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NextSeq 550Dx

Instrument Site Prep Guide

ILLUMINA PROPRIETARY
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Introduction

This guide provides specifications and guidelines for preparing your site for installation and operation of the Illumina® NextSeq[™] 550Dx instrument:

- Laboratory space requirements
- · Electrical requirements
- Environmental constraints
- Computing requirements
- User-supplied consumables and equipment

Safety Considerations

See the NextSeq 550Dx Instrument Safety and Compliance Guide (document # 100000009868) for important information about safety considerations.

Additional Resources

| Resource | Description |
|--|--|
| NextSeq 550Dx Instrument Safety and Compliance Guide (document # 1000000009868) | Provides information about operational safety considerations, compliance statements, and instrument labeling. |
| RFID Reader Compliance Guide (document # 1000000030332) | Provides information about the RFID reader in the instrument, compliance certifications, and safety considerations. |
| NextSeq 550Dx Instrument Reference Guide (document # 1000000009513) | Provides an overview of instrument components, instructions for operating the instrument, and maintenance and troubleshooting procedures. |
| BaseSpace help (help.basespace.illumina.com) | Provides information about using BaseSpace $^{^{\!$ |
| (document # 100000030332) NextSeq 550Dx Instrument Reference Guide (document # 1000000009513) BaseSpace help | compliance certifications, and safety considerations. Provides an overview of instrument components, instrument operating the instrument, and maintenance and troubleshooting procedures. Provides information about using BaseSpace Seque |

Delivery and Installation

An authorized service provider delivers the instrument, uncrates components, and places the instrument on the lab bench. Make sure that the lab space and bench are ready before delivery.

Access to the instrument USB ports is required for installation, maintenance, and service.



Caution

Only authorized personnel can uncrate, install, or move the instrument. Mishandling of the instrument can affect the alignment or damage instrument components.

An Illumina representative installs and prepares the instrument. When connecting the instrument to a data management system or remote network location, make sure that the path for data storage is selected before the date of installation. The Illumina representative can test the data transfer process during installation.



Caution

After your Illumina representative has installed and prepared the instrument, *do not* relocate the instrument. Moving the instrument improperly can affect the optical alignment and compromise data integrity. If you have to relocate the instrument, contact your Illumina representative.

Crated Dimensions and Contents

The NextSeq 550Dx instrument is shipped in one crate. Use the following dimensions to determine the minimum door width required to accommodate the shipping container.

| Measurement | Crated Dimensions |
|-------------|-------------------|
| Height | 97 cm (38 in) |
| Width | 90 cm (35.5 in) |
| Depth | 94 cm (37 in) |
| Weight | 165 kg (364 lb) |

The crate contains the instrument along with the following components:

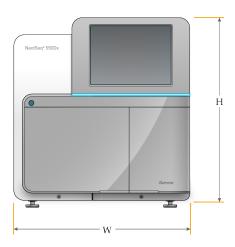
- Spent reagents bottle
- Reagent wash cartridge and buffer wash cartridge
- BeadChip adapter
- Power cord

- Accessories kit, which contains the following components:
 - Keyboard and mouse
 - NextSeq 550Dx Instrument Product Insert (document # 1000000041523)

Laboratory Requirements

This section provides specifications and requirements for setting up your lab space. For more information, see *Environmental Considerations* on page 9.

Instrument Dimensions



| Measurement | Instrument Dimensions (Installed) |
|-------------|-----------------------------------|
| Height | 58.5 cm (23 in) |
| Width | 54 cm (21 in) |
| Depth | 69 cm (27 in) |
| Weight | 84 kg (186 lb) |

Placement Requirements

Position the instrument to allow proper ventilation, access to the power switch and power outlet, and access for servicing the instrument.

