iDSC Reference Manual

Intelligent Digital Signal Conditioning Manual
Hardware and Software Description
and Reference Guide

Version 5.20

Microstar Laboratories, Inc.

This manual contains proprietary information which is protected by copyright. All rights are reserved. No part of this manual may be photocopied, reproduced, or translated to another language without prior written consent of Microstar Laboratories, Inc.

Copyright © 1997 - 2003

Microstar Laboratories, Inc.
2265 116th Avenue N.E.
Bellevue, WA 98004
Tel: (425) 453-2345
Fax: (425) 453-3199
http:// www.mstarlabs.com

Microstar Laboratories, DAPcell, Data Acquisition Processor, DAP, DAPL, and DAPview are trademarks of Microstar Laboratories, Inc.

Microstar Laboratories requires express written approval from its President if any Microstar Laboratories products are to be used in or with systems, devices, or applications in which failure can be expected to endanger human life.

Microsoft, MS, and MS-DOS are registered trademarks of Microsoft Corporation. Windows is a trademark of Microsoft Corporation. IBM is a registered trademark of International Business Machines Corporation. Intel is a registered trademark of Intel Corporation. Novell and NetWare are registered trademarks of Novell, Inc. Other brand and product names are trademarks or registered trademarks of their respective holders.

Part Number MSIDSCM520

Contents

Section I. Introduction

1. Introduction

The iDSC board from Microstar Laboratories is a complete data acquisition system that occupies one expansion slot in a PC. The board is suitable for a wide range of applications in laboratory and industrial data acquisition and control, especially those involving spectral analysis.

Control of the iDSC board is handled through a turnkey program called DSCview; through standard applications including DASYLab, LabVIEW, LabWindows/CVI, HP VEE, and MATLAB; through a programmer's graphical user interface; or through a programmer's function interface.

About This Document

This document is divided into the following four sections:

1. Introduction
2. Application Software
3. Programming Interfaces
4. Installation and Setup

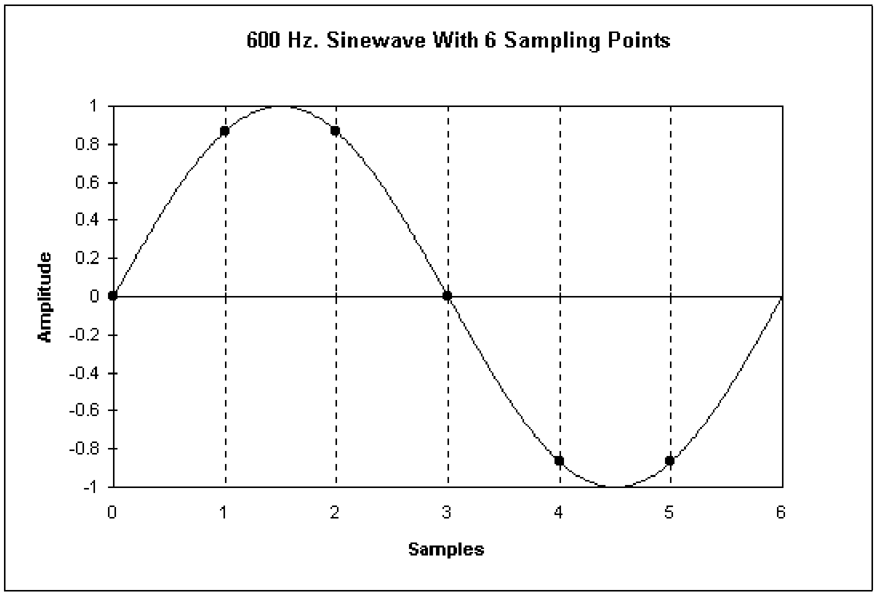
Each section is then subdivided into chapters that relate to specific topics within the section. The Introduction contains introductory material about spectral analysis and the iDSC board, including filter design. The Application Software section describes DSCview, and the DASY*Lab*, LabVIEW, LabWindows/CVI, HP VEE, and MATLAB support for the iDSC board. The Programming Interfaces section describes the graphical user interface and the function interface. Finally, Installation and Setup contains hardware and software installation instructions and detailed information about the hardware architecture of the iDSC 1816 and the iDSC 816.

iDSC Fundamentals

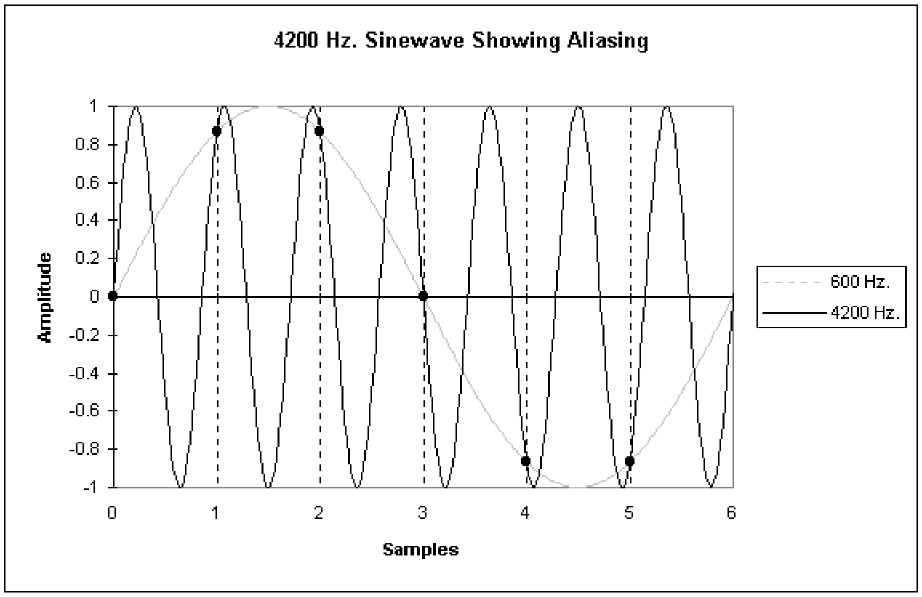
A typical data acquisition system samples input voltages at a fixed rate, the sampling frequency, to produce a stream of numbers. The Nyquist frequency is defined as one-half of the sampling frequency and a signal whose frequency components fall only below the Nyquist can be accurately reconstructed from its components. A signal with frequency components falling both above and below the Nyquist cannot be accurately reconstructed because it is impossible to distinguish between the various frequency components.

Spectral analysis for data acquisition studies observations in the frequency domain rather than in the time domain. This type of analysis places special requirements on a data acquisition system. The system must be accurate enough to distinguish small components at some frequencies from much larger components at other frequencies. The system must also provide alias-free data. If alias-free data cannot be guaranteed, any analysis applied to the data will yield questionable results.

The two figures below illustrate aliasing. The first figure displays one cycle of a 600 Hz sine wave sampled at a rate of 3600 samples/second. Six evenly spaced sampling points are plotted.


600 Hz. Sinewave With 6 Sampling Points
Amplitude
Samples
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6

The second figure displays the original sine wave at 600 Hz and a second sine wave at 4200 Hz that passes through the same sampling points. Aliasing makes it impossible to distinguish the 600 Hz signal from the 4200 Hz signal.

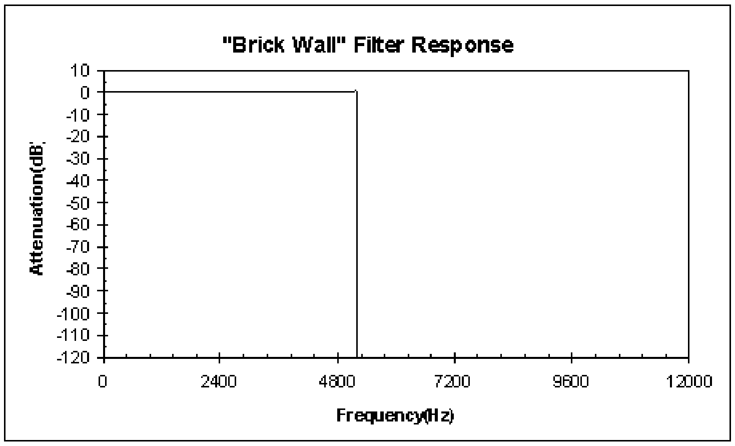


Aliasing is a sampling artifact, and digital signal processing (DSP) cannot remove aliases after a signal has been sampled. The solution to removing aliases from a data acquisition system is to apply analog filters to the system before sampling. Combining analog filters with digital oversampling, filtering, and decimation produces alias-free, high quality data suitable for spectral analysis.

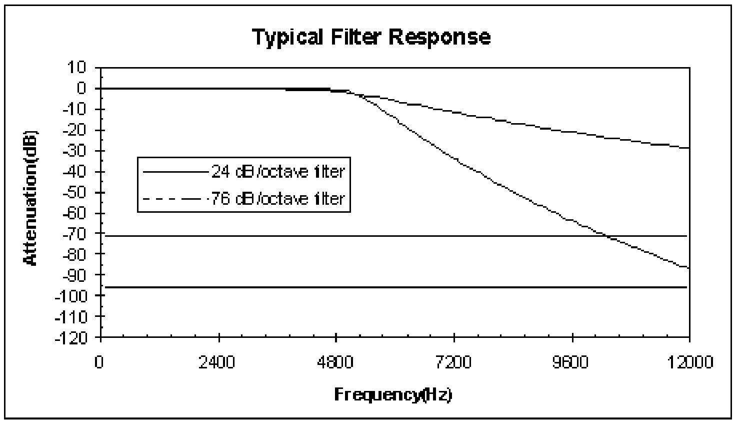
Filter Characteristics

The frequency response of a filter is characterized by its graphs of amplitude response and phase response in terms of frequency. A filter’s amplitude response can be plotted either on a logarithmic scale or a linear scale. The frequency axis of this graph is usually plotted on a linear scale, but can also can be plotted on a logarithmic scale. A filter’s phase response is plotted either in degrees or in radians.

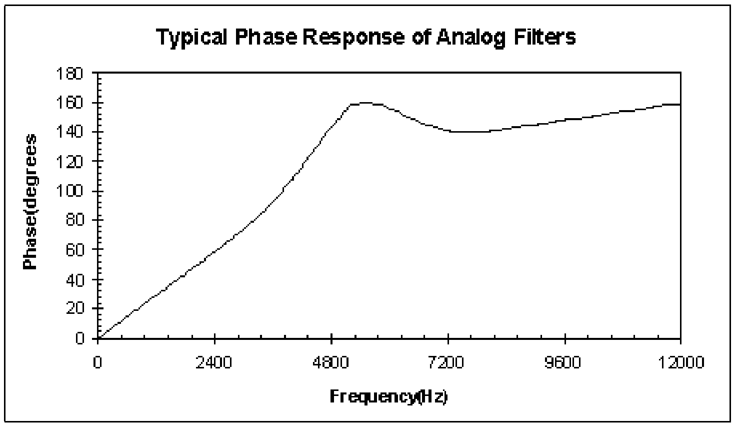
The figure below displays an ideal 'brick wall' filter. The ideal filter has no attenuation up to its cutoff frequency, and then has infinite attenuation. The ideal filter is not realizable but may be approximated by realizable filters.



The figure below displays typical characteristics of analog filters. Typical rolloff rates range from 24 dB/octave to 72 dB/octave. Even at 72 dB/octave, it takes more than 2 octaves - a factor of four in frequency - to roll off by 96 dB.



In addition to its attenuation, a filter is characterized by its phase response. The figure below displays a typical phase response curve for an analog filter.



The ideal phase response increases linearly with frequency. The delay through the filter is independent of frequency and therefore signals pass through the filter without distortion.

Analog filters are complex circuits, requiring precision resistors and capacitors. It is difficult and costly to make an analog filter with a variable cutoff frequency, especially if the cutoff frequency must cover a wide range. Also, analog filters cannot be perfectly linear, and for analog filters there is a trade-off between approximating the ideal amplitude response and approximating the ideal phase response.

2. DSC Graphical Design

The DSC Graphical Design simplifies the iDSC board input configuration and filter design process through graphical user interfaces. The Individual Interface allows configuration of a single iDSC board, and the Group Interface allows configuration of multiple iDSC boards. The Group Interface encapsulates the Individual Interface and therefore can also be used to configure a single iDSC board.

The Individual Interface and Group Interface consists of two main screens, the Input Screen and the Filter Design Screen. There is also an External Board Screen that is only accessible if `XbEnabled` is set to true. There is a tab for the input screen, filter design screen, and external board screen if `XbEnabled` is true. Within the filter design screen, there are eight tabs for the filter designs.

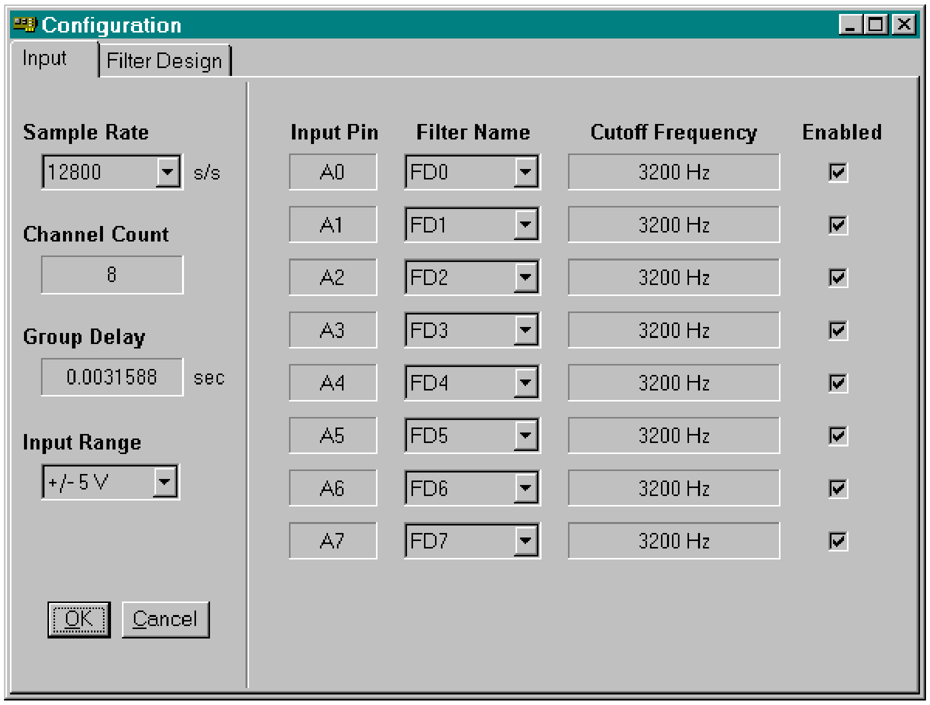
The Input Parameters, Filter Design Parameters, and External Board Parameters topics describe all the parameters in detail.

Individual Interface

Input Screen

The Input Screen is activated by selecting the Input tab.

The following figure displays the Input Screen.



Sample Rate: 12800 s/s

Channel Count: 8

Group Delay: 0.0031588 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

The following parameters are configured from the Input Screen.

- `Sample Rate`
- `Input Range`
- `Filter Name`
- `Enabled`

The following read only properties are displayed in the Input Screen.

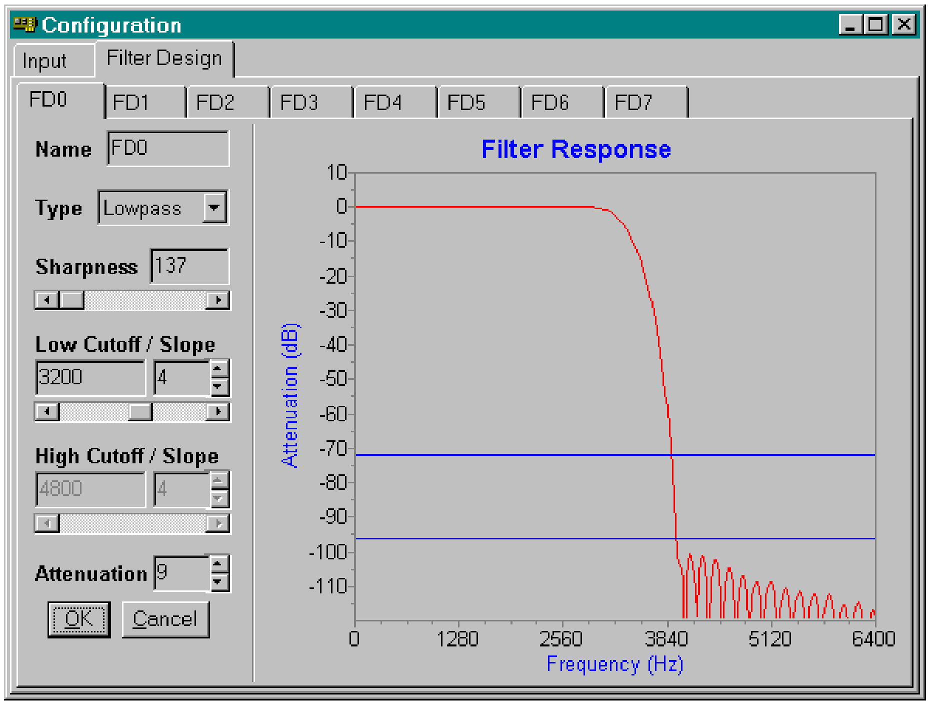
- `Channel Count`

- Group Delay
- Input Pin
- Cutoff Frequency

Filter Design Screen

The Filter Design Screen is activated by selecting the Filter Design tab. Eight distinct filter designs, activated by a second set of tabs, exist.

The following figure displays the Filter Design Screen.



Name: FD0
Type: Lowpass
Sharpness: 137
Low Cutoff / Slope: 3200 / 4
High Cutoff / Slope: 4800 / 4
Attenuation: 9

The following parameters are configured for each filter design from the Filter Design Screen.

- Filter Name
- Filter Type
- Sharpness
- Low Cutoff Frequency
- Low Cutoff Slope
- High Cutoff Frequency
- High Cutoff Slope
- Attenuation

The Filter Design Screen displays a filter's amplitude response in one of the following forms.

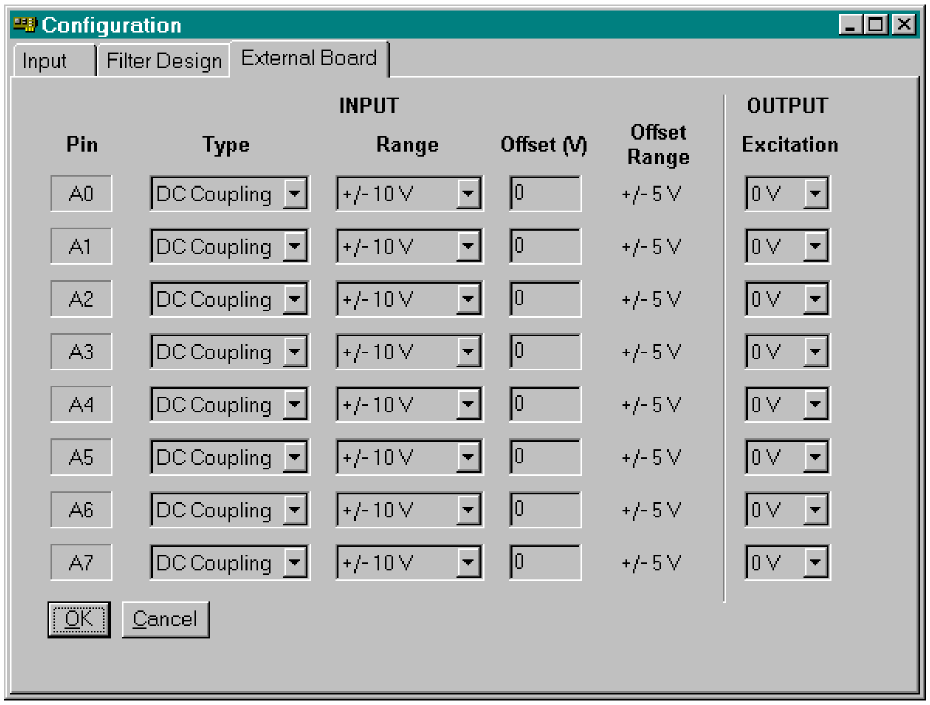
- `Linear Display`
- `Linear Zoom Display`
- `Log Display`
- `Log Zoom Display`
- `Unit Step Display`

The default amplitude response is `Log Display`. To change the amplitude response, click the right mouse button over the Filter Design Screen and select the `Y Display` menu item.

External Board Screen

The External Board Screen is activated by enabling `XbEnabled` and then selecting the External Board tab.

The following figure displays the External Board Screen.



		INPUT			OUTPUT
Pin	Type	Range	Offset (V)	Offset Range	Excitation
A0	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A1	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A2	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A3	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A4	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A5	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A6	DC Coupling	+/- 10 V	0	+/- 5 V	0 V
A7	DC Coupling	+/- 10 V	0	+/- 5 V	0 V

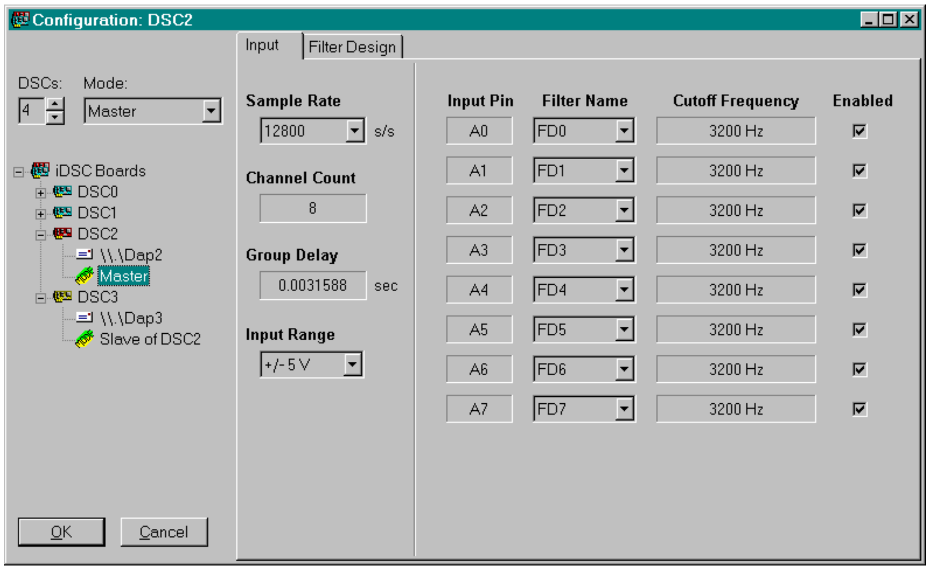
The following parameters are configured from the External Board Screen.
- `Input Type`
- `Input Range`
- `Input Offset`
- `Output Excitation`

The following read only properties are displayed in the External Board Screen.
- `Input Pin`
- `Input Offset Range`

Group Interface

The Group Interface encapsulates the Individual Interface and therefore it supports the Input Screen, Filter Design Screen and External Board Screen.

The following figure displays the Group Interface.



Configuration: DSC2

DSCs: 4
Mode: Master

- iDSC Boards
  - DSC0
  - DSC1
  - DSC2
    - \\.\Dap2
    - Master
  - DSC3
    - \\.\Dap3
    - Slave of DSC2

Input | Filter Design

Sample Rate: 12800 s/s

Channel Count: 8

Group Delay: 0.0031588 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

OK Cancel

The following parameters are configured from the Group Interface.

DSCs

The `DSCs` parameter configures the number of iDSC boards in the system. The up arrow adds iDSCs and the down arrow deletes iDSCs.

Address

The `Address` parameter is enabled when the iDSC address is selected from the tree of iDSC boards. The address can be changed in the tree or through the edit box.

Mode

The `Mode` parameter is enabled when the mode is selected from the tree of iDSC boards. The mode can be changed in the tree or through the drop down list. If the mode is changed in the tree, it must be either `Independent` or `Slave of Xxx`, where `Xxx` is the name of the iDSC board. It cannot be set to `Master` since that is automatically set when the slaves are selected.

These additional parameters are configured by clicking the right mouse button.

External Board Calibrate

The `External Board Calibrate` menu item calibrates the external board if the external board is enabled. The external board calibration is not automatic, and has to be invoked explicitly. It is a slow process and should be performed only if necessary.

External Board Enable

The `External Board Enable` menu item enables the external board. Before any communcation with the external board is performed, for example external board calibration, the external board must first be enabled.

Raw Data

The `Raw Data` menu item selects raw data rather than filtered data from the iDSC. When `Raw Data` is enabled, all filters configured from the Filter Design Screen are ignored.

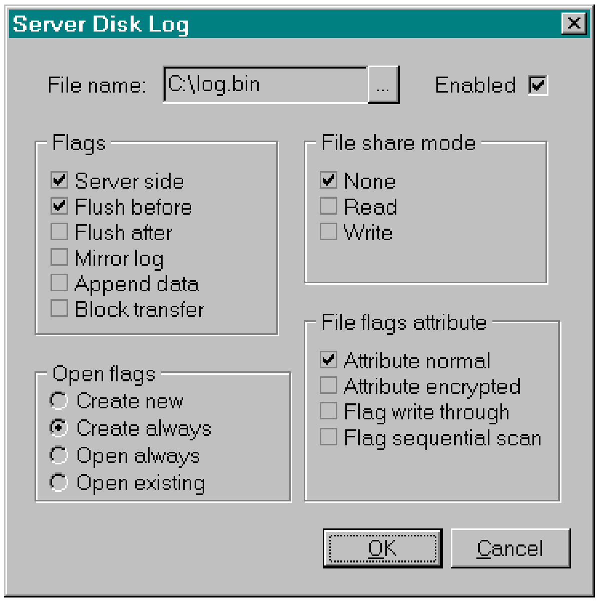
Remote Master

The `Remote Master` menu item configures a Master iDSC board as a remote master.

Server Disk Log

The `Server Disk Log` menu item configures the server disk log parameters which includes the filename, flags, file share mode, open flags, and file flags attributes. The filename must be valid and enabled must be checked for server disk logging to begin.

The following figure displays the Server Disk Log dialog.


Server Disk Log

File name: C:\log.bin ... Enabled ✓

Flags
- [✓] Server side
- [✓] Flush before
- [ ] Flush after
- [ ] Mirror log
- [ ] Append data
- [ ] Block transfer

File share mode
- [✓] None
- [ ] Read
- [ ] Write

Open flags
- ○ Create new
- ● Create always
- ○ Open always
- ○ Open existing

File flags attribute
- [✓] Attribute normal
- [ ] Attribute encrypted
- [ ] Flag write through
- [ ] Flag sequential scan

Copy

The `Copy` menu item will copy the entire iDSC configuration from the iDSC to the clipboard.

Paste

The `Paste` menu item will paste the copied iDSC configuration from the clipboard to another iDSC.

Input Parameters

The following Input Parameters are accessible from the Input Screen.

Sample Rate

The `Sample Rate` parameter sets the sample rate on each channel, in units of samples per second (s/s). The table below displays the valid sample rates arranged in octaves.

			153600		
102400			76800		
51200			38400		
25600			19200		15360
12800		10240	9600		7680
6400		5120	4800		3840
3200	3072	2560	2400	2048	1920
1600	1536	1280	1200	1024	960
800	768	640	600	512	480
400	384	320	300	256	240
200	192	160	150	128	120
100	96	80	75	64	60
50	48	40		32	30
25	24	20		16	15
	12	10		8	

Group Delay

The `Group Delay` parameter is the amount of time it takes for a reading to pass through the digital filters. All signal frequency components that are present in the passband of the filter are delayed by group delay. The group delay property is read-only and is expressed in units of seconds.

The group delay is calculated using the selected `Sample Rate` and filter designs. The group delay does not include the filter designs of disabled input pins.

Input Range

The `Input Range` parameter configures the input range to either +/- 5 V or +/- 10 V.

Filter Name

The `Filter Name` parameter maps an input pin to a named filter design. The same filter design may be applied to several input pins. An input pin is mapped to a filter design regardless of whether the input pin is disabled.

The filter name can be changed in the Filter Design Screen. When the filter name is changed, the filter name drop down list is updated to reflect the new filter name.

The default filter names are `FD0`, `FD1`, `FD2`, `FD3`, `FD4`, `FD5`, `FD6`, and `FD7`.

Enabled

The `Enabled` parameter check box enables or disables each input pin. At run-time, the iDSC board returns data to the PC only from enabled input pins.

Filter Design Parameters

The following Filter Design Parameters are accessible from the Filter Design Screen.

Each Filter Design Parameter is configured by either entering a number or moving a slider. If the you choose to enter a number, you must press ‘Enter,’ or exit the edit box when finished configuring the parameter.

Filter Name

The `Filter Name` parameter assigns a unique filter name to each filter design. If an already existing filter name is assigned, the existing filter name will not change. A filter name is limited to 63 characters.

The filter name parameter is displayed on the tab at the top of the Filter Design Screen. Changing the filter name parameter automatically updates this tab, and also updates the filter name in the Input Screen.

Filter Type

The `Filter Type` parameter assigns a filter type to each filter design. The filter type is either lowpass or bandpass.

Sharpness

The `Sharpness` parameter of a filter determines the sharpness of the corner frequency response. The sharpness of an ideal filter is the number of taps in the final filter stage.

Valid sharpness values are odd numbers in the range 37 to 255, depending on the sample rate.

Low Cutoff Frequency

The `Low Cutoff Frequency` parameter determines the ideal cutoff frequency that a filter is designed to approximate. The low cutoff frequency of an ideal filter is the filter’s first transition band. The low cutoff frequency for a filter is specified in Hertz (Hz).

Valid low cutoff frequency values are in the range 2% to 80% of the Nyquist frequency. The Nyquist frequency is half the `Sample Rate`.

For a lowpass filter the first transition band is the transition from passband to stopband. For a bandpass filter the first transition band is the transition from stopband to passband.

Low Cutoff Slope

The `Low Cutoff Slope` parameter determines the ideal cutoff response that a filter is designed to approximate. The low cutoff slope of an ideal filter is the width of the filter's first transition band. The low cutoff slope of a filter is defined as a percentage of the Nyquist frequency.

Valid low cutoff slope values are in the range 0% to 80% of the Nyquist frequency. The Nyquist frequency is half the `Sample Rate`.

High Cutoff Frequency

The `High Cutoff Frequency` parameter determines the ideal cutoff frequency that a filter is designed to approximate. The high cutoff frequency of an ideal filter is the filter's second transition band. The high cutoff frequency for a filter is specified in Hertz (Hz).

Valid high cutoff frequency values are in the range 2% to 80% of the Nyquist frequency. The Nyquist frequency is half the `Sample Rate`.

For a bandpass filter the second transition band is the transition from passband to stopband.

High Cutoff Slope

The `High Cutoff Slope` parameter determines the ideal cutoff response that a filter is designed to approximate. The high cutoff slope of an ideal filter is the width of the filter's second transition band. The high cutoff slope of a filter is defined as a percentage of the Nyquist frequency.

Valid high cutoff slope values are in the range 0% to 80% of the Nyquist frequency. The Nyquist frequency is half the `Sample Rate`.

Attenuation

The `Attenuation` parameter determines the response in the stopband of a filter.

Valid attenuation values are in the range 6.0 to 12.0.

Filter Response

The Filter Design Screen displays a filter's amplitude response based on selected filter parameters.

The Filter Response may be displayed graphically by one of the following methods.
- `Linear Display`
- `Linear Zoom Display`
- `Log Display`
- `Log Zoom Display`
- `Unit Step Display`

The default amplitude response is a `Log Display`. To change the amplitude response, click the right mouse button over the Filter Design Screen and select the `Y Display` menu item. The `Y Display` menu item allows the user to change the amplitude response display units to either linear, linear zoom, log, log zoom or unit step.

The linear, linear zoom, log, and log zoom graphs display the amplitude response at frequencies from zero to the Nyquist frequency. At all frequencies above the Nyquist frequency, the iDSC board has attenuation of more than 96 dB. A unit step display shows the amplitude response of the filter in relation to a change in the input from zero to positive full scale.

There are several more options when you click the right mouse button over the Filter Design Screen. These options include:
- `Crosshair Track`
- `Defaults Load`
- `Copy`
- `Paste`

Holding the left mouse button down and dragging the mouse over the graph will display a crosshair with the x and y coordinates of a particular point. If the `Crosshair Track` menu item is checked, the crosshair will track the filter response curve. This feature is useful in determining the exact cutoff frequency, cutoff slope, or attenuation at a particular point.

Selecting the `Defaults Load` menu item will load the default filter response graphs for a particular sample rate. The default filter response graphs always have very flat passband characteristics and stop band attenuation of more than 96 dB.

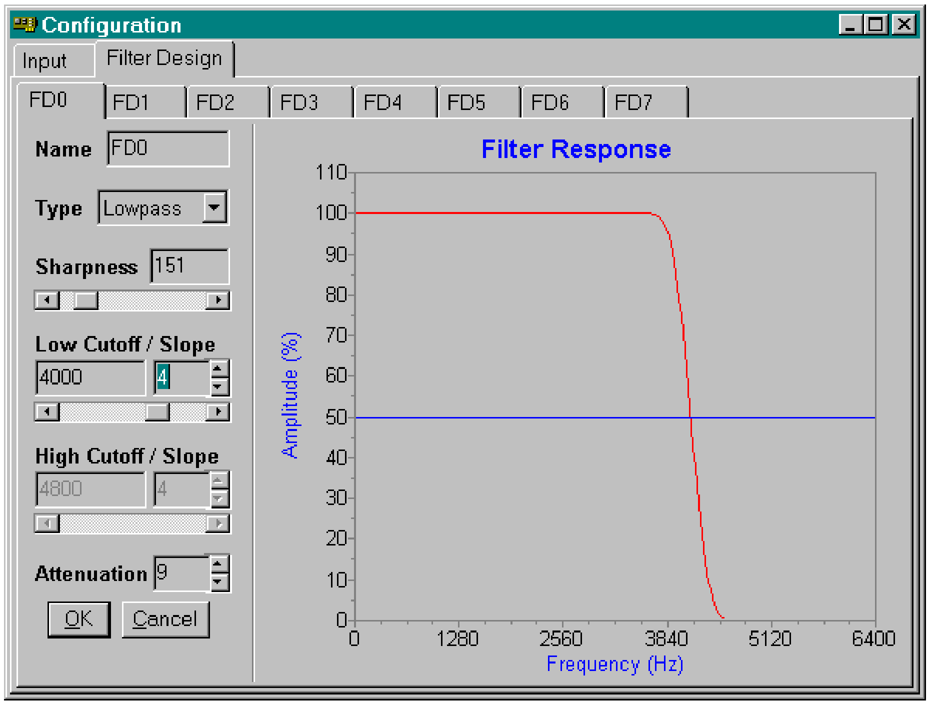
The `Copy` menu item will copy the filter design parameters from the filter design to the clipboard. The `Paste` menu item will paste the copied filter design parameters from the clipboard to another filter design.

Linear Display

A `Linear Display` shows the linear amplitude response in the frequency domain. A linear display graph plots the linear attenuation from 0 to 110%, with frequencies from zero to the Nyquist frequency. The Nyquist frequency is half the sample rate.

The filters used in the iDSC board have linear phase, so the phase response is specified by the `Group Delay`.

The following figure shows a linear display of the filter's amplitude response.

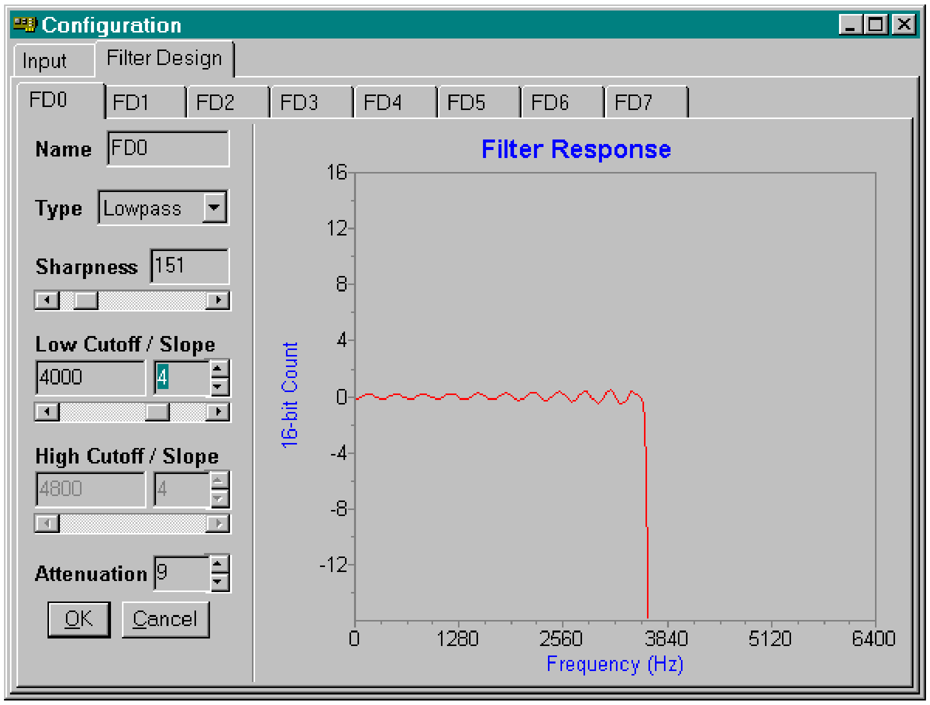


Name: FD0
Type: Lowpass
Sharpness: 151
Low Cutoff / Slope: 4000 / 4
High Cutoff / Slope: 4800 / 4
Attenuation: 9

Linear Zoom Display

A `Linear Zoom Display` shows the linear amplitude response in the frequency domain, with focus on the passband performance of the filter. A linear zoom display graph plots the linear attenuation, in 16-bit counts, from -16 counts to +16 counts, with frequencies from zero to the Nyquist frequency. The Nyquist frequency is half the `Sample Rate`.

The following figure shows a linear zoom display of the filter's amplitude response.

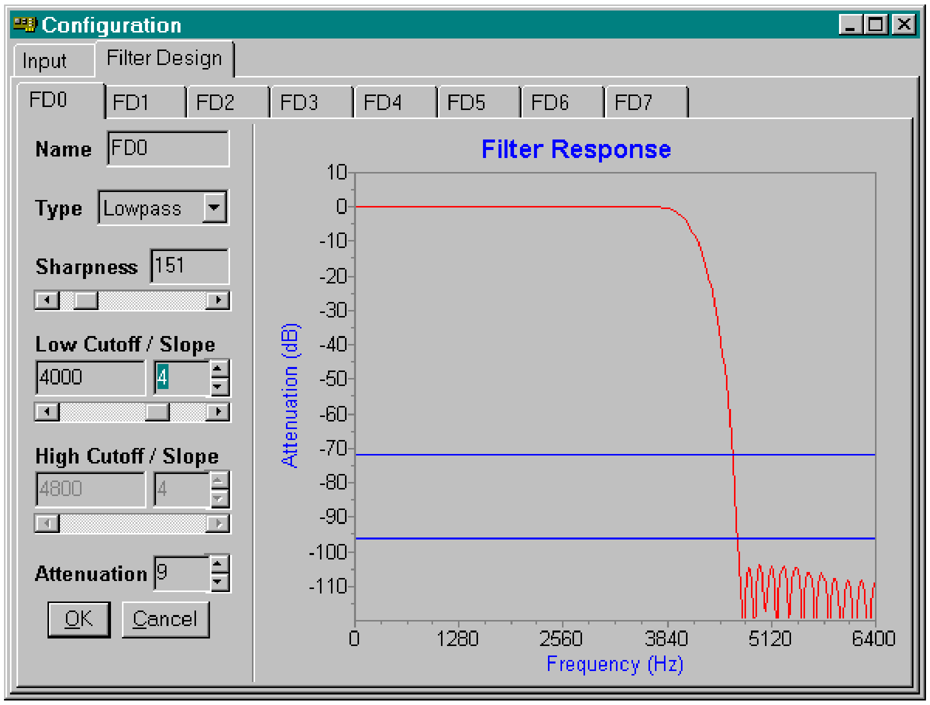


Name: FD0
Type: Lowpass
Sharpness: 151
Low Cutoff / Slope: 4000 / 4
High Cutoff / Slope: 4800 / 4
Attenuation: 9

Log Display

A Log Display shows the logarithmic amplitude response in the frequency domain. A logarithmic display graph plots the logarithmic attenuation, in decibels, from -120 dB to 10 dB, with frequencies from zero to the Nyquist frequency. The Nyquist frequency is half the Sample Rate.

The following figure shows a logarithmic display of the filter's amplitude response.



Name FD0

Type Lowpass

Sharpness 151

Low Cutoff / Slope 4000 4

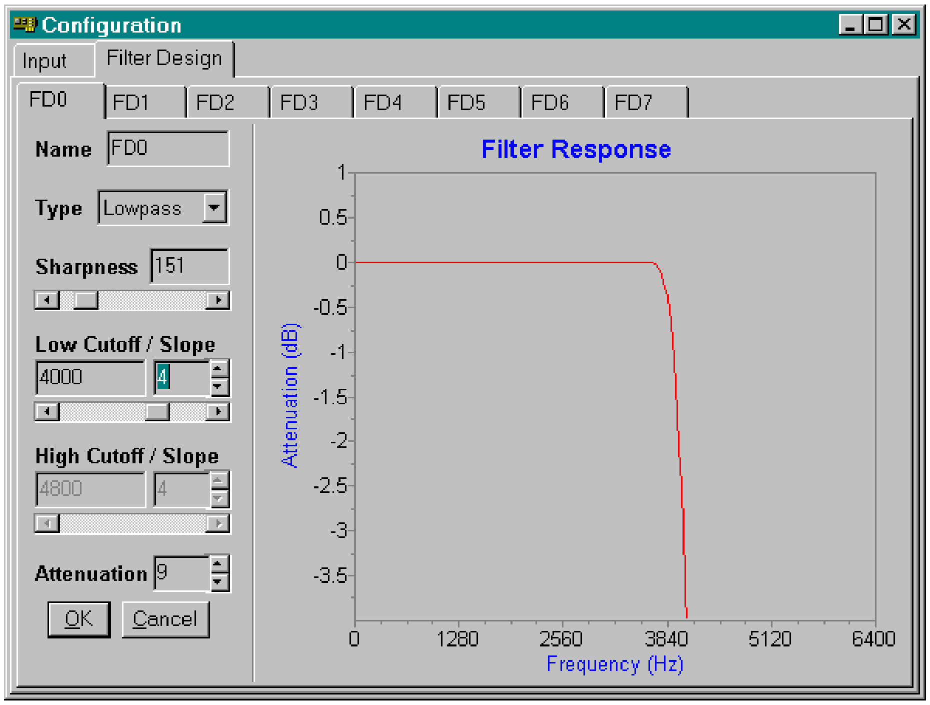
High Cutoff / Slope 4800 4

Attenuation 9

Log Zoom Display

A `Log Zoom Display` shows the logarithmic amplitude response in the frequency domain, with focus on the passband performance of the filter. A logarithmic zoom display graph plots the logarithmic attenuation, in decibels, from -4 dB to +1 dB, with frequencies from zero to the Nyquist frequency. The Nyquist frequency is half the `Sample Rate`.

The following figure shows a logarithmic zoom display of the filter's amplitude response.



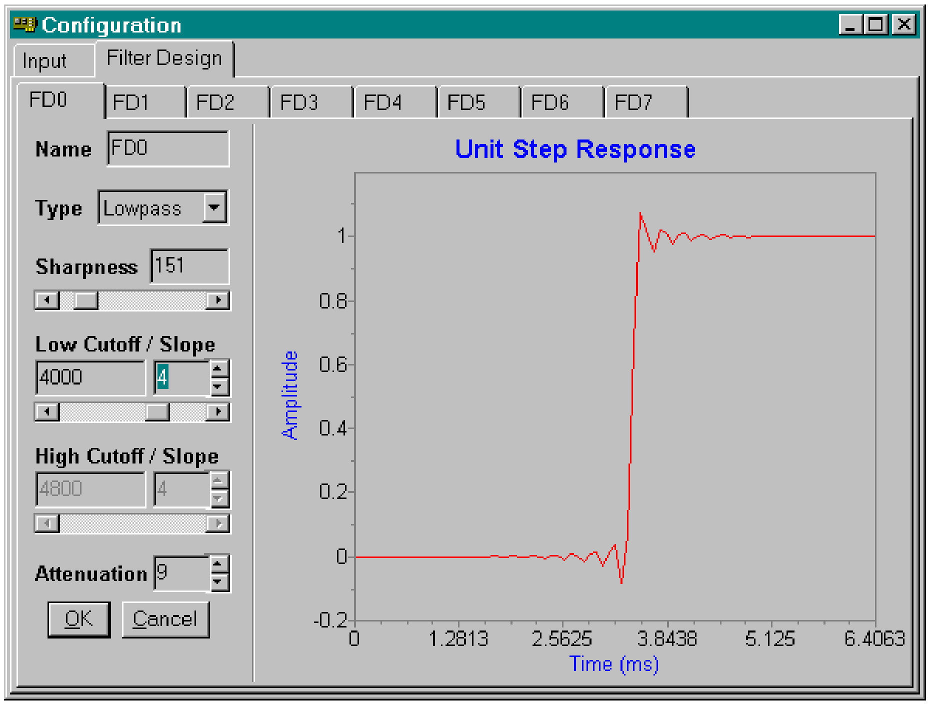
Configuration

Name: FD0
Type: Lowpass
Sharpness: 151
Low Cutoff / Slope: 4000 / 4
High Cutoff / Slope: 4800 / 4
Attenuation: 9

Unit Step Display

A `Unit Step Display` shows the amplitude response of the filter in relation to a change in the input from zero to positive full scale. Note that the response to a unit step change in the input is spread out over many samples. This is a necessary consequence of the very sharp cutoff in the frequency domain. It is possible to sharpen the unit step input response by increasing the cutoff slope parameter and decreasing the sharpness parameter

The following figure shows a unit step display of the filter's amplitude response.


Configuration

Input | Filter Design

FD0 | FD1 | FD2 | FD3 | FD4 | FD5 | FD6 | FD7

Name: FD0

Type: Lowpass

Sharpness: 151

Low Cutoff / Slope: 4000 / 4

High Cutoff / Slope: 4800 / 4

Attenuation: 9

External Board Parameters

The following External Board Parameters are accessible from the External Board Screen.

Input Type

The `Input Type` parameter configures the type of input signal. Valid input types include DC coupling, AC coupling and Excitation.

Input Range

The `Input Range` parameter configures the input range. Please note that this input range is different from the iDSC `Input Range`, and only works if the iDSC input range is set to +/- 5V.

Valid input ranges are:
+/- 10 mV, +/- 20 mV, +/- 50 mV,
+/- 100 mV, +/- 200 mV, +/- 500 mV,
+/- 1 V, +/- 2 V, +/- 5 V, +/- 10 V

Input Offset

The `Input Offset` parameter configures the input offset. The specified input offset must be in the `Input Offset`.

Input Offset Range

The `Input Offset Range` parameters displays the valid input offset range. The input offset range is determined by the selected `Input Range`.

For example, if the input range is +/- 500 mV then the input offset range is +/-2.5 V, if the input range is +/- 2 V then the input offset range is +/- 1V. This is a read only parameter that is dependent on the input range and cannot be specified.

Valid input offset ranges are:

+/- 0.5 V	when the input range is + /- 10 mV
+/- 1.0 V	when the input range is + /- 20 mV
+/- 2.5 V	when the input range is + /- 50 mV
+/- 0.5 V	when the input range is + /- 100 mV
+/- 1.0 V	when the input range is + /- 200 mV
+/- 2.5 V	when the input range is + /- 500 mV
+/- 1.0 V	when the input range is + /- 1 V

+/- 1.0 V	when the input range is + /- 2 V
+/- 5.0 V	when the input range is + /- 5 V
+/- 5.0 V	when the input range is + /- 10 V

Output Excitation

The `Output Excitation` parameter configures the output excitation. Valid output excitation voltages include 0 V, 1 V, 2 V, 5 V, 10 V.

Section II. Application Software

3. DSCview

DSCview provides immediate and easy access to one or more iDSC boards. From DSCview, communication with an iDSC board is automatically initiated and requires no programming.

DSCview provides a graphical interface to:

- Save and load workspaces
- Select system options
- Design and configure filters
- Perform signal conditioning
- Configure multiple iDSC boards
- Output data in a graph and table
- Disk log data to a text or binary file
- Server disk log data to a binary file by the server

DSCview is an invaluable diagnostic tool for confirming the proper operation of an iDSC board and for testing filter characteristics.

The following five windows are available in DSCview, and are discussed in detail in this chapter.

- Configuration Window
- Graph Window
- Table Window
- Disk Log Window
- Server Disk Log Window

Save and Load Workspaces

In DSCview you can save current workspaces and load new or saved workspaces. The extension for DSCview workspaces is `.CFG`.

The File menu item on DSCview's main menu contains options to save and load workspaces.

The following File menu options are discussed in detail below.

- `File|New`
  Opens a new workspace. If changes have been made to the current workspace, DSCview prompts you to save the changes.
- `File|Open`
  Opens an existing workspace. If changes have been made to the current workspace, DSCview prompts you to save the changes.
- `File|Close`
  Closes an opened workspace. If changes have been made to the current workspace, DSCview prompts you to save the changes.
- `File|Save`
  Saves the current workspace. If a filename has not yet been assigned, DSCview prompts you for a filename.
- `File|Save As`
  Saves the current workspace with a specified filename.
- `File|Exit`
  Exits DSCview.

In addition to loading workspaces from the file menu, a configuration may also be automatically loaded from the command line as shown below. In this example, we are assuming that `DSCview.exe` and `Graph.cfg` are located in `C:\`.

```
C:\DSCview C:\Graph.cfg
```

Start & Stop

The `Start!` and `Stop!` menu items are available from the main DSCview window.

Start!

The `Start!` menu item appears when DSCview is not acquiring data. When Start! is selected, data acquisition begins, and Start! changes to `Stop!`.

While DSCview is acquiring data the following items become gray and cannot be changed.

- File and System Options menu items of the main system.
- Selectable options of the Configuration window.
- `Graph Options|History` and `Graph Options|Display` menu items of the Graph Window.
- `Table Options|History` and `Table Options|Display` menu items of the Table Window.
- `Channels` and `Disk Log Options` menu items of the Disk Log Window.

Stop!

The `Stop!` menu item appears when DSCview is acquiring data. When Stop! is selected, data acquisition terminates, and Stop! changes to `Start!`.

System Options

The System Options are available from the main DSCview menu, and are accessible from all active windows.

The following System Options are discussed in detail below.

- `System|Address`
- `System|Board Setup Display`
- `System|Calibrate`
- `System|Commands Load`
- `System|Configuration Lock`
- `System|Memory Display`

System|Address

The `System|Address` menu item selects the iDSC board to communicate with. When selecting the iDSC board, System|Address uses the Universal Naming Convention. The default iDSC board name is \\.\Dap0 for DSC0, \\.\Dap1 for DSC1, \\.\Dap2 for DSC2, etc. For detailed information about the Universal Naming Convention, please refer to the Programming Interfaces section of this document.

System|Board Setup Display

The `System|Board Setup Display` menu item displays the setup configuration of a group of iDSC boards in the `Configuration Window`. Applications that have more than one iDSC board must enable this menu item to gain access to multiple iDSCs boards.

System|Calibrate

The `System|Calibrate` menu item calibrates the iDSC board for DC gain and offset. The first time `Start!` is selected, the iDSC board is automatically calibrated. The progress of iDSC calibration is displayed in the bottom border of DSCview.

System|Commands Load

The `System|Commands Load` menu item configures the iDSC board with the appropriate programs and coefficients. System|Commands Load should be selected only when the iDSC board configuration or filter designs change.

