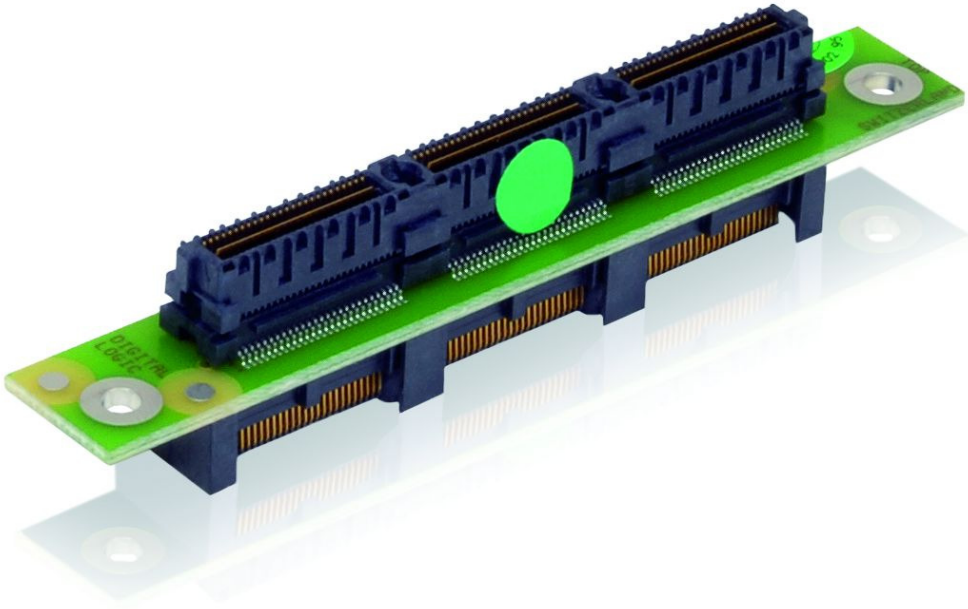
» Kontron User's Guide «



MSMSP104EX

Document Revision 101

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1 User Information

1.1 About this Document

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For the circuits, descriptions and tables indicated, Kontron assumes no responsibility as far as patents or other rights of third parties are concerned.

1.2 Copyright Notice

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1.3 Trademarks

The following lists the trademarks of components used in this board.

- IBM, XT, AT, PS/2 and Personal System/2 are trademarks of International Business Machines Corp.
- Microsoft is a registered trademark of Microsoft Corp.
- Intel is a registered trademark of Intel Corp.
- All other products and trademarks mentioned in this manual are trademarks of their respective owners.

1.4 Standards

Kontron AG is certified to ISO 9000 standards.

1.5 Warranty

This Kontron AG product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period, Kontron AG will, at its discretion, decide to repair or replace defective products.

Within the warranty period, the repair of products is free of charge as long as warranty conditions are observed.

The warranty does not apply to defects resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specifications or improper installation or maintenance.

Kontron AG will not be responsible for any defects or damages to other products not supplied by Kontron AG that are caused by a faulty Kontron AG product.

1.6 Technical Support

Technicians and engineers from Kontron AG and/or its subsidiaries are available for technical support. We are committed to making our products easy to use and will help you use our products in your systems.

Please consult our Web site at http://www.kontron.com/support for the latest product documentation, utilities, drivers and support contacts. Consult our customer section http://emdcustomersection.kontron.com for the latest BIOS downloads, Product Change Notifications and additional tools and software. In any case, you can always contact your board supplier for technical support.

1.7 Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements wherever possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations. All components within this product fulfill the requirements of the RoHS (Restriction of Hazardous Substances Directive). The product is soldered with a lead free process.