- Make sure that you can reach around the left-side of the instrument to access the power switch on the back panel.
- Position the instrument so that personnel can quickly disconnect the power cord from the outlet.
- Make sure that the instrument is accessible from all sides.

| Access | Minimum Clearance |
|--------|--|
| Sides | Allow at least 61 cm (24 in) on each side of the instrument. |
| Rear | Allow at least 10.2 cm (4 in) behind the instrument. |
| Тор | Allow at least 61 cm (24 in) above the instrument. |



Caution

Moving the instrument improperly can affect the optical alignment and compromise data integrity. If you have to relocate the instrument, contact your Illumina representative.

Lab Bench Guidelines

The instrument includes precision optical elements. Place the instrument on a sturdy lab bench away from sources of vibration.

| Width | Height | Depth | Casters |
|----------------|-----------------|-----------------|----------|
| 122 cm (48 in) | 91.4 cm (36 in) | 76.2 cm (30 in) | Optional |

Vibration Guidelines

Keep the vibration level of the lab floor at the VC-A standard of 50 µm/s for ⅓ octave band frequencies of 8–80 Hz, or lower. This level is typical for labs. Do not exceed the ISO Operating Room (baseline) standard of 100 µm/s for ⅓ octave band frequencies of 8–80 Hz.

During sequencing runs, use the following best practices to minimize vibrations and ensure optimal performance:

- Place the instrument on a flat hard floor and keep the clearance area free of clutter.
- Do not place keyboards, used consumables, or other objects on top of the instrument.
- Do not install the instrument near sources of vibration that exceed the ISO Operating Room standard. For example:
 - Motors, pumps, shake testers, drop testers, and heavy air flows in the lab.
 - Floors directly above or below HVAC fans, and controllers, and helipads.
 - Construction or repair work on the same floor as the instrument.
- Keep sources of vibration such as dropped items and movement of heavy equipment at least 100 cm (39.4 in) from the instrument.
- Use only the touch screen, keyboard, and mouse to interact with the instrument. Do not directly impact the instrument surfaces during operation.

Lab Setup for PCR Procedures

Some library prep methods require the polymerase chain reaction (PCR) process.

Establish dedicated areas and lab procedures to prevent PCR product contamination before you begin work in the lab. PCR products can contaminate reagents, instruments, and samples, causing inaccurate results and delay normal operations.

Pre-PCR and Post-PCR Areas

- Establish a pre-PCR area for pre-PCR processes.
- Establish a post-PCR area for processing PCR products.
- Do not use the same sink to wash pre-PCR and post-PCR materials.
- Do not use the same water purification system for pre-PCR and post-PCR areas.
- Store supplies used in pre-PCR protocols in the pre-PCR area, and transfer to the post-PCR area as needed.

Dedicate Equipment and Supplies

- Do not share equipment and supplies between pre-PCR and post-PCR processes. Dedicate a separate set of equipment and supplies in each area.
- Establish dedicated storage areas for consumables used in each area.

Required Storage for Sequencing Consumables

| Item (1 per run) | Storage Requirement |
|-------------------------|---------------------|
| Library dilution buffer | -25°C to -15°C |
| Reagent cartridge | -25°C to -15°C |
| Buffer cartridge | 15°C to 30°C |
| Flow cell cartridge | 2°C to 8°C |

Electrical Requirements

Power Specifications

Table 1 Instrument Power Specifications

| Туре | Specification |
|---------------------|-----------------------------|
| Line Voltage | 100–240 Volts AC @ 50/60 Hz |
| Power Supply Rating | 600 Watts, maximum |

Receptacles

Your facility must be wired with the following equipment:

- For 100–120 Volts AC—A 15 Amp grounded, dedicated line with proper voltage and electrical ground is required. North America and Japan—Receptacle: NEMA 5-15
- For 220–240 Volts AC—A 10 Amp grounded line with proper voltage and electrical ground is required. If the voltage fluctuates more than 10%, a power line regulator is required.

Protective Earth



The instrument has a connection to protective earth through the enclosure. 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 using this device.

Power Cords

The instrument comes with an international standard IEC 60320 C20 receptacle and is shipped with a region-specific power cord.

Hazardous voltages are removed from the instrument only when the power cord is disconnected from the AC power source.

