Element Biosciences

AVITI Dx™ System

Site Prep Guide

FOR USE WITH

AVITI Dx System

ELEMENT BIOSCIENCES

The AVITI Dx System product family delivers precise, high-quality raw DNA sequencing data from a variety of biological samples. The product is intended solely as a data generation tool and does not provide diagnostic interpretations or direct clinical recommendations.

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Introduction

The AVITI Dx System is a multidimensional genomics instrument that can sequence libraries for next-generation sequencing. The AVITI Dx 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. For additional specifications, see the *Element AVITI Dx System Specification Sheet (LT-00075)*.



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 Dx 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 Dx 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.

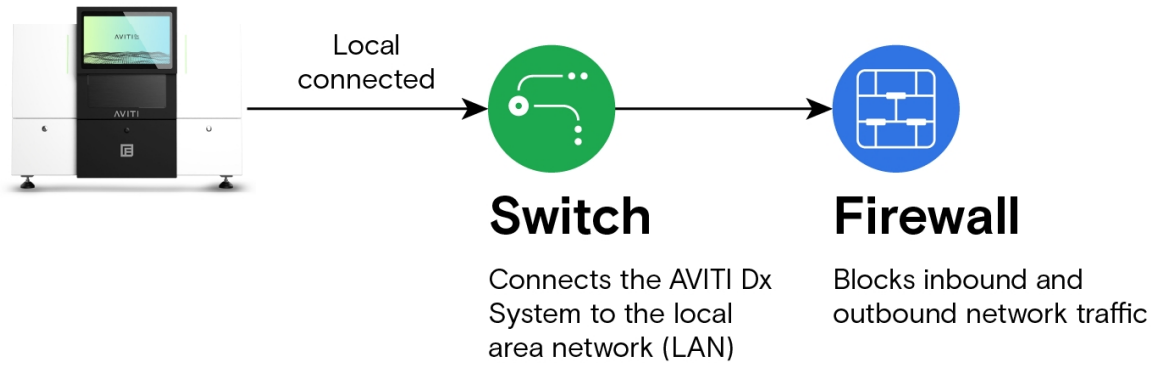
- **AppArmor**—A Mandatory Access Control (MAC) system to restrict OS access
- **Control groups (cgroups)**—A feature that allows resource allocation among system processes
- **devpts newinstance**—Pseudoterminal (PTY) functionality for bidirectional communication between multiple processes
- **Namespaces**—A 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 Dx Operating Software (AVITI Dx OS) is the on-instrument software that controls instrument operations and provides a user interface. AVITI Dx 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 Dx 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 Dx System network architecture



Storage Connections

A storage connection establishes an off-instrument location to which AVITI Dx OS transfers files. Storage connections transfer files to 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.

You are responsible for determining and providing the storage location information used for data transfer. During installation, an Element representative reviews the storage configuration with you and adds the initial storage connection to the system. 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 8.

Local Storage

Local Storage Connection	Description
Server Messenger Block (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 automatic export of log files from offline systems. • Supports Kerberos or NTLMv2 authentication.
USB	• Transfers data and log files to a USB drive connected to the instrument. • Supports automatic and 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.

Network Connections

An SMB storage connection, which provides offline storage on a Windows or Linux server, requires a network connection but not an internet connection.

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	Local
	Local	DHCP or static	Local
Offline	Local	None	Local

Required Connections

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

Connection	Requirement
Bandwidth	• 60 Mbps for data uploads
Network port	• Requires Ethernet 1 Gbps or higher with an RJ45 connector. The system does not support fiber optic cabling.
TCP/IP addressing	• The default is Dynamic Host Configuration Protocol (DHCP). • You can configure a static IP address. IPv4 is supported. For IPv6, contact Element Technical Support. • Configuring a static IP address requires an IP address, gateway address, subnet mask, and name server. For instructions, see the *AVITI Dx System User Guide (MA-00088)*.

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 Dx System
	Dedicated subnetwork or virtual LAN (VLAN) to isolate traffic
Switch	Uplink speeds must meet or exceed 60 Mbps per connected instrument

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. Local storage connections are managed on the instrument using AVITI Dx 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 - Sequencing with AVITI Dx OS v4.0

File Type	2 x 76	2 x 151
Alignments	15 GB	15 GB
Bases	240 GB	445 GB
Filters	2 GB	2 GB
Locations	8 GB	8 GB
Metrics	20 MB	20 MB
Other	5 MB	5 MB
Total	**265 GB**	**470 GB**

SMB Storage Connection

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

SMB Version

The AVITI Dx 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 Dx OS displays an error.

USB Storage Connection

The AVITI Dx 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 Dx 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 Dx System. If you need to 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 Dx System	1	Sequencing system
AVITI Dx cartridge baskets	4	Protecting reagent cartridges and reducing waste
AVITI Dx wash tray 1, gray	2	Performing maintenance washes
AVITI Dx wash tray 2, white	2	Performing maintenance, standby, and recovery washes
AVITI Dx 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 Dx 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 12.
- 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.

WARNING
Do not position the instrument in a way that restricts access to the rear power switch. The rear-mounted power switch, located next to the power cord inlet, serves as the disconnecting device for this instrument. Install the instrument with the clearance specified in the table below so the switch remains visible and operable at all times.

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 ⅓-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 ≤ VC-B.
- If you are using an alternative lab bench, maintain a floor vibration level of ≤ 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. Each instrument requires a dedicated outlet with a single-phase 15 amp circuit.

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

* 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 protective grounding conductor 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 Dx 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 ≤ 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 ≥ 2000 m (6500 ft), Element can enable the high elevation setting in AVITI Dx 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 Dx System require Element kits to prepare libraries and cell cultures for a run. 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.

Kit Storage

Library prep and other sample 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. Each kit component is packaged in a separate box. Use the following Cloudbreak Freestyle Dx™ 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)	Uline, H-5216

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: • Nalgene HDPE Heavy-Duty Bottles with Closure, 2 L • Nalgene Large Narrow-Mouth LDPE Bottles, 2 L	Thermo Fisher Scientific: • 2125-2000PK* • 2202-0005PK*
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
October 2026 Document # MA-00089 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.

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The AVITI Dx System product family delivers precise, high-quality raw DNA sequencing data from a variety of biological samples. The product is intended solely as a data generation tool and does not provide diagnostic interpretations or direct clinical recommendations.