



# Getting Started with ANT PC Development

## ABSTRACT

This application note describes how to start developing ANT enabled applications for PC devices connected to ANT enabled USB sticks using the ANT PC Libraries.

## COPYRIGHT INFORMATION AND USAGE NOTICE

This information disclosed herein is the exclusive property of Dynastream Innovations Inc. No part of this publication may be reproduced or transmitted in any form or by any means including electronic storage, reproduction, execution or transmission without the prior written consent of Dynastream Innovations Inc. The recipient of this document by its retention and use agrees to respect the copyright of the information contained herein.

The information contained in this document is subject to change without notice and should not be construed as a commitment by Dynastream Innovations Inc. unless such commitment is expressly given in a covering document.

The Dynastream Innovations Inc. ANT Products described by the information in this document are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Dynastream product could create a situation where personal injury or death may occur. If you use the Products for such unintended and unauthorized applications, you do so at your own risk and you shall indemnify and hold Dynastream and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Dynastream was negligent regarding the design or manufacture of the Product.

©2015 Dynastream Innovations Inc. All Rights Reserved.

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>3</b>
<b>2</b>	<b>RELEVANT DOCUMENTS .....</b>	<b>3</b>
<b>3</b>	<b>SETUP .....</b>	<b>4</b>
3.1	REQUIREMENTS .....	4
3.2	USB DRIVER INSTALLATION .....	4
<b>4</b>	<b>GETTING STARTED WITH ANTWARE II .....</b>	<b>5</b>
<b>5</b>	<b>GETTING STARTED WITH SIMULANT+ .....</b>	<b>6</b>
<b>6</b>	<b>DEVELOPING ANT ENABLED APPLICATIONS.....</b>	<b>7</b>
6.1	PROJECT HIERARCHY .....	7
6.2	PROJECT DESCRIPTION.....	8
6.3	DEMO_ANTFS (C#) .....	11
6.4	STARTING WITH THE C++ LIBRARIES.....	11
6.5	STARTING WITH THE C# LIBRARIES .....	13
6.6	DECODING ANT+ DATA .....	15
<b>7</b>	<b>CLOSING REMARKS.....</b>	<b>15</b>

## LIST OF FIGURES

<b>Figure 2.</b>	<b>Device Manager with 3 ANT USB Devices Connected. ....</b>	<b>4</b>
<b>Figure 3.</b>	<b>ANTWare II.....</b>	<b>5</b>
<b>Figure 14.</b>	<b>SimulANT+. ....</b>	<b>6</b>
<b>Figure 4.</b>	<b>DEMO LIB Console Application.....</b>	<b>8</b>
<b>Figure 5.</b>	<b>DEMO DLL Console Application. ....</b>	<b>9</b>
<b>Figure 6.</b>	<b>DEMO NET Console Application. ....</b>	<b>10</b>
<b>Figure 7.</b>	<b>NetDLL GUI Application.....</b>	<b>10</b>
<b>Figure 8.</b>	<b>DEMO ANT-FS Application. ....</b>	<b>11</b>
<b>Figure 9.</b>	<b>Upgrade Solution to Latest Version.....</b>	<b>11</b>
<b>Figure 10.</b>	<b>ANT Libraries in Visual Studio. ....</b>	<b>12</b>
<b>Figure 11.</b>	<b>DEMO DLL Source Code View. ....</b>	<b>13</b>
<b>Figure 12.</b>	<b>ANT NET Libraries in Visual Studio.....</b>	<b>14</b>
<b>Figure 13.</b>	<b>DEMO NET Source Code View.....</b>	<b>15</b>

## 1 Introduction

This guide will outline the main steps in the development of PC applications that can connect to an ANT chip or module, receive ANT messages from a specific ANT+ device, and decode this data according to its ANT+ device profile. It is assumed that you are already familiar with the basic operation of the ANT protocol and the use of network keys.

## 2 Relevant Documents

It is strongly recommended that the following documents be reviewed prior to using this application note. To ensure you are using the current versions, check the ANT+ website at [www.thisisant.com](http://www.thisisant.com) or contact your ANT+ representative

- ANT Message Protocol and Usage
- Device Pairing
- ANT Channel Search and Background Scanning Channel

## 3 Setup

### 3.1 Requirements

2 ANT-enabled USB sticks

Microsoft Visual Studio

ANT Windows Library Package

### 3.2 USB Driver Installation

In the newer versions of Windows you may find that these drivers install automatically the first time you insert the USB Stick. Otherwise Windows drivers for the ANT USB1 and USB2 sticks can be found under Software Tools on the website. Make sure you install drivers that match the type of USB stick you are using. The type of the USB stick (USB1/USB2) is printed on the dongle itself. If using the USB Interface Board (UIF) and an ANT module, you will need the drivers for USB1. Full instructions for installing the drivers for the USB stick are available in the "ANT Development Kit User Manual"

Once the ANT USB stick has been successfully installed, it should be listed on the Device Manager as a Universal Serial Bus controller. The name of the device will vary depending on whether the device is a commercial ANT USB1 or USB2 stick, or an interface board connected to an ANT module from an ANT development kit.

ANT USB1 / USB Interface Board: ANT USB Device

ANT USB2: ANT USB Stick 2

ANT USB-m: ANT USB-m

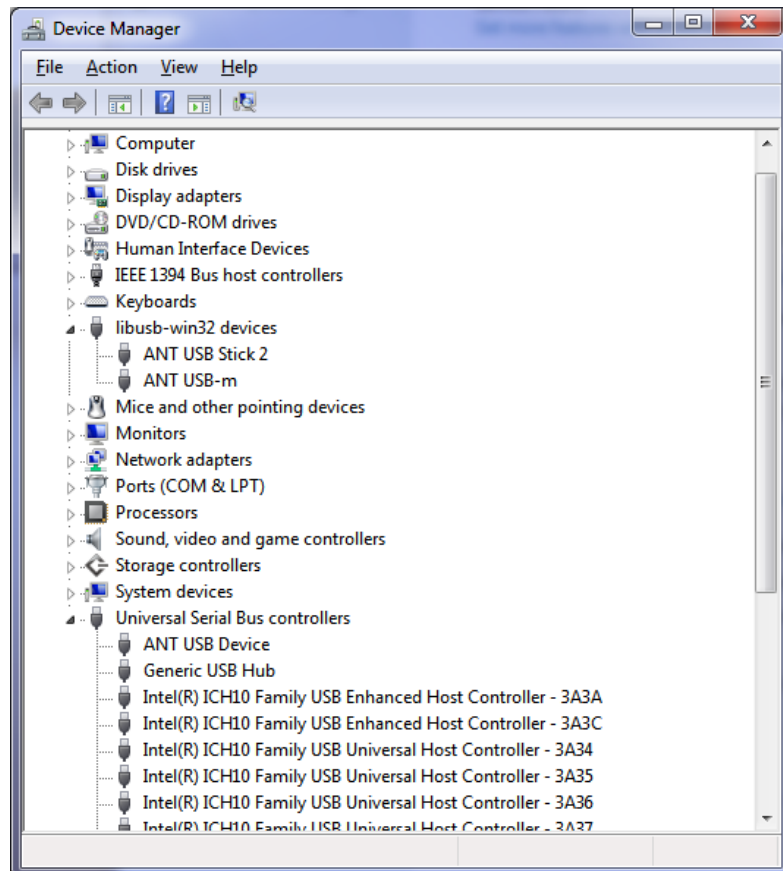


Figure 1. Device Manager with 3 ANT USB Devices Connected.

Important!

If drivers for an ANT USB stick bundled with an ANT+ enabled consumer product have already been installed, it is not necessary to install additional drivers. Only one application can access the ANT USB stick at a time. As such, all 3rd party applications (e.g. Garmin ANT Agent) must be closed to allow the ANT+ development tools and your own applications access to the USB device.

## 4 Getting Started with ANTware II

To gain hands-on experience with ANT, we recommend getting familiar with ANTware II as your next step. ANTware II is a GUI application used to control ANT devices, and it is an excellent resource for exploring the capabilities of ANT. ANTware II can be used to set up ANT channels and experiment with ANT's configuration commands.



Figure 2. ANTWare II.

## 5 Getting Started with SimulANT+

One of the key tools in ANT+ application development is SimulANT+. This software tool allows developers to create applications compatible with ANT+ sensors without the need for a physical sensor to generate ANT+ data during development (and vice versa). Before starting to work on custom ANT+ applications, we highly recommend becoming familiar with SimulANT+.

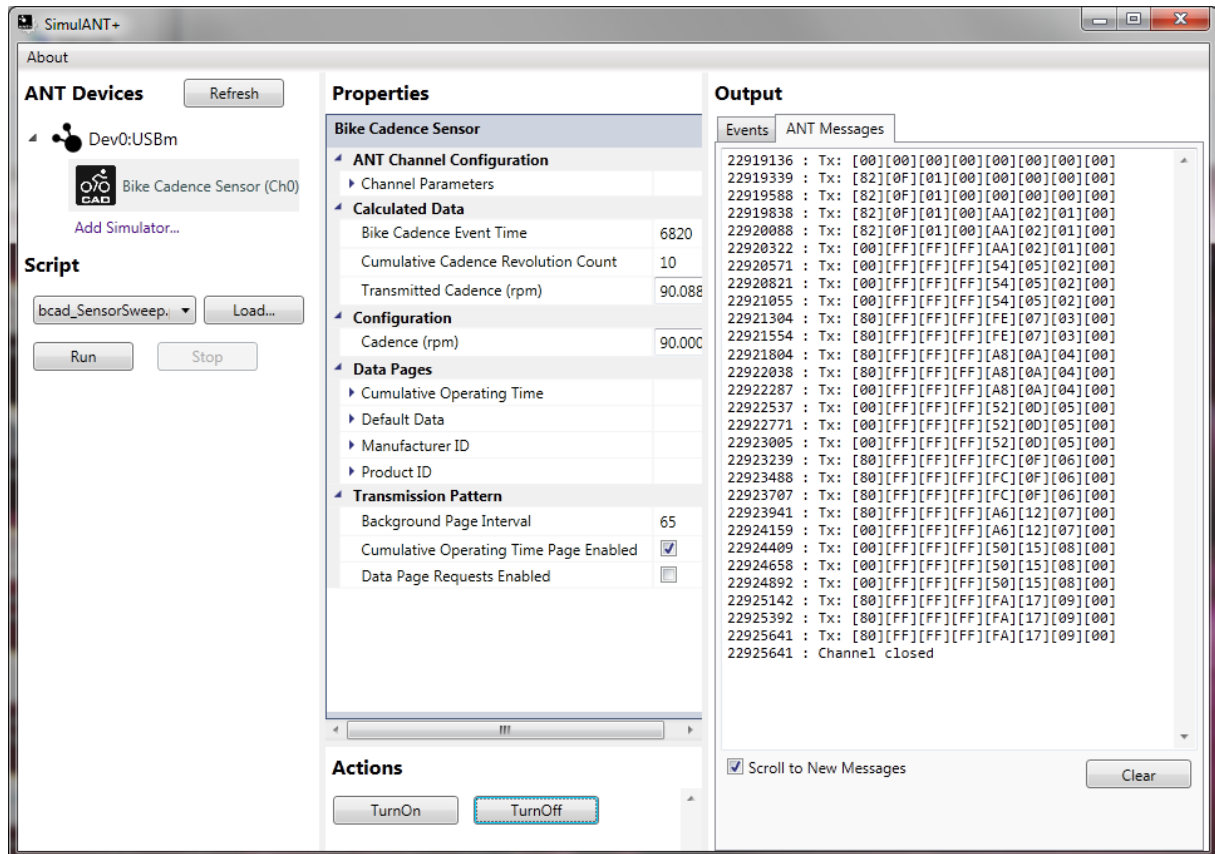


Figure 3. SimulANT+.

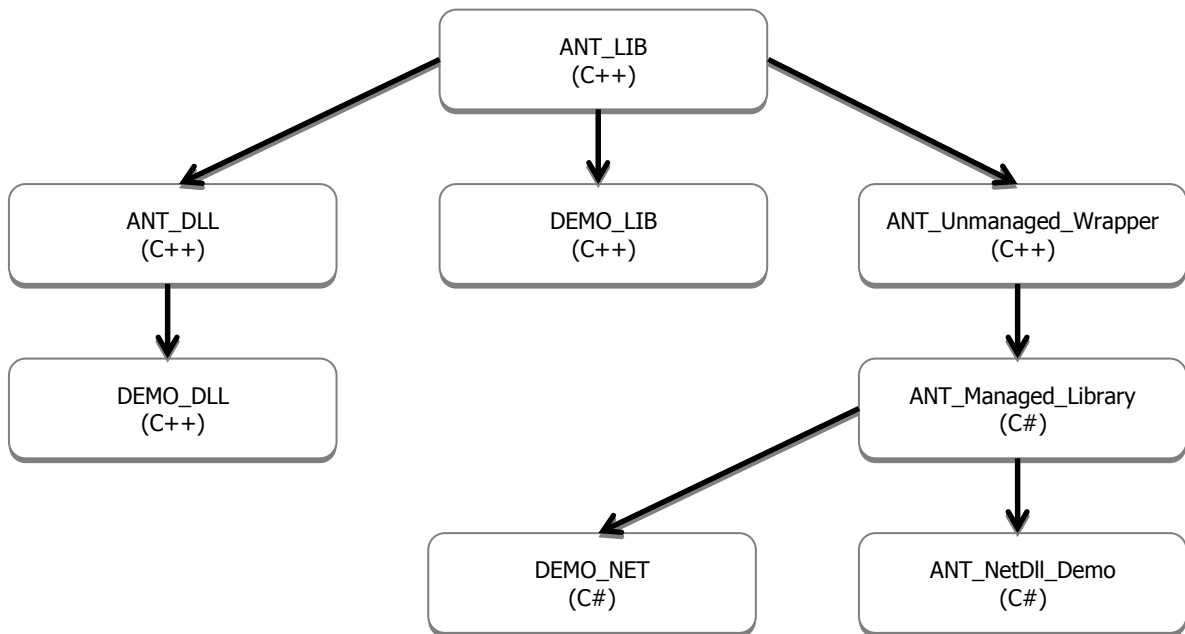
## 6 Developing ANT Enabled Applications

The ANT Windows Library Package contains a set of libraries to facilitate development of ANT enabled applications, along with demonstration applications illustrating the usage of the ANT libraries. The libraries contain functionality to connect to ANT enabled USB sticks, handle the low level serial communication, ANT message framing, and optional logging of raw messages during communication sessions for debug purposes.

The ANT\_Libraries.sln can be opened and compiled directly with Visual C++ 2008 or newer. This solution includes all settings to build the libraries and accompanying demos. Please have a look at the readme.txt file included within the Library Package, as it outlines its contents, the different projects available, and the dependencies between projects.

### 6.1 Project Hierarchy

The figure below describes the dependencies in the ANT Windows Library. All projects start from ANT\_LIB which contains the base implementation of the ANT PC USB Libraries.



## 6.2 Project Description

The Visual studio solutions included in this package have been designed to handle all of the dependencies between projects. Make sure to open the solution files instead of individual project files. In order to handle dependencies correctly, please build ANT\_Libraries.sln first, and then build ANT\_NET\_Libraries.sln

### 6.2.1 ANT\_Libraries.sln (C++)

#### 6.2.1.1 ANT\_LIB (C++)

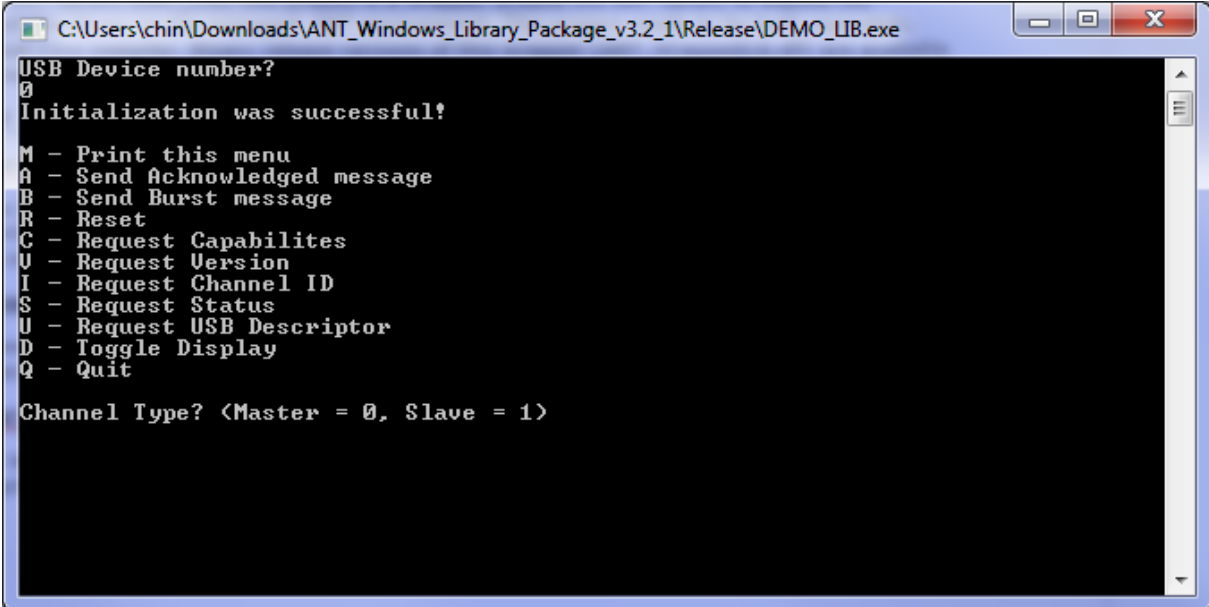
This is the main ANT library source code. It includes the low level serial driver required to communicate with the USB stick as well as ANT message framing, optional logging of serial messages exchanged between the PC and an ANT MCU, and ANT-FS client and host. This library can be statically linked into custom applications and provides greatest flexibility for custom implementations.

#### 6.2.1.2 ANT\_DLL (C++)

Based on the ANT library (ANT\_LIB), this project defines a windows dynamic library interface. The DLL may be imported into other languages that support dynamic libraries. Use of the ANT DLL interface greatly simplifies PC application development with ANT. Binary release versions of this DLL (ANT\_DLL.dll) are available in the BIN directory, along with all other necessary DLLs needed to run on a windows PC.

#### 6.2.1.3 DEMO\_LIB (C++)

A simple command line application built on top of the ANT library that demonstrates how to setup ANT channels and data messages.



```
C:\Users\chin\Downloads\ANT_Windows_Library_Package_v3.2.1\Release\DEMO_LIB.exe
USB Device number?
0
Initialization was successful!

M - Print this menu
A - Send Acknowledged message
B - Send Burst message
R - Reset
C - Request Capabilites
U - Request Version
I - Request Channel ID
S - Request Status
U - Request USB Descriptor
D - Toggle Display
Q - Quit

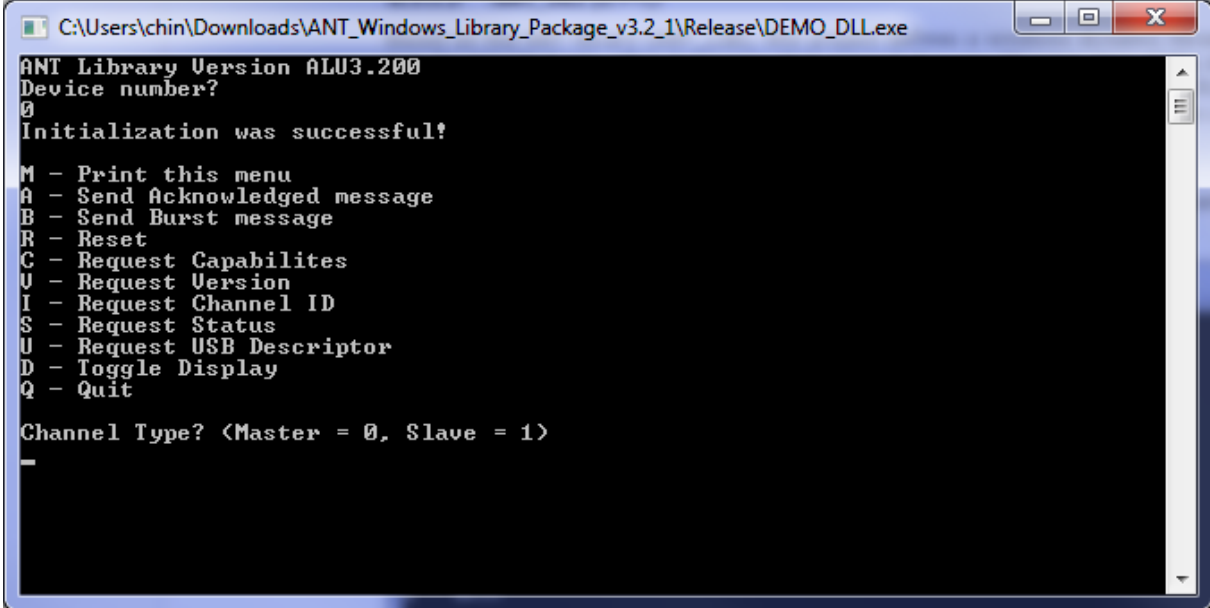
Channel Type? <Master = 0, Slave = 1>
```

Figure 4. DEMO LIB Console Application.

#### 6.2.1.4 DEMO\_DLL (C++)

A simple command line application built on top of the ANT DLL that demonstrates how to import the ANT DLL and setup ANT channels and data messages.





```
C:\Users\chin\Downloads\ANT_Windows_Library_Package_v3.2_1\Release\DEMO_DLL.exe
ANT Library Version ALU3.200
Device number?
0
Initialization was successful!

M - Print this menu
A - Send Acknowledged message
B - Send Burst message
R - Reset
C - Request Capabilities
U - Request Version
I - Request Channel ID
S - Request Status
U - Request USB Descriptor
D - Toggle Display
Q - Quit

Channel Type? <Master = 0, Slave = 1>
_
```

Figure 5. DEMO DLL Console Application.

#### 6.2.1.5 *ANT\_Unmanaged\_Wrapper (C++)*

Based on the ANT library (ANT\_LIB) this project is a wrapper around the ANT library to expose the functionality of the library to the managed .NET environment. This project needs to be built separately, using the Visual C++ compiler. Binary release versions of this wrapper (ANT\_WrappedLib.dll) are available in the BIN directory, along with all other necessary DLLs needed to run on a windows PC.

#### 6.2.2 *ANT\_NET\_Libraries.sln (C#)*

##### 6.2.2.1 *ANT\_Managed\_Library (C#)*

This project is the wrapper to be used in the .NET environment. It exposes the functionality of the unmanaged wrapper in a controlled class environment. Binary release versions of this DLL (ANT\_NET.dll) are available in the BIN directory.

##### 6.2.2.2 *DEMO\_NET (C#)*

A simple command line application built on top of the ANT\_NET DLL that demonstrates how to import the managed library and setup ANT channels and data messages.

```

C:\Users\chin\Downloads\ANT_Windows_Library_Package_v3.2_1\Release\demo_net.exe
Attempting to connect to an ANT USB device...
Initialization was successful!
M - Print this menu
A - Send Acknowledged message
B - Send Burst message
R - Reset
C - Request Capabilites
U - Request Version
I - Request Channel ID
S - Request Status
U - Request USB Descriptor
D - Toggle Display
Q - Quit
Channel Type? <Master = 0, Slave = 1>
_

```

Figure 6. DEMO NET Console Application.

### 6.2.2.3 ANT\_NetDLL\_Demo (C#)

A simple GUI application built on top of the ANT\_NET DLL that illustrates the usage of the managed library in graphical applications using WPF.

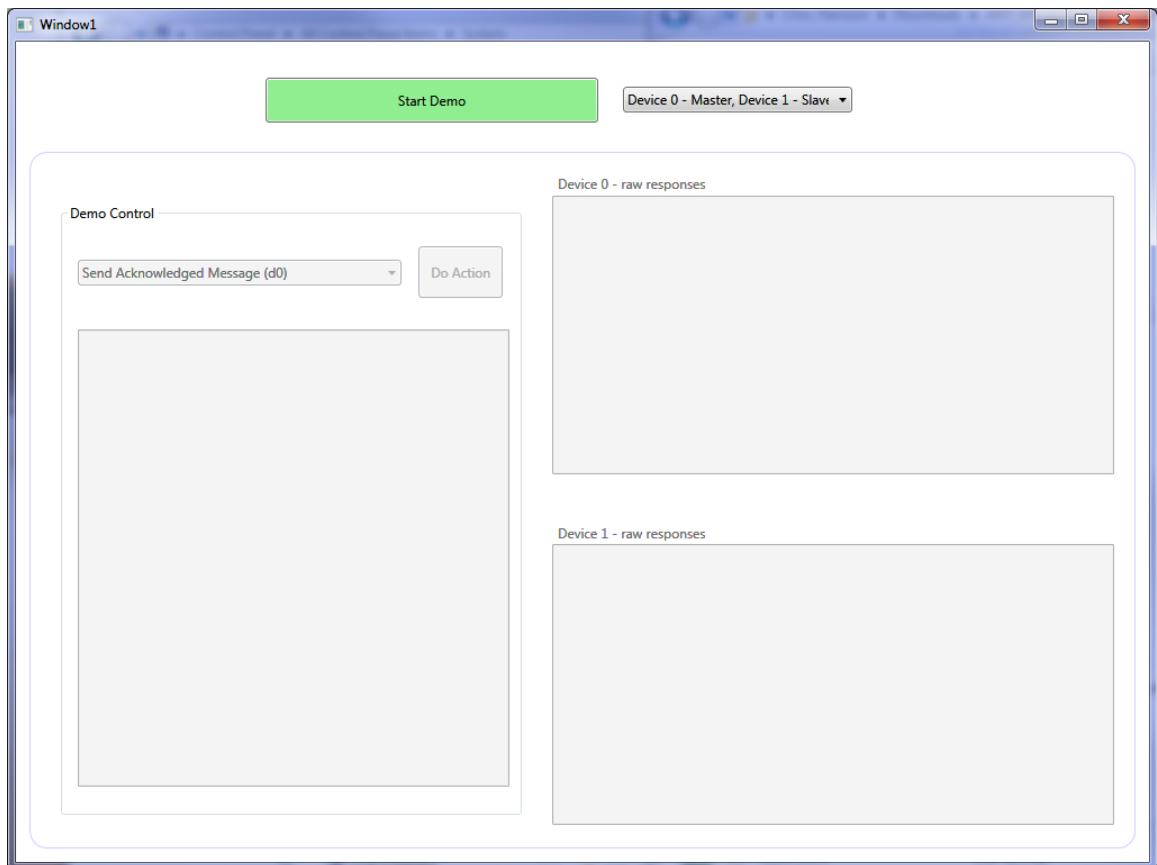


Figure 7. NetDLL GUI Application.

### 6.3 DEMO\_ANTFS (C#)

A simple command line application built on top of the ANT\_NET DELL that illustrates the usage of the managed library to setup and use the ANT-FS Host and Client functionality.

```

C:\Users\chin\Downloads\ANT_Windows_Library_Package_v3.2_1\DEMO_ANTFS\bin\x86\Release\...
Attempting to connect to an ANT USB device...
Initialization was successful!
Please select <Host = 0, Client = 1>
0

M - Print this menu
A - Authenticate
D - Download
U - Upload
E - Erase
X - Disconnect
C - Cancel
P - Print directory
U - Request version
S - Request status
Q - Quit

ANT-FS Host Idle
Searching for devices...
  
```

Figure 8. DEMO ANT-FS Application.

### 6.4 Starting with the C++ Libraries

Download the ANT Windows Library Package with source code.

Unzip the file.

Open the ANT\_Libraries.sln solution. You may have to perform a one-way upgrade to update to the latest version of Visual Studio.

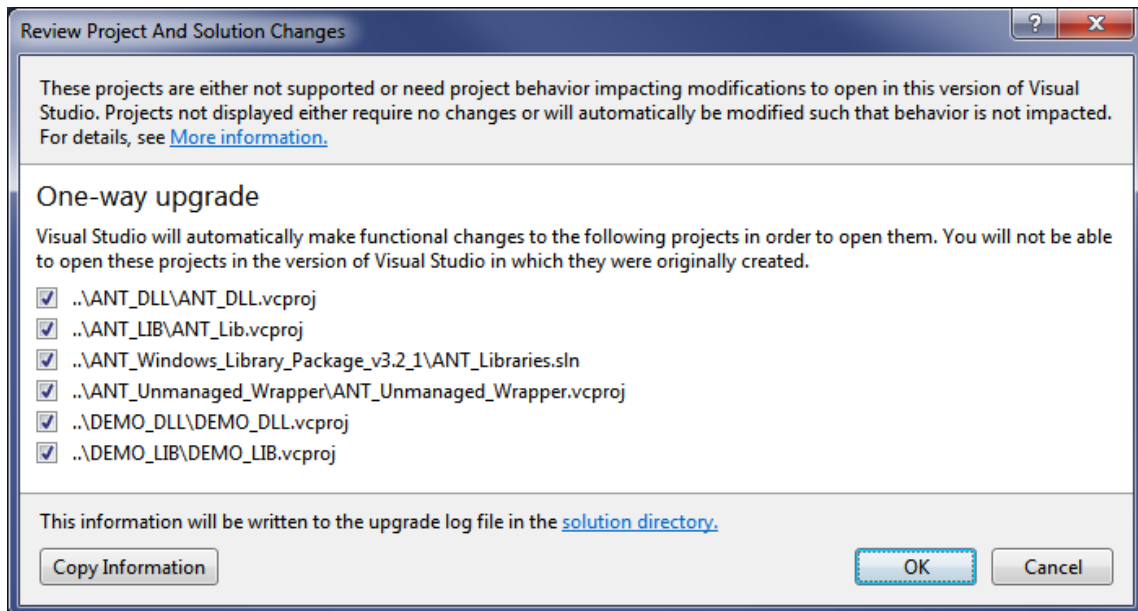
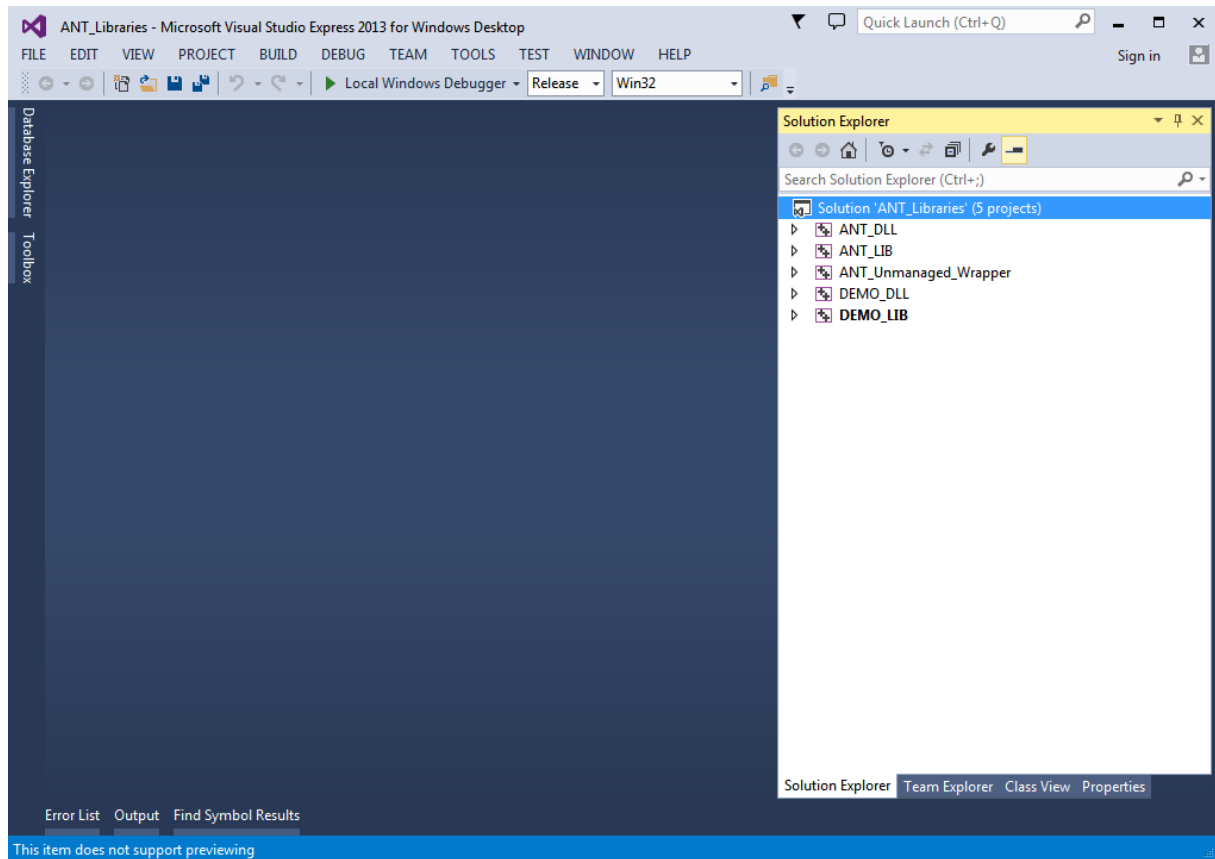


Figure 9. Upgrade Solution to Latest Version.

Right click on the Solution ANT\_Libraries and select "Build Solution".



**Figure 10. ANT Libraries in Visual Studio.**

Run DEMO\_LIB or DEMO\_DLL. These are simple console applications that show how to configure and open an ANT channel.

The source code of the demo applications is a great starting point to get familiar with the ANT library; all commands needed to configure and open an ANT channel are explained through documentation within the code.

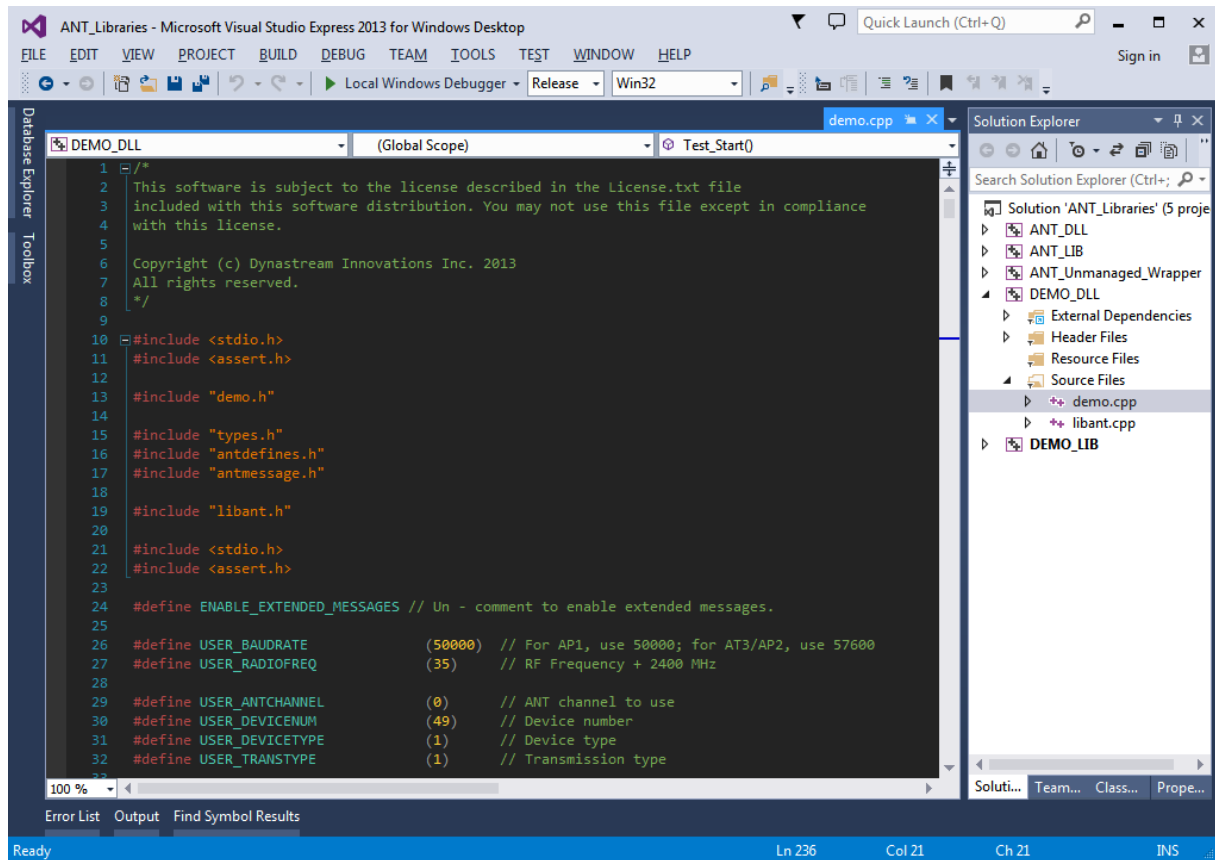


Figure 11. DEMO DLL Source Code View.

## 6.5 Starting with the C# Libraries

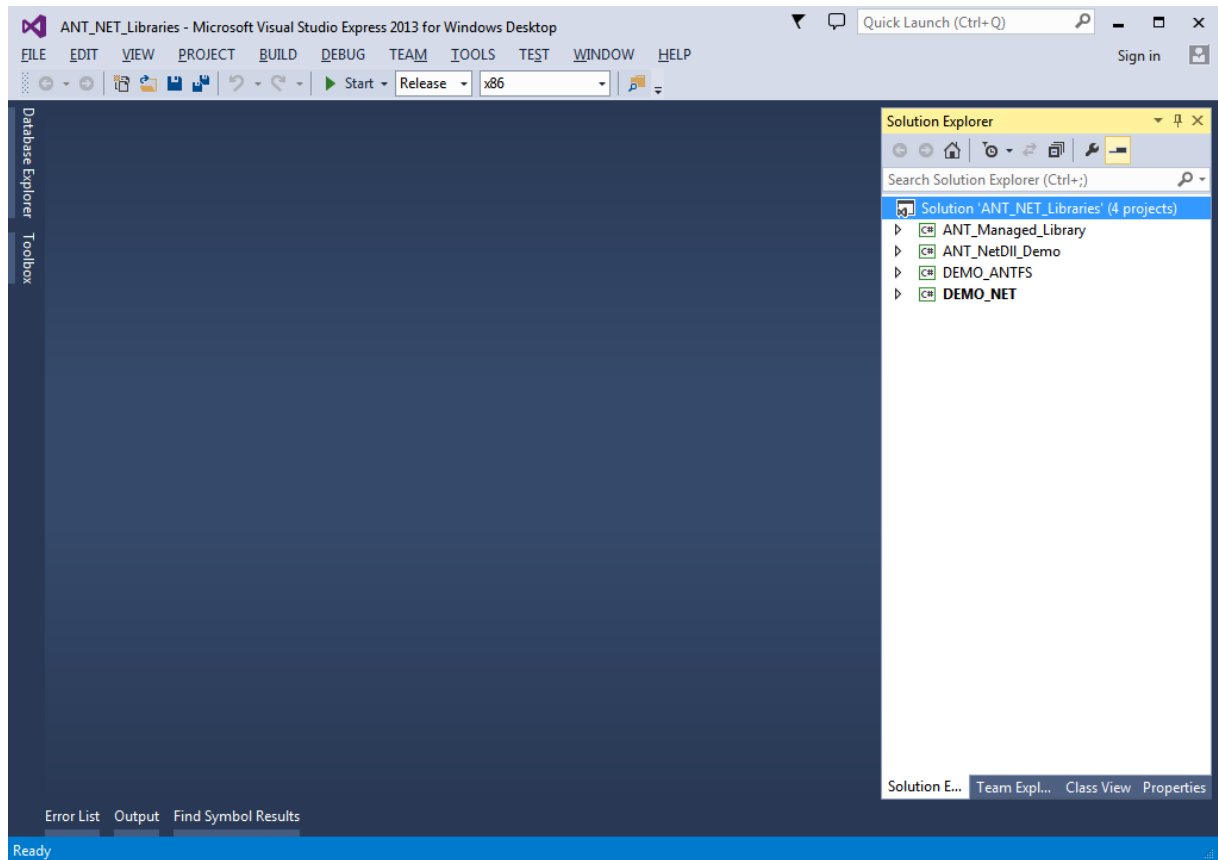
The ANT\_NET\_Libraries.sln contains the ANT Managed library, for use with .NET applications. The ANT\_LIB solution must be built before attempting to use the managed library, to resolve dependencies. Alternatively, the DLL's from the BIN directory may be copied into the working directory of the built project. Copying the ANT\_NET.xml file as well, and including it in a project using the ANT\_NET.dll will enable IntelliSense documentation for the ANT Managed Library.

The DEMO\_NET project is the best example to refer to in order to get familiar with the usage of the managed library. To get started with this code:

Download the ANT Windows Library Package with source code.

Unzip the file.

Open the ANT\_Libraries.sln solution (Visual C++)



**Figure 12. ANT NET Libraries in Visual Studio.**

Ensure you are configured to build against "x86". The libraries do not support "x64". Right click on the Solution ANT\_Libraries and select "Build Solution".

Open the ANT\_NET\_Libraries.sln (Visual C#)

Build the entire solution.

Run DEMO\_NET. This is a simple console application that shows how to configure and open an ANT channel.

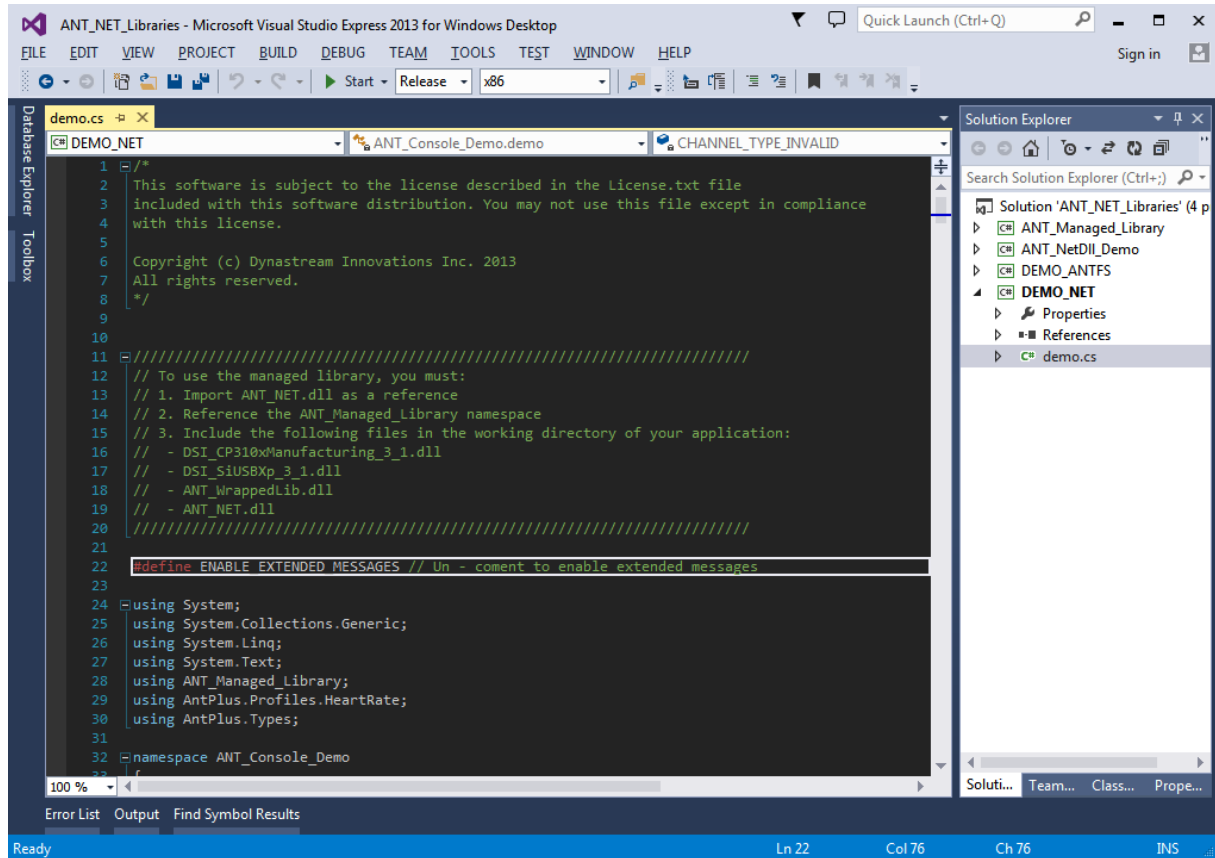


Figure 13. DEMO NET Source Code View.

## 6.6 Decoding ANT+ Data

ANT+ Device Profiles define the channel parameters and format of the data payload of specific devices. In other words, for a display device, a device profile specifies how to configure an ANT channel to receive data from a particular sensor, and how to decode the data received from that sensor. For a sensor device, a device profile specifies how to configure an ANT channel to send data, and how to format the sensor data to be transmitted.

Each device profile contains a detailed specification of the channel parameters and data format for each sensor type.

For sample code implementing some profiles, refer to the source code of the ANT+ simulator, (also available on the Downloads page). To build the code, you can use Microsoft Visual C++ 2008 or later. The "devices" directory within the project contains the code specific to each sensor and display device, and can serve as a reference for PC applications implementing ANT+ functionality.

## 7 Closing Remarks

This application note described how to start developing ANT enabled applications for PC devices connected to ANT enabled USB sticks using the ANT PC Libraries.

If any of the concepts presented in this application note are unclear or for any further inquiries, please use the developer forum at [www.thisisant.com](http://www.thisisant.com).