



DaqBook/2000[®] Series

16-Bit, 200-kHz Multifunction Data Acquisition Systems: Models /2000E, /2000A, & /2000X



Features

- Analog input, frequency input, timer output, digital I/O, and analog output; all in one compact and portable enclosure
- Available with either an Ethernet PC connection, or a parallel port which can link directly to a PC parallel port, or with an interface to PCI bus, PC-Card slot, or ISA slot
- 16-bit, 200-kHz A/D converter
- Synchronous analog, digital, and frequency measurements
- 8 differential or 16 single-ended analog inputs (software selectable per channel)
- Expandable up to 256 analog input channels, while maintaining 200-kHz (5 μ s per channel) scan rate
- Expandable up to 1024 analog inputs with DaqBook/2000E plus three slave parallel DaqBooks
- 512 location channel/gain FIFO, capable of scanning all channels, including expansion channels and digital/counter channels, at 5 μ s per channel
- Trigger modes include analog, digital, & software, with <5 μ s latency
- Virtually infinite pre-trigger buffer
- Optional four channel, 16-bit, 100-kHz analog output card installs internally
- 40 digital I/O lines scanned synchronously or asynchronously with analog inputs
- Digital I/O is expandable up to 272 lines, including isolation and relay closure options
- Four cascadable counter/pulse input channels scanned synchronously or asynchronously with analog inputs
- Two timer/pulse output channels
- Digital calibration—no potentiometers
- Multi-unit scan synchronization

Signal Conditioning Options

- Signal conditioning and expansion options for thermocouples, strain gages, accelerometers, isolation, RTDs, etc.—over 40 DBK I/O expansion options in all (see p. 143)

Software

- DaqView[™] software with eZ-PostView[™]
- Included drivers for Visual Basic[®], Delphi[™] & C++ for Windows[®]; DASyLab[®], TestPoint[®], & LabVIEW[®]



Ethernet-based DaqBook/2000E



Parallel-port DaqBook/2000A



Parallel-port DaqBook/2000X with three expansion slots

The DaqBook/2000[®] series of portable data acquisition devices can synchronously measure analog inputs, frequency inputs, and digital inputs. The 16-bit/200-kHz DaqBooks come equipped with built-in signal I/O capability, which can be further expanded and enhanced with over 40 DBK series expansion and signal conditioning options. The 200-kHz rate at which the DaqBook can make an analog, digital or frequency measurements is the same, regardless of whether the measurement is from a built-in channel, or from expansion channels.

The DaqBook is available with either a built-in Ethernet interface (model /2000E), or a parallel-port interface (model /2000A or /2000X). The Ethernet-based DaqBook/2000E[™] can attach directly to the Ethernet port of a PC, or to an installed Ethernet network. The DaqBook/2000E also contains three parallel expansion ports, which can

attach to an additional three parallel DaqBooks, thereby quadrupling the channel capacity of a single Ethernet link to the PC.

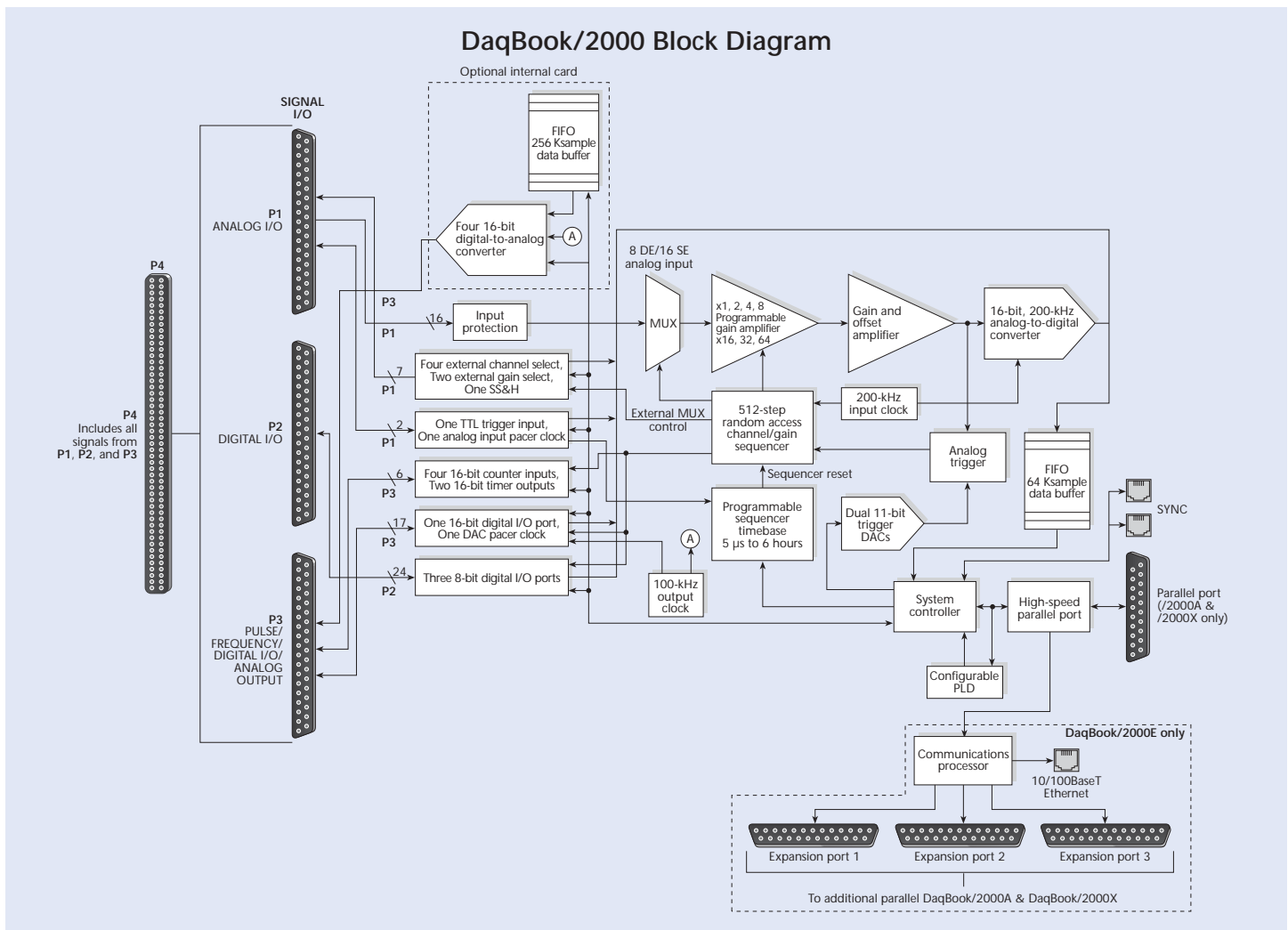
The parallel DaqBook/2000A[™] and DaqBook/2000X[™] can attach directly to the parallel port on a PC, or can attach to a PC-Card slot with the WBK20A, a PCI-slot via the WBK23[™], an ISA slot with the WBK21[™], or a parallel expansion port on a DaqBook/2000E. The difference between the /2000A and /2000X is the latter model includes 3 slots in which DBK expansion cards can be installed.

