Onboard/Integrated Intel Storage Configuration

Lenovo ThinkStation P920, P720, P520, P520c

Table of Contents

Overview

The purpose of this document is to provide guidance for users on how to configure their SATA storage options using the onboard integrated Intel SATA controller in the ThinkStation P520c, P520, P720, and P920. These ThinkStation systems are capable of supporting up to six SATA HDDs/SSDs at Gen3 (6Gb/s) maximum theoretical throughput. It is important to note that only SATA devices are supported with the onboard integrated Intel SATA controller.

Some users may find a different naming for the SATA controller, depending on BIOS level. Refer to the chart below to for guidance. The steps for creating and deleting SATA RAID are the same regardless of which version is displayed.

ThinkStation Platform	BIOS Level with "Intel® VROC SATA Controller"	BIOS Level with "Intel® RSTe SATA Controller"
P520 / P520c	S03KT30A & newer	S03KT29A & earlier
P720	S04KT40A & newer	S04KT38A & earlier
P920	S05KT40A & newer	S05KT38A & earlier

Section 1 – ThinkStation P920

Level of Support Summary

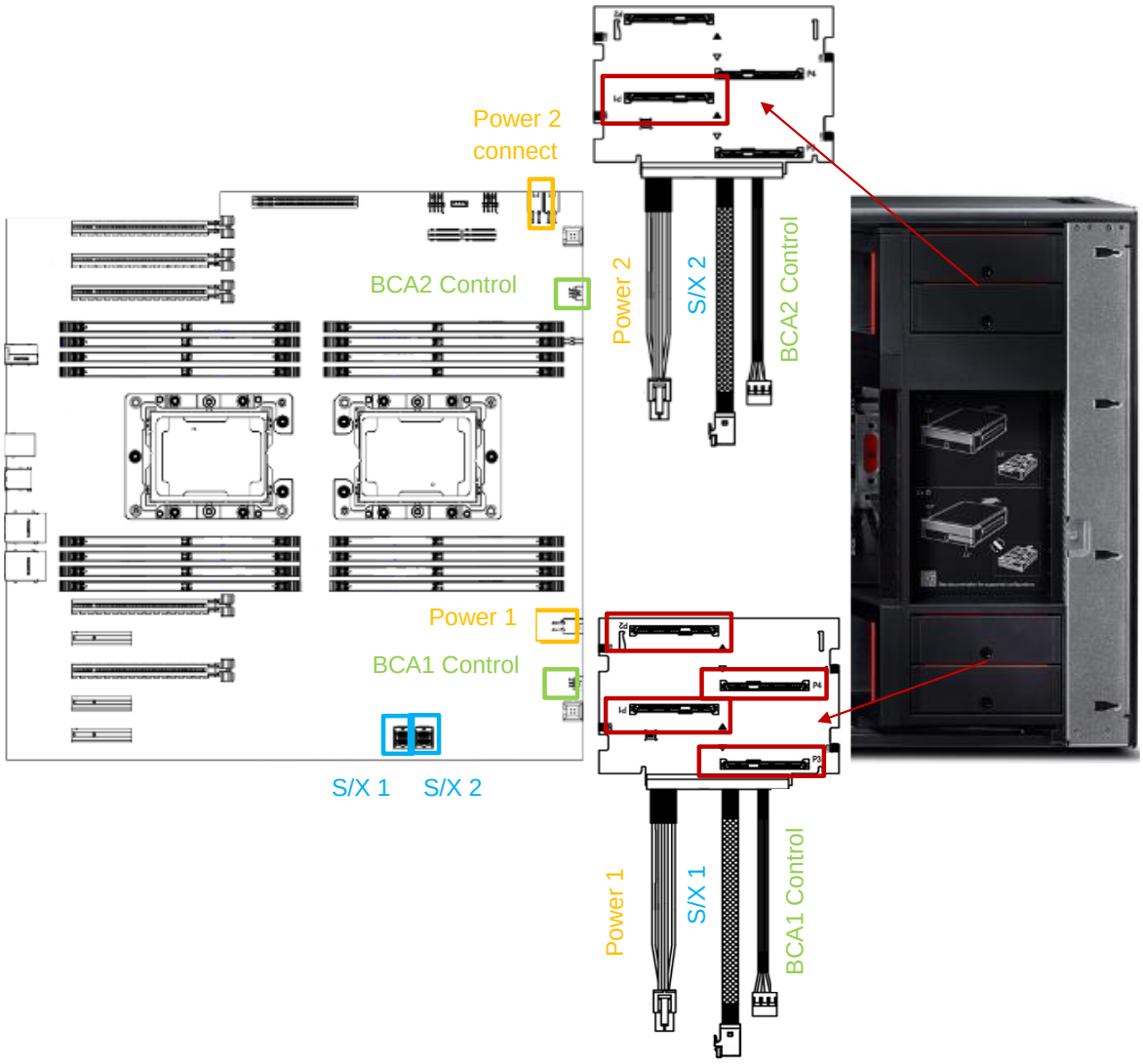
Maximum Number of Drives	6
Connection Method	Tool-less FLEX tray blind-mounted to a backplane (BCA). BCA is standard.
Drive Locations	Drives install into HDD Bays via FLEX Tray.
Hardware Required	BCA-S[1] or BCA-P Blind HDD FLEX Tray Assembly
Drive Type Supported (6Gb/s)	3.5” SATA HDD (7200rpm) 2.5” SATA SSD
RAID Level Support	RAID 0 RAID 1 RAID 5 RAID 10
Drive Data Rate	Maximum drive data rate is 6Gb/s.
Drive Bay Configuration	0,1,2 drive bays used → single BCA-S with dual blind connect FLEX Trays 3,4 drive bays used → dual BCA-S with 4 blind connect FLEX trays.

[1] BCA-S comes standard in P920.

How to Utilize the Onboard Intel SATA Controller

In the P920 system, drives are always connected through a backplane called Blind Connect Assembly (BCA). When using the onboard Intel SATA controller, up to four drives can be connected to the first (bottom) BCA and up to two drives can be connected to the second (top) BCA. This gives the P920 support for up to 6 drives with the onboard Intel SATA controller via two BCA's.

The red boxes in the diagram below show the active SATA ports that are available with the onboard Intel SATA controller.



Section 2 – ThinkStation P720

Level of Support Summary

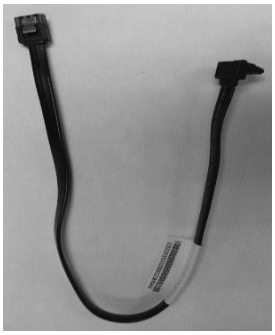
“Default" - Manual HDD Connect Option	
Maximum Number of Drives	4
Connection Method	Manual plug for data and power using standard cabling methods.
Drive Locations	Drives install into HDD Bays via FLEX Tray.
Hardware Required	SATA HDD cable(s) HDD Power cable Manual HDD FLEX Tray Assembly
Drive Type Supported (6Gb/s)	3.5” SATA HDD (7200rpm) 2.5” SATA SSD
RAID Level Support	RAID 0 RAID 1 RAID 5 RAID 10
Drive Data Rate	Maximum drive data rate is 6Gb/s.
Drive Bay Configuration	0,1 drives → 1 SATA + 1 dual drop power 2 drives → 2 SATA + 1 dual drop power 3 drives → 3 SATA + 1 quad drop power + 2 manual FLEX trays 4 drives → 4 SATA + 1 quad drop power + 2 manual FLEX trays

“Optional” – Blind Connect Assembly (BCA) using the integrated Intel Controller	
Maximum Number of Drives	4
Connection Method	Tool-less via BCA. BCA is optional.
Drive Locations	Drives install into HDD Bays via FLEX Tray.
Hardware Required	Up to two BCA-S or one BCA-S + BCA-P. Blind HDD FLEX Tray Handle Assembly.
Drive Type Supported (6Gb/s)	3.5” SATA HDD (7200rpm) 2.5” SATA SSD
RAID Level Support	RAID 0 RAID 1 RAID 5 RAID 10
Drive Data Rate	Maximum drive data rate is 6Gb/s.
Drive Bay Configuration	0,1,2,3,4 drives → 2 BCA’s + 4 FLEX trays