To obtain equivalent receptacles or power cords that comply with local standards, consult a third-party supplier such as Interpower Corporation (www.interpower.com).



Caution

Never use an extension cord to connect the instrument to a power supply.

Fuses

The instrument contains no user-replaceable fuses.

Uninterruptible Power Supply

A user-supplied uninterruptible power supply (UPS) is highly recommended. Illumina is not responsible for runs affected by interrupted power regardless of whether the instrument is connected to a UPS. Standard generator-backed power is often *not* uninterruptible and a brief power outage is typical before power resumes.

The following table lists region-specific recommendations.

| Specification | APC Smart UPS 2200 VA LCD 120 V (North America) | APC Smart UPS 1500 VA LCD 100 V (Japan) | APC Smart UPS 2200 VA LCD 230 V (International) |
|-----------------------------|---|---|---|
| Maximum Power | 1920 W | 980 W | 1980 W |
| Input Voltage (nominal) | 100-120 VAC | 100 VAC | 220-240 VAC |
| Input Frequency | 50/60 Hz | 50/60 Hz | 50/60 Hz |
| Input Connection | NEMA 5-20P | NEMA 5-15P | IEC-320 C20 |
| Typical Run Time (300 W) | 90 minutes | 51 minutes | 90 minutes |
| Typical Run Time (600 W) | 40 minutes | 17 minutes | 40 minutes |

To obtain an equivalent UPS that complies with local standards for facilities outside the referenced regions, consult a third-party supplier such as Interpower Corporation (www.interpower.com).

Environmental Considerations

| Element | Specification |
|-------------|--|
| Temperature | Transportation and Storage: -10°C to 50°C (14°F to 122°F). Operating Conditions: Maintain a lab temperature of 19°C to 25°C (22°C ±3°C). This temperature is the operating temperature of the instrument. During a run, do not allow the ambient temperature to vary more than ±2°C. |
| Humidity | Transportation and Storage: Non-condensing humidity between 15-80%. Operating Conditions: Maintain a noncondensing relative humidity between 20–80%. |
| Elevation | Locate the instrument at an altitude below 2000 meters (6500 feet). |
| Air Quality | Operate the instrument in a Pollution Degree II environment or better. A Pollution Degree II environment is defined as an environment that normally includes only nonconductive pollutants. |
| Ventilation | Consult your facilities department for ventilation requirements based on the instrument heat output specifications. |
| Vibration | Limit the continuous vibration of the lab floor to ISO office level. During a sequencing run, do not exceed ISO operating room limits. Avoid intermittent shocks or disturbances near the instrument. |

Heat Output

| Measured Power | Thermal Output |
|----------------|----------------|
| 600 Watts | 2048 BTU/hour |

Noise Output

| Noise Output (dB) | Distance from Instrument | |
|-------------------|--------------------------|--|
| <70 dB | 1 meter (3.3 feet) | |

A measurement of < 70 dB is within the level of a normal conversation at a distance of approximately 1 meter (3.3 feet).

Network and Computer Security

The following section provides guidelines for maintaining network and computer security. For information on recommended configurations, see *Operating System Configurations* on page 13. For the latest security guidance, alerts, and information for Illumina systems, refer to Security and Networking.

Antivirus Software

Illumina recommends the following antivirus/antimalware software: Windows Defender, Bit Defender or CrowdStrike. To avoid data loss or interruptions, configure the antivirus/antimalware software as follows:

- Set for manual scans. Do not enable automatic scans.
- Perform manual scans only when the instrument is not in use.
- Set updates to download without user authorization, but not install.
- Do not install or update during instrument operation. Update only when the instrument is not running and when it is safe to reboot the instrument computer.
- Do not reboot the computer automatically upon update.
- Exclude the application directory and data drive from any real-time file system protection. Apply this setting to the C:\Illumina directory and the D:\ drive, and any mapped network drives.
- Windows Defender is off by default. This may be enabled manually if desired.

Network Considerations

The NextSeq 550Dx instrument is designed for use with a network, regardless of whether runs in RUO mode are connected to BaseSpace or performed in standalone mode.

