

» EZ3-VX304x «



Getting Started

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Environmental protection is a high priority with Kontron.

Kontron follows the DEEE/WEEE directive.

You are encouraged to return our products for proper disposal.

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- > reduce waste arising from electrical and electronic equipment (EEE)
- > make producers of EEE responsible for the environmental impact of their products, especially when they become waste
- > encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- > improve the environmental performance of all those involved during the lifecycle of EEE

Conventions

This guide uses several types of notice: Note, Caution, ESD.



Note: this notice calls attention to important features or instructions.



Caution: this notice alert you to system damage, loss of data, or risk of personal injury.



ESD: This banner indicates an Electrostatic Sensitive Device.

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. The prefix `0x` shows a hexadecimal number, following the `C` programming language convention.

The multipliers `k`, `M` and `G` have their conventional scientific and engineering meanings of $*10^3$, $*10^6$ and $*10^9$ respectively. The only exception to this is in the description of the size of memory areas, when `K`, `M` and `G` mean $*2^{10}$, $*2^{20}$ and $*2^{30}$ respectively.



When describing transfer rates, `k` `M` and `G` mean $*10^3$, $*10^6$ and $*10^9$ *not* $*2^{10}$ $*2^{20}$ and $*2^{30}$.

In PowerPC terminology, multiple bit fields are numbered from 0 to n, where 0 is the MSB and n is the LSB. PCI and CompactPCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Signal names ending with an asterisk (*) or a hash (#) denote active low signals; all other signals are active high.

Signal names follow the PICMG 2.0 R3.0 CompactPCI Specification and the PCI Local Bus 2.3 Specification.

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!

All operations on this device must be carried out by sufficiently skilled personnel only.



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.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

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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Chapter 1 - Equipment Presentation

1.1 Overview

EZ3-VX304x is based on the best CPU computing technologies from the embedded world and is ideally suited for systems evaluation.

- > 5+ Years of Guaranteed Supply
- > 10+ Years of Hardware and Software Support
- > 3U Rackable Server
- > Fedora 16 Linux Support

EZ3-VX304x is ready to use; its factory settings can get you to a shell prompt under Linux OS in a few seconds.

Thanks to its modular design based on standards, EZ3-VX304x is compatible with many extensions.

1.2 Ordering Information

System type EZ3-VX304x

- EZ3-VX3042-00-L 3U VPX Intel® 3rd generation Core™ i7 Computer with dual core processor and 4GB DDR3 SDRAM Memory Linux software version.
- EZ3-VX3044-00-L 3U VPX Intel® 3rd generation Core™ i7 Computer with quad core processor and 8GB DDR3 SDRAM Memory Linux software version.
- EZ3-VX3044-A0-L Dual VX3044 system with 10 Gigabit and PCIe 8X Gen3 evaluation

Also available with VxWorks and Windows. For more information contact Kontron.



Non contractual photography

Figure 1: EZ3-VX304x Overview

1.3 At a Glance



Depending on the purchased Easy system, different order codes will equip the system.

- ▶ For the EZ3-VX3042-00-L and EZ3-VX3044-00-L systems:
 - SBC order code are respectively VX3042-SA24-2000300 and VX3044-SA48-2000300.
 - RTM order code is PB-VX3-410
 - ▶ For the EZ3-VX3044-A0-L system, 1 inch mechanical design is used and the order codes are the following:
 - SBCs order code is VX3044-SA48-2010300
 - RTMs order code is PB-VX3-401.
- The EZ3-VX304x system you have received may include a board, a RTM with a different order code. Please contact your Kontron representative for more information on this topic.

» Processor

- > Intel® Core™ i7 3rd Gen - 3612QE (quad core 2.1 GHz) or 3517UE(dual core 2.2 GHz)
- > Quad Core: 6M cache, 4 execution cores, 8 threads
Dual Core: 4M cache, 2 execution cores, 4 threads.

» Memory

- > 4 GB DDR3 SDRAM Memory for VX304x-SA24-20x0300
- > 8 GB DDR3 SDRAM Memory for VX304x-SA48-20x0300

» Storage

- > Onboard 32 GB SATA flash storage

» Connectivity (EZ3-VX304x Front Panel only)

- > Two serial lines
- > One Ethernet 10/100/1000 base-T channel available on the front or rear panel.
- > One 10 Gigabit ethernet SFP+ port.
- > Up to 3 mini DisplayPort
- > Up to four USB 2.0 ports
- > One USB 3.0 port
- > Two SATA III ports
- > Up to 2 additional SATA II ports.

» Software

- > Depending on the system Order Code, Linux, VxWorks or Windows Operating System is pre-loaded on the SATA Flash storage at the factory.
See Chapter 2 “Software” page 22 for details on your configuration.

» Management

- > EZ3-VX304x Front Panel Status LEDs: System LEDs

» Chassis Form Factor

- > 3U four-slot desktop chassis (Height: 191 mm – Width: 169.64 mm – Depth: 298.1 mm)

» Availability

- > 5+ years of Guaranteed Supply
- > 10+ years of Hardware and Software Support available

1.4 Receipt of the Equipment

1.4.1 Checking the Packages

Inspecting the packages and verifying their condition is the responsibility of the customer and should be carried out upon delivery.

- Inspect the cartons and check their condition:
 - ▶ no broken corners,
 - ▶ general state of the case (no rips or holes),
 - ▶ condition of the bands and the clips.
- If you wish to report any damage in transit, you should make out a full report, and also note the damage on the packing list that accompanies the equipment. Ensure that the report and the packing list are signed by yourself and also by the transport agent, and send a copy of these documents to:
 - ▶ the transport company,
 - ▶ Kontron.

1.4.2 Unpacking

Open the package and take out the items one by one.

Inspect each item and make a note of any possible defects (scratches, marks or blemishes, damaged cables, etc.). If necessary, make a report of any damage or defects.

Check the equipment against the packing list and report any missing items.



It is recommended that you keep the package and the anti-shock protection. This will be required if you decide to move your system or rack to a different site.

