



Element  
Biosciences

# AVITI™ System

## Site Prep Guide

### **FOR USE WITH**

AVITI System  
AVITI System LT

**ELEMENT BIOSCIENCES**

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# Introduction

The AVITI System is a benchtop instrument that integrates chemistry, hardware, and software to amplify and sequence DNA libraries. The AVITI System requires dedicated lab space for instrument operation and consumable preparation. An appropriate lab environment optimizes instrument performance, minimizes maintenance issues, and extends the lifetime of the instrument.

This site prep guide provides the specifications and guidelines for advance preparation of your network and lab space to ensure successful delivery, installation, and operation. The information in this guide also applies to the AVITI System LT. For additional specifications, see the *Element AVITI System Specification Sheet (LT-00003)*.



# Network Integration

Before installation, review the following network information. Consult your IT administrator to prepare the network for instrument integration and evaluate any advanced network requirements.

## Network and Device Security

To support a secure and low-risk system that you can trust on a network, Element has adopted security controls for the AVITI System, network, and operating system (OS).

Installation of third-party software for security scanning, antimalware, antivirus, or other security purposes is neither necessary nor supported. The OS is designed so that only the software embedded in the system at delivery can be installed and run. Therefore, malware cannot be installed onto the system either maliciously or accidentally.

## Operating System

The AVITI System runs on Ubuntu Core 20.04 LTS for internet of things (IoT) devices, a Linux OS. Designed for edge-based IoT devices and appliances, the Ubuntu Core OS provides multiple security layers, sandboxing, isolation, and over-the-air (OTA) updates. The Linux kernel leverages the principle of least privilege (PoLP) to limit attack vectors and vulnerabilities. The operating system includes only the essential packages required for system functionality.

Element developed applications with Canonical, the publishers of Ubuntu, to align guidelines, confinement, and access controls to Canonical standards. Additionally, Canonical validated and certified the Element technology stack.

## Security Features

An independent security auditor, Rule4, evaluated Ubuntu Core OS security and published the results in the *Ubuntu Core Cybersecurity Analysis Technical White Paper*. For more information on the following components and other security features, download the white paper at [ubuntu.com/engage/ubuntu-core-security-audit](https://ubuntu.com/engage/ubuntu-core-security-audit).

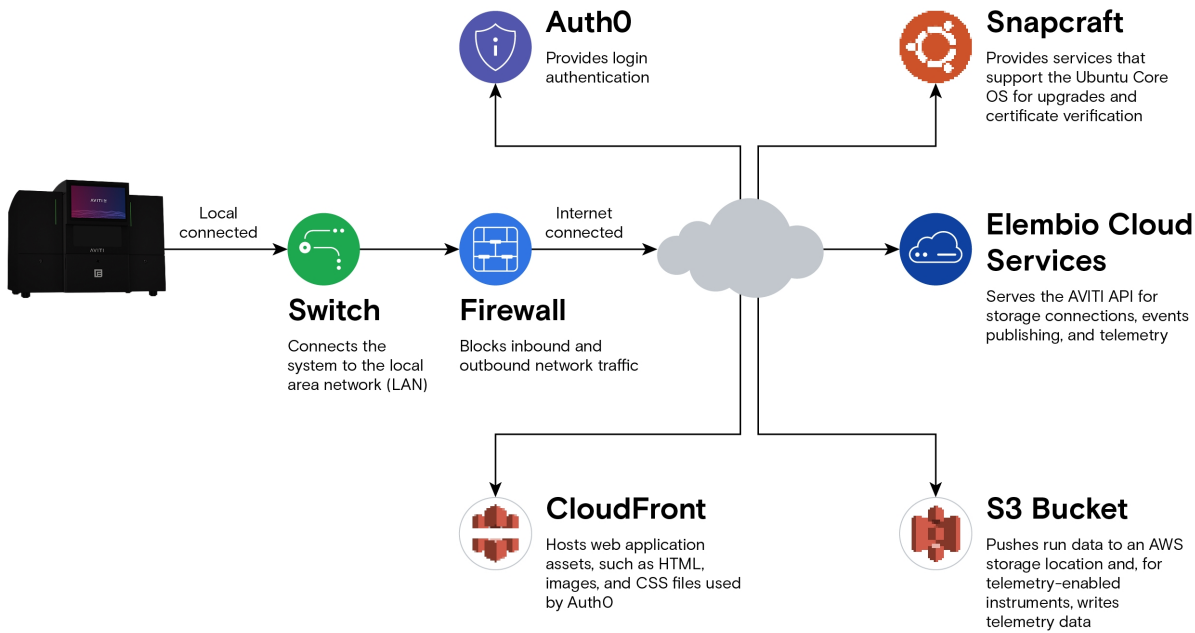
- **AppArmor**—A Mandatory Access Control (MAC) system to restrict OS access
- **Control groups (cgroups)**—A feature that allows resource allocation among system processes
- **devpts newinstance**—Pseudoterminal (PTY) functionality for bidirectional communication between multiple processes
- **Namespaces**—A feature that partitions resources so that one set of processes accesses only one set of resources
- **Secure computing mode (seccomp)**—A facility that allows one-way transitions to a secure state, limiting system calls
- **Traditional permissions**—A discretionary access control (DAC) system that restricts access by user
- **Ubuntu hardening**—The process of making the OS more secure and protecting against threats

## Network Communications

AVITI Operating Software (AVITI OS) is the on-instrument software that controls instrument operations and provides a user interface. AVITI OS writes to configured storage locations and communicates with a subset of known, secure hosts. The hosts provide authentication and authorization, telemetry, and software installation and management.

