EdgeXpert Series

Small Scale Server

MS-C931

User Guide

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Getting Started

This chapter provides you with the information on hardware setup procedures. While connecting devices, be careful in holding the devices and use a grounded wrist strap to avoid static electricity.

Package Contents

Small Scale Server	MS-C931
Documentation	Quick Start Guide
Accessories	USB PD Adapter
	Power Cord

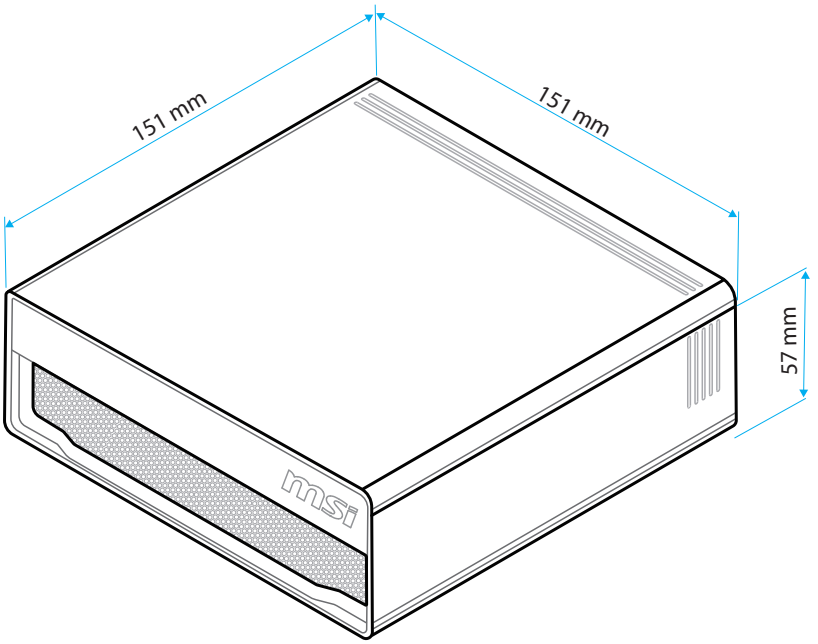
Important

- *Contact your place of purchase or local distributor if any of the items is damaged or missing.*
- *Package contents may vary by country and model.*
- *The included power cord is exclusively for this device and should not be used with other products.*

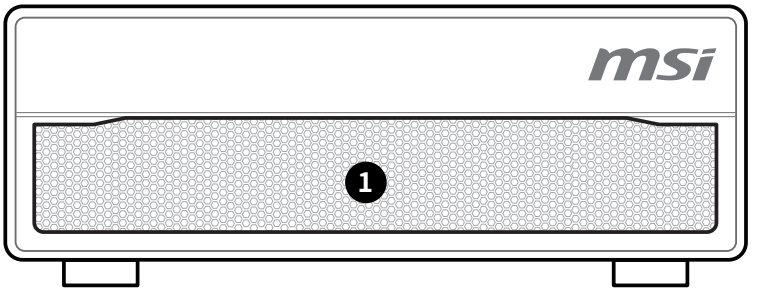
Safety & Comfort Tips

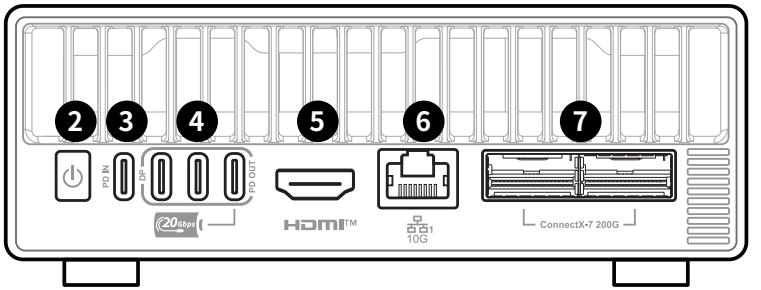
- Choosing a good workspace is important if you have to work with this device for a long period of time.
- Your work area should have enough illumination.
- Choose the proper desk and chair and adjust their height to fit your posture when operating.
- When sitting on the chair, sit straight and keep a good posture. Adjust the chair' s back (if available) to support your back comfortably.
- Place you feet flat and naturally on the floor, so that your knees and elbows have the proper position (about 90-degree) when operating.
- Put your hands on the desk naturally to support your wrists.
- Avoid using this device in a place where discomfort may occur (such as on the bed).
- This device is an electrical device. Please treat it with great care to avoid personal injury.

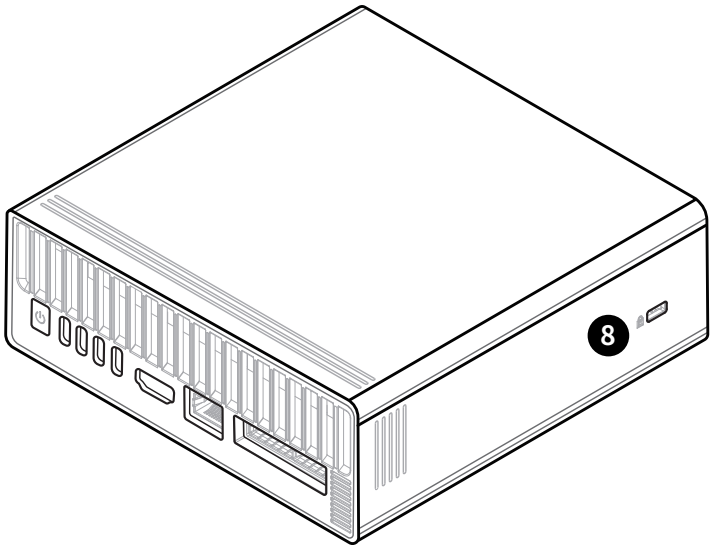
System Dimension



System Overview





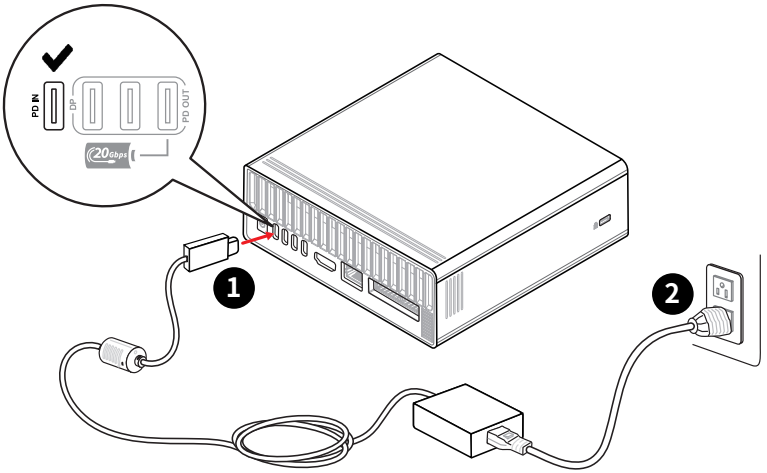


1	**Ventilator** The ventilator on the enclosure is used for air convection and to prevent the equipment from overheating. Do not cover the ventilator.
2	**Power Button** Press the power button to turn the system on and off.
3	**Power Jack** This jack supplies power to your system.
4	**USB 20Gbps Type-C Port** Each connector can provide up to 5V/3A of power, with a maximum combined output of 30W for three connected devices.
5	**HDMI™ Connector** Supports HDMI™ 2.1.
6	**10 Gbps LAN Jack** The standard RJ-45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.
7	**200 Gbps QSFP LAN Port** Use DAC/AOC cables to connect with compatible systems.
8	**Kensington Lock Port** This device provides a Kensington lock port, which allows users to secure the device in place with a key or some mechanical PIN device and attached through a rubberised metal cable. The end of the cable has a small loop which allows the whole cable to be looped around a permanent object, such as a heavy table or other similar equipment, thus securing the device in place.

