML BOTTL
1	253-1110	125 ML BOTTLE
1	253-2708	ALD INSTALLATION KIT ASSEMBLY (Containing)
1	900-0295	1/4 INCH OD, 95 DUROMETER, POLYURETHANE BLUE
1	900-5070	STRAIGHT FITTING, 1-8 NPT X 1-4 OD NP
1	900-0254	PNEUM, UNION ELBOW, 1/4", NICKLE PLATED
1	900-0279	PNEUM - SWIVEL MALE RUN TEE
1	323-5398	POWER SUPPLY, 120W AC TO 24VDC
1	900-5069	REDUCER BUSHING, 1/4"NPT MALE x 1/8"NPT FEMALE
3	900-5101-CUT	TUBING ASSY, SOLVENT LINE
1	30174097	TOOL EXTENDER FOR FLANGELESS NUT
1	30174777	TOOL HEX KEY 5-64IN
1	30188369	TOOL HEX KEY 7-64 IN
1	30195293	TECH SUPPORT INFO LABEL
1	253-5286	RESOLVEX A200 OPERATING MANUAL
1	102-5460	RESOLVEX A200 IQ/OQ Checklist
1	102-1013	RESOLVEX A200 Operator Training Checklist
1	30138084	RESOLVEX A200 ACCEPTANCE PROTOCOL
1	30215534	PM CHECKLIST A200
1	30141932	A200 RELEASE NOTES
1	30182576	DOC CHECKLIST REMOTE INSTALLATION A200
1	30139045	DOC A200 DECLARATION OF CONFORMITY

The Resolvex A200-24 is shipped with the 30221772 Accessory Kit which contains the following items:

QTY.	Part Number	DESCRIPTION
1	253-5168	A200 WASTE CONTAINER ASSY
1	253-0040	ACCESSORY KIT, IN LINE REGULATOR
1	253-0090	BOTTLE STAIRCASE
1	253-0103	SEAL COLUMN CONSTINUENT 10G
1	30221758	SEAL COLUMN REMOVABLE 24 PLACE SP
.1	633-0353C	COLUMN CEREX OFX 3ML 35MG _100/PK
1	30219827	RACK SAMPLE 3CC 20MM SPACING _1/EA
1	253-2709	A200 BOTTLE KIT ASSEMBLY
1	253-2708	ALD INSTALLATION KIT ASSEMBLY
1	253-5286	RESOLVEX A200 OPERATING MANUAL
1	102-5460	RESOLVEX A200 IQ/OQ Checklist
1	102-1013	RESOLVEX A200 Operator Training Checklist
1	30138084	RESOLVEX A200 ACCEPTANCE PROTOCOL
1	30215534	PM CHECKLIST A200
1	30141932	A200 RELEASE NOTES
1	30182576	DOC CHECKLIST REMOTE INSTALLATION A200
1	30139045	DOC A200 DECLARATION OF CONFORMITY

3.8.3 Associated Parts

The Resolvex A200 is designed to work with one of the following AC mains power cords that is ordered separately depending on destination country.

Part Number	Region	Plug/Connector Type	Rating	Length
323-5207	North America, Type B	EL-302 to C13	10A/120V	6FT
323-5399	Europe, Type E	CEE 7/7 to C13	10A/250V	6FT
323-5400	United Kingdom, Type G	BS 1363-A to C13	10A/250V	6FT
323-5401	China, Type I	GB 2099 to C13	10A/250V	6FT
323-5402	Switzerland, Type J	SEV 1011, 3 pos. to C13	10A/250V	2.5M
323-5403	Brazil, Type N	NBR 14136 to C13	10A/250V	2.5M

3.8.4 Consumable Materials

Some of the supplied parts are consumable materials and the safety rating of the equipment is dependent on the use of the correct consumables. If replacing any supplied parts, use only the exact part supplied. To obtain replacement parts, contact your Tecan service representative.

3.9 Installing

The Resolvex A200 does not include a filter on the gas supply input. A clean, oil-free gas source must be used to prevent contamination of the pneumatics and the consumables containing samples.

1. Open the crate and remove the accessories boxes. Standard contents are listed above.
2. Remove the unit from the box and place in desired location. See the Site Requirements above.
3. Remove the small window and the z-axis motion guard to expose packing foam used to prevent damage to the unit during shipping.

   Warning: Do not operate or power the equipment with protective covers removed, doing so is dangerous and a pinch hazard.
4. Remove the packing foam and tape.
5. Replace the z-axis motion guard and small window.
6. Plumb the unit into the gas source by using the provided tubing in the Installation Kit and inserting one end of the tubing into the open port at the rear of the unit and the other end into the supplied gas source. See section 3.4 for gas requirements.
7. Connect the power supply to the Resolvex A200 and to mains power.
8. Power the unit by pressing the power button on the front panel of the Resolvex A200.
9. The software will start automatically. Follow the prompts on the screen to initialize the Resolvex A200.

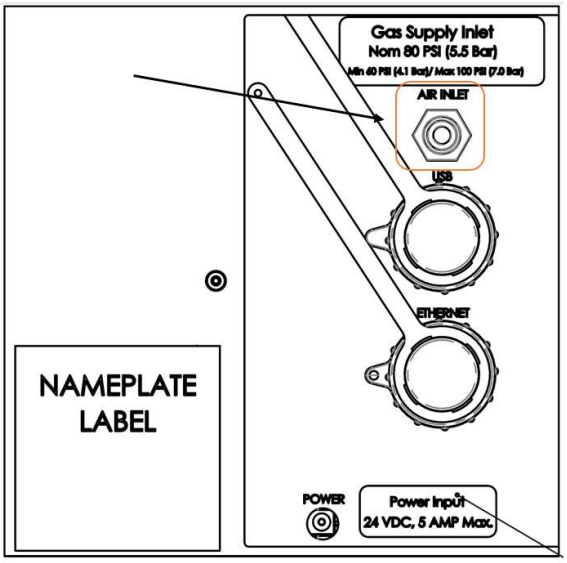
   Warning: A slight and rapid movement of the manifold may occur as the unit is pressurized after the software is started and detects nothing is blocking the light curtain.

3.10 Software Installation

Resolvex A200 Software comes pre-installed on the station's computer. Updates to the software will come with instructions for installation.

3.11 Gas Fittings Connections

Connect ¼" Tubing to the press fit connection labelled AIR INLET on the rear panel of the A200. The connection inlet is directly above the USB connector as seen below.



3.12 Functional Tests

3.12.1 Installation Qualification (IQ) Checklist

See Ref. 1.

3.12.2 Operational Qualification (OQ) Checklist

See Ref. 1.

4 Product Warranty

Refer to terms and conditions of contract at time of purchase for warranty information. Spare parts or replacements beyond the warranty period for such components as Resolvex A200 waste bins, syringes, and plumbing items are available. Contact Tecan Customer Service for current options and pricing.

5 Before Starting the Machine

Make sure the work area of the machine is clear of racks and other obstacles that may impede the movement of the machine including the rack area and the pump syringe area.

⚠ WARNING
Ensure area around syringe is not obstructed.

6 Solvent Line Fittings

It is possible that the fittings on the pump for the solvent lines have loosened during shipping. The flanged fittings can be tightened by hand. The fittings are torque limited and will click when tightened sufficiently.

7 SPE Rack Configurations and Use

The Resolvex A200 provides the means to batch process solid phase extraction columns. Depending upon the volume of the eluent, the appropriate collection rack or collection tray can be selected from the ancillary products available with the Resolvex A200.

For example, 96-format collection and waste trays are optimally designed to accommodate common trays (1.2 mL x 96-wells and 2.0 mL x 96-wells) for sample elution steps or single-well reservoirs for sample application and wash steps. These trays are physically keyed to the elevated platform indicated by an angled corner on the front right of the unit. When correctly installed, the trays sit securely and level on the elevated platform. The correct orientation of the well plates is with the A1 well position to the front left as shown below. Similarly, other formats have orienting features so that the user needs only to ensure that the tray sits flat to be sure that trays are correctly oriented.

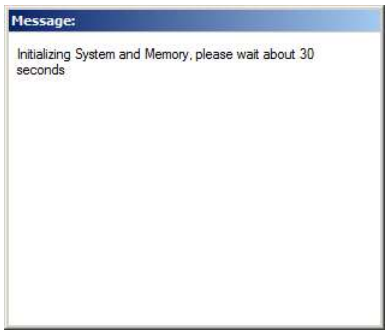
The CEREX® Rimless Column Blocks (RCB) and Aluminum Column Blocks (ACB) are keyed to the collection trays so that sample position is preserved throughout the SPE sequence. The Rimless Cartridge Holder (RCH) tray with an RCB or loose columns with an ACB is positioned directly on top of the collection or waste tray. Note that when appropriately placed, the stack sits level and securely on the platform.

8 Resolvex CONTROL SOFTWARE

The Resolvex CONTROL software is a Microsoft Windows application that runs on the embedded computer installed in the Resolvex A200. The application will automatically start and initialize the Resolvex A200 after Microsoft Windows has completed loading. For Users that are using version 4.0 and above refer to Section 12 for additional optional functionality provided in that version.

8.1 Running the Application

The application will start automatically upon power up of the station. If the program is exited inadvertently, it is recommended to restart the PC of the station to restart the program. The machine takes a few seconds to initialize all the components before it is ready for use and will display the dialog box shown to the right while initializing the system. Once initialization is complete, the Main Dialog (shown below) will be accessible.



8.2 Log File Configuration

The Resolvex A200 control software has the ability to log method progress to allow for accurate recovery in the event of power loss during the processing of samples in an assay. The USB thumb drive that comes installed has an empty file in the root directory of the drive named "logdrive". This must be present for the logging to store on the drive. If this “logdrive” file is not found, the file will be written to “…\Documents\Machine Log Data” of the embedded computer.

⚠ It is recommended that the external flash drive be used to store log files to prevent excessive wear of the internal flash drive of the computer.

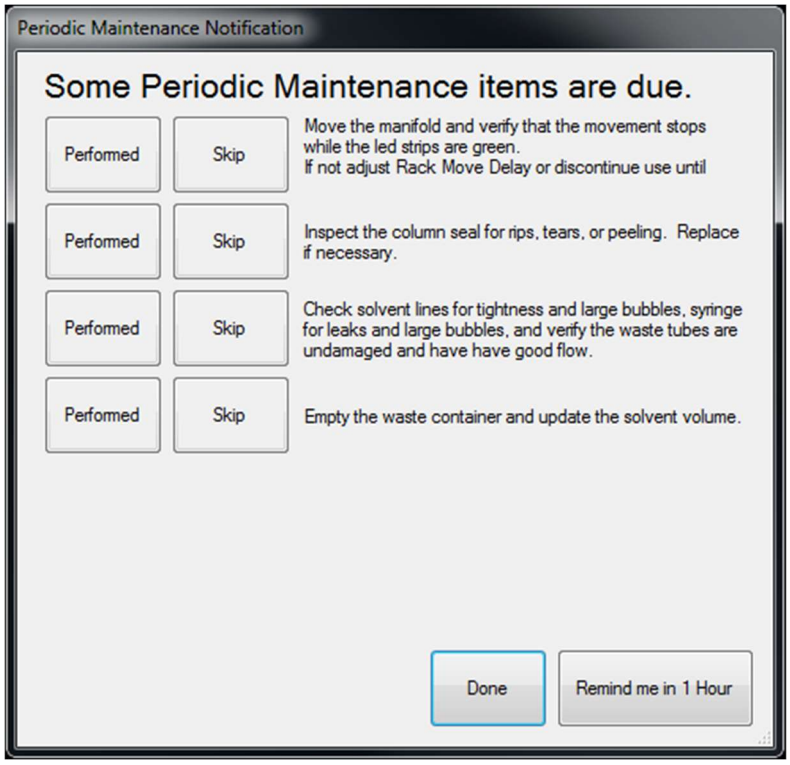
8.3 Firmware Upgrade

The Resolvex A200 control software has the ability to verify if the firmware installed in the control board inside the unit is of the most recent version. If prompted to upgrade, simply follow the on-screen instructions. Firmware upgrades to the internal control board have no effect on the Resolvex A200 control software nor the settings stored for the unit. NOTE: A power cycle of the unit may be necessary to fully install the upgrade and properly run the Resolvex CONTROL.

8.4 Periodic Maintenance Notification

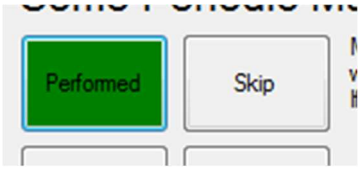
The Resolvex CONTROL software will notify the user of maintenance tasks that are due.

The user will be presented with a window with the days tasks at or after the set time if the software was not running.

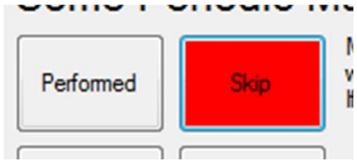


If the text in the task is not fully visible, it can be clicked on to get the full text.

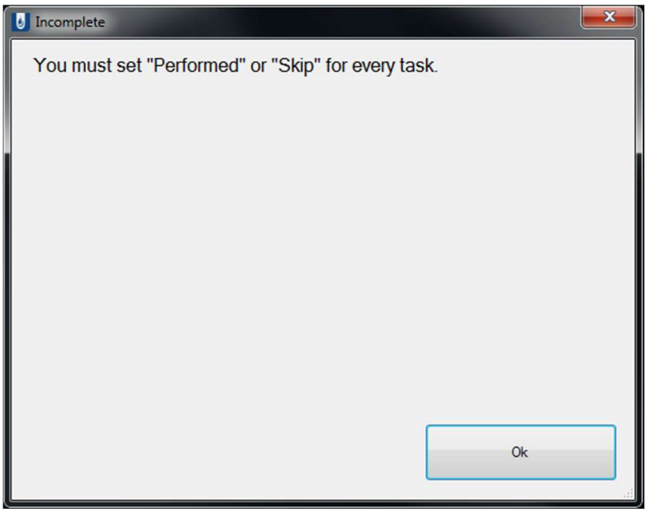
For each task, the user my select Performed and not be notified about that task until the next time it is due.



