DaqBook/2000 Series

16-Bit, 200 kHz Multifunction Data Acquisition Systems

A User's Manual for:

DaqBook/2000A
DaqBook/2000E
DaqBook/2000X

the smart approach to instrumentation ™

DaqBook/2000 Series
User's Manual

16-Bit, 200 kHz Multifunction
Data Acquisition Systems

p/n **1103-0901** Rev. **2.0**

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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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.

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.

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.**

Note: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. Initial navigation is as follows:

> **Start** [Desktop "Start" pull-down menu]
> ⇒ **Programs**
> ⇒ **IOtech DaqX Software**

You can also access the PDF documents directly from the data acquisition CD by using the <**View PDFs**> button located on the opening screen.

Refer to the PDF documentation for details regarding both hardware and software.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

PDF
1103-0901

DaqBook2000 Series Users Manual.pdf
Contains the DaqBook/2000 Series hardware-related and software-related chapters, as well as links to the .pdf files listed below. This pdf file, plus the following constitute a complete set of documentation for the DaqBook/2000 Series Devices.

PDF
457-0909

DaqView_DaqViewXL.pdf
Discusses how to install and use these "out-of-the-box" data acquisition programs.

PDF
1086-0926
1086-0922

PostAcquisition Analysis.pdf
This pdf consists of two documents. The first discusses *eZ-PostView*, a post data acquisition analysis program. The application is included free as a part of product support. The second includes information regarding *eZ-FrequencyView* and *eZ-TimeView*. These two applications have more features than does *eZ-PostView* and are available for purchase. They can; however, be used freely during a 30-day trial period.

DBK Options.pdf

The *DBK Option Cards and Modules User's Manual* discusses each DBK product. In addition, the document includes chapters on signal management, system connections, pinouts, DBK set up in software, and troubleshooting.

PDF
457-0905

ProgrammersManual.pdf

The Programmer's Manual pertains to developing custom programs using Applications Program Interface (API) commands.

PDF
1008-0901

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

Manual Layout

Note: For benefit of those who have not yet installed their DaqBook/2000 Series Device, this manual begins with a copy of the installation guide that is shipped with each unit. The guide is immediately followed by pinouts.

DaqBook/2000 Series Installation Guide (p/n 1103-0940). Discusses how to install software, connect hardware, and test the system.

System Connections and Pinouts (A Document Module) - Provides pinouts of P1, P2, P3, and P4. The document module also includes an overview of several DBK200 Series adapters that can be used for system expansion from a DaqBook/2000 Series device P4 connector.

Chapter 1 – *Operational Overview*. This chapter briefly discusses the modular concept of "Daq" systems and includes a DaqBook/2000 Series block diagram, information regarding scanning, triggering, synchronous and asynchronous I/O operations, and the use of DBK cards and modules for signal conditioning. The chapter includes material regarding the DBK46 card option, which provides the host unit with four Digital-to-Analog Converters (DACs).

DBK Basics (A Document Module) **-** discusses option cards and modules (DBKs) that can be used to enhance and expand data acquisition systems.

Chapter 2 – *DBK46 Reference* Discusses optional 4-channel analog output card that can be used to provide a DaqBook/2000 Series model with four DAC channels.

Chapter 3 - *CE Compliance* pertains to CE standards and conditions that are relevant to DaqBook/2000 Series Systems. *CA-209D CE Cable Kit Instructions* (p/n 1103-0902) are included at the end of the chapter.

Chapter 4 - *Calibration* lists the order in which to perform adjustments and briefly discusses *DaqCal.exe,* a program that provides on-screen instruction, graphics, and prompts.

Chapter 5 – *Specifications*

Chapter 6 – *Fuse Replacement*

Chapter 7 – *Troubleshooting and Customer Support*

Dimensional Drawings

Glossary

Reference Note:
Reference to additional documents, of importance to the DaqBook/2000 Series, begins on the preceding page.

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DaqBook/2000 Series

Installation Guide

For DaqBook/2000A, /2000E, /2000X

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**DaqBook/2000 Series
Installation Guide**

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Data Acquisition Systems*

p/n **1103-0940** Rev. **2.0**

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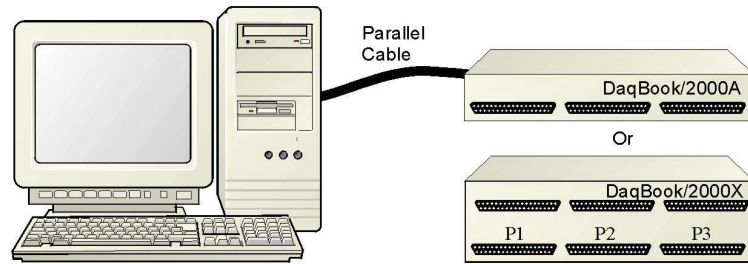
Connecting a DaqBook/2000E, or WaveBook/516E to the Ethernet   [Section B]
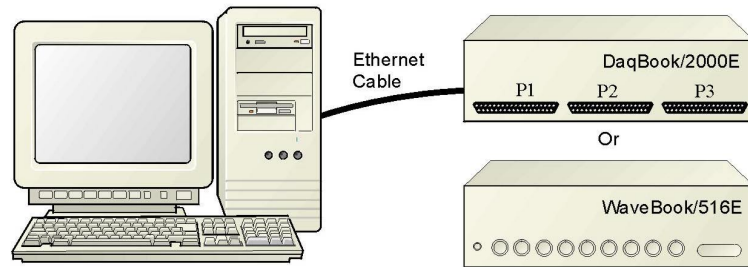
Connecting a DaqBook/2000A or DaqBook/2000X to a DaqBook/2000E   [Section C]

Appendix D – Device Connector Reference

Appendix E – System Expansion

Appendix F – Adding a Parallel Port to the PC

Appendix G – Resource and Performance Tests

A Comparison of Device Features

DaqBook/2000A	DaqBook/2000X	DaqBook/2000E

Feature	Description	Applies to:
ADC 16	**Analog Input Channels** Analog Input signals enter through P1 and/or P4, go to MUX, to PGA, to Gain & Offset Amplifier, then to Analog-to-Digital Converter (ADC).	All Models
DAC 4 (with DBK46)	**Analog Output Channels [Available only with DBK46 Option]** Digital Signals go through Digital-to-Analog Converters via the optional DBK46 plug-in card, then through "DAC Out" on P3 and P4. The card includes a 256K Sample Buffer. Note that the DBK46 option is a "Factory Install" Option Only.	Each model, providing a DBK46 is installed.
Digital I/O 40	**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 P2, P3, and/or P4.	All Models
Counter/ Timers 6	**Counter/Timers** Four 16-bit Counter Input signals and Two 16-bit Timer Output signals via P3 and/or P4 and System Controller.	All Models
10/100BaseT Ethernet	**10/100BaseT Ethernet Interface located on the chassis** The DaqBook/2000E includes a 10/100BaseT Ethernet interface. Note that DaqBook/2000A and DaqBook/2000X can connect to the DaqBook/2000E, or to a WBK25 Ethernet module.	/2000E
3 Card Exp.	**3 Card Expansion** The DaqBook/2000X includes three expansion slots that can accept a wide variety of analog and digital DBK signal conditioning cards.	/2000X

DaqBook/2000 Series Devices are high-speed, multi-function, data acquisition systems for use with notebook and desktop PCs. They feature a 16-bit, 200-kHz A/D converter, digital calibration, 40 digital I/O lines, four counters, and two timers and, *if the optional DBK46 card is installed*, four 16-bit, 100-kHz D/A converters

Up to 470 channels of analog and digital I/O can be accessed with one DaqBook/2000 Series Device.

All input and output signals can be connected via the three 37-pin DSUB connectors [P1, P2, and P3] located on the front panel. Duplicate I/O connectivity is also available on the rear panel via the 100-pin, P4 connector.

- **P1 –** Analog input port for 16 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.

- **P4 –** this 100-pin connector allows for optional connection to a DBK200 Series Device for expansion from the rear panel. P4 connectivity provides no additional I/O to that which is available to P1, P2, and P3.

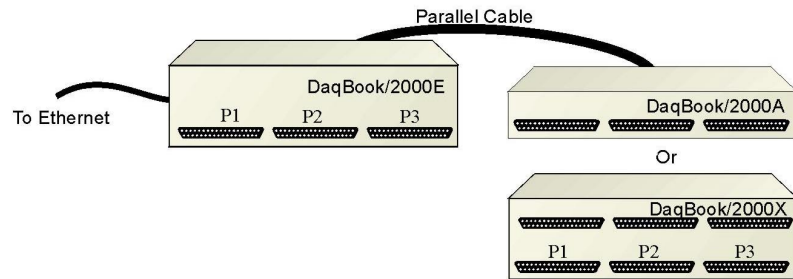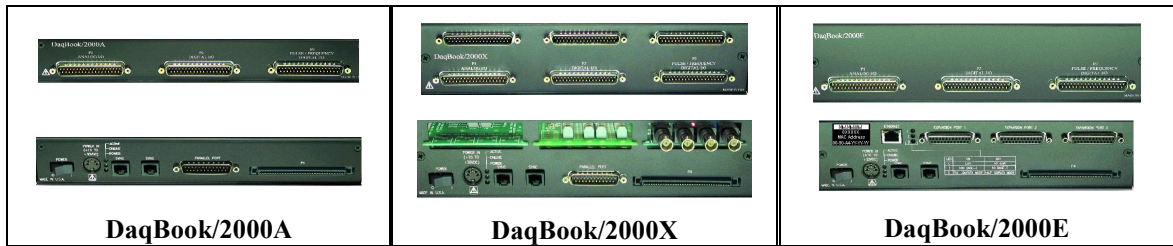# Section A

Connecting a DaqBook/2000A or a DaqBook/2000X to a PC Parallel Port.
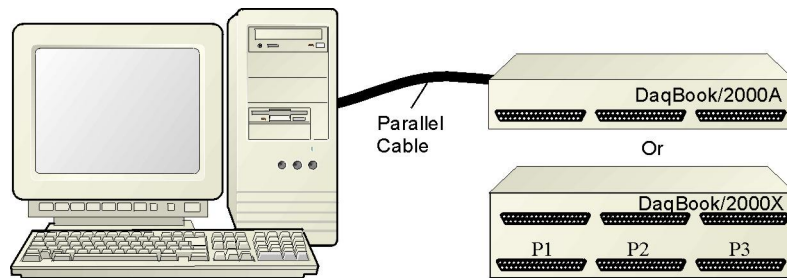
Connecting a DaqBook/2000A or a DaqBook/2000X to a PC Parallel Port

CAUTION
Turn off power to the system devices and externally connected equipment before connecting cables. Electric shock or damage to equipment can result even under low-voltage conditions.
Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)

Reference Note: Adobe PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. You can also access documents directly from the data acquisition CD via the <View PDFs> button located on the CD's opening screen.

Refer to the PDF documentation for details regarding both hardware and software. Note that hardcopy versions of the manuals can be ordered from the factory.

Minimum System Requirements

PC system with Pentium® Processor

Windows Operating System

RAM, as follows:
 32 Mbytes of RAM for Windows 95/98/NT
 64 Mbytes of RAM for Windows Me
 64 Mbytes of RAM for Windows 2000
 64 Mbytes of RAM for Windows XP

STEP A.1 –   Install the Software

1. Remove previous version Daq drivers, if present. You can do this through the Windows *Add/Remove Programs* feature.

2. Place the Data Acquisition CD into the CD-ROM drive. Wait for PC to auto-run the CD. This may take a few moments, depending on your PC. If the CD does not auto-run, use the Desktop's *Start/Run/Browse* feature to locate and run the CD's **setup.exe** file.

3. After the intro-screen appears, follow the screen prompts.

STEP A.2 – Connect the DaqBook/2000A or DaqBook/2000X to a Parallel Port

<u>**What you will need**</u>:

- A computer with an available parallel port. If your PC has no parallel port available, refer to *Appendix F, Adding a Parallel Port to the PC.*

- One parallel port cable, e.g. a CA-35-2 (2-foot) or a CA-35-12 (1-foot) cable.
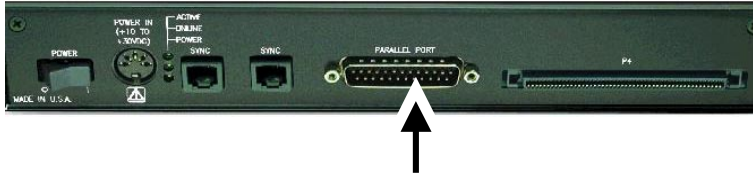
DB25 Parallel Port Connector

<u>**How to make the connection:**</u>

1. Connect the parallel port cable to the parallel port connector on the rear panel of the DaqBook/2000A or DaqBook/2000X.

2. Connect the other end of the cable to the parallel port connector on the PC.

STEP A.3 – Connect the System to Power

<u>**What you will need**</u>:

A power supply with a range of +10 VDC to +30 VDC.
The power supply needs to have a male DIN5 connector.

> **Note**: The switching-mode power supply that is commonly used with DaqBook/2000 Series systems has an input range of 100 VAC to 240 VAC at 50 Hz to 60 Hz. The power supply's output [to the DaqBook/2000 Series device] is 15 VDC @ 2.7 amps via a DIN5 connector.

> **Note**: Various AC adapter models support power grids of USA, Europe, Japan, and Asia.

> **Reference Note:** It is possible to use a VDC power source other than the commonly used switching-mode power supply, often referred to as an adapter. However, you should consult the *Power Management Section* of your *DaqBook/2000 Series User's Manual* (p/n 1103-0901) before doing so.

DIN5 POWER IN Connector (+10 to +30 VDC)

<u>How to make the connection:</u>

1. Place the DaqBook/2000 Series device power switch in the "OFF" (0) position, if it is not already OFF.

2. Connect the DIN5 end of the adapter's cable to the power in connector on the DaqBook/2000 Series device (see the preceding figure).

   If using a power source other than the adapter, consult the *Power Management Section* of your DaqBook/2000 Series User's Manual (p/n 1103-0901) before doing so.

3. Connect the adapter's plug to a standard AC outlet.

4. If your adapter has a power switch, position it to "ON."

5. Turn ON the DaqBook/2000 Series device's power by placing the power switch to the "1" position. The power led will light up.

STEP A.4 – Configure and Test the Hardware

1. Run the **Daq*Configuration** control panel applet. The applet can be accessed by navigating from the Windows' Desktop as follows:
   Start ⇒ Settings ⇒ Control Panel ⇒ Daq* Configuration

2. Select the "Computer" image in the Device Inventory configuration tree (see figure).

3. Click the <**Add Device>** button. The "Select Device Type" box will appear.
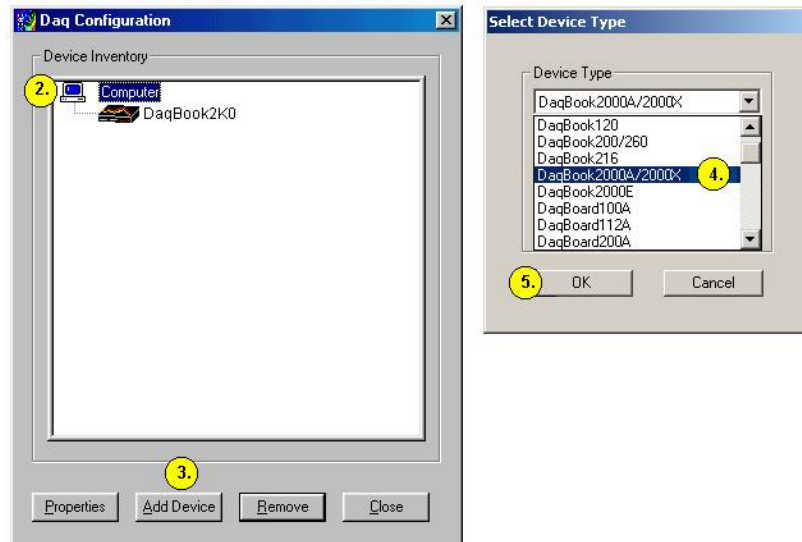
4. Select "DaqBook2000A/2000X" from the "Device Type" scroll-down.
   Note that the default name that appears in the Device Inventory configuration tree, e.g., "DaqBook2K0" can be renamed.

5. Click the <**OK>** button. The "Properties" box will appear for the selected device.

6. Ensure settings are correct, and make changes if needed. Refer to the following table for throughput speeds.

Support for Parallel Port Communication Protocols				
Protocol	Device Type, Applicability to			Estimated Throughput (Note 2)
	WaveBooks	DaqBook/2000 Series	LogBooks	
4 bit	Yes	Yes	No	40 to 50 Ks/sec
8 bit	Yes	Yes	No	80 to 100 Ks/sec
SMC666 EPP	Yes	Yes	No	350 to 370 Ks/sec
Fast EPP (WBK20)	Yes	Yes (Note 1)	No	500 Ks/sec
Fast EPP (WBK21)	Yes	Yes	No	1.2 / Ms/sec
Fast EPP (WBK23)	Yes	Yes	No	500 Ks/sec
ECP	Yes	Yes	Yes	350 to 400 Ks/sec

Note 1: No Windows NT support.
Note 2: The values of expected throughput are estimates only. Actual thru-put may vary due to the specific parallel port capabilities and BIOS settings of the computer involved.

7. Select the "Test Hardware" tab.

8. Verify that the DaqBook/2000 Series device has been properly installed and powered-on. Proper installation includes the parallel port cable being firmly in place on both the DaqBook/2000 Series device and on the host PC's parallel port.

9. Click the <**Resource Test>** button.

   Appendix G, Resource and Performance Test, includes a brief explanation of the test.

10. Click the <**Test>** button.

> **Testing the DaqBook/2000 Series device may, in some cases, cause the system to hang. If test results are not displayed in 30 seconds or the system does not seem to be responding, reboot the system. Upon power-up, re-enter the Daq Configuration and change the DaqBook/2000 Series device configuration settings to those that work properly.**

This completes the instructions for connecting a DaqBook/2000A or a DaqBook/2000X to a PC parallel port. At this point you should refer to the *DaqBook/2000 Series User's Manual* (p/n 1103-0901) for additional system information. You can access the document directly from the opening screen of the data acquisition CD via the <**View PDFs**> button. The user manual includes pinouts, information on system expansion, data acquisition, and links to software and programming documents (in PDF format).

Section B

Connecting a DaqBook/2000E or WaveBook/516E to the Ethernet
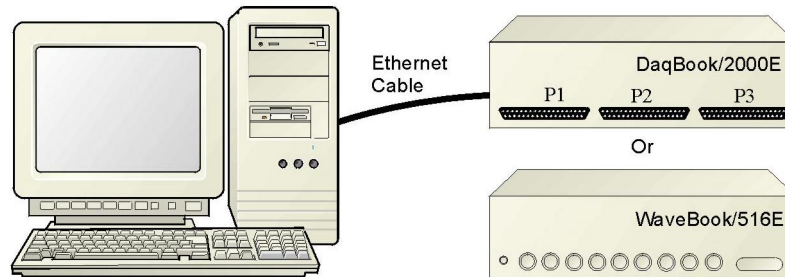
Connecting a DaqBook/2000E or WaveBook/516E to the Ethernet

Introduction

The DaqBook/2000E and WaveBook/516E connect directly to an Ethernet port on a PC or network hub via the their built-in 10/100BaseT Ethernet interface. An Ethernet patch cable CA-242 (1.5 foot) or CA-242-7 (7 foot) cable is used to make the connection.

Contact the factory or your service representative in regard to Ethernet connectivity if your operating system is other than Windows NT, Windows 2000, or Windows XP.

DaqBook/2000E
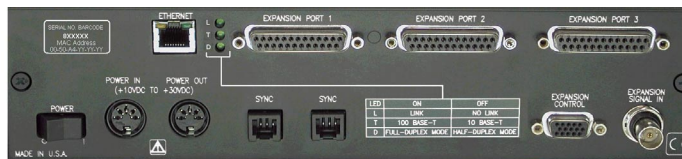
WaveBook/516E

The DaqBook/2000E and WaveBook/516E can be used as Ethernet interface devices for sister products that are not capable of direct Ethernet connection.

CAUTION

⚠️ **Turn off power to the system devices and externally connected equipment before connecting cables. Electric shock or damage to equipment can result even under low-voltage conditions.**

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

Reference Note: Adobe PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. You can also access documents directly from the data acquisition CD via the <View PDFs> button located on the CD's opening screen.

Refer to the PDF documentation for details regarding both hardware and software. Note that hardcopy versions of the manuals can be ordered from the factory.

Minimum System Requirements
PC system with Pentium® Processor
Windows Operating System
RAM, as follows:
  32 Mbytes of RAM for Windows 95/98/NT
  64 Mbytes of RAM for Windows Me
  64 Mbytes of RAM for Windows 2000
  64 Mbytes of RAM for Windows XP

STEP B.1 – Install the Software

1. Remove previous version Daq drivers, if present. You can do this through Microsoft's *Add/Remove Programs* feature.

2. Place the Data Acquisition CD into the CD-ROM drive. Wait for PC to auto-run the CD. This may take a few moments, depending on your PC. If the CD does not auto-run, use the Desktop's *Start/Run/Browse* feature.

3. After the intro-screen appears, follow the screen prompts.

STEP B.2 – Determine the type of Network Connection

To properly connect and configure a DaqBook/2000E or a WaveBook/516E, you must determine the type of network that the device will become part of. This is because the type of network used has a direct bearing on the IP address of the device.

Briefly, the four network types are as follows:

- **Dedicated Network - with a direct cable connection from the PC to the device**
- **Dedicated Network - making use of a network hub or switch**
- **LAN with a DHCP Server**
      (Local Area Network with a Dynamic Host Configuration Protocol)
- **LAN with no DHCP Server**
      (Local Area Network with no Dynamic Host Configuration Protocol)

Brief descriptions and illustrations follow.

Dedicated Network - with a direct cable connection from the PC to the device

In this scenario a DaqBook/2000E or a WaveBook/516E is connected directly to an Ethernet jack on a host computer.
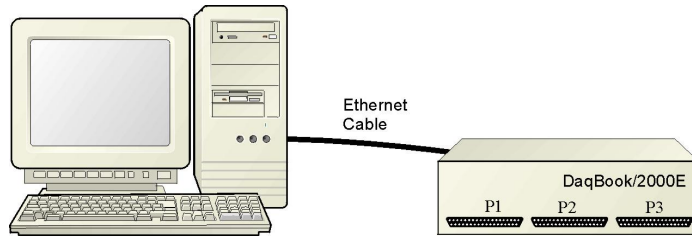
Dedicated Network using a Direct Cable Connection

Dedicated Network - making use of a network hub or switch

In this scenario the DaqBook/2000E or WaveBook/516E connects to the Ethernet through a network hub or switch. At least one computer is also connected to the hub.
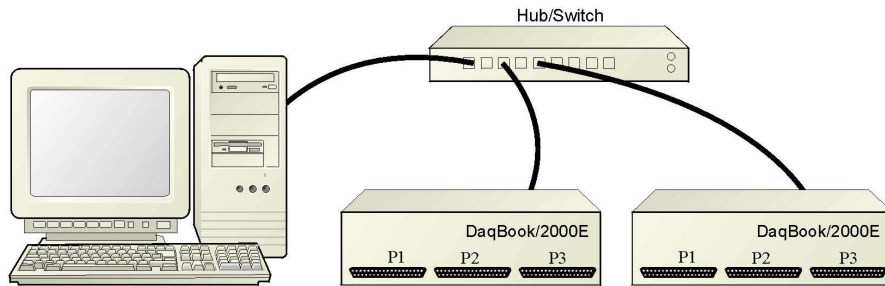
Dedicated Network using a Hub/Switch

> **Note!** Some network devices such as a *wireless access point* may act as a DHCP server. If this is the case, follow the instructions for the LAN with DHCP server. For detailed information consult the documentation that is specific to your network device.

LAN with a DHCP Server   (Local Area Network with a Dynamic Host Configuration Protocol)

Many corporations use the LAN/Server with DHCP arrangement for their networks. In this type of setup several computers are typically connected to a network that makes use of a DHCP server. In addition, a DaqBook/2000E or WaveBook/516E is connected to the network hub/switch.
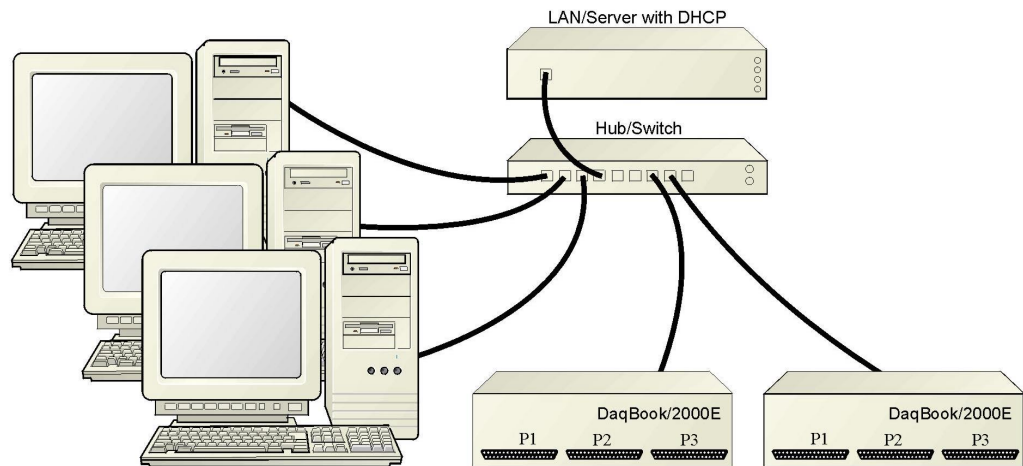
LAN with a DHCP Server

Notes:

➢ Using a DaqBook/2000E or WaveBook/516E on a typical LAN may affect the speed of the network and internet data transfer. Because of this we recommend adding a network card to the computer and using one of the two dedicated network configurations.

➢ Contact your network administrator before connecting a DaqBook/2000E or a WaveBook/516E to a corporate network.

LAN with no DHCP Server [Currently Not Supported]

(Local Area Network with no Dynamic Host Configuration Protocol)

This scenario looks the same as that shown in the previous illustration, except there is no Dynamic Host Configuration Protocol (DHCP). In this type of setup, one or more computers are connected to a network; and each computer has a static IP address. This configuration is currently not supported. We recommend adding a network card to the computer and using one of the two dedicated network configurations.

STEP B.3 – Connect the System Components

Reference Note:
For examples of system connections, including cable use, refer to the following documents, as applicable:

➢ For DaqBook/2000 Series systems refer to *Appendix E - System Expansion* in the installation guide (p/n 1103-0940).

➢ For WaveBook systems refer to the *System Enhancement and Expansion* section of the *WaveBook User's Manual* (p/n 489-0901).

What you will need to connect a DaqBook/2000E or a WaveBook/516E to the Ethernet:

- An available connection to the Ethernet. The connection can be either
  - an Ethernet jack on a computer or
  - an Ethernet jack on a hub that is connected to the Ethernet.

- An Ethernet patch cable, e.g., a CA-242 (1.5 foot cable) or a CA-242-7 (7-foot cable).

1. Connect the Ethernet cable to the Ethernet jack on the DaqBook/2000E or WaveBook/516E.

2. Connect the other end of the Ethernet cable to the Ethernet jack on the host computer or network hub.

STEP B.4 – Power-up the System Components

What you will need:

- A power supply with a range of +10 VDC to +30 VDC.
  The power supply needs to have a male DIN5 connector.

  Note: The switching-mode power supply that is commonly used with these systems has an input range of 100 VAC to 240 VAC at 50 Hz to 60 Hz. The power supply's output [to the device] is typically 15 VDC @ 2.7 amps via a DIN5 connector.

  Note: Various AC adapter models support power grids of USA, Europe, Japan, and Asia.

  Reference Note: It is possible to use a VDC power source other than the commonly used switching-mode power supply, often referred to as an adapter. However, you should consult the *Power Management Section* of your *DaqBook/2000 Series User's Manual* (p/n 1103-0901) before doing so.

How to make the connection:

1. Using the unit's power switch, turn the DaqBook/2000E or WaveBook/516E "OFF.
   The switch will be in the "0" position and the power LED will be unlit.

2. Connect the DIN5 end of the adapter's cable to the power in connector on the DaqBook/2000E or WaveBook/516E.

   If using a power source other than the adapter, consult the *Power Management Section* of your user's manual prior to doing so.

3. Connect the adapter's plug to a standard AC outlet.

4. If your adapter has a power switch, position it to "ON."

5. Turn ON the DaqBook/2000E or the WaveBook/516E by placing the power switch to the "1" position. The power led will light up.

Reference Note:
The power management and power requirements sections of the associated user's manual should be reviewed prior to powering up a system.

➢ For DaqBook/2000 Series systems refer the *DaqBook/2000 Series User's Manual* (p/n 1103-0901).

➢ For WaveBook systems refer to the *WaveBook User's Manual* (p/n 489-0901).

The PDF versions of these documents can be accessed from the data acquisition CD via the <**View PDFs**> button on the CD's opening screen.

STEP B.5 - Configure the Computer's Network Settings [Applies to "dedicated networks" only]

If using a LAN (Local Area Network), skip this section and continue with *Configure and Test the System using the Daq*Configuration Applet* **(page B-9).**

1. Open the Control Panel by navigating from the Windows Desktop as follows:
    Start Menu ⇒ Settings ⇒ Control Panel.

2. Double-click the "Network and Dial-up Connections" icon.

3. Double-click the "Network Connection" icon for the network that the DaqBook/2000E or the WaveBook/516E is connected to.
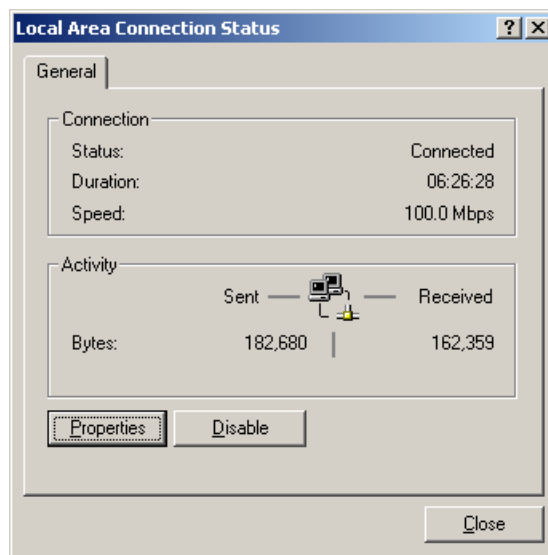
Local Area Connection Status

4. In the "Local Area Connection Status" box (previous figure), click on the <**Properties**> button. The "Local Area Connection Properties" box will appear (following figure).
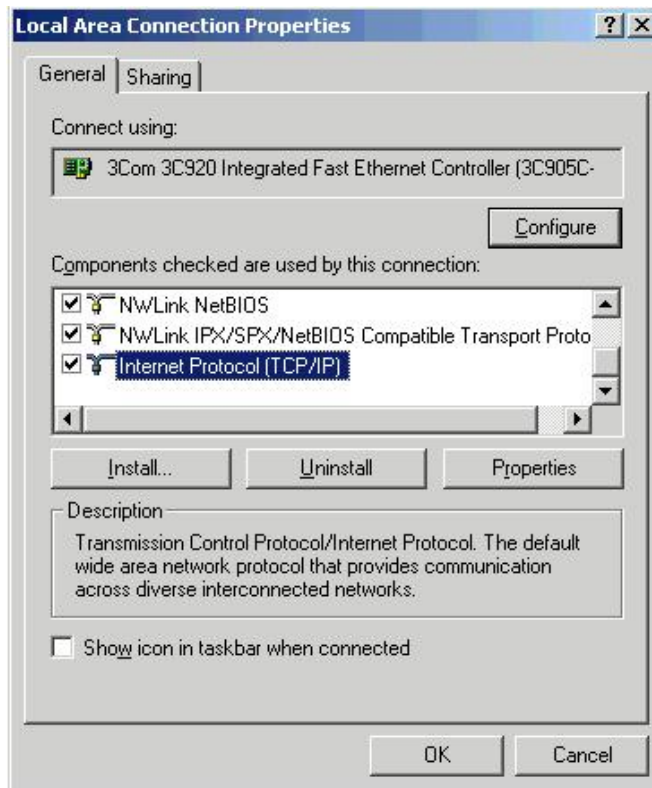
Local Area Connection Properties

5. Double-click the "Internet Protocol (TCP/IP)" component (previous figure). The "Internet Protocol (TCP/IP) Properties" box will appear (following figure).
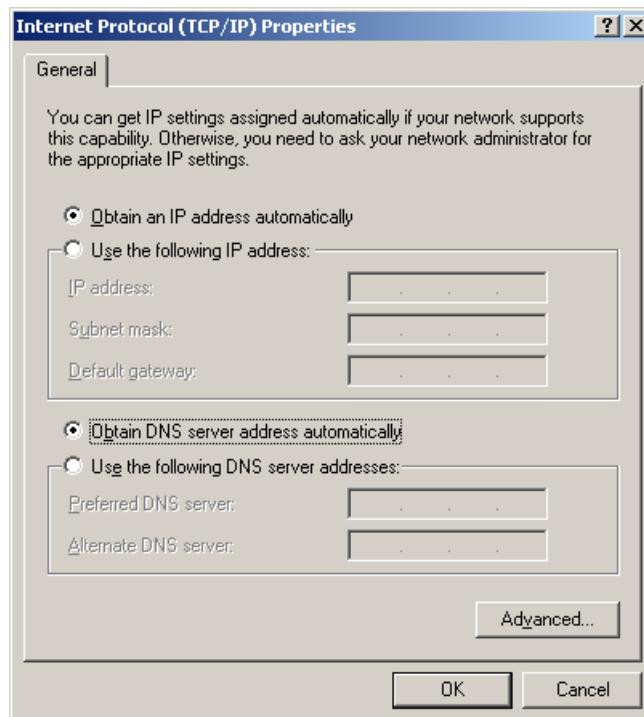
Internet Protocol (TCP/IP) Properties

Configure the Computer's TCP/IP settings as follows.
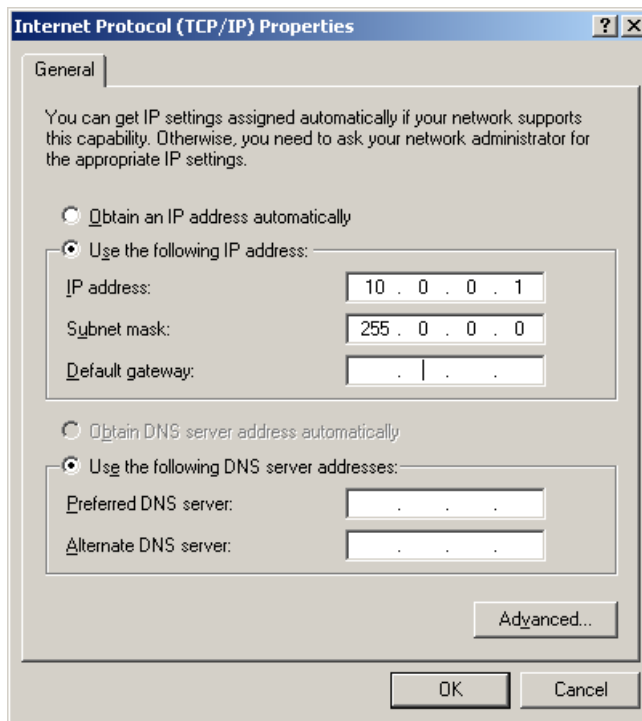
Internet Protocol (TCP/IP) Properties

6. Select the "Use the following IP Address" radio button.

7. Set the IP address field to 10.0.0.x where x is some number from 1 to 255.
    Make sure that each computer on the dedicated network has a unique IP address.

8. Set the Subnet mask to 255.0.0.0. Note that the remaining fields can be left unchanged.

The *Daq* Configuration* applet, designed for 32-bit Windows 95/98/Me/NT/2000/XP systems, is located in the Windows *Control Panel*. It allows you to add or remove a device and change configuration settings. The included test utility provides feedback on the validity of current configuration settings, as well as performance summaries.

1. Open the Daq* Configuration Applet.

    a.   Open the Control Panel by navigating from the Windows' Desktop as follows:
        Start Menu ⇒ Settings ⇒ Control Panel

    b.   From the Control Panel, double-click the ***Daq* Configuration*** icon.

2. Add the first-level device to the list of installed devices.

The first-level device is the device that will be connected directly to the Ethernet, via a host computer's Ethernet jack or a jack on a network hub. The DaqBook/2000E and WaveBook/516E are each examples of first-level devices.

    a.   Select the Computer image in the Device Inventory configuration tree (following figure).

    b.   Click the <**Add Device**> button. The "Select Device Type" box will appear.

    c.   Select the DaqBook2000E or the WaveBook516E from the list of devices, as applicable.

    d.   Click the <**OK**> button. The "Properties" box will appear for the selected device.
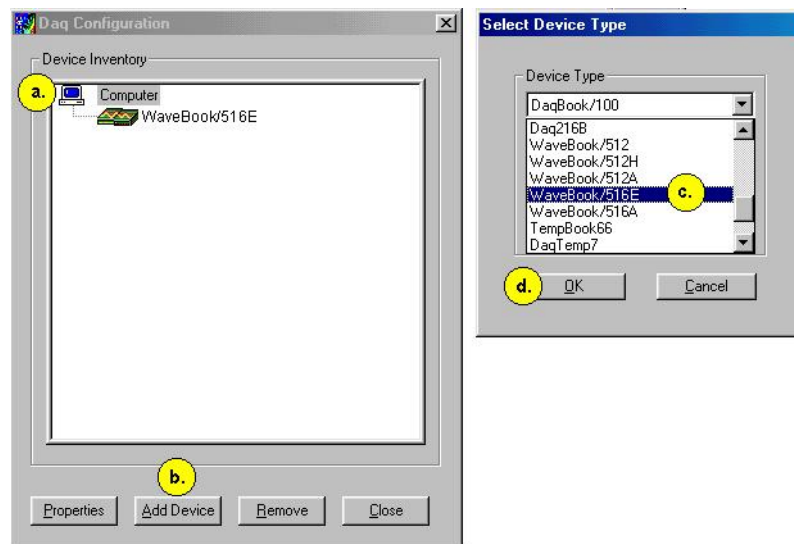
Using Daq* Configuration Device Inventory & Select Device Type to Add a Device

Note: Although the above figure indicates that a WaveBook/516E was selected as the first level device, we could similarly have a DaqBook/2000E as the first-level device.

3. Set the properties of the first-level device.

In this step you will set the device properties according to one of the following two methods, depending on whether you have a "Dedicated Network" or a "LAN with DHCP Server Network." Illustrations of the network types are provided on page B-3.

Users of <u>Dedicated Networks</u>, follow these 2 steps.
See following figure, left-hand image.

     a. In the "Properties" box, enter the serial number of the first-level device (DaqBook/2000E, or WaveBook/516E).

     b. Select the Auto IP Setting Radio button. Note that the IP address of the DaqBook/2000E, or the WaveBook/516E will automatically be calculated and displayed in the IP Address field.
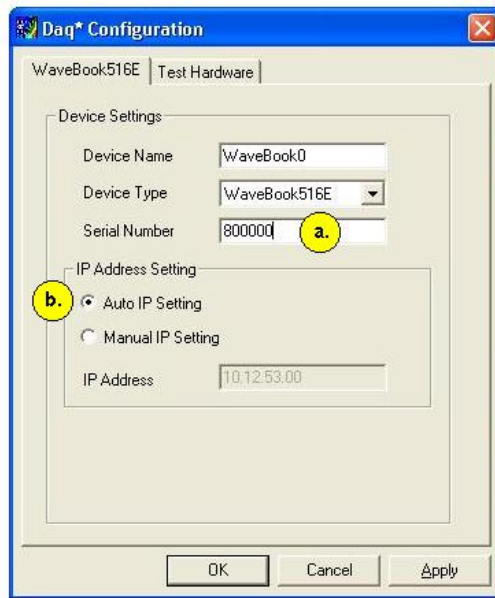
     For DEDICATED Networks   **For LAN with DHCP Server Networks**
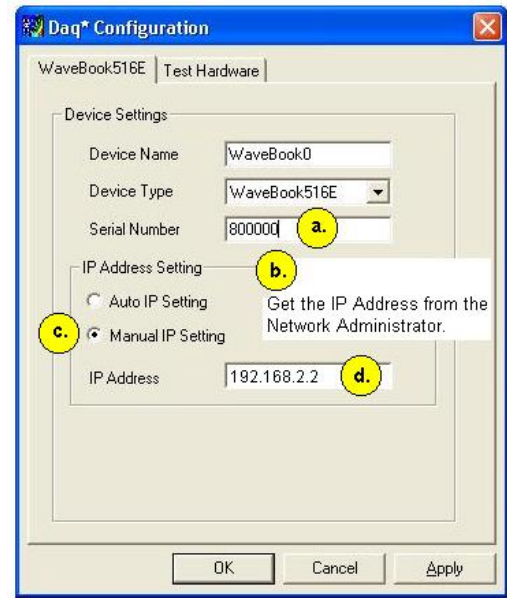
Daq* Configuration, Properties Dialog Boxes

Note: Although the above images are based on WaveBook/516E, we could similarly have a DaqBook/2000E selected in the *Properties Dialog Box*.

Users of <u>LAN with DHCP Server Networks</u>, follow these 4 steps.
See preceding figure, right-hand image.

     a. Enter the base 10 version of the serial number of the DaqBook/2000E or WaveBook/516E, as applicable. The number is located on the MAC label. The label is located on the left edge of the rear panel.

     b. Get the IP address of the device from your network administrator. The network administrator will need the unit powered-on and connected to the network. The administrator will also need the MAC address label's hexadecimal number (the label's bottom number).

     c. Select the "Manual IP Setting" radio button.

     d. In the IP Address field, enter the IP address obtained from your network administrator.

4. Test the system connections.

    a.   Make sure the device has been properly installed and is powered-on.

    b.   Make sure all cables are properly and securely connected.

    c.   Click the "Test Hardware" tab.

    d.   Click the <**Resource Test**> button.

The test results have two components: *Resource Tests* and *Performance Tests*. *Appendix G, Resource and Performance Tests*, includes a brief explanation of the tests.

When testing a WaveBook or DaqBook device, if the unit does not respond within 30 seconds perform the following steps:

    1) reboot the system
    2) upon power-up, re-open the *Daq* Configuration* applet
    3) select another configuration setting
    4) reinitiate the test

This completes the procedure for connecting a DaqBook/2000E or WaveBook/516E to the Ethernet. At this point you should refer to the more detailed user documentation that applies to your Ethernet-connected device. User's manuals typically include pinouts, information on system explanation, data acquisition, and links to software and programming documents (in PDF format).

Reference Notes:
For additional device and system information:

➢ DaqBook/2000E users should refer to the *DaqBook/2000 Series User's Manual* (p/n 1103-0901) and the *DBK Options Manual* (p/n 457-0905).

➢ WaveBook/516E users should refer to both the *WaveBook User's Manual,* (p/n 489-0901) and the *WBK Options Manual* (p/n 489-0902).

➢ Programming information is contained in the *Programmer's Manual*, (p/n 1008-0901).

Note: You can access PDF documents directly from the opening screen of the data acquisition CD via the <**View PDFs**> button.

Notes

Section C

Connecting a DaqBook/2000A or DaqBook/2000X to a DaqBook/2000E
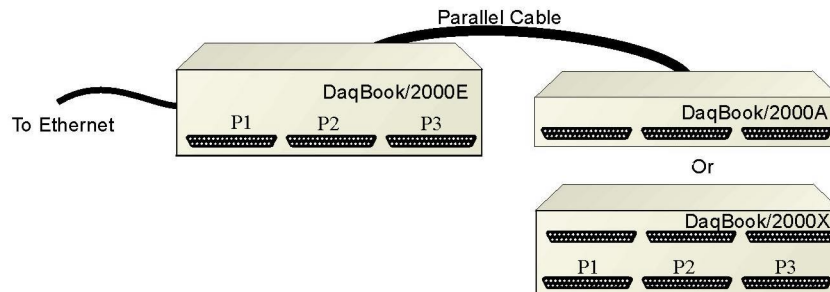
*Connecting a DaqBook/2000A or a DaqBook/2000X
to a DaqBook/2000E*

CAUTION

Turn off power to the system devices and externally connected equipment before connecting cables. Electric shock or damage to equipment can result even under low-voltage conditions.

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

Reference Note: Adobe PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. You can also access documents directly from the data acquisition CD via the <View PDFs> button located on the CD's opening screen.

Refer to the PDF documentation for details regarding both hardware and software. Note that hardcopy versions of the manuals can be ordered from the factory.

Minimum System Requirements

PC system with Pentium® Processor

Windows Operating System

RAM, as follows:
   32 Mbytes of RAM for Windows 95/98/NT
   64 Mbytes of RAM for Windows Me
   64 Mbytes of RAM for Windows 2000
   64 Mbytes of RAM for Windows XP

In this section we are dealing with a setup in which: (1) the DaqBook/2000E is already connected to the Ethernet, and (2) the associated software from the data acquisition CD is installed.

