Storage Configurator

Lenovo ThinkStation PX

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Overview

The ThinkStation PX workstation offers a vast majority of storage options. The PX workstation provides three standard M.2 slots directly on the motherboard as well as the ability to utilize up to three front accessible drive bays. Additionally, the PX workstation has the ability to convert the second PSU bay to a fourth SATA drive bay enclosure. The following document provides detailed guidance for users to optimally configure their system storage options in the ThinkStation PX platform.

Here is a high-level overview of the types of storage devices supported on the ThinkStation PX platform:

Table 1 - General overview of support storage devices in the ThinkStation PX

Drive Type and Speed	ThinkStation PX
3.5" SATA Gen3 Hard Disk Drive (HDD)	Up to 2TB each
3.5" SATA Gen3 Enterprise HDD	Up to 12TB each
M.2 PCIe SSD Gen4 x4	Up to 4TB each
U.3 PCIe SSD Gen4 x4	Up to 15.3TB each

Table 2 - Quantity and capacity by drive type

Drive Type and Speed	Number of Drives Supported	Total Storage	Additional Hardware
3.5" SATA Drives	4[1]	Up to 48TB	PSU Bay Enclosure (4th Bay)[2]
M.2 PCIe Drives	11[1]	Up to 36TB	Front access bay M.2 enclosure[3] PCIe Quad M.2 SSD Adapter[3]
U.3 PCIe Drives	4[1]	Up to 60TB	Front access bay U.2/U.3 enclosure[3] PCIe Single U.2/U.3 SSD Adapter[3]

[1] Extra hardware may be required to get to the maximum number of drives supported.
[2] Only supported with single power supply configurations.
[3] Depends on the system hardware configuration.

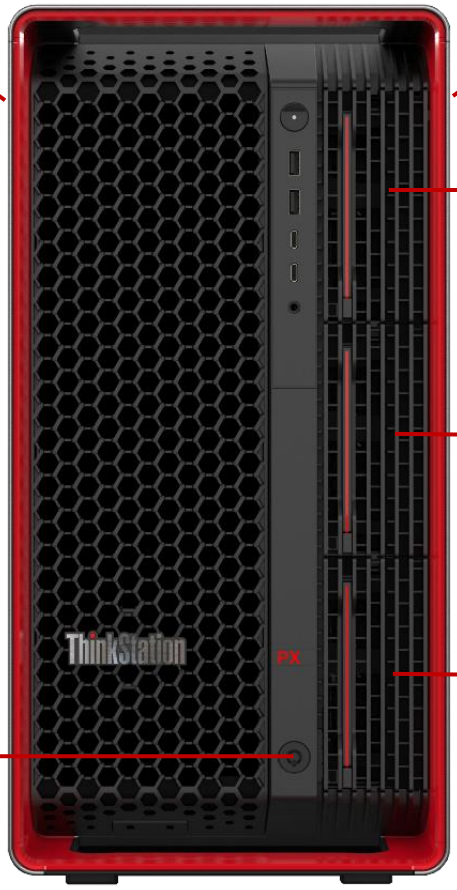
Section 1 – PX Storage Summary

The below Table 2 shows a high-level summary of what storage options are available in the ThinkStation PX platform.

Table 3 - Storage Summary

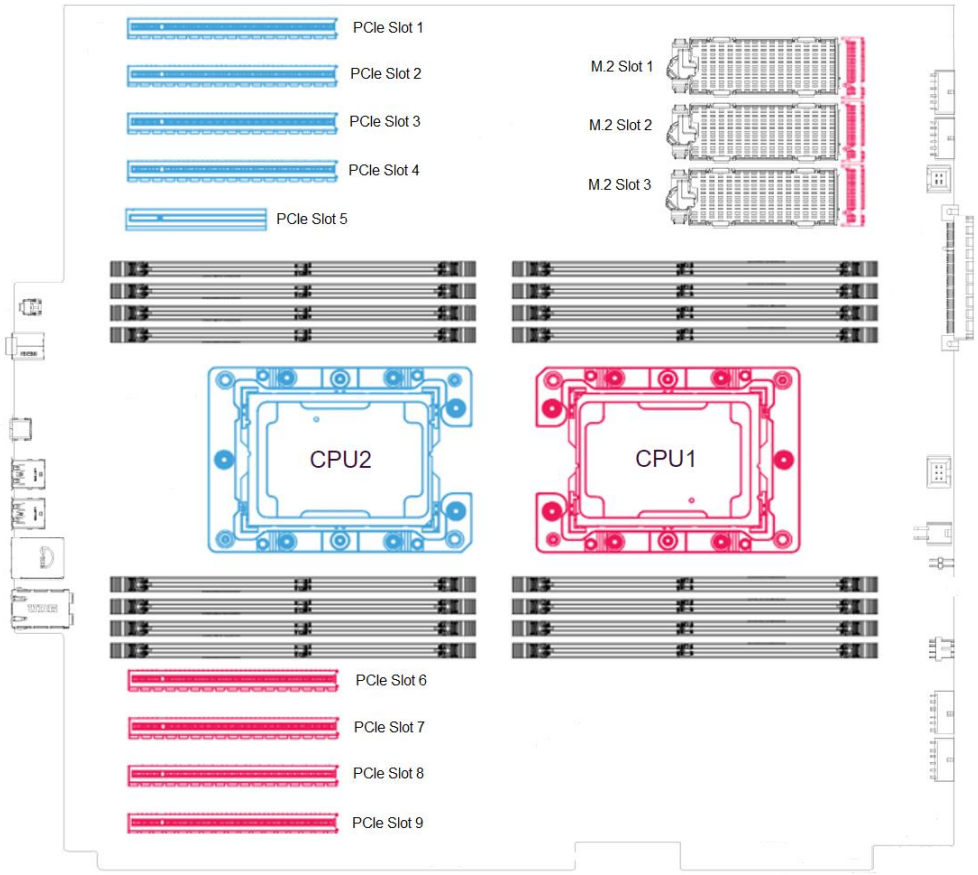
Storage Location	Drive Type Support
Internal onboard M.2 slots	3 x M.2 SSD Gen5 (CPU1)
ThinkStation PCIe Single U.2 / U.3 SSD Adapter	1 x U.2 / U.3 SSD Gen4 per adapter
ThinkStation PCIe Quad M.2 SSD Adapter	4 x M.2 SSD Gen4 per adapter[1]
Front access bay 1	1 x 3.5” SATA Gen3 (Chipset)
Front access bay 2	One of: • 1 x 3.5” SATA Gen3 (Chipset) • 2 x M.2 SSD Gen4 (requires CPU2) • 1 x U.3 SSD Gen4 (requires CPU2) + 1 x 3.5” SATA Gen3 (Chipset)
Front access bay 3	One of: • 1 x 3.5” SATA Gen3 (Chipset) • 2 x M.2 SSD Gen4 (requires CPU2) • 1 x U.3 SSD Gen4 (requires CPU2) + 1 x 3.5” SATA Gen3 (Chipset)
PSU bay 2	1 x 3.5” SATA Gen3 (Chipset)[2]

[1] Maximum drive capacity of 2TB. 4TB M.2 drives are *not* currently supported.
[2] Only supported with single power supply configurations.


Chassis door (left)
Chassis door (right)
Front access bay 1
Front access bay 2
Front access bay 3
Front access bay lock*
*Locks all three bays, not individual bays
ThinkStation
PX

Key Nest for Front Access Bays & Chassis Side Door

PSU bay 2 for additional 3.5”
*2nd PSU shown in diagram



Section 2 – PX M.2 SSD Drives on CPU-based Controller

The Lenovo ThinkStation PX platform supports a variety of different storage devices. Table 3 shows the available features for M.2 SSD drives utilizing the CPU-based controller. Table 4 highlights the compatibility and requirements for M.2 SSD drives utilizing the CPU-based controller.

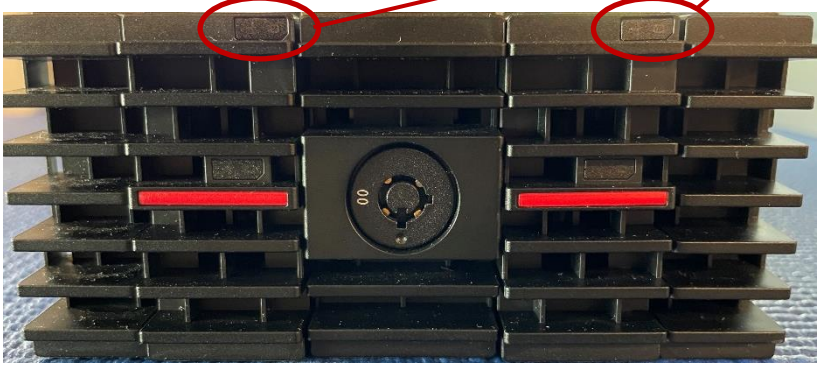
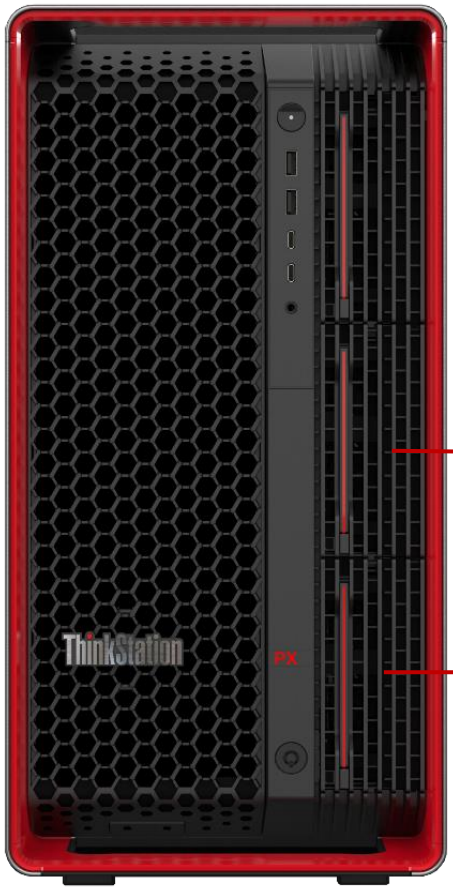


Table 4 - Features for M.2 SSD drives on CPU-based controllers

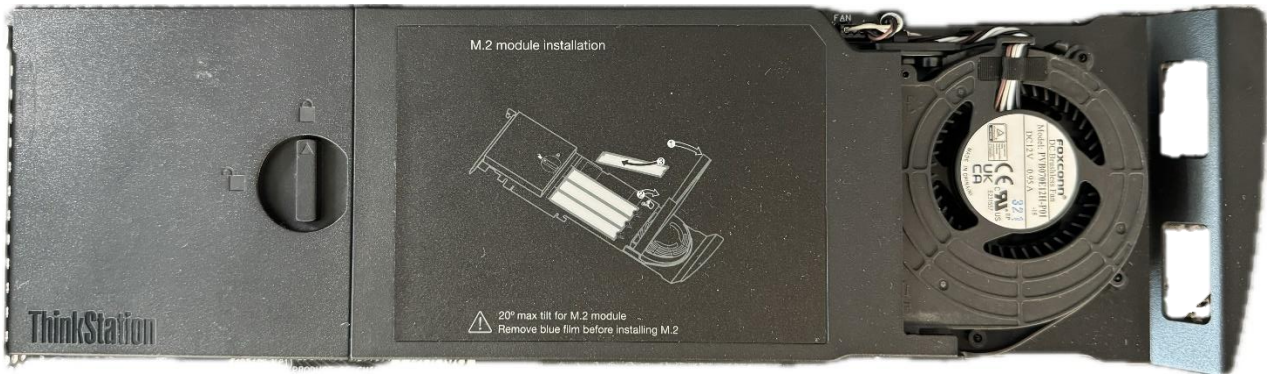
Feature	Onboard M.2 Slots	Front Access Bay Dual M.2 SSD enclosure (#1)	Front Access Bay Dual M.2 SSD enclosure (#2)
Drive Count (System max = 7)	3	2	2
Maximum PCIe speed	Gen5	Gen4	Gen4
Availability	Standard	Optional	Optional
Location	Motherboard	Front access bay 2	Front access bay 3
Controller	CPU1	CPU2	CPU2
Supported M.2 dimensions (mm)	(2) 2280 or 22110 + (1) 2280	2280	2280
Double side support	Yes	Yes	Yes
Maximum power per drive	8W	8W	8W
RAID support[1]	RAID 0, 1, 5, 10 (data array only)[2]		
	RAID 0, 1, 5	RAID 0, 1, 5, 10	
Front accessible	No	Yes	Yes
Toolless	Yes	Partial[3]	Partial[3]
Hot swappable	No	Yes	Yes
Individual activity/status LEDs	No	Yes	Yes
Combined in system activity LED	Yes	Yes	Yes

[1] See the “Intel VROC Storage Configurator” whitepaper for additional details.
[2] Each PCIe x16 port off the Intel CPU forms a logical Volume Management Device (VMD). Intel VROC only supports booting to RAID volumes within a single VMD.
[3] A screwdriver is required to install the drive into the sub enclosure, but then the sub enclosure can be removed from the main enclosure without tools.



Front Access Bay Dual M.2 SSD Enclosure (#1)

Front Access Bay Dual M.2 SSD Enclosure (#2)



ThinkStation PCIe Quad M.2 SSD Adapter

Table 5 - Compatibility and parts requirements for M.2 SSD drives on CPU-based controller

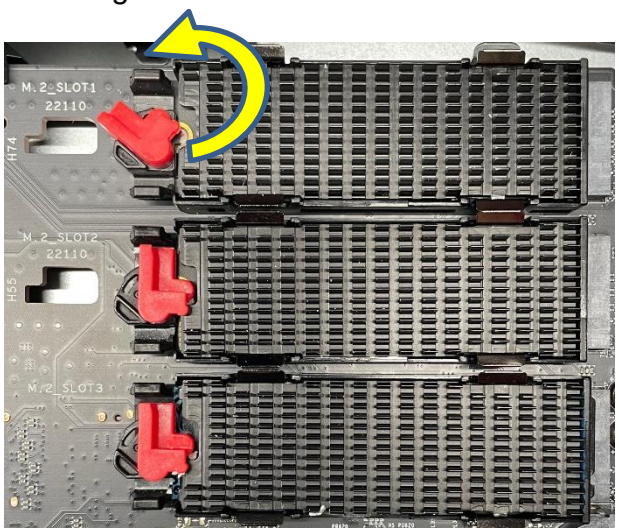
Location	Compatibility	Requirements and Parts
Onboard M.2		• M.2 Carrier and Heatsink kit standard on motherboard • RAID requires Intel VROC key[1]
Front Access Bay Dual M.2 SSD Enclosure x 1	Compatible with the following front access combinations: • 0-2 x SATA	• System must have two CPUs • Front access bay Dual M.2 SSD enclosure • Motherboard NVME bay2 Gen5 cable • Storage bay 5038 fan • RAID requires Intel VROC key[1]
Front Access Bay Dual M.2 SSD Enclosure x 2	Compatible with the following front access combinations: • 0-1 x SATA	• System must have two CPUs • Front access bay Dual M.2 SSD enclosure • Motherboard NVMe bay2 Gen5 cable • Motherboard NVME bay3 Gen5 cable • Storage bay 5038 fan • RAID requires Intel VROC key[1]
PCIe Quad M.2 SSD Adapter	Requires available PCIe x16 slot.	• RAID requires Intel VROC key[1]

[1] Intel Virtual RAID On CPU (VROC). Basic Intel VROC key supports RAID 0, 1, and 10. Premium Intel VROC key supports RAID 0, 1, 5, and 10. One Intel VROC key supports all NVMe drive locations.