1.8 RoHS Commitment

Kontron Compact Computers AG (Switzerland) is committed to develop and produce environmentally friendly products according to the Restriction of Hazardous Substances (RoHS) Directive (2002/95/EC) and the Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) established by the European Union. The RoHS directive was adopted in February 2003 by the European Union and came into effect on July 1, 2006. It is not a law but a directive, which restricts the use of six hazardous materials in the manufacturing of various types of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE) 2002/96/EC, which has set targets for collection, recycling and recovery of electrical goods and is part of a legislative initiative to solve the problem of huge amounts of toxic e-waste.

Each European Union member state is adopting its own enforcement and implementation policies using the directive as a guide. Therefore, there could be as many different versions of the law as there are states in the EU. Additionally, non-EU countries like China, Japan, or states in the U.S. such as California may have their own regulations for green products, which are similar, but not identical, to the RoHS directive.

RoHS is often referred to as the "lead-free" directive but it restricts the use of the following substances:

- Lead
- Mercury
- Cadmium
- Chromium VI
- PBB and PBDE

The maximum allowable concentration of any of the above mentioned substances is 0.1% (except for Cadmium, which is limited to 0.01%) by weight of homogeneous material. This means that the limits do not apply to the weight of the finished product, or even to a component but to any single substance that could (theoretically) be separated mechanically.

1.8.1 RoHS Compatible Product Design

All Kontron Compact Computers (KCC) AG standard products comply with RoHS legislation.

Since July 1, 2006, there has been a strict adherence to the use of RoHS compliant electronic and mechanical components during the design-in phase of all KCC AG standard products.

1.8.2 RoHS Compliant Production Process

Kontron Compact Computers AG selects external suppliers that are capable of producing RoHS compliant devices. These capabilities are verified by:

- A confirmation from the supplier indicating that their production processes and resulting devices are RoHS compliant.
- If there is any doubt of the RoHS compliancy, the concentration of the previously mentioned substances in a produced device will be measured. These measurements are carried out by an accredited laboratory.

1.8.3 WEEE Application

The WEEE directive is closely related to the RoHS directive and applies to the following devices:

- Large and small household appliances
- IT equipment
- Telecommunications equipment (although infrastructure equipment is exempt in some countries)
- Consumer equipment
- Lighting equipment – including light bulbs
- Electronic and electrical tools
- Toys, leisure and sports equipment
- Automatic dispensers

It does not apply to fixed industrial plants and tools. The compliance is the responsibility of the company that brings the product to market, as defined in the directive. Components and sub-assemblies are not subject to product compliance. In other words, since Kontron Compact Computers AG does not deliver ready-made products to end users the WEEE directive is not applicable for KCC AG. Users are nevertheless encouraged to properly recycle all electronic products that have reached the end of their life cycle.

1.9 Swiss Quality

- 100% Made in Switzerland
- This product was not manufactured by employees earning piecework wages
- This product was manufactured in humane work conditions
- All employees who worked on this product are paid customary Swiss market wages and are insured
- ISO 9000:2001 (quality management system)

1.10 The Swiss Association for Quality and Management Systems

The Swiss Association for Quality and Management Systems (SQS) provides certification and assessment services for all types of industries and services. SQS certificates are accepted worldwide thanks to accreditation by the Swiss Accreditation Service (SAS), active membership in the International Certification Network, IQNet, and co-operation contracts/agreements with accredited partners.

www.sqs.ch

The SQS Certificate ISO 9001:2000 has been issued to Kontron Compact Computers AG in the field of development, manufacturing and sales of embedded computer boards, embedded computer modules and computer systems. The certification is valid for three years at which time an audit is performed for recertification.

2 Introduction

2.1 MSMSP104EX Ordering Information

Part / Option	Part Number	Description
MSMSP104ex	802607	PCI/104-*Express* bus spacer kit
Spacer Kit PC104+	802051	PCI bus spacer kit
Spacer Kit PC104	802050	ISA bus spacer kit

2.2 Understanding MSMSP104EX Functionality

The MICROSPACE® PCI/104-*Express* spacer card allows a height increase of one PCI/104-*Express* unit (15.24mm + 1.6mm). Only 1 spacer card is allowed per PCI/104-*Express* stack. Equivalent spacer kits are available for the PCI bus (802051) as well as the ISA bus (802050).

