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Reference Manual

DOC. REV. 4/9/2013

VCM-DAS-3

Analog Output & Digital I/O Module for the PC/104 Bus

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MVCMDAS3

Product Release Notes

Rev 2 Release

Production release.

Rev 1 Release

Alpha. No customer release.

Support Page

The VCM-DAS-3 support page, at **http://www.VersaLogic.com/private/vcmdas3support.asp**, contains additional information and resources for this product including:

- Reference Manual (PDF format)
- Operating system information and software drivers
- Data sheets and manufacturers' links for chips used in this product
- BIOS information and upgrades
- Utility routines and benchmark software

Note: This is a private page for VCM-DAS-3 users that can be accessed only be entering this address directly. It cannot be reached from the VersaLogic homepage.

Contents

Introduction 1
- Description 1
- Technical Specifications 2
- RoHS Compliance 3
  - About RoHS 3
- Warnings 3
  - Electrostatic Discharge 3
- Technical Support 4
  - Repair Service 4

Physical Description 5
- Dimensions 5
  - Side Profile 6
- External Connectors 6
  - Connector Locations 6
  - Connector Functions and Interface Cables 7
  - J1 I/O Connector 8
  - J2 I/O Connector 9
  - J3 I/O Connector 10
- Installation 11
  - Hardware Assembly 11
  - Stack Arrangement Example 11

Configuration 12
- Jumper Blocks 12
  - Jumpers As-Shipped Configuration 12
  - Jumper Summary 13
- Base Address Configuration 14
- Bit Mode Configuration 15
- Enhanced Mode Configuration 16
- Power-up Span Range Configuration 16

Registers 17
- I/O Port Mapping 17
  - I/O Port Register Functions 18
- Enhanced Mode Registers 19
  - Enhanced Control Register 19
  - Enhanced Mode Data Registers 20
- Digital I/O Control Register 21
- Digital I/O Data Registers 22
  - Digital Input Registers 22
  - Digital Output Registers 23
- External Trigger Enable Register 24
- Analog Output Data Registers 25

DAC Channel Select Register 25
DAC Write Registers 26
DAC Read Registers 26

Analog Output 27
Analog Output Ranges and Resolution 27
Setting a Span Range 27
Analog Output Data Representation 28
Straight Binary Coding 28
Offset Binary Coding 29
Analog Output Programming 31
External Trigger Update 31
Load DAC Operation 31
Analog Output Code Example 32
Calibration 34
Setting the Gain 34
Reading the Gain 34
Enhanced Mode Operations 35
Reading DAC Data 35
Reading the Span of a Channel 35
Setting a Channel to Sleep Mode 36
Reading the Sleep Status of a Channel 36

Digital I/O 37
Signal Direction 37
Signal Polarity 37
Digital Input 37
Digital Output 37

References 38

1 Introduction

Description

The VCM-DAS-3 is a PC/104-format data acquisition board that provides analog outputs and digital I/O for process control and other applications. Its features include:

- 16 analog voltage outputs with 12-bit resolution
- Multiple output ranges
- Software adjustable output ranges per channel
- Simultaneous or individual DAC update
- Power-up ranges set by jumpers in groups of eight, reset per channel by software
- Software calibration
- 16-bit or 8-bit ISA modes
- Read-back of DAC and SPAN codes
- Reset/power up to 0V outputs for all ranges
- External trigger
- +5V operation
- 24-channel digital I/O

The VCM-DAS-3 module provides 16 single-ended analog outputs and 24 digital I/O channels. Fully compatible at the register and connector level with the Diamond Systems Ruby-MM DAC board, VCM-DAS-3 also provides enhanced mode operation that extends its capabilities. In enhanced mode:

- Analog output ranges can be set for individual channels through software.
- Analog output and ranges can be read from individual channels.
- Specific analog channels can be placed into sleep mode to conserve power.
- Individual channels can be updated and read.
- Calibration can be performed with software.

Technical Specifications

Specifications are typical at 25°C with 5.0V supply unless otherwise noted.

Board Size: 3.55" x 3.775" (PC/104 standard)

Storage Temperature:
−40° C to +85° C

Operating Temperature:
−40° C to +85° C

Power Requirements:
5V ± 10%

Analog Output:

Channels:	16 outputs
Resolution:	12 bits
Output Ranges:	Bipolar: ±10V, ±5V, ±2.5V, −2.5V to 7.5V Unipolar: 0 - 10V, 0 - 5V
Output Current:	±5 mA max per channel
Settling Time:	8 uS Typ. (±10V Range, 20V Step to ±1LSB)
Accuracy:	±1 LSB
Integral Nonlinearity:	±1 LSB
Differential Nonlinearity:	±1 LSB
Calibration:	One gain and one zero adjustment for all channels
Gain Temp. Coefficient:	±2 ppm/° C
Update Method:	Simultaneous, individual, or external trigger
Reset:	Outputs reset to 0V when board is jumpered for Enhanced Mode, mid-scale otherwise

Digital I/O:

Channels:	24
Compatibility:	CMOS / TTL, 82C55 Mode 0 only
Low Input Voltage:	−0.3V min., 0.8V max
High Input Voltage:	2.0V min., 5.5V max.
Low Output Voltage:	0.4V max.
High Output Voltage:	3.0V max.
Output Current:	+4 mA / −8 mA max.
Pull-up Resistor:	10 K Ohm
Reset:	All channels set to input mode

Software:

Operating Systems:	Compatible with most X86 operating systems including Windows 95/85/NT/CE/XP, QNX, VxWorks, and Linux
Driver Support:	No native drivers. Fully compatible with Diamond Systems drivers.