Hardware Setup

Connect the Power Supply

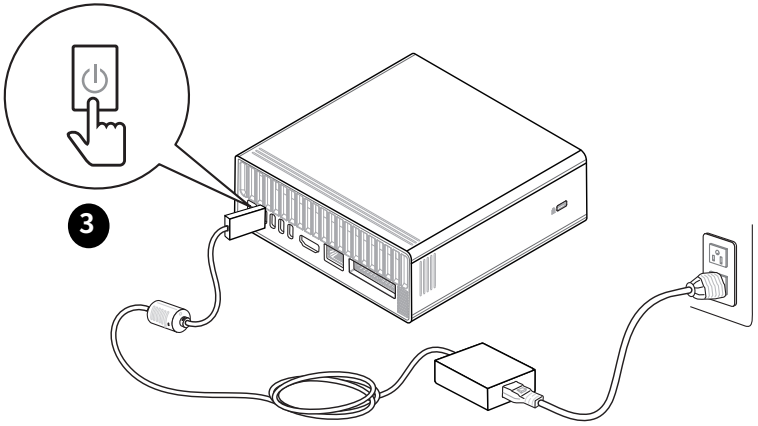
- External Power Supply: 240W, 48.0V
  - Input: 110~120Vac, 50/60Hz,3.5A / 200~240Vac, 50/60Hz,2.5A
  - Output: 48.0V ⎓ 5.0A



Important

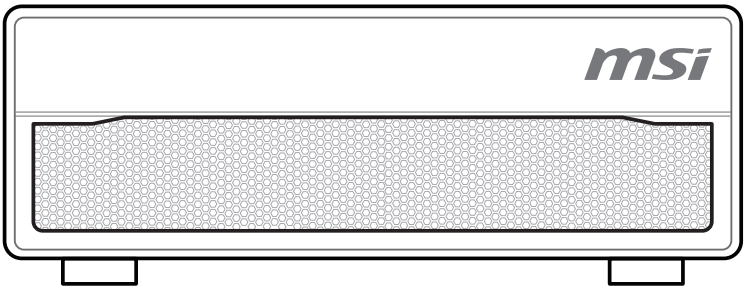
- *Use the adapter and power cord that shipped with your device only. Using a different or lower-rated power supply may result in reduced system performance, failure to boot or unexpected shutdown.*
- *Always be aware of heat coming from the in-use adapter.*
- *When unplugging the AC power cord, always hold the connector part of the cord. Never pull the cord directly.*

Power on the System



Placing the System

Users can place the system horizontally.

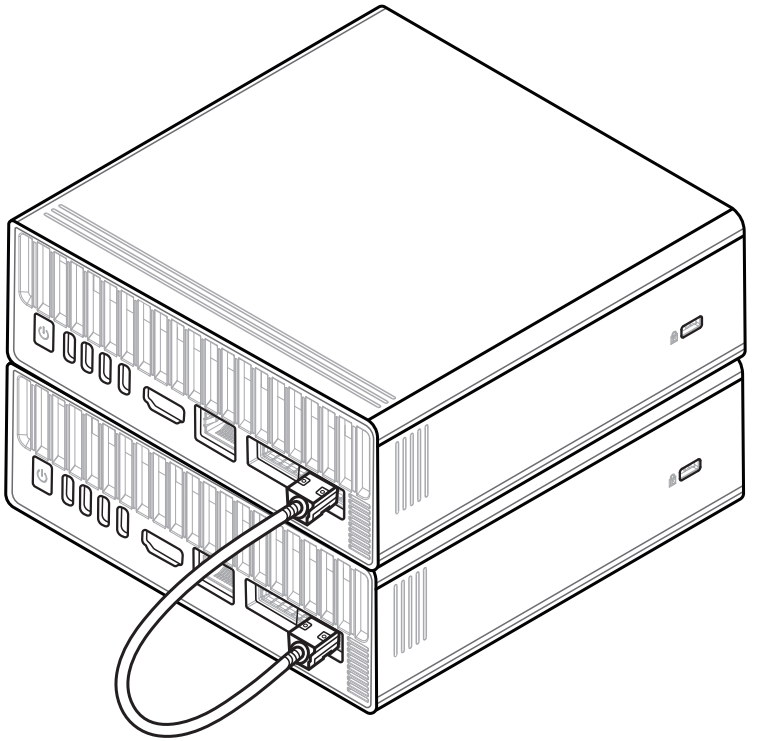


Stacking the System

Up to two systems can be stacked by using the optional QSFP cable.

Important

- *The second system and the connected QSFP cable shown are for illustration purposes only and are not included in the package.*
- *Please also refer to System Clustering for more detailed interconnect process.*



Initial Setup

Important

All information and screenshots are subject to change without prior notice.

What is NVIDIA DGX™ OS

This device is preinstalled with NVIDIA DGX™ OS to provide a turnkey solution for running AI and analytics workloads. Initial system configuration is deferred to a setup wizard that runs after the first boot. The setup wizard offers users a fast onboarding experience for using DGX™ systems.

NVIDIA DGX™ OS provides a customized installation of Ubuntu Linux with system-specific optimizations and configurations, additional drivers, and diagnostic and monitoring tools. It provides a stable, fully tested, and supported OS to run AI, machine learning, and analytics applications on this device.

Features

- Pre-installed NVIDIA drivers and CUDA toolkit.
- Ready for deep learning frameworks (e.g., TensorFlow, PyTorch).
- Containerized support (NVIDIA GPU Cloud Containers + Docker).
- System monitoring and diagnostic tools (e.g., Data Center GPU Manager, NVIDIA System Management).
- Support for NGC cloud resource integration. Enables developers to efficiently and seamlessly run AI/ML (Machine Learning) workloads in the cloud.
- Optimized kernel, network stack, and I/O to enhance overall performance.

First Boot Setup

This guide walks you through setting up your system for the first time. You’ ll choose how to use your system and run the installation wizard to configure everything.

What You’ ll Do

This setup process includes:

- Choosing between desktop or network appliance mode.
- Preparing your system and connections.
- Running the installation wizard to configure your system.

Choose Your Setup Mode

Your system can be configured in one of two ways:

Desktop Mode

- Connect keyboard and mouse via USB or Bluetooth.
- Work using the Ubuntu desktop directly.