» 1 height unit expander for a PCI/104-*Express* bus

» The MSMSP104EX is PCI/104-Express, version 1.0, compliant.

2.3 MICROSPACE® Documentation

This manual is written for the original equipment manufacturer (OEM) who plans to build computer systems based on the single board MICROSPACE-PC. It is for integrators and programmers of systems based on the MICROSPACE-Computer family. This manual provides instructions for installing and configuring the board and describes the system and setup requirements. This document contains information on hardware requirements, interconnections, and details of how to program the system. Please check the Product CD for further information and manuals.

2.4 MSMSP104EX Benefits

MICROSPACE PCI/104-*Express* embedded computer boards comply with the PC/104 Consortium form factor 3.55 × 3.775 inches (90.17 × 95.89 mm) and are available in "stack through" versions.

3 Specifications

Note:	All information is subject to change without notice.

3.1 Functional Specifications

Bus

» Standard: PCI/104express

» Size: 32 bit PCIe

3.2 Dimensions

» Length: 90 mm

» Width: 14 mm

» Height: 15 mm

3.3 Electrical Specifications

Power Supply

» Working: 3.3 / 5 Volt / 1W

3.4 Environmental Specifications

Temperature

» Operating, standard version: -25°C to +70°C

» Operating, industrial version: -25°C to +85°C (ask Kontron Compact Computers AG)

» Non-operating (storage): -55°C to +85°C

Vibration

» 5 to 2000 Hz

Humidity

» 5% to 90% (non-condensing)