To prevent improper communications, the AVITI System performs only predefined communications. Communications within the system (system to system communication) and outside the system (system to network communication) are restricted for network security purposes. All components are sandboxed, isolated, and limited to predefined communications. Network communication settings are not modifiable, and the system does not support an HTTP proxy configuration.

## AVITI System network architecture



## Storage Connections

A storage connection establishes an off-instrument location to which AVITI OS transfers files. Storage connections transfer files to a cloud storage location, a location on your local network, or a USB drive. Unless you change the storage connection during run setup, each run outputs data to the default storage location.

An Element representative adds the first storage connection at installation. You can add an unlimited number of additional storage connections. For information on the requirements for storage connections, see [Data Output and Storage on page 11](#).

## Cloud Storage

Cloud Storage Connection	Description
ElemBio Catalyst	<ul style="list-style-type: none"> <li>Subscription-based service.</li> <li>Connects the system to an Amazon Simple Storage Service (Amazon S3) bucket that Element creates and operates on your behalf.</li> <li>Transfers data using AWS Identity and Access Management (IAM).</li> </ul>
Amazon Web Services (AWS)	<ul style="list-style-type: none"> <li>Connects the system to an Amazon S3 bucket.</li> <li>Transfers data using secret key authentication through IAM.</li> </ul>
DNAnexus	<ul style="list-style-type: none"> <li>Connects the system to a DNAnexus project.</li> <li>Transfers data using an API key for authentication.</li> </ul>
Google Cloud Storage (GCS)	<ul style="list-style-type: none"> <li>Connects the system to a Cloud Storage bucket.</li> <li>Transfers data using secret key authentication through a keyed-hash message authentication code (HMAC).</li> </ul>

## Local Storage

Local Storage Connection	Description
Server Messenger Block (SMB)	<ul style="list-style-type: none"><li>• Connects the system to the server running SMB via a path to a folder.</li><li>• Uses the SMB protocol based on service user authentication to transfer data.</li><li>• Enables import of a run manifest from an SMB storage location during run setup.</li><li>• Supports automatic export of log files from offline systems.</li><li>• Supports Kerberos or NTLMv2 authentication.</li></ul>
USB	<ul style="list-style-type: none"><li>• Transfers data and log files to a USB drive connected to the instrument.</li><li>• Supports automatic and manual export of log files from offline systems.</li><li>• Supports USB-A 3.0 or newer versions and FAT32 or exFAT formats.</li><li>• Must store ≥ 1.6 TB of data, which is sufficient for at least two full runs.</li></ul>

## Network Connections

AVITI Systems in online mode require an Ethernet connection to save and process data to cloud storage locations. An SMB storage connection, which provides offline storage on a Windows or Linux server, requires a network connection but not an internet connection. An internet connection is required for cloud storage connections, AVITI OS online updates, telemetry, and remote support.

Offline mode lets you operate the instrument without an internet connection but still requires a network connection and a local storage connection. Only an Element representative can enable offline mode.

Mode	Network Connection	Internet Connection	Storage Connection
Online	Internet	DHCP or static	Cloud or local
	Local	DHCP or static	Local
Offline	Local	None	Local

## Required Connections

Connect the AVITI System to an active network port that can retrieve an IP address. The network connection must meet the following requirements.

Connection	Requirement
Bandwidth	<ul style="list-style-type: none"><li>• 60 Mbps for data uploads</li></ul>
Network port	<ul style="list-style-type: none"><li>• Requires Ethernet 1 Gbps or higher with an RJ45 connector. The system does not support fiber optic cabling.</li></ul>
TCP/IP addressing	<ul style="list-style-type: none"><li>• The default is Dynamic Host Configuration Protocol (DHCP).</li><li>• You can configure a static IP address. IPv4 is supported. For IPv6, contact Element Technical Support.</li><li>• Configuring a static IP address requires an IP address, gateway address, subnet mask, and name server. For instructions, see the <i>AVITI System User Guide (MA-00008)</i>.</li></ul>


## Optional Connections

In addition to the required network connections, Element recommends the following connections.

Connection	Recommendation
Cabling	Cable graded CAT5e for speeds ≤ 1 Gbps or higher for speeds > 1 Gbps
Local area network (LAN)	Dedicated port for the AVITI System
	Dedicated subnetwork or virtual LAN (VLAN) to isolate traffic
Switch	Uplink speeds must meet or exceed 60 Mbps per connected instrument.

## Outbound Connections

The system writes directly to any cloud storage bucket configured for AVITI OS. Allowlist storage connections based on ports, URLs, or IP ranges. The following table lists any applicable allowlist items for each storage connection.


