Element Biosciences

AVITI24™ System

User Guide

FOR USE WITH

AVITI24 System
AVITI Operating Software v4.1 or later

ELEMENT BIOSCIENCES
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CHAPTER 1

System Overview

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Introduction

The AVITI24 System is a sequencing, screening, and spatial platform that brings high-quality sequencing and integrated multiomics together in one benchtop system. A multiomics run on the AVITI24 System measures a diverse array of molecular features for deep profiling of RNA, protein, and morphology in a single sample.

The AVITI24 System offers flexibility through multiple sequencing kit configurations and Cytos™ kits that support an extensive range of applications. The dual flow cell design enables parallel runs or staggered runs with independent run setup options. AVITI™ Operating Software (AVITI™ OS) provides additional features to promote adaptive run setup and streamline analysis.

This guide provides an overview of system components, analysis options, maintenance instructions, configuration settings, and safety information for the AVITI24 System.

Site Prep and Safety

Before installation of an AVITI24 System, ensure your site meets the requirements in the *AVITI24 System Site Prep Guide (MA-00052)*. Before operating or maintaining the instrument, review the safety and regulatory information in *Safety and Compliance* on page 60.

The instrument does not contain any user-serviceable parts. Exterior shells enclose the instrument to protect the operator from laser light exposure and mechanical parts. Software and interlocks prevent exposure to hazards, and using the AVITI24 System in an unspecified manner can compromise these protections.

Warranties and Services

The purchase of an AVITI24 System includes a standard one-year warranty. Element offers supplemental procedures, preventative maintenance service, and annual service plans. For more information, visit elementbiosciences.com/instrument-service-coverage.

System Compatibility

For sequencing runs, the AVITI24 System is compatible with an array of library types, including third-party libraries. For more information about library compatibility, see *Product Compatibility* on the Element website.

To avoid mixing and matching components from different kit configurations and versions, AVITI OS validates the compatibility of the cartridge and flow cell provided in each sequencing or multiomics kit.

Additional Documentation

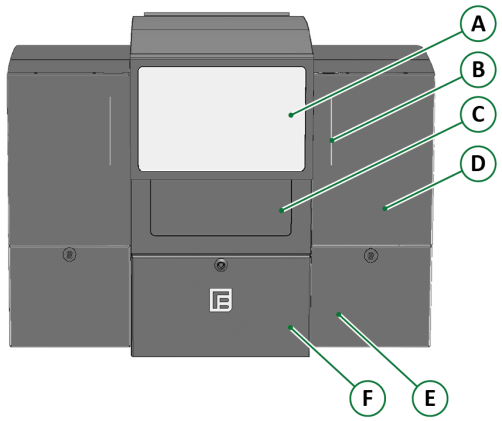
For run preparation and setup instructions for a specific workflow, see the following guides:

- *Cloudbreak™ Sequencing User Guide (MA-00058)* on the Cloudbreak documentation page.
- *Trinity™ Sequencing User Guide (MA-00059)* on the Trinity documentation page.
- The Cytos guides on the Cytos documentation page.

AVITI24 System Components

The instrument has two sides: side A on the left and side B on the right when you face the instrument. Each side operates independently so you can engage one side while the other is in use. Side A and B each include a dedicated pump bay and reagent bay enclosed with bay doors.

Between sides A and B is the glove-compatible touchscreen monitor that displays the AVITI OS interface. Below the monitor is the nest bay and the waste bay. Lighting illuminates the interior of each bay. During a run, AVITI OS locks all doors except the pump bay doors to protect against laser light exposure, mechanical moving parts, and other hazards.



- **A** Touchscreen monitor
- **B** Lightbars
- **C** Nest bay with automated nest door
- **D** Pump bays hold fluidic pumps
- **E** Reagent bays hold reagents for each run
- **F** Waste bay holds waste bottles

CAUTION
Do not place items on top of the instrument or on open doors. The doors can support the weight of run and wash components, but applying extra weight or bumping into an open door can damage the instrument.

Status Lights

The AVITI24 System includes two types of status lights: an interior nest light in front of each nest and an exterior lightbar on each side. The nest light colors indicate flow cell status. The lightbar colors indicate the current process and overall system status. Unless the system is initializing, each lightbar is side-specific.

Nest Light Colors

Color	Status
Blue	The flow cell is present and ready to be unloaded.
Green	The flow cell is properly loaded and ready for priming, sequencing, or washing.
Red	The flow cell is improperly loaded: the lid is open or the nest is empty.
None	The flow cell is present but is not ready to be unloaded.

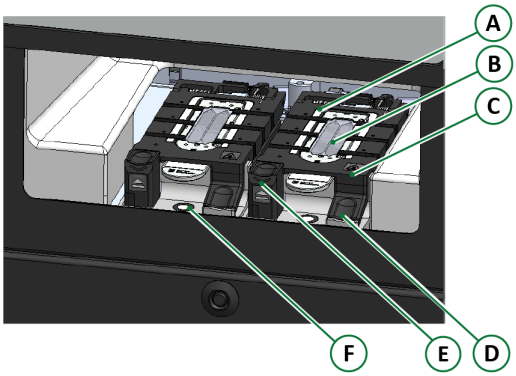
Lightbar Colors

Color	Status
White fade	The system is initializing.
Solid white	The system is initialized and idle.
Solid blue	Run or wash setup is in progress.
Blue fade	The system is priming, sequencing, or washing.
Solid orange	The system experienced a warning. The color changes after the run finishes.
Solid red	The system experienced an error or run failure. The color immediately changes when an error occurs.

Nest Bay

The nest bay includes two nests, one for each side, and each nest holds one flow cell. A hinged flow cell lid secures the flow cell in place. A button on each nest unlatches and opens the hinged lid to a 40° angle. To ensure proper alignment, three silver pins on the loading area fit into three corresponding holes on the flow cell.

An automated nest door on the middle shell encloses the nest bay. During a run, a camera and four tube lenses above the nest image the flow cell in four channels.

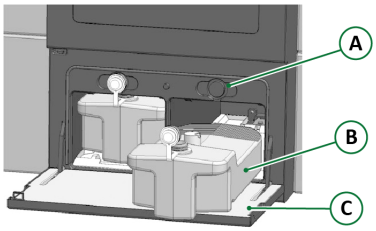


A Wall around the loading area
B Flow cell loaded on the nest
C Lid secured over a loaded flow cell
D Tab to close the lid
E Button to open the lid
F Nest status light

Waste Bay

The waste bay holds two waste bottles, one for each side. Two threaded cap holders above the waste bay secure the tethered transport cap to keep the caps clear of the door.

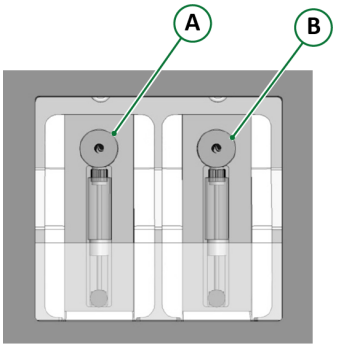
A sealed tray built into the bottom of the waste bay collects spills and leaks and directs liquid to the front of the instrument. During run or wash setup, sensors confirm the waste bottle is present and empty and allow the run or wash to proceed. Another sensor detects spills.



A Cap holder
B Waste bottle
C Open waste bay door

Pump Bays

Each pump bay contains two pumps that control the flow of liquid. The left pump pulls fluid through the left lane of the flow cell and the right pump pulls fluid through the right lane. Keep the pump bay doors closed during normal operation and maintenance.

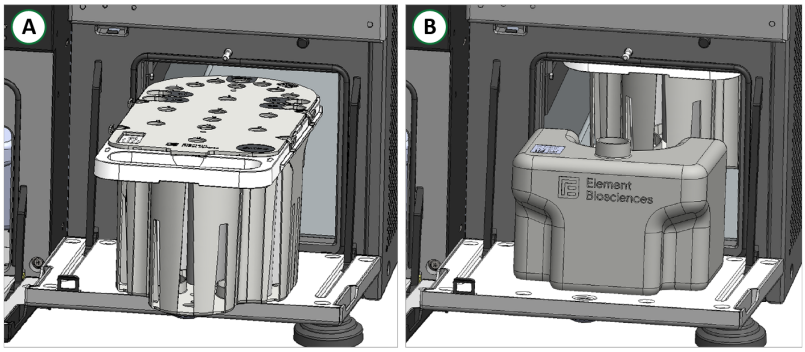


A Pump controlling the left lane of a flow cell
B Pump controlling the right lane of a flow cell

Reagent Bays

Each reagent bay holds a buffer bottle and cartridge basket that contains a cartridge or a wash tray, depending on whether the system is sequencing or washing. Keep the reagent bay doors closed to maintain the refrigeration, which chills reagents.

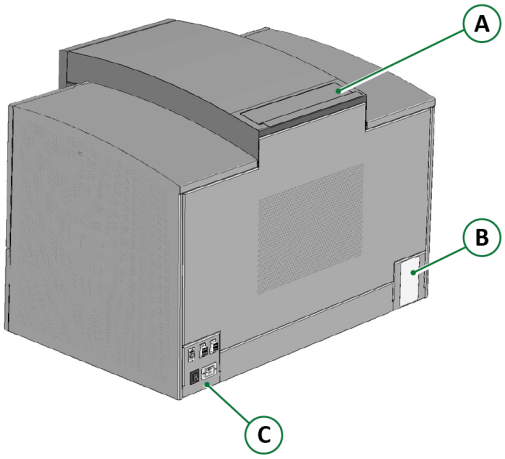
When priming starts, sippers descend into the bay, pierce the foil seals covering the cartridge wells, and aspirate reagents from the bottom of each well. The sippers continue to aspirate reagents throughout the run. Functioning similarly for a wash, the sippers aspirate wash solution instead of reagents.



A Loading a basket and cartridge
B Loading a buffer bottle

Back Panel

The back panel includes the air filter tray and input/output panel. A compliance label displays regulatory symbols for regulatory compliance, the instrument serial number, and electrical specifications. For more information on labeling, compliance, declarations, and certifications, see *Safety and Compliance* on page 60.



A Air filter tray
B Compliance label
C Input/output panel

Air Filter Tray

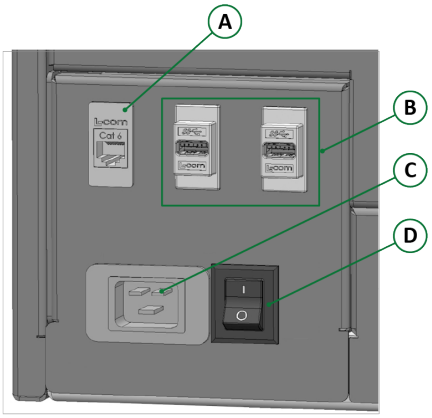
Air enters the instrument through a disposable air filter rated MERV 8. This type of filter keeps dust out of the instrument but does not filter smoke or particles < 3 µm. Keep aerosol and particulate sources away from the instrument to extend filter life.

The filter is positioned in a vertical tray that lifts from the top of the instrument to facilitate easy replacement. See *Replace the Air Filter* on page 35.

Input/Output Panel

Instrument connections and the power switch are located on the input/output panel on the back of the instrument. The panel includes a Category 6 (Cat6) Ethernet port and a power connection. Use only the power cord that Element provides.

The input/output panel includes two USB 3.0 ports for a mouse, keyboard, or USB drive for file transfer.



A Cat6 Ethernet port
B USB 3.0 ports
C Power entry module
D Power switch in the on position

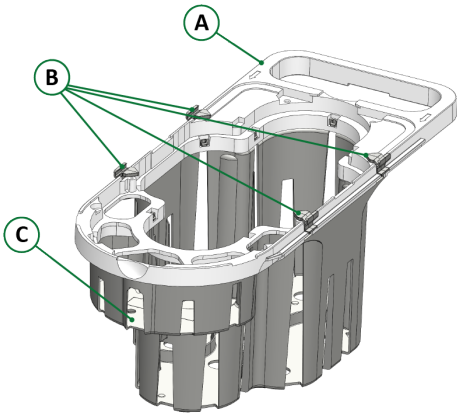
A third USB 3.0 port is located on the instrument side panel on side B. USB drives used for file transfer must be formatted as FAT32 or exFAT.

Reusable Accessories

Reusable accessories include four wash trays, two cartridge baskets, and two waste bottles. Although reusable for many runs, each accessory requires care, inspection, and periodic replacement.

Cartridge Basket

The cartridge basket holds and protects the cartridge during a run. The back of the basket extends into a handle with arrows to indicate the loading direction. Clips along the top of the basket secure the basket to the cartridge. A window at the front of the basket enables library inspection. The basket design accommodates the shape of the buffer bottle, which is loaded into the reagent bay behind the basket.