Shock

» 10 g

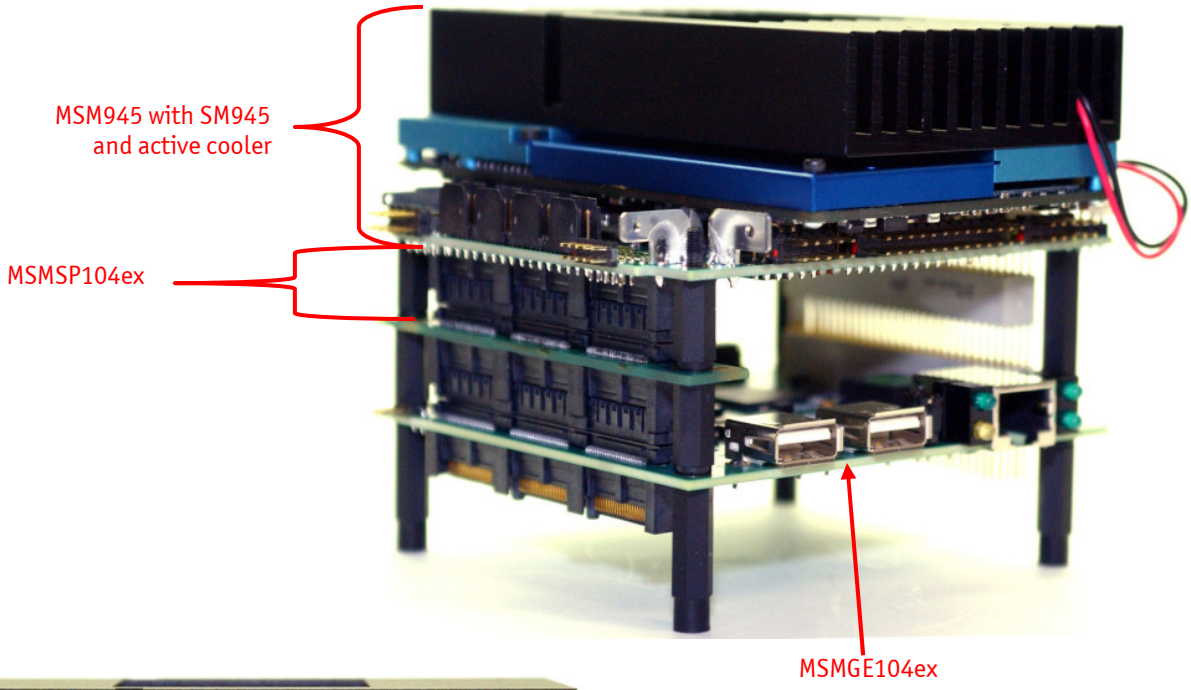
4 Spacer Kit

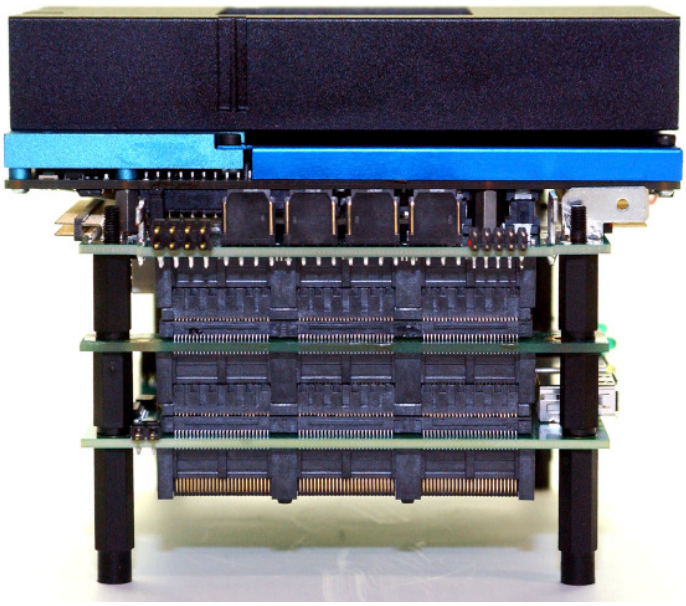
The contents of the Spacer Kit is as follows:

Part	Description
490535	PCB
439265	PCI/104express female connector
439264	PCI/104express male connector
439060	PC104+ connector 120pin
502233	bolts
502046	screws
502022	washer

Attention	Only one PCI/104-Express Spacer may be used per stack (system).

Example of an MSM945 with a spacer (MSMSP104ex) and a peripheral board (MSMGE104ex):





