DAQCreator

Smart and Easy-to-Use
Data Acquisition Systems Creator

User's Guide

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1

Introduction to DAQCreator

1.1 What is DAQCreator?

DAQCreator is a smart and easy-to-use data acquisition systems creator that works with ADLINK analog input and high-speed digital input devices. Its intuitive user interface reduces system development time. Users simply select the devices, configure the data acquisition settings and the viewing windows, and then the data acquisition system is ready for use. DAQCreator is designed for ease-of-use; programming expertise is not required. The features of DAQCreator includes:

- Setup data acquisition parameters (selecting channels, analog input range, trigger, etc.) to acquire data
- Customized viewing window style
- Custom configurations can be saved and loaded
- Easy to use Project Wizard to assist you to configure your task
- Input data can be recorded to disk or/and shown on the viewing window
- Up to 40MB/sec stream to disk capability (with Adaptec SCSI card and SCSI hard disk)
- FFT spectrum analysis

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1.2 Installing DAQCreator

1.2.1 System Requirements

Before running DAQCreator, the program and related libraries and drivers must be properly installed and configured. If necessary, refer to *section 3.1 Device Installation* on the *NuDAQ PCI Software Installation Guide manual* for the installation of ADLINK NuDAQ devices. To run DAQCreator, the minimum system requirements include:

- Microsoft Windows 98/NT/2000/XP operating system
- Personal computer with Pentium or higher microprocessor
- VGA resolution (or higher) video adapter
- Minimum of 64MB of memory
- Minimum of 20MB of free hard disk space
- Microsoft-compatible mouse
- Adaptec SCSI card and SCSI hard disk if you want to do stream to disk operation

1.2.2 Installation Instructions

This section provides instructions for installing DAQCreator software. You can start most of the installers directly from the startup screen that appears when you load the ***ADLINK DAQCreator CD***.

Installing DAQCreator

Note: To install DAQCreator on a Windows NT/2000/XP system, you must be logged on with Administrator privileges to complete the installation.

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Follow the following steps to install DAQCreator.

Insert the ***ADLINK DAQCreator CD*** into the CD-ROM drive of your computer. Click on **Install DAQCreator** from the self-startup screen. If the CD self-startup screen does not appear, use Windows Explorer or File Manager to run *x*:\SETUP.EXE (*x* identifies the drive that contains the CD).

When the DAQCreator installation process is completed, Setup will launch the NuDAQ Configuration Utility (*PciUtil)*. This utility is provided for making card configuration. Please refer to *section 4.1 Hardware Device Configuration* for information on using this utility.

[Windows 98/2000/XP]

After installing DAQCreator, the INF files and driver files are copied to appropriate directories. With the installed Device Information Files (.INF) and Device Driver Files (.SYS), Windows 98/2000/XP system will identify and install any new plugged data acquisition cards automatically.

Windows 98

After re-entering Windows 98, to ensure a successful hardware device installation, you can open the *Device Manager* in **Start>>Settings>>Control Panel>>System**, and then select the **Device Manager** tab.

In *Device Manager*, you should find the device in **NuDAQ**. Double-click the device; select the **Resources** tab to check if I/O port and IRQ resources for the device are allocated correctly.

Windows 2000/XP

After re-entering Windows 2000/XP, to ensure a successful hardware device installation, you can open the *Device Manager* in **Start>>Settings>>Control Panel>>System**, and select the **Hardware** tab, then click the **Device Manager** button.

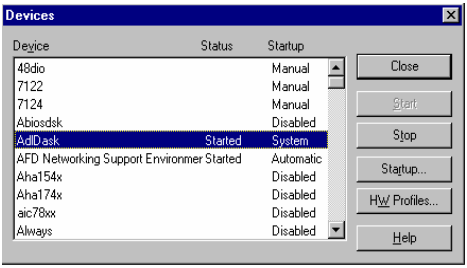
In *Device Manager*, you should find the device in **NuDAQ Boards**. Double-click the device; select the **Resources** tab to check if I/O port and IRQ resources for the device are allocated correctly.

[Windows NT 4.0]

After re-entering Windows NT and the devices you wish to operate have been plugged into your computer, make sure the NuDAQ hardware device drivers corresponding to the cards are started. For DAQCreator to be able to

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communicate with NuDAQ cards, the cards own device driver (e.g. PCI9111, PCI9112, etc.) must be started. You can check by opening the *Control Panel*, double-click *Devices*, and a *Devices* window will be shown as below.

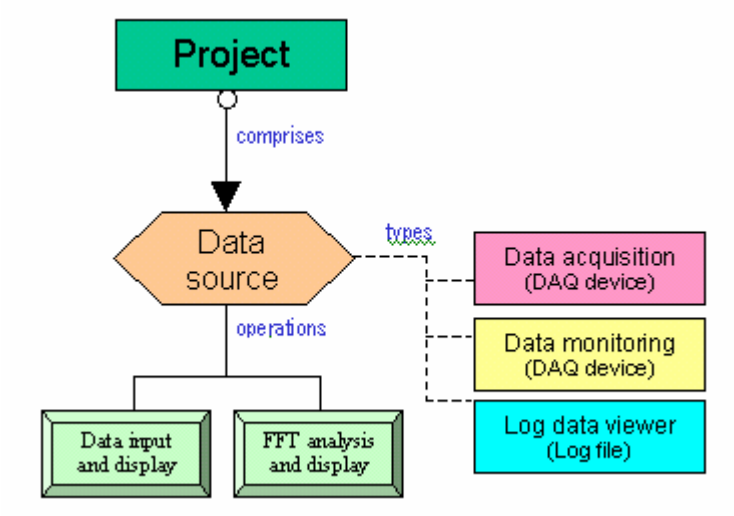


If the device status is none, you have to select the device and then press the **Start** button.

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1.3 Project Structure

With DAQCreator you can create projects to do data acquisition and measurement tasks. Each project can comprise of several data sources. Each data source corresponds to an ADLINK data acquisition device or a log data file. Each data source can have two viewing windows, *Data View* and *Spectrum View*. You can arrange the viewing windows in cascade or tile style. Also if you do not want to display the data, you can close the viewing window. (For example, you may only want to log the data to disk.)



The projects can be saved and re-loaded. Project file names have the format, <project name>.cwk. Data sources can be saved in the following format, <data source name>.daq.

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1.4 Data Source

1.4.1 Data Acquisition

The *Data Acquisition* data source links to an ADLINK DAQ device. The input data operation is to read a specified amount of data in one-snap. The operation completes and stops when the specified amount of data are acquired.

DAQCreator supports FFT spectrum analysis. You can perform FFT analysis on the analog input data after the data acquisition operation stops.

1.4.2 Data Monitoring

The *Data Monitoring* data source is linked to an ADLINK DAQ device. From the DAQ device input data is continuous. Therefore you can real-time monitor the data. The operation will not stop unless you click the **Stop** button on the *Function Panel*.

DAQCreator supports FFT spectrum analysis. You can analyze the analog input data. If the FFT analysis is enabled, by pushing the **Enable/Disable Real-time FFT** button on *Function Panel*, the FFT analysis is performed for every one screen of data. The result is displayed in *Spectrum View*.

1.4.3 Log Data Viewer

The *Log Data Viewer* data source links to log data file. You can load the data and display the data on *Data View* window.

DAQCreator supports FFT spectrum analysis. You can perform FFT analysis on a loaded data.

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1.5 Starting DAQCreator

To create or perform a data acquisition application using DAQCreator, follow these steps:

Step 1. Make sure the DAQ card device is working properly. Please refer to *section 1.2.2 Installation* for details.

Step 2. Make sure the following settings are correct:

(1) The kernel memory size setup. Please refer to *section 4.1 Hardware Device Configuration* for details.

(2) A SCSI hard disk configuration if high-speed stream to disk with Adaptec ASPI driver is required. Please refer to *section 6.1.2 SCSI Device Configuration* for details.

Step 3. Run DAQCreator. Create a new project or open an existing project. We suggest you use DAQCreator's *Project Wizard* to create a new project.

Step 4. You can select the **New** command from the *File* menu to add more data sources.

Step 5. You can configure the style of *Data View* and *Spectrum View* as you wish.

Step 6. The project is ready to accept data acquisition tasks. You can click **Start** or **Start All** button on the *Function Panel* to start the data acquisition. The input data are displayed in the *Data View* window.

Step 7. You can perform FFT analysis on the input data by clicking **Perform FFT** button on the *Function Panel*. The result is displayed in the *Spectrum View* window.

Step 8. If you select log data to file, you can use the Log Data Viewer to view the data.

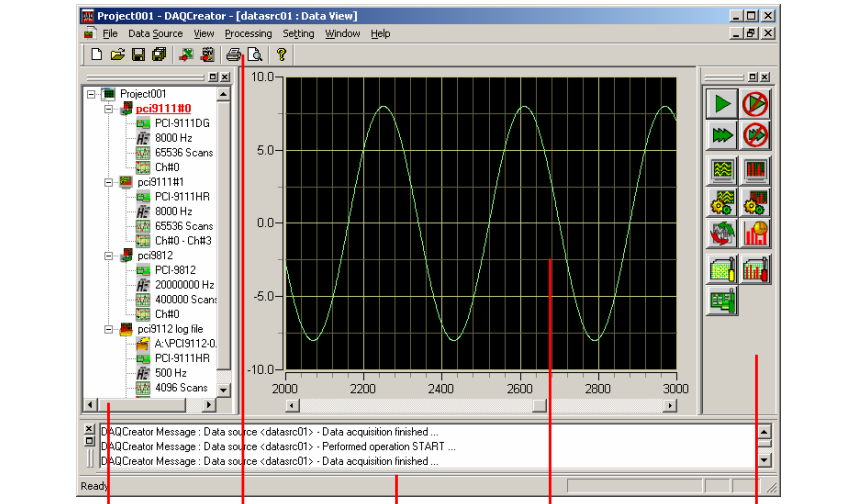
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2

Main Window Overview

This chapter includes a look at DAQCreator's windows, menus, panels, toolbar, etc.