A Handle at the back
B Latches along the top
C Window at the front

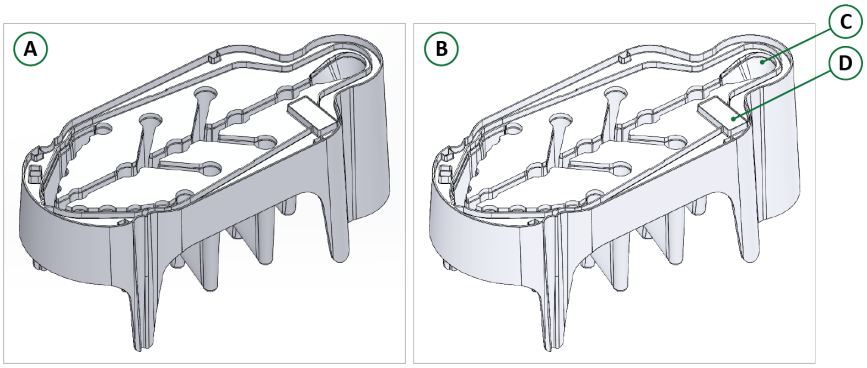
Wash Trays

The AVITI24 System includes two types of wash trays, each dedicated to different wash solutions:

- AVITI Wash Tray 1, Gray, for use with Wash 1 Solution.
- AVITI Wash Tray 2, White, for use with Wash 2 Solution and nuclease-free water.

For more information, see *Perform a Maintenance Wash* on page 30.

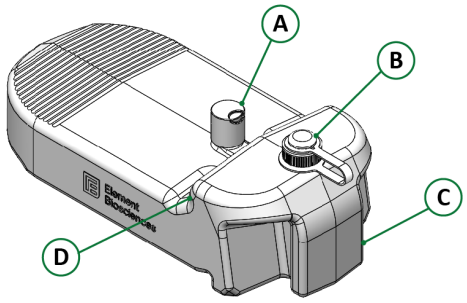
The back of a wash tray forms a handle and a fill area for adding wash solution. Interior fill lines indicate approximate volumes. An overflow wall contains any wash solution that exceeds the 800 ml maximum fill volume. Each tray includes a waterproof barcode label for validation purposes.



A Gray wash tray
B White wash tray
C Handle with fill area
D Barcode label

Waste Bottle

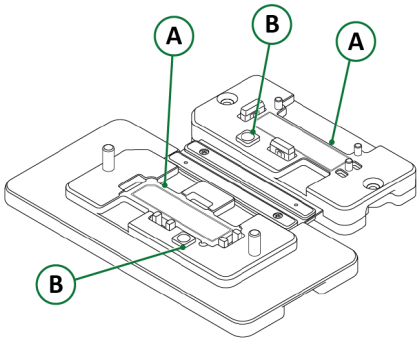
A waste bottle collects spent reagents and library throughout the run. The maximum capacity of 3.2 L per bottle is sufficient to contain all waste from one run. The transport cap seals the bottle during transport. The vent cap improves flow when emptying waste. Ridges on the back of the bottle and a handle at the front facilitate handling.



A Vent cap
B Transport cap
C Handle
D Thumb indentations

Flow Cell Aligner

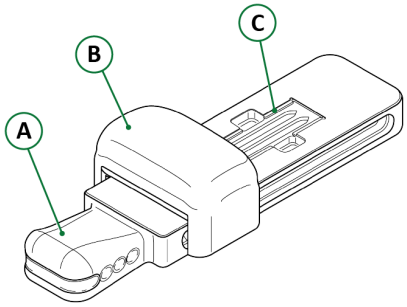
Use the Flow Cell Aligner to combine the prepared sample slide from the slide kit with an adhesive slide from the AVITI24 Flow Cell Assembly Kit. After you position the slides, the hinged fixture flips the adhesive side against the sample side and affixes the slides together. Then assemble the affixed slides into a flow cell cassette.



A Indentation for slide placement
B Button to release slide holder

Flow Cell Sealer

The Flow Cell Sealer ensures complete adhesion of the sample slide and adhesive slide. An indentation in the tray secures the assembled slides as you slowly push the roller grip forward and back to remove any trapped air.



A Base grip
B Roller grip
C Indentation for slides

Sequencing Kits

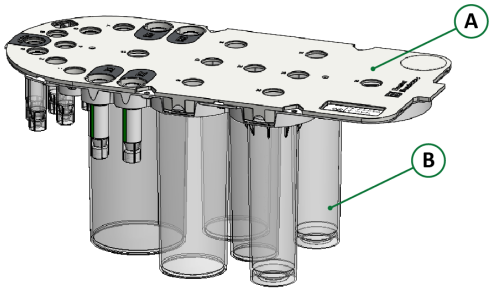
A sequencing kit provides a flow cell, a reagent cartridge, loading buffer, and wash buffer required for one run. The cartridge for each kit supports a specific number of cycles and output levels. Components include a barcode label for tracking and validation. For a complete list of kits, see the *Cloudbreak Sequencing User Guide (MA-00058)* or the *Trinity Sequencing User Guide (MA-00059)*.

To ensure the compatibility of run components, see the *Product Compatibility* page on the Element website.

Sequencing Reagent Cartridge

The reagent cartridge is a collection of reagents and buffers in foil-sealed wells that are packaged in an easy-to-load container. The cartridge lid secures the wells and labels the reagent positions. Each well is transparent to allow visual inspection after thawing. A barcode label enables tracking and validation.

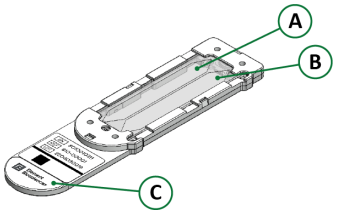
The Library well holds the diluted library. For kits compatible with the Individually Addressable Lanes add-on, the AUX well holds a second library. For more information, see *Individually Addressable Lanes* on page 19.



A Cartridge lid
B Transparent well

Sequencing Flow Cell

The flow cell is a two-lane glass substrate encased in a plastic cartridge. The cartridge includes a gripper for safe handling. Proprietary surface chemistry coats the flow cell and enables polony generation. Library and reagents enter the flow cell through inlet ports and exit as waste through outlet ports.



A Lane 1
B Lane 2
C Gripper

Loading and Wash Buffers

A sequencing kit includes loading and wash buffers that are packaged separately.

Buffer	Packaging	Description
Library Loading Buffer	Tube	Reagent for diluting the libraries to the target loading concentration
AVITI Buffer	Buffer bottle	Reagent that flushes reagents from the flow cell during a run
Instrument Wash	Cartridge	Wash solution for the automatic post-run wash

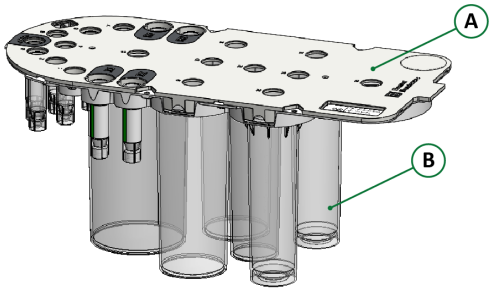
Multiomics Kits

A multiomics run requires a reagent kit, a slide kit, and a flow cell assembly kit. For a complete list of kits, see the Cytos guides on the Element website.

- **Cytos Reagent Kits**—Each kit includes a reagent cartridge, a buffer bottle, and additional reagents. The cartridge includes cell paint reagents for 1 run.
- **Cytos Slide Kits**—Used to prepare cell samples. Each slide kit includes a gasket with 48 wells, 12 wells, or one well. After you prepare cell samples, disassemble the slide kit and reassemble it in a flow cell cassette.
- **AVITI24 Flow Cell Assembly Kits**—Required to assemble the prepared slide in a flow cell cassette.

Cytos Reagent Cartridge

Each Cytos kit includes a reagent cartridge specific for an RNA or protein run, a buffer bottle, and additional reagents needed for the run. The reagent cartridge is a collection of reagents in foil-sealed wells that are packaged in an easy-to-load container. You can add your own reagents to the cartridge, as applicable. The cartridge lid secures the wells and labels reagent positions. Each well is transparent to allow visual inspection after thawing. A barcode label enables tracking and validation.



A Cartridge lid
B Transparent well

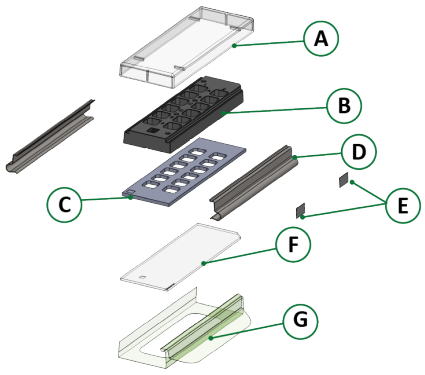
Wash Buffer

Cytos kits include a wash buffer that is packaged separately and labeled with a barcode for tracking and validation purposes.

Buffer	Packaging	Description
AVITI Buffer	Buffer bottle	Reagent that flushes reagents from the flow cell during a run

Cytos Slide Kit

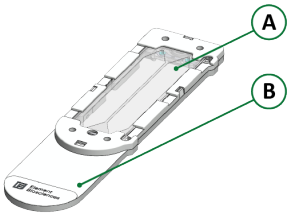
The multiomics workflow requires a Cytos Slide Kit for preparing samples directly onto the slide. The slide kit includes a barcode for tracking and validation. Slide kits are available in 48-well, 12-well, or 1-well configurations with uncoated surfaces. Coat uncoated slide kits with a custom surface specific to your cell line before cell culture. For more information, see the Cytos guides on the Element website.



A Lid
B Frame
C Gasket
D Side clip
E Sticker tab
F Glass slide
G Pull tab

Cytos Flow Cell Assembly

The Cytos flow cell is a combination of two slides affixed together. The affixed slides are assembled into a plastic cartridge with flow cell port gaskets provided in the AVITI24 Flow Cell Assembly Kit.



A Combined slides
B Assembled flow cell cassette

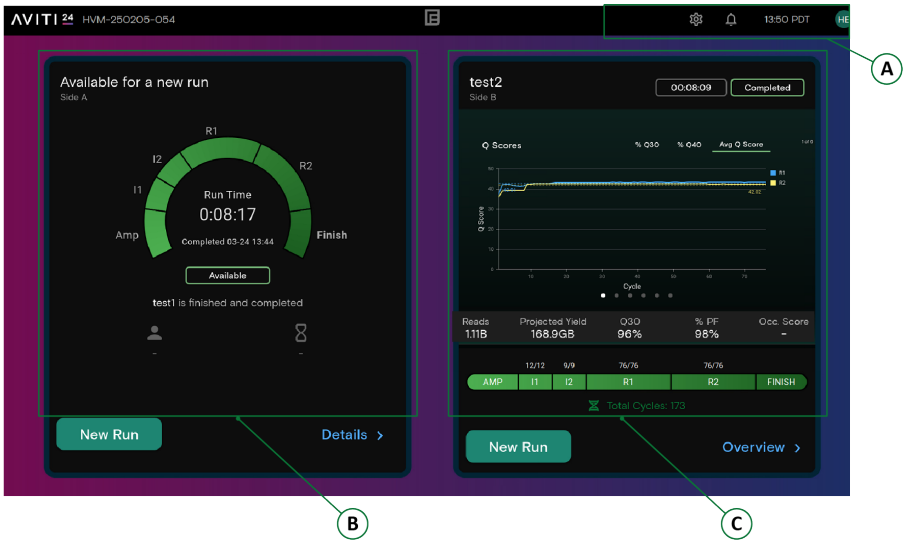
CHAPTER 2

Software and Analysis

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AVITI Operating Software

AVITI OS controls instrument operations during sequencing, analysis, and instrument washes. The Home screen functions as a system dashboard, displaying the status of each side with features to start runs and washes and monitor runs.



A Taskbar
B Overview view
C Details view

Home Screen Views

The Home screen includes buttons that display the following views:

- **Overview**—Displays general system status and previous run times for each side, or displays active run or wash information.
- **Details**—Displays metrics for the last completed run or a currently active run. When a run starts, AVITI OS automatically switches to this view for the active run. When no run or wash is active, this view is available for the last completed run.

Taskbar Icons

A taskbar at the top of the Home screen provides the following icons. The Settings and Notifications icons each open a unique screen. USB Drive and User icons each access additional features and functions.

Icon	Name	Function
	USB Drive	View a list of USB drives that are connected to the instrument and safely disconnect a USB device.
	Settings	View system information and configuration settings. See *Settings* on page 18.
	Notifications	Review notifications and perform the indicated action. See *Notifications* on page 20.
	User	Open the User menu. Alternatively, this icon displays initials.

Settings

AVITI OS includes configurable and read-only settings that control the instrument profile and system connections. AVITI OS divides the settings among the following tabs:

- **About**—Displays software and instrument information:
  - » AVITI OS version and the last license acceptance date
  - » AVITI24 System name, instrument type, serial number, available local storage, and compute ID
  - » Updates available for system firmware and software

  NOTE
  Compute ID is a unique code for the integrated circuit that identifies the instrument computer.
- **General**—Controls the system name and displays on-screen keyboard, telemetry, and elevation settings. Also, exports log files from offline systems.
- **Network**—Controls network and internet connections for the system. Includes a connectivity indicator.
- **Storage**—Lists storage connections with connectivity indicators and settings for adding and managing storage connections.
- **Maintenance & Tools**—Controls the door locks to retrieve your reagent cartridges, waste, or flow cells, resets the air filter time, and shows the last maintenance wash and power cycle.
- **Add-Ons**—Displays the add-ons that are enabled on the system and any applicable expiration dates. The tab always appears on offline systems and only appears on online systems with at least one active add-on.
- **User**—Provides password management for offline systems and online systems with local authentication. The tab only appears on applicable systems.

Network Status

The Network tab displays the following icons, which indicate the status of the network connection. An additional indicator appears on the tab to show internet connectivity.

