

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Pentek 4290* at our website: ***Click HERE***

OPERATING MANUAL

PENTEK MODEL 6226

Front Panel Data Port (FPDP) VIM Module
for Pentek VIM Baseboards

Pentek, Inc.
One Park Way
Upper Saddle River, NJ 07458
(201) 818–5900
http://www.pentek.com/

Copyright © 2005

Manual Part No: 800.62260 Rev: B.2 – February 1, 2005

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Manual Revision History

Date	Rev	Applicable Serial #'s	Comments
02/10/99	Preliminary	9906001 – Forward	Initial release.
02/22/99	Preliminary	9906001 – Forward	Minor typographical corrections.
05/25/99	A	9906001 – Forward	Rewrote entire installation instructions. Added new sections to Chapter 1 showing all options for the Model 6226.
08/15/00	A.1	9906001 – Forward	Added bit D07, RX_DIR, to Control/Status Register. Added Section 2.10 on OVRN LED.
01/03/01	A.2	9906001 – Forward	Corrected Table 2–3; to show inverted FPDP pinouts
01/10/01	A.3	9906001 – Forward	Corrected Table 2–3; made further corrections to table
02/21/03	A.4	9906001 – Forward	Section 1.3, FPDP, added information on transmitting data to multiple DSPs. Chapter 3, Memory Map, added VIM base addresses for Models 4292, 4293, and 4294 per KBCases 1143/1144. Section 3.4, Control Register, added reset timing information per KBCase 961. Added Section 3.5, Clock/SYNC Control Register. Section 2.9, Front Panel Connector, corrected mating connector part number per KBCases 1081/1101.
1/23/04	B	9906001 – Forward	Added base addresses for Model 4205 baseboard, removed references to 'C6x processors & specific references to Model 4290/4291. Section 3.4, added note about loss of data in DMA Demand Mode per KBCase 1173.
12/21/04	B.1	9906001 – Forward	Sect 3.7, added FPDP SUSPEND bit D02 to Clock/Sync Control Reg.
2/1/05	B.2	9906001 – Forward	Sect 3.4.2, corrected FPDP Cable Termination bit description.

WARRANTY

Pentek warrants that all products manufactured by Pentek conform to published Pentek specifications and are free from defects in materials and workmanship for a period of one year from the date of delivery when used under normal operating conditions and within the service conditions for which they were furnished. The obligation of Pentek arising from a warranty claim shall be limited to repairing or at its option, replacing without charge, any product which in Pentek's sole opinion proves to be defective within the scope of the warranty.

Pentek must be notified in writing of the defect or nonconformity within the warranty period and the affected product returned to Pentek within thirty days after discovery of such defect or nonconformity. Buyer shall prepay shipping charges, taxes, duties and insurance for products returned to Pentek for warranty service. Pentek shall pay for the return of products to buyer except for products returned from another country.

Pentek shall have no responsibility for any defect or damage caused by improper installation, unauthorized modification, misuse, neglect, inadequate maintenance, accident or for any product which has been repaired or altered by anyone other than Pentek or its authorized representatives.

The warranty described above is buyer's sole and exclusive remedy and no other warranty, whether written or oral, is expressed or implied. Pentek specifically disclaims fitness for a particular purpose. Under no circumstances shall Pentek be liable for any direct, indirect, special, incidental, or consequential damages, expenses, losses, or delays (including loss of profits) based on contract, tort, or any other legal theory.

COPYRIGHT

Copyright © 2005, Pentek, Inc. All Rights Reserved. Contents of this publication may not be reproduced in any form without written permission.

Appendix B, ICD2053B Data Sheet, is the copyrighted property of Cypress Semiconductor Corporation, 3901 North First Street, SanJose, CA 95134, 408–943–2600, and is used with their permission.

Printed in the United States of America.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Table of Contents

Page

Chapter 1: Overview

1.1 General Description....7
1.2 Features....7
1.3 Applications....7
1.4 FPDP Interface....7
1.5 Operation....8
1.6 Block Diagram....8
Figure 1–1: Model 6226 Block Diagram....8
1.7 Model 6226 Options....9
1.7.1 Model 6226–001....9
Figure 1–2: Model 6226–001....9
1.7.2 Model 6226–002....10
Figure 1–3: Model 6226–002....10
1.7.3 Model 6226–003....10
Figure 1–4: Model 6226–003....10
Figure 1–5: Model 6226–004....11
1.7.4 Model 6226–004....11
1.8 Specifications....12

Chapter 2: Installation and Connections

2.1 Inspection....13
2.2 Installation Overview....13
2.3 Removing a VIM Module from a VIM baseboard....14
Figure 2–1: VIM Module – Front Panel Screws....14
Figure 2–2: Model 6226 Mounting Configurations on VIM Baseboard....16
Figure 2–3: Model 6226 PC Board – FPDP & VIM Connectors....17
Figure 2–4: Typical VIM Baseboard – Connectors & Mounting Holes....18
2.4 Model 6226–001 or 6226–002 Installation....19
Figure 2–5: Model 6226 – Shipping Brackets....19
Figure 2–6: Model 6226 – Nylon Standoff Location....20
Figure 2–7: Model 6226 – VIM Screw Locations (top view)....21
Figure 2–8: Model 6226 – Front Panel Screws....21
2.5 Model 6226–003 Installation....22
Figure 2–9: Model 6226–003 Expansion Board & Connector Parts....22
Figure 2–10: Model 6226 – Shipping Brackets....23
Figure 2–11: Model 6226 – Front Panel Screws....24
Figure 2–12: Model 6226 – VIM Screw Locations (top view)....24

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Table of Contents

Page

Chapter 2: Installation and Connections (continued)

2.6 Model 6226–004 Installation 25
Figure 2–13: Model 6226–004 Two–slot Board and Parts 25
Figure 2–14: Model 6226–004 Disassembly Steps 26
Figure 2–15: Model 6226 – Shipping Brackets 27
Figure 2–16: Model 6226 – VIM Screw Locations (top view) 28
Figure 2–17: Expansion FPDP Front Panel & Blank VIM panel 29
2.7 Expansion Kits for the Model 6226 30
2.7.1 Model 6226–001 to Model 6226C–003 30
Table 2–1: Model 6626 Options & Expansion Kits 30
Figure 2–18: Model 6226–003 Expansion Board & Connector Parts 31
Figure 2–19: Model 6226–003 Stacking Connector Inserted into P4 32
Figure 2–20: Model 6226–003 Guide Blocks 33
Figure 2–21: Model 6226–003 Tightening Guide Block Screws 34
Figure 2–22: Model 6226 – VIM Screw Locations (top view) 35
2.7.2 Model 6226–001 to Model 6226C–004 36
Figure 2–23: Model 6226–004 Two–slot Board and Parts 36
Figure 2–24: Model 6226 – VIM Screw Locations (top view) 37
Figure 2–25: Expansion FPDP Front Panel & Blank VIM panel 38
2.8 Resistor Networks 39
Table 2–2: Model 6226 – FPDP Mode Resistor Network Placement 39
2.9 Front Panel Connector 40
Table 2–3: Model 6226 – FPDP Inverted Connector Pin Assignments 40
2.9.1 D31 – D00 (Data Bus) 41
2.9.2 DIR (Data Direction) 41
2.9.3 DVALID (Data Valid) 41
2.9.4 STROB (Data Strobe) 41
2.9.5 NRDY (Not Ready) 41
2.9.6 PIO1, PIO2 (Programmable I/O) 41
2.9.7 PSTROBE (+PECL Data Strobe) 41
2.9.8 PSTROBE (–PECL Data Strobe) 42
2.9.9 RESERVED 42
2.9.10 SUSPEND (Suspend Data) 42
2.9.11 SYNC (Sync Pulse) 42
2.10 Front Panel LED 42

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Table of Contents

Page

Chapter 3: Memory Map and Register Descriptions

3.1 Overview 43
3.2 Model 6226 Memory Map 43
Table 3–1: VIM Base Addresses for Models 4290 to 4295 VIM Baseboards 43
Table 3–2: VIM Base Addresses for Model 4205 VIM Baseboards 43
3.3 ID EEPROM Readout Register 44
Table 3–3: Model 6226 Memory Map 44
Table 3–4: ID EEPROM Register 44
3.4 Control Register 45
Table 3–5: Control Register 45
3.4.1 FPDP RX_DIR 45
3.4.2 FPDP Cable Termination 46
3.4.3 Receive Clock Detect 46
3.4.4 Receiver Not Ready 46
3.4.5 Factory Test 47
3.4.6 FPDP Programmable I/O Direction 47
3.4.7 Select Receive Clock 47
3.4.8 FPDP Direction 47
3.5 Programmable Clock Register 48
Table 3–6: Programmable Clock Register 48
3.5.1 SDATA for Programmable Clock Chip 48
3.5.2 SCLK for Programmable Clock Chip 48
3.6 Programmable I/O Data Register 49
Table 3–7: Programmable I/O Data Register 49
3.7 Clock/SYNC Control Register 50
Table 3–8: Clock/SYNC Control Register 50
3.7.1 FPDP Suspend 50
3.7.2 Select TTL Receive Clock Edge 50
3.7.3 Programmable Sync 50

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Table of Contents

Page

Appendix A: ID EEPROM Format

A.1 Introduction A–1
A.2 EEPROM Format Example A–1
Table A–1: VIM ID EEPROM Register.....A–1
Table A–2: EEPROM Example (Model 6226 shown).....A–2

Appendix B: Cypress Semiconductor – ICD2053B Data Sheet

B.1 Introduction B–1

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Chapter 1: Overview

1.1 General Description

The Model 6226 is a Front Panel Data Port (FPDP) Adapter VIM−2 module that attaches directly to VIM−compatible baseboards, including the Pentek Model 4205 and Models 4290 through 4295 DSP (Digital Signal Processing) VIM baseboards. The Model 6226 makes FPDP peripherals available to the baseboard processors.

Two Model 6226 adapters may be attached to a VIM baseboard to provide four bi−directional FPDP ports, one per processor. Alternately, the Model 6226 may be com−bined with another VIM−2 module to provide additional I/O functions.

1.2 Features

- ❑ VIM−2 module for the Pentek Model 4205, and Models 4290 through 4295 Quad DSP (Digital Signal Processing) VIM baseboards
- ❑ Provides two bi−directional FPDPs
- ❑ Supports sustained data rates to 160 MB/sec
- ❑ Compatible with Pentek FPDP peripherals, such as software radio products
- ❑ Expands to four bi−directional FPDPs using two Model 6226 modules
- ❑ Compatible with other VIM−2 modules to provide additional functions

1.3 Applications

This adapter allows peripherals with FPDP interfaces to be connected directly to the VIM baseboard processors. Peripherals available from Pentek include multichannel data acquisition systems, A/D and D/A converters, digital receivers, and high−capac−ity and high−speed memory buffers.

1.4 FPDP Interface

FPDP (Front Panel Data Port) is an industry standard front panel ribbon interface, now defined by an ANSI/VITA specification, that provides high−speed data transfers between system peripherals, array processors, and data acquisition devices. You can wire up to four 6226 receivers in parallel by utilizing a multidrop FPDP cable. FPDP implements a 32−bit parallel communication link capable of delivering data at sus−tained rates of 160 MB/sec using standard flat ribbon cable.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

1.5 Operation

The Model 6226 contains two identical sections, each providing bi–directional FPDP ports to its respective VIM baseboard processor. A CPLD controller provides interface through the mezzanine connectors to the 32–bit mezzanine Bi–FIFO ports of the VIM baseboard. Each FPDP port can be individually configured for either input or output operation. The baseboard Bi–FIFOs are bi–directional devices and can also be pro–grammed to match the mode of FPDP data flow.

Each Model 6226 features one 80–pin FPDP connector on its front panel. This connec–tor nests in the same slot as the VIM baseboard front panel. Provisions are made for cabling the second FPDP connector to an adjacent VME carrier panel. Two Model 6226 adapters can be installed to provide two FPDP interfaces in the same slot as the base–board, and two FPDP interfaces in the adjacent VMEbus slot.

1.6 Block Diagram

The following is a simplified block diagram of the Model 6226, connected to a VIM baseboard.

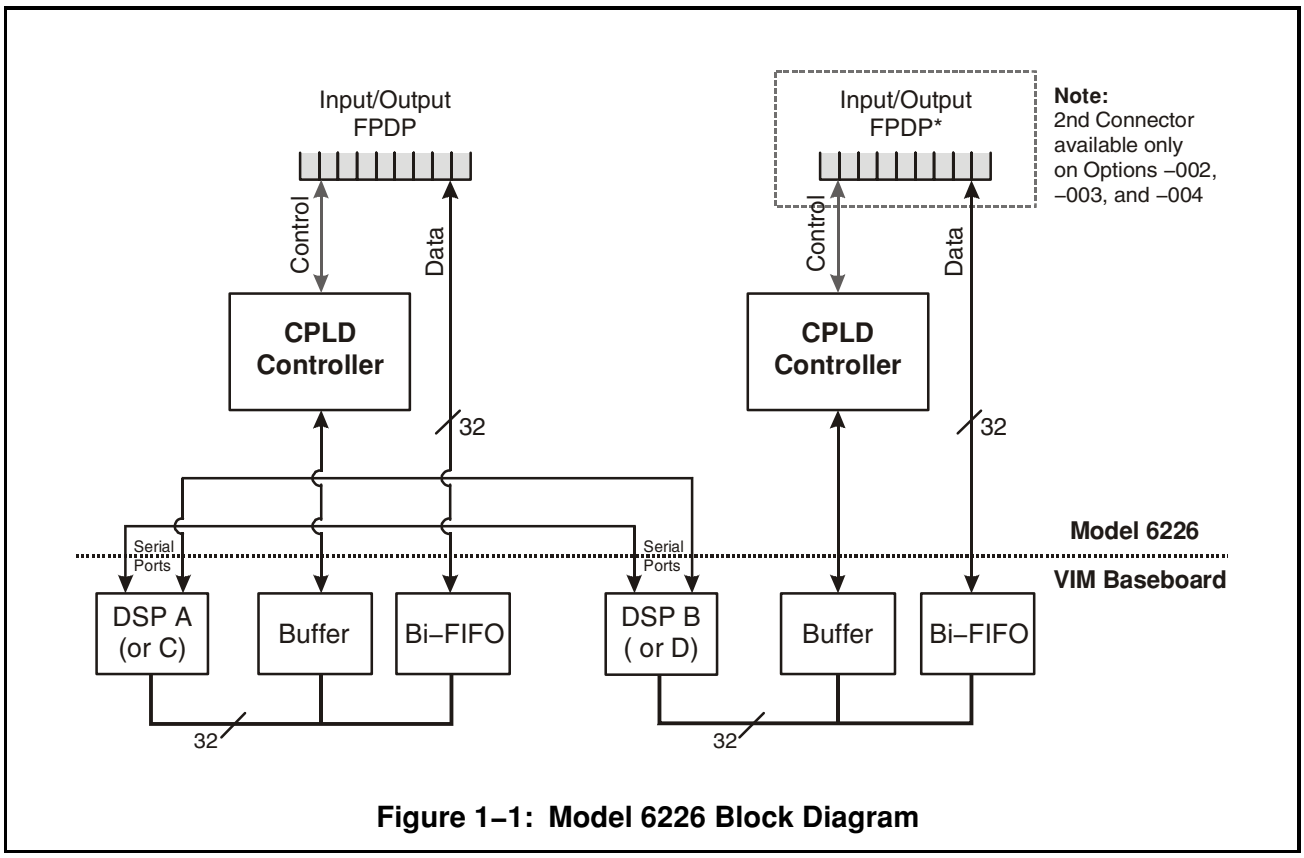


Figure 1–1: Model 6226 Block Diagram

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

1.7 Model 6226 Options

The Model 6226 is available in four options that provide different mounting and connector capabilities.

Model 6226–001 Mounts in one VIM expansion slot on the VIM baseboard;
Provides one FPDP connector on baseboard panel

Model 6226–002 Mounts in one VIM expansion slot on the VIM baseboard;
Provides two FPDP connectors — one connector on baseboard panel and one connector on an attached ribbon cable

Model 6226–003 Mounts in both VIM expansion slots on the VIM baseboard;
Provides two FPDP connectors on baseboard panel

Model 6226–004 Mounts in one VIM expansion slot on the VIM baseboard, plus one adjacent VMEbus slot;
Provides two FPDP connectors — one connector on baseboard panel and one connector on adjacent VMEbus adapter panel

Two Model 6226–001, 6226–002, or 6226–004 modules can be installed on a single VIM baseboard to provide up to four FPDF connections.

