DaqBoard/2000 Series User's Manual

PCI-bus Data Acquisition Boards

the smart approach to instrumentation ™

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DaqBoard/2000 Series

User's Manual

PCI-bus Data Acquisition Boards

p/n **1033-0901** Rev. **2.0**

October 2000 Printed in the United States of America

Warranty Information

Your IOtech warranty is as stated on the *product warranty card*. You may contact IOtech by phone, fax machine, or e-mail in regard to warranty-related issues.
Phone: (440) 439-4091, fax: (440) 439-4093, e-mail: sales@iotech.com

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IOtech devices emit radio frequency energy in levels compliant with Federal Communications Commission rules (Part 15) for Class A devices. If necessary, refer to the FCC booklet *How To Identify and Resolve Radio-TV Interference Problems* (stock # 004-000-00345-4) which is available from the U.S. Government Printing Office, Washington, D.C. 20402.

CE Notice

Many IOtech products carry the CE marker indicating they comply with the safety and emissions standards of the European Community. As applicable, we ship these products with a Declaration of Conformity stating which specifications and operating conditions apply.

Warnings, Cautions, Notes, and Tips

Refer all service to qualified personnel. This caution symbol warns of possible personal injury or equipment damage under noted conditions. Follow all safety standards of professional practice and the recommendations in this manual. Using this equipment in ways other than described in this manual can present serious safety hazards or cause equipment damage.

This warning symbol is used in this manual or on the equipment to warn of possible injury or death from electrical shock under noted conditions.

This ESD caution symbol urges proper handling of equipment or components sensitive to damage from electrostatic discharge. Proper handling guidelines include the use of grounded anti-static mats and wrist straps, ESD-protective bags and cartons, and related procedures.

This symbol indicates the message is important, but is not of a Warning or Caution category. These notes can be of great benefit to the user, and should be read.

In this manual, the book symbol always precedes the words "Reference Note." This type of note identifies the location of additional information that may prove helpful. References may be made to other chapters or other documentation.

Tips provide advice that may save time during a procedure, or help to clarify an issue. Tips may include additional reference.

Specifications and Calibration

Specifications are subject to change without notice. Significant changes will be addressed in an addendum or revision to the manual. As applicable, IOtech calibrates its hardware to published specifications. Periodic hardware calibration is not covered under the warranty and must be performed by qualified personnel as specified in this manual. Improper calibration procedures may void the warranty.

Quality Notice

IOtech has maintained ISO 9001 certification since 1996. Prior to shipment, we thoroughly test our products and review our documentation to assure the highest quality in all aspects. In a spirit of continuous improvement, IOtech welcomes your suggestions.

CAUTION

Using this equipment in ways other than described in this manual can cause personal injury or equipment damage. Before setting up and using your equipment, you should read *all* documentation that covers your system. Pay special attention to Warnings and Cautions.

Reference Note: Your installation CD contains electronic versions of the user documentation. These versions are in the Adobe Acrobat® pdf format and can be read and printed with use of the Adobe Acrobat Reader®. A copy of the reader is included on your CD.

The following Adobe Acrobat® pdf files (located on your install CD) apply to the DaqBoard/2000 series products.

- **DaqBoard/2000 Series Users Manual.pdf**
  Contains the DaqBoard/2000 Series "hardware-related" chapters, as well as links to the .pdf files listed below. This pdf file, plus the following three make up the complete user's manual (1033-0901). Note that the Programmer's Manual (1008-0901) is a completely separate document.
- **DaqView_DaqViewXL.pdf**
  These chapters, regarding *out-of-the-box* software, are shared by multiple documents. They make up chapters 4 and 5 of the DaqBoard/2000 Series User's Manual.
- **DIAdem User's Manual.pdf**
  The DIAdem file is shared by multiple documents. It constitutes chapter 6 of the DaqBoard/2000 Series User's Manual.
- **DBK Options.pdf**
  Discusses each of the DBK products currently available. The file is shared by other documents and constitutes chapters 7 through 12 of the DaqBoard/2000 Series User's Manual.
- **Programmer's Manual.pdf**
  The programmer's manual (1008-0901) pertains to developing custom programs using Applications Program Interface (API) commands.

Reference Note: Programmers should check the **readme.file** on the install CD-ROM for the location of program examples included on the CD.

Your order was carefully inspected prior to shipment. When you receive your system, carefully unpack all items from the shipping carton and check for physical signs of damage that may have occurred during shipment. Promptly report any damage to the shipping agent and your sales representative. Retain all shipping materials in case the unit needs returned to the factory.

Manual Layout

Note that the electronic version of this document is contained on more than one Adobe® Acrobat pdf file, as indicated on the facing page. The files may be read and printed using Adobe® Acrobat Reader. The reader is included on your installation CD.

This manual provides detailed instruction for the proper setup and operation of DaqBoard/2000 Series data Acquisition PCI boards. In addition, the document includes discussion of DBK Option Cards and Modules.

API Command information, essential to those wishing to create their own program applications, is contained in a separate companion manual, part number 1008-0901. If you prefer to use *out-of the-box* software, such as *DaqView*, you will not need to consult the Programmer's Manual.

The DaqBoard/2000 Series User's Manual is arranged as follows:

Chapter 1 - *DaqBoard/2000 Series, Installation* – Use this guide to get your DaqBoard/2000 installed in an available PCI bus-slot and detected by the board's host PC.

Chapter 2 – ***Device Overviews*** provides an overview for each member of the DaqBoard/2000 Series. System design, scope, flexibility, and signal connection are discussed. Pinouts are included. The final pages of the chapter provide brief descriptions of the options available for connection to the DaqBoard series 100-pin P4 connector.

Chapter 3 – *How Daq Products Interrelate* provides a brief discussion on the interrelation of Daq products, including DBK option cards and modules. Tips for setting up a data acquisition system are included.

Chapter 4 – Explains the use and features of ***DaqView***. Screen prints show you the controls, indicators, and fields discussed in the text.

Chapter 5 – ***DaqViewXL*** describes the Microsoft Excel add-on for data acquisition and spreadsheet display.

Chapter 6 – The **DIA*dem*®** chapter is actually an independent, abbreviated manual. It provides for rapid familiarization with the included **DIAdem-View** device application. Note that more detailed information is available in the DIAdem User's Manual that is distributed with Licensed Versions of DIAdem.

Chapter 7 – ***DBK Option Cards and Modules*** begins with an overview of DBK features and expansion options. A section on power management describes system power requirements and power availability from the various DBKs. Each DBK is described in a format that includes an overview (usually with a block diagram), hardware and software setup, and additional information as needed.

Chapter 8 – ***Signal Management and Troubleshooting Tips*** explains the basics of data acquisition including terminology, signal management techniques, channel identification, signal modes, etc. A troubleshooting section explains solutions to common noise, wiring, and configuration problems.

Chapter 9 – ***Accelerometer Tutorial*** describes how to use accelerometers. Text includes accelerometer information of systems making use of DBK4 *Dynamic Signal Input Cards*.

Chapter 10 – ***Specifications*** lists the physical and performance specifications for DaqBoard/2000 Series PCI boards, DaqBooks, ISA-type DaqBoards, Daq PC-Cards, and DBK option cards and modules.

Chapter 11 – ***CE Compliance*** pertains to CE standards and conditions that are relevant to DaqBoard/2000. Installation instructions for the DaqBoard/2000 CE Cable Kit are included.

Chapter 12 – ***Calibration*** lists the order in which to perform calibration-related adjustments and briefly discusses ***DaqCal.exe***, a program that provides on-screen instruction, graphics, and prompts.

Glossary

Reference Note:
For programming-related information refer to the separate Programmer's Manual, p/n 1008-0901. The document is included on your installation CD and is also available in hardcopy.

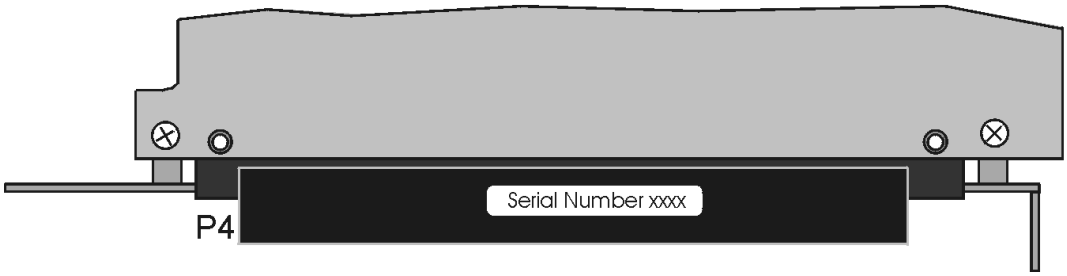
Table of Contents

DaqBoard/2000 Series, Installation 1

This guide tells you how to:

- **Install Software**
- **Install DaqBoard/2000 Series Boards into available PCI Bus-Slots**
- **Configure and test DaqBoard/2000 Series Boards**

You should keep your DaqBoard/2000 Series board's serial number and your DaqView/2000 authorization code (if applicable) with this document. Space is provided below for recording up to 4 board numbers and their PCI bus-slot location. The board serial number is located on the P4 connector as indicated in the following figure.



Serial Number Location on DaqBoard/2000 Series P4 Connector

	Board Type (e.g., 2000, 2002, 2003, etc.)*	Serial Number	PCI Bus-Slot Location
Board 1			
Board 2			
Board 3			
Board 4			

The host PC can support up to four DaqBoard/2000 Series Boards.

***Note**: DaqBoard/2000 Series boards have device labels which read, for example, "DaqBoard/2000," "DaqBoard/2001," "DaqBoard/2002," etc. The name labels are convenient for users of more than one board type.

DaqView/2000 Authorization Code _____

Customers who ordered DaqView/2000 can find their authorization code on the *authorization code sheet* located inside the sleeve of the install CD. Note that earlier documents may refer to this as a "registration code" or "registration ID."

Customers who did not order DaqView/2000 can run a *30-day free trial version*, as discussed elsewhere in the User's Manual.

CAUTION

Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

Reference Notes:
(1) Each DaqBoard/2000 Series Board plugs into a PCI bus-slot. Consult your PC owner's manual as needed.
(2) Be sure to read about the DBK cards and modules applicable to your acquisition system. Specific DBK information can be found in on the world wide web at **http://www.daqboard.com**; and in your Daq User's Manual (included on your install CD-ROM]. After the install you can navigate to the document from your desktop as follows:
Start ⇒ Programs ⇒ DaqX Software ⇒ DaqUsersManual.PDF
(3) The user's manual contains power management, hardware, software, and program-related information.

Registration Notice: DIA*dem*® is owned and registered by GfS Systemtechnik GmbH & Co.KG.

Install Software

1. Place the Data Acquisition Software CD in the host PC's CD-ROM drive. *Wait for PC to auto-access the CD. This may take a few moments, depending on your PC.*
2. After the Data Acquisition Software *Master Setup* screen appears, select **32-bit** for **DaqBook/DaqBoard Support**.
3. *If you do not have Acrobat Reader version 3.0 or greater* installed on your PC, select **Acrobat Reader**. This will enable you to read and print documentation that is included on the install CD-ROM.
4. Select **DIAdem Post Acquisition Data Analysis Program**.

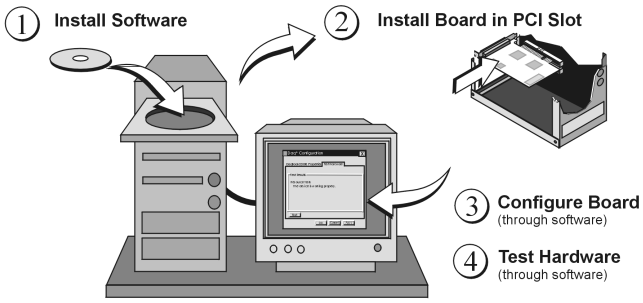
Reference Note:
If you are installing DIAdem, refer to the DIAdem chapter included in this manual. Note that the DIAdem material is also included on the install CD in Adobe® Acrobat format (pdf). The chapter includes a list of DIAdem install options.

5. Click "**Start Install**."
6. *If you get the following message*:

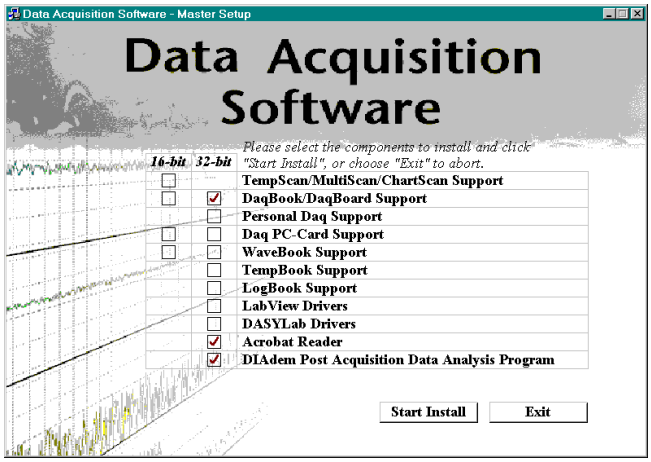
"Setup detected previously installed components. Would you like to exit setup now and uninstall the previous installation manually?"

Select "**Yes**" and use Microsoft's ***Add/Remove Programs*** feature to remove *any previous* version Daq* software.

This procedure is detailed in steps A through F, highlighted in the following figure.



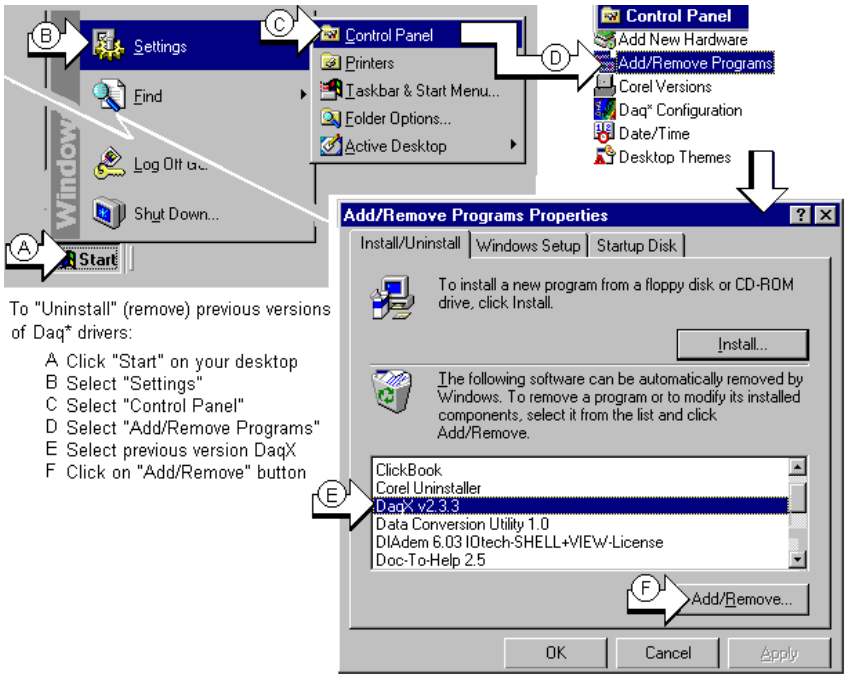
DaqBoard/2000 Series Installation, A Pictorial Overview



Selecting 32-Bit DaqBook/DaqBoard Support, Acrobat Reader, and DIAdem View

Screen images may vary depending on your operating system.