 **CAUTION** IP ranges are subject to frequent change, requiring frequent firewall reconfiguration that can interrupt sequencing. Therefore, Element does not recommend IP range-based allowlisting.

When allowlisting URLs for AWS and IP ranges for a cloud storage connection, make sure the bucket can communicate with the storage provider. Depending on network restrictions, allow every pairing of bucket and region that the network uses.

Storage Connection	Allowlisted Port	Allowlisted URL	Allowlisted IP Ranges
ElemBio Catalyst	443	{bucket}.s3. {region}.amazonaws.com <b>Note:</b> The Allowlisted URL can be found in the ElemBio Cloud UI.	Download the IP ranges from <a href="https://docs.aws.amazon.com/general/latest/gr/aws-ip-ranges.html">docs.aws.amazon.com/general/latest/gr/aws-ip-ranges.html</a> . Next, allowlist region-specific IP ranges by following the instructions at <a href="https://aws.amazon.com/premiumsupport/knowledge-center/s3-find-ip-address-ranges/">aws.amazon.com/premiumsupport/knowledge-center/s3-find-ip-address-ranges/</a> .
AWS	443	{bucket}.s3. {region}.amazonaws.com	Download the IP ranges from <a href="https://docs.aws.amazon.com/general/latest/gr/aws-ip-ranges.html">docs.aws.amazon.com/general/latest/gr/aws-ip-ranges.html</a> . Next, allowlist region-specific IP ranges by following the instructions at <a href="https://aws.amazon.com/premiumsupport/knowledge-center/s3-find-ip-address-ranges/">aws.amazon.com/premiumsupport/knowledge-center/s3-find-ip-address-ranges/</a> .
DNAexus	443	Not applicable	Not applicable
GCS	443	storage.googleapis.com	Obtain the IP ranges from <a href="https://support.google.com/a/answer/10026322">support.google.com/a/answer/10026322</a> .
SMB	445	Not applicable	Not applicable

## Outbound Hosts

As part of normal operation, AVITI OS communicates with the outbound hosts listed in the following table. Allowlist the hosts based on ports, IP ranges, or URLs.

 **CAUTION** IP ranges are subject to frequent change, requiring frequent firewall reconfiguration that can interrupt sequencing. Therefore, Element does not recommend IP range-based allowlisting.

Host	Purpose
Auth0	Authentication protocol
Canonical and Snapcraft	Software management
Element Biosciences	Telemetry and ElemBio™ Cloud

## Allowlisted Ports

To allowlist based on ports, allow all outbound traffic for Port 443.

## Allowlisted IP Ranges

To allowlist IP ranges for Auth0 and Element Biosciences, complete the following instructions.

Canonical and Snapcraft do not support allowlisting based on IP ranges. Because IP ranges extracted from Canonical and Snapcraft URLs can frequently change, allowlisting by IP ranges interferes with software and firmware updates to online systems.

Host	Instructions
Auth0	Review the following IP ranges and allowlist the ranges for your region: <a href="https://auth0.com/docs/secure/security-guidance/data-security/allowlist">auth0.com/docs/secure/security-guidance/data-security/allowlist</a> . Next, use the following guidance to allowlist AWS CloudFront IP ranges for Auth0 Universal Login: <a href="https://docs.aws.amazon.com/AmazonCloudFront/latest/DeveloperGuide/LocationsOfEdgeServers.html">docs.aws.amazon.com/AmazonCloudFront/latest/DeveloperGuide/LocationsOfEdgeServers.html</a> .
Element Biosciences	Download the IP ranges from <a href="https://docs.aws.amazon.com/general/latest/gr/aws-ip-ranges.html">docs.aws.amazon.com/general/latest/gr/aws-ip-ranges.html</a> . Next, use the following instructions to allowlist the us-west-2 IP ranges: <a href="https://aws.amazon.com/premiumsupport/knowledge-center/s3-find-ip-address-ranges/">aws.amazon.com/premiumsupport/knowledge-center/s3-find-ip-address-ranges/</a> .

## Allowlisted URLs

To allowlist based on URLs, allow all outbound traffic for the URLs for each host listed in the following table.