STEP C.1 – Connect the DaqBook/2000A or DaqBook/2000X to an Expansion Port on the DaqBook/2000E

What you will need:

One parallel port cable, e.g. a CA-35-2 (2-foot) or a CA-35-12 (1-foot) cable.
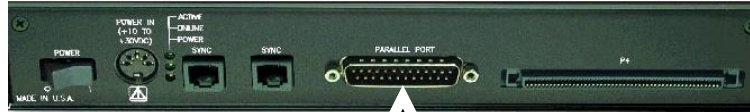
DB25 Parallel Port Connector

How to make the connection:

1. Place the DaqBook/2000E power switch in the "OFF" (0) position, if it is not already OFF.

2. Connect the parallel port cable to the parallel port connector on the rear panel of the DaqBook/2000A or DaqBook/2000X. See the preceding picture.

3. Connect the other end of the cable to one of three expansion ports on the DaqBook/2000E.

Expansion Ports
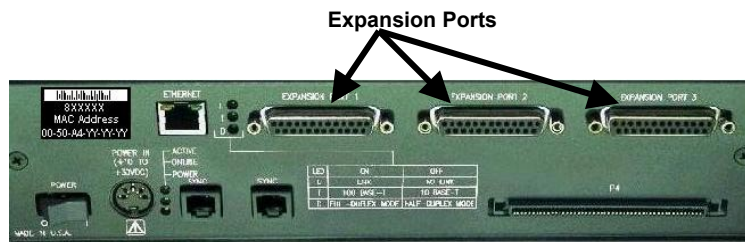
DaqBook/2000E

STEP C.2 – Connect the DaqBook/2000A or DaqBook/2000X to Power

What you will need:

A power supply with a range of +10 VDC to +30 VDC.
The power supply needs to have a male DIN5 connector.

Note: The switching-mode power supply that is commonly used with DaqBook/2000 Series systems has an input range of 100 VAC to 240 VAC at 50 Hz to 60 Hz. The power supply's output [to the DaqBook/2000 Series device] is 15 VDC @ 2.7 amps via a DIN5 connector.

Note: Various AC adapter models support power grids of USA, Europe, Japan, and Asia.

Reference Note: It is possible to use a VDC power source other than the commonly used switching-mode power supply, often referred to as an adapter. However, you should consult the *Power Management Section* of your *DaqBook/2000 Series User's Manual* (p/n 1103-0901) before doing so.

DIN5 POWER IN Connector (+10 to +30 VDC)

How to make the connection:

1. Place the DaqBook/2000A or DaqBook/2000X power switch in the "OFF" (0) position, if it is not already OFF.

2. Connect the DIN5 end of the adapter's cable to the power in connector on the DaqBook/2000A or DaqBook/2000X (see preceding figure).

   If using a power source other than the adapter, consult the *Power Management Section* of your DaqBook/2000 Series User's Manual (p/n 1103-0901) before doing so.

3. Connect the adapter's plug to a standard AC outlet.

4. If your adapter has a power switch, position it to "ON."

5. Turn ON the DaqBook/2000A or DaqBook/2000X by placing the unit's power switch to the "1" position. The power led will light up.

6. Turn the DaqBook/2000E "ON" by placing the unit's power switch to the "1" position. The power led will light up.

STEP C.3 – Configure and Test the Hardware

The *Daq* Configuration* applet, designed for 32-bit Windows 95/98/Me/NT/2000/XP systems, is located in the Windows *Control Panel*. It allows you to add or remove a device and change configuration settings. The included test utility provides feedback on the validity of current configuration settings, as well as performance summaries.

1. Open the Daq* Configuration Applet.

   a. Open the Control Panel by navigating from the Windows' Desktop as follows:
      Start Menu ⇒ Settings ⇒ Control Panel

   b. From the Control Panel, double-click the ***Daq* Configuration*** icon.

2. Add the DaqBook/2000A or DaqBook/2000X.

   In the Daq Configuration applet, add the DaqBook/2000A or DaqBook/2000X to one of the three expansion ports of the DaqBook/2000E.

   a. Select the DaqBook/2000E in the Device Inventory configuration tree (see following figure).

   b. Click the <**Add Device**> button. The "Select Device Type" box will appear.

   c. Select "DaqBook2000A/2000X" from the list of devices.

   d. Click the <**OK**> button. The "Properties" box for the device will appear.
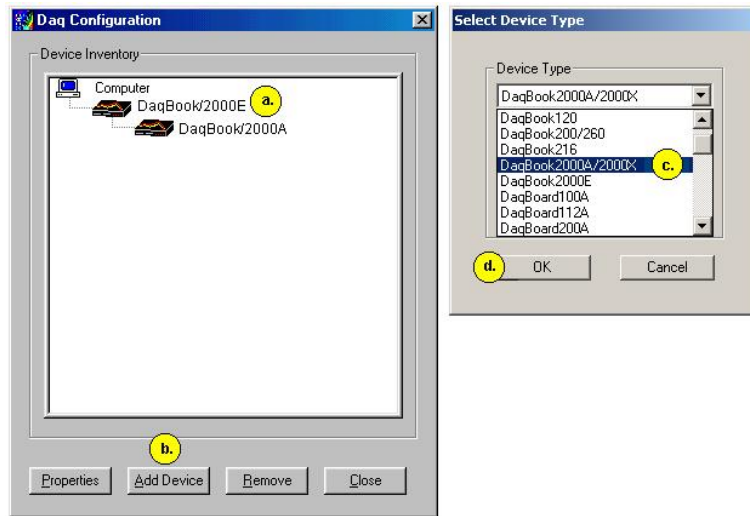
Adding a DaqBook/2000A to a DaqBook/2000E

Note: Devices have default names, for example, DaqBook2K0. If desired, you can change the device name.

3. Set the Expansion Port number.

In our current setup, the DaqBook/2000A (or DaqBook/2000X) is a second-level device. This is because it is connected to an expansion port of a first-level device, i.e., the DaqBook/2000E.

For this step select the expansion port number to which the DaqBook/2000A or DaqBook/2000X is connected, i.e., Port 1, Port 2, or Port 3.

Note: The DaqBook/2000A and DaqBook/2000X make use of the same IP address as the DaqBook/2000E to which they are connected. For this reason no configuration of the IP address is called for in the second-level device's properties box.
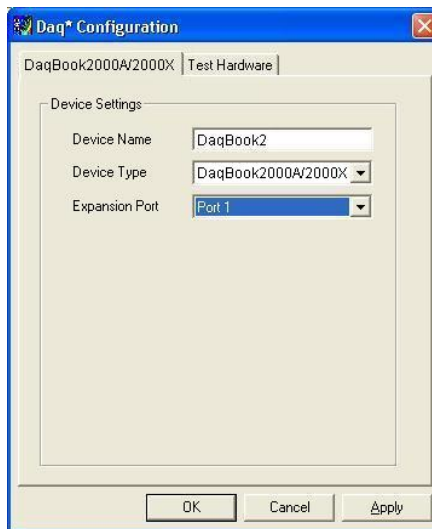
Setting the Expansion Port Number

4. Test the system connections.

      a.   Make sure the device has been properly installed and is powered-on.

      b.   Make sure all cables are properly and securely connected.

      c.   Click the "Test Hardware" tab.

      d.   Click the <**Resource Test**> button.

The test results have two components: *Resource Tests* and *Performance Tests*.
Appendix G, Resource and Performance Tests, includes a brief explanation of the tests.

Testing the DaqBook/2000 Series device may, in some cases, cause the system to hang. If test results are not displayed in 30 seconds or the system does not seem to be responding, reboot the system. Upon power-up, re-enter the Daq Configuration and change the DaqBook/2000 Series device configuration settings to those that work properly.

This completes the instructions for connecting a DaqBook/2000A or DaqBook/2000X to a DaqBook/2000E. At this point you should refer to the *DaqBook/2000 Series User's Manual* (p/n 1103-0901) for additional system information. The document includes pinouts, information on system expansion, data acquisition, and links to software and programming documents (in PDF format).

You can access the documents directly from the opening screen of the data acquisition CD via the <**View PDFs**> button.

Reference Notes:

➢ If you experience difficulties, please consult the additional user documentation before calling technical support. User documentation is included on your data acquisition CD, and is installed automatically as a part of product support, when your software is installed. The default location is the Programs Group. The documentation includes API information, pinouts, troubleshooting, and a great deal of material regarding specific DBK cards and modules.

➢ Documents can be read directly from the data acquisition CD via the <**View PDFs**> button located on the opening screen.

➢ Hardcopy versions of the manuals can be ordered from the factory.

For DaqBook/2000 Series Ethernet Applications:

When powering up a DaqBook/2000 Series system it is important that the DaqBook/2000E is powered last, and that the most remote system components are powered first. Other power-up sequences will result in software's failure to recognize all components.*

- **First, power-on the DBK expansion modules.**
- **Second, power-on the DaqBook/2000A, DaqBook/2000X, or DBK modules that are connected to the expansion ports of the DaqBook/2000E.**
- **Finally, power-on the DaqBook/2000E.**

* An exception to this power-up scheme is to power-on the entire system at once.

Appendix D – Device Connector Reference   D

For DaqBook/2000 Series Devices

DaqBook/2000A

Front Panel

The DaqBook/2000A's front panel offers three DB37 connectors designated as P1, P2, and P3.

> **P1** connects to Analog I/O.
> **P2** connects to Digital I/O.
> **P3** connects to Pulse / Frequency Digital I/O.

The *DaqBook/2000 Series User's Manual* (p/n 1103-0901) includes pinouts for each.

Rear Panel

DaqBook/2000A's rear panel contains a power switch, DIN5 power connector, LEDs, synchronization ports, a parallel port connector, and a 100-pin (P4) connector. Additional detail follows. Items described below are done so from left to right, when looking at the rear panel.

POWER Switch: A rocker-type switch with a "0" label for Power Off, and a "1" for Power On.

POWER IN: +10 to +30 VDC, through a socket type DIN5 connector on the chassis. Power is typically supplied from a TR40U power adapter.

LEDs: *ACTIVE* – Lights when a sample has been converted by the A/D Converter.
       ONLINE – Lights when software establishes communication to the unit.
       POWER – Lights when power is turned on and is present.

SYNC (Qty of 2) – Two "synchronization ports" provide a means of synchronizing multiple DaqBook/2000 Series units in regard to post-trigger scanning. The ports accept CA-74-1 and CA-74-5 RJ-11, 6 conductor type cables.

Parallel Port – A DB25 connector used to connect theDaqBook/2000A to the Parallel Port of the host PC, or to an Expansion Port of a DaqBook/2000E, or to an Expansion Port of a WBK25 Ethernet Interface Module. Applicable cables are CA-35-2 (2-foot) and CA-35-12 (1-foot).

P4 – P4 is a 100-pin connector that shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. You can connect a DBK200 Series Option to P4 via a CA-195 cable to essentially distance the P1, P2, P3 connection from the DaqBook/2000A. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

Use a CA-209D CE Cable Kit in electrically noisy environments. The kit includes a 3-foot long shielded cable, two grounding pigtails, two cable clamps, and 4 screws. The *CE Compliance* chapter of the DaqBook/2000 Series User's Manual (p/n 1103-0901) provides additional information.

Reference Note: The document section, *System Connections and Pinouts*, contains pinouts for P1, P2, P3 and P4. A copy of the document is included in *the DaqBook/2000 Series User's Manual* (p/n 1103-0901). The manual can be viewed from the data acquisition CD via the <View PDFs> button on the CD's opening screen.

DaqBook/2000X

Front Panel

The upper row of theDaqBook/2000X front panel contains port openings for three installed DBK cards. In the following figure, each connector seen in the upper row belongs to an installed DBK card.

Appendix E, *System Expansion*, contains a section entitled *Expansion via DBK Cards in a DaqBook/2000X*. The section includes one system example in which 3 analog DBK cards are used, and another in which 1 analog DBK card and 2 digital DBK cards are used.

The lower row of the DaqBook/2000X front panel offers three DB37 connectors designated as P1, P2, and P3.

> **P1** connects to Analog I/O.
> **P2** connects to Digital I/O.
> **P3** connects to Pulse / Frequency Digital I/O.

The *DaqBook/2000 Series User's Manual* (p/n 1103-0901) includes pinouts for each.

Rear Panel

The DaqBook/2000X rear panel contains an upper section of 3 card slots and a lower section, which includes a power switch, DIN5 power connector, LEDs, synchronization ports, a parallel port connector, and a 100-pin (P4) connector. Items described below are done so from left to right. The top row, consisting of three expansion slots, is listed first.

Expansion Cards - Up to three can be added, one per card slot.

POWER Switch: A rocker-type switch with a "0" label for Power Off, and a "1" for Power On.

POWER IN: +10 to +30 VDC, through a socket type DIN5 connector on the chassis. Power is typically supplied from a TR40U power adapter.

LEDs: *ACTIVE* – Lights when a sample has been converted by the A/D Converter.

> *ONLINE* – Lights when software establishes communication to the unit.

> *POWER* – Lights when power is turned on and is present.

SYNC – Two "synchronization ports" provide a means of synchronizing multiple DaqBook/2000 Series units in regard to post-trigger scanning. The ports accept CA-74-1 and CA-74-5 RJ-11, 6 conductor type cables.

Parallel Port – A DB25 connector used to connect theDaqBook/2000X to the parallel port of the host PC or to the EXPANSION PORT of a DaqBook/2000E. Applicable cables are CA-35-2 (2-foot) and CA-35-12 (1-foot).

P4 – P4 is a 100-pin connector that shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. You can connect a DBK200 Series Option to P4 via a CA-195 cable to essentially distance the P1, P2, P3 connection from the DaqBook/2000X. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

Use a CA-209D CE Cable Kit in electrically noisy environments. The kit includes a 3-foot long shielded cable, two grounding pigtails, two cable clamps, and 4 screws. The *CE Compliance* chapter of the DaqBook/2000 Series User's Manual (p/n 1103-0901) provides additional information.

Reference Note: The document section, *System Connections and Pinouts*, contains pinouts for P1, P2, P3 and P4. A copy of the document is included in *the DaqBook/2000 Series User's Manual* (p/n 1103-0901). The manual can be viewed from the data acquisition CD via the <View PDFs> button on the CD's opening screen.

DaqBook/2000E

Front Panel

The DaqBook/2000E's front panel offers three DB37 connectors designated as P1, P2, and P3.

> **P1** connects to Analog I/O.
> **P2** connects to Digital I/O.
> **P3** connects to Pulse / Frequency Digital I/O.
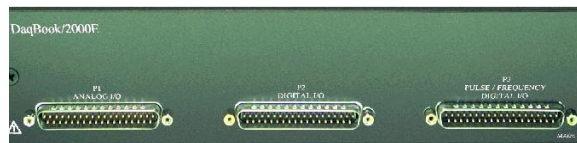
The *DaqBook/2000 Series User's Manual* (p/n 1103-0901) includes pinouts for each.

Rear Panel

The upper row of DaqBook/2000E's rear panel contains a MAC Address Label, Ethernet Port, 5 LEDs, and three expansion ports. The lower section of the panel includes a power switch, DIN5 power connector, 3 LEDs, 2 synchronization ports, and 100-pin (P4) connector. Items described below are done so from left to right, with the top row discussed first.

MAC Address Label: The Media Access Control (MAC) label is located in the upper left corner of the rear panel. The label shows the device serial number in three formats: (1) Barcode, (2) base 10, and (3) hexadecimal. If prompted to enter a serial number in software, use the base 10 number. Conversion to a hexadecimal number for use in addressing will be automatic.

ETHERNET: The 10/100BaseT Ethernet port can connect to the Ethernet port of the host PC, or to an Ethernet network. Either of two Ethernet patch cables may be used to make the connection. CA-242 is a 1.5 foot cable. CA-242-7 is a 7-foot cable. Note that the Ethernet connector has two built in LEDs that indicate traffic flow. These are discussed with the three other Ethernet-related LEDs. Note that the Ethernet cable length must be <10m in order for the system to be CE Compliant.

LEDs: There are 5 ETHERNET Status LEDS. Two rectangular LEDs, Tx and Rx are built right into the frame of the Ethernet jack. The other three, located just to the right of the jack, are round and are labeled L, T, and D.

Tx and Rx LEDs

> **Tx – "ON"** indicates traffic is being transmitted (see figure at right).
> **Rx –** "ON" indicates that the port is receiving traffic.
> **L (Link)** "ON" indicates a link exists. "OFF" indicates no link.
> **T (Transmit)** "ON" indicates 100 M-Bits, "OFF" indicates 10 M-Bits.
> **D (Duplex)** "ON" indicates full duplex, which allows simultaneous two-way data traffic. "OFF" indicates half-duplex, which only allows one-way data traffic at any given time.
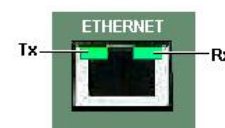
EXPANSION PORTS [1, 2, and 3]: used to expand the system with up to three additional devices. These are used to connect the DaqBook/2000E to the PARALLEL PORT connector of DaqBook/2000A and DaqBook/2000X units.

POWER Switch: A rocker-type switch with a "0" label for Power Off, and a "1" for Power On.

POWER IN: +10 to +30 VDC, through a socket type DIN5 connector on the chassis. Power is typically supplied from a TR40U power adapter.

LEDs: *ACTIVE* – Lights when a sample has been converted by the A/D Converter.

     ONLINE – Lights when the DaqBook/2000E's internal Ethernet module establishes communication to the unit.

     POWER – Lights when power is turned on and is present.

SYNC (Qty 2) – Two "synchronization ports" provide a means of synchronizing multiple DaqBook/2000 Series units in regard to post-trigger scanning. The ports accept CA-74-1 and CA-74-5 RJ-11, 6 conductor type cables.

P4 – P4 is a 100-pin connector that shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. You can connect a DBK200 Series Option to P4 via a CA-195 cable to essentially distance the P1, P2, P3 connection from the DaqBook/2000E. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

Use a CA-209D CE Cable Kit in electrically noisy environments. The kit includes a 3-foot long shielded cable, two grounding pigtails, two cable clamps, and 4 screws. The *CE Compliance* chapter of the DaqBook/2000 Series User's Manual (p/n 1103-0901) provides additional information.

Reference Note: The document section, *System Connections and Pinouts*, contains pinouts for P1, P2, P3 and P4. A copy of the document is included in *the DaqBook/2000 Series User's Manual* (p/n 1103-0901). The manual can be viewed from the data acquisition CD via the <View PDFs> button on the CD's opening screen.

Appendix E – System Expansion E

Note: If you are not familiar with the connectors of the DaqBook/2000 Series devices, please review *Appendix D, Device Connector Reference* before proceeding.

Expansion via Additional DaqBook/2000 Series Devices

The following figure represents only one of many possibly system configurations.
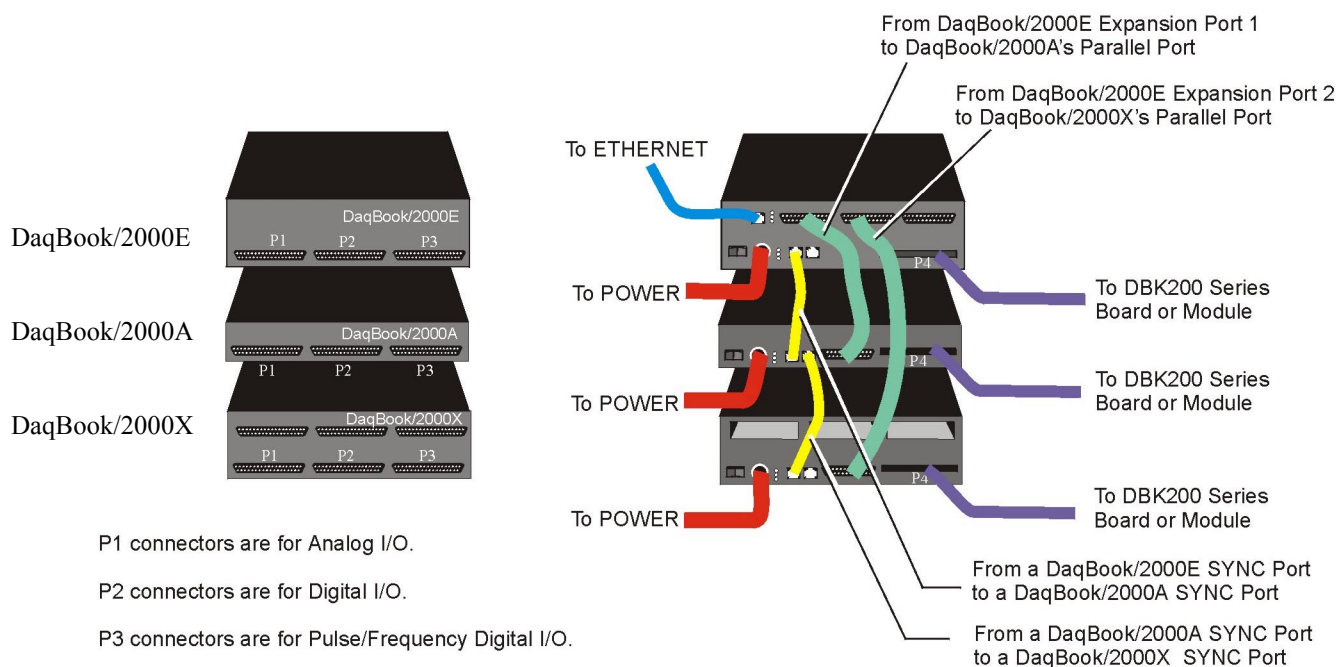
Possible DaqBook/2000 System Using /2000E, /2000A, and /2000X Units

Ports and Cables for Expansion, Synchronization, and Ethernet Connection

Expansion
Expansion Port Cables are used when up to three DaqBook/2000 Series devices are to be connected to a DaqBook/2000E via its expansion ports. The expansion port cables are the communication links that stream acquired data back to the DaqBook/2000E and to the host PC. Note that the expansion units need not be of the same type. Cables CA-35-2 (2-foot) and CA-35-12 (1-foot) have been approved for use as expansion port cables.

Synchronization
SYNC Cables can be used to make several DaqBook/2000 Series devices, which are linked to each other, *scan-synchronous*. Cables that have been approved for use in synchronizing DaqBook/2000 Series devices are CA-74-1 (1-foot) and CA-74-5 (5-foot). When scan-synchronization is employed, one of the DaqBook/2000 Series devices will be programmed as the "master." This unit drives the acquisition timing of the "slave" units. The section entitled *Multi-DaqBook/2000 Synchronization* contains detailed information.

Ethernet Connection
Ethernet Cables intended for use with DaqBook/2000 Series devices are CA-242 (a 1.5 foot cable) and CA-242-7 (a 7 foot cable). DaqBook/2000E can connect directly to an Ethernet port on a PC or network hub via either cable. DaqBook/2000A and DaqBook/2000X are connected to the Ethernet when interfaced with a DaqBook/2000E [which is connected to the Ethernet] or when connected to a WBK25 Ethernet Interface Module. In both scenarios the DB25 Parallel Port of the DaqBook/2000A (or /2000X) device is connected to one of three Expansion Ports located on the DaqBook/2000E [or on the WBK25]. The connection would be made with a CA-35-2 (2-foot) or a CA-35-12 (1-foot) cable.

Expansion via a WBK25 Ethernet Interface Module

The WBK25 is a high-speed Ethernet-to-parallel port interface module. The device includes one 10/100BaseT Ethernet port for connecting to a PC Ethernet Port or Ethernet network hub. It also includes three parallel ports, designated as "expansion ports." Parallel cables connected to these ports can be attached to any model of WaveBook, DaqBook, WBK40 Series option, or any combination of up to 3 of these devices. Note that these parallel ports cannot be used to connect to auxiliary devices such as printers and scanners.

Data transfer rates with the WBK25 depend on the network to which it is attached. If the WBK25 is used with DaqBook/2000 Series device and WBK40 series options, then up to three of these devices can be attached to one WBK25 and are able to transfer data at the maximum sampling rates on all three devices simultaneously.

If the WBK25 is attached to a shared Ethernet network, then data transfer rates will be dependent on the other network traffic at the time. It is not possible to guarantee maximum data transfer rates in this mode.

It is also possible to attach multiple WBK25 units to one PC having multiple Ethernet ports, or having a multi-port Ethernet hub. Performance under these conditions will be dependent on the PC's ability to handle multiple networks.

WBK25 Ethernet-to-Parallel Port Interface

You can connect a DaqBook/2000A or a DaqBook/2000X to the Ethernet via a WBK25 Ethernet Interface Module. To do so, the DB25 Parallel Port of a DaqBook/2000A (or /2000X) device is connected to one of the three Expansion Ports located on the WBK25. The connection would be made with a CA-35-2 (2-foot) or a CA-35-12 (1-foot) cable. Two additional DaqBook/2000 Series units could be connected to via the remaining two expansion ports. These connections would also be made via a CA-35-2 or CA-35-12 cables.

The WBK25 connects directly to an Ethernet port on a PC or network hub, via the unit's built-in 10/100BaseT Ethernet interface. An Ethernet patch cable CA-242 (1.5 foot) or CA-242-7 (7 foot) cable is used to make the connection.

DaqBook/2000A   DaqBook/2000A

DaqBook/2000A   DaqBook/2000A

WBK25   WBK25

DaqBook/2000A   DaqBook/2000A

Channel Input Side   *Device Interface Side*

To ETHERNET   To POWER

System with WBK25 Interface and 3 DaqBook/2000A Devices
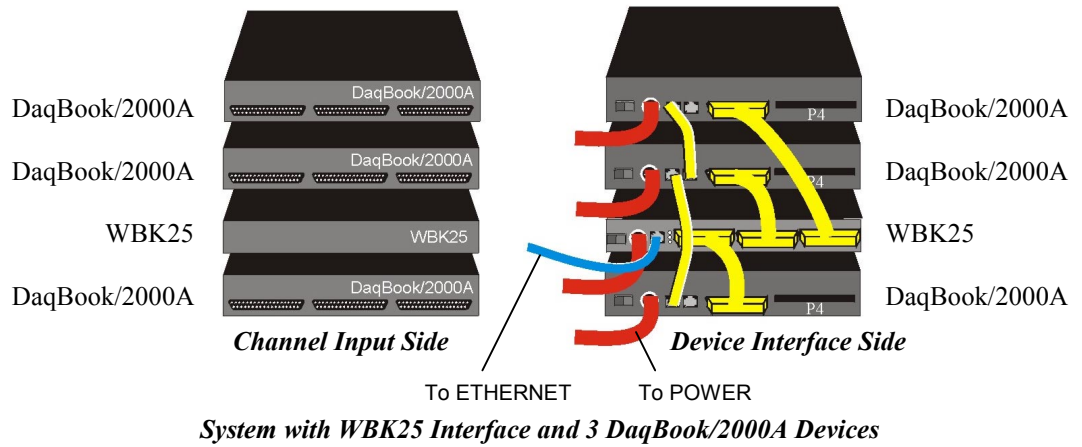
Lines and Cables Used in the WBK25 Interface Example [Device Interface Side Only]:

1. Power Supply - To each DaqBook/2000A POWER IN DIN 5 connector, +10 VDC to +30 VDC, and to the WBK25; typically from a TR40U power adapter.

2. From the bottom DaqBook/2000A's PARALLEL PORT connector to EXPANSION PORT 1 on the WBK25 Ethernet Interface Module. A CA-35-2 (2-foot) or CA-35-12 (1-foot) cable is used for this connection.

3. From either of two SYNC Ports on the bottom DaqBook/2000A to either of two SYNC Ports on the next DaqBook/2000A. Cable CA-74-1 (1-foot) or CA-74-5 (5-foot) is used for this connection.

4. From the available SYNC Port on the second DaqBook/2000A to either of two SYNC Ports on the upper DaqBook/2000A. Cable CA-74-1 (1-foot) or CA-74-5 (5-foot) is used for this connection.

5. From the WBK25's EXPANSION PORT 2 to the second DaqBook/2000A's Parallel Port. A CA-35-2 (2-foot) or CA-35-12 (1-foot) cable is used for this connection.

6. From the WBK25's EXPANSION PORT 3 to the third DaqBook/2000A's Parallel Port. A CA-35-2 (2-foot) or CA-35-12 (1-foot) cable is used for this connection.

Reference Note:
The WBK25 Ethernet-to-Parallel Port Interface is shipped with a user's guide (p/n 489-0903). Refer to that document for instructions regarding how to connect a WBK25 to the Ethernet.

Expansion via DBK Modules

This section consists of three system examples, each having a figure and a corresponding list of "cables used."

Note that the figures and tables illustrate primary device connections to each other, they do not show signal, power, Ethernet, or PC connections. These other types of connections are discussed elsewhere in the document.

In regard to power, note that DaqBook/2000 Series devices can provide 15000 mW of power. This means that many system configurations will not require additional power modules. However, to avoid the possibility of inadequate power, you should always check power management tables prior to putting an acquisition system together.

In regard to physically stacking modules, i.e., attaching one module to another, fastener Panels, sometimes referred to as "splice plates," (p/n 262-0801) are typically used. Optional handles (p/n HA-111) may also be attached to a system.

Example 1: **DaqBook/2000A with a DBK1, two DBK84 Modules, and DBK203**

DBK1

DBK84

DBK84

DBK203 (Note 2)

DaqBook/2000A

To POWER   To PC or to /2000E

Channel Input Side   *Device Interface Side*

DaqBook/2000A System
with a DBK1, two DBK84 Modules, and DBK203
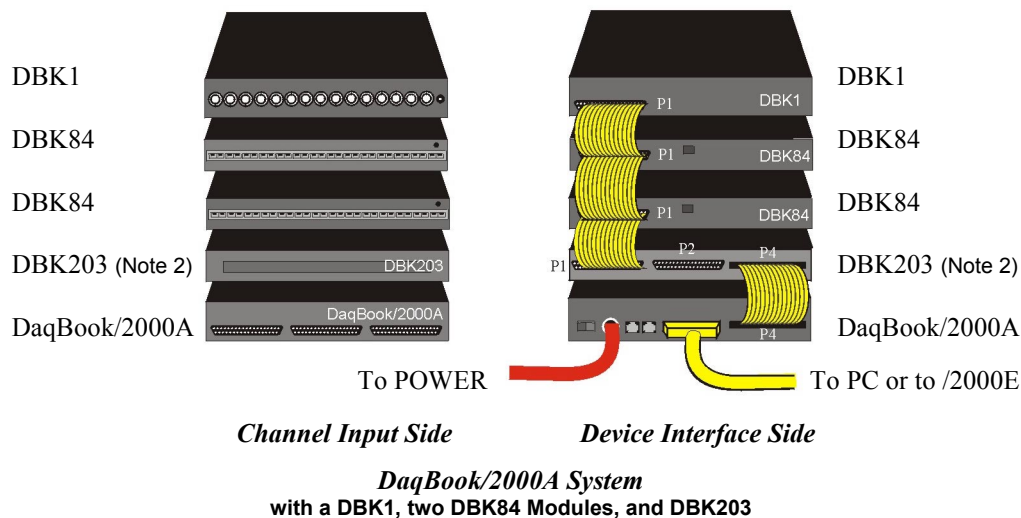
Lines and Cables Used in Example 1 [Device Interface Side Only]:

1. Power Supply - To the DaqBook/2000A POWER IN DIN 5 connector, +10 VDC to +30 VDC, typically from a TR40U power adapter.

2. From the DaqBook/2000A PARALLEL PORT connector, via a CA-35-x cable, to either
   (a) the host PC's PARALLEL PORT, or
   (b) one of three DaqBook/2000E EXPANSION PORTS
   (c) one of three WBK25 EXPANSION PORTS

3. From DaqBook/2000A's P4 connector to DBK203's P4 connector, via a CA-195-1 cable.

4. From DBK203's P1 connector to two DBK84s via two CA-37-1T cables. Connections are to the DBK84s' P1 connectors.

5. From the P1 connector on the upper DBK84 to the P1 connector on the DBK1, via a CA-37-1T cable.

   Note 1: Information regarding the use of CA-37-T cables is provided on page IG-9.

   Note 2: In reference to the above figure, it is possible to connect the two DBK84 modules and the DBK1 module without using a DBK203. In the scenario in which the DBK203 is not used, the DBK84 and DBK81 modules would be rotated 180° and then cabled to the DaqBook/2000A's P1 connector via a CA-37-3 cable.

Reference Note:
Both the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) and the *DBK Basics* document module include power management information. You should use the *Available Power Chart* and *DBK Power Requirement Worktable* to calculate your system's power needs. Doing so will enable you to ensure that adequate power will be supplied to all system components. PDF versions of both documents are included on your data acquisition CD.

Example 2: **DaqBook/2000E with a DBK41 and a DBK203**
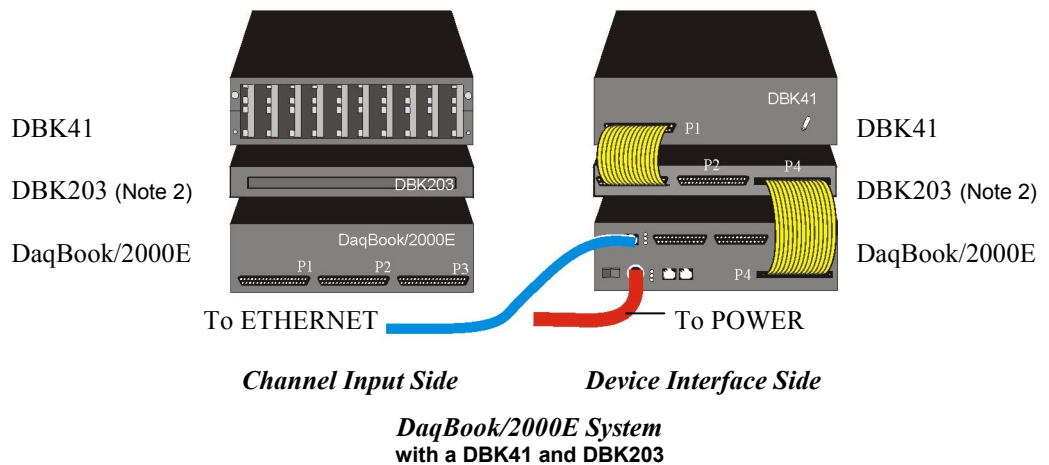
DBK41

DBK203 (Note 2)

DaqBook/2000E

To ETHERNET ──────── To POWER

Channel Input Side   *Device Interface Side*

DaqBook/2000E System
with a DBK41 and DBK203

Lines and Cables Used in Example 2 [Device Interface Side Only]:

1. Power Supply - To the DaqBook/2000E POWER IN DIN 5 connector, +10 VDC to +30 VDC, typically from a TR40U power adapter.

2. From the DaqBook/2000E ETHERNET jack to a 10/100BaseT Ethernet Network or to the ETHERNET jack on a PC. Applicable Ethernet patch cables (1.5-foot or 7-foot) are CA-242 and CA-242-7, respectively.

3. From DaqBook/2000E's P4 connector to the DBK203's P4 connector, via a CA-195-1 cable.

4. From DBK203's P1 connector to a DBK41's P1 connector via one CA-37-1T cable.

   Note 1: Information regarding the use of CA-37-T cables is provided on page E-9.

   Note 2: In reference to the above figure, it is possible to connect the DBK41 module without using a DBK203. In the scenario in which the DBK203 is not used, the DBK41 module would be rotated 180° and then cabled to the DaqBook/2000E's P1 connector via a CA-37-1 cable.

Reference Notes:

➢ For detailed information regarding the DBK41 10-Slot Analog Expansion Module or the DBK203 Screw-Terminal Adapter Module, refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). A PDF version of the document is included on the data acquisition CD.

➢ Both the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) and the *DBK Basics* document module include power management information. You should use the *Available Power Chart* and *DBK Power Requirement Worktable* to calculate your system's power needs. Doing so will enable you to ensure that adequate power will be supplied to all system components. PDF versions of both documents are included on your data acquisition CD.

Example 3: DaqBook/2000E with two DBK60 Modules and a DBK203
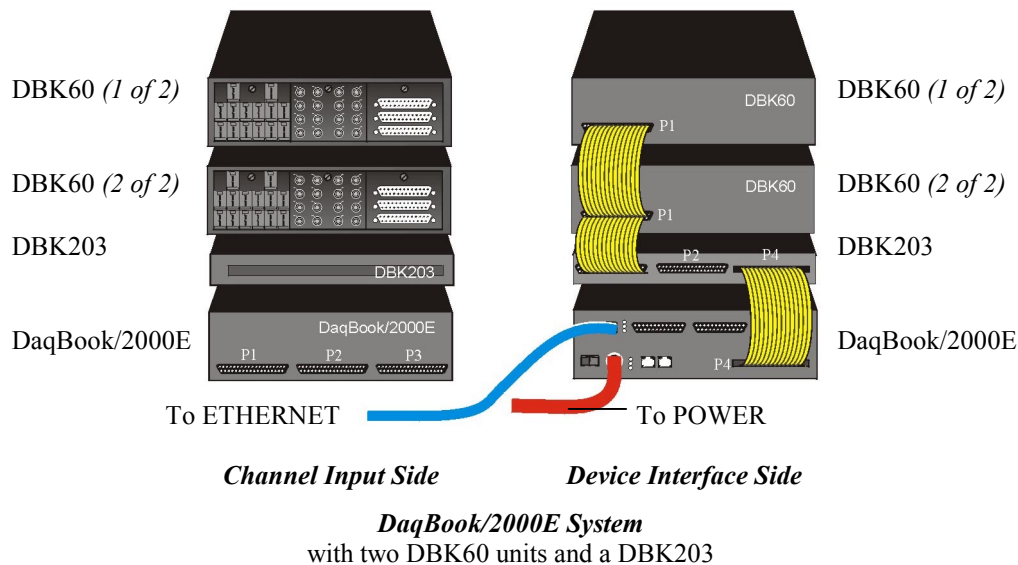
DBK60 *(1 of 2)*

DBK60 *(2 of 2)*

DBK203

DaqBook/2000E

To ETHERNET ——— To POWER

Channel Input Side   *Device Interface Side*

DaqBook/2000E System
with two DBK60 units and a DBK203

Lines and Cables Used in Example 2 [Device Interface Side Only]:

1. Power Supply - To the DaqBook/2000E POWER IN DIN 5 connector, +10 VDC to +30 VDC, typically from a TR40U power adapter.

2. From the DaqBook/2000E ETHERNET jack to a 10/100BaseT Ethernet Network or to the ETHERNET jack on a PC. Applicable Ethernet patch cables (1.5-foot or 7-foot) are CA-242 and CA-242-7, respectively.

3. From DaqBook/2000E's P4 connector to the DBK203's P4 connector, via a CA-195-1 cable.

4. From DBK203's P1 connector to two DBK60 P1 connectors, via two CA-37-3T cables.

Note: Information regarding the use of CA-37-T cables is provided on page E-9.

Reference Notes:

➢ For detailed information regarding the DBK60 3-Slot Expansion Module and its related Termination Panels, or the DBK203 Screw-Terminal Adapter Module, refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). A PDF version of the document is included on the data acquisition CD.

➢ Both the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) and the *DBK Basics* document module include power management information. You should use the *Available Power Chart* and *DBK Power Requirement Worktable* to calculate your system's power needs. Doing so will enable you to ensure that adequate power will be supplied to all system components. PDF versions of both documents are included on your data acquisition CD.

➢ This installation guide exists as an independent document (p/n 1103-0940). It is also included in the *DaqBook/2000 Series User's Manual*, p/n 1103-0901. The manual contains additional information regarding DaqBook/2000 Series devices.

User's of the independent installation guide should note that a PDF version of the *DaqBook/2000 Series User's Manual* is automatically installed onto your hard drive as a part of product support. The default location is the **Programs** group, which can be accessed from the *Windows Desktop*. The document can also be read directly from the installation CD by using the <**View PDFs**> button, accessible from the CD's introduction screen. Refer to the PDF documentation for details regarding both hardware and software.

Expansion via DBK Cards in a DaqBook/2000X

This section consists of two DaqBook/2000X system examples. In the first example, 3 analog DBK cards are used. In the second example, the system makes use of two digital DBK cards and one analog DBK card.

Example 1: **DaqBook/2000X with 3 Analog DBK Cards**

On DaqBook/2000X's front panel, P1 connects to all 3 analog DBK cards via a CA-37-3 Cable.
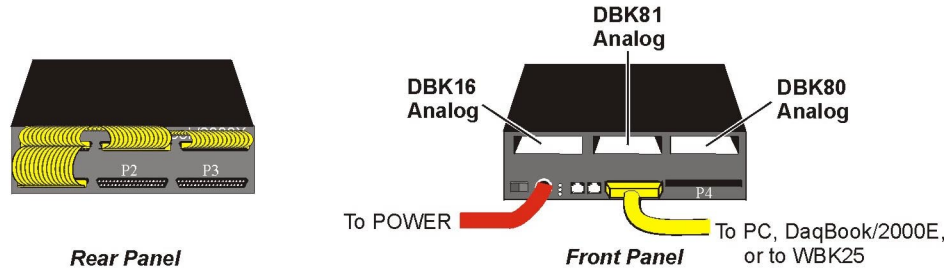
DaqBook/2000X with 3 Analog DBK Cards

Lines and Cables Used in Example 1:

On the Rear Panel:
1. Power Supply - To the DaqBook/2000X POWER IN DIN 5 connector, +10 VDC to +30 VDC, typically from a TR40U power adapter.

2. From the DaqBook/2000X PARALLEL PORT connector to one of the following:
PC Parallel Port, DaqBook/2000E EXPANSION PORT, WBK25 EXPANSION PORT.
The connection is made via a CA-35-2 (2-foot cable) or a CA-35-12 (1-foot cable).

3. DBK16, DBK81, and DBK80 Analog DBK cards inserted in the DaqBook/2000X card slots; then secured with jackscrews that are included with each card.

On the Front Panel:
From P1 to the DBK80 (located above P1), then to the DBK81 and the DBK16.
The connection is made via a CA-37-3 cable.

Example 2: **DaqBook/2000X with 2 Digital DBK Cards and 1 Analog DBK Cards**

On DaqBook/2000X's front panel, P1 connects to the analog DBK 81 card via a CA-37-1 cable; and P2 connects to the DBK20 and DBK21 digital cards via a CA-37-2 cable.
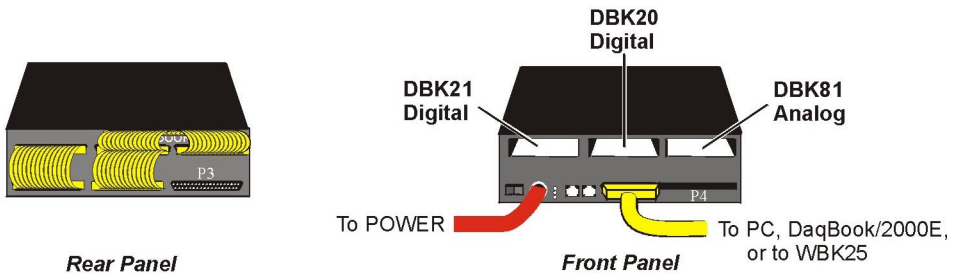
DaqBook/2000X with 2 Digital DBK Cards and 1 Analog DBK Card

Lines and Cables Used in Example 2:

On the Rear Panel:
1. Power Supply - To the DaqBook/2000X POWER IN DIN 5 connector, +10 VDC to +30 VDC, typically from a TR40U power adapter.

2. From the DaqBook/2000X PARALLEL PORT connector to one of the following:
PC Parallel Port, DaqBook/2000E EXPANSION PORT, WBK25 EXPANSION PORT.
The connection is made via a CA-35-2 (2-foot cable) or a CA-35-12 (1-foot cable).

3. DBK21 digital, DBK20 digital, and DBK81 analog DBK cards inserted in the DaqBook/2000X card slots.

(Continued)

On the Front Panel:

1. From the DaqBook/2000X P1 connector to the DBK81 analog card. Connection is made via a CA-37-1 cable.

2. From the P2 connector to the DBK20 digital card, then to the DBK21 digital card. Connection is made via a CA-37-2 cable.

How to Mount One Module to Another

For systems that make use of several data acquisition modules, stacking units together conserves space and simplifies cable runs. Such stacking can be facilitated with dual-lock tabs or splice plates.

- **Dual-lock tabs**. Dual-lock tabs, often referred to as Velcro,® provide a means of temporarily stacking modules together. The tabs provide a convenient way to quickly add modules to [or remove modules from] a system. Dual-lock tabs are often used to attach a notebook PC to a module.

- **Splice Plate Kits (Fastener Panels)**. Optional Splice Plate Kits, also referred to as Fastener Panels, are available through the factory. The kits include metal plates that screw into the sides of modules to form a vertical rack of two or more modules. This method allows the "enclosure" to size itself as needed rather than wasting space in a *1-size-fits-all* type of enclosure. A handle can be attached to the plate for convenience in portable applications.

