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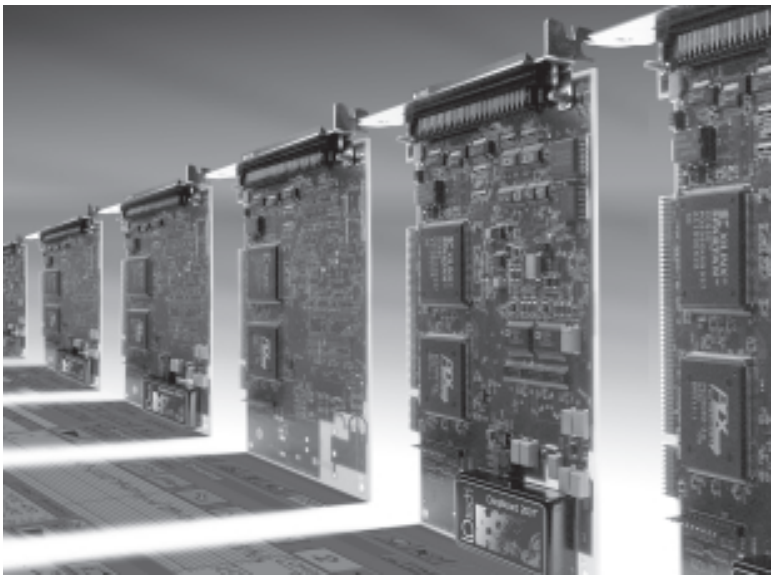
New High-Performance PCI Data Acquisition Boards

New Price-Performance Benchmark for 16-bit Solutions Feature Unmatched Channel Expansion and Signal Conditioning

CLEVELAND, October 2, 2000 — IOtech announces the release of the new DaqBoard/2000™ series, a family of five new PCI boards for high performance, multifunction data acquisition applications. This expanded family of PCI boards can be used individually, in any combination of up to four boards per PC, or in a system with any of IOtech's broad line of 35 DBK series signal conditioning boards. This unmatched range of I/O expansion and signal conditioning allows cost-conscious end-users and OEMs to closely match hardware with application requirements. New signal termination options supporting 5B-style isolated I/O and Opto-22® style electromechanical relays expand the application range for these boards into process monitoring, industrial monitoring and control, and production test applications.

The DaqBoard/2000 series of multifunction DAQ boards share a common hardware and software architecture. This commonality results in four key benefits. First, channel expansion, achieved by adding multiple PCI boards, is made virtually transparent by the combination of the PCI-bus's plug-and-play support and IOtech's board identification and configuration software. Second, since all boards share an industry-standard, high-density connector, they are supported by a common family of cables and signal terminations. This eliminates the need for more complex dual-connector solutions (with expensive mating cables) found on competitive boards. Third, for applications requiring channel expansion where there are no available PCI slots, or where signal conditioning is required to measure



New DaqBoard/2000 series with broader I/O count options economically meet a wider application range

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temperature, strain, or other parameters, all DaqBoard/2000 series boards are fully compatible with IOtech's family of DBK series signal conditioning boards. Fourth, a robust API library supports the entire family making custom application program development, system expansion/modification, and system maintenance easier and less time-consuming. Together, these features save both end-users and OEMs money by supporting rapid application development and lowering long-term system maintenance, and expansion costs.

DaqBoard/2000™ Series Selection Chart						
Feature	**DaqBoard/2001**	**DaqBoard/2000**	**DaqBoard/2005**	**DaqBoard/2004**	**DaqBoard/2002**	**DaqBoard/2003**
Analog inputs (16 bit/200 kHz)	16	16	16	—	—	—
Analog outputs (16 bit/100 kHz)	4	2	—	4	—	4
Digital I/O	40	40	40	40	40	—
Frequency/pulse I/O	6	6	6	6	6	—
Signal conditioning options	27	27	27	5	5	—
Price	***$895***	***$595***	***$495***	***$695***	***$295***	***$495***

Common features shared by all of the DaqBoard/2000 series multifunction I/O DAQ boards include:

- PCI-bus "plug-and-play" configuration
- No potentiometers, jumpers, or switches; 100% digital calibration
- PCI-bus mastering (DMA) for continuous, high-speed data streaming, without CPU intervention
- Synchronous scanning of all analog, digital and counter inputs
- On-board (FPGA) scan sequencer providing precise timing down to 5 µs between channels (up to 300 channels)
- On-board power supply for add-on DBK signal conditioning I/O expansion supporting analog input expansion up to 256 channels, analog output expansion up to 256 channels, and digital I/O expansion up to 192 lines
- Up to four DaqBoards per PC in any combination for channel expansion up to 1000 analog input channels and 800 digital I/O signals
- Free API library (Windows® 95/98/2000/NT) for Visual Basic®, C++ and Delphi™
- Over 100 free ready-to-use sample applications and utilities
- DaqView™ software for immediate, *Out-of-the-Box*™ board setup, data acquisition, and signal verification (including strip chart, bar graph, analog meter, and digital meter modes)
- DaqViewXL™ for dynamically acquiring data into an active Excel® spreadsheet without programming
- Robust drivers for commercial software packages including LabVIEW® and DASYLab®
- High-density, industry-standard 100-pin connector
- Optional CE-compliant shielded cable

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Analog Input*

DaqBoard/2000 series products feature a 16-bit, 200-kHz A/D converter and 16 single-ended or 8 differential analog inputs. Thirteen software programmable ranges provide inputs from ±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 up to 256 analog inputs using IOtech's external DBK signal conditioning and expansion options. 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.

Scanning

An on-board scan sequencer 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 also scan digital and counter inputs.

Bus Mastering

The DaqBoard/2000 series supports Bus Mastering DMA, which allows analog and digital 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, 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.

Triggering

Because triggering can be the most critical aspect of a data acquisition application, the DaqBoard/2000 series supports a full complement of trigger modes to accommodate any measurement situation. These include the following.

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 series uses true analog triggering, whereby the trigger level programmed by the user sets an analog DAC, which is 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 better than most other data acquisition boards. Any analog channel, including built-in or expansion channels, can be selected as the trigger channel.

Digital Triggering. 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.

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Software-Based Triggering. Software-based triggering differs from the modes described above because the readings (both analog and/or digital) 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 readings, such as on a specific temperature, which is derived from the acquisition of at least two analog measurements, plus the calculation of the resultant temperature using linearization algorithms.

The DaqBoard/2000 series 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 or exceeds a programmed level. Any of the built-in counter/totalizer channels can be programmed as a trigger source.

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 series 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/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 occurred.

Six modes of pre- and post-triggering are supported, providing a wide variety of options to accommodate any measurement requirement.

Calibration

Every range on the DaqBoard/2000 series plug-in board is calibrated from the factory using a digital calibration method. This process works by storing a correction factor for each range on the DaqBoard at the time of calibration. Whenever a particular range is selected, the appropriate calibration constant is automatically applied to compensating DACs, thereby calibrating the specific range. The result is that readings generated by the A/D are already calibrated and do not require additional processing in the PC. This is significantly better than other boards that merely adjust the readings in software after they are transferred to the PC. The “other” method has the disadvantage of reducing the dynamic range of the A/D, and this can adversely affect the speed by which the PC can obtain a calibrated reading.