1.4.3 Content

Depending on the system Order Code, the EZ3-VX304x 3U VPX Intel® Core i7 Computer is made of:

	EZ3-VX3042-00-L	EZ3-VX3044-00-L	EZ3-VX3044-A0-L
One computer rack and associated boards	X	X	X
One power supply cable	X	X	X
One serial cable KIT-RJ12DB9	X	X	X
One mini DP-VGA adapter CAB-CVT02-05CA0202	X	X	X
One USB 2.0 hub HUB-USB-4P-2.0	X	X	X
One 10 Gigabit Cable CABETH-0747521101			X
One documentation CD-ROM CDDOC	X	X	X
Easy EZ3-VX304x Getting Started SD.DT.G09 (this document)	X	X	X
Easy EZ3-VX304x Quick Start SD.DT.(not yet available)	X	X	X

Table 1: Delivery Content



Power Supply Cable



CDDOC



DP-VGA Adapter



10 Gigabit Cable



USB Hub



KIT-RJ12DB9

Figure 2: Delivery Content

1.5 System Identification

An identification label is available on the top side of the system.



Figure 3: System Identification

- > Model: System Order Code
- > Sn: Serial Number
- > ECL: Engineering Change Level

1.6 Introducing Front and Rear Views

1.6.1 System Type EZ3-VX304x

» Front View

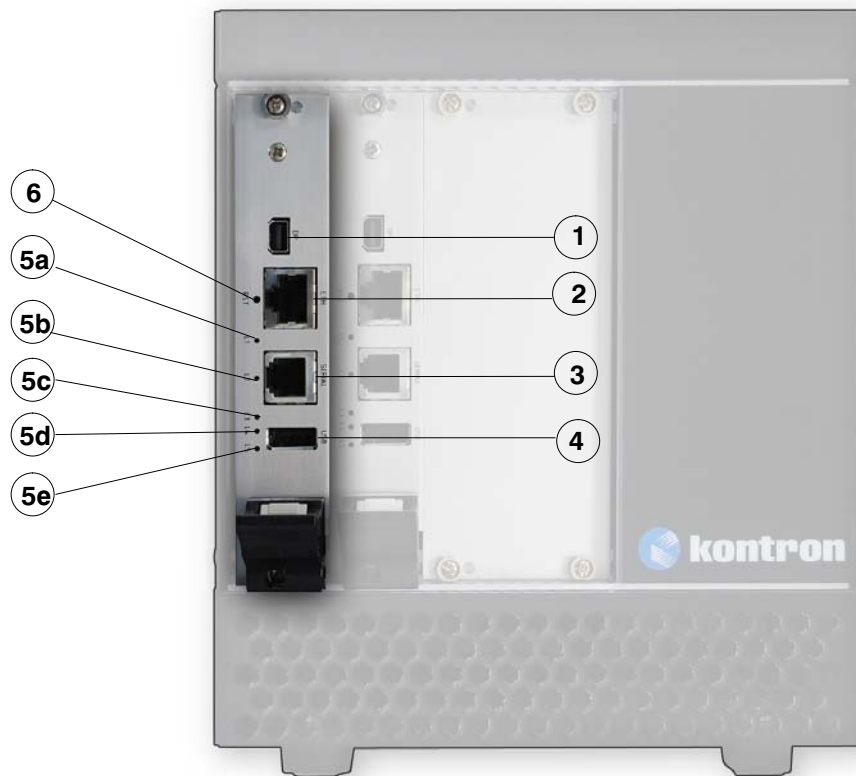


Figure 4: Front View

1. Mini DisplayPort
2. Gigabit Ethernet Connector
3. Serial Connector COM
4. USB 2.0
5. LEDs
 - ▶ 5a: L1 Permanent error / 1000BASE-T interface link up/down
 - ▶ 5b: L2 Internal EZ3-VX304x power off / 10G Ethernet controller link up
 - ▶ 5c: L3 Thermal Alert / Ethernet ETH0 Status
 - ▶ 5d: L4 Card in reset state / Card power OK / PCIe express activity / I2C activity
 - ▶ 5e: L5 Processor hot event / 1000BASE-T link direction
6. Reset Button