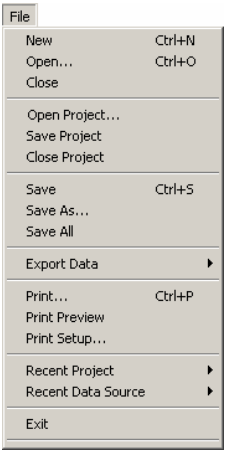
2.1 Main Window



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2.2 Pull-Down Menus

2.2.1 File Menu

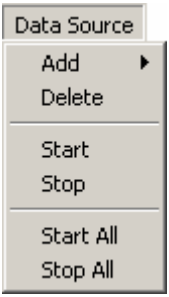


File Menu Items and Descriptions

Item	Description
New	Creates a new project or data source
Open	Open an existing data source or project
Close	Close the current data source
Open Project	Open an existing project
Save Project	Save the current project
Close Project	Close the current project
Save	Save the current data source
Save As	Save the current data source under a new filename
Save All	Save the project and all of the data sources
Export Data	Export the current data to an Excel or CSV file
Print	Print the current data
Print Preview	Preview the print result
Print Setup	Set the parameters of the printer
Recent Project	List the recent use projects
Recent Data Source	List the recent use data source files
Exit	Leave the DAQCreator program

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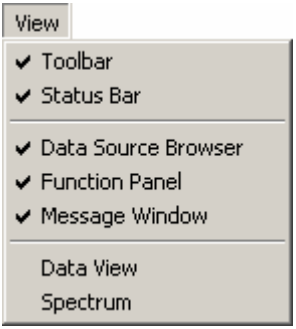
2.2.2 Data Source Menu



Data Source Menu Items and Descriptions

Item	Description
Add	Add a data source to the current project
Delete	Delete the current data source from the current project
Start	Start the data acquisition on the current data source
Stop	Stop the data acquisition on the current data source
Start All	Start the data acquisition on all data sources
Stop All	Stop the data acquisition on all data sources

2.2.3 View Menu



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View Menu Items and Descriptions

Item	Description
Toolbar	Check to make the Toolbar visible
Status Bar	Check to make the Status Bar visible
Data Source Browser	Check to make the Data Source Browser Panel visible
Function Panel	Check to make the Function Panel visible
Message Window	Check to make the Message Window visible
Data View	Show the Data View window if it is not shown. Make the Data View window the active window. The Data View window pops up to the top.
Spectrum	Show the spectrum View window if it is not shown. Make the Spectrum View window the active window. The Spectrum View window pops up to the top.

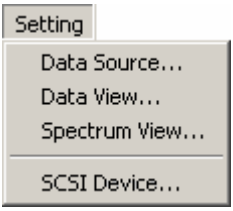
2.2.4 Processing Menu



Processing Menu Items and Descriptions

Item	Description
FFT	Perform FFT analysis on the acquired data. For Data Acquisition data source, it analyzes all of the data. For Data Monitoring data source, it analyzes the data retained in the chart memory (length of History length).

2.2.5 Setting Menu

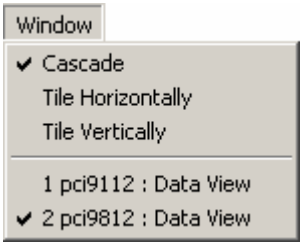


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Setting Menu Items and Descriptions

Item	Description
Data Source	Set the configuration of the data source
Data View	Set the style of Data View window
Spectrum View	Set the style of Spectrum View window
SCSI Device	Set the configuration of the SCSI hard drive. If there is no Adaptec SCSI card and SCSI hard disk in the system, this item is grayed.

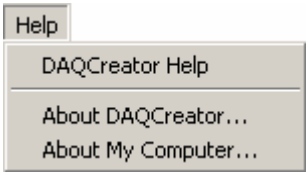
2.2.6 Window Menu



Window Menu Items and Descriptions

Item	Description
Cascade	Cascade the window view
Tile	Tile the window view
<Window List>	List all Data View and Spectrum View windows

2.2.7 Help Menu



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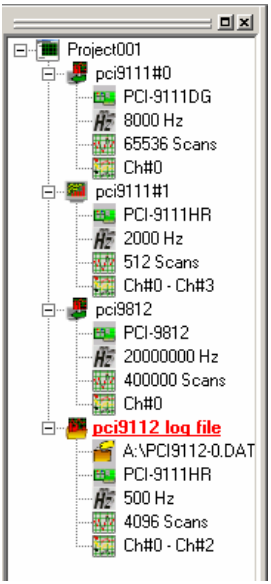
Help Menu Items and Descriptions

Item	Description
DAQCreator Help	DAQCreator Online Help
About DAQCreator	The information about DAQCreator
About My Computer	The information about the system resources

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2.3 Panels

2.3.1 Data Source Browser Panel



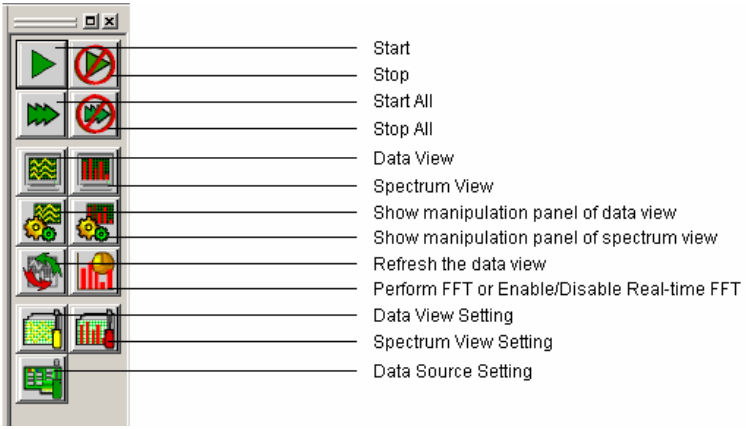
The *Data Source Browser Panel* initially located on the left part of the DAQCreator main window. You can move it to any place by drag-and-drop with the mouse. The *Data Source Browser* panel displays all of the data sources and their main attributes in the current project with a tree branching view style. The data source with red color and underlined is the current data source. You can double-click the data source to switch the current data source.

2.3.2 Function Panel

The *Function Panel* initially located on the right part of the DAQCreator main window. You can move it to any place by drag-and-drop with the mouse.

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Data Acquisition / Data Monitoring

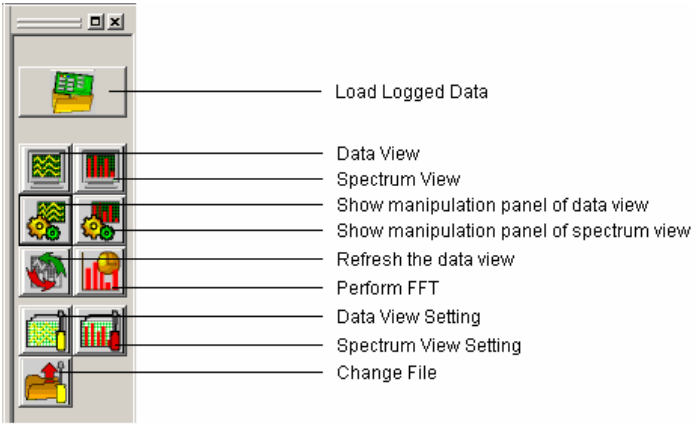


Function Panel Items and Descriptions

Item	Description
Start	Start the data acquisition on the current data source
Stop	Stop the data acquisition on the current data source
Start All	Start the data acquisition on all data sources
Stop All	Stop the data acquisition on all data sources
Data View	Show the Data View window if it is not shown. Make the Data View window the active window. The Data View window pops up to the top.
Spectrum View	Show the spectrum View window if it is not shown. Make the Spectrum View window the active window. The Spectrum View window pops up to the top.
Show the manipulation panel of data view	Show the manipulation panel of data view
Show the manipulation panel of spectrum view	Show the manipulation panel of spectrum view
Refresh the data view	Redraw the contents of Data View window
Perform FFT (Data Acquisition)	Perform FFT analysis on the acquired data
Enable/Disable Real-time FFT (Data Monitoring)	Enable/disable the real-time FFT analysis. It is set to Disable initially.
Data View Setting	Set the style of Data View window
Spectrum View Setting	Set the style of Spectrum View window
Data Source Setting	Set the configuration of the data source

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Log File Viewer



Function Panel Items and Descriptions

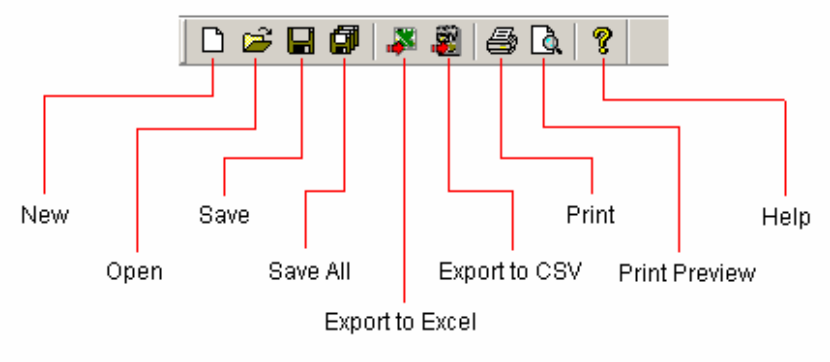
Item	Description
Load Logged Data	Load the logged data and display on Data View window
Data View	Show the Data View window if it is not shown. Make the Data View window the active window. The Data View window pops up to the top.
Spectrum View	Show the spectrum View window if it is not shown. Make the Spectrum View window the active window. The Spectrum View window pops up to the top.
Show the manipulation panel of data view	Show the manipulation panel of data view
Show the manipulation panel of spectrum view	Show the manipulation panel of spectrum view
Refresh the data view	Redraw the contents of Data View window
Perform FFT	Perform FFT analysis on the acquired data
Data View Setting	Set the style of Data View window
Spectrum View Setting	Set the style of Spectrum View window
Change File	Change the log data file

2.3.3 Message Window

Message Window shows the status and error messages.