Or they can skip the task and be



notified again on the next day.



All tasks must be Performed or Skipped before pressing Done. The user will get a reminder if they press “Done” without completing the tasks.

If the user is busy, they can snooze the tasks by pressing “Remind me in one Hour” and the window will close and reappear after 60 minutes.

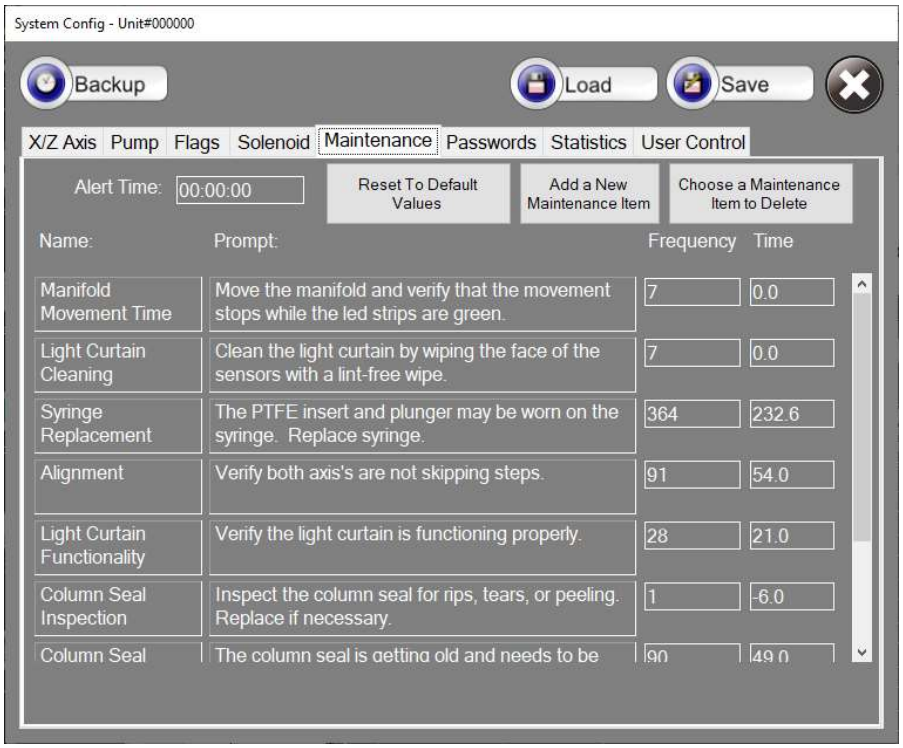
Periodic Maintenance Task Editing

Some parts of the default tasks and all user tasks may be edited from the Maintenance Tab in System Config.

To get to System Config, click the lock icon in the lower right corner, while within the program.

Then, in the box, enter the lock password (settable on the password tab) or “service”.

Finally, click on Settings.



In the “Maintenance” tab, there is Name, Prompt, Frequency, and Time for each task.

Every task must have a unique name.

Prompt is the text given in the Notify window

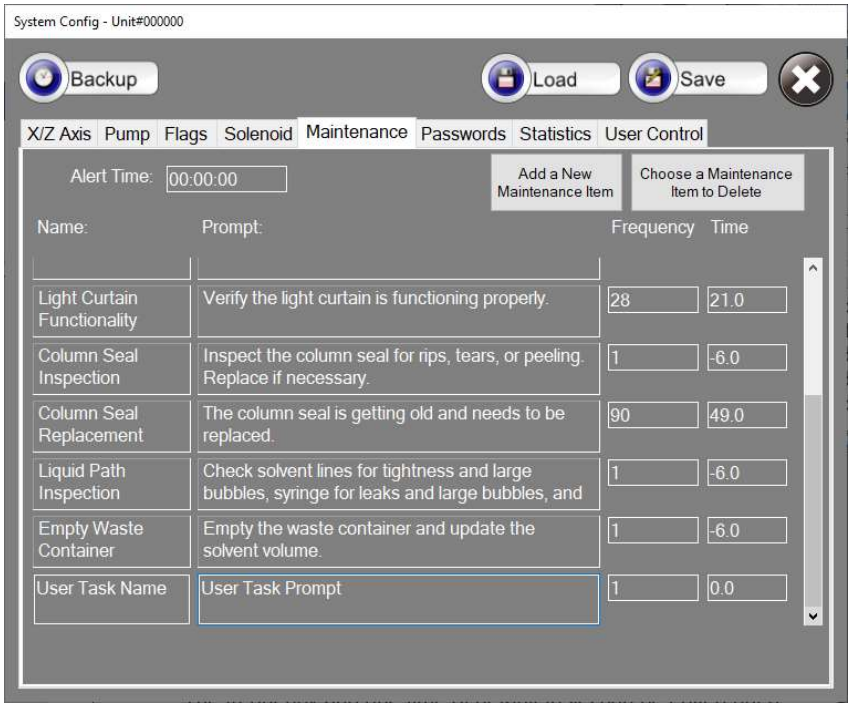
Frequency represents the days between when a task will appear on the notification.

Time is the time in days until the task will next be notified, a negative number indicates the task is past due and has been skipped.

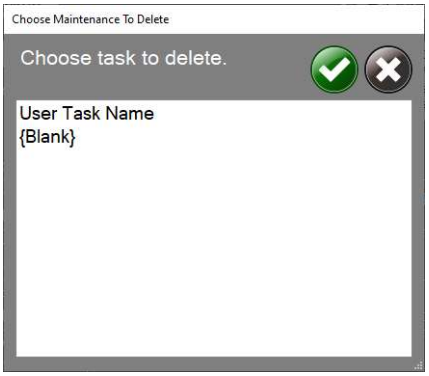
Alert Time is the time at which the Notify window will appear. It is in the format HH:MM:SS where HH is 00-23 hours, MM is 00-59 minutes and must SS is 00-59 seconds.

Users may add Tasks by pressing the “Add a New Maintenance Item” button.

Then scroll to the blank task and click the boxes to add text, and set the desired frequency.



User tasks may be deleted by clicking “Choose a Maintenance Item to Delete”. This brings up a window containing the tasks that can be deleted. Any tasks that have not yet been given a name will show as {Blank}, and can still be deleted.

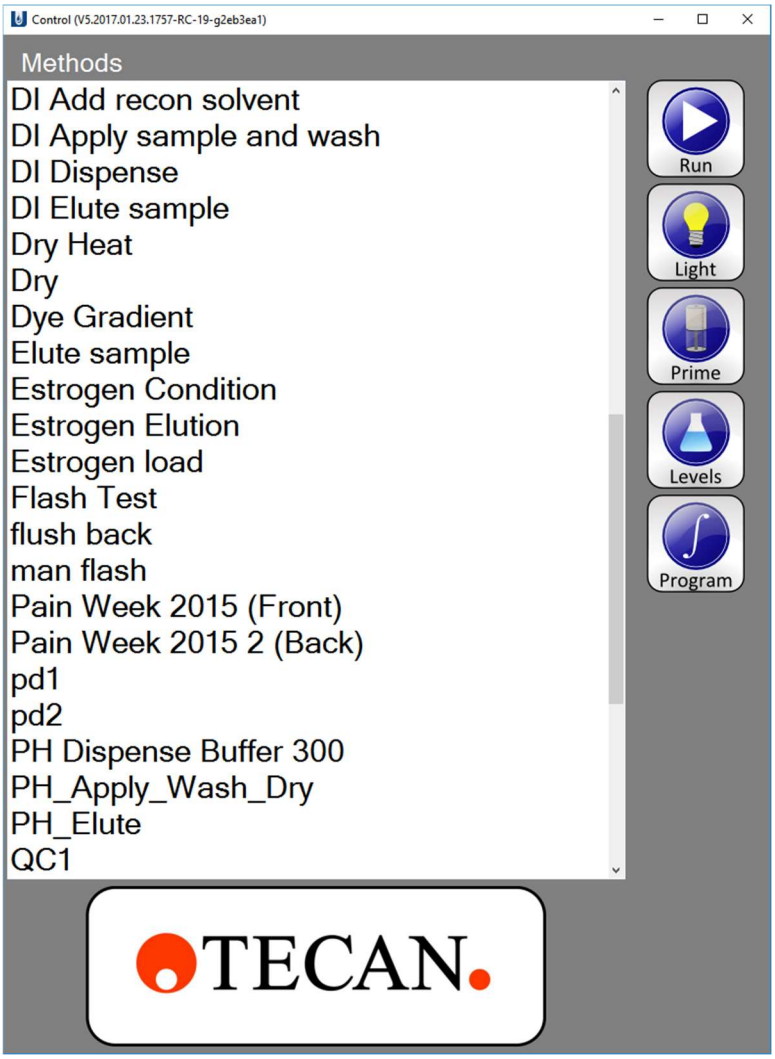


The frequency and due time of default tasks can be edited but a warning will be issued and confirmation to make the change.

8.5 Advanced Settings

Settings and Setup have individual icons, while the other buttons are opened with the Advanced Icon if the user has access (User Control).
They replace the Tecan logo when showing.

8.6 Main Dialog



8.6.1 Methods

The Methods list box shows all available methods to the user of the equipment. Additional methods not shown on screen can be accessed by using the screen scroll bar.

8.6.2 Run

The “Run” button will run a selected method. To select a method, tap on its name.

8.6.3 Light

The “Light” button toggles the state (on/off) of the column back light.

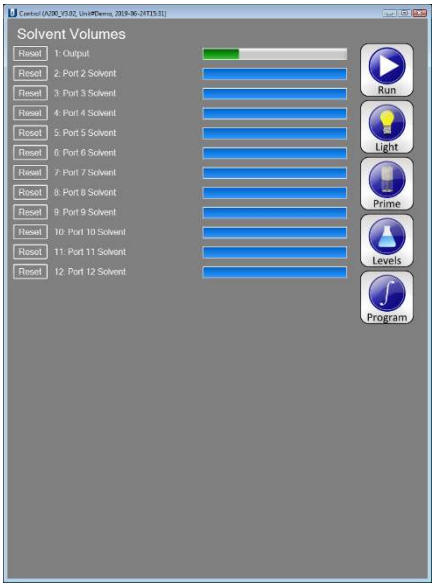
8.6.4 Prime

The “Prime” button opens the Solvent Prime dialog box.

8.6.5 Levels

The “Levels” button displays the Solvent Volumes.

There is a setting that changes Output to show as Empty Volume Left. If desired, the bar changes from green to brown and is 100% when the waste container is empty.

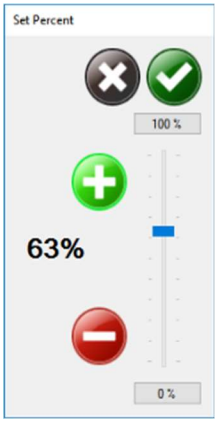


8.6.5.1 Solvent Reservoir Volume Indicators

The Resolvex A200 cannot actively monitor solvent volumes. However, it does calculate volumes dispensed and can keep track of where the volume is based on estimated percentage of solvent left in a container. This feature allows for alerting the user that a method may not successfully run if the solvent reservoirs are not full enough. Additionally the user can be warned should the waste be close to over flowing.

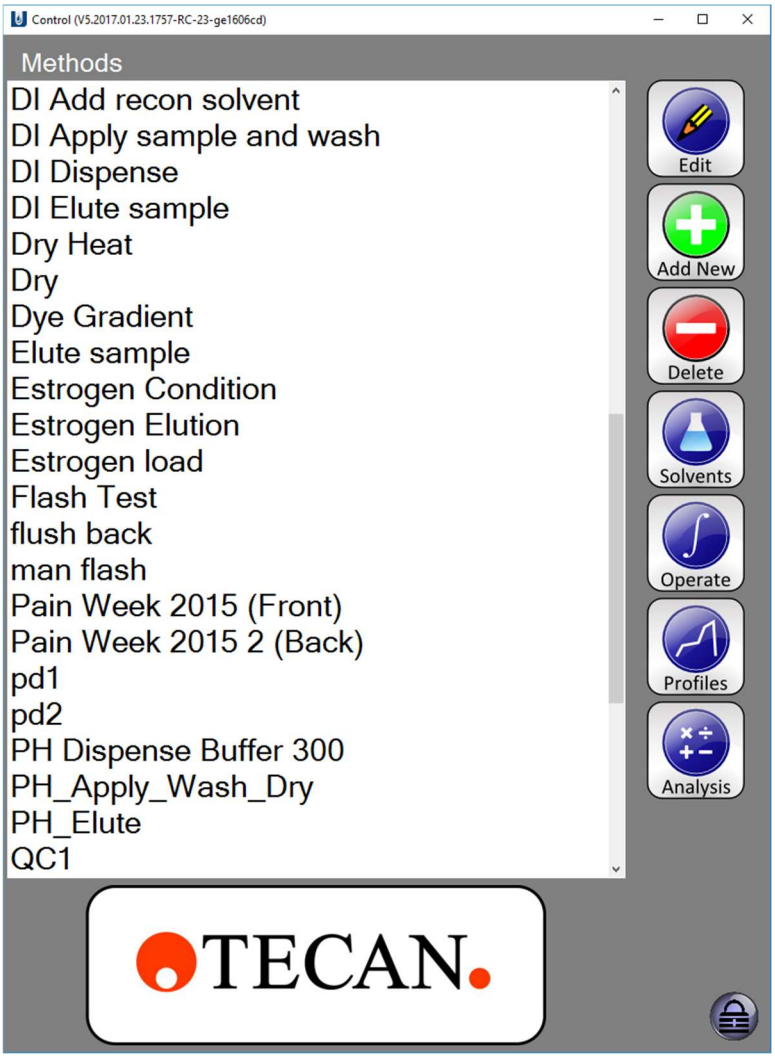
8.6.5.2 Reset

The “Reset” button allows for adjustment of the solvent volumes though the “Set Percent” dialog. The plus and minus icons allow for easy adjustment of volume in 1% increments. The 100% button allows for quick resetting of volume when a reservoir is refilled or changed. The 0% button allows for quick resetting of volume for a waste reservoir is emptied. The “X” icon exits the dialogue box, canceling any changes made. The green check icon saves the adjusted solvent volume.



