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Illumina DRAGEN Server for NextSeq 550Dx

Product Documentation

ILLUMINA PROPRIETARY
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FOR IN VITRO DIAGNOSTIC USE.

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Overview

This resource provides instructions for operating the Illumina® DRAGEN Server™, including preparing your site for delivery and installation.

Use the following specifications and guidelines to prepare your facility:

- Space requirements
- Electrical requirements
- Environmental considerations
- Computing requirements
- Network considerations
- Required Components

Site Preparation

This section provides specifications and guidelines for preparing your site for installation and operation of the DRAGEN Server.

- Laboratory space requirements
- Electrical requirements
- Environmental considerations

Delivery and Setup

The DRAGEN Server is unpacked and installed by an Illumina authorized service provider. The space must be ready before delivery.

Box Dimensions

Use the following dimensions to determine transport, setup, and storage plans.

Measurement	Dimension
Height	29.5 cm (11.6 in)
Width	62 cm (24.4 in)
Depth	96 cm (37.8 in)
Weight	34.8 kg (77 lb)

Shipping Box Components

The DRAGEN Server and components are shipped in one box. The following components are included:

- Power cord, country-specific
- DRAGEN Server license USB key
- Rack mount rails - 80 cm (31.5 in) length
- Rack mount screws
- Two SFP+ transceivers

Facility Requirements

Use the specifications and requirements provided in this section to set up your lab space.

Equipment Dimensions

Measurement	Dimension
Height	8.8 cm (3.46 in)
Width	43.8 cm (17.24 in)
Depth	76.0 cm (29.924 in)
Weight	23 kg (50.7 lb)

Rack Requirements

Measurement	Dimension
Minimum Depth	60.95 cm (25 in)
Maximum Depth	89.7 cm (35.4 in)

CAUTION

If the rack is shorter than the length of the server (29.9 in) or the rails (31.5 in), the server and rails will extend beyond the length of the rack. To avoid interference with power and cable management, and to make sure the rack closes properly, use a rack with a depth of at least 29 in.

Placement Requirements

Position the DRAGEN Server to allow proper ventilation, access to one power outlet, and access for servicing.

- Allow a rack height of at least 2U.
- Make sure that there is one standard pocket outlet within 3 m (10 ft) of the server.
- Position the instrument so personnel can quickly disconnect the power cords from the outlets.

Electrical Requirements

Power Specifications

Type	Specification
Line voltage	100–240 VAC at 47/63 Hz
Peak power consumption	750 watts

Type	Specification
Power supply rating	2000 watts at 100%

For 100–240 Volts AC, your facility must be wired with a minimum 15 amp grounded line with proper voltage. An electrical ground is required. If the voltage fluctuates more than 10%, a power line regulator is required.

The server must be connected to a dedicated circuit that must not be shared with any other equipment.

Receptacles

Your facility must be wired with the following receptacles:

- For 100–110 Volts AC—Two 10 amp grounded, dedicated lines with proper voltage and electrical ground.
- For 220–240 Volts AC—Two 6 amp grounded lines with proper voltage and electrical ground.
- North America and Japan—NEMA 5-15.
- If the voltage fluctuates more than 10%, power line regulators are required.

Protective Earth

The DRAGEN Server 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. To obtain equivalent receptacles or power cords that comply with local standards, consult a third-party supplier such as Interpower Corporation (`www.interpower.com`). All power cords are 2.5 m (8 ft) in length.

Hazardous voltages are removed from the instrument only when the power cord is disconnected from the AC power source. Position the server so that you can quickly disconnect the power cord from the outlet.

CAUTION

To avoid power surges, use an extension cord to connect the instrument to a power supply.

Fuses

The server contains no user-replaceable fuses.

Environmental Considerations

The following table specifies temperature, humidity, and other environmental considerations for safely housing the instrument.

Element	Specification
Temperature	Maintain a server room temperature of 0°C to 35°C. This temperature is the operating temperature of the DRAGEN Server. Do not allow the ambient temperature to vary by more than ±2°C.
Humidity	Maintain a noncondensing relative humidity between 10–85%.
Altitude	Locate the DRAGEN Server at an altitude below 2,000 m (6,500 ft).
Air Quality	Operate the server in a data center environment with air filtration per ISO 14644-1 Class 8 with a 95% upper confidence limit.
Ventilation	Consult your facilities department for ventilation requirements sufficient for the level of heat output expected from the DRAGEN Server.
Location	Operate the server in an indoor environment only. The server is not suitable for use in locations where children are likely to be present. The server is intended for use in a server room.

