

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

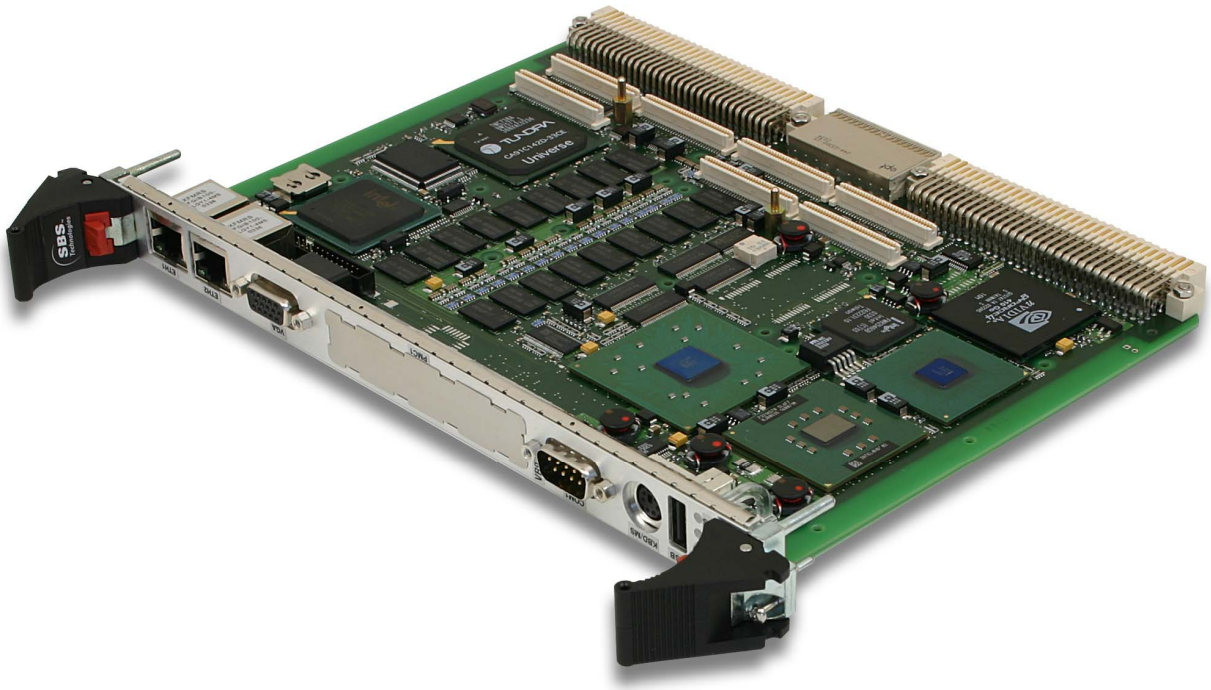
Find the *Abaco Systems / SBS VP9* at our website: *Click HERE*

GE Fanuc
Intelligent Platforms

Reference Manual

VR9, VP9
Celeron® M / Pentium® M
6U VME SBC

First Edition



Publication No. HRMVR91E

© 2009 GE Fanuc Intelligent Platforms, Inc.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written permission of GE Fanuc Intelligent Platforms, Inc.

This document contains Confidential/Proprietary Information belonging to GE Fanuc Intelligent Platforms, Inc.

Copyright © 2009 GE Fanuc Intelligent Platforms, Inc. All rights reserved.

VR9, VP9 Hardware User's Manual

This manual applies to the VR9, VP9 Celeron® M/Pentium® M PC/AT Compatible 6U VME Single Board Computer revision 1.0 and above, until superseded.

Rev.	Name	Date	Chapter	
0.0	GK	10/31/2003	all	Preliminary release Comments Initial Release
0.1	GK	03/24/2004	all	First release Extension for VP9, added pictures, removed TBD, added pinout for partly IO
0.2	MF	09/28/2004	All	Power Consumption CR9 added Not Final!
0.3	GK	11/02/2004	all	Inputs from reviews
0.31	GK	11/17/2004	Electrical characteristics Introduction	Reduce max. current on +12 V from 0.5 A to 0.1 A VG A and DVI-I resolution added
1.0	GK/JL	12/23/2004	All	External Manuals Referencing names corrected Getting Started Content of Application Note added into the manual Transition Module Video connectors: Never use two display devices connected to the rear of the VR9. You have to use one front and one rear. Resources, Function, Blocks: APIC controller section with short description added, more info with ICH4 datasheet. Serial ports: RS485 drivers are enabled with DTR signal Function blocks: Processor section, Memory section added and Watchdog section updated Appendix B corrected for VR9
1.1	GK	03/09/2005	Function Blocks Introduction Introduction Interface Interface Specifications PMC interface Specification	Wake on LAN deleted Important note to "EIDE/ATAPI" section Important note to "PMC slots" section Important note to "VMEbus Connector P0 (P7300) with partly PMC-I/O" table Important note to PMC-IO Connector P7204 Placement plans updated to V1 With board revision V1 and higher PMC slot 1 is PCI-X capable with 66/100/133 MHz Temperature diagram updated

1.2		03/22/2005 04/29/2005 08/03/2005	Interface Interface Specification Specification	VITA 31.1 note added to P0 connector Pinout of P1680 corrected to USB4 update to PCB revision V2 0,5 m/s airflow means convention cooled only
1.3	HHS	11/02/2005	All	Spelling, units, values, layout
1.4	HHS	12/12/2005	All	Legal & support & address pages New logo, headline correction Support chapter ESD/EMI, Product properties Add note about height violation Add note on altitude
1.5	MF	5/17/2006	All	Minor cosmetic changes
1.6	HHS	5/22/2007	All	Change China address in Support chapter Cosmetic changes Change 'SMB bus' to SMBus Correct blank spaces in captions Add info on ATI Radeon graphics
			Des. features, chapt. 1 All	Correct SMBus info. It does not go to the rear I/O Cosmetic changes, remove header, remove double spaces
				Insert changes from 'Freigabe Manual'
			Support	Updated list of web site addresses
			Title	Change title, header and footer
			Chapter 8 Table 25, 26 Page 66 Page 67 Figure 18	RoHS Compliance added Power Consumption for Celeron M 1.0 GHz and Pentium M 1.4 GHz added +5V STDBY updated Environmental Conditions updated Temperature Curve updated for new processors
			Page 5	Insert Waste Disposal (WEEE) info
			Chap. 2 & 3	Update Unpacking & Installation, cosmetic changes
			All	Finish updates from previous edition
			Chap. 8, Specif.	Insert note on electrical clearence
			Chap. 3	Correct configuration paragraph
				Correct storage temperature values & styles (non-RoHS)
				Add layout drawings for V3
			All	Integrate new drawings & cosmetic changes
			All	Incorporate corrections from GK
				Insert info about EIDE/PATA transfer speed limits change primary/secondary on EIDE interfaces
			Intro	Insert CE conformance text

				start chap. on odd page change Revision to Edition
First	HHS	2009-08-17	Chap. 8	Change text and diagrams of ‘onboard Lithium Battery’ section
			Chap. 8	Insert new text about Lithium battery
			All	Change to GE Fanuc company name
			Chap. 8	Clarify info on power consumption; spellchecking
			Chap. 8	Add ‘designed to meet’ to shock & vibration values; change Vx9 to VR9
			P 73	More precise wording of GPIO paragraph
			Chap. 7, p. 69	Note about termination of Graphics Controller signal lines
			Chap. 8	Add operating temperature table
			All	Spellchecking
				Insert battery removal & replacement info; change © to 2009; change company name to GEFIP
			p. 40,62,68/69	Remove mention of parallel port; insert correct publication no. on title page

Legal Information

Legal Disclaimers

© 2009 GE Fanuc Intelligent Platforms, Inc. All rights reserved.

The information in this manual is proprietary to and is the confidential information of GE Fanuc Intelligent Platforms, Inc. and may not be reproduced in whole or in part, for any purpose, in any form or by any means, electronic, mechanical, recording, or otherwise, without written consent of GE Fanuc Intelligent Platforms, Inc. Use, disclosure, and reproduction is permitted only under the terms of a GE Fanuc Intelligent Platforms license agreement or explicit written permission of GE Fanuc Intelligent Platforms. You are not authorized to use this document or its contents until you have read and agreed to the applicable license agreement. Receipt of this publication is considered acceptance of these conditions.

All information contained in this document has been carefully checked and is believed to be entirely reliable and consistent with the product that it describes. However, no responsibility is assumed for inaccuracies. GE Fanuc Intelligent Platforms assumes no liability due to the application or use of any product or circuit described herein; no liability is accepted concerning the use of GE Fanuc Intelligent Platforms products in life support systems. GE Fanuc Intelligent Platforms reserves the right to make changes to any product and product documentation in an effort to improve performance, reliability, or design.

THIS DOCUMENT AND ITS CONTENTS ARE PROVIDED AS IS, WITH NO WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF DESIGN, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR ARISING FROM ANY COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

Changes or modifications to this unit, not expressly approved by GE Fanuc Intelligent Platforms, could void the user's authority to operate the equipment.

All computer code and software contained in this document is licensed to be used only in connection with a GE Fanuc Intelligent Platforms hardware product. Even if this code or software is merged with any other code or software program, it remains subject to the terms and conditions of this license. If you copy, or merge, this code or software, you must reproduce and include all GE Fanuc Intelligent Platforms copyright notices and any other proprietary rights notices.

The content of this manual if furnished for informational use only and is subject to change without notice. Reverse engineering of any GE Fanuc Intelligent Platforms product is strictly prohibited.

In no event will GE Fanuc Intelligent Platforms be liable for any lost revenue or profits or other special, indirect, incidental and consequential damage, even if GE Fanuc Intelligent Platforms has been advised of the possibility of such damages, as a result of the usage of this document and the software that this

document describes. The entire liability of GE Fanuc Intelligent Platforms shall be limited to the amount paid by you for this document and its contents.

GE Fanuc Intelligent Platforms shall have no liability with respect to the infringement of copyrights, trade secrets, or any patents by this document of any part thereof. Please see the applicable software license agreement for full disclaimer or warranties and limitations of liability.

This disclaimer of warranty extends to GE Fanuc Intelligent Platforms' licensees, to licensees transfers, and to licensees customers or users and is in lieu of all warranties expressed, implied, or statutory, included implied warranties of scalability or fitness for a particular purpose.

GE Fanuc Intelligent Platforms and the GE Fanuc Intelligent Platforms logo are trademarks of GE Fanuc Intelligent Platforms, Inc. Other brand names and product names contained herein may be claimed as the property of others.

GE Fanuc Intelligent Platforms, Inc., 2500 Austin Drive, Charlottesville, VA 22911, U.S.A.

Regulatory compliance

Products sold or transferred between companies or operated on company premises (factory floor, laboratory) do not need CE, FCC or equivalent certification. Boards or subsystems which cannot provide a useful function on their own do not need certification.

Certification can only be granted to complete and operational systems. There are authorized testing agencies, regulatory organizations and laboratories who will issue certificates of compliance after system testing.

GE Fanuc Intelligent Platforms designs and tests all their products for EMI/EMC conformance. Where GE Fanuc Intelligent Platforms supplies a complete/functional system for use by end users a certificate will be cited in the manuals/documents which are provided with the products.

Products manufactured by GE Fanuc Intelligent Platforms should normally be suitable for use in properly designed and produced customer equipment (system boxes or operational systems) without any major redesign or additional filtering. However, the systems might not conform to specific regulations once assembled and used. The system integrator or installer must test for compliance as required in his country or by the intended application and certify this to the end user.

ESD/EMI issues

ESD (Electro-Static Discharge) and EMI (Electro-Magnetic Interference) issues may show up in complete and operational systems. There are many ways to avoid problems with these issues.

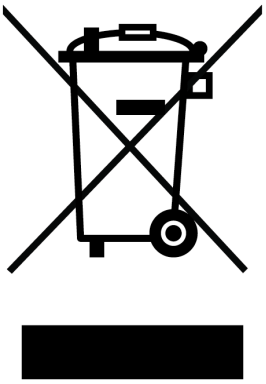
Any operational system with cables for I/O signals, connectivity or peripheral devices provides an entry point for ESD and EMI. If GE Fanuc Intelligent Platforms does not manufacture the complete system, including enclosure and cables, it is the responsibility of the system integrator and end user to protect

their system against potential problems. Filtering, optical isolation, ESD gaskets and other measures might be required at the physical point of entry (enclosure wall of box or rack). For example it is state-of-the-art that protection can not be done at the internal connector of an RTM if a cable is attached and routed outside the enclosure. It has to be done at the physical entry point as specified above.

Products manufactured by GE Fanuc Intelligent Platforms should normally be suitable for use in properly designed and produced customer equipment (system boxes or operational systems) without any major redesign. However, the systems might be subject to problems and issues once assembled, cabled and used. The end user, system integrator or installer must test for possible problems and in some cases show compliance to local regulations as required in his country or by the intended application.

Waste Disposal

The mark or symbol on any electrical or electronic product shows that this product may not be disposed off in a trash bin. Such goods have to be returned to the original vendor or to a properly authorized collection point.



Electric waste disposal symbol with black bar as explained below

The black bar underneath the waste bin symbol shows that the product was placed on the market after 13 August 2005. Alternatively the date of ‘placed on the market’ is shown in place of the bar symbol.

CE conformance declaration

CE certification is required in EU countries for equipment which is used or operated by the end user. Products sold or transferred between companies or operated on company premises (factory floor, laboratory) do not need CE certification.

CE certification can only be granted to complete and operational systems. Boards or subsystems which cannot provide a useful function on their own do not need CE certification.

GE Fanuc Intelligent Platforms designs and tests all their products for EMI/EMC conformance. Products manufactured by GE Fanuc Intelligent Platforms should normally be suitable for use in properly designed and produced customer equipment (system boxes or operational systems) without any major redesign or additional filtering. The system integrator or installer must, in any case, test for CE compliance and certify this to the end user.

Where GE Fanuc Intelligent Platforms supplies a complete/functional system for use by end users in EU countries a CE certificate will be cited in the manuals/documents which are provided with the products. The CE (and year of certification) symbol is shown on the equipment, typically on the type or S/N label or close to the power cable entry.

GE Fanuc Intelligent Platforms have tested their boards using their own card cages (chassis). Test results of these tests are available upon request.

Corporate addresses

Corporate headquarters

GE Fanuc Intelligent Platforms, Inc.
2500 Austin Drive
Charlottesville, VA 22911
U.S.A.

Phone: +1-800-322-3616
Fax: +1-
Email: gefanucsales@gefanuc.com

Regional headquarters

US	**EU**
Americas & Pacific Rim (Japan, Korea, China, Philippines, AUS, NZ)	Europe, Russia, Near East, India, Africa
GE Fanuc Intelligent Platforms, Inc. 2500 Austin Drive Charlottesville, VA 22911 U.S.A. Phone: +1-800-322-3616 Fax: +1- Email: gefanucsales@gefanuc.com	GE Fanuc Intelligent Platforms GmbH & Co. KG Memminger Str. 14 86159 Augsburg Germany Phone: +49-821-5034-0 Fax: +49-821-5034-119 E-Mail: aug-sales@gefanuc.com

GE Fanuc Intelligent Platforms on the Web:
http://www.gefanuc.com

For contact and other information (service, warranty, support etc.) see address list in chapter: ‘Support, Service’.

Intro

Welcome

The VR9, VP9 VME Single Board Computer is a fully IBM-AT compatible stand-alone PC equipped with numerous functions and add-on features on a minimal board foot print. This technical manual is designed to provide information regarding the general usage and application of the VR9, VP9 VME Single Board Computer. It also details the hardware and software methodologies. Programming information is also provided.

Chapter 1 gives a brief overview over the functions, features and devices of the VR9 and VP9.
Chapter 2 and 3 illustrate unpacking and installation procedures.
Chapter 4 contains important information for "Getting started"
Chapter 5 describes all onboard and panel interfaces with pin assignments.
Chapter 6 contains notes on system resources.
Chapter 7 describes the functional blocks.
Chapter 8 details electrical and environmental specifications.

A number of expansion and add-on products are available for the VR9 and VP9. The VTM21 transition module and the PMC interface are described in appendices to this manual.
Please observe all safety instructions when handling GE Fanuc Intelligent Platforms products as given in the unpacking and installation chapters.

The following document also covers items relevant to the VR9 and the VP9 VME Single Board Computer. It is also included under Technical Product Information on our Product CD-ROM.

- CR9, CT9, CP9, VR9, VP9 User's Manual for AMIBIOS8 Setup
- CR9, CT9, CP9, VR9, VP9 Board Specific Hardware Programmer´s Manual
- AMIBIOS8 Check Point and Beep Code List
- AMIBIOS8 Error Messages

Typographic Conventions

This manual uses the following notation conventions:

- Italics (sometimes additional in blue color) emphasize words in text or documentation or chapter titles or web addresses if underlined.
- Hexadecimal values (base 16) are represented as digits followed by "h", for example: 0C**h**.
- Hexadecimal values (base 16) are represented as digits preceded by "H", for example: **H**0C.
- Hexadecimal values (base 16) are represented as digits preceded by "$", for example: **$**0C.
- Binary values (base 2) are represented as digits followed by "b", for example 01**b**
- The use of a "#" (hash) suffix to a signal name indicates an active low signal. The signal is either true when it is at a logic zero level (voltage close to 0 V) or the signal initiates actions on a high-to-low transition.
- The use of a "\" (backslash) prefix to a signal name indicates an active low signal. The signal is either true when it is at a logic zero level (voltage close to 0 V) or the signal initiates actions on a high-to-low transition.
- Text in `Courier` font indicates a command entry or output from a GE Fanuc Intelligent Platforms embedded PC product using the built-in character set.
- Notes, warning symbols and cautions call attention to essential information.

Product Properties

Certification

The product or products described in this technical manual cannot be operated by themselves. They are components for integration into operational systems or add-ons to such systems. The products have been designed to meet relevant regulatory standards like FCC and CE. As mandated by these standards conformance to these standards can only be certified for complete operational systems. This has to be done by the end-user or by the systems integrator in their operational systems. GE Fanuc Intelligent Platforms have tested some products in their own systems. Upon request information is available which products have been tested and about the specific environment under which GE Fanuc Intelligent Platforms has tested these components.

Altitude

Altitude, air pressure and ambient temperature influence the thermal operation of the components described in this manual. They have been developed and tested at about 500 m (1650 ft.) above sea level at a typical ambient temperature of 20 °C (68 °F). Because of only marginal variations within a limited range of altitudes these products operate as specified within altitudes from sea level to 1000 m (3300 ft.). GE Fanuc Intelligent Platforms can assist the user of these components in planning operation outside this altitude range upon request.

Options

This manual describes the basic product plus all options. Your product may not have all options implemented. Please verify with your purchase contract which options are implemented. Descriptions of options which are not implemented obviously do not apply to your product.

Support, Service and Warranty

The manufacturer grants the original purchaser of GE Fanuc Intelligent Platforms products a warranty of 24 months from the date of delivery. For details regarding this warranty refer to Terms & Conditions of the initial sale.

Please see chapter “Support, Service, and Warranty Information” for further details on repairs and product support.