1.7.1 Model 6226–001

Model 6226–001, shown in Figure 1–2 at the right, consists of a single VIM–2 FPDP module with a single FPDP connector. This module can be installed in either the top or bottom VIM expansion slot on the VIM baseboard.

The Model 6226–001 can be converted into either a Model 6226–003 or 6226–004 with the purchase of the Model 6226C–003 or 6226C–004 Expansion Kit.

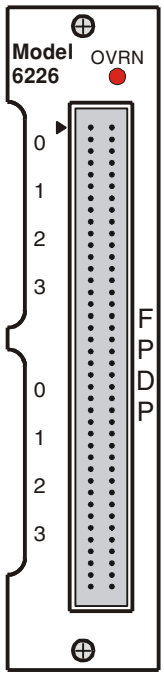


Figure 1–2: Model 6226–001

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

1.7 Model 6226 Options (continued)

1.7.2 Model 6226–002

Model 6226–002, shown in Figure 1–3 below, consists of a single VIM–2 FPDP module with two FPDP connectors. This module can be installed in either the top or bottom expansion slot on the VIM baseboard. The second FPDP connector (female) is on a ribbon cable, and fits into an FPDP connector on an adjacent board.

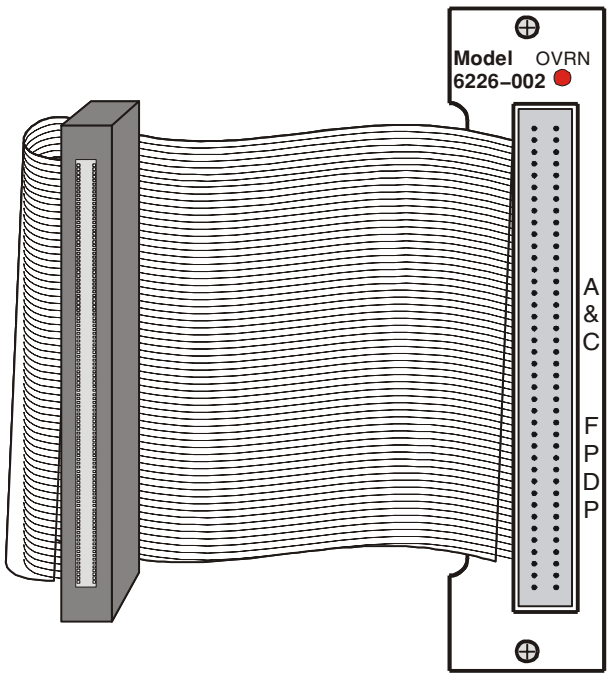


Figure 1–3: Model 6226–002

1.7.3 Model 6226–003

Model 6226–003, shown in Figure 1–4 at the right, consists of a VIM–2 FPDP board, plus a VIM–2 expansion board, mounted on a single VIM baseboard. (This essentially makes this module a VIM–4, although only two VIM connectors on the baseboard are used). This Model 6226 option offers two FPDP connectors in a single VMEbus slot. The main FPDP board must be installed in the top VIM expansion slot of the VIM baseboard.

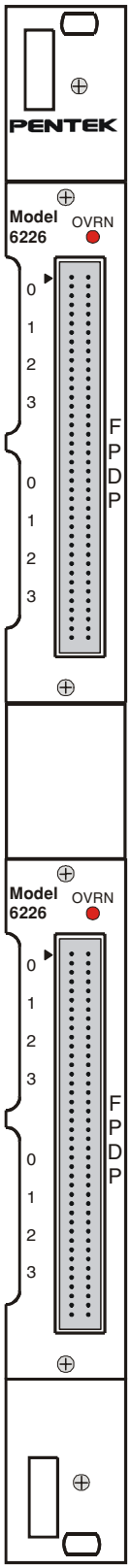


Figure 1–4: Model 6226–003

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

1.7 Model 6226 Options (continued)

1.7.4 Model 6226–004

Model 6226–004, shown in Figure 1–5 at the right, consists of a VIM–2 FPDP module, plus an expansion board and FPDP adapter panel that fits into an adjacent VMEbus slot. This Model 6226 option offers two FPDP connectors, one on the VIM baseboard panel and one on the adjacent FPDF adapter panel. The main FPDP board may be installed in either the top (as illustrated) or bottom VIM expansion slot of the VIM base–board.

Both the Models 6226–001 and 6226–003 can be converted into a Model 6226–004 with the purchase of the Model 6226C–004 Expansion Kit.



When installing the Model 6226C–004 expansion kit onto a Model 6226–003, the existing expansion FPDP board must be removed from the VIM baseboard before installing the 6226C–004 expansion board.

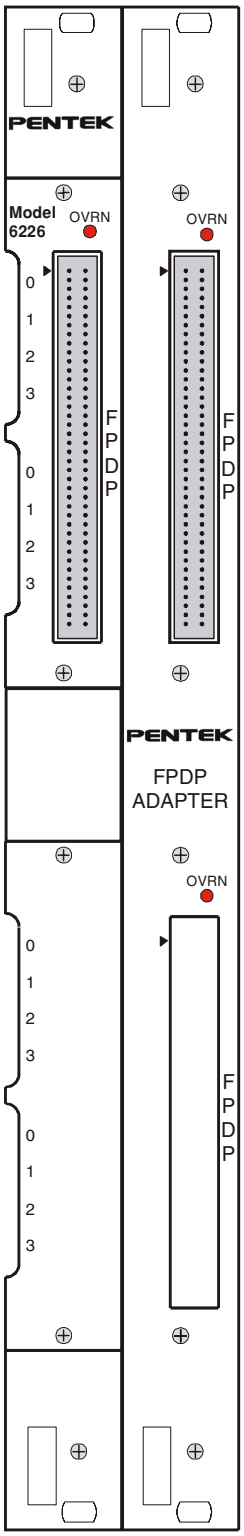


Figure 1–5: Model 6226–004

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

1.8 Specifications

Sample Rate Control

Clock Source:	Internal crystal oscillator
PECL	40 MHz
TTL	20 MHz

Front Panel

Input/Output:	(1) FPDP inverted connector on Model 6226 (1) FPDP inverted connector on VIM extender board; Connector transfers up to 32 bits of data, using 0.025" pitch 80−conductor ribbon cable, Pentek # 378.68000, and 80−pin connector, Pentek # 353.08050
LED:	(1) FIFO data overrun LED

Cable Lengths

Multiple FPDP Interfaces:	Up to 1 Meter (max.)
Single FPDP Interface:	Up to 2 Meters (max.) (one FPDP T/M, one FPDP R/M)

Power Requirements

+5V:	750 mA

Dimensions:	VIM−2 Module
Height:	114.3 mm (4.5 in.)
Depth:	102.4 mm (4.03 in.)
Width:	20.3 mm (0.8 in)

Environmental

Operating Temperature:	0° to 50°C
Storage Temperature:	−20° to 90°C
Relative Humidity:	0 to 95% non−condensing

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Chapter 2: Installation and Connections

2.1 Inspection

After unpacking the unit, inspect it carefully for possible damage to connectors or components. If any damage is discovered, contact Pentek immediately at (201) 818–5900. Please save the original shipping container and packing material in case reshipment is required.

2.2 Installation Overview

There are four different versions of the Model 6226. The instructions for installing the different VIM modules are included as separate sections within this chapter, as identified in the table below. Additional instructions for installing expansion kits are also included at the end of this chapter. These kits allow you to upgrade a Model 6226–001 to a Model 6226–003 or Model 6226–004, depending on the kit purchased (in addition, a model –004 can be converted to –003, or a –003 can be converted to a –004 with the correct upgrade kit). The Model 6226–002 cannot be upgraded to the Model 6226–003 or the Model 6226–004.

Section	Description	Begins on page
Section 2.3	Removing a VIM Module from a VIM baseboard	page 14
Section 2.4	Model 6226–001 or 6226–002 Installation	page 19
Section 2.5	Model 6226–003 Installation	page 22
Section 2.6	Model 6226–004 Installation	page 25
Section 2.7.1	Model 6226–001 to Model 6226C–003 Upgrade	page 30
Section 2.7.2	Model 6226–001 to Model 6226C–004 Upgrade	page 36

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.3 Removing a VIM Module from a VIM baseboard

Use these steps if a VIM module is already installed on your VIM baseboard. If no VIM is installed, go to the section that corresponds to the Model 6226 you purchased.

Tools required:

- ❑ #1 Phillips screwdriver
- ❑ Flat–blade screwdriver (blade width 5/16–inch or less)

⚠ WARNING: Perform all assembly steps at an anti–static workstation.

1) Remove the VIM baseboard from the VME chassis, and place the board on an anti–static workstation, solder side up — with the VIM modules facing down.

2) The VIM front panel is secured to the VIM baseboard by two countersunk Phillips–head screws passed through mounting holes at the front. If the module is a VIM–4, there are two front panels. Remove the screws from each VIM module front panel, as illustrated in the figure below.

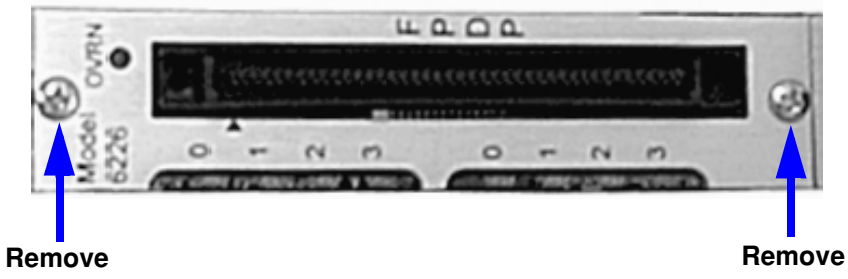


Figure 2–1: VIM Module – Front Panel Screws

3) The module is secured to the VIM baseboard by two short pan–head Phillips screws passed through the mounting holes at the front of the VIM baseboard (see Figure 2–4 on page 18). The panel is secured in two places (a) & (b) if the module is a VIM–2, or in four places (a), (b), (c), & (d) if the module is a VIM–4. Remove these screws and set two of them aside to use when installing the Model 6226. If the module you are removing is a VIM–4, store the remaining screws with the module for use if you reinstall that module.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.3 Removing a VIM Module from a VIM baseboard (continued)

4) Remove the nylon screw at the rear of the VIM module. The rear of the module is secured to the baseboard by a slotted nylon screw (two screws, if the module is a VIM−4) passed through the mounting hole(s) **(f)** and/or **(e)** between the mezzanine connectors and threaded into a nylon spacer(s) on the mezzanine (see Figure 2−4 on page 18). Remove the screw(s) with the flat−blade screwdriver, and set one aside to use when installing the Model 6226. If the module you are removing is a VIM−4, store the remaining screw with the module for use if you reinstall that module.

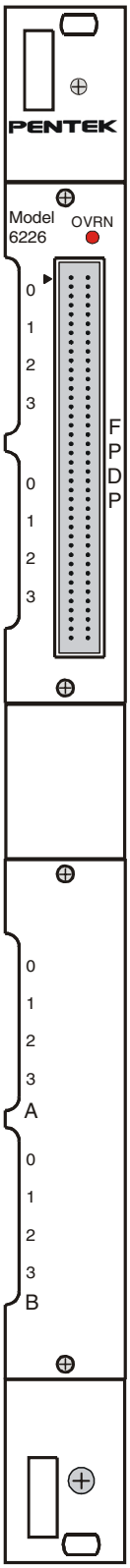
5) Remove the VIM module carefully. Turn the baseboard over, so the VIM module is on top. Gently and carefully, disengage the module's connectors from those on the baseboard. This is most easily accomplished by lifting the board at its edges, near the connector, one side at a time. This may need to be done a little bit at a time (e.g., lift first from the right, then from the left, then repeat the process until all pins are disengaged). At all times, be careful not to bend or break any of the connector pins on the mezzanine module or the baseboard.

6) Store the removed module in an anti−static bag.

7) Go to the section that corresponds to the Model 6226 you are installing.

Section	Description	Begins on page
Section 2.4	Model 6226−001 or 6226−002 Installation	page 19
Section 2.5	Model 6226−003 Installation	page 22
Section 2.6	Model 6226−004 Installation	page 25
Section 2.7.1	Model 6226−001 to Model 6226C−003 Upgrade	page 30
Section 2.7.2	Model 6226−001 to Model 6226C−004 Upgrade	page 36

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com



Model 6226–001, **Model 6226–002**, and **Model 6226–004** can be placed in either the top or bottom position of a VIM baseboard. Two Model 6226–001, Model 6226–002, or Model 6226–004 VIM modules can be installed on a VIM baseboard. The Model 6226–004 uses a second VME slot to the right of the VIM baseboard.

Model 6226–003 uses both VIM slots. The main FPDP board is installed in the top location, while the expansion board is installed in the bottom location.

In the top position of a VIM baseboard, the Model 6226–001 connects to Processor A. When in the bottom position, the Model 6226–001 connects to Processor C.

In the top position of a VIM baseboard, the Model 6226–002 connects to Processors A & B. When in the bottom position, the Model 6226–002 connects to Processors C & D.

Figure 2–2: Model 6226 Mounting Configurations on VIM Baseboard

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

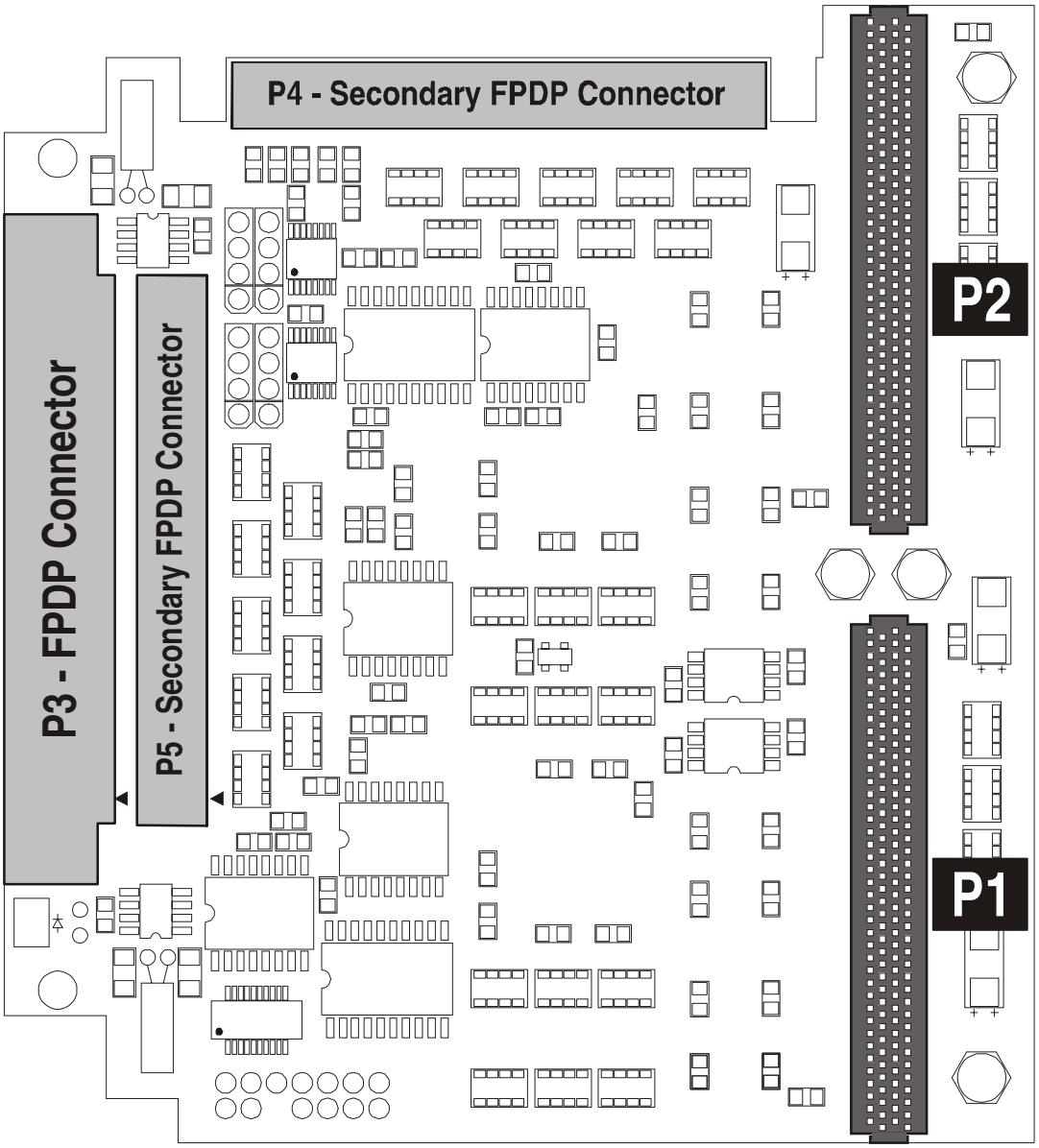


Figure 2–3: Model 6226 PC Board – FPDP & VIM Connectors

NOTE: The connector at P5 is installed only on the Model 6226–002.
The connector at P4 is installed only on Models 6226–001, –003, and –004.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