Icon	Network Status
	Connected
	Local internet only
	Disconnected

Storage Status

The Storage tab displays the following icons, which indicate the status of the storage connections. An additional indicator appears on the tab to show storage connectivity.

Icon	Storage Status
	At least one storage connection
	No storage connection

Add-Ons

Add-ons enable additional instrument capabilities. The Add-Ons tab lists each add-on available on the instrument.

- For online instruments, AVITI OS refreshes the add-on list every 12 hours and when the system restarts.
- For offline instruments, the installation of add-ons requires additional steps. For more information, see *Install Add-Ons on an Offline System* on page 49.

To enable an add-on, contact a sales representative or Element Technical Support.

Filter Mask

The Filter Mask add-on modifies the cycles used for filtering, which is advantageous for certain applications. Applying the feature causes run output data and on-instrument run metrics to account for the filter mask.

High Output Kits

The High Output Kits add-on enables sequencing with high-output kits.

Individually Addressable Lanes

The Individually Addressable Lanes add-on enables loading one library pool in each lane of a flow cell for sequencing runs. The second library is loaded into the AUX well of the sequencing cartridge.

The add-on is only compatible with sequencing kits that meet the following requirements:

- Cloudbreak, Cloudbreak Freestyle™, Trinity, or Trinity Freestyle™ chemistry
- 2 x 75 or 2 x 150 cycle kits
- A high-, medium-, or low-output configuration

CAUTION
The Individually Addressable Lanes add-on is ***not*** compatible with any 2 x 300 size sequencing kits or the Cloudbreak UltraQ™ sequencing kit. The cartridges in these kits reserve the AUX well for other reagents and cannot accommodate a second library.

Polony Density

The Polony Density add-on provides the option for an increased read output prioritized over the highest quality reads and lower error rates. The Polony Density setting is enabled for 2 x 300 cycle runs only.

ElemBio Catalyst™

ElemBio Catalyst is a native cloud storage and analysis subscription service within ElemBio™ Cloud. ElemBio Catalyst allows Element to host and manage cloud storage connections on your behalf. Element stores your data in Amazon Simple Storage Service (Amazon S3) storage buckets dedicated to you.

To use ElemBio Catalyst, purchase an ElemBio Catalyst subscription or subscribe to a 45-day free trial. If your ElemBio Catalyst storage connection is disabled, an **Expired** badge is displayed for 14 days and the run storage connection cannot be used to upload runs. After 14 days, the ElemBio Catalyst storage connection is no longer visible in AVITI OS. To resubscribe to ElemBio Catalyst, contact Element Technical Support at support@elembio.com. For more information, see the *ElemBio Catalyst documentation* in *Online Help*.

Notifications

Notifications display system messages across three tabs: General, Side A, and Side B. Expand a notification to see the message, date, and time.

Notification	Icon	Description	Action
Success		A run or wash completed successfully.	Acknowledge successful completion.
Information		The software is ready to be updated to a new version.	Acknowledge the update.
Warning		The system requires your attention, but you can continue operation.	Acknowledge the warning and resolve it by the indicated date.
Error		The system has malfunctioned and requires action to proceed.	Follow the on-screen prompt.

Unread Notifications

Notifications include badges that indicate the number of unread messages. Checkboxes mark notifications as read or unread. Marking a notification as read can reset the status lights on that side of the instrument.

Icon	Name	Action
	Mark as read	Mark the selected notifications as read.
	Mark as unread	Mark the selected notifications as unread.

Filtering and Sorting

Notifications include filters with sorting from newest to oldest or oldest to newest.

Filter	Description
All	View all messages on the selected tab.
Read	View only read messages on the selected tab.
Unread	View only unread messages on the selected tab.

Run Start Options

AVITI OS includes the following options for starting a run:

- **Single start**—Set up and start a run on one side of the instrument.
- **Dual start**—Concurrently set up and start runs of the same run type on both sides of the instrument.
- **Flexible start**—Set up and start a run or recovery wash on a side of the instrument while a run is active on the other side.

AVITI OS allows sequencing with different kits on each side of the instrument. Because both sides share a camera, the setup of one run can increase the duration of the other run.

Flexible Start

Flexible start safely pauses the active run and initiates a run or recovery wash on the other side of the instrument. When setting up the second run, AVITI OS finds a safe pause point before proceeding. While the run is paused, set up and start a run or recovery wash on the other side. The runs on both sides proceed asynchronously. For a flexible start recovery wash, the run on the other side proceeds concurrently.

AVITI OS indicates the typical wait time for the current run step. Pausing the first run typically takes several minutes but can take as long as ~2 hours depending on the run step. AVITI OS also includes options to cancel flexible start and resume the active run.

Run setup steps differ based on the type of kit you are using. For run setup instructions, see *Additional Documentation* on page 6.

Wash Setup Screens

Initiating a wash opens a series of wash setup screens that guide you through setting up a maintenance, standby, or recovery wash. Wash setup functions similarly to run setup, but closing the door validates the wash tray presence.

Run Setup Screens

AVITI OS guides you through a series of run setup screens. Each screen provides a set of steps and indicates run setup progress. AVITI OS unlocks the reagent and waste bay doors at the appropriate steps and prompts the loading of consumables. Closing a door validates the presence of each consumable and scans the consumable barcode. The software presents a warning alert if consumables are expired. Although not supported, AVITI OS allows the run to proceed.

After the step to empty waste and reload the waste bottle, priming starts automatically. Priming prepares reagents for delivery and pumps air and reagents through a used flow cell and the fluidic tubes, preventing contamination between runs.

Run setup steps differ based on the type of kit you are using. For run setup instructions, see *Additional Documentation* on page 6.

Advanced Run Settings

During run setup, select **Advanced Run Settings** to modify primary analysis and run recipe configurations. Available features depend on your kit selection, run type, and available add-ons.

Feature	Run Type	Description
Custom Recipe	Sequencing Multiomics	Tailors a run execution in consultation with Element. A recipe governs the stages of a run, so custom recipes can impact specifications and increase run times. The setting provides two options for recipes: • **Preloaded recipe:** Select a recipe on the instrument, such as the short insert or long insert custom recipes. To ensure run compatibility, contact Element Technical Support. • **Uploaded recipe:** Element creates an encrypted, custom recipe package as a .rec file, which you upload from a USB. To obtain a .rec file, contact Element Technical Support.
Filter Mask	Sequencing	Sets the mask for the Filter Mask add-on. See *Filter Mask* on page 19.
PMG Shift	Sequencing	Sets the number of cycles that are skipped for the PMG Shift feature. Polony map generation (PMG) refers to the process of mapping polonies during a sequencing run. The PMG Shift feature skips up to 20 cycles for compatibility with particular sequencing runs for Adept™ or third-party libraries. This setting is beneficial when libraries have low diversity at the beginning of Read 1.
Polony Density	Sequencing	Relaxes certain quality filters to increase the total number of polonies in a run. This setting has two options: Standard and High Density. Standard is the default option and the High Density option increases the read output. This feature is also known as Expert Mode HD. See *Polony Density* on page 19.
Save Raw Imaging Projections	Multiomics	Saves the original cell paint images captured from the flow cell before processing. Adds 50–100 GB per run output.
Save per Target Background Images	Multiomics	Save per-target background images to track background intensity over time and enable background subtraction. Saving per-target background images increases final data output size and run time as images are saved for every imaging target.
Illumination Correction	Multiomics	Illumination correction estimates the extracellular background signal to simultaneously subtract extracellular background signal and correct for variability in illumination across the field of view.

Sign In and Out

Signing in to AVITI OS requires the email address and password for your organization. The first time you sign in to AVITI OS after instrument installation or an update, you must accept the license agreement. A Logout option on the User menu signs you out.

If requested, Element can enable local authentication mode for an online system. This feature assigns a fixed user name and user-defined password to sign in.

Run Manifest

AVITI OS uses a run manifest as an input file that stores run information. The format of the run manifest differs between sequencing and multiomics runs. After a run, AVITI OS provides the run manifest as an output file to support run analysis.

The run manifest uses a comma-separated values (CSV) file format and can be created using a template on the Resources page of the Element Biosciences website. For more information, see the *Run Manifest Documentation* in the *Online Help*.

In addition, multiomics runs can also use target cell assignment manifests to assign cells to spacer (guide RNA) sequences. For more information, see the *Prepare a target cell assignment manifest* in the *Online Help*.

Sequencing Run Manifest

For sequencing runs, the run manifest includes demultiplexing settings, settings for FASTQ files, and a list of samples with any corresponding index sequences. After a sequencing run, you can use the run manifest that AVITI OS provides to support secondary analysis and Bases2Fastq. Demultiplexing indexed libraries requires preparing a run manifest.

When a sequencing run does not include a run manifest, AVITI OS generates a default run manifest that assigns all reads to one sample during FASTQ file generation.

Demultiplexing indexed libraries is ***not possible*** with a default run manifest. To use a default run manifest with Bases2Fastq, you must edit the file and create a corrected run manifest that includes sample and index information.

Run Manifest for Sequencing with Individually Addressable Lanes

If you are using the Individually Addressable Lanes add-on, the Lane column in your run manifest must correctly associate samples with both library pools.

- Lane 1 refers to the library pool loaded into the Library well of the sequencing cartridge.
- Lane 2 refers to the library pool loaded into the AUX well of the sequencing cartridge.

For an example run manifest for the Individually Addressable Lanes add-on, see *Sample Specification Examples* in the *Online Help*.

Multiomics Run Manifest

For multiomics runs, the run manifest associates each well location with a label. AVITI OS and Cells2Stats can use these labels to refer to each well. Additional optional settings include the cell type and cell diameter.

When a multiomics run does not include a run manifest, AVITI OS generates a default run manifest that uses the names of wells as well labels. The default run manifest does not include any optional settings.

Target Cell Assignment Manifest

A target cell assignment manifest (TCA Manifest) is a CSV file that tells the system which spacer (guide RNA) sequences to look for during sequencing. When a run includes at least one target site configured for cell assignment, such as a CRISPR pooled screen, the system reads each cell's in situ sequencing data, compares detected sequences against your manifest, and assigns each cell to a dominant spacer.

For more information, see the *Prepare a target cell assignment manifest* in the *Online Help*.

Analysis Overview

Onboard primary analysis depends on the type of run you perform.

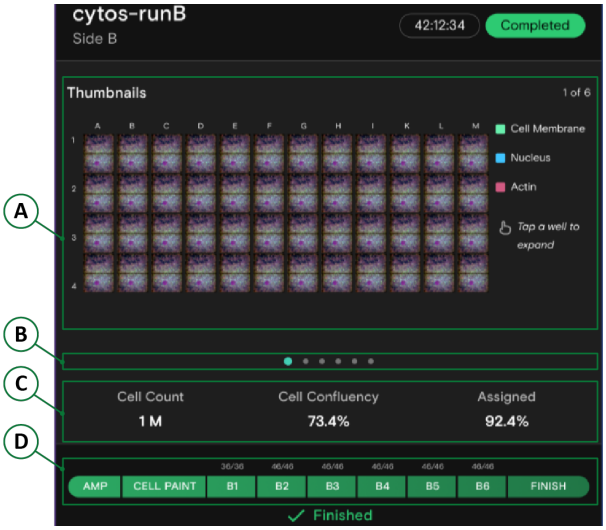
- **Sequencing runs:** AVITI OS calls bases, assigns quality scores (Q scores), and generates run metrics. The software extracts and corrects intensities from images to call a base, then assigns a Q score to the base.
- **Multiomics runs:** AVITI OS uses fluorescent protein and cell paint images to segment cells and generate CellProfiler features. The software also extracts and corrects intensities from images to call bases and assign targets to cells.

Run Monitoring

During a run, the Details view displays initial estimates for onboard-analysis-generated run metrics that monitor overall run health and progress. As the run progresses, metrics appear and regularly update. Sequencing runs that use the Individually Addressable Lanes add-on display metrics and charts for each library pool. The metrics are included in the run output and remain on the screen until you set up a new run.

The metrics and charts for a run depend on your workflow. Additional metrics appear in the charts, which you can cycle through. For more information on the types of metrics and charts that can appear during a run, see *Multiomics Metrics and Charts* and *Sequencing Metrics and Charts* in the *Online Help*.

NOTE
To obtain final metrics for a sequencing run, execute the Bases2Fastq Software after the run completes. For more information, see the *Cells2Stats Documentation* and *Bases2Fastq Documentation* in the *Online Help*.



A Example chart
B Carousel for available charts
C Example metrics
D Run progress information

Thumbnail Image

The thumbnail image displays a snapshot of the polonies on a tile from the run. For sequencing, the image is from the first cycle of the run. For multiomics, the thumbnail displays the cell membrane, nucleus, and actin images from the cell paint batch. If you are performing a sequencing run with the Individually Addressable Lanes add-on and two library pools, AVITI OS displays an image for each pool.

The thumbnail image can serve as a quality check for your run. For sequencing, the image indicates sample density and loading concentration on the flow cell. For multiomics, the image indicates the success of cell fixation and staining.

Run Output and Data Transfer

Run output is stored in a run folder. The run folder contains specific files depending on the run type. A storage connection transfers the run folder from the instrument to your local or cloud storage location. For more information, see *Storage Connections* on page 37.