Note that previous versions of DaqView will appear as **DaqX** followed by version number. In the example DaqXv2.3.3 is being removed.



Removing a Previous Daq* Software Install

Note: If you receive a message regarding *shared files*, read the message before selecting a provided option button. *If you are not sure what to do* after reading the message, select the "**No to All**" option.

7. After removing previous versions (if applicable), click **OK** and exit the Control Panel.

8. Eject, then reinsert the Install CD-ROM; then wait for Auto-Access. The install should take place automatically.

Note: If you receive a message during the software install stating that the DaqBoard device is *not detected*, click "**OK**."

9. When install is complete select the radio button for the "**Exit viewing Readme file**" option. This file contains important information that may not be available elsewhere.

10. After reviewing the Readme file, exit the program.

11. Remove the CD-ROM.

12. Shutdown the PC.

You are now ready to begin the next section.

Install Boards in available PCI Bus Slots

CAUTION

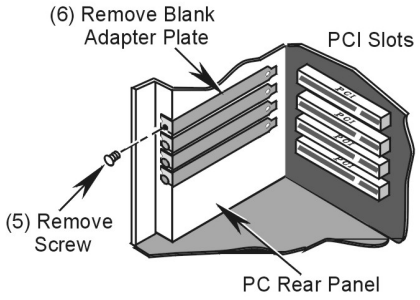
Turn off power to, and UNPLUG the host PC and externally connected equipment prior to removing the PC's cover and installing a DaqBoard/2000 Series Board. Electric shock or damage to equipment can result even under low-voltage conditions.

Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

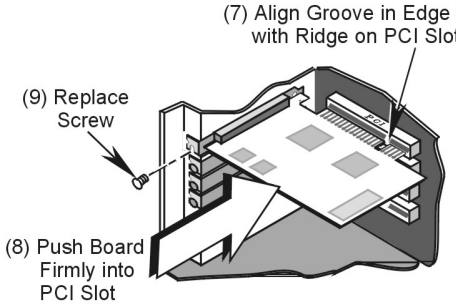
1. Turn **off** power to, and **UNPLUG the host PC** and externally connected equipment.
2. Remove the PC's cover. *Refer to your PC Owner's Manual as needed.*

3. Choose an available PCI bus-slot.
4. Carefully remove DaqBoard/2000 Series Board from its anti-static protective bag. If you have not already done so, write down the serial number of your board at this time. See inside front cover for details.
5. On the PC's rear panel, loosen and remove the screw for the blank adapter plate (that corresponds with to chosen PCI bus).
6. Remove the adapter plate for the chosen PCI slot.
   Refer to your PC Owner's Manual if needed.
7. Align groove in the DaqBoard/2000 Series board's PCI edge-connector with the ridge of the desired PCI slot, and with the PC's corresponding rear-panel slot.
8. Push the board firmly into the PCI slot. The board will snap into position.
9. Secure the board by inserting the rear-panel adapter-plate screw.
10. Using the previous steps, install additional boards into available PCI bus-slots, if applicable to your application.
11. Replace the computer's cover.
12. Plug in all cords and cables that were removed in step 1.
13. Apply power to, and start up the PC.



Removing a Blank Adapter Plate

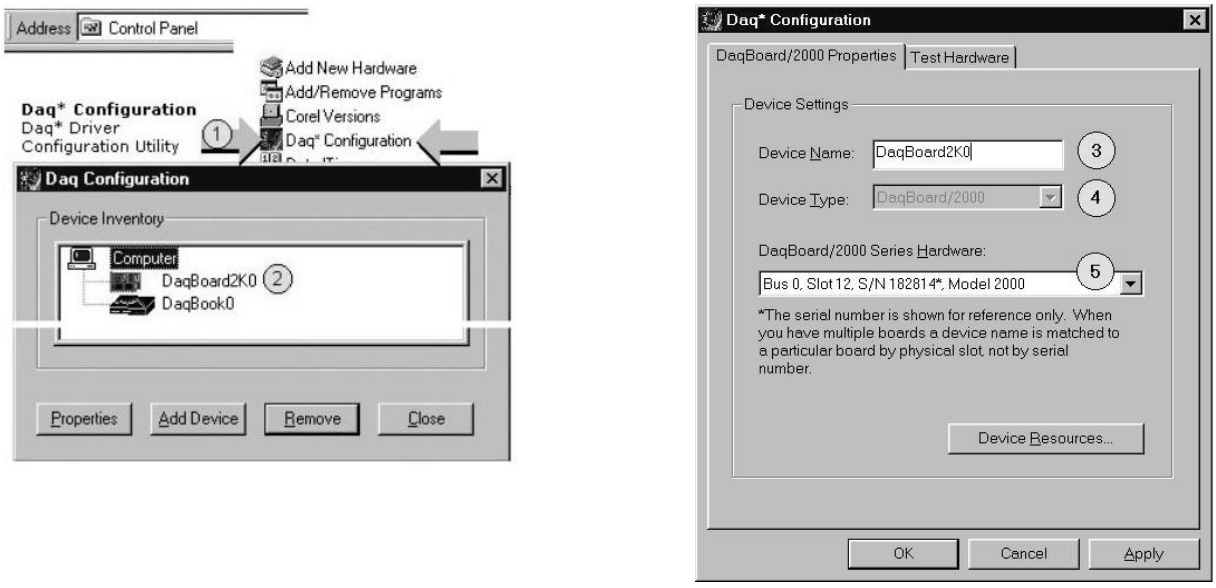
Note: At this point some PCs may prompt you to insert an installation disk. While this is rare, if you do receive such a prompt simply place the install CD-ROM into the disk drive and follow additional screen prompts.



Installing a DaqBoard/2000 Series Board

Configure Boards

DaqBoard/2000 Series Boards have no jumpers or switches to set. Configuration is performed, in its entirety, through software. Refer to the following figure and steps to complete the configuration. The numbers in the figure correspond to the numbered steps immediately following the figure.



Accessing the DaqBoard/2000 Properties Tab

1. Run the **Daq Configuration** control panel applet. Navigation from the desktop to the applet is as follows:
   Start ⇒ Settings ⇒ Control Panel ⇒ Daq*Configuration *(double-click)*
2. Double-click on the Device Inventory's DaqBoard2K0 icon. The DaqBoard/2000 Properties tab (used for the entire DaqBoard/2000 Series) will appear. **If the DaqBoard2K0 icon is not present, skip to the "Using Add Device" section provided below.**
3. Enter a "**Device Name**" in the text box, or use the default "DaqBoard2K0." Device Name is for identifying the specific DaqBoard/2000 Series board. Note that Device Name actually refers to the PCI slot and not to the actual board.
4. Verify that the "Device Type" shows the correct DaqBoard/2000 Series board, e.g., "**DaqBoard/2000, DaqBoard/2001, etc**."
   Note that available device types can be viewed via the pull-down list (▼).
5. Confirm that the DaqBoard/2000 Series text box shows a **Bus #, Slot #,** and **Serial Number**.
   If this text box is empty, use its pull-down list (▼) and select the serial number that matches the one for your board. Refer to the inside front cover page for serial number information.

Using "Add Device"

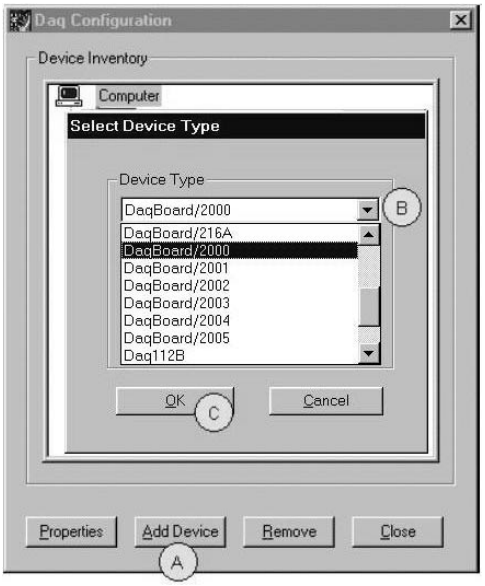
This method is for users who have accessed the **Daq Configuration** control panel applet, but have no DaqBoard2K icon (as described in step 2, above).

(A) After accessing the Daq Configuration control panel applet, click on the Add Device button (see figure, right). The *Select Device Type* window will appear.

(B) Using the *Device Type's* pull-down list, select the applicable board. In the example at the right **DaqBoard/2000** is selected.

(C) Click the **OK** button. The DaqBoard/2000 Properties tab will appear. This tab applies to all boards in the DaqBoard/2000 Series.

At this point, complete steps 3 through 5 from above.



Using "Add Device"

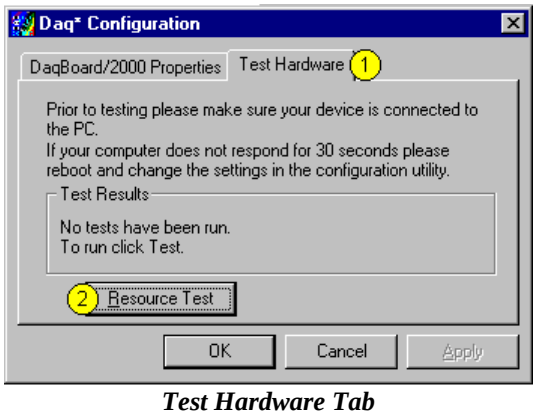
Test Hardware

Use the following steps to test the DaqBoard/2000 Series board. Note that these steps are continued from those listed under the previous section, "Configure Board."

1. Select the "**Test Hardware"** tab.
2. Click the "**Resource Test**" button.
3. After the test is complete, click "**OK**."

System capability is now tested for the DaqBoard/2000 Series board and a list of test results appears on screen.

Note: If you experience difficulties, please consult your user documentation (included on your CD) before calling for technical support. Note that the user documentation includes a troubleshooting chapter, as well as a great deal of information regarding specific DBK cards and modules.



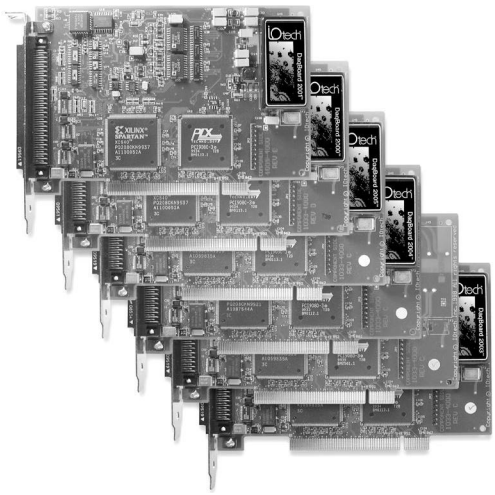
Test Hardware Tab
(Condensed Screen Image)

At this point we are ready to connect signals. This is typically accomplished with the use of a DBK200 Series option, as discussed in *Device Overviews* and DBK Option Cards and Modules chapters.


Notes

Device Overviews 2

This chapter provides information regarding each DaqBoard/2000 Series board. Aside from the comparative matrix below, each board is discussed independently. The chapter includes block diagrams and pinouts.



DaqBoard/2000 Series

DaqBoard/2000 Series I/O Comparison Matrix

DaqBoard/	Analog Input Channels Analog Input signals enter through P4 , go to MUX, to PGA, to Gain & Offset Amplifier, then to Analog-to-Digital Converter (ADC)	Analog Output Channels Digital Signals go through Digital-to-Analog Converters, then through "DAC Out" on P4.	Digital I/O Channels Digital signals pass through one 16-bit Digital I/O Port and three 8-bit Digital I/O Ports located on P4.	Counter/ Timers Four 16-bit Counter Input signals and Two 16-bit Timer Output signals via P4 and System Controller.
2000	ADC **16**	DAC **2**	Digital I/O **40**	Counter/ Timers **6**
2001	ADC **16**	DAC **4**	Digital I/O **40**	Counter/ Timers **6**
2002	--	--	Digital I/O **40**	Counter/ Timers **6**
2003	--	DAC **4**	--	--
2004	--	DAC **4**	Digital I/O **40**	Counter/ Timers **6**
2005	ADC **16**	--	Digital I/O **40**	Counter/ Timers **6**

Note: As implied by the preceding matrix, the following material does not apply globally to every DaqBoard/2000 series board. For example, boards /2002, /2003, and /2004 have no analog input.

Synchronous Input Operations

The DaqBoard/2000 series products allow synchronous scanning and acquisition of Analog Input, Digital Input and Counter Input Data at up to 200kHz aggregate scanning rates. The Analog Input data can be either main unit or expansion modules from P1 compatible analog input modules. The Digital Input data can be main unit 8-bit P2 (8255) digital inputs, 16-bit P3 digital inputs or P2 compatible DBK digital input expansion modules.

Analog Input Channels

The DaqBoard/2000 Series products that offer analog input (/2000, /2001, /2005) allow analog input configuration for the DaqBoard/2000 main unit as well as the P1 compatible DBK analog input expansion modules.

Channel Selection and Mode Settings

The main unit accepts up to 16 single ended or up to 8 differential-ended inputs and can be programmed for single-ended or differential-ended on a per channel basis. Just one analog channel is sacrificed when a DBK expansion module is enabled. See DBK documentation for further information.

Channel Range and Polarity

Each main unit channel also may be programmed for either unipolar or bipolar mode with gain settings of 1,2,4,8,16,32 and 64.

Channel Sampling Interval

The DaqBoard/2000 series allows programmable sampling intervals of 5us or 10us on a per channel basis. This mode allows some channels which change slowly but a higher degree of accuracy is desirable to be sampled at a longer interval while channels that change more rapidly to be sampled using a shorter interval. Each 5us or 10us interval reduces the maximum aggregate acquisition rate for the entire scan by that amount.

