

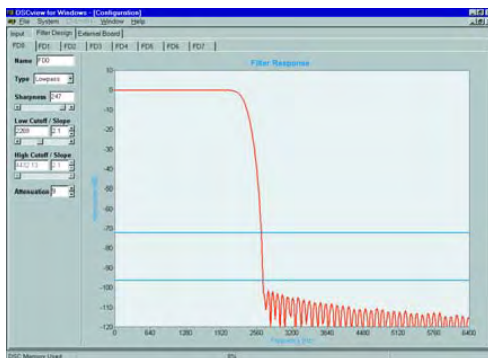
Anti-Aliasing: iDSC 1816

- 16-bit data acquisition
- 8 simultaneous inputs
- Multiple sampling rates
- Industry-standard software

ONBOARD FILTERS

- Linear phase response
- Guaranteed anti-aliasing
- User-specified filters
- Channel-by-channel cutoffs

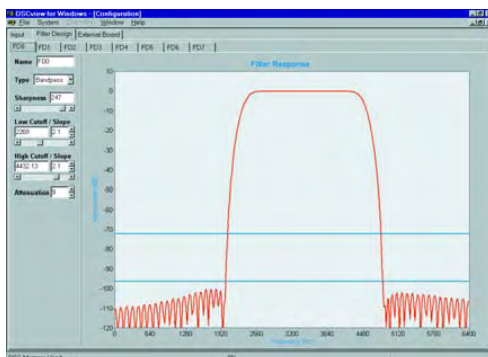
1.2M SAMPLES PER SECOND



Onscreen sliders let you customize the filter on each channel. DSCview displays the characteristic curve in real time: like this one of a typical lowpass filter.

The iDSC 1816 comes with DSCview included – see screen images on the left. It also includes software tools that let you access these and other DSCview functions from your choice of user interface: from DASYLab, LabVIEW, or VEE; or from one you build yourself in any Windows application or language that supports DLL calls.

With DSCview software on your PC, you can customize the filter characteristics channel by channel and transmit them to one or more iDSC 1816 boards. Download DSCview from our Web site and check out the multiple-board feature along with the filter-design interface.



A typical bandpass filter as displayed in DSCview

Microstar Laboratories provides other software¹ that integrates with your choice of user interface to allow you to supervise multiple iDSC boards from elsewhere on a network. In particular, you can control high-speed disk logging of filtered data – on a separate configuration optimized for the purpose – free from network delays and at a rate unaffected by random events on your own PC.

¹ DAPcell Software – a Windows service

iDSC 1816 Specifications

Anti-Aliasing Filter Board for the PCI bus

96 dB
per
Quarter-Octave
16-bit resolution

High-Speed Input

The iDSC 1816 provides continuous, gap-free input, and allows a different cutoff frequency on each channel.

Software-Selectable Acquisition Front End

Menu choices configure which physical inputs to sample. The iDSC 1816 provides up to 8 simultaneous inputs each with its own separate software-selected filter.

INPUT	
Analog inputs	8
Ranges (volts)	±5, ±10
Samples (x 1000) per second per ADC	153.6
A/D Converters	8
A/D Resolution (bits)	16
A/D Converter type	Sigma-delta
Gain	1
Timer inputs	
TTL	2
DSP	
Onboard DSP chips	2 @ 100 MHz
MICROPROCESSOR	
486 Processor	DX4
Clock speed (MHz)	96
Onboard operating system	32-bit
RAM (Mbytes)	16
PC INTERFACE	
Interface type	PCI
Samples (x 1000) transferred/second*	1229
Five boards synchronized*	6144
Samples (x 1000) logged/second*	1229
Five boards synchronized*	6144

* Continuous maximum disk logging and data transfer rates vary with PC platform.

Data Acquisition, Spectral Analysis, and Aliasing

Data acquisition digitizes an analog signal by sampling it at discrete times, several times in each cycle, to produce a stream of numbers. Spectral analysis does the math on these numbers, mostly using the fast Fourier transform, that breaks out the frequency components of the signal. And **aliasing** — high-frequency results folded into otherwise accurate data — **corrupts the results**.

The iDSC 1816 board takes out all aliasing from data acquisition. Guaranteed. Using the latest **analog** and **digital** components and proprietary algorithms, it implements onboard brick-wall filters. And that **makes spectral analysis reliable**.

