



DaqBoard/2000™

PCI Data Acquisition Board with Sixteen 16-Bit, 200-kHz Analog Inputs, 40 Digital I/O, & 2 Analog Outputs



Features

- PCI (DaqBoard/2000) & CompactPCI (DaqBoard/2000c) versions available
- 16-bit, 200-kHz A/D converter
- 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
- 100% digital calibration
- 512 location channel/gain FIFO, capable of scanning all channels, including 256 analog expansion channels & 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*
- Two 16-bit, 100-kHz analog outputs with infinite continuous waveform output capability*
- 40 digital I/O lines, can be scanned synchronously or asynchronously with analog inputs
- Digital I/O is expandable up to 272 lines, including optional isolation & relay closure
- Four counter/pulse input channels can be scanned synchronously or asynchronously with analog inputs
- Two timer/pulse output channels

Signal Conditioning Options

- Signal conditioning & expansion options for thermocouples, strain gages, accelerometers, isolation, RTDs, etc.—over 30 options in all (see p. 112)

Software (see p. 89)

- Included drivers for Visual Basic®, C++, & Delphi™ for Windows® 95/98/2000/Me/NT; DASYLab®, TestPoint®, & LabVIEW®
- Optional DaqView2000™ software package



The DaqBoard/2000 plug-in board provides cost-effective, high-speed data acquisition for up to 470 I/O channels



CompactPCI Versions
Now Available
(DaqBoard/2000c)

The new DaqBoard/2000™ sets the price/performance benchmark for high-speed, multi-function plug-and-play data acquisition for PCI bus computers. The DaqBoard/2000 hardware design offers all of the features normally found on significantly more expensive boards, including 16-bit, 200-kHz A/D, 100% digital calibration, bus mastering, dual 16-bit, 100-kHz D/A converters, 40 digital I/O lines, four counters and two timers.

DaqBoard/2000 is supported by a growing family of over 30 signal conditioning and expansion options, offering signal conditioning for thermocouples, RTDs, accelerometers, isolation, high-voltage, strain gages, and much more. Up to 528 channels of analog and digital I/O can be accessed using one DaqBoard/2000, while maintaining the 5 μ s per channel update rate. Up to four DaqBoard/2000s can be installed into one PC.

Software support is the most extensive of any board, including comprehensive drivers and programming tools for nearly every programming environment under Windows® 95/98/2000/Me/NT. Included in this list are Visual Basic, C++, Delphi, TestPoint®, LabVIEW, & DASYLab®. Also available is a suite of DaqView software options for *Out-of-the-Box™* setup, acquisition, display, and analysis of acquired data—no programming required. DaqView2000 combines DaqView, DaqViewXL™, and DIAdem®-View in one software package for use with the DaqBoard/2000.

In total, the DaqBoard/2000 sets a new industry standard for plug-and-play PCI data acquisition. For a comparison chart of the DaqBoard/2000 versus competing products, visit www.iotech.com/compare.html.

* Limited only by available PC RAM and hard disk space

QUICK FIND



DaqBoard/2000™

General Information

Signal I/O

One 100-pin connector on the DaqBoard/2000 provides access to all of the input and output signals. Unlike other multifunction boards that require multiple PC slots in order to access all of the I/O, careful design of the DaqBoard/2000 accommodates all I/O using one cable, and utilizing a single PCI slot.

The 100-pin DaqBoard/2000 I/O connector, P4, is logically divided into three sub-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 analog outputs. Several options are available to provide easy user access to all of the I/O signals on P4.

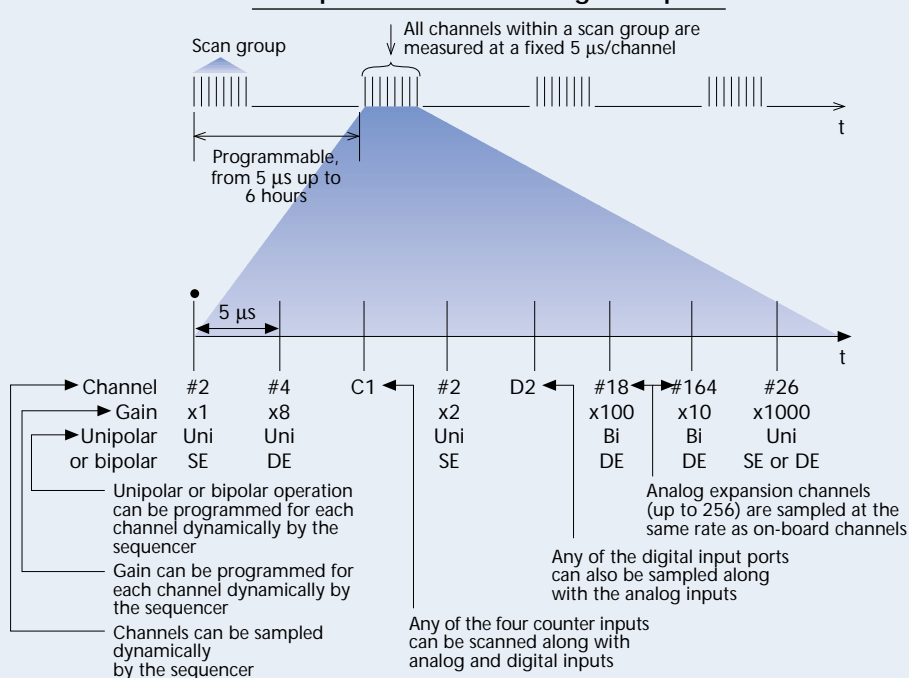
Analog Input (P1)

