NAMC-PMC
AMC Carrier for PMC Modules
Technical Reference Manual V1.1
HW Revision 1.1

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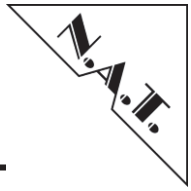

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Note:

The release of the Hardware Manual is related to a certain HW board revision given in the document title. For HW revisions earlier than the one given in the document title please contact N.A.T. for the corresponding older Hardware Manual release.

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Conventions

If not otherwise specified, addresses and memory maps are written in hexadecimal notation, identified by *0x*.
The following table gives a list of the abbreviations used in this document.

Table 1: List of used abbreviations

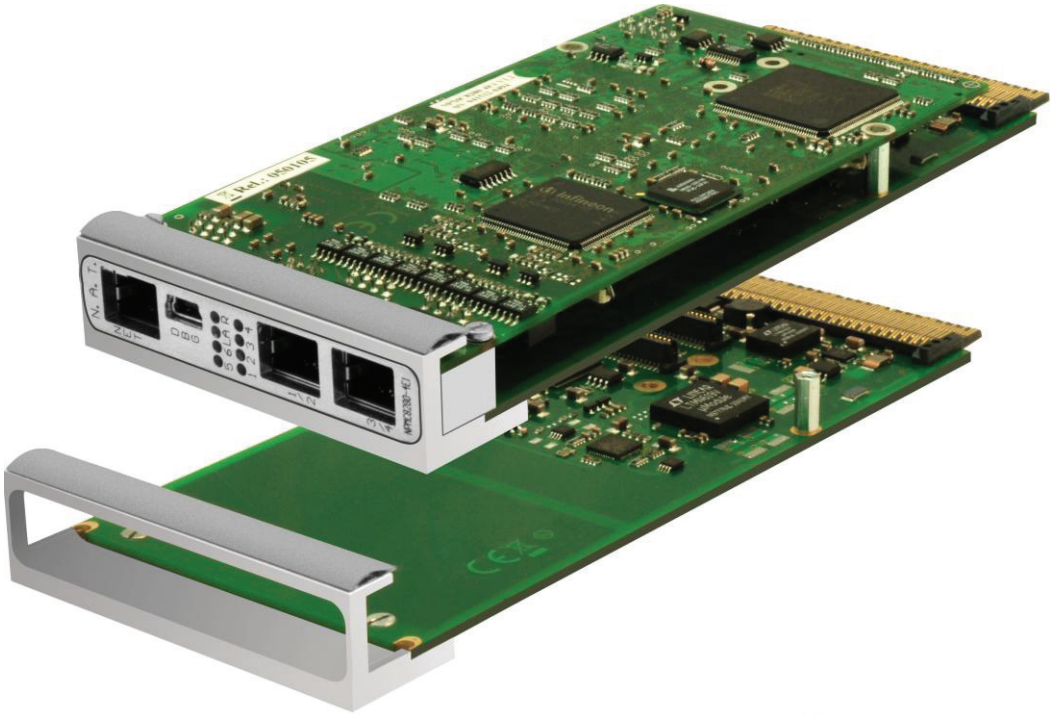
Abbreviation	Description
AMC	Advanced Mezzanine Card
ATCA	Advanced Telecommunications Computing Architecture
DC	Direct Current
DIP SW	Dual In-Line Switch
FCLK	Fabric Clock
I²C	Inter-Integrated Circuit
IPMI	Intelligent Platform Management Interface
JTAG	Joint Test Action Group
LED	Light Emitting Diode
µTCA/MTCA	Micro Telecommunications Computing Architecture
MMC	Module Management Controller
MUX	Multiplexer
PCI(e)	Peripheral Component Interconnect (Express)
PTMC	PCI (Telecom) Mezzanine Card

1 Introduction

The **NAMC-PMC** is a non-intelligent AMC carrier board which is intended to carry a PMC/PTMC extension module to enable the use of standard PMC/PTMC modules in a MicroTCA or ATCA system.

The following figure shows a photo of the **NAMC-PMC**; once the stand-alone carrier board and also in combination with an installed PMC extension module.

Figure 1: NAMC-PMC



Please note: As the dimensions of a single with AMC module are very similar to the dimensions of a standard PMC module, the **NAMC-PMC** differs in some points from the AMC specification. Please refer to chapter 6.2.1 for a detailed description of the deviation.

2 Overview

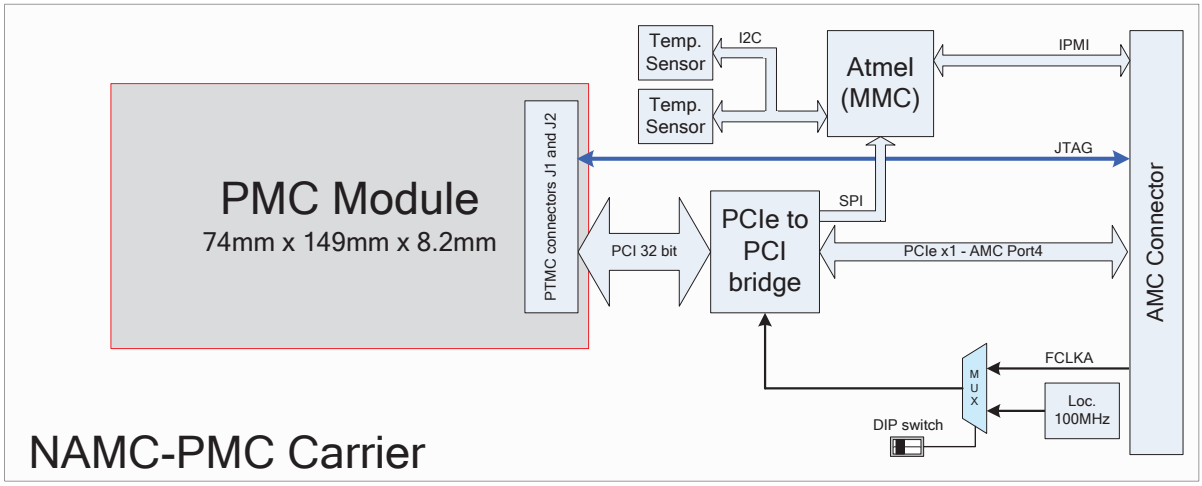
2.1 Major Features

- Atmel AVR1284P Microcontroller
- PCIe-toPCI-Bridge
- Power supply for PMC extension modules
- AMC Backplane Interface
- PMC Interface

2.2 Block Diagram

The following figure shows a block diagram of the **NAMC-PMC** carrier board. The optional available PMC extension module is surrounded by a red frame.

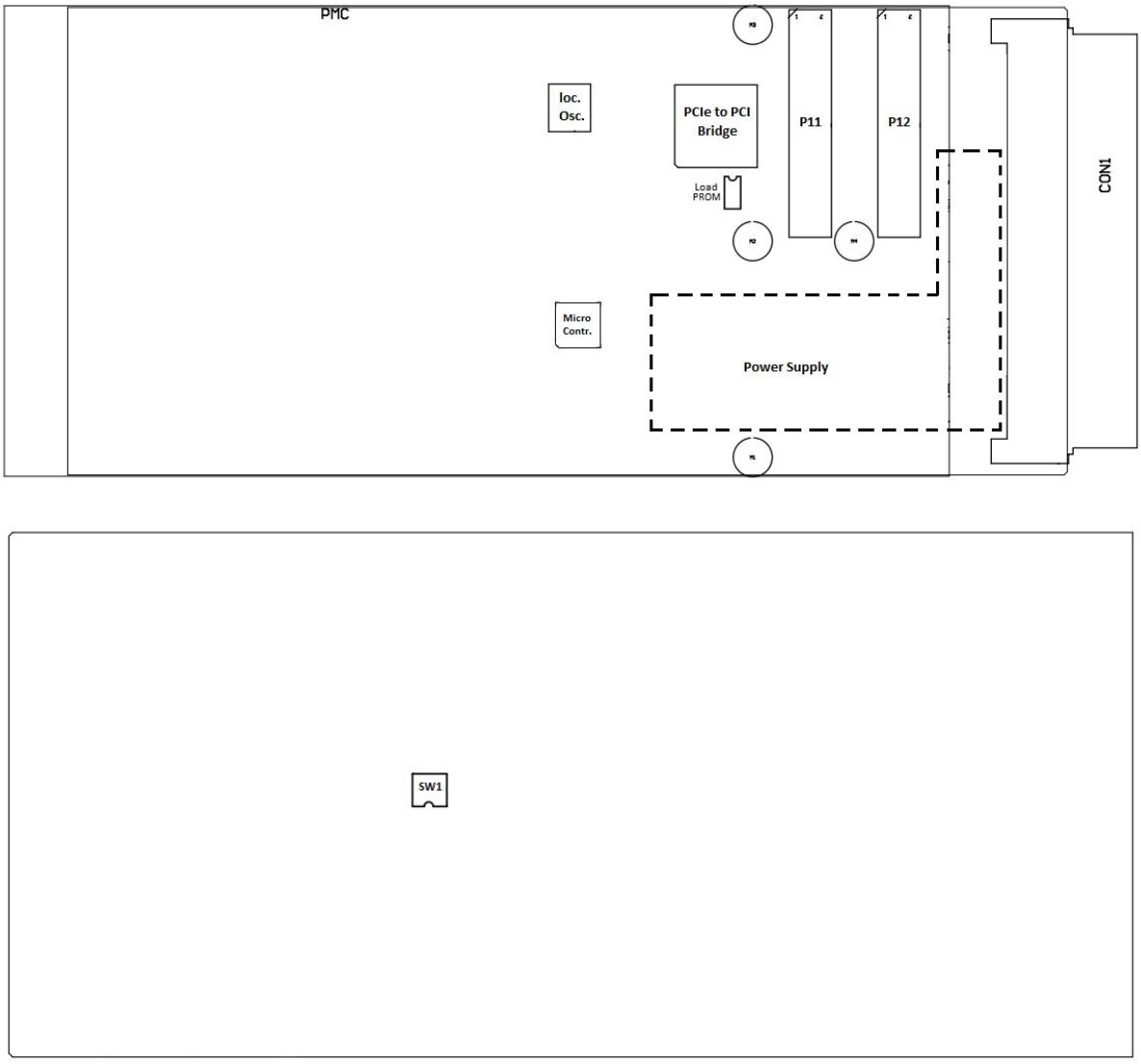
Figure 2: NAMC-PMC – Block Diagram



2.3 Location Diagram

The position of important components is shown in the following location overview. Depending on the board type it might be that the board does not include all components named in the location diagram.

Figure 3: NAMC-PMC – Location Diagram (Top/Bottom)



3 Board Features

This chapter contains a brief description of the functional blocks of the **NAMC-PMC** carrier board.

3.1 Microcontroller

An Atmel ATmega1284P microcontroller is used to support the required MMC functionality to acquire power in a managed system. Furthermore the microcontroller is used to implement different IPMI sensors to monitor temperature, current, voltage etc.

3.2 PCIe to PCI Bridge

The **NAMC-PMC** carrier board features a PCIe-to-PCI-Bridge (PLX PEX8112) to provide PCI connectivity for the PMC module.

3.3 Power Supply

Several DC/DC converters are used to generate the different supply voltages for the on-board devices and the PMC module. Power is taken from the +12V AMC payload power to generate the PMC's +3.3V, +5V and -12V.

3.4 AMC Backplane Interface

The PCIe-to-PCI-Bridge of the **NAMC-PMC** enables a PCIe x1 connection to AMC port 4. The source of the PCIe reference clock can be selected via DIP Switch. Please refer to chapter 4.2.3.1 for information about how to choose between FCKLA from an AMC or the local oscillator.

JTAG is also available at the backplane.

3.5 PMC Interface

The interface between the **NAMC-PMC** and the PMC extension module features a 32 bit PCI bus.

JTAG is connected as well.

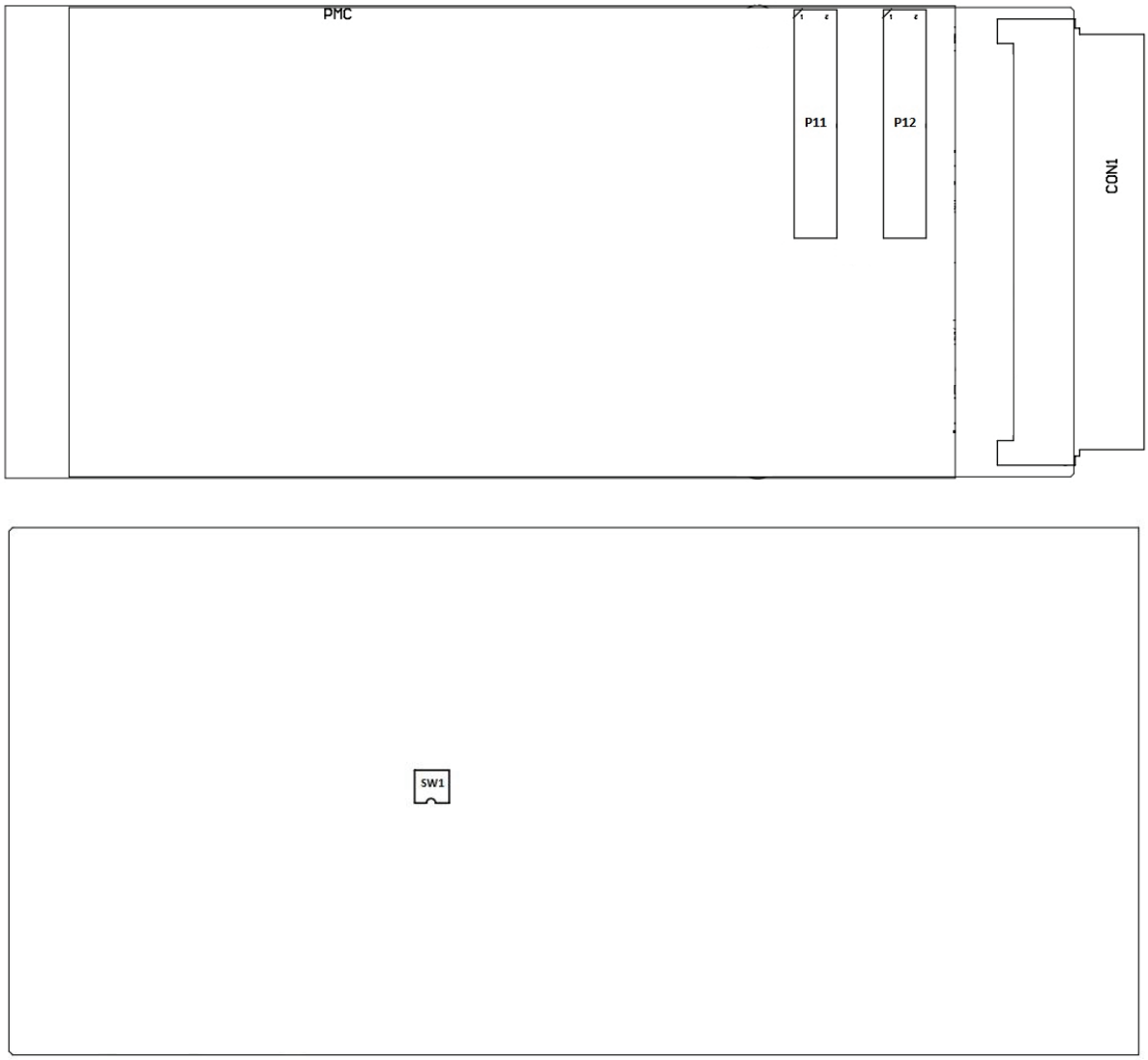
4 Hardware

4.1 Front Plate and LEDs

The **NAMC-PMC** does not have any interfaces or LEDs towards the front; it physically just offers a frame for the PMC extension module's front plate and so all front interfaces are determined by the PMC.

4.2 Connectors and Switches

Figure 4: NAMC-PMC – Connector and Switch Location (Top/Bottom)



Please refer to the following tables to look up the connector and switch pin assignment of the **NAMC-PMC**.

4.2.1 CON1: AMC Connector

Table 2: CON1: AMC Connector – Pin Assignment

Pin #	AMC-Signal	AMC-Signal	Pin #
1	GND	GND	170
2	PWR	TDI	169
3	/PS1	TDO	168
4	PWR_IPMB	/TRST	167
5	GA0	TMS	166
6	RESVD	TCK	165
7	GND	GND	164
8	RESVD	NC	163
9	PWR	NC	162
10	GND	GND	161
11	NC	NC	160
12	NC	NC	159
13	GND	GND	158
14	NC	NC	157
15	NC	NC	156
16	GND	GND	155
17	GA1	NC	154
18	PWR	NC	153
19	GND	GND	152
20	NC	NC	151
21	NC	NC	150
22	GND	GND	149
23	NC	NC	148
24	NC	NC	147
25	GND	GND	146
26	GA2	NC	145
27	PWR	NC	144
28	GND	GND	143
29	NC	NC	142
30	NC	NC	141
31	GND	GND	140
32	NC	NC	139
33	NC	NC	138
34	GND	GND	137
35	NC	NC	136
36	NC	NC	135
37	GND	GND	134
38	NC	NC	133
39	NC	NC	132
40	GND	GND	131
41	/ENABLE	NC	130
42	PWR	NC	129
43	GND	GND	128
44	PORT4_TX_P	NC	127
45	PORT4_TX_N	NC	126

Pin #	AMC-Signal	AMC-Signal	Pin #
46	GND	GND	125
47	PORT4_RX_P	NC	124
48	PORT4_RX_N	NC	123
49	GND	GND	122
50	NC	NC	121
51	NC	NC	120
52	GND	GND	119
53	NC	NC	118
54	NC	NC	117
55	GND	GND	116
56	IPMB_SCL	NC	115
57	PWR	NC	114
58	GND	GND	113
59	NC	NC	112
60	NC	NC	111
61	GND	GND	110
62	NC	NC	109
63	NC	NC	108
64	GND	GND	107
65	NC	NC	106
66	NC	NC	105
67	GND	GND	104
68	NC	NC	103
69	NC	NC	102
70	GND	GND	101
71	IPMB_SDA	NC	100
72	PWR	NC	99
73	GND	GND	98
74	NC	NC	97
75	NC	NC	96
76	GND	GND	95
77	NC	NC	94
78	NC	NC	93
79	GND	GND	92
80	FCLKA_P	NC	91
81	FCLKA_N	NC	90
82	GND	GND	89
83	/PS0	NC	88
84	PWR	NC	87
85	GND	GND	86

4.2.2 P11/P12: PMC Connectors

Table 3: P11/P12: PMC Connectors – Pin Assignment

P11				P12			
Pin #	**Signal**	**Signal**	**Pin #**	**Pin #**	**Signal**	**Signal**	**Pin #**
1	TCK	-12V	2	1	+12V	TRST#	2
3	Ground	INTA#	4	3	TMS	TDO	4
5	INTB#	INTC#	6	5	TDI	Ground	6
7	NC	+5V	8	7	Ground	PMC-RSVD	8
9	INTD#	PMC-RSVD	10	9	PMC-RSVD	PMC-RSVD	10
11	Ground	NC	12	11	NC	+3.3V	12
13	CLK	Ground	14	13	RST#	NC	14
15	Ground	GNT#	16	15	3.3V	NC	16
17	REQ#	+5V	18	17	PME#	Ground	18
19	V(I/O)	AD[31]	20	19	AD[30]	AD[29]	20
21	AD[28]	AD[27]	22	21	Ground	AD[26]	22
23	AD[25]	Ground	24	23	AD[24]	+3.3V	24
25	Ground	C/BE[3]#	26	25	IDSEL	AD[23]	26
27	AD[22]	AD[21]	28	27	+3.3V	AD[20]	28
29	AD[19]	+5V	30	29	AD[18]	Ground	30
31	V(I/O)	AD[17]	32	31	AD[16]	C/BE[2]#	32
33	FRAME#	Ground	34	33	Ground	PMC-RSVD	34
35	Ground	IRDY#	36	35	TRDY#	+3.3V	36
37	DEVSEL#	+5V	38	37	Ground	STOP#	38
39	Ground	LOCK#	40	39	PERR#	Ground	40
41	PCI-RSVD	PMC-RSVD	42	41	+3.3V	SERR#	42
43	PAR	Ground	44	43	C/BE[1]#	Ground	44
45	V(I/O)	AD[15]	46	45	AD[14]	AD[13]	46
47	AD[12]	AD[11]	48	47	M66EN	AD[10]	48
49	AD[09]	+5V	50	49	AD[08]	+3.3V	50
51	Ground	C/BE[0]#	52	51	AD[07]	PMC-RSVD	52
53	AD[06]	AD[05]	54	53	+3.3V	PMC-RSVD	54
55	AD[04]	Ground	56	55	PMC-RSVD	Ground	56
57	V(I/O)	AD[03]	58	57	PMC-RSVD	PMC-RSVD	58
59	AD[02]	AD[01]	60	59	Ground	PMC-RSVD	60
61	AD[00]	+5V	62	61	ACK64#	+3.3V	62
63	Ground	REQ64#	64	63	Ground	PMC-RSVD	64

4.2.3 DIP SW1: PCIe Reference Clock Select / Reserved

The table below gives an overview of the operating parameters configurable via DIP SW1. Details are given in the following subchapters.

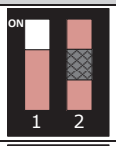
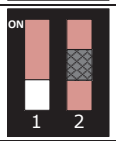
Table 4: DIP SW1: Pin Assignment - Overview

Switch #	Function
1	PCIe Reference Clock Select
2	Reserved

4.2.3.1 DIP SW1: Switch 1 – PCIe Reference Clock Select

By operating Switch 1 of DIP SW1 to ON, the reference clock provided by the system via FCLKA is selected. If Switch 1 of DIP SW1 is turned to OFF, the local oscillator is selected as reference.

Table 5: DIP SW1: Switch 1 – PCIe Reference Clock Select – Pin Assignment

DIP SW1 – Switch 1	Function
	PCIe Reference Clock via FCKLA
	PCIe Reference Clock from local oscialltor

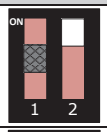
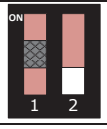
Default:

Switch 1 of DIP SW1 is toggled to OFF, local oscillator is selected as reference clock for PCIe.

4.2.3.2 DIP SW1: Switch 2 – Reserved

The output of that switch is connected to the micro controller for future use.

Table 6: DIP SW1: Switch 2 – Reserved – Pin-Assignment

DIP SW1 – Switch 2	Function
	Reserved
	Reserved

Default:

tbd

5 Board Specification

Power Supply	The PMC's +3.3V, +5V, +12V and -12V are generated from the AMC's 12V payload power. The **NAMC-PMC** carrier board itself draws very little power from the supplies.
Operating Temperature	0°C – +55°C with forced cooling
Storage Temperature	-40°C - +85°C
Humidity	10% – 90% rh non-condensing

6 Installation

6.1 Safety Note

To ensure proper functioning of the **NAMC-PMC** during its usual lifetime take the following precautions before handling the board.

CAUTION
Electrostatic discharge and incorrect board installation and uninstallation can damage circuits or shorten their lifetime.

- Before installing or uninstalling the **NAMC-PMC** read this installation section
- Before installing or uninstalling the **NAMC-PMC**, read the Installation Guide and the User's Manual of the carrier board used or of the µTCA system the board will be plugged into.
- Before installing or uninstalling the **NAMC-PMC** on a carrier board or both in a rack:
  - Check all installed boards and modules for steps that you have to takebefore turning on or off the power.
  - Take those steps.
  - Finally turn on or off the power if necessary.
  - Make sure the part to be installed / removed is hot swap capable, if you don't switch off the power.
- Before touching integrated circuits ensure to take all required precautions for handling electrostatic devices.
- Ensure that the **NAMC-PMC** is connected to the carrier board or to the µTCA backplane with the connector completely inserted.
- When operating the board in areas of strong electromagnetic radiation ensure that the module
  - is bolted the front panel or rack
  - and shielded by closed housing

6.2 Installation Prerequisites and Requirements

IMPORTANT
Before powering up check this section for installation prerequisites and requirements

6.2.1 Special Requirements (different to the requirements for standard AMCs)

- The width of a standard PMC module is slightly larger than the width of a full width AMC module. The **NAMC-PMC** will still fit into a standard MicroTCA backplane, but the Backplane requires special card guides. Please contact N.A.T. GmbH for a list of backplane Vendors that support these card guides.
- The standard PMC face plate is not much smaller than a half height, full width AMC face plate. Therefore it is no space left to support the hot swap handle and the blue hot swap LED (even though this is required by the AMC specification). Therefore the **NAMC-PMC** does **not** support hot swap based on hardware; however the power of the module can be switched on/off via the **NAT-MCH**-Software. For details, please refer to the **NAT-MCH** User's Manual.

6.2.2 Requirements

The installation requires only

- an ATCA carrier board, or a µTCA backplane for connecting the **NAMC-PMC**
- power supply
- cooling devices

6.2.3 Power supply

The power supply for the **NAMC-PMC** must meet the following specifications:

- required for the carrier module:
  +12V / 0.6A max.
- the current needed by the PMC module needs to be added!

6.2.4 Automatic Power Up

In the following situations the **NAMC-PMC** will automatically be reset and proceed with a normal power up:

- The voltage sensor generates a reset
  - when +12V payload power voltage level drops below 10V
  - when +3.3V management power voltage level drops below 3.08V
- The PCIe to PCI Bridge will assert the PCI reset towards the PMC module until a PCIe link is established.

6.3 Statement on Environmental Protection

6.3.1 Compliance to RoHS Directive

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS) predicts that all electrical and electronic equipment being put on the European market after June 30th, 2006 must contain lead, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and poly-brominated diphenyl ethers (PBDE) and cadmium in maximum concentration values of 0.1% respective 0.01% by weight in homogenous materials only.

As these hazardous substances are currently used with semiconductors, plastics (i.e. semiconductor packages, connectors) and soldering tin any hardware product is affected by the RoHS directive if it does not belong to one of the groups of products exempted from the RoHS directive.

Although many of hardware products of N.A.T. are exempted from the RoHS directive it is a declared policy of N.A.T. to provide all products fully compliant to the RoHS directive as soon as possible. For this purpose since January 31st, 2005 N.A.T. is requesting RoHS compliant deliveries from its suppliers. Special attention and care has been paid to the production cycle, so that wherever and whenever possible RoHS components are used with N.A.T. hardware products already.

6.3.2 Compliance to WEEE Directive

Directive 2002/95/EC of the European Commission on "Waste Electrical and Electronic Equipment" (WEEE) predicts that every manufacturer of electrical and electronical equipment which is put on the European market has to contribute to the reuse, recycling and other forms of recovery of such waste so as to reduce disposal. Moreover this directive refers to the Directive 2002/95/EC of the European Commission on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

Having its main focus on private persons and households using such electrical and electronic equipment the directive also affects business-to-business relationships. The directive is quite restrictive on how such waste of private persons and households has to be handled by the supplier/manufacturer, however, it allows a greater flexibility in business-to-business relationships. This pays tribute to the fact with industrial use electrical and electronical products are commonly integrated into larger and more complex environments or systems that cannot easily be split up again when it comes to their disposal at the end of their life cycles.

As N.A.T. products are solely sold to industrial customers, by special arrangement at time of purchase the customer agreed to take the responsibility for a WEEE compliant disposal of the used N.A.T. product. Moreover, all N.A.T. products are marked according to the directive with a crossed out bin to indicate that these products within the European Community must not be disposed with regular waste.

If you have any questions on the policy of N.A.T. regarding the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS) or the Directive 2002/95/EC of the European Commission on "Waste Electrical and Electronic Equipment" (WEEE) please contact N.A.T. by phone or e-mail.

6.3.3 Compliance to CE Directive

Compliance to the CE directive is declared. A 'CE' sign can be found on the PCB.

6.3.4 Product Safety

The board complies to EN60950 and UL1950.

6.3.5 Compliance to REACH

The REACH EU regulation (Regulation (EC) No 1907/2006) is known to N.A.T. GmbH. N.A.T. did not receive information from their European suppliers of substances of very high concern of the ECHA candidate list. Article 7(2) of REACH is notable as no substances are intentionally being released by NAT products and as no hazardous substances are contained. Information remains in effect or will be otherwise stated immediately to our customers.

7 Known Bugs / Restrictions

none

Appendix A: Reference Documentation

[1] Atmel ATmega1284P Microcontroller – Datasheet Rev. 8059D – 11/09
[2] PLX PEX8112 PCIe-to-PCI-Bridge – Detailed Technical Specification V1.2 – 10/08
[3] NAT-MCH – User's Manual V1.25 – 06/2014

Appendix B: Document's History

Version	Date	Description	Author
1.0	06.05.2011	initial version	ks
1.1	27.05.2013 25.07.2013	Address, phone and fax updated Adapted to new layout, minor corrections	Fh se
	01.10.2014	- Added chapter "Conventions" incl. Abbreviation List - Added Appendix A: Reference Documentation - Reworked chapter 1 (Introduction), 2 (Overview) and 3 (Board Features) - Update chapter 6.3 RoHS-Directive / REACH - Added Figure 4: Connectors and Switches - Minor changes	se