» EZ3-VX304x-00-L RearView

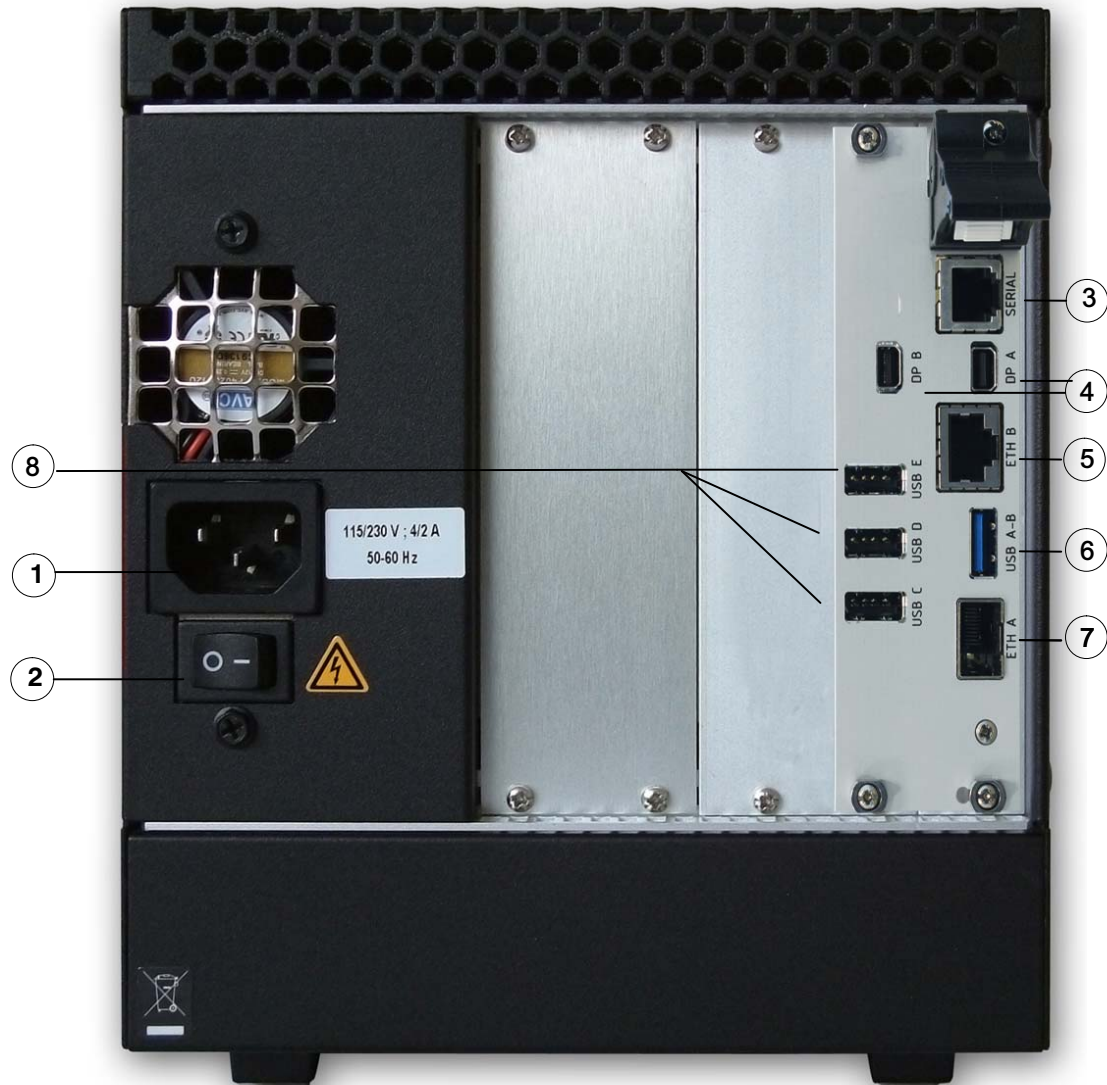


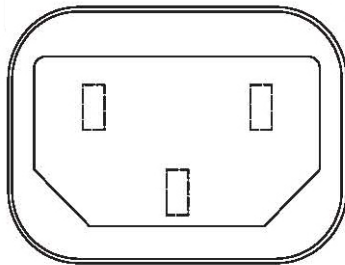
Figure 5: EZ3-VX304x-00-L Rear View

- | | |
|---------------------------|---------------------------------------|
| 1. Power Supply Connector | 5. Gigabit Ethernet Connector |
| 2. AC Switch | 6. USB 3.0 / 2.0 Port 2 |
| 3. Serial Connector COM | 7. 10 Gigabit Ethernet SFP+ Connector |
| 4. Mini DisplayPorts A, B | 8. USB 2.0 Ports 3, 4, 5 |

» Power Supply Connector

AC connector:
IEC320 type female plug rated 3

Pin	J1
1	Line
2	Neutral
3	Earth



» EZ3-VX3044-A0-L RearView



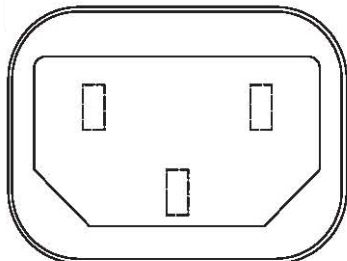
Figure 6: EZ3-VX3044-A0-L Rear View

- | | |
|---------------------------|----------------------------------|
| 1. Power Supply Connector | 5. Gigabit Ethernet Connector |
| 2. AC Switch | 6. USB 3.0 / 2.0 Connector |
| 3. Serial Connector COM | 7. 10 Gigabit Ethernet Connector |
| 4. Mini DisplayPort | |

» Power Supply Connector

AC connector:
IEC320 type female plug rated 3A

Pin	J1
1	Line
2	Neutral
3	Earth



1.7 Associated Documentation

This product is based on the VX304x board. Therefore, the following documentation is available on the Kontron web site or on the technical documentation CD-ROM.

» Hardware

- > VX3042 and VX3044 - User's Guide CA.DT.A98-1e

1.8 Plug and Play with EZ3-VX304x

1.8.1 Plug

To connect the EZ3-VX304x 3U VPX Intel Core i7 Computer, you need to attach the following cables:

- the Power Supply Cable (available in the delivery kit)
- the Serial Cable KIT-RJ12DB9 (available in the delivery kit)
- the miniDP to VGA adapter (if needed)
- the USB 2.0 hub in order to plug simultaneously mouse and keyboard.

» System Type EZ3-VX304x

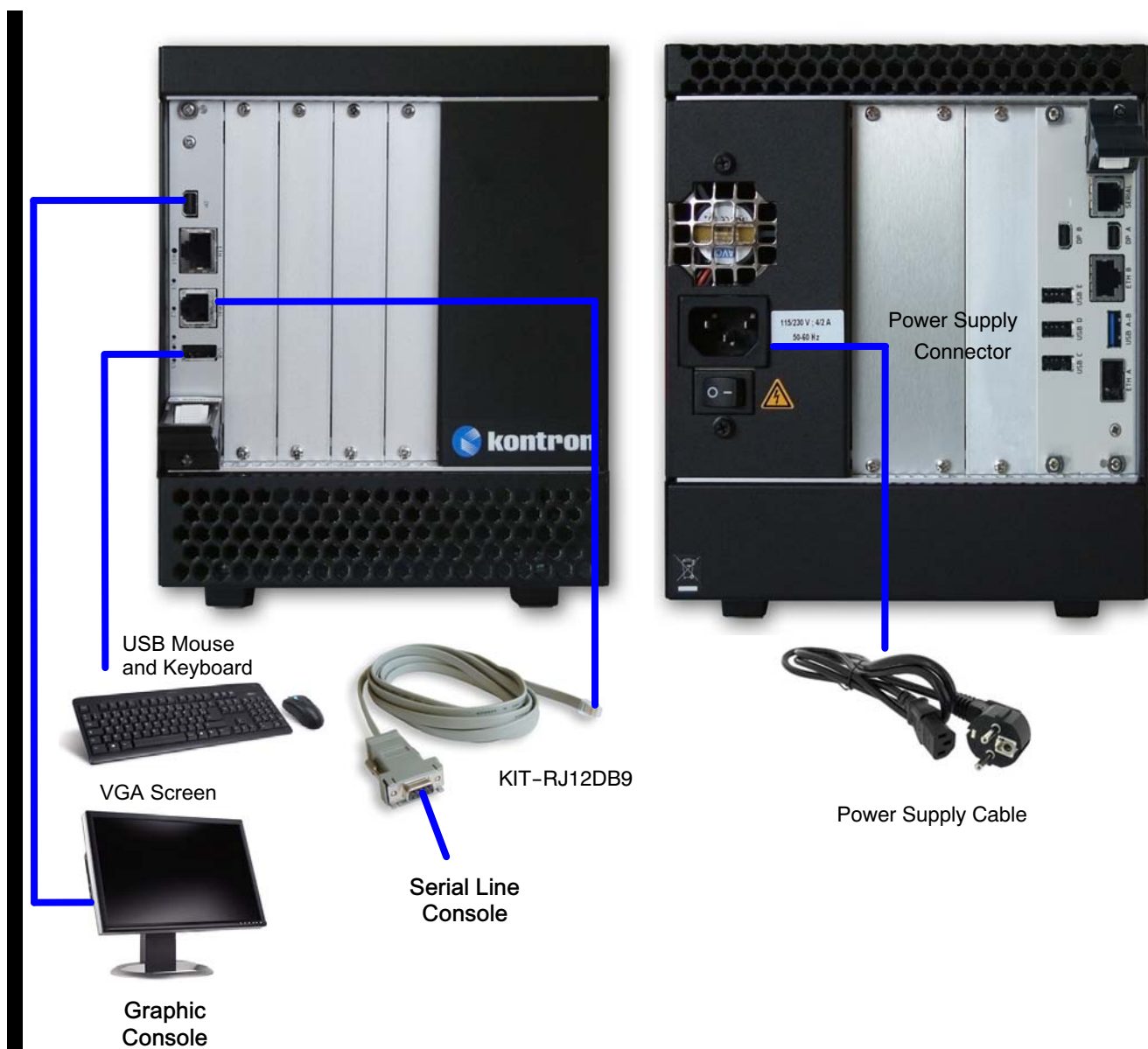


Figure 7: Connecting EZ3-VX304x

» EZ3-VX304x-00-L



» EZ3-VX3044-A0-L



Figure 8: Hardware Name of Ethernet Ports

Linux Device Name	Hardware Name	Chassis Location
em1 ⁽¹⁾	ETH (default)	Board front panel
em1 ⁽¹⁾	ETHB	RTM front panel on the back of the system
p16p1	Not connected	Not connected
p16p2	ETHA	RTM front panel on the back of the system

(1) Ethernet direction is configurable at BIOS stage.

Table 2: Mapping Table: Linux Device Name / Hardware Name



This table applies for all boards.

» ON/OFF Button

The ON/OFF button is located on the rear panel of the EZ3-VX304x Getting Started system.



AC Switch

» To start the system

- ▶ Power on the main power supply module, AC Switch on the rear side of the system.

» To stop the system

- ▶ Shutdown the OS.
- ▶ Power off the main power supply module (AC Switch on the rear side of the system).

» Powering the system Off and On



DO NOT turn the power on while the power is cycling off. Wait a few seconds until the power has completely cycled off. Follow the same precaution for turning the power off.

Turning the power on or off before this cycle is complete can cause the voltage and temperature values programmed into the board monitoring system to be lost.

MAKE SURE YOU FOLLOW THESE SAFETY PRECAUTIONS.



Make sure the rack has been powered off using the ON/OFF button (on the rear panel of the rack) before unplugging the power supply cable.

1.8.2 Play

- Plug the system as described in section 1.8.1 “Plug” page 13.
- Power on the system
- The following screens appear:
 - ▶ AMI BIOS EFI

```
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.
```

```
BIOS Date: 07/06/2012 17:53:04 Ver: 1APTJ
```

```
Press <DEL> or <F2> to enter setup.
```

- ▶ Linux Fedora 16 (Order Code: EZ3--VX3042-00-L / EZ3-VX3044-00-L)

The following boot process will be displayed on serial console only.

```
GRUB loading.
```

```
*****
```

```
* Fedora Linux, with Linux 3.2.7-12198.ki7.fc16.x86_64 *
```

```
* Fedora Linux, with Linux 3.2.7-12198.ki7.fc16.x86_64 (recovery mode) *
```

```
* *
```

```
* *
```

```
* *
```

```
* *
```

```
* *
```

```
* *
```

```
* *
```

```
*****
```

```
Use the * and * keys to select which entry is highlighted.
```

```
Press enter to boot the selected OS, 'e' to edit the commands
```

```
before booting or 'c' for a command-line.
```

```

Loading Linux 3.2.7-12198.ki7.fc16.x86_64 ...
Loading initial ramdisk ...
[ 1.390971] xhci_hcd 0000:00:14.0: Failed to enable MSI-X

Welcome to Fedora release 16 (Verne)!

Starting Collect Read-Ahead Data...
Starting Replay Read-Ahead Data...
Starting Syslog Kernel Log Buffer Bridge...
Started Syslog Kernel Log Buffer Bridge [ OK ]
Starting Media Directory...
Started Lock Directory [ OK ]
Started Runtime Directory [ OK ]
...
...
...
Starting Wait for storage scan...
Started Wait for storage scan [ OK ]
Starting Initialize storage subsystems (RAID, LVM, etc.)...
Started Initialize storage subsystems (RAID, LVM, etc.) [ OK ]
Starting Initialize storage subsystems (RAID, LVM, etc.)...
Starting File System Check on /dev/disk/by-uuid/69de067b-2c...2-a3b53f55ac4d...
systemd-fsck[735]: /dev/sda2: clean, 230/128016 files, 52940/512000 blocks
Started File System Check on /dev/disk/by-uuid/69de0...02-a3b53f55ac4d [ OK ]
Started Initialize storage subsystems (RAID, LVM, etc.) [ OK ]
Starting Monitoring of LVM2 mirrors, snapshots etc. using d...ogress polling...
Starting /boot...
Started /boot [ OK ]
Started Monitoring of LVM2 mirrors, snapshots etc. u...ogress polling [ OK ]
...
...
...
Started SSH server keys generation. [ OK ]
Started irqbalance daemon [ OK ]
Started Console Mouse manager [ OK ]
Started ACPI Event Daemon [ OK ]
Started Install ABRT coredump hook [ OK ]
Started Harvest vmcores for ABRT [ OK ]

Started Machine Check Exception Logging Daemon [ OK ]
Starting Command Scheduler...
Started Command Scheduler [ OK ]
Starting LSB: Bring up/down networking...
Starting LSB: Mount and unmount network filesystems....
Starting LSB: Starts and stops login and scanning of iSCSI devices....
Starting firstboot configuration program (graphical mode)...
Started D-Bus System Message Bus [ OK ]
Stopping Syslog Kernel Log Buffer Bridge...

Fedora release 16 (Verne)
Kernel 3.2.7-12198.ki7.fc16.x86_64 on an x86_64 (ttyS0)

Inx5 login:

```

▶ Log in as:

▶ EZ3-VX304x login: **root**
password: **kontron**

or

▶ EZ3-VX304x login: **guest**
password: **guest**

1.9 Health Management

» LEDs



Figure 9: SBC LEDs

CPU LED	COLOR	DESCRIPTION
L1	RED	Permanent system error
	GREEN	1000BASE-T interface link up, 10 or 100 Mbits/s. Blinking when activity on link
	ORANGE	1000BASE-T interface link up, 1000 Mbits/s. Blinking when activity on the link
	OFF	1000BASE-T interface link down, no permanent system error
L2	RED	If L1 is RED (permanent system error), internal EZ3-VX304x power is off
	GREEN	At least one 10G Ethernet controller link up at 10 Gbits/s speed. Blinking when activity on the link(s).
	ORANGE	At least one 10G Ethernet controller link up, no link at 10 Gbits/s speed. Blinking when activity on the link(s).
	OFF	No 10G Ethernet controller link up
L3 ⁽¹⁾	RED	Card in reset state
	GREEN	Card power OK, not in reset state
	ORANGE	Orange blinking when PCIe express activity on backplane
	OFF	Off blinking when backplane I2C/SMBus activity to/from this card

CPU LED	COLOR	DESCRIPTION
L4 ⁽¹⁾	RED	CPLD Watchdog expired
	GREEN	Normal operation
	ORANGE	Factory test mode
	OFF	Off blinking when SATA activity
L5 ⁽¹⁾	RED	Processor hot event (PROCHOT), superscede 1000BASE-T connector information
	GREEN	1000BASE-T link directed on front connector
	ORANGE	1000BASE-T link directed on VPX connector
	OFF	Reserved

⁽¹⁾ The color of these LEDs may also be fixed by software through CPLD registers

During the system operation, LEDs should display:

- ▶ L3: Green,
- ▶ L4: Green,
- ▶ L5: Green.

With L1 and L2 blinking if gigabit or 10 gigabit link connection is up.

» Reset



Figure 10: SBC Reset Switch

Chapter 2 - Software

2.1 AMI-BIOS Firmware

- AMI-BIOS release >= 12188UD

2.2 Linux



- Fedora 16 release
- Kontron release >= 12199

2.2.1 Networking

EZ3-VX304x has two Ethernet ports configured, named **em1** and **p16p2** under Linux Fedora 16.

em1 (hardware name: **ETH**) and **p16p2** (hardware name: **ETH A**) are respectively set to 192.168.0.1 and 192.168.30.1.

Use the "**ifup**" and "**ifdown**" commands to enable and disable the interface or configure the port with another IP address with "**ifconfig**" command.

2.2.2 Linux Pre-Installed Benchmarks

Several benchmarks are provided with the system. They can permit you to evaluate the current performance of the board. All the benchmarks provided are located under `/usr/share/vx304x_benchmark` directory.

» Lmbench

lmbench is an old fashion benchmark which consists of a suite of simple, portable benchmarks. It is interesting for results of memory bandwidth or latency.

To see the last **lmbench** result, change directory to `/usr/share/vx304x_benchmark/lmbench` and run the `make see` command.

```
[make[1]:Enteringdirectory`/usr/share/vx304x_benchmark/memory/lmbench/results`
```

```
  L M B E N C H  3 . 0  S U M M A R Y
```

```
-----
(Alpha software, do not distribute)
```

```
Basic system parameters
```

```
-----
Host                OS Description                Mhz  tlb  cache  mem  scal
                   pages         line  par  load
                   bytes
-----
pentxm2  Linux 2.6.9-3                boards 1331   65   128 3.4100   1
pentxm4  Linux 2.6.9-4                boards 1665   65   128 3.6200   1
vx304x   Linux 3.2.7-1                x86_64-linux-gnu 2100   32   128 4.8700   1
vx304x   Linux 3.2.7-1                x86_64-linux-gnu 2100   32   128 4.7800   1
```

```
Processor, Processes - times in microseconds - smaller is better
```

```
-----
Host                OS  Mhz null null      open slct sig  sig  fork exec sh
                   call I/O stat clos TCP  inst hndl proc proc proc
-----
pentxm2  Linux 2.6.9-3 1331 0.37 0.73 2.85 3.92 19.6 0.96 2.93 189. 673. 1979
pentxm4  Linux 2.6.9-4 1665 0.28 0.44 3.13 4.03 15.7 0.76 2.33 184. 634. 1761
vm6050.fc Linux 2.6.35. 2796 0.11 0.20 1.28 1.89 3.39 0.36 1.78 278. 817. 3333
vx3030   Linux 2.6.32. 2794 0.13 0.23 1.51 2.48 3.93 0.33 1.38 103. 379. 1677
vx3030.1. Linux 2.6.32. 1195 0.24 0.41 2.80 4.40 6.81 0.75 3.16 193. 712. 3104
vx3035_fc Linux 2.6.35. 2897 0.09 0.17 1.15 1.84 2.75 0.23 1.37 108. 370. 1519
vx3035_fc Linux 2.6.35. 2897 0.10 0.17 1.14 1.77 2.80 0.23 1.37 114. 347. 1652
vx6060-64 Linux 2.6.32. 2793 0.13 0.19 1.16 2.20 2.92 0.21 1.22 95.5 361. 1366
vx6060   Linux 2.6.31. 2758 0.14 0.29 1.85 3.01 3.21 0.34 1.42 218. 880. 3312
vx6060_fc Linux 2.6.35. 2796 0.11 0.19 1.23 2.01 3.05 0.26 1.34 286. 895. 3358
vx6060_fc Linux 3.1.5-2 2796 0.12 0.19 1.29 2.25 2.78 0.21 1.00 260. 907. 3214
vx6060_x6 Linux 2.6.32. 2749 0.12 0.22 1.28 2.38 3.15 0.22 1.34 180. 704. 2836
vx304x   Linux 3.2.7-1 2100 0.08 0.13 0.73 1.23 2.29 0.16 0.93 227. 724. 3091
vx304x   Linux 3.2.7-1 2100 0.08 0.13 0.72 1.40 2.30 0.16 0.93 230. 725. 3075
```

To rerun a benchmark with the same configuration, change directory to `/usr/share/vx304x_benchmark/memory/lmbench` and run the command:

```
make rerun
```

To run a benchmark with a new configuration, change directory to `/usr/share/vx304x_benchmark/memory/lmbench` and run the command:

```
make result
```

» mem_bandwidth

Mem_bandwidth is an home-made benchmark to evaluate the maximum bandwidth to DRAM. The benchmark is written with SSE instructions.

```
[root@vx304x mem_bandwidth]# ./mem_bandwidth
Prefetch offset=0 mode=_MM_HINT_NTA
Standard read throughput= 10499MB/s
Optimized read throughput= 15852MB/s
Standard write throughput= 8083MB/s
Optimized write throughput= 13912MB/s
Standard memcpy throughput= 6271MB/s
Standard bcopy throughput= 4867MB/s
Optimized copy throughput= 6658MB/s
```

