ACLS-LVIEW
LabVIEW â Interfaces
for NuDAQ ISA-Bus Cards,
Windows 3.1/95/NT
User's Guide

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How to Use This Manual

This manual is designed to help you use the ACLS-LVIEW software driver for NuDAQ ISA-bus data acquisition cards. The manual describes how to install and use the software library to meet your requirements and help you program your own software applications. It is organized as follows:

- Chapter 1, "Introduction to ACLS-LVIEW" describes how to install the software and how to program your application by using ACLS-LVIEW.
- Chapter 2, "Resource Setting in Windows NT" describes how to configure the NuDAQ ISA card NT device drivers.
- Chapter 3, "ACLS-LVIEW VI Overview" briefly describes each VI in ACLS-LVIEW.
- Appendix A, "Error Codes" lists the error codes returned by ACLS-LVIEW VIs, as well as their meanings.
- Appendix B, "AI Range Codes" lists all the valid AI range codes for each card.
- Appendix C, "Function Support" shows which NuDAQ ISA-bus card each VI supports.

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1

Introduction to ACLS-LVIEW

1.1 Hardware Support

This release of ACLS-LVIEW supports the following hardware:

- ACL-7120: 32 Digital I/O and 6 timer/counter Card
- ACL-7122: 144 Parallel Digital I/O Card
- ACL-7124: 24 Parallel Digital I/O Card
- ACL-7125: 8 Relay Actuactor & Isolated Digital Input
- ACL-7130: Isolated 32 Digital I/O card
- ACL-7225:16 Relay Actuactor & Isolated Digital Input
- PET-48DIO: 48-bit Parallel Digital I/O Card
- ACL-6126: 6-CH Analog Output Card
- ACL-6128: 2-CH Analog Output Card
- ACL-8111: Multi-function DAS Card
- ACL-8112DG: Advanced Multi-function Low Gain DAS Card
- ACL-8112HG: Advanced Multi-function High Gain DAS Card
- ACL-8112PG: Advanced Multi-function Low Gain DAS Card
- ACL-8113: 32-CH Isolated Analog Input Card
- ACL-8216: Low Cost, 16-bit A/D Multi-function Card
- ACL-8316/8312: High Performance DAS Card with FIFO

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1.2 Installation

1.2.1 ACLS-LVIEW Installation

System Requirements

ACLS-LVIEW requires the following minimum configuration:

- An IBM PC/AT or compatibles with 80386 or higher processor, running Windows 3.1/ 95/ 98, or NT version 4.0, or Windows 2000

Note : ACLS-LVIEW/95 can be used in both Windows 95 and Windows 98 systems. ACLS-LVIEW/NT can be used in both NT 4.0 and Windows 2000 systems.

- Eight megabytes of available memory
- A hard disk with enough disk space to install ACLS-LVIEW
- A CD-ROM drive.
- Application development system: National Instruments LabVIEW 4.0 or later
- NuDAQ ISA-bus data acquisition cards ACLS-LVIEW supports.

Installation

The Setup program provided by ACLS-LVIEW performs all tasks necessary for installing the software.

step 1. Place "ADLink All-In-One Compact Disc" in the CD-ROM drive.

step 2. If autorun setup program is not invoked automatically, please execute ***X*:\Setup.exe**.(***X*** indicates the CD-ROM drive)

step 3. Select Software Package→ACLS-LVIEW to setup ACLS-LVIEW software.

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When Setup displays a User Information dialog box, please fill items in the dialog box. You have to fill the valid serial number to get the valid license. Otherwise the ACLS-LVIEW will run in 120-minute demo/evaluation mode.

When the installation process is completed, the ACLS-LVIEW directory should contain the following files and sub-directories:

File/Sub-directory	Description
Alv.llb	ACLS-LVIEW VI Library file for all the cards except ACL-8316/8312
8316.llb	VI Library file for ACL-8316/8312
48DIO <DIR>	PET-48DIO sample programs
6126 <DIR>	ACL-6126 sample programs
7124 <DIR>	ACL-7124 sample programs
7125 <DIR>	ACL-7125 sample programs
7225 <DIR>	ACL-7225 sample programs
8111 <DIR>	ACL-8111 sample programs
8112 <DIR>	ACL-8112 sample programs
8113 <DIR>	ACL-8113 sample programs
8216 <DIR>	ACL-8216 sample programs
8316 <DIR>	ACL-8316/12 sample programs
Manual <DIR>	PDF manual files
Help <DIR> (95 and NT version)	On-line help files

ACLS-LVIEW' s DLL (Alv.dll and LV8316.dll) and needed drivers (386, VXD, or SYS files) are copied to appropriate system directories.

1.2.2 ACLS-LVIEW Un-installation

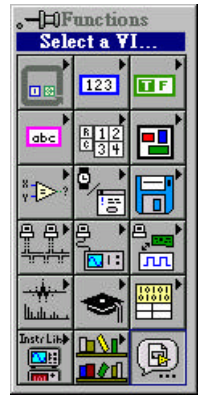
ACLS-LVIE software has the capability of automatic un-installation.

To un-install ACLS-LVIEW, open the "Control Panel", double-clck "Add/Remove Programs", select ACLS-LVIEW to un-install it.

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1.2.3 Using ACLS -LVIEW VIs

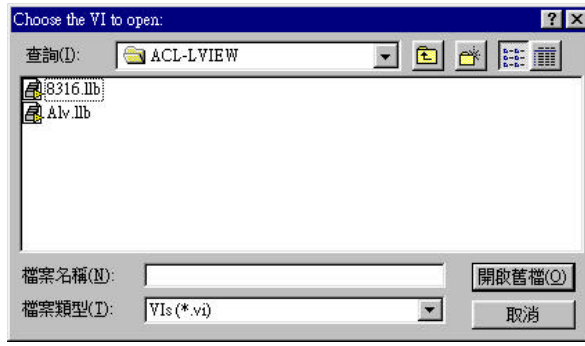
To use ACLS-LVIEW VIs, in Functions palette in Block Diagram,



select "Select a VI..". button:

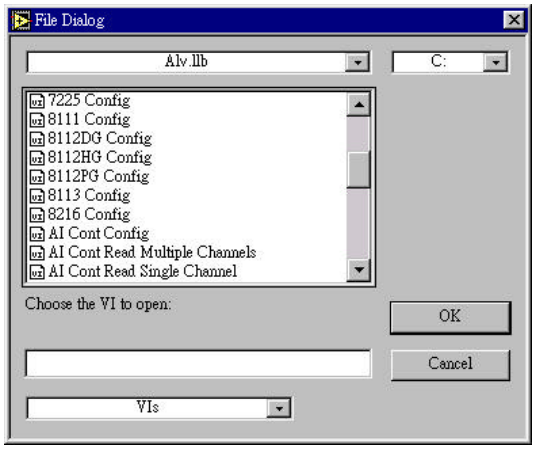


The following window will be prompt for you to select a VI or LLB.



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For the cards except ACL-8316/8312, please select <Install Dir>\ALV.LLB. For ACL-8316/8312, please select <Install Dir>\8316.LLB. Then you can select the VI to insert to your Block Diagram.



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2

Resource Setting in Windows NT/2000

When you completed the ACLS-LVIEW/NT installation under Windows NT/2000, please be careful of the following issues:

2.1 ACL-8111, ACL-8112 series, ACL-8216

[Under Win-NT 4.0]

1. Make sure the device drivers Dio and Dask are already started. You can open the "Control Panel", double-click "Devices", and a Devices windows will be shown as below. If the device status is none, you have to select the Dio or Dask device and press the "Start" button.



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2. Change IRQ level or DMA channel setting:

   The default setting of IRQ level is 15, Base Address is 0x220, and DMA channel is 1. When Windows NT startup, it allocates the corresponding resources (IRQ, DMA, etc) to your card. If you want to change the IRQ level or DMA channel of ACL-8111, ACL-8112 series, or ACL-8216 cards, please modify the file <INSTALLDIR>\INI\DASK.INI. (DASK.INI is a text file. You can use any text editor you like to modify it) The content of DASK.INI is as follows:

```
\Registry\Machine\System\CurrentControlSet\Services\Dask
    Type = REG_DWORD 0x00000001
    Start = REG_DWORD 0x00000002
    Group = Extended Base
    ErrorControl = REG_DWORD 0x00000001
    Parameters
      BaseAddress = REG_DWORD 0x00000220
      Irq = REG_DWORD 0x0000000F
      Dma = REG_DWORD 0x00000001
```

   You can modify the parameters Irq or Dma. Please note the values are hexadecimal number. After you modify the parameters, you also have to check the hardware setting in your NuDAQ card. Make sure the hardware setting is the same as software specified.

   Then type the following command under DOS command prompt:

```
cd  <INSTALLDIR>\INI
regini  dask.ini
```

   Where <INSTALLDIR> means the install directory of ACLS-LVIEW.

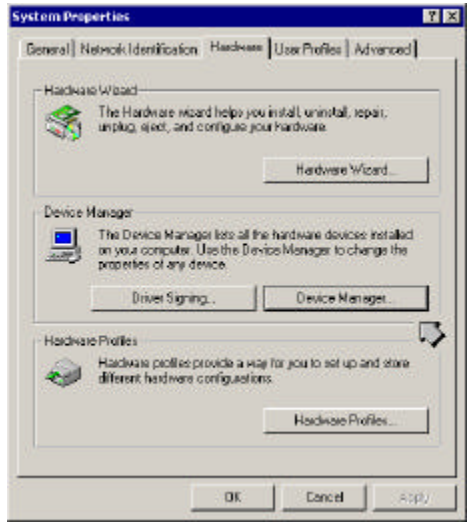
   This will change the registry information of your card. Then restart the Windows NT again. This time Windows NT will allocate the new resource to your card.

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Note : ACLS-LVIEW can only support one card within 8111, 8112, and 8216 to perform continuous analog input by interrupt or DMA transfer.

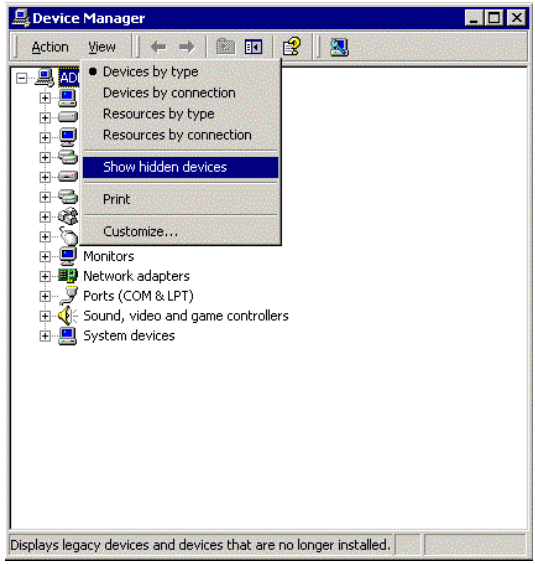
[Under Win-2000]

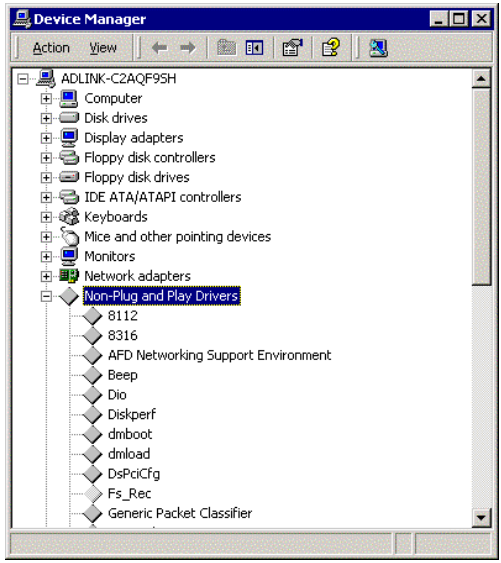
1. Make sure the device drivers Dio and Dask are already started. You can open the Device Manager in **Start>>Settings>>Control Panel>>System**, and then select the **Hardware** tab.



In Device Manager, you should select ***Show hidden devices*** item to display the **Non-Plug and Play Drivers.**

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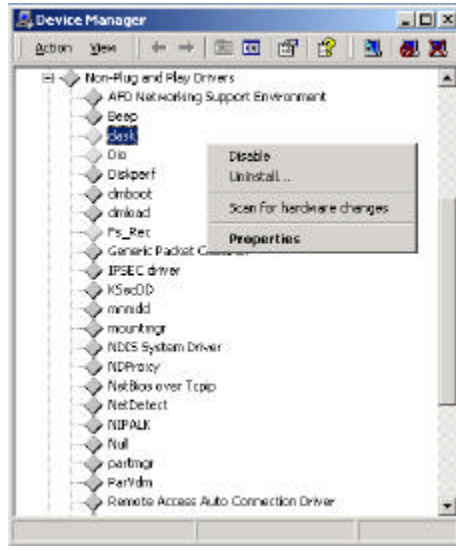




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And then you can double-click the device and select the **Resources** tab to check if I/O port and IRQ resources for the device are allocated successfully.

If your ACLS-LVIEW devices (Dask and Dio) are not loaded successfully, you will get the *GRAY* icons in **Device Manager**. To solve this problem, you can *right-click* the device icon, and select the **Scan for hardware changes** item in pop-up menu. The system will re-load the device drivers with the resource registered in the system registry.



2. Change IRQ level or DMA channel setting:

   The default setting of IRQ level is 15, Base Address is 0x220, and DMA channel is 1. When Windows 2000 startup, it allocates the corresponding resources (IRQ, DMA, etc) to your card. If you want to change the IRQ level or DMA channel of ACL-8111, ACL-8112 series, or ACL-8216 cards, please modify the file <INSTALLDIR>\INI\DASK.INI. (DASK.INI is a text file. You can use any text editor you like to modify it) The content of DASK.INI is as follows:

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\Registry\Machine\System\CurrentControlSet\Services\Dask
Type = REG_DWORD 0x00000001
Start = REG_DWORD 0x00000002
Group = Extended Base
ErrorControl = REG_DWORD 0x00000001
Parameters
BaseAddress = REG_DWORD 0x00000220
Irq = REG_DWORD 0x0000000F
Dma = REG_DWORD 0x00000001

You can modify the parameters Irq or Dma. Please note the values are hexadecimal number. After you modify the parameters, you also have to check the hardware setting in your NuDAQ card. Make sure the hardware setting is the same as software specified.

Then run the following command from **Start>>Run...**

<INSTALLDIR>\ini\regini dask.ini

Where <INSTALLDIR> means the install directory of ACLS-LVIEW.

This will change the registry information of your card. Then restart the Windows 2000 again. This time Windows 2000 will allocate the new resource to your card.

Note : ACLS-LVIEW can only support one card within 8111, 8112, and 8216 to perform continuous analog input by interrupt or DMA transfer.

2.2 ACL-8316/8312

[Under Win-NT 4.0]

1. Make sure the device drivers Dio and 8316 are already started. You can open the "Control Panel", double-click "Devices", and a Devices windows will be shown as below. If the device status is none, you have to select the Dio or 8316 device and press the "Start" button.

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2. Change IRQ level or DMA channel setting:

   The default setting of IRQ level is 12, Base Address is 0x220, and DMA channel is 5. When Windows NT startup, it allocates the corresponding resources (IRQ, DMA, etc) to your card. If you want to change the IRQ level or DMA channel of ACL-8316/8312, please modify the file <INSTALLDIR>\INI\8316.INI. (8316.INI is a text file. You can use any text editor you like to modify it) The content of 8316.INI is as follows:

```
\Registry\Machine\System\CurrentControlSet\Services\8316
    Type = REG_DWORD 0x00000001
    Start = REG_DWORD 0x00000002
    Group = Extended Base
    ErrorControl = REG_DWORD 0x00000001
    Parameters\Device0
       BaseAddress = REG_DWORD 0x00000220
       Irq = REG_DWORD 0x0000000C
       Dma = REG_DWORD 0x00000005
```

   You can modify the parameters Irq or Dma. Please note the values are hexadecimal number. After you modify the parameters, you also have to check the hardware setting in your NuDAQ card. Make sure the hardware setting is the same as software specified.

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Then type the following command under DOS command prompt:

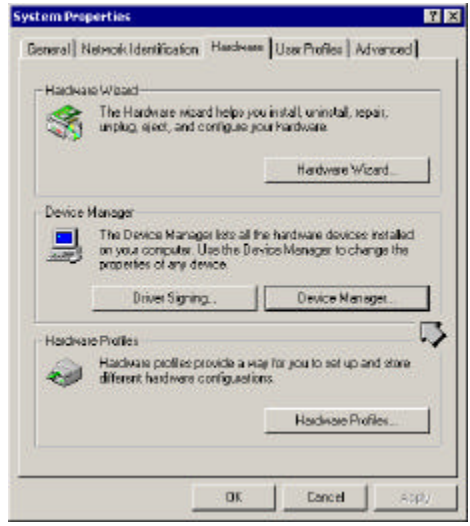
```
cd <INSTALLDIR>\INI
regini 8316.ini
```

Where <INSTALLDIR> means the install directory of ACLS-LVIEW.

This will change the registry information of your card. Then restart the Windows NT again. This time Windows NT will allocate the new resource to your card.

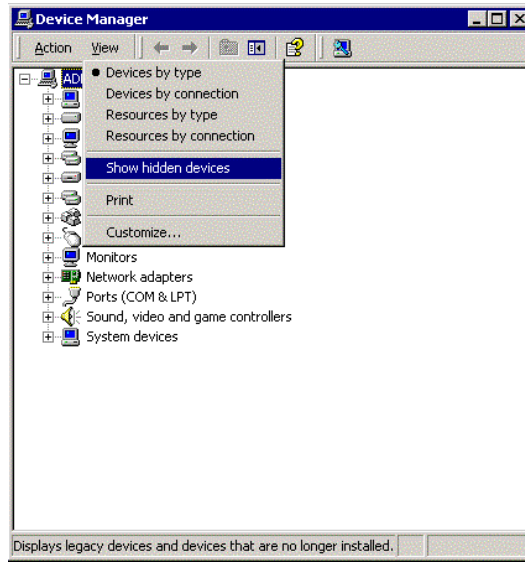
[Under Win-2000]

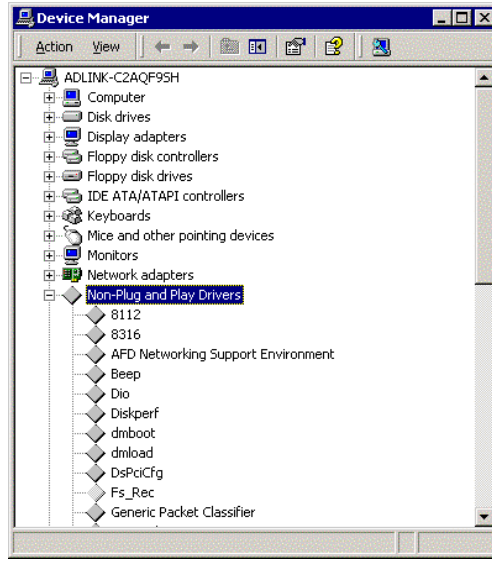
1. Make sure the device drivers Dio and 8316 are already started. You can open the Device Manager in **Start>>Settings>>Control Panel>>System**, and then select the **Hardware** tab.



In Device Manager, you should select ***Show hidden devices*** item to display the **Non-Plug and Play Drivers.**

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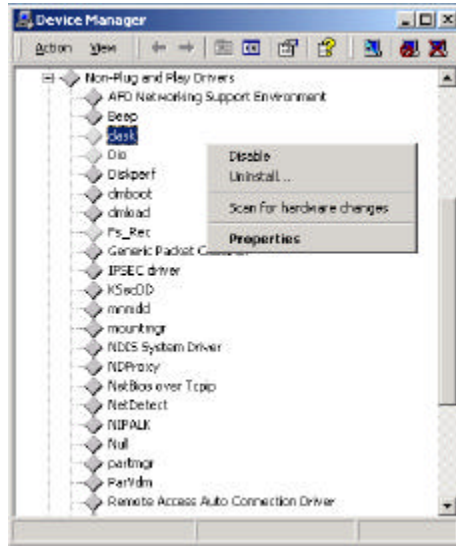




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And then you can double-click the device and select the **Resources** tab to check if I/O port and IRQ resources for the device are allocated successfully.

If the 8316 device is not loaded successfully, you will get the *GRAY* icons in **Device Manager**. To solve this problem, you can *right-click* the device icon, and select the **Scan for hardware changes** item in pop-up menu. The system will re-load the device drivers with the resource registered in the system registry.



2. Change IRQ level or DMA channel setting:

   The default setting of IRQ level is 12, Base Address is 0x220, and DMA channel is 5. When Windows NT startup, it allocates the corresponding resources (IRQ, DMA, etc) to your card. If you want to change the IRQ level or DMA channel of ACL-8316/8312, please modify the file <INSTALLDIR>\INI\8316.INI. (8316.INI is a text file. You can use any text editor you like to modify it) The content of 8316.INI:

   \Registry\Machine\System\CurrentControlSet\Services\8316

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Type = REG_DWORD 0x00000001
Start = REG_DWORD 0x00000002
Group = Extended Base
ErrorControl = REG_DWORD 0x00000001
Parameters\Device0
BaseAddress = REG_DWORD 0x00000220
Irq = REG_DWORD 0x0000000C
Dma = REG_DWORD 0x00000005

You can modify the parameters Irq or Dma. Please note the values are hexadecimal number. After you modify the parameters, you also have to check the hardware setting in your NuDAQ card. Make sure the hardware setting is the same as software specified.

Then run the following command from **Start>>Run…**

<INSTALLDIR>\ini\regini 8316.ini

where <INSTALLDIR> means the install directory of ACLS-LVIEW

This will change the registry information of your card. Then restart the Windows 2000 again. This time Windows 2000 will allocate the new resource to your card.

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3

ACLS-LVIEW VI Overview

This chapter briefly describes each VI in ACLS-LVIEW. You can find the detailed description of each VI by the following ways:

1. Select Show Help command of Help menu in LabVIEW. When you put the mouse cursor on ACLS-LVIEW VI, LabVIEW will show the description of the VI.
2. Through ACLS-LVIEW on-line help
3. PDF manual files in <Install Dir>\Manual directory.

3.1 ALV.LLB

The functionality of VIs in Alv.llb can be classified to the following capabilities:

General Configuration Function Group

Analog Input Function Group

- Analog Input Configuration VIs
- One-Shot Analog Input VIs
- Continuous Analog Input VIs

Analog Output Function Group

- Analog Output Vls

Digital Input Function Group

- Digital Input VIs

Digital Output Function Group

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- Digital Output VIs

DIO Function Group

- Digital Input/Output Configuration VIs

Timer/Counter Function Group

- Timer/Counter VIs

3.1.1 General Configuration Function Group

Config VIs (7120 Config, ..): Configure/initialize the base address, IRQ, or DMA channel of a NuDAQ ISA-bus data acquisition card. Configure VI must be called before any other ALV.LLB VI can be called for that card.

Release Card: Tells ACLS-LVIEW driver that this card is not used currently and can be released. This would make room for new card to initialize.

3.1.2 Analog Input Function Group

Analog Input Configuration VIs

AI Cont Config: Set the transfer mode and trigger mode of continuous analog input for the card.

One-Shot Analog Input VIs

AI Read Single Channel: Performs a software triggered A/D conversion (analog input) on an analog input channel and returns the value converted.

AI Read Multiple Channels: Performs a software triggered A/D conversion (analog input) on specified analog input channels and returns the values converted.

AI Read Channel Volt: Performs a software triggered A/D conversion (analog input) on an analog input channel and returns the result scaled to voltage in units of volts.

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Continuous Analog Input VIs

AI Cont Read Single Channel: Performs continuous A/D conversions on the specified analog input channel.

AI Cont Read Multiple Channels: Performs continuous A/D conversions on the specified analog input channels.

AI Scale VIs

AI Scale: Converts the binary A/D conversion result to the actual input voltage.

AI Multiple Scale: Converts the values of an array of binary data to the actual input voltages.

3.1.3 Analog Output Function Group

AO Update Channel Voltage: Scales the voltage value to the proper binary number, then writes that number to D/A converter.

AO Update Channel Current: Analog output current.

3.1.4 Digital Input Function Group

DI Read Line: Read the digital logic state of the specified digital line in the specified port.

DI Read Port: Reads digital data from the specified digital input port.

3.1.5 Digital Output Function Group

DO Write Line: Sets the specified digital output line in the specified digital port to the specified state.

DO Write Port: Writes digital data to the specified digital output port.

DO Readback Line: Read the digital logic state of the specified digital output line in the specified port.

DO Readback Port: Read back the output digital data from the specified digital output port.

3.1.6 DIO Function Group

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DIO Config Port: Set the direction (Input or output) configuration of the selected port.

3.1.7 Timer/Counter Function Group

Counter Read: Reads the current contents of the selected counter without disturbing the counting process.

Counter Reset: Sets the output of the selected counter to the specified state.

Counter Setup: Configures the selected counter to operate in the specified mode.

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3.2 8316.LLB

8316 Initial: Initialize the base address of a ACL-8316/12 card. Every ACL-8316/12 card has to be configured by this VI before using other VI.

8316 Switch Card: After initialized more than one ACL-8316/12 card, this VI is used to select which card is active currently.

8316 Acquire: Poll the A/D conversion data from a channel.

8316 AD DMA Cont Read: Performs continuous A/D conversions on the specified analog input channel at a rate as close to the rate you specified.

8316 AD INT Cont Read: Performs continuous A/D conversions on the specified analog input channel at a rate as close to the rate you specified.

8316 AD Set Autoscan: set automatic hardware channel scan to be enabled or disable.

8316 AD Set Channel: Set A/D channel.

8316 AD Set FIFO: Enable/disable the FIFO on the ACL-8312/16.

8316 AD Set Mode: Set the A/D trigger source, A/D channel selection and A/D data transfer mode.

8316 AD Set Range: Set the A/D analog input range.

8316 Counter Read: Read the counter value of the Timer #0.

8316 Counter Start: Program the Timer #0.

8316 Counter Stop: Stop the timer operation.

8316 DA Set Mode: Configure the D/A output mode.

8316 DA Write Channel: Write data to D/A converter.

8316 DI Read Line: Read data from digital input line (bit).

8316 DI Read Port: Read data from digital input port.

8316 DO Write Line: Write data to digital output line.

8316 DO Write Port: Write data to digital output port.

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Appendix A Error Codes

The ***Error Codes*** for ALV.LLB

Code	Name	Description
0	NoError	No error occurred
-2	BadBaseAddress	The value of input terminal *Base Address* is invalid.
-3	TooManyCardInitialized	There have been 16 cards that were initialized.
-4	CardNotInitialized	No card is initialized successfully as the id as the value of input terminal *Card Number*.
-5	FuncNotSupport	The function is not supported by this type of card.
-6	InvalidIoChannel	The value of AI/AO channel or DI/O port is invalid.
-7	InvalidAdRange	The value of AI range is invalid.
-8	ContIoNotAllowed	This type of card does not support continuous data I/O.
-13	OpenDriverFailed	Open device driver failed.
-15	TransferCountTooLarge	The DMA or interrupt transfer size is larger than the memory allocated in driver.
-17	InvalidSampleRate	The value of input terminal *Sample Rate* is invalid.
-18	InvalidCounterMode	The value of input terminal *Mode* is out of range.
-19	InvalidCounter	The value of input terminal *Counter* is out of range.
-20	InvalidCounterState	The value of input terminal *State* is out of range.
-21	InvalidBinBcdParam	The value of input terminal *BinBCD* is out of range.
-35	DioConfigFailed	The operation of configuring the direction of DI/O port is failed.
-36	InvalidPortDirection	The value of input terminal *Direction* is out of range.

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The ***Error Codes*** for 8316.LLB

Code	Name	Description
0	NoError	No error occurred
1	CardNotInitialized	Current active card is not successfully initialized
2	InvalidCardNumber	The value of input terminal *Card Number* is out of range.
4	BaseAddressError	The base address specified is invalid.
10	InvalidADChannel	The value of A/D channel is invalid.
11	InvalidDAChannel	The value of D/A channel is invalid.
12	InvalidDIOChannel	The value of DI/O channel is invalid.
15	InvalidIRQ	The value of input terminal *IRQ Level* is invalid.
16	InvalidDMA	The value of input terminal *DMA Channel* is invalid.
18	InvalidTimerValue	The value of input terminal *Counter Value* is invalid.
19	InvalidTimerMode	The value of input terminal *Timer Mode* is invalid.
28	ADAcquireTimeOut	Timeout for read A/D converion value
29	InvalidADRange	The value of input terminal *AD Range* is invalid.
31	InvalidTrigSource	The value of input terminal *Trig Source* is invalid.
32	InvalidINTMode	The value of input terminal *INT Mode* is invalid.

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Appendix B AI Range Codes

The ***Analog Input Range*** of NuDAQ ISA-bus Cards

Value	Range
1	Bipolar -10V to +10V
2	Bipolar -5V to +5V
3	Bipolar -2.5V to +2.5V
4	Bipolar -1.25V to +1.25V
5	Bipolar -0.625V to +0.625V
6	Bipolar -0.3125V to +0.3125V
7	Bipolar -0.5V to +0.5V
8	Bipolar -0.05V to +0.05V
9	Bipolar -0.005V to +0.005V
10	Bipolar -1V to +1V
11	Bipolar -0.1V to +0.1V
12	Bipolar -0.01V to +0.01V
13	Unipolar 0 to +20V
14	Unipolar 0 to +10V
15	Unipolar 0 to +5V
16	Unipolar 0 to +2.5V
17	Unipolar 0 to +1.25V
18	Unipolar 0 to +1V
19	Unipolar 0 to +0.1V
20	Unipolar 0 to +0.01V

Valid values for each card:

8111: 2, 3, 4, 5, 6
8112PG, 8112DG: 1, 2, 3, 4, 5, 6

Note: If JP9 on the card is set to +/-5V, then 1 is not allowed. If JP9 is set to +/-10V, then 6 is not allowed.

8112HG: 2, 7, 8, 9, 1, 10, 11, 12, 14, 18, 19, 20
8113: 1, 2, 3, 4, 5, 13, 14, 15, 16, 17

Note: Please check the setting of JP1 and JP2 on the card to make sure *AI_Range* is valid for the jumper setting. See ACL-8113 manual for detail.

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8216: 1, 2, 3, 4

Appendix C Function Support

This appendix shows which NuDAQ ISA-bus card each Alv.llb VI supports.

Function \ Board	ACL-7120	ACL-7122	ACL-7124	ACL-7125	ACL-7225	PET-48DIO	ACL-6126	ACL-8111	ACL-8112PG	ACL-8112DG	ACL-8112HG	ACL-8113	ACL-8216
AI Cont Config								●	●	●	●		●
AI Cont Read Multiple Channels								●	●	●	●		●
AI Cont Read Single Channel								●	●	●	●		●
AI Multiple Scale							●	●	●	●	●	●	●
AI Read Channel Volt							●	●	●	●	●	●	●
AI Read Multiple Channels							●	●	●	●	●	●	●
AI Read Single Channel							●	●	●	●	●	●	●
AI Scale							●	●	●	●	●	●	●
AI Voltage Range									●			●	
AO Update Channel Current							●	●	●	●	●		●
AO Update Channel Voltage							●	●	●	●	●		●
Counter Read	●							●	●	●	●		●
Counter Reset	●							●	●	●	●		●
Counter Setup	●							●	●	●	●		●
DI Read Line	●	●	●	●	●	●	●	●	●	●	●		●
DI Read Port	●	●	●	●	●	●	●	●	●	●	●		●
DIO Config Port		●	●			●							
DO Readback Line	●	●	●	●	●	●	●	●	●	●	●		●
DO Readback Port	●	●	●	●	●	●	●	●	●	●	●		●
DO Write Line	●	●	●	●	●	●	●	●	●	●	●		●
DO Write Port	●	●	●	●	●	●	●	●	●	●	●		●
Release Card	●	●	●	●	●	●	●	●	●	●	●	●	●

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