Digital Input Channels

The DaqBoard/2000 series allows either synchronous scanning of digital input channels or asynchronous I/O operations for all configured digital channels.

Counter Input Channels

The DaqBoard/2000 series allows synchronous scanning of the 4 16-bit counter input channels. The four 16-bit counter channels can also be cascaded into two 32-bit counter channels. For either cascaded or non-cascaded counter channels each channel can be configured for:

- ***Pulse Counting Mode*** – specifies that each counter should be cleared upon being read and placed into the input scan.
- ***Totalize Counting Mode*** – specifies that each counter is to free-run and not be cleared during the input acquisition.

Synchronous Input Acquisition Clocking

The DaqBoard/2000 series allows clocking of the synchronized inputs either by an internal, programmable pacer clock or by external clocking. These products use a sequencer to implement a multiplexing approach to gathering the input data. This means that with either internal or external clocking the entire channel scan (including the sampling time for each channel) may not exceed the maximum aggregate rate of 200kHz.

Synchronous Output Operations

The DaqBoard/2000 series products allow synchronous output of any D/A or P3 16-bit Digital channels available at up to 100kHz for each channel. All D/A channels available and the 16-bit P3 Digital channel may have output streamed to them and clocked out synchronously. The D/A channels may be configured for waveform output and the P3 digital channel may be configured for streamed digital pattern output using the same clock sources.

Output Channel Configuration

Analog Output Channels

Each D/A channel can be configured for waveform output individually. If the D/A channel is not configured for waveform output it then is available for asynchronous output operations.

Digital Pattern Output Channel

The 16-bit P3 Digital Port can be configured for streamed digital pattern output. If not configured for streamed digital pattern output operations it then may be used for asynchronous digital I/O operations.

Synchronous Output Clocking

The DaqBoard/2000 series allows clocking of the synchronized output by the acquisition clock source, an internal, programmable pacer clock or by an external clock source. When the clock source generates a new clock signal all outputs are updated concurrently. Regardless of the clock source, the clock may not exceed the maximum update rate of 100kHz.

Synchronous Output Data Source

The DaqBoard/2000 series allows the data source for synchronized output operations to be that of a memory based buffer or a file located on a mass storage medium. With either type of output data source, the output data for all the channels are contained in the buffer and/or file. The file path may be any file located on the on the machine or network accessible file.

Asynchronous I/O Operations

DaqBoard/2000 series products allow asynchronous input of any counter or digital channel that is not currently configured for synchronous acquisition. Also, the Daqboard/2000 series products allow for asynchronous output to any D/A channels not currently configured for waveform output. Likewise, the 16-bit P3 digital port can be used for both asynchronous input and output operations if it is not currently configured for streamed pattern output operations. In addition, the timer outputs can be programmed at any time regardless of the current state of synchronous or asynchronous operations on other channels.

Digital I/O Channels

Local 8255 Channels

The DaqBoard/2000 series products [which have digital I/O capabilities] have an implemented Intel 8255 core in the digital I/O logic on the P2 port of the product. With the Intel 8255 there are three 8-bit wide ports available for I/O and one 8-bit wide port for configuration purposes. The configuration port is used to configure the other three 8-bit ports for either input or output operations.

Local 16-bit P3 Port

The 16-bit P3 Digital Port can be used as either an input, or an output port. With this port, no configuration is required, the port simply outputs when written to and inputs when read.

Expansion Digital I/O

The DaqBoard/2000 series products that have digital I/O capabilities have the ability to expand these through the P2 port and the connection of applicable digital I/O expansion modules. These modules are discussed in the DBK chapter. When using the digital I/O expansion modules the local P2 Intel 8255 digital I/O becomes inaccessible in lieu of the expansion modules. These expansion modules provide additionally Intel 8255 ports as well as input isolation for applications that require the expanded capabilities.

Pulse Stream Output Using Timers

The DaqBoard/2000 series allows the generation of output pulses based upon a programmable setting. These output timers can be set at any time regardless of the state of any synchronous or asynchronous operations which are currently taking place on other channels.

Analog Output Channels

The DaqBoard/2000 series that have analog output capabilities have the ability to output analog data to any of the available (up to four) D/A channels. Each D/A channel may be asynchronously updated by an application if the D/A channel is not currently being used for waveform output operations.

Counter Input Channels

The DaqBoard/2000 series boards [except DaqBoard/2003] have counter input capabilities and have the ability to read counter input [if the counter channel is not configured for synchronous acquisition]. As in the case of synchronous operations the 4 16-bit counter input channels can be used individually or cascaded into 2 32-bit counter channels. For either cascaded or non-cascaded counter channels each channel can be configured for:

- ***Clear on Read Mode*** - specifies that each counter should be cleared (reset to 0) upon being read.
- ***Continuous Totalize Mode*** – specifies that each counter is to *free-run* and not be cleared during the read operation.

*DaqBoard/2000 Series Operation Matrix**

Operation	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Synchronous Input						
Analog Main Unit Inputs (P1)	Yes	Yes	No	No	No	Yes
Analog Expansion Input (P1)	Yes	Yes	No	No	No	Yes
Counter Inputs (P3)	Yes	Yes	Yes	No	Yes	Yes
Digital Main Unit Inputs (P2)	Yes	Yes	Yes	No	Yes	Yes
Digital Expansion Inputs (P2)	Yes	Yes	Yes	No	Yes	Yes
Digital Inputs (P3)	Yes	Yes	Yes	No	Yes	Yes
Synchronous Output						
Analog D/A Waveform Output	Yes(2)	Yes(4)	No (0)	Yes(4)	Yes(4)	No (0)
Streamed Digital Output (16-bit P3)	Yes	Yes	Yes	No	Yes	Yes
Asynchronous IO						
Main Unit Digital I/O	Yes	Yes	Yes	No	Yes	Yes
Expansion Digital I/O	Yes	Yes	Yes	No	Yes	Yes
Timer Output (Pulse Generation)	Yes	Yes	Yes	No	Yes	Yes
Analog Output	Yes(2)	Yes(4)	No (0)	Yes(4)	Yes(4)	No (0)

* A similar matrix, intended to highlight board differences at a glance, is presented on page 2-1.

DaqBoard/2000

16 **2** **40** **6**

DaqBoard/2000 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, two 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one DaqBoard/2000. Up to four boards can be installed into a PC.

A 100-pin connector on the DaqBoard/2000 provides access to all of the input and output signals. The DaqBoard/2000 accommodates all I/O with one cable and one PCI slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Analog input port for16 single-ended or 8 differential analog inputs with 13 software programmable ranges (±10 V to ±156 mV full scale).
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5µs or 10 µs/channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the DaqBoard/2000 without consuming CPU time.

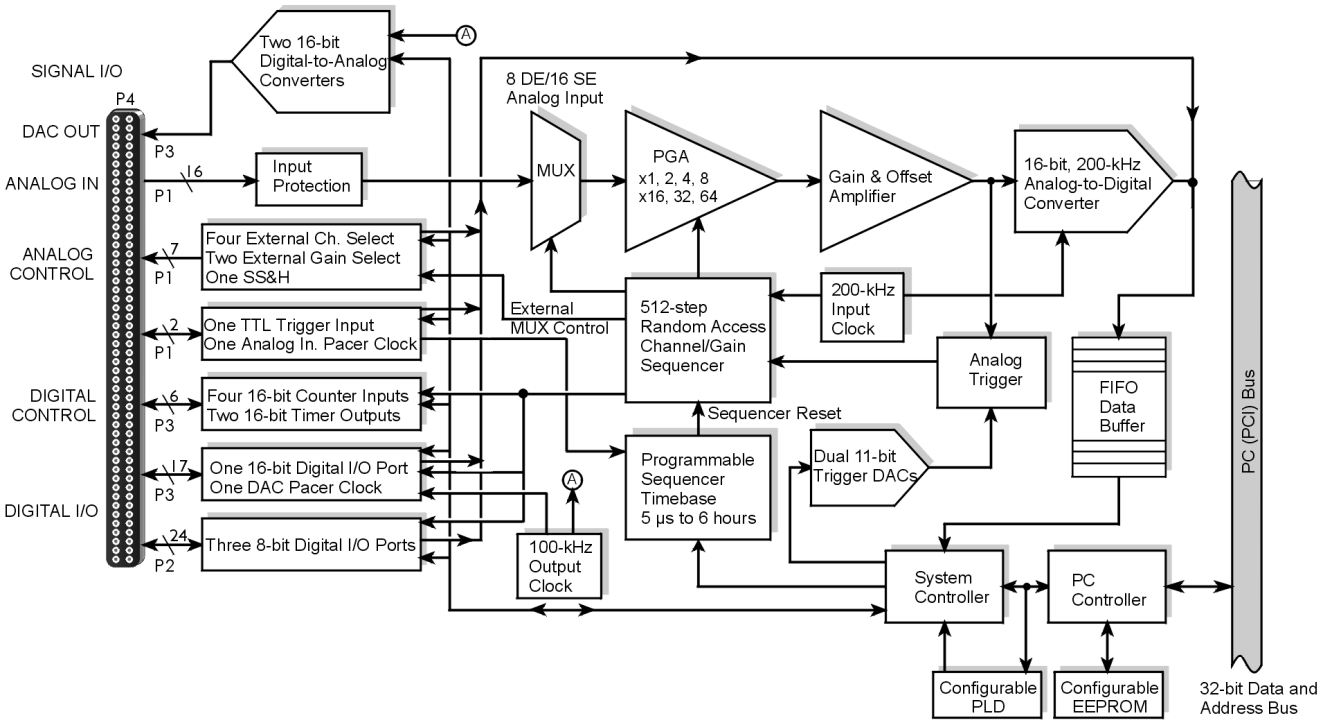
DaqBoard/2000 supports a full complement of trigger modes including:

- **Hardware analog triggering** – A user-programmed trigger level sets an analog DAC, which is compared in hardware to the analog input level on the selected channel. Trigger latency is < 5 µs.
- **Digital and pattern triggering** – The DaqBoard/2000 has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

The two 16-bit, 100-kHz analog output channels have an output from –10 V to +10 V. (These channels are separate from the D/As used to determine analog trigger levels.) Using Bus Mastering DMA, each D/A can output a waveform. Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2000 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/2000.



DaqBoard/2000 Block Diagram

Connections

Installation

Reference Note: For the DaqBoard/2000 installation procedure, please refer to the *Installation Guide* included at the beginning of this manual.

I/O Connectors

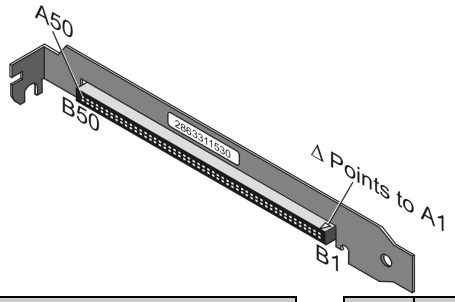
All input and output signals are available at the DaqBoard/2000 Series board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). These options, referred to as DBK200 Series, are discussed briefly at the end of this chapter and are detailed in the DBK Cards and Modules chapter, as well as in the documentation that is shipped with each DBK200 Series device.

P4 Pinout

100-pin Signal I/O

For DaqBoard/2000



Pin	Signal	Type	Dir	Description
A1	+5 Volts	Power	Out	+5 Volt supplies
B1				(Refer to manual, chapter 4)
A2	Port A 7	Digital	I/O	Port A 7 / P2 exp. D15
B2	A 6			A 6 / P2 exp. D14
A3	A 5			A 5 / P2 exp. D13
B3	A 4			A 4 / P2 exp. D12
A4	A 3			A 3 / P2 exp. D11
B4	A 2			A 2 / P2 exp. D10
A5	A 1			A 1 / P2 exp. D9
B5	A 0			A 0 / P2 exp. D8
A6	Port C 7	Digital	I/O	Port C 7 / P2 exp. D7
B6	C 6			C 6 / P2 exp. D6
A7	C 5			C 5 / P2 exp. D5
B7	C 4			C 4 / P2 exp. D4
A8	C 3			C 3 / P2 exp. D3
B8	C 2			C 2 / P2 exp. D2
A9	C 1			C 1 / P2 exp. D1
B9	C 0			C 0 / P2 exp. D0
A10	GND	Power	I/O	Digital Ground
B10	Port B 7	Digital	I/O	Port B 7 / P2 exp. A0 out.
A11	B 6			B 6 / P2 exp. A1 output
B11	B 5			B 5 / P2 exp. A2 output
A12	B 4			B 4 / P2 exp. A3 output
B12	B 3			B 3 / P2 exp. A4 output
A13	B 2			B 2 / P2 exp. RESET output
B13	B 1			B 1 / P2 exp. WR- output
A14	B 0			B 0 / P2 exp. RD- output
B14	GND	Power	I/O	Digital Ground
A15	14	Digital	I/O	16-bit Digital I/O (for P3)
B15	15			
A16	12			
B16	13			
A17	10			
B17	11			
A18	8			
B18	9			
A19	6			
B19	7			
A20	4			
B20	5			
A21	2			
B21	3			
A22	0			
B22	1			
A23	GND	Power	I/O	Digital Ground
B23	--------	Digital	Out	Reserved – Do Not Use
A24	GND	Power	I/O	Digital Ground
B24	Timer 0	Digital	Out	Timer Outputs
A25	Timer 1			
B25	GND	Power	I/O	Digital Ground

Pin	Signal	Type	Dir	Description
A26	DAC Pacer	Digital	I/O	Waveform DAC & pattern pacer clock
B26	Acq. Pacer	Digital	I/O	Acquisition pacer clock
A27	TTLTRG	Digital	In	TTL Trigger
B27	GND	Power	I/O	Digital Ground
A28	Counter 3	Digital	In	Counter Inputs
B28	Counter 2			
A29	Counter 1			
B29	Counter 0			
A30	------	Digital	In	Reserved – Do Not Use
B30	------	Digital	In	Reserved – Do Not Use
A31	AGND	Power	I/O	Analog Ground
B31	Gain 1	Digital	Out	External gain select outputs
A32	Gain 0			
B32	Chan 3	Digital	Out	External channel select outputs
A33	Chan 2			
B33	Chan 1			
A34	Chan 0			
B34	SSH	Digital	Out	Simultaneous-sample-and-hold output
A35	AGND	Power	I/O	Analog Ground
B35	POSREF	Analog	Out	+5 V reference
A36	NEGREF	Analog	Out	-5 V reference
B36	Ain 15	Analog	In	Analog in ch. 15 (SE) / 7–low (DIFF)
A37	Ain 7			Analog in ch. 7 (SE) / 7–high (DIFF)
B37	AGND	Power	I/O	Analog Ground
A38	Ain 14	Analog	In	Analog in ch. 14 (SE) / 6–low (DIFF)
B38	Ain 6			Analog in ch. 6 (SE) / 6–high (DIFF)
A39	AGND	Power	I/O	Analog Ground
B39	Ain 13	Analog	In	Analog in ch. 13 (SE) / 5–low (DIFF)
A40	Ain 5			Analog in ch. 5 (SE) / 5–high (DIFF)
B40	AGND	Power	I/O	Analog Ground
A41	Ain 12	Analog	In	Analog in ch. 12 (SE) / 4–low (DIFF)
B41	Ain 4			Analog in ch. 4 (SE) / 4–high (DIFF)
A42	AGND	Power	I/O	Analog Ground
B42	Ain 11	Analog	In	Analog in ch. 11 (SE) / 3–low (DIFF)
A43	Ain 3			Analog in ch. 3 (SE) / 3–high (DIFF)
B43	AGND	Power	I/O	Analog Ground
A44	Ain 10	Analog	In	Analog in ch. 10 (SE) / 2–low (DIFF)
B44	Ain 2			Analog in ch. 2 (SE) / 2–high (DIFF)
A45	SGND	Analog	I/O	Analog Signal Ground Reference
B45	Ain 9	Analog	In	Analog in ch. 9 (SE) / 1–low (DIFF)
A46	Ain 1			Analog in ch. 1 (SE) / 1–high (DIFF)
B46	AGND	Power	I/O	Analog Ground
A47	Ain 8	Analog	In	Analog in ch. 8 (SE) / 0–low (DIFF)
B47	Ain 0			Analog in ch. 0 (SE) / 0–high (DIFF)
A48	-15 Volts	Power	Out	-15 Volt Supply
B48	+ 15 Volts	Power	Out	+15 Volt Supply
A49	DAC 0	Analog	Out	DAC output
B49	------	------	----	Reserved – Do Not Use
A50	DAC 1	Analog	Out	DAC output
B50	------	------	----	Reserved – Do Not Use

Note: Software commands determine P4 digital I/O pin functions.