» fft

benchfftipp benchmark uses the fft primitives of the Intel IPP library to evaluate the CPU gflops performance.

```
[root@vx304x fft]# ./benchfftipp 0
Average time - gflops for FFT 64 points : 58 ns - 33.0 gflops
Average time - gflops for FFT 128 points : 163 ns - 27.5 gflops
Average time - gflops for FFT 256 points : 354 ns - 28.9 gflops
Average time - gflops for FFT 512 points : 827 ns - 27.9 gflops
Average time - gflops for FFT 1024 points : 1761 ns - 29.1 gflops
Average time - gflops for FFT 2048 points : 4924 ns - 22.9 gflops
Average time - gflops for FFT 4096 points : 11475 ns - 21.4 gflops
Average time - gflops for FFT 8192 points : 25214 ns - 21.1 gflops
```

» Dhrystone

Dhrystone is an old fashion benchmark which evaluates the CPU number of instructions per second capability. The results is given in number of dhrystones per second. Just divide by 1757 to get the DMIPS result.

```
[root@vx304x dhrystone]# sh dry.c
cc -c dry.c -o dry1.o
dry.c:503:14: warning: conflicting types for built-in function *malloc* [enabled by default]
dry.c: In function *main*:
dry.c:549:6: warning: incompatible implicit declaration of built-in function *exit* [enabled by default]
dry.c:572:3: warning: incompatible implicit declaration of built-in function *strcpy* [enabled by default]
dry.c:683:49: warning: cast from pointer to integer of different size [-Wpointer-to-int-cast]
dry.c:694:49: warning: cast from pointer to integer of different size [-Wpointer-to-int-cast]
cc -DPASS2 dry.c dry1.o -o dry2

Dhrystone Benchmark, Version C, Version 2.2
Program compiled without 'register' attribute
Using times(), HZ=100

Trying 50000 runs through Dhrystone:
Measured time too small to obtain meaningful results
```

```
Trying 500000 runs through Dhrystone:
Measured time too small to obtain meaningful results

Trying 5000000 runs through Dhrystone:
Microseconds for one run through Dhrystone:      0.1
Dhrystones per Second:                          10288066

Trying 5000000 runs through Dhrystone:
Measured time too small to obtain meaningful results
```

» iozone

IOzone is a filesystem benchmark tool. The benchmark generates and measures a variety of file operations.

```
[root@vx304x iozone]# /usr/share/vx304x_benchmark/iozone/src/current/iozone -i 0 -i 1 -s 64M -
r 8M -I
  Iozone: Performance Test of File I/O
  Version $Revision: 1.1.1.1 $
  Compiled for 64 bit mode.
  Build: linux-ia64

  Contributors:William Norcott, Don Capps, Isom Crawford, Kirby Collins
                Al Slater, Scott Rhine, Mike Wisner, Ken Goss
                Steve Landherr, Brad Smith, Mark Kelly, Dr. Alain CYR,
                Randy Dunlap, Mark Montague, Dan Million, Gavin Brebner,
                Jean-Marc Zucconi, Jeff Blomberg, Benny Halevy, Dave Boone,
                Erik Habbinga, Kris Strecker, Walter Wong, Joshua Root,
                Fabrice Bacchella, Zhenghua Xue, Qin Li, Darren Sawyer.
                Ben England.

  Run began: Tue Jul 31 18:29:16 2012

  File size set to 65536 KB
  Record Size 8192 KB
  O_DIRECT feature enabled
  Command line used: /usr/share/vx304x_benchmark/iozone/src/current/iozone
-i 0 -i 1 -s 64M -r 8M -I
  Output is in Kbytes/sec
  Time Resolution = 0.000001 seconds.
  Processor cache size set to 1024 Kbytes.
  Processor cache line size set to 32 bytes.
  File stride size set to 17 * record size.

                                random  random   bkwd   record
stride
      KB  reclen  write rewrite   read   reread   read   write
65536 8192 35427 34837 73146 73111

iozone test complete.
```

» VXFabric

In the case of the EZ3-VX3044-A0-L system, the two VX3044 boards are interconnected through the backplane by a PCIe x8 gen3 link. The VXFabric tools and kernel modules are provided to enable the communication over the PCIe between the different CPU nodes.

Each node on a VXFabric domain represents a board on the PCIe bus and gets a unique Node ID used to identify it.

There are two main ways to communicate on VXFabric domains: low level protocols, and TCP/IP over VXFabric.

► Setup VXFabric

In order to optimize VXFabric, run the following script on each board of the chassis:

```
[root@vx304x1 ~]# /root
/optim_perf.sh
```

► Check VXFabric status

The following command gives a status of the VXFabric on the VPX backplane

```
[root@vx304x1 ~]# vxfabric -a
```

```
-----
```

```
VX FABRIC 0 configuration
```

```
-----
```

```
N H S S C S P P M A ( I A (
```

```
O O L T P Y C C E R S 0 R S
```

```
D S O A U S I I M E I E I
```

```
E T T T C B D O A Z A Z
```

```
I U O U E R E E
```

```
D S N S V Y ) )
```

```
-----
```

```
1 * 1 CONNECT A * 0x064001000(0x3fff000) ( )
```

```
3 2 CONNECT A 6 0 0x080000000(0x4000000) 0x0f4000000(0x40000)
```

```
-----
```

➤ IP over VXFabric

The User Programming model of VXFabric is based on the IP protocol and a socket layer API through an emulation of an Ethernet interface over PCIe like similar implementations of pseudo-Ethernet over virtualization boxes. This is the main warranty that the portability to VXFabric is straight forward for software developers.

The objective is to allow a user to move from Gbit Ethernet TCP/IP implementation to VXFabric avoiding low level complex and proprietary APIs (like most of sRIO implementation for example) with a performance breakthrough in comparison to a standard Gbit Ethernet communication.

VXFabric is available under Linux for VX6060 and VX30xx and it is designed to be portable on other architectures and other operating systems.

Furthermore, it does not require any other infrastructure than the VPX backplane and a VPX PCIe switch to interconnect VPX boards.

The vxeth0 is dedicated to the backplane VXFabric

Those pseudo-Ethernet interfaces should be managed like the other Ethernet interfaces and a local sub-network address could be allocated to this interface. For example:

```
[root@vx304x1 ~]# ifconfig vxeth0 192.168.20.1
```

This is not different from other Ethernet interfaces configuration and, for example, on Fedora distribution, the service «network» can be used to setup this interface through the configuration file `/etc/sysconfig/networkscripts/ifcfg-vxeth0`.

On another node, the same previous steps should be performed with another IP address on the same local sub-network address.

```
[root@vx304x1 ~]# ifconfig vxeth0
vxeth0  Link encap:Ethernet  HWaddr 02:00:00:00:00:01
        inet addr:192.168.10.1  Bcast:192.168.10.255  Mask:255.255.255.0
        inet6 addr: fe80::ff:fe00:1/64 Scope:Link
        UP BROADCAST RUNNING MTU:64472 Metric:1
        RX packets:3 errors:0 dropped:0 overruns:0 frame:0
        TX packets:3 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:158 (158.0 b)  TX bytes:138 (138.0 b)
```

» Iperf & netperf

► Iperf

- 10 Gbit ETHERNET link performance.

Plug the cable CABETH-0747521101 on each RTM.

1. Start iperf on node 2

Node 2:

```
[root@vx304x2 ~]# iperf -s -w 8M
-----
Server listening on TCP port 5001
TCP window size: 256 KByte (WARNING: requested 8.00 MByte)
-----
```

2. Start iperf on node1

Node 1:

```
[root@vx304x2 ~]# iperf -c 192.168.30.2 -w 8M
-----
Client connecting to 192.168.30.2, TCP port 5001
TCP window size: 256 KByte (WARNING: requested 8.00 MByte)
-----
[ 3] local 192.168.30.1 port 54247 connected with 192.168.30.2 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 3] 0.0-10.0 sec  9.51 GBytes 8.17 Gbits/sec
```

- VXFabric ETHERNET link performance.

1. Start iperf on node 2

Node 2:

```
[root@vx304x2 ~]# iperf -s -w 8M
-----
Server listening on TCP port 5001
TCP window size: 256 KByte (WARNING: requested 8.00 MByte)
-----
```

2. Start iperf on node1

Node 1:

```
[root@vx304x1 ~]# iperf -c 192.168.10.3 -w 8M
-----
Client connecting to 192.168.10.3, TCP port 5001
TCP window size: 16.0 MByte (WARNING: requested 8.00 MByte)
-----
[ 3] local 192.168.10.1 port 35755 connected with 192.168.10.3 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 3] 0.0-10.0 sec  46.1 GBytes 39.6 Gbits/sec
```

➤ **Netperf**

- ▶ 10 Gbit ETHERNET link performance.

Netperf:
Node 2:

```
[root@vx304x2 ~]# netserver
```

Node 1:

```
[root@vx304x1 ~]# netperf -H 192.168.30.2 -t TCP_STREAM
MIGRATED TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.30.2 (192.168.30.2) port 0 AF_INET
Recv  Send  Send
Socket Socket Message Elapsed
Size  Size  Size  Time  Throughput
bytes bytes bytes secs.  10^6bits/sec
 87380 87380 87380  10.01  9379.91
```

- ▶ VXFabric ETHERNET link performance.

Node 2:

```
[root@vx304x2 ~]# netserver
```

Node 1:

```
[root@vx304x1 ~]# netperf -H 192.168.10.3 -t TCP_STREAM
MIGRATED TCP STREAM TEST from 0.0.0.0 (0.0.0.0) port 0 AF_INET to 192.168.10.3 (192.168.10.3) port 0 AF_INET
Recv  Send  Send
Socket Socket Message Elapsed
Size  Size  Size  Time  Throughput
bytes bytes bytes secs.  10^6bits/sec
 87380 65536 65536  10.00  39184.14
```

Chapter 3 - Technical Specifications

3.1 Rack

» Dimensions

- > H x W x D: 191 x 169.64 x 298.1 mm (2.45 x 6.62 x 11.63 in)

» Weight

- > 5.0 kg (approximate)

» Power Supply

- > 200W ATX industrial-power supply
- > Input range from 90 to 264 VAC (47-63 Hz)
- > Voltages: +3.3V / 14A
 +5V / 23A
 +12V / 12A

» Ambient Temperature

- > Operating: 0°C to +50°C (32°F to 122°F) at sea level
- > Non-operating: -20°C to +80°C (-4°F to 176°F)

» Humidity

- > 20 to 80%, non-condensing.

» Safety

- > TUV EN 60950 / UL 60950

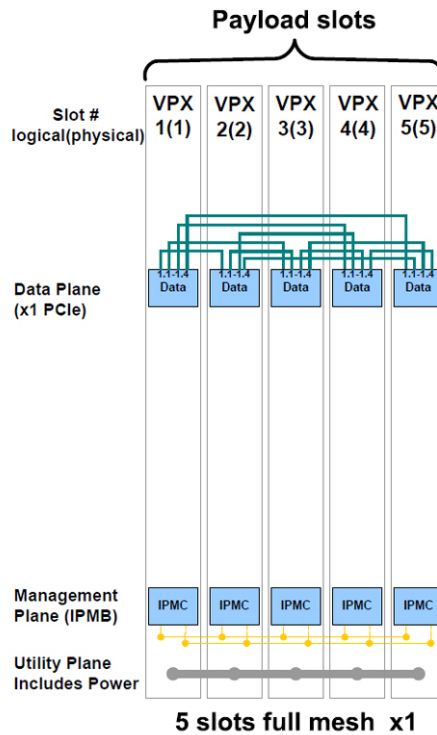
3.2 VPX Backplane

3.2.1 EZ3-VX304x-00-L

» Key Figures

- > Order Code: IFDP04-3U-VPXV1
 - > Compliant to VITA 46.0 baseline specification
 - > Supports VITA 46.4 Full mesh x1 PCI Express
 - > Supports VITA 46.10 with RTM connectors
 - > 3U, 4 slots, Full Mesh configuration
 - > M4 screws and ATX 24 poles connector for Power Entry
 - > PCB size 128.5 mm x 120.7 mm x 5.4 mm
 - > 4 HP from slot to slot (20.32 mm)
 - > System Management Interface on the backplane (I²C1, I²C2)
 - > Flexible keying and alignment mechanism
- > JTAG connector on first slot
 - > Geographical address pin
 - > Reference clock
 - > Non-Volatile Memory Read Only signal set by Jumper X5. Vbat extrnal or connected to 3.3 AUX.
 - > System Reset
 - > P1 Reserved Signals
 - > Operating temperature: -40°C +85°C
 - > Storage temperature: -55°C +85°C
 - > Flammability rating: UL94-V0