If the iDSC board configuration or filter designs change and `Start!` is selected, Start! automatically invokes System|Commands Load and downloads new commands to the iDSC board. Data will show up at the PC two times `Group Delay` seconds later.

If the iDSC board configuration or filter designs change and System|Commands Load is selected before Start!, data show up immediately at the PC. Data that show up immediately are actually data that were sampled group delay seconds ago.

System|Configuration Lock

The `System|Configuration Lock` menu items locks the configuration of the iDSC. This means that the number of iDSC boards, address and mode, and the Input Screen and Filter Design Screen parameters cannot be changed until the configuration is unlocked.

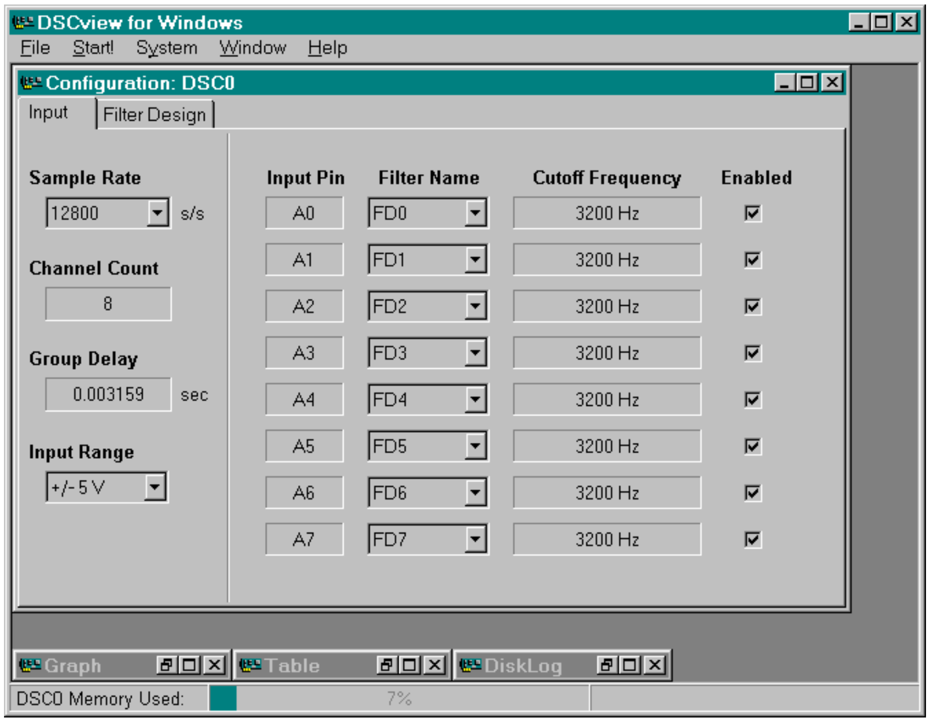
System|Memory Display

The `System|Memory Display` menu item displays the used memory on the iDSC board. System|Memory Display is useful in determining whether or not the iDSC board will be able to sustain a particular sample rate without overflowing. The memory used is displayed in the bottom border of DSCview.

Configuration Window

The Configuration Window is designed to simplify the iDSC board input configuration and filter design process. The Configuration Window is a derivative of DSC Graphical Design interface. For detailed information about the Configuration Window, please refer to the DSC Graphical Design chapter of this document.

The following figure displays the Input Screen of the Configuration Window.



Sample Rate: 12800 s/s

Channel Count: 8

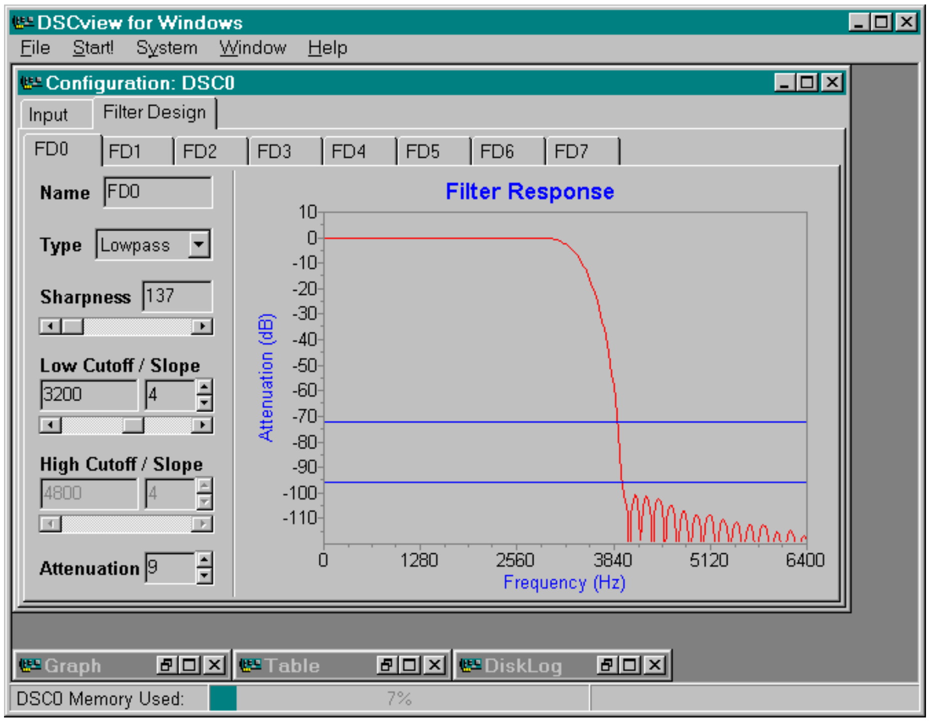
Group Delay: 0.003159 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

DSC0 Memory Used: 7%

The following figure displays the Filter Design Screen of the Configuration Window.



Name FD0

Type Lowpass

Sharpness 137

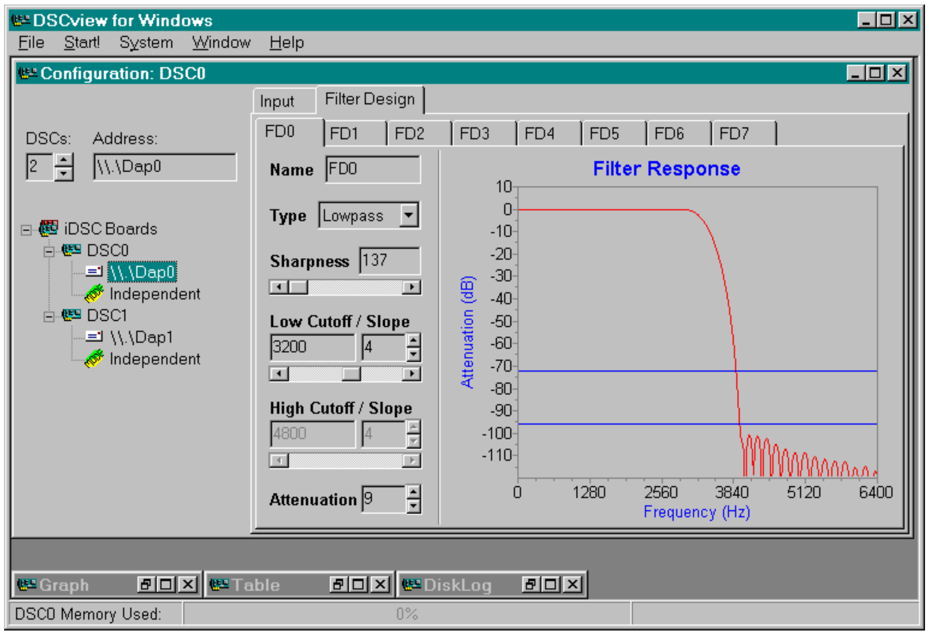
Low Cutoff / Slope 3200 4

High Cutoff / Slope 4800 4

Attenuation 9

DSC0 Memory Used: 7%

The following figure displays the Filter Design Screen of the Configuration Window with `System|Board Setup Display` checked.



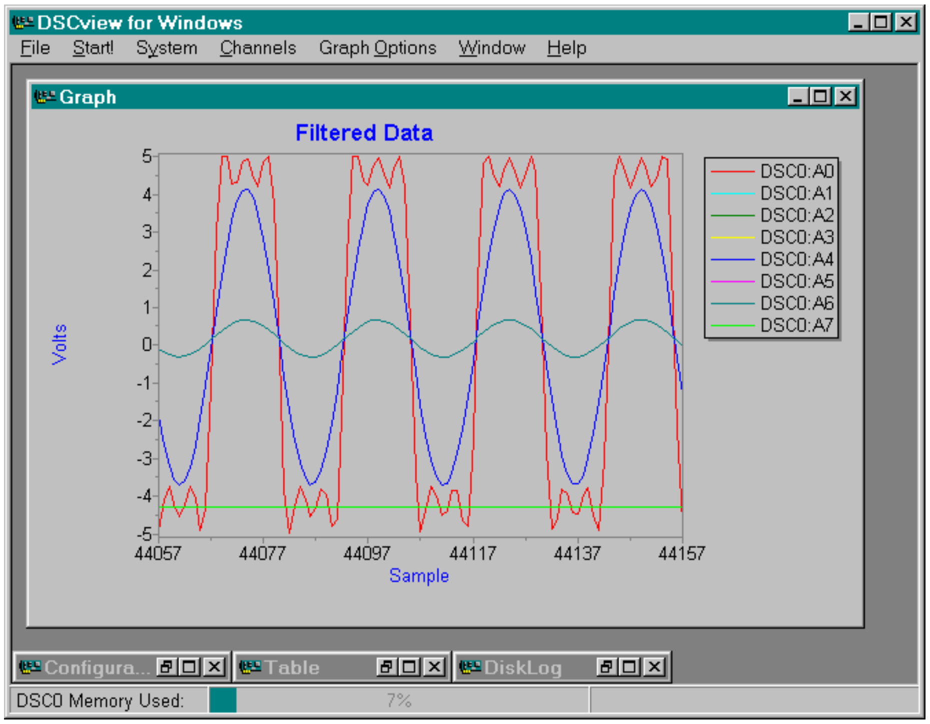
Graph Window

The Graph Window displays graphical representations of acquired and filtered data from the iDSC board. Only data from the selected channels are displayed. Any number of graph windows are allowed. To select a new graph window, select `Window|New Graph`.

When the Graph Window is active, the `Channels` and `Graph Options` menu items are available on the main menu. The `Channels` menu item displays a button grid of the enabled input pins, and the `Graph Options` menu item contains several options for configuring the graphical display. The `Graph Options` menu items are described later.

The Graph Window has zooming features. It also has channel data tracking features. These features are described later.

The following figure displays the Graph Window.



Channels

The `Channels` menu item displays a button grid of enabled iDSC board input pins. A channel is selected when the button is down and deselected when the button is up. There can be up to sixteen channels selected.

Graph Options|Enabled

The `Graph Options|Enabled` menu item enables or disables the Graph Window. A check mark beside `Enabled` signifies that the Graph Window is enabled. If the Graph Window is disabled and DSCview is started, no data are plotted.

Graph Options|History...

The `Graph Options|History` menu item determines the number of data points to store in the Graph Window. Any number of data points from 100 up to 10000 may be stored.

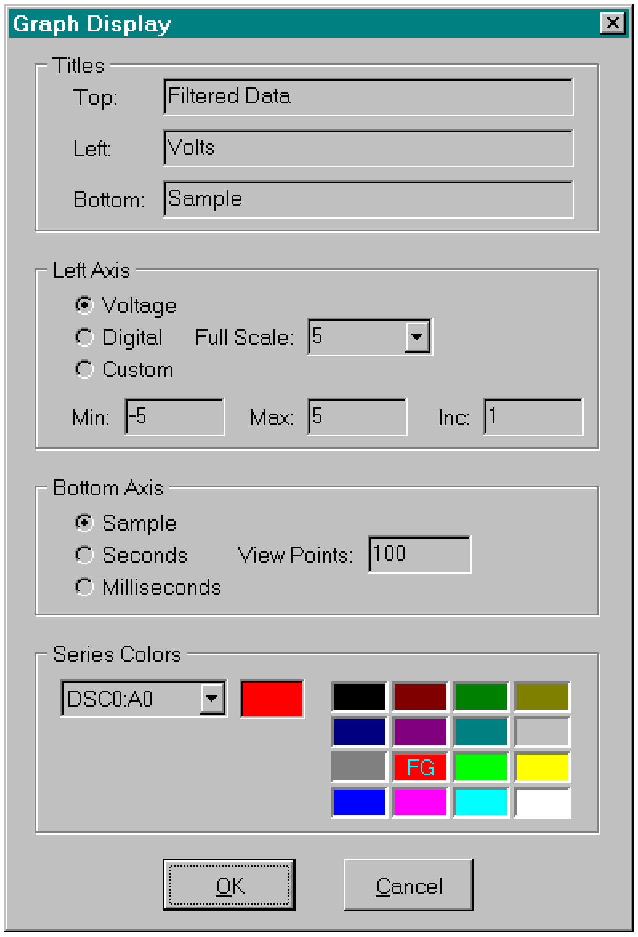
When DSCview is started, the `Graph Options|History` menu item is grayed and cannot be changed.

Graph Options|Display...

The `Graph Options|Display` menu item modifies the Graph Window display. Display items which can be modified include the titles, left axis, bottom axis, and series colors.

When DSCview is started, the `Graph Options|Display` menu item is grayed and cannot be changed.

The following figure displays the `Graph Options|Display` dialog.


Graph Display

Titles
Top: Filtered Data
Left: Volts
Bottom: Sample

Left Axis
[✓ Voltage] Digital Custom
Full Scale: 5
Min: -5 Max: 5 Inc: 1

Bottom Axis
[✓ Sample] Seconds Milliseconds
View Points: 100

Series Colors
DSC0:A0

The `Titles` box is used to select titles for the main graphical display, left axis and bottom axis. The default titles are `Filtered Data`, `Volts` and `Sample`.

The `Left Axis` box is used to configure the left axis for displaying data in `Voltage`, `Digital`, or `Custom` units. `Full Scale` is used internally to calculate an appropriate scale factor for the left axis display. The scale factor is (`Full Scale / 32768`).

Using `Voltage` units, `Full Scale` is either 5 or 10 because the input voltage range is either -5 to +5 volts or -10 to +10 volts. The scale factor is `(5 / 32768)` or `(10`

/ 32768). Using Digital units, Full Scale is 32768 because the integer range is -32768 to 32767. The scale factor is (32768 / 32768) or no scaling. Using Custom units, Full Scale is a number, x that corresponds to a 5 or 10 volt reading. The scale factor is (x / 32768).

Min and Max are used to define a range for graphically displaying the data. The display range must fall between -Full Scaleand +Full Scale or an error box will appear. Inc displays the spacing between the left axis ticks in the Min to Max range. If Inc is too small to fit all of the ticks on the display, Inc will be automatically adjusted.

The Bottom Axis box is used to configure the bottom axis for displaying data in Sample, Seconds, or Milliseconds units. The number of points that the user wishes to view per graph display are entered into the View Points field. Any number of points within the range 100 to 1024 are valid.

The Series Colors box is used to select from sixteen different colors to represent the selected channels. The legend on the right side of the Graph Window displays the selected channels and their corresponding colors. Any sequence of up to sixteen colors may be displayed.

Zooming

The Graph Window has zooming in features. To zoom in, place the cursor over the points of interest and use the left mouse button to create a rectangular box. When the left mouse button is released, the area inside the rectangular box is enlarged. You can zoom in indefinitely but the Graph Window only keeps a history of the five most recent zoomed in levels. There is also a minimum zoom in of 20 samples for the x axis and 20 counts for the y axis.

To view the saved zooms, use the right mouse button. Zoom Level shows which saved zoomed in level is currently displayed, with a maximum of five zoomed in levels. It is read only and non selectable. The Zoom Level of 0 is the original unzoomed display. Zoom Next displays the next saved zoom and Zoom Back displays the previous saved zoom. Zoom Clear clears all saved zooms.

Data Tracking

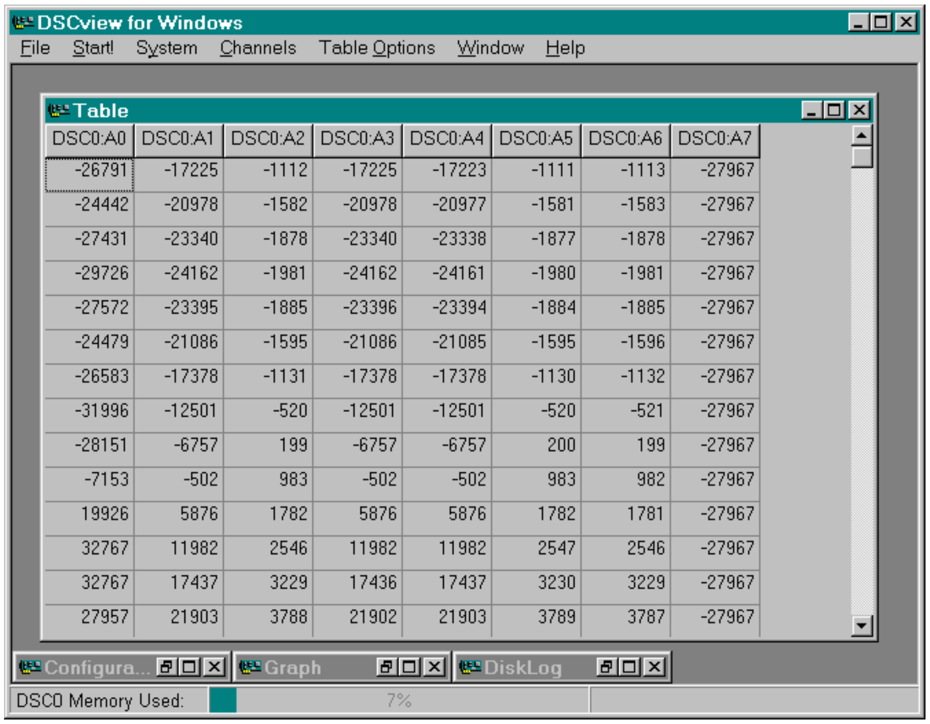
The Graph Window has channel data tracking features. To track the data of a channel, click and hold down the left mouse button over the channel of interest from the legend located on the right side of the Graph Window. Then drag the cursor over the plotting screen, and the corresponding data values will be located at the bottom left corner of the Graph Window.

Table Window

The Table Window displays text representations of acquired and filtered data from the iDSC board. Only data from the selected channels are displayed. Any number of table windows are allowed. To select a new table window, select `Window|New Table`.

When the Table Window is active, the `Channels` and `Table Options` menu items are available on the main menu. The `Channels` menu item displays a button grid of the enabled input pins, and the `Table Options` menu item contains several options for configuring the table display. The `Table Options` menu items are described later.

The following figure displays the Table Window.



DSC0:A0	DSC0:A1	DSC0:A2	DSC0:A3	DSC0:A4	DSC0:A5	DSC0:A6	DSC0:A7
-26791	-17225	-1112	-17225	-17223	-1111	-1113	-27967
-24442	-20978	-1582	-20978	-20977	-1581	-1583	-27967
-27431	-23340	-1878	-23340	-23338	-1877	-1878	-27967
-29726	-24162	-1981	-24162	-24161	-1980	-1981	-27967
-27572	-23395	-1885	-23396	-23394	-1884	-1885	-27967
-24479	-21086	-1595	-21086	-21085	-1595	-1596	-27967
-26583	-17378	-1131	-17378	-17378	-1130	-1132	-27967
-31996	-12501	-520	-12501	-12501	-520	-521	-27967
-28151	-6757	199	-6757	-6757	200	199	-27967
-7153	-502	983	-502	-502	983	982	-27967
19926	5876	1782	5876	5876	1782	1781	-27967
32767	11982	2546	11982	11982	2547	2546	-27967
32767	17437	3229	17436	17437	3230	3229	-27967
27957	21903	3788	21902	21903	3789	3787	-27967

Channels

The `Channels` menu item displays a button grid of enabled iDSC board input pins. A channel is selected when the button is down and deselected when the button is up. There is no limit on the number of channels selected.

Table Options|Enabled

The `Table Options|Enabled` menu item enables or disables the Table Window. A check mark beside `Enabled` signifies that the Table Window is enabled. If the Table Window is disabled and DSCview is started, no data are displayed.

Table Options|History...

The `Table Options|History` menu item determines the number of data points to store in the Table Window. Any number of data points from 100 to 10000 may be stored.

When DSCview is started, the `Table Options|History` menu item is grayed and cannot be changed.

Table Options|Display

The `Table Options|Display` menu item modifies the Table Window display. Display items which can be modified include the column widths and row heights.

In addition to modifying the column widths and row heights as a group, each column in a display may have a different width. To change the width of an individual column, place the mouse over the column separators and click the left mouse button and then drag the mouse left or right until you have obtained the desired column width.

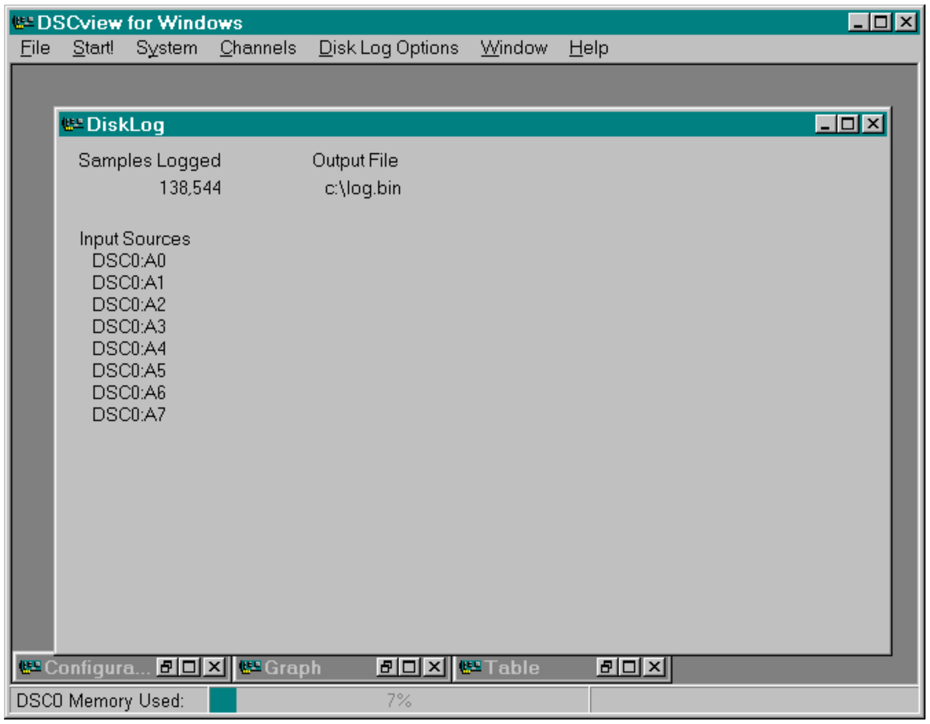
When DSCview is started, the `Table Options|Display` menu item is grayed and cannot be changed.

Disk Log Window

The Disk Log Window logs acquired and filtered data from the iDSC board to a disk file in binary or text format. Only data from the selected channels are logged. Any number of disk log windows are allowed. To select a new disk log window, select `Window|New Disk Log`. Each disk log window only allows logging data from within the same iDSC.

When the Disk Log Window is active, the `Channels` and `Disk Log Options` menu items are available on the main menu. The `Channels` menu item displays a button grid of the enabled input pins, and the `Disk Log Options` menu item contains several options for logging data to disk. The `Disk Log Options` menu items are described later.

The following figure displays the Disk Log Window.



Samples Logged
138,544

Output File
c:\log.bin

Input Sources
DSC0:A0
DSC0:A1
DSC0:A2
DSC0:A3
DSC0:A4
DSC0:A5
DSC0:A6
DSC0:A7

DSC0 Memory Used: 7%

Channels

The `Channels` menu item displays a button grid of enabled iDSC board input pins. A channel is selected when the button is down and deselected when the button is up. There is no limit on the number of channels selected.

When the channels are selected or deselected, the Disk Log Window updates the selected channels under the `Input Sources` label. Each disk log window only allows channel selection within the same iDSC.

When DSCview is started, the `Channels` menu item is grayed and cannot be changed.

Disk Log Options|Open File

The `Disk Log Options|Open File` menu item opens a new file for logging data to disk. When a file is opened, the filename is displayed under the `Output File` label.

Selecting either the `.BIN` or `.TXT` extension from `List files of type` automatically marks the `Disk Log Options|Format` as `Binary` or `Text`. Note that all file extensions must be explicitly typed.

When DSCview is started, the `Disk Log Options` menu item is grayed and cannot be changed.

Disk Log Options|Close File

The `Disk Log Options|Close File` menu item closes the opened log file.

To view a log file in an editor or environment other than DSCview, it is important to first close the log file in DSCview before switching to the other environment.

Disk Log Options|Format

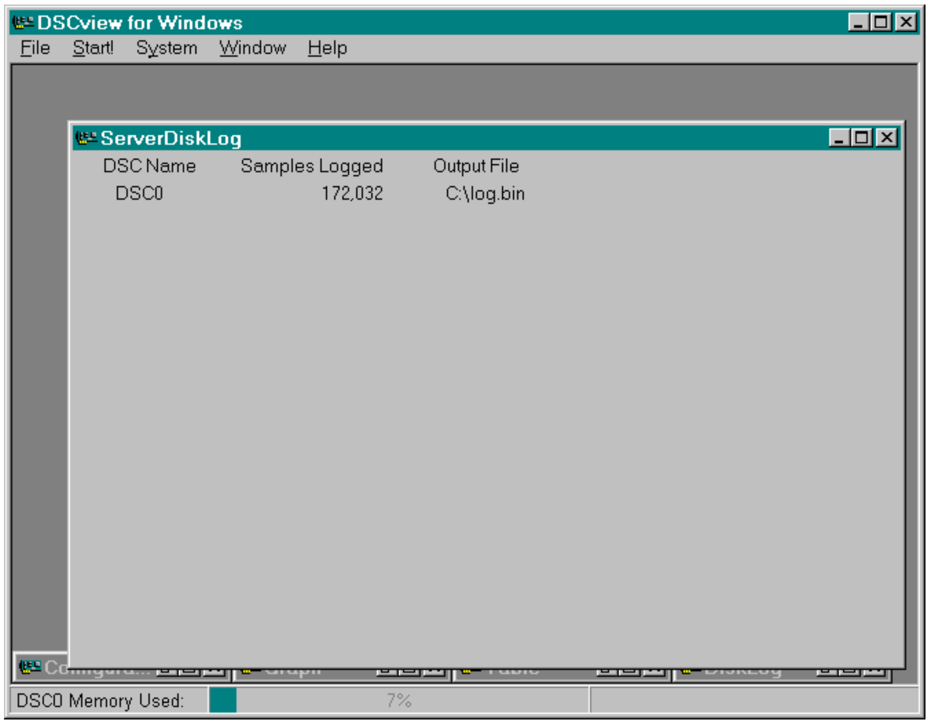
The `Disk Log Options|Format` menu item selects the format for logging data to disk. Data may be formatted as binary or text, and a check mark beside a formatting option indicates which format is selected. Data logged as text are delimited by tabs.

When a new file is opened with the `Disk Log Options|Open File` menu option, the file extension may be selected using `List files of type`. Selecting either the `.BIN` or `.TXT` extension from `List files of type` automatically marks the `Disk Log Options|Format` as `Binary` or `Text`.

Server Disk Log Window

The Server Disk Log Window is available only when server disk logging is enabled by clicking the right mouse button in the Group Interface and selecting `Server Disk Log`. This window displays the iDSC board name, the number of samples logged, and the output file name.

The following figure displays the Server Disk Log Window.



```
DSC Name     Samples Logged     Output File
  DSC0              172,032       C:\log.bin
```

DSC0 Memory Used: 7%

4. Using the iDSC Board with DASY*Lab*

The iDSC board includes a driver to seamlessly integrate with DASY*Lab* 4.x. Combining DASY*Lab* with the iDSC board provides many convenient features:

- Access to standard iDSC board filter parameters through an iDSC board module
- iDSC board channels wired directly to other DASY*Lab* modules
- Additional iDSC board modules to access more than one iDSC board
- All iDSC board parameters saved with the DASY*Lab* worksheet
- Master/slave mode used to synchronize several iDSC boards

Installing iDSC Board Support for DASY*Lab*

When the iDSC board software is installed, a directory named `IDSC\APPSW\DLAB` is created that contains DASY*Lab* support files. Copy this directory and its contents to the DASY*Lab* installation directory. The following example displays how to copy the files in a DOS shell:

```
XCOPY    *.*   "C:\PROGRAM FILES\DASYLAB"
```

Note: Replace the directory names above with the correct paths for your PC.

To enable the iDSC board menu, edit the file `DASYLAB.INI` located in the Windows directory. Find the section named `[EXTEND]` and modify the `DLL1` line to appear as follows:

```
DLL1=DLAB_DSC.DLL
```

Start DASY*Lab* to verify that installation was successful. A new menu option will appear in the main menu titled "Microstar iDSC." Use *File/Open* to open the example `DSC1.DSB` in the DASY*Lab* directory. The example will display an iDSC board module and will show one trace on a graph when the worksheet is started.

Using an iDSC Board Module with DASY*Lab*

To place an iDSC board module on the worksheet, select *New iDSC* from the "Microstar iDSC" menu. An iDSC board module will appear with one active channel. The outputs of the iDSC board module may be wired to other DASY*Lab* modules.

To configure the iDSC board, double-click on the iDSC board module to display the standard iDSC board configuration screen. You may activate additional channels and configure the filter parameters for each channel. The iDSC board configuration dialog box used in DASY*Lab* is the same dialog box used by DSCview and other iDSC board applications.

Running the DASY*Lab* iDSC Board Examples

Several examples show how DASY*Lab* interfaces with the iDSC board. The examples are located in the `IDSC` directory under the DASY*Lab* install directory. To run the examples, verify that the iDSC board and iDSC board software are installed and that DSCview works properly. Exit DSCview before running the DASY*Lab* iDSC board examples. The DASY*Lab* examples are titled "`DSCx.DSB`" where `x` is the example number.

Using More Than One iDSC Board with DASY*Lab*

Up to fourteen iDSC boards may be used with DASY*Lab*. Select *New iDSC* from the "Microstar iDSC" menu to create a new module for each board. An iDSC board must be installed for each new iDSC board module placed on the DASY*Lab* worksheet or an error message will be displayed. Configure each new module in the same manner as the first iDSC board module.

Synchronizing Several iDSC Boards

The DASY*Lab* iDSC board module supports master/slave mode which allows synchronization between several iDSC boards. Synchronization provides true simultaneous sampling across several iDSC boards. To enable master/slave mode, select *Use Master/Slave Mode* from the “Microstar iDSC” menu.

In DASY*Lab*, the first iDSC board, `iDSC0`, is always the master board. All additional iDSC boards are slave boards. Slave iDSC boards are automatically configured to use the same sample rate as the master iDSC board. Note that this automatic configuration will cause iDSC board parameters to change if the sample rate is not already set to the same value as that of the master iDSC board. For this reason, we recommend saving the worksheet before selecting the *Use Master/Slave Mode* option.

Note: Refer to the Multiple Board Installation section of this document for hardware configuration details of master/slave boards.

Special Addressing

There may be times when DASY*Lab* needs to access an iDSC board that is not at the default UNC address. This may occur when an iDSC board is used in a PC with DAP boards, or when DAPcell is used to access an iDSC board in another PC. To change the default address that DASY*Lab* uses edit the file `DASYLAB.INI`. Add the following section and key words:

```
[iDSC]
Addr0 = \\.\dap0
```

Modify the address to match the desired address. Additional lines may be added for more than one iDSC board.

5. Using the iDSC Board with LabVIEW

LabVIEW provides a graphical programming environment for which the iDSC board provides an ideal signal conditioning and data acquisition front end. A LabVIEW application can call iDSC board functions in the DSCIO DLL to acquire the full programmability and power of the iDSC board.

LabVIEW accesses iDSC board functions in DSCIO DLL through the `Call Library Function` node, which is a VI library function in LabVIEW. It is easy to use with a dialog box to configure all of the parameters required for each function.

Microstar Laboratories simplifies the task further by providing this package - iDSC Board support for LabVIEW. This package contains this reference manual and `DSC.LLB`, which contains the following components.

1. A collection of `Call Library Function` nodes for each functions in DSCIO DLL
2. Several subVIs to aid reducing the development time for an application
3. Several examples to show the use of many of the `Call Library Function` nodes and subVIs.

The iDSC support for LabVIEW supports LabVIEW version 5.1 or later.

Installation

The following steps show the procedure on installing iDSC Board support of LabVIEW.

1. LabVIEW must be installed correctly. Please refer to the LabVIEW installation instructions.
2. Install iDSC Development from the DAPtools CD. The default installed directory is `C:\Program Files\Microstar Laboratories\iDscDev`. The iDSC Board Support for LabVIEW can be found in the `APPSW\BIN` subdirectory.
3. To verify the iDSC board and its software are installed and running properly, please run DSCview in the `APPSW\BIN` subdirectory. Exit DSCview before running any iDSC board examples or applications in LabVIEW.

Creating an iDSC Board Application in LabVIEW

A new application in LabVIEW may be created by modifying one of the examples described below. The following section provides an outline about how LabVIEW interfaces to the iDSC board.

An iDSC board application should performs the following steps:

1. Opens a handle to an iDSC board with the function `DscHandleOpen`.
2. Defines the configuration of the board using a dialog box, a saved configuration file, or iDSC board configuration functions
3. Starts data acquisition with the function `DscStartAcquiring`.
4. Reads and processes the acquired data.
5. Stops data acquisition with the function `DscStopAcquiring`.
6. Closes the handle to the iDSC board with the function `DscHandleClose`.

The iDSC Init subVI provides all of the initialization routines, step 1 to 3, in one subVI.

After initialization, an application can read data from the iDSC board by using either `DscBufferGet` or `DscBufferGetEx`. The iDSC Read subVI performs the read data routines, step 4, in one subVI.

The iDSC Close subVI provides all of the termination routines, step5 and 6, to stop acquisition and terminate communication with the iDSC.

It is important to terminate the communication with the iDSC board using the provided functions in DSCIO DLL. The `STOP` button on the button bar does not stop the iDSC board, meaning THE iDSC WILL CONTINUE TO RUN EVEN THOUGH THE LABVIEW STOP BUTTON WAS PRESSED. It is best to put a button on the user panel that controls the termination of a run. The `STOP` button should enable the final sequence to run the iDSC Close subVI which closes the ACCEL32 Handle assigned to the application. Please see examples on how to accomplish this.

Running the LabVIEW iDSC Board Examples

Several examples applications are included and demonstrate how LabVIEW interfaces with an iDSC board. The examples can be found in `DSC.LLB` in the `APPSW\LABVIEW` subdirectory under the installed directory. To run the examples, an iDSC board and its software have to be installed and running properly.

App01 - BASIC

This example provides a very easy to use interface to an iDSC board. It uses one object, `iDSC` subVI, to provide access to iDSC configuration options and resulting data. This example reconfigures the iDSC board for each new block of data. For continuous operation and even more flexible options see the next example, `App02`.

App02 - GRAPH

This example is similar to App01 but adds transferring data continuously and configurability in accessing an iDSC board. This example uses an iDSC Init subVI to initialize iDSC board communication. The iDSC Init subVI will return the number of active channels. Based on this information, an iDSC Read subVI is used to read blocks of data and send the data to a graph, which automatically configures itself for the proper number of channels.

App03 - LOG

This example is similar to App02 but adds logging data to a file. Note that LabVIEW may use a special data format for data storage that may need conversion if read by applications other than LabVIEW.

App04 - LOGVW

This example shows how to read the file created by App03. This example is configured to read data for eight channels. If the data file is acquired for a different number of channels, the Number of Channels field needs to be modified accordingly.

App05 - DaplFFT

This example shows how to use DAPL interface. It configures an iDSC board with DAPL commands, reads data, and graphs the data with one trace for each channel. In this example, the DAPL commands configure the iDSC board to calculate forward fast Fourier transforms (FFT) of blocks of real-values data and send an amplitude spectrum to this example in LabVIEW. The amplitude spectrum received from iDSC Read will be sent to a graph for display.

App06 - DaplCC

This example is similar to App05 but applies custom commands `BZTRUNC` and `RAVE` to input channels instead of FFT. The `BZTRUNC` command truncates any number below 0 in an input channel, and RAVE computes the running average of the specified number of data points, 100 in this example, in an input channel. In this example, both raw and analyzed data for the input channels are sent to this example. The data received from iDSC Read will be sent to a graph for display.

App07 - Disk Logging (1 iDSC)

This example shows how to stream data directly to a disk file by using DAPcell Server disk logging service. This is implemented by the DiskLog subVI, which loads configurations to a server by a wrapper function `MslDscServerDiskLogConfigSet` . While the server is logging data to a disk file, the number of data being logged will be queried by using a Num Data subVI.

The server continues to log data to the disk file until the specified amount of data in DiskLog subVI, which is 100000 values per channel in this case, have been recorded, or the STOP button is pressed.

Before running this example, please make sure the following configurations are correct.
- The disk logging option is enabled and a valid default path is entered in Windows Control Panel | Data Acquisition Processor | Disk I/O.

App08 - Disk Logging (2 iDSC with synchronization)

This example is similar to App07 but adds one more iDSC board. The two iDSC boards are synchronized as master and slave by using iDSC MaSl subVI. Similar to App07, this example logs data to a disk file by a server and queries for the number of byte being logged to each file for each board.

The server continues to log data to the disk file until the specified amount of data in DiskLog subVI, which is 100000 values per channel in this case, have been recorded for each boards, or the STOP button is pressed.

Before running this example, please make sure the following configurations are correct.
- Two iDSC 1816 boards are connected by a synchronization cable, with part number MSCBL 078.
- The disk logging option is enabled and a valid default path is entered in Windows Control Panel | Data Acquisition Processor | Disk I/O.

App09 – A Group of iDSC

This example shows how to use group services provided by DSCIO DLL. In this example a DSCIO DLL function `DscGroupConfigDialogShow` is called to display a modal dialog screens for graphical configuration of multiple iDSC boards. It loads a configuration file `GROUP.DSC` for a group of two iDSC boards, which are configured as independent. The two iDSC boards can be synchronized by setting the approperiate mode. For more information, please see `DscGroupConfigDialogShow`.

The iDSC Read subVI are used to read blocks of data from the iDSC boards. The data will be sent data to graphs, which automatically configures themselves for the proper number of channels based on the dimension of the data array.

DLL Reference

This package contains a list of `Call Library Function` nodes that are configured to call the functions in DSCIO DLL and MSLAPP DLL. The list can be found in `DSC.LLB`, which is located in the `APPSW\LABVIEW` subdirectory under the installed directory.

DSCIO DLL Function Reference

This DSCIO DLL provides a complete set of functions for communicating with iDSC boards. The table below shows a complete list of `Call Library Function` nodes and its corresponding functions in DSCIO DLL. The name of each `Call Library Function` node may slightly different than the corresponding function in DSCIO DLL, but they share the same parameters list. For more information on the parameter lists, please see DSCIO Reference manual.

`Call Library Function` node in `DSC.LLB`	**DSCIO DLL Functions**
DscHandleOpenA	`DscHandleOpen`
DscHandleClose	`DscHandleClose`
DscCalibrate	`DscCalibrate`
DscCommandsLoad	`DscCommandsLoad`
DscStartAcquiring	`DscStartAcquiring`
DscStopAcquiring	`DscStopAcquiring`
DscBufferAvail	`DscBufferAvail`
DscBufferGet	`DscBufferGet`
DscBufferGetEx	`DscBufferGetEx`
DscConfigRead	`DscConfigRead`
DscConfigWrite	`DscConfigWrite`
DscConfigWriteSize	`DscConfigWriteSize`
DscConfigDialogShow	`DscConfigDialogShow`
DscFilterNameGet	Obsolete
DscFilterNameSet	Obsolete
DscFilterParametersGet	`DscFilterParametersGet`
DscFilterParametersSet	`DscFilterParametersSet`
DscPinToFilterMapGet	`DscPinToFilterMapGet`
DscPinToFilterMapSet	`DscPinToFilterMapSet`
DscFilterIndexA	`DscFilterIndex`
DscGroupDelay	`DscGroupDelay`
DscAddressGetA	`DscAddressGet`

DscAddressSetA	`DscAddressSet`
DscIdGetA	`DscIdGet`
DscIdSetA	`DscIdSet`
DscOperateModeGet	`DscOperateModeGet`
DscOperateModeSet	`DscOperateModeSet`
DscSampleRateGet	`DscSampleRateGet`
DscSampleRateSet	`DscSampleRateSet`
DscPinEnabledGet	`DscPinEnabledGet`
DscPinEnabledSet	`DscPinEnabledSet`
DscPinEnabledCount	`DscPinEnabledCount`
DscMasterGet	`DscMasterGet`
DscMasterSet	`DscMasterSet`
DscSlaveCount	`DscSlaveCount`
DscMemoryUsed (new)	`DscMemoryUsed`
DscLastErrorTextGetA	`DscLastErrorTextGet`
DscLastErrorTextSetA	`DscLastErrorTextSet`
DscDaplTextSetA	`DscDaplTextSet`
DscDaplTextLengthGet	`DscDaplTextLengthGet`
DscDaplTextGetA	`DscDaplTextGet`
DscDaplCCDownloadGet	`DscDaplCCDownloadGet*`
DscDaplCCDownloadSet	`DscDaplCCDownloadSet*`
DscDaplCCListGetA	`DscDaplCCListGet*`
DscDaplCCListLengthGet	`DscDaplCCListLengthGet*`
DscDaplCCListSetA	`DscDaplCCListSet*`
DscDaplCCStackSizeGet	`DscDaplCCStackSizeGet*`
DscDaplCCStackSizeSet	`DscDaplCCStackSizeSet*`
DscServerDiskLogEnabledSet (new)	`DscServerDiskLogEnabledSet`
DscServerDiskLogEnabledGet (new)	`DscServerDiskLogEnabledGet`
DscServerDiskLogBytes (new)	`DscServerDiskLogBytes`
DscXbCalibrate (new)	`DscXbCalibrate`
DscXbEnabledGet (new)	`DscXbEnabledGet`
DscXbEnabledSet (new)	`DscXbEnabledSet`
DscXbPinConfigGet (new)	`DscXbPinConfigGet`
DscXbPinConfigSet (new)	`DscXbPinConfigSet`
DscGroupConfigDialogShow (new)	`DscGroupConfigDialogShow`
DscGroupHandleOpen (new)	`DscGroupHandleOpen`
DscGroupHandleClose (new)	`DscGroupHandleClose`
DscGroupAddOne (new)	`DscGroupAddOne`
DscGroupDeleteOne (new)	`DscGroupDeleteOne`
DscGroupCount (new)	`DscGroupCount`
DscGroupDsc (new)	`DscGroupDsc`
DscGroupConfigRead (new)d	`DscGroupConfigRead`

DscGroupConfigWrite (new)	`DscGroupConfigWrite`
DscGroupConfigWriteSize (new)	`DscGroupWriteSizes`

* For more information, please see obsolete interface in the
DSCIO Function Summary.

MSLAPP DLL Function Reference

Due to the data types in LabVIEW, some DSCIO functions, which initialized by structures, cannot be accessed directly in LabVIEW. A wrapper function is implemented to interface between DSCIO DLL and LabVIEW. The wrapper function builds the structure, and passes it to the DSCIO function it interfaces with. All wrapper functions have the prefix Msl with the function for which they interface.

DSCIO DLL Routines	`Call Library Function` **node in** `DSC.LLB`
DscServerDiskLogConfigSet	`MslDscServerDiskLogConfigSet`

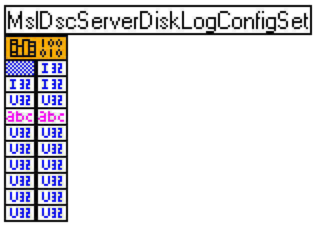
Data Format

The DSCIO DLL function reference uses C data types when specifying the type of each parameter. Here is a brief cross references to help determine corresponding LabVIEW data types:

C Data Type	**LabVIEW Data Type**
Char*	C String Pointer
Int	Signed 32-bit Integer
Short *	Signed 16-bit Integer
Long	Unsigned 32-bit Integer
Double	Double
HDSC	Signed 32-bit Integer
TbufferGetEx	Array Data Pointer of Signed 32-bit Integer. See iDSC Read subVI for an example of using this structure in LabVIEW. See DSCIO Reference Manual for details.
TDscIoInt64	Array Data Pointer of Signed 32-bit Integer. For example usage, please see Num Data subVI. For more information, please see DSCIO Reference Manual.

TfilterParam	Array Data Pointer of Signed 32-bit Integer. For more information, please see DSCIO Reference Manual.
TxbPinConfig	Array Data Pointer of Signed 32-bit Integer. For more information, please see DSCIO Reference Manual.

MslDscServerDiskLogConfigSet



Input	Name (Type)	Corresponding parameters in `TServerDiskLogConfig` **and brief descriptions**	Output	Pass-throug h
1:	*hDsc (Integer)*	---	1:	True
2:	*Flag (Long)*	`DwFlags` Specifies various logging options.	2:	True
3	*LogFile (String)*	`pszFileName` Points to a null-terminated string that specifies the name of the disk logfile.	3:	True
4:	*FileShareMode (Long)*	`dwFileShareMode` Specifies the file share properties of the disk logfile.	4:	True
5	*OpenFlags (Long)*	`dwOpenFlags` Specifies how file opening is to be handled.	5:	True
6:	*FileFlagsAttributes (Long)*	`dwFileFlagsAttributes` Specifies additional file attributes.	6:	True
7:	*BlockSize (Long)*	`dwBlockSize` Specifies the minimum amount of data, in bytes, to write to the	7:	True

		logfile at one time.		
8:	*Lowi64 (Long)*	`I64MaxCount` Specifies the low 32-bit maximum number of bytes to log.	8:	True
9:	*Highi64 (Long)*	`I64MaxCount` Specifies the high 32-bit maximum number of bytes to log.	9:	True

This `Call Library Function` node builds the structure `TServerDiskLogConfig` and passes it to `DscServerDiskLogConfigSet`, which initiates a disk logging session between an iDSC board specified by *`hDsc`* and a disk file specifies by `LogFile`. The parameter `BlockSize` is provided for disk transfer optimization. The default value is 8192.

If a full path is not given for the parameter `LogFile`, the log file resides in the default directory specified in the Control Panel | Data Acquisition Processor | Disk I/O on the server PC.

The disk logging sessions starts when `DscStartAcquiring` is invoked. Once it starts, it continues until the number of bytes specified in `Lowi64` and `Highi64` has been logged or until `DscStopAcquiring` or `DscHandleClose` is invoked on `hDsc`.

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

SubVIs Reference

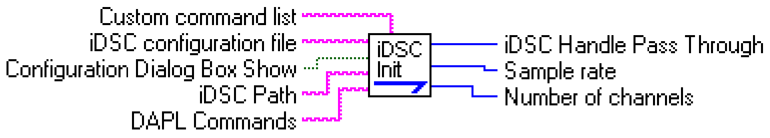
This package provides several subVIs to make it easy to configure and cleanup iDSC board communication. In LabVIEW if you select Show | Help from the Help menu, and place the mouse cursor over the subVI, diagrams as shown below will appear. To place a subVI onto a LabVIEW diagram:

1. Right click on the diagram.
2. Choose "Select a VI".
3. Open `DSC.LLB` and select the desire subVI.

In the following subVIs, most input parameters are optional. If the input parameters are missing, default values will be used.

iDSC Init

This subVI provides an easy way to configure an iDSC board. It allows the user to access different boards, download DAPL and custom commands, and select a previously saved iDSC board filter configuration.



iDSC Init has five inputs:

1. `Custom Command list` is a list containing names and size of custom commands.
   String.
   Default is `(None)`.
2. `iDSC configuration file` contains the filename of an iDSC board configuration.
   String.
   Default is `IDSC1.DSC`.
3. `Configuration Dialog Box Show` determines whether the iDSC board configuration dialog box is displayed.
   Boolean.
   Default is `TRUE`
4. `iDSC Path` is an UNC path specifies the target iDSC board to be opened.
   String.
   Default is `\\.\Dap0`.

5. `DAPL Commands` contains DAPL commands for configuring an iDSC board
   String.
   Default is `(None)`.

iDSC Init has three outputs:

1. `iDSC handle Pass Through` is the handle of the iDSC board.
   Integer.
2. `Sample rate` reports how fast the iDSC is acquiring data.
   Integer.
3. `Number of channels` reports the number of active channel.
   Integer.

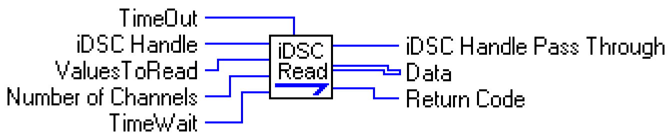
iDSC Init performs the following operations:

1. Opens a handle to the iDSC board specified by `iDSC Path` with the function `DscHandleOpen`.
2. Defines custom commands with `DscDaplCCListSetA` and enables downloading with `DscDaplCCDownloadSet` if `Custom Command list` is not equal to `(None)`.
3. Defines DAPL commands with `DscDaplTextSetA` if `DAPL Commands` is not equal to `(None)`.
4. Attempts to load the specified iDSC board configuration file with `DscConfigRead`, and defaults to the standard configuration.
5. If `Show dialog box?` input option is true, an iDSC board configuration dialog box will be loaded with `DscConfigDialogShow`.
6. Saves the configuration to a file with `DscConfigWrite` after a prompt to the user to replace an old file. If the file does not exist, it will be created. If no file name is specified, the default file will be used.
7. Begins data acquisition with the function `DscStartAcquiring`.
8. Gets the sample rate with the function `DscSampleRateGet`.
9. Gets the active channels with the function `DscPinEnabledGet`, counts and returns the number of active channels.

The inputs `Custom Command list` and `DAPL commands` normally are not used. They can be used if data processing is desired.
If you are using more than one iDSC board, it generally is the best to make a copy of iDSC Init, and provides an address to a target iDSC board and a configuration file if there is any.

iDSC Read

This subVI gets one block of data from an iDSC board.



iDSC Read has five inputs:

1. `TimeOut` is the maximum amount of time in milliseconds that the get operation should complete. If it fails to complete in this amount of time, the service aborts the operation.
   Integer.
   Default is `10000`.
2. `iDSC Handle` specifies the handle to the target iDSC board. It has to be passed by iDSC Init, or previously opened `DscHandleOpen`.
   Integer.
   Default is `0`.
3. `ValuesToRead` specifies the number of data per channel should get for each operation.
   Integer.
   Default is `500`
4. `Number of Channels` is the number of active channel.
   Integer.
   Default is `1`.
5. `TimeWait` is the maximum amount of time in milliseconds that the get operation can be blocked waiting for data. If no data show up in that amount of time, the service aborts the operation.
   Integer.
   Default is `10000`.

iDSC Read has three outputs:

1. `iDSC Handle Pass Through` is the handle of the iDSC board being passed through.
   Integer.
2. `Data` is a pointer to an array, which contains data from the iDSC board.
   Array pointer.
3. `Return Code` reports the result of the get operation. If the get operation is succeeds, it contains the number of data bytes read. If the get operation fails, it contains -1.
   Integer.

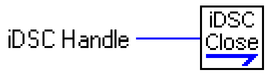
iDSC Read performs the following operations:

1. Builds and initializes an array for the required structure `TBufferGet`.
2. Builds and initializes a one-dimensional array for storing the returned data.

3. By passing the arrays to the function `DscBufferGetEx`, iDSC Read gets data from the iDSC board specifies by `iDSC Handle`.
4. Re-dimension the returned data array as a two-dimensional array with size M by N, where M is `ValuesToRead` and N is `Number of Channels`.

iDSC Close

This subVI terminates the communication with the iDSC board.



iDSC Close has one input:

1. `iDSC Handle` specifies the handle to the target iDSC board. It has to be passed by iDSC Init, or previously opened `DscHandleOpen`.
   Integer.
   Default is `0`.