8.7 Program

The “Program” button displays functions for method and pressure profile editing features, solvents analysis, and solvent speeds and names editing. Press the Operate button first to see this, as the Program button appears within this context, and is not visible otherwise.



8.7.1 Edit

The “Edit” button will open a selected method in the “Method Editor” dialog box for editing or preview. To edit a method, enter the code “change” when prompted.

8.7.2 Add New

The “Add New” button creates a new method and opens the “Method Editor” dialog box so that the method can be edited.

8.7.3 Delete

The “Delete” button will delete a selected method. To delete a method, enter the password “erase” if the default password has not been changed.

8.7.4 Solvents

The “Solvents” button opens the Solvents and Speeds dialog box.

8.7.5 Operate

The “Operate” button will return to the main screen.

8.7.6 Profiles

The “Profiles” button opens the pressure profile editor. To edit a Profile, enter the password “change” if the default password has not been changed.

8.7.7 Analysis

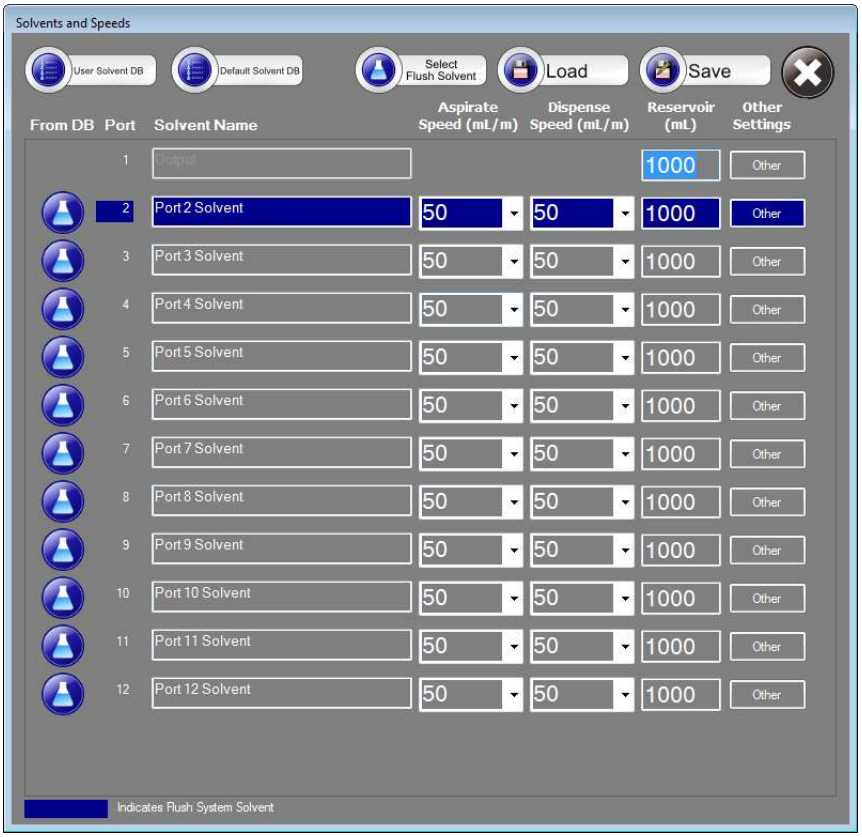
The “Analysis” button will analyze the selected method and verify if there is enough solvent to run the selected method as well as report the cost associated for each solvent.

8.8 Solvents and Speeds

The “Solvents and Speeds” dialog box allows for changing the name of solvents connected to the system as well as the speed at which they are pumped. The speed is in mL/m out of the pump syringe so the speed is divided by the number of tips for the system based on its configuration.

To set the solvent dispensing parameters, click on the aspirate or dispense speed field for the solvent to enter a new value. If possible use the solvent database for choosing the solvent dispensing parameters. If a solvent is not listed in the solvent database then use empirical testing to determine solvent dispensing parameters, especially for volatile solvents. When doing empirical testing, increase aspirate speed until cavitation occurs then back off on the speed to remove cavitation. When choosing the dispense speed, the speed can be increased until any one of the following occur: pump stalls due to too much back pressure, solvent fittings leaks or splashing occurs at dispense head due to extreme solvent velocity.

⚠ **Warning**: Caution must be exercised when selecting speeds. Solvents used have different viscosities that require different aspirate and dispense speeds. Aspirating too fast can lead to bubbles and cavitation. Dispensing too fast can lead to pump stalling, leaks or splashing.



8.8.1 Form Headers

8.8.1.1 From DB

Clicking the 'Erlenmeyer flask' button next to a solvent allows for selection of a solvent from the solvent database.

8.8.1.2 Solvent (Port)

This field is used to name the solvent associated to this port. The named solvent will be used in the method for selecting the port and must be *exact* in name in order for a method to operate.

Port 1 is the output port to the dispense head.

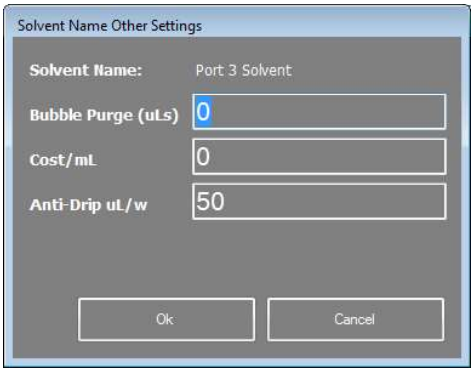
8.8.1.3 Aspirate Speed (mL/m) and Dispense Speed (mL/m)

Separate aspirate and dispense speeds can be defined for each solvent. More viscous solvents may need to be aspirated at a lower speed to reduce intake of air at fitting joints.

8.8.1.4 Reservoir (mL)

The reservoir size for each port is defined to allow the system to keep track of volumes in the system to prevent overflow of waste or insufficient solvent at the start of an operation. The reservoir volume associated with port 1 is to track waste volume.

8.8.1.5 Other Settings



Bubble Purge (uLs)

An extra amount to dispense to waste after each aspirate, to purge a bubble in the syringe caused by cavitation or outgassing of solvents. It is better to degas or aspirate slower if possible as this is a last resort.

Cost/mL (unit less)

The cost/mL field can be used to enter a purchase cost or disposal cost associated with each port on the pump. This allows the analysis function to calculate the cost to run a full plate of a given method for calculating budgetary costs.

This field is unit-less to accommodate the calculation in different currencies.

Anti-Drip uL/w

This is the amount the syringe will pull back while dispensing a plate to avoid having a drip hanging from the tip. The default should work for most solvents. If there are small bubbles collecting around the dispense tips, the value should be lowered for that solvent. The allowed range is 0 to 100.

8.8.1.6 Load

The “Load” button provides the ability to select a different solvent file for present use.

8.8.1.7 Save

The “Save” button saves the parameters that are present on the form.

8.8.2 Flush Solvent

The flush solvent button selects the solvent that is used between each dispense as well as at the end of a method to flush the system. The flush solvent *must* be miscible with and chemically compatible with all solvents used in the system. In the event that the System Solvent does not meet these requirements, methods may be written to include manual flushing with a "bridge solvent" between solvent selections.

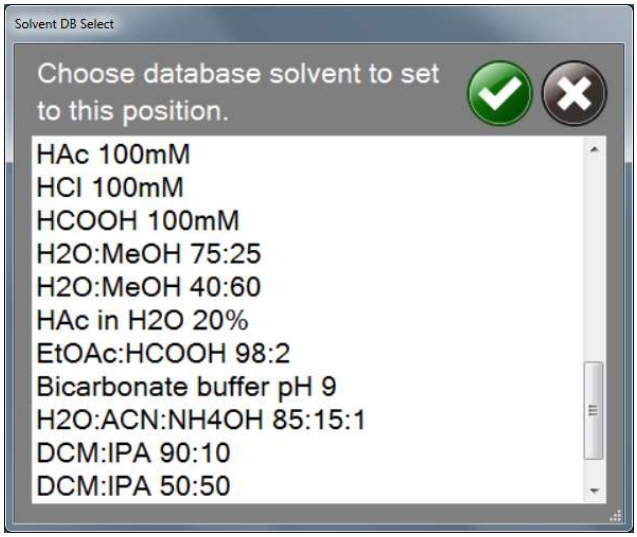
Inadvertently changing the flush solvent can cause assays to not work properly and care should be take when changing the flush solvent and assays should be re-validated.

8.8.3 Solvents Database

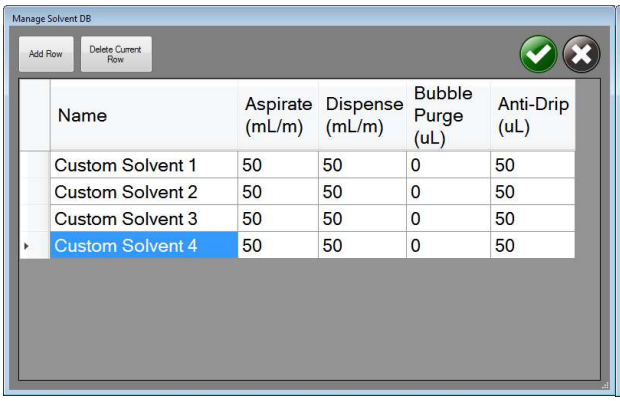
The Resolvex CONTROL software has a built in solvent database that is accessible from the “Solvents and Speeds” form. The solvent database predefines the aspirate and dispense speeds for some commonly used solvents used in the solid phase extraction process. Selecting solvents in the predefined database helps to prevent leaks and cavitation while processing samples. Deviation from the recommended aspirate and dispense speed is possible but will result in a warning each time a method is run using this deviated solvent. If the warning message is undesirable, the solvent can be added to a “User Solvent Database”. Adding a solvent to the “User Solvent Database” will suppress warning messages for this solvent. The “User Solvent Database” can also be used to add solvents that are not in the predefined database. Utilizing the built in solvent database also helps maintain consistent naming of solvents between machines making it easier to move methods from one machine to another.

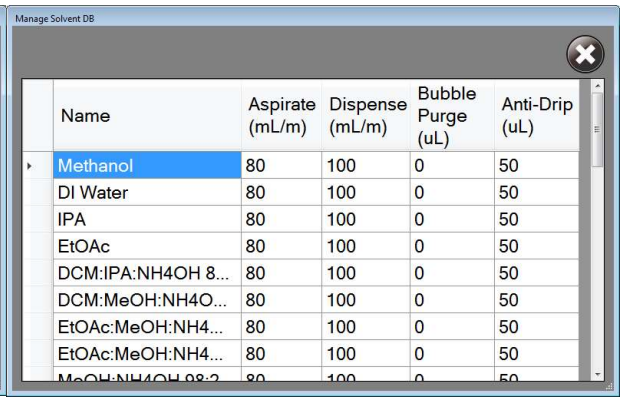
To choose a predefined solvent for a specific pump port, click on the Erlenmeyer flask button next to the specific pump port.

This will bring up a list box of solvents that is comprised of the combined “User Solvent DB” and “Default Solvent DB”. Once a solvent has been selected, click on the green check box button to accept the selected solvent. The “Solvent Name”, “Aspirate Speed” and “Dispense Speed” text boxes will be populated with the selected solvent.

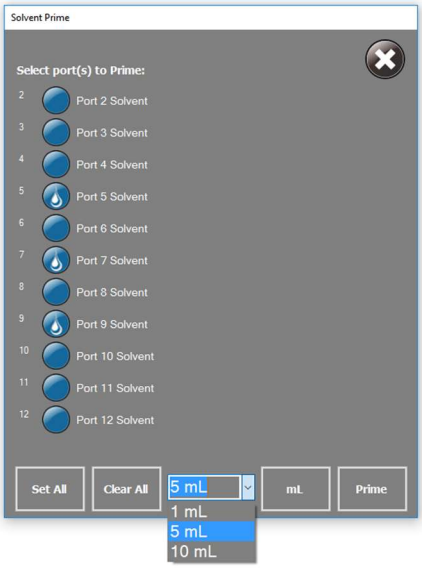


The “User Solvent DB” can be updated by clicking on the “User Solvent DB” button. The “Default Solvent DB” can be viewed by clicking on the “Default Solvent DB” button.





8.9 Solvent Prime



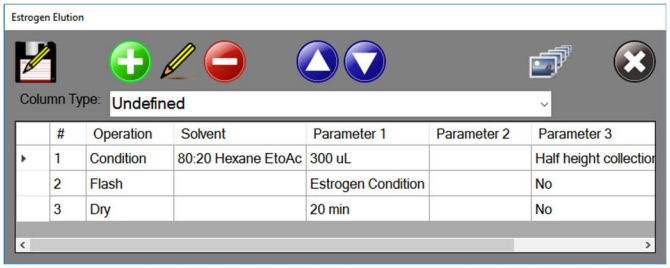
The “Solvent Prime” dialog box allows for priming of solvent lines for initial setup or if solvent is allowed to run empty and air gets in the lines. To prime the system, select the solvent(s) to be primed and the volume to be pumped by selecting the 1mL, 5mL or 10mL from the drop down menu or press the "mL" button to enter specific volume. When the "Prime" button is pressed, each of the selected solvents will be primed at the selected volume in order from lowest port number to highest. All solvents can either be selected or unselected using the "Set All" and "Clear All" buttons respectively.

NOTE: The syringe is not flushed between selecting solvents, so be sure to prime with a buffer solvent if there could be possible issues with large amounts of dissimilar solvents mixing.