Packaging and Power. The DaqBook/2000 is housed in rugged metal package, with the same footprint as most notebook PCs (8.5" x 11"). It can be powered from an included AC power adaptor, or can be directly attached to any 9 to 30 VDC supply, such as a car battery. Compact battery options are also available for applications



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where there is no access to DC or AC power. These options can also function as uninterruptible power supplies (UPS), to keep the DaqBook/2000 operational during intermittent power outages or voltage droops, such as during automobile cranking. A high-power DC/DC converter built into the DaqBook/2000 is capable of powering a large number of signal conditioning and expansion options.

Signal Conditioning and Expansion. The DaqBook/2000 can expand its built-in analog and digital I/O with the DBK family of over 40 signal conditioning and expansion options. The built-in 8 differential, 16 single-ended analog inputs can be expanded up to 256 analog input channels, including a wide variety of sensor measurements such as thermocouples, strain gages, accelerometers,

and many more. Every analog, digital, and counter input channel is measured in 5 μs, regardless of whether it is a built-in channel, or an expansion channel.

The included DaqView™ software automatically converts the sensor measurements to real-world readings, such as temperature, strain, etc.

The on-board 40 line digital I/O lines can also be expanded up to 272 I/O channels, including TTL level, isolated, and relay closure. Digital inputs, either on the DaqBook/2000, or on expansion options, can be scanned in 16-bit increments along with analog inputs, providing digital data that is time-correlated to acquired analog data (5 μs per 16 bit input). The 4 frequency and pulse-counting inputs on the

DaqBook/2000 can also be scanned synchronously with the analog and digital inputs. As an option, the DaqBook/2000 has four 16-bit, 100-kHz analog outputs, which install internally.

Software support is the most extensive of any data acquisition product. Comprehensive drivers and programming tools for nearly every programming environment under Windows® are also provided, including Visual Basic, C++, Delphi, TestPoint®, LabVIEW®, and DASyLab®. DaqView software, for *Out-of-the-Box*™ setup, acquisition, display, and analysis of acquired data is included (see p. 110). Post-acquisition analysis is achieved via included eZ-PostView™, or optional eZ-TimeView™ or eZ-FrequencyView™.



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DaqBook/2000E[®]

The DaqBook/2000E includes a built-in high-speed 10/100BaseT Ethernet interface, enabling a simple connection to any PC or network having an Ethernet port. The /2000E also includes three expansion parallel ports, allowing up to three additional DaqBook/2000A or DaqBook/2000X units to be attached. In this way, up to four DaqBook units can be attached to a PC via a single Ethernet link. If the SYNC connection on each DaqBook is used, then all of the DaqBooks will operate synchronously with each other. It is also possible to operate each DaqBook entirely independently of the others, yet still attached via the same Ethernet link.



