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PB-DIO4

Input/Output Piggyback Module
for VMOD-2 and IMOD

Manual Order No. 12448

User's Manual

Issue 4

Unpacking and Special Handling Instructions

This PepCard product is carefully designed for a long and fault-free life; nonetheless, its life expectancy can be drastically reduced by improper treatment during unpacking and installation.

Observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings, etc. If the product contains batteries for RTC or memory back-up, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. These can cause shorts and damage to the batteries or tracks on the board.

When installing the board, switch off the power mains to the chassis. Do not disconnect the mains as the ground connection prevents the chassis from static voltages, which can damage the board as it is inserted.

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REVISION HISTORY
PB-DIO4 User's Manual

Issue	Brief Description of Changes	PCB Index	Date of Issue
1 to 3	Original version together with PB-DIO2/3	00-01	April, 1990 -1991
4	New structure and PB-DIO2/3 put in separate manuals	00-01	April, 1995

PCB Index = Printed Circuit Board/Schematics Revision Number. This column provides a valid "from—to" range for the PCB index covered by each issue. These numbers combine to form the last four digits of the publication number. "/n" numbers suffixed to the index number show modifications to a local instruction note (addition of wires).

Date of issue = the release date of the issue. This date does not necessarily reflect the date the improvements were first made.

A thick bar to the left of any text indicates that the text has changed from the previous issue of the manual.

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Changes and additions to drawings and boxed text, such as notes or jumper setting tables, cannot be marked in the above way; therefore this marking system is used only for changes to "normal" body text.

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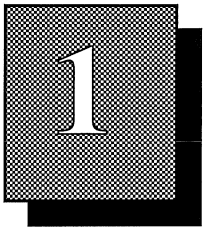
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1. INTRODUCTION

1.1 Product Overview

PB-DIO4 is a 16 channel parallel I/O piggyback with eight optoisolated inputs and eight optoisolated outputs with common GND in sub-groups. It can handle loads of up to 500 mA (subject to the inter-connection cables capabilities), and accept inputs of up to 80V DC. Protective measures must be applied for voltages higher than 50V DC.

The board can be used either with the VMOD-2 (non-intelligent Input/Output module for the VMEbus), or with the IMOD.

1.2 Ordering Information

Product	Description	Inputs	Outputs	Order Number
PB-DIO4	Industrial Input/Output piggyback with eight optoisolated high voltage inputs and outputs	Cmn GND in pairs 12-80V DC	Cmn Col. CE in pairs 12-80V DC	523-27 *Old* 3020 *New*

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1.3 Specifications

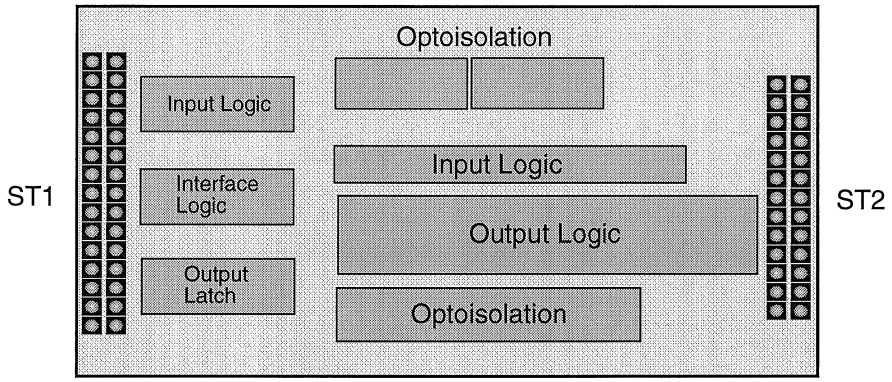
Input channels	8 digital inputs, all channels optoisolated., common GND with sub-groups
Output channels	8 digital output lines, all channels optoisolated, common GND with sub-groups
Input voltage	12 to 80V DC maximum
Input current	5mA over the whole range
Output voltage	5 - 80 V
Output current	500mA maximum
Switching level	<5V = low, >10V = high
Input frequency	6.5 KHz maximum
Isolation voltages	2500V RMS input to system 100V DC between inputs
Identification byte	$EF
Address range	128 byte
DTACK generation	On-board
Power requirements	+5V DC (+/- 5%) 80mA typically
Temperature range Standard Extended Storage	 0...+70°C -25...+85°C -55 to +85°C
Operating humidity	0 to 95% (Non-condensing)
Piggyback dimensions	Width: 48mm Length: 100mm Depth: 12 mm
VMOD-2 interface	Two sets of twin row header pins providing all necessary communication paths and a mechanical mounting method.

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1.4 Board Overview

Component Side



WARNING!

When using voltages higher than 50V DC it must be ensured that the solder pins on the rear side of the PB-DIO4 are not accessible (cannot be accidently touched) during use. These pins are under power whenever the external interfaces are connected and powered...

even when the VMOD-2/VMEbus is not powered !

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1.5 Features

- Eight optoisolated inputs with up to 80V direct current;
- Eight optoisolated outputs with up to 500 mA rating;
- All channels are independently programmable.

1.6 Advantages

The PB-DIO4 module has been designed to provide an easy to use interface for customer applications, resulting in maximum design flexibility. It provides a cost-effective solution, quick and easy implementation as well as full compatibility with existing PEP products.

The piggyback can be used with the VMOD-2 or the IMOD carrier modules.

1.7 Typical Applications

The PB-DIO4 is typically used for Inputs/Outputs requiring 24V, which would include end switches, alarms, emergency stop devices, sensors, actuators and relays/switches.

1.8 Glossary of Terms

PSU Power Supply Unit

PCB Printed Circuit Board

1.9 Related Publications

VMEbus Specifications Revision C1

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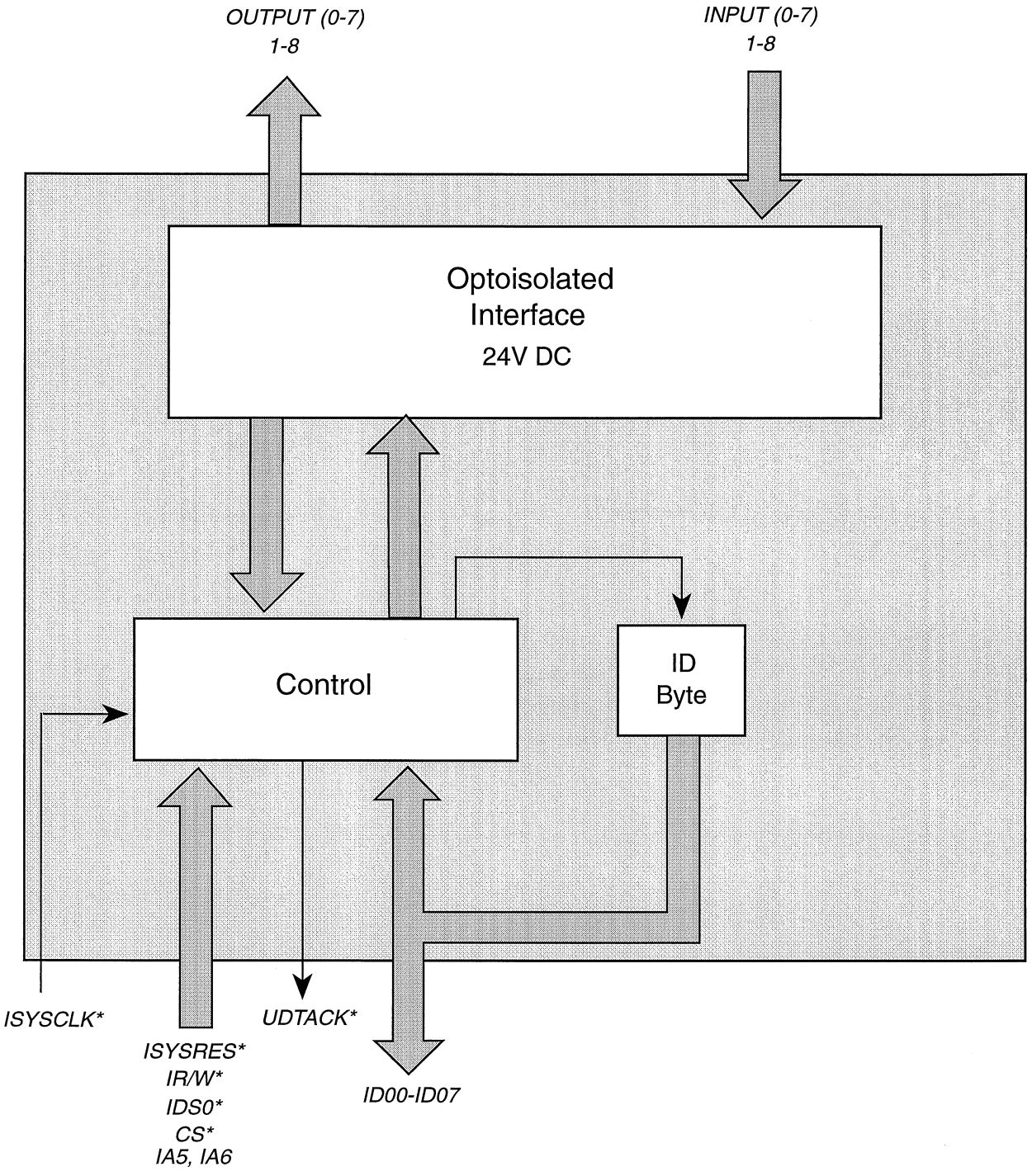
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2

2. FUNCTIONAL DESCRIPTION

This chapter describes the functionality of the main blocks of the PB-DIO4 piggybacks.

Figure 2.0.0.1: PB-DIO4 Block Diagram



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2.1 Input Circuit

The input section consists of an optoisolated input with current source and an input buffer to the VMOD-2 interface.

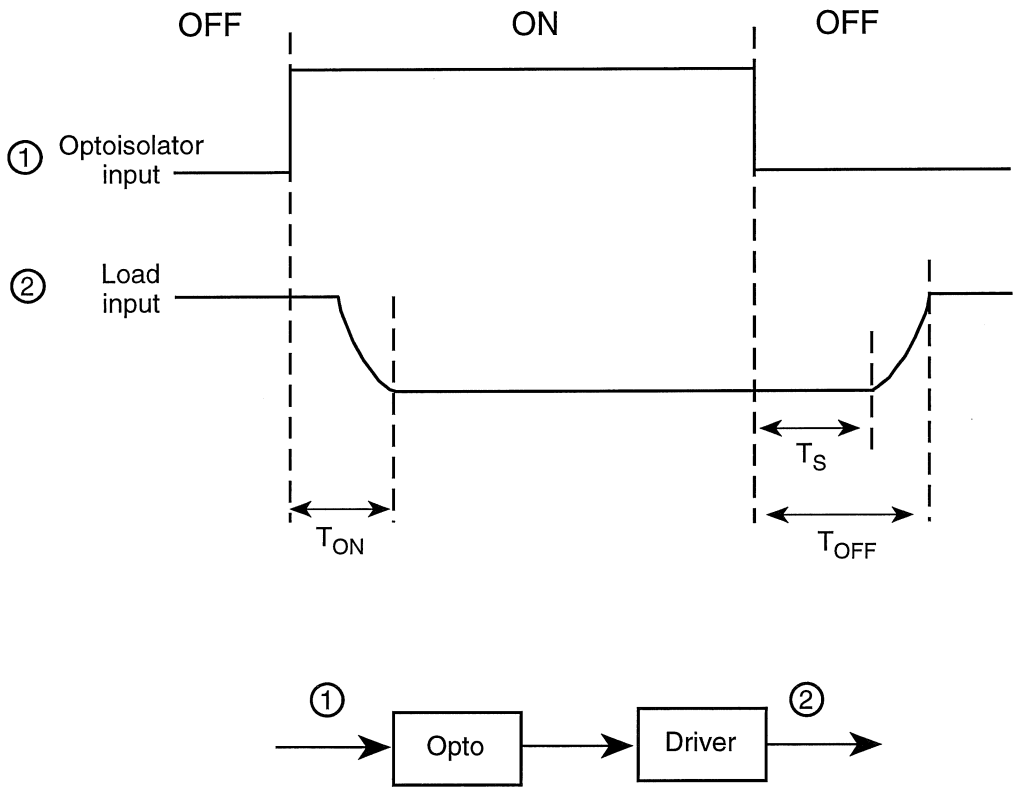
The current source limits the input current to 5 mA. In order to set a switching level to an offset of 0, a 7.5V Zener diode is added to the input path. The readout of inputs is transparent. A bit read as 0 represents low level input.

2.2 Output Circuit

The output section consists of an output latch, optocoupler and Darlington transistor acting as a power switch. A written bit of 0 represents a high level output.

The Table below provides some typical values for turning the output channel on and off. Similar values also apply turning the input on and off (port B).

Figure 2.2.0.1: Switching Behaviour



R_L	T_S	T_{ON}	T_{OFF}
150 Ω	80 µs	4 µs	110 µs

2.3 Power On/Off

During power up, the output drivers are set to 0 and therefore the optocouplers are turned off. In addition, if the system power is turned off, the optocoupler diode is off.

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2.3 Logic Interface

An important task performed by the logic interface is the generation of an ID byte. This built-in test feature allows an interrogation of the VMOD-2/IMOD, supplying an ID for each of the fitted piggybacks. If this is integrated into the application software, it can be used to check that any given tasks are valid for the fitted piggyback. Offsets $7F (for location A) and $FF (for location B), allow a software check of which piggybacks are fitted.

The PB-DIO4 has an ID Byte of "$EF".

Other ID Bytes are:

$EE	*PB-BIT*	*BITBUS communications controller*
$F0	*PB-CNT*	*Counter piggyback*
$F1	*PB-DAC/2*	*D to A converter piggyback*
$EA	*PB-DAC3*	*D to A output piggyback*
$F2	*PB-DIO*	*Digital I/O piggyback*
$F3	*PB-DIN/3*	*Digital input piggyback*
$F4	*PB-ADC/2*	*A to D converter piggyback*
$EB	*PB-ADC3*	*A to D input piggyback*
$F5	*PB-CIO/2*	*Counter/I/O piggyback*
$F7	*PB-SIO4*	*Quad serial piggyback RS232*
$E7	*PB-SIO4A*	*Quad serial piggyback RS422/RS485*
$F8	*PB-DOUT*	*12 channel high voltage digital output*
$ED	*PB-DOUT2*	*16 channel high voltage digital output*
$F9	*PB-DIN2*	*Digital input piggyback*
$FB	*PB-DIO2*	*Digital I/O piggyback*
$FC	*PB-REL*	*Relay piggyback*
$FD	*PB-DIO3*	*Digital I/O piggyback*
$FE	*PB-STP*	*Stepper motor controller piggyback*

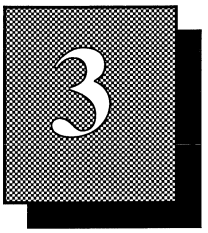
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3. CONFIGURATION

The PB-DIO4 board has no jumpers to be configured.

3.1 VMOD-2/IMOD Jumper Configuration

In order for the PB-DIO4 to be put into use on either the VMOD-2 or IMOD boards, the IRQ and Base Address jumper settings on these boards must be correctly configured.

For more details on these jumper configurations, please refer to the VMOD-2 or IMOD user manuals.

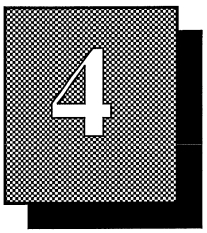
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4. PROGRAMMING

The base address of the PB-DIO4 in the upper piggyback position (location A) is the same as that set for the VMOD-2/IMOD used (default: $87FE2400/$F70000), whereas the base address in the lower piggyback position (location B) is +$80 of that set for the VMOD-2/IMOD (default: $87FE2480/$F70080).

4.1 Address Map Overview

Address	Access	Description
$01	Write	Write to output register
$01	Read	Read input buffers
$21	Write	Clear output register
$41 - $7F	Read	ID Byte

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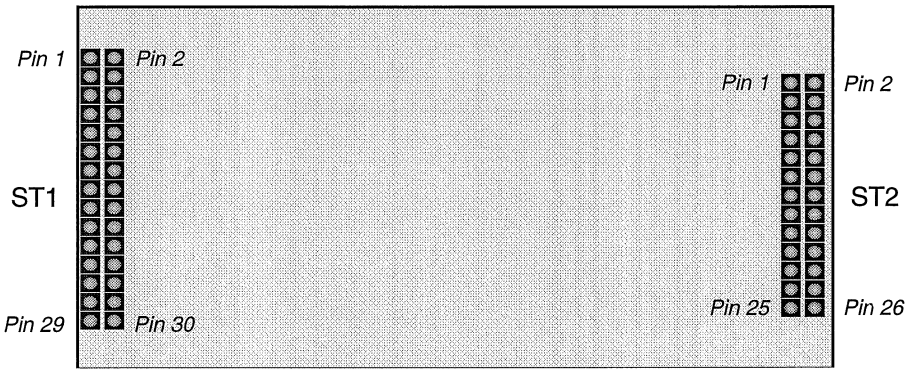


5. PINOUTS

The PB-DIO4 have two sets of connectors. ST1 is the rearmost row of 30 pins. At the front end of the piggyback there is ST2 with 26 pins.

5.1 Main Board

Figure 5.1.0.1: Board Connector Overview



5.1.1 ST1 Connector

The ST1 connector is fitted into the socket row BU1A or BU1B on the IMOD and VMOD-2 (depending if there is one or two piggybacks to be fitted) to the VMEbus interface logic.

Pin#	Signal	Pin#	Signal
1	GND	2	+5V (Vcc)
3	N/C	4	N/C
5	R/W	6	CLK
7	RESET*	8	UDTACK*
9	N/C	10	CS*
11	N/C	12	N/C
13	ID7	14	IDS0*
15	ID6	16	N/C
17	ID5	18	IA6
19	ID4	20	IA5
21	ID3	22	N/C
23	ID2	24	N/C
25	ID1	26	N/C
27	ID0	28	N/C
29	GND	30	+5V (Vcc)

** Active Signal Low*

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5.1.2 ST2 Connector

The ST2 connector is fitted into the socket row BU2A or BU2B on the IMOD and VMOD-2 (depending if there is one or two piggybacks to be fitted), directly to half of the 50-way VMOD-2 front panel connector, and ultimately to the user's external interfaces.

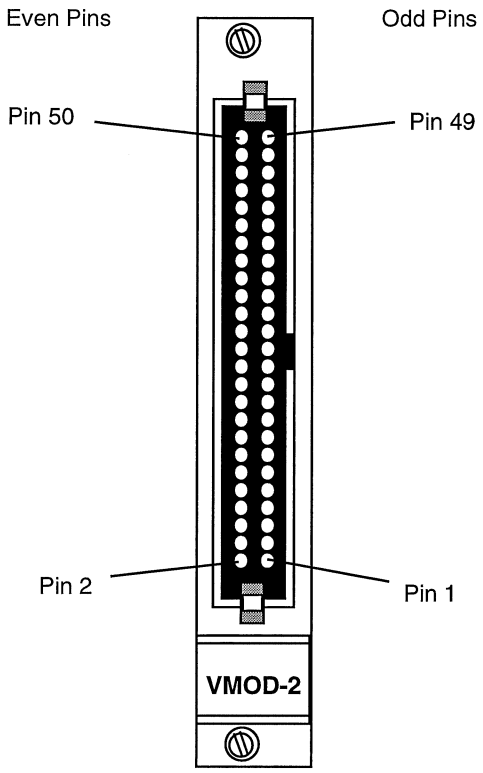
Pin#	Signal	Pin#	Signal
1	IN1+	2	IN1+
3	IN2+	4	OUT2+
5	IN1/2-	6	OUT1/2-
7	IN3+	8	OUT3+
9	IN4+	10	OUT4+
11	IN3/4-	12	OUT3/4-
13	IN5+	14	OUT5+
15	IN6+	16	OUT6+
17	IN5/6-	18	OUT5/6-
19	IN7+	20	OUT7+
21	IN8+	22	OUT8+
23	IN7/8-	24	OUT7/8-
25	OUT1+	26	OUT1+

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5.2 VMOD-2/IMOD Front Panel

Figure 5.2.0.1: VMOD-2/IMOD Front Panel



Piggyback A

Pin #	Signal	Pin #	Signal
50	IN1+	49	OUT1+
48	IN2+	47	OUT2+
46	IN1/2-	45	OUT1/2-
44	IN3+	43	OUT3+
42	IN4+	41	OUT4+
40	IN3/4-	39	OUT3/4-
38	IN5+	37	OUT5+
36	IN6+	35	OUT6+
34	IN5/6-	33	OUT5/6-
32	IN7+	31	OUT7+
30	IN8+	29	OUT8+
28	IN7/8-	27	OUT7/8-
26	Ext. Reset GND	25	Ext. Reset Vcc

Piggyback B

Pin #	Signal	Pin #	Signal
24	IN1+	23	OUT1+
22	IN2+	21	OUT2+
20	IN1/2-	19	OUT1/2-
18	IN3+	17	OUT3+
16	IN4+	15	OUT4+
14	IN3/4-	13	OUT3/4-
12	IN5+	11	OUT5+
10	IN6+	9	OUT6+
8	IN5/6-	7	OUT5/6-
6	IN7+	5	OUT7+
4	IN8+	3	OUT8+
2	IN7/8-	1	OUT7/8-

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The relevant half of the VMOD-2 and IMOD front panel 50-way connector (pins 1..24 for lower position and pins 27..50 for upper) assumes the relationship of PB-DIO2/3 signals and its ST102.

An optional 50-way header behind the front panel connector has an identical pin-out to the front panel connector. It is provided for applications where the flat band cable is to be routed internally, or where an alternative front panel is to be fitted and used. In some cases, cables can be routed through the systems interior i.e. to the back panel (from this optional connector) and some from the external connector on the front panel. In doing so take care not to exceed the fan out ability of the piggyback's driver circuits.

Note

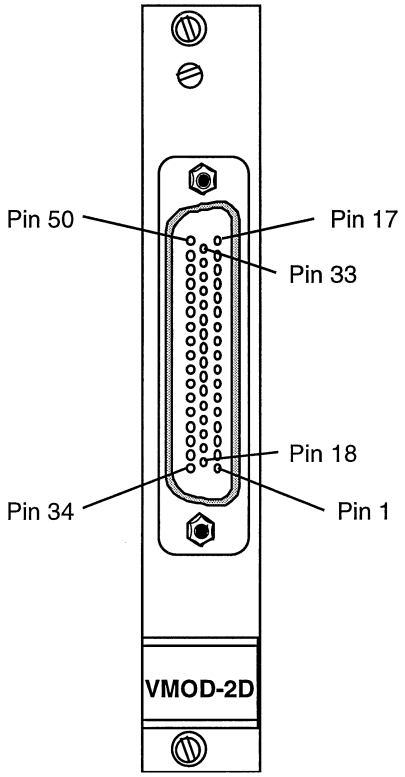
With systems that have more than one of this type of connector , or which use several VMOD-2 or IMODs with various piggybacks, it is advisable to put a drop of paint on the back of the mating connector and on the front panel of the VMOD-2 or IMOD, for correct connection. The connector splits virtually in half (pins 1-24 and 27-50) for connection to the rear piggyback location.

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5.3 VMOD-2D Front Panel

Figure 5.3.0.1: VMOD-2D Front Panel



Piggyback A

Pin #	Signal	Pin #	Signal	Pin #	Signal
50	IN1+	33	IN2+	17	OUT1+
49	OUT2+	32	OUT1/2-	16	IN1/2-
48	IN3+	31	IN4+	15	OUT3+
47	OUT4+	30	OUT3/4-	14	IN3/4-
46	IN5+	29	IN6+	13	OUT5+
45	OUT6+	28	OUT5/6-	12	IN5/6-
44	IN7+	27	IN8+	11	OUT7+
43	OUT8+	26	OUT7/8-	10	IN7/8-
42	Ext. Reset GND			9	Ext. Reset Vcc

Piggyback B

Pin #	Signal	Pin #	Signal	Pin #	Signal
		25	IN1+		
41	OUT1+	24	OUT2+	8	IN2+
40	IN1/2-	23	IN3+	7	OUT1/2-
39	OUT3+	22	OUT4+	6	IN4+
38	IN3/4-	21	IN5+	5	OUT3/4-
37	OUT5+	20	OUT6+	4	IN6+
36	IN5/6-	19	IN7+	3	OUT5/6-
35	OUT7+	18	OUT8+	2	IN8+
34	IN7/8-			1	OUT7/8-

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5.4 VMOD-2 / VMOD-2D Pinout Relationship

Piggyback A

Signal	VMOD-2 Pin #	VMOD-2D Pin #	Signal	VMOD-2 Pin #	VMOD-2D Pin #
IN1+	50	50	OUT1+	49	17
IN2+	48	33	OUT2+	47	49
IN1/2-	46	16	OUT1/2-	45	32
IN3+	44	48	OUT3+	43	15
IN4+	42	31	OUT4+	41	47
IN3/4-	40	14	OUT3/4-	39	30
IN5+	38	46	OUT5+	37	13
IN6+	36	29	OUT6+	35	45
IN5/6-	34	12	OUT5/6-	33	28
IN7+	32	44	OUT7+	31	11
IN8+	30	27	OUT8+	29	43
IN7/8-	28	10	OUT7/8-	27	26

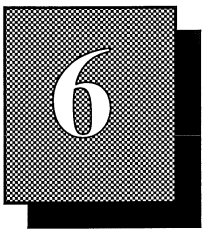
Signal	VMOD-2 Pin #	VMOD-2D Pin #	Signal	VMOD-2 Pin #	VMOD-2D Pin #
Ext. Reset GND	26	42	Ext Reset Vcc	25	9

Piggyback B

Signal	VMOD-2 Pin #	VMOD-2D Pin #	Signal	VMOD-2 Pin #	VMOD-2D Pin #
IN1+	24	25	OUT1+	23	41
IN2+	22	8	OUT2+	21	24
IN1/2-	20	40	OUT1/2-	19	7
IN3+	18	23	OUT3+	17	39
IN4+	16	6	OUT4+	15	22
IN3/4-	14	38	OUT3/4-	13	5
IN5+	12	21	OUT5+	11	37
IN6+	10	4	OUT6+	9	20
IN5/6-	8	36	OUT5/6-	7	3
IN7+	6	19	OUT7+	5	35
IN8+	4	2	OUT8+	3	18
IN7/8-	2	34	OUT7/8-	1	1

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6. INSTALLATION

6.1 VMEbus Connection

Caution!

Before installing or removing any VMEbus boards, always turn off the power to the bus and any external peripherals.

Inserting or removing modules, while the power is on, could result in damage to the VME module or peripherals interface.

Please refer to VMOD-2/IMOD user's manual for details on installing or removing.

Note

The VMEbus backplane uses automatic daisy-chaining (no BG/IACK jumpers), therefore does not need to be configured by the user.

For users with VBP backplanes, please refer to the *VBP Users Manual* for configuration information.

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6.2 Installing the PB-DIO4

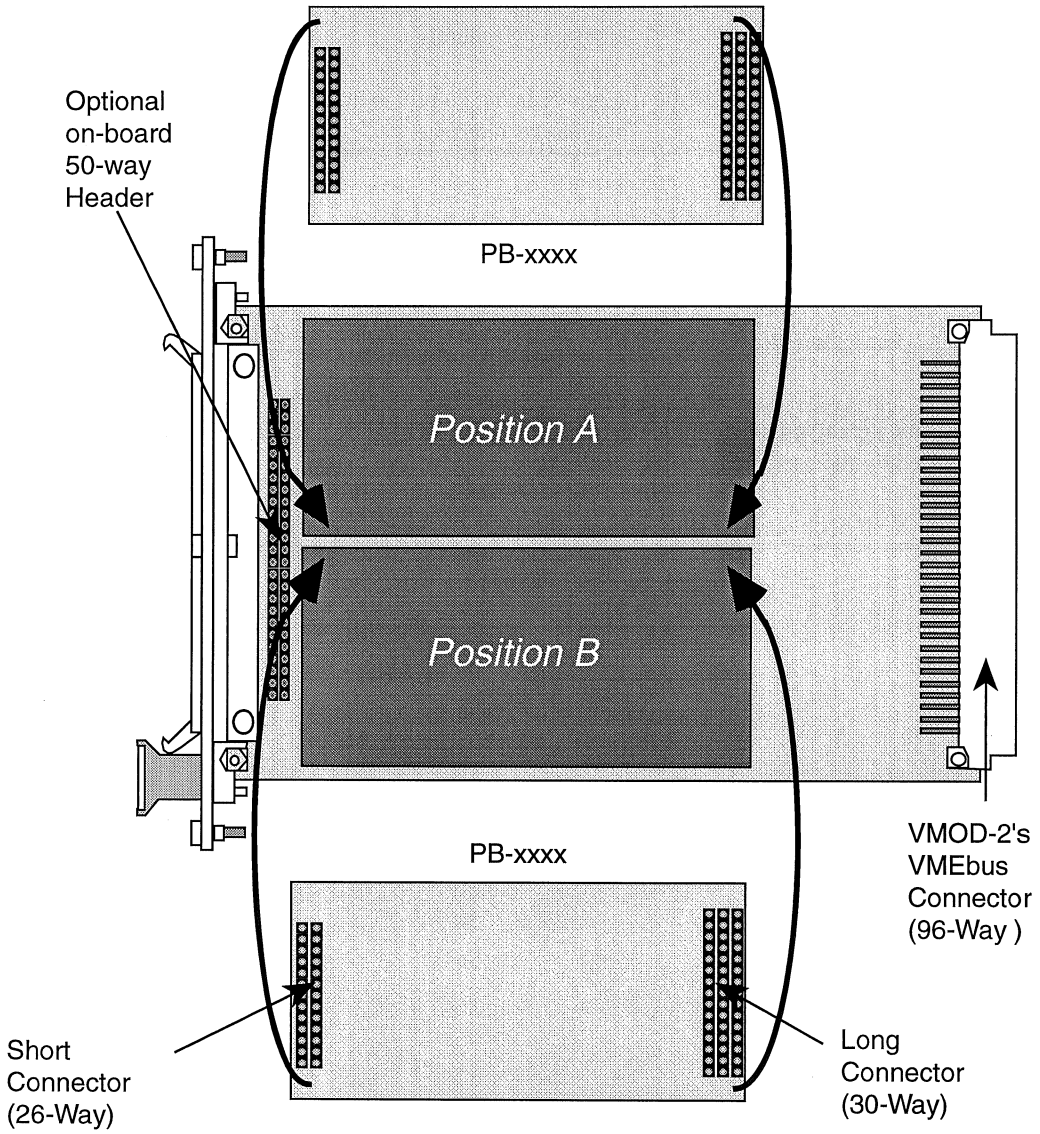
The PB-DIO4 may be plugged into any free piggyback position (A or B) on the VMOD-2 or IMOD. Please ensure the correct location before fitting.

Note

1.One connector on the PB-DIO4 has fewer pins than the other.

2.ST1 has two-rows which are to fit the front two-rows of the VMOD-2 amd IMOD three-row interface socket. Take care to ensure that the piggyback is in its correct position.

Figure 6.2.0.1: PB-DIO4 Installation Overview



Mechanical fastening and support is provided by the two interface connectors. In addition, the piggyback can be attached to the motherboard by screws and stand-off pillars at the front end of the piggyback, and at the corresponding location on the VMOD-2 and IMOD at the two holes provided for this purpose.

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6.3 General Notes for Using the System

Having designed a system, it is necessary to keep it in good working order. The three biggest risks to the system occur when:

- Connecting peripherals, disk-drives, printers, terminals and external power sources;
- Adding or changing modules, address settings and locations, etc;
- Becoming complacent and not referring to the manuals when altering or adding modules.

These risks can be reduced by:

- Checking the electrical compatibility of all devices to be connected;
- Ensuring that they are powered from the same mains supply branch (phase) and grounded to the same reference point;
- Shutting down all power before making or breaking any connections to modules or attachments to the system, including power to the peripherals;
- Observing sensible static protection procedures before handling any modules, piggybacks or memory IC's;
- Keeping all manuals available by the system and refer to them when required.

Some tips are:-

PEPCards are not over sensitive to static, but it is generally advisable to observe normal antistatic procedures.

When configuring the module, it should not be taken out of the original packing unless necessary. The clear packs can be opened and the jumpers set, piggybacks added, etc. without removing the card. This prevents inadvertent shorting of any on-board devices.

When inserting modules into a system, the power should be turned off and the mains lead not removed! The ground wire prevents the rack floating with dangerous static voltages, which could destroy circuits on the module being inserted.

The front panel of the module and the shell of the connector should be touched to any part of the rack before fitting. This discharges any static from the user.

Modules should not be pulled straight out of a rack and the back of the front panel checked to see if there are cables to unplug (such as the VSBC-1's 40-pin parallel on-board headers). Any leads should be disconnected from a module before unscrewing the front panel and removing from the rack. It should be ensured that, when fitted, these cables have enough play to allow the modules to be removed far enough to detach these cables. Modules should be put into the rack before connecting any front-panel connectors.

The "pulled" jumpers should be parked on to one of the pins they would normally bridge, so they can be quickly replaced.

It should be remembered to check the mains input voltage selector switch before installing or using any PSU!

A record should be kept of settings and a copy forwarded with any board returned to PEP for failure analysis.

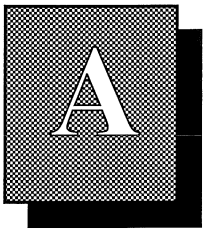
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APPENDIX A. PROGRAM EXAMPLES

WARNING!

The programs found in this chapter are only examples!
They may or may not run on your system, depending on your system configuration.

A.1 Initialisation

```
output      equ     $87FE0401       Output register
input       equ     $87FE0401       Input register


move.b      #$FF, output        Set all output lines low (switch on)
move.b      #$FE, output        Set output line 1 high (switch off)
move.b      input, d0
```


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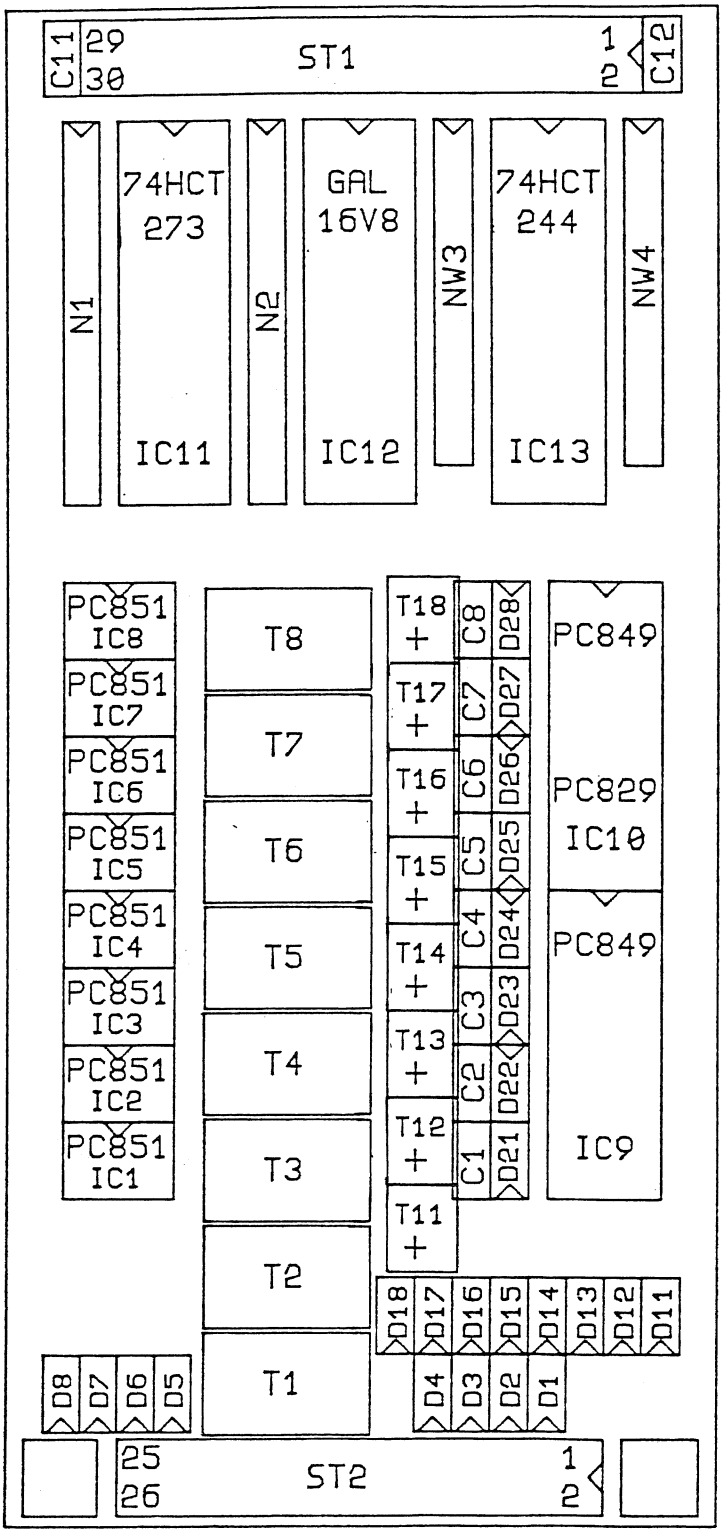
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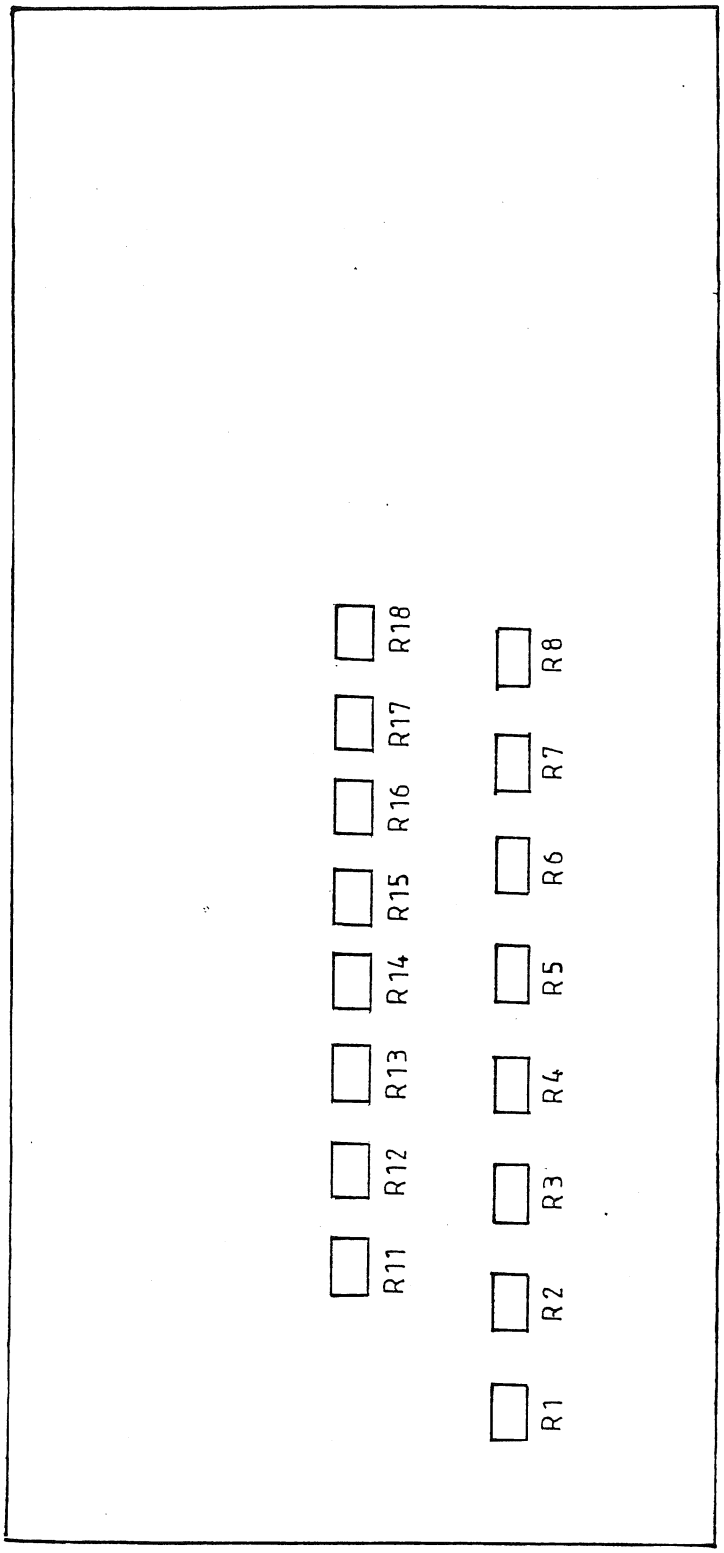
B - Seite / B - side

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