AD-Logger

Configuration-based Data Logger

User's Manual

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1 Introduction to AD-Logger

1.1 What is AD-Logger?

AD-Logger is a smart and easy-to-use data acquisition software that works with all ADLINK devices which equip with analog input and digital input function. AD-Logger provides an intuitive user interface that helps complete a data acquisition application in only four steps without any programming. Get started by defining a DAQ task with the DAQPilot interactive dialog; then configure the recording conditions, and start logging for online analysis or export the data for offline analysis and post processing



1.2 Features and Highlights

- Logs data based on DAQPilot task configurations
- Supports both real-time and historical viewers
- Supports intuitive user interface as a ready-to-run application
- Supports data exporting functions for offline analysis in third party applications, including Microsoft Excel, NI® DIADem, and Mathworks MATLAB®
- Supports all ADLINK DAQ hardware
- Provides basic analysis functions, such as FFT
- Provides monitoring features via a user-friendly toolbox
- Provides a buffer monitoring mechanism to automatically evaluate the system performance to know if the captured data can be processed in real-time

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1.3 Terminology

Below are some of the terms used in this document.

Word	Description
DAQ	Data acquisition. The capture or collection of data.
Task	A DAQ task is a complete set of parameters including channels, timing, and trigger properties. A DAQ task represents a type of measurement that you want to perform. You can easily create task, modify task and delete task in AD-Logger.
Tracking	The tracking function is embedded in the DataView for you to easily trace captured data. When the tracking function is enabled, the axes will adjust their min and span values based on the tracking style. In addition to enabling tracking, all cursors will be hidden, and the axes min and span will be restored to their previous values when the axes tracking were initially disabled.
DAQPilot	DAQPilot is a task-oriented DAQ driver comes with an intuitive wizard to assist you in developing cutting-edge DAQ applications in an instant.
Buffer Mechanism	AD-Logger provides a buffer evaluation mechanism to monitor system performance of data acquisition in real-time.
Export	Output data function. You can convert the logged files to other data formats for the further processing.
FFT	Fast Fourier Transform. AD-Logger provides FFT power spectrum analysis.
Log	Data logging is the practice of saving DAQ data to hard drive.

Table 1-1: Terminology

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2 Software Installation

This section provides the installation information before you start to use AD-Logger software.

2.1 Where to Obtain AD-Logger

The AD-Logger evaluation version is available on the All-In-One CD that comes in your DAQ card package. You can also download the latest evaluation version from the ADLINK website through the following URL: http://www.adlinktech.com/MAPS/AD-Logger.html.

2.2 Before You Proceed

Before you starting to use AD-Logger software, make sure your system meets the following requirements.

System Requirements

- Windows 98/NT/2000 or 32-/64-bit editions of Windows XP/ Server 2003/Vista operating system
- Intel Pentium-class CPU or higher
- VGA display or higher
- Minimum 64 MB of memory
- Minimum 40 MB of free hard disk space
- Mouse

Please install DAQMaster before other ADLINK software for basic configuration and diagnosis. The ADLINK DAQMaster is a smart device manager that accesses ADLINK data acquisition products (refer to http://www.adlintkech.com/MAPS/DAQ-Master.html).

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2.3 Installing AD-Logger

This section provides instructions on how to install AD-Logger in your system. Prepare the ADLINK AD-Logger CD that comes with the card package.

To install AD-Logger:

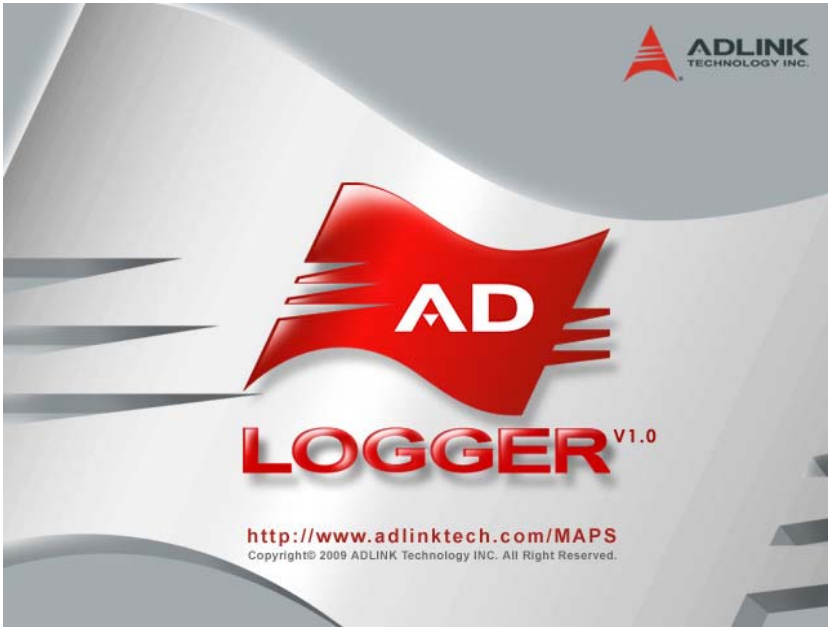
1. Place the ADLINK AD-Logger CD to the optical drive of the computer.
2. When the installation window appears, click on the AD-Logger installation button.

NOTE If Autorun is not enabled in your computer, explore the CD, and then double-click on the SETUP.EXE to display the installation window.

3. When installation is complete, simply launch AD-Logger to log data for further analysis.



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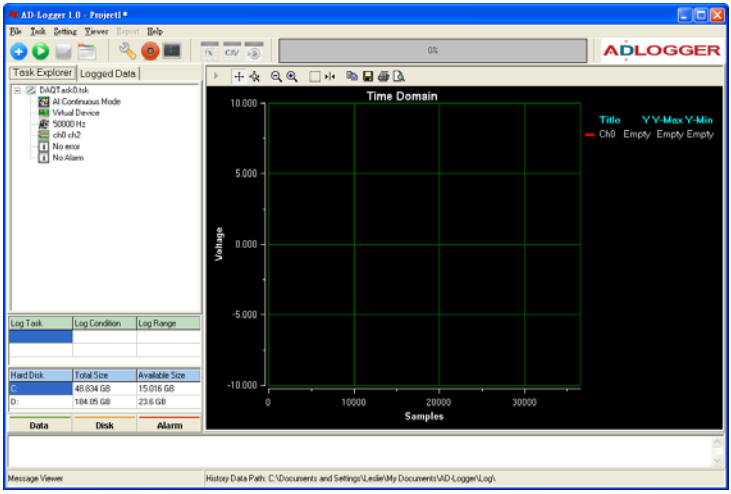
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2.4 Uninstalling AD-Logger

Uninstall AD-Logger using the “Add/Remove Programs” tool in the Control Panel in Windows.. Select AD-Logger from currently installed programs and click Change/Remove button to delete the software.

2.5 Launching the AD-Logger

To launch the AD-Logger from the Windows Start menu, click **Start** >**ADLINK**>**AD-Logger**>**AD-Logger**. The main AD-Logger window will appear.



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3 Understanding AD-Logger

3.1 Main Menu



Menu	Function
File	System commands
Task	DAQ task commands
Setting	System configuration options
Viewer	View commands
Export	Export log data commands
Help	Online help and support information

3.1.1 File Menu

The File Menu provides the following options:

File	Function
New Task	Create a new DAQ Task
Open	Open a Task or Log file
New project	Create a new AD-Logger project to perform data acquisition
Open project	Open an existing AD-Logger project
Close project	Close current AD-Logger project
Save project	Save all current data acquisition task configurations into current project
Print	Print current Data
Print Preview	Preview current Data for printing

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3.1.2 Task Menu

The Task Menu provides the following options:

Task	Function
New task	Launch the DAQPilot Interactive Dialog to create a new data acquisition task
Modify task	Launch the DAQPilot Interactive Dialog to modify The selected data acquisition task
Delete task	Delete an existing data acquisition task from the Task View Panel
Start tasks	Start to perform all data acquisition tasks on the Task View Panel
Stop tasks	Stop all data acquisition tasks on the Task View Panel

3.1.3 Setting Menu

The setting menu provides the following options:

Setting	Function
Display	Provides the Display configurations of time domain which includes X-axis, Y-axis, Appearance and Channel settings.
FFT	Provides the Display configurations of frequency domain which includes X-axis, Y-axis, Appearance and Channel settings.
Recording	Enable/Disable the function of data acquisition task. The Log functions can be stopped by manual, by pre-defined sample and by time. The location to save log data can also be selected.
Alarm Condition	Enable/Disable the Alarm functions which could be above or below a constant value.

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3.1.4 Viewer Menu

The Viewer Menu provides the following options:

View	Function
Graph Viewer	Enable/disable the time domain data display of the selected data acquisition task
FFT Viewer	Enable/disable the frequency domain data display of the selected data acquisition task
Status Viewer	Enable/disable the display of the system information, log task setting and hard disk space.
Message Viewer	Enable/disable the display of system commands and message.

3.1.5 Export Menu

The Export Menu provides the following options:

Export	Function
Excel	Export the logged data to a Microsoft Excel file
CSV	Export the logged data to a comma separated value file
Third-party	Export the logged data for the post-processing in third-party software, such as LabVIEW®, DIAdem, or MATLAB®

3.1.6 Help Menu

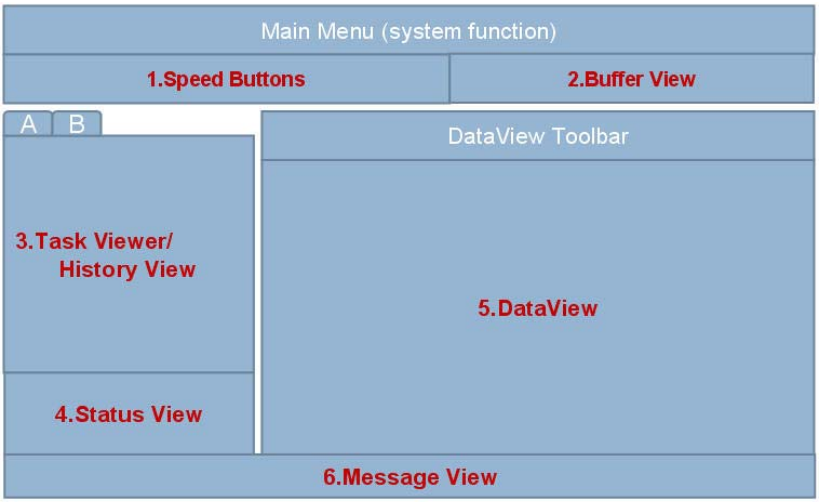
The Help Menu provides the following options

Help	Function
AD-Logger Help	Get on-line help
Contact us	Get technical support
About AD-Logger	Display the ADLINK AD-Logger version and copyright statement
About my computer	Display the system information such as the operating system version, processor and memory usage status
Register AD-Logger	Form to input the license number for using a licensed version of AD-Logger

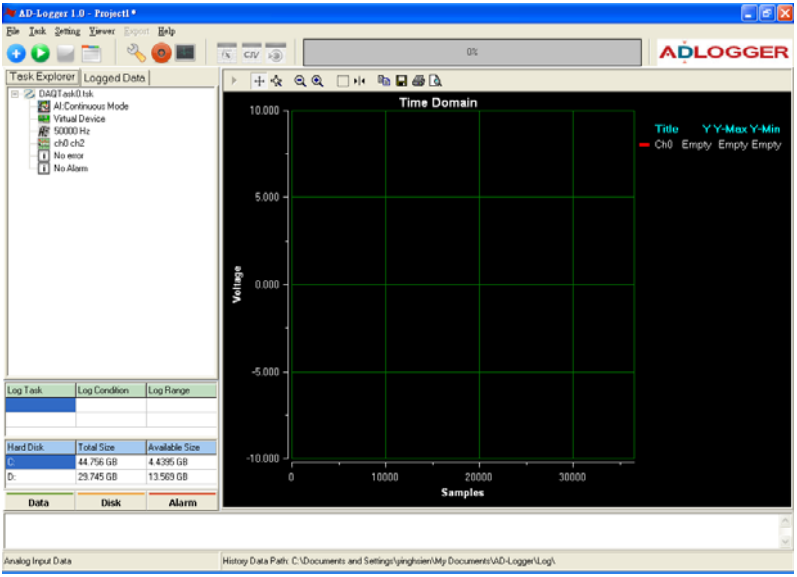
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3.2 AD-Logger Function

ADLINK AD-Logger is designed with six major function blocks that can be enabled/disabled individually for operatiosn. Refer to the block diagram below.