<b>Host</b>	<b>URLs</b>
Auth0	<a href="https://auth0.auth0.com">https://auth0.auth0.com</a>
	<a href="https://auth0.com">https://auth0.com</a>
	<a href="https://cdn.auth0.com">https://cdn.auth0.com</a>
	<a href="https://cdn.us.auth0.com">https://cdn.us.auth0.com</a>
	<a href="https://elembio.auth0.com">https://elembio.auth0.com</a>
	<a href="https://elembio.guardian.us.auth0.com">https://elembio.guardian.us.auth0.com</a>
	<a href="https://elembio.us.auth0.com">https://elembio.us.auth0.com</a>
	<a href="https://login.us.auth0.com">https://login.us.auth0.com</a>
	<a href="https://manage.auth0.com">https://manage.auth0.com</a>
	<a href="https://www.auth0.com">https://www.auth0.com</a>
Canonical and Snapcraft	<a href="https://api.snapcraft.io">https://api.snapcraft.io</a>
	<a href="https://canonical-bos01.cdn.snapcraftcontent.com">https://canonical-bos01.cdn.snapcraftcontent.com</a>
	<a href="https://canonical-lcy01.cdn.snapcraftcontent.com">https://canonical-lcy01.cdn.snapcraftcontent.com</a>
	<a href="https://canonical-lcy02.cdn.snapcraftcontent.com">https://canonical-lcy02.cdn.snapcraftcontent.com</a>
	<a href="https://canonical-lgw01.cdn.snapcraftcontent.com">https://canonical-lgw01.cdn.snapcraftcontent.com</a>
	<a href="https://dashboard.snapcraft.io">https://dashboard.snapcraft.io</a>
	<a href="https://login.ubuntu.com">https://login.ubuntu.com</a>
	<a href="https://ntp.ubuntu.com">https://ntp.ubuntu.com</a>
	<a href="https://status.snapcraft.io">https://status.snapcraft.io</a>
	<a href="https://storage.snapcraftcontent.com">https://storage.snapcraftcontent.com</a>
Element Biosciences	<a href="https://api.elembio.io">https://api.elembio.io</a>
	<a href="https://api.usw2.elembio.io">https://api.usw2.elembio.io</a>
	<a href="https://elembio-prod-usw2-s3-aviti-telemetry-logs-usw2.s3.us-west-2.amazonaws.com">https://elembio-prod-usw2-s3-aviti-telemetry-logs-usw2.s3.us-west-2.amazonaws.com</a>

# Data Output and Storage

Before installation, prepare your site for the first storage connection. The instrument hard drive has sufficient space to store data for at least two runs and start an additional two runs. During a run, the hard drive also processes several temporary files. Cloud storage connections are managed in ElemBio Cloud. Local storage connections are managed on the instrument using AVITI OS.

## Run Data File Sizes

Run data that is transferred and stored off-instrument includes the following file types. The file sizes assume 2 x 76, 2 x 151, and 2 x 301 runs with indexing and a high-output kit.

### Approximate File Sizes

File Type	2 x 76	2 x 151	2 x 301
Alignments	10 GB	10 GB	3 GB
Bases	160 GB	295 GB	177 GB
Filters	1.5 GB	1.5 GB	400 MB
Locations	5 GB	5 GB	1.5 GB
Metrics	20 MB	20 MB	40 MB
Other	5 MB	5 MB	5 MB
<b>Total</b>	<b>177 GB</b>	<b>312 GB</b>	<b>182 GB</b>

## AWS Storage Connection

An AWS storage connection requires an AWS S3 console account with the applicable permissions and credentials. Before configuring, you must set up the following required components:

- An Amazon S3 bucket
- One of the following authorizing IAM credentials: an IAM role **or** an IAM user
- An IAM policy that you associate with your IAM credential

See [Amazon Web Services](#) in the [Online Help](#) for the requirements to set up an AWS storage connection, including [JSON Policy Templates](#) for IAM policies. For more information on configuring the AWS components, see the following AWS documentation.

Task	AWS Documentation
Create an Amazon S3 bucket	<a href="#">Creating a Bucket</a>
Create an IAM role	<a href="#">Creating an IAM Role</a>
Create an IAM user	<a href="#">Create an IAM User in Your AWS Account</a>
Create an IAM policy	<a href="#">Define Custom IAM Permissions with Customer Managed Policies</a> and <a href="#">Create IAM Policies</a>

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## DNAnexus Storage Connection

A DNAnexus storage connection requires a DNAnexus project and the associated API key. However, to use the connection, you must set up a workflow in the DNAnexus project. To use data from sequencing runs, the workflow must start with the Bases2Fastq app. For more information on DNAnexus projects, see the [User Interface Quickstart](#) in the [DNAnexus Documentation](#).

For more information on DNAnexus integrations in ElemBio Cloud, see [DNAnexus](#) in the [Online Help](#).

## GCS Storage Connection

A GCS storage connection requires a keyed-hash message authentication code (HMAC) key, which includes an access key and a secret access key. Before connecting, create a Google Cloud project with a Cloud Storage bucket, a service account, and the HMAC key. The HMAC key belongs to the service account.

See [Google Cloud Platform](#) in the [Online Help](#) for the requirements to set up a GCS storage connection. For more information on configuring the GCS components, see the following Google Cloud documentation.

Task	Google Cloud Documentation
Create a Google Cloud project	<a href="#">Creating and Managing Projects</a>
Create a Cloud Storage bucket	<a href="#">Create Buckets</a>
Create a service account	<a href="#">Create Service Accounts</a>
Create an HMAC key	<a href="#">Manage HMAC Keys for Service Accounts</a>

## SMB Storage Connection

To prepare for the setup of an SMB storage connection, review the following requirements.

### SMB Version

The AVITI System supports SMB version 3.1.1, which provides a secure-by-design approach for the entire system. The system also supports the most recently stable versions of the equivalent Samba protocol. If you are using an older version of the Samba protocol, Element recommends that you upgrade to the most recent version.

### Authentication Protocol

SMB storage connections only support NTLMv2 or Kerberos authentication protocols, with Kerberos as the primary authentication protocol. Network File System (NFS) protocols are not supported.

### Server Requirements

Use either a Windows or Linux server. Make sure you know the host name and share name for the server.

