



Avionics Databus
Solutions

Arinc 429

Windows BSP

**Getting
Started**

Version 12.3.0
June, 2022

Arinc 429

Windows BSP



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1 Introduction

1.1 About This Manual

This Getting Started Manual has been developed to assist first time users of the following boards with software installation, hardware set up, and starting a sample project for the following boards:

Step by step instructions cover Arinc 429 Windows Board Software Package ([BSP](#)) installation, board installation, and driver adaptation. The [BSP](#) provides users with current documentation, board drivers, and sample development projects. Additionally, the [BSP](#) provides utility files that are used to upgrade the AIM 429 on-board firmware, which is also described in this manual. The current version of all [BSP](#) is available from the download area of the AIM website.

AIM is also a leading designer and manufacturer of other high performance test and simulation modules, data bus analyzer software and systems for MIL-STD-1553 A/B, AFDX/ARINC664, ARINC429, MIL-STD-1760 and CAN/ARINC825 Applications, PANAIA Serial Link and Fibre Channel. Supported hardware platforms include Peripheral Component Interconnect ([PCI](#)), PCI Express ([PCIe](#)), Compact PCI ([cPCI](#)), Versa Module Eurocard ([VME](#)), VME eXtensions for Instrumentation ([VXI](#)), PC104+, PC-Card, PCI Mezzanine Card ([PMC](#)), Express Card and Universal Serial Bus ([USB](#)). Information about all AIM products can be found at <http://www.aim-online.com>.

1.2 How This Manual Is Organized

This manual is organized as follows:

Section 1 "[Introduction](#)" contains an overview of this manual.

Section 2 "[Installation And Preparation](#)" describes the procedure used to install the [BSP](#) Software and the A429 Hardware on a system.

Section 3 "[Developing Custom C/C++ Applications](#)" describes how to create custom C/C++ based applications that make use of AIM Arinc 429 Application Programming Interface ([API](#)).

1.3 Applicable Documents

AIM has developed several documents that may be used to aid the user with other aspects of the ARINC 429 bus interface card. These documents and a summary of their contents are listed below (including this document):

ARINC 429 [API](#) Reference Manual provides the ARINC 429 application developer with detailed information about all functions provided by Arinc429 [API](#). This guide is to be used in conjunction with the ARINC 429 Programmer's Guide.

ARINC 429 [API](#) Programmer's Guide provides the ARINC 429 application developer with high level s/w development information including user application system design concepts, function call guidelines, and sample programs. This guide is to be used in conjunction with the ARINC 429 Reference Manual.

ARINC 429 API Python Programmer's Guide provides the ARINC 429 python script developer with high level s/w development information. This guide is to be used in conjunction with the ARINC 429 Reference Manual and the ARINC 429 API Programmer's Guide.

ANET429 Users's Manual provides information on how to configure, use, and update ANET429 devices. ANET429 is AIM's Ethernet based platform of Arinc 429 devices.

Arinc 429 Windows BSP Getting Started Manual assists the first time users of the AIM PCI 429 boards with software installation, hardware set up and starting a sample project for a Windows [BSP](#).

Arinc 429 BSP Linux Getting Started Manual assists the first time users of the AIM PCI 429 boards with software installation, hardware set up and starting a sample project for a Linux [BSP](#).

VME 429 VxWorks BSP Getting Started Manual assists the first time users of the AIM VME 429 boards with software installation, hardware set up and starting a sample project for a VxWorks [BSP](#).

PBA.pro Bus Analyzer User Manual provides instruction on how to use the PC based ARINC 429 bus analyzer software package, PBA.pro, to set up and control the PCI 429 Bus Interface Module.

Hardware Manuals – provide the hardware user manual for the specified modules. The documents cover the hardware installation, the board connections the technical data and a general description of the hardware architecture. The following hardware manuals are available:

- ASC429 Hardware Manual (USB)
- ACE429 Hardware Manual (PXIe)
- AEC429 Hardware Manual (ExpressCard)
- APE429 Hardware Manual (PCIe)
- AMCX429 Hardware Manual (PMC)
- AMCE429 Hardware Manual (PMC)
- AXC Hardware Manual (XMC)
- AXE Hardware Manual (XMC)
- APU429 Hardware Manual (USB)
- APX429 Hardware Manual (PCI)
- APXX429 Hardware Manual (PCI)
- ACX429-3U Hardware Manual (PXI)
- ACXX429 Hardware Manual (PXI)

2 Installation And Preparation

Follow the steps in this section for information on how to install the [BSP](#) software on your system and preparing your Arinc 429 devices for use.

2.1 Hardware Installation

Please insert the AIM Arinc 429 devices into your system according to the description within the corresponding hardware manual. Then power-on your system and boot your Windows Operating System (OS) installation.

Note:**ESD Warning!!!**

The AIM interface modules are typical electronic devices that are sensitive to electrostatic discharge. It is important to observe normal precautions when handling the board to prevent damage.

2.2 BSP Installation

Running The BSP Installer

To install the [BSP](#) software, run the installer application called [Setup.exe](#) from the AIM provided DVD or download it from AIM-Online. Once the installer application has started, step through the install wizard to complete the installation.

You will be prompted for a destination folder where to install the [BSP](#) to (See figure 1). All documentation, device drivers, sample development projects and firmware update utilities will be installed to this location which is later on referred to as *BSP installation directory*.

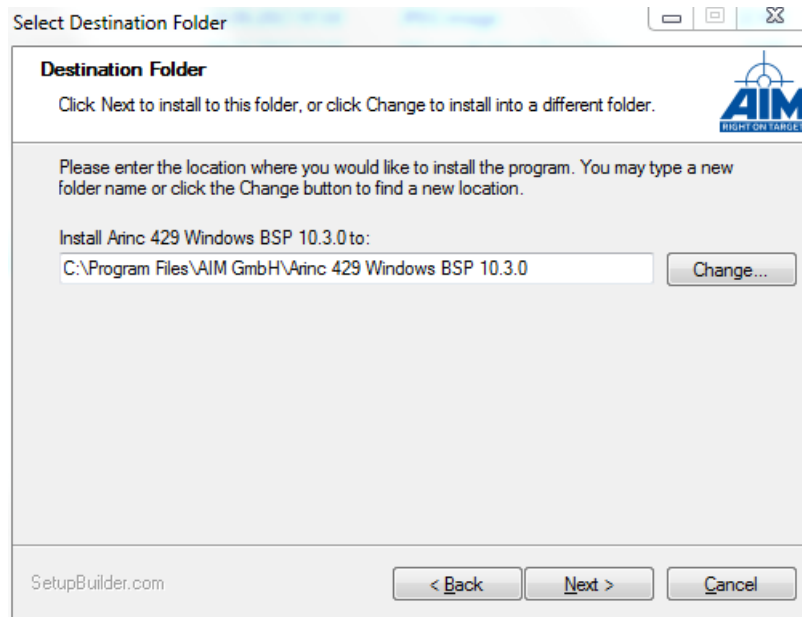


Figure 1: BSP Installation Directory

After successful [BSP](#) installation the installer application offers to update all the device drivers, [API](#) libraries and Firmware of your installed Arinc 429 devices (See figure 2). Running this procedure is highly recommended. If skipped, it can be run manually later on (See Section 2.3 "Integrating New Hardware Later On").

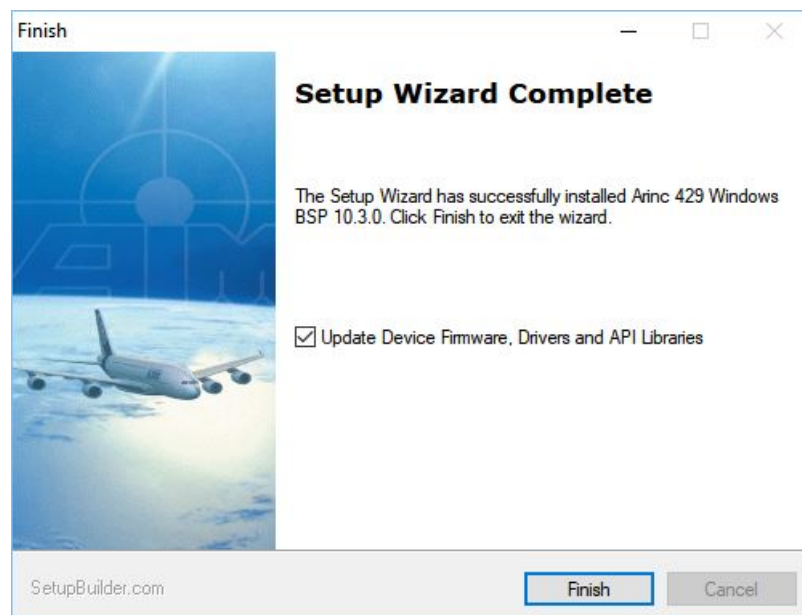


Figure 2: Automatic Firmware/Driver/API Update

Now a command shell will open that displays progress of the update procedure (See figure 3). Follow all other instructions you're given via this shell or via installation dialogues opened by this shell.

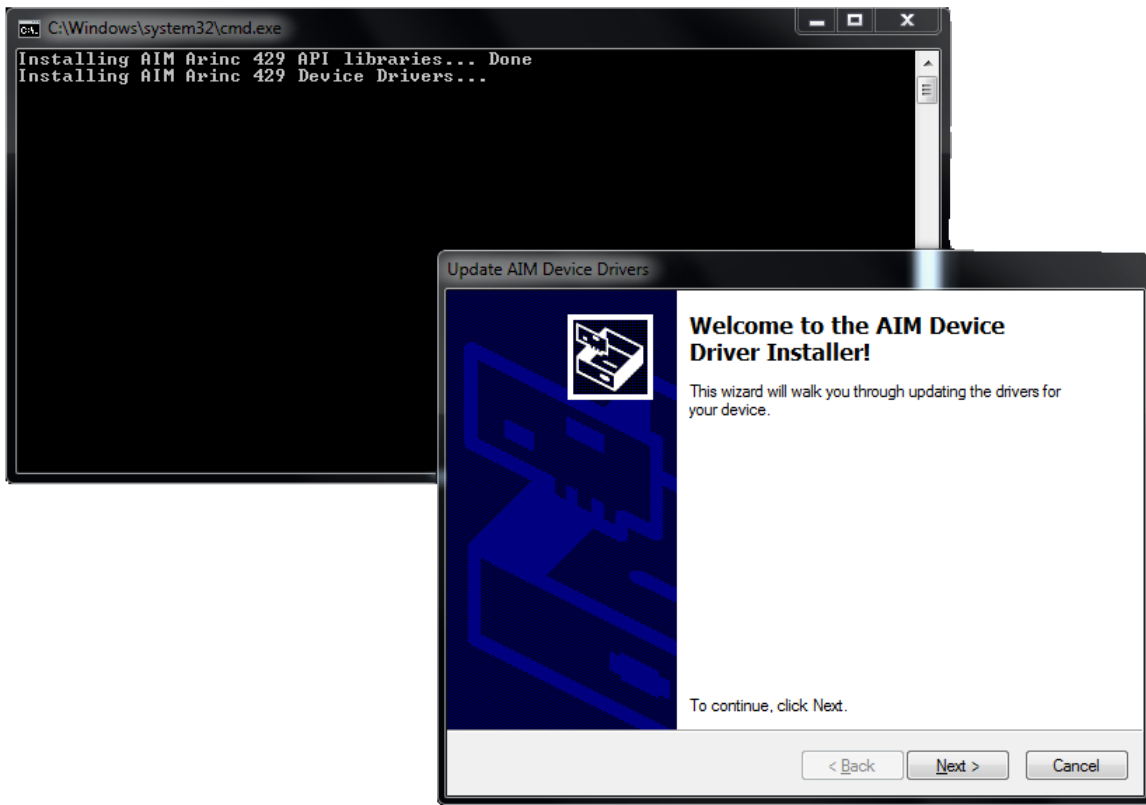


Figure 3: Update Procedure Command Shell

Confirm any reboot of your computer you are prompted for e.g. by message boxes:



The update procedure may also automatically restart your computer several times.

Note:
 Automatic firmware update is only supported for latest platforms of AIM Arinc 429 devices that are connected to your host via a local system bus. If you either own legacy hardware (APU429) or network based hardware (ANET429), you have to perform the Firmware update manually. (See Section 2.3 "Integrating New Hardware Later On")

BSP Components

The **BSP** installation will result in the creation of a Start Menu entry which can be located by going to *Start | All Apps | AIM GmbH | Arinc 429 x.y.z* (See figure 4). Clicking on this entry will open a Windows Explorer instance that will point to the **BSP** installation directory.

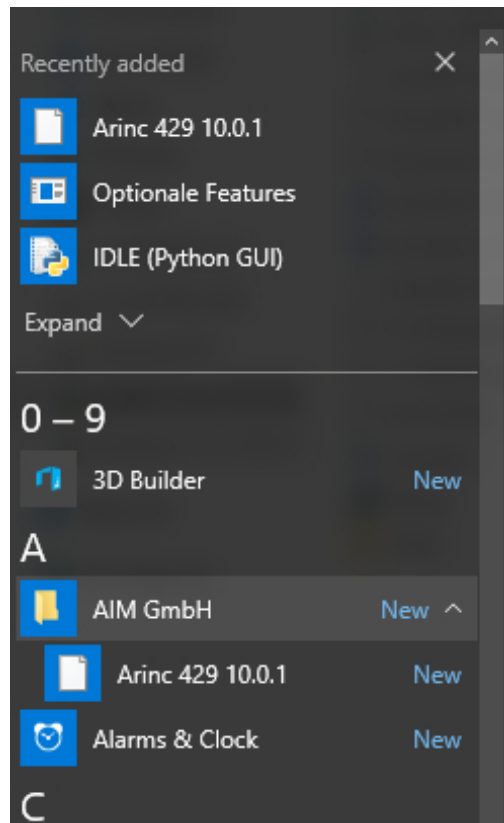


Figure 4: New entries in the start menu

The default location *C:\Program Files\AIM_GmbH\Arinc 429 Windows BSP x.y.z* will contain the following directories:

ANS429 AIM Network Server – for remote access to AIM modules.

Doc Software Library Reference manual, Release notes and other documents

Drivers Drivers for supported Arinc 429 devices.

include Header files used during compilation.

LabView LabView application DLL and Libraries

lib32 DLL and Import Library required to develop an 32 bit application for 32 and 64 bit Windows systems.

lib64 DLL and Import Library required to develop an 64 bit application for Windows systems.

Net-Detection-Tool Utility for detecting network based AIM devices (e.g. ANET429) in your local network.

Onboard-SW Update utilities that are used for updating the on-board firmware.

Python API Python bindings for the API library

Sample Sample project and source files for Microsoft Visual Studio 2013.

Verifying Proper Installation Of The Device Drivers

To verify proper installation of Windows driver:

1. Open the Windows Device Manager. (e.g. via *Control Panel->Device Manager*)
2. In the Device Manager window, expand the *AIM Components* entry by double clicking on it.
3. Then right click on the AIM Board entry and select Properties.
4. In the Properties window you will get status information that will show if the driver reported any errors at this point.

Note:

You will not see network based Arinc 429 devices in the device manager. Use the *Net-Detection-Tool* delivered with the [BSP](#) in order to verify if these devices are correctly integrated in your local network

2.3 Integrating New Hardware Later On

If you install new AIM Arinc 429 devices in a system where the [BSP](#) installation procedure as described in Section [2.2 "BSP Installation"](#) has already been run, you have to update the Firmware of these devices before you're able to use them. There are several different procedures depending on the device platform you want to update.

Note:

Never abort the board update process. Should the update appear to hang, please contact support@aim-online.com or your AIM sales representative.

Updating devices that are locally connected to a host

This method can be used for most devices that are connected to the host via a local system bus (e.g. [PCIe/USB](#)). Some boards belonging to legacy platforms can't be updated with this method. For these a message will appear indicating that they shall be updated in a different way - according to Section [2.3 "Updating legacy devices that are locally connected to a host"](#).

Open a file manager and navigate to the subdirectory *Onboard-SW* of your [BSP](#) that is by default located in *C:\Program Files\AIM GbmH\Arinc 429 Windows BSP x.y.z\Onboard-SW*

Then execute the batch file [update.bat](#). A DOS prompt will appear and the board update will now start. Please follow the instructions printed to the screen.

For some boards an additional reboot may be required. Please check the output on command prompt and (if requested) reboot and run the update.bat again. When the download is finished, a cold boot is required to start the new on-board software.

Updating network based devices

ANET429 devices can be updated using the web browser based *ANET Web Configuration* utility. Here, go to the *Update* tab and choose '*Reboot to maintenance system*'.

After the device rebooted to maintenance system, login to the web configuration interface and go back to the *Update* tab. Choose the update package (*.tar.gz) suitable for your device and start the update.

The update package is located in the *Onboard-SW* folder of your [BSP](#) installation directory. Usually this is at *C:\Program Files\AIM GmbH\Arinc 429 Windows BSP x.y.z\Onboard-SW\ANET429*

The update procedure might take some time. Please leave the browser window open until the update is finished.

For a detailed description of this procedure, find more information in the *ANET429 User's Manual* that is delivered with this [BSP](#).

Updating legacy devices that are locally connected to a host

APU429 boards cannot be updated with the standard method. They require a separate update procedure, which is described below.

Open a file manager and navigate to the subdirectory *Onboard-SW* of your [BSP](#) that is by default located in *C:\Program Files\AIM GmbH\Arinc 429 Windows BSP x.y.z\Onboard-SW*

Then execute the batch file [update_APU429.bat](#).

This begins the PCI interface FPGA update. This procedure takes a few minutes, depending on system speed. In our test environment the APU429 requires even about 45 minutes.

Note:

Do NOT switch off power during update!

When the update has finished shut down the system and turn power off to reboot the card completely. A Windows restart will not reboot all parts, so power has to be turned off for about 10 seconds. After the restart of the system, the driver should start without errors.

Note:

Only one AIM A429 module can be installed during the FPGA upgrade.

3 Developing Custom C/C++ Applications

This section describes the basic steps for configuring the build of an application that attaches to the AIM Arinc 429 [API](#). For further information regarding the usage and feature set of this [API](#), refer to Arinc 429 [API Reference Manual](#) and Arinc 429 [API Programmer's Guide](#).

3.1 Precompiled Sample

To execute a pre-compiled sample program already included in the BSP run:

`C:\Program Files\AIM GmbH\Arinc 429 BSP x.y.z\Sample\Sample.exe` The sample program opens a board and provides a selection of a sub-sample functions to execute. Its source code is included in the [BSP](#) and offers a first lead for 429 [API](#) programming.

3.2 Building Your Own Application

In this demonstration, the Microsoft Visual Studio 2013 Integrated Development Environment ([IDE](#)) is used . If you are using other [IDEs](#) or compilers, refer to the appropriate documentation on how to add header and library search paths and library dependencies. The general procedure follows these steps:

1. Include the [Api429.h](#) header file in your application's modules that want to make use of Arinc 429 functionality.

```
//Include the AIM Arinc 429 API header file
#include "Api429.h"

int main(void)
{
    Ailnt num_boards = 0;

    num_boards = Api429LibInit();

    printf("%d_AIM_Arinc_429_devices_found_\n");
}
```

2. Add the Arinc 429 [BSP's include](#) directory to the "Additional Include Directories" property in your project's `C/C++ -> General` configuration section. See following figure that assumes the [BSP](#) was installed to `C:\Temp\Arinc429 BSP`:

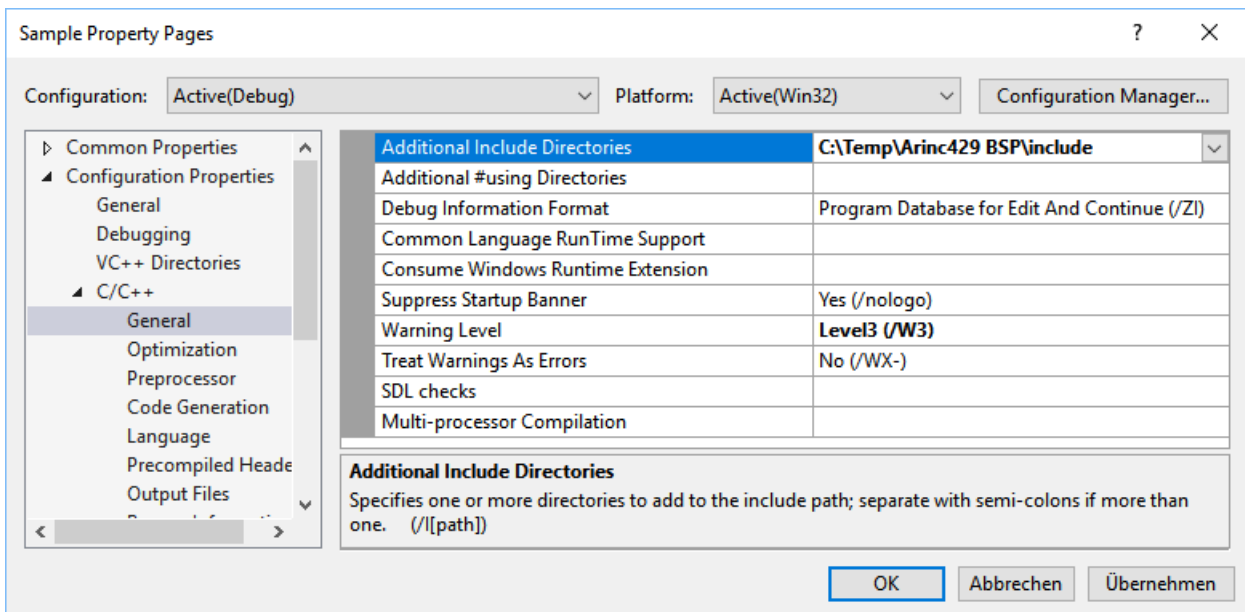
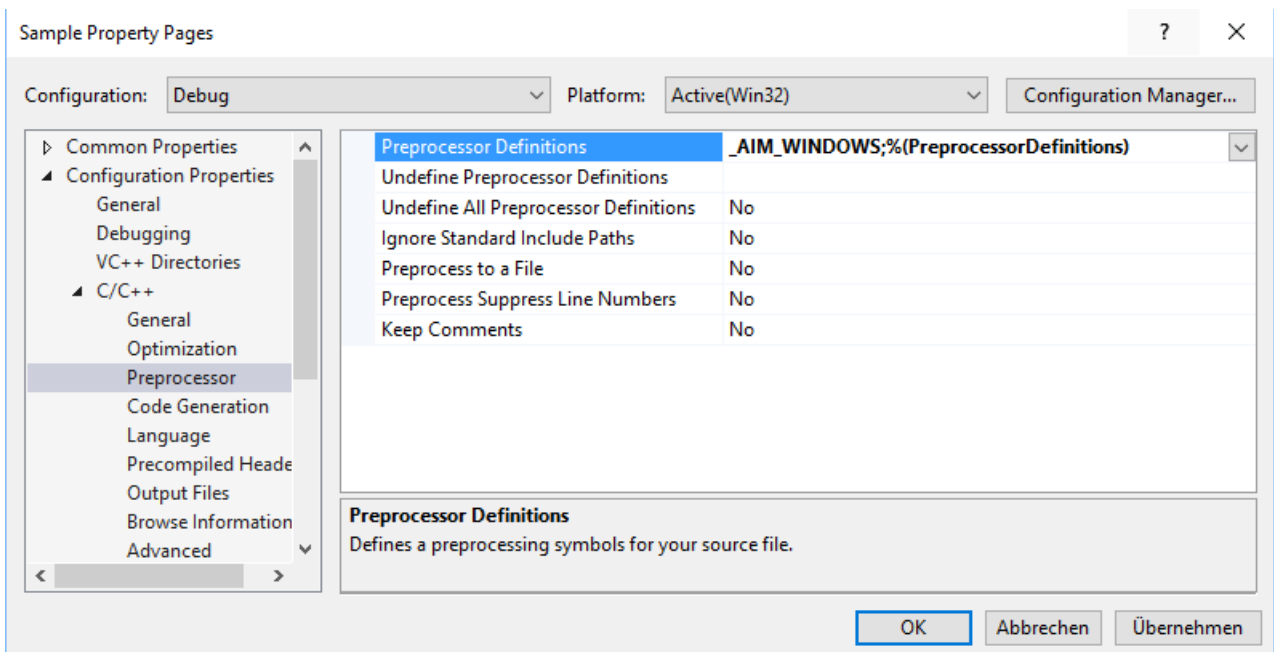


Figure 5: Adding 429 API include path

3. Add the preprocessor macro `_AIM_WINDOWS` to the "Preprocessor Definitions" property in your project's *C/C++ -> Preprocessor* configuration section:


 Figure 6: Adding `_AIM_WINDOWS` preprocessor macro

4. Now add the `api_civ.9.lib` library to the "Additional Dependencies" property in your project's *Linker -> Input* configuration section:

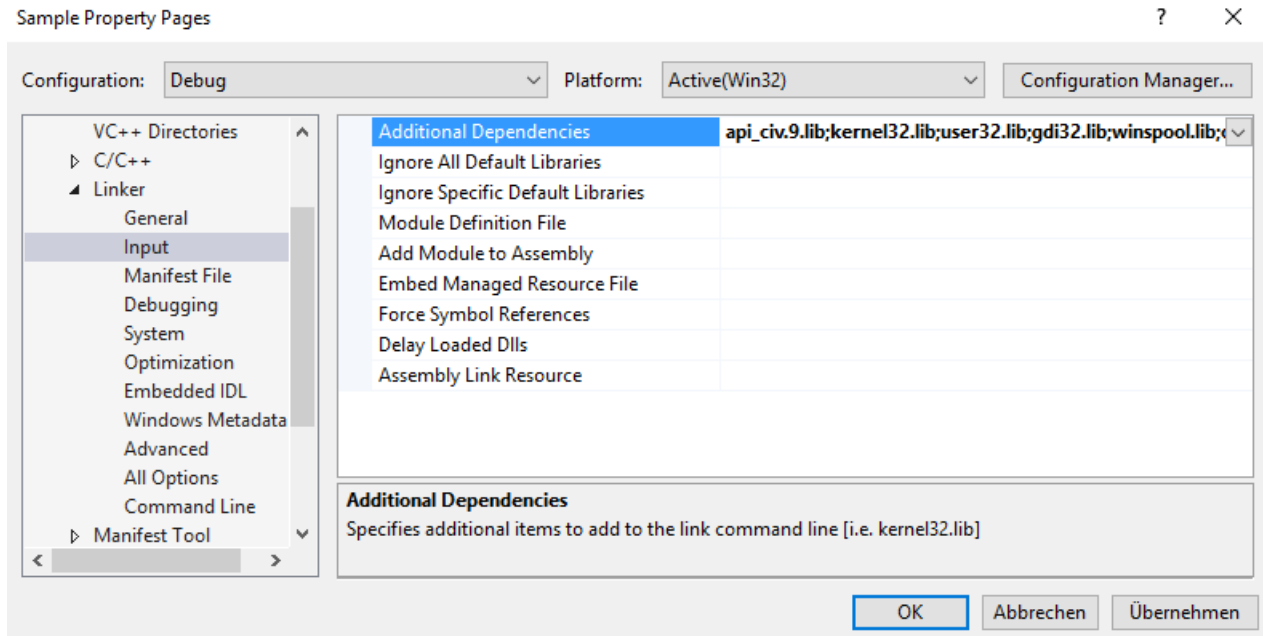


Figure 7: Adding api_civ.9.lib dependency

- As a last step, append the search path for the Arinc 429 API library to the "Additional Library Directories" property in your project's *Linker -> General* configuration section. If building a 32Bit application you have to add the *lib32* directory of the *BSP* installation directory. In case of building a 64Bit application, *lib64* has to be specified instead. See following figure that assumes the *BSP* was installed to *C:\Temp\Arinc429 BSP* and a 32Bit application is build:

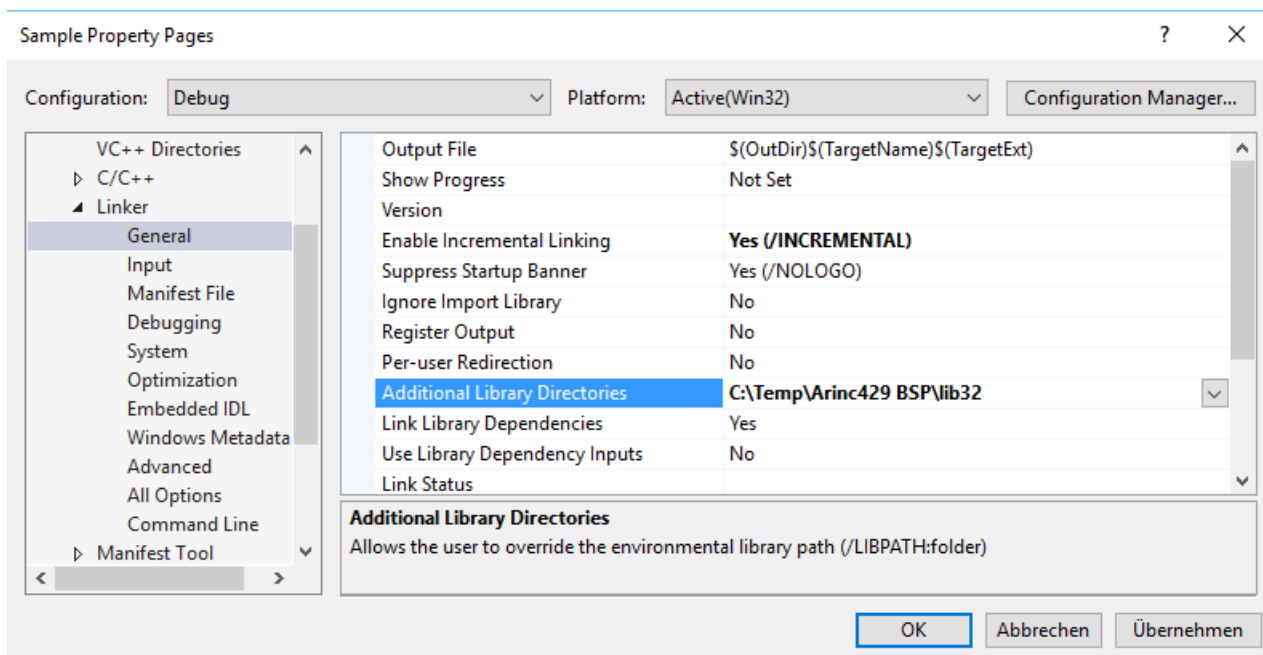


Figure 8: Adding library search path

4 Using The LabVIEW VI Interface

4.1 Install the LabVIEW VIs and examples

The VIs and examples are delivered in the BSP as VIP package. This package needs to be installed in order to be accessed by LabView. The installation by using the JKI VI Package Manager is as follows:

1. Open the JKI VI Package Manager and select open package file. Choose the VIP file from the installed BSPs VI folder.

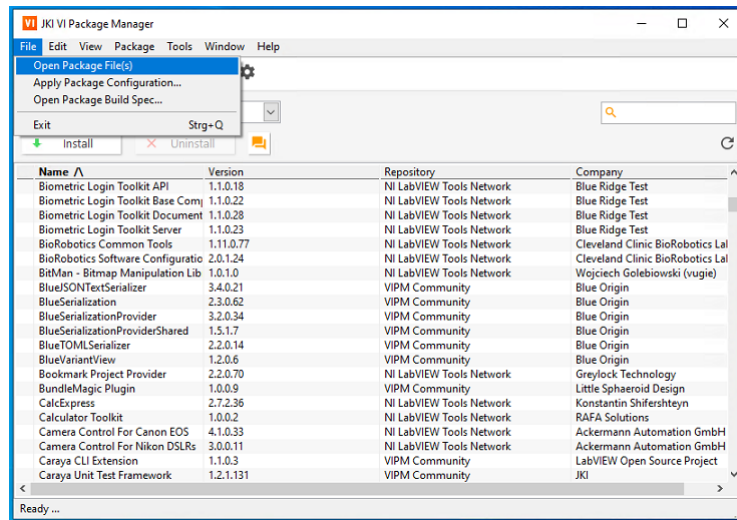


Figure 9: JKI VI Packet Manager Open File

2. Select Add to Library & Install

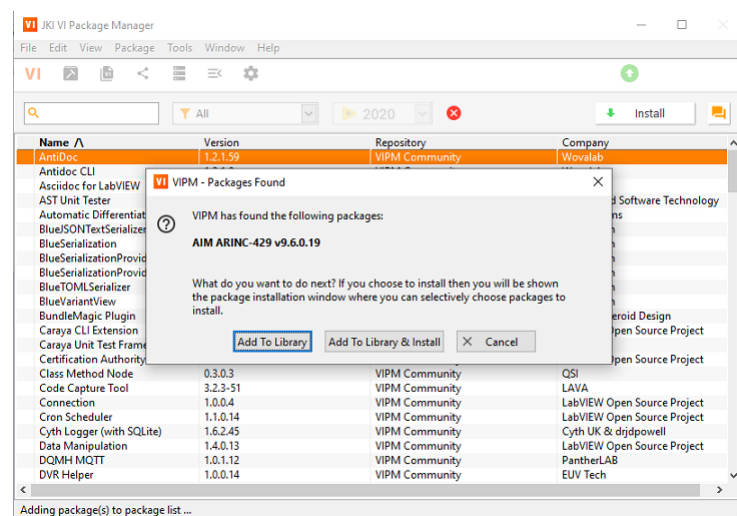


Figure 10: JKI VI Packet Manager Install

3. Accept License Agreement

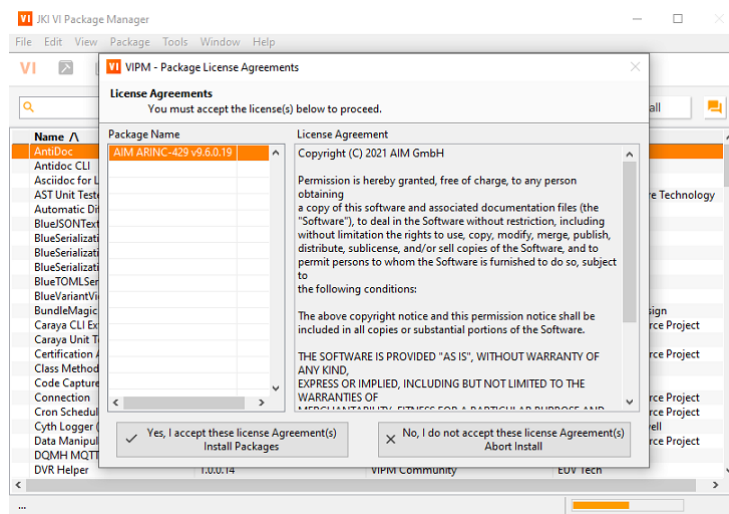


Figure 11: JKI VI Packet Manager Install

4. Select Finish

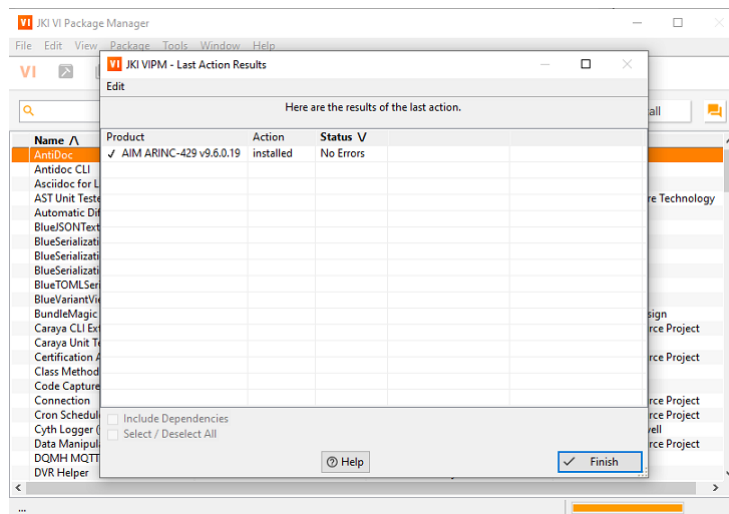


Figure 12: JKI VI Packet Manager Finish

5. The VIs can be found in the Instrument I/O section

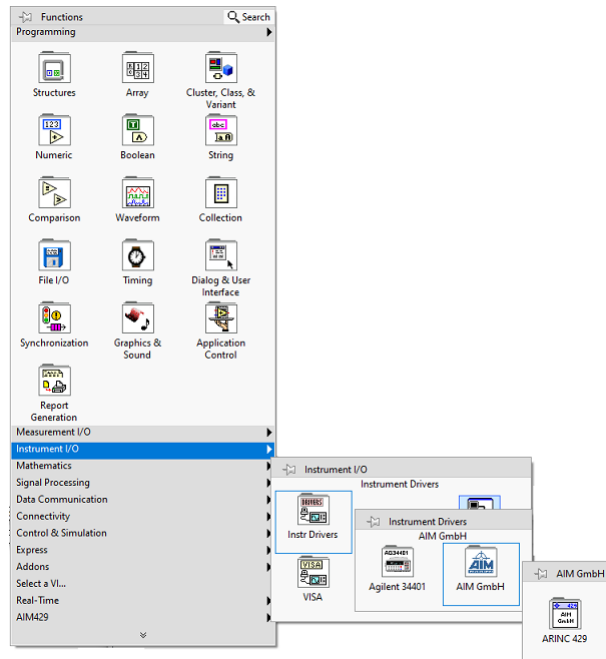


Figure 13: Path to ARINC-429 VIs

4.2 Using The Reference Manual

The LabVIEW AIM Arinc 429 palettes show only high level VIs. These high level VIs are provided to give the user a simple and comfortable access to the 429 board programming.

However, the basic VIs which reflect directly the C DLL Interface, are still available. They are located in within the LabVIEW directory, e.g. `c:\Program Files (x86)\National Instruments\LabVIEW 2020\instr.lib\AIM GmbH_ARINC-429\VIs\`.

If information about a high level LabVIEW Virtual Instrument (VI) is required, the help of it shows how to use the parameters.

If information about a basic VI is needed, searching for the name of the function in the Reference Manual will bring you to the description of the function. The VIs are named exactly like the corresponding C API function names.

The basic VIs have the same connections (single parameters/clusters) with the same name for every parameter/struct of the described function.

List of Abbreviations

API Application Programming Interface

BSP Board Software Package

cPCI Compact PCI

IDE Integrated Development Environment

OS Operating System

PCI Peripheral Component Interconnect

PCIe PCI Express

PMC PCI Mezzanine Card

USB Universal Serial Bus

VME Versa Module Eurocard

VXI VME eXtensions for Instrumentation

VI LabVIEW Virtual Instrument

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