For support on the web and product information, visit our website at http://www.gefanuc.com

Contents

Legal Information 5
Legal Disclaimers 5
Regulatory compliance 6
ESD/EMI issues 6
Waste Disposal 7
CE conformance declaration 7

Corporate addresses 8

INTRO WELCOME 9

Product Properties 10

Support, Service and Warranty 11

INTRO CONTENTS 13

CHAPTER 1 INTRODUCTION 21

Board Design 22
Design Features 24

CHAPTER 2 UNPACKING AND INSPECTION 27

Delivery Volume 27

Available Options 28

ESD 28

Warning 29

Initial Inspection 29

Unpacking 29

Handling 30

CHAPTER 3 INSTALLATION 33

Installation preparation 33

General advice 33
Advice on VMEbus products 34
Advice on Batteries 34

Required items 34

Minimum System Requirements 35

Installation of a plug-in board 36

Installation of the Rear Transition Module (VTM21) 36

Initial Power-On Operation 37

Entering the BIOS SETUP 37

CHAPTER 4 GETTING STARTED 39

Power Supply 39

Status indicator, Postcode and Beeps 39

Booting 40

Setup 41

Unexpected Resets 41

CHAPTER 5 INTERFACES 43

Front Panel Interfaces 44

VR9 Connectors 44
VMEbus Connector P1 (P7301) 44
VMEbus Connector P2 (P7302) 45

VMEbus Connector P0 (P7300) with partial PMC-I/O 46
VMEbus Connector P0 (P7300), with full PMC-I/O 47
EIDE Connector (P1800) 48
Keyboard and PS/2 Mouse Interface (P2001) 49
Ethernet Interface (U5600 and U5650) 51
Serial Port COM1 (P2201) 52
VGA Interface (P4200) 54
USB Interfaces (P1680) 55
PMC1 Connectors (P6201, P6202, and P6203) 56
PMC2 Connectors (P7201, P7202) 57
PMC-I/O Connector (P6204 and P7204) 59

Transition Module 59

CHAPTER 6 RESOURCES 61

Memory Map 61

Register Set 61
Standard Register Set 62
Plug and Play Devices 63

Interrupts 63

APIC Controller 64

CHAPTER 7 FUNCTION BLOCKS 65

Processor 65

Memory Controller 65

DMA Controller 65

Interrupt Controller 66

Timer 66

Real Time Clock 67

Keyboard and Mouse Controller 67

EIDE Interface 67

Serial Interface 68

Graphics Controller 68
Software Installation 69

PMC Interface 69

Ethernet Interface 69
Software Installation 70

Additional devices 70
SMBus devices 70
Temperature Sensor LM83 71
Temperature Sensors LM75 71
Serial EEPROM 71
Power Management Event 71
Geographic Addressing 71
GPIO (0..7) 71
Watchdog, Powerfail Monitor 72
Programmable Timer 72
LED 72
Reset Button 72
Speaker 72

CHAPTER 8 SPECIFICATIONS 73

Power Consumption 73

Onboard Lithium Battery 75
Not powered by the system 75
Powered by the system 77
Battery removal and replacement 78

+5VSTDBY 78

Environment Conditions 79
Card edge temperatures for VR9 style 8 81

Electrical Characteristics 81
Supply voltage range 81
GPIO 0...7 82
Electrical clearance 82
Isolation 82

Board layout drawings 83

Placement Plan Component Side VR9 Version V2 84

Placement Plan Bottom Side VR9 Version V2 85

Placement Plan Component Side VR9 Version V3 86

Placement Plan Bottom Side VR9 Version V3 87

APPENDIX A TRANSITION MODULE VTM21 89

VTM21 Interfaces 91
VGA Interface (P4001) 94

DVI-I connector (P4100) 95

Placement Plan VTM21V0 102

APPENDIX B PCI MEZZANINE CARD (PMC) SOCKET 103

APPENDIX C SUPPORT, SERVICE 105

Repairs 107
Warranty Repairs 107
Non-Warranty Repairs 107
Procedure 107
Obtaining an RMA Number 108
Shipping the Product 108

Error Report Form 108

FIGURES

Figure 1: VR9 board 21
Figure 2: VR9 Block diagram 23
Figure 3: Board packaging 30
Figure 4: Handling the 6U VME board 31
Figure 5: 6U board insertion into VMEbus system box 36
Figure 6: VR9 board with PMC sockets 43
Figure 7: Front panel on single slot board 44
Figure 8: Front panel on dual slot board 44
Figure 9: EIDE connector 48
Figure 10: Keyboard/Mouse connector 50
Figure 11: MiniDIN connector 50
Figure 12: Ethernet connectors 51
Figure 13: Ethernet connector pin assignment 51
Figure 14: COM 1 53
Figure 15: VGA interface 54
Figure 16: USB 55
Figure 17: USB pin assignment 55
Figure 18: Battery current versus temperature 76
Figure 19: Battery current versus time 77
Figure 20: Battery removal 78
Figure 21: Air temperature vs. air speed 80
Figure 22: Component side of VR9, V2 84
Figure 23: Bottom side of VR9, V2 85
Figure 24: Component side of VR9, V3 86
Figure 25: Bottom side of VR9, V3 87
Figure 26: VTM21 Transmission Module 90
Figure 27: Ethernet connector pin assignment 92
Figure 28: DVI-I connector 95
Figure 29: MiniDIN connector 97
Figure 30: Placement plan VTM21, V0 102
Figure 31: Mounting of PMC module on VR9 104

TABLES

Table 1: Styles available 26
Table 2: BIOS ID coding 38
Table 3: Boot sequence 41
Table 4: VMEbus connector P1 45
Table 5: VMEbus connector P2 46
Table 6: VMEbus connector P0 with partial I/O 47
Table 7: VMEbus connector P0 with full I/O 48
Table 8: EIDE connector 49
Table 9: MiniDIN connector 51
Table 10: Ethernet 1/2 connectors 52
Table 11: LEDs on Ethernet connector 52
Table 12: COM 1/2 connector 53
Table 13: VGA interface 54
Table 14: USB pin assignment 56
Table 15:PMC1 connectors 57
Table 16: PMC2 connectors 58
Table 17: Memory map 61
Table 18: Standard register set 62
Table 19:Interrupt assignments 63
Table 20: Interval timer functions 67
Table 21: Software interfaces 70
Table 22: Additional devices 70
Table 23: BIOS power up status 72
Table 24: Power consumption CPU dependent 74
Table 25: Power consumption DRAM dependent 75
Table 26: Environment conditions 79
Table 27: Shock & vibration parameters 79
Table 28: Maximum height usage 80
Table 29: Card edge temperatures 81
Table 30: Supply voltages 81
Table 31: Supply voltage range 81
Table 32: GPIO IN signal levels 82
Table 33: GPIO OUT signal levels 82
Table 34: VTM21 EIDE connector 91
Table 35: VTM21 Ethernet connectors 92
Table 36: VTM21 LEDs 92
Table 37: VTM21 TMDS connector 93
Table 38: VTM21 COM1 94
Table 39: VTM21 COM2 94
Table 40: VTM21 VGA 95
Table 41: VTM21 DVI-I Digital 95
Table 42: VTM21 DVI-I Analog 96
Table 43: VTM21 USB0 96
Table 44: VTM21 USB1 96
Table 45: VTM21 MiniDIN 97
Table 46: VTM21 Miscellaneous Connector 98
Table 47: PMC I/O connectors 99
Table 48: PMC I/O header 100
Table 49: VTM21 Power connector 101
Table 50: Electrical characteristics 103

CHAPTER 1 Introduction

Chapter Scope

This chapter describes features, capabilities and compatibilities of the VR9 and VP9 VME Single Board Computer. Both boards are based on the same PCB. All further occurrences of the board's names will be referred to as the VR9. Any further specification in this document referring to VR9 can be applied to VR9 and VP9 unless otherwise noted.

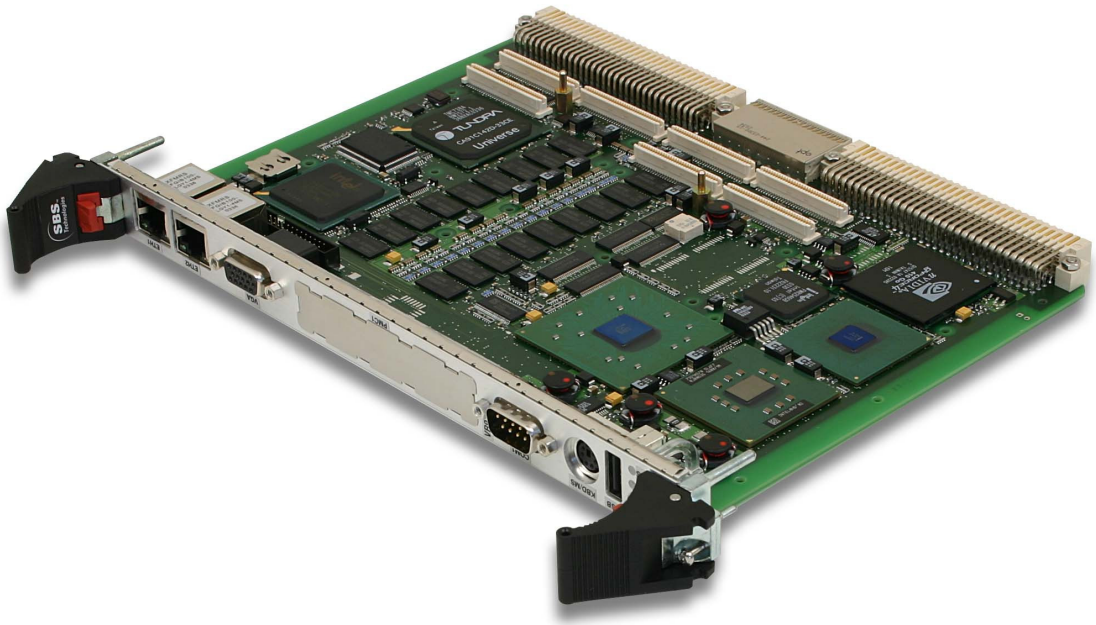


Figure 1: VR9 board

Board Design

The VR9 is a fully IBM-AT compatible stand-alone PC. It is equipped with many functions a conventional Personal Computer can only offer after the installation of several add-in cards. Extension boards can be connected via the VME interface. The minimal board size and the large number of I/Os and functions allow the VR9 to be used in many applications. See the following block diagram for the boards design.

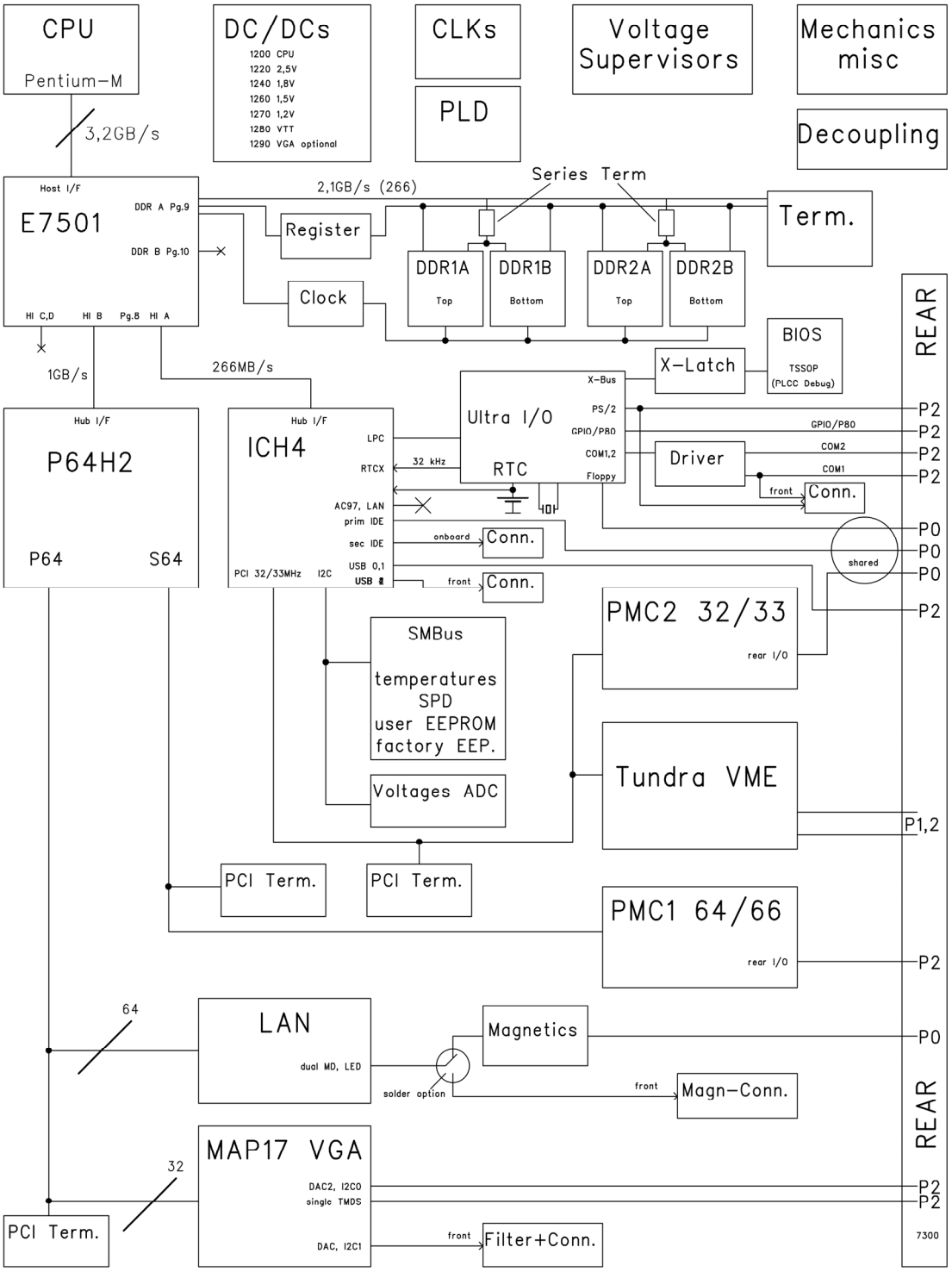


Figure 2: VR9 Block diagram

Design Features

The VR9 VME Single Board Computer features:

Microprocessor
Intel® Pentium® M processor 600 MHz to 1.8 GHz and higher
Intel® Celeron® M processor 1.3 GHz

Chipset
Intel E7501 with ICH4 and a P64H2 PCI bridge

DRAM
256 MB to 2 GB DDR 200 MHz with ECC

Flash BIOS
Easy updating, in-system programmable
AMI BIOS
LSI Logic SCSI BIOS
Intel Ethernet BOOT module

EEPROM (Serial)
512 Bytes or 64 Kbytes for user information.

CMOS RAM
242 byte non-volatile RAM
MC146818 compatible RTC with onboard Lithium battery.

Hard/Flash Disk
Onboard mountable 2,5" EIDE hard disk or FlashDrive.

Keyboard/Mouse
IBM PC/AT compatible keyboard controller with PS/2 style connector.

USB
One front (channel 4) and 2 rear (channel 0 & 1) USB 2.0 ports.

Watchdog
Watchdog implemented in ICH4 chipset and National PC87417 Super I/O

High Resolution Timer
User programmable timer, allows "Real Time Functions" implemented in chipset.

LCD/VGA
Version 2.x uses the NVIDIA® GeForce 420 Go (MAP17) series high performance graphics controller with integrated DDR DRAM 16 or 32 MByte.
Integrated 350 MHz Palette-DAC for analog VGA monitors up to 1600 x 1200
DVI-I interface (PanelLink®) for TFT displays up to 1024 x 768, single channel DVI (165 MHz)
Version 3.x (RoHS version) uses the ATI Mobility™ Radeon™ graphics controller with 128/256 bit 2D, 3D and multimedia graphics accelerator, 16

MB to 64 MB DDR memory, max. resolution 1600 x 1200 analog and 1024 x 768 DVI

Fast Ethernet
Two 10/100/1000BaseT high speed Ethernet channels either front or rear (PICMG 2.16) with Intel 82546GB Ethernet controller.

EIDE/ATAPI
UDMA 100 EIDE/ATAPI interface with two EIDE channels (secondary EIDE onboard and primary EIDE rear). Transfer rate with up to 100 MB/s, for two external devices and one onboard 2.5" hard/flash disk. Due to cable/connector limitations the secondary (onboard) EIDE/P-ATA interface is limited to UDMA 2 (33.3 MB/s) transfer speed.

Important note:
The primary EIDE signals are shared with some PMC2IO signals.
The primary EIDE is only available in the configuration with partly PMC-IO or without PMC2. In the configuration with partly PMC-IO PMC2IO31 to PMC2IO60, PMC2IO63 and PMC2IO64 are not available.
Make sure, that the PMC-IO pins on the PMC-module does not conflict with the EIDE-signals!

Serial I/O
National PC87417 Super I/O with two asynchronous 16550 compatible channels with 16 byte FIFO, Transfer rates up to 115.2 KBaud user selectable RS232/422/485 in BIOS setup.

PMC slots
PMC1 with 64 bit/66 MHz (3.3 V IO voltage signaling) and PMC2 with 32 bit/33 MHz (5 V IO voltage signaling) PCI mezzanine connector for standard PMC with front and rear IO. IO signals available at the rear connectors.
With PCB version V1 and higher the 64 bit PMC lot is PCI-X capable with 66/100/133 MHz

Important note:
Some PMC2IO signals are shared with the primary EIDE signals.
All PMC2IO signals are only available in the configuration with full PMC-IO.
In the partly PMC-IO configuration PMC2IO31 to PMC2IO60, PMC2IO63 and PMC2IO64 are not available.
Make sure, that the PMC-IO pins on the PMC-module does not conflict with the EIDE-signals!

VMEbus
PCI bus to VMEbus controller, up to 60 MByte/s transfer rates
FIFOs for write posting, DMA controller with linked list support
Master and Slave transfer modes:
BLT, ADOH, RMW, LOCK, RETRY
A32 / A24 / A16 and D64 (MBLT) / D32 / D16 / D8
Full VMEbus system controller

Temperature Sensors
This sensor measures the temperatures of the CPU-die in two onboard locations. The sensors are software readable in 1 °C increments from -55 °C to +125 °C.

Front panel I/O
2 x Ethernet, VGA, PMCIO, COM1, KB/MS, USB4, Reset, LED

Backpanel I/O
TMDS or VGA, LCD, EIDE (Master/Slave), COM1-2, USB0-1, 2x PMCIO, KB, MS, speaker, reset, ext. Battery, GPIO [0...7], 2x Ethernet.
Transition modules with 1:1 PC compatible connectors are available.

Power supply required
+5 V and +3.3 V board supply
+12 V PMC
-12 V optional, if needed on PMC

Note:
The VR9 boards shows a height violation which is to be checked if a PMC mezzanine module needs to be installed into the central area of the board (PMC1).

Approval
Designed to meet standard UL1950, CE class A, FCC-A

Styles available

Table 1: Styles available

VR9 (non-RoHS)	C	D	I	H	R	N
VR9 (RoHS)	1	2	3	4	6	8
Front panel	x	x	x	x	x	
Extended temp.			x	x	x	x
Parts soldered					x	x
Middle stiffener bar					x	x
Wedge locks						x
Conformal coating		x		x	x	x
Conduction cooling						x
Onboard battery	x	x	x	x		
Onboard speaker	x	x	x	x		

VP9 can only be ordered in C-, 1- or I-, 3-style.

CHAPTER 2 Unpacking and Inspection

Chapter Scope

This chapter covers the suggested inspection and preparation considerations and background information necessary prior to using the VR9. Unpacking, initial inspection, and first-time operation of the VR9 are covered. Following the procedures given in the chapter is recommended, since they will verify proper operation after shipping and before the product is integrated into your system.

Delivery Volume

Please check that the delivered package contains the following items:

Qty.	Item	Purpose
1	VR9 or VP9	VME Single Board Computer
1	CD-ROM	Technical Product Information with driver software and manuals in Adobe Acrobat (PDF) format:

The manual files are also available through the World Wide Web from our Web-Server:
http://www.gefanuc.com

Available Options

The following table lists accessories (options) which are available for the VR9:

Item	Purpose
ZKAAPS2SPLIT	Front panel Y-cable for keyboard and mouse
VTM21	Transition module, 4U x 4HE/HP
VGA2DVI	DVI to standard VGA converter

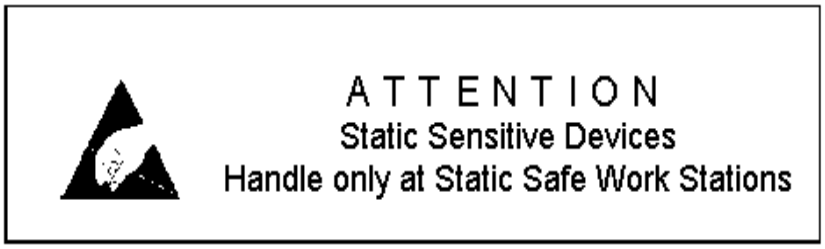
Please contact the GE Fanuc Intelligent Platforms sales department or your sales representative for latest information on options and accessories.

Accessories are subject to change without notice.

ESD

Electrostatic Discharge Notice

The discharge of static electricity, known as Electro Static Discharge or ESD, is a major cause of electronic component failure. The VR9 has been packed in a static-safe bag which protects the board from ESD while the board is in the bag. Before removing the VR9 or any other electronic product from its static-safe bag, be prepared to handle it in a static-safe environment.



You should wear a properly-functioning anti static strap and ensure you are fully grounded. Any surface upon which you place the unprotected VR9 should be static-safe, usually facilitated by the use of anti-static mats. From the time the board is removed from the anti-static bag until it is in the card cage and functioning properly, extreme care should be taken to avoid "zapping" the board with ESD. You should be aware that you could "zap" the board without you knowing it; a small discharge, imperceptible to the eye and touch, can often be enough to damage electronic components. Extra caution should be taken in cold and dry weather when static easily builds up.

Only after ensuring that both you and the surrounding area are protected from ESD, carefully remove the board or module from the shipping carton by grasping it by the front panel and the connectors. Place the board, in its antistatic bag, flat down on a suitable surface. You may then remove the board from the anti static bag by tearing the ESD warning labels.

Warning

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

Notes:
Drain static electricity before you install or remove any parts. Installing or removing modules without observing this precaution could result in damage to this and/or other modules in your system.

Initial Inspection

After unpacking the VR9, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact GE Fanuc Intelligent Platforms for additional instructions. Depending on the severity of the damage, it may necessary to return the product to the factory for repair**.**
DO NOT apply power to the board if it has visible damage.
Doing so may cause further, possibly irreparable damage, as well as introduce a fire or shock hazard.

Unpacking

Please read the manual carefully before unpacking the board or module or fitting the device into your system. Also adhere to the following:

- Please read this manual carefully before unpacking the module or fitting it into your system. This will certainly save time and avoid trouble.
- Observe all precautions for electrostatic sensitive modules
- If the product contains batteries, please do not place the board on conductive surfaces, antistatic plastic, or sponge, which can cause shocks and lead to battery or board trace damage.
- Please do not exceed the specified operational temperatures. Note that batteries and storage devices might also have temperature restrictions.
- Keep all original packaging material for future storage or warranty shipments of the board.

Although the VR9 is carefully packaged to protect it against the rigors of shipping, it is still possible that shipping damages can occur. Careful inspection of the shipping carton should reveal some information about how the package was handled by the shipping service. If evidence of damage or rough handling is found, you should notify the shipping service and GE Fanuc Intelligent Platforms as soon as possible.

Retain all packing material in case of future need.

Note
Before installing or removing any board, please ensure that the system power and external supplies have been turned off.

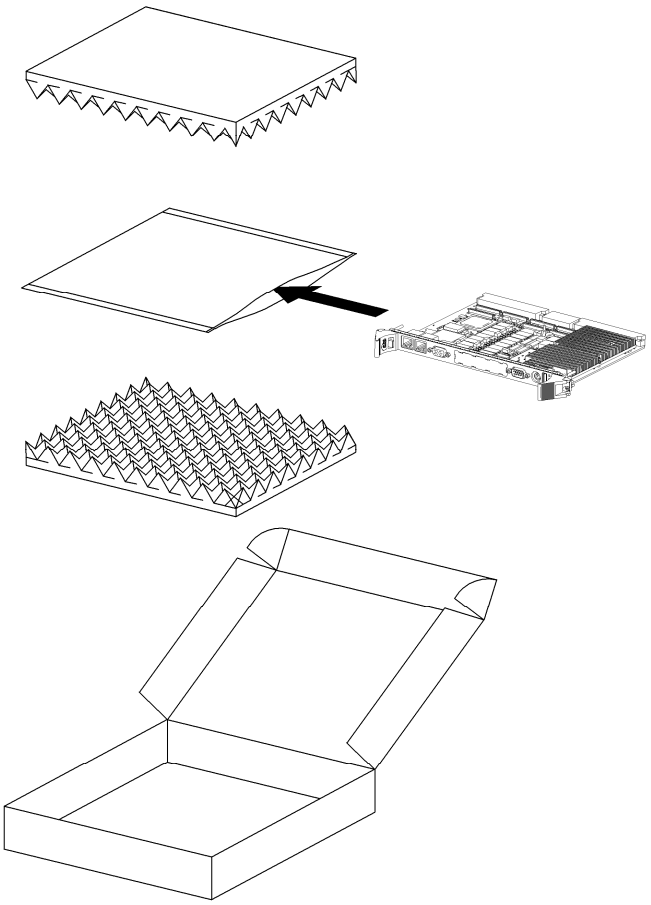


Figure 3: Board packaging

Handling

Proper handling of the board or module is critical to ensure proper operation and long-term reliability. When unpacking the board, and whenever handling it thereafter, be sure to hold the board by the front panel as shown. Do not hold the board by the circuit card edges, the heat sink, or the connectors.