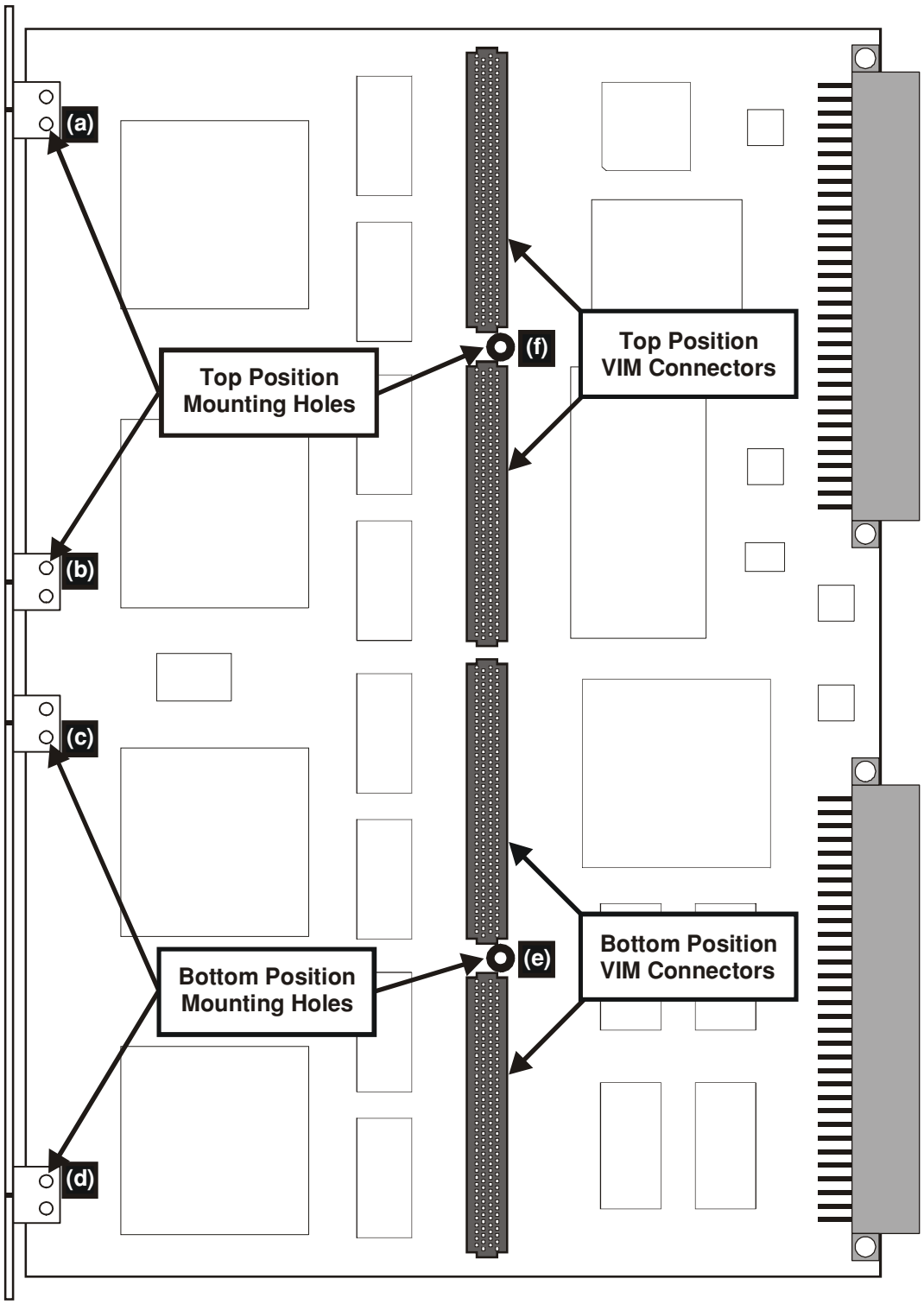


Figure 2–4: Typical VIM Baseboard – Connectors & Mounting Holes

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.4 Model 6226–001 or 6226–002 Installation

Both the Model 6226–001 and Model 6226–002 are single VIM–2 modules that mount on two adjacent mezzanine connectors on the VIM baseboard. Throughout this section of the manual, they are both referred to as Model 6226, except where a difference exists between the two versions of the VIM module. When there is a difference, each model is specifically called out in the text.

Tools required:

- ❑ #1 Phillips screwdriver
- ❑ Flat–blade screwdriver (blade width 5/16–inch or less)

⚠ WARNING: Perform all assembly steps at an anti–static workstation.

1) Remove the shipping brackets from the Model 6226. When the Model 6226 is shipped, two red shipping brackets are placed on the VIM module to hold the front panel in place, see Figure 2–5 below. These shipping brackets must be removed by removing four Phillips screws, two from the front panel (see Figure 2–1 on page 14), and two from the bottom (non–component side) of the Model 6226.

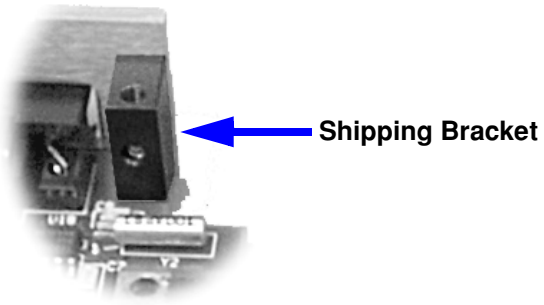


Figure 2–5: Model 6226 – Shipping Brackets

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.4 Model 6226–001 or 6226–002 Installation (continued)

2) Install the nylon standoff on the VIM baseboard. The nylon standoff goes in the mounting hole at the REAR of the VIM connectors, farthest from the front panel, see Figure 2–6 below. On the VIM baseboard diagram, Figure 2–4 on page 18, the mounting hole is labeled as **(f)** for the top VIM connectors, and **(e)** for the bottom VIM connectors.

   Figure 2–6 below shows the nylon screw inserted into the standoff. In this case, the screw needs to be removed so the Model 6226 can be properly installed. There are two nylon screws. One screw secures the nylon standoff to the VIM baseboard, the other secures the VIM module to the standoff. At first, only secure the standoff to the VIM baseboard.

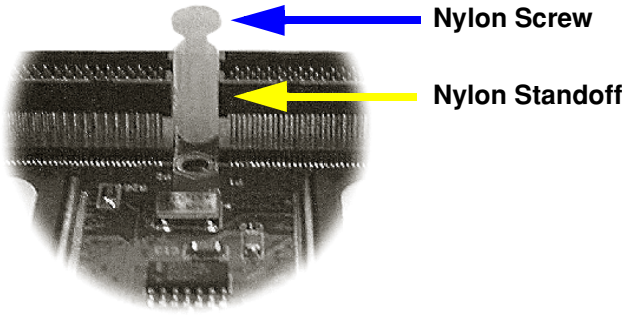


Figure 2–6: Model 6226 – Nylon Standoff Location

3) With the VIM baseboard's component side (the side with the VIM connectors) facing up, align the two VIM connectors on the Model 6226 VIM–2 module (P1 and P2) with two VIM connectors on the baseboard—the Model 6226 VIM–2 module may be installed in either the top or bottom mezzanine position on the VIM baseboard. See Figure 2–3 for location of the Model 6228 VIM connectors, and see Figure 2–4 for location of the VIM connectors on a typical VIM baseboard.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.4 Model 6226–001 or 6226–002 Installation (continued)

4) Securely fasten the Model 6226 module to the VIM baseboard. There are three screws that need to be tightened. A nylon screw attaches the Model 6226 to the nylon standoff (see Figure 2–6 on page 20), and two 2.5–mm Phillips–head screws attach the Model 6226 to the front brackets (see Figure 2–7 below). Place these screws on the Model 6226 and tighten them.

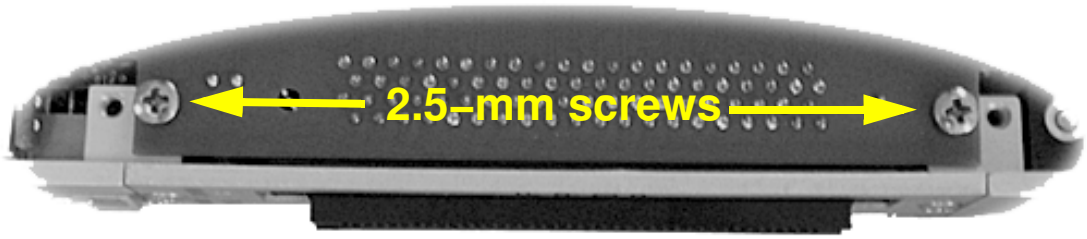


Figure 2–7: Model 6226 – VIM Screw Locations (top view)

5) Install the Model 6226 front panel. The front panel uses two Phillips screws to secure the front panel to the VIM module. Place the screws on the Model 6226 and tighten them (see Figure 2–8 below).

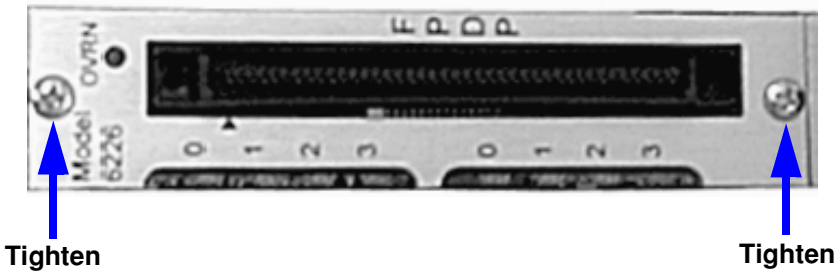


Figure 2–8: Model 6226 – Front Panel Screws

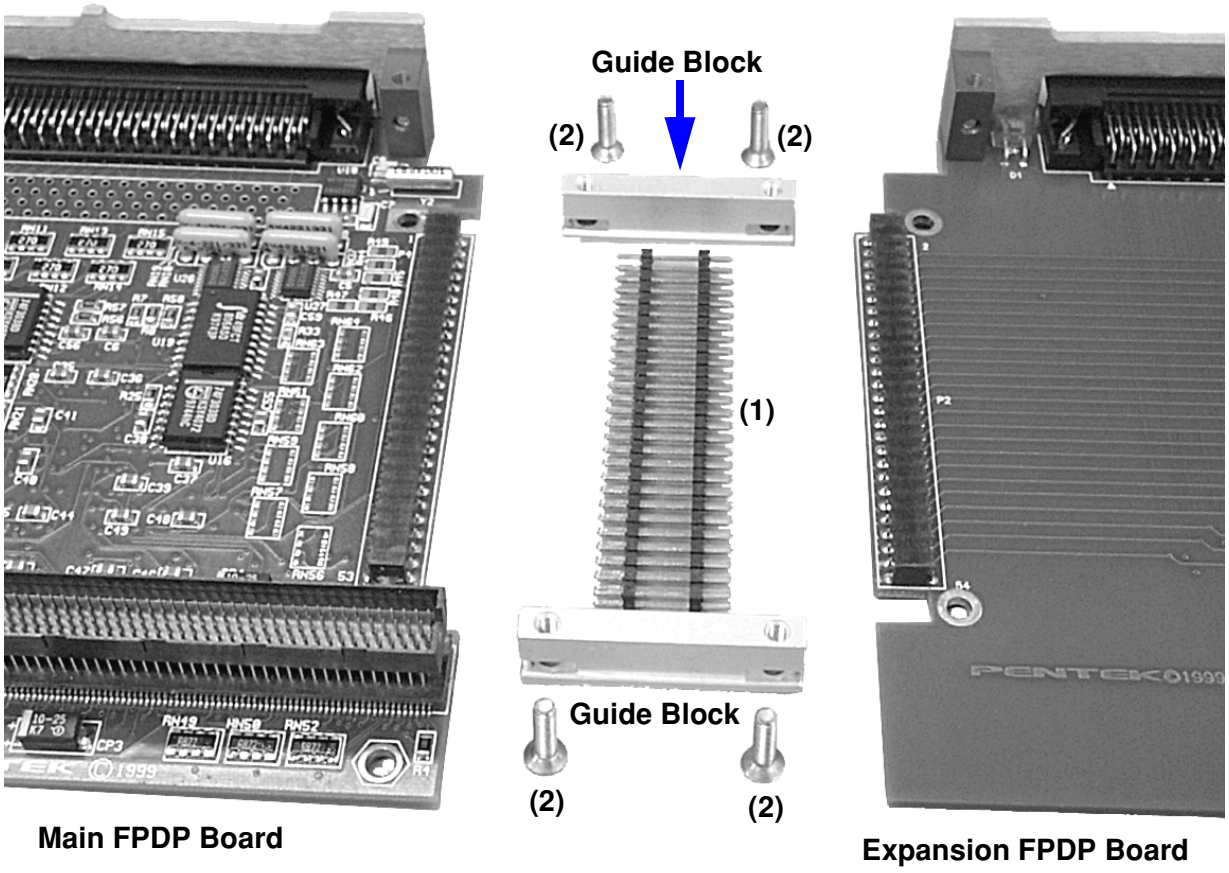
This completes the VIM module installation. The baseboard must be installed into a VMEbus system to complete the installation process.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.5 Model 6226–003 Installation

The Model 6226–003 provides two FPDP ports in a single VME slot. This module is made up of two FPDP boards, the main FPDP board and the expansion FPDP board. The main FPDP board, which contains the components and VIM connectors, **must** be placed in the top VIM slot on the baseboard. When the Model 6226–003 is assembled, it is impossible to put the main board anywhere else but the top VIM slot. Figure 2–9, below, shows the main components included for the installation of the Model 6226–003.

When the Model 6226–003 is shipped from the factory, it is fully assembled. Several parts must be removed prior to installing the unit in a VIM baseboard.



(1) 54–pin Stacking Connector
(2) 3–48UNC–2A Phillips–head screws – Quantity: 4

Figure 2–9: Model 6226–003 Expansion Board & Connector Parts

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.5 Model 6226–003 Installation (continued)

Tools required:

- ❑ #1 Phillips screwdriver
- ❑ Flat–blade screwdriver (blade width 5/16–inch or less)

⚠ WARNING: Perform all assembly steps at an anti–static workstation.

1) Remove the shipping brackets from the Model 6226–003. When the Model 6226–003 is shipped, four red shipping brackets are placed on the Model 6226–003, two on each VIM module. These brackets hold the front panel in place, see Figure 2–10 below. These shipping brackets must be removed. This requires removing four Phillips screws, two from the front panel (see Figure 2–11 on page 24), and two from the bottom (non–component side) of each VIM module. Remove the shipping brackets from both the main FPDP board and the expansion FPDP board. Set the screws aside, they are needed later in the installation.

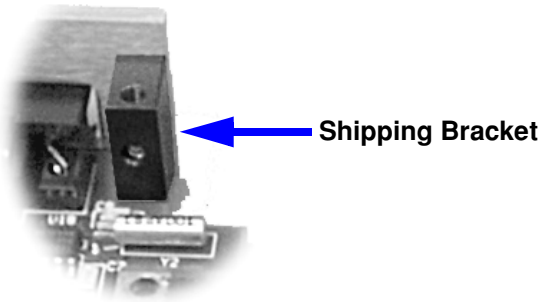


Figure 2–10: Model 6226 – Shipping Brackets

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.5 Model 6226–003 Installation (continued)

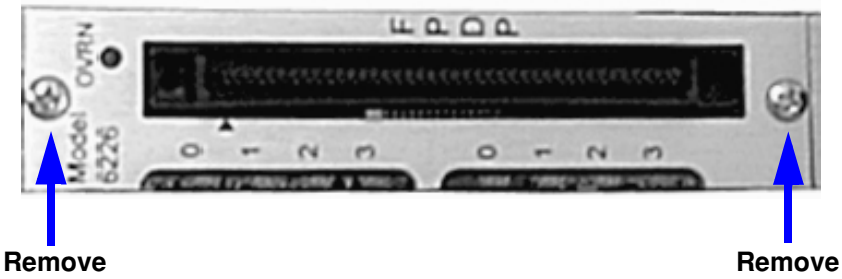


Figure 2–11: Model 6226 – Front Panel Screws

2) Remove the two nylon screws from the bottom of the nylon standoffs. The nylon screws secure the Model 6226–003 to the VIM baseboard. When the Model 6226–003 is shipped, the nylon screws are placed in standoffs (see Figure 2–6 on page 20).