The DaqBoard/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 $\pm 10V$ 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 DaqBoard/2000 up to 256 analog inputs using external DBK signal conditioning and expansion options (see p. 112). As with the on-board channels, expansion channels are scanned at the same 5 μs /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.

Channel-Scanning Flexibility

The DaqBoard/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 plug-in data acquisition boards — a drastic reduction in the scan rate for external expansion channels. All DaqBoard/2000 channels, including the 528 potential expansion channels, are scanned at 200 kHz (5 μs /channel). In addition, the digital and frequency inputs can be scanned using the same scan sequence employed for analog inputs, enabling the time correlation of acquired digital data to acquired analog data. The DaqBoard/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 μs /channel rate.

DaqBoard/2001 Scanning Example



Scanning

The DaqBoard/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 μs /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 (see p. 86).

Bus Mastering DMA

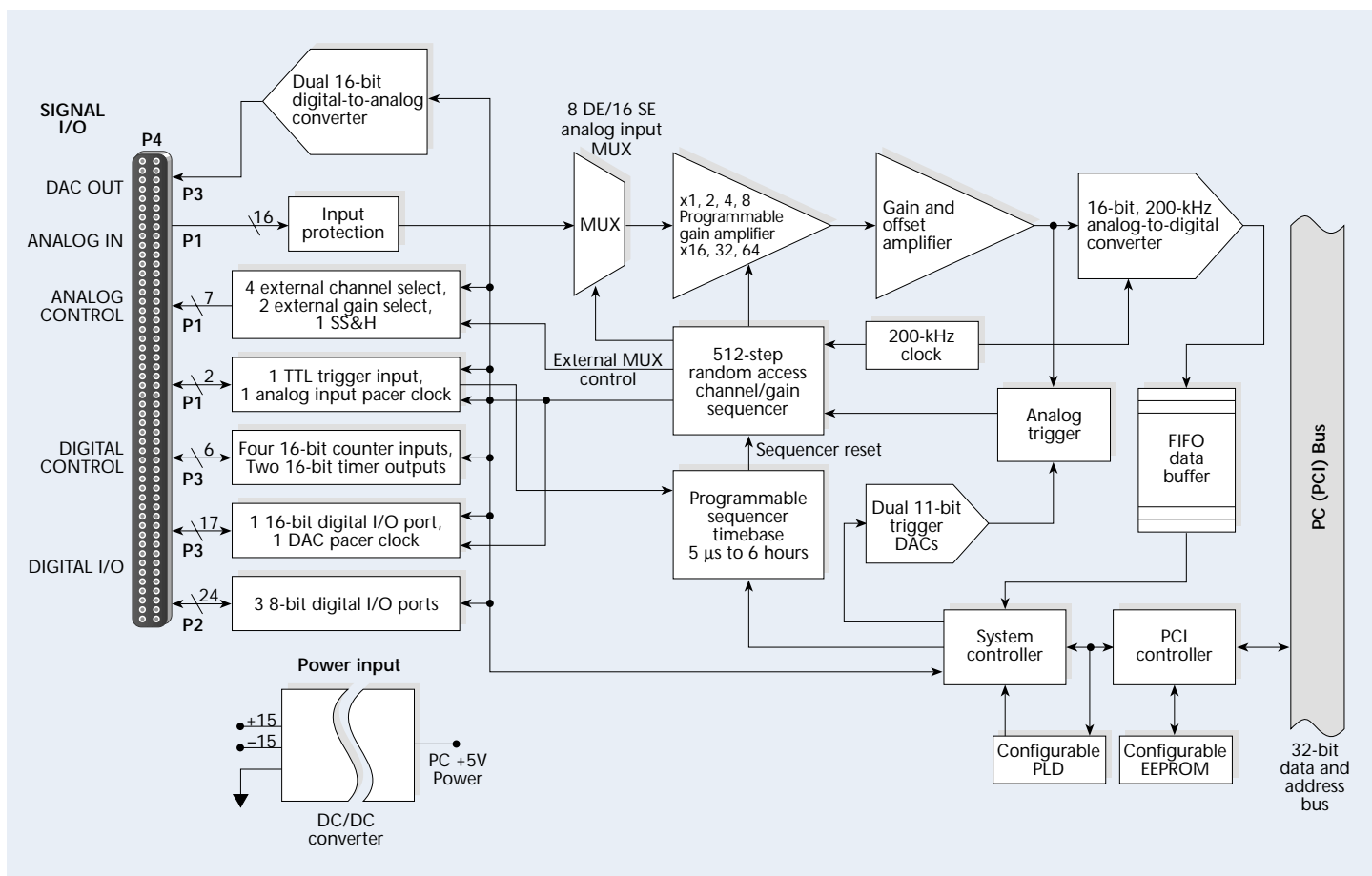
The DaqBoard/2000 supports Bus Mastering DMA, which allows analog and digital/counter input data, as well as analog and digital output data to flow between the PC and the DaqBoard/2000 without consuming valuable CPU time. The driver supplied with the DaqBoard/2000, as well as all other third-party software support such as TestPoint®, LabVIEW®, and DASyLab®, automatically utilize Bus Mastering DMA to efficiently conduct I/O from the PC to the DaqBoard.