Sequencing Run Output

The run folder for a sequencing run contains bases files with genomic data and other run data. Bases files are the primary output of a sequencing run. An AvitiRunStats.json file serves as the source file for run metrics. You can set up the integration of metrics into another system, such as a laboratory information management system (LIMS) interface. For more information on output files, see *Sequencing Run Output Files* in the *Online Help*.

After a sequencing run, use Bases2Fastq to perform demultiplexing and convert the bases files into FASTQ files for secondary analysis with the third-party software of your choice. For more information, see the *Bases2Fastq Documentation* in the *Online Help*.

Multiomics Run Output

The run folder for a multiomics run contains images of cell paint targets, protein and transcript counts per cell, and cell morphology features. The data enable downstream cell analysis and characterization. You can use additional files to regenerate cell statistics and updated cell segmentation masks. For more information on output files, see *Multiomics Run Output Files* in the *Online Help*.

After a multiomics run, if necessary, you can use Cells2Stats to support cell resegmentation and additional analysis of your cell samples. For more information, see the *Cells2Stats Documentation* in the *Online Help*.

Local Disk Storage

Because the system software transfers runs to off-instrument storage locations, local disk storage is intended only for temporary storage. Accordingly, the instrument hard drive has sufficient space to store at least two runs and start an additional two runs. When you initiate run setup, AVITI OS checks whether the system has sufficient space to support the run. If AVITI OS indicates that the system does not have sufficient space, contact Element Technical Support.

Telemetry

Separate from the transfer of genomic data to your storage location, ***which Element cannot access***, telemetry sends instrument health data to Element. This data helps support maintenance and troubleshooting and does not include any confidential information.

Telemetry is limited to the following data:

- **Software metrics**—Software and firmware versions, CPU and memory metrics, and the instrument serial number, ID, and name. These metrics are communicated as part of regular telemetry events.
- **Hardware metrics**—Data on motors, fans, lasers, and other instrument hardware, which helps Element understand the probable condition of select hardware components.
- **System logs**—Routine logs the system generates when idle or running. The logs include power cycle times, errors, internal communications, and the status of internal services.
- **Primary analysis metrics**—Run metrics, including data for Q30 scores, error rates, cell confluency, cell and target counts, expression levels, and index assignment metrics. Index assignment and other data exclude sample names.
- **Run information**—Data communicated for a run, including run name and ID, run side, run start and end dates and times, run type (sequencing, multiomics, or washing), consumable information, and the number of cycles per read or batch. The data excludes run descriptions.

- **Run logs**—Run-specific information from a subset of system logs. Data includes recipe execution, the timing of run steps, and communications between software, firmware, and hardware.

ElemBio Cloud

ElemBio Cloud is a central online platform that provides real-time remote run monitoring, data analysis, and account management for Element instruments, including AVITI24 Systems. Any system in online mode automatically connects to the platform. ElemBio Cloud allows you to connect to cloud service providers for data storage and initiate data analysis automation through flows.

You can access ElemBio Cloud on a computer or mobile device to support your organization from anywhere. For more information, see the *ElemBio Cloud Documentation* in the *Online Help*.

ElemBio Cloud Metadata

By default, AVITI OS sends the following metadata to a secure and customer-specific ElemBio Cloud database:

- Run description
- Sample names from the run manifest, if applicable

Metadata populates the run monitoring pages in ElemBio Cloud, which is separate from the telemetry database. Therefore, telemetry does not collect metadata. If you prefer to keep metadata on the instrument, contact Element Technical Support and request Restrict Metadata mode. When the mode is enabled, a lock appears on the run description in ElemBio Cloud and sample names are masked as numbers. The numbering reflects the order of samples in the run manifest.

CHAPTER 3

Maintenance

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Maintenance Schedule

Perform maintenance washes according to the following schedule:

- For instruments performing sequencing runs only, a maintenance wash is recommended weekly and required every 30 days.
- For instruments performing multiomics runs, a maintenance wash is required every 7 days.

AVITI OS provides a warning 2 days before a maintenance wash is due.

Procedure	Frequency	Purpose
Maintenance wash	Every 7 days	Cleans the outside of the sippers and prevents microbial growth and particulate debris from accumulating in the fluidic system.

Element recommends the following maintenance schedule for optimal performance.

Procedure	Frequency	Purpose
Power cycle	Every 7 days	Reinitializes the system and resets the instrument computer, which helps maintain instrument performance.
Standby wash	Preparing for an idle period of ≥ 7 days	Prepares one or both sides for an idle period of ≥ 7 days.
Air filter replacement	Every 6–12 months	Ensures proper cooling and continuous operation. The optimum frequency depends on lab cleanliness.
Exterior cleaning	As needed	Wipe the exterior with a damp microfiber cloth and Simple Green. Avoid harsh chemicals and abrasives.

To perform a wash after an incomplete run, see *Perform Wash After Stopped or Incomplete Run* on page 54.

For a list of maintenance consumables, see the *AVITI24 System Site Prep Guide (MA-00052)*.

Wash Tray Maintenance

Keep the wash trays in good condition to maximize time between replacements and prevent cross-contamination.

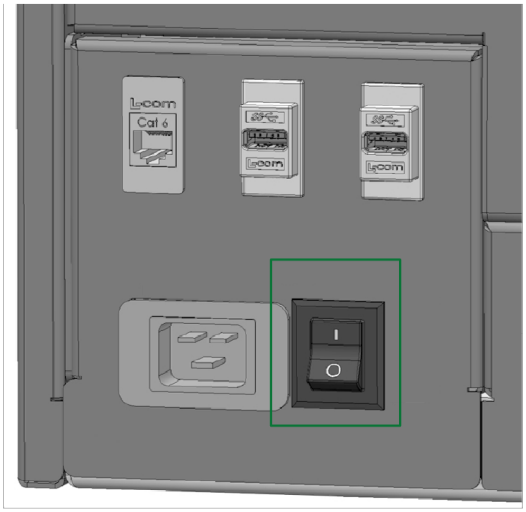
- After each use, discard residual wash solution, rinse the wash tray with nuclease-free water, and air-dry upside down.
- Store clean and dry wash trays upside down. Stack up to two wash trays.

Power Cycle the System

A power cycle resets the instrument computer, safely shutting down and restarting the system to maintain performance or recover from a problem. Turning off the system without a proper power cycle is reserved for emergencies.

NOTE
To check when the system was last power cycled, select **Settings** on the taskbar, then select the **Maintenance & Tools** tab. The Power Cycle setting displays the time of the last power cycle.

1. Select the User menu, and then select **Shut Down**.
2. When prompted, select **Shut Down** again to shut down the instrument computer.
3. Wait for the screen to go blank and a No Signal message to appear.
4. On the input/output panel on the back of the instrument, press the power toggle switch to turn off the instrument.



5. Wait *10 seconds* to make sure the system fully shuts down.
6. On the input/output panel, press the power toggle switch to turn on the instrument.

   —The system initializes and displays the Home screen.—
7. If a USB drive is connected to the instrument, reconnect it:

   a. In the taskbar, select **USB Drive**, and then select **Eject**.
   b. Detach the USB drive from the instrument.
   c. Reconnect the USB drive to the instrument.

   —Reconnecting the USB drive allows AVITI OS to detect it after a power cycle.—

Perform a Maintenance Wash

The maintenance wash is a two-part wash that takes a total of ~1.5 hours. Wash 1 cleans the system, removing carryover. Wash 2 rinses the system, removing residual Wash 1 solution and preparing for the next run. Each wash requires specific volumes of freshly prepared wash solutions.

NOTE
To check the time of the most recent maintenance wash, select **Settings** on the taskbar, then select the **Maintenance & Tools** tab. The Maintenance Wash setting displays the time of the most recent maintenance wash.

Prepare Wash Solutions

1. Gather the following materials:
   - 2 L bottles (2)
   - 4–15% lab-grade sodium hypochlorite. The dilution instructions in this topic use 4.00–4.99% sodium hypochlorite. Adjust volumes for other stock concentrations.
   - Gray wash tray
   - Nuclease-free water
   - Pipette controller
   - Serological pipettes (2)
   - Tween 20
   - Used flow cell
   - White wash tray

   —A used flow cell might already be present on the instrument.—
2. Add 1.5 L nuclease-free water to a new 2 L bottle.
3. Attach a new serological pipette to a pipette controller.
4. Add 37.5 ml 4.00–4.99% sodium hypochlorite to the bottle to prepare 1.54 L ~0.12% sodium hypochlorite. If using a different stock concentration, adjust volumes to prepare 1.54 L 0.12% sodium hypochlorite.
5. Label the bottle **Wash 1 Solution**.
6. Cap the bottle and invert several times to mix.
7. Set aside Wash 1 Solution at room temperature. Use within the day or discard.
8. Add 1.5 L nuclease-free water to a new 2 L bottle.
9. Attach a new serological pipette to the pipette controller.
10. Add 4.5 ml Tween 20 to the bottle to prepare 1.5 L 0.3% Tween 20.
11. Label the bottle **Wash 2 Solution**.
12. Cap the bottle and invert several times to mix.
13. Set aside Wash 2 Solution at room temperature.

Initiate a Maintenance Wash

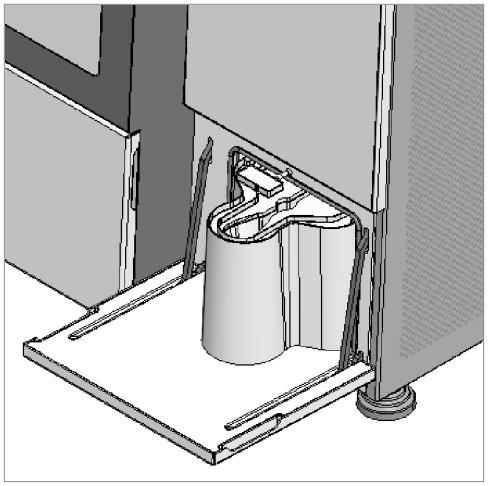
1. On the Home screen, select **New Run**.
2. If AVITI OS prompts that the flow cell is missing, load a ***used*** flow cell:
   a. Select **Open Nest**.

b. Place the used flow cell onto the nest and close the lid.
c. Select **Close Nest**.

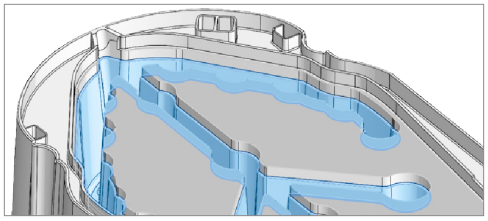
3. Select which side to wash:
   - **Side A**—Set up a maintenance wash on side A.
   - **Both**—Set up maintenance washes on sides A and B.
   - **Side B**—Set up a maintenance wash on side B.
4. Select **Wash**, and then select **Maintenance**.
5. Select **Next** to proceed to the Load Wash 1 screen.

Load Wash 1 Solution

1. Open the reagent bay door.
2. Remove any materials from the reagent bay and set aside.
3. Place a clean, uncovered gray wash tray onto the open door.
4. Slide ~2/3 of the wash tray into the reagent bay, so the barcode edge is about flush with the entrance.



5. Add 590 ml freshly prepared Wash 1 Solution to the fill area, filling the wash tray to slightly above the lower fill line.



6. Slide the wash tray all the way into the reagent bay until it stops and close the reagent bay door.
7. Select **Next** to proceed to the Empty Waste screen.

Empty Waste and Run Wash 1

1. Open the waste bay door.
2. Unscrew the transport cap from the cap holder above the waste bay.

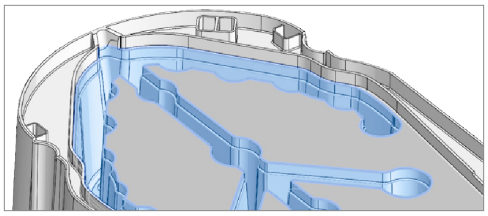
3. Remove the waste bottle from the waste bay and close the transport cap.

   CAUTION
   Waste bottle contents are considered hazardous. Dispose of waste according to local, state, and regional laws and regulations.

4. [Optional] Insert a funnel into a waste receptacle. Make sure the funnel is secure.
5. Open the transport cap and the vent cap.
6. Support the waste bottle with both hands and empty the waste:
   a. Position the bottle over the funnel or waste receptacle.
      - If you inserted a funnel, align the handle to the inner edge of the funnel.
      - If you did not insert a funnel, center the handle over the waste receptacle.
   b. Tip the bottle forward and drain. Invert the bottle and shake to expel all droplets.
   c. If necessary, wipe liquid off the bottle.
7. Close the vent cap and return the empty waste bottle to the waste bay.
8. Screw the transport cap onto the cap holder and close the waste bay door.
9. Select **Next** to open the Run Wash 1 screen and automatically start the wash, which takes ~34 minutes.
10. During the wash, process the materials removed from the reagent bay:
    » If you removed a used buffer bottle and cartridge basket, follow the discard instructions in the user guide for the kit.
    » If you removed a wash tray, follow the guidelines in *Wash Tray Maintenance* on page 28.
11. When the wash is complete, select **Next** to proceed to the Load Wash 2 screen.

Load Wash 2 Solution

1. Open the reagent bay door.
2. Remove the gray wash tray from the reagent bay and set aside.
   —Residual liquid in the wash tray is normal.—
3. Place a clean, uncovered white wash tray onto the open door.
4. Slide ~2/3 of the wash tray into the reagent bay, so the barcode edge is about flush with the entrance.
5. Add 660 ml freshly prepared Wash 2 Solution to the fill area, filling the wash tray to slightly above the upper fill line.



