» User Guide «

CP-RIO6-A
CP-RIO6-B
CP-RIO6-A216
CP-RIO6-B216

6U CompactPCI Rear Transition Modules

If it's embedded, it's Kontron.

Revision History

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Caution, Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.

Please refer also to the section "High Voltage Safety Instructions" on the following page.

Warning, ESD Sensitive Device!

This symbol and title inform that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section "Special Handling and Unpacking Instructions" on the following page.

Warning!

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and/or result in damage to your material.

Note ...

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

Warning!

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Caution, Electric Shock!

Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks.

Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

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General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

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Kontron grants the original purchaser of Kontron's products a *TWO YEAR LIMITED HARDWARE WARRANTY* as described in the following. However, no other warranties that may be granted or implied by anyone on behalf of Kontron are valid unless the consumer has the express written consent of Kontron.

Kontron warrants their own products, excluding software, to be free from manufacturing and material defects for a period of 24 consecutive months from the date of purchase. This warranty is not transferable nor extendible to cover any other users or long-term storage of the product. It does not cover products which have been modified, altered or repaired by any other party than Kontron or their authorized agents. Furthermore, any product which has been, or is suspected of being damaged as a result of negligence, improper use, incorrect handling, servicing or maintenance, or which has been damaged as a result of excessive current/voltage or temperature, or which has had its serial number(s), any other markings or parts thereof altered, defaced or removed will also be excluded from this warranty.

If the customer's eligibility for warranty has not been voided, in the event of any claim, he may return the product at the earliest possible convenience to the original place of purchase, together with a copy of the original document of purchase, a full description of the application the product is used on and a description of the defect. Pack the product in such a way as to ensure safe transportation (see our safety instructions).

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Chapter **1**

Introduction

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1.   Introduction

1.1   Board Overview

The CP-RIO6-Ax/Bx 6U CompactPCI rear transition module has been designed for use with Kontron 6U CompactPCI CPU boards and provides comprehensive rear I/O functionality for peripherals. In order to use the CP-RIO6-Ax/Bx, a special 6U CompactPCI backplane with rear I/O support as well as a compatible and correctly configured CPU board are required.

There are four modules described in this user guide: CP-RIO6-A, CP-RIO6-A216, CP-RIO6-B, and CP-RIO6-B216. All four modules provide various data, communication and multimedia interfaces as well as support for two optional USB 2.0 NAND Flash modules and four external SATA devices. The CP-RIO6-Ax/Bx comes with four USB 2.0 ports, four onboard SATA ports, two COM ports, and an HD audio codec supporting five audio ports such as one onboard CD-In port, one Mic-In port, one Line-In port, one Line-Out port, and one S/P-DIF-Out port. Furthermore, the CP-RIO6-A and the CP-RIO6-A216 are equipped with one VGA (CRT) port on the front panel. The CP-RIO6-B and the CP-RIO6-B216 provide a DVI-D port and a HDMI port on the front panel. In addition, the CP-RIO6-A and the CP-RIO6-B are equipped with two Gigabit Ethernet ports on the front panel. The CP-RIO6-Ax/Bx has three CompactPCI connectors for connecting the CP-RIO6-Ax/Bx to the backplane.

1.2   CP-RIO6-Ax/Bx Feature Comparison

The following table provides a feature comparison of the CP-RIO6-Ax/Bx.

Table 1-1:   CP-RIO6-Ax/Bx Feature Comparison

	PORT	CP-RIO6-A	CP-RIO6-A216	CP-RIO6-B	CP-RIO6-B216
Front Panel Ports	VGA	x	x	--	--
	DVI-D	--	--	x	x
	HDMI	--	--	x	x
	2x GbE	x	--	x	--
	COM1	x	x	x	x
	2x USB 2.0	x	x	x	x
	Mic-In	x	x	x	x
	Line-In	x	x	x	x
	Line-Out	x	x	x	x
	S/P-DIF-Out	x	x	x	x
Onboard Ports	COM2	x	x	x	x
	2x USB 2.0 NAND Flash	x	x	x	x
	4x SATA	x	x	x	x
	CD-In	x	x	x	x
	Internal Line-Out Mono	x	x	x	x
	2x FAN	x	x	x	x

1.3 Board Diagrams

The following diagrams provide additional information concerning the boards' functionality and component layout.

1.3.1 Functional Block Diagrams

Figure 1-1: CP-RIO6-A/CP-RIO6-A216 Functional Block Diagram
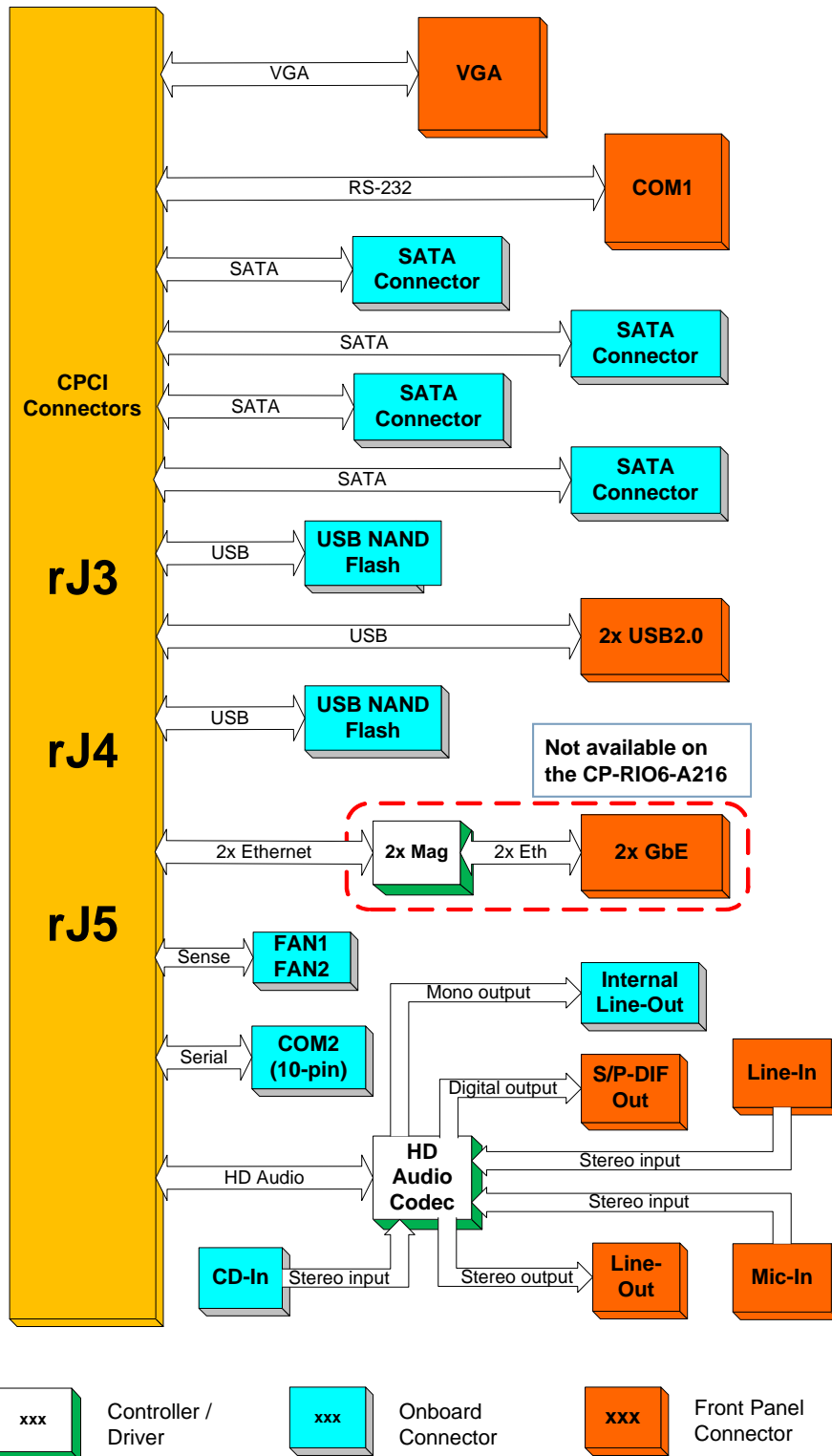
Figure 1-2: CP-RIO6-B/CP-RIO6-B216 Functional Block Diagram
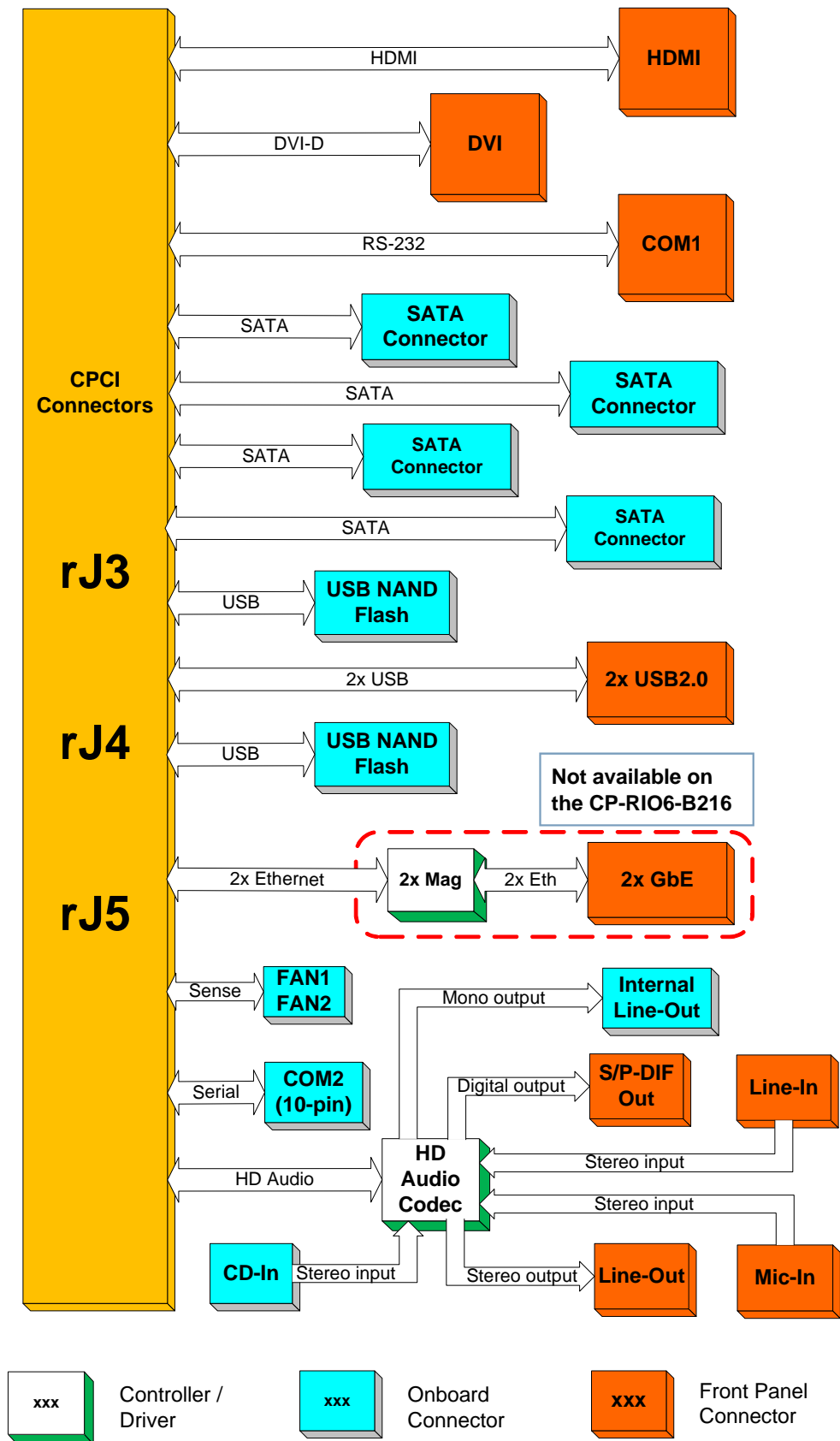
1.3.2 Front Panels