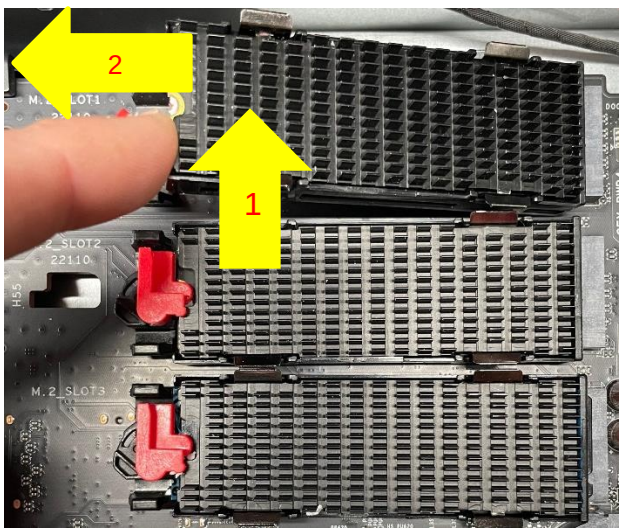
Onboard M.2 SSD drive installation

1. Open the side cover on the PX and remove any PCIe adapters that may interfere with accessing the onboard M.2 slots.

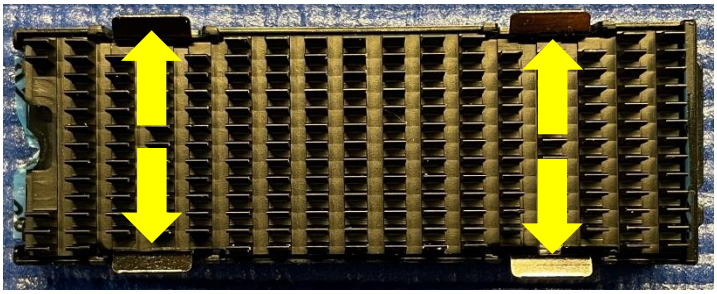
2. Rotate the red locking mechanism counterclockwise.



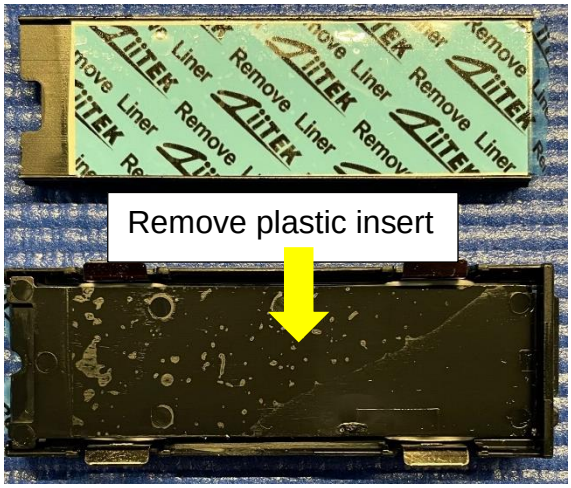
3. Slightly lift straight up to about a 15-degree angle and pull out.
Caution: Be careful <u>not</u> to lift too much to risk breaking the M.2 slot.

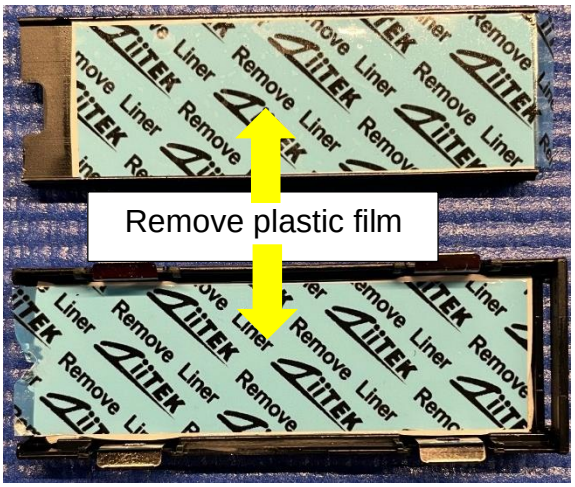


4. Lay the M.2 carrier flat on a desk and carefully separate the heatsink from the carrier by releasing the four tabs away from the heatsink.

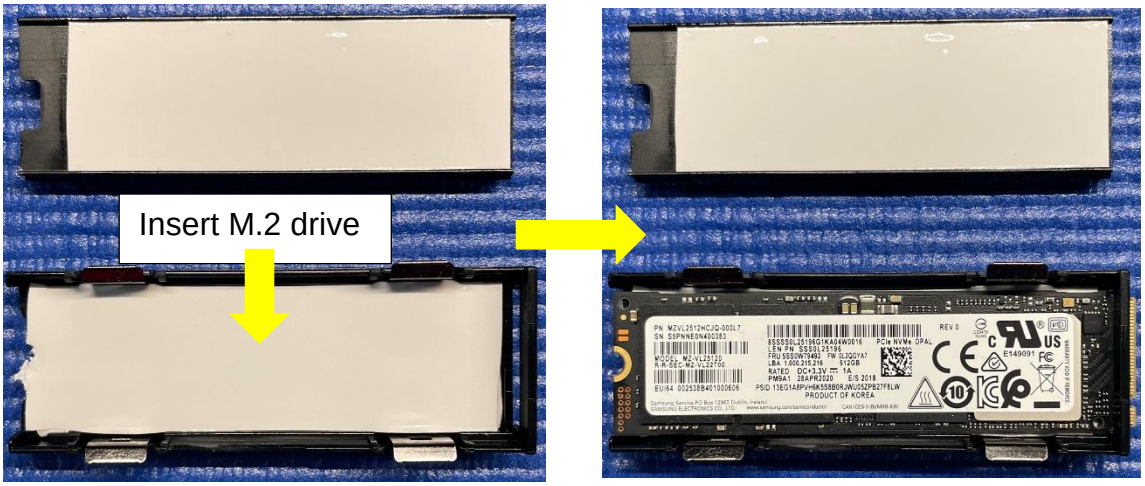


5. Remove the plastic insert as well as the thermal pad plastic film piece.



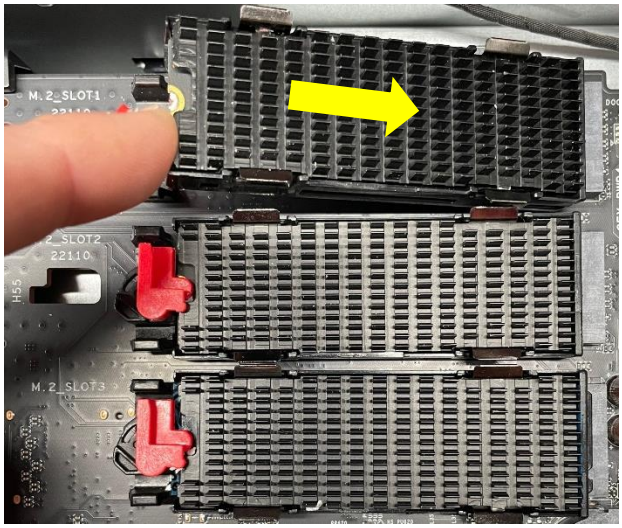


6. Insert the M.2 drive carefully in the M.2 bracket as shown below.

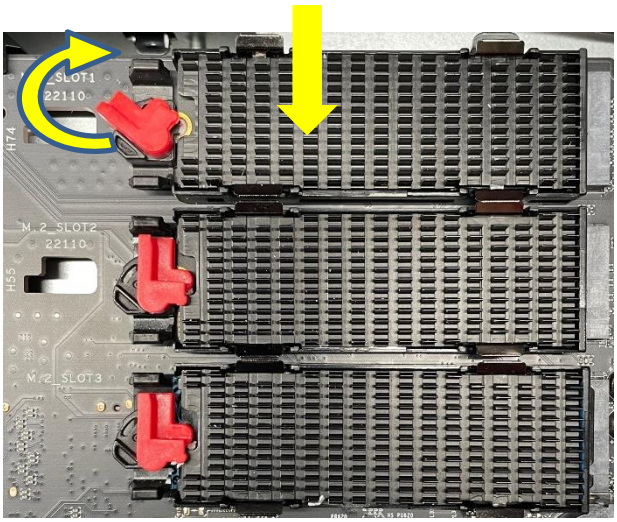


7. Reinstall the heatsink on top of the M.2 drive within the carrier and press to engage tabs on the heatsink to the metal brackets on the carrier.

8. Install the M.2 bracket back into the onboard M.2 slot at a slight 15-degree angle.
Caution: Be careful not to use excessive force to risk breaking the M.2 slot.



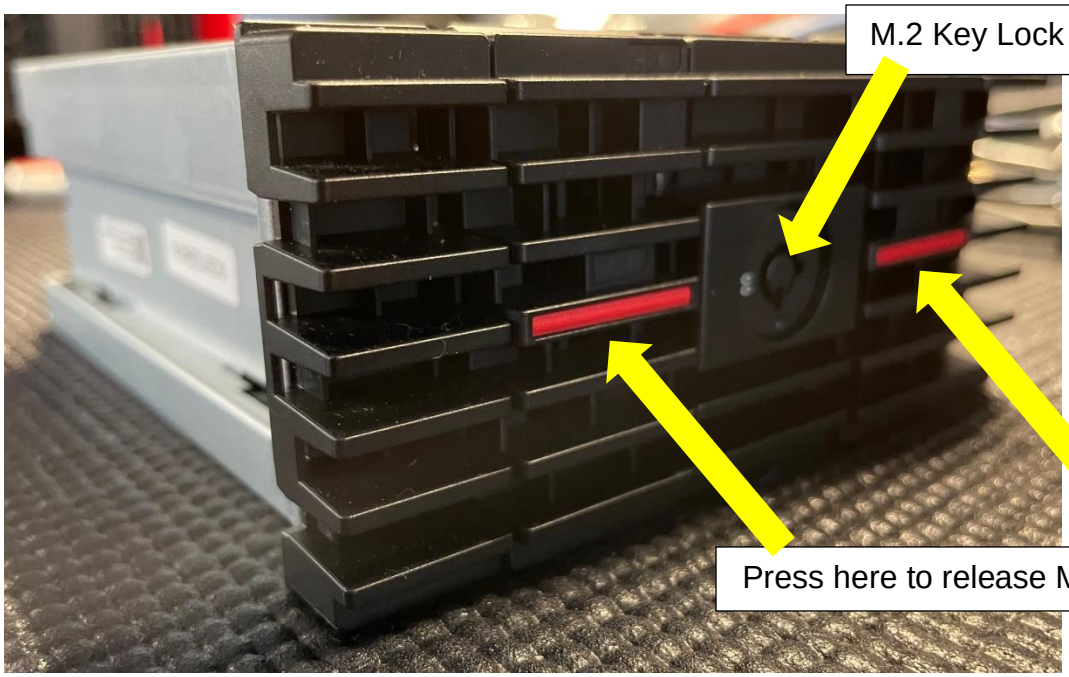
9. Push down and rotate the red latch clockwise to secure the M.2 carrier in the system.



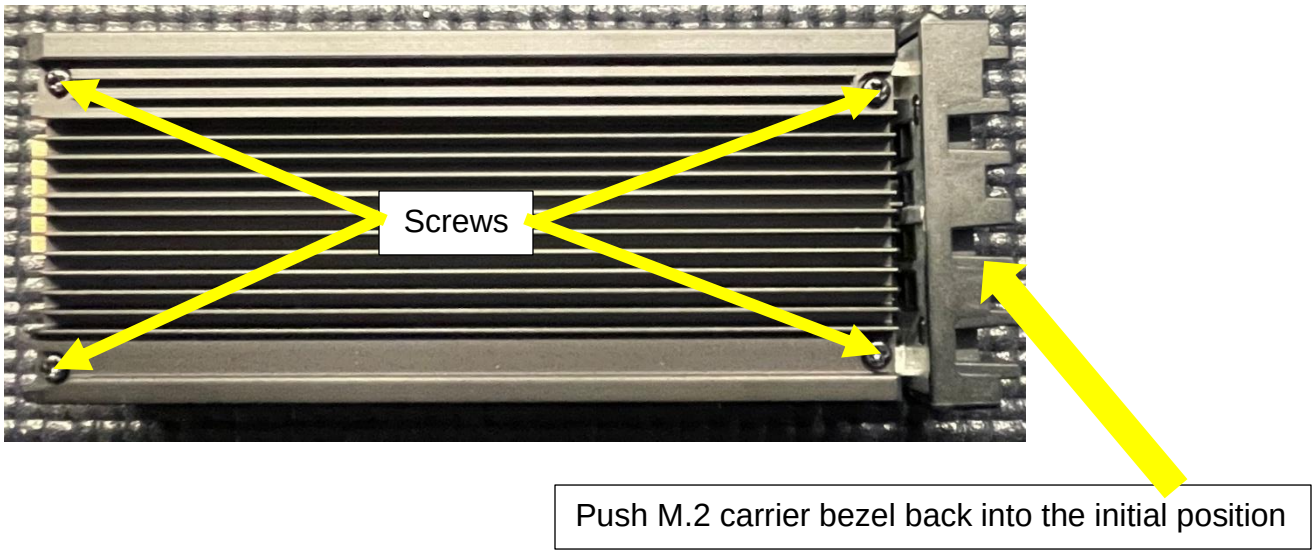
Front M.2 drive installation

1. Remove the M.2 carrier(s) from the Front Bay assembly by pressing on the red touchpoint to release the spring-loaded M.2 carrier from the Front Bay assembly.

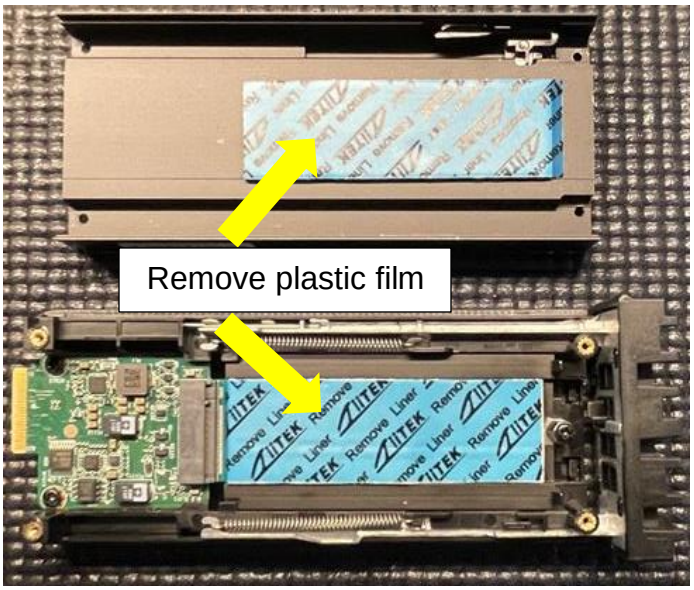
   Note: Make sure the key lock is in the unlocked position or else the M.2 carrier(s) will not be able to be removed.