Compatibility:
PC/104 – Full compliance, 8-bit and 16-bit

Weight:
0.152 lbs (0.069 kg)

Specifications are subject to change without notice.

RoHS Compliance

The VCM-DAS-3 is RoHS-compliant.

ABOUT ROHS

In 2003, the European Union issued Directive 2002/95/EC regarding the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

The RoHS directive requires producers of electrical and electronic equipment to reduce to acceptable levels the presence of six environmentally sensitive substances: lead, mercury, cadmium, hexavalent chromium, and the presence of polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) flame retardants, in certain electrical and electronic products sold in the European Union (EU) beginning July 1, 2006.

VersaLogic Corporation is committed to supporting customers with high-quality products and services meeting the European Union's RoHS directive.

Warnings

ELECTROSTATIC DISCHARGE

Warning! Electrostatic discharge (ESD) can damage circuit boards, disk drives and other components. The circuit board must only be handled at an ESD workstation. If an approved station is not available, some measure of protection can be provided by wearing a grounded antistatic wrist strap. Keep all plastic away from the board, and do not slide the board over any surface.

After removing the board from its protective wrapper, place the board on a grounded, static-free surface, component side up. Use an antistatic foam pad if available.

The board should also be protected inside a closed metallic anti-static envelope during shipment or storage.

Technical Support

If you are unable to solve a problem after reading this manual please visit the VCM-DAS-3 Product Support web page at **http://www.VersaLogic.com/private/vcmdas3support.asp**. If you have further questions, contact VersaLogic technical support at (503) 747-2261. VersaLogic technical support engineers are also available via e-mail at Support@VersaLogic.com.

VCM-DAS-3 Support Website

http://www.VersaLogic.com/private/vcmdas3support.asp

REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (503) 747-2261. VersaLogic's standard turn-around time for repairs is five working days after the product is received.

Please provide the following information:

- Your name, the name of your company and your phone number
- The name of a technician or engineer that can be contacted if any questions arise.
- Quantity of items being returned
- The model and serial number (barcode) of each item
- A detailed description of the problem
- Steps you have taken to resolve or recreate the problem
- The return shipping address

Warranty Repair All parts and labor charges are covered, including return shipping charges for UPS Ground delivery to United States addresses.

Non-warranty Repair All non-warranty repairs are subject to diagnosis and labor charges, parts charges and return shipping fees. Please specify the shipping method you prefer and provide a purchase order number for invoicing the repair.

Note: Please mark the RMA number clearly on the outside of the box before returning.

Dimensions

The VCM-DAS-3 complies with all PC/104 standards. Dimensions are given below to help with pre-production planning and layout.

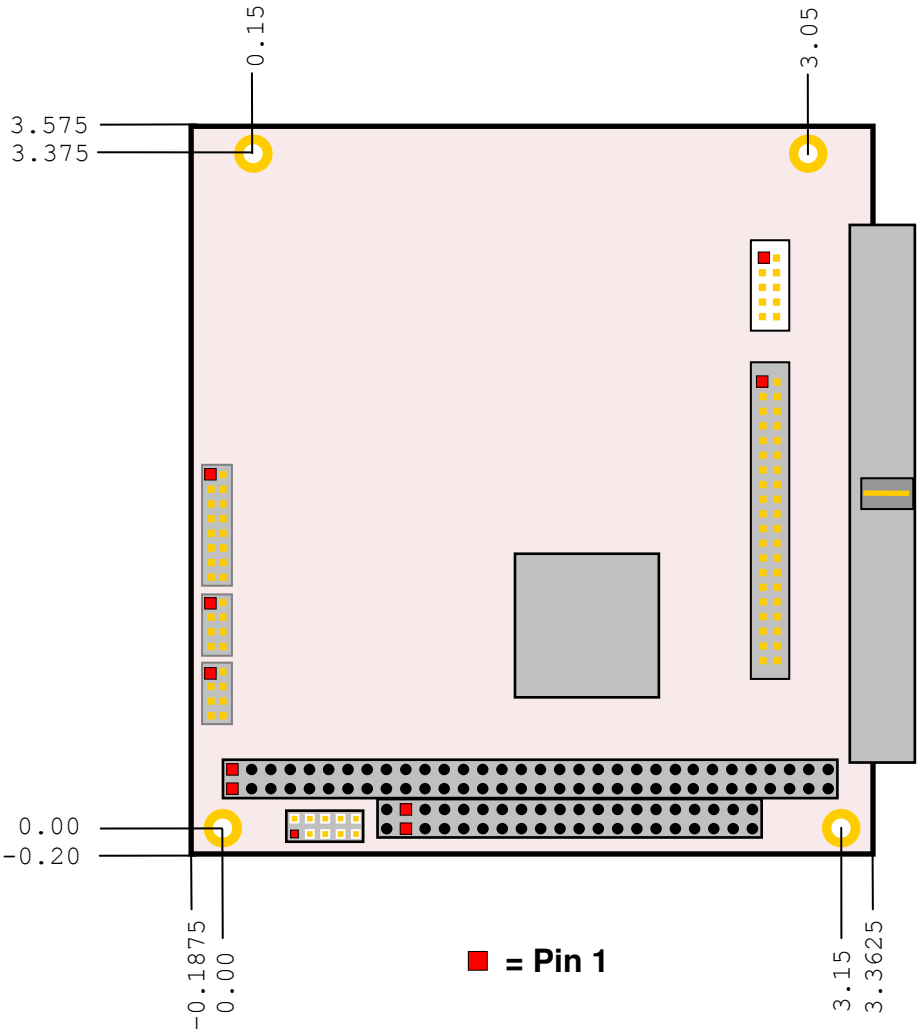

Figure 1. Dimensions and Mounting Holes

(Not to scale. All dimensions in inches.)

