

# HiSeq 4000 and HiSeq 3000 Systems

## Site Prep Guide

For Research Use Only. Not for use in diagnostic procedures.

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## Introduction

This guide provides specifications and guidelines for preparing your site for installation and operation of the Illumina® HiSeq® 4000 system or HiSeq 3000 system.

- ▶ Laboratory space requirements
- ▶ Electrical requirements
- ▶ Environmental constraints
- ▶ Computing requirements

## Additional Resources

The following documentation is available for download from the Illumina website.

Resource	Description
<i>Custom Protocol Selector</i>	A wizard for generating customized end-to-end documentation that is tailored to the library prep method, run parameters, and analysis method used for the sequencing run.
<i>HiSeq 4000 and HiSeq 3000 Systems Safety and Compliance Guide (document # 15066491)</i>	Provides information about instrument labeling, compliance certifications, and safety considerations.
<i>HiSeq 4000 System Guide (document # 15066496)</i>	Provides an overview of HiSeq 4000 components and software, instructions for performing sequencing runs, and procedures for proper instrument maintenance and troubleshooting.
<i>HiSeq 3000 System Guide (document # 15066493)</i>	Provides an overview of HiSeq 3000 components and software, instructions for performing sequencing runs, and procedures for proper instrument maintenance and troubleshooting.

Visit the HiSeq 4000 or HiSeq 3000 support page on the Illumina website for access to documentation, software downloads, online training, and frequently asked questions.

## Delivery and Installation

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



### 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.

## Crate Dimensions and Contents

The HiSeq instrument and components are shipped in 3 crates. Use the following dimensions to determine the minimum door width required to accommodate the shipping crates.

- ▶ Crate #1 contains the instrument.
- ▶ Crate #2 contains an uninterruptible power supply (Japan, North America, or an international version).
- ▶ Crate #3 contains the following items:
  - ▶ Instrument control computer, monitor, and monitor arm
  - ▶ Waste bottle and reagent racks
  - ▶ Instrument panels
  - ▶ Power cords—1 domestic power cord or 3 international power cords (UK, EU, and China)

Measurement	Crate #1: Instrument	Crate #2: UPS	Crate #3: Computer, Covers, and Power Cords
Width	165 cm (65 in)	78 cm (31 in)	115 cm (45 in)
Height	122 cm (48 in)	51 cm (20 in)	102 cm (40 in)
Depth	107 cm (42 in)	61 cm (24 in)	82 cm (32 in)
Weight	317 kg (698 lb)	81 kg (177 lb)	125 kg (265 lb)

## Laboratory Requirements

Use the following specifications and guidelines to determine required lab space.

### Instrument Dimensions

The instrument and instrument control computer have the following dimensions after installation.

Dimension	Instrument	Instrument Control Computer
Width	118.6 cm (46.7 in) The waste bottle extends an additional 10 cm (4.0 in) on the right side of the instrument.	18 cm (7.0 in)
Height	94 cm (37.0 in) minimum The instrument height is adjustable to an additional 1.27 cm (0.5 in).	45 cm (17.7 in)
Depth	76 cm (30.0 in) The keyboard tray extends an additional 19 cm (7.5 in) from the front panel.	28 cm (11.0 in)
Weight	226 kg (498 lb)	34 kg (75 lb)

### Placement Requirements

The following requirements ensure access to the instrument power switch and power outlet, allow proper ventilation, and provide sufficient access for servicing the instrument.

- ▶ Position the instrument so that personnel can reach around the right-side of the instrument to turn on or turn off the power switch on the back panel adjacent to the power cord.
- ▶ 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 using the following minimum clearance dimensions.

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.
Top	Allow at least 61 cm (24 in) above the instrument. If the instrument is positioned under a shelf, make sure that the minimum clearance requirement is met.

### Lab Bench Guidelines for the HiSeq

Place the HiSeq on a mobile lab bench with locking casters and a bottom shelf capable of supporting the instrument control computer. The bench must support the weight of the instrument and instrument control computer.

Width	Height	Depth	Locking Casters
152.4 cm (60 in)	76.2–91.4 cm (30–36 in)	76.2 cm (30 in)	Yes

For North American customers, Illumina recommends the following mobile lab benches: Bench-Craft ([www.bench-craft.com](http://www.bench-craft.com)), part # HS-30-60-30 P2 with casters or part # HS-30-60-36 P2 with casters.

- ▶ **HS** indicates standard bench
- ▶ **30-60-30** indicates 30 inch wide x 60 inch long x 30 inch high
- ▶ **30-60-36** indicates 30 inch wide x 60 inch long x 36 inch high
- ▶ **P2** indicates outlets on rear of bench

You can order any of the following casters for use with either of the recommended lab benches.