Heat Output

Measured Power	Thermal Output
800 Watts	2800 BTU/hr

Noise Output

Acoustical Performance	Noise Output (dB)	Distance from Server
Idle @ 25°C ambient	70	1 m (3.3 ft)
Maximum load @ 25°C ambient	76	1 m (3.3 ft)

Uninterruptible Power Supply

Illumina recommends using a user-supplied uninterruptible power supply (UPS).

Illumina is not responsible for data loss caused by interrupted power, regardless of whether the DRAGEN Server is connected to a UPS. Standard generator-backed power is often not uninterruptible, so a brief power outage occurs before power resumes. This power outage interrupts analysis and data transfer.

The following table shows three example recommended UPS models for the DRAGEN Server.

Specification	North America APC Model # SMT3000RM2U	Japan APC Model # SMT3000RMJ2U	International APC Model # SMT3000RMI2U
Maximum Output Capacity	2700 W 2880 VA	2400 W 2400 VA	2700 W 3000 VA
Input Voltage (Nominal)	120 VAC	100 VAC	230 VAC
Input Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Input Connection	NEMA L5-30P	NEMA L5-30P	BS1363A British IEC 320 C20 Schuko CEE 7 / EU1-16P
Built-In UPS Output Receptacles	3xNEMA 5-15R 3xNEMA 5-20R 1xNEMA L5-30R	3xNEMA 5-15R 3xNEMA 5-20R 1xNEMA L5-30R	8xIEC 320 C13 3xIEC Jumpers 1xIEC 320 C19
Dimensions	8.5 cm x 43.2 cm x 66.7 cm (3.35 in x 17.01 in x 26.26 in)	8.7 cm x 43.2 cm x 66.7 cm	8.6 cm x 48 cm x 68.3 cm
Rack Height	2U	2U	2U
Weight	38.45 kg (84.77 lb)	39 kg	44.28 kg
Typical Run Time (at 500 Watt Average Draw)	58 minutes	40 minutes	38 minutes

Required Components

This section provides information on the components required before installation. Make sure that you have all the components and your facility meets the requirements.

The following components are not included with the DRAGEN Server and are required to set up the server:

- Monitor with a VGA input
- VGA cable
- Keyboard with a USB input

Safety & Compliance

This section provides important safety information pertaining to the installation and operation of the DRAGEN Server. This section includes product compliance and regulatory statements. Read this section before performing any procedures on the server.

The country of origin and date of manufacture of the server are printed on the server label.

Safety Considerations and Markings

This section identifies potential hazards associated with installing, servicing, and operating the DRAGEN Server. Do not operate or interact with the DRAGEN Server in a manner that exposes you to any of these dangers.

General Safety Warnings

Make sure that all personnel are trained in the correct operation of the DRAGEN Server and any potential safety considerations.

Follow all operating instructions when working in areas marked with this label to minimize risk to personnel or the DRAGEN Server.

Electrical Safety Warnings

Do not remove the outer panels from the DRAGEN Server. There are no user-serviceable components inside. Operating the DRAGEN Server with any of the panels removed creates potential exposure to line voltage and DC voltages.

Compliance and Regulatory Markings

The DRAGEN Server is labeled with the following compliance and regulatory markings.

This label assures that the product is tested and certified by TUV Rheinland, a Nationally Recognized Testing Laboratory (NRTL).

This label assures that the product meets the essential requirements of all relevant EU directives.

This label assures that the product complies with the Environmental Protection Use Period - 10 years.

Waste Electrical & Electronic Equipment (WEEE)

This label indicates that the instrument meets the WEEE Directive for waste.

Visit support.illumina.com/certificates.html for guidance on recycling your equipment.

Product Certifications and Compliance

The DRAGEN Server is compliant with the following directives:

- EMC 2014/30/EU
- Low Voltage 2014/35/EU
- ROHS 2011/65/EU and 2015/863
- ErP 2009/125/EC

The complete EU declarations of conformity and certificates of compliance are available on the Illuminawebsite at support.illumina.com/certificates.html.

EMC Considerations

This equipment has been designed and tested to the CISPR 11 Class A standard. In a domestic environment, it might cause radio interference. If radio interference occurs, you might need to mitigate it.

Do not use the device in close proximity to sources of strong electromagnetic radiation, which can interfere with proper operation.

Evaluate the electromagnetic environment before operating the device.

Configuration Settings

You can configure the following settings for the DRAGEN Server:

- Security
- Networking
- Baseboard management controller

Security and Safety

The DRAGEN Server is designed to resist attacks. Supplement this design with the following security recommendations:

- A secure internal LAN to prevent the distribution of data to all web browsers.
- Limited access to the DRAGEN Server to prevent the removal of the RAID controller, disk drives, and access to data. Booting in single-user mode allows access to the whole system.
- The DRAGEN Server is designed to analyze sequencing data. Do not consider it a general-purpose computer. Refer to *User Behavior* on page 11 for more information on appropriate use.
- It is recommended that you review Illumina's Security Best Practices at *Illumina Security and Networking* to keep your server secure. These best practices include, for example, enabling firewalls and using appropriate account settings.

Antivirus Software

Illumina does not recommend running any virus scanners on the DRAGEN Server. Virus scanners often impact the performance of High-Performance Computing (HPC) systems.

Restricted Ports and Authentication

Outbound Connections	lus.edicogenome.com port 80 license.dragen.illumina.com port 443
Inbound Connections	SSH: TCP port 22

Stack Overflow Protection

Modern processors disable coded execution in data sections of the program to address stack overflow attacks. By default, this feature is enabled.

User Behavior

The DRAGEN Server is designed for analyzing sequencing data. For quality and security reasons, the server should not be used for general-purpose computing such as web browsing, checking email, or running third-party software. These activities can result in degraded performance or data loss. Users should also avoid storing files on the scratch drive as it can impede the proper operation of the server.

Network Considerations

Before running tests, make sure that your network contains the required components and meets the network connection recommendations.

DRAGEN Server setup requires the following network components:

- Default gateway address
- DNS Server IP address
- IP address for data transmission
- IP address for Baseboard Management Controller (BMC), optional
- Subnet mask for the IP addresses

The following operations require an external internet connection using TCP on ports 80 and 443:

- Updating the software
- Access to license server

Network Connections

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

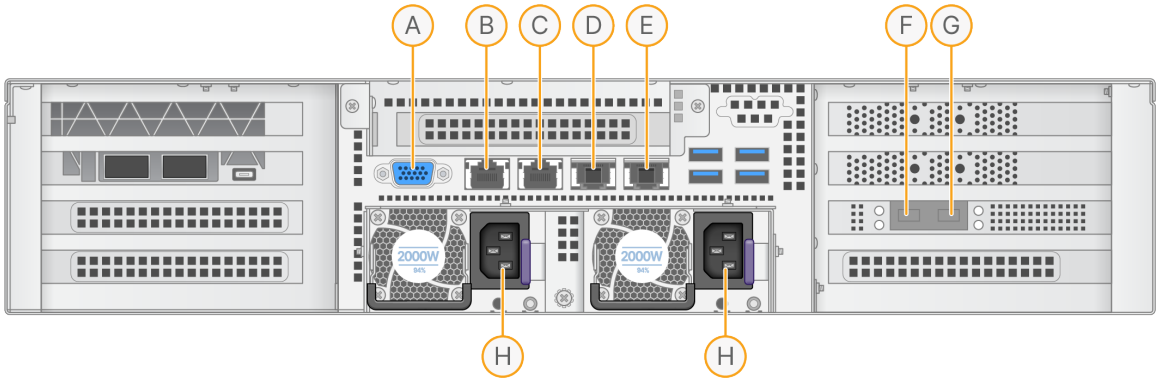
- Recommended bandwidth for a connection is 10 Gb per second.
- Switches and other network equipment must have a minimum of 10 Gb per second.
  - Calculate the total capacity of the workload on each network switch. The number of connected instruments and ancillary equipment, such as a printer, can impact capacity.
- For 10 Gb connections, SFP+ and RJ45 connections are supported. If using SFP+ ports, twinax cables or SFP+ transceivers are required. Validated transceivers include Intel and Finisar.
- Ask your IT professional to review network maintenance activities for potential compatibility risks with the system.

Network Configuration

A qualified Illumina field service representative configures the network. Contact Illumina Technical Support if changes are needed after server installation.

Server Ports

The following figure indicates the port location on the rear of the server for each cable required when installing the Illumina DRAGEN Server for NextSeq 550Dx.



A. VGA port (monitor)
B. 1 GB Ethernet port with interface name enp5s0 (BMC)
C. 1 GB Ethernet port with interface name enp4s0
D. 10 GB Ethernet port with interface name enp26s0f1
E. 10 GB Ethernet port with interface name enp26s0f0
F. 10 GB SFP+ port with interface name ens3f0
G. 10 GB SFP+ port with interface name ens3f1
H. Power supply inlets

Insert Cables

1. Using the VGA cable, attach the VGA monitor to the server VGA port.
2. Attach the USB keyboard to any open USB port.
3. Attach network cable RJ45 to network port D or E.

Set Server Time (Optional)

Synchronize Server Time to NTP Server

1. Log in as root.
2. Check if chrony daemon is running. Enter:

```
systemctl status chronyd
```

3. If the result from the previous command shows inactive or dead, enable the chrony daemon. Enter:

```
systemctl enable chronyd
```

4. To start the daemon, enter:

```
systemctl start chronyd
```

5. Edit /etc/chrony.conf using vi. Enter:

```
vi /etc/chrony.conf
```

6. Replace the default NTP server settings to the local NTP server.
   Original default settings:

```
server 0.centos.pool.ntp.org iburst
server 1.centos.pool.ntp.org iburst
server 2.centos.pool.ntp.org iburst
server 3.centos.pool.ntp.org iburst
```

   Settings to use local NTP server(s):

```
server 192.168.1.1 iburst
server 192.168.1.2 iburst
```

7. To save the file, enter:

```
:wq!
```

8. To restart the chrony daemon, enter:

```
systemctl restart chronyd
```

9. Check the health of the local time server as follows.

```
timedatectl
```

10. To make sure that DRAGEN Server can synchronize with the local NTP server, use one of the following commands:
    - chronyc tracking (Manual)
    - ntpdate (Automatic)

    The following is an example command:

```
ntpdate -q 192.168.1.1
```

Configure BMC (Optional)

You can connect to the Baseboard Management Controller (BMC) to provide remote monitoring and control for Illumina Technical Support. Refer to *Server Ports* on page 12 for the proper port to use.

CAUTION

Do not configure the BMC before Illumina Run Manager software is configured and initialized by your Field Personnel.

1. Log in as root user using the root password provided in the DRAGEN Server welcome email. If you have not received your sign in credentials, contact Illumina Customer Service.
2. If signing in for the first time, reset your password.
   Passwords must contain at least 10 alphanumeric characters and two special characters.
3. To use a static IP address, do as follows.
   a. Enter the following command:

   ```
   ipmitool lan set 1 ipsrc static
   ```

   b. To set the IP address, enter the following command:

   ```
   ipmitool lan set 1 ipaddr <IP address>
   ```

   c. To set the netmask, enter the following command:

   ```
   ipmitool lan set 1 netmask <netmask ID>
   ```

   d. To set the default gateway, enter the following command:

   ```
   ipmitool lan set 1 defgw ipaddr <gateway ID>
   ```

4. Enter the IP address into the web browser. You can sign in as an admin using the password printed on the back of the DRAGEN Server.

Access the Server Remotely (Optional)

To access your DRAGEN Server from a remote location, you must set your firewall zone to public and allow root login from SSH connections.

CAUTION

Configuring remote access allows any device on the network to access your server and exposes your server to security risks.

Set Firewall Zone

By default, the firewall is enabled and blocks all incoming connections. To allow remote SSH connections, run the following script:

```
/usr/local/bin/mfg_enable_network.sh
```

This script accomplishes the following steps:

- Sets firewall zone to public.
- Sets network interfaces to automatically start when the server is turned on.

- Allows users to log in via SSH.
- Reloads the SSHD configuration.
- Restarts the network manager service.

Allow Root Log in by SSH

WARNING

Enabling Root Log in by SSH introduces a significant cybersecurity risk to the device. Disable Root Log in by SSH after it is no longer required.

To access the Illumina DRAGEN Server for NextSeq 550Dx remotely, you must enable root log in by SSH connections. By default, root log in attempts from SSH connections are blocked.

1. Log in as root.
2. Open `nano /etc/ssh/sshd_config`.
3. Set `PermitRootLogin` to `yes`.
4. Restart sshd as follows.

```
systemctl restart sshd
```

Shut Down the Server

You can shut down the DRAGEN Server directly from the command line.

1. Log in as root.
2. To initiate system shutdown, enter the following command:

   ```
   poweroff
   ```

   Wait a few minutes until the server comes to a complete shutdown.

Resources & References

The Illumina DRAGEN Server for NextSeq 550Dx support pages on the Illumina support site provide additional resources. These resources include training, compatible products, and other considerations. Always check support pages for the latest versions.

Revision History

Document	Date	Description of Change
Document #200025560 v02	May 2025	Renamed document. Removed installation instructions.
Document #200025560 v01	December 2024	Updated: • CentOS note • Security and Safety recommendation • Set Server Time as optional • Configure BMC as optional • Access the Server Remotely as optional • Allow Root Log in by SSH Added: • Additional outbound port to Restricted Ports and Authentication • Set System Hostname • Set Server Time to Local Time Zone
200025560 v00	January 2023	Initial Release

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