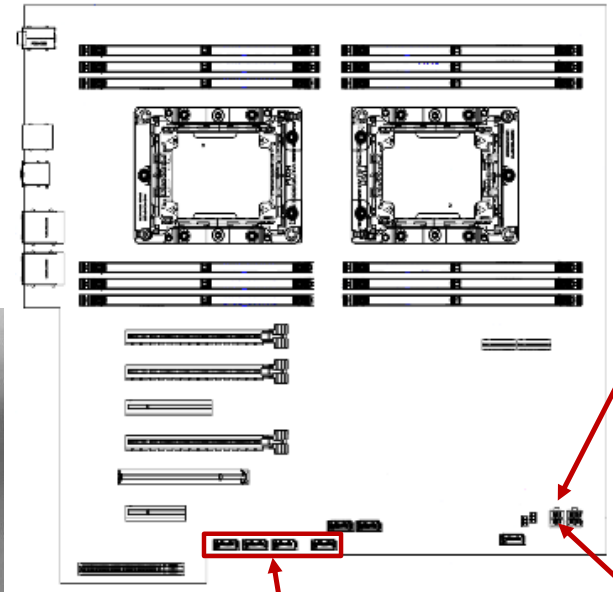
How to Utilize the Onboard Intel SATA Controller

In the P720 system, SATA drives are connected to the onboard Intel SATA controller via a manual plug method. This consists of manually cabling both power and data to each drive individually. The P720 system can support up to 4 drives using the onboard Intel SATA controller.

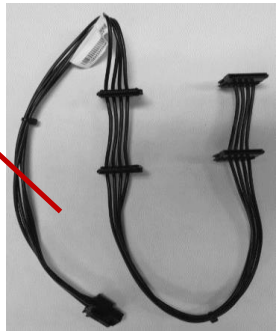
HDD/SSD Manual Connect Option



Data Cable



Power Cable
2-drop

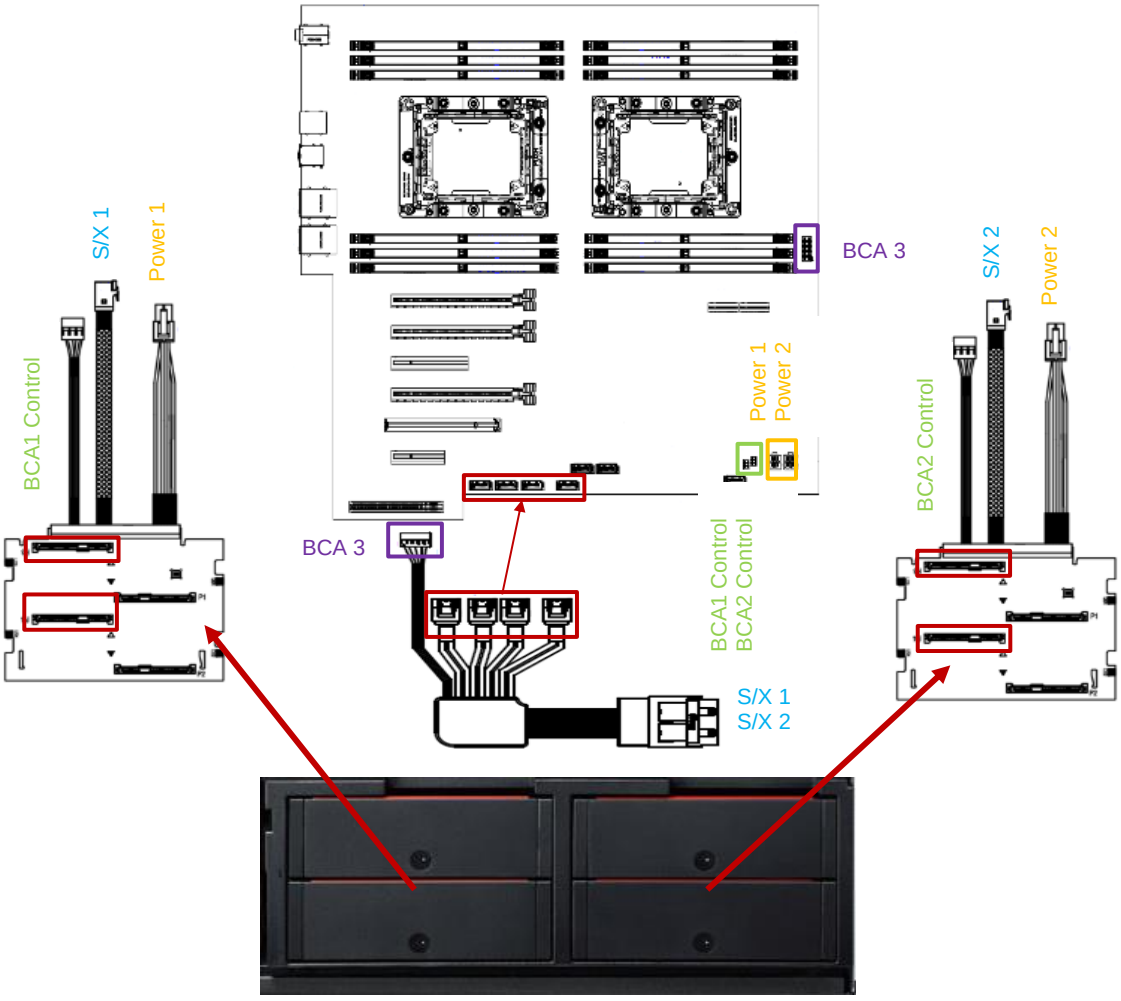


Power Cable
4-drop

Optionally, in the P720 system, SATA drives can be connected to the onboard Intel SATA controller via BCA's. This consists of the Blind Connect to SATA cable and dual BCA-S. The P720 system can support up to 4 drives using the onboard Intel SATA controller.

The red boxes in the diagram below show the active SATA ports that are available with the onboard Intel SATA controller.

Blind Connect Assembly (BCA) Option



Section 3 – ThinkStation P520

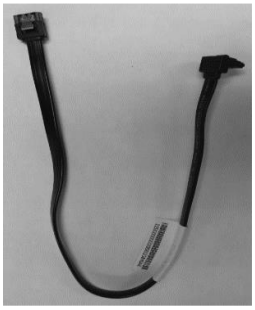
Level of Support Summary

Maximum Number of Drives	4
Connection Method	Manual plug for data and power using standard cabling methods. BCA is not supported.
Drive Locations	4 Drives install into HDD Bays via FLEX Tray.
Hardware Required	SATA HDD cable(s)[2] SATA HDD Power cable(s)[3] SATA HDD Power cable(s)[4]
Drive Type Supported (6Gb/s)	3.5” SATA HDD (7200rpm) 2.5” SATA SSD
RAID Level Support	RAID 0 RAID 1 RAID 5 RAID 10
Drive Data Rate	Maximum drive data rate is 6Gb/s.
Drive Bay Configuration	0,1 drives → 1 SATA + 1 dual drop power 2 drives → 2 SATA + 1 dual drop power 3 drives → 3 SATA + 1 quad drop power + 1 cage/tray kit 4 drives → 4 SATA + 1 quad drop power + 1 cage/tray kit

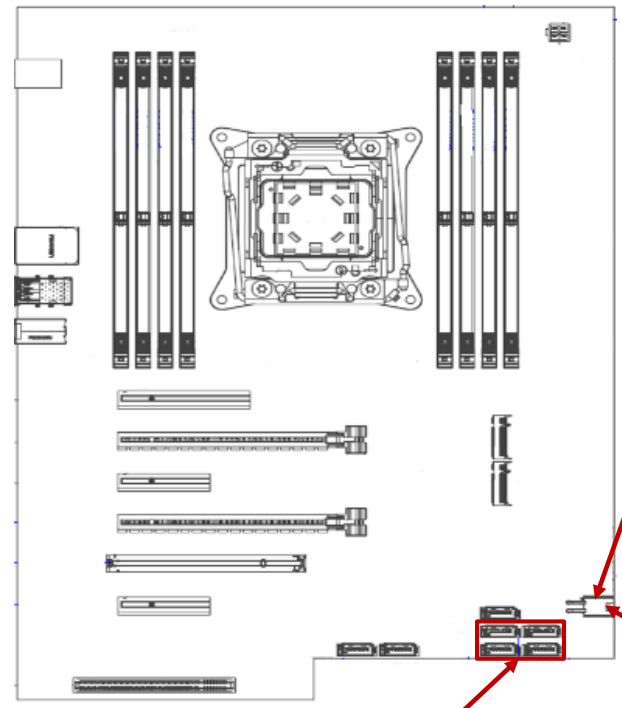
[2] SATA HDD cable(s) should equal the quantity of HDD’s/SSD’s in the HDD bays and FLEX bays.
[3] 2-drop HDD Power cable for the HDD’s/SSD’s in the HDD bays comes standard.
[4] 4-drop HDD Power cable for the HDD’s/SSD’s in the HDD bays gets derived when more than two drives are selected.