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DaqBoard/2000™

General Information



Triggering

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

Hardware Analog Triggering. Many data acquisition boards claim analog triggering, but rely on the PC to take readings and make a decision, which leads to uncertain and potentially long latencies. The DaqBoard/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 boards. 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 and Pattern 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.

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.

The DaqBoard/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.

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.

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DaqBoard/2000™

General Information

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 DaqBoard/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 DaqBoard 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.

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.

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*. 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.

Calibration

Every range on the DaqBoard/2000 is calibrated from the factory using a digital calibration method. This method works by storing a correction factor for each range on the DaqBoard/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 boards, 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 DaqBoard/2000 also has a user-cal mode, whereby the user can adjust the calibration of the board in their system, without destroying the factory calibration supplied with the board. This is accomplished by having 2 distinct calibration tables in the

DaqBoard/2000's on-board EPROM, one which contains the factory cal, and the other which is available for user calibration.

Analog Output (P3)

Two 16-bit, 100-kHz analog output channels are built into the DaqBoard/2000, with an output from -10V to +10V. These outputs are entirely separate from the D/As which are used to determine analog trigger level (some data acquisition board suppliers confusingly refer to trigger D/As as if they are available to the user). Through the use of Bus Mastering DMA, each D/A output can continuously output a waveform, which can be read from PC RAM or a file on the hard disk. In addition, a program can asynchronously output a value to either of the D/As for non-waveform applications, presuming that the D/A is not already being used in the waveform output mode. Additional low-speed D/A channels can be added to the DaqBoard through the use of the DBK2 analog output option card (see p. 118).

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.

* Driver support only

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DaqBoard/2000™

General Information

Digital Pattern Generation (P3)

The DaqBoard/2000 supports digital pattern generation via Bus Mastering DMA on the 16-bit high-speed digital I/O port. In the same manner as Analog Output, the digital pattern can be read from PC RAM or a file on the hard disk. Digital pattern generation is clocked in the same four modes as described above with analog output*.

Digital Inputs and Outputs (P2, P3)

Forty TTL-level digital I/O lines are included in the DaqBoard/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 scanned along with other analog and digital input channels, or can be asynchronously accessed via the PC at any time, including when a scanned acquisition is occurring.

In addition, the P2 ports can be expanded up to 192 digital I/O lines using external DBK digital options (p. 113). 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 DaqBoard/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 DaqBoard/2000, each capable of counting up to 65,536 TTL-level transitions. Each of the four 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 DaqBoard/2000, the counter inputs can be read asynchronously under program control, or synchronously as part of an analog and digital scan group.