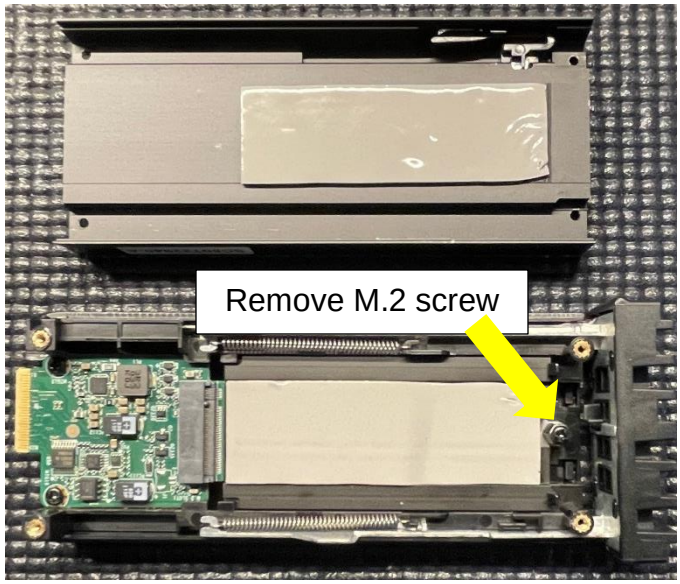


2. Place the M.2 carrier on a flat surface and remove the four (4) screws using a Phillips screwdriver. Make sure the M.2 carrier bezel is pushed back into the initial closed position.



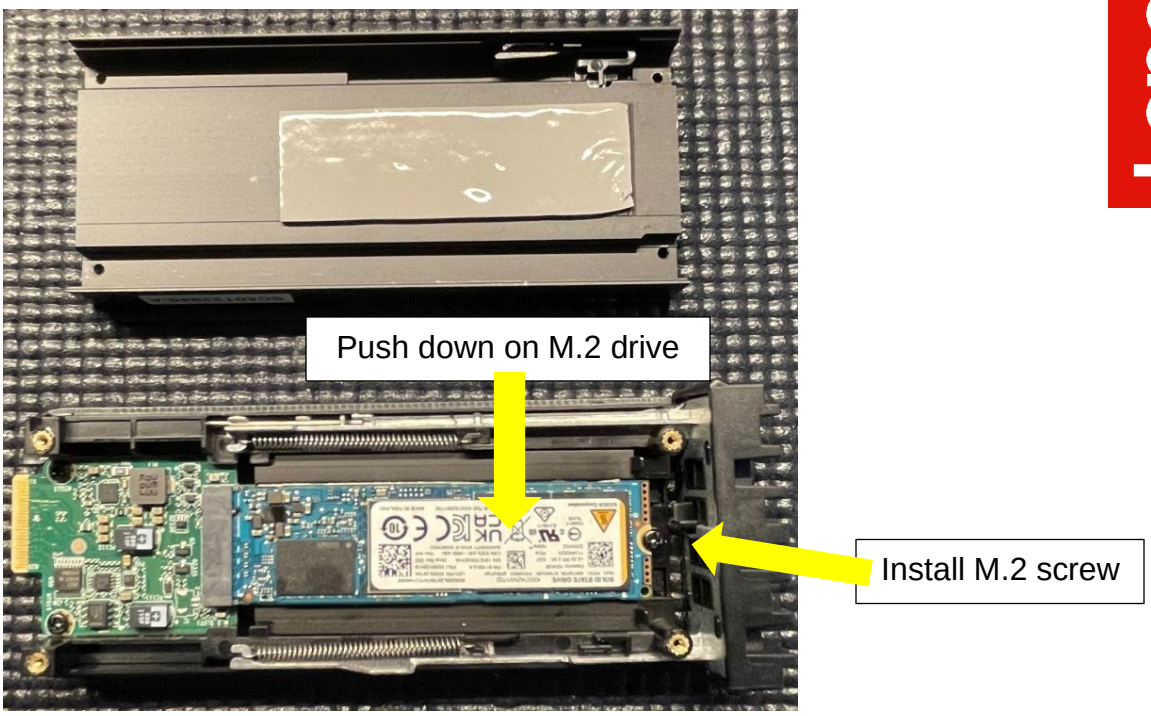
3. Remove the top part of the M.2 carrier and place it upside down on a flat surface. Remove the thermal pad plastic film as well as the screw used to secure the M.2 drive to the M.2 carrier.



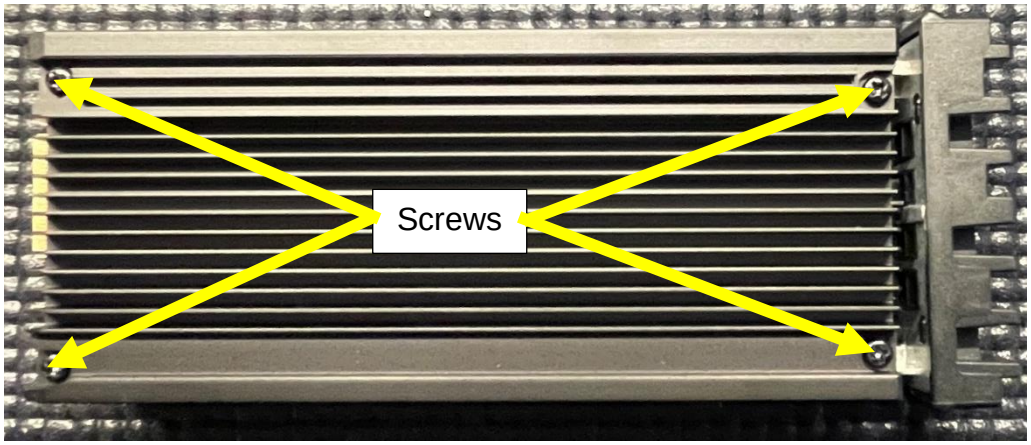


4. Install the M.2 drive at a slight 15-degree angle in the M.2 slot of the carrier.
Caution: Be careful not to use excessive force to risk breaking the M.2 slot.

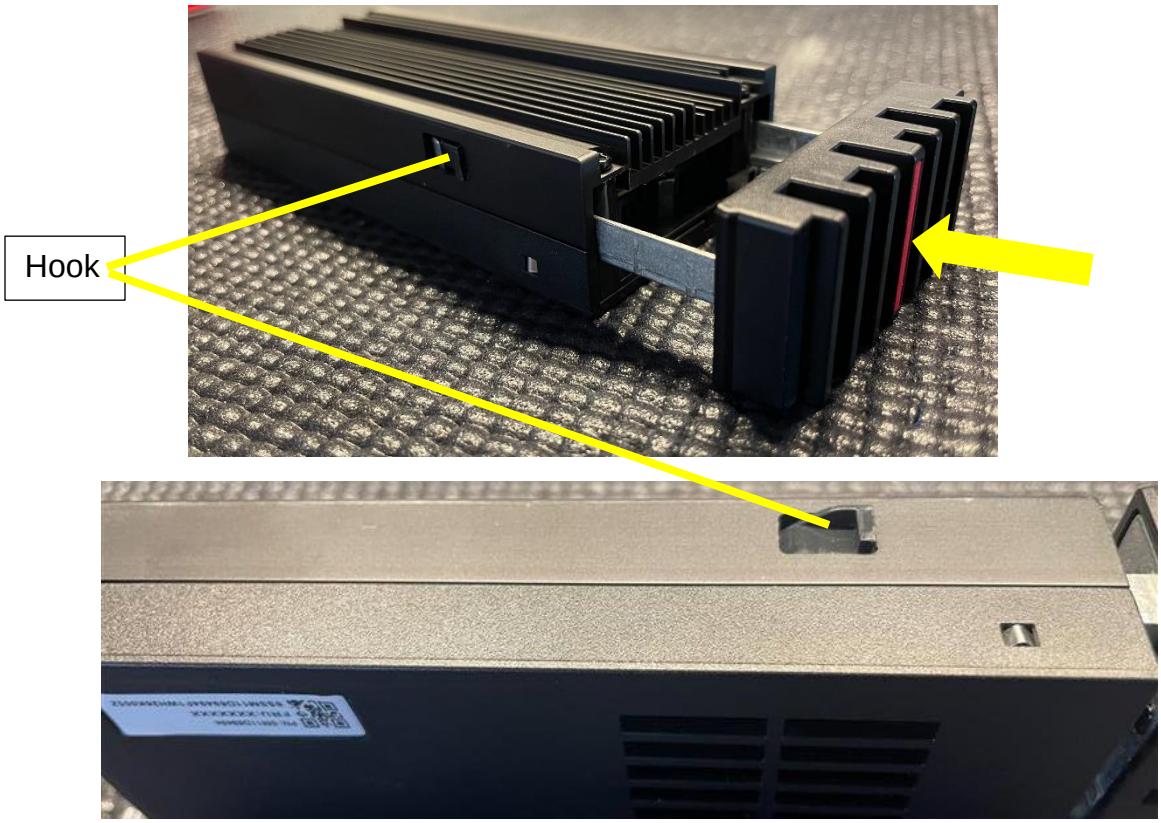
5. Push down on the M.2 drive and install the screw used to secure the M.2 drive to the M.2 carrier.



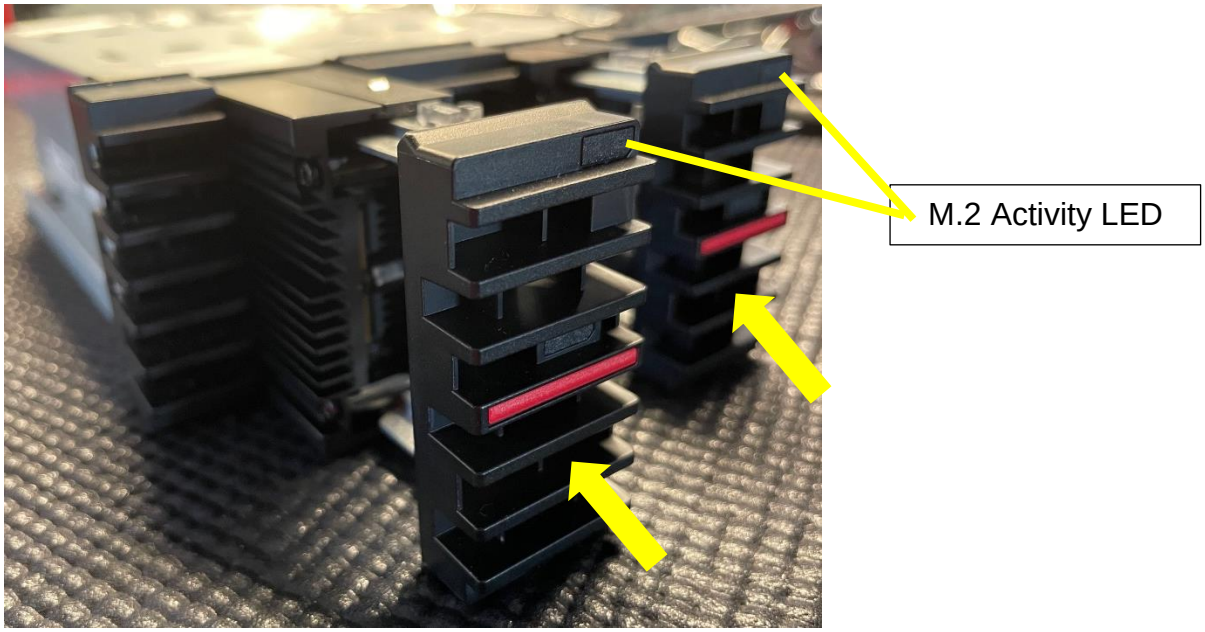
6. Install the top cover of the M.2 carrier and tighten all four (4) screws needed to secure the top and the bottom of the M.2 carrier together.



7. Push M.2 carrier bezel to release the hook and extend the M.2 carrier.



8. Install the M.2 carrier back into the Front Bay Assembly.

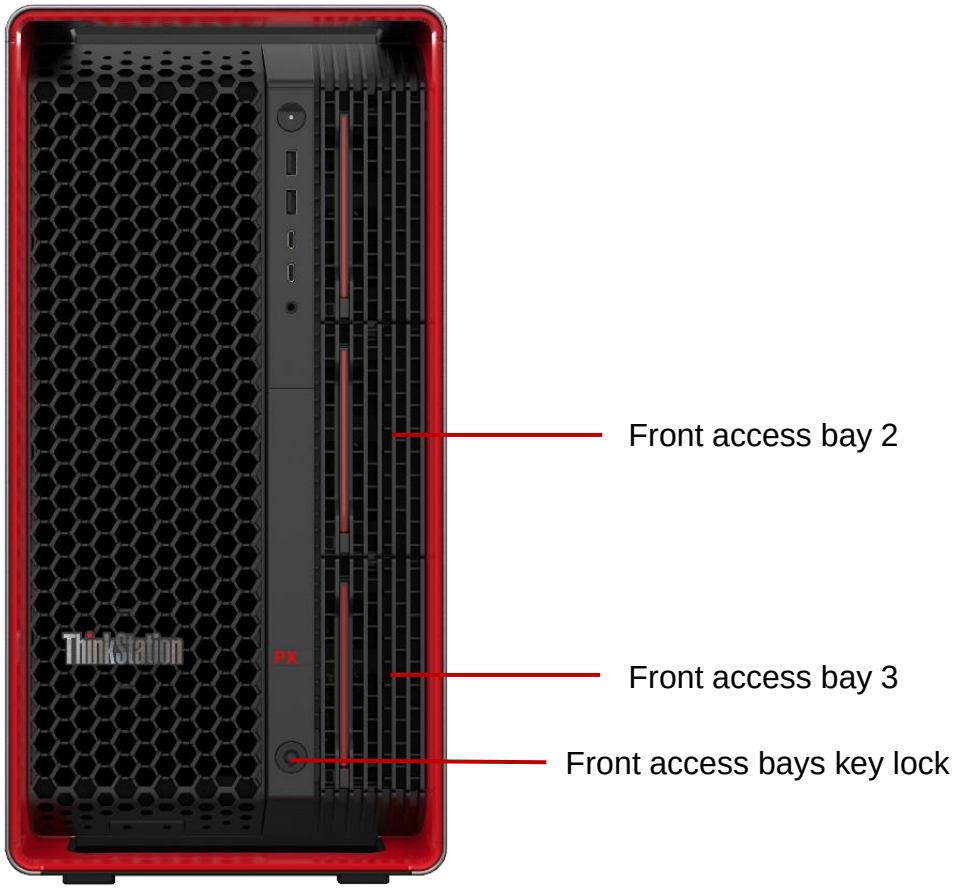


Front M.2 SSD Enclosure Installation

On ThinkStation PX models without Front M.2 SSD Enclosures installed previously, here are some step-by-step instructions on how to install the front M.2 SSD enclosure.