The filters in the iDSC 1816 have variable cutoff frequencies — up to 61.44 kHz — and linear phase response. Each channel can have a different filter. And the board **requires no programming**.

Synchronizing Several Boards

Onboard circuitry and special synchronization connectors can support several Microstar Laboratories boards, in any combination of iDSC and DAP models, running in the same PC. A software-selectable master iDSC provides a sampling clock to software-selectable slave iDSC boards. A master DAP provides a sampling or an update clock to software-selectable slave DAPs.

The iDSC sampling clock signal, when applied to the external clock input of the master DAP, synchronizes both groups of boards. Each DAP then may sample up to 153.6k samples per second. Microstar Laboratories also provides for synchronization of boards installed in different PCs.

Sampling Rate

Onboard analog filters pass signals to eight Sigma-Delta A/D converters that each run at 9.83M samples per second. This high rate allows digital filtering and decimation to eliminate any aliases below the stopband of the analog filters, and the hardware design delivers simultaneous streams of filtered data at 153.6k samples per second on each channel. Two additional TTL inputs provide clock/timer signals the application can access. The iDSC 1816 synchronizes the data streams with any signals on these channels. Configurable symmetric FIR filters implemented on two DSP chips allow any of these sampling rates:

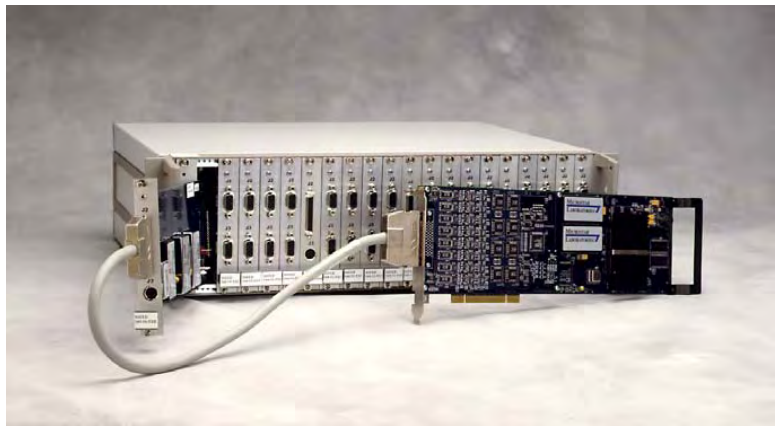
			153600
102400			76800
51200			38400
25600		19200	15360
12800	10240	9600	7680
6400	5120	4800	3840
3200	3072	2560	2048
1600	1536	1280	1204
800	768	640	602
400	384	320	301
200	192	160	150
100	96	80	75
50	48	40	37
25	24	20	18
	12	10	8

Cutoff Frequency

Valid cutoff frequencies fall in the range 2% to 80% of Nyquist; in other words: 100 to 2.5 samples per cycle. So cutoff frequencies range from 61.44 kHz on down. Above 50% of Nyquist, resulting filters roll off at better than 96 dB per quarter-octave.

Microstar Laboratories, Inc., claims Microstar Laboratories, Data Acquisition Processor, DAP, iDSC 1816, DSCview, DAPL, and Channel List Clocking as trademarks. Other product names may be trademarks or registered trademarks of their respective companies.

SCS Signal-Conditioning System for the iDSC 1816



SCS-32 package with iDSC 1816 – 32 channels of conditioned anti-aliased data

Optimize Signal Quality from Any Sensor

The SCS Sensor Signal-Conditioning System complements the iDSC 1816 anti-aliasing board to provide a continuous path in a single package: starting with raw measurements at the sensor and ending with conditioned anti-aliased data logged to disk on a PC.