Important

A USB-C to USB adapter is required for connecting a standard USB keyboard or mouse.

Network Appliance Mode

- Access the system remotely over the network.
- Use as a server or compute node.
- Manage without a local display.

Important

The mode you select here will be used throughout the initial setup process. After setup is complete, you can freely switch between desktop and network appliance modes. You’ re not locked into your original choice.

Get Ready

Before starting, ensure you have:

- Power connection to the system.
- Either an Ethernet connection that provides a valid internet connection or an available WiFi network that provides a valid internet connection without a captive portal (e.g. at a hotel/airport).
- For Desktop Mode: Display, keyboard, and mouse connected (or available via Bluetooth).
- For Network Appliance Mode: A computer on the same network for remote access.

Important

Display Troubleshooting: Some displays may have trouble with the system out of the box. If you are connecting over USB-C/DisplayPort and there is no display, try using HDMI instead.

Important

If you plan to use a wired network connection, plug in the network cable before starting the installation. This helps avoid connection issues later in the process.

Run the Installation Wizard

The installation wizard will guide you through:

- Powering on and initializing the system.
- Selecting your preferred setup mode.
- Downloading and installing critical updates.
- Completing your initial configuration.

Important

Critical: Do not shut down or reboot the system during the update process. The installation cannot be interrupted once the download begins, and powering down during updates can cause system damage.

Getting Started

The way you start the installation depends on your chosen mode:

Desktop Mode

1. Power on the system.
2. The installation wizard will start automatically on the connected display.
3. Use your wired keyboard and mouse (already connected) to navigate.
4. If a keyboard or mouse is not detected, you will be prompted to put your Bluetooth devices in pairing mode.

USB devices can be plugged in at any time and should start working, even if detected improperly. Bluetooth devices can be put into pairing mode and will generally still pair while on the “Get Started” screen (exception - keyboards that require a passcode to type in won’ t work on this screen). Once you click on “Get Started,” Bluetooth pairing stops, so you will have to power cycle to try again.

Network Appliance Mode

1. Power on the system.
2. Connect to the system using one of these methods:

- A captive portal screen will automatically appear showing the HTTP address for setup. This setup page is also listed on the quick start guide card and should be formatted like http://spark-abcd.local
- Open a web browser and navigate to the address shown on the captive portal screen.
- Plug in Ethernet if desired (optional step).

What to Expect During Setup

The installation wizard will guide you through several configuration steps. Simply follow the on-screen prompts to complete each step.

Setup Process Steps:

1. Language and Time Zone Selection

   Choose your preferred language and time zone settings for the system.
2. Keyboard Layout Selection (Desktop Mode only)

   Select your keyboard layout (e.g. US keyboard vs. Russian keyboard). This screen only appears in desktop mode.
3. Terms and Conditions

   Review and accept the terms and conditions to continue with the installation.
4. User Account Creation

   Create your username and password for system access. Note that the input fields will filter as you type since they are quite long.
5. Information Sharing Settings (Optional)

   Configure analytics and crash reporting preferences. You can skip this step if desired.
6. WiFi Network Selection

   Select your WiFi network. This step is automatically skipped if an Ethernet cable that is providing internet access is connected.
7. WiFi Password

   Enter the password for your selected WiFi network.
8. Joining WiFi Network

   The system connects to your WiFi network and tears down the access point. Your computer will automatically reconnect to your default network.

Important

- *Network Connection Issues.*
- *If your computer automatically reconnects to the same network as the system, the installation should continue seamlessly.*
- *If not, you' ll need to connect your computer to the same network as the system while the setup app is waiting for the network setup process to complete.*
- *If the setup fails, you must connect a display/keyboard/mouse to continue.*
- *The modal instructs you to try to reconnect to the system' s hotspot and try again. This will work if the system actually failed to join the network (e.g. wrong password) versus your laptop can' t communicate with the system.*
- *If you DO NOT see the hotspot available when this error modal appears, that means the system did join the network but your laptop can' t communicate with it. This could be because:*

  ▶Device isolation

  ▶You failed to join the same network as your system mDNS does not work on your network due to its configuration (e.g. a complex corporate network)

9. Software Download and Installation

   Once connected to the network, the system automatically downloads and installs the complete software image.

Important

Do not shut down or reboot the system during this process. The installation cannot be interrupted once the download begins.

10. Installation Complete

    The device will reboot automatically when installation is complete, and you can then use it normally.

System Clustering

This guide explains how to connect two systems into a virtual compute cluster using simplified networking configuration and a QSFP/CX7 cable for high-performance interconnect.

The goal is to enable distributed workloads across Grace Blackwell GPUs using MPI (for inter-process CPU communication) and NCCL v2.28.3 (for GPU-accelerated collective operations).

Additional Information can be found in the Connect Two Sparks playbook.

System Requirements

Before you begin, ensure the following:

- Both two systems have Grace Blackwell GPUs, are connected to each other using a QSFP/CX7 cable, and are running Ubuntu 24.04 (or later) with NVIDIA drivers installed.

Important

- *These ports support ethernet configuration only. Approved cables for these ports are:*
- *Amphenol: NJAAKK-N911 (QSFP to QSFP112, 32AWG, 400mm, LSZH), NJAAKK0006 is the 0.5m version of this cable.*
- *Luxshare: LMTQF022-SD-R (QSFP112 400G DAC Cable, 400mm, 30AWG).*

- The systems have internet access for initial software setup.
- You have sudo/root access on both systems.

Setup Networking Between Systems

Option 1: Follow these steps on both system nodes to configure network interfaces using “netplan”. The following commands should be run in a terminal session (either local or remote).

1. Download the netplan configuration file.

   sudo wget -O /etc/netplan/40-cx7.yaml https://github.com/NVIDIA/dgx-spark-playbooks/raw/main/nvidia/connect-two-sparks/assets/cx7-netplan.yaml

2. Set appropriate permissions on the configuration file.

   sudo chmod 600 ／etc／netplan／40-cx7.yaml

3. Apply the netplan configuration.

   sudo netplan apply

Option 2: Manual IP assignment (advanced). Follow these steps to manually assign IP addresses for dedicated cluster networking.

1. On Node 1, assign a static IP address and bring up the interface.
   sudo ip addr add 192.168.100.10／24 dev enP2p1s0f1np1
   sudo ip link set enP2p1s0f1np1 up
2. On Node 2, assign a static IP address and bring up the interface.
   sudo ip addr add 192.168.100.11／24 dev enP2p1s0f1np1
   sudo ip link set enP2p1s0f1np1 up
3. From Node 1, verify connectivity by testing connection to Node 2.
   ping -c 3 192.168.100.11
4. From Node 2, verify connectivity by testing connection to Node 1.
   ping -c 3 192.168.100.10

Run the System Discovery Script

This step will automatically identify interconnected systems and set up SSH authentication without requiring a password.

The following commands should be run in a terminal session (either local or remote) on both nodes.