5 MSMSP104EX Connectors

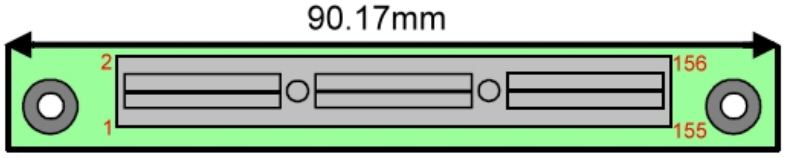
5.1 Connector References

5.1.1 X2 PCI/104-Express Bus (Bottom View Signal Assignment)

Pin	Signal		Signal	Pin
2	PE_RST#	+5 Volts	Reserved (GPIO0)	1
4	3.3V		3.3V	3
6	USB0+		USB1+	5
8	USB0-		USB1-	7
10	GND		GND	9
12	PEx1_0T+		PEx1_1T+	11
14	PEx1_0T-		PEx1_1T-	13
16	GND		GND	15
18	PEx1_3T+		PEx1_2T+	17
20	PEx1_3T-		PEx1_2T-	19
22	GND		GND	21
24	PEx1_0R+		PEx1_1R+	23
26	PEx1_0R-		PEx1_1R-	25
28	GND		GND	27
30	PEx1_3R+		PEx1_2R+	29
32	PEx1_3R-		PEx1_1R-	31
34	GND		GND	33
36	PEx1_0Clk+		PEx1_1Clk+	35
38	PEx1_0Clk-		PEx1_1Clk-	37
40	5V_Always		5V_Always	39
42	PEx1_3Clkp+		PEx1_2Clk+	41
44	PEx1_3Clk-		PEx1_2Clk-	43
46	PWRGOOD		CPU_DIR	45
48	PEx16_x8_x4_Clk+		SMB_DAT	47
50	PEx16_x8_x4_Clk-		SMB_CLK	49
52	PSON#		SMB_ALERT	51
54	PEG_ENA#	+5 Volts	Reserved / Wake#	53
56	GND		GND	55
58	PEx16_0T(0)+ / SDVO0R+		PEx16_0T(8)+	57
60	PEx16_0T(0)- / SDVO0R-		PEx16_0T(8)-	59
62	GND		GND	61
64	PEx16_0T(1)+ / SDVO1G+		PEx16_0T(9)+	63
66	PEx16_0T(1)- / SDVO1G-		PEx16_0T(9)n-	65
68	GND		GND	67
70	PEx16_0T(2)+ / SDVO0B+		PEx16_0T(10)+	69
72	PEx16_0T(2)- / SDVO0B-		PEx16_0T(10)-	71
74	GND		GND	73
76	PEx16_0T(3)+ / SDVO0CLK+		PEx16_0T(11)+	75
78	PEx16_0T(3)- / SDVO0CLK-		PEx16_0T(11)-	77
80	GND		GND	79
82	PEx16_0T(4)+ / SDVO1R+		PEx16_0T(12)+	81
84	PEx16_0T(4)- / SDVO1R-		PEx16_0T(12)-	83
86	GND		GND	85
88	PEx16_0T(5)+ / SDVO1G+		PEx16_0T(13)+	87
90	PEx16_0T(5)- / SDVO1G-		PEx16_0T(13)-	89
92	GND		GND	91
94	PEx16_0T(6)+ / SDVO1B+		PEx16_0T(14)+	93
96	PEx16_0T(6)- / SDVO1B-		PEx16_0T(14)-	95
98	GND		GND	97
100	PEx16_0T(7)+ / SDVO1CLK+		PEx16_0T(15)+	99
102	PEx16_0T(7)- / SDVO1CLK+		PEx16_0T(15)-	101
104	GND		GND	103

Pin	Signal		Signal	Pin
106	SDVO_CLK	+12 Volts	SDVO_DAT (PENA#)	105
108	GND		GND	107
110	PEx16_0R(0)+ / SDVO_TVCI+		PEx16_0R(8)+	109
112	PEx16_0R(0)- / SDVO_TVCI-		PEx16_0R(8)-	111
114	GND		GND	113
116	PEx16_0R(1)+ / SDVO_INT+		PEx16_0R(9)+	115
118	PEx16_0R(1)- / SDVO_INT-		PEx16_0R(9)-	117
120	GND		GND	119
122	PEx16_0R(2)+ / SDVO_STALL+		PEx16_0R(10)+	121
124	PEx16_0R(2)- / SDVO_STALL-		PEx16_0R(10)-	123
126	GND		GND	125
128	PEx16_0R(3)+		PEx16_0R(11)	127
130	PEx16_0R(3)-		PEx16_0R(11)-	129
132	GND		GND	131
134	PEx16_0R(4)+		PEx16_0R(12)+	133
136	PEx16_0R(4)-		PEx16_0R(12)-	135
138	GND		GND	137
140	PEx16_0R(5)+ / SDVO1_INT+		PEx16_0R(13)+	139
142	PEx16_0R(5)- / SDVO1_INT-		PEx16_0R(13)-	141
144	GND		GND	143
146	PEx16_0R(6)+		PEx16_0R(14)p	145
148	PEx16_0R(6)-		PEx16_0R(14)n	147
150	GND		GND	149
152	PEx16_0R(7)+		PEx16_0R(15)+	151
154	PEx16_0R(7)-		PEx16_0R(15)-	153
156	GND		GND	155