DaqBoard/2001

16 **4** **40** **6**

DaqBoard/2001 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, four 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one DaqBoard/2000. Up to four boards can be installed into a PC.

A 100-pin connector on the DaqBoard/2001 provides access to all of the input and output signals. The DaqBoard/2001 accommodates all I/O with one cable and one PCI slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Analog input port for16 single-ended or 8 differential analog inputs with 13 software programmable ranges (±10 V to ±156 mV full scale).
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5µs or 10µs/channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the DaqBoard/2001 without consuming CPU time.

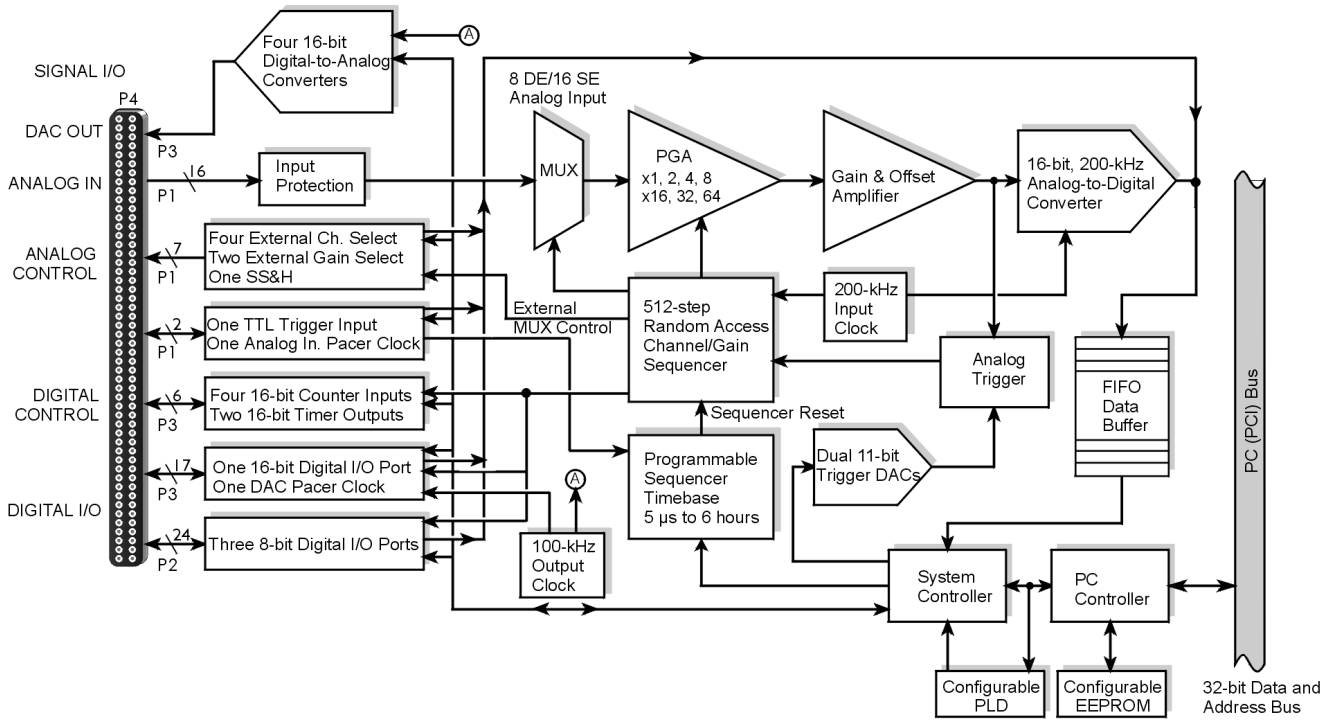
DaqBoard/2001 supports a full complement of trigger modes including:

- **Hardware analog triggering** – A user-programmed trigger level sets an analog DAC, which is compared in hardware to the analog input level on the selected channel. Trigger latency is < 5 µs.
- **Digital and pattern triggering** – The DaqBoard/2001 has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

The four 16-bit, 100-kHz analog output channels have an output from –10 V to +10 V. (These channels are separate from the D/As used to determine analog trigger levels.) Using Bus Mastering DMA, each D/A can output a waveform. Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2001 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/2001.



DaqBoard/2001 Block Diagram

Connections

Installation

Reference Note: For the DaqBoard/2001 installation procedure, please refer to the *Installation Guide* included at the beginning of this manual.

I/O Connector

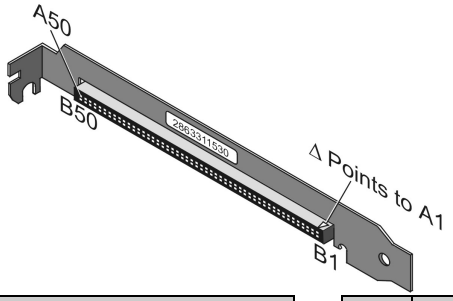
All input and output signals are available at the DaqBoard/2000 Series board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). These options, referred to as DBK200 Series, are discussed briefly at the end of this chapter and are detailed in the DBK Cards and Modules chapter, as well as in the documentation that is shipped with each DBK200 Series device.

P4 Pinout

100-pin Signal I/O

For DaqBoard/2001



Pin	Signal	Type	Dir	Description
A1	+5 Volts	Power	Out	+5 Volt supplies
B1				(Refer to manual, chapter 4)
A2	Port A 7	Digital	I/O	Port A 7 / P2 exp. D15
B2	A 6			A 6 / P2 exp. D14
A3	A 5			A 5 / P2 exp. D13
B3	A 4			A 4 / P2 exp. D12
A4	A 3			A 3 / P2 exp. D11
B4	A 2			A 2 / P2 exp. D10
A5	A 1			A 1 / P2 exp. D9
B5	A 0			A 0 / P2 exp. D8
A6	Port C 7	Digital	I/O	Port C 7 / P2 exp. D7
B6	C 6			C 6 / P2 exp. D6
A7	C 5			C 5 / P2 exp. D5
B7	C 4			C 4 / P2 exp. D4
A8	C 3			C 3 / P2 exp. D3
B8	C 2			C 2 / P2 exp. D2
A9	C 1			C 1 / P2 exp. D1
B9	C 0			C 0 / P2 exp. D0
A10	GND	Power	I/O	Digital Ground
B10	Port B 7	Digital	I/O	Port B 7 / P2 exp. A0 out.
A11	B 6			B 6 / P2 exp. A1 output
B11	B 5			B 5 / P2 exp. A2 output
A12	B 4			B 4 / P2 exp. A3 output
B12	B 3			B 3 / P2 exp. A4 output
A13	B 2			B 2 / P2 exp. RESET output
B13	B 1			B 1 / P2 exp. WR- output
A14	B 0			B 0 / P2 exp. RD- output
B14	GND	Power	I/O	Digital Ground
A15	14	Digital	I/O	16-bit Digital I/O (for P3)
B15	15			
A16	12			
B16	13			
A17	10			
B17	11			
A18	8			
B18	9			
A19	6			
B19	7			
A20	4			
B20	5			
A21	2			
B21	3			
A22	0			
B22	1			
A23	GND	Power	I/O	Digital Ground
B23	--------	Digital	Out	Reserved – Do Not Use
A24	GND	Power	I/O	Digital Ground
B24	Timer 0	Digital	Out	Timer Outputs
A25	Timer 1			
B25	GND	Power	I/O	Digital Ground

Pin	Signal	Type	Dir	Description
A26	DAC Pacer	Digital	I/O	Waveform DAC & pattern pacer clock
B26	Acq. Pacer	Digital	I/O	Acquisition pacer clock
A27	TTLTRG	Digital	In	TTL Trigger
B27	GND	Power	I/O	Digital Ground
A28	Counter 3	Digital	In	Counter Inputs
B28	Counter 2			
A29	Counter 1			
B29	Counter 0			
A30	------	Digital	In	Reserved – Do Not Use
B30	------	Digital	In	Reserved – Do Not Use
A31	AGND	Power	I/O	Analog Ground
B31	Gain 1	Digital	Out	External gain select outputs
A32	Gain 0			
B32	Chan 3	Digital	Out	External channel select outputs
A33	Chan 2			
B33	Chan 1			
A34	Chan 0			
B34	SSH	Digital	Out	Simultaneous-sample-and-hold output
A35	AGND	Power	I/O	Analog Ground
B35	POSREF	Analog	Out	+5 V reference
A36	NEGREF	Analog	Out	-5 V reference
B36	Ain 15	Analog	In	Analog in ch. 15 (SE) / 7–low (DIFF)
A37	Ain 7			Analog in ch. 7 (SE) / 7–high (DIFF)
B37	AGND	Power	I/O	Analog Ground
A38	Ain 14	Analog	In	Analog in ch. 14 (SE) / 6–low (DIFF)
B38	Ain 6			Analog in ch. 6 (SE) / 6–high (DIFF)
A39	AGND	Power	I/O	Analog Ground
B39	Ain 13	Analog	In	Analog in ch. 13 (SE) / 5–low (DIFF)
A40	Ain 5			Analog in ch. 5 (SE) / 5–high (DIFF)
B40	AGND	Power	I/O	Analog Ground
A41	Ain 12	Analog	In	Analog in ch. 12 (SE) / 4–low (DIFF)
B41	Ain 4			Analog in ch. 4 (SE) / 4–high (DIFF)
A42	AGND	Power	I/O	Analog Ground
B42	Ain 11	Analog	In	Analog in ch. 11 (SE) / 3–low (DIFF)
A43	Ain 3			Analog in ch. 3 (SE) / 3–high (DIFF)
B43	AGND	Power	I/O	Analog Ground
A44	Ain 10	Analog	In	Analog in ch. 10 (SE) / 2–low (DIFF)
B44	Ain 2			Analog in ch. 2 (SE) / 2–high (DIFF)
A45	SGND	Analog	I/O	Analog Signal Ground Reference
B45	Ain 9	Analog	In	Analog in ch. 9 (SE) / 1–low (DIFF)
A46	Ain 1			Analog in ch. 1 (SE) / 1–high (DIFF)
B46	AGND	Power	I/O	Analog Ground
A47	Ain 8	Analog	In	Analog in ch. 8 (SE) / 0–low (DIFF)
B47	Ain 0			Analog in ch. 0 (SE) / 0–high (DIFF)
A48	-15 Volts	Power	Out	-15 Volt Supply
B48	+ 15 Volts	Power	Out	+15 Volt Supply
A49	DAC 0	Analog	Out	DAC output
B49	DAC2	Analog	Out	DAC output
A50	DAC 1	Analog	Out	DAC output
B50	DAC3	Analog	Out	DAC output

Note: Software commands determine P4 digital I/O pin functions.

DaqBoard/2002

40 **6**

DaqBoard/2002 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features digital calibration, bus mastering DMA, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one DaqBoard/2002. Up to four boards can be installed into a PC.

A 100-pin connector on the DaqBoard/2002 provides access to all of the input and output signals. The DaqBoard/2002 accommodates all I/O with one cable and one PCI slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5 µs or 10 µs/channel.

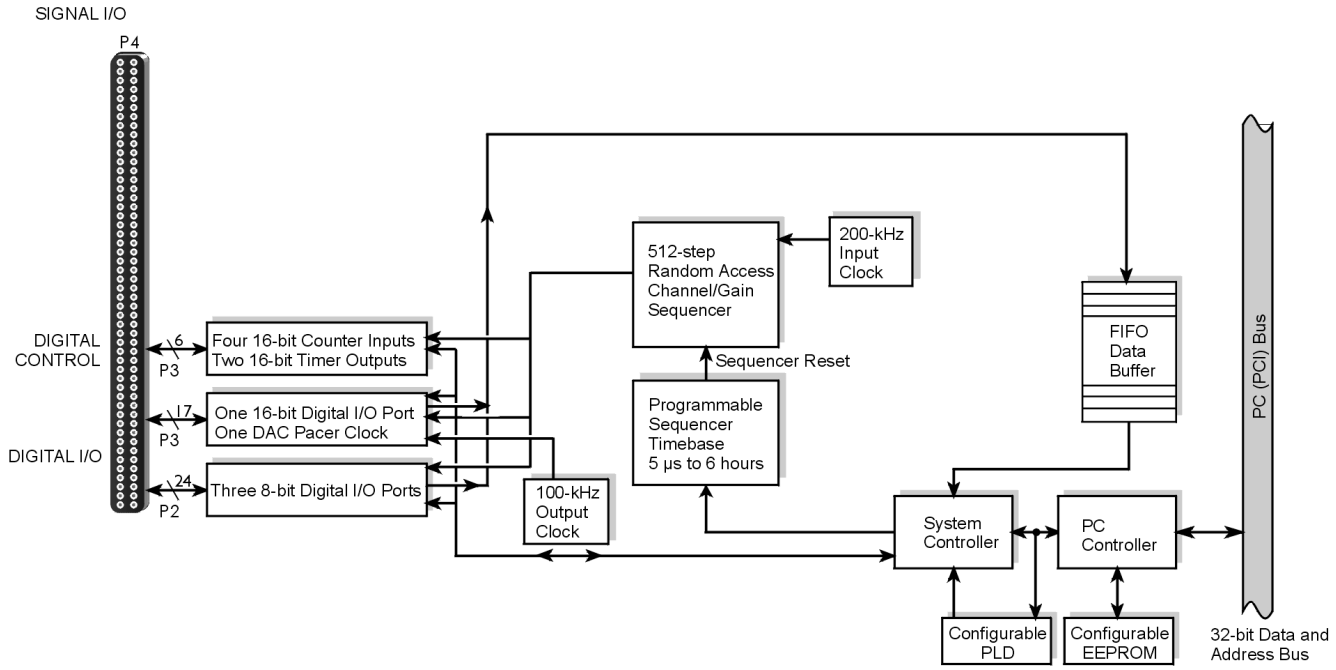
Bus mastering allows digital/counter input data and digital output data to flow between the PC and the DaqBoard/2002 without consuming CPU time.

