Development of a multifunctional unit: Blanc4

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SPring-8

Introduction

A beamline experimental station control system at SPring-8 has two types of systems installed.

1. A VMEbus system
- It is developed by the control group.
- It is a main stream that controls the accelerators, the insertion device, the front end, and the transport channel of beamlines.
- It can be used to develop a flexible control system by combining many VME modules.
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- It is difficult to handle by beamline staffs who are not experts of the control system.
- In a compact experimental control system, It is inappropriate to handle a few I/O signals or a few motor axes.
  - ➢ Chassis space, low portability, expensive

For one of the VMEbus system,
1. A chassis (8 U)
   - A CPU board
   - A analog input/output board
   - A digital I/O board
2. An analog connector box (2 U)
3. An digital connector box (1 U)

It is just a compact system…

2. A desktop PC-based system
- It is developed by beamilne staffs.
- It is of relatively low cost and suitable for a compact experimental system.
- Beamline staffs have been adapting their control system to the experimental condition.
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- The system is not unified in Spring-8, because beamelin staffs developt the system on their own way.
- They tend to save the time to develop the application software for a stable operation.

Requirements

We aimed to develop a convenient multifunctional unit instead of a VMEbus system for compact control system.
- It is just 1 U in height and it is a 19-inch rack mount-type.
  - ➢ High portability, easy setup
- It can develop a flexible control system by combining many modules. It can provide at least 4 cards supporting PCI or PCI Express.
- It has a reliable hardware system, I.e., it has zero spindles. It is low power consumption system.
- It dose not need a dedicated component to connect external equipment.

Blanc4

We developed a multifunctional unit to satisfy our requirements.

COM (Computer-on-Module) Express module
- COM Express is standardized by PICMG.
- The COM Express incorporates the latest technology standards based on serial differential signaling such as PCI Express, USB 2.0, Serial ATA, LVDS and Serial DVO implemented on an extremely compact COM.
- The form factor size is 95 mm x 125 mm.
  - ➢ We can custom a compact embedded computer.
We adopted COM Express module equipped with Intel Atom processor.
- TDP of the processor is 2.2 W.
- The module does not require a CPU fan.
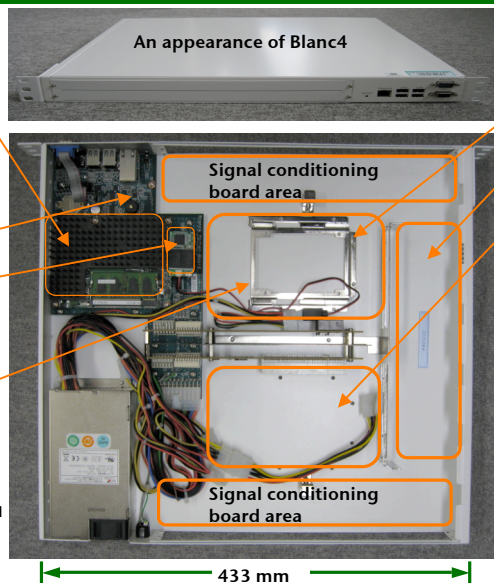
COM Express carrier board

DOM (Disk on Module) with SATA
- A DOM is compact size (about 26 mm x 46 mm) and is plugged directly to the carrier board.
- The capacity of the DOM is 16GB!!

Mounting bracket of a HDD or a SSD

Blanc4 can mount a 2.5-inch HDD or SSD on PCI (or PCIe) card slot area instead of a DOM.
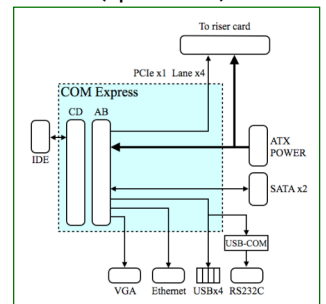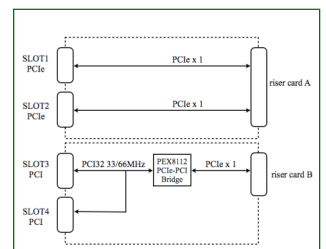
Blanc4 was developed in cooperation with ARKUS Inc. (http://www.arkus.co.jp/).

An appearance of Blanc4

1 U

Signal conditioning board area

Signal conditioning board area

400 mm

433 mm

PCI Express slot area (up to 2 cards)

Harness connector cable area

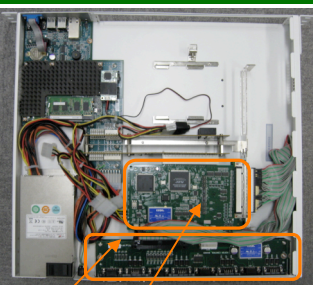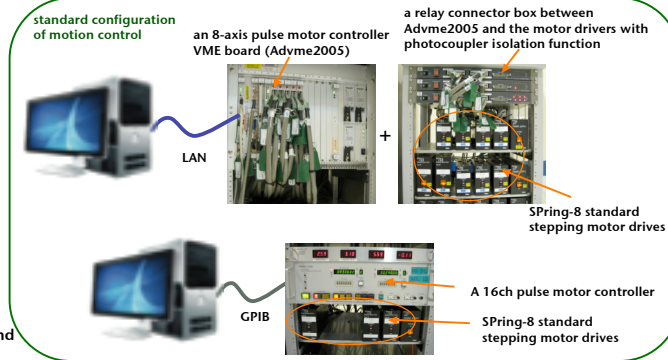**PCI slot area (up to 2 cards)**

A block diagram of COM Express carrier board of Blanc4

A block diagram of riser cards of Blanc4

Motion control

In a beamline experimental station control, a motion control is one of the most important controls.

PCI-7414M (Interface corporation)
- 4-axis motion controller PCI card

Signal conditioning board
- with connector panel for a PCI-7414M
- The board has 4 motor driver interfaces and 4 limit switch interfaces.
  - ➢ DE-9 connectors
- All interfaces are isolated by photo-couplers.

1U

Blanc4 can drive up to 8-axis motors.

standard configuration of motion control

an 8-axis pulse motor controller VME board (Advme2005)

a relay connector box between Advme2005 and the motor drivers with photocoupler isolation function

LAN

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SPring-8 standard stepping motor drives

GPIB

A 16ch pulse motor controller

SPring-8 standard stepping motor drives

Blanc4 having 8-axis motor controller and other functions…

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SPring-8 standard stepping motor drives

COM Express Module type2	AM 105 Model 110 (PFU Ltd.) Intel Atom processpr Z530 (1.6 GHz) Memory : 1 GB
PCI Express slot	PCIe x 1 lane 2 slots (half size)
PCI slot	PCI32 33/66 MHz 3.3 V 2 slots (half size)
Interfaces	Analog RGP (1280 x 1024) x 1 GbE x 1 USB2.0 x 4 RS232C x1
On-board connector	Serial ATA (7 pins) x 2 Parallel ATA (44 pins) x 1
Size (mm)	433 (W) x 43.65 (H) x 400 (D)
Power supply	DC +5 V, 5 VSB, +12 V, -12 V, +3.3 V Total power : 220 W

Specifications of Blanc4