3) Place the Model 6226–003 on the VIM baseboard. Align the two VIM connectors on the Model 6226 VIM–2 module (P1 and P2) with two VIM connectors on the baseboard—the Model 6226 VIM–2 module may be installed in either the top or bottom mezzanine position on the VIM baseboard. Gently, but firmly press on the PCB above the VIM connector locations until the VIM connectors are fully seated.

4) Securely fasten the Model 6226 to the VIM baseboard. Six screws must be tightened. Two nylon screws attach the Model 6226–003 to the nylon standoffs (see Figure 2–6 on page 20), and two 2.5–mm Phillips–head screws attach each Model 6226–003 board to the VIM baseboard front brackets (see Figure 2–12 below). Place these screws on the Model 6226 and tighten them.

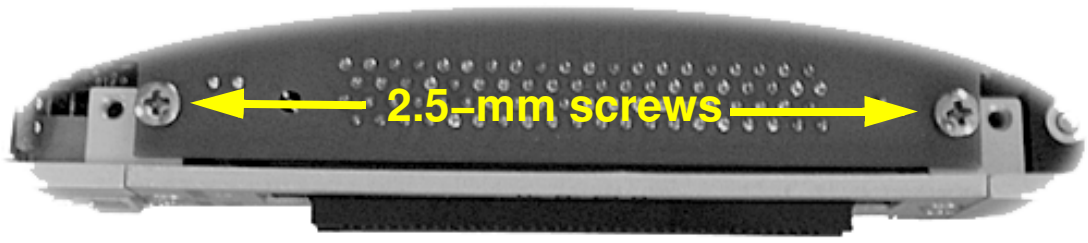


Figure 2–12: Model 6226 – VIM Screw Locations (top view)

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.5 Model 6226–003 Installation (continued)

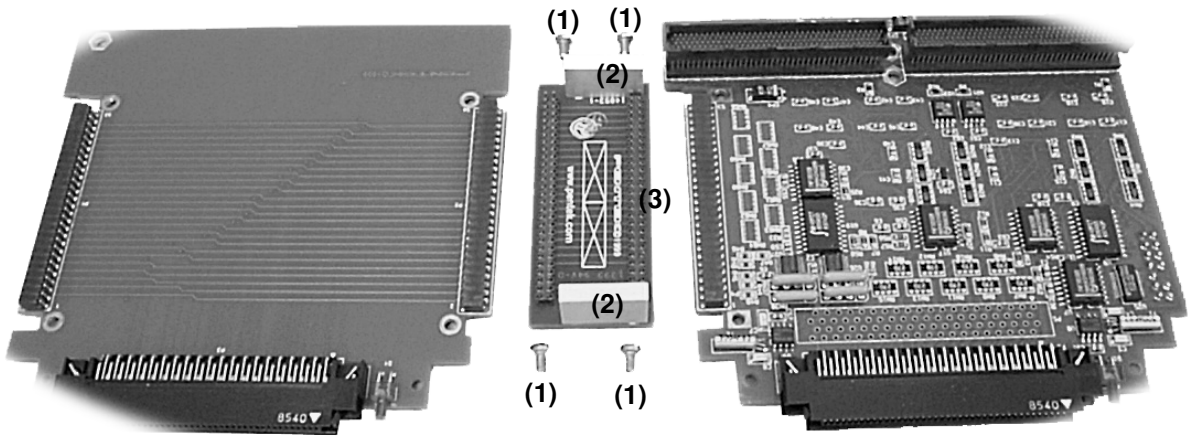
5) Install the Model 6226 front panels onto the VIM baseboard. Each front panel uses two 2.5–mm Phillips screws (these were removed in Step 1) to secure the front panel to the VIM module. Place the front panel over each VIM module and insert the screws into their proper location. It usually works best if each screw is not fully tightened until both screws are in place.

This completes the Model 6226 module installation. The baseboard must be installed into a VMEbus system to complete the installation process.

2.6 Model 6226–004 Installation

The Model 6226–004 provides two FPDP connectors in two VMEbus slots. The main FPDP board can be installed in either the top or the bottom VIM slot of the VIM base–board. The expansion FPDP board, which connects to the main FPDP board, is installed in a secondary VMEbus slot. Figure 2–13, below, shows the main components included for the installation of the Model 6226–004.

When the Model 6226–004 is shipped, it comes fully assembled. Before the unit can be installed in a VIM baseboard, it must be partially disassembled, then reassembled.



(1) 3–48UNC–2A Screws – Qty: 8
(2) Support Blocks – Qty: 2
(3) Two–slot Adapter Board

Figure 2–13: Model 6226–004 Two–slot Board and Parts

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.6 Model 6226–004 Installation (continued)

Tools required:

- ❑ #1 Phillips screwdriver
- ❑ Flat–blade screwdriver (blade width 5/16–inch or less)

> ⚠ **WARNING:** **Perform all assembly steps at an anti–static workstation.**

1) Remove the two front panel screws from the front panel of the expansion FPDP board. Once the two front panel screws are removed, set aside the front panel until needed later in the installation process.

2) Remove the nylon screw from the top of the expansion FPDP board. Set the nylon screw aside, it is needed later in the installation, see Figure 2–14 below.

3) Remove the two 3–48UNC–2A screws from the support blocks. Once the two screws are removed from the support blocks, remove the expansion FPDP board from the two–slot adapter, see Figure 2–14. Set the screws and expansion FPDP board aside.

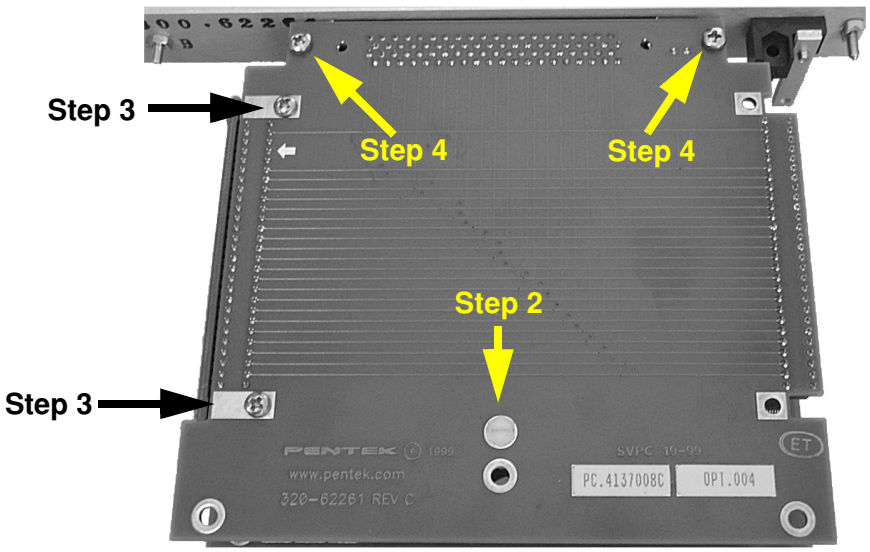


Figure 2–14: Model 6226–004 Disassembly Steps

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.6 Model 6226–004 Installation (continued)

4) Remove the shipping brackets from the Model 6226–004. When the Model 6226–004 is shipped, two red shipping brackets are placed on the main FPDP module to hold the front panel in place, see Figure 2–15 below. The shipping brackets must be removed. This requires the removal of four Phillips screws, two from the front panel (see Figure 2–11 on page 24), and two from the bottom (non–component side) of the Model 6226 (see Figure 2–14 on page 26). The expansion FPDP board has standard silver front panel brackets installed — **do not** remove these brackets. Set the screws aside, they are needed later in the installation.

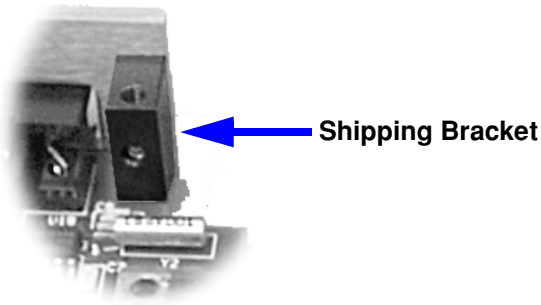


Figure 2–15: Model 6226 – Shipping Brackets

5) Remove the nylon screw from the underside of the main FPDP board. When shipped, the nylon screw that is needed to secure the Model 6226 to the VIM baseboard is placed on the Model 6226 main FPDP board. Remove and set aside the nylon screw.

6) Remove the blank panel from the VIM baseboard — you can use either the top or bottom VIM slot. To remove the blank panel from the VIM baseboard, simply remove the two 2.5–mm screws from the front panel. Set the screws aside, these are needed later in the installation process.

7) Install the main FPDP board on the VIM baseboard. Align the two VIM connectors on the Model 6226 VIM–2 module (P1 and P2) with two VIM connectors on the baseboard—the Model 6226 VIM–2 module may be installed in either the top or bottom mezzanine position on the VIM baseboard. Gently, but firmly press on the PCB above the VIM connector locations until the VIM connectors are fully seated.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.6 Model 6226–004 Installation (continued)

8) Securely fasten the Model 6226 main FPDP board to the VIM baseboard. There are three screws that must be tightened. The nylon screw, removed in Step 5, which attaches the main FPDP board to the nylon standoff, and two 2.5–mm Phillips screws, which attach the main FPDP board to the front brackets. Place these screws on the main FPDP board and tighten them.



Figure 2–16: Model 6226 – VIM Screw Locations (top view)

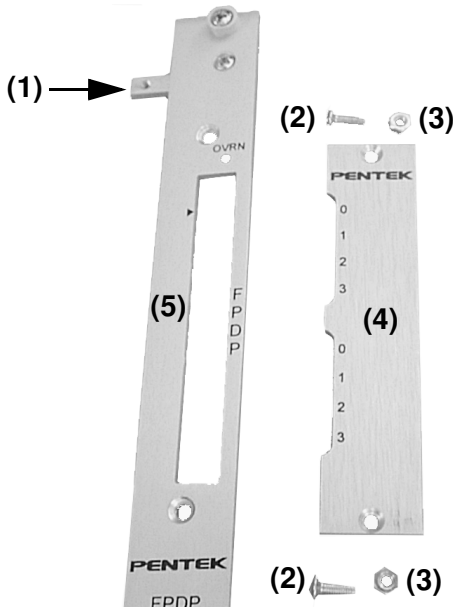
9) Install the Model 6226 front panel onto the VIM baseboard. The front panel uses two 2.5–mm Phillips screws (these were removed in Step 1) to secure the front panel to the VIM module. Insert and tighten both screws. It usually works best if each screw is not fully tightened until both screws are in place.

10) Insert the expansion FPDP board into the two–slot adapter board. Use the two 3–48UNC Phillips–head screws removed in Step 3 to fasten the expansion FPDP board to the support blocks on the two–slot adapter.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.6 Model 6226–004 Installation (continued)

11) Install a blank VIM front panel to the back of the expansion FPDP panel (see Figure 2–17 at the right). Remove the two screws and nuts from the expansion FPDP panel. Take the VIM module blank panel that was removed in Step 6 and place it behind the FPDP opening that will ***not*** be used by the expansion FPDP board. For example, if the FPDP module is going in the top VIM slot, the blank panel would be installed in the lower FPDP opening. Using the two screws and nuts just removed in this step, secure the blank panel.



(1) Expansion bar – Qty: 2
(2) 2.5–mm screw – Qty: 2
(3) 2.5–mm nuts – Qty: 2
(4) VIM module Blank Panel – Qty: 1
(5) Expansion FPDP Front Panel

Figure 2–17: Expansion FPDP Front Panel & Blank VIM panel

12) Loosen the screw on both the top and bottom ejector handles on the VIM baseboards. To loosen the ejector handle screw, first remove the Pentek nameplate by sliding it either to the left or right. A flat–tip screwdriver can be used to help push the nameplate to the side. Once removed, insert a #1 Phillips screwdriver and turn it counter–clockwise. **DO NOT** remove the screw and nut; simply loosen the screw so it is flush with the nut.

13) Place the expansion FPDP front panel on the expansion FPDP board. Once the front panel is placed over the expansion FPDP board, use two 2.5–mm screws to hold the panel in place. **Do not** tighten the screws fully; place the screws so they are loose.

14) Secure both expansion bars to the ejector handles on the VIM baseboard. Line up the screw holes in the expansion bar, and tighten the Phillips screw inside the ejector handle (turn the screw clockwise). Tighten both the top and bottom screws.

15) Slide the Pentek nameplates back onto the ejector handles.

This completes the Model 6226 module installation. The two–slot module must be installed into a VMEbus system to complete the installation process.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Expansion Kits for the Model 6226

There are two expansion kits available for the Model 6226 — the Model 6226C–003 and the Model 6226C–004. Both of these upgrades are available for all Model 6226 devices except the Model 6226–002. The Model 6226–002 cannot be upgraded to another model.

The table below lists all Model 6226 options, and the model number of the expansion kit needed to upgrade each option.

Table 2–1: Model 6626 Options & Expansion Kits

Model 6226 Option	# of FPDP Connections	# of VMEbus Slots Used	# of VIM-2 Positions Used	Can it be Expanded	Expansion Model	Equivalent Model after Expansion	# of FPDP Connections After Exp.	# of VMEbus Slots Used After Exp.
6626–001	1	1	1	Yes	6626C–003	6626–003	2	1
					6626C–004	6626–004	2	2
6626–002	2	1	1	No	N/A	N/A	N/A	N/A
6626–003	2	1	2	Yes	6626C–004	6626–004	2	2
6626–004	2	2	1	Yes	6626C–003	6626–003	2	1

2.7.1 Model 6226–001 to Model 6226C–003

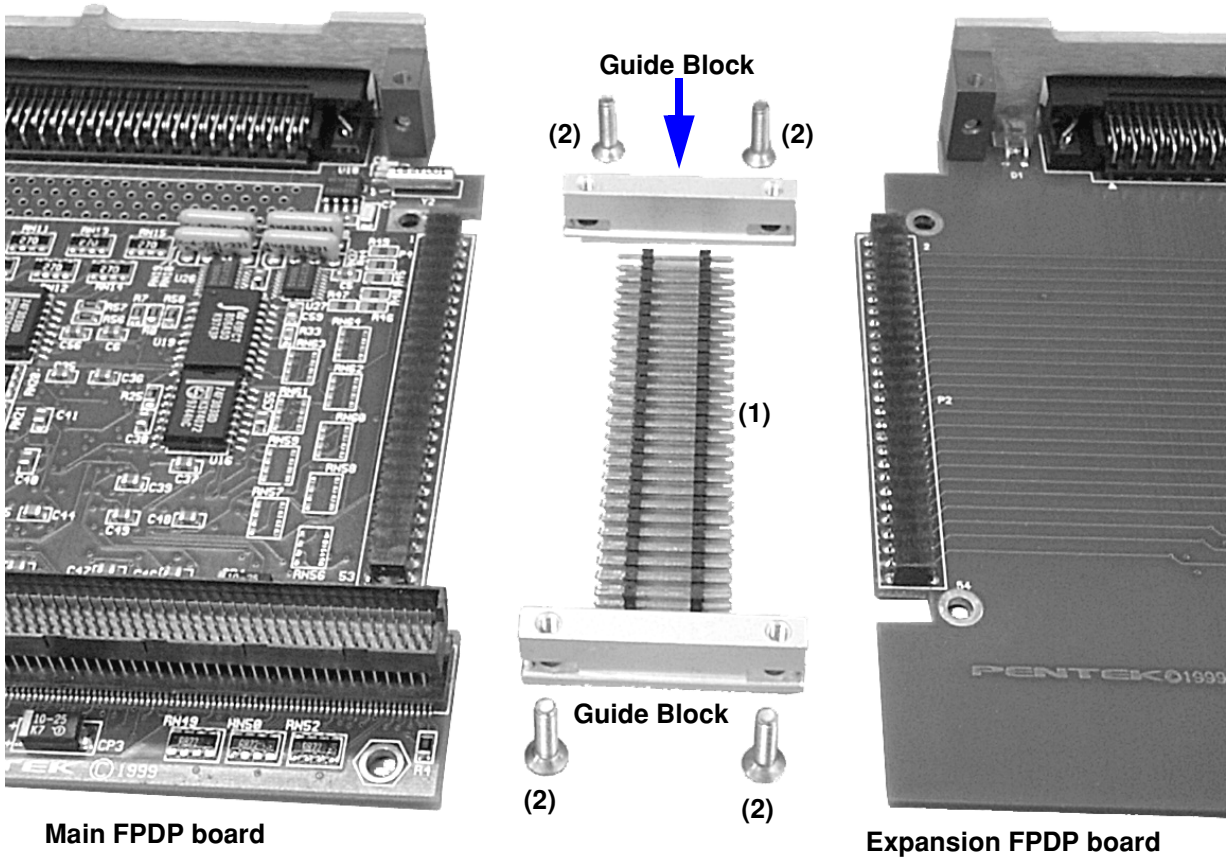
The upgrade process from option –001 to option –003 first requires the existing VIM Model 6226–001 to be removed from the VIM baseboard before the VIM module can be changed into option –003. See Section 2.3 on page 14 for VIM removal instructions.