Performing a run in manual mode requires a network connection to transfer run data to a network location. The instrument must be in research mode to run in manual mode. Do not save run data to the local hard drive on the NextSeq 550Dx instrument. The hard drive is intended for temporary storage before data are transferred automatically. Any data saved on the hard drive beyond the current run fills the hard drive and prevents subsequent runs until space is made available.

An internet connection is required for the following operations:

- Connect to Illumina BaseSpace Sequence Hub.
- Install updates to the NextSeq 550Dx Operating Software (NOS) from the instrument interface.
- [Optional] Upload instrument performance data.
- [Optional] Remote assistance from Illumina Technical Support.

Network Connections

Use the following recommendations to install and configure a network connection:

- Use a dedicated 1 Gb connection between the instrument and your data management system. This connection can be made directly or through a network switch.
- Required bandwidth for a connection is:
 - 50 Mb/s per instrument for internal network transfers.
 - [Optional] 50 Mb/s per instrument for BaseSpace Sequence Hub network uploads.
 - [Optional] 5 Mb/s per instrument for performance data uploads.
- Switches must be managed.
- Network equipment such as switches must have a minimum of 1 Gb/s.
- Calculate the total capacity of the workload on each network switch. The number of connected instruments and ancillary equipment such as a printer can impact capacity.

Use the following recommendations to install and configure a network connection:

- If possible, isolate sequencing traffic from other network traffic.
- Cables must be CAT 5e or better. A shielded CAT 5e network cable of 3 meters (9.8 feet) in length is provided with the instrument for network connections.
- Configure Windows Updates to prevent automatic updates.
- If you are using BaseSpace, use a minimum network connection of 10 Mb/s.

Network Support

Illumina does not install or provide technical support for network connections.

Review network maintenance activities for potential compatibility risks with the Illumina instrument, including the following risks:

- Removal of the Group Policy Objects (GPOs)—GPOs can affect the operating system (OS) of
 connected Illumina resources. OS changes can disrupt the proprietary software in Illumina systems.
 Illumina instruments have been tested and verified to operate correctly. After connecting to domain
 GPOs, some settings might affect the instrument software. If the instrument software operates
 incorrectly, consult your facility IT administrator about possible GPO interference.
- Activation of Windows Firewall
 —Windows Firewall is configured with protections necessary for
 Illumina software to operate in a secure environment and should be enabled instead of third-party
 AV/AM firewalls where possible.
- Changes to the privileges of preconfigured users—Maintain existing privileges for preconfigured users. Make preconfigured users unavailable as needed.
- **Potential IP address conflicts**—The NextSeq 550Dx has fixed internal IP addresses, which can cause system failure if there are conflicts.
- Server Message Block (SMB) file sharing—SMB v1 is disabled by default. To enable, contact Illumina Technical Support.

Internal Connections

| Connection | Value | Purpose |
|------------|-----------------------------|--|
| Domain | localhost:* | All ports for localhost-to-localhost communication, which are needed for interprocess communication. |
| IP Address | 192.168.113.*:* (or */*) | Allow all ports. Communication link with firmware on the network card. If using a proxy server, the following IPs addresses must be reserved: 192.168.113.5 and 192.168.113.2. For more information, contact Illumina Technical Support. |

| Connection | Value | Purpose |
|------------|-----------|--|
| Port | 80 443 | Local Run Manager |
| | 8081 | Real-Time Analysis |
| | 8080 | NextSeq 550Dx Operating Software (NOS) |
| | 29644 | Universal Copy Service (UCS) |

Outbound Connections

| Connection | Value | Purpose |
|------------|---|--|
| Domain | s3-external- 1.amazonaws.com s3.amazonaws.com *.basespace.illumina.com | BaseSpace Sequence Hub or Illumina Proactive |
| Port | 443 | BaseSpace Sequence Hub or Illumina Proactive |
| | 80 | BaseSpace Sequence Hub or Illumina Proactive |
| | 8080 | Software updates |

Operating System Configurations

Illumina instruments are tested and verified to operate within specifications before shipping. After installation, changes to settings can create performance or security risks.