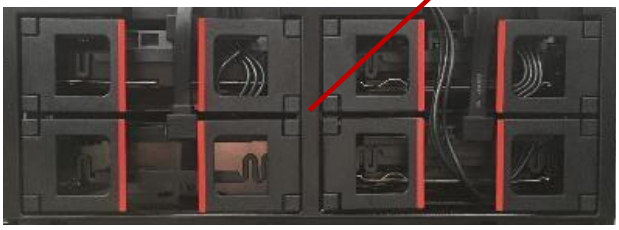
How to Utilize the Onboard Intel SATA Controller

In the P520 system, SATA drives are connected to the onboard Intel SATA controller via a manual plug method. This consists of manually cabling both power and data to each drive individually. The P520 system supports up to 4 drives using the onboard Intel SATA controller.

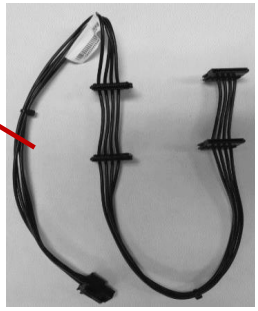


Data Cable





Power Cable
2-drop



Power Cable
4-drop

Section 4 – ThinkStation P520c

Level of Support Summary

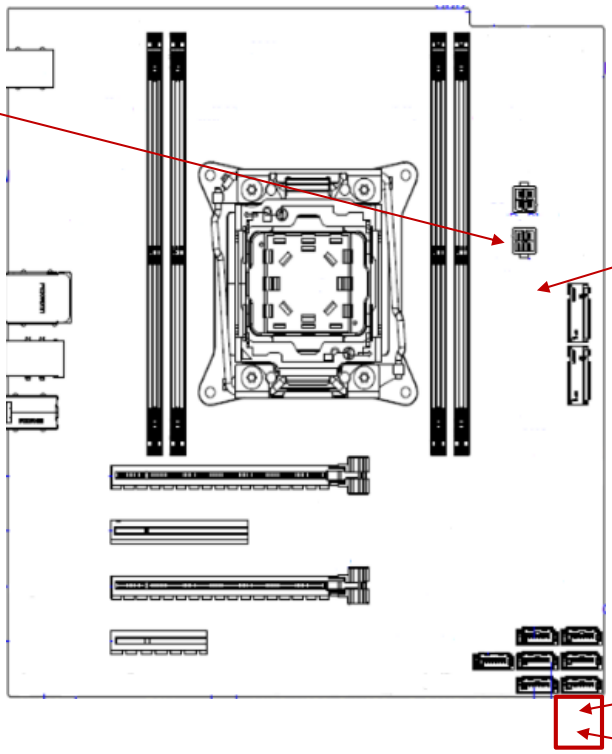
Maximum Number of Drives	2
Connection Method	Manual plug for data and power using standard cabling methods. BCA is not supported.
Drive Locations	2 Drives install into HDD Bays via FLEX Tray.
Hardware Required	SATA HDD cable(s)[5] HDD Power cable(s)[6]
Drive Type Supported (6Gb/s)	3.5” SATA HDD (7200rpm) 2.5” SATA SSD
RAID Level Support	RAID 0 RAID 1
Drive Data Rate	Maximum drive data rate is 6Gb/s.

[5] SATA HDD cable(s) should equal the quantity of HDD’s/SSD’s in the HDD bays and FLEX bays.
[6] 2-drop HDD Power cable for the HDD’s/SSD’s in the HDD bays.

How to Utilize the Onboard Intel SATA Controller

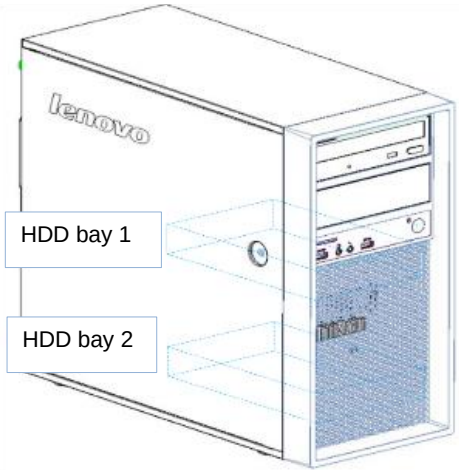
In the P520c system, SATA drives are connected to the onboard Intel SATA controller via a manual plug method. This consists of manually cabling both power and data to each drive individually. The onboard Intel SATA controller supports up to 4 drives (2 drives in the HDD bays and 2 drives in the FLEX bays).

FLEX Bay Power Cable – 3 drop



HDD Bay Power Cable – 2 drop

Data Cable

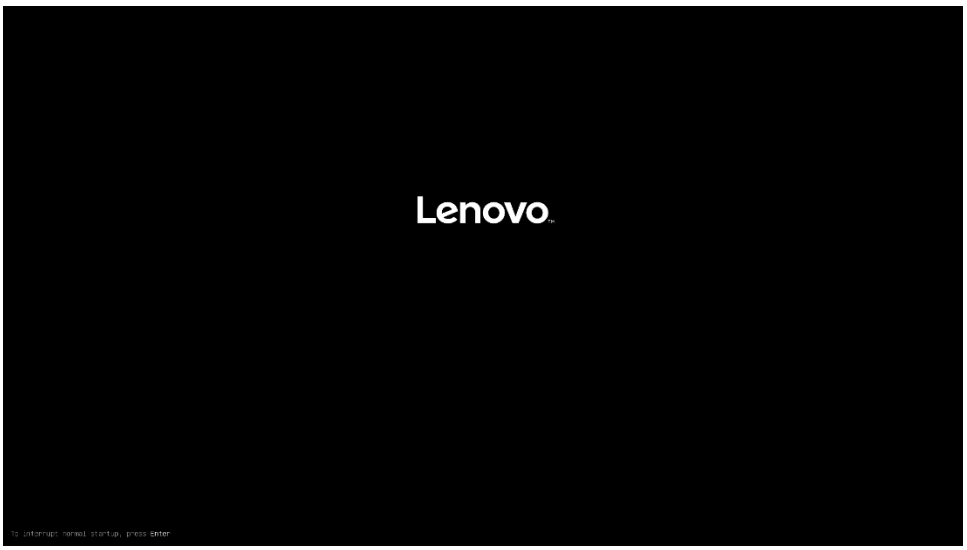


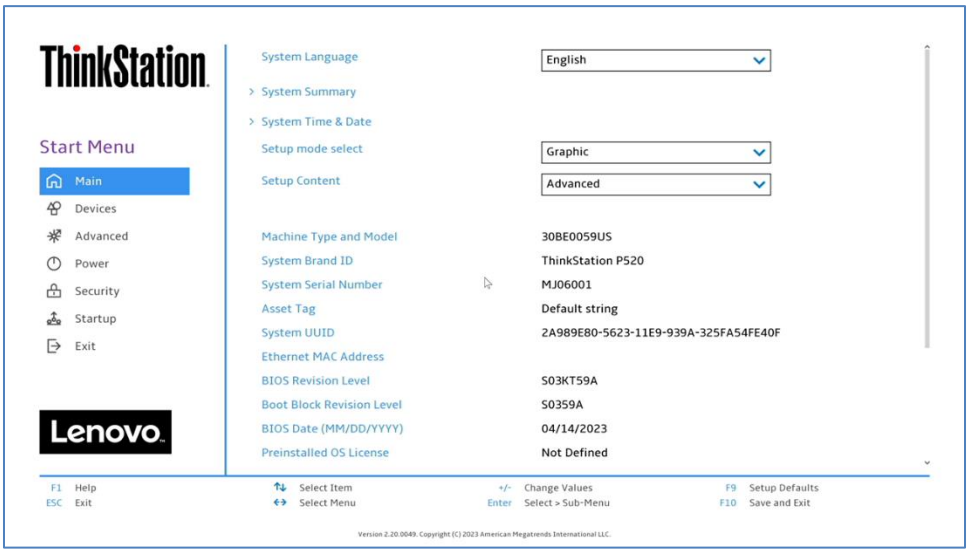
Section 5 – Configuring RAID Arrays

Follow the instructions below to create a basic RAID array using the onboard Intel SATA controller.