8.10 Method Editor

8.10.1 Overview

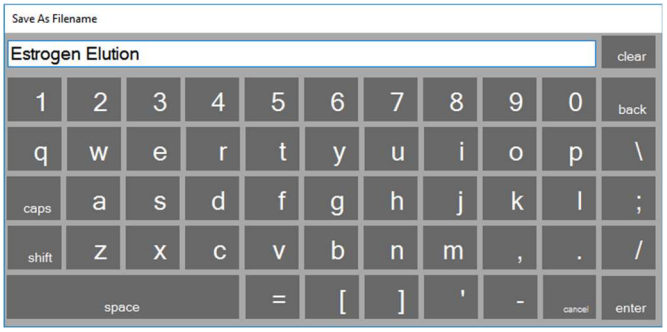
The method editor allows for adding new methods or editing existing methods using the touchscreen feature of the Resolvex A200.



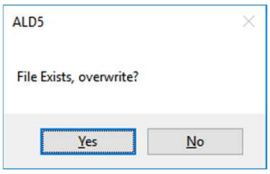
8.10.2 Buttons

8.10.2.1 Save

Save Method opens the touch pad to allow editing of the method name.



If the method already exists, the following message box will be displayed:



Press “Yes” to overwrite or “No” to return to the editor where a new name can be entered.

8.10.2.2 Add

Add a new step to the method after the current step and enter the edit mode for the newly added step.

8.10.2.3 Edit

Takes method editor out of read only mode and allows the current steps of method to be edited. Can also double click on the table to edit the step selected.

8.10.2.4 Delete

Deletes current step.

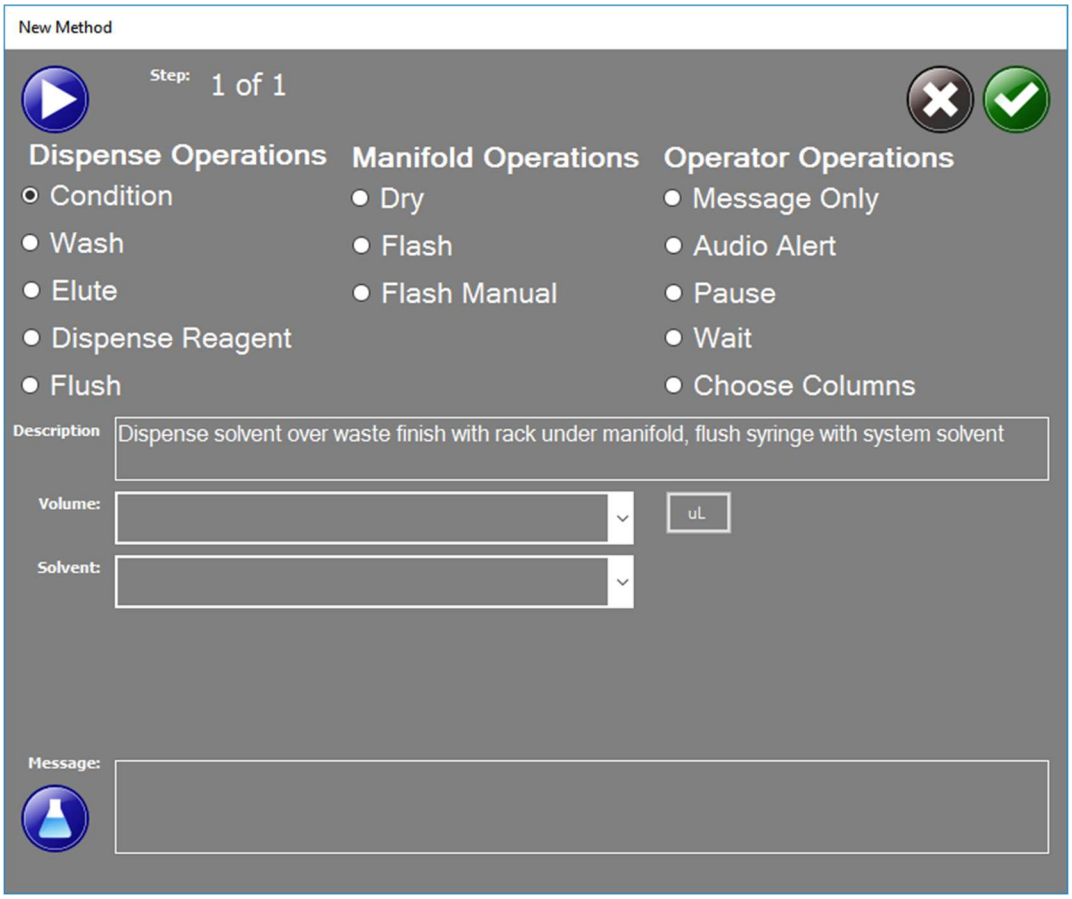
8.10.2.5 Scroll

Scroll up or down through the steps of the method.

8.10.2.6 Slide Show Wizard

A guide to add new or modify existing slideshows for the Message Only step in Operator Operations.

8.10.3 Dispense Operations



8.10.3.1 Condition, Wash

The Condition and Wash operations dispense selected solvent and volume in each of the selected columns over the waste tray. After operation is complete, the system flushed with the system solvent and the rack is moved into the flash position under the air manifold.

8.10.3.2 Elute

The Elute operation dispenses the selected elution solvent and volume in each of the selected columns over the collection tray.

8.10.3.3 Dispense Reagent

The Dispense Reagent operation dispenses the selected solvent and volume in each of the selected columns over the waste tray. After operation is complete, the system flushes with the system solvent.

8.10.3.4 Flush

The Flush operation flushes the syringe with the selected solvent and does not follow with the system solvent flush.

8.10.3.5 Volume

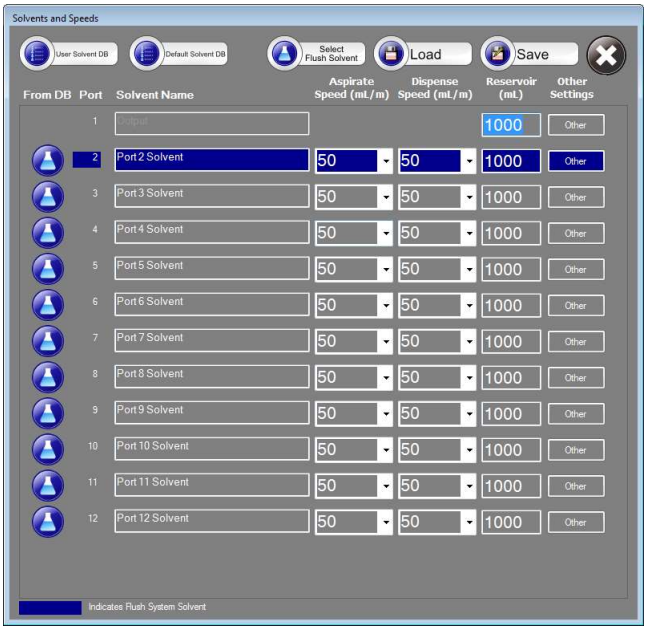
The amount of the specified solvent to dispense into each column for that step in units of µL. The volume can be selected from the drop-down list or a specific volume can be entered using the “uL” button.

8.10.3.6 Solvent

The specified solvent to dispense into each column for that step.

8.10.3.7 Solvent Info

Opens the Solvents and Speeds dialog box. ⟶



8.10.3.8 Test Operation (Play)

Tests the current step.

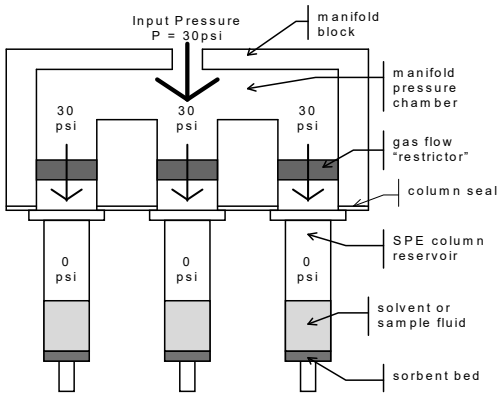
8.10.4 Manifold Operations

Each manifold port is flow-restricted in order to maintain uniform manifold pressure in all positions, even if some positions are not filled by columns. With no column in place, there is approximately 0.75 SCFH (0.35 L/min) of flow through a port at 1.72 bar (25 PSI). The principle of the restrictor manifold design is discussed in the following diagram.

***Positive Pressure* Control "with flow restrictors"**

Fig A. Initial state. Manifold pressure builds to controller set pressure. The effect of the restrictors is minimal in limiting flow from manifold to column reservoir. Reservoirs start at atmospheric pressure.

Fig B. Shortly after the initial state, the pressure builds in the column reservoir due to the fluid being held up by the flow characteristics of the column sorbent bed. Restriction still has minimal effect. Eventually the pressure builds enough to overcome the fluid flow resistance and the fluid begins to pass through the sorbent bed.



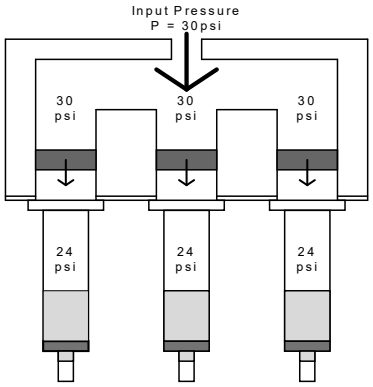
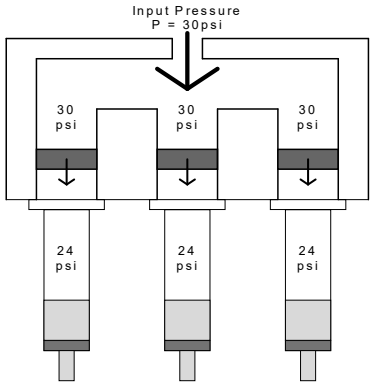
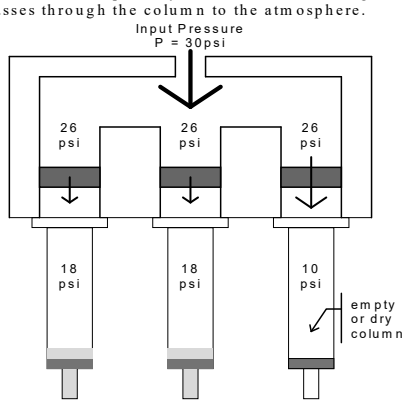


Fig. C. Depending on flow characteristics of column sorbent bed, pressure in column reservoir stabilizes.

Fig. D. When fluid passes through (one or more columns) completely, and there is minimal pressure drop across the column bed, the effect of the restrictor is maximized. The restrictor becomes the primary flow inhibitor of the gas as it passes through the column to the atmosphere.

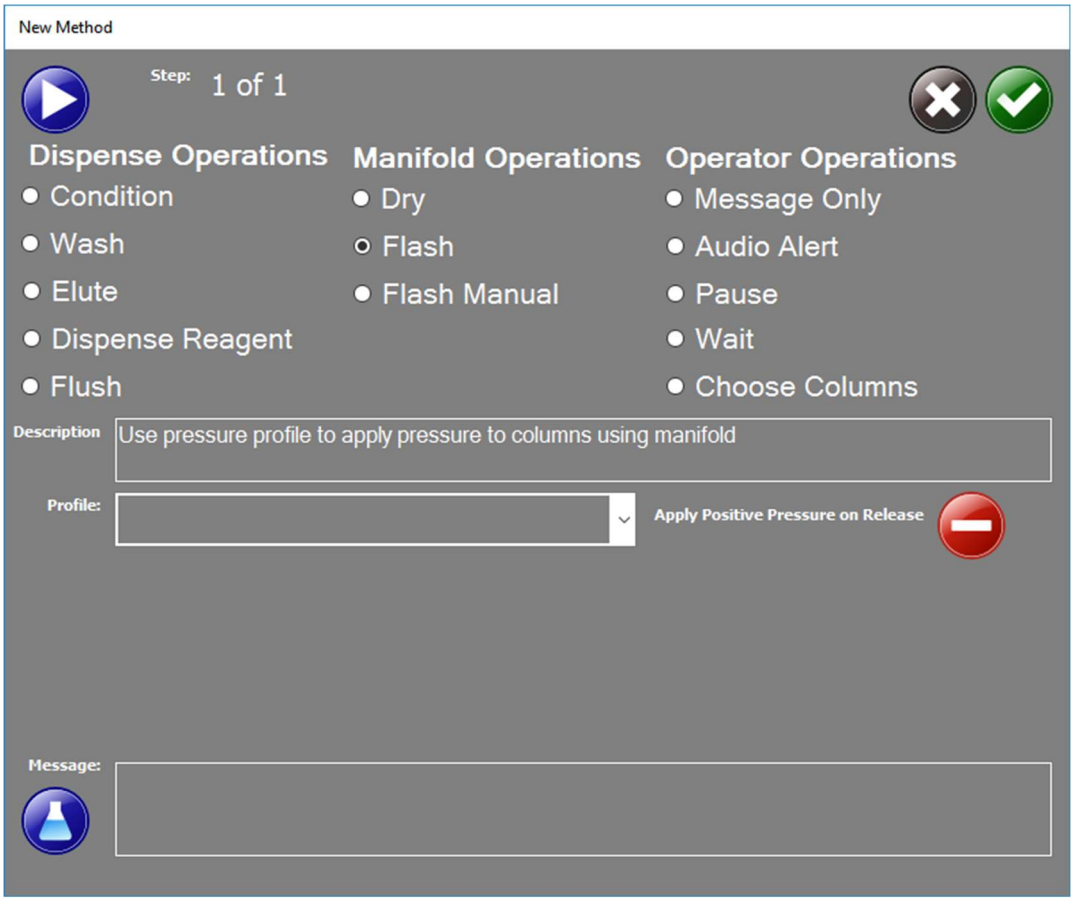




Inhibiting the flow with the constrictors at this time is helpful in two ways: (1) *the amount of gas* used is minimized as compared to a system with no inhibitors. (2) the *pressure remains high* in the columns containing liquid as compared to the empty or dry columns.

