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VME Bus Pin Assignments for Military Format-E Form Factor Boards and Backplanes Draft Standard

VITA 18-199X

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## Forward	This section will not form part of the standard

This standard has been prepared by a working group formed by the VITA Standards Organization (VSO). The standard defines the pinout required to implement VMEbus architecture on the standard connectors of Military Format-E Form Factor Modules, as defined by IEEE 1101.4.

The goal of this standard activity is to provide both a mechanical and electrical standard for standard electronic modules that will implement the VMEbus backplane and the SEM E mechanical module format. This stanard will guarantee interoperability across all programs, projects, and modules built to this standard.

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1. Introduction

ANSI/VITA-1 1996, IEEE 1010.10, IEEE 1014, and IEEE 1101.2 are four standards that define both mechanical and electrical board formats for conduction and convection cooled 6Ux160mm VMEbus boards. Because of these standards the VMEbus backplane module has been applied to both industrial rugged environments and military Airborne, Ground mobile, Maritine, and Manpack environments.

VMEbus products currently support a wide range of packaging options for 3U x 160mm and 6U x 160mm form factors. The VMEbus standard, IEEE 1014-1987 and ANSI/VITA-1, calls out both an electrical and mechanical interface that allows commercial industry and military industry to share products that are interoperable. Thus the military does not have to create or develop new products it just purchases the product that meets the programs requirements off-the-shelf. There are conduction cooled 6Ux160mm VMEbus modules that will mount into 1/2ATR, 3/4 ATR, 1ATR, 1ATR tall, short and long chassis. These products are currently available from a multitude of vendors found in the VME International Trade Association (VITA) VME products directory.

There exists today some military application platforms that will not support the size weight, power and volume constraints found in the standard VMEbus product family. It is these specific applications that the SEM E module form factor would be used.

The MIL-STD-1389 Design Requirements for Standard Electronic Module (SEM) established the design requirements for the Standard Electronic Module used in military systems. The SEM program was established in the mid 1960s to ensure a standard mechanical board format for military programs. There are currently five different packaging SEM types or board formats. Appendix E of MIL-STD-1389 establishes the design requirements for Format E SEMs. This standard addressed many environmental issues that effect military applications. MIL-STD-1389 SEM E boards are conduction cooled and have been designed to absorb shock and vibrations called out in MIL-STD-810. Recently the IEEE has adopted the SEM E mehanical form factor in IEEE 1101.4a standard.

The SEM E mechanical form factor is currently the largest SEM module available. However, many of these modules who use the same backplane or module interconnect will not be interoperable due to the fact that the SEM E standard only defines a mechanical form factor. The SEM E mechanical form factor is significantly smaller than a 6Ux160mm VMEbus board. SEM E products or modules are typically housed in military 3/4 ATR chassis. This document will recognize the IEEE 1101.4a SEM E mechanical format with the 396 pin or 372 pin connector option and should not be confused by the many SEM E “like” modules currently available from specific program offices within the military community.

One goal of applying a commercially successful multi-processor parallel backplane bus, like VME, to the SEM E mechanical form factor is an effort to extend the commercial market place to include packaging options that meet the very rugged requirements of our military unique applications. Now the commercial and military manufacturers can supply products in many mechanical form factors that will meet a greater scope of unique requirements not currently found in commercial markets. The second goal is to create a SEM E product that has a well defined mechanical and electrical interface to promote interoperability among our military platforms that require a SEM E form factor.