Figure 1-3: CP-RIO6-Ax/Bx Front Panels

| CP-RIO6-A | CP-RIO6-A216 | CP-RIO6-B | CP-RIO6-B216 |
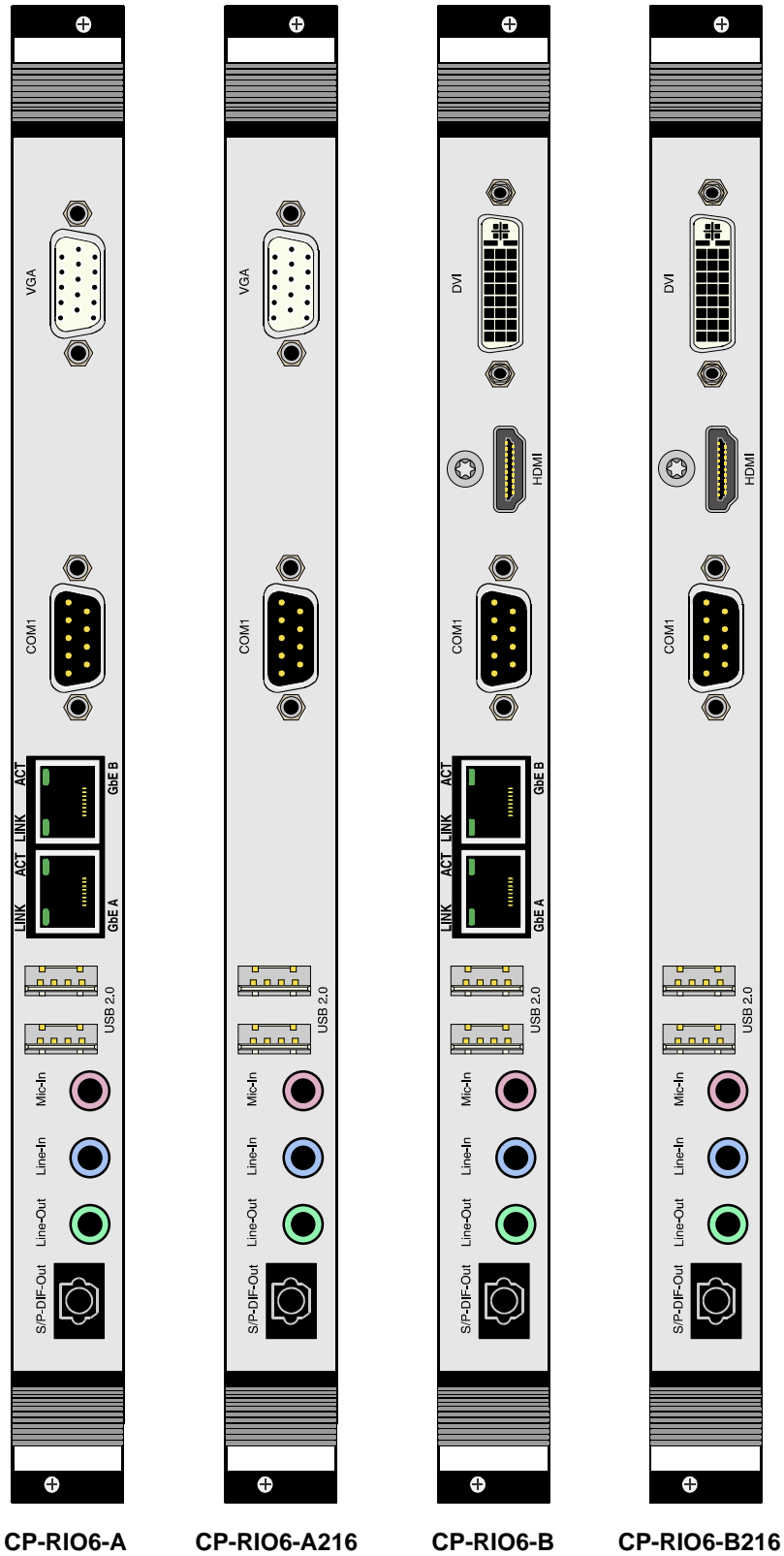
1.3.3   Board Layout