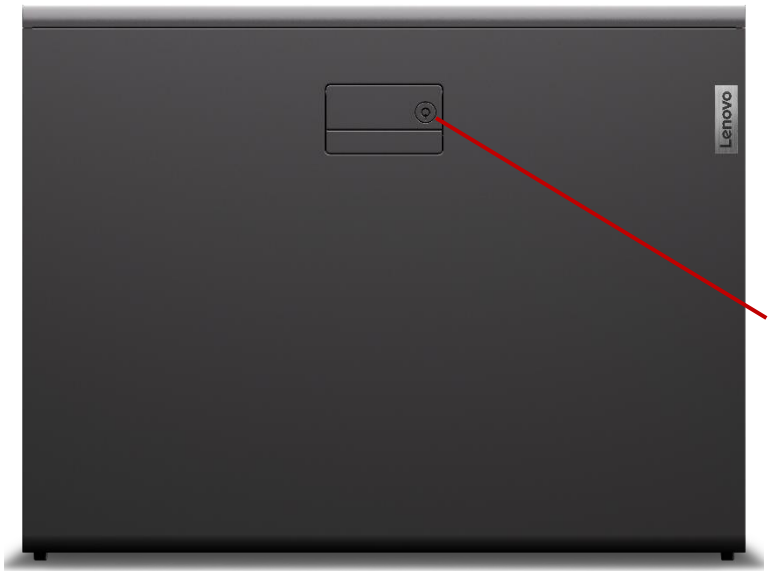
1. Remove the Front Access 3.5” HDD Tray from ‘Front Access Bay 2’ and/or ‘Front Access Bay 3’ depending on the number of front M.2 SSD enclosures to be installed.

   Note: Some ThinkStation PX models may have the front access bay key lock installed. If so, make sure the front access bays are unlocked.



2. Remove the chassis side door cover (left).

   Note: Some ThinkStation PX models may have the chassis side door key lock installed. If so, make sure the chassis side door cover is unlocked.



3. Remove the other chassis side door cover (right).

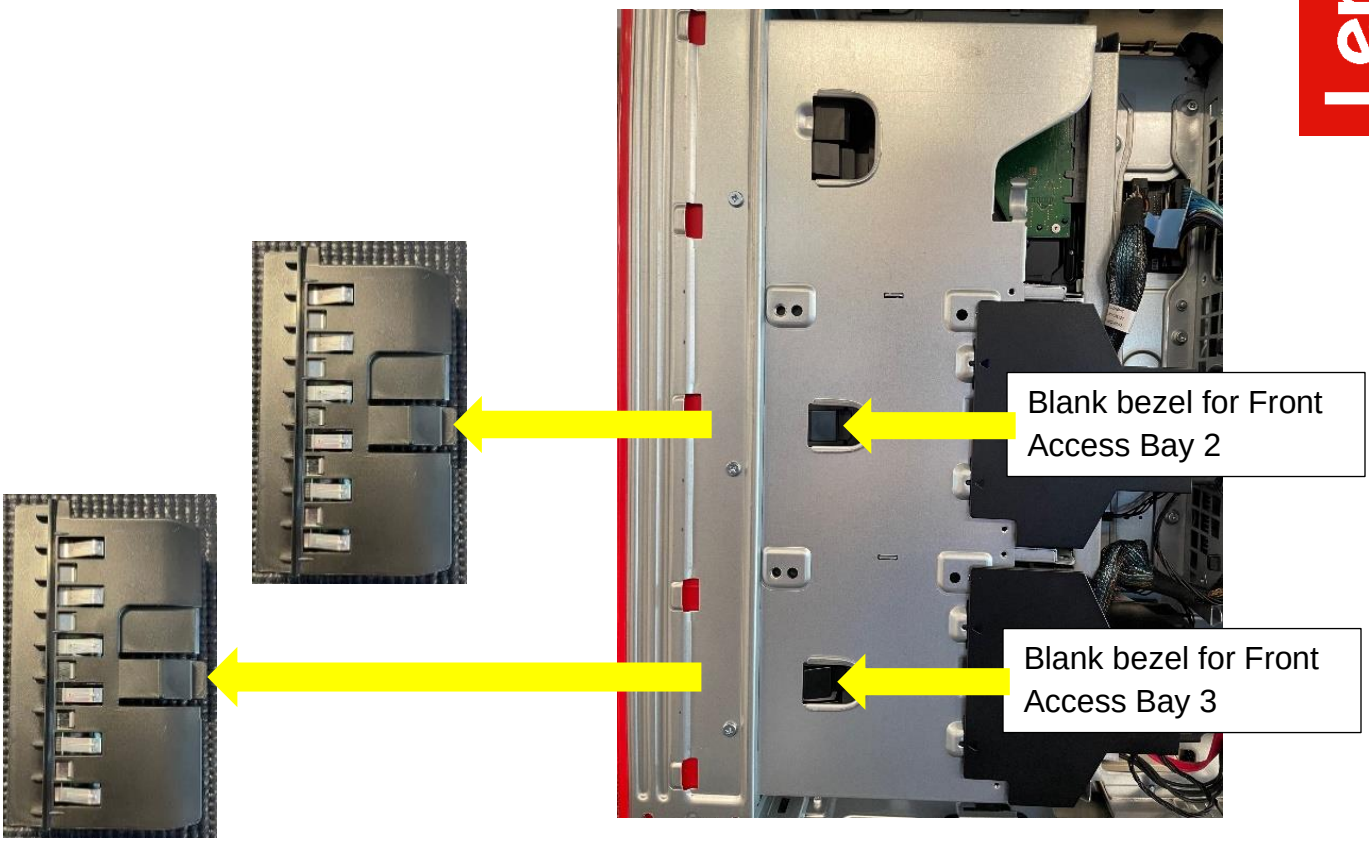
   Note: There is a lock feature on the inside of the chassis that prevents the right side door cover from opening. This mechanism can slide left or right to move it to the unlocked or locked positions. To remove the side cover, move this mechanism to the unlocked position.

Locked Position

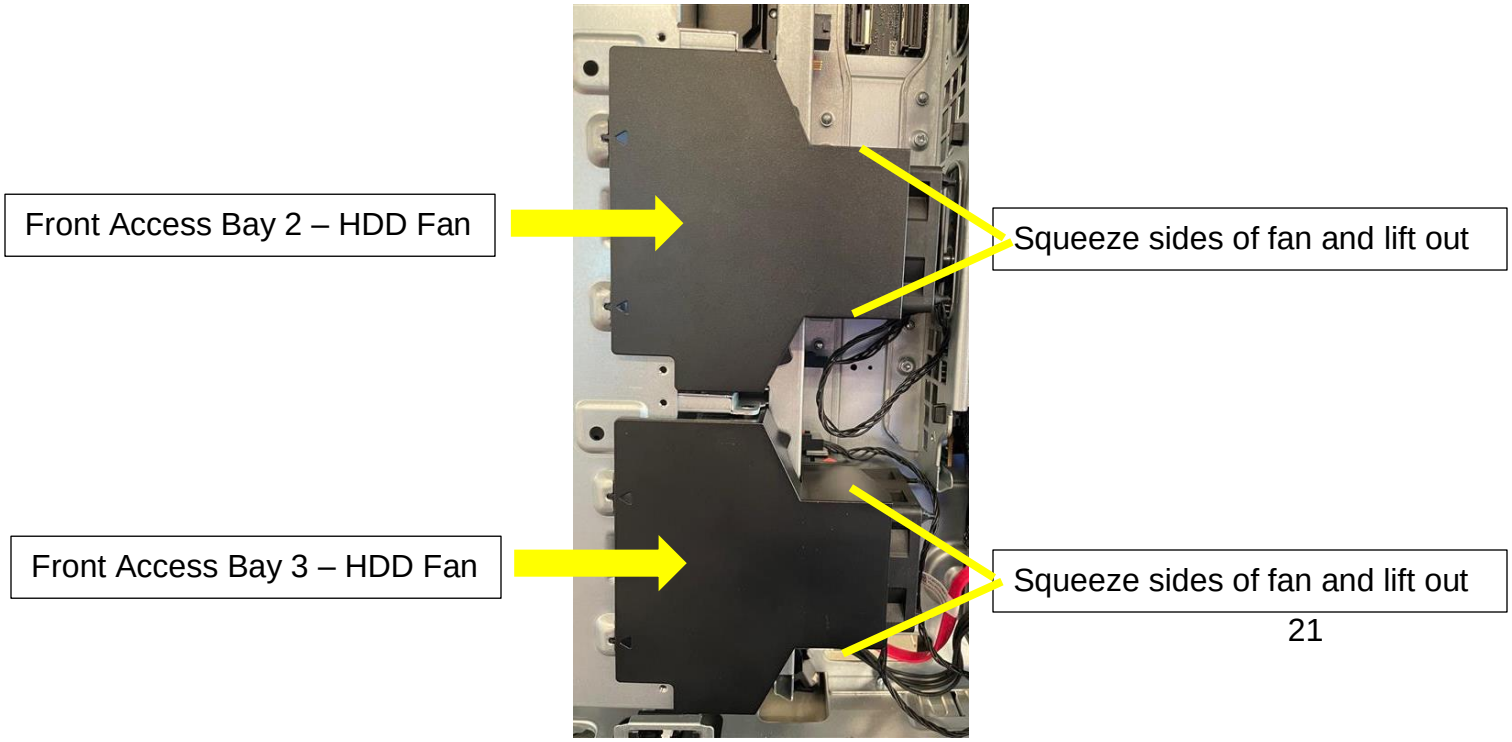
Unlocked Position

While looking at the rear side of the system, press the gray latch to release the hooks to slide the whole chassis side door cover back and out.

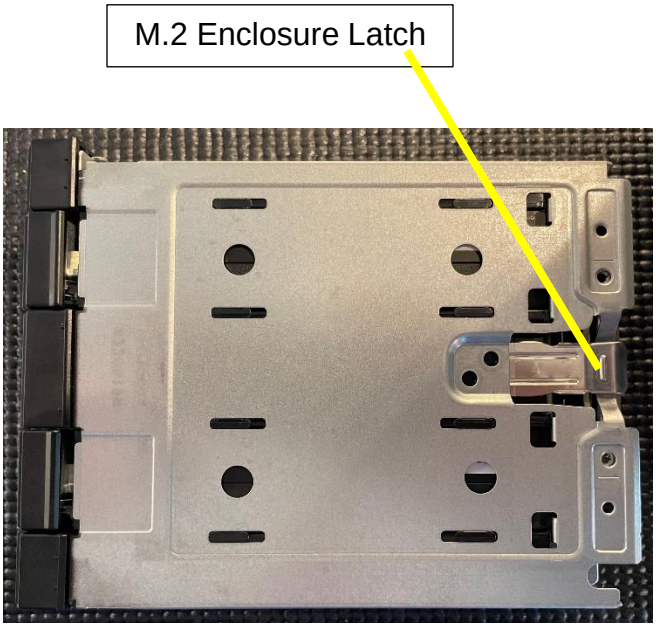
4. While looking at the right side of the system (under the motherboard), press the release tabs to remove the blank bezel for the front access bays 2 and/or 3 depending on how many M.2 storage enclosures to add.

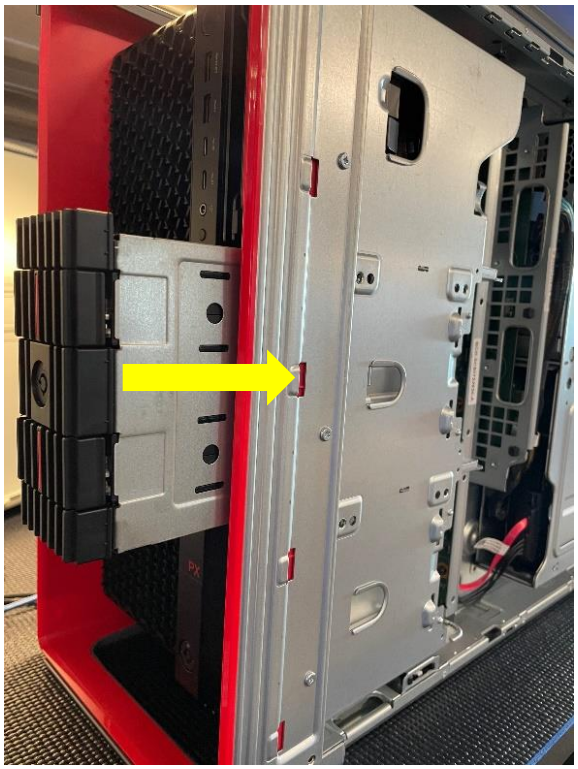


5. Remove HDD fans for the front access bay 2 and/or 3 depending on how many M.2 storage enclosures to add.

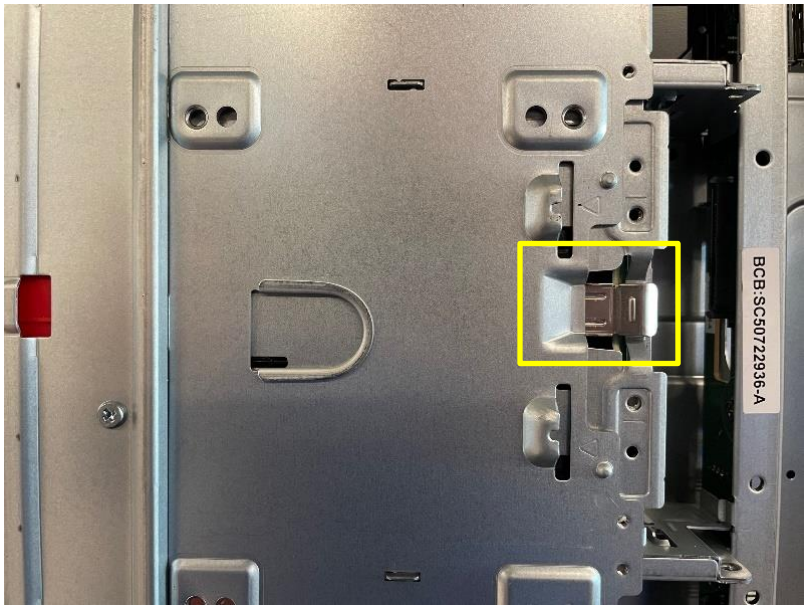


6. Slide the M.2 SSD Enclosure into one of the front access bays with the latch facing the right side (under system board) of the system until it latches into the chassis.

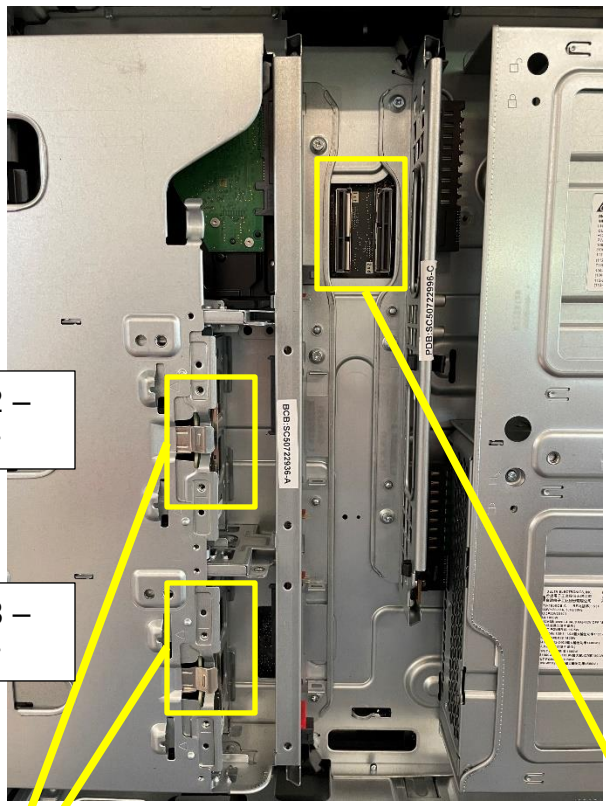




7. Make sure the M.2 SSD Enclosure latched into place as shown below.



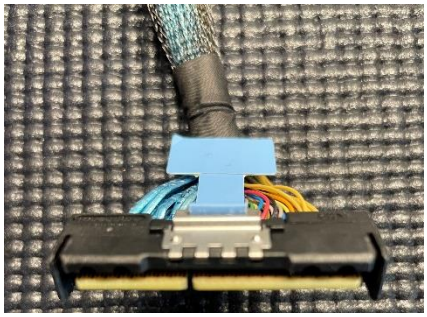
8. Connect the PCIe NVMe cable to both the motherboard connector as well as the M.2 SSD enclosure.