Caster	Supplier
Zinc casters	Bench-Craft, part # C-ML4**TPS
Medical-grade composite casters	Bench-Craft, part # PZT40120GR-TPR33(GG)
Stainless steel casters	Bench-Craft, part # 94-20-DADI-M-PO-SS-TL

## Vibration Guidelines

Use the following guidelines to minimize vibrations during sequencing runs and ensure optimal performance:

- ▶ Place the instrument on a sturdy immobilized lab bench.
- ▶ Do not install the instrument near frequently used doors. Opening and closing of doors might induce vibrations.
- ▶ Do not install a keyboard tray that hangs below the bench.
- ▶ Do not place other equipment on the bench that can produce vibrations, such as a shaker, vortexer, centrifuge, or instruments with heavy fans.
- ▶ Do not place objects on top of the instrument.

## Electrical Requirements

The following specifications describe electrical requirements for operating the instrument.

### Power Specifications

Type	Specification
Line Voltage	100–240 VAC at 50–60 Hz
Power Consumption	Maximum 1500 Watts combined for the instrument, monitor, and work station

### Receptacles

Your facility must be wired with the following equipment.

- ▶ **For 100–120 Volts AC**—A 20-amp grounded dedicated line with proper voltage and electrical ground is required.  
North America and Japan—Receptacle: NEMA 5-20  
Interpower Corp. Receptacle, part # 88030080 (or equivalent)
- ▶ **For 200–240 Volts AC**—At minimum, 10-amp grounded line with proper voltage and electrical ground is required. Use a higher rating as needed according to requirements for your region.
- ▶ 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 is equipped with an international standard IEC 60320 C13 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](http://www.interpower.com)).



#### CAUTION

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

### Fuses

Only Illumina field personnel are qualified to replace internal fuses. The power entry module includes 2 input fuses on the high-voltage input lines. The fuses are size 5x20 and rated for 10 Amps, 250 VAC, Slo-Blo.

## Uninterruptible Power Supply

The instrument is shipped with a region-specific uninterruptible power supply (UPS).

- ▶ **Japan**—APC SmartUPS 2200VA Model SUA2200JB
- ▶ **North America**—APC SmartUPS 2200VA Model SUA2200XL
- ▶ **International**—APC SmartUPS 2200VA Model SUA2200XLI

Specification	Japan	North America	International
Maximum Watts	1980 W	1800 W	1980 W
Maximum Current	2200 VA	1920 VA	2200 VA
Input Voltage (nominal)	100 VAC	120 VAC	230 VAC
Input Connection	NEMA L5-30P	NEMA 5-20P	IEC-320 C20 Schuko CEE 7/EU1-16P British BS1363A
Typical Run Time (50% load)	24 minutes	28 minutes	25 minutes
Typical Run Time (100% load)	7 minutes	11 minutes	10 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](http://www.interpower.com)).



### NOTE

The UPS *cannot* maintain the instrument during an extended power outage. Illumina recommends that the UPS receptacle is connected to a backup electrical source, such as a generator, to ensure minimal loss of data during an extended power outage.



## Environmental Considerations

Element	Specification
Temperature	Maintain a lab temperature of 19°C to 25°C (22°C $\pm$ 3°C). This temperature is the operating temperature of the instrument. During a run, do not allow the ambient temperature to vary more than $\pm$ 2°C.
Humidity	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.

### Noise Output

Noise output is 65 dB when standing 1 meter (3.3 feet) from the front of the instrument.

### Heat Output

Measured power is 1000 Watts for the combined instrument, computer, and monitor under normal operating conditions. Thermal output is 3400 BTU/hour.



#### CAUTION

Do not operate the HiSeq with any of the panels removed. Do not touch the temperature station in the imaging compartment. The Peltier effect heater used in the stage area is normally controlled between ambient room temperature (22°C) and 85°C. Exposure to temperatures at the upper end of this range could result in burns.

## Instrument Control Computer

The instrument is shipped with an instrument control computer that is customized to the latest system requirements. Contact Illumina Technical Support for more information about the computer specifications.

The instrument control computer is a dedicated subsystem of the instrument and is not intended for use or supported as a general-purpose computer. Loading and using third-party software can result in slow processing, loss of data, or invalid data.

### Data Connections

The HiSeq has 5 connections to the controlling computer:

- ▶ One USB connection for communication between the instrument and the computer. A standard USB type A to type B style connector is used.
- ▶ Four low voltage differential signaling (LVDS) CameraLink connections for the 2 main cameras. Standard CameraLink cables are used. The cameras transfer raw data from the instrument to the computer.

### Antivirus Software

An antivirus software of your choice is highly recommended to protect the instrument control computer against viruses.

To avoid data loss or interruptions, configure the antivirus 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 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 drives from any real-time file system protection. Apply this setting to the C:\Illumina directory, D:\ drive, and E:\ drive.

## Network Considerations

Illumina does not provide installation or technical support for networking the instrument control computer. However, you can configure and maintain a network connection on the instrument control computer after installation of the instrument.

- ▶ Use a 1 gigabit connection between the instrument control computer and your data management system. This connection can be made directly or through a network switch.



### NOTE

Illumina does not recommend or support using a greater than 1 gigabit connection per instrument control computer, such as a Fiber Channel PCI card.

- ▶ If you are using BaseSpace, Illumina recommends the following minimum network connections.

BaseSpace Use During Run	Minimum Network Connection
Data transfer of base call (BCL) files	100 Mbps
Send instrument health and run monitoring only	1 Mbps

- ▶ Upon connection to a network, configure Windows Update so that system does not update automatically. Illumina recommends waiting 1 month after a Windows release before allowing an update.