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2.4 Toolbar



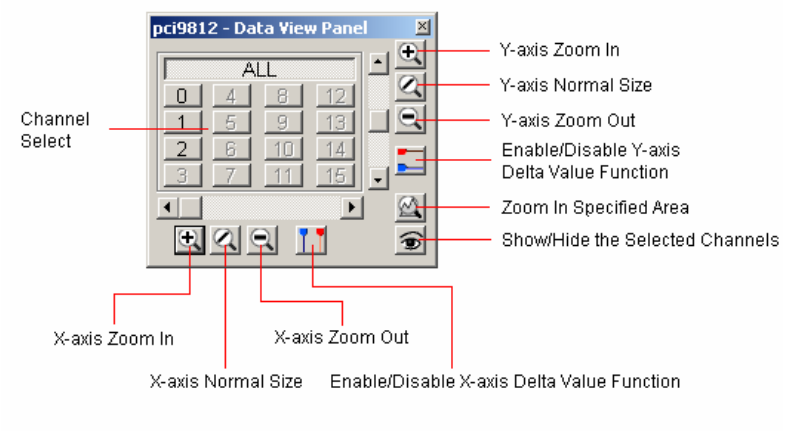
Toolbar Buttons and Descriptions

Item	Description
New	Creates a new project or data source
Open	Open an existing data source or project
Save	Save the current data source
Save All	Save the project and all of the data sources
Export to Excel	Export the current data to an Excel file
Export to CSV	Export the current data to an CSV file
Print	Print the current data
Print Preview	Preview the print result
Help	DAQCreator online help

2.5 Manipulation Panel of Data/Spectrum View Window

The *Manipulation Panel* of Data View or Spectrum View window does not appear initially. You can click the **Show manipulation panel of data view** or **Show manipulation panel of spectrum view** button to make it visible. It helps you view or manipulate the data. You can also make the manipulation function buttons bundled on the Data View or Spectrum View window by checking the *Function buttons* check box on the *Data View Setting* or *Spectrum View Setting* dialog box.

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Item	Description
Channel Select	Select the channel where data will be acquired . You can select all channels by clicking the **ALL** button.
X-axis Zoom In	Zoom in on X-axis (horizontal)
X-axis Normal Size	Make the X-axis to initial normal size
X-axis Zoom Out	Zoom out on X-axis (horizontal)
Enable/Disable X-axis Delta Value Function	If the function is enabled, two pointers appear on the top of the Data/Spectrum View and the *Delta Value Display* appears. You can move the pointers to check the value difference between two points. Please refer to the *Figure 2-1* below.
Y-axis Zoom In	Zoom in on Y-axis (vertical)
Y-axis Normal Size	Make the Y-axis to initial normal size
Y-axis Zoom Out	Zoom out on Y-axis (vertical)
Enable/Disable Y-axis Delta Value Function	If the function is enabled, two pointers appear on the left of the Data/Spectrum View and the *Delta Value Display* appears. You can move the pointers to check the value difference between two points. . Please refer to the *Figure 2-1* below.
Zoom In Specified Area	Pressing this button to enable the special zoom in function. You can drag a rectangle area on the Data/Spectrum View with the mouse. Then the Data/Spectrum View zooms in to show the area on the whole Data/Spectrum View.
Show/Hide the Selected Channels	Show or hide the selected channels. It is a toggle button.

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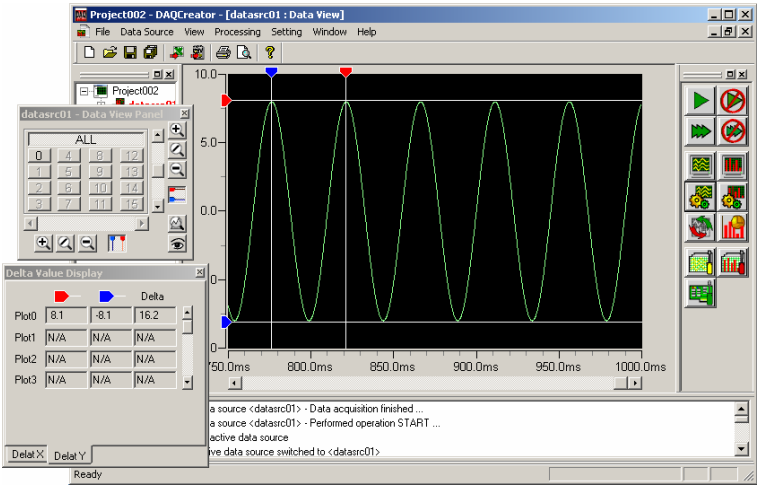


Figure 2-1

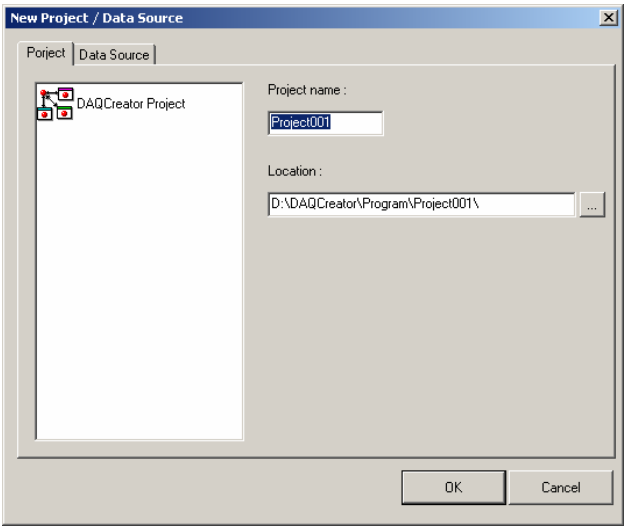
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3

Project Wizard

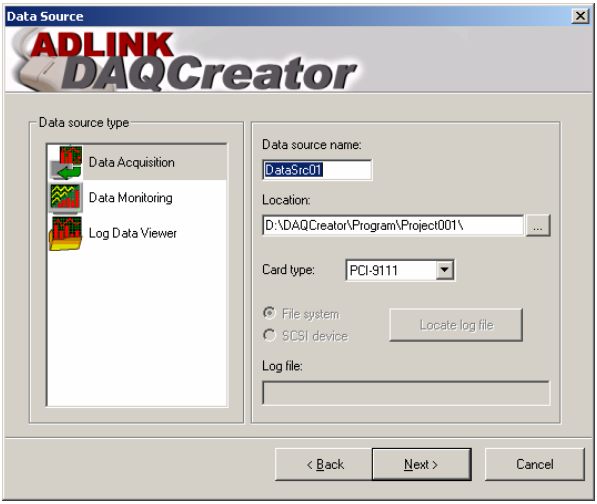
This chapter is intended to familiarize you quickly with the DAQCreator's *Project Wizard*. The *Project Wizard* guides you to create a new project step by step.

(1) The following is the first step of the *Project Wizard*. You can type the project name and set the location where you would like to save the project data. Then click the **OK** button to go to the next step.



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(2) The *Data Source* window appears. Here a data source can be added to the project. With the *Project Wizard* you can set one data source. You can add more data sources in the DAQCreator main window.



There are three data source types:

1. Data Acquisition: Read a certain amount of data in one-shot
2. Data monitoring: Real-time monitor the data
3. Log Data Viewer: The data been logged to the disk

You can select one data source type, enter the data source name and location, and select the card type or log file name, then click the **Next** button to go to the next step.

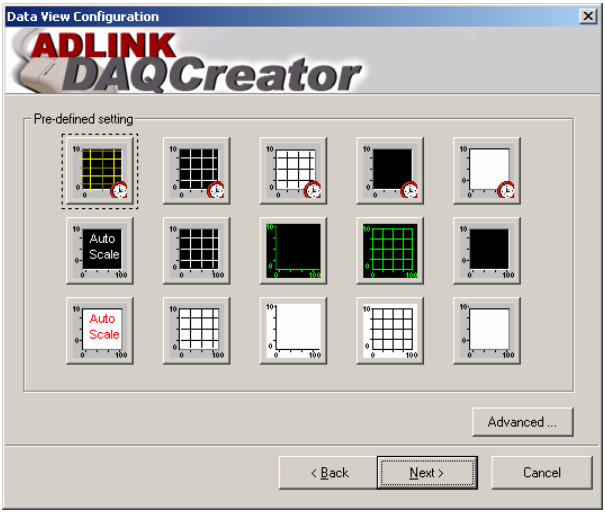
(3) If the data source type is Data Acquisition or Data Monitoring, the *Data Acquisition Configuration* window will appears.

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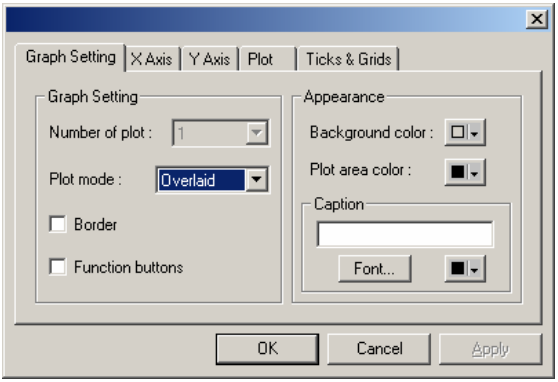
You can set the data acquisition related parameters, including the total number of channels, sampling rate, read count, clock source, etc. you can also select whether to log the input data to hard disk. The detailed description of this window can be found in chapter 4.

(4) The next step is the *Data Viewer Configuration*.

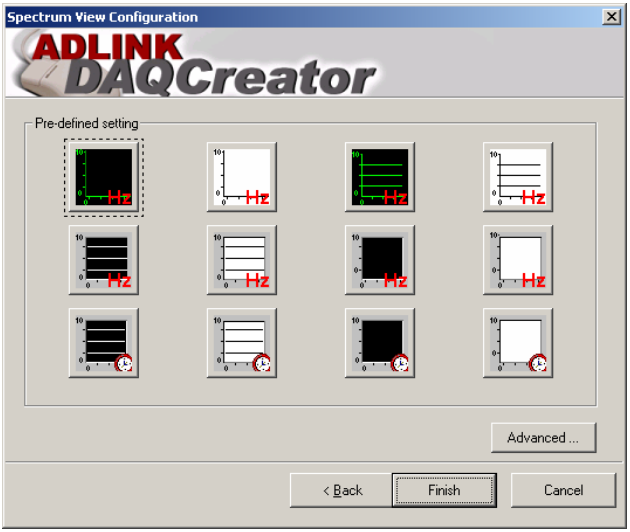


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In this step you can configure the appearance of the data viewer panel. Several pre-defined style can be selected. You can click the **Advanced** button to do more advanced setting.



(5) The next step is the *Spectrum Viewer Configuration*. In this step you can configure the appearance of the *Spectrum View* window. Several pre-defined style can be selected. You can click the **Advanced** button to do more advanced setting.



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Click the **Finish** button and you finish creating a new project. The project already contains a data source, which you configure in the *Project Wizard*.

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4

Configuration

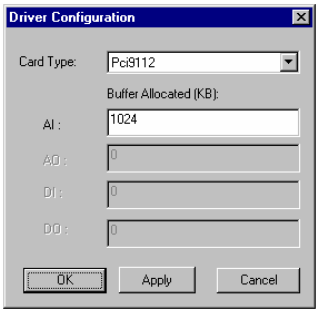
4.1 Hardware Device Configuration

NuDAQ Configuration Utility*, PciUtil,* is used to set/modify the kernel buffer sizes of continuous AI, AO, DI and DO operations. Only the AI and DI sizes are related to DAQCreator. PCI-9xxx cards need kernel AI buffers. PCI-7200 and PCI-7300A needs kernel DI buffers. The buffer size may affect the behavior or performance of the data acquisition.

NuDAQ Configuration Utility (PciUtil)

Windows 98/2000/XP

The main window of NuDAQ Configuration utility, *PciUtil*, is shown as the following window.



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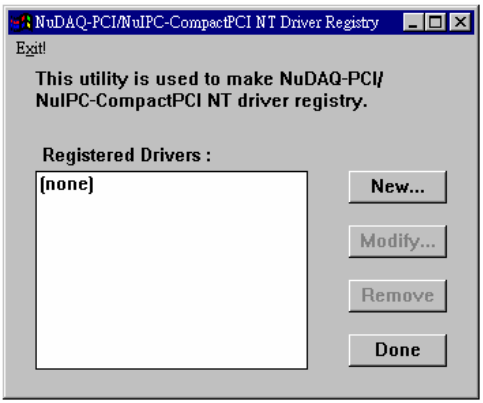
From this window, users can select the device they want to configure and type the value in the box corresponding to AI, AO, DI, or DO according to the requirements of the application. The *Buffer Allocated* to AI, AO, DI, DO represent the physical contiguous kernel buffer size allocated for the continuous analog input, analog output, digital input, digital output respectively. Its unit is Kbytes, i.e. 1024 bytes. Only the fields that are available for the card type are enabled, the others are grayed out. The device driver will try to allocate the size of memory at system startup time. If the system is unable to provide the memory size specified, the device driver will allocate the largest memory size it can. The information of actual kernel buffer size can be found on the *Data Source Browser Panel*.

After the device configuration of the driver is completed, click **Apply**. When all of the device configurations you wish to modify are done, click **OK** to exit the utility. To make the configuration modification effective, you must restart Windows 98/2000/XP system.

The size of kernel buffer is the maximum memory size that DMA or Interrupt transfer can be performed. That is, the maximum data size that can be acquired in one continuous input operation. The buffer size may affect the behavior or performance of the data acquisition. Please refer to the next section for further details.

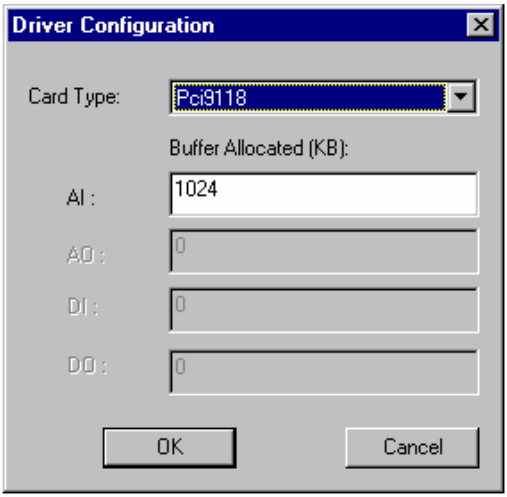
Windows NT 4.0

The main window of DAQ Configuration utility is shown as the following window. In Windows NT system, if any PCI card driver has been registered, it will be shown on the *Registered Driver* list.



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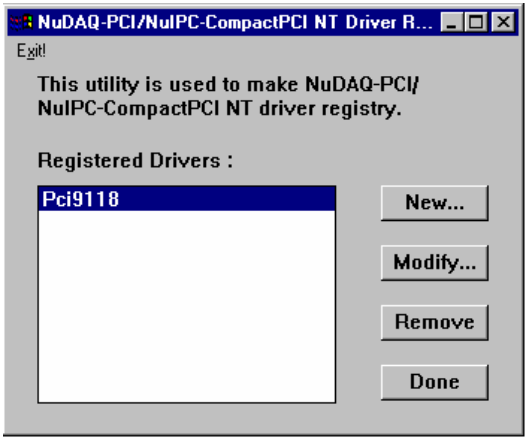
To register one of PCI card drivers, click the **New** button and a *Driver Configuration* window appears.



In this window, users can select the device they want to register and input the parameters in the box corresponding to AI, AO, DI, or DO for the requirements of the application. The *Buffer Allocated* to AI, AO, DI, DO represent the physical contiguous kernel buffer sizes allocated for continuous analog input, analog output, digital input, and digital output. Its unit is Kbytes, i.e. 1024 bytes. Only the fields that are available for the card type are enabled, the others are grayed out. The device driver will try to allocate the size of memory at system startup time. If the system is unable to provide the memory size specified, the device driver will allocate the largest memory size it can. The information of actual kernel buffer size can be found on the *Data Source Browser Panel*.

After the device configuration of the driver is completed, click **OK** button to register the driver and return to the main window. The driver just registered will be shown on the registered driver list as the following figure:

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Users can select the **Exit!** command on the menu bar or **Done** button to exit the driver registry utility. To make the registered drivers work, you must restart Windows NT.

The size of kernel buffer is the maximum memory size that DMA or Interrupt transfer can be performed. That is, the maximum data size that can be acquired in one continuous input operation. The buffer size may affect the behavior or performance of the data acquisition. Please refer to the next section for the details.

Kernel Buffer Size Setting

Data Acquisition Data Source

The Data Acquisition task inputs the specified amount of data in one-shot. The kernel buffer actually is the buffer for continuous analog input. However if the size you specified exceeds the kernel buffer size, DAQCreator uses double-buffering input to achieve the Data Acquisition task. Please refer to *Appendix B Double Buffering Principle* for more information. We suggest you set the largest kernel buffer possible. If there is system memory limitation, the kernel buffer size should be larger than one tenth of the specified input data samples per second in order to minimize the interruption to the system

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Data Monitoring Data Source

DAQcreator uses double-buffering input to achieve the Data Monitoring task. Please refer to *Appendix B Double Buffering Principle* for more information. The kernel buffer size is the maximum possible size of the circular buffer. DAQCreator calculates and determines the size of the circular buffer for you. The calculation result is always 2^n x 1024 samples. The calculation principles are as follows:

(1) DAQCreator finds the most suitable size that half-ready happens every 50 to 100 msec.

Example

Sampling rate: 25,000 samples/second

The circular buffer size: 4096 samples. That is, half-ready happens about every 82 msec, and 2048 samples are acquired and displayed each time.

Therefore you have to set the kernel buffer size larger than the size of 4096 samples.

(2) If the input rate is high, the screen display takes a lot of system resources. Therefore if the input rate is higher than 200K samples/second and log data is enabled, DAQCreator does not display the data on the Data View window. In this situation, DAQCreator calculates the base number according to principle (1), and then multiplies the number by a factor of 2, 4, 8, or 16. DAQCreator selects the largest factor it can. Please note the circular buffer size cannot exceed the kernel buffer size. The adjustment is because the large circular buffer makes the performance of data logging to disk better.