DaqBook/2000A[®]

The DaqBook/2000A is a parallel-port based DaqBook which can attach to any of the following devices:

1. directly to any PC with a built-in parallel port
2. notebook PC with a PC-Card slot using the WBK20A™ interface
3. PC with a PCI slot using the WBK23™ interface board
4. PC with an ISA slot using the WBK21™ interface board
5. DaqBook/2000E digital expansion port
6. PC or network via Ethernet using the WBK25™ Ethernet interface module



DaqBook/2000X[®]

The DaqBook/2000X is identical to the DaqBook/2000A, except it adds three expansion slots which can accept a wide variety of analog and digital DBK expansion and signal conditioning options.

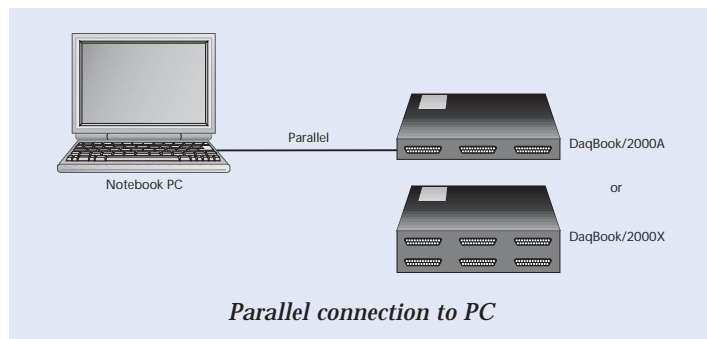




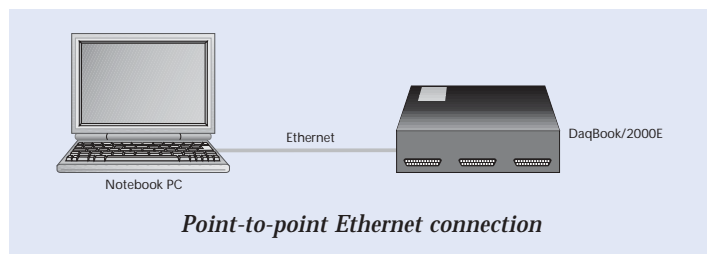
DaqBook/2000[®] Series

General Information

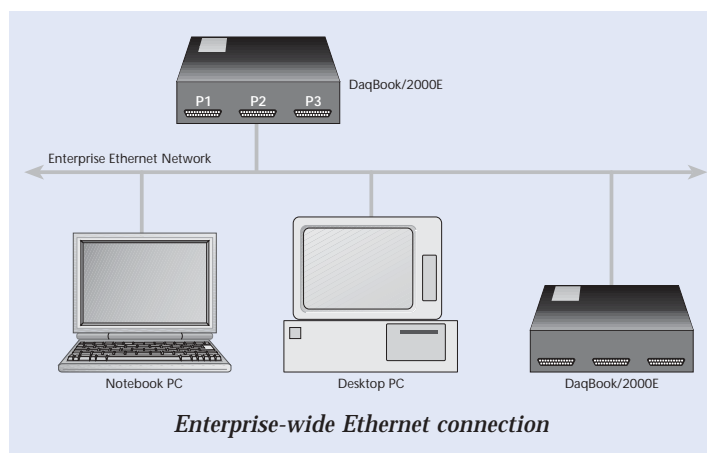
The parallel DaqBook/2000A or DaqBook/2000X can attach directly to a PC's parallel port. If no parallel interface is available, then the optional WBK20A, WBK21, WBK23, or WBK25 interface options are available.



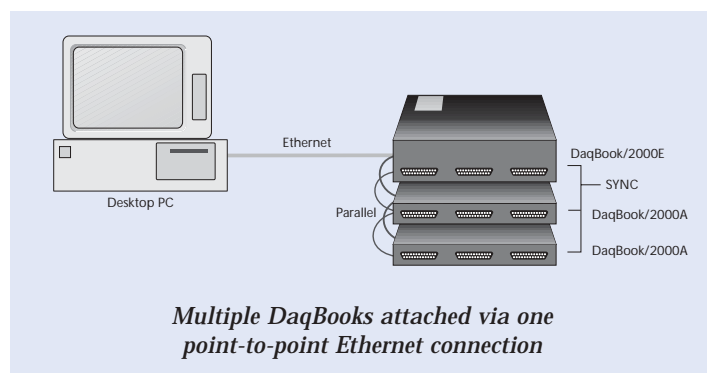
The most common configuration for a DaqBook/2000E is when directly attached to a PC via a point-to-point Ethernet link. In this mode, data transfers will occur at the full 200 Kreading per second rate of the DaqBook/2000E, insuring that no data is lost during transfer.