6. Slide the wash tray all the way into the reagent bay until it stops and close the reagent bay door.
7. [Optional] Store leftover Wash 2 Solution at 2°C to 8°C for ≤ 2 weeks.

Run Wash 2

1. Select **Next** to open the Run Wash 2 screen and automatically start the wash, which takes ~53 minutes.
2. When the wash is complete, select **Done** to return to the Home screen.
3. Leave all materials in the instrument.
4. Process the gray wash tray from the first wash per *Wash Tray Maintenance* on page 28.

Perform a Standby Wash

A standby wash takes ~52 minutes and flushes nuclease-free water through the fluidic system, removing any residual Tween 20. When complete, the washed side is idle. Performing a maintenance wash on the idle side ends the idle period and enables sequencing.

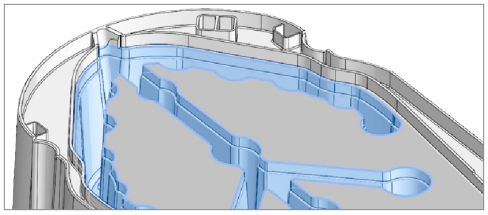
Initiate a Standby Wash

1. Gather the following materials:
   - » Nuclease-free water
   - » Used flow cell
   - » White wash tray

   —A used flow cell might already be present on the instrument.—
2. On the Home screen, select **New Run**.
3. If AVITI OS prompts that the flow cell is missing, load a ***used*** flow cell:
   a. Select **Open Nest**.
   b. Place the used flow cell onto the nest and close the lid.
   c. Select **Close Nest**.
4. Select which side to wash:
   - » **Side A**—Set up a standby wash on side A.
   - » **Both**—Set up standby washes on sides A and B.
   - » **Side B**—Set up a standby wash on side B.
5. Select **Wash**, and then select **Standby**.
6. Select **Next** to proceed to the Load Water screen.

Load Nuclease-Free Water

1. Open the reagent bay door.
2. Remove any materials from the reagent bay and set aside.
3. Place a clean, uncovered white wash tray onto the open door.
4. Slide ~2/3 of the wash tray into the reagent bay, so the barcode edge is about flush with the entrance.
5. Add 660 ml nuclease-free water to the fill area, filling the wash tray to slightly above the upper fill line.



6. Slide the wash tray all the way into the reagent bay until it stops.
7. Close the reagent bay door.
8. Select **Next** to proceed to the Empty Waste screen.

Empty Waste and Run the Standby Wash

1. Open the waste bay door.
2. Unscrew the transport cap from the cap holder above the waste bay.
3. Remove the waste bottle from the waste bay and close the transport cap.

   CAUTION
   Waste bottle contents are considered hazardous. Dispose of waste according to local, state, and regional laws and regulations.

4. [Optional] Insert a funnel into a waste receptacle. Make sure the funnel is secure.
5. Open the transport cap and the vent cap.
6. Support the waste bottle with both hands and empty the waste:

   a. Position the bottle over the funnel or waste receptacle.
      - If you inserted a funnel, align the handle to the inner edge of the funnel.
      - If you did not insert a funnel, center the handle over the waste receptacle.

   b. Tip the bottle forward and drain. Invert the bottle and shake to expel all droplets.

   c. If necessary, wipe liquid off the bottle.

7. Close the vent cap and return the empty waste bottle to the waste bay.
8. Screw the transport cap onto the cap holder and close the waste bay door.
9. Select **Next** to open the Run Water screen and automatically start the wash.
10. When the wash is complete, select **Next** to proceed to the Remove Tray screen.

Unload the Wash Tray

1. When prompted, open the reagent bay door and remove the wash tray.

   —Residual liquid in the wash tray is normal.—
2. Close the reagent bay door.
3. Select **Done** to proceed to the Home screen.
4. Leave the flow cell in the nest.
5. Process the materials removed from the reagent bay:

   » If you removed a used buffer bottle and cartridge basket, follow the discard instructions in the user guide for the kit.

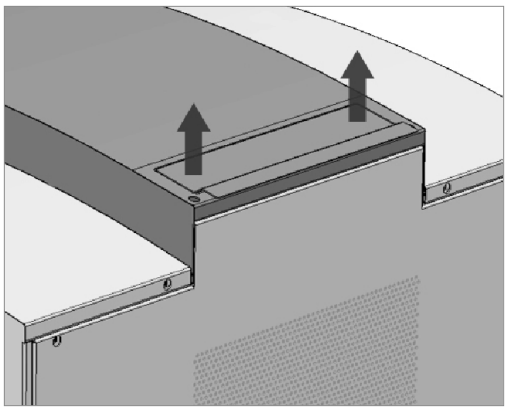
   » If you removed a wash tray, follow the guidelines in *Wash Tray Maintenance* on page 28.

Replace the Air Filter

To ensure proper cooling and continuous operation of the system, replace your air filter every 12 months. If your site is located at a high elevation, replace your air filter every 6 months. For more information, see the *AVITI24 System Site Prep Guide (MA-00052)*.

NOTE
To check the last time the air filter was replaced, select **Settings** on the taskbar, then select the **Maintenance & Tools** tab. The Air Filter Time setting displays the last reset of the air filter.

1. If the instrument is performing a run or washing, wait for the run or wash to complete.
2. Select the User menu, and then select **Shut Down**.
3. When prompted, select **Shut Down** again to shut down the instrument computer.
4. Wait for the screen to go blank and a No Signal message to appear.
5. On the input/output panel on the back of the instrument, press the power toggle switch to turn off the instrument.
6. Using the flange toward the back of the instrument, lift the air filter tray out of the top.



7. Remove the air filter from the tray and discard.
   —The filter might be loose in the tray, which is normal.—
8. Place the tray on a table or benchtop.
9. With the small arrow on the side of the filter pointing up, place the new air filter into the tray.
10. Lower the tray into the instrument. Use the pins to align the tray to the rails and guide entry.
11. On the input/output panel, press the power toggle switch to turn on the instrument.
    —The system initializes and displays the Home screen.—
12. Reset the air filter timer.

Reset the Air Filter Time

1. On the taskbar, select **Settings**.
2. Select the **Maintenance & Tools** tab.
3. From the Air Filter Time setting, select **Reset**.
4. When prompted, select **Reset** again to confirm that you have replaced your air filter. The timer is reset.

CHAPTER 4

System Configuration

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System Connections

The AVITI24 System uses a combination of network, internet, and storage connections to operate. Each system requires a network connection and at least one storage connection. Cloud storage connections, telemetry, over-the-air software updates, and remote support require an internet connection.

Mode	Network Connection	Internet Connection	Storage Connection
Online	Internet	Dynamic Host Configuration Protocol (DHCP) or static	Cloud or local
	Local	Dynamic Host Configuration Protocol (DHCP) or static	Local
Offline	Local	None	Local

System Modes

The system mode determines connection options and settings for exporting log files, password protection, and software updates:

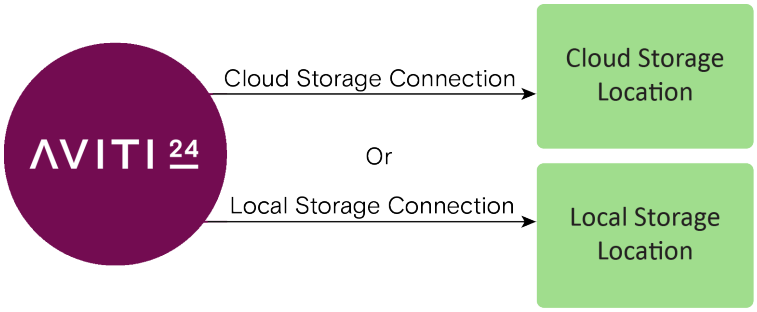
- Online mode connects the system to the internet, which streamlines operations.
- Online local authentication mode operates in online mode but includes local authentication, which avoids network requirements to allowlist Auth0 IP addresses. Only an Element representative can enable this mode.
- Offline mode operates the system without an internet connection. Only an Element representative can enable offline mode.

Storage Connections

A storage connection establishes an off-instrument location for run output files. Each run delivers bases files and other run output files to the default storage location unless you specify a different location during run setup.

AVITI OS supports cloud and local storage connections:

- A cloud storage connection transfers files to a storage location in the cloud.
- A local storage connection transfers files to a storage location on a local network or USB drive.



Storage Connection Requirements

Adding a storage connection requires permissions, network information, and account information that your IT administrator can provide. You must set up cloud storage connections in ElemBio Cloud and fulfill the requirements for the cloud service provider.

For comprehensive storage requirements, see the *AVITI24 System Site Prep Guide (MA-00052)*.

Supported Storage Connections

Cloud storage connections include ElemBio Catalyst, Amazon Web Services (AWS), DNAnexus, and Google Cloud Storage (GCS). For local storage, AVITI OS supports Server Message Block (SMB) and USB.

The storage location for a cloud storage connection is a bucket. A connected bucket is available to all systems. Local storage is exclusive to the system.

Cloud Storage

Cloud Storage Connection	Description
ElemBio Catalyst	• Subscription-based service. • Connects the system to an Amazon Simple Storage Service (Amazon S3) bucket that Element creates and operates on your behalf. For more information, see *ElemBio Catalyst™* on page 19. • Transfers data using AWS Identity and Access Management (IAM).
AWS	• Connects the system to an Amazon S3 bucket. • Transfers data using secret key authentication through IAM.
DNAnexus	• Connects the system to a DNAnexus project. • Transfers data using an API key for authentication.
GCS	• Connects the system to a Cloud Storage bucket. • Transfers data using secret key authentication through a keyed-hash message authentication code (HMAC).

Local Storage

Local Storage Connection	Description
SMB	• Connects the system to the server running SMB via a path to a folder. • Uses the SMB protocol based on service user authentication to transfer data. • Enables import of a run manifest from an SMB storage location during run setup. • Supports Kerberos or NTLMv2 authentication.
USB	• Transfers data and log files to a USB drive connected to the instrument. • Supports manual export of log files from offline systems. • Supports USB-A 3.0 or newer versions and FAT32 or exFAT formats. • Must store ≥ 1.6 TB of data, which is sufficient for at least two full runs.

Configure General Settings

General settings include the instrument name setting, the on-screen keyboard setting, file output settings for instrument priming and wash runs, and read-only settings that control the instrument profile. For offline systems, general settings also include features to export log files. For instructions, see *Exporting Log Files* on page 46.

Name the Instrument

1. On the taskbar, select **Settings**.
2. Select the **General** tab, and then select **Edit**.
3. Enter a preferred name consisting of 1–20 alphanumeric characters, hyphens (-), and underscores (_) to identify the instrument.

   —The default name is the serial number, field-programmable gate array (FPGA) ID, or Unnamed Instrument.—
4. Select **Save** to apply the name.

Configure On-Screen Keyboard

1. On the taskbar, select **Settings**.
2. Select the **General** tab.
3. Select the **Show on-screen keyboard** toggle to enable or disable the on-screen keyboard for text-entry fields.

Configure File Output Settings

1. On the taskbar, select **Settings**.
2. Select the **General** tab.
3. Select the **Save prime output to storage** toggle to enable or disable the output files for instrument priming.
4. Select the **Save wash run output to storage** toggle to enable or disable the output files for a wash run.

   —When you enable the setting, AVITI OS requires you to configure a storage connection before you start a wash.—

Review Read-Only Settings

1. On the taskbar, select **Settings**.
2. Select the **General** tab.
3. Review the following read-only settings. To change a setting, contact Element Technical Support.

Setting	Default	Description
High Elevation	Disabled	Calibrates the system to operate at a high elevation
Offline Mode	Disabled	Prevents an internet connection

Connect to the Network

Network settings connect the system to your network via DHCP or a static IP address. When the system is connected to an Ethernet port, AVITI OS automatically connects to a DHCP server and autopopulates the network settings. Alternatively, you can assign a static IP address and manually configure the network settings.

NOTE
If the network connection is lost in the middle of a run, wait for the AVITI24 System to reconnect to the network. Sequencing and multiomics chemistry are not affected by network disruptions. After the system reconnects, data transfer resumes automatically. Any interrupted transfers do not transfer partial data and are automatically restarted on network reconnect. The system has enough local disk storage for two sequencing runs.

Select a DHCP Server

1. On the taskbar, select **Settings**.
2. Select the **Network** tab.
3. In the drop-down menu, select **Automatic (DHCP)**.

   —AVITI OS assigns a dynamic IP address and all other network settings.—

Assign a Static IP Address

1. On the taskbar, select **Settings**.
2. Select the **Network** tab.
3. In the drop-down menu, select **Manual**.

   —AVITI OS assigns a unique and permanent IP address.—
4. Select **Edit**, and then configure the following network settings.

Setting	Example	Description
IP Address	11.2.34.178	The destination IP address
Gateway	11.2.34.177	The IP address of the gateway computer that manages network communications
Subnet Mask	11.2.34.176	The subnet mask that separates the IP address into host and network addresses
Name Server IP addresses	ngs-1.yourlab.com	The names of up to four Domain Name System (DNS) servers that provide IP addresses

   —Two additional network settings, Host name and Media Access Control (MAC) address, are read-only.—
5. Select **Save** to apply the settings and connect to the network.

Verify Network Connection

After setting up the network connection, verify that the instrument can reach all required network endpoints.