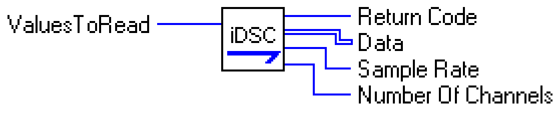
iDSC Close has no output:

iDSC Close performs the following operations:

1. Stops data acquisition on the iDSC board specified by `iDSC Handle` with the function `DscStopAcquiring`.
2. Terminates the communication with the iDSC boards specified by `iDSC Handle` with the function `DscHandleClose`.

iDSC

This subVI initiates a communication with an iDSC, reads one block of data, and terminates the communication.



iDSC has one input:

1. `ValuesToRead` specifies how many data per channel should be get for each operation.
   Integer.
   Default is `500`

iDSC has four outputs:

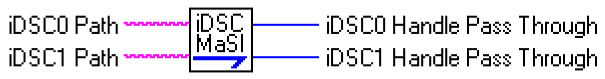
1. `Return Code` reports the result of the get data operation. If the get data operation is succeeds, this variable contains the number of data bytes read. If the get data operation fails, this variable contains -1.
   Integer.
2. `Data` is a pointer to an array, which contains data from the iDSC board.
   Array pointer.
3. `Sample rate` reports how fast the iDSC is acquiring data.
   Integer.
4. `Number of channels` reports the number of active channel.
   Integer.

iDSC performs the following operations:
1. Initiates a communication with iDSC Init subVI.
2. Reads a block of `Number of Values To Read` data with iDSC Read subVI.
3. Terminates the communication with iDSC Close subVI.

For example usage, please see App01.

iDSC MaSl

This sub-VI initiates a communication with two iDSC boards and synchronizes them by setting master/slave properties.



iDSC MaSl has two inputs:
1. `iDSC0 Path` is an UNC path specifies the target iDSC board to be opened, and it will be configured as a master board.
   String.
   Default is `\\.\Dap0`.
2. `iDSC1 Path` is an UNC path specifies the target iDSC board to be opened, and it will be configured as a slave board for `iDSC0 Path`.
   String.
   Default is `\\.\Dap1`.

iDSC MaSl has two outputs:
1. `iDSC0 Handle Pass Through` is the handle of the master iDSC board.
   Integer.
2. `iDSC1 Handle Pass Through` is the handle of the slave iDSC board.
   Integer.

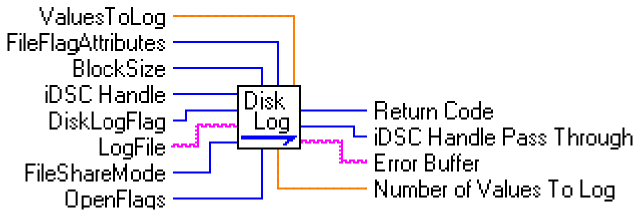
iDSC MaSl performs the following operations:

1. Open handles to iDSC boards specified by `iDSC0 Path` and `iDSC1 Path` with the function `DscHandleOpen`.
2. Connects the slave board at `iDSC1 Path` and the master board at `iDSC0 Path` with `DscMasterSet`.

This subVI configures the boards in software only. The configuration for master and slave must be done in hardware by using a special cable. For more information, please see Master/Slave Configuration in the DSCIO Reference Manual.

For example usage, please see App08.

DiskLog



DiskLog has two inputs:

1. `ValuesToLog` specifies the amount of data will be logged from each active channel.
   Double.
   Default is `100000` data per channel.
2. `FileFlagAttributes` specifies additional file attributes.
   Integer.
   Default is `1`, which means normal attributes.
3. `OpenFlags` specifies how file opening is to be handled.
   Integer.
   Default is 2, which means always open an existing file. If the file does not exist, it will be created.
4. `iDSC Handle` specifies the handle to the target iDSC board. It has to be passed by iDSC Init, or previously opened `DscHandleOpen`.
   Integer.
   Default is 0.
5. `DiskLogFlag` specifies various logging options.
   Integer.
   Default is 1, which means log on the same side of the network connection as the iDSC.

6. `LogFile` specifies the name of the log file.
   String.
   Default is `data.bin`.
7. `FileShareMode` specifies the file share properties of the `LogFile`.
   Integer.
   Default is `1`, which means the file can be read by another process.
8. `BlockSize` specifies the minimum amount of data, in bytes, to write to the `LogFile` at one time.
   Integer.
   Default is `8192`.

DiskLog has four outputs:

1. `Return code` is 1 if the server succeeds on setting the configuration for disk logging. It is 0 if the server fails.
   Integer.
2. `iDSC handle Pass Through` is the handle of the iDSC board being passed through.
   Integer.
3. `Error Buffer` contains the error message if it fails to configure for sever disk logging.
   String.
4. `Number of Values To Log` indicates the amount of data will be logged to `LogFile.` It is the product of number of active channels and `ValuesToLog`.
   Double.

DiskLog performs the following operations:

1. Converts `ValuesToLog` to total number of bytes to read by multiplying `ValuesToLog`, number of active channels from `DscPinEnabledCount`, and two.
2. Calls the wrapper function `MslDscServerDiskLogConfigSet` to initiate server disk logging.
3. Sets the state of the server disk logging option with the function `DscServerDiskLogEnabledSet`.
4. Returns the number of values will be logged for all channels in `Number of Values To Log.`

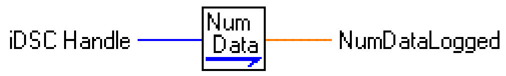
The iDSC 1816 board has to be configured for server disk logging before start acquiring data. So, a Disk Log subVI has to be called before `DscStartAcquiring`.

If a full path is not given for `LogFile`, the log file resides in the default directory specified in the Control Panel | Data Acquisition Processor | Disk I/O on the server PC.

For example usage, please see App07 and App08.

Num Data

This subVI queries for the number of bytes being logged to a disk file by a server.



Num Data has one input:

1. `iDSC Handle` specifies the handle to the target iDSC board. It has to be passed by iDSC Init, or previously opened `DscHandleOpen`.
   Integer.
   Default is 0.

Num Data has one outputs:

1. `NumDataLogged` specifies how many data have been logged by the server.
   Double.

Num Data performs the following operations:

1. Initializes a two-element data array.
2. Queries for the number of bytes being logged by a server with the function `DscServerDiskLogBytes`.
3. Recovers the result and stores it in a `DOUBLE`.

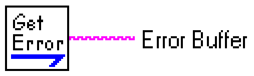
This subVI queries for the number of bytes being logged to a disk file by a server. Since the function `DscServerDiskLogBytes` returns a 64-bit integer, which is not supported by LabVIEW, this subVI is created to interface between DSCIO and LabVIEW. The results are stored in two 32-bit integers. The first and second elements of i64Count represent the low and high 32-bit of the result respectively. The 64-bit result can be recovered by performing the following calculation:

$$64\text{-}bit\ result = low\ 32\text{-}bit + high\ 32\text{-}bit \times 2^{32}$$

The result of the calculation is stored in a `DOUBLE` in LabVIEW.

Get Error

This subVI gets the last error message that occurred in the DSCIO DLL.



Get Error has no input:

Get Error has one outputs:

1. `Error Buffer` contains the error message.
   String.

Get Error performs the following operations:

1. Creates and initializes a buffer to store the error message.
2. Get the last error message with the function `DscLastErrorTextGet`.

This subVI gets the last error message occurred in the DSCIO DLL. An error occurs in the DSCIO DLL when a function call fails. It should be called immediately after the `Call Library Function` node of interest.

6. Using the iDSC Board with LabWindows/CVI

LabWindows/CVI provides graphical user-interface development with C code programming for which the iDSC board supplies an ideal signal conditioning and data acquisition front end. LabWindows/CVI uses DLL function calls to access the full programmability and power of the iDSC board.

Running the LabWindows/CVI iDSC Board Example

A standard example shows how LabWindows/CVI interfaces with the iDSC board. The example is located in the directory where `IDSC` software was installed under the subdirectory `LWCVI`. A typical location would be under "`c:\program files\Microstar Laboratories\idsc\appsw\lwcvi`."

To run the examples, verify that the iDSC board and iDSC board software are installed and that DSCview works properly. Exit DSCview before running the LabWindows/CVI iDSC board example. Set the working directory of LabWindows to the directory with the example. Load the file `GRAPH.PRJ` and select the "Run Project" menu option.

The example displays iDSC data in a strip chart. Select the buttons to configure, start, and stop the iDSC board.

Creating an iDSC Board Application in LabWindows/CVI

A new LabWindows/CVI application may be created by modifying the example described above. The following section provides additional details about how LabWindows/CVI interfaces to the iDSC board.

An iDSC board application performs the following steps:

1. Opens iDSC board handles with the function `DscHandleOpen`. This operation is generally performed in the main() function before `RunUserInterface()` is called.
2. Defines the configuration of the board using a dialog box, a saved configuration file, or iDSC board configuration functions. The example above uses a dialog box when a button is pressed. Please see the section on Programming Interfaces and the C examples for more details on using a saved configuration file or configuration functions.
3. Starts data acquisition. The example starts acquisition when a button is pressed.
4. Reads data. An idle event may be used to run a function that periodically check for data.
5. Stops acquisition and terminates communication. The example uses a button to control when acquisition is stopped.

After initialization, an application reads data from the iDSC board using the function `DscBufferGetEx`.

LabWindows/CVI calls iDSC board functions through DLL function calls. The section in this manual on Programming Interfaces describes the DLL functions. Use the example and the function descriptions as a reference for building your application. The C examples provided with the iDSC software also provide a useful resource for building applications in LabWindows/CVI.

7. Using the iDSC Board with HP VEE

HP VEE is a graphical programming environment for which the iDSC board provides an ideal signal conditioning and data acquisition front end. HP VEE uses objects and DLL function calls to acquire the full programmability and power of the iDSC board.

Installing iDSC Board Support for HP VEE

When the iDSC board software is installed, a directory named `IDSC\APPSW\HPVEE32` is created that contains HP VEE support files. Copy this directory and its contents to a directory named `IDSC` under the HP VEE installation directory. The following example displays how to copy the files in a DOS shell:

```
XCOPY    *.*   “C:\PROGRAM FILES\HP VEE 4.0” /S
```

Note: Replace the directory names with the correct paths for your PC.

Restart HP VEE to enable a new iDSC menu that provides access to iDSC board functions.

Running the HP VEE iDSC Board Examples

Several examples show how HP VEE interfaces with the iDSC board. The examples are located in the `IDSC` directory under the HP VEE install directory. To run the examples, verify that the iDSC board and iDSC board software are installed and that DSCview works properly. Exit DSCview before running the HP VEE iDSC board examples.

APP01.VEE

`APP01.VEE` shows how to configure the iDSC board to sample two channels and display the results in a graph. To run the example press the Start! button. To stop the example press the Stop! button on the worksheet rather than HP VEE's normal Stop! button. Pressing the Stop! button on the worksheet allows termination code to execute before HP VEE stops.

APP02.VEE

`APP02.VEE` is similar to `APP01.VEE` but adds disk logging to save the data to a disk file.

APP03.VEE

`APP03.VEE` shows how to read the data that were saved in `APP01.VEE`.

APP04.VEE

`APP04.VEE` is similar to `APP01.VEE` but it samples eight channels and displays the results in a graph.

Creating an iDSC Board Application in HP VEE

A new HP VEE application can be created by modifying one of the examples described above. The following section provides additional details about how HP VEE interfaces to the iDSC board.

An iDSC board application performs the following steps:

1. Opens iDSC board handles with the function `DscHandleOpen`.
2. Defines the configuration of the board using a dialog box, a saved configuration file, or iDSC board configuration functions.
3. Starts data acquisition.

The `iDSC Init` object provides all of these initialization routines in one object. `iDSC Init` stores the iDSC board handle in a global variable. An HP VEE application must be designed so that `iDSC Init` executes before any other functions that access the iDSC board.

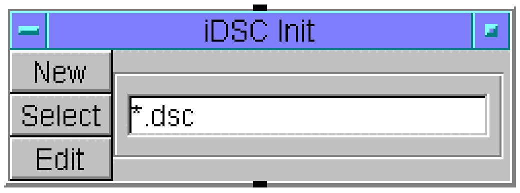
After initialization, an application reads data from the iDSC board using `iDSC Data` object.

HP VEE calls iDSC board functions through the `Call Function` object which calls functions stored in the DSCIO.DLL dynamic link library. HP VEE automatically configures a `Call Function` for any of the DSCIO.DLL functions. To configure a `Call Function`, load and run one of the examples. HP VEE loads a `DSCIO.VH` file with definitions for each function. From the Device menu select *Math & Functions*. Next, select *Compile functions and DSCIO* from the dialog box. A complete list of DSCIO functions appears to the right. Choosing any function in this list creates a `Call function` object with the proper inputs and outputs.

Refer to the DSCIO Function Summary in this document for complete descriptions of the iDSC board functions.

Object Reference

iDSC Init



The iDSC Init object makes it easy to configure and initialize the iDSC board. Three buttons on the iDSC Init object provide configuration options. A *New* button displays the iDSC board configuration dialog box and saves the configuration. A *Select* button selects an existing configuration file. An *Edit* button displays the iDSC board configuration dialog box used to edit an existing file. At run-time iDSC Init opens a handle to the iDSC board, downloads the configuration, and starts acquisition.

iDSC Data

The iDSC Data object reads data from the iDSC board. Data values are provided on eight output pins corresponding to eight channels. If fewer channels are actively being sampled, the data for those channels appear consecutively on the iDSC Data outputs. For example if iDSC board inputs 0 and 7 are sampled, the data appear on the first and second pins of iDSC Data.

iDSC Data reads 200 values from each active channel each time it is called. The number of values on each read may be changed by editing the object and modifying the constant named Values.

iDSC Close

The iDSC Close object terminates data acquisition and closes the iDSC board handle.

8. Using the iDSC Board with MATLAB

The iDSC board support for MATLAB allows a user to communicate with the iDSC board using the MATLAB programming environment. It integrates the processing power of an iDSC with the powerful technical computing environment of MATLAB.

MATLAB performs high-level numeric computation and visualization of data sets. iDSC board support for MATLAB allows acquired and processed data from an iDSC to be further manipulated under MATLAB to suit the specific requirements of an application.

The iDSC board support for MATLAB supports MATLAB version 6.0.

Installing iDSC Board Support for MATLAB

When the iDSC board support software is installed, a directory is created that contains iDSC board support for MATLAB. The default name for this directory path is usually `C:\Program Files\Microstar Laboratories\iDSCdev\APPSW\Matlab`. This discussion assumes that the default location was used.

This directory must be added to the MATLAB search path. The MATLAB search path is established in the `toolbox\local\MATLABRC.M` file, located in the directory where MATLAB is installed. One way to add the directory is to select it as the current directory at the top of the MATLAB main window. The best way is to add an `addpath` command to the `STARTUP.M` file. If `STARTUP.M` does not exist, you can create one with a text editor. `MATLABRC.M` will run `STARTUP.M` when a MATLAB application starts.

Below is a description of adding a search path; for iDSC board software for MATLAB; to the MATLAB search path.

1) Create `STARTUP.M`, if it does not already exist, under `toolbox\local` in the MATLAB installation directory.

2) Add the following lines to `STARTUP.M`.

```
disp('Adding iDSC board support to MATLAB search path');
addpath(['C:\Program Files\Microstar Laboratories\', …
        'iDSCdev\AppSw\Matlab'], path);
```

Using an iDSC Board with MATLAB

MATLAB cannot directly call DLL functions in DSCIO, but it can call and execute DLL MEX functions. The DLL MEX functions provide an interface to the DSCIO DLL, which is the interface to Accel32 and; iDSC hardware and drivers. The name of each DLL MEX function is slightly different than the corresponding function in DSCIO DLL. Also, the usage of some of the functions may vary slightly.

The table below shows the comparison between DLL MEX functions and DSCIO DLL routines. Please refer to the DLL MEX function reference provided in this manual for a description of each function.

DLL MEX Functions for MATLAB	**Corresponding DSCIO.DLL Routines**
`Handle = dscopen (‘unc_path’)`	`DscHandleOpen`
`<code> = dscclose (Handle)`	`DscHandleClose`
`Numbytes = dscavail (Handle)`	`DscBufferAvail`
`[data,<retval>] = dscbufg (Handle, Length, <LengthMax, TimeWait, TimeOut, BytesMultiple>)`	`DscBufferGetEx`
`<boolean> = dsccal (Handle)`	`DscCalibrate`
`<boolean> = dsccmdld (Handle)`	`DscCommandsLoad`
`[<retVal>] = dsccfgrd (Handle,buffer)`	`DscConfigurationRead`
`[data,<retval>] = dsccfgwt (Handle)`	`DscConfigurationWrite`
`<boolean> = dscdialg (Handle)`	`DscFilterDialogShow`
`[FilterType, Sharpness, CoFL, CoSL, CoFH, CoSH, Attenuation, <retval>] = dscfpget (Handle,FiltIndex)`	`DscFilterParametersGet`

`[<retVal>] = dscfpset (Handle, FiltIndex, FiltType, Sharpness, CutoffFreqLow, CutoffSlopeLow, CutoffFreqHigh, CutoffSlopeHigh, Attenuation)`	`DscFilterParametersSet`
`[gdlay, <retval>] = dscgdela (Handle)`	`DscGroupDelay`
`[string] = dscerrg`	`DscLastErrorTextGet`
`[<retVal>] = dscmaset (SlaveHandle, MasterHandle)`	`DscMasterSet`
`<mempercent> = dscmemus (Handle)`	`DscMemoryUsed`
`<count> = dscpecnt (Handle)`	`DscPinEnabledCount`
`<pins> = dscpeget (Handle)`	`DscPinEnabledGet`
`<boolean> = dscpeset (Handle)`	`DscPinEnabledSet`
`<rate> = dscsrget (Handle)`	`DscSampleRateGet`
`[rate, <retval>] = dscsrset (Handle, SampleRate)`	`DscSampleRateSet`
`<boolean> = dscstart (Handle)`	`DscStartAcquiring`
`<boolean> = dscstop (Handle)`	`DscStopAcquiring`
`<boolean> = dscteset (Handle, par1, par2, par3)`	`DscTcEnabledSet`
`ret = dsctccnt(Handle)`	`DscTcEnabledCount`
`<max> = dsctcmax (Handle)`	`DscTcMaximum`
`<width> = dsctcwdt (Handle)`	`DscTcWidth`
`[buf, <retval>] = dsctfget (Handle, FiltIndex, Length)`	`DscTransferFunctionGet`
`[buf, <retval>] = dscusget (Handle, FiltIndex, Length)`	`DscUnitStepGet`

[<retVal>] = dscdccls (Handle, 'CC list', stack_size)	DscDaplCCListSetA
[<retVal>] = dscdtset (Handle,'dapl text',stack)	DscDaplTextSetA
['unc_path', <retVal>] = dscaddrg(dscHandle)	DscAddressGet
<boolean> = dscaddrs(dscHandle, 'unc_path')	DscAddressSet
[scansDiscarded <, boolean>] = dscdscan(handle)	DscScanDiscarded
masterHandle = dscmaget(slaveHandle)	DscMasterGet
[numBytes <, boolean>] = dsclgsiz(handle)	DscServerDiskLogBytes
[flags, filename, fileShareMode, openFlags, fileFlagAttributes, blockSize, maxCount <,boolean>] = dsclgcg(handle)	DscServerDiskLogConfigGet
<boolean> = dsclgcs(handle, 'flags', 'filename', <['fileShareMode', 'openFlags', 'fileFlagsAttributes', blockSize, maxCount]>)	DscServerDiskLogConfigSet
retVal = dsclgqry(handle)	DscServerDiskLogEnabledGet
<boolean> = dsclgset(handle, setState)	DscServerDiskLogEnabledSet
retVal = dsctccnt(dscHandle)	DscTcEnabledCount
retVal = dscgdlg(grpHandle)	DscGroupConfigDialogShow
grpHandle = dscgopen	DscGroupHandleOpen
<boolean> = dscgclse(grpHandle)	DscGroupHandleClose

`index = dscgadd1(grpHandle <, unc_path>)`	`DscGroupAddOne`
`retVal = dscgcnt(grpHandle)`	`DscGroupCount`
`<boolean> = dscgdel1(grpHandle)`	`DscGroupDeleteOne`
`Handle = dscgdsc(grpHandle, index)`	`DscGroupDsc`
`<retVal> = dscgcfgr(grpHandle, buffer)`	`DscGroupConfigRead`
`[data,<retval>] = dscgcfgw(grpHandle)`	`DscGroupConfigWrite`
`<boolean> = dscxbcal(handle <,sampleRate>)`	`DscXbCalibrate`
`ret = dscxbeg(handle)`	`DscXbEnabledGet`
`<boolean> = dscxbes(handle, isEnabled)`	`DscXbEnabledSet`
`[iType, iRange, iOffset, iOffsetRange, oExcitation <,boolean>] = dscxbpcg(dscHandle, pinIndex)`	`DscXbPinConfigGet`
`<boolean> = dscxbpcs(dscHandle, pinIndex <, iType, iRange, iOffset, oExcitation>)`	`DscXbPinConfigSet`

For more information, please refer to the corresponding function in the DSCIO Reference Manual.

Running the MATLAB iDSC Board Examples

Several example applications are included and demonstrate the use of an iDSC board with MATLAB. The examples can be run by typing `app1`, `app2`, `app3` etc. at the MATLAB command prompt.

APP1.M

Application 1 reads a block of 1000 data values from the iDSC board. Input channels 0,1,2 etc can be selected using the iDSC dialog window. The values are merged into a MATLAB matrix. This column matrix has the size [1000,1]. This application shows how to initialize communication, get data, and terminate communication with the iDSC board.

APP2.M

Application 2 shows how to read an iDSC configuration block from a file to configure the parameters of an iDSC board. It also writes modified parameters back to the original file.

APP3.M

Application 3 shows the usage for many of the functions that modify the parameters of the iDSC board filters.

APP4.M

Application 4 shows the usage of the calibration function.

APP5.M

Before running this example, the module DAPLIIR.DLM should be installed. Use the DAP Service under the Control Panel; or use the module-related DLL MEX functions, such as DapModuleInstall, DapModuleUninstall, DapModuleLoad and DapModuleUnload, in DAPtools for MATLAB. (Please look at the DAPtools for MATLAB help for more information on module-related functions.) Application 5 gives an example of how to install a 32-bit module and configure DAPL commands for onboard processing.

APP6.M

Application 6 shows how to configure input timing channels.

APP7.M

Application 7 provides an example of getting matrix data with the transfer function and unit step function of an iDSC filter configuration.

APP8.M

Application 8 shows a simple example of using two iDSC boards in the master/slave configuration.

All the above examples open the handle to an iDSC board, get data from the iDSC board, and close the handle to the iDSC board. If you want to force a running example to stop, use `CTRL-C` to exit the example. When you do this, not all of the `M` file is executed and it is possible that the opened iDSC handle will not be closed. The opened handle should be closed explicitly by `dscclose`. If that does not work, restart MATLAB or the DAP service through the Control Panel.

DLL MEX Reference

Most of the returned arguments are message or error `code`s. These report whether or not the functions have been executed successfully.

Some functions have optional `TimeWait` and `TimeOut` parameters. The parameter `TimeWait` is the longest time in milliseconds that the operation can be blocked waiting for completion. The parameter `TimeOut` is the longest time in milliseconds that the operation can take for completion. If it is not completed in that amount of time, the operation is aborted. When this number is specified, it takes precedence over `TimeWait`. If values for these parameters are not given, the default is `TimeWait` of 100 ms and `TimeOut` of 20 seconds. These parameters are discussed in more detail in the DSCIO reference manual.

hDsc = dscopen('uncPath')

This function opens a handle to the communication pipe defined by the UNC (Universal Naming Convention) path. This function should be the first iDSC function called in an application. Examples include:

```
hDsc = dscopen('unc_path');

hDsc = dscopen('\\.\Dap0');

hDsc = dscopen('\\TestPC\Dap1');
```

The return value in `hDsc` is a handle to the iDSC board. The value of `hDsc` is 0 if an error occurred.

<code> = dscclose(hDsc)

This function closes a handle specified by `hDsc` and terminates communication with an iDSC board. The return value `code` is 1 if the handle was closed successfully or 0 if an error occurred.

code = dscavail(hDsc)

This function returns the number of bytes of data available for reading from an iDSC board specified by `hDsc`. For efficient data transfer, it is best to use **dscbufg** with a time wait and avoid using this function. The function **dscbufg** returns the actual number of bytes read which lets the application know what data have been transferred. The return value `code` is -1 if an error occurred.

[data, <code>] = dscbufg(hDsc, Len, <MaxLen, TimeWait, TimeOut, LenMult>)

This function reads a block of data from an iDSC board specified by `hDsc`, with two parameters, `TimeWait` and `TimeOut`, to control the transfer behavior. Parameters `Len` and `MaxLen` are the specified minimum and maximum number of bytes returned to `data` respectively. Both `Len` and `MaxLen` are always a multiple of `LenMult`. In most cases, data read from the iDSC is multiplexed: channel0, channel1, etc. It is possible to use standard MATLAB matrix operations to separate the channels. The return value `code` is the number of bytes read if the function succeeds, 0 if there is no data, or -1 if the function fails.

<code> = dsccal(hDsc)

This function performs calibration on an iDSC board specified by `hDsc`. It calibrates an iDSC board for DC gain and offset, and saves the calibration values. It is automatically invoked when **dscstart** is called for the first time. The saved calibration values are used until this function is invoked again. If the calibration values are not found, this function is automatically re-invoked to start calibration on the iDSC. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dsccmdld(hDsc)

This function downloads configuration commands from the host computer to an iDSC board specified by the handle `hDsc` and performs the necessary configuration for filtering. This function configures the iDSC board with the appropriate programs and coefficients.

The filter data are used by the iDSC internally to calculate and download the appropriate commands. If the iDSC board configuration or filter designs change and **dscstart** is executed, **dscstart** automatically invokes **dsccmdld** and downloads new commands to the iDSC board. Data will arrive at the PC two times **dscgdela(hDsc)** seconds later.

If the iDSC board configuration or filter designs have changed and this function is executed before **dscstart**, data will appear immediately on the host computers. These data are samples that were in the filtering buffers but are no longer needed there after the filter reconfiguration. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

[<code>] = dsccfgrd(hDsc, buffer)

This function transfers iDSC board configuration information from the host computer to an iDSC specified by the handle `hDsc`. The iDSC board information, which is specified by `buffer`, includes sample rate, enabled input pins, input pin to filter mappings, and details of the filter designs. The return value `code` is the number of bytes being read from the host computer if the function succeeds, or 0 if the function fails.

[buffer, <code>] = dsccfgwt(hDsc)

This function returns information about sampling, filtering, and hardware channel assignments in the `buffer` array, for the board specified by the handle `hDsc`. The return value `code` is the number of bytes in the `buffer` if the function succeeds, or 0 if the function fails.

<code> = dscdialg(hDsc)

This function displays modal dialog screens for graphical filter configuration and design associated with an iDSC board specified by the handle `hDsc`. A filter configuration screen provides a quick method for selecting sample rates, mapping input pins to selected filter designs, and enabling or disabling input pins. If the function succeeds, and the OK button is selected, the return value `code` is 1. If the OK button is selected without changes, the return value `code` is 5. If the CANCEL button is selected, the return value `code` is 2. If the function fails, the return value is 0.

[filtIndex, filtType, shrp, coFL, coSL, coFH, coSH, atten, <code>] = dscfpget(hDsc, filtIndex)

This function gets filter parameters associated with a filter at index `filtIndex` of an iDSC board specified by the handle `hDsc`. Parameters `filtType`, `shrp`, `coFL`, `coSL`, `coFH`, `coSH`, and `atten` specify a filter type, sharpness, cutoff frequency low and high, and cutoff slope low and high parameters at the beginning of the transition band. If the `filtIndex` is not in the range of 0 through 7, the function fails. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dscfpset(hDsc, filtIndex, filtType, shrp, coFL, coSL, coFH, coSH, atten)

This function sets filter parameters associated with a filter at index `filtIndex` of an iDSC board specified by `hDsc`. Filter parameters can be set graphically in **dscdialg**. Parameters `filtType`, `shrp`, `coFL`, `coSL`, `coFH`, `coSH`, and `atten` specify the filter type, sharpness, cutoff frequency low and high, and cutoff slope low and high parameters at the beginning of a transition band. Each iDSC board can store up to 8 filter designs, which can be accessed by the `filtIndex` parameter. If `filtIndex` is not in the range of 0 through 7, the function fails. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

[gdelay, <code>] = dscgdela(hDsc)

This function returns the group delay (in seconds) through all filter designs. The group delay is the amount of time to wait before data arrives at the PC.

The return value `code` is 1 if the function succeeds, or 0 if the function fails.

code = dscerrg

This function retrieves the text of the last error message that occurred in DSCIO DLL. This is useful in determining if there was an error related to any of the DSCIO DLL function calls. This function should be called immediately after a function of interest. If a function call fails, the last error message is updated. The last error message will stay the same until another function call fails. The return value `code` is the text of the last error message from the iDSC board if the function succeeds, or 0 if this function either fails or returns no error message.

<code> = dscmaset(slavehDsc, masterhDsc)

This function connects a Slave iDSC board specified by `slavehDsc` to a Master iDSC board specified by `masterhDsc`. It is only useful in a Master/Slave Configuration. The only way to specify an iDSC board as a master or slave is by invoking this function using two different iDSC board handles. If the same iDSC board handles are used, the Master and Slave iDSC boards will not be connected. When this function is completed, the iDSC board specified by `slavehDsc` becomes a Slave iDSC board and the iDSC board specified by `masterhDsc` becomes a Master iDSC board. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dscmemus(hDsc)

This function determines the used memory on an iDSC board specified by the handle `hDsc`. It is useful in determining whether or not the iDSC board will be able to sustain a particular sample rate without overflowing. The return value `code` is the amount of memory used, expressed as a percent, if the function succeeds, or 0 if the function fails.

<code> = dscpecnt(hDsc)

This function returns the number of enabled input pins on an iDSC board specified by the handle `hDsc`. Valid values for the enabled input pin count are in a range of one to eight since at least one input pin must be enabled. The return value `code` is the number of enabled input pins if the function succeeds, or 0 if the function fails.

<buffer> = dscpeget(hDsc)

This function gets the enabled input pins on an iDSC board specified by the handle `hDsc` as a one-by-eight array of integer. When an input pin is enabled, the corresponding element in the array is set to one. When an input pin is disabled, the corresponding element in the array is set to zero. To find out the number of enabled input pins, use the **dscpecnt** function. The return value `buffer` is a one-by eight-integer array if the function succeeds, or 0 if the function fails since at least one input pin must be enabled.

<code> = dscpeset(hDsc, pin0, pin1, pin2, pin3, pin4, pin5, pin6, pin7)

This function sets enabled input pins on an iDSC board specified by the handle `hDsc`. Set a pin variable to 1 to enable the corresponding pin, or to 0 to disable the pin. To find out the number of enabled input pins, use **dscpecnt** function. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

The following example enables input pins S1, S3 and S6:

```
DscPinEnabledSet(hDsc, 0,1,0,1,0,0,1,0);
```

code = dscsrget(hDsc)

This function gets an effective sampling rate, in units of samples per second, for each channel on an iDSC board specified by the handle `hDsc`. The return value `code` is the sampling rate if the function succeeds, or 0 if the function fails.

<code> = dscsrset(hDsc, samRate)

This function sets an effective sampling rate, in units of samples per second, for each channel to `samRate` on an iDSC board specified by the handle `hDsc`. Table 1 below displays valid sample rates.

	153600	
102400	76800	
51200	38400	
25600	19200	15360

12800		10240	9600		7680
6400		5120	4800		3840
3200	3072	2560	2400	2048	1920
1600	1536	1280	1200	1024	960
800	768	640	600	512	480
400	384	320	300	256	240
200	192	160	150	128	120
100	96	80	75	64	60
50	48	40		32	30
25	24	20		16	15
	12	10		8	

If an invalid sample rate is selected, the function will automatically select the closest larger sample rate. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dscstart(hDsc)

This function starts a data acquisition process on an iDSC board specified by the handle `hDsc`, causing data to start appearing on the host computer. This function internally forces a **dsccal** if it cannot find saved calibration values and a **dsccmdld** if the iDSC board configuration or filter designs have changed. If the iDSC board configuration or filter designs have changed, data will appear **dscgdela(hDsc)** seconds later.

Once this function is invoked, **dscbufg** can be called to read blocks of data into buffers. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dscstop(hDsc)

This function stops a data acquisition process on an iDSC specified by the handle `hDsc`. It is called after **dscstart** to stop data from appearing on the host computer. The return value `code` is 1 if the function succeeds, or 0 if the function fails.
[<code>] = dscteset(hDsc, Tc0, Tc1, TcWidth)

This function enables timing channels on an iDSC board specified by the handle `hDsc`. Parameters `Tc0` and `Tc1` are for Timing Channel 0 and 1 respectively. A value of one for one of a pin parameter enables a timing channel, or a value of zero disables it. Parameter `TcWidth` is for the width of the timing channel, which can be either 2 or 4 bytes depending on sampling rate. Setting `TcWidth` to one forces timing channel width to be 4 bytes (32 bits) regardless of the sample rate. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

The following example is used to enable Timing Channel 1 with 4 bytes for the timing channel width:

```
DscTcEnabledSet(hDsc, 0,1,1);
```

The following example is used to enable Timing Channel 0 and Timing Channel 1 with 4 bytes for the timing channel width:

```
DscTcEnabledSet(hDsc, 1,1,1);
```

<code> = dsctcmax(hDsc)

This function returns the maximum value a timing channel can contain based on the sampling rate associated with an iDSC board specified by the handle `hDsc`. It ranges from 128 to 2457600. The return value `code` is the maximum timing channel value if the function succeeds, or 0 if the function fails.

[buffer, <code>] = dsctfget(hDsc, filtIndex, len)

This function gets the transfer function data points of a filter design used by an iDSC board specified by the handle `hDsc`. Parameter `filtIndex` ranges from 0 to 7 since there are up to eight filter designs. The parameter `len` specifies number of data points in the returned transfter function arrary `buffer`. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dsctcwdt(hDsc)

This function returns the timing channel width in bytes associated with an iDSC board specified by the handle `hDsc`, either 2 bytes for 16-bit values or 4 bytes for 32-bit values. Width is dependent on the sample rate. The timing channel width for sample rates 8 s/s to 600 s/s is always 4 bytes. The timing channel width for sample rates 640 s/s to 153600 s/s is 2 bytes by default. The timing channel width for these higher sample rates can be forced to 4 bytes by setting `Tcwidth` in the **dscteset** function. The return value `code` is the timing channel width if the function succeeds, or 0 if the function fails.

[buffer, <code>] = dscusget(hDsc, filtIndex, <len>)

This function gets the unit step response data points of the filter design used by an iDSC board specified by the handle `hDsc`. Parameter `filtIndex` ranges from 0 to 7 since there are up to eight filter designs. Optional parameter `len` is the number of data points that should be returned in `buffer`. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dscdtset(hDsc, 'daplTxt')

Defines DAPL commands in text format for an iDSC board specified by the handle `hDsc`. The DAPL commands are defined by parameter `daplTxt`, which will be sent to the iDSC when **dsccmdld** or **dscstart** is invoked. Each line of the DAPL commands must be delimited by a carriage-return, line-feed, or both. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dscdccls(hDsc, 'custCmdTxt', stacksize)

Defines a list of DAPL custom commands and sends the commands to an iDSC board specified by the handle `hDsc` when **dsccmdld** or **dscstart** is invoked. A custom command list is defined by parameter `custCmdTxt`. Each custom command in the list must be delimited by a carriage-return by putting integer 13. Parameter `stacksize` is a matrix that defines the stack size for each command in the list. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

This function is used with obsolete 16-bit custom commands only. For downloading a 32-bit custom command module, please use Control Panel->Data Acquisition Processor, or **dapmdin** in DAPtools for MATLAB.

[unc_path, <code>] = dscaddrg(hDsc)

This function gets a UNC path associated with an iDSC board specified by the handle `hDsc`. The return argument `unc_path` is a UNC string consisting of a machine name and an iDSC board name. The return value `code` is the length of `unc_path` if the function succeeds, or -1 if the function fails.

<code> = dscaddrs(hDsc, ‘uncPath’)

This function changes the address, specified by `uncPath`, to an iDSC board specified by `hDsc`. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

[numData, <code>] = dscdscan(hDsc)

This function returns the number of scans thrown away since **dsccmdld**. Each scan consists of one sample for each of the active input pins. For example, if there are two enabled input pins, a scan consists of two samples. The scan value is used to synchronizing multiple iDSC boards. Since **dscstart** is a software command, the iDSC boards receive it at different times, which means the number of scans per iDSC board is different when the START command is received. Since iDSC boards must be synchronized, the same number of scans per iDSC board between **dsccmdld** and **dscstart** have to be ignored. The returned scan will be stored in `numData`. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

code = dscmaget(slavehDsc)

This function gets the handle to a master iDSC board when invoked on a slave iDSC board specified by `slavehDsc`. It is only useful in a Master/Slave Configuration. This function fails when invoked on a master or normal iDSC handle. The return value `code` is a handle to a master iDSC board if the function succeeds, or 0 if the function fails.

[numBytes <, code>] = dsclgsiz(hDsc)

This function gets the number of bytes logged to a disk server from an iDSC board specified by the handle `hDsc`. It should be called after the function **dscstart** is invoked, and when **dsclgqry** returns '1'. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

[flags, filename, fileShareMode, openFlags, fileFlagAttributes, blockSize, maxCount <, code>] = dsclgcg(hDsc)

This function gets a server disk log configuration associated with the iDSC board specified by the handle `hDsc`. Below is a brief description of the returned parameters:

`flags` – logging behavior
`filename` – name of disk log file
`fileShareMode` – file share mode of the disk log file
`openFlags` – file open options of the disk log file
`fileFlagsAttributes` – file attributes of the disk log file
`blockSize` – minimum amount of data, in bytes, to write to the disk log file at one time
`maxCount` – maximum number of bytes to log. The default is 0, which causes logging to continue indefinitely until **dscstop** is invoked

The return value `code` is 1 if the function succeeds, or 0 if the function fails. For more information, please look at TServerDiskLogConfig in the DSCIO reference manual.

<code> = dsclgcs(hDsc, ‘flags’, ‘filename’, <[fileShareMode’, ‘openFlags’, ‘fileFlagsAttributes’, blockSize, maxCount]>)

This function sets a server disk log configuration associated with the iDSC board specified by `hDsc`. Below is a brief descriptions of return parameters:

`flags` – logging behavior
`filename` – name of disk log file
`fileShareMode` – file share mode of the disk log file
`openFlags` – file open options of the disk log file
`fileFlagsAttributes` – file attributes of the disk log file
`blocksize` – minimum amount of data, in bytes, to write to the disk log file at one time
`maxCount` – maximum number of bytes to log. The default is 0, which causes logging to continue indefinitely until **dscstop** is invoked

The return value `code` is 1 if the function succeeds, or 0 if the function fails. For more information, please look at TServerDiskLogConfig in the DSCIO reference manual.

code = dsclgqry(hDsc)

This function queries the specified server, associated with an iDSC board specified by the handle `hDsc`, to determine whether disk logging is enabled. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code> = dsclgset(hDsc, setState)

This function changes the state of the specified server, associated with an iDSC board specified by the handle `hDsc`. Setting the parameter `setState` to one or zero enables and disables server disk logging, respectively. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

code = dsctccnt(hDsc)

This function returns the number of enabled timing channels associated with an iDSC board specified by `hDsc`. The return value `code` is the number of enabled timing channels if the function succeeds, or -1 if the function fails.

code = dscgdlg(grpHDsc)

This function displays modal dialog screens for the graphical configuration of multiple iDSC boards. The modal dialog screen from **dscdialg** is for one iDSC only. This function should be used to configure more than one iDSC board. It simplifies the configuration of multiple iDSC boards with a graphical interface. The return value `code` is 1 if the OK button has been clicked, 2 if the cancel button has been clicked, and 0 if the function fails.

code = dscgopen

This function opens a handle to an iDSC group. Similar to dscopen, this function is the first function called by an application ready to begin communication with the iDSC group. Once the iDSC group communication has begun, a specific iDSC board can be accessed through **dscgdsc**. The return value `code` is a handle to a group of iDSC boards if the function succeeds, or 0 if the function fails.

<boolean> = dscgclse(grpHDsc)

This function terminates communication and releases an iDSC group handle specified by `grpHDsc` previously opened with **dscopen**. It should be the last function called by an application to end communication with the iDSC group. Once the communication has ended, an iDSC board cannot be accessed through **dscgdsc**. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

code = dscgadd1(grpHDsc <, 'unc_path'>)

This function adds one iDSC to the tail of the iDSC group specified by `grpHDsc`. It provides an option to set the address of an iDSC. The return value `code` is an index of the newly added iDSC board if the function succeeds, or -1 if the function fails. The maximum capacity of an iDSC group handle is 64, which means the maximum index is 63.

code = dscgcnt(grpHDsc)

This function returns the number of iDSC boards in an iDSC group specified by `grpHDsc`. The count is increased by one when **dscgadd1** is invoked, and decreased by one when **dscgdel1** is invoked. The return value `code` is the number of iDSC boards in the group if the function succeeds, or -1 if the function fails.

<code> = dscgdel1(grpHDsc)

This function deletes one iDSC board from the tail of the iDSC group specified by `grpHDsc`. The iDSC board with highest index always is deleted first. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

code = dscgdsc(grpHDsc, iDscIndex)

This function accesses an iDSC board at index `iDscIndex` of an iDSC group specified by a group handle `grpHDsc`. Valid iDSC board indices are 0 through **dscgcnt** – 1. The individual iDSC board handle should not be stored because it is destroyed and recreated in functions like **dscgdlg**, **dscgdel1**, **dscgadd1**, etc. It should be called whenever accessing a specific iDSC board. The return value `code` is a handle to the target iDSC board if the function succeeds, or 0 if the function fails.

<code> = dscgcfgr(grpHDsc, buffer)

This function transfers configuration information in binary format from a host computer to an iDSC group specified by the group handle `grpHDsc`. iDSC group information includes the number of iDSC boards, address, mode, sample rate, input range, input pin to filter mappings, enabled input pin information, and details of filter designs. The return value `code` is the number of bytes read if the function succeeds, or 0 if the function fails.

[buffer <, code>] = dscgcfgw(grpHDsc)

This function transfers configuration information from an iDSC group specified by the group handle `grpHDsc` to the host computer. iDSC group information written includes the number of iDSC boards, address, mode, sample rate, input range, input pin to filter mappings, enabled input pin information, and details of the filter designs. The return value `code` is the number of bytes written if the function succeeds, or 0 if the function fails.

<code> = dscxbcal(hDsc <, sampleRate>)

This function performs calibration on an expansion board, part number MSXB042, associated with an iDSC board specified by the handle `hDsc`. This function works only if the board's enable flag is on, which can be queried by calling **dscxbeg.** If **dscxbeg** returns false, a failure has occurred. The sample rate should not exceed 1024 samples per second or the calibration values may be unstable. A higher sample rate allows this function to execute faster but the calibration values are less accurate. A lower sample rate executes more slowly but the calibration values are more accurate. The default and recommended value of 100 samples per second works well. The return value `code` is 1 if the function succeeds, or 0 if the function fails.

<code = dscxbeg(hDsc)

This function gets the state of an MSXB042 expansion board associated with an iDSC board specified by the handle `hDsc`. The return value `code` is 1 for enabled and 0 for disabled if function succeeds, or -1 if the function fails.

<code = dscxbes(hDsc, isEnabled)

This function sets the state of an MSXB042 expansion board associated with an iDSC board specified by the handle `hDsc`. Setting `isEnabled` to 1 enables the board and makes it visible in **dscdialg**, whereas setting `isEnabled` to 0 disables the board and makes it invisible in **dscdialg**. The return value `code` is 1 if function succeeds, or 0 if the function fails.

[iType, iRange, iOffset, iOffsetRange, oExcitation <,code>] = dscxbpcg(hDsc, pIndex)

This function gets a pin configuration at index `pIndex` of an MSXB042 expansion board associated with an iDSC board specified by the handle `hDsc`. Parameters `iType`, `iRange`, `iOffset`, `iOffsetRange`, and `oExcitation` specify an input type, input range, input offset, input offset range, and an output excitation. The return value `code` is 1 if the function succeeds, or 0 if the function fails. For more information, please see DscXbPinConfigGet and TXbPinConfig in the DSCIO Reference Manual.

<code> = dscxbpcs(hDsc, pIndex <, iType, iRange, iOffset, oExcitation>)

This function sets a pin configuration at index `pIndex` of an MSXB042 expansion board associated with an iDSC board specified by the handle `hDsc`. Parameters `iType`, `iRange`, `iOffset`, `iOffsetRange`, and `oExcitation` specify an input type, input range, input offset, input offset range, and an output excitation. The return value `code` is 1 if the function succeeds, or 0 if the function fails. For more information, please see DscXbPinConfigSet and TXbPinConfig in the DSCIO Reference Manual.

Section III. Programming Interfaces

9. DSCIO DLL Programmer’s Interface

The Digital Signal Conditioning Input Output (DSCIO) Dynamic Link Library Programmer’s Interface provides the link between an application and the iDSC board.

The DSCIO interface supports the Visual C++, Visual Basic, Delphi, and C++Builder 32-bit development environments, and the DASYLab, LabVIEW, LabWindows/CVI, HP VEE, and MATLAB 32-bit applications.

An application opens a handle to the iDSC board and then uses the handle to configure the system and receive data. An opened handle is reserved for access by the application exclusively until the application closes the handle. A handle is a 32-bit value that references the iDSC board.

To open a handle to the iDSC board, use the function `DscHandleOpen`. `DscHandleOpen` requires a single parameter, *`pszAddress`*, which is the name of the iDSC board expressed using the Universal Naming Convention (The Universal Naming Convention is discussed later in this chapter).

To close a handle to the iDSC board, use the function `DscHandleClose`. `DscHandleClose` requires a single parameter, *`hDsc`*, the handle previously opened with `DscHandleOpen`.

The DSCIO Function Summary at the end of this chapter provides a summary of all of the supported functions.

DSCIO Interface Examples

There are several examples located in the `<InstallDir>\Examples\VB` directory for Visual Basic and the `<InstallDir>\Examples\C` directory for C/C++ which demonstrate the use of the DSCIO interface. Before running the examples, verify that the iDSC board and iDSC board software are properly installed by running DSCview. Exit DSCview before running the DSCIO interface examples.

Visual Basic Examples

Dvm.vbp

`Dvm.vbp` shows how to display voltage measurements. It transfers blocks of data from the iDSC board into a data buffer. It displays the 1st index from the data buffer, assuming a 5V input signal.

BinLog.vbp

`BinLog.vbp` shows how to log binary data to disk. It allows the user to design filters and configure the iDSC board using the `DscConfigDialogShow` function. When the iDSC board is started, the selected disk log file is opened and data logging starts. When the iDSC board is stopped, the selected disk log file is closed and data logging stops.

LoadSave.vbp

`LoadSave.vbp` shows how to load and save the iDSC board configuration from and to a file. It displays a previously saved configuration using the `DscConfigDialogShow` function.

C/C++ Console Examples

BinLog.cpp

`BinLog.cpp` shows how to log binary data to disk. It allows the user to design filters and configure the iDSC board using the `DscConfigDialogShow` function.

TxtLog.cpp

`TxtLog.cpp` shows how to log text data to disk. It allows the user to design filters and configure the iDSC board using the `DscConfigDialogShow` function.

LoadSave.cpp

`LoadSave.cpp` shows how to load and save the iDSC board configuration from and to a file. It displays a previously saved configuration using the `DscConfigDialogShow` function.

Creating a DSCIO Interface Application

Before you create a DSCIO Interface application, make sure that you have installed the Accel32/DAPcell server. The DAPIO32.DLL that is shipped with the Accel32/DAPcell server is needed for any application that uses the DSCIO Interface.

The following steps describe the functions required for creating a simple application with the DSCIO interface.

1) Open a handle to the iDSC board using `DscHandleOpen`.

2) Configure the iDSC board by invoking the `DscConfigDialogShow` function. This allows the user to set the sample rate, enable/disable channels, design filters, etc.

3) Start data acquisition by invoking the `DscStartAcquiring` function.

4) Get binary data from the iDSC board by invoking the `DscBufferGetEx` function.

5) Stop data acquisition by invoking the `DscStopAcquiring` function.

6) Close the handle to the iDSC board using `DscHandleClose`.

When programming in C/C++, include the header file `Dscio.h` that is located in `<InstallDir>\Dll\Import\C`. If you are using a Microsoft C/C++ compiler, you must link with the `Dscio.lib` located in `<InstallDir>\Dll\Lib\MC`. If you are using a Borland C/C++ compiler, you must link with the `Dscio.lib` located in `<InstallDir>\Dll\Lib\BC`.

When programming in Visual Basic, include the header file `Dscio.bas` that is located in `<InstallDir>\Dll\Import\VB`.

When programming in Pascal, include the header file `Dscio.pas` that is located in `<InstallDir>\Dll\Import\Pascal`.

More complicated applications that use DAPL text and DAPL custom commands are also available with the DSCIO interface.

Universal Naming Convention

DSCIO addresses the iDSC board using the Universal Naming Convention (UNC). A UNC name consists of two parts, the machine name and the iDSC board name. A UNC name begins with two backslashes, and the parts of the name are separated by a single backslash as shown below.

```
\\<Machine name>\<iDSC board name>
```

A local machine is denoted by a period. A remote machine is represented by its unique network machine name. Only the DAPcell implementation of the iDSC board supports remote machine names. All other implementations support only local machine names.

iDSC board names are predefined as `Dap0, Dap1, ..., Dap(N-1)` where `N` is the number of iDSC boards installed on the system. The maximum value for `N` is 14.

The UNC name is used with the DSCIO interface functions, `DscAddressGet` and `DscAddressSet.` For `\\.\Dap0`, `\\.` denotes the name of the local machine and `\Dap0` denotes the name of the iDSC board. If connected through DAPcell to a remote machine named PC45 that contains `Dap0`, then *`pszAddress`* is `\\PC45\Dap0`.

Master/Slave Configuration

To synchronize multiple iDSC boards on a system, a user must designate one iDSC board as the master unit and the other iDSC boards as slave units. The configuration for master and slave must be done in hardware by using a special cable, and in software by calling the `DscMasterSet` function.

Synchronous iDSC boards must share the same sampling clock; therefore, a special cable is necessary to distribute the sampling clock. The Synchronization Connector used in Master\Slave Configurations is described in the Hardware Architecture chapters of this document.

Apart from connecting the cable, one iDSC board must be configured as the Master iDSC board by using the `DscMasterSet` function. The `DscMasterSet` function associates a slave iDSC board to a master iDSC board.

The following functions support Master/Slave Configurations.

```
DscMasterGet
DscMasterSet
DscOperateModeGet
DscOperateModeSet
DscRemoteMasterGet
DscRemoteMasterSet
DscSlaveCount
DscSlaveHandle
```

The master unit and slave units must use the same effective sample rate. Therefore, the sample rate should only be changed on the Master iDSC board using `DscSampleRateSet`. Changing the sample rate on the Slave iDSC board will have no effect. The Slave iDSC board will continue using the sample rate of its master.

If two independent iDSC boards are running at different sample rates, and the user decides to set up the iDSC boards in a Master/Slave configuration, the Slave iDSC board will use the sample rate of the Master iDSC board.