The following configuration recommendations mitigate performance and security risks for the operating system:

- Configure a password that is at least 10 characters and use local ID policies for additional guidance. Keep a record of the password.
 - Illumina does not keep customer login credentials, and unknown passwords cannot be reset.
 - An unknown password requires that an Illumina representative restore the factory default, which removes all data from the system and extends the necessary support time.
- When connecting to a domain with Group Policy Objects (GPOs), some settings might affect the operating system or instrument software. If the instrument software operates incorrectly, consult your facility IT administrator about possible GPO interference.
- Use the Windows firewall or a network firewall (hardware or software) and disable the Remote Desktop Protocol (RDP).

- Maintain administrative privileges for users. Illumina instrument software is configured to allow user permissions when the instrument is shipped.
- The system has fixed internal IP addresses, which can cause system failure when conflicts occur.
- The control computer is designed to operate Illumina sequencing systems. Web browsing, checking
 email, reviewing documents, and other nonsequencing activity creates quality and security
 problems.

Services

NOS and Local Run Manager software utilize the following services:

- Illumina Local Run Manager Analysis Service
- Illumina Local Run Manager Job Service
- Illumina Universal Copy Service

By default, the services use the same credentials as those for logging in to the NextSeq 550Dx. To change credentials in Local Run Manager, see Specify Service Account Settings in the NextSeq 550Dx Instrument Reference Guide (document # 1000000009513).

Drive Mapping

Do not share any drives or folders from the instrument.

Map drives using Server Message Block (SMB) v2 or later or Network File System (NFS).

In the operating software, use the full UNC path for run output.

Windows Updates

To secure your data, it is recommended that all Windows critical security updates are applied on a regular schedule. The instrument must be idle when updates are applied as some updates require a full system reboot. General updates can put the system operating environment at risk and is not supported.

If security updates are not possible, alternatives to turning on Windows Update include:

- More robust firewalling and network isolation (virtual LAN).
- Network isolation of network attached storage (NAS), which still allows for data to sync to the network.
- Local USB storage.
- User behavior and management to avoid improper use of the control computer and ensure the appropriate permission-based controls.

For more information on Windows Update alternatives, contact Illumina Technical Support.

Third-party Software

Illumina does not support software beyond what is provided at installation. Do not install Chrome, Java, Box, or any other third-party software that was not provided with the system.

Third-party software is untested and can interfere with performance and security. For example, RoboCopy or other synchronization and streaming programs can cause corrupt or missing sequencing data because it interferes with streaming performed by the control software suite.

User Behavior

The instrument control computer is designed to operate Illumina sequencing systems. Do not consider it a general-purpose computer. For quality and security reasons, do not use the control computer for web browsing, checking email, reviewing documents, or other unnecessary activity. These activities can result in degraded performance or loss of data.

Storage Requirements for BaseSpace Sequence Hub

Based on run size, BaseSpace Sequence Hub requires the following storage per run:

Table 2 NextSeq 550Dx System Performance Parameters

| Flow Cell Configuration | Read Length | Output | Required Input |
|---|----------------|------------|------------------|
| High output flow cell, up to 400 M single reads | 2 x 150 bp | 100-120 Gb | 100 ng–1 µg with |
| and up to 800 M paired-end reads. | 2 x 75 bp | 50-60 Gb | TruSeq Library |
| | 1 x 75 bp | 25-30 Gb | Prep Kits |
| Mid-output flow cell, up to 130 M single reads | 2 x 150 bp | 32-39 Gb | - |
| and up to 260 M paired-end reads. | 2 x 75 bp | 16-19 Gb | - |

User-Supplied Consumables and Equipment

The following consumables and equipment are used on the NextSeq 550Dx instrument. For more information, see the NextSeq 550Dx Instrument Reference Guide (document # 100000009513).

