EKF SYSTEM

Technical Information

PCS-BALLET
Mezzanine I/O Expansion Board
Multifunction Side Card

Edition 13

Document No. 6597 • 8 September 2017

Contents

About this Manual

This manual is a short form description of the technical aspects of the PCS-BALLET, required for installation and system integration. It is intended for the advanced user only. The latest version of this document may be obtained from www.ekf.com/p/pcs/pcs_ti.pdf.

Edition History

Ed.	Contents/*Changes*	Author	Date
1	Technical Information PCS-BALLET, english, preliminary edition Text #6597, File: pcs_ti.wpd	jj	10 January 2012
2	Modified J1 rear I/O USB port assignment due to CPCI Serial backplane stiffeners which would cause a short-circuit fault across pin rows J1 23/24/25 (all tied to GND now) Added images DisplayPort adapter cables	jj	26 January 2012
3	RIO incompatibility for CPCI Serial systems addressed	jj	1 February 2012
4	Photos added 12HP Assembly, SATA controllers now Marvell (was Jmicron)	jj	16 January 2013
5	Photos added 8HP Assembly	jj	17 January 2013
6	Added photos w. 2.5-inch SSD & C20-SATA module	jj	21 January 2013
7	Added photos w. C41-CFAST, C43-SATA, Half-Slim SATA SSD	jj	22 January 2013
8	Added photo SC1-PCS explodes view	jj	6 February 2013
9	Fixed pin assignment DisplayPort connector (was mDP pin numbering)	jj	4 March 2013
10	Added information DP connector spacer PCB C21 & C66	jj	3 April 2013
11	Fixed mix-up for connector J1 pin assignment	jj	28 June 2017
12	Added recommendation Schroff and Elma rear I/O backplanes	jj	5 September 2017
13	Updated photos	jj	8 September 2017

Related Documents

Related Information PCS-BALLET	
PCS-BALLET Home	www.ekf.com/p/pcs/pcs.html
PCS-BALLET Product Information	www.ekf.com/p/pcs/pcs_pi.pdf
PCS-BALLET Technical Information (this document)	www.ekf.com/p/pcs/pcs_ti.pdf

Related Documents CompactPCI® PlusIO & CompactPCI® Serial	
CompactPCI® PlusIO Home	www.ekf.com/p/plus.html
CompactPCI® Serial Home	www.ekf.com/s/serial.html

Nomenclature

Signal names used herein with an attached '#' designate active low lines.

Trade Marks

Some terms used herein are property of their respective owners, e.g.

▸ Core™, Atom™: ® Intel
▸ CompactPCI, CompactPCI PlusIO, CompactPCI Serial: ® PICMG
▸ Windows: ® Microsoft
▸ EKF, ekf system: ® EKF

EKF does not claim this list to be complete.

Legal Disclaimer - Liability Exclusion

This manual has been edited as carefully as possible. We apologize for any potential mistake. Information provided herein is designated exclusively to the proficient user (system integrator, engineer). EKF can accept no responsibility for any damage caused by the use of this manual.

Standards

Reference Documents		
Term	**Document**	**Origin**
CFast™	CFast™ Specification Rev. 1.0	www.compactflash.org
CompactFlash®	CFA™ CompactFlash Specification Rev. 4.1	www.compactflash.org
CompactPCI®	CompactPCI Specification, PICMG® 2.0 R3.0, Oct. 1, 1999	www.picmg.org
CompactPCI® PlusIO	CompactPCI PlusIO Specification, PICMG® 2.30 R1.0, November 11, 2009	www.picmg.org
CompactPCI® Serial	PICMG® CPCI-S.0	www.picmg.org
DisplayPort®	VESA DisplayPort Standard Version 1.1 March 19, 2007 VESA Mini DisplayPort Connector Standard Version 1 October 26, 2009	www.vesa.org
DVI	Digital Visual Interface Rev. 1.0 Digital Display Working Group	www.ddwg.org
Ethernet	IEEE Std 802.3, 2000 Edition	standards.ieee.org
LPC	Low Pin Count Interface Specification, Revision 1.1	developer.intel.com/design/ chipsets/industry/lpc.htm
Micro SATA	SFF-8144 Specification	ftp://ftp.seagate.com/sff
microSDHC	SD Card Specifications	www.sdcard.org
mSATA	Jedec MO-300B mSATA SSD Assembly	www.jedec.org
HD Audio	High Definition Audio Specification Rev.1.0	www.intel.com/design/chipsets/hd audio.htm
PCI Express®	PCI Express® Base Specification 3.0	www.pcisig.com
PCI Express® Mini Card	PCI Express ® Mini Card Electromechanical Specification	www.pcisig.com
SATA	Serial ATA Specifications	www.sata-io.org
USB	USB 3.0 Universal Serial Bus Specification (SuperSpeed) USB 2.0 Universal Serial Bus Specification	www.usb.org

Features

Feature Summary

- ▸ 3U/4HP Mezzanine Side Card (8HP or 12HP assembly stack height) for EKF CPU boards

- ▸ Suitable for EKF CompactPCI® PlusIO CPU cards e.g.
    - ▸ PC3-ALLEGRO
    - ▸ PC4-PRESTO
    - ▸ PC5-LARGO
- ▸ Suitable for EKF CompactPCI® Serial CPU cards (w/o rear I/O) e.g.
    - ▸ SC2-PRESTO
    - ▸ SC3-LARGO

- ▸ 2 x USB 3.0 xHCI SuperSpeed F/P connectors
- ▸ DisplayPort F/P connector
- ▸ Analog Audio F/P jacks
- ▸ Either RS-232 F/P D-Sub (male) or Digital Audio (stuffing option) D-Sub (female)
- ▸ Option C32-FIO legacy front panel I/O (RS-232, KB/MS, Audio - additional 4HP F/P width)
- ▸ Integrated front panel CPU card and PCS-BALLET (8HP in total, 12HP when C32-FIO third floor mezzanine is installed in addition)

- ▸ Option on-Board SATA SSD/HDD 2.5-inch or Half-Slim SATA module
- ▸ Option C20-SATA - single/dual 2.5-inch SSD/HDD mezzanine card
- ▸ Option C41-CFAST - CFast™ SSD socket mezzanine card
- ▸ Option C42-SATA - 1.8-Inch Solid State Drive mezzanine card
- ▸ Option C47-MSATA - dual mSATA Module mezzanine card
- ▸ Option C48-M2 - dual M.2 SATA SSD mezzanine card
- ▸ Up to three SATA connectors for system internal devices

- ▸ Rear I/O option J1/J2 (SATA, USB, KB/MS, UART, GPIO) available for CPCI Classic CPU carrier boards (not available for CPCI Serial CPU carrier cards)

- ▸ Long Term Availability
- ▸ Coating, Sealing, Underfilling on request
- ▸ RoHS compliant 2002/95/EC
- ▸ Operating temperature: 0°C to +70°C (industrial temperature range on request)
- ▸ Storage temperature: -40°C to +85°C, max. gradient 5°C/min
- ▸ Humidity 5% ... 95% RH non condensing
- ▸ Altitude -300m ... +3000m
- ▸ Shock 15g 0.33ms, 6g 6ms
- ▸ Vibration 1g 5-2000Hz
- ▸ EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)

General Information

Available as a mezzanine add-on expansion board (aka side board) to the PC3-ALLEGRO, SC2-PRESTO and successor CompactPCI® PlusIO and CompactPCI® Serial CPU cards, the **PCS-BALLET** *provides a number of frequently required I/O functions. In addition, the user can choose between several SATA based on-board mass storage solutions.*

For dual- or triple-screen applications (in addition to the primary DP video connector(s) on the CPU carrier board), the PCS-BALLET front panel is equipped with a DisplayPort connector. The on-board USB 3.0 SuperSpeed controller allows for attachment of high speed external devices. Audio and legacy signal support is provided in addition.

PCS-BALLET (8HP Assembly Stack w. PC4-PRESTO CPU Carrier Card)

System Requirements

The PCS-BALLET is a mezzanine side card, to be fixed on top of a suitable CPU carrier board. The pitch between carrier PCB and mezzanine PCB is 4HP, resulting in a 8HP common front panel for the entire assembly. Up to four mezzanine inter-board connectors are in use, for distribution of legacy and high speed I/O signals from the CPU carrier to the side board. These are referred to as *HSE* (SATA & USB 2.0 High Speed Expansion), *EXP* (Legacy Expansion), *PCIE* (PCI Express® x 4), and *DP* (DisplayPort). The mezzanine connectors are situated on the bottom side of the PCS-BALLET, facing towards their mating CPU card connectors.

The PCS-BALLET also is a carrier board itself, which can accommodate a low profile storage module or SATA drive, and a front panel I/O expansion card as an option.

With respect to the system backplane, it is recommended to have the CPU card system slot on the right edge, in order to prevent loss of a peripheral slot (the PCS-BALLET is then positioned out of backplane shape). The rear I/O option requires a single slot P1/P2 RIO backplane in addition, and is available with CompactPCI® CPU carrier cards only, such as the PC4-PRESTO.

Mezzanine Connectors (HSE, EXP, PCIE, DP)

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
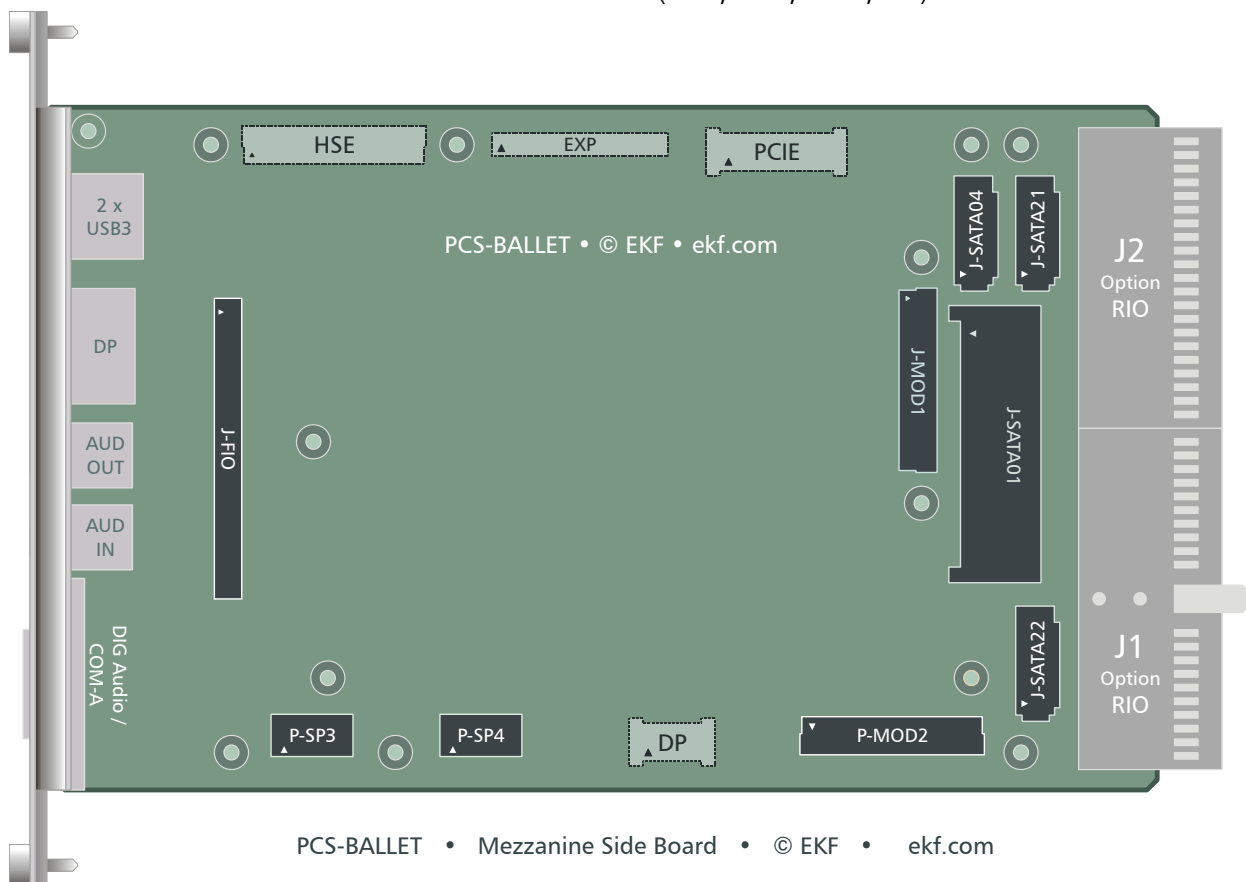
Related Information CPU Carrier Cards	
PC1-GROOVE (CompactPCI® PlusIO)	www.ekf.com/p/pc1/pc1.html
PC3-ALLEGRO (CompactPCI® PlusIO)	www.ekf.com/p/pc3/pc3.html
PC4-PRESTO (CompactPCI® PlusIO)	www.ekf.com/p/pc4/pc4.html
PC5-LARGO (CompactPCI® PlusIO)	www.ekf.com/p/pc5/pc5.html
SC1-ALLEGRO (CompactPCI® Serial)	www.ekf.com/s/sc1/sc1.html
SC2-PRESTO (CompactPCI® Serial)	www.ekf.com/s/sc2/sc2.html
SC3-LARGO (CompactPCI® Serial)	www.ekf.com/s/sc3/sc3.html

For the CompactPCI® Serial CPU cards SC1 - SC3 consider also the SCS-TRUMPET side card, which offers similar features as the PCS-BALLET, with a rear I/O connector suite conforming to the CompactPCI® Serial specification.

CPU Carrier to Mezzanine Side Card Connector Suite

Storage Options

The PCS-BALLET can accommodate a 2.5-inch SATA drive (SATA01 docking connector), which is also suitable for a Half-Slim SATA module.

As an alternate, low profile Flash based mezzanine storage modules are available that fit on the PCS-BALLET (MOD1 mezzanine connector).

The C42-SATA module e.g. is equipped with a 1.8-inch SATA Solid State Drive (SSD). The C47-MSATA module can hold two mSATA Mini Cards. The SATA channels related to these storage options are derived from the CPU carrier card via the mezzanine connector HSE. The PCS-BALLET is equipped with on-board SATA redrivers for optimum signal integrity.

PCS-BALLET • Option 2.5-Inch on-Board SSD

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com

Related Documents Low Profile Mezzanine Storage Modules	
C40 ... C48 Series Mezzanine Storage Modules Overview	www.ekf.com/c/ccpu/c4x_mezz_ovw.pdf
C42-SATA Mezzanine Storage Module	www.ekf.com/c/ccpu/c42/c42.html
C47-MSATA Mezzanine Storage Module	www.ekf.com/c/ccpu/c47/c47.html
C48-M2 Mezzanine Storage Module	www.ekf.com/c/ccpu/c48/c48.html
The EKF Mezzanine Module Concept	www.ekf.com/c/ccpu/cpci_mezzanine_evolution.pdf

PCS-BALLET • Option C42-SATA Low Profile Storage Module

HSE

EXP

PCIE

2 x
USB3

DP

AUD
OUT

AUD
IN

DIG Audio /
COM-A

J-FIO

Option
C42-SATA
1.8-Inch SSD
Mezzanine

J-MOD1

J-SATA04

J-SATA21

J-SATA01

J-SATA22

J2
Option
RIO

J1
Option
RIO

P-SP3

P-SP4

DP

P-MOD2

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
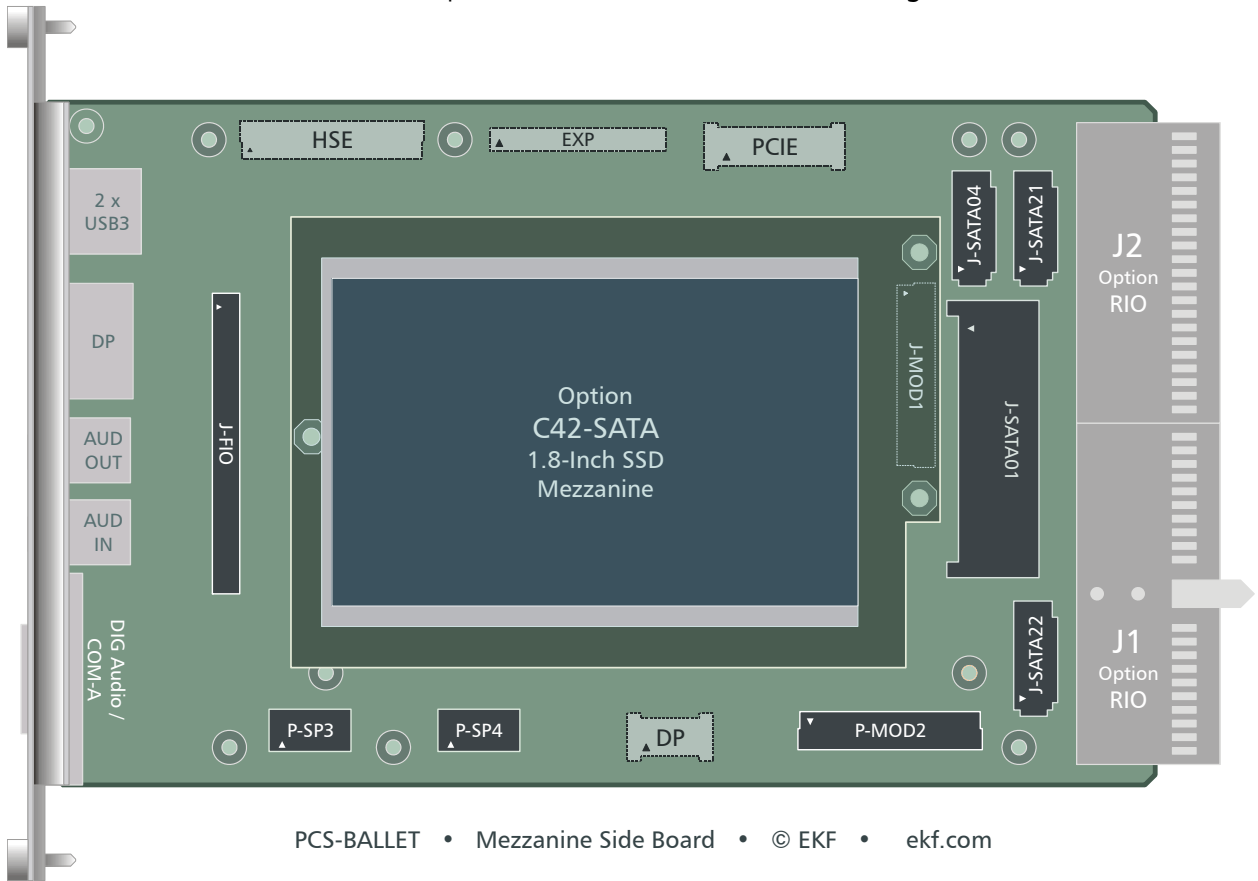
C42-SATA • Solid State Drive Mezzanine Module

PCS-BALLET • Option C47-MSATA Low Profile Storage Module

HSE

EXP

PCIE

2 x USB3

DP

AUD OUT

AUD IN

DIG Audio / COM-A

J-FIO

Full/ Half Size

mSATA SSD 1

Full/ Half Size

mSATA SSD 2

C47-MSATA © EKF

J-MOD1

J-SATA01

J-SATA04

J-SATA21

J-SATA22

J2 Option RIO

J1 Option RIO

P-SP3

P-SP4

DP

P-MOD2

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
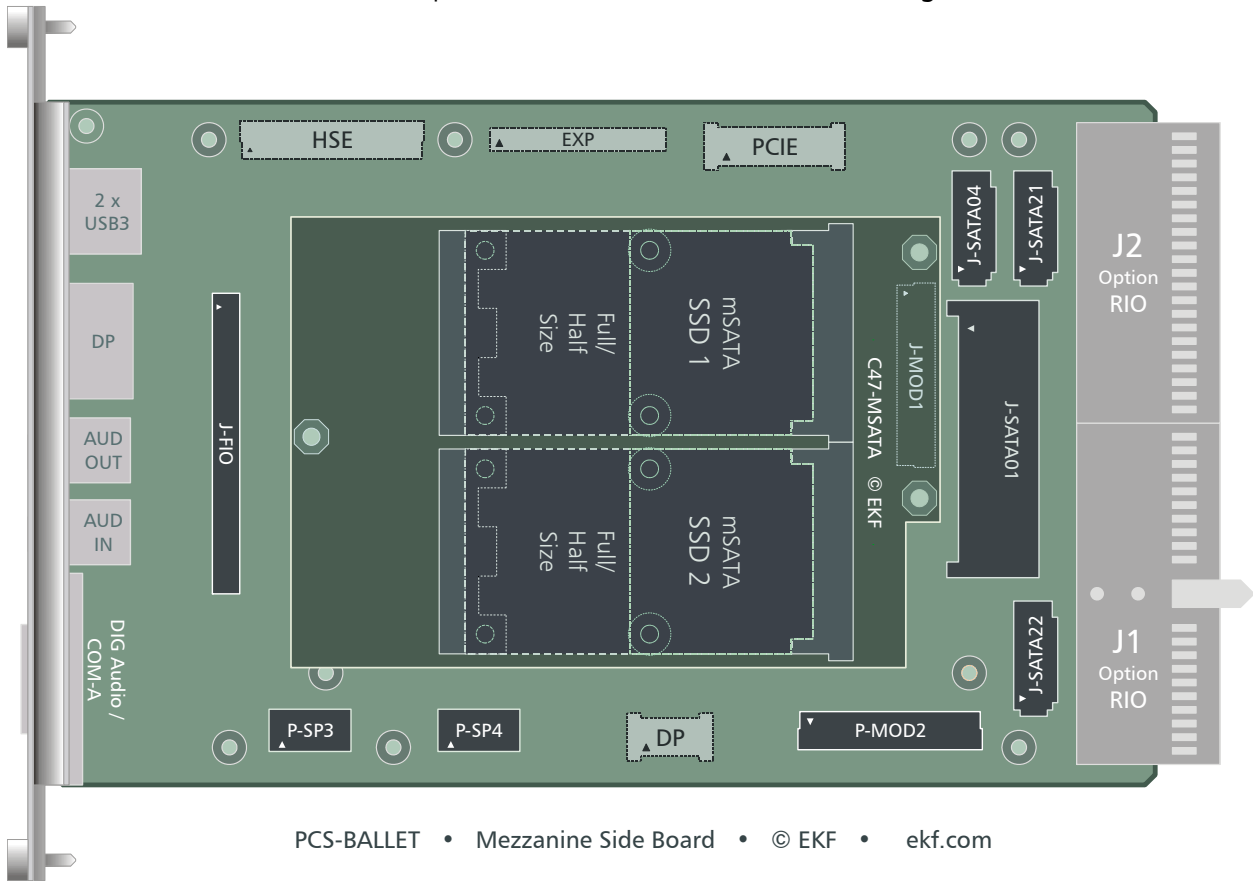
C47-MSATA • mSATA Mini Card Mezzanine Module

PCS-BALLET • Option C48-M2 Low Profile Mezzanine Storage Module

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
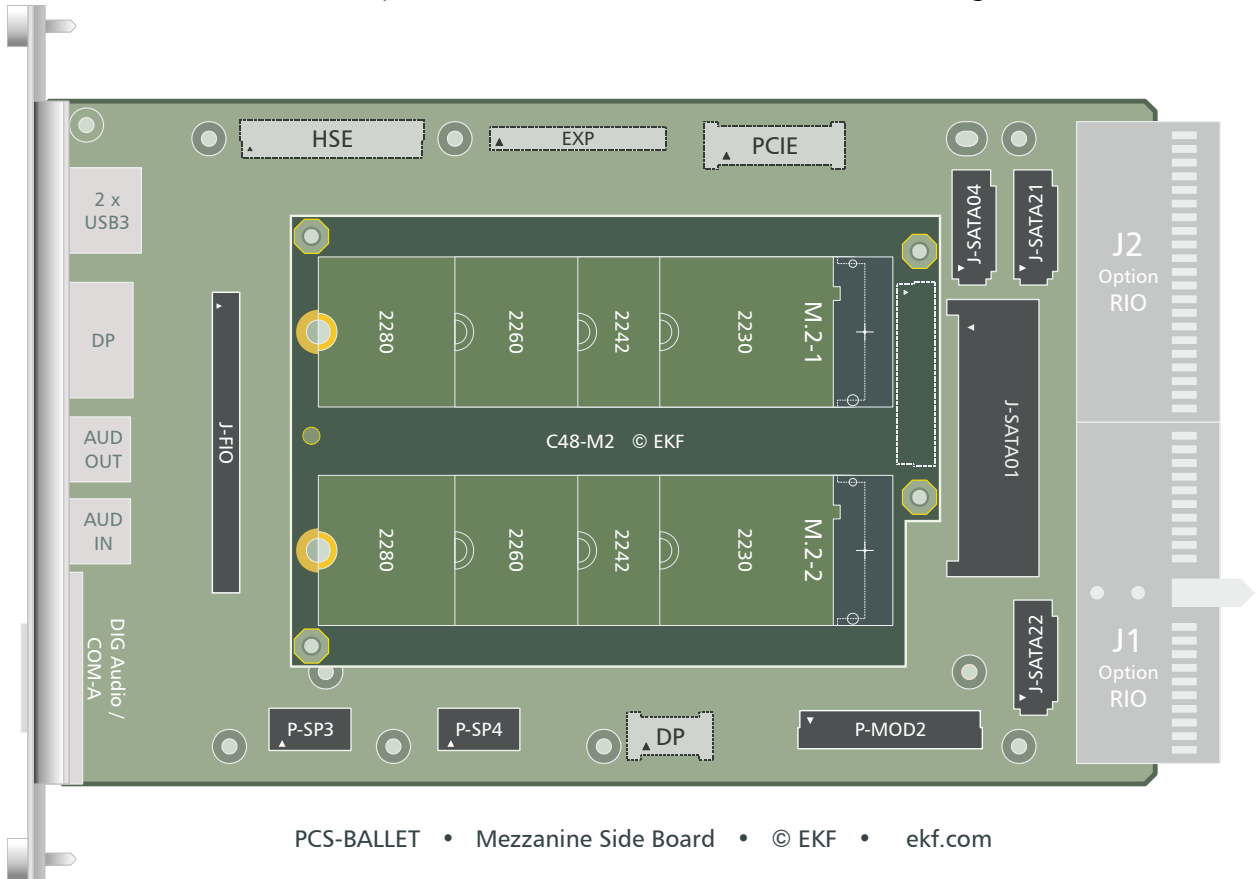

C48-M2 • M.2 SATA SSD Mezzanine Module

Advanced Storage Options

The maximum optional data storage capacity can be achieved when employing the C20-SATA dual drive 2.5-inch SSD/HDD module on the PCS-BALLET (mezzanine card connector MOD2). If this ordering option was chosen, the PCS-BALLET comes with an on-board PCIe to SATA 6Gbps controller assigned to MOD2.

When populated with two drives, top and bottom mount, the C20-SATA is not a low profile mezzanine module. Additional front panel width would be required for the entire assembly comprised of CPU carrier card, PCS-BALLET and C20-SATA (12HP typically in total).

PCS-BALLET • Option C20-SATA Dual-2.5-Inch Drive

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
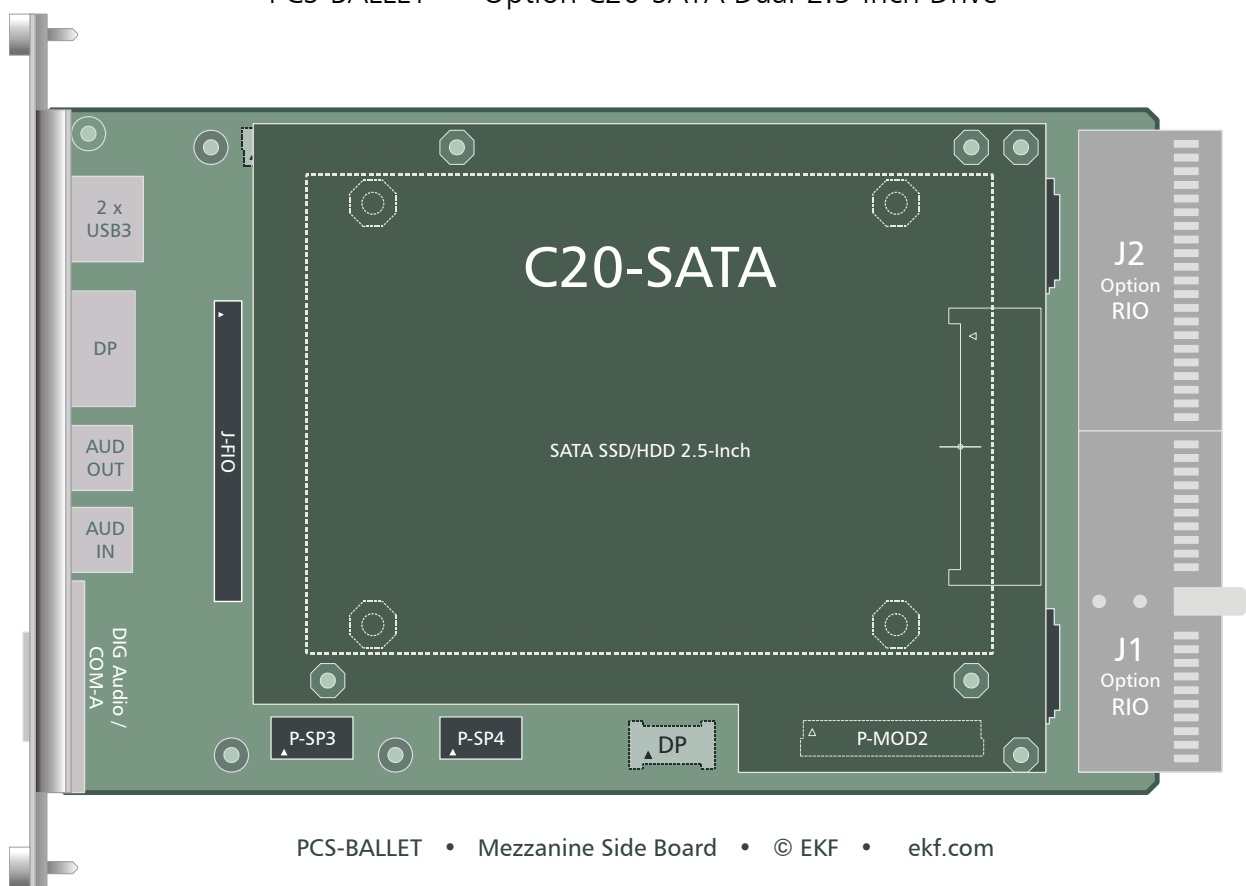
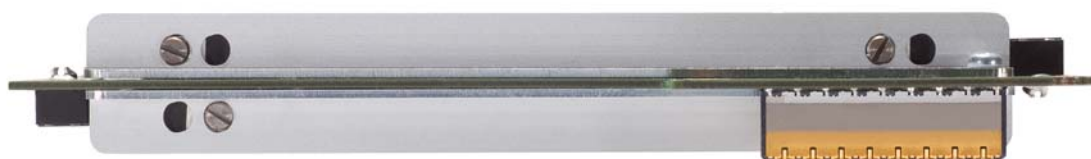| Related Documents	
C20-SATA Mezzanine Storage Module	www.ekf.com/c/ccpu/c20/c20_tie.pdf

C20-SATA

C20-SATA Side View (Dual Drive)

C20-SATA (Dual Drive)

PCS-BALLET w. on-Board 2.5-Inch SATA SSD (8HP Assembly)

PCS-BALLET w. C20-SATA Dual SSD Storage Module (12HP Assembly)

PCS-BALLET w. C41-CFAST Mezzanine Module

PCS-BALLET w. C43-SATA Internal Cable Connector Module

PCS-BALLET w. Half-Slim SATA SSD Module on-Board

Front Panel I/O

Front Panel Options

The PCS-BALLET expands the suite of front panel connectors of a particular CPU carrier board by two USB 3.0 receptacles, a DisplayPort video output, 3.5mm Audio In/Out jacks, and a D-Sub connector with either Digital Audio or EIA-232 COM port pin assignment.

In addition, the PCS-BALLET can accommodate the C32-FIO front panel I/O mezzanine module, for a total front panel width of 12HP. The C32-FIO provides another two RS-232 COM ports, two USB 2.0 receptacles, and *optionally* a PS/2 style keyboard/mouse Mini-DIN connector.

PCS-BALLET • Option C32-FIO Front I/O Module

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
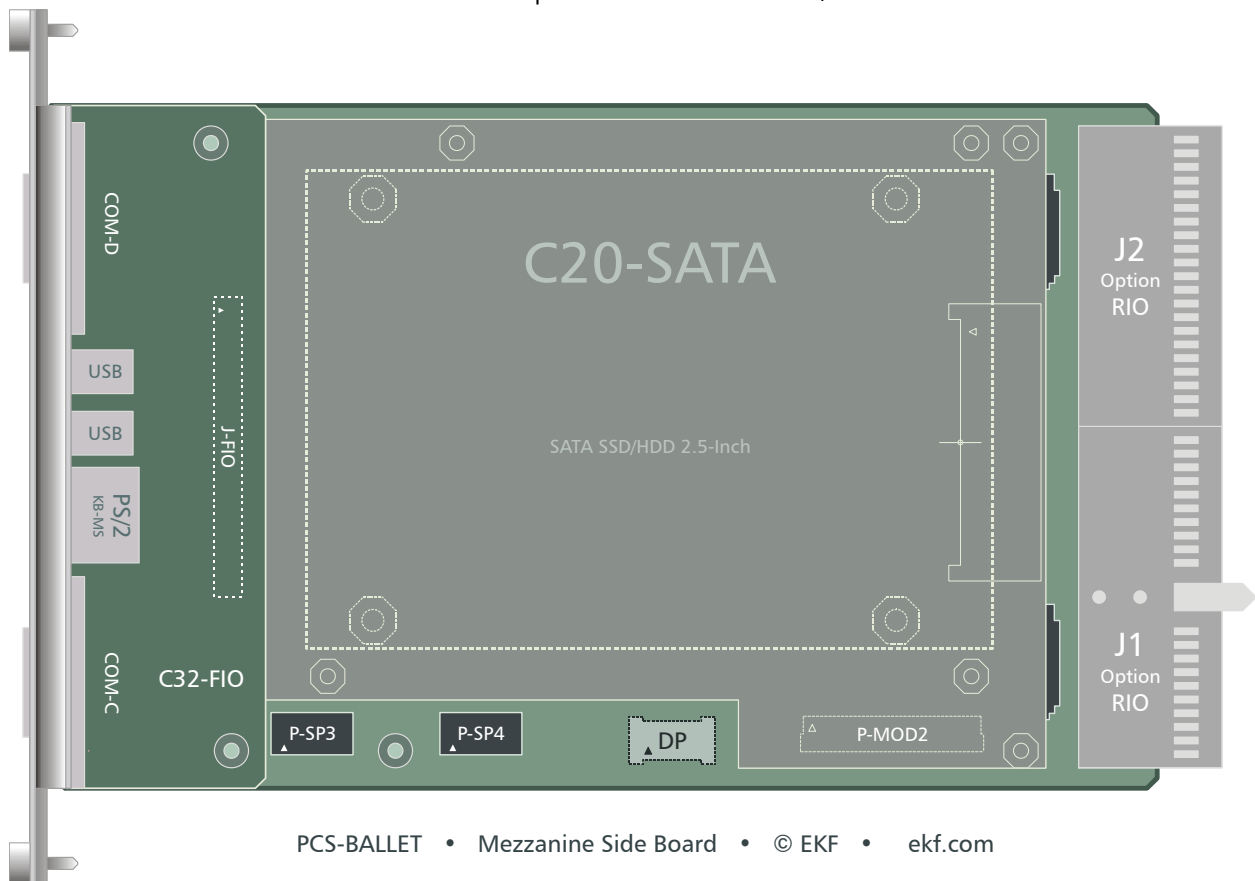
Related Documents	
C32-FIO Mezzanine Front I/O Module	www.ekf.com/c/ccpu/c32/c32_tie.pdf

PCS-BALLET w. C32-FIO 12HP Assembly

Sample Front Panel Options 8HP/12HP

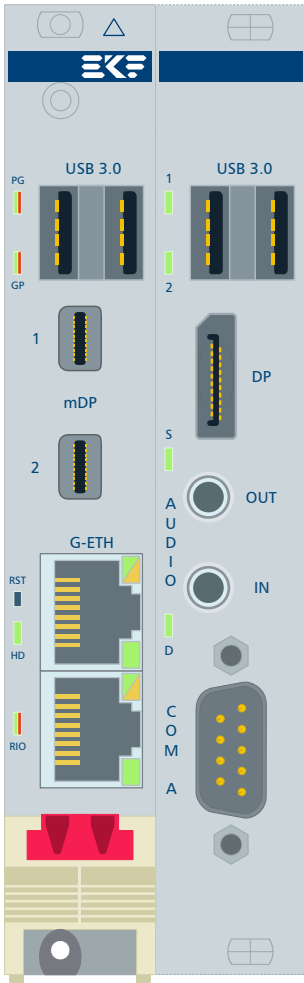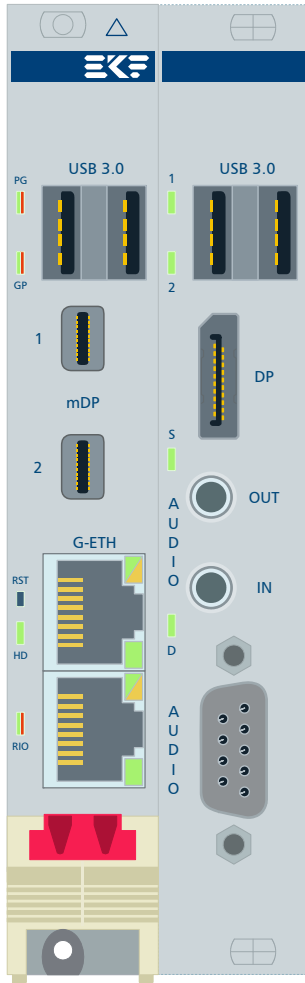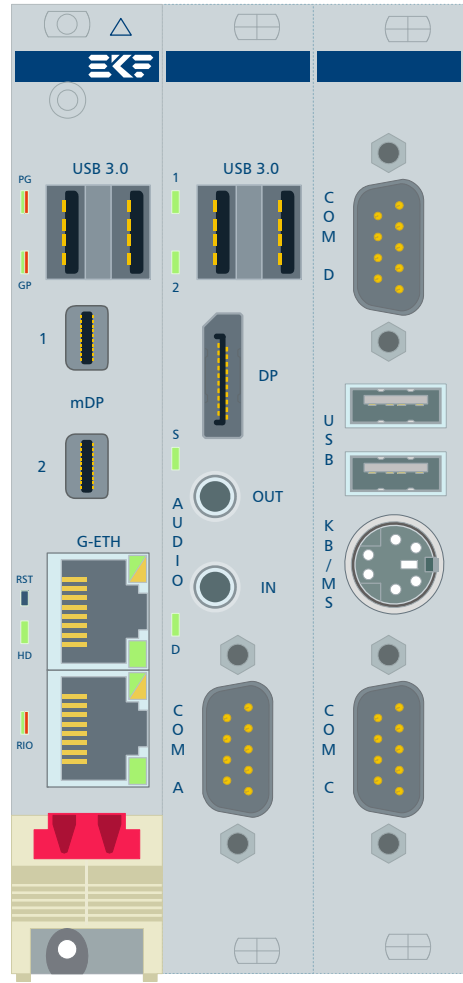| SC1-ALLEGRO Dual - mDP | PCS-BALLET RS-232 | SC1-ALLEGRO Dual - mDP | PCS-BALLET Dig. Audio | SC1-ALLEGRO Dual - mDP | PCS-BALLET RS-232 | C32-FIO |

Legacy PS/2 Mini-DIN connector (Keyboard/Mouse) available on request

C32-FIO (on Top)

C32-FIO (on Top)

On-Board I/O & RIO

As an option, the PCS-BALLET can be populated with up to three on-board SATA latching receptacles, for attachment of system internal drives via SATA cable assemblies. These connectors are SATA04, and SATA21/SATA22.

SATA04 is fed by the CPU carrier card, via signal redrivers. Due to space restrictions, SATA04 cannot be populated when an on-board 2.5-inch drive is mounted, attached to the SATA01 docking connector.

The optional SATA21/22 connectors are assigned to an on-board 6Gbps dual-channel SATA controller.

Two more SATA channels (SATA31/SATA32) are wired to the rear I/O connector J2, derived from another optional on-board dual-port 6Gbps SATA controller.

Two pin-headers SP3 and SP4 are provided as an option, for attachment of RS-232/RS-485 UART PHY modules.

In addition, legacy I/O would be available trough the J1/J2 rear I/O connector suite, such as USB 2.0, UART, KB/MS.

Rear I/O usage requires a suitable single slot backplane which mates the PCS-BALLET, and in addition a custom specific rear I/O module.

RIO is not available when the PCS-BALLET is bundled with a CompactPCI® Serial CPU carrier board, due to the mechanical incompatibility of a suitable backplane connector arrangement. This issue is described in the PICMG® CPCI-S.0 specification chapter 5.3 (side by side backplane arrangement).

Related Documents	
CU7-RS485 UART Module	www.ekf.com/c/ccom/cu7/cu7.html
CU8-RS232 UART Module	www.ekf.com/c/ccom/cu8/cu8.html

Theory of Operation

The PCS-BALLET side board communicates by means of four bottom mount expansion connectors with the host CPU: PCIE (PCI Express x 4), HSE (High Speed Expansion meaning SATA and USB), DP (DisplayPort), and EXP (multi-function legacy I/F such as LPC). Best results can be achieved with the PC1-GROOVE or SC1-ALLEGRO as CPU carrier card. Older CPU cards may not support all the functions available on the PCS-BALLET, e.g. the DisplayPort.

The PCI Express interface mezzanine connector PCIE is comprised of 4 PCIe lanes. The CPU carrier must be configured for 4 links x 1 (by CPU card DIP-switch settings, consult CPU user guide). On the PCS-BALLET, one PE lane is dedicated to the USB 3.0 host controller, the other three are in use for up to three on-board SATA host controllers. Up to four USB 3.0 SuperSpeed ports are available from the USB controller (two front panel jacks, and as an option two rear I/O channels across J1). The SATA controllers provide two channels each, for a total of up to six SATA ports, in addition to the CPU card SATA channels passed across the mezzanine connector HSE.

The DP mezzanine connector is provided for applications with need for a third DisplayPort front panel video connector, in addition to the dual-video outputs provided by the CPU carrier card.

The HSE mezzanine connector passes a maximum of 4 x SATA channels and 4 x USB 2.0 ports from the host CPU to the PCS-BALLET side board. A simple mass storage solution such as an on-board SATA drive thus could be realized w/o stuffing any of the optional on-board SATA controllers. SATA redrivers are provided on the PCS-BALLET for optimum signal integrity.

The mezzanine connector EXP combines several side-band data channels: The HD Audio interface (aka Azalia) is a data path to the on-board audio codec. The LPC (Low Pin Count) enables the super-I/O (SIO) controller chip to emulate the legacy I/O interfaces; among these are the classic serial (COM) and PS/2 keyboard/mouse ports.

The PCS-BALLET fits on the top side of the CPU board, which is on the right side when viewing the common front panel. A suitable backplane provides its CPCI slots beginning with the CPU carrier board (CPCI system slot) from right to left. The CPCI system must provide additional mounting space to the right side for the PCS-BALLET. In addition, a single slot rear I/O backplane would be needed for rear I/O usage, and a also custom specific rear I/O transition module (RIO option not available with CompactPCI® Serial CPU carrier boards, please refer to CPCI-S.0 chapter 5.3 'Side By Side Backplane Arrangement').

SATA Controllers

A major goal of the PCS-BALLET is to provide versatile storage solutions. Up to four SATA channels are passed through from the CPU carrier card via the side card mezzanine connector HSE. These ports are in use for basic storage options such as a 2.5-inch SSD or HDD (docking connector SATA01, and the low profile mezzanine storage module socket MOD1, and the SATA04 cable connector. Redrivers care for optimum SATA signal integrity.

As an option, the PCS-BALLET can be equipped with up to three 88SE9170 PCI Express® dual-port 6Gbps SATA controllers.

One 88SE9170 is dedicated to the C20-SATA mezzanine module socket MOD2. Another 88SE9170 is tied to the SATA cable connectors SATA21/SATA22. The third 88SE9170 is provided for optional rear I/O through the J1 connector.

USB 3.0 Controller

The HSE and EXP side card mezzanine connectors comprise up to 6 USB 2.0 ports in total, passed through from the CPU carrier card to the PCS-BALLET. SuperSpeed USB however is provided by the on-board TUSB7320 controller, made available across two USB 3.0 front panel jacks for attachment of external devices.

As an option, the PCS-BALLET can be equipped with the quad-port TUSB7340 controller. The additional USB 3.0 ports are wired to J1 for optional rear I/O usage.

Super I/O Controller

The on-board SIO is tied to the LPC interface provided by the EXP side card mezzanine connector. The SIO comprises legacy I/O circuitry such as UART, PS/2, and parallel printer.

The four serial interfaces (UART) of the SIO are available for front panel I/O (EIA-232 D-Sub), and either mezzanine modules or rear I/O usage (TTL-level).

HD Audio Codec

The ALC262 is provided with several software configurable I/O cells. As well the 3.5mm front panel audio jacks, as the optional D-SUB front panel audio connector are provided with input- and output-capable channels. Additional expansion inputs are available across J-FIO (option).

Microphone (MIC) capable inputs provide a bias voltage. Headphone (HP) outputs are buffered, with lower output resistance compared to straight line outputs (recommended also for long cables).

ALC262 Port Configurations					
Port	Name	LINE OUT / HP	LINE IN	MIC	Connector
A	HP	✓	✓		Dig. Audio
B	MIC1			✓	J-FIO
C	LINE1		✓		J-FIO
D	LINE-OUT	✓	✓		Dig. Audio
E	LINE2	✓	✓	✓	Audio Out
F	MIC2	✓	✓	✓	Audio In
	CD		✓		J-FIO
	S/PDIF				Dig. Audio J-FIO

The illustration below shows the Realtek Audio Manager (Windows), menu "Audio I/O". It allows to setup most ports adequately.

No Usage

Port A (D-SUB)
Line Out - HP - Line In

Port C (J-FIO)
Line In

Port D (D-SUB)
Line Out - HP - Line In

Port B (J-FIO)
MIC In

Port E (3.5mm OUT)
Line Out - HP - Line In - MIC In

Port F (3.5mm IN)
Line Out - HP - Line In - MIC In

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CCO-CONCERT
Realtek Audio Driver Analog Configurations

Block Diagram

Simplified Block Diagram
PCS-BALLET
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Sheet 1/5
HD Audio

Azalia
HD Audio
Codec

ALC
262

FIO = Front Panel I/O Module

J-FIO other sections see sheet 2

Option Next Floor
Mezzanine
Expansion Connector

Front Panel I/O

D-Audio COM
IN
OUT
DP
USB3
USB3

Option D-Audio
R-NET
S/PDIF IN/OUT
LINE OUT
HP OUT
MIC 2
MIC IN
LINE IN
LINE OUT
HP OUT
LINE 2
HP OUT

S/PDIF Digital

CD IN
MIC 2
LINE 1

BEEP IN

Speaker
HD Audio

J-EXP Audio

Mezzanine Side Card I/O

J1 J2
RIO
Option

Simplified Block Diagram
PCS-BALLET
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Sheet 2/5
Super I/O

D-Audio
COM

IN

OUT

DP

USB3

USB3

Front
Panel
I/O

Power Switch 1.5A

TPS
2060

USB 3.0 SuperSpeed

PCIe
to
USB 3.0

PCI Express® x 1

GPIO[0-3]

USB 3.0 (Option)

Additional DisplayPort Video Output

Simplified Block Diagram
PCS-BALLET
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Sheet 3/5
USB 3.0 Controller &
Secondary DisplayPort

J-SDVO/
DP
Video

Mezzanine
Side Card
I/O

J-PCIE

J1 J2
RIO
Option

J1
USB
3.0

J2
GPIO

Front Panel I/O

D-Audio COM

IN   OUT

DP

USB3

USB3

Simplified Block Diagram
PCS-BALLET
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Exclusive Stuffing Options
either Option 1
or Option 2 & 3

Option
C42-SATA
C47-MSATA
Module

Option
2.5-Inch
on-Board
SATA SSD/HDD

Option
SATA
Vertical
Latching
Receptacle

J-SATA04

J-MOD1

J-SATA01

Option 3
Cable Connector

Option 2
Mezzanine Storage

Option 1
2.5-Inch SSD

SATA 2.5-Inch SSD
Docking Connector

SATA04

USB3 USB4

SATA02 SATA03

SATA01

SATA01

Sheet 4/5
Mass Storage Options
through
Carrier Card SATA Ports

SATA
Redriver

SATA
Redriver

SATA
Redriver

SATA04

Wireless Option

USB3 USB4

RAID Option

SATA02 SATA03

SATA01

Mezzanine Side Card I/O

P-HSE
SATA4

P-HSE
USB3
USB4

P-HSE
SATA2
SATA3

J-EXP
USB

P-HSE
SATA1

USB 2.0

J1 J2
RIO
Option

J2
USB

Front Panel I/O

D-Audio COM

IN

OUT

DP

USB3

USB3

Option 88SE9170 1

PCIe to SATA

SATA11 SATA12

SATA 6G

P-MOD2

Option C20-SATA 2.5-Inch Single/Dual Drive SSD/HDD Module

Option 88SE9170 2

PCIe to SATA

J-SATA22

J-SATA21

SATA 6G

Option SATA Vertical Latching Receptacles

Simplified Block Diagram PCS-BALLET
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Option 88SE9170 3

PCIe to SATA

SATA 6G

Sheet 5/5 Extended Mass Storage Options

SATA31 SATA32

PCI Express®

Mezzanine Side Card I/O

J-PCIE

J1 J2 RIO Option

J1 SATA

Summary of Connectors

Not all of the connectors or other elements listed below may be present or functional on your actual PCS-BALLET board. Assembly of these connectors is highly custom specific. Discuss your needs (target application) with EKF before ordering, for an optimum CPU & side card configuration.

Front Panel Connectors

AUDIO	Female D-SUB 9-position, S/PDIF digital audio (exclusive to male D-Sub COM connector)
AUDIO-IN	3.5mm stereo audio jack, analog audio, software configurable (default = MIC input)
AUDIO-OUT	3.5mm stereo audio jack, analog audio, software configurable (default = HP output)
COM-A	Male D-SUB 9-position, RS-232E (exclusive to female D-Sub digital audio connector)
DP	DisplayPort video output connector
USB	USB 3.0 dual-jack

On-Board Connectors

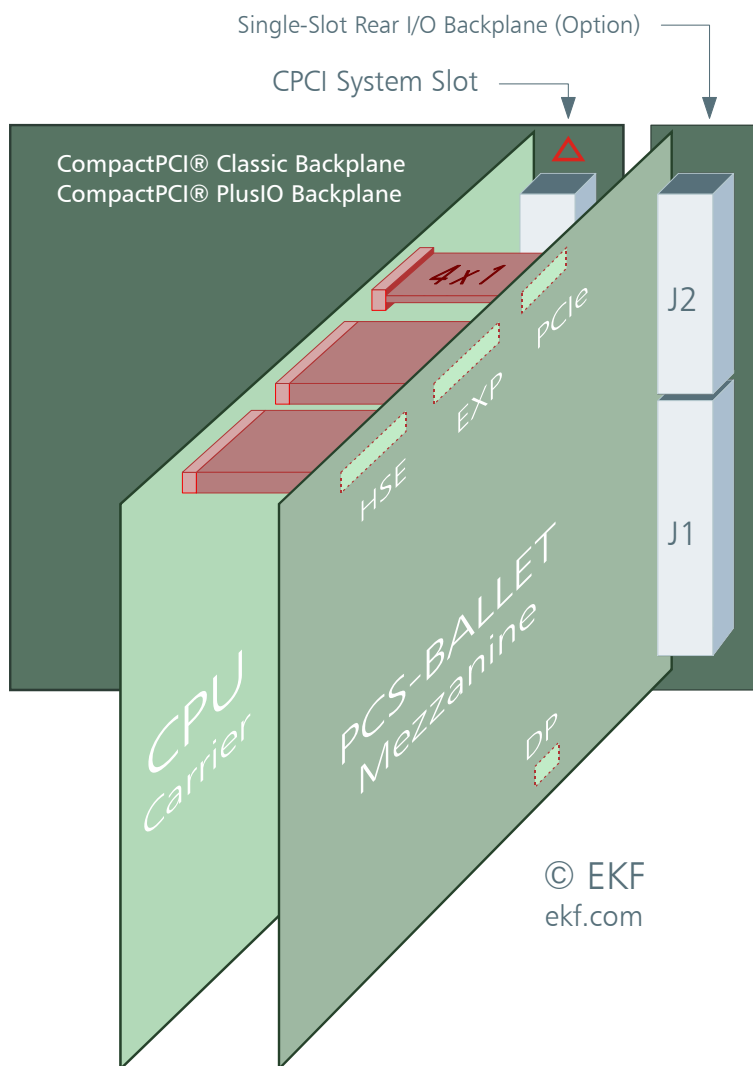|	
FIO	Option, 12HP front panel I/O mezzanine connector suitable for the C32-FIO module (UART, USB, PS/2)
MOD1	Mezzanine connector for attachment of a C4*-series storage module, stuffing option, 3 x SATA channels SATA[01-03] derived from CPU via HSE and redrivers, population of MOD1 is exclusive to the 2.5-inch SSD docking connector SATA01 and also to the mezzanine connector MOD2 for the C20-SATA module
MOD2	Mezzanine connector for attachment of the C20-SATA storage module, stuffing option, 2 x SATA channels SATA[11-12] derived from an on-board 2-port SATA controller, population of MOD2 is exclusive to the SATA01 2.5-inch SSD docking connector and also to the MOD1 mezzanine connector for a C4*-series storage module
SATA01	SATA docking connector, suitable for on-board 2.5-inch SATA SSD/HDD, stuffing option, SATA signal derived from CPU via HSE and redriver, connector not populated if either a C4*-series module (MOD1) or the C20-SATA module (MOD2) is attached
SATA04	Vertical latched SATA header, 7-position, for attachment of additional SATA devices by cable assembly, stuffing option, SATA signal derived from CPU via HSE and redriver, connector not populated if either 2.5-inch SSD (SATA01) or C20-SATA module (MOD2) is attached
SATA21 SATA22	Vertical latched SATA headers, 7-position, for attachment of additional SATA devices by cable assembly, stuffing option, SATA signals derived from an on-board 2-port SATA controller, connectors not populated if C20-SATA module is attached
SP3 SP4	Pin headers providing TTL-level serial COM port signals, may be used for attachment of CU*-series PHY modules

Inter-Board Connectors (CPU Carrier)

EXP	Dual row socket, available from bottom of the PCS-BALLET PCB, mating with the corresponding socket on the CPU carrier board, connected through a board stacker, comprised of: ▸ LPC Low Pin Count interface ▸ HD Audio (Azalia) ▸ 2 x USB ▸ SMB, Speaker, Reset
HSE	High speed mezzanine connector, available from bottom of the PCS-BALLET PCB, mating with the corresponding connector on the CPU carrier board, comprising of: ▸ Host CPU (PCH) SATA (SATA01 & SATA04 ports) ▸ Host CPU (88SE9170) SATA (SATA02 & SATA03 ports) ▸ Host CPU 4 x USB
PCIE	High speed socket edge card connector, available from bottom of the PCS-BALLET PCB, mating with the corresponding socket on the CPU carrier board, connected through a high speed strip line PCB (C22), comprising of: ▸ Host CPU PCI Express (PCIe) x 4 interface (must be configured as 4 links x 1 lane)
DP	High speed mezzanine connector, available from bottom of the PCS-BALLET PCB, mating with the corresponding SDVO/DP connector on the CPU carrier board, comprising of: ▸ DisplayPort video out, from Intel chipset graphics

Rear I/O Connectors

J1	Rear I/O option 2.00mm brown keyed hard metric female connector ▸ SATA31 & SATA32 channels derived from an on-board 88SE9170 SATA controller ▸ 2 x USB 3.0 derived from the optional TUSB7340 quad-port USB controller
J2	Rear I/O option 2.00mm hard metric female connector ▸ 4 x GPIO derived from SIO and 4 x GPIO from USB 3.0 controller ▸ LPT parallel port ▸ Serial ports (UART TTL-level signals) ▸ 2 x USB 2.0 ▸ PS/2 keyboard & mouse ▸ SMB, Speaker, Reset#

Backplane Mounting

Single-Slot Rear I/O Backplane (Option)

CPCI System Slot

CompactPCI® Classic Backplane
CompactPCI® PlusIO Backplane

4x1

PCIe

EXP

HSE

J2

J1
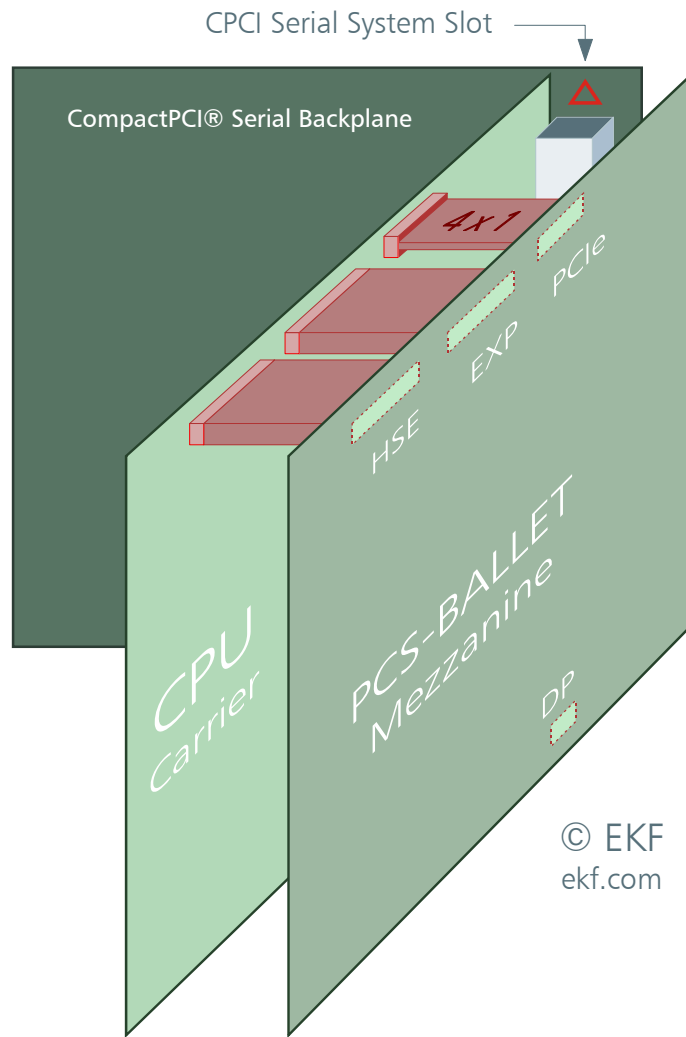
CPU Carrier

PCS-BALLET Mezzanine

DP

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RIO Option with CompactPCI and CompactPCI PlusIO

The PCS-BALLET can be used as an assembly together either with a CompactPCI® PlusIO CPU carrier card such as the PC1-GROOVE, or with a CompactPCI® Serial CPU board such as the SC1-ALLEGRO.

If the backplane is provided with a right aligned system slot, be sure to position the CPU carrier board to system slot (and not the PCS-BALLET). Consequently, the PCS-BALLET then occupies the next card cage slot to the right, outside of the backplane shape.

This assembly order (right aligned backplane system slot) is recommended because no regular CompactPCI® or CompactPCI® Serial backplane peripheral slot would get lost for the PCS-BALLET.

A single slot rear I/O P1/P2 backplane would be required in addition in order to make use of the rear I/O capability of the PCS-BALLET. With J1/J2 stuffed, a coding key present on J1 would prevent insertion of the PCS-BALLET into a regular CompactPCI® card slot. J1/J1 are not populated with a CPCI Serial CPU carrier card.

CPCI Serial System Slot

CompactPCI® Serial Backplane

4x1

PCIe

EXP

HSE

CPU Carrier

PCS-BALLET Mezzanine

DP

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ekf.com

4HP RIO Not Available w. CompactPCI Serial

Combined with a CompactPCI® Serial CPU carrier card, the PCS-BALLET cannot be used for rear I/O. The hardmetric P1/P2 connectors on a single slot RIO backplane would collide with the left hand high speed CPCI Serial Airmax backplane connectors J1-J6, for a nominal 4HP slot pitch. This issue is addressed in the CPCI-S.0 specification, chapter 5.3.

As a custom specific assembly however, EKF can raise the mounting distance between the PCS-BALLET and the CPU carrier card e.g. to 5HP, 6HP or 8HP. This requires a modified front panel, and customized spacer PCBs for the high speed mezzanine connectors HSE, PCIE and DP. These modifications would allow RIO even with a CPCI Serial CPU carrier card.

If a native backplane is mandatory with a left aligned system slot, or when a hybrid backplane is in use with its system slot in the middle, the PCS-BALLET must not be equipped with J1/J2 connectors, and will occupy a regular CompactPCI® or CompactPCI® Serial peripheral slot then. Of course, this assembly solution is not suitable for rear I/O, and a regular CPCI peripheral card slot will be lost.

Please contact sales@ekf.de for hybrid and native backplane solutions providing an empty card slot for optimum positioning of a CPU and side card assembly.
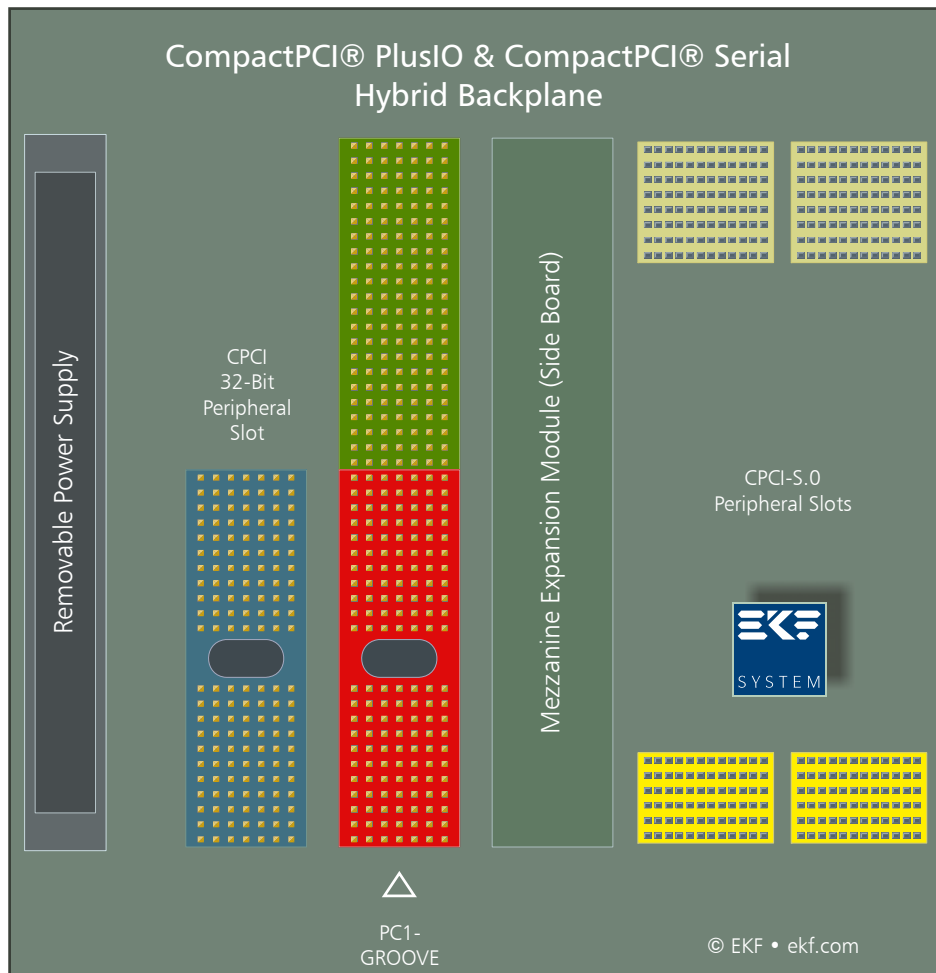
Sample Proprietary Hybrid Backplane (with Side Card Spare Slot)

Installing and Replacing Components

Before You Begin

Warnings

The procedures in this chapter assume familiarity with the general terminology associated with industrial electronics and with safety practices and regulatory compliance required for using and modifying electronic equipment. Disconnect the system from its power source and from any telecommunication links, networks or modems before performing any of the procedures described in this chapter. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage. Some parts of the system can continue to operate even though the power switch is in its off state.

Caution

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis or board front panel. Store the board only in its original ESD protected packaging. Retain the original packaging (antistatic bag and antistatic box) in case of returning the board to EKF for repair.

Installing the Board

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord

- Attach your antistatic wrist strap to a metallic part of the system

- Remove the board assembly packaging, be sure to touch the board only at the front panel

- Identify the related CompactPCI slot (peripheral slot for I/O boards, system slot for CPU boards, with the system slot typically most right or most left to the backplane)

- Insert card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighboured front panels)

- A card with onboard connectors requires attachment of associated cabling now

- Lock the ejector lever, fix screws at the front panel (top/bottom)

- Retain original packaging in case of return

Removing the Board

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

• Switch off the system, remove the AC power cord

• Attach your antistatic wrist strap to a metallic part of the system

• Identify the board, be sure to touch the board only at the front panel

• Unfasten any front panel screws (top/bottom), unlock the ejector lever

• Remove any onboard cabling assembly

• Activate the ejector lever

• Remove the card assembly carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighboured front panels)

• Store board in the original packaging, do not touch any components, hold the board at the front panel only

Warning

Do not expose the card to fire. Battery cells and other components could explode and cause personal injury.

EMC Recommendations

CE

In order to comply with the CE regulations for EMC, it is mandatory to observe the following rules:

- The chassis or rack including other boards in use must comply entirely with CE

- Close all board slots not in use with a blind front panel

- Front panels must be fastened by built-in screws

- Cover any unused front panel mounted connector with a shielding cap

- External communications cable assemblies must be shielded (shield connected only at one end of the cable)

- Use ferrite beads for cabling wherever appropriate

- Some connectors may require additional isolating parts

Reccomended Accessories

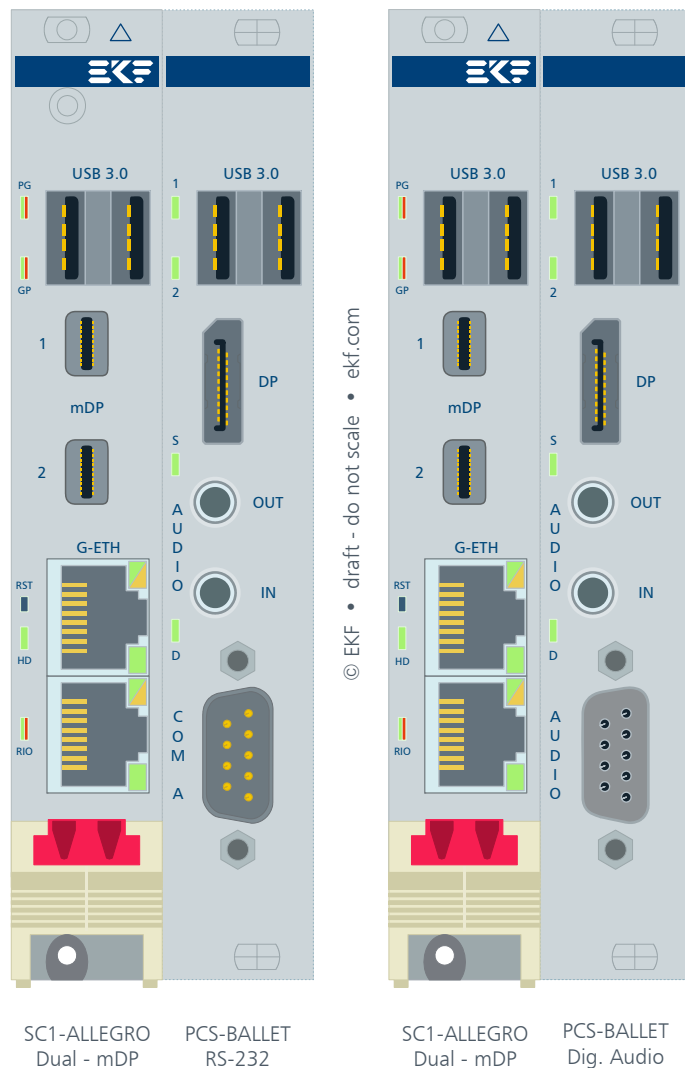| Blind CPCI Front Panels	EKF Elektronik	Widths currently available (1HP=5.08mm): with handle 4HP/8HP without handle 2HP/4HP/8HP/10HP/12HP

Technical Reference

Caution

Some of the connectors may provide operating voltage (e.g. +12V, +5V and +3.3V) to devices inside the system chassis, such as internal peripherals. Not all of these connectors are overcurrent protected. Do not use these connectors for powering devices external to the computer chassis. A fault in the load presented by the external devices could cause damage to the board, the interconnecting cable and the external devices themselves.

Please Note

The PCS-BALLET mezzanine module may be equipped with several on-board connectors for system internal usage. Not all of these connectors may be present on a particular board. Be sure to specify your individual needs when ordering the PCS-BALLET board. Characteristic features and the pin assignments of each connector are described on the following pages (connector designation in alphabetical order within the groups 'front panel connectors', 'on-board connectors', 'inter-board connectors', and 'rear I/O connectors').

Front Panel Elements

As of current, suitable CPU carrier boards for use together with the PCS-BALLET side card are the PC1-GROOVE and the SC1-ALLEGRO. The PCS-BALLET side board mounts on top (at the right side) of the CPU card. By default, the PCS-BALLET shares an 8HP (~40.6mm) front panel with the CPU. Further more, custom specific front panel options are available on request. Shown below are typical variants of the PCS-BALLET.

SC1-ALLEGRO Dual - mDP   PCS-BALLET RS-232   SC1-ALLEGRO Dual - mDP   PCS-BALLET Dig. Audio

AUDIO	Female D-SUB 9-position, S/PDIF digital audio (exclusive to male D-Sub COM connector)
AUDIO-IN	3.5mm stereo audio jack, analog audio, software configurable (default = MIC input)
AUDIO-OUT	3.5mm stereo audio jack, analog audio, software configurable (default = HP output)
COM-A	Male D-SUB 9-position, RS-232E (exclusive to female D-Sub digital audio connector)
DP	DisplayPort front panel video connector
USB	USB 3.0 dual-jack

AUDIO

The PCS-BALLET is equipped with a HD Audio Codec, which is tied to the EXP side card mezzanine connector. The HD Audio I/F is provided by the CPU carrier card PCH (Platform Controller Hub). The optional digital audio connector provides analog stereo I/O and digital S/PDIF I/O. The analog lines are software configurable as line input, line output or headphone output. Default is output.

AUDIO • S/PDIF Digital Audio Female D-Sub 9 (261.01.009.23)					
9 5 6 1 261.01.009.23 © EKF ekf.com				5	Port A In/Out L
	Port A In/Out R	9			
				4	A-GND
	Port D In/Out R	8			
				3	Port D In/Out L
	A-GND	7			
				2	S/PDIF OUT
	S/PDIF IN	6			
				1	D-GND

The D-SUB female audio connector assignment is a proprietary solution and was chosen for reliability reasons, targeting industrial applications. A custom specific cable assembly is required therefore. It is highly recommended to use 75 Ohm coaxial cables for both the S/PDIF signals (shield = D-GND). Any shielded wire should be sufficient for each of the analog signals (shield = A-GND). For longer cable distances, configure the analog outputs as headphone. Due to the lower output impedance of a buffered HP output, a superior noise immunity will be achieved.

The AUDIO D-Sub is a manufacturing option of the PCS-BALLET, exclusive to the COM-port connector. Be sure to specify your needs when ordering.

ALC262 Port Configuration - D-SUB Connector					
Port	Name	LINE OUT / HP	LINE IN	MIC	Connector
A	HP	✓	✓		Dig. Audio
D	LINE-OUT	✓	✓		Dig. Audio
	S/PDIF				Dig. Audio

Port A (HP)
Line Out - HP - Line In

Port D (LINE-OUT)
Line Out - HP - Line In

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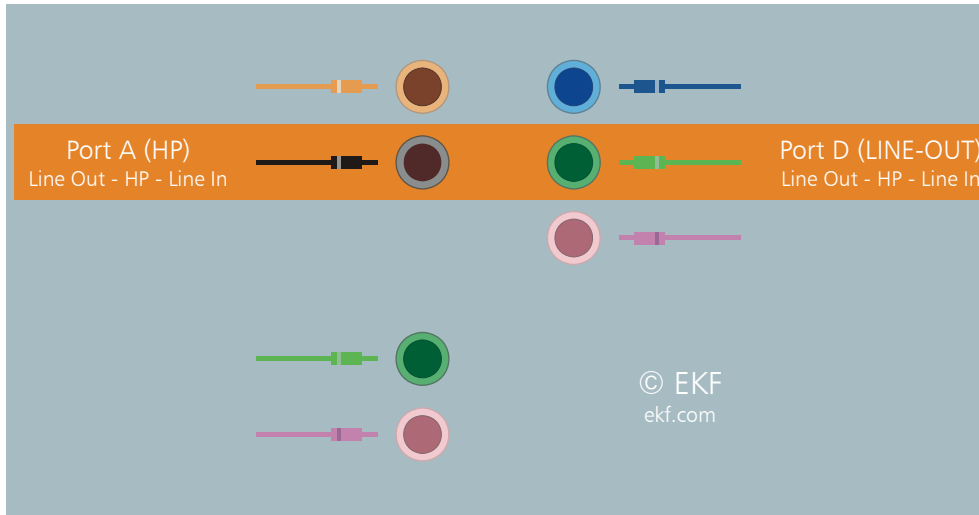
CCO-CONCERT
Realtek Audio Driver Analog Configurations - DIG-AUDIO D-SUB Front Panel Connector
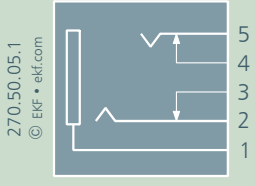
For details of the ALC262 and latest HD Audio driver software, please refer to www.realtek.com.tw.
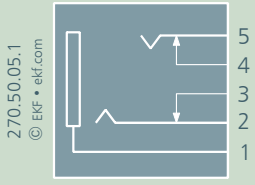
AUDIO IN/OUT Audio Jacks

The PCS-BALLET is equipped with an ALC262 HD Audio Codec, controlled by the PCH (Platform Controller Hub) on the CPU carrier board via the Intel Azalia HDA link. Two 3.5mm stereo audio jacks are available from the PCS-BALLET front panel for attachment of audio devices such as audio power amplifier, headphones, microphone.

The particular function of each audio jack is controlled by the driver software (e.g. Realtek). By default, the AUDIO IN audio jack is configured as microphone input, and the AUDIO OUT jack is suitable for headphones $\geq$32 Ohms. Other configurable options are line in and line out. The typical full scale input voltage is 1.5V_{rms} (input resistance $\geq$10kOhm), and the typical full scale output voltage is 1.4V_{rms} (10 kOhm / 50pF external load).

The difference between headphones out mode and line out mode is mainly the low output impedance of 1 Ohm when in HP mode, compared to 200 Ohms in line out mode. This is also useful for noise immunity when long external audio cables are required. For optimum THD however chose line out mode.

AUDIO OUT • Stereo Audio Jack 3.5mm (270.50.05.1)		
		HeadPhones Out
	1	AGND
	2	ALC262 Port E Input/Output Signal Right
	3	AGND
	4	AGND
	5	ALC262 Port E Input/Output Signal Left

Stereo Audio Jack 3.5mm
270.50.05.1 © EKF • ekf.com

AUDIO IN • Stereo Audio Jack 3.5mm (270.50.05.1)		
		MIC In
	1	AGND
	2	ALC262 Port F Input/Output Signal Right
	3	AGND
	4	AGND
	5	ALC262 Port F Input/Output Signal Left

Stereo Audio Jack 3.5mm
270.50.05.1 © EKF • ekf.com

ALC262 Port Configuration - 3.5mm Audio Jacks					
Port	Name	LINE OUT / HP	LINE IN	MIC	Connector
E	LINE2	✓	✓	✓	Audio Out
F	MIC2	✓	✓	✓	Audio In

The assignment of input or output to the audio jacks is highly ambiguous, due to the software configurable ports E and F of the ALC262. For details of the ALC262 and latest HD Audio driver software, please refer to www.realtek.com.tw.
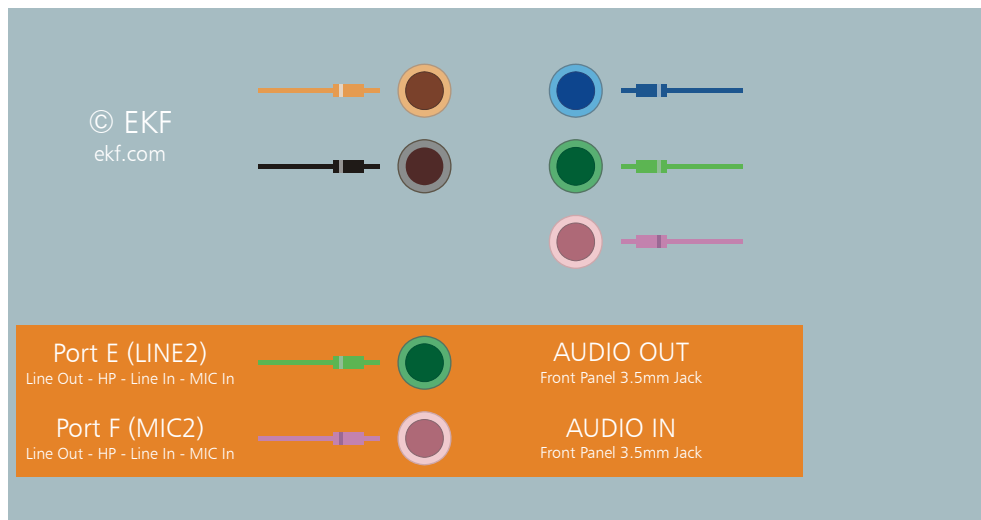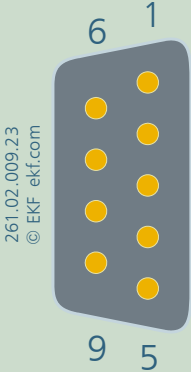

CCO-CONCERT
Realtek Audio Driver Analog Configurations - Front Panel Stereo Jacks 3.5mm

COM-A

The on-board secondary Super-I/O (SIO) on the PCS-BALLET provides four asynchronous serial interfaces, one of them available from the front panel (EIA/TIA 232). The other three (TTL-level) are available either as on-board pin headers, or at the optional J2 rear I/O connector, or can be used across J-FIO on the C32-FIO mezannine board.

Due to another (primary) SIO potentially available on the CPU host board, the serial interfaces are not necessarily dedicated to the COM-1/COM-4 ports of a typical Windows PC. Verify or modify the accompanying CPU BIOS settings for mapping of physical asynchronous serial I/O ports to the logical COM port order. Being ignorant of the actual port mapping, the serial port front panel connector is marked neutrally as COM-A (COM-C and COM-D in addition when using the optional C32-FIO mezzanine board).

COM-A • RS-232 Male D-Sub 9 (261.02.009.23)				
			1	DCD1
	DSR1	6		
			2	RXD1
	RTS1	7		
			3	TXD1
	CTS1	8		
			4	DTR1
	RI1	9		
			5	GND

The COM-A male D-SUB connector is a manufacturing option, exclusive to the female D-SUB AUDIO connector. The on-board ESD protected RS-232E transceivers on the PCS-BALLET will allow a bit rate of up to 230kbps.
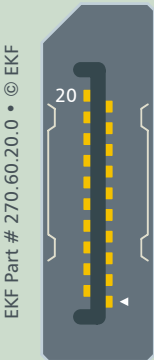
In addition, all serial ports are also available for rear I/O across J2, as an option. When using the serial port 1, there is a conflict with the on-board EIA-232 transceivers (COM-A). Hence, in order to avoid signal interference, the on-board ADM211E serial transceiver must not be stuffed or disabled, for signal usage of the serial port 1 on a rear I/O transition module. Consider usage of the serial ports 2, 3 and 4 as an alternate to the serial port 1 for rear I/O. However, if the C32-FIO mezzanine module is engaged on the PCS-BALLET, the serial ports 3/4 are also in use for additional EIA-232 transceivers and C32-FIO front panel D-SUB connectors (COM-C, COM-D). If in doubt, please discuss your individual requirements with sales@ekf.de before ordering.

DisplayPort

As of current, the Intel graphics processing unit (GPU) on the CPU carrier card incorporates up to three external DisplayPort video channels. At least one video output is available via the CPU card front panel DisplayPort connector. The PC1-GROOVE is equipped with a single standard DisplayPort front panel receptacle, while the SC1-ALLEGRO offers two mDP (Mini DisplayPort) connectors.

For applications with need for a second or even third independent DisplayPort video output, the PCS-BALLET is equipped with a standard DisplayPort front panel receptacle, in addition to the CPU card front panel video connector(s). The related PCS-BALLET DisplayPort video signals are passed from the CPU carrier board through an inter-board mezzanine connector to the side card.

Independent operation of multiple displays (e.g. Windows® Expanded Desktop) is enabled by the Intel graphics drivers (for the Intel download link please refer to the respective CPU card homepage at www.ekf.com). You can also check your drivers for latest updates by the Intel® Driver Update Utility www.intel.com/p/en_US/support/detect/?wapkw=(driver+update).

DP • DisplayPort Video Standard DisplayPort Receptacle, 20-lead (270.60.20.0)			
20	Power +3.3V 0.5A	19	Return
18	Hot Plug Detect	17	AUX(N)
16	GND	15	AUX(P)
14	CONFIG2	13	CONFIG1
12	LANE3(N)	11	GND
10	LANE3(P)	9	LANE2(N)
8	GND	7	LANE2(P)
6	LANE1(N)	5	GND
4	LANE1(P)	3	LANE0(N)
2	GND	1	LANE0(P)

EKF Part # 270.60.20.0 • © EKF

[1] +3.3V protected by a PolySwitch resettable fuse 0.75A. This voltage is switched on in S0 state only.

The DP inter-board mezzanine connector on the PCS-BALLET mates with the SDVO2 connector on the PC1-GROOVE, or the SDVO/DP connector on the SC1-ALLEGRO. Consult the respective CPU user guide manuals in order to achieve the suitable configuration for DisplayPort operation across this mezzanine connector. The SDVO mode is suitable only for side cards with DVI video connectors.

For attachment of either a classic style analog RGB monitor or DVI type display to the DP front panel receptacle, there are both adapters and also adapter cables available, from DisplayPort to the VGA or DVI connector.

Plug Style DP to DVI Adapter

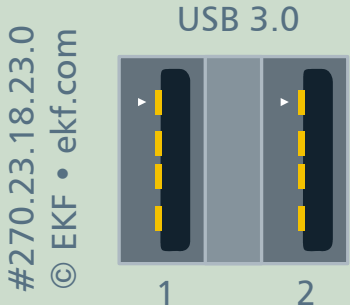Cable Adapter DP to DVI

Cable Adapter DP to VGA

Specified by the VESA DisplayPort connector standard is a dedicated power pin 20 (+3.3V 0.5A). Both the PCS-BALLET (source side) and a DP monitor (sink side) must provide power via this pin. A VESA specified standard DisplayPort cable however must not connect the pins 20 of both cable ends, in order to avoid a back driving conflict. Unfortunately there are cable assemblies available with pin 20 passed through, with unpredictable results on the system behaviour. Before ordering DP cable assemblies, verify the associated wiring diagram.

Sample VESA Compliant DisplayPort Cable Assemblies 2.0m Plug to Plug, w. Latches • EKF Part. #270.66.1.02.0	
Manhattan	307116, 391931
Molex	68783-0007
TE (Tyco)	2040687-2, 2040638-2

USB 3.0

The PCS-BALLET is equipped with a dual front panel receptacle, which can accommodate two USB 3.0 or USB 2.0 type A cable connectors (USB root hub). When connected to USB 2.0 compliant devices, only the classic 4 contacts (data pair, +5V and GND) are in use. USB 3.0 devices in addition communicate via the SuperSpeed differential transmit and receive signal pairs, available across another 5 contact pins.

The front panel USB jacks are tied to an on-board PCI Express® to USB 3.0 controller (TUSB7320 or TUSB7340). For some operating systems e.g. Windows® 7, installation of a xHCI driver would be required to enable the SuperSpeed mode (download via www.ti.com).

USB • Dual USB 3.0 Receptacle		
USB 3.0 dual type A receptacle, stacked, 18-position (270.23.18.2)		
USB 3.0 (#270.23.18.23.0 © EKF • ekf.com) 1 2	1	VBUS +5V 1.5Amax
	2	USB D-
	3	USB D+
	4	GND
	5	SS RX-
	6	SS RX+
	7	GND
	8	SS TX-
	9	SS TX+

Each connector provides +5V (VBUS) for powering external devices. A dual-channel electronic power switch (TPS2060) is used on the PCS-BALLET which limits the maximum output current of each individual USB connector to a safe level. The USB power switch is rated at >2A current limit typically, which is suitable even for applications where heavy capacitive loads are likely to be encountered, e.g. VBUS powered USB disk drives. The electronic switch is enabled by the on-board USB controller (i.e. it is managed by the driver software). Front panel LEDs labelled 1 and 2 signal the power-on state individually for each USB receptacle.

Front Panel Indicators

1	USB VBUS Power (belongs to left USB receptacle)
2	USB VBUS Power (belongs to right USB receptacle)
S	Activity signalled by either one of the optional on-board SATA controllers
D	Drive activity signalled by a 2.5-inch SSD/HDD attached to the SATA01 docking connector

PCS-BALLET
RS-232

On-Board Connectors

The PCS-BALLET can be equipped with several on-board connectors, for I/O and mezzanine module expansion. Some of these connectors are available as an option only or exclusive to each other, and therefore may not be functional or even present on your actual board.

Assembly of these connectors is highly custom specific. Discuss your needs with EKF before ordering, so that the optimum board configuration for your application will be chosen.

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
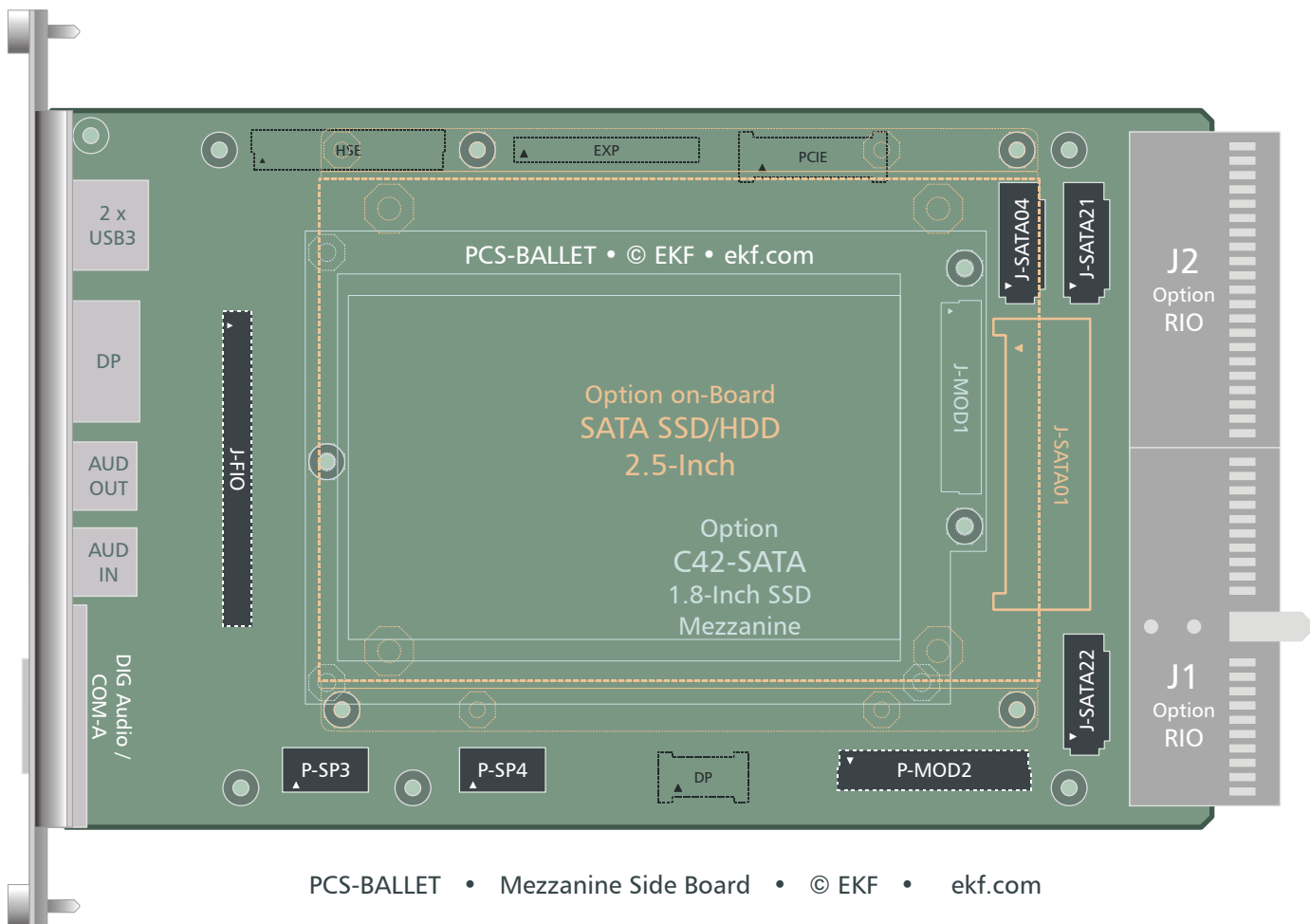
FIO (Mezzanine Expansion Module C32-FIO)	
I/F Type	SOURCE
AUDIO Analog (2 x)	Codec ALC262
AUDIO S/PDIF (Option)	Codec ALC262
PS/2 KB/MS	SIO2
Serial (UART) SP3/SP4	SIO2
USB1 - USB2	CPU Carrier (HSE)

MOD1 (Mezzanine Expansion Module C42-SATA C47-MSATA)	
I/F Type	SOURCE
SATA01 - SATA03	CPU Carrier (HSE) via Redriver
USB3 - USB4	CPU Carrier (HSE)

MOD2 (Mezzanine Expansion Module C20-SATA)	
I/F Type	SOURCE
SATA11 - SATA12	On-Board SATA Controller 88SE9170

SATA01 (SATA Host Connector for 2.5-Inch on-Board Drive)	
I/F Type	SOURCE
SATA01	CPU Carrier (HSE) via Redriver

SATA04 SATA21 SATA22 (SATA Cable Connectors)	
I/F Type	SOURCE
SATA04	CPU Carrier (HSE) via Redriver
SATA21 - SATA22	On-Board SATA Controller 88SE9170

FIO

As an option, the PCS-BALLET can be expanded by a small front panel I/O mezzanine module, the C32-FIO. This requires a 12HP front panel in total (CPU carrier, PCS-BALLET, C32-FIO). The C32-FIO provides additional COM-Ports, USB, and a PS/2 legacy Mini-DIN connector.

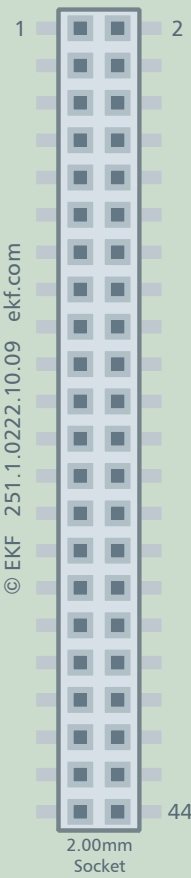FIO is a 2mm pitch dual row socket on top of the PCS-BALLET, which connects to the C32-FIO by means of a board stacker element.

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
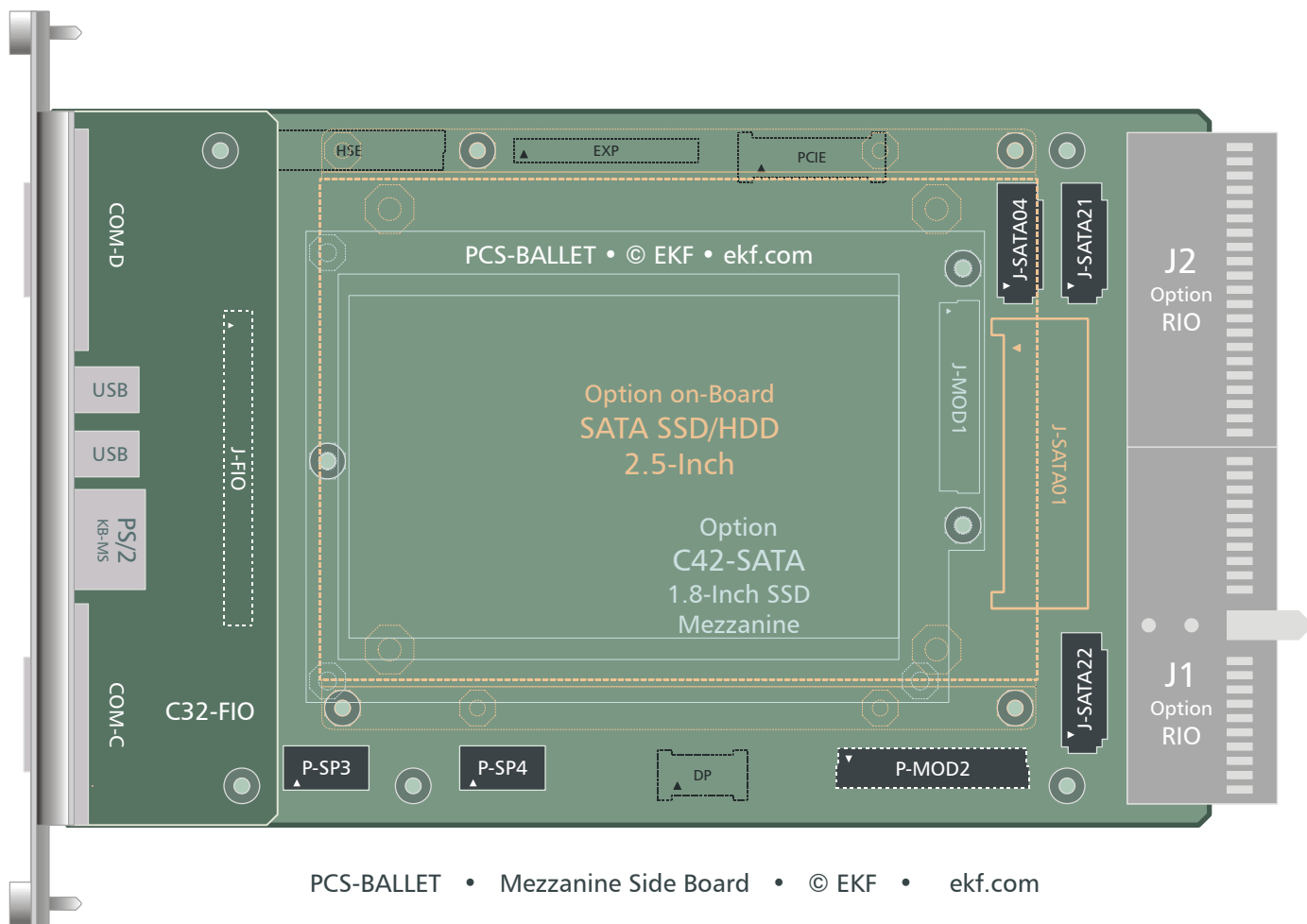
For a description of the C32-FIO mezzanine module refer to www.ekf.com/c/ccpu/c32/c32_tie.pdf.

FIO • Secondary I/O Mezzanine Expansion Interface (Audio - COM - PS/2 - USB)
2.00mm Socket 2 x 22 (251.1.0222.10.09)

Left Signal	Pin	Pin	Right Signal
GND	1	2	+3.3V_CR *
SP4_RI#	3	4	SP4_DSR#
SP4_TXD	5	6	SP4_RXD
SP4_RTS#	7	8	SP4_DTR#
SP4_DCD#	9	10	SP4_CTS#
GND	11	12	+3.3V_CR *
SP3_RI#	13	14	SP3_DSR#
SP3_TXD	15	16	SP3_RXD
SP3_RTS#	17	18	SP3_DTR#
SP3_DCD#	19	20	SP3_CTS#
GND	21	22	+5V_CR *
USB_2N 1)	23	24	USB_1N 1)
USB_2P 1)	25	26	USB_1P 1)
USB_OC2# 1)	27	28	GND
PS/2 Clock Keyboard	29	30	PS/2 Clock Mouse
PS/2 Data Keyboard	31	32	PS/2 Data Mouse
GND	33	34	+5V_A **
S/PDIF_IN	35	36	S/PDIF_OUT
CD_L	37	38	CD_R
LINE1_L	39	40	MIC1_L
AGND	41	42	CD_GND
LINE1_R	43	44	MIC1_R

The connector illustration shows: 1, 2 at top, 44 at bottom, labelled "2.00mm Socket". Vertical text: "© EKF   251.1.0222.10.09   ekf.com".

1)   from CPU carrier card mezzanine connector HSE

*   switched power supply lines from CPU carrier board according to Sx state
**   mostly on power supply line from CPU carrier board according to Sx state

The SP3/SP4 serial port signals (UART TTL-level) are shared with the on-board connectors SP3/SP4 and the rear I/O option connector J2, and must be used for one destination only in order to avoid signal interference. The PS/2 KB/MS signals are shared with the rear I/O option connector J2, and must also be used for one destination only. The audio signals (pins 35-44) are not in use on the C32-FIO mezzanine module. The S/PDIF signals would be shared with the optional D-SUB AUDIO front panel I/O connector, either one destination is available by PCS-BALLET stuffing options.

| ALC262 Analog Port Configuration - FIO					
Port	Name	LINE OUT / HP	LINE IN	MIC	Connector
B	MIC1			✓	J-FIO
C	LINE1		✓		J-FIO
	CD		✓		J-FIO
	S/PDIF				J-FIO
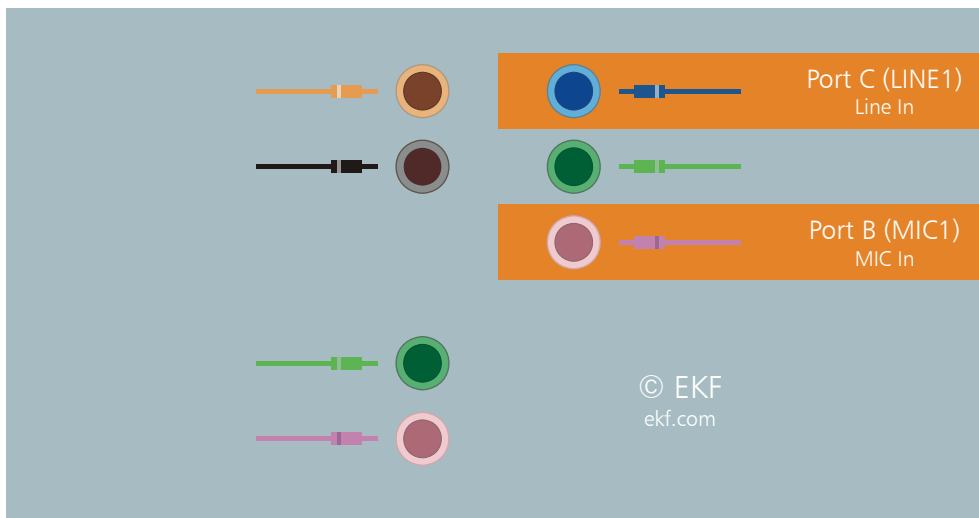
CCO-CONCERT
Realtek Audio Driver Analog Configurations - J-FIO Mezzanine Connector

MOD1

The PCS-BALLET can be equipped with a mezzanine connector, suitable for attachment of a low profile mezzanine storage module, e.g. the C42-SATA (1.8-inch SSD), or the C47-MSATA (dual mSATA). MOD1 is stuffed exclusive to the 2.5-inch drive docking connector SATA01 only.

The MOD1 SATA signals are passed over from the CPU card via the inter-board mezzanine connector HSE. SATA signal redrivers on the PCS-BALLET are provided for optimum signal integrity. Up to three SATA ports are available over MOD1. In addition, MOD1 comprises also two USB ports for optional usage together with certain C4* mezzanine cards.

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
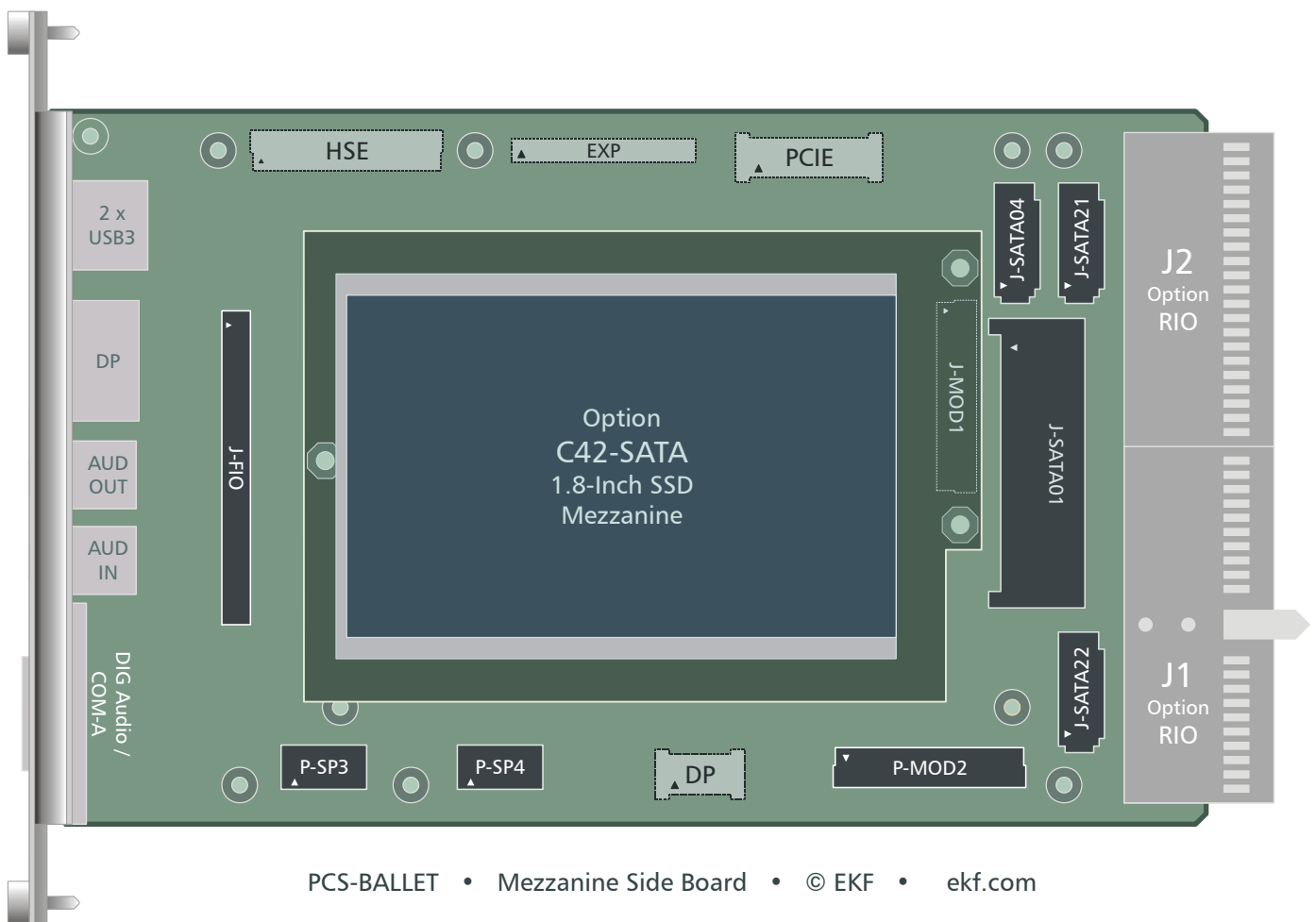
MOD1 • Low Profile Storage Module Mezzanine Connector
1.00mm Pitch Female Connector 8mm Height • 275.90.08.068.01
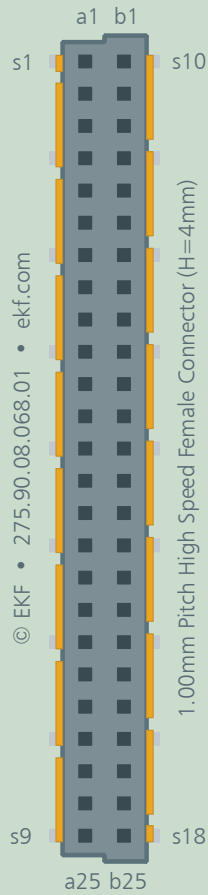
GND	a1	b1	GND
SATA01 TXP	a2	b2	SATA03 TXP
SATA01 TXN	a3	b3	SATA03 TXN
GND	a4	b4	GND
SATA01 RXN	a5	b5	SATA03 RXN
SATA01 RXP	a6	b6	SATA03 RXP
GND	a7	b7	GND
SATA02 TXP	a8	b8	
SATA02 TXN	a9	b9	
GND	a10	b10	GND
SATA02 RXN	a11	b11	
SATA02 RXP	a12	b12	
GND	a13	b13	GND
	a14	b14	USB3 DP
	a15	b15	USB3 DN
GND	a16	b16	GND
	a17	b17	USB4 DP
	a18	b18	USB4 DN
GND	a19	b19	GND
	a20	b20	USB_OC3#
	a21	b21	USB_OC4#
+3.3V_SATA 1)	a22	b22	+5V_SATA 2)
+3.3V_SATA 1)	a23	b23	+5V_SATA 2)
	a24	b24	
+12V_SATA 3)	a25	b25	+12V_SATA 3)

Left side graphic labels: a1 b1 · s1 · s10 · s9 · s18 · a25 b25 · 1.00mm Pitch High Speed Female Connector (H=4mm) · © EKF • 275.90.08.068.01 • ekf.com

1) +3.3V_SATA through self resettable fuse 1.5A, normally derived from +3.3V_CR (switched on/off according to Sx state power rail)

2) +5V_SATA through self resettable fuse 1.5A, normally derived from +5V_CR (switched on/off according to Sx state power rail)

3) +12V_SATA through self resettable fuse 0.5A, not available by default

Notes:

▸ All s# pins (connector shield) are tied to GND

▸ All TX/RX designations with respect to the SATA controllers on the CPU carrier board (TX controller = RX drive, RX controller = TX drive)

MOD2

As an option, the PCS-BALLET can be provided with a high speed mezzanine connector for accommodating of the C20-SATA single/dual drive storage module. The C20-SATA can be equipped with up to two 2.5-inch drives (top and bottom mount), which would be connected to a 88SE9170 dual-channel 6Gbps SATA controller.

By default, the supply voltage(s) on the MOD2 storage module connector are derived from the CPU carrier board (switched according to CPU Sx state). As an alternative, SATA hard disk power could be attached externally, across the rear I/O connector J1 (stuffing option).

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
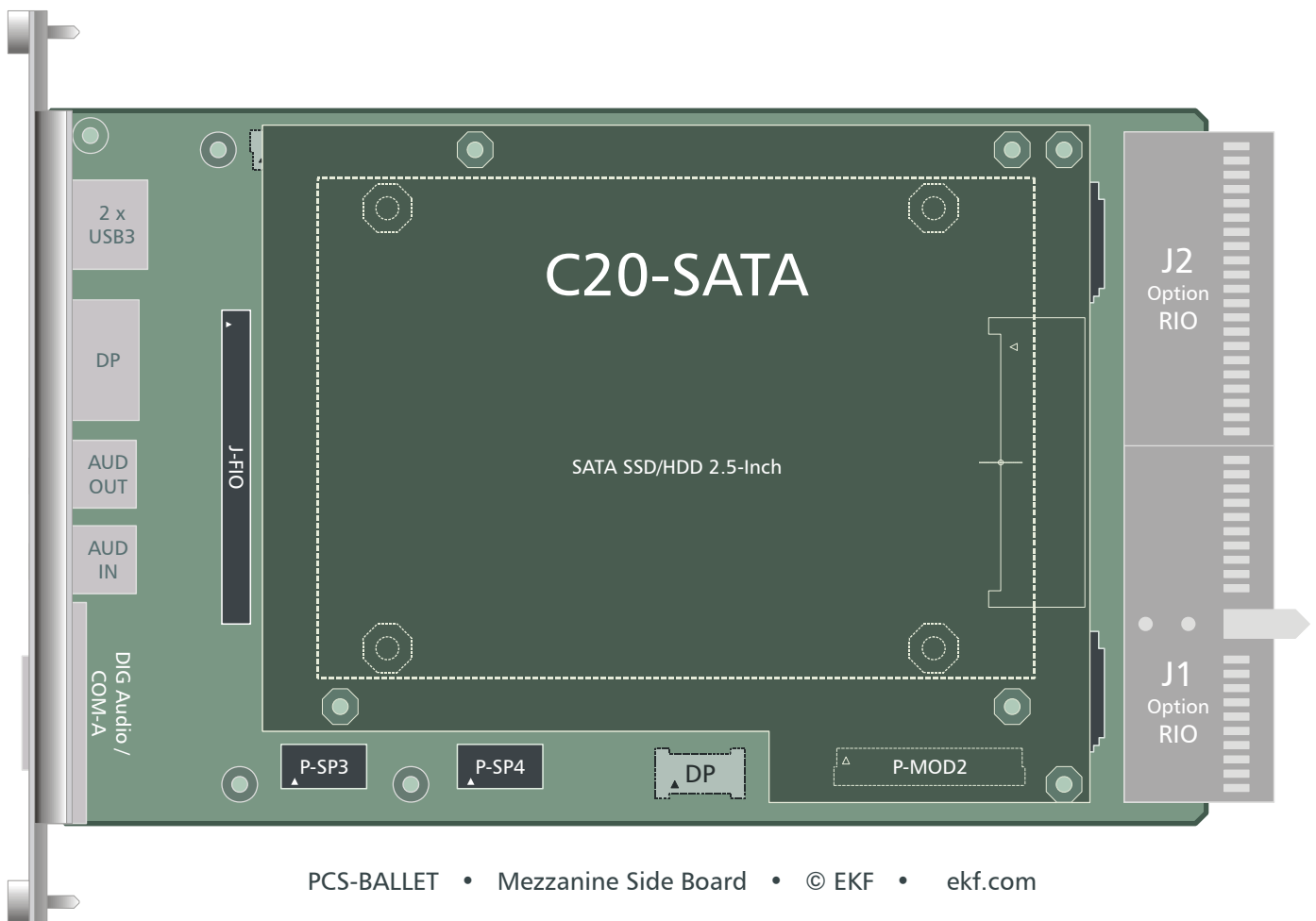
Installation of Marvell SATA driver software would be required prior to MOD2 usage (http://www.ekf.com/p/pcs/drv/sata/).

MOD2 • SATA Expansion Interface
1.00mm Pitch Male Connector 2mm Height (275.90.02.068.51)
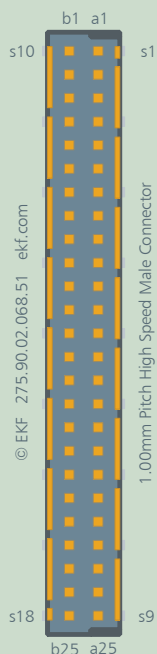
GND	b1	a1	GND
	b2	a2	SATA4_TXP
	b3	a3	SATA11 TXN
GND	b4	a4	GND
	b5	a5	SATA11 RXN
	b6	a6	SATA11 RXP
GND	b7	a7	GND
	b8	a8	SATA12 TXP
	b9	a9	SATA12 TXN
GND	b10	a10	GND
	b11	a11	SATA12 RXN
	b12	a12	SATA12 RXP
GND	b13	a13	GND
	b14	a14	
	b15	a15	
GND	b16	a16	GND
	b17	a17	
	b18	a18	
	b19	a19	
	b20	a20	
	b21	a21	
+5V_SATA	b22	a22	+3.3V_SATA
+5V_SATA	b23	a23	+3.3V_SATA
	b24	a24	
+12V_SATA	b25	a25	*+12V_SATA*

Notes:

▸ +3.3V_SATA and +5V_SATA by default are connected to +3,3V_CR and +5V_CR across 1.5A PolySwitch resettable fuses - can be tied to external voltages applied to J1 as an manufacturing option

▸ +12V_SATA is not connected by default - can be tied to either +12V_A or +12V_EXT as manufacturing option

▸ All sx pins (shield) are tied to GND

▸ All TX/RX designations with respect to SATA controller (TX controller = RX drive, RX controller = TX drive)
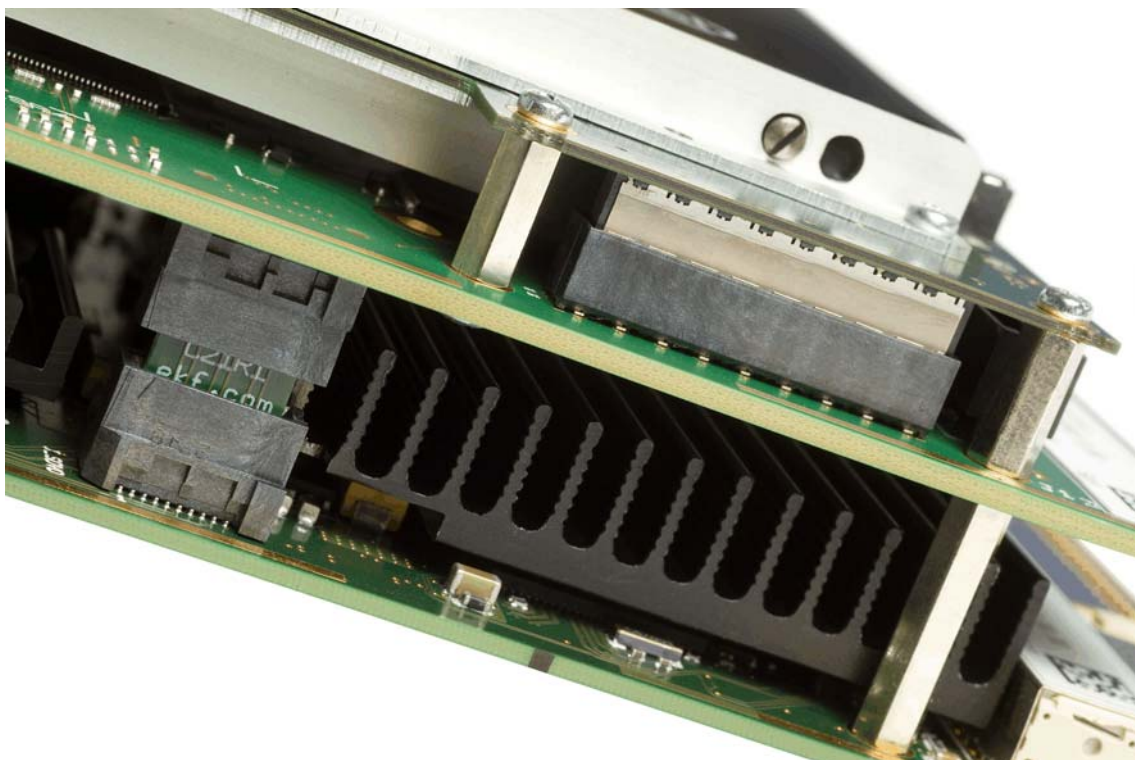
MOD2 with C20-SATA Dual SSD Attached

C20-SATA

C20-SATA Top View

C20-SATA Bottom View

SATA01

The PCS-BALLET can be equipped with a SATA host receptacle (docking connector), suitable for attachment of an on-board 2.5-inch SATA HDD/SSD. SATA01 is stuffed exclusive to the low profile mezzanine storage module connector MOD1 only. SATA01 has a reasonable standoff for stuffing components below the drive, which requires 2 mounting rails in order to fix and carry the drive.

The SATA01 signals are passed over from the CPU card via the inter-board mezzanine connector HSE. SATA signal redrivers on the PCS-BALLET are provided for optimum signal integrity.

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com

Signal designations RX/TX are shown with respect to the SATA host controller. Typical SATA devices are powered from the +5V rail. By default, power is supplied from the CPU carrier board, across the PCS-BALLET inter-board mezzanine connectors. As an alternate, external power can be sourced across the optional rear I/O connector J1 (manufacturing options).

SATA01 • Serial ATA Docking Connector	
Serial ATA host receptacle (256.022.10.02)	
Part No. 256.022.10.02 • SATA Host Receptacle • © EKF • ekf.com	
S1	GND
S2	SATA01 TXP
S3	SATA01 TXN
S4	GND
S5	SATA01 RXN
S6	SATA01 RXP
S7	GND
P1	+3.3V_SATA
P2	+3.3V_SATA
P3	+3.3V_SATA
P4	GND
P5	GND
P6	GND
P7	+5V_SATA
P8	+5V_SATA
P9	+5V_SATA
P10	GND
P11	DAS (Drive Activity)
P12	GND
P13	*+12V_SATA*
P14	*+12V_SATA*
P15	*+12V_SATA*

DAS (P11) is used to control the PCS-BALLET front panel LED labelled 'D'. Please note, that not all drive types support this drive activity signal accordingly. SATA01 host controller activity can also be observed from a CPU card front panel indicator LED.

+12V_SATA (P13-P15) may not be available from the docking connector SATA01 (left unconnected by default).

SATA04 SATA21 SATA22

The PCS-BALLET can be optionally equipped with up to three vertical latched SATA signal headers, for attachment of SATA drives by cable. TX/RX designation of signals is with respect to the SATA controller.

The SATA04 port is derived from the CPU carrier card via the inter-board connector HSE. SATA signal redrivers are provided for optimum signal integrity. SATA04 cannot be populated if a 2.5-inch on-board drive is attached to the docking connector SATA01 due to space restrictions.

The optional cable connectors SATA21 and SATA22 correspond to a dedicated on-board SATA controller (88SE9170, 6Gbps).

PCS-BALLET • Mezzanine Side Board • © EKF • ekf.com
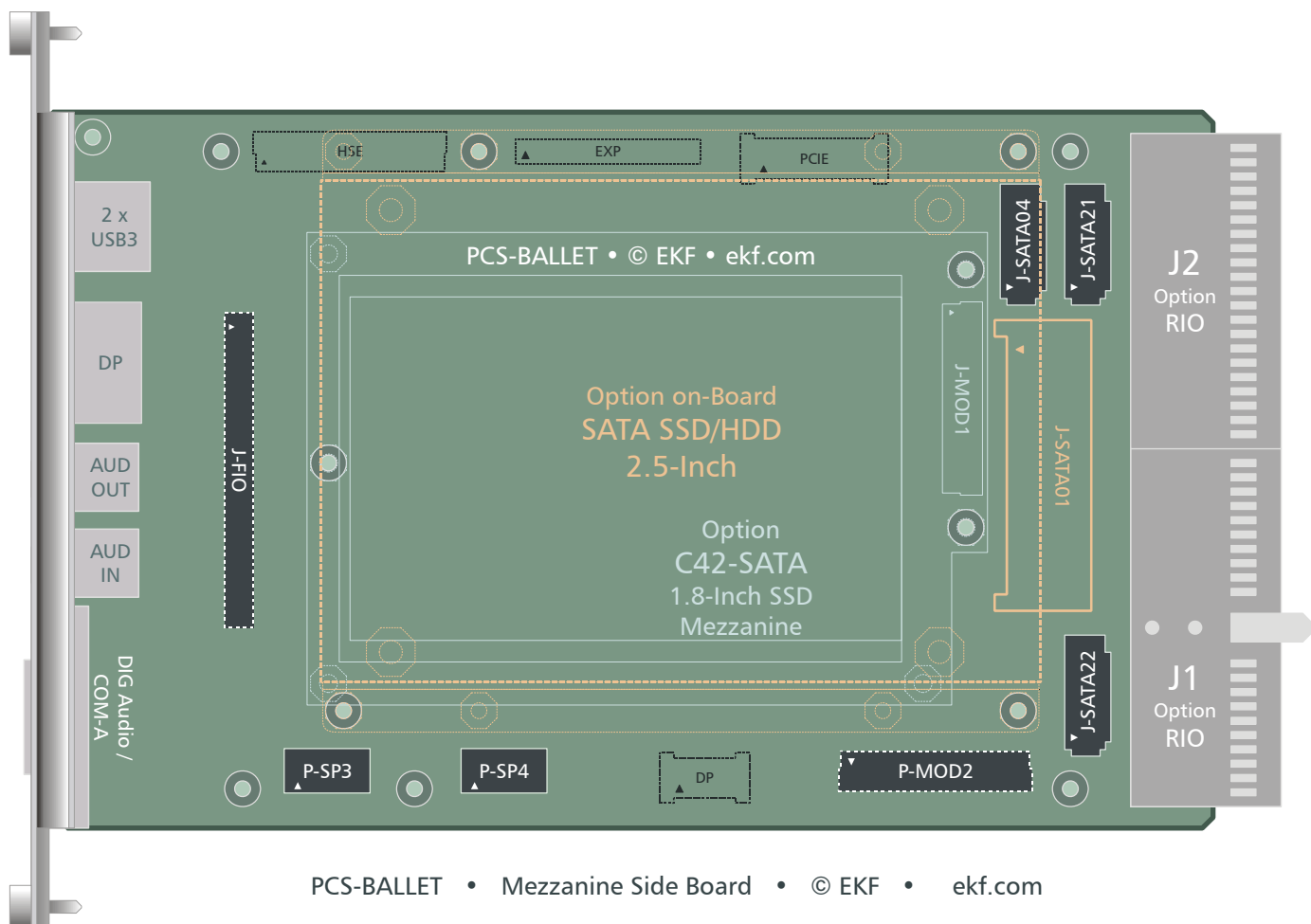
Installation of Marvell SATA driver software would be required prior to SATA21/22 usage (http://www.ekf.com/p/pcs/drv/sata/).

SATA04 SATA21 SATA22 • Latched Headers	
	1	GND
	2	SATA04 (21/22) TXP
	3	SATA04 (21/22) TXN
	4	GND
	5	SATA04 (21/22) RXN
	6	SATA04 (21/22) RXP
	7	GND
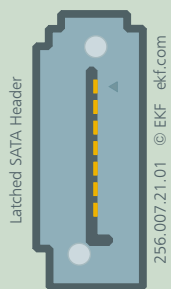
Latched SATA Header

256.007.21.01   © EKF   ekf.com

SP3 SP4

The on-board SIO (Super I/O controller) provides up to four serial interfaces (UART, DOS COM ports). While the serial port SP1 is are already assigned to the front panel RS-232 COM port connector, another two UARTs are available in addition from the optional pin headers SP3 and SP4 (TTL-level on all signals). SP3 and SP4 are suitable for attachment of EKF CU-series PHY modules via a micro ribbon flat cable assembly. A PHY module is a transceiver from TTL level signals to a specific symmetric or asymmetric interface standard, e.g. EIA-485 or RS-232E, with or w/o galvanic isolation. Please contact sales@ekf.de for availability of different CU-series modules (inquiries for custom specific PHY or transition modules welcome). Also custom specific front panel design can be done.
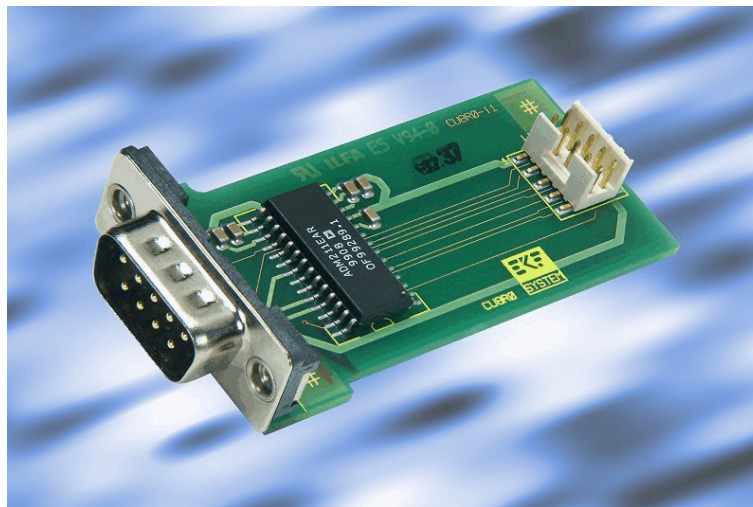
CU-Series PHY Module

Due to another (primary) SIO typically available on the CPU carrier card, the PCS-BALLET additional serial interfaces are not necessarily assigned to COM-1/COM-4 by the operating system. Verify or modify the accompanying CPU carrier board BIOS settings for mapping of physical asynchronous serial I/O ports to the logical COM port order.

Alternatively the connectors SP3/SP4 can be used as 5V tolerant programmable I/O (GPIO). Details can be derived from the SCH3114 Super I/O controller data sheet (www.smsc.com).

In addition, all the serial ports provided by the SIO2 are also available for rear I/O across J2 (option). As another option, the PCS-BALLET can accommodate a front panel I/O mezzanine module (C32-FIO), which has RS-232 on-board transceivers wired to SP3 and SP4. In order to avoid signal interference and malfunction, attach a transceiver module or other circuitry only once, either to the pin headers SP3/4, or through a rear I/O transition module via J2, or by employment of the C32-FIO module.

SP3 • TTL-Level Serial I/O or GPIO			
2.00mm Pin Header 2 x 5 (277.01.010.21)			
+5V_SP3 0.75A [1]	1	2	DSR3# / GP12
RI3# / GP13	3	4	RXD3 / GP10
TXD3 / GP11	5	6	DTR3# / GP15
RTS3# / GP17	7	8	CTS3# / GP16
DCD3# / GP12	9	10	GND

SP4 • TTL-Level Serial I/O or GPIO			
2.00mm Pin Header 2 x 5 (277.01.010.21)			
+5V_SP4 0.75A [1]	1	2	DSR4# / GP66
RI4# / GP31	3	4	RXD4 / GP64
TXD4 / GP65	5	6	DTR4# / GP34 [2]
RTS4# / GP67 [2]	7	8	CTS4# / GP62
DCD4# / GP63	9	10	GND

[1]   short circuit protection by a PolySwitch resettable fuse, voltage derived from +5V_CR carrier board switched power well

[2]   RTS4# may be in use as WP (write protect) signal for board configuration EEPROM. DTR4# may be in use as A1 address signal for board configuration EEPROM.

On-Board Jumpers

J-RES Reset

Provided as an option, the pin header J-RES can be used for resetting the CPU host board (processor reset) if wired to additional circuitry (e.g. watchdog or manual pushbutton). Tie reset# to GND with an open collector output. While debugging the system, a 2.54mm jumper may be used to force a manual reset.

J-RES

1=RST# 2=GND
© EKF 240.1.02 ekf.com

Inter-Board Connectors

The PCS-BALLET is equipped with 4 inter-board connectors. These are the EXP (LPC and mixed signals), the HSE (SATA & USB), the PCIE (4-Lane PCI Express®), and the DP (DisplayPort) connectors. All host CPU inter-board connectors are situated at the bottom of the PCS-BALLET and establish the data path and power link to the carrier board CPU.

As the PCS-BALLET comes typically mounted as a unit together with the SC1-ALLEGRO or PC1-GROOVE (or other carrier board), there is normally no need for the user to get access to any of the inter-board connectors. They are described here as a reference only and for better understanding of the PCS-BALLET.

DP	
I/F Type	SC1-ALLEGRO Controller
DisplayPort (Mux with SDVO)	PCH (Platform Controller Hub)

EXP	
I/F Type	SC1-ALLEGRO Controller
LPC (Low Pin Count)	PCH (Platform Controller Hub)
HD Audio	PCH (Platform Controller Hub)
SMBus	PCH (Platform Controller Hub)
2 x USB 2.0	PCH (Platform Controller Hub)

HSE	
I/F Type	SC1-ALLEGRO Controller
SATA01, SATA04 (3G)	PCH (Platform Controller Hub)
SATA02, SATA03 (6G)	PCH (Platform Controller Hub)
4 x USB 2.0	1:4 USB Hub

PCIE	
I/F Type	SC1-ALLEGRO Controller
PCI Express®	PE Switch

CPU Carrier to Mezzanine Side Card Connector Suite
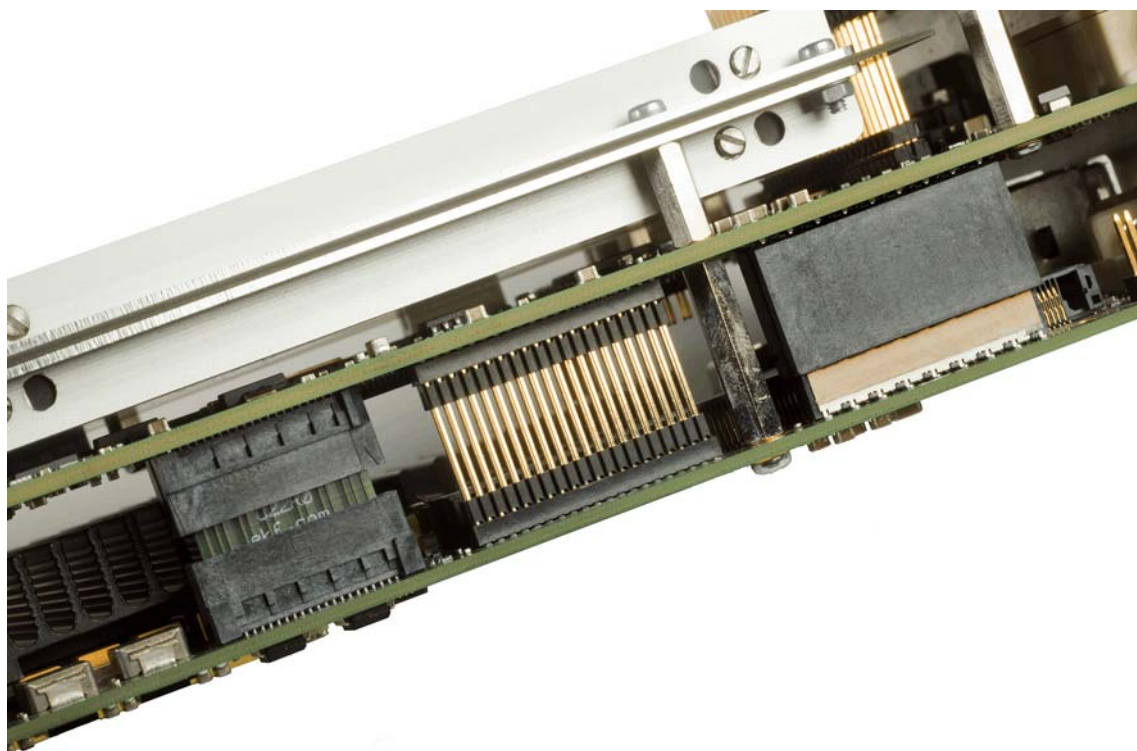
PCIE   EXP   HSE

DP

DP

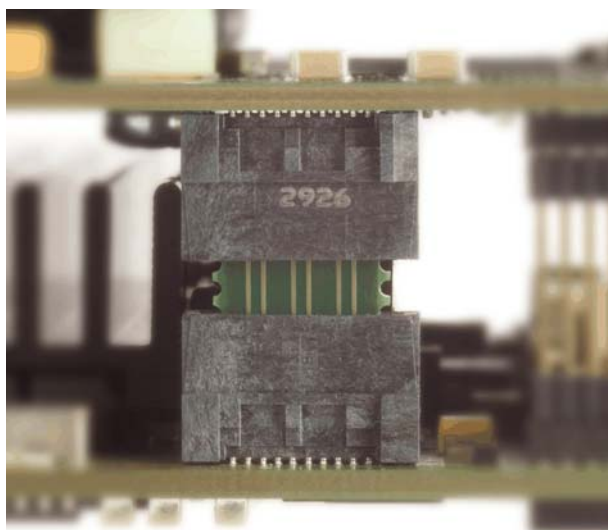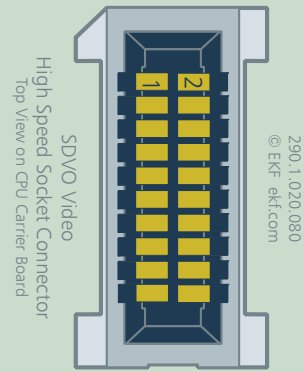The high speed expansion socket DP is mounted on bottom of the PCS-BALLET. This allows to attach the mezzanine companion card on top of the CPU carrier board. A mating strip line PCB (C21-PCIEX1 with respect to the SC1-ALLEGRO CPU carrier card, and C66-DP for the PC1-GROOVE CPU) is used in addition to bridge the gap between the two boards, which results from the horizontal 0.8-inch (20.32mm) card slot pitch.

DP • DisplayPort Video High Speed Dual Row Socket 0.8mm Pitch (290.1.020.080)				
	GND	1	2	GND
	DP0+	3	4	DP3+
	DP0-	5	6	DP3-
	GND	7	8	GND
	DP1+	9	10	DP_AUX+
	DP1-	11	12	DP_AUX--
	GND	13	14	GND
	DP2+	15	16	DP_CFG
	DP2-	17	18	DP_HPD
	GND	19	20	GND

SDVO Video
High Speed Socket Connector
Top View on CPU Carrier Board

290.1.020.080
© EKF ekf.com

pin orientation shows
CPU carrier board top view

With respect to the particular CPU carrier card, the DP connector (AKA SDVO/DP) may be also configurable for SDVO video. Be sure to setup the CPU board for DisplayPort technology via the DP inter-board mezzanine connector, when combined with the PCS-BALLET.

Recent Intel graphics drivers should be installed in your system; if in doubt verify your drivers by the Intel® Driver Update Utility: www.intel.com/p/en_US/support/detect/?wapkw=(driver+update)

C21 use with
SC1-ALLEGRO
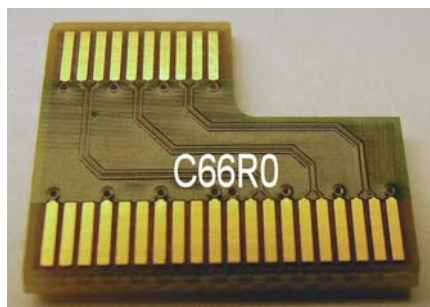
C66 use with
PC1-GROOVE

EXP

The inter-board connector EXP is mounted on bottom of the PCS-BALLET PCB. This allows to attach the PCS-BALLET mezzanine companion card on top of the CPU carrier board. A suitable board stacker is used in addition to bridge the gap between the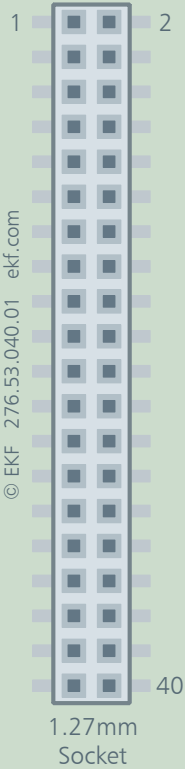 two boards (exactly 4HP distance between PCBs). EXP is used to pass the Low Pin Count I/F to the PCS-BALLET, besides two USB channels and some sideband signals.

EXP • Expansion Board Interface (LPC/HD-Audio/USB)			
1.27mm Socket 2 x 20 (276.53.040.01)			
GND	1	2	+3.3V_CR [*]
CLK_33MHZ	3	4	PLTRST#
LPC_AD0	5	6	LPC_AD1
LPC_AD2	7	8	LPC_AD3
LPC_FRAME#	9	10	LPC_DRQ#
GND	11	12	+3.3V_CR [*]
SERIRQ	13	14	PME#
SMI#	15	16	CLK_14MHZ
	17	18	
KBD_RST#	19	20	A20GATE
GND	21	22	+5V_CR [*]
USB2_DN	23	24	USB1_DN
USB2_DP	25	26	USB1_DP
USB_OC#	27	28	DBRESET#
SMB_CLK	29	30	SMB_DAT
GND	31	32	+5V_CR [*]
HDA_SDOUT	33	34	HDA_SDIN0
HDA_RST#	35	36	HDA_SYNC
HDA_BITCLK	37	38	
SPEAKER	39	40	+12V_A

1
2

© EKF 276.53.040.01 ekf.com

40

1.27mm
Socket

pin orientation shows
CPU carrier board top view

[*]   switched power supply lines from CPU carrier board according to Sx state

HSE

The connector HSE is a 10mm height shielded male pin header. Its counterpart on the CPU carrier board is a 8mm height receptacle, for a nominal headroom of 18.72mm between the boards (equivalent to 4HP board to board CL pitch).

HSE • SATA & USB Mezzanine Interface			
1.00mm Pitch Male Connector 10mm Height (275.90.10.068.51)			
GND	b1	a1	GND
SATA03_TXP 4)	b2	a2	SATA01_TXP 3)
SATA03_TXN 4)	b3	a3	SATA01_TXN 3)
GND	b4	a4	GND
SATA03_RXN 4)	b5	a5	SATA01_RXN 3)
SATA03_RXP 4)	b6	a6	SATA01_RXP 3)
GND	b7	a7	GND
SATA04_TXP 3)	b8	a8	SATA02_TXP 4)
SATA04_TXN 3)	b9	a9	SATA02_TXN 4)
GND	b10	a10	GND
SATA04_RXN 3)	b11	a11	SATA02_RXN 4)
SATA04_RXP 3)	b12	a12	SATA02_RXP 4)
GND	b13	a13	GND
USB3_P	b14	a14	USB1_P
USB3_N	b15	a15	USB1_N
GND	b16	a16	GND
USB4_P	b17	a17	USB2_P
USB4_N	b18	a18	USB2_N
GND	b19	a19	GND
USB3_OC#	b20	a20	USB1_OC#
USB4_OC#	b21	a21	USB2_OC#
+5V_CR 2)	b22	a22	+3.3V_CR 1)
+5V_CR 2)	b23	a23	+3.3V_CR 1)
+5V_A	b24	a24	+3.3V_A
+12V_A	b25	a25	+12V_A

The connector diagram to the left is labeled:
- b1 a1
- s10 s1
- © EKF 275.90.10.068.51 ekf.com
- 1.00mm Pitch High Speed Male Connector
- s18 s9
- b25 a25

1) 2) Switched voltages from carrier board, according to CPU sleep state S0
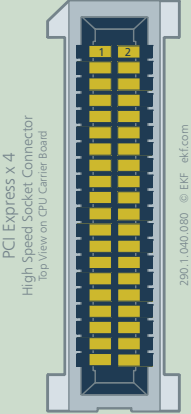3)   3Gbps SATA (SC1-ALLEGRO)
4)   6Gbps SATA (SC1-ALLEGRO)

Notes:
▸   All s# connector pins (shield) are tied to GND
▸   All TX/RX designations with respect to SATA controller (TX controller = RX drive, RX controller = TX drive)

PCIE

The high speed expansion socket PCIE is mounted on bottom of the PCS-BALLET. This allows to attach the mezzanine companion card on top of the CPU carrier board. A mating strip line spacer PCB (C22-PCIEX2) is used in addition to bridge the gap between the two boards, which results from the horizontal 0.8-inch (20.32mm) card slot pitch.

PCIE must be organized as 4 links by 1 lane each (i.e. 4 single PCI Express® lanes). Check the CPU carrier card PCIE DIP-switch settings for proper configuration (DSW1.1 = OFF, DSW1.2 = ON).

PCIE • PCI Express x 4 High Speed Dual Row Socket 0.8mm Pitch 290.1.040.080				
GND	1	2	GND
+5V_CR [1]	3	4	+3.3V_CR [1]
+5V_CR [1]	5	6	+3.3V_CR [1]
GND	7	8	GND
PE_CLKP	9	10	PLTRST#
PE_CLKN	11	12	*PE_WAKE#*
GND	13	14	GND
PE0_TP	15	16	PE0_RP
PE0_TN	17	18	PE0_RN
GND	19	20	GND
GND	21	22	GND
PE1_TP	23	24	PE1_RP
PE1_TN	25	26	PE1_RN
GND	27	28	GND
PE2_TP	29	30	PE2_RP
PE2_TN	31	32	PE2_RN
GND	33	34	GND
PE3_TP	35	36	PE3_RP
PE3_TN	37	38	PE3_RN
GND	39	40	

PCI Express x 4
High Speed Socket Connector
Top View on CPU Carrier Board

290.1.040.080 © EKF ekf.com

pin assignment shows CPU carrier board top view (see-trough mezzanine side board PCB)

[1] switched on/off power lines on CPU carrier boards according to S3 state

[1] Supply voltages from carrier board, switched on/off according to sleep state

Rear I/O Connectors

As an option together with CompactPCI® and CompactPCI® PlusIO CPU carrier cards only, the PCS-BALLET can be equipped with the rear I/O connectors J1 and J2. A single slot rear I/O backplane (directly adjoining the CompactPCI® Classic backplane) would be required for handing over the available signal lines to a suitable rear I/O transition module.
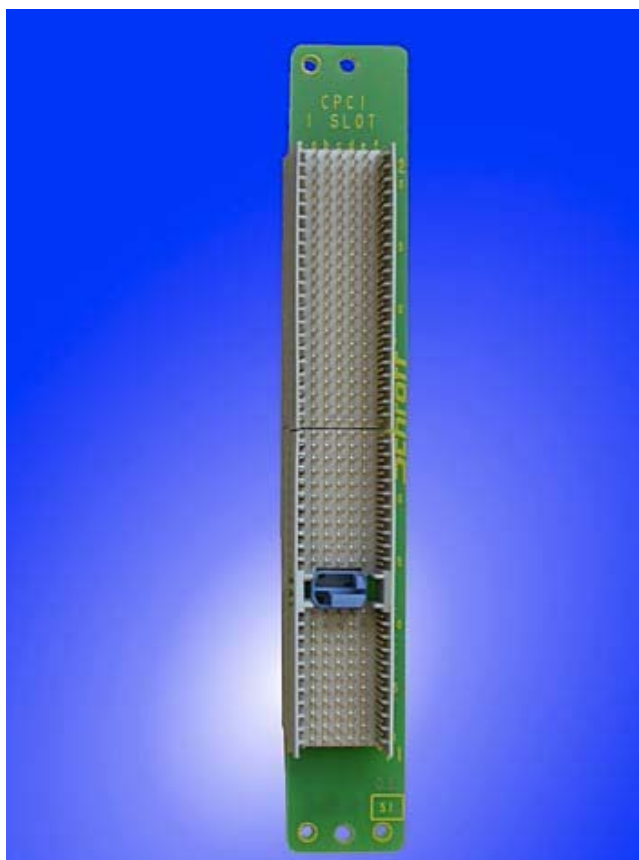

Schroff/Pentair 23090-719

A suitable single slot rear I/O backplane must have no interconnections or copper planes such as power or ground between different pins, since this would cause a short circuit situation for the I/O signals affected. Sometimes a fitting single slot RIO backplane is referenced as P4/P5 backplane, since it was originally intended to be installed with 6U CompactPCI® Classic boards for J4/J5 rear I/O. EKF recommends the 'Schroff I/O board backplane order code 23090-719', or Elma/Trenew #80970-001 (both items EKF part no. 932.2.01.000).

A single slot P1/P2 RIO backplane does not fit into a system with a left hand CompactPCI® Serial backplane, with respect to the required 4HP slot distance, due to the different backplane connector dimensions of a Serial board. Hence, the PCS-BALLET cannot be used for rear I/O together with the CPU cards SC1-ALLEGRO, SC2-PRESTO or SC3-LARGO. Consider the SCS-TRUMPET side card for rear I/O with these CPU boards.

Please note, that quite a lot of signals are also available either on-board or via front panel (stuffing options). Be sure to have connected any signal only once, in order to avoid interference/malfunction or even damage.

SATA channels may not be present on J1, if the particular SATA controller JMB32 is not populated. USB 3.0 ports available via J1 require the quad-port USB 3.0 controller to be populated (dual-port USB 3.0 controller by default). Discuss manufacturing options with sales@ekf.com before ordering.

The PCS-BALLET must not be plugged into a common CompactPCI® peripheral slot in order to avoid damaging the board or other components of the system. An optional brown key on the J1 connector would prevent the user from erroneously inserting the PCS-BALLET into an unsuitable (dangerous) position. However, the key may have to be removed or changed in order to match the single slot rear I/O backplane actually in use.
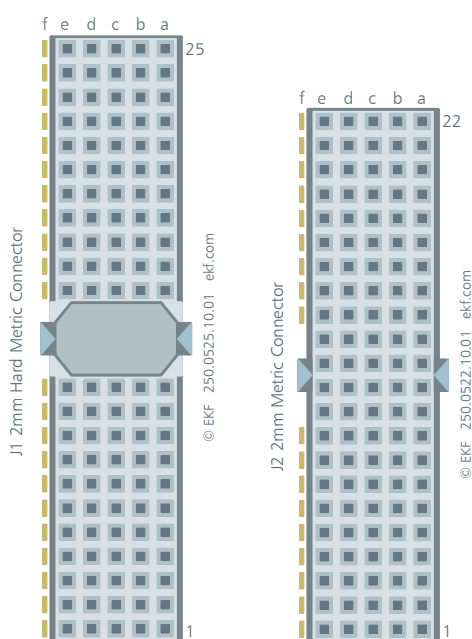
Signal names used in the J1 and J2 connector tables hereafter are associated with their main function. However, the Super I/O controller allows a number of signals also be used as general purpose I/O. Please consult the SMSC SCH3114 datasheet for details (www.smsc.com).

J1

Connector Assignment J1 Rear I/O

J1	A	B	C	D	E
25	NC	GND	USB4_DM 1)	NC	USB3_DM 1)
24	NC	GND	USB4_DP 1)	GND	USB3_DP 1)
23	GND	GND	GND	GND	GND
22	NC	GND	USB4_SSRN 1)	GND	USB3_SSRN 1)
21	NC	GND	USB4_SSRP 1)	GND	USB3_SSRP 1)
20	GND	GND	GND	GND	GND
19	NC	GND	USB4_SSTN 1)	GND	USB3_SSTN 1)
18	NC	GND	USB4_SSTP 1)	GND	USB3_SSTP 1)
17	GND	GND	GND	GND	GND
16	NC	GND	USB4_PON# 1)	GND	USB3_PON# 1)
15	NC	GND	USB4_OC# 1)	GND	USB3_OC# 1)
14					
13			KEY AREA - BROWN KEY (tbd/custom)		
12					
11	SATA32_TP 2)	GND	NC	GND	+3.3V_CR
10	SATA32_TN 2)	GND	NC	GND	+3.3V_CR
9	GND	GND	GND	GND	+5V_CR
8	SATA32_RN 2)	GND	NC	GND	+5V_CR
7	SATA32_RP 2)	GND	NC	GND	+12V_A
6	GND	GND	GND	GND	NC
5	SATA31_TP 2)	GND	NC	GND	+3.3V_EXT
4	SATA31_TN 2)	GND	NC	GND	+3.3V_EXT
3	GND	GND	GND	GND	+5V_EXT
2	SATA31_RN 2)	GND	NC	GND	+5V_EXT
1	SATA31_RP 2)	GND	NC	GND	+12V_EXT

1) Rear I/O USB3 & USB4 ports available with TUSB7340 option only (default TUSB7320)
2) Rear I/O SATA ports require the SHC3 88SE9170 host controller to be stuffed (option)

Installation of Marvell SATA driver software would be required prior to J1 SATA usage (http://www.ekf.com/p/pcs/drv/sata/).

J2

Connector Assignment J2 Rear I/O

J2	A	B	C	D	E
22	+5V_CR	+3.3V_CR	+3.3V_A	+5V_A	+12V_A
21	GND	GND	GND	GND	GND
20	SP1_RI#	SP1_CTS#	SP2_RI#/GP50	SP2_CTS#/GP56	TUSB_GPIO0 4)
19	SP1_RXD	GND	SP2_RXD/GP52	GND	TUSB_GPIO1 4)
18	SP1_DSR#	SP1_DCD#	SP2_DSR#/GP54	SP2_DCD#/GP51	TUSB_GPIO2 4)
17	SP1_DTR# 3)	GND	SP2_DTR#/GP57	GND	GND
16	SP1_RTS# 3)	SP1_TXD	SP2_RTS#/GP55 3)	SP2_TXD/GP53	DBRESET#
15		GND	TUSB_GPIO3 4)	GND	RESET#
14	SP3_RI#/GP13	SP3_CTS#/GP16	SP4_RI#/GP31	SP4_CTS#/GP62	SMB_DAT 1)
13	SP3_RXD/GP10	GND	SP4_RXD/GP64	GND	SMB_CLK 1)
12	SP3_DSR#/GP14	SP3_DCD#/GP12	SP4_DSR#/GP66	SP4_DCD#/GP63	GND
11	SP3_DTR#/GP15	GND	SP4_DTR#/GP34 2)	GND	USB1_DM
10	SP3_RTS#/GP17	SP3_TXD/GP11	SP4_RTS#/GP67 2)	SP4_TXD/GP65	USB1_DP
9		GND		GND	GND
8	LPT_SLCT	LPT_PE	LPT_BUSY	SIO_GP47	USB_OC#
7	LPT_ACK#	GND	GND	SIO_GP46	GND
6	LPT_D7	LPT_D6	LPT_D5	SIO_GP45	USB2_DM
5	LPT_D4	GND	LPT_D3	SIO_GP44	USB2_DP
4	LPT_D2	LPT_D1	LPT_SLCTIN#	SPEAKER	GND
3	LPT_D0	GND	LPT_INIT#	KBDAT	KBCLK
2	LPT_ALF#	LPT_ERROR#	LPT_STROBE#	GND	+5V_A
1	GND	GND	GND	MSDAT	MSCLK

1) Manufacturing option: SM Bus signals buffered via LTC4300A-3, voltage level @ +5V_CR buffer enable input is controlled by GP40 SCH3114 SIO (high=enabled)

2) GP34 may be used to control serial EEPROM A1 (stuffing option)
GP67 may be used to control serial EEPROM WP (stuffing option)

3) These serial port handshake signals may be also in use for power up strapping options of the SCH3114 SIO (10k PU or PD) with no or minor impact on normal operation

4) 3.3V compliant GPIOs derived from the TUSB7320/TUSB7340 USB 3.0 SuperSpeed host controller (10k PU)

Additional Functions

SMBus EEPROM

The PCS-BALLET is provided with a 24C02 2Kbit I^2C EEPROM, for storing board configuration data. The EEPROM is accessed via the SMBus.

If required, the SMBus EEPROM address A1 can be optionally controlled (stuffing option) by SIO GP34 (serial port 4 DTR#), and the SMBus EEPROM WP is likewise tied to GP67 (serial port 4 RTS4#).
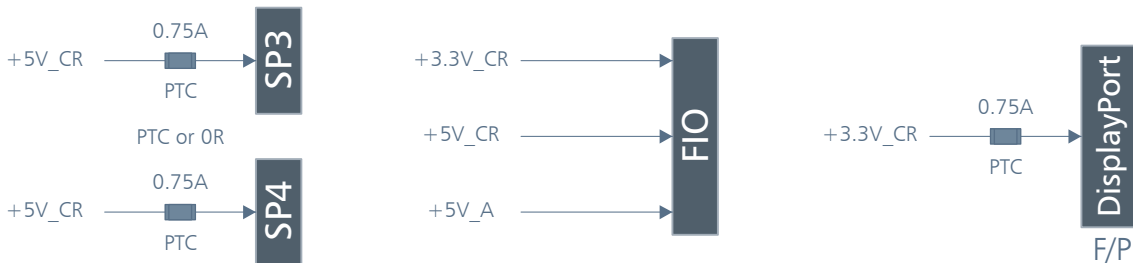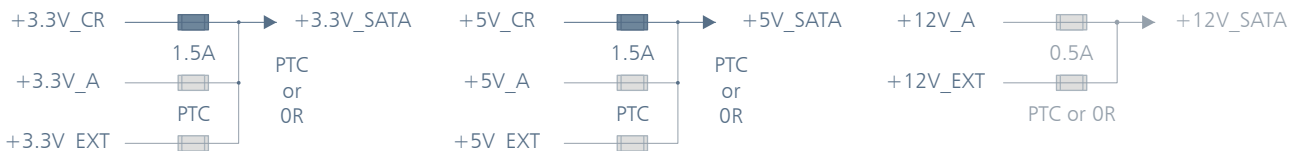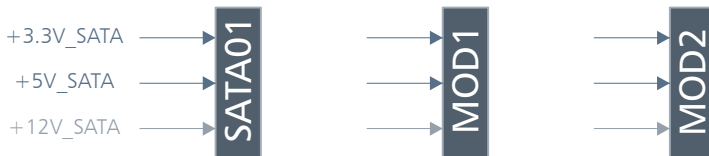
Power Distribution

The PCS-BALLET gets its power from two possible sources:

The CPU carrier board supplies +3.3V_CR and +5V_CR, which are switched on/off according to the current system sleep state, and +12V_A (A = always on). In addition, if the HSE is populated (CCM-BOOGIE CPU carrier board), +3.3V_A and +5V_A will be also passed through.

As an option, the rear I/O connector J1 can also be used to deliver power from an external supply (+12V_EXT, +5V_EXT, +3.3V_EXT) to the internal SATA storage connectors SATA01, MOD1 and MOD2, as an alternate to the CPU carrier board voltages. MOD2 e.g. would be used for a C20-SATA mezzanine storage module, which may be equipped with up to 2 hard disk drives, resulting in a considerable inrush current.

Power Distribution
PCS-BALLET
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CPU Carrier Card PC1-GROOVE SC1-ALLEGRO

LPC & MISC

EXP
→ +12V_A
→ +5V_CR
→ +3.3V_CR

PCI Express

PCIE
→ +5V_CR
→ +3.3V_CR

SATA & USB

HSE
→ +12V_A
→ +5V_A
→ +5V_CR
→ +3.3V_A
→ +3.3V_CR

Option Custom Specific Rear I/O Module

Rear I/O J2
+12V_A →
+5V_A →
+5V_CR →
+3.3V_A →
+3.3V_CR →

Rear I/O J1
+12V_A →
+5V_CR →
+3.3V_CR →
+12V_EXT ←
+5V_EXT ←
+3.3V_EXT ←

+3.3V_SATA → **SATA01**
+5V_SATA →
+12V_SATA →

→ **MOD1**
→

→ **MOD2**
→

+3.3V_CR → [1.5A] • → +3.3V_SATA
+3.3V_A → [PTC]   PTC or 0R
+3.3V_EXT → [PTC]

+5V_CR → [1.5A] • → +5V_SATA
+5V_A → [PTC]   PTC or 0R
+5V_EXT → [PTC]

+12V_A → [0.5A] • → +12V_SATA
+12V_EXT →   PTC or 0R

+5V_CR → [0.75A] → **SP3**
[PTC]
PTC or 0R
+5V_CR → [0.75A] → **SP4**
[PTC]

+3.3V_CR → **FIO**
+5V_CR →
+5V_A →

+3.3V_CR → [0.75A] → **DisplayPort**
[PTC]
F/P

F/P
+5V_CR → [1.5A] → **USB 3.0**
Electronic Switch

F/P
+5V_CR → [1.5A] → **USB 3.0**
Electronic Switch

Schematics

Complete circuit diagrams for this product are available for customers on request. Signing of a non-disclosure agreement would be needed. Please contact sales@ekf.de for details.

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