In a Master/Slave Configuration, the system services listed below should only be invoked on the Master iDSC board. If these functions are invoked on the Slave iDSC board, an error will occur and the functions will return zero.

```
DscCalibrate
DscCommandsLoad
DscStartAcquiring
```

```
    DscStopAcquiring
    DscXbCalibrate
```

The memory streaming functions `DscConfigWrite`, `DscConfigWriteSize`, and `DscConfigRead` manage iDSC board information to and from memory. The iDSC board information includes the sample rate, enabled input pins, input pin to filter mappings, and the details of all of the filter designs. However the iDSC board information does not include Master/Slave Configuration information related to `DscMasterSet`. Because the functions do not store Master/Slave Configuration information, a user must store this information explicitly.

`DscGroupConfigDialogShow` allows easy graphical configuration of masters and slaves.

DAPL Support

Writing DAPL

The DSC system writes the filtered data to pipe pDscData for use in DAPL. Pipe pDscData has interleaved data only from the enabled channels. Before the user can perform further processing on the data, the SEPARATE command is recommended for separating the data from pipe pDscData into the correct number of pipes. If the user only has five channels enabled out of the maximum of eight, the user should separate the interleaved data into five pipes. Once the user has completed processing the data, the results must be merged to $BINOUT.

The restricted DAPL interface requires that input and output procedures, and START and STOP commands, not be included in the DAPL listing. The iDSC can only be started and stopped using the DscStartAcquiring and DscStopAcquiring functions.

The example below shows the form of the first few lines in DAPL. Pipe pDscData has interleaved data from five enabled channels.

```
PIPES P0, P1, P2, P3, P4

PDEF A
 SEPARATE(pDscData, P0, P1, P2, P3, P4)
 ...
 ...(further processing)
 ...
 ...(must write output to $BINOUT)
END
```

P0, P1, P2, P3, P4 are the number of enabled channels, which is five in this example.

Using the DAPL Interface

To write custom DAPL text, the user should use DscDaplTextSet. Once the DAPL text has been defined for the iDSC using DscDaplTextSet, the DAPL text will be sent to the iDSC when the user invokes DscCommandsLoad or DscStartAcquiring
.

If the user wants to change the already defined DAPL text, `DscDaplTextSet` must be reinvoked with the new DAPL text followed by either a `DscCommandsLoad` or `DscStartAcquiring` to activate the new DAPL text.

If the user wants to retrieve the defined DAPL text, `DscDaplTextLengthGet` along with `DscDaplTextGet` should be used.

Below is a C/C++ example:

```
HDSC hDsc;
hDsc = DscHandleOpen(
    "\\\\.\\Dap0");                     // Open iDSC handle.
DscDaplTextSet(hDsc,                    // Define DAPL text.
  "PIPES P0, P1, P2, P3, P4\r\n"
  "PIPES R0, R1, R2, R3, R4\r\n"
  "PDEF A\r\n"
  "  SEPARATE(pDscData, P0, P1, P2, P3, P4)\r\n"
  "  FFT(5, 9, 4, P0, R0)\r\n"
  "  FFT(5, 9, 4, P1, R1)\r\n"
  "  FFT(5, 9, 4, P2, R2)\r\n"
  "  FFT(5, 9, 4, P3, R3)\r\n"
  "  FFT(5, 9, 4, P4, R4)\r\n"
  "  MERGE(R0, R1, R2, R3, R4, $BINOUT)\r\n"
  "  END\r\n");

DscStartAcquiring(hDsc);                // Send DAPL text.
//... (other function calls) ...
```

Structure Summary

Structures are used to pass information to and from many DSCIO functions. Applications must initialize all fields before passing structures to DSCIO functions.

To use the supported structures, the memories of the structures must first be fully initialized to zero. This memory initialization is necessary because different versions of the DSCIO interface may have different size structures. Therefore it is important to use `DscStructPrepare` for proper initialization.

The following structures are discussed in detail on the following pages.

```
TBufferGetEx
TDscIoInt64
TFilterParam
TProcSystemErrorStdcall
TServerDiskLogConfig
TXbPinConfig
```

TBufferGetEx

The `TBufferGetEx` structure defines the behavior of `DscBufferGetEx`.

```
typedef struct tag_TBufferGetEx {
    int iInfoSize;                    // Size of this structure.
    int iMinBytes;                    // Minimum number of bytes to get.
    int iMaxBytes;                    // Maximum number of bytes to get.
    int iTimeWait;                    // Longest time to wait for data.
    int iTimeOut;                     // Longest total time for operation.
    int iBytesMultiple;               // Bytes to get is a multiple of this.
    } TBufferGetEx;
```

Members

iInfoSize
: Size of this information structure.

iMinBytes
: Minimum number of bytes to get. It can be zero or any positive integer.

iMaxBytes
: Maximum number of bytes to get. *iMaxBytes* must be greater than or equal to *iMinBytes*.

iTimeWait
: Longest time in milliseconds that the get operation can be blocked waiting for data. If no data shows up in that amount of time, the operation should be aborted.

iTimeOut
: Longest time in milliseconds that the get operation should complete. If it fails to complete in that amount of time, the operation is aborted. When this member is specified, it takes precedence over *iTimeWait*. This member is ignored if its value is zero.

iBytesMultiple
: The number of bytes to get is always a multiple of *iBytesMultiple*.

Remarks

`TBufferGetEx` is used in `DscBufferGetEx`. `TBufferGetEx` should be initialized using `DscStructPrepare` or `DscBufferGetEx` will fail.

Each member of `TBufferGetEx` must be initialized to the appropriate value before being passed to `DscBufferGetEx`. The member *`iMinBytes`* must be greater than or equal to zero, and the member *`iMaxBytes`* must be greater than or equal to *`iMinBytes`*. If *`iMinBytes`* is zero `DscBufferGetEx` will never block even when there are no data available.

A zero value of *`iBytesMultiple`* is treated the same as one. The value of *`iBytesMultiple`* cannot be larger than the maximum pipe buffer size on the PC side (converted to bytes) minus 1024, or minus the iDSC side blocking size (converted to bytes), whichever is larger; otherwise, the first condition causes an error. The second condition is not checked and may cause a deadlock. It is the application's responsibility to guarantee that it never happens.

Both *`iMinBytes`* and *`iMaxBytes`* must be an integral multiple of the *`iBytesMultiple`* value; otherwise, an error occurs.

See Also

`DscBufferGetEx`, `DscStructPrepare`

TDscIoInt64

The `TDscIoInt64` structure defines the behavior of the `DscServerDiskLogBytes` function and the *`i64MaxCount`* parameter of `TServerDiskLogConfig`. `TDscIoInt64` represents a 64-bit integer type.

```
#ifdef M_DscIoNoInt64

typedef struct tag_TDscIoInt64 {
   unsigned long dwLowPart;            // Low 32-bits of 64-bit integer type.
   unsigned long dwHighPart;           // High 32-bits of 64-bit integer type.
   } TDscIoInt64;

#else

typedef __int64 TDscIoInt64;

#endif
```

Example

The following examples show how to initialize the *`i64MaxCount`* parameter of `TServerDiskLogConfig` to a value of 4294967296. The first example is for environments that support the `__int64` data type while the second example is for environments that do not support the `__int64` data type.

// Example 1: `__int64` type is supported

```
#include <dscio.h>
...

TServerDiskLogConfig sdlc;
DscStructPrepare(&sdlc, sizeof(sdlc));
sdlc.i64MaxCount = 4294967296;
```

// Example 2: `__int64` type is not supported

```
#define M_DscIoNoInt64 1
#include <dscio.h>
...

TServerDiskLogConfig sdlc;
DscStructPrepare(&sdlc, sizeof(sdlc));
```

```
   sdlc.i64MaxCount.dwLowPart = 0;
   sdlc.i64MaxCount.dwHighPart = 1;
```

See Also

TServerDiskLogConfig, DscServerDiskLogBytes

TFilterParam

The `TFilterParam` structure defines the behavior of `DscFilterParametersGet` and `DscFilterParametersSet`. The defaults for the members depend on the sample rate.

```
typedef struct tag_TFilterParam {
    int iInfoSize;                  // Size of this structure.
    char achName[64];               // Filter name.
    int iFilterType;                // Filter type.
    int iSharpness;                 // Filter sharpness.
    float fCutoffFreqLow;           // Filter low cutoff frequency.
    float fCutoffSlopeLow;          // Filter low cutoff slope.
    float fCutoffFreqHigh;          // Filter high cutoff frequency.
    float fCutoffSlopeHigh;         // Filter high cutoff slope.
    float fAttenuation;             // Filter attenuation.
    } TFilterParam;
```

Members

iInfoSize

Size of this information structure.

achName

Name of the filter. The name is restricted to 63 characters plus one null-terminated character. The default is `FD0`, `FD1`, `FD2`, `FD3`, `FD4`, `FD5`, `FD6`, and `FD7` for each of the eight filters.

iFilterType

Type of the filter, either lowpass or bandpass. These constants simplify selecting the filter type: `Dsc_LowPass`, `Dsc_BandPass`. The default is lowpass.

iSharpness

Sharpness of the filter specified as an odd number. Valid numbers are in the range 37 to 255, depending on the sample rate.

The default is 37 for sample rate 153600 s/s, 119 for sample rate 102400 s/s, 95 for sample rate 76800 s/s, 195 for sample rates of 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 137 for all other sample rates.

fCutoffFreqLow

Low cutoff frequency of the filter specified in Hertz. Valid numbers are in the range 2% to 80% of the Nyquist frequency (0.02 * Nyquist frequency to 0.8 *

Nyquist frequency). The Nyquist frequency is half the sample rate. The default is half the Nyquist frequency.

fCutoffSlopeLow

Low cutoff slope of the filter specified as a fraction of the Nyquist frequency, with the Nyquist frequency normalized to 1.0. Valid numbers are in the range 0.0 to 0.8. 0.0 corresponds to 0% of the Nyquist frequency and 0.8 corresponds to 80% of the Nyquist frequency. The Nyquist frequency is half the sample rate.

The default is 0.0 for sample rates of 153600 s/s, 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 0.04 for all other sample rates.

fCutoffFreqHigh

High cutoff frequency of the filter specified in Hertz. Valid numbers are in the range 2% to 80% of the Nyquist frequency (0.02 * Nyquist frequency to 0.8 * Nyquist frequency). The Nyquist frequency is half the sample rate. The default is three-quarters the Nyquist frequency.

fCutoffSlopeHigh

High cutoff slope of the filter specified as a fraction of the Nyquist frequency, with the Nyquist frequency normalized to 1.0. Valid numbers are in the range 0.0 to 0.8. 0.0 corresponds to 0% of the Nyquist frequency and 0.8 corresponds to 80% of the Nyquist frequency. The Nyquist frequency is half the sample rate.

The default is 0.0 for sample rates of 153600 s/s, 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 0.04 for all other sample rates.

fAttenuation

Attenuation of the filter in the stopband region. Valid numbers are in the range 6.0 to 12.0. The larger the number, the more attenuation in the stopband, but this will further attenuate the frequencies near cutoff.

The default is 10.2 for sample rate 153600 s/s, 9.4 for sample rate 76800 s/s, 9.8 for sample rates of 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 9.0 for all other sample rates.

Remarks

`TFilterParam` is used in `DscFilterParametersGet` and `DscFilterParametersSet`. `TFilterParam` should be initialized using `DscStructPrepare` or both functions will fail.

`DscFilterParametersGet` will return the filter parameters in the *achName*, *iFilterType*, *iSharpness*, *fCutoffFreqLow*, *fCutoffSlopeLow*, *fCutoffFreqHigh*, *fCutoffSlopeHigh*, and *fAttenuation* members.

Before invoking `DscFilterParametersSet`, the *`achName`*, *`iFilterType`*, *`iSharpness`*, *`fCutoffFreqLow`*, *`fCutoffSlopeLow`*, *`fCutoffFreqHigh`*, *`fCutoffSlopeHigh`*, and *`fAttenuation`* members must be set to the new desired values.

See Also

`DscFilterParametersGet`, `DscFilterParametersSet`, `DscStructPrepare`

TProcSystemErrorStdcall

The `TProcSystemErrorStdcall` structure defines the behavior of the `DscOnSystemErrorSet` function.

```
typedef void_stdcallTProcSystemErrorStdcall(
    void *pInfo,                    // Pointer to additional information.
    HDSC hDsc,                      // iDSC board handle.
    const char *sError              // Error from the iDSC board.
    );
```

Members

pInfo

A pointer to additional information to satisfy type calling conventions.

hDsc

Handle of the iDSC board.

sError

The error returned from the iDSC board.

Remarks

`TProcSystemErrorStdcall` supports `DscOnSystemErrorSet`. The parameter, *sError*, displays an error message when a system error occurs. The user can use the *sError* parameter to display the error message in an error handling routine.

The `DscOnSystemErrorSet` function runs when the `DscSystemErrorProcess` function is invoked. `DscSystemErrorProcess` is automatically invoked during `DscBufferGetEx` if there are errors from the iDSC. The user can also call `DscSystemErrorProcess` and invoke `DscOnSystemErrorSet` if errors from the iDSC are suspected.

See Also

`DscOnSystemErrorSet`, `DscSystemErrorProcess`

TServerDiskLogConfig

The `TServerDiskLogConfig` structure defines the behavior of `DscServerDiskLogConfigGet` and `DscServerDiskLogConfigSet`.

```
typedef struct tag_TServerDiskLogConfig {
    int iInfoSize;                              // Size of this structure.
    unsigned long dwFlags;                      // Logging behavior flags.
    char *pszFileName;                          // File name.
    unsigned long dwFileNameSize;               // Size of file name.
    unsigned long dwFileShareMode;              // File share properties.
    unsigned long dwOpenFlags;                  // File open options.
    unsigned long dwFileFlagsAttributes;        // File attributes.
    unsigned long dwBlockSize;                  // Size of block to write.
    TDscIoInt64 i64MaxCount;                    // File maximum count.
    } TServerDiskLogConfig;
```

Members

iInfoSize

Size of this information structure.

dwFlags

Flags to control disk logging behavior. The constants below simplify selecting *dwFlags*. The default is `DscDlfServerSide` and `DscDlfFlushBefore`.

`DscDlfServerSide`

Log on the same side of the network connection as the iDSC. If not specified, logging will take place on the application (client) side of the network connection.

`DscDlfFlushBefore`

Flush the input data pipe before beginning the logging session. Default action is to not flush the pipes before logging.

`DscDlfFlushAfter`

Flush the input pipe after the logging session has terminated. Default action is to not flush the pipes after logging.

`DscDlfMirrorLog`

Enable mirror logging. Mirror logging creates a copy of the logged data in another file.

`DscDlfAppendData`
: Allow new data to be appended to an existing file. Only the `DscOfOpenAlways` and `DscOfOpenExisting` flags of the *`dwOpenFlags`* member can be used for appending.

`DscDlfBlockTransfer`
: Open the file with no intermediate buffering or caching and access the file in a special way that is highly dependent on the target disk attributes to improve performance. This transfer mode adds overhead to slow rate transfer with small buffers. It should only be used when necessary with a very large *`dwBlockSize`* value (such as 1048576 and above). If this option is selected, *`dwBlockSize`* is automatically set to 1048576.

`pszFileName`

Name of the primary disk log file and name of a possible mirror disk log file, if mirror logging is enabled. The default is an empty string. The size of the user allocated buffer must be specified using *`dwFileNameSize`* when used with **`DscServerDiskLogConfigGet`**.

Mirror logging is enabled by selecting the `DscDlfMirrorLog` flag of the *`dwFlags`* member. Multiple file names are separated by semi-colons. Currently, only one mirror file is allowed. Both files must be on the same side of the DAPcell Local/DAPcell service (the PC application side or the iDSC side).

`dwFileNameSize`

Size of the user allocated buffer to store the file name specified by *`pszFileName`*. The size must include an extra space for the null terminator. This field is important in **`DscServerDiskLogConfigGet`**. It is not used in **`DscServerDiskLogConfigSet`**.

If *`dwFileNameSize`* is 0, the file name is not returned in *`pszFileName`*. If *`dwFileNameSize`* is 1, only the null terminator is returned in *`pszFileName`*.

`dwFileShareMode`

File share mode of the disk log file. The constants below simplify selecting *`dwFileShareMode`*. The default is `DscFsmRead`.

`DscFsmNone`	The file cannot be used by another process.
`DscFsmRead`	The file can be read by another process.
`DscFsmWrite`	The file can be written to by another process.
`DscFsmReadWrite`	The file can be read and written to by another process.

`dwOpenFlags`

File open options of the disk log file. The constants below simplify selecting *`dwOpenFlags`*. The default is `DscOfCreateAlways`.

`DscOfCreateNew`	Create a new file. Creation fails if the file already exists.
`DscOfCreateAlways`	Create a new file. If the file already exists, it is overwritten.
`DscOfOpenAlways`	Open an existing file. If the file does not exist, it will be created.
`DscOfOpenExisting`	Open an existing file without resetting permissions. Opening fails if the file does not exist.

dwFileFlagsAttributes

File attributes of the disk log file. The constants below simplify selecting *dwFileFlagsAttributes*. The default is `DscFfaAttributeNormal`.

`DscFfaAttributeNormal`	No special attributes.
`DscFfaAttributeEncrypted`	The data in the file is encrypted.
`DscFfaFlagWriteThrough`	Write through any intermediate caching and go directly to disk.
`DscFfaFlagSequentialScan`	Can be used to optimize the transfer of large blocks of data. Most applications will not need this flag.

dwBlockSize

Minimum amount of data, in bytes, to write to the disk log file at one time. This field is provided for disk transfer optimization. The default is 8192.

i64MaxCount

Maximum number of bytes to log. The default is 0, which causes logging to continue indefinitely until `DscStopAcquiring` is invoked. It is a `TDscIoInt64` structure.

Remarks

`TServerDiskLogConfig` is used in `DscServerDiskLogConfigGet` and `DscServerDiskLogConfigSet`. `TServerDiskLogConfig` should be initialized using `DscStructPrepare` or both functions will fail.

`DscServerDiskLogConfigGet` will return the server disk log configuration in the *dwFlags*, *pszFileName*, *dwFileShareMode*, *dwOpenFlags*, *dwFileFlagsAttributes*, *dwBlockSize*, and *i64MaxCount* members of `TServerDiskLogConfig`.

To use `DscServerDiskLogConfigSet` it is recommended that the user invokes `DscServerDiskLogConfigGet` to get the server disk log configuration defaults, updates the pertinent fields, and then invokes `DscServerDiskLogConfigSet`.

See Also

`DscStructPrepare`, `DscServerDiskLogConfigGet`, `DscServerDiskLogConfigSet`

TXbPinConfig

The `TXbPinConfig` structure defines the behavior of `DscXbPinConfigGet` and `DscXbPinConfigSet`.

```
typedef struct tag_TXbPinConfig {
    int iInfoSize;                    // Size of this structure.
    int iInputType;                   // Input type.
    float fInputRange;                // Input range voltage.
    float fInputOffset;               // Input offset voltage.
    float fInputOffsetRange;          // Input offset range voltage.
    float fOutputExcitation;          // Output excitation voltage.
    } TXbPinConfig;
```

Members

iInfoSize

Size of this information structure.

iInputType

Type of input signal, DC coupling, AC coupling or excitation. These constants simplify selecting the input type: `DscXb_DCCoupling`, `DscXb_ACCoupling`, `DscXb_Excitation`. The default is `DscXb_DCCoupling`.

fInputRange

Input range of the signal specified in Volts. Please note that this input range is different from `DscInputRangeGet`, and only works if `DscInputRangeSet` is set to +/- 5V.

If you select 0.5 the input range is +/- 500 mV, if you select 2.0 the input range +/- 2V. If you specify an invalid input range, the input range will not change from its previous setting. The default is 10.0.

Valid input ranges are:
0.01, 0.02, 0.05,
0.1, 0.2, 0.5,
1.0, 2.0, 5.0,
10.0

fInputOffset

Input offset of the signal specified in Volts. The input offset must be within the range of the input offset range. If you specify an invalid input offset, the input offset will not change from its previous setting. The default is 0.0.

fInputOffsetRange

Input offset range of the signal returned in Volts. The input offset range is determined by the input range. For example, if the input range is 0.5 then the input offset range is 2.5 for +/-2.5 V, if the input range is 2.0 then the input offset range is 1.0 for +/- 1V. This is a read only property that is dependent on the input range and you cannot specify it.

Valid input offset ranges are:

0.5	when the input range is 0.01
1.0	when the input range is 0.02
2.5	when the input range is 0.05
0.5	when the input range is 0.1
1.0	when the input range is 0.2
2.5	when the input range is 0.5
1.0	when the input range is 1.0
1.0	when the input range is 2.0
5.0	when the input range is 5.0
5.0	when the input range is 10.0

fOutputExcitation

Output excitation signal specified in Volts. If you specify an invalid output excitation, the output excitation will not change from its previous setting. The default is 0.0.

Valid output excitation ranges are:

0.0, 1.0, 2.0, 5.0, 10.0

Remarks

`TXbPinConfig` is used in `DscXbPinConfigGet` and `DscXbPinConfigSet`. `TXbPinConfig` should be initialized using `DscStructPrepare` or both functions will fail.

`DscXbPinConfigGet` will return the pin configuration in the *iInputType*, *fInputRange*, *fInputOffset*, *fInputOffsetRange*, and *fOutputExcitation* members of `TXbPinConfig`.

Before invoking `DscXbPinConfigSet`, the *iInputType*, *fInputRange*, *fInputOffset*, and *fOutputExcitation* members of `TXbPinConfig` must be set to the new desired values. *fInputOffsetRange* cannot be set since it is a read only property.

See Also

`DscStructPrepare`, `DscXbPinConfigGet`, `DscXbPinConfigSet`

Function Summary

The DSCIO interface provides a complete set of functions for communicating with the iDSC board. Each function falls into one of several categories.

Category	**Dsc Services**

Graphical services	`DscConfigDialogOptionsGet`
	`DscConfigDialogOptionsSet`
	`DscConfigDialogShow`

Filter design services	`DscFilterIndex`
	`DscFilterParametersGet`
	`DscFilterParametersSet`
	`DscPinToFilterMapGet`
	`DscPinToFilterMapSet`
	`DscTransferFunctionGet`
	`DscUnitStepGet`
	`DscUnitStepLengthGet`

Handle services	`DscHandleClose` `DscHandleOpen`

Communication services	`DscCalibrate`
	`DscCommandsLoad`
	`DscStartAcquiring`
	`DscStopAcquiring`

I/O services	`DscBufferAvail`
	`DscBufferGet`
	`DscBufferGetEnabledGet`
	`DscBuffetGetEnabledSet`
	`DscBufferGetEx`

System services	`DscAddressGet`
	`DscAddressSet`
	`DscGroupDelay`
	`DscHardwareStop`
	`DscIdGet`
	`DscIdSet`
	`DscInputRangeGet`
	`DscInputRangeSet`

	`DscMemoryUsed`
	`DscPinEnabledCount`
	`DscPinEnabledGet`
	`DscPinEnabledSet`
	`DscRunning`
	`DscSampleRateGet`
	`DscSampleRateSet`
	`DscScansDiscarded`
	`DscStructPrepare`
DAPL services	`DscDaplTextGet`
	`DscDaplTextLengthGet`
	`DscDaplTextSet`
Master/slave services	`DscMasterGet`
	`DscMasterSet`
	`DscOperateModeGet`
	`DscOperateModeSet`
	`DscRemoteMasterGet`
	`DscRemoteMasterSet`
	`DscSlaveCount`
	`DscSlaveHandle`
External board services	`DscXbCalibrate`
	`DscXbEnabledGet`
	`DscXbEnabledSet`
	`DscXbPinConfigGet`
	`DscXbPinConfigSet`
Server disk log services	`DscServerDiskLogBytes`
	`DscServerDiskLogConfigGet`
	`DscServerDiskLogConfigSet`
	`DscServerDiskLogEnabledGet`
	`DscServerDiskLogEnabledSet`
	`DscServerDiskLogFileNameGet`
	`DscServerDiskLogFileNameSet`
Timing channel services	`DscTcEnabledCount`
	`DscTcEnabledGet`
	`DscTcEnabledSet`
	`DscTcMaximum`
	`DscTcWidth`
Error handling services	`DscLastErrorTextGet`
	`DscLastErrorTextSet`

	DscSystemErrorProcess
Events	DscOnSystemErrorSet
Memory services	DscConfigRead DscConfigWrite DscConfigWriteSize
Category	**DscGroup Services**
Graphical services	DscGroupConfigDialogShow
Handle services	DscGroupHandleClose DscGroupHandleOpen
Configuration services	DscGroupAddOne DscGroupCount DscGroupDeleteOne DscGroupDsc
Memory services	DscGroupConfigRead DscGroupConfigWrite DscGroupConfigWriteSize

DscAddressGet

The `DscAddressGet` function gets the machine name and iDSC board name. The name returned is in UNC format.

```
int __stdcall DscAddressGet(
    HDSC hDsc,                          // iDSC board handle.
    int iSize,                          // Size of pszAddress buffer.
    const char *pszAddress              // Pointer to buffer of characters.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSize

Size of the *pszAddress* buffer that stores the DscAddress. The buffer is allocated by the application.

pszAddress

Pointer to a buffer that stores the DscAddress. The buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the length of the string. If the function fails, the return value is -1.

Remarks

`DscAddressGet` returns the machine name and the iDSC board name. An example is `\\.\Dap0`, where `\\.` denotes the local machine and `\Dap0` is the name of the iDSC board.

See Also

`DscAddressSet`, UNC

DscAddressSet

The `DscAddressSet` function sets the machine name and iDSC board name. The name returned is in UNC format.

```
int __stdcall DscAddressSet(
   HDSC hDsc,                          // iDSC board handle.
   const char *pszAddress              // UNC name.
   );
```

Parameters

hDsc

Handle of the iDSC board.

pszAddress

Pointer to a UNC name that specifies which iDSC board to open.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscAddressSet` takes the parameter *pszAddress*, that consists of two portions, the machine name and the iDSC board name. The naming method is based on the UNC.

Using `\\.\Dap0` as an example, `\\.` denotes the local machine and `\Dap0` is the name of the iDSC board. If you are connected through DAPcell to a remote machine named PC45 , that contains `Dap0`, then *pszAddress* is `\\PC45\Dap0`.

See Also

`DscAddressGet`, UNC

DscBufferAvail

The `DscBufferAvail` function gets the number of bytes available for reading from the iDSC board.

```
int __stdcall DscBufferAvail(
    HDSC hDsc                                    // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the number of bytes available for reading. If the function fails, the return value is -1. If there are no data available, the return value is 0.

Remarks

`DscBufferAvail` returns the number of bytes already buffered. An application is safe to read that number from the iDSC board without being blocked.

For efficient data transfer, it is best to use `DscBufferGetEx` with a time wait, and avoid using `DscBufferAvail`. `DscBufferGetEx` returns the actual number of bytes read which lets the application know what data have been transferred.

See Also

`DscBufferGet`, `DscBufferGetEx`

DscBufferGet

The `DscBufferGet` function reads a block of data from the iDSC board.

```
int __stdcall DscBufferGet(
    HDSC hDsc,                    // iDSC board handle.
    int iBytes,                   // Number of bytes to read.
    int iTimeWait,                // Longest time to wait for data.
    void *pvBuffer                // Address of buffer to receive data.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iBytes
Number of bytes to read.

iTimeWait
Longest time in milliseconds that the get operation can be blocked waiting for data. If no data shows up in that amount of time, the operation should be aborted.

pvBuffer
Pointer to a buffer for storing the data from the iDSC board.

Return Values

If the function succeeds, the return value is the number of bytes read. If the function fails, the return value is -1. If there are no data available, the return value is 0.

Remarks

`DscBufferGet` attempts to read all the requested *iBytes* from the iDSC board. If, all the requested *iBytes* are not available for *iTimeWait* milliseconds, it returns with the number of bytes read so far.

An application that cannot guarantee data availability should use `DscBufferGetEx` to avoid waiting for data.

This function is useful for displaying the acquired and filtered data in graphs, tables, etc.

See Also

`DscBufferGetEx`

DscBufferGetEnabledGet

The `DscBufferGetEnabledGet` function gets the state of the `DscBufferGet` function and `DscBufferGetEx` function.

```
int __stdcall DscBufferGetEnabledGet(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 0 for disabled and 1 for enabled. If the function fails, the return value is -1.

Remarks

`DscBufferGetEnabledGet` returns the state of the `DscBufferGet` function and `DscBufferGetEx` function. If `DscBufferGetEnabledGet` is 0, `DscBufferGet` and `DscBufferGetEx` are disabled, and invoking those functions will return -1. If `DscBufferGetEnabledGet` is 1, `DscBufferGet` and `DscBufferGetEx` are enabled.

See Also

`DscBufferGet`, `DscBufferGetEnabledSet`, `DscBufferGetEx`

DscBufferGetEnabledSet

The `DscBufferGetEnabledSet` function sets the state of the `DscBufferGet` function and `DscBufferGetEx` function.

```
int __stdcall DscBufferGetEnabledSet(
    HDSC hDsc,                          // iDSC board handle.
    int iBufferGetEnabled               // DscBufferGet/GetEx state.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iBufferGetEnabled

DscBuffetGet and DscBufferGetEx state.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscBufferGetEnabledSet` sets the state of the `DscBufferGet` function and `DscBufferGetEx` function. If *iBufferGetEnabled* is 0, `DscBufferGet` and `DscBufferGetEx` are disabled, and invoking those functions will return -1. If *iBufferGetEnabled* is 1, `DscBufferGet` and `DscBufferGetEx` are enabled.

`DscBufferGetEnabledSet` is useful if another PC wants to access the iDSC data from the PC with the iDSC through networking. The networking capability is only available with the DAPcell Local and DAPcell servers. It is not available with the Accel32 server.

See Also

`DscBufferGet`, `DscBufferGetEnabledGet`, `DscBufferGetEx`

DscBufferGetEx

The `DscBufferGetEx` function reads a block of data from the iDSC board, using the `TBufferGetEx` structure to control its behavior.

```
int __stdcall DscBufferGetEx(
    HDSC hDsc,                              // iDSC board handle.
    const TBufferGetEx *pBufferGetEx,       // Address of structure.
    void *pvBuffer                          // Address of buffer to receive data.
    );
```

Parameters

hDsc

Handle of the iDSC board.

pBufferGetEx

Pointer to a `TBufferGetEx` structure that passes the appropriate parameters. `TBufferGetEx` must be initialized using `DscStructPrepare`.

pvBuffer

Pointer to a buffer for storing the data from the iDSC board.

Return Values

If the function succeeds, the return value is the number of bytes read. If the function fails, the return value is -1. If there are no data available, the return value is 0.

Remarks

`DscBufferGetEx` is an extended version of `DscBufferGet`. It allows a minimum request count, *iMinBytes*, and a maximum request count, *iMaxBytes*, specification. Both *iMinBytes* and *iMaxBytes* are passed into this function through the `TBufferGetEx` structure. Both *iMinBytes* and *iMaxBytes* are in bytes and must be an integral multiple of *iBytesMultiple*. The function reads at least *iMinBytes* bytes of data. Once it reads enough data to cover *iMinBytes*, the function reads all available data up to *iMaxBytes* without waiting. The actual bytes returned is always an integral multiple of *iBytesMultiple*.

Before *iMinBytes* is covered, the function will be blocked waiting for data if the target pipe becomes empty. In this case, the two members of the `TBufferGetEx` structure, *iTimeWait* and *iTimeOut*, determine the behavior of the function. If *iMinBytes* is not covered in *iTimeOut* milliseconds, or if no data are available for *iTimeWait* milliseconds, the function returns immediately. The return value is then the number of bytes actually read up to the point where the operation is aborted. It can be zero or any integral multiple of *iBytesMultiple* less than *iMinBytes*. An application can check the return value to determine if a time-out has occurred.

See Also

`DscBufferGet`

DscCalibrate

The `DscCalibrate` function performs calibration on the iDSC board.

```
int __stdcall DscCalibrate(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscCalibrate` calibrates the iDSC board for DC gain and offset, and saves the calibration values.

`DscCalibrate` is automatically invoked when a user selects `DscStartAcquiring` for the first time. The next time a user uses the DLL, the saved calibration values are reused.

If the calibration values are not found, calibration is automatically re-invoked. A user can force recalibration by calling `DscCalibrate`.

See Also

`DscStartAcquiring`

DscCommandsLoad

The `DscCommandsLoad` function downloads the configuration commands to the iDSC board and performs the necessary configuration for filtering.

```
int __stdcall DscCommandsLoad(
    HDSC hDsc                          // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscCommandsLoad` configures the iDSC board with the appropriate programs and coefficients. The filter designs are used internally by `DscCommandsLoad` to calculate and download the appropriate commands.

If the iDSC board input or filter designs change and `DscStartAcquiring` is selected, `DscStartAcquiring` automatically invokes `DscCommandsLoad` and downloads new commands to the iDSC board. Data will show up at the PC two times `DscGroupDelay` seconds later.

If the iDSC board input or filter designs change and `DscCommandsLoad` is selected before `DscStartAcquiring`, data will show up immediately at the PC. Data that show up immediately are actually data that were sampled `DscGroupDelay` seconds ago.

See Also

`DscGroupDelay`, `DscStartAcquiring`

DscConfigDialogOptionsGet

The `DscConfigDialogOptionsGet` function gets the display options of `DscConfigDialogShow`.

```
int __stdcall DscConfigDialogOptionsGet(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the display options. If the function fails, the return value is -1.

Remarks

`DscConfigDialogOptionsGet` returns the display options as an integer value. The lowest eleven bits (bits 0 through bit 10) are used since there are eleven display options, `InputScreenHide`, `FDScreenHide` (filter design screen hide), `TcHide` (timing channels selection hide), `FD0Hide` (filter design index 0 hide), `FD1Hide`, `FD2Hide`, `FD3Hide`, `FD4Hide`, `FD5Hide`, `FD6Hide`, `FD7Hide`.

`InputScreenHide` is bit 0, `FDScreenHide` is bit 1, `TcHide` is bit 2, `FD0Hide` is bit 3, `FD1Hide` is bit 4, `FD2Hide` is bit 5, `FD3Hide` is bit 6, `FD4Hide` is bit 7, `FD5Hide` is bit 8, `FD6Hide` is bit 9, `FD7Hide` is bit 10.

When the display options are enabled, the corresponding bits are set. When the display options are disabled, the corresponding bits are cleared.

See Also

`DscConfigDialogOptionsSet`, `DscConfigDialogShow`

DscConfigDialogOptionsSet

The `DscConfigDialogOptionsSet` function allows manipulating the display options of `DscConfigDialogShow`.

```
int __stdcall DscConfigDialogOptionsSet(
    HDSC hDsc,                              // iDSC board handle.
    int iOptions                            // Display options.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iOptions

`DscConfigDialogShow` display options.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscConfigDialogOptionsSet` specifies the display options of `DscConfigDialogShow`. The default is `DscConfigDialog_TcHide`.

The constants below simplify selecting the display options.

DscConfigDialog_InputScreenHide	Hide the Input Screen.
DscConfigDialog_FDScreenHide	Hide the Filter Design Screen.
DscConfigDialog_TcHide	Hide the timing channels selection.
DscConfigDialog_FD0Hide	Hide filter design index 0.
DscConfigDialog_FD1Hide	Hide filter design index 1.
DscConfigDialog_FD2Hide	Hide filter design index 2.
DscConfigDialog_FD3Hide	Hide filter design index 3.
DscConfigDialog_FD4Hide	Hide filter design index 4.
DscConfigDialog_FD5Hide	Hide filter design index 5.
DscConfigDialog_FD6Hide	Hide filter design index 6.
DscConfigDialog_FD7Hide	Hide filter design index 7.

See Also

`DscConfigDialogOptionsGet`, `DscConfigDialogShow`

DscConfigDialogShow

The `DscConfigDialogShow` function displays modal dialog screens for graphical configuration of the inputs and filter designs.

```
int __stdcall DscConfigDialogShow(
    HDSC hDsc                                    // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

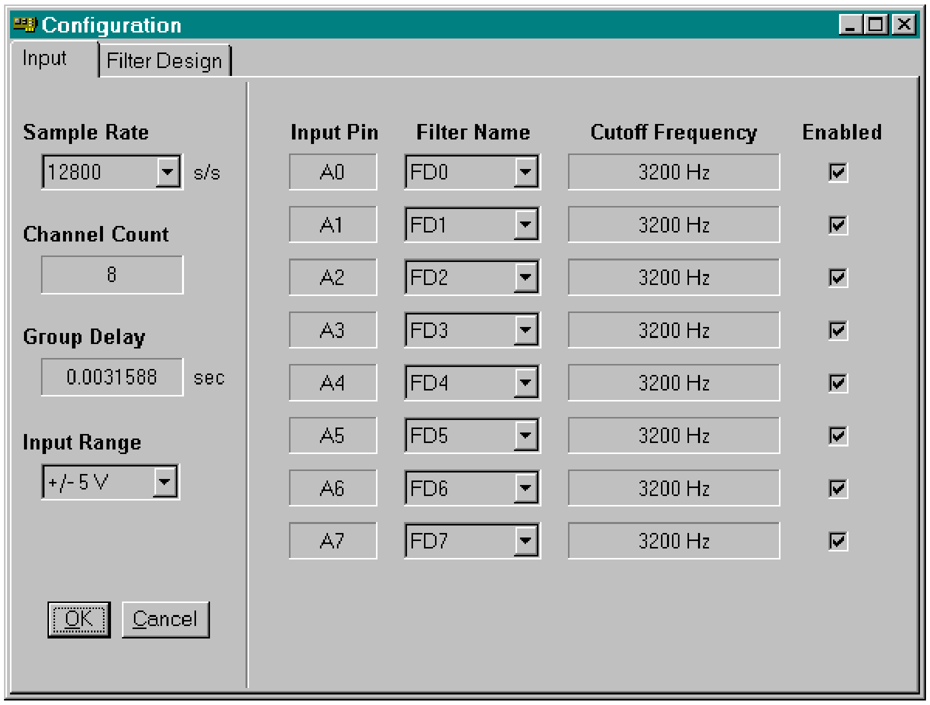
If the user selects the OK button when changes are made, the return value is IDOK (of value 1). If the user selects the OK button when no changes are made, the return value is IDIGNORE (of value 5). If the user selects the Cancel button, the return value is IDCANCEL (of value 2).

If the function fails, the return value is 0.

Remarks

`DscConfigDialogShow` simplifies the configuration of the input and filter design process with a graphical interface. The Input Screen provides a quick method for selecting the sample rate, selecting the input range, mapping the input pins to selected filter designs, and enabling or disabling the input pins.

The figure below displays the Input Screen.



Sample Rate: 12800 s/s

Channel Count: 8

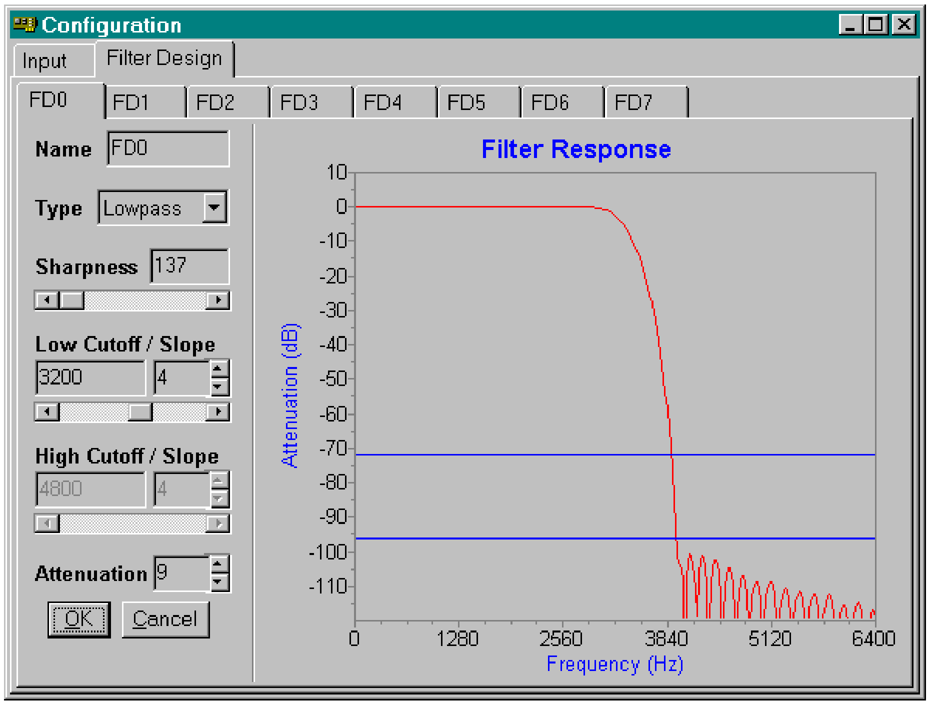
Group Delay: 0.0031588 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

The Filter Design Screen allows easy manipulation of filter parameters like sharpness, low cutoff frequency, low cutoff slope, high cutoff frequency, high cutoff slope, and attenuation, either by entering a valid number or by adjusting a slider. When the user selects the right click button, there are several more options like `Crosshair Track`, `Y Display` (linear, linear zoom, log, log zoom, and unit step), `Defaults Load`, `Copy`, and `Paste`. The `Copy` (`Ctrl-C`) and `Paste` (`Ctrl-V`) feature copies the filter parameters from one filter design tab to another.

The figure below displays the Filter Design Screen.



Name FD0
Type Lowpass
Sharpness 137
Low Cutoff / Slope 3200 4
High Cutoff / Slope 4800 4
Attenuation 9

A user can also design filters using the run-time design techniques available in the one of the pairs of functions below.

`DscFilterParametersGet` & `DscFilterParametersSet`
`DscPinToFilterMapGet` & `DscPinToFilterMapSet`

The Input Screen, Filter Design Screen, timing channels selection, and individual filter designs can be hidden using `DscConfigDialogOptionsSet`.

See Also

`DscConfigDialogOptionsGet`, `DscConfigDialogOptionsSet`, `DscFilterParametersGet`, `DscFilterParametersSet`

DscConfigRead

The `DscConfigRead` function reads iDSC board information from memory.

```
int __stdcall DscConfigRead(
    HDSC hDsc,                          // iDSC board handle.
    int iSize,                          // Size of memory allocated.
    void *pvBuffer                      // Pointer to memory buffer.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iSize
Size of the memory buffer for the iDSC board information. The memory buffer is allocated by the application.

pvBuffer
Pointer to the memory buffer that stores the iDSC board information. The memory buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the number of bytes read from memory. If the function fails, the return value is 0.

Remarks

`DscConfigRead` reads iDSC board information in binary format from memory. The information in memory is probably retrieved from a disk file.

The iDSC board information read includes the sample rate, input range, input pin to filter mappings, enabled input pins, iDSC address, and details of the filter designs. Note that when `DscConfigRead` is invoked, the iDSC address used in `DscHandleOpen` will be overwritten with the iDSC address that was stored in `DscConfigRead`.

iSize is the value that was previously used as the *iSize* parameter of `DscConfigWrite` when the iDSC board information was stored to memory. The user cannot use `DscConfigWriteSize` for *iSize* in `DscConfigRead` because it will not return the correct size. `DscConfigWriteSize` is provided only for the `DscConfigWrite` operation.

See Also

`DscConfigWrite`, `DscConfigWriteSize`

DscConfigWrite

The `DscConfigWrite` function writes iDSC board information to memory.

```
int __stdcall DscConfigWrite(
    HDSC hDsc,                          // iDSC board handle.
    int iSize,                          // Size of memory buffer.
    void *pvBuffer                      // Pointer to memory buffer.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSize

Size of the memory buffer for the iDSC board information. The memory buffer is allocated by the application.

pvBuffer

Pointer to the memory buffer that stores the iDSC board information. The memory buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the number of bytes written to memory. If the function fails, the return value is 0.

Remarks

`DscConfigWrite` writes iDSC board information in binary format to memory. The information in memory can then be written to a disk file.

The iDSC board information written includes the sample rate, input range, input pin to filter mappings, enabled input pins, iDSC address, and details of the filter designs.

iSize is the size of the memory buffer allocated and must be at least `DscConfigWriteSize`. *iSize* should be stored by the program to be used later as the *iSize* parameter of `DscConfigRead`.

See Also

`DscConfigRead`, `DscConfigWriteSize`

DscConfigWriteSize

The `DscConfigWriteSize` function returns the minimum number of bytes to allocate for `DscConfigWrite`.

```
int __stdcall DscConfigWriteSize(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the minimum number of bytes to allocate. If the function fails, the return value is 0.

Remarks

`DscConfigWriteSize` must be used to determine the minimum number of bytes to allocate for the *iSize* parameter of `DscConfigWrite`. It cannot be used as the *iSize* parameter of `DscConfigRead`

See Also

`DscConfigWrite`, `DscConfigRead`

DscDaplTextGet

The `DscDaplTextGet` function gets the DAPL text defined for the iDSC.

```
int __stdcall DscDaplTextGet(
    HDSC hDsc,                        // iDSC board handle.
    int iSize,                        // Size of pszDaplText buffer.
    const char *pszDaplText           // Pointer to buffer of characters.
    );
```

Parameters

hDsc
: Handle of the iDSC board.

iSize
: Size of the *pszDaplText* buffer for the DAPL text. The buffer is allocated by the application.

pszDaplText
: Pointer to a buffer that stores the DAPL text. The buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the length of the string. If the function fails, the return value is -1.

Remarks

`DscDaplTextGet` returns the DAPL text defined for the iDSC. Each line of DAPL text is delimited by a carriage-return and line-feed.

The DAPL text is sent to the iDSC when the user invokes `DscCommandsLoad` or `DscStartAcquiring`.

See Also

`DscDaplTextLengthGet`, `DscDaplTextSet`

DscDaplTextLengthGet

The `DscDaplTextLengthGet` function gets the length of the DAPL text defined for the iDSC.

```
int __stdcall DscDaplTextLengthGet(
    HDSC hDsc                                    // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the length of the buffer for the DAPL text. If the function fails, the return value is 0.

Remarks

`DscDaplTextLengthGet` returns the length of the buffer for the DAPL text defined for the iDSC. This includes an extra character at the end for the null-terminator.

`DscDaplTextLengthGet` allows the user to determine the size of buffer to allocate when using the `DscDaplTextGet` function.

See Also

`DscDaplTextGet`, `DscDaplTextSet`

DscDaplTextSet

The `DscDaplTextSet` function defines the DAPL text for the iDSC.

```
int __stdcall DscDaplTextSet(
    HDSC hDsc,                          // iDSC board handle.
    const char *pszDaplText             // DAPL text.
    );
```

Parameters

hDsc

Handle of the iDSC board.

pszDaplText

Pointer to the DAPL text.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscDaplTextSet` allows the user to define custom DAPL text for the iDSC. Each line of DAPL text must be delimited by a carriage-return, line-feed, or both.

The DAPL text is sent to the iDSC when the user invokes `DscCommandsLoad` or `DscStartAcquiring`.

See Also

`DscDaplTextGet`, `DscDaplTextLengthGet`

DscFilterIndex

The `DscFilterIndex` function returns the filter index when given a filter name.

```
int __stdcall DscFilterIndex(
    HDSC hDsc,                          // iDSC board handle.
    const char *pszFilterName           // Filter name.
    );
```

Parameters

hDsc
Handle of the iDSC board.

pszFilterName
Pointer to a filter name.

Return Values

If the function succeeds, the return value is the filter index. So, if the filter name of interest is associated with filter index 0, the return value is 0. If the function fails, the return value is -1. For example, if *pszFilterName* is an invalid name, failure occurs.

Remarks

`DscFilterIndex` determines the filter index associated with a particular filter name. Since there are a maximum of eight filter designs, valid filter indices are 0 through 7.

The filter index is useful in functions like `DscFilterParametersGet`, `DscFilterParametersSet`, `DscPinToFilterMapGet` and `DscPinToFilterMapSet`.

See Also

`DscFilterParametersGet`, `DscFilterParametersSet`

DscFilterParametersGet

The `DscFilterParametersGet` function gets the filter parameters associated with a filter index. The filter parameters include the name, type, sharpness, cutoff frequency, cutoff slope, and attenuation.

```
int __stdcall DscFilterParametersGet(
    HDSC hDsc,                          // iDSC board handle.
    int iFilterIndex,                   // Filter index.
    TFilterParam *pFilterParam          // Address of structure.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iFilterIndex
Filter index of interest. Valid filter indices are 0 through 7.

pFilterParam
Pointer to a `TFilterParam` structure that receives the filter parameters. `TFilterParam` must be initialized using `DscStructPrepare`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscFilterParametersGet` returns the filter parameters for an associated filter index in the `TFilterParam` structure. `TFilterParam` must be initialized using `DscStructPrepare` before invoking `DscFilterParametersGet` or the function will fail.

Valid filter indices are 0 through 7. If the filter index is invalid, the function will fail.

See Also

`DscConfigDialogShow`, `DscFilterParametersSet`, `TFilterParam`

DscFilterParametersSet

The `DscFilterParametersSet` function sets the filter parameters associated with a filter index. The filter parameters include the name, type, sharpness, cutoff frequency, cutoff slope, and attenuation.

```
int __stdcall DscFilterParametersSet(
    HDSC hDsc,                              // iDSC board handle.
    int iFilterIndex,                       // Filter index.
    const TFilterParam *pFilterParam        // Address of structure.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

pFilterParam

Pointer to a `TFilterParam` structure that passes the filter parameters. `TFilterParam` must be initialized using `DscStructPrepare`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscFilterParametersSet` modifies the filter parameters for an associated filter index. All members of `TFilterParam` must be set before invoking `DscFilterParametersSet`.

`TFilterParam` must be initialized using `DscStructPrepare` before invoking `DscFilterParametersSet` or the function will fail. The *achName*, *iFilterType*, *iSharpness*, *fCutoffFreqLow*, *fCutoffSlopeLow*, *fCutoffFreqHigh*, *FCutoffSlopeHigh*, and *fAttenuation* members of `TFilterParam` must be set to the new desired values. Note that the filter parameters can be graphically set in `DscConfigDialogShow`.

Valid filter indices are 0 through 7. If the filter index is invalid, the function will fail.

See Also

`DscConfigDialogShow`, `DscFilterParametersGet`, `TFilterParam`

DscGroupDelay

The `DscGroupDelay` function returns the group delay in seconds for all of the filter designs.

```
int __stdcall DscGroupDelay(
    HDSC hDsc,                      // iDSC board handle.
    float *fGroupDelay              // Address to receive group delay.
    );
```

Parameters

hDsc

Handle of the iDSC board.

fGroupDelay

Pointer to a float that receives the group delay. The float variable is allocated by the application.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscGroupDelay` informs a user of the group delay (in seconds) through all the filter designs. The group delay is the amount of time to wait before data start showing up at the PC, and does not include the filter designs of disabled input pins.

If the iDSC board inputs or filter designs change and `DscStartAcquiring` is selected, `DscStartAcquiring` automatically invokes `DscCommandsLoad` and downloads new commands to the iDSC board. Data will show up at the PC two times `DscGroupDelay` seconds later.

If the iDSC board inputs or filter designs change and `DscCommandsLoad` is selected before `DscStartAcquiring`, data will show up immediately at the PC. Data that show up immediately are actually data that were sampled `DscGroupDelay` seconds ago.

See Also

`DscCalibrate`, `DscCommandsLoad`, `DscStartAcquiring`

DscHandleClose

The `DscHandleClose` function releases a handle previously opened with `DscHandleOpen`.

```
int __stdcall DscHandleClose(
    HDSC hDsc                              // iDSC board handle to close.
    );
```

Parameters

hDsc

Handle of the iDSC board to close. It must be a handle previously opened by `DscHandleOpen`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscHandleClose` terminates communication with the iDSC board. `DscHandleClose` is the last function called by any application ready to end communication with the iDSC board.