Example

Suppose each datum is 2 bytes; the kernel buffer size is set to 40x1024 Kbytes = 20 Mbytes.

Sampling rate: 10,000,000 samples/second

The base number: 1024x1024 samples = 2048K bytes = 2 Mbytes

The circular buffer size: 2 Mbytes x 8 = 16 Mbytes

The half-ready happens about every 419 msec, and 4 mega samples are acquired and stored to the disk each time.

The half-ready happens about every 82 msec, and 2048 samples are acquired and displayed each time.

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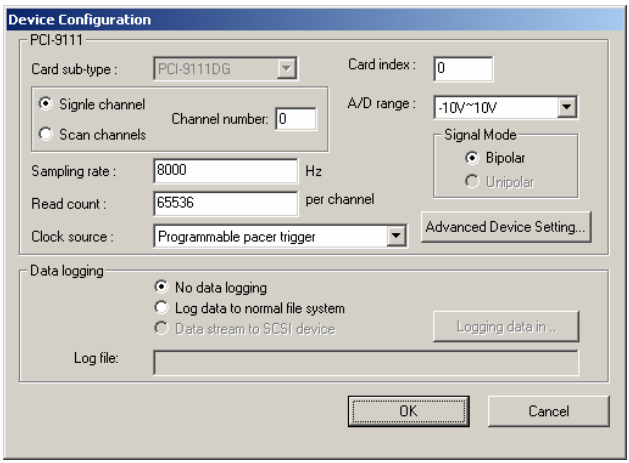
Therefore you have to set the kernel buffer size larger than 4096 samples.

For high-speed stream to disk application, we suggest you set a large size of kernel buffer to reduce the data lost possibility.

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4.2 Data Source Configuration

Clicking the **Data Source Setting** button on the *Function Panel* or the **Data Source** command from the *Setting* menu will display the *Device Configuration* window. The *Device Configuration* window includes the general setup parameters for the device. These parameters are general for all kinds of the ADLINK DAQ devices.

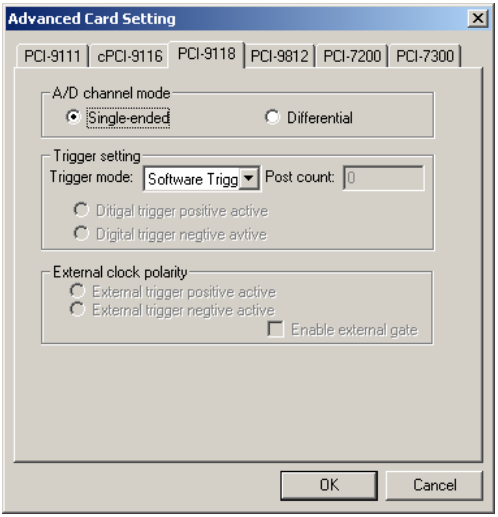


Item	Description
Card index	The index number of the card belonging to the same card type series. The index number setting is according to the PCI slot sequence on the main board. The first card is with index 0. The following cards on the same row are in the same card type series: PCI-9111DG, PCI-9111HR PCI-9112 PCI-9113 PCI-9114DG, PCI-9114HG cPCI-9116 PCI-9118DG, PCI-9118HG, PCI-9118HR PCI-9812, PCI-9810 PCI-7200 PCI-7300A

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Channel number	With the *Single channel* checked, please specify the channel to input the data. With *Scan channels* checked, please specify the end channel of the channel scan.
Sampling rate	The sampling rate in Hertz for each channel
Read count	For Data Acquisition data source, this indicates the total amount of data to acquire for each channel. For Data Monitoring data source, this field is of no use.
Clock source	The clock source for A/D conversion, either Programmable pacer trigger of External signal trigger
Signal mode	The analog input range is bipolar or uni-polar
A/D range	The A/D range setting
Data logging	Whether or not to log data to disk. You have to specify the path and file name if you choose to log data.

If the device has additional parameters, you can click the **Advanced Device Setting** button to display the *Advanced Device Setting* window.



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PCI-9111

Item	Description
Enable pre-trigger	Enable pre-trigger mode
Trace count	The number of data will be accessed after trigger event.

cPCI-9116

Item	Description
Scan interval	The length of the scan interval
Common mode	Local ground or User defined common mode
A/D channel mode	A/D channel input mode, single-ended or differential
Trigger mode	software trigger, post trigger, pre-trigger, middle trigger, or delay trigger
Enable re-trigger	re-trigger in an acquisition if enabled
Enable MCounter	If MCounter is enabled. The trigger signal is ignored before M terminal count is reached.
PostCnt	The number of data will be accessed after the trigger event. It is only available for middle trigger and delay trigger.
ReTrgCnt	The accepted trigger times in an acquisition
MCnt	The counter value of MCounter
Trigger Polarity	The trigger polarity, positive or negative
Delay source	Delay in samples or delay in time base

PCI-9118DG/HG/HR

Item	Description
A/D channel mode	The A/D channel input mode, single-ended or differential
Trigger mode	software trigger, post trigger, pre-trigger, or about trigger
Post count	The number of data will be accessed after trigger event
Trigger polarity	The trigger polarity, positive or negative
External clock polarity	The external clock polarity, positive or negative

PCI-9812/9810

Item	Description
Trigger mode	software trigger, post trigger, pre-trigger, middle trigger, or delay trigger

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Trigger source	The trigger source
Post count	The number of data will be accessed after the trigger event. It is only available for middle trigger and delay trigger.
Trigger level	The analog trigger level in volts
Trigger polarity	The trigger polarity, positive or negative
Clock source setting	Frequency of clock source is higher or lower than the PCI clock frequency.

PCI-7200

Item	Description
Wait I_TRG to start DI	Whether to wait for the I_TRG trigger to start DI. If this is not checked, the DI starts immediately
I_TRG polarity	I_TRG signal is rising or falling edge active
I_REQ polarity	I_REQ signal is rising or falling edge active

PCI-7300A

Item	Description
Wait I_TRG to start DI	Whether to wait for the I_TRG trigger to start DI. If this is not checked, the DI start immediately
DITRG polarity	I_TRG signal is rising or falling edge active
DIREQ polarity	DIREQ signal is rising or falling edge active
DIACK polarity	DIACK signal is rising or falling edge active
Port A terminator ON	Port A terminator is on or off

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4.3 Data View and Spectrum View Configuration

Selecting the **Data View Setting** or **Spectrum View Setting** button on the *Function Panel* or the *Data View* or *Spectrum View* command from the *Setting* menu will display the *Data View Setting* or *Spectrum View Setting* window. You can set the style of the Data View and Spectrum View to fit your requirements. The following diagram is a Data View window.

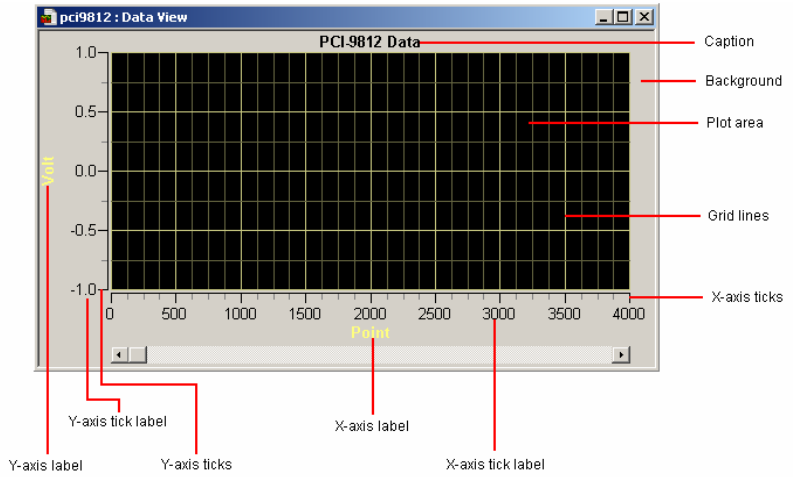
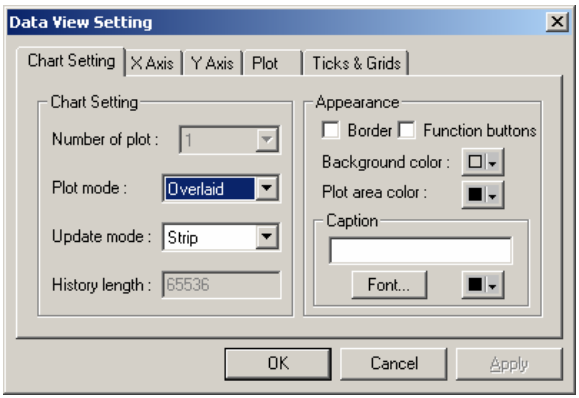


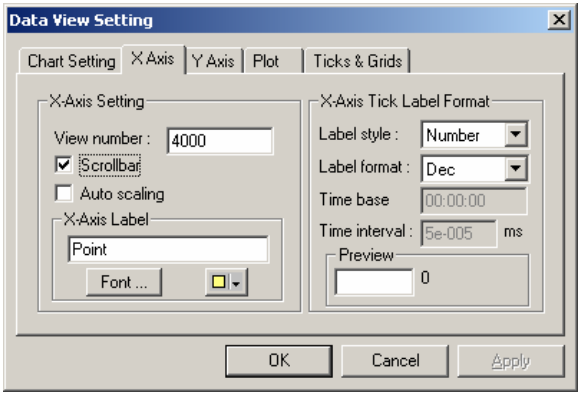
Chart Setting Page



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Item	Description
Number of plot	The value is determined by the number of channels of data sources. You cannot change this value.
Plot mode	Overlaid: all channels display on the same chart area Stack: Each channel display on one chart area
Update mode	Three update modes can be selected, Strip, Scope, and Sweep.
History length	The amount of data samples stored in the chart. It is determined by DAQCreator.
Border	Show/hide the border of the chart
Function buttons	Show/hide the function buttons of the chart. For usage of the function buttons, please refer to *section 2.5 Manipulation Panel of Data/Spectrum View Window*.
Background color	Background color
Plot area color	Plot area color

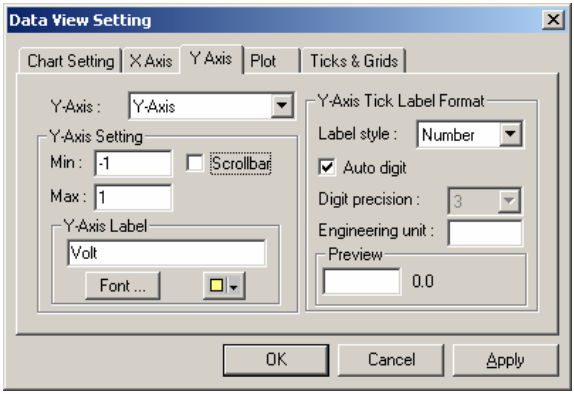
X Axis Page



Item	Description
View number	The amount of data that can display on the plot area
Scrollbar	Enable/disable the scrollbar
Auto scaling	Enable/disable X-axis auto scaling
X-axis label	X-axis label
X-axis tick label format	Three styles can be chosen, Number, Time, and Frequency. For each style, you can set the label format. If the Time style is chosen, you have to set Time base and Time interval. The Time base means the start time label. The Time interval means the time interval between each data samples.

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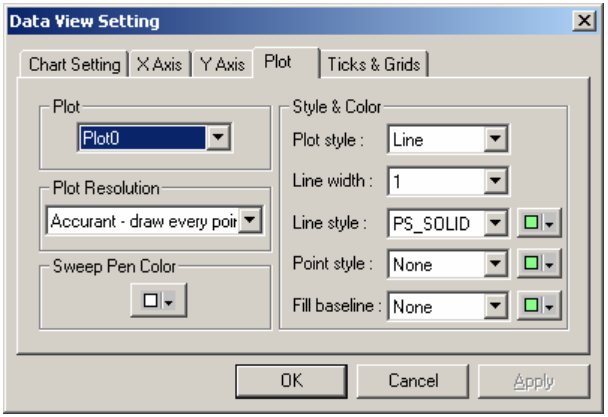
Y Axis Page



Item	Description
Min and Max	Set the range of Y-axis
Scrollbar	Enable/disable the scrollbar
Auto scaling	Enable/disable X-axis auto scaling
Y-axis label	Y-axis label
Y-axis tick label format	Three styles can be chosen, Number, Scientific, and Currency. You can type the Engineering unit to display after number. With the Auto digit checkbox unchecked, you can set the digits precision.

Plot Page

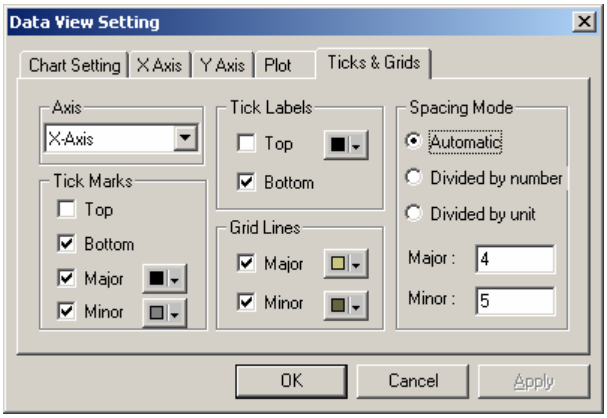
You can set the attributes of each plot.



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Ticks & Grids Page

You can set the attributes of the ticks and grids of X-axis and Y-axis.



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5

Data Acquisition and Analysis

5.1 Data Acquisition

The *Data Acquisition* data source links to an ADLINK DAQ device. The input data operation is to read a certain amount of data in one-shot. The operation completes and stops as the specified amount of data are acquired.

The data are displayed on the *Data View* window. You can close the *Data View* window if you do not want to display the data on screen. (For Example, you only want to save the data to disk.)

You can click the **Start** button on *Function Panel* or select the **Start** command from the *Data Source* menu to start the data acquisition operation on the current active data source. The **Start All** button on the *Function Panel* or the **Start All** command from the *Data Source* menu is used to start the operation on all of the data sources of the project.

When all of the data are acquired, you can perform FFT spectrum analysis on the data. You can click the **Perform FFT** button on the *Function Panel* or select **FFT** command from the *Processing* menu to start the analysis. The analysis result is displayed on *Spectrum View* window.

Note: (1) DAQCreator does not display digital input data from PCI-7200 or PCI-7300A. For data sources with digital input device, there are no *Data View* and *Spectrum View* windows.

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(2) If the input data size specified is larger than the kernel buffer size, DAQCreator uses double-buffering input to achieve the Data Acquisition task. In this situation, the device might overwrite data before DAQcreator has copied it to the data buffer (i.e. data lost happens). Whether the overwriting happens depends on your systems performance. DAQcreator must copy the data at least as fast as the rate at which the NuDAQ device is reading data.

5.2 Data Monitoring

The *Data Monitoring* data source links to an ADLINK DAQ device. The input data operation is to input data continuously. Therefore you can real-time monitor the data. The operation does not stop unless you click the **Stop** button on the *Function Panel* or select the **Stop** command from the *Data Source* menu.

The data are displayed on the *Data View* window. You can close the Data View window if you do not want to display the data on screen. (For Example, you only want to save the data to disk.)

Note: If the input rate is high, the screen display takes a lot of system resources. Therefore if the input rate is higher than 200K samples/second and log data is enabled, DAQCreator automatically hides the Data View window and does not display the data in order not to affect the data logging operation.

You can click the **Start** button on the *Function Panel* or select the **Start** command from the *Data Source* menu to start the data monitoring operation on the current active data source. The **Start All** button on the *Function Panel* or the **Start All** command from the *Data Source* menu is used to start the operation on all of the data sources of the project.

DAQCreator supports FFT spectrum analysis. You can analyze the analog input data. If the FFT analysis is enabled, by pushing the **Enable/Disable Real-time FFT** button on *Function Panel*, the FFT analysis is performed for every one screen of data acquired. The result is displayed on the *Spectrum View*.

Note: (1) DAQCreator does not display digital input data from PCI-7200 or PCI-7300A. For data sources with digital input devices, there are no *Data View* and *Spectrum View* windows.

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(2) Data Monitoring data source does not retain all of the input data. It only retains certain amount of the latest data. You can find the total number of the retained data in the *History length* field on the *Data View Setting* window. The number is determined by DAQCreator, you are not allowed to change this parameter.

(3) The maximum total number of data samples that can be displayed by *Data View* is 2G.

5.3 Log Data Viewer

The *Log Data Viewer* data source links to a log data file (.dat) or the header file of the SCSI hard disk data (.s2d). You can load and display the data on the *Data View* window.

You can click the **Load Logged Data** button on the *Function Panel* to load the data to the memory and display it on the *Data View* window.

Note:(1) The largest size of .dat data file that DAQCreator can load is 2GB.

(2) If the SCSI hard disk data (with header file .s2d) exceeds 1GB, DAQCreator converts the data to multiple .dat data files with each file sized 1GB, and loads the first file to *Data View*.

When all of the data are loaded, you can perform FFT spectrum analysis on the data. You can click the **Perform FFT** button on the *Function Panel* or select **FFT** command from the *Processing* menu to start the analysis. The analyzed result is displayed on the *Spectrum View* window.

Note: DAQCreator does not display digital input data. For the data source links to the file containing data from PCI-7200 or PCI-7300A device, it has no *Data View* and *Spectrum View* windows. Also the **Perform FFT** button on *Function Panel* is disabled.

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6

Data Logging

You can configure the data source to save the input data to disk. DAQCreator supports two kinds of data logging.

- Log data to normal file system
- Stream data to SCSI hard disk

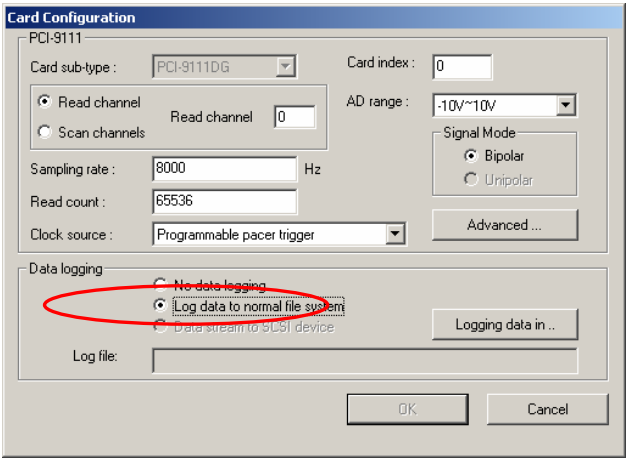
The Data Acquisition data source writes data to disk after the total amount of data are acquired. The Data Monitoring data source writes data to disk in real time. Actually the Data Monitoring operation is implemented by double-buffered input. DAQCreator displays and writes data to disk every time the half of the circular buffer is ready.

