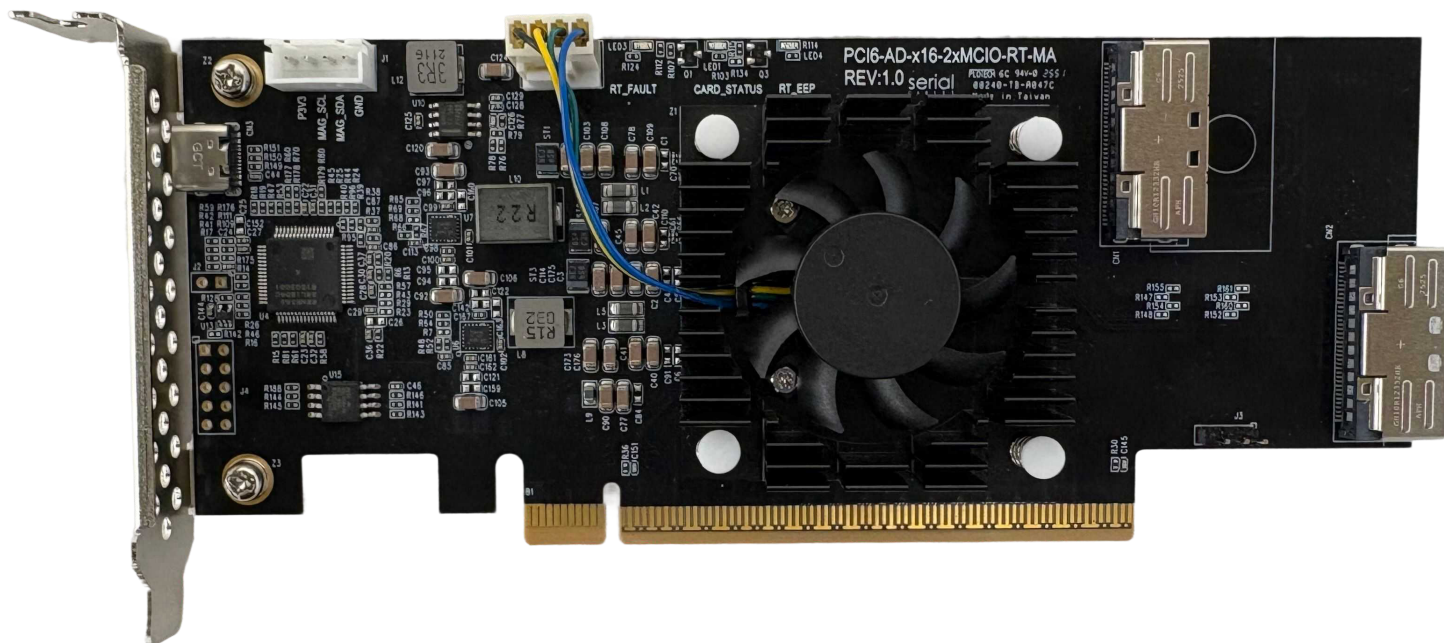


PCIe 6.0 x16 AIC to x8 MCIO Retimer

TECHNICAL MANUAL



Revision 1.2 July 2026

PCI6-AD-x16-2xMCIO-RT-MA
PCI6-AD-x16-2xMCIO-RT-CR



Command-line interface
for monitoring

PCI
EXPRESS
6.0



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Declaration and Revision Notice

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Product Overview

The **PCI6-AD-x16-2xMCIO-RT** is a PCIe Gen6 and CXL 3.1 retimer add-in card designed for signal integrity validation, interoperability testing, compliance preparation, and early system bring-up at 64 GT/s. Available with **retimer ICs from Marvell and Credo**, the card regenerates PCIe and CXL signals to restore eye margin and stabilize link training across high-loss channels.

Unlike a linear redriver, the retimer **performs full signal retiming**: it fully recovers the clock and data from the incoming signal before re-driving a clean, regenerated output. This enables reliable operation in long-reach and high-loss environments where simple equalization is not sufficient.

Implemented as a half-height, half-length (HHHL) PCIe add-in card, the PCI6-AD-x16-2xMCIO-RT connects between a PCIe Gen6 host slot and an endpoint or backplane device using standard MCIO (SFF-TA-1016) cable connectors. Its MCU-driven CLI provides per-port control, diagnostics, and status monitoring via a USB Type-C interface.

Key Features

- **PCIe Gen6 / CXL 3.1 Support** – Full signal retiming at 64 GT/s; backward-compatible with PCIe Gen1 through Gen5.
- **Multiple Retimer IC Options** – Available with Marvell MV-CHP10160 or Credo CPR61664 retimer ICs.
- **Flexible Lane Configurations** – Supports 1×16, 2×8, 4×4, and 8×2 lane groupings per transfer.
- **MCIO Connectivity** – Two MCIO SFF-TA-1016 connectors (CN1, CN2) supporting x8 PCIe/CXL link configurations.
- **PCIe Slot Power** – Powered directly from the host PCIe slot; no external supply required.
- **MCU-Based CLI** – USB Type-C management interface for board status, diagnostics, firmware updates, and PERST# control.
- **Built-In Monitoring and Diagnostics** – LED status indicators, built-in self-test (BIST), board information, and fan/PWM control.
- **HHHL Form Factor** – PCBA dimensions 69 × 167 × 19 mm, including fan-sink.
- **No Driver Required** – Operates transparently; no software or driver installation needed.



Hardware Specifications

Parameter	Value
Form Factor	HHHL (Half-Height, Half-Length) PCIe add-in card
Dimensions (PCBA)	69 × 167 × 19 mm (W × L × H); height includes fan-sink
Retimer ICs	Marvell: MV-CHP10160-A0-FH228AB-C06ES Credo: CPR61664-A1-ACKY
Protocol Support	PCIe Gen6/Gen5/Gen4/Gen3/Gen2/Gen1 and CXL 3.1
Lane Configurations	1×16 (one 16-lane link) 2×8 (two 8-lane links) 4×4 (four 4-lane links) 8×2 (eight 2-lane links)
Connectors	2× MCIO SFF-TA-1016 (CN1, CN2) – x8 PCIe/CXL, SFF9402 Root pinout 1× USB Type-C (CN3) – MCU management interface 1× 1R4P 2.54 mm wafer header (J1) – SMBus access to retimer IC
Power	Sourced from host PCIe slot Marvell: TBD Credo: <16.4 W (at Gen6 64 GT/s, 1×16)
Operating Temperature	0 °C to +40 °C
Storage Temperature	–40 °C to +85 °C
Operating Humidity	10% to 90% RH, non-condensing
Storage Humidity	5% to 95% RH, non-condensing
Drivers / Software	No software or driver installation required

Safety, Handling, and Compliance

This product is intended for use in professional lab, validation, and system-integration environments. Follow all safety and handling guidelines to protect the board, connected systems, and high-speed components during operation or servicing.

Electrical Safety

- Always power off the host system before installing or removing the card from a PCIe slot.
- Do not touch exposed signal pads or connector pins while the system is powered.
- Ensure the host system's PCIe slot provides adequate power for the card under load.
- Never operate the card with damaged cables, connectors, or power connections.

ESD Protection

- Handle the board only in an ESD-controlled workspace.
- Use a grounded wrist strap and avoid contact with connector pads, component pins, or high-speed signal traces.
- Keep the board in anti-static packaging when not in use or during transport.
- High-speed retimer ICs are sensitive to static discharge. Improper handling may cause immediate or latent failure.

Thermal and Airflow Considerations

- Ensure adequate airflow around the board when operating at Gen6 speeds. Retimer ICs may reach elevated temperatures under continuous load.
- Do not obstruct the fan-sink or block airflow paths on the board surface.
- Operate the board only within its specified ambient temperature range (0 °C to +40 °C typical).
- Monitor board temperature using the **bist** CLI command during extended operation. Persistent overheating may degrade signal integrity.

Compliance

This product is manufactured in accordance with standard international safety and environmental regulations:

- **CE** – Designed to support compliance with applicable European EMC and low-voltage directives.
- **FCC Class A** – Intended for use in commercial or industrial environments.
- **RoHS 3** – Compliant with the Restriction of Hazardous Substances directive.

Hardware Overview

The PCI6-AD-x16-2xMCIO-RT provides a **full-retiming signal path** between a PCIe Gen6 host slot and an attached device or backplane. The card integrates high-speed retimer ICs, two MCIO connectors, a USB Type-C management interface, LED status indicators, and an on-board fan-sink.

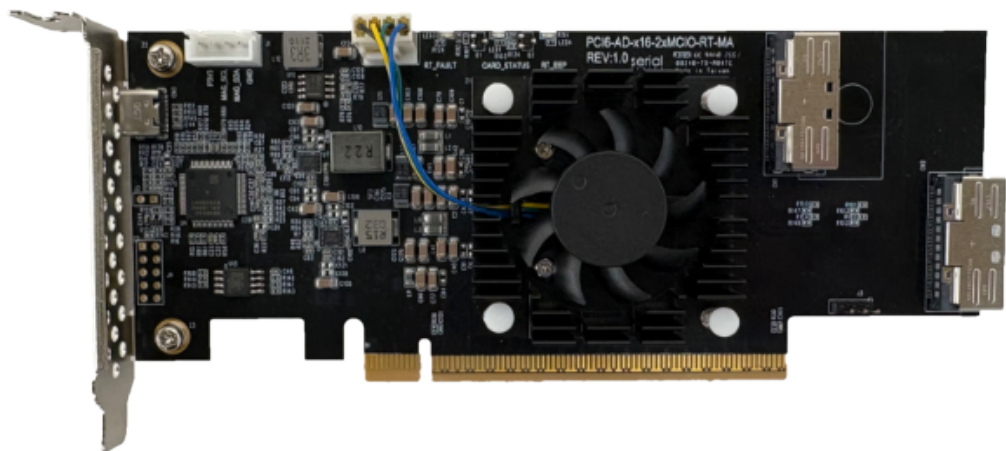
The card is a **standard HHHL PCIe add-in card** that draws power directly from the host PCIe slot. It connects the host to downstream devices using MCIO SFF-TA-1016 cables. The compact form factor and PCIe slot integration make it suitable for bench evaluation, rack-mount systems, and cable-based test setups.

Board Options

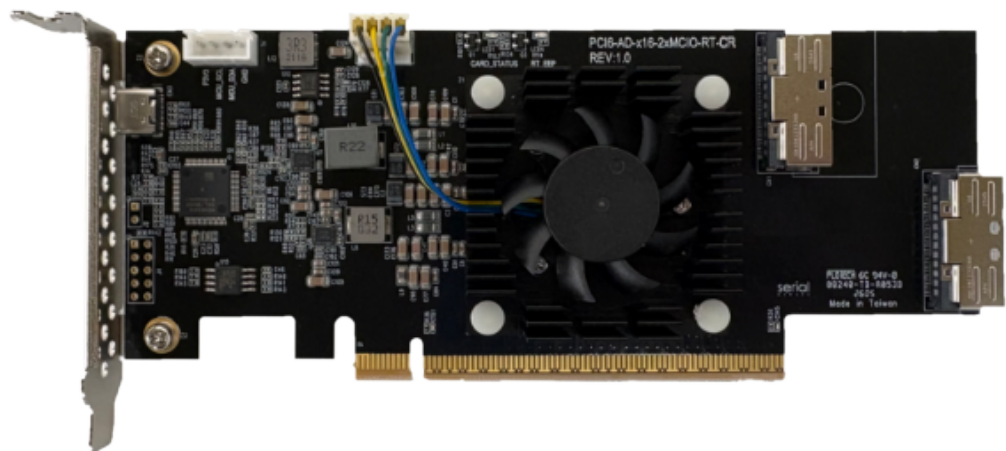
The card is available in two vendor-specific variants incorporating Marvell or Credo retimer ICs:

Part Number	Retimer IC
PCI6-AD-x16-2xMCIO-RT-MA	Marvell MV-CHP10160-A0-FH228AB-C06ES
PCI6-AD-x16-2xMCIO-RT-CR	Credo CPR61664-A1-ACKY

Marvell (PCI6-AD-x16-2xMCIO-RT-MA)



Credo (PCI6-AD-x16-2xMCIO-RT-CR)

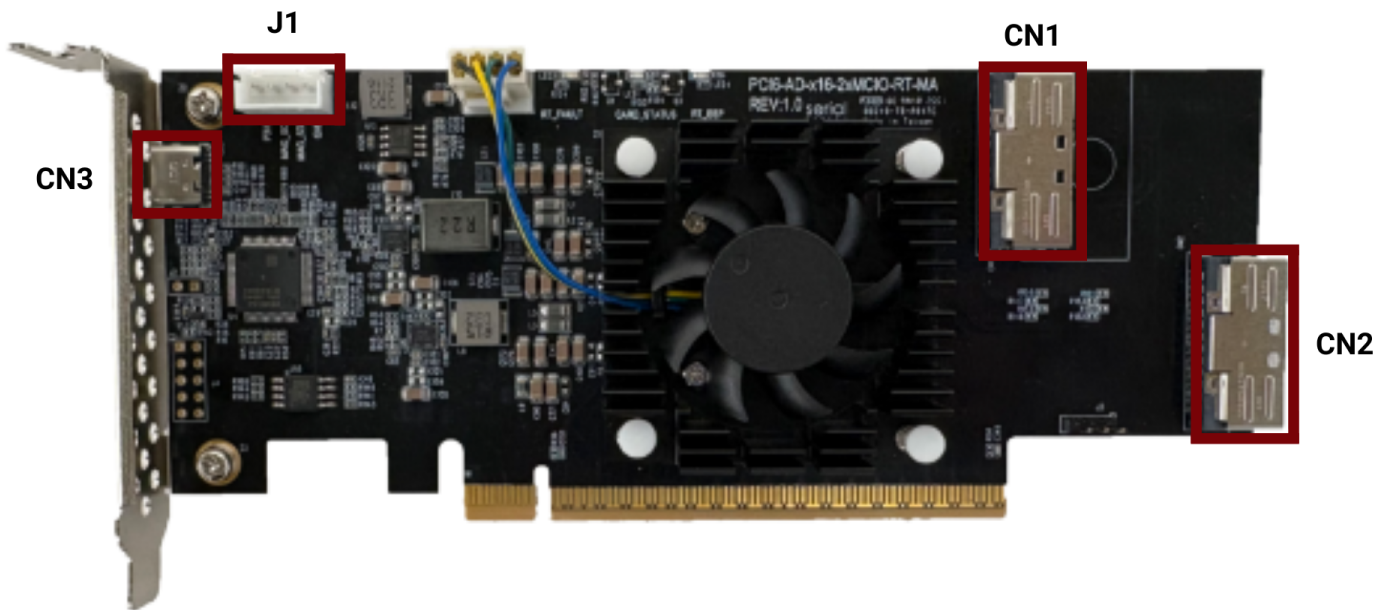


Connector Summary

The card includes the following connectors for PCIe/CXL signal routing and management:

Connector	Type	Description				
CN1	Host Signal (MCIO)	MCIO SFF-TA-1016 connector, lanes [7:0]. SFF9402 Root pinout. Supports x8 PCIe/CXL link.				
CN2	Host Signal (MCIO)	MCIO SFF-TA-1016 connector, lanes [15:8]. SFF9402 Root pinout. Supports x8 PCIe/CXL link.				
USB Type-C (CN3)	Management Control	MCU management interface for CLI commands, board diagnostics, PERST# control, and firmware updates.				
SMBus Header (J1)	Debug / Configuration	1R4P 2.54 mm wafer header providing SMBus access to the retimer IC (3.3 V signal level). Used for bring-up and advanced configuration.				
		Signals	P3V3	MAG_SCL	MAG_SDA	GND
		Pins in Header	1	2	3	4

 Refer to the connector location diagram below for exact placement and orientation. Connector locations are identical on both the Marvell and Credo variants.

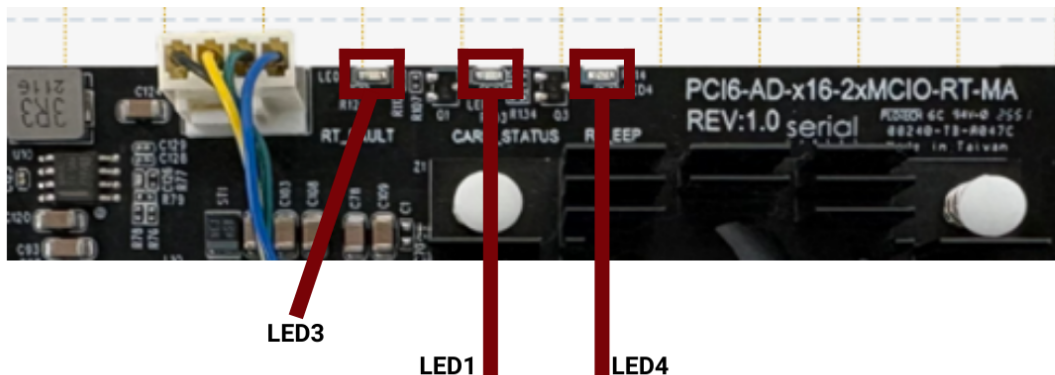


LED Indicators

The card includes three on-board LEDs that indicate system and firmware status. LEDs are located on the board face and visible from the bracket end of the card.

LED ID	Color	Description	Supported By
LED1	Blue	Retimer Card Health. Controlled by the on-board MCU. Blinks continuously during normal operation.	Marvell (-MA) Credo (-CR)
LED3	Red	Retimer Fault (Reserved). Controlled by retimer firmware. Lights if any error is detected in the retimer firmware.	Marvell (-MA)
LED4	Blue	EEPROM Read Done. Controlled by retimer firmware. Lights when the retimer has successfully completed its EEPROM read at power-on.	Marvell (-MA) Credo (-CR)

Marvell (PCI6-AD-x16-2xMCIO-RT-MA)



Credo (PCI6-AD-x16-2xMCIO-RT-CR)

Connector Pin Definitions

This section defines the electrical pin assignments for each MCIO connector. CN1 carries lanes [7:0] and CN2 carries lanes [15:8]. Both connectors use the SFF9402 Root pinout.

CN1 – Lanes [7:0]

CN1	2		3	5	6	8	9
	A	B_PERN7	B_PERP7	B_PERN6	B_PERP6	MCIO_CLK_P0	MCIO_CLK_N0
	B	A_PETN7	A_PETP7	A_PETN6	A_PETP6	MCIO_SCL_A0	MCIO_SDA_A0
	14		15	17	18	11	12
	A	B_PERN5	B_PERP5	B_PERN4	B_PERP4	MCIO_CLK_P1	MCIO_CLK_N1
	B	A_PETN5	A_PETP5	A_PETN4	A_PETP4	MCIO_PERST#_0	MCIO_PERST#_1
	20		21	23	24	26	27
	A	B_PERN3	B_PERP3	B_PERN2	B_PERP2	MCIO_CLK_P2	MCIO_CLK_N2
	B	A_PETN3	A_PETP3	A_PETN2	A_PETP2	MCIO_SCL_B0	MCIO_SDA_B0
	32		33	35	36	29	30
	A	B_PERN1	B_PERP1	B_PERN0	B_PERP0	MCIO_CLK_P3	MCIO_CLK_N3
	B	A_PETN1	A_PETP1	A_PETN0	A_PETP0	MCIO_PERST#_2	MCIO_PERST#_3

CN2 – Lanes [15:8]

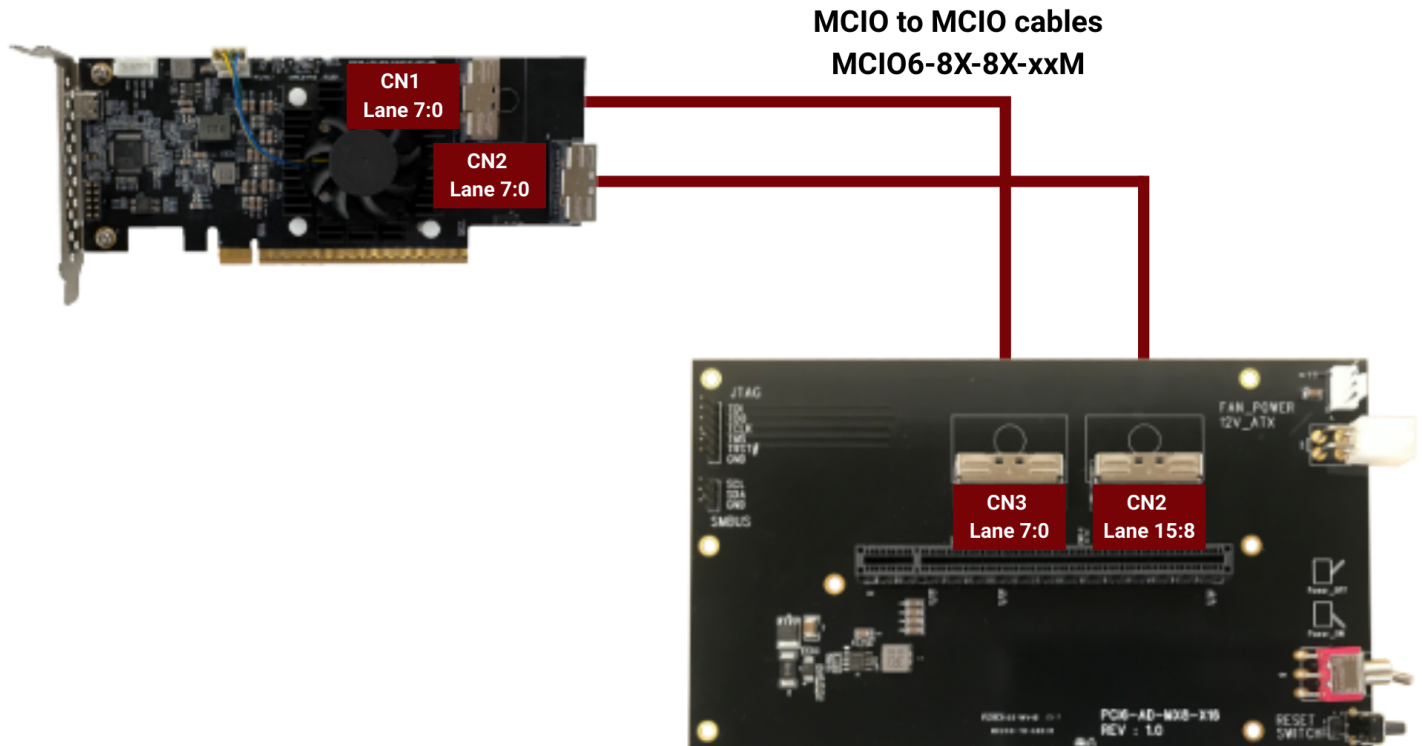
CN2	2		3	5	6	8	9
	A	B_PERN15	B_PERP15	B_PERN14	B_PERP14	MCIO_CLK_P4	MCIO_CLK_N4
	B	A_PETN15	A_PETP15	A_PETN14	A_PETP14	MCIO_SCL_A1	MCIO_SDA_A1
	14		15	17	18	11	12
	A	B_PERN13	B_PERP13	B_PERN12	B_PERP12	MCIO_CLK_P5	MCIO_CLK_N5
	B	A_PETN13	A_PETP13	A_PETN12	A_PETP12	MCIO_PERST#_4	MCIO_PERST#_5
	20		21	23	24	26	27
	A	B_PERN11	B_PERP11	B_PERN10	B_PERP10	MCIO_CLK_P6	MCIO_CLK_N6
	B	A_PETN11	A_PETP11	A_PETN10	A_PETP10	MCIO_SCL_B1	MCIO_SDA_B1
	32		33	35	36	29	30
	A	B_PERN9	B_PERP9	B_PERN8	B_PERP8	MCIO_CLK_P7	MCIO_CLK_N7
	B	A_PETN9	A_PETP9	A_PETN8	A_PETP8	MCIO_PERST#_6	MCIO_PERST#_7

Applications

The PCI6-AD-x16-2xMCIO-RT supports a range of system configurations. The two MCIO connectors (CN1: lanes 7:0, CN2: lanes 15:8) can be used independently for split connections or together for a full x16 link.

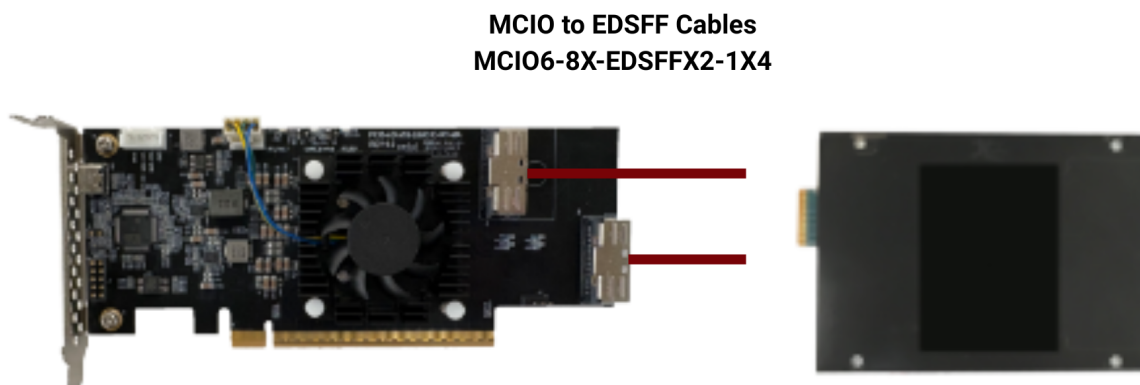
PCIe Slot Expansion

Connect the retimer card to a PCIe Gen6 expansion backplane or switch using two MCIO-to-MCIO cables. Use MCIO6-8X-8X-xxM cables to bridge the host slot to a downstream PCIe expansion device.



SSD Direct Attach

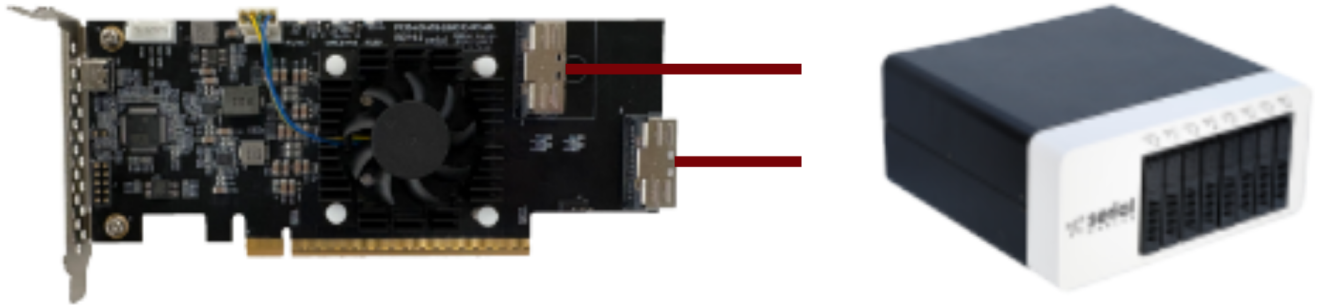
Connect directly to EDSFF (E1.L, E1.S, E3) drives using MCIO-to-EDSFF cables. Use MCIO6-8X-EDSFFX2-1X4 cables for x8 connections to high-density NVMe storage.



Gen6 JBOF Connection

Connect to a Gen6 JBOF (Just a Bunch of Flash) enclosure using an X8 MCIO to dual X8 MCIO fanout cable. Use MCIO6-8X-2X8B-xxM cables to reach JBOF backplane connectors.

**X8 MCIO to two x8 MCIO cables
MCIO6-8X-2X8B-xxM**



MCU Command Reference

Commands	Description
help	Display all available commands
fdl	Upgrade MCU firmware via XMODEM
lsd	Shows retimer board information
conrst	Send PERST# with 300ms duration to attached devices in MCIO ports
bist	Run on-board device diagnostics
pwmctrl	PWM adjustment for on-board FAN
ver	Display part number, serial number, and MCU firmware information
sysinfo	Show complete system summary
reset	Reset the MCU firmware

Command Usage Notes

Firmware Upgrade – **fdl**

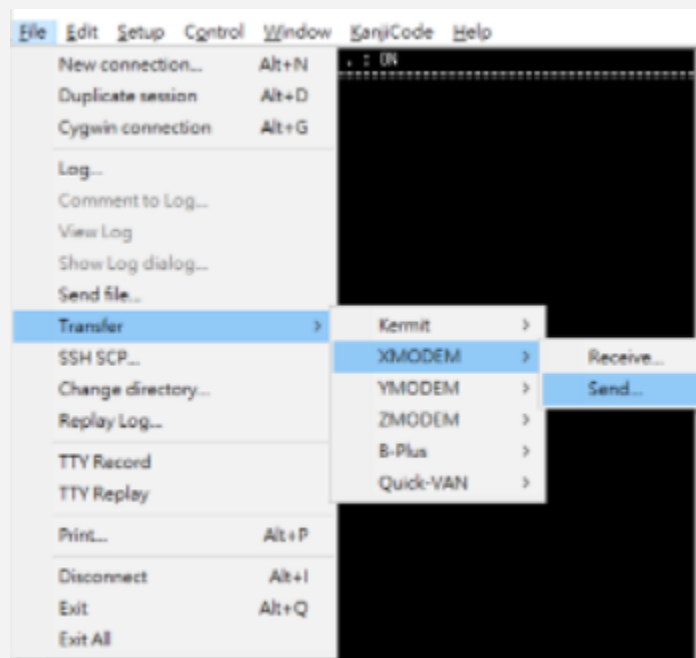
Initiates MCU firmware upgrades via XMODEM transfer. After running the command, the MCU waits for incoming data from the terminal software.

To upgrade firmware:

1. Type **fdl mcu** at the CLI prompt.
2. In the terminal application, select **Transfer** → **Send File**.
3. Set **Protocol: XMODEM**, then start the transfer.

The update typically completes within a few seconds.

Maintain a stable USB connection during the transfer. Power interruptions or serial disconnects may corrupt the firmware image.



System Status — **lsd**

The **lsd** command displays real-time readings for the retimer card, including system temperature, fan speed (RPM), and per-rail voltage sensor readings. The output of this command will appear as follows:

```
Cmd>lsd

=====
      * Board Information *
=====

[ Thermal ]
  · System Temperature   : 29° C

[ Fan Speed ]
  · System Fan           : 0      RPM

[ Voltage Sensors ]
  · 1.8V Voltage         : 1.868 V
  · 0.8V Voltage         : 0.828 V
  · 1.5V Voltage         : 1.554 V
  · 12V Voltage          : 12.631 V
```

Connector Reset — **conrst**

Sends PERST# with 300ms duration to attached devices on the specified MCIO ports.

If the **conrst** command is entered with a connector number (1-2) or **all**, the CLI sends a reset signal to the specified connector(s) and optional channel (**a** or **b**). For example:

- **conrst 1** — Sends PERST# reset to connector 1
- **conrst 1 a** — Sends PERST# reset to channel a of connector 1
- **conrst all** — Sends PERST# reset to all connectors
- **conrst all a** — Sends PERST# reset to channel a of all connector

Note:

- Channel "A" is for PERST# in **MCIO pins B11**
- Channel "B" is for PERST# in **MCIO pins B29**

Built-In Self-Test — **bist**

Runs a diagnostic check on all on-board devices, reporting the channel, device, address, and status of each.

If any component fails, the CLI will report **Fail**:

Channel	Device	Address	Status
CH2	AT24C64D	0xA0	OK
CH2	RC19016	0xD8	OK

PWM Fan Control — **pwmctrl**

Adjusts the PWM duty cycle for the on-board fan.

Enter the command **pwmctrl** followed by the duty cycle value (**0–100**), where 0 is off and 100 is full speed. For example:

- **pwmctrl 100** — Sets the fan to full speed
- **pwmctrl 50** — Sets the fan to 50% speed
- **pwmctrl 0** — Turns the fan off

```
Cmd>pwmctrl 100  
Set duty 100 Success.
```

Note: Do not run at reduced fan speed during sustained Gen6 operation. The retimer ICs may overheat, degrading signal integrity.

System Version — **ver**

Displays the retimer board model, serial number, MCU firmware version, and build information. Use this command to verify firmware version before upgrades or troubleshooting.

Marvell

```
Cmd>ver

----- Product Info -----
Company      : Serial Cables
Model        : PCI6-AD-x16-2xMCIO-RT-MA
Serial No.   : MA6R22603010001

----- App Info -----
Version      : 0.0.1
Build Time   : Feb 24 2026 21:35:36
```

Credo

```
Cmd>ver

----- Product Info -----
Company      : Serial Cables
Model        : PCI6-AD-x16-2xMCIO-RT-CR
Serial No.   : CR6R22602010008

----- App Info -----
Version      : 0.0.1
Build Time   : Feb 11 2026 19:34:08
```

System Information — **sysinfo**

Displays detailed system information for the redriver card, including:

- Retimer card model
- Serial number
- MCU firmware version and build time
- Board temperature readings
- Fan speed
- Voltage sensors

This is effectively a sequence of several key commands (**ver**, **lsd**, **bist**), consolidated into a single report for quick system validation.

System Reset — **reset**

Resets the on-board MCU firmware without affecting the redriver ICs or the link state.

Use **reset** after configuration changes, firmware updates, or if the CLI becomes unresponsive.

Maintenance & Diagnostics

The redriver card provides built-in CLI commands for monitoring system health and diagnosing issues at the device and board level. Regular checks help catch thermal or device problems before they affect signal integrity.

- Run **lsd** to monitor board temperature and voltage rails during normal operation, particularly during sustained Gen6 traffic.
- Run **bist** to verify all on-board devices are responding correctly after installation or following any board-level changes.
- Use **sysinfo** before and after maintenance to capture a complete snapshot of firmware version, thermal state, and device status.

Revision History

Revision	Description
1.2	Add new branded cover and changed logo in the <i>Contact Us</i> section
1.1	Reformatted and restyled for brand consistency and readability. Rewritten for clarity. Added <i>Product Overview</i> , <i>Safety</i> , <i>Handling & Compliance</i> , <i>Maintenance & Diagnostics</i> , and <i>Contact Us</i> sections.
1.0	Initial manual release.

Contact Us

For technical assistance, product inquiries, or additional documentation, our team is here to help.

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