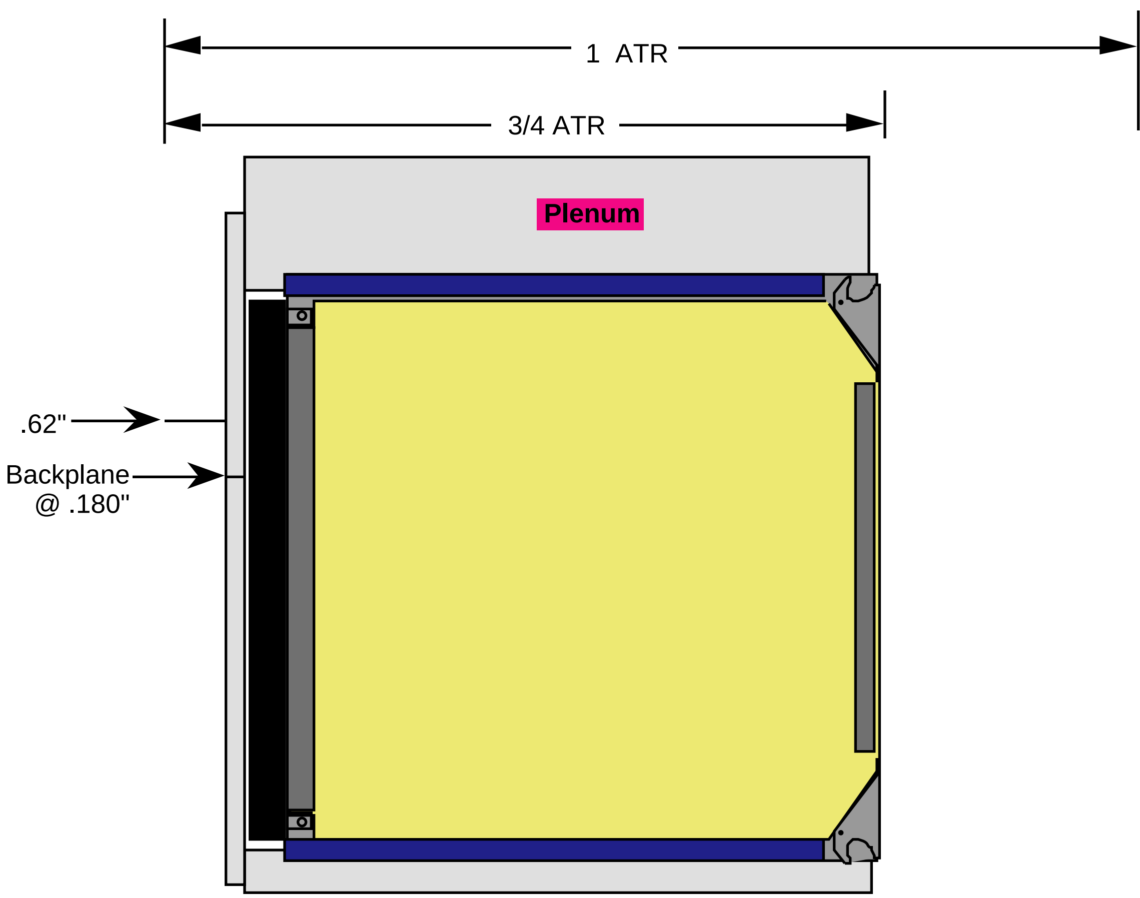
1.1 Application Objectives

Expanded use of the Commercial-Off-the-Shelf (COTS) electronics and electronics meeting military specifications has resulted the use of VMEbus systems with modules conforming to the form, fit, and function of military specifications. In light of Secretary of Defense Dr. William Perry's memorandum "A new way of doing business" this document captures the commercial succes of the VMEbus backplane and documents the pinout design to allow module to be built on the SEM E form factor in accordance with IEEE 1101.4a. This document will provide the VME backplane bus with the widest variety of environemental packaging options available serving both the military and commercial industry applications.

IEEE 1101.4a recognizes a limited number of connectors for use in that standard format. The VMEbus implementation onto the IEEE 1101.4 will also limit the connector options to only the high density 372 pin contact connector. This decision is in an effort to maximize interoperability and minimize redesign of modules.

1.2 Backplane and Chassis

Normal system configurations of SEM E modules or boards consist of a 3/4 ATR box or chassis a power supply and a backplane. The SEM E modules are mounted on 0.6 centers and the backplane's length is approximately 8 to 8.5 inches.



A typical power disapation of a 3/4 ATR is approximately 350 to 450 Watts. This figure is derived by the ambiant air temperature flow and the total board count and power draw. A estimate power of a SEM E board is recommended not to exceed 35 Watts.

1.3 Definitions

ATR box or enclosure	Austin Trumble Radio (ATR) or Air Transportable Rack (ATR) are two names given to a family of chassis that accept conduction cooled modules. The full ATR and _ ATR are two of the different sizes in this family of air-cooled enclosures.
alpha side	The side of the connector having the lowest alpha numeric pin assignment.
Format-E Form Factor	The physical envelope and interface of modules originally used in the Navy's Standard Electronic Module program ("SEM-E"); 6.4 inches high and 5.88 inches deep, and now defined in IEEE 1101.4.
Module	The assembly consisting of printed circuit board and electronic components, heat sink or structural support (if any), handles or locking mechanism (if any), and connector, which plugs into a backplane. Modules exist in various mechanical form factors, which will be identified in this document to differentiate Format-E form factor modules and VME board modules.
Pins	A term used to describe a connectors physical mechanism of connecting a signal between board and backplane. The connectors recognized for use with IEEE 1101.4 are physically blade and fork style contacts. Within this standard, the term "pin" is used to describe this connector contacts.

1.4 References

IEEE Std 1101.4a, Military Format-E Form Factor Modules
ANSI/VITA-1 1996
IEEE 1014-1987, the VMEbus Standard
EIA IS-22. Interim Standard for Two-part Blade and Backplane Tuning Fork Connector

2. Connector Pinouts

IEEE 1101.4 recognizes two *high density* connectors: a high density 396 pin connector, EIA E700AAXA, and a high density 372 pin connector, DESC. This standard will only adopt one connector that will guarantee interoperability among all modules built to this standard.

2.1 EIA E700AAXA.

Pinouts appear in Table 1. Unassigned pins are user defined in all cases. Assigned pins identified by a "*" are considered options (e.g. multiple dc power pins may be unnecessary; the user may assign the function of the pin if multiple dc power pins are unnecessary). In general, *t*he ends of this connector have been kept unassigned, because these are the most frequent locations for optional guide pins, optical inserts, and other non-electrical mating components. A diagram of the connector pinout appears in Figure 2

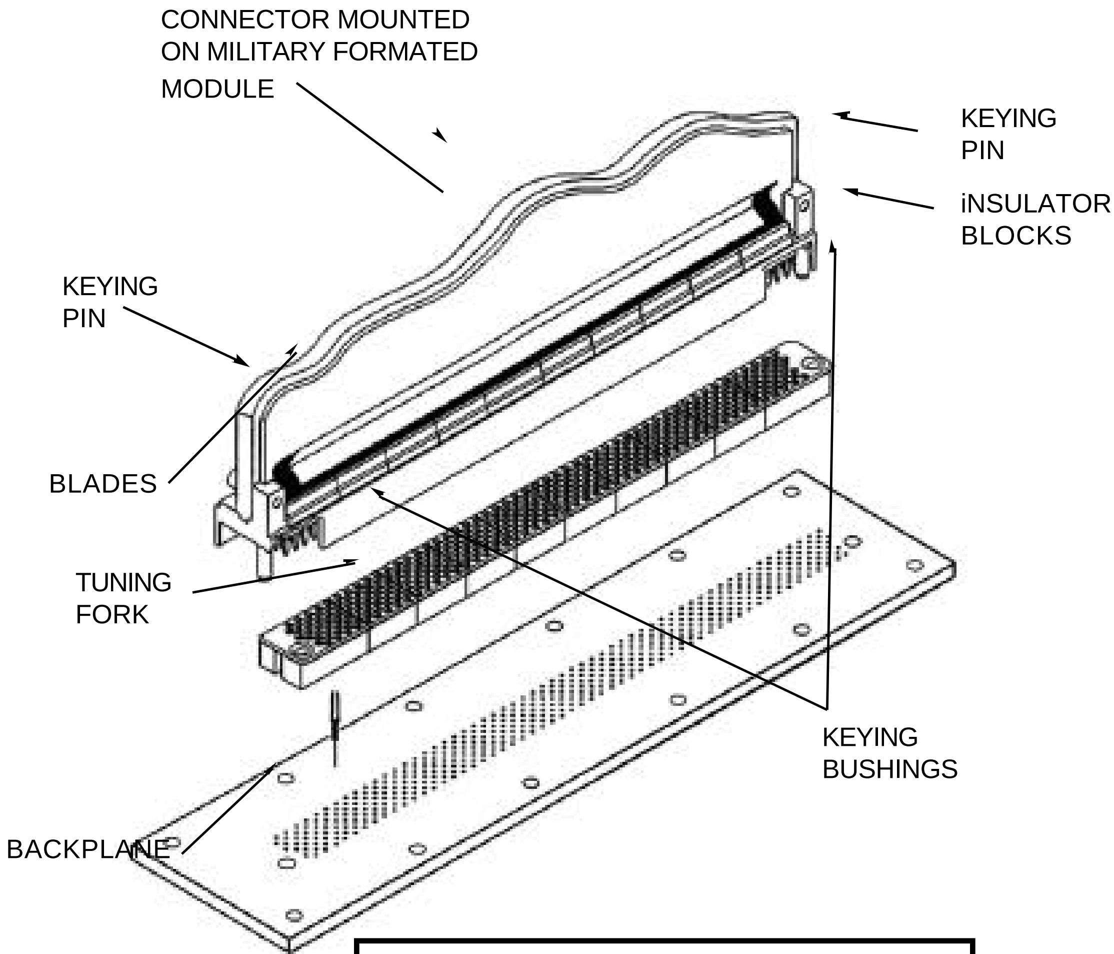


FIGURE 2. ULTRA HIGH DENSITY BLADE and TUNING FORK CONNECTOR

2.2 DESCRIPTION

Pinouts appear in Table 2. (***Table to be added. The 372 pin connector is both physically and electrically very similar to the 396 pin connector. The pinout for the 372 will be nearly identical to that of the 396, but with fewer user assignments.)*** Unassigned pins are user defined in all cases. Assigned pins identified by a "*" are considered options (e.g. multiple dc power pins may be unnecessary; the user may assign the function of the pin if multiple dc power pins are unnecessary). In general, the ends of this connector have been kept unassigned, because these are the most frequent locations for optional guide pins, optical inserts, and other non-electrical mating components. The connector pinout appears in Figure 3. ***(Figure to be added.)***

TABLE 2. PINOUTS

PIN #	ROW A FRONT	ROW B FRONT	ROW C FRONT	ROW D FRONT	ROW E REAR	ROW F REAR	ROW G REAR	ROW H REAR
1								
2								GND
3	GND							GND
4	GND							
5		PLS05V		PLS05V		PLS05V		PLS05V
6								
7								GND
8	GND							GND
9	GND							
10		PLS05V		PLS05V		PLS05V		PLS05V
11								
12								GND
13	GND							GND
14	GND							
15		PLS05V		PLS05V		PLS05V		PLS05V
16								
17								GND
18	GND							GND
19	GND							
20		PLS05V		PLS05V		PLS05V		PLS05V
21								
22	GND							GND
23	GND							GND
24		~~PLS05V~~		PLS05V		~~PLS05V~~		PLS05V
27	PLS05V				PLS05V			
28	GND							GND
29	GND							GND
30								
31	PLS05V		PLS05V		PLS05V		PLS05V	
32								GND
33	GND							GND
34	GND							
35								
36	PLS05V		PLS05V		PLS05V		PLS05V	
37								GND
38	GND							GND
39	GND							
40								
41	PLS05V		PLS05V		PLS05V		PLS05V	
42								GND
43	GND							GND
44	GND							
45								
46	PLS05V		PLS05V		PLS05V		PLS05V	
47								GND
48	GND							GND
49	GND							
50								

PIN #	ROW A FRONT	ROW B FRONT	ROW C FRONT	ROW D FRONT	ROW E REAR	ROW F REAR	ROW G REAR	ROW H REAR
1								
1								
2								
2								GND
3	GND							
3								GND
4	GND							
4								
5								
5		PLS05V		PLS05V		PLS05V		PLS05V
6								
6								
7								
7								GND
8	GND							
8								GND
9	GND							
9								
10								
10		PLS05V		PLS05V		PLS05V		PLS05V
11								
11								
12								
12								GND
13	GND							
13								GND
14	GND							
14								
15								
15		PLS05V		PLS05V		PLS05V		PLS05V
16								
16								
17								
17								GND
18	GND							
18								GND
19	GND							
19								
20								
20		PLS05V		PLS05V		PLS05V		PLS05V
21								
21								
22	GND							
22								GND
23	GND							
23								GND
24								
24				PLS05V				PLS05V

27		PLS05V				PLS05V			
27									
28		GND							
28									GND
29		GND							
29									GND
30									
30									
31		PLS05V		PLS05V		PLS05V		PLS05V	
31									
32									
32									GND
33		GND							
33									GND
34		GND							
34									
35									
35									
36		PLS05V		PLS05V		PLS05V		PLS05V	
36									
37									
37									GND
38		GND							
38									GND
39		GND							
39									
40									
40									
41		PLS05V		PLS05V		PLS05V		PLS05V	
41									
42									
42									GND
43		GND							
43									GND
44		GND							
44									
45									
45									
46		PLS05V		PLS05V		PLS05V		PLS05V	
46									
47									
47									GND
48		GND							
48									GND
49		GND							
49									
50									
50									

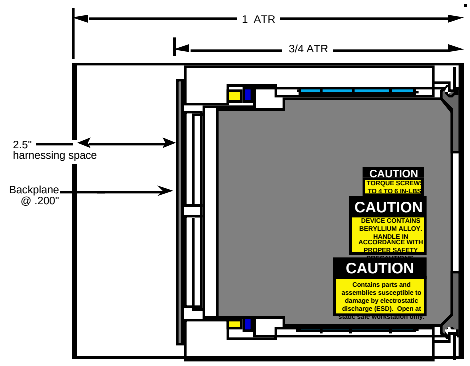
Figure 3. Pinouts for DESC (372 pin), VMEbus use.

Pin #		Pin #		Pin #		Pin #	
		B1	*UA*			D1	*UA*
A2	*UA*	B2	*UA*	C2	*UA*	D2	*UA*
A3	*UA*	B3	*UA*	C3	*UA*	D3	*UA*
A4	*UA*	B4	*UA*	C4	*UA*	D4	*UA*
A5	*UA*	B5	*UA*	C5	*UA*	D5	*UA*
A6	D0	B6	SYS RESET	C6	BG OUT 0	D6	**GND**
A7	D1	B7	BERR	C7	BG IN 0	D7	**GND**
A8	D2	B8	D12	C8	**GND**	D8	**GND**
A9	D3	B9	D11	C9	BG OUT 1	D9	**GND**
A10	WRITE	B10	**5V**	C10	BG IN 1	D10	**5V**
A11	DSO	B11	SYS FAIL	C11	BG OUT 2	D11	**GND**

Pin #		Pin #		Pin #		Pin #	
A12	DS1	B12	SYS CLK	C12	BG IN 2	D12	**GND**
A13	DTACK	B13	D10	C13	**GND**	D13	**GND**
A14	AS	B14	D9	C14	BG OUT 3	D14	**GND**
A15	IACK	B15	**3.3V**	C15	BG IN 3	D15	**3.3.V**
A16	D4	B16	MPR	C16	D13	D16	**GND**
A17	D5	B17	MCLK	C17	D14	D17	**GND**
A18	IACK IN	B18	MSD	C18	**GND**	D18	**GND**
A19	IACK OUT	B19	MMD	C19	D15	D19	**GND**
A20	D6	B20	**5V**	C20	D16	D20	**5V**
A21	D7	B21	MCTL	C21	D17	D21	**GND**
A22	RETRY	B22	BBSY	C22	D18	D22	**GND**
A23	LWORD	B23	BCLR	C23	**GND**	D23	**GND**
A24	D8	B24	*UA*	C24	RTRY 1	D24	**48 V RET**
A25	*UA*	B25	*UA*	C25	*UA*	D25	*UA*
A26	*UA*	B26	*UA*	C26	*UA*	D26	*UA*
A27	**48V IN**	B27	SER A	C27	*UA*	D27	**GND**
A28	GAP	B28	SER B	C28	BRO	D28	**GND**
A29	GA1	B29	AM 5	C29	BR1	D29	**GND**
A30	GA2	B30	AM 4	C30	BR2	D30	**GND**
A31	GA3	B31	**5V**	C31	BR3	D31	**5V**
A32	GA4	B32	AM 3	C32	IRQ1	D32	**GND**
A33	A13	B33	AM 2	C33	IRQ2	D33	**GND**
A34	A12	B34	AM 1	C34	IRQ3	D34	**GND**
A35	A11	B35	AM 0	C35	IRQ4	D35	**GND**
A36	A10	B36	**3.3V**	C36	IRQ5	D36	**3.3V**
A37	A9	B37	AC FAIL	C37	IRQ6	D37	**GND**
A38	A8	B38	SBA	C38	**GND**	D38	**GND**
A39	A7	B39	SBB	C39	IRQ7	D39	**GND**
A40	A6	B40	A18	C40	L I / I	D40	**GND**
A41	*A5*	B41	**5 V**	C41	L I / O	D41	**5V**
A42	A4	B42	A17	C42	A22	D42	**GND**
A43	A3	B43	A16	C43	A21	D43	**GND**
A44	A2	B44	A15	C44	A20	D44	**GND**
A45	A1	B45	A14	C45	A19	D45	**GND**
A46	*UA*	B46	*UA*	C46	*UA*	D46	*UA*
A47	*UA*	B47	*UA*	C47	*UA*	D47	*UA*
A48	*UA*	B48	*UA*	C48	*UA*	D48	*UA*
A49	*UA*	B49	*UA*	C49	*UA*	D49	*UA*
A50	*UA*			C50	*UA*		

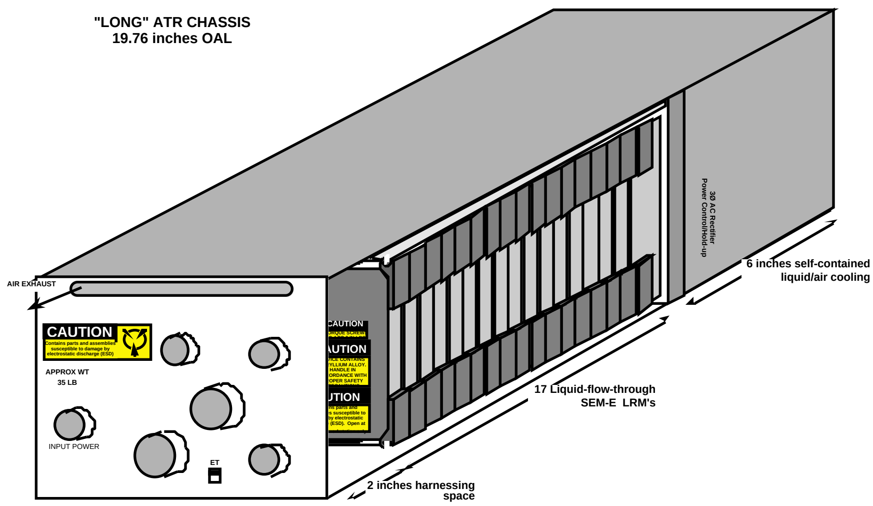
Appendix 1 Draft Revision history

Draft No.	Date	Comments and Major Changes/Updates
0.1	1 May 1995	First Draft
0.2	21 July 1995	Completion of first cut of pin assignments.
0.3	15 Sept. 1995	Draft revision after first comments.
0.4	5 Nov. 1995	Draft revision to further separate address and data pinouts.
0.5	5 April 1996	Draft revision to allow only high density connectors, expand background information, revamp pinout ground/power distribution.
1.0	1 July 1996	First draft as part of task group instead of study group. Includes complete 396 pin connector pinouts for discussion.
1.1		
1.2	14 March 1997	Chairman Mary Mosier transfers power to Robert McKee
1.3	14 May 1997	Editorial comments and changes added by working group at VITA/VSO meeting prior to working group ballot



NOTES:

This LFT card will not fit in a 3/4 ATR chassis space, even without fiber optics.
It's more feasible [3/4 ATR] if using the Teradyne connector. The Bendix one is too high.
In the ATR short chassis[12.76"], only 8 SEM-E's will fit.
In the ATR long chassis[19.76"] shown, 18 SEM-E's will fit.


"LONG" ATR CHASSIS
19.76 inches OAL
AIR EXHAUST
CAUTION
Contains parts and assemblies susceptible to damage by electrostatic discharge (ESD)
APPROX WT
35 LB
INPUT POWER
ET
3Ø AC Rectifier
Power Control/Hold-up
6 inches self-contained
liquid/air cooling
17 Liquid-flow-through
SEM-E LRM's
2 inches harnessing
space

"SHORT" ATR CHASSIS
12.76 inches OAL