See Also

`DscHandleOpen`

DscHandleOpen

The `DscHandleOpen` function returns a handle to the target iDSC board when given a UNC name. The UNC name includes the machine name and the iDSC board name set by `DscAddressSet` and returned by `DscAddressGet`.

```
HDSC __stdcall DscHandleOpen(
    const char *pszAddress                      // UNC name of the iDSC board.
    );
```

Parameters

pszAddress

Pointer to a UNC target name string that specifies which iDSC board to open.

Return Values

If the function succeeds, the return value is an open handle to the specified target. If the function fails, the return value is a NULL handle (of value 0).

Remarks

`DscHandleOpen` initiates communication with the iDSC board. `DscHandleOpen` is the first function called by any application ready to begin communication with the iDSC board. It returns a handle to the target iDSC board when given a UNC name.

A handle is a 32-bit value that references the iDSC board. This handle is used in all `DscXxxx` services to reference the appropriate iDSC board.

See Also

`DscAddressGet`, `DscAddressSet`, `DscHandleClose`

DscHardwareStop

The `DscHardwareStop` function stops the hardware on the iDSC board.

```
int __stdcall DscHardwareStop(
    HDSC hDsc,                              // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscHardwareStop` stops and resets the hardware on the iDSC board.

See Also

`DscRunning`

DscIdGet

The `DscIdGet` function gets the identification name of the iDSC board.

```
int __stdcall DscIdGet(
    HDSC hDsc,                          // iDSC board handle.
    int iSize,                          // Size of pszId buffer.
    const char *pszId                   // Pointer to buffer of characters.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSize

Size of the *pszId* buffer that stores the DscId. The buffer is allocated by the application.

pszId

Pointer to a buffer that stores the DscId. The buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the length of the string. If the function fails, the return value is -1.

Remarks

`DscIdGet` returns the identification name of the iDSC board. The DscId is unrelated to the DscAddress. The default identification names for the iDSC boards on a system are `iDsc0, iDsc1, ...`, etc. A maximum of 14 iDSC boards may run on one system.

See Also

`DscIdSet`

DscIdSet

The `DscIdSet` function sets the identification name of the iDSC board.

```
int __stdcall DscIdSet(
    HDSC hDsc,                        // iDSC board handle.
    const char *pszId                 // Identification name.
    );
```

Parameters

hDsc

Handle of the iDSC board.

pszId

Pointer to an identification name for the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscIdSet` allows a user to assign a unique identification name to the iDSC board. The default identification names for the iDSC boards on a system are `iDsc0`, `iDsc1, ...`, etc. A maximum of 14 iDSC boards may run on one system.

See Also

`DscIdGet`

DscInputRangeGet

The `DscInputRangeGet` function gets the input range of the iDSC board.

```
int __stdcall DscInputRangeGet(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc
    Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the input range. If the function fails, the return value is 0.

Remarks

`DscInputRangeGet` returns the input range on the iDSC board. The return value will be either 5000 to represent +/- 5 Volts or 10000 to represent +/- 10 Volts.

See Also

`DscInputRangeSet`

DscInputRangeSet

The `DscInputRangeSet` function sets the input range of the iDSC board.

```
int __stdcall DscInputRangeSet(
    HDSC hDsc,                          // iDSC board handle.
    int iInputRange                     // Input range.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iInputRange

Input range to set.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscInputRangeSet` configures the input range on the iDSC board. A user can select either +/- 5 Volts or +/- 10 Volts.

To use this property the voltages must be specified as absolute values in millivolts. For example, 5000 represents +/- 5 Volts and 10000 represents +/- 10 Volts.

If the user selects an invalid input range, the function will fail and return an error code of 0. The error can be retrieved using `DscLastErrorTextGet`.

See Also

`DscInputRangeGet`

DscLastErrorTextGet

The `DscLastErrorTextGet` function gets the last error message that occurred in the DSCIO DLL.

```
int __stdcall DscLastErrorTextGet(
    int iSize,                                  // Size of pszError buffer.
    const char *pszError                        // Pointer to buffer of characters.
    );
```

Parameters

iSize

Size of the *pszError* buffer that stores the last error message. The buffer is allocated by the application.

pszError

Pointer to a buffer that stores the last error message. The buffer is allocated by the application.

Return Values

The function always returns the length of the string. If the function returns 0, it could mean that the string is empty or *iSize* is invalid.

Remarks

`DscLastErrorTextGet` returns the last error message that occurred in the DSCIO DLL. An error occurs in the DSCIO DLL when a function call fails. To use `DscLastErrorTextGet`correctly, it must be called immediately after the function of interest.

If a function call does not fail, the last error message is empty. If a function call fails, the last error message is updated by the last function call that failed. The last error message will stay the same until another function call fails. To clear the last error message, use the `DscLastErrorTextSet` function.

See Also

`DscLastErrorTextSet`

DscLastErrorTextSet

The `DscLastErrorTextSet` function updates the last error message.

```
int __stdcall DscLastErrorTextSet(
    const char *pszError                        // Error message
    );
```

Parameters

pszError

Pointer to an error message.

Return Values

The function always returns 1.

Remarks

`DscLastErrorTextSet` allows the user to update the last error message. However, if a function fails in the DSCIO DLL, the function will update the last error message.

`DscLastErrorTextSet` is only useful if the user has a reason to clear or change the last error message.

See Also

`DscLastErrorTextGet`

DscMasterGet

The `DscMasterGet` function gets the handle of a Master iDSC board when invoked on a Slave iDSC board. `DscMasterGet` is only useful in a Master/Slave Configuration.

```
HDSC __stdcall DscMasterGet(
    HDSC hDscSlave                    // Slave iDSC board handle.
    );
```

Parameters

hDscSlave

Handle of the Slave iDSC board.

Return Values

If the function succeeds, the return value is the Master iDSC board handle. If the function fails, the return value is a NULL handle (of value 0).

Remarks

`DscMasterGet` gives access to all Master iDSC boards on a system when invoked on a Slave iDSC board in a Master/Slave Configuration. If `DscMasterGet` is invoked on a Master or Normal iDSC board, the return value is a NULL handle.

See Also

`DscMasterSet`, `DscOperateModeGet`, `DscOperateModeSet`, `DscRemoteMasterSet`

DscMasterSet

The `DscMasterSet` function connects a Slave iDSC board to a Master iDSC board. `DscMasterSet` is only useful in a Master/Slave Configuration.

```
int __stdcall DscMasterSet(
    HDSC hDscSlave,                          // Slave iDSC board handle.
    HDSC hDscMaster                          // Slave Master handle to set.
    );
```

Parameters

hDscSlave
: Handle of the Slave iDSC board.

hDscMaster
: Handle of the Master iDSC board to set to the Slave iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscMasterSet` connects a Slave iDSC board to a Master iDSC board in a Master/Slave configuration. The only way to specify the iDSC board as a master or slave is by invoking `DscMasterSet` using two unique iDSC board handles.

When `DscMasterSet` completes, the specified slave becomes a Slave iDSC board and the specified master becomes a Master iDSC board. `DscMasterSet` will automatically update the operational state of the iDSC board in `DscOperateModeGet`. If non-unique iDSC board handles are used, the Master and Slave iDSC boards are not connected.

See Also

`DscMasterGet`, `DscOperateModeGet`, `DscOperateModeSet`, `DscRemoteMasterSet`

DscMemoryUsed

The function `DscMemoryUsed` displays the used memory on the iDSC board.

```
int __stdcall DscMemoryUsed(
    HDSC hDsc,                              // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the amount of memory used, expressed in tenths of a percent. If the function fails, the return value is 0.

Remarks

`DscMemoryUsed` displays the used memory on the iDSC board in tenths of a percent. As an example, if `DscMemoryUsed` returns 42, it means that 4.2% of memory is used.

`DscMemoryUsed` is useful in determining whether or not the iDSC board will be able to sustain a particular sample rate without overflowing.

DscOnSystemErrorSet

The `DscOnSystemErrorSet` function runs when the system encounters a failure.

```
int __stdcall DscOnSystemErrorSet(
    HDSC hDsc,                          // iDSC board handle.
    TProcSystemErrorStdcall *Proc,      // Pointer to function.
    void *pInfo                         // Pointer to additional information.
    );
```

Parameters

hDsc
Handle of the iDSC board.

Proc
Pointer to function with the format `TProcSystemErrorStdcall`.

pInfo
Pointer to additional information to satisfy type calling conventions.

Return Values

If the function succeeds, the return value is the pointer to a null-terminated message text string. If the function fails, the return value is the pointer to a null string.

Remarks

`DscOnSystemErrorSet` is useful in determining if the system has encountered a failure since it provides a way to access the errors. `DscOnSystemErrorSet` runs when `DscSystemErrorProcess` is invoked. `DscSystemErrorProcess` is automatically invoked during `DscBufferGetEx` if there are errors from the iDSC. The user can also call `DscSystemErrorProcess` and invoke `DscOnSystemErrorSet` if errors from the iDSC are suspected.

An example of a system error is an input channel pipe overflow when the sample rate of the iDSC board is too high for the PC to keep up.

See Also

`DscSystemErrorProcess`, `TProcSystemErrorStdcall`

DscOperateModeGet

The `DscOperateModeGet` function gets the operational mode of the iDSC board. Valid operational modes are Normal, Master, or Slave.

```
int __stdcall DscOperateModeGet(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the operate mode. If the function fails, the return value is -1.

If the operate mode is Normal, the return value is the constant `Dsc_Normal`.

Remarks

`DscOperateModeGet` informs a user of the operational mode of the iDSC board.

The values returned for the operational mode correspond to the constants below.

`Dsc_Normal`, `Dsc_Master`, `Dsc_Slave`

See Also

`DscMasterGet`, `DscMasterSet`, `DscOperateModeSet`, `DscRemoteMasterSet`

DscOperateModeSet

The `DscOperateModeSet` function sets the operational mode of the iDSC board. Valid operational modes are Normal, Master, or Slave.

```
int __stdcall DscOperateModeSet(
    HDSC hDsc,                          // iDSC board handle.
    int iOperateMode                    // Selected operate mode.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iOperateMode

Operate mode to select. Use only the constant `Dsc_Normal`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscOperateModeSet` is provided to allow the user to select a Normal iDSC board. `DscOperateModeSet` cannot be used to specify Master and Slave iDSC boards. Instead, `DscMasterSet` should be used to set up Master and Slave iDSC boards. `DscMasterSet` will automatically update the mode to the correct state.

The constants below simplify selecting the operate mode.

```
Dsc_Normal, Dsc_Master, Dsc_Slave
```

The following call may be used to set the operational mode to Normal.

```
DscOperateModeSet(hDsc, Dsc_Normal);
```

See Also

`DscMasterGet`, `DscMasterSet`, `DscOperateModeGet`, `DscRemoteMasterSet`

DscPinEnabledCount

The `DscPinEnabledCount` function returns the number of enabled input pins on the iDSC board.

```
int __stdcall DscPinEnabledCount(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the number of enabled input pins. If the function fails, the return value is 0.

Remarks

`DscPinEnabledCount` returns the number of enabled input pins on the iDSC board. It is related to the `DscPinEnabledGet` and `DscPinEnabledSet` functions. Valid values for the enabled input pin count are in the range one to eight.

See Also

`DscPinEnabledGet`, `DscPinEnabledSet`

DscPinEnabledGet

The `DscPinEnabledGet` function gets the enabled input pins on the iDSC board.

```
int __stdcall DscPinEnabledGet(
    HDSC hDsc                              // iDSC board handle.
    );
```

Parameters

hDsc
    Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the enabled input pins. If the function fails, the return value is zero since at least one input pin must be enabled.

Remarks

`DscPinEnabledGet` returns the enabled input pins as an integer value. Only the lowest eight bits (bit 0 through bit 7) are used since there are a total of eight input pin options, `A0`, `A1`, `A2`, `A3`, `A4`, `A5`, `A6`, and `A7`. `A0` is bit 0, `A1` is bit 1, `A2` is bit 2, `A3` is bit 3, `A4` is bit 4, `A5` is bit 5, `A6` is bit 6, and `A7` is bit 7 of the returned integer value.

When the input pins are enabled, the corresponding bits are set. When the input pins are disabled, the corresponding bits are cleared. To find out the number of enabled input pins, use the `DscPinEnabledCount` function.

See Also

`DscPinEnabledCount`, `DscPinEnabledSet`

DscPinEnabledSet

The `DscPinEnabledSet` function sets the enabled input pins on the iDSC board.

```
int __stdcall DscPinEnabledSet(
    HDSC hDsc,                        // iDSC board handle.
    int iPinEnabled                   // Input pins to enable.
    );
```

Parameters

hDsc
    Handle of the iDSC board.

iPinEnabled
    Input pins to enable.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscPinEnabledSet` enables or disables the input pins using the *iPinEnabled* integer value. Only the lowest eight bits (bit 0 through bit 7) are used since there are a total of eight input pin options, `A0`, `A1`, `A2`, `A3`, `A4`, `A5`, `A6`, and `A7`. `A0` is bit 0, `A1` is bit 1, `A2` is bit 2, `A3` is bit 3, `A4` is bit 4, `A5` is bit 5, `A6` is bit 6, and `A7` is bit 7 of *iPinEnabled*.

When the input pins are enabled, the corresponding bits are set. When the input pins are disabled, the corresponding bits are cleared. To find out the number of enabled input pins, use the `DscPinEnabledCount` function.

The constants below simplify enabling the input pins.

```
DscPin_A0, DscPin_A1, DscPin_A2, DscPin_A3,
DscPin_A4, DscPin_A5, DscPin_A6, DscPin_A7
```

The following example is used to enable input pins `A1`, `A3` and `A6`.

```
DscPinEnabledSet(hDsc, DscPin_A1|DscPin_A3|DscPin_A6);
```

See Also

`DscPinEnabledCount`, `DscPinEnabledGet`

DscPinToFilterMapGet

The `DscPinToFilterMapGet` function gets the mapping of a filter index to an input pin index.

```
int __stdcall DscPinToFilterMapGet(
    HDSC hDsc,                          // iDSC board handle.
    int iPinIndex                       // Input pin index.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iPinIndex

Input pin index of interest. Valid input pin indices are 0 through 7.

Return Values

If the function succeeds, the return value is the filter index. If the function fails, the return value is -1.

If the input pin of interest is mapped to filter index 0, the return value is 0.

Remarks

`DscPinToFilterMapGet` returns the filter index that is mapped to an input pin index. The default mapping is: input pin index 0 to filter index 0, input pin index 1 to filter index 1, ..., input pin index 7 to filter index 7.

Valid input pin indices are 0 through 7, which correspond to input pins `A0` through `A7`. Valid filter indices are 0 through 7. If an input pin index is invalid, the function will fail.

See Also

`DscConfigDialogShow`, `DscPinToFilterMapSet`

DscPinToFilterMapSet

The `DscPinToFilterMapSet` function sets the mapping of a filter index to an input pin index.

```
int __stdcall DscPinToFilterMapSet(
    HDSC hDsc,                          // iDSC board handle.
    int iPinIndex,                      // Input pin index.
    int iFilterIndex                    // Filter index to map.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iPinIndex
Input pin index of interest. Valid input pin indices are 0 through 7.

iFilterIndex
Filter index to map to the input pin index. Valid filter indices are 0 through 7.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscPinToFilterMapSet` associates a filter index to a corresponding input pin index.

Valid input pin indices are 0 through 7, which correspond to input pins `A0` through `A7`. Valid filter indices are 0 through 7. If an input pin index or filter index is invalid, the function will fail.

See Also

`DscConfigDialogShow`, `DscPinToFilterMapGet`

DscRemoteMasterGet

The `DscRemoteMasterGet` function gets the remote master state of the Master/Slave Configuration.

```
int __stdcall DscRemoteMasterGet(
   HDSC hDsc                              // iDSC board handle.
   );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 0 for disabled and 1 for enabled. If the function fails, the return value is -1.

Remarks

`DscRemoteMasterGet` returns the remote master state of the master/slave configuration. If `DscRemoteMasterGet` is 0, the remote master state is disabled. If `DscRemoteMasterGet` is 1, the remote master state is enabled.

The remote master state enables the user to synchronize multiple iDSCs across PCs. It only works if the MSXB 045 hardware is present. Please refer to the MSXB 045 hardware manual for more description on the hardware.

See Also

`DscMasterSet`, `DscOperateModeGet`, `DscRemoteMasterSet`

DscRemoteMasterSet

The `DscRemoteMasterSet` function sets the remote master state of the Master/Slave Configuration.

```
int __stdcall DscRemoteMasterSet(
    HDSC hDsc,                          // iDSC board handle.
    int iRemoteMaster                   // Remote master state.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iRemoteMaster

Remote master state.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscRemoteMasterSet` sets the remote master state of the master/slave configuration. If `iRemoteMaster` is 0, the remote master state is disabled. If `iRemoteMaster` is 1, the remote master state is enabled.

The remote master state enables the user to synchronize multiple iDSCs across PCs. It only works if the MSXB 045 hardware is present. Please refer to the MSXB 045 hardware manual for more description on the hardware.

See Also

`DscMasterGet`, `DscOperateModeGet`, `DscRemoteMasterSet`

DscRunning

The `DscRunning` function returns the state of the iDSC board.

```
int __stdcall DscRunning(
    HDSC hDsc,                              // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 0 for not running and 1 for running. If the function fails, the return value is -1.

Remarks

`DscRunning` specifies whether the iDSC is running. Once `DscStartAcquiring` is invoked, `DscRunning` will return 1. Once `DscStopAcquiring` is invoked, `DscRunning` will return 0.

See Also

`DscHardwareStop`, `DscStartAcquiring`, `DscStopAcquiring`

DscSampleRateGet

The `DscSampleRateGet` function gets the effective sampling rate per channel on the iDSC board.

```
int __stdcall DscSampleRateGet(
    HDSC hDsc                                    // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the sampling rate. If the function fails, the return value is 0.

Remarks

`DscSampleRateGet` returns the effective sampling rate for each channel on the iDSC board in units of samples per second. There are two effective sampling rates in the highest octave and lowest octave, and three effective sampling rates in every other octave.

Note: See `DscSampleRateSet` for the valid sampling rates.

See Also

`DscConfigDialogShow`, `DscSampleRateSet`

DscSampleRateSet

The `DscSampleRateSet` function sets the effective sampling rate per channel on the iDSC board.

```
int __stdcall DscSampleRateSet(
    HDSC hDsc,                          // iDSC board handle.
    int iSampleRate                     // Sample rate.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iSampleRate
Effective sample rate to set.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscSampleRateSet` sets the effective sampling rate for each channel on the iDSC board in units of samples per second. The table below displays the valid sample rates arranged in octaves. There are two effective sampling rates in the highest octave.

			153600		
102400			76800		
51200			38400		
25600			19200		15360
12800		10240	9600		7680
6400		5120	4800		3840
3200	3072	2560	2400	2048	1920
1600	1536	1280	1200	1024	960
800	768	640	600	512	480
400	384	320	300	256	240
200	192	160	150	128	120

100	96	80	75	64	60
50	48	40		32	30
25	24	20		16	15
	12	10		8	

If an invalid sample rate is selected, the function will automatically select the closest larger sample rate. The function is always successful in this case.

When the sampling rate is changed, the *iSharpness*, *fCutoffSlope*, and *fAttenuation* members of `TFilterParam` will return their default values when used with `DscFilterParametersGet`. Only *fCutoffFreq* will retain its previously set value if the set value is valid. If the previously set value of *fCutoffFreq* is out of range, then *fCutoffFreq* will also return the default value.

See Also

`DscConfigDialogShow`, `DscSampleRateGet`

DscScansDiscarded

The `DscScansDiscarded` function returns the number of scans thrown away since `DscCommandsLoad`.

```
int __stdcall DscScansDiscarded(
    HDSC hDsc,                           // iDSC board handle.
    __int64 *i64Discarded                // Address to receive the scans.
    );
```

Parameters

hDsc

Handle of the iDSC board.

i64Discarded

Pointer to a 64-bit integer that receives the scans discarded. The `__int64` variable is allocated by the application.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscScansDiscarded` informs the user of the scans discarded since `DscCommandsLoad`. This information is useful in calculating timing delays.

A scan is a set of enabled input pins. For example, if there are five enabled input pins, a scan consists of five samples, if there are two enabled input pins, a scan consists of two samples.

See Also

`DscCommandsLoad`

DscServerDiskLogBytes

The `DscServerDiskLogBytes` function returns the number of bytes logged to disk by the server.

```
int __stdcall DscServerDiskLogBytes(
    HDSC hDsc,                          // iDSC board handle.
    TDscIoInt64 *i64Bytes               // Address to receive logged bytes.
    );
```

Parameters

hDsc

Handle of the iDSC board.

i64Bytes

Pointer to a `TDscIoInt64` structure that receives the number of bytes logged. The `TDscIoInt64` variable is allocated by the application.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscServerDiskLogBytes` informs the user of the number of bytes logged to disk by the server. It is a `TDscIoInt64` structure. It should be called after `DscStartAcquiring` is invoked if `DscServerDiskLogEnabledGet` is 1. `DscServerDiskLogBytes` will return 0 if no data has been logged to disk.

See Also

`DscServerDiskLogEnabledGet`, `DscServerDiskLogEnabledSet`, `DscServerDiskLogConfigGet`, `DscServerDiskLogConfigSet`

DscServerDiskLogConfigGet

The `DscServerDiskLogConfigGet` function gets the server disk log configuration through `TServerDiskLogConfig`.

```
int __stdcall DscServerDiskLogConfigGet(
    HDSC hDsc,                              // iDSC board handle.
    TServerDiskLogConfig
        *pServerDiskLogConfig,              // Address of structure.
    );
```

Parameters

hDsc

Handle of the iDSC board.

pServerDiskLogConfig

Pointer to a `TServerDiskLogConfig` structure that receives the server disk log configuration. `TServerDiskLogConfig` must be initialized using `DscStructPrepare`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscServerDiskLogConfigGet` returns the server disk log configuration in the `TServerDiskLogConfig` structure. `TServerDiskLogConfig` must be initialized using `DscStructPrepare` before invoking `DscServerDiskLogConfigGet` or the function will fail.

The *pszFileName* field of `TServerDiskLogConfig` must be initialized to point to the user allocated buffer. The size of the user allocated buffer must be specified using the *dwFileNameSize* field. It must include an extra space for the null terminator.

If *dwFileNameSize* is 0, the file name is not returned in *pszFileName*. If *dwFileNameSize* is 1, only the null terminator is returned in *pszFileName*.

See Also

`DscServerDiskLogConfigSet`, `TServerDiskLogConfig`

DscServerDiskLogConfigSet

The `DscServerDiskLogConfigSet` function sets the server disk log configuration through `TServerDiskLogConfig`.

```
int __stdcall DscServerDiskLogConfigSet(
    HDSC hDsc,                                  // iDSC board handle.
    const TServerDiskLogConfig
        *pServerDiskLogConfig,                  // Address of structure.
    );
```

Parameters

hDsc

Handle of the iDSC board.

pServerDiskLogConfig

Pointer to a `TServerDiskLogConfig` structure that passes the server disk log configuration. `TServerDiskLogConfig` must be initialized using `DscStructPrepare`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscServerDiskLogConfigSet` modifies the server disk log configuration through the `TServerDiskLogConfig` structure. `TServerDiskLogConfig` must be initialized using `DscStructPrepare` before invoking `DscServerDiskLogConfigSet` or the function will fail.

The *pszFileName* field of `TServerDiskLogConfig` must be initialized to point to the user allocated and initialized buffer. The *dwFileNameSize* field is not used.

It is recommended that the user invokes `DscServerDiskLogConfigGet` to get the server disk log configuration defaults, updates the pertinent fields, and then invokes `DscServerDiskLogConfigSet` to set the new desired values.

The DAPcell Local or DAPcell server will start a disk logging session when `DscStartAcquiring` is invoked only if the following has been done:

1) Under Windows Control Panel | Data Acquisition Processor | Disk I/O tab | Disk Logging:

- Set the `Default Path` to a valid path (or valid paths) on the server PC
- Set the `Permission` to *`Restricted`* or *`Normal`*
- Select the `Save` button before closing the dialog, or changes will be lost

For more information on `Default Path` and `Permission`, refer to the `DAP Service` documentation by selecting the `Help` button, or going to the main documentation reference on the DAPtools CD.

2) Set a valid filename for *`pszFileName`* of `TServerDiskLogConfig`.

3) Enable `DscServerDiskLogEnabledSet`.

The disk logging session will end when `DscStopAcquiring` is invoked.

The Accel32 server does not support server disk logging sessions.

See Also

`DscServerDiskLogConfigGet`, `DscServerDiskLogBytes`, `DscServerDiskLogEnabledSet`, `TServerDiskLogConfig`

DscServerDiskLogEnabledGet

The `DscServerDiskLogEnabledGet` function gets the state of the server disk log option.

```
int __stdcall DscServerDiskLogEnabledGet(
    HDSC hDsc,                                    // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 0 for disabled and 1 for enabled. If the function fails, the return value is -1.

Remarks

`DscServerDiskLogEnabledGet` returns the state of the server disk log option. If `DscServerDiskLogEnabledGet` is 0, the server will not log any data to disk when `DscStartAcquiring` is invoked. If `DscServerDiskLogEnabledGet` is 1, the server will log data to disk when `DscStartAcquiring` is invoked.

See Also

`DscServerDiskLogEnabledSet`, `DscServerDiskLogConfigSet`

DscServerDiskLogEnabledSet

The `DscServerDiskLogEnabledSet` function sets the state of the server disk log option.

```
int __stdcall DscServerDiskLogEnabledSet(
    HDSC hDsc,                        // iDSC board handle.
    int iSdlEnabled                   // Server disk log state.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSdlEnabled

Server disk log state.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscServerDiskLogEnabledSet` sets the state of the server disk log option. If *iSdlEnabled* is 1, the server will log data to disk when `DscStartAcquiring` is invoked. If *iSdlEnabled* is 0, the server will not log any data to disk when `DscStartAcquiring` is invoked.

See Also

`DscServerDiskLogEnabledGet`, `DscServerDiskLogConfigSet`

DscServerDiskLogFileNameGet

The `DscServerDiskLogFileNameGet` function gets the file name used for server disk logging.

```
int __stdcall DscServerDiskLogFileNameGet(
    HDSC hDsc,                          // iDSC board handle.
    int iSize,                          // Size of pszFileName buffer.
    const char *pszFileName             // Pointer to buffer of characters.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSize

Size of the *pszFileName* buffer that stores the file name. The buffer is allocated by the application.

pszFileName

Pointer to a buffer that stores the file name. The buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the length of the string. If the function fails, the return value is -1.

Remarks

`DscServerDiskLogFileNameGet` returns the name of the primary disk log file and the name of a possible mirror disk log file, if mirror logging is enabled. The default is an empty string.

See Also

`DscServerDiskLogFileNameSet`, `TServerDiskLogConfig`

DscServerDiskLogFileNameSet

The `DscServerDiskLogFileNameSet` function sets the file name to use for server disk logging.

```
int __stdcall DscServerDiskLogFileNameSet(
    HDSC hDsc,                          // iDSC board handle.
    const char *pszFileName             // File name.
    );
```

Parameters

hDsc

Handle of the iDSC board.

pszFileName

Pointer to a file name to use for server disk logging.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscServerDiskLogFileNameSet` specifies the name of the primary disk log file and the name of a possible mirror disk log file, if mirror logging is enabled. The default is an empty string. You can also set the file name through *pszFileName* in `TServerDiskLogConfig`.

Mirror logging is enabled by selecting the *DscDlfMirrorLog* flag of *dwFlags* in `TServerDiskLogConfig`. Multiple file names are separated by semi-colons. Currently, only one mirror file is allowed. Both files must be on the same side of the DAPcell Local/DAPcell service (the PC application side or the iDSC side).

See Also

`DscServerDiskLogFileNameGet`, `TServerDiskLogConfig`

DscSlaveCount

The `DscSlaveCount` function returns the number of slaves attached to a Master iDSC board. It is only useful in a Master/Slave Configuration.

```
int __stdcall DscSlaveCount(
  HDSC hDscMaster                    // Master iDSC board handle.
  );
```

Parameters

hDscMaster

Handle of the Master iDSC board.

Return Values

If the function succeeds, the return value is the number of slaves. If the function fails, the return value is -1.

If there are no slaves attached to the master, the return value is 0. If `DscSlaveCount` is invoked on a Slave or Normal iDSC board the return value is also 0.

Remarks

`DscSlaveCount` should only be called on a Master iDSC board. It returns the slave count, and not the slave index, of a Master iDSC board. For example, if the slave count is 1, then the slave index is 0. The slave index in used in the `DscSlaveHandle` function.

See Also

`DscMasterGet`, `DscMasterSet`

DscSlaveHandle

The `DscSlaveHandle` function returns the handle of a Slave iDSC board that is attached to a Master iDSC board, given a slave index. It is only useful in a Master/Slave Configuration.

```
HDSC __stdcall DscSlaveHandle(
    HDSC hDscMaster,                    // Master iDSC board handle.
    int iSlaveIndex                     // Slave index.
    );
```

Parameters

hDscMaster

Handle of the Master iDSC board.

iSlaveIndex

Slave index of interest. Valid slave indices are 0 through `DscSlaveCount` - 1.

Return Values

If the function succeeds, the return value is the Slave iDSC board handle for the given slave index. If the function fails, the return value is a NULL handle (of value 0).

Remarks

`DscSlaveHandle` should only be called on a Master iDSC board. When passed a valid slave index, it returns the corresponding slave handle connected to the Master iDSC board.

Valid slave indices are 0 through `DscSlaveCount` - 1. To get the handles of all slaves attached to a Master iDSC board, the user could use a `for` loop that goes from 0 to `DscSlaveCount` - 1.

The function will fail if `DscSlaveHandle` is invoked on a Slave or Normal iDSC board or if the user passes an invalid slave index to `DscSlaveHandle`.

See Also

`DscMasterGet`, `DscMasterSet`

DscStartAcquiring

The `DscStartAcquiring` function starts the data acquiring process. Data will start showing up at the PC.

```
int __stdcall DscStartAcquiring(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscStartAcquiring` starts the sampling process, which causes data to start showing up at the PC. `DscStartAcquiring` will force a `DscCalibrate` if it cannot find the saved calibration values, and a `DscCommandsLoad` if the iDSC board configuration or filter designs have changed. If the iDSC board configuration or filter designs have changed, the user may see a delay of two times `DscGroupDelay` seconds.

Once `DscStartAcquiring` is invoked, the user can use `DscBufferGetEx` to read blocks of data into buffers.

See Also

`DscBufferGetEx`, `DscCalibrate`, `DscCommandsLoad`, `DscStopAcquiring`

DscStopAcquiring

The `DscStopAcquiring` function stops the data acquiring process. Data will stop showing up at the PC.

```
int __stdcall DscStopAcquiring(
    HDSC hDsc                           // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscStopAcquiring` stops the sampling process. It is called after `DscStartAcquiring` to stop data from showing up at the PC.

See Also

`DscStartAcquiring`

DscStructPrepare

The `DscStructPrepare` function prepares structures for use with functions.

```
int __stdcall DscStructPrepare(
    void *pvStruct,                    // Address of structure to initialize.
    unsigned long ulSize               // Size of structure.
    );
```

Parameters

pvStruct
: Pointer to structure.

ulSize
: Size of structure.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscStructPrepare` initializes the `iInfoSize` field and zeroes out all other fields of structures. It should be used with structures that have an `iInfoSize` field before the other fields of the structures are initialized. Since `DscStructPrepare` initializes the `iInfoSize` field, there is no need to initialize it separately.

See Also

`TBufferGetEx`, `TFilterParam`, `TXbPinConfig`

DscSystemErrorProcess

The `DscSystemErrorProcess` function processes error messages from the iDSC.

```
int __stdcall DscSystemErrorProcess(
    HDSC hDsc                              // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscSystemErrorProcess` processes error messages from the iDSC if they exist, and then invokes `DscOnSystemErrorSet`. `DscSystemErrorProcess` is automatically invoked by `DscBufferGetEx`. The user can also call `DscSystemErrorProcess` and invoke `DscOnSystemErrorSet` if errors from the iDSC are suspected.

See Also

`DscOnSystemErrorSet`

DscTcEnabledCount

The `DscTcEnabledCount` function returns the number of enabled timing channels on the iDSC board.

```
int __stdcall DscTcEnabledCount(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the number of enabled timing channels. If the function fails, the return value is -1.

Remarks

`DscTcEnabledCount` returns the number of enabled timing channels on the iDSC board. It is related to the `DscTcEnabledGet` and `DscTcEnabledSet` functions. Valid values for the enabled timing channel count are in the range zero to two.

See Also

`DscTcEnabledGet`, `DscTcEnabledSet`

DscTcEnabledGet

The `DscTcEnabledGet` function gets the enabled timing channels on the iDSC board.

```
int __stdcall DscTcEnabledGet(
    HDSC hDsc                                  // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the enabled timing channels. If the function fails, the return value is -1.

Remarks

`DscTcEnabledGet` returns the enabled timing channels as an integer value. Only the lowest three bits (bit 0 through bit 2) are used since there are a total of three timing channel options, `Tc0` (Timing Channel 0), `Tc1` (Timing Channel 1), and `TcWidth32` (32-bit width). `Tc0` is bit 0, `Tc1` is bit 1, and `TcWidth32` is bit 2 of the returned integer value.

When the timing channels are enabled, the corresponding bits are set. When the timing channels are disabled, the corresponding bits are cleared. To find out the number of enabled timing channels, use the `DscTcEnabledCount` function.

See Also

`DscTcEnabledCount`, `DscTcEnabledSet`, `DscTcMaximum`, `DscTcWidth`

DscTcEnabledSet

The `DscTcEnabledSet` function sets the enabled timing channels on the iDSC board.

```
int __stdcall DscTcEnabledSet(
    HDSC hDsc,                              // iDSC board handle.
    int iTcEnabled                          // Timing channels to enable.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iTcEnabled
Timing channels to enable.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscTcEnabledSet` enables or disables the timing channels using the *iTcEnabled* integer value. Only the lowest three bits (bit 0 through bit 2) are used since there are a total of three timing channel options, `Tc0` (Timing Channel 0), `Tc1` (Timing Channel 1), and `TcWidth32` (32-bit width). `Tc0` is bit 0, `Tc1` is bit 1, and `TcWidth32` is bit 2 of *iTcEnabled*.

When the timing channels are enabled, the corresponding bits are set. When the timing channels are disabled, the corresponding bits are cleared. To find out the number of enabled timing channels, use the `DscTcEnabledCount` function.

`Tc0` enables Timing Channel 0 and `Tc1` enables Timing Channel 1. `TcWidth32` forces the timing channel width to be 4 bytes (32-bits) regardless of the sample rate. If `TcWidth32` is not enabled, the timing channel width can be either 2 bytes or 4 bytes depending on the sample rate. To find out the actual timing channel width, use the `DscTcWidth` function.

The constants below simplify enabling the timing channels.

```
DscTc_Tc0, DscTc_Tc1, DscTc_TcWidth32
```

The following example is used to enable Timing Channel 1 with 4 bytes for the timing channel width.

```
DscTcEnabledSet(hDsc, DscTc_Tc1|DscTc_TcWidth32);
```

See Also

`DscTcEnabledCount`, `DscTcEnabledGet`, `DscTcMaximum`, `DscTcWidth`

DscTcMaximum

The `DscTcMaximum` function returns the maximum timing channel value based on the sample rate.

```
int __stdcall DscTcMaximum(
    HDSC hDsc                                   // iDSC board handle.
    );
```

Parameters

hDsc
  Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the maximum timing channel value. If the function fails, the return value is 0.

Remarks

`DscTcMaximum` returns the maximum timing channel value which is dependent on the sample rate. `DscTcMaximum` can range from 128 to 2457600. The wide range of `DscTcMaximum` forces `DscTcWidth` to be either 2 bytes or 4 bytes.

See Also

`DscTcEnabledGet`, `DscTcEnabledSet`, `DscTcWidth`

DscTcWidth

The `DscTcWidth` function returns the width, in bytes, of timing channel values.

```
int __stdcall DscTcWidth(
    HDSC hDsc                              // iDSC board handle.
    );
```

Parameters

hDsc
Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the timing channel width. If the function fails, the return value is 0.

Remarks

`DscTcWidth` returns the width, in bytes, of timing channel values. It returns either 2 for 16-bit values or 4 for 32-bit values.

`DscTcWidth` is dependent on the sample rate. The timing channel width for sample rates 8 s/s to 600 s/s are always 4 bytes. The timing channel width for sample rates 640 s/s to 153600 s/s are 2 bytes by default. The timing channel width for these higher sample rates can be forced to 4 bytes by setting `TcWidth32` in the `DscTcEnabledSet` function.

See Also

`DscTcMaximum`, `DscTcEnabledGet`, `DscTcEnabledSet`

DscTransferFunctionGet

The `DscTransferFunctionGet` function is used to plot the filter response.

```
int __stdcall DscTransferFunctionGet(
    HDSC hDsc,                      // iDSC board handle.
    int iFilterIndex,               // Filter index.
    int iLength,                    // Number of data points.
    double *pdBuffer                // Buffer to receive data.
    );
```

Parameters

hDsc
Handle of the iDSC board.

iFilterIndex
Filter index of interest. Valid filter indices are 0 through 7.

iLength
Number of data points to return.

pdBuffer
Buffer for storing the transfer function data points. The buffer must be large enough to accommodate the requested *iLength* data points.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscTransferFunctionGet` plots the filter responses of the filter designs. There can be up to eight filter response plots since there are up to eight filter designs.

See Also

`DscUnitStepLengthGet`, `DscUnitStepGet`

DscUnitStepGet

The `DscUnitStepGet` function plots the unit step responses of the filter designs.

```
int __stdcall DscUnitStepGet(
    HDSC hDsc,                          // iDSC board handle.
    int iFilterIndex,                   // Filter index.
    int iLength,                        // Number of data points.
    double *pdBuffer                    // Buffer to receive data.
    );
```

Parameters

hDsc
: Handle of the iDSC board.

iFilterIndex
: Filter index of interest. Valid filter indices are 0 through 7.

iLength
: Number of data points to return.

pdBuffer
: Buffer for storing the unit step data points. The buffer must be large enough to accommodate the requested *iLength* data points.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscUnitStepGet` plots the unit step responses of the filter designs. The `DscUnitStepLengthGet` function should be used to determine the *iLength* parameter. There can be up to eight unit step response plots since there are up to eight filter designs.

See Also

`DscTransferFunctionGet`, `DscUnitStepLengthGet`

DscUnitStepLengthGet

The `DscUnitStepLengthGet` function returns the number of data points in the unit step response.

```
int __stdcall DscUnitStepLengthGet(
    HDSC hDsc,                              // iDSC board handle.
    int iFilterIndex                        // Filter index.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Return Values

If the function succeeds, the return value is the number of data points. If the function fails, the return value is 0.

Remarks

`DscUnitStepLengthGet` returns the number of data points in the unit step response. The function should be used to determine the *iLength* parameter of `DscUnitStepGet`.

See Also

`DscTransferFunctionGet`, `DscUnitStepGet`

DscXbCalibrate

The `DscXbCalibrate` function performs calibration on the external board.

```
int __stdcall DscXbCalibrate(
    HDSC hDsc                              // iDSC board handle.
    int iSampleRate                        // Sample rate to use for calibration.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSampleRate

Sample rate to use for external board calibration. A sample rate of 100 s/s is recommended.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscXbCalibrate` is used to calibrate the external board. It is advisable to not exceed a sample rate of 1024 s/s or the calibration values may be unstable. `DscXbCalibrate` works only if `DscXbEnabledGet` is true, otherwise a failure occurs.

A higher sample rate allows `DscXbCalibrate` to execute faster but the calibration values are less accurate. A lower sample rate executes slower but the calibration values are more accurate. The recommended value of 100 s/s works well.

`DscXbCalibrate` is not automatically invoked if the external board calibration values are not found. The user has to explicitly call `DscXbCalibrate` to calibrate the external board.

See Also

`DscXbEnabledGet`, `DscXbEnabledSet`

DscXbEnabledGet

The `DscXbEnabledGet` function gets the state of the external board.

```
int __stdcall DscXbEnabledGet(
    HDSC hDsc                                    // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is 0 for disabled and 1 for enabled. If the function fails, the return value is -1.

Remarks

`DscXbEnabledGet` returns the state of the external board, whether enabled or disabled. If `DscXbEnabledGet` is 0, the external board is disabled and not visible in `DscConfigDialogShow`. If `DscXbEnabledGet` is 1, the external board is enabled and visible in `DscConfigDialogShow`.

See Also

`DscXbEnabledSet`

DscXbEnabledSet

The `DscXbEnabledSet` function sets the external board state.

```
int __stdcall DscXbEnabledSet(
    HDSC hDsc,                              // iDSC board handle.
    int iXbEnabled                          // External board state.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iXbEnabled

External board state, whether enabled or disabled.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscXbEnabledSet` sets the external board state, whether enabled or disabled. If `iXbEnabled` is 0, the external board is disabled and not visible in `DscConfigDialogShow`. If `iXbEnabled` is 1, the external board is enabled and visible in `DscConfigDialogShow`.

To access the external board, `iXbEnabled` must be 1 so that the configuration information is sent to the external board. Also `DscXbCalibrate` will work only if `iXbEnabled` is true.

See Also

`DscXbEnabledGet`, `DscXbCalibrate`

DscXbPinConfigGet

The `DscXbPinConfigGet` function gets the external board pin configuration associated with a pin index. The pin configuration includes the input type, input range, input offset, input offset range, and output excitation.

```
int __stdcall DscXbPinConfigGet(
    HDSC hDsc,                           // iDSC board handle.
    int iPinIndex,                       // Pin index.
    TXbPinConfig *pXbPinConfig           // Address of structure.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

pXbPinConfig

Pointer to a `TXbPinConfig` structure that receives the pin configuration. `TXbPinConfig` must be initialized using `DscStructPrepare`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscXbPinConfigGet` returns the pin configuration for an associated pin index in the `TXbPinConfig` structure. `TXbPinConfig` must be initialized using `DscStructPrepare` before invoking `DscXbPinConfigGet` or the function will fail.

Valid pin indices are 0 through 7. If the pin index is invalid, the function will fail.

See Also

`DscConfigDialogShow`, `DscXbPinConfigSet`, `TXbPinConfig`

DscXbPinConfigSet

The `DscXbPinConfigSet` function sets the pin configuration associated with a pin index. The pin configuration includes the input type, input range, input offset, input offset range, and output excitation.

```
int __stdcall DscXbPinConfigSet(
    HDSC hDsc,                              // iDSC board handle.
    int iPinIndex,                          // Pin index.
    const TXbPinConfig *pXbPinConfig        // Address of structure.
    );
```

Parameters

hDsc
  Handle of the iDSC board.

iPinIndex
  Pin index of interest. Valid pin indices are 0 through 7.

pXbPinConfig
  Pointer to a `TXbPinConfig` structure that passes the pin configuration. `TXbPinConfig` must be initialized using `DscStructPrepare`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscXbPinConfigSet` modifies the pin configuration for an associated pin index through the `TXbPinConfig` structure. `TXbPinConfig` must be initialized using `DscStructPrepare` before invoking `DscXbPinConfigSet` or the function will fail.

The *iInputType*, *fInputRange*, *fInputOffset*, and *fOutputExcitation* members must be set to the new desired values. *fInputOffsetRange* cannot be set since it is a read only property. Note that the pin configuration can be graphically set in `DscConfigDialogShow`.

Valid pin indices are 0 through 7. If the pin index is invalid, the function will fail.

See Also

`DscConfigDialogShow`, `DscXbPinConfigGet`, `TXbPinConfig`

DscGroupAddOne

The `DscGroupAddOne` function adds one iDSC to the iDSC group.

```
int __stdcall DscGroupAddOne(
    HDSCGROUP hDscGroup,                // iDSC group handle.
    );
```

Parameters

hDscGroup
  Handle of the group of iDSC boards.

Return Values

If the function succeeds, the return value is the index of the added iDSC. If the function fails, the return value is -1.

Remarks

`DscGroupAddOne` adds one iDSC to the iDSC group and returns the index of the added iDSC. The index of the iDSC is the `DscGroupCount` minus one. The maximum number of iDSCs in the iDSC group is 64 which means that the maximum index is 63. When `DscGroupAddOne` is invoked, the `DscGroupCount` increases by one.

As an example, `DscGroupAddOne` returns 3. Therefore, the newly added iDSC index is 3 and the `DscGroupCount` is 4.

See Also

`DscGroupDeleteOne`, `DscGroupCount`

DscGroupConfigDialogShow

The `DscGroupConfigDialogShow` function displays modal dialog screens for graphical configuration of multiple iDSC boards.

```
int __stdcall DscGroupConfigDialogShow(
    HDSCGROUP hDscGroup,                    // iDSC group handle.
    );
```

Parameters

hDscGroup
Handle of the group of iDSC boards.

Return Values

If the user selects the OK button, the return value is IDOK (of value 1). If the user selects the Cancel button, the return value is IDCANCEL (of value 2). If the function fails, the return value is 0.

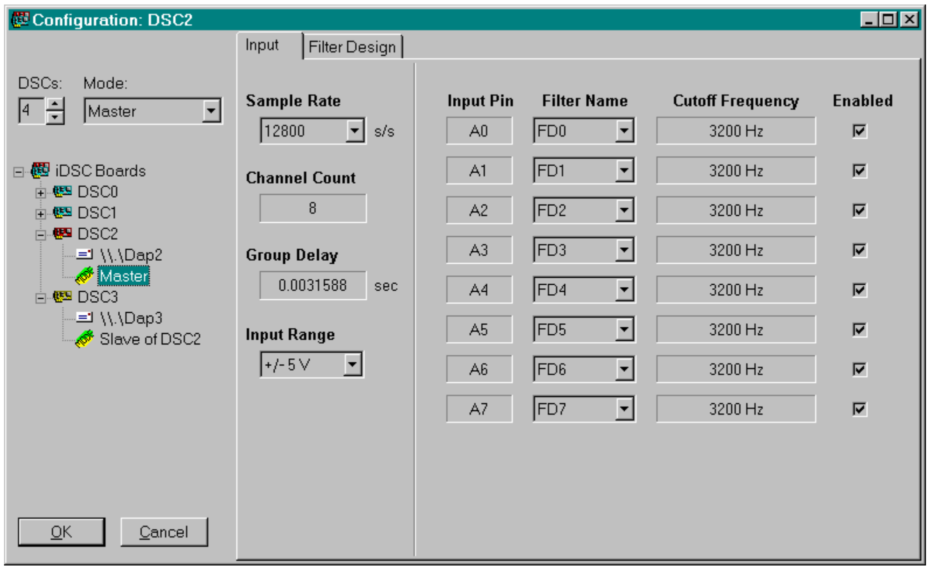
Remarks

`DscGroupConfigDialogShow` simplifies the configuration of multiple iDSC boards with a graphical interface. When the user expands the iDSC Boards tree, there are options for changing the `Address` and `Mode`. When the user selects the DSC name with the right click button, there are several more options like `External Board Calibrate`, `External Board Enable`, `Raw Data`, `Remote Master`, `Server Disk Log`, and `Copy` and `Paste`. The `Copy` and `Paste` feature allows the user to copy the entire configuration of an iDSC board to another iDSC board.

For each iDSC board, the Input Screen provides a quick method for selecting the sample rate, selecting the input range, mapping the input pins to selected filter designs, and enabling or disabling the input pins.

The Filter Design Screen allows easy manipulation of filter parameters like sharpness, low cutoff frequency, low cutoff slope, high cutoff frequency, high cutoff slope, and attenuation, either by entering a valid number or by adjusting a slider. When the user selects the right click button, there are several more options like `Crosshair Track`, `Y Display` (linear, linear zoom, log, log zoom, and unit step), `Defaults Load`, `Copy`, and `Paste`. The `Copy` (`Ctrl-C`) and `Paste` (`Ctrl-V`) feature copies the filter parameters from one filter design tab to another.

The figure below displays the configuration of a group of four iDSC boards. DSC0 and DSC1 are configured as Independent, while DSC2 is the Master of DSC3.



DSCs: 4

Mode: Master

iDSC Boards
- DSC0
- DSC1
- DSC2
  - \\.\Dap2
  - Master
- DSC3
  - \\.\Dap3
  - Slave of DSC2

Sample Rate: 12800 s/s

Channel Count: 8

Group Delay: 0.0031588 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

See Also

`DscGroupAddOne`, `DscGroupDeleteOne`, `DscGroupCount`

DscGroupConfigRead

The `DscGroupConfigRead` function reads iDSC group information from memory.

```
int __stdcall DscGroupConfigRead(
    HDSCGROUP hDscGroup,                // iDSC group handle.
    int iSize,                          // Size of memory allocated.
    void *pvBuffer                      // Pointer to memory buffer.
    );
```

Parameters

hDscGroup
: Handle of the group of iDSC boards.

iSize
: Size of the memory buffer for the iDSC group information. The memory buffer is allocated by the application.

pvBuffer
: Pointer to the memory buffer that stores the iDSC group information. The memory buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the number of bytes read from memory. If the function fails, the return value is 0.

Remarks

`DscGroupConfigRead` reads iDSC group information in binary format from memory. The information in memory is probably retrieved from a disk file.

The iDSC group information read includes the number of iDSCs boards, address, mode, sample rate, input range, input pin to filter mappings, enabled input pins, and details of the filter designs.

iSize is the value that was previously used as the *iSize* parameter of `DscGroupConfigWrite` when the iDSC group information was stored to memory. The user cannot use `DscGroupConfigWriteSize` for *iSize* in `DscGroupConfigRead` because it will not return the correct size. `DscGroupConfigWriteSize` is provided only for the `DscGroupConfigWrite` operation.

See Also

`DscGroupConfigWrite`, `DscGroupConfigWriteSize`

DscGroupConfigWrite

The `DscGroupConfigWrite` function writes iDSC group information to memory.

```
int __stdcall DscGroupConfigWrite(
    HDSCGROUP hDscGroup,                // iDSC group handle.
    int iSize,                          // Size of memory allocated.
    void *pvBuffer                      // Pointer to memory buffer.
    );
```

Parameters

hDscGroup

Handle of the group of iDSC boards.

iSize

Size of the memory buffer for the iDSC group information. The memory buffer is allocated by the application.

pvBuffer

Pointer to the memory buffer that stores the iDSC group information. The memory buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the number of bytes written to memory. If the function fails, the return value is 0.

Remarks

`DscGroupConfigWrite` writes iDSC group information in binary format to memory. The information in memory can then be written to a disk file.

The iDSC group information written includes the number of iDSCs boards, address, mode, sample rate, input range, input pin to filter mappings, enabled input pins, and details of the filter designs.

iSize is the size of the memory buffer allocated and must be at least `DscGroupConfigWriteSize`. *iSize* should be stored by the program to be used later as the *iSize* parameter of `DscGroupConfigRead`.

See Also

`DscGroupConfigRead`, `DscGroupConfigWriteSize`

DscGroupConfigWriteSize

The `DscGroupConfigWriteSize` function returns the minimum number of bytes to allocate for `DscGroupConfigWrite`.

```
int __stdcall DscGroupConfigWriteSize(
    HDSCGROUP hDscGroup,                    // iDSC group handle.
    );
```

Parameters

hDscGroup

Handle of the group of iDSC boards.

Return Values

If the function succeeds, the return value is the minimum number of bytes to allocate. If the function fails, the return value is 0.

Remarks

`DscGroupConfigWriteSize` must be used to determine the minimum number of bytes to allocate for the *iSize* parameter of `DscGroupConfigWrite`. It cannot be used as the *iSize* parameter of `DscGroupConfigRead` .

See Also

`DscGroupConfigWrite`, `DscGroupConfigRead`

DscGroupCount

The `DscGroupCount` function returns the number of iDSCs in the iDSC group.