Certain storage connections also require a workgroup or domain name, so note them when setting up the SMB server. The Kerberos authentication protocol requires you to enter the Kerberos realm name (for example, elembio.com).

### SMB Host Name

Provide the host name as an IP address or a fully qualified domain name (FQDN).

- For a Kerberos authentication protocol, FQDN is the only supported protocol for the hostname.

Example FQDN: datapc.elembio.com

- For an NTLMv2 authentication protocol, an IP address or FQDN is supported.

## Service User

An SMB storage connection requires the user name and password of a service user. The service user must have read and write permissions for the server. Give the service user a name clearly associated with the instrument, such as AVITI-Streaming.

## Server Connection

The instrument must connect to the same network as the Windows or Linux server, and the path to the server must exist. If the path does not exist when adding an SMB storage connection, AVITI OS displays an error.


## USB Storage Connection

The AVITI System supports a storage connection for a USB that meets the following requirements:

- Uses USB-A 3.0 or a newer version and the FAT32 or exFAT format. A solid-state drive (SSD) with a USB-A 3.0 connector is a recommended option to meet data transfer performance standards.
- Provides at least 1.6 TB of available space, which accommodates at least two full runs.
- Uses a name with only alphanumeric characters, hyphens (-), and underscores (\_). The name cannot contain any spaces.

# Delivery and Installation

An Element Biosciences representative delivers, unpacks, and places the AVITI System on the lab bench. The instrument and accessories ship in one crate. The unpacking area must have sufficient space for the shipping crate, instrument, and accessories. Following delivery, a field service engineer (FSE) installs the system and performs verification procedures, including a performance verification run.

 **WARNING** Improper handling can impact optical alignment or damage the instrument. Only authorized personnel can unpack, install, or move an AVITI System. If you must move the instrument after installation, contact Element Technical Support.

## Shipping Crate Dimensions

Measurement	Dimension (cm)	Dimension (in)
Height	123.4	48.6
Width	129.5	51
Depth	88.9	35

Weight: 84 kg (185 lb) when empty

## Shipping Crate Contents

Accessory	Quantity	Purpose
AVITI System	1	Sequencing system
AVITI cartridge baskets	4	Protecting reagent cartridges and reducing waste
AVITI wash tray 1, gray	2	Performing maintenance washes
AVITI wash tray 2, white	2	Performing maintenance, standby, and recovery washes
AVITI waste bottles	3	Collecting waste from runs and washes
Category 6 (Cat 6) Ethernet cable	1	Connecting the instrument to the internet
Funnel, waste transfer	1	Emptying the waste bottles
Power cord	1	Supplying power to the instrument
Screwdriver, #2 Phillips	1	Removing the instrument shells
Screwdriver, 5 mm hex	1	Removing the shipping brackets

# Lab Space and Setup

The AVITI System requires sufficient lab space for safe operation, an appropriate lab bench for stability, and proper clearances for airflow, operation, and service. Maintain adjacent space for preparing consumables, wash trays, and other materials during operation.

## Instrument Location

Use the following guidelines to determine the best lab location for your instrument:

- Place the instrument on a sturdy, isolated lab bench with leveling and locking casters. For recommendations, see [Lab Bench on page 16](#).
- Make sure the instrument position lets you easily disconnect the power cord.
- Locate the instrument within 2.7 m (9 ft) of the power supply and Ethernet port.
  - » The Ethernet cable and power cord that ship with the instrument are each 3 m (10 ft) long.
  - » The Ethernet cable can plug into any Ethernet port.
- Maintain a clear path between the instrument and power supply to protect the power cord from strain, abrasion, and kinking.
- Make sure the space above the instrument provides unobstructed access to the air filter.

## Instrument Dimensions

Measurement	Dimension (cm)	Dimension (in)
Height	74.9	29.5
Width	95.5	37.6
Depth	72.3	28.5
Weight: 155.1 kg (342 lb)		

## Position and Clearance

The following clearance dimensions enable proper airflow and accessibility from all sides of the instrument.

Location	Clearance (cm)	Clearance (in)
Each side of the instrument	≥ 15.2	≥ 6
Behind the instrument	≥ 15.2	≥ 6
In front of the instrument	≥ 92	≥ 36
Above the instrument	≥ 48.3	≥ 19

## Lab Bench

Use a sturdy lab bench that accommodates the weight and dimensions of the instrument. The lab bench must provide sufficient stability to minimize vibrations and optimize optical performance. A lab bench with locking casters facilitates installation, maintenance, and service procedures.

The following table provides lab bench dimensions and Element ordering information. If you select an alternative lab bench, make sure the bench meets the stated dimensions, can accommodate the instrument weight, and provides sufficient stability to minimize vibrations. Casters must be able to lock in place and attached to the bench before installation. Built-in tables are acceptable but impede installation and service.

Item	Width	Depth	Height	Ordering Information
Instrument Bench	40 in (101.6 cm)	28 in (71.1 cm)	34 in (86.4 cm)	Element catalog # 880-00002*

\* Contact your sales representative.

## Vibration

Place the instrument away from external sources of vibration. Observe the following best practices:

- Make sure the lab bench is free of shakers, vortex mixers, centrifuges, and other equipment that can produce vibrations.
- Make sure the lab bench does not touch anything that can cause vibrations.
- Make sure the top of the instrument remains free of keyboards, reagent tubes, and any other objects.
- Only use the instrument as instructed. Use the touchscreen, keyboard, mouse, and module doors to interact with the instrument and avoid other forms of contact.
- Minimize floor vibrations from other equipment or lab personnel.

### NOTE

The floor vibration described in ISO 2631-1 measures vibration criteria (VC) as velocity amplitude value in 1/3-octave frequency bands over frequencies 4–100 Hz.

Exceeding either of the following vibration levels can affect performance and extend run time:

- If you are using the recommended lab bench, maintain a floor vibration level of  $\leq$  VC-B.
- If you are using an alternative lab bench, maintain a floor vibration level of  $\leq$  VC-A.

# Electrical Requirements

Adherence to electrical requirements facilitates safe and effective operation. Plug the instrument into a properly grounded receptacle with adequate current capacity. Make sure the electrical supply has suitable voltage.

Power	Specification
Electrical supply (line voltage)	100–240 V at 50/60 Hz*
Average power consumption	600 W
Peak power consumption	1200 W

\* Compatible with all regions

## Uninterruptible Power Supply

Element recommends an uninterruptible power supply (UPS) to sustain and protect the instrument during a power surge or outage. Most generators introduce brief power interruptions before resuming output. A UPS is recommended to avoid power interruptions.

### NOTE

Element is not responsible for runs affected by power interruptions, regardless of whether the instrument is connected to a UPS.

When selecting a UPS, choose a model that meets the following requirements:

- A maximum output capacity of at least 865/1500 W/VA
- An output connection for the provided NEMA 5-15P or IEC-320 C14 power cord
- An input connection and a nominal input voltage range appropriate for the region

## Regional Recommendations

The following UPS models can sustain power to the instrument for ~5–10 minutes and meet the UPS requirements.

Model	Input Connection	Output Connection	Regions*
APC Back-UPS Pro 1500VA, Tower Part # BR1500GI	IEC 60320 C13	IEC 60320 C13	Australia, European Union, Hong Kong, Israel, Jordan, Kuwait, Malaysia, Norway, Saudi Arabia, Singapore, South Africa, South Korea, Switzerland, Thailand, Turkey, United Kingdom, and Vietnam
APC Back-UPS Pro 1500VA, Tower Part # BR1500G	NEMA	NEMA 5-15R	Brazil, China, and Mexico
APC Back-UPS Pro 1500VA, Tower Part # BX1500M	NEMA	NEMA 5-15P	USA and Canada
APC Smart-UPS, Line Interactive, Tower Part # SMT1500C	NEMA	NEMA 5-15P	USA and Canada

\* Nations, regions, and territories that do not appear in the table might require UPS models with different specifications. Confirm local requirements and voltage conversion requirements.

## Power Cord

Use only the power cord that Element provides. Plug the power cord directly into a standard wall outlet without an extension cord. If the wall outlet is not compatible with the available Element power cord options, use a power plug adapter approved for sale and use in the site location. Each instrument requires a dedicated outlet with a single-phase 15 amp circuit.

To minimize the risk of electric shock, the provided power cord includes a ground that connects the instrument to protective earth. The safety ground on the power cord returns protective earth to a safe reference. The protective earth connection on the power cord must be in good working condition when operating the instrument.

# Environmental Conditions

The AVITI System is intended for indoor use only and requires a suitable lab environment. Install and operate the instrument in a well-ventilated area that meets the following environmental specifications.

Condition	Specification
Elevation	< 2000 m (6500 ft)
Humidity	30–70% relative humidity, noncondensing
Pollution	Pollution degree 2*
Temperature	18–26°C

\* A pollution degree 2 environment is typical of offices and labs.

## Heat Output

The main exhaust is through the lower-right and lower-left portions of the back panel. Keep temperature-sensitive equipment away from the exhaust.

The average heat output depends on usage and can be approximately half the maximum.

Calculation	Approximate Heat Output (W)
Average	500
Maximum	1000

## Sound Level

The maximum sound level is  $\leq 62$  dB at 1 m (3.3 ft) from the instrument, which is comparable to the sound level of a normal conversation.

## High Elevation

If your site is located at an elevation  $\geq 914.4$  m (3000 ft), Element can enable the high elevation setting in AVITI OS to prevent moderately high elevations from affecting the fluidic system. If your instrument requires this setting, contact Element Technical Support.

# Materials

Workflows for the AVITI System require Element kits to prepare and sequence libraries. Make sure the lab has appropriate storage for the kits and is stocked with the applicable user-supplied consumables, equipment, and accessories that supplement the kits.

For chemical properties of Element reagents, review the safety data sheets (SDS) at [elementbiosciences.com/resources](https://elementbiosciences.com/resources).

## Kit Storage

Library prep kit dimensions vary in size. Use the following information as example requirements. For more information on the specific storage requirements for a kit, see the user guide for the library prep workflow or kit.