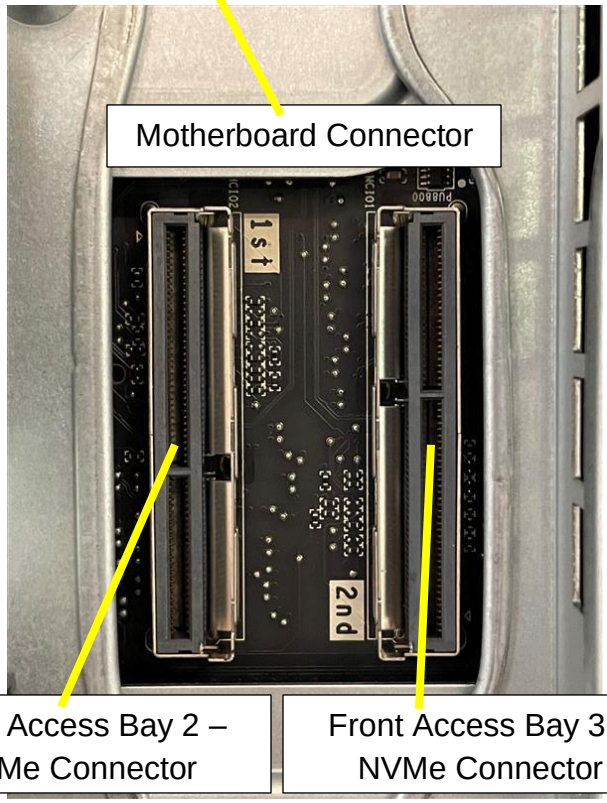
Front Access Bay 2 – NVMe Connector

Front Access Bay 3 – NVMe Connector

PCIe NVMe cable



M.2 SSD enclosure connector

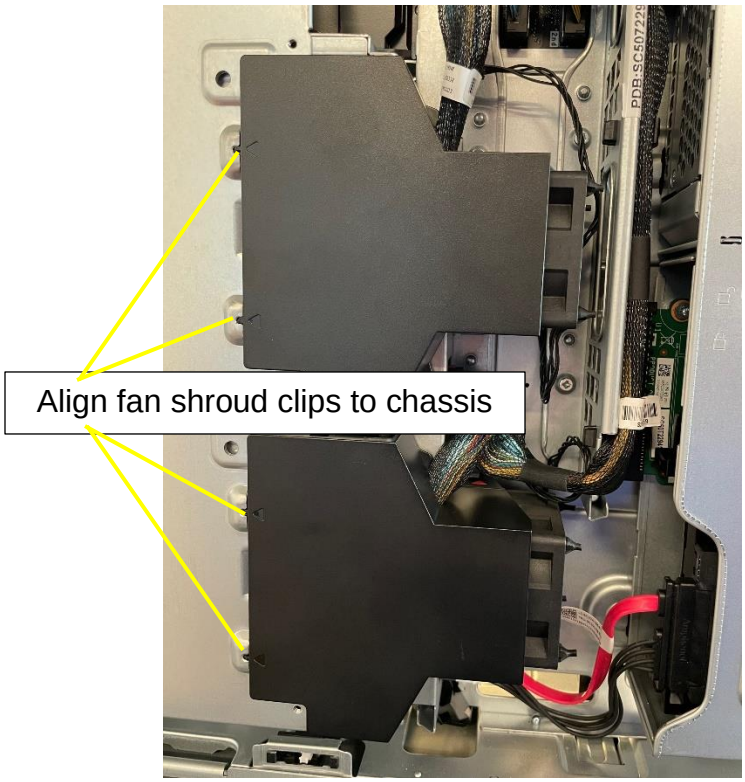


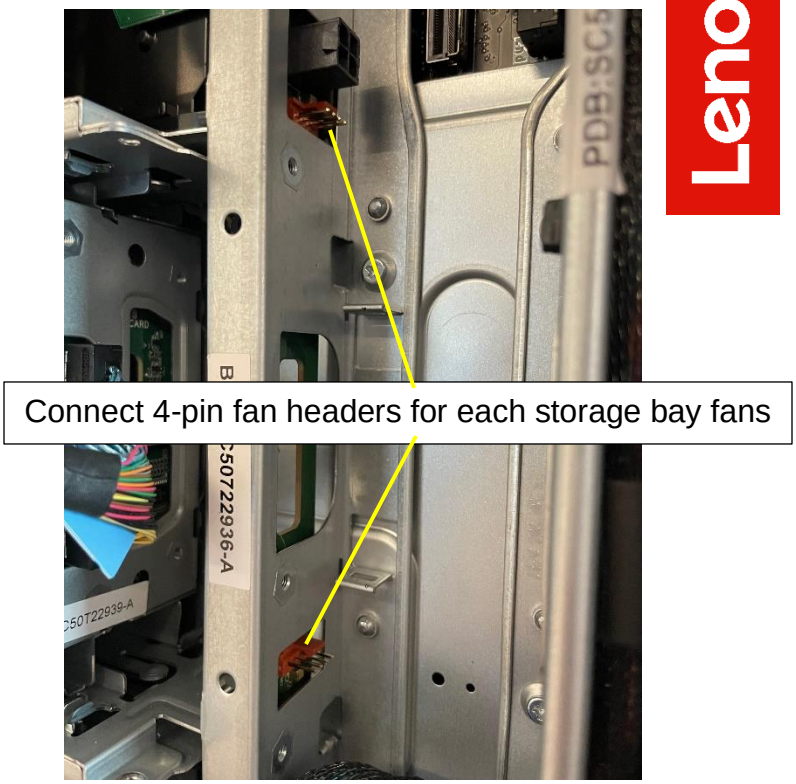
Motherboard Connector

Front Access Bay 2 – NVMe Connector

Front Access Bay 3 – NVMe Connector

9. Install the storage bay fans.



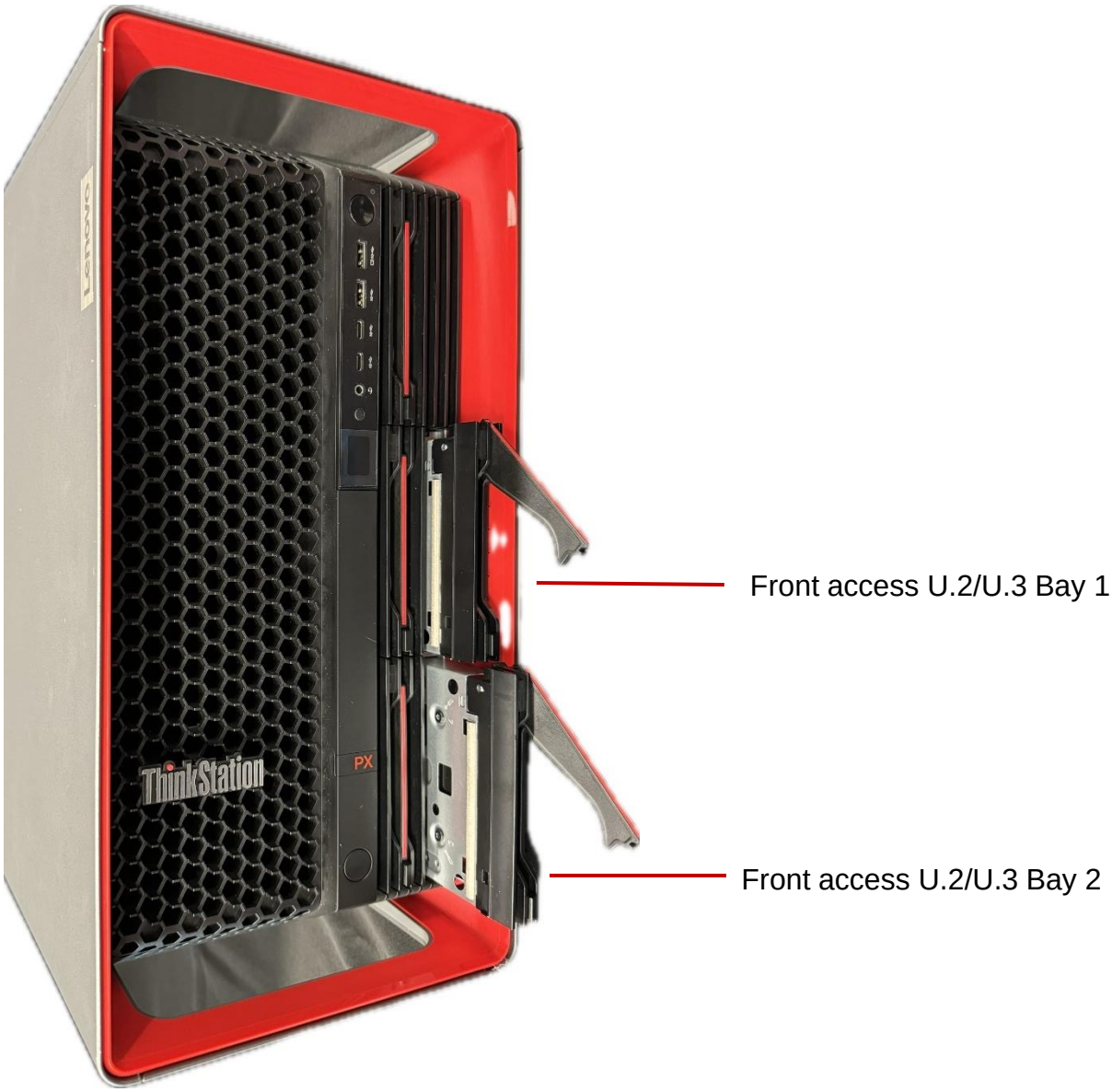


10. Reinstall the right-side door cover to the chassis.

11. Reinstall the left-side door cover to the chassis.

Section 3 – PX U.2 / U.3 SSD Drives on CPU-based Controller

The Lenovo ThinkStation PX platform supports a variety of different storage devices. Table 6 shows the available features for U.2/U.3 SSD drives utilizing the CPU-based controller. Table 7 highlights the compatibility and requirements for U.2/U.3 SSD drives utilizing the CPU-based controller.



HDD Activity LED

ThinkStation PCIe Single U.2 / U.3 SSD Adapter

Table 6 - Features for U.2 / U.3 SSD drives on CPU-based controllers

Feature	PCIe Single U.2/U.3 SSD Adapter	Front Access Bay U.2/U.3 SSD enclosure (#1)	Front Access Bay U.2/U.3 SSD enclosure (#2)
Drive Count (System max = 4)	Up to 2	1	1
Maximum PCIe speed	Gen5	Gen5	Gen5
Availability	Optional	Optional	Optional
Location	Motherboard PCIe Slots	Front access bay 2 (right side)	Front access bay 3 (right side)
Controller	CPU 1: PCIe Slots 6-9 CPU 2: PCIe Slots 1-4	CPU2	CPU2
Maximum power per drive	17W	17W	17W
RAID support	Not Supported	RAID 0, 1[1]	
Front accessible	No	Yes	Yes
Toolless	Yes	Partial[2]	Partial[2]
Hot swappable	No	Yes	Yes
Individual activity/status LEDs	No	Yes	Yes
Combined in system activity LED	Yes	Yes	Yes

[1] Each PCIe x16 port off the Intel CPU forms a logical Volume Management Device (VMD). Intel VROC only supports booting to RAID volumes within a single VMD.
[2] A screwdriver is required to install the drive into the sub enclosure, but then the sub enclosure can be removed from the main enclosure without tools.

Table 7 - Compatibility and parts requirements for U.2 / U.3 SSD drives on CPU-based controller

Drive Installation	Compatibility	Requirements and Parts
Front Access Bay U.2 / U.3 SSD Enclosure x 1	Compatible with the following front access combinations: • 3 x SATA HDDs • 2 x SATA HDDs + 1 x Dual M.2 SSD enclosure	• System must have two CPUs installed • Front access bay U.2/U.3 SSD enclosure • Motherboard NVME bay2 Gen5 cable • Storage bay 5038 fan • RAID requires Intel VROC key[1]
Front Access Bay U.2 / U.3 SSD Enclosure x 2	Compatible with the following front access combinations: • 3 x SATA HDDs	• System must have two CPUs installed • Front access bay U.2/U.3 SSD enclosure • Motherboard NVMe bay 2 Gen5 cable • Motherboard NVME bay3 Gen5 cable • (2) Storage bay 5038 fans • RAID requires Intel VROC key[1]
PCIe Single U.2 / U.3 SSD Adapter	Requires available PCIe x16 slot.	• ThinkStation PCIe Single U.2 / U.3 SSD Adapter

[1]Intel Virtual RAID On CPU (VROC). Basic Intel VROC key supports RAID 0, 1, and 10. Premium Intel VROC key supports RAID 0, 1, 5, and 10. One Intel VROC key supports all NVMe drive locations.

Front U.2 / U.3 SSD Enclosure Installation

On ThinkStation PX models without Front U.2 / U.3 SSD Enclosures installed previously, here are some instructions on how to install the front U.2 / U.3 SSD enclosure.

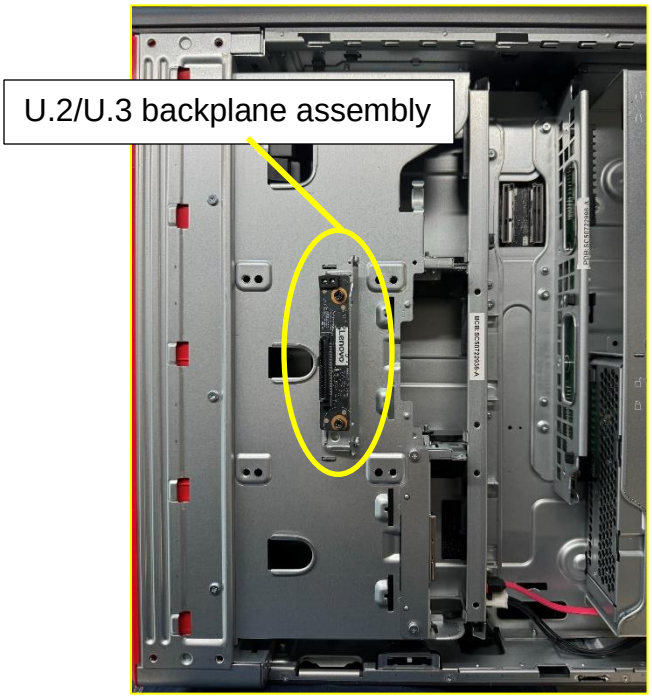
**Note: Front Access 3.5" HDD Trays do NOT need to be removed from the system but will need to make sure the front access bays are unlocked if the system is equipped with the front access bay key lock.*

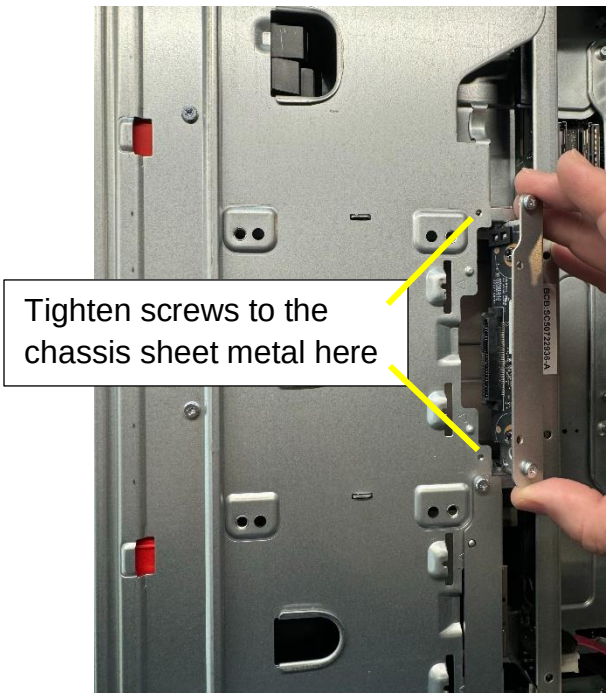
1. Remove the chassis side door cover (left) as highlighted in the previous section.

