ANSI/VITA 1.3-1997

Approved as an American National Standard by ANSI

American National Standard
for VME64x 9U x 400 mm Format

Secretariat
VMEbus International Trade Association

Approved June 9, 1998
American National Standards Institute, Inc.

VMEbus INTERNATIONAL TRADE ASSOCIATION
7825 E. Gelding Drive, Suite 104, Scottsdale, AZ 85260-3415
PH: 602-951-8866, FAX: 602-951-0720
E-mail: info@vita.com, URL: http://www.vita.com

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Abstract

This standard is an extension of the ANSI/VITA 1-1994, VME64 Standard. It defines 9U x 400 mm boards, backplanes and subracks. This standard builds off of ANSI/VITA 1.1-1997, VME64 Extensions. The formal name of this document is VME64x 9U x 400 mm Format and will be referred to as VME64x-9U in this document

American National Standard

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Foreword

VME became the industrial bus of choice in the 80's with hundreds of manufactures supplying more than a thousand different boards to the world-wide market place. Thousands of customers utilized VME for an extremely broad number of applications.

In the late 80's, the VME's draft specification was expanded for 64 bit data and address capability, which also doubled the throughput. Locks, Configuration ROM / Control & Status Registers (CR/CSR), rescinding DTACK*, auto system control detection, auto slot ID, plus optional shielded DIN connectors were also added. These additional features effectively transformed VME from an 80's bus to a 90's bus, which allows VME to be used in even more demanding applications for the early 90's. This standard is commonly referred to as VME64.

In the summer of 1993 the VITA Standards Organization (VSO) agreed to publish the VME64 Standard. It was also agreed to use additional standards to add features as they are agreed upon by the VSO membership. The VME64x Standard expanded the features of VME64 mainly by using a new 160 pin connector. These and other features in the VME64x Standard gained the interest of the Telecommunications Industry and the Physics Research Community. A major concern in both groups was a larger board format yet keeping as much compatibility with the existing VME standards as possible. This 1997 standard is a response to these needs.

The following companies sponsored the development of this standard in the VITA Standards Organization.

Name	**Company**
Ed Barsotti	FNAL
Bill McBride	Hybricon
Eike Waltz	Rittal Corp.

The following individuals served on the VITA 1.3 task group.

First Name	**Affiliation**
Ray Alderman	VITA
Ed Barsotti	FNAL
Robert Downing	FNAL
Wayne Fischer	Force
Michael Harms	SLAC
Frank Hom	Electronic Solutions
Richard Jaenicke	Sky Computers
Tad Kubic	Dawn VME
Tony Lavely	Mercury Computer
Michael Munroe	ERNI
Chris Parkman	CERN
Elwood Parsons	AMP
Robert Patterson	AMP
Dave Robak	Harting North America
John Rynearson	VITA
Holly Sherfinski	Harting North America
Morton Thayer	C-MAC
Michael Thompson	Schroff
Istvan Vadasz	Force Computers
Eike Waltz	Rittal Corp.
Doug Williams	SKY Computers
David Wright	Hybricon

After development in the VSO this standard was submitted to the ANSI canvass ballot process. The following people participated in the canvass ballot of this standard.

Name	**Company**
Malcolm Airst	MITRE Corporation
Harry Andreas	Raytheon Systems Company
Ed Barsotti	Fermi Nat'l. Accelerator Lab
Martin Blake	VERO Electronics
Louis Costrell	NIST
Wayne Fischer	Force Computers
Michael Harms	Stanford Linear Accelerator Center
Frank Hom	Electronic Solutions, Inc.
Tad Kubic	Dawn VME Products, Inc.
Andreas Lenkisch	Trenew Electronic GmbH
Patrick McHugh	LogicVision
Robert McKee	MITRE Corporation
Chris Parkman	CERN
Elwood Parsons	AMP
Robert Patterson	AMP Inc
David Robak	Harting Inc. of North America
John Rynearson	VITA
Keith Schuh	Fermi Lab
Holly Sherfinski	Harting Inc. of North America
Michael Thompson	Schroff, Inc.
Uwe Uhmeyer	LeCroy Research Systems
Eike Waltz	Rittal Corporation

Chapter 1 - Introduction to the VME64x 9U x 400 mm Format Standard

1.1 VME64x 9U x 400 mm Format Objectives

The following normative documents contain certain provisions which, through reference in this text, constitute provisions of this VSO Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this international Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

The following new features are defined for optional usage in VME64 based applications:

- Addition of P5/J5 and P6/J6 centered on the lower 3U area using IEC 61076-4-101 connectors .
- Optional P3/J3 centered on the lower 3U area using the same IEC 61076-4-113 connectors in the upper 6U.
- A user defined P4/J4 connector between P2/J2 and P5/J5 similar to P0/J0 in the VME64x with:
  - 95 user defined pins
  or
  - 4.8 mm (nominal) cavity option for P0/J0 and P4/J4 connectors per IEC 61076-4-101
- P5/J5 and P6/J6 connectors using the cPCI family of connectors
- Front panel per IEEE 1101.10
- Ejection/Injection mechanism per IEEE 1101.10
- Locking mechanism per VME64x
- EMC per IEEE 1101.10
- Transition Boards per IEEE 1101.11
- Rear board attachment design guide Appendix B
- 3U and 6U adapter for 9U subracks design guide Appendix C
- Connector layout diagrams in Appendix E.

1.2 Definitions and References

See Appendix A for the new terminology specific to the added features described in this standard. Terminology described in the VME64 and VME64x Standards are not repeated in Appendix A.

Appendix F has a list of IEEE 1101.1, 1101.10 and 1101.11 references which should be useful to the board or subrack designer.

1.3 References

The following publications are used in conjunction with this standard. When they are superseded by an approved revision, that revision shall apply.

IEC 60603-2	IEC Standard for defining two-piece 2.54 mm connectors
IEC 61076-4-113	Proposed addition complementary to IEC 60603-2 Style C connectors. It is the 160 pin connector used in VME64x.
IEC 61076-4-101	IEC Standard for Hard Metric 2 mm Connectors
IEEE 1101.1-1991	IEEE Standard for Mechanical Core Specifications
IEEE 1101.10-1996	IEEE Standard for additional Mechanical Specification for Microcomputers using the IEEE 1101.1 Equipment Practice
IEEE 1101.11-1998	IEEE Standard for Mechanical Rear Plug-in Units Specification for Microcomputers Using the IEEE 1101.1 and the IEEE 1101.10 Equipment Practice
ANSI/VITA 1-1994	VME64 Standard
ANSI/VITA 1.1-1997	VME64 Extensions (VME64x) Standard
cPCI	CompactPCI Specification authored by PICMG (PCI Industrial Computer Manufacturers Group)

1.4 Connector Notes

The 160 pin connector defined in the IEC 61076-4-113 connector specification is an expanded 96 pin connector that is complementary to the IEC 60603-2 Style C connector. Rows a, b & c are identical in form, fit and function to the 96 pin IEC 60603-2 Style C connectors, used in original VME and VME64 applications. Rows z and d add 64 pins to the outer shell for a total of 160 pins.

IEC 61076-4-101 connector specification also defines a 95 pin connector (P0/J0) that fits between the VME64x P1/J1 and P2/J2 connector pairs or between P2/J2 and P5/J5 or P3/J3. The 95 pin connector is a 2 mm Hard Metric style connector which is popular in new bus systems. A 125 and 110 pin 2 mm Hard Metric connector similar to that used by cPCI bus and is an option for use for P5/J5 and P6/J6 respectively.

1.5 Standard Terminology

To avoid confusion and to make very clear what the requirements for compliance are, many of the paragraphs in this standard are labeled with keywords that indicate the type of information they contain. Any text not labeled with one of these keywords describes the VME64x-9U structure or operation. It is written in either a descriptive or a narrative style. These keywords are used as follows:

Rule:

Rules form the basic framework of the VMEbus specification. They are sometimes expressed in text form and sometimes in the form of figures and tables. Rules indicate items that are mandatory for compliance with this document. The words ***shall*** and ***shall not*** are reserved exclusively for stating rules in this document.

Recommendation:

Wherever a recommendation appears, designers would be wise to take the advice given. Doing otherwise might result in poor performance or other problems. While the VMEbus, VME64 and VME64 Extensions architecture has been designed to support high performance systems, it is possible to design a system that complies with all the rules, but has abysmal performance. In many cases, a designer needs a certain level of experience with VMEbus in order to design boards that deliver top performance. Recommendations found in this standard are based on this kind of experience and are provided to designers to speed their traversal of the learning curve. The words ***should*** and ***should not*** are reserved exclusively for stating recommendations.

Permission:

In some cases a rule does not specifically prohibit a certain design approach, but the reader might be left wondering whether that approach might violate the spirit of the rule or whether it might lead to some subtle problem. Permissions reassure the reader that a certain approach is acceptable. The word ***may*** is used for stating permissions in this document but is also used in a more general sense..

Suggestion:

A suggestion contains advice which is helpful but not vital. The reader is encouraged to consider the advice before discarding it. Some design decisions that need to be made are difficult until experience has been gained. Suggestions are included to help a designer who has not yet gained this experience.

Observation:

Observations do not offer specific advice. They provide information and sometimes follow naturally from what has been discussed. They spell out the implications of certain rules and bring attention to things that might otherwise be overlooked. They also give the rationale behind certain rules so that the reader understands why the rule is to be followed.

Chapter 2 - 9U Board and Subrack Sizing

2.1 Introduction

This chapter specifies the sizing of 9U VME boards and subracks. The 9U x 400 mm size was chosen for standardization because of common industry practice for constructing larger VME like boards. With the larger size certain construction problems can arise which were minimal in the 3U and 6U VME hardware. Warp and bow can cause interference with adjacent boards in the subrack. The user is cautioned to add stiffening bars and/or alter the construction of the printed circuit board to minimize this problem. The increased pin count causes the insertion force to increase. This force could result in backplane bowing if not properly addressed. The backplane stiffening problem is complicated if rear transition boards are used (see Appendix B). The larger boards can mean higher power. Cooling is more complicated for 120 watt boards than for 30 watt boards.