DaqBoard/2002 supports a complement of trigger modes including:

- **Digital and pattern triggering** – The DaqBoard/2002 has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings [digital, or counter]. Six pre- and post-triggering modes are supported.

Other features of the DaqBoard/2002 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/2002.



DaqBoard/2002 Block Diagram

Connections

Installation

Reference Note: For the DaqBoard/2002 installation procedure, please refer to the *Installation Guide* included at the beginning of this manual.

I/O Connector

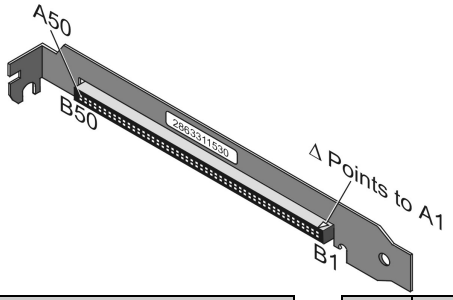
All input and output signals are available at the DaqBoard/2000 Series board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). These options, referred to as DBK200 Series, are discussed briefly at the end of this chapter and are detailed in the DBK Cards and Modules chapter, as well as in the documentation that is shipped with each DBK200 Series device.

P4 Pinout

100-pin Signal I/O

For DaqBoard/2002



Pin	Signal	Type	Dir	Description
A1	+5 Volts	Power	Out	+5 Volt supplies
B1	+5 Volts	Power	Out	+5 Volt supplies
A2	Port A 7	Digital	I/O	Port A 7 / P2 exp. D15
B2	A 6			A 6 / P2 exp. D14
A3	A 5			A 5 / P2 exp. D13
B3	A 4			A 4 / P2 exp. D12
A4	A 3			A 3 / P2 exp. D11
B4	A 2			A 2 / P2 exp. D10
A5	A 1			A 1 / P2 exp. D9
B5	A 0			A 0 / P2 exp. D8
A6	Port C 7	Digital	I/O	Port C 7 / P2 exp. D7
B6	C 6			C 6 / P2 exp. D6
A7	C 5			C 5 / P2 exp. D5
B7	C 4			C 4 / P2 exp. D4
A8	C 3			C 3 / P2 exp. D3
B8	C 2			C 2 / P2 exp. D2
A9	C 1			C 1 / P2 exp. D1
B9	C 0			C 0 / P2 exp. D0
A10	GND	Power	I/O	Digital Ground
B10	Port B 7	Digital	I/O	Port B 7 / P2 exp. A0 out.
A11	B 6			B 6 / P2 exp. A1 output
B11	B 5			B 5 / P2 exp. A2 output
A12	B 4			B 4 / P2 exp. A3 output
B12	B 3			B 3 / P2 exp. A4 output
A13	B 2			B 2 / P2 exp. RESET output
B13	B 1			B 1 / P2 exp. WR- output
A14	B 0			B 0 / P2 exp. RD- output
B14	GND	Power	I/O	Digital Ground
A15	14	Digital	I/O	16-bit Digital I/O (for P3)
B15	15			
A16	12			
B16	13			
A17	10			
B17	11			
A18	8			
B18	9			
A19	6			
B19	7			
A20	4			
B20	5			
A21	2			
B21	3			
A22	0			
B22	1			
A23	GND	Power	I/O	Digital Ground
B23	--------	Digital	Out	Reserved – Do Not Use
A24	GND	Power	I/O	Digital Ground
B24	Timer 0	Digital	Out	Timer Output
A25	Timer 1	Digital	Out	Timer Output
B25	GND	Power	I/O	Digital Ground

Pin	Signal	Type	Dir	Description
A26	DAC Pacer	Digital	I/O	Waveform & pacer clock
B26	Acq. Pacer	Digital	I/O	Acquisition pacer clock
A27	TTLTRG	Digital	In	TTL Trigger
B27	GND	Power	I/O	Digital Ground
A28	Counter 3	Digital	In	Counter Input
B28	Counter 2	Digital	In	Counter Input
A29	Counter 1	Digital	In	Counter Input
B29	Counter 0	Digital	In	Counter Input
A30	------	Digital	In	Reserved – Do Not Use
B30	------	Digital	In	Reserved – Do Not Use
A31	AGND	Power	I/O	Analog Ground
B31	------	Digital	Out	Reserved – Do Not Use
A32	------			Reserved – Do Not Use
B32	Chan 3	Digital	Out	External channel output
A33	Chan 2	Digital	Out	External channel output
B33	Chan 1	Digital	Out	External channel output
A34	Chan 0	Digital	Out	External channel output
B34	SSH	Digital	Out	SSH Output
A35				Reserved – Do Not Use
B35				Reserved – Do Not Use
A36				Reserved – Do Not Use
B36				Reserved – Do Not Use
A37				Reserved – Do Not Use
B37				Reserved – Do Not Use
A38				Reserved – Do Not Use
B38				Reserved – Do Not Use
A39				Reserved – Do Not Use
B39				Reserved – Do Not Use
A40				Reserved – Do Not Use
B40				Reserved – Do Not Use
A41				Reserved – Do Not Use
B41				Reserved – Do Not Use
A42				Reserved – Do Not Use
B42				Reserved – Do Not Use
A43				Reserved – Do Not Use
B43				Reserved – Do Not Use
A44				Reserved – Do Not Use
B44				Reserved – Do Not Use
A45				Reserved – Do Not Use
B45				Reserved – Do Not Use
A46				Reserved – Do Not Use
B46				Reserved – Do Not Use
A47				Reserved – Do Not Use
B47				Reserved – Do Not Use
A48	-15 Volts	Power	Out	-15 Volt Supply
B48	+ 15 Volts	Power	Out	+15 Volt Supply
A49				Reserved – Do Not Use
B49				Reserved – Do Not Use
A50				Reserved – Do Not Use
B50				Reserved – Do Not Use

Note: Software commands determine P4 digital I/O pin functions.

DaqBoard/2003

4

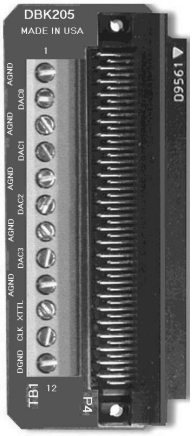
DaqBoard/2003 is a high-speed plug-and-play data acquisition board for PCI bus computers. The board is used for analog output and includes four 16-bit, 100-kHz D/A converters. Up to four DaqBoards can be installed into a PC.

A 100-pin connector on the DaqBoard/2003 provides access to the DAC analog output signals. The DaqBoard/2003 plugs directly into a PCI bus slot. The DAC analog output leaves the board through "P3-designated" pins located on the board's 100-pin P4 connector.

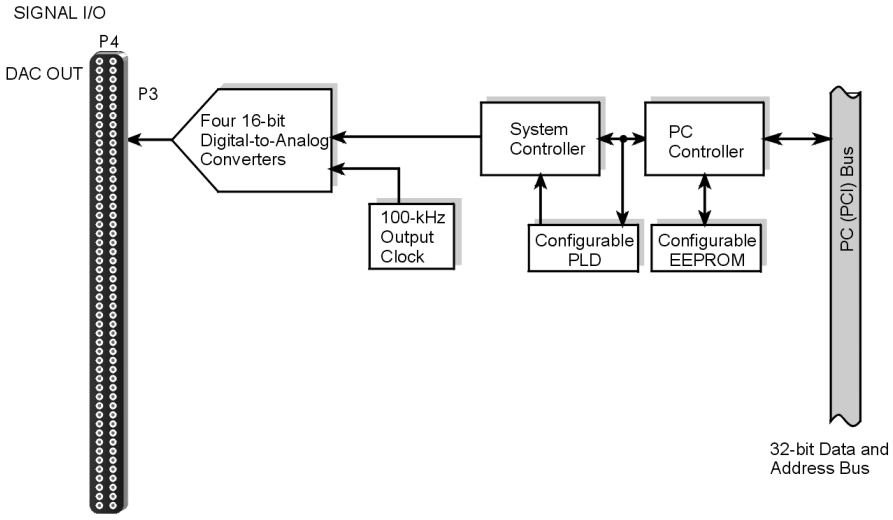
DaqBoard/2003 supports **Software-based triggering**. In "Software-based" triggering the PC detects the trigger event from the readings. Six pre- and post-triggering modes are supported.

DBK205 Terminations

TB1-1 AGND
TB1-2 DAC0
TB1-3 AGND
TB1-4 DAC1
TB1-5 AGND
TB1-6 DAC2
TB1-7 AGND
TB1-8 DAC3
TB1-9 AGND
TB1-10 XTTL
TB1-11 CLK
TB1-12 DGND



DBK205 Adapter



DaqBoard/2003 Block Diagram

Note: DaqBoard/2003 is shipped with one DBK205 adapter. The adapter has twelve screw terminals as follows: DAC0, DAC1, DAC2, DAC3, 1 digital ground, 5 analog grounds, 1 external clock (CLK), and 1 external trigger (XTTL). DBK205 connects directly to DaqBoard/2003's P4 connector.

Connections

Installation

Reference Note: For the DaqBoard/2003 installation procedure, please refer to the *Installation Guide* included at the beginning of this manual.

I/O Connector

Analog output signals are available at the DaqBoard/2003's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4; however, a DBK205 adapter board is included for connecting the 100 pins of P4 to a terminal block (TB1).

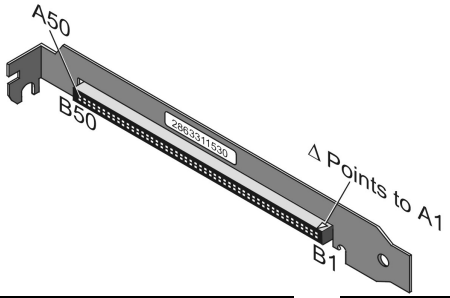
DBK205's TB1 includes screw terminals for: DAC0, DAC1, DAC2, and DAC3, 1 digital ground, 5 analog grounds, 1 external clock (CLK), and 1 external trigger (XTTL). DBK205 connects directly to DaqBoard/2003's P4 connector.

DBK205 is discussed briefly at the end of this chapter and is detailed in the DBK Cards and Modules chapter, as well as in the documentation that is shipped with each DBK200 Series device.

P4 Pinout

100-pin Signal I/O

For DaqBoard/2003



Pin	Signal	Type	Dir	Description
A1	+5 Volts	Power	Out	+5 Volt supply
B1	+5 Volts	Power	Out	+5 Volt supply
A2				
B2				
A3				
B3				
A4				
B4				
A5				
B5				
A6				
B6				
A7				
B7				
A8				
B8				
A9				
B9				
A10				
B10				
A11				
B11				
A12				
B12				
A13				
B13				
A14				
B14				
A15				
B15				
A16				
B16				
A17				
B17				
A18				
B18				
A19				
B19				
A20				
B20				
A21				
B21				
A22				
B22				
A23	GND	Power	I/O	Digital Ground
B23	--------	Digital	Out	Reserved – Do Not Use
A24	GND	Power	I/O	Digital Ground
B24				
A25				
B25	GND	Power	I/O	Digital Ground

Pin	Signal	Type	Dir	Description
A26	DAC Pacer	Digital	I/O	Waveform & pacer clock
B26				
A27	TTLTRG	Digital	In	TTL Trigger
B27				
A28				
B28				
A29				
B29				
A30				
B30				
A31				
B31				
A32				
B32				
A33				
B33				
A34				
B34				
A35				
B35				
A36				
B36				
A37				
B37				
A38				
B38				
A39				
B39				
A40				
B40				
A41				
B41				
A42				
B42				
A43				
B43				
A44				
B44				
A45				
B45				
A46				
B46				
A47				
B47				
A48	-15 Volts	Power	Out	-15 Volt Supply
B48	+ 15 Volts	Power	Out	+15 Volt Supply
A49	DAC 0	Analog	Out	DAC output
B49	DAC 2	Analog	Out	DAC output
A50	DAC 1	Analog	Out	DAC output
B50	DAC 3	Analog	Out	DAC output

Note: Software commands determine P4 digital I/O pin functions.

DaqBoard/2004

DaqBoard/2004 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features bus mastering DMA, four 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters, and two timers.

Up to four DaqBoards can be installed in one PC.

A 100-pin connector on the DaqBoard/2004 provides access to all of the input and output signals. The DaqBoard/2004 accommodates all I/O with one cable and one PCI slot. The 100-pin I/O connector, P4, is logically divided into three ports: P1, P2, and P3; however, DaqBoard/2004 only makes use of the P2 and P3 pin designations.

- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, timer outputs, and analog outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5 µs or 10 µs per channel.

Bus mastering allows the digital/counter input data and analog and digital output data to flow between the PC and the DaqBoard/2004 without consuming CPU time.