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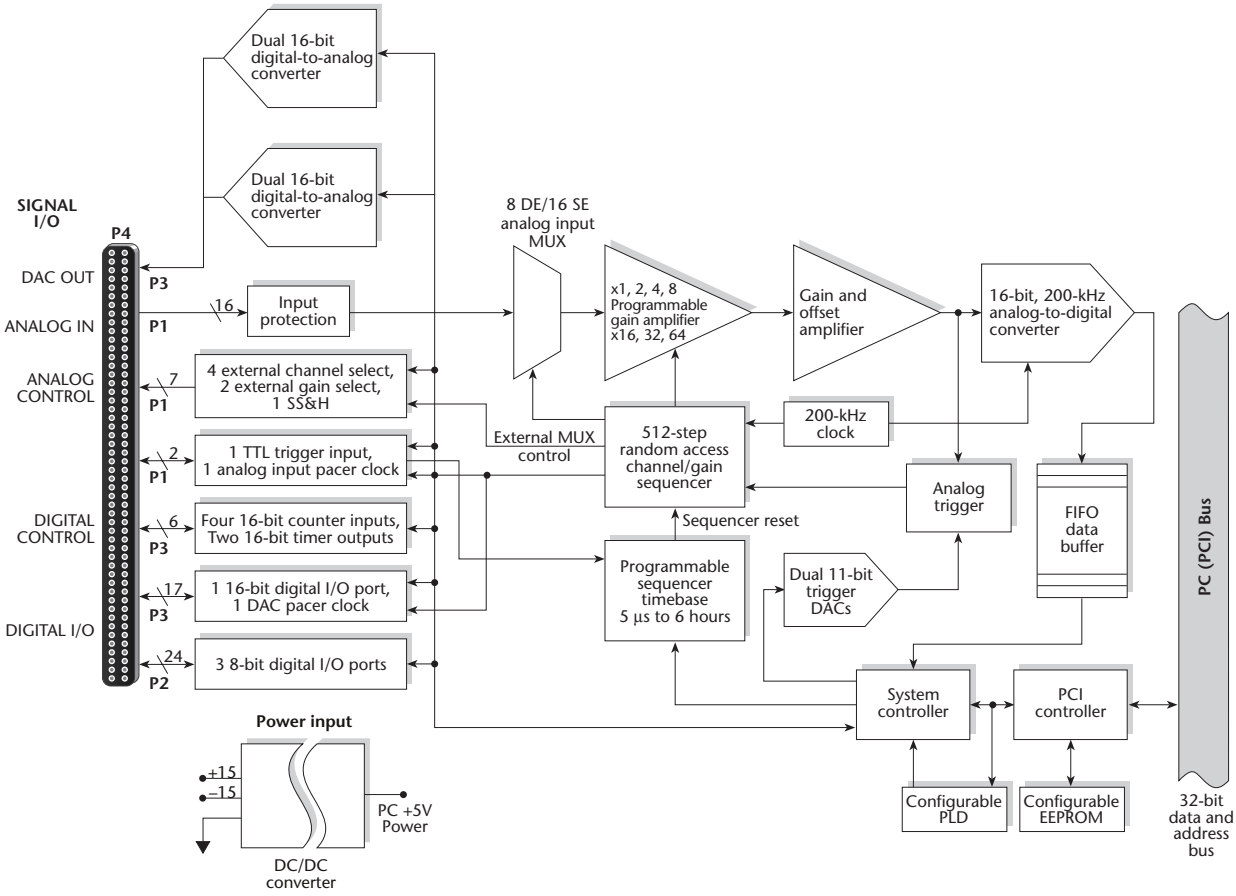

Block diagram of the DaqBoard/2001

The DaqBoard/2000 series also has a user-cal mode, whereby the user can adjust the calibration of the board in his or her system without destroying the factory calibration supplied with the board. This is accomplished by having two distinct calibration tables in the DaqBoard's on-board EPROM, one containing the factory calibration and the other available for user calibration.

Analog Output*

Two or four 16-bit, 100-kHz analog output channels are built into the DaqBoard/2000 series, with an output range from -10V to +10V. These outputs are entirely separate from the trigger 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 any of the D/As for non-waveform applications, presuming the D/A is not already being used in the waveform output mode. Additional D/A channels can be added to the DaqBoard through the use of IOtech's DBK2™ analog output option card.

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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 following sources:

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 updates can be synchronized to the acquisition rate derived from the on-board pacer clock, with rates up to 100 kHz.

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

Synchronous External Clock. A user-supplied external input clock paces both the D/A and the analog input.

Digital-Pattern Generation

The DaqBoard/2000 series 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 PC's hard disk. Digital-pattern generation is clocked in the same four modes as described above with analog output.

Digital I/O*

Forty TTL-level digital I/O lines are included in the DaqBoard/2000 series. They are divided into three 8-bit ports and one 16-bit port. The 8-bit ports can be programmed in 8-bit groups as either input or output. The 16-bit 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 three 8-bit ports can be expanded up to 192 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 DaqBoard/2000 series, the P2 I/O lines are no longer user-programmable and are instead used to communicate with the expansion options.

Counter Inputs*

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 into two 32-bit, each capable of four billion counts to be accumulated. As with all other inputs to the DaqBoard/2000 series, the counter inputs can be read asynchronously under program control or synchronously as part of an analog and digital scan group. If a counter is not included in a scan group, it can be accessed asynchronously even while a scanned acquisition is occurring.

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Timer Outputs*

Two 16-bit timer outputs are built into the DaqBoard/2000 series, each capable of generating square waves with a programmable frequency range from 16 Hz to 1 MHz. The timer outputs can be loaded and initiated asynchronous to the scanning of analog inputs, or they can be configured to commence output upon receipt of a trigger event.

Signal Conditioning

IOtech's growing family of 35 DBK signal conditioning, I/O expansion, and signal termination options (see ordering information), expands the DaqBoard/2000 series' application range. Available modules support thermocouple and RTD-based temperature measurements as well as accelerometer and strain gage-based measurements. Additional specialty modules provide simultaneous sample and hold (SS&H), filtering, high-voltage, and isolation functions. All DBK series modules can be optionally panel or DIN-rail mounted.

Termination Options

The DaqBoard/2000 series of boards provide access to all I/O on a high-density, 100-pin connector. The following adapter options make it easy for the user to attach signals and expansion options to the DaqBoard/2000 series. The DBK205™ adapter, included with the DaqBoard/2003™, provides screw-terminal access to the DaqBoard/2003's four analog outputs. The DBK200™ is suitable, exclusively, for analog-signal expansion; this is the most convenient way to add analog expansion options if access to the DaqBoard/2000 series' digital I/O or frequency signals is not required or supported. The DBK201™ is suitable for both analog and digital expansion. This adapter board provides three male DB-37 connectors, which are divided into three ports and connect to DBK expansion options via an optional expansion cable. The DBK209™ is identical to the DBK201 except that straight, in-line DB-37's are used and mounted vertically on the board to facilitate clean cable routing for panel-mount applications.

The DBK202™ is a screw-terminal board that provides convenient screw-terminal access to all signals and also features sockets reserved for user-supplied resistor/capacitor networks. The DBK203™ is identical to the DBK202, except it is housed in a shielded metal enclosure that easily mounts to other signal conditioning and expansion modules. For applications with limited space (e.g. NEMA enclosure), the small form-factor DBK206™ provides screw-terminal access to all I/O signals as well as analog and digital channel expansion. For more industrial applications where isolation is required, the new 16 channel DBK207™ carrier board supports 5B-type modules (Analog Devices and DataForth compatible), and for applications with control requirements, the new 16 channel DBK208™ carrier supports industry-standard solid state relay modules (Grayhill, Opto-22® and Gordos compatible). Both the DBK207 and the DBK208 also provide expansion via IOtech's family of 35 DBK series signal conditioning boards. Connection between all DaqBoard/2000 series PCI boards and the entire family

* Analog input specific to DaqBoard/2000, DaqBoard/2001, and DaqBoard/2005; analog out specific to DaqBoard/2000, DaqBoard/2001, DaqBoard/2003, and DaqBoard/2004; digital I/O and counter/timers specific to DaqBoard/2000, DaqBoard/2001, DaqBoard/2002, DaqBoard/2004, and DaqBoard/2005

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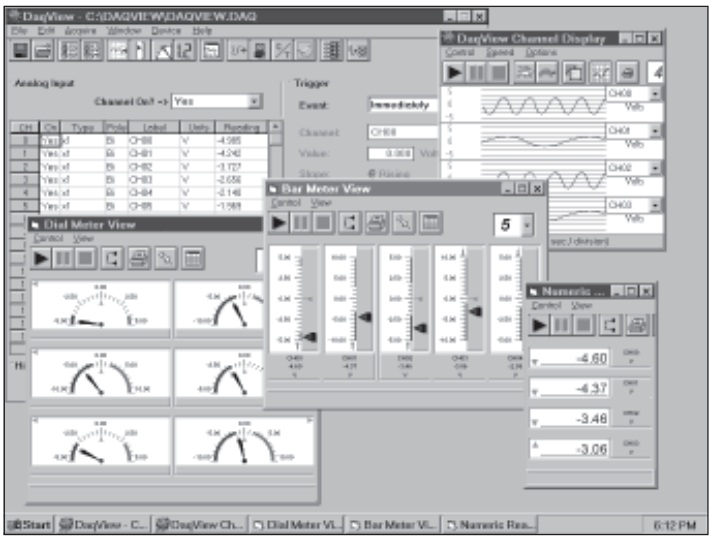
of termination boards is accomplished via the three-foot CA-195, the six-foot CA-195-6 cable, or the three-foot CE-compliant CA-209 cable. All DBK series signal termination boards can be panel-mounted.

Software Support

The DaqBoard/2000 series is supported by three levels of software. The first level is a robust universal API library (DaqX™) available free to programmers writing custom applications for



An Out-of-the-Box™ DaqView2000 package is an option for the DaqBoard/2000 series. DaqView2000 allows easy setup, display, and recording to disk, with no programming.

Visual Basic®, C++, and Delphi™ under Windows® 95/98/2000/NT. DaqX is complemented by over 100 ready-to-use sample program examples supporting rapid application program development. For custom, real-time requirements, including the development of non-Windows based applications (e.g. VxWorks® or Linux®), low-level driver source code is available. Included with this well documented source is a detailed reference of the DaqBoard/2000 series' register map and a detailed explanation of how to implement chained Bus-Mastered DMA — a unique performance enhancing feature of the DaqBoard/2000 series. The second software level is the optional *Out-of-the-Box*™ DaqView2000™ package providing immediate board setup, data acquisition and data display, without the need for programming. It is bundled with DaqViewXL™, an add-in for Microsoft Excel that provides seamless execution within Excel's tool palette. The third software level features drivers for popular third-party software environments including DASYLab®, LabVIEW®, and TestPoint® as well as compatible file formats linking data with post-acquisition analysis and display packages including DIA*dem*® and MATLAB™.

Starter Kit

IOtech's "single solution" Starter Kit is targeted at providing end-users with a complete *Out-of-the-Box*™ solution. It includes the high-performance DaqBoard/2000, multifunction, PCI data acquisition board and all necessary cables, terminations, and software. All of these components are together for the first time in a single convenient package. The Starter Kit

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provides four benefits. First, a single part number simplifies ordering. Second, as a pre-defined system there is no chance the system will be incorrectly configured. Third, the kit provides re-usable storage for all components. And fourth, the total cost of the kit is more than $100 under the list price of components purchased independently. Just open the box, follow the simple "quick-start" instructions, and in minutes, a fully functional PCI board-based system can be running on a desktop or industrial PC.

Pricing and Availability

The DaqBoard/2000 series is a stock item with delivery approximately 4 weeks ARO.

Product	Description	U.S. Price
DaqBoard/2000	16-bit, 200-kHz data acquisition board for PCI-bus with 16 analog inputs, 2 analog outputs, 40 digital I/O channels, and 6 frequency/pulse I/O; includes free DaqX API library	***$595***
DaqBoard/2001	16-bit, 200-kHz data acquisition board for PCI-bus with 16 analog inputs, 4 analog outputs, 40 digital I/O channels, and 6 frequency/pulse I/O; includes free DaqX API library	***$895***
DaqBoard/2002	16-bit, PCI expansion board with 40 digital I/O channels, and 6 frequency/pulse I/O; includes free DaqX API library	***$295***
DaqBoard/2003	16-bit PCI expansion board with 4 analog outputs; includes free DaqX API library	***$495***
DaqBoard/2004	16-bit expansion board with 4 analog outputs, 40 digital I/O channels, and 6 frequency/pulse I/O; includes free DaqX API library	***$695***
DaqBoard/2005	16-bit, 200-kHz data acquisition board for PCI-bus with 16 analog inputs, 40 digital I/O channels, and 6 frequency/pulse I/O; includes free DaqX API library	***$495***
Starter Kit	Package containing a DaqBoard/2000 board, DaqView2000 software CD, DBK202 adapter, CA-195 ribbon cable, and user manual	***$995***
DBK200	Adapter board for the DaqBoard/2000 series (analog I/O only with right angle 37-pin D-shell connectors)	***$35***
DBK201	Adapter board for the DaqBoard/2000 series (analog and digital I/O)	***$45***
DBK202	Screw-terminal adapter board for the DaqBoard/2000 series (analog and digital I/O with locations for user-supplied resistor/capacitor networks)	***$145***
DBK203	Screw-terminal adapter board for the DaqBoard/2000 series housed in a shielded metal enclosure (analog and digital I/O with locations for user-supplied resistor/capacitor networks)	***$245***

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Product	Description	U.S. Price
DBK205	Adapter board for the DaqBoard/2003 (analog output only; included with the DaqBoard/2003)	***$35***
DBK206	Adapter board for the DaqBoard/2000 series (analog and digital I/O, with analog and digital I/O expansion)	***$125***
DBK207	Carrier board for 5B compatible I/O modules (with analog and digital I/O expansion)	***$268***
DBK208	Carrier board for Opto-22® compatible solid-state-relay (SSR) modules (with analog and digital I/O expansion)	***$149***
DBK209	Mini adapter board for the DaqBoard/2000 series (with analog and digital I/O expansion)	***$145***
DaqView2000	Optional *Out-of-the-Box*™ data acquisition and analysis software package that includes DaqView, DaqViewXL, and DIA*dem*®-View	***$295***
CA-195	100-conductor expansion cable for DaqBoard/2000 series, 3′	***$55***
CA-195-6	100-conductor expansion cable for the DaqBoard/2000 series, 6′	***$65***
CA-209	100-conductor shielded expansion cable for the DaqBoard/2000, 3′	***$235***

About IOtech

IOtech produces data acquisition and IEEE 488 hardware and software for use in computer-based test-and-measurement systems. Its products are used in research and manufacturing facilities and are sold throughout the world. IOtech, Inc. is located at 25971 Cannon Road, Cleveland, Ohio, 44146; telephone: (440) 439-4091; fax: (440) 439-4093; E-mail: sales@iotech.com; World Wide Web: www.iotech.com.

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