2.2 9U Board

Rule 2.2.1 (board size):
VME64x-9U boards shall be constructed to conform to both IEEE 1101.1 and IEEE 1101.10 for 9U board height and 400 mm board depth.

Rule 2.2.2 (keying):
Boards shall have the capability of being keyed in accordance with IEEE 1101.10.

Rule 2.2.3 (connector labels):
The connectors shall be labeled as in Figure 2.2.1. If the connectors in the P5/P6 position are replaced with a connector which is the same as P1 or P2 then it shall be labeled P3.

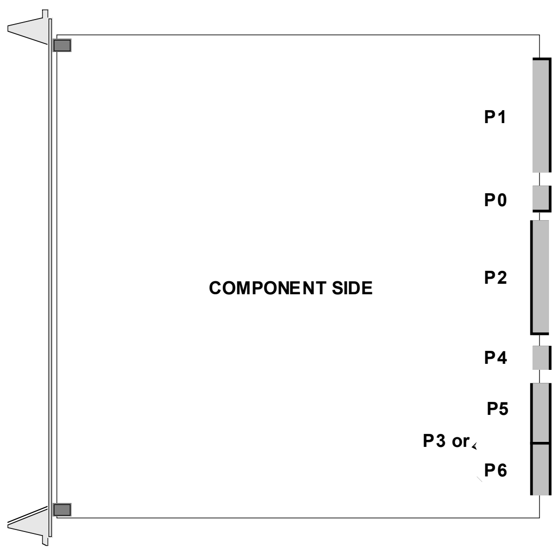


Figure 2.2.1
9U x 400 mm Board
Connector Placement Diagram

Rule 2.2.4 (P1 & P2 placement):
Boards shall have connectors P1, P2 and (if used) P3 located in accordance with IEEE 1101.10.

Rule 2.2.5 (pin assignments):
The pin assignments for P0, P1 and P2 shall be as in VME64x.

Rule 2.2.6 (Hard Metric connector placement):
Connectors P0, P4, P5 and P6 shall be positioned as in Appendix E.

Recommendation 2.2.1 (locking handles):
VME64x-9U boards should be constructed with locking handles per VME64x.

2.3 9U Subrack Backplane

Rule 2.3.1 (backplane rigidity):
VME64x-9U backplane shall maintain sufficient rigidity to meet the mechanical requirements specified in IEEE 1101.1.

Observation 2.3.1 (backplane stiffeners):
If the structural member is not used between both J1-J2 and J2-J5 additional strengthening must be provided to prevent bowing on board insertion. The backplane in this case will have to be a single monolithic unit. Stiffeners may be added vertically but care should be taken to not interfere with transition boards or other rear attachments.

Observation 2.3.2 custom connector interference):
Any custom connector on the backplane should be implemented such that VME64x-9U boards without connectors between P1 and P2 will function in the slots. For example, they should not extend above the height of the existing J1/J2 connectors and intrude into the component space on the board.

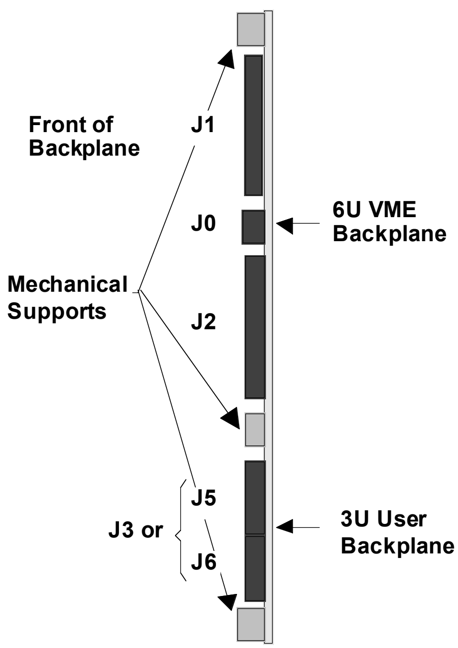


Figure 2.3.1
Split 9U Backplane

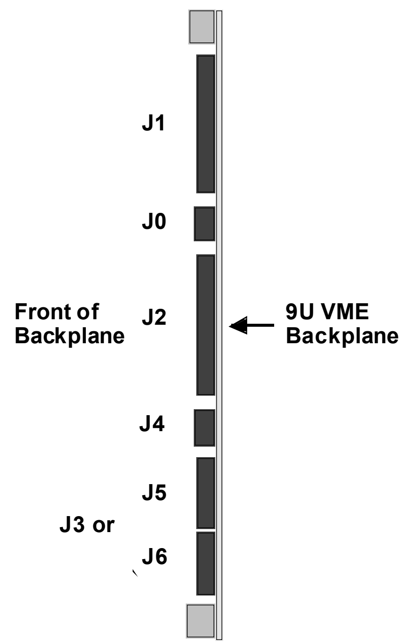


Figure 2.3.2
Monolithic 9U Backplane

Figures 2.3.1 and 2.3.2 show two possibilities for constructing a 9U backplane. In Figure 2.3.1 a "standard" 6U VME backplane is shown at the top with a 3U user custom backplane filling in the bottom. Mechanical supports shown preclude the use of J4. Figure 2.3.2 shows a monolithic 9U VME backplane which permits the use of J4. If rear mounted transitions boards are used other construction constraints may arise. Appendix B discusses these issues. The two figures above are only for example and should not be considered as definitive.

Rule 2.3.2 (structural member position and size):
Structural members which are in positions where connectors could be mounted shall not interfere with boards which have connectors in these positions. For example in Figure 2.3.1 a structural member in the J4 area shall not prevent a VME board which has a P4 connector from being inserted.

Rule 2.3.3 (backplane width):
The width of the backplane shall be as in VME64x.

Observation 2.3.2 (left side interference):
The additional width specified in VME64x is necessary to mount the 2 mm Hard Metric connectors and avoid hitting the left side wall of the subrack.

Rule 2.3.4 (structural members and transition boards):
Rule 2.3.2 shall also apply on the rear of the backplane for transition boards.

2.4 9U Subrack

Rule 2.4.1 (subrack standard):
The VME64x-9U subrack shall conform to IEEE 1101.10. This standard defines subracks which are compatible with keying, injection/ejection handles and EMC.

Rule 2.4.2 (backplane fit to subrack):
The inside width of the subrack shall be as in VME64x to accommodate the backplane in Rule 2.3.3.

Observation 2.4.1 (subrack height for power connections):
Subracks for 9U VME boards may need to be at least 10U in height to provide sufficient space for power connections when rear transition boards are used. See Figure 2.4.1.

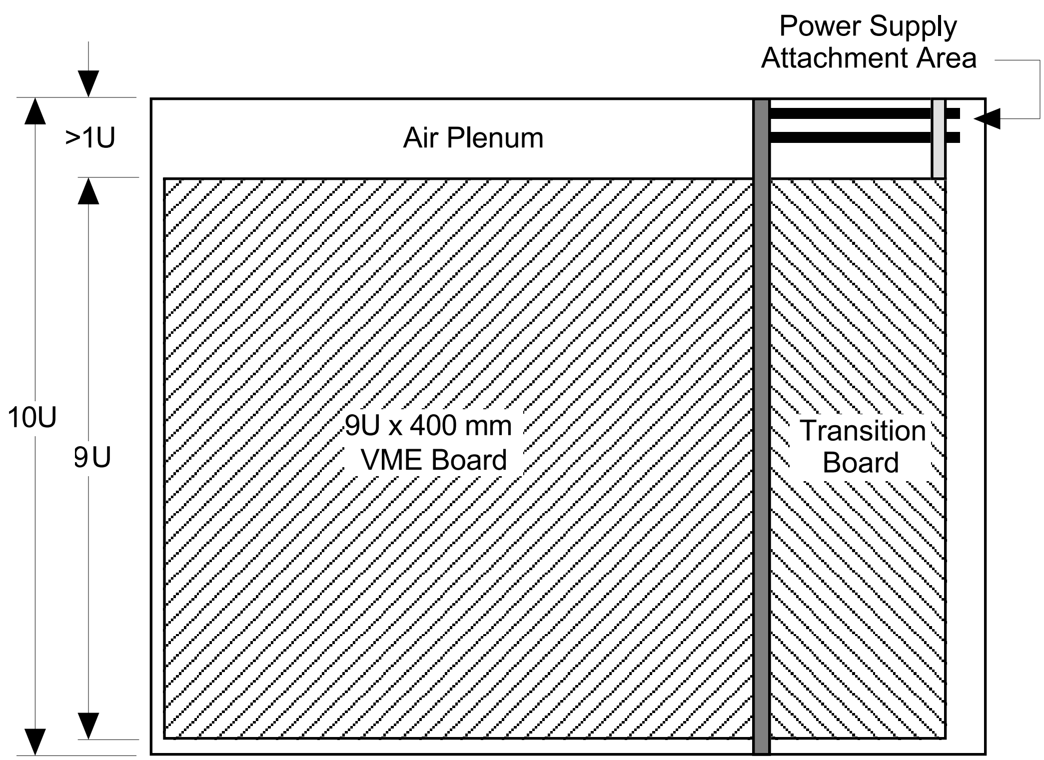


Figure 2.4.1
10U Subrack with Transition Boards
Showing Power Attachment

Observation 2.4.2 (bottom stiffening):
A portion of the added 1U to the subrack may be used at the bottom of the subrack for bracing. The space used at the bottom needs to be restricted, e.g. 10 mm maximum, so sufficient space is at the top for power.

Chapter 3 - P1/J1, P2/J2 Connectors

3.1 Introduction

This chapter defines the P1/J1 and P2/J2 connectors. These connectors and their use are as in VME64x.

3.2 P1/J1 and P2/J2 Connectors

Rule 3.2.1 (board connector types):

VME64x-9U boards that incorporate the usage of the 160 pin connectors for the P1 and P2 connector positions shall use the IEC 61076-4-113 160 pin plug connector.

Rule 3.2.2 (board connector placement):

Placement of the P1 and P2 connectors on VME64x-9U boards shall be per IEEE 1101.10.

Rule 3.2.3 (backplane connector types):

VME64 backplanes that incorporate the 160 pin connectors for the J1 and J2 connector positions shall use the IEC 61076-4-113 160 pin receptacle connector.

Rule 3.2.4 (backplane connector placement):

Placement of the J1 and J2 connectors on VME64 backplanes shall be per IEEE 1101.10.

Permission 3.2.1 (selective loading):

P1 and P2 connectors on VME64x-9U boards may be selectively loaded as specified in the ANSI/VITA 1.1-1997, VME64x Standard.

Rule 3.2.5 (pin assignments):

The assignment of pins in P1/J1 and P2/J2 shall be as specified in the ANSI/VITA 1.1-1997, VME64x Standard.

Chapter 4 - P0/J0 & P4/J4 Connectors

4.1 Introduction

Many manufacturers and users of VME64x-9U boards have a need for additional pins for power and I/O through the backplane. This chapter specifies the requirements and provides observations for implementation of the P0/J0 connector area between the P1/J1 and P2/J2 connectors. Additionally, the location of the optional P4/J4 connector between P2/J2 and P5/J5 is described.

4.2 P0/J0 Connector

Rule 4.2.1 (conformity with VME64x):

The P0/J0 connector shall conform to Chapter 4 of VME64x..

Observation 4.2.2 (caution on special connectors):

VME64x-9U boards using a P0 connector not specified in this document may conflict with VME backplanes that have a mechanical structure member between J1 and J2 connectors.

4.3 P4/J4 Connector

Permission 4.3.1 (additional connector permitted):

VME64x-9U boards and backplanes may be constructed with a P4/J4 connector between P2/J2 and P5/J5 (See Figure 2.2.1 and Figure 2.2.2).

Rule 4.3.1 (compatibility with P0/J0):

The P4/J4 connector shall be conform to the specifications for P0/J0 in Chapter 4 of VME64x.

Observation 4.3.1 (caution on special connectors):

VME64x-9U boards using a P4 connector not specified in this document may conflict with VME backplanes that have a mechanical structure member between J2 and the J5 or J3 connectors.

4.4 P0/J0 & P4/J4 Connector Pin Assignments

Rule 4.4.1 (pin assignments):

The signal pin assignment for P0/J0 and P4/J4 shall be defined by the user.

4.5 Live Insertion

Suggestion 4.5.1 (live insertion issues):

The user should be aware of the live insertion features of the VME64x standard and conform to those features if assigning power to any of the user defined pins.

4.6 Custom P0/J0 & P4/J4 Connectors

Permission 4.6.1 (use of special connectors):

Custom connectors with high current pins, coaxial cable or fiber optic connections may also be used on VME64x-9U boards and backplanes which require specialized custom I/O or power in the P0/J0 and P4/J4 area. These connectors should conform to IEC 61076-4-101.

Rule 4.6.1 (key custom connectors):

Boards that use custom connectors shall use the keying system specified in IEEE 1101.10. The user shall install the keys to prevent damage to the connectors and contacts.

Suggestion 4.6.1 (suggested custom types):

When using connectors with fiber optics, high current pins, coaxial connections, etc. it is suggested that the IEC 61076-4-101 housings with 4.8 mm diameter holes be specified. The use of these connectors will ensure proper alignment and mating depths.

Observation 4.6.1 (compatibility):

Backplanes with custom J0 and/or J4 connectors will not be compatible with VME64x-9U boards containing a P0 and/or P4 connector per Sections 4.2 and 4.3.

Rule 4.6.2 (interference and custom connectors):

Any custom connector on the backplane shall be implemented to ensure that VME64x-9U boards without connectors between P1 and P2 and/or P2 and P5 (or P3) will function in any position. For example, they shall not extend above the height of the existing J2 connectors and intrude into the component space on the board.

Observation 4.6.2 (datum and custom connectors):

If IEC 61076-4-101 connectors are not used for P0/J0 and P4/J4 additional complications in constructing backplanes and boards could arise from different datum and seating planes.

Chapter 5 - P5/J5 & P6/J6 Connectors

5.1 Introduction

This chapter describes the use of the 2 mm Hard Metric connector in the lower 3U of the VME64x-9U board and backplane. The use of these connectors is highly recommended for new designs. The 2 mm Hard Metric connectors are also compatible with the CompactPCI (cPCI) specification. The lower 3U accommodates two connectors, P5/J5 (upper) and P6/J6 (lower) or P3/J3 (see Chapter 6).

5.2 P5/J5 Connectors

Recommendation 5.2.1 (110 pin connector):
VME64x-9U boards should use IEC 61076-4-101, modified Type B female connectors with 22 positions for the P5 connector and the mating male connector for J5 on the backplane.

Observation 5.2.1 (compatibility with CompactPCI):
The connector pair in Recommendation 5.2.1 is the same as the CompactPCI's P2/J2 or P5/J5.

Observation 5.2.2: (VME - cPCI connector and pin numbering)
VME numbers the connectors from the top of the board to the bottom where as CompactPCI numbers from the bottom to the top. Also, the pin rows on CompactPCI are numbered from bottom to top; the reverse of VME.

Suggestion 5.2.1 (CompactPCI standard):
If the P5 and P6 are used for CompactPCI the user is encouraged to obtain the CompactPCI Specification and ANSI/VITA 4.1-1997.

Recommendation 5.2.2 (shields):
When using IEC 61076-4-101 connectors it is recommended that the 5 + 2 versions be used for P5/J5. The board and backplane should contain the hole pattern for attachment of the ground pins and shields.

Rule 5.2.1 (placement of board connectors):
Placement of the P5 connector on VME64x-9U boards shall be as defined in Appendix E of this document.

Rule 5.2.2 (placement of backplane connector):
Placement of the J5 connector on VME64x-9U backplanes shall be as defined in Appendix E of this document.

5.3 P6/J6 Connectors

Recommendation 5.3.1 (125 pin connector):
VME64x-9U boards should use IEC 61076-4-101, Type B female connectors with 25 positions for the P6 connector position and the mating male connector for J6 on the backplane.

Observation 5.3.1 (compatibility with CompactPCI):
This connector is the same as the CompactPCI's P1 or P4 but may not have the CompactPCI connector key.

Observation 5.3.2 (use front panel keys):
The use of the key in the center 3 rows (Type A) for the P6/J6 connector is not necessary since the boards front panel is keyed.

Recommendation 5.3.2 (shields):
When using IEC 61076-4-101 connectors it is recommended that the 5 + 2 version be used for P6/J6. The board and backplane should contain the hole pattern for attachment of the ground pins and shields.

5.4 P5/J5 and P6/J6 Connector Pin Assignments

Rule 5.4.1 (pin assignments):

The signal pin assignments for P5 and P6 shall be defined by the user.

5.5 Live Insertion

Observation 5.5.1:

The user needs to be aware of the live insertion features of the VME64x standard and conform to those features if assigning power to any of the user defined pins.

5.6 Custom P5/J5 and P6/J6 Connectors

Permission 5.6.1:

Connectors with high current pins, coaxial cable or fiber optic connections may also be used on VME64x-9U boards and backplanes which require specialized custom I/O or power in the P5/J5 and P6/J6 area. These connectors should conform to IEC 61076-4-101.

Rule 5.6.1:

Boards that use custom connectors shall use the keying system specified in IEEE 1101.10. The user shall install the keys to prevent damage to the connectors and contacts.

Suggestion 5.6.1:

When using connectors for fiber optics, high current pins, coaxial connections, etc. it is suggested that one use the IEC 61076-4-101 housings with 4.8 mm diameter holes. The use of these connectors will ensure proper alignment and mating depths.

Observation 5.6.1:

Backplanes with custom connectors will not be compatible with VME64x-9U boards containing a P5 or P6 connector per Recommendation 5.2.1 and 5.3.1.

Rule 5.6.2:

Any custom connector on the backplane shall be implemented such that VME64x-9U boards without connectors in P5 and P6 will function in any position. For example, they shall not extend above the height of the existing J1/J2 connectors intruding into the component space on the board.

Observation 5.6.2:

If IEC 61076-4-101 connectors are not used for P5/J5 and P6/J6 additional complications in constructing backplanes and boards could arise from different datum and seating planes.

Chapter 6 - P3/J3 Connectors

6.1 Introduction

The IEC 602 style connectors with either 96 pins or 160 pins can be used in the lower 3U of the 9U board and backplane in place of the P5/J5 and P6/J6 connectors in Chapter 5.

6.2 P3/J3 Connectors

Permission 6.2.1 (160 pin connector):
VME64x-9U boards may use the IEC 61076-4-113, 160 pin connectors in the P3/J3 connector position.

Permission 6.2.2 (96 pin connector):
VME64x-9U boards may use the IEC 60603-2, type M, Class 2, 96 pin connectors in the P3/J3 position.

Rule 6.2.1 (board connector placement):
The P3 board connector shall be placed as specified in IEEE 1101.10.

Rule 6.2.2 (backplane connector placement):
The J3 backplane connector shall be placed as specified in IEEE 1101.10.

Chapter 7 - EMC Front Panels and Subracks

7.1 Introduction

This chapter specifies the optional usage of EMC front panels on VME64x-9U boards. In some applications there is a need to restrict the amount of EMI and RFI being radiated from the front of a VME64x-9U subrack without the aid of a special cover. The EMC front panels and subracks specified in IEEE 1101.10 are intended to provide this capability.

7.2 Requirements

Rule 7.2.1 (EMC front panels):
VME64x-9U boards that require the use of an EMC front panel shall use the EMC front panel as specified in IEEE 1101.10.

Rule 7.2.2 (extra board/panel attachment):
The circuit board shall be secured to the front panel at the top and bottom locations as specified in IEEE 1101.10 and additionally have at least one mounting block near the center of the front panel.

Suggestion 7.2.1 (EMC good design practice):
The use of EMC/EMI hardware should always be considered by the designer to reduce electrical interference. The extra cost is minimal but the potential benefits are large.

Rule 7.2.3 (EMC filler panels):
When filler panels are used in conjunction with VME64x-9U boards that have EMC front panels, the filler panels shall provide EMC protection. Filler panels shall comply with the filler panels as specified in IEEE 1101.10.

Rule 7.2.4 (standard for EMC construction):
VME64x-9U subracks that are to be used in conjunction with VME64x-9U EMC front panels shall meet the subrack specification given in IEEE 1101.10.

Rule 7.2.5 (no ground connection):
The EMC front panels shall *not* be connected to the board logic ground plane (GND) or the ESD strips (if implemented).

Observation 7.2.1 (discharge path):
Any electrical charge build up on the front panel will be discharged into the system chassis through the ESD contacts between the front panel and the chassis.

Chapter 8 - Injector/Extractor/Locking Handles

8.1 Introduction

The 9U board with five row connectors will need mechanical assistance during the insertion and/or removal (extraction) from subracks. Over 700 pins can be on a 9U board. An Injector/Extractor Handle and associated subrack defined in IEEE 1101.10 serves this purpose. A locking mechanism is defined in VME64x.

The usage of screws to secure VME64x-9U boards to a subrack is discouraged. The screw heads can become damaged, plus the usage of a tool would be required to remove and replace VME64x-9U boards from a sub-rack. The locking features built into the injector/extractor/locking handle will aid in preventing VME64x-9U boards from becoming loose under IEC 68-2-6 (1982) vibration conditions.

8.2 Front Panel Handles

Rule 8.2.1 (injector/ejector handles):
The Injector/Extractor Handle used on VME64x-9U boards shall be in compliance with the handle defined in IEEE 1101.10.

Rule 8.2.2 (locking handles):
The locking mechanism shall be as specified in VME64x.

8.3 Subracks

A slotted lip is provided on the front of IEEE 1101.10 subracks to support the usage of the referenced Injector/Extractor Handle.

Rule 8.3.1 (injector/ejector handles):
Subracks shall support the usage of the Injector/Extractor Handle and be as defined in IEEE 1101.10.

Observation 8.3.1 (screws):
Subracks which conform to IEEE 1101.10 will accommodate VME boards which have securing screws on the front panel.

Chapter 9 - ESD Protection

9.1 Introduction

In some VME64 applications, boards being plugged into a VME64 subrack are required to have static electricity bled off prior to contact with the backplane. This is known as electrostatic discharge (ESD) protection. Two schemes for implementation of this capability are defined in IEEE 1101.10.

9.2 ESD Strips on VME64x-9U Boards

Rule 9.2.1 (ESD strips):

VME64x-9U boards that are designed to provide electrostatic discharge capability shall use one or two ESD Strips in one or both of the following locations: bottom edge or top edge on the component side of the PCB. Position and size of the ESD strip(s) shall be in compliance with the ESD Strips defined in IEEE 1101.10.

Rule 9.2.2 (resistors for ESD):

Two 1 Megohm resistors, +/- 20%, in series, shall be connected between each of the ESD strip(s) implemented and the board's ground plane for discharge of electrostatic energy.

Rule 9.2.3 (clip contact break):

The ESD Strip on the printed circuit board shall break contact with the subrack ESD contact spring prior to the connector engagement.

Observation 9.2.1 (disconnect ESD when inserted):

The board's ESD strip is in contact with the subrack's ESD contact spring clip during most of the boards insertion into a subrack. The ESD strip is disconnected from the ESD clip when the board is fully inserted into the backplane. This feature reduces ground loop problems.

9.3 ESD Clips in 9U Card Guides and Subracks

Rule 9.3.1 (subrack ESD clips):

All VME64x-9U Systems that provide ESD protection shall use subracks and card guides with ESD contact spring clips on both the top and bottom per the requirements specified in IEEE 1101.10.

Appendix A

Glossary of Additional VME64x-9U Terms

A.1 Introduction

This is an extension of the terms defined in the VME64 and VME64x Standards, Appendix A. Terminology described in these Standards are not repeated in this standard. Refer to the VME64 and VME64x Standards for a complete listing of the VME64 Terminology.

Board
A term used to describe the assembly consisting of a printed circuit board, front panel, handles, backplane connectors, etc. which plug into the front of a VME backplane. Also called plug-in unit in some documents.

Transition Board
A term used to describe the assembly consisting of a printed circuit board, front panel, handles, backplane connectors, etc. which plug into the rear of a VME backplane.

P0/J0 Connector Area
A term used to describe the area on a VME64 board between the P1 and P2 connectors and on a VME64 backplane between the J1 and J2 connectors. The area is used to mount additional connectors for user defined I/O or power on VME64 boards through the VME64 backplane.

P4/J4 Connector Area
A term used to describe the area on a VME64x-9U board between the P2 and P5 connectors and on a VME64x-9U backplane between the J2 and J5 connectors. The area is used to mount additional connectors for user defined or power on VME64x-9U boards through the VME64x-9U backplane.

Pins
A term used to describe a connectors physical mechanism of connecting a signal between a board and backplane. The expanded IEC 60603-2 connector described in IEC 61076-4-113 Standard, provides additional contacts on the connector's outer shell. These are physically blade-on-beam style contacts. Within this standard, the term "pin" is used to represent both styles of connector contacts.

Appendix B

Rear Transition Boards Design Guide

B.1 Introduction

The user connection area at the rear of the backplane sometimes necessitates the use of transition boards. This section may help the user needing these boards. Transition Boards are used when cables cannot directly attach to the backplane. They may also be used when electronics is needed between the cable and the VME board.

B.2 Transition Board Sizes

Rear transition boards should conform to IEEE 1101.11 sizing rules. When boards are sized in accordance with this method the user has the advantage of standard hardware. Standardization of hardware results in more cost effective equipment and a minimization of design time. Transition boards may be of any height to accommodate particular systems. In some cases the power connections into the backplane may be complicated by the presence of these boards attached to the rear. The backplane and associated hardware should be constructed in a way that a notch in the transition board in the area of RJ0/RP0 or RJ4/RP4 is not necessary.

Recommendation B.2.1 (transition board sizes):
Transition board sizes should conform to IEEE 1101.11.

Observation B.2.1 (subrack depth issues):
Transition board depth affects not only the subrack depth but also the rack depth. The 400 mm depth of the 9U VME board, 80 mm depth of the transition board and the thickness of the backplane with associated hardware of about 25 mm makes the total depth of over 500 mm (20.7 in). When power, cabling and other hardware is added the required rack depth can easily exceed 750 mm (30 in).

Rule B.2.1 (alignment of 2 mm connectors):
If a Transition Board has the 2 mm Hard Metric connectors at RP0 or RP4 or RP5 or RP6 it shall have RP2 to provide vertical guidance.

Permission B.2.1 (no RP2 pin required):
An RP2 shell only may be used for guidance if no connections are necessary.

B.2.1 Examples of Rear Boards

The following figures illustrate several sizes of transition boards. For simplicity the board panels have been omitted in all cases. The use of panels is recommended on transition boards. The panels facilitate the flow of air for proper cooling. Connections are not shown to RJ1 in these diagrams. If powered components are used on the transition boards a connection could be made to RJ1. Since bus bars may block access to RJ1 in the rear a better method is to have power fed through another connector by the user.

In Figure B.2.1.1 two 3U transition boards are attached to RJ2 and RJ5 - RJ6. In this configuration the mechanical supports can either be mounted as shown of on the front of the backplane as long as they conform to IEEE 1101.11 for clearance. Figure B.2.1.2 is similar but with the 3U board is replaced by a single 6U board.

Figures B.2.1.3 and B.2.1.4 show the transition boards attaching to RJ0 or RJ4. The case of both RJ0 and RJ4 is not illustrated. Figure B.2.1.3 shows an optional 9U transition board if more attachment space is needed. In Figure B.2.1.4 the 9U board is necessary for the attachment to RJ0. The case of both RJ0 and RJ4 is possible but not shown.

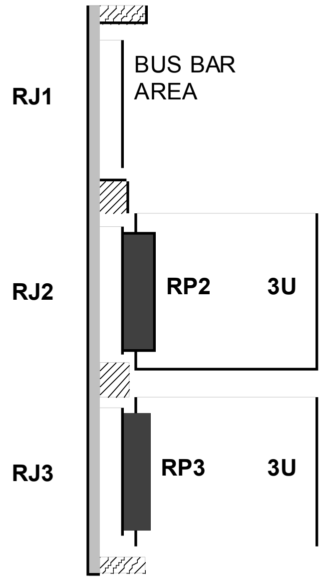


Figure B.2.1.1
Two 3U Transition Boards

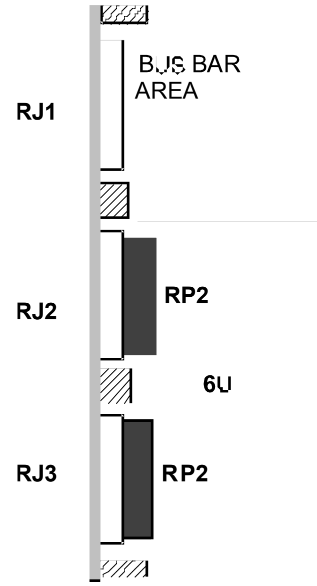


Figure B.2.1.2
6U Transition Boards

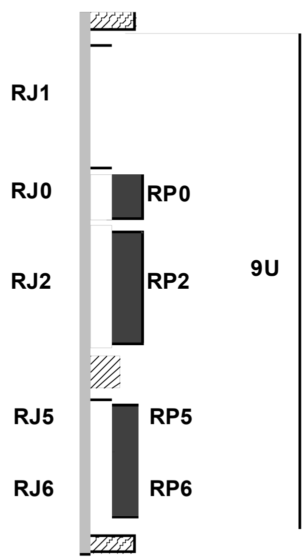


Figure B.2.1.3
Side View
9U Transition Board
P0/J0 Connector

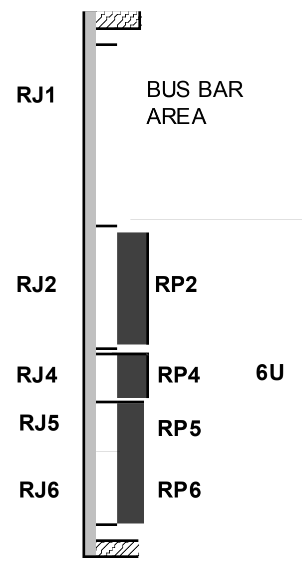
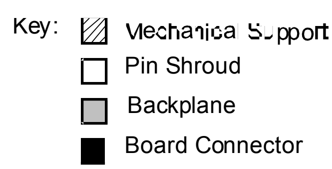


Figure B.2.1.4
Side View
6U Transition Board
P4/J4 Connector



Key for Figures B.2.1.1 through B.2.1.4

The area behind RJ1 is generally used for bus bars in VME subracks. When transition boards are used which are behind RJ1 (see Figure B.2.1.3) the connection of power to the backplane is difficult. Because of this a backplane which is about 1U higher will aid in making these connections (see Figure 2.3.1).

Recommendation B.2.1.1 (transition board preferred heights):
Transition boards should be sized in increments of 3U in height, e.g. 3U, 6U or 9U. This conforms to front board panel sizing in IEEE 1101.11.

B.3 Sub Racks

B.3.1 and B.3.2 discuss issues arising from various configurations of rear mounted transition boards. The impact on subrack design is described in B.3.3 for systems that require the use of all rear transition board slots. In section B.3.4 reference surfaces are described for positioning card guides.

B.3.1 In-line Transition Boards

Figures B.3.1.2 and B.3.1.3 show the in-line configuration using the 96 pin connector and a connector similar to the 160 pin Type TE except that the mounting surface is offset 2.54 mm (0.100 in) to bring the transition board printed circuit board coplanar with the VME board printed circuit board.

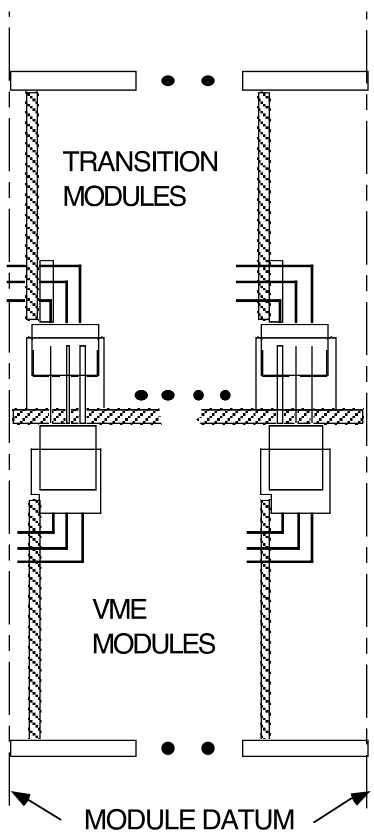


Figure B.3.1.1
Top View
96 Pin Connector
In-line Transition Boards

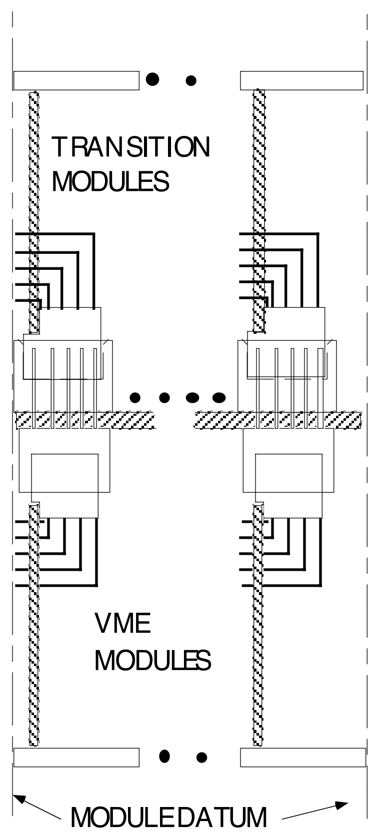


Figure B.3.1.2
Top View
160 Pin Type Offset Connector
In-line Transition Boards

Recommendation B.3.1.1 (in-line configuration):
It is recommended that transition boards be oriented as shown in Figures B.3.1.1 and Figure B.3.1.2. This orientation is defined as *in-line*.

Observation B.3.1.1 (in-line and ground paths):
The in-line orientation minimizes the length of the ground pins and thereby minimizes the lead inductance. The minimal ground lead inductance will provide a transition board with active components the best electrical environment.

Recommendation B.3.1.2 (air flow):
If rear transition boards are powered the gaps between the board panels and the subrack sides should be filled to properly guide the air flow.

Observation B.3.1.2 (preferred connectors):
The use of IEC 61076-4-101 style connectors are compatible with the in-line configuration shown in Figures B.3.1.1 and B.3.1.2. The IEC 61076-4-101 and the IEC 602 connectors used for RP1/RJ1 and RP2/RJ2 can be mixed on a Transition Board and maintain proper alignment and insertion depth.

Observation B.3.1.3 (datum problems):
Connectors which do not have the same mounting datum's as the recommended IEC 602 and IEC 61076-4-101 connectors may not properly mate when used on Transition Boards.

B.3.2 Connector Pin Mating Table

The following is background information on connector pin number correspondence with the various connectors and transition board orientations. Figure B.3.2.1 shows the 160 pin connector mating with a 96 pin reverse female DIN connector. Other combinations are possible but not shown. Table B.3.2.1 lists other mating connectors and the pin numbering. VME64x also discusses numbering for Transition Boards when mated with VME boards in Chapter 9.

VME Std. DIN Pin No.	96 Pin DIN In Line Rev - Adpt		160 Pin DIN In Line Rev - Adpt	
Z1	--	--	Z32	Z1
A1	A32	A1	A32	A1
B1	B32	B1	B32	B1
C1	C32	C1	C32	C1
D1	--	--	D32	D1
• •	• •	• •	• •	• •
• •	• •	• •	• •	• •
Z32	--	--	Z1	Z32
A32	A1	A32	A1	A32
B32	B1	B32	B1	B32
C32	C1	C32	C1	C32
D32	--	--	D1	D32

Table B.3.2.1
Pin Mating Table for Transition Boards

Notes to Table

Rev Right angle **Rev**erse female connector per DIN 41612. Female connector which fits male connector printed circuit board pattern without pin number change.

Adpt Right angle **Adapt**er female connector per DIN 41612. Female connector which is a backplane connector bent for printed circuit board insertion. Pin numbers do not match male printed circuit connectors.

In Line Transition board in line with VME board. See B.3.1.

B.3.3 Subrack Construction

Figure B.3.3.1 shows the top view of a subrack with a rear transition board area. The actual distance inside the wall will be greater than that shown to accommodate the backplane (see Rule 2.2.3).

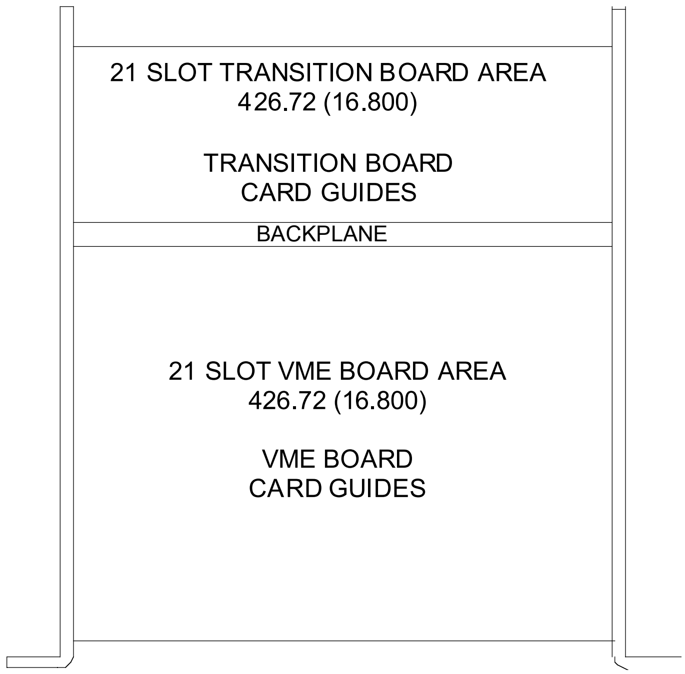


Figure B.3.3.1
Subrack with
Transition Boards Card Area

B.3.4 Transition Board Card Guides

Rule B.3.4.1 (card guide position):
The location of card guides, as viewed from the front of the subrack, in the horizontal and vertical planes shall be the same as for the front boards.

Rule B.3.4.2 (card guide backplane reference):
The position for the card guides perpendicular to the backplane shall be referenced from the front surface of the backplane. The dimensions shall be as given in IEEE 1101.11.

Rule B.3.4.3 (pin insertion depth):
The pin insertion depth shall be as given in IEEE 1101.11.

Rule B.3.4.4 (rear shroud):
The dimensions for mounting the shroud and other hardware for the transition board are detailed in IEEE 1101.11.

B.4 Backplanes

The construction of the backplane is determined by the use of RJ0 and/or RJ4. If RJ4 is not used, the VME64 bus can be on one printed circuit board and the RJ5/RJ6 part of the backplane on another. In this configuration the user specifies a "standard" VME64 backplane and develops a special backplane only for RJ5 and RJ6. When using RJ4 a monolithic backplane is necessary. Figures 2.2.1 and 2.2.2 show two possible backplane configurations and mechanical supports. Other construction techniques are possible.

Rule B.4.1 (backplane standards):

The 9U x 400 mm subrack and backplane assembly shall conform to IEEE 1101.1 or IEEE 1101.10. Backplanes used with transition boards shall additionally conform to IEEE 1101.11

Rule B.4.2 (backplane stiffness):

The backplane stiffness in combination with the mating tolerances for the connectors shall be such that the connector contact wipe meets the minimum specified for each connector type.

Observation B.4.1 (backplane deflection):

The maximum deflection of the backplane under any combination of RJ0 through RJ4 should be less than 0.5 mm. This number should not be used as definitive, however, this is an indication of the rigidity necessary. This stiffness criteria may be obtained by a combination of backplane thickness and supporting bars. The correct deflection can be obtained by obeying Rule B.4.2.

Observation B.4.2 (extra backplane supports):

Although backplane supports are shown in only the horizontal plane in Figures B.2.1.1 through B.2.1.4, vertical supports may also be required.

Observation B.4.3 (support interference with transition boards):

The use of mechanical supports at the rear of the backplane may conflict with the use of transition boards.

Recommendation B.4.1 (rear pin length):

For the best electrical characteristics, the VME bus signal pins on RJ1 and RJ2 should be only long enough to ensure reliable contact with the backplane. The power and user defined pins may be long enough to facilitate rear attachment.

B.5 Electronics on Transition Boards

The use of electronics is permitted on transition boards. The system designer is cautioned that cooling, live insertion, inrush current control, etc. need to be considered when powering these boards just as when powering standard VME boards. Power may be obtained from RJ1 or RJ2. The designer may also derive power from a user defined pin(s) on any connector (RJ0, RJ2, RJ4, RJ5, RJ6 or RJ3). If the transition board is powered from inside the associated VME board the current rating of that VME boards power pins must include the transition boards power also (see ANSI/VITA 1-1994). The total current is the sum of the board current *and* the transition board current. If power is supplied from the backplane by connecting to the specified pins on RJ1 and/or RJ2 or user defined pins on RJ0, RJ2, RJ4, RJ5 and/or RJ6 or RJ3 then only the current ratings of those pins connected to the transition board need to be considered. Because of difficulties in constructing backplanes the RJ1 connector may not be available from the rear.

Rule B.5.1 (powered transition board construction):

Transition boards which are powered shall be constructed similar to front VME boards. Transition boards shall include board panels, injectors/ejectors and, where necessary, EMC hardware as in IEEE 1101.10.

Rule B.5.2 (no attachment to VMEbus):

Transition boards shall not attach to the VME bus signals as defined in ANSI/VITA 1.1-1997. The extra loading of these boards on the VME bus can cause signal distortions and potentially poor performance. (see Recommendation B.4.1)

Permission B.5.1 (attach to user pins only):

The transition board may attach to the rear user defined or power pins of RJ1 and/or RJ2.

Observation B.5.1 (attaching to power):
When drawing power from both sides of the same power pin the current carrying capacity of that pins connection to the backplane should be checked. For example, if the rated current is drawn from both sides of the pin the point of attachment to the power plane is *twice* that current. If the contact resistance at the power plane interface is to high heating of that connection could lead to failure.

Observation B.5.2 (transition board panels):
When mixing powered and unpowered transition boards in the same subrack the unpowered boards should also be constructed with board panels. The use of panels on all boards will facilitate the control of cooling air through any board which is powered. The omission of these panels can result in air bypassing components resulting in overheating.

B.6 Transition Board Cooling

For maximum reliability both VME boards and transition boards should be cooled so that the maximum die temperature does not exceed 85°C. Several methods can be used for directing air through the system. Figure B.6.1 is a general diagram of a cooling system for subracks. The simplest is to place a fan tray below the subrack and direct the air through the boards, exhausting the heated air to the atmosphere. Where several subracks are placed in a vertical configuration the exhausted air might be collected in a plenum and directed to the front or rear of the rack.

Another possibility is to replace the plenum with a heat exchanger which recools the air. In this case a single air mover might be used. After the air is heated by a subrack the heat exchanger recools that air before it enters the next subrack. This scheme lends itself to constructing closed rack systems. The air out of the last subrack is ducted to the air mover inlet, cooled and recirculated. Closed systems remain cleaner and reduce noise. Fire safety is enhanced by the closed rack. The flames are contained and the rack which can be flooded with a fire suppressant gas. The closed rack is very effective means for getting the suppressants at the fire source and reducing human exposure to these chemicals.

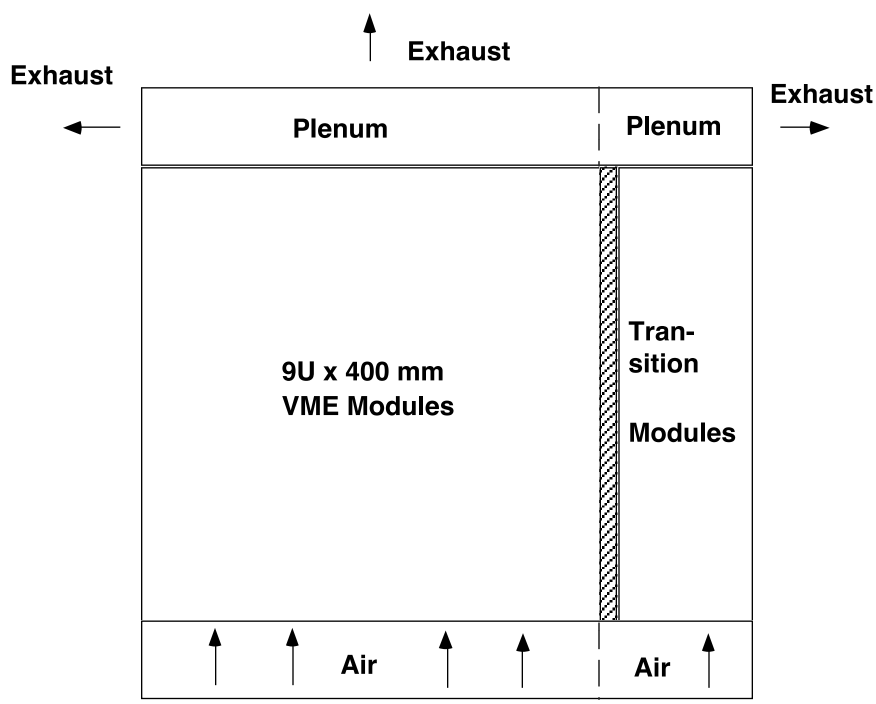


Figure B.6.1
Subrack Air Flow
VME & Transition Boards

Appendix C

Adapter Boards for 3U & 6U VME
Design Guide

C.1 Introduction

In many cases users will want to use available 3U or 6U x 160 mm VME boards in a system with 9U x 400 mm hardware. This annex shows various methods of adapting the 6U VME into a 9U subracks. Some methods do not require alterations of the 3U or 6U board. In other schemes the front panel is removed and the board printed circuit board mounted in a carrying frame. If the front panel is removed the board may need adapters to bring the boards front accessible features to the 9U carrier front panel. The user must consider cooling of not only 9U boards but also boards in the carrier. The carrier should not obstruct the airflow to either the board in the adapter or any adjacent board. Before any modification of a VME board is made the user should contact the manufacturer.

C.2 Adapters without Interface Electronics

It is possible to mount some 3U or 6U VMEbus boards in a carrier without any electronics between the board and the bus. If the bus is to perform at the maximum rate and reliability the adapter must not add stubs or other loads to the bus. Stubs on a 9U adapter could be as long as 300 mm. This length would severely distort the bus signals and potentially cause errors. The designer should be familiar with the high speed signaling requirements of the VME64x.

C.2.1 3U and 6U Adapters

Rule C.2.1.1 (6U adapter without buffering electronics):
When mounting 6U VME boards in an adapter frame for a 9U subrack which does not have buffering electronics between the board and the VME bus the board shall be positioned in the adapter such that the 6U board attaches directly to the backplane connectors. Adapters similar to Figure C.2.1.1 or C.2.1.2 are acceptable configurations.

Recommendation C.2.1.1 (stub length):
To keep the stub length minimized it is recommended that the front panel be removed from a 6U VME board which is inserted into a 9U subrack adapter without electronics for buffering the bus. Before making this modification contact the manufacturer.

Observation C.2.1.1 (maximum stub):
If the front panel if the 6U VME board was retained it would have to be offset downward by 16.8 mm and placed as close to the rear as possible as in Figure C.2.1.4. The adapter would have connectors to plug the 6U board into and short traces connecting to the 9U adapter P0, P1 and P2. In this case the shortest stub obtainable is about 25 mm. This length of trace when added to the allowed trace length on the VME board is twice as long as that which maintains maximum bus performance and is therefore not recommended. See VITA 2-199x.

Rule C.2.1.2 (adapter stubs):
Any adapter which adds a stub of more than 10 mm shall not be used on the VME bus. An adapter similar to Figure C.2.1.3 is *not* an acceptable configuration.

Suggestion C.2.1.1 (securing board to adapter):
"Front mounting hardware" is shown in two places in figure C.2.1.1 and C.2.1.2. When the front panel is removed the holes used for attaching the front panel to the printed circuit board may be used for securing the board to the adapter.

Recommendation C.2.1.2 (adapter provision for other connectors):
Board adapters shown in Figures C.2.1.1 and C.2.1.2 should have provisions for installing P2, P4, P5 and P6 in the case of 3U adapters and P5 and P6 in the case of 6U adapters. The possible connectors are discussed in Chapters 2 and 3.

Observation C.2.1.2 (user defined pins):
The use of connectors containing user defined pins may require other hardware on the 9U adapter board.

Recommendation C.2.1.3 (adapter latch):
Board adapters which are similar to that shown in Figure C.3.1.1 should have provisions for a "latch bracket" so 3U or 6U boards can be retained with the hardware in Chapter 6. It is also recommended that the adapters implement the EMC provisions in Chapter 5 and the ESD protection in Chapter 7 in such a way that boards plugged into the adapter have the same protection as if they were plugged into their "natural" subrack directly.

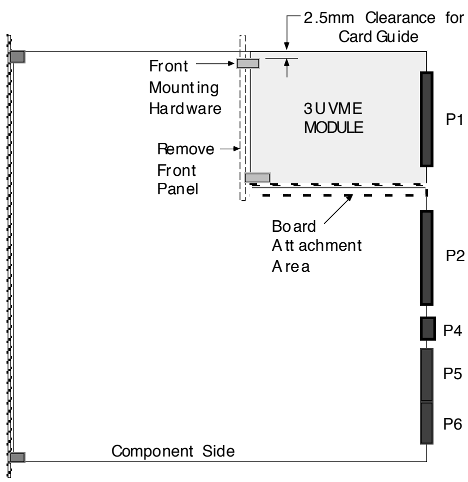


Figure C.2.1.1
3U VME Adapter
Board Front Panel Removed

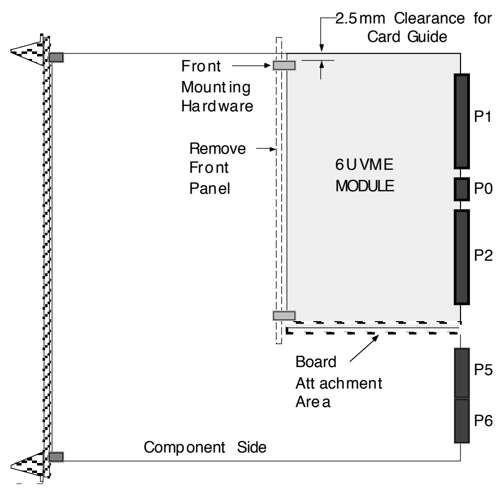


Figure C.2.1.2
6U VME Adapter
Board Front Panel Removed

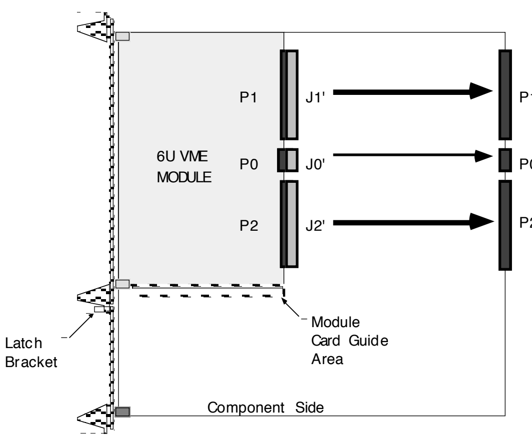


Figure C.2.1.3
6U VME Adapter
Board Front Panel Retained
Front Mount
(This method is not acceptable)

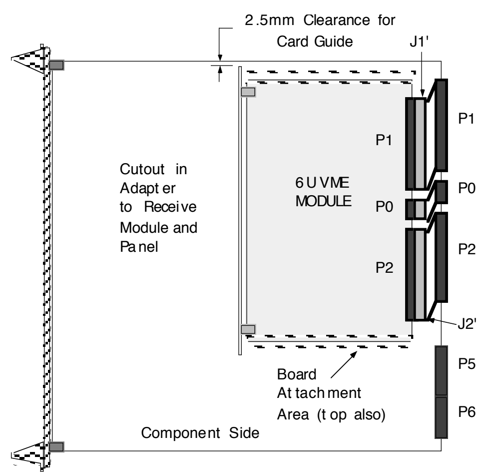


Figure C.2.1.4
6U VME Adapter
Board Front Panel Retained
Rear Mount
(This method is not acceptable)

C.2.2 Subracks for Mixed Board Sizes

It is possible to build subracks for a mix of board sizes within the IEEE 1101.1 and IEEE 1101.10 standards. These subracks have rails the proper length at each slot position to accommodate boards of different depths. This subrack construction technique is difficult to change and so requires that the system designer knows what depth board is going to be at each position. Also, cooling must be addressed since the front panel no longer "seal" the air flow. Some plates will be required in front of the shorter boards for air steering.

C.3 Adapters with Interface Electronics

The addition of electronics to the 9U adapter board can add some features for the user and allow 3U or 6U VMEbus boards to be used without modification. In addition the 3U or 6U VMEbus boards can be inserted and removed easily and the front panel hardware is directly accessible.

C.3.1 6U Adapters

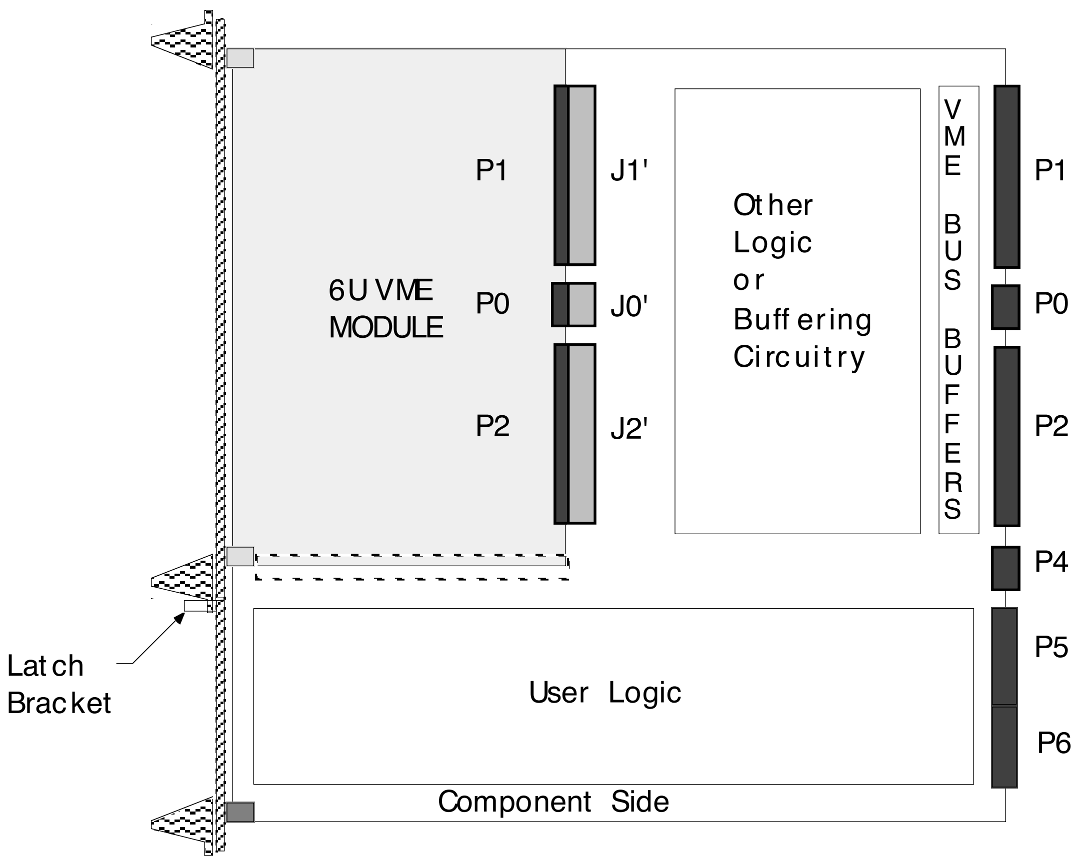


Figure C.3.1.1
6U VME Adapter with Electronics
Front Panel Retained

Appendix D

Existing 9U Hardware Compatibility Issues and Guidelines for use with this Standard

D.1 "SUN" Boards

SUN Microsystems, Inc. chose to use VME in their line of computer systems in about 1985. SUN computers used the 32 bit VME bus but needed boards which could accommodate 400 to 500 IC's. In keeping with the Eurocard packaging of VME SUN chose to use a 9U high by 400 mm deep format. SUN used the J3/P3 connector position to bring in additional power which was needed for the large format card. The front panel retention hardware doesn't conform to IEEE 1101.1. Also, some SUN boards are 2.35 mm thick and may not work in card guides designed for 1.6 mm thick boards.

D.1.1 SUN Board Format

The SUN board follows the Eurocard standard for size and connector position. In addition SUN specified board stiffeners in the middle and near the rear connectors. See Figure D.1.1.1 below.

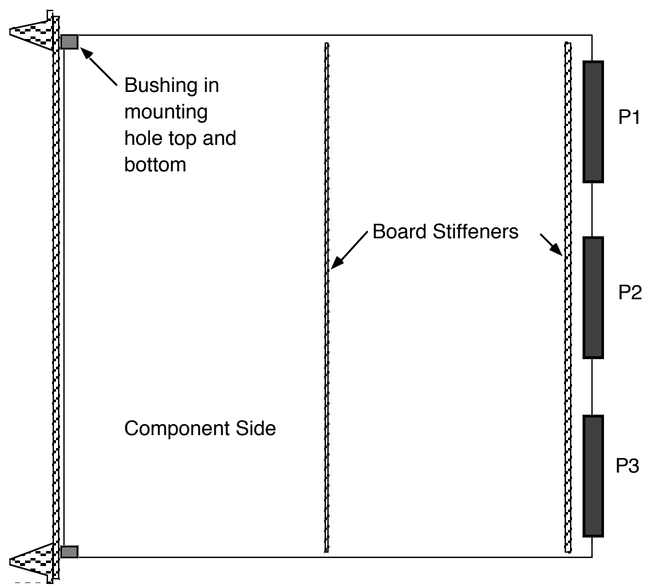


Figure D.1.1.1
Stiffener Positions and Panel Mounting Holes

D.1.2 SUN J3/P3 Pin Assignments

The following table lists at least one of the SUN pin assignment for the J3/P3 connector. J1/P1 is standard VME. J2/P2 is standard VME on row B. Rows A and C (user defined) are used by SUN and defined as intra-board buses. J3/P3 has power on rows A and C. Row B is used for other bus connections defined by SUN.

Pin #	Row A	Row B	Row C
1	+5V	RES	GND
2	+5V	RES	GND
3	+5V	RES	GND
4	+5V	RES	GND
5	+5V	RES	GND
6	+5V	RES	GND
7	+5V	RES	GND
8	+5V	RES	GND
9	+5V	RES	GND
10	+5V	RES	GND
11	+5V	RES	GND
12	+5V	RES	GND
13	+5V	RES	GND
14	+5V	RES	GND
15	+5V	RES	GND
16	+5V	RES	GND
17	+5V	RES	GND
18	+5V	RES	GND
19	+5V	RES	GND
20	+5V	RES	GND
21	+5V	RES	GND
22	+5V	RES	GND
23	+5V	RES	GND
24	+5V	RES	GND
25	+5V	RES	GND
26	+12V	RES	+12V
27	+12V	RES	+12V
28	-12V	RES	-12V
29	-12V	RES	-12V
30	-5V	RES	-5V
31	-5V	RES	-5V
32	-5V	RES	-5V

Table D.1.2.1
J3/P3 Connector Pin Assignments

SUN defined their use of the VME connectors before the 160 pin connector was introduced. Because of the backward compatibility of the connector mechanics the SUN board can be inserted into a new 160 pin backplane. The electrical connections, however, must be checked for compatibility.

Observation D.1.2.1 (conflicting SUN pinouts)
Other pinouts and incompatible connectors can be used for P3/J3. The system designer should carefully check the pin usage and connector type before inserting these boards into a subrack. The use of keys specified in IEEE 1101.10 will avoid these problems.

D.1.3 Modifications for this Standard

SUN board can be converted to be compatible with IEEE 1101.10. The front panel and associated hardware are removed and replaced with hardware that is specified in IEEE 1101.10. The only incompatibility is in the diameter of the holes at the top and bottom of the front edge (see Figure D.1.1.1) which are used to mount the panel and injector/ejector hardware. The IEEE 1101.10 standard specifies these holes at 2.7 mm diameter. The SUN mechanics specifies these holes at 3.17 mm diameter. A simple bushing inserted into the hole on the SUN board will solve the discrepancy in diameter and allow a correct fit. The location of the center of these holes is in the same position in both specifications.

Appendix E

Connector Layout Dimensions for 9U x 400 mm VME

E.1 Connector Layout Dimensions for VME Board

Two options for connectors are available to designers of 9U x 400 mm VME boards. The 110 pin plus shield P5 and the 125 pin plus shield 2 mm Hard Metric connector, or its derivatives, per IEC 61076-4-101. The P5 andP6 combination are similar to the connectors used by CompactPCI. The second option uses the 160 pin VME connector per IEC 61076-4-113 at the P3 position. This is the connector which is also used for J1 and J2.

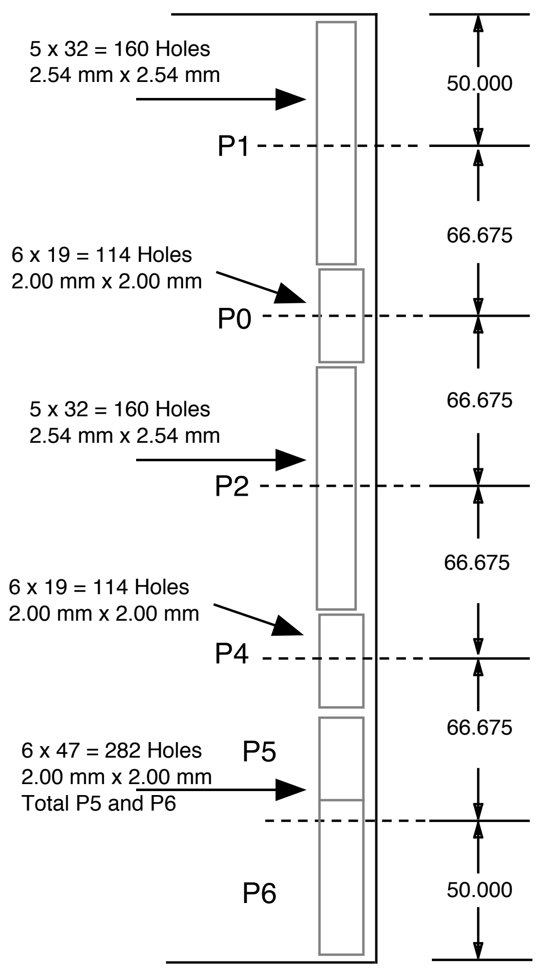


Figure E.1.1
9U VME Board
Connector Placement
2 mm Hard Metric at P5 & P6

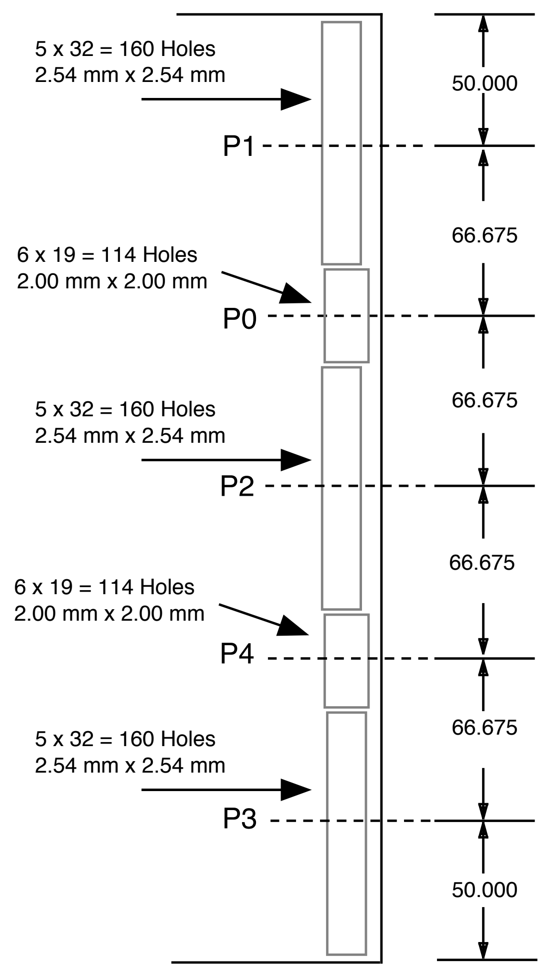


Figure E.1.2
9U VME Board
Connector Placement
160 Pin VME at P3

Chapter 4 of VME64x shows a detail for placement of the connectors relative to the board edge and the center-to-center distance. The patterns for P2, P4, P5 and P6 are similar to those shown in VME64x.

E.2 Connector Layout Dimensions for 9U VME Backplane

The backplane hole pattern shown in Chapter 4 of VME64x specifies the relation between the 2 mm Hard Metric and the 160 pin backplane connector. The relations between J2, J4, J5 and J6 are similar. The connector center distances can be obtained from Figures E.1.1 and E.1.2. The backplane hole pattern for the 160 pin J1 and J2 are as in IEEE 1101.10.

Recommendation E.2.1 (omit mounting holes):
Because of the minimal clearances between connectors the connector mounting holes specified in IEEE 1101.10 should be omitted. The retention force from the 160 press fit pins is sufficient to insure reliable attachment of the connector to the backplane.

Appendix F

References for Mechanics

F.1 IEEE 1101.1

General PCB sizes and tolerances	Clauses 6/7/8/9
Front mounted PCB assembly Test/Inspection dimensions - DT2	Table 5
General Backplane sizes and tolerances	Clause 10
Backplane bow, static and dynamic	Clause 11
General non-EMC Subrack sizes and tolerances	Clause 11 (8)
Subrack assembly Test/Inspection dimension - Dc	Table 7
Non-EMC Front Panels	Figures 13/14
Front Panel/PCB/Connector/Backplane relationship	Figure 15
Board to Board relationship	Figure 16

F.2 IEEE 1101.10

EMC Subrack interface dimensions	Clause 5
EMC PCB Front Panel and Filler Panel interface dimensions	Clause 5
EMC Front Panel and PCB relationship	Figure 5
Keying and Alignment Pin	Clause 6
Programming Key	Figure 10
Programming of Keys	Figure 11
Alignment Pin Test dimensions	Figure 12
Protective Solder Side Cover (for PCB mounting holes see IEEE 1101.1)	Clause 7
Subrack Injector/Extractor detail	Clause 8
Subrack Injector/Extractor Test dimension	Figure 15
Injector/Extractor detail	Figure 15
Front Panel assembly with Injector/Extractor Test dimension G	Table 6
ESD protection	Clause 9
5 row 160 pin Connector mounting detail	Clause 10

F.3 IEEE 1101.11

Inline mounting of rear PCB assemblies	Clause 5
Rear mounted PCB sizes	Clause 6
Rear mounted PCB assembly Test/Inspection dimensions - DT2	Table 2
Connector Orientation and Labeling	Clause 7
Rear mounted PCB assembly Subrack Test/Inspection dimensions for RDc/RDx	Table 2
Maximum Backplane thickness	Clause 9
Connector Labeling	Clause 10
Connector performance	Clause 12
Connector alignment	Clause 13
Front/Rear PCB Panel assembly Safety GND	Clause 15
J0, 2 mm metric Connector mounting	Appendix A

F.4 VME, VME64 and VME64x Connector Insertion Forces

Board Height	Standard	Connector(s)	Total Pins	Insertion Force	Insertion Force (lbs)
3U	VME/VME64	J1	96	90 N	20
6U	VME/VME64	J1/J2	192	180 N	40
6U	VME64x	J1/J0/J2	435	395 N	89
9U	VME64x-9U	J1/J0/J2/J4/J3	746	650 N	146
9U	VME64x-9U	J1/J0/J2/J4/J5/J6	905	780 N	175

Table F.4.1
Insertion Forces for
3U, 6U and 9U Boards