SAMTEC
156pin Differential Connector



5.1.2 X3 PCI/104-Express Bus (Top View Signal Assignment)

Pin	Signal		Signal	Pin
1	Reserved (GPI00)	+5 Volts	PE_RST#	2
3	3.3V		3.3V	4
5	USB1+		USB0+	6
7	USB1-		USB0-	8
9	GND		GND	10
11	PEx1_1T+		PEx1_0T+	12
13	PEx1_1T-		PEx1_0T-	14
15	GND		GND	16
17	PEx1_2T+		PEx1_3T+	18
19	PEx1_2T-		PEx1_3T-	20
21	GND		GND	22
23	PEx1_1R+		PEx1_0R+	24
25	PEx1_1R-		PEx1_0R-	26
27	GND		GND	28
29	PEx1_2R+		PEx1_3R+	30
31	PEx1_1R-		PEx1_3R-	32
33	GND		GND	34
35	PEx1_1Clk+		PEx1_0Clk+	36
37	PEx1_1Clk-		PEx1_0Clk-	38
39	5V_Always		5V_Always	40
41	PEx1_2Clk+		PEx1_3Clkp+	42
43	PEx1_2Clk-		PEx1_3Clk-	44
45	CPU_DIR		PWRGOOD	46
47	SMB_DAT		PEx16_x8_x4_Clk+	48
49	SMB_CLK		PEx16_x8_x4_Clk-	50
51	SMB_ALERT		PSON#	52
53	Reserved / Wake#		PEG_ENA#	54
55	GND		GND	56
57	PEx16_0T(8)+		PEx16_0T(0)+ / SDVO0R+	58
59	PEx16_0T(8)-		PEx16_0T(0)- / SDVO0R-	60
61	GND		GND	62
63	PEx16_0T(9)+		PEx16_0T(1)+ / SDVO1G+	64
65	PEx16_0T(9)n-		PEx16_0T(1)- / SDVO1G-	66
67	GND		GND	68
69	PEx16_0T(10)+		PEx16_0T(2)+ / SDVO0B+	70
71	PEx16_0T(10)-		PEx16_0T(2)- / SDVO0B-	72
73	GND		GND	74
75	PEx16_0T(11)+		PEx16_0T(3)+ / SDVO0CLK+	76
77	PEx16_0T(11)-		PEx16_0T(3)- / SDVO0CLK-	78
79	GND	+5 Volts	GND	80
81	PEx16_0T(12)+		PEx16_0T(4)+ / SDVO1R+	82
83	PEx16_0T(12)-		PEx16_0T(4)- / SDVO1R-	84
85	GND		GND	86
87	PEx16_0T(13)+		PEx16_0T(5)+ / SDVO1G+	88
89	PEx16_0T(13)-		PEx16_0T(5)- / SDVO1G-	90
91	GND		GND	92
93	PEx16_0T(14)+		PEx16_0T(6)+ / SDVO1B+	94
95	PEx16_0T(14)-		PEx16_0T(6)- / SDVO1B-	96
97	GND		GND	98
99	PEx16_0T(15)+		PEx16_0T(7)+ / SDVO1CLK+	100
101	PEx16_0T(15)-		PEx16_0T(7)- / SDVO1CLK+	102
103	GND		GND	104

Pin	Signal		Signal	Pin
105	SDVO_DAT (PENA#)	+12 Volts	SDVO_CLK	106
107	GND		GND	108
109	PEx16_0R(8)+		PEx16_0R(0)+ / SDVO_TVCI+	110
111	PEx16_0R(8)-		PEx16_0R(0)- / SDVO_TVCI-	112
113	GND		GND	114
115	PEx16_0R(9)+		PEx16_0R(1)+ / SDVO_INT+	116
117	PEx16_0R(9)-		PEx16_0R(1)- / SDVO_INT-	118
119	GND		GND	120
121	PEx16_0R(10)+		PEx16_0R(2)+ / SDVO_STALL+	122
123	PEx16_0R(10)-		PEx16_0R(2)- / SDVO_STALL-	124
125	GND		GND	126
127	PEx16_0R(11)		PEx16_0R(3)+	128
129	PEx16_0R(11)-		PEx16_0R(3)-	130
131	GND		GND	132
133	PEx16_0R(12)+		PEx16_0R(4)+	134
135	PEx16_0R(12)-		PEx16_0R(4)-	136
137	GND		GND	138
139	PEx16_0R(13)+		PEx16_0R(5)+ / SDVO1_INT+	140
141	PEx16_0R(13)-		PEx16_0R(5)- / SDVO1_INT-	142
143	GND		GND	144
145	PEx16_0R(14)p		PEx16_0R(6)+	146
147	PEx16_0R(14)n		PEx16_0R(6)-	148
149	GND		GND	150
151	PEx16_0R(15)+		PEx16_0R(7)+	152
153	PEx16_0R(15)-		PEx16_0R(7)-	154
155	GND		GND	156

6 Appendix A: Architecture Information

The following sources of information can help you better understand PC architecture.

6.1 Buses

6.1.1 ISA, Standard PS/2 – Connectors

- AT Bus Design: Eight and Sixteen-Bit ISA, E-ISA and EISA Design, Edward Solari, Annabooks, 1990, ISBN 0-929392-08-6
- AT IBM Technical Reference, Volumes 1&2, 1985
- ISA & EISA Theory and Operation, Edward Solari, Annabooks, 1992, ISBN 0929392159
- ISA Bus Specifications and Application Notes, Jan. 30, 1990, Intel
- ISA System Architecture, Third Edition, Tom Shanley and Don Anderson, Addison-Wesley Publishing Company, 1995, ISBN 0-201-40996-8
- Personal Computer Bus Standard P996, Draft D2.00, Jan. 18, 1990, IEEE Inc
- Technical Reference Guide, Extended Industry Standard Architecture Expansion Bus, Compaq 1989

6.1.2 PCI/104

- Embedded PC 104 Consortium
- The consortium provides information about PC/104 and PC/104-Plus technology. You can search for information about the consortium on the Web.
- PCI SIG
- The PCI-SIG provides a forum for its ~900 member companies, who develop PCI products based on the specifications that are created by the PCI-SIG. You can search for information about the SIG on the Web.
- PCI & PCI-X Hardware and Software Architecture & Design, Fifth Edition, Edward Solari and George Willse, Annabooks, 2001, ISBN 0-929392-63-9.
- PCI System Architecture, Tom Shanley and Don Anderson, Addison-Wesley, 2000, ISBN 0-201-30974-2.

6.2 General PC Architecture

- Embedded PCs, Markt&Technik GmbH, ISBN 3-8272-5314-4 (German)
- Hardware Bible, Winn L. Rosch, SAMS, 1997, 0-672-30954-8
- Interfacing to the IBM Personal Computer, Second Edition, Lewis C. Eggebrecht, SAMS, 1990, ISBN 0-672-22722-3
- The Indispensable PC Hardware Book, Hans-Peter Messmer, Addison-Wesley, 1994, ISBN 0-201-62424-9
- The PC Handbook: For Engineers, Programmers, and Other Serious PC Users, Sixth Edition, John P. Choisser and John O. Foster, Annabooks, 1997, ISBN 0-929392-36-1

6.3 Programming

» C Programmer's Guide to Serial Communications, Second Edition, Joe Campbell, SAMS, 1987, ISBN 0-672-22584-0

» Programmer's Guide to the EGA, VGA, and Super VGA Cards, Third Edition, Richard Ferraro, Addison-Wesley, 1990, ISBN 0-201-57025-4

» The Programmer's PC Sourcebook, Second Edition, Thom Hogan, Microsoft Press, 1991, ISBN 1-55615-321-X

» Undocumented PC, A Programmer's Guide to I/O, CPUs, and Fixed Memory Areas, Frank van Gilluwe, Second Edition, Addison-Wesley, 1997, ISBN 0-201-47950-8

7 Appendix B: Document Revision History

Revision	Date	Edited by	Changes
100	11.Feb.2010	WAS	Changed to new Kontron Corporate Design from DLAG V1.0.
101	23.Mar.2010	WAS	Kontron formatted title photo added.

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