1. Download the discovery script.
   wget https://github.com/NVIDIA/dgx-spark-playbooks/raw/refs/heads/main/nvidia/connect-two-sparks/assets/discover-sparks
2. Make the script executable.
   chmod +x discover-sparks
3. Run the discovery script.
   ./discover-sparks

Example output:

```
Found: 192.168.100.10 (spark-1b3b.local)
Found: 192.168.100.11 (spark-1d84.local)
Copying your SSH public key to all discovered nodes using ssh-copy-id.
You may be prompted for your password on each node.
Copying SSH key to 192.168.100.10 ...
Copying SSH key to 192.168.100.11 ...
nvidia@192.168.100.11' s password:
```

SSH key copy process complete. These two systems can now talk to each other.

Install Required Software and Verify the Configuration

With the networking configured and the systems able to communicate with each other, the next step is to install the required software for distributed workloads and run test workloads to verify that GPU-to-GPU communication is working correctly and to measure performance across the stacked systems.

For complete instructions on building NCCL, running the NCCL test suite, and interpreting the results, see the NCCL for two Sparks playbook.

NCCL for Two Systems

Install and test NCCL on two systems.

1. Configure network connectivity.

Follow the network setup instructions to establish connectivity between your system nodes. This includes:

- Physical QSFP cable connection.
- Network interface configuration (automatic or manual IP assignment).
- Passwordless SSH setup.
- Network connectivity verification.

2. Build NCCL with Blackwell support.

Execute these commands on both nodes to build NCCL from source with Blackwell architecture support.

```
# Install dependencies and build NCCL
sudo apt-get update && sudo apt-get install -y libopenmpi-dev
git clone -b v2.28.3-1 https://github.com/NVIDIA/nccl.git ~/nccl/
cd ~/nccl/
make -j src.build NVCC_GENCODE="-gencode=arch=compute_121,code=sm_121"

# Set environment variables
export CUDA_HOME="/usr/local/cuda"
export MPI_HOME="/usr/lib/aarch64-linux-gnu/openmpi"
export NCCL_HOME="$HOME/nccl/build/"
export LD_LIBRARY_PATH="$NCCL_HOME/lib:$CUDA_HOME/lib64/:$MPI_HOME/lib:$LD_LIBRARY_PATH"
```

3. Build NCCL test suite.

Compile the NCCL test suite to validate communication performance.

```
# Clone and build NCCL tests
git clone https://github.com/NVIDIA/nccl-tests.git ~/nccl-tests/
cd ~/nccl-tests/
make MPI=1
```

4. Find the active network interface and IP addresses.

Execute multi-node NCCL performance test using the active network interface. First, identify which network ports are available and up.

```
# Check network port status
ibdev2netdev
```

Example output:

```
roceP2p1s0f0 port 1 ==> enP2p1s0f0np0 (Down)
roceP2p1s0f1 port 1 ==> enP2p1s0f1np1 (Up)
rocep1s0f0 port 1 ==> enp1s0f0np0 (Down)
rocep1s0f1 port 1 ==> enp1s0f1np1 (Up)
```

Use an interface that shows as “(Up)” in your output. In this example, we’ ll use enp1s0f1np1. You can disregard interfaces starting with the prefixenP2p<...> and only consider interfaces starting with enp1<...> instead.

You will need to find the IP addresses for the interfaces that are up. On both nodes, run the following command to find the IP addresses and take note of them for the next step.

```
ip addr show enp1s0f0np0
ip addr show enp1s0f1np1
```

Example output:

```
# In this example, we are using interface enp1s0f1np1.
nvidia@dgx-spark-1:~$ ip addr show enp1s0f1np1
  4: enp1s0f1np1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq
state UP group default qlen 1000
    link/ether 3c:6d:66:cc:b3:b7 brd ff:ff:ff:ff:ff:ff
    inet **169.254.35.62**/16 brd 169.254.255.255 scope link noprefixroute
enp1s0f1np1
     valid_lft forever preferred_lft forever
    inet6 fe80::3e6d:66ff:fecc:b3b7/64 scope link
     valid_lft forever preferred_lft forever
```

In this example, the IP address for Node 1 is 169.254.35.62. Repeat the process for Node 2.

5. Run NCCL communication test.

Execute the following commands on both nodes to run the NCCL communication test. Replace the IP addresses and interface names with the ones you found in the previous step.

```
# Set network interface environment variables (use your Up interface from the
previous step)
export UCX_NET_DEVICES=enp1s0f1np1
export NCCL_SOCKET_IFNAME=enp1s0f1np1
export OMPI_MCA_btl_tcp_if_include=enp1s0f1np1

# Run the all_gather performance test across both nodes (replace the IP addresses
with the ones you found in the previous step)
mpirun -np 2 -H <IP for Node 1>:1,<IP for Node 2>:1 \
 --mca plm_rsh_agent "ssh -o UserKnownHostsFile=/dev/null -o
StrictHostKeyChecking=no" \
 -x LD_LIBRARY_PATH=$LD_LIBRARY_PATH \
 $HOME/nccl-tests/build/all_gather_perf
```

You can also test your NCCL setup with a larger buffer size to use more of your 200Gbps bandwidth.

```
# Set network interface environment variables (use your active interface)
export UCX_NET_DEVICES=enp1s0f1np1
export NCCL_SOCKET_IFNAME=enp1s0f1np1
export OMPI_MCA_btl_tcp_if_include=enp1s0f1np1

# Run the all_gather performance test across both nodes
mpirun -np 2 -H <IP for Node 1>:1,<IP for Node 2>:1 \
 --mca plm_rsh_agent "ssh -o UserKnownHostsFile=/dev/null -o StrictHostKeyChecking=no" \
 -x LD_LIBRARY_PATH=$LD_LIBRARY_PATH \
 $HOME/nccl-tests/build/all_gather_perf -b 16G -e 16G -f 2
```

Note: The IP addresses in the mpirun command are followed by :1. For example, mpirun -np 2 -H 169.254.35.62:1,169.254.35.63:1

6. Cleanup and rollback.

```
# Rollback network configuration (if needed)
rm -rf ~/nccl/
rm -rf ~/nccl-tests/
```

7. Next steps.

Your NCCL environment is ready for multi-node distributed training workloads on your system. Now you can try running a larger distributed workload such as TRT-LLM or vLLM inference.

Troubleshooting

- Ensure the QSFP/CX7 interface is active and used for IP assignment.
- Verify connectivity between nodes via "ping".
- Check your interface bindings with "ip a" and "ethtool".
- If the discovery script fails, manually verify SSH connectivity between nodes.
- For additional troubleshooting guidance and support options, see Maintenance and Troubleshooting.

Upgrading the NVIDIA DGX™ OS

Intend to upgrade to the latest OS or software package, please refer to

https://ipc.msi.com/product_download/Industrial-Computer-Box-PC/AI-Supercomputer/EdgeXpert-MS-C931

Reimaging the NVIDIA DGX™ OS

Important

Reimaging the system erases all data stored on the OS drives. This includes the /home partition, where all users' documents, software settings, and other personal files are stored.

NVIDIA DGX™ OS is already preinstalled in your device and only requires reinstalling in limited cases, such as

- Replace storage devices.
- Rebuild cluster nodes.
- Recover from system failures.