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

DaqBoard/2000 Signal Conditioning & Expansion Options		
Product	Description	Capacity
DBK1	16-conductor BNC interface module	16 connectors
DBK2	D/A voltage-output card	4 channels
DBK4	dynamic signal-input card	2 channels
DBK5	current output card	4 channels
DBK7	frequency-to-voltage input card	4 channels
DBK8	high-voltage input card	8 channels
DBK9	RTD measurement card	8 channels
DBK10	expansion-card enclosure module	3 cards
DBK11A	screw-terminal card	40 terminals
DBK12	programmable low-gain analog input card	16 channels
DBK13	programmable high-gain analog input card	16 channels
DBK15	universal current/voltage input card	16 channels
DBK16	strain gage measurement card	2 channels
DBK17	simultaneous sample and hold card	4 channels
DBK18	low-pass filter card	4 channels
DBK19	high-accuracy thermocouple card	14 channels
DBK20	digital I/O card (screw-terminal connectors)	48 channels
DBK21	digital I/O card (male DB37 connectors)	48 channels
DBK23	optically isolated digital-input module	24 channels
DBK24	optically isolated digital-output module	24 channels
DBK25	relay output card	8 channels
DBK30A	rechargeable battery/excitation module	14.4 or 28.8 VDC
DBK32A	auxiliary power supply card	±15 VDC @ 500 mA
DBK33	triple-output auxiliary power supply card	±15 VDC @ 250 mA & ±5 VDC @ 1000 mA
DBK40	BNC interface module	18 connectors
DBK41	analog expansion enclosure module	10 cards
DBK42	5B isolated signal-conditioning module	16 channels
DBK43A	strain gage module	8 channels
DBK44	5B isolated signal conditioning card	2 channels
DBK45	SS&H card with low-pass filter	4 channels
DBK50	isolated high-voltage input module	8 channels
DBK51	isolated low-voltage input module	8 channels
DBK52	high-accuracy thermocouple module	14 channels
DBK53	programmable low-gain analog input module	16 channels
DBK54	programmable high-gain analog input module	16 channels
DBK60	3-slot expansion module w/customizable panels	3 card
DBK200	adapter board for analog inputs	P1
DBK201	panel-mount adapter board with three (DBK) expansion ports	P1, P2, P3
DBK202	screw-terminal adapter board, solder locations for user-supplied resistors and R/C networks, with three expansion ports	120 terminals, P1, P2, P3
DBK203	same as DBK202 adapter board with a rugged metal enclosure	120 terminals, P1, P2, P3
DBK206	adapter board with removable screw-terminals with three expansion ports	120 terminals, P1, P2, P3
DBK207	5B-isolated analog input signal conditioning board with two expansion ports	P1 (2)
DBK207/CJC	same as DBK207 plus on-board, cold-junction compensation; two expansion ports	P1 (2)
DBK208	Opto-22® signal conditioning board for isolated (solid-state-relay) digital I/O, with two P2 digital I/O expansion ports	P2 (2)
DBK209	same as DBK201 but rack and DIN-rail mountable with optional kits	P1, P2, P3

Timer Outputs (P3)

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

Multiple DaqBoards per PC

All of the features described for the DaqBoard/2000 can be replicated with up

to four DaqBoard/2000s installed in the same PC. The serial number on each DaqBoard/2000 is used to differentiate one from another, and a user-selected name can be assigned to each board for easy program documentation. Thus, with four boards installed along with DBK expansion options, over 1,000 analog input channels and over 800 digital I/O channels could be accessed from one PC.



DaqBoard/2000™

Connectivity Options



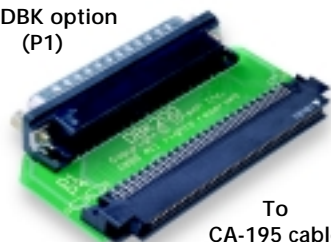
The DaqBoard/2000 provides all I/O signals on one 100-pin connector. The following adapter options make it easy for the user to attach signals and expansion options to the DaqBoard/2000.

Note: The following boards are not depicted with respect to scale.

DBK200™ Adapter Board

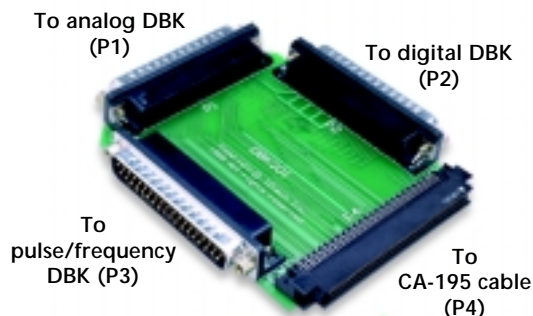
Suitable exclusively for analog-signal expansion, the DBK200 adapter board contains one 100-pin connector which connects to the DaqBoard/2000 via the CA-195 cable, and one female DB37 connector that mates directly with the P1 port of any of the DBK analog signal conditioning and expansion options. This is the most convenient way to add analog expansion options if access to the DaqBoard/2000 digital I/O or frequency signals is not required. Access to P1 analog signals is also possible via included female-mating solder-lug connectors or optional CA-37-x* or CA-37-xT* expansion cables.

