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Find the *Measurement Computing / IOtech DaqBoard/1005* at our website: *Click HERE*

DaqBoard/1000 Series

16-Bit, 200 kHz PCI Data Acquisition Boards

MEASUREMENT COMPUTING

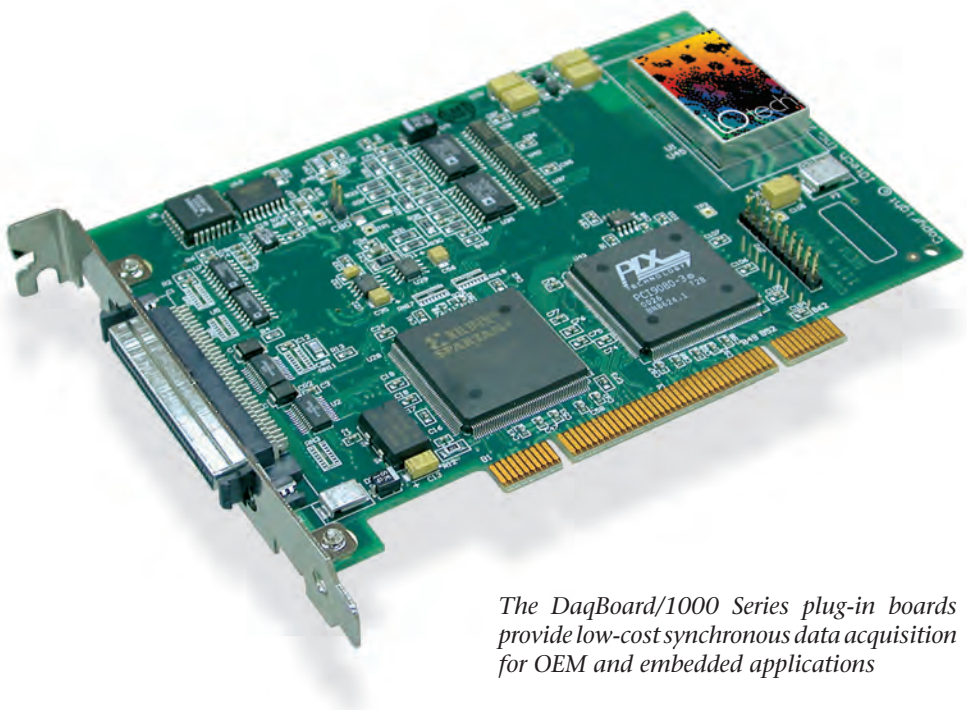
Features

- 16-bit, 200 kHz A/D converter
- 8 differential or 16 single-ended analog inputs (software selectable per channel)
- Up to four boards can be installed into one PC
- 100% digital calibration
- 512 location channel/gain FIFO
- DMA bus mastering for synchronous analog I/O, digital I/O, and counter inputs
- Trigger modes include digital and software, with <5 µs latency
- Virtually infinite pre-trigger buffer
- Two 16-bit, 100 kHz analog outputs with infinite continuous waveform output capability (model /1000 only)
- 24 digital I/O lines, can be scanned synchronously or asynchronously with analog and frequency inputs
- Four counter/pulse input channels can be scanned synchronously or asynchronously with analog and digital inputs
- Two timer/pulse output channels

Software

- Includes DaqView *Out-of-the-Box* software application for effortless data logging and analysis
- Comprehensive drivers for DASYLab®, NI LabVIEW®, Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET
- DaqCal software application for easy user calibration
- Supported Operating Systems: Windows 7/Vista/XP SP2, 32-bit or 64-bit

The DaqBoard/1000 Series of low-cost, multifunction PCI boards are ideal for OEM or embedded applications. These boards are best suited to applications with pre-conditioned voltage signals up to 16 channels. For applications that require channel expansion or signal conditioning for measuring temperature, strain, vibration and more, consider our DaqBoard/2000 Series with its line of over 40 DBK signal conditioning and expansion options.



The DaqBoard/1000 Series plug-in boards provide low-cost synchronous data acquisition for OEM and embedded applications

The DaqBoard/1000 Series offers all the functionality of higher priced PCI boards along with features not found in other manufacturers' low-cost offerings including flexible analog inputs with 7 analog gain ranges, inputs configurable as differential or single ended, 24 digital I/O lines, synchronous analog, digital and frequency I/O.

Synchronous I/O for High-Speed Applications

The DaqBoard/1000 Series has the ability to make analog measurements, read digital inputs, and read counter inputs, while synchronously generating up to two analog outputs. Most other boards require CPU interaction to access I/O other than analog input, making it impossible to generate time-critical analog waveforms.