The Model 6226C–003 consists of two boards; the main FPDP board (originally the Model 6226–001) and the expansion FPDP board, attached by a stacking connector and two guide blocks. Figure 2–18, on the next page, shows the main parts for joining the expansion FPDP board to the main FPDP board.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.1 Model 6226–001 to Model 6226C–003 (continued)



(1) 54–pin Stacking Connector
(2) 3–48UNC–2A Phillips–head screws – Quantity: 4

Figure 2–18: Model 6226–003 Expansion Board & Connector Parts

Tools required:

- ❑ #1 Phillips screwdriver
- ❑ Flat–blade screwdriver (blade width 5/16–inch or less)

⚠ WARNING: Perform all assembly steps at an anti–static workstation.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.1 Model 6226–001 to Model 6226C–003 (continued)

1) Remove the Model 6226–001 VIM module.

   See Section 2.3 on page 14 for removal instructions.

2) Insert the 54–pin stacking connector into P4 on the Model 6226–001 board (this board now is referred to as the main FPDP board in the remainder of this section). Figure 2–3 on page 17 shows the location of P4. Figure 2–19, below, shows the stacking connector being inserted into P4.

   Ensure the stacking connector is fully seated into P4.

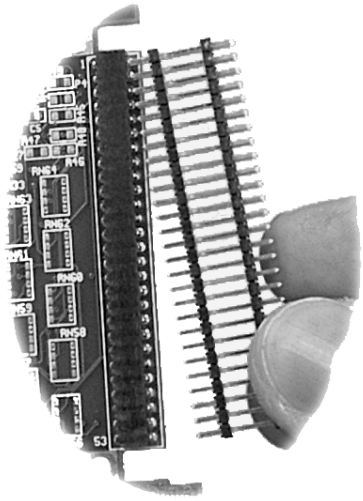


Figure 2–19: Model 6226–003 Stacking Connector Inserted into P4

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.1 Model 6226–001 to Model 6226C–003 (continued)

3) Insert the guide blocks into the slots next to P4. When placing the guide blocks onto the main FPDP board, the blocks should be inserted so they are relatively flush with the non–component side of the main FPDP board, see Figure 2–20.

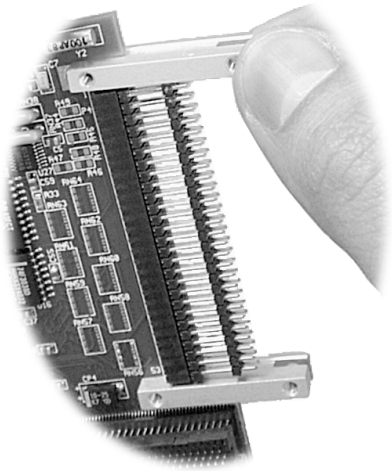


Figure 2–20: Model 6226–003 Guide Blocks

4) Secure the guide blocks onto the main FPDP board. Using two 3–48UNC–2A screws, secure each guide block, leave the screws loose. The screws will be tightened later when the expansion FPDP board is in place.

5) Insert the expansion FPDP board into the guide blocks and stacking connector. The stacking connector should fit almost flush with connectors on both boards.

6) Secure the guide blocks onto the expansion FPDP board. Using the other two 3–48UNC–2A screws, secure each guide block. To fully tighten the two FPDP boards to the guide blocks, place your palm under the PCB near the guide block. Tightening the screws requires some downward force on the screwdriver as you turn the screws. When fully tightened, there is only limited flex between the two boards. See Figure 2–21 on the next page.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.1 Model 6226–001 to Model 6226C–003 (continued)

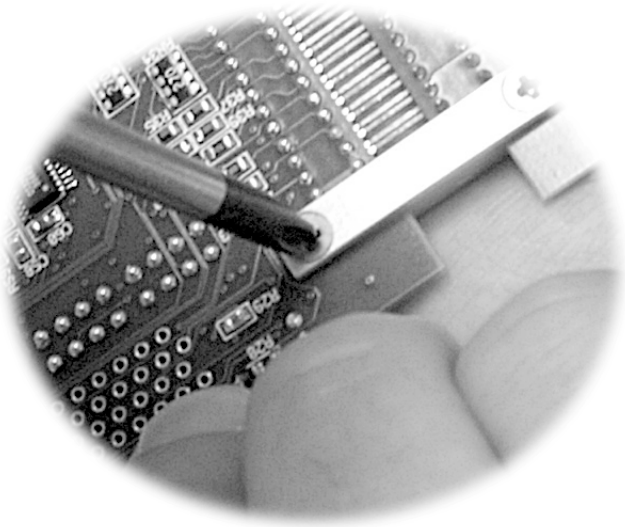


Figure 2–21: Model 6226–003 Tightening Guide Block Screws

7) Install the nylon standoffs on the VIM baseboard. The nylon standoffs go into the mounting holes closest to the VIM connectors. On the VIM baseboard diagram, Figure 2–4 on page 18, the mounting holes are labeled as **(f)** for the top VIM connectors, and **(e)** for the bottom VIM connectors.

   On the Model 6226C–003, there are two nylon standoffs. One for the main FPDP board, the other for the expansion FPDP board. There are two nylon screws for each standoff. One screw secures the nylon standoff to the VIM baseboard, the other secures the VIM module to the standoff. At first, only secure the standoff to the VIM baseboard.

8) Place the Model 6226C–003 on the VIM baseboard. Align the two Model 6226C–003 VIM connectors with the VIM connectors P11 & P14 on the VIM baseboard. Gently press on the PCB above the VIM connector locations until the VIM connectors are fully seated.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.1 Model 6226–001 to Model 6226C–003 (continued)

9) Securely fasten the Model 6226C–003 to the VIM baseboard. There are six screws that need to be tightened. Two nylon screws attach the Model 6226C–003 to the nylon standoffs, and two 2.5–mm Phillips screws attach each Model 6226 PCB to the VIM baseboard front brackets. Place these screws on the Model 6226 and tighten them.

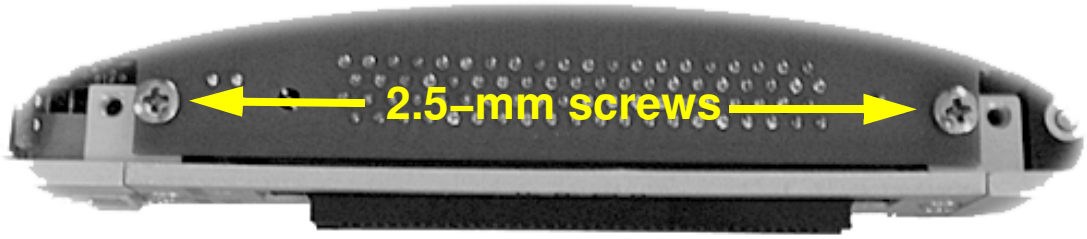


Figure 2–22: Model 6226 – VIM Screw Locations (top view)

10) Install the Model 6226 front panels. Each front panel uses two 2.5–mm Phillips screws to secure the front panel to the VIM module. Insert and tighten both screws. It usually works best if each screw is not fully tightened until both screws are in place.

This completes the Model 6226 installation. The module must be installed into a VMEbus system to complete the installation process.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.2 Model 6226–001 to Model 6226C–004

The upgrade process from option –001 to option –004 first requires the existing VIM module to be removed from the VIM baseboard before the VIM module can be changed into option –004.

The Model 6226C–004 consists of two FPDP boards, the main FPDP board and an expansion FPDP board, joined by a two–slot adapter. The Model 6226C–004 requires two VME slots, one for the VIM baseboard, and one for the expansion FPDP board. The main FPDP board goes to the left of expansion board. Figure 2–23, below, shows the main parts for joining the expansion FPDP board to the main FPDP board.

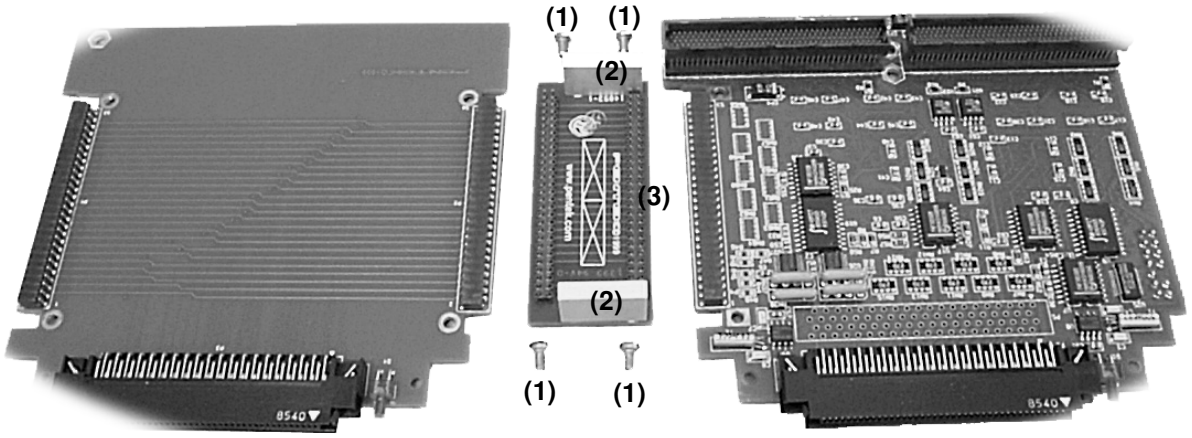


Figure 2–23: Model 6226–004 Two–slot Board and Parts

Tools required:

- ❑ #1 Phillips screwdriver
- ❑ Flat–blade screwdriver (blade width 5/16–inch or less)

⚠ WARNING: Perform all assembly steps at an anti–static workstation.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

2.7.2 Model 6226–001 to Model 6226C–004 (continued)

1) Remove the Model 6226–001 VIM module (referred to as the main FDPD board in the remainder of this section) from the baseboard.

   See Section 2.3 on page 14 for removal instructions.

2) Install both support blocks onto the two–slot adapter board. This requires two 3–48UNC–2A screws per support block.

3) Install the two–slot adapter onto connector P4 on the main FPDP board. When placing the two–slot adapter onto the main FPDP board, line up the two arrows. The adapter board should hang over the non–component side of the main FPDP board.

4) Replace the main FPDP board on the VIM baseboard. Align the VIM module connectors with the connectors on the VIM baseboard. Gently press on both sides of the Model 6226 until the VIM connectors on both the VIM module and baseboard are fully seated.

5) Securely fasten the main FPDP board to the VIM baseboard. There are three screws that need to be tightened. A nylon screw attaches the main FPDP board to the nylon standoff, and two 2.5–mm Phillips–head screws attach the main FPDP board to the front brackets. Place these screws on the main FPDP board and tighten them.

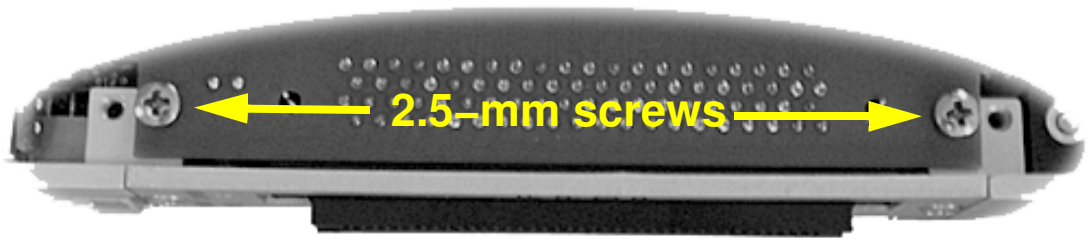


Figure 2–24: Model 6226 – VIM Screw Locations (top view)

6) Insert the expansion FPDP board into the two–slot adapter board. Use two 3–48UNC Phillips screws to fasten the expansion FPDP board to the support blocks on the two–slot adapter.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.7 Option Kits for the Model 6226 (continued)

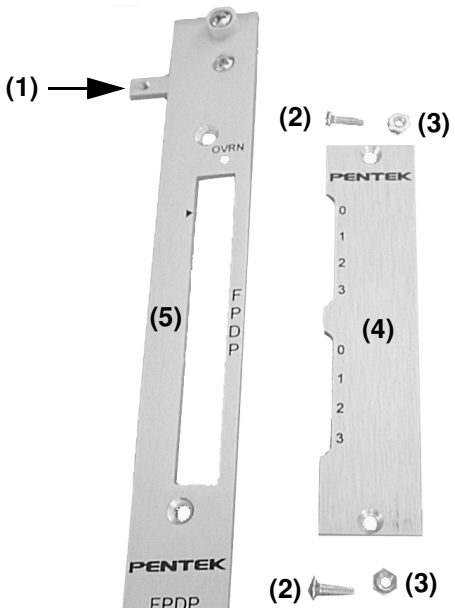
2.7.2 Model 6226–001 to Model 6226C–004 (continued)

7) Install a blank VIM front panel onto the back of the expansion FPDP panel. See Figure 2–25.

8) Place the expansion FPDP board connector through the expansion front panel opening.

9) Secure the front panel to the expansion FPDP board. Use two 2.5–mm head screws in the two front panel screw holes to secure the expansion front panel to the board.

10) Loosen the screw on both the top and bottom ejector handles on the VIM baseboard. To loosen the ejector handle screw, first slide the Pentek nameplate to either the left or right. A flat–tip screwdriver can be used to push the nameplate to the side. Once removed, insert a #1 Phillips screwdriver and turn it counter–clockwise. **DO NOT** remove the screw and nut; simply loosen the screw so it is flush with the nut.



(1) Expansion bar – Qty: 2
(2) 2.5–mm screw – Qty: 2
(3) 2.5–mm nuts – Qty: 2
(4) VIM module Front Panel – Qty: 1
(5) Expansion FPDP Front Panel

Figure 2–25: Expansion FPDP Front Panel & Blank VIM panel

11) Secure both expansion bars to the ejector handles on the VIM baseboard. Tighten the Phillips screw inside the ejector handle (turn the screw clockwise). Tighten both the top and bottom screws.

12) Slide the Pentek nameplates back onto the ejector handles.

13) Install the front panel to the Model 6226. The front panel uses two 2.5–mm Phillips screws to secure the panel to the VIM module. Insert and tighten both screws. It usually works best if each screw is not fully tightened until both screws are in place.

This completes the main installation. The module must be installed into a VMEbus system to complete the installation process.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.8 Resistor Networks

The Model 6226 has a series of resistor networks used for terminating the FPDP signal. These resistor networks are not physically removed; they are enabled or disabled by bit **D06**, FPDP Cable Termination, in the Control Register (Section 3.4.2).

The following table shows the resistors that are enabled or disabled, depending on the status of the FPDP connector, and the default values.

Table 2–2: Model 6226 – FPDP Mode Resistor Network Placement

FPDP Connector	FPDP Mode	RN19 & RN18 Enabled?	RN 37 & RN 38 Enabled?	Control Register D06 Setting (Termination)
Processor A or C FPDP Connector	Transmitter Master	Yes	**N/A**	'**0**' – Automatically set, no adjustment to **D06** necessary.
	Receiver Master	Yes	**N/A**	'**0**' – Automatically set, no adjustment to **D06** necessary.
	Receiver	No	**N/A**	'**1**' – Must set **D06** bit to '**1**', the default value for a Receiver is '**0**'.
Processor B or D FPDP Connector (only on options –003 and –004)	Transmitter Master	**N/A**	Yes	'**0**' – Automatically set, no adjustment to **D06** necessary.
	Receiver Master	**N/A**	Yes	'**0**' – Automatically set, no adjustment to **D06** necessary.
	Receiver	**N/A**	No	'**1**' – Must set **D06** bit to '**1**', the default value for a Receiver is '**0**'.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.9 Front Panel Connector

The Model 6226 uses an inverted FPDP connector on the front panel. The mating connector required is an 80–pin flat ribbon inverted cable header, Pentek part # 353.08050. The recommended 0.025" pitch flat ribbon cable is Pentek part # 378.68000. The pin assignments for the 80–pin connector are listed in the following table.