1. Under Network Health Check, select **Run**.
2. If AVITI OS cannot reach all required network endpoints, verify your network settings and try again.
3. Review the result for each URL.
4. If AVITI OS cannot reach a URL, give the failed URL to your IT department and confirm that the network allowlists it.
5. Correct the network settings, and then select Run again to confirm that all URLs pass.

   —The *AVITI24 System Site Prep Guide (MA-00052)* lists the URLs tested and the purpose of each host.—

Add Storage Connections

The Storage tab lists storage connections for the system, including available storage for each local storage connection. An Element representative adds the first storage connection at installation. After installation, you can add an unlimited number of additional storage connections.

AVITI OS only lets you add local storage connections. To add a cloud storage connection, access ElemBio Cloud. For more information, see *Storage Connections* in the *Online Help*.

Add an SMB Storage Connection

1. On the taskbar, select **Settings**.
2. Select the **Storage** tab.
3. Select **Add Storage**, and then select **Local File Server (SMB)** as the storage provider.
4. In the Name field, enter a preferred name for the storage connection.
5. Complete the following fields to configure an SMB network storage location for the SMB storage connection.

Field	Instruction
Host	Enter the host network IP address or fully qualified domain name (FQDN). The Kerberos authentication protocol requires an FQDN. • Example IP address: 1.222.333.44 • Example FQDN: datapc.elembio.com
Port	Enter a port number for the file transfer service or leave blank to accept the default of port 445.
Workgroup/Domain	Enter the name of the workgroup or domain that the user belongs to. The Kerberos authentication protocol requires you to enter the Kerberos realm name. • Example workgroup/domain for Kerberos: elembio.com
Share	Enter the name of the share that makes the directory accessible to SMB.
Path	Enter the path to an ***existing*** folder where you want to output data.
User	Enter the user name for the service user.
Password	Enter the password for the service user.

—All fields except Port and Path are required. Certain server configurations require a work group or domain.—

6. In the Temporary Prefix drop-down menu, select **Disabled** or **Enabled**.

   —The Temporary Prefix setting appends two underscores to the name of a file (e.g., __ExampleFileName.zip) while in transfer to the SMB location. The prefix disappears when the file transfer finishes.—

7. In the Session Security drop-down menu, select a setting for the level of encryption:
   - **High (Recommended)**—AVITI OS requests an encrypted connection with the SMB server. This option is the default setting.
   - **Medium**—The SMB server determines use of an encrypted connection. The server determines if a connection is encrypted or signed.
   - **Low**—AVITI OS disables extended SMB security negotiation (SPNEGO) for wider compatibility with SMB servers. The SMB server determines if a connection is encrypted or signed.
8. In the File Checksums drop-down menu, select **Disabled** or **Enabled**.

   —The File Checksums setting computes the MD5 checksum for each transferred file and lists them in the RunUploaded.json file. You can use this information to verify the integrity of files.—

9. If prompted, select **Confirm** to set the Session Security selection.
10. Select **Save** to add the storage connection.

Add a USB Storage Connection

For a USB storage connection, the instrument supports USB-A 3.0 or newer versions and the FAT32 or exFAT formats. The USB drive must have > 1.6 TB of available storage space, and the USB name can only use alphanumeric characters, hyphens, and underscores.

1. Connect a USB drive to a USB port on the side or back of the instrument.
2. On the taskbar, select **Settings**.
3. Select the **Storage** tab.
4. Select **Add Storage**, and then select **USB Drive** as the storage provider.
5. In the USB Drive drop-down menu, select the USB drive connected to the instrument.
6. In the Name field, enter a preferred name for the storage connection.
7. Select **Save** to add the storage connection.

   —AVITI OS makes sure the USB drive is connected to the instrument and has write permission and sufficient storage.—

Disconnect the USB for a Storage Connection

1. Select **More** for the USB storage connection, and then select **Eject**.
2. Detach the USB drive from the instrument.
3. To reuse the USB after disconnecting, reconnect the device to a USB port.

   —The USB name must remain the same for AVITI OS to identify the storage connection.—

Manage Storage Connections

Storage settings manage storage connections and include setting the default storage connection. Unless you reset the default storage connection, the default storage connection is the first cloud location added to the instrument. If a cloud location does not exist, the default storage connection is the first local network location.

You can verify any storage connection, but only local storage connections can be edited and deleted in AVITI OS. If you must edit a cloud storage connection, access ElemBio Cloud. For more information, see *Storage Connections* in the *Online Help*.

For ElemBio Catalyst, storage connections that expired fewer than 14 days ago appear as expired in the storage connections list. You cannot select them in run setup. Storage connections that have been expired for more than 14 days do not appear in the storage connections list. To renew your ElemBio Catalyst subscription, contact your sales representative.

Verify a Storage Connection

1. On the taskbar, select **Settings**.
2. Select the **Storage** tab.
3. For the applicable storage connection, select **More**, and then select **Verify Storage**.
4. Wait ~20 seconds for a success message to appear, indicating a valid storage connection.

   —AVITI OS indicates that the connection is connected, unverified, or partially verified with a blocked network.—
5. If AVITI OS cannot verify the storage connection, troubleshoot:

   a. Make sure the storage connection is correctly set up.
      - For an AWS storage connection, check the IAM permissions. See the applicable JavaScript Object Notation (JSON) policy template in the *Online Help*.
      - For a GCS storage connection, check the role assigned to the HMAC key.
      - For an SMB storage connection, check the permissions associated with the users.
      - For a USB storage connection, make sure the USB is not ejected, and check that the USB name and type are correct. For USB requirements, see *Local Storage* on page 38.

   b. If the storage connection is correctly set up, contact Element Technical Support.

Set the Default Storage Connection

1. On the taskbar, select **Settings**.
2. Select the **Storage** tab.
3. For the applicable storage connection, select **More**, and then select **Set as Default**.
4. When prompted, select **Set Default**.

Edit a Local Storage Connection

1. On the taskbar, select **Settings**.
2. Select the **Storage** tab.
3. For the local storage connection you want to edit, select **More**, and then select **Edit**.

   —Editing a busy storage connection can affect where run output is stored.—
4. On the Edit Storage Connection screen, edit any of the following fields.

Field	Instruction
Name	Enter a preferred name for the storage connection.
Workgroup/Domain	Enter the name of the workgroup or domain that the user belongs to. The Kerberos authentication protocol requires you to enter the Kerberos realm name. • Example workgroup/domain for Kerberos: elembio.com
User	Enter the user name for the service user.
Password	Enter the password for the service user.
Session Security	Select **High (Recommended)**, **Medium**, or **Low**.

—The Host, Share, Port, Path, Temporary Prefix, and File Checksums fields are read-only. If you must edit these fields, create another storage connection.—

5. Select **Save** to apply the edits and update the storage connection.

Delete a Local Storage Connection

1. On the taskbar, select **Settings**.
2. Select the **Storage** tab.
3. For the local storage connection you want to delete, select **More**, and then select **Delete**.
4. When prompted, select **Delete**.

   —AVITI OS does not allow you to delete a busy storage connection.—

Update the Software

AVITI OS checks for new software versions daily and sends a notification when an update is available. The update runs over-the-air and takes 1–2 hours to complete. Make sure that you initiate the update during instrument downtime to avoid disruptions. If an update exceeds 3 hours and you require support, contact Element Technical Support at support@elembio.com.

For offline systems, Element notifies you of an update and provides the files that are needed for a manual update. Manual updates are only available for systems in offline mode. For instructions, see *Perform a Manual Update* on page 49.

Perform an Over-the-Air Update

1. Make sure that the AVITI24 System is not performing a run or wash.
2. Power cycle the system. For more information, see *Power Cycle the System* on page 29.

   —If you have not power cycled the system in the previous 7 days, the system prompts you to power cycle before the update starts.—
3. On the taskbar, select **Settings**, and then select **Update Software**.
4. When prompted, select **Update Now** to start the update.

   —The system might restart multiple times during the update process.—
5. After the update completes, power cycle the system when prompted.
6. After the system power cycles, select **Notifications** to view a notification that confirms success.
7. If the update is unsuccessful or takes longer than 3 hours, contact Element Technical Support.

   —AVITI OS reverts to the previous version so you can continue operation.—

Manage an Offline System

For AVITI24 Systems in offline mode, AVITI OS lets you export log files, password-protect the system, and perform manual software updates. To install add-ons, offline systems require a specific procedure that uses a USB with an add-on key downloaded from ElemBio Cloud. These procedures and features are unique to offline mode and help manage offline systems.

Exporting Log Files

Offline systems support the export of log files using manual export, which saves log files to a USB drive as needed to provide troubleshooting resources to Element Technical Support. AVITI OS lets you perform different log file exports:

- **Full Log Export**—Export all log files for a system. Use to support in-depth system and run troubleshooting.
- **Run Log Export**—Export the log files for a selected run. Use to support in-depth run troubleshooting.
- **Limited Log Export**—Export a limited list of log files for a selected run. Use to support initial troubleshooting of a run. **Limited Log Export** exports the following files, if available:
  - » RunStats.bin
  - » valuesLog.csv
  - » InternalRunParameters.json
  - » P1_C001_Center.tif / I1_C001_Center.tif, only for sequencing runs.
  - » Thumbnail for each well in the run in the format of WellXX_Thumbnail.png, only for multiomics runs.

When exporting log files to a USB drive, a solid-state drive (SSD) offers significant time savings compared to a flash drive.

NOTE
Use an exFAT-formatted USB drive. FAT32 is not supported.

Manually Export Full Log Files

1. Connect a USB drive to a USB port on the side or back of the instrument.
2. On the taskbar, select **Settings**.
3. Select the **General** tab.
4. In the drop-down menu for manual exports, select **Full Log Export**.
5. In the USB Drive drop-down menu, select the USB drive connected to the instrument.
6. Enter an Export Range using the Start Date, End Date, and time fields.
   —The Export Range cannot exceed 14 days.—
7. [Optional] Select the **All Day** toggle to remove time fields and export all log files for the dates in the Export Range.
8. Select **Export Logs**.
   —AVITI OS exports the log files to the USB drive.—
9. On the taskbar, select **USB Drive**, and then select **Eject** to disconnect the USB drive.
10. Detach the USB drive from the instrument.
11. Upload the log files to the location that Element Technical Support provides.

Manually Export Run Log Files

1. Connect a USB drive to a USB port on the side or back of the instrument.
2. On the taskbar, select **Settings**.
3. Select the **General** tab.

4. In the drop-down menu for manual exports, select **Run Log Export**.
5. In the USB Drive drop-down menu, select the USB drive connected to the instrument.
6. In the Export Run drop-down menu, select the run for which you want log files.
   - » Only runs from the last 14 days are available.
   - » If you select an active run, only certain files might be available.
   - » If you attempt to export log files soon after an active run starts, you might receive an error message. Wait until the run progresses further and attempt the export again.
7. Select **Export Logs**.
   —AVITI OS exports the log files to the USB drive.—
8. On the taskbar, select **USB Drive**, and then select **Eject** to disconnect the USB drive.
9. Detach the USB drive from the instrument.
10. Upload the log files to the location that Element Technical Support provides.

Manually Export Limited Log Files

1. Connect a USB drive to a USB port on the side or back of the instrument.
2. On the taskbar, select **Settings**.
3. Select the **General** tab.
4. In the drop-down menu for manual exports, select **Limited Log Export**.
5. In the USB Drive drop-down menu, select the USB drive connected to the instrument.
6. In the Export Run drop-down menu, select the run for which you want log files.
   - » Only runs from the last 14 days are available.
   - » If you select an active run, only certain files might be available.
   - » If you attempt to export log files soon after an active run starts, you might receive an error message. Wait until the run progresses further and attempt the export again.
7. Select **Export Logs**.
   —AVITI OS exports the log files to the USB drive.—
8. On the taskbar, select **USB Drive**, and then select **Eject** to disconnect the USB drive.
9. Detach the USB drive from the instrument.
10. Upload the log files to the location that Element Technical Support provides.

Manage Passwords

User settings manage passwords for offline systems and online systems with local authentication. Offline systems support setting, changing, resetting, and removing passwords. An online system supports password reset and removal only.

NOTE
Resetting or removing a password requires assistance from Element Technical Support.

Set a Password

1. On the taskbar, select **Settings**.
2. Select the **User** tab.
3. In the Password field, enter a new password.
   —The field accepts ≥ 4 alphanumeric and special characters, excluding spaces.—

4. In the Confirm Password field, reenter the new password.
5. Select **Save**.
6. When prompted, select **Yes, Set Password**.

Change the Password

1. On the taskbar, select **Settings**.
2. Select **User**.
3. In the Current Password field, enter the current password.
4. In the Password field, enter a new password.
   —The field accepts ≥ 4 alphanumeric and special characters, excluding spaces.—
5. In the Confirm Password field, reenter the new password.
6. Select **Save** to apply the new password.

