Chapter 8

ESD and Front Panel Safety Ground Protection

8.1 Introduction

In some VME64x applications, boards being plugged into a VME64x subrack are required to have static electricity bled off prior to contact with the backplane. This is known as electrostatic discharge (ESD) protection. A scheme for implementation of this capability is defined in the IEEE 1101.10.

Also, some VME64x applications need to provide a front panel safety ground where high currents are shorted to earth ground. If the equipment at the other end of an I/O cable faults and attempts to place a high voltage on the ground of an I/O cable, the front panel safety ground feature will keep the voltage low enough to prevent VME64x systems failing as well as prevent the operator from being harmed.

Note that for VME64x boards and subracks being built according to IEEE 1101.2, IEEE Standard for Mechanical Core Specifications for Conduction-Cooled Eurocards, the ESD Protection design defined in this chapter is not applicable.

8.2 Requirements

Observation 8.1:

The features defined in this chapter are not applicable to IEEE 1101.2 based applications.

8.2.1 ESD Strips on VME64 Boards

Rule 8.1:

VME64x boards that are designed to provide electrostatic discharge (ESD) capability shall use one or two ESD strips in one or both of the following locations: bottom edge or the 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 8.2:

Two 1 Meg Ohm 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.

8.2.2 ESD Clips in Card Guides and Subracks

Rule 8.3:

All VME64x systems that provide ESD protection shall use subracks and card guides with clips on both the top and bottom per the requirements specified in IEEE 1101.10.

Observation 8.2:

The board's ESD strip is in contact with the subrack's ESD 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.

Observation 8.3:

Any ESD build up on the front panel will be discharged into the system chassis through the ESD contacts between the front panel and the chassis.

8.2.3 Solder Side Covers with ESD Protection

Recommendation 8.1:

Solder side covers with ESD protection should be used on VME64x boards as defined in IEEE 1101.10.

Observation 8.4:

This will provide added ESD protection of VME64x boards during operator handling.

Observation 8.5:

This solder side cover is the same cover as recommended in Section 5.2.2.

8.2.4 Front Panel Design for ESD Protection

Recommendation 8.2:

All components mounted on the front panel, such as switches, I/O connectors, LEDS, etc. with metal supports or connector metal shields should be mounted in such a way as to provide ESD protection.

Observation 8.6:

This will provide added ESD protection of VME64x boards during operator handling.

8.2.5 Front Panel Safety Ground Protection

In some applications there is a need to provide a safety ground protection. If an I/O device like a display monitor, a printer, test equipment, etc. fail and short its chassis and I/O cable ground to the main power voltage, both the electronic equipment and human operators are exposed to high voltage shock hazards. A safety ground return for high currents will prevent this from happening.

The safety ground protection system has four elements:

a) IEEE 1101.10 metallic board front panel with galvanically connection
b) multifunctional alignment pin
c) IEEE 1101.10 chassis ground connection
d) and a low impedance chassis to earth ground connection

Recommendation 8.3:

For applications that need a front panel safety ground return, the following capability should be provided:

a) support a continuous 25 A current at no more than 100 milliohm for a least 2 minutes.
b) support a short term 200 A current for 10 ms at 1 s intervals, 10 pulses, at no more than 100 milliohm.

Observation 8.7:

The resistance measurement is between the front panel and earth ground.

Suggestion 8.1:

The 100 milliohm maximum resistance can be divided into three parts as follows:

a) 40 milliohm maximum between front panel and card guide connector
b) 40 milliohm maximum between card guide connector and subrack ground frame
c) 20 milliohm maximum between subrack ground frame and earth ground

Chapter 9

Rear I/O Transition Boards

9.1 Introduction

VME, VME64 and VME64x boards might route I/O through the backplane via the P2/J2/RJ2/RP2 connectors and the P0/J0/RJ0/RP0 connectors. In the P2/J2/RJ2/RP2 connector family, rows a & c provides 64 I/O pins. Rows z & d of the same connector family provide 46 I/O pins for a total of 110 user defined I/O pins. Additionally, 35 pins are available for ground returns in the z & d rows, as defined in Chapter 3.

When the 2 mm hard metric P0/J0/RJ0/RP0 connector family (as defined in Chapter 4) is used, 95 user defined I/O pins are available. Additionally, 19 or 38 pins are available for ground returns.

In some applications that utilize these user defined I/O pins for I/O through the backplane, there is a need for a commonly defined rear I/O transition board scheme. These boards provide the connectors required for specific kinds of I/O functions such as serial ports, parallel ports, video terminals, disk drive ports, T1/E1 communication lines, etc.

IEEE P1101.11, defines the generic mechanics for rear I/O transition boards. This chapter selects the recommended board and slot depth size to be used for VME64x applications.

9.2 Requirements

9.2.1 Mechanical Dimensions

Rule 9.1:

If rear I/O transition boards are being implemented, the mechanics of such an implementation shall be in accordance to IEEE P1101.11.

Recommendation 9.1:

For I/O through 3U and 6U backplanes, the 80 mm deep rear I/O transition boards should be used.

Recommendation 9.2:

3U and 6U subracks supporting rear I/O transition boards should be designed to accommodate the 80 mm depth version.

9.2.2 Mechanical Components

Recommendation 9.3:

It is recommended that the same front panel, the same handles, the same keying, the same alignment pin, the same EMC and the same ESD mechanics be used as on the front VME64x boards, as defined in chapters 5, 6, 7 and 8.

Recommendation 9.4:

It is recommended that the same subrack rails, card guides, EMC support, ESD support, keying, alignment pin hole, and injector/extractor comb be used as on the subrack front side, except for the card guide's depth, as defined in chapters 5, 6, 7 and 8.

Observation 9.1:

Rear I/O transition boards are "in-line" with the front VME64x boards. This means that the front panel of rear I/O transition boards are reversed (mirrored) from the front VME64x boards. This includes the card guides, the keying scheme and the handles. The top handles are on the bottom and the bottom handles are on the top.

Rule 9.2:
If a transition module has an RP0 then it shall have an RP2 connector.

Observation 9.2:
The rear RJ0 shroud does not have any vertical guiding for the RP0 connector. The RP2 connector is necessary since there is a potential for misalignment and the bending of pins in RP0.

Permission 9.1:
An RP2 housing without pins may be mounted on the transition module if no contacts are used in that connector.

9.2.3 Board Layout Orientation

Recommendation 9.5:
As a visual aid, the typical orientation for a VME board should be positioned with the front panel on the left side and the backplane connectors on the right side. See Figure 9-1 of this standard and Figures 7-2, 7-3, 7-10 and 7-11 in the VME64 Standard.

Recommendation 9.6:
As a visual aid, the typical orientation for a rear I/O transition board should be positioned with the front panel on the right side and the rear backplane connectors on the left side. See Figure 9-1 of this standard.

Observation 9.3:
By following Recommendations 9.5 and 9.6, layout and I/O signal routing errors will be minimized.

9.2.4 Slot Keying Codes

Observation 9.4:
The same front panels and shortened card guides are used for rear I/O transition boards. Unfortunately all the slot keying holes in both the card guides and front panels will be upside down. The top and bottom holes are swapped as well as the letter labels will be upside down.

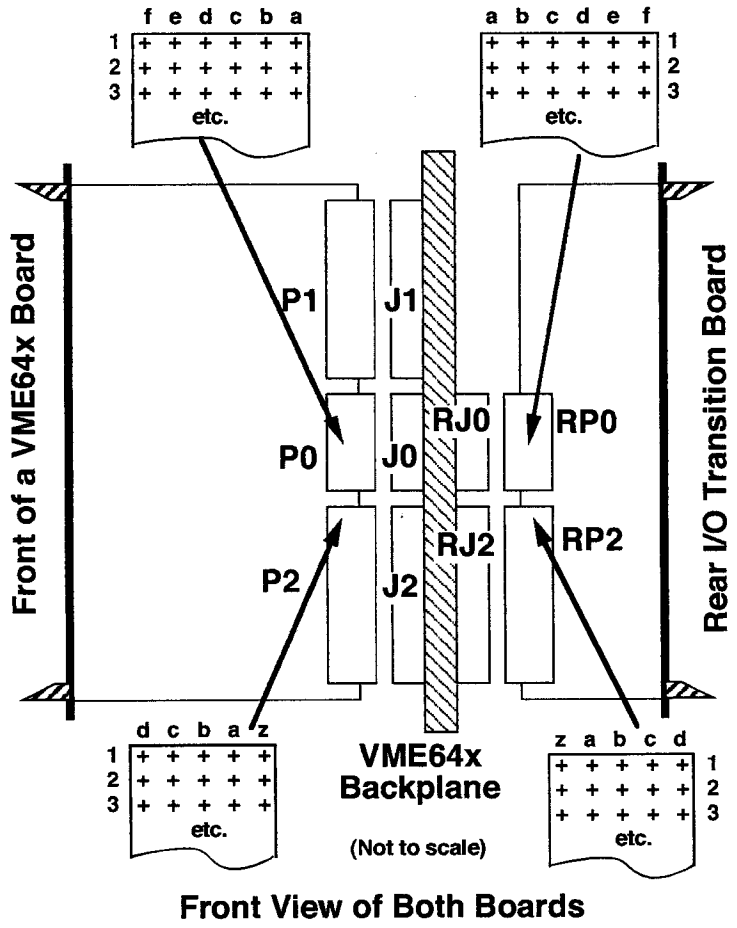
Recommendation 9.7:
The same keying code identification and labeling should be used as on the front boards and front card guide.

9.2.5 Connector Pin Labeling

Rule 9.3:
Whenever rear I/O transition boards are implemented, any connector that plugs into the rear of the backplane shall use the same pin numbering scheme, mirror image, as used on the front boards.

Observation 9.5:
Rule 9.3 eliminates confusion and I/O signal pin mapping problems by requiring a 1 for 1 pin mapping. Example, P2, a3 is connected to RP2, a3 and P0, d1 is connected to RP0, d1. See Figure 9-1 above for illustration.

Observation 9.6:
If the same CAD component database is used for connectors on front plug-in boards and rear plug-in boards the pin labels will be incorrect on rear plug-in board connectors. The pin sequence needs to be re-sequenced.



Front View of Both Boards

Note: Connectors RJ1 and RP1 are not normally used and therefore are not shown. If these two connectors are used, care should be taken when connecting to the VME64x bused signals and to the power pins.

Figure 9-1 Front and Rear Board Orientation & Connector Pin Labeling

(view of component side on both boards)

9.2.6 Increase in Backplane Height

When rear I/O transition boards are used, the attachment of power connectors and associated power cabling might need to be done outside the normal connector area. It might be necessary to extend the height of VME64x backplanes on either or both the top or bottom edges.

Recommendation 9.7:

The incremental height extensions of VME64x backplanes should be in one half of a 1U increment or 22.22 mm.

9.2.7 Power to Rear I/O Transition Board

In some applications, the rear transition board will have active components. Power can be applied either through the I/O pins from the front board, or from the normal power and ground pins defined as part of the P1/J1 and P2/J2 connectors.

Rule 9.4:

When power is routed through the I/O pins from the front board to the rear I/O transition board, the maximum current through each pin shall be the same as allowed per pin for the normal connector operation.

Rule 9.5:

Backplanes that provide long tail connectors on the rear of the backplane shall design the backplane to accommodate full power being drawn from both the front and rear connectors at the same time.