TabSheet A for Task View; TabSheet B for History View



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Panels	Description
1. Speed Buttons	Includes four major task operations and related functions (such as exporting data).
2. Buffer Viewer	Display the buffer status.
3. Task /History View	Display the information of existed DAQ task and history log. This part include two tabsheets : "Task Explorer" and "Logged Data"
4. Status Viewer	Display system information including the task setting, available hard disk and the system resource.
5. Data View	Display the logged data in time domain and frequency domain.
6. Message View	Display the history commands and task status

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3.2.1 Speed Buttons

These speed buttons are designed with major task commands and exporting functions. The buttons will be dynamically enabled or disabled depends on the operation mode.



Speed Buttons	Description
Create Task	Launch the ADLINK DAQPilot interactive configuration dialog to create a new data acquisition task. AD-Logger is powered by DAQPilot, so you can finish DAQ application without any programming effort.
Start	Start to perform the all data acquisition tasks
Stop	Stop all data acquisition tasks
Setting	Launch the setting form for configuration such as Graph, FFT, Log, Alarm and ADC.
Modify	Launch ADLINK DAQPilot interactive configuration dialog to modify the existed data acquisition task.
Recording	Enable/disable the recording function.
FFT	Enable/disable the power spectrum view panel
Excel	Export the logged data to an Excel file.
CSV	Export the logged data to a comma separated value file.
Third Party	Export the logged data for the post-processing in third-party software, such as LabVIEW®, DIAdem and MATLAB®.

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3.2.2 Buffer Viewer

AD-Logger provides a data buffer evaluation mechanism. The buffer evaluation mechanism will be automatically enabled to monitor and display the buffer status on the Buffer Viewer when you perform a DAQ task with recording function. The buffer status will be dynamically changed in real-time depending on system performance.



The Buffer View has following status:

Buffer View Status	Description
Blue Color	The system's performance is ample for data logging with the DAQ tasks. The buffer has more than 50 percent of available space when logging data.
Yellow Color	The buffer usage is sufficient with the the DAQ tasks. The buffer has 20 percent to 50 percent of available space when logging data.
Red Color	The buffer usage is running low with the DAQ tasks. The buffer has less than 20 percent of available space when logging data.

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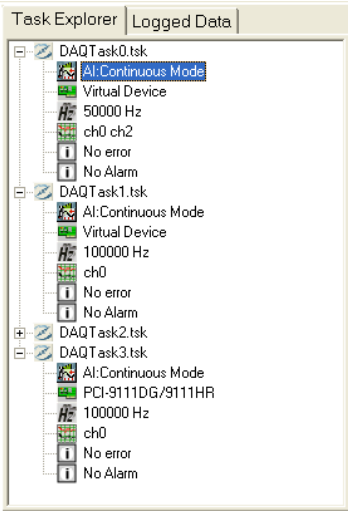
3.2.3 Task Explorer/Logged Data Viewer

The Task/History view Panel is located on the left part of the AD-Logger main window. The View Panel displays the current DAQ tasks in the Tasks panel (page 15) and history log data in the Logged Data panel (page 16).

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"Task Explorer" Tabsheet

The Tasks tabsheet displays the all DAQ tasks and related attributes in the project. The task with a blue background color is the selected task which displays logged data in the Data View Panel. You can click the task node to check the task status and double-click the task node to modify parameters via the pop-up configuration window.

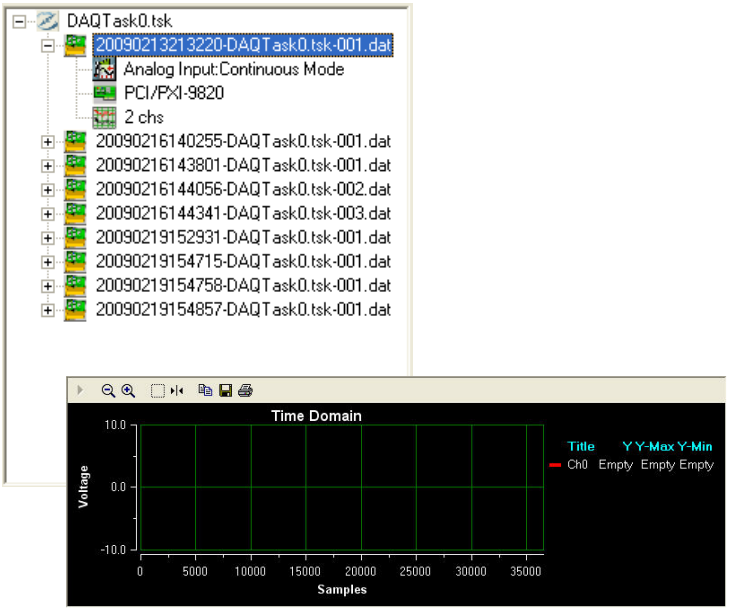


Icons	Description
	DAQ task name.
	DAQ tasks type. This icon will be dynamically changed depends on the DAQ task type.
	DAQ device type.
	Sample rate of the DAQ task.
	Enable channel(s) of DAQ task.
	Operation error message.
	Alarm status

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"Logged Data" Tabsheet

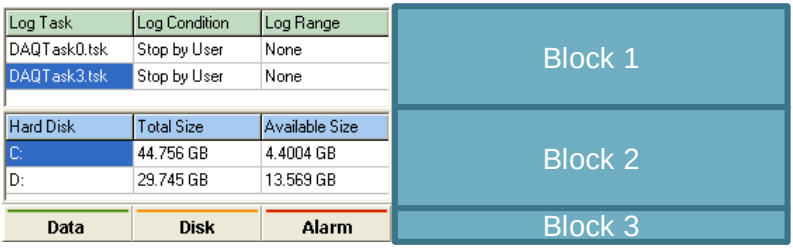
The "Logged Data" tabsheet displays the logged file(s) which are classified by the task name and sorted by logged time. You can double click the node to display the logged data value in the Data View.



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3.2.4 Status Viewer

The Status Viewer consists of three blocks. Each block is described as follows.

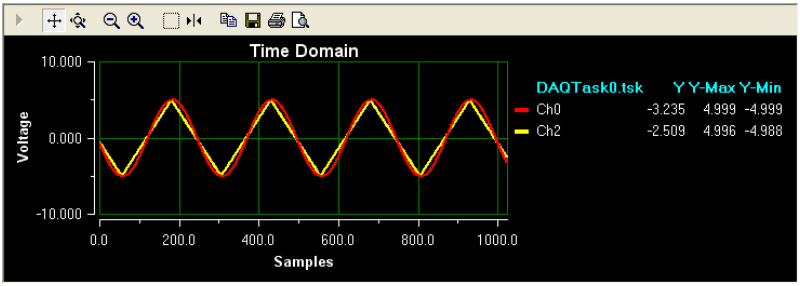


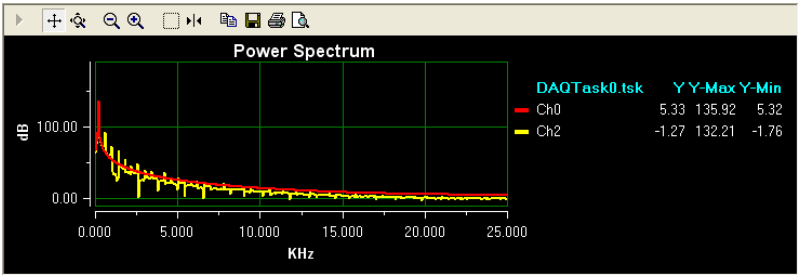
Status View	Description
Block 1	Shows the selected log task(s) and its log condition.
Block 2	Displays hard drive status
Block 3	Indicates if the following status is enabled in AD-Logger. ▶ Data: Acquiring data if this label is blinking ▶ Disk: Recording to Disk if this label is blinking ▶ Alarm: Alarm indicator

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3.2.5 Data Viewer

The Data Viewer displays the logged data in both time and frequency domains. Initially, the selected DAQ task only displays time domain data. User can enable the frequency domain data on demand. Please refer to Section 3.2.1 (Speed Buttons).





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The toolbars on the top on the time domain and frequency domain graph both provide the same function to control the data display. The functions are described as follows.

Data Viewer Toolbars	Description
 Resume	The resume button enables tracking function on all axes. When tracking function is enabled, the axes will adjust their min and span values based on the tracking style. In addition to enabling tracking, all cursors will be hidden, and the axes min and span will be restored to their previous values when the axes tracking were initially disabled.
 Scroll (Axes)	When the Axes Scroll Mode button is enabled, you can drag the axis and scroll the view. When this button is selected, the Axes Zoom Mode button is correspondingly unselected.
 Zoom (Axes)	When the Axes Zoom Mode button is enabled, you can drag the axis and zoom the view. When this button is selected, the Axes Scroll Mode button is correspondingly unselected.
 Zoom out All Axes	When this button is clicked, all axes are zoomed out by a factor 2x.When this button is clicked, the tracking function on all axes will be disabled and the view data will be frozen.
 Zoom in All Axes	When this button is clicked, all axes are zoomed in by a factor 2x.When this button is clicked, the tracking function on all axes will be disabled and the view data will be frozen.
 Zoom Box	This button allows you to band a region in the Data Viewer for zooming into. The box can start at any point, but must be dragged to the lower right to define a region for zoom function. The zoom action will affect all axes.
 Data Cursor	This button shows or hides all data cursors.
 Copy to Clipboard	This button copies the current plot image to the clipboard.
 Save to File	This button brings up a Save dialog to save the plot image to a file. You can select from bitmap, metafile, or JPEG as the file type.
 Print	This button prints the plot image.
 Preview	This button launches the Print-Preview dialog before printing out the plot image.

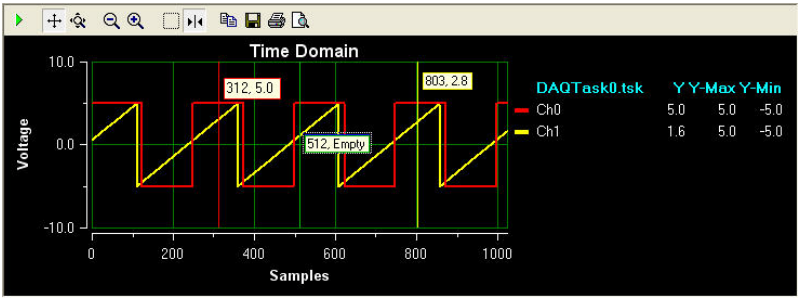
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Data Cursor

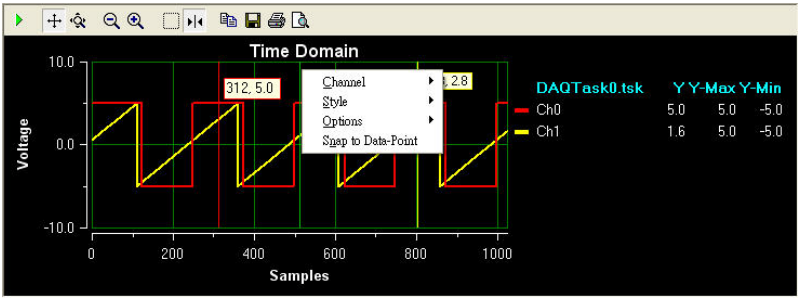
The Data Cursor of the DataView has many useful functions which let you to check the data value on the DataView. You can click the

button to enable the Data Cursor function.

When you enable the Data Cursor function, you can just drag and drop the green line in the middle of the DataView to any position. The x and y value of the Data Cursor will be displayed in real-time.



The Data cursor provides advanced configurations: you can right-click the mouse on the middle green line to launch the popup menu (as shown below). You can see there are sixteen Data Cursors in each domain in the Data Viewer Panel. You can set all Data Cursors to only a specified channel at a different position, each Data Cursor to each channel, or any style you wish.



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The popup menu of the Data Cursor contains the following settings.