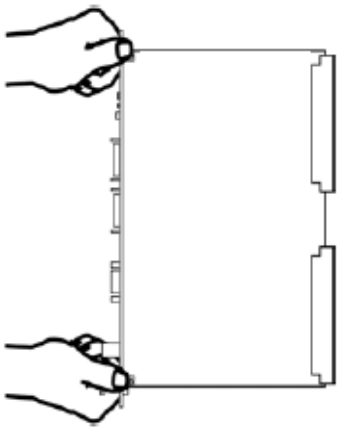


Figure 4: Handling the 6U VME board

CHAPTER 3 Installation

Chapter Scope

This chapter covers the installation of the VR9 VME Single Board Computer on a VME backplane and initial power-on operations.
For details please see application note AN-HW-028.

Installation preparation

Use the following steps to install your GE Fanuc Intelligent Platforms hardware.

- Before installing or removing any board, please ensure that the system power and external supplies have been turned off.
- Check that the jumpers and mezzanines are correctly configured for your application.
- Mount the board/mezzanine/transition module very carefully. See also additional advisories for VMEbus and CompactPCI products below.
- Connect all IO cables.
- Once you are certain that all modules are correctly fitted into the system and all connections have been made properly, restore the power.

General advice

Please observe all safety procedures to avoid damaging system and protect operators and users.

Before installing or removing any board, please ensure that the system power and external supplies have been turned off.

Check that jumpers and mezzanines are correctly configured for your application. Mount the board, mezzanine, or transition module very carefully. See also sections on additional advisories below.

Do not restore power until you are sure that all modules are fitted correctly and all connections have been made properly.

Advice on VMEbus products

On a standard VMEbus backplane, remove the jumpers on the IACKIN - IACKOUT interrupt daisy-chain (1 jumper) and on the BGxIN - BGxOUT busgrant daisy-chains (4 jumpers) for the slot where the board is to be mounted. The daisy-chain jumpers on the VMEbus backplane should be mounted on all free slots.

Setting jumpers is not necessary for the GE Fanuc Intelligent Platforms Auto-Daisy-Chain VMEbus backplane (order number: VBUSxxAD). Please read additional advisories within the manual.

A board with system controller functionality must be fitted into slot 1 (for GE Fanuc Intelligent Platforms products, see additional notes within the manual).

The backplane must supply +3.3 V and +5 V.

Because the board is available in several options the description in this chapter is related to the standard configuration.

Mount the CPU board carefully in the VME slot. Note that on some boards connectors are used for I/O purposes and should not be inserted into a VME backplane. A transition module must be used instead.

Advice on Batteries

There is danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by GE Fanuc Intelligent Platforms.
Dispose of used batteries according to instructions of GE Fanuc Intelligent Platforms and applicable local regulations.

Required items

The following items are required to start the board in a standard configuration:

Backplane and Power Supply

You will need a standard VME backplane wired into a regulated power supply capable of providing stable low noise +5 V and +3.3 V sources. Make sure that the supply is capable of meeting the total power requirements of the VR9. Please refer to chapter “Specifications” on page 73 for details.

Initially, you may plug the board into your 3U or 6U system slot of your CPCI or VMEbus system. Optionally, when used as an intelligent peripheral board, this board can also be used in a non-system slot. In case that the board is used in a non-system slot you have to have an additional CPU board in the system slot for providing system clock, arbiter function and more. Please make sure that you do not have the power supply turned ON when the board is plugged into your backplane.

Keyboard and Mouse

You should have a compatible keyboard for initial system operation. Depending on your application, this keyboard may be a standard keyboard, or one which utilizes membrane switches for harsh environments. The miniature DIN keyboard connector is located on the front panel and is directly compatible with existing compliant keyboards. If your keyboard has the normal IBM PC-type keyboard connector you will need to use a cable adapter. This cable adapter is not delivered by GE Fanuc Intelligent Platforms, but available off-the-shelf from other suppliers.

The connector is defined for both keyboard and mouse. GE Fanuc Intelligent Platforms delivers a split adapter cable for keyboard and mouse. This has to be ordered separately. Plug this adapter cable ZKAAPS2SPLIT (Y form) into the keyed PS2 connector on the front panel. Then plug the keyboard and mouse into the adapter. If the adapter is not used, only a keyboard can be connected.

Plugging and unplugging a PS/2 keyboard or mouse while power is applied is not recommended and can cause software failure or damage to the PS/2 device and/or on-board circuitry.

Video Monitor

Any VGA-compatible video monitor can be used initially for display output. The VR9 offers front side access to the video signal. Video is also available via the P2 VME connector. In order to get access to these pins it is necessary to use the transition module VTM21.

Minimum System Requirements

The VR9 has been thoroughly tested, and is nearly ready for usage in the target system. In order to verify VR9 operation for the first time, it is suggested that you only configure a minimal system. It is not necessary to have disk drives, a Flash disk or other accessories connected in order to perform the VR9 POWER-ON-SELF-TEST (POST).

THE POST TEST

Each time the computer boots up it must pass the POST (Power-On Self Test). The following is the procedure of the POST:

** The first step of POST is the testing of the Power Supply to ensure that it is turned on and that it releases its reset signal.
** CPU must exit the reset status mode and thereafter be able to execute instructions
** BIOS was readable
** BIOS checksum must be valid, meaning that it must be readable.
** CMOS is readable
** CMOS checksum must be valid, meaning that it must be readable
** CPU must be able to read all forms of memory such as the memory controller, memory bus, and memory module
** The first 64 KB of memory must be operational and have the capability to be read and written to and from, and capable of containing the POST code
** I/O bus / controller must be accessible

** I/O bus must be able to write / read from the video subsystem and be able to read all video RAM

If the computer does not pass any of the above tests, the board will receive an irregular POST. An irregular POST is a beep code which is different from the standard situation which can be either no beep at all or a combination of different beeps indicating what is causing the computer not to past the POST.

Beep codes can only be heard if the user has a speaker which is either on the board or connected to a transition module.

Because the boards are available in several configurations the description in this chapter is related to the standard configuration. See other sections of this document for standard and optional configurations and their influence on initial operation.

The VR9 is available in several options. This chapter is related to the standard configuration(s).

Installation of a plug-in board

Boards are installed in a CPCI or VMEbus chassis by carefully sliding them into the guide rails, inserting them all the way until the handles can be operated to seat and lock the board in place. Handles typically have a lock (snap lever) to unlock them when extracting a board. Older boards may have screws instead of handles to secure the board in place.

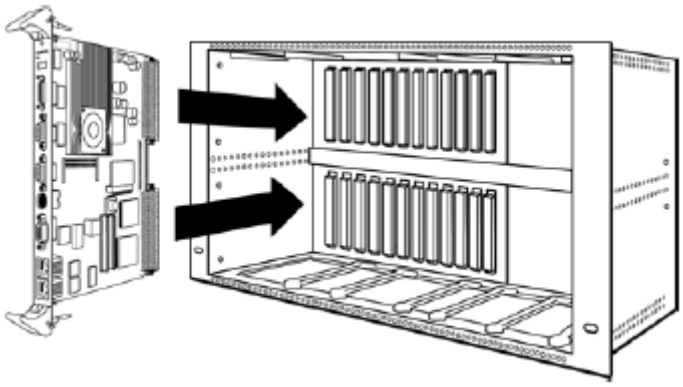


Figure 5: 6U board insertion into VMEbus system box

Installation of the Rear Transition Module (VTM21)

The VTM21 is a 6U x 80 mm rear I/O module which has to be plugged into the VR9 with the backplane between. This transition module has a DVI-I connector which needs an external adaptor to be fully compatible with the VGA standard connector and pin assignments.

Plug the monitor into this connector. Make sure that your selected chassis supports this type of rear I/O transition module.

After making sure that you have installed the VR9 properly into your VME backplane, apply power to your monitor and then the VME supply. When the board is completely reset, the processor should begin executing initial BIOS-resident routines.

Note: If the VR9 was ordered without video onboard, you can use an external video VME card or a video PMC module. Consult the technical descriptions of these boards for required voltage and power consumption in the system.

Please see the chapter “Interfaces” for details on onboard interfaces where the location of the VR9 interfaces are shown.

Initial Power-On Operation

After a few seconds, the VR9 system BIOS banner will display on the screen and the red LED on the front will switch to non-blinking green.

If you have seen all the on-screen messages to this point, you can be confident that the board is running properly and is ready to be installed and setup for your application.

Entering the BIOS SETUP

To enter SETUP during the initial power-on sequence, press the DELETE key during the boot up sequence. Also see the applicable on-screen messages.. It tells you when you can enter the BIOS by pressing the DELETE key. Press the DELETE key when the green LED goes from blinking to steady on.

Consult the 'User’s Manual for AMIBIOS8 Setup' for further information on how to change settings and configurations.

If the board does not perform as described above, some damage may have occurred in shipping or the board is not installed or setup properly. Contact GE Fanuc Intelligent Platforms technical support as described in chapter “Support, Service, and Warranty Information” for further instructions.

If the BIOS setup is wrong in the CMOS memory, please press the “0/INS” or the “INS” key during boot up. This clears the CMOS settings and stops the video output at an early stage. There you will see the BIOS ID line:

Example/coding of the ID line:

Table 2: BIOS ID coding

63 –	0102 –	004199 –	00101111 –	071595 –	Intel E7501 –	OQF90008–	Y2KC
processor, flash ROM size	major & minor BIOS revisions	supplier ID	BIOS features	AMIBIOS core copyright date	Chip set	project ID	year 2000 compliant

CHAPTER 4 Getting started

Chapter Scope

This chapter gives some useful tips when using a board from VR9 family the first time. It might be also useful to read this chapter carefully, when problems came up in using the VR9.

Power Supply

All boards of the VR9 family require up to 50 Watts from the power supply. For exact values please check the actual datasheet, but for rough data a current of up to 7 A at the 5 V rail and 12 A at the 3.3 V rail must be taken into consideration. The +12 V must only supply a few mA and is not very critical. If there are harddisc or PMC modules attached to the VR9, then their power consumption must also be calculated. Keep in mind, that standard power supplies often require minimum loads on every supply voltage for proper operation. It might be necessary to add a load to the +12 V to ensure correct voltage levels on 3.3 V and 5V.
If you ever see the board not starting well or doing resets at random states, please check the voltage of the three supply voltages at the backplane. When measuring there, you can use a standard digital multimeter and you have to attach it to the backplane at positions where no high current is flowing. So better use rear contacts of the bus connectors or unused power connectors to measure, because measuring the voltages at the used power connectors can result in wrong values, which are caused by the high current flowing.
The +12 V are less critical, but 5 V and 3.3 V should reach their nominal value when measuring with a multimeter. If the voltages are less than 5.0 V or 3.3 V, then short voltage drops while the CPU or memory gets into high activities may result in resetting the VR9 board.

Status indicator, Postcode and Beeps

The VR9 family has a dual color LED at the front panel for a quick status indicator usage. The possible colors are red, orange or green and the LED can blink in different frequencies or be on continuously.

While running its BIOS initialization all boards of the VR9 family write postcodes (POST = Power On Self Test) to port 80h at the PCI bus 0 (at

PMC2). These accesses can be monitored with appropriate equipment or a PMC post card.

- Currently some more debug support is integrated on the VR9 family, which beeps the postcode if the POST stops before the CRT is initialized. This POST beep support can be removed at a later development stage, if the required space within the onboard programmable logic is no longer available, so don't rely on this. The beeps are long for a '1' and short for a '0'. They start with the highest bit 7 and beep 8 represents the lowest bit 0. After some seconds the beep sequence is repeated for an easier recognition. If the beep code is not repeated, then this beeps are issued within the BIOS execution to show some other failures (i.e. fails in memory detection or if no VGA is detected). For more information please check the AMIBIOS8 Check Point and Beep Code List as well as the AMIBIOS8 Error Messages.

Booting

When switching-on the VR9 following steps are done by hardware:

- On the VR9 family, all voltages at the backplane are observed until they reach a first trip point which is 2.5 V at the 5 V/3.3 V rails and 9.5 V at the +12 V rail. After this the onboard voltages are controlled raised up to the external supplied value
- The continuous red Status LED shows that all circuitry is in reset
- All onboard DC/DC converters are ramped up
- If all onboard supply voltages are at their correct values, the powergood status is acknowledged to all onboard devices and the red LED is switched off
- Especially when the battery is removed, this can take a few seconds to start the 32 kHz Oscillator.
- After this the CPU start reading it first instructions from BIOS. Very soon the red LED is programmed to a red blinking state and the first postcode is issued
- If the CPU does not start correctly, the red LED keeps off until the hardware watchdog will issue a further reset 1.6 seconds later. You can see this at the red LED, which is on again for a short moment. This sequence continues until the CPU starts correctly.

For reference the complete BIOS boot sequence is shown with the current BIOS version. This version is a rather early one and hopefully some of the long periods will speed up. The times depend mainly on the memory size and they are measured with 1 GB and quick boot enabled. Some of the postcodes are 16bit. All postcodes are shown in hex.

Table 3: Boot sequence

Time after releasing PCI reset	POSTCODE	Status LED	Comment
1 us	D0	Red 1Hz blinking	
726 ms	AC	Orange 1Hz blinking	All memory is initialized
3.9 s *1	D4		
8.4 s	D6		
12.2 s	D7		
12.3 s	03	Green 1 Hz blinking	Keyboard enabled *2
12.7 s	4013	Green 2 Hz blinking	
15.2 s	202A		Video Bios is started *3
16.9 s	3C	Green 3 Hz blinking	
17.2 s	78		Starting external BIOS *4
17.2 s	8C	Green 4 Hz blinking	
17.3 s	00	Green steady on	Try booting from mass storage

*1 from here add 2.9 seconds for 2 GByte of memory
*2 now is the right point to press DEL if you want to go to BIOS SETUP
*3 CRT and/or panel are now initialized and show the startup screen. Depending on the monitor/display type it may need some additional seconds until you can see something on the screen
*4 external BIOS from add on cards i.e. SCSI

Setup

When you want to enter the BIOS Setup, you have to press the keyboard 'DEL' key at the right moment. Especially when using a slow starting monitor it might be too late to wait for the CRT to show the message 'Press DEL to enter Setup'. Better look for the LED and press 'DEL' as soon as the LED goes from orange to green blinking. When you are using add on cards with external BIOS, you can hit the DEL key while their BIOS runs.

When you miss the right moment to press the DEL key, please use the reset button on the front panel to restart the power up sequence or switch off the power supply for a few seconds and restart it. With the current BIOS pressing the Ctrl-Alt-Del key combination at this boot-moment will result in switching to the next bootable device and try to boot from this. This feature cannot be disabled within Setup.

Unexpected Resets

Whenever the VR9 unexpectedly issues a reset and starts booting again, you may want to know the reset source. For this reason a set of special registers is implemented onboard. Every reset source set there a special bit and can be read in the next boot up. The register description can be found in the 'Board Specific Hardware Programmer's Manual'.

CHAPTER 5 Interfaces

Chapter Scope

This chapter describes the interfaces of the VR9 VME Single Board Computer located top side on the board and on the front panel. Each section on a particular interface includes a graphics illustration of the connector and a pin assignment table as well as notes on certain signal line characteristics, if necessary.

For information on the interface of expansion and transition modules, please refer to the appropriate chapters in the appendices of this manual.

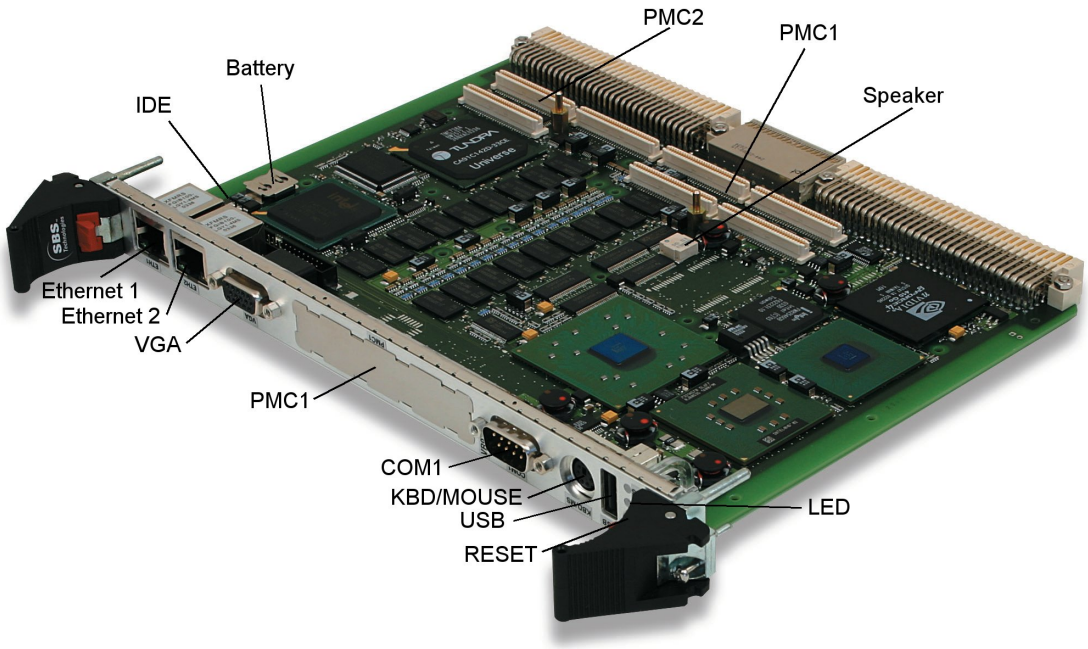


Figure 6: VR9 board with PMC sockets

Front Panel Interfaces

Refer to the drawing for the location of interfaces on the front panel of the VR9 single slot board:

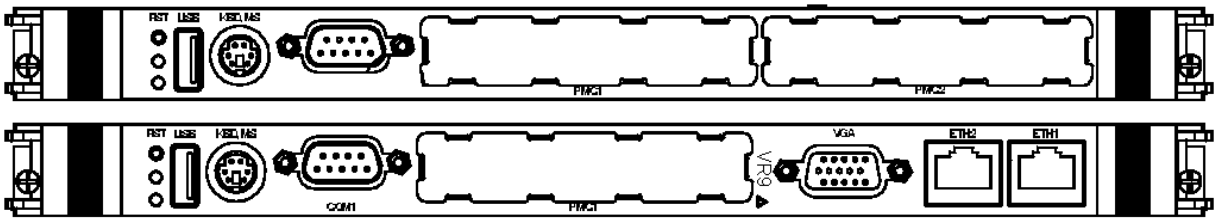


Figure 7: Front panel on single slot board

Refer to the drawing for the location of interfaces on the front panel of the VP9 dual slot board:

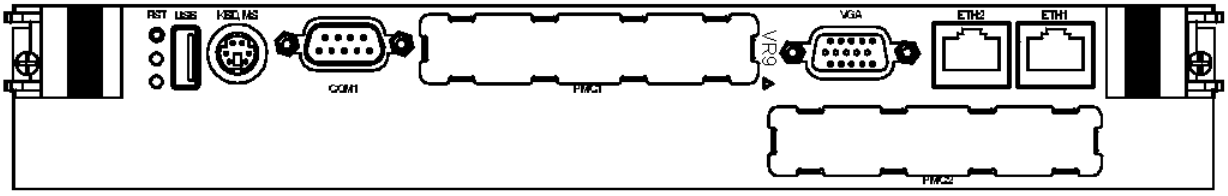


Figure 8: Front panel on dual slot board

VR9 Connectors

VMEbus Connector P1 (P7301)

The following table lists the pin assignments of connector P1. The connector is compatible to the P1 connector of the VMEbus specification ANSI/IEEE STD 1014-1987 and IEC 821 and 297.

Table 4: VMEbus connector P1

	z	a	b	c	d
1	Reserved	D00	BBSY*	D08	+5 V
2	GND	D01	BCLR*	D09	GND
3	reserved	D02	ACFAIL*	D10	reserved
4	GND	D03	BG0IN*	D11	reserved
5	reserved	D04	BG0OUT*	D12	reserved
6	GND	D05	BG1IN*	D13	reserved
7	reserved	D06	BG1OUT*	D14	reserved
8	GND	D07	BG2IN*	D15	reserved
9	reserved	GND	BG2OUT*	GND	GAP*
10	GND	SYSCLK	BG3IN*	SYSFAIL*	GA0*
11	reserved	GND	BG3OUT*	BERR*	GA1*
12	GND	DS1*	BR0*	SYSRESET*	+3.3 V
13	reserved	DS0*	BR1*	LWORD*	GA2*
14	GND	WRITE*	BR2*	AM5	+3.3 V
15	reserved	GND	BR3*	A23	GA3*
16	GND	DTACK*	AM0	A22	+3.3 V
17	reserved	GND	AM1	A21	GA4*
18	GND	AS*	AM2	A20	+3.3 V
19	reserved	GND	AM3	A19	reserved
20	GND	IACK*	GND	A18	+3.3 V
21	reserved	IACKIN*	N.C.	A17	reserved
22	GND	IACKOUT*	N.C.	A16	+3.3 V
23	reserved	AM4	GND	A15	reserved
24	GND	A07	IRQ7*	A14	+3.3 V
25	reserved	A06	IRQ6*	A13	reserved
26	GND	A05	IRQ5*	A12	+3.3 V
27	reserved	A04	IRQ4*	A11	reserved
28	GND	A03	IRQ3*	A10	+3.3 V
29	reserved	A02	IRQ2*	A09	reserved
30	GND	A01	IRQ1*	A08	+3.3 V
31	reserved	-12 V	+5 V STDBY	+12 V	GND
32	GND	+5 V	+5 V	+5 V	+5 V

VMEbus Connector P2 (P7302)

The following table lists the pin assignments of connector P2. Row b of the connector is compatible to connector P2 of the VMEbus specification ANSI/IEEE STD 1014-1987 and IEC 821 and 297.
Rows a and c are compliant to the VMEbus specification, ANSI/VITA 35-2000 chapter 2.3 ´Mapping of Single PMC-P4 to VME-P2-Rows-A,C´.

