# Developer Interface Guide

## For Navitar 2nd generation Motorized Zoom Systems

## Introduction

This document provides guidance to software developers who wish to develop custom applications using the Navitar 2nd generation Motorized Zoom Systems.  To ease development with the controllers Navitar provides a Software Development Kit (SDK) comprised of the following:

• This document

• A communications protocol specification, "Second_Generation_Controller_Protocol_v1.0.pdf", describing the protocol for operation of the controllers using either the serial or USB connections. This document is located in the nav_sdk/doc directory.

• A C#/.NET class library for use developing .NET applications.  Applications making use of the .NET class libraries need not make use of the communications protocol directly.

• USB device drivers (for both 2nd generation and legacy Motorized Zoom System controllers). The device drivers allow controllers connected via USB to appear as virtual COM ports.

• Source code for the Navitar Demo Application, a Windows application that uses the SDK to drive both 2nd generation as well as legacy Motorized Zoom System controllers.

## Controller Theory of Operation

Navitar 2nd Generation Motorized Zoom System Controllers provide both serial (RS232) and USB (CDC virtual COM port) communications interfaces.  Both interfaces implement an ASCII, command-line style protocol as defined in the document "Second_Generation_Controller_Protocol_v1.0.docx".  The protocol uses a register based control model whereby values are read from and written to specific registers to monitor and control the motors.  After power up, the controller perform necessary initialization of system hardware and then move the connected motors through their range of travel to locate the limit sensors and establish the position of the motors.  After the initialization sequence, the controllers remain idle until the controlling application writes to the registers to operate the motors.

## Controller Communications Protocol

The communications protocol is described in detail in the document "Second_Generation_Controller_Protocol_v1.0.docx".  It is a simple command-line style ASCII protocol intended for ease of use.  NOTE: the protocol is NOT compatible with legacy (1st generation) controllers. For debug purposes, it is possible to operate a controller manually using a terminal emulator program (e.g. hyperterm.exe) connected directly to either the serial or USB interface of the controller.  Commands may then be issued using the terminal interface to read and write register, etc, according to the protocol specification.

Software developers that cannot make use of the provided .NET class library must implement the protocol directly in their programs, according to the protocol specification.

## .NET Class Library

For .NET developers, Navitar provides a class library, "nav_sdk", that provides convenient programmatic access to the controllers.  The class library provides the ability to automatically detect any Navitar 1st or 2nd generation controllers that are connected to the system, and gain access to them using a single common

interface.  Navitar recommends this class library be used for .NET development and especially in cases where both 1st and 2nd generation controllers are being used together.  The class library is provided in full source code form as a .NET class library project.  Developers can simply add this project to their solutions to gain simple programmatic access to both 1st and 2nd generation controllers from .NET applications.  The class library was developed using the .NET 4.0 framework, though it should be possible to build it using earlier version of the .NET framework if desired.

The class library is documented using Doxygen style comments, and the Doxygen generated HTML documentation can be found in the "doc" directory under "nav_sdk".  See also the Navitar demo application source code for a working example using the class library to control both 2nd generation and legacy controllers simultaneously.

NOTE: For developers not using .NET, the .NET class library can be packaged as a COM component, though this is well beyond the scope of this document.

NOTE: For developers that need access to legacy (1st generation) controllers from non .NET applications, the legacy DLL-based interface (supplied separately with those controllers) must be utilized.

## USB Device Drivers

There are three separate USB device drivers supplied with the SDK:

- USB drivers for 2nd generation Motorized Zoom System controllers.
- USB drivers for legacy (1st generation) Motorized Zoom System controllers.
- USB drivers for 2nd generation controller Device Firmware Upgrade.

The Device Drivers are found in the "Windows_USB_Drivers" directory.

## USB drivers for 2nd generation Motorized Zoom System controllers

The 2nd generation Motorized Zoom System drivers are CDC class device drivers that allow the USB connection to the controller to appear to the Windows operating system as a virtual COM port.  When using this virtual COM port, all serial port settings (such as baud rate, etc) are irrelevant.

To install the drivers, plug the powered-on Navitar controller into any USB port on the system.  When Windows discovers the device, use the driver installation wizard to browse to the directory "Windows_USB_Drivers\second_generation_drivers".  The wizard should then automatically install the correct drivers for the operating system version.

NOTE for Windows 8 Users:  The 2nd generation USB drivers are unsigned.  By default Windows 8 will not allow unsigned device drivers to be installed.  To install the drivers on Windows 8, you must boot the system in a special mode that disables driver signature enforcement by following these steps:

1. Move the mouse to the bottom right corner of the screen to bring up the Charms bar, and click Settings
2. This will bring up your basic settings such as volume, notifications, etc. Click Change PC settings
3. You should now be in the settings menu.  Click the General button.
4. You will now see a bunch of settings in the right pane of the window. Scroll down to find the Advanced startup section. These are options that specify and tweak Windows startup, and it is at the startup that we will disable the driver signature enforcement. Hit the Restart now button.

5. Go to Troubleshoot > Advanced options > Startup Settings and hit Restart.
6. The PC will now restart, and upon startup you will be given a list of options to choose from. Choose Disable driver signature enforcement and then click Restart button.
7. Now you can install the USB drivers without the signature check preventing the installation from proceeding.

## USB drivers for legacy (1st generation) Motorized Zoom System controllers

The legacy Motorized Zoom System drivers are CDC class device drivers that allow the USB connection to the controller to appear to the Windows operating system as a virtual COM port.  When using this virtual COM port, all serial port settings (such as baud rate, etc) are irrelevant.

To install the drivers, plug the powered-on Navitar controller into any USB port on the system.  When Windows discovers the device, use the driver installation wizard to browse to the directory "Windows_USB_Drivers\legacy_drivers".  The wizard should then automatically install the correct drivers for the operating system version.

## USB drivers for 2nd generation controller Device Firmware Upgrade

When a 2nd generation Navitar controller is commanded to perform a firmware upgrade (see the protocol specification for details), the controller will drop off the USB bus as a CDC class device, and then reappear on the USB bus as a DFU class device.  At this point the DFU class drivers are required in order to execute the firmware upgrade.

The DFU class device drivers are included with the CDC class device driver for the 2nd generation controller, in the directory "Windows_USB_Drivers\second_generation_drivers".  The same procedure is used to install these drivers as that described above for the CDC class drivers.

## Navitar Demo Application

The Navitar Demo Application is a fully functional Windows Forms control application for both 2nd generation and legacy Navitar Motorized Zoom System controllers.  It was developed in C# with the .NET 4.0 framework and Visual Studio 2012.  It makes use of the Navitar .NET class library and should serve as a fully feature example application for the .NET class library.  It is provided in full source code form without warranty.  The source code and Visual Studio project are found in the directory "nav_demo_app".