An SCS package provides direct connection to sensors, and offers many signal-conditioning services in a single convenient, powerful package. These include

- current sensor excitation: 4 mA at up to 28 Volts
- voltage sensor excitation: 1, 2, 5, and 10 Volts at up to 70 mA
- quarter-, half-, and full-bridge resistor networks
- 120 and 350 ohm resistors as standard options
- any value resistor networks, sensor by sensor
- 10 full-scale options: 10 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, and 1, 2, 5, and 10 Volts
- programmable gain with auto-calibration
- programmable AC/DC coupling for ICP sensors
- two high-resolution acquisition-synchronized timing channels per iDSC 1816

A basic SCS, part number SCS-08, offers 8 channels of conditioned data, matching the 8 acquisition channels provided on each iDSC 1816 board. (Every iDSC 1816 also includes two high-resolution acquisition-synchronized timing inputs, running at 128 times the maximum acquisition rate.) An SCS-08 package consists of an industrial enclosure and one MSSC-8 signal-conditioning module. A single enclosure is sufficient for 8, 16, 24, or 32 channels, so SCS packages are available in each of those options. The SCS-32 package can be a part of an even larger system, for higher channel counts.

Each SCS-08 package requires an MSCBL 048-01 cable to send conditioned signals to an iDSC 1816 anti-aliasing data acquisition board in a PC. It includes a cable to carry power from the PC.

Scalable for High-Channel-Count Applications

An MSCBL 048 cable connects the SCS package to an 8-channel iDSC 1816 data acquisition board that has built-in anti-aliasing filters. This combination scales up in two dimensions. First, a single PC may contain up to four iDSC 1816 boards—each connected to an MSSC-8—for a total of 32 channels of conditioned anti-aliased data acquired at the maximum rate of 153.6k samples per second per channel.¹ Second, DAPcell network software, with at-the-server disk logging, supports multiple instances of these 32-channel modules controlled from a single DAPcell client.

The SCS brings with it the potential for hundreds of channels of simultaneously-sampled, conditioned, anti-aliased data logged to disk at up to 153.6k samples per second per channel.

A single PC can support up to fourteen iDSC 1816 boards. At these high channel counts, signal-conditioning power requirements likely will exceed 12-volt power normally available from the PC. In any case where this may happen, Microstar Laboratories can make special arrangements to boost the power provided by the PC.

Commercially available off-the-shelf PCs and associated disk controllers and drives have enough electrical power and enough computing power to form a balanced total system with four iDSC 1816 boards and an SCS-32. A total system like this can continuously log to disk all 32 channels of conditioned anti-aliased data at the full data acquisition rate of 153.6k samples per second—an overall rate of just under 5 million samples per second.

An MSXB 045 board in each of two or more networked PCs, that each contain one or more iDSC 1816 boards, allows the whole networked system to work as a single synchronized system with possibly hundreds of conditioned channels.

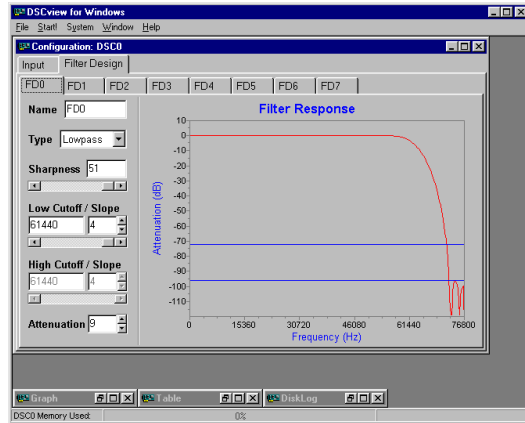
¹ A single PC may contain more than four iDSC 1816 boards, but then may not log to disk at the full data acquisition rate. Four MSSC-8 modules exactly fit in a single full-size industrial enclosure.

DSCview

Windows

Linux

During the design process, the right mouse button provides additional functions: crosshair track (numeric readout); Y-display (scale options); default response (for a given sample rate); copy design (to clipboard); paste design (from clipboard).



Filter Design Screen

DSCview, a complete Windows or Linux application, allows immediate and easy access to the iDSC 1816. DSCview requires no programming, and provides a graphical interface to

- design and configure filters
- save and load workspaces
- select system options
- perform signal conditioning
- configure multiple iDSC boards
- output data in graphs and tables
- disk log data to a text or binary file
- server disk log data to a binary file

Microstar Laboratories includes appropriate software functions from DSCview to support other interfaces: DASYLab, VEE, LabVIEW, LabWindows/CVI, and MATLAB. We also include the same user functionality for Visual Basic, Visual C++, and other Windows programming environments through DSCIO.DLL.