Signal I/O

One 68-pin connector on the DaqBoard/1000 Series 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/1000 Series accommodates all I/O using one cable, and utilizing a single PCI slot. The latching 68-pin I/O connector contains all analog input channels plus digital I/O lines, counter inputs, timer outputs and analog outputs.

Analog Input

The DaqBoard/1000 Series has a 16-bit, 200 kHz A/D coupled with 16 single-ended, or 8 differential analog inputs. Seven 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 bipolar input.

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Scanning

The DaqBoard/1000 Series 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.

Bus Mastering DMA

The DaqBoard/1000 Series 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/1000 Series without consuming valuable CPU time. The driver supplied with the DaqBoard/1000, as well as all other third-party software support such as NI LabVIEW®, automatically utilize Bus Mastering DMA to efficiently conduct I/O from the PC to the DaqBoard.

Triggering

Triggering can be the most critical aspect of a data acquisition application. The DaqBoard/1000 Series supports a full complement of trigger modes to accommodate any measurement situation.

Digital and Pattern 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.

Software-Based Channel Level Triggering. Software-based Channel Level triggering differs from the mode 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.

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. Triggers can be detected on scanned digital input channel patterns as well.

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/1000 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 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.

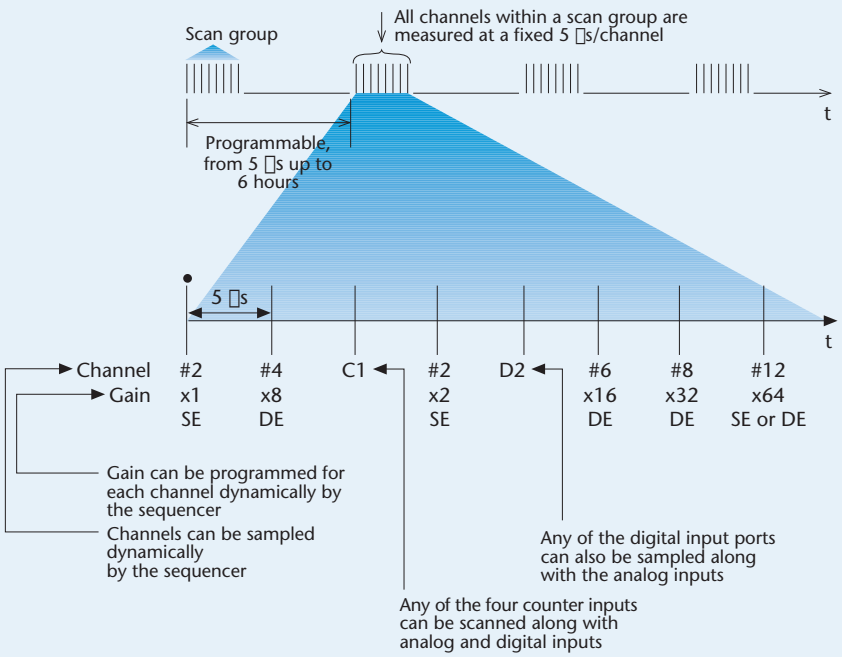
Stop Trigger. Any of the software trigger modes described above can also be used to stop an acquisition. Thus an acquisition can be programmed to begin on one event, such as a voltage level, and then can stop on another event, such as a digital pattern.

* TTL pattern triggering is one scan period

Channel-Scanning Flexibility

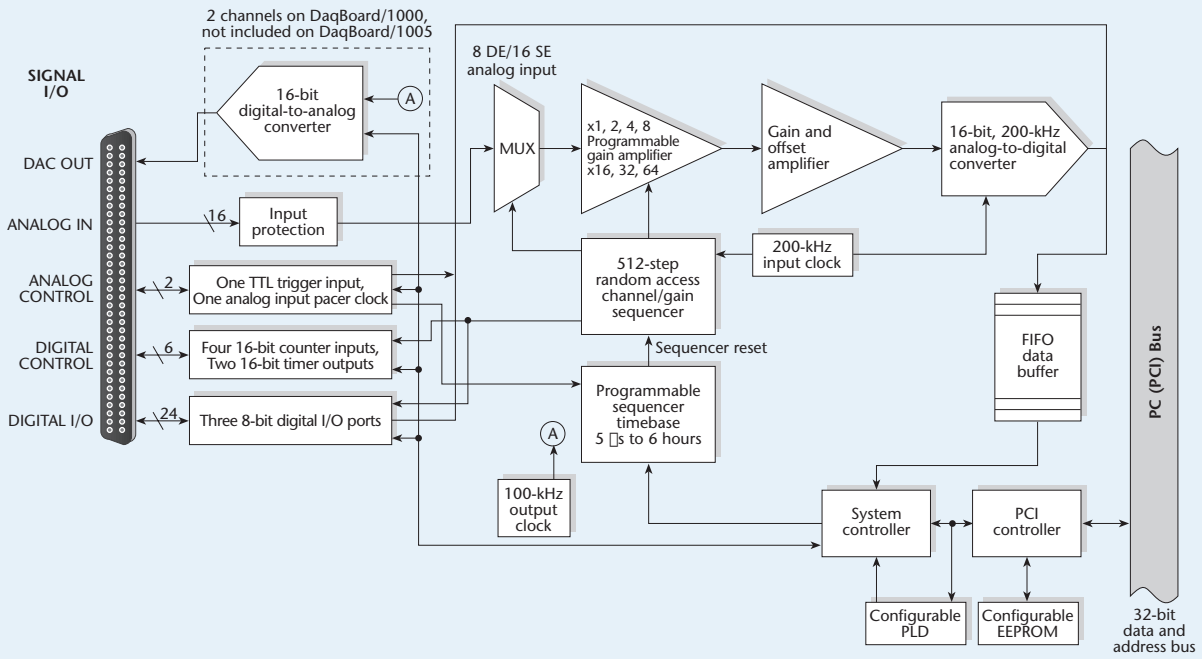
The DaqBoard/1000 Series offers a 512-location scan sequencer that allows you to select each channel and associated input amplifier gain at random. All DaqBoard/1000 Series channels are scanned at 200 kHz (5 µs/channel). In addition, the digital and frequency inputs can be scanned using the same scan sequence employed for analog inputs, enabling the time correlation of acquired digital data to acquired analog data. The DaqBoard/1000 Series 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/1000 Series Scanning Example



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DaqBoard/1000 and /1005 Block Diagram



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/1000 Series is calibrated from the factory using a digital calibration method. This method works by storing a correction factor for each range on the DaqBoard/1000 Series 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 at which the PC can obtain a calibrated reading.

* Using one of the programming languages

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The DaqBoard/1000 Series 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 two distinct calibration tables in the DaqBoard/1000 Series on-board EPROM, one which contains the factory cal, and the other which is available for user calibration.

Analog Output

Two 16-bit, 100 kHz analog output channels are built into the DaqBoard/1000, with an output from –10V to +10V. 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.

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.

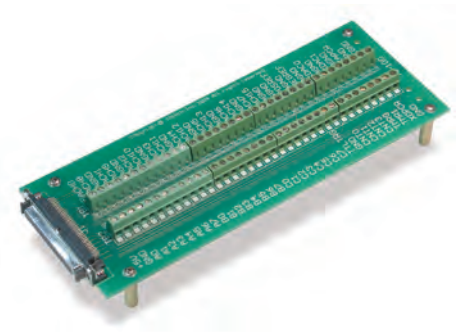
Synchronous External Clock. A user-supplied external input clock can pace both the D/A and the analog input.

Digital Inputs and Outputs

Twenty-four TTL-level digital I/O lines are included in the DaqBoard/1000 Series. They are divided into three 8-bit ports. Ports can be programmed in 8-bit groups as either input or output. 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.

Counter Inputs

Four 16-bit counters are built into the DaqBoard/1000, 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 four 16-bit counters can also be cascaded into two 32-bit counters, allowing over four-billion counts to be accumulated. As with all other inputs to the DaqBoard/1000 Series, the counter inputs can be read asynchronously under program control, or synchronously as part of an analog and digital scan group. Counter inputs can be configured for pulse count or totalize mode.



The TB-100, termination board with screw terminals, provides access to all DaqBoard/1000 Series I/O. The TB-100 can be panel mounted or 19" rack mounted using optional Rack3.

Timer Outputs

Two 16-bit timer outputs are built into the DaqBoard/1000, 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/1000 can be replicated with up to four DaqBoard/1000s installed in the same PC. The serial number on each DaqBoard/1000 is used to differentiate one from another, and a user-selected name can be assigned to each board for easy program documentation. When multiple boards are installed, all boards can be operated synchronously.

The DaqBoard/1000 Series provides all I/O signals on one 68-pin connector. The TB-100 adapter option makes it easy for the user to attach signals to the DaqBoard/1000 Series boards.

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DaqBoard/1000 Series
Specifications

MEASUREMENT COMPUTING

Specifications

General (all boards)

Power Consumption (per board): 3.5W
Operating Temperature: 0 to +60 ˚C
PCI Bus: PCI r2.2 compliant, universal 3.3V/5V signaling support, compatible with PCI-X
Vibration: MIL STD 810E
Signal I/O Connector: 68-pin SCSI type III 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")

Analog Inputs

Channels: 16 single-ended or 8 differential, programmable on a per-channel basis as single-ended or differential bipolar
Bandwidth: 500 kHz
Settling Time: 5 µs to 1 LSB for full-scale step
Maximum Input Voltage: ±11V relative to analog common
Over-Voltage Protection: ±35V
Ranges: Software or sequencer selectable on a per-channel basis

Voltage Range*	Accuracy** One Year, 0-35℃ (% reading+% range)
	Absolute
-10 to +10V	0.015 + 0.005
-5 to +5V	0.015 + 0.005
-2.5 to +2.5V	0.015 + 0.005
-1.25 to +1.25V	0.015 + 0.005
-0.625 to +0.625V	0.015 + 0.008
-0.3125 to +0.3125V	0.015 + 0.008
-0.156 to +0.156V	0.02 + 0.008

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

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

Input Sequencer

Analog, digital, and counter 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.
Scan Clock Sources: 2
1. Internal, programmable from 5 µs to 5.96 hours in 1 µs steps
2. External, TTL level input up to 200 kHz max

Programmable Parameters per Scan: Channel (random order), gain
Depth: 512 location
On-Board Channel-to-Channel Scan Rate: 5 or 10 µs 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: 5, individually selectable for starting and stopping an acquisition. Stop acquisition can occur on a different trigger source other than start acquisition, and can be triggered via modes 1, 3, 4, or 5. Pre-trigger is supported with fixed or variable pre-trigger periods.
1. Single-Channel Analog Software Trigger
   Latency: One scan period max
2. Single-Channel Digital Trigger
   Latency: 5 µs max
3. Digital Pattern Triggering
   Latency: One Scan period, max
4. Counter/Totalizer Triggering
   Latency: One scan period, max
5. Software Triggering
   Trigger can be initiated under program control

Analog Outputs (/1000 only)

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 be updated asynchronously, independent of any other scanning in the system. Bus Mastering DMA provides CPU and system-independent data transfers, ensuring accurate outputs independent of other system activities. Streaming from disk or memory is supported, allowing continuous waveform outputs (limited only by available PC system resources).
Channels: 2
Resolution: 16 bits
Output Voltage Range: ±10V
Offset Error: ±0.0045V max
Gain Error: ±0.01%
Digital Feedthru: 50 mV when updated
Clock Sources: 4, programmable
1. Onboard D/A clock, independent of scanning input clock
2. Onboard scanning input clock
3. External D/A input clock, independent of external scanning input clock
4. External scanning input clock

Digital I/O

Channels: 24
Input Scanning Modes: 2, programmable
1. Asynchronous, under program control at anytime
2. Synchronous with input scanning

Ports: 3 x 8-bit (82C55 emulation). Each port is software programmable as input or output
Input Characteristics: 100 Ohm series, 20 pF to common
I/O Levels: TTL
Sampling/Update Rate: 200 kHz max
Output Characteristics: Output 12 mA per pin, 200 mA total continuous (per bank of 24 outputs)

Counter

Counter inputs can be scanned synchronously along with analog and digital scanned inputs, based either on internal programmable timer, or an external clock source. Counter can also be read asynchronously.
Channels: 4 x 16-bit; cascadable as 2 x 32-bit
Frequency Measurement Rate: 10 MHz max
Trigger Level: TTL

Frequency/Pulse Generators

Channels: 2 x 16-bit
Output: 1 MHz base rate divided by 1 to 65,535 (programmable)

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DaqBoard/1000 Series

Specifications & Ordering Information

Ordering Information

Description	Part No.
16-bit, 200 kHz data acquisition board for PCI-bus PCs with 16 analog inputs, two 16-bit, 100 kHz analog outputs, 24 digital I/O, four 16-bit counter-timers, and two 16-bit frequency/pulse generators; includes DaqView and DaqCal software; comprehensive drivers for DASYLab®, NI LabVIEW®, Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET	DaqBoard/1000
Same as DaqBoard/1000 but with no analog outputs	DaqBoard/1005

Accessories & Cables

BNC termination module with 16 BNC connectors and internal screw-terminal connections; connects via a CA-G55, CA-G56, or CA-G56-6 cable	DBK215
Termination board with screw terminals for access to all DaqBoard/1000 Series I/O; connects via CA-G56 cable	TB-100
Rack-mount kit for TB-100	Rack3
68-conductor ribbon expansion cable, mates with the DaqBoard/1000 Series boards and the TB-100, 3 ft.	CA-G55
68-conductor shielded expansion cable, mates with the DaqBoard/1000 Series boards and the TB-100, 3 ft.	CA-G56
68-conductor shielded expansion cable, mates with the DaqBoard/1000 Series boards and the TB-100, 6 ft.	CA-G56-6

Software

Description	Part No.
Icon-based data acquisition, graphics, control, and analysis software	DASYLab



The DBK215 provides 16 BNC connectors plus internal screw-terminal connections



CA-G56, 68-conductor shielded expansion cable

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