Table 2–3: Model 6226 – FPDP Inverted Connector Pin Assignments

Pin #	Signal	Pin #	Signal
1	GND	**2**	D0
3	D1	**4**	GND
5	D2	**6**	D3
7	GND	**8**	D4
9	D5	**10**	GND
11	D6	**12**	D7
13	GND	**14**	D8
15	D9	**16**	GND
17	D10	**18**	D11
19	GND	**20**	D12
21	D13	**22**	GND
23	D14	**24**	D15
25	GND	**26**	D0
27	D1	**28**	GND
29	D2	**30**	D3
31	GND	**32**	D4
33	D5	**34**	GND
35	D6	**36**	D7
37	GND	**38**	D8
39	D9	**40**	GND
41	D10	**42**	D11.
43	GND	**44**	D12
45	D13	**46**	GND
47	D14	**48**	D15
49	GND	**50**	$\overline{\text{DVALID}}$
51	GND	**52**	$\overline{\text{SYNC}}$
53	GND	**54**	$\overline{\text{PSTROBE}}$
55	GND	**56**	PSTROBE
57	GND	**58**	Reserved
59	GND	**60**	Reserved
61	GND	**62**	PIO1
63	GND	**64**	PIO2
65	GND	**66**	GND
67	GND	**68**	$\overline{\text{SUSPEND}}$
69	GND	**70**	Reserved
71	GND	**72**	$\overline{\text{DIR}}$
73	GND	**74**	$\overline{\text{NRDY}}$
75	GND	**76**	GND
77	GND	**78**	GND
79	STROB	**80**	GND

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.9 Front Panel Connector (continued)

2.9.1 D31 – D00 (Data Bus)

The **D31-D00** signals are 32–bit FPDP data bus signals.

2.9.2 $\overline{\text{DIR}}$ (Data Direction)

The FPDP Transmitter asserts DIR low. When bit **D00** of the Model 6226 Control Register (Section 3.4.8) is set to '**1**', transmit, it drives this signal low.

2.9.3 $\overline{\text{DVALID}}$ (Data Valid)

When asserted, $\overline{\text{DVALID}}$ indicates that the data bus has valid data. This signal is generated by the FPDP Transmitter Master.

2.9.4 STROB (Data Strobe)

STROB is a free running clock supplied by the FPDP Transmitter Master. FPDP Receiver and FPDP Receiver Master interfaces will sample the data with the rising edge of the STROB when $\overline{\text{DVALID}}$ is asserted.

2.9.5 $\overline{\text{NRDY}}$ (Not Ready)

NRDY is asserted by FPDP Receiver or FPDP Receiver Master interface when it is not ready to receive data. On the Model 6226, when bit **D05** of the Control Register (Section 3.4.4) is cleared to '**0**', the $\overline{\text{NRDY}}$ signal is asserted. The FPDP Transmitter Master will sample this signal until the FPDP Receiver or FPDP Receiver Master brings it high, at which time the transfer will commence. Since NRDY is asynchronous to STROB, the FPDP Transmitter Master will double–synchronize to it before sampling its state; this avoids metastability problems.

2.9.6 PIO1, PIO2 (Programmable I/O)

The two PIO signals are programmable I/O lines. They may be configured as inputs or outputs (see Section 3.4.6).

2.9.7 PSTROBE (+PECL Data Strobe)

This signal, along with the $\overline{\text{PSTROBE}}$, is generated by the FPDP Transmitter Master as an optional differential ±PECL data strobe. PSTROBE is the positive version of the differential clock and has the same polarity as STROB. For high data rate applications, the differential ±PECL data strobe should be used instead of STROB.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

2.9 Front Panel Connector (continued)

2.9.8 $\overline{\text{PSTROBE}}$ (–PECL Data Strobe)

This signal is the negative version of the differential PECL data strobe (see Section 2.9.7).

2.9.9 RESERVED

These pins are reserved and no connection should be made to these signals.

2.9.10 $\overline{\text{SUSPEND}}$ (Suspend Data)

SUSPEND is generated by FPDP Receiver or FPDP Receiver Master interface to inform the data source of a pending buffer overflow condition. The FPDP Transmitter Master may delay for no more than 16 cycles total before sus–pending the transfer by negating $\overline{\text{DVALID}}$. Since $\overline{\text{SUSPEND}}$ is asynchro–nous to STROB, the FPDP Transmitter Master will double–synchronize to it before sampling its state; this avoids metastability problems.

2.9.11 $\overline{\text{SYNC}}$ (Sync Pulse)

The FPDP Transmitter Master provides a SYNC pulse to the FPDP Receiver and FPDP Receiver Master interface to synchronize data transfers when transmitting Single Frame data, Fixed Size Repeating Frame data, or Dynamic Size Repeating Frame data to a FPDP Receiver.

2.10 Front Panel LED

The Model 6226 front panel has a red LED, labeled OVRN, which indicates a possible FIFO buffer overflow. When the Model 6226 is an FPDP Receiver or FPDP Receiver Master, the OVRN LED illuminates 16 cycles after receipt of the Almost_Full flag from the FIFO, unless the flag is cleared. (See also the SUSPEND data signal, Section 2.9.10 above.)

During normal operation, this LED may flicker briefly, indicating proper data transfers.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Chapter 3: Memory Map and Register Descriptions

3.1 Overview

This section contains the Model 6226 memory map and provides a description of the registers. Memory maps to VIM module resources are given from the baseboard Processor and details are given describing the use of each resource.

3.2 Model 6226 Memory Map

The two tables below provide base addresses of the Model 6226 control and status registers for each type of Pentek VIM Baseboard. Use the applicable address from these tables as the VIM registers base address ('VIMReg_base') in the following sections.

For a Pentek Model 4290 through 4295 VIM baseboard, use the VIM registers base addresses in Table 3–1, below. These baseboards have four processor nodes, one for each VIM Interface, and each node processor uses the same VIM base address to access the associated VIM module.

Table 3–1: VIM Base Addresses for Models 4290 to 4295 VIM Baseboards

VIM Baseboard	VIM Registers Base Address (VIMReg_base)
Model 4290 or 4291	**0x0032 0000**
Model 4292 or 4293	**0x0202 0000**
Model 4294 or 4295	**0x1D02 0000**

For a Pentek Model 4205 VIM baseboard, use the VIM registers base addresses in Table 3–2, below. The Model 4205 has a single baseboard processor, which uses a separate base address for each VIM Interface (emulating four processors). In addition, on this baseboard the VIM module registers can be accessed from the VMEbus.

Table 3–2: VIM Base Addresses for Model 4205 VIM Baseboards

VIM Site	VIM Registers Base Address (VIMReg_base)	
	Processor	VMEbus A32 Slave *
VIM A	**0x4082 0000**	A32VME_base + **0x00B2 0000**
VIM B	**0x4086 0000**	A32VME_base + **0x00B6 0000**
VIM C	**0x408A 0000**	A32VME_base + **0x00BA 0000**
VIM D	**0x408E 0000**	A32VME_base + **0x00BE 0000**

* Offsets relative to the base address 'A32VME_base' set on the Model 4205 baseboard (refer to the Model 4205 Operating Manual for these settings)

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.2 Model 6226 Memory Map (continued)

The following table provides a memory map for the Model 6226 32–bit control and status registers. All register addresses are expressed as offsets from the VIM registers base address for the applicable VIM baseboard—see Table 3–1 or Table 3–2 on the prior page for the VIM registers base address ('VIMReg_base') for your VIM baseboard. The sections following the table provide detailed information about each register.

Table 3–3: Model 6226 Memory Map

Address Offset*	Register Description	Access	Information
VIMReg_base + 0000	ID EEPROM Readout Register	R/W	Section 3.3
VIMReg_base + 0004	Control Register	R/W	Section 3.4
VIMReg_base + 0008	Programmable Clock Register	R/W	Section 3.5
VIMReg_base + 000C	Programmable I/O Data Register	R/W	Section 3.6
VIMReg_base + 0010	Clock/SYNC Control Register	R/W	Section 3.7

* VIMReg_base = see Table 3–1 or Table 3–2 on prior page

3.3 ID EEPROM Readout Register

A serial EEPROM used on the Model 6226 is organized as a 64–word x 16–bit device. The format for the code stored by Pentek in this EEPROM is listed in Appendix A of this manual. The EEPROM is read by the controlling processor on the VIM baseboard at power–up, and is used in the initialization of the Model 6226. This register provides bits allowing you to read the code stored in the EEPROM.

The table below shows the contents of the ID EEPROM Readout Register.

Table 3–4: ID EEPROM Register
R/W @ VIMReg_base+0x0000

Bit	D31 – D4	D3	D2	D1	D0
Bit Name	Not Used	Chip Select	Serial Data Out	Reserved	Serial Clock
Access	Write with zeros, Mask when reading	Read/Write	Read Only	Read Only	Read/Write
Function		1 = Selected 0 = Not Selected	Stored Data	Mask when reading	Toggle to pulse Clock line

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.4 Control Register

The Control Register contains bits that control the flow of the FPDP data stream bits **D31** through **D00**, the programmable I/O bits, and select the clock used when the this Model 6226 is used as an FPDP Receiver or Receiver Master.



The Model 6226 FPDP I/O is not recommended for use with Models 4205, 4294, or 4295 VIM baseboards in DMA Demand Mode operation, as samples may be lost.

Refer to Pentek Knowledgebase Case 1173 for details, at:
http://www.pentek.com/support

The following table shows the contents of the Control Register. The subsections following the table provide descriptions of the bits.

Table 3–5: Control Register
R/W @ VIMReg_base + 0x0004

	D31 – D08	D07	D06	D05
Bit Name	Not used	FPDP RX_DIR	FPDP Cable Termination	Receive Clock Detect
Function	Write with zeros, Mask when reading	**Read–only:** 0 = Inactive 1 = Active, driven by another unit	0 = Enable 1 = Disable	**Read:** 0 = No Clock 1 = Clock Detected **Write:** 0 = Enable 1 = Clear

	D04	D03	D02	D01	D00
Bit Name	Receiver Not Ready	Factory Test	FPDP Programmable I/O Direction	Select Receive Clock	FPDP Direction
Function	0 = Not Ready 1 = Ready	Write 0's Mask read	0 = Receive 1 = Transmit	0 = PECL Clock 1 = TTL Clock	0 = Receive 1 = Transmit

All write bits default to the logic '0' state at power on and reset.

3.4.1 FPDP RX_DIR – Bit D07

This read–only bit indicates whether another FPDP Transmitter is driving the FPDP bus. This bit must be checked before turning on a Model 6226 as an FPDP Transmitter to prevent accidental FPDP Bus connection. If this bit reads logic '1' another FPDP Transmitter is driving the FPDP bus. If the bit reads logic '0' the bus is inactive.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.4 Control Register (continued)

3.4.2 FPDP Cable Termination – Bit D06

This bit enables termination of the FPDP bus. When the bit is cleared to logic '0', Enabled (the default setting), the FPDP bus is terminated by this 6226. When the bit is set to logic '1', Disabled, the FPDP bus is not terminated by this 6226.

- When the Model 6226 is an FPDP Master or an FPDP Receiver Master, this bit must remain at the default setting of '0', Enabled.
- When the Model 6226 is an FPDP Receiver, and **not** a FPDP Receiver Master, this bit must be set to logic '1' to disable termination.

See Table 2–2, on page 39, for the settings for each mode of FPDP operation.

3.4.3 Receive Clock Detect – Bit D05

When the Model 6226 is used as an FPDP Receiver Master or FPDP Receiver, this read/write bit can be used as a status register to determine if a valid clock signal is being transmitted by the FPDP Transmitter Master.

Reading: If this bit reads '0', no clock is present, or the minimum eight clock cycles have not been fulfilled. When eight clocks have been counted, this bit changes and reads '1'.

Writing: When a '1' is written to this bit, it resets the counter to zero and holds it in reset until a '0' is written to the bit. If this bit is not set to '0' after writing a '1' to it, it will always read back '0' since the counter has not be released from reset. The default setting for this bit is '0', no clock, counter enabled.



When writing to the Receive Clock Detect Bit, the signal should be held for at least four times the FPDP Receive clock speed after it is enabled (100 ns for the PECL clock or 200 ns for the TTL clock).

3.4.4 Receiver Not Ready – Bit D04

This bit drives the $\overline{\text{NRDY}}$ pin on the FPDP connector. When used as an FPDP Receiver Master, or FPDP Receiver, this bit controls when the FPDP Transmitter Master sends data to the Receiver. When set to logic '1', the receiver signals it is ready to receive data. The default setting for this bit is '0', Receiver Not Ready for data.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.4 Control Register (continued)

3.4.5 Factory Test – Bit D03

This bit is reserved for use during factory tests. If writing to this bit, use '0'.

3.4.6 FPDP Programmable I/O Direction – Bit D02

This bit selects between using the two I/O bits (PIO1, POI2) from the Programmable I/O Data Register, Section 3.6, as receive bits or transmit bits. When this bit is set to logic '1', the I/O Data bits are transmitting. When this bit is cleared to logic '0' (the default setting), the I/O Data bits are receiving. This bit works independently from FPDP Direction, **D00**.

The FPDP Direction, bit **D00** (Section 3.4.8 below), and FPDP Programmable I/O Direction, bit **D02**, are independent of each other. While the FPDP main data stream (**D31** to **D00**) can be set as a Transmitter Master, the two I/O data bits can be setup to receive data for some other use.

3.4.7 Select Receive Clock – Bit D01

When used as a FPDP Receiver or Receiver Master, this bit selects between using a PECL clock or a TTL clock. When the bit is set to logic '1', the TTL clock is used. When the bit is cleared to logic '0' (the default setting) the PECL clock is used.

When the FPDP is setup as a Transmitter Master, both TTL and PECL clocks are transmitted. When the FPDP is setup as a Receiver or Receiver Master, this bit selects which clock to use.

3.4.8 FPDP Direction – Bit D00

This bit selects between having the FPDP as a Receiver or Transmitter. This bit controls the flow of bits **D31** through **D0** of the data stream. When this bit is set to '1', the FPDP becomes a FPDP Transmitter Master. When this bit is cleared to '0' (the default setting), the FPDP becomes a FPDP Receiver or FPDP Receiver Master.

The FPDP Direction, bit **D00**, and FPDP Programmable I/O Direction, bit **D02** (Section 3.4.6 above), are independent of each other. While the FPDP main data stream (**D31** to **D00**) can be set as a Transmitter Master, the two I/O data bits can be setup to receive data for some other use.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.5 Programmable Clock Register

The Model 6226 contains a Cypress ICD2053B programmable clock register chip, which can be used to provide a clock signal up to 40 MHz, using a 10 MHz crystal.

The programmable clock register uses two bits for programming the ICD2053 transmit clock chip. It uses a serial programming stream allowing it to be programmed from 391 kHz to 100 MHz clock frequency. However, the FPDP working specification has an upper limit of 40 MHz. Bit **D01** is used for the data, while bit **D00** is used for the clock. When setting the clock, the SCLK HIGH Time and SCLK LOW Time on the ICD2053B chip have a minimum delay of 450 ns. The data sheet for the ICD2053B is provided in Appendix B.

The following table shows the contents of this register. The subsections following the table provide description of the two bits.

Table 3–6: Programmable Clock Register
R/W @ VIMReg_base + 0x0008

	D31 – D02	D01	D00
Bit Name	Not used	SDATA for Programmable Clock Chip	SCLK for Programmable Clock Chip
Function	Write with zeros, Mask when reading	0 = binary '0' 1 = binary '1'	
Bits D01 and D00 default to the logic '0' state at power on and reset.			

3.5.1 SDATA for Programmable Clock Chip – Bit D01

This bit makes up the data stream of the clock chip. The clock chip can be programmed from 391 kHz to 40 MHz.

3.5.2 SCLK for Programmable Clock Chip – Bit D00

This bit makes up the clock stream of the clock chip. The clock chip can be programmed from 391 kHz to 40 MHz.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.6 Programmable I/O Data Register

These two bits make up an I/O data register for the FPDP Programmable I/O bits, PIO1 and PIO2. These two bits work independently from the FPDP data bits (FPDP bits **D31** through **D00**), thus if the FPDP may be setup as Receiver, these two bits could be used to transmit to another device.

The following table shows the contents of this register. The paragraphs following the table provide a description of the two bits.

Table 3–7: Programmable I/O Data Register
R/W @ VIMReg_base + 0x000C

	D31 – D02	D01	D00
Bit Name	Not used	Programmable I/O Bit 1 (PIO2)	Programmable I/O Bit 0 (PIO1)
Function	Write with zeros, Mask when reading	0 = binary '0' 1 = binary '1'	
Bits D01 and D00 default to the logic '0' state at power on and reset.			