## Network Support

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

Review network maintenance activities for potential compatibility risks with the Illumina system, 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 and Windows Defender**—These Windows products can affect the OS resources used by Illumina software. Install antivirus software to protect the instrument control computer.
- ▶ **Changes to the privileges of preconfigured users**—Maintain existing privileges for preconfigured users. Make preconfigured users unavailable as needed.

## Multiple Instruments

- ▶ Make sure that the server drive is sufficient for the high volume of data being transferred from multiple instruments. Consider setting up the instruments to copy to different servers.
- ▶ Make sure that the connection to analysis servers is sufficient for the high volume of data being transferred from multiple instruments. Consider setting up the

instruments to use different connections or use a higher bandwidth link for the shared connection, such as 10 gigabit.

## User-Supplied Consumables and Equipment

The following user-supplied consumables and equipment are required for a sequencing run on the HiSeq. For more information, see the system guide for your instrument.

### User-Supplied Consumables

Consumable	Supplier	Purpose
Alcohol wipes, 70% Isopropyl or Ethanol, 70%	VWR, catalog # 95041-714 General lab supplier	Cleaning the flow cell and flow cell stage.
Carboy, at least 6 liters	General lab supplier	Preparing maintenance wash solution.
Centrifuge tubes, 250 ml	Corning, catalog # 430776	SBS reagent racks, positions containing PW1. Instrument wash.
Conical tubes, 15 ml	Corning, catalog # 430052	PE reagent racks, positions containing PW1. Instrument wash. Collecting and measuring waste volumes.
Disposable gloves, powder-free	General lab supplier	General use.
Lab tissue, low-lint	VWR, catalog # 21905-026	Cleaning the flow cell holder.
Lens paper, 4 x 6 in	VWR, catalog # 52846-001	Cleaning the flow cell.
ProClin 300, 50 ml	Sigma-Aldrich, catalog # 48912-U	Maintenance wash.
Tween 20, viscous liquid, 100 ml	Sigma-Aldrich, catalog # P7949	Maintenance wash.
Tweezers, square plastic tip	McMaster-Carr, catalog # 7003A22	Removing the flow cell gaskets.
Water, laboratory-grade, 18 MΩ	Millipore	SBS and PE reagent racks, positions containing PW1. Instrument wash.

### 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

### User-Supplied Equipment

Item	Source
Balance, top-loading, digital, 420 g capacity	Sartorius, Model CPA423S (or similar)

Item	Source
Bottle rack, 6-position 250 ml centrifuge tube, epoxy-coated	LabScientific, catalog # CBR 200
Freezer, -25°C to -15°C	General lab supplier
Ice bucket	General lab supplier
Refrigerator, 2°C to 8°C	General lab supplier
Stir bar, large	General lab supplier
Stir plate	General lab supplier
Tweezers, square-tip plastic	McMaster-Carr, catalog # 7003A22 (or similar)

## Revision History

Document	Date	Description of Change
Document # 15066492 v04	January 2017	Removed Sigma-Aldrich catalog # SRE0076 for SeqClin Wash Solution. If you cannot obtain ProClin due to its restricted use for IVD, use the alternative maintenance wash that does not require ProClin 300.
Document # 15066492 v03	September 2016	Added Custom Protocol Selector to Additional Resources. Added Sigma-Aldrich catalog # SRE0076 for SeqClin Wash Solution.
Document # 15066492 v02	February 2016	Updated lab bench guidelines to include an additional lab bench option and casters for either bench option. Updated guidelines for laboratory-grade water to include deionized water as an acceptable form of water for performing instrument procedures.
Document # 15066492 v01	September 2015	Removed self-standing conical tubes and pipette tips from user-supplied consumables. Corrected the weight and crated weight of the instrument. Corrected the specifications for heat output.
Document # 15066492 Rev. A	February 2015	Initial release.

## Notes



## Technical Assistance

For technical assistance, contact Illumina Technical Support.

**Table 1** Illumina General Contact Information

<b>Website</b>	www.illumina.com
<b>Email</b>	techsupport@illumina.com

**Table 2** Illumina Customer Support Telephone Numbers

Region	Contact Number	Region	Contact Number
North America	1.800.809.4566	Japan	0800.111.5011
Australia	1.800.775.688	Netherlands	0800.0223859
Austria	0800.296575	New Zealand	0800.451.650
Belgium	0800.81102	Norway	800.16836
China	400.635.9898	Singapore	1.800.579.2745
Denmark	80882346	Spain	900.812168
Finland	0800.918363	Sweden	020790181
France	0800.911850	Switzerland	0800.563118
Germany	0800.180.8994	Taiwan	00806651752
Hong Kong	800960230	United Kingdom	0800.917.0041
Ireland	1.800.812949	Other countries	+44.1799.534000
Italy	800.874909		

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

**Product documentation**—Available for download in PDF from the Illumina website. Go to [support.illumina.com](http://support.illumina.com), select a product, then select **Documentation & Literature**.



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