Reset a Lost Password

1. On the login screen, select **Forgot Password**.
2. Select **Generate** to display a password reset token and the instrument serial number.
3. Contact Element Technical Support and provide the token and serial number.
   —Element Technical Support emails you a single-use password reset file.—
4. Save the password reset file at the root level of a USB drive. Do not rename the file or save it in a folder.
5. Connect the USB drive to a USB port on the side or back of the instrument.
6. Select **Next**.
7. Select **Load Reset File** to upload the password reset file, which removes the password from the system.
8. In the Password field, enter a new password.
   —The field accepts ≥ 4 alphanumeric and special characters, excluding spaces.—
9. In the Confirm Password field, reenter the new password.
10. Select **Reset Password** to apply the new password and return to the login screen.
11. Sign in to the system using the new password.
12. On the taskbar, select **USB Drive**, and then select **Eject** to disconnect the USB drive.
13. Detach the USB drive from the instrument.
14. Discard the password reset file.

Remove the Password

1. On the taskbar, select **Settings**.
2. Select **User**, and then select **Remove Password**.
3. When prompted, select **Yes, Remove Password**.
4. Select **Generate** to display a password reset token and the instrument serial number.
5. Contact Element Technical Support and provide the token and serial number.
   —Element Technical Support emails you a single-use password reset file.—
6. Save the password reset file at the root level of a USB drive. Do not rename the file or save it in a folder.
7. Connect the USB drive to a USB port on the side or back of the instrument.
8. Select **Next**.

9. Select **Load Reset File** to upload the password file, which removes the password from the system.
10. On the taskbar, select **USB Drive**, and then select **Eject** to disconnect the USB drive.
11. Detach the USB drive from the instrument.
12. Discard the password reset file.

Perform a Manual Update

1. Unzip the files that Element provides for the update.
2. Save the files at the root level of a USB drive, formatted as exFAT, with a minimum storage of 12 GB.
3. Connect the USB drive to a USB port on the side or back of the instrument.
4. Make sure the AVITI24 System is not performing a run or wash.
5. Power cycle the system. For more information, see *Power Cycle the System* on page 29.

   NOTE
   The system prompts you to power cycle before starting the update if a power cycle has not been performed within 7 days.
6. On the taskbar, select **Settings**.
7. Under Software Update, in the USB Drive drop-down menu, select the USB drive that contains the update files.
8. When prompted, select **Update Now** to perform the update.

   —The system might restart multiple times as it updates.—
9. After the update completes, power cycle the system when prompted.
10. After the system power cycles, select **Notifications** to view a notification that confirms a successful update.
11. If the update is unsuccessful or takes longer than 3 hours, contact Element Technical Support.

    —AVITI OS reverts to the previous version so you can continue using the system.—
12. On the taskbar, select **USB Drive**, and then select **Eject** to disconnect the USB drive.
13. Detach the USB drive from the instrument.

Install Add-Ons on an Offline System

Add-ons on offline AVITI24 Systems require an installation procedure using a USB with a key downloaded from ElemBio Cloud. The add-on key file must be located at the root level of the USB. For instructions to download the add-on key, see *Add-Ons* in the *Online Help*.

1. Use a USB port on the side or back of the instrument to connect the USB drive with the add-on key file downloaded from ElemBio Cloud.
2. On the taskbar, select **Settings**.
3. Select the **Add-Ons** tab.
4. In the drop-down menu, select the USB Drive.
5. Select **Upload**.

   —AVITI OS uploads the key file, which installs the add-ons. The Add-Ons tab displays the add-ons and expiration dates.—

CHAPTER 5

Troubleshooting

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General Troubleshooting

Error messages communicate hardware or software problems and describe both the problem and solution. A power cycle typically resolves a problem. For instructions, see *Power Cycle the System* on page 29. If a problem persists, contact Element Technical Support.

Problem	Solution
The monitor does not display AVITI OS.	Power cycle the system.
Initialization sequence does not complete, and the loading screen persists.	
Software, keyboard, or mouse stop operating.	
The reagent or waste bay contains liquid.	See *Clean Spills and Leaks* on page 58.
Liquid is spilling from the front or bottom of the instrument.	
The nest is wet.	
AVITI OS detects a full waste bottle but the bottle is empty.	Reload the waste bottle and make sure the waste bay is unobstructed.
Reagent bay contains condensation.	Dry the inside of the reagent bay with a clean, dry microfiber cloth. Avoid sensors and cables.
Suspected fluidic obstruction	Consult Element Technical Support if you suspect a fluid obstruction. Element Technical Support might direct you to perform a service wash to troubleshoot a suspected fluidic obstruction. After the service wash is complete, Element Technical Support reviews the wash logs to determine whether the obstruction has been resolved.
The door to the reagent, nest, or waste bay is locked, or you need to open a door to retrieve or swap consumables outside a run.	Select **Settings** on the taskbar, and then select the **Maintenance & Tools** tab. In the Troubleshooting Tools section, select **Open Controls** next to **Instrument Door Controls**. On the Instrument Door Controls screen, select the button for the door you want to open or unlock, follow the on-screen instructions, and then select **Finish**.
Instrument does not accept a USB device.	Confirm that the USB device meets the following requirements: • Contains > 1.6 TB available space • USB is USB-A 3.0 or a newer version • Formatted as FAT32 or exFAT • Name is alphanumeric characters, hyphens, and underscores only
AVITI OS does not proceed with run setup despite sufficient on-instrument storage.	Set up a storage connection. A run requires a storage connection. The system reserves on-instrument storage as a backup in case of network disruption.
A run continues after you stop it.	Wait for the run to stop. AVITI OS waits for a safe point to stop the run, which can take several minutes to ~2 hours depending on the run stage.

Problem	Solution
Network connection is lost in the middle of a run.	Wait for the AVITI24 System to reconnect to the network. To check the status of the network connection, select **Settings** on the taskbar, then select **Network**. Under Network Health Check, select **Run**. Debug the output for any failed URLs with your IT department. See also *Verify Network Connection* on page 40. Sequencing and multiomics chemistry are not affected by network disruptions. After the system reconnects, data transfer resumes. The system has enough local disk storage for two runs.
Connection to storage location is lost and the instrument cannot reconnect.	Confirm with your IT department that all necessary ports and URLs in the *AVITI24 System Site Prep Guide (MA-00052)* are allowlisted.
Run folder is missing data.	Make sure the user interface indicates that the system is uploading and wait for the upload to complete. • A slow connection delays data transfer. • Data transfer failure prompts a notification.

Cancel Runs

AVITI OS displays the following buttons for canceling runs and washes:

- **Discard**—Cancels the run. The button appears when you can discard setup without compromising consumables.
- **Stop**—Appears on the Home screen and cancels an active run. The button is always enabled so you can free the instrument when run parameters are incorrect, data quality is poor, or a hardware problem occurs.

Discard Run Setup

1. On any run setup screen before priming, select **Discard**.
2. When prompted to confirm the discard, select an option:
   - » **Unlock Door A** or **Unlock Door B**—Discard the run and save the cartridge. Proceed to step 3.
   - » **Discard Setup**—Discard the run, delete the run, and return to the Home screen without saving the cartridge. No further action is required.
3. Open the reagent bay door and remove the cartridge.
4. Place the cartridge on ice or refrigerate at 2°C to 8°C.
5. Place a clean, uncovered white wash tray onto the open reagent bay door.
6. Slide ~2/3 of the wash tray into the reagent bay, so the barcode edge is about flush with the entrance.
7. Add 660 ml nuclease-free water to the fill area, filling the wash tray to slightly above the upper fill line.
8. Slide the wash tray all the way into the reagent bay until it stops.
9. Close the reagent bay door.
10. Set up a new run and use the cartridge within ***4 hours***.

Discard Wash Setup

1. On any wash setup screen, select **Discard**.
2. When prompted to confirm the discard, select **Discard Setup**.

Stop an Active Run

Stopping an active run is a two-part process: stop the run and then perform a ~60-minute recovery wash to remove residual library from the fluidic system.

CAUTION
Stopping a run is ***final***. You cannot resume a stopped run or reuse any of the consumables.

1. On the applicable side of the Home or Run Details screen, select **Stop**.
2. When prompted, select **Yes, Stop Run**. Wait for the current step to complete and the run to terminate.
3. Proceed to *Perform Wash After Stopped or Incomplete Run* on page 54 and complete the recovery wash.

Perform Wash After Stopped or Incomplete Run

If you stop a **multiomics** run or a multiomics run does not complete, perform a ~1.5-hour maintenance wash. See *Perform a Maintenance Wash* on page 30.

After a run has been stopped or after any run does not complete, perform a ~60-minute recovery wash as described below to remove residual library from the fluidic system.

Prepare Wash 2 Solution

1. Gather the following materials:
   - » 2 L bottle
   - » Nuclease-free water
   - » Pipette controller
   - » Serological pipette
   - » Tween 20
   - » Used flow cell
   - » White wash tray

   —A used flow cell might already be present on the instrument.—
2. Add 1.5 L nuclease-free water to a new 2 L bottle.
3. Attach a new serological pipette to a pipette controller.
4. Add 4.5 ml Tween 20 to the bottle to prepare 1.5 L 0.3% Tween 20.
5. Label the bottle **Wash 2 Solution**.
6. Cap the bottle and invert several times to mix.
7. Set aside Wash 2 Solution at room temperature.

Initiate a Recovery Wash

1. On the Home screen, select **New Run**.
2. If AVITI OS prompts that the flow cell is missing, load a ***used*** flow cell:
   a. Select **Open Nest**.
   b. Place the used flow cell onto the nest and close the lid.
   c. Select **Close Nest**.
3. Select which side to wash:
   - » **Side A**—Set up a recovery wash on side A.
   - » **Both**—Set up recovery washes on sides A and B.
   - » **Side B**—Set up a recovery wash on side B.
4. Select **Wash**, and then select **Recovery**.
5. Select **Next** to proceed to the Load Wash 2 screen.

Load Wash 2 Solution

1. Open the reagent bay door.

2. Remove the buffer bottle and cartridge basket from the reagent bay. Set aside both materials.
3. Place a clean, uncovered white wash tray onto the open door.
4. Slide ~2/3 of the wash tray into the reagent bay, so the barcode edge is about flush with the entrance.
5. Add 660 ml freshly prepared Wash 2 Solution to the fill area, filling the wash tray to slightly above the upper fill line.
6. Slide the wash tray all the way into the reagent bay until it stops.
7. Close the reagent bay door, and select **Next** to proceed to the Empty Waste screen.
8. [Optional] Store leftover Wash 2 Solution at 2°C to 8°C for ≤ 2 weeks.

Empty Waste and Run Wash 2

1. Open the waste bay door.
2. Unscrew the transport cap from the cap holder above the waste bay.
3. Remove the waste bottle from the waste bay and close the transport cap.

   CAUTION
   Waste bottle contents are considered hazardous. Dispose of waste according to local, state, and regional laws and regulations.

4. [Optional] Insert a funnel into a waste receptacle. Make sure the funnel is secure.
5. Open the transport cap and the vent cap.
6. Support the waste bottle with both hands and empty the waste:
   a. Position the bottle over the funnel or waste receptacle.
      - If you inserted a funnel, align the handle to the inner edge of the funnel.
      - If you did not insert a funnel, center the handle over the waste receptacle.
   b. Tip the bottle forward and drain. Invert the bottle and shake to expel all droplets.
   c. If necessary, wipe liquid off the bottle.
7. Close the vent cap and return the empty waste bottle to the waste bay.
8. Screw the transport cap onto the cap holder and close the waste bay door.
9. Select **Next** to open the Run Wash 2 screen and automatically start the wash.
10. When the wash is complete, select **Next** to proceed to the Home screen.
11. Discard the cartridge and buffer bottle and wash the basket. See the discard instructions in the user guide for your sequencing or multiomics kit.

Perform Service Wash

Perform a service wash only when directed by Element Technical Support to troubleshoot a suspected fluidic obstruction. After the ~68-minute service wash is complete, Element Technical Support reviews the wash logs to determine whether the obstruction has been resolved.

Prepare Wash 2 Solution

1. Gather the following materials:
   - » 2 L bottle
   - » Nuclease-free water
   - » Pipette controller
   - » Serological pipette
   - » Tween 20
   - » Used flow cell
   - » White wash tray

   —A used flow cell might already be present on the instrument.—
2. Add 1.5 L nuclease-free water to a new 2 L bottle.
3. Attach a new serological pipette to a pipette controller.
4. Add 4.5 ml Tween 20 to the bottle to prepare 1.5 L 0.3% Tween 20.
5. Label the bottle **Wash 2 Solution**.
6. Cap the bottle and invert several times to mix.
7. Set aside Wash 2 Solution at room temperature.

Initiate a Service Wash

1. On the Home screen, select **New Run**.
2. If AVITI OS prompts that the flow cell is missing, load a ***used*** flow cell:
   a. Select **Open Nest**.
   b. Place the used flow cell onto the nest and close the lid.
   c. Select **Close Nest**.
3. Select which side to wash:
   - » **Side A**—Set up a service wash on side A.
   - » **Both**—Set up service washes on sides A and B.
   - » **Side B**—Set up a service wash on side B.
4. Select **Wash**, and then select **Service**.
5. Select **Next** to proceed to the Load Wash 2 screen.

Load Wash 2 Solution

1. Open the reagent bay door.
2. Remove the buffer bottle and cartridge basket from the reagent bay. Set aside both materials.

3. Place a clean, uncovered white wash tray onto the open door.
4. Slide ~2/3 of the wash tray into the reagent bay, so the barcode edge is about flush with the entrance.
5. Add 660 ml freshly prepared Wash 2 Solution to the fill area, filling the wash tray to slightly above the upper fill line.
6. Slide the wash tray all the way into the reagent bay until it stops.
7. Close the reagent bay door, and select **Next** to proceed to the Empty Waste screen.
8. [Optional] Store leftover Wash 2 Solution at 2°C to 8°C for ≤ 2 weeks.