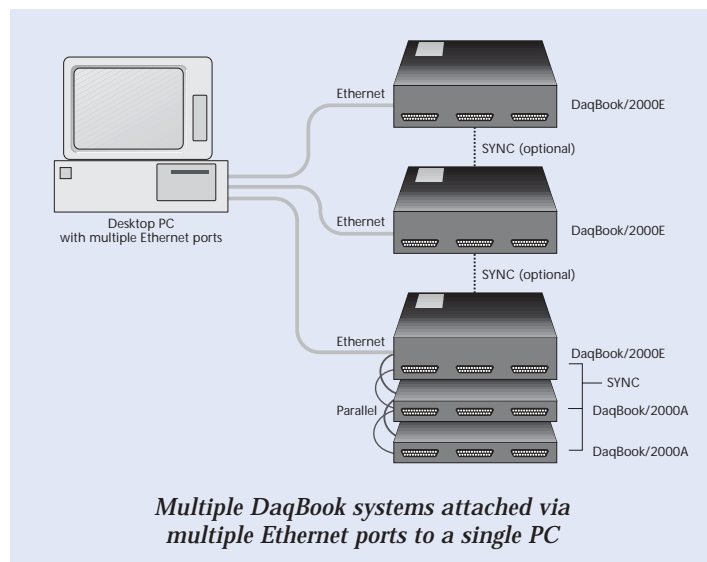
The DaqBook/2000E can also be attached to an enterprise-wide network, where it is one of many devices on the network. In this application, the data transfer rate is highly dependent on other data traffic on the network.



Up to 3 parallel DaqBook/2000A and DaqBook/2000X units can be attached to a DaqBook/2000E via their built-in parallel interface. This configuration is useful when the channel requirements are beyond the 256 channel capability of one DaqBook. It is also useful when the per-channel bandwidth exceeds what a single DaqBook can accomplish. In multiple DaqBook applications, the system can appear to the user as one large, synchronous system. It can also be configured as multiple, and independent systems, each with their own independent triggering sampling rates.



A virtually unlimited number of DaqBook/2000E units can be attached to a PC when multiple Ethernet ports are employed. As in the case above, the DaqBooks can be operated as one synchronous system, or can be operated as entirely independent systems, each with their own independent triggering and sampling rates.





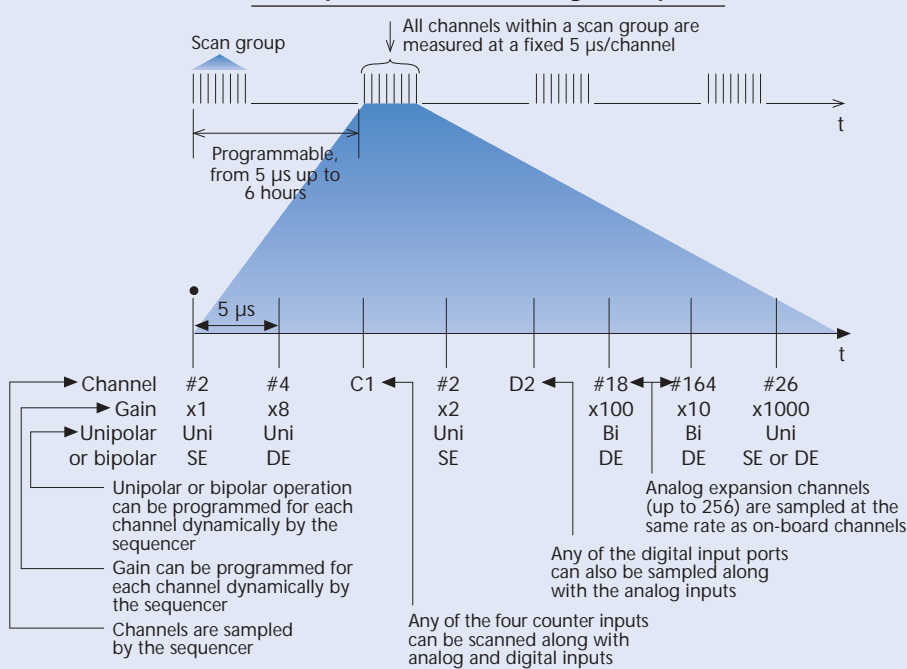
DaqBook/2000® Series

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Channel-Scanning Flexibility

The DaqBook/2000 offers a 512-location scan sequencer that allows you to select each channel and associated input amplifier gain at random. The sequencer circuitry circumvents a major limitation encountered with many data acquisition devices — a drastic reduction in the scan rate for external expansion channels. All built-in and expansion channels, are scanned at 200 kHz (5 μ s/channel). 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. The DaqBook/2000 permits each scan group, which can contain up to 512 channel/gain combinations, to be repeated immediately or at programmable intervals of up to 6 hours. Within each scan group, consecutive channels are measured at a fixed 5 μ s/channel rate.

DaqBook/2000 Scanning Example



Analog Input (P1)

The DaqBook/2000 has a 16-bit, 200-kHz A/D coupled with 16 single-ended, or 8 differential analog inputs. Thirteen software programmable ranges provide inputs from ± 10 V to ± 156 mV full scale. Each channel can be software-configured for a different range, as well as for single-ended or differential, and unipolar or bipolar input. Beyond the 16 built-in analog inputs, the user can expand the DaqBook/2000 up to 256 analog inputs using external DBK signal conditioning and expansion options. As with the on-board channels, expansion channels are scanned at the same 5 μ s/channel rate (200 kHz), and most are software-programmable for range. There is *no* speed penalty for scanning expansion channels versus built-in channels. The DBK expansion options offer a wide variety of signal measurements, including thermocouples, RTDs, strain gages, accelerometers, high voltage, isolation, current, and much more (see DBK options on p. 143).