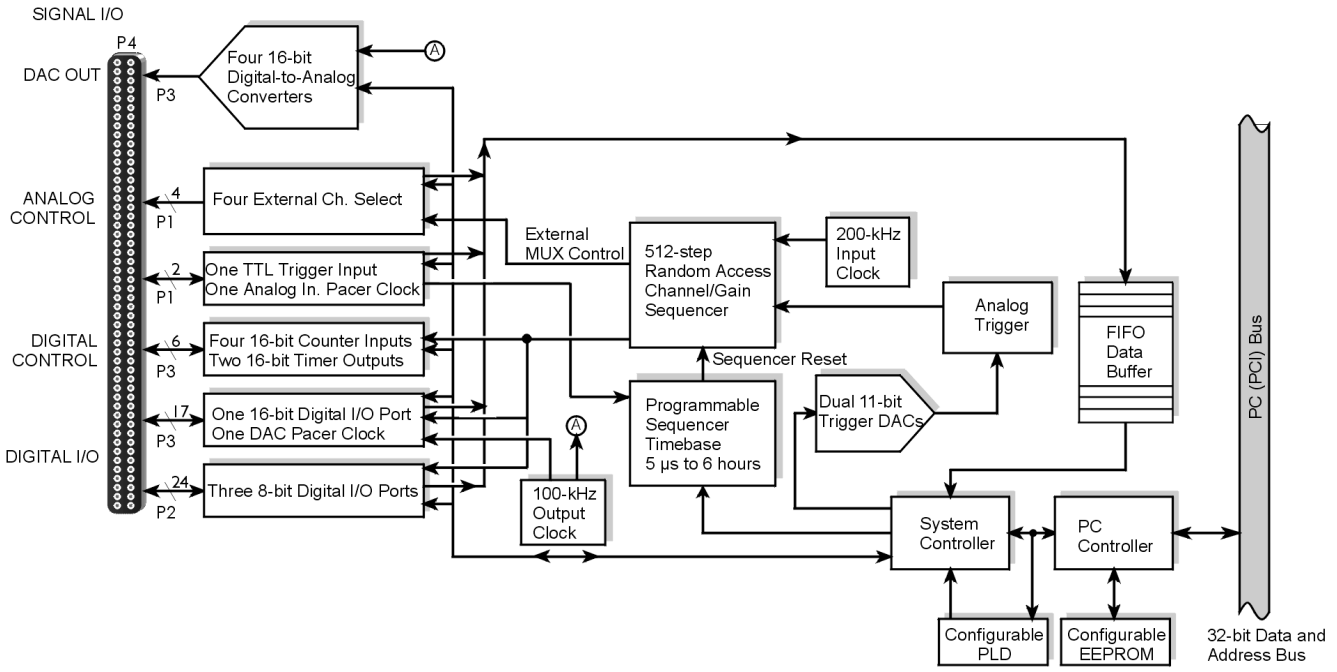
DaqBoard/2004 supports several trigger modes including:

- **Digital and pattern triggering** – The DaqBoard/2004 has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

The four 16-bit, 100-kHz analog output channels have an output from –10 V to +10 V. Using Bus Mastering DMA, each D/A can output a waveform. Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2004 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/2004.



DaqBoard/2004 Block Diagram

Connections

Installation

Reference Note: For the DaqBoard/2004 installation procedure, please refer to the *Installation Guide* included at the beginning of this manual.

I/O Connector

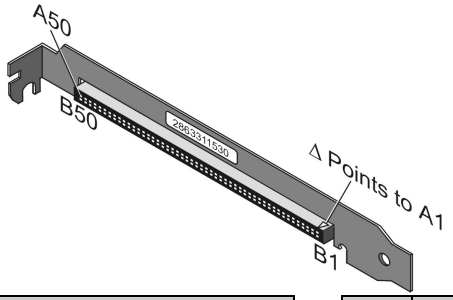
All input and output signals are available at the DaqBoard/2000 Series board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). These options, referred to as DBK200 Series, are discussed briefly at the end of this chapter and are detailed in the DBK Cards and Modules chapter, as well as in the documentation that is shipped with each DBK200 Series device.

P4 Pinout

100-pin Signal I/O

For DaqBoard/2004



Pin	Signal	Type	Dir	Description
A1	+5 Volts	Power	Out	+5 Volt supplies
B1	+5 Volts	Power	Out	+5 Volt supplies
A2	Port A 7	Digital	I/O	Port A 7 / P2 exp. D15
B2	A 6			A 6 / P2 exp. D14
A3	A 5			A 5 / P2 exp. D13
B3	A 4			A 4 / P2 exp. D12
A4	A 3			A 3 / P2 exp. D11
B4	A 2			A 2 / P2 exp. D10
A5	A 1			A 1 / P2 exp. D9
B5	A 0			A 0 / P2 exp. D8
A6	Port C 7	Digital	I/O	Port C 7 / P2 exp. D7
B6	C 6			C 6 / P2 exp. D6
A7	C 5			C 5 / P2 exp. D5
B7	C 4			C 4 / P2 exp. D4
A8	C 3			C 3 / P2 exp. D3
B8	C 2			C 2 / P2 exp. D2
A9	C 1			C 1 / P2 exp. D1
B9	C 0			C 0 / P2 exp. D0
A10	GND	Power	I/O	Digital Ground
B10	Port B 7	Digital	I/O	Port B 7 / P2 exp. A0 out.
A11	B 6			B 6 / P2 exp. A1 output
B11	B 5			B 5 / P2 exp. A2 output
A12	B 4			B 4 / P2 exp. A3 output
B12	B 3			B 3 / P2 exp. A4 output
A13	B 2			B 2 / P2 exp. RESET output
B13	B 1			B 1 / P2 exp. WR- output
A14	B 0			B 0 / P2 exp. RD- output
B14	GND	Power	I/O	Digital Ground
A15	14	Digital	I/O	16-bit Digital I/O (for P3)
B15	15			
A16	12			
B16	13			
A17	10			
B17	11			
A18	8			
B18	9			
A19	6			
B19	7			
A20	4			
B20	5			
A21	2			
B21	3			
A22	0			
B22	1			
A23	GND	Power	I/O	Digital Ground
B23	--------	Digital	Out	Reserved – Do Not Use
A24	GND	Power	I/O	Digital Ground
B24	Timer 0	Digital	Out	Timer Output
A25	Timer 1	Digital	Out	Timer Output
B25	GND	Power	I/O	Digital Ground

Pin	Signal	Type	Dir	Description
A26	DAC Pacer	Digital	I/O	Waveform DAC & pacer clock
B26	Acq. Pacer	Digital	I/O	Acquisition pacer clock
A27	TTLTRG	Digital	In	TTL Trigger
B27	GND	Power	I/O	Digital Ground
A28	Counter 3	Digital	In	Counter Input
B28	Counter 2	Digital	In	Counter Input
A29	Counter 1	Digital	In	Counter Input
B29	Counter 0	Digital	In	Counter Input
A30	------	Digital	In	Reserved – Do Not Use
B30	------	Digital	In	Reserved – Do Not Use
A31	AGND	Power	I/O	Analog Ground
B31	------			Reserved – Do Not Use
A32	------			Reserved – Do Not Use
B32	Chan 3	Digital	Out	External channel output
A33	Chan 2	Digital	Out	External channel output
B33	Chan 1	Digital	Out	External channel output
A34	Chan 0	Digital	Out	External channel output
B34	-----			Reserved – Do Not Use
A35	AGND	Power	I/O	Analog Ground
B35	POSREF	Analog	Out	+5 V reference
A36	NEGREF	Analog	Out	-5 V reference
B36	-----			Reserved – Do Not Use
A37	-----			Reserved – Do Not Use
B37	AGND	Power	I/O	Analog Ground
A38	-----			Reserved – Do Not Use
B38	-----			Reserved – Do Not Use
A39	AGND	Power	I/O	Analog Ground
B39	-----			Reserved – Do Not Use
A40	-----			Reserved – Do Not Use
B40	AGND	Power	I/O	Analog Ground
A41	-----			Reserved – Do Not Use
B41	-----			Reserved – Do Not Use
A42	AGND	Power	I/O	Analog Ground
B42	-----			Reserved – Do Not Use
A43	-----			Reserved – Do Not Use
B43	AGND	Power	I/O	Analog Ground
A44	-----			Reserved – Do Not Use
B44	-----			Reserved – Do Not Use
A45	SGND	Analog	I/O	Analog Signal Ground Reference
B45	-----			Reserved – Do Not Use
A46	-----			Reserved – Do Not Use
B46	AGND	Power	I/O	Analog Ground
A47	-----			Reserved – Do Not Use
B47	-----			Reserved – Do Not Use
A48	-15 Volts	Power	Out	-15 Volt Supply
B48	+ 15 Volts	Power	Out	+15 Volt Supply
A49	DAC 0	Analog	Out	DAC output
B49	DAC 2	Analog	Out	DAC output
A50	DAC 1	Analog	Out	DAC output
B50	DAC 3	Analog	Out	DAC output

Note: Software commands determine P4 digital I/O pin functions.

DaqBoard/2005

DaqBoard/2005 is a high-speed, multi-function, plug-and-play data acquisition board for PCI bus computers. It features a 16-bit, 200-kHz A/D converter, digital calibration, bus mastering DMA, 40 digital I/O lines, four counters, and two timers.

Up to 470 channels of analog and digital I/O can be accessed with one DaqBoard/2005. Up to four boards can be installed in one PC.

A 100-pin connector on the DaqBoard/2005 provides access to all of the input and output signals. The DaqBoard/2005 accommodates all I/O with one cable and one PCI bus-slot. The 100-pin I/O connector, P4, is logically divided into three ports:

- **P1 –** Analog input port for16 single-ended or 8 differential analog inputs with 13 software programmable ranges (±10 V to ±156 mV full scale).
- **P2 –** General purpose digital I/O port with 24 lines, or digital I/O expansion port controlling up to 192 external lines.
- **P3 –** 16-bit digital I/O port, counter inputs, and timer outputs.

The on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5 µs or 10 µs per channel.

Bus mastering allows analog and digital/counter input data, as well as analog and digital output data, to flow between the PC and the DaqBoard/2005 without consuming CPU time.

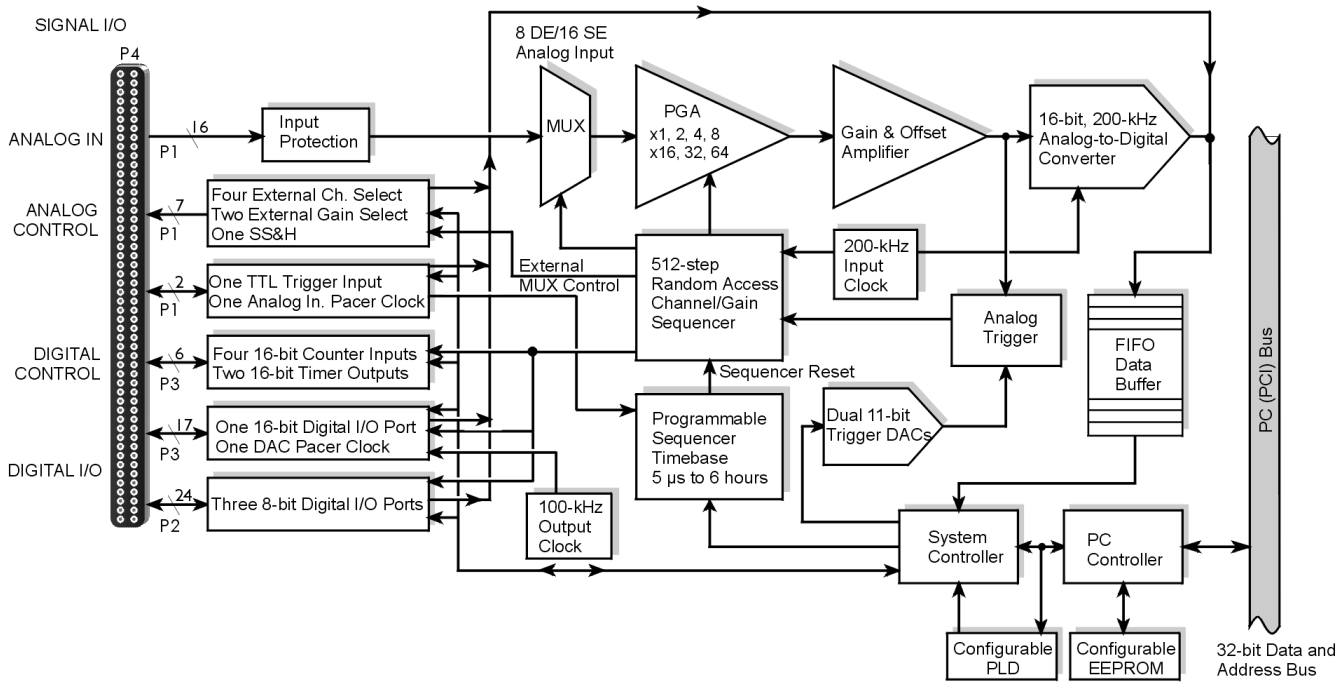
DaqBoard/2005 supports a full complement of trigger modes including:

- **Hardware analog triggering** – A user-programmed trigger level sets an analog DAC, which is compared in hardware to the analog input level on the selected channel. Trigger latency is < 5 µs.
- **Digital and pattern triggering** – The DaqBoard/2005 has a separate digital trigger input line, allowing TTL-level triggering and latencies less than 5 µs. The trigger can be programmed for logic level or edge triggering. In pattern triggering, any of the digital input ports acts as the trigger port. You can program the digital pattern.
- **Software-based triggering** – The PC detects the trigger event from readings, either analog, digital, or counter. Six pre- and post-triggering modes are supported.

Bus Mastering DMA also allows for digital pattern generation on the 16-bit high-speed digital I/O port.

Other features of the DaqBoard/2005 include:

- **40 TTL-level digital I/O lines**. They are divided into three 8-bit ports and one 16-bit port.
- **Four 16-bit counters**. Each can accept frequency inputs up to 10 MHz. The counters can be cascaded into two 32-bit counters.
- **Two 16-bit timer outputs**. Each can generate square waves from 16 Hz to 1 MHz.
- **Configuration through software**. There are no switches or jumpers on the DaqBoard/2005.



DaqBoard/2005 Block Diagram

Connections

Installation

Reference Note: For the DaqBoard/2005 installation procedure, please refer to the *Installation Guide* included at the beginning of this manual.

I/O Connector

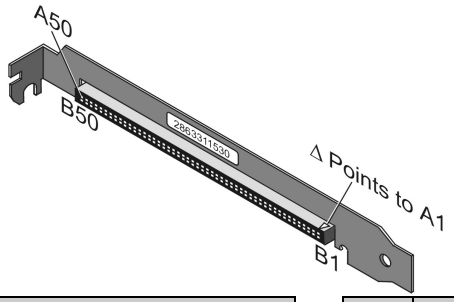
All input and output signals are available at the DaqBoard/2000 Series board's 100-pin P4 connector. A 3-foot, 100-conductor ribbon cable, part number CA-195, mates with connector P4.