```
int __stdcall DscGroupCount(
    HDSCGROUP hDscGroup,                    // iDSC group handle.
    );
```

Parameters

hDscGroup

Handle of the group of iDSC boards.

Return Values

If the function succeeds, the return value is the number iDSCs in the iDSC group. If the function fails, the return value is -1.

Remarks

`DscGroupCount` returns the number of iDSCs in the iDSC group. `DscGroupCount` increases by one when `DscGroupAddOne` is invoked and decreases by one when `DscGroupDeleteOne` is invoked. The maximum number of iDSCs in the iDSC group is 64.

See Also

`DscGroupAddOne`, `DscGroupDeleteOne`

DscGroupDeleteOne

The `DscGroupDeleteOne` function deletes one iDSC from the iDSC group.

```
int __stdcall DscGroupDeleteOne(
    HDSCGROUP hDscGroup,                    // iDSC group handle.
    );
```

Parameters

hDscGroup
Handle of the group of iDSC boards.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscGroupDeleteOne` deletes one iDSC from the iDSC group. The maximum number of iDSCs in the iDSC group is 64. When `DscGroupDeleteOne` is invoked, the `DscGroupCount` decreases by one.

See Also

`DscGroupAddOne`, `DscGroupCount`

DscGroupDsc

The `DscGroupDsc` function allows access to a specific iDSC board using the iDSC index.

```
HDSC __stdcall DscGroupDsc(
    HDSCGROUP hDscGroup,              // iDSC group handle.
    int iDscIndex,                    // iDSC board index.
    );
```

Parameters

hDscGroup

Handle of the group of iDSC boards.

iDscIndex

iDSC board index of interest. Valid iDSC board indices are 0 through `DscGroupCount` - 1.

Return Values

If the function succeeds, the return value is the iDSC board handle for the given iDSC board index. If the function fails, the return value is a NULL handle (of value 0).

The iDSC board handle should not be stored, instead `DscGroupDsc` should be called repeatedly to access a specific iDSC board.

Remarks

`DscGroupDsc` allows access to a specific iDSC board using the iDSC board index. Valid iDSC board indices are 0 through `DscGroupCount` - 1.

The iDSC board handle should not be stored because it is destroyed and recreated in functions like `DscGroupConfigDialogShow`, `DscGroupDeleteOne`, `DscGroupAddOne`, etc. `DscGroupDsc` should be called repeatedly to access a specific iDSC board.

See Also

`DscGroupConfigDialogShow`, `DscGroupCount`

DscGroupHandleClose

The `DscGroupHandleClose` function releases a handle previously opened with `DscGroupHandleOpen`.

```
int __stdcall DscGroupHandleClose(
    HDSCGROUP hDscGroup,                    // iDSC group handle to close.
    );
```

Parameters

hDscGroup

Handle of the group of iDSC boards to close. It must be a handle previously opened by `DscGroupHandleOpen`.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscGroupHandleClose` terminates communication with the iDSC group. `DscGroupHandleClose` is the last function called by any application ready to end communication with the iDSC group. Once the iDSC group communication has ended, the user can no longer access a specific iDSC board through `DscGroupDsc`.

See Also

`DscGroupHandleOpen`, `DscGroupDsc`

DscGroupHandleOpen

The `DscGroupHandleOpen` function returns a group handle to the target iDSC group.

```
HDSCGROUP __stdcall DscGroupHandleOpen(
   );
```

Return Values

If the function succeeds, the return value is an open handle to the specified target. If the function fails, the return value is a NULL handle (of value 0).

Remarks

`DscGroupHandleOpen` initiates communication with the iDSC group. `DscGroupHandleOpen` is the first function called by any application ready to begin communication with the iDSC group. It returns a group handle to the target iDSC group.

A group handle is a 32-bit value that references the group of iDSC boards. This handle is used in all `DscGroupXxxx` services to reference the appropriate iDSC group.

Once the iDSC group communication has began, the user can access a specific iDSC board through `DscGroupDsc`.

See Also

`DscGroupHandleClose`, `DscGroupDsc`

Obsolete Interface

The functions listed below are obsolete. They are discussed in greater detail in the following pages.

Category	Dsc Services

Custom command services	`DscDaplCCDownloadGet`
	`DscDaplCCDownloadSet`
	`DscDaplCCListGet`
	`DscDaplCCListLengthGet`
	`DscDaplCCListSet`
	`DscDaplCCStackSizeGet`
	`DscDaplCCStackSizeSet`

DAPL Custom Command Support

Using the DAPL custom command interface

To define DAPL custom commands, the user should use DscDaplCCListSet. Each line of the custom command list is a custom command filename. Once a single or a list of custom commands have been defined for the iDSC using DscDaplCCListSet, the custom commands will be downloaded to the iDSC when the user invokes DscCommandsLoad or DscStartAcquiring if the download code in DscDaplCCDownloadSet is set to enabled.

If the default stack size of 1024 bytes is not sufficient for the custom commands, the user can change the stack size using DscDaplCCStackSizeSet. The stack size should only be changed after the custom commands have been defined using DscDaplCCListSet but before DscCommandsLoad or DscStartAcquiring is invoked.

If the user wants to retrieve the defined custom commands, DscDaplCCListLengthGet along with DscDaplCCListGet should be used. DscDaplCCDownloadGet is used to get the state of the download code. DscDaplCCStackSizeGet is used to get the stack size of a custom command.

Below is a C/C++ example:

```
HDSC hDsc;
hDsc = DscHandleOpen(
  "\\\\.\\Dap0");                   // Open iDSC handle.

DscDaplCCListSet(hDsc,              // Define two custom
  "c:\\t1.bin\r\n"                  //  commands.
  "c:\\t2.bin\r\n");

DscDaplCCStackSizeSet(hDsc,         // Set t1.bin stack
  0, 2048);                         //  size to 2048 bytes.
DscDaplCCStackSizeSet(hDsc,         // Set t2.bin stack
  1, 2048);                         //  size to 2048 bytes.
DscDaplCCDownloadSet(hDsc, 1);      // Enable custom
                                    //  command download.
DscStartAcquiring(hDsc);            // Send custom command
                                    //  list to iDSC.
//... (other function calls) ...
```

DscDaplCCDownloadGet

The `DscDaplCCDownloadGet` function gets the download code that indicates if downloading the DAPL custom command list is enabled or disabled.

```
int __stdcall DscDaplCCDownloadGet(
    HDSC hDsc                              // iDSC board handle.
    );
```

Parameters

hDsc

Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the download code. The download code is 0 if downloading the custom command list is disabled and 1 if downloading the custom command list is enabled. If the function fails, the return value is -1.

Remarks

`DscDaplCCDownloadGet` returns the download code that indicates if downloading the DAPL custom command list is enabled or disabled.

If the download code is enabled, the DAPL custom command list is downloaded to the iDSC when the user invokes `DscCommandsLoad` or `DscStartAccquiring`. If the download code is disabled, the DAPL custom command list is not downloaded to the iDSC.

The user should only have to download the DAPL custom command list to the iDSC once at startup.

See Also

`DscDaplCCDownloadSet`

DscDaplCCDownloadSet

The `DscDaplCCDownloadSet` function sets the download code that indicates if downloading the DAPL custom command list is enabled or disabled.

```
int __stdcall DscDaplCCDownloadSet(
    HDSC hDsc,                          // iDSC board handle.
    int iDownload                       // Download code.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iDownload

Download code. Set it to 0 to disable downloading or 1 to enable downloading.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscDaplCCDownloadSet` sets the download code that indicates if downloading the DAPL custom command list is enabled or disabled.

If the download code is enabled, the DAPL custom command list is downloaded to the iDSC when the user invokes `DscCommandsLoad` or `DscStartAccquiring`. If the download code is disabled, the DAPL custom command list is not downloaded to the iDSC.

The user should only have to download the DAPL custom command list to the iDSC once at startup.

See Also

`DscDaplCCDownloadGet`

DscDaplCCListGet

The `DscDaplCCListGet` function gets the DAPL custom command list defined for the iDSC.

```
int __stdcall DscDaplCCListGet(
    HDSC hDsc,                          // iDSC board handle.
    int iSize,                          // Size of pszCCList buffer.
    const char *pszCCList               // Pointer to buffer of characters.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iSize

Size of the *pszCCList* buffer for the DAPL custom command list. The buffer is allocated by the application.

pszCCList

Pointer to a buffer that stores the DAPL custom command list. The buffer is allocated by the application.

Return Values

If the function succeeds, the return value is the length of the string. If the function fails, the return value is -1.

Remarks

`DscDaplCCListGet` returns the DAPL custom command list defined for the iDSC. Each custom command in the list is delimited by a carriage-return and line-feed.

The DAPL custom command list is sent to the iDSC when the user invokes `DscCommandsLoad` or`DscStartAcquiring` if the download code in `DscDaplCCDownloadSet` is enabled.

See Also

`DscDaplCCListLengthGet`, `DscDaplCCListSet`

DscDaplCCListLengthGet

The `DscDaplCCListLengthGet` function gets the length of the DAPL custom command list defined for the iDSC.

```
int __stdcall DscDaplCCListLengthGet(
   HDSC hDsc                                   // iDSC board handle.
   );
```

Parameters

hDsc
Handle of the iDSC board.

Return Values

If the function succeeds, the return value is the length of the buffer for the DAPL custom command list. If the function fails, the return value is 0.

Remarks

`DscDaplCCListLengthGet` returns the length of the buffer for the DAPL custom command list defined for the iDSC. This includes an extra character at the end for the null-terminator.

`DscDaplCCListLengthGet` allows the user to determine the size of buffer to allocate when using the `DscDaplCCListGet` function.

See Also

`DscDaplCCListGet`, `DscDaplCCListSet`

DscDaplCCListSet

The `DscDaplCCListSet` function defines the DAPL custom command list for the iDSC.

```
int __stdcall DscDaplCCListSet(
    HDSC hDsc,                          // iDSC board handle.
    const char *pszCCList               // Custom command list.
    );
```

Parameters

hDsc
Handle of the iDSC board.

pszCCList
Pointer to the DAPL custom command list.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0.

Remarks

`DscDaplCCListSet` allows the user to define a DAPL custom command list for the iDSC. Each custom command in the list must be delimited by a carriage-return, line-feed, or both.

The DAPL custom command list is sent to the iDSC when the user invokes `DscCommandsLoad` or `DscStartAcquiring` if the download code in `DscDaplCCDownloadSet` is enabled.

See Also

`DscDaplCCListGet`

DscDaplCCStackSizeGet

The `DscDaplCCStackSizeGet` function gets the stack size of the custom command identified by an index.

```
int __stdcall DscDaplCCStackSizeGet(
    HDSC hDsc,                          // iDSC board handle.
    int iIndex                          // Index of custom command.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iIndex

Index of the custom command. Valid numbers are from 0 to (n-1), where n is the number of custom commands in the list.

Return Values

If the function succeeds, the return value is the stack size. If the function fails, the return value is 0. The minimum value allowed for the stack size is 1024 bytes.

Remarks

`DscDaplCCStackSizeGet` returns the stack size of the custom command identified by an index from the list of custom commands. If there is only one custom command in the list, the index is 0.

See Also

`DscDaplCCStackSizeSet`

DscDaplCCStackSizeSet

The `DscDaplCCStackSizeSet` function sets the stack size of the custom command identified by an index.

```
int __stdcall DscDaplCCStackSizeSet(
    HDSC hDsc,                          // iDSC board handle.
    int iIndex,                         // Index of custom command.
    int iStackSize                      // Stack size.
    );
```

Parameters

hDsc

Handle of the iDSC board.

iIndex

Index of the custom command. Valid numbers are from 0 to (n-1), where n is the number of custom commands in the list.

iStackSize

Stack size to set. The default is 1024.

Return Values

If the function succeeds, the return value is 1. If the function fails, the return value is 0. The minimum value allowed for the stack size is 1024 bytes.

Remarks

`DscDaplCCStackSizeSet` sets the stack size of the custom command identified by an index from the list of custom commands. If there is only one custom command in the list, the index is 0.

If the required stack size of the custom command is larger than 1024 bytes, the stack size must be set after the DAPL custom command list has been defined using `DscDaplCCListSet`. The DAPL custom command list is then sent to the iDSC with the new stack size when the user invokes `DscCommandsLoad` or `DscStartAcquiring` if the download code in `DscDaplCCDownloadSet` is enabled.

See Also

`DscDaplCCStackSizeGet`

10. DSC Component Programmer's Interface

The Digital Signal Conditioning Board Component (DSCC) Programmer's Interface provides the link between an application and the iDSC board.

The DSCC interface supports the Delphi 5, Delphi 6, Delphi 7, C++Builder 5, and C++Builder 6 development environments. When the DSC Component Library is installed, the `Dsc` and `DscGroup` components will appear on the `Microstar` tab with the label `DSC` and `DSCs`. Installing the Component Library describes installing the DSC Component Library in detail.

The Object and Type Summary provides a summary of all of the objects and types. The Property, Method, and Event Summary provides a summary of all of the supported properties, methods, and events.

DSCC Interface Examples

There are several examples located in the `<InstallDir>\Examples\Pascal` directory for Delphi which demonstrate the use of the DSCC interface. Before running the examples, verify that the iDSC board and iDSC board software are properly installed by running DSCview. Exit DSCview before running the DSCC interface examples.

BinLog.dpr

`BinLog.dpr` shows how to log binary data to disk. It allows the user to design filters and configure the iDSC board using the `ConfigDialogShow` method. When the iDSC board is started, the selected log file is opened and data logging starts. When the iDSC board is stopped, the selected log file is closed and data logging stops.

Dvm.dpr

`Dvm.dpr` shows how to display voltage measurements. It transfers blocks of data from the iDSC board into a data buffer. It displays the 0th index from the data buffer, assuming a 5V input signal.

Graph.dpr

`Graph.dpr` shows how to display data in a graph. It allows the user to design filters and configure the iDSC board using the `ConfigDialogShow` method. When the iDSC board is started, graphing starts. When the iDSC board is stopped, graphing stops.

Installing the Component Library

The DSC Component Library supports the Delphi and C++Builder development environments. It consists of two components; the `Dsc` and `DscGroup` components. The `Dsc` component configures a single DSC and the `DscGroup` component configures multiple DSCs.

Before you install the DSC Component Library, make sure that you have installed the Accel32/DAPcell server. The DAPIO32.DLL that is shipped with the Accel32/DAPcell server is needed for the DSC Component Library installation.

Delphi 5, Delphi 6, Delphi 7

The following steps outline the process of incorporating the DSC Component Library into Delphi 5, Delphi 6, and Delphi 7. It involves installing the design time package and configuring the search path.

If you build with run time packages, copy `DscLibXX.Xpl` to your application directory.

A. Installing the design time package

1) Select the `Component|Install Packages...` menu item.

2) Select `Add...`, enter `<InstallDir>\Comp\DelphiX\DscLibXX.Xpl` as the file name, and select `Open`.

   `<InstallDir>` is the installation directory for the iDSC software.

   `\DelphiX\DscLibXX.Xpl` is
   `\Delphi5\DscLib50.bpl` for Delphi 5,
   `\Delphi6\DscLib60.bpl` for Delphi 6,
   `\Delphi7\DscLib70.bpl` for Delphi 7.

3) Select `OK`.

4) The `Dsc` and `DscGroup` components are available on the `Microstar` tab of the component palette with the label `DSC` and `DSCs`.

B. Configuring the search path

1) Select the `Tools|Environment Options...` menu item.

2) Select the `Library` tab, add `<InstallDir>\Comp\DelphiX` to the library path, and select `OK`.

C++Builder 5, C++Builder 6

The following steps outline the process of incorporating the DSC Component Library into C++Builder 5 and C++Builder 6. It involves installing the design time package and configuring the search path.

If you build with run time packages, copy `DscLibXX.bpl` to your application directory.

A. Installing the design time package

1) Select the `Component|Install Packages...` menu item.

2) Select `Add...`, enter `<InstallDir>\Comp\CBuildX\DscLibXX.bpl` as the file name, and select `Open`.

   `<InstallDir>` is the installation directory for the iDSC software.

   `\CBuildX\DscLibXX.bpl` is
   `\CBuild5\DscLib50.bpl` for C++Builder 5
   `\Cbuild6\DscLib60.bpl` for C++Builder 6.

3) Select `OK`.

4) The `Dsc` and `DscGroup` components are available on the `Microstar` tab of the component palette with the label `DSC` and `DSCs`.

B. Configuring the search path

1) Select the `File|Close All` menu item if any projects are opened.

2) Select the `Tools|Environment Options...` menu item.

3) Select the `Library` tab, add `<InstallDir>\Comp\CBuildX` to the library path, and select `OK`.

Creating a DSCC Interface Application

Before you create a DSCC Interface application, make sure that you have installed the Accel32/DAPcell server. The DAPIO32.DLL that is shipped with the Accel32/DAPcell server is needed for any application that uses the DSCC Interface.

The following steps describe the functions required for creating a simple application with the DSCC interface using the `Dsc` component.

1) Select the `Dsc` component from the `Microstar` tab of the Component Palette and drop the component onto the application form.

2) Configure the iDSC board at design time by selecting the `ConfigDialog` property from the Object Inspector. This allows the user to set the sample rate, enable/disable channels, design filters, etc. through a graphical interface.

3) Start data acquisition by invoking the `StartAcquiring` method.

4) Get binary data from the iDSC board by invoking the `BufferGetEx` method.

5) Stop data acquisition by invoking the `StopAcquiring` method.

The steps above describe a complete application. To configure the iDSC board at run time, the user must invoke the `ConfigDialogShow` method.

More complicated applications that use DAPL text and DAPL custom commands are also available with the DSCIO interface.

Universal Naming Convention

DSCC addresses the iDSC board using the Universal Naming Convention (UNC). A UNC name consists of two parts, the machine name and the iDSC board name. A UNC name begins with two backslashes, and the parts of the name are separated by a single backslash as shown below.

```
\\<Machine name>\<iDSC board name>
```

A local machine is denoted by a period. A remote machine is represented by its unique network machine name. Only the DAPcell implementation of the iDSC board supports remote machine names. All other implementations support only local machine names.

iDSC board names are predefined as `Dap0, Dap1, ..., Dap(N-1)` where `N` is the number of iDSC boards installed on the system. The maximum value for `N` is 14.

The UNC name is used with the `Address` property of the DSCC interface. Using `\\.\Dap0` as an example, `\\.` denotes the local machine and `\Dap0` denotes the name of the iDSC board. If connected to a remote machine through DAPcell named PC45 that contains `Dap0`, then `Address` is `\\PC45\Dap0`.

Master/Slave Configuration

To synchronize multiple iDSC boards on a system, you must designate one iDSC board as a master unit and the other iDSC boards as slave units. From iDSC board software, use the `Master` property to setup the Master/Slave Configuration. From iDSC board hardware, use a special cable to setup the Master/Slave Configuration.

Since iDSC boards share a sampling clock, the special cable distributes the sampling clock The Synchronization Connector is described in the Hardware Architecture chapters of this document.

Apart from connecting the cable, one iDSC board has to be configured as a Master iDSC board by using the `Master` property. Basically, setting up a Master or Slave iDSC board means associating a slave to a master through this property.

The supported properties and methods for Master/Slave Configuration are listed below.

`Master` property
`OperateMode` property
`RemoteMaster` property
`SlaveCount` property
`SlaveName` method

The master and slave units must use the same effective sample rate. Therefore, the sample rate should only be changed on a Master iDSC board using the `SampleRate` property. Changing the sample rate on a Slave iDSC board will have no effect. The Slave iDSC board will continue using the sample rate of its master.

If two independent iDSC boards are running at different sample rates, and the user decides to set up the iDSC boards in a Master/Slave configuration, the Slave iDSC board will use the sample rate of the Master iDSC board.

In a Master/Slave Configuration, the system services listed below should only be invoked on a Master iDSC board. If these methods are invoked on a Slave iDSC board, there will be an exception.

`Calibrate` method
`CommandsLoad` method
`StartAcquiring` method
`StopAcquiring` method
`XbCalibrate` method

`ConfigDialogShow` of `TDscGroup` allows easy graphical configuration of masters and slaves.

DAPL Support

Writing DAPL

The DSC system writes the filtered data to pipe `pDscData` for use in DAPL. Pipe `pDscData` has interleaved data only from the enabled channels. Before the user can perform further processing on the data, the `SEPARATE` command is recommended for separating the data from pipe `pDscData` into the correct number of pipes. If the user only has five channels enabled out of the maximum of eight, the user should separate the interleaved data into five pipes. Once the user has completed processing the data, the results must be merged to `$BINOUT`.

The restricted DAPL interface requires that input and output procedures, and `START` and `STOP` commands, not be included in the DAPL listing. The iDSC can only be started and stopped using the `StartAcquiring` and `StopAcquiring` methods.

The example below shows the form of the first few lines in DAPL. Pipe `pDscData` has interleaved data from five enabled channels.

```
PIPES P0, P1, P2, P3, P4

PDEF A
 SEPARATE(pDscData, P0, P1, P2, P3, P4)
 ...
 ...(further processing)
 ...
 ...(must write output to $BINOUT)
END
```

`P0`, `P1`, `P2`, `P3`, `P4` are the number of enabled channels, which is five in this example.

Using the DAPL Interface

To write custom DAPL text, the user should use the `DaplText` property. Once the DAPL text has been defined for the iDSC using `DaplText`, the DAPL text will be sent to the iDSC when the user invokes `CommandsLoad` or `StartAcquiring`.

If the user wants to change the already defined DAPL text, the `DaplText` property must be updated with the new DAPL text followed by either a `CommandsLoad` or `StartAcquiring` to activate the new DAPL text.

If the user wants to retrieve the defined DAPL text, invoke the `DaplText` property.

Below is a Delphi example, where `Dsc1` of type `TDsc` is already on the form:

```
Dsc1.DaplText.Text :=                    // Define DAPL text.
  ‘PIPES P0, P1, P2, P3, P4’#13#10 +
  ‘PIPES R0, R1, R2, R3, R4’#13#10 +
  ‘PDEF A’#13#10 +
  ‘  SEPARATE(pDscData, P0, P1, P2, P3, P4)’#13#10 +
  ‘  FFT(5, 9, 4, P0, R0)’#13#10 +
  ‘  FFT(5, 9, 4, P1, R1)’#13#10 +
  ‘  FFT(5, 9, 4, P2, R2)’#13#10 +
  ‘  FFT(5, 9, 4, P3, R3)’#13#10 +
  ‘  FFT(5, 9, 4, P4, R4)’#13#10 +
  ‘  MERGE(R0, R1, R2, R3, R4, $BINOUT)’#13#10 +
  ‘  END’;

Dsc1.StartAcquiring;                     // Send DAPL text.
//... (other function calls) ...
```

Object and Type Summary

Special objects and types are used to define some properties, methods, and events of the DSCC interface. The special objects and types, and the properties and methods they support are displayed below.

Object	Supports
`TDsc` object	iDSC Board, `Master` property
`TDscGroup` object	iDSC Board Group
`TExternalBoard` object	`ExternalBoard` property
`TFilterDesign` object	`FilterDesign` property
`TServerDiskLog` object	`ServerDiskLog` property

Type	Supports
`TBufferGetEx` type	`BufferGetEx` method
`TDscIoInt64` type	`ServerDiskLogBytes` property
`TFilterParam` type	`FilterParametersGet` method
	`FilterParametersSet` method
`TServerDiskLogConfig` type	`ServerDiskLogConfigGet` method
	`ServerDiskLogConfigSet` method
`TXbPinConfig` type	`XbPinConfigGet` method
	`XbPinConfigSet` method

TDsc object

The `TDsc` object defines the behavior of the iDSC board and the `Master` property.

Remarks

`TDsc` is the underlying object of the iDSC board. `TDsc` supports the properties, methods, and events below.

Properties

`Address` property
`BufferGetEnabled` property
`ConfigDialogOptions` property
`DaplText` property
`ExternalBoard` property
`FilterDesign` property
`GroupDelay` property
`InputRange` property
`Master` property
`MemoryUsed` property
`OperateMode` property
`PinEnabled` property
`PinEnabledCount` property
`RemoteMaster` property
`Running` property
`SampleRate` property
`ScansDiscarded` property
`ServerDiskLog` property
`ServerDiskLogBytes` property
`ServerDiskLogEnabled` property
`SlaveCount` property
`TcEnabled` property
`TcEnabledCount` property
`TcMaximum` property
`TcWidth` property
`XbEnabled` property

Methods

`BufferAvail` method

`BufferGet` method
`BufferGetEx` method
`Calibrate` method
`CommandsLoad` method
`ConfigDialogShow` method
`HardwareStop` method
`SlaveName` method
`StartAcquiring` method
`StopAcquiring` method
`StructPrepare` method
`SystemErrorProcess` method
`XbCalibrate` method

Events

`OnCalibrateProgress` event
`OnHardwareDelayChange` event
`OnInputRangeUpdate` event
`OnPinEnabledUpdate` event
`OnSystemError` event

TDscGroup object

The `TDscGroup` object defines the behavior of the iDSC group.

Remarks

`TDscGroup` is the underlying object of the iDSC group. The iDSC group consists of a list of iDSC boards that are of type `TDsc`. The specific iDSC board can be accessed through the array property `Dsc`.

`TDscGroup` supports the properties, methods, and events below.

Properties

`Count` property
`Dsc` property

Methods

`AddOne` method
`ConfigDialogShow` method
`DeleteOne` method

Events

`OnAfterNumDscChange` event
`OnBeforeNumDscChange` event

TExternalBoard object

The `TExternalBoard` object defines the behavior of the `ExternalBoard` property.

Remarks

`TExternalBoard` supports the properties and methods below.

Properties

`InputOffset` property
`InputOffsetRange` property
`InputRange` property
`InputType` property
`OutputExcitation` property

Methods

`XbPinConfigGet` method
`XbPinConfigSet` method

TFilterDesign object

The `TFilterDesign` object defines the behavior of the `FilterDesign` property.

Remarks

`TFilterDesign` supports the properties and methods below.

Properties

`Attenuation` property
`CutoffFreqHigh` property
`CutoffFreqLow` property
`CutoffSlopeHigh` property
`CutoffSlopeLow` property
`FilterName` property
`FilterType` property
`PinToFilterMap` property
`Sharpness` property

Methods

`FilterIndex` method
`FilterParametersGet` method
`FilterParametersSet` method
`TransferFunctionGet` method
`UnitStepGet` method
`UnitStepLengthGet` method

TServerDiskLog object

The `TServerDiskLog` object defines the behavior of the `ServerDiskLog` property.

Remarks

`TServerDiskLog` supports the properties and methods below.

Properties

`BlockSize` property
`FileFlagsAttributes` property
`FileName` property
`FileShareMode` property
`Flags` property
`MaxCount` property
`OpenFlags` property

Methods

`ServerDiskLogConfigGet` method
`ServerDiskLogConfigSet` method

TBufferGetEx type

The `TBufferGetEx` type defines the behavior of `BufferGetEx`.

Declaration

```
TBufferGetEx = packed record
   iInfoSize: integer;                  // Size of this record.
   iMinBytes: integer;                  // Minimum number of bytes to get.
   iMaxBytes: integer;                  // Maximum number of bytes to get.
   iTimeWait: integer;                  // Longest time to wait for data.
   iTimeOut: integer;                   // Longest total time for operation.
   iBytesMultiple: integer;             // Bytes to get is a multiple of this.
   end;
```

Members

iInfoSize
: Size of this information record.

iMinBytes
: Minimum number of bytes to get. It can be zero or any positive integer.

iMaxBytes
: Maximum number of bytes to get. *iMaxBytes* must be greater than or equal to *iMinBytes.*

iTimeWait
: Longest time in milliseconds that the get operation can be blocked waiting for data. If no data shows up in that amount of time, the operation should be aborted.

iTimeOut
: Longest time in milliseconds that the get operation should complete. If it fails to complete in that amount of time, the operation is aborted. When this member is specified, it takes precedence over *iTimeWait*. This member is ignored if its value is zero.

iBytesMultiple
: The number of bytes to get is always a multiple of *iBytesMultiple*.

Remarks

`TBufferGetEx` is used in `BufferGetEx`. `TBufferGetEx` should be initialized using `StructPrepare` or `BufferGetEx` will fail.

Each member of `TBufferGetEx` must be initialized to the appropriate value before being passed to `BufferGetEx`. The member *`iMinBytes`* must be greater than or equal to zero, and the member *`iMaxBytes`* must be greater than or equal to *`iMinBytes`*. If *`iMinBytes`* is zero `BufferGetEx` will never block even when there are no data available.

A zero value of *`iBytesMultiple`* is treated the same as one. The value of *`iBytesMultiple`* cannot be larger than the maximum pipe buffer size on the PC side (converted to bytes) minus 1024, or minus the iDSC side blocking size (converted to bytes), whichever is larger; otherwise, the first condition causes an error. The second condition is not checked and may cause a deadlock. It is the application's responsibility to guarantee that it never happens.

Both *`iMinBytes`* and *`iMaxBytes`* must be an integral multiple of the *`iBytesMultiple`* value; otherwise, an error occurs.

See Also

`BufferGetEx` method, `StructPrepare` method

TDscIoInt64 type

The `TDscIoInt64` type defines the behavior of the `ServerDiskLogBytes` property and the *`i64MaxCount`* parameter of `TServerDiskLogConfig`. `TDscIoInt64` represents a 64-bit integer type.

Declaration

```
{$IFDEF DscIoNoInt64}

TDscIoInt64 = packed record
   dwLowPart: DWORD;                    // Low 32-bits of 64-bit integer type.
   dwHighPart: DWORD;                   // High 32-bits of 64-bit integer type.
   end;

{$ELSE}

TDscIoInt64 = int64;

{$ENDIF}
```

Remarks

TDscIoInt64 supports the Delphi 5, Delphi 6, and Delphi 7, and C++Builder 5, and C++Builder 6 development environments.

Example

The following examples show how to initialize the *`i64MaxCount`* parameter of `TServerDiskLogConfig` to a value of 4294967296. The first example is for environments that support the `int64` data type, while the second example is for environments that do not support the `int64` data type.

`Dsc1` is of type `TDsc`.

// Example 1: `int64` type is supported

```
var
  sdlc: TServerDiskLogConfig;
begin
  Dsc1.StructPrepare(sdlc, SizeOf(sdlc));
  sdlc.i64MaxCount := 4294967296;
  ...
end;
```

// Example 2: `int64` type is not supported

```
var
  sdlc: TServerDiskLogConfig;
begin
  Dsc1.StructPrepare(sdlc, SizeOf(sdlc));
  sdlc.i64MaxCount.dwLowPart := 0;
  sdlc.i64MaxCount.dwHighPart := 1;
  ...
end;
```

See Also

`TServerDiskLogConfig` type, `ServerDiskLogBytes` property

TFilterParam type

The `TFilterParam` type defines the behavior of the `FilterParametersGet` method and `FilterParametersSet` method.

Declaration

```
TFilterParam = packed record
  iInfoSize: integer;                  // Size of this record.
  achName:array[0..63] of char;        // Filter name.
  iFilterType: integer;                // Filter type.
  iSharpness: integer;                 // Filter sharpness.
  fCutoffFreqLow:single;               // Filter low cutoff frequency.
  fCutoffSlopeLow:single;              // Filter low cutoff slope.
  fCutoffFreqHigh:single;              // Filter high cutoff frequency.
  fCutoffSlopeHigh:single;             // Filter high cutoff slope.
  fAttenuation:single;                 // Filter attenuation.
  end;
```

Members

iInfoSize

Size of this information record.

achName

Name of the filter. The name is restricted to 63 characters plus one null-terminated character. The default is `FD0`, `FD1`, `FD2`, `FD3`, `FD4`, `FD5`, `FD6`, and `FD7` for each of the eight filters.

iFilterType

Type of the filter, either lowpass or bandpass. These constants simplify selecting the filter type: `Dsc_LowPass`, `Dsc_BandPass`. The default is lowpass.

iSharpness

Sharpness of the filter specified as an odd number. Valid numbers are in the range 37 to 255, depending on the sample rate.

The default is 37 for sample rate 153600 s/s, 119 for sample rate 102400 s/s, 95 for sample rate 76800 s/s, 195 for sample rates of 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 137 for all other sample rates.

fCutoffFreqLow

Low cutoff frequency of the filter specified in Hertz. Valid numbers are in the range 2% to 80% of the Nyquist frequency (0.02 * Nyquist frequency to 0.8 *

Nyquist frequency). The Nyquist frequency is half the sample rate. The default is half the Nyquist frequency.

`fCutoffSlopeLow`

Low cutoff slope of the filter specified as a fraction of the Nyquist frequency, with the Nyquist frequency normalized to 1.0. Valid numbers are in the range 0.0 to 0.8. 0.0 corresponds to 0% of the Nyquist frequency and 0.8 corresponds to 80% of the Nyquist frequency. The Nyquist frequency is half the sample rate.

The default is 0.0 for sample rates of 153600 s/s, 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 0.04 for all other sample rates.

`fCutoffFreqHigh`

High cutoff frequency of the filter specified in Hertz. Valid numbers are in the range 2% to 80% of the Nyquist frequency (0.02 * Nyquist frequency to 0.8 * Nyquist frequency). The Nyquist frequency is half the sample rate. The default is three-quarters the Nyquist frequency.

`fCutoffSlopeHigh`

High cutoff slope of the filter specified as a fraction of the Nyquist frequency, with the Nyquist frequency normalized to 1.0. Valid numbers are in the range 0.0 to 0.8. 0.0 corresponds to 0% of the Nyquist frequency and 0.8 corresponds to 80% of the Nyquist frequency. The Nyquist frequency is half the sample rate.

The default is 0.0 for sample rates of 153600 s/s, 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 0.04 for all other sample rates.

`fAttenuation`

Attenuation of the filter in the stopband region. Valid numbers are in the range 6.0 to 12.0. The larger the number, the more attenuation in the stopband, but this will further attenuate the frequencies near cutoff.

The default is 10.2 for sample rate 153600 s/s, 9.4 for sample rate 76800 s/s, 9.8 for sample rates of 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, and 1024 s/s and 9.0 for all other sample rates.

Remarks

`TFilterParam` is used in `FilterParametersGet` and `FilterParametersSet`. `TFilterParam` should be initialized using `StructPrepare` or both methods will fail.

`FilterParametersGet` will return the filter parameters in the *`iSharpness`*, *`fCutoffFreqLow`*, *`fCutoffSlopeLow`*, *`fCutoffFreqHigh`*, *`fCutoffSlopeHigh`*, and *`fAttenuation`* members.

Before invoking `FilterParametersSet`, the user must set the *iSharpness*, *fCutoffFreqLow*, *fCutoffSlopeLow*, *fCutoffFreqHigh*, *fCutoffSlopeHigh*, and *fAttenuation* members to the new desired values.

See Also

`FilterParametersGet` method, `FilterParametersSet` method, `StructPrepare` method

TServerDiskLogConfig type

The `TServerDiskLogConfig` type defines the behavior of `ServerDiskLogConfigGet` and `ServerDiskLogConfigSet`.

Declaration

```
TServerDiskLogConfig = packed record
   iInfoSize: integer;                      // Size of this record.
   dwFlags: DWORD;                          // Logging behavior flags.
   pszFileName: PChar;                      // File name.
   dwFileNameSize: DWORD;                   // Size of file name.
   dwFileShareMode: DWORD;                  // File share properties.
   dwOpenFlags: DWORD;                      // File open options.
   dwFileFlagsAttributes: DWORD;            // File attributes.
   dwBlockSize: DWORD;                      // Size of block to write.
   i64MaxCount: TDscIoInt64;                // File maximum count.
   end;
```

Members

iInfoSize

Size of this information record.

dwFlags

Flags to control disk logging behavior. The constants below simplify selecting *dwFlags*. The default is `DscDlfServerSide` and `DscDlfFlushBefore`.

`DscDlfServerSide`

Log on the same side of the network connection as the iDSC. If not specified, logging will take place on the application (client) side of the network connection.

`DscDlfFlushBefore`

Flush the input data pipe before beginning the logging session. Default action is to not flush the pipes before logging.

`DscDlfFlushAfter`

Flush the input pipe after the logging session has terminated. Default action is to not flush the pipes after logging.

`DscDlfMirrorLog`

Enable mirror logging. Mirror logging creates a copy of the logged data in another file.

`DscDlfAppendData`
: Allow new data to be appended to an existing file. Only the `DscOfOpenAlways` and `DscOfOpenExisting` flags of the *`dwOpenFlags`* member can be used for appending.

`DscDlfBlockTransfer`
: Open the file with no intermediate buffering or caching and access the file in a special way that is highly dependent on the target disk attributes to improve performance. This transfer mode adds overhead to slow rate transfer with small buffers. It should only be used when necessary with a very large *`dwBlockSize`* value (such as 1048576 and above). If this option is selected, *`dwBlockSize`* is automatically set to 1048576.

`pszFileName`

Name of the primary disk log file and name of a possible mirror disk log file, if mirror logging is enabled. The default is an empty string. The size of the user allocated buffer must be specified using *`dwFileNameSize`* when used with `ServerDiskLogConfigGet`.

Mirror logging is enabled by selecting the `DscDlfMirrorLog` flag of the *`dwFlags`* member. Multiple file names are separated by semi-colons. Currently, only one mirror file is allowed. Both files must be on the same side of the DAPcell Local/DAPcell service (the PC application side or the iDSC side).

`dwFileNameSize`

Size of the user allocated buffer to store the file name specified by *`pszFileName`*. The size must include an extra space for the null terminator. This field is important in `ServerDiskLogConfigGet`. It is not used in `ServerDiskLogConfigSet`.

If *`dwFileNameSize`* is 0, the file name is not returned in *`pszFileName`*. If *`dwFileNameSize`* is 1, only the null terminator is returned in *`pszFileName`*.

`dwFileShareMode`

File share mode of the disk log file. The constants below simplify selecting *`dwFileShareMode`*. The default is `DscFsmRead`.

`DscFsmNone`	The file cannot be used by another process.
`DscFsmRead`	The file can be read by another process.
`DscFsmWrite`	The file can be written to by another process.
`DscFsmReadWrite`	The file can be read and written to by another process.

`dwOpenFlags`

File open options of the disk log file. The constants below simplify selecting *`dwOpenFlags`*. The default is `DscOfCreateAlways`.

`DscOfCreateNew`	Create a new file. Creation fails if the file already exists.
`DscOfCreateAlways`	Create a new file. If the file already exists, it is overwritten.
`DscOfOpenAlways`	Open an existing file. If the file does not exist, it will be created.
`DscOfOpenExisting`	Open an existing file without resetting permissions. Opening fails if the file does not exist.

`dwFileFlagsAttributes`

File attributes of the disk log file. The constants below simplify selecting *`dwFileFlagsAttributes`*. The default is `DscFfaAttributeNormal`.

`DscFfaAttributeNormal`	No special attributes.
`DscFfaAttributeEncrypted`	The data in the file is encrypted.
`DscFfaFlagWriteThrough`	Write through any intermediate caching and go directly to disk.
`DscFfaFlagSequentialScan`	Can be used to optimize the transfer of large blocks of data. Most applications will not need this flag.

`dwBlockSize`

Minimum amount of data, in bytes, to write to the disk log file at one time. This field is provided for disk transfer optimization. The default is 8192.

`i64MaxCount`

Maximum number of bytes to log. The default is 0, which causes logging to continue indefinitely until `StopAcquiring` is invoked. It is a `TDscIoInt64` type.

Remarks

`TServerDiskLogConfig` is used in `ServerDiskLogConfigGet` and `ServerDiskLogConfigSet`. `TServerDiskLogConfig` should be initialized using `StructPrepare` or both functions will fail.

`ServerDiskLogConfigGet` will return the server disk log configuration in the *`dwFlags`*, *`pszFileName`*, *`dwFileShareMode`*, *`dwOpenFlags`*, *`dwFileFlagsAttributes`*, *`dwBlockSize`*, and *`i64MaxCount`* members of `TServerDiskLogConfig`.

To use `ServerDiskLogConfigSet` it is recommended that the user invokes `ServerDiskLogConfigGet` to get the server disk log configuration defaults, updates the pertinent fields, and then invokes `ServerDiskLogConfigSet`.

See Also

`StructPrepare` method, `ServerDiskLogConfigGet` method, `ServerDiskLogConfigSet` method

TXbPinConfig type

The `TXbPinConfig` type defines the behavior of the `XbPinConfigGet` method and `XbPinConfigSet` method.

Declaration

```
TXbPinConfig = packed record
    iInfoSize: integer;              // Size of this record.
    iInputType: integer;             // Input type.
    fInputRange: single;             // Input range voltage.
    fInputOffset: single;            // Input offset voltage.
    fInputOffsetRange: single;       // Input offset range voltage.
    fOutputExcitation: single;       // Output excitation voltage.
    end;
```

Members

iInfoSize

Size of this information record.

iInputType

Type of input signal, DC coupling, AC coupling or excitation. These constants simplify selecting the input type: `DscXb_DCCoupling`, `DscXb_ACCoupling`, `DscXb_Excitation`. The default is `DscXb_DCCoupling`.

fInputRange

Input range of the signal specified in Volts. Please note that this input range is different from `InputRange`, and only works if `InputRange` is set to +/- 5V.

If you select 0.5 the input range is +/- 500 mV, if you select 2.0 the input range +/- 2V. If you specify an invalid input range, the input range will not change from its previous setting. The default is 10.0.

Valid input ranges are:
0.01, 0.02, 0.05,
0.1, 0.2, 0.5,
1.0, 2.0, 5.0,
10.0

fInputOffset

Input offset of the signal specified in Volts. The input offset must be within the range of the input offset range. If you specify an invalid input offset, the input offset will not change from its previous setting. The default is 0.0.

fInputOffsetRange

Input offset range of the signal returned in Volts. The input offset range is determined by the input range. For example, if the input range is 0.5 then the input offset range is 2.5 for +/-2.5 V, if the input range is 2.0 then the input offset range is 1.0 for +/- 1V. This is a read only property that is dependent on the input range and you cannot specify it.

Valid input offset ranges are:

0.5	when the input range is 0.01
1.0	when the input range is 0.02
2.5	when the input range is 0.05
0.5	when the input range is 0.1
1.0	when the input range is 0.2
2.5	when the input range is 0.5
1.0	when the input range is 1.0
1.0	when the input range is 2.0
5.0	when the input range is 5.0
5.0	when the input range is 10.0

fOutputExcitation

Output excitation signal specified in Volts. If you specify an invalid output excitation, the output excitation will not change from its previous setting. The default is 0.0.

Valid output excitation ranges are:

0.0, 1.0, 2.0, 5.0, 10.0

Remarks

`TXbPinConfig` is used in `XbPinConfigGet` and `XbPinConfigSet`. `TXbPinConfig` should be initialized using `StructPrepare` or both functions will fail.

`XbPinConfigGet` will return the pin configuration in the *iInputType*, *fInputRange*, *fInputOffset*, *fInputOffsetRange*, and *fOutputExcitation* members of `TXbPinConfig`.

Before invoking `XbPinConfigSet`, the *iInputType*, *fInputRange*, *fInputOffset*, and *fOutputExcitation* members of `TXbPinConfig` must be set to the new desired values. *fInputOffsetRange* cannot be set since it is a read only property.

See Also

`StructPrepare` method, `XbPinConfigGet` method, `XbPinConfigSet` method

Property, Method, and Event Summary

The DSCC interface provides a complete set of properties, methods, and events for communicating with the iDSC board. Each property, method, and event falls into one of several categories.

Category	TDsc Services
Graphical services	`ConfigDialogOptions` property `ConfigDialogShow` method
Filter design services	`FilterDesign` property
Communication services	`Calibrate` method `CommandsLoad` method `StartAcquiring` method `StopAcquiring` method
I/O services	`BufferAvail` method `BufferGet` method `BufferGetEnabled` property `BufferGetEx` method
System services	`Address` property `GroupDelay` property `HardwareStop` method `InputRange` property `MemoryUsed` property `PinEnabled` property `PinEnabledCount` property `Running` property `SampleRate` property `ScansDiscarded` property `StructPrepare` method
Master/slave services	`Master` property `OperateMode` property `RemoteMaster` property `SlaveCount` property `SlaveName` method

DAPL services	`DaplText` property
External board services	`ExternalBoard` property `XbCalibrate` method `XbEnabled` property
Server disk log services	`ServerDiskLog` property `ServerDiskLogBytes` property `ServerDiskLogEnabled` property
Timing channel services	`TcEnabled` property `TcEnabledCount` property `TcMaximum` property `TcWidth` property
Error handling services	`SystemErrorProcess` method
Events	`OnCalibrateProgress` event `OnHardwareDelayChange` event `OnInputRangeUpdate` event `OnPinEnabledUpdate` event `OnSystemError` event

Category	**TDscGroup Services**
Graphical services	`ConfigDialogShow` method
Configuration services	`AddOne` method `Count` property `DeleteOne` method `Dsc` property
Events	`OnAfterNumDscChange` event `OnBeforeNumDscChange` event

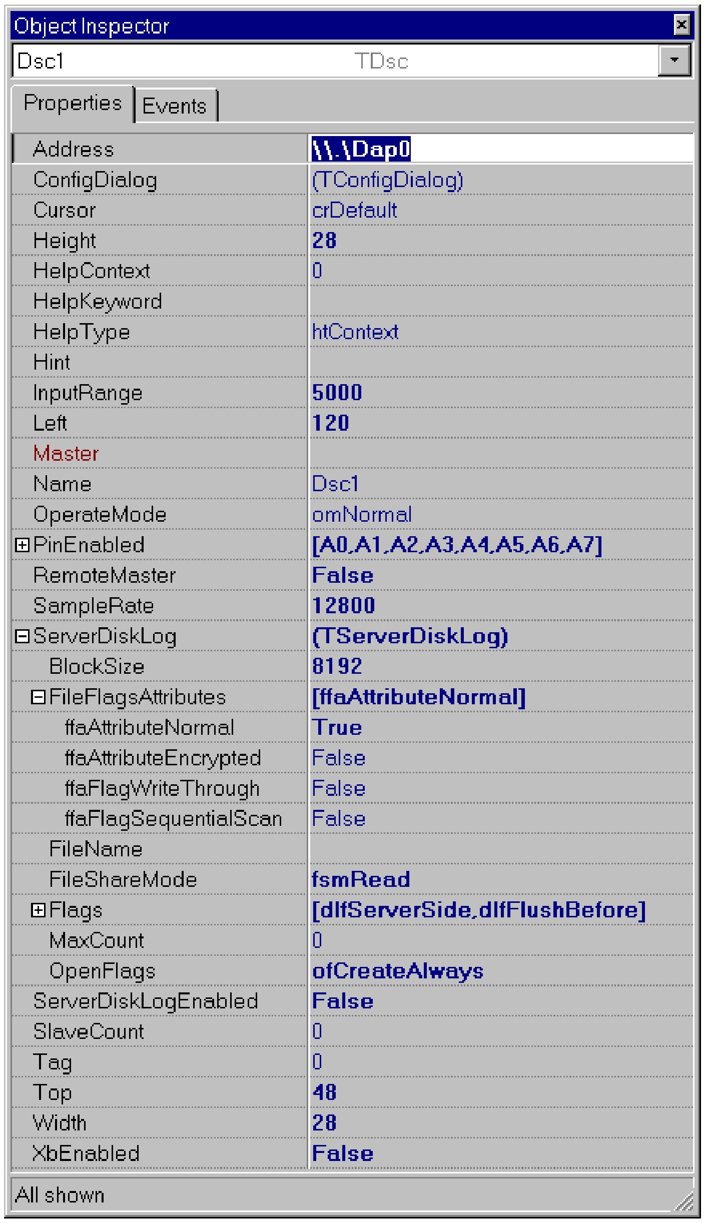
Category	**TExternalBoard Services**
External board properties	`InputOffset` property `InputOffsetRange` property

	`InputRange` property `InputType` property `OutputExcitation` property
External board utilities	`XbPinConfigGet` method `XbPinConfigSet` method

Category	**TFilterDesign Services**
Filter design properties	`Attenuation` property `CutoffFreqHigh` property `CutoffFreqLow` property `CutoffSlopeHigh` property `CutoffSlopeLow` property `FilterName` property `FilterType` property `PinToFilterMap` property `Sharpness` property
Filter design utilities	`FilterIndex` method `FilterParametersGet` method `FilterParametersSet` method `TransferFunctionGet` method `UnitStepGet` method `UnitStepLengthGet` method

Category	**TServerDiskLog Services**
Server disk log properties	`BlockSize` property `FileFlagsAttributes` property `FileName` property `FileShareMode` property `Flags` property `MaxCount` property `OpenFlags` property
Server disk log utilities	`ServerDiskLogConfigGet` method `ServerDiskLogConfigSet` method

The following figure displays available design time properties with the `TDsc` object from the Delphi 7.0 development environment.



Object Inspector

Dsc1 TDsc

Properties | Events

Address	\\.\Dap0
ConfigDialog	(TConfigDialog)
Cursor	crDefault
Height	28
HelpContext	0
HelpKeyword	
HelpType	htContext
Hint	
InputRange	5000
Left	120
Master	
Name	Dsc1
OperateMode	omNormal
⊞PinEnabled	[A0,A1,A2,A3,A4,A5,A6,A7]
RemoteMaster	False
SampleRate	12800
⊟ServerDiskLog	(TServerDiskLog)
BlockSize	8192
⊟FileFlagsAttributes	[ffaAttributeNormal]
ffaAttributeNormal	True
ffaAttributeEncrypted	False
ffaFlagWriteThrough	False
ffaFlagSequentialScan	False
FileName	
FileShareMode	fsmRead
⊞Flags	[dlfServerSide,dlfFlushBefore]
MaxCount	0
OpenFlags	ofCreateAlways
ServerDiskLogEnabled	False
SlaveCount	0
Tag	0
Top	48
Width	28
XbEnabled	False

All shown

AddOne method

The `AddOne` method adds one iDSC to the iDSC group.

Applies To

`TDscGroup`

Declaration

function AddOne: integer;

Return Values

The return value is the index of the added iDSC or `Count` - 1.

Remarks

`AddOne` adds one iDSC to the iDSC group and returns the index of the added iDSC. The index of the iDSC is the `Count` minus one. The maximum number of iDSCs in the iDSC group is 64 which means that the maximum index is 63. When `AddOne` is invoked, the `Count` increases by one.

As an example, `AddOne` returns 3. Therefore, the newly added iDSC index is 3 and the `Count` is 4.

See Also

`DeleteOne` method, `Count` property, `ConfigDialogShow` method

Address property

The `Address` property specifies the machine name and iDSC board name. The name returned is in `UNC` format.

Applies To

`TDsc`

Declaration

property Address: string;

Default

`\\.\Dap0`

Access Restrictions

None

Remarks

`Address` consists of two portions, the machine name and the iDSC board name. The naming method is based on the UNC.

Using `\\.\Dap0` as an example, `\\.` denotes the local machine and `\Dap0` is the name of the iDSC board. If you are connected to a remote machine through DAPcell named PC45, that contains `Dap0`, then `Address` is `\\PC45\Dap0`.

See Also

UNC

Attenuation property

The `Attenuation` property is an array property that specifies the attenuation of the filter.

Applies To

`TFilterDesign`

Declaration

property Attenuation[*iFilterIndex*: integer]: single;

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

Dependent on SampleRate
153600 s/s: 10.2
76800 s/s: 9.4
102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, 1024 s/s: 9.8
All others: 9.0

Access Restrictions

Run time only

Remarks

`Attenuation` specifies the filter response in the stopband region. Valid numbers are in the range 6.0 to 12.0. The larger the number, the more attenuation in the stopband, but this will further attenuate the frequencies near cutoff.

Valid filter indices are 0 through 7. If the filter index is not valid, the exception ‘Filter index is out of range’ is raised.

`Attenuation` is a `TFilterDesign` property.

See Also

`ConfigDialogShow` method

BlockSize property

The `BlockSize` property specifies the size of block to write.

Applies To

`TServerDiskLog`

Declaration

property BlockSize: DWORD;

Default

8192

Access Restrictions

None

Remarks

`BlockSize` specifies the minimum amount of data, in bytes, to write to the disk log file at one time. This field is provided for disk transfer optimization.

See Also

`ServerDiskLog` property, `TServerDiskLog` object

BufferAvail method

The `BufferAvail` method gets the number of bytes available for reading from the iDSC board.

Applies To

`TDsc`

Declaration

function BufferAvail: integer;

Return Values

If the function succeeds, the return value is the number of bytes available for reading. If the function fails, the return value is -1. If there are no data available, the return value is 0.

Remarks

`BufferAvail` returns the number of bytes already buffered. An application is safe to read that number from the iDSC board without being blocked.

For efficient data transfer, it is best to use `BufferGetEx` with a time wait, and avoid using `BufferAvail`. `BufferGetEx` returns the actual number of bytes read which lets the application know what data have been transferred.

See Also

`BufferGet` method, `BufferGetEx` method

BufferGet method

The `BufferGet` method reads a block of data from the iDSC board.

Applies To

`TDsc`

Declaration

```
function BufferGet(
    iBytes: integer;                // Number of bytes to read.
    iTimeWait: integer;             // Longest time to wait for data.
    var Buffer                      // Buffer to receive data.
    ): integer;
```

Parameters

iBytes

Number of bytes to read.

iTimeWait

Specifies the longest time in milliseconds that the get operation can be blocked waiting for data. If no data shows up in that amount of time, the operation should be aborted.

Buffer

Buffer for storing the data from the iDSC board.

Return Values

If the function succeeds, the return value is the number of bytes read. If the function fails, the return value is -1 or an exception is raised. If there are no data available, the return value is 0.

Remarks

`BufferGet` attempts to read all the requested *iBytes* from the iDSC board. If all the requested *iBytes* are not available for *iTimeWait* milliseconds, it returns with the number of bytes read so far.

This method is useful for displaying the acquired and filtered data in graphs, tables, etc.

See Also

`BufferGetEx` method

BufferGetEnabled property

The `BufferGetEnabled` property enables or disables the `BufferGet` method and `BufferGetEx` method.

Applies To

`TDsc`

Declaration

property BufferGetEnabled: boolean;

Default

True

Access Restrictions

Run time only

Remarks

`BufferGetEnabled` allows enabling or disabling the `BufferGet` method and `BufferGetEx` method. If `BufferGetEnabled` is true, `BufferGet` and `BufferGetEx` are enabled. If `BufferGetEnabled` is false, `BufferGet` and `BufferGetEx` are disabled, and invoking those methods will return -1.

`BufferGetEnabled` is useful if another PC wants to access the iDSC data from the PC with the iDSC through networking. The networking capability is only available with the DAPcell Local and DAPcell servers. It is not available with the Accel32 server.

See Also

`BufferGet` method, `BufferGetEx` method

BufferGetEx method

The `BufferGetEx` method reads a block of data from the iDSC board, using the `TBufferGetEx` record to control its behavior.

Applies To

`TDsc`

Declaration

```
function BufferGetEx(
    const bgeBufferGetEx: TBufferGetEx;     // Information record.
    var Buffer                              // Buffer to receive data.
    ): integer;
```

Parameters

bgeBufferGetEx

`TBufferGetEx` is a record that passes the appropriate parameters. `TBufferGetEx` must be initialized using `StructPrepare`.

Buffer

Buffer for storing the data from the iDSC board.

Return Values

If the function succeeds, the return value is the number of bytes read. If the function fails, an exception is raised. If there are no data available, the return value is 0. If `CommandsLoad` or `StartAcquiring` has not been invoked, the return value is -1.

Remarks

`BufferGetEx` is an extended version of `BufferGet`. It allows a minimum request count, *iMinBytes*, and a maximum request count, *iMaxBytes*, specification. Both *iMinBytes* and *iMaxBytes* are passed into this function through the `TBufferGetEx` record. Both *iMinBytes* and *iMaxBytes* are in bytes and must be an integral multiple of *iBytesMultiple*. The function reads at least *iMinBytes* bytes of data. Once it reads enough data to cover *iMinBytes*, the function reads all available data up to *iMaxBytes* without waiting. The actual bytes returned is always an integral multiple of *iBytesMultiple*.

Before *iMinBytes* is covered, the function will be blocked waiting for data if the target pipe becomes empty. In this case, the two members of the `TBufferGetEx` record, *iTimeWait* and *iTimeOut*, determine the behavior of the function. If *iMinBytes* is not covered in *iTimeOut* milliseconds, or if no data are available for *iTimeWait* milliseconds, the function returns immediately. The return value is then the number of bytes actually read up to the point where the operation is aborted. It can be zero or any integral multiple of *iBytesMultiple* less than *iMinBytes*. An application can check the return value to determine if a time-out has occurred.

See Also

`BufferGet` method

Calibrate method

The `Calibrate` method performs calibration on the iDSC board.

Applies To

`TDsc`

Declaration

procedure Calibrate;

Remarks

`Calibrate` calibrates the iDSC board for DC gain and offset, and saves the calibration values.

`Calibrate` is automatically invoked when a user selects `StartAcquiring` for the first time. The next time a user uses the component, the saved calibration values are reused.

If the calibration values are not found, calibration is automatically re-invoked. A user can force recalibration by calling `Calibrate`.

See Also

`StartAcquiring` method

CommandsLoad method

The `CommandsLoad` method downloads the configuration commands to the iDSC board and performs the necessary configuration for filtering.

Applies To

`TDsc`

Declaration

procedure CommandsLoad;

Remarks

`CommandsLoad` configures the iDSC board with the appropriate programs and coefficients. The filter designs are used internally by `CommandsLoad` to calculate and download the appropriate commands.

If the iDSC board configuration or filter designs change and `StartAcquiring` is selected, `StartAcquiring` automatically invokes `CommandsLoad` and downloads new commands to the iDSC board. Data will show up at the PC two times `GroupDelay` seconds later.

If the iDSC board configuration or filter designs change and `CommandsLoad` is selected before `StartAcquiring`, data will show up immediately at the PC. Data that show up immediately are actually data that was sampled `GroupDelay` seconds ago.

See Also

`GroupDelay` property, `StartAcquiring` method

ConfigDialogOptions property

The `ConfigDialogOptions` property allows manipulating the display options of `ConfigDialogShow`.

Applies To

`TDsc`

Declaration

property ConfigDialogOptions: TConfigDialogOptions;

TConfigDialogOptions = **set of** TConfigDialogOption;

TConfigDialogOption = (
  cdoInputScreenHide, *cdoFDScreenHide*, *cdoTcHide*,
  cdoFD0Hide, *cdoFD1Hide*, *cdoFD2Hide*, *cdoFD3Hide*,
  cdoFD4Hide, *cdoFD5Hide*, *cdoFD6Hide*, *cdoFD7Hide*
  );

Default

[cdoTcHide]

Access Restrictions

None

Remarks

`ConfigDialogOptions` specifies the display options of ConfigDialogShow. It is of type `TConfigDialogOptions`, which is a set of `TConfigDialogOption`. `ConfigDialogOptions` can be manipulated using the **set** operators.

`ConfigDialogOptions` specifies one or more of the following options.

cdoInputScreenHide	Hide the Input Screen.
cdoFDScreenHide	Hide the Filter Design Screen.
cdoTcHide	Hide the timing channels selection.
cdoFD0Hide	Hide filter design index 0.
cdoFD1Hide	Hide filter design index 1.
cdoFD2Hide	Hide filter design index 2.
cdoFD3Hide	Hide filter design index 3.

cdoFD4Hide	Hide filter design index 4.
cdoFD5Hide	Hide filter design index 5.
cdoFD6Hide	Hide filter design index 6.
cdoFD7Hide	Hide filter design index 7.

See Also

`ConfigDialogShow` method

ConfigDialogShow method

The `ConfigDialogShow` method displays modal dialog screens for graphical configuration of the inputs and filter designs.

Applies To

`TDsc`

Declaration

function ConfigDialogShow: integer;

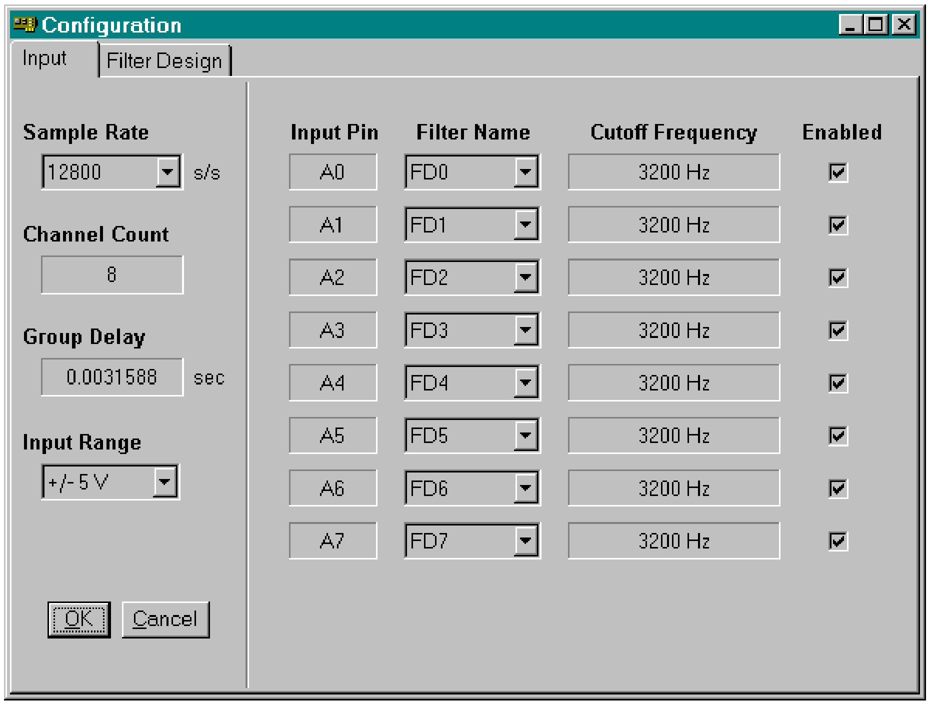
Return Values

If the user selects the OK button when changes are made, the return value is mrOk (of value 1). If the user selects the OK button when no changes are made, the return value is mrIgnore (of value 5). If the user selects the Cancel button, the return value is mrCancel (of value 2).

Remarks

`ConfigDialogShow` simplifies the configuration of the input and filter design process with a graphical interface. The Input Screen provides a quick method for selecting the sample rate, selecting the input range, mapping the input pins to selected filter designs, and enabling or disabling the input pins.

The figure below displays the Input Screen.



Sample Rate: 12800 s/s

Channel Count: 8

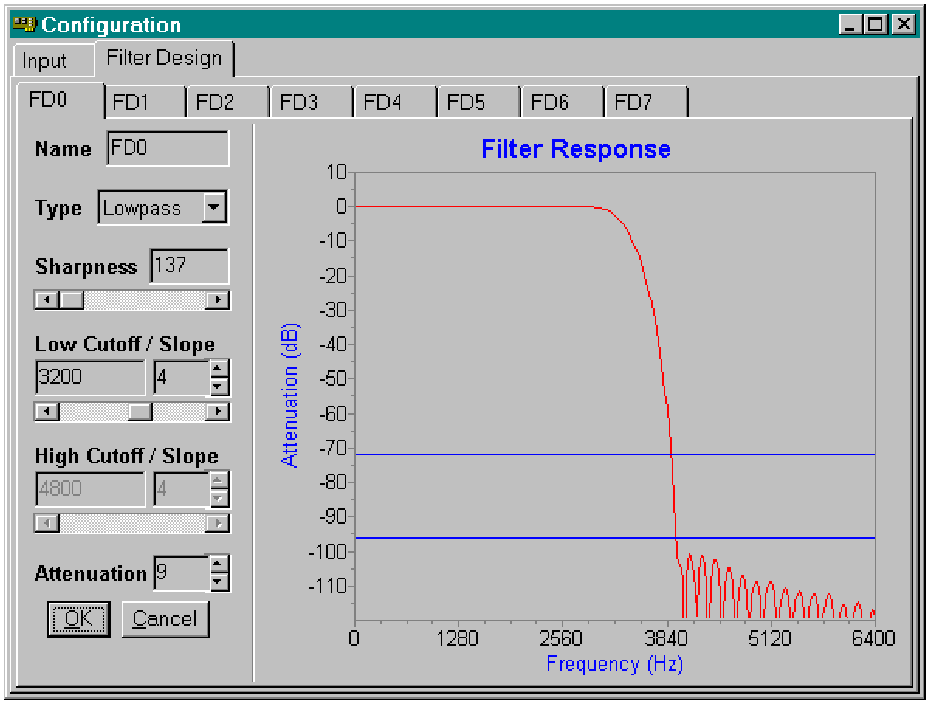
Group Delay: 0.0031588 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

The Filter Design Screen allows easy manipulation of filter parameters like sharpness, low cutoff frequency, low cutoff slope, high cutoff frequency, high cutoff slope, and attenuation, either by entering a valid number or by adjusting a slider. When the user selects the right click button, there are several more options like `Crosshair Track`, `Y Display` (linear, linear zoom, log, log zoom, and unit step), `Defaults Load`, `Copy`, and `Paste`. The `Copy` (`Ctrl-C`) and `Paste` (`Ctrl-V`) feature copies the filter parameters from one filter design tab to another.

The figure below displays the Filter Design Screen.



Name: FD0

Type: Lowpass

Sharpness: 137

Low Cutoff / Slope: 3200 / 4

High Cutoff / Slope: 4800 / 4

Attenuation: 9

A user can also design filters using the run-time design techniques available. These include `FilterParametersGet` and `FilterParametersSet`.

The Input Screen, Filter Design Screen, timing channels selection, and individual filter designs can be hidden using `ConfigDialogOptions`.

See Also

`ConfigDialogOptions` property, `FilterParametersGet` method, `FilterParametersSet` method

ConfigDialogShow method

The `ConfigDialogShow` method displays modal dialog screens for graphical configuration of multiple iDSC boards.

Applies To

`TDscGroup`

Declaration

function ConfigDialogShow: integer;

Return Values

If the user selects the OK button, the return value is IDOK (of value 1). If the user selects the Cancel button, the return value is IDCANCEL (of value 2).

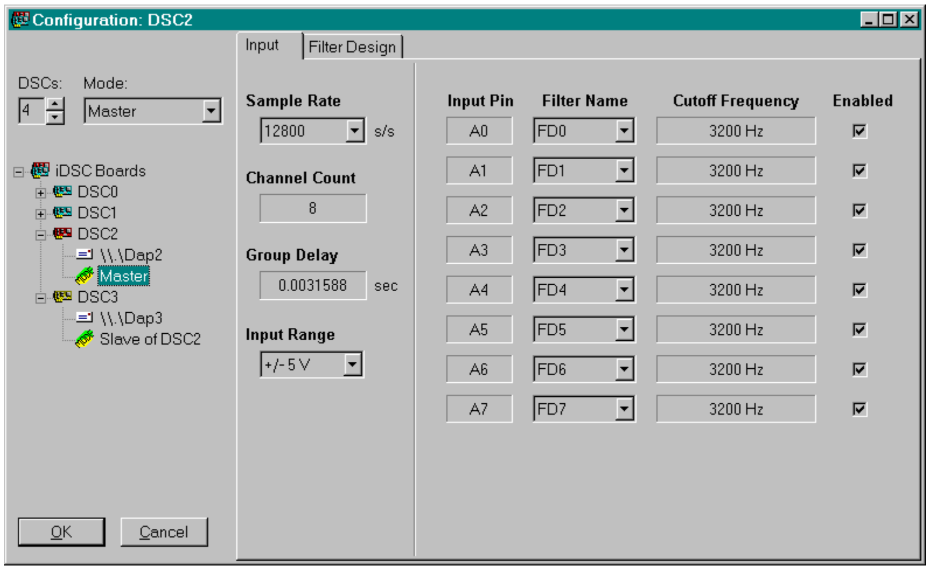
Remarks

`ConfigDialogShow` simplifies the configuration of multiple iDSC boards with a graphical interface. When the user expands the iDSC Boards tree, there are options for changing the `Address` and `Mode`. When the user selects the DSC name with the right click button, there are several more options like `External Board Calibrate`, `External Board Enable`, `Raw Data`, `Remote Master`, `Server Disk Log`, and `Copy` and `Paste`. The `Copy` and `Paste` feature allows the user to copy the entire configuration of an iDSC board to another iDSC board.

For each iDSC board, the Input Screen provides a quick method for selecting the sample rate, selecting the input range, mapping the input pins to selected filter designs, and enabling or disabling the input pins.

The Filter Design Screen allows easy manipulation of filter parameters like sharpness, low cutoff frequency, low cutoff slope, high cutoff frequency, high cutoff slope, and attenuation, either by entering a valid number or by adjusting a slider. When the user selects the right click button, there are several more options like `Crosshair Track`, `Y Display` (linear, linear zoom, log, log zoom, and unit step), `Defaults Load`, `Copy`, and `Paste`. The `Copy` (`Ctrl-C`) and `Paste` (`Ctrl-V`) feature copies the filter parameters from one filter design tab to another.

The figure below displays the configuration of a group of four iDSC boards. DSC0 and DSC1 are configured as Independent, while DSC2 is the Master of DSC3.



Configuration: DSC2

DSCs: 4 Mode: Master

- iDSC Boards
  - DSC0
  - DSC1
  - DSC2
    - \\.\Dap2
    - Master
  - DSC3
    - \\.\Dap3
    - Slave of DSC2

Input | Filter Design

Sample Rate: 12800 s/s

Channel Count: 8

Group Delay: 0.0031588 sec

Input Range: +/- 5 V

Input Pin	Filter Name	Cutoff Frequency	Enabled
A0	FD0	3200 Hz	✓
A1	FD1	3200 Hz	✓
A2	FD2	3200 Hz	✓
A3	FD3	3200 Hz	✓
A4	FD4	3200 Hz	✓
A5	FD5	3200 Hz	✓
A6	FD6	3200 Hz	✓
A7	FD7	3200 Hz	✓

See Also

`AddOne` method, `DeleteOne` method

Count property

The `Count` property returns the number of iDSCs in the iDSC group.

Applies To

`TDscGroup`

Declaration

property Count: integer;

Access Restrictions

Read only; Run time only

Remarks

`Count` returns the number of iDSCs in the iDSC group. `Count` increases by one when `AddOne` is invoked and decreases by one when `DeleteOne` is invoked. The maximum number of iDSCs in the iDSC group is 64.

See Also

`AddOne` method, `DeleteOne` method

CutoffFreqHigh property

The `CutoffFreqHigh` property is an array property that specifies the high cutoff frequency of the filter.

Applies To

`TFilterDesign`

Declaration

property CutoffFreqHigh[*iFilterIndex*: integer]: single;

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

Three-quarters the Nyquist frequency

Access Restrictions

Run time only

Remarks

`CutoffFreqHigh` determines the ideal high cutoff response which the filter is designed to approximate. It is specified in Hertz. Valid numbers are in the range 2% to 80% of the Nyquist frequency (0.02 * Nyquist frequency to 0.8 * Nyquist frequency). The Nyquist frequency is half the sample rate.

Valid filter indices are 0 through 7. If the filter index is not valid, the exception ‘Filter index is out of range’ is raised.

`CutoffFreqHigh` is a `TFilterDesign` property.

See Also

`CutoffFreqLow` property, `ConfigDialogShow` method

CutoffFreqLow property

The `CutoffFreqLow` property is an array property that specifies the low cutoff frequency of the filter.

Applies To

`TFilterDesign`

Declaration

property CutoffFreqLow[*iFilterIndex*: integer]: single;

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

Half the Nyquist frequency

Access Restrictions

Run time only

Remarks

`CutoffFreqLow` determines the ideal low cutoff response which the filter is designed to approximate. It is specified in Hertz. Valid numbers are in the range 2% to 80% of the Nyquist frequency (0.02 * Nyquist frequency to 0.8 * Nyquist frequency). The Nyquist frequency is half the sample rate.

Valid filter indices are 0 through 7. If the filter index is not valid, the exception 'Filter index is out of range' is raised.

`CutoffFreqLow` is a `TFilterDesign` property.

See Also

`CutoffFreqHigh` property, `ConfigDialogShow` method

CutoffSlopeHigh property

The `CutoffSlopeHigh` property is an array property that specifies the high cutoff slope of the filter.

Applies To

`TFilterDesign`

Declaration

property CutoffSlopeHigh[*iFilterIndex*: integer]: single;

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

Dependent on SampleRate
153600 s/s, 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, 1024 s/s: 0.0
All others: 0.04

Access Restrictions

Run time only

Remarks

`CutoffSlopeHigh` determines the ideal high cutoff response which the filter is designed to approximate. It is specified as a fraction of the Nyquist frequency, with the Nyquist frequency normalized to 1.0. Valid numbers are in the range 0.0 to 0.8. 0.0 corresponds to 0% of the Nyquist frequency and 0.8 corresponds to 80% of the Nyquist frequency. The Nyquist frequency is half the sample rate.

Valid filter indices are 0 through 7. If the filter index is not valid, the exception ‘Filter index is out of range’ is raised.

`CutoffSlopeHigh` is a `TFilterDesign` property.

See Also

`CutoffSlopeLow` property, `ConfigDialogShow` method

CutoffSlopeLow property

The `CutoffSlopeLow` property is an array property that specifies the low cutoff slope of the filter.

Applies To

`TFilterDesign`

Declaration

property CutoffSlopeLow[*iFilterIndex*: integer]: single;

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

Dependent on SampleRate

153600 s/s, 102400 s/s, 51200 s/s, 10240 s/s, 2048 s/s, 1024 s/s: 0.0

All others: 0.04

Access Restrictions

Run time only

Remarks

`CutoffSlopeLow` determines the ideal low cutoff response which the filter is designed to approximate. It is specified as a fraction of the Nyquist frequency, with the Nyquist frequency normalized to 1.0. Valid numbers are in the range 0.0 to 0.8. 0.0 corresponds to 0% of the Nyquist frequency and 0.8 corresponds to 80% of the Nyquist frequency. The Nyquist frequency is half the sample rate.

Valid filter indices are 0 through 7. If the filter index is not valid, the exception 'Filter index is out of range' is raised.

`CutoffSlopeLow` is a `TFilterDesign` property.

See Also

`CutoffSlopeHigh` property, `ConfigDialogShow` method

DaplText property

The `DaplText` property defines the DAPL text for the iDSC.

Applies To

`TDsc`

Declaration

property DaplText: TStringList;

Access Restrictions

Read only; Run time only

Remarks

`DaplText` allows the user to define custom DAPL text for the iDSC. Each line of DAPL text must be delimited by a carriage-return, line-feed, or both.

The DAPL text is sent to the iDSC when the user invokes `CommandsLoad` or `StartAcquiring`.

See Also

`CommandsLoad` method, `StartAcquiring` method

DeleteOne method

The `DeleteOne` method deletes one iDSC from the iDSC group.

Applies To

`TDscGroup`

Declaration

function DeleteOne: integer;

Return Values

The return value is the last index of the remaining iDSCs or `Count` - 1.

Remarks

`DeleteOne` deletes one iDSC from the iDSC group and returns the last index of the remaining iDSCs. The index of the iDSC is the `Count` minus one. The maximum number of iDSCs in the iDSC group is 64 which means that the maximum index is 63. When `DeleteOne` is invoked, the `Count` decreases by one.

As an example, `DeleteOne` returns 3. Therefore, the last index of the remaining iDSCs is 3 and the `Count` is 4.

See Also

`AddOne` method, `Count` property, `ConfigDialogShow` method

Dsc property

The `Dsc` property is an array property that allows access to a specific iDSC board.

Applies To

`TDscGroup`

Declaration

property Dsc[i: integer]: TDsc;

Parameters

i

iDSC board index of interest. Valid iDSC board indices are 0 through `Count` - 1.

Access Restrictions

Read only; Run time only

Remarks

`Dsc` allows access to a specific iDSC board using the iDSC board index. Valid iDSC board indices are 0 through `Count` - 1.

The `Dsc` property should not be stored because it is destroyed and recreated in methods like `ConfigDialogShow`, `DeleteOne`, `AddOne`, etc. The `Dsc` property should be called repeatedly to access a specific iDSC board.

`Dsc` is of type `TDsc`.

See Also

`ConfigDialogShow` method, `Count` property, `TDsc` object

ExternalBoard property

The `ExternalBoard` property allows access to the external board configuration through the `TExternalBoard` object.

Applies To

`TDsc`

Declaration

property ExternalBoard: TExternalBoard;

Access Restrictions

Read only; Run time only

Remarks

`ExternalBoard` provides access to the external board properties like `InputOffset`, `InputOffsetRange`, `InputRange`, `InputType`, and `OutputExcitation`.

It also provides access to the external board methods like `XbPinConfigGet` and `XbPinConfigSet`. If `ExternalBoard` is not addressed, these properties and methods are inaccessible.

See Also

`TExternalBoard` object

FileFlagsAttributes property

The `FileFlagsAttributes` property specifies the file attributes.

Applies To

`TServerDiskLog`

Declaration

```
property FileFlagsAttributes: TFileFlagsAttributes;

TFileFlagsAttributes = set of TFileFlagsAttributesEnum;

TFileFlagsAttributesEnum = (
   ffaAttributeNormal,
   ffaAttributeEncrypted,
   ffaFlagWriteThrough,
   ffaFlagSequentialScan
   );
```

Default

[ffaAttributeNormal]

Access Restrictions

None

Remarks

`FileFlagsAttributes` specifies the file attributes of the disk log file. It is of type `TFileFlagsAttributes`, which is a set of `TFileFlagsAttributesEnum`. `FileFlagsAttributes` can be manipulated using the **set** operators.

`FileFlagsAttributes` specifies one or more of the following options.

ffaAttributeNormal	No special attributes.
ffaAttributeEncrypted	The data in the file is encrypted.
ffaFlagWriteThrough	Write through any intermediate caching and go directly to disk.
ffaFlagSequentialScan	Can be used to optimize the transfer of large blocks of data. Most applications will not need this flag.

See Also

`ServerDiskLog` property, `TServerDiskLog` object

FileName property

The `FileName` property specifies the file name.

Applies To

`TServerDiskLog`

Declaration

property FileName: string;

Default

Empty string

Access Restrictions

None

Remarks

`FileName` specifies the name of the primary disk log file and the name of a possible mirror disk log file, if mirror logging is enabled. The default is an empty string.

Mirror logging is enabled by selecting the *`dlfMirrorLog`* flag of the `Flags` property. Multiple file names are separated by semi-colons. Currently, only one mirror file is allowed. Both files must be on the same side of the DAPcell Local/DAPcell service (the PC application side or the iDSC side).

See Also

`ServerDiskLog` property, `TServerDiskLog` object

FileShareMode property

The `FileShareMode` property specifies the file share properties.

Applies To

`TServerDiskLog`

Declaration

property FileShareMode: TFileShareMode;

TFileShareMode = **set of** TFileShareModeEnum;

TFileShareModeEnum = (
  fsmNone,
  fsmRead,
  fsmWrite,
  fsmReadWrite
  );

Default

[fsmRead]

Access Restrictions

None

Remarks

`FileShareMode` specifies the file share mode of the disk log file. It is of type `TFileShareMode`, which is a set of `TFileShareModeEnum`. `FileShareMode` can be manipulated using the **set** operators.

`FileShareMode` specifies one or more of the following options.

`fsmNone`	The file cannot be used by another process.
`fsmRead`	The file can be read by another process.
`fsmWrite`	The file can be written to by another process.
`fsmReadWrite`	The file can be read and written to by another process.

See Also

`ServerDiskLog` property, `TServerDiskLog` object

FilterDesign property

The `FilterDesign` property specifies the currently active filter design through the `TFilterDesign` object.

Applies To

`TDsc`

Declaration

property FilterDesign: TFilterDesign;

Access Restrictions

Read only; Run time only

Remarks

`FilterDesign` provides access to the filter design properties like `Attenuation`, `CutoffFreqHigh`, `CutoffFreqLow`, `CutoffSlopeHigh`, `CutoffSlopeLow`, `FilterName`, `FilterType`, `PinToFilterMap`, and `Sharpness`.

It also provides access to the filter design methods like `FilterIndex`, `FilterParametersGet`, `FilterParametersSet`, `TransferFunctionGet`, `UnitStepGet`, and .`UnitStepLengthGet`. If `FilterDesign` is not addressed, these properties and methods are inaccessible.

See Also

`TFilterDesign` object

FilterIndex method

The `FilterIndex` method returns the filter index given a filter name.

Applies To

`TFilterDesign`

Declaration

```
function FilterIndex(
    sFilterName: string                 // Filter name.
    ): integer;
```

Parameters

sFilterName

Filter name string.

Return Values

If the function succeeds, the return value is the filter index. If the function fails, the return value is -1. For example, if *sFilterName* is an invalid name, failure occurs.

If the filter name of interest is associated with filter index 0, the return value is 0.

Remarks

`FilterIndex` determines the filter index associated with a particular filter name. Since there are a maximum of eight filter designs, valid filter indices are 0 through 7.

The filter index is useful in methods like `FilterParametersGet` and `FilterParametersSet`.

`FilterIndex` is a `TFilterDesign` method.

See Also

`FilterParametersGet` method, `FilterParametersSet` method, `TFilterDesign` object

FilterName property

The `FilterName` property is an array property that specifies the filter name associated with a filter index.

Applies To

`TFilterDesign`

Declaration

property FilterName[*`iFilterIndex`*: integer]: string;

Parameters

`iFilterIndex`

Filter index of interest. Valid filter indices are 0 through 7.

Default

`FD0`, `FD1`, `FD2`, `FD3`, `FD4`, `FD5`, `FD6`, `FD7`

Access Restrictions

Run time only

Remarks

`FilterName` allows the user to specify a unique filter name for an associated filter index. If an already existing filter name is assigned, the existing filter name will not change. The filter name is restricted to 63 characters.

Valid filter indices are 0 through 7. If a filter index is invalid, the exception 'Filter index is out of range' is raised.

`FilterName` is a `TFilterDesign` property.

See Also

`ConfigDialogShow` method

FilterParametersGet method

The `FilterParametersGet` method gets the filter parameters associated with a filter index. The filter parameters include the name, type, sharpness, cutoff frequency, cutoff slope, and attenuation.

Applies To

`TFilterDesign`

Declaration

```
procedure FilterParametersGet(
    iFilterIndex: integer;              // Filter index.
    var pFilterParam: TFilterParam      // Information record.
    );
```

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

pFilterParam

A `TFilterParam` record that receives the filter parameters. `TFilterParam` must be initialized using `StructPrepare`.

Remarks

`FilterParametersGet` returns the filter parameters for an associated filter index in the `TFilterParam` record. `TFilterParam` must be initialized using `StructPrepare` before invoking `FilterParametersGet` or the method will fail.

Valid filter indices are 0 through 7. If the filter index is invalid, the exception 'Filter index is out of range' is raised.

`FilterParametersGet` is a `TFilterDesign` method.

See Also

`ConfigDialogShow` method, `FilterParametersSet` method, `TFilterParam` type

FilterParametersSet method

The `FilterParametersSet` method sets the filter parameters associated with a filter index. The filter parameters include the name, type, sharpness, cutoff frequency, cutoff slope, and attenuation.

Applies To

`TFilterDesign`

Declaration

```
procedure FilterParametersSet(
    iFilterIndex: integer;                  // Filter index.
    const pFilterParam: TFilterParam        // Information record.
    );
```

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

pFilterParam

A `TFilterParam` record that passes the filter parameters. `TFilterParam` must be initialized using `StructPrepare`.

Remarks

`FilterParametersSet` modifies the filter parameters for an associated filter index. All members of `TFilterParam` must be set before invoking `FilterParametersSet`.

`TFilterParam` must be initialized using `StructPrepare` before invoking `FilterParametersSet`or the method will fail. The *achName*, *iFilterType*, *iSharpness*, *fCutoffFreqLow*, *fCutoffSlopeLow*, *fCutoffFreqHigh*, *FCutoffSlopeHigh*, and *fAttenuation* members of `TFilterParam` must be set to the new desired values. Note that the filter parameters can be graphically set in `ConfigDialogShow`.

Valid filter indices are 0 through 7. If the filter index is invalid, the exception 'Filter index is out of range' is raised.

`FilterParametersSet` is a `TFilterDesign` method.

See Also

`ConfigDialogShow` method, `FilterParametersGet` method, `TFilterParam` type

FilterType property

The `FilterType` property is an array property that specifies the filter type associated with a filter index.

Applies To

`TFilterDesign`

Declaration

```
property FilterType[iFilterIndex: integer]: TFilterType;

TFilterType = (
   fLowPass,                              // Lowpass filter.
   fBandPass                              // Bandpass filter.
   );
```

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

fLowPass

Access Restrictions

Run time only

Remarks

`FilterType` allows the user to specify the filter type for an associated filter index. The filter type is *fLowPass* for a lowpass filter and *fBandPass* for a bandpass filter.

Valid filter indices are 0 through 7. If a filter index is invalid, the exception ‘Filter index is out of range’ is raised.

`FilterType` is a `TFilterDesign` property.

See Also

`ConfigDialogShow` method

Flags property

The `Flags` property controls the disk logging behavior.

Applies To

`TServerDiskLog`

Declaration

property Flags: TDiskLogFlags;

TDiskLogFlags = **set of** TDiskLogFlagsEnum;

TDiskLogFlagsEnum = (
  dlfServerSide,
  dlfFlushBefore,
  dlfFlushAfter,
  dlfMirrorLog,
  dlfAppendData,
  dlfBlockTransfer
  );

Default

[dlfServerSide, dlfFlushBefore]

Access Restrictions

None

Remarks

`Flags` controls the disk logging behavior. It is of type `TDiskLogFlags`, which is a set of `TDiskLogFlagsEnum`. `Flags` can be manipulated using the **set** operators.

`Flags` specifies one or more of the following options.

dlfServerSide
: Log on the same side of the network connection as the iDSC. If not specified, logging will take place on the application (client) side of the network connection.

dlfFlushBefore
: Flush the input data pipe before beginning the logging session. Default action is to not flush the pipes before logging.

dlfFlushAfter
: Flush the input pipe after the logging session has terminated. Default action is to not flush the pipes after logging.

dlfMirrorLog
: Enable mirror logging. Mirror logging creates a copy of the logged data in another file.

dlfAppendData
: Allow new data to be appended to an existing file. Only the *ofOpenAlways* and *ofOpenExisting* flags of the `OpenFlags` member can be used for appending.

dlfBlockTransfer
: Open the file with no intermediate buffering or caching and access the file in a special way that is highly dependent on the target disk attributes to improve performance. This transfer mode adds overhead to slow rate transfer with small buffers. It should only be used when necessary with a very large `BlockSize` value (such as 1048576 and above). If this option is selected, `BlockSize` is automatically set to 1048576.

See Also

`ServerDiskLog` property, `OpenFlags` property, `BlockSize` property, `TServerDiskLog` object

GroupDelay property

The `GroupDelay` property returns the group delay in seconds for all of the filter designs.

Applies To

`TDsc`

Declaration

property GroupDelay: single;

Default

Dependent on sample rate

Access Restrictions

Read only, Run time only

Remarks

`GroupDelay` informs a user of the group delay (in seconds) through all the filter designs. The group delay is the amount of time to wait before data start showing up at the PC, and does not include the filter designs of disabled input pins.

If the iDSC board configuration or filter designs change and `StartAcquiring` is selected, `StartAcquiring` automatically invokes `CommandsLoad` and downloads new commands to the iDSC board. Data will show up at the PC two times `GroupDelay` seconds later.

If the iDSC board configuration or filter designs change and `CommandsLoad` is selected before `StartAcquiring`, data will show up immediately at the PC. Data that show up immediately are actually data that were sampled `GroupDelay` seconds ago.

See Also

`Calibrate` method, `CommandsLoad` method, `StartAcquiring` method

HardwareStop method

The `HardwareStop` method stops the hardware on the iDSC board.

Applies To

`TDsc`

Declaration

procedure HardwareStop;

Remarks

`HardwareStop` stops and resets the hardware on the iDSC board.

See Also

`Running` property

InputOffset property

The `InputOffset` property is an array property that configures the input offset voltage on the external board.

Applies To

`TExternalBoard`

Declaration

property InputOffset[*iPinIndex*: integer]: single;

Parameters

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

Default

0.0

Access Restrictions

Run time only

Remarks

`InputOffset` specifies the input offset voltage on the external board. The input offset of the signal is specified in Volts. The input offset must be within the range of the input offset range. If you specify an invalid input offset, the input offset will not change from its previous setting. The default is 0.0.

Valid pin indices are 0 through 7. If the pin index is not valid, the exception 'Pin index is out of range' is raised.

`InputOffset` is a `TExternalBoard` property.

See Also

`TXbPinConfig` type

InputOffsetRange property

The `InputOffsetRange` property is an array property that configures the input offset range voltage on the external board.

Applies To

`TExternalBoard`

Declaration

property InputOffsetRange[*iPinIndex*: integer]: single;

Parameters

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

Default

Dependent of the input range

Access Restrictions

Read only; Run time only

Remarks

`InputOffsetRange` specifies the input offset range voltage on the external board. The input offset range of the signal is specified in Volts. The input offset range is determined by the input range. For example, if the input range is 0.5 then the input offset range is 2.5 for +/-2.5 V, if the input range is 2.0 then the input offset range is 1.0 for +/- 1V. This is a read only property that is dependent on the input range and you cannot specify it.

Valid input offset ranges are:

0.5	when the input range is 0.01
1.0	when the input range is 0.02
2.5	when the input range is 0.05
0.5	when the input range is 0.1
1.0	when the input range is 0.2
2.5	when the input range is 0.5
1.0	when the input range is 1.0

1.0	when the input range is 2.0
5.0	when the input range is 5.0
5.0	when the input range is 10.0

Valid pin indices are 0 through 7. If the pin index is not valid, the exception ‘Pin index is out of range’ is raised.

`InputOffsetRange` is a `TExternalBoard` property.

See Also

`TXbPinConfig` type

InputRange property

The `InputRange` property configures the input range voltage on the iDSC board.

Applies To

`TDsc`

Declaration

property InputRange: integer;

Default

5000

Access Restrictions

None

Remarks

`InputRange` configures the input range voltage on the iDSC board. A user can select either +/- 5 Volts or +/- 10 Volts.

To use this property the voltages must be specified as absolute values in millivolts. For example, 5000 represents +/- 5 Volts and 10000 represents +/- 10 Volts.

If the input range is not valid, the exception 'Input range of xxx is invalid' is raised where xxx represents the invalid input range.

See Also

`ConfigDialogShow` method

InputRange property

The `InputRange` property is an array property that configures the input range voltage on the external board.

Applies To

`TExternalBoard`

Declaration

property InputRange[*iPinIndex*: integer]: single;

Parameters

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

Default

10.0

Access Restrictions

Run time only

Remarks

`InputRange` specifies the input range voltage on the external board. The input range of the signal is specified in Volts. For example, if you select 0.5 the input range is +/- 500 mV, if you select 2.0 the input range +/- 2V. If you specify an invalid input range, the input range will not change from its previous setting. The default is 10.0.

Valid input ranges are:

0.01, 0.02, 0.05,
0.1, 0.2, 0.5,
1.0, 2.0, 5.0,
10.0

Valid pin indices are 0 through 7. If the pin index is not valid, the exception 'Pin index is out of range' is raised.

`InputRange` is a `TExternalBoard` property.

See Also

`TXbPinConfig` type

InputType property

The `InputType` property is an array property that configures the input type on the external board.

Applies To

`TExternalBoard`

Declaration

```
property InputType[iPinIndex: integer]: TInputType;

TInputType = (
   itDCCoupling,                          // DC coupling.
   itACCoupling,                          // AC coupling.
   itExcitation,                          // Excitation voltage.
   );
```

Parameters

`iPinIndex`

Pin index of interest. Valid pin indices are 0 through 7.

Default

`itDCCoupling`

Access Restrictions

Run time only

Remarks

`InputType` specifies the input type on the external board. The type of input signal includes DC coupling, AC coupling or excitation.

See Also

`ExternalBoard` property

Master property

The `Master` property specifies the Master iDSC board through the `TDsc` object. It is only useful in a Master/Slave Configuration.

Applies To

`TDsc`

Declaration

property Master: TDsc;

Default

Nil

Access Restrictions

None

Remarks

`Master` allows a user to designate one or more Master iDSC boards on a system. When the Master iDSC boards are designated, the Slave iDSC boards are automatically defined. `Master` will automatically update the operational state of the iDSC board in `OperateMode`.

For example, imagine two iDSC boards on a system, DSC1 and DSC2. To make DSC1 a Master iDSC board and DSC2 a Slave iDSC board, select DSC2 and hook up DSC1 as its `Master`. DSC1 is now a Master and DSC2 is now a Slave. The `OperateMode` for DSC1 is `omMaster` and for DSC2 is `omSlave`.

See Also

`OperateMode` property, `RemoteMaster` property, `TDsc` object

MaxCount property

The `MaxCount` property specifies the file maximum count.

Applies To

`TServerDiskLog`

Declaration

```
property MaxCount: TDscIoInt64;

TDscIoInt64 = packed record                 // For environments that do not
   dwLowPart: DWORD;                        // support 64-bit integers.
   dwHighPart: DWORD;
   end;

TDscIoInt64 = int64;                        // For environments that support
                                            // 64-bit integers.
```

Default

0

Access Restrictions

None

Remarks

`MaxCount` specifies the maximum number of bytes to log. The default is 0, which causes logging to continue indefinitely until `StopAcquiring` is invoked.

See Also

`ServerDiskLog` property, `TServerDiskLog` object

MemoryUsed property

The `MemoryUsed` property displays the used memory on the iDSC board.

Applies To

`TDsc`

Declaration

property MemoryUsed: integer;

Access Restrictions

Read only; Run time only

Remarks

`MemoryUsed` displays the used memory on the iDSC board in tenths of a percent. As an example, if `MemoryUsed` returns 42, it means that 4.2% of memory is used.

`MemoryUsed` is useful in determining whether or not the iDSC board will be able to sustain a particular sample rate without overflowing.

OnAfterNumDscChange event

The `OnAfterNumDscChange` event runs after the number of iDSC boards change.

Applies To

`TDscGroup`

Declaration

property OnAfterNumDscChange: TNotifyEvent;

TNotifyEvent = **procedure** (Sender: TObject) **of object**;

Remarks

`OnAfterNumDscChange` is useful for executing user specific code after the number of iDSC boards change, whether the number increases or decreases. The user can increase the number of iDSCs using `AddOne` and decrease the number of iDSCs using `DeleteOne`.

See Also

`OnBeforeNumDscChange` event, `TDscGroup` type

OnBeforeNumDscChange event

The `OnBeforeNumDscChange` event runs before the number of iDSC boards change.

Applies To

`TDscGroup`

Declaration

property OnBeforeNumDscChange: TNotifyEvent;

TNotifyEvent = **procedure** (Sender: TObject) **of object**;

Remarks

`OnBeforeNumDscChange` is useful for executing user specific code before the number of iDSC boards change, whether the number increases or decreases. The user can increase the number of iDSCs using `AddOne` and decrease the number of iDSCs using `DeleteOne`.

See Also

`OnAfterNumDscChange` event, `TDscGroup` type

OnCalibrateProgress event

The `OnCalibrateProgress` event runs while the `Calibrate` method is executing to inform the user of the progress of calibration.

Applies To

`TDsc`

Declaration

property OnCalibrateProgress: TProcCalibrateProgressEvent;

TProcCalibrateProgressEvent = **procedure** (
    Sender: TObject;
    iProgress: integer
) **of object;**

Remarks

`OnCalibrateProgress` is useful in determining the progress of calibration while the `Calibrate` method is executing. `OnCalibrateProgress` is of type `TProcCalibrateProgressEvent`. The parameter, *iProgress*, specifies the progress of iDSC calibration. The user can use the *iProgress* parameter in a progress bar, status bar, etc. to display the progress of calibration.

The `OnCalibrateProgress` event runs while the `Calibrate` method executes. *iProgress* is measured as a percentage from 0 to 100. A value of 0 means that calibration has not begun. A value of 100 means that calibration is complete.

See Also

`Calibrate` method

OnHardwareDelayChange event

The `OnHardwareDelayChange` event runs if the hardware delay constant changes.

Applies To

`TDsc`

Declaration

property OnHardwareDelayChange: TProcEvent;

TProcEvent = **procedure** (*Sender*: TObject) **of object;**

Remarks

`OnHardwareDelayChange` is useful in determining if the hardware delay constant has changed. The new hardware delay constant can then be displayed correctly.

The `OnHardwareDelayChange` event runs when the iDSC is first initialized, which happens the first time `Calibrate`, `XbCalibrate`, `CommandsLoad`, or `StartAcquiring` is called.

See Also

`StartAcquiring` method

OnInputRangeUpdate event

The `OnInputRangeUpdate` event runs when the input range is updated.

Applies To

`TDsc`

Declaration

```
property OnInputRangeUpdate: TProcInputRangeUpdateEvent;

TProcInputRangeUpdateEvent = procedure (
    Sender: TObject;
    iInputRange: integer
    ) of object;
```

Remarks

`OnInputRangeUpdate` is useful in determining when the input range has changed. The new input range can then be used correctly. `OnInputRangeUpdate` is of type `TProcInputRangeUpdateEvent`. The parameter, *`iInputRange`*, specifies the supported input range of the iDSC.

The `OnInputRangeUpdate` event runs when the user changes the input range using `ConfigDialogShow` or `InputRange`.

Different models of the iDSC support different ranges, so it is advisable to check `InputRange` after setting it. `InputRange` returns the same value as *`iInputRange`*.

See Also

`InputRange` property

OnPinEnabledUpdate event

The `OnPinEnabledUpdate` event runs when the enabled input pins are updated.

Applies To

`TDsc`

Declaration

property OnPinEnabledUpdate: TProcPinEnabledUpdateEvent;

TProcPinEnabledUpdateEvent = **procedure** (
    Sender: TObject;
    NewPins: TInputPins
) **of object;**

Remarks

`OnPinEnabledUpdate` is useful in determining when the enabled input pins have changed. The new enabled input pins can then be used correctly.
`OnPinEnabledUpdate` is of type `TProcPinEnabledUpdateEvent`. The parameter, *NewPins*, specifies the enabled input pins.

The `OnPinEnabledUpdate` event runs when the user enables or disables an input pin using `ConfigDialogShow` or `PinEnabled`.

See Also

`PinEnabled` property

OnSystemError event

The `OnSystemError` event runs when the system encounters a failure.

Applies To

`TDsc`

Declaration

property OnSystemError: TProcSystemErrorEvent;

TProcSystemErrorEvent = **procedure** (
Sender: TObject;
sError: string
) **of object;**

Remarks

`OnSystemError` is useful in determining if the system has encountered a failure since it provides a way to access the errors. `OnSystemError` is of type `TProcSystemErrorEvent`. The parameter, *sError*, displays an error message when a system error occurs. The user can use the *sError* parameter to display the error message in an error handling routine.

The `OnSystemError` event runs when the `SystemErrorProcess` method is invoked. `SystemErrorProcess` is automatically invoked during `BufferGetEx` if there are errors from the iDSC. The user can also call the `SystemErrorProcess` method and invoke the `OnSystemError` event if errors from the iDSC are suspected.

An example of a system error is an input channel pipe overflow when the sample rate of the iDSC board is too high for the PC to keep up.

See Also

`SystemErrorProcess` method

OpenFlags property

The `OpenFlags` property specifies the file open options.

Applies To

`TServerDiskLog`

Declaration

```
property OpenFlags: TOpenFlags;

TOpenFlags = (
   ofCreateNew,
   ofCreateAlways,
   ofOpenAlways,
   ofOpenExisting
   );
```

Default

ofCreateAlways

Access Restrictions

None

Remarks

`OpenFlags` specifies the file open options of the disk log file. It is of type `TOpenFlags`.

`OpenFlags` specifies one of the following options.

ofCreateNew	Create a new file. Creation fails if the file already exists.
ofCreateAlways	Create a new file. If the file already exists, it is overwritten.
ofOpenAlways	Open an existing file. If the file does not exist, it will be created.
ofOpenExisting	Open an existing file without resetting permissions. Opening fails if the file does not exist.

See Also

`ServerDiskLog` property, `TServerDiskLog` object

OperateMode property

The `OperateMode` property specifies the operational mode of the iDSC board. Valid operational modes are Normal, Master, or Slave.

Applies To

`TDsc`

Declaration

```
property OperateMode: TOperateMode;

TOperateMode = (
   omNormal,                       // Normal iDSC board.
   omMaster,                       // Master iDSC board.
   omSlave                         // Slave iDSC board.
   );
```

Default

omNormal

Access Restrictions

None

Remarks

`OperateMode` specifies the operational mode of the iDSC board. It is of type `TOperateMode`. `OperateMode` supports three operational modes: *omNormal*, *omMaster*, and *omSlave*. However, it is only provided to allow the user to select a Normal iDSC board.

`OperateMode` cannot be used to specify Master and Slave iDSC boards. Instead, the `Master` property should be used to set up Master and Slave iDSC boards. `Master` will automatically update `OperateMode` to the correct state of either *omMaster* or *omSlave*.

If the master has to support synchronization across PCs, `RemoteMaster` must be set.

See Also

`Master` property, `RemoteMaster` property

OutputExcitation property

The `OutputExcitation` property is an array property that configures the output excitation voltage on the external board.

Applies To

`TExternalBoard`

Declaration

property OutputExcitation[*iPinIndex*: integer]: single;

Parameters

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

Default

0.0

Access Restrictions

Run time only

Remarks

`OutputExcitation` specifies the output excitation voltage on the external board. The output excitation of the signal is specified in Volts. If you specify an invalid output excitation, the output excitation will not change from its previous setting. The default is 0.0.

Valid output excitation ranges are:

0.0, 1.0, 2.0, 5.0, 10.0

Valid pin indices are 0 through 7. If the pin index is not valid, the exception ‘Pin index is out of range’ is raised.

`OutputExcitation` is a `TExternalBoard` property.

See Also

`TXbPinConfig` type

PinEnabled property

The `PinEnabled` property specifies the set of enabled input pins on the iDSC board.

Applies To

`TDsc`

Declaration

property PinEnabled: TInputPins;

TInputPins = **set of** TInputPin;

TInputPin = (*A0, A1, A2, A3, A4, A5, A6, A7*);

Default

[A0, A1, A2, A3, A4, A5, A6, A7]

Access Restrictions

None

Remarks

`PinEnabled` specifies the enabled input pins. It is of type `TInputPins`, which is a set of `TInputPin`. `PinEnabled` can be manipulated using the **set** operators.

`PinEnabled` is configured from a **set** of eight input pin options *[A0, A1, A2, A3, A4, A5, A6, A7]*. Empty sets *[]* of input pins are not allowed. To find out the number of enabled input pins, use the `PinEnabledCount` property.

See Also

`PinEnabledCount` property

PinEnabledCount property

The `PinEnabledCount` property returns the number of enabled input pins on the iDSC board.

Applies To

`TDsc`

Declaration

property PinEnabledCount: integer;

Default

Eight

Access Restrictions

Read only; Run time only

Remarks

`PinEnabledCount` returns the number of enabled input pins on the iDSC board. It is related to the `PinEnabled` property. Valid values for the enabled input pin count are in the range one to eight.

See Also

`PinEnabled` property

PinToFilterMap property

The PinToFilterMap property is an array property that specifies the mapping of a filter index to an input pin index.