Scanning

The DaqBook/2000 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 fastest rate of 5 μ s/channel, 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.

Signal I/O

The DaqBook/2000 I/O connectors are divided into three ports, P1, P2, and P3. **P1**, the analog input port, contains all of the analog input channels, as well as the sequencer control signals for accessing external analog input options. All analog expansion options attach to the P1 port. **P2**, the general purpose digital I/O port, can be used directly to control and monitor 24 digital I/O lines. P2 can also function as the digital I/O expansion port, whereby the 24 lines are exclusively used to control external

digital DBK expansion options, for up to 256 lines of digital input or output. **P3** contains an additional 16-bit digital I/O port, as well as the counter inputs, timer outputs, and optional analog outputs. **P4** is also provided on the DaqBook/2000, providing single-connector access to P1, P2, and P3 signals. This is convenient for attaching the DBK203 option, for example, which provides screw-terminal access to all on-board signal I/O (P1, P2, P3).



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Triggering

Triggering can be the most critical aspect of a data acquisition application. The DaqBook/2000 supports a full complement of trigger modes to accommodate any measurement situation.

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. The DaqBook/2000 uses 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 which is guaranteed to be less than 5 μ s, significantly shorter than most data acquisition devices. Any analog channel can be selected as the trigger channel, including built-in or expansion channels. 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 μ s. Both the logic levels (1 or 0), as well as the edge (rising or falling), can be programmed for the discrete digital trigger input.

Digital Pattern Triggering (P2 or P3). The DaqBook/2000 also supports 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.

DaqBook/2000 Signal Conditioning & Expansion Options			
Product	Description	Capacity	Page
DBK1	16-connector BNC interface module	16 connectors	148
DBK2	D/A voltage-output card	4 channels	149
DBK4	dynamic signal input card	2 channels	150
DBK5	current-output card	4 channels	152
DBK7	frequency input card	4 channels	154
DBK8	high-voltage input card	8 channels	156
DBK9	RTD measurement card	8 channels	115
DBK10	expansion-card enclosure	3 cards	158
DBK11A	screw-terminal card	40 terminals	159
DBK15	universal current/voltage input card	16 channels	160
DBK16	strain gage expansion card	2 channels	162
DBK17	simultaneous sample and hold card	4 channels	164
DBK18	low-pass filter card	4 channels	166
DBK20	general-purpose digital I/O card (screw terminals)	48 channels	168
DBK21	general-purpose digital I/O card (male DB37 connectors)	48 channels	168
DBK23	optically isolated digital-input module	24 channels	169
DBK24	optically isolated digital-output module	24 channels	171
DBK25	relay output card	8 channels	173
DBK32A	auxiliary power supply	\pm 15 VDC @ 500 mA	175
DBK33	triple-output auxiliary power supply	\pm 15 VDC @ 250 mA & \pm 5 VDC @ 1000 mA	175
DBK34A	DC to DC uninterruptable power supply	5 Amp Hrs @ 12V & 2.5 Amp Hrs @ 24V	176
DBK40	18-connector BNC interface	18 connectors	177
DBK41	analog expansion enclosure	10 cards	178
DBK42	multi-purpose isolated signal-conditioning module	16 channels	180
DBK43A	strain gage module	8 channels	182
DBK44	multi-purpose isolated signal-conditioning card	2 channels	184
DBK45	simultaneous sample and hold card with low-pass filter	4 channels	186
DBK46	internal analog output card	4 channels	108
DBK50	isolated high-voltage input module	8 channels	188
DBK51	isolated low-voltage input module	8 channels	188
DBK60	3-slot expansion module w/customizable panels	3 cards	190
DBK70	vehicle network interface module	4 cards	192
DBK80	differential voltage input card with excitation output	16 channels	197
DBK81	TC/mV card with screw-terminal connections	7 channels	198
DBK82	TC/mV card with screw-terminal connections	14 channels	198
DBK83	TC/mV card with external screw-terminal Pod and 3 ft. cable	14 channels	198
DBK84	TC/mV module with mini TC connector jacks	14 channels	198
DBK203	screw-terminal adapter board in rugged metal enclosure; P1/P2/P3, analog and digital I/O expansion ports	120 terminals, P1, P2, P3	121

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 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 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.



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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*. 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*. This is similar to the mode described above, except that the acquisition is terminated upon receipt of a command from the program to halt the acquisition.

Multi-Unit Synchronization

Multiple DaqBook/2000s can be synchronized via the SYNC ports. By connecting cables (CA-74-1, CA-74-5) between any 2, 3, or 4 DaqBook/2000s they can be synchronized so that all acquired data is time correlated.

DaqBook/2000 software will establish one DaqBook/2000 as a "master" and the others as "slaves". Master DaqBook/2000s can run at the full 200-kHz aggregate sampling rate, slaves must have 5 μ s of unassigned sampling time in their scan group. Not all trigger modes are supported in multi-DaqBook/2000 configurations.

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

Calibration

Every range on the DaqBook/2000 is calibrated from the factory using a digital calibration method. This method works by storing a correction factor for each range on the DaqBook/2000 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 other products, that merely adjust the readings in software after they are transferred to the PC. That method has the disadvantage of reducing the dynamic range of the A/D, and can adversely affect the speed by which the PC can obtain a calibrated reading.

The DaqBook/2000 also has a user-cal mode, whereby the user can adjust the calibration of the DaqBook/2000, without destroying the factory calibration supplied. This is accomplished by having 2 distinct calibration tables in the DaqBook/2000's on-board EPROM, one which contains the factory cal, and the other which is available for user calibration.

Analog Output DBK46[™] (P3)

The optional DBK46[™] four channel, 16-bit, 100-kHz analog output card is available for the DaqBook/2000, offering an output range from -10V to +10V. These outputs are entirely separate from the D/As which are used to determine analog trigger level. On-board the DBK46 is 256 KSamples of memory, which can store waveforms loaded from the PC. Additional low-speed D/A channels can also be added to the DaqBook/2000 through the use of the DBK2 analog output option card.

When used to generate waveforms, the D/As can be clocked in several different modes. Each D/A can be separately selected to be clocked from one of the sources described below.

Asynchronous internal clock. The on-board programmable clock can generate updates ranging from 1.5 Hz to 100 kHz, independent of any acquisition rate.

Synchronous internal clock. The rate of analog output update can be synchronized to the acquisition rate derived from 100 kHz to once every 5.96 hours.

Asynchronous external clock. A user-supplied external input clock can be used to pace the D/A, entirely independent of analog inputs.

Synchronous external clock. A user-supplied external input clock can pace both the D/A and the analog input.

* When digital pattern generation is used, one of the analog output channels is limited to asynchronous output mode



DaqBook/2000® Series

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Digital Inputs and Outputs (P2, P3)

Forty TTL-level digital I/O lines are included in the DaqBook/2000. They are divided into three 8-bit ports (P2) and one 16-bit port (P3). The P2 ports can be programmed in 8-bit groups as either input or output. The 16-bit P3 port can be programmed as all inputs or all outputs. Ports programmed as inputs can be part of the scan group and read along with other analog and digital input channels, or can be read asynchronously via the PC at any time, including when a scanned acquisition is occurring.

In addition, the P2 ports can be expanded up to 256 digital I/O lines using external DBK digital options. These options are available as TTL-level I/O, relay output, or optically isolated input and output. Whenever expansion digital I/O is attached to the DaqBook/2000, the P2 I/O lines are no longer user-programmable, and are instead used to communicate with the digital expansion options.

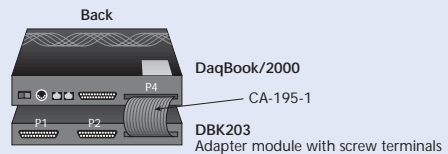
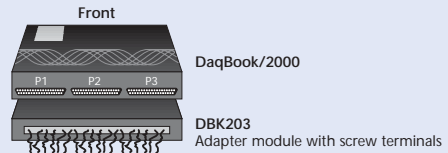
Counter Inputs (P3)

Four 16-bit counters are built into the DaqBook/2000, each capable of counting up to 65,536 TTL-level transitions. Each of the counters will accept frequency inputs up to 10 MHz. The counters can also be cascaded, allowing over four billion counts to be accumulated. As with all other inputs to the DaqBook/2000, the counter inputs can be read asynchronously under program control, or synchronously as part of an analog and digital scan group.

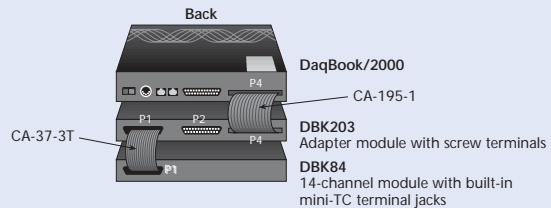
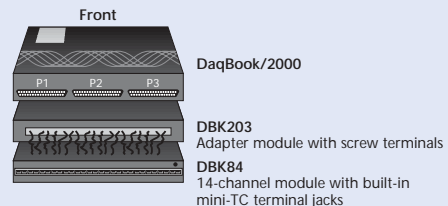
Timer Outputs (P3)

Two 16-bit timer outputs are built into the DaqBook/2000, each capable of generating different square waves with a programmable frequency range from 16 Hz to 1 MHz.

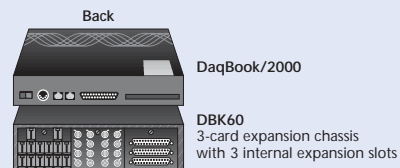
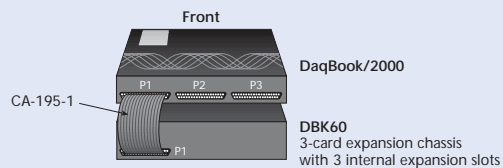
DaqBook/2000 Series Expansion Examples



The DaqBook/2000 (any model) attached to the DBK203 (via a P4) provides convenient screw-terminal access to all built-in analog and digital I/O on the DaqBook



The DaqBook/2000 (any model) attached to the DBK84 (via P1) and DBK203 (via P4) provides 14 TC inputs, plus screw-terminal access to all of the built-in analog and digital I/O on the DaqBook



The DaqBook/2000 (any model) attached to a DBK60 (via P1) provides a housing for up to three DBK analog input options cards, plus user-selectable rear panel connectors



Software Support

Included Software for DaqBook® Series & Daq PC-Cards

The DaqBook® series is supported by several levels of software support, allowing you to select the software environment that best fits your application and skill set.

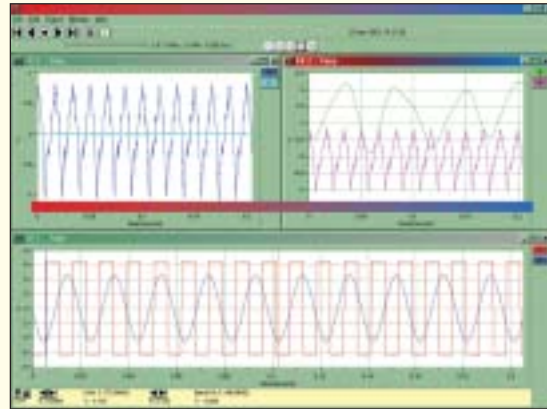
On this page is a description of the software that is included with every DaqBook. The next page is an overview of optional software available for the DaqBook.

Out-of-the-Box™ DaqView™



DaqView™ graphical data acquisition and display software is included with all DaqBook systems. Using DaqView software's spreadsheet-style interface, you can easily set up your application and begin taking data within minutes of connecting your hardware, with no programming required. See p. 138 for complete information.

eZ-PostView™



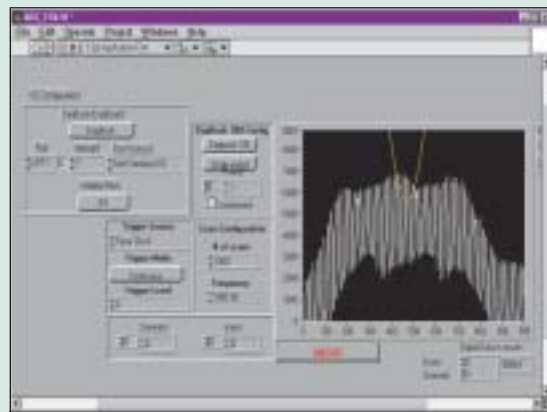
eZ-PostView™ is included with the DaqBook, providing a simple method of graphically viewing acquired waveforms from the DaqBook. Up to 8 windows can be displayed on one screen, with up to 16 channels overlaid on each window. eZ-PostView makes it simple to visually inspect acquired waveforms from multiple channels within seconds of acquiring the data. See p. 228 for complete information.

DaqX Subroutine API Libraries



DaqBooks are supplied with free DaqX Subroutine API Libraries providing complete support for all of the functionality available on each data acquisition device in Visual Basic®, C/C++, and Delphi™. Further, DaqX is supported under all versions of Windows®. Included with DaqX Subroutine API Libraries are over 100 example programs, and comprehensive API documentation is provided through an online programmers manual.

LabVIEW® Support



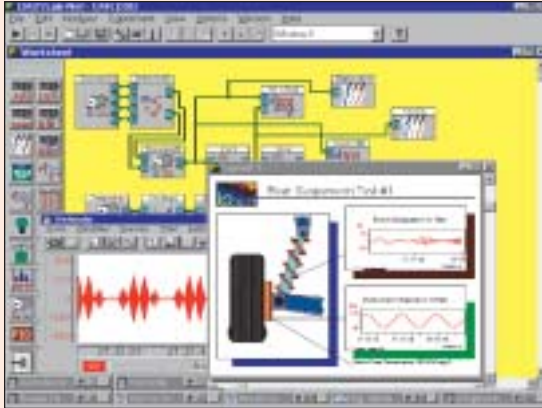
IOtech offers extensive LabVIEW® support for the DaqBook, including expansion and signal conditioning modules. IOtech data acquisition VIs for LabVIEW are more than just simple hardware access VIs, they are complete with engineering data conversion, data display and logging capabilities.



Software Support

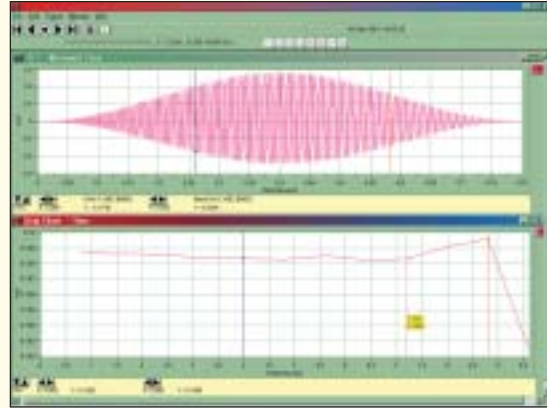
Optional Software for DaqBook® Series & Daq PC-Cards

DASYLab®



If your application requirements go beyond the scope of DaqView™, DASYLab® software offers a greater degree of flexibility and customization. You can learn DASYLab in a matter of days, without the weeks of training required for some other icon-based application-development software. See p. 223 for complete information.

eZ-TimeView™ & eZ-FrequencyView™



eZ-TimeView™ and eZ-FrequencyView™ are post-acquisition analysis packages for data acquired from the DaqBook. 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. See p. 229-230 for complete information.

DaqCOM™ ActiveX/COM Support



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. See p. 221 for complete information.



DaqBook/2000[®] Series

Specifications

Specifications

General

Supply Voltage Range: 10 to 30 VDC
Power Available for external signal conditioning and expansion options: 5V at 1A (all models); ±15V at 500 mA each
Operating Temperature: 0° to +50°C
Storage Temperature: -40° to +80°C
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

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)
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 without Damage: ±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

Voltage Range*	Accuracy** One Year, 0-35°C (% reading+% range)	
	Absolute	Transfer
0 to +10V	0.015 + 0.005	0.004 + 0.002
0 to +5V	0.015 + 0.005	0.004 + 0.002
0 to +2.5V	0.015 + 0.005	0.004 + 0.002
0 to +1.25V	0.015 + 0.008	0.004 + 0.002
0 to +0.625V	0.015 + 0.008	0.004 + 0.002
0 to +0.3125V	0.015 + 0.008	0.004 + 0.003
-10 to +10V	0.015 + 0.005	0.004 + 0.001
-5 to +5V	0.015 + 0.005	0.004 + 0.001
-2.5 to +2.5V	0.015 + 0.005	0.004 + 0.001
-1.25 to +1.25V	0.015 + 0.005	0.004 + 0.001
-0.625 to +0.625V	0.015 + 0.008	0.004 + 0.001
-0.3125 to +0.3125V	0.015 + 0.008	0.004 + 0.0015
-0.156 to +0.156V	0.02 + 0.008	0.004 + 0.0015

* Specifications assume differential input single channel scan, 200-kHz scan rate, unfiltered
 ** Accuracy specification is exclusive of noise

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

Depth: 512 locations

On-Board Channel-to-Channel Scan Rate: 5 or 10 µs per channel, programmable

Expansion Channel Scan Rate: 5 or 10 µs per channel, programmable

Data Buffer: 64 Ksample FIFO

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 units to be scan-synchronous (post trigger)

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.

Analog Output (DBK46 option)

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 µsec max to 1 LSB for full-scale step

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



DaqBook/2000[®] Series

Specifications & Ordering Information

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

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

Frequency/Pulse Generators

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

Description	Part No.
All DaqBook models include documentation on CDROM, quick start guide, DaqView™, and drivers for Visual Basic®, Delphi™ & C++ for Windows®, DASYLab®, TestPoint®, & LabVIEW®	
Ethernet 16-bit, 200-kHz data acquisition system	DaqBook/2000E
Parallel port 16-bit, 200-kHz data acquisition system	DaqBook/2000A
Parallel port 16-bit, 200-kHz data acquisition system with 3 DBK expansion slots	DaqBook/2000X
Internal 4-channel, 16-bit, 100-kHz analog output option card	DBK46

Accessories & Cables

Adapter board with screw terminals, housed in a shielded metal enclosure, connects DBK signal conditioning and expansion options to a CA-195 or CA-209 expansion cable

DBK203

Expansion-card cable for connecting DBK/CDK series expansion options; specify number of option cards (x) to be connected

CA-37-x

DBK expansion cable from DaqBook to DBK modules; 2.5 in.

CA-37-1T

DBK expansion cable from DaqBook to DBK modules; 4.5 in.

CA-37-3T

DBK expansion cable from DaqBook to DBK modules; 5.5 in.

CA-37-4T

DBK expansion cable from DaqBook to DBK modules; 11.5 in.

CA-37-8T

SYNC cable for multiunit synchronization; 1 ft.

CA-74-1

SYNC cable for multiunit synchronization; 5 ft.

CA-74-5

Ribbon cable with female DB37 connector, provides convenient wiring to DaqBook P1, P2, and P3 ports without requiring soldering to DB37 connectors, 6 ft.

CA-113

5-pin male DIN to 5-pin male DIN provides convenient connection between DaqBook power input connectors and battery packs

CA-115

5-pin DIN to automobile cigarette lighter power cable, 8 ft.

CA-116

100-conductor expansion cable, mates with the DaqBoard/2000 series boards and the DBK200, DBK201, DBK202, DBK203, DBK206, DBK207, DBK207/CJC, DBK208, and DBK209;

1 ft. expansion cable

CA-195-1

3 ft. expansion cable

CA-195

6 ft. expansion cable

CA-195-6

Software

Description	Part No.
ActiveX/COM-based applications program interface	DaqCOM
Icon-based data acquisition, graphics, control, and analysis software	DASYLab
Post-acquisition time-domain analysis software for data acquired from the DaqBook	eZ-TimeView
Post-acquisition frequency-domain analysis software for data acquired from the DaqBook	eZ-FrequencyView

Related Products

Expansion Hardware

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