There are several P4-connector board options available for connecting the 100 pins of P4 to typical DB37 connectors (P1, P2, and P3). These options, referred to as DBK200 Series, are discussed briefly at the end of this chapter and are detailed in the DBK Cards and Modules chapter, as well as in the documentation that is shipped with each DBK200 Series device.

P4 Pinout

100-pin Signal I/O

For DaqBoard/2005



Pin	Signal	Type	Dir	Description
A1	+5 Volts	Power	Out	+5 Volt supplies
B1	+5 Volts	Power	Out	+5 Volt supplies
A2	Port A 7	Digital	I/O	Port A 7 / P2 exp. D15
B2	A 6			A 6 / P2 exp. D14
A3	A 5			A 5 / P2 exp. D13
B3	A 4			A 4 / P2 exp. D12
A4	A 3			A 3 / P2 exp. D11
B4	A 2			A 2 / P2 exp. D10
A5	A 1			A 1 / P2 exp. D9
B5	A 0			A 0 / P2 exp. D8
A6	Port C 7	Digital	I/O	Port C 7 / P2 exp. D7
B6	C 6			C 6 / P2 exp. D6
A7	C 5			C 5 / P2 exp. D5
B7	C 4			C 4 / P2 exp. D4
A8	C 3			C 3 / P2 exp. D3
B8	C 2			C 2 / P2 exp. D2
A9	C 1			C 1 / P2 exp. D1
B9	C 0			C 0 / P2 exp. D0
A10	GND	Power	I/O	Digital Ground
B10	Port B 7	Digital	I/O	Port B 7 / P2 exp. A0 out.
A11	B 6			B 6 / P2 exp. A1 output
B11	B 5			B 5 / P2 exp. A2 output
A12	B 4			B 4 / P2 exp. A3 output
B12	B 3			B 3 / P2 exp. A4 output
A13	B 2			B 2 / P2 exp. RESET output
B13	B 1			B 1 / P2 exp. WR- output
A14	B 0			B 0 / P2 exp. RD- output
B14	GND	Power	I/O	Digital Ground
A15	14	Digital	I/O	16-bit Digital I/O (for P3)
B15	15			
A16	12			
B16	13			
A17	10			
B17	11			
A18	8			
B18	9			
A19	6			
B19	7			
A20	4			
B20	5			
A21	2			
B21	3			
A22	0			
B22	1			
A23	GND	Power	I/O	Digital Ground
B23	--------	Digital	Out	Reserved – Do Not Use
A24	GND	Power	I/O	Digital Ground
B24	Timer 0	Digital	Out	Timer Output
A25	Timer 1	Digital	Out	Timer Output
B25	GND	Power	I/O	Digital Ground

Pin	Signal	Type	Dir	Description
A26	DAC Pacer	Digital	I/O	Waveform DAC & pattern pacer clock
B26	Acq. Pacer	Digital	I/O	Acquisition pacer clock
A27	TTLTRG	Digital	In	TTL Trigger
B27	GND	Power	I/O	Digital Ground
A28	Counter 3	Digital	In	Counter Input
B28	Counter 2	Digital	In	Counter Input
A29	Counter 1	Digital	In	Counter Input
B29	Counter 0	Digital	In	Counter Input
A30	------	Digital	In	Reserved – Do Not Use
B30	------	Digital	In	Reserved – Do Not Use
A31	AGND	Power	I/O	Analog Ground
B31	Gain 1	Digital	Out	External gain select outputs
A32	Gain 0			
B32	Chan 3	Digital	Out	External channel select outputs
A33	Chan 2			
B33	Chan 1			
A34	Chan 0			
B34	SSH	Digital	Out	Simultaneous-sample-and-hold output
A35	AGND	Power	I/O	Analog Ground
B35	POSREF	Analog	Out	+5 V reference
A36	NEGREF	Analog	Out	-5 V reference
B36	Ain 15	Analog	In	Analog in ch. 15 (SE) / 7–low (DIFF)
A37	Ain 7			Analog in ch. 7 (SE) / 7–high (DIFF)
B37	AGND	Power	I/O	Analog Ground
A38	Ain 14	Analog	In	Analog in ch. 14 (SE) / 6–low (DIFF)
B38	Ain 6			Analog in ch. 6 (SE) / 6–high (DIFF)
A39	AGND	Power	I/O	Analog Ground
B39	Ain 13	Analog	In	Analog in ch. 13 (SE) / 5–low (DIFF)
A40	Ain 5			Analog in ch. 5 (SE) / 5–high (DIFF)
B40	AGND	Power	I/O	Analog Ground
A41	Ain 12	Analog	In	Analog in ch. 12 (SE) / 4–low (DIFF)
B41	Ain 4			Analog in ch. 4 (SE) / 4–high (DIFF)
A42	AGND	Power	I/O	Analog Ground
B42	Ain 11	Analog	In	Analog in ch. 11 (SE) / 3–low (DIFF)
A43	Ain 3			Analog in ch. 3 (SE) / 3–high (DIFF)
B43	AGND	Power	I/O	Analog Ground
A44	Ain 10	Analog	In	Analog in ch. 10 (SE) / 2–low (DIFF)
B44	Ain 2			Analog in ch. 2 (SE) / 2–high (DIFF)
A45	SGND	Analog	I/O	Analog Signal Ground Reference
B45	Ain 9	Analog	In	Analog in ch. 9 (SE) / 1–low (DIFF)
A46	Ain 1			Analog in ch. 1 (SE) / 1–high (DIFF)
B46	AGND	Power	I/O	Analog Ground
A47	Ain 8	Analog	In	Analog in ch. 8 (SE) / 0–low (DIFF)
B47	Ain 0			Analog in ch. 0 (SE) / 0–high (DIFF)
A48	-15 Volts	Power	Out	-15 Volt Supply
B48	+ 15 Volts	Power	Out	+15 Volt Supply
A49	------	Analog	Out	Reserved – Do Not Use
B49	------	Analog	Out	Reserved – Do Not Use
A50	------	Analog	Out	Reserved – Do Not Use
B50	------	Analog	Out	Reserved – Do Not Use

Note: Software commands determine P4 digital I/O pin functions.

DBK200, Series P4 Connector Options

Overview

DaqBoard/2000 Series Boards communicate [external to the host PC] through a 100-pin P4 connector. Typically a DBK200 Series P4-adapter is used to provide one or more DB37 connectors (P1, P2, P3). The DBK200 Series also includes a few panel-mount card options that connect directly to the P4 connector via a cable.

Note: The P1, P2, and P3 connectors discussed in association with the DBK200 Series are subset connectors of the 100-pin P4 connector (found on the DaqBoard/2000 Series boards).

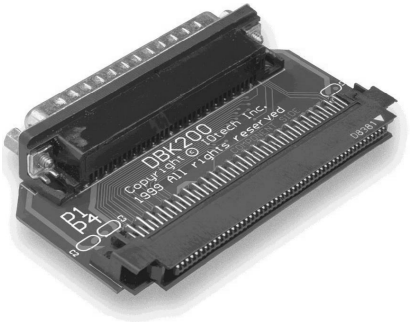
If you are using one of the following options, refer to the DBK200 Series section of the DBK chapter, or to the documentation that is shipped with each DBK200 Series card. If you are not using a DBK200 Series option, refer to the P4 pinout that is applicable to your specific DaqBoard/2000 type; i.e., 2000, 2001, 2002, 2003, 2004, or 2005. The first part of this chapter includes a separate P4 pinout for each of these boards.

As will be seen from the following option descriptions, P1, P2, and P3 DB37 connectors are not found on every DBK200 series adapter option; in fact, DBK205 [shipped with DaqBoard/2003 boards] has no DB37 connector. Instead, DBK205 makes use of a Terminal Block (TB1).

DBK200 is suitable for analog-signal expansion. The adapter does not support Digital I/O or frequency signals.

Includes P1 – for Analog I/O.

Connects to DaqBoard/2000 Series P4 connector via a CA-195 cable.



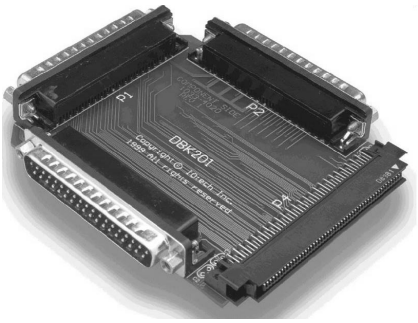
DBK200 Adapter with P1

DBK201 is suitable for both analog and digital expansion.

This adapter includes:

P1 – for Analog I/O
P2 – for Digital I/O
P3 – for Pulse/Frequency/Digital I/O

Connects to DaqBoard/2000 Series P4 connector via a CA-195 cable.



DBK201 Adapter with P1, P2, and P3

Note: Adapter images are not to scale.

DBK202 is a screw-terminal board suitable for both analog and digital expansion. The board includes sockets for custom RC filter setup by the user.

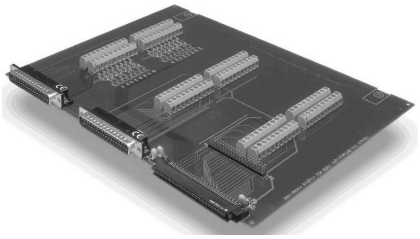
DBK203 consists of a DBK202 housed on a "removable card drawer," within a protective enclosure. The enclosure can be easily mounted to other signal-conditioning or expansion modules.

DBK204 consists of a DBK203 and a CA-209 CE cable kit for meeting CE compliance.

The DBK202, DBK203, and DBK204 options include:

- P1 – for Analog I/O
- P2 – for Digital I/O
- P3 – for Pulse/Frequency/Digital I/O
- TB1 through TB12 (Screw Terminal Blocks for P1, P2, and P3)

Connects to DaqBoard/2000 Series P4 connector via a CA-195 cable.



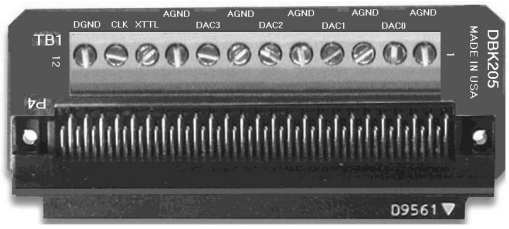
DBK202 – Screw-Terminal Board with DB37 Connectors

DBK203 – Chassis Mounted Screw-Terminal Board with DB37 Connectors

Note: DBK204 consists of a DBK203 and a CA-209 CE Cable Kit.

DBK205 is included with DaqBoard/2003. This adapter option provides screw-terminal access to DaqBoard/2003's four analog outputs (DAC0, DAC1, DAC2, and DAC3). The board includes terminations for 1 Digital Ground (DGND), 1 external clock (CLK), 1 external trigger (XTTL) and 5 analog grounds (AGND).

The board connects directly to DaqBoard/2003 Series P4 connector and screw-locks to the DaqBoard/2003 board's extended ORB.

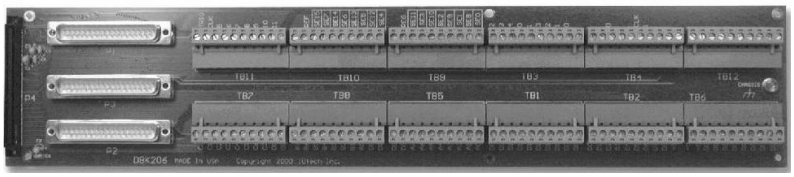


DBK205 Screw-Terminal Board Direct Plug-in to DaqBoard/2003

DBK206 is a screw-terminal board suitable for both analog and digital expansion. It provides three DB37 connectors (P1, P2, and P3) and corresponding terminal blocks.

Note that DBK206, unlike like the DBK202, has no provision for RC filter setup.

Connects to DaqBoard/2000 Series P4 connector via a CA-195 cable.

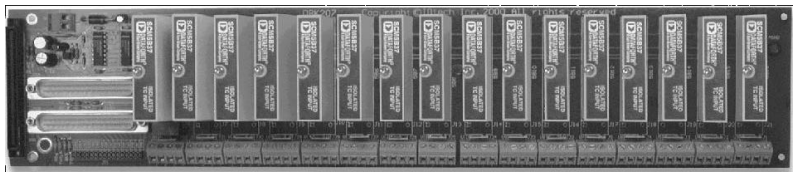


DBK206 Screw-Terminal Board with DB37 Connectors

Note: Adapter images are not to scale.

DBK207 and **DBK207/CJC** are carrier boards for 5B-compatible analog I/O modules. Each DBK207 and DBK207/CJC board includes two P1 connectors for analog expansion, a power connection terminal, and 16 signal terminal blocks. In addition, the DBK207/CJC board includes CJC (Cold Junction Compensation) for thermocouple applications.

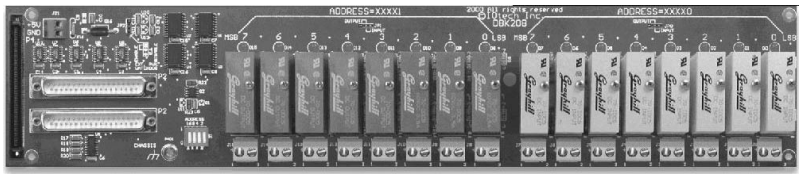
DBK207 and DBK207/CJC can be connected to a DaqBoard/2000 Series board's P4 connector via a CA-195 cable. Other methods are possible. The DBK chapter includes an illustration that depicts a DBK207 in a daisy-chain, within a NEMA panel.



DBK207 Carrier Board for 5B Compatible Analog I/O Modules

DBK208 is a carrier board for Opto-22 compatible solid-state-relay (SSR) digital modules. The DBK208 board includes two P2 connectors for digital expansion, a power connection terminal, and 16 signal terminal blocks.

DBK208 can be connected to a DaqBoard/2000 Series board's P4 connector via a CA-195 cable. Other methods are possible. The DBK chapter includes an illustration that depicts a DBK208 in a daisy-chain, within a NEMA panel.

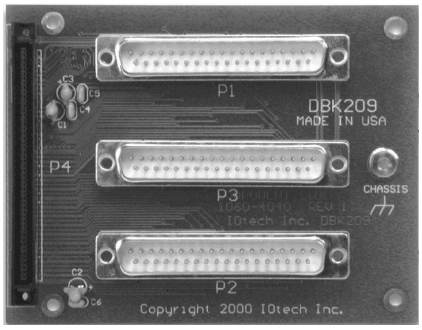


DBK208 Carrier Board for Opto-22 Compatible, Solid-State-Relay Digital Modules

DBK209 is a mini-adapter board suitable for both analog and digital expansion. The board provides three DB37 connectors (P1, P2, and P3).