To DBK option
(P1)

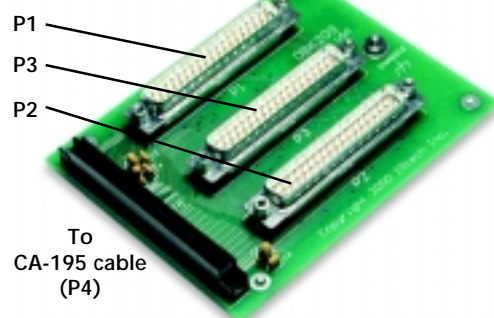


To
CA-195 cable

DBK201



DBK209



DBK201™ & DBK209™ Adapter Boards

For both analog and digital expansion, the DBK201 adapter board mates with the DaqBoard/2000 via a 3-ft. CA-195 cable. It provides three male DB37 connectors, divided into P1 analog I/O, P2 digital I/O, and P3 digital and counter/timer I/O. Each port on the DBK201 connects to DBK expansion options via an optional CA-37-x* or CA-37-xT* expansion cable. Alternatively, users can solder wires to the included DB37 female-mating solder-lug connectors, or custom make their own cables that are terminated with a female DB37. An optional 6-ft. cable is available that contains a mating female DB37 connector at one end, and is unterminated at the other end (CA-113). The DBK209 is identical in function to the DBK201 but is snap-track (DIN-rail), and rack-mountable with optional mounting kits.



The CA-195 100-pin conductor cable connects the DaqBoard/2000 series boards with the DBK200 series adapters



DaqBoard/2000™

Connectivity Options



DBK202™ Screw-Terminal Adapter Board

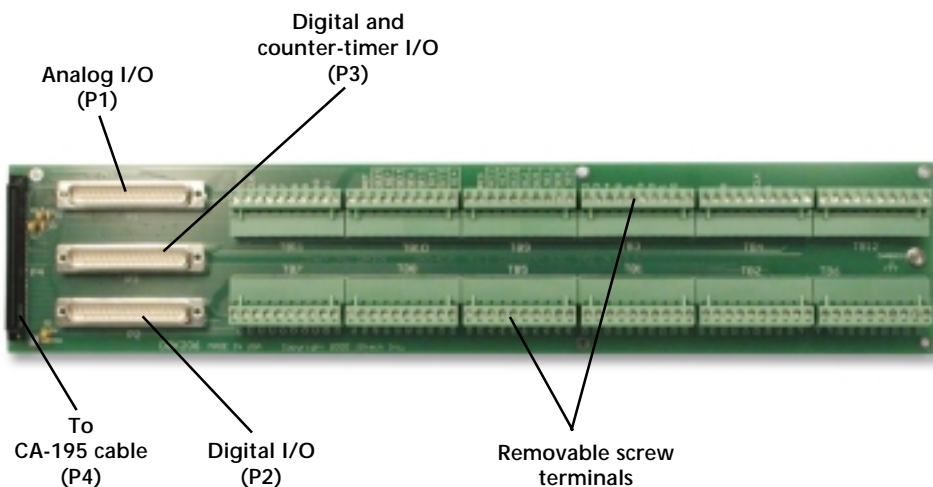
The DBK202 screw-terminal board provides convenient screw-terminal access to all signals from the DaqBoard/2000. Divided into three ports (P1, P2, and P3), the DBK202 also provides another way to access signals. There are male DB37 connectors on P1 and P2, and an adapter cable (CA-60) can be used to connect to the P3 header for connection to DBK signal conditioning and expansion options. Mounting holes in the DBK202 permit it to be easily screw-mounted into a user-provided enclosure.

DBK203™ Screw-Terminal Adapter Module

The DBK203 is identical to the DBK202, except that it is housed in a shielded metal enclosure, which easily mounts to other DBK signal conditioning and expansion modules. Fastener panels are included for attaching other DBK modules.

DBK206 Screw-Terminal Adapter Board

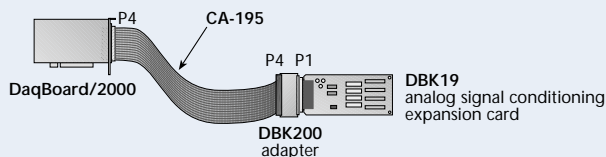
Similar in function to the DBK202, but designed for mounting in 19-inch enclosures, the DBK206 features three vertically mounted straight male DB37 connectors for analog and digital channel expansion (P1 analog I/O, P2 digital I/O, and P3 digital and counter-timer I/O). Two rows of removable screw terminals provide convenient access to all DaqBoard/2000 I/O signals (10-22 AWG wire). It mates with the DaqBoard/2000 via a 3ft. CA-195 cable, and each port (P1, P2, and P3) connects to DBK signal conditioning/expansion options via optional CA-37-x cable(s). The standard DBK206 can be panel mounted, but it also is DIN-rail mountable with option DIN2 and is rack-mountable with option Rack3.