These two bits provide general–purpose Programmable I/O data bits, PIO1 and PIO2, for the FPDP connector (see Section 2.9.6). Data bit **D01** is for FPDP signal PIO2, and data bit **D00** is for FPDP signal PIO1.

The I/O direction of these two bits (receive or transmit) is determined by the setting of bit **D02** in the Control Register, Section 3.4.6. These two bits work independently from the FPDP data bits (**D31 - D00**). So, for example, if the FPDP is set to be a Receiver, these two bits can be used to transmit data to another device.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

3.7 Clock/SYNC Control Register

Clock/SYNC Control Register contains bits that control the Programmable Sync, the Select TTL Receive Clock Edge, and the FPDP SUSPEND signal.

NOTE: The control bits in this register have been added in different Options to the Model 6226 board (Options 009 and 010). These bits are now available on all Model 6226 boards with artwork Revision G (etched '**REV–G**' on the 320–62260 PCB) or greater.

The following table shows the contents of this register. The subsections following the table provide description of the two bits.

Table 3–8: Clock/SYNC Control Register
R/W @ VIMReg_base + 0x0010

	D31 – D03	D02	D01	D00
Bit Name	Not used	FPDP Suspend	Select TTL Receive Clock Edge	Programmable Sync
Function	Write with zeros, Mask when reading	0 = Enable Suspend 1 = Disable Suspend	0 = Inverted Clock 1 = Non–Inverted Clock	0 = SYNC signal is '0' 1 = SYNC signal is '1'
Bits D02, D01, and D00 default to the logic '0' state at power on and reset.				

3.7.1 FPDP Suspend – Bit D02

This bit enables or disables the outgoing FPDP SUSPEND signal. When the bit is set to logic '1', the suspend is disabled. When the bit is cleared to logic '0' the suspend is enabled.

3.7.2 Select TTL Receive Clock Edge – Bit D01

This bit sets the Select TTL Receive Clock Edge. When the bit is set to logic '1', a non–inverted clock is selected. When the bit is cleared to logic '0' an inverted clock is selected.

3.7.3 Programmable Sync – Bit D00

This bit indicates the level of the SYNC signal. When the bit is set to logic '1', the SYNC signal is '1'. When the bit is cleared to logic '0', the SYNC Signal is '0'.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Appendix A: ID EEPROM Format

A.1 Introduction

All VIM Modules contain an Identification (ID) EEPROM with a checksum stored in the last location. When booted, each VIM baseboard processor checks for the presence of a VIM module, through the presence bit on the VIM connector. If a module is present, the processor reads the module's ID EEPROM and generates a 16–bit checksum from the data read. If the generated checksum does not match the stored value, the processor illuminates its red LED. Even though the processor illuminates LED 0, the red LED, the processor is fully functional.

The contents of the ID EEPROM, plus the calculated checksum, are stored in Global SDRAM on the VIM baseboard. Refer to the respective VIM baseboard Operating Manual for the location of the Global SDRAM. The first word stored is a valid data flag, based on the checksum: valid checksum (**0x00EE CODE**), bad checksum (**0x000B ADC5**), or no VIM module installed (**0xFFFF FFFE**).

The ID EEPROM is accessed using a Model 6226 register at memory address VIMReg_base+0x0000, as offset from the VIM registers base address for the applicable VIM baseboard. The bit layout of this register is defined in Table A–1, below.

Table A–1: VIM ID EEPROM Register
R/W @ VIMReg_base+0x0000

Bit	D31 – D4	D3	D2	D1	D0
Bit Name	Not Used	Chip Select	Serial Data Out	Reserved	Serial Clock
Access	Write with zeros, Mask when reading	Read/Write	Read Only	Read Only	Read/Write
Function		1 = Selected 0 = Not Selected	Stored Data	Mask when reading	Toggle to pulse Clock line

A.2 EEPROM Format Example

Table A–2 on the next page shows the contents of the EEPROM for the Pentek Model 6226, and an explanation of what each pair of 16–bit words is used for. The SDRAM location is the address where each pair of words is stored relative to the start address of the Global SDRAM on the VIM baseboard.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

A.2 EEPROM Format Example (continued)

Table A–2: EEPROM Example (Model 6226 shown)

EEPROM Word Location	SDRAM Location	Contents	Comments
00/01	+0x00	0x00EE CODE	Valid data flag
02/03	+0x04	0x6226 0000	Model, Model Extension (Extension currently unused)
04/05	+0x08	0x0354 2001	PCB number – this is taken from the VIM board
06/07	+0x0C	0x0001 FFFF	Assembly Rev, Option #1 Rev A = 0001, Rev B = 0002, etc.; Option #1 – up to 9 installed options may be specified, if there are no options, field = '**FFFF**'
08/09	+0x10	0xFFFF FFFF	Option #2, Option #3
10/11	+0x14	0xFFFF FFFF	Option #4, Option #5
12/13	+0x18	0xFFFF FFFF	Option #6, Option #7
14/15	+0x1C	0xFFFF FFFF	Option #8, Option #9
16/17	+0x20	0xFFFF FFFF	Module Specific Code goes in locations 16 through 61
18/19	+0x24	0xFFFF FFFF	
20/21	+0x28	0xFFFF FFFF	
22/23	+0x2C	0xFFFF FFFF	
24/25	+0x30	0xFFFF FFFF	
26/27	+0x34	0xFFFF FFFF	
28/29	+0x38	0xFFFF FFFF	
30/31	+0x3C	0xFFFF FFFF	
32/33	+0x40	0xFFFF FFFF	
34/35	+0x44	0xFFFF FFFF	
36/37	+0x48	0xFFFF FFFF	
38/39	+0x4C	0xFFFF FFFF	
40/41	+0x50	0xFFFF FFFF	
42/43	+0x54	0xFFFF FFFF	
44/45	+0x58	0xFFFF FFFF	
46/47	+0x5C	0xFFFF FFFF	
48/49	+0x60	0xFFFF FFFF	
50/51	+0x64	0xFFFF FFFF	
52/53	+0x68	0xFFFF FFFF	
54/55	+0x6C	0xFFFF FFFF	
56/57	+0x70	0xFFFF FFFF	
58/59	+0x74	0xFFFF FFFF	
60/61	+0x78	0xFFFF FFFF	
62/63	+0x7C	0x0000 xxxx	Word 62 should always be cleared (**0000**). Word 63 contains the checksum of words 0 – 61.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Appendix B: Cypress Semiconductor – ICD2053B Data Sheet

B.1 Introduction

This appendix contains Cypress Semiconductor's ICD2053B, Programmable Clock Generator, data sheet.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

This page is intentionally blank

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

ICD2053B

Programmable Clock Generator

Features

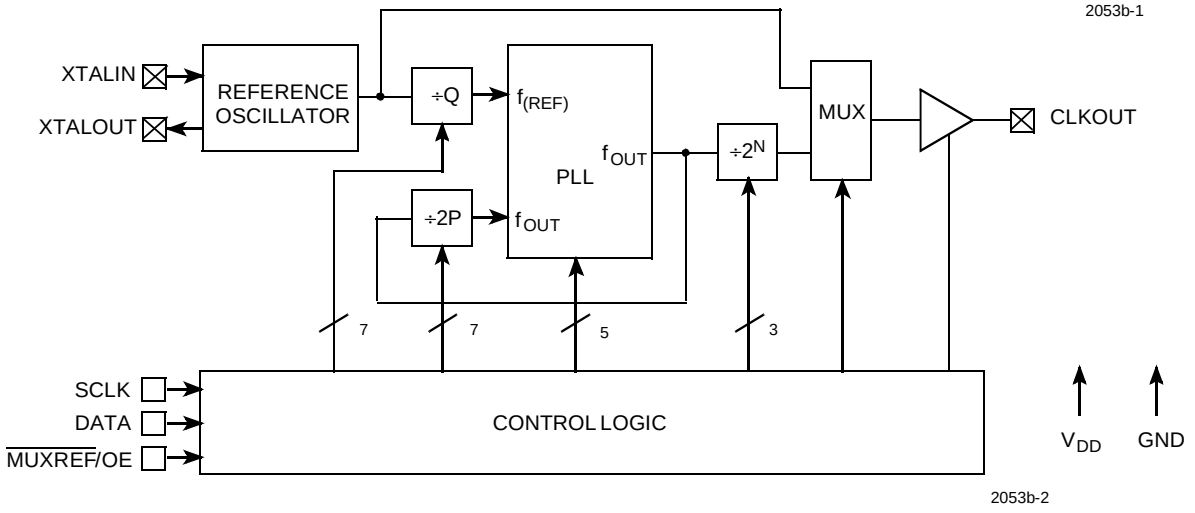
- **Clock outputs ranging from 391 kHz to 100 MHz (TTL levels) or 90 MHz (CMOS levels)**
- **2-wire serial interface facilitates programmable output frequency**
- **Phase-Locked Loop oscillator input derived from external reference clock (1 MHz to 25 MHz) or External Crystal (2 MHz to 24 MHz)**
- **Three-State output control disables output for test purposes**
- **Sophisticated internal loop filter requires no external components or manufacturing tweaks as commonly required with external filters**
- **Low power consumption makes device ideal for power- and space-critical applications**
- **8-pin 150-mil packaging achieves minimum footprint for space-critical applications**
- **5V operation**
- **High-speed CMOS technology**

Functional Description

The ICD2053B Programmable Clock Generator offers a fully user-programmable phase-locked loop in a single 8-pin package. The output may be changed “on the fly” to any desired frequency value between 391 kHz and 100 MHz (90 MHz at CMOS levels). The ICD2053B is ideally suited for any design in which package size, power, and/or frequency programmability are important design issues.

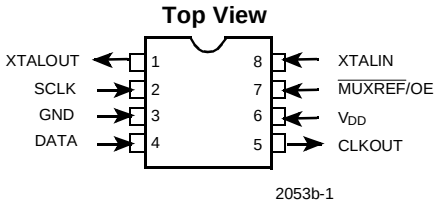
The ability to dynamically change the output frequency adds a whole new degree of freedom for the designer. Some examples of the uses for this device include: laptop computers, in which slowing the speed of operation can mean less power consumption; graphics board dot clocks to allow dynamic synchronization of different brands of monitors or display formats; on-board test strategies where the ability to skew a system’s desired frequency (e.g., ±10%) allows worst-case evaluation.

Logic Block Diagram



Pin Configuration

Top View



2053b-1

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Pin Summary

Name	Number	Description
XTALOUT[1, 2]	1	Reference crystal feedback
SCLK	2	Serial clock input line for programming purposes
GND	3	Ground
DATA	4	Serial data input line for programming purposes
CLKOUT	5	Programmable clock output. This clock output can be three-stated by either pin 7, when it is configured as an Output Enable pin, or by bit 1 of the Control register.
V_{DD}	6	+5 volts
$\overline{\text{MUXREF}}$/OE	7	If bit 3 (Pin 7 Usage) in the Control register is set to 1, this input pin controls the multiplexed reference frequency function. The operation is defined in *Table 1.* If bit 3 (Pin 7 Usage) in the Control Register is set to 0, this input pin controls the three-state output function. The operation is defined in *Table 1.* On power-up, pin 7 implements the OE function; a HIGH on pin 7 enables CLKOUT. An internal pull-up allows pin to be not-connected.
XTALIN[1, 2]	8	Reference crystal input or external reference input ($f_{(REF)}$)

ICD2053B Registers

The ICD2053B contains two registers, Control and Program.

These registers are written using a protocol which uses a Protocol word = 011110 to distinguish Control register data from Program register data. This Protocol word is recognized by the four sequential 1s; therefore, all other data sent must have a 0 bit stuffed in after each sequence of three sequential 1s (whether originally followed by a 1 or a 0). This is called bit-stuffing.

Please see the example under “Program Register Example” and the “Frequency Modification Procedure” section. Following is a bit-stuffing example (read right to left, LSB to MSB):

To send this programming data: 1111 0111 1110 111111
Transmit this serial bit stream: 10111 00111 01110 01110111

All serial words are shifted in bit-serially starting with the LSB. A low-to-high transition on SCLK is used to shift data. Whenever the Protocol word is detected, the preceding 8 bits are transferred into the Control register. The control command is then immediately executed.

Control Register

The Control register is used to control the non-frequency setting aspects of the ICD2053B. It is an 8-bit register, which is defined as shown in *Figure 1* and *Table 1.*

At power-up, the Control register is loaded with 0000 0100. This means that the MUXREF Control bit is set to 1, forcing the CLKOUT to equal the reference frequency. The Program register is disabled from loading. The “OE Control” and “Pin 7 Usage” bits are set to 0, implying that pin 7 is an output enable pin.

7	6	5	4	3	2	1	0
0 (Reserved)	0 (Reserved)	Duty Cycle Adjust (Set to 1)	0 (Reserved)	Pin 7 Usage	MUXREF Control	OE Control	Enable Program Word

Figure 1. Control Register

Notes:
1. For best accuracy, use a parallel-resonant crystal.
2. Assume $C_{LOAD} \approx 17$ pF.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Table 1. Control Register

Bit	Definition
RESERVED	For future use. Set to 0.
Duty Cycle Adjust	Set to 1 to reduce duty cycle by approximately 0.7 ns. Normally set to 1.
Pin 7 Usage	Definition of whether pin 7 is MUXREF or OE input pin 0 = Pin 7 is OE input (default) 1 = Pin 7 is MUXREF input
MUXREF Control	Allows internal control of MUXREF. If enabled, this feature automatically multiplexes the reference frequency to the CLKOUT output. This is used to change output glitch-free to new frequencies. 0 = CLKOUT is VCO frequency 1 = CLKOUT is $f_{(REF)}$ (default)
OE Control	Forces the CLKOUT output into a three-state mode 0 = CLKOUT is VCO frequency or $f_{(REF)}$ (default) (depending on current MUXREF state) 1 = CLKOUT is three-stated
Enable Program Word	Enable Program word loading into Program register. When enabled, the Program word may be shifted in. This permits changing the Control register without disturbing Program register data. 0 = Program register is disabled from loading (default) 1 = Program register is enabled to receive data

Program Register

The Program register can be loaded with a 22-bit programming word, the fields of which are defined in *Table 2.*

Table 2. Program Register

Field	# of Bits	Notes
P Counter value (P')	7	MSB (Most Significant Bits)
Duty Cycle Adjust Up (D)	1	Set to logic 1 to increase duty cycle by approx. 0.7 ns. Normally set to 1.
Mux (M)	3	
Q Counter value (Q')	7	
Index (I)	4	LSB (Least Significant Bits)

The VCO frequency, $f_{(VCO)}$, is determined by the following relation:

$$f_{(VCO)} = (2 * f_{(REF)} * P/Q)$$

where $P' = P - 3$

$Q' = Q - 2$

$f_{(REF)}$ = Reference frequency (1 MHz to 25 MHz)

The value of $f_{(VCO)}$ must remain between 50 MHz and 150 MHz. Therefore, for output frequencies below 50 MHz, $f_{(VCO)}$ must be brought into range. To accomplish this, a post-VCO Divisor is selected by setting the values of the Mux field (M) as follows:

Mux Field (M)

M	Divisor
000	1
001	2
010	4
011	8
100	16
101	32
110	64
111	128

The index field (I) is used to preset the VCO to an appropriate range. The value for this field should be chosen from the following table. (Note that this table is referenced to the VCO frequency $f_{(VCO)}$ rather than to the desired output frequency and that only the MSB is significant.)

Index Field (I)

I	$f_{(VCO)}$ @ 5V
0000	50 to 80 MHz
1000	80 to 150 MHz

To assist with these calculations, Cypress/IC Designs provides the BITCALC program. BITCALC is a Windows™ program for the IBM PC which automatically generates the appropriate programming word from the user's reference input and desired output frequencies.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

VCO Programming Constraints

There are seven primary programming constraints the user must be aware of:

Table 3. Programming Constraints

Parameter	Minimum	Maximum
$f_{(REF)}$	1 MHz	25 MHz
$f_{(REF)}/Q$	200 kHz	1 MHz
$f_{(VCO)}$	50 MHz	150 MHz
divisor	1	128
f_{OUT}	50 MHz/128	100 MHz
Q	3	129
P	4	130

The constraints have to do with trade-offs between optimum speed with lowest noise, VCO stability and factors affecting the loop equation. The factors are listed for completeness sake; however, by using the above-mentioned BITCALC program, these constraints become transparent.