Figure 1-4: CP-RIO6-A Board Layout – Front View
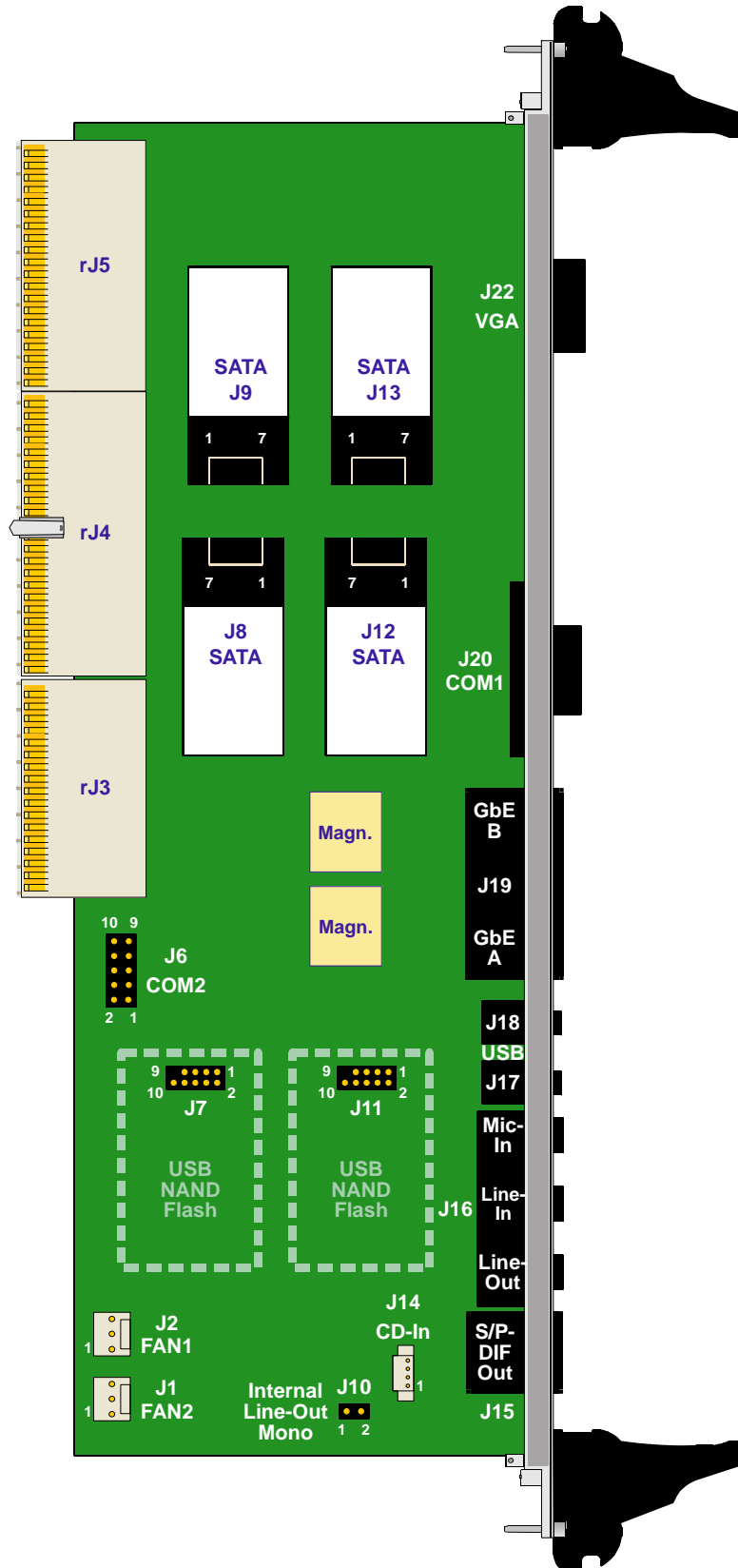
Figure 1-5: CP-RIO6-A216 Board Layout – Front View
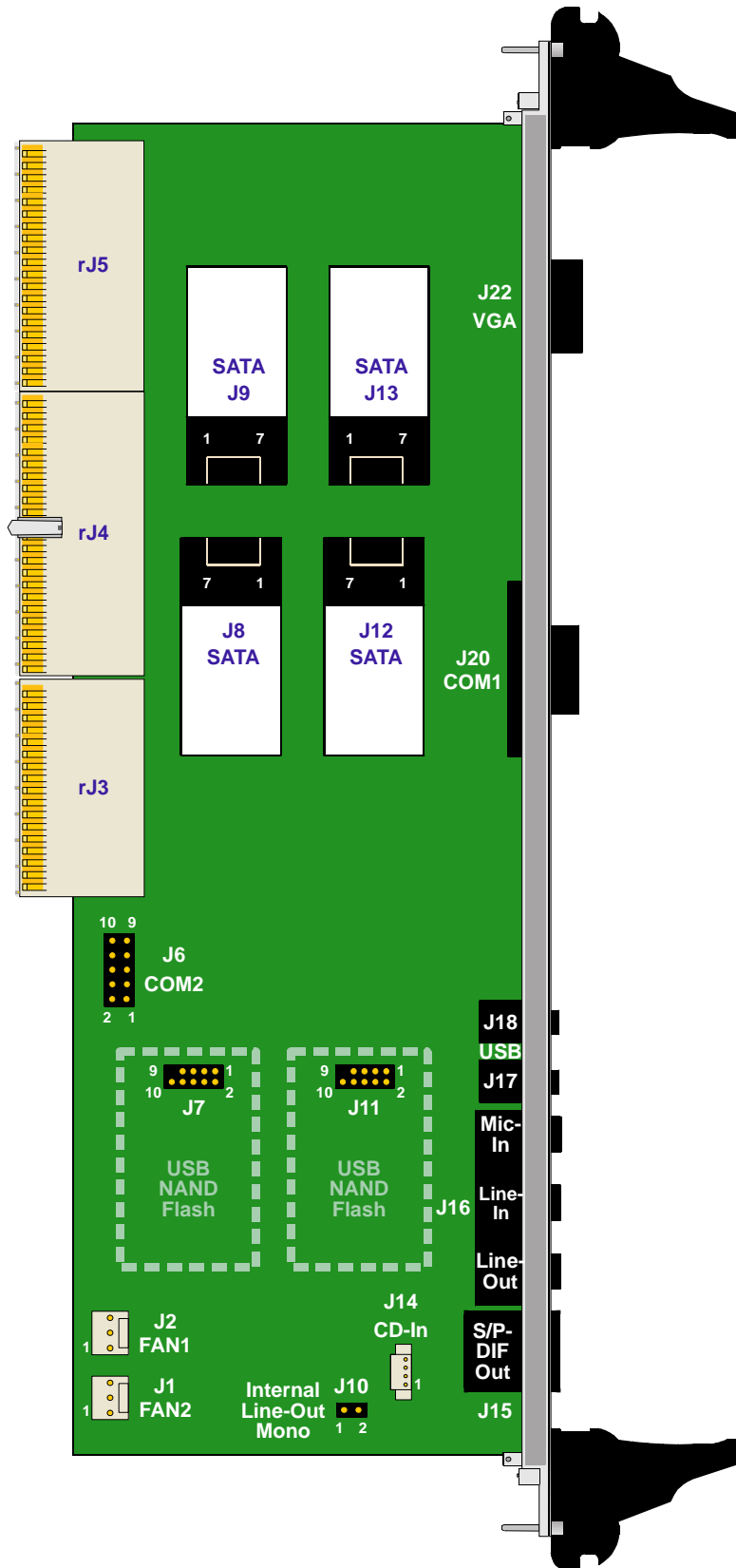
Figure 1-6: CP-RIO6-B Board Layout – Front View
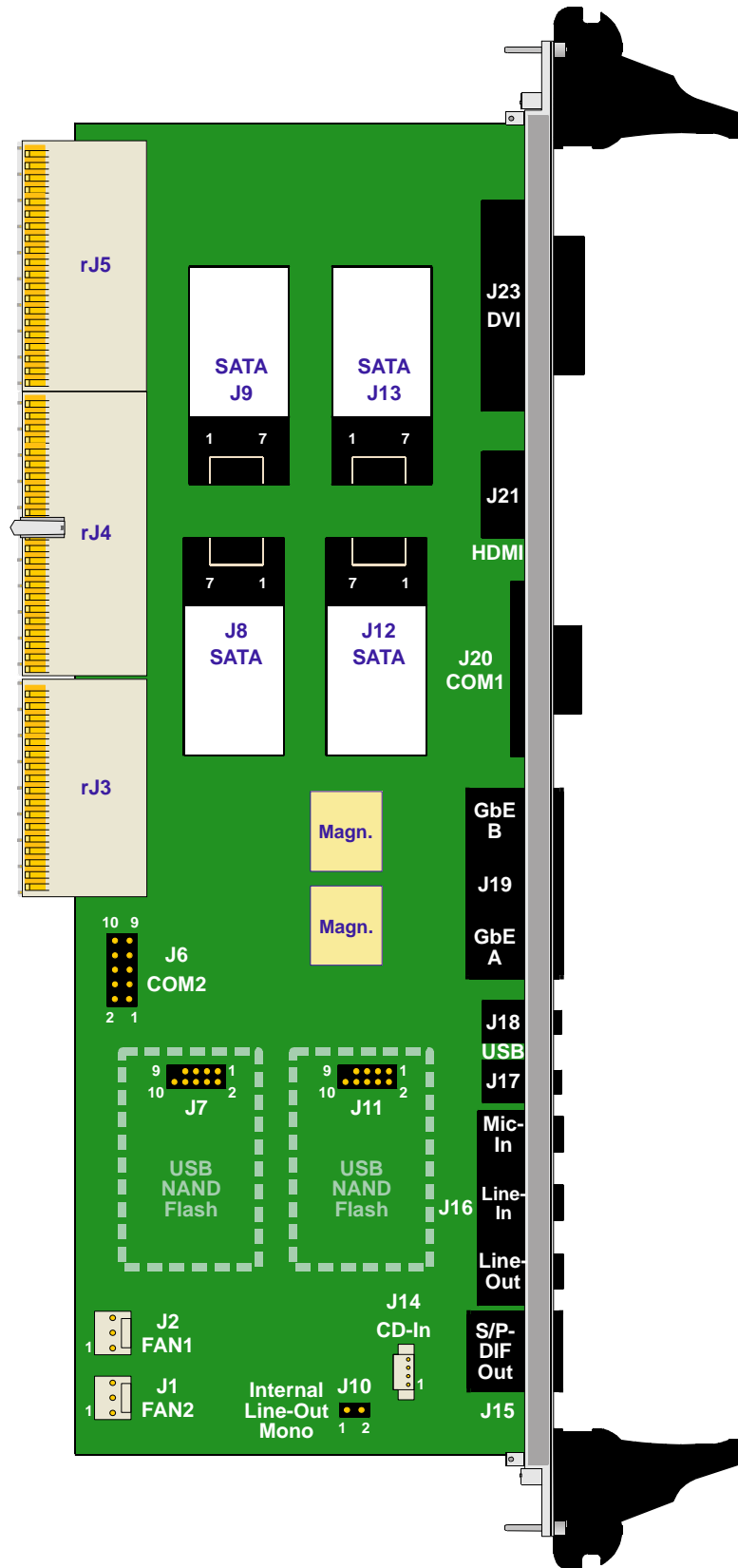
Figure 1-7: CP-RIO6-B216 Board Layout – Front View
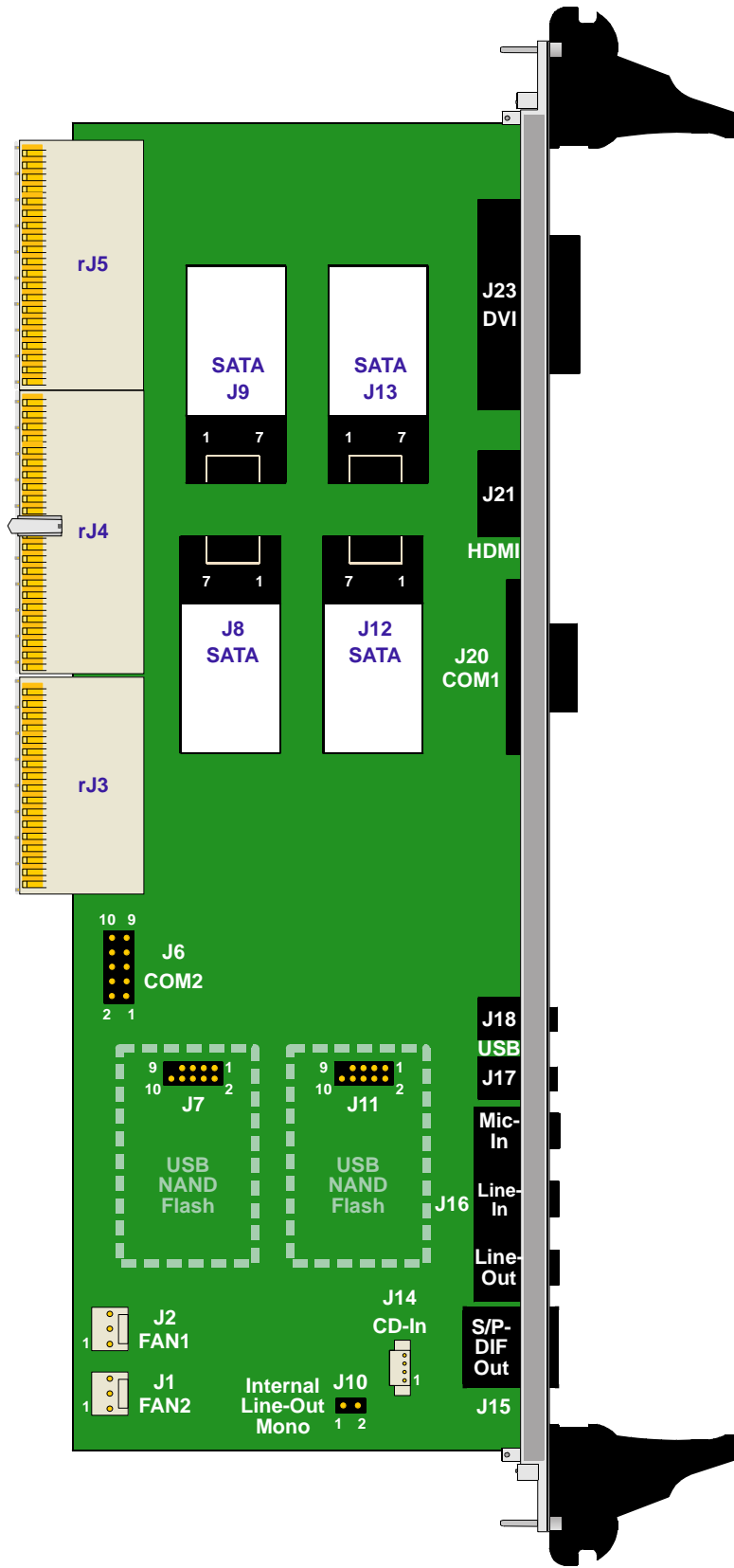
1.4 Technical Specification

Table 1-2: CP-RIO6-Ax/Bx Main Specifications

CP-RIO6-Ax/Bx		SPECIFICATIONS
Front Panel Interfaces	VGA (CP-RIO6-A, CP-RIO6-A216)	One VGA interface on a 15-pin, D-Sub connector, J22, for connecting a standard analog monitor
	DVI-D (CP-RIO6-B, CP-RIO6-B216)	One DVI-D interface (digital only) on a 29-pin DVI connector, J23, for connecting a monitor with a DVI-D interface
	HDMI (CP-RIO6-B, CP-RIO6-B216)	One HDMI interface on a 19-pin HDMI connector, J21, for connecting a monitor with a HDMI interface
	Ethernet (CP-RIO6-A, CP-RIO6-B)	Two Gigabit Ethernet interfaces implemented as a dual RJ-45 connector, J19A/B
	COM1	One serial RS-232 port on a 9-pin, D-Sub connector, J20
	USB	Two USB 2.0 interfaces on type A connectors, J17 and J18
	HD Audio	AD1884A HD audio codec supporting the following ports: • Mic-In stereo port on a 3.5 mm stereo jack (pink), J16 • Line-In stereo port on a 3.5 mm stereo jack (blue), J16 • Line-Out stereo port on a 3.5 mm stereo jack (green), J16 • S/P-DIF-Out digital port on an optical fiber connector (Toslink), J15 The CP-RIO6-Ax/Bx provides no audio jack detection support.
Onboard Interfaces	SATA	Four SATA I interfaces implemented as onboard connectors, J8, J9, J12 and J13, for connecting external SATA devices via a SATA cable
	USB	Two onboard connectors, J7 and J11, for connecting two USB 2.0 NAND Flash modules
	COM2	One onboard serial port implemented as a 10-pin, 2.54 mm connector, J6
	HD Audio	AD1884A HD audio codec supporting the following ports: • CD-In stereo port on a 4-pin onboard connector, J14 • Internal line-out mono port on a 2-pin onboard connector, J10
	Fan	Two fan connectors, J1 and J2, with PWM control and sense inputs for monitoring the fan speed.
	CompactPCI	Three CompactPCI connectors, rJ3, rJ4 and rJ5, for connecting the CP-RIO6-Ax/Bx to the backplane

Table 1-2: CP-RIO6-Ax/Bx Main Specifications (Continued)

CP-RIO6-Ax/Bx		SPECIFICATIONS
General	Temperature Range	Operational: 0°C to +60°C Standard -40°C to +85°C E2 (optional) Storage: -55°C to +85°C Without any additional components ***Note ...*** When additional components are installed, refer to their operational specifications as this will influence the modules' operational and storage temperature.
	MTBF	750253 h (MIL-HDBK-217 FN2, Ground Benign 30°) 1262748 h (Bellcore Issue 6, Ground Benign 30°)
	Mechanical	6U, 4HP, CompactPCI-compliant form factor
	Dimensions	233.35 mm x 80 mm
	Board Weight	CP-RIO6-A: 227 g (without USB NAND Flash module) CP-RIO6-A216: 223 g (without USB NAND Flash module) CP-RIO6-B: 231 g (without USB NAND Flash module) CP-RIO6-B216: 227 g (without USB NAND Flash module)

1.5   Standards

The CP-RIO6-Ax/Bx complies with the requirements of the following standards:

Table 1-3:   Standards for the CP-RIO6-Ax/Bx

TYPE	ASPECT	STANDARD	REMARKS
CE	Emission	EN55022 EN61000-6-3	--
	Immission	EN55024 EN61000-6-2	--
	Electrical Safety	EN60950-1	--
Mechanical	Mechanical Dimensions	IEEE 1101.10	--
Environmental	Climatic Humidity	IEC60068-2-78	93% RH at 40°C, non-condensing
	WEEE	Directive 2002/96/EC	Waste electrical and electronic equipment
	RoHS	Directive 2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment
	Vibration (Sinusoidal)	IEC61131-2 IEC60068-2-6	Test parameters: • 5-150 (Hz) frequency range • 1 (g) acceleration • 1 (oct/min) sweep rate • 10 cycles/axis • 3 axes
	Single Shock	IEC61131-2 IEC60068-2-27	Test parameters: • 15 (g) acceleration • 11 (ms) pulse duration • 3 shocks per direction • 6 directions • 5 (s) recovery time

Note …

Kontron performs comprehensive environmental testing of its products in accordance with applicable standards.

Customers desiring to perform further environmental testing of Kontron products must contact Kontron for assistance prior to performing any such testing. This is necessary, as it is possible that environmental testing can be destructive when not performed in accordance with the applicable specifications.

In particular, for example, boards **without conformal coating** must not be exposed to a change of temperature exceeding 1K/minute, averaged over a period of not more than five minutes. Otherwise, condensation may cause irreversible damage, especially when the board is powered up again.

Kontron does not accept any responsibility for damage to products resulting from destructive environmental testing.

1.6 Related Publications

The following publications contain information relating to the CP-RIO6-Ax/Bx.

Table 1-4:   Related Publications

PRODUCT	PUBLICATION
CompactPCI Systems and Boards	CompactPCI Specification 2.0, Rev. 3.0
	CompactPCI Packet Switching Backplane Specification PICMG 2.16 Rev. 1.0 (CP-RIO6-A216, CP-RIO6-B216)
	Kontron CompactPCI Backplane Manual, ID 24229
HD Audio	Intel's High Definition Audio Specification, Rev. 1.0, April 15, 2004
All Kontron products	Product Safety and Implementation Guide, ID 1021-9142

Chapter **2**

Functional Description

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2. Functional Description

2.1 Board Interfaces

2.1.1 USB Interfaces

The CP-RIO6-Ax/Bx supports four USB 2.0 ports, two on the front panel and two onboard for the USB 2.0 NAND Flash modules. All ports are high-speed, full-speed, and low-speed capable. High-speed USB 2.0 allows data transfers of up to 480 Mb/s. One USB peripheral may be connected to each port. For connecting more USB devices to the CP-RIO6-Ax/Bx than there are available ports, an external USB hub is required.

> ***Note ...***
>
> The USB host interfaces can be used with maximum 500 mA continuous load current as specified in the Universal Serial Bus Specification, Revision 2.0. Short-circuit protection is provided. All the signal lines are EMI-filtered.

> ***Note …***
>
> The rear I/O interface supports the USB 1.1 and USB 2.0 standards. For USB 2.0 it is strongly recommended to use a cable length not exceeding 3 meters.