8.10.4.1 Column Compression and Decompression

Because of the unique manifold design of the Resolvex A200, each column/well is pressurized to the same level even if columns are omitted.



8.10.4.2 Dry

The Dry operation pushes air through the columns at maximum flow for a specified amount of time.

8.10.4.3 Flash

The Flash operation uses a specified pressure profile to apply pressure to columns in either the waste or collection position.

8.10.4.3.1 Profile

The specified pressure profile to flash into the columns for that step.

8.10.4.4 Flash Manual

The Flash Manual operation allows the user to manually control pressure being applied to columns in either the waste or collection position.

8.10.4.4.1 Flow

Select from either Low or High flow. Low flow is a restricted flow rate that allows for extremely low flow. High flow is unrestricted, incoming pressure to the Resolvex A200 to be applied in 1% increments. The maximum pressure that can be applied to the columns is 5.5 bar (80 PSI) at 100% flow. If less than 5.5 bar (80 PSI) is available, then the maximum available pressure to the system will be applied.

⚠ Warning: Full flow rate cannot be achieved if the gas pressure is in the range of 4.1 bar (60 PSI) to 5.45 bar (79 PSI)

8.10.4.4.2 Course / Fine

“Course and Fine” adjustments are used to adjust the percentage of flow for the selected flow rate (either High or Low). Course adjusts flow in 5% increments of full scale flow and Fine adjusts flow in 1% increments of full scale flow. As soon as flow starts, the seconds counter starts increasing in 10^{th} second increments.

8.10.4.4.3 Stop

“Stop” ends the flash sequence.

8.10.4.4.4 Save As

“Save As” saves the last flash sequence so that is can be used for an automated flash.

8.10.4.4.5 Done

“Done” closes the form.

8.10.4.5 Apply Positive Pressure on Release

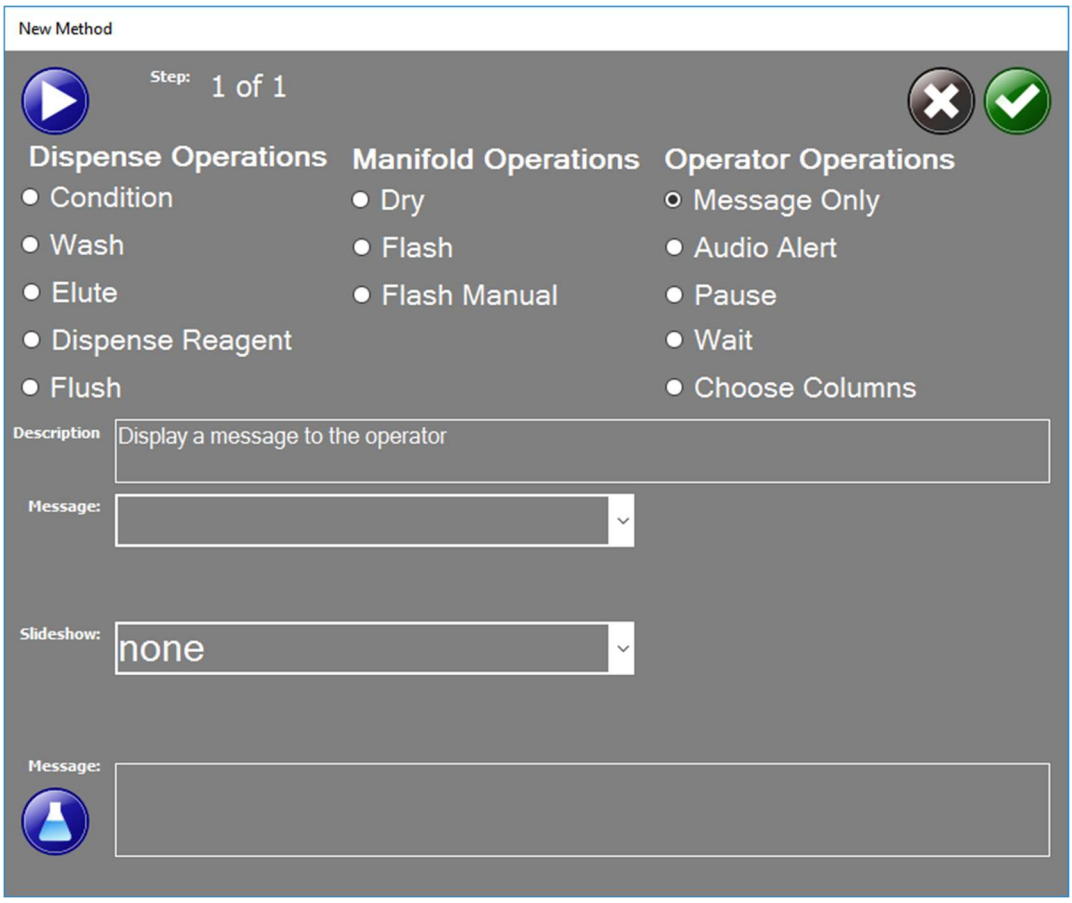
When checked in the Manifold Operations, slight pressure is passed through the manifold as the manifold lifts off of columns to prevent the columns from sticking onto the manifold's column seal.

When not checked the pressure to the columns is completely removed prior to releasing the manifold.

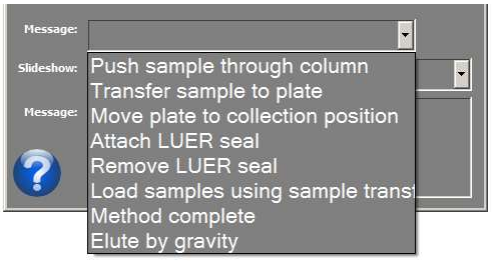
8.10.4.6 Test Operation (Play)

Tests the current step.

8.10.5 Operator Operations

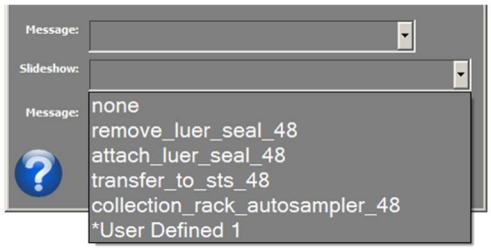


8.10.5.1 Message Only



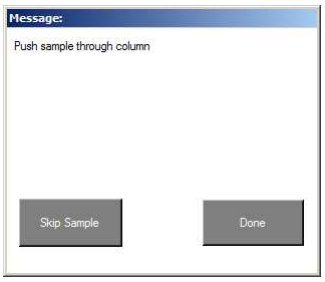
The Message Only operation displays a message and/or slideshow to the operator and waits for acknowledgement before proceeding to the next step of the method. The 'Message Only' operation takes two parameters: Message and Slideshow.

The 'Message' parameter allows selection of messages that are defined in the messagelist.xml file in the 'Data\System Settings' directory of the application install location (external flash drive: \LauncherPrograms\DispenseSoftware\). Once a message has been selected, it can be customized by touching the edit box on the bottom of the method edit dialog box.



The 'Slideshow' parameter allows for selection of a slideshow that can be displayed to the operator when the method is running to help illustrate operations that need to be done manually by the operator.

If the parameter is set to 'none', then no slideshow will be displayed. User defined slideshows can be created and stored in the "Slideshows" directory in the application directory.



User defined slideshows appear in the Slideshow dropdown preceded with an asterisk (*). The Slide Show Wizard can be used to make a slideshow. A user defined slideshow can also be created manually by creating a directory inside the Slideshow directory that will give the slideshow its name. In the created directory, add jpg files named 1.jpg, 2.jpg, ..., 100.jpg. The images will be displayed in order from 1 to 100. Image numbers cannot be skipped and must start with 1.jpg. A missing file will cause the slideshow to start over. The display area of the slide show is 607 x 442 pixels. Smaller images will be loaded in the upper left hand corner of the dialog box and displayed with a white background filling the rest of the rectangle.

8.10.5.2 Pause

The Pause operation is used to pause the method currently running and prevents further look ahead so that solvents are not aspirated in anticipation of the next step in the method.

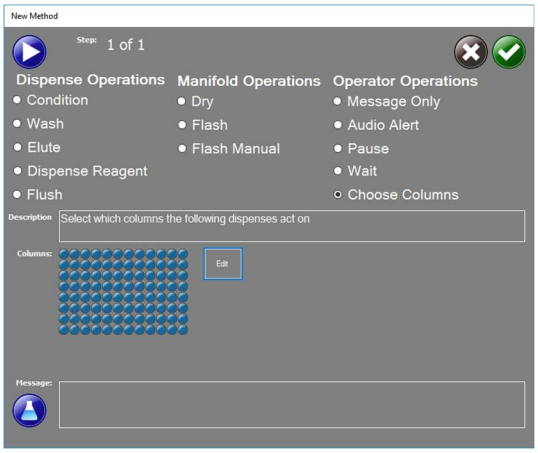
8.10.5.3 Audio Alert

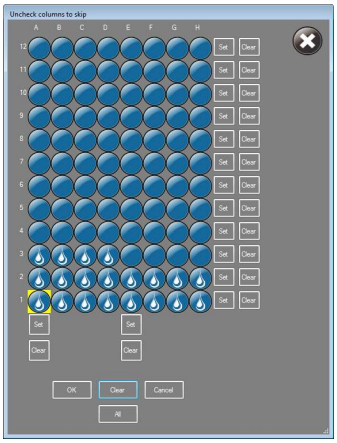
The Audio Alert operation uses an internal buzzer to get the operators attention.

8.10.5.4 Wait

The Wait operation is a timer that counts down prior to proceeding to the next step in the method. When inputting a length of time in the parameter field, be sure to follow the numeric value with “Sec” or “Min”.

8.10.5.5 Choose Columns



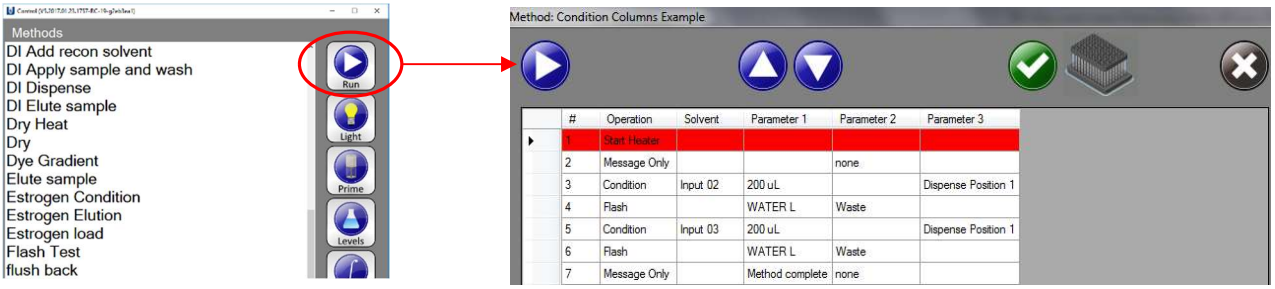


The Choose Columns operation can be used to override the columns that were initially selected at the beginning of the method if a specific solvent is not to be used on all the columns in the assay. Note: the appearance of the well plate will vary based on the configurated number of wells.

8.10.5.6 Test Operation (Play)

Tests the current step.

8.11 Run Program



The “Run Program” dialog box is opened when a method is selected and then the “Run” button is pressed on the main dialog. Before a method is run, the Resolvex A200 software has the ability to verify if the solvents in the method match that of the solvents that are connected to the unit and that there is sufficient solvent to complete a method. Simply follow the on-screen instructions if there are any discrepancies.

8.11.1 Check Alignment Button

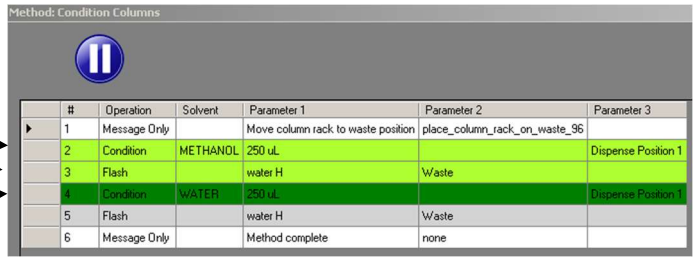
The Check Alignment button successively moves the solvent dispense to the left, center, right and then home to quickly check dispense head alignment with the SPE columns. This check should be done when first placing the columns onto the shuttle tray to assure that all liquids will dispense correctly and that the columns are placed squarely onto the shuttle tray.

8.11.2 Scroll Buttons

The Scroll Buttons can be used to move up and down through a given operation if certain steps need to be skipped or the method needs to be started further down in the process.

8.11.3 Play Button

The Play Button runs the method after selecting which columns to process. If operator intervention is required, the machine may continue to flush or pump solvents to prep for the next step in the method while the operator is doing off-line processing such as pushing solvents through the column or transferring samples into SPE columns. This “look ahead” functionality of the Resolvex A200 is provided by using multitasking features of the computer. This can make it difficult to tell what step the machine is actually performing. The operations that are running or waiting for machine resources are highlighted in light green and the next task to run is highlighted in dark green as shown below:



#	Operation	Solvent	Parameter 1	Parameter 2	Parameter 3
1	Message Only		Move column rack to waste position	place_column_rack_on_waste_96	
2	Condition	METHANOL	250 uL		Dispense Position 1
3	Flash		water H	Waste	
4	Condition	WATER	250 uL		Dispense Position 1
5	Flash		water H	Waste	
6	Message Only		Method complete	none	

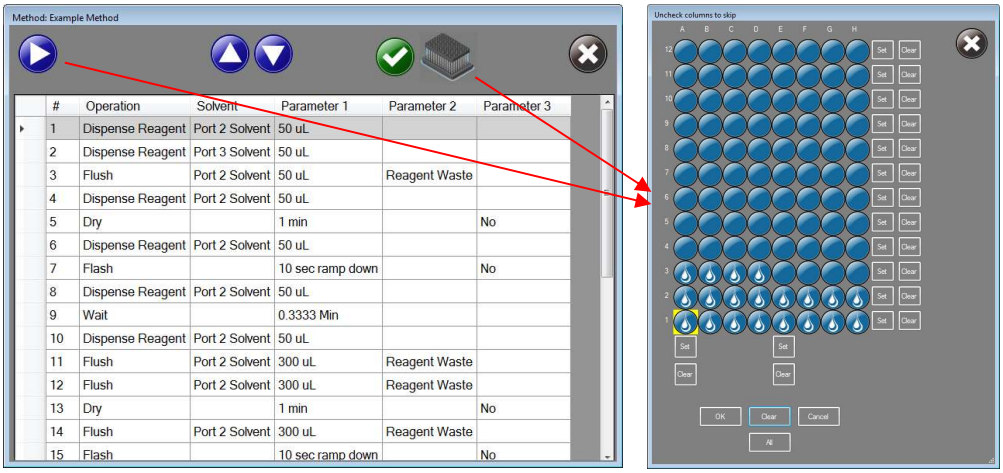
Note: Color of steps may vary depending on the screen's resolution; i.e. from light green to yellow.

It is possible for one or more tasks to be running at the same time and is not uncommon to have up to four tasks running at the same time. Also, tasks may complete out of order and as they complete, the task will return to the original color.

8.11.4 Pause Button

The Pause Button suspends the method after the current step has been completed. This would be useful in cases where columns need to be inspected before proceeding further in the method. Upon doing so, the Run Program Buttons appear. This would also allow navigating to other steps in the method and resuming from a different step. Depending on where the method was paused and resumed, the outcome may not be desirable and could possibly cause an unwanted error.

8.11.5 Run Partial



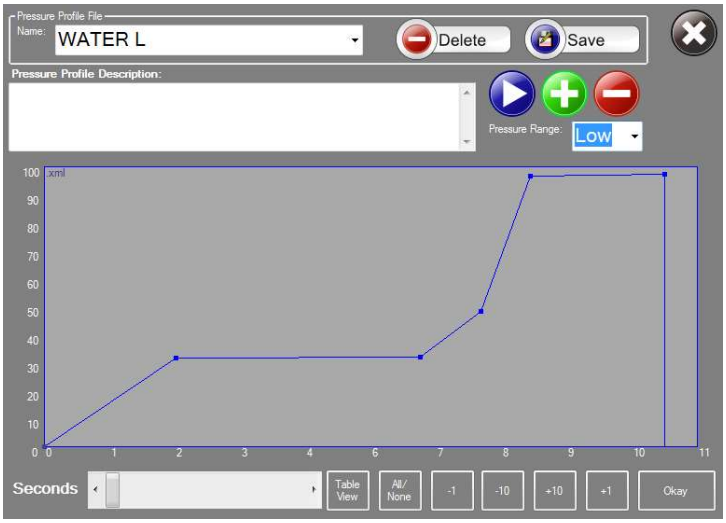
#	Operation	Solvent	Parameter 1	Parameter 2	Parameter 3
1	Dispense Reagent	Port 2 Solvent	50 uL		
2	Dispense Reagent	Port 3 Solvent	50 uL		
3	Flush	Port 2 Solvent	50 uL	Reagent Waste	
4	Dispense Reagent	Port 2 Solvent	50 uL		
5	Dry		1 min		No
6	Dispense Reagent	Port 2 Solvent	50 uL		
7	Flash		10 sec ramp down		No
8	Dispense Reagent	Port 2 Solvent	50 uL		
9	Wait		0.3333 Min		
10	Dispense Reagent	Port 2 Solvent	50 uL		
11	Flush	Port 2 Solvent	300 uL	Reagent Waste	
12	Flush	Port 2 Solvent	300 uL	Reagent Waste	
13	Dry		1 min		No
14	Flush	Port 2 Solvent	300 uL	Reagent Waste	
15	Flash		10 sec ramp down		No

When the run button is pressed prior to starting the run, the "Run Partial" dialog will open and allow selected columns to be processed. When all of the desired columns have been selected, press the "OK" button.

8.11.6 Abort a Method Run

To abort a run in the middle of a method close the “Run Method” screen using the close box on the top, right of the window. When this button is pressed, the operator will be prompted with a message verifying that the method is to be aborted. If “No” is selected, the prompt will disappear and the method can continue. If “Yes” is selected, the method will complete any operations underway, then evacuate any solvent in the syringe pump. *The program may prompt for a restart. This will lose any memory of where the last dispense step occurred*.

8.12 Pressure Profile Editor



This is launched from the main form by pressing the "Profiles" button. The Pressure Profile Editor allows for creating and editing of custom pressure profiles used for the flash chromatography through the columns. The values on the y-axis of the graph (0-100) represent the percentage of the incoming air pressure. The values on the x-axis of the graph represent the length of run time, in seconds, for that profile.

8.12.1 Pressure Profile File Selection

Pressure profiles can be loaded for editing or testing by clicking on the drop down list and selecting from all detected pressure profiles in the pressure profile directory of the system.

8.12.2 Save Button

Pressing the "Save" button will open a dialog box that allows the user to save the current pressure profile being edited.

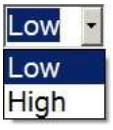
8.12.3 Delete Button

Pressing the "Delete" button will open a dialog box that allows the user to delete the current pressure profile being edited.

8.12.4 Okay Button

The "Okay" button will close the form.

8.12.5 Low / High Selection

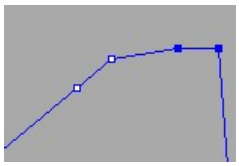


The "Low/High" drop down list selects whether the current pressure profile runs as low or high flow rates. The low flow rate is set at the factory to 0.5 l/min at 50% full scale with zero restriction at the manifold. The actual flow is dependent on the SPE column being used, the solvent being pushed through the columns, and the number of columns in the rack. High flow provides unrestricted flow to the columns. 100% full scale in low flow is roughly equivalent to 10% full scale in high flow.

8.12.6 Add and Delete Point Buttons

The Add and Delete Point Buttons are used to add or delete points for further refinement of a pressure profile. The delete button will delete any points currently selected. The add button will add new points to the right of any selected points.

8.12.7 Selecting and Deselecting Points



Points can be selected by clicking on them. Selected points are marked by a white point at their center. Each time a new point is clicked, it is added to the collection of selected points. If a selected point is clicked on, it will be deselected and removed from the list of selected points. If a line segment connecting two points is clicked on, then the two points terminating the line segment will be selected and all others will be deselected.

8.12.8 Moving Points

Clicking and dragging in the light gray background of the pressure profile graph area will move all selected points relative to the dragging motion.

8.12.9 Seconds Slider

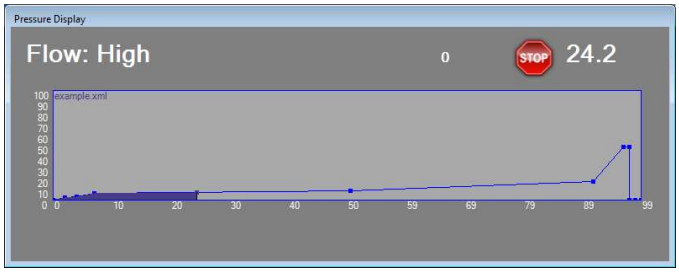
This can be used to determine the length of time for the pressure profile.

8.12.10 Increment Buttons

This can be used to determine the length of time for the pressure profile.

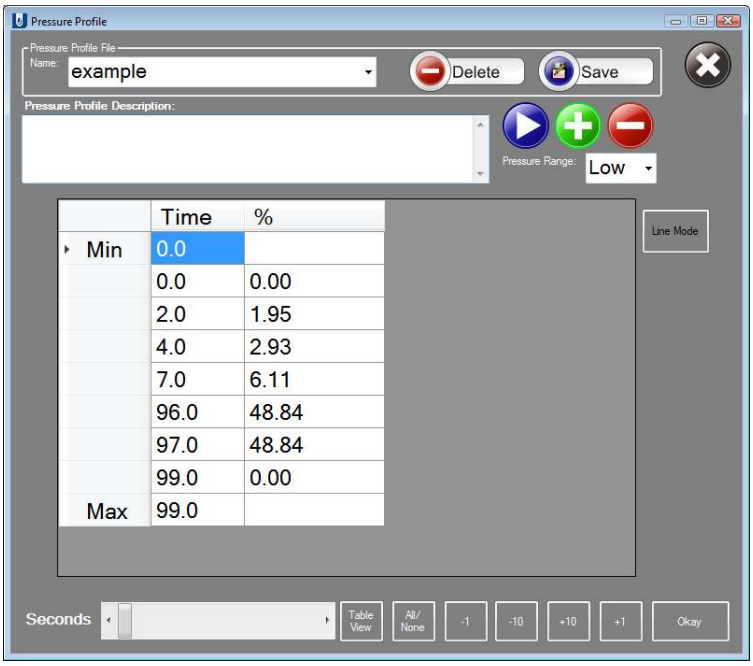
8.12.11 Run Button

The run button tests the pressure profile currently being edited by applying air pressure to the manifold using the currently selected profile. The Pressure Display form will be displayed with a black point cursor and infill to indicate the progress along the current pressure profile.



8.12.12 Pressure Profile Table View

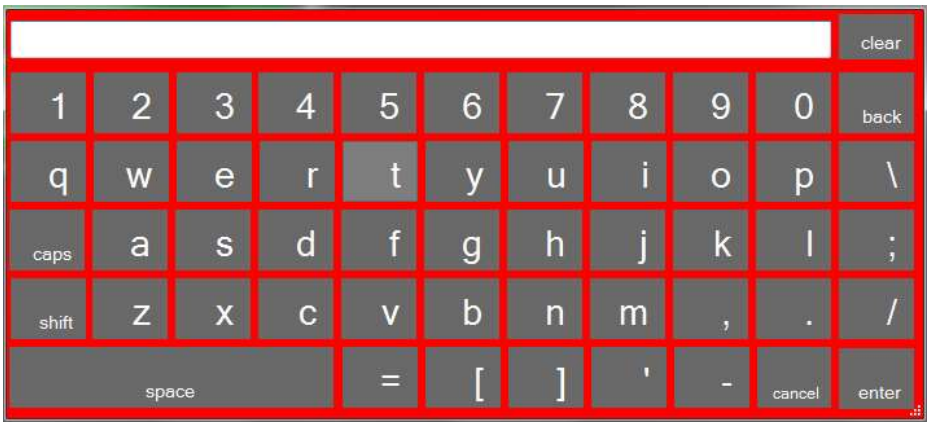
Right click on Pressure Profile in the edit or run screen to open a table view of the profile. There is also a Table View button at the bottom of the window.



8.13 Touchpads

(a)

(b)



The touchpad is an alphanumeric touch pad molded after the cell phone type touch pads to allow easier entry of data from a touch screen with limited screen space.

For touchpads as in image (a), enter values simply by touching the screen within the bounding box for the desired character. The first value to appear is the numerical value from the box touched. Other values visible on the box and some not visible are possible to achieve by touching the box successive times with less than one second pause between touches. If the same character is desired in sequence, then touch the box for that character once, then pause for at least one second and then touch the same box again.

For touchpads as in image (b), enter values as desired. This is molded after a standard keyboard. Other non-alphanumeric characters are visible when the shift or caps button is pressed.

9 Faults and Troubleshooting

9.1 Solvent Name Discrepancy

Issue: When trying to run a method, the system complains that a given solvent is not present.

Possible Cause: This problem can occur because at the time a method is created, the named solvents that are on the system at the time of creation are used to build the method. If at some future point the solvents on the system are renamed, even if only by a single character, the previously generated methods will not know which port to find them on.

Remedy: Either the solvents on the system need to be renamed to match the solvents in the created methods or the methods need to be edited and solvents updated to match those that are connected to the system.

9.2 Uneven Dispense (Air Bubbles)

Issue: When dispensing solvents into SPE wells, one or more wells are short solvent.

Possible Cause: This could be caused by air getting into the solvent lines.

Remedy: Read next section for more detailed solutions and possible causes.

9.2.1 Air bubbles appear in syringe only during aspiration

How to identify: Visually inspect syringe during aspiration. The bubbles disappear when the plunger stops moving.

Remedy: Degas solvent or lower solvent aspiration speed. Verify the solvent bottle cap is vented to prevent unwanted vacuum pressure.

9.2.2 Solvent lines are not fully immersed in solvent

How to identify: Visually inspect solvent line for submersion into solvent.

Remedy: Lower solvent lines unit they reach the bottom of the solvent bottle.

9.2.3 Kinked or damaged solvent lines

How to identify: While solvent is being aspirated into syringe, an air bubble appears at a mid-point in the solvent line.

Remedy: Cut out damaged line. Replace line if cutting out damage portion will result in line being too short to submerge in solvent.

9.2.4 A large air bubble forms at the top of the inner part of the syringe

How to identify: Prime each solvent line and make note if the air bubble accumulates from all solvent lines or a specific couple of lines. If the air bubble forms at a specific line, use “Remedy 1”. If the air bubble forms from all solvent lines, use “Remedy 2”.

Remedy 1: For specific solvent line(s);

1. Verify that the troubled solvent line’s fitting is secure and not loose.
2. Repeat for each solvent port.

Remedy 2: For all solvent lines;

1. Loosen the syringe collar and tighten the syringe another ¼” turn in the clockwise direction.
2. If problem persists, remove the syringe and verify that the syringe to valve seal has not bottomed out. This can be observed by the white, Teflon piece at the top of the syringe. If it is no longer protruding pass the metallic part of the syringe, the syringe needs to be replaced.

9.2.5 Syringe’s O-ring at bottom of plunger

How to identify: Air bubbles will come in from the bottom of the syringe and float to the top.

Remedy: Seal is warped or damaged. Replace syringe.

9.2.6 Pressure varies from flash to flash

How to identify: Observable variation of pressure profiles between runs

Remedy: Verify that a regulator is positioned between the gas source and the unit. The same source pressure should be used to assure repeatable results between runs.

Verify that the air supply can provide a minimum flow rate greater than the maximum flow consumption of the Resolvex A200.

Verify that additional equipment on the same air supply is not starving the Resolvex A200 of required flow.

10 Pre-operation Checklist

1. Verify liquid level in waste container and make sure the waste tubing are not submerged in the liquid as this will prevent proper draining.

   ⚠ Warning: Waste bin and surroundings may be contaminated with biological samples. Operators should wear gloves, protective clothing and follow good laboratory practices when emptying waste bin or cleaning surroundings to prevent exposure to biohazards. Waste should be treated as biohazard materials.

2. Verify each solvent level and replenish if needed.

3. Reset the level of each solvent to its actual level as a percentage of solvent bottle size on the main screen of the Resolvex A200.

4. Inspect the syringes for leaks and correct any problems. A leak is defined as fluid that is visible below the seal or air bubbles that comes up from the bottom around the seal during aspiration.

5. Inspect the manifold column seal for wear and tear or detachment. Replace if necessary or clean using a lint-free cloth or wipe.

6. Inspect solvent lines connections at valve for loose fittings, leaks, any air pockets and correct any problems. Round Fittings are torque limited, are finger tightened and cannot be overtightened (When they click, they are tight enough).

7. Wipe up all spills on and around the pump, syringe, and valve.

8. Do NOT allow the pump to run dry for more than a few cycles as this will put excessive wear on the seal.

9. Inspect waste tubing for obstacles or kinks that may cause the deck waste reservoirs to overflow. Tubing should not be damaged and should allow free flow of fluids into the waste bottle.

10. Flush waste tray tubing with distilled or de-ionized water after use and when the unit is not in use to prevent clogging in the tubing.

11. Inspect the waste bottle. The waste bottle should be emptied daily or sooner if ¾ capacity has been reached.

11 Preventive Maintenance

Note: Software has utilities to schedule prompts to alert users of routine preventive maintenance items.

11.1 Weekly Maintenance

Any of the following cleaning procedures can be used:

11.1.1 Cleaning for a Pure Organic Used System

1. No flushing or cleaning is required.

11.1.2 Cleaning for a Mixed Water and Immiscible Organics Used System

1. Prime the pump with a bridging solvent like IPA (miscible with both water and water-immiscible organics) with the syringe fully lowered.
2. Flush the pump with distilled or de-ionized water.
3. Prime the pump a minimum of 2 cycles with 25 mL of distilled or de-ionized water.

11.1.3 Cleaning for High Salt Buffer Used System

1. Prime the pump with 25 mL of distilled or de-ionized water a minimum of 5 cycles.

11.1.4 Weak Acid-Base-Sequence Cleaning

1. Prime the pump with 0.1 N NaOH and allow the solution to remain in the pump for 10 minutes with the syringe fully lowered.
2. Flush the pump with distilled or de-ionized water.
3. Prime the pump with 0.1 N HCl, and allow the solution to remain in the pump for 10 minutes with the syringe fully lowered.
4. After a 10-minute period, remove the reagent tubing from the 0.1 N HCl solution and cycle all the fluid from the syringe and tubing into a waste container.
5. Prime the pump a minimum of 10 cycles with distilled or de-ionized water.

11.1.5 Verification of Light Curtain Operation

1. Initiate a manifold movement within a method and observe that the light curtain remains active during the entire manifold movement.

Note: The light curtain is active while the system LEDs are green. Correct function is verified only if the manifold completes the entire motion before the LEDs change color.

11.2 Semiyearly Maintenance

11.2.1 Lead Screw

1. The lead screw of the pump should be lubricated if the pump is making a "screeching" noise and/or if the syringe is stalling frequently.

2. Lubrication is usually only needed after 1 million syringe strokes. If the pump screw appears to need lubrication more frequently, suspect another problem. NOTE: Only a specific lubricant should be used for lubricating the lead screw.

11.3 Periodic Maintenance

11.3.1 Solvent Tubing

1. It is important that all tubing be kept clean and free of crimps. Tubing that has become dirty, blocked or crimped can result in poor accuracy and precision. Replace the tubing if necessary.

   To replace the solvent line, follow these steps:

   Loosen the round fittings Remove the solvent Line from the pump valve.

   Install the new solvent line into the pump valve by hand tightening it. Use a 5/16” wrench to tighten the square head fitting an additional 1/8 - 1/4 turn.

   When replacing solvent lines, make note of the line labeled “Port 1 Only.” This line should only be used to replace the solvent line in port 1 (the hole on the valve on the outermost row of holes and furthest to the back of the unit, leading up to the dispense head).

2. Make certain that the Tefzel nuts on the solvent lines are secure and tight. Loose fittings can result in air bubbles and poor accuracy of dispensing solvents.

11.3.2 Syringe and Pumps

If either become worn, it is likely that these symptoms will occur:

1. Poor precision and accuracy in dispensing solvents.

2. Large air bubbles accumulating at the top of the syringe (not to be confused with normal cavitation).

3. Leakage.

Syringes are considered maintenance items. The syringes should be changed a minimum of once per year or upon leaking. Leakage is defined as fluid that is visible below the seal. If the syringe is not changed it will cause degradation of the unit's performance, scratching of the syringe barrel and damage to the pump.

To replace a syringe, follow these steps:

1. Go to the "Replace Syringe Form".
2. It is recommended to evacuate all lines to prevent spillage.
3. Select the syringe to be replaced and press "Run". The pump will lower the syringe plunger.
4. Remove the plunger lock screw.
5. Loosen the collar.
6. Unscrew the syringe from the valve by turning counter-clockwise.
7. Pull the syringe plunger down to the plunger holder assembly on the new syringe.
8. If an O-ring is supplied, insert the O-ring into the syringe port of the valve. NOTE: The O-ring should be seated past the threaded area of the valve, with caution taken, as to not damage the threads of the valve.
9. By hand, install the replacement syringe and collar by aligning the syringe straight with the syringe port of the pump and rotate clockwise until the syringe end cap seal hits the bottom of the valve.
10. After bottoming out, rotate another ¼ to ½ turn more clockwise to ensure seal without over tightening. NOTE: Over tightening may cause unwanted cavitation during operation, i.e. large air bubbles. However, rotating slightly more than ½ turn is acceptable.
11. Push the plunger up to align with the carriage.
12. Slide the plunger lock screw through the plunger, and fasten to the carriage. Do not overtighten.
13. Go to the "Replace Syringe Form" and press "Done".

Note: Make sure the plunger lock screw is securely tightened and the plunger button is free to move on the plunger lock screw.

11.3.3 Pump Lead Screw

1. If the pump is used in a dusty environment, the lead screw should be cleaned periodically with compressed air.

11.3.4 Cleaning Surface Area

1. The deck of the Resolvex A200 can become dusty or dirty from solvent or sample spills. Periodic cleaning should take place to prevent damage to the surface areas of the platform.

2. A lint-free cloth should be used along with IPA and/or a mild cleaning agent to clean the sheet metal and anodized areas.

11.3.5 Column Seal

1. Replace manifold gasket every 12 months. Due to the adhesive strength of the manifold gaskets, when replacing, acetone and a lint-free wipe may be necessary to remove the remaining adhesive. NOTE: Care should be taken to prevent any blockage in the ports of the manifold which can cause poor and uneven air flow into columns, as well as cross contamination.

11.3.6 Light Curtain

1. The light curtain of the Resolvex A200 can become dusty or dirty from solvent or sample spills. Periodic cleaning should take place to prevent malfunction of this safety feature.

2. Only a lint-free cloth should be used to wipe down the lenses of the curtain. Soap and water may be used if necessary. NOTE: The use of harsh solvents could deform the plastic lens.

11.3.7 Drain Tubes

1. It is important that both tubes be kept clean. Tubing that has become dirty or blocked can result in poor waste drainage. Replace the tubing if necessary.

2. Flush the waste tubes with distilled or de-ionized water to prevent build ups of solvents or samples.

11.3.8 Column Seal Replacement

The manifold gasket that provides the interface between the columns and the manifold should be replaced every 12 months or as needed depending on use. The solvents in some assays may cause the gasket adhesive to wear out sooner. If aggressive solvents are commonly used, a gasket with a more permanent adhesive can be ordered. The gasket replacement kit comes with the required tools to replace the gasket. The following procedure should be used to replace the manifold gasket but the kit may come with instructions that are more up to date. If assistance is required with gasket replacement, contact Tecan customer service.

1. Use the enclosed 3/16 inch hex key to remove the two 1/4-20 screws fastening the manifold to the unit.
2. Lift the manifold off the standoffs and place it upside down on the table.
3. Remove old column seal from the manifold and wipe the surface area with a lint-free wipe and acetone or IPA.
4. Remove the backing of the replacement column seal.
5. Insert two of the enclosed screws into two of the corners of the column seal. Opposite corners is ideal.
6. Use the screws for aligning by placing them in their respective corners of the manifold.
7. Carefully adhere the replacement column seal making sure all ports are visible.
8. Once the column seal is attached remove the screws.
9. Take the manifold and carefully set it on the standoffs. Fasten the manifold with the two 1/4-20 screws. Be sure to tighten the screws using the 3/16 inch hex key.

12 Default Passwords

Default passwords can be changed in the passwords tab of the settings dialog box. To change the passwords, put the Resolvex CONTROL in to program mode then press the lock button. Enter the password then press the settings button.

Once passwords have been changed, settings must be saved by pressing the save button on the settings form.

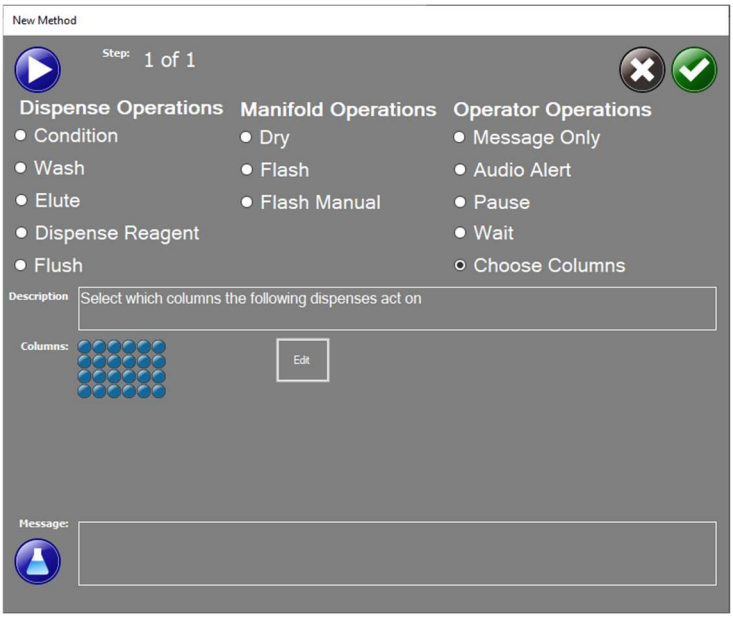
Function	Password
LockPassword	cerex
EditMethodPassword	change
DeleteMethodPassword	erase
EditPressureProfilePassword	change
EditSolventsPassword	change
StopRunningProfilePassword	stop
AlterDryTimePassword	Timeflies
AlterWaitTimePassword	timeflies

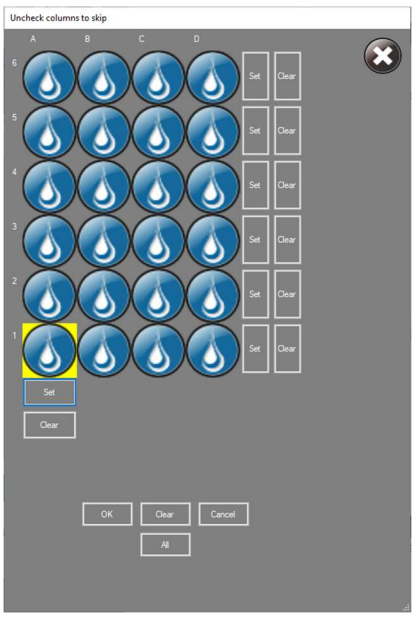
13 Resolvex™ A200 24 Configuration

The A200 24 configuration is designed to process 24 column workflows.

This unit has an air manifold with 24 ports to force liquids through the columns.

Likewise, the column chooser is configured for 24 columns:





The Choose Columns operation can be used to override the columns that were initially selected at the beginning of the method if a specific solvent is not to be used on all the columns in the assay.

14 Resolvex™ A200 “Omics” Configuration

The standard A200 configuration has a fan that draws air from inside the unit, so that fumes are vented away from the unit. This is desirable for many workflows. However, this means that dust particles in the air containing keratins could be pulled into the unit and interfere with “omics” applications.

The A200 Omics configuration reverses the fan direction, and it adds a Hepa filter to the unit. Hepa filtered air is pushed into the unit. This creates a higher pressure inside the unit, relative to the surrounding air. So dust particles are not drawn inside, but instead they are blown away from any place where they may enter, except though the Hepa filter itself. In most use cases, the Hepa filter should be changed annually. However, the filter should be replaced more often if used in a particularly dusty environment or if results indicate a sudden rise in particulates.

It takes approximately two minutes to purge the air inside the unit with Hepa filtered air. The Hepa filtered air blows continuously as long as the unit is turned on.

⚠ **Warning**: As stated above, the standard A200 has a fan that draws air from inside the unit, so that fumes are vented away from the unit, and the Omics configuration reverses this flow. Therefore if the Omics configuration were to be used with solvents that should not be breathed, consider that the fan will blow these into the surrounding air rather than venting away from the unit. In this case appropriate measures such as using within a fume hood are necessary to ensure operator safety. Because use cases may vary and cannot be fully predetermined, only the end user can determine safe practice with respect to venting of the unit for their particular use.

15 File Security Features

Version 4.0 and above provide enhanced security of files. Files are encrypted to minimize the possibility of tampering with files.

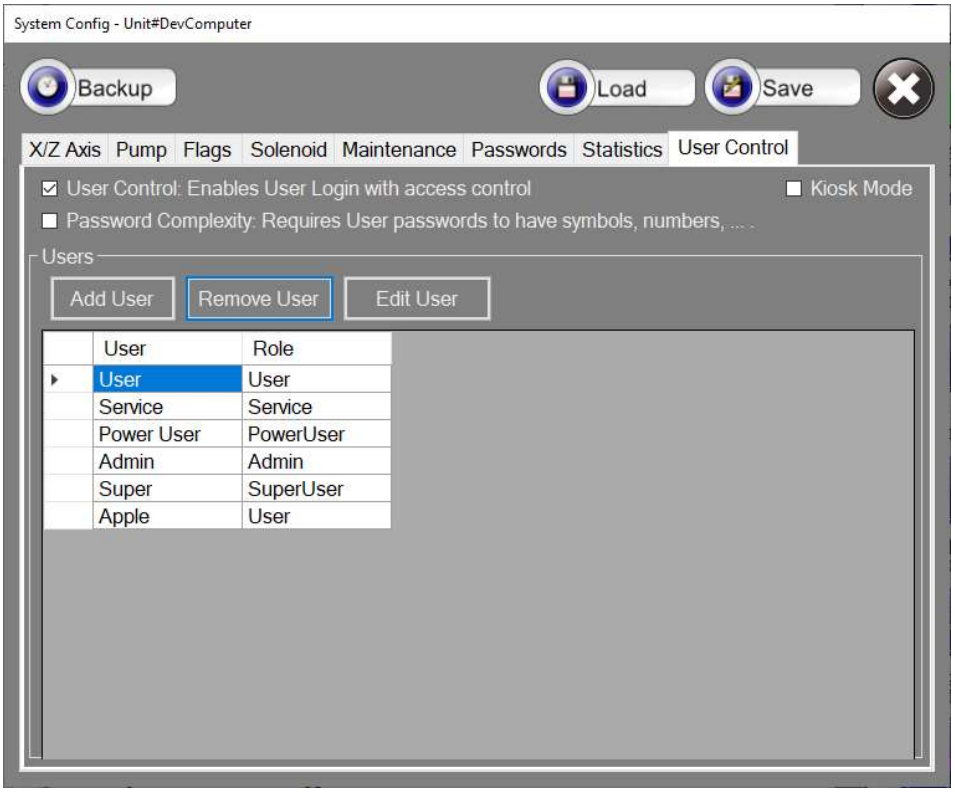
16 User Control Features

The User Control Features described in this section are available in Software Revision V 4.0 and higher. These features facilitate Good Laboratory Practices with regard to ensuring that methods are not changed in an uncontrolled manner.

16.1 Enable User Control

To enable User Control, open the system config there is a new tab. Click the User Control Check box.

Note: There must be a Admin user for this to stay enabled



16.1.1 Method Types

With User Control there are two classes of methods:

R&D and Production

Any method not made into Production is R&D and is marked with a "*". Role "User" is limited to only using "Production" methods.

16.1.2 Roles

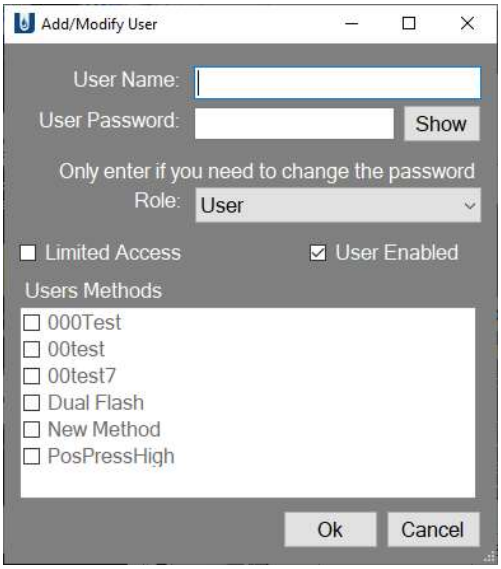
There are 5 user roles that define what can be accessed and when not logged in.

User Activity		Types of User					
Form	Control	None (no login)	Normal User	Power User	Administrator	Service User	Super User
Main Operate	Minimize	No	No	No	No	Yes	Yes
	Maximize	No	No	No	No	Yes	Yes
	Exit	No	No	No	No	Yes	Yes
	Run	No	Yes	Yes	No	Yes	Yes
	Light	No	Yes	Yes	No	Yes	Yes
	Prime	No	Yes	Yes	No	Yes	Yes
	Levels	No	Yes	Yes	No	Yes	Yes
	Program - toggle	No	No	Yes	Yes	Yes	Yes
	User Button	Yes	Yes	Yes	Yes	Yes	Yes
	Favorites - Toggle	No	Yes	Yes	Yes	Yes	Yes
	Reboot System - (kiosk only)	Yes	Yes	Yes	Yes	Yes	Yes
	Favorites - Config	No	Yes	Yes	Yes	Yes	Yes
Main Program	Minimize	No	No	No	No	Yes	Yes
	Maximize	No	No	No	No	Yes	Yes
	Exit	No	No	No	No	Yes	Yes
	Edit	No	No	Yes	No	Yes	Yes
	Add New	No	No	Yes	No	Yes	Yes
	File Management	No	No	Yes	Yes	Yes	Yes
	Solvents	No	No	Yes	Yes	Yes	Yes
	Operate - toggle	No	No	Yes	Yes	Yes	Yes
	Profiles	No	No	Yes	Yes	Yes	Yes
	Analysis	No	No	Yes	Yes	Yes	Yes
	Lock Button ->	No	No	Yes	Yes	Yes	Yes
	Advanced Button	No	No	No	No	Yes	Yes
	Settings	No	No	Yes	Yes	Yes	Yes
	Setup	No	No	No	No	Yes	Yes
	** Trap Log	No	No	No	No	Yes	Yes

	** External Serial Inject	No	No	No	No	Yes	Yes
	** Serial Terminal	No	No	No	No	Yes	Yes
	** Color Show	No	No	No	No	Yes	Yes
Settings - (System Config)	X/Z Axis	No	No	No	No	Yes	Yes
	Pump	No	No	No	No	Yes	Yes
	Flags	No	No	No	No	Yes	Yes
	Solenoid	No	No	No	No	Yes	Yes
	Maintenance	No	No	Yes	Yes	Yes	Yes
	Passwords	No	No	No	Yes	No	Yes
	Statistics	No	No	No	No	Yes	Yes
	User Control	No	No	No	Yes	No	Yes
Setup	X-Axis	No	No	No	No	Yes	Yes
	Z-Axis	No	No	No	No	Yes	Yes
	Pump	No	No	No	No	Yes	Yes
	Sole	No	No	No	No	Yes	Yes
	Flow	No	No	No	No	Yes	Yes
	Exercise	No	No	No	No	Yes	Yes
	Axis Firmware	No	No	No	No	Yes	Yes

16.1.3 Add

Opens a windows to add new users. Limited is for the “User” role to limit which of the “Production” methods they are allowed to use. User Enabled allows for a user to be disabled without removing their information.



If Hide Password Characters is enabled, there is a “Show” button to allow verifying passwords.

16.1.4 Delete

Used to delete users.

16.1.5 Edit

Alter existing users.

16.1.6 Kiosk Mode

When enabled, access to the OS is limited for all roles except “Service” and “Super User”.

16.1.7 Password Complexity

If desired, requires a complex password.

Passwords must:

Contain at least one digit 0-9.

Contain at least one uppercase A-Z.

Contain at least one lowercase a-z.

Contain at least one symbol ~!@#$%^&*_-+=`|\(){}[]:;" '<>,.?/.

Be at least 8 characters long.

16.2 Main

16.2.1 Login

Login button in the lower left click to login, change user, or log out.

Right click or click hold on a touch screen to change the password.

16.2.2 Favorites Select

Opens the Favorites window

16.2.3 Favorites Window

Check box to enable Favorites.

Select methods that will be displayed, when Favorites is selected.

Can also change the order of the selected favorites.

16.3 Favorites Toggle

 Show All available methods

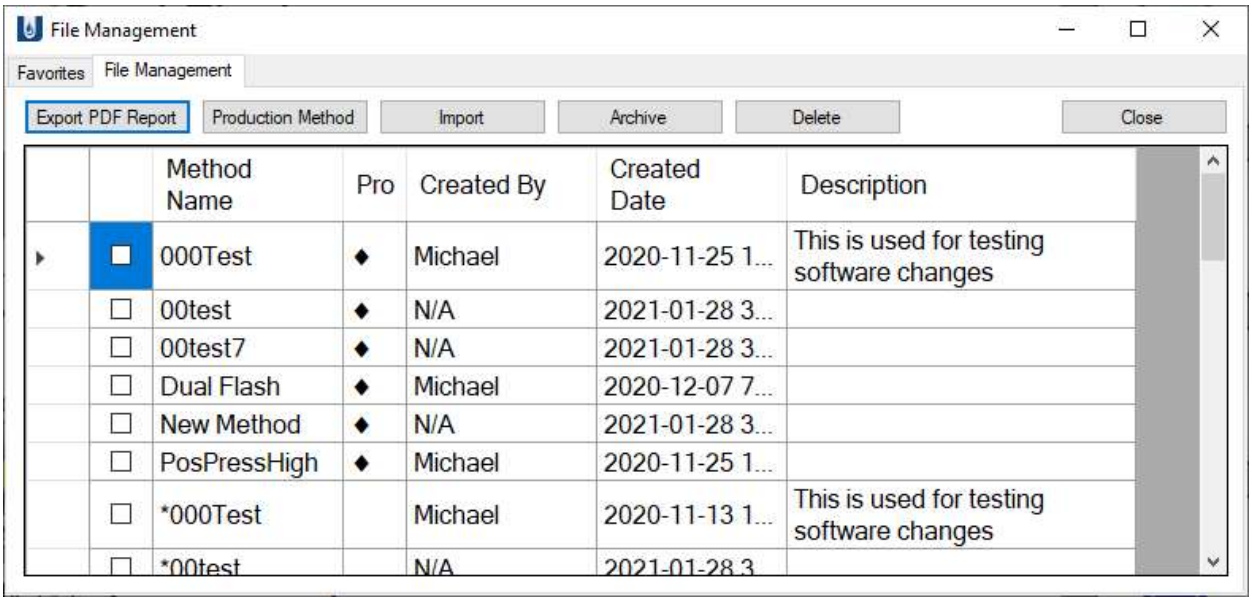
 Show Only methods selected in the Favorites Window

16.4 Program Mode

16.4.1 File Management

Opens the File Management form and replaces the delete method button

16.4.2 File Management Form



Select one or more methods using the check boxes.

Export PDF Report: Saves the methods to a user readable PDF format including solvents, profiles, and slide shows.

Production Method: Converts Methods from R&D to Production.

Import: Imports Archived methods.

Archive: Creates a backup of a method including solvents, profiles, and slide shows.

Delete: Deletes methods. Production methods are archived before delete to keep as records.

17 Cross-References

17.1 References

Ref. 1: RESOLVEX A200 INSTALLATION QUALIFICATION AND OPERATIONAL QUALIFICATION CHECKLIST, PART NO. 102-5460

Ref. 2: RESOLVEX A200 OPERATOR TRAINING CHECKLIST

18 Abbreviations, Trademarks and Symbols

18.1 Abbreviations

The following abbreviations are provided as a reference and may appear in the Instruction for Use.

A	Ampere
AC	Alternating Current
ACB	Aluminum Column Block
ADC	Analog Digital Converter
ANSI/SBS	American National Standards Institute/Society for Biomolecular Screening
ASCII	American Standard Code for Information Interchange
ASTM	American Society for Testing and Material
DB	Database
°C	Degrees Celsius
CE	Conformité Européenne
CFR	Code of Federal Regulations
CISPR	Comité International Spécial des Perturbations Radioélectriques
cm	Centimeter
DC	Direct Current
EC	European Community
ELISA	Enzyme-linked Immunosorbent Assay
EN	European Norm
EMC	Electromagnetic Compatibility
°F	Degrees Fahrenheit
FDA	Food and Drug Administration
FCC	Federal Communication Commission United States of America government agency
HPLC	High Performance Liquid Chromatography
Hz	Hertz
IEC	International Electrotechnical Commission
ID	Inner Diameter
IFU	Instructions for Use
IQ	Installation Qualification
IVD	In vitro diagnostics
kg	Kilogram
l	Liter
LC/MS	Liquid Chromatography / Mass Spectrometry
LED	Light Emitting Diode
LIS	Laboratory Information System

mg	Milligram
ml	Milliliter
mL/m	Milliliter per minute
mm	Millimeter
MTP	Microplate
µl	Microliter
NFM	Nonferrous Metal
NIST	National Institute of Standards and Technology
nm	Nanometer
OD	Outer Diameter
OQ	Operational Qualification
PCB	Printed Circuit Board
PSI	Pressure per Square Inch
RCB	Rimless Column Block
RCH	Rimless Cartridge Holder
RF	Radio Frequency
RoHS	Restriction of the Use of Certain Hazardous Substances
SOP	Standard Operating Procedure
USB	Universal Serial Bus
UA	Arbitrary Units
TÜV	Technischer Überwachungsverein (Technical Inspection Agency)
V	Volt
VA	Volt Ampere
VAC	Volts Alternating Current
VDC	Volts Direct Current
WEEE	Waste electrical and electronic equipment

18.2 Trademarks

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18.3 Tecan Customer Support

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Prior to contacting Tecan for product support, prepare the following information for the best possible technical support (see name plate):

- Model name of your product
- Serial number (SN) of your product
- Software and software version (if applicable)
- Description of the problem and contact person
- Date and time when the problem occurred
- Steps that you have already taken to correct the problem
- Your contact information (phone number, fax number, e-mail address, etc.)

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