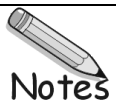
Other than the form factor, DBK209 is identical to DBK201.

DBK209 connects to DaqBoard/2000 Series P4 connector via a CA-195 cable.



DBK209 Mini-adapter Board

Note: Adapter images are not to scale.


Notes

How Daq Products Interrelate 3

DaqView and DASYLab can only be used with one DaqBoard/2000 Series board at a time. LabView can be used with multiple boards.

For multiple board use (via custom programming) refer to the *Programmer's Manual* (1008-0901), chapter 3, *Using Multiple Devices*.
An electronic copy of the Programmer's Manual is included on your install CD.

Overview

Daq equipment and software form a modular, interrelated family of products that provide great flexibility in data acquisition system design. This flexibility allows for the development of custom systems that are unique to the user, and which can be optimized for his or her specific application needs. With the Daq product line, system expansion or redesign can typically be accomplished with relative ease. The following table shows the relation among the three main categories of Daq-related products:

- ***Primary Acquisition Device***. This is the main data acquisition device, e.g., a DaqBook, DaqBoard, or Daq PC-Card. These devices provide a vital data conversion and communications link between the data source of transducers and signal conditioners and the data processor of the host computer.
- ***DBK Option Cards and Modules***. Over 30 DBK cards and modules (the number is constantly growing) provide various types of signal conditioning and system expansion. Note that certain DBK modules exist for the purpose of supplying power to other members of the acquisition system. The DBK options are discussed in a separate chapter that is included [in pdf format] on your installation CD.
- ***Software***. DaqView out-of-the-box software provides a graphical user interface with easy to read spreadsheet formats for viewing channel data, as well as a choice of analog, digital, and bar-graph meters. Waveform analysis can be performed, when applicable. Post data analysis can be performed with the DIAdem program. More information is included in the software-specific chapters (also included on your install CD). Note that, in addition to the included out-of-the-box software, Daq products can be controlled via user-written custom programs through Applications Program Interface (API). Several languages are supported, e.g., C/C++, VisualBASIC, Delphi. See the separate programmer's manual (1008-0901) for program-related information.

Daq Data Acquisition Devices		
Category	**Device**	**Description**
Primary Acquisition Device	DaqBook*	**Portable Data Acquisition Modules** 12-bit: DaqBook/100, /112, /120 16-bit: DaqBook/200, /216, /260
	DaqBoard/2000 Series	**Plug-In Boards for PCI Bus-Slots** 16-bit , 200 kHz. Six boards identified as /2000 through /2005
	DaqBoard (ISA types)*	**Plug-In Boards for ISA Bus-Slots** 12-bit: DaqBoard/100A, /112A 16-bit: DaqBoard/200A, /216A, /2000
	Daq PC-Card*	**Plug-In PCMCI Card** 12-bit: Daq/112B 16-bit: Daq/216B
DBK Option Cards and Modules	Analog Signal Conditioning	**Cards and modules used to condition Analog Signals** DBK/ 4, 7, 8, 9, 12, 13, 15, 17, 18, 19, 42, 43A, 44, 45, 50, 51, 52, 53, 54, 207, 207/CJC
	Analog Output	**Cards used to modify Analog Output Signals** DBK/ 2, 5
	Digital I/O and Control	**Cards and modules used to condition Digital I/O** DBK/ 20, 21, 23, 24, 25, 208
	Expansion Connections	**Cards and modules used to expand the acquisition system.** DBK/ 1, 10, 11A, 35, 40, 41, 60, 200, 201, 202, 203, 204, 205, 206, 209
	Power Supply	DBKs: 30A, 32A, 33, 34; CDK10
Software	Included Software	DaqView, DIAdem-View, Visual Basic extensions, Application Programming Interface (API)
	Optional Software	DaqView/2000, DaqViewXL, DASYLab

* This manual pertains to the DaqBoard/2000 Series Boards and to related DBKs and software. It does not cover DaqBooks, ISA-type DaqBoards, or PC MCIA Cards. For information regarding these other "Daq" devices, please refer to hardcopy or CD version of the Daq User's Manual (457-0901).

Using DBK Cards and Modules for Signal Conditioning

The DBK signal-conditioning units are designed for use with the Daq devices; however, the DBKs can be used with ISA or PCI bus-based data acquisition boards from other vendors. The DBKs perform best when used with an acquisition device that can dynamically select channel, gain, and range. Dynamic channel and gain/range selection allow for high channel-to-channel scan rates with a variety of transducers.

DBK output signals can be bipolar, e.g., -5 to +5 V, or unipolar, e.g., 0 to 10 V. The user can select a range of relevant values to correspond to the lowest signal (e.g., -5 or 0 V) and the highest signal (e.g., 5 or 10 V) signal. This type of range selection guarantees the highest resolution in 12-bit or 16-bit conversion.

DBK modules share the same footprint as the DaqBook and a typical notebook PCs; allowing for convenient stacking. The majority of these modules have their own power supply.

Several options exist for packaging and powering the DBKs and are discussed later in this chapter. The following table lists the DBKs by function. Note that the *DBK Option cards and Modules* chapter describes each DBK in detail.

DBK Option Cards and Modules			
Product	**Name/Description**	**Capacity**	**Signal Connectivity***
Analog Signal Conditioning			
DBK4	Dynamic Signal Input Card	2 channels	P1
DBK7	Frequency-to-Voltage Input Card	4 channels	P1
DBK8	High-Voltage Input Card	8 channels	P1
DBK9	RTD Measurement Card	8 channels	P1
DBK12	Low-Gain Analog Multiplexing Card	16 channels	P1
DBK13	High-Gain Analog Multiplexing Card	16 channels	P1
DBK15	Universal Current/Voltage Input Card	16 channels	P1
DBK16	Strain-Gage Measurement Card	2 channels	P1
DBK17	Simultaneous Sample & Hold Card	4 channels	P1
DBK18	Low-Pass Filter Card	4 channels	P1
DBK19	High-Accuracy Thermocouple Card	14 channels	P1
DBK42	5B Isolated Signal-Conditioning Module	16 channels	P1
DBK43A	Strain-Gage Measurement Module	8 channels	P1
DBK44	5B Isolated Signal-Conditioning Card	2 channels	P1
DBK45	SSH and Low-Pass Filter Card	4 channels	P1
DBK50	Isolated High-Voltage Input Module	8 channels	P1
DBK51	Isolated Low-Voltage Input Module	8 channels	P1
DBK52	Thermocouple Input Module	14 channels	P1
DBK53	Low-Gain Analog Multiplexing Module	16 channels	P1
DBK54	High-Gain Analog Multiplexing Module	16 channels	P1
DBK207	Carrier Board for 5B Compatible Analog Input Modules.	16 channels	Two P1s P4
DBK207/CJC	Carrier Board for 5B Compatible Analog Input Modules. DBK207/CJC includes cold junction compensation (CJC).	16 channels	Two P1s P4
Analog Output			
DBK2	Voltage Output Card	4 channels	P1
DBK5	Current Output Card	4 channels	P1
Digital I/O / Control			
DBK20	General-Purpose Digital I/O Card (Screw Terminals)	48 channels	P2
DBK21	General-Purpose Digital I/O Card (DB37 Connectors)	48 channels	P2
DBK23	Optically Isolated Digital-Input Module	24 channels	P2
DBK24	Optically Isolated Digital-Output Module	24 channels	P2
DBK25	Relay Output Card	8 channels	P2
DBK208	Carrier board for Opto-22 Compatible Solid-State-Relay Digital Modules.	Two 8-bit banks of SSR modules	Two P2s P4
Expansion and Connection			
DBK1	16-Connector BNC Adapter Module	16 connectors	P1
DBK10	3-Slot Expansion Chassis	3 cards	P1, P2, or P3
DBK11A	Screw-Terminal Option Card (DB37-Screw Terminal Block)	Component sockets	P1
DBK40	BNC Interface	18 connectors	P1 or P3
DBK41	Analog Expansion Enclosure	10 cards	P1 or P2
DBK60	Expansion Chassis with Termination Panels	3 cards	P2
DBK200	P4-to-P1 Adapter Board	P1	P4
DBK201	P4-to-P1/P2/P3 Adapter Board	P1, P2, P3	P4
DBK202	P4-to-P1/P2/P3 Adapter Board with Screw-Terminals	P1, P2, P3	P4
DBK203	A module version of DBK202	P1, P2, P3	P4
DBK204	A module version of DBK202 with an included CE cable kit.	P1, P2, P3	P4
DBK205	P4-to-TB1 12-slot Screw Terminal Block for DaqBoard/2003.	TB1, 12-slot	P4
DBK206	P4-to-P1/P2/P3 Adapter Board with Screw-Terminals	P1, P2, P3	P4
DBK209	P4-to-P1/P2/P3 Mini-Adapter Board	P1, P2, P3	P4

P1, P2, and P3 do not exist on the DaqBoard/2000 Series boards, but are obtained by use of the P4 adapters (DBK200 series). These adapters typically connect to the DaqBoard/2000 series 100-pin P4 connector via cable. The DBK200 series boards are detailed in the DBK chapter. Note that the DBK chapter is included on your install CD in pdf format, as a stand-alone document.

Daq Software

DaqView and DASYLab can only be used with one DaqBoard/2000 Series board at a time. LabView can be used with multiple boards.

For multiple board use (via custom programming) refer to the *Programmer's Manual* (1008-0901), chapter 3, *Using Multiple Devices*.
An electronic copy of the Programmer's Manual is included on your install CD.

The Daq devices have software options capable of handling most applications. Three types of software are available:

- ready-to-use graphical programs, e.g., DaqView, DaqViewXL, and DIAdem
- drivers for third-party, icon-driven software such as DASYLab and LabView
- various language drivers to aid custom programming using API

Ready-to-use programs are convenient for fill-in-the-blank applications that do not require programming for basic data acquisition and display:

- DaqView is a Windows-based program for basic set-up and data acquisition. DaqView lets you select desired channels, gains, transducer types (including thermocouples), and a host of other parameters with a click of a PC's mouse. DaqView lets you stream data to disk and display data in numerical or graphical formats. PostView is a post-acquisition waveform-display program within DaqView.
- DaqViewXL allows you to interface directly with Microsoft Excel to enhance data handling and display. Within Excel you have a full-featured Daq control panel and all the data display capabilities of Excel.
- DIAdem-View lets you view, measure and edit your data.
- The Daq Configuration control panel allows for interface configuration, testing, and troubleshooting.

Each Daq system comes with an Application Programming Interface (API). API-language drivers include: C/C++, Delphi, and Visual Basic. The latest software is a 32-bit version API.

Reference Note:
Programming topics are covered in the Programmer's User Manual (1008-0901). A pdf-formatted version of the programmer's manual is included on your installation CD.

Tips on Setting up a Data Acquisition System

Prior to designing or setting up a custom data acquisition system, you should review the following tips. After reviewing the material you can write out the steps you will need to follow to setup a system that will best meet your specific application needs.

1. The end use of the data can affect how you set up and program you acquisition system. Prior to creating the system you should determine channel assignments, and lay out the whole system. If you can answer the following questions you are off to a good start. If not, you need to find the answers.
   - What units, ranges, sampling rates, etc. are best for your data?
   - Will the data be charted graphically, statistically processed, or exported to other programs?
   - How will your data be used?
   - How will the data be saved?
   - What are your system' power requirements? Using several DBKs or transducers that require excitation current may require an extra power supply, e.g., a DBK32A.
2. Assign channel numbers.
3. Plan the location of transducers, cable runs, DBKs, the Daq device, and the computer. Label your transducers, cables, and connectors to prevent later confusion.
4. When configuring your Daq device(s) consider the following:
   - The DaqBook and DaqBoard (ISA type) have internal jumpers and switches that you must set manually to match your application.
   - Some DaqBook models are partially configured in software.
   - Daq PC-Card are configured entirely in software.
   - DaqBoard/2000 Series boards are PCI type boards. They have no jumpers or switches and are configured entirely through software.
   - You may need to refer to other documentation, such as Quick Starts, Installation Guides, and pertinent DBK documentation.
5. Remember to configure all the DBK cards and modules for your application. Several jumpers and DIP switches may need to be set (channel, gain, filters, signal mode, etc).
6. Perform all hardware configurations before connecting signal and power.
7. Route and connect all signal and power cables while all power is turned OFF.
8. To minimize electrical noise, route all signal lines away from any RF or high-voltage devices.
9. Follow your device's specific installation instructions. For certain devices software should be installed first; for others, hardware should be installed prior to software installation.
10. After software is loaded, remember to set the software parameters as needed for your application. The software must recognize all the hardware in the system. Measurement units and ranges should be checked to verify that they meet your application requirements.
11. Remember to set all channels to the proper mode for your DBK or other signal source.
12. After your system is up and running, verify proper data acquisition and data storage.
13. Verify system accuracy; adjust ranges or calibrate as needed.

Device specific information regarding system setup and expansion can be found in the Daq hardware chapters and in the DBK chapter. You may need to read the DBK10/41/60 sections for system expansion and the DBK30A/32A/33 and the CDK10 sections for power management.

Since DBK modules are controlled by the Daq sequencer, external channels can be scanned at the same high speed as internal channels. Each main (base) channel can support up to 16 sub-channels and thereby provide expansion up to 256 input channels. DBK cards and modules can be daisy-chained off the P1 connector of the Daq or expansion module. DBKs add another level of multiplexing and programmable gain to each channel. Setting up channel parameters often requires both hardware and software setup.

Modules for packaging DBK expansion cards are available with 3 slots (DBK10) or 10 slots (DBK41)—some DaqBooks also have expansion slots. The best option depends on the number of DBK cards in your system. For just a few cards, use the stackable 3-slot DBK10 low-profile expansion enclosure. For more than six cards, use the 10-slot DBK41. Multiple DBK41s can be daisy-chained to handle a large number of DBKs in a system. For termination panel connections, use the DBK60 expansion chassis or DaqBook/260, which is a combination of the DaqBook/200 and DBK60.

Additional power supplies (essential with the Daq PC-Card) may be needed to handle the load. The DBK power options accommodate a wide range of applications from laboratory to automotive and other field applications. The power systems can use any 10 to 20 VDC source or an AC source with the included adapter. For portable applications, the compact DBK30A rechargeable power supply can provide power to the DBK10 or DBK41. The DBK30A also includes a 28 V output for powering 4 to 20 mA transducers. For applications with many DBK cards (initially or in future expansion), the DBK32A or DBK33 can be installed into any expansion slot. The DBK32A provides ±15 VDC and the DBK33 provides ±15 VDC *and* +5 VDC.