

The Intelligent Solution For Data Acquisition



Onboard Intelligence

Signal Interfaces

Anti-Aliasing

System Integration



**MICROSTAR
LABORATORIES™**

DAP 840/103

DAP 4000a/112

DAP 4000a/212

DAP 5000a/526

DAP 5016a/527

DAP 5200a/626

DAP 5216a/627

DAP 5380a/526

DAP 5400a/627

iDSC 1816

INPUT

| | | | | | | | | | | |
|----------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------|----------------------|-------------------|
| Analog inputs | 8 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 8 |
| Expandable to | n/a | n/a | 512 | 512 | 512 | 512 | 512 | 512 | 512 | n/a [~] |
| Ranges ¹ | abcd | abcd | abcd | cd [†] | cd [†] | abcd | cd [†] | cd | cd | cd |
| Samples (x1000) per second | 800 ^{††} | 800 ^{††} | 800 ^{††} | 800 ^{††} | 500 ^{††} | 800 ^{††} | 500 ^{††} | 5000 ^{††} | 10000 ^{††} | 1229 [~] |
| A/D converters/resolution (bits) | 1/14 | 1/14 | 1/14 | 1/14 | 1/16 | 1/14 | 1/16 | 8/14 | 8/14 | 8/16 |
| Time interval (microseconds) | 1.25 | 1.25 | 1.25 | 1.25 | 2.00 | 1.25 | 2.00 | 1.24 ^{†††} | 0.50 ^{††††} | n/a |
| Time increment (nanoseconds) | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 20 | 20 | n/a |
| Maximum programmable gain* | 500 | 500 | 500 | 40 | 40 | 500 | 40 | 1 | 1 | 1 |
| Digital inputs (synchronous) | 8 | 16 | 16 | 16 | 16 | 16 | 16 | n/a | n/a | n/a |
| Expandable to | n/a | n/a | 128 | 128 | 128 | 128 | 128 | n/a | n/a | n/a |
| Samples (x1000) per second | 800 | 800 | 800 | 1666 | 1666 | 1666 | 2000 | n/a | n/a | n/a |
| Time interval (microseconds) | 1.25 | 1.25 | 1.25 | 0.6 | 0.6 | 0.6 | 0.5 | n/a | n/a | n/a |

OUTPUT

| | | | | | | | | | | |
|---|-------|-------|-------|------|------|-------|------|-----|-----|-----|
| Analog outputs | 2 | 2 | 2 | 2 | 2 | 2 | 2 | n/a | n/a | n/a |
| Expandable to | n/a | 66 | 66 | 66 | 66 | 66 | 66 | n/a | n/a | n/a |
| Ranges ¹ | abcde | abcde | abcde | cd | cd | abcde | cd | n/a | n/a | n/a |
| Updates (x1000) per second per onboard channel | 400 | 400 | 400 | 833 | 833 | 833 | 1000 | n/a | n/a | n/a |
| Time interval (microseconds) | 2.5 | 2.5 | 2.5 | 1.2 | 1.2 | 1.2 | 1.0 | n/a | n/a | n/a |
| DAC Resolution (bits) | 12 | 12 | 12 | 12 | 16 | 12 | 16 | n/a | n/a | n/a |
| Digital outputs | 8 | 16 | 16 | 16 | 16 | 16 | 16 | n/a | n/a | n/a |
| Expandable to | n/a | 1024 | 1024 | 1024 | 1024 | 1024 | 1024 | n/a | n/a | n/a |
| Updates (x1000) per second | 800 | 800 | 800 | 1666 | 1666 | 1666 | 2000 | n/a | n/a | n/a |
| Time interval (microseconds) | 1.25 | 1.25 | 1.25 | 0.6 | 0.6 | 0.6 | 0.5 | n/a | n/a | n/a |

MICROPROCESSOR

| | | | | | | | | | | |
|------------------------|-----|-----|-----|-----|-----|---------|---------|-----|---------|----------|
| Processor ² | SXL | SXL | SXL | P | P | K6 III+ | K6 III+ | P | K6 III+ | DX4 |
| Clock speed (MHz) | 50 | 50 | 50 | 233 | 233 | 400 | 400 | 233 | 400 | 96 |
| Onboard OS - DAPL2000 | yes | yes | yes | yes | yes | yes | yes | yes | yes | modified |
| RAM (Mbytes) | 8 | 8 | 8 | 32 | 32 | 32 | 32 | 128 | 128 | 16 |

PC INTERFACE

| | | | | | | | | | | |
|------------------------------------|-----|-----|-----|------|------|------|------|------|------|------|
| Interface type | PCI | PCI | PCI | PCI | PCI | PCI | PCI | PCI | PCI | PCI |
| Samples (x1000) transferred/sec.** | 800 | 800 | 800 | 1666 | 1666 | 1666 | 2000 | 3200 | 5000 | 1229 |
| Samples (x1000) logged/second** | 800 | 800 | 800 | 1666 | 1666 | 1666 | 2000 | 3200 | 5000 | 1229 |

Notes for DAP Boards

[†] Ranges of +/-1.25 volts and +/-2.5 volts available using gain 4.

^{††} To maintain full 14-bit resolution (16-bit resolution for DAP 5016a and DAP 5216a) may require a lower sample rate when sampling more than one channel per ADC.

^{†††} Minimum time interval in four-channel mode, with a maximum per-channel rate of 800k samples per second and an aggregate rate of 3.2M s/s. When sampling in eight-channel mode – maximum aggregate rate 5M s/s – the minimum time interval is 1.60 microseconds.

^{††††} Minimum time interval in four-channel mode, with a maximum per-channel rate of 2M samples per second and an aggregate rate of 8M s/s. When sampling in eight- or sixteen-channel mode – maximum aggregate rate 10M s/s – the minimum time interval is .80 microseconds.

Notes for iDSC 1816 Board

[~] It is possible to synchronize multiple iDSC boards in one application: 256 or more analog inputs.

[~] Maximum aggregate rate over 8 channels. Maximum analog sampling rate per channel is 153.6k samples/second.

Notes for DAP Boards and iDSC Board

* Top sampling speeds are at gain=1.

The DAP 5000a, DAP 5016a, DAP 5380a, and DAP 5216a/627 have gains of 1, 4, 10, and 40.

The DAP 840, DAP 4000a, and DAP 5200a have gains of 1, 10, 100, and 500.

The iDSC 1816, DAP 5380a, and DAP 5400a have a gain of 1.

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

| Symbol | Range (volts) |
|--------|-----------------------------------|
| a | 0 to +5 |
| b | -2.5 to +2.5 |
| c | -5 to +5 (default calibration) |
| d | -10 to +10 |
| e | 0 to +10 |

| Symbol | Processor |
|---------|---------------|
| SXL | 486SXL2 |
| DX4 | i486DX4 |
| P | Intel Pentium |
| K6 III+ | AMD K6 III+ |

Microstar Laboratories makes Data Acquisition Processor (DAP) boards for PC systems. A unique¹ product feature – onboard intelligence – may make all the difference in the world to you and your application. That and anti-aliasing. And we provide you with easy expansion and whatever application engineering help you need.

Onboard Intelligence

under Windows or Linux

Every DAP board we make has an onboard processor that runs

DAPL, a real-time operating system optimized for data acquisition and control applications. You normally control DAPL through Windows², using DAPstudio or other PC software, either locally or over a network. Every standard DAP model in current production also will run under Linux. DAPL makes it easy for you to configure a DAP board for high-performance applications under Windows or Linux. It includes over 100 easy-to-use commands optimized for data acquisition and control. A complete application can require as few as six or seven of them.

Continued on last page...

Channel Architecture

connecting the DAP board to the world

Even if your system starts with only a few

channels, you can expand it at any time. DAPL takes care of the details, so your PC software addresses nothing more complicated than a higher logical channel count. DAPL also supports multiple DAPs on one PC, and enables DAPcell software servers to support multiple PCs in a single synchronized data acquisition system. And a channel architecture based on Eurocards – plug-in hardware that mounts in industry-standard 19" racks – provides expansion, termination, and other functions that greatly extend the reach of even a single DAP. See page 2.

Anti-Aliasing

something to take care of

Whenever you digitize real-world frequencies higher than half the sam-

pling rate, you corrupt your data with lower frequency aliases. And by that stage you can do nothing – nothing at all – to correct the problem. So unless you know for sure that the signal you measure contains none of these higher frequencies at energy levels that your sensors can detect, you have to deal with the issue up front. Microstar Laboratories provides two solutions to this problem: a specialized DAP and, for other DAPs, a Eurocard-format expansion board.³ See page 4.

System Integration

extensive application engineering support

The good news: you can stop reading and call us.

With more than twenty-five years of providing application engineering support, we know how to help you specify a system that performs as required. So stop reading right here if you like, give us a call, and tell us what you want to do. Use our toll-free line: 1-888-MSTARLABS (678-2752). In countries served by our distributors, call the numbers on the back cover. For more on System Integration, see page 6.

^{1,2,3} See Notes inside back cover.