SIDE PROFILE

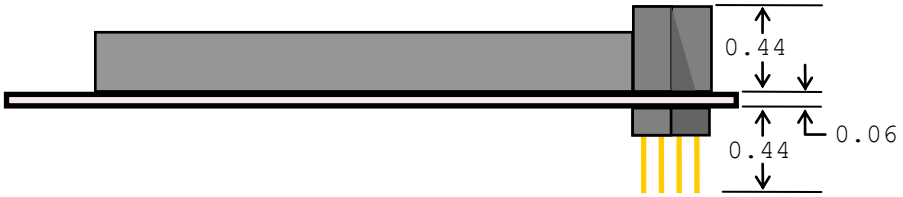

Figure 2. Side Profile
(Not to scale. All dimensions in inches.)

External Connectors

CONNECTOR LOCATIONS

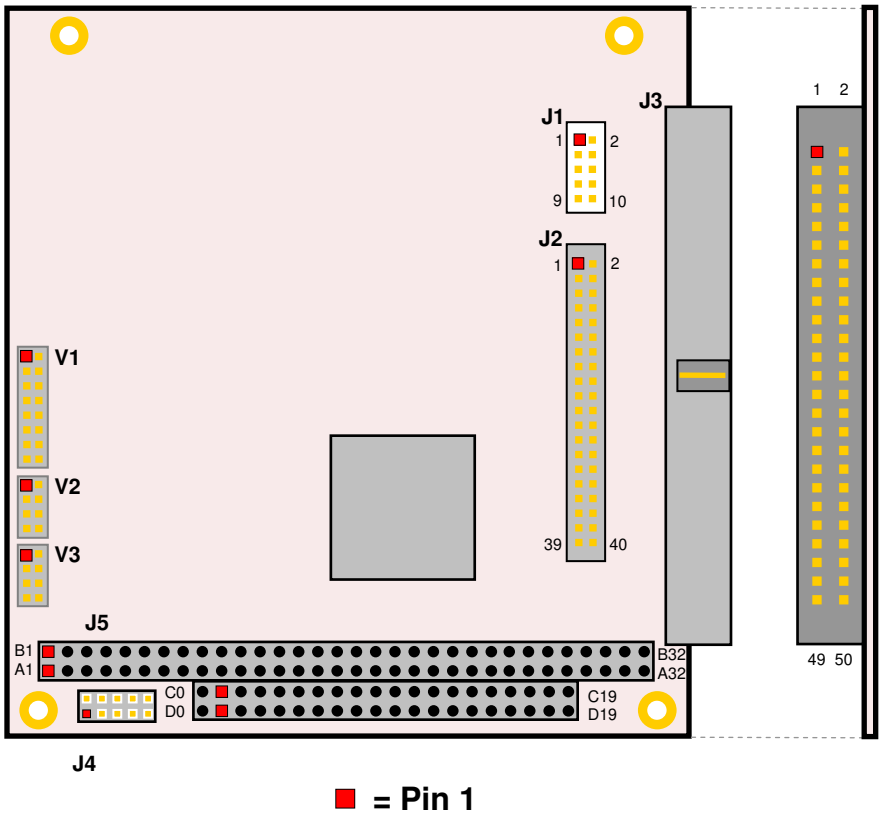

Figure 3. Connector Locations (Top)
(Not to scale.)

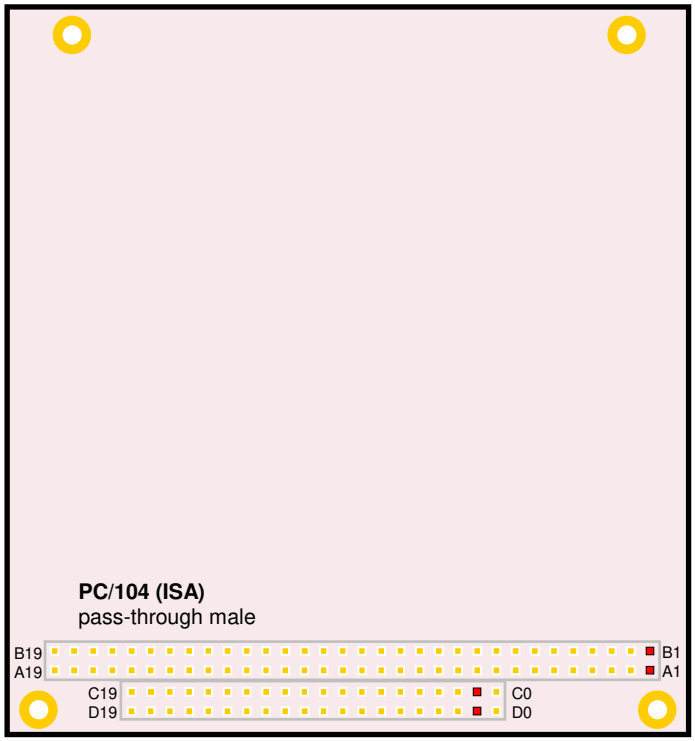

Figure 4. Connector Locations (Bottom)

(Not to scale.)

CONNECTOR FUNCTIONS AND INTERFACE CABLES

Table 1 provides information about the function, mating connectors, and transition cables for VCM-DAS-3 connectors. Page numbers indicate where a detailed pinout is available.