    Note that even when splice plates are used, dual-lock tabs are typically used to attach a notebook PC to the top-level acquisition module.

Associated Part Numbers:
Splice Plate Kit: p/n 232-0810
Optional Handle: p/n HA-111

Dual-lock Tabs
(To attach to notebook PC)

Splice Plate Kit: p/n 232-0810
Includes 2 plates and 8 mounting screws. The handle (HA-111) is purchased separately.

Splice Plates

Splice Plates

Optional Handle
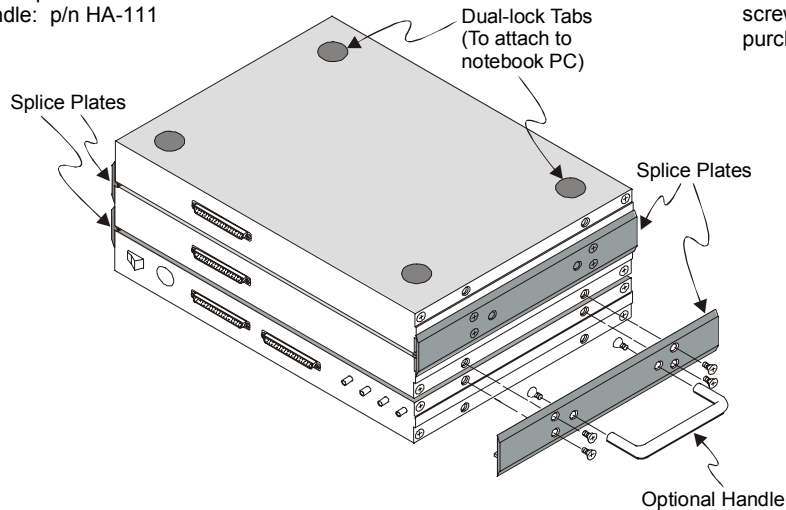
Stacking Data Acquisition Modules

Using T-Cables

A T-Cable is a ribbon cable that extends the connections of one of the ports it plugs into, thus allowing a second cable to plug into that port. The following figure clarifies the concept.

T-Cables are available in different lengths and can be used for linking two or more compatible devices together via the device's 37-pin digital I/O connectors.

The bottom-end of the T-Cable is a dual-connector, consisting of both a female connector, and a 37-pin (male) connector. As seen in the following illustration, the T-Cable's 37-pin (male) connector can be used for "Daisy-Chain" applications.

Each T-Cable comes with three sets of screws. These are designated (in the diagram) as: short, medium, and long. Use the short screws to secure the single, female-end of the cable to the device; and use the medium length screws to secure a cable's "dual-end" connector. Use the long screws for daisy-chain applications (when you are connecting one T-Cable to another T-Cable).

Note! **Tighten screws snug only; do not over-tighten!**
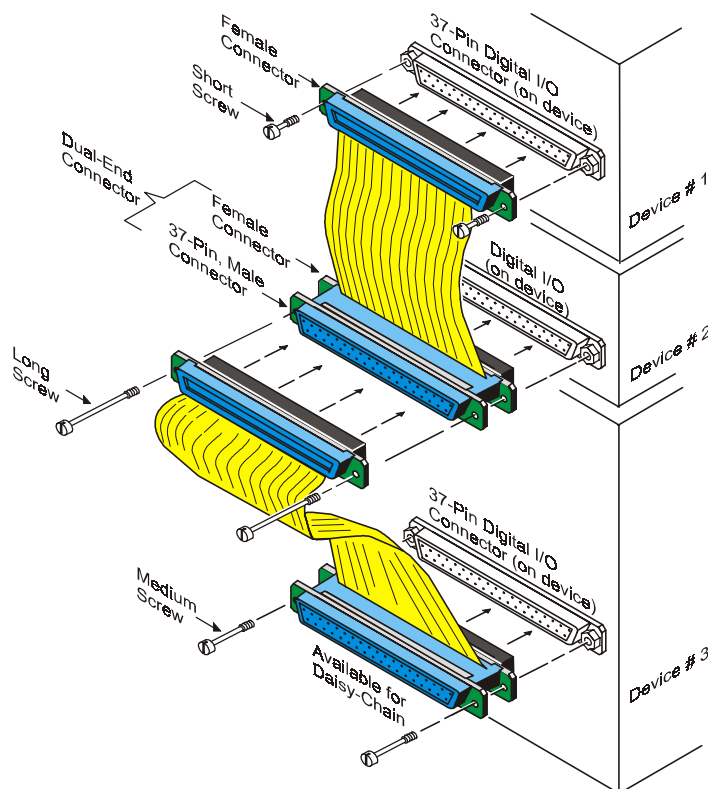
Daisy-Chain Example
Using two T-Cables to Connect Three Devices

Notes

Appendix F – Adding a Parallel Port to the PC   F

If you need to connect a DaqBook/2000A or DaqBook/2000X to a notebook or desktop PC that has no parallel port available, you can most likely use an interface device to obtain a port. To do so, your PC needs to have an available PC-Card Slot, ISA Bus Slot, PCI Bus Slot, or an Ethernet jack. You can use one of the following devices, depending on which type of interface applies.

WBK20A

For Interfacing with a PC-Card Slot

If you need to connect your DaqBook/2000A or DaqBook/2000X to a notebook PC that has no available parallel port, you can use a WBK20A. This device consists of a PCMCIA Interface Card, cable, and DB25 Connector.

Refer to separate instructions [supplied with the WBK20A] if applicable.
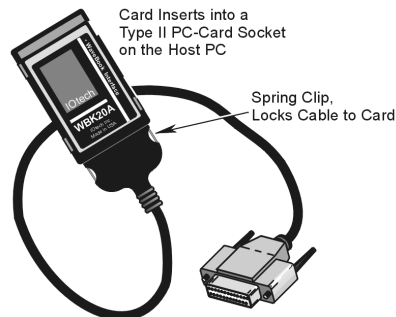
WBK20A, Plugs into a PC-Card Slot

WBK21

For Interfacing with an ISA Bus Slot.

If you need to connect your DaqBook/2000A or DaqBook/2000X to a desktop PC that has no available parallel port, you may be able to use the WBK21 option to provide a port. The board's connector is labeled LPT. WBK21 plugs into and ISA Bus Slot.

Refer to separate instructions [supplied with the WBK21] if applicable.
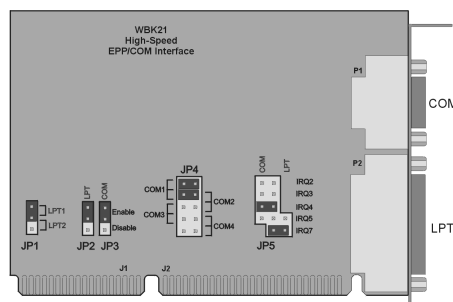
WBK21, Plugs into an ISA Bus Slot

WBK23

For Interfacing with a PCI Bus Slot.

If you need to connect your DaqBook/2000A or DaqBook/2000X to a desktop PC that has no available parallel port, you may be able to use a WBK23 to provide a port. The WBK23 plugs into a PCI Bus Slot.

Refer to separate instructions [supplied with the WBK23] if applicable.
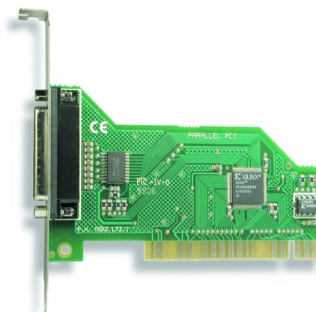
WBK23, Plugs into a PCI Bus Slot

WBK25

For interfacing with an Ethernet jack on a PC or on a network hub.

If you are using a PC or a network with an available Ethernet jack you can obtain three parallel ports by using a WBK25 Ethernet-to-Parallel Port Interface.

The WBK25 provides high-speed Ethernet connectivity for WaveBook, DaqBook, WBK40, and WBK41 systems. Connection to the Ethernet is made via an Ethernet patch cable, which links the WBK25's 10/100BaseT Ethernet port to a PC's Ethernet jack or an Ethernet network hub.

The WBK25 Ethernet-to-Parallel Port Interface connects to the Ethernet and provides three parallel ports.

The WBK25 includes three parallel ports, labeled as expansion ports 1 through 3. Each of these parallel ports can be attached to one of the designated acquisition devices via a parallel cable. The ports cannot be used for auxiliary devices such as printers and scanners.

Refer to separate instructions [supplied with the WBK25] if applicable.

WBK25's three parallel ports are labeled as expansion ports 1 through 3. They are used to connect to WaveBook, DaqBook, WBK40, and WBK41 systems via parallel cables. The ports cannot be used for other parallel devices, such as printers and scanners.

Before you run a test

Before testing the system, make sure the device has been properly installed and powered-on. Make sure all cables are properly and securely connected.

When testing a WaveBook or DaqBook device, if the unit does not respond within 30 seconds perform the following steps:

1) **reboot the system**
2) **upon power-up, re-open the *Daq* Configuration* applet**
3) **select another configuration setting**
4) **reinitiate the test**

How to run a test

a. Open the Control Panel by navigating from the Windows' Desktop as follows:
   Start Menu ⇒ Settings ⇒ Control Panel

b. From the Control Panel, double-click the ***Daq* Configuration*** icon.

c. Select the device that you want to test from the Device Inventory configuration tree (see following figure, item "c").

d. Click the <**Properties**> button. The Properties dialog box will open.

e. Click the "Test Hardware" tab.

f. Click the <**Resource Test**> button.
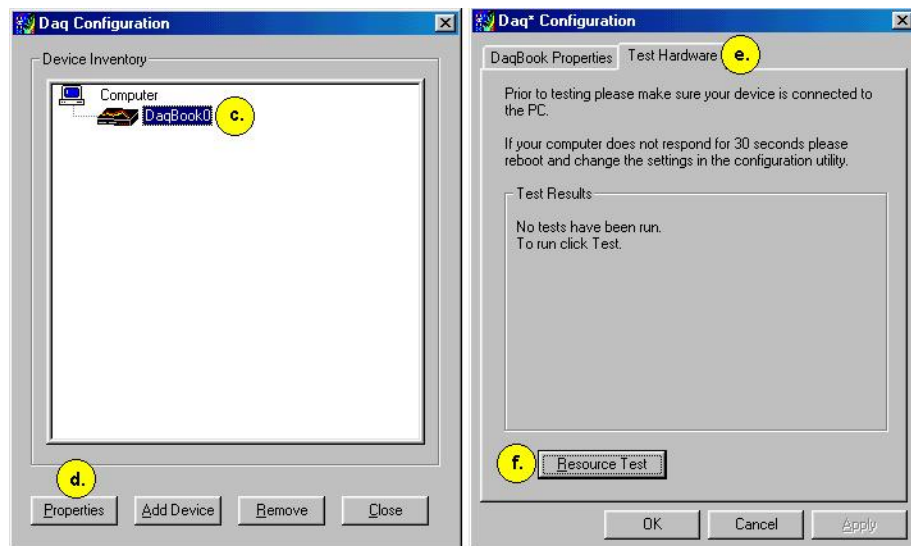
Preparing to Run a Resource Test

What do the tests tell me?

Resource Tests. The resource tests are intended to test system capability for the current device configuration. Resource tests are *pass/fail*. Test failure may indicate a lack of availability of the resource, or a possible resource conflict.

Base Address Test. This resource test checks the base address for the selected port. Failure of this test may indicate that the port is not properly configured within the system. See relevant operating system and computer manufacturer's documentation to correct the problem.

Interrupt Level Test – Tests the ability of a parallel port to generate interrupts. Failure of this test may indicate that the parallel port may be currently unable to generate the necessary hardware interrupt, while other parallel port devices may work OK in this mode. Some parallel port devices (such as printers) do not require interrupts to work properly. See relevant operating system and computer manufacturer's documentation to correct the problem.

Performance Tests. These types of tests are intended to check various device functions, using the current device configuration. Performance tests provide quantitative results for each supported functional group.

Test results represent maximum rates the various operations can be performed. The rates depend on the selected parallel port protocol, and vary according to port hardware capabilities.

The ADC FIFO Input Speed part of the test results in a display of the maximum rate at which data can be transferred from the tested device's internal ADC FIFO to computer memory through the parallel port. Results are given in samples/second, where a sample (2 bytes in length) represents a single A/D value.

If the device has a WBK30 card installed, a WBK30 FIFO Test can be run.

WBK30 FIFO Test. This *performance test* checks the data-storing capabilities of the optional, WBK30 memory card.

Note that the figure to the right represents results from a previous test. Initially the screen shows no test results.

When the test is completed successfully, the *Daq* Configuration Test Dialog Box* indicates a passed condition. For example, in the above figure:

WBK30 FIFO Test → Passed.

"Passed" messages indicate that you can exit the test program and run your application.
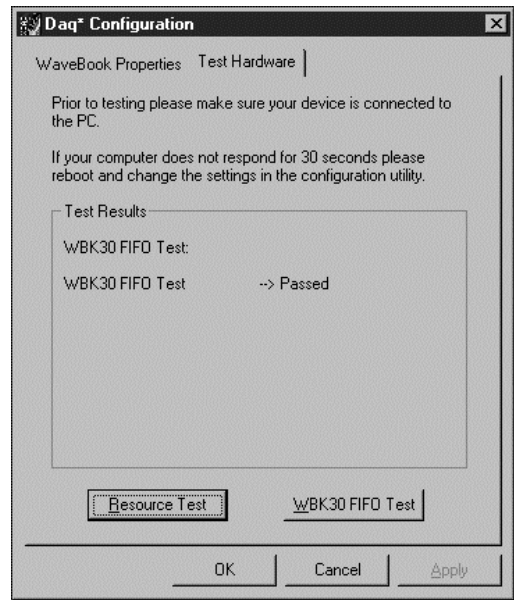
Daq* Configuration - Test Hardware Dialog Box

Reference Notes:

➢ If you experience difficulties, please consult the additional user documentation before calling technical support. User documentation is included on your data acquisition CD, and is installed automatically as a part of product support, when your software is installed. The default location is the Programs Group. The documentation includes API information, pinouts, troubleshooting, and a great deal of material regarding specific DBK cards and modules.

➢ Documents can be read directly from the data acquisition CD via the <**View PDFs**> button located on the opening screen.

➢ Hardcopy versions of the manuals can be ordered from the factory.

System Connections and Pinouts

CAUTION

Turn off power to all devices connected to the system before connecting cables or setting configuration jumpers and switches. Electrical shock or damage to equipment can result even under low-voltage conditions.

CAUTION

The discharge of static electricity can damage some electronic components. Semiconductor devices are especially susceptible to ESD damage. You should always handle components carefully, and you should never touch connector pins or circuit components unless you are following ESD guidelines in an appropriate ESD controlled area. Such guidelines include the use of properly grounded mats and wrist straps, ESD bags and cartons, and related procedures.

Overview

DaqBook/2000 Series Devices have 37-pin P1, P2 and P3 connectors. P1 is used for Analog I/O, P2 for Digital I/O, and P3 for Pulse/Frequency/Digital I/O. Each DaqBook/2000 Series device includes a 100-pin P4 connector. In regard to P4, a DBK200 Series Card or Module can be connected to it via cable to provide different connection options for Analog, Digital, and Pulse/Frequency/Digital I/O connectivity. The most preferred of the DBK200 Series expansion options are discussed following the Pinout Sections for P1, P2, P3, and P4.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O.   See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The following pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.

Note! There are two ways to connect a DBK option to a DaqBook/2000 Series device. The first method is preferable, as it introduces less noise.

Preferred Method – (a) Connect a CA-37-x cable to the appropriate DB37 connector [P1, P2, or P3] on the DaqBook/2000 Series device. (b) Connect the free end of the cable to the DBK card or module.

Optional Method – (a) Connect a CA-195-x cable to the P4 connector on the DaqBook/2000 Series device. (b) Connect the free end of the cable to a DBK200 Series device. (c) Connect the DBK option to the DBK200 Series device, as applicable.

The primary reason that less noise is seen in the "preferred" method is that a DaqBook/2000 Series device's P1 connector pertains only to analog acquisition signals and the P2 connector pertains only to digital I/O. This provides a strong degree of isolation between the two signal types. However, in the case of a CA-195-x cable connected to P4, digital and analog signals co-exist in one cable.

Tip If you need to use the P4 connection method, use of the 8-inch ribbon cable (CA-195-1) will result in the lowest level of crosstalk [for that method].

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CAUTION

Do not confuse connectors. Ensure that you only connect P1 I/Os to P1, P2 I/Os to P2, and P3 I/Os to P3. Improper connection may result in equipment damage.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The following pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.

P1
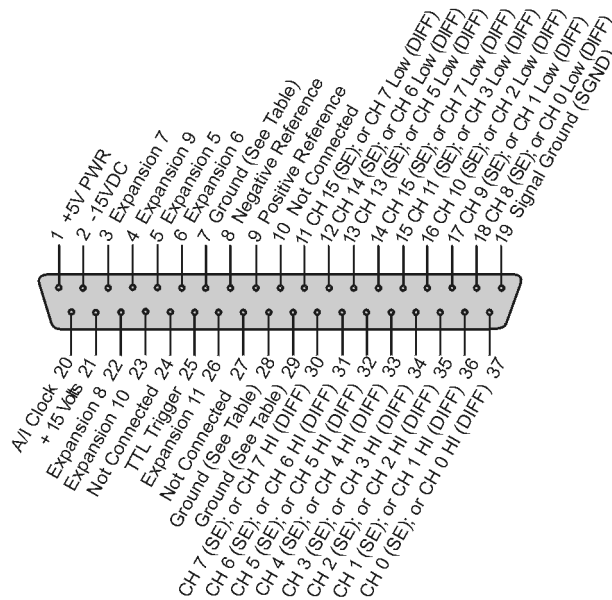
Pin	Signal Name	Description for P1 Pin Use	P4 Correlation
1	+5 Volts	Expansion +5 V power	A1
2	-15 Volts	Expansion -15 VDC power	A48
3	Expansion 7	Digital OUT, external ADDRESS select bit 3	B32
4	Expansion 9	Digital OUT, external ADDRESS select bit 1	B33
5	Expansion 5	Digital OUT, external GAIN select bit 1	B31
6	Expansion 6	Digital OUT, external GAIN select bit 0	A32
7	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
8	Negative Reference	Analog, -5 V reference	A36
9	Positive Reference	Analog +5V reference	B35
10	Not Connected	N/A	N/A
11	CH 15 (SE), or CH 7 LO DIFF	Ch 15 HI IN (single-ended mode) / Ch 7 LO IN (differential mode)	B36
12	CH 14 (SE), or CH 6 LO DIFF	Ch 14 HI IN (single-ended mode) / Ch 6 LO IN (differential mode)	A38
13	CH 13 (SE), or CH 5 LO DIFF	Ch 13 HI IN (single-ended mode) / Ch 5 LO IN (differential mode)	B39
14	CH 12 (SE), or CH 4 LO DIFF	Ch 12 HI IN (single-ended mode) / Ch 4 LO IN (differential mode)	A41
15	CH 11 (SE), or CH 3 LO DIFF	Ch 11 HI IN (single-ended mode) / Ch 3 LO IN (differential mode)	B42
16	CH 10 (SE), or CH 2 LO DIFF	Ch 10 HI IN (single-ended mode) / Ch 2 LO IN (differential mode)	A44
17	CH 9 (SE), or CH 1 LO DIFF	Ch 9 HI IN (single-ended mode) / Ch 1 LO IN (differential mode)	B45
18	CH 8 (SE), or CH 0 LO DIFF	Ch 8 HI IN (single-ended mode) / Ch 0 LO IN (differential mode)	A47
19	Signal Ground (SGND)	Sense Common (SGND)	A45
20	A/I Clock	External ADC Pacer Clock Input / Internal ADC Pacer Clock Output	B26
21	+15 Volts	Expansion +15 V power	B48
22	Expansion 8	Digital OUT, external ADDRESS select bit 2	A33
23	Expansion 10	Digital OUT, external ADDRESS select bit 0	A34
24	Not Connected	N/A	N/A
25	TTL Trigger	Digital IN, External TTL Trigger Input	A27
26	Expansion 11	Digital OUT, Simultaneous sample and hold (SSH)	B34
27	Not Connected	N/A	N/A
28	AGND	Analog Ground A31, A35, B37, A39, B40, A42, B43, B46	⇐
29	AGND	Analog Ground A31, A35, B37, A39, B40, A42, B43, B46	⇐
30	CH 7 (SE), or CH 7 HI DIFF	Ch 7 IN (single-ended mode) / Ch 7 HI IN (differential mode)	A37
31	CH 6 (SE), or CH 6 HI DIFF	Ch 6 IN (single-ended mode) / Ch 6 HI IN (differential mode)	B38
32	CH 5 (SE), or CH 5 HI DIFF	Ch 5 IN (single-ended mode) / Ch 5 HI IN (differential mode)	A40
33	CH 4 (SE), or CH 4 HI DIFF	Ch 4 IN (single-ended mode) / Ch 4 HI IN (differential mode)	A33, B41
34	CH 3 (SE), or CH 3 HI DIFF	Ch 3 IN (single-ended mode) / Ch 3 HI IN (differential mode)	A43
35	CH 2 (SE), or CH 2 HI DIFF	Ch 2 IN (single-ended mode) / Ch 2 HI IN (differential mode)	B44
36	CH 1 (SE), or CH 1 HI DIFF	Ch 1 IN (single-ended mode) / Ch 1 HI IN (differential mode)	A46
37	CH 0 (SE), or CH 0 HI DIFF	Ch 0 IN (single-ended mode) / Ch 0 HI IN (differential mode)	B47

P2

Digital I/O Port B (Pins 3 thru 10)

Digital I/O Port C (Pins 22 thru 29)

Digital I/O Port A (Pins 30 thru 37)
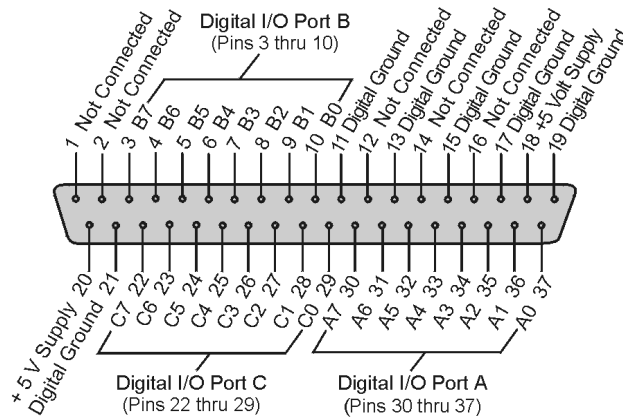
Pin	Signal Name	Description for P2 Pin Use	P4 Correlation
1	Not Connected	N/A	N/A
2	Not Connected	N/A	N/A
3	Port B - B7	Digital I/O: P2 Digital Port B, Bit 7; or, P2 Expansion Address Bit 0 Out	B10
4	Port B - B6	Digital I/O: P2 Digital Port B, Bit 6; or, P2 Expansion Address Bit 1 Out	A11
5	Port B - B5	Digital I/O: P2 Digital Port B, Bit 5; or, P2 Expansion Address Bit 2 Out	B11
6	Port B - B4	Digital I/O: P2 Digital Port B, Bit 4; or, P2 Expansion Address Bit 3 Out	A12
7	Port B - B3	Digital I/O: P2 Digital Port B, Bit 3; or, P2 Expansion Address Bit 4 Out	B12
8	Port B - B2	Digital I/O: P2 Digital Port B, Bit 2; or, P2 Expansion RESET Output	A13
9	Port B - B1	Digital I/O: P2 Digital Port B, Bit 1; or, P2 Expansion WRITE Output	B13
10	Port B - B0	Digital I/O: P2 Digital Port B, Bit 0; or, P2 Expansion READ Output	A14
11	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
12	Not Connected	N/A	N/A
13	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
14	Not Connected	N/A	N/A
15	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
16	Not Connected	N/A	N/A
17	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
18	+ 5 Volt Supply	Expansion +5 Volt Power	A1, B1
19	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
20	+ 5 Volt Supply	Expansion +5 Volt Power	A1, B1
21	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
22	Port C - C7	Digital I/O: P2 Digital Port C, Bit 7; or, P2 Expansion Data Bit 7	A6
23	Port C - C6	Digital I/O: P2 Digital Port C, Bit 6; or, P2 Expansion Data Bit 6	B6
24	Port C - C5	Digital I/O: P2 Digital Port C, Bit 5; or, P2 Expansion Data Bit 5	A7
25	Port C - C4	Digital I/O: P2 Digital Port C, Bit 4; or, P2 Expansion Data Bit 4	B7
26	Port C - C3	Digital I/O: P2 Digital Port C, Bit 3; or, P2 Expansion Data Bit 3	A8
27	Port C - C2	Digital I/O: P2 Digital Port C, Bit 2; or, P2 Expansion Data Bit 2	B8
28	Port C - C1	Digital I/O: P2 Digital Port C, Bit 1; or, P2 Expansion Data Bit 1	A9
29	Port C - C0	Digital I/O: P2 Digital Port C, Bit 0; or, P2 Expansion Data Bit 0	B9
30	Port A - A7	Digital I/O: P2 Digital Port A, Bit 7	A2
31	Port A - A6	Digital I/O: P2 Digital Port A, Bit 6	B2
32	Port A - A5	Digital I/O: P2 Digital Port A, Bit 5	A3
33	Port A - A4	Digital I/O: P2 Digital Port A, Bit 4	B3
34	Port A - A3	Digital I/O: P2 Digital Port A, Bit 3	A4
35	Port A - A2	Digital I/O: P2 Digital Port A, Bit 2	B4
36	Port A - A1	Digital I/O: P2 Digital Port A, Bit 1	A5
37	Port A - A0	Digital I/O: P2 Digital Port A, Bit 0	B5

P3
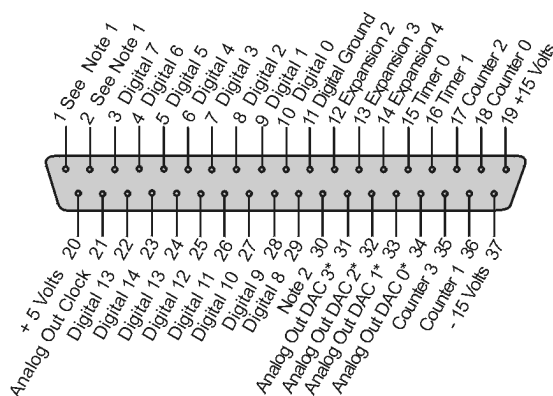
DB37 P3 Connector

*In regard to pins 31 through 34, for Analog Out DACs, see Note 3.

Pin	Signal Name	Description for P3 Pin Use	P4 Correlation
1	Not Connected		---
2	Not Connected		---
3	Digital 7	P3 Digital Port Bit 7	B19
4	Digital 6	P3 Digital Port Bit 6	A19
5	Digital 5	P3 Digital Port Bit 5	B20
6	Digital 4	P3 Digital Port Bit 4	A20
7	Digital 3	P3 Digital Port Bit 3	B21
8	Digital 2	P3 Digital Port Bit 2	A21
9	Digital 1	P3 Digital Port Bit 1	B22
10	Digital 0	P3 Digital Port Bit 0	A22
11	DGND	Digital Ground A10, B14, A23, A24, B25, B27	⇐
12	Expansion 2	Reserved for XC/D-	---
13	Expansion 3	Reserved for XWR-	---
14	Expansion 4	Reserved for XRD-	---
15	Timer 0	P3 Timer 0 Output	B24
16	Timer 1	P3 Timer 1 Output	A25
17	Counter 2	P3 Counter 2 Input	B28
18	Counter 0	P3 Counter 0 Input	B29
19	+ 15 Volts	Expansion, +15 VDC	B48
20	+ 5 Volt Supply	Expansion, +5 Volt Power	A1, B1
21	Analog Out Clock	External DAC Pacer Clock Input/Internal DAC Pacer Clock Output	A26
22	Digital 15	Digital I/O; P3 Digital Port Bit 15	B15
23	Digital 14	Digital I/O; P3 Digital Port Bit 14	A15
24	Digital 13	P3 Digital Port Bit 13	B16
25	Digital 12	P3 Digital Port Bit 12	A16
26	Digital 11	P3 Digital Port Bit 11	B17
27	Digital 10	P3 Digital Port Bit 10	A17
28	Digital 9	P3 Digital Port Bit 9	B18
29	Digital 8	P3 Digital Port Bit 8	A18
30	AGND	Analog Ground A31, A35, B37, A39, B40, A42, B43, B46	⇐
31	Analog Out DAC 3 (Note)	Analog DAC 3 Output (Note)	B50
32	Analog Out DAC 2 (Note)	Analog DAC 2 Output (Note)	B49
33	Analog Out DAC 1 (Note)	Analog DAC 1 Output (Note)	A50
34	Analog Out DAC 0 (Note)	Analog DAC 0 Output (Note)	A49
35	Counter 3	P3 Counter 3 Input	A28
36	Counter 1	P3 Counter 1 Input	A29
37	- 15 Volts	Expansion, - 15 VDC Power	A48

Note: Pins 31, 32, 33, and 34 on the P3 DB37 connector are used for Analog Out DACs. These four pins only apply to a DaqBook/2000 Series device when a DBK46 Analog Channel Output option card is installed in that device. Installation of the DBK46 option is only to be performed at the factory.

P4 to P1, P2 and P3 Correlation for DaqBook/2000 Series Devices

A50

A1

B50

B1
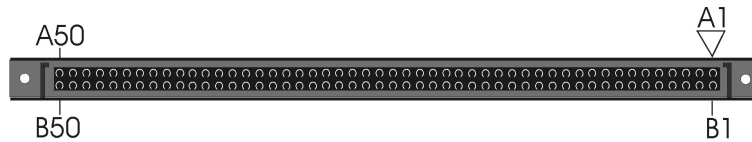
P4, 100-Pin Connector

The following table lists the correlation between the P4 I/O lines and their respective P1, P2 and P3 pin locations on the DaqBook/2000 Series devices.

P4 Pin	Signal	Type	Description	P1, P2, P3 Correlation
A1	+5VDC	Power	Expansion +5 Volts	P1 pin 1 P2 pin 18, 20 P3 pin 20
B1	+5VDC	Power	Expansion +5 Volts	P1 pin 1 P2 pin 18, 20 P3 pin 20
A2	Port A bit 7	Dig I/O	P2 Digital Port A, bit 7	P2 pin 30
B2	Port A bit 6	Dig I/O	P2 Digital Port A, bit 6	P2 pin 31
A3	Port A bit 5	Dig I/O	P2 Digital Port A, bit 5	P2 pin 32
B3	Port A bit 4	Dig I/O	P2 Digital Port A, bit 4	P2 pin 33
A4	Port A bit 3	Dig I/O	P2 Digital Port A, bit 3	P2 pin 34
B4	Port A bit 2	Dig I/O	P2 Digital Port A, bit 2	P2 pin 35
A5	Port A bit 1	Dig I/O	P2 Digital Port A, bit 1	P2 pin 36
B5	Port A bit 0	Dig I/O	P2 Digital Port A, bit 0	P2 pin 37
A6	Port C bit 7	Dig I/O	P2 Digital Port C, bit 7 -or- P2 expansion Data bit 7	P2 pin 22
B6	Port C bit 6	Dig I/O	P2 Digital Port C, bit 6 -or- P2 expansion Data bit 6	P2 pin 23
A7	Port C bit 5	Dig I/O	P2 Digital Port C, bit 5 -or- P2 expansion Data bit 5	P2 pin 24
B7	Port C bit 4	Dig I/O	P2 Digital Port C, bit 4 -or- P2 expansion Data bit 4	P2 pin 25
A8	Port C bit 3	Dig I/O	P2 Digital Port C, bit 3 -or- P2 expansion Data bit 3	P2 pin 26
B8	Port C bit 2	Dig I/O	P2 Digital Port C, bit 2 -or- P2 expansion Data bit 2	P2 pin 27
A9	Port C bit 1	Dig I/O	P2 Digital Port C, bit 1 -or- P2 expansion Data bit 1	P2 pin 28
B9	Port C bit 0	Dig I/O	P2 Digital Port C, bit 0 -or- P2 expansion Data bit 0	P2 pin 29
A10	Ground	Dig I/O	Digital Common	Multiple, see P1, P2, P3
B10	Port B bit 7	Dig I/O	P2 Digital Port B, bit 7 -or- P2 expansion address bit 0	P2 pin 3
A11	Port B bit 6	Dig I/O	P2 Digital Port B, bit 6 -or- P2 expansion address bit 1	P2 pin 4
B11	Port B bit 5	Dig I/O	P2 Digital Port B, bit 5 -or- P2 expansion address bit 2	P2 pin 5
A12	Port B bit 4	Dig I/O	P2 Digital Port B, bit 4 -or- P2 expansion address bit 2	P2 pin 6
B12	Port B bit 3	Dig I/O	P2 Digital Port B, bit 3 -or- P2 expansion address bit 3	P2 pin 7
A13	Port B bit 2	Dig I/O	P2 Digital Port B, bit 2 -or- P2 expansion RESET	P2 pin 8
B13	Port B bit 1	Dig I/O	P2 Digital Port B, bit 1 -or- P2 expansion WRITE	P2 pin 9

This table is continued.

P4 Pin	Signal	Type	Description	P1, P2, P3 Correlation
A14	Port B bit 0	Dig I/O	P2 Digital Port B, bit 0 -or- P2 expansion READ	P2 pin 10
B14	Ground	Dig I/O	Digital Common	Multiple, see P1, P2, P3
A15	P3 Dig bit 14	Dig I/O	P3 Digital Port bit 14	P3 pin 23
B15	P3 Dig bit 15	Dig I/O	P3 Digital Port bit 15	P3 pin 22
A16	P3 Dig bit 12	Dig I/O	P3 Digital Port bit 12	P3 pin 25
B16	P3 Dig bit 13	Dig I/O	P3 Digital Port bit 13	P3 pin 24
A17	P3 Dig bit 10	Dig I/O	P3 Digital Port bit 10	P3 pin 27
B17	P3 Dig bit 11	Dig I/O	P3 Digital Port bit 11	P3 pin 26
A18	P3 Dig bit 8	Dig I/O	P3 Digital Port bit 8	P3 pin 29
B18	P3 Dig bit 9	Dig I/O	P3 Digital Port bit 9	P3 pin 28
A19	P3 Dig bit 6	Dig I/O	P3 Digital Port bit 6	P3 pin 4
B19	P3 Dig bit 7	Dig I/O	P3 Digital Port bit 7	P3 pin 3
A20	P3 Dig bit 4	Dig I/O	P3 Digital Port bit 4	P3 pin 6
B20	P3 Dig bit 5	Dig I/O	P3 Digital Port bit 5	P3 pin 5
A21	P3 Dig bit 2	Dig I/O	P3 Digital Port bit 2	P3 pin 8
B21	P3 Dig bit 3	Dig I/O	P3 Digital Port bit 3	P3 pin 7
A22	P3 Dig bit 0	Dig I/O	P3 Digital Port bit 0	P3 pin 10
B22	P3 Dig bit 1	Dig I/O	P3 Digital Port bit 1	P3 pin 9
A23	Ground	Dig I/O	Digital Common	Multiple, see P1, P2, P3
B23	XWR-	Dig I/O	Reserved	P3 pin 13
A24	Ground	Dig I/O	Digital Common	Multiple, see P1, P2, P3
B24	Timer 0	Dig OUT	P3 Timer 0 Output	P3 pin 15
A25	Timer 1	Dig OUT	P3 Timer 1 Output	P3 pin 16
B25	Ground	Dig I/O	Digital Common	Multiple, see P1, P2, P3
A26	DAC Pacer	Dig I/O	External DAC Pacer Clock Input / Internal DAC Pacer Output	P3 pin 21
B26	ADC Pacer	Dig I/O	External ADC Pacer Clock Input / Internal ADC Pacer Output	P1 pin 20
A27	TTL Trigger	Dig IN	External TTL Trigger Input	P1 pin 25
B27	Ground	Dig I/O	Digital Common	Multiple, see P1, P2, P3
A28	Counter 3	Dig IN	P3 Counter 3 Input	P3 pin 35
B28	Counter 2	Dig IN	P3 Counter 2 Input	P3 pin 17
A29	Counter 1	Dig IN	P3 Counter 1 Input	P3 pin 36
B29	Counter 0	Dig IN	P3 Counter 0 Input	P3 pin 18
A30	XRD-	Dig I/O	Reserved	P3 pin 14
B30	XC/D	Dig I/O	Reserved	P3 pin 12
A31	Ground	Analog	Analog Signal Common	Multiple, see P1, P2, P3
B31	XI/O Gain 1	Dig OUT	Analog Expansion Gain Select bit 1	P1 pin 5
A32	XI/O Gain 0	Dig OUT	Analog Expansion Gain Select bit 0	P1 pin 6
B32	XI/O Address 3	Dig OUT	Analog Exp. Address Select bit 3	P1 pin 3
A33	XI/O Address 2	Dig OUT	Analog Exp. Address Select bit 2	P1 pin 22
B33	XI/O Address 1	Dig OUT	Analog Exp. Address Select bit 1	P1 pin 4
A34	XI/O Address 0	Dig OUT	Analog Exp. Address Select bit 0	P1 pin 23
B34	External SSH	Dig OUT	Analog Expansion Simultaneous Sample/Hold Signal	P1 pin 26
A35	Ground	Analog	Analog Signal Common	Multiple, see P1, P2, P3
B35	Positive Ref	Analog	Analog +5 Volt Reference	P1 pin 9
A36	Negative Ref	Analog	Analog -5 Volt Reference	P1 pin 8
B36	Analog In Ch15	Analog	Analog Input Chan 15 (SE) Analog Input Chan 7L (DIF)	P1 pin 11
A37	Analog In Ch7	Analog	Analog Input Chan 7 (SE) Analog Input Chan 7H (DIF)	P1 pin 30
B37	Ground	Analog	Analog Signal Common	Multiple, see P1, P2, P3
A38	Analog In Ch14	Analog	Analog Input Chan 14 (SE) Analog Input Chan 6L (DIF)	P1 pin 12
B38	Analog In Ch6	Analog	Analog Input Chan 6 (SE) Analog Input Chan 6H (DIF)	P1 pin 31
A39	Ground	Analog	Analog Signal Common	Multiple, see P1, P2, P3

This table is continued.

P4 Pin	Signal	Type	Description	P1, P2, P3 Correlation
B39	Analog In Ch13	Analog	Analog Input Chan 13 (SE) Analog Input Chan 5L (DIF)	P1 pin 13
A40	Analog In Ch5	Analog	Analog Input Chan 5 (SE) Analog Input Chan 5H (DIF)	P1 pin 32
B40	Ground	Analog	*Analog Signal Common*	*Multiple, see P1, P2, P3*
A41	Analog In Ch12	Analog	Analog Input Chan 12 (SE) Analog Input Chan 4L (DIF)	P1 pin 14
B41	Analog In Ch 4	Analog	Analog Input Chan 4 (SE) Analog Input Chan 4H (DIF)	P1 pin 33
A42	Ground	Analog	*Analog Signal Common*	*Multiple, see P1, P2, P3*
B42	Analog In Ch11	Analog	Analog Input Chan 11 (SE) Analog Input Chan 3L (DIF)	P1 pin 15
A43	Analog In Ch3	Analog	Analog Input Chan 3 (SE) Analog Input Chan 3H (DIF)	P1 pin 34
B43	Ground	Analog	*Analog Signal Common*	*Multiple, see P1, P2, P3*
A44	Analog In Ch10	Analog	Analog Input Chan 10 (SE) Analog Input Chan 2L (DIF)	P1 pin 16
B44	Analog In Ch2	Analog	Analog Input Chan 2 (SE) Analog Input Chan 2H (DIF)	P1 pin 35
A45	Signal Ground	Analog	Sense Common (SGND)	P1-19
B45	Analog In Ch9	Analog	Analog Input Chan 9 (SE) Analog Input Chan 1L (DIF)	P1 pin 17
A46	Analog In Ch1	Analog	Analog Input Chan 1 (SE) Analog Input Chan 1H (DIF)	P1 pin 36
B46	Ground	Analog	*Analog Signal Common*	*Multiple, see P1, P2, P3*
A47	Analog In Ch8	Analog	Analog Input Chan 8 (SE) Analog Input Chan 0L (DIF)	P1 pin 18
B47	Analog In Ch0	Analog	Analog Input Chan 0 (SE) Analog Input Chan 0H (DIF)	P1 pin 37
A48	-15VDC	Power	Expansion -15 Volts	P1 pin 2 P3 pin 37
B48	+15VDC	Power	Expansion +15 Volts	P1 pin 21 P3 pin 19
A49 *	DAC 0	Analog	DAC 0 Output	Requires a DBK46 to be Installed.	P3 pin 34
B49 *	DAC 2	Analog	DAC 2 Output		P3 pin 32
A50 *	DAC 1	Analog	DAC 1 Output		P3 pin 33
B50 *	DAC 3	Analog	DAC 3 Output		P3 pin 31

* DAC 0, DAC1, DAC2, and DAC 3 (from P4 pins A49, B49, A50, and B50, respectively) only apply to the DaqBook/2000 Series Devices when a DBK46 plug-in card has been installed in the unit.

DBK200 Series, Selected P4 Connector Options

This section of the document pertains to DBK200 Series devices that are typically used when the P4 connection option is desired. For information regarding other DBK200 Series options, refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). A PDF version of the document is included on the data acquisition CD.

If your acquisition system needs to be CE Compliant, read the Declaration of Conformity for your DaqBook/2000 Series device and *Chapter 3, CE Compliance* prior to expanding the acquisition system.

Reference Note: Prior to connecting a DBK to a DaqBook/2000 Series device, refer to the applicable DBK document module(s), in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).). A PDF version of the document is included on the data acquisition CD.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The previous pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.

There are two ways to connect a DBK option to a DaqBook/2000 Series device. The first method is preferable, as it introduces less noise.

Preferred Method – (a) Connect a CA-37-x cable to the appropriate DB37 connector [P1, P2, or P3] on the DaqBook/2000 Series device. (b) Connect the free end of the cable to the DBK card or module.

Optional Method – (a) Connect a CA-195-x cable to the P4 connector on the DaqBook/2000 Series device. (b) Connect the free end of the cable to a DBK200 Series device. (c) Connect the DBK option to the DBK200 Series device, as applicable.

The primary reason that less noise is seen in the "preferred" method is that a DaqBook/2000 Series device's P1 connector pertains only to analog acquisition signals and the P2 connector pertains only to digital I/O. This provides a strong degree of isolation between the two signal types. However, in the case of a CA-195-x cable connected to P4, digital and analog signals co-exist in one cable.

If you need to use the P4 connection method, use of the 8-inch ribbon cable (CA-195-1) will result in the lowest level of crosstalk [for that method].

The following matrix provides a quick comparison of the DBK200 Series adapter boards. Details for each board are provided in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). An illustration and brief discussion of selected adapter boards is presented after the following table.

DBK200 Series, Adapter Board Matrix							
DBK	P1 Analog	P2 Digital	P3 Pulse, Freq., Digital	P4	Screw Term-inals	Special Features	Comments
200	Yes	No	No	Yes	No	No	Analog I/O use only.
201	Yes	Yes	Yes	Yes	No	No	Like DBK209, except for form-factor.
202 203 204	Yes	Yes	40-pin header for P3	Yes	Yes	Custom RC Filter Setup.	DBK202 is a board only. DBK203 consists of a DBK202 mounted in a chassis. DBK204 consists of a DBK203 and a CA-209 CE cable kit. *
205	No	No	12 screw-term.	Yes	Yes	No	Only used with DaqBoard/2003 or /2003c. Can plug directly into P4. Screw terminals are related to P3.
206	Yes	Yes	Yes	Yes	Yes	No	Similar to DBK202, but has a different form-factor and has no RC filter setup.
207 207/CJC	Yes (Qty. 2)	No	No	Yes	Yes	Can carry 5B modules.	Supports 5B-compatible Analog I/O modules. DBK207/CJC includes Cold Junction Compensation. Includes two P1 connectors. Screw terminals are for 5B module connections.
208	No	Yes (Qty. 2)	No	Yes	Yes	Can carry relay modules.	Supports Opto-22 compatible Solid-State-Relay (SSR) digital modules. Includes two P2 connectors.
209	Yes	Yes	Yes	Yes	No	No	Like DBK201, except for form-factor.

- Cable Kit CA-209 CE, which is included with DBK204, does not apply to DaqBook/2000 Series devices. Refer to chapter 3, *CE Compliance*, for detailed information.

DBK202 and DBK203
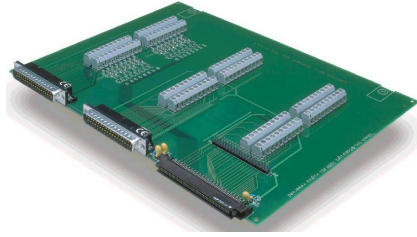
DBK202

**P4-to-P1/P2/P3 Adapter with Screw-Terminals
and Locators for RC Filter Setup**

DBK203, with Cover Plate Removed

**Chassis-Mounted P4-to-P1/P2/P3 Adapter with
Screw-Terminals and Locators for RC Filter Setup**

DBK203 Screw-Terminal Adapter Module

The DBK203 consists of a DBK202 board that is mounted to a card drawer. DBK203's card drawer is housed in a shielded metal enclosure; and can be slid free of the module. The sliding card drawer provides easy access to the board's twelve terminal blocks and to the 40-pin P3 header. Note that the DBK203 modules can be easily mounted to other DBK modules via fastener panels that are included in splice plate kits.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The previous pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.

DBK203 Includes a Slide-Out Draw with a DBK202 Board

Reference Note:

You can install resistors and capacitors to create RC networks for P1's Analog Input Channels. Refer to the DBK203 section of the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) for details. A PDF version of the document is included on the data acquisition CD.

The DBK202 and DBK203 adapters each provide a DB37 P1 connector, DB37 P2 connector, and a 40-pin header (designated as P3).

- P1 is used for ANALOG I/O
- P2 for DIGITAL I/O
- P3 for Pulse/Frequency (Digital and Counter/Timer) I/O

In addition to the P1, P2, and P3 connectors, these boards include terminal blocks designated TB1 through TB12. The blocks provide a screw-terminal connection option for P1, P2, and P3.

Each of the three adapters can be connected to the DaqBook/2000 Series Device's 100-pin P4 connector via a CA-195 cable.

Note: These screw-terminal adapter boards provide a means of connecting signals to a DaqBook/2000 Series Device via one of three methods:

- Cables connected to the DBK202 [or DBK203] P1, P2, and P3 connectors, as applicable.
- Signal wires connected to the appropriate screw-terminal blocks (TB1 through TB12). The board's silkscreen identifies all screw terminals.
- A combination of the above two methods.

DBK206

The DBK206 provides a P1, P2, and P3 connector and corresponding screw-terminal blocks.

- P1 is used for ANALOG I/O
- P2 for DIGITAL I/O
- P3 for Pulse/Frequency (Digital and Counter/Timer) I/O
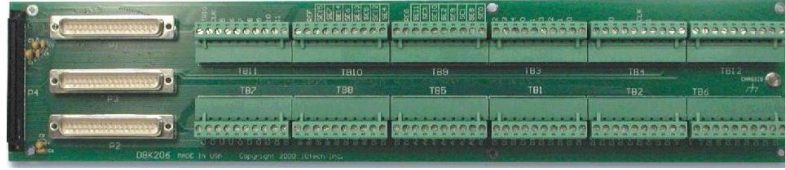
DBK206, P4-to-P1/P2/P3 Adapter with Screw-Terminals

The DBK206 is suitable for both analog and digital expansion. Signal connection to a DaqBook/2000 Series Device can be made as follows:

- With cables connected to P1, P2, and P3 connectors, as applicable.
- With signal wires connected to the appropriate screw-terminal blocks (TB1 through TB12). Note that the DBK206 board's silkscreen identifies all screw terminals.
- With a combination of the above two methods.

Regardless of which method is used, the DBK206 connects to the 100-pin P4 connector of the DaqBook/2000 Series Device. The connection is made via a CA-195 cable. The board contains mounting holes that allow the board to be secured inside a user-provided enclosure.

Note: Terminal block correlation to P1, P2, and P3 is provided on the next three pages.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.
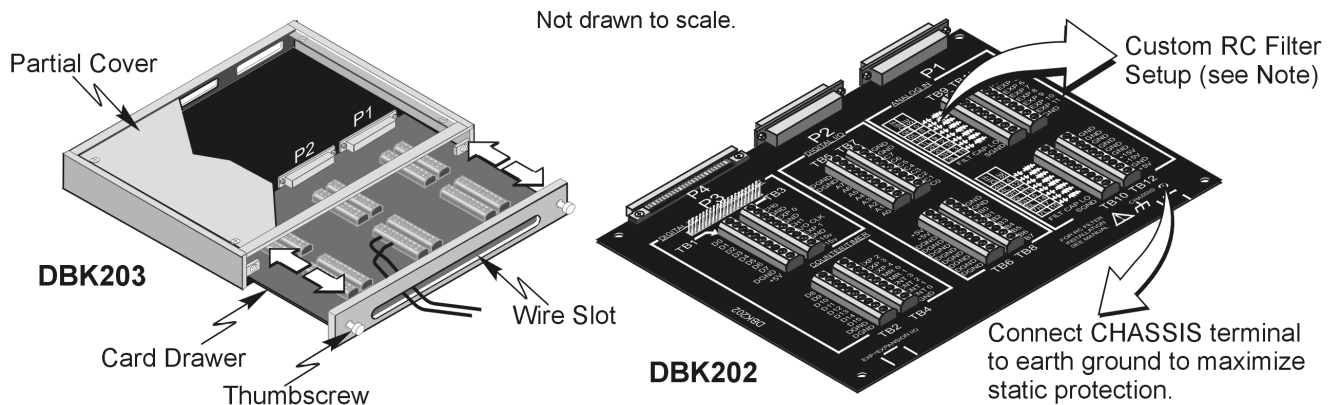
CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The previous pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use those pinouts and the related terminal block pinouts [which follow] to avoid making duplicate signal connections.

DBK206: TB Correlation to P1 – Applies to TB11, TB10, TB9, and TB12 for Analog I/O.
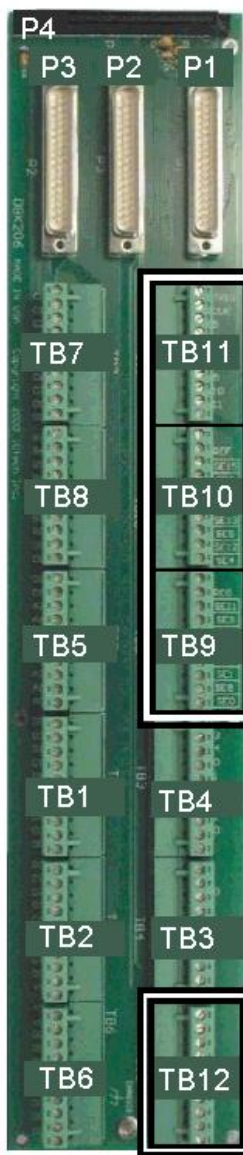
TB11	P1 Pin Number and Description	
TTL TRIG	25	TTL Trigger, Digital IN, External TTL Trigger Input
A/I CLK	20	A/I Clock, External ADC Pacer Clock Input/ Internal ADC Pacer Clock Output
EXP 5	5	Expansion 5. Digital OUT, external GAIN select bit 1
EXP 6	6	Expansion 6. Digital OUT, external GAIN select bit 0
EXP 7	3	Expansion 7. Digital OUT, external ADDRESS, select bit 3
EXP 8	22	Expansion 8. Digital OUT, external ADDRESS, select bit 2
EXP 9	4	Expansion 9. Digital OUT, external ADDRESS, select bit 1
EXP 10	23	Expansion 10. Digital OUT, external ADDRESS, select bit 0
EXP 11	26	Expansion 11. Simultaneous Sample and Hold (SSH)
AGND	*	Common Ground
TB10	**P1 Pin Number and Description**	
SGND	19	Signal Ground, Sense Common
POSREF	9	Positive Reference, Analog +5 V reference
SE15	11	CH 15 IN (Single-Ended Mode) / CH 7 LO IN (Differential Mode)
SE7	30	CH 7 IN (Single-Ended Mode) / CH 7 HI IN (Differential Mode)
SE14	12	CH 14 IN (Single-Ended Mode) / CH 6 LO IN (Differential Mode)
SE6	31	CH 6 IN (Single-Ended Mode) / CH 6 HI IN (Differential Mode)
SE13	13	CH 13 IN (Single-Ended Mode) / CH 5 LO IN (Differential Mode)
SE5	32	CH 5 IN (Single-Ended Mode) / CH 5 HI IN (Differential Mode)
SE12	14	CH 12 IN (Single-Ended Mode) / CH 4 LO IN (Differential Mode)
SE4	33	CH 4 IN (Single-Ended Mode) / CH 4 HI IN (Differential Mode)
TB9	**P1 Pin Number and Description**	
SGND	19	Signal Ground, Sense Common
NEGREF	8	Negative Reference, Analog -5 V reference
SE11	15	CH 11 IN (Single-Ended Mode) / CH 3 LO IN (Differential Mode)
SE3	34	CH 3 IN (Single-Ended Mode) / CH 3 HI IN (Differential Mode)
SE10	16	CH 10 IN (Single-Ended Mode) / CH 2 LO IN (Differential Mode)
SE2	35	CH 2 IN (Single-Ended Mode) / CH 2 HI IN (Differential Mode)
SE9	17	CH 9 IN (Single-Ended Mode) / CH 1 LO IN (Differential Mode)
SE1	36	CH 1 IN (Single-Ended Mode) / CH 1 HI IN (Differential Mode)
SE8	18	CH 8 IN (Single-Ended Mode) / CH 0 LO IN (Differential Mode)
SE0	37	CH 0 IN (Single-Ended Mode) / CH 0 HI IN (Differential Mode)
TB12	**P1 Pin Number and Description**	
AGND	*	Common Ground
AGND	*	Common Ground
AGND	*	Common Ground
AGND	*	Common Ground
AGND	*	Common Ground
AGND	*	Common Ground
+ 15 V	21	Expansion, +15 V Power
- 15 V	2	Expansion, -15 V Power
AGND	*	Common Ground
+ 5 V	1	Expansion, +5 V Power

* In regard to the P1-related grounds, refer to the P1 pinout on page sc-3.

DBK206: TB Correlation to P2 – Applies to TB5, TB6, TB7, and TB8 for Digital I/O.
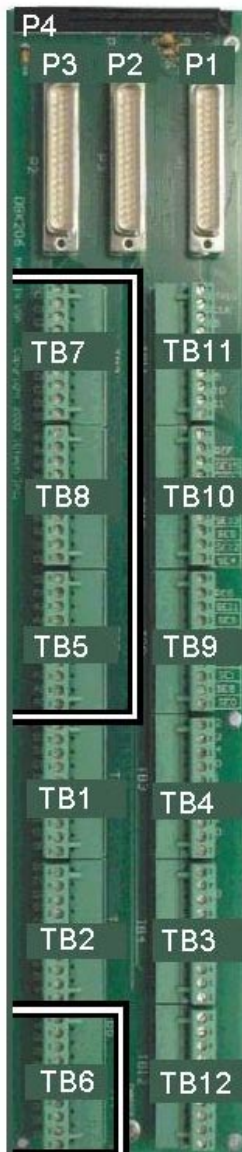
TB7		P2 Pin Number and Description
C0	29	Digital I/O: P2, Digital Port C, Bit 0; or P2 Expansion Data Bit 0
C1	28	Digital I/O: P2, Digital Port C, Bit 1; or P2 Expansion Data Bit 1
C2	27	Digital I/O: P2, Digital Port C, Bit 2; or P2 Expansion Data Bit 2
C3	26	Digital I/O: P2, Digital Port C, Bit 3; or P2 Expansion Data Bit 3
C4	25	Digital I/O: P2, Digital Port C, Bit 4; or P2 Expansion Data Bit 4
C5	24	Digital I/O: P2, Digital Port C, Bit 5; or P2 Expansion Data Bit 5
C6	23	Digital I/O: P2, Digital Port C, Bit 6; or P2 Expansion Data Bit 6
C7	22	Digital I/O: P2, Digital Port C, Bit 7; or P2 Expansion Data Bit 7
DGND	*	Digital Common
DGND	*	Digital Common
TB8		**P2 Pin Number and Description**
B7	3	Digital I/O: P2, Digital Port B, Bit 7; or P2 Expansion Address Bit 0 Out
B6	4	Digital I/O: P2, Digital Port B, Bit 6; or P2 Expansion Address Bit 1 Out
B5	5	Digital I/O: P2, Digital Port B, Bit 5; or P2 Expansion Address Bit 2 Out
B4	6	Digital I/O: P2, Digital Port B, Bit 4; or P2 Expansion Address Bit 3 Out
B3	7	Digital I/O: P2, Digital Port B, Bit 3; or P2 Expansion Address Bit 4 Out
B2	8	Digital I/O: P2, Digital Port B, Bit 2; or P2 Expansion RESET Output
B1	9	Digital I/O: P2, Digital Port B, Bit 1; or P2 Expansion WRITE Output
B0	10	Digital I/O: P2, Digital Port B, Bit 0; or P2 Expansion READ Output
DGND	*	Digital Common
DGND	*	Digital Common
TB5		**P2 Pin Number and Description**
DGND	*	Digital Common
DGND	*	Digital Common
A7	30	Digital I/O: P2, Digital Port A, Bit 7; or P2 Expansion Data Bit 15
A6	31	Digital I/O: P2, Digital Port A, Bit 6; or P2 Expansion Data Bit 14
A5	32	Digital I/O: P2, Digital Port A, Bit 5; or P2 Expansion Data Bit 13
A4	33	Digital I/O: P2, Digital Port A, Bit 4; or P2 Expansion Data Bit 12
A3	34	Digital I/O: P2, Digital Port A, Bit 3; or P2 Expansion Data Bit 11
A2	35	Digital I/O: P2, Digital Port A, Bit 2; or P2 Expansion Data Bit 10
A1	36	Digital I/O: P2, Digital Port A, Bit 1; or P2 Expansion Data Bit 9
A0	37	Digital I/O: P2, Digital Port A, Bit 0; or P2 Expansion Data Bit 8
TB6		**P2 Pin Number and Description**
+5 V	18	Expansion +5 V Power
+5 V	20	Expansion +5 V Power
DGND	*	Digital Common
DGND	*	Digital Common
DGND	*	Digital Common
DGND	*	Digital Common
DGND	*	Digital Common
DGND	*	Digital Common
DGND	*	Digital Common
DGND	*	Digital Common

* In regard to the P2-related grounds, refer to the P2 pinout on page sc-4.

DBK206: TB Correlation to P3 – Applies to TB1, TB2, TB3, and TB4 for Pulse/Frequency/Digital I/O.
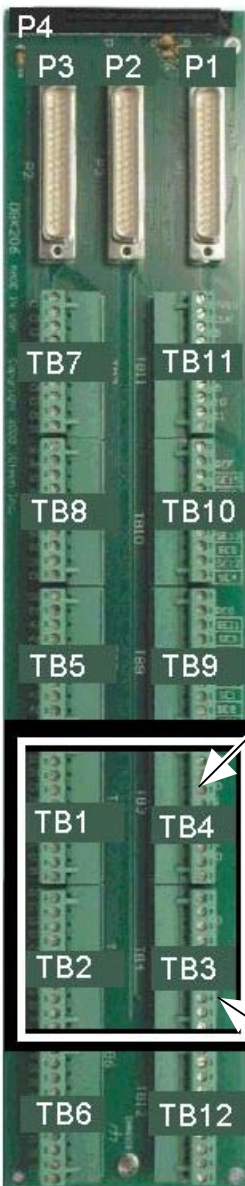
TB1	P3 Pin Number and Description	
D8	29	P3 Digital Port Bit 8
D9	28	P3 Digital Port Bit 9
D10	27	P3 Digital Port Bit 10
D11	26	P3 Digital Port Bit 11
D12	25	P3 Digital Port Bit 12
D13	24	P3 Digital Port Bit 13
D14	23	P3 Digital Port Bit 14
D15	22	P3 Digital Port Bit 15
DGND	*	Digital Common
DGND	*	Digital Common
TB2	**P3 Pin Number and Description**	
D0	10	P3 Digital Port Bit 0
D1	9	P3 Digital Port Bit 1
D2	8	P3 Digital Port Bit 2
D3	7	P3 Digital Port Bit 3
D4	6	P3 Digital Port Bit 4
D5	5	P3 Digital Port Bit 5
D6	4	P3 Digital Port Bit 6
D7	3	P3 Digital Port Bit 7
DGND	*	Digital Common
+5V	20	Expansion, +5 Volt Power
TB4	**P3 Pin Number and Description**	
EXP 2	12	Reserved
EXP 3	13	Reserved
EXP 4	14	Reserved
TMR 0	15	P3 Timer 0 Output
TMR 1	16	P3, Timer 1 Output
CNT 3	35	P3 Counter 3 Input
CNT 2	17	P3 Counter 2 Input
CNT 1	36	P3 Counter 1 Input
CNT0	18	P3 Counter 0 Input
DGND	*	Digital Common
TB3	**P3 Pin Number and Description**	
DAC0	34	Analog Out; Analog DAC 0 Output
DGND	*	Digital Common
DAC2	32	Analog Out; Analog DAC 2 Output
DGND	*	Digital Common
DAC1	33	Analog Out; Analog DAC 1 Output
A/O CLK	21	Analog Out Clock; External DAC Pacer Clock Input/ Internal DAC Pacer Clock Output
DAC3	31	Analog Out; Analog DAC 3 Output
DGND	*	Digital Common
+15 V	19	Expansion, + 15 VDC
-15 V	37	Expansion, -15 VDC

*In regard to P3-related grounds, refer to the P3 pinout on page sc-5.

DBK207 and DBK207/CJC

The DBK207 and DBK207/CJC are carrier boards for 5B-compatible analog input modules. They each provide:

- two P1 connectors – for ANALOG I/O
- a 5 VDC power terminal
- footprints for sixteen 5B Modules
- 16 terminal blocks.

In addition, DBK207/CJC provides Cold Junction Compensation. The DBK207 and DBK207/CJC each include a 100-pin P4 connector for use with DaqBook/2000 Series Devices.

DBK207/CJC Carrier Board for 5B Compatible Modules

WARNING

Ensure that hard-wire emergency over-ride circuitry exists for all applications that make use of dangerous switch-loads. Do not operate such switch-loads unless emergency over-ride circuitry is present.

DBK207 and DBK207/CJC are typically installed in NEMA-type panels; however, they may be installed on DIN rails. Separate mounting instructions are included with Rack Mount Kit (part no. Rack-DBK-3) and with DIN-rail Mount Kit (part no. DIN-DBK-1).

DBK207 and DBK207/CJC allow Daq-based acquisition systems to use various combinations of sixteen 5B signal-conditioning modules. 5B modules can accommodate a variety of signals, including low-level thermocouple and strain-gage signals. Configuration options are flexible. You can select the type of signal attached to each channel. One Daq device can support up to 16 DBK207 [or DBK207/CJC] boards, providing a maximum of 256 isolated, analog input channels. Note that Daq devices scan the channels at the same 10 µs/channel rate as other DBKs (256 scans in 2.56 ms in a full system).

Each user-installed 5B module offers 500 V isolation from the system and between channels. Both DBK207 and DBK207/CJC include 16 screw-terminal blocks for signal inputs. In addition, the DBK207/CJC includes cold junction compensators (CJCs) for use with thermocouple 5B modules. Sockets are provided for user-installed AC1362 current-sense resistor modules, as discussed in *5B Module Connection* in the DBK207 section of the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). A PDF version of the document is included on the data acquisition CD.

> **The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.**

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The previous pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.

DBK208

DBK208 is a two-bank carrier board for optically-isolated Solid-State-Relay (SSR) modules. Each bank supports up to eight digital I/O modules. The banks can be independently set as "input" or "output" via jumpers (JP0 for Bank 0, and JP1 for Bank 1). The I/O modules are industry standard Opto-22 compatible, 5-volt logic level modules.

The DBK208 includes:

- two P2 connectors for DIGITAL I/O
- footprints for sixteen optically-isolated Solid-State-Relay (SSR) Modules
- 16 dual-screw terminal blocks
- a 100-pin P4 connector
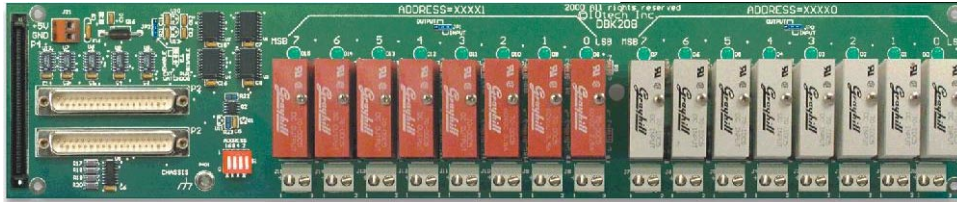
DBK208 Carrier Board for Opto-22 Compatible Solid-State-Relays

WARNING
Ensure that hard-wire emergency over-ride circuitry exists for all applications that make use of dangerous switch-loads. Do not operate such switch-loads unless emergency over-ride circuitry is present.

DBK208 boards are typically installed in NEMA-type panels; however, they may alternatively be installed on DIN rails. Separate mounting instructions are included with Rack Mount Kit (part no. Rack-DBK-3) and with DIN-rail Mount Kit (part no. DIN-DBK-1).

Connection of these devices to DBK208 can be made directly or indirectly as follows:

- Connection can be made from the DaqBook/2000 Series device P2 connector to a DBK208 P2 connector via a CA-37 cable.
- Connection can be made from the DaqBoook/2000 Series Device 100-pin P4 connector to a DBK208's P4 connector via a CA-195 cable.

Note that a single Daq-based data acquisition system can support up to 16 DBK208 boards, providing a total of 256 channels. DBK208 boards contain two DB37 P2 connectors for the purpose of daisy-chaining to other DBK208s or to other P2-supported devices.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.

| CAUTION |
|---|
| **Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.** |
| **Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.** |
| **The previous pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.** |

Operational Overview 1

Daq Systems, the Modular Concept

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.

- *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. Note the DaqBoards can be one of three types: (1) ISA, (2) PCI, or (3) compact-PCI.

- *DBK Option Cards and Modules*. A variety of DBK cards and modules are available for system expansion and to provide signal-conditioning options. 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 *DBK Basics* document module and in the detailed *DBK Option Cards and User's Manual* (p/n 457-0905).

  Note: Only *passive* DBKs, such as the DBK1 BNC module, the DBK11A screw terminal card, and the DBK40 BNC analog interface, can be used with a Daq PC-Cards.

  Reference Notes:
  DBK options are discussed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). As a part of product support, an Adobe PDF version of the manual is automatically loaded onto your hard drive during software installation. The default location is the **Programs** group, which can be accessed through the Windows Desktop.

  Note that our PDF documents can be read directly from the CD. To use this feature: When the CD's opening screen appears, click the <**View PDFs**> button; then select the desired document from the scroll list. The documents are read using the Adobe Acrobat Reader. A copy of the reader is included on the 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. A product support option, included on the data acquisition CD, provides a means of performing post data analysis. More information is included in the software-specific PDF documents that are installed on your hard-drive as a part of product support.

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.

DaqView and DASYLab can only be used with one DaqBook/2000 Series Device at a time. LabVIEW can be used with multiple devices. For multiple device use (via custom programming) refer to the *Using Multiple Devices* section of the *Programmer's Manual*. During software installation from the data acquisition CD, a PDF version of the Programmer's Manual is automatically loaded onto your hard drive as a part of product support. The default location is the Programs group.

Reference Note:
Programming topics are covered in the *Programmer's User Manual* (p/n 1008-0901). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs directory, which can be accessed through the Windows Desktop.

Block Diagram and Basic Features
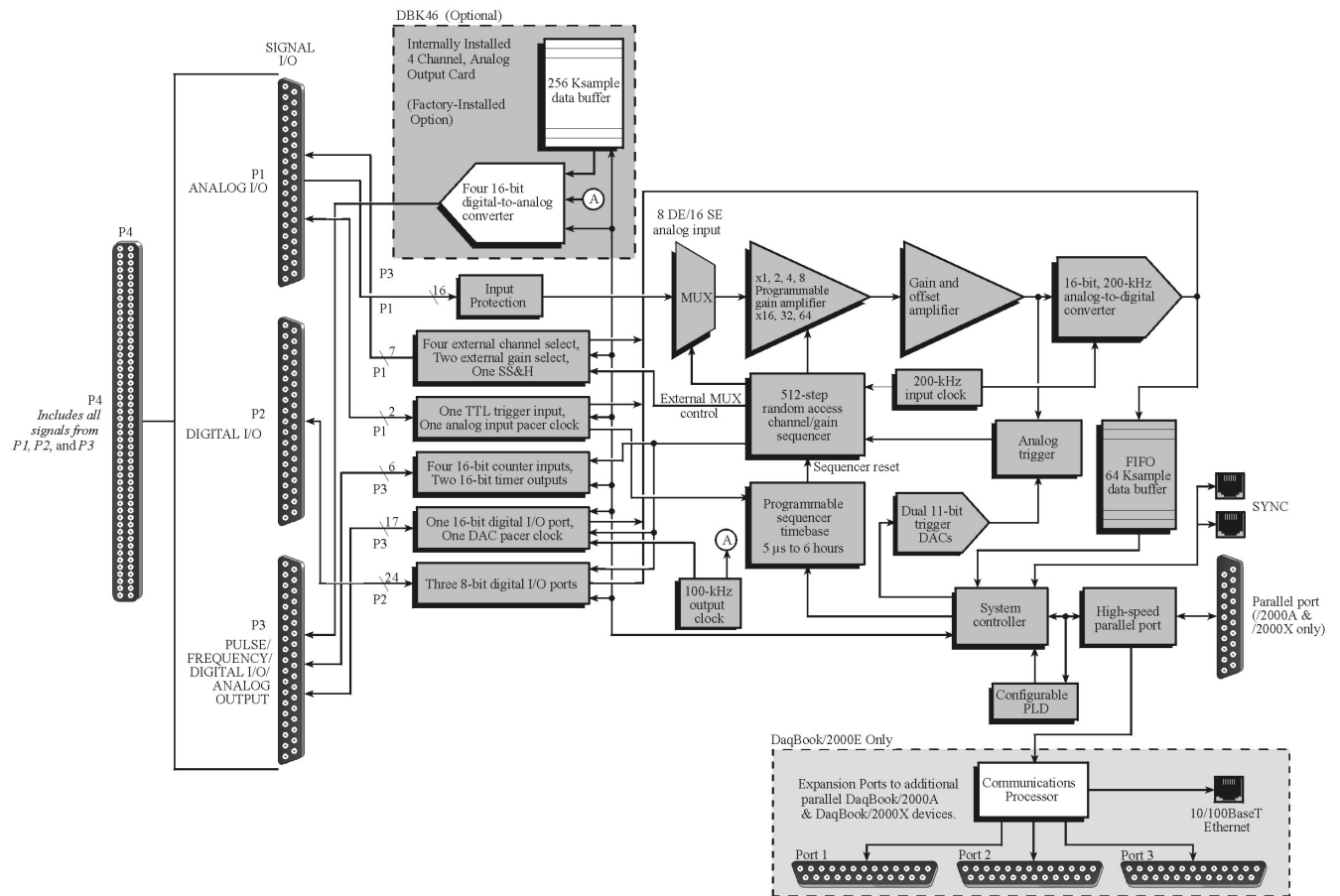
DaqBook/2000 Series Block Diagram

DaqBook/2000 Series, A Comparison of Device Features

DaqBook/2000A	DaqBook/2000X	DaqBook/2000E

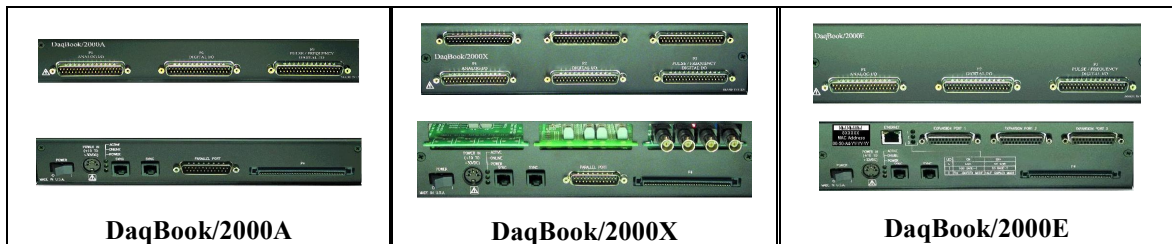| Feature	Description	Applies to:
ADC **16**	**Analog Input Channels** Analog Input signals enter through P4 and P1, go to MUX, to PGA, to Gain & Offset Amplifier, then to Analog-to-Digital Converter (ADC).	All Models
DAC **4** **(with DBK46)**	**Analog Output Channels [Available only with DBK46 Option]** Digital Signals go through Digital-to-Analog Converters via the optional DBK46 plug-in card, then through "DAC Out" on P4 and P3. The card includes a 256K Sample Buffer. Note that the DBK46 option is a "Factory Install" Option Only.	Each model, providing a DBK46 is installed.
Digital I/O **40**	**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, P3, and P2.	All Models
Counter/ Timers **6**	**Counter/Timers** Four 16-bit Counter Input signals and Two 16-bit Timer Output signals via P4 and System Controller.	All Models
10/100BaseT Ethernet	**10/100BaseT Ethernet Interface located on the chassis** The DaqBook/2000E includes a 10/100BaseT Ethernet interface. Note that DaqBook/2000A and DaqBook/2000X can connect to the DaqBook/2000E, or to a WBK25 Ethernet module.	**/2000E**
3 Card Exp.	**3 Card Expansion** The DaqBook/2000X includes three expansion slots that can accept a wide variety of analog and digital DBK signal conditioning cards.	**/2000X**

DaqBook/2000 Series Devices are high-speed, multi-function, data acquisition systems for use with notebook and desktop PCs. They feature a 16-bit, 200-kHz A/D converter, digital calibration, 40 digital I/O lines, four counters, and two timers and, *if the optional DBK46 card is installed*, four 16-bit, 100-kHz D/A converters

Up to 470 channels of analog and digital I/O can be accessed with one DaqBook/2000 Series Device.

All input and output signals are accessed via the three 37-pin DSUB connectors [P1, P2, and P3] located on the front panel.

- **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.

All I/O signals are also available on the rear panel via the 100-pin, P4 connector. P4 allows for optional connection to a DBK200 Series Device for expansion from the rear panel.

Each DaqBook/2000 Series Device's internal on-board scan sequencer lets you select up to 512 channel/range combinations. The sequencer scans all channels of the scan at 5μs/channel, 10μs/channel, or 1000μs/channel.

Note: All inputs [to a DaqBook/2000 Series device] can be measured at the 5 μs/channel rate. Some DBK expansion options require more settling time and can be measured at the slower rate of 10 μs/channel or 1000 μs/channel. All types of measurements can be mixed within the scan group.

All DaqBook/2000 Series models have a 64K Sample Buffer. This allows analog and digital/counter input data, as well as analog and digital output data, to flow from the PC to the DaqBook/2000 Series Device, with no burden on the PC.

DaqBook/2000 Series Devices support 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** – Every DaqBook/2000 Series Device 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.

Multi-unit synchronization via the SYNC ports does not support pre-trigger data. Only post-trigger data can be collected and time correlated between the units.

Other features 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 only**. All DaqBook/2000 device settings are made via software. There are no hardware settings to be made, for example, there are no device DIP switches to be set or jumpers to be positioned. However, note that DBK expansion options may require s small degree of manual set up. Refer to the *DBK Option Cards and Modules User's Manual* (457-0905) for details. A PDF version of the document is included on the data acquisition CD.

- **Synchronization**. Every DaqBook/2000 Series model includes two SYNC ports. The units can be synchronized, with respect to each other, by connecting one DaqBook/2000 Series device SYNC port to the SYNC port of a second DaqBook/2000 Series device. A unit can be *scan-synchronized* and *triggered* from any other DaqBook/2000 Series that is connected to it via a SYNC cable. Either one of a unit's two sync ports, or both, can be used. A more detailed discussion follows.

Scanning

Every DaqBook/2000 Series device has an on-board scan sequencer that permits the user to select any combination of up to 512 channel/range combinations. The sequencer scans all channels contained in the sequence at the rate of 5 µs/channel, 10 µs/channel, or 1000 µs/channel, depending on the speed of the DBK expansion options; thereby minimizing the time-skew from channel-to-channel. The user can also set the time between scan groups, from 0 to 6 hours. In addition to scanning analog inputs, the sequencer can scan digital inputs and counter inputs.
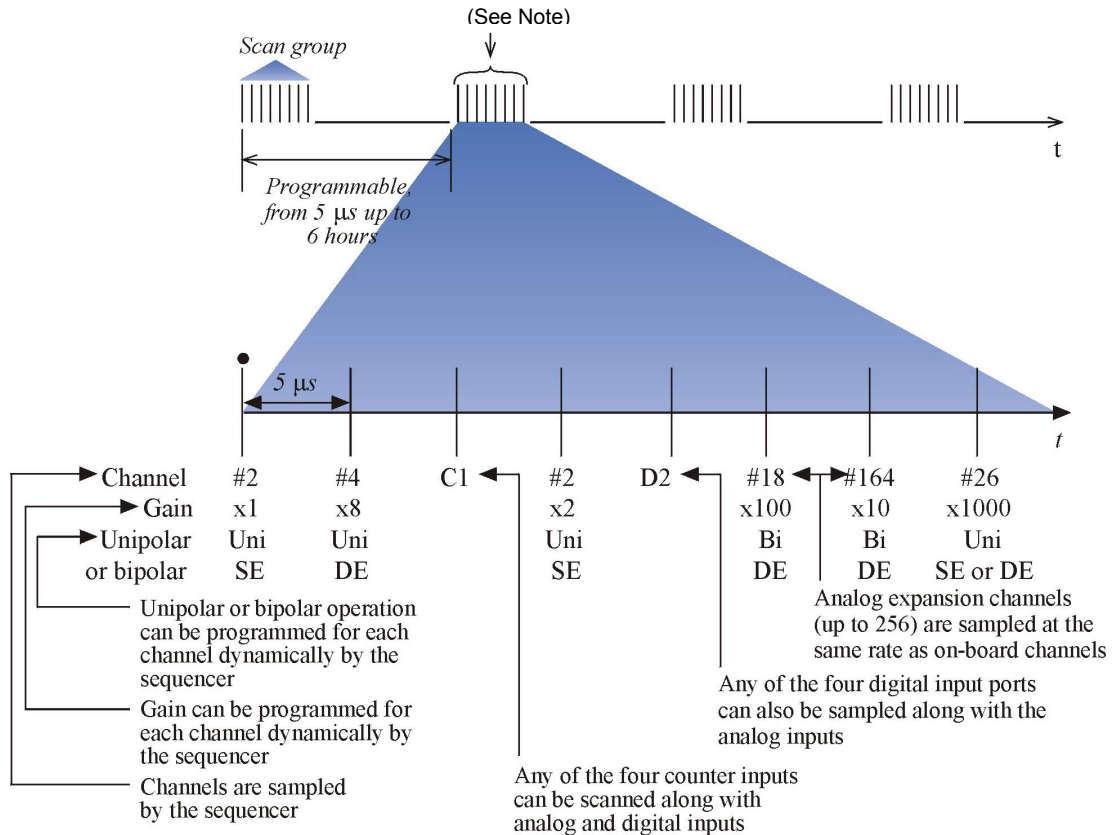
DaqBook/2000 Series, Scanning Example

Note: All inputs [to a DaqBook/2000 Series device] can be measured at the 5 µs/channel rate. Some DBK expansion options require more settling time and can be measured at the slower rate of 10 µs/channel or 1000 µs/channel. All types of measurements can be mixed within the scan group.

The 512-location scan sequencer allows you to select each channel and associated input amplifier gain. All channels are scanned at 5 µs/channel, 10 µs/channel, or 1000 µs/channel, depending on the speed of the DBK expansion options. In addition, the digital and frequency inputs can be scanned using the same scan sequencer employed for analog inputs, enabling the time correlation of acquired digital data to acquired analog data.

Each scan group, which can contain up to 512 channel/gain combinations, can be repeated immediately or at programmable intervals of up to 6 hours. Within each scan group, consecutive channels are measured at the fixed rate of 5 µs/channel, 10 µs/channel, or 1000 µs/channel.

Triggering

Triggering can be the most critical aspect of acquiring data. DaqBook/2000 Series models support a full complement of trigger modes to accommodate a wide variety of applications.

> **Multi-unit synchronization via the SYNC ports does not support pre-trigger data. Only post-trigger data can be collected and time correlated between the units.**

Hardware Analog Triggering.   Many data acquisition products claim analog triggering, but rely on the PC to take readings and make a decision, which leads to uncertain and potentially long latencies. DaqBook/2000 Series devices use true analog triggering, whereby the trigger level programmed by the user, sets an analog DAC, which is then compared in hardware to the analog input level on the selected channel. The result is analog trigger latency that is guaranteed to be less than 5 µs, significantly shorter than most data acquisition devices. Any analog channel can be selected as the trigger channel. The user can program both the trigger level, as well as the edge (rising or falling).

Digital Triggering (P1). A separate digital trigger input line is provided, allowing TTL-level triggering, again with latencies guaranteed to be less than 5 µs. Both the logic levels (1 or 0), as well as the edge (rising or falling), can be programmed for the discrete digital trigger input.   The digital trigger input is labeled TTLTRG.

Digital Pattern Triggering (P2). All DaqBook/2000 Series models support digital pattern triggering, whereby the user can designate any of the digital input ports as the trigger port. The programmed digital pattern, including the ability to mask or ignore specific bits, is then compared to the actual input until a match is detected, after which the sequencer begins the scan sequence.

Counter Triggering. Triggering can also be programmed to occur when one of the counters reaches, exceeds, or is within a programmed level. Any of the built-in counter/totalizer channels can be programmed as a trigger source.

Software-Based Triggering. Software-based triggering differs from the modes described above because the readings, analog, digital, or counter, are interrogated by the PC to detect the trigger event, not in the hardware as described above. The advantage of this mode is to permit triggering based on more complex situations, such as on a specific temperature, which was derived from the acquisition of at least two analog measurements, plus the calculation of the measured temperature using linearization algorithms.

Normally software-based triggering results in long latencies from the time that a trigger condition is detected, until the actual capturing of data commences. However, the DaqBook/2000 Series circuitry circumvents this undesirable phenomenon by use of pre-trigger data. Specifically, when software-based triggering is employed, and the PC detects that a trigger condition has occurred, (which may be thousands of readings later than the actual occurrence of the signal), the DaqBook/2000 Series driver automatically looks back to the location in memory where the actual trigger-causing measurement occurred. The acquired data that is presented to the user actually begins at the point where the trigger-causing measurement occurs. The latency in this mode is equal to one scan cycle.

Pre- and Post-Triggering Modes. Six modes of pre- and post-triggering are supported, providing a wide variety of options to accommodate any measurement requirement. When using pre-trigger, the user must use software-based triggering to initiate an acquisition.

- *No pre-trigger, post-trigger stop event.* This, the simplest of modes, acquires data upon receipt of the trigger, and stops acquiring upon receipt of the stop-trigger event.

- *Fixed pre-trigger with post-trigger stop event.* In this mode, the user specifies the number of pre-trigger readings to be acquired, after which, acquisition continues until a stop-trigger event occurs.

- *No pre-trigger, infinite post-trigger.* No pre-trigger data is acquired in this mode. Instead, data is acquired beginning with the trigger event, and is terminated when the operator issues a command to halt the acquisition.

- *Fixed pre-trigger with infinite post-trigger*. The user specifies the amount of pre-trigger data to acquire, after which the system continues to acquire data until the program issues a command to halt acquisition.

- *Variable pre-trigger with post trigger stop event* (driver support only). Unlike the previous pre-trigger modes, this mode does not have to satisfy the pre-trigger number of readings before recognizing the trigger event. Thus the number of pre-trigger readings acquired is variable and dependent on the time of the trigger event relative to the start. In this mode, data continues to be acquired until the stop trigger event is detected.

- *Variable pre-trigger with infinite post trigger* (driver support only). This is similar to the mode just described, except that the acquisition is terminated upon receipt of a command from the program.

- *Stop Trigger*. Any of the software trigger modes described above can be used to stop an acquisition. Thus an acquisition can be programmed to begin on one event, such as a temperature level, and then stopped on another, such as a digital pattern event.

Synchronous I/O Operations

Synchronizing Multiple Units

All DaqBook/2000 Series units can be synchronized to other DaqBook/2000 Series units via their SYNC ports. Each unit has two identical SYNC ports located on the rear panel. Either, or both SYNC ports can be used to connect to the units via SYNC cables, CA-74-1 or CA-74-5 (1-foot or 5-foot cables, respectively).   The units can be scan-synchronized and triggered from any other SYNC-connected unit.
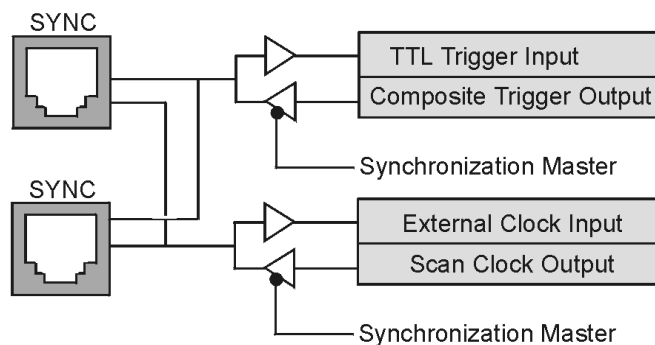
Synchronization Concept Block Diagram

The preceding diagram shows how a DaqBook/2000 Series unit can input or output synchronization timing and trigger events on either SYNC connector. A more detailed block diagram follows shortly.

Reference Note: The SYNC features are programmable via software. For detailed information see the *Using Multiple Devices* and the `daqAdcSetClockSource` sections of the *Programmer's Manual* (p/n 1008-0901).

PDF NOTE: During software installation, Adobe® PDF versions of user manuals automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software.
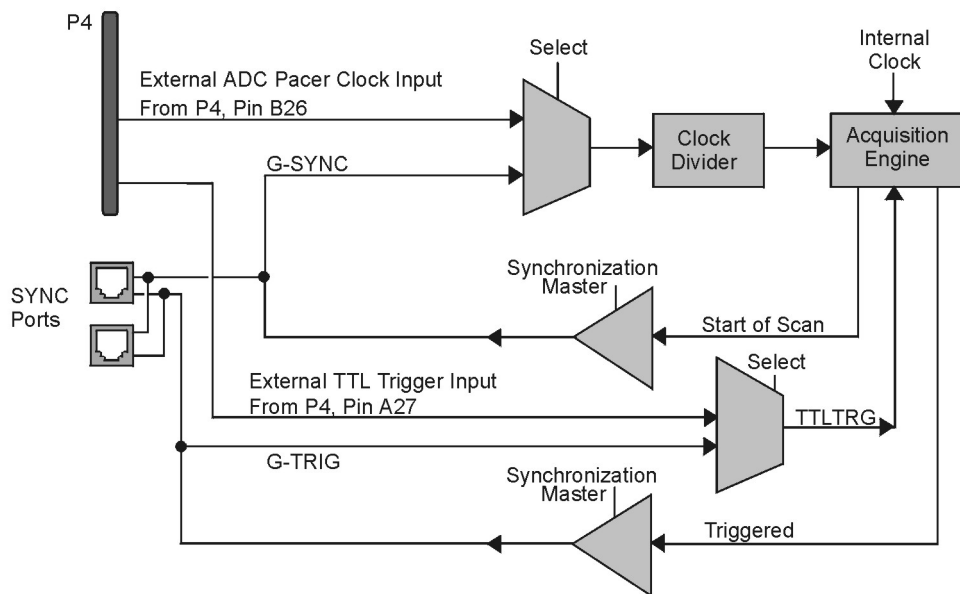
Synchronization Model

The synchronization model illustrates the SYNC function that is available with DaqBook/2000 Series units. In regard to synchronization, the following apply:

- One of three signals can be used to drive the DaqBook/2000 Series device's acquisition scan rate. These are:
    - the internal acquisition pacer clock
    - an external acquisition pacer clock (from P1, pin 20 or P4, pin B26)
    - the global sync (G-SYNC) input from the SYNC ports on the rear panels

- Both the SYNC connector input and the external clock input can be divided down.

- When a DaqBook/2000 Series device is in the Master Mode, both the trigger condition and the scan timing are output on the SYNC port. The global trigger (G-TRIG) is selected instead of the TTL Trigger Input (from P4, Pin A27).

Whether the DaqBook/2000 Series device is using its **internal scan clock**, or **external clock input**, it can be programmed to output the clock on the SYNC connector. In either case, the unit is behaving like a *synchronization master*. Other DaqBook/2000 Series units [that are connected to the *master*, via a SYNC port] should be programmed as *synchronization slaves*.

When a DaqBook/2000 Series device is programmed as a *synchronization slave*, it will derive its scan period from the SYNC port. If the *slave unit* must be triggered at the same time as the *master unit*, **then the slave unit should use TTL Trigger as its trigger source**.

Multi-unit synchronization via the SYNC ports does not support pre-trigger data. Only post-trigger data can be collected and time correlated between the units.

Synchronous Input Operations

The DaqBook/2000 Series devices 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

P1 – Channels 0 through 15

The DaqBook/2000 Series devices allow analog input configuration of their internal board as well as for the P1 compatible DBK analog input expansion modules.