2.1.1.1 Front Panel USB 2.0 Interface

On the front panel of the CP-RIO6-Ax/Bx, there are two USB interfaces implemented on two 4-pin connectors with the following pinout:

Figure 2-1: USB Con. J17 and J18

J17
1 2 3 4

J18
1 2 3 4
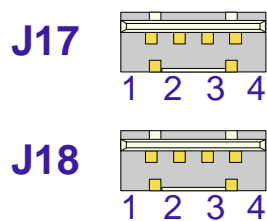
Table 2-1: USB Con. J17 and J18 Pinout

PIN	SIGNAL	FUNCTION	I/O
1	VCC	VCC	--
2	UV0-	Differential USB-	I/O
3	UV0+	Differential USB+	I/O
4	GND	Signal ground	--

2.1.1.2 Onboard USB 2.0 NAND Flash Interface

The CP-RIO6-Ax/Bx has two onboard USB 2.0 interfaces implemented on two 9-pin connectors, J7 and J11, with the following pinout:

Figure 2-2: USB NAND Flash Connectors J7 and J11
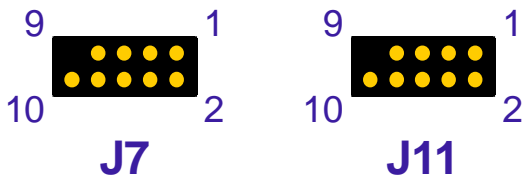
Table 2-2: USB NAND Flash Connectors J7 and J11 Pinout

PIN	SIGNAL	FUNCTION	I/O
1	VCC	VCC	--
3	UV0-	Differential USB-	I/O
5	UV0+	Differential USB+	I/O
7	GND	Signal ground	--
9		Key	
2, 4, 6, 8	NC	Not connected	--
10	Res.	Reserved	--

The J7 and J11 connectors are used to connect two optional USB 2.0 NAND Flash modules qualified by Kontron.

The USB 2.0 NAND Flash module is a USB 2.0-based NAND Flash drive with a built-in full hard-disk emulation and a high data transfer rate. It is optimized for embedded systems providing high performance, reliability and security.

Note ...

Only qualified USB 2.0 NAND Flash modules from Kontron are authorized for use with the CP-RIO6-Ax/Bx. Use of unqualified USB 2.0 NAND Flash modules or improper installation will void the warranty and may result in damage to the CP-RIO6-Ax/Bx or the system.

2.1.2   COM Interfaces

The CP-RIO6-Ax/Bx provides two COM ports, COM1 and COM2.

COM1 is available on the front panel and is implemented as a 9-pin, D-Sub connector, J20.

COM2 is available onboard and is implemented as a 10-pin connector, J6. The configuration of the COM2 port is either RS-232 or RS-422 depending on the CompactPCI CPU board used with the rear transition module.

The following figure illustrates the D-Sub, serial port connector, J20 (COM1).

Figure 2-3: Serial Port Connector J20 (COM1)
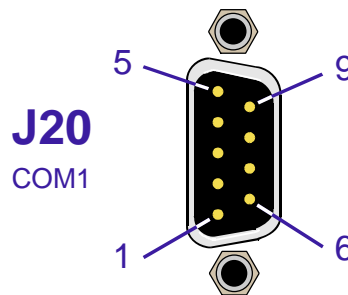
The following table indicates the pinout of the D-Sub, serial port connector, J20 (COM1).

Table 2-3: Serial Port Connector J20 (COM1) Pinout (RS-232)

PIN	SIGNAL	DESCRIPTION	I/O
1	DCD	Data carrier detect	I
2	RXD	Receive data	I
3	TXD	Transmit data	O
4	DTR	Data terminal ready	O
5	GND	Signal ground	--
6	DSR	Data send request	I
7	RTS	Request to send	O
8	CTS	Clear to send	I
9	RI	Ring indicator	I

The following figure illustrates the serial port connector J6 (COM2).

Figure 2-4: Serial Port Connector J6 (COM2)
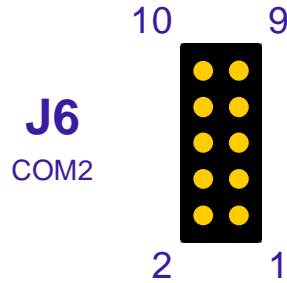
The following table indicates the pinout of the serial port connector J6 (COM2).

Table 2-4: Serial Port Connector J6 (COM2) Pinout (RS-232/RS-422)

RS-232			PIN	RS-422		
I/O	DESCRIPTION	SIGNAL		SIGNAL	DESCRIPTION	I/O
I	Data carrier detect	DCD	1	RX+	Receive data +	I
I	Data send request	DSR	2	RX-	Receive data -	I
I	Receive data	RXD	3	NC	Not connected	--
O	Request to send	RTS	4	NC	Not connected	--
O	Transmit data	TXD	5	TX+	Transmit data +	O
I	Clear to send	CTS	6	TX-	Transmit data -	O
O	Data terminal ready	DTR	7	NC	Not connected	--
I	Ring indicator	RI	8	NC	Not connected	--
--	Signal ground	GND	9	NC	Not connected	--
--	Not connected	NC	10	NC	Not connected	--

2.1.3   VGA Interface

The CP-RIO6-A and the CP-RIO6-A216 provide one 15-pin, female connector, J22, on the front panel. This connector is used to connect an analog VGA (CRT) monitor to the modules.

The following figure illustrates the D-Sub VGA connector J22.

Figure 2-5: D-Sub VGA Connector J22

The following table indicates the pinout of the D-Sub VGA connector J22.

Table 2-5:   D-Sub VGA Connector J22 Pinout

PIN	SIGNAL	FUNCTION	I/O
1	Red	Red video signal output	O
2	Green	Green video signal output	O
3	Blue	Blue video signal output	O
4	NC	Not connected	--
5 - 8	GND	Signal ground	--
9	VCC	Power +5V, 0.5 A fuse protection	O
10	GND	Synchronization ground	--
11	NC	Not connected	--
12	SDA	I²C data (EDID)	I/O
13	Hsync	Horizontal synchronization	TTL Out
14	Vsync	Vertical synchronization	TTL Out
15	SCL	I²C clock (EDID)	I/O

2.1.4   DVI-D Interface

The CP-RIO6-B and the CP-RIO6-B216 provide one 29-pin DVI connector, J23, on the front panel. This connector is used to connect a monitor with DVI-D interface to the modules.

The following figure illustrates the DVI connector J23.

Figure 2-6: DVI Connector J23
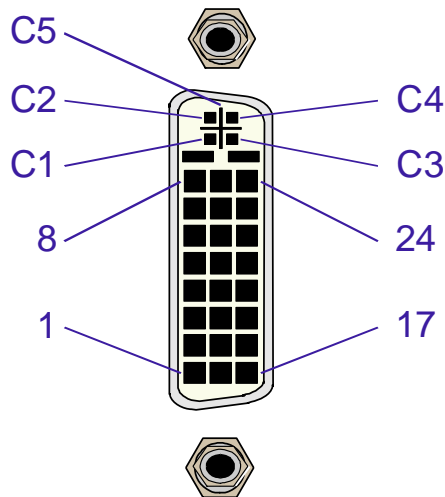
The following table indicates the pinout of the DVI connector J23.

Table 2-6:   DVI Connector J23 Pinout

PIN	SIGNAL	DESCRIPTION	I/O	PIN	SIGNAL	DESCRIPTION	I/O
1	TMDS Data 2-	TMDS Link -	O	2	TMDS Data 2+	TMDS Link +	O
3	GND	Signal ground	--	4	NC	Not connected	--
5	NC	Not connected	--	6	DDC Clock	I²C™ Clock	O
7	DDC Data	I²C™ Data	I/O	8	NC	Not connected	--
9	TMDS Data 1-	TMDS Link -	O	10	TMDS Data 1+	TMDS Link +	O
11	GND	Signal ground	--	12	NC	Not connected	--
13	NC	Not connected	--	14	VCC	Power +5 V, 0.5A fused	--
15	GND	Signal ground	--	16	HPDETECT	Hot Plug Detect	I
17	TMDS Data 0-	TMDS Link -	O	18	TMDS Data 0+	TMDS Link +	O
19	GND	Signal ground	--	20	NC	Not connected	--
21	NC	Not connected	--	22	GND	Signal ground	--
23	TMDS Clock +	TMDS Link +	O	24	TMDS Clock -	TMDS Link -	O
C1	NC	Not connected	--	C2	NC	Not connected	--
C3	NC	Not connected	--	C4	NC	Not connected	--
C5	GND	Signal ground	--				

2.1.5 HDMI Interface

The CP-RIO6-B and the CP-RIO6-B216 provide one 19-pin HDMI connector, J21, on the front panel. This connector is used to connect a monitor with HDMI interface to the modules.

The following figure illustrates the HDMI connector J21.

Figure 2-7: HDMI Connector J21

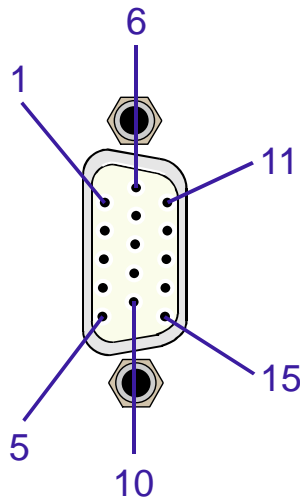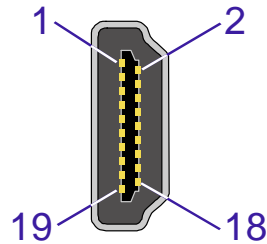The following table indicates the pinout of the HDMI connector J21.

Table 2-7:   HDMI Connector J21 Pinout

PIN	SIGNAL	DESCRIPTION	I/O	PIN	SIGNAL	DESCRIPTION	I/O
1	TMDS Data 2+	TMDS Link +	O	2	GND	Signal ground	--
3	TMDS Data 2-	TMDS Link -	O	4	TMDS Data 1+	TMDS Link +	O
5	GND	Signal ground	--	6	TMDS Data 1-	TMDS Link-	O
7	TMDS Data 0+	TMDS Link +	O	8	GND	Signal ground	--
9	TMDS Data -	TMDS Link -	O	10	TMDS Clock +	TMDS Link +	O
11	GND	Signal ground	--	12	TMDS Clock -	TMDS Link -	O
13	CEC	Control signal	I/O	14	NC	Not connected	--
15	DDC Clock	I²C Clock	O	16	DDC Data	I²C Data	I/O
17	GND	Signal ground	--	18	VCC	Power +5 V, 0.5 A fuse	--
19	HPDETECT	Hot Plug Detect	I				

2.1.6   Gigabit Ethernet Interfaces

The CP-RIO6-A and the CP-RIO6-B provide one dual Gigabit Ethernet connector J19A/B realized as two RJ-45 connectors. The interfaces provide automatic detection and switching between 10Base-T, 100Base-TX and 1000Base-T data transmission (Auto-Negotiation). Auto-wire switching for crossed cables is also supported (Auto MDI-X).

Figure 2-8: Gigabit Ethernet Con. J19A/B

Table 2-8:   Pinout of GbE Connector J19A/B
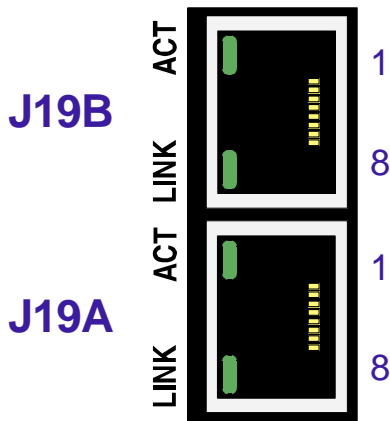
| PIN | MDI / STANDARD ETHERNET CABLE | | | | | |
| | 10BASE-T | | 100BASE-TX | | 1000BASE-T | |
	I/O	SIGNAL	I/O	SIGNAL	I/O	SIGNAL
1	O	TX+	O	TX+	I/O	BI_DA+
2	O	TX-	O	TX-	I/O	BI_DA-
3	I	RX+	I	RX+	I/O	BI_DB+
4	-	-	-	-	I/O	BI_DC+
5	-	-	-	-	I/O	BI_DC-
6	I	RX-	I	RX-	I/O	BI_DB-
7	-	-	-	-	I/O	BI_DD+
8	-	-	-	-	I/O	BI_DD-

Ethernet LED Status

ACT (green): This LED monitors network connection and activity. When this LED is lit, it means that a link has been established. The LED blinks when network packets are sent or received through the RJ-45 port. When this LED is not lit, there is no link established.

LINK (green): This LED lights up to indicate a successful 100Base-TX connection. When not lit and the ACT-LED is active, the connection is operating at 1000Base-T or 10Base-T.

2.1.7 HD Audio Interfaces

The CP-RIO6-Ax/Bx is equipped with an HD audio codec chip, AD1884A, which supports the following audio ports: Mic-In, Line-In, Line-Out, S/P-DIF-Out, CD-In and internal line-out mono. The HD audio codec is directly connected to the I/O Controller Hub on the respective CPU board.

2.1.7.1 HD Audio Specifications

Table 2-9: HD Audio Specifications

INTERFACE		PARAMETER	SPECIFICATIONS
Input	Mic-In (Stereo)	Sampling Rates	8 kHz, 11.025 kHz, 16 kHz, 22.05 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Dynamic Range	85 dB
		Signal-to-Noise Ratio	85 dB
		ADC Resolution	24-bit
		Input Impedance	20 kΩ/unbalanced, Mic. Boost = 0 dB
		Input Sensitivity	typ. 1 Vrms, Mic Boost = 0 dB typ. 0.316 Vrms, Mic. Boost = 10 dB typ. 0.1 Vrms, Mic. Boost = 20 dB typ. 0.032 Vrms, Mic. Boost = 30 dB
		Input Gain/Attenuation Range: All Mixer Inputs	min. -34.5 dB max. +12 dB
		Total Harmonic Distortion (THD + N)	0.013%
		Input BIAS	3.3 V
	Line-In (Stereo)	Sampling Rates	8 kHz, 11.025 kHz, 16 kHz, 22.05 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Dynamic Range	85 dB
		Signal-to-Noise Ratio	85 dB
		ADC Resolution	24-bit
		Input Impedance	20 kΩ/unbalanced
		Input Sensitivity	typ. 1 Vrms
		Total Harmonic Distortion (THD + N)	0.013%

Table 2-9:   HD Audio Specifications (Continued)

INTERFACE		PARAMETER	SPECIFICATIONS
Output	Line-Out (Stereo)	Dynamic Range	90 dB
		Signal-to-Noise Ratio	90 dB
		DAC	24-bit
		Sampling Rates	8 kHz, 11.025 kHz, 16 kHz, 22.05 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Output Impedance	Line-Out mode: typ. 190 Ω Headphone mode: max. 0.5 Ω
		External Load Impedance	Line-Out mode: min. 10 kΩ Headphone mode: min. 32 Ω
		Output Level	min. 1 Vrms (full-scale output voltage)
		Total Harmonic Distortion (THD + N)	0.006%
	Internal Line-Out Mono	Output Impedance	typ. 190 Ω
		External Load Impedance	min. 10 kΩ
		Output Level	min. 1 Vrms (full-scale output voltage)
	S/P-DIF-Out (Optical)	Dynamic Range	90 dB
		Signal-to-Noise Ratio	90 dB
		DAC	24-bit
		Sampling Rates	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz
		Formats	PCM, AC3

2.1.7.2   Mic-In, Line-In and Line-Out Interfaces
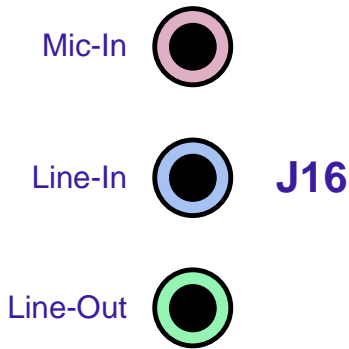
Figure 2-9: Triple Audio Jack 16

Mic-In

Line-In   **J16**

Line-Out

The CP-RIO6-Ax/Bx provides one audio triple jack on the front panel with the following audio interfaces:

- Microphone-Input stereo port on 3.5 mm jack (pink)
- Line-Input stereo port on 3.5 mm jack (blue)
- Line-Output stereo port with headphone detection on 3.5 mm jack (green)

The audio interfaces mentioned in this section comply with the High Definition Audio Specification Rev. 1.0. except that there is no audio jack detection support provided.

2.1.7.3   S/P-DIF-Out Interface
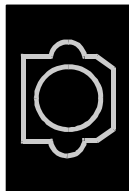
Figure 2-10: S/P-DIF-Out Connector 15

The CP-RIO6-Ax/Bx provides one S/P-DIF-Out interface implemented on an optical fiber connector (Toslink), J15, on the front panel. This connector is used to transmit digital audio data, for example, via a decoder.

2.1.7.4   CD-In Interface

The CP-RIO6-Ax/Bx provides one CD-In interface implemented on an 4-pin onboard connector, J14, used to connect a peripheral audio device, such as a CD-ROM.

Figure 2-11: CD-In Connector J14
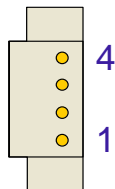
Table 2-10: CD-In Connector J14 Pinout

PIN	SIGNAL	DESCRIPTION	I/O
1	Left	Left channel audio signal	I
2	GND_AUD	Signal ground audio	--
3	Right	Right channel audio signal	I
4	GND_AUD	Signal ground audio	--

2.1.7.5   Internal Line-Out Mono Interface

The CP-RIO6-Ax/Bx provides one internal line-out mono interface implemented on a 2-pin onboard connector, J10, used to connect an audio device such as a mono active speaker with an external load impedance of min. 10 kΩ.

Figure 2-12: Internal Line-Out Mono Connector J10

Table 2-11: Internal Line-Out Mono Connector J10 Pinout

PIN	SIGNAL	DESCRIPTION	I/O
1	Mono-Out	Mono signal output	O
2	GND_AUD	Signal ground audio	--

2.1.8 FAN Connectors

The CP-RIO6-Ax/Bx has two 3-pin onboard fan connectors, J1 and J2, used to connect two external cooling fans.

Figure 2-13: Fan Control Con. J1 and J2
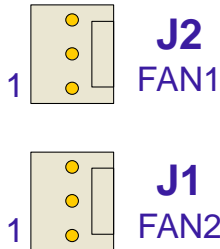
Table 2-12: Fan Control Con. J1 and J2 Pinout

PIN	SIGNAL	DESCRIPTION	I/O
1	GND	Signal ground	--
2	PWM	Fan Supply Voltage (12V)	O
3	SENSE	Fan Sense	I

Note ...

The maximum allowable continuous load current on each fan interface is 300 mA.

2.1.9 Serial ATA Interfaces

The CP-RIO6-Ax/Bx provides four onboard SATA I interfaces implemented as four onboard SATA connectors used to connect standard SATA devices via a SATA cable.

Figure 2-14: SATA Con. J8, J9, J12 and J13

Table 2-13: SATA Con. J8, J9, J12 and J13 Pinout
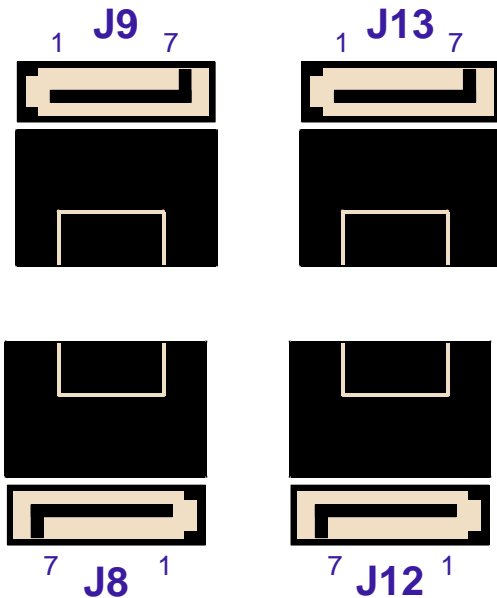
PIN	SIGNAL	FUNCTION	I/O
1	GND	Signal ground	--
2	SATA_TX0+	Differential Transmit +	O
3	SATA_TX0-	Differential Transmit -	O
4	GND	Signal ground	--
5	SATA_RX0-	Differential Receive -	I
6	SATA_RX0+	Differential Receive +	I
7	GND	Signal ground	--

Note …

To ensure secure connectivity, the SATA connector supports the use of SATA II cables (SATA cables with locking latch).

2.1.10   Rear I/O Interface on CompactPCI Connectors rJ3, rJ4 and rJ5

The CP-RIO6-Ax/Bx is equipped with three CompactPCI rear I/O connectors, rJ3, rJ4 and rJ5.

Warning!

To support the rear I/O feature, a 6U CompactPCI backplane with rear I/O support as well as a compatible and correctly configured CPU board are required. Do not plug the CP-RIO6-Ax/Bx in a backplane without rear I/O support. Failure to comply with the above will result in damage to the CP-RIO6-Ax/Bx.

Figure 2-15: Rear I/O CompactPCI Connectors rJ3, rJ4 and rJ5
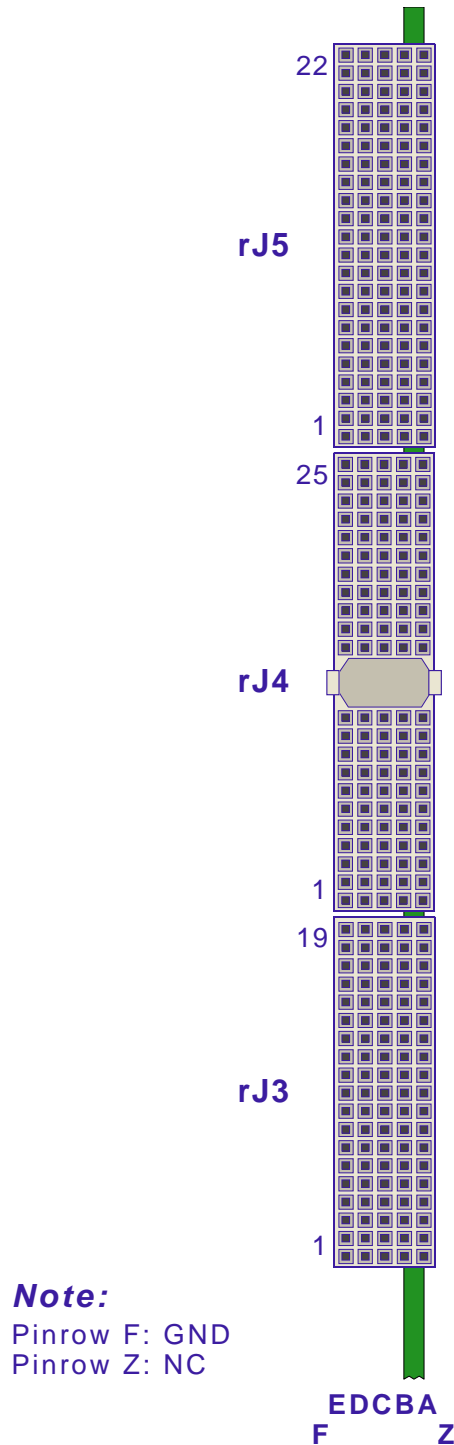
Note:
Pinrow F: GND
Pinrow Z: NC

Table 2-14:   **Rear I/O CompactPCI Rear I/O Connector rJ3 Pinout**

PIN	Z	A	B	C	D	E	F
19	NC	RIO_VCC	RIO_VCC	RIO_3.3V	RIO_+12V	RIO_-12V	GND
18	NC	LPa_DA+	LPa_DA-	GND	LPa_DC+	LPa_DC-	GND
17	NC	LPa_DB+	LPa_DB-	GND	LPa_DD+	LPa_DD-	GND
16	NC	LPb_DA+	LPb_DA-	GND	LPb_DC+	LPb_DC-	GND
15	NC	LPb_DB+	LPb_DB-	GND	LPb_DD+	LPb_DD-	GND
14	NC	LPa:LINK	LPb:LINK	LPab:CT1	LPc:LINK	FAN:SENSE2	GND
13	NC	LPa:ACT	LPb:ACT	NC	NC	FAN:SENSE1	GND
12	NC	NC	NC	GND	NC	NC	GND
11	NC	NC	NC	GND	NC	NC	GND
10	NC	USB1:VCC	USB0:VCC	GND	USB3:VCC	USB2:VCC	GND
9	NC	USB1:D-	USB1:D+	GND	USB3:D-	USB3:D+	GND
8	NC	USB0:D-	USB0:D+	GND	USB2:D-	USB2:D+	GND
7	NC	RIO_3.3V	NC	ID3	ID4	SPEAKER	GND
6	NC	VGA:RED	VGA:GREEN	VGA:SDA	NC	NC	GND
5	NC	VGA:BLUE	VGA:HSYNC	VGA:VSYNC	VGA:SCL	NC	GND
4	NC	NC	NC	SP1:TX-	SP1:TX+	NC	GND
3	NC	NC	NC	SP1:RX-	SP1:RX+	NC	GND
2	NC	SP0:RI	SP0:DTR	SP0:CTS	SP0:TX	NC	GND
1	NC	SP0:RTS	SP0:RX	SP0:DSR	SP0:DCD	ID1	GND

Warning!

The RIO_XXX signals are power supply **INPUTS** to supply the CP-RIO6-Ax/Bx with power from the CPU board. These pins **MUST NOT** be connected to any other power source, either within the backplane itself or within the CP-RIO6-Ax/Bx.

Failure to comply with the above will result in damage to the CP-RIO6-Ax/Bx.

The following table describes the signals of the rJ3 connector.

Table 2-15: Rear I/O CompactPCI Rear I/O Connector rJ3 Signals

SIGNAL	DESCRIPTION
SP0	COM1 port
SP1	COM2 port
USB0	USB port 0 routed to J17
USB1	USB port 1 routed to J18
USB2	USB port 2 routed to J7
USB3	USB port 3 routed to J11
SPEAKER	Standard PC speaker
FAN	Fan sensoring
LPa	Rear I/O LAN port B
LPb	Rear I/O LAN port A
VGA	VGA (CRT) port

2.1.10.1   States of ID Bits

The pins E1 (bit ID1), C7 (bit ID3), and D7 (bit ID4) have the following states.

Bit ID1 is used to indicate the presence of a rear transition module.

Table 2-16: Bit ID1 States

ID1	DEFINITION
0	CP-RIO6-Ax/Bx present (grounded)
1	CP-RIO6-Ax/Bx not present (opened)

Bits ID4 and ID3 are used to identify the rear transition module version detected.

Table 2-17: Bits ID4 and ID3 States

ID[4:3]	DEFINITION
11	Kontron pinout version 1.X (IDE, FD)
10	Reserved
01	Kontron pinout version 2.X (DVI, HDMI, HDA) used on the CP-RIO6-Ax/Bx
00	Reserved

Table 2-18: Rear I/O CompactPCI Rear I/O Connector rJ4 Pinout

PIN	Z	A	B	C	D	E	F
25	NC	NC	NC	GND	NC	NC	GND
24	NC	NC	NC	GND	NC	NC	GND
23	NC	NC	RIO_5V	GND	NC	RIO_3.3V	GND
22	NC	NC	NC	GND	NC	NC	GND
21	NC	NC	NC	GND	NC	NC	GND
20	NC	GND	GND	GND	GND	GND	GND
19	NC	NC	NC	GND	NC	NC	GND
18	NC	NC	NC	GND	NC	NC	GND
17	NC	GND	GND	GND	GND	GND	GND
16	NC	NC	NC	GND	NC	NC	GND
15	NC	NC	NC	GND	NC	NC	GND
12-14				Key Area			
11	NC	NC	NC	GND	NC	NC	GND
10	NC	NC	NC	GND	NC	NC	GND
9	NC	GND	GND	GND	GND	GND	GND
8	NC	NC	NC	GND	NC	NC	GND
7	NC	NC	NC	GND	NC	NC	GND
6	NC	GND	GND	GND	GND	GND	GND
5	NC	NC	NC	GND	NC	NC	GND
4	NC	NC	NC	GND	NC	NC	GND
3	NC	GND	GND	GND	GND	GND	GND
2	NC	NC	NC	GND	NC	NC	GND
1	NC	NC	NC	GND	NC	NC	GND

Warning!

The RIO_XXX signals are power supply **INPUTS** to supply the CP-RIO6-Ax/Bx with power from the CPU board. These pins **MUST NOT** be connected to any other power source, either within the backplane itself or within the CP-RIO6-Ax/Bx.

Failure to comply with the above will result in damage to the CP-RIO6-Ax/Bx.

Table 2-19: Rear I/O CompactPCI Rear I/O Connector rJ5 Pinout

PIN	Z	A	B	C	D	E	F
22	NC	SATA:LED#	PWM1:OUT	GND	PWM2:OUT	NC	GND
21	NC	HDA:SYNC	HDA:RST#	GND	HDA:SDOUT	NC	GND
20	NC	NC	HDA:SDIN1	GND	NC	HDA:SDIN2	GND
19	NC	GND	GND	GND	NC	HDA:BITCLK	GND
18	NC	DVI2:D0+	DVI2:D0-	GND	GND	GND	GND
17	NC	DVI2:D2+	DVI2:D2-	GND	DVI2:D1+	DVI2:D1-	GND
16	NC	RIO_3.3V	DVI2:HPDET	GND	RIO_3.3V	RIO_3.3V	GND
15	NC	DVI2:CLK+	DVI2:CLK-	GND	DVI2:SDA	DVI2:SDC	GND
14	NC	GND	GND	GND	GND	GND	GND
13	NC	DVI1:D0+	DVI1:D0-	GND	DVI1:D1+	DVI1:D1-	GND
12	NC	DVI1:D2+	DVI1:D2-	GND	NC	NC	GND
11	NC	NC	DVI1:HPDET	GND	DVI1:SDA	DVI1:SDC	GND
10	NC	DVI1:CLK+	DVI1:CLK-	GND	NC	NC	GND
9	NC	GND	GND	GND	GND	GND	GND
8	NC	HT3:TX+	HT3:TX-	GND	HT3:RX+	HT3:RX-	GND
7	NC	GND	GND	GND	GND	GND	GND
6	NC	HT2:TX+	HT2:TX-	GND	HT2:RX+	HT2:RX-	GND
5	NC	GND	GND	GND	GND	GND	GND
4	NC	HT1:TX+	HT1:TX-	GND	HT1:RX+	HT1:RX-	GND
3	NC	GND	GND	GND	GND	GND	GND
2	NC	HT0:TX+	HT0:TX-	GND	HT0:RX+	HT0:RX-	GND
1	NC	GND	GND	GND	GND	GND	GND

Warning!

The RIO_XXX signals are power supply **INPUTS** to supply the CP-RIO6-Ax/Bx with power from the CPU board. These pins **MUST NOT** be connected to any other power source, either within the backplane itself or within the CP-RIO6-Ax/Bx.

Failure to comply with the above will result in damage to the CP-RIO6-Ax/Bx.

The following table describes the signals of the rJ5 connector.

Table 2-20:   Rear I/O CompactPCI Rear I/O Connector rJ5 Signals

SIGNAL	DESCRIPTION
HT0	SATA port 0 routed to J8
HT1	SATA port 1 routed to J12
HT2	SATA port 2 routed to J9
HT3	SATA port 3 routed to J13
DVI1	HDMI signaling
DVI2	DVI signaling
PWM	Pulse width modulation output for fan
HDA	High definition audio signaling

Chapter **3**

Installation

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3.   Installation

The CP-RIO6-Ax/Bx has been designed for easy installation. However, the following standard precautions, installation procedures, and general information must be observed to ensure proper installation and to preclude damage to the CP-RIO6-Ax/Bx, other system components, or injury to personnel.

3.1   Safety Requirements

The following safety precautions must be observed when installing or operating the CP-RIO6-Ax/Bx. Kontron assumes no responsibility for any damage resulting from failure to comply with these requirements.

Caution!

Ensure that the system main power is removed prior to installing or removing the CP-RIO6-Ax/Bx. Ensure that there are no other external voltages or signals being applied to the CP-RIO6-Ax/Bx or other boards within the system. Failure to do so could endanger your life or health and may damage the CP-RIO6-Ax/Bx or other system components including process-side signal conditioning equipment.

ESD Equipment!

The CP-RIO6-Ax/Bx contains electrostatically sensitive devices. Please observe the necessary precautions to avoid damage to the CP-RIO6-Ax/Bx:

- Discharge your clothing before touching the assembly. Tools must be discharged before use.
- Do not touch components, connector-pins or traces.
- If working at an anti-static workbench with professional discharging equipment, please do not omit to use it.

3.2 Initial Installation Procedures

The following procedures are applicable only for the initial installation of the CP-RIO6-Ax/Bx in a system.

To perform an initial installation of both the CP-RIO6-Ax/Bx in a system, proceed as follows:

1. Ensure that the safety requirements indicated Chapter 3.1 are observed.

> *Warning!*
>
> Failure to comply with the instruction below may cause damage to the CP-RIO6-Ax/Bx or result in improper system operation.

2. Ensure that the CP-RIO6-Ax/Bx is compatible with the CPU board and the backplane prior to installation.

3. If appropriate, ensure that the onboard peripheral devices are properly installed prior to installation.

4. Ensure that no power is applied to the system before proceeding.

> *Warning!*
>
> Even though power may be removed from the system, the CP-RIO6-Ax/Bx front panel cables may have power applied which comes from an external source.
>
> In addition, these cables may be connected to devices that can be damaged by electrostatic discharging or short-circuiting of pins.
>
> It is the responsibility of the system designer or integrator to ensure that appropriate measures are taken to preclude damage to the system or injury to personnel which may arise from the handling of these cables (connecting or disconnecting).
>
> Kontron disclaims all liability for damages or injuries resulting from failure to comply with the above.

> *Warning!*
>
> When performing the next step, **DO NOT** push the CP-RIO6-Ax/Bx into the backplane connectors. Use the ejector handles to seat the CP-RIO6-Ax/Bx into the backplane connectors.

5. Carefully insert the CP-RIO6-Ax/Bx into the slot designated by the application requirements for the CP-RIO6-Ax/Bx until it makes contact with the backplane connectors.
6. Using both ejector handles, engage the CP-RIO6-Ax/Bx with the backplane. When the ejector handles are locked, the CP-RIO6-Ax/Bx is engaged.
7. Fasten the two front panel retaining screws.
8. Connect all external interfacing cables to the CP-RIO6-Ax/Bx as required.
9. Ensure that the CP-RIO6-Ax/Bx and all required interfacing cables are properly secured.

The CP-RIO6-Ax/Bx is now ready for initial operation.

3.3   Standard Removal Procedures

To remove the CP-RIO6-Ax/Bx proceed as follows:

1. Ensure that the safety requirements indicated in Chapter 3.1 are observed.

> ***Warning!***
>
> Care must be taken when applying the procedures below to ensure that neither the CP-RIO6-Ax/Bx nor system boards are physically damaged by the application of these procedures.

2. Ensure that no power is applied to the system before proceeding.

> ***Warning!***
>
> Even though power may be removed from the system, the CP-RIO6-Ax/Bx front panel cables may have power applied which comes from an external source.
>
> In addition, these cables may be connected to devices that can be damaged by electrostatic discharging or short-circuiting of pins.
>
> It is the responsibility of the system designer or integrator to ensure that appropriate measures are taken to preclude damage to the system or injury to personnel which may arise from the handling of these cables (connecting or disconnecting).
>
> Kontron disclaims all liability for damages or injuries resulting from failure to comply with the above.

3. Disconnect any interfacing cables that may be connected to the CP-RIO6-Ax/Bx.
4. Unscrew the front panel retaining screws.
5. Disengage the CP-RIO6-Ax/Bx from the backplane by first unlocking the ejection handles and then by pressing the handles as required until the CP-RIO6-Ax/Bx is disengaged.
6. After disengaging the CP-RIO6-Ax/Bx from the backplane, pull it out of the slot.
7. Dispose of the CP-RIO6-Ax/Bx as required.

3.4   Installation of Peripheral Devices

The CP-RIO6-Ax/Bx is designed to accommodate a variety of peripheral devices whose installation varies considerably. The following chapters provide information regarding installation aspects and not detailed procedures.

3.4.1   USB Device Installation

The CP-RIO6-Ax/Bx supports all USB Plug and Play computer peripherals (e.g. keyboard, mouse, printer, etc.).

> ***Note ...***
>
> All USB devices may be connected or removed while the host or other peripherals are powered up.

3.4.2 USB 2.0 NAND Flash Module Installation

Two USB 2.0 NAND Flash modules may be connected to the CP-RIO6-Ax/Bx via the onboard USB 2.0 NAND Flash connectors, J7 and J11.

The USB 2.0 NAND Flash module must be physically installed on the CP-RIO6-Ax/Bx prior to installation of the CP-RIO6-Ax/Bx in a system.

During installation it is necessary to ensure that the USB 2.0 NAND Flash module is properly seated in the onboard USB 2.0 NAND Flash connector, i.e. the pins are correctly aligned and not bent.

Note ...

Only qualified USB 2.0 NAND Flash modules from Kontron are authorized for use with the CP-RIO6-Ax/Bx. Use of unqualified USB 2.0 NAND Flash modules or improper installation will void the warranty and may result in damage to the CP-RIO6-Ax/Bx or the system.

3.4.3 Installation of External Serial ATA Devices

Up to four external SATA devices may be connected to the CP-RIO6-Ax/Bx via the onboard SATA connectors J8, J9, J12, and J13 as well as the appropriate SATA cables.

Some symptoms of incorrectly installed SATA devices are:

- Device on a SATA channel does not spin up: check power cables and cabling. May also result from a bad power supply or SATA device.
  The SATA connector on the CP-RIO6-Ax/Bx provides only a data connection. The power for this device must be supplied by a separate connector. For further information, refer to the respective documentation of the device.

- SATA device fail message at boot-up: may be a bad cable or lack of power going to the drive.

Warning!

The incorrect connection of power or data cables may damage the SATA device and/or the CP-RIO6-Ax/Bx.