Table 1: Connector Functions and Interface Cables

Connector	Function	Mating Connector	Transition Cable	Cable Description	Page
J1	Digital I/O (A0-A7)	FCI 89361-710LF	–	2mm 10-pin IDC	8
J2	Analog Outputs, Digital I/O (B0-C7)	FCI 89361-740LF	CBR-4004A	12” 2mm 40-pin to 40-pin IDC to screw terminal board CBR-4004B	9
J3	Analog Outputs, Digital I/O	Standard 0.1” 50-pin cable-mount IDC	Diamond Systems C-50-18	Data acquisition, 50 conductor 0.1" ribbon cable	10
J4	Factory use only	–	–	–	–
J5	PC/104	AMP 1375795-2	–	–	–

J1 I/O CONNECTOR

The J1 I/O connector incorporates digital I/O signals A0 through A7. The pinout of the connector is shown in Table 2.

Table 2 J1 I/O Connector Pinout

J1 Pin	Signal Name	Function
1	Ground	Ground
2	DIO A7	Digital I/O A7
3	DIO A6	Digital I/O A6
4	DIO A5	Digital I/O A5
5	DIO A4	Digital I/O A4
6	DIO A3	Digital I/O A3
7	DIO A2	Digital I/O A2
8	DIO A1	Digital I/O A1
9	DIO A0	Digital I/O A0
10	Ground	Ground

J2 I/O CONNECTOR

The J2 I/O connector incorporates analog voltage outputs 0 through 15 and digital I/O channels B0 through C7. Table 3 illustrates the function of each pin and the pinout assignments to connectors on the CBR-4004 I/O board.

Table 3: J2 I/O Connector Pinout

J2 Pin	Signal Name	Function	CBR-4004 Connector	CBR-4004 Pin (Label)
1	VOUT 00	Analog Out Ch 0	**J1**	5 (IO1)
2	VOUT 01	Analog Out Ch 1	**Analog**	4 (IO2)
3	VOUT 02	Analog Out Ch 2	**Output**	3 (IO3)
4	VOUT 03	Analog Out Ch 3		2 (IO4)
5	Ground	Ground		1 (GND1)
6	VOUT 04	Analog Out Ch 4	**J2**	5 (IO5)
7	VOUT 05	Analog Out Ch 5	**Analog**	4 (IO6)
8	VOUT 06	Analog Out Ch 6	**Output**	3 (IO7)
9	VOUT 07	Analog Out Ch 7		2 (IO8)
10	Ground	Ground		1 (GND1)
11	VOUT 08	Analog Out Ch 8	**J3**	5 (IO9)
12	VOUT 09	Analog Out Ch 9	**Analog**	4 (IO10)
13	VOUT 10	Analog Out Ch 10	**Output**	3 (IO11)
14	VOUT 11	Analog Out Ch 11		2 (IO12)
15	Ground	Ground		1 (GND2)
16	VOUT 12	Analog Out Ch 12	**J4**	5 (IO13)
17	VOUT 13	Analog Out Ch 13	**Analog**	4 (IO14)
18	VOUT 14	Analog Out Ch 14	**Output**	3 (IO15)
19	VOUT 15	Analog Out Ch 15		2 (IO16)
20	Ground	Ground		1 (GND2)
21	DIO B7	Digital I/O B7	**J6**	5 (IO17)
22	DIO B6	Digital I/O B6	**Digital I/O B**	4 (IO18)
23	DIO B5	Digital I/O B5		3 (IO19)
24	DIO B4	Digital I/O B4		2 (IO20)
25	Ground	Ground		1 (GND3/PBRST#)
26	DIO B3	Digital I/O B3	**J7**	5 (IO21)
27	DIO B2	Digital I/O B2	**Digital I/O B**	4 (IO22)
28	DIO B1	Digital I/O B1		3 (IO23)
29	DIO B0	Digital I/O B0		2 (IO24)
30	Ground	Ground		1 (GND3)
31	DIO C7	Digital I/O C7	**J8**	5 (IO25)
32	DIO C6	Digital I/O C6	**Digital I/O C**	4 (IO26)
33	DIO C5	Digital I/O C5		3 (IO27)
34	DIO C4	Digital I/O C4		2 (I028)
35	Ground	Ground		1 (GND4)
36	DIO C3	Digital I/O C3	**J9**	5 (IO29)
37	DIO C2	Digital I/O C2	**Digital I/O C**	4 (IO30)
38	DIO C1	Digital I/O C1		3 (IO31)
39	DIO C0	Digital I/O C0*		2 (IO32)
40	Ground	Ground		1 (GND4)

* Pin 39 can also used as an external trigger for updating DAC channels. See External Trigger Update.

J3 I/O CONNECTOR

The J3 I/O connector incorporates analog voltage outputs 0 through 15 and digital I/O channels A0 through C7. The pinout of the connector is shown in Table 4.

Note This connector is compatible with Diamond Systems' cable C-50-18. Any standard 0.1" 50-pin cable-mount IDC connector will mate with this connector.