Creating a Bootable USB Flash Drive

On Windows system, please refer to

https://ipc.msi.com/product_download/Industrial-Computer-Box-PC/AI-Supercomputer/EdgeXpert-MS-C931

Booting the NVIDIA DGX™ OS ISO Image

1. Plug the USB flash drive containing the OS image into the system.
2. Connect a monitor and keyboard directly to the system.
3. Boot the system and then press F2 when the NVIDIA logo appears to access the boot menu.
4. Select the USB volume name that corresponds to the inserted USB flash drive and boot the system from it.

NVIDIA Sync

NVIDIA Sync is a system tray utility that provides a simple way of accessing your system from another machine when it' s running as a headless appliance (without a monitor or keyboard).

Installation

1. Download the latest version of NVIDIA Sync from the https://build.nvidia.com/spark. Installers are available for Windows, macOS, and Linux.
2. Run the installer.
3. NVIDIA Sync will search for compatible applications that can connect remotely to the system. Select the applications that you want to use, and click "Next".
4. Provide the system' s machine name and your login credentials.

Supported Applications

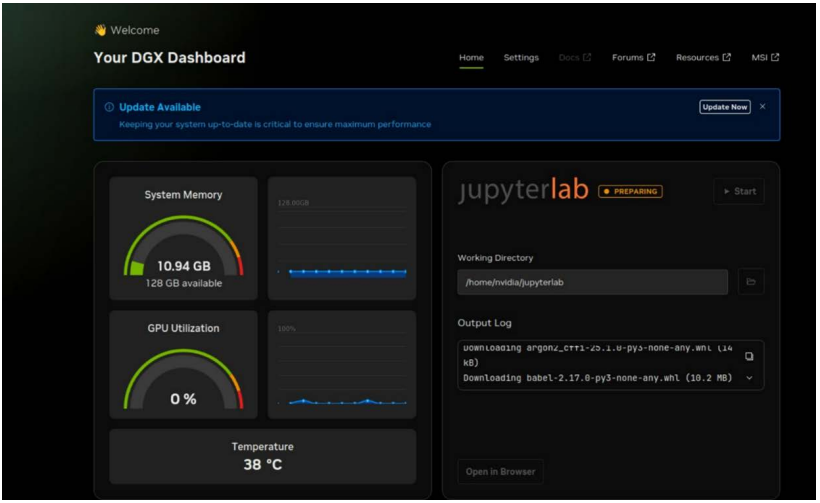
- AI Workbench
- Cursor IDE
- VSCode
- Windsurf

Additional Connection Methods

- DGX™ Dashboard (via web browser)
- SSH Terminal (RSA keys automatically managed by NVIDIA Sync)

DGX™ Dashboard

The system comes with a built-in dashboard that provides an overview of the system' s current operational metrics, the ability to apply updates, change some system settings, and access local Jupyter Notebooks.



The DGX™ Dashboard provides real-time system monitoring and integrated JupyterLab access.

Important

To run updates and change the device name, you must have "sudo" access. The account created during initial setup will have access.

Integrated JupyterLab

The dashboard includes an integrated JupyterLab instance that provides a convenient development environment:

- When started, JupyterLab creates a virtual environment in the specified working directory and automatically installs a set of recommended packages.
- If you enter a new working directory and start JupyterLab, a new environment will be created.
- Each user account on the device is assigned a port located in /opt/nvidia/dgx-dashboardservice/jupyterlab_ports.yaml
- To access JupyterLab remotely, you must tunnel it just like the dashboard itself. The port to tunnel is in the ports file. Using NVIDIA Sync, this tunnel is managed for you automatically and just works.

Accessing the Dashboard

The dashboard can be accessed locally by clicking on the “Show Apps” button in the bottom left corner of the Ubuntu desktop. Then, in the app grid, select the “DGX Dashboard” shortcut to open the dashboard in your default web browser.

Remotely, the dashboard can be accessed using NVIDIA Sync or via a manually created SSH tunnel.

If using NVIDIA Sync, after connecting, simply click on the “DGX Dashboard” button and the dashboard will open in your default web browser at http://localhost:11000.

To manually access over SSH, first open a tunnel, e.g., ssh -L 11000:localhost:11000 <username>@<IP or spark-abcd.local>. Then, open the dashboard in your web browser at http://<spark-host-ip>:11000.

NVIDIA Container Runtime for Docker

The NVIDIA Container Runtime enables Docker containers to access GPU resources on the systems. This runtime acts as a bridge between Docker and the NVIDIA drivers, allowing containers to utilize GPU acceleration for AI/ML workloads, CUDA applications, and other GPU-accelerated software.

Key benefits:

- Seamless GPU access within containers.
- Automatic driver and library management.
- Support for multi-GPU configurations.
- Compatibility with popular container orchestration platforms.

The runtime works in conjunction with the NVIDIA Container Toolkit, which provides the necessary components to expose GPU devices and CUDA libraries to containerized applications.

Installation

The NVIDIA Container Toolkit is preinstalled and configured on the system. This includes:

- NVIDIA Container Runtime.
- Docker integration.
- GPU device access configuration.
- CUDA library management.

The runtime is ready to use out of the box for running GPU-accelerated containers.

Optional: Add User to Docker Group

By default, Docker requires sudo privileges to run commands. Adding your user to the docker group allows you to run Docker commands without sudo, which provides:

- Convenience: No need to type sudo before every Docker command.
- Better workflow: Seamless integration with development tools and scripts.
- Reduced friction: Faster iteration when working with containers.

To add your user to the docker group:

```
sudo usermod -aG docker $USER
```

Important

- *You must log out and log back in (or restart your session) for the group membership to take effect.*
- *This step is optional. You can continue using Docker with sudo if you prefer not to modify group memberships.*

Usage

Basic GPU Access. Run a container with GPU access using the –gpus flag:

```
docker run -it --gpus=all nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 nvidia-smi
```

This command: Runs an interactive container (-it) - Enables access to all GPUs (–gpus=all) - Uses the NVIDIA CUDA development image - Executes nvidia-smi to display GPU information.

Set GPU Capabilities. Control which GPU capabilities are available to the container.

```
docker run -it --gpus '"capabilities=compute,utility"' nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 nvidia-smi
```

Mount CUDA Libraries. For applications that need specific CUDA libraries, mount them from the host.

```
docker run -it --gpus=all \
  -v ／usr／local／cuda:／usr／local／cuda:ro \
  nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 bash
```

Validation

Test GPU Access.

1. Run the test command to verify GPU access.

   docker run -it --gpus=all nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 nvidia-smi

Expected output should show: - GPU device information - Driver version - CUDA version - Memory usage and temperature.

2. Check runtime configuration.

   docker info | grep -A 10 “Runtimes”

3. Verify NVIDIA runtime is available.

   docker run --rm --runtime=nvidia nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 nvidia-smi

Inspect Container GPU Access. Check what GPU resources are available inside a running container.

```
docker run -it --gpus=all nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 bash

# Inside the container:

nvidia-smi

ls ／dev／nvidia*
```

Troubleshooting

If you encounter runtime not found errors.

1. Verify NVIDIA Container Toolkit is installed.

   nvidia-ctk --version

2. Check Docker daemon configuration.

   cat ／etc／docker／daemon.json

3. Restart Docker service.

   sudo systemctl restart docker

If you see CUDA version mismatches.

1. Check host CUDA driver version.

   nvidia-smi

2. Use a container image with compatible CUDA version.

   docker run -it --gpus=all nvcr.io／nvidia／cuda:12.0.1-devel-ubuntu24.04 nvidia-smi

If you encounter permission errors.

1. Ensure your user is in the docker group (if not using sudo).
   groups $USER
2. Check device permissions.
   ls -la ／dev／nvidia*
3. Verify Docker daemon has access to GPU devices.
   sudo docker run -it --gpus=all nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 nvidia-smi

If containers fail to start.

1. Check Docker logs.
   docker logs <container_id>
2. Verify GPU devices are available on host.
   ls ／dev／nvidia*
3. Test with a minimal container.
   docker run --rm --gpus=all nvcr.io／nvidia／cuda:13.0.1-devel-ubuntu24.04 echo “GPU test successful”

NGC

NVIDIA GPU Cloud (NGC) is a comprehensive registry of GPU-optimized containers, pre-trained models, and AI/ML software that enables rapid development and deployment of AI applications. For users, NGC provides access to the latest frameworks, tools, and optimized environments specifically designed for the Grace Blackwell architecture.

Key benefits for users:

- Optimized Containers: Pre-configured environments with the latest AI/ML frameworks, CUDA, and libraries optimized for Grace Blackwell GPUs.
- Pre-trained Models: Access to state-of-the-art models and model collections for various AI tasks.
- Rapid Development: Skip complex environment setup and focus on your AI/ML projects.
- Cutting-edge Software: Access to the latest NVIDIA software stack and experimental features.

NGC is particularly valuable for users because it provides the most current and optimized software stack for this new platform, ensuring you have access to the latest performance optimizations and features.

Getting Started

Create an NGC Account.

1. Visit the NGC website.
2. Click Sign Up and create a free account.
3. Verify your email address.
4. Complete your profile information.

Generate an API Key.

1. Log in to your NGC account.
2. Navigate to Setup API Key.
3. Click Generate API Key.
4. Copy and securely store your API key.

Important

Your API key is required for pulling containers and accessing NGC resources. Keep it secure and never share it publicly.

Install NGC CLI (Optional). The NGC CLI provides convenient command-line access to NGC resources.

```
# Download and install NGC CLI
wget https://ngc.nvidia.com/downloads/ngccli_linux.zip
unzip ngccli_linux.zip
sudo mv ngc-cli/ngc /usr/local/bin/
ngc config set
```

Authenticate with Docker. Configure Docker to access NGC registries.

```
# Login to NGC with Docker
docker login nvcr.io
# Username: $oauthtoken
# Password: <your-api-key>
```

Basic Usage

Pull and Run a Container. Start with a popular AI/ML framework container.

```
# Pull a PyTorch container optimized for Grace Blackwell
docker pull nvcr.io／nvidia／pytorch:24.08-py3
# Run the container with GPU access
docker run -it --gpus=all nvcr.io／nvidia／pytorch:24.08-py3
```

Explore Available Resources. Browse NGC resources through the web interface.

- Containers: AI/ML frameworks, development environments, and specialized tools.
- Models: Pre-trained models for computer vision, natural language processing, and more.
- Helm Charts: Kubernetes deployment configurations.
- Jupyter Notebooks: Interactive tutorials and examples.

Common Workflows

Development Environment. Use NGC containers as your development environment.

```
# Run a development container with persistent storage
docker run -it --gpus=all \
  -v ／path／to／your／project:／workspace \
  nvcr.io／nvidia／pytorch:24.08-py3
```

Model Inference and Training. Access pre-trained models and training scripts.

```
# Pull a model from NGC
ngc registry model download-version nvidia／bert-base-uncased:1
# Or use models directly in containers
docker run -it --gpus=all \
  nvcr.io／nvidia／tensorflow:24.08-tf2-py3
```

Best Practices

Container Management.

- Pin Versions: Use specific container tags for reproducible environments.
- Regular Updates: Periodically update to newer container versions for latest optimizations.
- Resource Limits: Set appropriate memory and CPU limits for your workloads.

Data Persistence.

- Volume Mounts: Mount your data directories into containers for persistence.
- Model Storage: Store trained models and checkpoints outside containers.
- Configuration: Keep configuration files in version control.

Security.

- API Key Security: Store your NGC API key securely and rotate it regularly.
- Container Scanning: Scan containers for vulnerabilities before use.
- Network Security: Use appropriate network configurations for your environment.

Troubleshooting

Authentication Failures.

```
# Verify your API key is correct
docker login nvcr.io
# Check if your account has access to the requested resource
```

Container Pull Issues.

```
# Check network connectivity
ping nvcr.io
# Verify container name and tag
docker search nvcr.io／nvidia／
```

GPU Access Problems.

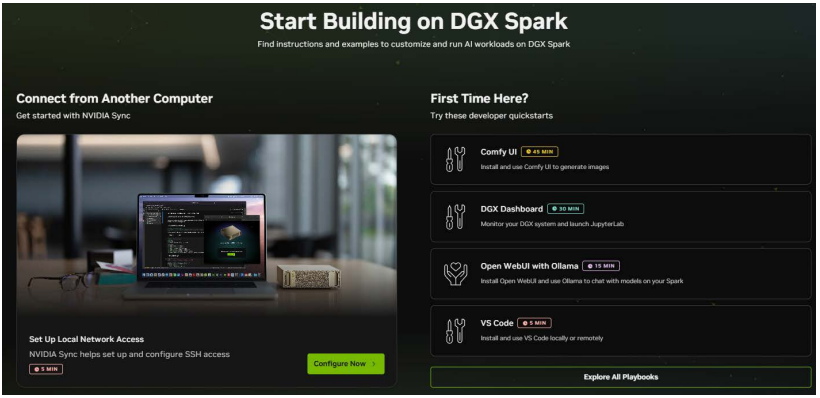
```
# Verify NVIDIA Container Runtime is installed
docker run --rm --gpus=all nvidia／cuda:12.0-base-ubuntu20.04 nvidia-smi
```

Getting Help

- NGC Documentation: Visit the NGC documentation.
- Community Forums: Join the NVIDIA Developer Forums.

Obtaining and Activating an AI Model from NVIDIA Official Website

To find instructions and examples to customize and run AI workload, please visit Nvidia developer website https://build.nvidia.com/spark



Firmware Update

This section provides guidance for updating firmware components on your system.

Important

This update information applies only to the Founders Edition. Devices from other manufacturers may have different firmware update procedures.

Recommended Method

NVIDIA recommends using the DGX™ Dashboard to perform firmware updates on your system. The DGX™ Dashboard provides a user-friendly interface for managing firmware updates and system maintenance tasks.

For detailed information about accessing and using the DGX™ Dashboard, see DGX™ Dashboard.

Important

- *Ensure your system is connected to a stable power source.*
- *Close all running applications and save your work.*
- *Have a recovery plan in place.*
- *Schedule updates during maintenance windows when possible.*

Manual Method

If you are unable to use the DGX™ Dashboard, you can update the firmware manually using the following steps:

1. Open a remote or local terminal on the system.
2. Run the following commands.

   sudo apt update

   sudo apt upgrade

   sudo fwupdmgr refresh

   sudo fwupdmgr upgrade

   sudo reboot

Troubleshooting

If you encounter issues during firmware updates.

- Ensure stable power supply during the update process.
- For additional troubleshooting guidance and support options, see spark-maintenance-troubleshooting

Additional Resources

- Visit the NVIDIA Spark Developer Portal at https://build.nvidia.com/spark for the latest guides, tutorials, and updates.
- Refer to spark-release-notes for the latest software updates and features.
- See spark-known-issues for troubleshooting common problems.

Your system is now ready to power your AI development and deployment workflows!

Safety Instructions

- Read the safety instructions carefully and thoroughly.
- All cautions and warnings on the device or User Guide should be noted.
- Refer servicing to qualified personnel only.
- IEC 60825-1 :2014 transfer to FDA/CDRH Complies with FDA performance standards for laser products except for conformance with IEC 60825-1 Ed.3., as described in Laser Notice No. 56, dated May 8, 2019.
- The SFP ports should use UL Listed Optional Transceiver product, Rated 3.3Vdc, Laser Class 1.

Power

- Make sure that the power voltage is within its safety range and has been adjusted properly to the value of 100~240V before connecting the device to the power outlet.
- If the power cord comes with a 3-pin plug, do not disable the protective earth pin from the plug. The device must be connected to an earthed mains socket-outlet.
- Please confirm the power distribution system in the installation site shall provide the circuit breaker rated 120/240V, 20A (maximum).
- Always unplug the power cord before installing any add-on card or module to the device.
- Always disconnect the power cord or switch the wall socket off if the device would be left unused for a certain time to achieve zero energy consumption.
- Place the power cord in a way that people are unlikely to step on it. Do not place anything on the power cord.
- If this device comes with an adapter, use only the MSI provided AC adapter approved for use with this device.

Battery

Please take special precautions if this device comes with a battery.

- Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.
- Avoid disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, which can result in an explosion.
- Avoid leaving a battery in an extremely high temperature or extremely low air pressure environment that can result in an explosion or the leakage of flammable liquid or gas.
- Do not ingest battery. If the coin/button cell battery is swallowed, it can cause severe internal burns and can lead to death. Keep new and used batteries away from children.

European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

Battery Recycle:

廢電池請回收

For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.
For further information please visit: https://dtsc.ca.gov/perchlorate/

⚠WARNING

- **INGESTION HAZARD**: This product contains a button cell or coin battery.
- **DEATH** or serious injury can occur if ingested.
- A swallowed button cell or coin battery can cause **Internal Chemical Burns** in as little as **2 hours**.
- **KEEP** new and used batteries **OUT OF REACH OF CHILDREN**
- **Seek immediate medical attention** if a battery is suspected to be swallowed or inserted inside any part of the body.

- Remove and immediately recycle or dispose of used batteries according to local regulations and keep away from children. Do NOT dispose of batteries in household trash or incinerate.
- Even used batteries may cause severe injury or death. Call a local poison control center for treatment information.
- Battery type: CR2032
- Battery voltage: 3V
- Non-rechargeable batteries are not to be recharged.
- Do not force discharge, recharge, disassemble, heat above (manufacturer' s specified temperature rating) or incinerate. Doing so may result in injury due to venting, leakage or explosion resulting in chemical burns.
- This product contains an irreplaceable battery.
- This icon indicates that a swallowed button battery can cause serious injury or death. Please keep batteries out of sight or reach of children.

Environment Information

- To reduce the possibility of heat-related injuries or of overheating the device, do not place the device on a soft, unsteady surface or obstruct its air ventilators.
- Use this device only on a hard, flat and steady surface.
- To prevent fire or shock hazard, keep this device away from humidity and high temperature.
- Do not leave the device in an unconditioned environment with a storage temperature above 60°C or below -20°C, which may damage the device.
- The operating temperature range is approximately 0°C to 35°C.
- When cleaning the device, be sure to remove the power plug. Use a piece of soft cloth rather than industrial chemical to clean the device. Never pour any liquid into the opening; that could damage the device or cause electric shock.
- Always keep strong magnetic or electrical objects away from the device.
- If any of the following situations arises, get the device checked by service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated into the device.
  - The device has been exposed to moisture.
  - The device does not work well or you can not get it working according to the User Guide.
  - The device has dropped and damaged.
  - The device has obvious sign of breakage.

Regulatory Notices

CE Conformity

Products bearing the CE marking comply with one or more of the following EU Directives as may be applicable:

- RED 2014/53/EU
- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- RoHS Directive 2011/65/EU
- Implementing measure Directive 2009/125/EC of ESPR Regulation (EU) 2024/1781

Compliance with these directives is assessed using applicable European Harmonized Standards.

For any support regarding the EU General Product Safety Regulation (GPSR), please contact MSI Computer Europe B.V. via gpsr@msi.com Churchilllaan 202, 5705 BK Helmond, the Netherlands.

Products with Radio Functionality (EMF)

This product incorporates a radio transmitting and receiving device. For computers in normal use, a separation distance of 20 cm ensures that radio frequency exposure levels comply with EU requirements. Products designed to be operated at closer proximities, such as tablet computers, comply with applicable EU requirements in typical operating positions. Products can be operated without maintaining a separation distance unless otherwise indicated in instructions specific to the product.

Restrictions for Products with Radio Functionality (select products only)

CAUTION: IEEE 802.11x wireless LAN with 5.15~5.35 GHz frequency band is restricted for indoor use only in all European Union member states, EFTA (Iceland, Norway, Liechtenstein), and most other European countries (e.g., Switzerland, Turkey, Republic of Serbia). Using this WLAN application outdoors might lead to interference issues with existing radio services.

Radio frequency bands and maximum power levels

- Features: Wi-Fi 7, BT
- Frequency Range:

  2.4 GHz: 2.412~2.484GHz

  5 GHz: 5.180~5.895GHz

  6 GHz: 5.925~7.125GHz
- Max Power Level:

  2.4 GHz: 20dBm

  5 GHz: 23dBm

  6 GHz: 23dBm

FCC-B Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the measures listed below:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user' s authority to operate the equipment.

Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

MSI Computer Corp.

901 Canada Court, City of Industry, CA 91748, USA

(626) 913-0828

www.msi.com

- Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.
- This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
- End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

- In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user' s authority to operate this equipment.
- If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.
- FCC regulations restrict the operation of this device to indoor use only. Operation prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

WEEE Statement

European Union: This symbol on the product indicates that this product cannot be discarded as municipal waste. Instead, it is your responsibility to dispose of your waste electrical and electronic equipment by handing it over to a designated collection point for recycling. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

Thailand Compliance Statement

"เครื่องวิทยุคมนาคมนี้มีระดับการแผ่คลื่นแม่เหล็กไฟฟ้าสอดคล้องตามมาตรฐานความปลอดภัยต่อสุขภาพของมนุษย์จากการใช้เครื่องวิทยุคมนาคมที่คณะกรรมการกิจการโทรคมนาคมแห่งชาติประกาศกำหนด"

NCC無線設備警告聲明

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Canadian Compliance Statement

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

1) This device may not cause interference, and

2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d' Industrie Canada applicables aux appareils radio exempts de licence . L' exploitation est autorisée aux deux conditions suivantes :

1) l' appareil ne doit pas produire de brouillage ;

2) l' utilisateur de l' appareil doit accepter tout brouillage radioélectrique subi, meme si le brouillage est susceptible d' en compromettre le fonctionnement .

Caution

1) Any devices capable of operating in the band 5150–5250 MHz shall only be used indoors to reduce the potential for harmful interference to co-channel mobile satellite systems (this requirement does not apply to OEM devices installed in vehicles by vehicle manufacturers);

2) For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;

3) For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and

4) Where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 7.3.2.4 or 7.3.5.3 shall be clearly indicated.

Avertissement

1) tout dispositif capable de fonctionner dans la bande de 5150 à 5250 MHz ne doit être utilisé qu' à l' intérieur des bâtiments afin de réduire les risques d' interférences nuisibles avec les systèmes mobiles par satellite à canaux multiples (cette exigence ne s' applique pas aux dispositifs FEO installés dans les véhicules par les constructeurs automobiles);

2) pour les dispositifs munis d' antennes amovibles, le gain maximal d' antenne permis pour les dispositifs utilisant les bandes de 5 250 à 5 350 MHz et de 5 470 à 5 725 MHz doit être conforme à la limite de la p.i.r.e;

3) pour les dispositifs munis d' antennes amovibles, le gain maximal d' antenne permis (pour les dispositifs utilisant la bande de 5 725 à 5 850 MHz) doit être conforme à la limite de la p.i.r.e. spécifiée, selon le cas;

4) lorsqu' il y a lieu, les types d' antennes (s' il y en a plusieurs), les numéros de modèle de l' antenne et les pires angles d' inclinaison nécessaires pour rester conforme à l' exigence de la p.i.r.e. applicable au masque d' élévation, énoncée à la section 7.3.2.4 ou 7.3.5.3, doivent être clairement indiqués.

Radiation Exposure Statement

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d' exposition aux radiations

Cet équipement est conforme aux limites d' exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This product meets the applicable Innovation, Science and Economic Development Canada technical specifications.

Devices shall not be used for control of or communications with unmanned aircraft systems.

Les dispositifs ne doivent pas être utilisés pour commander des systèmes d' aéronef sans pilote ni pour communiquer avec de tels systèmes.

Operation shall be limited to indoor use only.

Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited except for on large aircraft flying above 3,048 m (10,000 ft).

leur utilisation doit être limitée à l' intérieur seulement;

leur utilisation à bord de plateformes de forage pétrolier, d' automobiles, de trains, de navires maritimes et d' aéronefs doit être interdite, sauf à bord d' un gros aéronef volant à plus de 3 048 m (10 000 pi) d' altitude.

Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:
https://csr.msi.com/global/index

RoHS Statement

日本JIS C 0950材質宣言

日本工業規格JIS C 0950により、2006年7月1日以降に販売される特定分野の電気および電子機器について、製造者による含有物質の表示が義務付けられます。

https://csr.msi.com/tw/Japan-JIS-C-0950-Material-Declarations

India RoHS

This product complies with the “India E-waste (Management and Handling) Rule 2016” and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers in concentrations exceeding 0.1 weight % and 0.01 weight % for cadmium, except for the exemptions set in Schedule 2 of the Rule.

Türkiye EEE yönetmeliği

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Україна обмеження на наявність небезпечних речовин

Обладнання відповідає вимогам Технічного регламенту щодо обмеження vvi використання деяких небезпечних речовин в електричному та електронному обладнані, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057.

Việt Nam RoHS

Kể từ ngày 01/12/2012, tất cả các sản phẩm do công ty MSI sản xuất tuân thủ Thông tư số 30/2011/TT-BCT quy định tạm thời về giới hạn hàm lượng cho phép của một số hóa chất độc hại có trong các sản phẩm điện, điện tử”

Material Declaration under India’ s Plastic Waste Management Rules:

INDOMSI COMPUTERS PRIVATE LIMITED

Regn. No.: IM-06-000-06-AAHCI0478A-25

Thickness ≥ 50 microns

产品中有害物质的名称及含有信息表

部件名称	有害物质									
	Pb	Hg	Cd	Cr(VI)	PBBs	PBDEs	DBP	DIBP	BBP	DEHP
电路板组件*	×	○	○	○	○	○	○	○	○	○
处理器和散热器	×	○	○	○	○	○	○	○	○	○
内存条/硬盘	×	○	○	○	○	○	○	○	○	○
电缆/连接器	×	○	○	○	○	○	○	○	○	○
输出输入设备	×	○	○	○	○	○	○	○	○	○
电源供应器/适配器	×	○	○	○	○	○	○	○	○	○
金属机构件	×	○	○	○	○	○	○	○	○	○

注1：○：表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出电器电子产品有害物质限制使用国家标准要求。

注2：以上未列出的部件，表明其有害物質含量均不超出电器电子产品有害物质限制使用国家标准要求。

注3：上述表格标注"×"之部件，皆符合达标管理目录限用物质应用例外清单之限值要求。

* 电路板组件：包括印刷电路板及其构成的零部件。

限用物質含有情況標示聲明書

單元	限用物質及其化學符號					
	鉛 (Pb)	汞 (Hg)	鎘 (Cd)	六價鉻 (Cr^{+6})	多溴聯苯 (PBB)	多溴二苯醚 (PBDE)
電路板總成	—	○	○	○	○	○
儲存裝置	—	○	○	○	○	○
輸出/入裝置	—	○	○	○	○	○
電源供應器	—	○	○	○	○	○
金屬機構件	—	○	○	○	○	○
塑膠機構件	○	○	○	○	○	○
風扇	—	○	○	○	○	○
配件(例:電源線等)	—	○	○	○	○	○

備考1. “超出0.1 wt %” 及 “超出0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。

備考2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。

備考3. “—” 係指該項限用物質為排除項目。

Environmental Policy

- The product has been designed to enable proper reuse of parts and recycling and should not be thrown away at its end of life.
- Users should contact the local authorized point of collection for recycling and disposing of their end-of-life products.
- Visit the MSI website <https://csr.msi.com/global/pevn_ewaste> and locate a nearby distributor for further recycling information.
- Please visit <https://us.msi.com/page/recycling> for information regarding the recycling of your product in the US.

Warranty

For any further information about the product users purchased, please contact the local dealer. Do not attempt to upgrade or replace any component of the product.

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Technical Support

If a problem arises with your system and no solution can be obtained from the user' s manual, please contact your place of purchase or local distributor. Alternatively, please try the following help resources for further guidance. Visit the MSI website for technical guide, BIOS updates, driver updates and other information via https://www.msi.com/support/