Empty Waste and Run Wash 2

1. Open the waste bay door.
2. Unscrew the transport cap from the cap holder above the waste bay.
3. Remove the waste bottle from the waste bay and close the transport cap.

   CAUTION
   Waste bottle contents are considered hazardous. Dispose of waste according to local, state, and regional laws and regulations.

4. [Optional] Insert a funnel into a waste receptacle. Make sure the funnel is secure.
5. Open the transport cap and the vent cap.
6. Support the waste bottle with both hands and empty the waste:
   a. Position the bottle over the funnel or waste receptacle.
      - If you inserted a funnel, align the handle to the inner edge of the funnel.
      - If you did not insert a funnel, center the handle over the waste receptacle.
   b. Tip the bottle forward and drain. Invert the bottle and shake to expel all droplets.
   c. If necessary, wipe liquid off the bottle.
7. Close the vent cap and return the empty waste bottle to the waste bay.
8. Screw the transport cap onto the cap holder and close the waste bay door.
9. Select **Next** to open the Run Wash 2 screen and automatically start the wash.
10. When the wash is complete, select **Next** to proceed to the Home screen.
11. Discard the cartridge and buffer bottle and wash the basket. See the discard instructions in the user guide for your sequencing or multiomics kit.

Clean Spills and Leaks

Clean the nest, waste bay, or reagent bay to recover from a leak or spill observed when setting up a run or wash. A leak or spill that occurs in the waste bay during a run causes an error and requires cleaning and contacting Element Technical Support.

If the bottom of the instrument is leaking or liquid is spilling from the front of the instrument: shut down and unplug the instrument if doing so is safe and contact Element Technical Support.

Clean the Nest

IMPORTANT
Handle the nest carefully during every nest interaction to avoid scratches and defects. Pulling the flow cell out forcefully or at an angle can scratch the nest surface.

1. Before wiping the nest, inspect the nest carefully to ensure there is no visible debris. If any debris is visible, gently remove and discard the debris.
2. Dampen a microfiber cloth with isopropyl alcohol.
3. Wipe the nest with the damp microfiber cloth and allow to dry.
4. If necessary, use a polyurethane foam-tip swab to clean additional areas around the nest.
5. Resume run or wash setup.

Clean the Reagent Bay

1. Keep the reagent bay door open.
2. Remove any materials from the reagent bay and set aside.
3. Wipe the interior of the reagent bay with a damp microfiber cloth, cleaning to the back of the bay while avoiding sensors and cables.
4. Inspect the exterior of the instrument for any visible fluid. If necessary, wipe with a damp microfiber cloth.
5. Resume run or wash setup.

Clean the Waste Bay

1. Keep the waste bay door open. If the leak occurs during a run, open the door:
    a. Wait for any runs or washes on the unaffected side to finish.
    b. On the taskbar, select **Notifications**.
    c. On the applicable error, select **Unlock Waste Module Door**.
    d. Open the waste bay door.
2. Unscrew the transport cap from the cap holder on the affected side.
3. Remove the waste bottle from the waste bay and close the transport cap.

    CAUTION
    Waste droplets might be on the exterior of the waste bottle.
4. Inspect the waste bottle for cracks, holes, and other defects.
5. [Optional] Insert a funnel into a waste receptacle. Make sure the funnel is secure.
6. Open the transport cap and the vent cap.
7. Support the waste bottle with both hands and empty the waste:

a. Position the bottle over the funnel or waste receptacle.
    - If you inserted a funnel, align the handle to the inner edge of the funnel.
    - If you did not insert a funnel, center the handle over the waste receptacle.
b. Tip the bottle forward and drain. Invert the bottle and shake to expel all droplets.
c. If necessary, wipe liquid off the bottle.

8. Close the vent cap, leave the transport cap open, and set aside the waste bottle.
9. Wipe the interior of the waste bay with a damp microfiber cloth.
10. Inspect the exterior of the instrument for any visible fluid. If necessary, wipe with a damp microfiber cloth.
11. Return the waste bottle to the waste bay.
    » If the bottle is defective and you have a spare, load the spare.
    » If the bottle is defective and you do not have a spare, load the defective bottle. Do not use the affected side until the defective waste bottle is replaced.

    —A run or wash on either side requires the presence of both bottles.—
12. Screw the transport cap onto the cap holder and close the waste bay door.
13. Resume run or wash setup. If necessary, set up a new run with new consumables and clean accessories.

CHAPTER 6

Safety and Compliance

General Safety 61
Laser Safety 62
Product Compliance 63

General Safety

Review this chapter before operating or maintaining the AVITI24 System to ensure safe, correct usage. The procedures described in this guide are tested and optimized, so any deviation can compromise results, cause personal injury, or damage the instrument. All personnel operating the instrument must be trained in correct operation and safety.

The *AVITI24 System Site Prep Guide (MA-00052)* provides delivery information and installation requirements, including instrument specifications, power specifications, and environmental conditions. A field service engineer (FSE) installs the AVITI24 System.

WARNING
Do not attempt to move the instrument, which can result in injury or damage the instrument. Only trained Element personnel are qualified to safely move the instrument.

Safety Labels

The following table lists the safety labels affixed to the instrument. The labels identify potential hazards associated with installation, service, and operation. Follow the procedures in this guide as described to avoid interactions that expose you to these hazards.

WARNING
This product can expose you to chemicals including formaldehyde, which is known to the State of California to cause cancer, and methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Potential Hazard	Label	Description
Class 4 Laser		The instrument is a Class 1 laser product that contains a Class 4 laser. See *Laser Safety* on page 62.
Heat hazard		The nest has a hot surface and exposure can cause burns.

Laser Safety

The AVITI24 System is certified as a Class 1 laser product per the US Federal Product Performance Standard for Laser Products requirements described in 21 CFR Subchapter J. The exception to these requirements is the deviations described in FDA Laser Notice #56. The product is classified per IEC/EN 60825-1:2014.

WARNING
Adjusting or performing procedures other than those described in this guide or other Element guides can result in hazardous radiation exposure.

Class 4 Laser

The instrument is a Class 1 laser product that contains a Class 4 laser. The Class 4 laser produces Class 4 levels of visible laser radiation, which can be hazardous to eyes and skin. Protective shells prevent exposure or access to laser radiation levels that exceed Class 1 during operation, maintenance, or normal service.

The following figure depicts the label that identifies locations where a tool is required to remove shell fasteners that prevent access to laser radiation.

Label warning at protective shell removal locations



Operating Conditions

Do not operate an AVITI24 System with damaged shells or any portion of the shells removed. These conditions make Class 4 levels of laser radiation possible and risk exposure to direct or reflected laser light.

Only Element service personnel, agents authorized by Element, or personnel trained by Element can perform services that require internal removal of portions of the shells. If you are present during service, take the proper safety precautions to mitigate the risk of direct and reflected laser light.

Product Compliance

The AVITI24 System meets the Canadian, EU, South Korean, UK, and US requirements for safety and electromagnetic compatibility (EMC). The system has been tested to and complies with the standards in the following sections.

US and Canadian Safety and EMC Standards

The AVITI24 System is certified to the following safety standards:

- IEC 60825-1, safety of laser products
- IEC 61010-1, general safety requirements for electrical equipment for measurement, control, and laboratory use
- IEC 61010-2-010, particular requirements for laboratory equipment for the heating of materials
- IEC 61010-2-081, particular requirements for automatic and semiautomatic laboratory equipment for analysis and other purposes

The system also has been tested to and complies with the following EMC requirements:

- FCC 47 CFR Part 15, title 47: telecommunication; part 15 – radio frequency (RF) devices
- ICES-003, information technology equipment (including digital apparatus)

FCC Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

EU Safety and EMC Standards

The AVITI24 System has been tested to and complies with the following safety standards:

- Low Voltage Directive 2014/35/EU
  - » EN 61010-1, general safety requirements for electrical equipment for measurement, control and laboratory use
  - » EN 61010-2-010, particular requirements for laboratory equipment for the heating of materials
  - » EN 61010-2-081, particular requirements for automatic and semiautomatic laboratory equipment for analysis and other purposes
  - » EN 60825-1, safety of laser products

The system has been tested to and complies with the following EMC standards:

- EMC Directive 2014/30/EU, EMC requirements
  - » EN 61326-1, general EMC requirements for electrical equipment for measurement, control and laboratory use

The system also complies with the Restriction of Hazardous Substances (RoHS) Directive (2011/65/EU) as amended by the Directive (EU) 2015/863. The directives restrict the use of certain hazardous substances in electrical and electronic equipment.

UK Safety and EMC Standards

The AVITI24 System has been tested to and complies with the following safety standards:

- S.I. 2016 No. 1101, general safety regulations

- » BS EN 61010-1, general safety requirements for electrical equipment for measurement, control and laboratory use
- » BS EN IEC 61010-2-010, particular requirements for laboratory equipment for the heating of materials
- » BS EN IEC 61010-2-081, particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes
- » BS EN 60825-1, safety of laser products

The system also has been tested to and complies with the following EMC standards:

- S.I. 2016 No. 1091, EMC requirements
  - » BS EN IEC 61326-1, general EMC requirements for electrical equipment for measurement, control and laboratory use

South Korea EMC and Regulatory Compliance

The AVITI24 System has been tested to and complies with the following EMC standards:

- KS C 9610-6-2, electromagnetic immunity standards for equipment used in industrial environments
- KS C 9610-6-4, electromagnetic emission standards in industrial environments

Additional regulatory information to comply with South Korean regulations (in Korean and English):

- 이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.
- "This equipment has been evaluated for its suitability for use in a business environment. When used in a residential environment, there is a concern of radio interference."

Regulatory Markings

The following markings indicate that the instrument complies with conformity requirements, including EMC and safety requirements, for Australia, Canada, the EU, South Korea, the UK, and the US.

Symbol	Description
c N US 61010-1	Nemko Electrical Safety Certification Mark for US and Canada
	Australia Regulatory Compliance Mark
CE	European Conformity (CE) Marking
UK CA	UK Conformity Assessed Marking
R-R-EB6-710-00975	South Korea Conformity Assessment Marking

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Document History

Revision	Description of Change
October 2026 Document # MA-00051 Rev. F	• Added Cytos support. • Removed Teton support. • Renamed cytoprofiling to multiomics. • Added Trinity to the list of kits that are compatible with individually addressable lanes. • Added descriptions for instrument door controls, last maintenance wash, and last power cycle to the Maintenance & Tools screen topic. • Updated references to the Service tab to Maintenance & Tools tab. • Added the ability to verify network connectivity from the Network screen. • Revised PMG shift functionality to reflect its status as a standard feature rather than an add-on. • Removed the automatic log export feature from Manage an Offline System. • Added export run log files instructions to Manage an Offline System. • Added note to Exporting Log Files: Use an exFAT-formatted USB drive. FAT32 is not supported. • Expanded the acceptable stock bleach concentration range for maintenance washes. • Updated maintenance wash durations. • Added service wash instructions. • Added TCA manifest topic. • Added multiomics Advanced Run Settings. • Specified no recovery wash for multiomics runs, instead maintenance wash. • Added actin to multiomics thumbnail description. • Updated Clean the Nest instructions to remove debris and prevent scratches.
July 2025 Document # MA-00051 Rev. E	• Updated maintenance wash requirements to specify every 30 days for instruments performing sequencing runs only and every 7 days for instruments performing cytoprofiling runs. • Updated PMG shift description to note that an Index Read is required to retain all Read 1 bases. • Updated Polony Density description to note availability for 2 x 300 cycle runs only when running AVITI OS v3.4. • Added step to reset the air filter time after replacing the air filter.

Revision	Description of Change
April 2025 Document # MA-00051 Rev. D	• Updated the General tab description in Settings. • Updated note in Run Monitoring to include content for cytoprofiling. • Updated the maintenance wash requirement. • Updated the estimated completion time for software updates. • Updated title of Perform a Remote Update to Perform an Over-the-Air update and added power cycle steps. • Updated USB drive specifications for manual software updates. • Updated Nemko symbol in Regulatory Markings. • Added links to sequencing and cytoprofiling metrics and charts. • Added ElemBio Catalyst to Supported Storage Connections. • Added ElemBio Catalyst to Add-Ons. • Added Polony Density to Add-Ons. • Added recommendation to perform software updates during downtime. • Added power cycle steps for manual software updates. • Added replacement intervals for air filters.
January 2025 Document # MA-00051 Rev. C	• Removed description of cartridge shipping configurations, such as shipping locks or shipping cover.
December 2024 Document # MA-00051 Rev. B	• Added list of additional documentation for workflow instructions. • Added Trinity to the list of kits that are not compatible with individually addressable lanes. • Specified that Cloudbreak cartridges include shipping locks and Trinity cartridges include a thermoform cover. • Updated images of Teton flow cell aligner and sealer to the latest configuration. • Removed the lid from wash tray description.
October 2024 Document # MA-00051 Rev. A	• Initial release

Technical Support

Visit the User Documentation page on the Element Biosciences website for additional guides and the most recent version of this guide. For technical assistance, contact Element Technical Support.

Website: www.elementbiosciences.com

Email: support@elembio.com

Regional Phone Numbers: www.elementbiosciences.com/contact



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