Consumables for Sequencing

| Consumable | Supplier | Purpose |
|---|---|--|
| Alcohol wipes, 70% Isopropyl or Ethanol, 70% | VWR, catalog # 95041-714 (or equivalent) General lab supplier | Flow cell cleaning and general purpose |
| Lab tissue, low-lint | VWR, catalog # 21905-026 Flow cell cleaning (or equivalent) | |

Consumables for Maintenance and Troubleshooting

| Consumable | Supplier | Purpose |
|--|---|--|
| NaOCI, 5% (sodium hypochlorite) | Sigma-Aldrich, catalog # 239305 (or laboratory-grade equivalent) | Washing the instrument using the manual post-run wash; diluted to 0.12% |
| Tween 20 | Sigma-Aldrich, catalog # P7949 | Washing the instrument using manual wash options; diluted to 0.05% |
| Water, laboratory-grade | General lab supplier | Washing the instrument (manual wash) |
| Reagent or spectrophotometric-grade methanol or isopropyl alcohol (99%), 100 ml bottle | General lab supplier | Cleaning optics components periodically and support the objective cleaning cartridge |
| Air filter | Illumina, catalog # 20063988 | For instruments with an air filter accessible from the rear panel. Cleaning the air the instrument takes in for cooling. |

Guidelines for Laboratory-Grade Water

Always use laboratory-grade water or deionized water to perform instrument procedures. Never use tap water. Use only the following grades of water or equivalents:

- Deionized water
- Illumina PW1
- 18 Megohms (MΩ) water
- Milli-Q water
- Super-Q water
- Molecular biology grade water

Equipment

| Item | Source | Purpose |
|-------------------------------------|----------------------|-------------------------|
| Freezer, -25°C to -15°C, frost-free | General lab supplier | Storing the cartridge |
| Ice bucket | General lab supplier | Setting aside libraries |
| Refrigerator, 2°C to 8°C | General lab supplier | Storing the flow cell |

Revision History

| Document | Date | Description of Change |
|---------------------------------|------------------|--|
| Document # 1000000009869 v07 | April 2023 | Updated Antivirus Software and Network Support sections to comply with TruSight Oncology Comprehensive Assay Software cybersecurity requirements. |
| | | Updated <i>Network and Computer Security</i> with a link to the Support Site's Security and Networking page. |
| | | Updated Consumables for Maintenance and Troubleshooting with new air filter PN 20063988, replaced PN 20022240. |
| | | Updated the regulatory markings on the back cover. |
| Document # 1000000009869 v06 | August 2021 | Updated EU Authorized Representative address. |
| Document # 1000000009869 v05 | November 2020 | Updated Network Considerations, Network Support, Internal Connections, Outbound Connections, OS Configurations, and Antivirus Software sections for Windows 10, Local Run Manager, and BaseSpace Sequence Hub compatibility changes. Updated and added BSSH domains. Added new Services and Storage Requirements for BaseSpace Sequence Hub section. Added BaseSpace Sequence Hub information throughout guide for use with RUO mode. Added Vibration element to Environmental Considerations table and updated Vibration Guidelines section. Removed reference to the Illumina Security Best Practices guide. |
| Document # 1000000009869 v04 | December 2019 | Updated EU Authorized Representative address. Updated Australian Sponsor address. |
| Document # 1000000009869 v03 | March 2019 | Corrected formatting for bandwidth requirement speed. |

| Document | Date | Description of Change |
|---------------------------------|------------------|--|
| Document # 1000000009869 v02 | January 2019 | Added information for NextSeq 550Dx High Output Flow Cell Cartridges v2.5 (300 cycles). Updated installation instructions to note that USB port access is required. Corrected UPS specifications for use in Japan. |
| Document # 1000000009869 v01 | August 2018 | Updated regulatory markings. |
| Document # 1000000009869 v00 | November 2017 | Initial release. |

Technical Assistance

For technical assistance, contact Illumina Technical Support.

Website: www.illumina.com

Email: techsupport@illumina.com

Safety data sheets (SDSs)—Available on the Illumina website at support.illumina.com/sds.html.

Product documentation—Available for download from support.illumina.com.



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