Table 4: J3 I/O Connector Pinout

J3 Pin	Signal Name	Function	J3 Pin	Signal Name	Function
1	Ground	Ground	26	DIO A6	Digital I/O A6
2	VOUT 00	Analog Output 0	27	DIO A5	Digital I/O A5
3	Ground	Ground	28	DIO A4	Digital I/O A4
4	VOUT 01	Analog Output 1	29	DIO A3	Digital I/O A3
5	Ground	Ground	30	DIO A2	Digital I/O A2
6	VOUT 02	Analog Output 2	31	DIO A1	Digital I/O A1
7	Ground	Ground	32	DIO A0	Digital I/O A0
8	VOUT 03	Analog Output 3	33	DIO B7	Digital I/O B7
9	Ground	Ground	34	DIO B6	Digital I/O B6
10	VOUT 04	Analog Output 4	35	DIO B5	Digital I/O B5
11	Ground	Ground	36	DIO B4	Digital I/OB4
12	VOUT 05	Analog Output 5	37	DIO B3	Digital I/O B3
13	Ground	Ground	38	DIO B2	Digital I/O B2
14	VOUT 06	Analog Output 6	39	DIO B1	Digital I/O B1
15	Ground	Ground	40	DIO B0	Digital I/O B0
16	VOUT 07	Analog Output 7	41	DIO C7	Digital I/O C7
17	VOUT 08	Analog Output 8	42	DIO C6	Digital I/O C6
18	VOUT 09	Analog Output 9	43	DIO C5	Digital I/O C5
19	VOUT 10	Analog Output 10	44	DIO C4	Digital I/O C4
20	VOUT 11	Analog Output 11	45	DIO C3	Digital I/O C3
21	VOUT 12	Analog Output 12	46	DIO C2	Digital I/O C2
22	VOUT 13	Analog Output 13	47	DIO C1	Digital I/O C1
23	VOUT 14	Analog Output 14	48	DIO C0	Digital I/O C0*
24	VOUT 15	Analog Output 15	49	V5_0	Protected +5.0 Volts
25	DIO A7	Digital I/O A7	50	Ground	Ground

* Pin 48 can also used as an external trigger for updating DAC channels. See External Trigger Update.

Installation

HARDWARE ASSEMBLY

The VCM-DAS-3 uses pass-through PC/104 (ISA) connectors so that expansion modules can be added to the top or bottom of the stack. PC/104 modules must not be positioned between the CPU board and any PC/104-*Plus* (PCI) modules on the stack.

The entire assembly can sit on a table top or be secured to a base plate. When bolting the unit down, make sure to secure all four standoffs to the mounting surface to prevent circuit board flexing. Standoffs are secured to the top circuit board using four pan head screws. Standoffs and screws are available as part number VL-HDW-101.

An extractor tool is available (part number VL-HDW-201) to separate the PC/104 modules from the stack. Use caution when using the extractor tool not to damage any board components.