6.1 Log Data to Normal File System

Save data to a binary file through file system. The performance depends on the system and hard drive specifications. Normally with an IDE hard drive, the performance is about 1 ~ 3 MB/sec. With a SCSI hard drive, it can increase to about 10MB/sec.

To log data to normal file system, you can check **Log data to normal file system** in the *Device Configuration* window. Then click **Log Data In** button to set the path and the file name. The file name extension is *dat*.

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If you want to view the data outside DAQCreator, please refer to *Appendix A .DAT File Format* for the format of the .dat log file.

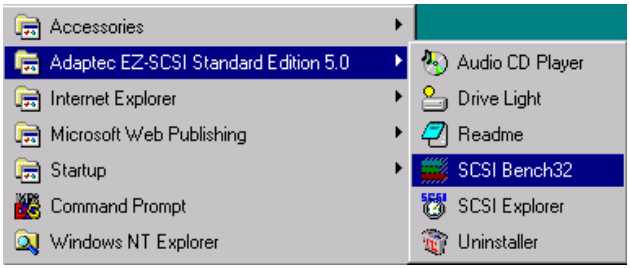
6.2 Stream Data to SCSI Hard Disk

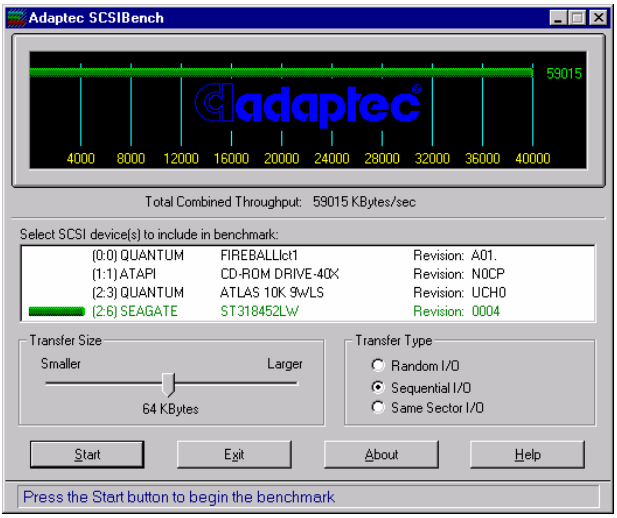
For users that want to do high-speed data logging, DAQCreator provides a solution. DAQCreator can stream the data to SCSI disk directly. The stream to disk operation does not go through the file system. To do this operation, you must install an Adaptec SCSI card and SCSI hard disks. DAQCreator writes data to SCSI disk by using Adaptec ASPI driver. It can achieve 30 ~ 40 MB/sec writing speed, depending on the SCSI hard drive performance. DAQCreator creates a Stream-to-Disk header file for the data. The header file name extension is .s2d.

6.2.1 ASPI Installation Check

The ASPI library comes with the *EZ-SCSI*, the software bundled with the Adaptec products. To setup the ASPI library, please install the *EZ-SCSI*. Before you stream the acquisition data to the SCSI disk, please check the installation of the ASPI and SCSI devices. *SCSI Bench32*, the SCSI bench mark utility bundled with the Adaptec SCSI adapter card will help you to check the operation of the ASPI library.

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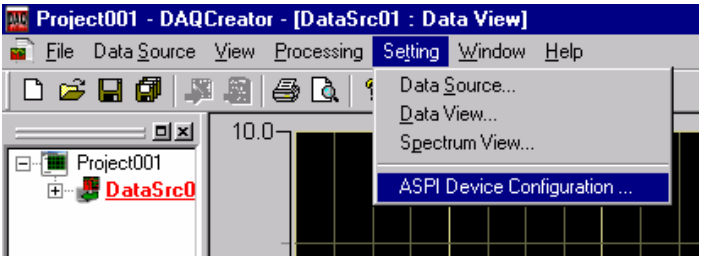
If errors occurred, please refer to the *Installation Guide of Adaptec* to solve the problem.

In addition, updating the ASPI to V4.70 is recommended. You could find the *version detection utility* and the *ASPI package 4.70* from Adaptec web site.

6.2.2 SCSI Device Configuration

Before using stream to SCSI disk function, you have to configure the SCSI disks into an ASPI logic device. Multiple SCSI disks can be configured into one ASPI logic device. You could start the SCSI configuration by selecting the **ASPI Device Configuration** command from the **Setting** menu.

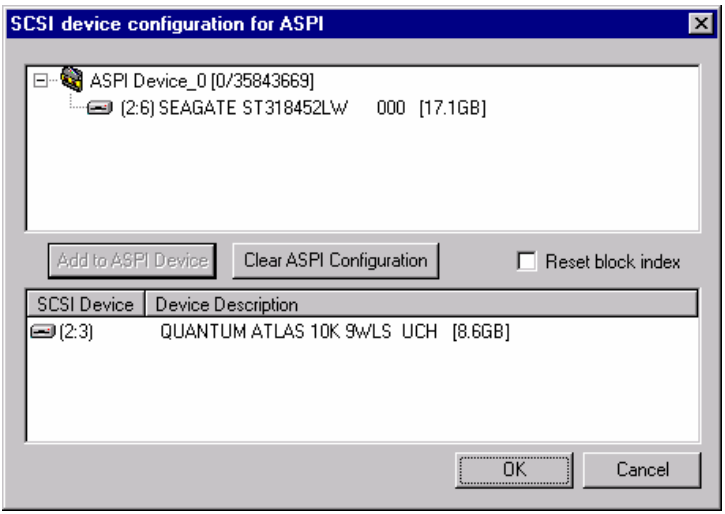
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By using the ASPI library, the configuration utility scans the SCSI bus and lists all devices installed on the SCSI bus. The main functions are listed below:

Add to ASPI Device button: add individual SCSI disk into logic device. **Clear ASPI Configuration** button: remove all configured SCSI disks. **Reset block index** check box: inform DAQCreator to reset the block index.

Finally, click the **OK** button to finish the SCSI configuration.



Note: DAQCreator stores the raw data without a file system. Any SCSI disk configured for ASPI library will destroy all data in its file system. Please check device description before you choose the target SCSI disks.

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6.2.3 ASPI Extractor

Besides the data conversion function embedded in the *Log Data Viewer*, we also provide individual utility to extract data from ASPI devices. The main functions are listed below:

Browse button for input file: show the file dialog to choose the Stream to Disk header file.

Load button for input file: display the information recorded in Stream to Disk header file, including Start block index, Total sectors and the ASPI configurations.

Browse button for output file: show the file dialog to locate the file name that will store the acquisition data extracted from SCSI devices.

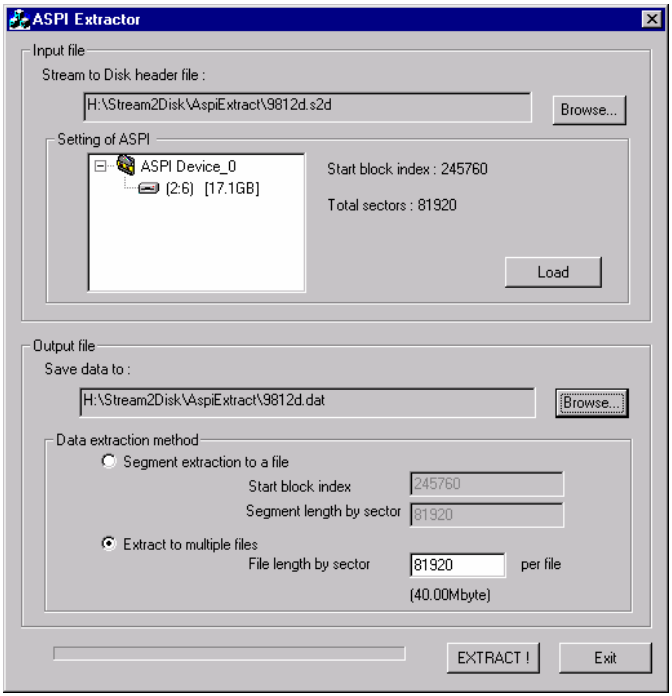
For the data reading, we provide two methods to extract the sectors from SCSI devices:

Segment extraction to a file: extract data from the SCSI disk to a file. You can specify the start block and the segment length by sector. The largest data size that can be extracted to a file is 2G bytes. If you want to extract more than 2G bytes of data, please select the other option *Extract to multiple files*.

Extract to multiple files: extract all sectors and store data to multiple files with configurable file sizes.

After choose the input file and output file, you can click the **Extract!** button to save the acquisition data to normal file system. The progressive bar will show the extraction status.

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6.2.4 SCSI Data Reading Library

For programmers who need to read the acquisition data in their program, we provide the Win32 Dynamic-Link Library (DLL). The sample program packaged with the library demonstrates the usage of the APIs.

The DLL's file name is ASPI_Read.dll. It is copied to Windows System directory (`Windows\System for Win98, Winnt\System32 for Win NT/2000/XP`) by DAQCreator setup program. The header files, import library file, and the sample programs are copied to <DAQCreator_InstallDir>\ASPI_Read_Lib directory.

The function reference is listed below:

int SetASPIFromHeader (char* s2d_pathname)

Parameters:

s2d_pathname : [in] Pointer to a null-terminated string containing the path name of the Stream-to-Disk header file.

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Return:

ERR_ASPI_READY, ERR_HEADERFILE_OPEN, ASPI_OK

unsigned long GetFileLengthBySector (void)

Return:

The total sectors recorded in Stream-to-Disk header file.

unsigned long GetStartIndexSector (void)

Return:

The logic start index recorded in Stream-to-Disk header file.

int read_large_block (DWORD* start_block_index, char* buf, DWORD access_blocks)

Parameters:

start_block_index: [in,out] Pointer to the start block index for sector reading. After reading, the start_block_index will be updated automatically.

buf: [in] Point to a buffer that receives the data.

access_blocks: [in] the value specifies the size, in sectors, of reading data. For performance concern, giving the value large than 128 is recommended.

Return:

ASPI_OK, ERR_ASPI_READY, ERR_ASPI_EXCESS, ERR_ASPI_READING.

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Appendix A .DAT File Format

This appendix describes the file format of the .dat files logged through file system.

The data file includes two parts, Header and Data Block. The file structure is shown in the figure below:



Header

The *header* part records the information related to the stored data and its total length is 60 bytes. The data structure of the file header is as follows:

Header *Total Length: 60 bytes*			
Elements	**Type**	**Size (bytes)**	**Comments**
ID	char	10	file ID *ex. ADLinkDAQ1*
card_type	short	2	card type *PCI-9111DG: 20* *PCI-9111HR: 21* *PCI-9112: 22* *PCI-9113: 23* *PCI-9114DG: 24*

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			PCI-9114HG: 25 *PCI-9118DG: 26* *PCI-9118HG: 27* *PCI-9118HR: 28* *PCI-9810: 29* *PCI-9812: 30* *cPCI-9116: 32*
num_of_channels	short	2	The total number of scanned channels *ex. 1, 2*
channel_no	unsigned char	1	channel number where the data was read from (only available for single channel) *ex. 0, 1*
num_of_scan	long	4	the number of data for each channel
data_width	short	2	the data width 0: 8 bits, 1: 16 bits, 2: 32 bits
channel_order	short	2	the channel scanned sequence 0: normal (ex. 0-1-2-3)
ad_range	short	2	the AI range code *1: +/-10V* *2: +/-5V* *3: +/-2.5V* *4: +/-1.25V* *5: +/-0.625V* *6: +/-0.3125V* *7: +/-0.5V* *8: +/-0.05V* *9: +/-0.005V* *10: +/-1V* *11: +/-0.1V* *12: +/-0.01V* *13: +/-0.001V* *14: 0-20V* *15: 0-10V* *16: 0-5V*

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			17: 0-2.5V *18: 0-1.25V* *19: 0-1V* *20: 0-0.1V* *21: 0-0.01V* *22: 0-0.001V*
scan_rate	double	8	The sampling rate of each channel
num_of_channel_range	short	2	Not used by DAQCreator
start_date	char	8	The starting date of data acquisition *ex. 12/31/99*
start_time	char	8	The starting time of data acquisition *ex. 18:30:25*
start_millisec	char	3	The starting millisecond of data acquisition *ex. 360*
reserved	char	6	not used

* If the *num_of_channel_range* is 0, the *ChannelRange* block won't be included in the data file.

* The *channel_order* is set to "custom" only when the card supports variant channel scanning order.

Data Block

The second part is the data block. The data is written to file in 16-bit binary format, with the lower byte first (little endian). For example, the value 0x1234 is written to disk with 34 first followed by 12. The total length of the data block depends on the data width and the total data count.

Card Type	**Data Format**	**Value calculation** ** channel no. (CH#)* ** A/D converted data (ND)* ** Value stored in the file*
PCI-9111DG	*Every 16-bit signed integer data:* *D11 D10 D9 ..... D1 D0 C3 C2 C1 C0* *where D11, D10, ... , D0 : A/D data*	CH# = OD & 0x0F ND = OD >>4 or ND = OD/16

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	C3, C2, C1, C0 : channel no.	
PCI-9111HR	*Every 16-bit signed integer data:* *D15 D14 D13 ..... D1 D0* *where D15, D14, ... , D0 : A/D data*	ND = OD
PCI-9112 cPCI9112	*Every 16-bit unsigned integer data:* *D11 D10 D9 ..... D1 D0 C3 C2 C1 C0* *where D11, D10, ... , D0 : A/D data* *C3, C2, C1, C0 : channel no.*	CH# = OD & 0x0F ND = OD >>4 or ND = OD/16
PCI-9113	*Every 32-bit unsigned integer data (including 12-bit unsigned A/D data):* *B31… B21 C4… C0 B15… B12 D11 D10... D0* *where D11, D10, ... , D0 : A/D data* *C4, C3, C2, C1, C0 : channel no.* *B31 ~ B21 & B15 ~ B12: don't care*	CH# = (OD >>16) & 0x1F ND = OD & 0x0FFF
PCI-9114DG PCI-9114HG	*Every 32-bit unsigned integer data (including 16-bit signed A/D data):* *B31 … B21 C4 C3 C2 C1 C0 D15 D14 ... D1 D0* *where D15, D14, ... , D0 : A/D data* *C4, C3, C2, C1, C0 : channel no.* *B31 ~ B21: don't care*	CH# = (OD >>16) & 0x1F ND = OD & 0xFFFF
cPCI-9116	*Every 16-bit signed integer data:* *D15 D14 D13 ..... D1 D0* *where D15, D14, ... , D0 : A/D data*	ND = OD
PCI-9118HR	*Every 16-bit signed integer data:* *D15 D14 D13 ..... D1 D0* *where D15, D14, ... , D0 : A/D data*	ND = OD
PCI-9118DG PCI-9118HG	*Every 16-bit unsigned integer data:* *D11 D10 D9 ..... D1 D0 C3 C2 C1 C0* *where D11, D10, ... , D0 : A/D data* *C3, C2, C1, C0 : channel no.*	CH# = OD & 0x0F ND = OD >>4 or ND = OD/16
PCI-9812	*Every 16-bit signed integer data:*	ND = OD >>4 or ND = OD/16

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	D11 D10 D9 ..... D1 D0 b3 b2 b1 b0 *where D11, D10, ... , D0 : A/D data* *b2, b1, b0 : Digital Input data.* *b3: trigger detection flag*	
PCI-9810	*Every 16-bit signed integer data:* *D9 D8 D7 .....….... D1 D0 b5 b4 b3 b2 b1 b0* *where D9, D8, ... , D0 : A/D data* *b2, b1, b0 : Digital Input data.* *b3: trigger detection flag*	ND = OD >>6 or ND = OD/64

The file is written in Binary format and can't be read in normal text editor. You can use any binary file editor to view it or the functions used for reading files, e.g. fread, to get the file information and data value. DAQCreator can load the data file as a data source. DAQCreator can export the data to Excel or CSV file format.

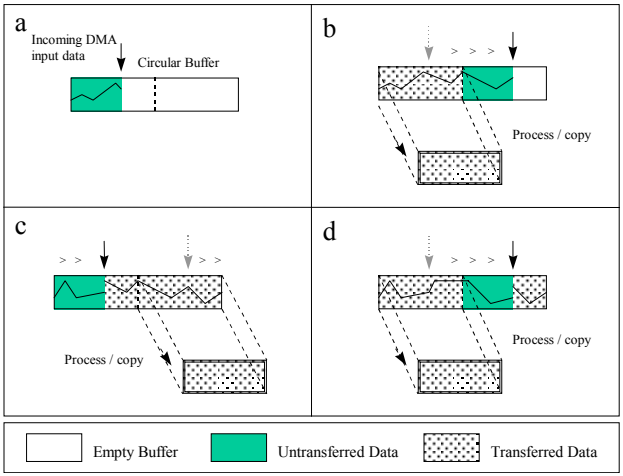
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Appendix B

Double-Buffering Principles

Double-Buffering Principle

The data buffer for double-buffered continuous input operation is a circular buffer logically. It is logically divided into two equal halves. The double-buffered input begins when device starts writing data into the first half of the circular buffer (Figure a). After the device begins writing to the second half of the circular buffer, you can process the data on the first half (for example, display the data or copy the data to another buffer) (Figure b). After the board has filled the second half of the circular buffer, the board returns to the first half buffer and overwrites the old data. You now can process the second half of the circular buffer (Figure c). The process can be repeated endlessly to provide a continuous stream of data to your application (Figure d).



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1. Before using ADLINK's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: http://rma.adlinktech.com/policy/.
2. All ADLINK products come with a limited two-year warranty, one year for products bought in China.
    - The warranty period starts on the day the product is shipped from ADLINK's factory.
    - Peripherals and third-party products not manufactured by ADLINK will be covered by the original manufacturers' warranty.
    - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ADLINK is not responsible for any loss of data.
    - Please ensure the use of properly licensed software with our systems. ADLINK does not condone the use of pirated software and will not service systems using such software. ADLINK will not be held legally responsible for products shipped with unlicensed software installed by the user.
    - For general repairs, please do not include peripheral accessories. If peripherals need to be included, be certain to specify which items you sent on the RMA Request & Confirmation Form. ADLINK is not responsible for items not listed on the RMA Request & Confirmation Form.
3. Our repair service is not covered by ADLINK's guarantee in the following situations:
    - Damage caused by not following instructions in the User's Manual.
    - Damage caused by carelessness on the user's part during product transportation.

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- Damage caused by fire, earthquakes, floods, lightening, pollution, other acts of God, and/or incorrect usage of voltage transformers.
- Damage caused by inappropriate storage environments such as with high temperatures, high humidity, or volatile chemicals.
- Damage caused by leakage of battery fluid during or after change of batteries by customer/user.
- Damage from improper repair by unauthorized ADLINK technicians.
- Products with altered and/or damaged serial numbers are not entitled to our service.
- This warranty is not transferable or extendible.
- Other categories not protected under our warranty.

4. Customers are responsible for all fees necessary to transport damaged products to ADLINK.

For further questions, please e-mail our FAE staff: service@adlinktech.com

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