NPMC-EXT64
PMC Module Extender
Technical Reference Manual V1.4
HW Revision 1.2

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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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1 Introduction

The **NPMC-EXT64** is a passive PMC extender module intended for use with VME or cPCI carrier boards. It eases debugging of PMC modules by enabling the user to access the module under test from both sides, install debug port cables, and allow access for measurement of all PCI and I/O signals from the module.

2 Technical Specifications

2.1 Bus Interface

- PCI interface for PMC modules as defined by IEEE P1386.1 Draft 2.4a, 12.1.2001
- PCI bus 64 bit, 66 MHz signals supported
- all 64 I/O signals routed between both PMC interfaces
- Termination Shottky diodes on all PCI signals

2.2 Test Equipment Access Points

The module is equipped with connector rows which are directly plug-compatible to Tectronix logic analyzers.

2.3 Power Supply

The NPMC-EXT64 draws very little power from the carrier supplies. The +5V and +3.3V supplies are buffered by capacitor sets.

Current drawn from +3.3V, +5V, +12V, -12V, +3.3Vaux, V(I/O) is less than 10mA each.
+3.3V, +5V, and V(I/O) share a power plane, GND has a plane of its own.

There are testpoints for all power supplies and GND. All power supplies drive signalling LEDs. All power supplies may be cut by opening solder fields for current measurements.

2.4 Environment

Temperature:	-40 – +85°C	operating and storage
Humidity:	5 – 90% rh	not condensing

2.5 Statement on Environmental Protection

2.5.1 Compliance to RoHS Directive

Directive 2002/95/EC of the European Comission 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 polybrominated diphenyl ethers (PBDE) and cadmium in maximum concentration values of 0.1% respective 0.01% by weight in homogenous materials only.

As these harzadous 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 payed to the production cycle, so that whereever and whenever possible RoHS components are used with N.A.T. hardware products already.

2.5.2 Compliance to WEEE Directive

Directive 2002/95/EC of the European Comission 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 Comission 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 intergrated into larger and more complex envionments 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 2002/95/EC of the European Comission 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 Comission on "Waste Electrical and Electronic Equipment" (WEEE) please contact N.A.T. by phone or e-mail.

2.5.3 Compliance to CE Directive

Compliance to the CE directive is declared. A ‘CE’ sign can ce found on the PCB.

2.5.4 Product Safety

The board complies to EN60950 and UL1950.

3 Hardware Description

This chapter contains a brief description of the functional blocks of the NPMC-EXT64 PMC extender board.

Figure 1: Location diagram of the NPMC-EXT64, Top Layer

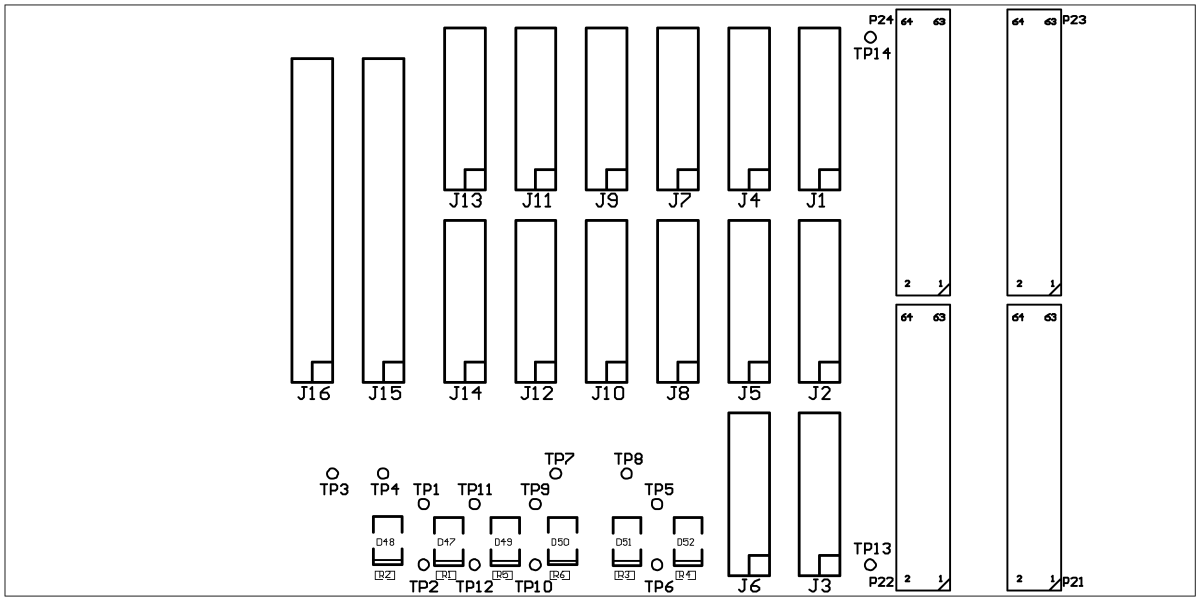
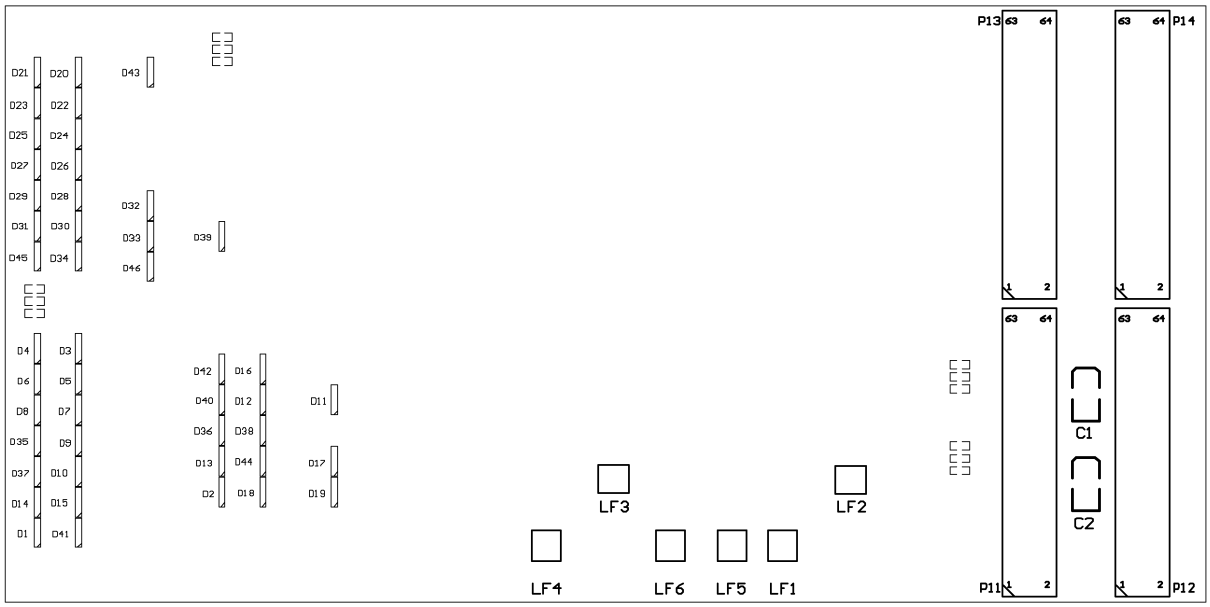


Figure 2: Location diagram of the NPMC-EXT64, Bottom Layer



3.1 Hardware Overview

The **NPMC-EXT64** is a passive extender board, i.e. it does not contain any circuitry apart from 2 PMC connector sets (P11 – P14 plugging into the carrier board, P21 – P24 for acceptance of the module under test), and a set of terminating diodes close to the connector set for acceptance of the module under test.

Connectors J1 – J14 carry all PCI bus signals and PMC specific signals routed between the two sets of PMC connectors for access by measuring equipment. The signals on these connectors are grouped by 8 and may be easily connected to a logic analyzer probe. One row of these double-row connectors carries the signals, the other is grounded. The male headers assembled fit directly into the probes of e.g. a Tectronix TLA logic analyzer series.

Connectors J15 – J16 carry all 64 I/O signals signals routed between the two sets of PMC connectors for access by measuring equipment.

3.2 LEDs, Testpins, and Solder Fields

There are 6 LEDs and 14 test pins assembled on the **NPMC-EXT64**; two test pins / one LED for every power supply voltage, and two test pins for GND, suitable e.g. for the connection of GND cables of scope probes. The relationship between test points, LEDs, and solder fields is shown below:

Table 1: LEDs and Testpoints

LED	Supply	Testpoint	Solder Field
	+5V_IN	TP1	LF1
LED D47	+5V_OUT	TP2	
	+3.3V_IN	TP3	LF2
LED D48	+3.3V_OUT	TP4	
	+3.3Vaux_IN	TP5	LF4
LED D52	+3.3Vaux_OUT	TP6	
	V(I/O)_IN	TP7	LF3
LED D51	V(I/O)_OUT	TP8	
	-12V_IN	TP9	LF6
LED D50	-12V_OUT	TP10	
	+12V_IN	TP11	LF5
LED D49	+12V_OUT1	TP12	
	GND	TP13	
	GND	TP14	

Opening the solder fields connecting Vx_IN and Vx_OUT allows connection of an ampere meter between the respective test points for supply current measurement of every voltage.

4 Connectors

4.1 PMC Connectors

Table 2: PMC connectors P11, P21, P12, P22

P11, P21				P12, P22			
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	BUSMODE1#	+5V	8	7	Ground	PCI-RSVD	8
9	INTD#	PCI-RSVD	10	9	PCI-RSVD*	PCI-RSVD	10
11	Ground	3.3Vaux	12	11	BUSMODE2#	+3.3V	12
13	CLK	Ground	14	13	RST#	BUSMODE3#	14
15	Ground	GNT#	16	15	3.3V	BUSMODE4#	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	PCI-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

Table 3: PMC Connectors P13, P23, P14, P24

P13, P23				P14,P24			
Pin	**Signal**	**Signal**	**Pin**	**Pin**	**Signal**	**Signal**	**Pin**
1	PCI-RSVD	Ground	2	1	I/O	I/O	2
3	Ground	C/BE[7]#	4	3	I/O	I/O	4
5	C/BE[6]#	C/BE[5]#	6	5	I/O	I/O	6
7	C/BE[4]#	Ground	8	7	I/O	I/O	8
9	V(I/O)	PAR64	10	9	I/O	I/O	10
11	AD[63]	AD[62]	12	11	I/O	I/O	12
13	AD[61]	Ground	14	13	I/O	I/O	14
15	Ground	AD[60]	16	15	I/O	I/O	16
17	AD[59]	AD[58]	18	17	I/O	I/O	18
19	AD[57]	Ground	20	19	I/O	I/O	20
21	V(I/O)	AD[56]	22	21	I/O	I/O	22
23	AD[55]	AD[54]	24	23	I/O	I/O	24
25	AD[53]	Ground	26	25	I/O	I/O	26
27	Ground	AD[52]	28	27	I/O	I/O	28
29	AD[51]	AD[50]	30	29	I/O	I/O	30
31	AD[49]	Ground	32	31	I/O	I/O	32
33	Ground	AD[48]	34	33	I/O	I/O	34
35	AD[47]	AD[46]	36	35	I/O	I/O	36
37	AD[45]	Ground	38	37	I/O	I/O	38
39	V(I/O)	AD[44]	40	39	I/O	I/O	40
41	AD[43]	AD[42]	42	41	I/O	I/O	42
43	AD[41]	Ground	44	43	I/O	I/O	44
45	Ground	AD[40]	46	45	I/O	I/O	46
47	AD[39]	AD[38]	48	47	I/O	I/O	48
49	AD[37]	Ground	50	49	I/O	I/O	50
51	Ground	AD[36]	52	51	I/O	I/O	52
53	AD[35]	AD[34]	54	53	I/O	I/O	54
55	AD[33]	Ground	56	55	I/O	I/O	56
57	V(I/O)	AD[32]	58	58	I/O	I/O	58
59	PCI-RSVD	PCI-RSVD	60	59	I/O	I/O	60
61	PCI-RSVD	Ground	62	61	I/O	I/O	62
63	Ground	PCI-RSVD	64	63	I/O	I/O	64

Connector descriptors P1x refer to PMC connectors plugging into the carrier board, connector descriptors P2x refer to PMC connectors for acceptance of the module under test.

4.2 Connectors for PCI Signal Measurement

Connectors J1 – J14 carry all PCI bus and PMC specific signals. These connectors are intended for use with measurement equipment. J1 – J14 are suitable for direct connection to logic analyzers, e.g. the Tectronix TLA logic analyzer series.

Table 4: Connector J1

Pin	Signal	Signal	Pin
1	GND	PCICLK	2
3	GND	FRAME#	4
5	GND	DEVSEL#	6
7	GND	IDSEL	8
9	GND	IRDY#	10
11	GND	TRDY#	12
13	GND	STOP#	14
15	GND	PCIRST#	16

Table 5: Connector J2

Pin	Signal	Signal	Pin
1	GND	PERR#	2
3	GND	SERR#	4
5	GND	REQ#	6
7	GND	GNT#	8
9	GND	REQ64#	10
11	GND	ACK64#	12
13	GND	PAR	14
15	GND	LOCK#	16

Table 6: Connector J3

Pin	Signal	Signal	Pin
1	GND	C/BE0#	2
3	GND	C/BE1#	4
5	GND	C/BE2#	6
7	GND	C/BE3#	8
9	GND	C/BE4#	10
11	GND	C/BE5#	12
13	GND	C/BE6#	14
15	GND	C/BE7#	16

Table 7: Connector J4

Pin	Signal	Signal	Pin
1	GND	PCI_AD7	2
3	GND	PCI_AD6	4
5	GND	PCI_AD5	6
7	GND	PCI_AD4	8
9	GND	PCI_AD3	10
11	GND	PCI_AD2	12
13	GND	PCI_AD1	14
15	GND	PCI_AD0	16

Table 8: Connector J5

Pin	Signal	Signal	Pin
1	GND	PCI_AD15	2
3	GND	PCI_AD14	4
5	GND	PCI_AD13	6
7	GND	PCI_AD12	8
9	GND	PCI_AD11	10
11	GND	PCI_AD10	12
13	GND	PCI_AD9	14
15	GND	PCI_AD8	16

Table 9: Connector J6

Pin	Signal	Signal	Pin
1	GND	PCI_AD23	2
3	GND	PCI_AD22	4
5	GND	PCI_AD21	6
7	GND	PCI_AD20	8
9	GND	PCI_AD19	10
11	GND	PCI_AD18	12
13	GND	PCI_AD17	14
15	GND	PCI_AD16	16

Table 10: Connector J7

Pin	Signal	Signal	Pin
1	GND	PCI_AD31	2
3	GND	PCI_AD30	4
5	GND	PCI_AD29	6
7	GND	PCI_AD28	8
9	GND	PCI_AD27	10
11	GND	PCI_AD26	12
13	GND	PCI_AD25	14
15	GND	PCI_AD24	16

Table 11: Connector J8

Pin	Signal	Signal	Pin
1	GND	PCI_AD39	2
3	GND	PCI_AD38	4
5	GND	PCI_AD37	6
7	GND	PCI_AD36	8
9	GND	PCI_AD35	10
11	GND	PCI_AD34	12
13	GND	PCI_AD33	14
15	GND	PCI_AD32	16

Table 12: Connector J9

Pin	Signal	Signal	Pin
1	GND	PCI_AD47	2
3	GND	PCI_AD46	4
5	GND	PCI_AD45	6
7	GND	PCI_AD44	8
9	GND	PCI_AD43	10
11	GND	PCI_AD42	12
13	GND	PCI_AD41	14
15	GND	PCI_AD40	16

Table 13: Connector J10

Pin	Signal	Signal	Pin
1	GND	PCI_AD55	2
3	GND	PCI_AD54	4
5	GND	PCI_AD53	6
7	GND	PCI_AD52	8
9	GND	PCI_AD51	10
11	GND	PCI_AD50	12
13	GND	PCI_AD49	14
15	GND	PCI_AD48	16

Table 14: Connector J11

Pin	Signal	Signal	Pin
1	GND	PCI_AD63	2
3	GND	PCI_AD62	4
5	GND	PCI_AD61	6
7	GND	PCI_AD60	8
9	GND	PCI_AD59	10
11	GND	PCI_AD58	12
13	GND	PCI_AD57	14
15	GND	PCI_AD56	16

Table 15: Connector J12

Pin	Signal	Signal	Pin
1	GND	INTA#	2
3	GND	INTB#	4
5	GND	INTC#	6
7	GND	INTD#	8
9	GND	PME	10
11	GND	M66EN	12
13	GND	SBO#	14
15	GND	SDONE#	16

Table 16: Connector J13

Pin	Signal	Signal	Pin
1	GND	TCK	2
3	GND	TMS	4
5	GND	TDI	6
7	GND	TDO	8
9	GND	TRST#	10
11	GND	nc	12
13	GND	nc	14
15	GND	nc	16

Table 17: Connector J14

Pin	Signal	Signal	Pin
1	GND	BUSMODE1#	2
3	GND	BUSMODE2#	4
5	GND	BUSMODE3#	6
7	GND	BUSMODE4#	8
9	GND	nc	10
11	GND	nc	12
13	GND	nc	14
15	GND	PAR64	16

4.3 Connectors for I/O Signal Measurement

Connectors J15 – J16 carry all PMC I/O signals. These connectors are intended for use with measurement equipment.

Table 18: Connector J15

Pin	Signal	Signal	Pin
1	PMC_IO2	PMC_IO1	2
3	PMC_IO4	PMC_IO3	4
5	PMC_IO6	PMC_IO5	6
7	PMC_IO8	PMC_IO7	8
9	PMC_IO10	PMC_IO9	10
11	PMC_IO12	PMC_IO11	12
13	PMC_IO14	PMC_IO13	14
15	PMC_IO16	PMC_IO15	16
17	PMC_IO18	PMC_IO17	18
19	PMC_IO20	PMC_IO19	20
21	PMC_IO22	PMC_IO21	22
23	PMC_IO24	PMC_IO23	24
25	PMC_IO26	PMC_IO25	26
27	PMC_IO28	PMC_IO27	28
29	PMC_IO30	PMC_IO29	30
31	PMC_IO32	PMC_IO31	32

Table 19: Connector J16

Pin	Signal	Signal	Pin
1	PMC_IO34	PMC_IO33	2
3	PMC_IO36	PMC_IO35	4
5	PMC_IO38	PMC_IO37	6
7	PMC_IO40	PMC_IO39	8
9	PMC_IO42	PMC_IO41	10
11	PMC_IO44	PMC_IO43	12
13	PMC_IO46	PMC_IO45	14
15	PMC_IO48	PMC_IO47	16
17	PMC_IO50	PMC_IO49	18
19	PMC_IO52	PMC_IO51	20
21	PMC_IO54	PMC_IO53	22
23	PMC_IO56	PMC_IO55	24
25	PMC_IO58	PMC_IO57	26
27	PMC_IO60	PMC_IO59	28
29	PMC_IO62	PMC_IO61	30
31	PMC_IO64	PMC_IO63	32

5 Document's History

Version	Date	Description	Author
1.0	15.02.2002	initial version	ga
1.1	04.06.2002	adapted to PCB version V1.2	ga
1.2	21.10.2005	corrected flipped pinning description for J4 – J11	ga
1.3	10.02.2006	'Statement on Environmental Protection' added	ga
1.4	06.06.2007	chapters 2.5.3. and 2.5.4. added	ga