2. Remove the other chassis side door cover (right) as highlighted in the previous section.

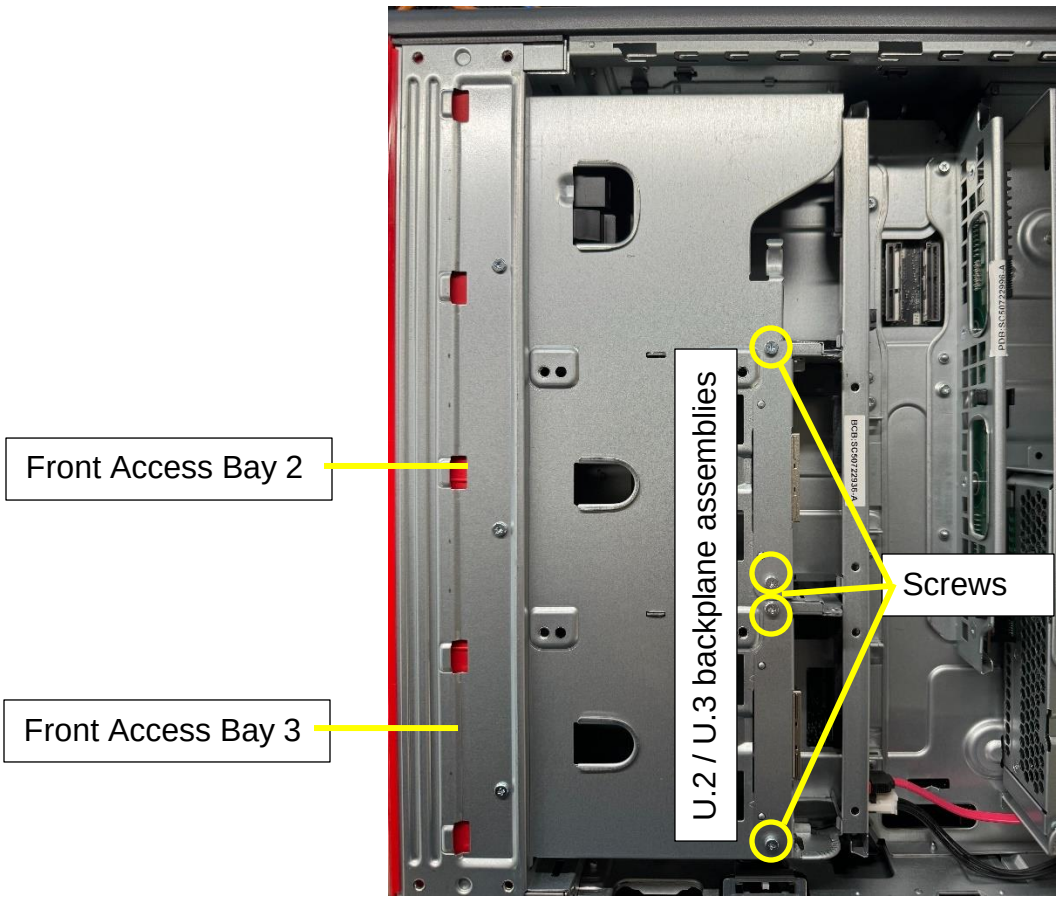
3. Remove the blank bezel and HDD fans as highlighted in the previous section.

4. Install the U.2 / U.3 backplane assembly, with the PCB pointing downward and tighten the two screws to the chassis sheet metal.

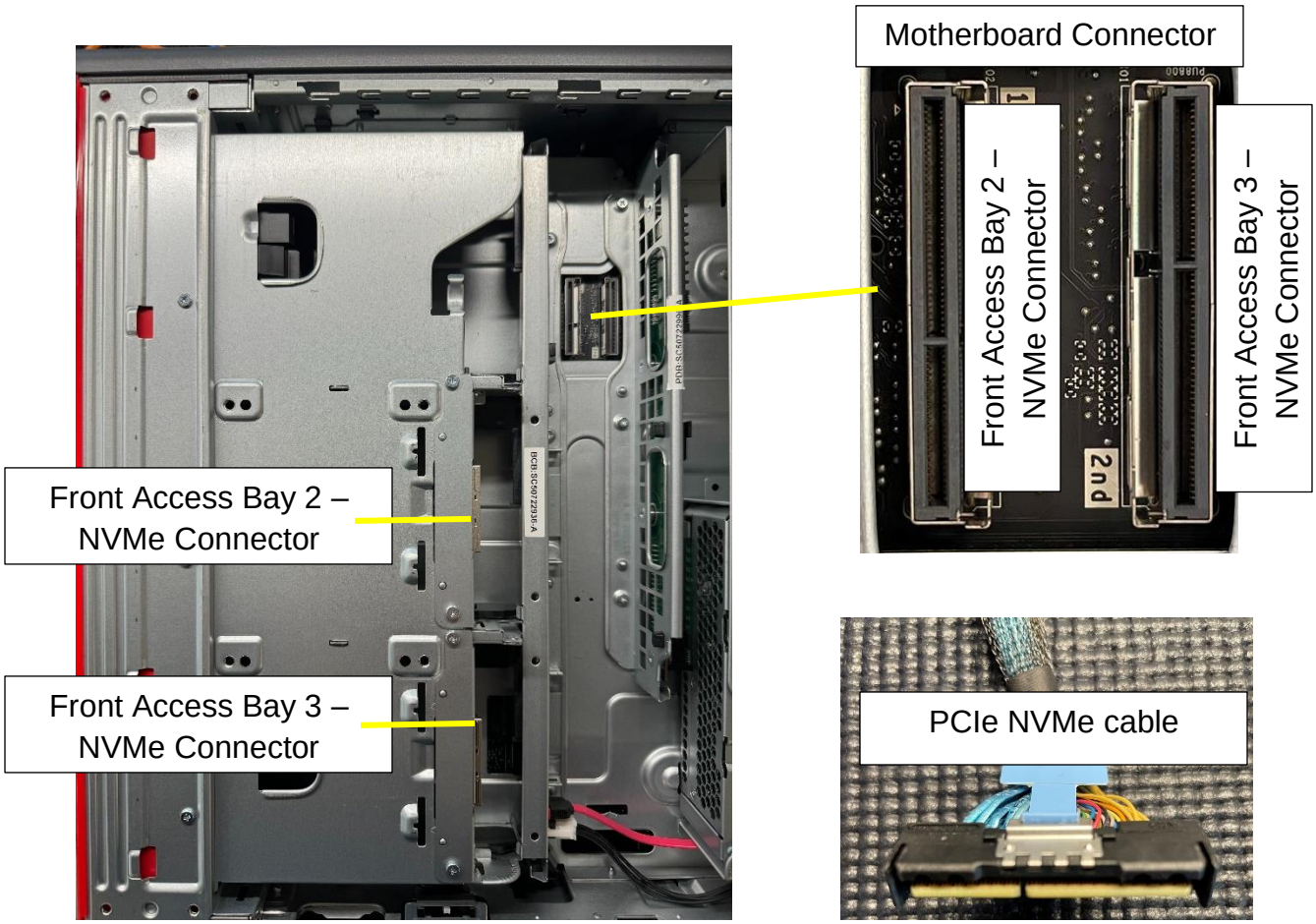




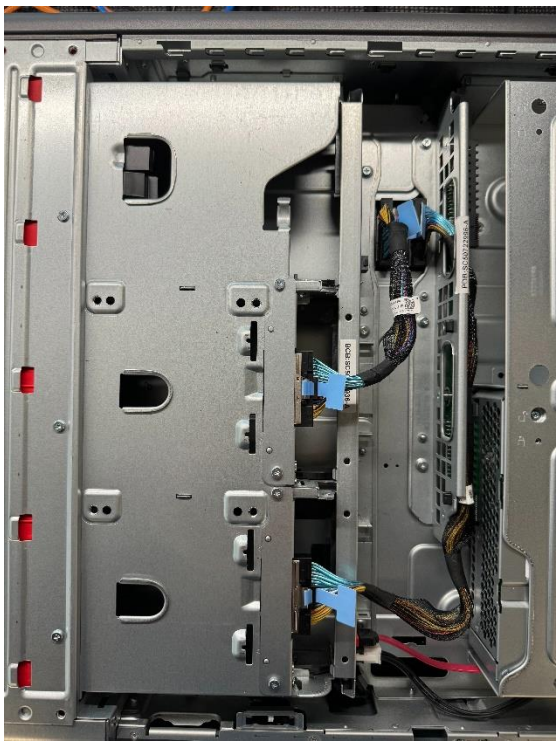
5. The below picture shows what the system should look like with both two (2) U.2 / U.3 backplane assemblies installed.



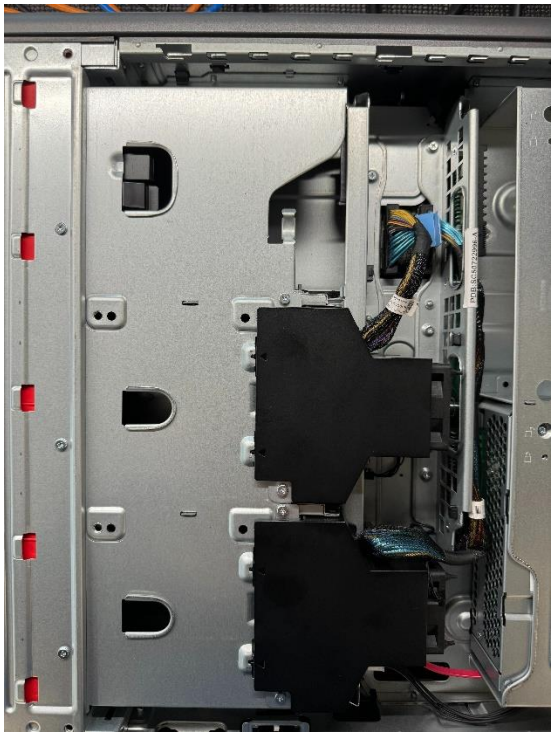
6. Connect the PCIe NVMe cable(s) to both the motherboard connector as well as the U.2 / U.3 SSD enclosure(s).



Note: Here is a general overview of what the cables should look like when they get connected.



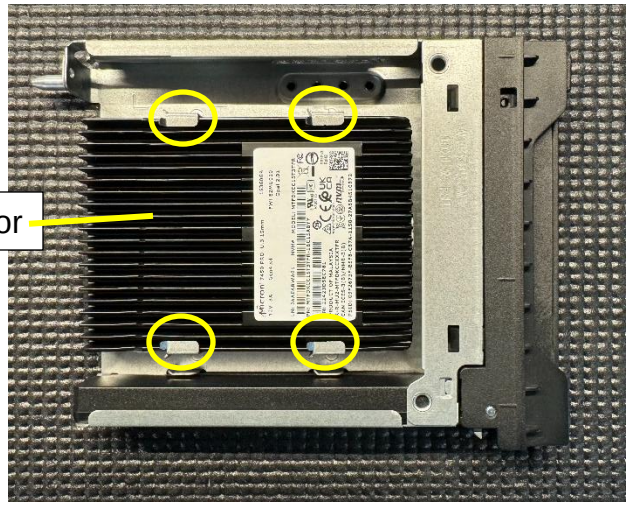
7. Reinstall the HDD fan assemblies as shown in the previous section.
   Note: Here's what the HDD fan assemblies should look like when they get reinstalled.



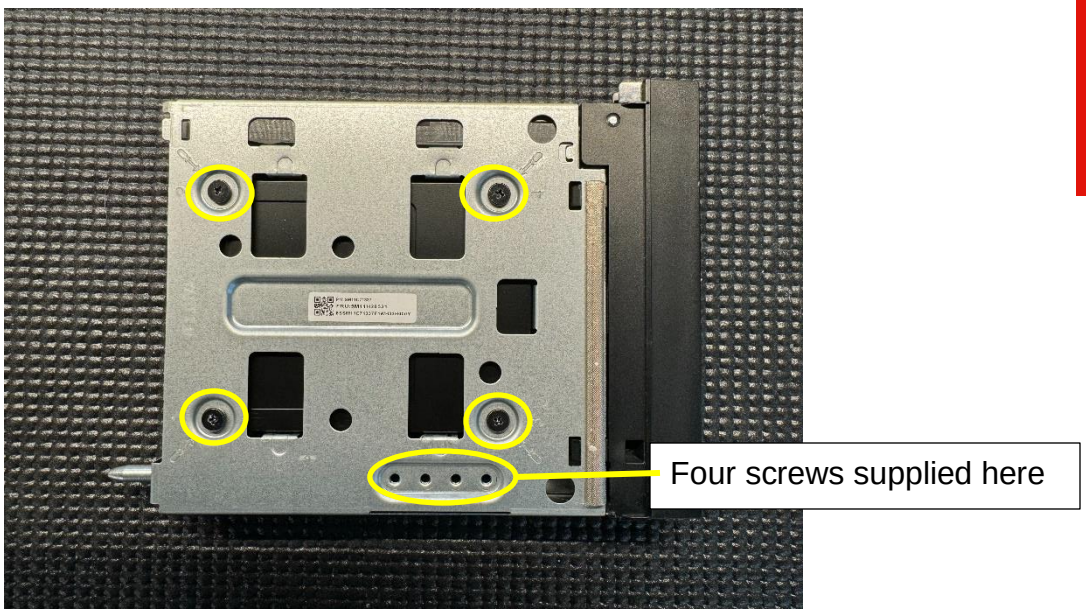
8. Reinstall the chassis side door cover (right) as shown in the previous section.