Workflow	Library Prep Kit	Storage Temperature	Package Dimensions (H x W x D cm)	Package Dimensions (H x W x D in)
Adept Library Prep	Adept Rapid PCR-Plus Kit	-25°C to -15°C	15.2 x 10.2 x 0.8	6 x 4 x 0.3
Elevate Library Prep	Element Mechanical Library Prep Kit	-25°C to -15°C	6.4 x 14 x 12.7	2.5 x 5.5 x 5
	Elevate Long UDI Adapter Kit Set A	-25°C to -15°C	2.5 x 27.9 x 14	1 x 11 x 5.5

The kits for sequencing provide the reagents and flow cell for one run. Each kit component is packaged in a separate box. Use the following Cloudbreak™ kit information as example requirements.

Component	Storage Temperature	Package Dimensions (H x W x D cm)	Package Dimensions (H x W x D in)
Reagent cartridge	-25°C to -15°C	21.1 x 18.8 x 37.3	8.3 x 7.4 x 14.7
Flow cell	2°C to 8°C *	2.5 x 7.9 x 17.5	1 x 3.1 x 6.9
Adept Primer Set Cloudbreak **	-25°C to -15°C	5.9 x 10.2 x 10.2	2.3 x 4 x 4
AVITI Buffer Bottle	Room temperature	17.3 x 23.6 x 18.5	6.8 x 9.3 x 7.3
Library Loading Buffer (quantity 2)	-25°C to -15°C	15.2 x 10.2 x 0.8	6 x 4 x 0.3

\* Ships at room temperature

\*\* Use as an example only. Other primer sets have different dimensions.

## Equipment and Accessories

Consumable	Supplier and Catalog #
Freezer, -25°C to -15°C	General lab supplier
Ice bucket	
Mini centrifuge	
Pipette controller	
Pipettes, single-channel	
Refrigerator, 2°C to 8°C	
Tub for water baths	
Vortex mixer	
FAT32 USB drive (optional)	
Heavy-Duty Funnel, 64 oz (optional)	

## Maintenance Consumables

Consumable	Supplier and Catalog #
Air Filter, MERV 8	Element Biosciences, 895-00052
Sodium hypochlorite solution, reagent grade, 4.00–4.99%, 500 ml	MilliporeSigma, 239305*
Either bottle: <ul style="list-style-type: none"><li>• Nalgene HDPE Heavy-Duty Bottles with Closure, 2 L</li><li>• Nalgene Large Narrow-Mouth LDPE Bottles, 2 L</li></ul>	Thermo Fisher Scientific: <ul style="list-style-type: none"><li>• 2125-2000PK*</li><li>• 2202-0005PK*</li></ul>
Alcohol Prep Pads, 70% isopropyl alcohol	VWR, 95041-712*
Tween 20, reagent grade, 1 L	VWR, 97062-332*
Microfiber cloths	General lab supplier
Nuclease-free water	
Polyurethane foam-tip swabs with plastic handles	
Serological pipettes	
Simple Green All-Purpose Cleaner*	

\* Or equivalent

# Document History

Document #	Description of Change
July 2025 Document # MA-00007 Rev. R	<ul style="list-style-type: none"><li>• Updated regions for UPS specifications to include European Union.</li></ul>
April 2025 Document # MA-00007 Rev. P	<ul style="list-style-type: none"><li>• Added ElemBio Catalyst to Cloud Storage connections.</li><li>• Added ElemBio Catalyst to Outbound Connections.</li></ul>
December 2024 Document # MA-00007 Rev. N	<ul style="list-style-type: none"><li>• Added Trinity equipment list.</li><li>• Updated cloud storage connection information to refer to ElemBio Cloud Online Help provider pages.</li><li>• Updated kit storage information to use examples.</li><li>• Updated sequencing basket to cartridge basket in crate contents.</li><li>• Corrected unit of measure for total run data file size to GB.</li><li>• Removed port 8000 from allowlist requirements.</li><li>• Removed Cloudbreak kit list. See <i>Cloudbreak Sequencing User Guide (MA-00058)</i>.</li></ul>
August 2024 Document # MA-00007 Rev. M	<ul style="list-style-type: none"><li>• Updated run data file sizes estimates.</li><li>• Updated elevation and vibration information for clarity.</li><li>• Reorganized materials list and library prep kit storage information.</li></ul>
June 2024 Document # MA-00007 Rev. L	<ul style="list-style-type: none"><li>• Added AVITI 2x150 Sequencing Kit Cloudbreak UltraQ kit information.</li><li>• Updated cloud storage setup information to only use ElemBio Cloud.</li><li>• Updated lab bench information for clarity and ordering information.</li><li>• Updated air filter information.</li><li>• Updated Online Help cross-references to new style.</li><li>• Updated document history formatting.</li><li>• Renamed User-Supplied Materials section as Materials List.</li></ul>
March 2024 Document # MA-00007 Rev. K	<ul style="list-style-type: none"><li>• Added AVITI Sequencing Kits Cloudbreak Freestyle and related consumables to kit storage and materials lists.</li><li>• Added DNAnexus storage connection information.</li><li>• Added optional JSON policy permission for AWS storage connections.</li><li>• Added <a href="https://ntp.ubuntu.com">https://ntp.ubuntu.com</a> to allowlisted URLs.</li><li>• Reorganized SMB storage requirements.</li><li>• Reorganized the user-supplied materials list.</li></ul>
November 2023 Document # MA-00007 Rev. J	<ul style="list-style-type: none"><li>• Added Adept Rapid PCR-Plus Kit storage information.</li><li>• Updated library prep kit storage information for consistency between kits.</li><li>• Updated lab bench dimensions for accuracy.</li><li>• Updated Samba version guidance for clarity.</li></ul>