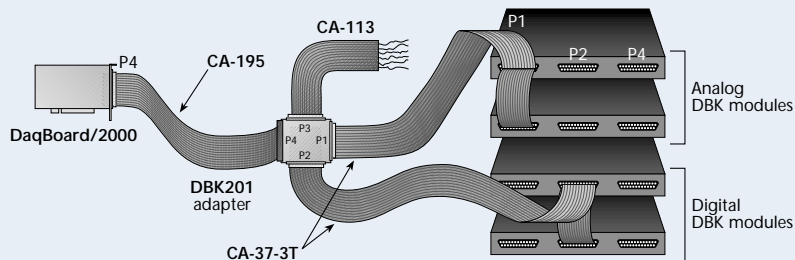
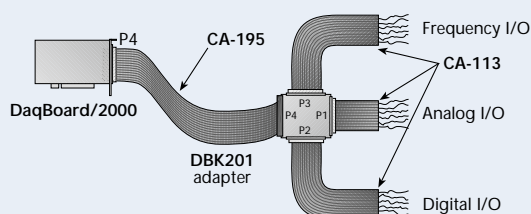
DaqBoard/2000™

Connectivity Options

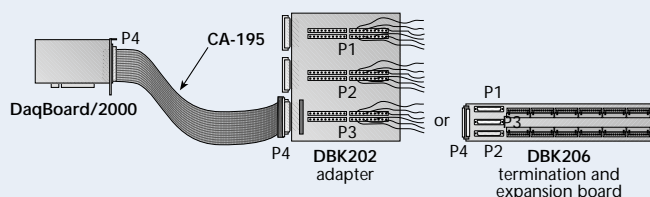
DaqBoard/2000 System Examples



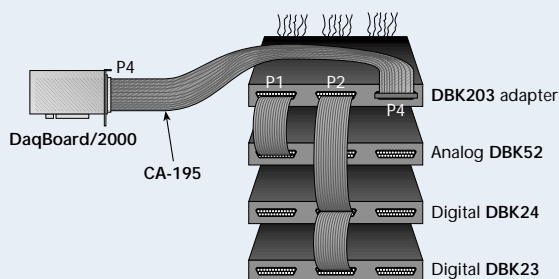
The DBK200 adapter mates directly with analog DBK signal conditioning options



The DBK201 adapter with analog and digital DBK signal conditioning and expansion modules



The DBK202 adapter with screw terminal connectors



The DBK203 adapter with screw terminal connectors



The CA-195 100-pin conductor cable connects the DaqBoard/2000 with the DBK200 series adapters



3 Levels of Software Support for DaqBoard/2000™



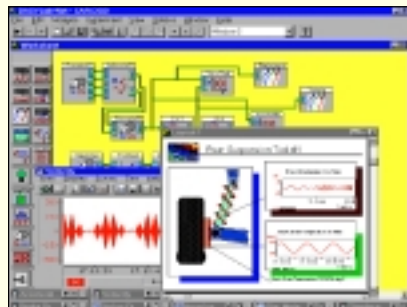
Iotech's DaqBoard/2000 is supported by three levels of software, allowing you to choose the package that best fits your application and your skill level.

Out-of-the-Box™ DaqView™ & DaqViewXL™



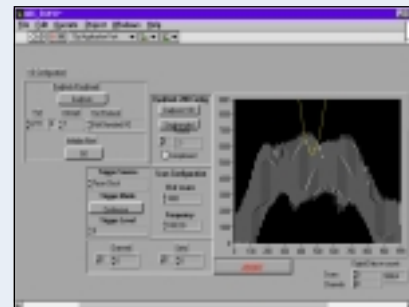
An *Out-of-the-Box™* DaqView2000 package is an option for the DaqBoard/2000. It includes DaqView which allows easy setup, display, and recording to disk, with no programming. It is bundled with DaqViewXL, an add-in for Microsoft Excel™ that provides seamless execution within Excel's tool palette, and DIAdem®-View. See p. 107 for a full description.

Icon-Based DASyLab®



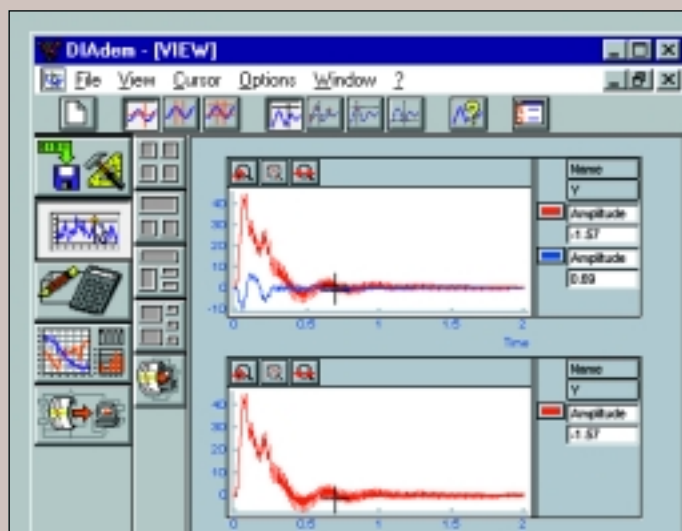
If your application requirements go beyond the scope of DaqView, DASyLab software offers a greater degree of flexibility and customization. You can teach yourself DASyLab in a matter of days, without the weeks of training required for some other icon-based application-development software. See p. 194 for a full description.

Drivers



A complete set of language drivers and documentation are included with DaqBoard/2000 for developing custom applications using programming languages like Visual Basic®, C++, and Delphi™ for Windows® 95/98/2000/Me/NT; and LabVIEW®. The drivers are easy to use and provide both high- and low-level control of the hardware.

DIAdem®



Included with DaqView software, DIAdem-View is a powerful tool for reviewing and analyzing previously acquired data. Its interactive display, data management, and data reduction tools provide easy inspection of even the biggest files. Optional DIAdem modules can be added to provide post-acquisition viewing and analysis services for any data collection software, or can be operated seamlessly from within DaqView. See p. 198 for a full description.



DaqBoard/2000™

Specifications

Specifications

General

Supply Voltage Range: 4.75 VDC to 5.25 VDC (from PCI Bus)

Power Consumption: 3.5W (up to 10W with external accessories)

Power Available for external signal conditioning and expansion options: 5V at 1A; $\pm 15V$ at 75 mA each

Operating Temperature: 0° to +60°C

Storage Temperature: -40° to +80°C

Relative Humidity: 0 to 95%, non-condensing

Vibration: MIL STD 810E

Signal I/O Connector: 100-pin high-density edge-type carries all analog and digital I/O signals

Dimensions: 165 mm W x 15 mm D x 108 mm H (6.5" x 0.6" x 4.2")

Weight: 160 g (0.4 lbs)

A/D Specifications

Type: Successive approximation

Resolution: 16 bit

Conversion Time: 5 μ s

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 μ s/channel)

Bandwidth: 500 kHz

Settling Time: 5 μ s to 1 LSB for full-scale step

Temperature Coefficient: $\pm(10\text{ppm} + 0.3 \text{ LSB})/^{\circ}\text{C}$

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: $\pm 11V$ relative to analog common

Over-Voltage Protection: $\pm 35V$

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

† Transfer accuracy assumes calibration inside computer; applicable for measurements made 5°C from ambient temperature at calibration

Analog, digital and frequency inputs can be scanned synchronously, based on either an internal programmable timer, or an external clock source. Analog and digital outputs can be synchronized to either of these clocks. Bus Mastering DMA provides CPU and system-independent data transfers, ensuring data acquisition performance irrespective of other system activities.

Scan Clock Sources: 2

1. Internal, programmable from 5 μ s to 5.96 hours in 5 μ s 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 μ s per channel, programmable

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

External Acquisition Scan Clock Input

Maximum Rate: 200 kHz

Clock Signal Range: 0V to +5V

Minimum Pulse Width: 50 ns high, 50 ns low

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 μ s 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 μ s 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

The two 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. Bus Mastering DMA provides CPU and system-independent data transfers, ensuring accurate outputs that are irrespective of other system activities. Streaming from disk or memory is supported, allowing continuous, nearly-infinite length, waveform outputs (limited only by available PC system resources).

Channels: 2

Resolution: 16 bits

Output Voltage Range: $\pm 10V$

Output Current: ± 10 mA

Offset Error: $\pm 0.0045V$ max

Gain Error: $\pm 0.01\%$

Update Rate: 100 kHz max, 1.5 Hz min (no minimum with external clock)

Settling Time: 10 μ s 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

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 Characteristics: 100 Ohm series, 20 pF to common; output 12 mA per pin, 200 mA total continuous (per bank of 40 outputs)

Input Protection: $\pm 8KV$ ESD clamp diodes parallel

I/O Levels: TTL

Sampling/Update Rate: 200 kHz max

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DaqBoard/2000™

Specifications & Ordering Information

Pattern Generation Output

The P3 16-bit digital I/O port can be configured for 16-bit pattern generation. The pattern can be updated synchronously with an acquisition from a file. If pattern generation mode is utilized, then one of the D/A outputs can only be used in an asynchronous mode. Bus Mastering DMA provides CPU and system-independent data transfers, ensuring data acquisition performance irrespective of other system activities. Streaming from disk or memory is supported, allowing continuous, nearly-infinite length, pattern outputs (limited only by available PC system resources)

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. Bus Mastering DMA provides CPU and system-independent data transfers, ensuring data acquisition performance irrespective of other system activities. 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.
16-bit, 200-kHz data acquisition board for PCI-bus PCs; CD ROM with all documentation; and drivers for Windows® 95/98/2000/Me/NT for C++™, Visual Basic®, Delphi™, LabVIEW®, TestPoint® & DASyLab®	DaqBoard/2000
16-bit, 200-kHz CompactPCI data acquisition board; CD ROM with all documentation; and drivers for Windows® 95/98/2000/Me/NT for C++™, Visual Basic®, Delphi™, LabVIEW®, TestPoint® & DASyLab®	DaqBoard/2000c
DaqBoard/2000, DaqView2000 software, DBK202, and CA-195	DAQ2000/STR-KIT
Adapter board, directly connects DBK signal conditioning and expansion options (P1, analog only) to the CA-195 expansion cable	DBK200
Adapter board, connects all DBK signal conditioning and expansion options to CA-195 expansion cable	DBK201

Adapter board with screw terminals, also connects DBK signal conditioning and expansion options to CA-195 expansion cable	DBK202
Same as DBK202 but housed in a shielded metal enclosure	DBK203
Termination and expansion board with removable screw terminals for access to all DaqBoard/2000 series I/O with direct connection for DBK signal conditioning and expansion options (P1, P2 and P3 for analog and digital I/O) via CA-37-1 cable(s); connects to DaqBoard/2000 series P4 connector via CA-195 cable	DBK206
Termination and (P1) expansion board with fixed screw terminals and sockets for up to 16 multiplexed 5B-compatible isolated analog input modules; connects to DaqBoard/2000 series (P4) connector via CA-195 cable and to LogBook or DaqBook series devices (P1) connector via CA-37-1	DBK207
Same as DBK207 but with on board, cold-junction compensation and two (P1) expansion ports	DBK207/CJC
Termination and expansion board with fixed screw terminals (12 to 26 AWG wire), sockets for up to sixteen Opto-22®-compatible isolated solid-state-relay (SSR) digital I/O modules, and status LEDs per channel; provides direct connection for DBK signal conditioning and expansion options (P1, P2 and P3 for analog and digital I/O) via CA-37-1 cable(s); connects to DaqBoard/2000 series P4 connector via CA-195 cable	DBK208
Same as DBK201 but rack and DIN-rail mountable with optional kits	DBK209
Rack-mount kit for DBK206, DBK207, DBK207/CJC, DBK208, and DBK209 signal termination and expansion boards	Rack3
DIN-rail adapter kit for DBK206, DBK207, DBK207/CJC, and DBK208 signal termination and expansion boards	DIN1
DIN-rail adapter kit for DBK209 signal termination and expansion board	DIN2
User manual for the DaqBoard/2000 series boards and all of the DBK signal conditioning and expansion options	1033-0901
Programmers manual for the DaqBoard/2000 series boards and all of the DBK signal conditioning and expansion options	1008-0901

Software

DaqView for setup, data acquisition, display, and analysis; DaqViewXL for seamless execution within Microsoft Excel's™ tool palette; DIAdem®-View for post-acquisition viewing	DaqView2000
Icon-based data acquisition, graphics, control, and analysis software	DASyLab

Cables

Ribbon cable with female DB37 connector, provides convenient wiring to P1, P2, and P3 ports without requiring soldering to DB37 connectors, 6 ft.	CA-113
Expansion-card cable for connecting DBK/CDK series expansion options; specify number of option cards (x) to be connected	CA-37-x
100-conductor expansion cable, mates with the DaqBoard/2000 series boards and the DBK200, DBK201, DBK202, DBK203, DBK206, DBK207, DBK207/CJC, DBK208, and DBK209;	
3 ft expansion cable	CA-195
6 ft expansion cable	CA-195-6
Same as CA-195 with CE compliance; 3 ft.	CA-209

Related Products

Expansion Hardware

DBK1	p. 117
DBK2	p. 118
DBK4	p. 119
DBK5	p. 121
DBK7	p. 123
DBK8	p. 125
DBK9	p. 126
DBK10	p. 127
DBK11A	p. 128
DBK12	p. 129
DBK13	p. 129
DBK15	p. 130
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Software

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DIAdem	p. 198

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