Applies To

TFilterDesign

Declaration

property PinToFilterMap[*iPinIndex*: integer]: integer;

Default

A0 mapped to FD0, A1 mapped to FD1, A2 mapped to FD2, A3 mapped to FD3, A4 mapped to FD4, A5 mapped to FD5, A6 mapped to FD6, A7 mapped to FD7, where A is the input pin, FD is the filter index

Access Restrictions

Run time only

Remarks

PinToFilterMap associates a filter index to a corresponding input pin index. The same filter design may be applied to several input pins.

Valid input pin indices are 0 through 7, which correspond to input pins A0 through A7. Valid filter indices are 0 through 7. If an input pin index is invalid, the exception 'Pin index is out of range' is raised.

PinToFilterMap is a TFilterDesign property.

See Also

ConfigDialogShow method

RemoteMaster property

The `RemoteMaster` property allows synchronization across PCs.

Applies To

`TDsc`

Declaration

property RemoteMaster: boolean;

Default

False

Access Restrictions

Run time only

Remarks

`RemoteMaster` enables the user to synchronize multiple iDSCs across PCs. It only works if the MSXB 045 hardware is present. Please refer to the MSXB 045 hardware manual for more description on the hardware.

See Also

`Master` property, `OperateMode` property

Running property

The `Running` property returns the state of the iDSC board.

Applies To

`TDsc`

Declaration

property Running: boolean;

Default

False

Access Restrictions

Read only, Run time only

Remarks

`Running` specifies whether the iDSC is running. Once `StartAcquiring` is invoked, `Running` will return true. Once `StopAcquiring` is invoked, `Running` will return false.

See Also

`HardwareStop` method, `StartAcquiring` method, `StopAcquiring` method

SampleRate property

The `SampleRate` property specifies the effective sampling rate per channel on the iDSC board.

Applies To

`TDsc`

Declaration

property SampleRate: integer;

Default

12800

Access Restrictions

None

Remarks

`SampleRate` specifies the effective sampling rate in samples per second per channel. The table below displays the valid sample rates arranged in octaves. There are two effective sampling rates in the highest octave.

			153600		
102400			76800		
51200			38400		
25600			19200		15360
12800		10240	9600		7680
6400		5120	4800		3840
3200	3072	2560	2400	2048	1920
1600	1536	1280	1200	1024	960
800	768	640	600	512	480
400	384	320	300	256	240
200	192	160	150	128	120
100	96	80	75	64	60
50	48	40		32	30
25	24	20		16	15

12 10 8

If an invalid sample rate is selected, the property will automatically select the closest larger sample rate.

When the user changes the SampleRate, the Sharpness, CutoffSlopeLow, and Attenuation properties of TFilterDesign will resort to their defaults. Only CutoffFreqLow will retain its previously set value if the set value is valid. If the previously set value of CutoffFreqLow is out of range, then CutoffFreqLow will also resort to its default.

See Also

ConfigDialogShow method

ScansDiscarded property

The `ScansDiscarded` property returns the number of scans thrown away since `CommandsLoad`.

Applies To

`TDsc`

Declaration

property ScansDiscarded: TDoubleLong;

Access Restrictions

Read only; Run time only

Remarks

`ScansDiscarded` is useful in determining the number of scans discarded since `CommandsLoad`. This information is useful in calculating timing delays.

A scan is a set of enabled input pins. For example, if there are five enabled input pins, a scan consists of five samples, if there are two enabled input pins, a scan consists of two samples.

See Also

`CommandsLoad` method

ServerDiskLog property

The `ServerDiskLog` property allows access to the server disk log configuration through the `TServerDiskLog` object.

Applies To

`TDsc`

Declaration

property ServerDiskLog: TServerDiskLog;

Access Restrictions

Read only

Remarks

`ServerDiskLog` provides access to the server disk log configuration properties like `BlockSize`, `FileFlagsAttributes`, `FileName`, `FileShareMode`, `Flags`, `MaxCount`, and `OpenFlags`.

It also provides access to the server disk log configuration methods like `ServerDiskLogConfigGet` and `ServerDiskLogConfigSet`. If `ServerDiskLog` is not addressed, these properties and methods are inacccessible.

See Also

`TServerDiskLog` object, `ServerDiskLogEnabled` property

ServerDiskLogBytes property

The `ServerDiskLogBytes` property returns the number of bytes logged to disk by the server.

Applies To

`TDsc`

Declaration

property ServerDiskLogBytes: TDscIoInt64;

Access Restrictions

Read only, Run time only

Remarks

`ServerDiskLogBytes` returns the number of bytes logged to disk by the server. It is a `TDscIoInt64` type. It should be called after `StartAcquiring` is invoked if `ServerDiskLogEnabled` is true. `ServerDiskLogBytes` will return 0 if no data has been logged to disk.

See Also

`ServerDiskLog` property, `ServerDiskLogEnabled` property

ServerDiskLogConfigGet method

The `ServerDiskLogConfigGet` method gets the server disk log configuration through `TServerDiskLogConfig`.

Applies To

`TServerDiskLog`

Declaration

```
procedure ServerDiskLogConfigGet(
    var pServerDiskLogConfig: TServerDiskLogConfig    // Information record.
    );
```

Parameters

pServerDiskLog

A `TServerDiskLogConfig` record that receives the server disk log configuration. `TServerDiskLogConfig` must be initialized using `StructPrepare`.

Remarks

`ServerDiskLogConfigGet` returns the server disk log configuration in the `TServerDiskLogConfig` record. `TServerDiskLogConfig` must be initialized using `StructPrepare` before invoking `ServerDiskLogConfigGet` or the function will fail.

The *pszFileName* field of `TServerDiskLogConfig` must be initialized to point to the user allocated buffer. The size of the user allocated buffer must be specified using the *dwFileNameSize* field. It must include an extra space for the null terminator.

If *dwFileNameSize* is 0, the file name is not returned in *pszFileName*. If *dwFileNameSize* is 1, only the null terminator is returned in *pszFileName*.

See Also

`ServerDiskLogConfigSet` method, `ServerDiskLogEnabled` property, `TServerDiskLogConfig` type

ServerDiskLogConfigSet method

The `ServerDiskLogConfigSet` method sets the server disk log configuration through `TServerDiskLogConfig`.

Applies To

`TServerDiskLog`

Declaration

```
procedure ServerDiskLogConfigSet(
   const pServerDiskLogConfig: TServerDiskLogConfig  // Information record.
   );
```

Parameters

pServerDiskLogConfig

A `TServerDiskLogConfig` record that passes the server disk log configuration. `TServerDiskLogConfig` must be initialized using `StructPrepare`.

Remarks

`ServerDiskLogConfigSet` modifies the server disk log configuration through the `TServerDiskLogConfig` record. `TServerDiskLogConfig` must be initialized using `StructPrepare` before invoking `ServerDiskLogConfigSet` or the function will fail.

The *pszFileName* field of `TServerDiskLogConfig` must be initialized to point to the user allocated and initialized buffer. The *dwFileNameSize* field is not used.

It is recommended that the user invokes `ServerDiskLogConfigGet` to get the server disk log configuration defaults, updates the pertinent fields, and then invokes `ServerDiskLogConfigSet` to set the new desired values.

The DAPcell Local or DAPcell server will start a disk logging session when `StartAcquiring` is invoked only if the following has been done:

1) Under Windows Control Panel | Data Acquisition Processor | Disk I/O tab | Disk Logging:

- Set the `Default Path` to a valid path (or valid paths) on the server PC
- Set the `Permission` to *Restricted* or *Normal*
- Select the `Save` button before closing the dialog, or changes will be lost

For more information on `Default Path` and `Permission`, refer to the `DAP Service` documentation by selecting the `Help` button, or going to the main documentation reference on the DAPtools CD.

2) Set a valid filename for *`pszFileName`* of `TServerDiskLogConfig`.

3) Enable `ServerDiskLogEnabled`.

The disk logging session will end when `StopAcquiring` is invoked.

The Accel32 server does not support server disk logging sessions.

See Also

`ServerDiskLogConfigGet` method, `ServerDiskLogEnabled` property, `TServerDiskLogConfig` type

ServerDiskLogEnabled property

The `ServerDiskLogEnabled` property enables or disables the state of the server disk log option.

Applies To

`TDsc`

Declaration

property ServerDiskLogEnabled: boolean;

Default

False

Access Restrictions

None

Remarks

`ServerDiskLogEnabled` allows enabling or disabling the state of the server disk log option. If `ServerDiskLogEnabled` is true, the server will log data to disk when `StartAcquiring` is invoked. If `ServerDiskLogEnabled` is false, the server will not log any data to disk when `StartAcquiring` is invoked.

See Also

`ServerDiskLog` property, `ServerDiskLogBytes` property

Sharpness property

The `Sharpness` property is an array property that specifies the sharpness of the filter.

Applies To

`TFilterDesign`

Declaration

property Sharpness[*iFilterIndex*: integer]: integer;

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

Default

Dependent on SampleRate
153600 s/s: 37
102400 s/s: 119
76800 s/s: 95
51200 s/s, 10240 s/s, 2048 s/s, 1024 s/s: 195
All others: 137

Access Restrictions

Run time only

Remarks

`Sharpness` specifies the sharpness of the corner frequency response. It is specified as an odd number. Valid numbers are in the range 37 to 255, depending on the sample rate.

Valid filter indices are 0 through 7. If the filter index is not valid, the exception ‘Filter index is out of range’ is raised.

`Sharpness` is a `TFilterDesign` property.

See Also

`ConfigDialogShow` method, `UnitStepLengthGet` method, `UnitStepGet` method

SlaveCount property

The `SlaveCount` property returns the number of slaves attached to a Master iDSC board. It is only useful in a Master/Slave Configuration.

Applies To

`TDsc`

Declaration

property SlaveCount: integer;

Default

N/A

Access Restrictions

Read only

Remarks

`SlaveCount` only applies to a Master iDSC board. It is zero for a Normal iDSC board or Slave iDSC board.

See Also

`Master` property

SlaveName method

The `SlaveName` method returns the name of a Slave iDSC board that is attached to a Master iDSC board, given a slave index. It is only useful in a Master/Slave Configuration.

Applies To

`TDsc`

Declaration

```
function SlaveName(
    iSlaveIndex: integer                    // Slave index.
    ): string
```

Parameters

`iSlaveIndex`

Slave index of interest. Valid slave indices are from 0 through `SlaveCount` - 1.

Return Values

If the function succeeds, the return value is the slave name for the given slave index. If the function fails, the return value is an error message string.

Remarks

`SlaveName` should only be called on a Master iDSC board. When passed in a valid slave index, it returns the corresponding slave name connected to the Master iDSC board.

Valid slave indices are from 0 through `SlaveCount` - 1. To get the names of all slaves attached to a Master iDSC board, the user could use a for loop that goes from 0 to `SlaveCount` - 1.

The method will return an error message string if `SlaveName` is invoked on a Slave or Normal iDSC board or if the user passes an invalid slave index to `SlaveName`.

See Also

`Master` property

StartAcquiring method

The `StartAcquiring` method starts the data acquiring process. Data will start showing up at the PC.

Applies To

`TDsc`

Declaration

procedure StartAcquiring;

Remarks

`StartAcquiring` starts the sampling process, which causes data to start showing up at the PC. `StartAcquiring` will force a `Calibrate` if it cannot find the saved calibration values, and a `CommandsLoad` if the iDSC board configuration or filter designs have changed. If the iDSC board configuration or filter designs have changed, the user may see a delay of two times `GroupDelay` seconds.

Once `StartAcquiring` is invoked, the user can use `BufferGetEx` to read blocks of data into buffers.

See Also

`BufferGetEx` method, `Calibrate` method, `CommandsLoad` method

StopAcquiring method

The `StopAcquiring` method stops the data acquiring process. Data will stop showing up at the PC.

Applies To

`TDsc`

Declaration

procedure StopAcquiring;

Remarks

`StopAcquiring` stops the sampling process. It is called after `StartAcquiring` to stop data from showing up at the PC.

See Also

`StartAcquiring` method

StructPrepare method

The `StructPrepare` method prepares structures for use with methods.

Applies To

`TDsc`

Declaration

```
procedure StructPrepare(
  var Struct;                        // Structure to initialize.
  ulSize: Cardinal                   // Size of structure.
  );
```

Parameters

`Struct`

Structure to initialize.

`ulSize`

Size of structure.

Remarks

`StructPrepare` initializes the *`iInfoSize`* field and zeroes out all other fields of structures. It should be used with structures that have an *`iInfoSize`* field before the other fields of the structures are initialized. Since `StructPrepare` initializes the *`iInfoSize`* field, there is no need to initialize it separately.

See Also

`TBufferGetEx` type, `TFilterParam` type, `TServerDiskLogConfig` type, `TXbPinConfig` type

SystemErrorProcess method

The `SystemErrorProcess` method processes error messages from the iDSC.

Applies To

`TDsc`

Declaration

procedure SystemErrorProcess;

Remarks

`SystemErrorProcess` processes error messages from the iDSC if they exist, and then invokes the `OnSystemError` event. `SystemErrorProcess` is automatically invoked during the `BufferGetEx` method. The user can also call the `SystemErrorProcess` method and invoke the `OnSystemError` event if errors from the iDSC are suspected.

See Also

`OnSystemError` event

TcEnabled property

The `TcEnabled` property specifies the set of enabled timing channels on the iDSC board.

Applies To

`TDsc`

Declaration

```
property TcEnabled: TTimingChannels;

TTimingChannels = set of TTimingChannel;

TTimingChannel = (
   Tc0,                                   // Timing Channel 0.
   Tc1,                                   // Timing Channel 1.
   TcWidth32                              // 32-bit width.
   );
```

Default

[]

Access Restrictions

Run time only

Remarks

`TcEnabled` specifies the enabled timing channels. It is of type `TTimingChannels`, which is a set of `TTimingChannel`. `TcEnabled` can be manipulated using the **set** operators.

`TcEnabled` is configured from a **set** of three timing channel options *[Tc0, Tc1, TcWidth32]*. To find out the number of enabled timing channels, use the `TcEnabledCount` property.

Tc0 enables Timing Channel 0 and *Tc1* enables Timing Channel 1. *TcWidth32* forces the timing channel width to be 4 bytes (32-bits) regardless of the sample rate. If *TcWidth32* is not enabled, the timing channel width can be either 2 bytes or 4 bytes depending on the sample rate. To find out the actual timing channel width, use the `TcWidth` property.

See Also

`TcEnabledCount` property, `TcMaximum` property, `TcWidth` property

TcEnabledCount property

The `TcEnabledCount` property returns the number of enabled timing channels on the iDSC board.

Applies To

`TDsc`

Declaration

property TcEnabledCount: integer;

Default

Zero

Access Restrictions

Read only; Run time only

Remarks

`TcEnabledCount` returns the number of enabled timing channels on the iDSC board. It is related to the `TcEnabled` property. Valid values for the enabled timing channel count are in the range zero to two.

See Also

`TcEnabled` property

TcMaximum property

The `TcMaximum` property specifies the maximum timing channel value based on the sample rate.

Applies To

`TDsc`

Declaration

property TcMaximum: integer;

Default

Dependent on sample rate

Access Restrictions

Read only; Run time only

Remarks

`TcMaximum` specifies the maximum timing channel value which is dependent on the sample rate. `TcMaximum` can range from 128 to 2457600. The wide range of `TcMaximum` forces `TcWidth` to be either 2 bytes or 4 bytes.

See Also

`TcEnabled` property, `TcWidth` property

TcWidth property

The `TcWidth` property specifies the width, in bytes, of timing channel values.

Applies To

`TDsc`

Declaration

property TcWidth: integer;

Default

Dependent on sample rate

Access Restrictions

Read only; Run time only

Remarks

`TcWidth` specifies the width, in bytes, of timing channel values. It returns either 2 for 16-bit values or 4 for 32-bit values.

`TcWidth` is dependent on the sample rate. The timing channel width for sample rates 8 s/s to 600 s/s are always 4 bytes. The timing channel width for sample rates 640 s/s to 153600 s/s are 2 bytes by default. The timing channel width for these higher sample rates can be forced to 4 bytes by setting *`TcWidth32`* in the `TcEnabled` property.

See Also

`TcEnabled` property, `TcMaximum` property

TransferFunctionGet method

The `TransferFunctionGet` method plots the filter responses of the filter designs.

Applies To

`TFilterDesign`

Declaration

```
procedure TransferFunctionGet(
    iFilterIndex: integer;           // Filter index.
    iLength: integer;                // Number of data points.
    var Buffer: array of double      // Buffer to receive data.
    );
```

Parameters

`iFilterIndex`

Filter index of interest. Valid filter indices are 0 through 7.

`iLength`

Number of data points to return.

`Buffer`

Buffer for storing the transfer function data points. The buffer must be large enough to accommodate the requested *`iLength`* data points.

Remarks

`TransferFunctionGet` plots the filter responses of the filter designs. There can be up to eight filter response plots since there are up to eight filter designs.

`TransferFunctionGet` is a `TFilterDesign` method.

See Also

`UnitStepLengthGet` method, `UnitStepGet` method

UnitStepGet method

The `UnitStepGet` method plots the unit step responses of the filter designs.

Applies To

`TFilterDesign`

Declaration

```
procedure UnitStepGet(
    iFilterIndex: integer;                 // Filter index.
    iLength: integer;                      // Number of data points.
    var Buffer: array of double            // Buffer to receive data.
    );
```

Parameters

iFilterIndex

Filter index of interest. Valid filter indices are 0 through 7.

iLength

Number of data points to return.

Buffer

Buffer for storing the unit step data points. The buffer must be large enough to accommodate the requested *iLength* data points.

Remarks

`UnitStepGet` plots the unit step responses of the filter designs. The `UnitStepLengthGet` method should be used to determine the *iLength* parameter. There can be up to eight unit step response plots since there are up to eight filter designs.

`UnitStepGet` is a `TFilterDesign` method.

See Also

`UnitStepLengthGet` method, `TransferFunctionGet` method

UnitStepLengthGet method

The `UnitStepLengthGet` method returns the number of data points in the unit step response.

Applies To

`TFilterDesign`

Declaration

```
function UnitStepLengthGet(
    iFilterIndex: integer                    // Filter index.
    ):integer;
```

Parameters

`iFilterIndex`

Filter index of interest. Valid filter indices are 0 through 7.

Remarks

`UnitStepLengthGet` returns the number of data points in the unit step response. The method should be used to determine the *`iLength`* parameter of `UnitStepGet`.

`UnitStepLengthGet` is a `TFilterDesign` method.

See Also

`UnitStepGet` method, `TransferFunctionGet` method

XbCalibrate method

The `XbCalibrate` method performs calibration on the external board.

Applies To

`TDsc`

Declaration

```
procedure XbCalibrate(
    iRate: integer                    // Sample rate to use for calibration.
    )
```

Parameters

iRate

Sample rate to use for external board calibration. A sample rate of 100 s/s is recommended.

Remarks

`XbCalibrate` is used to calibrate the external board. It is advisable to not exceed a sample rate of 1024 s/s or the calibration values may be unstable. `XbCalibrate` works only if `XbEnabled` is true, otherwise an exception is raised.

A higher sample rate allows `XbCalibrate` to execute faster but the calibration values are less accurate. A lower sample rate executes slower but the calibration values are more accurate. The recommended value of 100 s/s works well.

`XbCalibrate` is not automatically invoked if the external board calibration values are not found. The user has to explicitly call `XbCalibrate` to calibrate the external board.

See Also

`XbEnabled` property, `ExternalBoard` property

XbEnabled property

The `XbEnabled` property enables or disables the external board.

Applies To

`TDsc`

Declaration

property XbEnabled: boolean;

Default

False

Access Restrictions

None

Remarks

`XbEnabled` allows enabling or disabling the external board. If `XbEnabled` is true, the external board is enabled and visible in `ConfigDialogShow`. If `XbEnabled` is false, the external board is disabled and not visible in `ConfigDialogShow`.

To access the external board, `XbEnabled` must be true so that the configuration information is sent to the external board. Also `XbCalibrate` will work only if `XbEnabled` is true.

See Also

`XbCalibrate` method

XbPinConfigGet method

The `XbPinConfigGet` method gets the external board pin configuration associated with a pin index. The pin configuration includes the input type, input range, input offset, input offset range, and output excitation.

Applies To

`TExternalBoard`

Declaration

```
procedure XbPinConfigGet(
    iPinIndex: integer;                    // Pin index.
    var pXbPinConfig: TXbPinConfig         // Information record.
    );
```

Parameters

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

pXbPinConfig

A `TXbPinConfig` record that receives the pin configuration. `TXbPinConfig` must be initialized using `StructPrepare`.

Remarks

`XbPinConfigGet` returns the pin configuration for an associated pin index in the `TXbPinConfig` record. `TXbPinConfig` must be initialized using `StructPrepare` before invoking `XbPinConfigGet` or the method will fail.

Valid pin indices are 0 through 7. If the pin index is invalid, the exception ‘Pin index is out of range’ is raised.

`XbPinConfigGet` is a `TXbPinConfig` method.

See Also

`ConfigDialogShow` method, `XbPinConfigSet` method, `TXbPinConfig` type

XbPinConfigSet method

The `XbPinConfigSet` method sets the pin configuration associated with a pin index. The pin configuration includes the input type, input range, input offset, input offset range, and output excitation.

Applies To

`TExternalBoard`

Declaration

```
procedure XbPinConfigSet(
    iPinIndex: integer;                    // Pin index.
    const pXbPinConfig: TXbPinConfig       // Information record.
    );
```

Parameters

iPinIndex

Pin index of interest. Valid pin indices are 0 through 7.

pXbPinConfig

A `TXbPinConfig` record that passes the pin configuration. `TXbPinConfig` must be initialized using `StructPrepare`.

Remarks

`XbPinConfigSet` modifies the pin configuration for an associated pin index. All members of `TXbPinConfig`, except for *fInputOffsetRange*, must be set before invoking `XbPinConfigSet`.

`TXbPinConfig` must be initialized using `StructPrepare` before invoking `XbPinConfigSet` or the method will fail. The *iInputType*, *fInputRange*, *fInputOffset*, and *fOutputExcitation* members must be set to the new desired values. *fInputOffsetRange* cannot be set since it is a read only property. Note that the pin configuration can be graphically set in `ConfigDialogShow`.

Valid pin indices are 0 through 7. If the pin index is invalid, the exception ‘Pin index is out of range’ is raised.

`XbPinConfigSet` is a `TXbPinConfig` method.

See Also

`ConfigDialogShow` method, `TXbPinConfig` type, `XbPinConfigGet` method

Obsolete Interface

The objects, properties, and methods listed below are obsolete. They are discussed in greater detail in the following pages.

Category	Dsc Services
Custom command services	`TDaplCCList` object `DaplCCList` property

DAPL Custom Command Support

Using the DAPL custom command interface

To define DAPL custom commands, the user should use `DaplCCList`. Each line of the custom command list is a custom command filename. Once a single or a list of custom commands have been defined for the iDSC using `DaplCCList`, the custom commands will be downloaded to the iDSC when the user invokes `CommandsLoad` or `StartAcquiring` if the download code in `Download` is set to enabled.

If the default stack size of 1024 bytes is not sufficient for the custom commands, the user can change the stack size using `StackSize`. The stack size should only be changed after the custom commands have been defined using `DaplCCList` but before `CommandsLoad` or `StartAcquiring` is invoked.

If the user wants to retrieve the defined custom commands, invoke the `DaplCCList` property. `Download` is used to get the state of the download code. `StackSize` is used to get the stack size of a custom command.

Below is a Delphi example, where `Dsc1` of type `TDsc` is already on the form:

```
Dsc1.DaplCCList.Text :=             // Define two custom
  ‘c:\t1.bin’#13#10 +               //  commands.
  ‘c:\t2.bin’;

Dsc1.DaplCCList.StackSize[0]        // Set t1.bin stack
  := 2048;                          //  size to 2048 bytes.
Dsc1.DaplCCList.StackSize[1]        // Set t2.bin stack
  := 2048;                          //  size to 2048 bytes.
Dsc1.DaplCCList.Download := true;   // Enable custom
                                    //  command download.
Dsc1.StartAcquiring;                // Send custom command
                                    //  list to iDSC.
//... (other function calls) ...
```

TDaplCCList object

The `TDaplCCList` object defines the behavior of the `DaplCCList` property.

Remarks

`TDaplCCList` supports the properties below:

Properties

`Download` property
`StackSize` property

DaplCCList property

The `DaplCCList` property defines the DAPL custom command list for the iDSC through the `TDaplCCList` object.

Applies To

`TDsc`

Declaration

property DaplCCList: TDaplCCList;

Access Restrictions

Read only; Run time only

Remarks

`DaplCCList` allows the user to define a DAPL custom command list for the iDSC. Each custom command in the list must be delimited by a carriage-return, line-feed, or both.

The DAPL custom command list is sent to the iDSC when the user invokes `CommandsLoad` or `StartAcquiring` if the download code in `Download` is enabled.

See Also

`TDaplCCList` object, `Download` property, `StackSize` property

Download property

The `Download` property indicates whether downloading the DAPL custom command list is enabled or disabled.

Applies To

`TDaplCCList`

Declaration

property Download: boolean;

Default

False

Access Restrictions

None

Remarks

`Download` allows enabling or disabling the download code to indicate if downloading the DAPL custom command list is enabled or disabled.

If the download code is enabled, the DAPL custom command list is downloaded to the iDSC when the user invokes `CommandsLoad` or `StartAcquiring`. If the download code is disabled, the DAPL custom command list is not downloaded to the iDSC.

The user should only have to download the DAPL custom command list to the iDSC once at startup.

See Also

`DaplCCList` property, `StackSize` property

StackSize property

The `StackSize` property is an array property that configures the stack size of the custom command identified by an index.

Applies To

`TDaplCCList`

Declaration

property StackSize[*iIndex*: integer]: integer;

Default

1024

Access Restrictions

None

Remarks

`StackSize` configures the stack size of the custom command identified by an index from the list of custom commands. If there is only one custom command in the list, the index is 0.

If the required stack size of the custom command is larger than 1024 bytes, the stack size must be set after the DAPL custom command list has been defined using `DaplCCList`. The DAPL custom command list is then sent to the iDSC with the new stack size when the user invokes `CommandsLoad` or `StartAcquiring` if `Download` is enabled.

See Also

`DaplCCList` property, `Download` property

Section IV. Installation and Setup

11. iDSC Board Hardware Architecture

The iDSC board hardware architecture is partially defined by a set of features common to all models. Additionally, the architecture supports a number of options which differentiate various models. Among the common features that characterize the iDSC board architecture are the structure and division of labor between the analog and digital filters, the ability to self-calibrate using an on-board reference, isolation of the analog front-end from the PC ground and the ability to synchronize multiple boards for simultaneous sampling. Some of the characteristics that vary from model-to-model include the system bus (ISA and PCI), input voltage range, and maximum sample rate.

While configuration of the iDSC board hardware is accessible only through the programmer's interfaces described in an earlier section, an understanding of the architecture will help you achieve maximum performance out of the iDSC board.

Hardware Overview

The iDSC board hardware combines the best of analog and digital design to provide powerful capabilities at a very reasonable cost. Each of the eight analog front-end sections has an input buffer amplifier, an analog anti-aliasing filter, and an oversampling analog-to-digital converter. Two 100 MHz digital signal processors provide programmable lowpass filtering with extremely sharp cut-off characteristics and near-perfect phase linearity. An Intel processor handles data buffering and PC communications.

The iDSC board's exceptional versatility results from combining fixed-cutoff analog anti-alias filters with 64X oversampling sigma-delta analog-to-digital converters and configurable digital filters. The very high constant acquisition rate necessary for oversampling greatly simplifies the design of the analog anti-alias filters. Once the data is digitized, the DSPs filter and decimate the data to obtain the desired sampling rate, while preserving freedom from aliases. The DSPs also implement the user's lowpass and bandpass filter specifications. The hallmark of the iDSC board's flexibility lies in the ability to independently specify the sample rate and, on a channel-by-channel basis, the filter cutoff frequencies.

The components of the iDSC board architecture provide the necessary bandwidth for true 16-bit programmable filtering with attenuation of at least 96 dB for all frequencies above the effective Nyquist frequency. The analog-to-digital converters of the iDSC board operate internally at a fixed sampling rate of 9830400 samples/second. After decimation by 64 within the analog-to-digital converters, the digital signal processors receive output data at a fixed sampling rate of 153600 samples/second. The digital signal processors then filter and decimate from the raw data rate of 153600 samples/second down to the effective sampling rate, if lower. The effective Nyquist frequency, the highest frequency which can be resolved by sampling at the effective sampling rate, is half of the effective sampling rate.

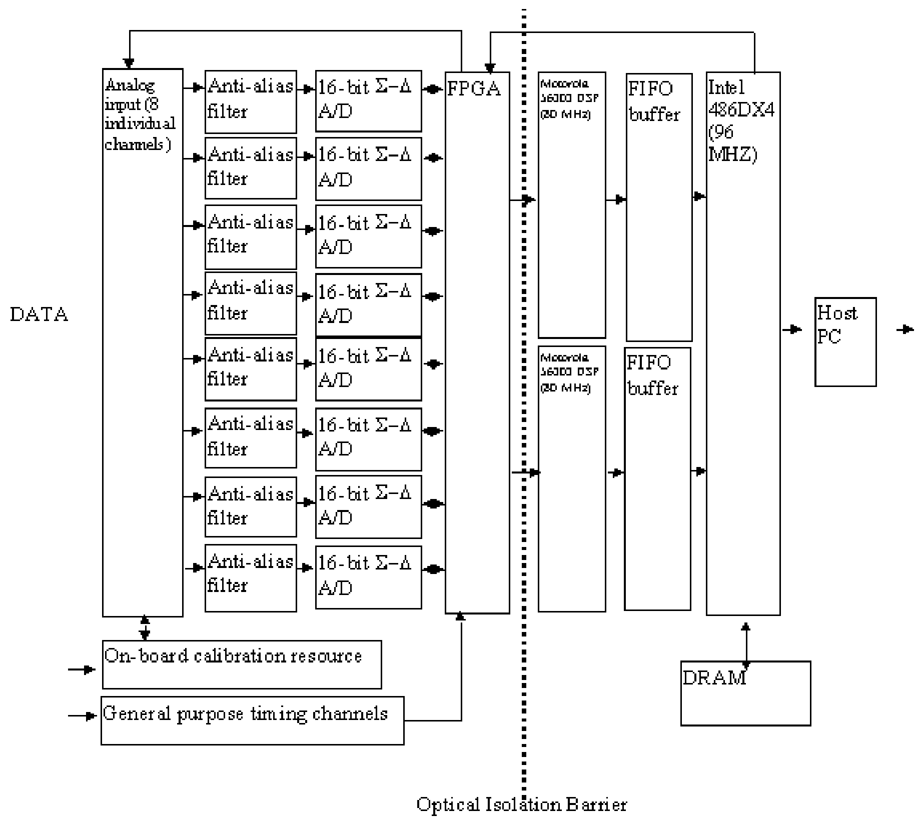
Features of the iDSC board include:

- Guaranteed Anti-aliasing
- Variable Sampling Rates from 8 to 153,600 Samples/Second
- Independently variable cut-off frequencies from 2% to 80% of Nyquist
- Very steep transition bands: -96dB/quarter-octave typical
- Eight simultaneous, dedicated channels
- 16-bit Resolution
- Linear Phase Response
- 300 Volts input signal isolation from PC ground
- Simple User Interface---consistent across all applications
- No programming required to configure low pass and bandpass filters

To achieve this performance, the iDSC board uses an impressive array of hardware including:

- 8 fourth order analog anti-alias filters
- 64-times oversampling 16 bit Sigma-Delta analog-to-digital converters
- A 96 MHz Intel 486 DX4 processor
- 16MB RAM on the iDSC 1816
- 4MB RAM on the iDSC 816
- Two 100 MHz Motorola DSP56303 digital signal processors

iDSC Board Block Diagram


DATA
Analog input (8 individual channels)
Anti-alias filter
16-bit Σ-Δ A/D
FPGA
Motorola 56003 DSP (80 MHz)
FIFO buffer
Intel 486DX4 (96 MHZ)
Host PC
DRAM
On-board calibration resource
General purpose timing channels
Optical Isolation Barrier

Warm-up and Self-Calibration

The iDSC board architecture provides for manual calibration of a single on-board voltage reference. The recommended calibration interval for this reference is one year. Microstar Laboratories provides this calibration service at a nominal fee.

Using this reference, an iDSC board performs a self-calibration of offset and gain on each channel the first time it is initialized in a PC. Self-calibration can also be initiated under software control. This procedure takes well under one minute.

Best performance is obtained when self-calibration is initiated after the board reaches a stable operating temperature. The length of time required to stabilize depends greatly on the PC and the environment in which it operates. It is recommended that sampling be initiated and other operating conditions be duplicated as closely as possible for 30 minutes to 1 hour prior to initiating self calibration. If operating conditions do not vary significantly from day to day, self calibration will need to be run only infrequently thereafter. Some experimentation may be required to determine the self-calibration interval appropriate for your acquisition system.

Isolation

The iDSC board's entire analog section, including the analog-to-digital converters, is isolated from the digital section and, therefore, from the PC's ground. The analog section "floats" with respect to this ground. By providing a low-impedance ground reference with your input signals, you completely determine the ground potential of the analog section. Although all eight channels are provided with a separate ground connection, all eight grounds are joined together at the iDSC board's external `J1` connector. Please contact Microstar Laboratories for alternative solutions if you have balanced differential signals for which this arrangement is unsuitable.

Components which provide optical and galvanic isolation, and the physical layout tolerances are designed to provide a minimum of 300 Volts isolation between the field (sensor) system and any power or ground rail on the PC. You should consider carefully whether it will be necessary to provide a weak path for current to flow between your sensor system and the PC ground to prevent the potential difference from exceeding this limit.

An important consideration in maintaining the 300 Volt Isolation is the spacing between the iDSC board and any board present in an adjacent slot. Below 10,000 feet mean sea-level (pressure) altitude, the minimum clearance required to maintain this level of isolation is .064 inches of free space, slightly more than the thickness of the printed circuit boards. Failure to observe this clearance may result in extensive damage to the circuit boards and the PC.

Warning: Improper installation of equipment may result in fire, electrical shock, or other hazards.

When multiple iDSC boards are present in a single PC, their respective analog sections are floating with respect to each other except for two cases. The first, an external connection, occurs when the input signal grounds are related through the system of field sensors. The second case arises when the boards are synchronized for simultaneous sampling by means of the synchronization cable. This cable joins the analog ground planes of the boards and thus joins the grounds of the input signals. Again, please contact Microstar Laboratories for alternative solutions if this arrangement is not suitable for your application. Note that in both cases, the joined analog sections are still isolated from the digital section and PC ground.

Simultaneous Sampling and Synchronization

By design, the iDSC board architecture samples all eight channels simultaneously. It is possible to build larger simultaneous acquisition systems made up of iDSC boards and even mixed systems of iDSC boards and DAP boards by means of synchronization cables. In an iDSC board-only system, boards are synchronized with the MSCBL 078 cable. One software-designated board acts as the timing controller and all other boards connected by the cable are configured as subordinates to the controller. Details of `DscMasterSet` and related functions may be found in the "Programming Interfaces" section of this document.

For information on synchronizing a mixed system of iDSC boards and DAP boards, please contact Microstar Laboratories.

12. Installation

This chapter contains detailed installation instructions for the iDSC 1816 and iDSC 816 boards, and the iDSC board software. The Advanced Installation Options chapter provides additional information for the iDSC 816 in nonstandard PC configurations.

Installing an iDSC board involves the following steps:

1. Installing the iDSC 1816 / Installing the iDSC 816
2. Installing the iDSC Board Software
3. Testing the Installation

iDSC Board Handling Precautions

Static control is required for handling all electronic equipment. The iDSC board is especially sensitive to static discharge because it contains many high-speed analog and digital components. To protect the iDSC board, observe the following precautions:

- Wear a grounding strap when handling the iDSC board. If it is not possible to use a grounding strap, continuously touching a metal screw on a grounded PC offers protection.
- If it is necessary to transport the iDSC board outside of the PC, be sure to shield the iDSC board in a conductive plastic bag. If a conductive bag is not available, shield the iDSC board by wrapping it completely in aluminum foil. Do not ship or store an iDSC board in plastic peanuts without suitable shielding.

Static damage to analog components can cause subtle problems, including oscillation, increased settling time, and reduced slew rate. If you suspect that an iDSC board has been affected by static discharge, return it to Microstar Laboratories for testing, repair, and quality control.

Installing the iDSC 1816

System Hardware Requirements

The iDSC 1816 is compatible with 5V 32 bit PCI bus slots that support bus-mastering in 486/Pentium/Pentium Pro/Pentium II/Pentium III/Pentium 4/Xeon/Athlon and other PC AT compatible computers.

Installation Steps

Caution: Do not install the iDSC 1816 while the PC is on.

1. Make sure that connections with a high voltage potential are disconnected or turned off.
2. Turn off the PC and remove the PC's cover.
3. Insert the iDSC 1816 into any free PCI slot.
4. Screw down the back panel of the iDSC 1816 to the back chassis of the PC.
5. Make sure that the iDSC 1816 is properly installed before turning on the PC or connecting signals or cables to the iDSC 1816. Refer to the Isolation section in the iDSC Board Hardware Architecture chapter.

Warning: Improper installation of equipment may result in fire, electrical shock, or other hazards.

The iDSC 1816 requires approximately 17.5 Watts from the PC's power supply. If the system behaves erratically with the iDSC 1816 installed, the PC may need a larger power supply.

Installing the iDSC 816

System Hardware Requirements

The iDSC 816 is compatible with 16 bit ISA or 32 bit EISA bus slots in 486/Pentium/Pentium Pro/Pentium II/Pentium III/Pentium 4/Xeon/Athlon and other PC AT compatible computers.

Standard Configurations

The iDSC 816 is factory-configured to use interrupt 2 and I/O addresses in the range 220-22F (hexadecimal). This configuration does not conflict with most standard PC hardware. If you have nonstandard PC hardware or any installed cards that use the same interrupt vector or I/O address as the iDSC 816, please read the Advanced Installation Options chapter before preceding with installation.

Note: Some sound cards use I/O addresses in the 220-22F range. If your system has a sound card, check the configurations.

Interrupt and I/O address conflicts may cause subtle or obvious problems in your PC. If your PC does not operate properly after installing the iDSC 816, check that there are no configuration conflicts.

Installation Steps

Caution: Do not install the iDSC 816 while the PC is on.

1. Make any necessary changes to the hardware configurations. Interrupt vector and I/O address information are provided in the Advanced Installation Options chapter.
2. Make sure that connections with a high voltage potential are disconnected or turned off.
3. Turn off the PC and remove the PC's cover.
4. Insert the iDSC 816 into any free ISA slot.
5. Screw down the back panel of the iDSC 816 to the back chassis of the PC.
6. Make sure that iDSC 816 is properly installed before turning on the PC or connecting signals or cables to the iDSC 816. Refer to the Isolation section in the iDSC Board Hardware Architecture chapter.

Warning: Improper installation of equipment may result in fire, electrical shock, or other hazards.

The iDSC 816 requires approximately 17.5 Watts from the PC's power supply. If the system behaves erratically with the iDSC 816 installed, the PC may need a larger power supply.

Several iDSC Boards

Many iDSC boards can operate simultaneously in one PC. Running several boards in parallel increases the maximum sampling rate and the real-time processing power of a system. The Accel32/DAPcell server supports up to fourteen iDSC boards in one PC. However, the number of iDSC boards is limited by the number of available PCI /ISA slots in the PC.

Installing the iDSC Board Software

When you insert the DAPtools CD into your CD-ROM drive, the Microstar Laboratories Setup Launcher will automatically run. When you select the 'Getting Started' link, you will obtain instructions for installing iDSC board software.

If the Windows hardware installer asks for the INF file, you can find the MSLACOM.INF file at the root of the DAPtools CD.

You can obtain more detailed instructions for installing iDSC board software under various operating systems by selecting the 'Documentation' link, followed by 'DAPtools Basic|Accel32|Installation'.

Testing the Installation

To test the installation, run the `DSCview.exe` program. Begin acquiring data by selecting `Start!` from the main menu and verify that the data are showing up in the graph or table window. An error message will be displayed if there was a problem with the installation.

Troubleshooting the iDSC 1816

If the Accel32 Service will not start, check the host PC hardware manual to make sure that the particular PCI slot that the iDSC 1816 uses supports bus-mastering. If necessary, switch to a different slot.

13. Advanced Installation Options

Installation for the iDSC 1816 and iDSC 816 in standard hardware configurations is described in the Installation chapter of this document. This section covers iDSC 816 installation with nonstandard configurations.

Nonstandard Configurations

The iDSC board uses two resources from the host PC:

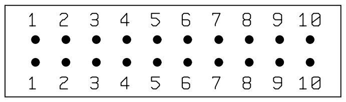
- an interrupt vector
- a range of I/O addresses

The iDSC board allows several interrupt vector and I/O address selections. The interrupt vector may be 2, 3, 4, 5, 11, or 15. When selecting an interrupt vector, note the following interrupt vectors used by standard cards:

EGA/VGA	2
serial port COM2	3
serial port COM1	4
parallel port #2	5
hard disk controller on IBM XT	5
parallel port #1	7
secondary IDE controller	15

The iDSC board comes configured to use interrupt 2 since this interrupt does not conflict with most standard hardware. If you have any other cards installed, determine the interrupts that the cards use and select an iDSC board interrupt number distinct from these. The host computer may lose access to one of the serial COM ports or one of the parallel ports, depending on the selection.

To change interrupt vectors, locate the twenty-pin `HOST CONFIGURE (J10)` connector directly above the gold fingers on the iDSC board printed circuit board.



J10 HOST CONFIGURE

The six possible interrupt selections are:

Interrupt Vector	**Jumper**
2	pin pair 9
3	pin pair 6
4	pin pair 7
5	pin pair 8
11	pin pair 5
15	pin pair 4

To change the interrupt, remove the jumper and replace it according to this table. Note that exactly one of the pin pairs 4, 5, 6, 7, 8, and 9 should be connected.

The iDSC board comes configured to use I/O addresses in the range 220-22F (hexadecimal). To change this range, change the jumpers on the `HOST CONFIGURE` connector. Pin pairs 1, 2, and 3 select the I/O address of the iDSC board according to the following table:

I/O Address Range	**Jumpers**
220 - 22F	1, 2, 3
230 - 23F	2, 3
240 - 24F	1, 3
250 - 25F	3
320 - 32F	1, 2
330 - 33F	2
340 - 34F	1

Multiple Board Installation

Up to fourteen iDSC boards can operate simultaneously in one PC. Running several boards in parallel increases the maximum sampling rate and the real-time processing power of a system.

Microstar Laboratories iDSC boards are also compatible with Microstar Laboratories Data Acquisition Processors. Any combination of up to fourteen iDSC boards and DAP boards can run as one system in a PC.

Each iDSC 816 board requires one ISA-compatible slot. All of the iDSC 816 boards and ISA-compatible DAP boards in a PC share just one interrupt line; no DMA lines are required. The iDSC 816 boards and ISA-compatible DAP boards are distinguished from one another by their I/O addresses. Before installing iDSC 816 boards in the PC, select a distinct I/O address for each board. Set the I/O addresses with the jumpers on the `HOST CONFIGURE` connector. Information on the `HOST CONFIGURE` is provided at the beginning of this chapter.

Note: Pin pair 10 of the `HOST CONFIGURE` connector sets the level of the PC's interrupt line. Pin pair 10 must be connected for one ISA-compatible board in a PC, and must not be connected for all other iDSC 816 boards and DAP boards.

Once the iDSC boards have been properly installed, run the Accel32 / DAPcell server setup as described in the Installation chapter. It will auto-detect the iDSC board system configuration on the host machine and also auto-detect any DAP boards on the system.

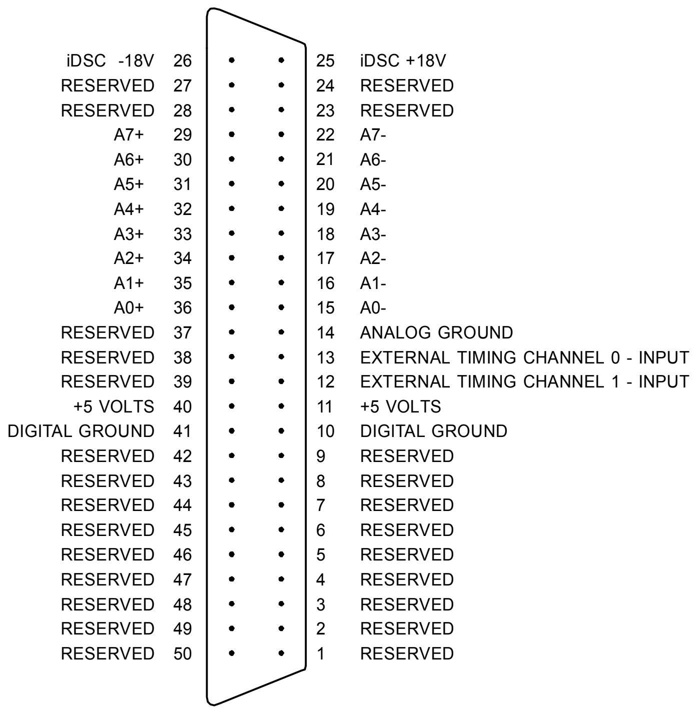
14. Physical Interface

This chapter describes the physical interface of the iDSC board.

Input/Output Connector

Analog and digital voltages connect to the iDSC board through a 50-pin connector on the back panel of the PC. This connector is located on the edge of the iDSC board and is labeled `J1 IN/OUT`. `J1` has a double row of pins on 0.050 inch centers. The connector is AMP part number 787394-5. This connector mates with discrete wire connector T&B part number HFM050A or insulation displacement connector AMP part number 786090-5. `J1` mates with Microstar Laboratories cable numbers MSCBL 047-01, MSCBL 048-01, MSCBL 049-01K, MSCBL 050-01, and MSCBL 051-01K.

Looking at the input/output connector from the back of a PC, the pin numbering is



iDSC -18V	26	25	iDSC +18V
RESERVED	27	24	RESERVED
RESERVED	28	23	RESERVED
A7+	29	22	A7-
A6+	30	21	A6-
A5+	31	20	A5-
A4+	32	19	A4-
A3+	33	18	A3-
A2+	34	17	A2-
A1+	35	16	A1-
A0+	36	15	A0-
RESERVED	37	14	ANALOG GROUND
RESERVED	38	13	EXTERNAL TIMING CHANNEL 0 - INPUT
RESERVED	39	12	EXTERNAL TIMING CHANNEL 1 - INPUT
+5 VOLTS	40	11	+5 VOLTS
DIGITAL GROUND	41	10	DIGITAL GROUND
RESERVED	42	9	RESERVED
RESERVED	43	8	RESERVED
RESERVED	44	7	RESERVED
RESERVED	45	6	RESERVED
RESERVED	46	5	RESERVED
RESERVED	47	4	RESERVED
RESERVED	48	3	RESERVED
RESERVED	49	2	RESERVED
RESERVED	50	1	RESERVED

Note: Use the pin numbering on this chart, rather than numbers which may be found on your connector. Connectors from different manufacturers are not numbered consistently.

Analog inputs are indicated by `A0+` through `A7+`; their corresponding ground inputs are `A0-` through `A7-`.

External timing channel inputs are indicated by `EXTERNAL TIMING CHANNEL 0 - INPUT` and `EXTERNAL TIMING CHANNEL 1 - INPUT`. These correspond to `Tc0` and `Tc1` in software.

Pins 11 and 40 connect to the isolated 5 volt digital power supply. Pins 25 and 26 are +18 volt and -18 volt supplies respectively. This information is advisory only. No current is available from these pins. iDSC board performance is unspecified if current is drawn for any purpose.

Pins 1, 2, 3, 4, 5, 6, 7, 8, 9, 23, 24, 27, 28, 37, 38, 39, 42, 43, 44, 45, 46, 47, 48, 49, and 50 are indicated by `RESERVED`. These pins are reserved future expansion and should not be used.

Analog Inputs

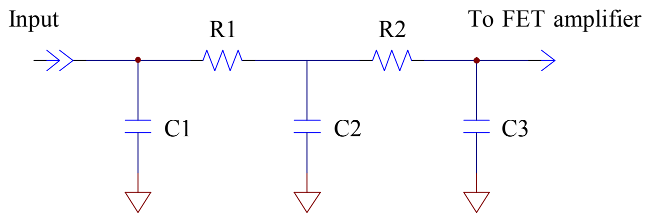
Warning: Measuring signals with a high voltage potential from the PC supply is always hazardous. The iDSC board and all cables and boards connected to the iDSC board should be considered hazardous whenever any connections are made to a high voltage potential.

Each analog input on the iDSC board has dedicated anti-alias filter and analog-to-digital conversion circuits. All inputs are optically and galvanically isolated from the PC power supplies and ground. Each iDSC 1816 channel provides:

- High input impedance
- Single-ended inputs
- Input range of ±5 Volts or ±10 Volts, software selectable
- Absolute maximum ±40 Volts relative to signal ground
- 300 Volts isolation from the PC power supply
- Simultaneous Sampling

Each iDSC 816 channel provides the same features except:
- Input range is fixed at either ±5 Volts or ±10 Volts (model dependent)

The iDSC 1816 analog input signals pass through analog multiplexers used for self-calibration and then on to the high-impedance inputs of the FET op amps. Since the multiplexers of the iDSC 1816 have channel protection built in, it does not have separate channel protectors. The DC input impedance is very high; the AC input impedance is dominated by the capacitance of the channel protector and switch or multiplexer. The iDSC 816 analog input signals pass through channel protectors and analog switches used for self-calibration. Following this they pass to the high-impedance inputs of FET op amps.



The following table shows approximate typical resistance and capacitance values for the equivalent circuit of the figure above:

Component	**iDSC 1816**	**iDSC 816**
R1	N/A	80Ω
R2	400Ω	25Ω
C1	N/A	5 pF
C2	5 pF	35 pF
C3	30 pF	55 pF

iDSC Board Synchronization Connector

A synchronization connector (`J3` on the iDSC 1816 and `J100` on the iDSC 816), allows the synchronization of several iDSC boards to deliver simultaneous sampling with respect to one other. By connecting the synchronization connector of each iDSC board using a MSCBL 078 cable available from Microstar Laboratories, the iDSC boards can be synchronized together. Up to fourteen iDSC boards can be synchronized this way. To enable master/slave synchronization in software please refer to the Programming Interfaces section of this document. This connector should only be used for synchronizing iDSC boards together. The iDSC 1816 also has an External Synchronization Connector, `J2`, described below.

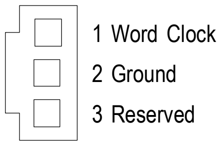
The full part number of the cable is MSCBL 078-xx-L0.8 where xx specifies the number of slave processors. The MSCBL 078 is compatible with both the iDSC 1816 and the iDSC 816. It replaces the MSCBL 014-xx-L0.7 which is incompatible with the iDSC 1816.

iDSC 1816 External Synchronization Connector

Note: When using an iDSC 1816 as a remote master with an MSXB 045 synchronization board, connector `J2` is used to control the MSXB 045 synchronization board. Therefore it is not available for other applications. See the documentation for the MSXB 045 synchronization board for details on using this product.

An external synchronization connector, `J2`, provides a means to synchronize DAPs or other measurement circuits with an iDSC 1816. This connector is not available on the iDSC 816. The synchronization signal is a 153.6 kHz word clock with a 50% duty cycle. The samples aggregated to form a single output word are collected at the 64X oversampling rate between the rising edges of this clock. The clock output has CMOS levels and can source 1mA, sinking up to 12mA.

The `J2` connector is located between the PCI carrier board and the daughter card. Viewed from above with J1-end of the board closest to you, the pin numbering is



For additional information on using this connector and/or synchronizing a mixed system of iDSC boards and DAP boards, please contact Microstar Laboratories.

Index