PROGRAM Register Example

The following is an example of the calculations BITCALC performs:

Derive the proper programming word for a 39.5 MHz output frequency, using 14.31818 MHz as the reference frequency:

Since 39.5 MHz < 50 MHz, double it to 79.0 MHz. Set M to 001 to post divide by 2. Set I to 0000. The result:

$f_{(VCO)} = 79.0 = (2 * 14.31818 * {}^{P}/_{Q})$

${}^{P}/_{Q} = 2.7587$

Several choices of P and Q are available for this example:

P	Q	$f_{(VCO)}$	Error (PPM)
69	25	79.0363	460
80	29	78.9969	40
91	33	78.9969	419

Normally, one would choose (P,Q) = (80,29) for the best accuracy (40 PPM). However, we will choose (P,Q) = (91,33) as it illustrates bit stuffing.

Therefore:

P' = P – 3 = 91 – 3 = 88 = 1011000
Q' = Q – 2 = 33 – 2 = 31 = 0011111

The programming word, W, is generated by first creating the non-bit-stuffed word W' by concatenating P'=1011000, D=1, M=001, Q'=0011111, I=0000, and then bit-stuffing.

W' = 1011000 1 001 0011111 0000
W = 10110001001001101110000

Zeros were stuffed in one place in this example.

Output Frequency Accuracy

The accuracy of the ICD2053B output frequency depends on the target output frequency and reference frequency. As stated previously, the output frequency of the ICD2053B is mathematically related to the input reference frequency:

$f_{(OUT)} = (2 * f_{(REF)} * {}^{P}/_{Q}) \div 2^{n}$, n = 0...7.

Only certain output frequencies are possible for a particular reference frequency. However, the ICD2053B generally produces an output frequency within 0.1% of the desired output frequency. Specifics regarding accuracy (in ppm) are given for any desired output frequency in the BITCALC program output.

Frequency Modification Procedure

When changing to a new frequency, there is a period of time during which the output signal will jump in frequency, or glitch due to changes in the serial word. For applications in which it is critical that the output clock not glitch and always maintain some known value, the MUXREF feature in the Control register should be used. MUXREF causes the reference clock to be multiplexed, glitch-free, to the output clock. The output will remain at this fixed frequency while the VCO seeks its new programmed value.

The procedure for programming the ICD2053B to an initial or new frequency is as follows:

1. Load the Control register to enable MUXREF and enable loading of the Program register. This will set the output to the reference frequency. The transition is guaranteed to be glitch-free. (See timing specifications.) Note that the Protocol Word must follow the Control register data. Also note that all data is shifted in LSB (Least Significant Bit) first.

   Control word = 0 1 1 1 1 0 (Protocol Word) 0 0 0 0 X 1 0 1 ← LSB (Control Reg. Data)

   The state of the Pin 7 Usage bit is defined by the user, and so is denoted as X.

2. Shift in the desired output frequency value computed via a 22-bit data word (as defined above), plus any bit-stuffs (as defined above). Remember to bit-stuff a 0 after any three sequential 1s.

3. Load the Control register to enable MUXREF and disable loading of the Program register. This loads the Program word bits into the Program register and keeps the output set to the reference frequency while the new frequency settles

   Control word = 0 1 1 1 1 0 (Protocol Word) 0 0 0 0 X 1 0 0 (Control Reg. Data)

4. Wait for VCO to settle in the new state (10 ms to within 0.1% of the new frequency).

   Load the Control register to enable new frequency output. The transition is guaranteed to be glitch-free. (See the timing specifications.)

   Control word = 0 1 1 1 1 0 (Protocol Word) 0 0 0 0 X 0 0 0 (Control Reg. Data)

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Supply Voltage to Ground Potential ..... –0.5V to +7.0V

Input Voltage ..... –0.5V to V_{DD}+0.5

Operating Temperature ..... 0°C to +70°C

Storage Temperature ..... –65°C to +150°C

Max. Soldering Temperature (10 sec) ..... +260°C

Junction Temperature ..... +125°C

Static Discharge Voltage ..... Class 1[3] (per MIL-STD-883, Method 3015)

Operating Range

Range	Ambient Temperature	V_{DD}
Commercial	0°C to +70°C	5V ± 10%

Note:
3. Static sensitive <2000V.

Operating Conditions

Parameter	Description	Min.	Max.	Unit
V_{DD}	Supply Voltage	4.5	5.5	V
T_A	Ambient Operating Temperature	0	70	°C
C_L	Load Capacitance		25	pF

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	Min.	Max.	Unit
V_{OH}	HIGH-level Output Voltage	I_{OH} = –4.0 mA	2.4		V
V_{OL}	LOW-level Output Voltage	I_{OL} = 4.0 mA		0.4	V
V_{IH}	HIGH-level Input Voltage	Except XTALIN pins	2.0		V
V_{IL}	LOW-level Input Voltage	Except XTALIN pins		0.8	V
V_{IH}	HIGH-level Reference Input Voltage, when DC coupled[4]	XTALIN pin only	V_{DD}–0.8		V
V_{IL}	LOW-level Reference Input Voltage, when DC coupled[4]	XTALIN pin only		0.8	V
I_{IH}	Input HIGH Current	V_{IN} = 5.0V, except SCLK		100	µA
I_{IL}	Input LOW Current	V_{IN} = 0.5V, except SCLK		–250	µA
I_{IH}	Input HIGH Current	V_{IN} = 5.0V, SCLK only		250	µA
I_{IL}	Input LOW Current	V_{IN} = 0.5V, SCLK only		–100	µA
I_{OZ}	Output Leakage Current	Three-state		10	µA
I_{DD}	Power Supply Current	V_{DD}=V_{DD} max., 100 MHz, V_{IN}=V_{DD} or 0V	13	50	mA

Capacitance

Parameter	Description	Max.	Unit
C_{IN}	Input Capacitance, except XTALIN pin	10	pF
C_{IN}	Input Capacitance, XTALIN pin	34	pF

Switching Characteristics Over the Operating Range

Parameter	Name	Description	Min.	Max.	Unit
$f_{(REF)}$	Reference Frequency	Reference Oscillator nominal value[4]	1	25	MHz
$t_{(REF)}$	Reference Clock Period	$t_{(REF)} = 1/f_{(REF)}$	40	1000	ns
t_1	Reference Clock HIGH Time	Input pulse width HIGH for reference. Measured at V_{DD}/2, DC coupled.[4]	16		ns

Note:
4. See Externally Driven Crystal Oscillator section of the "Crystal Oscillator Topics" Application Note. For AC coupling, use an input duty cycle near 50%.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Switching Characteristics Over the Operating Range (continued)

Parameter	Name	Description		Min.	Max.	Unit
t_2	Output Period	CLKOUT period (frequency), TTL levels		10 (100 MHz)	2560 (391 kHz)	ns
		CLKOUT period (frequency), CMOS levels		11.1 (90 MHz)	2560 (391 kHz)	
t_3	Output Duty Cycle (t_0/t_2)	Duty cycle of CLKOUT measured at 1.4V (TTL) threshold	$f_{(OUT)} < 50$ MHz AND post-divide ≥ 2	45%	55%	
			$f_{(OUT)} > 50$ MHz OR post-divide = 1	40%	60%	
		Duty cycle of CLKOUT measured at $V_{DD}/2$ (CMOS) threshold	post-divide ≥ 2	45%	55%	
			post-divide = 1	40%	60%	
t_4	Rise Time	Rise time for the clock output into a 25 pF load	TTL 0.4V to 2.4V		3	ns
			CMOS, $0.1V_{DD}$ to $0.9V_{DD}$		6	
t_5	Fall Time	Fall time for the clock output into a 25 pF load	TTL 0.4V to 2.4V		3	ns
			CMOS, $0.1V_{DD}$ to $0.9V_{DD}$		6	
t_6	SCLK HIGH Time	Minimum HIGH time for the SCLK clock		450		ns
t_7	Clock Valid	Time required for the CLKOUT oscillator to become valid after last SCLK clock[5]		$t_{(REF)}$	$3 * t_{(REF)} + 25$	ns
t_8	Serial Data Set-up	Time required for the data to be valid prior to the rising edge of SCLK		15		ns
t_9	Hold	Time required for the data to remain valid after the rising edge of SCLK		0		ns
t_{10}	Delay, MUXREF[6] Asserted to CLKOUT HIGH	Time for CLKOUT to go HIGH after assertion of MUXREF[6]		0	$t_{old} + 25$	ns
t_{11}	Transition, $f_{(OLD)}$ to $f_{(REF)}$	Delay of first falling edge of $f_{(REF)}$ signal at output		t_{13}	$t_{(REF)} + 25$	ns
t_{12}	Reference Output High Time	Output during MUXREF[6], reference DC coupled		$t_{16} - 10$	$t_{16} + 10$	ns
t_{13}	Reference Output Low Time	Output during MUXREF[6], reference DC coupled		$t_1 - 10$	$t_1 + 10$	ns
t_{14}	Transition, $f_{(REF)}$ to $f_{(NEW)}$	Time for CLKOUT to go HIGH after release of MUXREF[6]		0	$t_{(REF)} + 25$	ns
t_{15}	Transition, MUXREF[6] released to CLKOUT LOW	Delay of first falling edge of $f_{(NEW)}$ signal at output		$t_{new}/2$	$t_{new} * 3/2 + 25$	ns
t_{16}	Reference Clock Low Time	Input pulse width low for reference. Measured at $V_{DD}/2$, DC coupled[4]		18		ns
t_{17}	Reference Input Rise/Fall	Rise/fall time for DC coupled reference input[4]			$t_{(REF)}/10$	ns
t_{18}	Output Enable Delay	Delay from Output Enable HIGH to Output Valid		0	20	ns
t_{19}	Output Disable Delay	Delay from Output Enable LOW to Output Floating		0	20	ns
t_{old}	Original Period	Output period before reprogramming, $1/f_{(OLD)}$				
t_{new}	New Period	Output period after reprogramming, $1/f_{(NEW)}$				
t_{lock}	VCO Lock Time	Time for VCO to lock onto new $f_{(VCO)}$ within 0.1%			10	msec
t_{20}	SCLK LOW Time	Minimum LOW time for the SCLK clock		450		ns

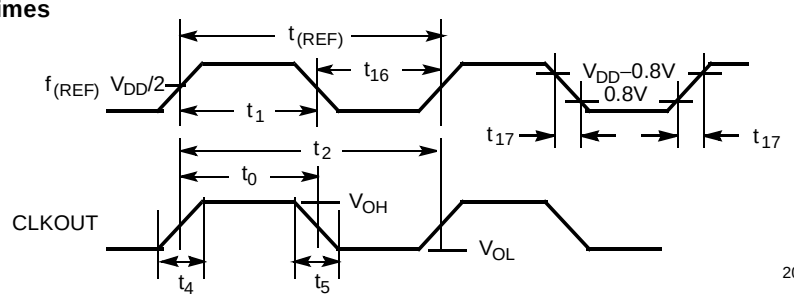
Notes:

5. This is the time for the serial word shifted in to take effect, including the Control Word output enable bit. The VCO stabilization time is separate.
6. Pin or internal bit.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

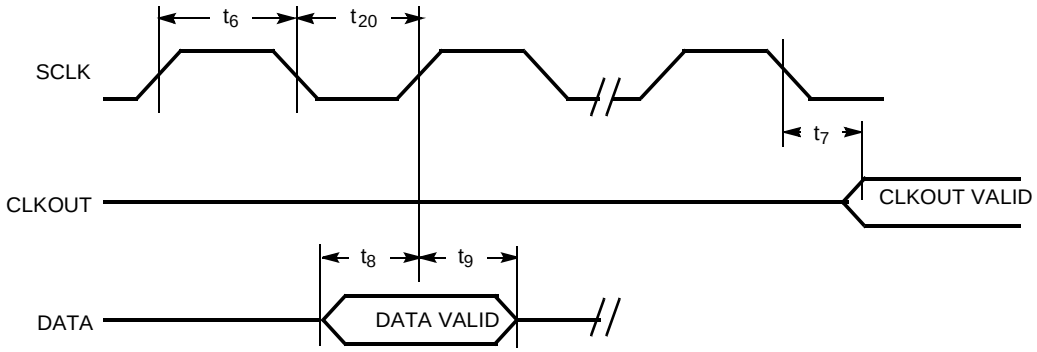
Switching Waveforms

Rise and Fall Times



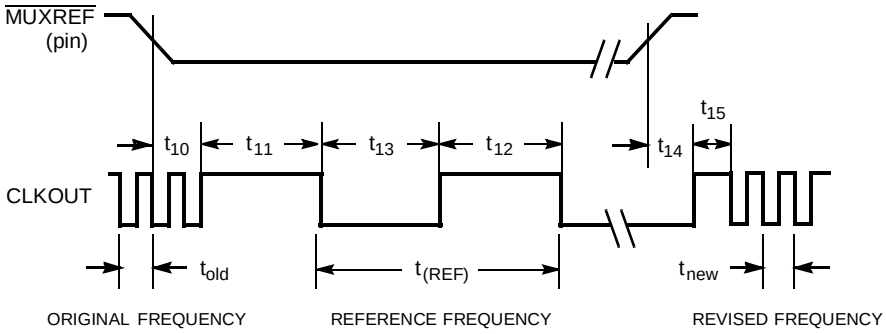
2053b-3

Serial Programming Timing



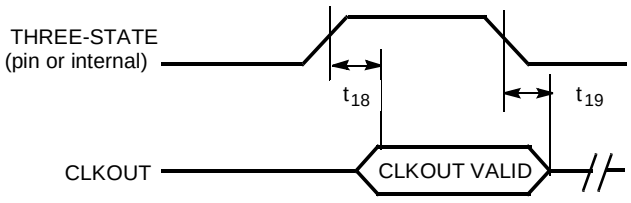
2053b-4

MUXREF Timing[7]



2053b–5

Three-State Timing



2053b-6

Note:
7. Identical behavior is exhibited when the internal MUXREF bit in the Control register is HIGH.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Ordering Information

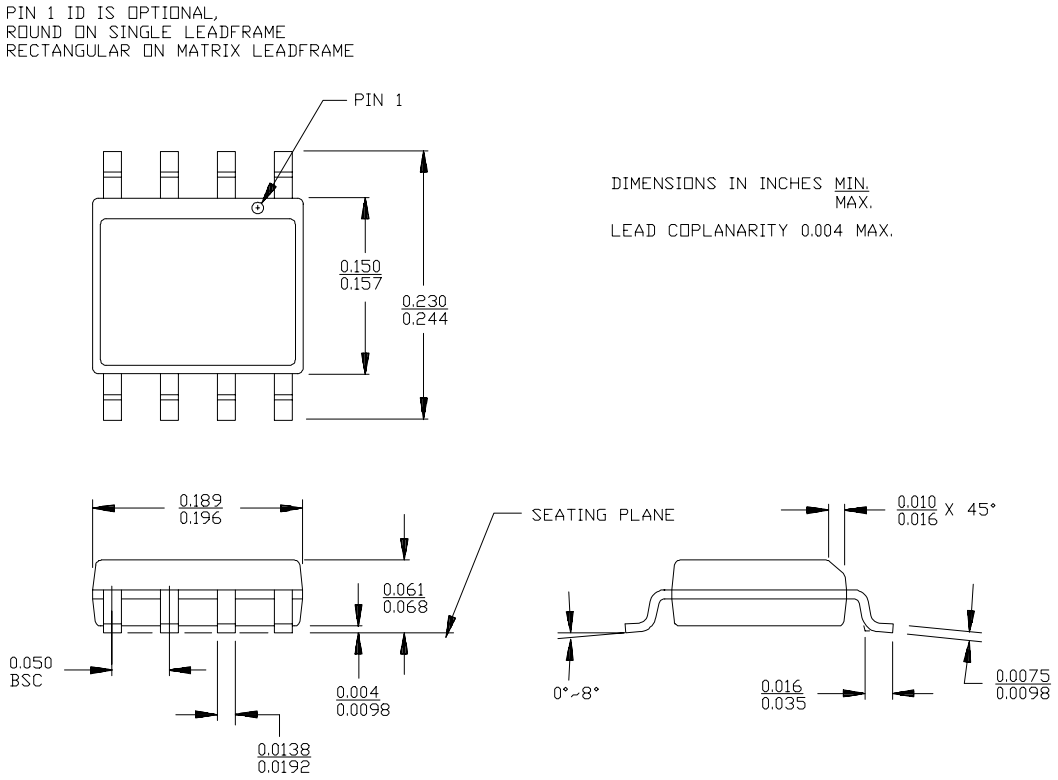
Ordering Code	Package Name	Package Type	Operating Range
ICD2053BSC–1	S8	8-Pin (150-Mil) SOIC	

Document #: 38–00412–A

Windows is a trademark of Microsoft Corporation.

Package Diagrams

8-Lead (150-Mil) SOIC S8



© Cypress Semiconductor Corporation, 1996. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress Semiconductor product. Nor does it convey or imply any license under patent or other rights. Cypress Semiconductor does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress Semiconductor products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress Semiconductor against all charges.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP