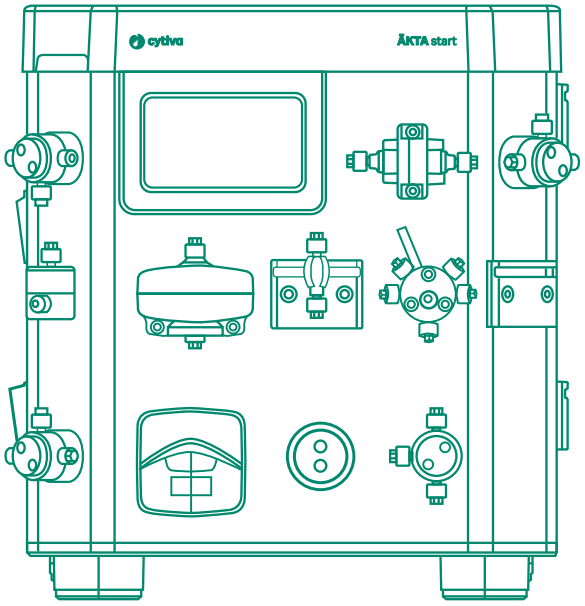
cytiva

ÄKTA start™

Maintenance Manual



UNICORN™ start

cytiva.com

Table of Contents

1 Introduction

About this chapter

This chapter contains important user information and a list of associated documentation.

In this chapter

1.1 Important user information

Introduction

This section contains important user information about the product and this manual.

Read this before operating the product

All users must read the entire *Operating Instructions* before installing, operating, or maintaining the product.

Always keep the *Operating Instructions* at hand when operating the product.

Do not install, operate, or perform maintenance on the product in any other way than described in the user documentation. If you do, you can be exposed or expose others to hazards that can lead to personal injury and you can cause damage to the equipment.

Intended use

The ÄKTA start™ system is a liquid chromatography system that is used for preparative purification of proteins at laboratory-scale. The system can be used for a variety of research purposes to fulfill the needs of the users in academia and the life sciences industry.

The system is intended for research use only, and shall not be used in any clinical procedures, or for diagnostic purposes.

System definition

In this manual, the combination of the ÄKTA start instrument and the UNICORN™ start software is referred to as the system.

The ÄKTA start instrument without the software is referred to as the instrument.

Prerequisites

In order to operate the ÄKTA start system in the way it is intended:

- The user must understand the concepts of liquid chromatography.
- The user must know how to use a computer with the Windows operating system.
- The user must read and understand the *Safety Instructions* chapter in the *Operating Instructions*.
- The ÄKTA start instrument must be installed in accordance with the site requirements and instructions in the *Operating Instructions*.

1.2 About this manual

Introduction

This section contains information about the purpose and scope of this manual, notes and tips, and typographical conventions.

Purpose of this manual

This manual provides information needed to install, operate and maintain the product in a safe way.

Nomenclature conventions

The nomenclature used in this manual is explained in the table below.

Concept	Explanation
ÄKTA start	The instrument.
Frac30	The Fraction collector.
UNICORN start	The software installed on a computer.
ÄKTA start System	The entire liquid chromatography system, including instrument, Fraction collector and software.

Definitions

This user documentation contains safety notices (WARNING, CAUTION, and NOTICE) concerning the safe use of the product. See definitions below.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

NOTICE

NOTICE indicates instructions that must be followed to avoid damage to the product or other equipment.

Notes and tips

Note: *A note is used to indicate information that is important for trouble-free and optimal use of the product.*

Tip: *A tip contains useful information that can improve or optimize your procedures.*

Typographical conventions

Software items are identified in the text by ***bold italic*** text.

Hardware items are identified in the text by **bold** text.

Tip: *The text can include clickable hyperlinks to reference information.*

1.3 Associated documentation

Introduction

This section describes the user documentation that is delivered with the product, and how to find related literature that can be downloaded or ordered from Cytiva.

User documentation for ÄKTA start

The user documentation for ÄKTA start is listed in the table below.

Translations of the Operating Instructions in several languages are provided on the translation CD.

Documentation	Main contents
ÄKTA start Operating Instructions (29027057)	Instructions needed to install, operate and maintain ÄKTA start in a safe way.
ÄKTA start Maintenance Manual (this manual)	Detailed instructions for maintenance and troubleshooting of ÄKTA start.
ÄKTA start Unpacking Instructions (29027046)	Instructions for unpacking ÄKTA start.
ÄKTA start UV module and Support Information (29140373)	Instructions for initial setup of the UV monitor.
ÄKTA start System Cue Card (29024042)	A condensed guide to prepare and run chromatographic techniques on ÄKTA start.
ÄKTA start Maintenance Cue Card (29024043)	A condensed guide to handling routine maintenance operations and trouble-shooting ÄKTA start.

The following documentation is available from the Instrument Display.

Documentation	Main contents
ÄKTA start Instrument Display Help	Dialog descriptions of the functionality menu for ÄKTA start (only accessible from the Instrument Display).

From the Help menu in UNICORN start or on the *UNICORN start DVD*, the following user documentation is available.

Documentation	Main contents
UNICORN start User Manual	Overview and detailed descriptions of the system control software designed for ÄKTA start, which includes process picture map for real time monitoring, method editor, evaluation and administration modules.
UNICORN start Online Help	Dialog descriptions for UNICORN start (only accessible from the Help menu).
ÄKTA start firmware and UNICORN start Compatibility matrix	Provides the compatibility matrix for the ÄKTA start instrument and the UNICORN start software versions.

Data files, application notes and user documentation on the web

To order or download data files, application notes or user documentation, see the instruction below.

Step	Action
1	Go to *cytiva.com/aktastart*.
2	Navigate to ***Related Documents***.
3	Select to download the chosen literature.

Access user documentation online

Scan the QR code or visit *cytiva.com/instructions*. Enter the title or the document number to access the file.

eLearning course on-demand

An on demand eLearning course is available for the ÄKTA start system. To enroll go to *cytiva.com/aktastartelearning*.

The following lessons are available for the *Get started: ÄKTA start system* course.

- Get to know ÄKTA start
- Preparing ÄKTA start
- Operating ÄKTA start – standalone
- Operating UNICORN start software
- Maintenance and calibration of ÄKTA start
- Tips for improved protein purification with ÄKTA start
- Protein purification troubleshooting for ÄKTA start

1.4 Abbreviations

Introduction

This section explains abbreviations that appear in the user documentation for ÄKTA start.

Abbreviations

Abbreviation	Definition
AC	affinity chromatography
AU	absorbance unit
BMP	bitmap file format
cP	centipoise (unit of viscosity)
CV	column volume
DM	demineralized
DS	desalting
ETFE	ethylene tetrafluoroethylene
FEP	fluorinated ethylene propylene
FPGA	field-programmable gate array
GF	gel filtration (synonymous with size exclusion chromatography
IEX	ion exchange chromatography
LED	light-emitting diode
mS	milliSiemens (unit of conductivity)
PEEK	polyether ether ketone
RBS	proprietary detergent
SEC	size-exclusion chromatography (synonymous with gel filtration)
UNF	unified fine thread (screw thread standard)
UPS	uninterruptible power supply
USB	universal serial bus

2 System description

About this chapter

This chapter provides an overview of the ÄKTA start instrument, and the optional Fraction collector Frac30. For more details, refer to the *ÄKTA start Operating Instructions*.

In this chapter

2.1 System overview

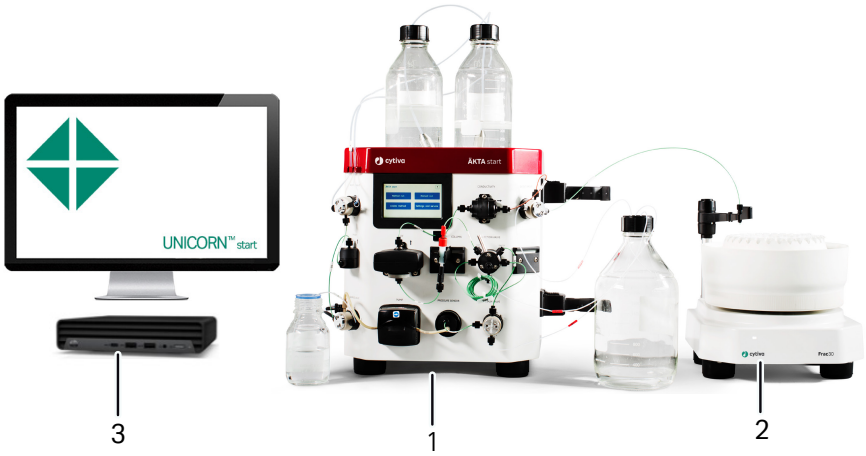
Introduction

ÄKTA start is operated and controlled from the Instrument Display. In addition, the UNICORN start software can be used to control ÄKTA start and to analyze the data acquired during chromatography runs. UNICORN start offers several additional features that are described in detail in *UNICORN start User Manual*.

This section gives an overview of the ÄKTA start system.

Illustration of the system

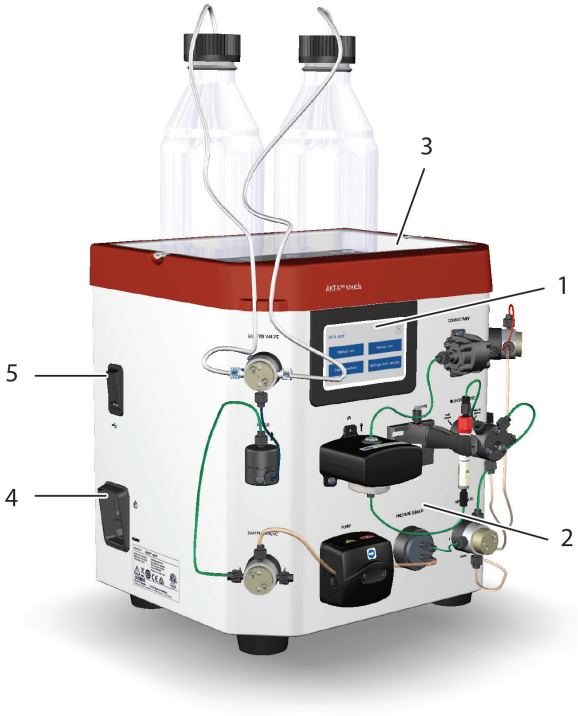
The illustration below shows the ÄKTA start System with UNICORN start installed on a computer.



Part	Description
1	ÄKTA start (instrument)
2	Fraction collector, Frac30
3	UNICORN start (software installed on a mini computer)

Illustration of the instrument

The illustration below shows the main parts of the instrument.



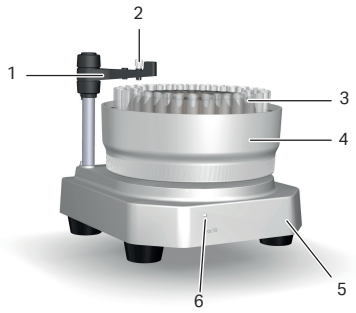
Part	Description	Function
1	Instrument Display	User interface for controlling the system and visualization of the runtime data.
2	Wet side	The modules interconnected by tubing have the following functions: • to deliver the liquid in a specified flow path and divert the flow as required, • to monitor the UV absorbance and conductivity of the liquid.
3	Buffer tray	Location intended for the placement of buffer bottles used during chromatography runs.
4	Power switch	Connects or disconnects the power.

Part	Description	Function
5	USB port	To connect a USB memory stick for storage of results and transfer of files. ***Note:*** *USB hard drives are not supported.*

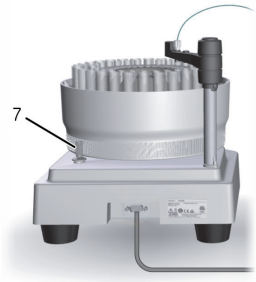
Illustration of the Fraction collector

The illustration below shows the front and rear views of the Fraction collector, Frac30.

Note: *ÄKTA start does not support fractionation with any fraction collector other than Fraction collector Frac30.*



Front side view



Rear view

Part	Description	Function
1	Dispenser arm assembly	Holds and positions the tubing holder for dispensing the liquid into fractions.
2	Tubing holder	Holds the tubing used for dispensing the liquid fractions into the collection tubes.
3	Collection tubes	12 mm and 17 mm diameter tubes of different lengths used to collect the fractions.
4	Bowl assembly	Holder for collection tubes, which supports tubes of four sizes.
5	Base unit	Case for electromechanical assembly and holder for the Bowl assembly.
6	LED	Power on indicator.

Part	Description	Function
7	Drive sleeve	Friction drive to turn the Bowl assembly during fraction collection.

Main features of ÄKTA start

The main features of ÄKTA start are listed below:

- ÄKTA start is a compact and one step purification solution for quick and reliable purification of proteins.
- A simple and modern system offered to automate the protein purification workflow by providing features like automated sample injection, fraction collection, real-time monitoring.
- Method templates are available for all common chromatography techniques such as Affinity Chromatography, Ion Exchange Chromatography, Gel filtration, and Desalting.
- Quick start methods are available for purifying several common proteins.
- Predefined system methods are available for cleaning the flow path.
- ÄKTA start is operated using a touch screen on the instrument.
- In addition, the system can be operated from a computer connected to the instrument using the UNICORN start software.
- ÄKTA start is offered with a dedicated Fraction collector, Frac30, allowing collection of fractions in four different tube sizes.

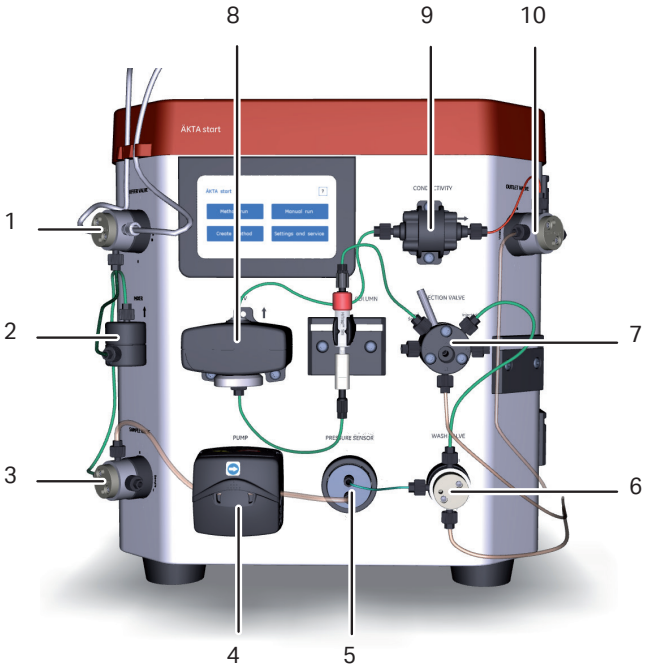
2.2 Instrument

Introduction

This section provides an overview of ÄKTA start modules.

Illustration of the instrument modules

The illustration below shows the locations and gives brief descriptions of the modules placed on the wet side of the instrument.



Part	Function	Description
1	**Buffer valve**	A 3-port valve that is used as a switching valve for gradient formation using two buffers.
2	**Mixer**	A static mixer that is used for mixing buffers A and B.

Part	Function	Description
3	**Sample valve**	A 3-port valve that allows either the buffer or the sample to enter the flow path. The **Sample valve** enables direct application of the sample onto the column using the **Pump**.
4	**Pump**	A peristaltic pump, which delivers buffer or sample to the flow path with a flow rate of up to 5 mL/min. For cleaning procedures, the **Pump** can flush the flow path at a flow rate of 10 mL/min.
5	**Pressure sensor**	The **Pressure sensor** reads the pressure in the flow path and senses overpressure.
6	**Wash valve**	A 3-port valve that is used to divert the flow path to waste. The **Wash valve** switches automatically during the predefined cleaning procedure, ***Pump wash***. In a manual run, the valve can be set to the intended position by configuring the run parameters.
7	**Injection valve**	A 6-port manually operated valve that is used to transfer the sample loaded in the sample loop on to the column. A sample loop is connected to the appropriate ports of the valve. The valve is switched manually to positions: • ***Load sample***: to allow the loading of the sample into the sample loop. • ***Inject to column***: to transfer the sample from the loop on to the column during a chromatography run.
8	**UV**	The **UV** Monitor continuously measures the absorbance of the liquid in the **UV flow cell** at a fixed wavelength of 280 nm. The **UV flow cell** has a path length of 2 mm.

Part	Function	Description
9	**Conductivity**	The **Conductivity** Monitor continuously reads the conductivity of the liquid in the **Conductivity flow cell**. The conductivity is automatically calculated by multiplying the measured conductance by the cell constant of the flow cell. The cell constant is factory-calibrated. The **Conductivity flow cell** is provided with a temperature sensor that measures the temperature of the liquid in the **Conductivity flow cell**. ***Note:*** *The buffers used should be within the conductivity range of the instrument (0 to 300 mS/cm).*
10	**Outlet valve**	A 3-port valve that is used to direct the flow to the Fraction collector or to Waste.

3 Maintenance operations

About this chapter

Regular maintenance of ÄKTA start is essential for reliable function and performance. This chapter provides instructions for periodic maintenance, including calibration and configuration, as well as other required maintenance.

In this chapter

Safety precautions

To avoid damage to person when performing maintenance on the instrument, follow the instructions below.

WARNING

To avoid damage to person when performing maintenance on ÄKTA start, follow the instructions below.

- **Electrical shock hazard**. Do not open any covers or parts unless specified in the user documentation. Except for the maintenance and service described in the user documentation, all other repairs should be done by service personnel authorized by Cytiva.
- Only spare parts and accessories that are approved or supplied by Cytiva may be used for maintaining or servicing ÄKTA start.
- **Disconnect power**. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.
- **Spillage Hazard**. Avoid spillage of fluids on the surfaces of the instrument which have cables, plugs and other wirings. Be careful if there is spillage of fluids on the tray while trying to remove the tray from ÄKTA start.
- NaOH is corrosive and therefore dangerous to health. When using hazardous chemicals, avoid spillage and wear protective glasses and other suitable Personal Protective Equipment (PPE).

CAUTION

To avoid damage to person when performing maintenance on ÄKTA start, follow the instructions below.

- Always use appropriate personal protective equipment during operation and maintenance of ÄKTA start.
- **Hazardous UV light**. Always switch off power to the instrument before replacing the **UV flow cell**.
- If hazardous chemicals are used for system or column cleaning, wash the system or columns with a neutral solution in the last phase or step before maintenance.

3.1 Regular maintenance schedule

Introduction

Regular maintenance must be performed on a daily, weekly and monthly basis. For cleaning instructions, refer to the *ÄKTA start Operating Instructions*.

Daily maintenance

The following maintenance operations should be performed daily when the system is in use.

Maintenance action	See section
Visually inspect the instrument for leakages in the flow path. Check the **Pump** for leakage. If there are signs of liquid leaking from the **Pump**, check the integrity of the pump tubing and the tubing connections. ***Note:*** • *Make sure that the pump tubing is not left inside the* **Pump** *when it is not in use.* • *Keep the tubing ends of the waste tubing and sample tubing at a higher level than the respective bottles to prevent draining due to siphoning.*	-
Clean the column and the system flow path after use and leave the system filled with DM water. ***Note:*** *If the instrument is not going to be used for a few days, prepare the system for storage.*	*ÄKTA start Operating Instructions*
Clean the valves (at least with DM water), after every run, or at the end of the day, or while leaving the instrument idle for several days to avoid salt crystal formation. ***Note:*** *If a thorough cleaning is required, 1 M NaOH can be used. After using NaOH for cleaning make sure to wash the flow path thoroughly with DM water before starting a run.*	*ÄKTA start Operating Instructions*

Weekly maintenance

The following maintenance operations should be performed weekly or when required.

Maintenance action	See section
Calibrate the **Pump**.	*Section 3.6.1 Calibration, on page 50*
Visually inspect the inlet filters and clean them if necessary.	*ÄKTA start Operating Instructions*

Monthly maintenance

The following maintenance operations should be performed monthly or when required.

Maintenance action	See section
Clean the system flow path with 1 M NaOH and rinse with DM water. ***Note:*** *The frequency of the cleaning depends on the use of the instrument and nature of the samples.*	*ÄKTA start Operating Instructions*
Visually inspect the drive sleeve on the Fraction collector. Replace if worn out.	*Remove and replace the drive sleeve, on page 145*

Other maintenance

The following maintenance operations should be performed when required.

Maintenance action	See section
Clean the instrument externally	*ÄKTA start Operating Instructions*
Clean the Fraction collector	*ÄKTA start Operating Instructions*
Perform ***System cleaning***	*ÄKTA start Operating Instructions*
Clean the **UV flow cell**	*ÄKTA start Operating Instructions*
Clean the **Conductivity cell**	*ÄKTA start Operating Instructions*
Calibrate the touch screen	*Section 3.4.1 Touch screen calibration, on page 30*
Calibrate the **UV flow cell**	*Section 3.5.1 UV LED calibration, on page 38*

Maintenance action	See section
Calibrate the **Conductivity cell**	*Section 3.11 Conductivity Monitor, on page 68*
Pressure sensor zero offset	*Section 3.12 Pressure sensor, on page 75*
Replace the inlet filters	*ÄKTA start Operating Instructions*
Replace the tubing and connectors	*ÄKTA start Operating Instructions*

3.2 Cleaning before planned service

Cleaning before planned maintenance/service

To protect the safety of service personnel, all equipment and work areas must be clean and free of any hazardous contaminants before a Service Engineer starts maintenance work.

Complete the checklist in the *On Site Service Health and Safety Declaration Form* or the *Health and Safety Declaration Form for Product Return or Servicing*, depending on whether the instrument is going to be serviced on site or returned for service, respectively.

Health and safety declaration forms

Health and safety declaration forms are available for copying or printing in the *Reference information* chapter of this manual, or on digital media supplied with the user documentation.

3.3 Access the modules

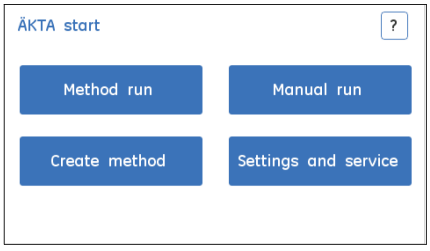
Instrument modules

The location of modules is shown in *Section 2.2 Instrument, on page 17*.

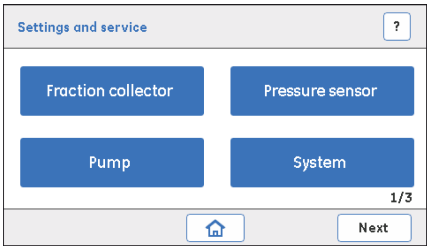
Software access

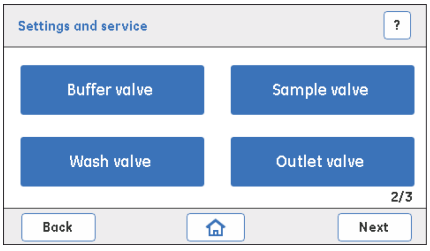
Maintenance and service of the different modules is managed from the Instrument Display. For instructions about maintenance of a module, see the specific sections in this chapter.

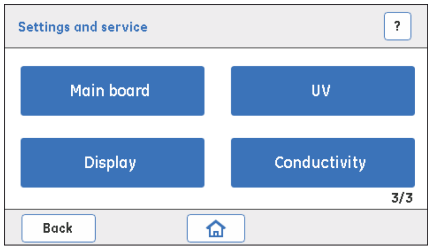
Step	Action
1	Tap ***Settings and service*** to access different modules for parameter setting or maintenance.



2	Tap ***Next*** or ***Back*** to move through the screens 1 to 3. Tap the intended module button to select a specific module for maintenance.





Step	Action
	

Settings and service
?
Main board
UV
Display
Conductivity
3/3
Back

3.4 Instrument Display

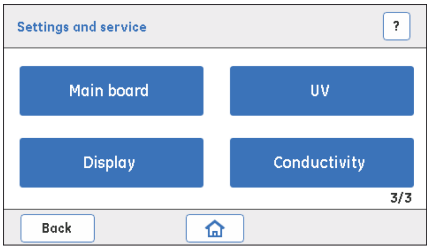
Introduction

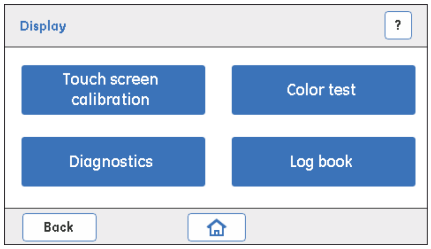
This section describes how to calibrate and test the Instrument display.

In this section

Instructions

Follow the instructions below to select an option to calibrate and/or diagnose the Instrument display.

Step	Action
1	In the ***Settings and service*** screen, tap ***Next*** →***Next*** to access the 3rd screen. *Result:* The following screen opens. 
2	Tap ***Display*** to access the Instrument Display options.

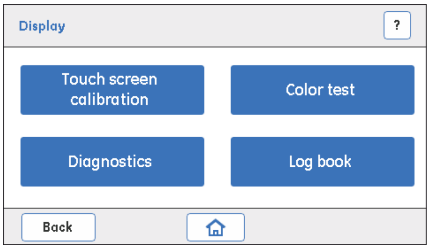
Step	Action
	Result: The ***Display*** screen opens. 

3.4.1 Touch screen calibration

Instructions

Follow the instructions below to calibrate the Touch screen.

Step	Action
1	In the ***Display*** screen, tap ***Touch screen calibration***.



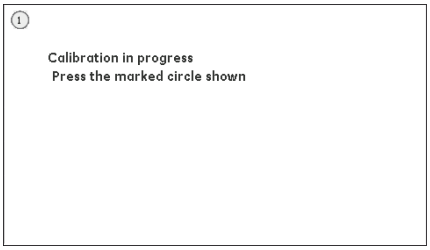
Result:

A confirmation screen opens.

2	Tap ***Yes*** to proceed with the calibration of the Touch screen.

Result:

The following screen opens.

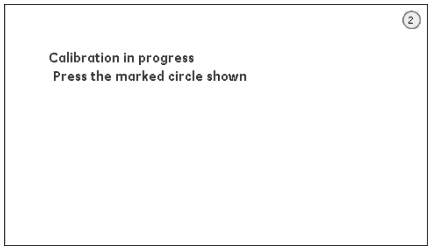


3	Tap precisely on the marked circle ***1***.

Step	Action

Result:

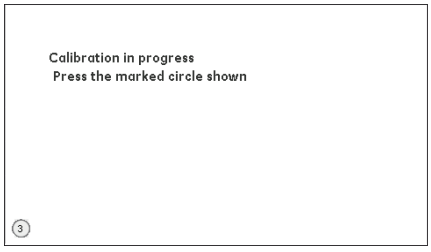
The following screen opens.



4 Tap precisely on the marked circle ***2***.

Result:

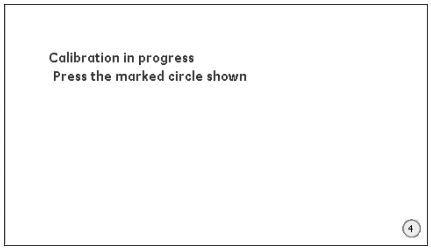
The following screen opens.



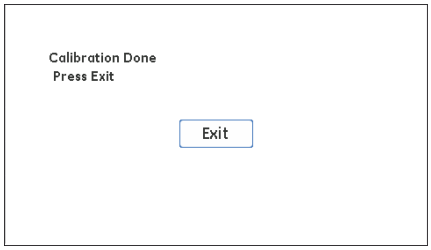
5 Tap precisely on the marked circle ***3***.

Result:

The following screen opens.



6 Tap precisely on the marked circle ***4***.

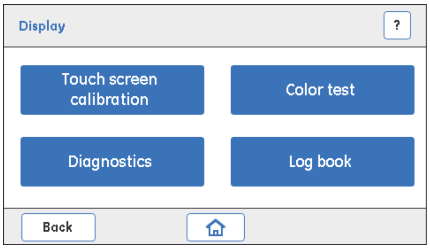
Step	Action
	Result: The following screen opens. 
7	Tap ***Exit***. ***Note:*** *If the calibration fails, repeat the test. If the calibration fails again, contact a Cytiva Service Engineer.*

3.4.2 Color test

Instructions

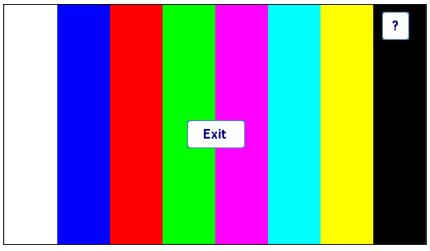
Follow the instructions below to test the colors of the Touch screen.

Step	Action
1	In the ***Display*** screen, tap ***Color test***.



Result:

The following screen opens.



2	Tap ***Exit***.

Result:

The Color test is completed.

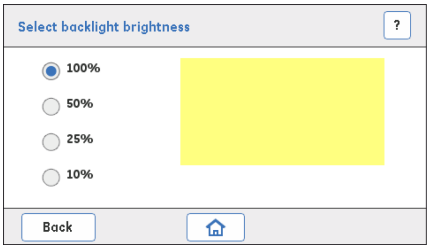
Note:

If the test fails, contact a Cytiva Service Engineer.

3.4.3 Diagnostics

Instructions

Follow the instructions below to perform diagnostics of the Touch screen.

Step	Action
1	In the ***Display*** screen, tap ***Diagnostics***. *Result:* The following screen opens. 
2	In the ***Select backlight brightness*** screen, tap a radio button to select the intended brightness (%). *Result:* The rectangle shows the backlight brightness at the selected brightness level.
3	Tap ***Back*** to return to the ***Display*** screen.

3.4.4 Log book

Description

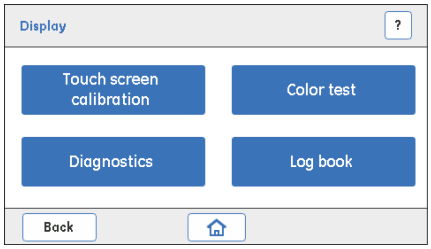
The ***Log Book*** displays the number of hours the Instrument Display has been used. The number of hours should be reset to zero when the Instrument Display is replaced.

Note: *The instrument display must be replaced by a Cytiva Service Engineer.*

Instructions

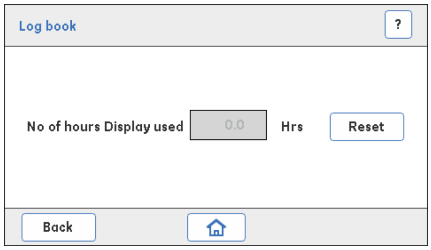
Follow the instructions below to read the ***Log book*** for the Display.

Step	Action
1	In the ***Display*** screen, tap ***Log book***.



Result:

The following screen opens.



The screen displays the number of hours the Instrument Display has been used.

2	If the Instrument Display has been replaced, tap ***Reset*** to set the number of hours to 0.

Step	Action
	Result: A confirmation screen opens.  Tap ***Yes*** to confirm the reset if the Instrument Display has been replaced. Or, If the Instrument Display has not been replaced, tap ***No*** to cancel the action.

3.5 UV Monitor

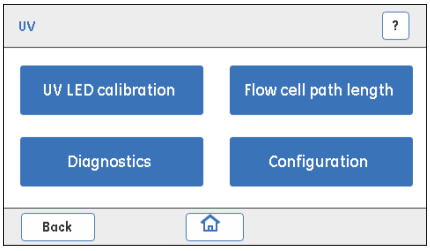
Introduction

This section describes how to access the **UV** Monitor options, perform a calibration, and edit **UV** settings.

In this section

Access the UV Monitor options

Follow the instructions below to access the options for calibrating and troubleshooting the **UV** Monitor.

Step	Action
1	Navigate to the ***Settings and service*** page containing the ***UV*** option (see *Software access, on page 26*).
2	Tap ***UV*** to access the **UV** Monitor options. *Result:* The ***UV*** screen opens. 

3.5.1 UV LED calibration

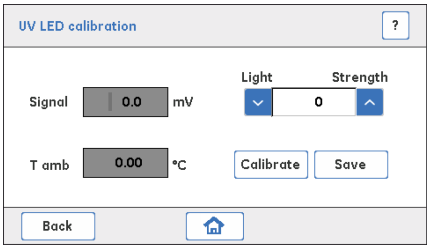
Description

UV LED calibration is used to calibrate the **UV LED** intensity to get the desired response level of the photo detector.

Parameter	Description
Light strength	Light intensity needed to get the expected response at the photo detector.
Tamb	**UV** temperature sensor reading.
Signal	The output of the photo detector (mV).

Instructions

Follow the instructions below to calibrate the UV LED.

Step	Action
1	Make sure that: • The **UV flow cell** is assembled tightly. • The inlet and outlet tubing and the fingertight connectors are properly tightened to block any stray light from entering the **UV flow cell**. • The system is not exposed to direct sunlight.
2	Flush the **UV flow cell** with demineralized water using the **Pump**. Make sure that there are no air bubbles in the **UV flow cell**.
3	Tap ***UV LED calibration***. *Result:* The following screen opens. 
4	Set the ***Light Strength*** value to 500 using up and down pointing arrows or enter the value. Then, tap ***Calibrate***.

Step	Action
	Result: The message ***Please wait while bias search is being done*** is displayed
5	When the message ***UV biasing successful*** is displayed, press ***OK***. *Result:* The ***Light strength*** value is automatically adjusted to get a minimum ***Signal*** response of 2700 mV.
6	Tap ***Save*** → ***Yes***. *Result:* The calibrated ***Light strength*** value is saved and stored in the permanent memory on main board.

3.5.2 Diagnostics

Description

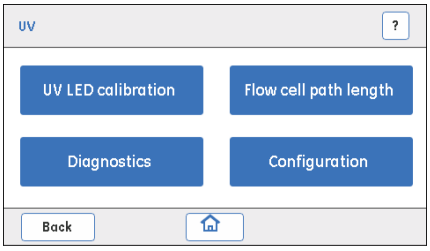
Diagnostics is used to conduct a ***Dark current test*** and/or a ***Stray light test*** to assess electrical noise or presence of stray light.

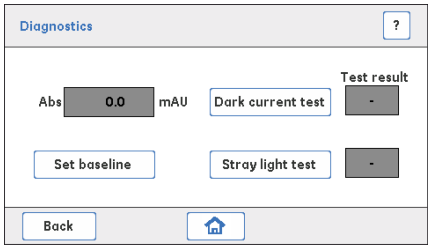
Test	Description
Dark current test	• Switches off the **UV LED** during the test. • The test result is presented as ***Pass*** if the ***Signal*** response is below 50 mV.
Stray light test	• Checks the absorbance when the **UV flow cell** is filled with 15% acetone. • Absorbance ***(Abs)*** should have a value > 2000 mAU.

Check for electrical noise

Follow the instructions below to perform a ***Dark current test***.

Step	Action
1	Make sure that: • The **UV flow cell** is assembled tightly. • The inlet and the outlet tubing, and connectors are tightened to block any stray light from entering. • The system is not exposed to direct sunlight.
2	Flush and fill the **UV flow cell** with demineralized water using a syringe. Make sure that there are no air bubbles in the syringe.
3	Tap ***Diagnostics***.



Step	Action
	Result: The ***Diagnostics*** screen opens. 
4	Tap ***Set baseline*** to capture a new reference value for the test.
5	Tap ***Dark current test***. The result is displayed as ***Pass*** or ***Fail***: • ***Pass***: the **UV** Monitor is working as it should. • ***Fail***: replace the **UV** Monitor.

Check for presence of stray light

Follow the instructions below to perform a ***Stray light test***.

Step	Action
1	Flush and fill the **UV flow cell** with 15% acetone using a syringe. Make sure that there are no air bubbles in the syringe.
2	Tap ***Stray light test***. The result is displayed as ***Pass*** or ***Fail***: • ***Pass***: the **UV** Monitor is working as it should. • ***Fail***: clean, reassemble and secure the **UV flow cell** and the connected tubing. Make sure that the detector is not exposed to e.g., direct sunlight. If the test fails again, replace the flow cell and then possibly the **UV** Monitor, or contact a Cytiva Service Engineer.
3	Flush the system with demineralized water so that the ***Abs*** value returns close to zero.

3.5.3 Flow cell path length

Description

A ***Flow cell path length*** test is used to derive the actual path length of the **UV flow cell**. The test should be performed when the **UV** Monitor or the **UV flow cell** has been replaced, and when normalized UV absorption comparisons between different systems are needed.

The table below describes the parameters for ***Flow cell path length***.

Parameter	Description
Cell	Path length of the **UV flow cell** (mm).
Abs	The absorbance of the liquid in the **UV flow cell** (mAU).

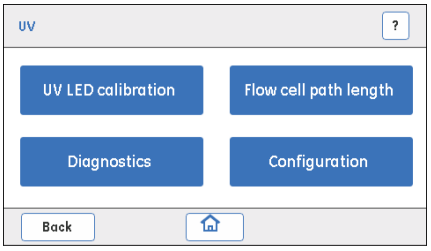
Prerequisites

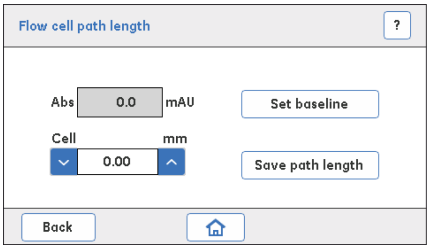
- Buffer A: immerse Buffer A inlet into demineralized water.
- Buffer B: freshly prepared 1.0% acetone solution (vol/vol), which is expected to give an absorbance value of 340 mAU.

Instructions

Follow the instructions below to perform a ***Flow cell path length*** test and set a new cell length.

Step	Action
1	Flush the **UV flow cell** with demineralized water using the **Pump**, and then leave the **UV flow cell** filled with water.
2	Tap ***Flow cell path length***.



Step	Action
	Result: The following screen opens. 
3	Set the ***Cell*** value to ***2.00 mm*** by using the up/down arrows or enter the value in the text box.
4	Flush the **UV flow cell** thoroughly and leave it filled with demineralized water. Tap ***Set baseline*** to capture a new reference value for the test. *Result:* ***Abs*** should show a value close to **0** mAU.
5	Flush the **UV flow cell** with 1.0% acetone solution, and then leave it filled. Note the new ***Abs*** value.
6	Calculate the actual ***Flow cell path length*** by using the following formula: ***Cell*** (mm) = 2.00 * (new ***Abs*** value / 340)
7	Update the calculated ***Cell*** length value by using up/down buttons or enter the value. Tap ***Save path length*** to save the value to permanent memory. ***Note:*** *The **Abs** value should be 340 ± 5% mAU, confirming that normalization has been done.* ***Note:*** *For higher precision, instead of using acetone, use the UV test kit, product number 29276997*

3.5.4 Configuration

Description

The table below describes the parameters for ***Configuration*** of the UV monitor.

Parameter	Description
UV run hrs	Resets the number of run hours when the **UV** Monitor is replaced.
Turn UV OFF	Turns the UV off when not in use.
C drft	UV LED drift compensation constant.
C amb	Ambient temperature compensation constant.

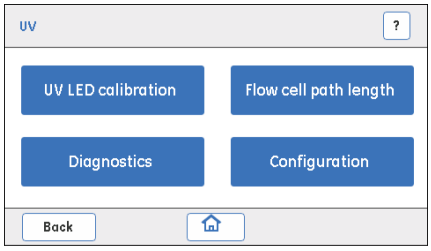
NOTICE

Do not change the ***C drft*** and ***C amb*** values. These parameters must be set by a Cytiva Service Engineer.

Reset number of run hours

Follow the instructions below to reset the number of run hours of **UV** Monitor. Reset the number of run hours when the **UV** Monitor is replaced.

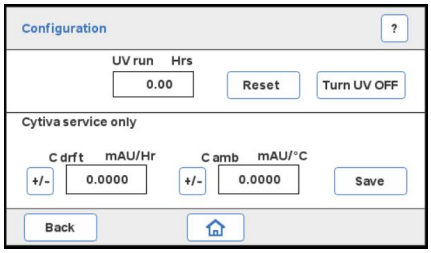
Step	Action
1	Tap ***Configuration***.



Step	Action

Result:

The ***Configuration*** screen opens.



NOTICE

Do not change the ***C drft*** and ***C amb*** values. These parameters must be set by a Cytiva Service Engineer.

2 Tap ***Reset***.

Result:

A confirmation screen opens.

3 If the **UV** Monitor has been replaced, tap ***Yes***.

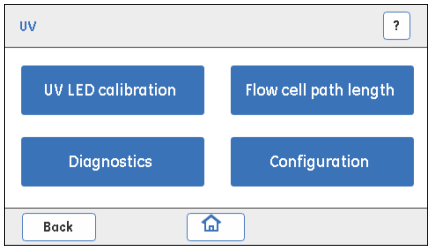
Or,

If the **UV** Monitor has not been replaced, tap ***No*** to cancel the action.

Turn OFF UV

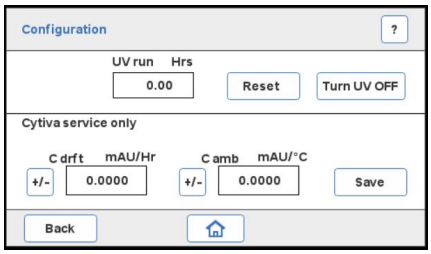
Follow the instructions below to turn off the UV monitor.

Step	Action
1	Tap ***Configuration***.



Result:

The ***Configuration*** screen opens.



Do not change the ***C drft*** and ***C amb*** values. These parameters must be set by a Cytiva Service Engineer.

2 Tap ***Turn UV OFF***.

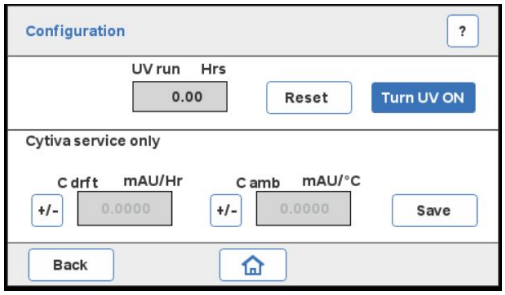
Result:

A confirmation screen opens.

3 Tap ***Yes***.

Result:

The UV module is turned off and the ***Turn UV OFF*** changes to ***Turn UV ON***.

Step	Action
	

Configuration
?
UV run Hrs
0.00
Reset
Turn UV ON
Cytiva service only
C drft mAU/Hr
+/-
0.0000
C amb mAU/°C
+/-
0.0000
Save
Back

3.6 Pump

Introduction

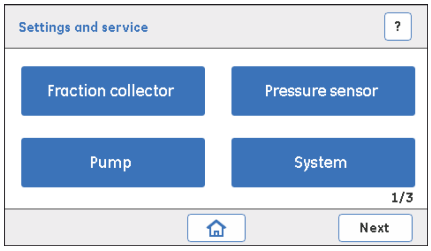
This section describes how to perform pump diagnostics and calibration and manage the pump tubing log.

In this section

Access the Pump service options

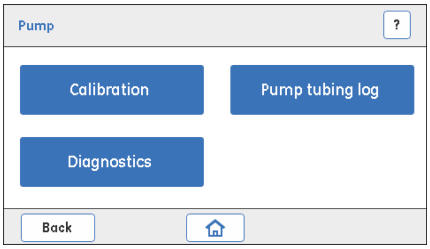
Follow the instruction below to access the options for Pump calibration and trouble-shooting.

Step	Action
1	In the ***Settings and service*** screen, tap ***Pump***.



Result:

The ***Pump*** screen opens.

Step	Action
2	Tap to select the intended option. 

3.6.1 Calibration

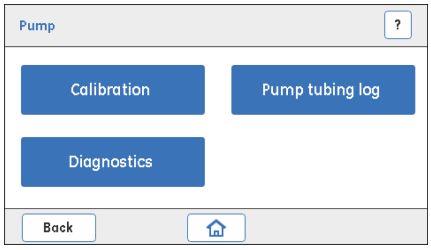
Description

The table below describes the parameters for calibrating the **Pump**.

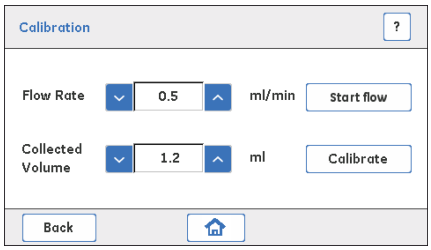
Parameter	Description
Flow Rate	The intended flow rate used for **Pump** calibration.
Collected Volume	The volume of liquid collected for a certain period of time at the set flow rate. The ***Collected Volume*** value and the expected value of the volume corresponding to the set flow rate are used internally for calibration.

Instructions

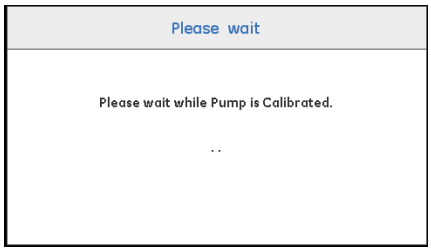
Follow the instructions below to calibrate the **Pump**.

Step	Action
1	**a.** Immerse the buffer inlet tubing **A** in demineralized water. **b.** Place the outlet tubing from the **Wash valve** in a pre-weighed collection tube. ***Note:*** *Before starting the calibration, fill the flow path with DM water and make sure that the outlet tubing where the pumped water is collected is also filled with DM water. This ensures that the volume of the collected water corresponds to the pumped volume.*
2	In the ***Pump*** screen, tap ***Calibration***.  *Result:* The ***Calibration*** screen opens.

Step	Action
3	Use the up/down arrows to set the desired ***Flow Rate***.



4	**a.** Tap ***Start flow*** to start the **Pump**. **b.** Collect water for at least one minute in the pre-weighed collection tube. **c.** Tap ***Stop flow*** to turn the **Pump** OFF. **d.** Weigh the pre-weighed collection tube containing the collected water and calculate the volume of the pumped water, then set the ***Collected Volume*** value equal to this volume.
5	Tap ***Calibrate***. *Result:* The following screen opens.



6	Wait while the calibration is running. The calibration is done when the ***Calibration*** screen re-opens.

3.6.2 Diagnostics

Description

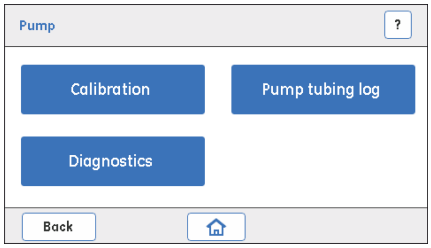
The table below describes the parameters for **Pump** diagnostics.

Parameter	Description
Flow rate	Setting of the desired flow rate (mL/min).
Pump run	Displays the actual number of run hours for the **Pump**.

Check the Pump flow rate

Follow the instructions below to perform **Pump** diagnostics.

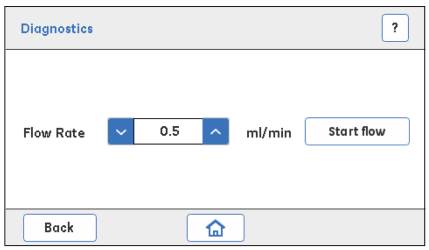
Step	Action
1	Immerse the buffer inlet tubing **A** in demineralized water.
2	In the ***Pump*** screen, tap ***Diagnostics***.



Result:

The ***Diagnostics*** screen opens.

3	Use the up/down arrows to set the desired ***Flow Rate*** value in the range 0.5 to 5 mL/min.



4	**a.** Make sure the flow path and outlet tubing are filled with DM water. **b.** Tap ***Start flow*** to run the **Pump**.

Step	Action
	c. Place the outlet tubing from the **Wash valve** (**Waste** port) in a pre-weighed collection tube.
5	Collect at least 1 mL of water in the collection tube. Measure and note the collection time.
6	**a.** Tap ***Stop flow*** to turn the **Pump** *OFF*. **b.** Weigh the pre-weighed collection tube containing the collected water and calculate the volume of the pumped water. **c.** Calculate the flow rate and verify that it corresponds to the set flow rate.
7	If the calculated flow rate does not correspond to the set flow rate, inspect the condition of the pump tubing, replace the pump tubing, re-calibrate the **Pump** and repeat the diagnosis.
8	If the calculated flow rate still does not correspond to the set value after replacing the pump tubing, replace the **Pump**.
9	If the **Pump** is replaced with a new one, tap ***Reset*** to reset ***Pump run*** to 0 hours.

3.6.3 Pump tubing log

Description

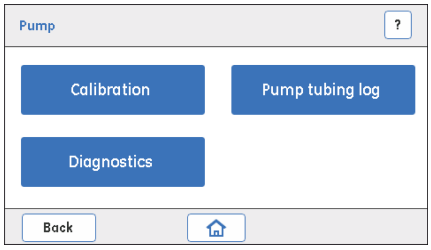
The table below describes the parameters for ***Pump tubing log***.

Parameter	Description
Tubing run	• Indicates how many hours the pump tubing has been used. • When the pump tubing is replaced, use the ***Reset*** button to reset the number of hours to 0.

Instructions

Follow the instructions below to check the Pump tubing log and to reset the number of hours the pump tubing has been used.

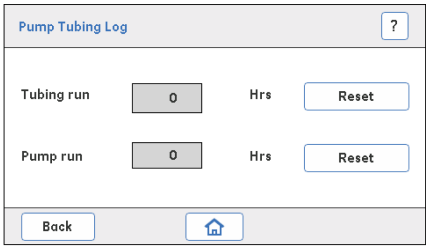
Step	Action
1	Tap ***Pump tubing log***.



Result:

The ***Pump tubing log*** screen opens.

2	In the ***Pump tubing log*** screen, tap ***Reset***.



Step	Action
	Result: A confirmation screen opens.
3	Tap ***Yes*** if the pump tubing has been replaced. Or, If the pump tubing has not been replaced, tap ***No*** to cancel the action. 

3.7 Buffer valve

Description

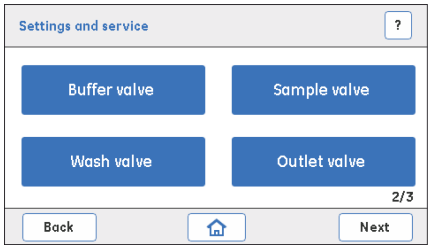
The **Buffer valve** can be switched to allow the inlet of either buffer A or buffer B, or a mixture of A and B (gradient).

Parameter	Description
Valve switches	• Indicates how many times the valve has switched between buffer A or buffer B. • When a valve has been replaced, the number of counts has to be reset to 0. • ***Turn valve*** switches the valve between the ***A*** and ***B*** inlet ports. This option is used for troubleshooting the valve.

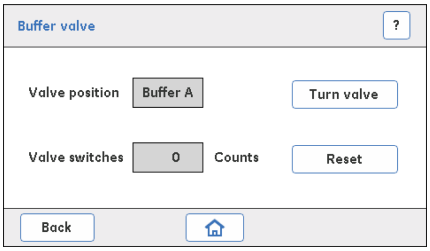
Instructions

Follow the instructions below to check if the **Buffer valve** functions properly.

Step	Action
1	**a.** Immerse the buffer inlet tubing A and B in demineralized water. **b.** Place the outlet tubing from the **Wash valve** in the waste bottle.
2	To start the **Pump**: **a.** In the ***Settings and service*** screen, access ***Pump***:***Diagnostics*** screen. **b.** Enter the desired flow rate and then start the **Pump** by tapping ***Start flow***, and then tap ***Back***:***Back*** to return to the ***Settings and service*** screen.
3	In the ***Settings and service*** screen, tap ***Next*** to access the 2nd screen. *Result:* The following screen opens.



Step	Action
	In the ***Settings and service*** screen, tap ***Buffer valve***.
	*Result*The ***Buffer valve*** screen opens.



4

a. Check that the valve position ***Buffer A*** is selected.

b. Tap ***Turn valve*** to check that the **Buffer valve** switches between ***Buffer A*** and ***Buffer B*** on the Display. There is also a click sound when the valve switches.

c. Check that the flow is delivered from the ***Buffer A*** inlet or the ***Buffer B*** inlet, according to the selected valve position.

Note:

The **Buffer valve** *is by default in the* ***Buffer A*** *position (the liquid is delivered from the* ***Buffer A*** *inlet).*

5 Visually inspect the flow at the outlet.

If the water is not flowing properly, check the following and fix accordingly:

- Is there a blockage in the tubing?
- Are the connectors tightly connected?

6 To stop the **Pump**:

a. In the ***Settings and service*** screen, access ***Pump*** →***Diagnostics*** screen.

b. Stop the **Pump** by tapping ***Stop flow***.

7 If these checks indicate that the valve is faulty, replace the **Buffer valve**.

8 If the valve has been replaced, tap ***Reset*** to set the ***Valve switches*** counter to 0.

Step	Action
	Result: A confirmation screen opens.  Tap ***Yes*** to confirm the reset if the valve has been replaced. Or, If the valve has not been replaced, tap ***No*** to cancel the action.

3.8 Sample valve

Description

The **Sample valve** can be switched to allow the inlet of either buffer or sample.

The table below describes the parameter for **Sample valve**.

Parameter	Description
Valve switches	• Indicates how many times the valve has switched. • When a valve has been replaced, the number of counts has to be reset to 0. • ***Turn valve*** switches the valve between the ***Buffer*** and ***Sample*** inlet ports. This option is used for trouble-shooting the valve.

Instructions

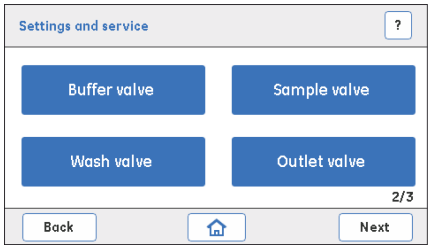
Follow the instructions below to check if the **Sample valve** functions properly.

Step	Action
1	**a.** Immerse the buffer inlet tubing A and the sample inlet tubing in demineralized water. **b.** Place the outlet tubing from the **Wash valve** in the waste bottle. **c.** Check that ***Buffer A*** is selected in the ***Buffer valve*** screen. **d.**
2	To start the **Pump**: **a.** In the ***Settings and service*** screen, access ***Pump***:***Diagnostics*** screen. **b.** Enter the desired flow rate and then start the **Pump** by tapping ***Start flow***.
3	In the ***Settings and service*** screen, tap ***Next*** to access the 2nd screen.

Step	Action

Result:

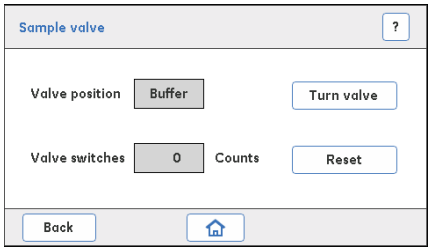
The following screen opens.



4 In the ***Settings and service*** screen, tap ***Sample valve***.

Result:

The ***Sample valve*** screen opens.



5 **a.** Check that the Valve position ***Buffer*** is selected.

b. Tap ***Turn valve*** to check that the **Sample valve** switches between ***Buffer*** and ***Sample*** on the Display. There is a click sound when the valve switches.

c. Check that the flow is delivered from the Buffer inlet or the Sample inlet according to the selected valve position.

Note:

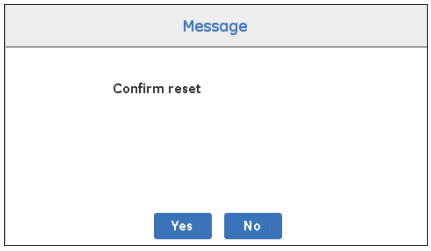
The **Sample valve** *is by default in the* ***Buffer*** *position (the liquid is delivered from the* ***Buffer*** *inlet).*

6 Visually inspect the flow at the outlet. If the water is not flowing properly, check the following and fix accordingly:

- Is there a blockage in the tubing?
- Are the connectors tightly connected?

7 To stop the **Pump**:

a. In the ***Settings and service*** screen, access ***Pump***:***Diagnostics*** screen.

Step	Action
	b. Stop the **Pump** by tapping ***Stop flow***.
8	If these checks indicate that the valve is faulty, replace the **Sample valve**.
9	If the valve has been replaced, tap ***Reset*** to set the ***Valve switches*** counter to 0. *Result:* A confirmation screen opens.  Tap ***Yes*** to confirm the reset if the valve has been replaced. Or, If the valve has not been replaced, tap ***No*** to cancel the action.

3.9 Wash valve

Description

The **Wash valve** can be switched to divert the flow either to column or to waste.

The table below describes the parameter for **Wash valve**.

Parameter	Description
Valve switches	• Indicates how many times the valve has switched. • When a valve has been replaced, the number of counts has to be reset to 0. • ***Turn valve*** switches the valve between the ***Waste*** and ***Column*** outlet ports. This option is used for troubleshooting the valve.

Instructions

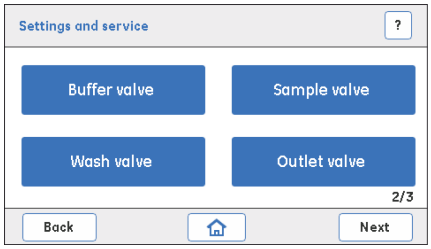
Follow the instructions below to check if the **Wash valve** functions properly.

Step	Action
1	**a.** Immerse the buffer inlet tubing A in demineralized water. **b.** Place the outlet tubing from the **Wash valve** and the outlet tubing from the **Outlet valve** in the waste bottle. • Check that: - ***Buffer A*** is selected in the ***Buffer valve*** screen - ***Buffer*** is selected in the ***Sample valve*** screen
2	To start the **Pump**: **a.** In the ***Settings and service*** screen, access ***Pump →Diagnostics*** screen. **b.** Enter the desired flow rate and then start the **Pump** by tapping ***Start flow***.
3	In the ***Settings and service*** screen, tap ***Next*** to access the second screen.

Step	Action

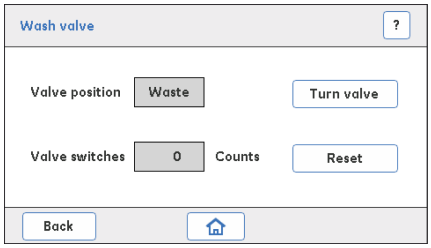
Result:

The following screen opens.



In the ***Settings and service*** screen, tap ***Wash valve***.

*Result*The ***Wash valve*** screen opens.



4

a. Check that the valve position ***Waste*** is selected.

b. Tap ***Turn valve*** to check/listen that the **Wash valve** switches between ***Waste*** and ***Column***. There is a click sound when the valve switches.

c. Check that the flow is diverted to the ***Waste*** outlet or the ***Column*** outlet according to the selected valve position.

Note:

The **Wash valve** *is by default in* ***Waste*** *position (the flow is diverted to waste).*

5 Visually inspect the flow at the outlet. If the water is not flowing properly, check the following and fix accordingly:

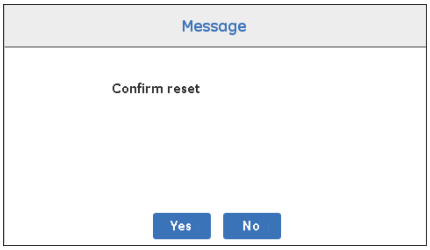
- Is there a blockage in the tubing?
- Are the connectors tightly connected?

6 To stop the **Pump**:

a. In the ***Settings and service*** screen, access ***Pump***:***Diagnostics*** screen.

b. Stop the **Pump** by tapping ***Stop flow***.

7 If these checks indicate that the valve is faulty, replace the **Wash valve**.

Step	Action
8	If the valve has been replaced, tap ***Reset*** to set the ***Valve switches*** counter to 0. *Result:* A confirmation screen opens.  Tap ***Yes*** to confirm the reset if the valve has been replaced. Or, If the valve has not been replaced, tap ***No*** to cancel the action.

3.10 Outlet valve

Description

The **Outlet valve** can be switched to divert the flow, either to waste or to the Fraction collector.

The table below describes the parameter for **Outlet valve**.

Parameter	Description
Valve switches	• Indicates how many times the valve has switched. • When a valve has been replaced, the number of counts has to be reset to 0. • ***Turn valve*** switches the valve between the ***Waste*** and ***Collection*** outlet ports. This option is used for troubleshooting the valve.

Instructions

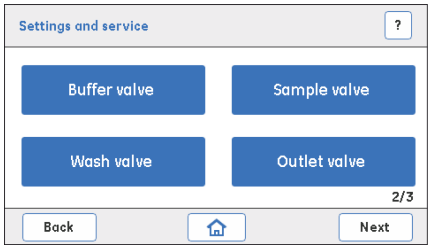
Follow the instructions below to check if the **Outlet valve** functions properly.

Step	Action
1	**a.** Immerse the buffer inlet tubing A in demineralized water. **b.** Place the outlet tubing from the **Outlet valve** in the waste bottle. • Check that: - ***Buffer A*** is selected in the ***Buffer valve*** screen - ***Buffer*** is selected in the ***Sample valve*** screen - ***Column*** is selected in the ***Wash valve*** screen
2	To start the **Pump**: **a.** In the ***Settings and service*** screen, access ***Pump*** →***Diagnostics*** screen. **b.** Enter the desired flow rate and then start the **Pump**, tap ***Start flow***.
3	In the ***Settings and service*** screen, tap ***Next*** to access the second screen.

Step	Action

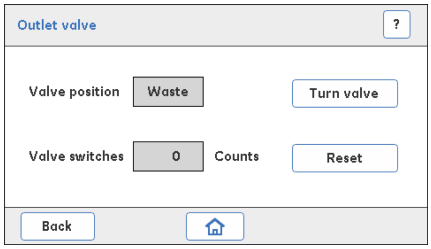
Result:

The following screen opens.



In the ***Settings and service*** screen, tap ***Outlet valve***.

*Result*The ***Outlet valve*** screen opens.



4

a. Check that the valve position ***Waste*** is selected.

b. Tap ***Turn valve*** to check that the **Outlet valve** switches between ***Waste*** and ***Collection***. There is a click sound when the valve switches.

c. Check that the flow is diverted to the ***Waste*** outlet or the ***Fraction collector*** outlet according to the selected valve position.

Note:

The **Wash valve** *is by default in* ***Waste*** *valve position. Hence, the flow is diverted to Waste.*

5

Visually inspect the flow at the outlet. If the water is not flowing properly, check the following and fix accordingly:

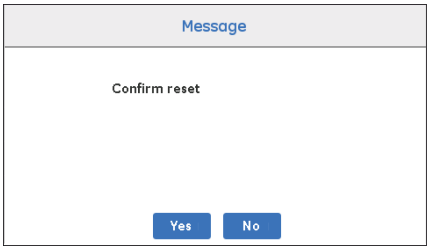
- Is there a blockage in the tubing?
- Are the connectors tightly connected?

6

To stop the **Pump**:

a. In the ***Settings and service*** screen, access ***Pump*** →***Diagnostics*** screen.

b. Stop the **Pump** by tapping ***Stop flow***.

Step	Action
7	If these checks indicate that the valve is faulty, replace the **Outlet valve**.
8	If the valve has been replaced, tap ***Reset*** to set the ***Valve switches*** counter to 0. *Result:* A confirmation screen opens.  Tap ***Yes*** to confirm the reset if the valve has been replaced. Or, If the valve has not been replaced, tap ***No*** to cancel the action.

3.11 Conductivity Monitor

Introduction

This section describes how to perform **Conductivity** Monitor calibration and edit the Cell constant settings.

In this section

Description

The **Conductivity** Monitor consists of a conductivity cell with two parallel cylindrical electrodes positioned in the flow path of the cell. One of the electrodes has a temperature sensor for measuring the temperature of the liquid in the cell.

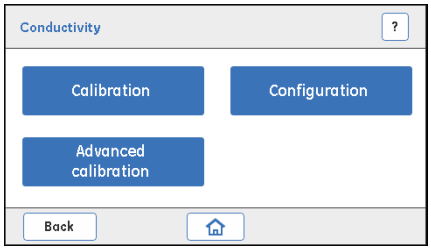
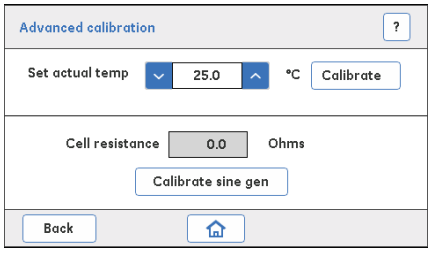
The table below describes the parameters for calibrating the **Conductivity Monitor**.

Parameter	Description
Cell constant ***(Set cell const)***	The Cell constant is a characteristic of the conductivity cell, defined as the ratio of the distance between the electrodes and the area of an electrode.
Reference temperature (***Set ref temp***)	Ambient temperature variations influence the conductivity. In Handbooks and other documentation, the conductivity values are most often given at a certain Reference Temperature (20°C or 25°C). To compare with those values, the actual conductivity has to be re-calculated to conductivity at the reference temperature.

3.11.1 Temperature sensor calibration

Instructions

Follow the instructions below to calibrate the temperature sensor.

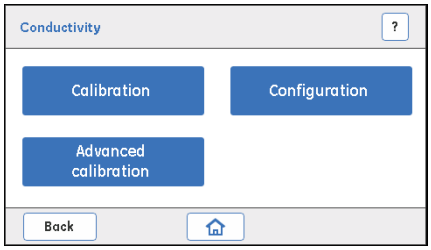
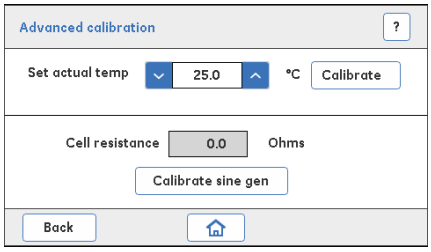
Step	Action
1	Place a precision thermometer in the flow cell path directly after the **Conductivity flow cell** (i.e., immediately after the conductivity tubing which is connected to **Outlet valve**), and then pump demineralized water through the system with a flow rate of 0.5 mL/min.
2	In the ***Conductivity*** screen, tap ***Advanced calibration***.  *Result:* The ***Advanced calibration*** screen opens. 
3	Note the temperature and enter it into the ***Set actual temp*** text box, and then tap ***Calibrate*** to carry out the temperature calibration. ***Note:*** *Make sure that the temperature of the* **Conductivity flow cell** *has stabilized and measure the temperature of the calibration solution with a precision thermometer.*

3.11.2 Sine generator calibration

Instructions

Follow the instructions below to calibrate the sine generator. This must be done whenever the Main Board is replaced.

Note: *The Main Board must only be replaced by a Cytiva service engineer.*

Step	Action
1	Use ***Manual Run*** to empty any liquid present in the conductivity flow path. Remove the end connectors on the conductivity flow cell and blow oil-free air through the cell to remove the last traces of liquid.
2	Navigate to screen 3 in ***Settings and service***. Tap ***Conductivity***. Result: The ***Conductivity*** screen opens.  *Result:* The ***Advanced calibration*** screen opens. 
3	Tap ***Calibrate sine gen***. Result: The sine generator is calibrated and the ***Cell resistance*** value is displayed on the screen.
4	Check that the ***Cell resistance*** value is 6×10^7 ohm. If a different value is displayed, clean the conductivity flow cell and recalibrate. If the value is still incorrect after repeated attempts, contact Cytiva service.

3.11.3 Conductivity flow cell calibration

Prerequisites

Calibration solution:

- 1.00 M NaCl

  or

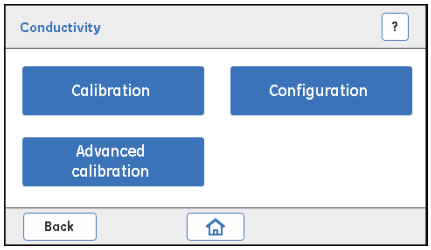
- 100 mS/cm conductivity standard solution

Instructions

Follow the instructions below to calibrate the **Conductivity flow cell**.

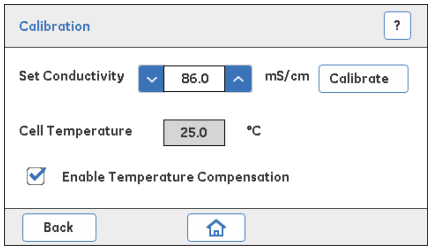
Note: *Temperature compensation is enabled by default (factory setting). If you want to disable temperature compensation, tap the* ***Enable temperature compensation*** *checkbox in the* ***Calibration*** *screen.*

Step	Action
1	Fill the **Conductivity flow cell** with conductivity standard solution.
2	In the ***Conductivity*** screen, tap ***Calibration***.



Result:

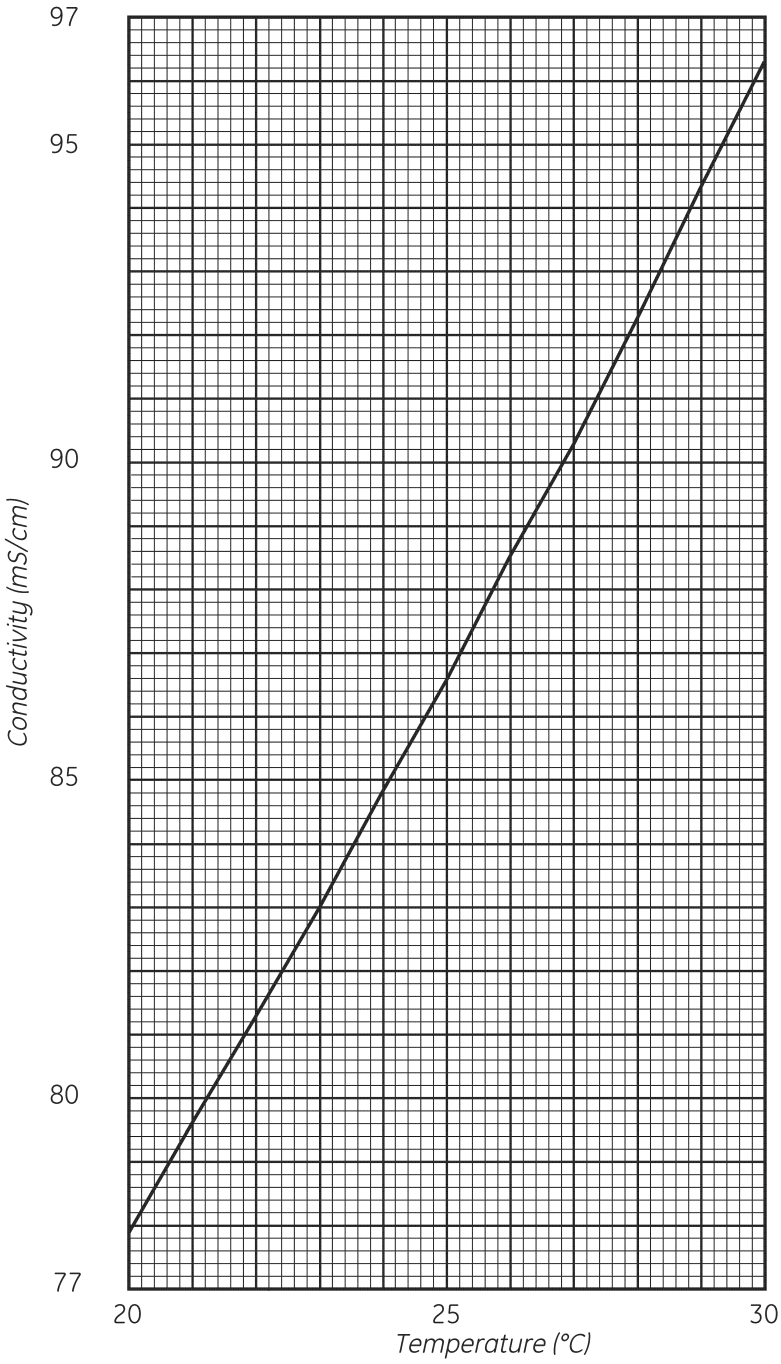
The ***Calibration*** screen opens.



3	Note the current temperature of the calibration solution in the **Conductivity flow cell** as displayed in the ***Cell Temperature*** field. This value is required for setting the reference temperature (see *Section 3.11.4 Set reference temperature, on page 74*).

Step	Action
4	Make sure that ***Enable Temperature Compensation*** is checked.
5	In the ***Calibration*** screen, enter the theoretical conductivity value at the current temperature in the **Set Conductivity** field and then tap ***Calibrate*** to carry out the **Conductivity** calibration. ***Note:*** • *If a certified conductivity standard solution is used, use the supplied theoretical conductivity value corresponding to the temperature in question.* • *If a manually prepared 1.00 M NaCl calibration solution is used, read the conductivity value at the current temperature from the graph for conductivity of the 1.00 M NaCl as a function of temperature presented below.*

Conductivity of 1.00 M NaCl at 20–30°C



3.11.4 Set reference temperature

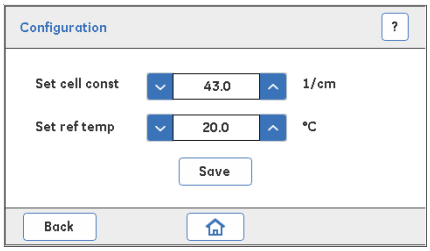
Description

For the system to calculate the conductivity correctly at different temperatures, the following conditions must be met:

- The ***Enable Temperature Compensation*** setting must be checked in the ***Calibration*** screen (see *Section 3.11.3 Conductivity flow cell calibration, on page 71*).
- The temperature at which calibration is performed must be set as a reference temperature.

Instructions

Follow the instructions below to set the reference temperature.

Step	Action
1	In the ***Settings and Service*** screen 3, tap ***Conductivity*** →***Configuration screen***. Result: The ***Configuration*** screen appears. 
2	Set the ***Set ref temp*** value to the temperature noted from the ***Calibration*** screen (see *Section 3.11.3 Conductivity flow cell calibration, on page 71*). ***Note:*** *The cell constant value is automatically calculated when calibration is performed. Do not change this value.*
3	Tap ***Save*** to save the new reference temperature.

3.12 Pressure sensor

Description

The table below describes the parameter for **Pressure sensor**.

Parameter	Description
P set	Displays the current pressure in the flow path (MPa).

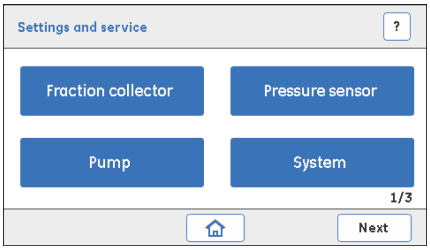
Instructions

Follow the instructions below to set the pressure to **0** when the **Pressure sensor** is exposed to atmospheric pressure only.

NOTICE

Calibration of **Pressure sensor** must be performed by a Cytiva Service Engineer, and must be done when the **Pressure sensor** has been replaced.

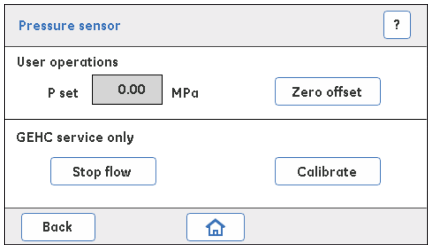
Step	Action
1	Disconnect the inlet tubing from the **Pressure sensor** to expose the sensor to atmospheric pressure only. ***Note:*** *Make sure that the Pump is OFF before disconnecting the tubing.*
2	In the ***Settings and service*** screen, tap ***Pressure sensor***.



Step	Action

Result:

The ***Pressure sensor*** screen opens.



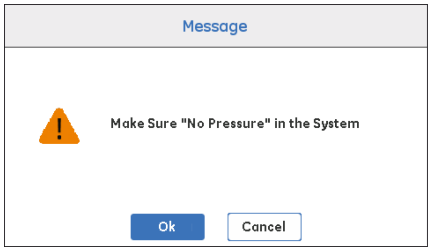
Note:

Stop flow and Calibrate are for use by Cytiva service engineers only.

3 In the ***Pressure sensor*** screen, tap ***Zero offset***.

Result:

A Message screen opens.



Make sure that there is no back pressure in the system, and then tap ***OK***.

3.13 Frac30

Introduction

This section describes how to enable or disable Frac30, perform diagnostics, and handle the run log.

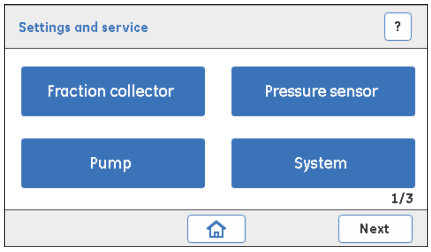
In this section

3.13.1 Enable or disable Frac30

Instructions

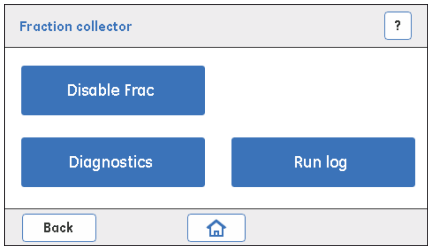
Follow the instructions below to enable or disable Frac30.

Step	Action
1	In the **Settings and service** screen, tap ***Fraction collector***.

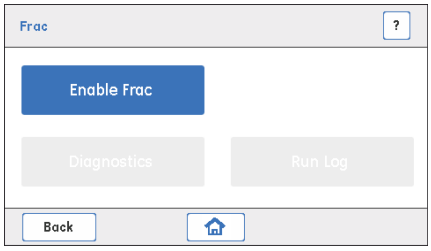


Result:

If the Fraction collector is enabled, the following ***Fraction collector*** screen opens.



If the Fraction collector is not enabled, the following screen opens.



2	Tap ***Enable Frac*** to enable the Fraction collector. or, Tap ***Disable Frac*** to disable the Fraction collector.

3.13.2 Diagnostics

Description

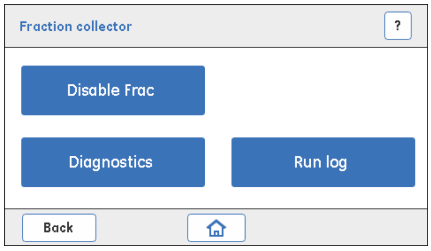
The table below describes the parameters for ***Diagnostics*** for Frac30.

Parameter	Description
Feed tube test	Checks that Frac30 rotates the Bowl assembly correctly and shifts one tube at a time.
Home test	Checks that Frac30 rotates the Bowl assembly correctly and shifts from the current position to the home position (tube number 1).

Instructions

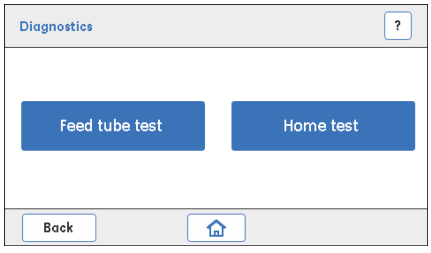
Follow the instructions below to run a diagnostics test on Frac30.

Step	Action
1	In the **Fraction collector** screen, tap ***Diagnostics***.



Result:

The **Diagnostics** screen opens.



2	Tap ***Feed tube test*** and verify that Frac30 rotates from one tube to the next.

Step	Action
3	Tap ***Home test*** and verify that Frac30 rotates to home position (tube no. 1) from current position. ***Note:*** *If Frac30 does not rotate the Bowl assembly, check if the Frac30 cable is connected properly to ÄKTA start.*

3.13.3 Run Log

Description

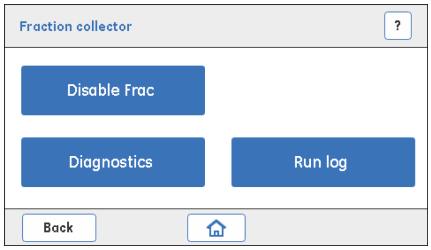
The table below describes the parameter for ***Run log***.

Parameter	Description
Run log	Displays the number of hours of drive sleeve usage.

Instructions

Follow the instructions below to reset the ***Run log***.

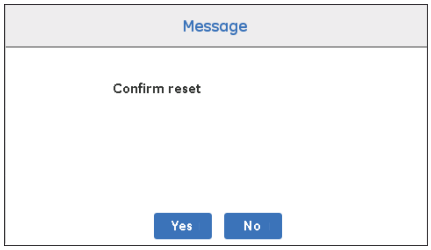
Step	Action
1	In the **Fraction collector** screen, tap ***Run log***.



Result:

The **Run log** screen opens.

2	If the drive sleeve has been replaced, tap ***Reset*** to set the ***Run time*** to 0.

Step	Action
	Result: A confirmation screen opens.  Tap ***Yes*** to confirm the reset if the drive sleeve has been replaced. Or, If the drive sleeve has not been replaced, tap ***No*** to cancel the action.

3.14 System

Introduction

This section describes how to handle firmware updates and export system reports. It also describes how to set delay volumes and switch valve timing.

In this section

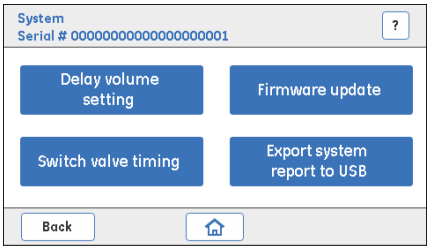
Options

Option	Description
Delay volume setting	The delay volume represents the volume of liquid in the flow path between the outlet of the **UV** Monitor and the collection tubes. This option is used to set the delay volume (mL).
Firmware update	This option is used to update the instrument firmware whenever a new firmware version is made available on the ÄKTA start product support page. This option includes update functions for both instrument firmware and FPGA (field-programmable gate array) definitions. These can be updated separately. Files for firmware and FPGA updates can be downloaded from the ÄKTA start product support page (see *cytiva.com/aktastart*).
Switch valve timing	Used for optimizing the switch valve timing. It is recommended to optimize the timing of switch valve (**Buffer valve**) when wavy gradients are obtained or when fluctuations in the step gradient are observed during either system performance tests or chromatography runs.

Option	Description
Export system report to USB	For exporting details on the running condition of the **UV**, **Pump**, pump tubing, all the solenoid valves and the latest 4 error messages with ***Error codes***, to a USB memory stick. The latest Firmware version and FPGA version can also be exported. The data is used by a Cytiva Service Engineer when troubleshooting the instrument.

Instructions

Follow the instructions below to manage the system options.

Step	Action
1	In the ***Settings and service*** screen, tap ***System*** *Result:* The following screen opens. 
2	Tap to access a desired system option.

3.14.1 Firmware update

NOTICE

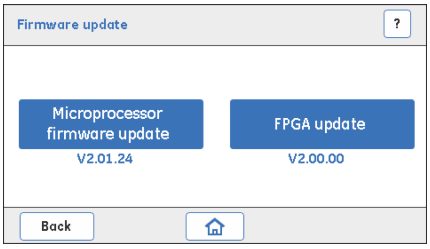
Before tapping the ***Firmware update*** ensure that the system is connected to a stable source of power such as a UPS. During firmware update the system should not be switched off.

Prerequisites

- USB memory stick with at least 10 MB free space.
- Delete any previous AKTASTRT.src files located on the USB memory stick.
- Download the latest AKTASTRT.src file from the product support page onto the USB memory stick, refer to (*cytiva.com/AKTAstart*).

Instructions

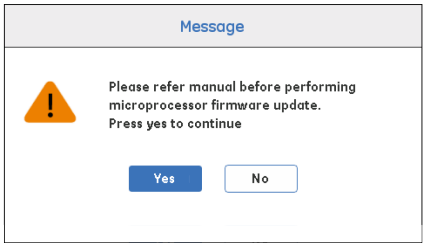
Follow the instructions below to update the firmware.

Step	Action
1	Plug the USB memory stick into the USB port located on ÄKTA start.
2	In the ***System*** screen, tap ***Firmware update***. *Result:* The following screen opens. 
3	Tap ***Microprocessor firmware update***.

Step	Action

Result:

The following screen opens.



Tap ***Yes*** and then wait for approximately 3 minutes for the update to be done.

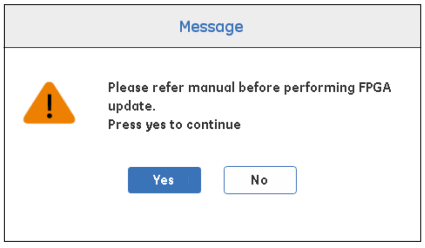
Note:

When the firmware update is completed, the instrument automatically restarts and displays the version of the firmware.

4 From the product support page (*cytiva.com/AKTAstart*), download ***AKTASTRT.dat*** for FPGA update.

5 Tap ***FPGA update***.

Result: The following screen opens.



6 Tap ***Yes***. The updating may take up to 5 minutes.

Result:

The following screen opens.

Step	Action
7	Once the firmware is updated, perform the following calibration sequence: • ***Display*** **→** ***Touch screen calibration*** • ***Pressure sensor*** **→** ***Zero offset*** • ***Pump*** **→** ***Calibration*** **→** ***Flow rate*** • ***UV*** **→** ***UV LED calibration*** • ***Conductivity*** **→** ***Advanced calibration*** (temperature sensor calibration) • ***Conductivity*** **→** ***Calibration*** (flow cell calibration)

3.14.2 Export system report to USB

Instructions

Follow the instructions below to export the system report to a USB memory stick. Use the system report in further contacts with Cytiva Service Engineers.

Step	Action
1	Plug the USB memory stick into the USB port located on ÄKTA start.
2	In the ***System*** screen, tap ***Export System Report to USB***. *Result:* The files INSTLOG.TXT and ERRORLOG.TXT are exported to the USB memory stick.
3	Remove the USB memory stick from the USB port and connect it to a computer.
4	Check the content of the system report files INSTLOG.TXT and ERRORLOG.TXT, see section *System report file parameters* .

System report parameters

The content of the ***INSTLOG.TXT*** file contains the following parameters:

- ÄKTA start serial no.
- ***Firmware*** version
- ***FPGA*** version
- **Pump** run
- **Pump** tube run
- **UV LED** run time
- **Buffer valve** count
- **Wash valve** count
- **Outlet valve** count
- **Sample valve** count

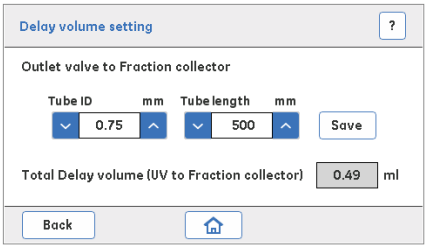
The content of the ***ERRORLOG.TXT*** file contains Error codes, for example:

- ***501***: Over Pressure
- ***301***: Fraction collector failure
- ***603***: Illegal operation, restart instrument

3.14.3 Delay volume setting

Instructions

Follow the instructions below to set the delay volume.

Step	Action
1	In the ***System*** screen, tap ***Delay volume setting***. *Result:* The following screen opens. 
2	Enter the internal diameter (ID) and length of the tubing from the **Outlet valve** to Frac30 in the respective fields, and then tap ***Save***. Result: The total delay volume from the **UV** Monitor to Frac30 is displayed in the ***Total Delay volume*** field. ***Note:*** *The delay volume from the* **UV** *Monitor to the* **Outlet valve** *is constant (0.27 mL) in all ÄKTA start instruments.*

Note: ***Delay volume setting*** *needs to be set when the tube between* **Outlet valve** *and Frac30 has been replaced.*

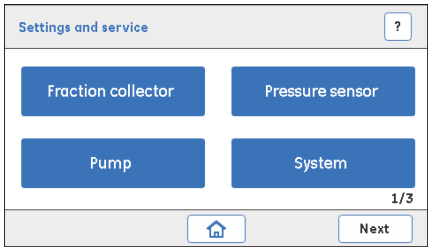
3.14.4 Switch valve timing

Instructions

The switch valve timing may need to be changed if gradients show fluctuations.

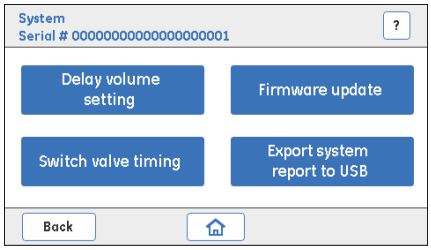
Follow the instructions below to set the ***Switch valve timing***. For more details, refer to *ÄKTA start Operating Instructions* section *Switch valve timing*.

Step	Action
1	In the ***Settings and service*** screen, tap ***System***.



Result:

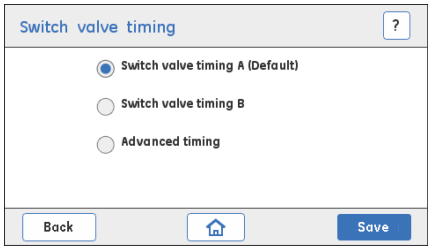
The following screen opens.

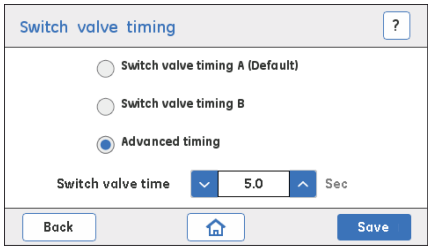
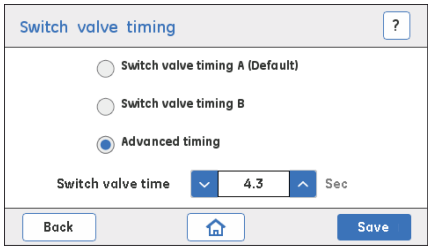


2	In the ***System*** screen, tap ***Switch valve timing***.

Result:

The following screen opens.



Step	Action
3	Tap the radio button to select the required timing: • ***Switch valve timing A*** (switch time 4 s) • ***Switch valve timing B*** (switch time 5 s) Tap ***Save*** to save the timing.
4	Perform ***Gradient run***, either by performing ***System performance method*** or manually set the ***B concentration*** (Buffer valve) to 50%. Examine the gradient for fluctuations.
5	If wavy gradients still are obtained, or if fluctuations on step gradient levels are large, then select ***Advanced timing***. *Result:* The following screen opens.  Set switch valve time in the range of 3.0 to 5.0 s (0.1 s increments) by pressing the up/down arrows.
6	Tap ***Save*** to save the optimized timing. 

3.15 Main board

NOTICE

The ***Main board*** screen is reserved for operations performed by a Cytiva Service Engineer *only*. Do not perform any further operations from this screen. Tap ***Back*** or ***Home*** to return to the previous screen or to go to the ***Home*** screen.

4 Troubleshooting

About this chapter

This chapter contains information regarding troubleshooting procedures. *Warning messages and Error codes* are provided, and possible causes and solutions to those codes are described.

In this chapter

Introduction

For ÄKTA start and Frac30 there are two kinds of Troubleshooting procedures:

- *Basic* - Application related troubleshooting. For instructions, refer to section *Basic Troubleshooting* in *ÄKTA start Operating Instructions*.
- Troubleshooting with the aid of ***Warning messages*** and ***Error codes*** displayed on the Touch Screen. This is described in this chapter.

For information about Troubleshooting related to UNICORN start, refer to the *UNICORN start User Manual*.

4.1 UV

Warning messages

Warning code	Description	Possible cause	Action
111	**UV** intensity low	In the ***Settings and service*** →***UV*** screen: When trying to calibrate; if the detector output is less than 2700 mV, even for a maximum UV light strength of 1024.	• Flush the **UV flow cell** and mount it securely *Or,* • Replace the **UV flow cell** and re-calibrate. For instructions, see: *Section 5.4 UV flow cell, on page 122* *Section 3.5.1 UV LED calibration, on page 38*
112	**UV** intensity high	In the***Settings and service*** →***UV*** screen: When trying to save the UV light strength after calibration, if the signal is greater than 4000 mV.	• Set a lower UV light strength (maximum 500). • Tap **Calibrate** to get a signal of about 2700 mV.
113	**UV** reaching end of life-time	In the ***Settings and service*** →***UV*** screen: When trying to save the UV light strength after calibration, if the UV light strength is in the range 1016 to 1020.	• Replace the **UV** Monitor. • Perform **UV LED** calibration. For instructions, see: *Section 3.5.1 UV LED calibration, on page 38* *Section 3.5.3 Flow cell path length, on page 42*
114	**UV** reached end of life-time	In the ***Settings and service*** →***UV*** screen: When trying to save the UV light strength after calibration, if the UV light strength is 1020.	• Replace the **UV** Monitor. • Perform **UV LED** calibration. For instructions, see: *Section 3.5.1 UV LED calibration, on page 38* *Section 3.5.3 Flow cell path length, on page 42*

Warning code	Description	Possible cause	Action
115	Flush **UV flow cell** and mount securely	In the ***Settings and service*** →***UV*** screen: When trying to calibrate, if there are repeated calibrations and the signal strength is decreasing.	• Flush the **UV flow cell** and mount securely. • Recalibrate.
116	**UV** baseline ignored	In the ***Settings and service*** →***UV*** screen: Calibration and run time: When the UV signal is *not* in the range 2700 to 4000 mV, auto zero cannot be performed.	• Flush the **UV flow cell** and mount it in a secure way. • Try to recalibrate. If the voltage is still less than 2700 mV, change UV module.

Error messages

Error code	Description	Possible cause	Action
101	**UV** module failure	During power up, too little light is reaching the detector, i.e., too high absorbance in the cell or to weak light source.	See *Troubleshooting Flow chart 1, on page 102*
102	**UV** module failure	During power up, stray light test has failed, light is "leaking" in to the detector.	See *Troubleshooting Flow chart 2, on page 103*
103	**UV** module failure	UV module cable may be loose or disconnected, no communication with **UV** module. Main PWA (printed wiring assembly) failure.	See *Troubleshooting Flow chart 3, on page 104*

4.2 Conductivity

Error messages

Error code	Description	Possible cause	Action
201	**Conduc-tivity** module failure	• Loose cable connector. • The temperature sensor is not functioning.	See *Troubleshooting Flow chart 6, on page 107*

4.3 Frac30

Error messages

Error code	Description	Possible cause	Action
301	Fraction collector failure	• The cable connected between ÄKTA start and Frac30 is not working. • Drive sleeve worn out. • Sensors are not working. • The Frac30 internal cable is not working. • Motor failure. • Main board failure.	See *Troubleshooting Flow chart 4, on page 105*

4.4 Pump

Error messages

Error code	Description	Possible cause	Action
401	**Pump** failure	**Pump** is not working.	• Contact a Cytiva Service Engineer. • See *Troubleshooting Flow chart 5, on page 106*
-	No flow from the **Pump**.	The rollers are not rotating.	• Check the condition of the pump tubing. • Check that there is no blockage on the inlet (or outlet). • Open the pump head and visually check if the pump rollers are rotating freely when starting the **Pump** from the ***Diagnostics*** screen. If not, check if the **Pump** connector is connected or if anything is stuck between the rollers.

4.5 Pressure sensor

Error messages

Error code	Description	Possible cause	Action
501	Overpressure	• Blockage in the tubing, valves or in the column. • Improperly selected Flow rate. • Wrong pressure setting used for chosen application.	• Check tubing and valves by disconnecting one at a time starting from the Fraction collector going backwards towards the **Pump**. When pressure is released the blockage has been found, clean or replace tube to resolve the issue. • Clean the column/separation media with suitable solution (1 M NaOH) or replace the column with a new one. • Check the specification and pressure of the columns for correct flow rate.
502	**Pressure sensor** failure	The sensor is not connected or not calibrated.	• Perform ***Zero offset***. • Contact a Cytiva Service Engineer.

4.6 Main board and Power Supply

Warning messages

Warning code	Description	Possible cause	Action
011	System over-temperature	Instrument temperature is out of range (4°C to 35°C)	• Tap ***Continue*** on the Touch screen. • If the system is in a cold chamber, make sure that the temperature is not below +4°C. • Make sure that there is adequate ventilation surrounding the system. • Make sure that the system is not standing in direct sun light. • System operation is not affected by this warning, the system can continue to be used.

Error messages

Error code	Description	Possible cause	Action
001	EPROM error		• Contact a Cytiva Service Engineer.
002	MPWA temperature	Instrument temperature is out of range (4°C to 35°C)	• Contact a Cytiva Service Engineer. • The system cannot be used in this condition.
003	Power supply monitor error	Voltage out of operating range.	• Contact a Cytiva Service Engineer. • With assistance from a Cytiva Service Engineer, check the Power supply for voltages.

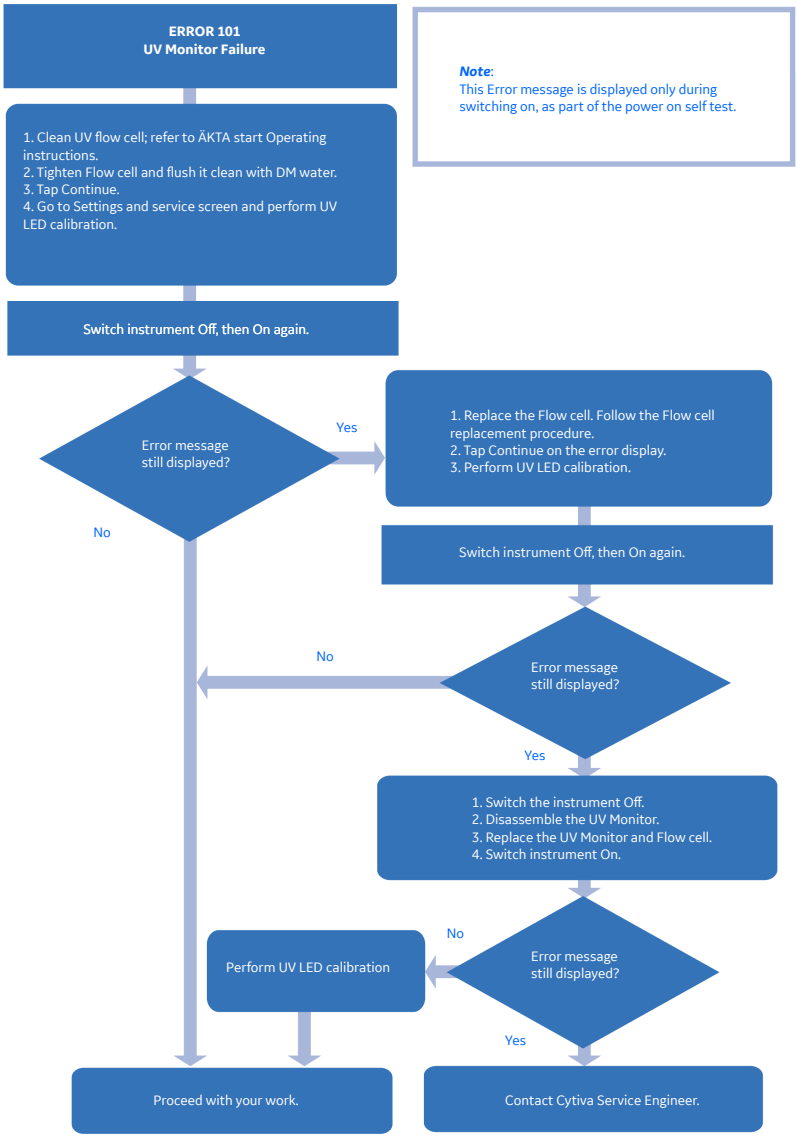
4.7 System related error messages

Error messages

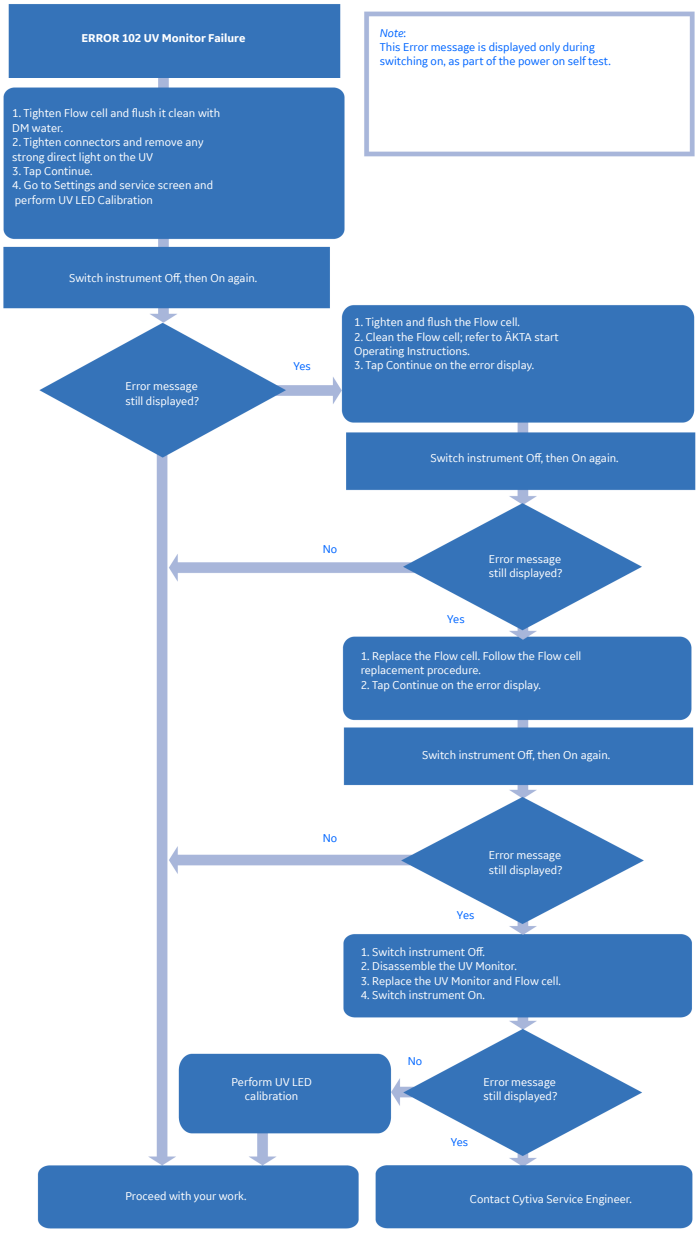
Error code	Description	Possible cause	Action
601	Method Error. Reload Method	Incomplete method. Wrong method loaded.	Reload the method.
602	Illegal opcode Reload Method	Incomplete method. Wrong method loaded.	Reload the method.
603	Illegal Operation, Restart Instrument	Wrong operations in the system. User is trying to work on features that are not supported.	Restart the system.

4.8 Troubleshooting flow charts

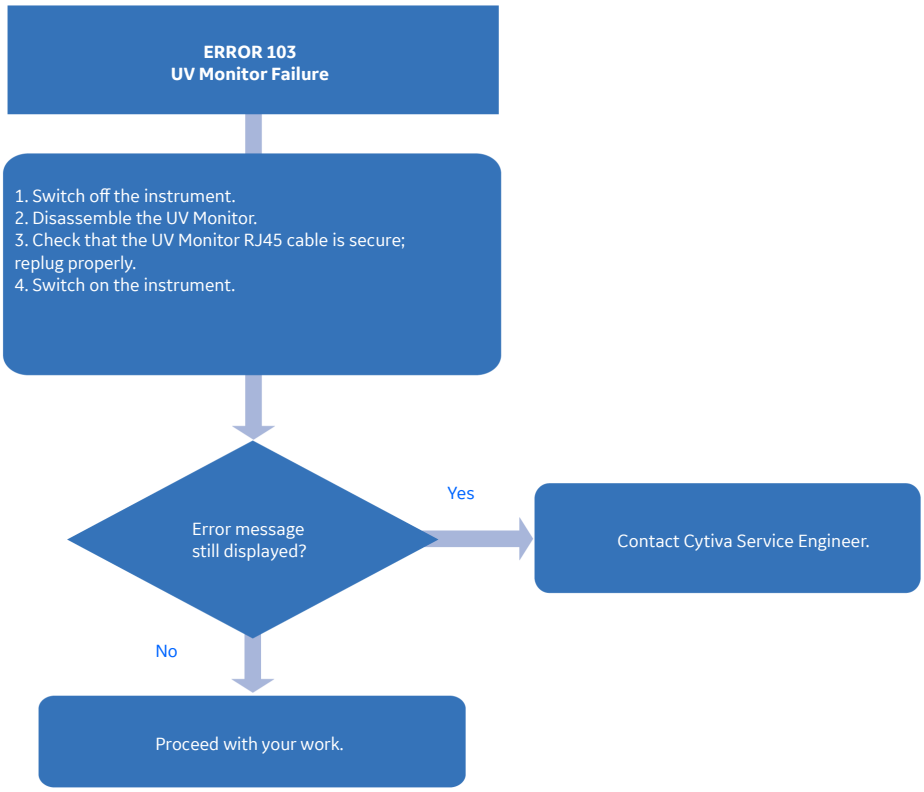
Troubleshooting Flow chart 1



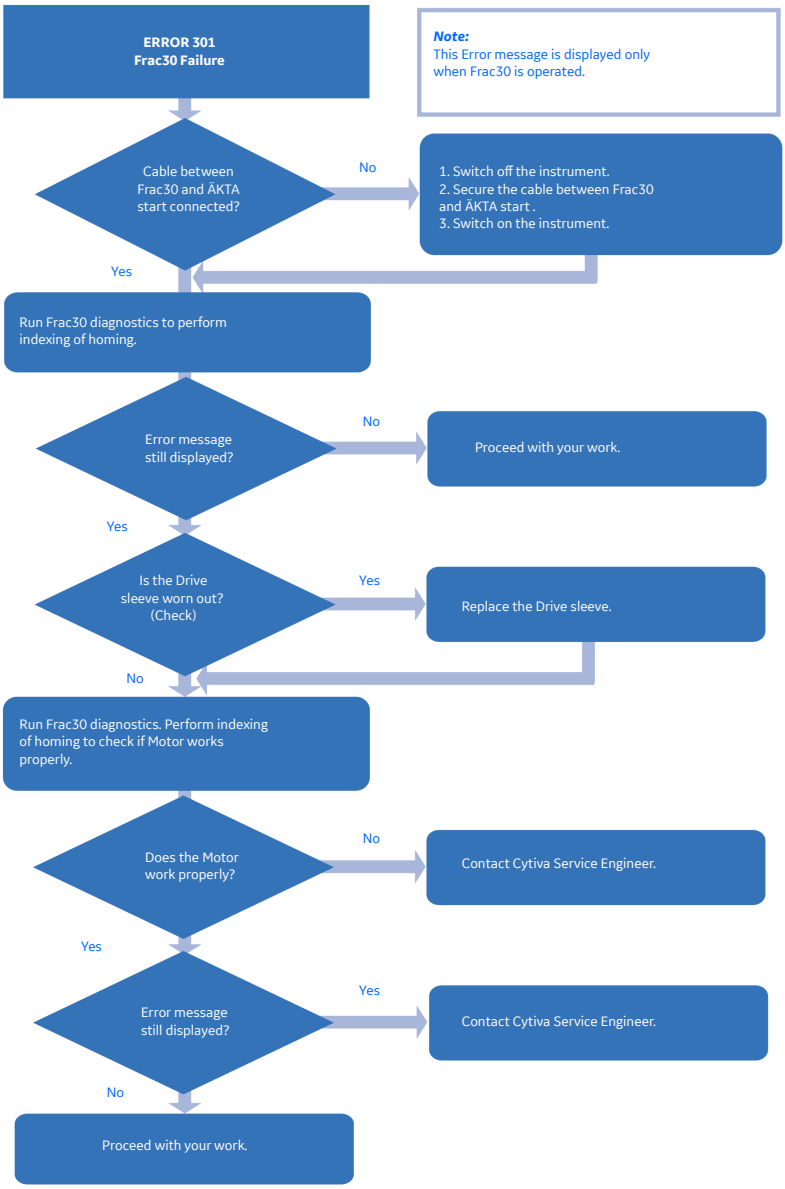
Troubleshooting Flow chart 2



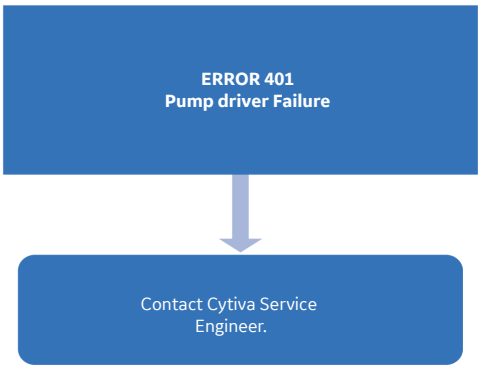
Troubleshooting Flow chart 3



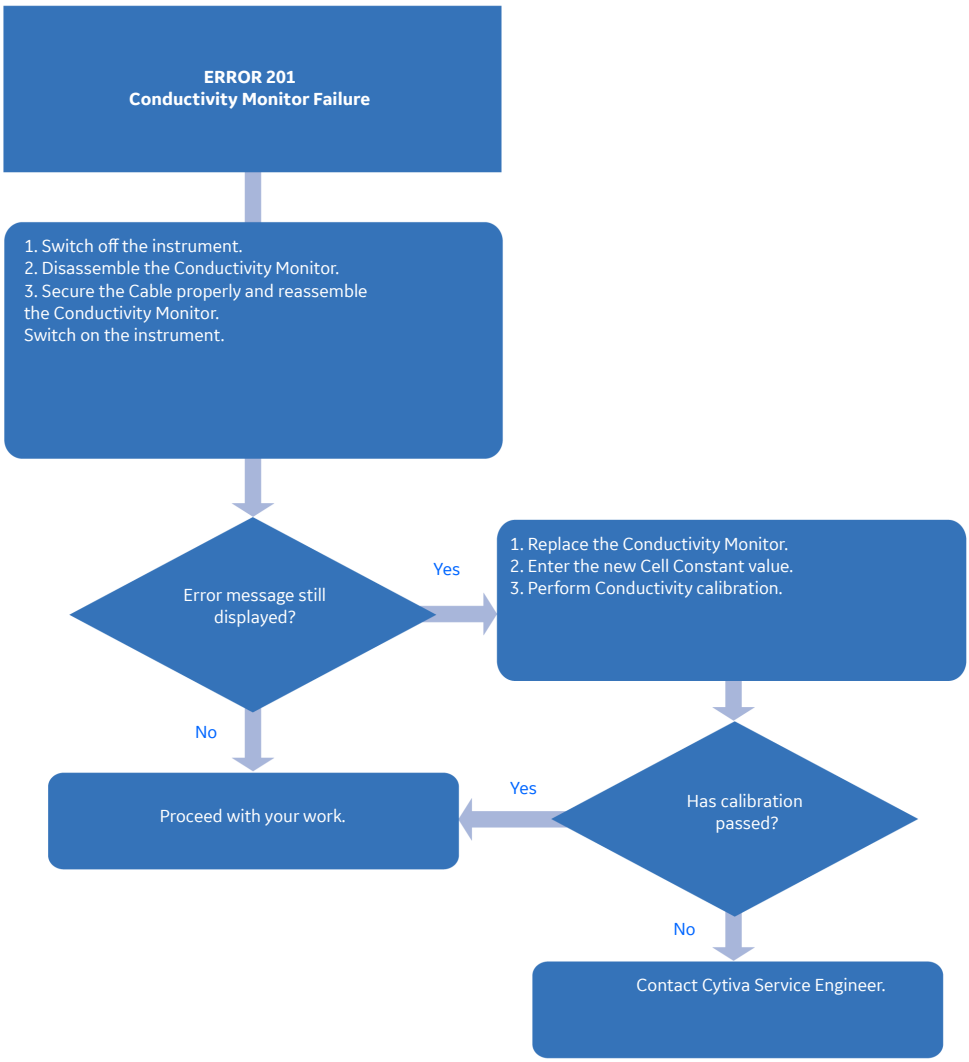
Troubleshooting Flow chart 4



Troubleshooting Flow chart 5



Troubleshooting Flow chart 6



5 Replacement procedures

About this chapter

This chapter contains instructions how to remove and replace ÄKTA start modules.

In this chapter

Introduction

The design of ÄKTA start allows all wet modules, except for the **Pressure sensor**, to be easily removed and replaced by the user.

The location of modules is shown in *Illustration of the instrument modules, on page 17*.

Precautions

WARNING

To avoid personal injury when performing maintenance on ÄKTA start, follow the instructions below.

- **Electrical shock hazard.** Do not open any covers or parts unless specified in the user documentation. Except for the maintenance and service described in the user documentation, all other repairs should be done by a Cytiva Service Engineer.
- **Disconnect power.** Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

NOTICE

Replacement of modules located on the wet side of the instrument must be performed by trained laboratory staff only.

NOTICE

Replacement of modules located on the inside of the instrument must be performed by a Cytiva Service Engineer only. If an internal part needs to be replaced, please contact a Cytiva Service Engineer.

Internal modules include:

- Main board
- Display Sub assembly
- Power supply
- **Pressure sensor**

5.1 3-Port valves

Introduction

This section provides instructions for removal and replacement of 3-port valves, and applies to **Buffer valve**, **Sample valve**, **Wash valve**, and **Outlet valve**. Illustrations show the **Wash valve**: the principles are the same for all four 3-port valves. Note that the orientation of the valve ports on the instrument is different for the different valves.

NOTICE

The 3-port valves are similar in appearance. Make sure that the correct part number is used when replacing valves, according to the table below. Interchanging valves between positions can cause failure of multiple valves.

Required tools

Tool	Dimension
Torx driver	T10

Instructions

Follow the instructions below to remove and replace the valve.

WARNING

Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.

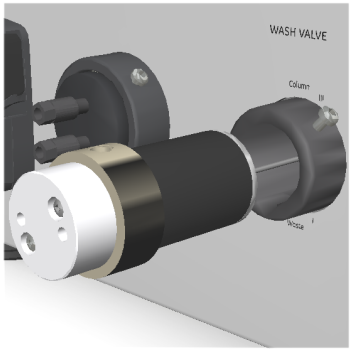
Step	Action
2	Remove all tubing from the ports.

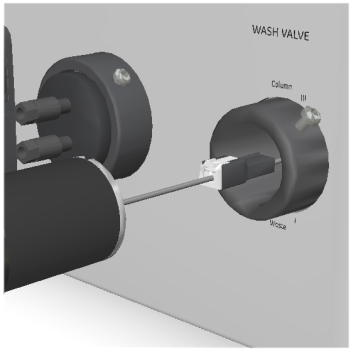
3	Loosen the retaining screw from the valve fitting using a T10 torx driver, supplied with the equipment at delivery.

Note:

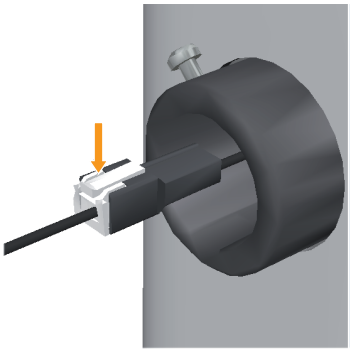
The screw can be located on different places on the top circumference of the holder.

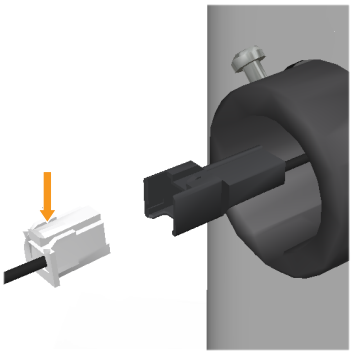
Step	Action
4	Slowly remove the valve until a cable connector is accessible.





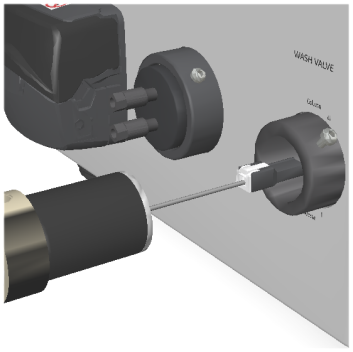
5	Disconnect the connector.





6	Remove the valve from the instrument.

Step	Action
7	Replace with a new valve. Connect the cable, and then insert the valve gently into the instrument.



NOTICE

Only replace the valve with the same part number (see *note on page 110*).

8	Make sure that the ports are aligned to the markings on the instrument chassi, then tighten the retaining screw on the valve fitting.
9	Reconnect the tubing to the ports.
10	Switch on the instrument by pressing the Power Switch to the **I** position.

5.2 Mixer

Required tools

Tool	Dimension
Torx screwdriver	T20

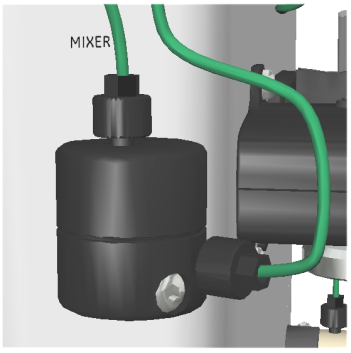
Instructions

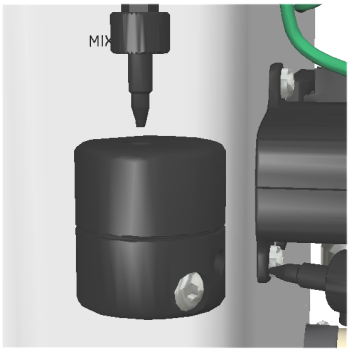
Follow the instructions below to remove and replace the Mixer.

WARNING

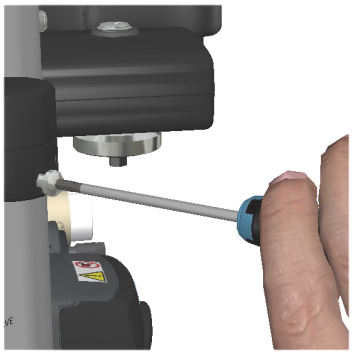
Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.
2	Remove the inlet and outlet tubing from the ports.



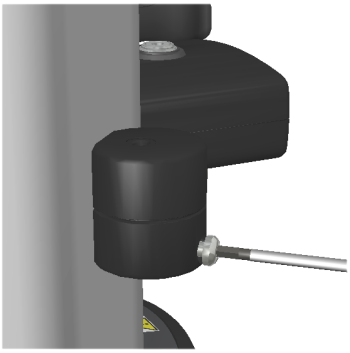


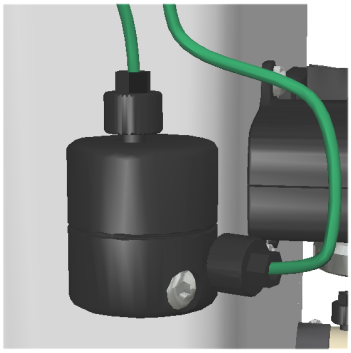
Step	Action
3	Remove the screw from the **Mixer** using a T20 screwdriver, supplied with the equipment at delivery.



4	Remove the **Mixer**.

Step	Action
5	Replace with a new **Mixer** and reconnect the tubing to the ports.





6	Switch on the instrument by pressing the Power Switch to the **I** position.

5.3 UV

Required tools

Tool	Dimension
Torx screwdriver	T20

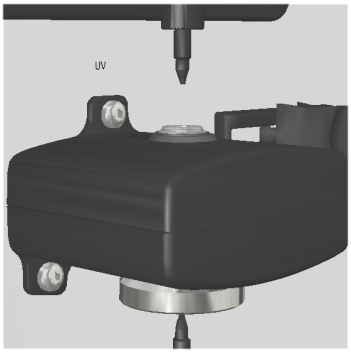
Instructions

Follow the instructions below to remove and replace the **UV** Monitor.

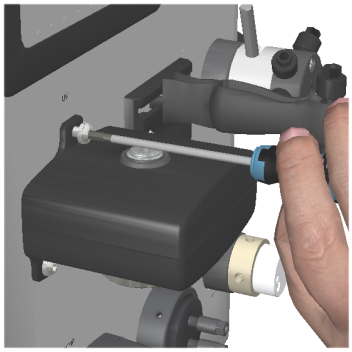
WARNING

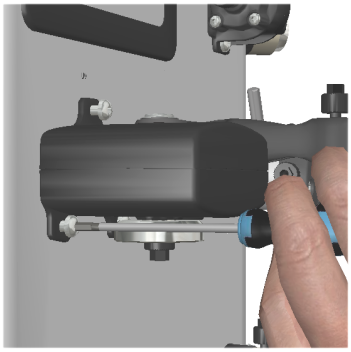
Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.
2	Remove the inlet and outlet tubing from the ports.

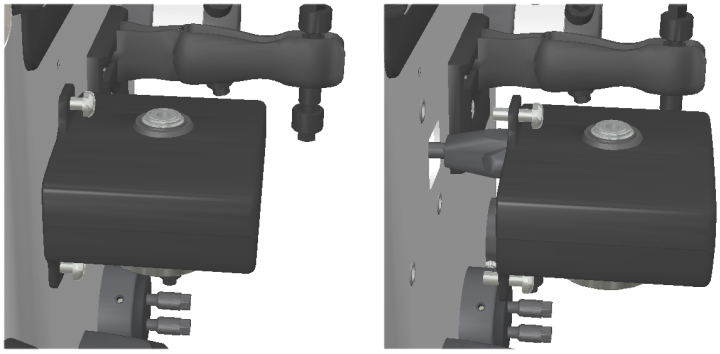


Step	Action
3	Remove the single screw at the top of the **UV** Monitor, and then the two screws at the bottom using a T20 screwdriver, supplied with the equipment at delivery.





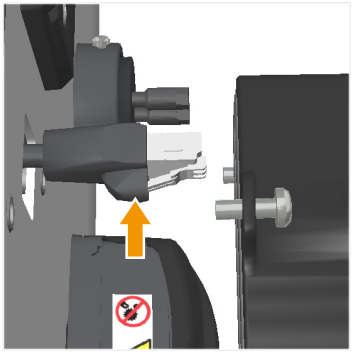
Step	Action
4	Gently remove the **UV** Monitor until the **RJ45** connector on the module is accessible.



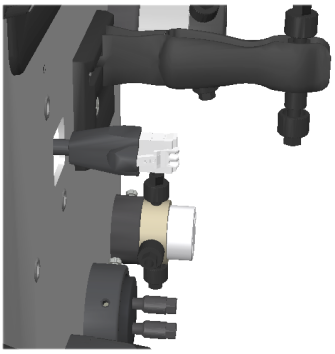
5	Press the latching tab and disconnect the **RJ45** connector from the **UV** Monitor side.

Note:

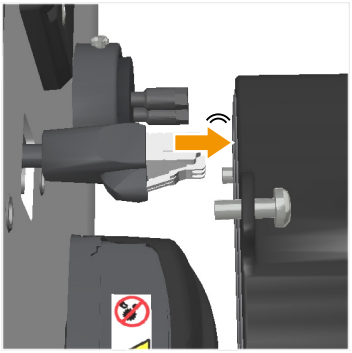
Make sure that the **RJ45** *connector is not moved inside the cabinet. The connector needs to be retained outside the cabinet for re-assembling of a new* **UV** *module.*



Step	Action
6	Remove the **UV** Monitor and leave the **RJ45** connector as it is.



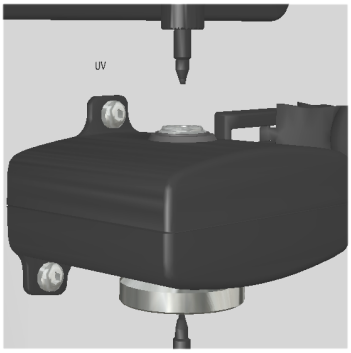
7	Connect the **RJ45** connector to the new **UV** monitor.



Note:

Make sure that there is a click sound when the **RJ45** *connector is connected. The* **UV** *monitor may not work properly if the* **RJ45** *connector is not properly connected.*

Step	Action
8	Reconnect the tubing to the ports.



9	Switch on the instrument by pressing the Power Switch to the **I** position.

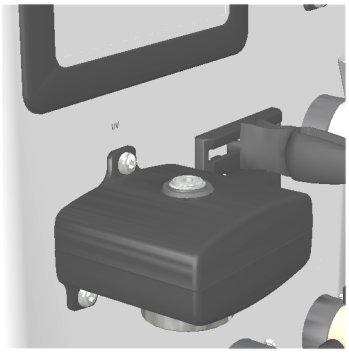
5.4 UV flow cell

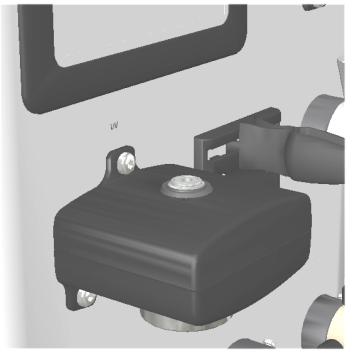
Instructions

Follow the instructions below to remove and replace the **UV** flow cell.

Step	Action
1	Disconnect the inlet and outlet tubing from the **UV** Monitor.
2	Rotate the locknut in the anticlockwise direction.

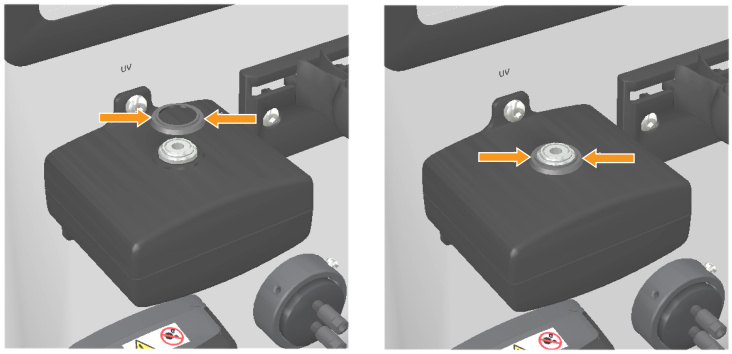
Step	Action
3	Pull up the **UV** flow cell.





Step	Action
4	Put a new **UV** flow cell in place from above so that it fits in properly, and simultaneously tighten the locknut.

Step	Action
5	Place the protective cover around the flow cell to protect the electronics inside the optical unit from liquid spillage.



Note:

The protective cover should be assembled after completing the assembly of the **UV** *flow cell inside the* **UV** *Monitor by just press-fit.*

6	In the ***Settings and Service*** screen, tap ***UV***. In the ***UV*** screen, perform a ***UV LED calibration*** and a ***Flow cell path length test*** (see *Section 3.5 UV Monitor, on page 37*).

5.5 Pump

Required tools

Tool	Dimension
Torx driver	T20

Instructions

Follow the instructions below to remove and replace the **Pump**.

WARNING

Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

NOTICE

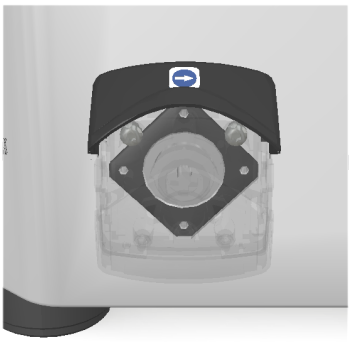
Keep the pump cover open when not using the system. Open the peristaltic pump cover after you switch off the equipment. This reduces the risk of shortening the life time of the pump tubing.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.
2	Open the top cover to remove the tubing from the **Pump**.

Step	Action
3	Remove the two screws from the **Pump** using a T20 screwdriver, supplied with the equipment at delivery.

Note:

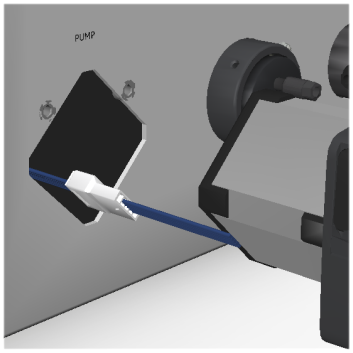
Make sure that the pump connector is not moved inside the cabinet. The connector needs to be retained outside the cabinet for re-assembling of a new **Pump** *module.*



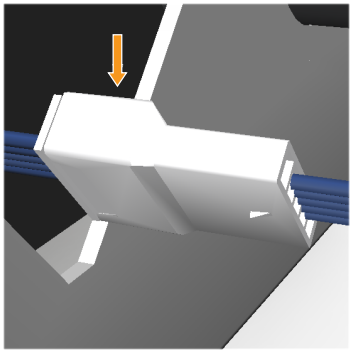
Note:

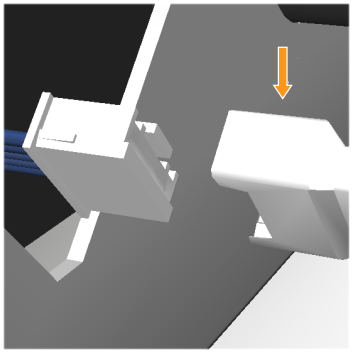
Do not allow the screws to fall into the pump head.

Step	Action
4	Gently remove the **Pump** until the cable connector is accessible.



5	Disconnect the connector.



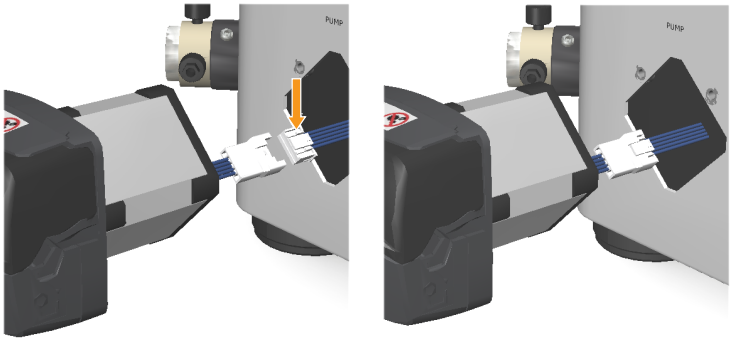


Step	Action
6	Remove the **Pump**.

Note:

After removing the **Pump***, make sure that the pump cable is placed clear of the fan, on the left side of the instrument. This is to ensure that the cable does not get stuck in the ventilation fan.*

7	Replace with a new **Pump**, install the new **Pump** in reverse order.



8	Place the **Pump** tubing between the rollers and the track of the new **Pump**.
9	Switch on the instrument by pressing the Power Switch to the **I** position.
10	In the ***Pump*** screen, tap ***Diagnostics*** and then reset the number of hours of ***Pump run*** to ***0***.

5.6 Pump tubing

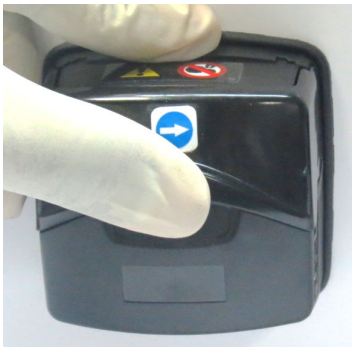
Instructions

Follow the instructions below to replace the pump tubing.

WARNING

Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.
2	Open the top cover on the **Pump** fully.



3	Remove the old tubing.

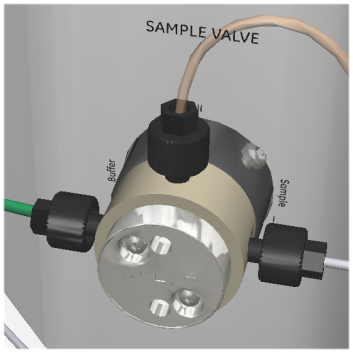
Step	Action
4	Place the new tubing between the rollers and the track, press against the pump head inner wall.

Note:

Make sure that the pump tubing is not twisted or stretched against the rollers.

5	Lower the top cover until it clicks into its fully closed position. The track closes automatically and the tubing is stretched correctly as the track closes.

Step	Action
6	Connect the pump tubing to the **Sample valve** and to the **Pressure sensor**.



7	Switch on the instrument by pressing the Power Switch to the **I** position.

5.7 Conductivity Monitor

Required tools

Tool	Dimension
Torx screwdriver	T20

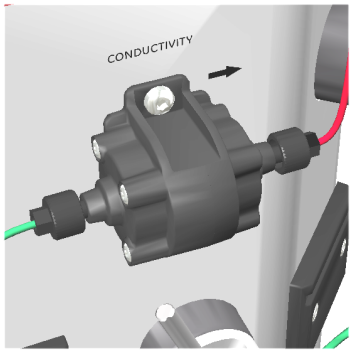
Instructions

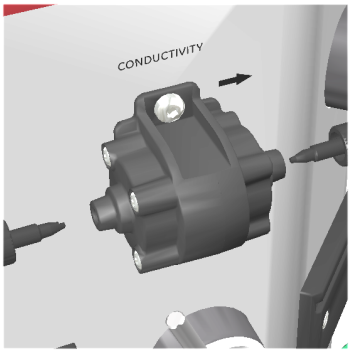
Follow the instructions below to remove and replace the **Conductivity** Monitor.

WARNING

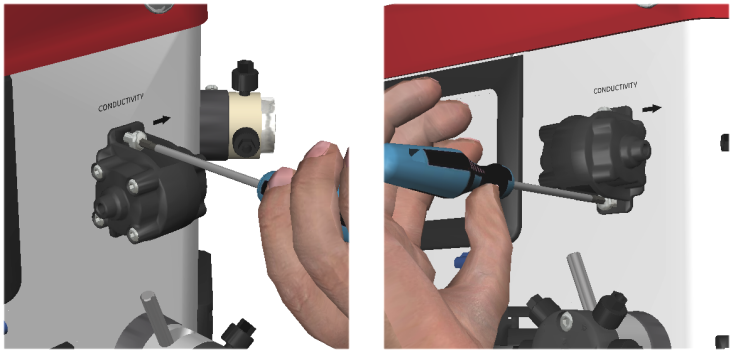
Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.
2	Remove the inlet and outlet tubing from the ports.





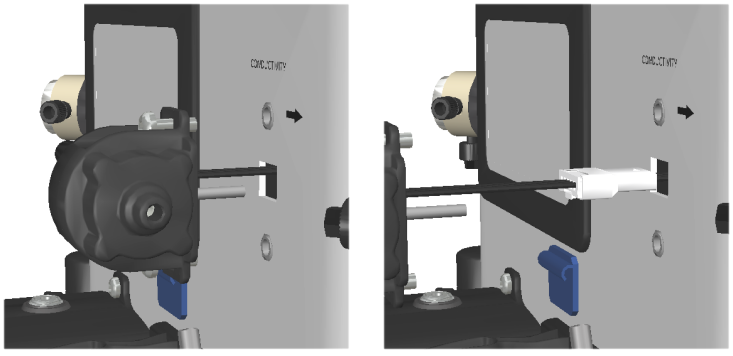
Step	Action
3	Loosen the screws from the **Conductivity** Monitor using a T20 screwdriver, supplied with the equipment at delivery.



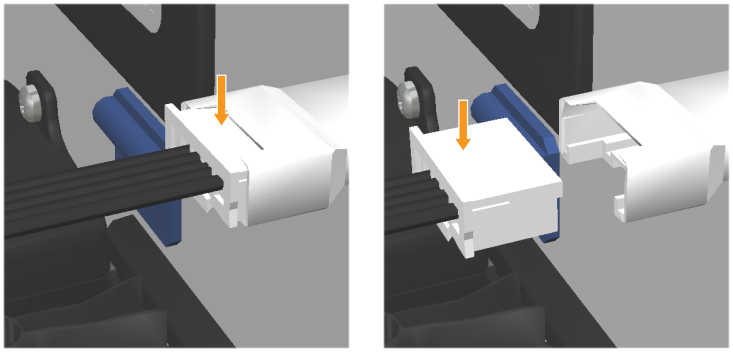
4	Slowly remove the **Conductivity** Monitor until a cable is visible. The cable is assembled with two connectors interconnected.

Note:

If required, twist the connector to bring the connector out of the instrument hole, before disassembly the **Conductivity** *Monitor.*



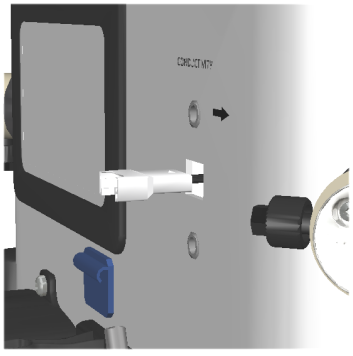
Step	Action
5	Disconnect the connector from the **Conductivity** Monitor side.

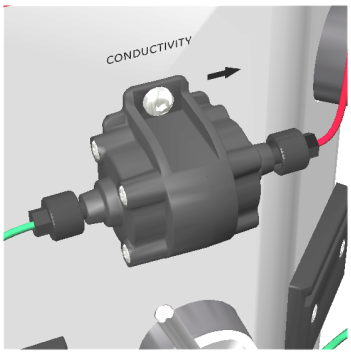


Step	Action
6	Remove the **Conductivity** Monitor and leave the connector as it is.

Note:

Make sure that the connector is not moved inside the cabinet. The connector needs to be retained outside the cabinet for re-assembling of a new **Conductivity** *module.*



Step	Action
7	Replace with a new **Conductivity** Monitor and reconnect the tubing to the ports. 
8	Switch on the instrument by pressing the Power Switch to the **I** position.
9	In the ***Settings and service*** screen, access the ***Conductivity*** screen to set the cell constant for the new **Conductivity flow cell**. For details, see *Section 3.11 Conductivity Monitor, on page 68*.

5.8 Injection valve

Introduction

Replace the complete valve when internal valve parts are damaged, worn or blocked with salt deposits.

Use the Injection valve kit (see *Section 5.9 Injection valve kit, on page 138*) to service the valve when the external parts and liquid distribution parts are damaged, worn or blocked with salt deposits.

Required tools

Tool	Dimension
Torx driver	T10

Instructions

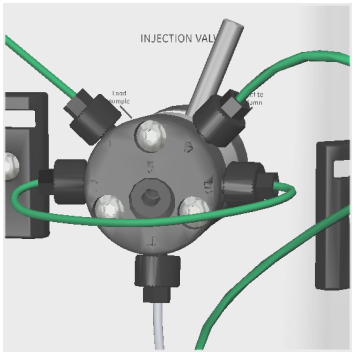
Follow the instructions below to remove and replace the **Injection valve**.

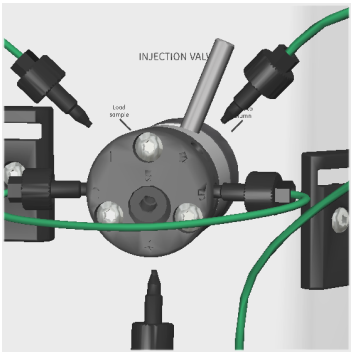
WARNING

Disconnect power. Always switch off power to the instrument before replacing any component on the instrument or cleaning the instrument, unless stated otherwise in the user documentation.

Step	Action
1	Switch off the instrument by pressing the Power Switch to the **O** position.

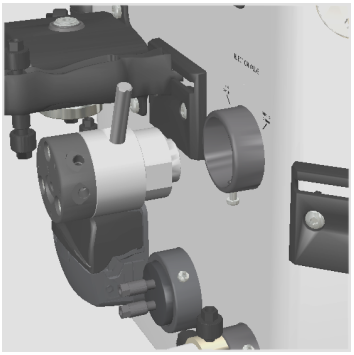
Step	Action
2	Remove the inlet and outlet tubing from the ports.



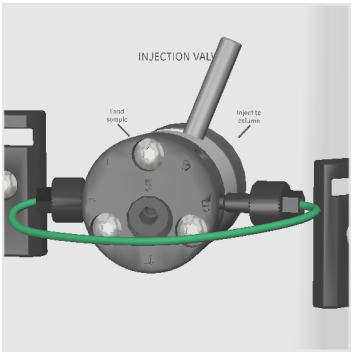


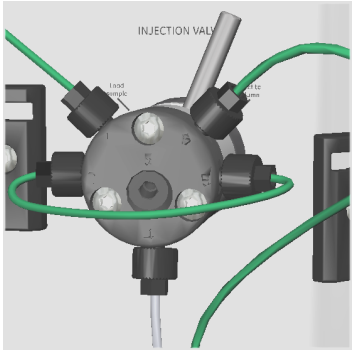
3	Loosen the screw from the **Injection valve** using a T10 torx driver, supplied with the equipment at delivery.

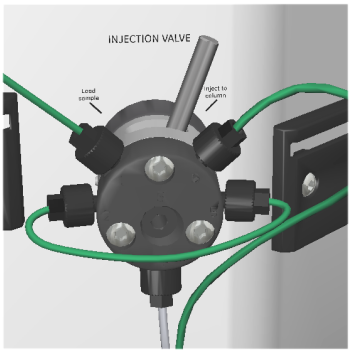
4	Remove the **Injection valve**.



Step	Action
5	Replace with a new **Injection valve** and reconnect the tubing to the ports.







6	Make sure that the ports are aligned to the markings on the instrument chassi.
7	Switch on the instrument by pressing the Power Switch to the **I** position.

5.9 Injection valve kit

Introduction

Use the Injection valve kit to service the valve when the external parts and liquid distribution parts are damaged, worn or blocked with salt deposits.

Replace the complete valve (see *Section 5.8 Injection valve, on page 135*) when internal valve parts are damaged, worn or blocked with salt deposits.

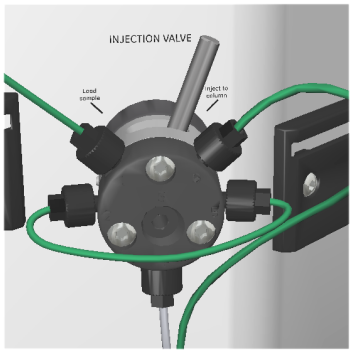
Required tools

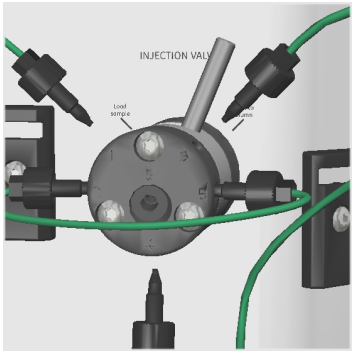
Tool	Dimension
Torx driver	T10

Instructions

Follow the instructions below to remove and replace the **Injection valve** kit.

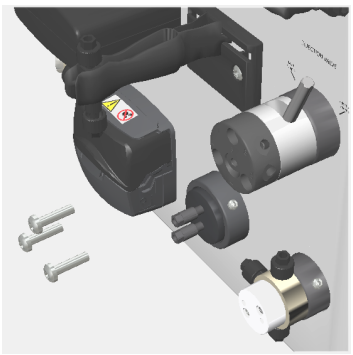
Step	Action
1	Make sure that the valve is in position: **Inject**, and then disconnect the inlet and outlet tubing from the ports.



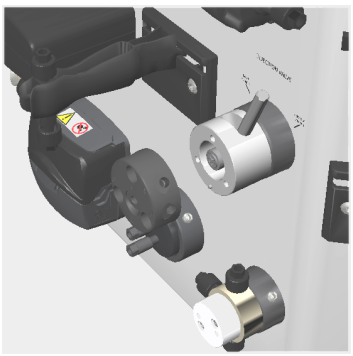


Step	Action
2	Remove the 3 screws on the front side, using the supplied torx driver. Loosen each screw equally in turn, so the distribution plate comes off in parallel to the valve body.

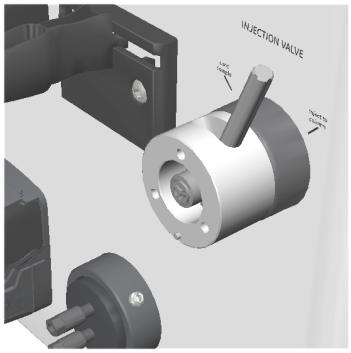
3	Slide the screws out.

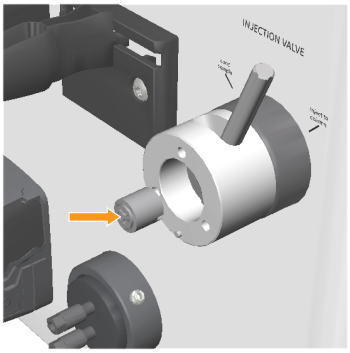


4	Remove the distribution plate containing the ports.

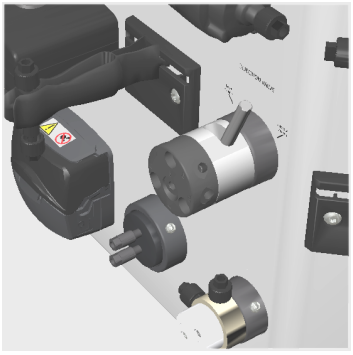


Step	Action
5	Remove the old channel plate and insert a new one.





6	Remount a new distribution plate so that the marks on the plate match the marks on ÄKTA start. Using the torx driver, tighten the 3 screws in turn, a little at a time, until the distribution plate is fixed to the valve body.

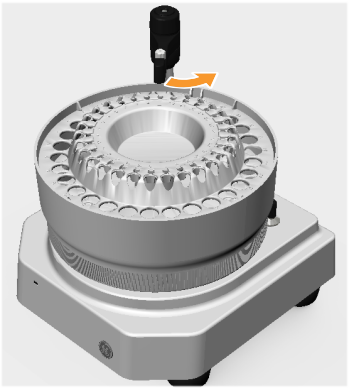


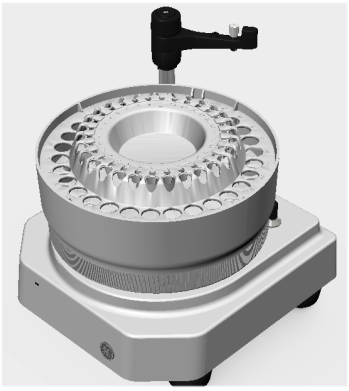
5.10 Frac30 Bowl assembly

Remove the Bowl assembly

Follow the instructions below to remove the Frac30 Bowl assembly.

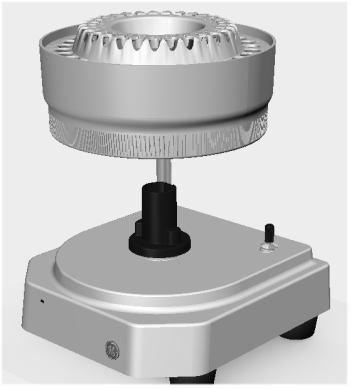
Step	Action
1	Gently move the Dispenser arm counterclockwise to the non-dispensing (end) position.





2	Push the drive assembly laterally and hold it at the retracted position.

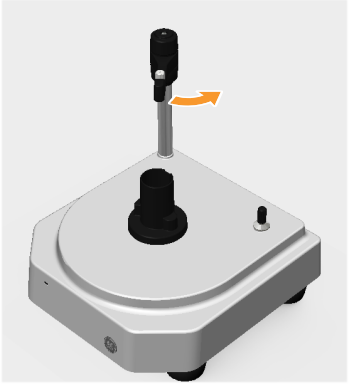
Step	Action
3	Lift and remove the Bowl assembly.



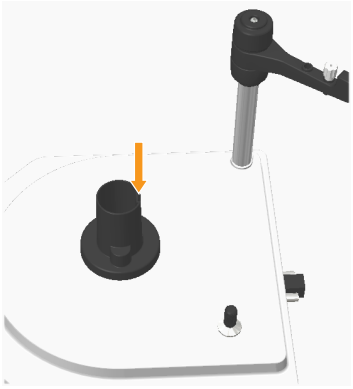
Mount the Bowl assembly onto the Bowl holder

Follow the instructions below to mount the Frac30 Bowl assembly onto the Bowl holder.

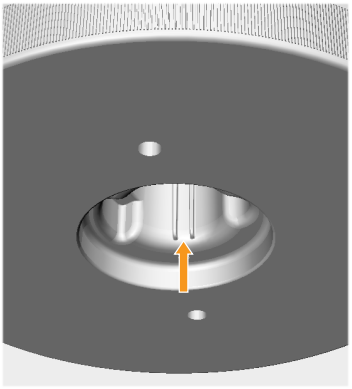
Step	Action
1	Make sure that the Dispenser arm is in the non-dispensing position.



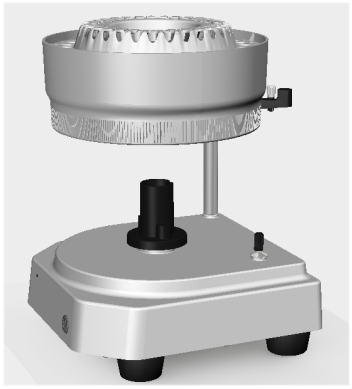
Step	Action
2	Note the position of the aligning groove on the Bowl holder.

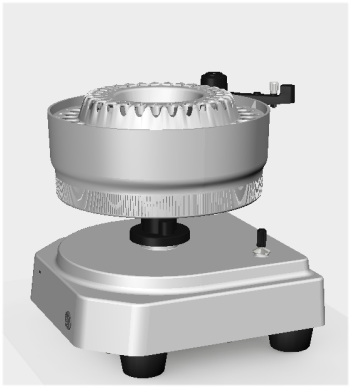


3	Note the position of the aligning ribs on the Bowl.



Step	Action
4	Hold the Bowl assembly and orient the Bowl with the aligning ribs oriented towards the aligning groove on the Bowl holder.





Note:

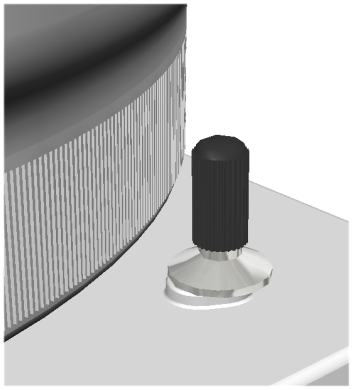
Do not lift the fraction collector by holding the Dispenser arm.

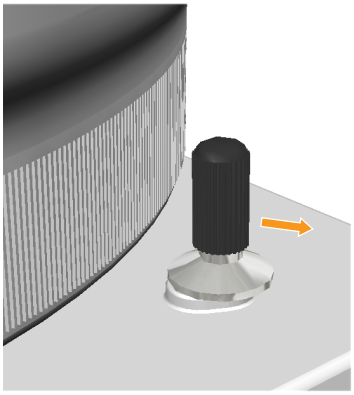
Tip:

If it is hard to locate the alignment feature in corresponding parts, hold the Bowl assembly near the top of the Bowl holder and rotate the Bowl holder until the aligning ribs are located.

5	After locating the aligning features, leave the Bowl to slide freely into the Bowl holder.

Step	Action
6	Hold the Drive assembly at the retracted position to completely assemble the Bowl assembly on the Bowl holder.

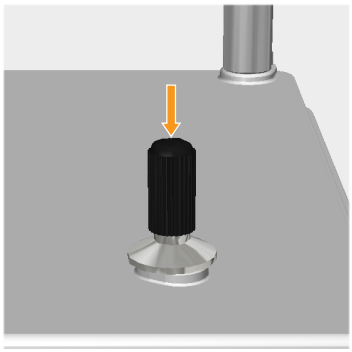


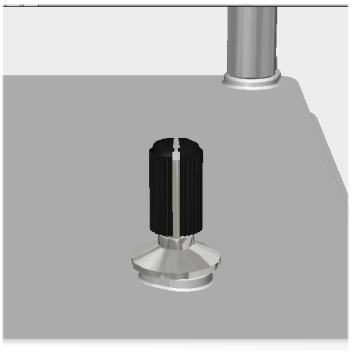


Remove and replace the drive sleeve

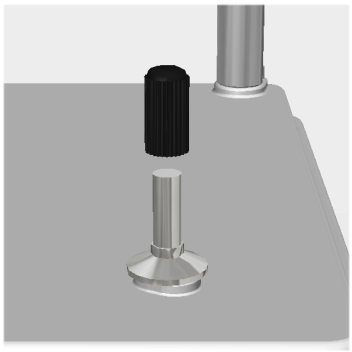
Follow the instructions below to remove and replace the drive sleeve.

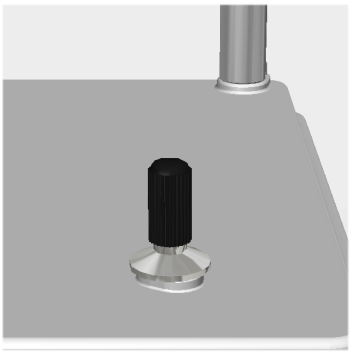
Step	Action
1	Cut the old drive sleeve with a sharp knife, and then remove the drive sleeve.





2	Mount a new drive sleeve by pressing and sliding it onto the drive.

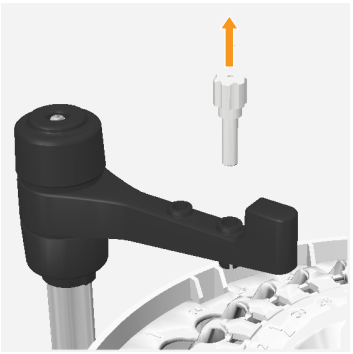




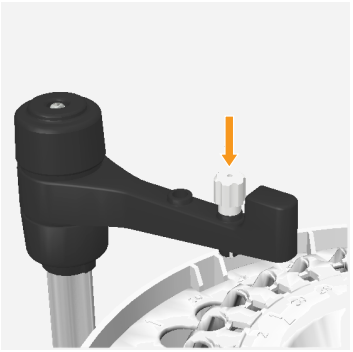
Remove and replace the Tubing holder

Follow the instructions below to remove and replace the Tubing holder.

Step	Action
1	Pull out the Tubing holder from the Dispenser arm.



2	Press down the new Tubing holder into the Dispenser arm until it is stopped by the dispensing arm stopping feature.



5.11 Fuse

WARNING

Disconnect power. Always disconnect power from the instrument before replacing fuses.

WARNING

For continued protection from fire hazard, replace only with the same type and rating of fuse.

CAUTION

Do not replace the mains fuse if you suspect that there may be a malfunction in the instrument. Contact your Cytiva service representative for advice.

Required tools

Tool	Dimension
Flat screwdriver	2 to 3 mm

Remove the fuse

Follow the instructions below to remove the fuse.

Step	Action
1	Use the flat screwdriver provided, and push the *Snap feature* on the left side of the fuse holder, in the direction indicated by the arrow mark.

2	Use the flat screwdriver, and push the *Snap feature* on the right side of the fuse holder, in the direction indicated by the arrow mark.

Step	Action
3	Pull the fuse holder out of the mains connector panel by hand.

4	Remove the fuse from the fuse holder.

Mount the fuse

Follow the instructions below to replace the fuse.

Step	Action
1	Fit a new fuse of the same type and rating in the fuse holder.

Step	Action
2	Align the fuse holder to the rectangular slot in the mains connector panel. 
3	Push the fuse holder into the rectangular slot until it fits into the rectangular groove of the mains connector panel. 

5.12 Replace tubing and connectors

Maintenance interval

Replace tubing and connectors when required, for example if a tubing is clogged or has been bent so that the flow is stopped.

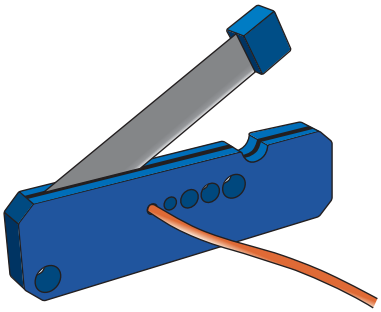
Required material

- Tubing and connectors
- Tubing cutter

Instruction

Follow the steps below to replace tubing and connectors.

Step	Action
1	Unscrew the connectors, and disconnect the tubing.
2	If the tubing has labels, remove the labels to be used with the new tubing later.
3	Cut the new tubing to the same length as the old tubing. Use a tubing cutter to get a straight angle cut.



CAUTION

Cut injuries. The tubing cutter is very sharp and must be handled with care to avoid injuries.

Note:

When replacing system tubing, use the original inner diameter and length to make sure that the correct internal volumes are maintained.

4	Put the old labels on the new tubing.

Step	Action
5	Mount the new connectors on the tubing. • For fingertight connectors, slide the connector onto the tubing. • For tubing connectors 1/8", slide the connector onto the tubing. Slide the ferrule onto the tubing with the thick end towards the end of the tubing.
6	Insert the tubing with connector into the port. Make sure to insert the tubing all the way into the bottom of the port.
7	Tighten the connector fully. For areas difficult to access, use the fingertight wrench included in the accessory kit.

Tubing length

The tubing must be cut to an appropriate length as described below.

Note:
- *When replacing system tubing, use the original inner diameter and length to make sure that the correct internal volumes are maintained.*
- *Use the old tubing labels on the new tubing.*
- *Tubing length between 100 to 700 mm must be cut within ± 2 mm of the recommended tubing length described above.*
- *Tubing length > 700 mm must be cut within 0.3% of the recommended tubing length described above.*

Label	Tubing	Length (mm)	Description
A	FEP, i.d. 1.6 mm	1000	Buffer bottle to Buffer valve A
B	FEP, i.d. 1.6 mm	1000	Buffer bottle to Buffer Valve B
AB	PEEK, i.d. 0.75 mm	150	Buffer valve to Mixer
G1	PEEK, i.d. 0.75 mm	230	Mixer to Sample Valve
S	ETFE, i.d. 1 mm	250	Sample valve to Pump
G2	Marprene tubing, i.d. 0.8 mm Wall thickness, 1.6 mm	250	Sample valve to Pressure sensor (through the pump)
G3	PEEK, i.d. 0.75 mm	130	Pressure sensor to Wash Valve
G4	PEEK, i.d. 0.75 mm	170	Wash Valve to Injection valve
G5	PEEK, i.d. 0.75 mm	150	Injection valve to Column

Label	Tubing	Length (mm)	Description
G6	PEEK, i.d. 0.75 mm	150	Column to UV Monitor
G7	PEEK, i.d. 0.75 mm	200	UV monitor to Conductivity Monitor
G8	PEEK, i.d. 0.5 mm	190	Conductivity Monitor to Outlet valve
F1	PEEK, i.d. 0.75 mm	500	Outlet to Frac30
W1	ETFE, i.d. 1 mm	600	Wash valve to Waste
W2	ETFE, i.d. 1 mm	600	Injection valve to Waste
W3	ETFE, i.d. 1 mm	600	Outlet valve to Waste

5.13 Replace the inlet filters

Maintenance interval

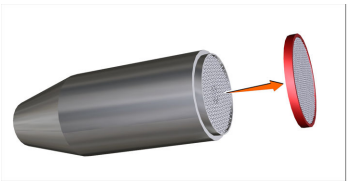
Replace the inlet filters when required, for example when the filters are clogged.

Required material

Inlet filter set

Instruction

Follow the steps below to replace the inlet filter and support net from inlet tubing.

Step	Action
1	Pull off the inlet filter and the support net from the inlet filter holder. 
2	Fit the new support net and inlet filter, and press the filter into position.

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