9. Reinstall the chassis side door cover (left) as shown in the previous section.

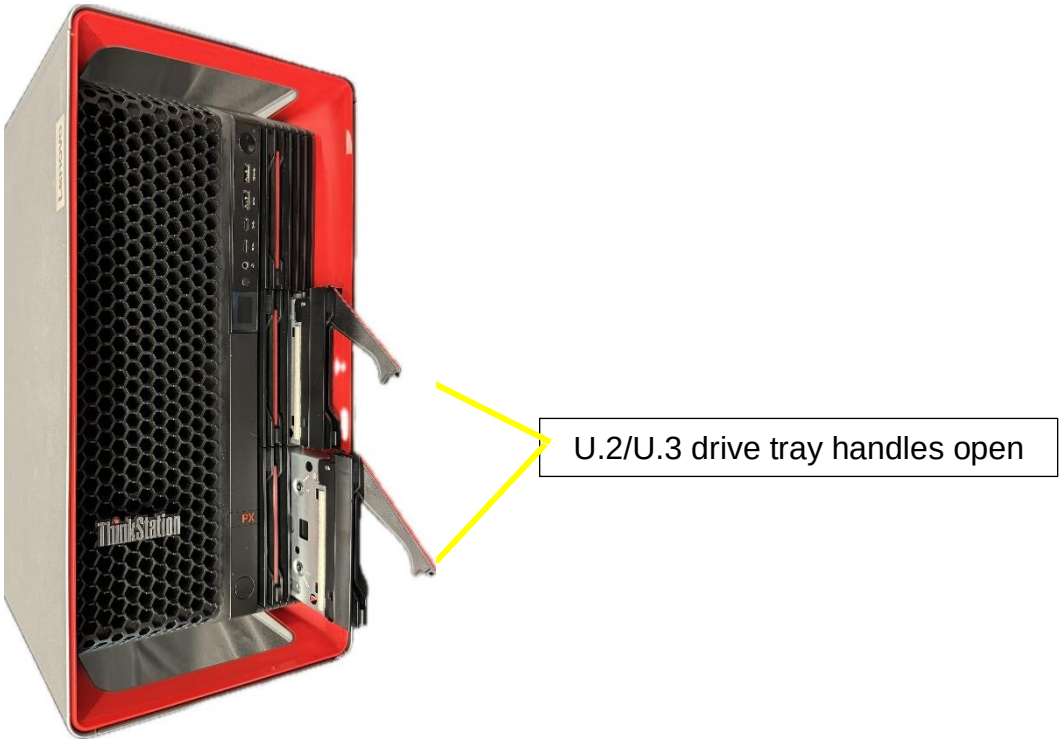
10. Install the U.2 / U.3 drive into the tray by sliding the drive under the four metal tabs as shown with the drive connector facing out.



11. Turn the drive tray over and install the four supplied screws to the drive as shown below.



12. Install the drive tray(s) in the front access bay(s) making sure the red handle is propped open before sliding the tray fully into the drive bay. Once the drive tray is fully installed, then close the red handle.



Section 4 – PX SATA Drives on Chipset-based Controller

The Lenovo ThinkStation PX platform supports a variety of different storage devices. Table 5 shows the available features for SATA drives utilizing the chipset-based controller. Table 6 highlights the compatibility and requirements for SATA drives utilizing the chipset-based controller.

Table 8 - Features for SATA drives on Chipset-based controller

Feature	Front Access Bay 1	Front Access Bay 2	Front Access Bay 3	PSU bay storage enclosure
Drive Count (System max = 4)	1	1	1	1
Drive Size	3.5” only	3.5” only	3.5” only	3.5” only
Maximum SATA Speed	6Gb/s SATA3	6Gb/s SATA3	6Gb/s SATA3	6Gb/s SATA3
Availability	Standard	Standard	Standard	Optional
Location	Front Access Bay 1	Front Access Bay 2	Front Access Bay 3	PSU Bay 2
Controller	PCH	PCH	PCH	PCH
RAID support	RAID 0, 1, 5, 10 (data array only on Windows)[1] *Intel VROC Key is **not** required for SATA RAID.*			
Front accessible	Yes	Yes	Yes	No
Toolless	Yes	Yes	Yes	No
Hot swappable	Yes	Yes	Yes	No
Individual activity/status LEDs	Yes	Yes	Yes	No
Combined in system activity LED	Yes	Yes	Yes	No

[1] Microsoft Windows 11 no longer supports booting from magnetic rotational media.

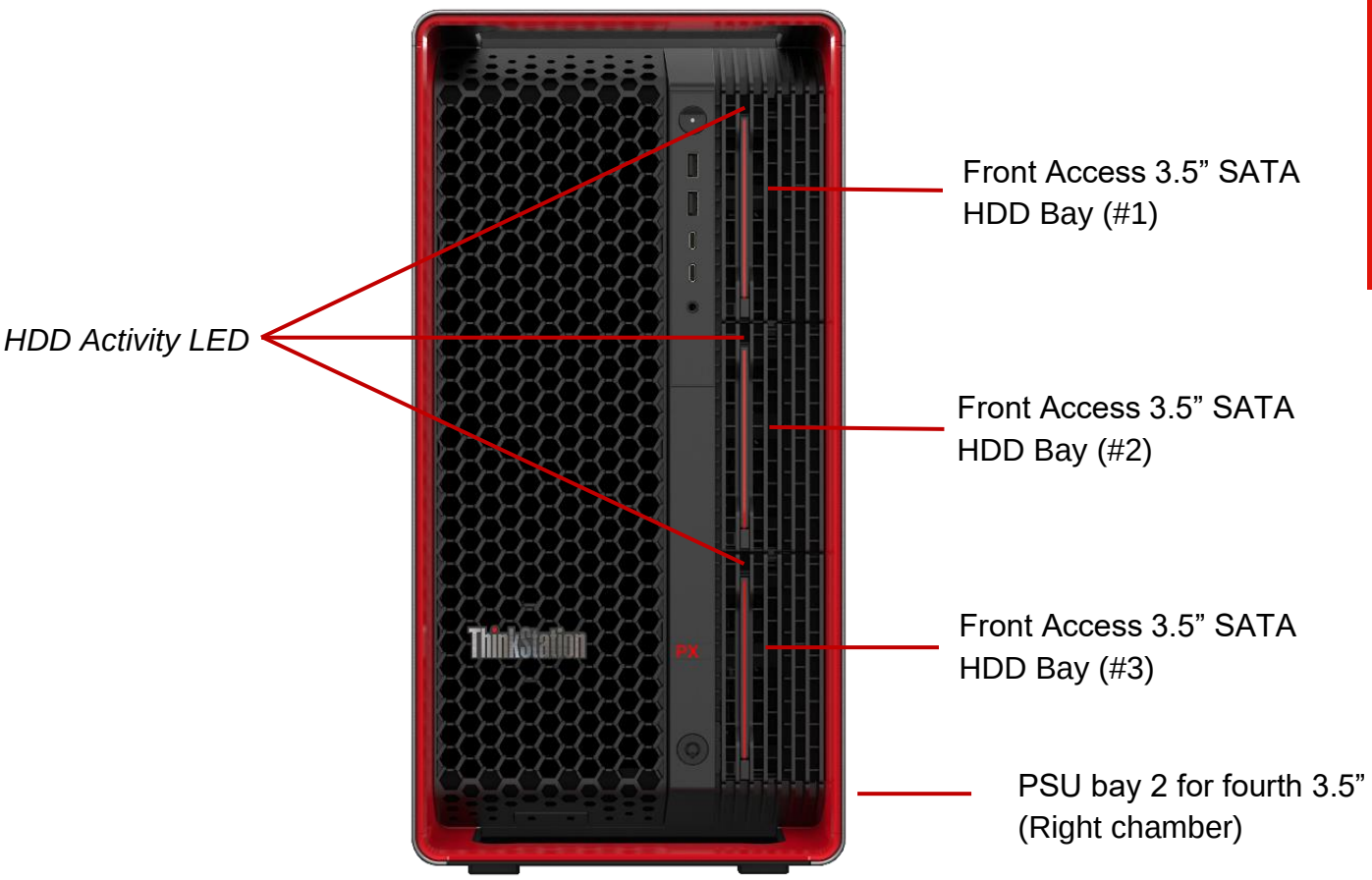

HDD Activity LED
Front Access 3.5” SATA HDD Bay (#1)
Front Access 3.5” SATA HDD Bay (#2)
Front Access 3.5” SATA HDD Bay (#3)
PSU bay 2 for fourth 3.5” (Right chamber)
ThinkStation
PX

Table 9 - Compatibility and parts requirements for SATA drives on Chipset-based controller

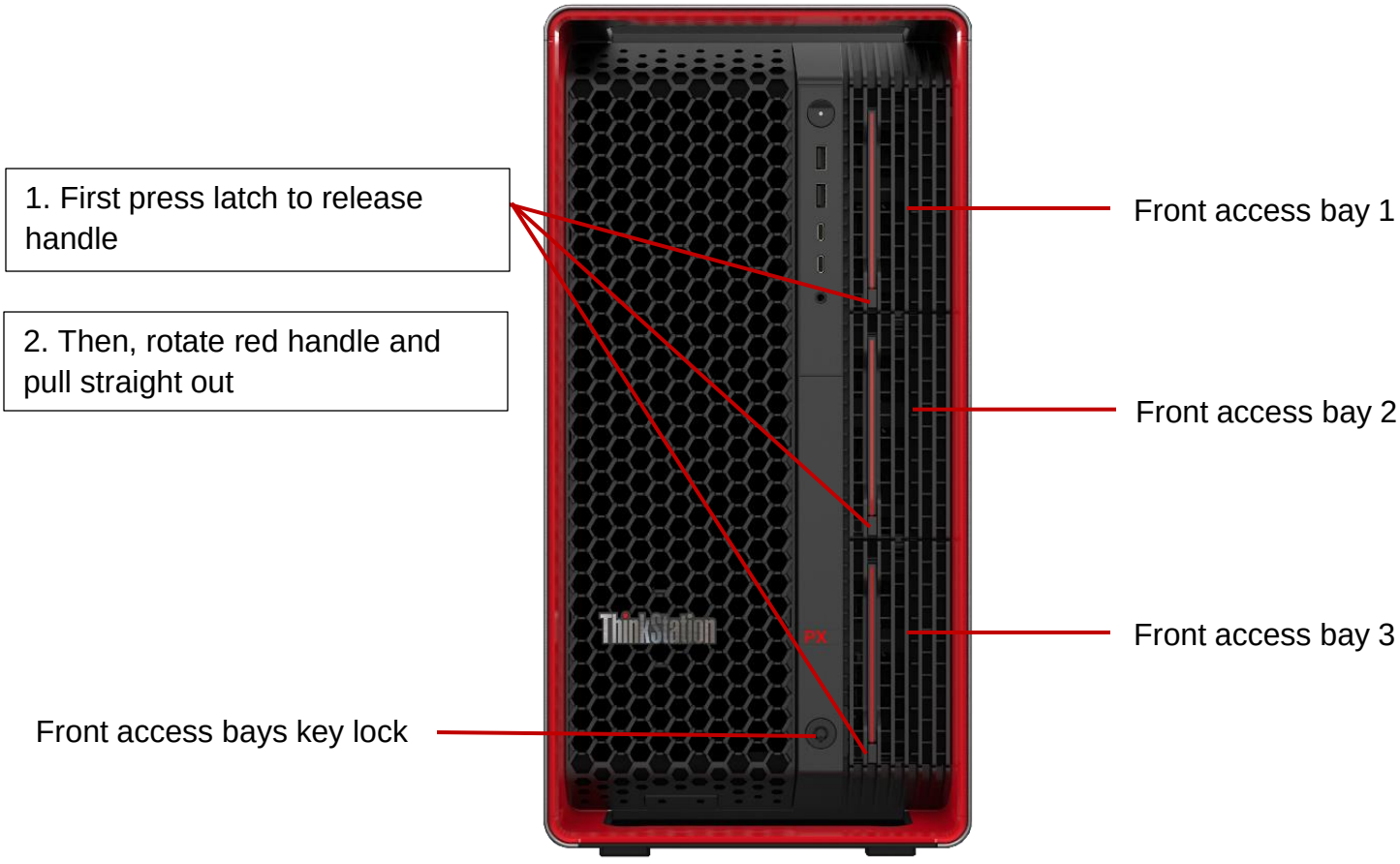
Location	Compatibility	Requirements and Parts
Front Access Bay 1	• 3 x SATA drives compatible simultaneously together. • 2 x SATA drives compatible with the following front access combinations: - 1 x Dual M.2 enclosures • 1 x SATA drive compatible with the following front access combinations: - 2 x Dual M.2 enclosures	SATA backplane on Bays 1, 2, 3 included standard
Front Access Bay 2		
Front Access Bay 3		
PSU bay storage enclosure	• 1850 Watt, 92%, Tool-less Power Supply #2 (second power supply for redundancy or teamed power)	PSU bay storage enclosure (includes enclosure/card/fan/cable)

3.5” SATA HDD Installation using the Front Access Bays

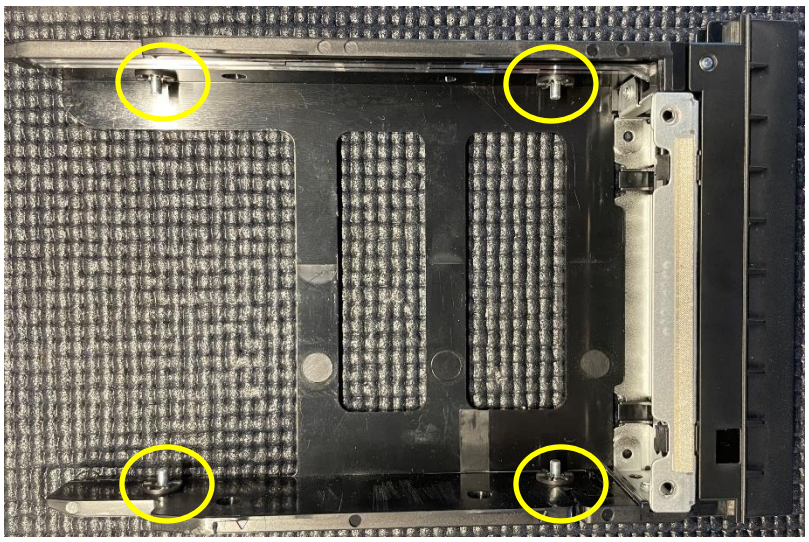
On ThinkStation PX models without Front M.2 SSD Enclosures installed previously, the user has the option to put up to three (3) 3.5” SATA HDDs in the front access bays. Here are some step-by-step instructions on how to install 3.5” SATA HDDs in the front access bays.

1. Remove the Front Access 3.5” HDD Tray from any of the front access bays that do not have front M.2 SSD enclosures installed.

   Note: Some ThinkStation PX models may have the front access bay key lock installed. If so, make sure the front access bays are unlocked.



2. Place the 3.5” front access tray on a flat surface and note the location of the pegs.



Tray Handle

3. Install the 3.5” SATA HDD in the front access tray. Note, the HDD SATA data and power connections should face away from the front access tray handle.

SATA Power Connector

SATA Data Connector

Tray Handle

4. Prior to installing the front access tray into the front access bay, make sure the red handle and latch be opened as shown in the picture.

5. Slide the front access HDD tray into the front access bay as shown below.

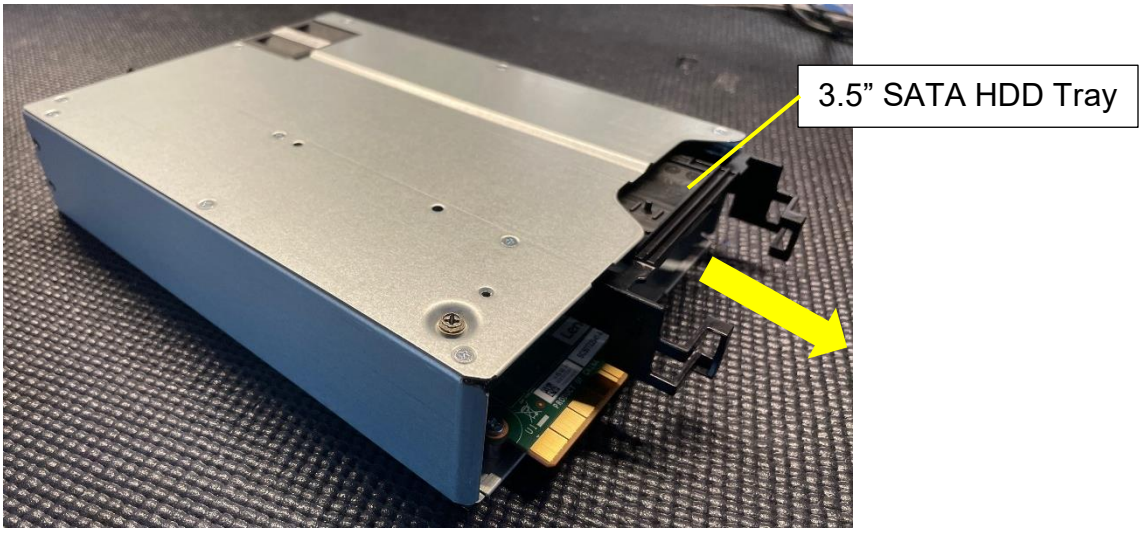
6. Close the red handle on the front access HDD tray as shown below.

7. Repeat the steps above for additional 3.5” SATA HDDs to be installed in the front access bays.

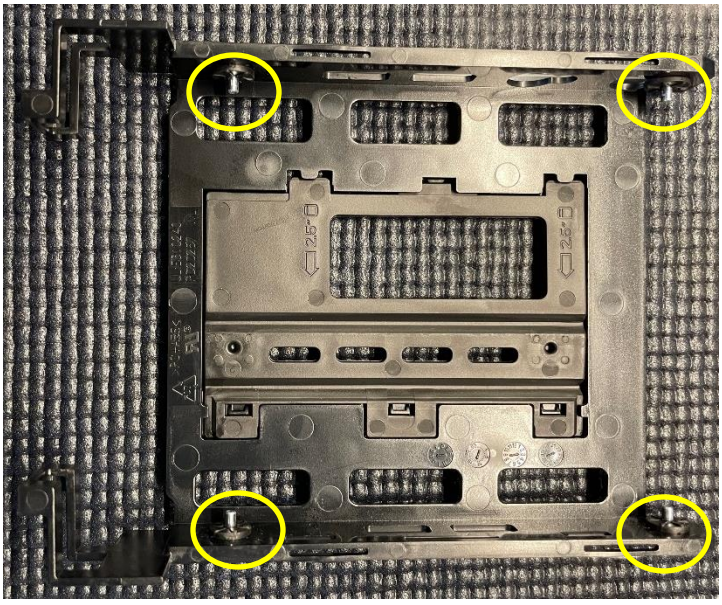
3.5” SATA HDD Installation using the Optional Second Power Supply Bay

On ThinkStation PX models without the use of a second power supply, the user has the option to install a 3.5” SATA HDD in the second power supply bay. Here are some step-by-step instructions on how to install 3.5” SATA HDD in the second power supply bay.

1. Place the PSU bay storage enclosure on a flat surface and remove the 3.5” SATA HDD tray.



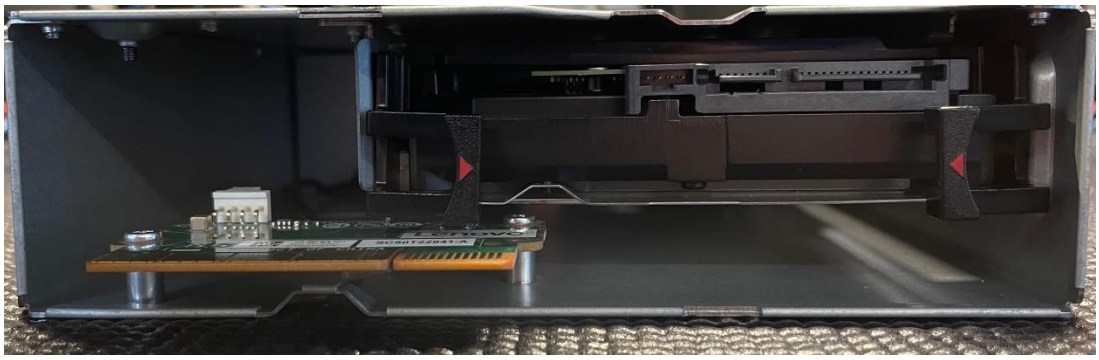
2. Place the 3.5” SATA HDD tray on a flat surface and note the location of the pegs.



3. Install the 3.5” SATA HDD bottom down in the SATA HDD Tray with the signal and power connections on the same end as the tray handles as shown.

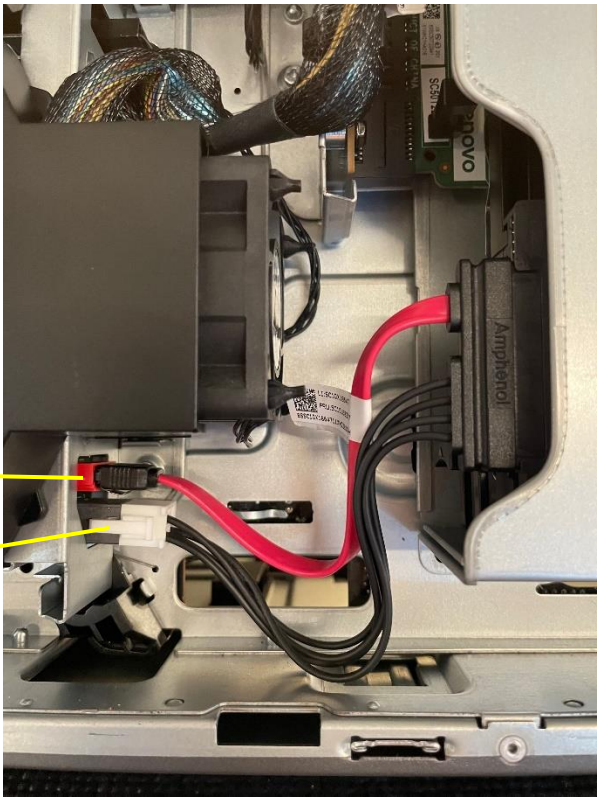
4. Slide the SATA HDD tray back into the PSU bay storage enclosure until it latches into place as shown below.

5. Here is what the end of the PSU bay storage enclosure should look like when the drive is fully installed.

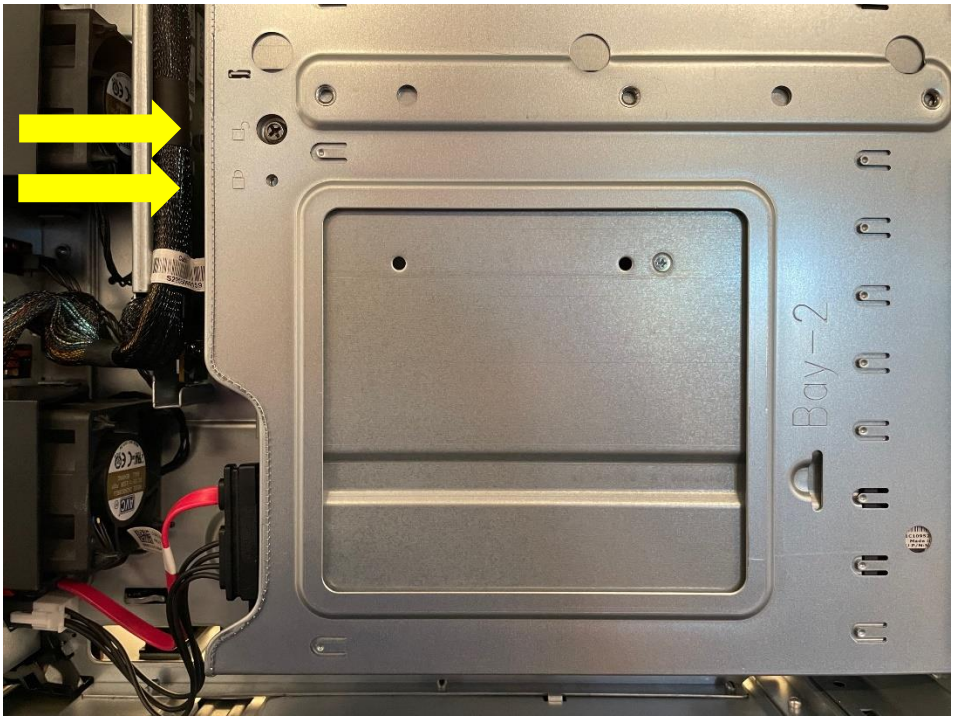


6. Slide the PSU bay storage enclosure into the bottom PSU bay as shown below.

7. Remove the chassis right side door cover to install the SATA signal plus power cable as shown below.



8. Optionally, the PSU bay storage enclosure can be locked inside the chassis by moving the screw from the unlocked position to the locked position as shown below.



Section 5 – Appendix

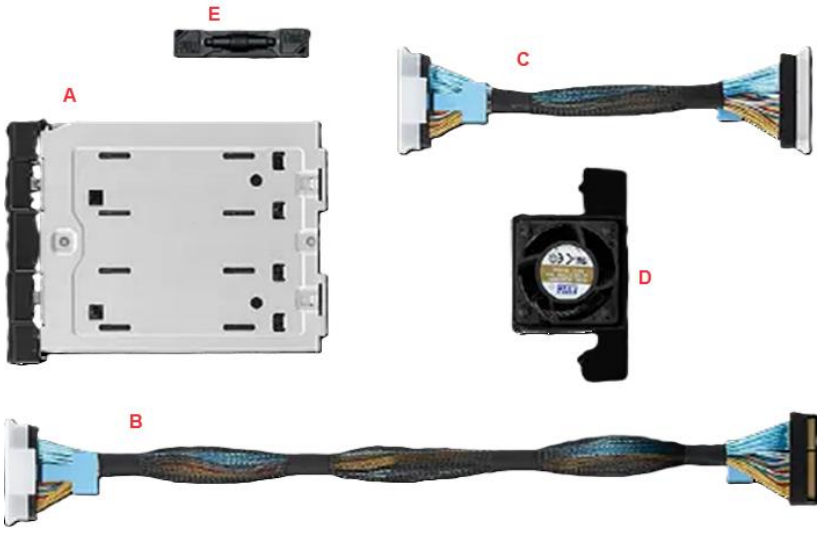
The ThinkStation PX platform contains all new mechanical parts for different storage device options. Here are some pictures representing a few of these parts.

Option Kits

4XH0Q89603 - Intel VROC Key Module - Premium

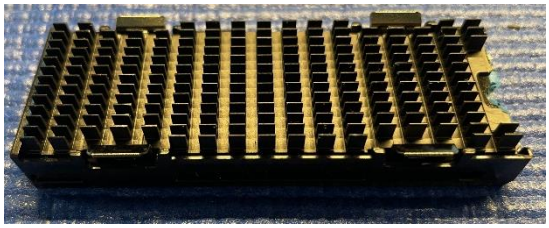
4XH1M64236 - ThinkStation Flex Bay Kit for M.2 SSD Enclosure

- (A) *Front access bay Dual M.2 SSD enclosure*
  FRU: 5M11H28529
- (B) *Motherboard NVME bay3 Gen5 cable, 370mm*
  FRU: 5C10U58351
- (C) *Motherboard NVME bay2 Gen5 cable, 170mm*
  FRU: 5C10U58338
- (D) *FAN 5038 - Storage bay FAN*
  FRU: 5M11H28534
- (E) *Front Access bay, common key*
  FRU: 5M11H28532



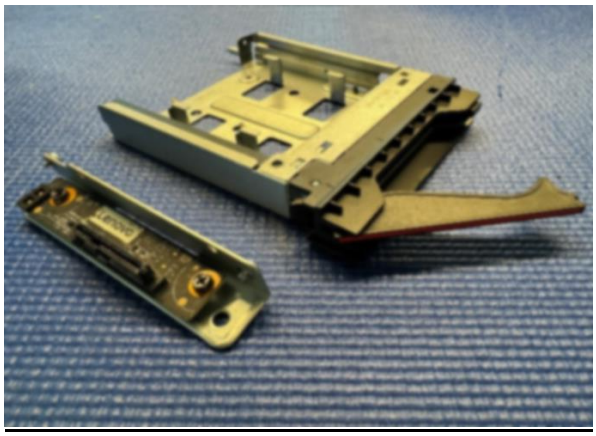
Field Replacement Unit (FRU)

5M11H28470 - Onboard M.2 Carrier + Heatsink



5M11H28556 - Front Access Bay, 3.5” HDD Tray

5M11H28531 - Front access bay U.2/U.3 SSD enclosure

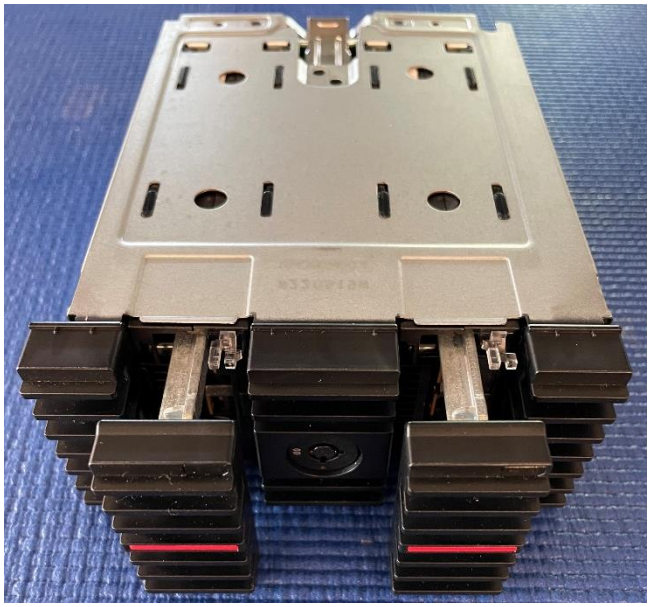


5C10U58338 - **Motherboard NVME bay2 cable, 170mm**

5C10U58351 - **Motherboard NVME bay3 cable, 370mm**

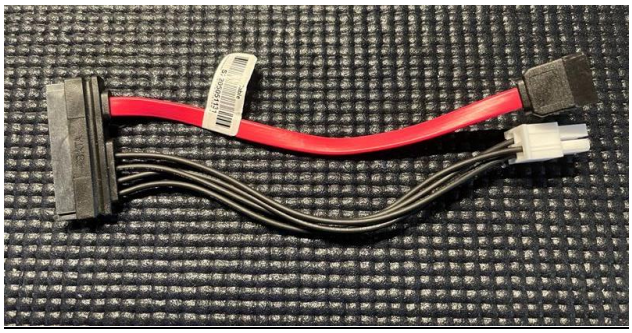
5M11H28534 - **Storage Bay 5038 Fan**

5M11H28529 - **Dual M.2 SSD Enclosure**



5M11H28527 - PSU Bay Storage Enclosure (4th HDD Bay)

5C10U58337 - SATA HDD Data & Power Cable (Required for 4th HDD Bay)



Revision History

Version	Date	Author	Changes/Updates
1.1	5/8/2024	Jason M.	Update for new product features.
1.0	5/26/2023	Jason M.	Initial launch release.