1. Install the drives for the RAID array into the system. See the above sections to determine the correct hardware and placement of the storage devices.

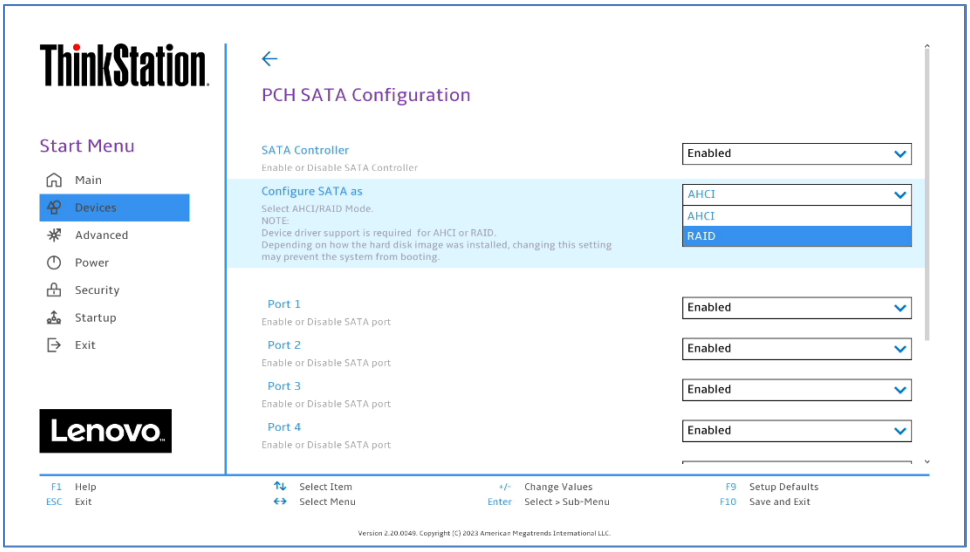
2. Power on the system and press the ‘F1’ function key at the ‘Lenovo’ splash screen indicated below to enter BIOS.



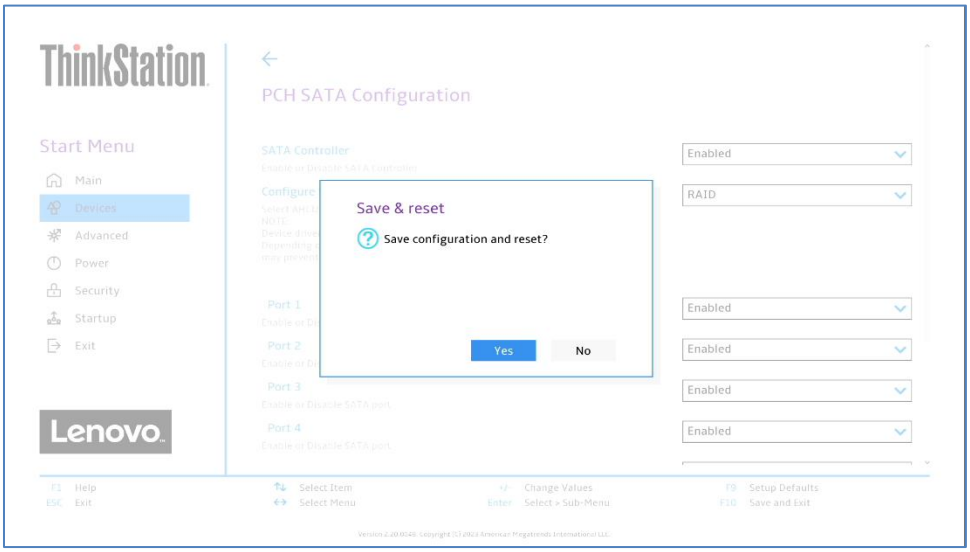


3. Select the “Devices” menu along the left column and “PCH SATA Configuration” menu along the right column at the screen indicated below.

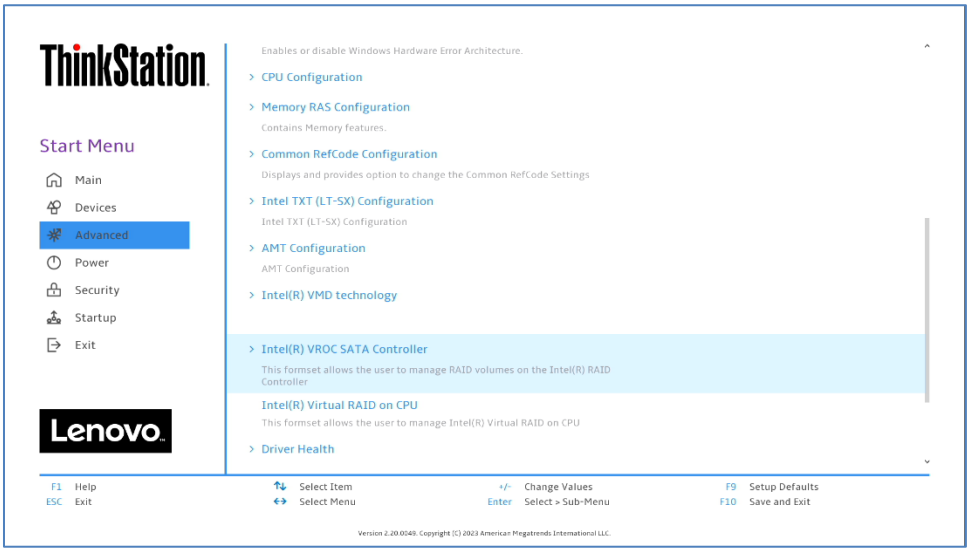
4. Select the “Configure SATA as” menu option drop-down menu box and select “RAID” as indicated below.



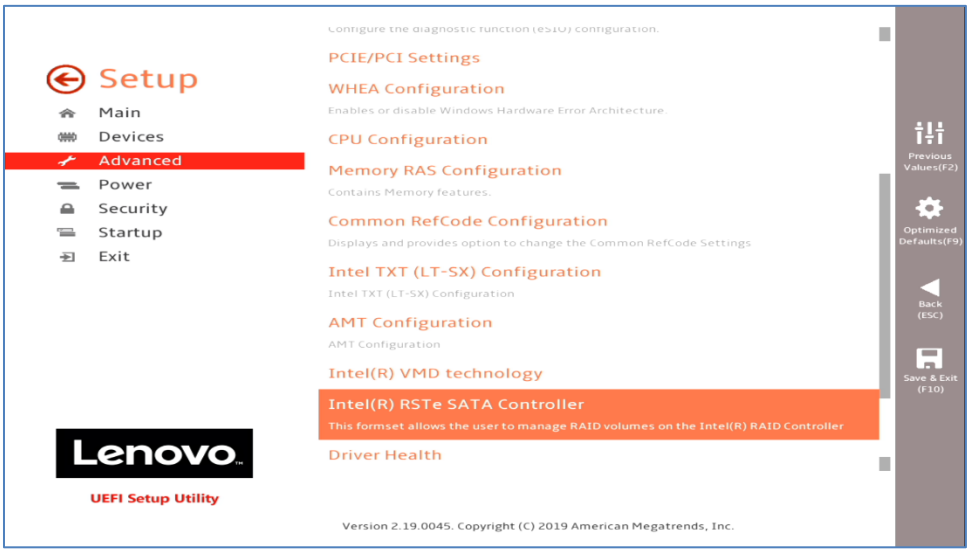
5. Select F10 key to “Save and Exit” the BIOS setup menu.



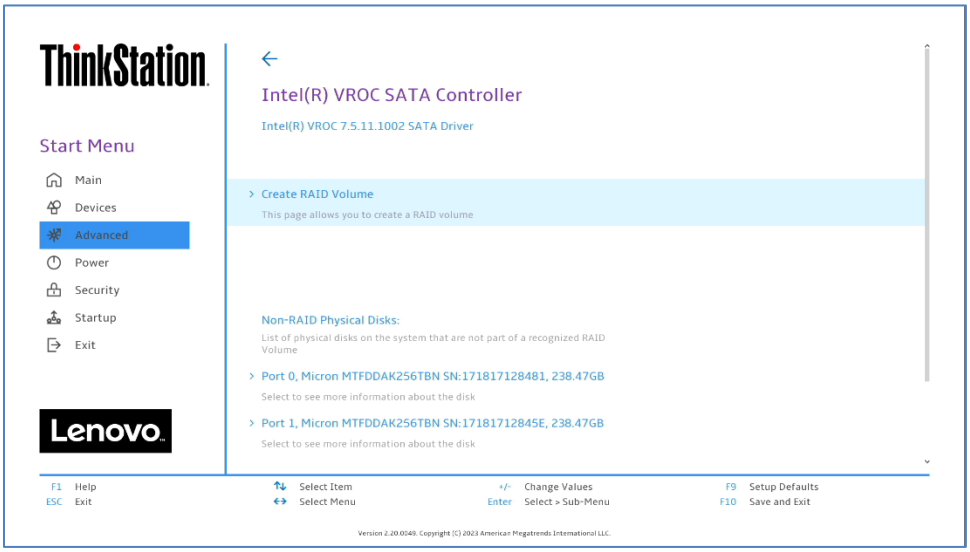
6. As the system reboots, reenter BIOS using the same method as before. Select the “Advanced” menu along the left column and select the “Intel® VROC SATA Controller” menu along the right column at the screen indicated below.



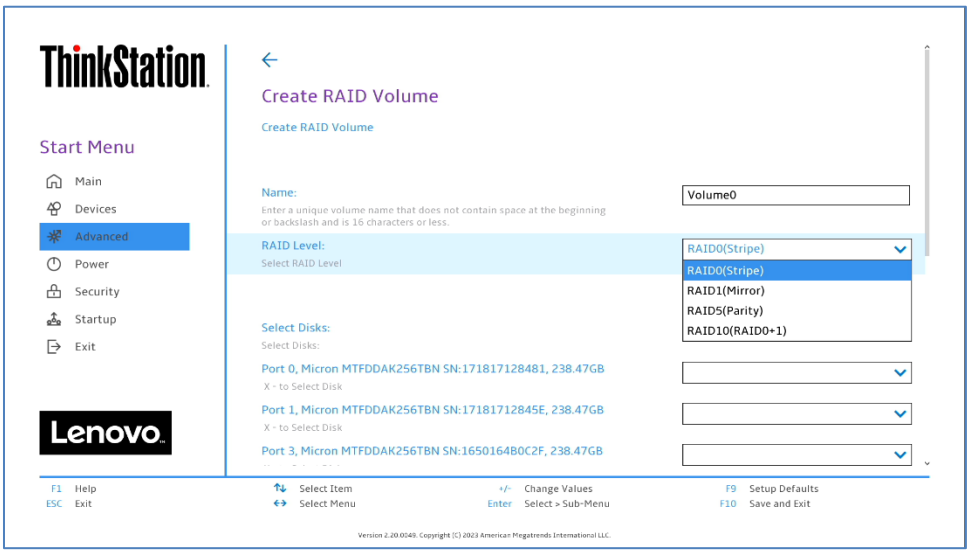
On older BIOS versions, this option may display as “Intel® RSTe SATA Controller”. For more information, please see this table in the Overview section. The process for creating SATA RAID is identical, so continue following along the next steps.



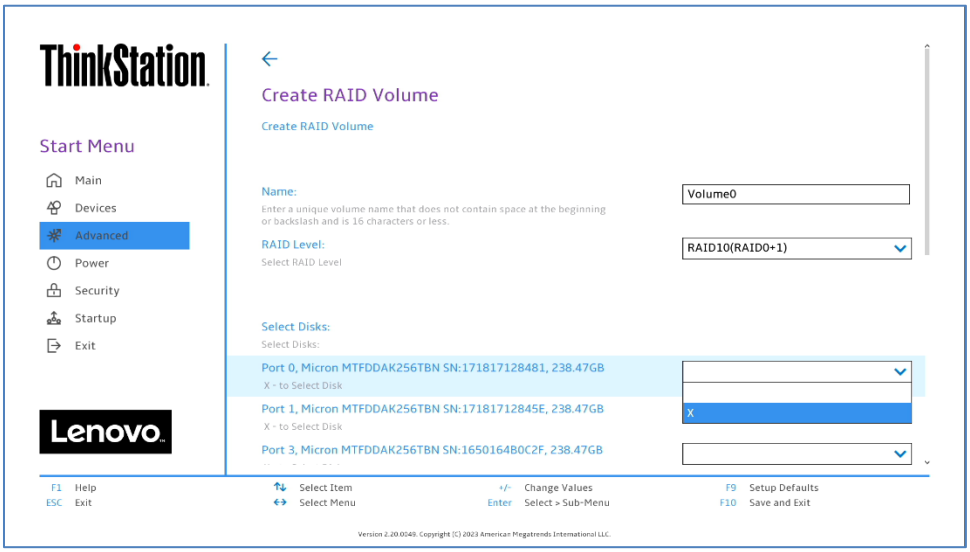
7. Select the “Create RAID Volume” menu option.



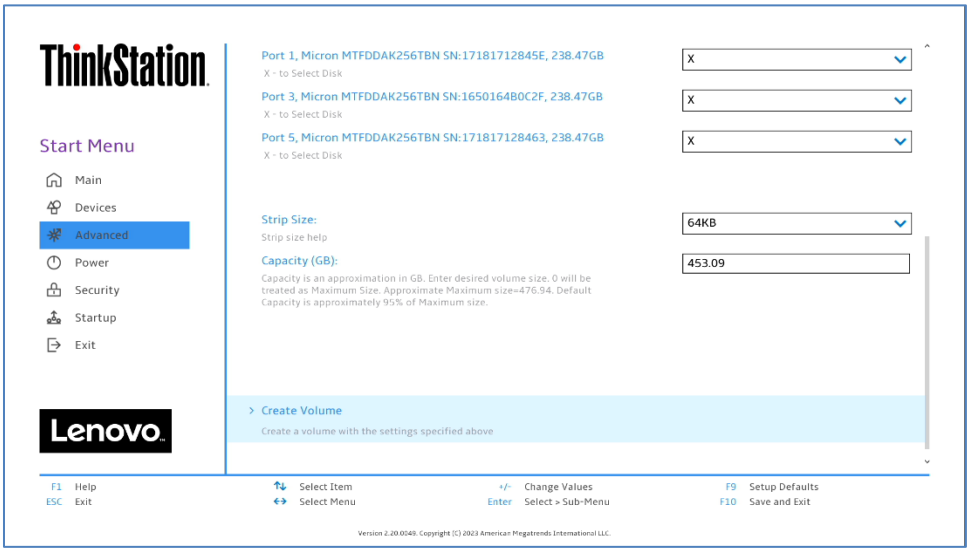
8. Select the “RAID Level” drop-down menu box and select the RAID type.



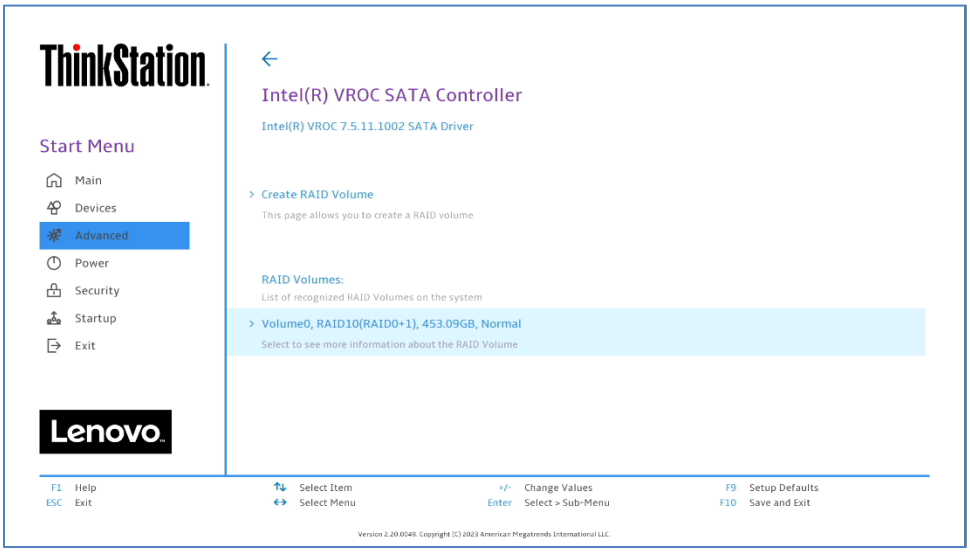
9. Select the disks to use in the RAID array by selecting the drop-down box next to each disk and select ‘X’ to select the disk to use in the RAID array creation.



10. Scroll down to the bottom of the window and select “Create Volume”.



11. The RAID array will then show up under the “RAID Volumes:” section as indicated in the screenshot below.

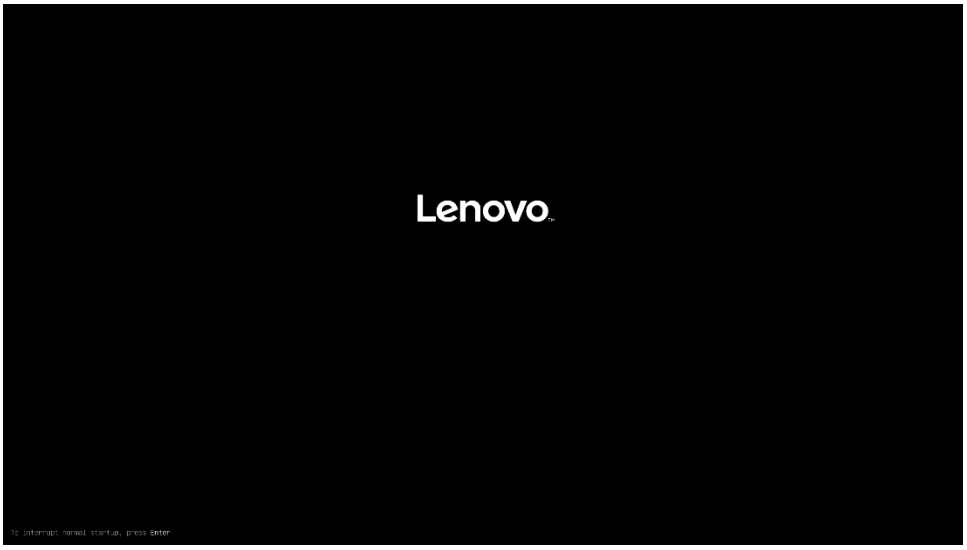


12. Once finished with creating the RAID array(s), press ‘F10’ to ‘Save and ‘Exit’ BIOS.

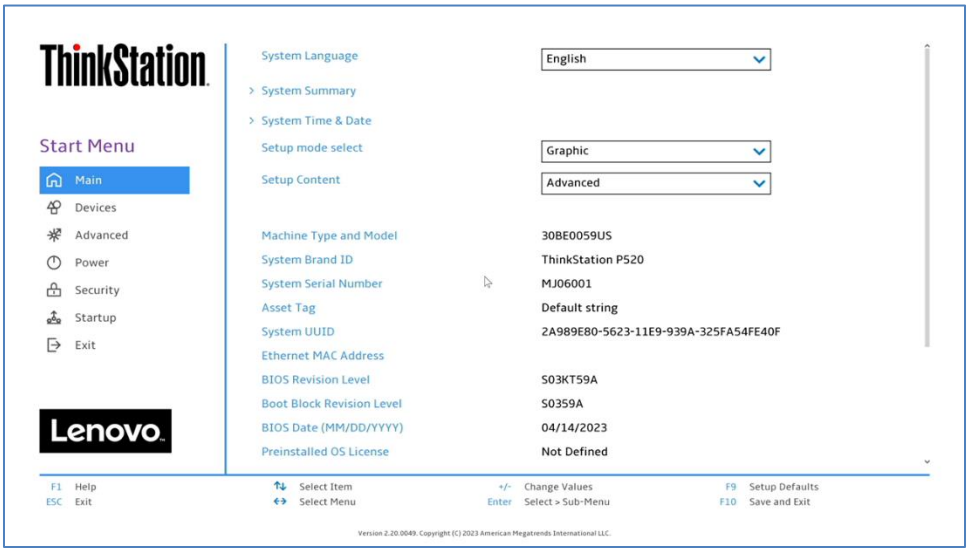
Section 6 – Deleting RAID Arrays

Follow the instructions below to delete an existing RAID array using the onboard Intel SATA controller.

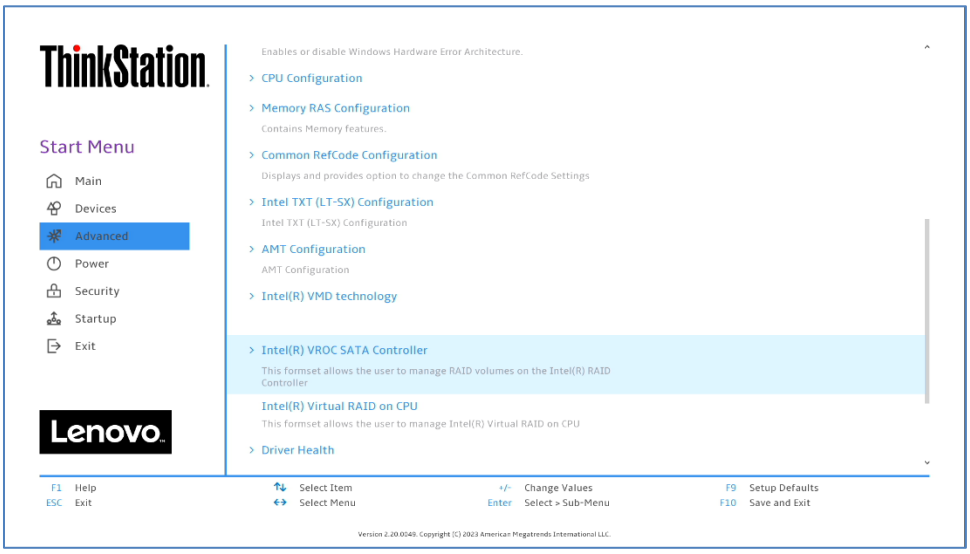
1. Power on the system and press the ‘F1’ function key at the ‘Lenovo’ splash screen indicated below to enter BIOS.



2. Select the “Setup” menu option at the screen indicated below.

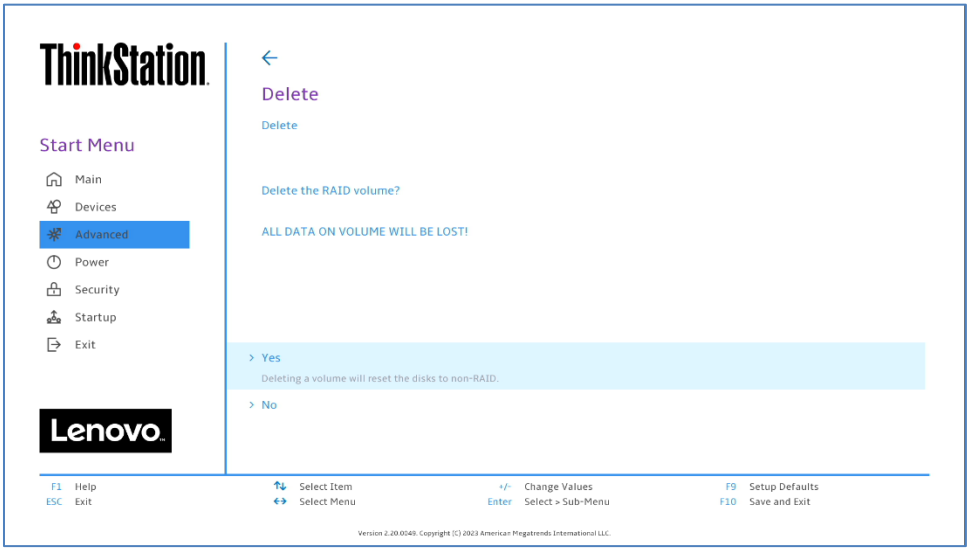


3. Select the “Advanced” menu along the left column and select the “Intel® VROC SATA Controller” menu along the right column at the screen indicated below. On older BIOS versions, this option may display as “Intel® RSTe SATA Controller”.

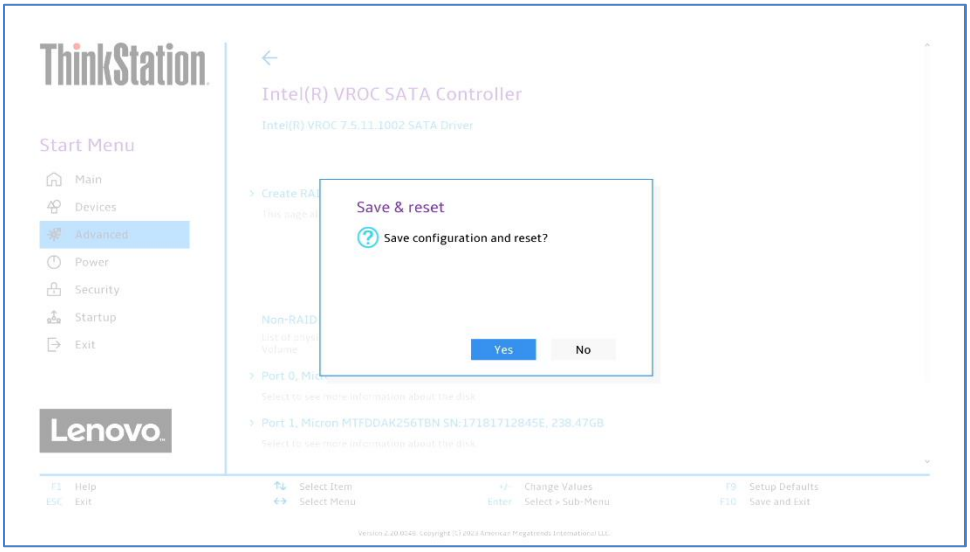


4. To delete the RAID volume, select the RAID volume and select “Delete”.

5. Select “Yes” to confirm deletion. **<u>This step will permanently wipe all data on the drive</u>**.



6. Once finished, press F10 to save changes and exit BIOS.

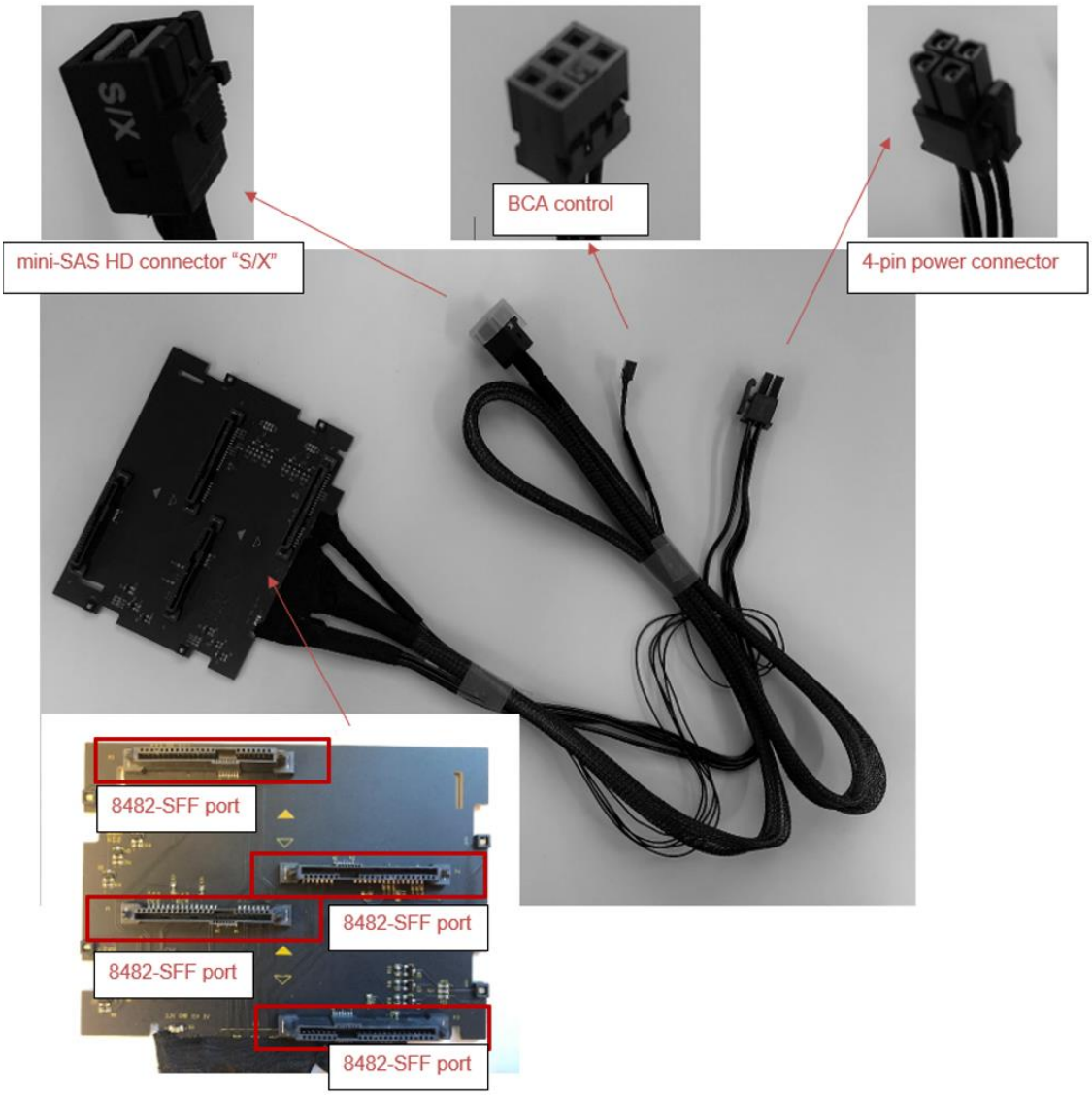


Section 7 - Glossary

Blind Connect Assembly (BCA)

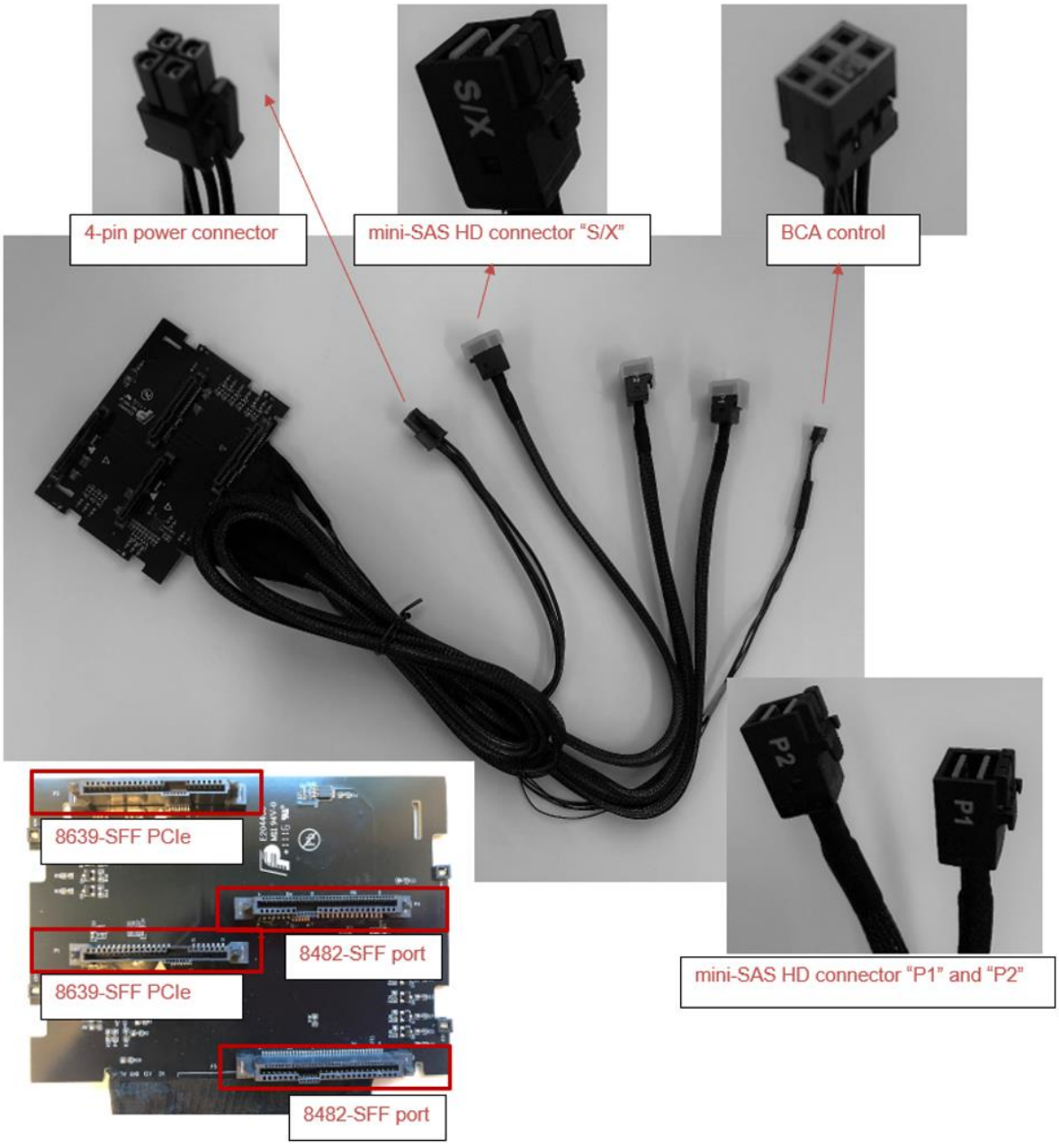
BCA-S: Blind Connect Assembly consisting of four 8482-SFF ports (supporting SAS and SATA drives). The assembly also contains the following cable connections:

- One 4-pin power connector that connects to the motherboard.
- One mini-SAS HD connector labeled “S/X” that connects to either the onboard Intel controller or the Broadcom controller



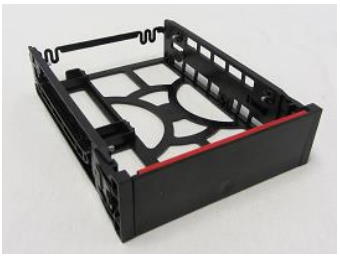
BCA-P: Blind Connect Assembly consisting of two 8639-SFF (U.2) ports (supporting PCIe, SAS, or SATA drives) and two 8482-SFF ports (supporting SAS or SATA drives). The assembly also contains the following cable connections:

- One 4-pin power connector that connects to the motherboard.
- Two mini-SAS HD connectors that connect to the Broadcom adapter (for PCIe connections).
- One mini-SAS HD connector labeled “S/X” that connects to either the onboard Intel controller or the Broadcom controller.

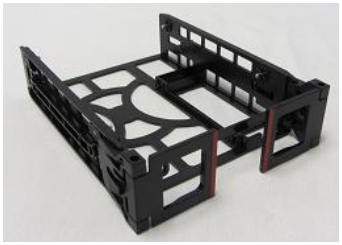


Connector Type	Drives Supported
8639-SFF (U.2) PCIe port	SATA
	SAS (only with Broadcom controller)
	NVMe (U.2 only)
8482-SFF port	SATA
	SAS (only with Broadcom controller)

FLEX Tray



Blind Connect FLEX Tray : Tool-less tray that can hold up to two drives and utilizes a “pull-bar” style handle to connect drive(s) to the BCA



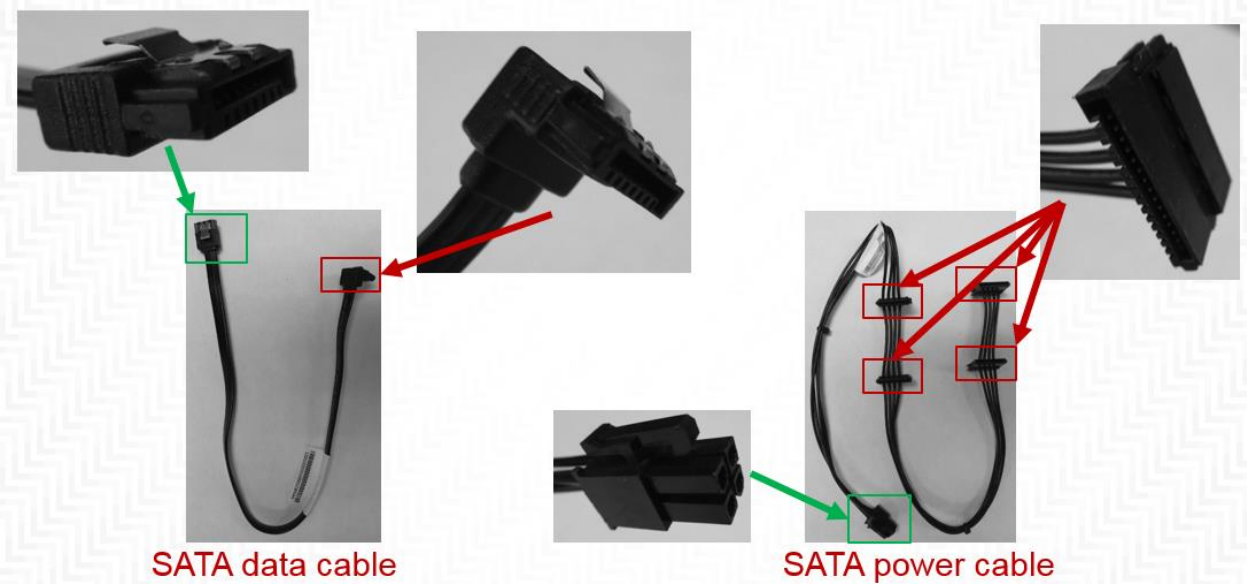
Manual Connect FLEX Tray : Tool-less tray that can hold up to two drives. These trays utilize hinged pulls that open and allow for cable access and manual cable connections.

Blind Connect to SATA cable

Blind Connect to SATA cable used to support SATA drives on Intel Onboard Controller via BCA-S for P720.

Manual HDD Connect Cables

Manual HDD connect cables are used to support SATA drives using Intel onboard SATA controller.



Section 8 – Document Revision History

Version	Date	Author	Changes/Updates
1.4	7/26/2023	Chris C.	Updated information and visuals
1.3	10/25/2018	Jason Moebs	Updated Blind Connect to SATA cable in Glossary Section.
1.2	10/24/2018	Jason Moebs	Update Glossary Section.
1.1	10/10/2018	Jason Moebs	Updates throughout.
1.0	10/10/2018	Jason Moebs	Initial launch release.