Table 5: VMEbus connector P2

	z	a	b	c	d
1	USB1+	PMC1IO02	+5 V	PMC1IO01	TXC+ / GPIO0
2	GND	PMC1IO04	GND	PMC1IO03	TXC- / GPIO1
3	USB1-	PMC1IO06	RESERVED	PMC1IO05	TX0+ / GPIO2
4	GND	PMC1IO08	VMEA24	PMC1IO07	TX0- / GPIO3
5	USB0+	PMC1IO10	VMEA25	PMC1IO09	TX1+ / GPIO4
6	GND	PMC1IO12	VMEA26	PMC1IO11	TX1- / GPIO5
7	USB0-	PMC1IO14	VMEA27	PMC1IO13	TX2+ / GPIO6
8	GND	PMC1IO16	VMEA28	PMC1IO15	TX2- / GPIO7
9	N.C.	PMC1IO18	VMEA29	PMC1IO17	HOTPLG
10	GND	PMC1IO20	VMEA30	PMC1IO19	\RST_BUT
11	\USB_OC	PMC1IO22	VMEA31	PMC1IO21	\SPEAKER
12	GND	PMC1IO24	GND	PMC1IO23	KCLK
13	\STAT_LED	PMC1IO26	+5 V	PMC1IO25	KDATA
14	GND	PMC1IO28	VMED16	PMC1IO27	MCLK
15	\DEB_LED	PMC1IO30	VMED17	PMC1IO29	MDATA
16	GND	PMC1IO32	VMED18	PMC1IO31	C1_DSR
17	C1_DCD	PMC1IO34	VMED19	PMC1IO33	C1_RXD
18	GND	PMC1IO36	VMED20	PMC1IO35	C1_RTS
19	SCL	PMC1IO38	VMED21	PMC1IO37	C1_TXD
20	GND	PMC1IO40	VMED22	PMC1IO39	C1_CTS
21	SDA	PMC1IO42	VMED23	PMC1IO41	C1_DTR
22	GND	PMC1IO44	GND	PMC1IO43	C1_RI
23	VGA_HSYN	PMC1IO46	VMED24	PMC1IO45	C2_DCD
24	GND	PMC1IO48	VMED25	PMC1IO47	C2_DSR
25	VGA_VSYN	PMC1IO50	VMED26	PMC1IO49	C2_RXD
26	GND	PMC1IO52	VMED27	PMC1IO51	C2_RTS
27	VGA_BLUE	PMC1IO54	VMED28	PMC1IO53	C2_TXD
28	GND	PMC1IO56	VMED29	PMC1IO55	C2_CTS
29	VGA_GREN	PMC1IO58	VMED30	PMC1IO57	C2_DTR
30	GND	PMC1IO60	VMED31	PMC1IO59	C2_RI
31	VGA_RED	PMC1IO62	GND	PMC1IO61	GND
32	GND	PMC1IO64	+5 V	PMC1IO63	+5 V

USB signals	USB..	VGA	VGA_...
COM	C1_..., C2_...	TMDS	TX…

VMEbus Connector P0 (P7300) with partial PMC-I/O

Note:
The LAN pin assignment is compliant to the VITA 31.1 specification "Gigabit Ethernet on VME64x Backplanes".

Table 6: VMEbus connector P0 with partial I/O

	a	b	c	d	e	f
1	GND	GND	GND	GND	GND	GND
2	LPA_DA+	LPA_DA-	GND	LPA_DC+	LPA_DC-	GND
3	LPA_DB+	LPA_DB-	GND	LPA_DD+	LPA_DD-	GND
4	LPB_DA+	LPB_DA-	GND	LPB_DC+	LPB_DC-	GND
5	LPB_DB+	LPB_DB-	GND	LPB_DD+	LPB_DD-	GND
6	\M1ACT	\M2ACT	+3.3V	\M1LINK	\M2LINK	GND
7	PMC2IO05	PMC2IO04	PMC2IO03	PMC2IO02	PMC2IO01	GND
8	PMC2IO10	PMC2IO09	PMC2IO08	PMC2IO07	PMC2IO06	GND
9	PMC2IO15	PMC2IO14	PMC2IO13	PMC2IO12	PMC2IO11	GND
10	PMC2IO20	PMC2IO19	PMC2IO18	PMC2IO17	PMC2IO16	GND
11	PMC2IO25	PMC2IO24	PMC2IO23	PMC2IO22	PMC2IO21	GND
12	PMC2IO30	PMC2IO29	PMC2IO28	PMC2IO27	PMC2IO26	GND
13	PHD06	PHD08	PHD07	PMC2IO32	\ PHD_RST	GND
14	PHD11	PHD04	PHD10	PHD05	PHD09	GND
15	PHD01	PHD13	PHD02	PHD12	PHD03	GND
16	PMC2IO50	PMC2IO49	PHD15	PHD00	PHD14	GND
17	\PHD_DACK	\PHD_IORDY	\PHD_IOR	\PHD_IOW	PHD_DRQ	GND
18	PHD_A2	PHD_A0	PHD_ATA	PHD_A1	IRQ14	GND
19	N.C.	\PHD_CS1	\PHD_CS0	PMC2IO62	PMC2IO61	GND

Signal groups:

EIDE Hard disk signals: PHD_... and \PHD_....
Gigabit Ethernet LPA_… and LPB_…

Important note:
In the partly PMC-IO configuration PMC2IO31 to PMC2IO60, PMC2IO63 and PMC2IO64 are not available.
Make sure, that the PMC-IO pins don't conflict with the EIDE-signals!

VMEbus Connector P0 (P7300), with full PMC-I/O

Note:
The LAN pin assignment is compliant to the VITA 31.1 specification "Gigabit Ethernet on VME64x Backplanes".

Table 7: VMEbus connector P0 with full I/O

	a	b	c	d	e	f
1	GND	GND	GND	GND	GND	GND
2	LPA_DA+	LPA_DA-	GND	LPA_DC+	LPA_DC-	GND
3	LPA_DB+	LPA_DB-	GND	LPA_DD+	LPA_DD-	GND
4	LPB_DA+	LPB_DA-	GND	LPB_DC+	LPB_DC-	GND
5	LPB_DB+	LPB_DB-	GND	LPB_DD+	LPB_DD-	GND
6	\M1ACT	\M2ACT	+3.3 V	\M1LINK	\M2LINK	GND
7	PMC2IO05	PMC2IO04	PMC2IO03	PMC2IO02	PMC2IO01	GND
8	PMC2IO10	PMC2IO09	PMC2IO08	PMC2IO07	PMC2IO06	GND
9	PMC2IO15	PMC2IO14	PMC2IO13	PMC2IO12	PMC2IO11	GND
10	PMC2IO20	PMC2IO19	PMC2IO18	PMC2IO17	PMC2IO16	GND
11	PMC2IO25	PMC2IO24	PMC2IO23	PMC2IO22	PMC2IO21	GND
12	PMC2IO30	PMC2IO29	PMC2IO28	PMC2IO27	PMC2IO26	GND
13	PMC2IO35	PMC2IO34	PMC2IO33	PMC2IO32	PMC2IO31	GND
14	PMC2IO40	PMC2IO39	PMC2IO38	PMC2IO37	PMC2IO36	GND
15	PMC2IO45	PMC2IO44	PMC2IO43	PMC2IO42	PMC2IO41	GND
16	PMC2IO50	PMC2IO49	PMC2IO48	PMC2IO47	PMC2IO46	GND
17	PMC2IO55	PMC2IO54	PMC2IO53	PMC2IO52	PMC2IO51	GND
18	PMC2IO60	PMC2IO59	PMC2IO58	PMC2IO57	PMC2IO56	GND
19	N.C.	PMC2IO64	PMC2IO63	PMC2IO62	PMC2IO61	GND

Signal groups:

PMC I/O signals: PM2CIO_...
Gigabit Ethernet LPA_… and LPB_…

EIDE Connector (P1800)

The EIDE interface is designed as a 44-pin 2 mm pitch male onboard connector P1800 to fit directly to a 2,5-inch EIDE hard drive or flash disk. P1800 is the secondary EIDE interface of the onboard EIDE controller.

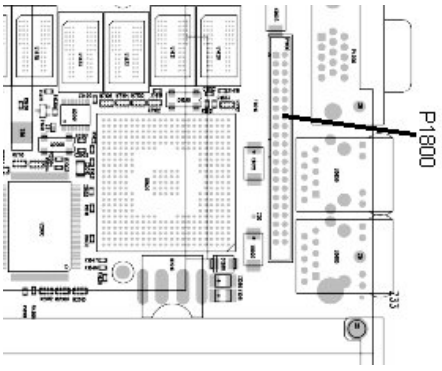


Figure 9: EIDE connector

Table 8: EIDE connector

Name	P1800		Name
GND	2	1	\HD_RST
HD_D8	4	3	HD_D7
HD_D9	6	5	HD_D6
HD_D10	8	7	HD_D5
HD_D11	10	9	HD_D4
HD_D12	12	11	HD_D3
HD_D13	14	13	HD_D2
HD_D14	16	15	HD_D1
HD_D15	18	17	HD_D0
NC	20	19	GND
GND	22	21	HD_DRQ0
GND	24	23	\HD_IOW
GND	26	25	\HD_IOR
NC	28	27	HD_RDY
GND	30	29	\HD_DAK
NC	32	31	HD_IRQ
DIAG	34	33	HD_A1
HD_A2	36	35	HD_A0
\HD_CS1	38	37	\HD_CS0
GND	40	39	DASP
+5V	42	41	+5V
NC	44	43	GND

Keyboard and PS/2 Mouse Interface (P2001)

The VR9 allows the easy adaptation of a keyboard to a standard 6-pin MINIDIN connector. Also a PS/2 mouse can be connected directly or via an external cable splitter.

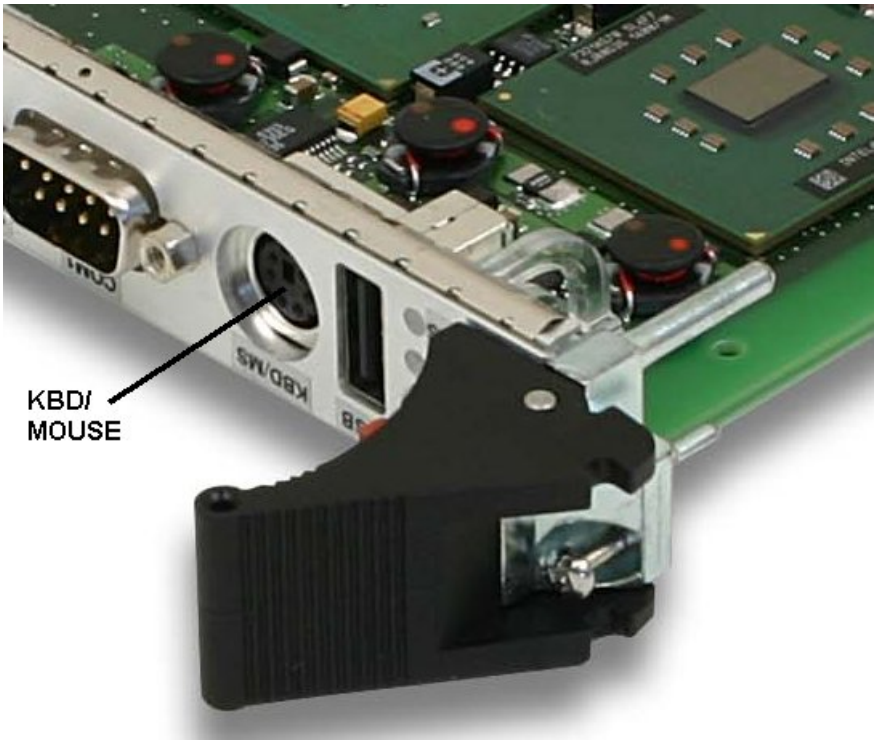


Figure 10: Keyboard/Mouse connector

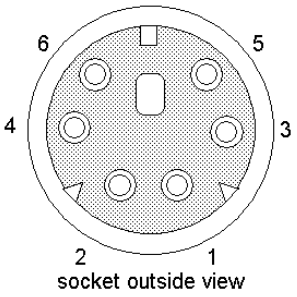


Figure 11: MiniDIN connector

Table 9: MiniDIN connector

Name	P2001
Keyboard Data	1
Mouse Data	2
GND	3
Fused +5V(1	4
Keyboard clock	5
Mouse clock	6

(1 the Fused +5 V pin is fused with a 2 A fuse. For normal operation don't exceed 100 mA current. The used fuse does automatically recover if the over current is resolved.

Ethernet Interface (U5600 and U5650)

The Ethernet output front or rear can be selected when ordering the product.

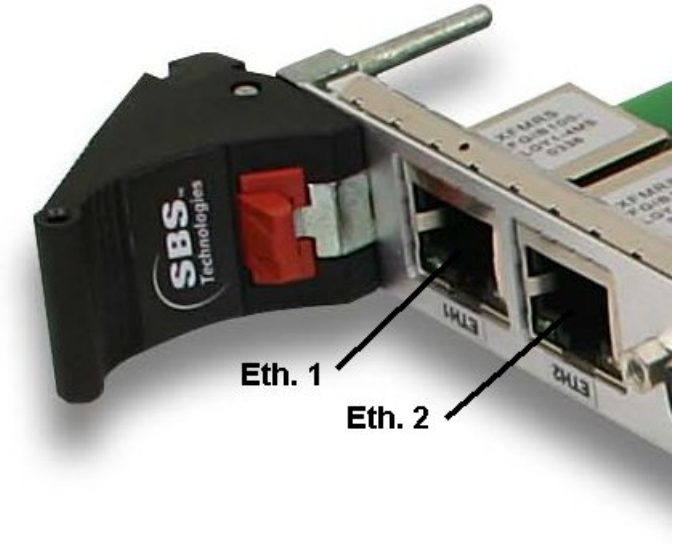


Figure 12: Ethernet connectors

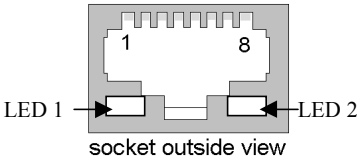


Figure 13: Ethernet connector pin assignment

Table 10: Ethernet 1/2 connectors

Name 10/100base	Name 1000base	Ethernet1, 2
TxD+	LP_DA+	1
TxD-	LP_DA-	2
RxD+	LP_DB+	3
NC	LP_DC+	4
NC	LP_DC-	5
RxD-	LP_DB-	6
NC	LP_DD+	7
NC	LP_DD-	8

Two LED's (LED1-green and LED2-yellow) are integrated in each of the RJ45 connector. These LED's indicates the link status of the interface.

Table 11: LEDs on Ethernet connector

LED1 green	Function
On	Link
Off	No link
LED2 yellow	Function
On, blink	TX/RX activity
Off	No activity

Serial Port COM1 (P2201)

The VR9 offers two RS232 serial ports. All COM ports are accessible via the transition module; additionally COM1 is accessible via the front panel connector

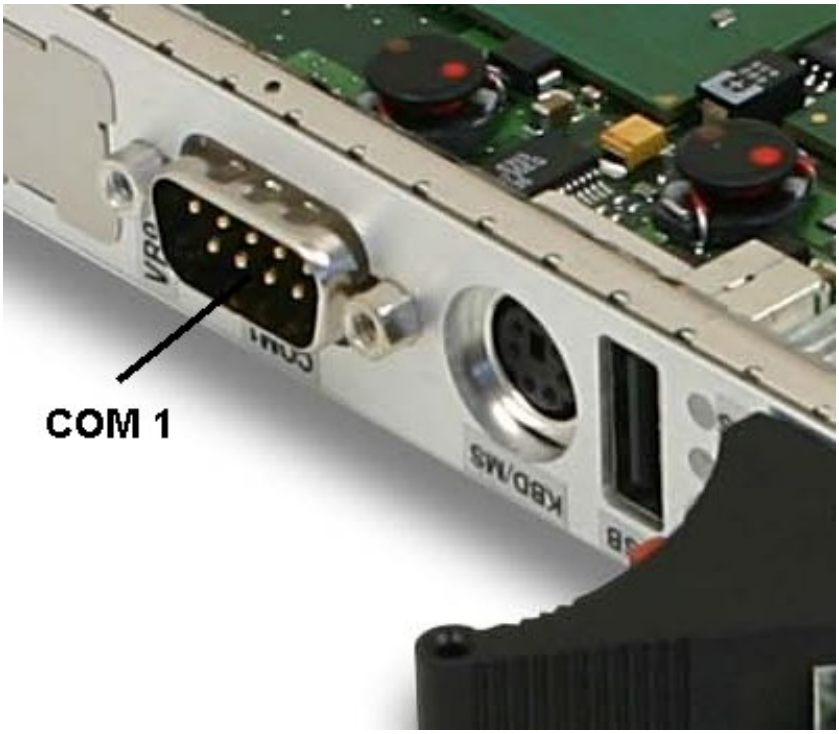


Figure 14: COM 1

COM 1/2 are setup selectable for RS-232 or RS-422/485 operation within the Bios Setup. The RS485 output drivers can be enabled or disabled with the DTR signal. An active DTR means the drivers to be enabled. When using the RS422 setting the output drivers are always enabled and the DTR signal is not used.

Table 12: COM 1/2 connector

Name RS232	Name RS422/485	P2201
DCD	TXD-	1
DSR	TXD+	6
RXD	RTS-	2
RTS	RTS+	7
TXD	CTS+	3
CTS	CTS-	8
DTR	RXD+	4
RI	RXD-	9
GND	GND	5

VGA Interface (P4200)

The monitor signals are available at the front panel on a standard 15-pin female D-Sub connector.

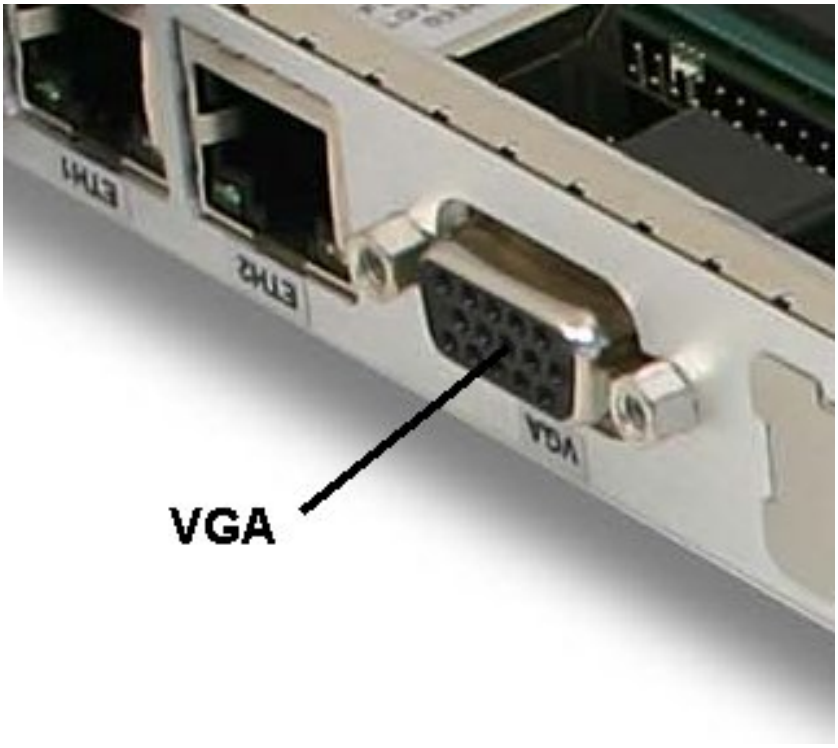


Figure 15: VGA interface

Table 13: VGA interface

Name	P4200
RED	1
GREEN	2
BLUE	3
HSYNC	13
VSYNC	14
DDC-Data	12
DDC-Clock	15
Fused +5 V [a]	9
GND	5, 6, 7, 8, 10
NC	4, 11

[a] the +5 V pin has a 2 A fuse. For normal operation don't exceed 100 mA current. The used fuse does automatically recover if the over current is resolved.

USB Interfaces (P1680)

One USB channel is available at the front panel and two USB channels are available on rear IO.

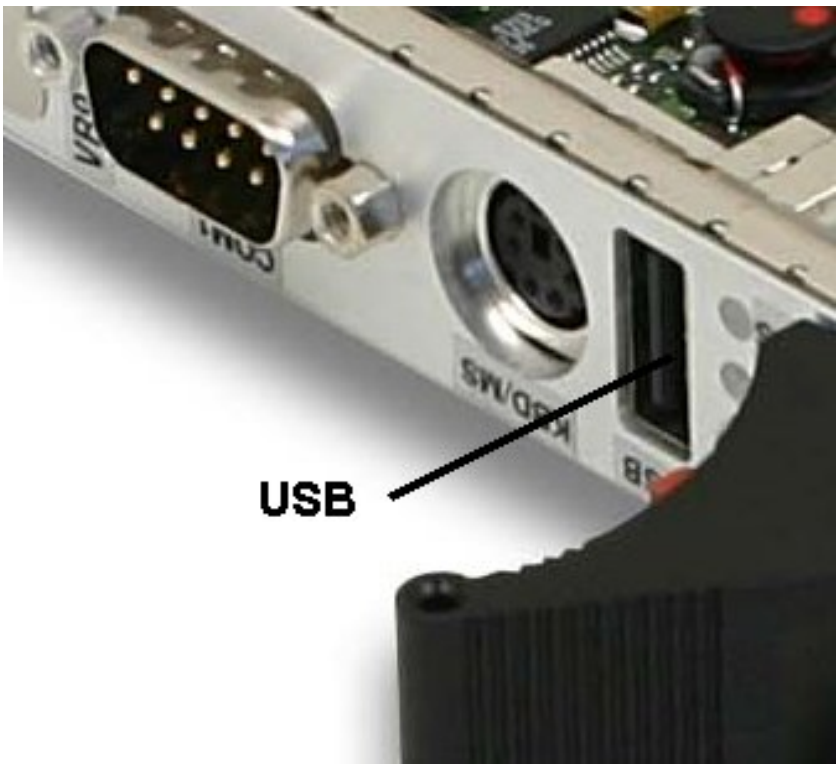


Figure 16: USB

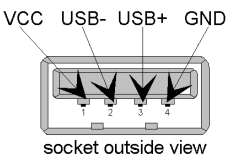


Figure 17: USB pin assignment

Table 14: USB pin assignment

Name	P1680
USB_VCC(1	1
USB4-	2
USB4+	3
GND	4

(1 the USB_VCC pin has a 2 A fuse. For normal operation don't exceed 100 mA current. The used fuse does automatically recover if the over current is resolved.