STACK ARRANGEMENT EXAMPLE

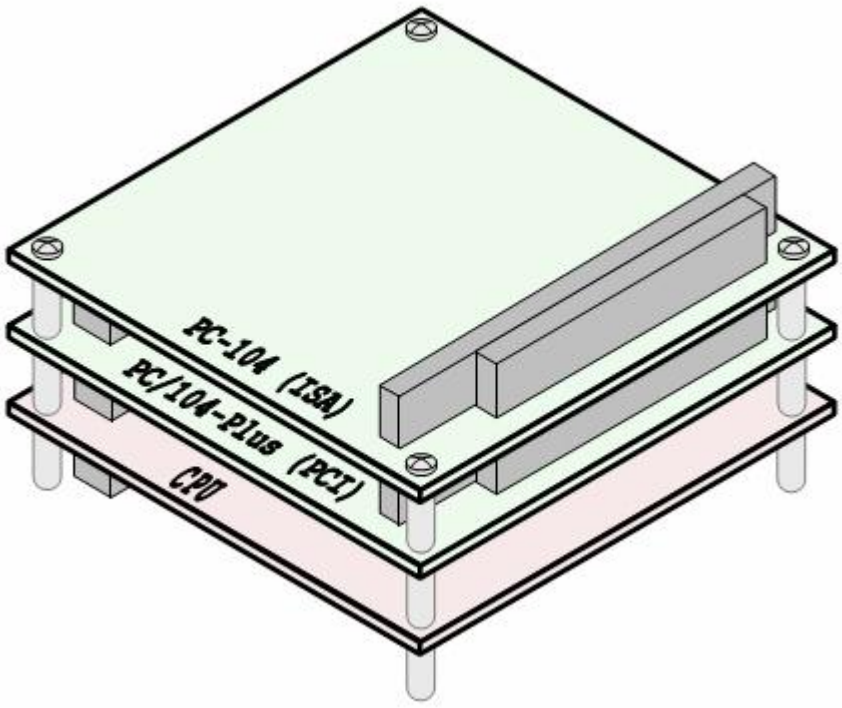

Figure 5. Stack Arrangement

Jumper Blocks

JUMPERS AS-SHIPPED CONFIGURATION

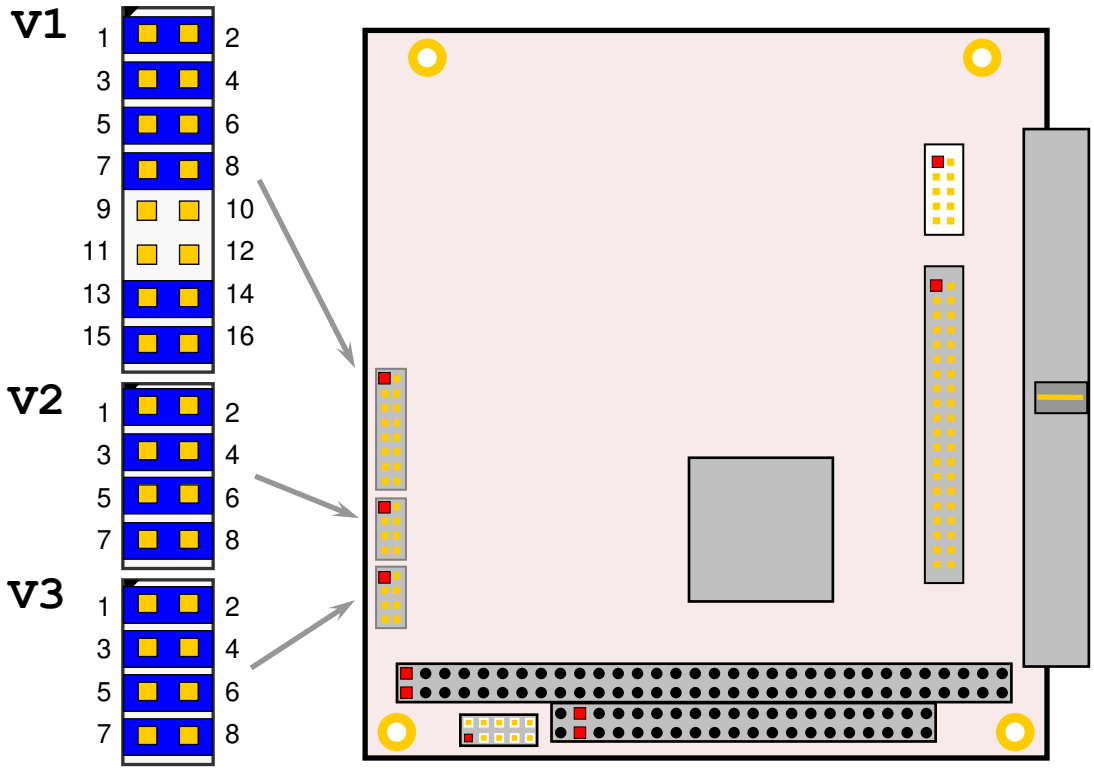

Figure 6. Jumper Block Locations

JUMPER SUMMARY

Table 5: Jumper Summary

Jumper Block	Description	As Shipped	Page
V1[15-16]	**Bit Mode Selector** In = 16-bit ISA Transactions Out = 8-bit ISA Transactions 8-bit mode forces the VCM-DAS-3 to respond with 8-bit transactions. This mode is required when using the board on an 8-bit bus. The 16-bit mode allows both 8 and 16-bit transactions.	In	15
V1[13-14]	**Enhanced/Compatible Mode Selector** In = Enhanced Mode Out = Compatible Mode Enhanced mode provides extra DAC functions, which should operate properly in applications designed for the Diamond Systems Ruby-MM board.	In	16
V1 [11-12] to [1-2]	**Base Address Selector** – A base address of 0x000 to 0x3F0 can be selected. The last digit is always 0. First Digit: 0 = [11-12] In, 9-10] Out; 1 = Out, In; 2 = Out, In; 3 = Out, Out Second Digit: 0 = [7-8] In, [5-6] In, [3-4] In, [1-2] In; 1 = In, In, In, Out; 2 = In, In, Out, In; 3 = In, In, Out, Out; 4 = In, Out, In, In; 5 = In, Out, In, Out; 6 = In, Out, Out, In; 7 = In, Out, Out, Out; 8 = Out, In, In, In; 9 = Out, In, In, Out; A = Out, In, Out, In; B = Out, In, Out, Out; C = Out, Out, In, In; D = Out, Out, In, Out; E = Out, Out, Out, In; F = Out, Out, Out, Out	Out, Out, In, In, In, In, (0x300)	16
V2	**A/D Channel 0-7 Span Range Selector** 0V to +5V: [7-8] In, [5-6] In, [3-4] In, [1-2] In 0V to +10V: In, In, In, Out −5V to +5V: In, In, Out, In −10V to +10V: In, In, Out, Out −2.5V to +2.5V: In, Out, In, In −2.5V to +7.5V: In, Out, In, Out These jumpers set the initial power up span ranges for A/D channels 0-7.	In, In, In, In (0V to +5V)	27

V3	**A/D Channel 8-16 Span Range Selector**					In, In, In, In (0V to +5V)	27
		[7-8]	[5-6]	[3-4]	[1-2]		
	0V to +5V	In	In	In	In		
	0V to +10V	In	In	In	Out		
	−5V to +5V	In	In	Out	In		
	−10V to +10V	In	In	Out	Out		
	−2.5V to +2.5V	In	Out	In	In		
	−2.5V to +7.5V	In	Out	In	Out		
	These jumpers set the initial power up span ranges for A/D channels 8-16.						

Base Address Configuration

As shipped, the VCM-DAS-3 is configured for a base address of 0x300. The card occupies up to 16 consecutive I/O addresses in enhanced mode (only eight I/O addresses in compatible mode). Jumper block V1[11-12] through V1[1-2] is used set the base address.

The base address can be configured from 0x000 to 0x3F0 on any 10h address boundary. Figure 7 shows how to set the address selector jumpers for the appropriate upper and middle hex digits of the three digit base address (for example, the “3” and “1” of base address 0x310).

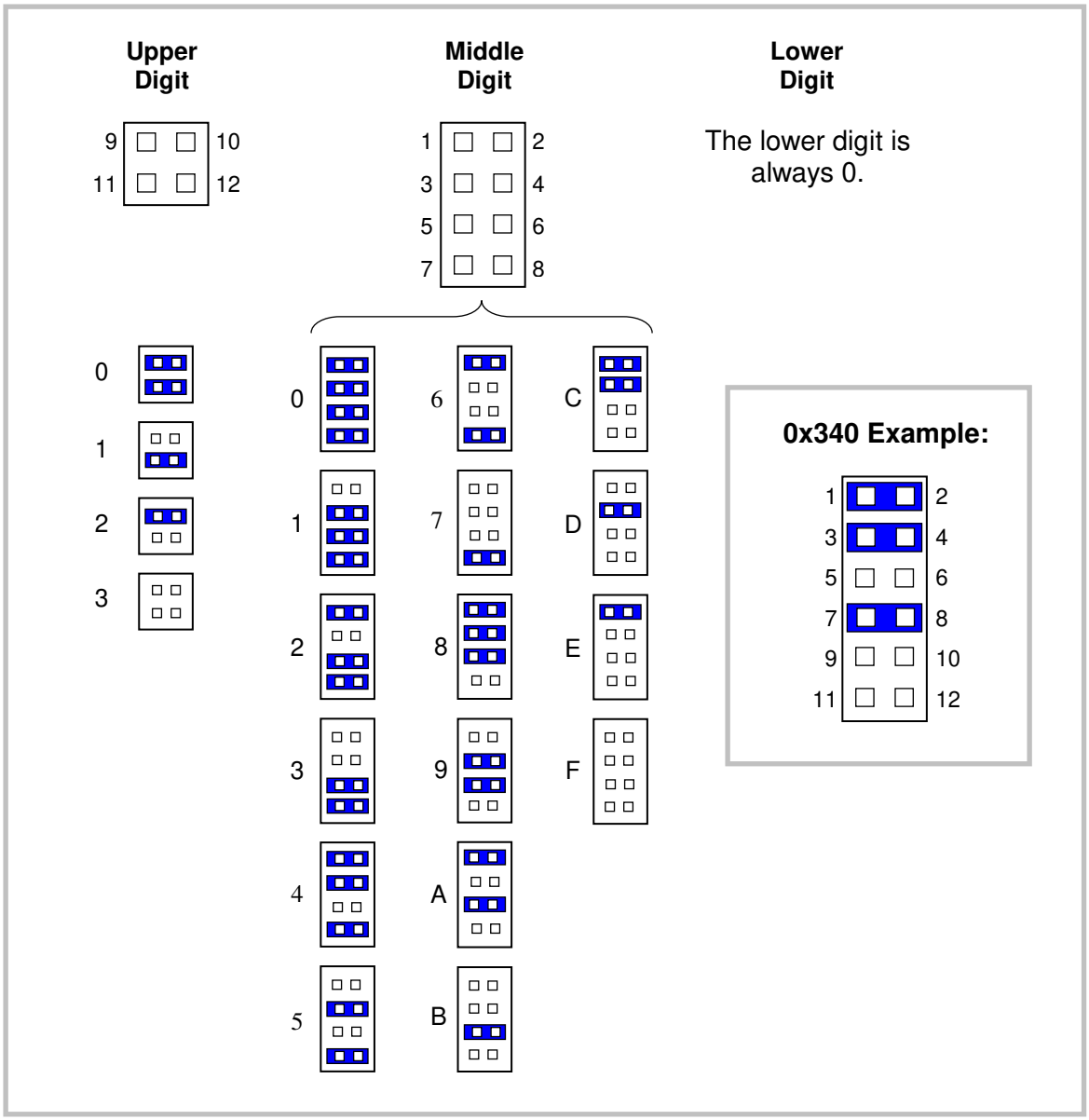

Figure 7. Base Address Jumpers

Bit Mode Configuration

The VCM-DAS-3 can operate using 8-bit or16-bit ISA transactions. For compatibility with 8-bit ISA buses, you must set the VCM-DAS-3 to use 8-bit ISA transactions.

Jumper V1[15-16] selects the bit mode. When a jumper is present, the board will operate on either 16-bit or 8-bit ISA bus. When the jumper is removed, the board is forced to perform only 8-bit ISA transactions. The default setting is jumper installed.

Enhanced Mode Configuration

Jumper V1[13-14] enables you to select between compatible or enhanced modes. A jumper installed on V1[13-14] sets the VCM-DAS-3 to enhanced mode. When no jumper is installed, the board operates in compatible mode. The default mode is enhanced.

In compatible mode, eight registers are decoded for use, including all the registers needed for DAC and DIO operations and control. These registers are identical to those provided by the Diamond Systems Ruby-MM, and enable full compatibility in applications designed with that board. In this mode, analog output ranges are determined by jumper settings (in two banks of eight registers) and are not software programmable.

Enhanced mode provides three additional registers for more specific control of DAC operations. The ENH_CON register enables you to set spans for specific DAC channels, read DAC data and spans, set DAC channels to sleep mode for power savings, and set and read the gain for all channels.

Power-up Span Range Configuration

Jumper block V2 sets the initial span range for A/D channels 7-0. Jumper block V3 sets the initial span range for A/D channels 15-8. (See Table 5 for a list of settings.) The span range can be set differently for each 8-channel bank. Within each bank, all channels will have the same initial span range; however, in enhanced mode, ranges can be set individually for each channel via software.

Two unipolar output ranges (0V to 5V and 0V to 10V), and four bipolar ranges (±2.5V, ±5V, ±10V and −2.5V to 7.5V) are available.

I/O Port Mapping

In enhanced mode, the VCM-DAS-3 operates occupies 16 ports in the I/O map. Eleven ports are mapped to functional registers, and the remaining five ports are decoded by the board and cannot be used by other PC/104 modules.

Table 6: Enhanced Mode I/O Port Addresses

Write Register	Read Register	I/O Port Address	As Shipped Address
–	PLDVER	Base Address + F	0x30F
–	–	Base Address + E	0x30E
–	–	Base Address + D	0x30D
–	–	Base Address + C	0x30C
–	–	Base Address + B	0x30B
ENCTRL	ENCTRL	Base Address + A	0x30A
ENDATHI	ENDATHI	Base Address + 9	0x309
ENDATLO	ENDATLO	Base Address + 8	0x308
DIOCTRL	DIOCTRL	Base Address + 7	0x307
DIOC	DIOC	Base Address + 6	0x306
DIOB	DIOB	Base Address + 5	0x305
DIOA	DIOA	Base Address + 4	0x304
EXTRIG	EXTRIG	Base Address + 3	0x303
DACSEL	–	Base Address + 2	0x302
DACHI	DACALL1	Base Address + 1	0x301
DACLO	DACALL0	Base Address + 0	0x300

In compatible mode, the VCM-DAS-3 operates occupies eight ports in the I/O map, all of which are functional.

Table 7: Compatible Mode I/O Port Addresses

Write Register	Read Register	I/O Port Address	As Shipped Address
DIOCTRL	DIOCTRL	Base Address + 7	0x307
DIOC	DIOC	Base Address + 6	0x306
DIOB	DIOB	Base Address + 5	0x305
DIOA	DIOA	Base Address + 4	0x304
EXTRIG	EXTRIG	Base Address + 3	0x303
DACSEL	–	Base Address + 2	0x302
DACHI	DACALL1	Base Address + 1	0x301
DACLO	DACALL0	Base Address + 0	0x300

I/O PORT REGISTER FUNCTIONS

The following table lists the functions assigned to each read and write I/O port register.

Table 8: Register Functions

Write Register	Description	Page
ENCTRL	Enhanced control	19
ENDATHI	Enhanced Data MSB	20
ENDATLO	Enhanced Data LSB	20
DIOCTRL	Digital I/O control register	21
DIOC	Digital I/O port C data	23
DIOB	Digital I/O port B data	23
DIOA	Digital I/O port A data	23
EXTRIG	External trigger enable	24
DACSEL	DAC channel register	25
DACHI	Analog output most significant data byte (MSB).	26
DACLO	Analog output least significant data byte (LSB).	26

Read Register	Description	Page
ENCTRL	Enhanced control	19
ENDATHI	Enhanced Data MSB	20
ENDATLO	Enhanced Data LSB	20
DIOCTRL	Digital I/O control register	21
DIOC	Digital I/O port C data	22
DIOB	Digital I/O port B data	22
DIOA	Digital I/O port A data	22
EXTRIG	External trigger enable	24
DACALL1	Update all DACs simultaneously	26
DACALL0	Update all DACs simultaneously	26

Enhanced Mode Registers

Setting the VCM-DAS-3 to enhanced mode enables three additional functional registers. To enable enhanced mode, install a jumper on pins V1[13-14].

ENHANCED CONTROL REGISTER

ENCTRL (Write) 030Ah

7	6	5	4	3	2	1	0
CTRL3	CTRL2	CTRL1	CTRL0	SEL3	SEL2	SEL1	SEL0

Table 9: Register Bit Assignments

Bit	Mnemonic	Description
7-4	CTRL	**Enhanced DAC Control** – These bits select operations to be performed on specific DAC channels.

CTRL3	CTRL2	CTRL1	CTRL0	Function
0	0	0	0	Set Span: 0V to +5V
0	0	0	1	Set Span: 0V to +10V
0	0	1	0	Set Span: −5V to +5V
0	0	1	1	Set Span: −10V to +10V
0	1	0	0	Set Span: −2.5V to +2.5V
0	1	0	1	Set Span: −2.5V to +7.5V
0	1	1	0	(Reserved. Do not use.)
0	1	1	1	(Reserved. Do not use.)
1	0	0	0	Read DAC
1	0	0	1	Read Span
1	0	1	0	Load DAC (LDAC)
1	0	1	1	DAC Sleep
1	1	0	0	(Reserved. Do not use.)
1	1	0	1	(Reserved. Do not use.)
1	1	1	0	Set Gain
1	1	1	1	Read Gain

Bit	Mnemonic	Description
3-0	SEL	**Channel Selection** – These bits select the DAC channel for the operation.

SEL3	SEL2	SEL1	SEL0	Channel
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

ENCTRL (Read) 030Ah

7	6	5	4	3	2	1	0
–	–	–	–	–	–	–	READY

Table 10: Register Bit Assignments

Bit	Mnemonic	Description
7-1	–	Enhanced DAC Control
0	Ready	**Ready** – Factory use only. 0 = SPI transaction in progress 1 = SPI transaction complete The internal logic of the SPI state machine is much faster than the ISA bus speed, which limits the usefulness of his bit for anything other than factory debugging of the design.

ENHANCED MODE DATA REGISTERS

ENDATHI MSB (Read) 0309h

7	6	5	4	3	2	1	0
D15	D14	D13	D12	D11	D10	D9	D8

ENDATLO LSB (Read/Write) 0308h

7	6	5	4	3	2	1	0
D7	D6	D5	D4	D3	D2	D1	D0

The data format of these registers depends on the operation executed in the ENCTRL register. See the sections listed below for information on data formats for specific operations.

Operation	CTRL Code (ENCTRL)	Page
Read DAC	08h	35
Read Span	09h	35
Set Gain	0Eh	34
Read Gain	0Fh	34