



Astro PN64-E1 User Guide





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ABOUT THIS GUIDE

Please read this User's Guide before using your CIARA Astro PN64-E1 Micro PC.

This User's Guide is divided into four chapters that provide information on Installation, trouble shooting, certification, detailed description and a Glossary. Please remember to fill out the Equipment Log and keep a copy in a safe place.

With proper care and operating procedures your CIARA Astro PN64-E1 will give you many years of service and high performance computing.

1.0 Installing and upgrading your system

1.1 Unpacking your micro PC

Your micro PC is packed with ecologic moulded boxboard on four sides to keep it in place during transit.

Carefully unpack your micro PC and be sure to save all boxboards for future shipping and transportation.



1.2 Choosing a site for the system

All CIARA computers operate reliably in a typical office or home environment. Choose a location that is readily accessible and meets the following requirements :

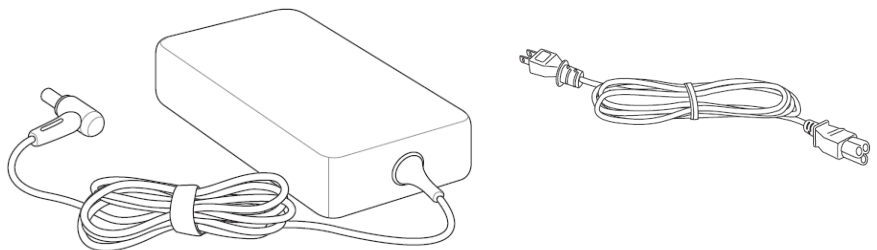
- Is near a grounded, three pronged power outlet
- The socket-outlet shall be installed near the equipment and shall be easily accessible.
- Is clean and dust free
- Is well-ventilated and lighted and away from sources of heat
- Is isolated from strong electromagnetic fields produced by electrical devices
(*i.e. air conditioners, large fans, large electric motors, radio and TV transmitters*)
- Has an appropriate table or desk that will allow you to work without physical discomfort and strain.

The Astro PNG4-E1 micro PC can be placed horizontally on your desk or mounted behind the monitor with the VESA mounting kit.



The external power supply adapter must be :

- Input voltage : 100-240 Vac
- Input frequency : 50-60 Hz
- Rating output current : 6.32 A (120 W)
- Rating output voltage : 19 Vdc



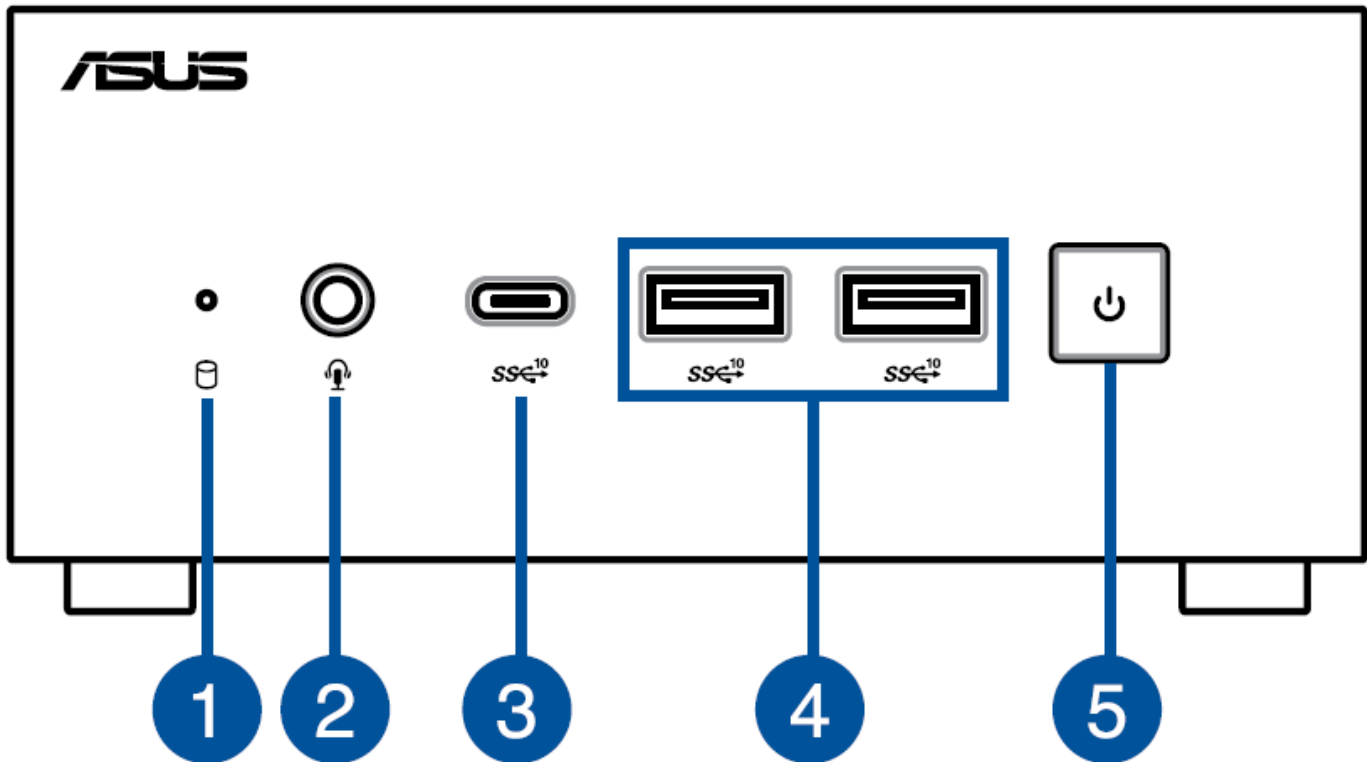
The adapter cannot be disassembled and is recyclable. The power cord is also recyclable but must be disposed of separately in accordance with the EU WEEE Directive Annex VII.

A few general precautions should always be observed :

- Never connect any peripheral such as a monitor to the system unit if the power is turned "ON". Always shut down the system first.
- Never remove the casing cover if the power is turned "ON".

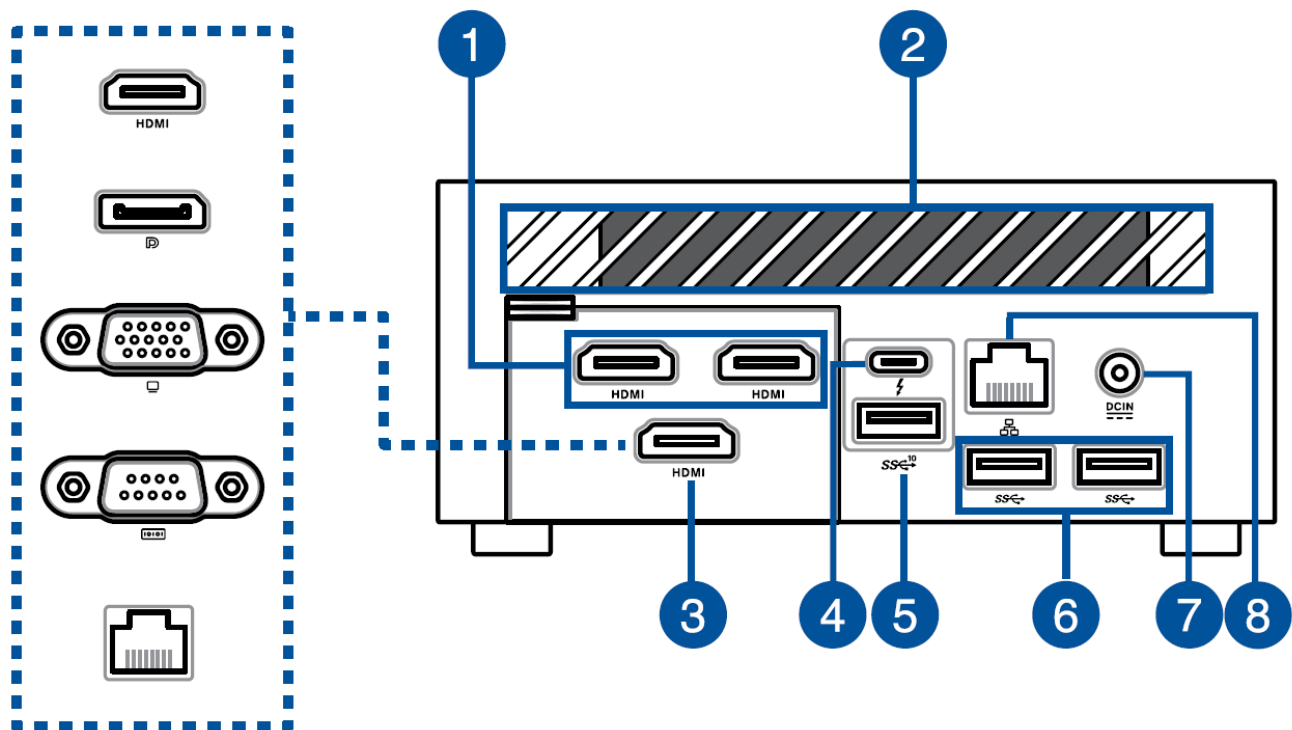
1.3 Getting to know your Astro PNG4-E1 micro PC

Front view



- 1**  **Drive activity indicator**
 This indicator lights up when your Micro PC is accessing the internal storage drive.
- 2**  **Headphone/Headset/Microphone jack**
 This port allows you to connect amplified speakers or headphones. You can also use this port to connect your headset or an external microphone.
- 3**  **USB 3.2 Gen 2 Type-C® port**
 This USB 3.2 Gen 2 Type-C® port provides the following:
 - Transfer rate of up to 10 Gbit/s for USB 3.2 Gen 1 devices.
 - Backward compatible to USB 2.0.
 - USB power delivery with a maximum of 5V / 3A output.
- 4**  **USB 3.2 Gen 2 port**
 The USB 3.2 Gen 2 (Universal Serial Bus) port provides a transfer rate up to 10 Gbit/s.
- 5**  **Power button**
 The power button allows you to turn the Micro PC on or off. You can use the power button to put your Micro PC to Sleep mode or press it for four (4) seconds to force shutdown your Micro PC.

Rear view



1 HDMI HDMI™ port

The HDMI™ (High Definition Multimedia Interface) port supports a Full-HD device such as an LCD TV or monitor to allow viewing on a larger external display.

NOTE: The left HDMI port supports CEC (Consumer Electronics Control). Connect any CEC compatible device that you want to control with a remote control to this port, and make sure that the device's HDMI-CEC is enabled. When using only this port as a display output source, this port will support a resolution of up to 4096 x 2160 @60Hz. The resolution may also be affected by the cabling and output device.

2 Air vents (exhaust vent)

The air vents allow your Micro PC chassis to expel hot air.

IMPORTANT: For optimal heat dissipation and air ventilation, make sure that the air vents are free from obstructions.

3 Configurable port

This port varies between models and consists of the following port options:

HDMI 2.1/VGA/COM/2.5G LAN/DP 1.4

4



Thunderbolt™ 4 with Power Delivery input port

This Thunderbolt™ 4 port provides the following:

- Transfer rate of up to 40 Gbit/s for Thunderbolt™ 4 devices.
- DisplayPort 1.4 support (5120 x 2880 @60 Hz).
- Backward compatible to USB 3.2.
- USB power delivery with a maximum of 5 V / 3 A output.
- Support for power (DC) input when connected to an external device that is PD (Power Delivery) compliant with a 20 V / 5 A output.

CAUTION!

- DO NOT connect your Mini PC to a device that supports less than 20 V / 5 A PD when using the Thunderbolt™ 4 port as a power (DC) input port. Doing so may cause problems when powering on your Mini PC.
- Always disconnect the charging cable from the power (DC) input port before using the Thunderbolt™ 4 port for power input.
- Make sure to power off your device when switching between the Thunderbolt™ 4 and power input ports.

5



USB 3.2 Gen 2 port

The USB 3.2 Gen 2 (Universal Serial Bus) port provides a transfer rate up to 10 Gbit/s.

6



Power input

The supplied power adapter converts AC power to DC power for use with this jack. Power supplied through this jack supplies power to the Micro PC. To prevent damage to the Micro PC, always use the supplied power adapter.

WARNING! The power adapter may become warm to hot when in use. Do not cover the adapter and keep it away from your body.

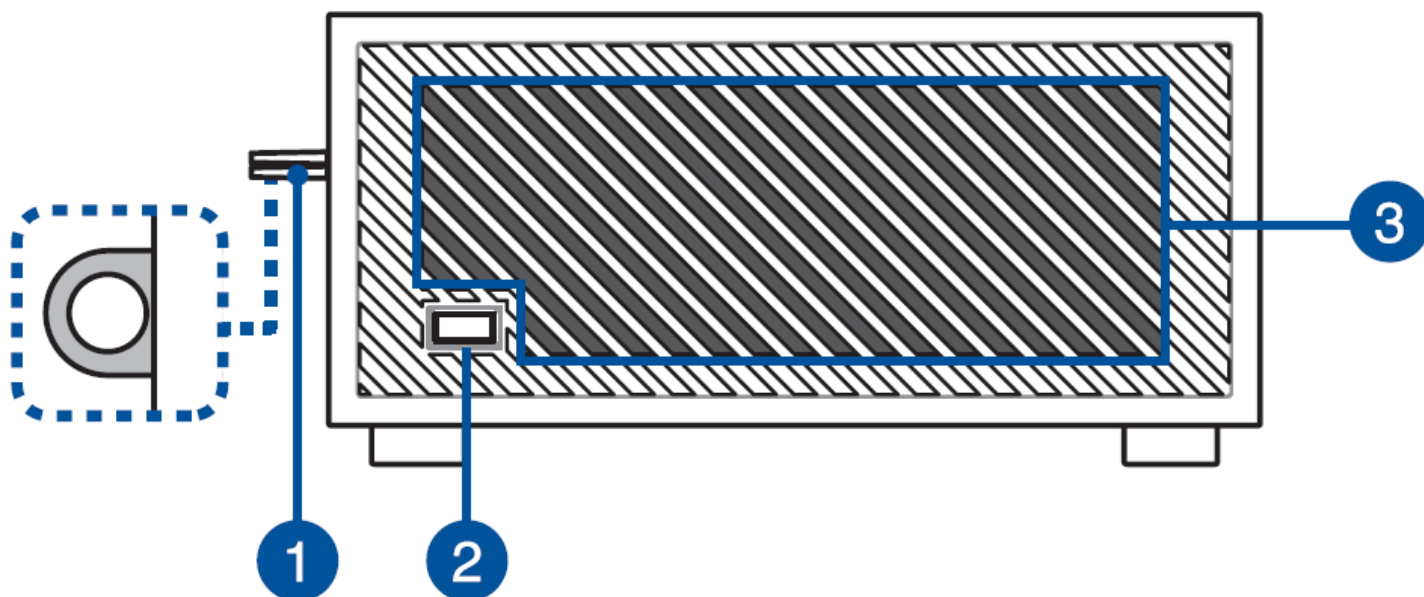
7



LAN port

The 8-pin RJ-45 LAN port supports a standard Ethernet cable for 10/100/1000/2500Mbps connection to a local network.

Left view



1

Padlock ring

This ring allows you to attach a standard padlock to prevent unauthorized disassembly of your Micro PC.

NOTE: The padlock is purchased separately.

2

Kensington® security slot

The Kensington® security slot allows you to secure your Micro PC using Kensington® security products.

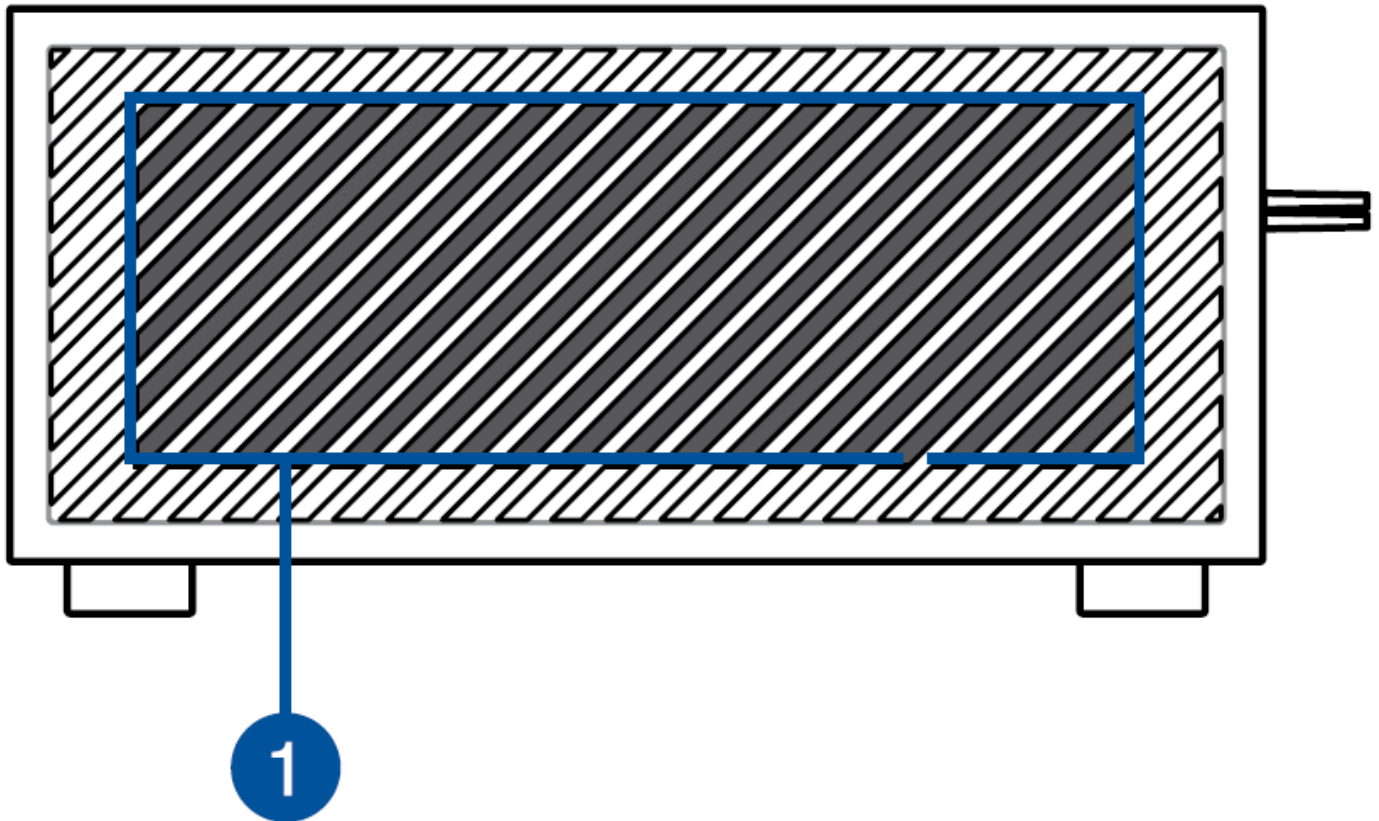
3

Air vents (intake vent)

The air vents allow cooler air to enter your Micro PC chassis.

IMPORTANT: For optimal heat dissipation and air ventilation, make sure that the air vents are free from obstructions.

Right view



- 1 **Air vents (intake vent)**
The air vents allow cooler air to enter your Micro PC chassis.
IMPORTANT: For optimal heat dissipation and air ventilation, make sure that the air vents are free from obstructions.

1.3.1 Recovery from CIARA recovery DVD

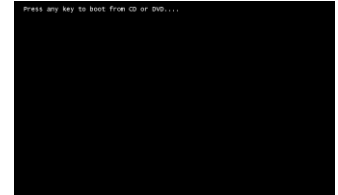
1.3.1.1 Recovery from CIARA Window 10 Pro recovery DVD



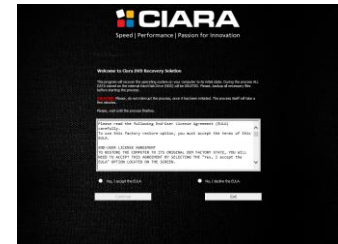
Before you start this procedure, please back up all your important information, the recovery media will erase all data on HDD before installation.

Insert the Windows 10 Pro Recovery DVD and restart the system.

- 1- When prompted, press any key to boot from the DVD.
The recovery image will then start.



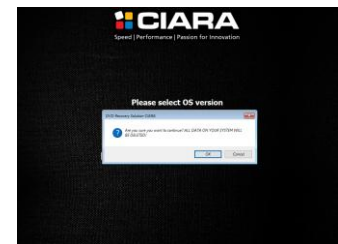
- 2- Accept the EULA and press on Continue.



- 3- Select the OS version and press Start System Recovery.

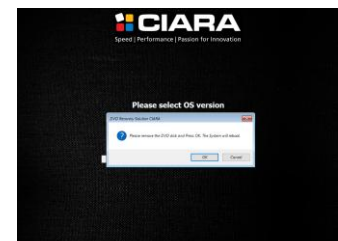


- 4- A pop up will then open warning you that all the data will be lost.
If all your files are already saved, press OK.



- 5- The recovery will take around 30 minutes to complete. A window will show you the process of the recovery, once completed Eject the DVD then press OK. The system will then reboot.

NOTE: All drivers required for your system will be already installed except for components that were not part of your original purchase



1.3.1.2 Recovery from CIARA Window 11 Home recovery DVD



Before you start this procedure, please back up all your important information, the recovery media will erase all data on HDD before installation.

Insert the Windows 11 Home Recovery DVD and restart the system.

- 1- When prompted, press any key to boot from the DVD.
The recovery image will then start.



- 2- Accept the EULA and press on Continue.



- 3- Select the OS version and press Start System Recovery.



- 4- A pop up will then open warning you that all the data will be lost.
If all your files are already saved, press OK.



- 5- The recovery will take around 30 minutes to complete. A window will show you the process of the recovery, once completed Eject the DVD then press OK. The system will then reboot.
NOTE: All drivers required for your system will be already installed except for components that were not part of your original purchase



1.3.1.3 Recovery from CIARA Window 11 Pro recovery DVD



Before you start this procedure, please back up all your important information, the recovery media will erase all data on HDD before installation.

Insert the Windows 11 Pro Recovery DVD and restart the system.

- 1- When prompted, press any key to boot from the DVD.
The recovery image will then start.



- 2- Accept the EULA and press on Continue.



- 3- Select the OS version and press Start System Recovery



- 4- A pop up will then open warning you that all the data will be lost.
If all your files are already saved, press OK.



- 5- The recovery will take around 30 minutes to complete. A window will show you the process of the recovery, once completed Eject the DVD then press OK. The system will then reboot.

NOTE: All drivers required for your system will be already installed except for components that were not part of your original purchase



1.3.2 Windows Recovery from Startup Settings

1.3.2.1 Windows 10 Recovery from Startup Settings

With the Windows Startup Settings screen (formerly advanced boot options) you can start Windows in different advanced troubleshooting modes so you can find and fix problems on your PC. In previous versions of Windows, you could get to this screen by pressing F8 before Windows started up. Windows 10 PCs start up quickly so there's not enough time to press F8.

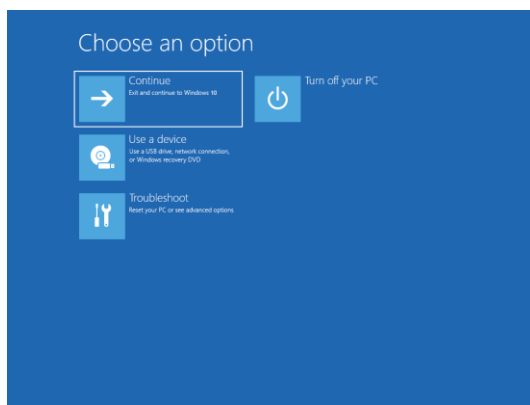
There are two ways to get to the Windows Startup Settings screen in Windows 10:

- If you're not signed in to Windows, tap or click the power icon  from the sign-in screen, hold **Shift**, and then tap or click **Restart**.

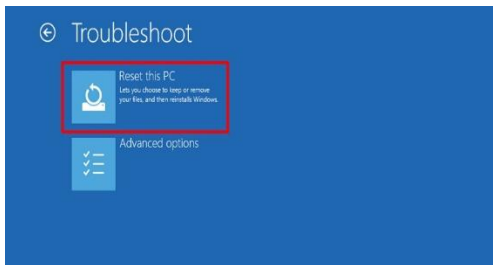


- Or, if you're already signed in:
 1. Click on windows button, select **Settings**, and then select Update security.
 2. From left select Recovery.
 3. Under **Advanced startup**, tap or click **Restart now**.
 4. On the **Choose an option** screen, tap or click **Troubleshoot**.
 5. Select Advanced options **and then** Startup Settings
 6. Tap or click **Restart**.
 7. On the **Startup Settings** screen, choose the startup setting you want.
 8. Sign in to your PC with a user account that has administrator rights.

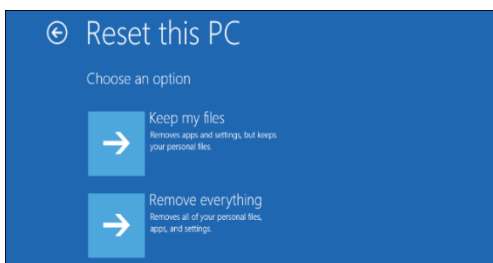
Choose **Troubleshoot**



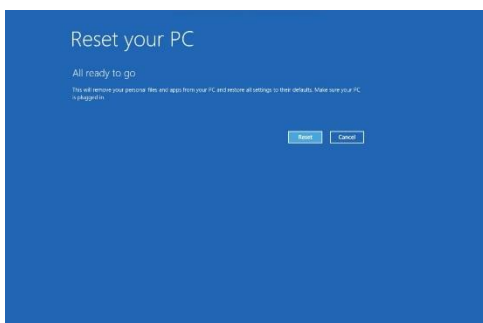
Choose **Reset your PC**



Choose **Remove everything**



Press **Reset**



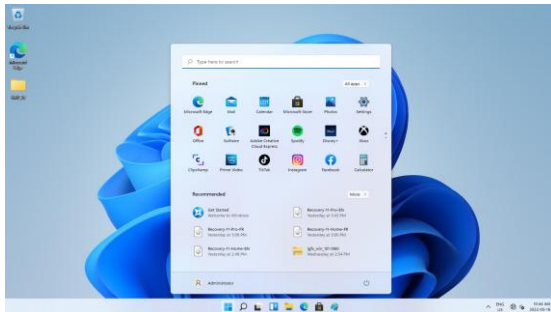
Then follow the regular Windows 10 Installation process.

1.3.2.2 Windows 11 Recovery from Startup Settings

With the Windows Startup Settings screen (formerly advanced boot options) you can start Windows in different advanced troubleshooting modes so you can find and fix problems on your PC. In previous versions of Windows, you could get to this screen by pressing F8 before Windows started up. Windows 11 PCs start up quickly so there's not enough time to press F8.

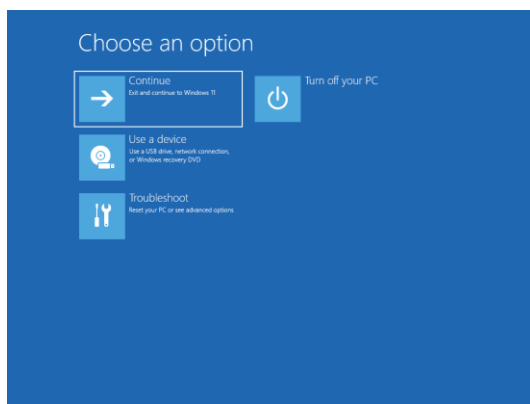
There are two ways to get to the Windows Startup Settings screen in Windows 11:

- If you're not signed in to Windows, tap or click the power icon  from the sign-in screen, hold **Shift**, and then tap or click **Restart**.

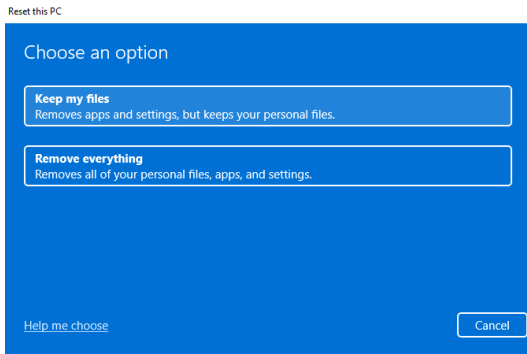


- Or, if you're already signed in:
 1. Click on the windows logo button, select **Settings**, and then select **System**.
 2. From the **Right side pane** select **Recovery**.
 3. Under **Recovery Options**, tap or click **Reset PC**.
 4. On the **pop-up screen**, tap or click **Remove Everything** then press **Next**.
 5. Select **Advanced Settings**, and then press **Change Settings**, then clean data to **Yes**, press **Confirm**.
 6. Tap or click **Restart**.
 7. Windows will restart and reset your PC to its initial state.
 8. Follow instructions at the Startup Settings screen and choose the startup setting you want.
 9. Sign in to your PC with a user account that has administrator rights.

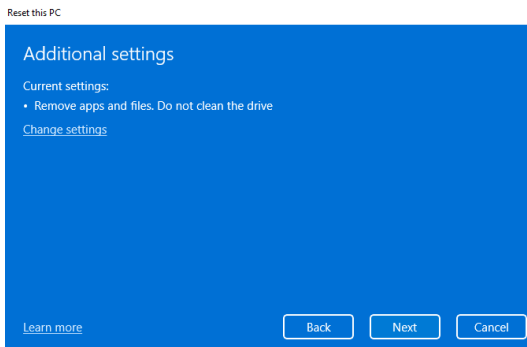
Choose **Continue**



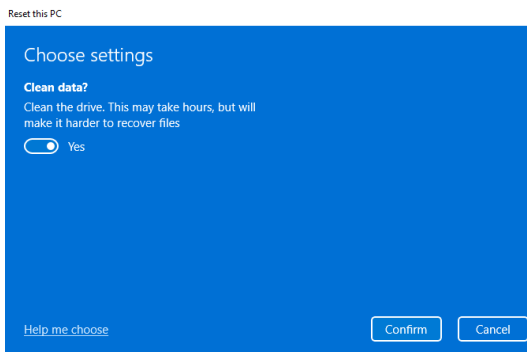
Choose **Remove everything**



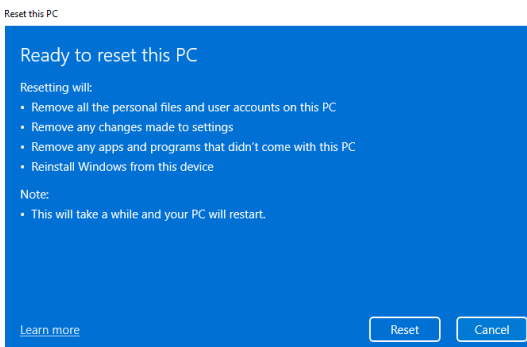
Press **Next**



Set **Clean data** to **Yes** and press **Confirm**



Press **Reset**



Then follow the regular Windows 11 Installation process.

1.3.3 Corrupted BIOS recovery

The ASUS CrashFree BIOS 3 is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using the motherboard support USB flash drive that contains the updated BIOS file.

NOTE: Before using this utility, rename the BIOS file in the removable device into **PN64-E1.CAP**.

Download the latest BIOS file from the Asus website at https://www.asus.com/displays-desktops/mini-pcs/pn-series/asus-expertcenter-PN64-E1/helpdesk_bios/.

Recovering the BIOS

To recover the BIOS :

1. Turn on the system.
2. Insert the support USB flash drive that contains the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 2 utility automatically.
4. The system requires you to enter BIOS Setup to recover BIOS settings. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure.

1.3.4 System maintenance

Read and follow carefully all the instructions and warnings in this manual and on these products!

Only use a damp cloth to clean your system unit and monitor case. Do not use detergents!

Position your system unit, monitor and cables/wires away from direct sunlight, moisture, dust, oil, and thoroughfares.

Ensure that all ventilation outlets are always free from obstruction.

In the event of mechanical/power failure or damage, do not attempt to repair the system unit, monitors, cables /wires. Refer all such problems to experienced service personnel.

Ensure that the front of the system unit is at least 6" away from anything that might obstruct the ventilation outlets and cause overheating.

Ensure that the power source is grounded correctly. This product is equipped with a 3-wire grounding-type plug. This plug will only fit into a grounded power outlet.

1.3.5 Using the CIARA Astro PN64-E1

1.3.5.1 Introduction

The CIARA Astro PN64-E1 is a powerful micro PC that has the ability to run a variety of operating systems. Unless you have specified something different, your system comes configured with a Windows operating system pre-loaded onto the hard drive. Each operating system comes with its own user manuals, and you should refer to these for information specific to your system.

1.3.5.2 A caution about viruses

Due to the prevalence of computer viruses, we strongly recommend that you take precautions to protect your computer from them. Purchase and use a reputable virus-checking program. Ensure that the program is kept up to date by registering the program, and installing updates as they become available. Please be aware, however, that even the best virus checking programs cannot be regarded as the perfect solution. It is possible for even the best program to fail, particularly if it is not updated. Please contact your CIARA account representative for more information.

1.3.5.3 Windows

Windows is a Graphical User Interface (GUI) that provides a screen composed of icons. You select or “click” on the icons to run programs. As noted above, Windows has been installed on your computer. For further information about using Windows, please consult the appropriate Microsoft software manual provided with your CIARA Astro PN64-E1.

1.3.5.4 Windows Server 2019, 2022 and Linux

Windows Server 2019, Windows Server 2022 and Linux are operating systems that provide sophisticated networking capabilities to Windows based computers. The onboard Network Interface Controller (NIC) in the micro PC allows the user to connect the CIARA Astro PN64-E1 to a network server computer running Windows Server 2019, Windows Server 2022 or Linux.

Microsoft and Linux provide workstations on the network with access to files and applications stored on the file server (a dedicated computer running the Windows Server 2019, Windows Server 2022 or Linux operating systems), as well as access to shared printers on the network. Sophisticated tools are built into the Windows Server 2019, Windows Server 2022 and Linux operating systems to manage the network, and to restrict access to resources on the file server.

For further information about Windows Server 2019, Windows Server 2022 or Linux, please consult the manuals provided with the network operating system (NOS), or speak to your service representative.

1.4 Troubleshooting your system after first install

1.4.1 Helpful hints

If you encounter some minor problems with the micro PC, monitor, or software, see the following list of general suggestions before taking further action :

- Check that the micro PC and monitor are plugged into a working electrical outlet.
- Check to see that the micro PC is turned on.
- Check to see that the monitor is turned on and the monitor light is on.
- Turn up the brightness and contrast controls of the monitor if the monitor is dim.
- Press and hold any key. If the system beeps, then the keyboard should be operating correctly.
- Check all cable connections for loose connections or incorrect connections.
- Wake the micro PC by pressing any key on the keyboard or pressing the power button. If the system remains in suspend mode, shut down the micro PC by pressing and holding the power button for at least four seconds then press the power button again to restart the micro PC. If the system will not shut down, unplug the power cord, wait a few seconds, and then plug it in again. The micro PC will restart if automatic start on power loss is set in the BIOS. If it does not restart, press the power button to start the micro PC.
- Be sure that all the needed device drivers have been installed. For example, if you are using a printer, you need a driver for that model of printer.
- If you have installed an operating system other than the factory-installed operating system, check to be sure that it is supported on the system.
- Your system can support four independent monitors using any of the two available HDMI ports, the optional port or the USB type C port at the rear panel.

1.5 Solving general problems

You should be able to easily resolve the general problems described in this section. If a problem persists and you are unable to resolve it, or if you feel uncomfortable about performing the operation, contact CIARA at 1-877-242-7272 and ask for the Customer Service department.

Solving general problems		
Problem	Cause	Solution
Micro PC appears locked up and will not turn off when the power button is pressed	Software control of the power switch is not functional.	Press and hold the power button for at least four seconds until the computer turns off.
Micro PC will not respond to USB keyboard or mouse.	Micro PC is in Last State mode.	Press the power button to resume from Last State mode.
CAUTION : When attempting to resume from Last State mode, do not hold down the power button for more than four seconds. Otherwise, the micro PC will shut down and you will lose your data.		
Micro PC date and time display is incorrect.	RTC (real-time clock) battery may need to be replaced. ► Connecting the computer to a live AC outlet prolongs the life of the RTC battery.	Reset the date and time under Control Panel (Computer Setup can also be used to update the RTC date and time). If the problem persists, replace the RTC battery.
Cursor will not move using the arrow keys on the keypad.	The Num Lock key may be on.	Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys.
Poor performance is experienced	Processor is hot.	1. Make sure the airflow to the computer is not blocked. 2. Make sure the fans are connected and working properly (some fans only operate when needed) 3. Make sure the processor heat sink is installed properly. 4. The system might be infected with a virus and that it would need to be cleaned with an antivirus software
	Hard drive or SSD is full.	Transfer data from the hard drive or SSD to create more space on the drive.

1.5.1 Solving hard drive problems

Solving hard drive problems		
Problem	Cause	Solution
Hard drive error occurs.	Hard disk has bad sectors or has failed.	Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.
Disk transaction problem.	Either the directory structure is bad or there is a problem with a file.	In Windows, right-click Start, click Explore, and select a drive. Select File > Properties > Tools. Under Error-checking, click Check Now.
Drive not found.	Cable could be loose.	Check cable connections.
Micro PC seems to be locked up.	Program in use has stopped responding to commands.	Attempt the normal Windows "Shut Down" procedure. If this fails, press the power button for four or more seconds to turn off the power. To restart the micro PC, press the power button again.

1.5.2 Solving display problems

Solving display problems		
Problem	Cause	Solution
Blank screen (no video).	Monitor is not turned on and the monitor light is not on.	Turn on the monitor and check that the monitor light is on.
	The cable connections are not correct.	Check the cable connection from the monitor to the micro PC and to the electrical outlet. See section 1.3.
	You may have a screen blanking utility installed or energy saver features are enabled.	Press any key or click the mouse button and, if set, type your password.
	You are using a fixed-sync monitor and it will not sync at the resolution chosen.	Be sure that the monitor can accept the same horizontal scan rate as the resolution chosen.
	Micro PC is in Last State mode.	Press the power button to resume from Last State mode.
CAUTION : When attempting to resume from Last State mode, do not hold down the power button for more than four seconds. Otherwise, the micro PC will shut down and you will lose your data.		
Dim characters.	The brightness and contrast controls are not set properly.	Adjust the monitor brightness and contrast controls.
	Cables are not properly connected.	Check that the graphics cable is securely connected to the video port and the monitor. See section 1.3
Blurry video or requested resolution cannot be set.	If the graphics controller was upgraded, the correct graphics drivers may not be loaded.	Install the video drivers included in the upgrade kit.
	Monitor is not capable of displaying requested resolution.	Change requested resolution.
The picture is broken up, or it rolls, jitters, or flashes.	The monitor connections may be incomplete or the monitor may be incorrectly adjusted.	1. Be sure the monitor cable is securely connected to the micro PC. See section 1.3 2. In a two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart. 3. Fluorescent lights or fans may be too close to the monitor.
High-pitched noise coming from inside a flat panel monitor.	Brightness and/or contrast settings are too high.	Lower brightness and/or contrast settings.

1.5.3 Solving audio problems

Solving audio problems		
Problem	Cause	Solution
Sound does not come out of the speaker or headphones.	Software volume control is turned down.	Double-click the Speaker icon on the taskbar, and then make sure that Mute is not selected and use the volume slider to adjust the volume.
	The external speakers are not turned on.	Turn on the external speakers.
	External speakers plugged into the wrong audio jack.	Only one of the two audio ports is reserved for speakers.
	Micro PC is in Last State mode.	Press the power button to resume from Last State mode.
CAUTION : When attempting to resume from Last State mode, do not hold down the power button for more than four seconds. Otherwise, the micro PC will shut down and you will lose your data.		
Sound cuts in and out.	Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.
Micro PC appears to be locked up while recording audio.	The hard disk may be full.	Before recording, make sure there is enough free space on the hard disk. You can also try recording the audio file in a compressed format.

1.5.4 Solving printer problems

Printer prints garbled information.	The correct printer driver for the application is not installed.	Install the correct printer driver for the application.
	The cables may not be connected properly.	Reconnect all cables.
	Printer memory may be overloaded.	Reset the printer by turning it off for one minute and then turn it back on.
Printer is offline.	The printer may be out of paper.	Check the paper tray and refill it if it is empty. Select online.
Printer will not print.	Printer is not turned on and online.	Turn the printer on and make sure it is online.
	The correct printer drivers for the application are not installed.	Install the correct printer driver for the application.
	If you are on a network, you may not have made the connection to the printer.	Make the proper network connections to the printer.
	Printer may have failed.	Run printer self-test.
Printer will not turn on.	The cables may not be connected properly.	Reconnect all cables and check the power cord and electrical outlet.

1.5.5 Solving keyboard and mouse problems

Solving keyboard and mouse problems		
Problem	Cause	Solution
The micro PC does not recognize keyboard commands and typing.	Keyboard connector is not properly connected.	Connect keyboard correctly
	Keyboard needs repairs.	Contact CIARA so that we may proceed to repairs.
	Micro PC is in Last State mode.	Press the power button to resume from Last State mode.
CAUTION : When attempting to resume from Last State mode, do not hold down the power button for more than four seconds. Otherwise, the micro PC will shut down and you will lose your data.		
Cursor will not move using the arrow keys on the keypad.	The Num Lock key may be on.	Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys.
Mouse does not respond to movement or is too slow.	Mouse connector is not properly plugged into the back of the computer.	Connect mouse properly.
	Mouse needs repairs.	Contact CIARA so that we may proceed to repairs.
	Micro PC is in Last State mode.	Press the power button to resume from Last State mode.
CAUTION : When attempting to resume from Last State mode, do not hold down the power button for more than four seconds. Otherwise, the micro PC will shut down and you will lose your data.		

1.5.6 Solving hardware installation problems

Solving hardware installation problems		
Problem	Cause	Solution
A new device is not recognized as part of the system.	Device is not seated or connected properly.	Ensure that the device is properly and securely connected and that pins in the connector are not bent down.
	Cable(s) of new external device are loose or power cables are unplugged.	Ensure that all cables are properly and securely connected and that pins in the cable or connector are not bent down.
	Power switch of new external device is not turned on.	Turn off the computer, turn on the external device and then turn on the computer to integrate the device with the computer system.
	When the system advised you of changes to the configuration, you did not accept them.	Reboot the computer and follow the instructions for accepting the changes.
Power LED flashes six times, once every second, followed by a two second pause, and the micro PC beeps six times.	Memory is installed incorrectly or is bad.	1. Reseat DIMMs. Power on the system. 2. Replace DIMMs one at a time to isolate the faulty module. 3. If a faulty module is found, Contact CIARA for the replacement of the module. 4. If the problem persists, Contact CIARA for this may necessitate the replacement of the motherboard.

1.5.7 Solving memory problems

Solving memory problems		
Problem	Cause	Solution
System will not boot or does not function properly after installing additional memory modules.	Memory module is not the correct type or speed grade for the system or the new memory module is not seated properly.	Replace memory module with a module approved for your system. See Sections 1.6.6 of the present Guide to verify if you have installed memory modules compatible to your system and if they were installed correctly.
Out of memory error.	You have run out of memory to run the application.	Check the application documentation to determine the memory requirements.
Insufficient memory error during operation.	Too many programs are being used.	Close any programs that you do not need.
	You have run out of memory for the application.	Check the memory requirements for the application or add more memory to the computer.
Power LED flashes five times, once every second, followed by a two second pause, and the micro PC beeps three times.	Memory is installed incorrectly or is bad.	1. Reseat DIMMs. Power on the system. 2. Replace DIMMs one at a time to isolate the faulty module. 3. If a faulty module is found, Contact CIARA for the replacement of the module. 4. If the problem persists, Contact CIARA for this may necessitate the replacement of the motherboard.

1.5.8 Solving processor problems

Solving processor problems		
Problem	Cause	Solution
Poor performance is experienced.	Processor is hot.	1. Make sure the airflow to the computer is not blocked. 2. Make sure the fan is connected and working properly. 3. Make sure the processor thermal pipe is installed properly. 4. Make sure the processor fan connector is properly connected to the CPU_FAN header on the motherboard. 5. Make sure sufficient thermal compound has been applied on the processor before the thermal pipe is put in place. This ensures that heat is drawn away from the processor to the thermal pipe.

1.6 Component installation guide

1.6.1 Precautions against static electricity



ATTENTION: Components such as processors and memory may be permanently damaged by shocks arising from static electricity. It is hence important to wear antistatic, smock, gloves, shoes and ankle during the installation process. Here are a few examples of protective equipment.

Typical antistatic foot ground device.



Antistatic shoes with foot ground device.
Note that the floor surface is also antistatic.



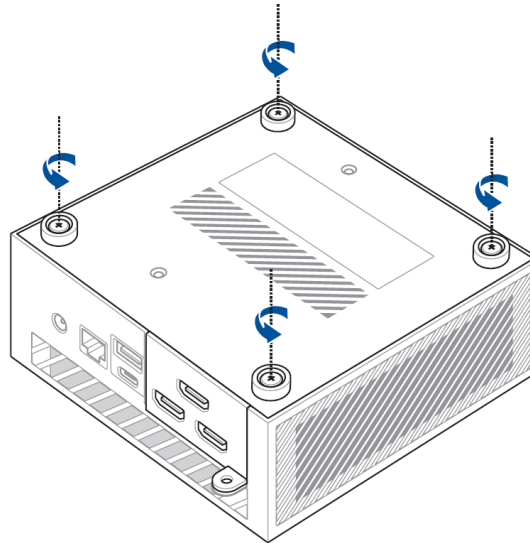
Antistatic smock and gloves.
Note that the table surface is also antistatic.



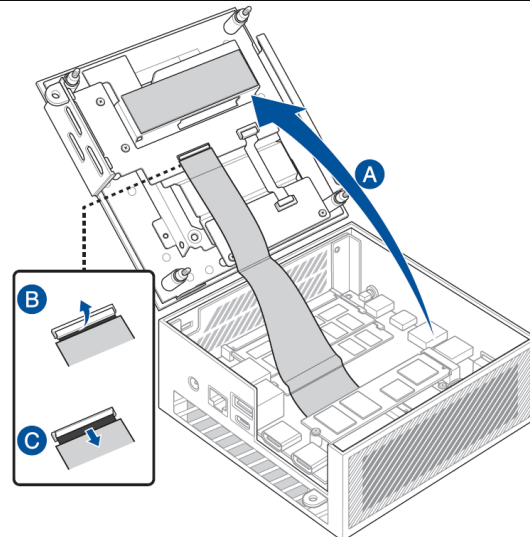
1.6.2 Removing and replacing the bottom cover

1.6.2.1 Removing the bottom cover

- 1- Turn off your Micro PC then disconnect all cables and peripherals.
- 2- Place the Micro PC on a flat stable surface with its top side facing down.
- 3- Completely loosen the four (4) screws from the bottom cover.



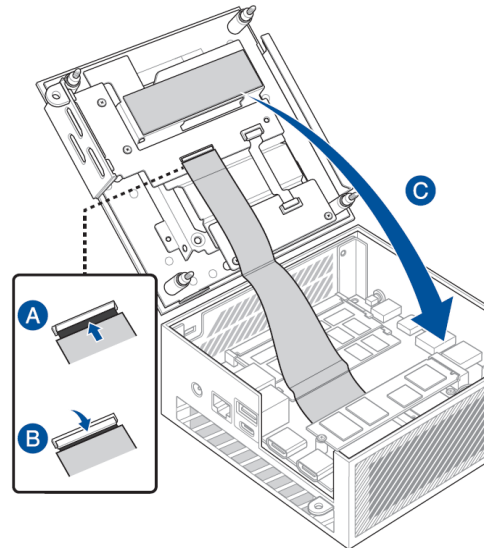
- 4- Gently lift the bottom cover in the direction shown in the illustration (A), then flip the connector flaps open (B) and remove the cable (C).



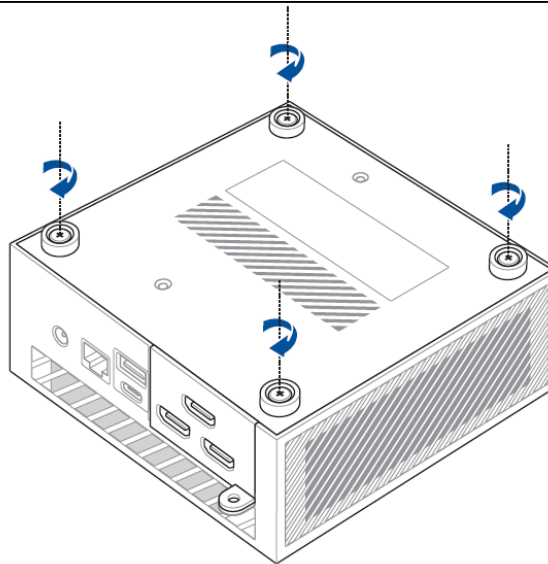
1.6.2.2 Replacing the bottom cover

- 1- Insert the cable into the connectors (A), then close the flaps to secure the cable (B). Close the bottom cover (C).

IMPORTANT! Ensure the PCB gold fingers on the cable are facing the connectors.



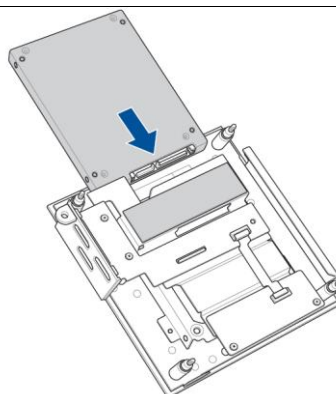
- 2- Tighten the four (4) screws on the bottom cover to secure it in place.



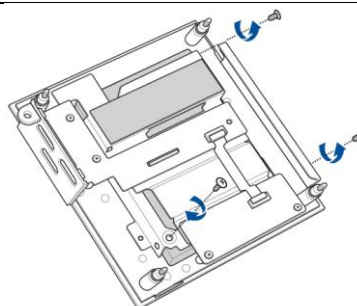
1.6.3 Installing 2.5" HDD or SSD

- 1- Prepare your 2.5" HDD or SSD, then align it with the storage bay on the bottom cover of your Micro PC.
- 2- Insert your HDD or SSD into the storage bay.

IMPORTANT! This device only supports 7 mm and 9.5 mm 2.5" HDD or SSD.



- 3- Secure the HDD or SSD with three (3) screws.

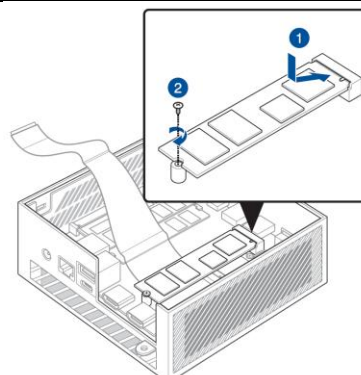


1.6.4 Installing an M.2 SSD

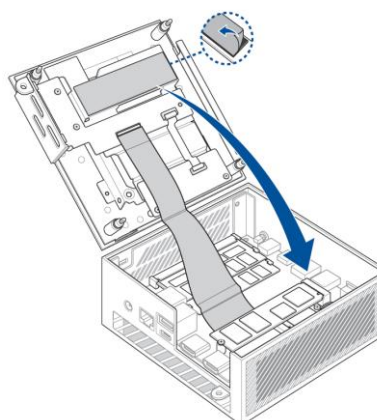
Your Micro PC comes with an M.2 slot in the chassis.

To install an M.2 SSD into the chassis

- 1- Align and insert the 2280 M.2 SSD into its slot inside the Micro PC.
- 2- Gently push down the 2280 M.2 SSD on top of the standoff and fasten it using one of the bundled 3mm round screws.



- 3- Before closing the bottom cover, make sure to remove the plastic film on the thermal pad.



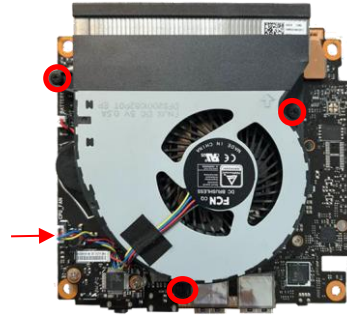
1.6.5 Installation of the processor fan and the thermal pipe

The processor is pre-installed at the factory and cannot be replaced.

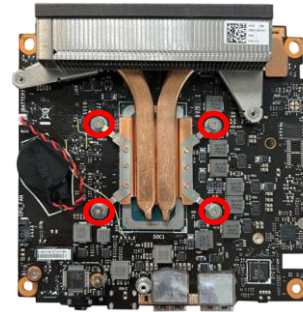
If you have to replace the processor fan and the thermal pipe, follow the procedure below.

Unscrew the 3 screws that hold the fan.

Unplug it and remove it.



Unscrew the 4 screws holding the thermal pipe and remove it.

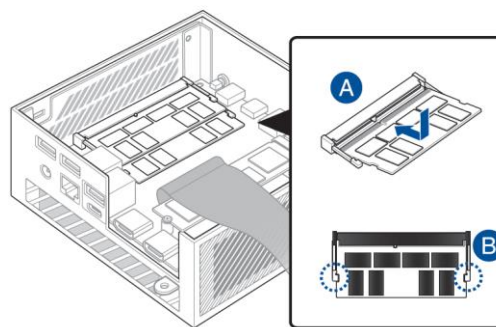


1.6.6 Installation of the memory modules

Your Micro PC comes with two SO-DIMM memory slots that allow you to install two DDR5 SO-DIMMs.

IMPORTANT! Refer to <http://www.asus.com> for a list of compatible DIMMs. You can only install DDR5 SO-DIMMs to the Micro PC's DIMM slots.

Align and insert the memory module into the slot (A) and press down (B) until it is securely seated in place. Repeat the same steps to install the other memory module.



ATTENTION : Components such as memory may be permanently damaged by shocks arising from static electricity. It is hence important to wear an antistatic bracelet during the installation process.

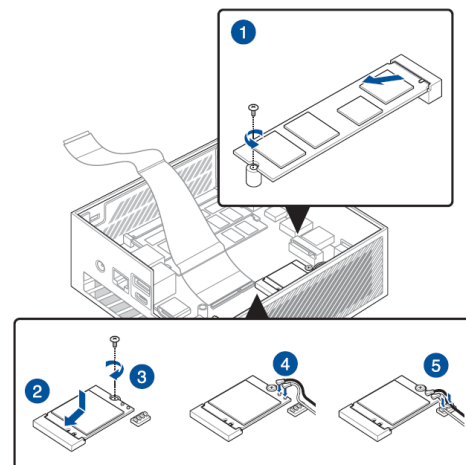
1.6.7 Installation of WiFi card

NOTE: Your Micro PC includes an M.2 slot for 2230 wireless and Bluetooth modules. Refer to <http://www.asus.com> for a list of compatible wireless and Bluetooth modules.

- 1- (optional) Remove the M.2 SSD if one is installed. To remove the M.2 SSD, remove the screw from the standoff, then remove the M.2 SSD.
- 2- Align and insert the wireless card into its slot inside the Micro PC.
- 3- Gently push down the wireless card on top of the standoff and fasten it using a screw.
- 4- (optional) Connect the antennas to your wireless card.
- 5- (optional) Organize your antenna cables with the cable holder clips.

NOTE:

- Connecting antennas to your wireless card may strengthen the wireless signal.
- A soft clicking sound indicates that the antenna has been securely attached to the wireless card.



1.6.8 Chassis Characteristics

Mid-Tower Specifications	
Drive Bay Space :	Int. 1 x 2.5"
Power Source :	External AC adapter 120 W
Dimensions :	120 x 130 x 58 mm [0.9 L]
Processor cooling fan :	Rear exhaust fan
Security :	Kensington slot and safety loop
Casing material :	Recyclable metal
Monting :	Can be mounted at the rear of monitor with VESA mounting kit

Front view



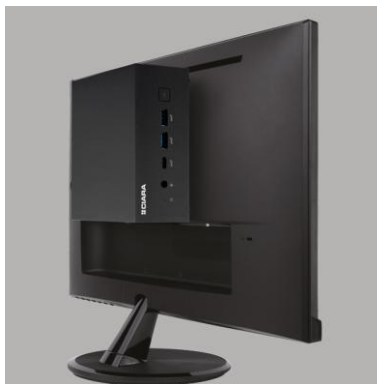
Rear view



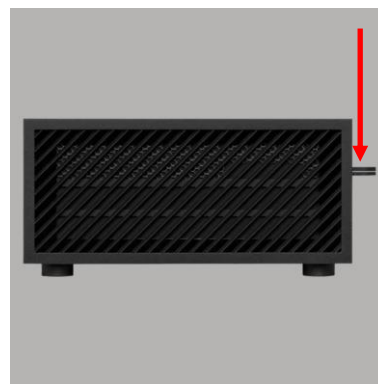
Side view



At the rear of monitor



Padlock ring



Kensington lock slot



1.6.9 Installing your Mini PC to a VESA mount-compatible device

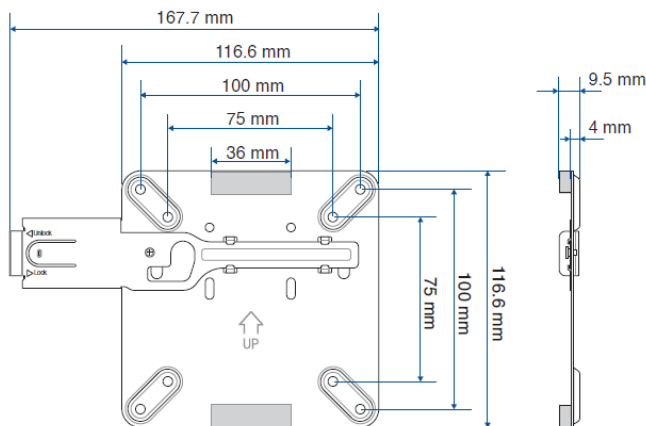
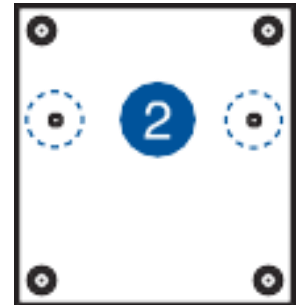
NOTE:

- If you are installing your Mini PC to a monitor, make sure that the monitor complies to VESA standards.
- Product and accessory images are for illustrative purposes only. The actual appearance and specifications may vary depending on model.

1. Place your Mini PC upside down on a flat and stable surface.
2. Attach the two (2) bundled 12mm screws into the screw holes at the bottom of your Mini PC.

WARNING! Do not overtighten the screws as it may cause damage to your Mini PC.

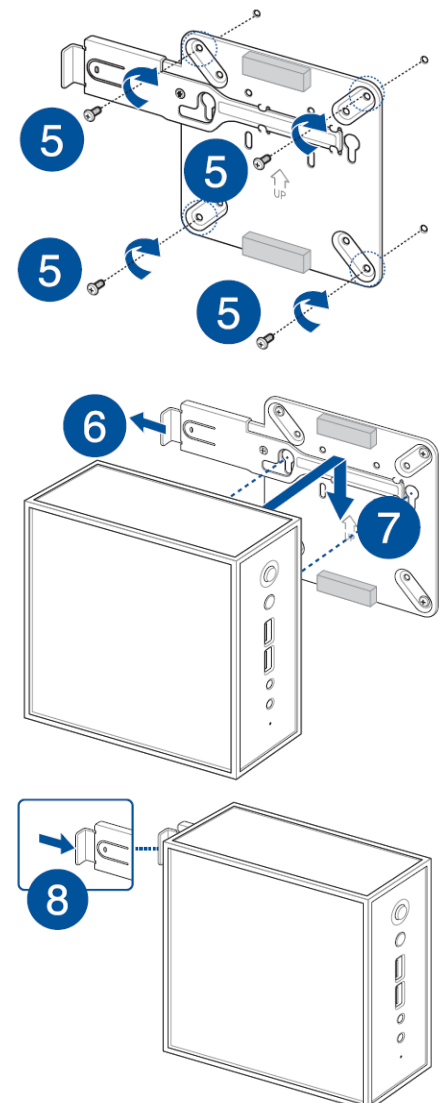
3. Remove the screw hold covers at the back of your VESA mount-compatible device, if they exist.
4. With the arrow on the VESA mounting plate pointing upward, align the screw holes on the VESA mount-compatible device to one of the two sets of standard mounting hole patterns (75 x 75 or 100 x 100).



5. Secure the VESA mounting plate to the VESA mount-compatible device using the bundled screws.

WARNING! Do not overtighten the screws as it may cause damage to your VESA mount-compatible device.

6. Pull the metal lock on the VESA mounting plate outwards.
7. Position the Mini PC and insert the screws attached on the Mini PC to the mounting holes of the VESA mounting plate, then gently push the Mini PC down to secure it in place.
8. Push the metal lock back towards the Mini PC until it securely snaps in place.



2.0 Certification and declaration

All CIARA Astro PN64-E1 models run the following operating systems software :

- Microsoft® Windows 10
- Microsoft® Windows 11

CIARA Astro PN64-E1 models will operate on Windows Server 2019 and Windows Server 2022 based networks, provided that appropriate application software have been installed.

CIARA is licensed to supply the Windows 11 operating systems software with its CIARA Astro PN64-E1 micro PCs. A package of the latest version of Windows software and a manual is included with the CIARA Astro PN64-E1.

If you have purchased a Windows license with your CIARA Astro PN64-E1 system, please abide by the Copyright and License terms and conditions that are enclosed with this software package. These require that the Windows software may only be used and installed on the CIARA Astro PN64-E1 micro PC with which they were purchased.

You may make copies of this Windows software solely for your own back-up purposes.

All CIARA Astro PN64-E1 series micro PCs are certified by UL/ULC Canada and United States and meet or exceed the Class B limitations for Radio noise emissions from digital apparatus as set out in the Radio Interference Regulations of Industry Canada.

2.1 Radio interference precautions

To minimize the likelihood of interference being caused to any radio or TV equipment, CIARA recommends that shielded cables with metal RFI/EMI connector hoods be used to connect all peripheral devices to the CIARA Astro PN64-E1 micro PC.

In the event that perceptible interference occurs, then please ensure that a ground connection is made from any peripheral devices to the computer chassis. However, a separate ground connection is not necessary if a shielded cable is used to connect the computer with any peripheral device.

Very often, simply moving the computer equipment to another location a few feet away will remove any signs of interference to television reception.

Under no circumstances should any "radio-type" modems be attached to the computer, unless a license has been obtained from the appropriate regulatory authorities (in Canada - the Department of Communications of Industry Canada, and in the U.S.A. - the Federal Communications Commission).

2.2 Declaration of conformity

We, Manufacturer/Importer

CIARA
9300 Trans-Canada Highway
Montreal, Quebec H4S 1K5
Tel : (514) 798-8880
Fax : (514) 798-8889

Declare that the product

Micro PC System
CIARA Astro PN64-E1

is in conformity with ICES-003 and Part 15 subpart B of the FCC Rules.

Simon Ahdoot, President
CIARA

2.3 FCC Information to User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of 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 guide, may cause harmful interference to radio communications. However, there are no guarantees that radio 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 following measures:

Reorient or relocate the receiving antenna.

Increase the distance between the equipment and the receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the vendor or an experienced radio/TV technician for help.

Warning

Changes or modifications not expressly approved by CIARA could void the user's authority to operate the equipment.

This equipment is equipped with a shielded 3-wire power cord and plug. Use this power cord in conjunction with a properly grounded electrical outlet to avoid electrical shock and to reduce radio frequency interference that may emanate from the power cord.

We recommend you use shielded remote I/O cables, with properly grounded shields and metal connectors in order to reduce radio frequency interference, which may emanate from these cables.

3.0 ONE YEAR LIMITED WARRANTY

CIARA customarily provides a one (1) year, 100% parts and labour non-transferable and limited warranty to all Original Purchasers of its Astro PN64-E1 series micro PCs. The warranty terms are normally Return-to-Depot. This one-year limited warranty starts on the "Date of Delivery". The warranty covers any optional product(s) manufactured and sold by CIARA and installed by CIARA in an Astro PN64-E1 series system unit. This one-year limited warranty, however, does not apply to any other item not internally installed in the System Unit by CIARA, or to any subsequent owners.

All CIARA customers may elect to purchase an extended three years warranty additional to the standard one year warranty. If you are interested in purchasing a warranty extension, please contact your CIARA representative within one month of receipt of your system. If you have purchased a different type of warranty, or an extension to the standard warranty, you will need to provide the CIARA Service Contract Number to the Customer Support representative when placing a call for service or support. It is advisable to affix this Contract Number to the machine in the event that service is required.

In lieu of either the On-Site or Return-to-Depot portions of the warranty, CIARA reserves the right to directly ship certain customer replaceable components as replacement products for failed components. When this option is invoked, the customer will be asked to replace the component(s) and return the original failed component to CIARA within five (5) working days.

3.1 Procedures to be followed for service during the warranty period:

Refer to the back of the casing and record the model number and serial number from the Machine Identification Label.

Make sure that you know the name and version number of the operating system that you are using, what accessory expansion cards you have installed in your system, and that you have the system Owner's and User's Guides ready at hand.

Call CIARA Support Centre at 877-242-7272.

Provide the computer system's model number and serial number. If you have purchased an extended warranty, please provide the Service Contract number as well. The Customer Service Representative will verify your warranty status immediately, and then pass the call to the dedicated PC Support Group for further action.

Answer any questions from the support personnel to the best of your ability: The support group may ask you to provide additional information, run specific commands, change or verify parameter settings, etc.

The service support personnel may be able to rectify the problem over the telephone, at which time you should ask for and record the unique call number for your own records. If the support group is unable to resolve the problem remotely, an On-Site call may be generated or additional information will be provided to you to obtain a Returned Merchandise Authorization Number (RMA), depending upon the type and current status of your warranty.

Make a back-up copy of all of the files on your hard disk before returning your computer for service. CIARA is not responsible for the loss or damage of any data on the returned system. In some cases, hard disks may need to be reformatted or replaced. It is the responsibility of the user to ensure data is backed up prior to shipment to CIARA.

Use the original box with its foam protective inserts whenever you return your computer to us for service. CIARA is not responsible for shipping damage due to poor packaging. Include your phone number and a list of times when you may be contacted.

If you have any questions please contact us using our site at:

<http://www.ciaratech.com>

3.2 Limited Warranty

CIARA warrants the product ("Product") you have purchased from CIARA or from an authorized CIARA reseller to be free from defects in materials and/or workmanship under normal use during the warranty period applicable to the product as defined by the standard warranty purchased with the Product, or any additional warranties and/or warranty extensions purchased through CIARA or an authorized CIARA reseller. The warranty period commences on the date of delivery. This warranty extends only to you, the original Purchaser. It is not transferable to anyone who subsequently purchases leases or otherwise obtains the Product from you. It excludes expendable (consumable) parts.

During the warranty period, CIARA will, at no additional charge, repair or replace defective parts with new or serviceable used parts that are equivalent to new parts in performance, form, fit and function. All exchanged parts and Products replaced under this warranty will become the property of CIARA. If after repeated efforts, CIARA is unable to restore the Product to good working order, you may claim the purchase price of the Product. This Limited Warranty also does not extend to any Product that has been damaged or rendered defective (i) as a result of the use of the Product other than for its intended use, failure to use the Product in accordance with the User's Guide which accompanies the Product or other misuse, abuse or negligence to the Product ; (ii) by the use of parts not manufactured or sold by CIARA ; (iii) by modification of the Product ; (iv) as a result of service by anyone other than CIARA or an Authorized CIARA Service Provider ; or (v) improper transportation or packaging when returning the Product to CIARA or an authorized CIARA Service Provider.

This Limited Warranty does not extend to expendable (consumable) parts. Expendable parts are those items that during the normal course of product usage will require periodic replacement, e.g., printer cartridges, batteries, diskette/tape head cleaning kits, etc.

Regarding any CIARA supplied software which accompanies the Product, CIARA warrants the media (e.g., hard disk, CD ROM) upon which this software is delivered to be free from defects in material and/or workmanship for a period of ninety (90) days from the date of purchase by the end-user. In the event of defective media, as your exclusive remedy and the sole liability of CIARA, CIARA will replace the defective media at no charge to you if you return the defective media, with prepaid shipping, to CIARA within the warranty period.

Except for this media warranty, this software is provided "As is" and CIARA disclaims any and all warranties, express or implied, including but not limited to any implied warranty of non-infringement of third party rights, merchantability or fitness for a particular purpose. CIARA does not warrant that the operation of this software will be uninterrupted or error free or that this software will meet your requirements.

CIARA is not responsible for damage to or loss of any programs, data, or removable storage media. You are responsible for saving (backing up) any programs, data or removable storage media.

EXCEPT FOR THE WARRANTIES SET FORTH HEREIN, CIARA DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED OR STATUTORY, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY APPLICABLE LAW ARE LIMITED TO THE TERMS OF THIS LIMITED WARRANTY. IN NO EVENT SHALL CIARA BE LIABLE FOR ANY INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF BUSINESS, PROFITS, DATA OR USE, WHETHER IN AN ACTION IN CONTRACT OR TORT OR BASED ON A WARRANTY, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT OR ANY CIARA SUPPLIED SOFTWARE WHICH ACCOMPANIES THE PRODUCT, EVEN IF CIARA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. YOU AGREE THAT REPAIR, REPLACEMENT OR REFUND, AS APPLICABLE, UNDER THE WARRANTY SERVICES DESCRIBED HEREIN ARE YOUR SOLE AND EXCLUSIVE REMEDIES WITH RESPECT TO ANY BREACH OF THE CIARA LIMITED WARRANTY SET FORTH HEREIN.

Some provinces (or states) do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some provinces (or states) do not allow limitations on how long an implied warranty lasts. In such provinces (or states), the exclusions or limitations of this Limited Warranty may not apply to you.

This Limited Warranty gives you specific legal rights. You may also have other rights that vary from province to province and state to state. You are advised to consult applicable provincial or state laws for a full determination of your rights.

3.3 Documenting your computer

CIARA recommends that you record the information about your computer and keep a copy of this in a safe but readily accessible location.

Please keep your equipment log up to date and include a copy of it whenever your equipment is returned to **CIARA** for servicing.

The equipment log is also helpful if your **CIARA** computer is lost, stolen, or damaged. It can serve as your record of when the equipment was placed in service, and the dates of all equipment upgrades and configuration changes.

Record the model and serial numbers of the system components, dates of component removal and/or replacement. Be sure to include the same information for any components added to the system, such as fixed disk, add-in boards, or printers. Record the model and serial numbers of the **CIARA** System. The model and serial numbers of the System Unit are recorded on the label attached to the rear cover.

The location of serial numbers on add-in boards, fixed and floppy disk drives, and external equipment, such as video displays or printers, varies from one manufacturer to another, but should be easily recognizable.

3.3.1 Base System Details

Component	Purchase date	Model	Serial number
System Unit			
Memory			
Processor			
SATA SSD			
M.2 SSD			
Mouse			
Keyboard			
Monitor			
Power supply			

4.0 Technical product specification CIARA Astro PN64-E1

The CIARA Astro PN64-E1 is a series of micro PCs that use thirteenth generation Intel® Core™ i5-13500H or i7-13700H processor with integrated Intel® Iris® Xe graphics controller, both in the BGA1744 package. All versions have two M.2 slots PCIe gen4 type 2280 to accommodate NVMe SSD drive and one M.2, key E connector with Intel® Wi-Fi 6 AX201, 802.11 ax, 2 x2, Bluetooth® 5.2 module.

All CIARA Astro PN64-E1 versions use an Asus® BIOS, up to 64 GB of main memory DDR5 type, 4800 MHz SO-DIMM. The Set-Up and Configuration procedures for all versions are identical.

All versions utilize essentially the same Set-Up and configuration procedures and the same Asus BIOS.

With care and proper operating procedure, all CIARA Astro PN64-E1 micro PCs will give many years of trouble-free service. The CIARA Astro PN64-E1 can be configured for a wide range of special purpose, business, industrial and scientific applications.

The information provided in this guide is all that you should need to set up and use your CIARA Astro PN64-E1 micro PC. We offer Technical Reference Manuals for sale to knowledgeable users.

Please note that any modifications or additions not made by CIARA or our authorized personnel, to any CIARA Astro PN64-E1 that is under Warranty, such as your insertion or removal of adapter cards not supplied and installed by CIARA could cause damage and may void the Warranty.

Please do not experiment if you are unsure, and remember we are ready to answer your questions. Please call us first.



Processor :	13 th generation Intel® Core™ i5-13500H or i7-13700H with integrated Intel® Iris® Xe graphics controller, with BGA1744 connection.
System Board :	Asus® PN64-E1
BIOS :	Asus Flash BIOS standard, with ACPI, APM, DMI, Plug & Play and SMBIOS features.
RAM :	DDR5 262 pin Type 4800 MHz SDRAM, Minimum 8 GB (1 SO-DIMM) and 64 GB (2 SO-DIMM) maximum. Two SO-DIMM sockets. SPD (Serial Presence Detect) memory is mandatory. Only Non-ECC memory is supported.
Front ports :	2 USB 3.2 Gen 2 Type A 1 USB 3.2 Gen 2 Type-C 1 audio jack (audio out, mic in, headphone out)
Rear ports :	1 Thunderbolt™ 4 port (w/ DP output, PD power input) 1 USB 3.2 Gen2 port 2 USB 3.2 Gen1 ports 2 HDMI ports 1 2.5G LAN port 1 configurable port (options: DP1.4/ HDMI2.1/ COM/ VGA/ 2.5G LAN) 1 DC-in connector
SSD drives :	Choice of SATA SSD drives (One onboard SATA 6.0 Gb/s port) ; Choice of M.2 type 2280 SSD drives.
Video :	Intel® Iris® Xe Graphics integrated to the processor, supports up to 4 displays simultaneously. (2 HDMI output + 1 optional VGA/HDMI/DisplayPort output + Thunderbolt™ Type-C support DP)
Audio :	Four channel high definition audio controller, Realtek® ALC3251 Audio CODEC
Network :	One integrated Ethernet network interface controller 2.5 G LAN, Intel® I226V
Wi Fi :	Intel® Wi-Fi 6 AX201, 802.11 ax, 2 x2, Bluetooth® 5.2
Certification :	BSMI/CB/CE/FCC/UL/C-Tick/WiFi/RF/VCCI.

4.1 Upgrading

As the purchaser of a powerful state of the art CIARA Astro PN64-E1 micro PC you have no doubt decided on the features and upgrade capabilities that you might wish to add to your computer. There are many exciting possibilities for upgrading your CIARA Astro PN64-E1. CIARA has extensively tested a range of potential upgrade and enhancement options that range from hard disks to various optical drives. Some of these work much better than others and we are able to recommend the ones that work best with your CIARA Astro PN64-E1 computer.

CIARA will be pleased to help you choose the most reliable and compatible system components when the time comes to upgrade and enhance your CIARA Astro PN64-E1 micro PC in a manner that will preserve the Warranty. Table below summarizes the general features of the various types of upgrades and enhancements that may be added to any CIARA Astro PN64-E1.

UPGRADES AVAILABLE	CIARA Astro PN64-E1
SATA Solid State Disk Drives (SSD)	Several SSD ranging from 250 GB to 7.68 TB
M.2 Solid State Disk Drives (SSD)	Several SSD ranging from 250 GB to 4 TB
Optical Drives	External Blu-ray drives, Blu-ray writers, DVD drives and DVD writers may be added.
System Memory	Up to 64 GB DDR5, 262 pin, 4800 MHz.
Disk Controller	One onboard SATA 6.0 Gb/s port.
Hi Res. Monitors & Display Adapters	21.5 to 49 inches LCD monitors.

UPGRADABILITY AND REPAIRABILITY		CIARA Astro PN64-E1			
Component	Upgradable	Replaceable	Repairable	Serviceability	Tools required
Casing	No	Yes	Yes	CIARA only	Special tools
Power adapter	No	Yes	Yes	CIARA or customer	Common tools
Motherboard	No	Yes	Yes	CIARA only	Special tools
CR2032 battery	No	Yes	No	CIARA only	Special tools
Processor	No	No	No	CIARA or customer	Common tools
Processor heatsink	No	Yes	No	CIARA or customer	Common tools
Processor fan	No	Yes	Yes	CIARA or customer	Common tools
Memory	Yes	Yes	Yes	CIARA or customer	Common tools
SSD drive	Yes	Yes	Yes	CIARA or customer	Common tools
WiFi module	No	Yes	Yes	CIARA or customer	Common tools

The upgrade/repair/replacement services described above are available to purchasers for a period of 5 years after the date of sale.

4.2 Networking

Among the more exciting applications for extending the power and utility of CIARA Astro PN64-E1 micro PCs is to connect them (using communication links and network ports) with other computer systems to form computer / communication networks in order to share software resources (such as databases) and hardware resources (such as printers and scanners). This is referred to as Local Area Networking (LAN) and Wide Area Networking (WAN).

All CIARA Astro PN64-E1 micro PCs can be networked running the Microsoft Windows and Linux Operating Systems.

CIARA System Integration and Networks Group would be pleased to provide you with turnkey solutions for all your Windows Server 2019, Windows Server 2016 and Linux networking needs. We have trained and certified experts on staff to help you.

4.3 The CIARA Astro PN64-E1 BIOS

4.3.1 BIOS configuration and installation

The purpose of this section is to describe the procedures to set up the BIOS configuration options of your CIARA Astro PN64-E1 micro PC. All this work is done for you at the CIARA factory enabling the system to be ready to start on Power on. However, we are describing this procedure as a means of transparency.

Every CIARA Astro PN64-E1 is now delivered with the latest version of the Asus BIOS (as of the manufacturing date). The Asus BIOS is a set of permanently recorded software that gives the CIARA Astro PN64-E1 its fundamental operational characteristics.

The Asus BIOS is made up of code that provides the device-level control for the major I/O devices in the CIARA Astro PN64-E1 micro PC system. It contains a set of routines (called POST, for Power-On Self-Test) that tests your CIARA Astro PN64-E1 system when you turn it on.

It will be necessary to run the Set-Up program if you replace the battery.

In any of these cases you must use the Set-Up program to modify the system parameters to reflect the options actually installed in your system.

To use the Set-Up program proceed as follows:

Turn on or re-boot (press simultaneously <Ctrl>, <Alt>,) your CIARA Astro PN64-E1 system. After the Asus BIOS performs a series of diagnostic checks, the following message appears:

Press <Del or F2> to enter Set-Up.

Once in Bios Menu choose a Set-Up option with the arrow keys and press < ↵ > to select.

4.3.2 BIOS set-up program function keys

BIOS Set-up Program Function Key	Description
General Help → ←: Select Screen ↑ ↓: Select Item Enter: Select +/-: Change Option F1: General Help F2: Previous Values F5: Optimized Defaults F10: Save F12: Print Screen ESC: Exit	

4.3.3 Legacy USB support

Legacy USB support enables USB devices to be used even when the operating system's USB drivers are not yet available. Legacy USB support is used to access the BIOS Setup program, and to install an operating system that supports USB. By default, Legacy USB support is set to Enabled.

Legacy USB support operates as follows :

1. When you apply power to the computer, legacy support is disabled.
2. POST begins.
3. Legacy USB support is enabled by the BIOS allowing you to use a USB keyboard to enter and configure the BIOS Setup program and the maintenance menu.
4. POST completes.
5. The operating system loads. While the operating system is loading, USB keyboards and mice are recognized and may be used to configure the operating system. (Keyboards and mice are not recognized during this period if Legacy USB support was set to Disabled in the BIOS Setup program.)
6. After the operating system loads the USB drivers, all legacy and non-legacy USB devices are recognized by the operating system, and Legacy USB support from the BIOS is no longer used.

To install an operating system that supports USB, verify that Legacy USB support in the BIOS Setup program is set to Enabled and follow the operating system's installation instructions.

NOTE

It is recommended to connect USB keyboard and mouse devices to USB 2.0 ports (black) as the operating system installation may be interrupted if keyboard and mouse devices are connected to the SuperSpeed USB 3.1 gen. 1 ports (blue) or SuperSpeed+ USB 3.1 gen.

2 (green) due to the lack of native USB 3.1 driver support from the operating system. The device driver for the USB 3.1 host controller is installed separately and is required to be operational in the operating system.

4.3.4 BIOS updates

The BIOS can be updated using either of the following utilities :

- The ASUS BIOS Updater allows you to update BIOS in a DOS environment. This utility also allows you to copy the current BIOS file that you can use as a backup when the BIOS fails or gets corrupted during the updating process.
- The ASUS EZ Flash 2 feature allows you to update the BIOS without using an OS-based utility

NOTE

Review the instructions distributed with the upgrade utility before attempting a BIOS update.

4.3.5 Language support

The BIOS setup program and help messages are supported in English, French, Deutsch, Spanish and more.

4.3.7 BIOS recovery

It is unlikely that anything will interrupt a BIOS update; however, if an interruption occurs, the BIOS could be damaged. The following table lists the drives and media types that can and cannot be used for BIOS recovery. The BIOS recovery media does not need to be made bootable.

Acceptable Drives/Media Types for BIOS Recovery	
Media Type	Can be used for BIOS recovery?
DVD-ROM drive connected to an USB port	Yes
USB removable drive (a USB Flash Drive, for example)	Yes
USB hard disk drive	No

4.3.8 Boot options

In the BIOS Setup program, the user can choose to boot from a USB optical drive, hard drive, USB drive, USB flash drive or the network. The default setting is for the USB optical drive to be the first boot device, the hard drive second, and a removable drive third (such as USB drive, USB flash or USB floppy drive) and the network last.

NOTE

Optical devices, USB devices and network will only appear in the boot menu if they are enabled.

4.3.8.1 USB optical drive boot

Bootting from optical drive is supported in compliance to the El Torito bootable CD/DVD format specification. Under the Boot menu in the BIOS Setup program, a USB optical drive is listed as a boot device. Boot devices are defined in priority order. Accordingly, if there is no bootable CD or DVD in the optical drive, the system will attempt to boot from the next defined drive.

4.3.8.2 Network boot

The network can be selected as a boot device. This selection allows booting from the onboard LAN or a network add-in card with a remote boot ROM installed. Pressing the <F8> key during POST will display the boot device menu, then choose "PXE IPv4 Intel (R) Ethernet Connection ... " to force booting from the LAN. To use this key during POST with a user password set, the User Access Level in the BIOS Setup program's Security menu must be set to Full Access and the boot to Network option in the BIOS Setup program's Boot menu must be enabled.

4.3.8.3 Booting without attached devices

For use in embedded applications, the BIOS has been designed so that after passing the POST, the operating system loader is invoked even if the following devices are not present:

- Video adapter
- Keyboard
- Mouse

4.3.8.4 Changing the default boot device during POST

Pressing the <F8> key during POST causes a boot device menu to be displayed. This menu displays the list of available boot devices (as set in the BIOS setup program's Boot Device Priority Submenu). The following table lists the boot device menu options.

NOTE

All boot devices such as Optical, Removable and network will always appear in the <F8> boot menu unless an administrator password has been set, even if Boot to Optical Devices, Boot to Removable Devices and Boot to Network have been disabled in the BIOS Setup program's Boot menu.

Boot Device Menu Function Keys	Description
<↑> or <↓>	To move selection.
<↵>	To select boot device.
<Esc>	To boot using defaults.

4.3.9 Adjusting boot speed

This factor affects system boot speed

- Selecting and configuring peripherals properly

4.3.9.1 Peripheral selection and configuration

The following techniques help improve system boot speed:

- Select an optical drive with a fast initialization rate. This rate can influence POST execution time.
- Eliminate unnecessary add-in adapter features, such as logo displays, screen repaints, or mode changes in POST. These features may add time to the boot process.
- Try different monitors. Some monitors initialize and communicate with the BIOS more quickly, which enables the system to boot more quickly.

4.3.9.2 BIOS boot optimizations

Use of the following BIOS setup program settings reduces the POST execution time.

- In the Boot Menu, set the hard disk drive as the first boot device. As a result, the POST does not first seek an optical drive, which saves about one second from the POST execution time.
- In the Peripheral Configuration submenu, disable the LAN device if it will not be used. This can reduce up to four seconds of option ROM boot time.

4.3.10 BIOS security features

The BIOS includes security features that restrict access to the BIOS Setup program and who can boot the computer. A supervisor password and a user password can be set for the BIOS Setup program and for booting the computer, with the following restrictions :

- The supervisor password gives unrestricted access to view and change all the Setup options in the BIOS Setup program. This is the supervisor mode.
- The user password gives restricted access to view and change Setup options in the BIOS Setup program. This is the user mode.
- If only the supervisor password is set, pressing the <Enter> key at the password prompt of the BIOS Setup program allows the user restricted access to Setup.
- If both the supervisor and user passwords are set, users can enter either the supervisor password or the user password to access Setup. Users have access to Setup respective to which password is entered.
- Setting the user password restricts who can boot the computer. The password prompt will be displayed before the computer is booted. If only the supervisor password is set, the computer boots without asking for a password. If both passwords are set, the user can enter either password to boot the computer.
- For enhanced security, use different passwords for the supervisor and user passwords.
- Valid password characters are A-Z, a-z, and 0-9. Passwords may be up to 16 characters in length.

The following table shows the effects of setting the supervisor password and user password. This table is for reference only and is not displayed on the screen.

Supervisor and User Password Functions

Password Set	Supervisor Mode	User Mode	Setup Options	Password to Enter Setup	Password During Boot
Neither	Can change all options (Note)	Can change all options (Note)	None	None	None
Supervisor only	Can change all options	Can change a limited number of options	Supervisor Password	Supervisor	None
User only	N/A	Can change all options	Enter Password Clear User Password	User	User
Supervisor and user set	Can change all options	Can change a limited number of options	Supervisor Password Enter Password	Supervisor or user	Supervisor or user

Note: If no password is set, any user can change all Setup options.

4.4 Disk drives

4.4.1 Serial ATA interface

The board provides one Serial ATA (SATA) 6.0 Gb/s connector which support one device.

4.4.1.1 Serial ATA support

The PCH provides independent SATA ports with a theoretical maximum transfer rate of 6.0 Gb/s for one port.

The underlying SATA functionality is transparent to the operating system. The SATA controller can operate in both legacy and native modes. In legacy mode, standard IDE I/O and IRQ resources are assigned. In Native mode, standard PCI Conventional bus resource steering is used. Native mode is the preferred mode for configurations using the Windows® 10 operating system.

For more information, see : <http://www.serialata.org/>.

NOTE

Many Serial ATA drives use new low-voltage power connectors and require adapters or power supplies equipped with low-voltage power connectors.

4.4.2 M.2 slots

CIARA Astro PN64-E1 system is equipped with two M.2 slots, M key, PCIe gen4 type 2280 to accommodate NVMe SSD drive and one M.2 slot, E key to accommodate a Wi-Fi controller.

4.5 Graphics subsystem

4.5.1 Integrated graphics

The board supports system graphics through Intel® Iris® Xe Graphics integrated to the processor.

4.5.2 HDMI 2.1 port

The HDMI™ (High Definition Multimedia Interface) port supports a Full-HD device such as an LCD TV or monitor to allow viewing on a larger external display.

NOTE: When using only this port as a display output source, this port will support a resolution of up to 7680 x 4320 @60Hz. The resolution may also be affected by the cabling and output device.

4.5.3 DisplayPort 1.4 (optional)

This port allows you to connect your Micro PC to an external display.

NOTE: When using only this port as a display output source, this port will support a resolution of up to 5120 x 2160 @60Hz. The resolution may also be affected by the cabling and output device.

4.5.4 Video Graphics Adapter (VGA) port (optional)

This port allows you to connect your Micro PC to an external display.

NOTE: When using only this port as a display output source, this port will support a resolution of up to 1920 x 1200 @60Hz. The resolution may also be affected by the cabling and output device.

4.6 Audio subsystem

The CIARA Astro PN64-E1 micro PC supports 4-channel Realtek® ACL3251 High Definition Audio CODEC.

The front audio port allows you to connect amplified speakers or headphones. You can also use this port to connect your headset or an external microphone.

Audio software and drivers are available from https://www.asus.com/ca-en/displays-desktops/mini-pcs/pn-series/asus-expertcenter-PN64-E1/helpdesk_download/.

4.7 I/O Port set-up

Each CIARA Astro PN64-E1 micro PC system includes built-in multi-I/O capabilities. These provide your computer with two USB 3.2 Gen 2 Type A ports, one USB 3.2 Gen 2 Type-C port and one audio jack (audio out, mic in, headphone out) at front panel. One USB 3.2 Gen 2 Type A port, one Thunderbolt™ 4 port (w/ DP output, PD power input), two HDMI 2.0 ports, one empty port (punch out) (HDMI 2.1/VGA/COM/2.5G LAN/DP 1.4), one RJ45 LAN port, one DC-in at rear panel.

To configure these I/O ports use the BIOS configuration screens. Please refer to the paragraphs in section 2.0, “BIOS Configuration and installation” for more information on this subject.

NOTE

All USB ports along with serial port can be enabled or disabled in the BIOS.

4.8 LAN subsystem

The LAN subsystem consists of the following :

- Intel I226V 2.5 Gigabits Ethernet Controller (10/100/1000/2500 Mbits/s)
- One RJ-45 LAN connector with integrated status LEDs

4.8.1 Intel® I226V 2.5 Gigabits Ethernet controller

This PCI Express controller with Base-T copper networking interface, provides compact, single-port integrated multi-gigabit (up to 2.5G) - MDI (Copper) standard IEEE 802.3 Ethernet interface for 2500BASE-T, 1000BASE-T, 100BASE-TX, 10BASE-TE connections (IEEE 802.3, 802.3u, 802.3ab).

- PCI Express 3.1 (5GT/s) x1 host interface
- MDI (Copper) standard IEEE 802.3 Ethernet interface up to 2.5Gb/s¹
- Time Sensitive Networking (TSN) capability support
- Innovative power management features
- Support for Intel® Stable IT Platform Program

4.8.2 RJ-45 LAN connector LEDs

Two LEDs are built into the RJ-45 LAN connector located on the back panel (see Figure). These LEDs indicate the status of the LAN.

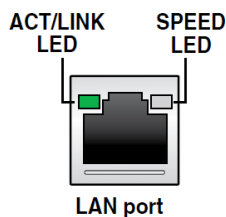


Table 4.8 describes the LED states when the board is powered up and the LAN subsystem is operating.

Table 4.8	LAN Connector LED States		
LED	LED color	LED state	Condition
Link/Activity Left	Orange	Off	LAN link is not established
		On	LAN link is established
		Blinking	Data activity
Link speed Right		Off	LAN link is not established
		Off	10 /100 Mbits/s data rate is selected or negotiated.
	Green	On	2.5 Gbits/s data rate is selected or negotiated.
	Orange	On	1 Gbit/s data rate is selected or negotiated.

4.8.3 WiFi Module

The motherboard is equipped with an M.2 slot, E key that can receive an Intel® Wi-Fi 6 AX201 module with the following features :

- 802.11 ax 2x2
- Bluetooth® 5.2

4.9 Trusted Platform Module (TPM)

The TPM module version 2.0 component is specifically designed to enhance platform security above-and-beyond the capabilities of today's software by providing a protected space for key operations and other security critical tasks. Using both hardware and software, the TPM protects encryption and signature keys at their most vulnerable stages—operations when the keys are being used unencrypted in plain-text form. The TPM shields unencrypted keys and platform authentication information from software-based attacks.

NOTE

The Intel® TPM uses the onboard coin-cell battery (CR2032) to maintain its monotonic counters. One major function of the monotonic counters is for anti-replay protection of the internal Intel® TPM data. If the battery is removed or exhausted, the Intel® TPM data will be deleted in accordance with Trusted Computing Group guidelines. Please back-up TPM keys and data before removing the battery.

4.10 Replacing the system battery

In all CIARA Astro PN64-E1 models the battery is a custom 3 V Lithium battery model CR-2032U made by Asus that can be installed only by CIARA. This type of battery should last at least 3 years, if the system is not in use. When the computer is plugged in, the standby current from the power supply extends the life of the battery. If the battery wears out, your system will no longer retain BIOS information when turned off. For example, you will get a message stating that the time and date are invalid. If this happens, you should replace the battery, or call your CIARA service representative.

CAUTION :

There is a danger of explosion if the battery is incorrectly replaced. If it has to be replaced, it can be done only by a qualified CIARA technician. The disposal of used batteries is subject to environment issues and this work should be done by a qualified CIARA technician who will dispose safely of the used battery.

NOTE

The Intel TPM uses the onboard coin-cell battery (CR2032) to maintain its monotonic counters. One major function of the monotonic counters is for anti-replay protection of the internal Intel TPM data. If the battery is removed or exhausted, the Intel TPM data will be deleted in accordance with Trusted Computing Group guidelines. Please back-up TPM keys and data before removing the battery.

4.10.1 Clearing or changing passwords

Clear RTC RAM (2-pin CLRTC)

This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.

To erase the RTC RAM :

1. Turn OFF the computer and unplug the power cord.
2. Use a metal object such as a screwdriver to short the two pins.
3. Plug the power cord and turn ON the computer.
4. Hold down the key during the boot process and enter BIOS setup to reenter data.

Except when clearing the RTC RAM, never short the pins on CLRTC header. Shorting the pins will cause system boot failure!

4.11 Installing an upgrade flash BIOS

Before any new BIOS is programmed into the system, be very careful to ensure that the BIOS is intended for use with your specific system board. If not, you may completely disable your system, and require CIARA service assistance to restore the system to working order.

You may obtain the latest BIOS revision for your CIARA Astro PN64-E1 system on Asus web site at

https://www.asus.com/ca-en/supportonly/pn64-e1/helpdesk_bios/ .

Several methods exist to update the BIOS of your CIARA Astro PN64-E1 system, and they are as follows :

- Recovery BIOS Update - A .CAP file to be used for BIOS recovery process, regardless of operating system. In the unlikely event that a BIOS update is interrupted, it is possible the BIOS may be left in an unusable state. Use the Recovery BIOS update to recover from this condition. It requires a blank CD and a read/writeable CD drive or a USB flash device.
- The ASUS EZ Flash 2 feature allows you to update the BIOS without using an OS-based utility. This function supports USB flash disks formatted using FAT32/16 on a single partition only.

- Bupdater.exe BIOS Update / Integrator Toolkit BIOS ZIP Files - A DOS-based utility to update the BIOS regardless of operating system. It requires a CD and a read/writeable CD drive or a USB flash device.

Make sure to download the appropriate BIOS update file, and follow the installation instructions found in the readme file for the BIOS update. It is also recommended to read the release notes file for the BIOS update to know the changes that have been made in the version of the BIOS.

4.12 Spare parts

Spare parts for the Astro PN64-E1 are available as follows:

1. Casing
2. DC power adapter
3. Motherboard¹
4. Processor fan and heatsink
5. Memory
6. SSD drive
7. WiFi module

These spare parts will either correspond to the components in your system or will be a replacement equivalent or better than what you had in your system. You can procure these spare parts at any time by contacting CIARA at <http://www.ciaratech.com> or by phone at 1-877-242-7272.

¹ The motherboard is scheduled for end of life in 2026 and cannot be replaced after 2028. All other spare parts are available until at least 2028 and afterwards will be subject to availability of our suppliers.

4.13 Media sanitization software

You can download a media sanitization software from the web at the following URL: <http://killdisk.com/downloads/KillDisk-Freeware-Setup.exe>

This tool is an easy-to use and compact utility that allows to sanitize storage media with the One Pass Zeros data sanitizing standard. It permanently erases all data on Hard Disks, Solid State Drives, Memory Cards & USB drives, SCSI storage & RAID disk arrays and even two disks in parallel.

4.14 Latest version

To download the latest version of this User Guide, please go to <http://ciaratech.com/download/19105/>

GLOSSARY

32-Bit -- In computer architecture, 32-bit integers, memory addresses, or other data units are those that are at most 32 bits (4 octets) wide. Also, 32-bit CPU and ALU architectures are those that are based on registers, address buses, or data buses of that size. 32-bit is also a term given to a generation of computers in which 32-bit processors were the norm.

The range of integer values that can be stored in 32 bits is 0 through 4,294,967,295 or -2,147,483,648 through 2,147,483,647 using two's complement encoding. Hence, a processor with 32-bit memory addresses can directly access 4 GB of byte-addressable memory. The external address and data buses are often wider than 32 bits but both of these are stored and manipulated internally in the processor as 32-bit quantities.

64-Bit -- In computer architecture, 64-bit integers, memory addresses, or other data units are those that are at most 64 bits (8 octets) wide. Also, 64-bit CPU and ALU architectures are those that are based on registers, address buses, or data buses of that size. 64-bit is also a term given to a generation of computers in which 64-bit processors were the norm.

Without further qualification, a 64-bit computer architecture generally has integer and addressing registers that are 64 bits wide, allowing direct support for 64-bit data types and addresses. However, a CPU might have external data buses or address buses with different sizes than the registers, even larger (the 32-bit Pentium had a 64-bit data bus, for instance). The term may also refer to the size of low-level data types, such as 64-bit floating-point numbers.

Adapter card -- A printed circuit board that gives your computer some added capability, such as more memory, or control of a new device. A card plugs into an expansion slot on the system board.

Analog monitor -- A type of video display that uses a continuously variable analog voltage to display a large number of colours at resolutions up to 1024 x 768 and beyond. The voltage levels on the red, green and blue lines on the VGA connector determine colours.

Auto switching -- The ability of a video display to detect the video display mode for a given application program and automatically switch to that mode.

BIOS -- Basic Input Output System. Programs permanently stored in the system board's ROM chips that provide the fundamental processes or functions of the system, such as the Power On Self Test (POST). The VGA circuitry has its own video BIOS. See also ROM.

Bit -- A bit is the basic unit of information in computing and telecommunications ; it is the amount of information that can be stored by a digital device or other physical system that can normally exist in only two distinct states. In computing, a bit can also be defined as a variable or computed quantity that can have only two possible values. These two values are often interpreted as binary digits and are usually denoted by the Arabic numerical digits 0 and 1. Indeed, the term "bit" is a contraction of binary digit. The two values can also be interpreted as logical values (true/false, yes/no), algebraic signs (+/-), activation states (on/off), or any other two-valued attribute. In several popular programming languages, numeric 0 is equivalent (or convertible) to logical false, and 1 to true. The correspondence between these values and the physical states of the underlying storage or device is a matter of convention, and different assignments may be used even within the same device or program.

Bus -- A set of address or data lines used to transfer information between different components within a computer (such as memory, the microprocessor, and slots).

Cache -- A device that contains high-speed memory and permits higher speed accesses than general-purpose memory.

Cache hit rate -- The percentage of time data is delivered from the cache rather than from main memory.

Central processing unit (CPU) -- An integrated circuit chip that performs the actual computing functions of the computer. Other chips perform support functions like storing data and controlling peripherals. See also microprocessor.

Chip -- An electronic device that combines thousands of transistors on a small sliver of silicon. See also

integrated circuit.

Chip set -- The logic devices on the motherboard that connects the microprocessor and other board functions.

Clock -- A circuit that sends a consistent, periodic signal that is used to step logic information through a computer circuit.

CMOS RAM -- Complementary Metal Oxide Semiconductor. CMOS RAM stores basic configuration information about your computer.

Colour display -- A video display capable of displaying colours based on the RGB (Red, Green, and Blue) colour-mixing scheme.

Configuration -- The way in which a computer and peripheral equipment (such as printers and display monitors) are interconnected and programmed to operate as a system.

Default -- The initial setting when the system left the factory.

Digital monitor -- A type of monitor in which display colour is controlled by digital colour control lines that switch on and off ; the number of colours that can be displayed depends on the selected display mode.

DIMM -- Dual In-Line Memory Module. RAM chips installed on a small circuit board module, having a single row of connectors (240 pins) on the bottom of the module where it is plugged into the main system board.

DisplayPort -- A digital display interface standard put forth by the Video Electronics Standards Association (VESA) since 2006. It defines a new royalty-free, digital audio/video interconnect, intended to be used primarily between a computer and its display monitor, or a computer and a home-theater system.

DMA (Direct Memory Address) -- A method for transferring data directly to and from system memory, bypassing the microprocessor.

DVI-D and DVI-I -- (Digital Visual Interface- integrated) is the connection, or interface used between monitors and computers or home theatre systems. DVI-I is used to interface with an LCD monitor display for digital video output. DVI-I supports both digital and analog. However, it will not use both at the same time. DVI-I detects and chooses digital or analog depending on the connected display. Contrast with DVI-D, which is a digital-only interface and DVI-A which is an analog-only interface.

Driver -- A utility program accompanying the motherboard that permits application programs to use the extended resolutions of the VGA circuitry.

Expansion slot -- A connector on the motherboard for holding an adapter card.

Gigahertz (GHz) -- A frequency of 1 billion cycles per second.

Hertz (Hz) -- A unit of frequency equal to one cycle per second.

Horizontal frequency -- The rate, at which monitor displays each scan line, usually measured in kilohertz (kHz).

I/O -- An abbreviation for "input/output", a generic term that refers to the devices and processes involved in the computer's reading and writing data.

Integrated circuit -- An electronic device that combines thousands of transistors on a small chip of silicon. Such devices are the building blocks of computers.

Interleaving -- A technique for improving the performance of system memory by splitting the memory into two or four sections that alternately process information. While one memory section goes through a refresh cycle, the microprocessor sends information to another section for processing.

Jumper -- On a printed circuit board, a patch connector, wire, or cable used to establish a circuit.

LCD -- A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. As LCD panels produce no light of their own, they require an external lighting mechanism to be easily visible. On most displays, this consists of a cold cathode fluorescent lamp that is situated behind the LCD panel. Passive-matrix displays are usually not backlit, but active-matrix displays almost always are. Recently, two types of LED backlit LCD displays have appeared in some screens as an alternative to conventional backlit LCDs. In one scheme, the LEDs are used to backlight the entire LCD panel. In another scheme, a set of red, green and blue LEDs is used to illuminate a small cluster of pixels, which can improve contrast and black level in some situations. For example, the LEDs in one section of the screen can be dimmed to produce a dark section of the image while the LEDs in another section are kept bright. Both schemes also allows for a slimmer panel than on conventional displays.

LED -- A light-emitting diode is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting.

M.2 -- M.2 (pronounced *M dot two*), formerly known as the Next Generation Form Factor (NGFF), is a specification for internally mounted computer expansion cards and associated connectors. It replaces the mSATA standard, which uses the PCI Express Mini Card physical card layout and connectors. M.2's more flexible physical specification allows different module widths and lengths, and, paired with the availability of more advanced interfacing features, makes the M.2 more suitable than mSATA for solid-state storage applications in general and particularly for the use in small devices such as ultrabooks or tablets.

Megahertz (MHz) -- A frequency of 1 million cycles per second.

Memory -- Semiconductor chips used to hold information and programs while they are being accessed by the microprocessor. See also RAM and ROM.

Microprocessor -- An integrated circuit that contains the circuits the computer needs to calculate and to communicate with the other parts of the system. See also central processing unit.

Multi-frequency monitor -- A monitor (also known by the trade names MultiSync or MultiScan) that, due to its ability to scan at various horizontal and vertical frequencies, is capable of displaying a wide variety of resolution modes.

Parity bit -- An additional non-informational bit appended to a group of bits to make the number of ones in the group of bits either an odd or even number ; an elementary mechanism for error checking.

Peripheral -- A hardware device (such as a keyboard, monitor, or printer) that connects to a computer.

Pin -- Any of the leads on a device, such as a chip, that plug into a socket and connect it to a system.

Pixel -- Short for "picture element", the smallest single dot displayable on the display.

Power-On Self Test (POST) -- Internal test procedures that the BIOS runs automatically when the system is turned on. These procedures verify that the entire computer's hardware is functioning properly. If the test detects problems, the computer displays error codes before (or instead of) starting the operating system. The error codes can help a service person determine what is wrong with your computer.

RAM -- An acronym for "random-access memory." The type of computer memory used to store information while a program is running. All data stored in RAM is lost when the computer is turned off or power is lost.

Refresh -- Periodic rewrite of system memory contents to the same memory locations by the microprocessor so that the contents do not decay beyond redemption.

Resolution -- A measure of the quality of the image that can be shown on a particular display ; usually expressed as the number of pixels that can be displayed horizontally across the display screen by the number of pixels that can be displayed vertically on the display screen.

ROM -- An acronym for "read-only memory." The type of computer memory that is used to permanently store the information vital to computer operation, including some parts of the operating system. ROM is permanent and the contents will not be lost when the computer is turned off.

SATA or Serial ATA -- Serial ATA (SATA) is a computer bus interface for connecting host bus adapters to mass storage devices such as hard disk drives and optical drives. Serial ATA was designed to replace the older ATA (AT Attachment) standard (also known as EIDE). It is able to use the same low level commands, but serial ATA host-adapters and devices communicate via a high-speed serial cable over two pairs of conductors. In contrast, the parallel ATA (the redesignation for the legacy ATA specifications) used 16 data conductors each operating at a much lower speed. First-generation SATA interfaces, now known as SATA 1.5 Gb/s, communicate at a rate of 1.5 Gb/s (150 MB/s). Second generation SATA interfaces running at 3.0 Gb/s (300 MB/s) are prevalent in all SATA disk drives and the majority of PC and server chipsets. The SATA III standard (6 Gb/s) (peak throughput about 600 MB/s) was released on May 27, 2009.

Serial interface -- An interface that transmits and receives data in a serial manner, transmitting or receiving data one bit at a time.

Set-up -- The arrangement of connections between an assembly of individual computing units, and the adjustments needed for the computer to operate.

SRAM -- Static Random Access Memory. A type of memory that does not need to be refreshed. Data stored in the SRAM remains until changed or until the computer is turned off.

System -- An assembly of components united by some form of regulated interaction to form an organized whole.

System board -- The large printed-circuit board in a computer on which most electronic devices are mounted ; the primary board in a computer. All other interfaces receive control signals or information from the system board. Also commonly referred to as a "motherboard" or "main board".

USB -- Universal Serial Bus. USB 1.1 is a hot pluggable daisy chained 1.5 or 12 Mb/s (1.5 MB/s) serial bus. USB 2.0 is a hot pluggable daisy chained 480 Mb/s (60 MB /s) serial buses. USB 3.0 is a hot pluggable daisy chained 4.8 Gb/s (600 MB /s) serial buses. USB 3.0 receptacles are electrically compatible with USB 2.0 device plugs if they can physically match. Most combinations will work, but there are a few physical incompatibilities. However, only USB 3.0 Standard-A receptacles can accept USB 3.0 Standard-A device plugs. Devices may be plugged in or out without turning off the system. USB devices include mice, scanners, keyboards, and digital cameras.

Wait states -- A delay in the computer's information processing cycle caused by a difference in speed between a faster processor and slower memory, which holds data. Zero wait states means the processor does not have to "wait" for memory, and can access data as fast as it is needed.

Word -- The set of bits comprising the largest unit that the computer can handle in a single operation.

NOTES :

This image shows a full page of blank handwriting practice paper. It features multiple sets of horizontal lines. Each set consists of three lines: two solid black outer lines and one dashed purple middle line, providing a guide for letter height and placement. The lines are evenly spaced and run across the entire width of the page.