Document #	Description of Change
September 2023 Document # MA-00007 Rev. H	<ul style="list-style-type: none"> <li>• Added AVITI 2x300 Sequencing Kits Cloudbreak and AVITI 2x300 Cartridge Cloudbreak to sequencing materials.</li> <li>• Added reference in introduction to AVITI System LT.</li> <li>• Added 2 x 301 file size estimates to Run Data File Sizes table.</li> <li>• Added encryption requirement for SMB storage transfer.</li> <li>• Reorganized UPS information to list general requirements.</li> <li>• Updated Sequencing Kits Cloudbreak in sequencing materials for High, Medium, and Low Output kits.</li> <li>• Updated instrument location and vibration guidelines for clarity and preciseness.</li> <li>• Updated MA-00008 reference to new name, <i>Element AVITI System User Guide</i>.</li> </ul>
July 2023 Document # MA-00007 Rev. G	<ul style="list-style-type: none"> <li>• Added the IAM role option for AWS storage connections.</li> <li>• Added Kerberos authentication examples for SMB storage connection fields.</li> <li>• Added W x L x H indicators to lab bench dimensions.</li> <li>• Removed Included Consumables section.</li> <li>• Updated IAM user details for AWS storage connections.</li> <li>• Updated IAM policy information to align with ElemBio Cloud documentation.</li> <li>• Specified SMB v3.1.1 for compatibility.</li> </ul>
April 2023 Document # MA-00007 Rev. F	<ul style="list-style-type: none"> <li>• Added a network architecture diagram.</li> <li>• Added USB drive as a local storage connection and the connection settings and requirements.</li> <li>• Added a domain to the work group requirement.</li> <li>• Added a clearance requirement for space above the instrument.</li> <li>• Added the instrument to the shipping crate contents.</li> <li>• Added the AVITI 2x75 Sequencing Kit Cloudbreak (catalog # 860-00004) and AVITI 2x150 Sequencing Kit Cloudbreak (catalog # 860-00003).</li> <li>• Added an optional USB drive to the materials list.</li> <li>• Updated the SMB storage connection requirements to include Linux and Samba compatibility.</li> <li>• Updated language in Network and Device Security to emphasize OS security features.</li> <li>• Updated the allowlisted URLs.</li> <li>• Updated the link to the IAM policy template.</li> <li>• Updated the altitude specification to elevation.</li> <li>• Updated the kits in the Elevate Workflow.</li> <li>• Updated the links for safety data sheets.</li> <li>• Warned against improper handling.</li> <li>• Renamed AOS to AVITI OS.</li> </ul>

Document #	Description of Change
October 2022 Document # MA-00007 Rev. E	<ul style="list-style-type: none"> <li>• Added Element catalog # 860-00002 for the AVITI 2x75 Sequencing Kit.</li> <li>• Added Element catalog # 820-00008 for the Adept Custom Oligonucleotide Buffer Set.</li> <li>• Added a section describing storage connections.</li> <li>• Added a work group requirement for Windows Server.</li> <li>• Renamed the AVITI Sequencing Kit to AVITI 2x150 Sequencing Kit.</li> <li>• Renamed the Element Adept Library Compatibility Kit to Element Adept Library Compatibility Kit v1.1.</li> <li>• Updated terminology to allowlist and reorganized the requirements.</li> <li>• Updated the allowlisted URLs.</li> <li>• Updated the power cord description.</li> <li>• Reorganized kit storage information.</li> <li>• Replaced Windex glass cleaner with SimpleGreen All-Purpose Cleaner.</li> </ul>
August 2022 Document # MA-00007 Rev. D	<ul style="list-style-type: none"> <li>• Added port 8000 to allowlisted URLs and IP ranges.</li> </ul>
August 2022 Document # MA-00007 Rev. C	<ul style="list-style-type: none"> <li>• Added allowlist requirements for outbound connections and hosts.</li> <li>• Updated network port requirement to Ethernet 1 Gbps or higher.</li> <li>• Updated internet connection to DHCP or static for local online networks.</li> <li>• Updated trademark and patent information in the legal notice.</li> <li>• Specified speeds per cable grade in cabling recommendation.</li> <li>• Marked the FAT32 USB drive as optional.</li> </ul>
July 2022 Document # MA-00007 Rev. B	<ul style="list-style-type: none"> <li>• Added requirements for a GCS storage connection and offline mode.</li> <li>• Decreased the approximate size of bases files to 250 GB.</li> <li>• Removed the IAM policy template, which is available on the website.</li> </ul>
June 2022 Document # MA-00007 Rev. A	<ul style="list-style-type: none"> <li>• Initial release</li> </ul>

# Technical Support

Visit the [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.

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