DSCIO.DLL provides a link between these programming environments and the iDSC board. It lets users easily program custom interfaces in any environment they choose. If you prefer, use the Delphi and C++ Builder development environments through a native DSC Component, and program your own user interfaces. All user interfaces share a common look and feel for designing and configuring filters.

iDSC Filters

Selecting the Filter Design tab in the DSCview Configuration Window activates the Filter Design Screen. This screen provides for up to eight unique filter designs: one for each channel, if required. Selecting one of eight tabs in the Filter Design Screen puts the specifications for that filter on top, and allows choices for

- filter ID
- filter type
- sharpness
- low cutoff frequency
- low cutoff slope
- high cutoff frequency
- high cutoff slope
- attenuation

Selecting the Input tab in the DSCview Configuration Window activates the Input Screen. This screen allows choices for

- sample rate
- input range
- filter ID (for each channel)
- enable/disable (each channel)



Displayed properties include transition band cutoff frequencies for each channel, and group delay.

Input Screen

Multiple Boards

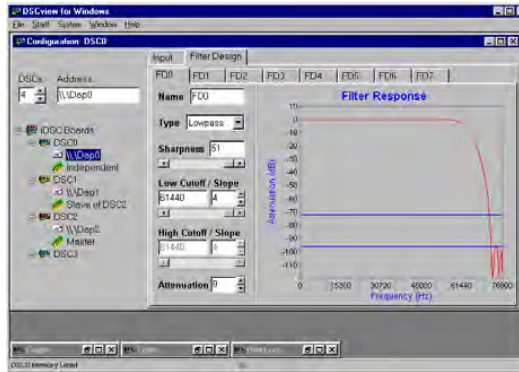
From the DSCview menu, System|Board Setup Display|Group Interface activates multiple board support and provides choices for

- DSCs – the number of iDSC boards in the system
- address – the unique address of a board
- mode – independent, slave, or master

Signal Conditioning

The External Board tab (see Group Interfacer Screen caption) activates signal conditioning. This allows choices for

- input type – DC coupling, AC coupling, or Excitation
- input range – ± 10 mV, ± 20 mV, ± 50 mV, ± 100 mV, ± 200 mV, ± 500 mV, ± 1 V, ± 2 V, ± 5 V, or ± 10 V
- input offset – range depends on input range
- output excitation – 0 V, 1 V, 2 V, 5 V, or 10 V



Group Interface Screen

The right mouse button provides additional functions: external board enable (for signal conditioning, see below); external board calibrate (if enabled); raw data select (cut out filter); remote disk log; copy configuration (to clipboard); paste configuration (from clipboard).

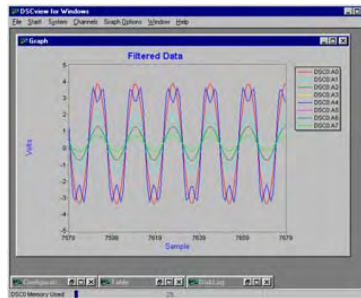


External Board Screen

Displayed properties include the input offset range for each channel: ± 0.5 V, ± 1.0 V, ± 2.5 V, or ± 5.0 V (supported range dependent on input range).

Output Data Screens

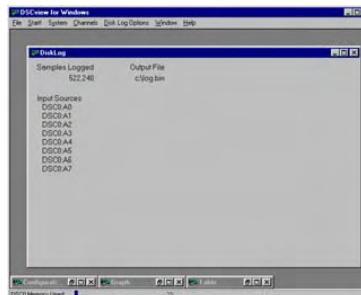
There are four types of output data screens: graph, table, disk log, and server disk log. The user may have any number of graph, table and disk log screens. However, there is only one server disk log screen and it emerges automatically if server disk logging is enabled.



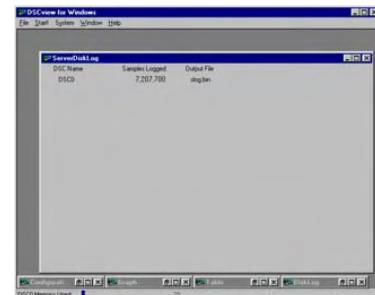
Graph Screen



Table Screen



Disk Log Screen



Server Disk Log Screen