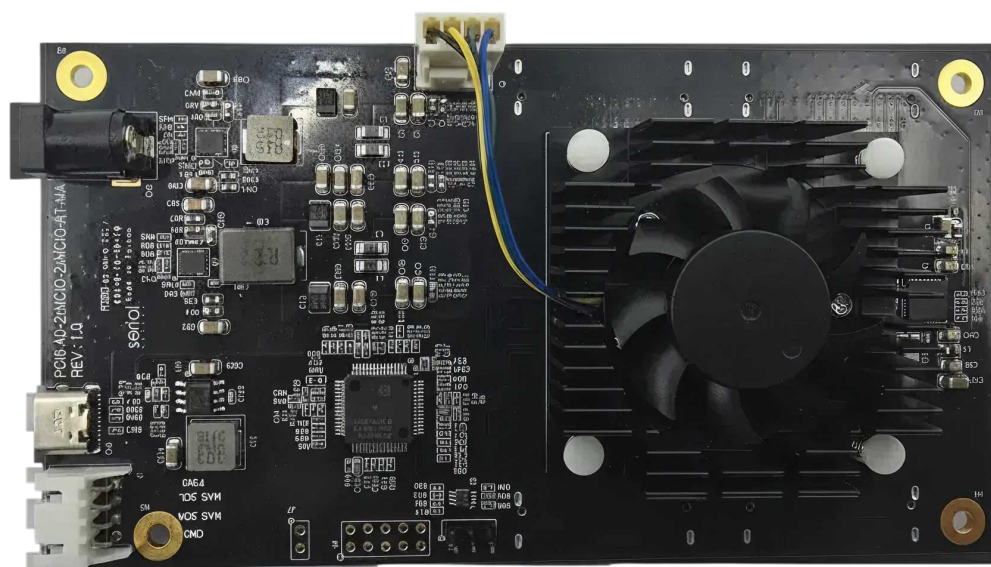


PCIe 6.0 / CXL x16 MCIO Retimer

TECHNICAL MANUAL



Revision 1.2 Jul 2026

PCI6-AD-2xMCIO-2xMCIO-RT-



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Product Overview

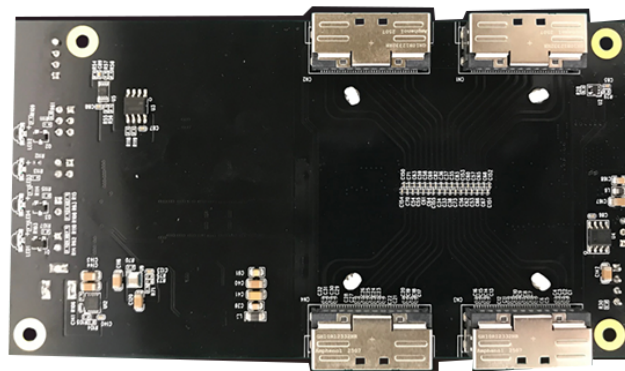
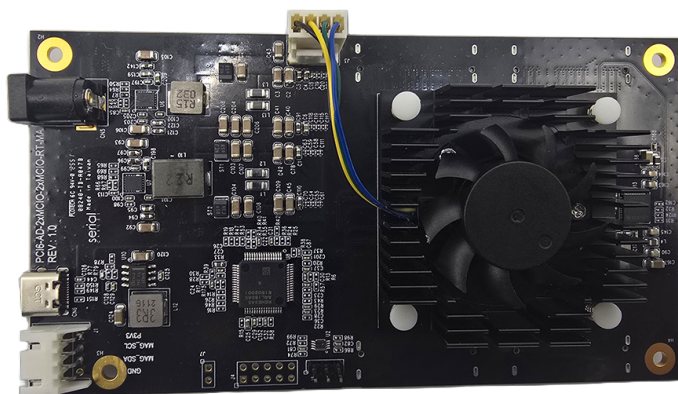
The **PCI6-AD-2xMCIO-2xMCIO-RT** is a PCIe Gen6 and CXL 3.1 retimer adapter board designed for signal integrity validation, interoperability testing, compliance preparation, and early system bring-up at 64 GT/s. Built around **industry-leading retimer ICs from Broadcom, Marvell, and Credo**, the board 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 standalone board powered by an external 12 V DC supply, the PCI6-AD-2xMCIO-2xMCIO-RT connects between a PCIe Gen6 root complex or host card 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.

Key Features

- **PCIe Gen6 / CXL 3.1 Support** – Full signal retiming at 64 GT/s, compatible with PCIe Gen6 and CXL 3.1 devices.
- **Multiple Retimer IC Options** – Supports Broadcom BCM85667, Marvell MV-CHP10160, and Credo CPR61664 retimer ICs.
- **MCIO Connectivity** – Four MCIO SFF-TA-1016 connectors supporting x4 and x8 PCIe/CXL link configurations.
- **External 12 V DC Power** – Powered independently via a 12 V DC barrel jack; no host slot power required.
- **MCU-Based CLI** – USB Type-C management interface for board status, diagnostic, firmware, and PERST# control.
- **Built-In Monitoring and Diagnostics** – LED status indicators, built-in self-test (BIST), board information, and fan/PWM control.
- **Compact Form Factor** – Dimensions 76 × 140 × 24 mm, including fan-sink and MCIO connectors.



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 board by disconnecting the 12 V DC supply before installing or removing cables, connectors, or making any hardware changes.
- Do not touch exposed power pins or signal pads while the board is energized.
- Use a properly rated 12 V DC power source. Verify polarity before connecting.
- Never operate the board with damaged cables, connectors, or power leads.
- Ensure the power adapter is rated for the board's power consumption under load.

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 `ver` or `bist` CLI commands 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-2xMCIO-2xMCIO-RT provides a **full-retiming signal path** between a PCIe Gen6 host interface and an attached device or backplane. The board integrates high-speed retimer ICs, four MCIO connectors, a USB Type-C management interface, LED status indicators, an on-board fan-sink, and a 12 V DC power input.

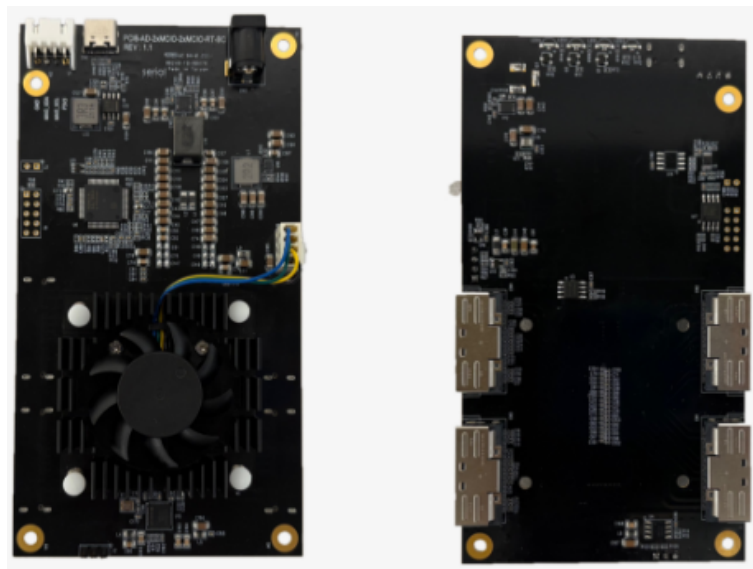
The board is a **standalone PCB** (not an add-in card) powered by an external 12 V DC supply. It connects inline between host and device using MCIO SFF-TA-1016 cables. The compact form factor makes it suitable for bench use, rack integration, and cable-based test setups.

Board Options

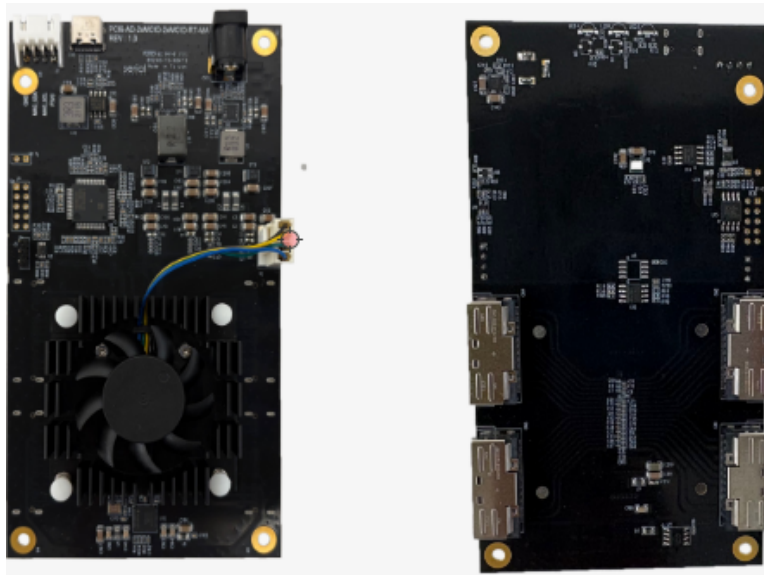
The board is available in a standard SC configuration for signal validation and bring-up, as well as three vendor-specific variants incorporating Broadcom, Marvell, or Credo retimer ICs:

Part Number	Retimer IC
PCI6-AD-2xMCIO-2xMCIO-RT-BC	Broadcom BCM85667
PCI6-AD-2xMCIO-2xMCIO-RT-MA	Marvell MV-CHP10160-A0-FH228AB-C06ES
PCI6-AD-2xMCIO-2xMCIO-RT-CR	Credo CPR61664-A1-AC

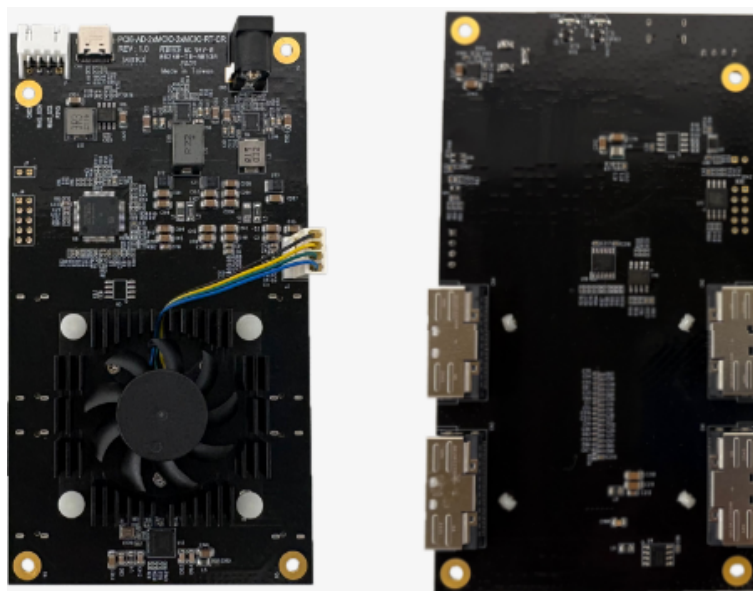
Broadcom (PCI6-AD-2xMCIO-2xMCIO-RT-BC)



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



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



Connector Summary

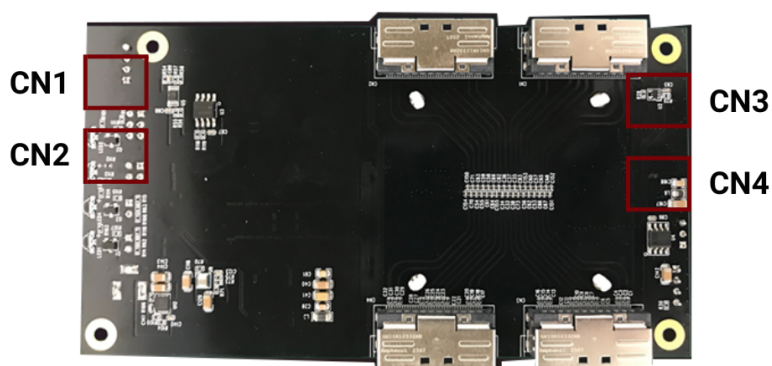
The board includes the following connectors for PCIe/CXL signal routing, power delivery, and management:

Connector	Type	Description
CN1, CN2	Host Signal (MCIO)	MCIO SFF-TA-1016 connectors on the host (Root/Server) side. Support x4 or x8 PCIe/CXL links.
CN3, CN4	Device Signal (MCIO)	MCIO SFF-TA-1016 connectors on the device (Endpoint/Backplane) side. Support x4 or x8 PCIe/CXL links.
12V DC Jack (CN5)	Power Input	External 12 V DC barrel jack for board power.
USB Type-C (CN6)	Management / Control	MCU management interface for CLI commands, board diagnostics, PERST# control, and firmware updates.
SMBus Header (J1)	Debug / Configuration	1×4-pin 2.54 mm wafer header providing SMBus access to the retimer IC. Used for bring-up and advanced configuration.

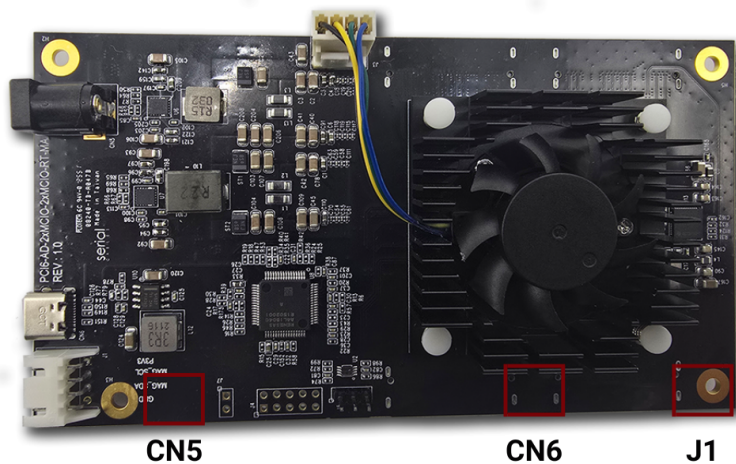


Refer to the connector location diagrams for exact placement and orientation.

Bottom View



Top View

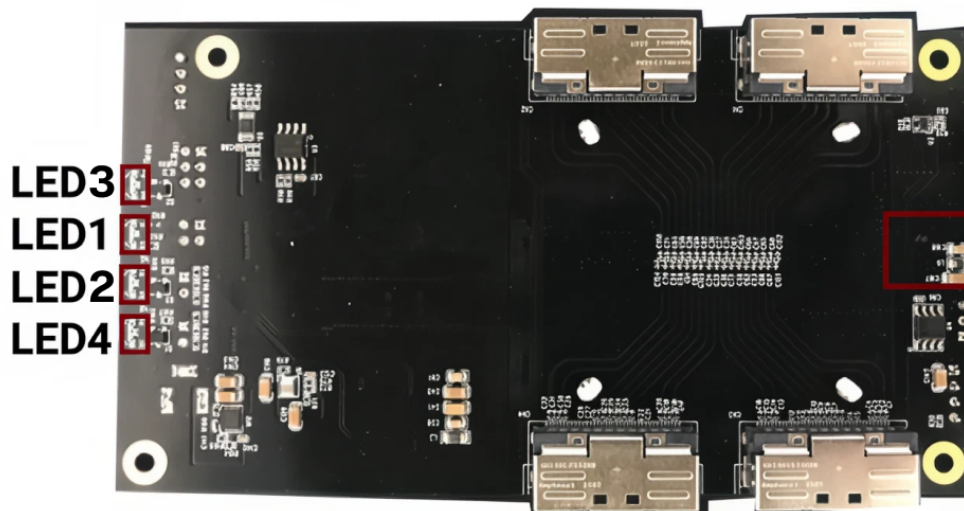


LED Indicators

The board includes four on-board LEDs that indicate system and firmware status:

LED ID	Color	Description	Supported By
LED1	Blue	Retimer Card Health. Controlled by the on-board MCU. Blinks continuously during normal operation.	Broadcom (-BC) Marvell (-MA) Credo (-CR)
LED2	Green	Retimer Heartbeat. Controlled by retimer firmware. Blinks as a heartbeat indicator for retimer FW activity.	Broadcom (-BC) Marvell (-MA) Credo (-CR)
LED3	Red	Retimer Fault (Reserved). Controlled by retimer firmware. Lights if any error is detected in the retimer firmware.	Broadcom (-BC) Marvell (-MA)
LED4	Blue	EEPROM Read Done. Controlled by retimer firmware. Lights when the retimer has successfully completed its EEPROM read at power-on.	Broadcom (-BC)

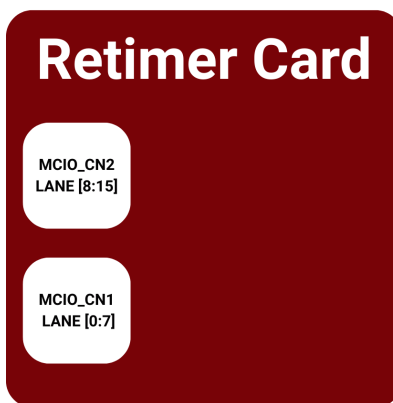
Bottom View



Connector Pin Definitions

This section defines the electrical pin assignments for each user-accessible interface. Refer to the connector location diagrams for orientation before wiring.

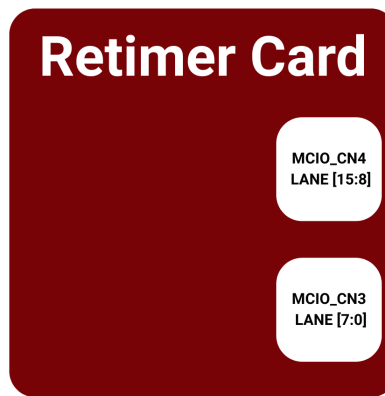
Top View



CN1	2		3	5	6	8	9
	A	B_PERP0	B_PERN0	B_PERP1	B_PERN1	MCIO_BPTYPE_A0	MCIO_CWAKEB_A0
	B	A_PETP0	A_PETN0	B_PETN6	A_PETN1	MCIO_SCL_A0	MCIO_SDA_A0
	14		15	17	18	11	12
	A	B_PERP2	B_PERN2	B_PERP3	B_PERN3	MCIO_CLKP_OUT_A0	MCIO_CLKN_OUT_A0
	B	A_PETP2	A_PETN2	A_PETP3	A_PETN3	MCIO_RST#_OUT_A0	MCIO_CPRSNTB_A0
	20		21	23	24	26	27
	A	B_PERP4	B_PERN4	B_PERP5	B_PERN5	MCIO_BPTYPE_B0	MCIO_CWAKEB_B0
CN2	B	A_PETP4	A_PETN4	A_PETP5	A_PETN5	MCIO_SCL_B0	MCIO_SDA_B0
	32		33	35	36	29	30
	A	B_PERP6	B_PERN6	B_PERP7	B_PERN7	MCIO_CLKP_OUT_B0	MCIO_CLKN_OUT_B0
	B	A_PETP6	A_PETN6	A_PETP7	A_PETN7	MCIO_RST#_OUT_B0	MCIO_CPRSNTB_B0

CN2	2		3	5	6	8	9
	A	B_PERP8	B_PERN8	B_PERP9	B_PERN9	MCIO_BPTYPE_A1	MCIO_CWAKEB_A1
	B	A_PETP8	A_PETN8	A_PETP9	A_PETN9	MCIO_SCL_A1	MCIO_SDA_A1
	14		15	17	18	11	12
	A	B_PERP10	B_PERN10	B_PERP11	B_PERN11	MCIO_CLKP_OUT_A1	MCIO_CLKN_OUT_A1
	B	A_PETP10	A_PETN10	A_PETP11	A_PETN11	MCIO_RST#_OUT_A1	MCIO_CPRSNTB_A1
	20		21	23	24	26	27
	A	B_PERP12	B_PERN12	B_PERP13	B_PERN13	MCIO_BPTYPE_B1	MCIO_CWAKEB_B1
CN1	B	A_PETP12	A_PETN12	A_PETP13	A_PETN13	MCIO_SCL_B1	MCIO_SDA_B1
	32		33	35	36	29	30
	A	B_PERP14	B_PERN14	B_PERP15	B_PERN15	MCIO_CLKP_OUT_B1	MCIO_CLKN_OUT_B1
	B	A_PETP14	A_PETN14	A_PETP15	A_PETN15	MCIO_RST#_OUT_B1	MCIO_CPRSNTB_B1

Top View



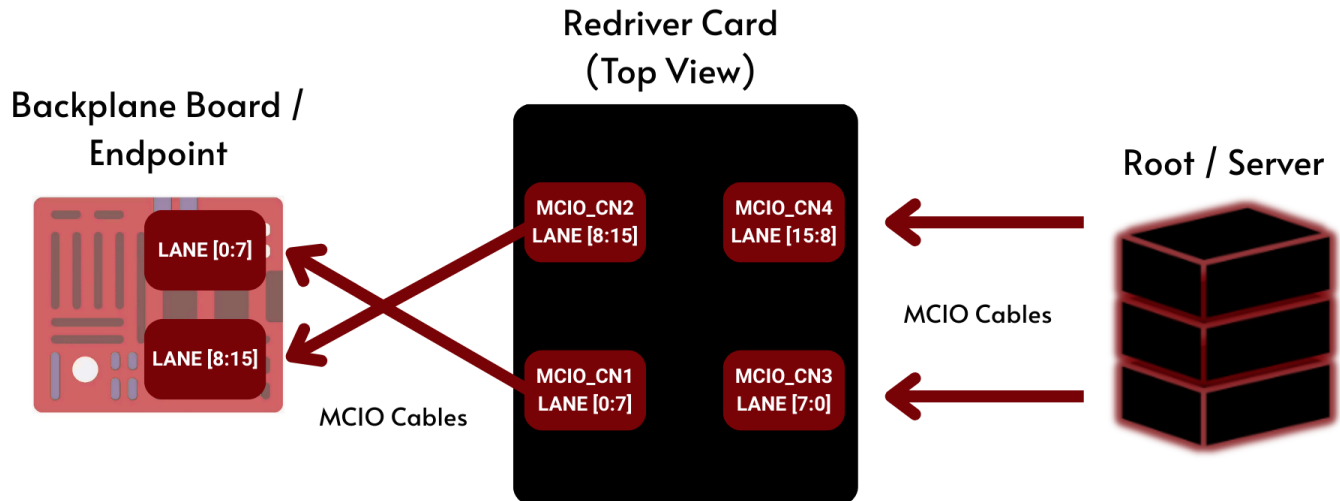
CN3	2		3	5	6	8	9
	A B	A_PERN7 B_PETN7	A_PERP7 B_PETP7	A_PERN6 B_PETN6	A_PERP6 B_PETP6	MCIO_SCL_A0 MCIO_BPTYPE_A0	MCIO_SDA_A0 MCIO_CWAKEB_A0
	14		15	17	18	11	12
	A B	A_PERN5 B_PETN5	A_PERP5 B_PETP5	A_PERN4 B_PETN4	A_PERP4 B_PETP4	MCIO_RST#_IN_A0 MCIO_CLKOUTN_A0	MCIO_CPRSNTB_A0 MCIO_CLKOUTP_A0
	20		21	23	24	26	27
	A B	A_PERN3 B_PETN3	A_PERP3 B_PETP3	A_PERN2 B_PETN2	A_PERP2 B_PETP2	MCIO_SCL_B0 MCIO_BPTYPE_B0	MCIO_SDA_B0 MCIO_CWAKEB_B0
	32		33	35	36	29	30
	A B	A_PERN1 B_PETN1	A_PERP1 B_PETP1	A_PERN0 B_PETN0	A_PERP0 B_PETP0	MCIO_RST#_IN_B0 NC	MCIO_CPRSNTB_B0 NC

CN4	2		3	5	6	8	9
	A B	A_PERN15 B_PETN15	A_PERP15 B_PETP15	A_PERN14 B_PETN14	A_PERP14 B_PETP14	MCIO_SCL_A1 MCIO_BPTYPE_A1	MCIO_SDA_A1 MCIO_CWAKEB_A1
	14		15	17	18	11	12
	A B	A_PERN13 B_PETN13	A_PERP13 B_PETP13	A_PERN12 B_PETN12	A_PERP12 B_PETP12	MCIO_RST#_IN_A1 MCIO_CLKOUTN_A1	MCIO_CPRSNTB_A1 MCIO_CLKOUTP_A1
	20		21	23	24	26	27
	A B	A_PERN11 B_PETN11	A_PERP11 B_PETP11	A_PERN10 B_PETN10	A_PERP10 B_PETP10	MCIO_SCL_B1 MCIO_BPTYPE_B1	MCIO_SDA_B1 MCIO_CWAKEB_B1
	32		33	35	36	29	30
	A B	A_PERN9 B_PETN9	A_PERP9 B_PETP9	A_PERN8 B_PETN8	A_PERP8 B_PETP8	MCIO_RST#_IN_B1 NC	MCIO_CPRSNTB_B1 NC

Cable Connection

The board passes PCIe Gen6 signals between host and device using MCIO cables. Two MCIO connectors on each side support **x4 (CN1/CN3)** and **x8 (CN2/CN4)** link configurations.

 For x16 link configurations, verify pin orientation on both ends of the cable assembly to ensure correct lane mapping between root and endpoint devices.



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
clkssel	Set mode of clock generator to support common clock or SRNS.
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**

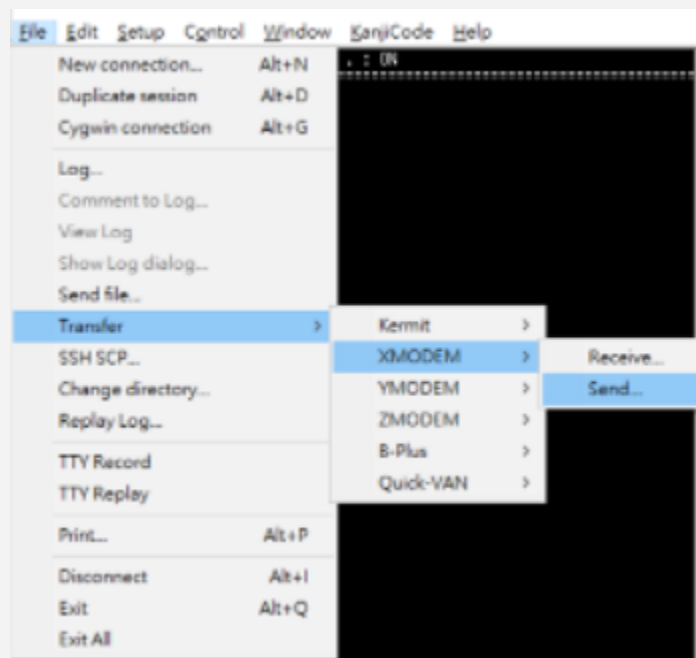
Initiates MCU firmware upgrades via XMODEM transfer. After running the command, the MCU waits for incoming data from the terminal software.

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 board, including temperature, fan speed (RPM) and voltage. 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 in 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**

Clock Select — **clkssel**

Sets the mode of the clock generator to support either common clock or SRNS.

Enter the command **clkssel** followed by the mode number (1 or 2):

- **Mode 1** — Common clock
- **Mode 2** — SRNS

Note: A power cycle is required after changing the clock mode for the setting to take effect.

```
Cmd>clkssel 2
Write data to 0x400 ~ 0x480.

Cmd>clkssel 2
Write data to 0x780 ~ 0x800.
Write data to RC21012A eeprom success.

Set operation mode to mode 2.
Please power cycle to take effect.
```

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
CH1	AT24C16	0xA0	OK
CH1	RC21012	0x12	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.
```

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.

Broadcom

```
Cmd>ver

----- Product Info -----
Company      : Serial Cables
Model        : PCI6-AD-2xMCIO-2xMCIO-RT-BC
Serial No.   :

----- App Info -----
Version      : 0.0.2
Build Time   : Feb 11 2026 19:48:09
```

Marvell

```
Cmd>ver

----- Product Info -----
Company      : Serial Cables
Model        : PCI6-AD-2xMCIO-2xMCIO-RT-MA
Serial No.   : MA6R12602010002

----- App Info -----
Version      : 0.0.2
Build Time   : Feb 12 2026 10:09:28
```

Credo

```
Cmd>ver

----- Product Info -----
Company      : Serial Cables
Model        : PCI6-AD-2xMCIO-2xMCIO-RT-CR
Serial No.   : CR6R12602010009

----- App Info -----
Version      : 0.0.1
Build Time   : Feb 10 2026 14:13:49
```

System Information — **sysinfo**

Displays detailed system information for the redriver card, including:

- Product details
- 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 early.

- Run **lsd** to monitor board temperature during normal operation.
- Use **sysinfo** before and after maintenance to review firmware version, temperature readings, and redriver device status.

Revision History

Revision	Description
1.2	Updated LED table with correct numbering pg. 9
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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