Menu	Description
Channel	Set the Data Cursor to detect which channel you specify.
Style	The value of Data cursor can be configured to several styles. ▶ Value of x-y: Show both the X and Y axes falues. ▶ Value of x: Only show the X-Axis value. ▶ Value of y: Only show the Y-Axis value. ▶ Period: Show a period value of two cursors on the X-Axis ▶ Peak to Peak: Show the difference in value between two peaks on the Y-Axis ▶ Frequency: Display the inverse of the instance along the X-Axis or the frequency.
Options	Use Channel Color: Set the cursor's color to channel color.
	Hide Hint on Release: Hide all value styles.
	Flip alignment: Switch value label to the opposite position.

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3.2.6 Message Viewer

The Message Viewer logs a history of operation command(s) and system messages.



The Message Viewer includes the following three types of log messages:

Prefix	Description
<Task>	Regarding a DAQ task operation.
<Config>	Regarding Data Viewer, Log, and Alarm configurations.
<Buffer>	Regarding the Buffer Mechanism status.

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4 Starting AD-Logger

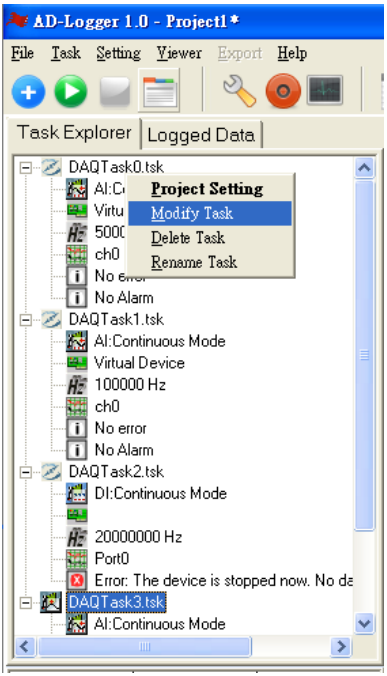
When you launch AD-Logger, there is a default DAQ Task with pre-defined continuous analog input function which works with a Simulated Device. You can easily modify the task for further configurations.

4.1 Configure a DAQ Task

4.1.1 Modify Task

1. Choose the task node that you want to modify.

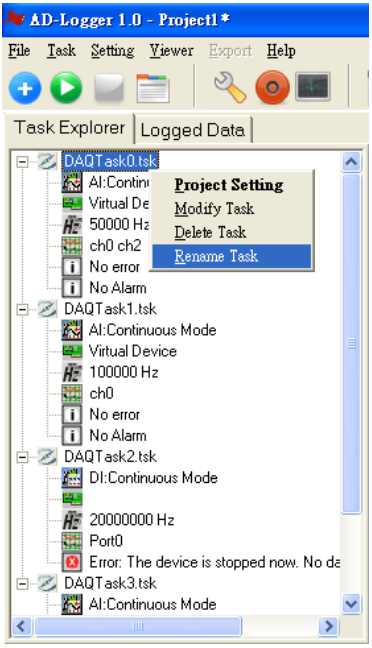
2. Click the Modify button  or right-click the task node and select “modify task” in the pop-up menu to launch the DAQPilot configuration dialog. The DAQPilot interactive configuration dialog will guide you in configuring the DAQ task.



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3. The Task name will be shown in the DAQPilot interactive configuration dialog as shown in Step 1. If you need to change the Task name, you need to modify it first on the task node on the tree.



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4. Select the supported device, then configure the channels



The DAQPilot interactive configuration dialog allows you to select the device and define the corresponding channel settings. This configuration window enables you to easily set the Range and RefGround from the drop-down combo box. For more details about using the DAQPilot interactive configuration dialog, please refer to Chapter 3 of the DAQPilot user manual. More information can also be found at http://www.adlinktech.com/MAPS/DAQPilot.html

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5. Acquisition Parameters

   The next window enables you to set the acquisition parameters. This includes the setting of the clock source, sampling rate, etc.

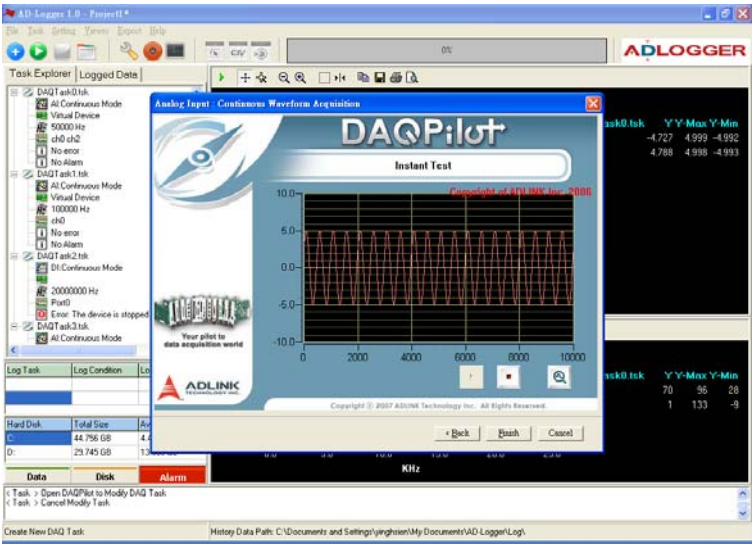


Click Next when finished.

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6. Testing the Task

   After setting the task parameters, you can use the DAQPilot built-in test panel to check whether the task parameters are in range and the task works well. Click  to begin to test the task. To stop testing, click  . You can click  to change the setting of instant test panel.

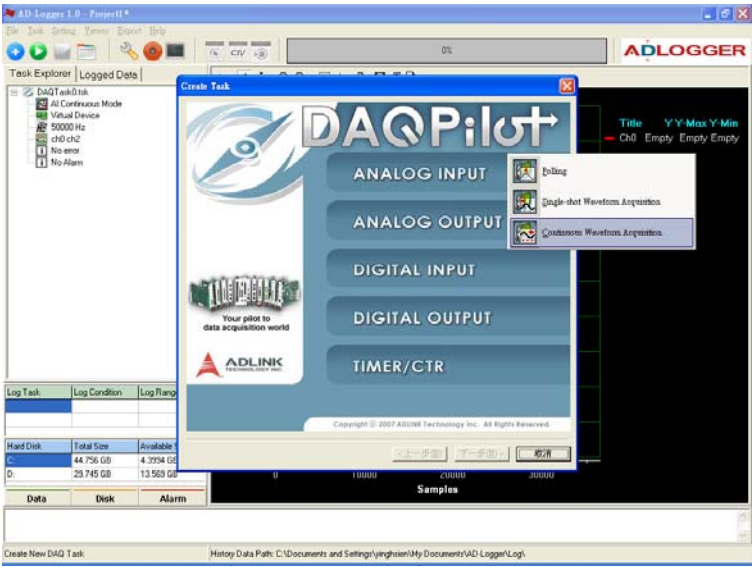


After a quick task verification, you can click the **Finish** button to complete defining your DAQ task and close the configuration interactive dialog and return to the AD-Logger main window.

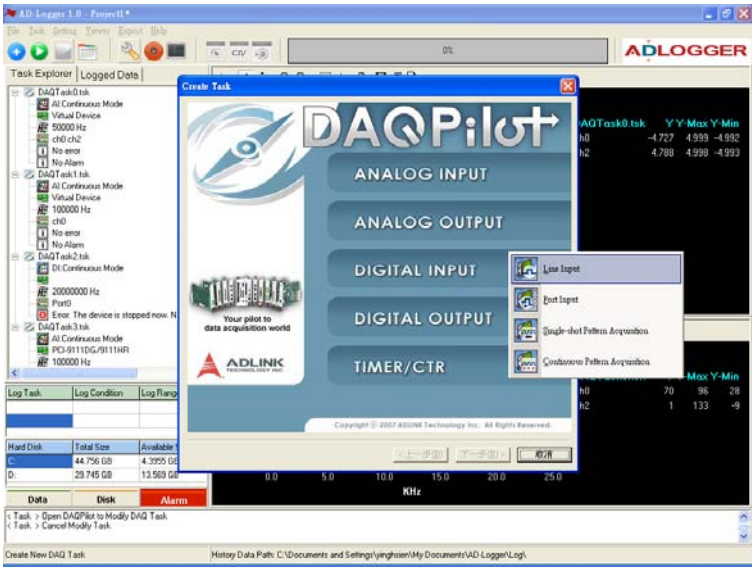
4.1.2 Create Task

Click the  button to launch the DAQPilot interactive configuration dialog to create a new DAQ task.

When the DAQPilot interactive dialog appears, right-click the mouse to select the task type/function; then select the task subtype from the pop-up menu. AD-Logger supports analog and digital input functions as shown in the figures below.



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The task types AD-Logger supports are listed as follows.

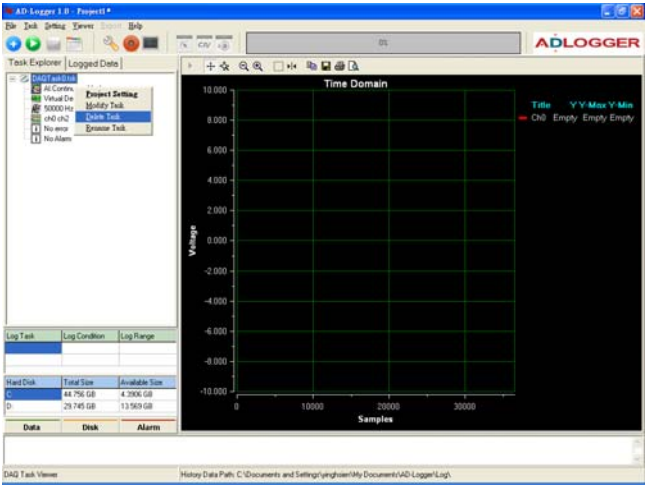
Function	Support Mode
Analog Input Function	Continuous Mode
	Single Shot Mode
	Polling Mode
Digital Input Function	Continuous Mode
	Single Shot Mode
	Port Mode
	Line Mode

After choosing the task type, please refer to section 4.1.1- to modify the selected task for following setting illustration.

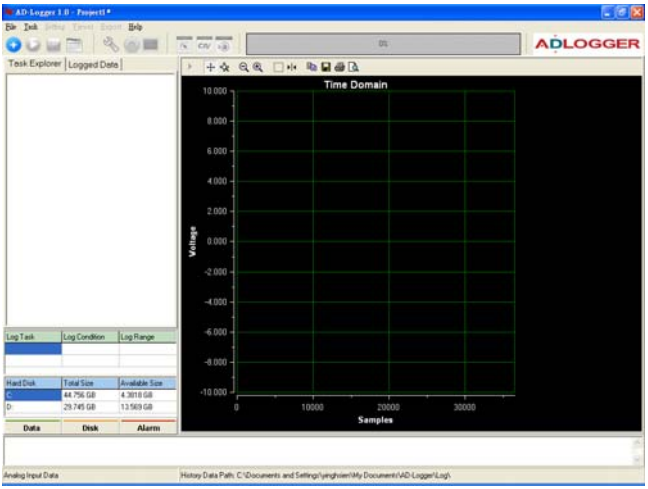
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4.1.3 Delete Task

In the Task Tree, you can right-click the mouse on the task node to launch a pop-up menu and choose **Delete Task**.



If there is no task in the **Task tree**, the AD-Logger will automatically be settled in disabled mode. A DAQ task must be created or loaded.



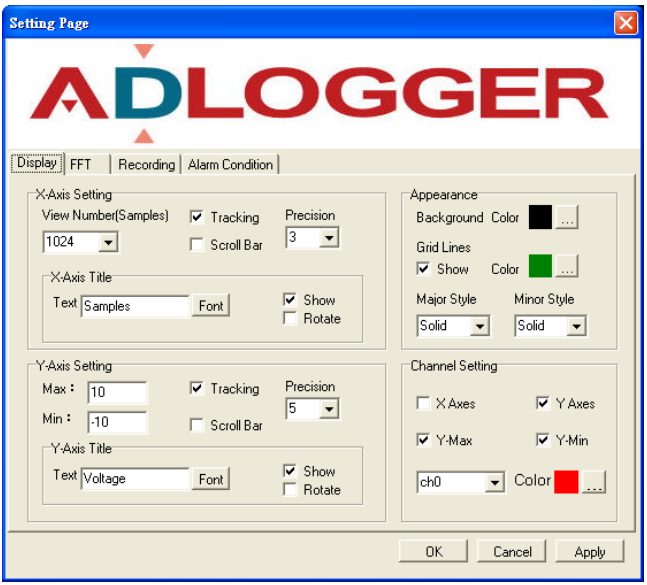
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4.2 Setting DAQ Condition

After creating a new DAQ task, the AD-Logger will automatically open the setting form to configure the Display, FFT View, Recording Conditions and Alarm Conditions settings. If you want to launch the setting form, you can just click the task node and click



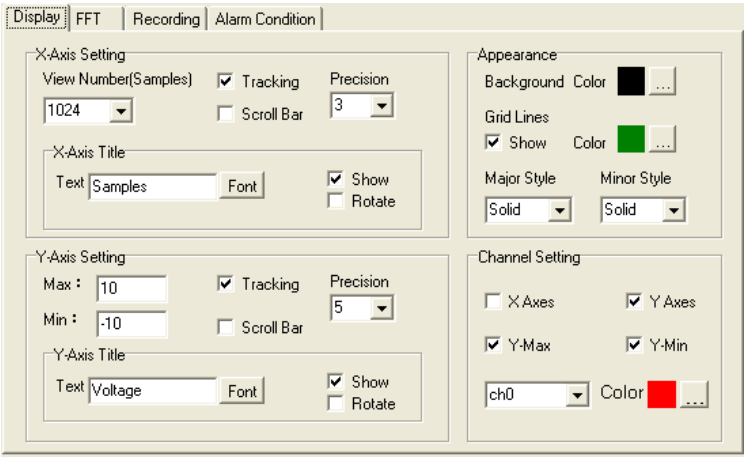
setting button.



The following sections will describe the setting forms.

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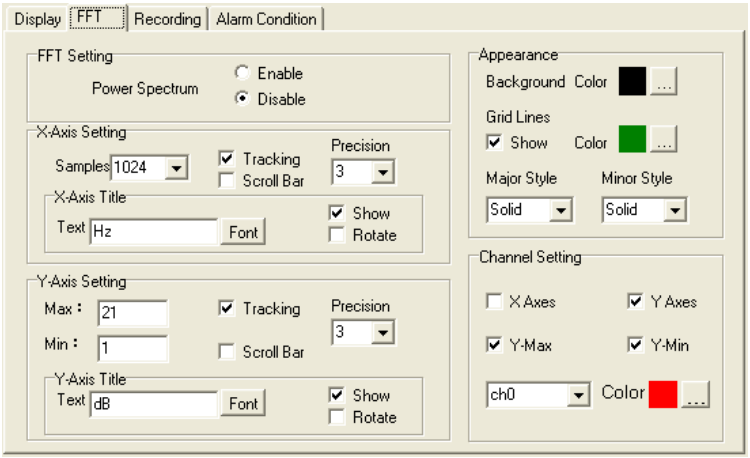
4.2.1 Display Settings



item	Description
View Number	Set the number of data samples you want to display on the time domain Data Viewer.
Tracking	Enable/disable the tracking function. When the tracking function is enabled, the axes will adjust their min and span values based on the tracking style.
Scroll Bar	Enable/disable scroll bar.
X-Axis Title	Set the X-Axis title.
Max/Min	Set the Y-Axis maximum/minimum display value.
Y-Axis Title	Set the Y-Axis title.
Appearance	Configure the color of background, grid lines and the style of grid lines.
Channel Setting	Enable/disable the display of X and Y-Axis values in legend and set the related channel color.

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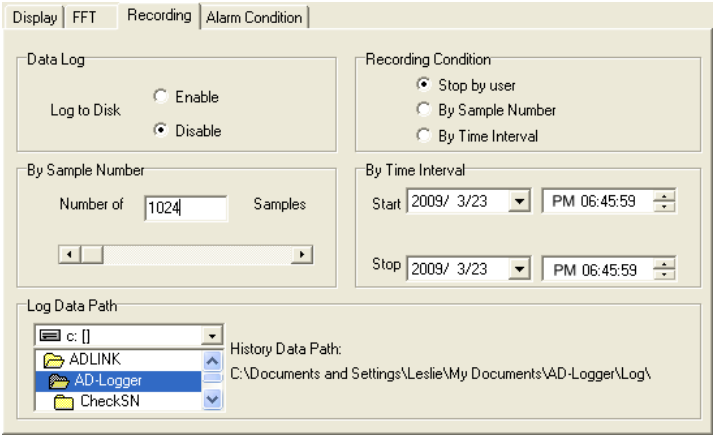
4.2.2 FFT setting



item	Description
Enable	Enable/disable to perform the FFT calculation when capturing data.
View Number	Set the number of data samples to perform FFT calculation and display the result on the frequency domain DataView.
Tracking	Enable/disable the tracking function. When the tracking function is enabled, the axes will adjust their min and span values based on the tracking style.
Scroll Bar	Enable/disable the function of scroll bar.
X-Axis Title	Set the X-Axis title.
Max/Min	Set the Y-Axis maximum/minimum display value.
Y-Axis Title	Set the Y-Axis title
Appearance	Configure the color of background, grid lines and the style of grid lines.
Channel Setting	Enable/disable the display of X and Y Axis values in legend and set channel color.

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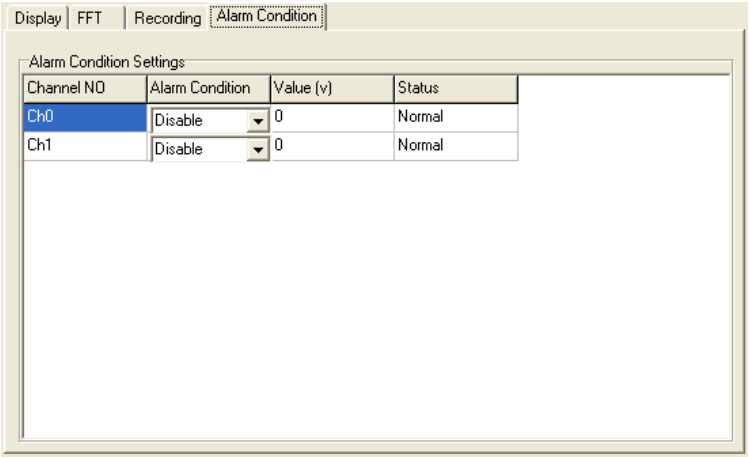
4.2.3 Recording Condition



item	Description
Data Log	Enable/disable to log DAQ data to disk.
Recording Condition	Set a condition to automatically stop log-ging file to disk.
By Sample Number	Set the amount of sample to log data to disk.
By Time Interval	Set the time range to log data to disk.
Set Location	Set a path to store logged data.

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4.2.4 Alarm condition



Item	Description
Alarm Condition Settings	You can enable/disable the alarm condition and set trigger value for each channel of the DAQ task. If AD-Logger detects the trigger value you set, the **Alarm** warning will show in the **Status Viewer**.

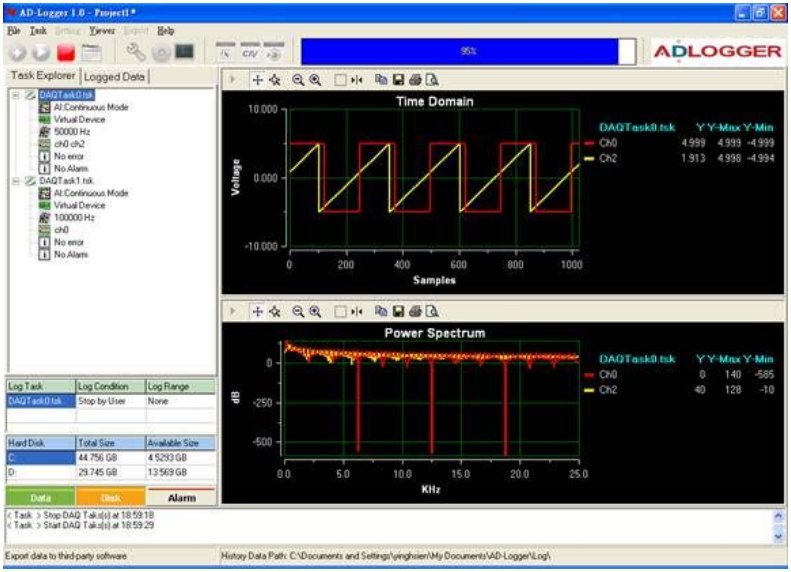
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4.3 Start Data Acquisition

After you configure the DAQ parameters in section 4.2, you can click  button in the AD-Logger main window to start data acquisition based on the pre-defined DAQ task.

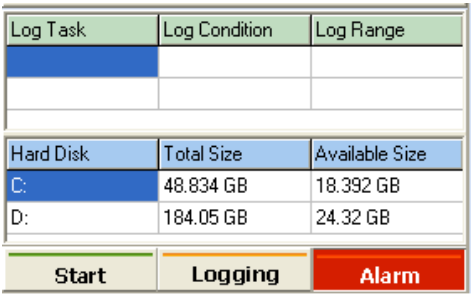
Display Log Enable Status

If the task start with the recording function. (Section 4.2.3), the **Buffer Monitor Bar** will display the available memory status of buffer (see figure below). When the AD-Logger completes the logging task, the **Buffer Monitor Bar** will switch to a disabled status.

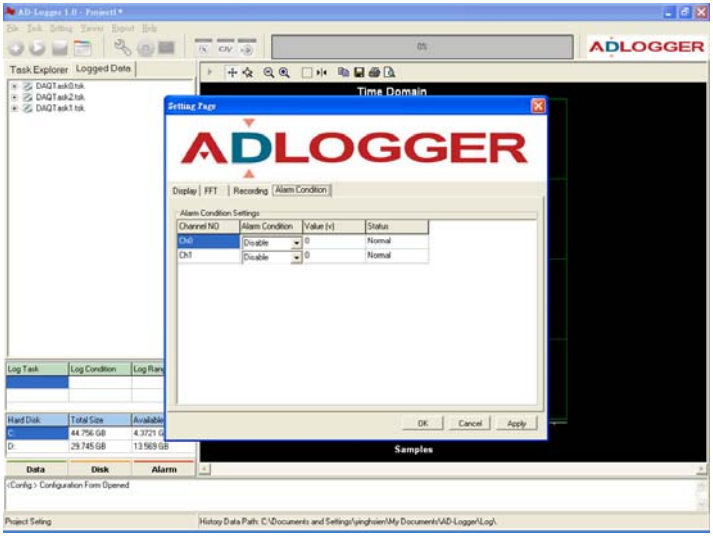


Display Alarm Status

If the task starts with the alarm function (Section 4.2.4), AD-Logger will keep detecting the alarm condition during the data logging until you click the **Stop** button. If AD-Logger detects the trigger condition, AD-Logger will automatically stop the DAQ procedure (figure below). The related task in the Task View Panel will also show the **alarmed** status with a red color.



You can launch the setting form and switch to the **Alarm Condition** tabsheet to configure the Alarm conditions.



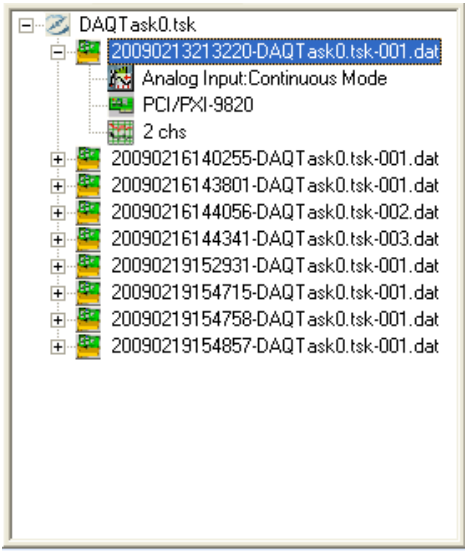
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4.4 Stop and Export Data for post-processing

Click the  button to stop the task(s). If you already have data logged in the system, the log files could be managed in the **Logged Data tabsheet**.

Switch to **Logged Data tabsheet**; double click the selected log file to display the data in the **DataView Window**.

If the sample number is more than 1024, the scrollbar can be used to switch the data block for display.



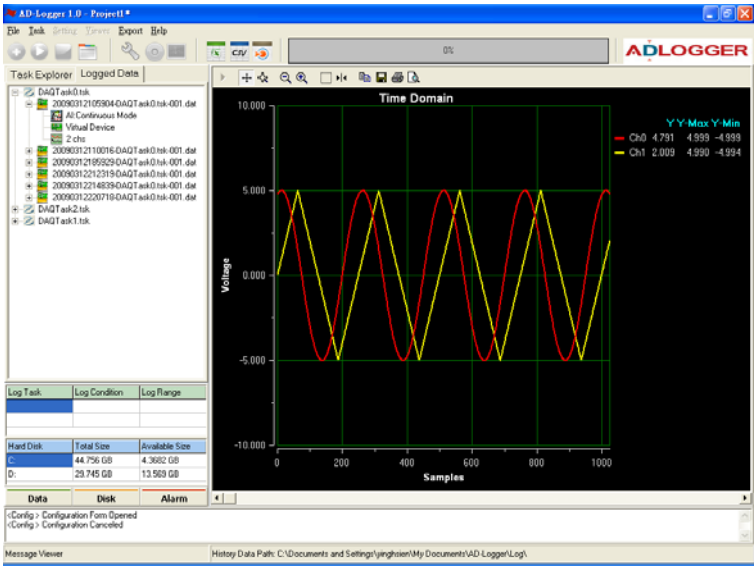
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5 Exporting Functions

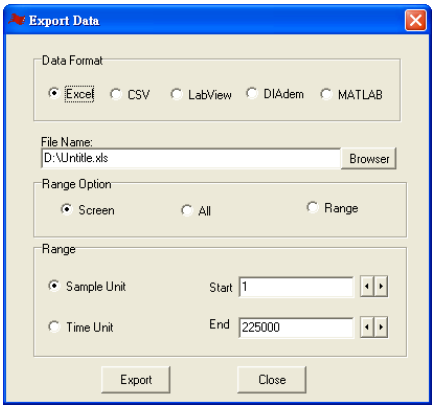
The AD-Logger log data is in binary files with private data format (Appendix). You can manage log file on AD-Logger "**Logged Data**" **tabsheet** or use the following exporting functions. The AD-Logger provides several data formats which help you to do analysis and post-processing in the third-party applications.

5.1 Export Data to Excel for post processing

1. Launch AD-Logger and select the **Logged Data tabsheet**.
2. Double click the log file you want to export.
3. Click the  button to show **Export Data** setting form.



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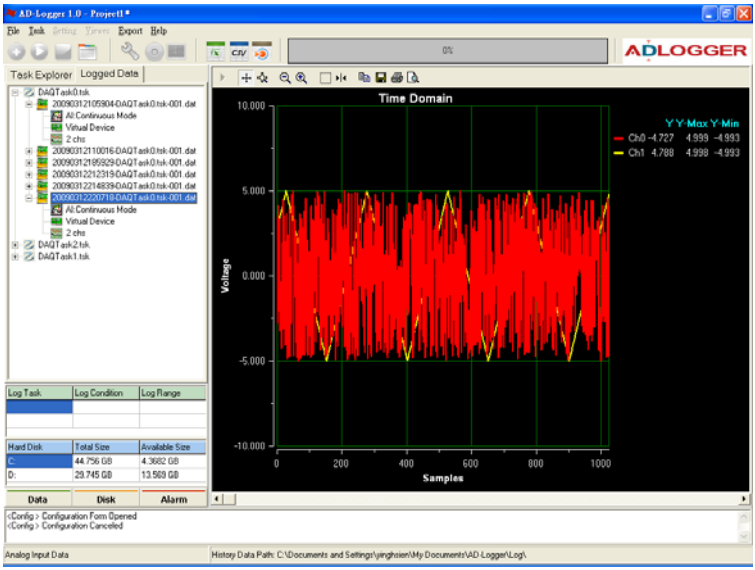


4. Specify the file name and file path by **Browser** button.
5. Configure the **Range Option** and click the **Export button**. The exported data will be automatically loaded and displayed in the Excel tabsheet.

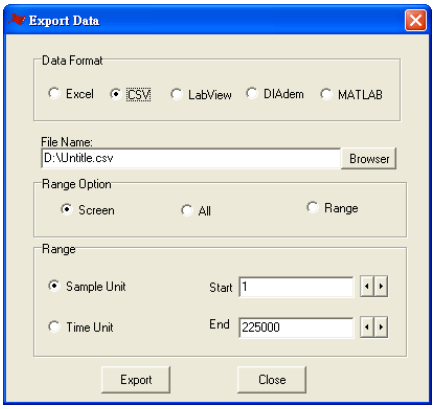
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5.2 Export Data as a CSV file for Excel for post processing

1. Launch AD-Logger and Switch to the **Logged Data tab-sheet**
2. Double click the log file you want to export.
3. Click the  button to show **Export Data** setting form.



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4. Specify the file name and file path by **Browser** button.
5. Configure the **Range Option** and click the **Export** button. The data will be exported to a CSV file in the path you specified.

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5.3 Export Data into LabVIEW for post processing

This section will demonstrate how to perform Data Acquisition with ADLINK PCI-9221 and do FFT analysis in LabVIEW. Before the post-processing captured in LabVIEW, you need to use AD-Logger **Export** function to convert the AD-Logger file to LabVIEW compatible format. The process includes three steps:

- Configure DAQ device and Set log conditions.
- Start the data acquisition and Export captured data to LabVIEW.
- Use LabVIEW to do FFT analysis

1. Configure DAQ device and parameters.

   Launch AD-Logger and click  Modify DAQ task button to open DAQPilot interactive configuration dialog. You can configure DAQ device and relative parameters in the following setting dialogs.



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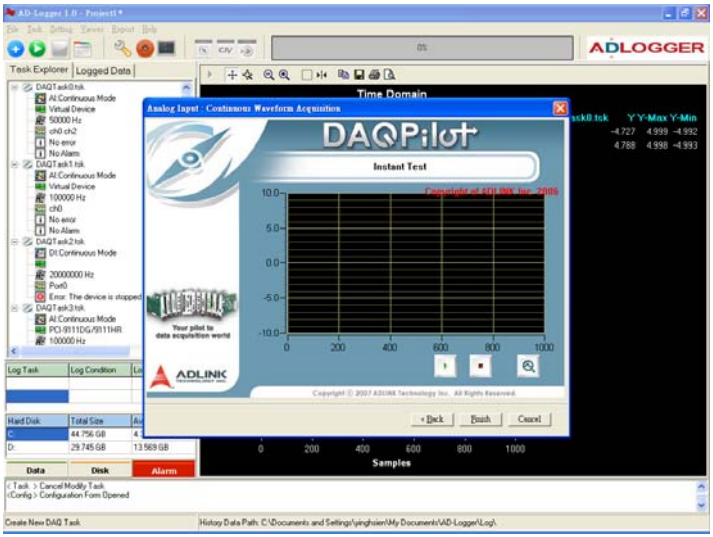


<Interactive Configuraiton Dialog STEP 1:
Select Device & Channel>



<Interactive Configuraiton Dialog STEP 2:
Timing/Trigger Setting >

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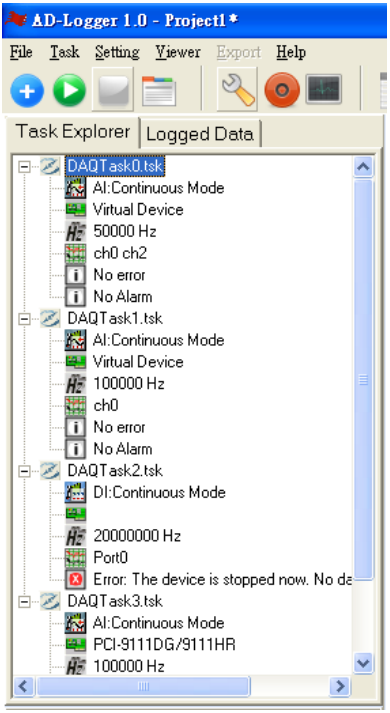
<Interactive Configuraiton Dialog STEP 3: Get Instant Result>

After quick task verification, you can click **Finish** button to finish the definition of your DAQ task then close the configuration interactive dialog and return to the AD-Logger main window.

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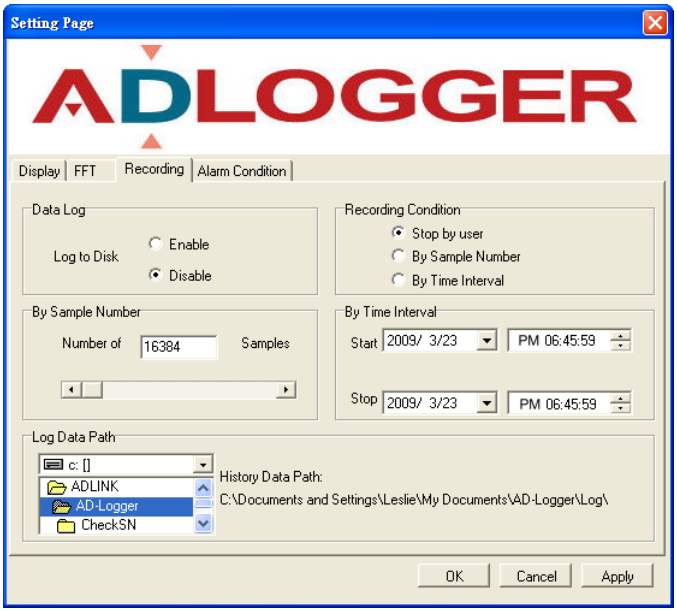
2. Set log conditions

Click the  Project Setting button to open the AD-Logger setting form.



Change to Log Tab sheet and finish following steps.

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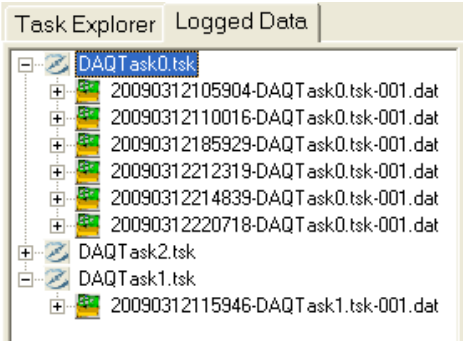
- Step 1: Set Enable data Log>
- Step 2: Set Data Log Condition by Sample Number>
- Step 3: Set 16384 Samples to log>
- Step 4: Set the Path to save log file to>
- Step 5: Click OK button to return AD-Logger Main Window>

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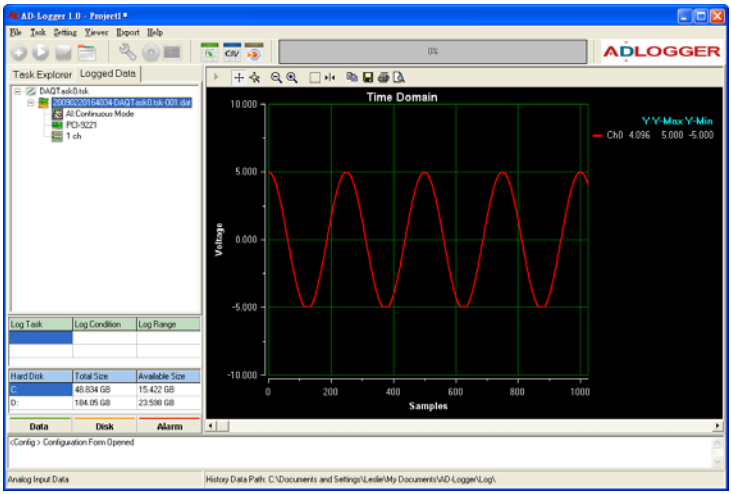
3. Start to DAQ and Export data to LabVIEW file

After configuring DAQ and log parameters, click  Start button the AD-Logger will start to perform DAQ; the log file will be saved to the path you specified.

Click “Logged Data” change to See history data



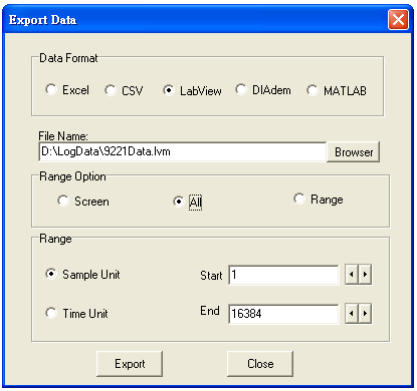
The log files will be sequentially list by task name and time in the **Logged Data tabsheet**. Double click the file name in the tree, AD-Logger will display the data value in the Time Domain Data View; then the **Export** buttons will be enabled.



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Click the  button to show the **Export Data** setting form.

- **Step 1**:
  Choose LabVIEW data format
- **Step 2**:
  Set exported file name and path
- **Step 3**:
  Set ALL range data to export
- **Step 4**:
  Click Export button

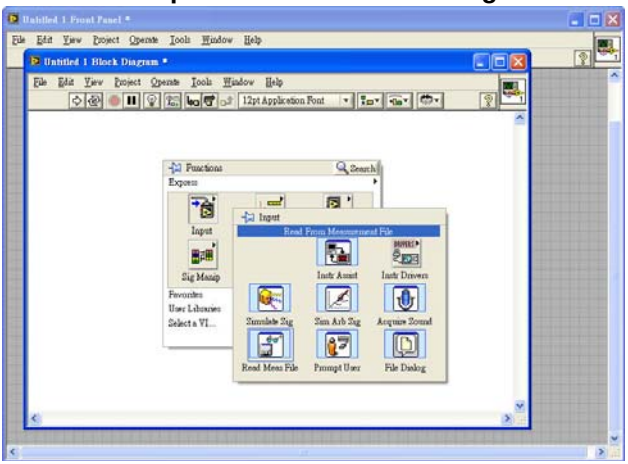


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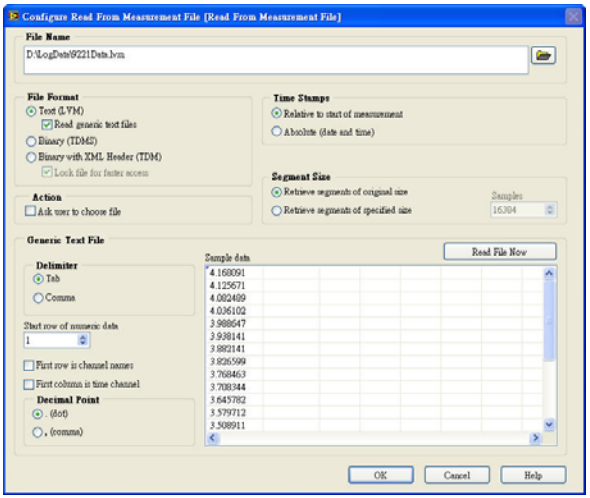
4. Use LabVIEW to do advanced analysis

Load the exported LVM file into LabVIEW.

- **Step 1: Open a Blank VI in the NI LabVIEW software.**
- **Step 2: Right click and place a "Read From Measurement File" Express VI in the Block Diagram.**



- **Step 3: In the Configure "Read From Measurement File" form, specify the file location that you want to import.**
- **Step 4: Click "Read File Now" button can preview the data value then close form by click OK button.**



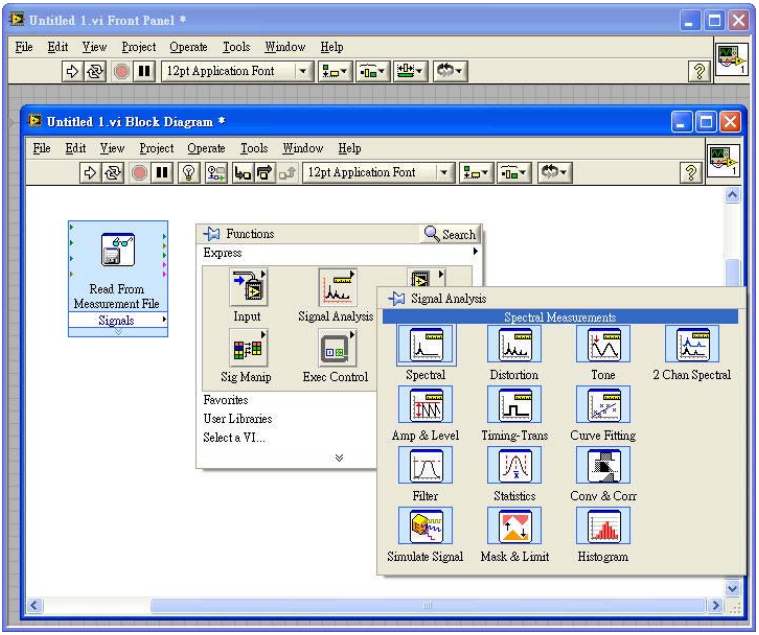
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- **Step 5: Right click and place a "Spectral Measurements" Express VI of Signal Analysis in the Block Diagram. The "Spectral Measurements" setting form will be opened.**

  Example: Using FFT function to calculate power spectrum result.

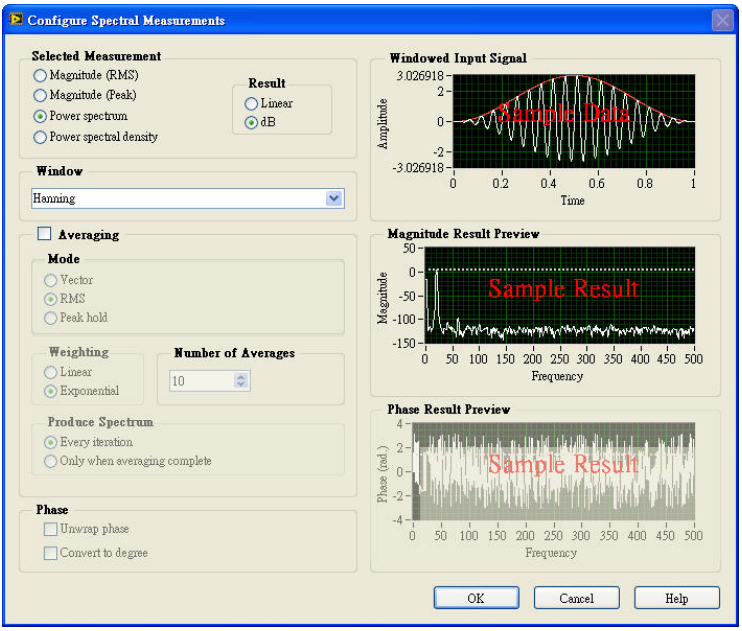
  Input Signal = 1022.34 Hz

  Sampling rate = 250 KHz

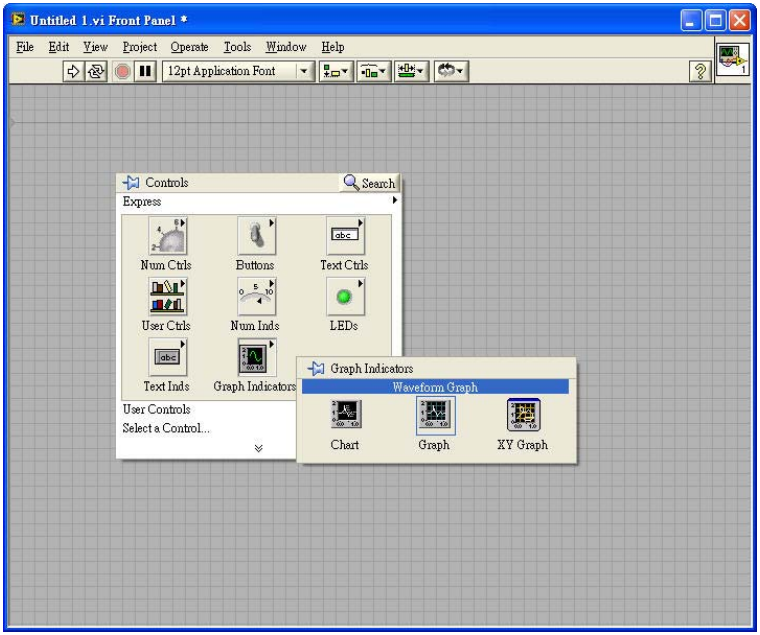


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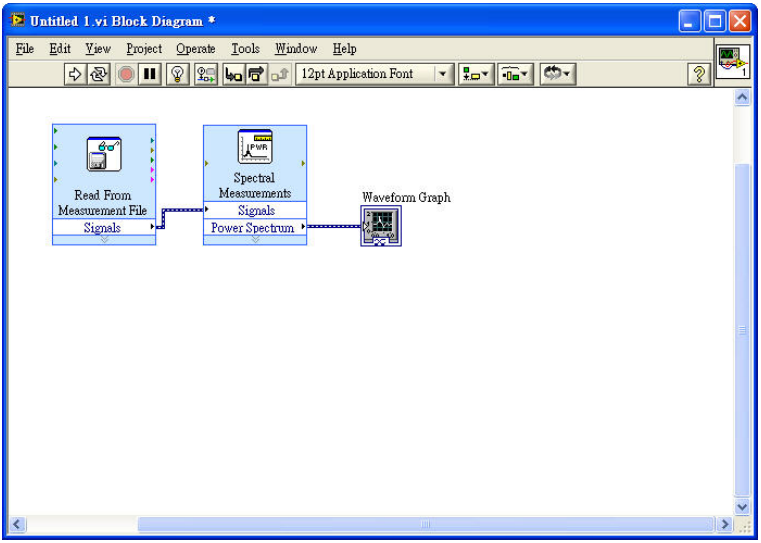
- **Step 6: There are four measurement functions in the Configure Spectral Measurements , in this case we chose “Power spectrum” function.**



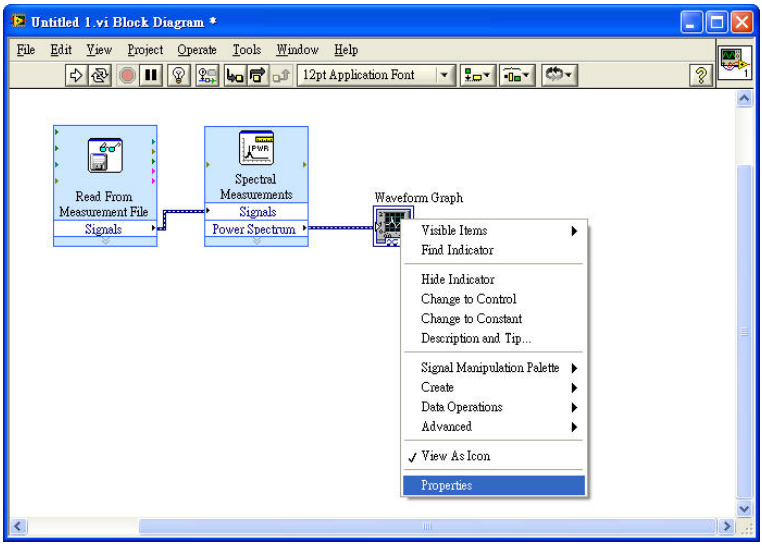
- **Step 7: Place a "Waveform Graph" VI in the Front Panel**



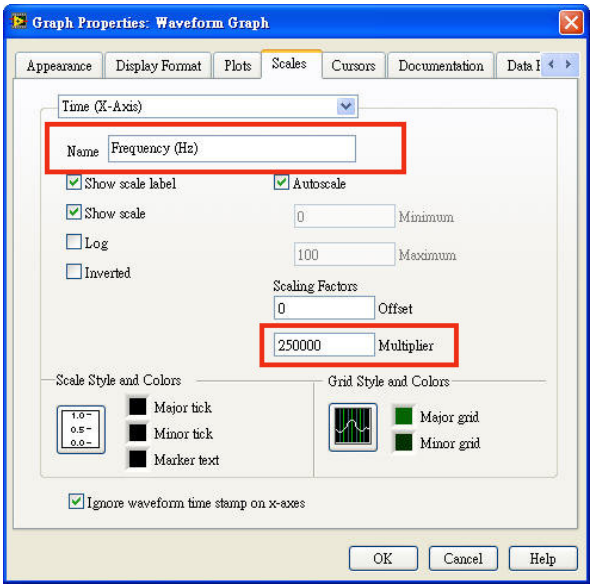
- **Step 8: Finish following signal links in the Block Diagram.**



- **Step 9: Right click on the Waveform Graph VI and choose property of the pop-up menu.**

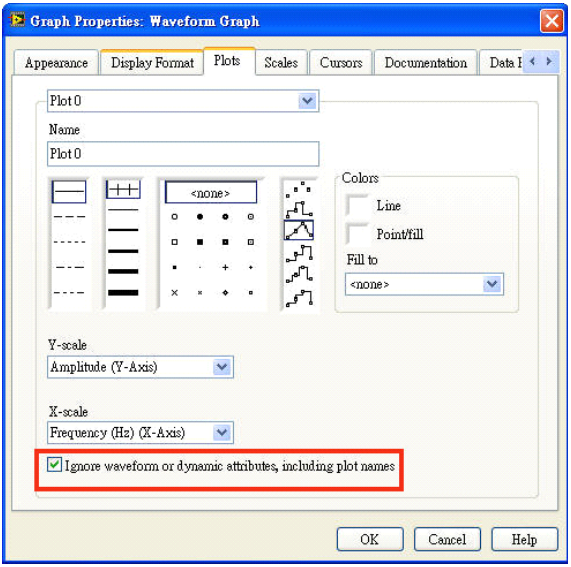


- **Step 10: In the Scales tab, set Name of the X-Axis and Multiplier of Scaling Factors(sample rate).**

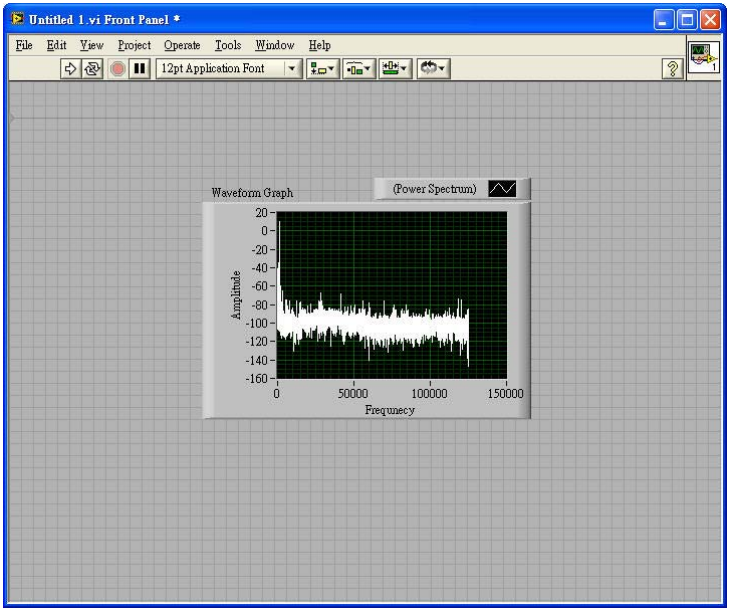


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- **Step 11: In the Plots tab, enable the following option.**

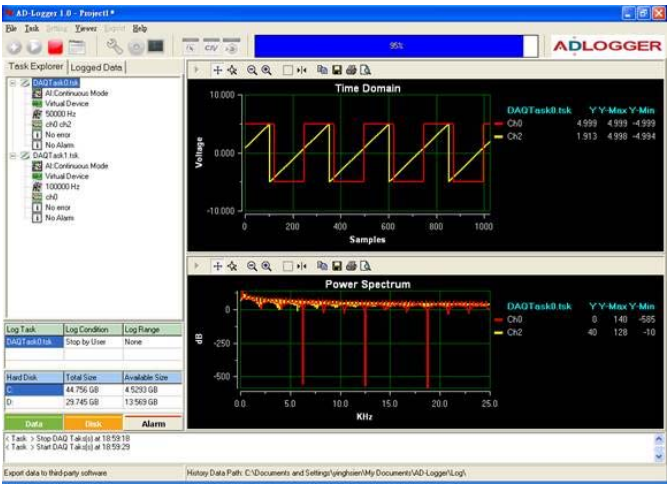


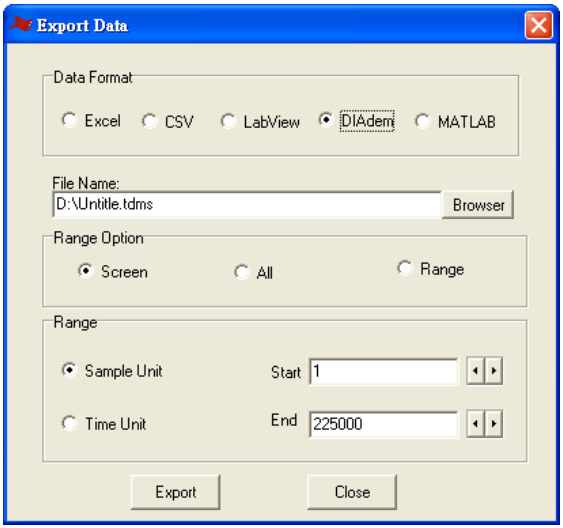
- **Step 12: Switch to the Block Diagram, start to execute the program will display the power spectrum result.**



5.4 Export Data into DIAdem for post processing

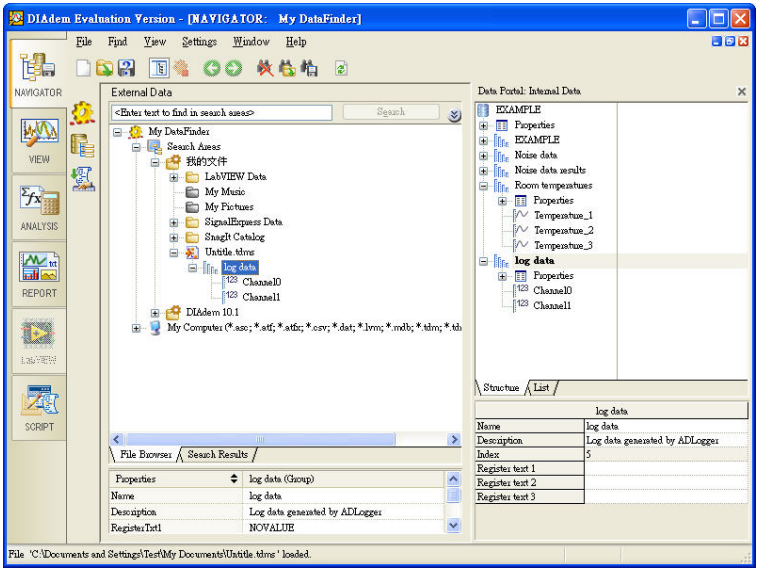
1. Launch AD-Logger and Switch to the **Logged Data tab-sheet**.
2. Double click the log file you want to export.
3. Click the  button to show the **Export Data** setting form.





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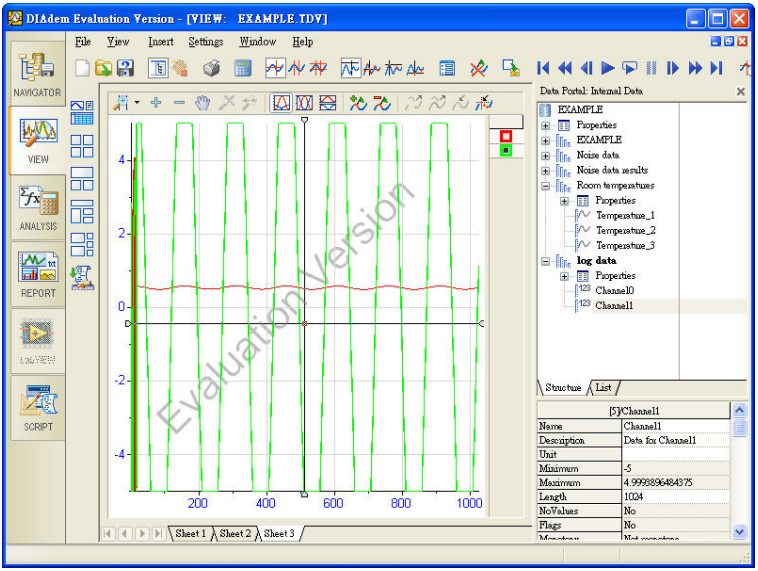
4. Assign the file name and file path.
5. Click the DIAdem data format.
6. Configure the **Range Option** and click the **Export** button. The exported data can be found in the path you specified.
7. Load the exported data through the **DIAdem NAVIGATOR**.
8. Drag and drop the **Group Name** of log file into the **Data Portal** window. Then the Group Name will be added in the **Data Portal** for further operations.



9. Switch to the VIEW window of DIAdem, select a 2D Axis System in the worksheet.

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10. Drag and drop Channel 0 and Channel 1 to the 2D Axis System. The data value will be displayed in the graph.



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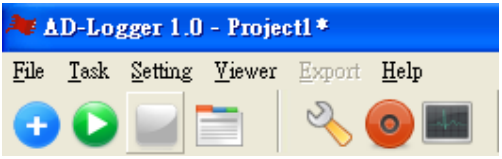
5.5 Export Data into MATLAB post processing

This section will demonstrate how to perform Data Acquisition with ADLINK PCI-9221 and do analysis in MATLAB. Before the post-processing captured in MATLAB, you need to use the AD-Logger **Export** function to convert the AD-Logger file to MATLAB compatible format. The process includes three steps:

- Configure DAQ device and Set log conditions.
- Start the data acquisition and Export captured data to MATLAB.
- Use MATLAB to do advanced analysis

1. Configure DAQ device and parameters.

   Launch AD-Logger and click  Modify DAQ task button to open DAQPilot interactive configuration dialog. You can configure DAQ device and relative parameters in the following setting dialogs.



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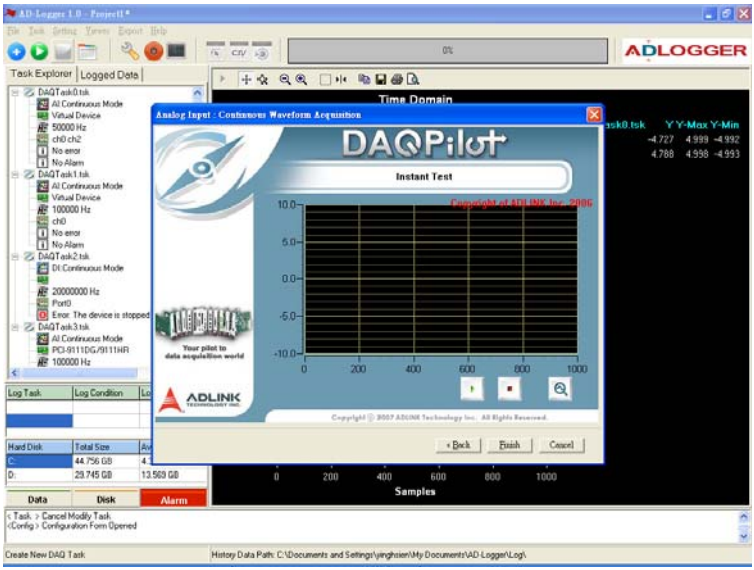


<Interactive Configuraiton Dialog STEP 1:
Select Device & Channel>



<Interactive Configuraiton Dialog STEP 2:
Timing/Trigger Setting >

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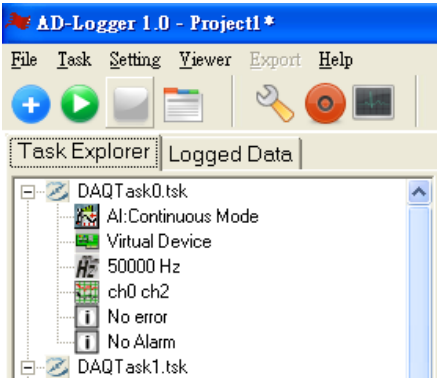
<Interactive Configuraiton Dialog STEP 3:
Get Instant Result>

After quick task verification, you can click the **Finish button** to finish the definition of your DAQ task then close the configuration interactive dialog and return to the AD-Logger main window.

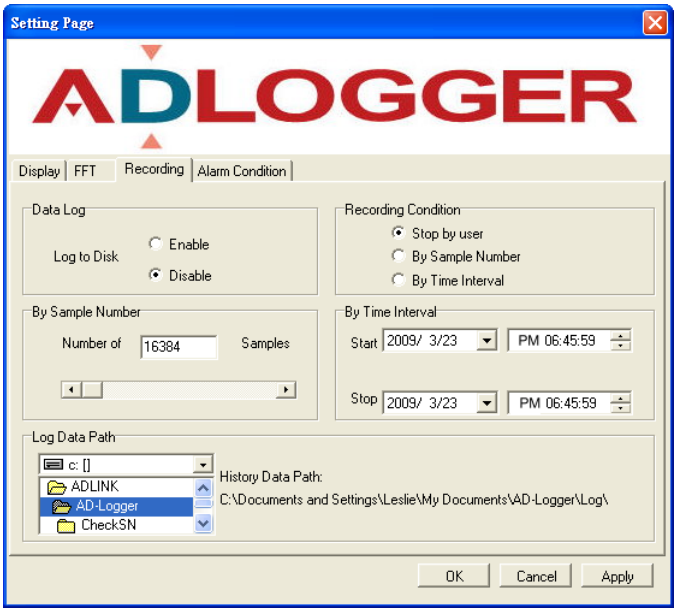
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2. Set log conditions

Click the  **Project Setting** button to open the AD-Logger setting form.



Change to Log Tab sheet and finish following steps.



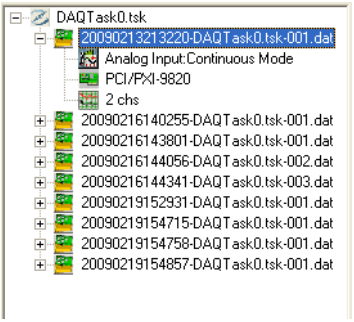
- **Step 1: Set Enable data Log**
- **Step 2: Set Data Log Condition by Sample Number**
- **Step 3: Set 16384 Samples to log**
- **Step 4: Set the Path to save log file to**
- **Step 5: Click OK button to return AD-Logger Main Window**

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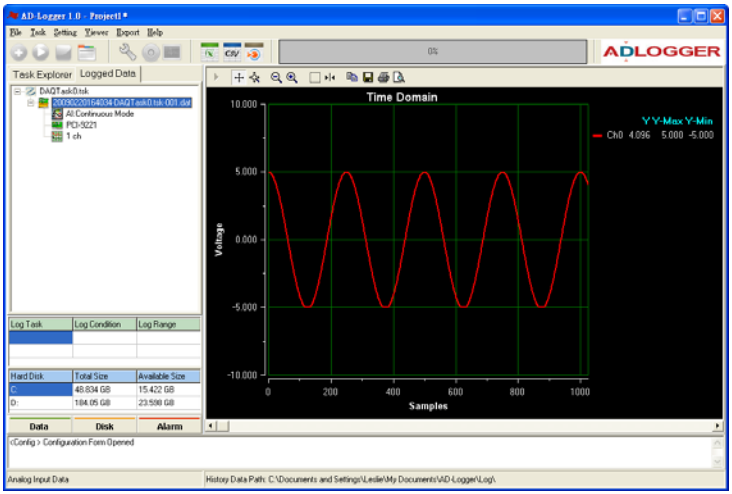
3. Start to DAQ and Export data to MATLAB file

After configuring DAQ and log parameters, click  Start button the AD-Logger will start to perform DAQ; the log file will be saved to the path you specified.

Click “Logged Data” change to History Data View



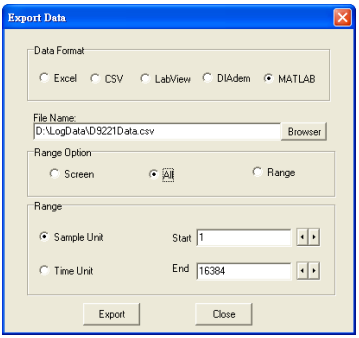
The log files will be sequentially list by task name and time in the Logged Data tabsheet. Double click the file name in the tree, AD-Logger will display the data value in the Time Domain DataView; then the Export buttons will be enabled.



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Click the  button to show the **Export Data** setting form.

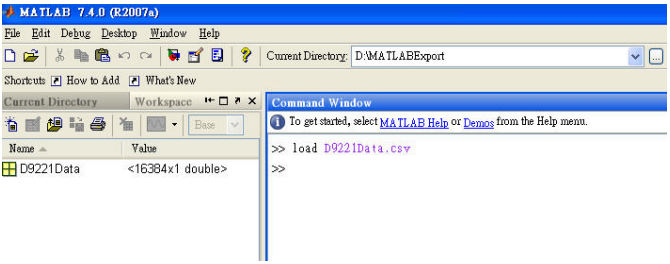
- ▷ **Step 1: Choose MATLAB data format**
- ▷ **Step 2: Set exported file name and path**
- ▷ **Step 3: Set ALL range data to export**
- ▷ **Step 4: Click Export button**



4. Use MATLAB to do advanced analysis

   Load the exported CSV file into MATLAB.

   - ▷ **Step 1: Set the Current Directory to the exported file saved.**
   - ▷ **Step 2: Type "load D9221Data.csv" in the Command Window**
   - ▷ **Step 3: An array created with the same name of the exported file in the Workspace.**



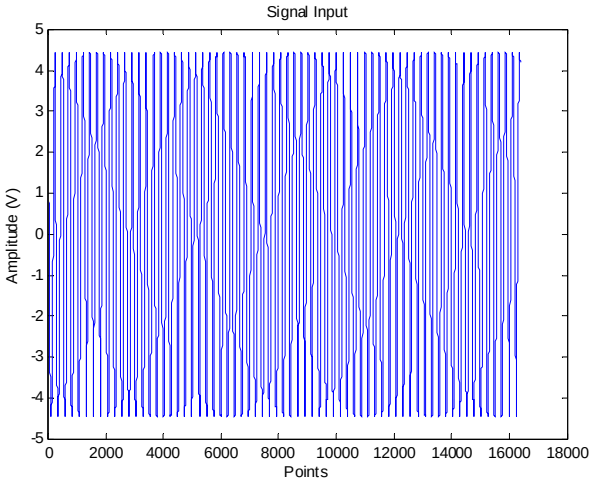
- **Step 4: You can use this data array to do the advanced analysis like following pictures**

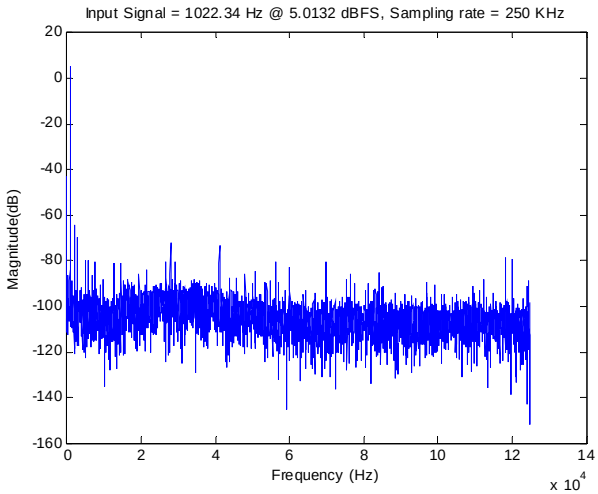
  Example: Using FFT function to calculate power spectrum result.

  Input Signal = 1022.34 Hz

  Sampling rate = 250 KHz

The source code is listed in the next page.





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```
load D9221Data.csv
Fs = 250000;    % Sampling frequency
fin = 1022.34;
numpt = 16384;  % Length of signal
notdc = 3;

figure(1);
plot(D9221Data);
title('Signal Input');
xlabel('Points');ylabel('Amplitude (V)');

Doutw = D9221Data.*hann(numpt);
Dout_spect = fft(Doutw);
Dout_dB = 20*log10(abs(Dout_spect));
     % Recalculate to dB
spectP = (abs(Dout_spect)).*(abs(Dout_spect));
     % Determine power spectrum

FFT_freq = [0:numpt/2-1].*Fs/numpt;
FFT_spectrum = Dout_dB(1:numpt/2);
figure(2);
% Plot single-sided amplitude spectrum.
plot(FFT_freq,FFT_spectrum)
title('Power Spectrum of Input Signal')
xlabel('Frequency (Hz)')
ylabel('Magnitude(dB)')
pll_title = ['Input Signal = ', num2str(fin), '
     Hz @ ',num2str(signal_dBFS),
    ' dBFS',', Sampling rate = ', num2str(Fs/
     1000), ' KHz'];
title(pll_title);
```

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6 Appendix

6.1 AD-Logger .DAT File Format

This appendix describes the file format of the .dat files logged through file AD-Logger file system. The data file includes five parts, ADLINK DASK Header, ChannelRange, Data Block, AD-Logger Header and ChannelRange. The file structure is shown in the figure below:

DASK Header
ChannelRange(Optional)
DAQ data
AD-Logger Header
ChannelRange(Optional)

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6.1.1 DASK Header

The DASK 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:

DASK Header Length: 60 bytes			
Elements	**Type**	**Size (bytes)**	**Comments**
ID	char	10	file ID ex. ADLinkDAQ1
card_type	short	2	card Type ex. PCI-7250, PCI-9112
num_of_channel	short	2	number of scanned channels ex. 1, 2
channel_no	unsigned char	1	channel number where the data read from (only available as the num_of_channel is 1) ex. 0, 1
num_of_scan	long	4	the number of scan for each channel (total count / num_of_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 Please refer to ADLINK DASK Function Reference Appexdix B ex. 0 (AD_B_5V)
scan_rate	double	8	The scanning rate of each channel (total samplingate/ num_of_channel)
num_of_channel_range	short	2	The number of ChannelRange* structure
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	The AD-Logger supports log files which the first byte of reservd element is “A”. Others no used.

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

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6.1.2 ChannelRange

The ChannelRange part records the channel number and data range information related to the stored data. This part consists of several channel and range units. The length of each unit is 2 bytes. The total length depends on the value of num_of_channel_range (one element of the file header) and is calculated with this formula:

Total Length = 2 * num_of_channel_range bytes

The data structure of each ChannelRange unit is listed below:

ChannelRange Length: 2 bytes			
Elements	**Type**	**Size (bytes)**	**Comments**
channel	char	1	scanned channel number ex. 0, 1
range	char	1	the AI range code Please refer to ADLINK DASK Function Reference Appexdix B ex. 0 (AD_B_5V)

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6.1.3 Data Block

The data is written to file in a 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.

The file is written in Binary format and may not be read by normal text editor. You can use any binary file editor to view it or the functions used for reading files (such as fread) to get the file information and data value. PCIS-DASK provides the DAQCvt utility to convert the binary file. Refer to the PCIS-DASK user manual for details

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6.1.4 AD-Logger Header

The AD-Logger header part records the information related to the stored data and its total length is 64 bytes. The data structure of the file header is as follows:

AD-Logger Header Length: 64 bytes			
Elements	**Type**	**Size (bytes)**	**Comments**
ID	char	10	file ID ex. ADLogger1
task_type	unsigned long	4	The DAQPilot DAQ task type ex. Continuous Wave Acquisition
card_type	short	2	card Type ex. PCI-7250, PCI-9112
num_of_channel	short	2	number of scanned channels ex. 1, 2
channel_no	unsigned char	1	channel number where the data read from (only available as the num_of_channel is 1) ex. 0, 1
num_of_scan	long	4	the number of scan for each channel (total count / num_of_channel)
data_width	short	2	the data width 1: 8 bits, 2: 16 bits, 4: 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 Please refer to ADLINK DAQPilot User Manual ex. 0 (AD_B_5V)
scan_rate	double	8	The scanning rate of each channel (total samplingate/ num_of_channel)
num_of_channel_range	short	2	The number of ChannelRange* structure
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	No used.

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

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6.1.5 ChannelRange

The ChannelRange part records the channel number and data range information related to the stored data. This part consists of several channel and range units. The length of each unit is 2 bytes. The total length depends on the value of num_of_channel_range (one element of the file header) and is calculated with this formula:

Total Length = 2 * num_of_channel_range bytes

The data structure of each ChannelRange unit is listed below:

ChannelRange Length: 2 bytes			
Elements	**Type**	**Size (bytes)**	**Comments**
channel	char	1	scanned channel number ex. 0, 1
range	char	1	the AI range code Please refer to ADLINK DAQPilot User Manual ex. 0 (AD_B_5V)

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