» Topology: Full Mesh x1

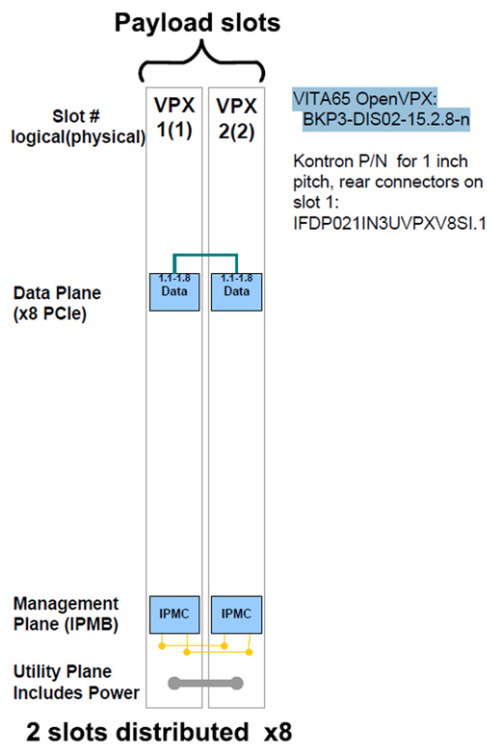


3.2.2 EZ3-VX304x-A0-L

» Key Figures

- > Order Code: IFDP021IN3UVPXV8SI.1
- > Compliant to VITA 46.0 baseline specification
- > Supports VITA 46.4 x8 PCIe Express
- > Supports VITA 46.10 with RTM connectors
- > Supports VITA65 OpenVPX: BKP3-DIS02-15.2.8-n
- > 3U, 2 slots
- > M4 screws for Power Entry
- > PCB size 128.5 mm x 5.36 mm x 5.4 mm
- > 5 HP from slot to slot (25.4 mm)
- > System Management Interface on the backplane (I²C1, I²C2)
- > Flexible keying and alignment mechanism
- > Geographical address pin
- > Non-Volatile Memory Read Only signal set by Jumper X5. Vbat extrnal or connected to 3.3 AUX.
- > System Reset
- > P1 Reserved Signals
- > Operating temperature: -40°C +85°C
- > Storage temperature: -55°C +85°C
- > Flammability rating: UL94-V0

» Topology: x8



Chapter 4 - System Revision Guide

4.1 How to Use the System Revision Guide Table

1. Find the E.C. Level associated to your system as described in the Chapter 1.5 "System Identification" page 7.
2. Find the column associated to this E.C. Level in the table.
3. Check for a specific item in the table lines:
 - 3.1. A x (cross) in the E.C. Level column indicates that this item applies to this E.C. Level.
 - 3.2. No x (cross) in the E.C. Level column indicates that this item does not apply to this E.C. Level.



Each item is fully described in section 4.3 "Item Detailed Description" page 34.

4.2 Revision Guide Tables

» EZ3-VX304x-00-L

Item	Description	E.C. Level					
		00000	00001				
1	Turbo Mode and C-States disabled	X	X				
2	RTM		X				

» EZ3-VX3044-A0-L

Item	Description	E.C. Level					
		00000					
1	Turbo Mode and C-States disabled	X					

4.3 Item Detailed Description



Each item applies only to a specific group of E.C. Levels.

Refer to the table available in section 4.2 “Revision Guide” page 33 to find the specific E.C. Levels associated to a specific item.

Item # 1 Turbo Mode and C-States disabled

Description: Turbo mode and C-states have been set off in BIOS parameters to ensure stable graphical output during Linux boot. This is due to an electrical coupling that may happen between the display port and the phase3 core current surge. To avoid any graphical stability issue, please use «Restore User Default» option in BIOS setup and do not use « Restore Default ».

Impact: Graphical blinking

Workaround: Fix under investigation.

Item # 2 RTM included as standard

Appendix A - Technical Recommendations



Recommendation

Avoid connecting your rack on the same circuit as any electrical equipment that does not have a noise suppressor, and can produce transient phenomena.

It is preferable to install a separate power line directly from the main electrical network.

All the system components (peripheral rack, printer, etc.) must be connected directly to the main electrical network.



Power Supply

Check the correct input voltage prior applying power to the unit. Refer to Chapter 3 "Technical Specifications", section "Power Supply".



Electrical safety

To prevent electrical accidents that could damage your equipment and threaten user safety, adhere to the regulations and standards recommended in the IEC publication 364 (International Electronic Commission) and the French standard NFC 15-100.



Electrical Damage

Avoid connecting cables to the front panel application connectors while functioning. Voltage discharge may damage the inserted boards I/O devices or the power supply.



Fire safety

Fire extinguishers, type CO2, should be installed in the work area, close to the rack.



User Safety

All fans are externally protected with proper finger guard grids. User should avoid touching any fan part with his fingers.



DO NOT turn the power on while the power is cycling off. Wait a few seconds until the power has completely cycled off. Follow the same precaution for turning the power off.

Turning the power on or off before this cycle is complete can cause the voltage and temperature values programmed into the board monitoring system to be lost.

MAKE SURE YOU FOLLOW THESE SAFETY PRECAUTIONS.



Make sure the rack has been powered off using the ON/OFF button (on the rear panel of the rack) before unplugging the power supply cable.



It is strongly recommended to use an antistatic wrist strap and a conductive foam pad when you install or upgrade your system to prevent the accumulation of electrostatic charges.



Avoid touching areas of integrated circuitry; static discharge can damage circuits.

Appendix B - List of Abbreviations

AC	Alternating Current
BSP	Board Support Package
DC	Direct Current
EMC	Electro-Magnetic Compatibility
ESD	Electrostatic Sensitive Device
LED	Light Emitting Diode
MTBF	Mean Time Between Failures
OS	Operating System
PMC	PCI Mezzanine Card
RTM	Rear Transition Module
SBC	Single Board Computer
SDRAM	Synchronous DRAM. A type of dynamic RAM memory chip.
U	The U is a standard unit of height measurement (e.g. 1U). One U is 4.445 centimetres (1.75 inches).
USB	Universal Serial Bus.
WEEE	Waste Electrical and Electronics Equipment
XMC	Express Mezzanine Card (VITA)

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www.kontron.com.