Choose a DAP

for scanning for trigger events in real time and for significant real-time processing:

DAP 5200a.....8

as above, and with 16-bit resolution:

DAP 5216a.....8

for high-speed simultaneous sampling with stringent timing requirements and many signal channels:

DAP 5400a.....10

as above, with less processing power, lower speeds, and as many signal channels:

DAP 5380a.....10

for equivalent sampling speeds and channel configurations to the DAP 5200a, and with less real-time processing power:

DAP 5000a.....12

as above, and with 16-bit resolution:

DAP 5016a.....12

for light-to-moderate real-time processing and with, as an option, the same expansion potential as more powerful DAP boards:

DAP 4000a.....14

for a data acquisition or control application with few data channels and light real-time processing:

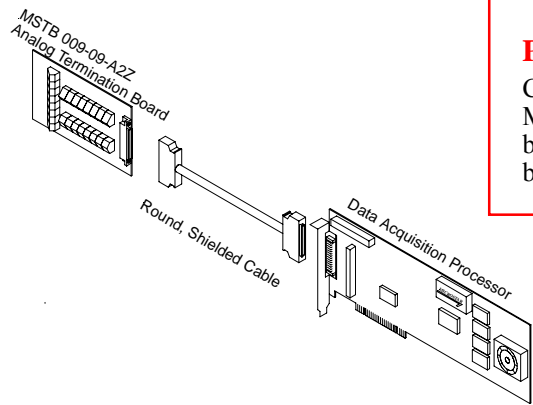
DAP 840.....16

**FREE
MANUALS**

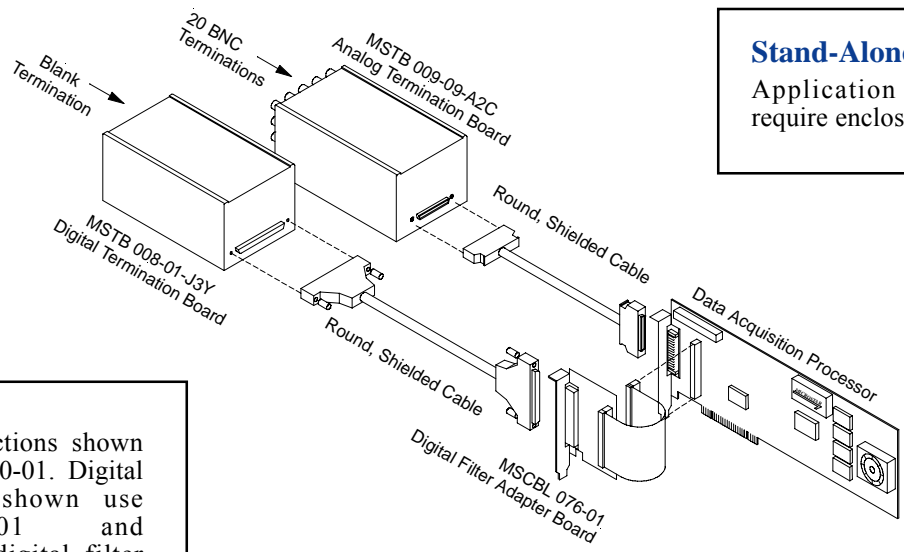
You can download the contents of the DAPtools Basic CD at no charge. We include this CD with every DAP board we ship. It contains all our user manuals for all our software and hardware products in Windows Help format as well as in PDF format. You can go to our Web site now and download these manuals and everything else that we include on the CD – DAPstudio, for instance. (See pages 6 and 7.)

Channel Architecture


Putting It All Together
 Create systems like these with Microstar Laboratories DAP boards, 3U Eurocard-format boards, and optional enclosures.

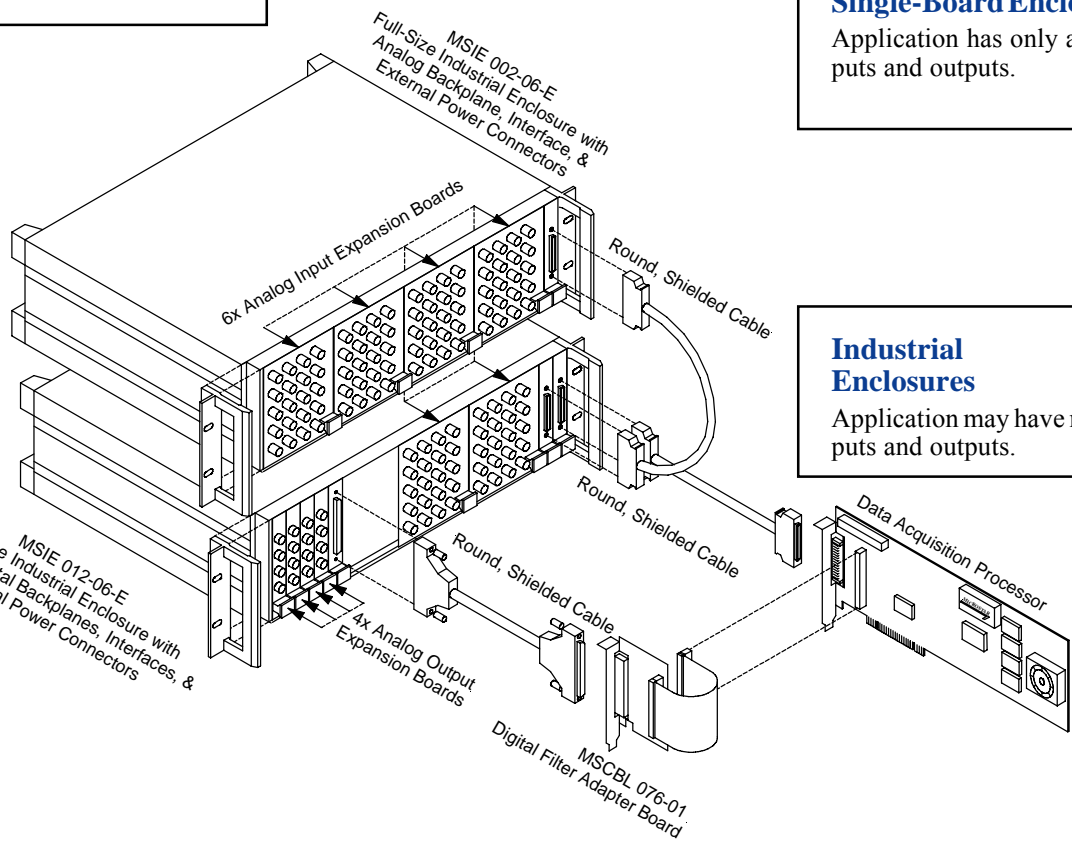



Stand-Alone Board
 Application does not require enclosed hardware.



Cables
 Analog connections shown use MSCBL 040-01. Digital connections shown use MSCBL 054-01 and MSCBL 076 digital filter adapter board.

Single-Board Enclosures
 Application has only a few inputs and outputs. 



Industrial Enclosures
 Application may have many inputs and outputs. 

Several DAP boards – in any combination of model numbers – can work together as a single, synchronized, PC-based system* with, potentially, several thousand analog and digital inputs and outputs. Most PC-based systems, however, have maybe a hundred or so inputs and outputs, and some have only a handful. Whatever the case, the signals have to connect somewhere. The examples on the left illustrate the channel architecture used by Microstar Laboratories: signal connectors on 3U (100mm high) Eurocard B¹ (220mm deep) boards – Eurocards – that often pre-process a signal.

Channel Architecture

All Microstar Laboratories Eurocards – other than DAP-to-backplane interfaces – offer one or more types of termination. Most also multiplex inputs or outputs. Many perform additional functions. On the Microstar Laboratories Web site you can browse the full range, arranged in these eight main function groups:

- simple termination
- simple multiplexing
- anti-alias filtering
- simultaneous sampling
- isolation
- counter/timer
- quadrature-decoder
- signal conditioning

Examples of three of these groups appear in the drawing on the right.

Application Requirements

The need for one or more of the above functions, the number and speed of inputs and outputs, the mix of analog and digital signals, and termination choices – as well as the extent that your application can benefit from onboard processing – determines the DAP board, Microstar Laboratories Eurocards, and enclosure models required. Account Representatives and Application Engineers at Microstar Laboratories know the product range, know how it works in a number of applications, and they welcome the opportunity to talk with you about how it can work in yours.

Industrial Enclosures

Microstar Laboratories Eurocards fit easily into the factory-installed backplanes in industry-standard, full-size, 19-inch rack-mountable enclosures. The installed backplanes come in three variations: full-size analog, full-size digital, or half-size analog and half-size digital. Each backplane has a factory-installed DAP-to-backplane interface board. Full-size backplanes have 20 available slots; half-size backplanes have 9.

Cables

Microstar Laboratories Eurocards connect to a DAP through an enclosure backplane, interface, and cables. An analog backplane connects through its interface and a 68-line round, shielded cable to the DAP analog connector in the PC back panel. A digital backplane connects through its interface and a 100-line round, shielded cable to a digital connector in the PC back panel with integral digital filter board; this occupies the PC slot next to the DAP and connects through a short ribbon cable to its onboard digital connector. The short ribbon cable runs entirely within the PC enclosure, and this shields it.

Drawings

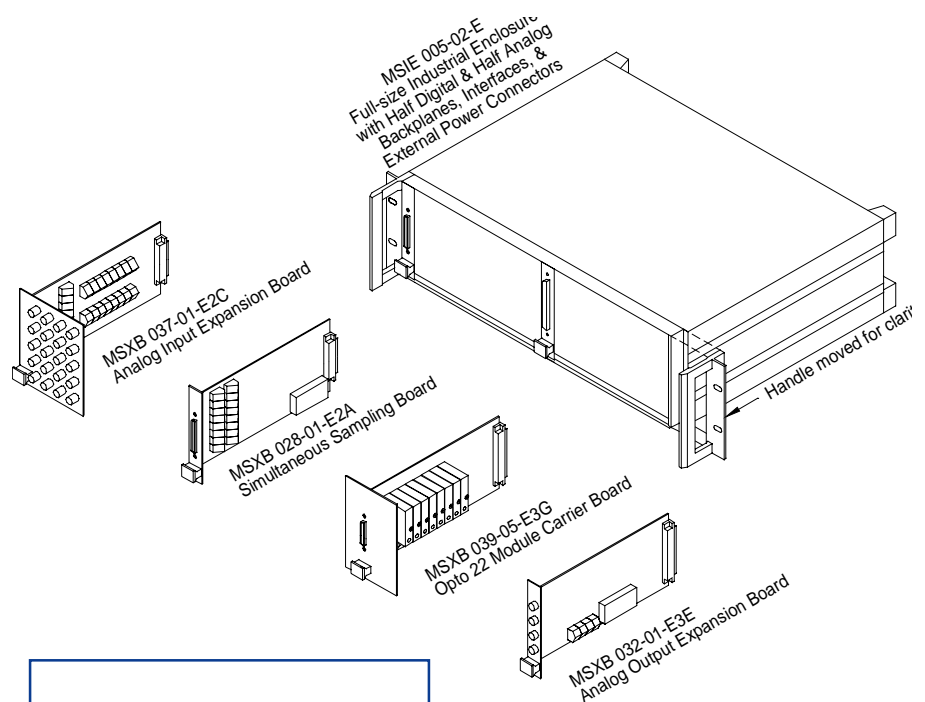
Talk with us about your application. Between us we will arrive at a suitable channel architecture and overall system configuration, illustrated by a 3-D line drawing, like the samples you see on these pages. You will clearly see the products you need and the ways they connect. We do not charge for this service, so go ahead and call us. Toll-free. 1-888-678-2752. Do it now.

Systems Without Industrial Enclosures – Microstar Laboratories Eurocards Without Backplanes

If your DAP system has only a few inputs and outputs, you can buy boards for termination – and for some additional functions – each packaged in its own enclosure: a **single-board** enclosure.

If your DAP system does not require packaging, you can buy **stand-alone** boards.

Industrial Enclosure – Microstar Laboratories Eurocards Removed



*On one PC or on several networked² PCs.

^{1,2} See Notes on last page.

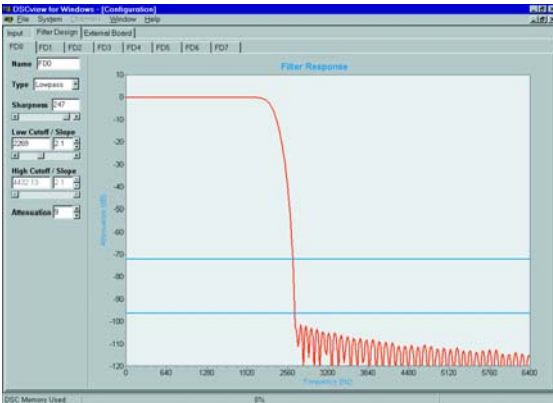
Anti-Aliasing

- 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

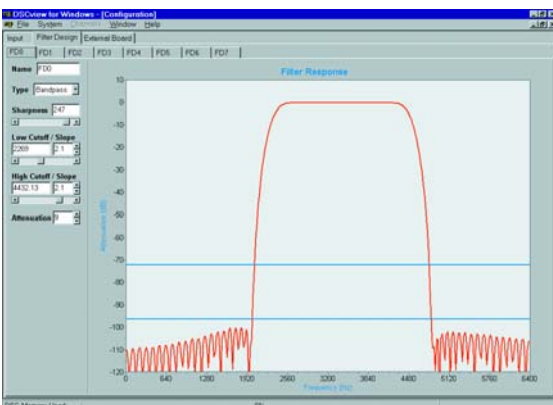
1.2M SAMPLES PER SECOND



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 Agilent 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 download them to one or more iDSC 1816 boards. Download DSCview from our Web site and check out this 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 as above 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 See *Footnotes* on last page.

Digitizing a signal destroys all evidence of any frequencies higher than half the sampling rate. Samples of these higher frequencies map exactly into their lower frequency aliases. You cannot detect any one of the higher frequencies in your sampled data. But you do detect each alias. And this corrupts your results.

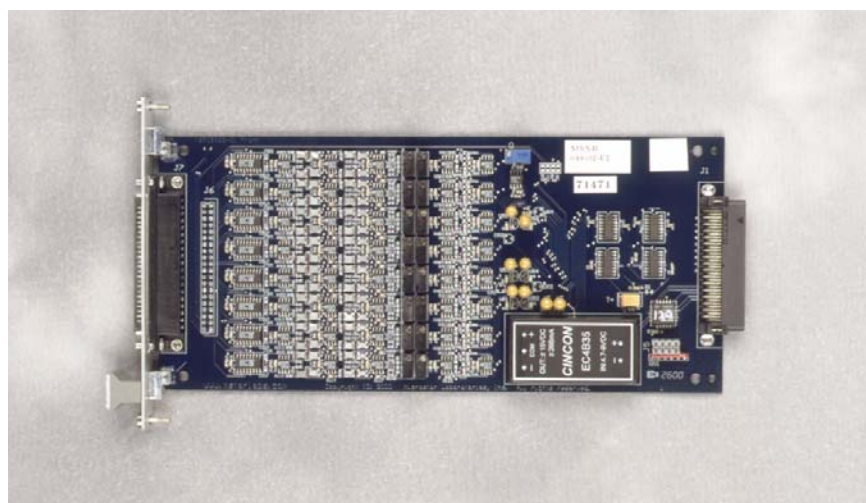
A suitable analog filter, placed between a sensor and any analog-to-digital converter, effectively takes out unwanted higher frequencies. Microstar Laboratories offers two off-the-shelf implementations. The one to choose depends on the application.

MSXB 048

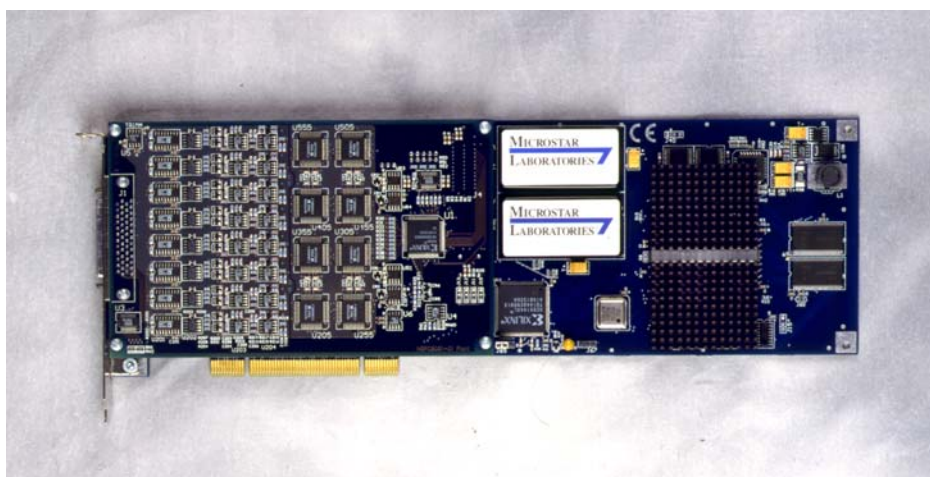
The simpler implementation, using MSXB 048 Filtered Analog Input Expansion Boards in place of MSXB 037 Analog Input Expansion Boards, works with any a-Series DAP. Each of the sixteen input channels on an MSXB 048 board has its own analog filter built in. Three models of the board offer three different cutoff options: 100Hz, 1kHz, and 10kHz.

iDSC 1816

For more advanced filter applications, and those that require higher and variable cutoff frequencies, choose the iDSC 1816: a specialized DAP with onboard analog filters. The iDSC 1816 combines brick-wall anti-aliasing filters on each of 8 simultaneous channels with 16-bit data acquisition all on one board at a throughput of 1.2M samples per second: 153.6k samples per second on each of the 8 channels. It comes with DSCview software and with drivers for other Windows programs.



Onboard analog filters – similar to the analog filters on the iDSC 1816 – block unwanted high frequencies on each channel of the MSXB 048, shown here.



*iDSC 1816: 1.2 million **filtered** samples per second*

- An iDSC 1816 board **optically isolates** its analog section from the PC.
- An iDSC 1816 board supports applications that require simultaneous sampling on up to 8 **simultaneous** inputs.
- An iDSC 1816 board can work with others as a single **synchronized** system.

To turn a good idea into a successful project, someone somewhere has to do some work. We can do all of it. Or we can show you all the tools that we would have used, and you then can use some or all of them to do the whole thing yourself. Or you can decide on something in between. Take a brief look now at the tools described here.

DAPtools Basic

The DAPtools Basic software bundle, included at no charge with every DAP, comprises all the software needed to install a DAP and to develop and run a PC-based data acquisition application. It includes all services required to communicate with DAPL and to take advantage of onboard intelligence. It includes the evaluation version of DAPstudio, described on page 6. It also includes DAPview for Windows, a PC application that provides a user interface without requiring any Windows programming. With DAPtools Basic you can, if you like, construct your own user interface, developing it in any Windows programming language (or application) that can call DLL functions.

DAPtools Basic includes two other PC applications: DAPlog Plus and FGen for Windows. The first of these provides an even simpler interface than DAPview for Windows for the specific tasks of logging to disk and continuously graphing the logged data. Use DAPlog if you need a quick way to do these tasks well. You can check out FGen for Windows for yourself anytime: just download it from our Web site.

FGen for Windows makes it easy to generate digital filters that do exactly what you want them to do. DAPL includes three ready-to-use DSP filtering commands: FIRFILTER, FIRLOWPASS, and RAVERAGE. FGen outputs a vector of coefficients to use as a parameter in the FIRFILTER command. Note that IIR (Infinite Impulse Response) filter commands in the DAPL IFM (IIR Filter Module) described later on this page do not take these coefficients. The filter type defines the characteristics, as modified by only three scalar parameters: order, cutoff, and ripple level.

DAPtools Standard

The DAPtools Standard software bundle adds DAPtools for Agilent VEE, DAPtools for LabVIEW, DAPtools for MATLAB, DAPtools OCX, DAPL IFM, and DAPcell Local Server.

Each of the first three allows you to use the related third-party software – to enhance it, even, with the onboard intelligence of a DAP.

DAPtools OCX lets you develop your own application in Visual Basic, Delphi, or any language that supports OCX.

DAPL IFM – the DAPL IIR Filter Module – contains five additional DAPL filter commands, named for the five classic filter types: Bessel, Butterworth, Chebyshev, Inverse Chebyshev, and Elliptic.

DAPcell Local Server implements communication with DAPL using client/server software architecture. Server software interacts with DAPL running on the DAP board to deliver data acquisition services to client software running on the (local) PC: VEE, LabVIEW, VB, etc. DAPcell also acts as a vehicle for additional services provided by Microstar Laboratories; high-speed disk transfers to and from the DAP, the first of these bundled services, allows 1) continuous logging to disk at the maximum acquisition rate, and 2) output of continuous arbitrary waveforms at the maximum DAC update rate.

DAPtools Professional

The DAPtools Professional software bundle adds even more to the above: it includes the Developer's Toolkit for DAPL, and DAPcell Network Server. A full copy of DAPstudio also comes with the Professional package.

With the Developer's Toolkit for DAPL, an experienced programmer can extend the functionality of DAPL by writing one or more additional commands and then packaging these into a DAPL module. DAPL IFM – in DAPtools Standard – is an example of a DAPL module.

DAPcell Network Server allows you to implement an application across a network, while DAPL on every DAP board protects the application from PC- and network-related delays. DAPcell Network Server software interacts with DAPL running on one or more DAP boards installed in a PC to deliver data acquisition services to client software on that PC or on any PC on the network.

FSCS-128: 128 channels in a filtered signal-conditioning system

Includes

16 iDSC 1816

4 SCS-32 signal conditioning systems providing AC/DC coupling, programmable gain, and DC voltage offset for each channel in the system

2 industrial computer chassis, each holding two completely separate personal computers (4 iDSC per PC)

1 operator console serving as the main user interface PC for software configuration



Microstar Laboratories built and integrated this networked hardware and software system for a customer. DAPcell Network server software delivers data acquisition services to client software: a user interface, written in Visual Basic, that allows the user to supervise and control any DAP board on the network from any PC on the network.

Specifications

DAP 5200a and DAP 5216a

PCI PC Interface

The DAP boards in this catalog each use a PCI slot. They use DMA bus-mastering for high-speed data transfer to the PC.

Industry-Standard Software

The DAPtools Standard software bundle works with these DAPs to allow a choice of industry-standard user-interfaces: LabVIEW, DASYLab, Agilent VEE, or MATLAB – or other Windows applications.

**16k-point FFT at a
sustained rate of 1.4M
samples per second**

Simultaneous High-Speed Input and Output

DAPs can provide continuous gap-free input and output at the same time. Microstar Laboratories software allows users to select independent input and output speeds, and it communicates those settings to the hardware.

Software-Selectable Acquisition Front End

DAPL, the onboard operating system, allows a user to choose between single-ended and differential inputs channel by channel, and to specify or change the gain on any channel.

Intelligent Expansion Control

A DAP board generates its own external expansion control signals without help from the PC. User interface software on the PC refers to any channel simply by number at run-time, with no other distinction. This takes all random loads off the PC – even at maximum channel speeds.

Flexible Output Updating

A DAP board can update both of its onboard analog outputs concurrently. A user may choose between fast-response asynchronous updates and high-speed synchronous updates. Synchronous updates can run continuously, stop after a set number of updates, or send output data in predefined bursts.

Hardware Clocks and Triggers

DAP boards send and receive TTL-compatible clock and trigger signals. Onboard circuitry protects against signals that violate timing requirements. The Microstar Laboratories Channel List Clocking feature – built into every DAP – samples or updates a series of channels on a single external sampling or update clock edge.

Synchronization of Several DAPs

All DAPs have onboard circuitry and DAP-to-DAP connectors for linking DAPs of any mix of models into a synchronized data acquisition system within a single PC. A designated master DAP outputs a synchronizing signal to one or more slave DAPs. In networked systems, a separate network connects the DAPs from different PCs to allow every DAP on the network to form part of a single synchronized data acquisition system.

| INPUT | DAP 5216a/627 | DAP 5200a/626 |
|---|-------------------|----------------------------------|
| Analog inputs (synchronous) | 16 | 16 |
| Expandable to | 512 | 512 |
| Ranges (volts) | ±5, ±10 | 0 to +5, ±2.5, ±5, ±10 |
| Samples (x 1000) per second | 500 ¹ | 800 ² |
| A/D Converters/Resolution (bits) | 1/16 | 1/14 |
| Minimum time interval (microseconds) | 2.0 ¹ | 1.25 ² |
| Time increment (nanoseconds) | 50 | 50 |
| Maximum programmable gain* | 40 | 500 |
| Digital inputs (synchronous) | 16 | 16 |
| Expandable to | 128 | 128 |
| Samples (x 1000) per second | 2000 | 1666 |
| Minimum time interval (microseconds) | 0.5 | 0.6 |
| OUTPUT | DAP 5216a/627 | DAP 5200a/626 |
| Analog outputs | 2 | 2 |
| Expandable to | 66 | 66 |
| Ranges (volts) | ±5, ±10 | 0 to +5, ±2.5, ±5, ±10, 0 to +10 |
| Updates(x1000) per second per onboard channel | 1000 ³ | 833 |
| Minimum time interval (microseconds) | 1.0 ³ | 1.2 |
| Digital outputs | 16 | 16 |
| Expandable to | 1024 | 1024 |
| Updates (x 1000) per second | 2000 | 1666 |
| Minimum time interval (microseconds) | 0.5 | 0.6 |
| MICROPROCESSOR | DAP 5216a/627 | DAP 5200a/626 |
| Processor | AMD K6 III+ | AMD K6 III+ |
| Clock speed (MHz) | 400 | 400 |
| Onboard operating system: DAPL | DAPL 2000 | DAPL 2000 |
| RAM (Mbytes) | 32 | 32 |
| PC INTERFACE | DAP 5216a/627 | DAP 5200a/626 |
| Interface type | PCI | PCI |
| Samples (x 1000) transferred/second** | 2000 | 1666 |
| Samples (x 1000) logged/second** | 2000 | 1666 |

* Top sampling speeds are at gain=1. The DAP 5216a/627 also has gains of 4,10, and 40. The DAP 5200a/626 also has gains of 10, 100, and 500.

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

¹ To maintain full 16-bit resolution may require a lower sample rate when sampling more than one channel.

² To maintain full 14-bit resolution may require a lower sample rate when sampling more than one channel.

³ For full 16-bit resolution, the maximum analog output update rate is 400k samples/second per onboard channel.

The DAP 5200a and DAP 5216a boards excel at applications that require extensive real-time computation: FFTs that keep up with the acquisition rate for instance. Each can perform a 16k-point FFT at a sustained rate of 1.4M samples per second: faster than either board can sample. Note that although most FFT benchmarks test a 1024-point (1k-point) FFT, the one run in this case tested a 16k-point FFT.

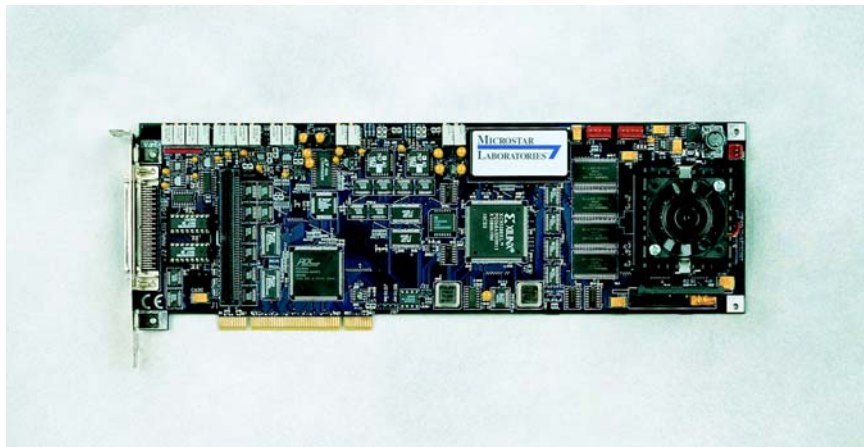
The DAP 5200a samples analog inputs at 800k samples per second with 14-bit resolution on all channels; onboard analog outputs have 12-bit resolution. The DAP 5216a samples analog inputs at 500k samples per second with 16-bit resolution on all channels; onboard analog outputs have 16-bit resolution. Apart from those differences, the models have everything else in common.

Each model

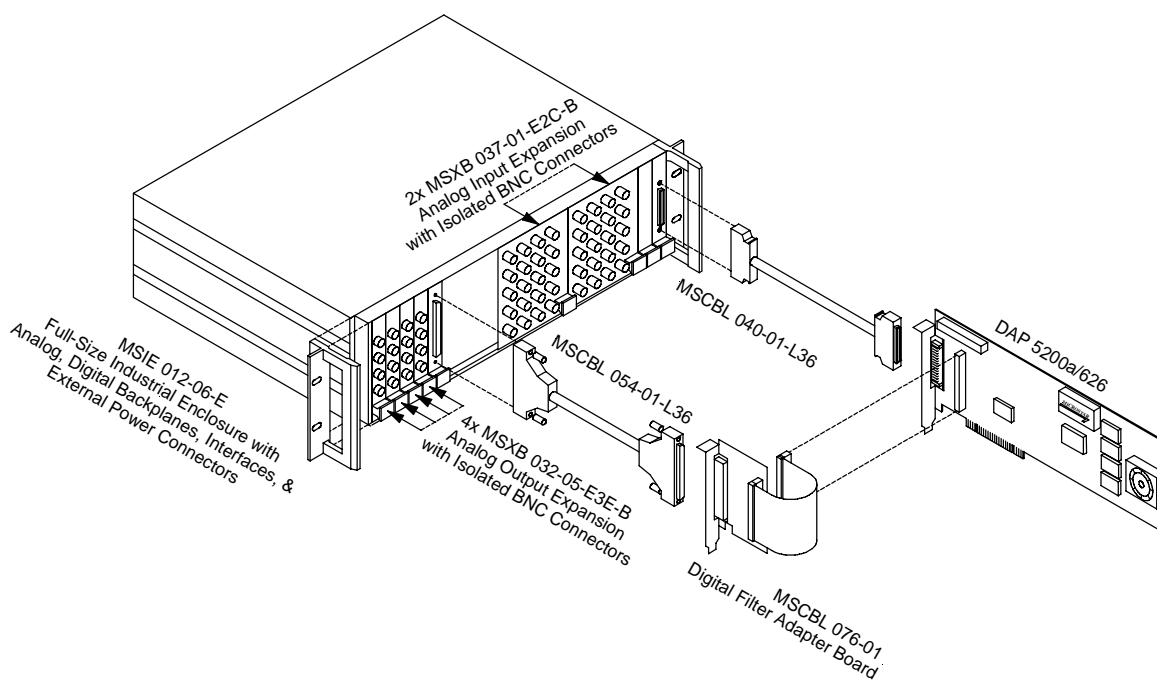
- has an onboard 400 MHz AMD K6-III+ processor
- comes with 32M of DRAM onboard memory
- drops in to replace other a-Series boards
- resolves the sampling period to 50 ns
- offers low latency – 0.1 ms task time quantum – for fast response

A single board of either model can simultaneously control 50 independent processes by PID control loop, or by some other purpose-built algorithm, with a complete cycle time on all 50 loops of under 250 μ s (.25ms). When real time means response in milliseconds, the message-driven, event-polling Windows user interface cannot work in real time. So, in that case, neither can programs running under Windows. For real-time performance from systems with a Windows user interface, work around this limitation by using the onboard intelligence of a DAP directed by associated software from Microstar Laboratories.

The simplest way to implement an application that works in real time under Windows is to build a DAP into your system. So if you want real-time performance, talk to us here at Microstar Laboratories.



The Microstar Laboratories DAP 5200a/626 board performs 16k-point FFTs in real time at up to 1.4M samples per second. It can perform a 1k-point FFT in 614 μ s.



Specifications

DAP 5400a and DAP 5380a

PCI PC Interface

The DAP boards in this catalog each use a PCI slot. They use DMA bus-mastering for high-speed data transfer to the PC.

Industry-Standard Software

The DAPtools Standard software bundle works with these DAP boards to allow a choice of industry-standard user-interfaces: LabVIEW, DASyLab, Agilent VEE, or MATLAB – or other Windows applications.

**Simultaneous sampling
at 2 million samples per
second per channel**

Intelligent Expansion Control

A DAP board generates its own external expansion control signals without help from the PC. User interface software on the PC refers to any channel simply by number at run-time, with no other distinction. This takes all random loads off the PC – even at maximum channel speeds.

Hardware Clocks and Triggers

DAP boards send and receive TTL-compatible clock and trigger signals. Onboard circuitry protects against signals that violate timing requirements. The Microstar Laboratories Channel List Clocking feature – built into every DAP – samples or updates a series of channels on a single external sampling or update clock edge.

Synchronization of Several DAPs

All DAPs have onboard circuitry and DAP-to-DAP connectors for linking DAPs of any mix of models into a synchronized data acquisition system within a single PC. A designated master DAP outputs a synchronizing signal to one or more slave DAPs. In networked systems, a separate network connects the DAPs from different PCs to allow every DAP on the network to form part of a single synchronized data acquisition system.

DAPcell Network Server

DAP-to-DAP synchronization connections between DAPs – independent of PC-to-PC network connections – keep the synchronization free of network-related delays. DAPL, running on each DAP, keeps the critical real-time component of any data acquisition application free of PC- or network-related delays.

DAPcell Network Server software, running on each networked PC, provides data acquisition services from the DAPs on that PC to client software elsewhere on the network. These services include server-side disk logging: high-speed transfer of acquired data from the DAPs on a PC to a disk drive on that PC.

So client software – LabVIEW or any other user interface – can direct as many channels as required of synchronized simultaneous data acquisition from server PCs on the network. Client software can supervise disk-logging on those server PCs at the maximum rate the configurations allow, free from random delays on the client PC or on the network.

| INPUT | DAP 5380a/526 | DAP 5400a/627 |
|---|-------------------|-------------------|
| Analog inputs (synchronous) | 16 | 16 |
| Expandable to | 512 | 512 |
| Ranges (volts) | ±5, ±10 | ±5, ±10 |
| Samples (x 1000) per second per ADC ¹ | 800 ² | 2000 ³ |
| A/D Converters/Resolution (bits) | 8/14 | 8/14 |
| Minimum time interval (microseconds) ¹ | 1.24 ² | 0.50 ³ |
| Time increment (nanoseconds) | 50 | 20 |
| Maximum gain | 1 | 1 |
| MICROPROCESSOR | DAP 5380a/526 | DAP 5400a/627 |
| Processor | Intel Pentium | K6 III+ |
| Clock speed (MHz) | 233 | 400 |
| Onboard operating system: DAPL | DAPL 2000 | DAPL 2000 |
| RAM (Mbytes) | 128 | 128 |
| DSP | DAP 5380a/526 | DAP 5400a/627 |
| Software Implementation | Enhanced | Enhanced |
| PC INTERFACE | DAP 5380a/526 | DAP 5400a/627 |
| Interface type | PCI | PCI |
| Samples (x 1000) transferred/second ⁴ | 3200 | 5000 |
| Samples (x 1000) logged/second ⁴ | 3200 | 5000 |

¹ To maintain full 14-bit resolution on these models may require a lower sample rate (longer time interval).

² 650k samples per second – 1.60 µsec interval – with 8 converters operating simultaneously.

³ 1250k samples per second – 0.80 µsec interval – with 8 converters operating simultaneously.

⁴ Maximum disk logging and data transfer rates vary with PC platform.

Specialized for High-Speed Simultaneous Sampling

The DAP 5400a and DAP 5380a models, optimized for high-speed analog input, work well in simultaneous sampling applications. By grouping a number of these boards into a single synchronized system as described on the right and opposite, you can simultaneously sample high-speed inputs in groups. Each board can sample inputs simultaneously in two groups of eight.

So, for example, thirty-two simultaneous input channels, in four groups, can be spread across four synchronized DAP 5380a boards with an aggregate data acquisition rate of 20 million samples per second. Two groups of thirty-two simultaneous input channels can be spread across four synchronized DAP 5400a boards with an aggregate data acquisition rate of 40 million samples per second.

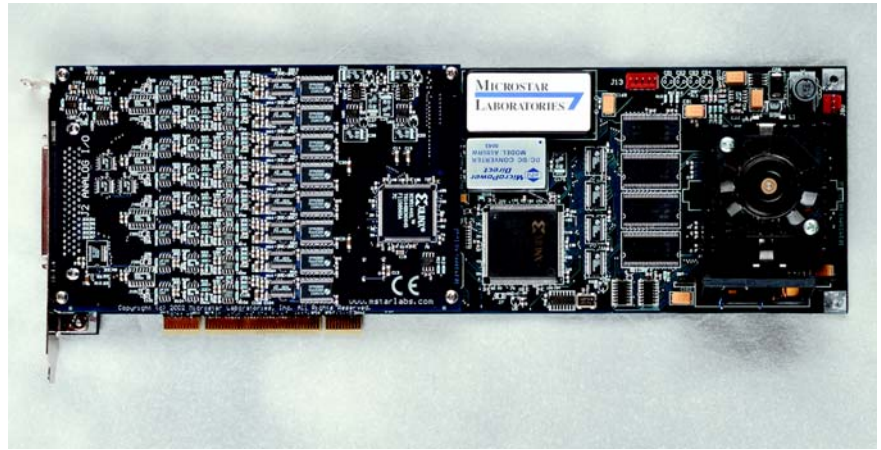
Each of the eight onboard A/D converters on a DAP 5380a/526 can acquire data at 625k samples per second, and each of the eight onboard A/D converters on a DAP 5400a/627 can acquire data simultaneously at 1250k samples per second, so the boards have aggregate data acquisition rates of 5M samples per second and 10M samples per second, respectively.

An onboard clock signal synchronizes the onboard A/D converters so that an application can simultaneously sample high-speed inputs in groups of four, as well as in groups of eight. Thus you can use a DAP 5380a for

- 800k samples per second on each of 4 channels for an aggregate rate of 3.2M samples per second per board
- 625k samples per second on each of 8 channels for an aggregate rate of 5M samples per second per board

Or use a DAP 5400a for

- 2M samples per second on each of 4 channels for an aggregate rate of 8M samples per second per board
- 1.25M samples per second on each of 8 channels for an aggregate rate of 10M samples per second per board

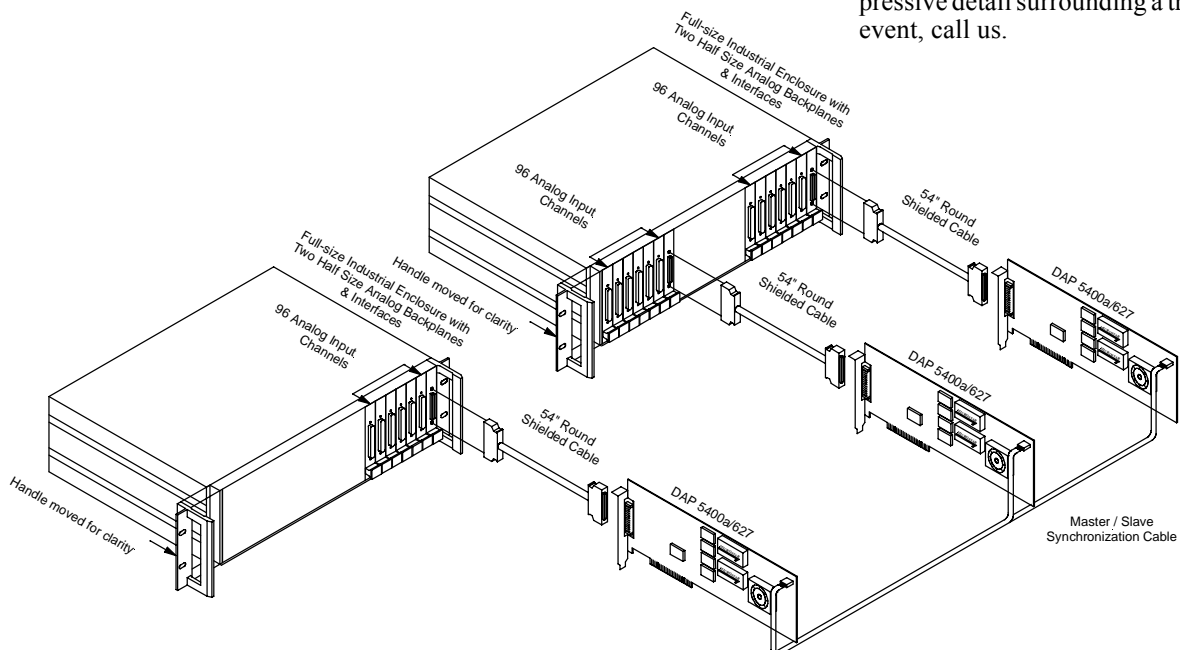


DAP 5400a/627 with onboard processor acquires analog inputs simultaneously at 10M samples per second.

As described opposite, Microstar Laboratories provides the hardware and software to synchronize two or more DAP boards of any model together, so that, given 1, 2, 3, 4, or 5 DAP 5380a boards, an application can simultaneously sample high-speed inputs in groups of 4, 8, 12, 16, and 20 . . . with corresponding aggregate data acquisition rates of 3.2M, 6.4M, 9.6M, 12.8M, and 16M samples per second. With DAP 5380a boards acquiring data at 625k samples per second per channel, the application can simultaneously sample in groups of 8, 16, 24, 32, and 40 . . . at aggregate rates of 5M, 10M, 15M, 20M, and 25M samples per second.

With DAP 5400a boards in place of DAP 5380a boards, the corresponding aggregate data acquisition rates rise to 8M, 16M, 24M, 32M, and 40M samples per second. With DAP 5400a boards acquiring data at 1250k samples per second per channel, the application can simultaneously sample at aggregate rates of 10M, 20M, 30M, 40M, and 50M samples per second.

DAPL performs data reduction in real time, so user interface software running on the PC receives only data of interest: summarized or filtered data in the general case, and detailed data preceding or following a transient event in particular. In a transient recorder application, DAPL acquires, buffers, and discards data, and scans the data all the while for a trigger event. Such an event can trigger some action on the channel where the event occurred, or it can trigger some action on one or more other channels. If you have an application that requires impressive detail surrounding a transient event, call us.



Specifications

DAP 5000a and DAP 5016a

PCI Bus

*14-bit or 16-bit
resolution*

233 MHz

PCI PC Interface

The DAP 5016a and DAP 5000a use a PCI slot. They use DMA bus-mastering for high-speed data transfer to the PC.

Industry Standard Software

DAPstudio lets you configure and control any DAP from your PC. DAPtools Standard adds alternative development paths, with options for LabVIEW, DASyLab, MATLAB, C++, VB, and any applications that use DLLs.

Simultaneous High-Speed Input and Output

DAPs can provide continuous, gap-free input and output at the same time. The input and output speeds are individually selectable by software.

Software Selectable Acquisition Front End

Channel numbers and gains, and the choice between single-ended and differential inputs, are programmable. Each setting can be changed channel-by-channel.

Intelligent Expansion Control

DAP boards automatically generate external expansion control signals; the PC is not involved. Any channel is simply referred to by number. There is no load on the PC — even at maximum speed.

Flexible Output Updating

High-speed synchronous updates and fast-response asynchronous updates are both available. Both onboard analog outputs also can be updated concurrently. Synchronous outputs can be configured to run continuously, to stop after a set number of updates, or to send output data in predefined bursts.

Hardware Clocks and Triggers

Clocks and triggers are TTL compatible. Onboard circuitry protects against signals that violate timing requirements. Channel List Clocking allows all input channels to be acquired on a single external clock edge.

Synchronization of Several DAPs

Onboard circuitry and a special synchronization connector support several DAPs running in the same PC. Any mix of DAP models is allowed. A software-selectable master DAP provides a sampling or an update clock to software-selectable slave DAPs. Other hardware and software options can synchronize all DAPs distributed over a PC network.

| INPUT | DAP 5016a/527 | DAP 5000a/526 |
|---|---------------|---------------|
| Analog inputs (synchronous) | 16 | 16 |
| Expandable to | 512 | 512 |
| Ranges (volts) | +/-5, +/-10 | +/-5, +/-10 |
| Samples (x 1000) per second | 500† | 800† |
| A/D Converters/Resolution (bits) | 1/16 | 1/14 |
| Minimum time interval (microseconds) | 2.0† | 1.25† |
| Time increment (nanoseconds) | 50 | 50 |
| Maximum programmable gain* | 40 | 40 |
| Digital inputs (synchronous) | 16 | 16 |
| Expandable to | 128 | 128 |
| Samples (x 1000) per second | 1666 | 1666 |
| Minimum time interval (microseconds) | 0.6 | 0.6 |
| OUTPUT | DAP 5016a/527 | DAP 5000a/526 |
| Analog outputs | 2 | 2 |
| Expandable to | 66 | 66 |
| Ranges (volts) | +/-5, +/-10 | +/-5, +/-10 |
| Updates (x 1000) per second per onboard channel | 833†† | 833 |
| Minimum time interval (microseconds) | 1.2†† | 1.2 |
| Digital outputs | 16 | 16 |
| Expandable to | 1024 | 1024 |
| Updates (x 1000) per second | 1666 | 1666 |
| Minimum time interval (microseconds) | 0.6 | 0.6 |
| MICROPROCESSOR | DAP 5016a/527 | DAP 5000a/526 |
| Processor | Intel Pentium | Intel Pentium |
| Clock speed (MHz) | 233 | 233 |
| Onboard operating system: DAPL | DAPL 2000 | DAPL 2000 |
| RAM (Mbytes) | 32 | 32 |
| DSP | DAP 5016a/527 | DAP 5000a/526 |
| Implementation | Enhanced | Enhanced |
| PC INTERFACE | DAP 5016a/527 | DAP 5000a/526 |
| Interface type | PCI | PCI |
| Samples (x 1000) transferred/second** | 1666 | 1666 |
| Samples (x 1000) logged/second** | 1666 | 1666 |

* Top sampling speeds are at gain=1. Each board also has gains of 4, 10, and 40.

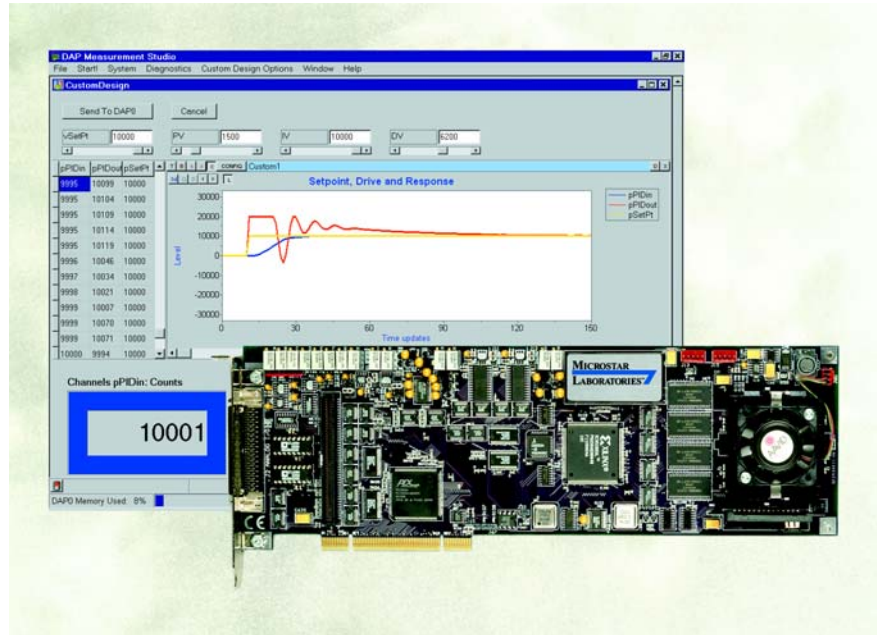
** Maximum disk logging and data transfer rates vary with PC platform.

† To maintain full resolution may require a lower sample rate when sampling more than one channel.

†† For full 16-bit resolution, the maximum analog output update rate is 400k samples/second per onboard channel.

When your application needs Pentium-powered, real-time processing and 16-bit sampling under Windows, choose the DAP 5016a. Even at maximum sampling rates, the combination of a fast processor with low latency allows computation in real time between samples – and on-time response for control applications.

The DAP 5016a provides 16-bit A/D resolution for its 16 onboard analog inputs and its 2 onboard analog outputs. The onboard analog input channels sample at an overall 500k samples per second, and the 16 onboard digital input channels sample at an overall rate of 1.666M words per second. The two onboard analog output channels update at an overall 1.666M updates per second, and the 16 onboard digital output channels update at an overall 1.666M words per second.

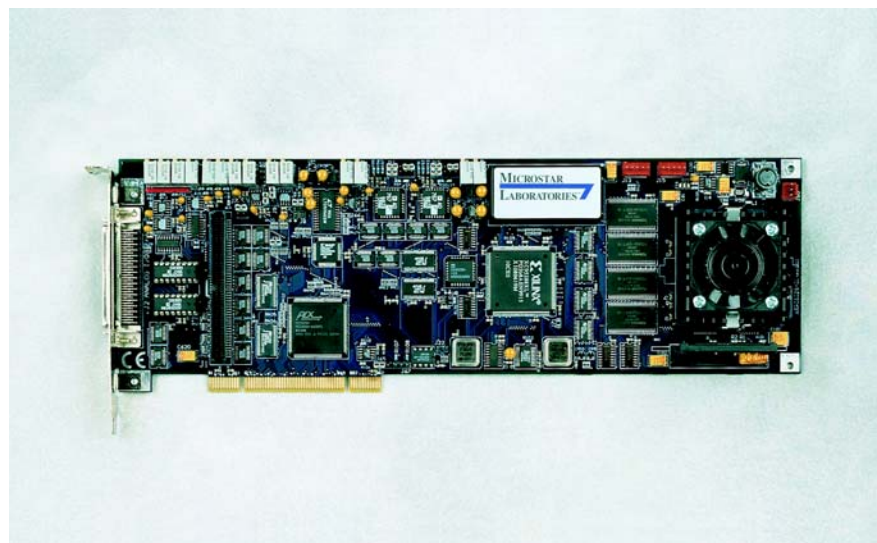


You can use DAPstudio, a Windows application, to configure each high-resolution DAP 5016a/527 board in a synchronized network. You then can use DAPstudio to run your data acquisition application from any PC on the network. DAP boards also work with LabVIEW, or with any application that allows DLL calls.

The DAP 5000a/526 can acquire 800k samples per second on its analog inputs and up to 1.67M samples per second on its 16 digital inputs. It can continuously log to disk 1.67M words (3.34MB) per second.

Each word can hold either a single 14-bit sample from an analog channel, or 16 single-bit samples from digital channels. So the DAP 5000a/526 can acquire and continuously log to disk some mix of analog and digital samples that combine to a throughput of 1.67M words.

Apart from a slightly lower analog sampling rate, the DAP 5000a has all the application performance attributes of the DAP 5200a, although with a less powerful onboard processor. It has the same digital sampling rate, the same update rates on outputs, and the same expansion potential. Use this board in applications that require moderate real-time processing. Call us to find out how real-time processing can benefit your application.



The Intel Pentium 233MHz CPU on this DAP 5000a/526 Data Acquisition Processor board runs a real-time OS that you control from Windows.

Specifications

DAP 4000a

PCI PC Interface

The DAP boards in this catalog each use a PCI slot. They use DMA bus-mastering for high-speed data transfer to the PC.

Industry-Standard Software

The DAPtools Standard software bundle works with these DAPs to allow a choice of industry-standard user-interfaces: LabVIEW, DASyLab, Agilent VEE, or MATLAB – or other Windows applications.

Full expansion potential

Simultaneous High-Speed Input and Output

DAPs can provide continuous gap-free input and output at the same time. Microstar Laboratories software allows users to select independent input and output speeds, and it communicates those settings to the hardware.

Software-Selectable Acquisition Front End

DAPL, the onboard operating system, allows a user to choose between single-ended and differential inputs channel by channel, and to specify or change the gain on any channel.

Intelligent Expansion Control

A DAP board generates its own external expansion control signals without help from the PC. User interface software on the PC refers to any channel simply by number at run-time, with no other distinction. This takes all random loads off the PC – even at maximum channel speeds.

Flexible Output Updating

A DAP board can update both of its onboard analog outputs concurrently. A user may choose between fast-response asynchronous updates and high-speed synchronous updates. Synchronous updates can run continuously, stop after a set number of updates, or send output data in predefined bursts.

Hardware Clocks and Triggers

DAP boards send and receive TTL-compatible clock and trigger signals. Onboard circuitry protects against signals that violate timing requirements. The Microstar Laboratories Channel List Clocking feature – built into every DAP – samples or updates a series of channels on a single external sampling or update clock edge.

Synchronization of Several DAPs

Onboard circuitry and a special synchronization connector support several DAPs running in the same PC. Any mix of DAP models is allowed. A software-selectable master DAP provides a sampling or an update clock to software-selectable slave DAPs. Other hardware and software options can synchronize all DAPs distributed over a PC network.

| INPUT | DAP 4000a/112 | DAP 4000a/212 |
|--|----------------------------------|----------------------------------|
| Analog inputs (synchronous) | 16 | 16 |
| Expandable to | n/a | 512 |
| Ranges (volts) | 0 to +5, ±2.5, ±5, ±10 | 0 to +5, ±2.5, ±5, ±10 |
| Samples (x 1000) per second | 800 ¹ | 800 ¹ |
| A/D Converters/Resolution (bits) | 1/14 | 1/14 |
| Minimum time interval (microseconds) | 1.25 ¹ | 1.25 ¹ |
| Time increment (nanoseconds) | 50 | 50 |
| Maximum programmable gain ² | 500 | 500 |
| Digital inputs (synchronous) | 16 | 16 |
| Expandable to | n/a | 128 |
| Samples (x 1000) per second | 800 | 800 |
| Minimum time interval (microseconds) | 1.25 | 1.25 |
| OUTPUT | DAP 4000a/112 | DAP 4000a/212 |
| Analog outputs | 2 | 2 |
| Expandable to | 66 | 66 |
| Ranges (volts) | 0 to +5, ±2.5, ±5, ±10, 0 to +10 | 0 to +5, ±2.5, ±5, ±10, 0 to +10 |
| Updates(x1000) / second per onboard channel | 400 | 400 |
| Minimum time interval (microseconds) | 2.5 | 2.5 |
| Digital outputs | 16 | 16 |
| Expandable to | 1024 | 1024 |
| Updates (x 1000) per second | 800 | 800 |
| Minimum time interval (microseconds) | 1.25 | 1.25 |
| MICROPROCESSOR | DAP 4000a/112 | DAP 4000a/212 |
| Processor | 486SXLC2 | 486SXLC2 |
| Clock speed (MHz) | 50 | 50 |
| Onboard operating system: DAPL | DAPL 2000 | DAPL 2000 |
| RAM (Mbytes) | 8 | 8 |
| PC INTERFACE | DAP 4000a/112 | DAP 4000a/212 |
| Interface type | PCI | PCI |
| Samples (x 1000) transferred/second ³ | 800 | 800 |
| Samples (x 1000) logged/second ³ | 800 | 800 |

¹ To maintain full 14-bit resolution may require a lower sample rate (longer time interval) when sampling more than one channel per ADC.

² Only unit assures top sampling speed. The DAP 4000a also has gains of 10 and 100.

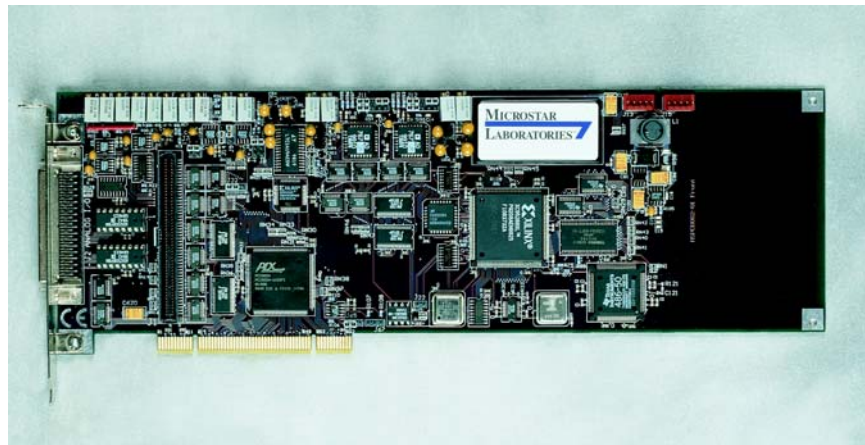
³ Maximum disk logging and data transfer rates vary with PC platform.

The DAP 4000a/212 has all the application performance attributes of the DAP 4200a/526, although with a less powerful onboard processor. As with all DAPs, its onboard intelligence translates into three things that may matter to you: (1) high sampling speed without interruptions or data loss, (2) high channel count, and (3) real-time processing.

A single DAP 4000a can sample up to 512 analog inputs and 128 digital inputs; it can update up to 66 analog outputs and 1024 digital outputs.

The DAP 4000a/112 has all the attributes of the DAP 4000a/212 except for input expansion and whatever accessories depend on that: simultaneous sampling, counter/timer, and quadrature decoder boards, for example. A return-to-factory upgrade converts a DAP 4000a/112 to a DAP 4000a/212.

Use the DAP 4000a in applications that require light-to-moderate real-time processing. Again, call us to find out how real-time processing can benefit your application.



DAP 4000a/212 with onboard processor can sample up to 512 analog inputs and 128 digital inputs, and can update up to 66 analog outputs and 1024 digital outputs.

Synchronization of Several DAPs

All DAPs have onboard circuitry and DAP-to-DAP connectors for linking DAPs of any mix of models into a synchronized data acquisition system within a single PC. A designated master DAP outputs a synchronizing signal to one or more slave DAPs. In networked systems, a separate network connects the DAPs from different PCs to allow every DAP on the network to form part of a single synchronized data acquisition system.

Specifications

DAP 840

PCI PC Interface

The DAP boards in this catalog each use a PCI slot. They use DMA bus-mastering for high-speed data transfer to the PC.

Industry-Standard Software

The DAPtools Standard software bundle works with this DAP to allow a choice of industry-standard user-interfaces: LabVIEW, DASYLab, Agilent VEE, or MATLAB – or other Windows applications.

Real-time data acquisition and control

Simultaneous High-Speed Input and Output

DAPs can provide continuous gap-free input and output at the same time. Microstar Laboratories software allows users to select independent input and output speeds, and it communicates those settings to the hardware.

Software-Selectable Acquisition Front End

DAPL, the onboard operating system, allows a user to choose between single-ended and differential inputs channel by channel, and to specify or change the gain on any channel.

Intelligent Expansion Control

A DAP board generates its own external expansion control signals without help from the PC. User interface software on the PC refers to any channel simply by number at run-time, with no other distinction. This takes all random loads off the PC – even at maximum channel speeds.

Flexible Output Updating

A DAP board can update both of its onboard analog outputs concurrently. A user may choose between fast-response asynchronous updates and high-speed synchronous updates. Synchronous updates can run continuously, stop after a set number of updates, or send output data in predefined bursts.

Hardware Clocks and Triggers

DAP boards send and receive TTL-compatible clock and trigger signals. Onboard circuitry protects against signals that violate timing requirements. The Microstar Laboratories Channel List Clocking feature – built into every DAP – samples or updates a series of channels on a single external sampling or update clock edge.

Synchronization of Several DAPs

All DAPs have onboard circuitry and DAP-to-DAP connectors for linking DAPs of any mix of models into a synchronized data acquisition system within a single PC. A designated master DAP outputs a synchronizing signal to one or more slave DAPs. In networked systems, a separate network connects the DAPs from different PCs to allow every DAP on the network to form part of a single synchronized data acquisition system.

| INPUT | | DAP 840/103 |
|--|----------------------------------|-------------------|
| Analog inputs (synchronous) | | 8 |
| Expandable to | | n/a |
| Ranges (volts) | 0 to +5, ±2.5, ±5, ±10 | |
| Samples (x 1000) per second | | 800 ¹ |
| A/D Converters/Resolution (bits) | | 1/14 |
| Minimum time interval (microseconds) | | 1.25 ¹ |
| Time increment (nanoseconds) | | 50 |
| Maximum programmable gain ² | | 500 |
| Digital inputs (synchronous) | | 8 |
| Expandable to | | n/a |
| Samples (x 1000) per second | | 800 |
| Minimum time interval (microseconds) | | 1.25 |
| OUTPUT | | DAP 840/103 |
| Analog outputs | | 2 |
| Expandable to | | n/a |
| Ranges (volts) | 0 to +5, ±2.5, ±5, ±10, 0 to +10 | |
| Updates (x 1000) per second per onboard channel | | 400 |
| Minimum time interval (microseconds) | | 2.5 |
| Digital outputs | | 8 |
| Expandable to | | n/a |
| Updates (x 1000) per second | | 800 |
| Minimum time interval (microseconds) | | 1.25 |
| MICROPROCESSOR | | DAP 840/103 |
| Processor | | 486SXLC2 |
| Clock speed (MHz) | | 50 |
| Onboard operating system: DAPL | | DAPL 2000 |
| RAM (Mbytes) | | 8 |
| PC INTERFACE | | DAP 840/103 |
| Interface type | | PCI |
| Samples (x 1000) transferred/second ³ | | 800 |
| Samples (x 1000) logged/second ³ | | 800 |

¹ To maintain full 14-bit resolution may require a lower sample rate (longer time interval) when sampling more than one channel per ADC.

² Only unit gain assures top sampling speed. The DAP 840 also has gains of 10 and 100.

³ Maximum disk logging and data transfer rates vary with PC platform.

The low-cost DAP 840/103 makes many more real-time applications affordable. Like every other DAP, it has onboard intelligence implemented as DAPL: a 32-bit multitasking real-time operating system that runs on an onboard processor; the user controls this from any Windows system that contains the board. A user also can exercise control remotely from any other Windows system on the same network.

DAPL generates a Windows event when the DAP requires direction from user interface software on the PC. So the PC can run Windows in its native, virtual event-driven mode, while the DAP monitors real events in real time where it really matters.

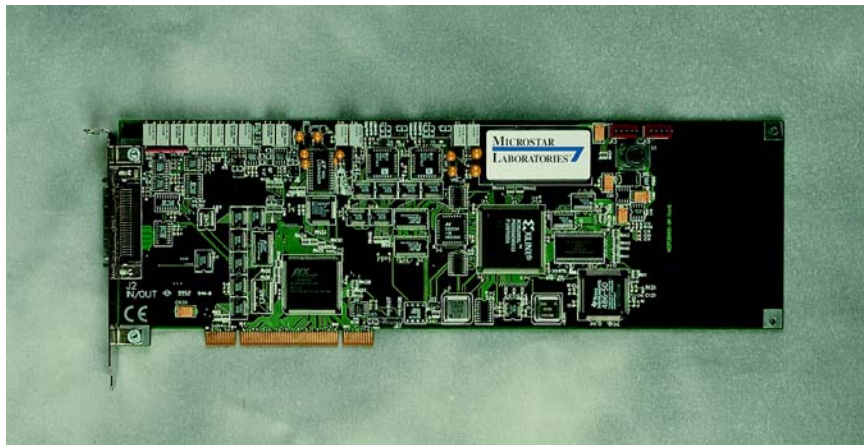
To design a real-time data acquisition and control application, simply define what tasks the DAP 840/103 has to perform. Choose from over 100 easy-to-use commands optimized for data acquisition and control. Many applications require as few as six task-definition commands. Command categories include

- DSP – Filtering
- DSP – Spectral Analysis
- Sensor Conditioning
- Software Triggering
- Process Control

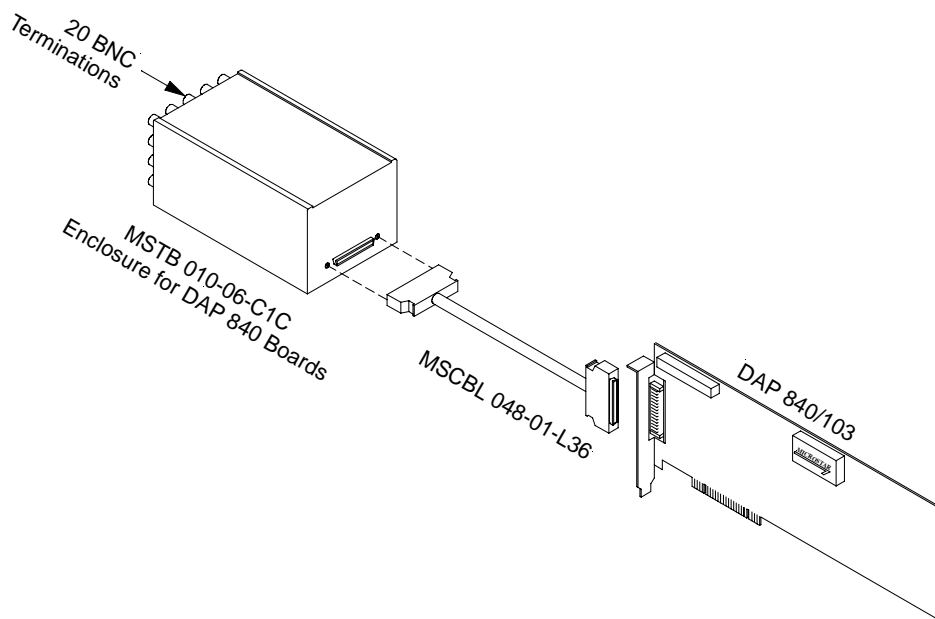
You can check out the complete command list (with brief descriptions) anytime at

www.mstarlabs.com/software/dapl/commands.html

or turn the page for just the list.



The DAP 840/103 with onboard processor offers 100+ built-in commands for real-time data acquisition and control.



System Commands

START
STOP
RESET
PAUSE
OPTION
FILL
LET
HELP
DISPLAY
ERASE
HELLO
STATISTICS

Structure Definition

CONSTANT
VARIABLE
PIPE
VECTOR
TRIGGER
STRING

Configuration

END
TIME
COUNT
HTRIGGER
CLOCK
MASTER or
SLAVE

Input -Specific

IDEFINE
SET IPIPE
CHANNELS or
GROUPS
GROUPSIZE

Output -Specific

ODEFINE
SET OPIPE
CYCLE
UPDATE
DACOUT
DIGITALOUT

Processing Commands

Data Management

COPY
LCOPY
REPLICATE
COPYVEC
SKIP
EXTRACT
MERGE
MERGEF
BMERGE
NMERGE
BMERGEF
SEPARATE
SEPARATEF

Expression

+ - * /
& | ^ <<>>

Statistical

HIGH
LOW
FINDMAX
AVERAGE
BAVERAGE
VARIANCE
PCOUNT
PVALUE
RMS
PULSECOUNT
CTCOUNT
CTRATE

Signal Generation

SINEWAVE
COSINEWAVE
SQUAREWAVE
SAWTOOTH
TRIANGLE
RANDOM

Data Transformation

ABS
DELTA
INTEGRATE
SQRT
POLAR
DECIBEL

DSP – Filtering¹

FIRFILTER
FIRLOWPASS
RAVERAGE
CHEBYSHEV
BUTTERWORTH
BESSEL
CHEBYINV
ELLIPTIC

DSP – Spectral Analysis

FFT
CORRELATE
CROSSPOWER
TFUNCTION1 or
TFUNCTION2

Signal Conditioning

THERMO
INTERP
OFFSET
SCALE

Process Control

PID1
PWM
ALARM

Software Triggering

LIMIT
DLIMIT
LOGIC
PCASSERT
TOGGLE
WAIT
TOGGWT
TSTAMP
FREQUENCY
TRIGSCALE
TAND
TOR
TCOLLATE
TRIGARM
TRIGSEND
TRIGRECV

Text Formatting

PRINT
FORMAT

Any given application uses only a handful of the more than 100 commands in DAPL, shown here.

DAP 5200a benchmarks²

| | |
|-----------------------|----------------|
| 1024-point FFT in | 614 μ sec |
| 101-tap FIR filter in | 1.05 μ sec |
| 50 PID loops, each in | 250 μ sec |

DAPL

The DAPL Manual, available at no charge on CD or by download from www.mstarlabs.com, provides the syntax and all other details of each command shown on the left.

Every DAP model in this catalog can run any relevant⁴ DAPL command shown in the box on the left. How fast a DAPL command executes depends on the power of the onboard processor. Choose your DAP model to match the real-time processing needs of your application: from the DAP 840, for light real-time processing, through the DAP 5200a, for applications that call for heavy-duty performance in real time. See inset box on left.

Onboard Intelligence

continued from first page

Powerful DAP boards excel at applications that require extensive real-time computation: FFTs that keep up with the acquisition rate, for instance. A top-of-the-line DAP can perform a 16k-point FFT at a sustained rate of 1.4M samples per second. Imagine what it does to FIR filters.⁵

Typical real-time procedures that any DAP can perform include continuously sampling high-speed data while watching for a trigger event, and then passing pre-trigger and post-trigger blocks of data to a Windows or Linux application. A trigger event in a signal can take many forms: a level, a slope, a minimum within a time period, a maximum, and so on. More complex

actions potentially triggered by an event include other real-time processes performed by DAPL on the DAP board, and direct control of analog or digital outputs.

The benefits of onboard intelligence in the PC environment depend on the particular application. They cover a spectrum ranging from helpful through essential. You can visit our Web site and look at some sample applications to develop a sense of how much onboard intelligence matters to some of our customers.⁶ Call us to find out how onboard intelligence can help with your application.

Onboard intelligence allows synchronization between several DAPs in a single PC – without PC interrupts. For networked PCs, onboard intelligence allows synchronization between hardware in different DAPcell⁷ software servers over a parallel DAP-to-DAP network independent of PC-network

delays. Microstar Laboratories has shipped such systems with many hundreds of channels. A scalable benchmark server shows that such a distributed system could acquire data at over 50 million samples per second.⁸ So, if the potential for easily handled high channel counts matters to you, you have another reason to call us.

^{1, 2, 3, 4, 5, 6, 7, 8} See Notes on last page.

Notes

This page lists the footnotes referenced in the Microstar Laboratories product catalog.

Page 1

1 [unique]

Other companies now feature some degree of onboard intelligence. Our approach remains unique, however: engineers who use compiler-provided IDE implementations like Microsoft Visual C++ and Visual Studio or Borland C++Builder to build applications on a PC under Windows can use the same tools to build applications to run on a data acquisition board under a real-time operating system. See page 6 of the print catalog.

2 [Windows]

Microstar Laboratories products work with these Microsoft operating systems: Windows Vista, Windows 2003, Windows XP, Windows 2000, Windows NT, Windows ME, Windows 98, and Windows 95.

3 [1816/048]

Both solutions employ a built-in four-pole lowpass Butterworth filter on every channel before analog-to-digital conversion. The specialized DAP, the iDSC 1816, uses onboard DSP chips to implement further signal processing on the filtered data.

Page 3

1 [Eurocard B]

The Eurocard A format, used in CompactPCI systems, has the same 3U height (100mm) but not the depth: 160mm against 220mm for the Eurocard B format.

2 [networked]

DAPcell Local Server and DAPcell Network Server software, described on page 7, allow a number of DAP boards to act as a single synchronized system even though spread across networked PCs. See also p. 18.

Page 4

1 [other software [DAPcell]]

DAPcell Network Server software makes selecting a board on the network as easy as selecting a printer: even from out-of-the-box versions of LabVIEW, for example.

Page 6

1 [manual [Free CD]]

To receive the complete set of our user manuals, download our DAPtools Basic CD or call us. Or download individual manuals from our Web site.

Page 18

1 [DSP - Filtering]

The DAPtools Standard package, described on page 7, includes the DAPL IIR Filter Module (DAPL IFM) to provide the last five commands on this list. The DAPtools Basic package does not include this module.

2 [DAP 5200a benchmarks]

Performed on a DAP 5200a/626 running under Windows NT 4.0 on an 800MHz Pentium III.

3 [no charge on CD]

To receive the complete set of our user manuals, download our DAPtools Basic CD or call us. Or download individual manuals from our Web site.

4 [relevant]

The DAP 5380a and DAP 5400a have no analog output and no digital input or output; DAPL commands that invoke these features will not work on this board.

5 [FIR filters]

Technical Note TN-164 gives the details.

6 [applications [...] customers]

See sample applications on our Web site.

7 [DAPcell]

The DAPtools Standard package and the DAPtools Professional package, described on page 7, include, respectively, DAPcell Local Server software and DAPcell Network Server software.

8 [50M samples per second]

A single DAPcell server PC can support up to 7 DAP boards as standard. In the benchmark server, Microstar Laboratories used 4 DAP boards, each with an overall data acquisition rate of 1228.8k samples per second, and logged to disk at the full acquisition rate: 4.9152M samples per second. A single DAPcell client PC, requesting the disk logging service from 11 servers configured like the benchmark server, then can log to disk at an overall rate of 54.0672M samples per second.

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