Channel Selection and Mode Settings

Each DaqBook/2000 Series device can accept 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 in the *DBK Option Cards & Modules User's Manual* (p/n 457-0905) for additional information.

Channel Range and Polarity

Each DaqBook/2000 Series Device channel can be programmed for either unipolar or bipolar mode with gain settings of 1, 2, 4, 8, 16, 32 and 64.

Channel Sampling Interval

The devices allow for programmable sampling intervals of 5 us, 10 us, or 1000 us on a per channel basis. This mode allows some DBK expansion channels [which change slowly but offer a higher degree of accuracy] to be sampled at a longer interval, while channels that change more rapidly to be sampled using a shorter interval. Each 5 μs, 10 μs, or 1000 μs interval reduces the maximum aggregate acquisition rate for the entire scan by that amount.

Digital Input Channels

P2 Port A – Channels A0 through A7
P2 Port B – Channels B0 through B7
P2 Port C – Channels C0 through C7
P3 – Digital 0 through Digital 15

The DaqBook/2000 Series devices allow for either synchronous scanning of digital input channels or asynchronous I/O operations for all configured digital channels.

Counter Input Channels

Counter 0, 1, 2, 3

The devices allow 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

A /I Clock

The DaqBook/2000 Series devices allow 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 DBK46 Factory-Install Option is Required]*

The DaqBook/2000 Series devices allow synchronous output of any D/A channels available at up to 100kHz for each channel.   All D/A channels may have output clocked out synchronously.

Output Channel Configuration

Analog Output Channels *[The DBK46 Factory-Install Option is Required]*

DAC0, DAC1, DAC2, DAC3

Each D/A channel of a DBK46 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.

Synchronous Output Clocking

A / O Clock

The DaqBook/2000 Series Devices allow 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

Each DaqBook/2000 Series device [that has a DBK46 installed] allows the data source for synchronized DAC output operations to be that of a memory based buffer on the DBK46. The output data, for all channels, is contained in the buffer on the DBK46.

Asynchronous I/O Operations

Each DaqBook/2000 Series Device allows asynchronous input of any counter or digital channel that is not currently configured for synchronous acquisition. The boards also allow for asynchronous output to any DBK46 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. 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 (P2 - Port A, Port B, Port C)
The DaqBook/2000 Series Devices have an implemented Intel 8255 core in the digital I/O logic on the P2 port. 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 (P3 – Digital 0 through Digital 15)
The 16-bit P3 Digital Port can be used as either an input or 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 DaqBook/2000 Series Devices have the ability to expand their digital I/O capabilities via the P2 port and the connection of applicable digital I/O expansion modules. These modules are discussed in the *DBK Option Cards & Modules User's Manual*. 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 (Timer0, Timer1)

Each DaqBook/2000 Series Device allows for 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 DBK46 Factory Install Option is Required]* (DAC0, DAC1, DAC2, DAC3)

When a DaqBook/2000 Series Device has a DBK46 option installed it has the ability to output analog data to any of the 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 (Counter0, 1, 2, 3)

DaqBook/2000 Series Devices 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 two 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.

Using DBK Cards and Modules for Signal Conditioning

The DBK signal-conditioning cards and module are designed for use with DaqBooks, LogBooks, and various types of data acquisition boards, i.e., ISA, PCI, and compact-PCI types. The DBKs perform best when used with an acquisition device [such as a DaqBook/2000 Series unit] that can dynamically select channel, gain, and range. DBK cards and modules with dynamic channel and gain/range selection allow for high channel-to-channel scan rates with a variety of transducers.

Note: Only *passive* DBKs, such as the DBK1 BNC module, the DBK11A screw terminal card, and the DBK40 BNC analog interface, can be used with Daq PC-Cards.

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; however, several options exist for packaging and powering the DBKs.

Reference Note:
DBK options are detailed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs directory, which can be accessed through the Windows Desktop. A PDF version of the document can be read directly from the data acquisition CD via the introduction screen's <View PDFs> button.

Daq Software

Overview

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 post acquisition data analysis programs such as eZ-PostView, eZ-TimeView, and eZ-FrequencyView.

- drivers for third-party, icon-driven software such as DASYLab and LabVIEW.

- various language drivers to aid custom programming using API; includes DaqCOM™ ActiveX/COM support.

Ready-to-use Programs

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.

- **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.

- **eZ-PostView** provides a simple method of graphically viewing acquired waveforms from the DaqBook/2000 Series Device. Up to 8 windows can be displayed on one screen, with up to 16 channels overlaid on each window. eZ-PostView makes it simple to visually inspect acquired waveforms from multiple channels within seconds of acquiring the data. Documentation, in Adobe PDF format, is provided on the CD. Refer to the *PostAcquisition Analysis.PDF*.

- **eZ-TimeView & eZ-FrequencyView**
  eZ-TimeView and eZ-FrequencyView are optional post-acquisition analysis packages, which are related to eZ-PostView, but include more features. eZ-TimeView is targeted at time-domain analysis, including min/max, peak-peak, mean, RMS, plus a wide variety of plotting and waveform viewing capabilities. eZ-FrequencyView is targeted at post-acquisition frequency-domain analysis, including FFT's, octave analysis, plus dozens of other analysis features. Documentation, in Adobe PDF format, is provided on the CD. Refer to the *PostAcquisition Analysis.PDF*.

- The **Daq Configuration control panel** allows for interface configuration, testing, and troubleshooting.

Reference Notes:

➤ The software document modules, *DaqView*, *DaqViewXL*, and *Post Acquisition Data Analysis User's Guide*, are not included as part of the hardcopy manual, but are available in PDF version. See the PDF Note, below.

➤ Programming topics are covered in the *Programmer's User Manual* (1008-0901). As a part of product support, this manual is automatically loaded onto your hard drive during software installation. The default location is the Programs directory, which can be accessed through the Windows Desktop.

PDF Note: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** group, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software.

Note that the PDF documents can be read directly from the CD by using the <**View PDFs**> button located on the opening install screen.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

Drivers for Third-party, Icon-driven Software

LabVIEW® Support
We provide LabVIEW® support for expansion and signal conditioning modules. Our data acquisition VIs for LabVIEW are more than just simple hardware access VIs, they are complete with engineering data conversion, data display and logging capabilities.

DASYLab®
If your application requirements go beyond the scope of DaqView, you may want to consider DASYLab software, as the latter offers a greater degree of flexibility and customizing.

Language Drivers

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.

DaqBook/2000 SeriesDevices are supplied with DaqX Subroutine API Libraries. These provide complete support for all of the functionality available on each data acquisition device in Visual Basic®, C/C++, and Delphi™. In addition, DaqX is supported under all versions of Windows®. Over 100 program examples are included with DaqX Subroutine API Libraries. API documentation is provided in a *Programmer's Manual* (p/n 1008-0901), which is included on the installation CD.

The DaqCOM™ suite of programming allows applications developers to rapidly develop and deploy custom systems by leveraging COM (Component Object Model) technology. DaqCOM does this by providing a powerful easy-to-use interface to most programming languages including, Visual Basic®, VBA, C++, Delphi™ and J++. In addition, DaqCOM supports the new Windows.NET architecture and includes examples for VisualBasic.NET and C.

Notes

DBK Basics

CAUTION
⚠ Turn off power to all devices connected to the system before connecting cables or setting configuration jumpers and switches. Electrical shock or damage to equipment can result even under low-voltage conditions.

CAUTION
The discharge of static electricity can damage some electronic components. Semiconductor devices are especially susceptible to ESD damage. You should always handle components carefully, and you should never touch connector pins or circuit components unless you are following ESD guidelines in an appropriate ESD controlled area. Such guidelines include the use of properly grounded mats and wrist straps, ESD bags and cartons, and related procedures.

Introduction

The term "DBK" typically refers to a card or module that is used to expand or enhance a primary data acquisition device, such as a DaqBook, DaqBoard, or LogBook. As will be seen in the upcoming DBK identification tables, DBKs provide a wide variety of data acquisition functions. Depending on the DBKs used, one or more of the following can be realized:

- signal conditioning
- analog output
- digital I/O
- channel expansion
- supplying powering to another acquisition device
- providing an interface for different connectivity; for example, in a DaqBoard/2000 Series board, converting a P4, 100-pin connector to P1, P2, and P3 37-pin, DB37 connectors.

Reference Notes: During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation, especially the *DBK Option Cards and Modules User's Manual* (p/n 457-0905) for details regarding both hardware and software in relevant to DBKs.

A copy of the Adobe Acrobat Reader® is included on your CD. The Acrobat Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

How Do DBKs Connect to the Data Acquisition Device?

Each DBK connects to the primary data acquisition device; e.g., a DaqBook, DaqBoard, or LogBook, through one of three 37-pin ports, which are designated as follows:

- P1 – Analog I/O
- P2 – Digital I/O
- P3 – Pulse/Frequency/High-Speed Digital I/O

Depending on the primary data acquisition device, connectivity issues differ slightly. This will be made clear by the figures and accompanying text that follow.

Connecting DBKs to DaqBook/100/200 Series Devices, ISA-Type DaqBoards, & LogBooks

Reference Notes:

➢ DaqBoard/2000 Series and /2000c Series users, refer to page 4.

➢ DaqBook/2000 Series users, refer to page 5.

For DaqBook/100 Series and DaqBook/200 Series devices, ISA-Type DaqBoards, and LogBooks, DBK connections are not made directly to the port, but through a CA-37-x ribbon cable, where "x" indicates the number of expansion devices that can be connected. For example, in addition to providing a DB37 connector to interface with the primary data acquisition device, a CA-37-3 cable includes three additional DB37 connectors. These provide a means of adding three DBKs to one port. Use of a CA-37-16 cable will allow up to 16 DBKs to be added. The CA-37-x cable system is excellent for DaqBooks, LogBooks, and ISA-type DaqBoards.
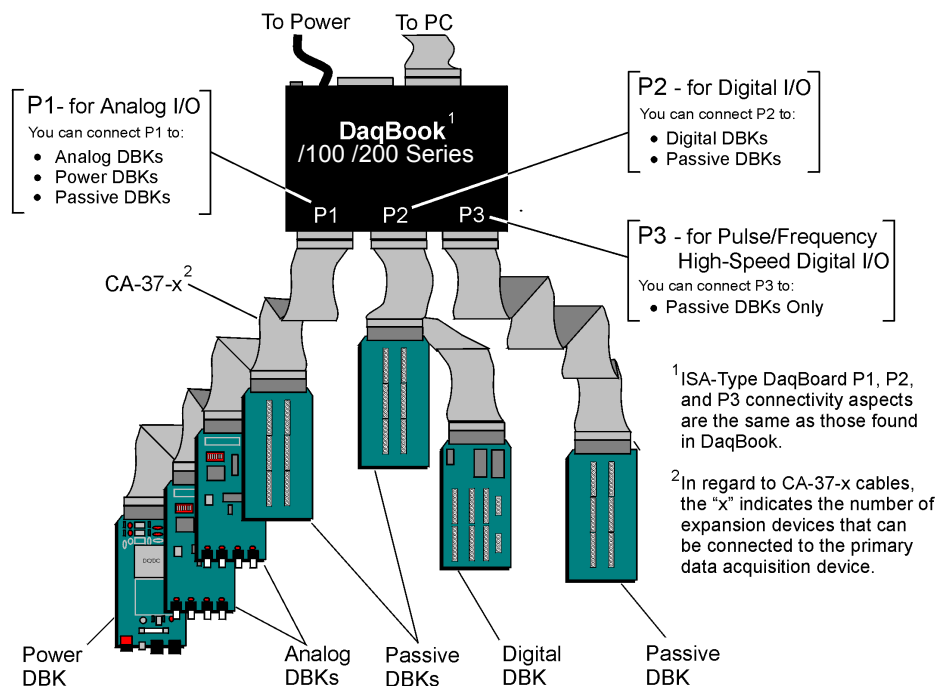
Connecting DBKs to a DaqBook/100 Series or /200 Series Device

The previous figure applies to LogBooks, DaqBook/100/200 Series devices, and ISA-type DaqBoards. As will be seen elsewhere in this document, some devices do not include all three connectors, i.e., P1, P2, and P3.

Connecting DBKs to Daq PC-Cards

The Daq PC-Card is only intended for connections to a P1 connector of a single "passive" DBK card or module. A passive DBK card or module is one that provides a desired connectivity (such as BNCs or screw terminals), but performs no signal conditioning.

A CA-134 Interface Cable and a CN-86-F (dual DB37 female adapter) are used to provide the DB37, P1 connector.

Daq PC-Card Cabling
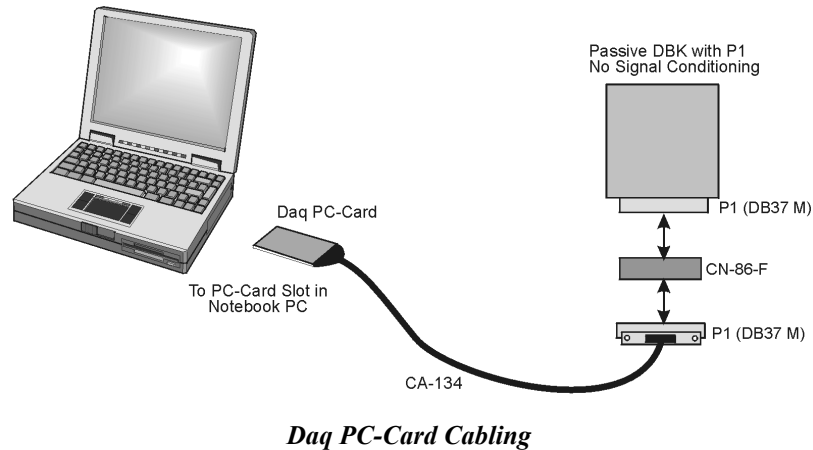
The CA-134 cable connects to a CN-86-F adapter, which then connects to a single "passive" card or module. The passive DBKs are:

- **DBK1 – 16 Connector BNC Module**
- **DBK11A – Screw Terminal Option Card**
- **DBK40 – BNC Analog Interface**

Reference Note:
For information regarding the passive DBKs (DBK1, DBK11A, and DBK40), refer to the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).

Connecting DBKs to DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards

DaqBoard/2000 Series and cPCI DaqBoard/2000 Series boards have 100-pin connectors designated as P4. The 100 pins correlate to various pins on P1, P2, and P3 DB37 connectors.* Connectivity in the system is as follows (see figure).

- Both the DaqBoard/2000 and /2000c Series board connect to a CA-195 cable. The cable has two, 100-pin, P4 connectors.

- The CA-195 connects to a DBK200 Series adapter board or adapter module for 100-pin to 37-pin adaptations, e.g., P4-to-P1, P2, P3; but not necessarily all three.*

- The DBK200 Series adapter connects to a CA-37-x ribbon cable, where "x" indicates the number of expansion devices that can be connected. For example, in addition to providing a DB37 connector to interface with the primary data acquisition device, a CA-37-3 cable includes three additional DB37 connectors. These provide a means of adding three DBKs to one port. Use of a CA-37-16 cable will allow up to 16 DBKs to be added.

- The CA-37-x cable connects to expansion DBKs, in accordance with port type. For example, Analog DBKs to port P1, Digital DBKs to port P2, and passive DBKs to port P3.
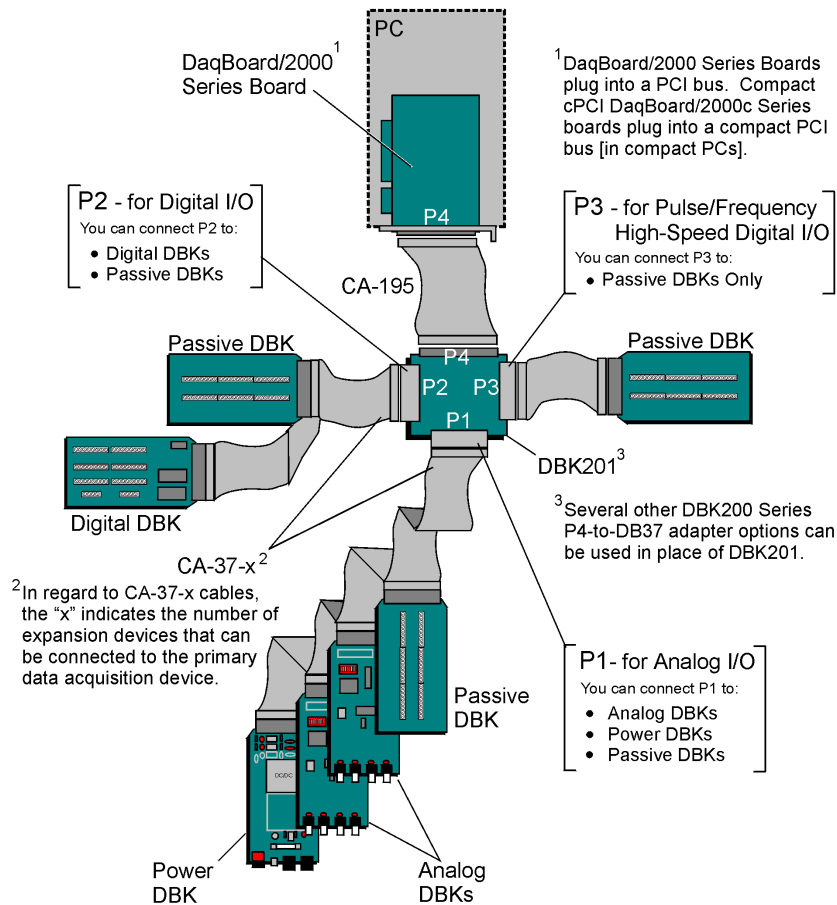
Connecting DBKs to a DaqBoard/2000 Series Board

* DaqBoard/2003 and cPCI DaqBoard/2003c are exceptions to the above connectivity method. The /2003 board typically connects directly to a DBK205 (P4-to-Screw Terminal Adapter), as discussed in the *DBK Option Cards and Modules User's Manual* (p/n 457-0905).

Note: DaqBook/2000 Series Devices, which are discussed in the following section, can also connect to DBKs via a P4 connector, as indicated in the above figure.

Connecting DBKs to DaqBook/2000 Series Devices

For DaqBook/2000 Series devices, DBK connections can be made to Ports P1, P2, and/or P3, as well as to the unit's 100-pin P4 connector. A discussion of both methods, which can be used at the same time, follows.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

Refer to P1, P2, P3, and P4 pinouts to avoid making duplicate signal connections.

There are two ways to connect a DBK option to a DaqBook/2000 Series device. The first method is preferable, as it introduces less noise.

Preferred Method – **(a) Connect a CA-37-x cable to the appropriate DB37 connector [P1, P2, or P3] on the DaqBook/2000 Series device. (b) Connect the free end of the cable to the DBK card or module.**

Optional Method – **(a) Connect a CA-195-x cable to the P4 connector on the DaqBook/2000 Series device. (b) Connect the free end of the cable to a DBK200 Series device. (c) Connect the DBK option to the DBK200 Series device, as applicable.**

The primary reason that less noise is seen in the "preferred" method is that a DaqBook/2000 Series device's P1 connector pertains only to analog acquisition signals and the P2 connector pertains only to digital I/O. This provides a strong degree of isolation between the two signal types. However, in the case of a CA-195-x cable connected to P4, digital and analog signals co-exist in one cable.

If you need to use the P4 connection method, use of the 8-inch ribbon cable (CA-195-1) will result in the lowest level of crosstalk [for that method].

Connecting DBKs to a DaqBook/2000 Series Device via P1, P2, and/or P3

The DBKs do not connect directly to the port, but through a CA-37-x ribbon cable, where "x" indicates the number of expansion devices that can be connected. For example, a CA-37-3 cable includes a 37-pin mating connector to interface with the DaqBook/2000 Series DB37 connector (P1, P2, P3); it also includes three additional DB37 connectors. These provide a means of adding three DBKs to one port. Use of a CA-37-16 cable will allow up to 16 DBKs to be added to one DaqBook/2000 Series device DB37-type port.
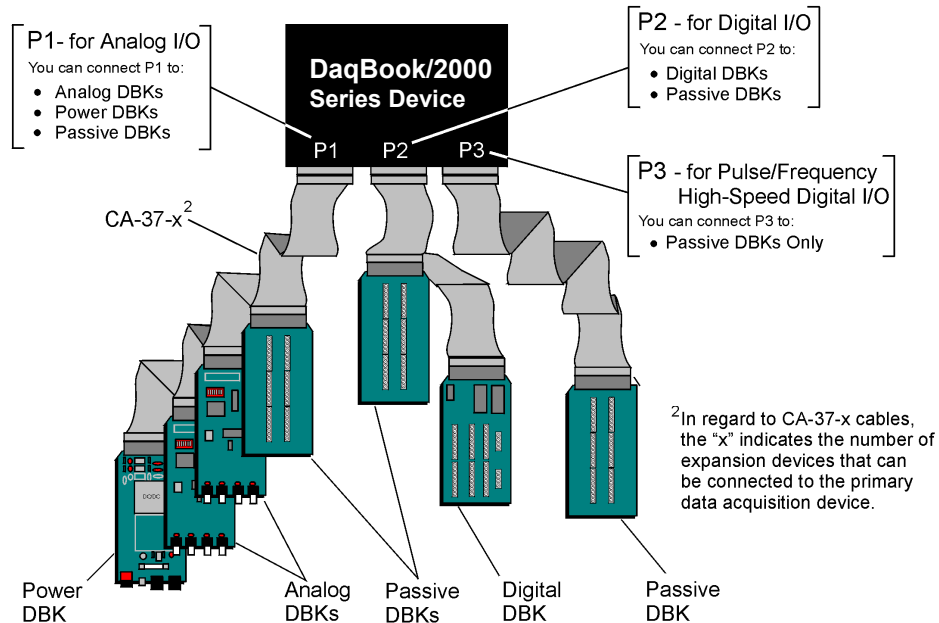
Connecting DBKs to a DaqBook/2000 Series Device via P1, P2, and P3

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

The following pinouts indicate the P1, P2, and P3 pins, and their P4 equivalents. Use the pinouts to avoid making duplicate signal connections.

Connecting DBKs to a DaqBook/2000 Series Device via P4

Every DaqBook/2000 Series device has a 100-pin connector designated as P4. The P4 pins correlate to various pins on P1, P2, and P3.

The P4 connector on a DaqBook/2000 Series device shares signal connections with the P1, P2, and P3 connectors. P4 offers no additional I/O. Connecting a DBK200 Series Option to P4 via a CA-195 cable distances the P1, P2, P3 connection from the DaqBook/2000 Series device. It does not provide any new signal I/O. See the following Caution.

CAUTION

Signal conflicts between a DaqBook/2000 Series device's P1, P2, P3 connectors and its P4 connector can result in erroneous readings and possible equipment damage.

Therefore, when connections have been made to P1, P2, and/or P3, use caution when making connections through P4, and visa versa.

Refer to P1, P2, P3, and P4 pinouts to avoid making duplicate signal connections.

A brief explanation of P4 connectivity for DaqBook/2000 Series devices follows the illustration.
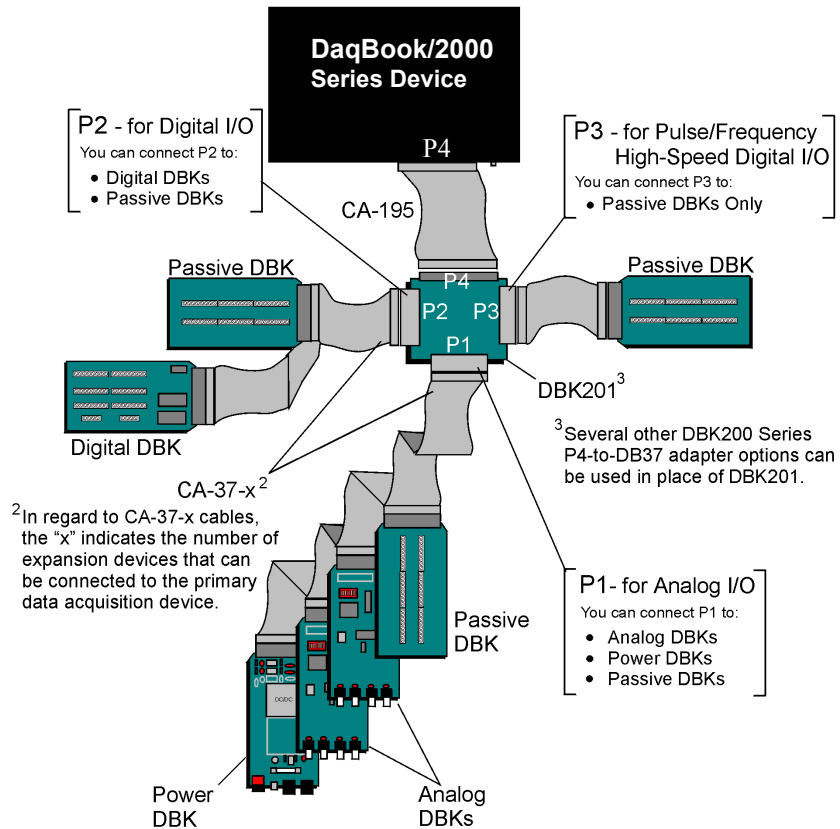
Connecting DBKs to a DaqBook/2000 Series Device via P4

P4 connectivity for DaqBook/2000 Series devices is as follows:

- One end of a CA-195 cable connects to the DaqBook/2000 Series device's 100-pin P4 connector. Note that the CA-195 cable has two P4 connectors.

- The other end of the CA-195 cable connects to a DBK200 Series adapter board [or adapter module] for *100-pin to 37-pin* adaptations, e.g., P4-to-P1, P2, P3; but not necessarily all three.

- The DBK200 Series adapter connects to one or more CA-37-x ribbon cables, where "x" indicates the number of expansion devices that can be connected. For example, in addition to providing a DB37 connector to interface with the primary data acquisition device, a CA-37-3 cable includes three additional DB37 connectors. These provide a means of adding three DBKs to one port. Use of a CA-37-16 cable will allow up to 16 DBKs to be added.

- The CA-37-x cable connects to expansion DBKs, in accordance with port type. For example, Analog DBKs to port P1, Digital DBKs to port P2, and passive DBKs to port P3.

> **There are two ways to connect a DBK option to a DaqBook/2000 Series device. The first method is preferable, as it introduces less noise.**
>
> **Preferred Method** – **(a) Connect a CA-37-x cable to the appropriate DB37 connector [P1, P2, or P3] on the DaqBook/2000 Series device. (b) Connect the free end of the cable to the DBK card or module.**
>
> **Optional Method** – **(a) Connect a CA-195-x cable to the P4 connector on the DaqBook/2000 Series device. (b) Connect the free end of the cable to a DBK200 Series device. (c) Connect the DBK option to the DBK200 Series device, as applicable.**
>
> **The primary reason that less noise is seen in the "preferred" method is that a DaqBook/2000 Series device's P1 connector pertains only to analog acquisition signals and the P2 connector pertains only to digital I/O. This provides a strong degree of isolation between the two signal types. However, in the case of a CA-195-x cable connected to P4, digital and analog signals co-exist in one cable.**

> **If you need to use the P4 connection method, use of the 8-inch ribbon cable (CA-195-1) will result in the lowest level of crosstalk [for that method].**

> **The CE Cable Kit, p/n CA-209D, may be required for systems that require a P4 cable length of 3 feet. The CA-209D kit includes a shielded version of the CA-195 cable, two grounding pigtails, and associated cable clamps. When properly connected, the shielded cable provides greater immunity to noise. Chapter 3, *CE Compliance*, includes details.**

DBK Identification Tables

Analog Output DBKs

Analog Output			
Product	**Name/Description**	**I/O**	**Connects To:**
DBK2	Voltage Output Card	4 channels	P1
DBK5	Current Output Card	4 channels	P1
DBK46	Analog Output Card; factory install option for DaqBook/2000 Series Devices and WBK41 Modules	4 channels	Internal PC Board

Digital I/O Control DBKs

Digital I/O / Control			
Product	**Name/Description**	**I/O**	**Connects To:**
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	P2 or P4

Analog Signal Conditioning DBKs

The DBKs that are used for analog signal conditioning attach to transducers and condition their outputs into analog voltages.   An A/D converter, located in the primary acquisition device, measures the analog voltages. There are many signal-conditioning solutions available (and more are in development). Note that DBK high-capacity modules require more circuitry than can fit on a compact card.

Analog Signal Conditioning			
Product	**Name/Description**	**I/O**	**Connects To:**
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 Note 2	16 channels	P1
DBK13	High-Gain Analog Multiplexing Card Note 2	16 channels	P1
DBK15	Universal Current/Voltage Input Card Note 2	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	Thermocouple Card Note 2	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 Note 2	14 channels	P1
DBK53	Low-Gain Analog Multiplexing Module Note 2	16 channels	P1
DBK54	High-Gain Analog Multiplexing Module Note 2	16 channels	P1
DBK70	Vehicle Network Interface, Analog Multiplexer Module	16 channels	P1
DBK80	Differential Voltage Input Card with Excitation Output	16 channels	P1
DBK81	Thermocouple Card, High-Accuracy	7 channels	P1
DBK82	Thermocouple Card, High-Accuracy	14 channels	P1
DBK83	Thermal Couple Card, High-Accuracy; uses Connection Pod	14 channels	P1
DBK84	Thermocouple Module, High-Accuracy	14 channels	P1
DBK207	Carrier Board for 5B Compatible Analog Input Modules	16 channels	P1 or P4
DBK207/CJC	Carrier Board for 5B Compatible Analog Input Modules. DBK207/CJC includes cold junction compensation (CJC)	16 channels	P1 or P4

Note 1:   P1, P2, and P3 DB37 connectors do not exist on the DaqBoard/2000 Series or /2000c Series boards, but are obtained by using P4 adapters (DBK200 series). These adapters typically connect to the DaqBoard/2000 Series [/2000c Series] 100-pin P4 connector via a CA-195 cable.

Note 2:   For DaqBoard/2000 and cPCI DaqBoard/2000 Series boards, internal clocks should be set to 100 kHz when used with any of the following DBK options: DBK12, DBK13, DBK15, DBK19, DBK52, DBK53, and DBK54. See specific DBK section for details.

Expansion and Terminal Panel Connection DBKs

The following DBKs offer provide various expansion and connection options. The stackable 3-slot DBK10 low-profile enclosure can be used for up to three DBKs. If a system has more than 3 DBKs, the 10-slot DBK41 can be used. Several DBK41s can be daisy-chained to accommodate many DBKs in one system.

Expansion and Connection, General			
Product	Name/Description	I/O	Connects To:
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, P2, or P3
DBK40	BNC Interface	18 connectors	P1
DBK41	Analog Expansion Enclosure	10 cards	P1
DBK60	Expansion Chassis with Termination Panels	3 cards	P1 or P2

Termination Panels, Connectivity for DaqBoard/260			
Product	Name/Description	I/O	Connects To:
DBK601	Termination Panel - Blank rear panel	none	N/A
DBK602	Termination Panel - BNC rear panel	16 connectors	DBK Card
DBK603	Termination Panel - Safety Jacks, single ended	16 connectors	DBK Card
DBK604	Termination Panel - Safety Jacks, differential	8 differential (16)	DBK Card
DBK605	Termination Panels - Thermocouple, differential panels; specify type: B, J, K, R, S, or T	16 differential	DBK Card
DBK606	Termination Panel – 3 Terminal Blocks; 16 connections per TB	48 connectors	DBK Card
DBK607	Termination Panel – strain relief clamp	none	N/A
DBK608	Termination Panel – 3 female DB37 connectors	three DB37	DBK Card

Several signal connection options were developed primarily for use with DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards. The DBK200 Series P4-Adapter documentation provides the basic connection concepts. That information, along with the related DBK subsections should enable you to set up your desired configuration.

P4 Adaptive Connection for DaqBoard/2000 Series and cPCI DaqBoard/2000c Series			
Product	Name/Description	I/O	Connects To:
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

Note 1: P1, P2, and P3 DB37 connectors do not exist on the DaqBoard/2000 Series, or /2000c Series boards, but are obtained by using P4 adapters (DBK200 series). These adapters typically connect to the DaqBoard/2000 Series [/2000c Series] 100-pin P4 connector via cable.

Power Supply DBKs

Power supply type DBKs are typically used in laboratory, automotive, and field applications. Input power can come from any +10 to +20 VDC source, or from an AC source by using an appropriately rated AC-to-DC adapter. The DBK30A rechargeable power supply can power DBK modules where AC mains are not available (the DBK30A outputs 28 V for powering transducers). For a large number of DBK cards, the DBK32A or DBK33 can be installed into an expansion slot. The DBK33 is used when +5 V is required in addition to ±15 VDC. The DBK34 provides a steady 12 or 24 VDC while working with vehicle electrical systems that may be turned on or off during testing.

Power Supply		
Product	Name/Description	Power
DBK30A	Rechargeable Battery/Excitation Module	+12-14, 24-28 VDC (3.4 A-hr @ 14 VDC)
DBK32A	Auxiliary Power Supply Card	±15 V @ 500 mA
DBK33	Triple-Output Power Supply Card	±15 V @ 250 mA; +5 V @ 1 A
DBK34	Vehicle UPS Module	12/24 VDC (5 A-hr @12 VDC)
DBK34A	UPS Battery Module	12/24 VDC (5 A-hr @12 VDC)

Tips on Setting up a Data Acquisition System

A successful installation involves setting up equipment and setting software parameters. In addition to this manual, you may need to consult your Daq device or LogBook user's manual.

DBKs should be configured before connections are made and power is applied. This sequence can prevent equipment damage and will help ensure proper operation on startup. Many DBKs have on-board jumpers and/or DIP switches that are used for setting channels and other variables. You will need to refer to the individual DBK document modules to ensure that the DBKs are properly configured for you application.

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 to setup a system that will best meet your specific application needs.

1. The end use of the acquisition data should be used to determine how you set up and program your acquisition system. Prior to creating the system you should understand its layout and know how you are going to assign the channels. If you can answer the following questions you are off to a good start. If not, you need to find the answers.

   - What engineering 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 the 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 acquisition device [LogBook or Daq device], and the computer. Label your transducers, cables, and connectors to prevent later confusion.

4. When configuring your LogBook or Daq device(s) consider the following:

   - LogBook calibration is typically performed automatically through LogView software; however, some DBKs may require manual calibration.

   - **The DaqBook/100 Series and DaqBook/200 Series devices, and DaqBoards (ISA type) have internal jumpers and switches that you must set manually to match your application.**

   - Some DaqBook/100 Series and DaqBook/200 Series models are partially configured in software.

   - DaqBook/2000 Series devices have no jumpers or internal switches and are configured entirely through software.

   - Daq PC-Cards 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.

   - cPCI DaqBoard/2000c Series boards are *compact* PCI (cPCI) 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, User's Manuals, and pertinent DBK document modules.

5. Perform all hardware configurations before connecting signal and power. 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. Setting up channel parameters often requires both hardware and software setup.

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.

14. Device specific information regarding system setup and expansion can be found in the Daq and LogBook User's manuals; and in the applicable DBK document modules of this manual.

15. *If you are considering system expansion*, review the DBK10, DBK41, and DBK60 document modules. 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. DBK41s can be daisy-chained to one-another to handle a large number of DBKs.

16. *In regard to power management*, you should review the DBK30A, DBK32A, and DBK33 document modules. 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.

Power Supplies and Connectors

Power supplies convert the raw power they receive into a lower DC voltage and/or current for use by devices with various power demands. Many of the power supplies that are used to power data acquisition equipment are of the *switching-mode* type. These devices provide a regulated output whether the power supply's input is, for example, 60 Hz, 120 VAC as in the United States or, 50 Hz, 220 VAC as found in European countries. Small power supplies, that do not switch, consist of simple transformer/rectifiers and filtered capacitors; and operate over a smaller voltage range.

DaqBook/2000 Series Devices – The switching-mode power supply [commonly used with DaqBook/2000 Series systems] has an input range of 100 VAC to 240 VAC at 50 Hz to 60 Hz. The power supply's output [to the DaqBook/2000 Series device] is 15 VDC @ 2.7 amps via a DIN5 connector.

LogBooks - The switching-mode power supply [commonly used with LogBook systems] has an input range of 100 VAC to 240 VAC at 50 Hz to 60 Hz. The power supply's output [to the LogBook] is 15 VDC @ 2.7 amps via a DIN5 connector.

DaqBook/100 and DaqBook/200 Series Devices - Power supplies that are used with DaqBook/100 Series and DaqBook/200 Series devices are typically of the transformer/rectifier type. They supply the unit with 15 VDC @ 900 mA via a DIN5 connector.

DBKs – The following table indicates the type of power supply that is typically used with certain DBKs.

15 VDC @ 2700 mA *Switching-Mode* Type Power Supply The DBKs in this column use up to 15 VDC @ 2700 mA. This *switching-mode* power supply receives power from a 100 to 240 VAC source, at 50 to 60 Hz, and converts it to the required value.		15 VDC @ 900 mA *Transformer/Rectifier* Type, Unregulated Power Supply The DBKs in this column use up to15 VDC @ 900 mA. This transformer/rectifier type power supply receives power from a 110 to 125 VAC source, at 60 Hz, and converts it to the required value.	
DBK	**Description**	**DBK**	**Description**
DBK32A	Auxiliary Power Supply Card	DBK23	Optically Isolated Digital-Input Module
DBK33	Triple-Output Power Supply Card	DBK24	Optically Isolated Digital-Output Module
DBK42	5B Isolated Signal Conditioning Module	DBK43A	Strain Gage Measurement Module
DBK70	Vehicle Network Interface	DBK50	Isolated High-Voltage Input Module
		DBK51	Isolated Low-Voltage Input Module

The DIN5 is the system's basic power connector (see the following figure). The CA-115 is a 6-in. cable with a plug (male) DIN5 connector on both ends. The CA-115 is used to connect DBK32As [or DBK33s] in parallel when they are to be powered by the same power supply.

Power output connector (plug) on power supply cable and both ends of CA-115 cable — GND, +V — **Power Out**

Power input (or daisy-chain) connector (socket) on device powered (DaqBook, DBK32A, DBK33) — GND, +V — **Power In**
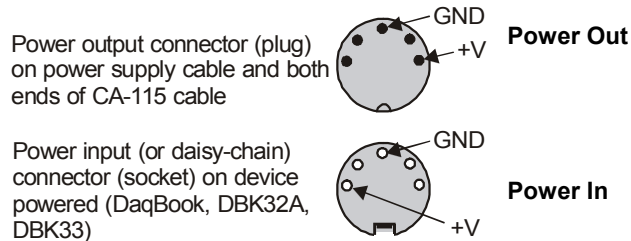
DIN5 Power Connectors

Note: DIN5 connectors for LogBook, DBK34, and DBK34A have threaded retaining rings.

Note: The following figure shows the pinout for the DBK34 and DBK34A Power Out DIN5 connector. The 28 V pin is only active when the device is in the 28 VDC mode; however, the 14 V pin is active regardless of the mode selected.

GND, +14 V, +28 V
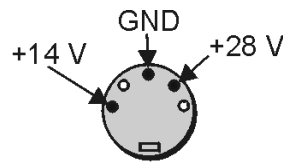
DIN5 Power Out
On a DBK34 and DBK34A

An Introduction to Power-Related DBKs

The power-related DBK options are the DBK30A, DBK32A, DBK33, DBK34, and DBK34A. From the standpoint of providing reliable power, these DBKs have proven convenient in laboratory, automotive, and field applications.

Input power for these devices can come from any 10 to 20 VDC source, or from an AC source via an appropriate AC-to-DC adapter.

A brief synopsis of the DBK power options follows. Refer to the respective document modules for complete information.

DBK30A module - provides power at 14 and 28 VDC with a rated capacity of 3.4 A-hr @ 14 VDC.

The DBK30A's 28 V output will power 4 to 20 mA transducers. The module's rechargeable power supply can power DBK modules in situations where AC mains are not available.

Note: Some transducers (e.g., 2-wire 4-20 mA transmitters, bridge-configured sensors, etc) require an excitation voltage in order to work properly. The DBK30A supplies 14 and 28 VDC. Consult transducer documentation before applying power.
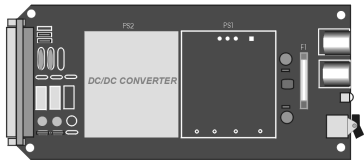
DBK32A - provides ±15 VDC @ 500 mA.   **DBK33** - provides ±15 VDC @ 250 mA *and* +5 VDC @ 1000 mA.

The DBK32A and DBK33 power cards attach directly to the P1 analog expansion bus where they supply power to DBK analog expansion cards. The DBK32A and the DBK33 can be powered from an included AC adapter, an optional DBK30A battery module, or from a +10 to +20 VDC source such as a car battery.

When installed in a DBK10 three-slot expansion chassis, the DBK32A or DBK33 supplies power to the analog DBK [that is to receive power] via a CA-37-x cable.

If used with the DBK41 ten-slot expansion enclosure, the DBK32A or DBK33 installs into one of the analog expansion slots on the DBK41's backplane. A power card in any DBK41slot (other than the leftmost, when viewed from the rear) will power the other cards that are connected to the DBK41's backplane.

CAUTION
⚠ **If using a DBK32A or a DBK33 with a DaqBook/100 Series, DaqBook/200 Series, or a DaqBoard [ISA type] device, you must entirely remove the shunt jumpers from JP1. Failure to do so will result in damage to the 8254 timer chip. Refer to the power card document modules and to the *Daq device Hardware* sections of the DaqBook/100 Series and DaqBook/200 Series, and DaqBoard [ISA] user's manuals for JP1 locations and configurations.**
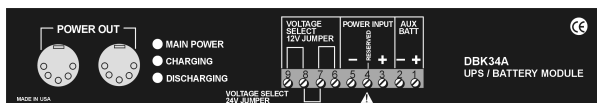
DBK34A module – provides 12 or 24 VDC with a 5.0 or 2.5 A-hr capacity (respectively).

The DBK34A is classified as a UPS / Battery module. The module can be used for in-vehicle testing in scenarios where the vehicle's electrical system does not affect acquisition device power during starter-current surge, or power-off.

Power Requirements

The improper use of power can cause system damage. The following terms are important in regard to understanding your system's power needs.

- **Supply** power for signal conditioning type DBKs comes from a primary acquisition device, such as a DaqBook/2000 Series device or LogBook, or from a power card or module. If needed, the DBK32A or DBK33 can provide additional power to meet DBK power demands. The DBK power supplies work off of low-voltage DC that can come from an AC adapter or from a DC source, such as a car battery.

- **Demand** for power comes from DBK cards and modules [and in some systems, from transducers]. You should use the *DBK Power Requirement Worktable* to calculate your system's power needs. After completing the table, compare the total power demand to the supply power.

- **Distribution** of power to most DBKs is via the P1 interface. The DBK41 expansion chassis has a jumper to isolate +5 VDC power from P1. The P1 Pin designations are as follows:

  Pin 1: +5 VDC
  Pin 2: -15 VDC
  Pin 21: +15 VDC
  Pin 7: digital ground
  Pin 28: analog ground
  Pin 29: analog ground

Note: Certain DBK modules have their own internal power supplies and require only 10 VDC to 20 VDC.

LogBook

The LogBook [with no DBKs attached] uses approximately 12 Watts of power. If using battery-power, you can compute operational endurance from your battery's watt×hr rating and the following calculation tables.

DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards

DaqBoard/2000 Series and cPCI DaqBoard/2000c Series Boards use 3.5 watts of power (700 mA @ 5 VDC) from their host computer. Power consumption can be up to 10 W with external accessories.

Avoid power cycling the host PC. Wait 10 seconds after powering down the host PC before powering it back on. This will allow any residual voltages to decay enabling the DaqBoard/2000 Series or /2000c Series board to start up in a known good state.

DaqBook/100 Series & /200 Series, DaqBoard [ISA], and Daq PC-Card

If using power from AC mains (through adapter), you need not worry about Daq device power use. If using battery-power, you can compute operational endurance from the battery's watt×hr rating and power tables. Daq PC-Card and DaqBoard use power from their host PC.

DaqBook/100 and DaqBook/200 Series devices use no power from the PC, but do require DC voltage from an AC-to-DC adapter, or another suitable source. Voltage needs are as follows:

- +7 to +20 VDC for DaqBook/100, DaqBook/112, and DaqBook/120

- +10 to +24 VDC for DaqBook/216

- 9 to +18 VDC for DaqBook/200 and DaqBook/260.

Various AC adapter models support power grids of USA, Europe, Japan, and Asia.

DaqBook/2000 Series Devices

If using power from AC mains (through adapter), you need not worry about Daq device power use. If using battery-power, you can compute operational endurance from the battery's watt×hr rating and power tables.

DaqBook/2000 Series devices use no power from the PC, but do require DC voltage from an AC-to-DC adapter with a supply range of +10 VDC to +30 VDC, or another suitable DC source.

Various AC adapter models support power grids of USA, Europe, Japan, and Asia.

Power Requirements Table

Device	Power Required (Watts)
DaqBook/100	510 mA @ 12 VDC = 6.12 W
DaqBook/112	360 mA @ 12 VDC = 4.32 W
DaqBook/120	510 mA @ 12 VDC = 6.12 W
DaqBook/200	620 mA @ 12 VDC = 7.44 W
DaqBook/216	600 mA @ 12 VDC = 7.2 W
DaqBook/260	620 mA @ 12 VDC = 7.44 W
DaqBoard/100A	1330 mA @ 5 VDC = 6.65 W
DaqBoard/112A	970 mA @ 5 VDC = 4.85 W
DaqBoard/200A	1700 mA @ 5 VDC = 8.5 W
DaqBoard/216A	1340 mA @ 5 VDC = 6.7 W
DaqBoard/2000 Series board	700 mA @ 5 VDC = 3.5 W (Note 1)
cPCI DaqBoard/2000c Series board	700 mA @ 5 VDC = 3.5 W (Note 1)
DaqBook/2000A DaqBook/2000X	Under No External Load (0W): 467mA @ 15VDC = 7 W Under Full External Load (15W): 1533mA @ 15VDC = 23 W
DaqBook/2000E	Under No External Load (0W): 1133mA @ 15VDC = 17 W Under Full External Load (15W): 2200mA @ 15VDC = 33 W
Daq PC-Card/112B Daq PC-Card/216B	Normal Operation: 160 mA @ 5 VDC = 0.8W Power Down Mode: 40 mA @ 5 VDC = 0.2 W

Note 1: For DaqBoard/2000 Series and /2000c Series boards, consumption can be up to 10 W with external accessories.

Calculating Your System's Power Needs

Use the chart below and the worktable on the next page to ensure your system will have sufficient power. If the load (calculated in the worktable) exceeds available power (from the chart at the right), you must add a power card or a module such as a DBK32A or DBK33.

Available Power Chart — Supply to Expansion Devices	
Product	**Available Power**
LogBook	+5 VDC @ 0.10 A from P1-1, P2-18, P2-20, P3-20 +15 VDC @ 0.15 A from P1-21 +15 VDC @ 0.05 A from P3-19 -15 VDC @ 0.15 A from P1-2 -15 VDC @ 0.05 A from P3-37
DaqBook/100	2100 mW
DaqBook/112	2400 mW
DaqBook/120	2100 mW
DaqBook/200	4000 mW
DaqBook/216	4000 mW
DaqBook/260	4000 mW
DaqBoard/100A	3300 mW
DaqBoard/112A	3300 mW
DaqBoard/200A	3000 mW
DaqBoard/216A	3000 mW
DaqBoard/260A	3000 mW
DaqBoard/2000 Series & /2000c Series	5000 mW; 5 V at 1 A; ±15 V at 75 mA each (with exception of DaqBoard/2002 and /2002c)
DaqBook/2000 Series	15000 mW; 5V at 1 A; ± 15 V at 500 mA each
Daq PC-Card/112B	0 mW
Daq PC-Card/216B	0 mW
DBK32	7500 mW
DBK32A	15000 mW
DBK33	7500 mW
DBK34	5 A-hr in 12 V mode; fused at 8 A
DBK34A	5 A-hr in 12 V mode; fused at 8 A

Use the following procedure and table to calculate the required system power.

1.   In the Quantity column (5th), list the number of DBKs of that type in your system.

2.   In the Sub Total column (7th), enter the product of column 5 and column 6 (mW).

3.   Add the Sub Total column, and enter the sum at the bottom right of the table. This result is your power requirement in mW.

Note!

DBK32, DBK32A, and DBK34 cannot supply +5 VDC.
In cases that require +5 VDC, if the +5 VDC requirement exceeds 500 mW from a LogBook or Daq device, then a DBK33 must be used. Note that DBK33 can supply 1000 mW at +5 VDC.

Note: The DBK34 has an 8 amp fuse, and has a capacity of 5 A-hr when in the 12V mode, and a capacity of 2.5 A-hr when in the 24V mode.

DBK Power Requirement Worktable—Demand						
DBK	**Voltage Reference**			**Calculation**		
Options	**+15 VDC**	**-15 VDC**	**+5 VDC**	**Quantity**	**× mW**	**= Sub Total**
DBK1	0	0	0		0	
DBK2	18 mA	18 mA	5 mA		565	
DBK4	95 mA	80 mA	25 mA		2750	
DBK5	2 mA	2 mA	15 mA		135	
DBK7	14 mA	8 mA	18 mA		420	
DBK8	15 mA	15 mA	<1 mA		455	
DBK9	21 mA	16 mA	<1 mA		560	
DBK11A	0	0	0		0	
DBK12	15 mA	15 mA	<1 mA		455	
DBK13	15 mA	15 mA	<1 mA		455	
DBK15	16 mA	16 mA	<1 mA		485	
DBK16	37 mA	32 mA	<1 mA		1040	
DBK17	30 mA	30 mA	<1 mA		905	
DBK18	36 mA	36 mA	<1 mA		1085	
DBK19	6 mA	7 mA	<1 mA		200	
DBK20	0	0	<10 mA		50	
DBK21	0	0	<10 mA		50	
DBK23***	0	0	<2 mA		10	
DBK24***	0	0	<2 mA		10	
DBK25	0	0	<2 mA		10	
DBK40	0	0	0		0	
DBK41	0	0	0		0	
DBK42	<1 mA	<1 mA	<1 mA		35	
DBK43A***	<1 mA	<1 mA	<1 mA		35	
DBK44	<1 mA	<1 mA	60 mA (Note 1)		330	
DBK45	52 mA	52 mA	<1 mA		1565	
DBK46	20 mA	20 mA	400 mA		2600	
DBK50***	<1 mA	<1 mA	<1 mA		35	
DBK51***	<1 mA	<1 mA	<1 mA		35	
DBK52	6 mA	7 mA	<1 mA		200	
DBK53	15 mA	15 mA	<1 mA		455	
DBK54	15 mA	15 mA	<1 mA		455	
DBK70***	<1 mA	<1 mA	<1 mA		35	
DBK80	25 mA	25 mA	<1 mA		755	
DBK81	35 mA	35 mA	<2 mA		1060	
DBK82	60 mA	60 mA	<2 mA		1810	
DBK83	60 mA	60 mA	<2 mA		1810	
DBK84	60 mA	60 mA	<2 mA		1810	
Total Power Requirement in mW						

Note 1: DBK44's 60 mA value is based on 30 mA for each of two 5B modules. This value will be higher if using 5B module 5B38 (200 mA for each 5B38), or if using 5B39 (170 mA for each 5B39). Refer to the DBK44 document module for more information.

Note 2: DBK2 and DBK5 are not used with LogBook.

*** Three asterisks indicate that the DBK is a module with internal power supply; powered separately.

Additional Reading

During software installation, Adobe® PDF versions of user manuals will automatically install onto your hard drive as a part of product support. The default location is in the **Programs** directory, which can be accessed from the *Windows Desktop*. Refer to the PDF documentation for details regarding both hardware and software.

A copy of the Adobe Acrobat Reader® is included on your CD. The Reader provides a means of reading and printing the PDF documents. Note that hardcopy versions of the manuals can be ordered from the factory.

You should refer to the following documents, as applicable, for acquisition system and programming information.

➤ *DBK Option Cards and Modules User's Manual* (p/n 457-0905)

➤ *DBK70 User's Manual* (p/n 1056-0901)

➤ *DaqBoard [ISA] User's Manual* (p/n 457-0907)

➤ *DaqBook/100/200 Series User's Manual* (p/n 457-0906)

➤ *DaqBook/2000 Series User's Manual* (p/n 1103-0901)

➤ *Daq PC-Card User's Manual* (p/n 457-0908)

➤ *DaqBoard/2000 Series and cPCI DaqBoard/2000c Series User's Manual* (p/n 1033-0901)

➤ *LogBook User's Manual* (p/n 461-0901)

➤ *Programmer's Manual* (p/n 1008-0901)

➤ *Post Acquisition Data Analysis User's Guide*

Of the above listed documents, the most relevant to the DBKs is the *DBK Option Cards and Modules User's Manual* (p/n 457-0905). A synopsis of the contents follows:

1 – ***Introduction to DBKs***. Explains what DBKs are and uses tables to identify the various types of DBKs. The chapter includes tips for setting up a data acquisition system, discussions of signal management and signal conditioning, and CE compliance information.

2 – ***Power Management***. Explains how to determine system power requirements and discusses various power options.

3 – ***System Connections and Pinouts***. Provides instructions for connecting a DBK option to a Daq or LogBook device. Pinouts are included for the P1, P2, and P3 DB37 connectors, as well as the 100-pin P4 connector used by PCI and compact PCI (cPCI) boards.

4 – ***DBK Set Up in DaqView***. Provides instruction for setting up analog and digital DBKs in *DaqView's Hardware Configuration* screen.

5 – ***DBK Set Up in LogView***. Provides instruction for setting up analog and digital DBKs in *LogView's Hardware Configuration* window.

6 – ***Troubleshooting***. Explains solutions to common noise, wiring, and configuration problems.

DBK Document Modules – This section consists of independent document modules, each with information specific to the associated DBK card or DBK module.

Factory Installed, 4-Channel Analog Output Card

For use with: **DaqBook/2000A**
DaqBook/2000E
DaqBook/2000X
WBK41

Reference Note:
The *System Connections and Pinouts* document module, located just before Chapter 1 of this manual, includes a pinout of the DaqBook/2000 Series P3 connector. The P3 connector's DAC related pins [31, 32, 33, and 34] apply to the DaqBook/2000 Series Device only when a DBK46 is installed. Pin 34 applies to DAC0, pin 33 to DAC1, pin 32 to DAC2, and pin31 to DAC3.

Overview

The DBK46 is a factory-installed option currently available for DaqBook/2000A, DaqBook/2000E, DaqBook/2000X, and WBK41. JP1 plugs into a 40-pin header on the primary acquisition device. For DaqBook/2000 Series devices, Analog DAC Output is available from the device's P3 connector and from P4.

Note: For WBK41 applications, the DBK46 DAC connections are made via screw terminal blocks on the WBK41's front panel, not on a P3 connector. The following figure applies only to the DBK46 when used in DaqBook/2000 Series devices.
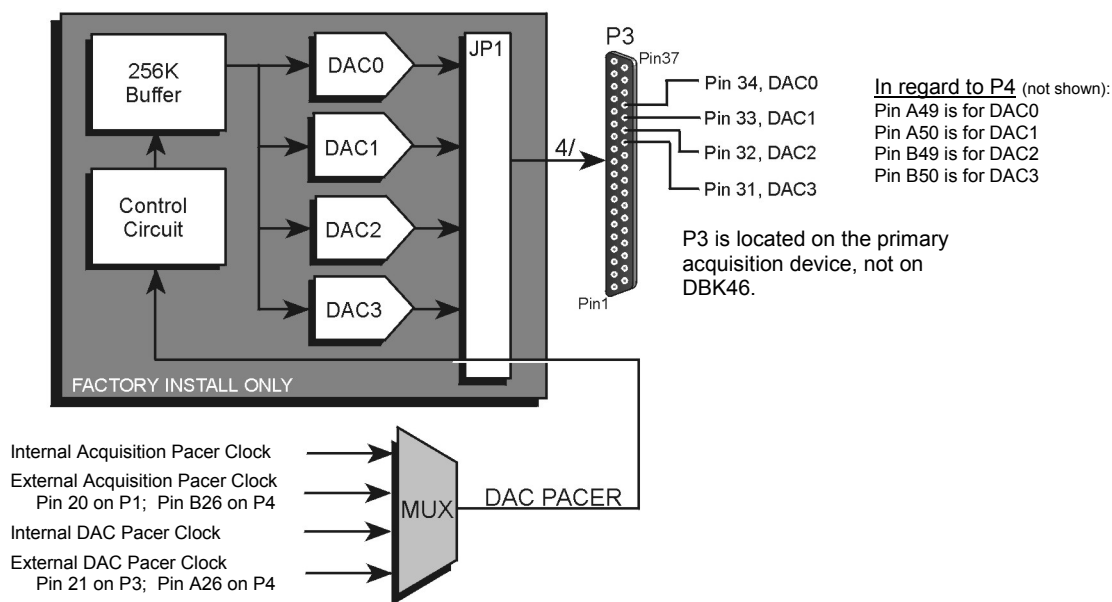
DBK46 Block Diagram

The DBK46 has a 256K sample buffer that can be used for one to four DACs. If only one DAC is enabled for waveform output, then the entire 256K sample memory can be used to store a waveform for that DAC. If two DACs are enabled for waveform output, then 128K of sample memory is available for each of the two DACs. Use of all four DACs drops the available memory down to 64K per DAC.

Software loads the waveform(s) into all, or a portion of, the 256K sample buffer. The waveform data drives the DACs at the rate of the specified DAC Pacer Clock. The waveforms will repeat until the DACs are disabled by software.

The DBK46 provides an output range of -10V to +10V. The card's 256 Kbyte of sample buffer memory can store waveforms from the PC. For DaqBook/2000 Series devices: when used to generate waveforms, each DAC can be independently clocked in one of four modes. These are:

- **Internal DAC Pacer Clock -** The on-board programmable clock can generate updates ranging from 1.5 Hz to 100 kHz, independent of any acquisition rate.

- **Internal Acquisition Pacer Clock -** Using the on-board programmable clock, the analog output *rate of update* can be synchronized to the acquisition rate derived from 100 kHz to once every 5.96 hours.

- **External DAC Pacer Clock -** A user-supplied external input clock can be used to pace the DAC, entirely independent of other analog inputs.

- **External Acquisition Pacer Clock -** A user-supplied external input clock can simultaneously pace the DAC and the analog input.

Hardware Setup

DBK46 is installed at the factory. To verify that a DBK46 is installed, simply check the acquisition software's Analog Output Window for the presence of DAC0, DAC1, DAC2, and DAC3.

Software Setup

DBK46 does not require setup in software.

Reference Notes:
In regard to the *out-of-the-box* software and analog output channels, refer to the *DaqView and DaqViewXL* Document Module (p/n 457-0909), especially the following two sections: *Analog Output Window,* and *Waveform and Digital Pattern Output Window.*

DBK46 - Specifications

Reference Note:
For DBK46 Specifications, refer to Chapter 5.

CE Compliance 3

Overview

CE-compliant products bear the "CE" mark and include a *Declaration of Conformity* stating the particular specifications and conditions that apply. The test records and supporting documentation that validate the compliance are kept on file at the factory.

The European Union established CE standards in 1985. The standards include specifications for safety, EMI emissions, and immunity from electromagnetic interference. Products that are intended for placement in the European Union must meet or exceed the standards and bear the "CE" mark.

Although not required in the USA, meeting or exceeding the CE standards is considered good engineering practice, since doing so enhances safety while reducing noise and ESD problems.

In contracted and in-house testing, most Daq products met the required specifications. In many cases, products that were not originally in compliance were redesigned accordingly. In noted instances, alternate product versions, shield plates, edge guards, special connectors, or add-on kits are required to meet CE compliance.

CE Standards and Directives

The electromagnetic compatibility (EMC) directives specify two basic requirements:

1. The device must not interfere with radio or telecommunications.
2. The device must be immune from electromagnetic interference from RF transmitters, etc.

The standards are published in the *Official Journal of European Union* under direction of CENELEC (European Committee for Electrotechnical Standardization). The specific standards relevant to Daq equipment are listed on the product's Declaration of Conformity and include: CISPR22:1985; EN55022:1988 (Information Technology Equipment, Class A for commercial/industrial use); and EN50082-1:1992 for various categories of EMI immunity.

The safety standard that applies to Daq products is EN 61010-1 : 1993 (*Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements*). Environmental conditions include the following:

- indoor use
- altitude up to 2000 m
- temperature 5°C to 40°C (41°F to 104°F)
- maximum relative humidity 80% for temperatures up to 31°C (87.8°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- mains supply voltage fluctuations not to exceed ±10% of the nominal voltage
- other supply voltage fluctuations as stated by the manufacturer
- transient overvoltage according to installation categories (overvoltage categories) I, II and III For mains supply, the minimum and normal category is II
- pollution degree I or II in accordance with IEC 664

For clarification, terms used in some Declarations of Conformity include:

- **pollution degree**: any addition of foreign matter, solid, liquid or gaseous (ionized gases) that may produce a reduction of dielectric strength or surface resistivity. **Pollution Degree I** has no influence on safety and implies: the equipment is at operating temperature with non-condensing humidity conditions; no conductive particles are permitted in the atmosphere; warm-up time is sufficient to avert any condensation or frost; no hazardous voltages are applied until completion of the warm-up period. **Pollution Degree II** implies the expectation of occasional condensation.

- **overvoltage (installation) category**: classification with limits for transient overvoltage, dependent on the nominal line voltage to earth. **Category I** implies signals without high transient values. **Category II** applies to typical mains power lines with some transients.

Safety Conditions

Users must comply with all relevant safety conditions in the user's manual and the Declarations of Conformity. This manual and Daq hardware make use of the following Warning and Caution symbols: If you see either of these symbols on a product, carefully read the related information and be alert to the possibility of personal injury.

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 warning/caution symbol is used to warn of possible personal injury or equipment damage under noted conditions.

Daq products contain no user-serviceable parts; refer all service to qualified personnel. The specific safety conditions for CE compliance vary by product; but general safety conditions include:

- The operator must observe all safety cautions and operating conditions specified in the documentation for all hardware used.
- The host computer and all connected equipment must be CE compliant.
- All power must be off to the device and externally connected equipment before internal access to the device is permitted.
- Isolation voltage ratings: do not exceed documented voltage limits for power and signal inputs. All wire insulation and terminal blocks in the system must be rated for the isolation voltage in use. Voltages above 30 Vrms or ±60 VDC must not be applied if any condensation has formed on the device.
- Current and power use must not exceed specifications. Do not defeat fuses or other over-current protection.

Emissions/Immunity Conditions

The specific immunity conditions for CE compliance vary by product; but general immunity conditions include:
- Cables must be shielded, braid-type with metal-shelled connectors. Input terminal connections are to be made with shielded wire. The shield should be connected to the chassis ground with the hardware provided.
- The host computer must be properly grounded.
- In low-level analog applications, some inaccuracy is to be expected when I/O leads are exposed to RF fields or transients over 3 or 10 V/m as noted on the Declaration of Conformity.

CE Enhancements for DBKs

The following CE enhancements are described in the individual document modules of the
DBK Cards and Modules User's Manual (p/n 457-0905).

- DBK41/CE
- Edge Guard (for DBK5, DBK8, and DBK44)
- Applicable cables and connectors

CE Compliance for DaqBook/2000 Series System Expansion

DaqBook/2000A, DaqBook/2000E, and DaqBook/2000X are CE Compliant at the time they leave the factory, and will remain in compliance providing that the required conditions, as stated on the *DaqBook/2000 Series Declaration of Conformity* (p/n 1103-0740), continue to be met.

Note that connecting a *non-CE Compliant* DBK module or card to your system will make the system non-compliant.

You may want to expand your DaqBook/2000 Series System while having it retain its status of "CE Compliant." If so, refer to the most recent *Declaration of Conformity* for each device, prior to making any efforts to expand the system.

In order to remain CE Compliant, some variations of expanded systems may require special shielded cables, such as the CA-195CE cable included in the CA-209D CE Cable Kit.

There are a few general rules of thumb regarding the expansion of DaqBook/2000 Series systems that are to remain CE Compliant. These are:

- Review the most recent *Declaration of Conformity* for each device.
- Use short cables.
- When possible, use shielded cables.
- When assembling or disassembling components, take ESD precautions, including the use of grounded wrist straps.
- Ensure that the host computer is CE Compliant.
- Ensure that expansion devices are CE Compliant
- Ensure all system components are properly grounded.

Use a CA-209D CE Cable Kit in electrically noisy environments. The kit includes a 3-foot long shielded cable, two grounding pigtails, two cable clamps, and 4 screws.

Reference Note:
The document, *CA-209D CE Cable Kit Instructions* (p/n 1103-0902), is included immediately after page 3-4.

Notes

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CA-209D   CE Cable Kit Instructions

For DaqBook/2000 Series Devices

CAUTION
Turn OFF the power to, and UNPLUG the DaqBook/2000 Series device and all externally connected equipment, measurement wires, sensors, etc. 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.

Overview

This document provides instructions for connecting an expansion unit to a DaqBook/2000 Series device via a 3-foot long, 100-conductor, shielded cable, which will keep the DaqBook system CE compliant. The cable is a shielded version of the CA-195 cable, and is designated as p/n CA-195CE. The cable is included in a kit, p/n CA-209D.

By correctly following these instructions and by adhering to the requirements of your products' Declarations of Conformity, your DaqBook/2000 Series system will remain CE compliant.

Note: DaqBook/2000 Series systems are CE compliant when the DaqBook/2000 Series device is properly connected to a CE compliant expansion chassis [such as the DBK203] via an 8-inch long CA-195-1 cable. To use a longer cable and remain CE compliant, shielding is required; such as that provided by the CA-209D CE Cable Kit.

The DaqBook/2000 Series devices are intended for class A environments as defined in the reference document: *British Standard EN 61326: 1997*, which is identical to *IEC 61326:1997 with A1:1998*. Class A environments are characterized as: industrial with separate power networks than domestic power networks; laboratory and testing areas with equipment operated by trained personnel; a controlled EMC environment where electrostatic discharges are minimized and transient electromagnetic fields can be controlled or minimized. Our data acquisition equipment, when operated with a typical configuration, will be within the limits of emissions and immunity as described in the reference document and associated test standards.

In order to minimize the effects of noise, good shielding practices must be employed. For DaqBook/2000 Series systems that need a 3-foot expansion cable, this includes the use of the CA-209D shielded cable kit. Consider the following facts:

- Data acquisition devices may be susceptible to large electromagnetic field transients, for example, those produced by solenoids, transmission lines, and high-voltage equipment.

- It is not always possible to control the ambient electromagnetic environment to ensure it meets class A requirements.

- Certain cabling schemes, between the data acquisition instrument and the test points [or sensor locations], can actually increase noise problems.

How to Connect the CA-195CE Cable to the DaqBook/2000 Series Device

1. Turn off power to the DaqBook/2000 Series device and remove all signal connections and cables. Before proceeding, verify that the device has no external connections.

2. **For DaqBook/2000A or DaqBook/2000X** : Using a 3/16" nut-driver, remove the Jackscrew (closest to P4) from the PARALLEL PORT connector. (See figure).

   For DaqBook/2000E: Using a 3/16" nut-driver, remove the right-side Jackscrew from the EXPANSION PORT 3 connector. Although not illustrated, the Jackscrew connection method is essentially the same. However, we will be attaching the Grounding Pigtail to the right-hand side of EXPANSION PORT 3.

3. **For DaqBook/2000A or DaqBook/2000X**: Attach one end of a Grounding Pigtail to the DaqBook/2000 Series device, as shown in the figure. The Jackscrew must be tightened such that it firmly presses the Grounding Pigtail to the chassis of the DaqBook/2000 Series device. Note that the second Grounding Pigtail is not used in this step. It is used for the expansion device, as discussed on page 3.

   For DaqBook/2000E: Attach one end of a Grounding Pigtail to the DaqBook/2000E. The Jackscrew must be tightened such that it firmly presses the Grounding Pigtail to the chassis of the DaqBook/2000E. Note that the second Grounding Pigtail is not used in this step. It is used for the expansion device, as discussed on page 3.

4. While verifying that the P4 *white locator triangles* [of the CA-195CE cable's connector and the device's P4 connector] point to each other, attach the cable to the device. Firmly press the cable connector into the device connector until it snaps into place.

5. Using a set of Cable Clamps (p/n1033-2009 and p/n 1033-2010) and two 4-40 x 5/16 screws, secure the Grounding Pigtail to the cable. Note that the Clamps must be positioned over the cable's copper band as shown in the figure. Tighten the screws snug.
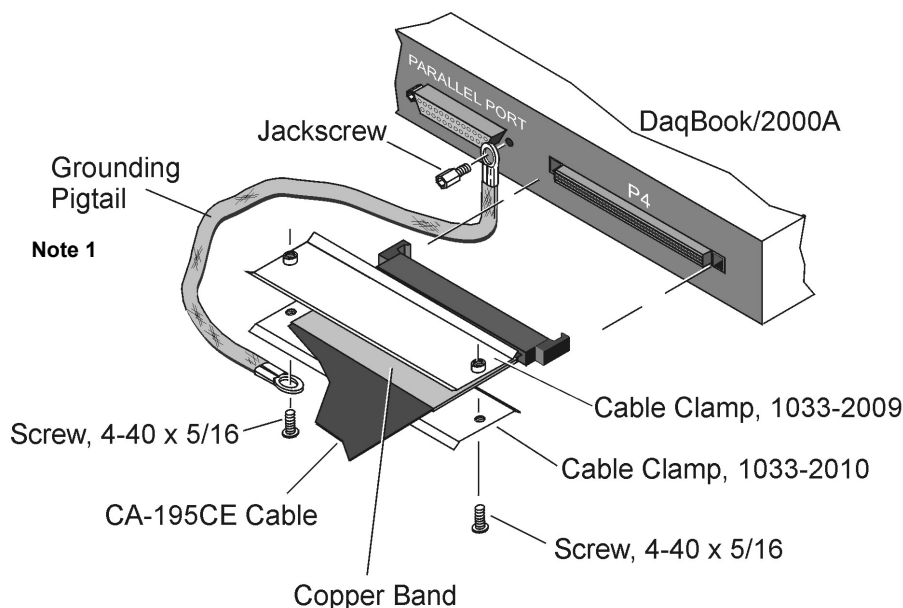
Connections at the DaqBook/2000A End of the CA-195CE Cable

Note 1: **DaqBook/2000X will have the Grounding Pigtail connected in the same manner as does the DaqBook/2000A. DaqBook/2000E will have the Grounding Pigtail connected to the right-hand side of the cable and to the right-hand side of EXPANSION PORT 3.**

After connecting the cable to the DaqBook/2000 Series device, connect the other end of the cable to the expansion device, according to the steps provided in the following section.

How to Connect the CA-195CE Cable to the Expansion Device

The cable-end not shown is connected to the DaqBook/2000 Series Device, as discussed in the preceding section.
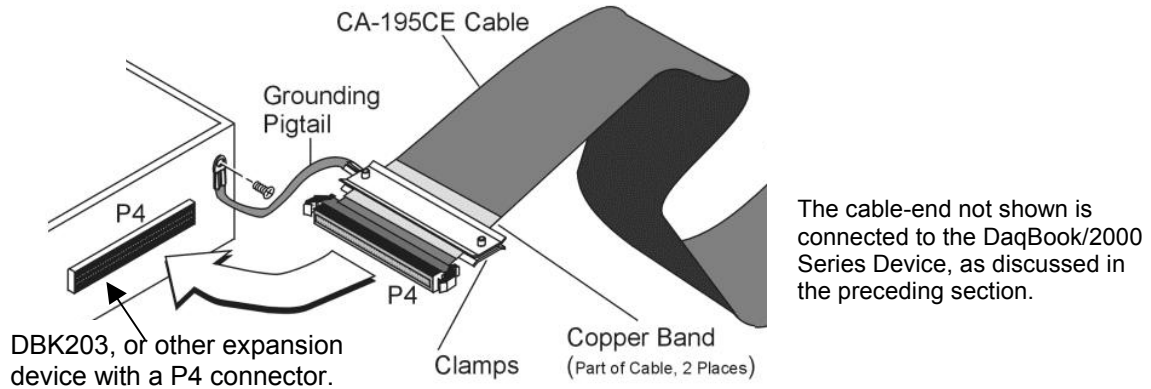
After one end of the CA-195CE Cable has been connected to the DaqBook/2000 Series device, as previously described, connect the other end of the cable to the expansion device. Instructions follow. **Note that the white locator triangles must align with each other**.

Secure the Second Grounding Pigtail to Cable CA-195CE

Using the remaining set of Cable Clamps (p/n 1033-2009 and p/n 1033-2010) and two 4-40 x 5/16 screws, secure the second Grounding Pigtail to the cable. Note that the Clamps must be positioned over the cable's Copper Band as indicated in the first figure on this page. Tighten screws snug, but do not over tighten.

Note: In the right-hand figure, the cable is not shown to allow for greater clarity of parts.
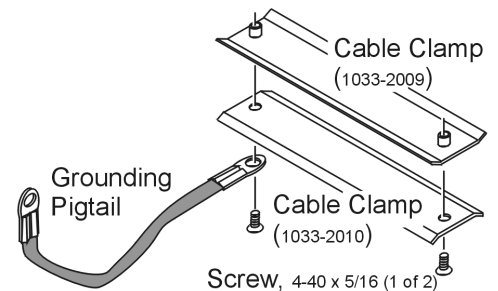
Connect Cable and Grounding Pigtail

1. Verify that the P4 connectors of the CA-195CE Cable and the expansion device (such as a DBK203) are correctly aligned. Correct alignment is indicated when the P4 locator triangles face each other.

2. Complete the connection.

3. Connect the open end of the Grounding Pigtail to the threaded insert located to the right of the P4 connector on the expansion device. Should the expansion device lack a grounding lug, use one of the device's jackscrews to secure the pigtail.

At this point your DaqBook/2000 Series system should be more immune to large electromagnetic field transients.

You can return power to the system and commence with normal operation of your data acquisition system.

Notes

Calibration 4

Overview

The circuit boards that are used in DaqBook/2000 Series Devices are digitally calibrated at the factory. The digital method involves storing a correction factor for each range [on the Board] at the time of calibration. Whenever a particular range is selected, the appropriate calibration constant is automatically applied to a compensating DAC, thereby calibrating the specific range. The result is that readings generated by the A/D are already calibrated, and do not require additional processing.

This is significantly better than calibration methods used by many other products, in which readings are adjusted in software after they are transferred to the PC. That method reduces the dynamic range of the A/D, and can adversely affect the speed at which the PC obtains a calibrated reading.

Each DaqBook/2000 Series Device offers a user-cal mode, whereby the user can adjust the calibration of the unit's board, without destroying the supplied factory calibration. This is accomplished with two distinct calibration tables in the unit's on-board EPROM, one which contains the factory calibration factors, and the other which is available for user calibration.

Using DaqCal.exe

When calibration adjustments are needed they should be completed in the following order:

1. PGA Input and Output Offset
2. Sample/Hold Offset
3. A/D Offset and Gain
4. VDC Voltage Reference
5. DAC0 Full-Scale[1]
6. DAC1 Full-Scale[1]
7. DAC2 Full-Scale[1]
8. DAC3 Full-Scale[1]

[1]DAC Full-Scale only applies when a DBK46 is installed. The DBK 46 option is discussed in chapter 1.

A Windows-based program, DaqCal.exe, is used to calibrate Daq systems, including analog expansion cards. DaqCal.exe is used in conjunction with:

- a 4.5 digit, digital multi-meter
- an adjustable voltage calibrator
- an ambient temperature meter

To use the calibration program:

1. Launch **DaqCal**.

   Note: DaqCal is installed automatically from your data acquisition CD as a part of product support. This takes place during software installation. DaqCal's default location is the **IOtech DaqX Software** folder, in the **Programs** group.

2. When DaqCal opens you will be prompted to select your device from a list. After doing so, simply follow the illustrated on-screen instructions.

Notes

Specifications   5

DaqBook/2000 Series Specifications

Power

Supply Voltage Range: 10 to 30 VDC

Power Required:
> **/2000A and /2000X:**
>> With no external load (0W) on the +5V, +15V, or -15V outputs: 7W typical (+15V at 467 mA)
>> With full external load (15W) on the +5V, +15V, or -15V outputs: 23W typical (+15V at 1533 mA)
>> **Input Power Fuse (F201)**: 4A MINI ATO, user replaceable (refer to chapter 6)
>
> **/2000E:**
>> With no external load (0W) on the +5V, +15V, or -15V outputs: 17W typical (+15V at 1133 mA)
>> With full external load (15W) on the +5V, +15V, or -15V outputs: 33W typical (+15V at 2200 mA)
>> **Input Power Fuse (F201)**: 4A MINI ATO, user replaceable (refer to chapter 6)

Power Available for external signal conditioning and expansion options:
> 5V at 1A (all models); ±15V at 500 mA each; 15W maximum
> **5V Power Output Fuse (F1)**: 3A auto-reset ptc fuse. F1 is not user replaceable.
> **Note**: ±15V has no fuse; ±15V relies on over-current sense shutdown protection

General

Operating Temperature: 0° to 50°C (32° to 122°F)

Storage Temperature: -40° to 70°C (-40° to 158°F)

Relative Humidity: 0 to 95%, non-condensing

Vibration: MIL STD 810E

Signal I/O Connector: DB37 male for P1, P2, and P3;
   100-pin high density connector for P4 expansion (on rear panel of unit)

Dimensions
> **/2000A:** 285 mm W x 220 mm D x 45 mm H
>   (11" x 8.5" x 1.75")
> **/2000E:** 285 mm W x 220 mm D x 70 mm H
>   (11" x 8.5" x 2.70")
> **/2000X:** 285 mm W x 220 mm D x 70 mm H
>   (11" x 8.5" x 2.70")

Weight
> **/2000A:** 1.3 kg (2.9 lbs)
> **/2000E:** 1.7 kg (3.74 lbs)
> **/2000X:** 1.6 kg (3.5 lbs)

A/D Specifications

Type: Successive approximation

Resolution: 16 bit

Conversion Time: 5 µs

Maximum Sample Rate: 200 kHz

Nonlinearity (Integral): ±1 LSB

Nonlinearity (Differential): No missing codes

(Continued)

Note: Specifications are subject to change without notice.

Analog Inputs

Channels: 16 single-ended or 8 differential, programmable on
a per-channel basis as single-ended or differential and unipolar or bipolar

Expansion: Up to 256 channels, without degradation in
maximum channel-to-channel scan rate (5 µs/channel),
some DBK options will require the 10 µs, or 1000 µs sampling option.

Bandwidth: 500 kHz

Settling Time: 5 µsec to 1 LSB for full-scale step

Temperature Coefficient: ±(10ppm +0.3 LSB)/°C

Input Impedance: 10M Ohm (single-ended): 20M Ohm (differential)

Bias Current: <1nA (0 to 35°C)

Common Mode Rejection: 86 dB, DC to 60 Hz for gains < =8; >100 dB for gains > =16

Maximum Input Voltage: ±11V relative to analog common

Over-Voltage Protection: ±35V

Ranges: Software or sequencer selectable on a per-channel basis

Crosstalk: -100 dB DC to 60 Hz; 86 dB @10 kHz, assuming that P1 connections
are made with a CA-37-x cable

Total Harmonic Distortion (THD): -85dB, Typical, measured at P1

Signal to Noise and Distortion (SINAD): +85 dB, Typical, measured at P1

Input Voltage Ranges (software programmable via sequencer):				Notes
Voltage Range	**Accuracy (Note 2)** **One Year,** **0 to 35°C** **±(% reading+% range)**		**Input Noise** **(LSB rms)** **10 Hz-200 kHz** **(Note 4)**	(1) Specifications assume differential input single channel scan, 200 kHz scan rate, unfiltered.
	Absolute	**Transfer** (Note 3)		(2) Accuracy specification is exclusive of noise. Measured at P1.
0 to +10 V	0.015+.005	0.004+.002	1	
0 to +5 V	0.015+.005	0.004+.002	1	
0 to +2.5 V	0.015+.005	0.004+.002	1	(3) Transfer accuracy; applicable for measurements made ±5°C from ambient temperature at calibration.
0 to +1.25 V	0.015+.008	0.004+.002	2	
0 to +0.625 V	0.015+.008	0.004+.002	2	
0 to +0.3125 V	0.015+.008	0.004+.003	2	
-10 to +10 V	0.015+.005	0.004+.001	1	(4) P1 inputs shorted to P1-19, differential input, 8192 samples.
-5 to +5 V	0.015+.005	0.004+.001	1	
-2.5 to +2.5 V	0.015+.005	0.004+.001	1	
-1.25 to +1.25 V	0.015+.005	0.004+.001	2	
-0.625 to +0.625 V	0.015+.008	0.004+.001	2	
-0.3125 to +0.3125 V	0.015+.008	0.004+.0015	3	
-0.156 to +0.156 V	0.02+.008	0.004+.0015	3	

Input Sequencer

Analog, digital and frequency inputs can be scanned synchronously,
based on either an internal programmable timer, or an external clock source.

Scan Clock Sources: 2

  1. Internal, programmable from 5 µs to 5.96 hours in 5 µs steps

  2. External, TTL level input up to 200 kHz max

Programmable Parameters per Scan: Channel
(random order), gain, unipolar/bipolar, sampling time: 5 µs, 10 µs, 1000 µs per channel, programmable

Depth: 512 locations

On-Board Channel-to-Channel Scan Rate: 5 µs

Expansion Channel Scan Rate: 5 µs, 10 µs, 1000 µs per channel, programmable

Data Buffer: 64 K sample FIFO

Note: Specifications are subject to change without notice.

External Acquisition Scan Clock Input

Maximum Rate: 200 kHz

Clock Signal Range: 0V to +5V

Minimum Pulse Width: 50 ns high, 50 ns low

External SYNC Port: Available on rear panel, allows multiple DaqBook/2000 Series
  units to be *scan-synchronous* (post trigger) with other DaqBook/2000 Series units.

Triggering

Trigger Sources: 6, individually selectable for starting and stopping an acquisition.
  Stop acquisition can occur on a different channel than start acquisition; stop acquisition
  can be triggered via modes 2, 4, 5 or 6 described below. Pre-trigger is supported with fixed
  or variable pre-trigger periods.

1. Single-Channel Analog Hardware Trigger

Any analog input channel can be software programmed as
  the analog trigger channel, including
  any of the 256 analog expansion channels.

Input Signal Range: -10 to +10V max

Trigger Level: Programmable (11-bit resolution)

Hysteresis: Programmable (11-bit resolution)

Latency: 5 µs max

2. Single-Channel Analog Software Trigger

Any analog input channel, including any of the 256 analog expansion channels,
  can be selected as the software trigger channel. If the trigger channel involves a
  calculation, such as temperature, then the driver automatically compensates for
  the delay required to obtain the reading, resulting in a maximum latency of one
  scan period.

Input Signal Range: Anywhere within range of the selected trigger channel

Trigger Level: Programmable (16-bit resolution), including "window triggering"

Latency: One scan period max.

3. Single-Channel Digital Trigger

A separate digital input is provided for digital triggering.

Input Signal Range: -15V to +15V

Trigger Level: TTL

Minimum Pulse Width: 50 ns high, 50 ns low

Latency: 5 µs max

4. Digital Pattern Triggering

8- or 16-bit pattern triggering on any of the digital input ports. Programmable for trigger
  on equal, above, below, or within/outside of a window. Individual bits can be masked
  for "don't care" condition.

Latency: One scan period max

5. Counter/Totalizer Triggering

Counter/totalizer inputs can trigger an acquisition. User can select to trigger on a frequency
  or on total counts that are equal, above, below, or within/outside of a window.

Latency: One scan period, max.

6. Software Triggering

Trigger can be initiated under program control.

Note: Specifications are subject to change without notice.

Analog Output (The DBK46 Option is Required for Analog Output)

The four analog output channels are updated synchronously relative to scanned inputs, and clocked from either an internal onboard clock, or an external clock source. Analog outputs can also be updated asynchronously, independent of any other scanning in the system.

Channels: 4

Resolution: 16 bits

Data Buffer: 256 Ksample FIFO

Output Voltage Range: ±10V

Output Current: ±10 mA

Offset Error: ±0.0045V max

Gain Error: ±0.01%

Update Rate: 100 kHz max, 1.5 Hz min (no minimum with external clock)

Settling Time: 10 μs max to 1 LSB for full-scale step

Digital Feed-thru: a spike of up to 50 mV may occur on the DAC output each time the DAC output is updated

Clock Sources: 4, programmable

1. Onboard D/A clock, independent of scanning input clock
2. Onboard scanning input clock
3. External D/A input clock, independent of external scanning input clock
4. External scanning input clock

Digital I/O

Channels: 40, expandable up to 272 with external digital DBK options

Input Scanning Modes: 2

1. Asynchronous, under program control at any time relative to input scanning
2. Synchronous with input scanning

Ports: 3 x 8-bit (82C55 emulation), and 1 x 16-bit; each port is programmable as input or output

Input Protection: ±8KV ESD clamp diodes parallel

I/O Levels: TTL

Sampling/Update Rate: 200 kHz max

P2 – Digital I/O Characteristics:
  Output Driver:
    Resistor & Pull-up: 33 Ω series resistor with a 680 Ω pull-up to 5 V
    Current: can only sink current, source-current from pull-up resistor
  Output Voltage:
    High Level: 2.0 V min @ 4 mA; 4.0 V min @ 1 mA
    Low Level: 0.5 V min @ 4 mA
  Input Voltage: valid range of - 0.3 V to + 5.0 V

P3 – Digital I/O Characteristics:
  Output Driver:
    Resistor & Pull-up: 100 Ω series resistor with a 10 KΩ pull-up to 5 V
    Current: source 12 mA; sink 12 mA
  Output Voltage:
    High Level: 2.5 V min @ 12 mA
    Low Level: 0.5 V min @ 4 mA
  Input Voltage: valid range of - 0.3 V to + 5.0 V

Note: Specifications are subject to change without notice.

Frequency/Pulse Counters

Counter inputs can be scanned synchronously along with analog and
  digital scanned inputs, based either on internal programmable timer,
  or an external clock source. Counters can be configured to clear when
  read, or to totalize and clear under program control.

Channels: 4 x 16-bit; cascadable as 2 x 32-bit

Frequency Measurement Rate: 10 MHz max

Input Signal Range: -15V to +15V

Trigger Level: TTL

Minimum Pulse Width: 50 ns high, 50 ns low

Timer/Pulse Generators (Timer0, Timer1)

Channels: 2 x 16-bit

Output Waveform: Square wave

Output Rate: 1 MHz base rate divided by 1 to 65535 (programmable)

High-Level Output Voltage: 2.0V min @ -3.75 mA; 3.0V min @ -2.5 mA

Low-Level Output Voltage: 0.4V max @ 2.5 mA

Ordering Information, Includes Accessories

Note: All DaqBook models include documentation on CDROM, quick start guide, DaqView™, and drivers for Visual Basic®, Delphi™ & C++ for Windows®; DASYLab®, TestPoint®, & LabVIEW®

Item	Description
DaqBook/2000E	Ethernet 16-bit, 200-kHz data acquisition system
DaqBook/2000A	Parallel port 16-bit, 200-kHz data acquisition system
DaqBook/2000X	Parallel port 16-bit, 200-kHz data acquisition system with 3 DBK expansion slots
DBK46	Internal 4-channel, 16-bit, 100-kHz analog output option card
DBK203 (Note 1)	Adapter board with screw terminals, housed in a shielded metal enclosure, connects DBK signal conditioning and expansion options to a DaqBook/2000 Series Devices via a CA-195 expansion cable.
CA-35-2 (2 foot)	DB25M to DB25F expansion cable. Used for parallel and expansion port connections. 2-ft.
CA-35-12 (1 foot)	DB25M to DB25F expansion cable. Used for parallel and expansion port connections. 1-ft.
CA-37-x	Expansion-card cable for connecting DBK/CDK series expansion options; specify number of option cards (x) to be connected
CA-37-1T (2.5 inch)	DBK expansion cable from DaqBook/2000 Series Device to DBK modules; 2.5 in.
CA-37-3T (4.5 inch)	DBK expansion cable from DaqBook/2000 Series Device to DBK modules; 4.5 in.
CA-37-4T (5.5 inch)	DBK expansion cable from DaqBook/2000 Series Device to DBK modules; 5.5 in.
CA-37-8T (11.5 inch)	DBK expansion cable from DaqBook to DBK modules; 11.5 in.
CA-74-1 (1 foot)	SYNC cable for multi-unit synchronization; RJ-11, 6-conductor, 1 ft.
CA-74-5 (5 foot)	SYNC cable for multi-unit synchronization; RJ-11, 6-conductor, 5 ft.
CA-113 (6 foot)	Ribbon cable with female DB37 connector, provides convenient wiring to DaqBook/2000 Series P1, P2, and P3 ports without requiring soldering to DB37 connectors, 6 ft.
CA-115 (6 inch)	5-pin male DIN to 5-pin male DIN provides convenient connection between DaqBook power input connectors and battery packs
CA-116 (8 foot)	5-pin DIN to automobile cigarette lighter power cable, 8 ft.
CA-195-1 (8 inch) **CA-195** (3 foot) **CA-195-6** (6 foot)	100-conductor expansion cables. Three different lengths. These connect a DaqBook/2000 Series Device to a DBK200 Series adapter board: i.e., DBK200, DBK201, DBK202, DBK203, DBK206, DBK207, DBK207/CJC, DBK208, or DBK209. For a shielded version of the CA-195 cable, i.e., CA-195CE, refer to CE Cable Kit, item p/n CA-209D.
CA-209D (3 foot)	CE Cable Kit. Includes a shielded version of the CA-195 cable (CA-195CE), 2 grounding pigtails, cable clamps, and clamp screws. CA-209D is recommended for use in electrically noisy environments. In regard to CE Compliance and additional information regarding the CE Cable Kit, refer to Chapter 3.
CA-242 (1.5 foot) **CA-242-7** (7 foot)	Ethernet Patch Cables, CAT5E; Shielded, 24/26awg. Used to connect an Ethernet-ready device from its Ethernet jack to a jack on a PC or Ethernet network hub. CA-242 is 1.5 feet long. CA-242-7 is 7 feet long.
232-0810	Splice Plate Kit. Includes two splice plates (fastener panels) and 8 screws. Used to stack data acquisition devices. Refer to Installation Guide, p/n 1103-0940, for an illustration. A copy of the guide is included in this user's manual. Also see related part, HA-111, which is an optional handle.
HA-111	Optional handle for use with splice plate kit p/n 232-0810. Refer to Installation Guide, p/n 1103-0940, for an illustration. A copy of the guide is included in this user's manual.

Note 1: The DBK203 module is the most popular expansion option. However, as discussed in the *System Connections and Pinouts* document module, several DBK200 Series P4-adapter options are available. Before expanding a system, you should review *Chapter 3, CE Compliance*.

DBK46 – Specifications

The four analog output channels are updated synchronously relative to scanned inputs, and are clocked from either an internal clock on the primary acquisition device, such as a DaqBook/2000A; or from a user-supplied external clock source. Analog outputs can also be updated asynchronously, independent of any other scanning in the system.

Channels: 4

Resolution: 16 bits

Data Buffer: 256 K sample FIFO

Output Voltage Range: ±10V

Output Current: ±10 mA

Offset Error: ±0.0045V max

Gain Error: ±0.01%

Update Rate: 100 kHz max, 1.5 Hz min (no minimum with external clock)

Settling Time: 10 µsec max to 1 LSB for full-scale step

Digital Feed-thru: a spike of up to 50 mV may occur on the DAC output each time the DAC output is updated

Clock Sources: 4 programmable clock sources:

- The primary acquisition device's *onboard* **D/A input clock**, independent of the scanning input clock

- The primary acquisition device's *onboard* **scanning input clock**

- An *external* **D/A input clock**, independent of an external scanning input clock

- An *external* **scanning input clock**

Note: Specifications are subject to change without notice.

Notes

Fuse Replacement – for DaqBook/2000 Series Devices   6

CAUTION
Turn OFF the power to, and UNPLUG the DaqBook/2000 Series device and all connected equipment. Remove all signal I/O lines from the unit. Electric shock or damage to equipment can result even under low-voltage conditions.
Take ESD precautions, to include using a grounded wrist strap.
Use care to avoid touching board surfaces and onboard components. Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.

You should only replace a fuse if your device shows no sign of damage. If your device appears damaged, such as evidenced by a "smoked" component, contact the factory as soon as possible.

If the replacement fuse blows, contact the factory, as this indicates a problem may exist with your DaqBook/2000 Series device.

General Information

Each DaqBook/2000 Series device has one user-replaceable fuse designated as F201.

> **F201 Input Power Fuse**. **4.0 A, MINI ATO**.
> This 4-amp fuse is located near the rear panel's 5DIN POWER IN connector.
> If this fuse has blown, the DaqBook/2000 Series device will not power up.
> Factory Part Number: **FU-8-4**
> Littelfuse Part Number: **297-004**, Littelfuse Body Color Code: **Pink**

Observe the Caution and Note prior to beginning any of the fuse-replacement procedures in this chapter.

You will need the following:

- Phillips Screwdriver
- 3AG Fuse Puller, or needle-nose pliers*
- 3/16-inch hex-nut driver
- Grounding wrist strap and associated anti-static pad
- Replacement fuse F201

* Needle-nose pliers can be used to pull MINI ATO fuses; but should not be used to insert fuses.

DaqBook/2000A

Observe the Cautions and the important note on page 6-1 prior to beginning this fuse replacement procedure.

1. If you have not already done so, turn OFF the power to, and UNPLUG the DaqBook/2000A and all connected equipment. Remove all signal I/O lines from the unit.

2. Using a Phillips screwdriver, remove the four *Cover Plate Screws* from the left and right sides of the unit. The following figure points out the screw locations.

3. Remove the Cover Plate [not shown].

Cover Plate Screws (2 of 4)

Cover Plate Screws (2 of 4)
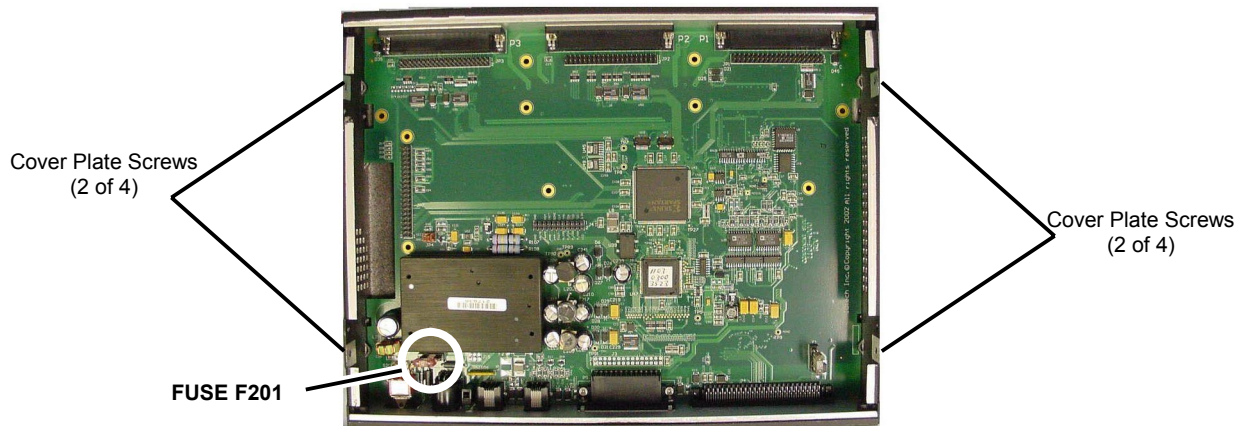
FUSE F201

DaqBook/2000A, F201 Location

4. Locate fuse F201. See Figure.

5. While wearing a grounded wrist strap, remove and replace the bad fuse.

6. Replace the Cover Plate and secure it to the chassis with the 4 screws that were removed in step 2.

7. Return the DaqBook/2000A to normal service. Should any problems be noted, consult the factory.

6-2   Fuse Replacement   967496   DaqBook/2000 Series User's Manual

> **Observe the Cautions and the important note on page 6-1 prior to beginning this fuse replacement procedure.**

1. If you have not already done so, turn OFF the power to, and UNPLUG the DaqBook/2000X and all connected equipment. Remove all signal I/O lines from the unit. Remove DBK option cards from the unit, if any are installed.

2. Using a Phillips screwdriver, remove the four *Cover Plate Screws* from the sides of the unit. The following figure points out the screw locations.

3. Remove the Cover Plate [not shown].
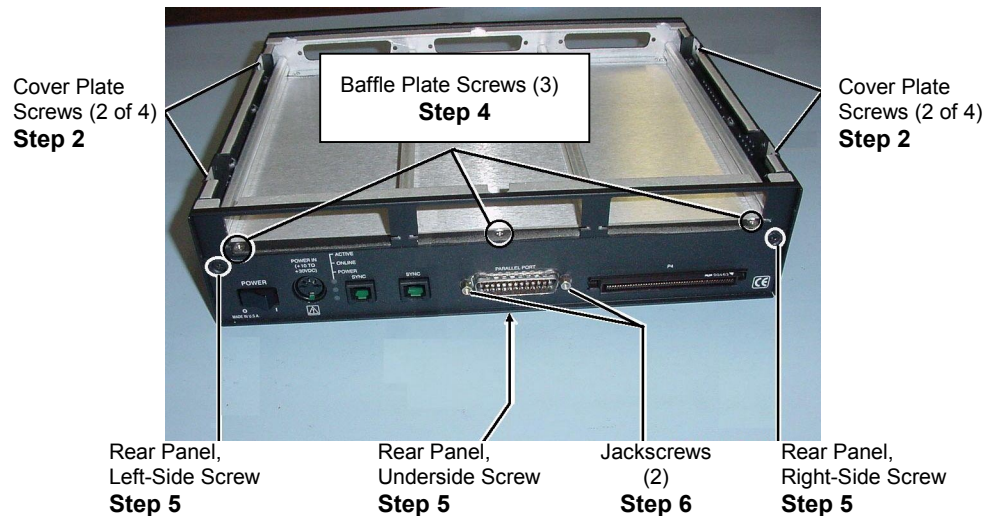
DaqBook/2000X, Screw Removal

4. Remove the three *Baffle Plate Screws*.

5. Remove the following three Rear Panel screws: *Left-Side Screw*, *Right-Side Screw*, and *Underside Screw*.

6. Using a 3/16 inch nut-driver, remove the two # 4-40 hex *Jackscrews* from the Parallel Port connector.

7. Remove the Rear Panel from the main chassis (See following figure).

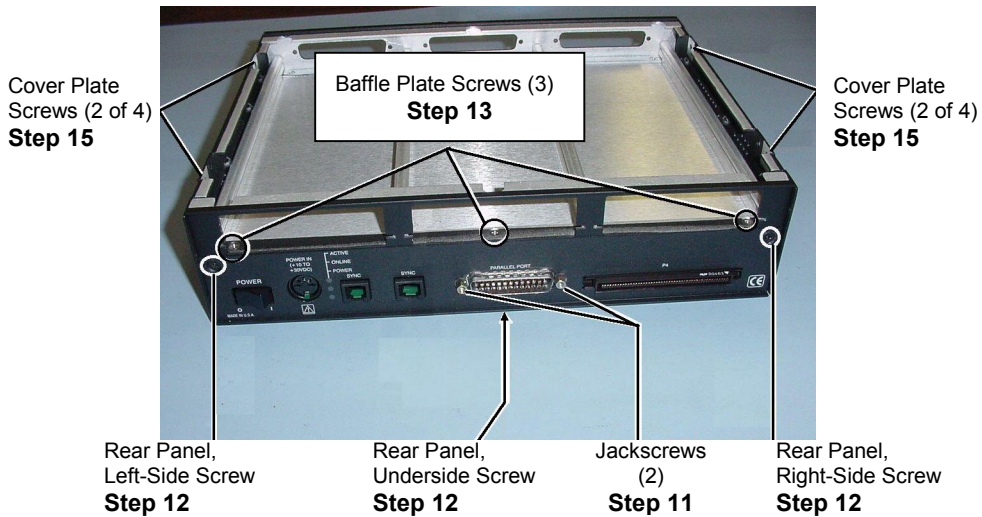*DaqBook/2000X, Top Cover Plate and Rear Panel Removed*

8. Locate fuse F201. See following figure.

9. While wearing a grounded wrist strap, remove and replace the bad fuse.

Fuse F201

DaqBook/2000X, F201 Location

10. Position the Rear Panel onto the DaqBook/2000X chassis. See following figure.

11. Thread the two #4-40 hex Jackscrews back into the Parallel Port connector. Tighten snug.

Cover Plate
Screws (2 of 4)
Step 15

Baffle Plate Screws (3)
Step 13

Cover Plate
Screws (2 of 4)
Step 15

Rear Panel,
Left-Side Screw
Step 12

Rear Panel,
Underside Screw
Step 12

Jackscrews
(2)
Step 11

Rear Panel,
Right-Side Screw
Step 12

DaqBook/2000X, Re-Assembly

12. Secure the Rear Panel to the chassis with the following three Rear Panel screws:
Left-Side Screw, *Right-Side Screw*, and *Underside Screw*.

13. Insert the three *Baffle Plate Screws* in the designated locations, and tighten snug.

14. Position the Cover Plate [not shown] onto the chassis.

15. Secure the Cover Plate to the unit by inserting the four *Cover Plate Screws*, and tightening snug.

16. Re-install the DBK option cards that were removed in step 1.

17. Return the DaqBook/2000X to normal service. Should any problems be noted, consult the factory.

Note! **Observe the Cautions and the important note on page 6-1 prior to beginning this fuse replacement procedure.**

Note: In regard to fuse replacement for the DaqBook/2000E, there is no need to remove the top Cover Plate.

1. If you have not already done so, turn OFF the power to, and UNPLUG the DaqBook/2000E and all connected equipment. Remove all signal I/O lines from the unit.

2. Remove the following three Rear Panel screws:
    Left-Side Screw, *Right-Side Screw*, and *Underside Screw* (see figure).

3. Using a 3/16-inch nut-driver, remove the two # 4-40 hex *Jackscrews* from each of the three Expansion Port connectors. A total of six *Jackscrews* will be removed.

Note:
For DaqBook/2000E there is no need to remove the top cover plate.

Rear Panel,
Left-Side Screw
Step 2

Rear Panel,
Underside Screw
Step 2

Rear Panel,
Right-Side Screw
Step 2

DaqBook/2000E, Screw Removal

4. Remove the Rear Panel from the main chassis.

5. Locate fuse F201. See following figure.

6. While wearing a grounded wrist strap, remove and replace the bad fuse.

Fuse F201

DaqBook/2000E, F201 Location

7. Position the Rear Panel onto the DaqBook/2000E chassis.

8. Using a 3/16-inch nut-driver, thread two # 4-40 hex *Jackscrews* into each of the three Expansion Port connectors. Tighten all six *Jackscrews* snug.

DaqBook/2000E, Re-Assembly

9. Secure the Rear Panel to the chassis with the following three Rear Panel screws: *Left-Side Screw*, *Right-Side Screw*, and *Underside Screw*.

10. Return the DaqBook/2000E to normal service. Should any problems be noted, consult the factory.

Troubleshooting and Customer Support 7

Electrostatic Discharge (ESD), Handling Notice

The discharge of static electricity can damage some electronic components. Semiconductor devices are especially susceptible to ESD damage. You should always handle components carefully, and you should never touch connector pins or circuit components unless you are following ESD guidelines in an appropriate ESD-controlled area. Such guidelines include the use of properly grounded mats and wrist straps, ESD bags and cartons, and related procedures.

Product Care

DaqBooks, DBK options, and pertinent WBK options are essentially maintenance free and require a minimal amount of care. They should be treated much like other high-tech equipment. In general:

- Keep them clear of harsh chemicals and abrasive elements.

- Avoid exposing the products to extreme heat, for example, avoid setting up a DaqBook system near a boiler or furnace.

- Avoid extreme shock and vibration.

- Avoid subjecting the units to liquids and extremely fine air particulate, such as silica dust.

- Never touch circuit boards without proper ESD (Electrostatic Discharge) measures in place.

A "common-sense" approach to handling your data acquisition equipment will go a long way in protecting it from inadvertent damage.

Note that you can use lint-free rags and Isopropyl Alcohol (Rubbing Alcohol) to clean the outer plate surfaces of DaqBooks and optional modules.

Isopropyl Alcohol

Lint-Free Rags
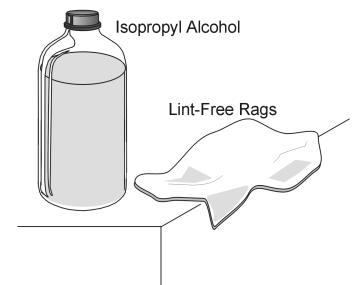
ReadMe Files and the Install CD-ROM

The Install CD-ROM includes ReadMe Files. These files often contain late-breaking information that may not appear in the user documentation. During installation you should review the ReadMe files when prompted to by the program.

The Install CD-ROM includes:
- DaqBook/2000 Series Windows NT/2000/XP driver
- DaqBook/2000 Series Windows 95/98/Me driver
- **DaqX.DLL** (32-bit API) for DaqBook/2000 Series
- Microsoft C/C++ API support
- Microsoft VB API support
- Borland Delphi API support
- Daq* Configuration Control Panel Applet
- User documentation in Adobe® PDF format
- DaqView

Upon installation, the user needs to run the *Daq* Configuration* Control Panel applet. The applet is used to configure the DaqBook/2000 Series device for an appropriate LPT Port, or Ethernet Port (if applicable). This must be performed in order for the application to access the DaqBook through the Windows NT/2000, or through the Windows 95/98/Me driver.

Driver Support

The daqX API can be used with WaveBook, DaqBook, DaqBoard, Daq PC Card and TempBook product lines. All daqX functions share the **daq** prefix.

The API support examples can be found in the installed directory
  <Install> ProgrammingLanguageSupport\DAQ

Ethernet Problems

- Make sure the Ethernet network is not experiencing technical problems. Check with your Network Administrator.

- Ensure that your system is properly configured in the Daq*Configuration Applet [located in the Windows' Control Panel]. If a device is not configured correctly it will not be accessible from an application.

- Verify that the correct MAC (Media Access Control) number is reflected by the software.

- If communications cannot be established with the DaqBook/2000E or with the WBK25 Ethernet Interface Module or, if trying to connect causes the system to hang or crash, try the following:

    - Verify that the device power switch is set to ON and that the POWER ON indicator is lit.

    - Ensure that all physical device interface connections are correct. This includes Ethernet connections from the DaqBook/2000E or the WBK25 Ethernet Interface Module to their respective PC Ethernet jacks, or Ethernet Network hubs.

    - Run the *Daq Configuration* applet from the Windows Control Panel. Make sure the device is configured to the appropriate Ethernet port with the appropriate protocol. Run the device test and if it fails try other protocols for the device. Be sure to click on **<Apply>** to apply the settings, before re-running the test.

- If problems persist, notify your Network Administrator. If he or she can't solve the problem, contact the factory.

Parallel Port Problems

Make sure the parallel port is operable and capable of generating interrupts. The parallel port, to which the DaqBook/2000A or DaqBook/2000X is to be connected, must be properly configured in order for the device to operate correctly.

Each device must be configured using the Daq*Configuration Applet [located in the Windows' Control Panel]. If a device is not configured correctly it will not be accessible from an application.

If communications cannot be established with the DaqBook or, if trying to connect causes the system to hang or crash, try the following:

- Verify that the power switch is set to ON and that the module's power indicator is lit.

- Check to make sure that the Notebook PC communication cable is properly connected to the DaqBook's DB25 PARALLEL PORT connector.

- Check that the desired LPT port is properly configured and the base address and interrupt are recognized by the operating system.

- Check the BIOS settings for the LPT port. Make sure that the BIOS LPT protocol settings are compatible with the settings selected for the LPT port. "Compatibility mode" is recommended.

- Run the *Daq Configuration* applet from the Windows Control Panel. Make sure the device is configured to the appropriate LPT port with the appropriate protocol. Run the device test and if it fails try other protocols for the device. Be sure to click on `<Apply>` to apply the settings, before re-running the test.

- *Windows NT/2000/XP*: Make sure that the driver has been loaded. The installation will configure the operating system to automatically load the driver at boot-up. However, if there is a problem communicating with the device, the driver can be loaded manually by using the following start sequence from a DOS shell: `NET START DAQBK`.
  To unload the driver manually, use the following sequence: `NET STOP DAQBK`.

- Users of Enhanced Capabilities Ports (ECP) should refer to the following *ECP Setup* section.

Windows 95/98/Me Issues

This section only applies to Windows 95/98/Me installations.

Resource Settings

If the DaqBook fails to communicate or has problems transferring data, there may be a resource conflict with other devices within the system. Take the following steps if this appears to be the case.

ECP Setup (Enhanced Capabilities Port Setup)

If the DaqBook fails to communicate in ECP mode, make certain that the DaqBook hardware is actually capable of ECP communications. This can be done as follows:

1. Verify the parallel port hardware is in ECP mode. For ports built into the computer's motherboard, the port is usually configured using the computer's BIOS setup utility (accessible during computer start up). See your computer's specific documentation regarding accessing the BIOS setup utility and configuring peripherals.

2. Verify the parallel port is configured [in the Windows Control Panel] as an "ECP parallel port" and not "Parallel port."

   Windows95/98/Me users can follow the steps below in regard to locating parallel port resource information.

Parallel Port Setup (general)

If the DaqBook fails to communicate or has problems transferring data there may be a problem with the way the parallel port is configured. If this appears to be the case take the following steps:

1. Ensure that any hardware settings on the parallel port are configured properly. If unsure of proper configuration, refer to the parallel port manufacturer's documentation. If this fails to solve the problem, proceed to the next step until the problem is resolved.

2. Click the Windows desktop *Start* button; select the *Settings* menu item; then, select the *Control Panel* menu item.

3. Double-click the *System* icon.

4. Click the *Device Manager* tab.

5. If the small box to the far left of the "Ports (COM & LPT)" entry contains a "+", click once on the "+" to show all your communication and line printer ports.

6. In the Configuration utility, click once to highlight the line containing the LPT port you chose to use with the DaqBook/2000 Series device.

7. Click the *Properties* button.

8. The *Device Status* section should contain the message "This device is working properly." If the message is not present, either the wrong I/O address is selected, or the hardware is missing or broken.

9. Click the *Resources* tab.

10. The *Resource Settings* section should contain entries for "Input/Output Range" and "Interrupt Request" with "Settings" from the table below that correspond to the LPT port chosen for the DaqBook.

    Note: A "Direct Memory Access" entry may also exist for EPP or ECP printer ports.

Printer Port	Input/Output Range	Interrupt Request
LPT1	**0378-037B (or 037F)**	**7**
LPT2	**0278-027B (or 027F)**	**5**
LPT3	**03BC-03BF**	**7 (shares with LPT1)**

    If the settings do not correspond to those in the previous table, or if there is no "Interrupt Request" entry, complete steps 10a through 10b before moving on to step 11.

    a. Click on the check mark in the small box to the left of "Use automatic settings."

    b. Click on the now active drop-down combo-box to the right of "Setting based on."

    c. Click on different "Basic configuration" choices (use the up-down slide bar to the right, if needed) until the resource settings match those of your printer port in the table above.

11. The "Conflicting device list" section should contain the message "No conflicts." If this is not the case and a DMA conflict is described, repeat Steps 10a - 10c *but change only the DMA setting*.

12. If one or more conflicts are described in the "Conflicting device list" section, you must find the conflicting device(s) and change the conflicting resource(s) by following these steps:

    a. Take note of all conflicts, then click the *OK* button.
    b. If a window appears titled "Creating a Forced Configuration", click *Yes* to continue.
    c. Open the conflicting device type by clicking on the "+" in the small box to its left, if necessary.
    d. The conflicting device's icon should be marked with an exclamation point in a yellow circle. Click once on the device to highlight it; then click the *Properties* button.
    e. Click the *Resources* tab.
    f. Perform Steps 10a - 10c to resolve the resource conflict.
    g. Repeat Step 11 for each additional existing resource conflict.

13. If one or more resource conflicts remain, the conflicting device(s) must either be removed or kept absolutely dormant for proper operation. Click the *OK* button to close the device properties window and return to the "System Properties" window. If a window appears titled "Creating a Forced Configuration", click the *Yes* button to continue. To remove a device, perform the following steps:

    a. If necessary, open the device type by clicking on the "+" in the small box to its left.
    b. Click once on the device to highlight it, then click the *Remove* button.
    c. Click the *OK* button to confirm the device's removal.

14. Click the *Close* button to close the "System Properties" window. Close the "Control Panel" window and any other tasks running; then shut down Windows 95/98/Me.

15. If any hardware was removed in Step 13 or if any hardware reconfigured in Step 12 requires manual reconfiguring, power off the computer and remove or reconfigure the hardware before rebooting. Otherwise, simply reboot the computer.

16. Run the Configuration utility and test the DaqBook's communication. If problems persist and no resource conflicts exist, perform the following steps:

    a. Check for loose cable connections and verify the power indicator is ON.
    b. Verify that the computer's printer port and data cable work with a printer or other device.
    c. Verify there are no installed devices that Windows 95/98/Me does not recognize but whose resources might conflict with the DaqBook.
    d. Verify that DaqBook works on another PC (from a different manufacture if possible).

Parallel Port Troubleshooting Tips

Windows9x Users

After completing the test hardware function within the DaqConfig control panel applet. It is possible that a connection may not be made. Before doing anything else, try the following:

Recheck your parallel port cable and the power supply so you are certain that the connection is tight and power is applied

Try all of the communication protocols listed in the DaqConfig icon because it is possible that the parallel port has a communication protocol other than standard or normal mode.

If you still have not established communication, then go to control panel, system, device manager, ports, LPT1 and verify that the following things are true:

Under the general and driver sections, make sure that the parallel port is a standard parallel port with a driver installed and that no resource conflicts are present. If no driver is installed or resource conflicts are present, then you need to resolve these issues with your computer supplier or your information services department.

Under the resource section, make sure that the parallel port has an interrupt level assigned. If it doesn't you will need to add one by un-checking the use default settings box, selecting configuration one so the same base address is maintained but an interrupt level is added, and then double clicking on the interrupt level so you can add the interrupt level. Generally, 7 is reserved for parallel ports but you should pick one where no conflict exists. Reboot the computer and everything should work If you find that the parallel port is configured as an ECP parallel port, then you will need to access the bios and change the parallel port to a standard or normal mode. You can generally access the bios by pushing F2 or escape during the initial boot up of the computer. If so, you will see a computer message "Push F2 to enter setup". Change the parallel port mode from ECP to standard or normal. Reboot the computer and everything should work.

WindowsNT Users

After completing the test hardware function within the daqconfig control panel applet. It is possible that a connection may not be made. Before doing anything else, try the following:

Recheck your parallel port cable and the power supply so you are certain that the connection is tight and power is applied

Try all of the communication protocols listed in the daqconfig icon because it is possible that the parallel port has a communication protocol other than standard or normal mode

If you still have not established communication, verify that the parallel port drivers are installed by going to control panel, devices, hardware profiles, parallel port. If the drivers are not installed, then you need to resolve this issue with your computer manufacturer. Verify that your parallel port interrupt has an interrupt level assigned to it by looking at the parallel port resources in daqconfig applet.

If it is necessary to add an interrupt level or to change to parallel port communication protocol, that must be done in the BIOS, which can generally be accessed during computer boot up. You should see the message "Push F2 to enter setup". If the parallel port is configured for ECP or EPP, change it to standard or normal and everything should be fine.

Frequently Asked Questions

(1) Topic: Environmental Factors

Question: What Environments are DaqBook/2000 Series Systems Intended for?

Answer: DaqBook/2000 Series Systems are designed to operate within 0° to 50°C (32° to 122°F) and with a relative humidity of up to 95%RH, non-condensing. The products can be stored at temperatures within the range of -40° to +70°C (-40° to 158°F). DaqBook systems should always be protected from snow, rain, extreme dust, and harsh sun.

(2) Topic: DaqX

Question: What is DaqX software?

Answer: DaqX software is low-level software support for application development. DaqX is installed during the installation of the DaqView application. DaqX supports Visual C++, Visual Basic, and Delphi programming environments.

Question: Where can I get the latest version of DaqX software?

Answer: You can download the latest versions from our website. This service is free.

(3) Topic: Calibration

Question: Should I calibrate my DaqBook/2000 Series system when I receive it?

Answer: No, because each DaqBook-related product is factory-calibrated to its rated accuracy before it leaves the factory.

Question: When is calibration required?

Answer: Depending on your operating guidelines, your equipment will require periodic calibration to ensure the original accuracy is maintained. We recommend that you have your DaqBook/2000 Series system calibrated at least once a year.

(4) Topic: WBK20 - PCMCIA/EPP Interface Card

Question: How do I configure the WBK20 in Windows 95 or Windows 98?

Answer: Insert the WBK20 into the PCMCIA slot. Windows 95/98 should recognize it and display a window *'New Hardware Found'* followed by a window *'Building driver data base'*.

Select the option *'Select driver from disk provided by hardware manufacturer'*. *'Install from disk'* is the next window. Provide a path to the floppy drive after you have inserted the disk that came with the WBK20. It contains a file 'IOTWBK20.INF'. Select OK.

In the next window, select 'IOtech Inc' in the left box and 'IOtech WBK20: 1 Parallel Port' in the right box. Select OK. At this time, it may ask for your Windows CD or certain diskettes. Then you will be prompted to restart the computer.

The WBK20 will show up in ControlPanel/System/Device Manager/ Ports (COM and LPT) as 'IOtech WBK20: 1 Parallel Port LPT#'. Double clicking on this will show you the resources (IRQ and I/O range).

(5) Topic: Computers for Data Acquisition

Question: What type of computer do you recommend for use with data acquisition devices such as DaqBook/2000 Series devices?

Answer: If you intend to use the Ethernet, then you should select a PC with built in Ethernet capabilities. If you have no intentions of using the Ethernet, look for a PC that has a fast parallel port, disk drives with high rotation speeds and low access times. If you are using a notebook PC, it should have a PCMCIA or PC Card slot.

We recommend that you use a PC with more than 16 Mbytes of RAM with a Windows 95 (or higher version) operating system. While RAM does not influence transfer speeds per se, it will benefit the Windows operating system in operational areas other than transfer speed.

Note that processor speed usually has less bearing on transfer rates than one might suspect, although you may want the speed for other things such as number crunching or scrolling waveforms. A 400 MHz Pentium might not transfer as fast as a 75 MHz Pentium.

(6) Topic: ECP and EPP

Question: My computer uses ECP. Is ECP the same as EPP?

Answer: No; ECP (Enhanced Capabilities Port) is a different protocol than EPP (Enhanced Parallel Port). If the DaqBook fails to communicate in ECP mode, make certain that the host hardware is actually capable of ECP communications. This can be done as follows:

1. Verify the parallel port hardware is in ECP mode. For ports built into the computer's motherboard, the port is usually configured using the computer's BIOS setup utility (accessible during computer start up). See your computer's specific documentation regarding accessing the BIOS setup utility and configuring peripherals.

2. Verify the parallel port is configured [in the Windows Control Panel] as an "ECP parallel port" and not "Parallel port."

(7) Topic: WBK20 and WBK21 Interface Options

Question: I realize that the WBK20A and WBK21 are interface options. Will they improve my speeds?

Answer: In the majority of cases, by far, both products result in higher through-put [than you would see with the use of the standard 8 bit port. The exact amount varies with PC configuration.
When using the WBK21, ISA plug-in board, 1 MHz through put is more the rule than the exception. Because this boards sits directly on the bus, most computers can handle the data rate.
The WBK20A (PCMCIA card) plugs into the PC-card slot on the side of the notebook PC. Up until early 1997, all notebooks with these slots were PCMCIA type. In these older computers, 1 MHz was often seen, but 750-800 kHz was typical. In early 1997 notebooks started shipping with a PC card bus instead of the PCMCIA card slot. This change was almost completely transparent to PC users since the PCMCIA card plugs in and the PC Card bus is backward compatible with PCMCIA cards. However, one important change occurred. The WBK20A appears to operate slower in the new PC Card slot. With this change, 1 MHz transfer rates using the WBK20A in a PC Card slot are almost non-existent, instead, 300K to 500K samples/sec is typical.

Customer Support

If you want to Expand or Enhance Your DaqBook/2000 Series System . . .

You can visit our internet site at **http//:www.iotech.com** to find the latest accessories, DBK options, and pertinent WBK options. You can also call our sales department directly at (440) 439-4091.

If you need to Report Problems or Request Product Support

Note: **Please do not return any equipment to the factory unless it has an RMA number (Return Merchandise Authorization number). RMA numbers are issued by the factory.**

To report problems or request support, call the manufacturer's Applications department. Contact information follows shortly. When you contact us, please have the following information available, as applicable:

- Hardware model numbers and software version numbers.
- Operating system, type of computer, and device information in the Windows control panel, such as interrupts and address settings for our hardware and others.
- Results of tests, such as the Daq* Configuration control panel.
- Hardware setup and software configuration.
- Information on input signals, including voltage ranges, signal impedance ranges, noise content, and common mode voltages.
- The name of a contact person from your company who can discuss the problems encountered.
- Instructions for return shipping.
- All troubleshooting notes and comments on tests performed, and all problem-related conditions.
- If your problem is Ethernet related, discuss the problem with your Network Administrator prior to contacting the factory. Please provide us with your administrator's comments, if applicable.

Note: Before calling for assistance, take a few minutes to read all parts of the manual that may be relevant to the problem. Also, please review the troubleshooting material.

You can reach IOtech by one of the following means:

Phone: **(440) 439-4091**

Fax: **(440) 439-4093**

E-mail (Product Information/Sales): **sales@iotech.com**

E-mail (Technical Support): **productsupport@iotech.com**

Internet: **http//:www.iotech.com**

Mail: **IOtech, Inc. ● 25971 Cannon Road ● Cleveland, Ohio 44146-1833**

All equipment returned to the manufacturer must have an RMA (Return Material Authorization) number. You can obtain an RMA number by calling the Customer Service or Applications departments. When returning the equipment, use the original shipping container (or equivalent) to prevent damage. Put the RMA number on your shipping label to ensure that your shipment will be handled properly. After receiving your equipment, we will fax a confirmation form that summarizes the charges (if applicable) and expected return date.

Notes

Dimensional Drawings

Chassis for Primary Data Acquisition Devices and Optional Modules

Note: With exception of the 11" x 8.5" x 2.63" category, either one [of two] dimensional drawings could apply to your device, depending on the unit's assembly date.   Legacy chassis have notable grooves on the left and right sides of the enclosure. The modern chassis have smooth surfaces. Refer to the associated drawing, *modern* or *legacy*, as applicable.

11" x 8.5" x 1.40" Category ...... page DD-2
Two drawings provided: *Modern Chassis* and *Legacy Chassis*.

DaqBook/100, /120, /112, /200, /216; DBK1, DBK10, DBK23, DBK24, DBK30A, DBK43A, DBK50, DBK51, DBK52, DBK53, DBK54, DBK84, DBK203, DBK204, TempBook/66; WaveBook/512, WaveBook/512H; WBK10, WBK10H, WBK10A, WBK14, WBK15, WBK16, WBK17

11" x 8.5" x 1.72" Category ...... page DD-4
Two drawings provided: *Modern Chassis* and *Legacy Chassis*.

DBK34A, DBK70; LogBook/300; WaveBook/512A, WaveBook/516, WaveBook/516A, DaqBook/2000A

11" x 8.5" x 2.63" Category ...... page DD-6
One drawing provided.

DaqBook/2000E, DaqBook/2000X, WBK40, WBK41, WaveBook/516E

11" x 14" x 3.44" Category ...... page DD-7
Two drawings provided: *Modern Chassis* and *Legacy Chassis*.

DaqBook/260, DBK60, LogBook/360

Dimensions for DBK Cards and Boards (excludes DBK46 and DBK200 Series) ...... page DD-9
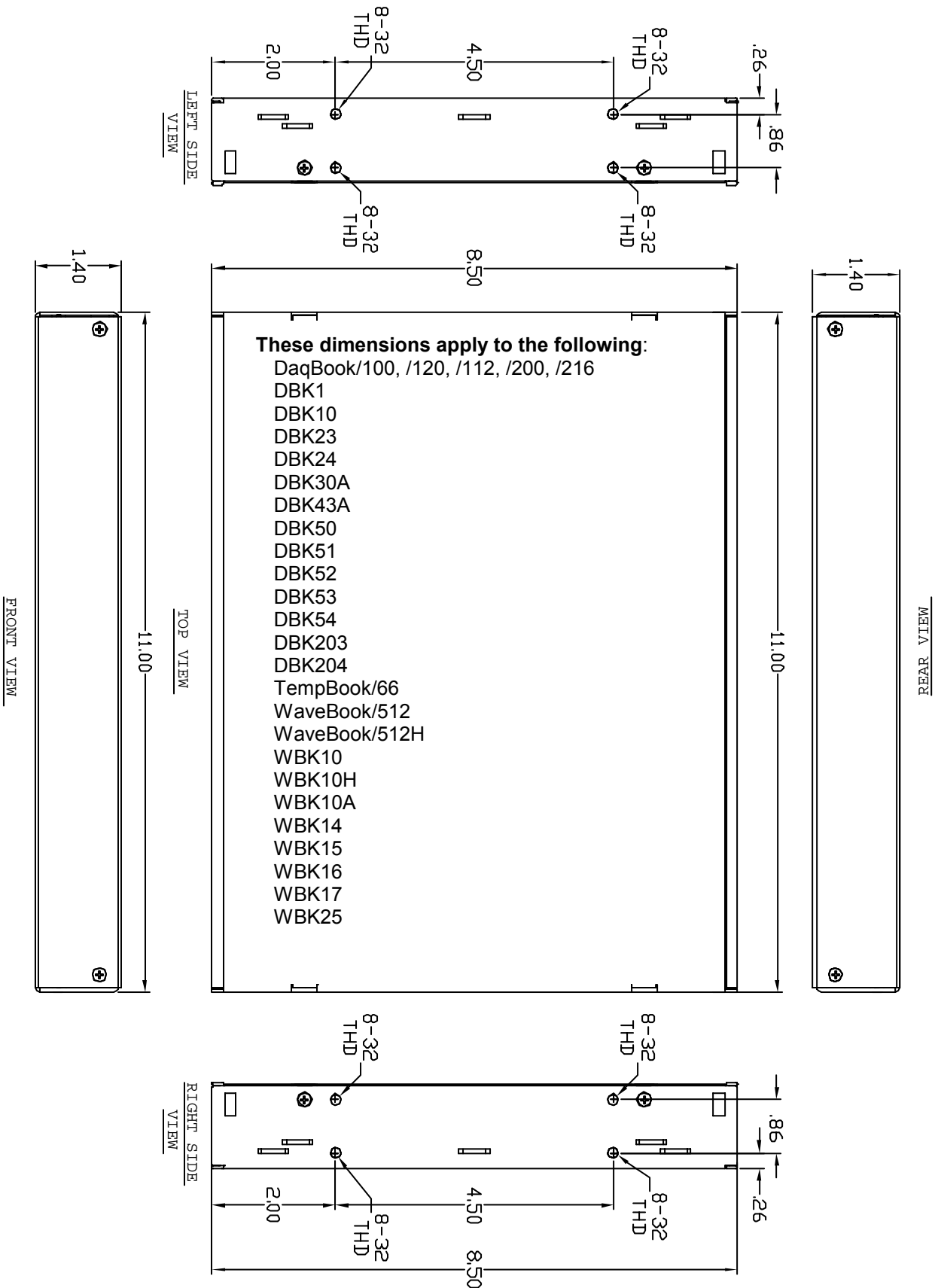
3.26" x 8.32" Category
DBK2, DBK4, DBK5, DBK7, DBK8, DBK9, DBK11A, DBK12, DBK13, DBK15, DBK16, DBK17, DBK18, DBK19, DBK20, DBK21, DBK25, DBK32A, DBK33, DBK44, DBK45, DBK81, DBK82, DBK83

Dimensions for DBK200 Series Devices ...... page DD-10

DBK200
DBK201
DBK202
DBK203 Module (See 11" x 8.5" x 1.40" Category)
DBK204 Module (See 11" x 8.5" x 1.40" Category)
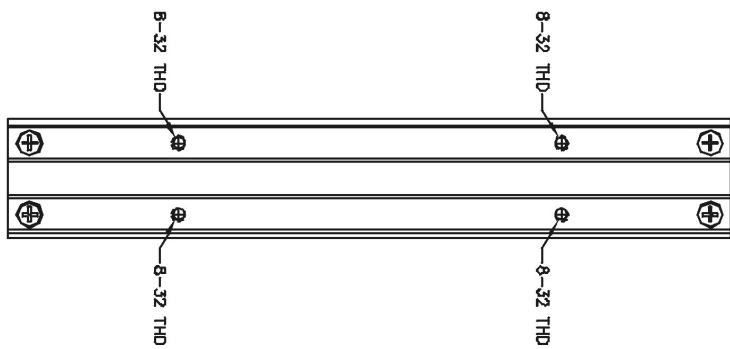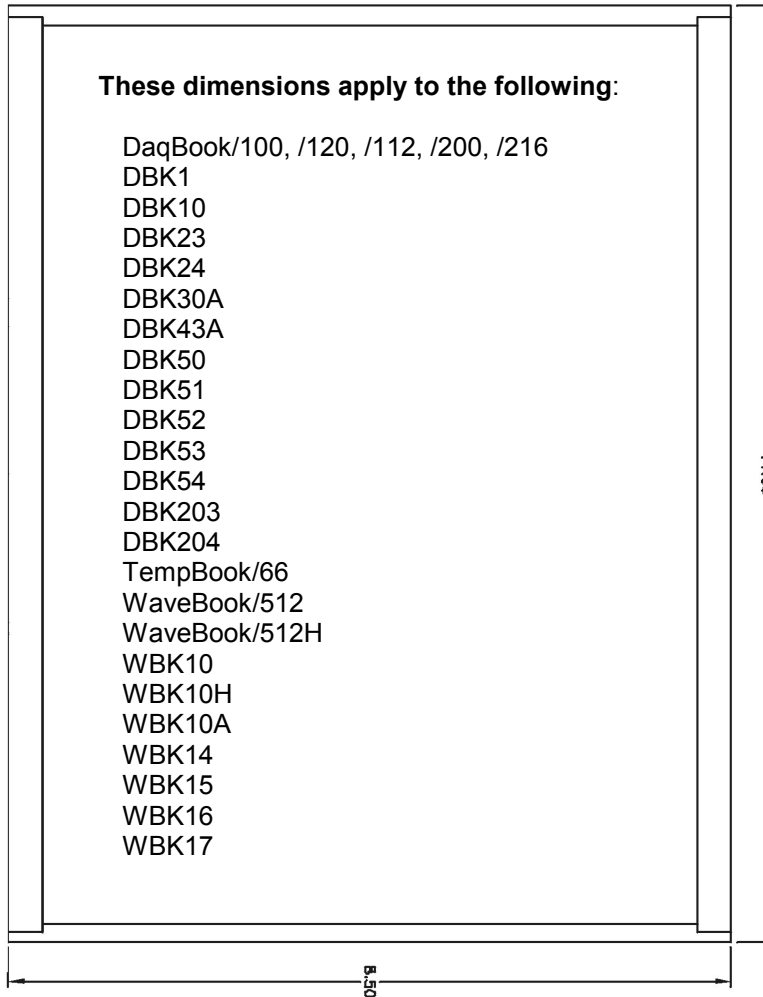DBK205
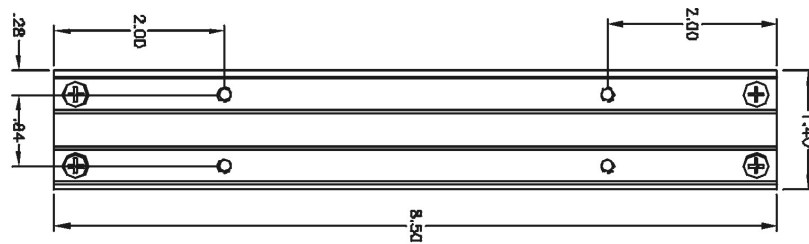DBK206
DBK207
DBK207/CJC
DBK208
DBK209

Chassis for Primary Devices and Modules

11" x 8.5" x 1.40" Category, *Modern Chassis*

LEFT SIDE VIEW

8-32 THD
2.00
4.50
8-32 THD
.26
.86
8-32 THD
8-32 THD

FRONT VIEW

1.40
11.00

TOP VIEW

8.50
11.00

These dimensions apply to the following:
DaqBook/100, /120, /112, /200, /216
DBK1
DBK10
DBK23
DBK24
DBK30A
DBK43A
DBK50
DBK51
DBK52
DBK53
DBK54
DBK203
DBK204
TempBook/66
WaveBook/512
WaveBook/512H
WBK10
WBK10H
WBK10A
WBK14
WBK15
WBK16
WBK17
WBK25

REAR VIEW

1.40

RIGHT SIDE VIEW

8-32 THD
8-32 THD
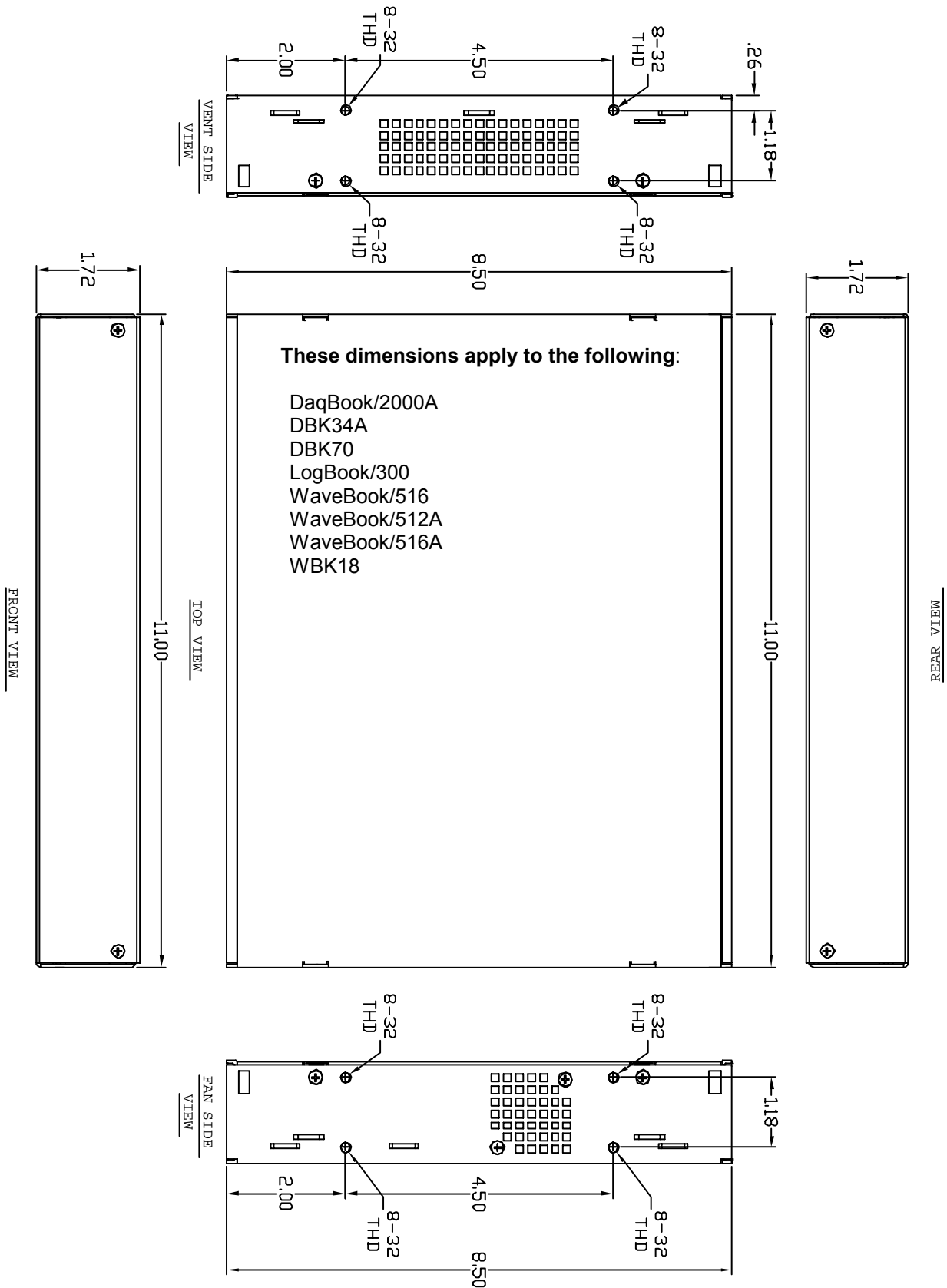.86
2.00
4.50
8-32 THD
8-32 THD
.26
8.50

Chassis for Primary Devices and Modules

11" x 8.5" x 1.40" Category, *Legacy Chassis*

These dimensions apply to the following:

DaqBook/100, /120, /112, /200, /216
DBK1
DBK10
DBK23
DBK24
DBK30A
DBK43A
DBK50
DBK51
DBK52
DBK53
DBK54
DBK203
DBK204
TempBook/66
WaveBook/512
WaveBook/512H
WBK10
WBK10H
WBK10A
WBK14
WBK15
WBK16
WBK17

8—32 THD

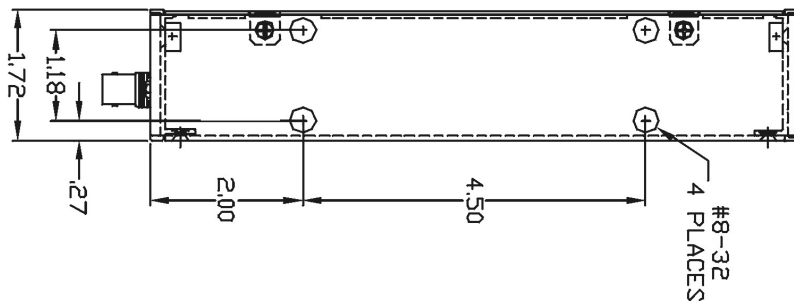8—32 THD

8—32 THD

8—32 THD

Chassis for Primary Devices and Modules

11" x 8.5" x 1.72" Category, *Modern Chassis*

These dimensions apply to the following:

DaqBook/2000A
DBK34A
DBK70
LogBook/300
WaveBook/516
WaveBook/512A
WaveBook/516A
WBK18

VENT SIDE VIEW

FRONT VIEW

TOP VIEW

REAR VIEW

FAN SIDE VIEW

8-32 THD

2.00

4.50

8.50

.26

1.18

1.72

11.00

1.72

11.00

Chassis for Primary Devices and Modules

11" x 8.5" x 1.72" Category, *Legacy Chassis*

These dimensions apply to the following:

DBK34A
DBK70
LogBook/300
WaveBook/516
WaveBook/512A
WaveBook/516A

#8-32
4 PLACES

2.00
4.50
.27
1.72
1.18

1.72
8.50
11.00

1.72
1.18
.27
2.00
4.50

#8-32
4 PLACES
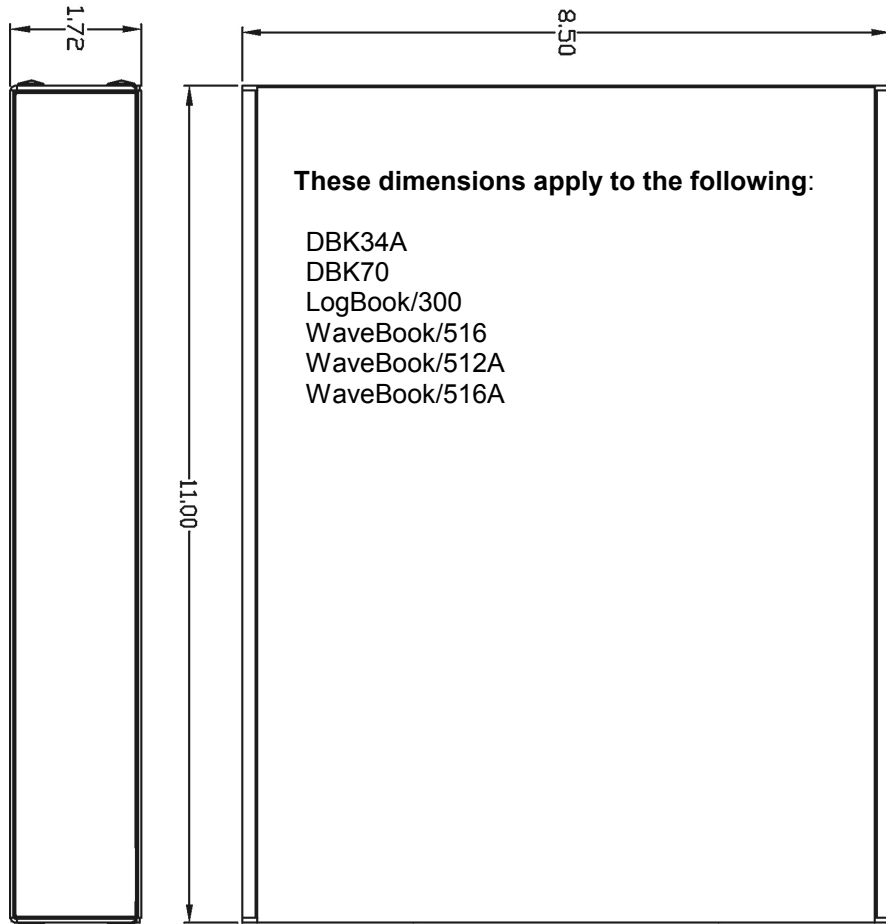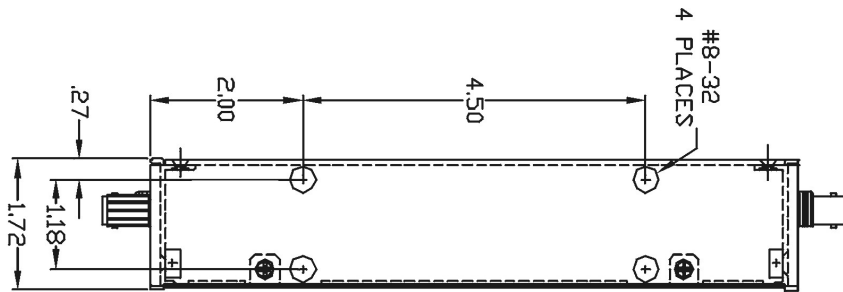
Chassis for Primary Devices and Modules

11" x 8.5" x 2.63" Category, *Modern Chassis*

VENT SIDE VIEW

8-32 THD

2.00

4.50

8-32 THD

.26

2.63

2.09

8-32 THD

8-32 THD

FRONT VIEW

2.63

11.00

TOP VIEW

8.50

These dimensions apply to the following:

DaqBook/2000E
DaqBook/2000X
WaveBook/516E
WBK40
WBK41

11.00

REAR VIEW

2.63

FAN SIDE VIEW

8-32 THD

8-32 THD

2.09

.26

2.00

4.50

8-32 THD

8-32 THD

8.50
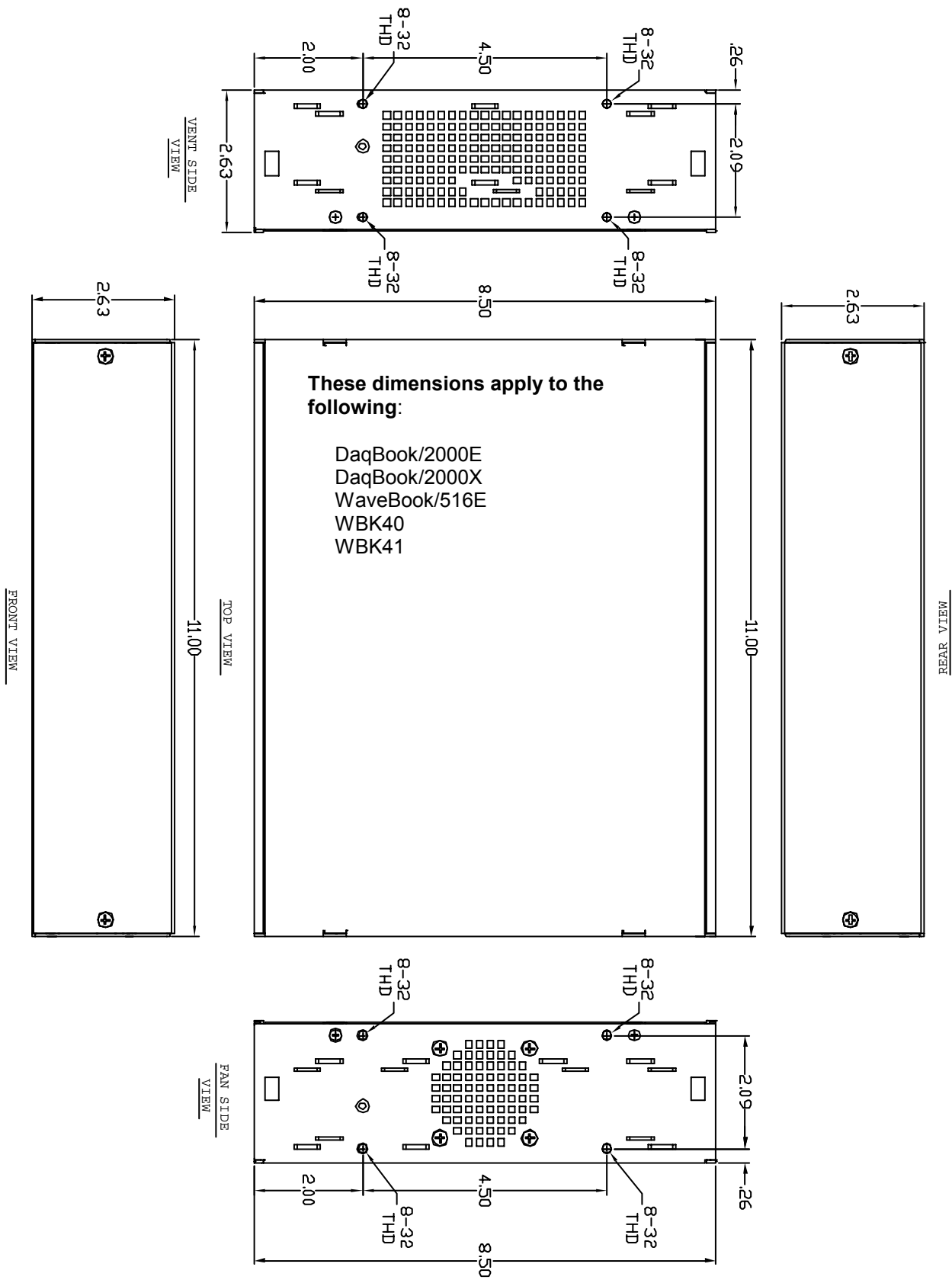
Chassis for Primary Devices and Modules

11" x 14" x 3.44" Category, *Modern Chassis*

8-32 THD

2.00

4.50

8-32 THD

.26

2.91

VENT SIDE VIEW

3.44

8-32 THD

8-32 THD

3.44

8.50

3.44

FRONT VIEW

11.00

TOP VIEW

These dimensions apply to the following:

DaqBook/260
DBK60
LogBook/360

11.00

REAR VIEW

8-32 THD

8-32 THD

FAN SIDE VIEW

2.91

.26

2.00

4.50

8-32 THD

8-32 THD

8.50
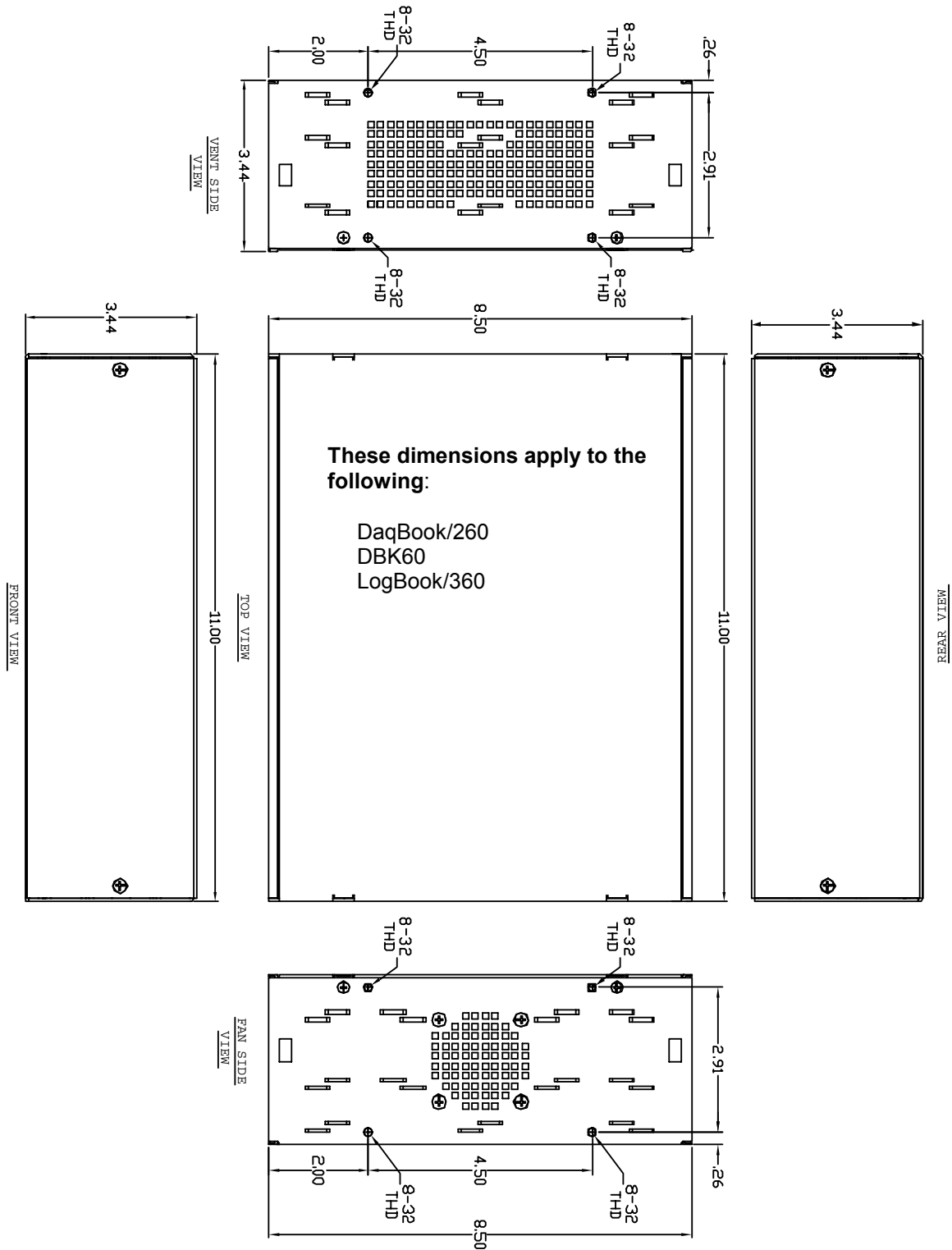
Chassis for Primary Devices and Modules

11" x 14" x 3.44" Category, *Legacy Chassis*

These dimensions apply to the following:

DaqBook/260
DBK60
LogBook/360

4.50 2.00
1.00
13.00
11.00
1.54
5.75
3.38

3.44
2.47
0.97
1.00
12.00
13.00
6.50
2.00
11.00
3.44
.28
3.16

#10-32 THD
4 PLACES

#8-32 THD
6 PLACES

3.44
0.62
1.41
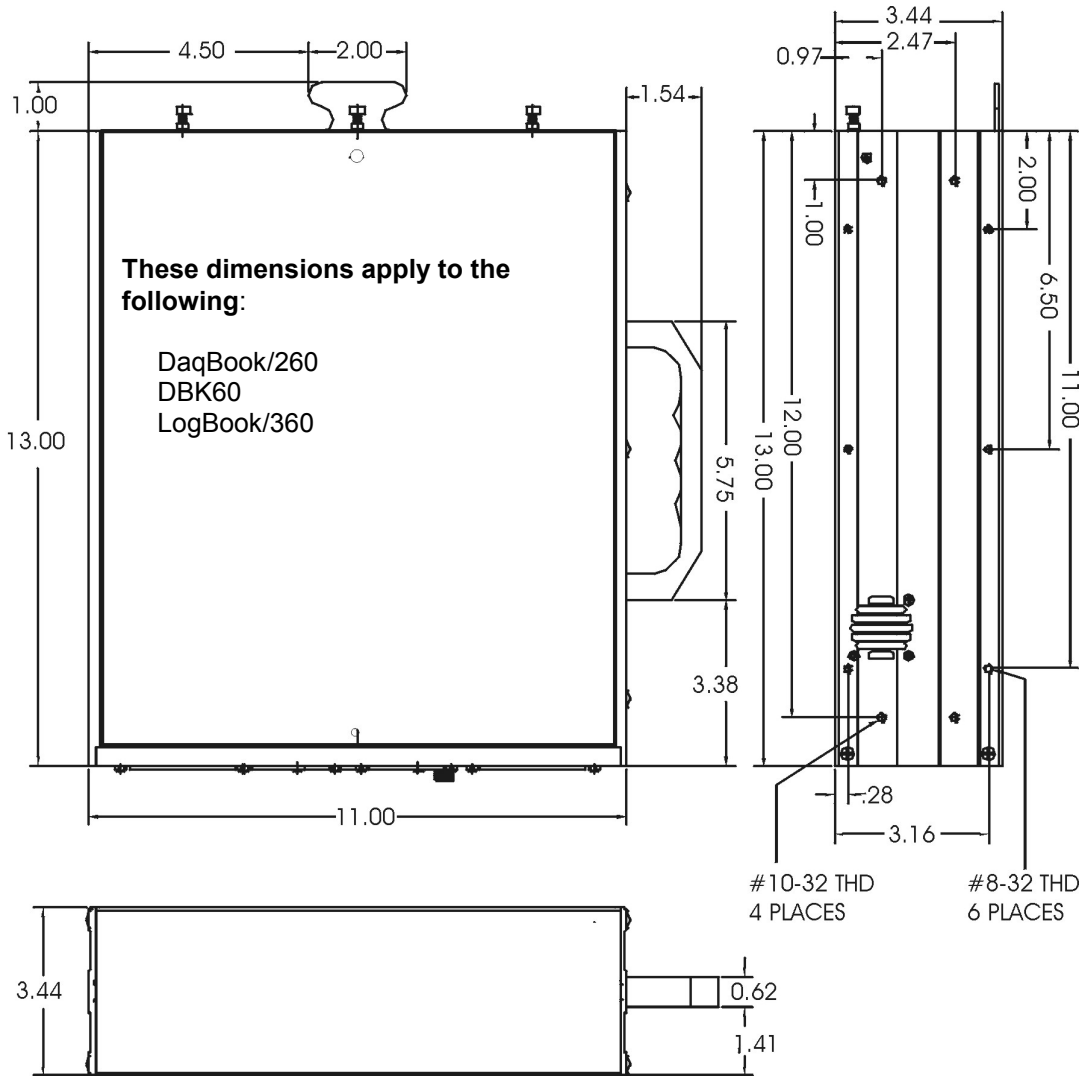
Dimensions for DBK Cards and Boards (excludes DBK46 and DBK200 Series)

3.26" x 8.32" Board Size Category

These dimensions apply to the following:

DBK2
DBK4
DBK5
DBK7
DBK8
DBK9
DBK11A
DBK12
DBK13
DBK15
DBK16
DBK17
DBK18
DBK19
DBK20
DBK21
DBK25
DBK32A
DBK33
DBK44
DBK45
DBK80
DBK81
DBK82 (Note 1)
DBK83 (Note 2)
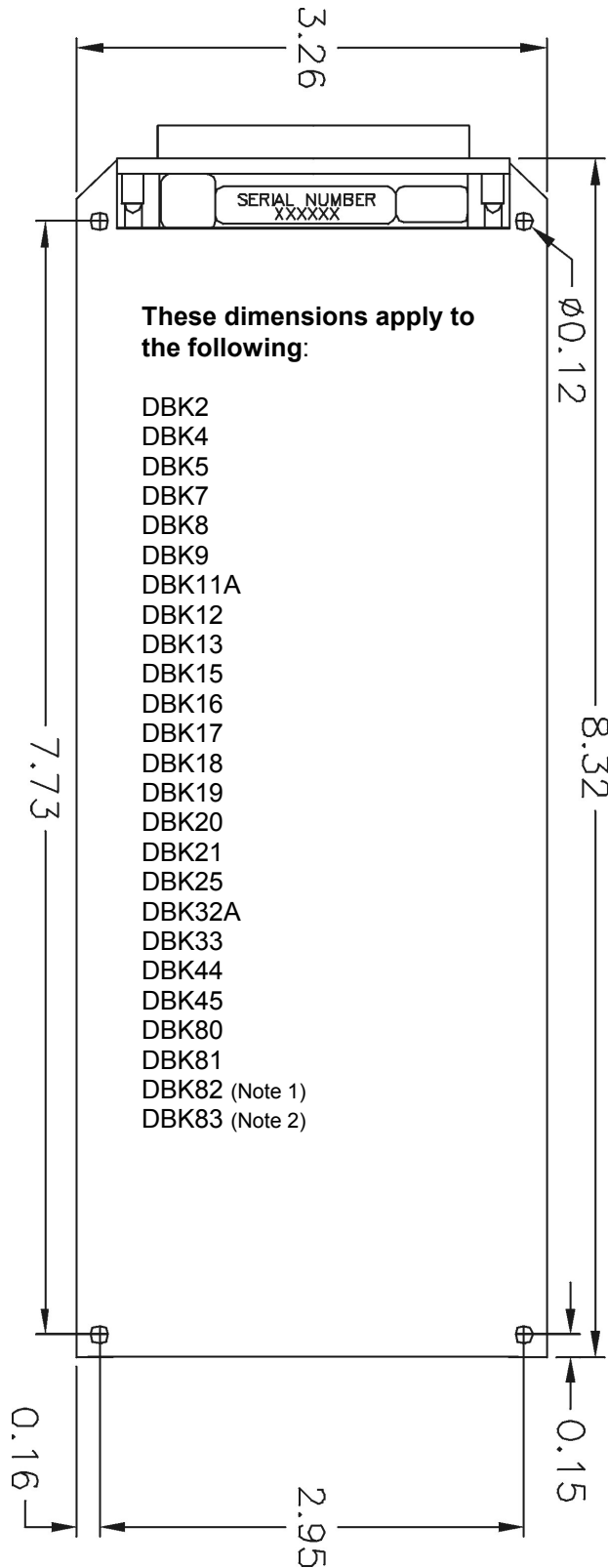
Note 1: DBK82, being significantly thicker than other boards, does not fit into 1-slot enclosures such as the DBK10 and the DaqBook/216. DBK82 does fit into DBK41 enclosures and in drawer type products such as DaqBoard/260.

Note 2: DBK83 makes use of a an external screw-terminal connector, which is designated as POD-1.
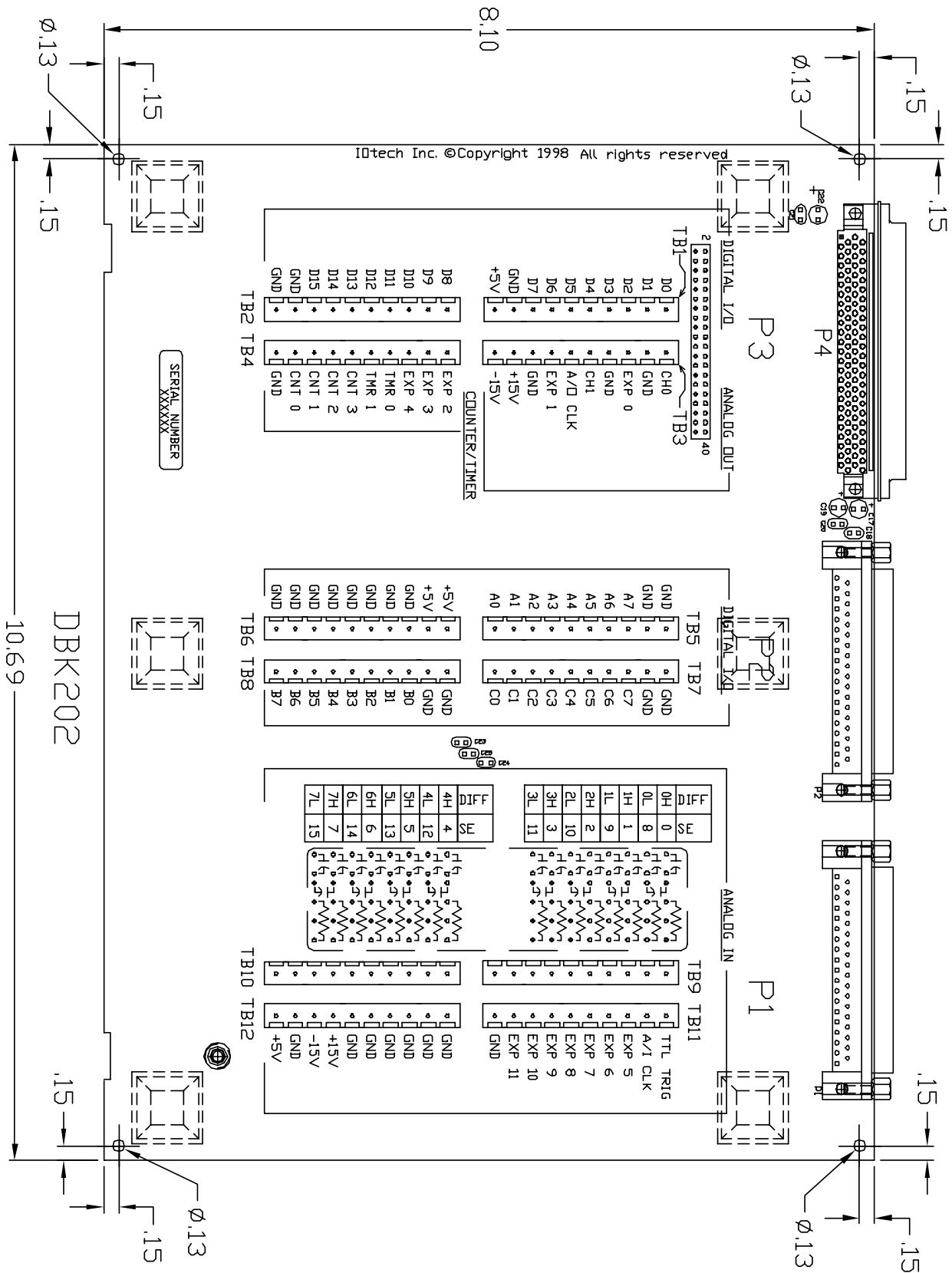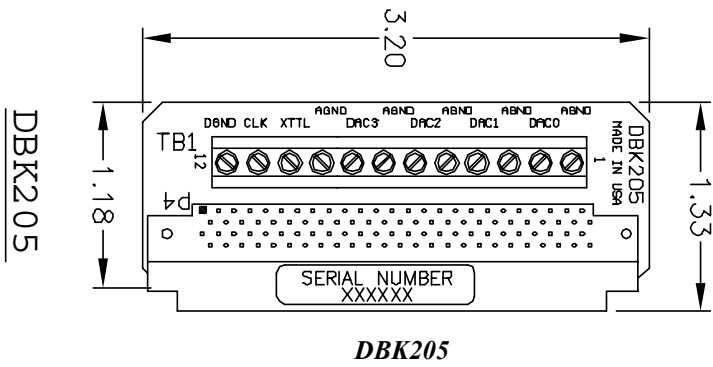
DBK200 Series Boards
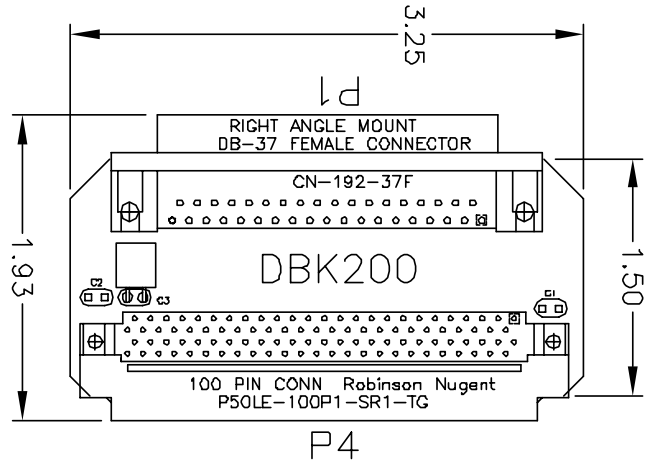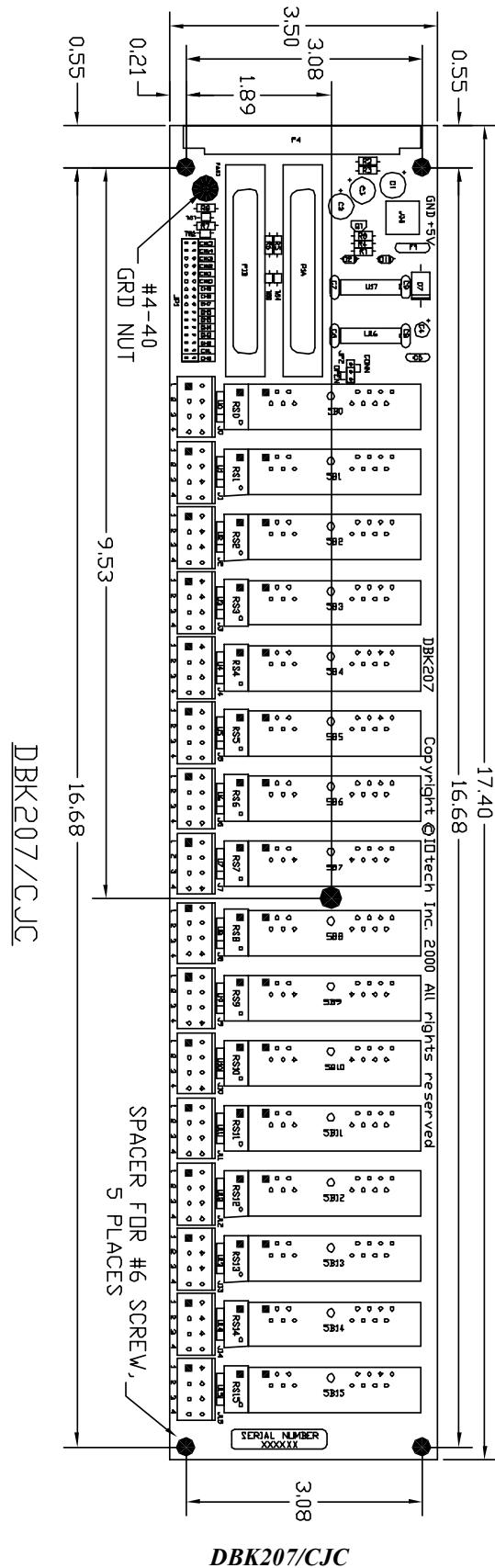

DBK200
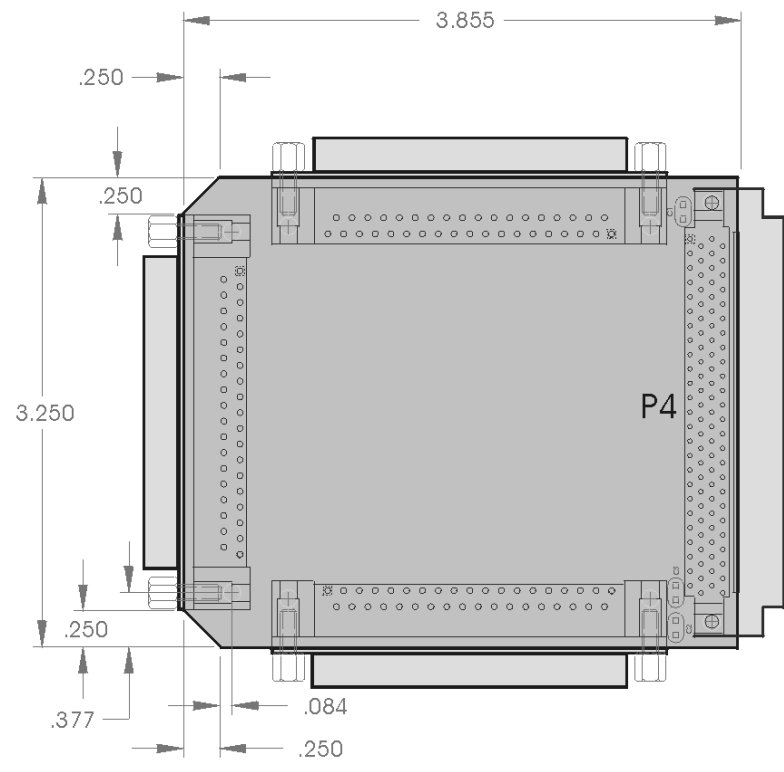
DBK201

DBK202

Note: DBK203 and DBK204 are modules that house a DBK202 board. Refer to the 11" x 8.5" x 1.40" category for applicable dimensions.
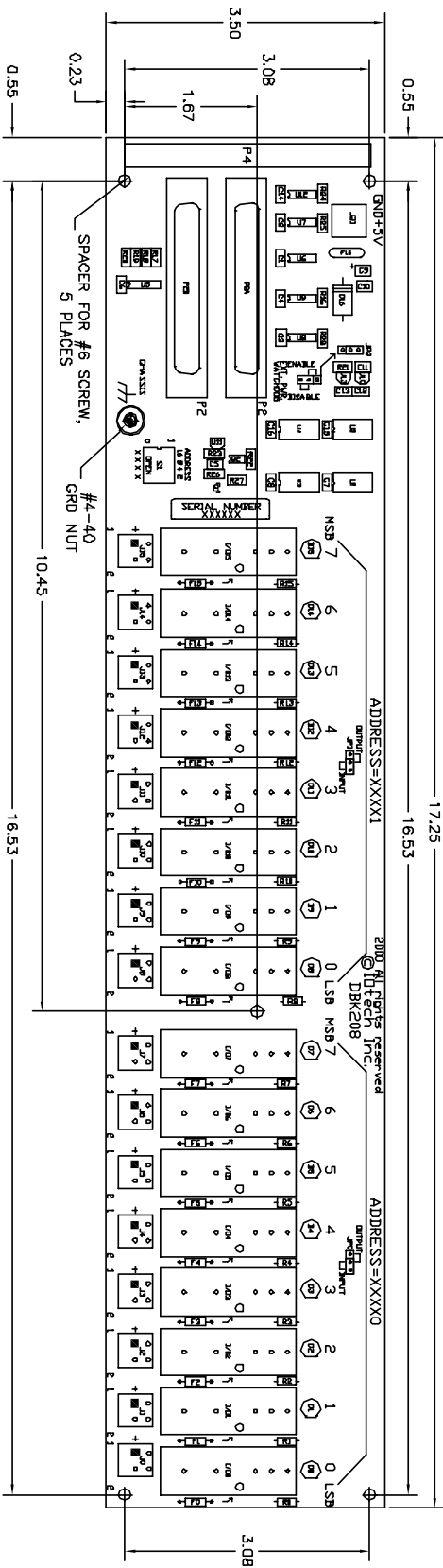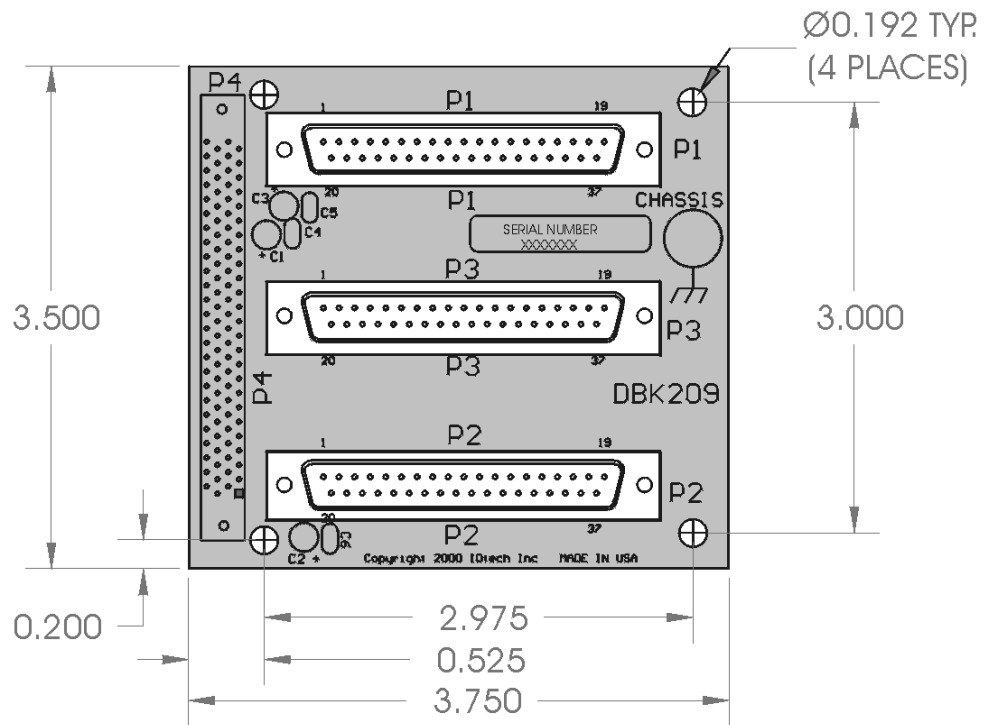
DBK205

878797

DBK206

DBK207/CJC

These dimensions apply to the both the DBK207 and the DBK207/CJC.

DBK208

DBK209

Glossary

Acquisition	A collection of scans acquired at a specified rate as controlled by the sequencer.
Analog	A signal of varying voltage or current that communicates data.
Analog-to-Digital Converter (ADC)	A circuit or device that converts analog values into digital values, such as binary bits, for use in digital computer processing.
API	Application Program Interface. The interface program within the Daq system's driver that includes function calls specific to Daq hardware and can be used with user-written programs (several languages supported).
Bipolar	A range of analog signals with positive and negative values (e.g., -5 to +5 V); see *unipolar*.
Buffer	*Buffer* refers to a circuit or device that allows a signal to pass through it, while providing isolation, or another function, without altering the signal. *Buffer* usually refers to:
	(a) A device or circuit that allows for the temporary storage of data during data transfers. Such storage can compensate for differences in data flow rates. In a FIFO (First In - First Out) buffer, the data that is stored first is also the first data to leave the buffer.
	(b) A follower stage used to drive a number of gates without overloading the preceding stage.
	(c) An amplifier which accepts high source impedance input and results in low source impedance output (effectively, an impedance buffer).
Buffer Amplifier	An amplifier used primarily to match two different impedance points, and isolate one stage from a succeeding stage in order to prevent an undesirable interaction between the two stages. (Also see, *Buffer*).
Channel	In reference to Daq devices, *channel* simply refers to a single *input*, or *output* entity.
	In a broader sense, an *input channel* is a signal path between the transducer at the point of measurement and the data acquisition system. A channel can go through various stages (buffers, multiplexers, or signal conditioning amplifiers and filters). Input channels are periodically sampled for readings.
	An *output channel* from a device can be digital or analog. Outputs can vary in a programmed way in response to an input channel signal.
Common mode	Common mode pertains to signals that are identical in amplitude and duration; also can be used in reference to signal components.
Common mode voltage	Common mode voltage refers to a voltage magnitude (referenced to a common point) that is shared by two or more signals. *Example*: referenced to common, Signal 1 is +5 VDC and Signal 2 is +6 VDC. The common mode voltage for the two signals is +5.5 VDC [(5 + 6)/2].
Crosstalk	An undesired transfer of signals between systems or system components. Crosstalk causes signal interference, more commonly referred to as *noise*.
Digital	A digital signal is one of discrete value, in contrast to a varying signal. Combinations of binary digits (0s and 1s) represent digital data.

Digital-to-Analog Converter (DAC)	A circuit or device that converts digital values (binary bits), into analog signals.
DIP switch	A DIP switch is a group of miniature switches in a small *Dual In-line Package* (DIP). Typically, users set these switches to configure their particular application.
Differential mode	The differential mode measures a voltage between 2 signal lines for a single channel. (Also see *single-ended mode*).
Differential mode voltage	Differential mode voltage refers to a voltage difference between two signals that are referenced to a common point. Example: Signal 1 is +5 VDC referenced to common. Signal 2 is +6 VDC referenced to common.

If the +5 VDC signal is used as the reference, the differential mode voltage is +1 VDC (+ 6 VDC - +5 VDC = +1 VDC).

If the +6 VDC signal is used as the reference, the differential mode voltage is -1 VDC (+ 5 VDC - +6 VDC = -1 VDC). |
ESD	Electrostatic discharge (ESD) is the transfer of an electrostatic charge between bodies having different electrostatic potentials. This transfer occurs during direct contact of the bodies, or when induced by an electrostatic field. ESD energy can damage an integrated circuit (IC).
Excitation	Some transducers [e.g. strain gages, thermistors, and resistance temperature detectors (RTDs)] require a known voltage or current. Typically, the variation of this signal through the transducer corresponds to the condition measured.
Gain	The degree to which an input signal is amplified (or attenuated) to allow greater accuracy and resolution; can be expressed as ×n or ±dB.
Isolation	The arrangement or operation of a circuit so that signals from another circuit or device do not affect the *isolated* circuit.

In reference to Daq devices, *isolation* usually refers to a separation of the direct link between the signal source and the analog-to-digital converter (ADC). Isolation is necessary when measuring high common-mode voltage. |
Linearization	Some transducers produce a voltage in linear proportion to the condition measured. Other transducers (e.g., thermocouples) have a nonlinear response. To convert nonlinear signals into accurate readings requires software to calibrate several points in the range used and then interpolate values between these points.
Multiplexer (MUX)	A device that collects signals from several inputs and outputs them on a single channel.
Sample (reading)	The value of a signal on a channel at an instant in time. When triggered, the ADC reads the channel and converts the sampled value into a 12- or 16-bit value.
Scan	The channels that are selected for sampling.
Sequencer	A programmable device that manages channels and channel-specific settings.
Simultaneous Sample-and-Hold	An operation that gathers samples from multiple channels at the same instant and holds these values until all are sequentially converted to digital values.
Single-ended mode	The single-ended mode measures a voltage between a signal line and a common reference that may be shared with other channels. (Also see *differential mode*).

Trigger   An event to start a scan or mark an instant during an acquisition. The event can be defined in various ways; e.g., a TTL signal, a specified voltage level in a monitored channel, a button manually or mechanically engaged, a software command, etc. Some applications may use pre- and post-triggers to gather data around an instant or based on signal counts.

TTL   Transistor-Transistor Logic (TTL) is a circuit in which a multiple-emitter transistor has replaced the multiple diode cluster (of the diode-transistor logic circuit); typically used to communicate logic signals at 5 V.

Unipolar   A range of analog signals that is always zero or positive (e.g., 0 to 10 V). Evaluating a signal in the right range (unipolar or bipolar) allows greater resolution by using the full-range of the corresponding digital value. See *bipolar*.