PMC1 Connectors (P6201, P6202, and P6203)

The following table lists the pin assignments of the onboard PMC1 connector. The PMC1 slot is 64 bit and 66 MHz capable and works with the internal second PCI bus of the P64H2 PCI Bridge. If an installed PMC card operates at 33 MHz only the PCI bus speed is reduced to 33 MHz. With PCB version V1 and higher the 64 bit PMC lot is PCI-X capable with 66/100/133 MHz. The PMC is electrically and mechanically compliant to the specification IEEE 1386 and 1386.1 with enhancements of the Processor PMC Standard VITA 32-2003. Check for possible height incompatibility in the 'Features' and 'Specifications' sections of this manual. These enhancements provide pins for a second device; (IDSELB and REQB/GNTB) but they do not support a monarch PMC card.
The PCI signaling voltage is fixed to 3.3 V. Nevertheless PMC cards with 3.3 V or 5 V supply voltage can be used on this PMC slot.

Table 15:PMC1 connectors

P6201	P6202	P6203	Pin	Pin	P6201	P6202	P6203
NC	+12 V	Reserved	01	02	-12 V	NC	GND
GND	NC	GND	03	04	PCIIRQ4#	NC	C/BE7
PCIIRQ5#	NC	C/BE6	05	06	PCIIRQ6#	GND	C/BE5
PRESENT#	GND	C/BE4	07	08	+5 V	Reserved	GND
PCIIRQ7#	Reserved	V(I/O)	09	10	Reserved	Reserved	PAR64
GND	PUP [a]	AD63	11	12	NC	+3.3 V	AD62
PCICLK	PCIRST#	AD61	13	14	GND	PDN [a]	GND
GND	+3.3V	GND	15	16	GNT0#	PDN [a]	AD60
REQ0#	PME#	AD59	17	18	+5 V	GND	AD58
V(I/O)	AD30	AD57	19	20	AD31	AD29	GND
AD28	GND	V(I/O)	21	22	AD27	AD26	AD56
AD25	AD24	AD55	23	24	GND	+3.3V	AD54
GND	AD29 (IDSEL)	AD53	25	26	C/BE3#	AD23	GND
AD22	+3.3 V	GND	27	28	AD21	AD20	AD52
AD19	AD18	AD51	29	30	+5 V	GND	AD50
V(I/O)	AD16	AD49	31	32	AD17	C/BE2#	GND
FRAME#	GND	GND	33	34	GND	AD30 (IDSELB)	AD48
GND	TRDY#	AD47	35	36	IRDY#	+3.3 V	AD46
DEVSEL#	GND	AD45	37	38	+5 V	STOP#	GND
GND	PERR#	V(I/O)	39	40	LOCK#	GND	AD44
Reserved	+3.3 V	AD43	41	42	RES.	SERR#	AD42
PAR	C/BE1#	AD41	43	44	GND	GND	GND
V(I/O)	AD14	GND	45	46	AD15	AD13	AD40
AD12	M66EN	AD39	47	48	AD11	AD10	AD38
AD9	AD8	AD37	49	50	+5V	+3.3 V	GND
GND	AD7	GND	51	52	C/BE0#	REQB#	AD36
AD6	+3.3 V	AD35	53	54	AD5	GNTB#	AD34
AD4	Reserved	AD33	55	56	GND	GND	GND
V(I/O)	NC	V(I/O)	57	58	AD3	EREADY	AD32
AD2	GND	Reserved	59	60	AD1	RSTOUT#	Reserved
AD0	ACK64#	Reserved	61	62	+5 V	+3.3 V	GND
GND	GND	GND	63	64	REQ64#	NC	Reserved

[a] Weak 10kΩ pull-down (PDN) to GND and pull-up (PUP) to VIO.

NC	Not connected
Reserved.	Reserved. Do not connect anything
V(I/O)	I/O Voltage, connected with +3.3V
+12V/-12V	Only available if connected at the VME backplane.

PMC2 Connectors (P7201, P7202)

PMC2 is available on a VR9 only without the front Ethernet and/or front VGA connector. On a VP9, the PMC2 is available in the second slot

The following table lists the pin assignments of the PMC2 connector. The PMC slot is 32 bit and 33 MHz capable and works with the internal primary PCI bus of the I/O Controller Hub. The PMC is electrically and mechanically compliant to the specification IEEE 1386 and 1386.1 with enhancements of the Processor PMC Standard VITA 32-2003. Check for possible height incompatibility in the ‘Features’ and ‘Specifications’ sections of this manual. The enhancements provide pins for a second device; (IDSELB and REQB/GNTB) but do not support a monarch PMC card. PCI signaling

voltage is fixed at 5 V for this PMC2. Nevertheless PMC cards with 3.3 V or 5 V supply voltage can be used on this PMC slot.

Table 16: PMC2 connectors

P7201	P7202	Pin	Pin	P7201	P7202
NC	+12 V	01	02	-12 V	NC
GND	NC	03	04	PCIIRQG#	NC
PCIIRQH#	NC	05	06	PCIIRQE#	GND
NC	GND	07	08	+5 V	Reserved
PCIIRQF#	Reserved	09	10	Reserved	Reserved
GND	PUP [a]	11	12	NC	+3.3 V
PCICLK	PCIRST#	13	14	GND	PDN [a]
GND	+3.3 V	15	16	GNT1#	PDN [a]
REQ1#	PME#	17	18	+5 V	GND
V(I/O)	AD30	19	20	AD31	AD29
AD28	GND	21	22	AD27	AD26
AD25	AD24	23	24	GND	+3.3 V
GND	AD30 (IDSEL)	25	26	C/BE3#	AD23
AD22	+3.3 V	27	28	AD21	AD20
AD19	AD18	29	30	+5 V	GND
V(I/O)	AD16	31	32	AD17	C/BE2#
FRAME#	GND	33	34	GND	AD31 (IDSELB)
GND	TRDY#	35	36	IRDY#	+3.3 V
DEVSEL#	GND	37	38	+5 V	STOP#
GND	PERR#	39	40	LOCK#	GND
Reserved	+3.3 V	41	42	RES.	SERR#
PAR	C/BE1#	43	44	GND	GND
V(I/O)	AD14	45	46	AD15	AD13
AD12	GND	47	48	AD11	AD10
AD9	AD8	49	50	+5 V	+3.3V
GND	AD7	51	52	C/BE0#	REQB#
AD6	+3.3 V	53	54	AD5	GNTB#
AD4	Reserved	55	56	GND	GND
V(I/O)	NC	57	58	AD3	NC
AD2	GND	59	60	AD1	RESETOUT#
AD0	PUP [a]	61	62	+5 V	+3.3 V
GND	GND	63	64	PUP [a]	NC

[a] Weak 10kΩ pull-down (PDN) to GND and pull-up (PUP) to VIO.



NC	Not connected
Reserved	Reserved. Do not connect anything
V(I/O)	I/O Voltage, connected with +5V
-12V	Only available if connected at the CPCI backplane.

PMC-I/O Connector (P6204 and P7204)

Pin 1 of the I/O connector is PMCxIO_01. Pin 2 is PMCxIO_02 and so on. The x denotes PMC1 or PMC2 respectively. All traces which are not connected to any onboard signal are not paired or length-adjusted to the backplane connectors.

Important note:
In the partly PMC-IO configuration PMC2IO31 to PMC2IO60, PMC2IO63 and PMC2IO64 are not available. Make sure, that the PMC-IO pins don't conflict with the EIDE-signals!

Transition Module

Please refer to the appendix A for interface location and connector pin assignments for the optional extension boards and transition modules.

CHAPTER 6 Resources

Chapter Scope

This chapter describes system resources, such as memory mapping, register set and default interrupt request assignments.

Memory Map

The table below shows the memory address area used by the VR9.

Table 17: Memory map

Address	Size	Used by
$00000 - $9FFFF	640 Kbytes	System RAM
$A0000 - $BFFFF	128 Kbytes	Video RAM (if enabled)
$C0000 - $DFFFF	128 Kbytes	Used by PCI ROMs: VGA, SCSI, Ethernet
$E0000 - $FFFFF	128 Kbytes	System BIOS
$100000 - $3FFFFFFF	depends on available DRAM	Extended RAM
$4000000 - $FFFBFFFF	depends on available DRAM	Dynamically used by PCI devices
$FFFC0000 - $FFFFFFFF	256 Kbytes	System BIOS

Register Set

The following section provides an overview of the registers located in the I/O address area of the VR9.

Note:
The address location of the PCI devices such as SCSI or Ethernet are not described in the following tables because the system BIOS automatically configures (PnP, Plug and Play) each PCI device to avoid address conflicts. Many device drivers show the actual address locations after installation and loading.

Standard Register Set

The standard register set is equal to all standard PC/AT systems. The table below provides an overview of the address ranges occupied by these registers.

Table 18: Standard register set

I/O Address Range (Hex)	Function
0x00h – 0x0Fh	DMA Controller 1
0x20h – 0x21h	Interrupt Controller 1
0x40h – 0x43h	Counter / Timer
0x60h	Keyboard Controller
0x61h	NMI Status and Control
0x64h	Keyboard Controller
0x70h – 0x71h	RTC, NMI Mask
0x80h – 0x8Fh	DMA Page register
0xA0h – 0xA1h	Interrupt Controller 2
0xB2h – 0xB3h	Power Management
0xC0h – 0xDEh	DMA Controller 2
0xF0h – 0xF1h	Coprocessor
0x160h – 0x16Fh	Reserved [b]
0x170h – 0x177h	Secondary EIDE
0x1F0h – 0x1F7h	Primary EIDE
0x2E8h – 0x2Efh	COM port [a]
0x2F8h - 0x2FFh	COM port [a]
0x3E8h – 0x3Efh	COM port [a]
0x3F2h – 0x3F7h	Floppy
0x3F8h – 0x3FFh	COM1 port [a]

a. Via setup four address ranges can be defined for four the serial interfaces.

b. Used for onboard programmable options. They are not intended to be used from normal users. For more explanation please check the ‘Board Specific Hardware Programmer’s Manual’.

Plug and Play Devices

See ´Board Specific Hardware Programmer's Manual´.

Interrupts

The interrupt routing for standard components such as COM1/2 is in compliance with standard PC/AT systems. Unused interrupts can be used for add-on cards or other board specific PCI devices such as SCSI and Ethernet.

Table 19:Interrupt assignments

Hardware IRQ	IRQ Source
INTC1	
IRQ00	System Timer
IRQ01	Keyboard
IRQ02	Cascade from INTC2
IRQ03	COM2 / COM1 [a]
IRQ04	COM1 / COM2 [a]
IRQ05	LPT1 [a] / PnP/PCI [b]
IRQ06	Floppy Disk Controller
IRQ07	LPT1 [a] / PnP/PCI [b]
INTC2	
IRQ08	Real Time Clock
IRQ09	Power Management Contr./PCI [b]
IRQ10	PnP/PCI [b]
IRQ11	PnP/PCI [b]
IRQ12	PS/2 Mouse [c]
IRQ13	Numeric Coprocessor
IRQ14	External EIDE [d]
IRQ15	Onboard EIDE [e]
NMI	Parity Error, ECC Error, System Error

[a]. This interrupt is available when no Interrupt Service Routine is installed.
[b]. Interrupts are available for Plug and Play PCI devices
[c]. This interrupt is available when PS/2 mouse is not connected.
[d]. This interrupt is available when the primary EIDE is disabled in SETUP.
[e]. This interrupt is available when the secondary EIDE is disabled in SETUP.

APIC Controller

The VR9 supports also the Interrupt handlings with APIC (Advanced Interrupt Controller). This handling of the APIC interrupt services must be supported by the operating system. The I/O APIC handles interrupts very differently than the 8259. Briefly, these differences are:

- **Method of Interrupt Transmission.** The I/O APIC transmits interrupts through a three wire bus, and interrupts are handled without the need for the processor to run an interrupt acknowledge cycle.
- **Interrupt Priority.** The priority of interrupts in the I/O APIC is independent of the interrupt number. For example, interrupt 10 may be given a higher priority than interrupt 3.
- **More Interrupts.** The I/O APIC in the Intel ICH4 supports a total of 24 interrupts.

For complete operation description please refer to the “Intel ICH4 I/O Controller Hub” datasheet.

CHAPTER 7 Function Blocks

Chapter Scope

This section gives a brief overview of the VR9 VME Single Board Computer onboard devices software interfaces.

Processor

The Intel Pentium M processor family provides high performance with low power and features Enhanced Intel SpeedStep® technology which provides the ability to dynamically adjust the power and performance of the processor based on CPU demand. This results in optimal performance without compromising the power performance of the VR9.
The processor die is thermally protected by two thermal monitor features. When reaching a maximum safe operating temperature the Thermal Control Circuit in the processor activates a throttling feature and reduces the voltage and frequency dynamically. If this feature is active the VR9 will indicate it with short clicks at the speaker. In case of a catastrophic die overheating (above 125 °C) the VR9 switches off the processor core voltage. Recovery from this catastrophic event can be done with a power off-on cycle only.

Memory Controller

The memory controller in the VR9 supports double data rate synchronous DRAM (DDR SDRAM) with a data bus width of 64 bits + ECC. One, two or four banks are provided by the VR9 with a size of either 256 MByte or 512 MByte. This results in a minimum memory size of 256 MByte and a maximum size of 2 GByte.

DMA Controller

In standard AT compatible PCs, as well as on the VR9, the two DMA controllers integrated on the board are internally cascaded. Both controllers are compatible with the Intel 8237A. The DMA Controller 1 (DMAC1) is used for byte-wide transfers while the DMAC2 is used for word-wide transfers.

Interrupt Controller

The Interrupt controller on a standard PC consists of two 82C59A devices with eight interrupt request lines each. The two controllers are cascaded so that 14 external and two internal interrupt sources are available. The master interrupt controller provides IRQ [7...1]; the slave interrupt controller provides IRQ [15...8]. IRQ2 is used to cascade the two controllers, IRQ0 is used as a system timer interrupt and is tied to interval timer 1, counter 0. The remaining 14 interrupt lines are mapped to various onboard devices. Each 82C59A provides several internal registers. The interrupts on the IRQ input lines are handled by two registers, the interrupt request register IRR and the in-service register ISR. For programming details see the 82C59A data sheet. The VR9 support also the Interrupt handling of the APIC (Advanced Interrupt Controller). This handling of the APIC interrupt services must be supported by the operating system. The I/O APIC handles interrupts very differently than the 8259.

Timer

VME Single Board Computers like the VR9 are equipped with an 8254 compatible timer. This timer contains three counters. Each counter output provides a key system function. Counter 0 is connected to interrupt controller input IRQ0 and provides a system timer interrupt for time-of-day, floppy disk timeout and other system timing functions. Counter 1 generates a refresh request signal and Counter 2 generates the sound for the speaker.

The following table gives an overview over the 8254 functions.

Table 20: Interval timer functions

Interval Timer Functions	
Function	Counter 0 (System Timer)
Gate	Always on
Clock In	1.193 MHz (OSC/12)
Out	IRQ0 (INT1)
Function	Counter 1 (Refresh Request)
Gate	Always on
Clock In	1.193 MHz (OSC/12)
Out	Refresh Request
Function	Counter 2 (Speaker Tone)
Gate	Programmable via Port $061
Clock In	1.193 MHz (OSC/12)
Out	Speaker

The counter/timers are programmed by I/O accesses. A single control word register controls the operation of all three counters. For more information on programming and a detailed register description see the 8254 data sheet.

Real Time Clock

The RTC is a low-power clock that provides a time-of day clock and a 100-year calendar with alarm features and battery backed operation. The time-of-day function includes 14 control registers. Other features include maskable interrupt sources and 242 bytes of general purpose CMOS RAM used by system BIOS. Valid RAM data and time can be maintained after power down through the use of an external battery source. The RTC is software compatible to the Dallas DS1287 and the Motorola MC146818.

Keyboard and Mouse Controller

The communication between the PC and the keyboard is managed by a device compatible to the Intel 8042 microcontroller, which also provides the PS/2 mouse interface.

EIDE Interface

The VR9 offers two independent EIDE/ATAPI interfaces. Both devices are logically connected to the primary PCI bus. Therefore a higher data transfer rate is achievable. Due to cable/connector limitations the secondary (onboard) EIDE/P-ATA interface is limited to UDMA 2 (33.3 MB/s) transfer speed.
The signals of the primary EIDE interface are available at the backpanel IO

connector only. The signals of the primary EIDE interface are used for connection of a 2,5" HDD or Flash disk via connector P1800 on board. The VR9 System BIOS automatically detects a connected EIDE HDD or flash disk and enters the corresponding drive parameters into the BIOS setup. This feature allows faster and easier handling of varying types of EIDE hard disks. At the primary EIDE interface two hard disks can be connected. In this case one HDD must be configured as master and the other one as slave. Read the hard disk manual to find out where these jumpers are located on your drive. The optional 2,5" onboard disk is connected to an onboard EIDE connector (secondary EIDE interface).

Using EIDE and SCSI devices: MS-DOS 6.22 can handle up to seven hard disks at a time. The VR9 products allow the simultaneous use of EIDE and SCSI hard disks. BIOS setup allows the re-ordering of the drives to boot from either SCSI or EIDE drives.

Please note:
For correct operation of the EIDE interface, a maximum cable length of 12 inches (30 cm) must not be exceeded. For use with fast transfer rates such as UDMA 66 and higher a high density 80-pin cable must be used. The use of round wired cables is not recommended.

Serial Interface

The VR9's serial ports are fully compatible with the NS16450 and NS16550. This means that each serial interface provides a 16 byte FIFO and therefore offers a higher performance than earlier used standard serial interfaces. The UARTs have programmable baud rate generators capable of 50 to 115200 baud. There are four address locations defined for serial interfaces on standard PCs. The two serial interfaces are I/O mapped and can occupy four address ranges.

Graphics Controller

The NVIDIA ® Graphics Controller used in versions 2.x is a GeForce4 410/420 Go and has the following features:

- Highly integrated Flat Panel and CRT GUI
- Max. pixel clock 350 MHz
- Dual Independent Display for CRT front and CRT/Flat Panel rear
- CRT resolution up to 1600x1200, DVI up to 1024x768

Note:
Termination resistors of the RGB lines are on the VR9 board for both front and rear interfaces.

At higher resolutions the cable and connectors have great influence on picture quality. Use very good quality cables and connectors or reduce resolution to get a stable display of good quality. This is especially important for the highest resolution of 1600 x 1200.

The Graphic Controller ATI Mobility™ Radeon™ used in versions 3.x has the following features:

- Highly integrated Flat Panel and CRT GUI

- Max. pixel clock 400 MHz
- Dual Independent Display for CRT front and CRT/Flat Panel rear
- CRT resolution up to 1600x1200, DVI up to 1024x768

Note:
Termination resistors of the RGB lines are on the VR9 board for both front and rear interfaces.

At higher resolutions the cable and connectors have great influence on picture quality. Use very good quality cables and connectors or reduce resolution to get a stable display of good quality. This is especially important for the highest resolution of 1600 x 1200.

Software Installation

Since the NVIDIA graphics chips are used on a large number of computers, many operating systems like OS/2, Windows®, 98, NT, 2000 and Windows XP already include high resolution drivers. . The Technical Product Information CD-ROM supplied with the VR9 includes the most commonly used software drivers and utilities.

PMC Interface

The PCI Mezzanine Card (PMC) Interface is an additional slot for parallel mounted expander or option cards. Please see chapter “PCI Mezzanine Card (PMC)” on page 103 of this manual for further details. The VR9 PMC connector interface is described in chapter 5 'Interfaces'.

Ethernet Interface

The Ethernet controller 82546GB from Intel used with the VR9 is a high performance dual Gigabit Ethernet 10/100/1000 Mbit PCI controller. Both channels are available on the VR9. Front or rear Ethernet can be selected when ordering. For registration and identification of a workstation in a LAN, a unique ID number is required. Each network card is assigned a unique ID number which resides in an Ethernet address ROM on the VR9.
An Ethernet boot option can be enabled in BIOS setup.

Software Installation

The drivers available for the Ethernet controller 82546GB support a large number of operating systems. The table shows operating systems supported by the available software:

Table 21: Software interfaces

Type	System
ODI	DOS, VxWorks
NDIS	DOS, Linux
NDIS	Windows NT 4.0, 98, 2000, XP

The Technical Product Information CD-ROM supplied with the VR9 includes the most commonly used software drivers and utilities.

Additional devices

SMBus devices

The VR9 uses a serial 2-wire I^2C bus to communicate with several onboard devices:

Table 22: Additional devices

Device	Designation	SMBus address a
Clock synthesizer *	U1100	1101 001Xb
User Serial EEPROM (24C04)	U1980	1010 00XXb
Optional big User EEPROM	U1983	1010 010Xb
SPD EEPROM Bank 0 *	U1981	1010 100Xb
SPD EEPROM Bank 1 *	U1981	1010 101Xb
Factory EEPROM *	U1984	1010 11XXb
Temperature sensor LM83	U1982	0011 001Xb
Temperature sensor LM75-1	U1985	1001 110Xb
Temperature sensor LM75-2	U1986	1001 111Xb
Analog Digital Converter	U1953	1001 000Xb
Northbridge E7501	U1300	0011 000Xb
Southbridge ICH4 (slave)	U1600	1000 100Xb
PCI Bridge P64H2 *	U6000	11Y0 YYYXb

Devices marked * are handled by BIOS. It is strongly recommended not to access these devices via the user software.
An X at bit 0 represents the R/#W bit.

Temperature Sensor LM83

A Maxim LM83 temperature sensor is implemented on the VR9 board. The sensor is located close to the CPU and shows the die-temperature of the CPU and the local onboard temperature. The sensor has an over-temperature output integrated and this can be used to take actions like reducing the CPU speed. For programming information please see the 'Board Specific Hardware Programmer's Manual´.

More information on LM83 can be found in the data sheet from National Semiconductors.

Temperature Sensors LM75

Two LM75 temperature sensors from National Semiconductors are implemented on the VR9 board. The first sensor shows the average between the air temperature below the heatsink and the PCB temperature in the CPU area. With the second LM75 the air temperature across the graphics controller and the Ethernet controller can be read. This reading is also influenced by the PCB temperature is measured below the heatsink.

Serial EEPROM

For storage of user data a serial EEPROM is implemented on the VR9 board. The user EEPROM is a 24C512 type with 64 kBytes. More information about writing and reading the contents can be found in the data sheets from the manufacturer (e.g. Microchip Technology, SGS Thomson, Atmel, Catalyst and many others).

Power Management Event

A Power Management Event can be initiated on VR9 by the following event.

Event	Description
Wake on IO	Wake VR9 by IO-device i.e. Modem, KB, MS, etc.

Geographic Addressing

If the backplane supports geographic addressing, the VR9 can detect the unique address in a VME System with the GA [4...0] pins on the P7301.
For programming information please see the 'Board Specific Hardware Programmer's Manual'.

GPIO (0..7)

Eight GPIO-Pins are available on the P7302. These pins can be used for I/O functions with output 3.3 V signals as well as 5 V tolerant inputs. They can be used only when the TMDS is not installed. GPIO and TMDS are mutually exclusive ordering options. For more information please see the 'Board Specific Hardware Programmer's Manual.

Watchdog, Powerfail Monitor

In order to secure application software, the VR9 offers a software controlled hardware two-stage counter with independent count values for each stage. First stage generates an INT or SMI. The second stage issuing a reset signal if its time-out interval expires. The configurable granularity reaches from 1us to 10min. For more information please see the Intel ICH4 I/O Controller Hub datasheet and the 'Board Specific Hardware Programmer's Manual'.

Programmable Timer

An additional programmable Timer is implemented on the VR9. The timer can generate an Interrupt. For more information please see the "Board Specific Hardware Programmer's Manual'.

LED

The Status LED is a green/red bi-color for BIOS power-up status indication. After boot-loading, the user software is free to use this LED for its own purpose.

Table 23: BIOS power up status

Status	LED color
Power-up, still Reset state	Red on
BIOS early init	Blink red 1Hz
BIOS start POST	Blink amber 1Hz
BBIOS POSTA init	Blink green 1 Hz up to 4 Hz
OS boot	Green on
System halted or reset	Red on

Reset Button

There is a Reset Button onboard. An external Reset button may be connected between the appropriate IO connector at the back side and GND

Speaker

An internal buzzer is implemented on the VR9 except on a VR9 N-, 8-Style. An external standard PC compatible speaker may be connected between the appropriate IO connector at the rear side and +5 V.

CHAPTER 8 Specifications

PCB

FR4 Multilayer

Size

Total board size: 6U, 4 HP (VR9)
Total size with optional extension board 8HP (VP9)

Dimensions

PCB: 233,35 mm x 178 mm x 20 mm (VR9 single Slot)
PCB: 233,35 mm x 178 mm x 40 mm (VP9 dual Slot)

Mechanical Incompatibility

There is an incompatibility in terms of component height on the VR9 boards close to the P0 connector (VMEbus). **The Ethernet transformer is slightly higher than the height envelope of the respective specification allows.** This is to be checked when planning to insert a PMC mezzanine module in the center of a 6U board (PMC1). If no PMC is inserted into this mezzanine slot then there is no mechanical height violation.

Weight

Approx. 650 g (with front panel, HDD, and heatsink),
depending on model and style

RoHS compliance

Version 2 of VR9 is only available in Non-RoHS
Version 3 of VR9 is available in RoHS

Power Consumption

The following two tables are intended to help you calculate the power consumption of a VR9 system. Select power consumption, depending on configuration, in both tables and add them together for total power consumption. Also add any other extra power consumption as described in the footnotes of both tables.

For measurement purposes, the VR9 board is mounted on a VME backplane. During measurement, the power consumption of the backplane, keyboard and the hard disk drive are deducted from the results. The values measured are typical

Table 24: Power consumption CPU dependent

Vx9	DOS prompt without Power management, CPU die around +50 °C*	DOS CPU running full cache access, CPU die around +50 °C*	Windows XP, CPU running a maximum power consumption instruction mix at +100 °C die temperature
	+5 V	**+5 V**	**+5 V**
Pentium M 600 MHz 130 nm	0.7 A	0.9 A	0.9 A
Celeron M 1.0 GHz 90 nm **	0.7 A	0.9 A	0.9 A
Pentium M 1.1 GHz 130 nm	1.2 A	1.6 A	2.3 A
Pentium M 1.4 GHz 90 nm **	1.2 A	1.6 A	2.3 A
Pentium M 1.6 GHz 130 nm	2.7 A	3.5 A	5.4 A
Pentium M 1.8 GHz 90 nm	2.5 A	3.0 A	4.5 A
Celeron M 1.3 GHz 130 nm	2.2 A	2.6 A	4.6 A

* for every 25 °C more please add around 10 %
** estimated values

Table 25: Power consumption DRAM dependent

Vx9	DOS prompt or CPU running full cache access, mid range temperature	BIOS POST during memory initialization	Windows XP, 3D graphics active, both Gigabit Ethernet channels linked
	+3.3 V	**+3.3 V**	**+3.3 V**
256 MB (1 bank, 9 devices)	4.9 A*	5.8 A*	6.2 A
512 MB (2 banks, 18 devices)	5.2 A*	6.2 A*	6.7 A
1 GB (4 banks, 36 devices)	5.9 A*	7.1 A*	7.5 A
2 GB (4 banks, 36 devices)	5.9 A*	7.1 A*	7.5 A

* for every Ethernet channel linked to gigabit please add 0.55A
The exact values may vary with different dram vendors by +/- 20 %

- When using onboard PMC modules don't forget to add their power consumption
- With an onboard hard disk drive please add following values to the +5 V current:
  - During power up 0.9 A max.
  - In an idle condition 0.13 A typical.
  - During read/write access 0.42 A typical

  Values are taken from the Fujitsu MHT 2060 AT datasheet
- With an onboard compact flash drive please add 0.1 A to the +5 V current
- For keyboard, mouse, etc. please add 0.1 A (typical) to the +5 V current
- Connectors P1680, P2001, and P4200 provide fused VCC voltage (+5 V). The total current drawn from this source may not exceed 1.0 A

Onboard Lithium Battery

Not powered by the system

BR1225 (50 mAh), estimated life time depending on temperature and power status. The diagram below shows discharge if board is not powered from the system, i.e. if battery has to supply all current for the clock circuits.

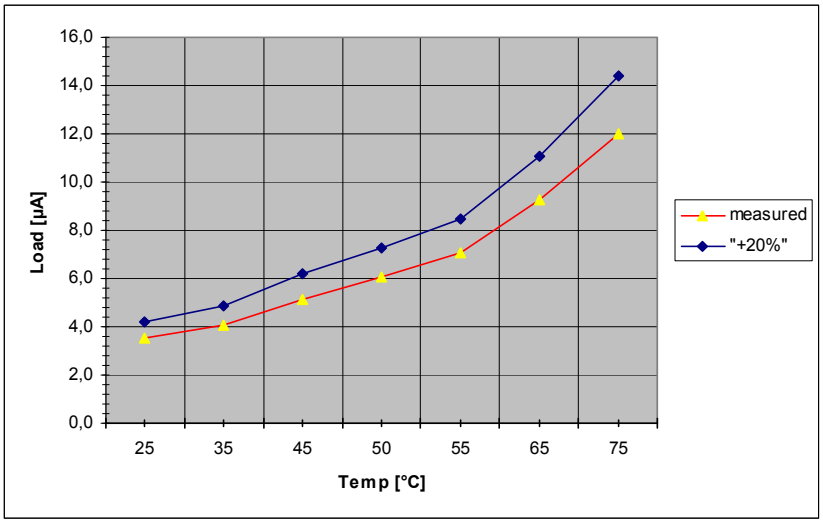


Figure 18: Battery current versus temperature

At temperatures lower than +25 °C use the value at 25 °C. Actually power usage is lower, which means longer operational lifetime for the battery.

All values were taken at 40 % RH (relative humidity).

Using the values of the diagram above (Battery current versus temperature) lifetime of the battery can be derived from the diagram below (Battery current versus time).

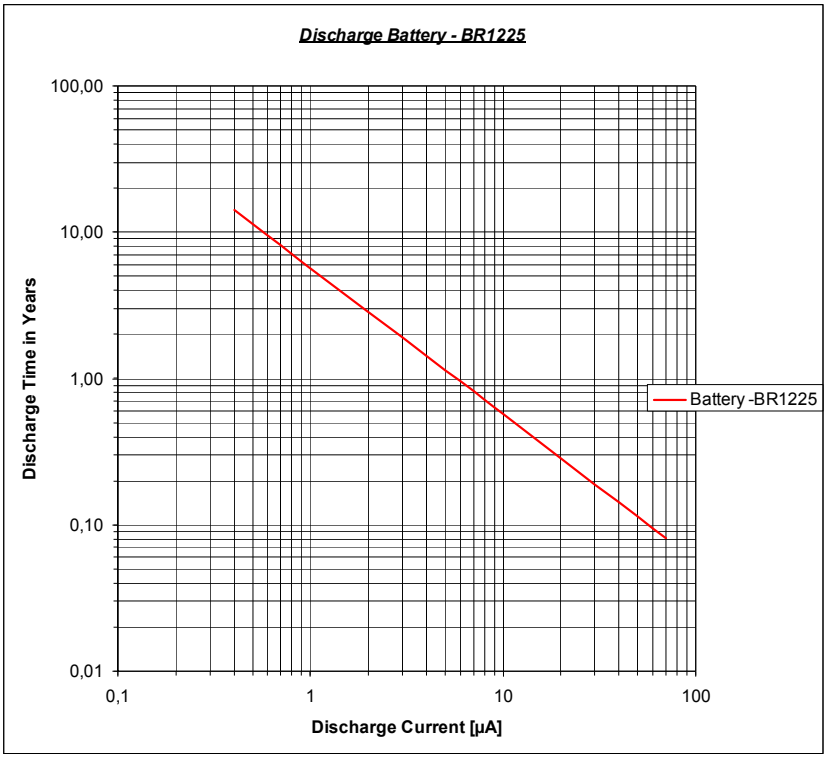


Figure 19: Battery current versus time

Powered by the system

If power to the board is supplied by the system then the battery is not supplying power to the clock circuits. However, self-discharge happens. Typical self-discharge rates are less than 0.3 percent per year with respect to a fully loaded battery at an ambient temperature of 25 °C. Self-discharge rates increase by less than 3 percent per year for temperature values up to 95 °C.

The battery has a user accessible holder on the VR9.

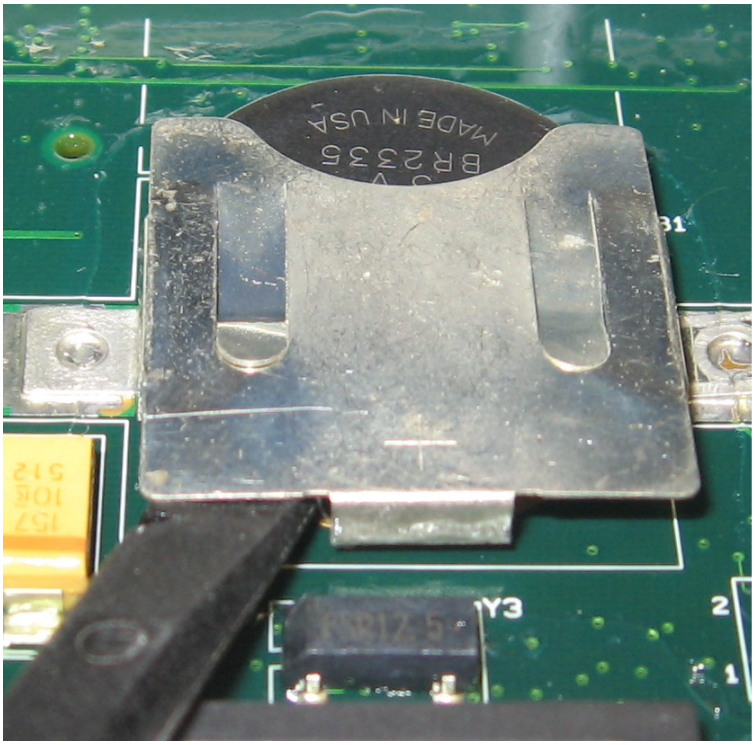


Figure 20: Battery removal

Note:
If the battery is exchanged by customer, please use same type of battery and ensure correct polarization.
For operating without battery please check the following description of the external battery input.

Battery removal and replacement

Locate battery on the computer. Reference the product manual if it is not easily located. On some of the dual slot SBCs, the top board may need to be removed to make it easier to remove the battery. Once the battery is located, take a non-conductive tool and push at the back of the battery holder. Gently apply pressure in order to not break the socket. The battery should slide forward out of the holder. Pressure can be alternated between the two sides to get the battery to slide out of the socket. The battery should slide forward enough that it could be removed from the socket. A new battery can be installed by sliding it into the holder. Make sure to observe correct polarity.

+5VSTDBY

The RTC can be supplied by this voltage, if there is no battery onboard. It is located at VME-Connector P1 (P7301) pin B31.

Without an onboard battery it is recommended to use an external supply connected to this input. This voltage supplies the real time clock and the CMOS RAM for storing the BIOS Setup settings.
Without battery and without this supply voltage, the real time clock oscillator has to be started at each power up. This time gets longer when operating at

lower temperatures and can be up to around 30 seconds (at -40 °C). At normal ambient temperatures this delay is below one second.

The red status LED goes off after the reset sequence and starts its normal blinking within the BIOS POST after the RTC oscillator is up.
When ordering a battery-less VR9, the setup information is stored automatically within an onboard EEPROM and is updated via standard BIOS Setup function. No external software is needed to create a user defined setup like in earlier products from GE Fanuc Intelligent Platforms. It is still recommended to use an external supply voltage to this battery input to avoid the power on oscillator start time and to keep the date and time information.

Environment Conditions

Ambient temperatures and humidity values for theVR9:

Table 26: Environment conditions

	C-, D-, 1-, 2-Style	I-, H-, R-, N-, 3-, 4-. 6-. 8-Style
High Temperature - Storage - Operating (see diagram below)	 +85 °C	 +85 °C
Low Temperature - Storage - Operating	 -40 °C 0 °C	 -40 °C -40 °C
Temperature Shock - Storage - Operating	 +/-10 °C/min +/-5 °C/min	 +/-20 °C/min +/-10 °C/min
Relative Humidity - Storage, Operating	 Up to 95 %, non-condensing	

VP9 only support C-, 1- and I-, 3-style.
Storage temperature on R-, N-, 6-, 8-style is between -55 °C (low) and +105 °C (high).

Shock and vibration values for the VR9:

Table 27: Shock & vibration parameters

	C-, D-, I-, H-, 1-, 2-, 3-, 4-Style	R-, 6-Style	N-, 8-Style
Vibration - Spectrum - Acceleration	 5 to 100 Hz 2 g rms	 5 to 2000 Hz 2 g rms	 5 to 2000 Hz 14 g rms
Shock - Amplitude - Duration	 12 g 6 ms	 20 g 6 ms	 40 g / 100 g 11 ms / 6 ms

VP9 only support C-, 1- and I-, 3-style

Maximum height usage

Table 28: Maximum height usage

	C-, D-, I-, H-, R-, 1-, 2-, 3-, 4-, 6-Style	N-, 8-Style
Maximum height - Operating - Storage	 4.5 km 12 km	 Vacuum Vacuum

Only the N-, 8-style board is capable to be used in a vacuum environment. All other styles contain either batteries and do not have the possibility to be cooled without airflow.
For highest operating temperatures (C-, D-, I-, H-, R-, 1-, 2-, 3-, 4-, 6-Style) please refer to the following diagram:

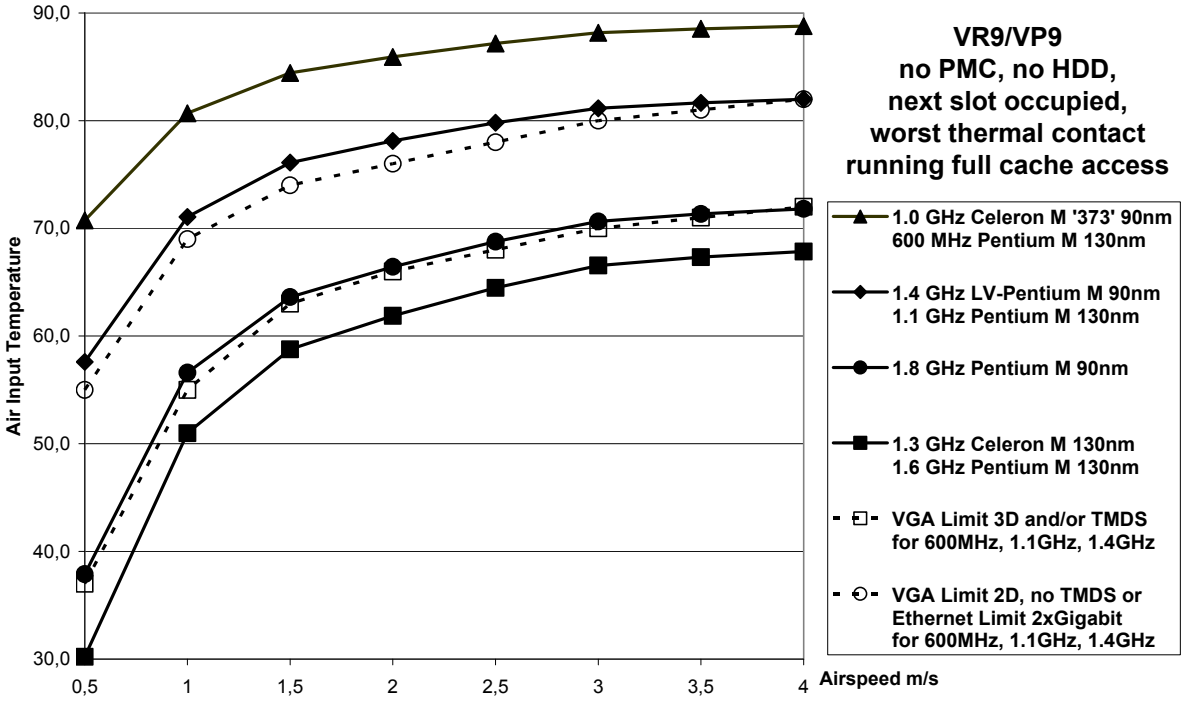


Figure 21: Air temperature vs. air speed

This diagram is based on estimated data and may change.

- 0.5 m/s airflow means convention cooled only.
- The core temperature of the CPU can be read out via the onboard temperature sensor. The value must be kept below 95 °C for all operating conditions. This value is already included in the airspeed diagram above.

Card edge temperatures for VR9 style 8

Table 29: Card edge temperatures

Processor	Operating Temperature
Pentium M, 1.6 GHz (130 nm)	67°C
Pentium M (745), 1.8 GHz (90 nm)	72°C
Celeron M (320), 1.3 GHz (130 nm)	76°C
Low Voltage Pentium M, 1.1 GHz (130 nm)	83°C
Low Voltage Pentium M (738), 1.4 GHz (90 nm)	85°C
Ultra Low Voltage Celeron M 600 MHz (130 nm)	85°C
Ultra Low Voltage Celeron M (373) 1 GHz (90 nm)	85°C

These values do not include temperature variations due to PMC modules.

For even more detailed information especially on the N-, 8-style version, please check the thermal report document of the VR9.

Electrical Characteristics

The supply voltages are +5 V and 3.3 V. +12 V and -12 V are required only if needed on the PMC slot. All Output voltages of the VR9 boards have an over-current protection. The maximum current for each voltage is shown below:

Table 30: Supply voltages

Name	U	Imax	Description	Fuse
+12V	12 V	0,1 A	Supply for PMC-Module	
-12V	-12 V	0,1 A	Supply for PMC-Module	
USB_VCC	5 V	2 A	Supply for front panel USB	F1681 [b]
FUSE_VCC	5 V	2 A	Supply for front panel I/Os: KB/MS, CRT-DCD	F9001 [b]

[b]. TPS2034D (Texas Instruments)

Supply voltage range

The following ranges are defined by the VME64 specification ANSI/VITA 1-1994 for VME64 and ANSI/VITA 1.1-1997 for VME64 Extensions. The voltages have to be measured at the backplane.

Table 31: Supply voltage range

Supply	Voltage and tolerance
+5 V	5.0 V +0.250 V / -0.125 V
+5 V STDBY	5.0 V +0.250 V / -0.125 V
+3.3V	3.3 V +0.150 V / -0.050 V
+12V	12.0 V +0.60 V / -0.36 V

GPIO 0...7

This general purpose I/O pins can be used as inputs, with following signal levels:

Table 32: GPIO IN signal levels

level	voltage
low	-0.5 V ... +0.8 V
high	+2.0 V ... +5.5 V

When used as outputs, the following signal levels are supplied:

Table 33: GPIO OUT signal levels

level	voltage
low	-0.4 V at 6 mA sinking
high	+2.4 V at 3 mA sourcing

Electrical clearance

Starting with board version x.y certain rules on spacing between conductors on individual layers of the printed circuit board (PCB) apply. The boards starting with version V3.x are designed to meet the parameters as listed below.

Voltage between conductors (DC or AC peaks) of 51 V – 100 V require a spacing of

- **0.6 mm for type B2 conditions**

external conductors, uncoated, sea level to 3050 m.

These rules are in accordance with IPC-2221 requirements.

Isolation

The Isolation of the Ethernet outputs whether front or rear is limited to 500 V peak against GND and any other supply voltage.
By itself the onboard digital ground GND and the front panel/chassis frame ground FGND are isolated on the VR9 with a layout distance of more than 0.3 mm in all PCB layers. However most standard devices (keyboard, mouse, and monitor) except Ethernet will connect FGND and GND directly in the device. Also standard racks (our starter cage too) connect both grounds at the power supply for safety reasons.

Board layout drawings

Board layouts change occasionally. Please check for correct revision of layout drawings. They are inserted here in ascending order. Incase of doubt consult GE Fanuc Intelligent Platforms.

Placement Plan Component Side VR9 Version V2

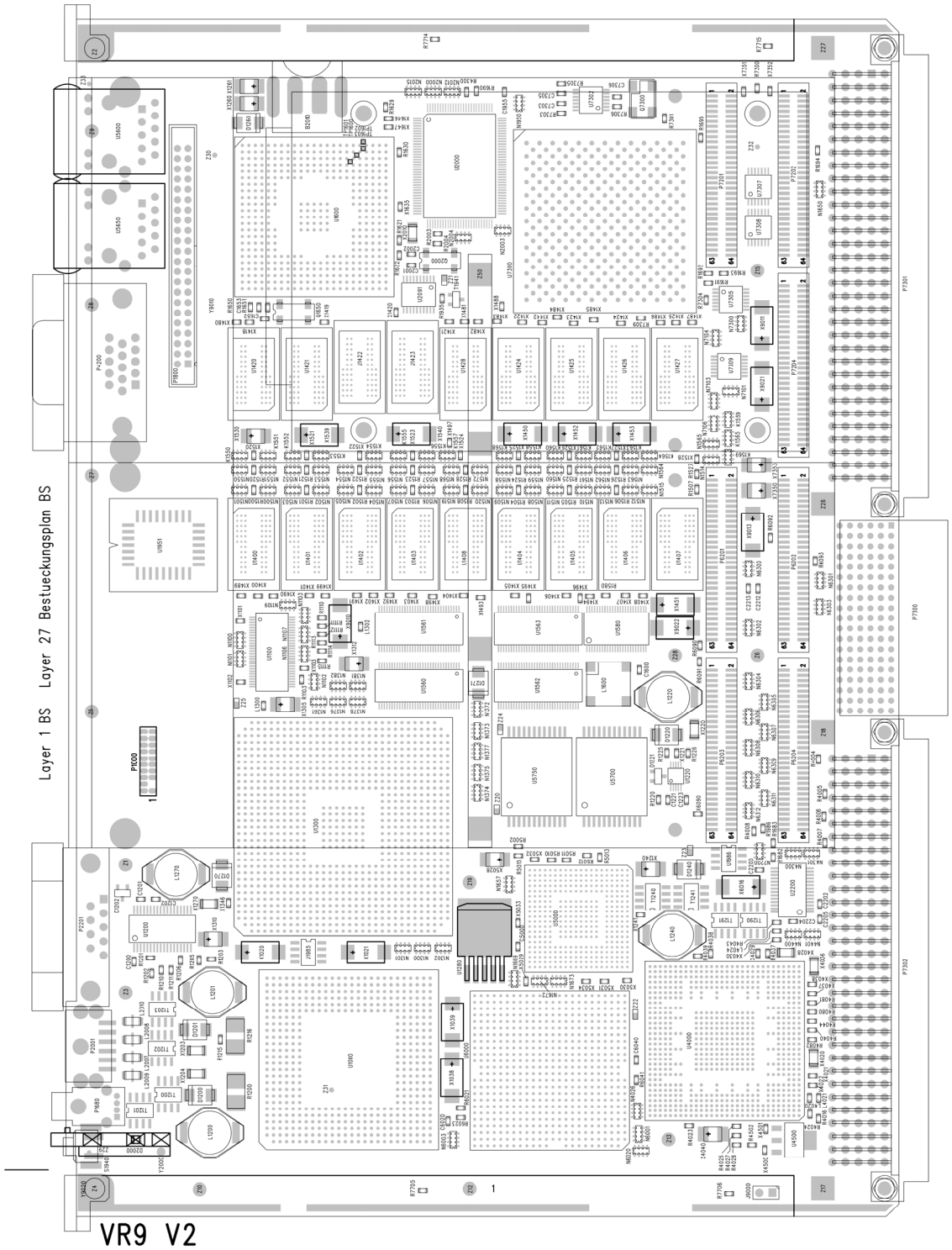


Figure 22: Component side of VR9, V2

Placement Plan Bottom Side VR9 Version V2

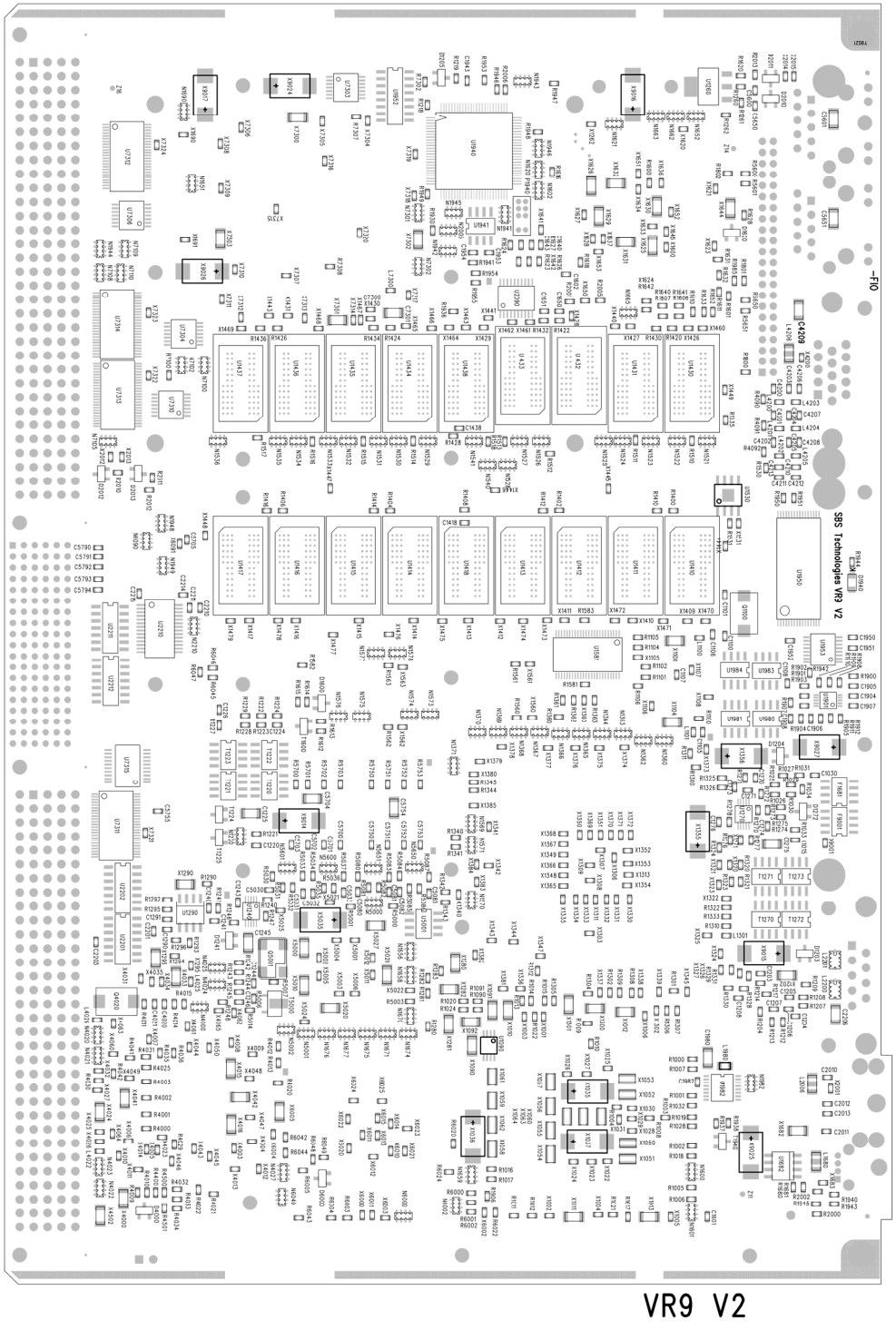


Figure 23: Bottom side of VR9, V2

Placement Plan Component Side VR9 Version V3

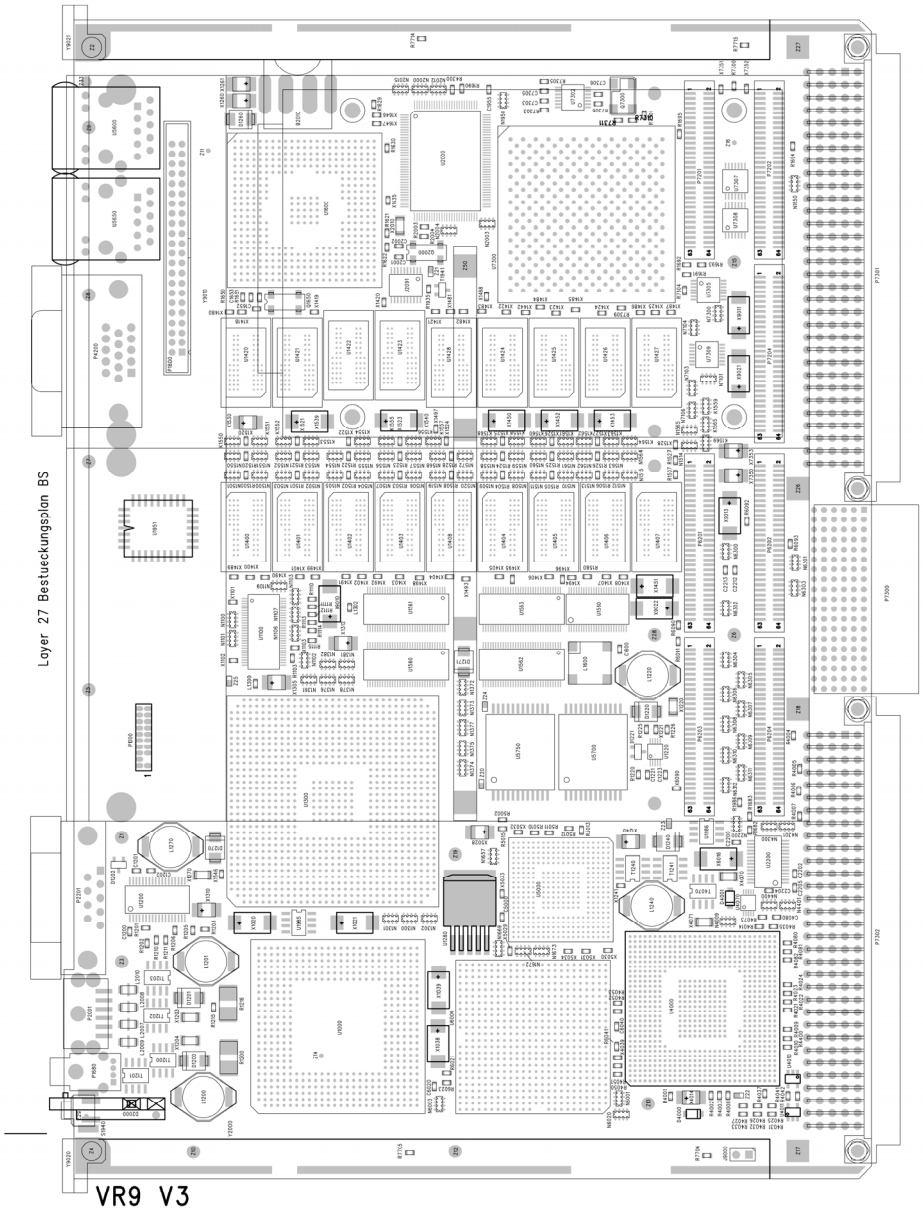


Figure 24: Component side of VR9, V3

Placement Plan Bottom Side VR9 Version V3

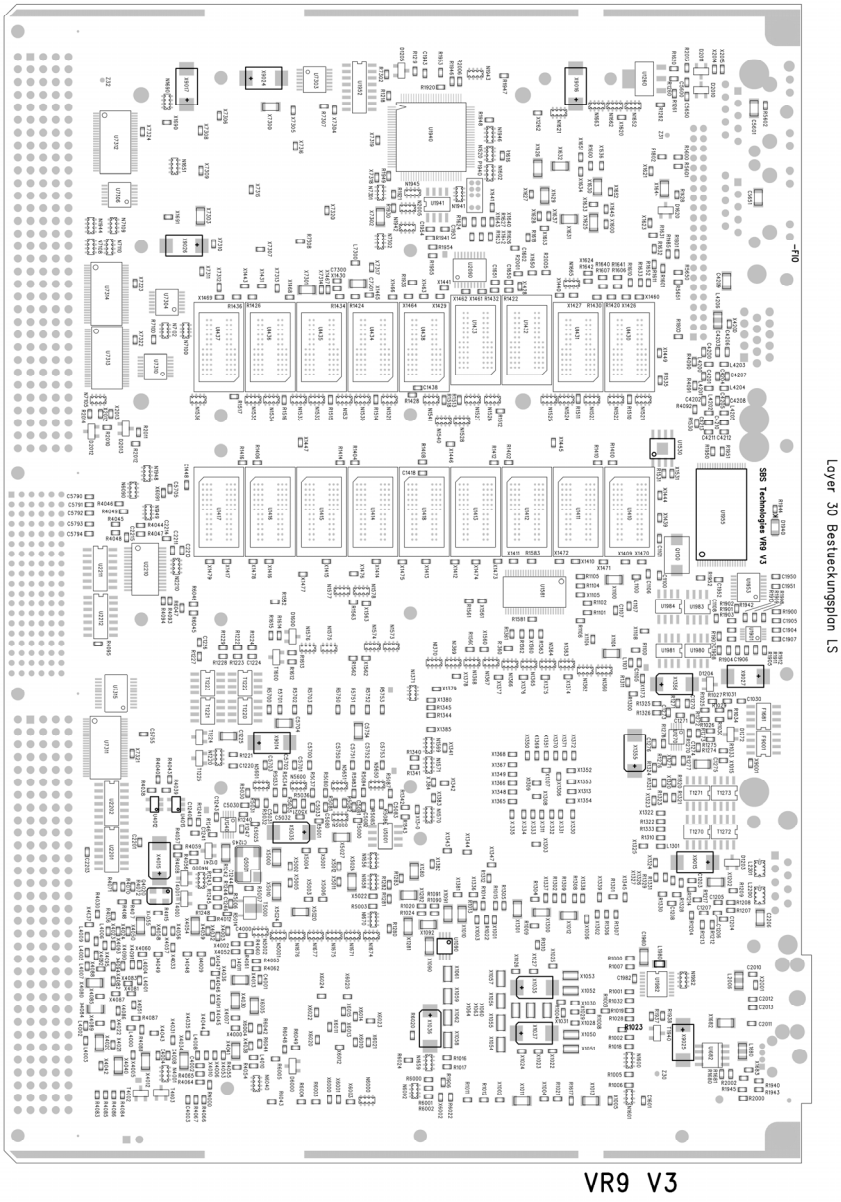


Figure 25: Bottom side of VR9, V3

Appendix A Transition Module VTM21

The VTM21 transition module is used for easy connection of I/O signals to standard connectors. Please refer to the drawing for the location of available interfaces:

Please note:
You either can use a DVI display on P4100 or a standard VGA Monitor/Display connected to P4001 or a standard VGA Monitor/Display via a DVI-to-VGA adaptor connected to P4100. You never can use two display devices connected to the transition module. If you want to have two display outputs, you will have to connect one to the front of the VR9 and one to the rear transition module.

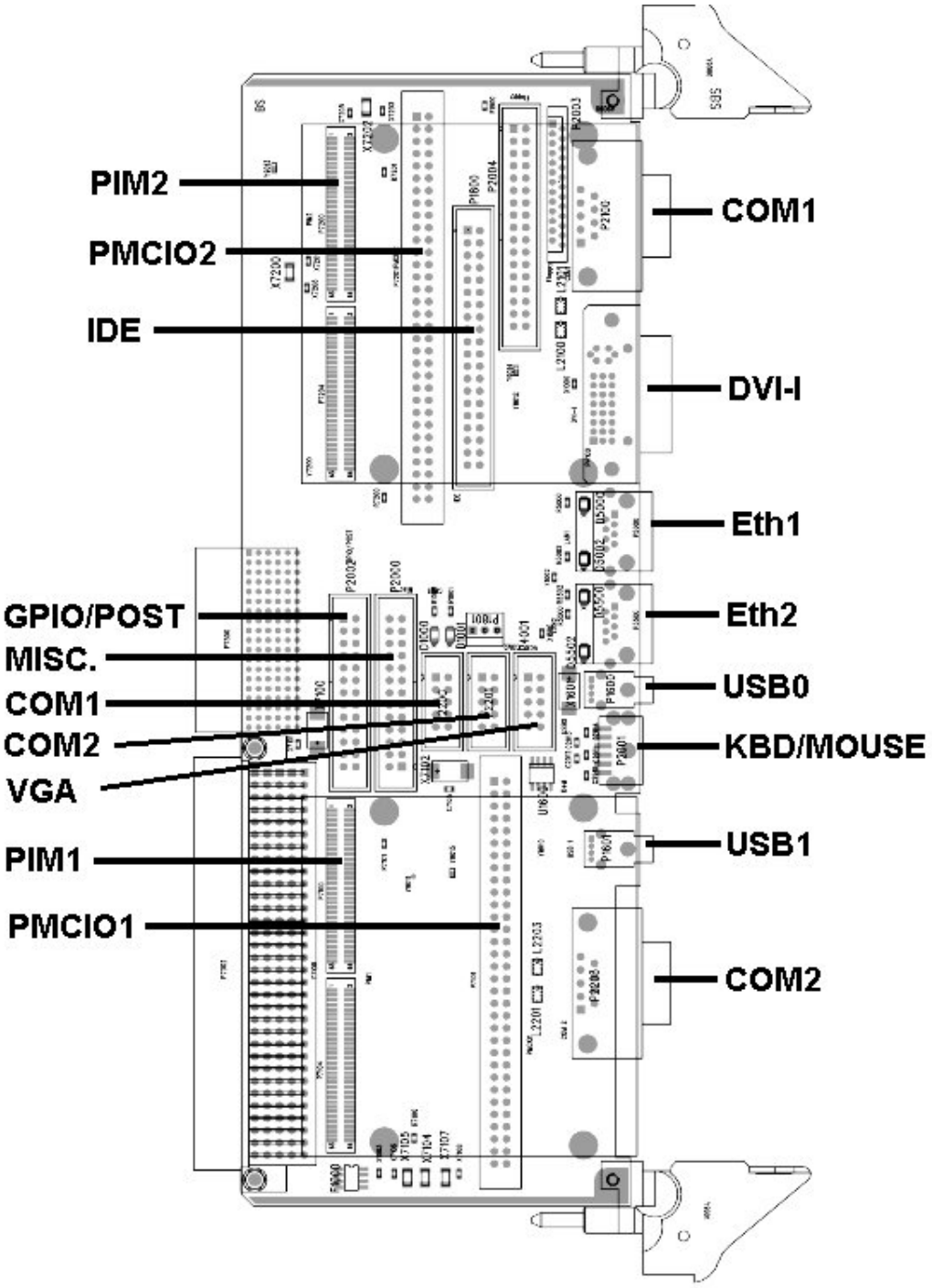


Figure 26: VTM21 Transmission Module

VTM21 Interfaces

This chapter describes all connector pin assignments on the VTM21 transition module.

EIDE Connector (P1800)

The EIDE interface is designed as a 40-pin 2.54 mm pitch male connector to fit directly to one or two external EIDE hard drives. The cable length must not exceed 30 cm. It is recommended to use an 80-pin high density cable for UDMA transfer.

Table 34: VTM21 EIDE connector

Name	P1800		Name
GND	2	1	\RST_DRV
HD_D8	4	3	HD_D7
HD_D9	6	5	HD_D6
HD_D10	8	7	HD_D5
HD_D11	10	9	HD_D4
HD_D12	12	11	HD_D3
HD_D13	14	13	HD_D2
HD_D14	16	15	HD_D1
HD_D15	18	17	HD_D0
NC	20	19	GND
GND	22	21	HD_DRQ0
GND	24	23	\HD_IOW
GND	26	25	\HD_IOR
NC	28	27	HD_RDY
GND	30	29	HD_DAK0
NC	32	31	HD_IRQ
NC	34	33	HD_A1
HD_A2	36	35	HD_A0
\HD_CS3	38	37	\HD_CS1
GND	40	39	NC

Ethernet Interface 10/100/1000BaseT (P5000, P5500)

The Ethernet interfaces for RearI/O requires usage of CAT 5 cable for proper operation with 100/1000BaseT.

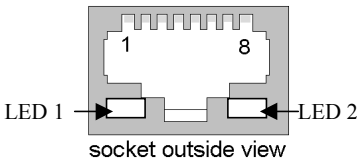


Figure 27: Ethernet connector pin assignment

Table 35: VTM21 Ethernet connectors

Name 10/100base	Name 1000base	Ethernet1, 2
TxD+	LP_DA+	1
TxD-	LP_DA-	2
RxD+	LP_DB+	3
NC	LP_DC+	4
NC	LP_DC-	5
RxD-	LP_DB-	6
NC	LP_DD+	7
NC	LP_DD-	8

Two LED's (LED1 green and LED2 yellow) are integrated in each of the RJ45 connector. These LED's indicate the link status of the interface.

Table 36: VTM21 LEDs

LED1 green	Function
On	Link
Off	No link
LED2 yellow	Function
On, blink	TX/RX activity
Off	No activity

TMDS / GPO Connector (P2002)

Table 37: VTM21 TMDS connector

Name	P2002
TXC+/GP0	3
TXC-/GP1	5
TX0+/GP2	7
TX0-/GP3	9
TX1+/GP4	11
TX1-/GP5	13
TX2+/GP6	15
TX2-/GP7	17
HTPLG/\PEN	24
FUSE_VCC	26
GND	10,12,14,16,18,20,22
NC	1, 2, 4, 6, 8, 19, 21, 23, 25

This connector shares the functions TMDS and GPO. Only one function is available at the same time and is board specific.

Serial Interfaces COM1 (P2200, P2100) and COM2 (P2201, P2203)

The VR9 offers two RS232 serial ports. All COM ports are accessible via the transition module at 10-pin headers and are software selectable for RS-232 or RS-422/485 operation. The RS485 output drivers can be enabled or disabled with the DTR signal. An active DTR means the driver are always enabled. When using RS422 setting the output drivers are always enabled and the DTR signal is not used. COM1 and COM2 are also available at the rear panel with 9-pin D-sub connectors.

Table 38: VTM21 COM1

Name RS232	Name RS422/485	P2100	P2200
DCD	TXD-	1	1
DSR	TXD+	6	2
RXD	RTS-	2	3
RTS	RTS+	7	4
TXD	CTS+	3	5
CTS	CTS-	8	6
DTR	RXD+	4	7
RI	RXD-	9	8
GND		5	9
+5 V fused		-	10

Table 39: VTM21 COM2

Name RS232	Name RS422/485	P2203	P2201
DCD	TXD-	1	1
DSR	TXD+	6	2
RXD	RTS-	2	3
RTS	RTS+	7	4
TXD	CTS+	3	5
CTS	CTS-	8	6
DTR	RXD+	4	7
RI	RXD-	9	8
GND		5	9
+5 V fused		-	10

VGA Interface (P4001)

The VGA monitor signals are available on the 10-pin male header P4001. They are parallel connected with the DVI-I connector P4100. You either can use a DVI display on P4100 or a standard VGA Monitor/Display connected to P4001 or a standard VGA Monitor/Display via a DVI-to-VGA adaptor connected to P4100. You never can use two display devices connected to the transition module. If you want to have two display outputs, you will have to connect one to the front of the VR9 and one to the rear transition module.

Table 40: VTM21 VGA

Name	P4001
RED	2
GREEN	4
BLUE	6
HSYNC	8
VSYNC	10
GND	1, 3, 5, 7, 9

DVI-I connector (P4100)

The VTM21 provides a DVI-I connector to connect DVI-capable monitors. Both digital and analog video signals are provided. For the digital signals the "Transition Minimized Differential Signaling" (TMDS) is used. The max. resolution with a VR9 is limited to 1024x768.

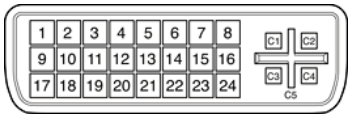


Figure 28: DVI-I connector

Table 41: VTM21 DVI-I Digital

Pin	Signal name	Pin	Signal name
1	TX2- (TMDS Data2–)	13	NC
2	TX2+ (TMDS Data2+)	14	FUSE_VCC
3	GND	15	GND
4	NC	16	HOTPLUG
5	NC	17	TX0- (TMDS Data0–)
6	DDC Clock	18	TX0+ (TMDS Data0+)
7	DDC Data	19	GND
8	VSYNC	20	NC
9	TX1- (TMDS Data1–)	21	NC
10	TX1+ (TMDS Data1+)	22	GND
11	GND	23	TXC+ (TMDS Clock+)
12	NC	24	TXC- (TMDS Clock–)

Table 42: VTM21 DVI-I Analog

Pin	Signal name
C1	RED Analog Red Video
C2	GREEN Analog Green Video
C3	BLUE Analog Blue Video
C4	HSYNC Analog Horizontal Sync
C5	GND

Note:
The graphics controller supports the functions TMDS and analog RGB, but only one function is available at the same time. The RGB-Signals at P4000 and P4001 are identical.

USB connectors (P1600, P1601)

Two channels are available at the standard USB connectors. FUSE_VCC is fused with 2 A but for normal operation don't exceed 1 A at this pin.

Table 43: VTM21 USB0

Name	P1600
FUSE_VCC	1
USB0-	2
USB0+	3
GND	4

Table 44: VTM21 USB1

Name	P1601
FUSE_VCC	1
USB1-	2
USB1+	3
GND	4

Keyboard and PS/2 Mouse Interface (P2001)

The VR9 allows an easy adaptation of a keyboard to a standard 6-pin MINIDIN connector. Also a PS/2 mouse can be connected directly or via an external cable splitter.

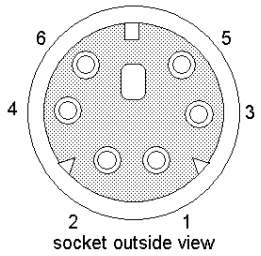


Figure 29: MiniDIN connector

Table 45: VTM21 MiniDIN

Name	P2001
Keyboard data	1
Mouse data	2
GND	3
Fused +5 V	4
Keyboard clock	5
Mouse clock	6

Misc. connector (P2000)

Table 46: VTM21 Miscellaneous Connector

Name	P2000		Name
NC	1	2	NC
NC	3	4	NC
GND	5	6	\RST_BUT
FUSE_VCC	7	8	\SPEAKER
FUSE_VCC	9	10	NC
FUSE_VCC	11	12	\STATUS_LED
FUSE_VCC	13	14	MOUSE_CLK
GND	15	16	MOUSE_DAT
FUSE_VCC	17	18	KBD_CLK
GND	19	20	KBD_DATA
FUSE_VCC	21	22	USB1-
USB1+	23	24	USB0-
USB0+	25	26	GND

PMC I/O connectors

The PMC I/O signals of both the PMC slots are either available on a 64-pin male headers (P7101/P7201) or via VITA36 compliant PIM (PMC I/O Module) connectors (P7100/P7104 and P7200/P7204). The availability of a PIM interface or 64-pin header is mutually exclusive.

The following table lists the pin assignments of the onboard PIM connectors.

Table 47: PMC I/O connectors

P7100/P7200	P7104/P7204	Pin	Pin	P7100/P7200	P7104/P7204
	PMCx_IO01	01	02	+12V	PMCx_IO02
	PMCx_IO03	03	04		PMCx_IO04
+5 V	PMCx_IO05	05	06		PMCx_IO06
	PMCx_IO07	07	08		PMCx_IO08
	PMCx_IO09	09	10	+3.3 V	PMCx_IO10
	PMCx_IO11	11	12		PMCx_IO12
GND	PMCx_IO13	13	14		PMCx_IO14
	PMCx_IO15	15	16		PMCx_IO16
	PMCx_IO17	17	18	GND	PMCx_IO18
	PMCx_IO19	19	20		PMCx_IO20
+5V	PMCx_IO21	21	22		PMCx_IO22
	PMCx_IO23	23	24		PMCx_IO24
	PMCx_IO25	25	26	+3.3 V	PMCx_IO26
	PMCx_IO27	27	28		PMCx_IO28
GND	PMCx_IO29	29	30		PMCx_IO30
	PMCx_IO31	31	32		PMCx_IO32
	PMCx_IO33	33	34	GND	PMCx_IO34
	PMCx_IO35	35	36		PMCx_IO36
+5 V	PMCx_IO37	37	38		PMCx_IO38
	PMCx_IO39	39	40		PMCx_IO40
	PMCx_IO41	41	42	+3.3 V	PMCx_IO42
	PMCx_IO43	43	44		PMCx_IO44
GND	PMCx_IO45	45	46		PMCx_IO46
	PMCx_IO47	47	48		PMCx_IO48
	PMCx_IO49	49	50	GND	PMCx_IO50
	PMCx_IO51	51	52		PMCx_IO52
+5 V	PMCx_IO53	53	54		PMCx_IO54
	PMCx_IO55	55	56		PMCx_IO56
	PMCx_IO57	57	58	+3.3 V	PMCx_IO58
	PMCx_IO59	59	60		PMCx_IO60
-12 V	PMCx_IO61	61	62		PMCx_IO62
	PMCx_IO63	63	64		PMCx_IO64

The following table lists the pin assignment of the PMC I/O signals on the 64-pin header.

Table 48: PMC I/O header

P7101/P7201	Pin		P7101/P7201
PMCx_IO01	1	2	PMCx_IO02
PMCx_IO03	3	4	PMCx_IO04
PMCx_IO05	5	6	PMCx_IO06
PMCx_IO07	7	8	PMCx_IO08
PMCx_IO09	9	10	PMCx_IO10
PMCx_IO11	11	12	PMCx_IO12
PMCx_IO13	13	14	PMCx_IO14
PMCx_IO15	15	16	PMCx_IO16
PMCx_IO17	17	18	PMCx_IO18
PMCx_IO19	19	20	PMCx_IO20
PMCx_IO21	21	22	PMCx_IO22
PMCx_IO23	23	24	PMCx_IO24
PMCx_IO25	25	26	PMCx_IO26
PMCx_IO27	27	28	PMCx_IO28
PMCx_IO29	29	30	PMCx_IO30
PMCx_IO31	31	32	PMCx_IO32
PMCx_IO33	33	34	PMCx_IO34
PMCx_IO35	35	36	PMCx_IO36
PMCx_IO37	37	38	PMCx_IO38
PMCx_IO39	39	40	PMCx_IO40
PMCx_IO41	41	42	PMCx_IO42
PMCx_IO43	43	44	PMCx_IO44
PMCx_IO45	45	46	PMCx_IO46
PMCx_IO47	47	48	PMCx_IO48
PMCx_IO49	49	50	PMCx_IO50
PMCx_IO51	51	52	PMCx_IO52
PMCx_IO53	53	54	PMCx_IO54
PMCx_IO55	55	56	PMCx_IO56
PMCx_IO57	57	58	PMCx_IO58
PMCx_IO59	59	60	PMCx_IO60
PMCx_IO61	61	62	PMCx_IO62
PMCx_IO63	63	64	PMCx_IO64

Power connector (P1801)

This connector provides +5 V to supply external logic or devices as 2.5” hard drives etc.

Table 49: VTM21 Power connector

Name	P1801
GND	1
FUSE_VCC [a]	2
GND	3

Placement Plan VTM21V0

1

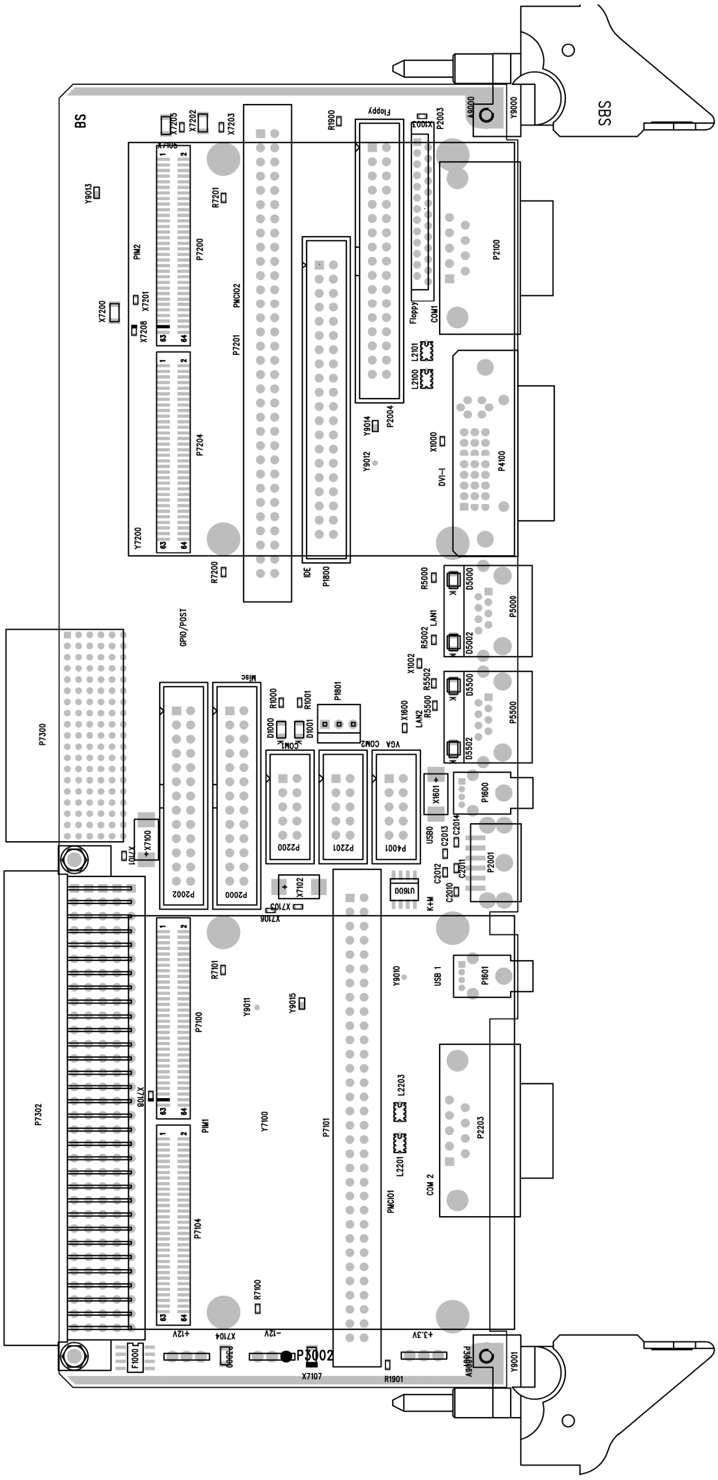


Figure 30: Placement plan VTM21, V0

Appendix B PCI Mezzanine Card (PMC) socket

The PCI Mezzanine Card (PMC) Interface is an additional slot for parallel mounted add on cards. The interface is compliant to the IEEE 1386.1 specification and is based on the electrical and logical layer of the PCI specification. Check for possible height incompatibility in the 'Features' and 'Specifications' sections of this manual. PMC Slot1 is 66/100/133 MHz PCI-X capable. PMC Slot 2 is 33 MHz/32 bit only. The user definable I/O Pins are connected to the rear IO connector on the Cx9, as defined in the PICMG 2.3 specification.

- A 5 V key is mounted on PMC2, for 5 V compatible PMC-Cards.
- A 3 V key is mounted on PMC1, for 3.3 V compatible PMC-Cards.

Electrical characteristics

Table 50: Electrical characteristics

Parameter	Comment	Value
I3.3 V	Max. current on 3.3 V Pins	1.5 A [c]
I5 V	Max. current on 5 V Pins	1 A [c]
I+12 V	Max. current on +12 V Pin	0.1 A
I-12 V [a]	Max. current on -12 V Pin	0.1 A
V(I/O) [b]	Voltage for PCI IO	3.3 V or 5 V
P	Max. power consumption total	7.5 W

a) -12 V must be connected to the backplane.
b) The appropriate key has to be mounted.
c) Total power dissipation on 3.3 V and 5 V rail is 7.5 W

To mount a PMC board to the VR9, follow these steps:

1. Remove VR9 from system housing
2. Remove the front panel cover of the PC slot
3. Take PMC from inside through front panel and push connectors together.
4. Verify correct installation of EMC gasket
5. Fix PMC on host boards with 4 screws. Screws must be locked with Loctite 243.

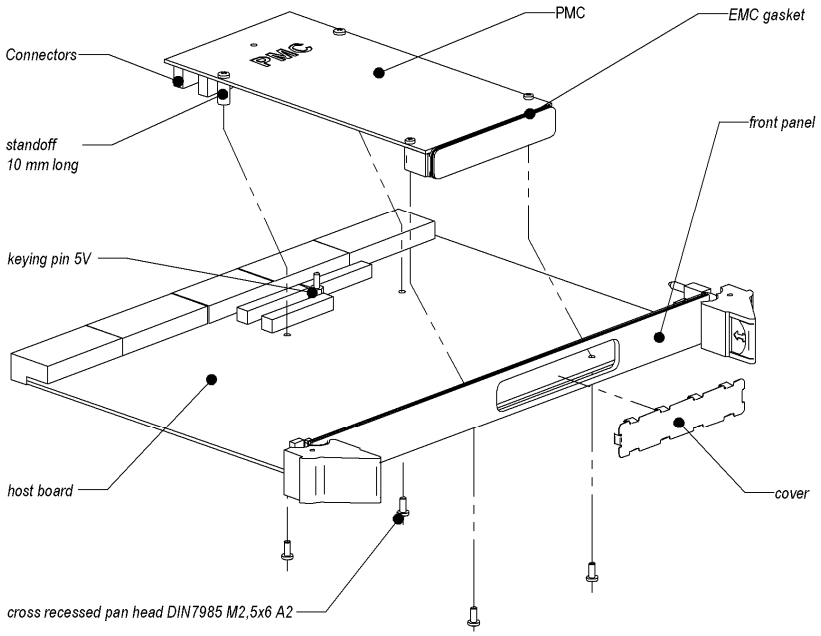


Figure 31: Mounting of PMC module on VR9

Appendix C Support, Service and Warranty Information

Chapter Scope

The following section describes GE Fanuc Intelligent Platforms' product support program. There are two regional support headquarters and regional customer centers. In this chapter you will find information about our product warranty terms and details about what action to take if you experience a problem with the product.

Geographical Regions

World-wide headquarter of GE Fanuc Intelligent Platforms, Inc. is at

GE Fanuc Intelligent Platforms Inc.
2500 Austin Drive
Charlottesville, VA 22911
U.S.A.

GE Fanuc Intelligent Platforms, Inc. uses two regional headquarters for the purpose of support, service, RMA returns and other functions.

Regional areas:

WW	world-wide
EU	Europe, Russia, Near East, India, Africa
US	Americas & Pacific Rim (Japan, Korea, China, Philippines, AUS, NZ)

Technical Support

If you should have a problem with a GE Fanuc Intelligent Platforms product: Free technical support is available by phone, fax or email. Telephone support

is available at main locations or at the regional center where the product was bought.

EU	US
Monday through Thursday 8:00 – 17:00 (CET) Friday 8:00 – 16:00 (CET) Phone +49-821-5034-170 Fax +49-821-5034-119 E-Mail Aug-support@gefanuc.com	Monday through Friday 8:30 AM – 5:30 PM (Eastern Time) Phone +1-800-322-3616 Fax +1- E-Mail support.government@gefanuc.com

Support on the Web

For support and information, visit our website at http://www.gefanuc.com

Information for components, corresponding driver software, etc. can also be found at the following locations:

AMD Corp.	www.amd.com
American Megatrends	www.ami.com
Fedora	www.fedora.redhat.com
IBM Corp.	www.ibm.com
Intel Corp.	www.intel.com
Linear Technology	www.linear-tech.com
Microsoft Corp.	www.microsoft.com
Freescale Corp.	www.freescale.com
Novell	www.novell.com
NVIDIA	www.nvidia.com
PCI Industrial Computer Manufacturing Group	www.picmg.org
PLX Technology	www.plxtech.com
QNX Software Systems	www.qnx.com
Red Hat	www.redhat.com
Smybios Logic	www.lsilogic.com
VITA	www.vita.com
Wind River Systems	www.windriver.com

Warranty

GE Fanuc Intelligent Platforms' products come with a "return-to-factory" warranty which covers defects in materials and workmanship for a period of **two years in the case of board-level products and one year in the case of system-level products** from the date of product shipment to the customer (original purchaser), provided the product is unmodified and has been subject to normal and proper use.

For details refer to the "Terms and Conditions" of your purchase contract

Repairs

Warranty Repairs

Any product returned and found to be under warranty will be repaired or replaced at the discretion of GE Fanuc Intelligent Platforms. The return shipping freight is paid by GE Fanuc Intelligent Platforms.

Non-Warranty Repairs

If a product is found not to be under warranty, GE Fanuc Intelligent Platforms will:

- Repair the product without notice of the customer when the cost is below Euro/US$250.
- Notify the customer of the non-warranty situation and provide a cost estimate to the customer, if the cost of the repair is equal to or greater than Euro/US$250. Non-warranty repairs above Euro/US$250 generally require that a purchase order be issued to GE Fanuc Intelligent Platforms for the amount of the repair before repairs are undertaken.

The shipping freight is paid by the customer in addition to repair cost.

Procedure

In the event of repair, please return the product together with additional information:

- Description of the type of defect.
- Is the defect restricted to certain environmental conditions?
- What was the hardware environment before the defect appeared?
- Where there input signals? If yes, which?
- Please specify: “warranty” or “no warranty” repair.

You may use the report form at the end of this manual for this purpose.

Please use the original packing material for shipping to avoid damage. Otherwise warranty may be lost.

To expedite assistance for problems, also provide the following:

- Your Name, Phone and Company.
- Product with which you are having trouble.
- Serial Number, Part Number and Revision.
- Hardware environment the product is used.
- Operating system you are running.
- Detailed description of your problem and any error messages that have appeared on the screen.
- The name of a technically qualified individual at your company familiar with the product failure.

Depending on the circumstances of the problem, it may be deemed necessary to return the product to GE Fanuc Intelligent Platforms for repair. In order to return the product for repair, the following steps are necessary:

- Obtain a Return Material Authorization number (RMA#) from GE Fanuc Intelligent Platforms Customer Support.
- Ship the product prepaid to the designated repair point.
- Provide a written description of the claimed defect with the product.

Obtaining an RMA Number

To obtain a product Return Merchandise Authorization number (RMA#), you should call our Customer Service department through our main number.

Shipping the Product

Any product returned to GE Fanuc Intelligent Platforms should be in its original shipping carton if possible. Otherwise the product should be carefully packed in a conductive (ESD) packing material and placed in a cushioned corrugated carton suitable for shipping.

Please mark the shipping label with the RMA number and return it to:

EU	**US**
GE Fanuc Intelligent Platforms GmbH & Co. KG RMA# (*put RMA here*) Memminger Strasse 14 86159 Augsburg Germany	Customer Service Dept. ATTN: RMA# (*put RMA here*) GE Fanuc Intelligent Platforms, Inc. 2500 Austin Drive Charlottesville, VA 22911 U.S.A.

Note:
Returns in the US and associated regions should be sent to the office where products were bought. See separate address list of office, support and RMA addresses.

Error Report Form

When you are returning a product for repair, it is very important to include a written report which details the nature of the problem in order to expedite the repair. Please always use the Error Report Form attached at the end of this manual or include the following information:

- RMA Number, if applicable
- Product & Serial Number
- Part Number
- Version
- Contact: Name & Phone Number
- Detailed Description of the Problem/Defect

Example/coding of the ID line:

62 –	0102 –	004199 –	00101111 –	071595 -	E7501 –	VR9 -	Y2KC-0
							year 2000 compliant
						project ID	
					chip set		
				AMIBIOS core copyright date			
			BIOS features				
		supplier ID					
	major & minor BIOS revisions						
processor, flash ROM size							

You can stop the video output for proper reading the three information lines as described: Simply press the “0 / Enter” key during the start-up sequence. This key is located on the numeric keypad of your keyboard.

Error Report Form (EU)

GE Fanuc Intelligent Platforms GmbH & Co. KG	Company Name
Memminger Str. 14	Department
86159 Augsburg	Contact Person
Germany	Mailing Address
Phone Number +49 821 5034-170	Phone Number
Fax Number +49 821 5034-119	Fax Number
RMA# _____	Email Address

Part. No. _____ Version __ . __ Date __ __ __ Serial No. _____

Error Description:
Hardware Environment:
Operating System/Software:
Warranty repair: ❑ YES ❑ NO (Please see section 'Warranty')

Error Report Form (US)

GE Fanuc Intelligent Platforms, Inc.	Company Name
	Department
	Contact Person
	Mailing Address
Phone Number +	Phone Number
Fax Number +	Fax Number
RMA# _____	Email Address

Part. No. _____ Version __ . __ Date __ __ __ Serial No. _____

Error Description:
Hardware Environment:
Operating System/Software:
Warranty repair: ❑ YES ❑ NO (Please see section 'Warranty')

GE Fanuc Intelligent Platforms Information Centers

Americas:
1 800 322 3616 or 1 256 880 0444

Asia Pacific:
86 10 6561 1561

Europe, Middle East and Africa:
+49 821 5034-0

Additional Resources

For more information, please visit
the GE Fanuc Intelligent Platforms web site at:

www.gefanuc.com



© 2009 GE Fanuc Intelligent Platforms, Inc. All Rights Reserved.
All other brand names and product names contained herein are trademarks, registered trademarks, or trade names of their respective owners.

HRMVR91E

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP