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Introduction

The AVT Direct Stream Package is a Software Development Kit (SDK) that focuses on DirectShow and COM based programming. Thereby, the provided DirectShow compliant streaming driver allows also using AVT 1394 cameras with many DirectShow compliant image processing solutions.

The additionally provided AMCap-based viewer sample allows customers to test and evaluate AVT 1394 cameras with streaming applications. This included viewer sample is a ready-for-use example program provided as C++ source code. Based on this sample code, customers can write their own DirectShow based applications. With AVT Direct Stream Package, your application immediately supports AVT’s 1394a and 1394b digital cameras.

Advantages

- FireWire according IEEE1394a/b up to 800 Mbit/s supported, depending on your Windows version
- Easy integration of AVT 1394 cameras into 3rd-party software solutions based on DirectShow.
- COM-based programming interface to support languages like C, C++, and C# (.net).

Restrictions

- Support for 32- and 64-bit Windows operating systems.
- Chapter Redistribution on page 70 gives you information on restrictions concerning redistribution.

Note AVT Direct Stream Package is the successor of the AVT Direct FirePackage.
Document history
<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>V2.0.0</td>
<td>23.02.10</td>
<td>New manual 32-bit version <strong>AVT Direct Stream Package</strong> RELEASE status</td>
</tr>
</tbody>
</table>
| V2.0.1  | 19.07.10   | Due to customer problems hot-plugging a 1394 camera, added second and third **FireWire hot plug precautions, not to hotplug a 1394 camera**:  
See the following additional safety instructions:  
• **Caution** on page 13 and  
• **Caution** on page 19.  
Added step by step instructions to shut down the system, before connecting a 1394 camera:  
• See step 2. **Shut down your system**. on page 13.  
• See step 17. **Shut down your system**. on page 22. |
| V2.1.0  | 10 June 2011 | New file format:  
• Changed file format from FM7 to FM9 |
|         |            | **Added descriptions for 64-bit installations:**  
• Chapter **Operating system requirements** on page 10  
• New screenshots due to new icons in Chapter **Installing AVT Direct Stream Package** on page 13ff.  
• Added Info how to register DLL under 64-bit systems: see Chapter **Mandatory requirements** on page 70  
**Windows Vista not supported, but again supported but not tested yet (please read Release Notes for latest status)** / **64 bit only Windows 7:**  
• All chapters.  
**Updated to new icons:**  
• New icons for the DSP 1394 Driver Installer in Chapter **Installing AVT Direct Stream Package** on page 13ff.  
• New icons for the AVT AMCap in Figure 10: **AVT Direct Stream Package setup: Desktop icons** on page 20  
**Added new features:**  
• Added description of new **LUT** tab in Chapter **LUT tab (AVT)** on page 59  
• Handling of **SmartFeat. 1** tab changed, see Chapter **Smart Feature 1 tab (AVT)** on page 61 |

Table 1: Document history
Manual overview

The manual overview briefly describes each chapter of this manual.

- Chapter **System requirements** on page 9 lists conditions for hardware, operating system and software.
  - Read the Chapter **Special advice when working with Windows Vista / Windows 7** on page 10.
- Chapter **Package installation** on page 12 describes how to install AVT **Direct Stream Package**. You can install the necessary drivers automatically or manually.
- Chapter **Components overview** on page 29 describes the SDK components of AVT **Direct Stream Package**.
- Chapter **Package architecture** on page 31 gives you an overview of the package architecture.
- Chapter **Quick start for programmers** on page 32 provides a tutorial, in which you learn step by step how to create your own project. A viewer sample in C++ code is provided, with which you can immediately test the AVT camera and acquire your first images.
  - Read the explanations to the User Account Control (UAC) very carefully before starting any project.
  - For users who want to program their own applications: Read the AVT **Direct Stream Property Set Documentation** which is also provided as help file (**AVT1394DirectStreamProperty.chm**). After installation you find this help file under:
    C:\Program Files\Allied Vision Technologies\DirectStreamPackage\Doc
- Chapter **Redistribution** on page 70 describes redistribution procedures for AVT **Direct Stream Package**.

Conventions used in this manual

To give this manual an easily understandable layout and to emphasize important information, the following typographical styles and symbols are used:

**Styles**

<table>
<thead>
<tr>
<th>Style</th>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bold</td>
<td>Programs, inputs or highlighting important things</td>
<td><strong>bold</strong></td>
</tr>
<tr>
<td>Courier</td>
<td>Code listings etc.</td>
<td>Input</td>
</tr>
<tr>
<td>Upper case</td>
<td>Register</td>
<td>REGISTER</td>
</tr>
</tbody>
</table>

Table 2: Styles
Symbols

**Note** This symbol highlights important information.

**Caution** This symbol highlights important instructions. You have to follow these instructions to avoid malfunctions.

**www** This symbol highlights URLs for further information. The URL itself is shown in blue.

Example:

http://www.alliedvisiontec.com

Before operation

**Target group** This User Guide supports you with detailed technical information about the software and is mainly written for experts. We expect a deep knowledge of the Microsoft operating systems and their underlying techniques on a programmer’s level. You should also have a deep knowledge of DirectShow and Windows SDK.

The AVT Direct Stream Package User Guide describes the installation of the AVT Direct Stream Package and gives also a quick start for programmers.

The following two chapters are for readers using DirectShow-based applications:

- Chapter Package installation on page 12ff.
- Chapter Property pages: AVT-own tabs on page 51ff.

---

<table>
<thead>
<tr>
<th>Style</th>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italics</td>
<td>Modes, fields</td>
<td>Mode</td>
</tr>
<tr>
<td>Parentheses and/or blue</td>
<td>Links</td>
<td>(Link)</td>
</tr>
</tbody>
</table>

Table 2: Styles
System requirements

This chapter describes the requirements for installing AVT Direct Stream Package:

• Hardware requirements
• Operating system requirements
• Software requirements
• Special advice when working with Windows Vista / Windows 7 (UAC)

Hardware requirements

• PC or laptop with 1 GHz 32-bit or 64-bit (x86) processor or better and a minimum of 1 GByte RAM
• Use one of the following interfaces:
  – Built-in IEEE 1394 interface or
  – PC: IEEE 1394 adapter (OHCI) card (one or more) for PCI or PCI Express
  – Laptop: PCI Express bus or PC card or ExpressCard with IEEE 1394 port(s)
• One or more AVT 1394a or 1394b cameras connected to the system

Note: AVT offers a wide range of accessories (IEEE 1394 adapters, both 1394a or 1394b for different requirements).

FireWire hot plug precautions

Caution: Although FireWire devices can be hot-plugged without powering down equipment, we recommend turning the computer power off, before connecting a 1394 digital camera to the system via a FireWire cable.

If you hot-plug a 1394 digital camera, it may be damaged.
Operating system requirements

The AVT Direct Stream Package supports the following Windows operating systems:

• Windows 7 (32 bit and 64 bit)
• Windows Vista (32 bit only)
• Windows XP (32 bit only)

Software requirements

• AVT Direct Stream Package installation file
• For being able to compile the provided examples, you need Visual Studio 2005 or higher and a Platform SDK containing DirectShow and DirectX SDK.
• In order to use S800 speed with Windows Vista (or if you don’t intend to apply the driver rollback in Windows XP), you need to install the bus driver from the AVT 1394 Bus Driver Package (For more information see AVT 1394 Bus Driver Package User Guide).

Special advice when working with Windows Vista / Windows 7

This chapter gives you a short introduction to a new technology from Microsoft: the so-called User Account Control.

Basic information

User Account Control (UAC) is a technology and security infrastructure for Windows Vista / Windows 7 operating systems. It aims at improving the security of Windows by limiting application software to standard user privileges until an administrator authorizes an increase in privilege level. In this way, only applications that the user trusts receive higher privileges, and malware is kept from receiving the privileges necessary to compromise the operating system. So a user account may have administrator privileges assigned to it, but applications that the user runs do not have those privileges automatically unless the user explicitly authorizes them to have higher privileges.

Effects

Windows Vista / Windows 7 User Account Control (UAC) prevents the compilation of example projects if those are opened directly from a location protected by UAC (i.e. C:\Program Files\...).
Therefore, to compile the AVT Direct Stream Package example projects under Windows 7, copy the project to a user-writable location as described in Chapter Workaround for UAC problems on page 68.

**UAC warning**

An example of an UAC warning when a program (e.g. the AVT Direct Stream Package 1394 Driver Installer DSP1394DriverInstaller.exe) wants to write in a system folder is the following:

![UAC Warning Example](image)

Figure 1: UAC warning: example

Perform the following steps:

1. In this case just click **Yes** because the shown program DSP1394DriverInstaller.exe is the driver installer of the AVT Direct Stream Package and needs to write certain files to the system folder for general use.
2. Go on working.

**Note**

You may prevent this UAC warning by right-clicking the DSP1394DriverInstaller.exe and select **Run as administrator** before you install the software.
Package installation

Overview

We assume that you have already installed the IEEE1394 interface card in your system. What happens when you do this is the following:

First of all Plug & Play will find the IEEE1394 interface card and starts searching for appropriate drivers. Normally the standard Microsoft driver for OHCI cards will be installed as well as a device driver if any device like a camera is already connected to the card. This device driver that is normally installed for a camera must be replaced by the AVT Direct Stream Driver.

After the IEEE1394 interface card installation is completed, you have to replace the default DCAM driver with the so-called AVT Direct Stream Driver.

You can do this in two ways:

• Using the Driver Installation Utility or
• Installing the driver manually

In any of the two cases you start with installation of the AVT Direct Stream Package. During this installation you can decide to install the driver automatically or install the driver later.

Note

If you have more than one FireWire card in your system and you want to use other FireWire devices, consider the following:

• If you use a different bus driver than the Microsoft bus driver in your system (like the intek 1394 bus driver), make sure to install the Microsoft bus driver on all 1394 cards where you connect a camera that you want to control via the AVT Direct Stream Driver.

• If you use the intek 1394 bus driver from earlier installations, this driver can live side by side with the Microsoft driver when multiple cards are present in your system.

• Warning: intek 1394 bus driver and MS 1394 card driver cannot be installed on the same interface simultaneously.
Installing AVT Direct Stream Package

Note: Screenshots in this chapter were done under Windows 7.

To install AVT Direct Stream Package, perform the following steps:

1. Close all open applications.

Caution: Although FireWire devices can be hot-plugged without powering down equipment, we recommend turning the computer power off, before connecting a 1394 digital camera to the system via a FireWire cable.

If you hot-plug a 1394 digital camera, it may be damaged.

2. Shut down your system.
3. Turn computer power off.
4. Connect your camera to the 1394 (FireWire) port.
5. Turn computer power on.
6. Restart your system.
7. Download the AVT Direct Stream Package zip file from the AVT web site. Unpack it and start the corresponding *.exe.

The Windows Installer box with a status bar will appear while setup prepares to start the installation process.

Now you are ready to start installing AVT Direct Stream Package.
The Welcome dialog box will appear:

Figure 2: AVT Direct Stream Package setup: Welcome

8. Read the information in the Welcome dialog box.
   – If any programs are running on your system, click Cancel to quit the setup program, then close any programs you have running.
   – If you have already closed all your programs, click Next to continue the installation.

The Readme Information dialog box will appear:

Figure 3: AVT Direct Stream Package setup: Readme Information

9. Read the information displayed here carefully.
10. Click Next to proceed.
The **Choose Setup Type** dialog box will appear.

![Choose Setup Type](image)

**Figure 4: AVT Direct Stream Package** setup: Choose Setup Type

11. Select the setup type by clicking on the corresponding icon: You can choose between **Typical**, **Custom** and **Complete**.

<table>
<thead>
<tr>
<th>Setup type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typical</strong></td>
<td>In most cases this will be the setup type <strong>suitable for most users</strong>. Compared to the <strong>Complete</strong> type this setup type does not install the Programming sample of the AVT AMCap viewer.</td>
</tr>
</tbody>
</table>

**Table 3: Setup types**
The Installation options dialog box will appear:

If you click the Custom icon, the Select Features dialog box will appear:
Here you can choose which components will be installed.
Click on the icons to change current settings:

<table>
<thead>
<tr>
<th>Will be installed on local hard drive</th>
<th>Entire feature will be installed on local hard drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Entire feature will be unavailable</td>
</tr>
</tbody>
</table>

Click Reset to go back to standard settings.
Click Disk Usage to show available disk space on different volumes.

<table>
<thead>
<tr>
<th>Base components</th>
<th>The base components are installed anyway.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming examples</td>
<td>Choose to install example applications or not.</td>
</tr>
<tr>
<td></td>
<td>Here the source files for example applications are installed, which show how to use various features of the AVT Direct Stream Package. For more information see Table 6: AVT Direct Stream Package example viewer project on page 30.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Setup type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom</td>
<td>Note: This setup type is recommended for advanced users. If you click the Custom icon, the Select Features dialog box will appear: Here you can choose which components will be installed. Click on the icons to change current settings:</td>
</tr>
<tr>
<td>Complete</td>
<td>Installs all program features.</td>
</tr>
</tbody>
</table>

Table 3: Setup types

The default location of AVT Direct Stream Package files is
C:\Program Files\Allied Vision Technologies\DirectStreamPackage
12. If you want to change the location, click **Browse**, enter drive and path for the desired folder and click **OK**. Furthermore you can set a few general **Installation Options**:

<table>
<thead>
<tr>
<th>Check box / option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create shortcuts ... on the desktop.</td>
<td>When chosen: for <strong>AVT AMCap</strong> and <strong>DSP 1394 Driver Installer</strong> shortcuts on your desktop are created.</td>
</tr>
</tbody>
</table>
| Install startmenu items and shortcuts for... | Choose an option to install the items/shortcuts for  
  • All users  
  • Current user |

Table 4: **AVT Direct Stream Package** setup: Installation options (shortcuts/start menu items)

13. Click **Next** to proceed.

The following dialog will appear:

![Figure 6: AVT Direct Stream Package setup: Ready to Install the Application](image)

14. Click **Install**.
The following dialog will appear:

![AVT Direct Stream Package setup: Updating System](image)

**Figure 7:** **AVT Direct Stream Package** setup: Updating System

**AVT Direct Stream Package** will be installed.

The following dialog will appear:

**Caution**

The following dialog may appear below the installer window.

![AVT Direct Stream Package setup: Camera Driver Configuration](image)

**Figure 8:** **AVT Direct Stream Package** setup: Camera Driver Configuration
15. If you have not connected your camera to the 1394 (FireWire) port so far, do not hot-plug your camera, because it may be damaged. In this case the driver can be installed as described in Chapter Driver management on page 20.
If you connected your camera before software installation, proceed with next step.

16. Click Refresh to update the AVT 1394 camera list.
All detected AVT 1394 cameras are listed. Select the cameras for which the AVT DirectShow driver (AVT Direct Stream) should be installed.
We recommend to install the driver for all cameras listed. This prevents the usage of outdated drivers.
If you don’t want that AVT Direct Stream Driver is installed for a device, uncheck the check box for that device.

Note If you don’t want to install the AVT Direct Stream Driver click Cancel.
You can install this driver later. See Chapter Driver management on page 20ff.

17. Click OK.
Once the installation is finished, the following dialog box will appear:

Figure 9: AVT Direct Stream Package setup: Successfully installed
18. Activate **Show Release Notes**, if you want to read the release notes with the latest information.

19. Click **Finish** to exit the installer.

**Note**

Depending on your operating system you might need to reboot your system at this point. You will be prompted if a reboot is required; if a message appears, follow the on-screen instructions.

If you selected the **Create shortcuts ... on the desktop** check box, you will find the following icons on your desktop:

![DSP 1394 Driver Installer](image1.png) ![AVT AMCap](image2.png)

*Figure 10: AVT Direct Stream Package setup: Desktop icons*

## Driver management

If you have cancelled the DSP driver installation during package installation or if you want to use further (new) AVT 1394 cameras, you have the following two choices to install the appropriate driver:

- Using DSP 1394 Driver Installer (see Chapter **Using DSP 1394 Driver Installer** on page 20 and Chapter **Automatic driver setup** on page 20) or
- Installing driver manually (see Chapter **Manual driver setup** on page 24)

### Using DSP 1394 Driver Installer

**AVT Direct Stream Package** provides a special driver installation utility. To start this **DSP 1394 Driver Installer** see Chapter *Starting DSP 1394 Driver Installer* on page 21.

### Automatic driver setup

This package includes the **DSP 1394 Driver Installer** for an easy configuration of 1394 host controllers and AVT 1394 cameras.

The automatic driver setup consists of two phases:

- Phase 1 (only under XP): Host controller configuration
- Phase 2: AVT camera configuration

---

**AVT Direct StreamPackage User Guide V2.1.0**

20
Technological background: Host controller configuration

Host controller driver configuration could be useful for two reasons:
- compatibility and
- performance

Compatibility may be an issue, as there are commercially available bus drivers exposing proprietary driver interfaces, which are not supported by the AVT Direct Stream Package.

The camera driver (DirectShow capture source) provided with the AVT Direct Stream Package is a WDM streaming driver that controls the processing and transport of AVT 1394 camera streaming data at operating system level (kernel mode) and is intended to be used with the standard Microsoft bus driver. Additionally, the capture source is compatible with the AVT 1394 bus driver provided with the AVT 1394 Bus Driver Package.

This camera driver may, however, also work with third-party bus drivers exposing a compatible interface.

If you want to use the AVT 1394 Bus Driver Package, you have two choices:
- Install the driver provided with the package before calling the Driver Installation Tool or
- Exchange the bus driver after calling the Driver Installation Tool.

The result is the same: you are able to use S800 speed for 1394b cameras like the Stingray, Pike or Guppy PRO cameras.

Additionally, on Windows XP systems with Service Pack 2 or greater, and on Windows Vista systems (but not on Windows 7 systems), changes may be needed to obtain the full data rate of 1394b adapters. On these systems, data rates exceeding the limits of 1394a are not supported officially. To circumvent this limitation, a downgrade to Service Pack 1 drivers may be performed. This unofficial workaround modifies important Windows system files and is not endorsed by Microsoft.

Note • Before performing this downgrade, a full system backup is highly recommended
• This downgrade is only supported for Windows XP (32-bit) systems.

Starting DSP 1394 Driver Installer

Perform the following steps:
1. Start DSP 1394 Driver Installer.

   You have two choices to open the DSP 1394 Driver Installer:
Package installation

– **First choice:** Double-click icon on desktop:

![DSP 1394 Driver Installer](image)

Note This is only possible if you activated *Create shortcuts ... on the desktop* check box during the installation process.

– **Second choice:**
  
  Start → All Programs → Allied Vision Technologies → DirectStreamPackage → DSP 1394 Driver Installer

At startup, the **DSP 1394 Driver Installer** determines the configuration of existing 1394 host controllers.

**XP: Host controller configuration dialog**

Note **Only Windows XP:** When 1394 bus driver performance improvements are possible, the host controller configuration dialog will be shown. See *Figure 12: XP: DSP 1394 Driver Installer (Host Controller Driver Configuration)* on page 23.

Windows Vista / Windows 7: Go on reading Chapter *AVT camera configuration* on page 24.

In case 1 (1394 bus driver performance improvements are possible) and in case 2 (1394 bus driver performance improvements are not possible) the following window will appear:

![Figure 11: XP: DSP 1394 Driver Installer (Host Controller Driver Configuration)](image)

Host controllers already bound to the Microsoft bus driver or AVT 1394 bus driver are displayed in **green** or **blue color**. Green entries represent per-
fectly configured adapters, whose configuration should not be changed by the user.

Blue entries represent adapters which would benefit from a driver downgrade to SP1. When such an adapter is selected, the downgrade option is shown on the right.

**Note** Host controller driver downgrade is always performed system-wide.

Controllers bound to unknown drivers are displayed normally (black color). These devices can be selected for re-configuration by use of the check boxes next to the device description.
**AVT camera configuration**

The camera driver configuration dialog shows a list of all detected AVT cameras:

![AVT camera configuration](image)

**Figure 13: AVT camera configuration**

**Note** Cameras connected to a 1394 port that uses a non MS compliant driver, will not be displayed. See Chapter *Technical background* on page 25.

2. If you connected additional cameras during the driver installation process, click *Refresh* to trigger a rebuild of the camera list.

   As default, all cameras are selected for driver installation.

3. Deactivate listed cameras that you don’t want to be used with the **AVT Direct Stream Package** in order to keep their driver configuration untouched.

4. Click **OK**.

   The **AVT Direct Stream Driver** will be installed for all selected cameras.

**Manual driver setup**

This subsection describes how to manually install the camera driver.

**Note** Configuration depends on your operating system:

- 1394a devices: Windows Vista / Windows 7: only camera driver
- 1394b devices: Windows 7: only camera driver
- Windows Vista: bus driver + camera driver
- XP: bus driver + camera driver

In most cases we recommend an installation via the **DSP 1394 Driver Installer**.
But there may be scenarios where it’s advisable to install the driver manually, e.g.:
- If the software package installation via the DSP 1394 Driver Installer fails, you may try to install the driver manually.
- If an unknown FireWire card cannot be identified by the DSP 1394 Driver Installer, you have to install the driver manually.

Technical background
In order for AVT Direct Stream Package to recognize 1394 digital cameras that are connected to your system, the AVT Direct Stream Driver must be installed for each camera. This chapter explains how to install the driver manually in your system.

Note
If your 1394 camera comes with its own IIDC-compatible system software, do not use it, as it will not be compatible with AVT Direct Stream Package.

Installing driver manually (Windows XP, Windows Vista, Windows 7)
To install the DSP camera driver manually, perform the following steps.
1. Make sure AVT Direct Stream Package is installed on your system.
2. Connect your camera to the 1394 (FireWire) port.
   - If no driver was previously installed for the camera, [XP:] the Found New Hardware dialog will appear:

![Found New Hardware dialog](image)

Figure 14: AVT Direct Stream Package: manual driver installation (Found New Hardware)
3. Depending on the dialog:
If the dialog does not appear, proceed with Chapter No New Hardware Found dialog (Windows XP) / Manual camera driver installation under Windows Vista or Windows 7 on page 26.

If the dialog does appear [XP]: Choose No, not this time and click Next.

4. Select Install the software automatically. [If a warning message appears that the driver is not signed up / not certified with Microsoft then click Continue Anyway].

5. Click Finish.

The installation of the AVT 1394 Direct Stream Driver for the selected camera is completed.

No New Hardware Found dialog (Windows XP) / Manual camera driver installation under Windows Vista or Windows 7

1. If the New Hardware Found dialog didn’t appear after you connected your AVT 1394 camera:

<table>
<thead>
<tr>
<th>Windows XP</th>
<th>Windows Vista / Windows 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right-click on My Computer and click Properties. Select the Hardware tab and click Device Manager.</td>
<td>Start  Computer  System properties  Device Manager</td>
</tr>
</tbody>
</table>

If there is no compatible driver installed, your camera will appear in the device list as a

[Windows XP:] Generic 1394 Camera
[Windows Vista / Windows 7:] Generic 1394 Desktop Camera

with a question or exclamation mark next to it:

Figure 15: AVT Direct Stream Package: manual driver installation (Generic 1394 Desktop camera)
In order for the camera to work properly with AVT Direct Stream Package software, its driver must be changed to AVT 1394 Direct Stream Driver.

2. Right click on your device and select Properties. Choose the Driver tab and then click Update Driver.

3. Select Install from a list or specific location and click Next.

4. Select Don't search, I will choose the driver to install and click Next.

5. Click Have disk and provide the path to AVT Direct Stream Package driver folder where AVT1394DSPCamera.inf is located. Typically:
   C:\Program Files\Allied Vision Technologies\DirectStreamPackage\Driver

6. Click OK.

   The following dialog will appear:

   Figure 16: AVT Direct Stream Package: manual driver installation (Install From Disk)

7. Click OK.

   The following dialog will appear:
8. Choose the entry that matches your specific camera model, if available.
9. Ignore all signature warnings and continue until you reach the Finish dialog.
10. Click on Close/Finish.
11. Verify that your camera is now listed in the device manager as an AVT [camera name] device (AVT1394DirectStream).
    [camera name] is e.g. Stingray F080B
    The driver installation is now complete.
12. You might need to restart the system for the changes to come into effect.

**Note**
- Repeat the described procedure for each AVT camera you intend to use with AVT Direct Stream Package, regardless of the model.
- AVT Direct Stream Package works only with AVT 1394 digital cameras. (Prosilica EC and CV cameras are not supported.)
Components overview

This chapter describes the package content.
For more information see Chapter Package architecture on page 31.

Package content

The AVT Direct Stream Package consists of the following SDK components:

<table>
<thead>
<tr>
<th>SDK component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVT1394DSPCamera.sys</td>
<td>WDM-based streaming driver and associated files for AVT 1394 cameras using Microsoft’s or AVT 1394 bus driver</td>
</tr>
<tr>
<td>AVT1394DSPCamera.inf</td>
<td>Easy-to-use driver installation tool</td>
</tr>
<tr>
<td>AVT1394DSPCamera.cat</td>
<td>Contains all files needed for the XP driver rollback</td>
</tr>
<tr>
<td>DSP1394DriverInstaller.exe</td>
<td>Property pages to control AVT camera features</td>
</tr>
<tr>
<td>1394driverfiles.xml</td>
<td>Info: On 64-bit systems both versions (32 bit and 64 bit) are installed.</td>
</tr>
<tr>
<td>XPSP1_data*.*</td>
<td>Transforms filter for converting AVT image formats to displayable and other usable image formats.</td>
</tr>
<tr>
<td>AVT1394DirectStreamProperty.ax</td>
<td>Contains: conversions from AVT image formats and other image formats to RGB24, RGB32.</td>
</tr>
<tr>
<td>AVTAmCap.exe</td>
<td>Replaces: the YUV411 transform filter and the Y800 transform filter from the Direct FirePackage.</td>
</tr>
<tr>
<td>AVTAmCap.exe</td>
<td>Info: On 64-bit systems both versions (32 bit and 64 bit) are installed.</td>
</tr>
</tbody>
</table>

Table 5: AVT Direct Stream Package SDK components
Together with the AVT Direct Stream Package the following example is provided:

<table>
<thead>
<tr>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example viewer project</td>
<td>AMCap-based example for demonstrating DirectShow-based camera usage</td>
</tr>
</tbody>
</table>

Table 6: AVT Direct Stream Package example viewer project
Package architecture

The following diagram describes how the AVT Direct Stream Package is accessed by Windows applications:

Figure 18: AVT Direct Stream Package architecture
Quick start for programmers

In this chapter you learn how to grab your first images with your AVT camera, open a project under Visual studio and use the given examples to do some typical image acquisition.

Note For detailed information see AVTDirectStreamProperty.chm

Tutorial: Step by step to the first frame

The following sample shows step by step, how to develop a C++ application to get frames from the camera and show them on the screen. The sample uses Visual Studio .NET 2005.

Step 1: Creating the Project

The application is created as a simple console project.

Figure 19: Creating a new project
**Step 2: Component Object Model (COM) and DirectShow**

DirectShow is based on COM. That’s why at first a COM initialization is required. Additionally, it’s required to include some ATL helper classes. This makes the usage of COM much easier.

```cpp
// C++Sample.cpp : Defines the entry point for the
// Console application
//
#include "stdafx.h"

#include <atlbase.h>

int _tmain(int argc, _TCHAR* argv[])
{
    HRESULT hRes = CoInitialize(NULL);
    if( SUCCEEDED( hRes) )
    {
        CCaptureGraphData CaptureGraphData;
        hRes = CaptureGraphData.Initialize();
        if ( SUCCEEDED( hRes ) )
        {
            hRes = CaptureGraphData.BuildCaptureGraph();
            if( SUCCEEDED( hRes) )
            {
                CaptureGraphData.RunGraph();
            }
        }
    }
    CoUninitialize();
    return 0;
}
```

In addition DirectShow support has to be added to the project by including the required header files

```cpp
... #include <atlbase.h>
#include <dshow.h>

int _tmain(int argc, _TCHAR* argv[])
...```

and linking the following library:

```
C:\DXSDK\Samples\C++\DirectShow\BaseClasses\Release\strmbase.lib
```
Step 3: The filter graph

A central object in DirectShow is the filter graph. It represents the path of the image data, starting with capturing an image and ending with the image display on the screen.

Like all other objects in the COM model, the filter graph is represented by an interface. To display the image data on the screen, an interface is required to control the filter graph. DirectShow provides its own object to create the filter graph and add filter objects to the graph. The programming code for this is as follows:
class CCaptureGraphData
{
    CComPtr<IGraphBuilder> m_pGraph;
    CComPtr<ICaptureGraphBuilder2> m_pCapture;
    CComPtr<IMediaControl> m_pMC;
    CComPtr<IVideoWindow> m_pVideoWindow;
    CComPtr<IBaseFilter> m_pSrc;
    ...

    HRESULT Initialize()
    {
        ...
        HRESULT BuildCaptureGraph()
        {
            ...
            HRESULT RunGraph()
            {
            ...
        }
        return hRes;
    }

    // Creates the necessary Com interfaces for the filter grab, the graph builder, media control and video window

    HRESULT Initialize()
    {
        HRESULT hRes;
        hRes = m_pGraph.CoCreateInstance(CLSID_FilterGraph,
                                          NULL, CLSCTX_INPROC_SERVER);
        if( SUCCEEDED(hRes) )
        {
            hRes = m_pCapture.CoCreateInstance(CLSID_CaptureGraphBuilder2,NULL,CLSCTX_INPROC_SERVER);
            if( SUCCEEDED( hRes) )
            {
                hRes = m_pGraph->QueryInterface( IID_IMediaControl,
                                                  (void**) &m_pMC );
                if( SUCCEEDED(hRes) )
                {
                    hRes = m_pGraph->QueryInterface(
                                                  IID_IVideoWindow,(void**) &m_pVideoWindow);
                }
            }
        }
        return hRes;
    }
Step 4: Adding the camera

At least a camera object is missing to complete the program code. To determine the camera object is a little bit difficult, but fortunately DirectShow guides us through this process.

First a device enumeration is created and it is initialized to enumerate all system devices that have the VideoInputDeviceCategory. The returned list (enumeration) can be walked through and the enumerated devices can be inspected for desired property.
#include <atlstr.h>
#include <dshow.h>

RESULT FindCaptureDevice( CComPtr<IBaseFilter> &pSrc)
{
    USES_CONVERSION;
    HRESULT hRes;
    CComPtr<IMoniker> pMoniker = NULL;
    ULONG cFetched;
    CComPtr<ICreateDevEnum> pDevEnum = NULL;
    pSrc=NULL;
    hRes=pDevEnum.CoCreateInstance (CLSID_SystemDeviceEnum,
         NULL, CLSCTX_INPROC);
    if( FAILED( hRes) )
        return hRes;
    CComPtr<IEnumMoniker> pClassEnum = NULL;
    hRes = pDevEnum->CreateClassEnumerator(
        CLSID_VideoInputDeviceCategory, &pClassEnum,0);
    if(FAILED(hRes) )
        return hRes;
    if( NULL == pClassEnum)
        return E_FAIL;
    while ( S_OK == ( pClassEnum->Next(1,&pMoniker,&cFetched)))
    {
        CComPtr<IPropertyBag> pBag;
        hRes = pMoniker->BindToStorage( 0,0,
            IID_IPropertyBag, (void**) &pBag) ;
        if( SUCCEEDED( hRes) )
        {
            VARIANT var;
            var.vt  = VT_BSTR;
            hRes = pBag->Read(L"FriendlyName",&var,NULL );
            if( SUCCEEDED( hRes) )
            {
                CString tmp( var.bstrVal );
                VariantClear( &var );
                if( tmp.Left(3) == "AVT" )
                {
                    hRes = pMoniker->BindToObject( NULL, NULL,
                        IID_IBaseFilter, (void**) &pSrc);
                    if( FAILED( hRes) )
                        return hRes;
                    return S_OK;
                }
            }
        }
        pMoniker = NULL;
    }
    return E_FAIL;
}
Step 5: Showing the images on the screen

Finally connect the elements of the filter graph and run the resulting graph.

Build capture graph

```c
HRESULT BuildCaptureGraph()
{
    HRESULT hRes;
    hRes = FindCaptureDevice(m_pSrc);
    if( SUCCEEDED( hRes ) )
    {
        hRes = m_pCapture->SetFiltergraph( m_pGraph);
        if( SUCCEEDED( hRes) )
        {
            hRes = m_pGraph->AddFilter(m_pSrc, L"Video Capture Source");
            if( SUCCEEDED( hRes) )
            {
                hRes = m_pCapture->RenderStream(
                        &PIN_CATEGORY_CAPTURE, &MEDIATYPE_Video,m_pSrc,NULL,NULL);
            }
        }
    }
    return hRes;
}
```

Run filter graph

```c
HRESULT RunGraph()
{
    HRESULT hRes;
    if( NULL == m_pMC)
        return E_POINTER;
    hRes = m_pMC->Run();
    if( FAILED( hRes) )
        return hRes;
    Sleep(10000);
    return m_pMC->Stop();
}
```

DirectShow creates its own window to display the frames.
The complete sample is part of the package.
System overview

This chapter gives you a short overview over the DirectShow system and its objects.

DirectX and DirectShow

DirectShow is a programming interface, provided by Microsoft, to handle streaming data in a simple way. DirectShow is a part of the Platform SDK / Windows SDK and also based on COM.

The AVT Direct Stream Package driver is implemented as kernel mode driver. DirectShow exposes WDM compatible video capture sources via the KSProxy as COM DirectShow CaptureSources.

Note You need DirectX SDK 9 and the Platform SDK to develop DirectShow applications.

Previous versions of the DirectShow SDK shipped as part of the DirectX SDK. The last version of the DirectX SDK that included DirectShow was DirectX 9.0 SDK Update - (February 2005) Extras. The DirectShow SDK was moved to the Windows Platform SDK starting with the Microsoft® Windows Server 2003 SP1 Platform SDK.

To get the latest DirectShow SDK, you have to download the latest version of the Windows SDK from http://msdn.microsoft.com
The following diagram shows the relationship between an application, the DirectShow components, and some of the hardware and software components that DirectShow supports. AVT Convert and AVT Streaming Driver are from AVT.

Figure 21: Architecture of AVT Direct Stream Package

<table>
<thead>
<tr>
<th>Box</th>
<th>Color name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Blue</td>
<td>Direct Show</td>
</tr>
<tr>
<td>Light red</td>
<td>Light red</td>
<td>AVT components</td>
</tr>
<tr>
<td>Light yellow</td>
<td>Light yellow</td>
<td>Peripheral components (codecs, file system, DirectDraw, graphics card, internet)</td>
</tr>
<tr>
<td>Grey</td>
<td>Grey</td>
<td>Application</td>
</tr>
</tbody>
</table>

Table 7: Colors and their meaning in architecture diagram
Description of the architecture diagram

The central object in DirectShow is the filter graph. This object manages the image data from capturing to showing them on the screen. For these purposes for each image processing step different filter graph objects are created.

To control the filter graph as well as to create and connect the particular filter graph objects DirectShow provides a filter graph manager. In order that the specific objects can exchange image data they have to negotiate to a consistent format. Therefore, every filter object provides so called pins as interconnecting points whereby each pin can provide different types and formats.

The following diagram shows in more detail a source filter and AVT Convert (a transform filter) connected through pins:

Figure 22: Example of filters connected through pins

If the filter graph manager receives the directive to connect the different filter graph objects, it searches for an input and an output pin of the same type and format.

Figure 23: Example of typical filter graph

The diagram above shows a typical filter graph used to capture images from a video camera and to display them on a screen.
System architecture and streaming driver

The **AVT Direct Stream Package** includes a WDM streaming driver. This driver is embedded in Microsoft DirectShow and allows that in all corresponding programs AVT cameras are made available as video capture devices.

![AVT cameras as video capture source](image)

The driver is developed as video streaming miniclass driver.

**Implemented DirectShow interfaces**

The following DirectShow interfaces are supported by the 1394 capture source provided with the **AVT Direct Stream Package**:

**DirectShow interface: IAMVideoProcAmp**

- Implemented methods: all
- Implemented properties:
  - `VideoProcAmp_Brightness`
  - `VideoProcAmp_Contrast`
  - `VideoProcAmp_Hue`
  - `VideoProcAmp_Saturation`
  - `VideoProcAmp_Sharpness`
  - `VideoProcAmp_Gamma`
  - `VideoProcAmp_ColorEnable (MirrorImage)`
  - `VideoProcAmp_WhiteBalance (WhiteBalance VR)`
  - `VideoProcAmp_BacklightCompensation (WhiteBalance UB)`
  - `VideoProcAmp_Gain`
**DirectShow interface: IAMCameraControl**
- Implemented methods: all
- Implemented properties
  - CameraControl_Exposure (Shutter)
  - CameraControl_Tilt (mapped to AutoExposure)

**DirectShow interface: IAMVideoControl**
- Implemented methods
  - GetCaps
  - GetMode
  - SetMode

**DirectShow interface: IAMStreamConfig**
- Implemented methods: all
- Only VIDEO_STREAM_CONFIG_CAPS available, only for type FORMAT_VideoInfo. For media types see Chapter Camera image formats and media types on page 44.

**DirectShow interface: ISpecifyPropertyPages**
- Implemented methods: all

**DirectShow interface: IAMDroppedFrames**
- Implemented methods
  - GetAverageFrameSize
  - GetNumDropped
  - GetNumNotDropped

**DirectShow interface: IKsPropertySet, IAMBufferNegotiation, IAMFilterMiscFlags, IAMPushSource**
These interfaces are implemented indirectly via KSProxy.

**DirectShow interface: IAMVideoCompression**
This interface is not implemented (no compressed videos result from capture source)
**Camera image formats and media types**

In version 1.0, the capture device provides just one pin to the user:
- **PINNAME_VIDEO_CAPTURE**

and only the media type *video*.

The following table lists the camera image formats that are supported by the capture filter and the media subtype of its output.

<table>
<thead>
<tr>
<th>Camera image format</th>
<th>Capture filter output (media subtype (video type))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono8</td>
<td>Y800</td>
</tr>
<tr>
<td>Mono12</td>
<td>AY12</td>
</tr>
<tr>
<td>Mono16</td>
<td>AY16</td>
</tr>
<tr>
<td>YUV422</td>
<td>UYVY</td>
</tr>
<tr>
<td>YUV411</td>
<td>Y411</td>
</tr>
<tr>
<td>RGB (RGB24)</td>
<td>BGR8</td>
</tr>
<tr>
<td>Raw8</td>
<td>ARW8</td>
</tr>
<tr>
<td>Raw12</td>
<td>ARW2</td>
</tr>
<tr>
<td>Raw16</td>
<td>ARW6</td>
</tr>
</tbody>
</table>

Table 8: Camera image formats and associated media subtypes

Media subtypes BGR8 and UYVY may be transformed and rendered with standard Windows DirectShow filters.

For conversions of all the other media subtypes to subtypes that may be rendered, the additional transform filter AVT_Convert is provided.

See Table 9: Image format transformations for RGB sensors provided by the AVT_Convert filter on page 45.

Figure 25: Example of filter graph for color conversion
The following table shows all available transformations provided by the AVT_Convert filter:

<table>
<thead>
<tr>
<th>Source format</th>
<th>RGB24 (Y,Y,Y) or 3*RAW8</th>
<th>BGR8 (RGB24 for Windows)</th>
<th>BGRA8 (RGB32 for Windows)</th>
<th>YUV422</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono8 (Y800)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Mono12 (AY12)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
</tr>
<tr>
<td>Mono16 (AY16)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
</tr>
<tr>
<td>YUV411 (Y411)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td></td>
</tr>
<tr>
<td>Raw8 (ARW8)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Raw12 (ARW2)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Raw16 (ARW6)</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Color legend</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>conversion done by AVT_Convert</td>
</tr>
</tbody>
</table>

* optionally with additional color conversion functionality
1 selection of the debayering algorithm to be used (depends on camera types)
2 also available for interlaced cameras

Table 9: Image format transformations for RGB sensors provided by the AVT_Convert filter
Property pages: standard and advanced features

**AVT Direct Stream Package** installs some custom property pages, which represent standard and advanced features.

The following C++ code segment shows how to open a property page in an application:

```cpp
LRESULT CChildFrame::OnCameraproperties(WORD /*wNotifyCode*/, WORD /*wID*/, HWND /*hWndCtl*/, BOOL &bHandled)
{
    HRESULT hr;
    CComPtr<ISpecifyPropertyPages> pSpec;
    CAUUID cauuid;

    hr = m_pSrc->QueryInterface(IID_ISpecifyPropertyPages, (void **)&pSpec);
    if(SUCCEEDED(hr))
    {
        hr = pSpec->GetPages(&cauuid);
        // m_pSrc is a Ptr to a IBaseFilter Interface
        hr = OleCreatePropertyFrame(m_hWnd, 30, 30, NULL, 1,
                                   (IUnknown **)&(m_pSrc.p), cauuid.cElems,
                                   (GUID *)cauuid.pElems, 0, 0, NULL);

        CoTaskMemFree(cauuid.pElems);
    }
    bHandled = true;
    return 0;
}
```

**Note**
- You need to link the following files (for 32-bit Windows operating system):
  - comccl32.dll, olepro32.dll, version.zip, winmm.lib,
  - wfw32.lib, ksproxy.lib
- You need to link the following files (for 64-bit Windows 7):
  - comccl32.dll, oleaut32.dll, version.zip, winmm.lib,
  - wfw32.lib, ksproxy.lib
- For more information how to use property pages: see the corresponding chapters of the **Platform SDK help file**.
- If using a non-English operating system: property pages from Microsoft (Camera control page, Video ProcAmp page) will appear in the language of the operating system (e.g. German, when using German operating system).
Property pages: AVT_Convert

This property page is used to select the properties specifying the AVT Convert Filter attributes.

Proppage.dll exposes additional property settings (XForm In and XForm Out) for filters when REGISTERED with the operating system using the command `regsvr32 proppage.dll`. The regsvr32 command must be run at elevated privileged level.

![Property page: AVT_Convert (Properties tab)](image)

**Properties tab**

Select from the following options:

**Function**: Depending on the input media type, the possible output types are displayed.

The following table lists the possible combinations:

(Pattern: Input subtype to output type)
### BayerPattern

BayerPattern: Sets the layout of pixels in the CCD array of a Bayer camera with RGB color sensor or CYGM color sensor.

---

<table>
<thead>
<tr>
<th>Input type</th>
<th>FOURCC code</th>
<th>Input subtype</th>
<th>Output type</th>
<th>Output format</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONO8</td>
<td>'Y800'</td>
<td>MONO8</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td>RAW8 RGGB</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR Mono</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR 3x3</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR LCAA+V</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YUV422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW8 CYGM</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR Mono</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR 3x3</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR LCAA+V</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YUV422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW8 RAW</td>
<td>3*RAW8</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YUV411</td>
<td>'Y411'</td>
<td>YUV411</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td></td>
<td>BGR Mono</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MONO16</td>
<td>'AY16'</td>
<td>MONO16 RGB</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td>RAW8</td>
<td>'ARW8'</td>
<td>RAW8 RGGB</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td></td>
<td>BGR Mono</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR 3x3</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR LCAA+V</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YUV422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW8 CYGM</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR Mono</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR 3x3</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BGR LCAA+V</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>YUV422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW8 RAW</td>
<td>3*RAW8</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAW16</td>
<td>'ARW6'</td>
<td>RAW16 RGGB</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td>RAW16 RAW</td>
<td>3*RAW8</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MONO12</td>
<td>'AY12'</td>
<td>MONO12 RGB</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td>RAW12</td>
<td>'ARW2'</td>
<td>RAW12 RGGB</td>
<td>BGR</td>
<td>BGR24/BGR32</td>
</tr>
<tr>
<td>RAW12 RAW</td>
<td>3*RAW8</td>
<td>BGR24/BGR32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10: Possible combinations of AVT_Convert filter: Input subtype ⇔ output type
For the Guppy cameras with **RGB** color sensors the following layouts are possible:

<table>
<thead>
<tr>
<th>Layout name</th>
<th>Description</th>
<th>Line number</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGGB</td>
<td>R G R G R</td>
<td>first line</td>
</tr>
<tr>
<td></td>
<td>G B G B R</td>
<td>second line</td>
</tr>
<tr>
<td>GBRG</td>
<td>G B G B G</td>
<td>first line</td>
</tr>
<tr>
<td></td>
<td>R G R G R</td>
<td>second line</td>
</tr>
<tr>
<td>GRBG</td>
<td>G R G R G</td>
<td>first line</td>
</tr>
<tr>
<td></td>
<td>B G B G B</td>
<td>second line</td>
</tr>
<tr>
<td>BGGR</td>
<td>B G B G B</td>
<td>first line</td>
</tr>
<tr>
<td></td>
<td>G R G R G</td>
<td>second line</td>
</tr>
</tbody>
</table>

Table 11: Bayer pattern for **RGB** color sensors

For the Guppy cameras with **CYGM** color sensors the following layouts are possible:

<table>
<thead>
<tr>
<th>Layout name</th>
<th>Description</th>
<th>Line number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYGM</td>
<td>C Y C Y C</td>
<td>first line</td>
</tr>
<tr>
<td></td>
<td>G M G M G</td>
<td>second line</td>
</tr>
<tr>
<td></td>
<td>C Y C Y C</td>
<td>third line</td>
</tr>
<tr>
<td></td>
<td>M G M G M</td>
<td>fourth line</td>
</tr>
</tbody>
</table>

Table 12: Bayer pattern for **CYGM** color sensors

**Output Format:** Select the desired output format.

**Note** The output format cannot be changed after output pin is connected.

**Format:** Depending on the output type the following values are possible:

output type: **YUV422**

YUV422

The output format is YUV422.

output type: **BGR** or **3*RAW8**
RGB32
The output format is RGB32.
RGB24
The output format is RGB24.

Flip Vertical: This property modifies the alignment of the image. The following values are possible:

On
The image is flipped vertically.

Off
No image flipping is performed.

Auto
Depending on the downstream filter, automatic alignment is performed.

Note
YUV422 is only possible with Auto.
Property pages: AVT-own tabs

In this chapter tabs programmed by AVT are described briefly (in alphabetical order):

Chapter Color tab (AVT) on page 51
Chapter Direct Access tab (AVT) on page 53
Chapter Exposure tab (AVT) on page 54
Chapter Format tab (AVT) on page 56
Chapter Info tab (AVT) on page 58
Chapter LUT tab (AVT) on page 59
Chapter Smart Feature 1 tab (AVT) on page 61
Chapter Trigger tab (AVT) on page 63

Note

- Most changes done on the property pages take effect immediately except if stated differently.
- Depending on the Windows version and the DirectShow application you use … :
  - … action is needed: Click Apply for changes to take effect.
  - … changes made to AVT features on the AVT property pages may not be mirrored on the standard DirectShow pages and vice versa.
- Features not supported by the camera are displayed in grey.

Color tab (AVT)

This tab is for adjusting:
- White balance UB
- White balance VR
- Hue
- Saturation
- Color correction
System overview

Figure 27: **Color** tab (AVT)

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting...</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slider</td>
<td>White balance UB</td>
<td>Edit box: Enter here numeric values</td>
</tr>
<tr>
<td>Slider</td>
<td>White balance VR</td>
<td>For entering values choose Manual from combo box</td>
</tr>
<tr>
<td>Slider</td>
<td>Hue</td>
<td></td>
</tr>
<tr>
<td>Slider</td>
<td>Saturation</td>
<td></td>
</tr>
<tr>
<td>Edit boxes in matrix formation</td>
<td>Color correction</td>
<td></td>
</tr>
</tbody>
</table>

Table 13: **Color** tab (AVT)
Direct Access tab (AVT)

This tab allows direct access to the register addresses of the camera (standard IIDC registers and AVT camera-specific (vendor-specific) advanced registers).

![Direct Access tab (AVT)](image)

**Figure 28: Direct access tab (AVT)**

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting…</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number field</td>
<td>Hexadecimal address</td>
<td>For a detailed description of all available standard IIDC registers and vendor-specific advanced registers: see the <strong>Technical Manuals</strong> of the AVT camera families.</td>
</tr>
<tr>
<td>Number field</td>
<td>Value for this address</td>
<td></td>
</tr>
<tr>
<td>Read button</td>
<td>Read value from this address</td>
<td></td>
</tr>
<tr>
<td>Write button</td>
<td>Write value from this address</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

All changes take effect immediately.

Table 14: Direct access tab (AVT)
**Exposure tab (AVT)**

This tab is for adjusting:

- Brightness
- Gain
- Shutter + extended shutter
- Gamma
- Auto Exposure

Figure 29: Exposure tab (AVT)
### Control element | Use for adjusting... | Further elements (description)
--- | --- | ---
Slider | Brightness | Edit box entering numeric values
For entering values manually choose **Manual** from combo box
Slider | Gain | Edit box entering numeric values
For entering values manually choose **Manual** from combo box
Slider | Shutter (exposure) | Edit box entering numeric values
• Choose time base combo box to adjust time base
• For entering values manually choose Manual from combo box and activate Extended shutter check box
Slider | Gamma | Combo box to switch on/off gamma
Edit box entering numeric values
For entering values manually choose **Manual** from combo box
Slider | Auto Exposure | Edit box entering numeric values
For entering values manually choose **Manual** from combo box

**Note**
- All changes take effect immediately except modifications to the time base value.
- Changing the time base can only take place:
  - if the camera is **not** grabbing images

For a detailed description of all available standard IIDC registers and vendor-specific advanced registers: see the **Technical Manuals** of the AVT camera families.

Table 15: **Direct access** tab (AVT)
**Format tab (AVT)**

This tab is for adjusting:

- Image mode and position (AOI: only Format_7)
- Frame rate in fps
- ISO channel and ISO speed (S100/S800)
- Multi-shot/free-run

![Format tab (AVT)](image)

Figure 30: **Format** tab (AVT)
### Control element | Use for adjusting... | Further elements (description)
--- | --- | ---
Combo box | IIDC fixed modes and Format_7 modes | The last selected mode in the list is always shown.
Edit boxes and spinners | AOI settings: X / Y position of image Width / height of image (Only in Format_7 modes) | Edit boxes/spinners entering/changing numeric values
 |  | This is the way you can define AOI.
 |  | In the edit boxes the last selected value is shown.
Slider | Frame rate (in fps = frames per second) | Edit box entering numeric values
Combo box | Channel | Set no. of ISO channel for image transport. (This is a 4-bit address to identify the source of a video data stream). Normally set to Any.
 |  | Select Any, if driver can decide which channel should be used.
 |  | Otherwise all cameras connected to one bus must have a different ISO channel.
 |  | The last selected no. is shown.
Combo box | ISO speed (S100, S200, S400, S800) | Camera/bus supported ISO speeds. The last selected ISO speed is shown.
Edit box | Number of multi-shot images | Currently not implemented.

**Note**
- All changes can only take place if the capture filter is not part of a connected filter graph.
- Most changes (but X/Y position) are only written to camera by clicking Apply.

Table 16: Format tab (AVT)
**Info tab (AVT)**

This tab shows the following information:

**Camera Info:**
- Camera (model)
- Serial number
- Driver version number
- Microcontroller version
- FPGA version

**Bus Info:**
- Bus utilisation information
- Bytes Per Packet used by the camera
- byte per packet free on the bus the camera is connected to
- Allocated Iso channels on the camera bus

![Info tab (AVT)](image)

Figure 31: **Info** tab
LUT tab (AVT)

This tab is for:

- Controlling the LUT (switch on/off and choose LUT number)
- Loading LUT files from a csv file
- Copying a LUT into the camera
- Showing diagram of a LUT

![LUT tab (AVT)](image)

**Figure 32: LUT tab (AVT)**

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting...</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check box</td>
<td>Enable check box: switch LUT on/off</td>
<td>For a detailed description of all available standard IIDC registers and vendor-specific advanced registers: see the Technical Manuals of the AVT camera families.</td>
</tr>
<tr>
<td>Combo box</td>
<td>LUT no: If more than 1 LUT is available, choose desired LUT.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 17: LUT tab (AVT)**
A SmartView compatible csv file looks like (comment lines are allowed, the header content can be quoted):

```
CamName Separator LUTName ( ... Separator LUTName)
InputValue1 Separator OutputValue1 (... Separator Output)
...
InputValueN Separator OutputValueN (...)
```

Meaning of N: Number of LUT entries
Separator: ([;]) that means: the only possible separator is semicolon
Value: Integer

Example csv file:
```
Pike;Gamma0.75;Gamma0.9
0;0;0
...
100;357;166
```

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting...</th>
<th>Further elements (description)</th>
</tr>
</thead>
</table>
| LUT Editor      | Loading csv file, choosing LUT, copy LUT and displaying LUT | **Load CSV button:**
Click to load SmartView compatible csv file. In case of several LUTs, all LUTs are loaded into the editor.

**Combo box:**
The LUT’s name from the csv file is displayed. Choose one from the loaded LUTs.

**To Cam button:**
Loads the chosen LUT into the camera.

**Diagram Input/Output:**
Chosen LUT is displayed as diagram.

For a detailed description of all available standard IIDC registers and vendor-specific advanced registers: see the Technical Manuals of the AVT camera families.

Table 17: **LUT tab (AVT)**
**Smart Feature 1 tab (AVT)**

This tab is for adjusting:
- Display test image
- DSNU correction (if available)
- High SNR (if available)

![Smart Feature 1 tab (AVT)](image)

Figure 33: **Smart Feat. 1 tab (AVT)**

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting…</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combo box</td>
<td>Test image on/off</td>
<td>For a detailed description of all available standard IIDC registers and vendor-specific advanced registers: see the Technical Manuals of the AVT camera families.</td>
</tr>
<tr>
<td></td>
<td>Choose test image number</td>
<td></td>
</tr>
</tbody>
</table>

Table 18: **Smart Feat. 1 tab (AVT)**
### Table 18: Smart Feat. 1 tab (AVT)

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting…</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check boxes / slider</td>
<td>DSNU correction</td>
<td>Edit box entering numeric values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For entering values choose Manual from combo box</td>
</tr>
<tr>
<td>Slider</td>
<td>High SNR</td>
<td>Edit box entering numeric values</td>
</tr>
</tbody>
</table>

**Note**
- All changes take effect immediately except modifications to the High SNR.
- Changing the HighSNR feature can only take place:
  - if the camera is not grabbing images and
  - if the capture filter is not part of a connected filter graph.
**Trigger tab (AVT)**

This tab is for adjusting:
- Trigger modes
- Trigger delay
- Delayed IntEna (integration enable)

![Trigger tab (AVT)](image)

Figure 34: **Trigger tab (AVT)**
<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting...</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combo box</td>
<td>Trigger mode: edge mode (0) level mode (1) progr. mode (15) 2nd combo box: IIDC trigger source [not implemented: has no meaning]</td>
<td>Enable check box: switch on/off <strong>Invert Polarity</strong> check box (falling/rising, high/low) For a detailed description of all available standard IIDC registers and vendor-specific advanced registers: see the Technical Manuals of the AVT camera families.</td>
</tr>
<tr>
<td>Slider</td>
<td>Trigger delay</td>
<td>Combo box: on/off Edit box: delay in µs</td>
</tr>
<tr>
<td>Slider</td>
<td>Integration enable delay</td>
<td>Combo box: on/off Edit box: delay in µs</td>
</tr>
</tbody>
</table>

**Note**
- All changes take effect immediately except modifications to the Trigger feature.
- Changing the triggering can only take place:
  - if the camera is not grabbing images and
  - if the capture filter is not part of a connected filter graph

Table 19: Smart Feat. 1 tab (AVT)
Standard DirectShow tabs

In this chapter tabs automatically provided by DirectShow are described briefly in alphabetic order. Some of these features are mapped by AVT to AVT-own features and have therefore a different meaning, although the original DirectShow name is displayed all the time (see the following tables).

For standard DirectShow tabs see the following subsections:

- Chapter Camera Control tab (DirectShow) on page 66
- Chapter Capture tab (DirectShow) on page 66
- Chapter Video Proc Amp tab (DirectShow) on page 67

Note

- Camera control tab, Capture tab, and Video Proc Amp tab are a fixed part of DirectShow.
- These tabs cannot be switched off and appear always in the language of your operating system.
- Depending on your application you are using, the DirectShow tabs may be the only tabs shown. Due to AVT mapping the most needed features can be controlled anyway.
- Depending on the Windows version and the DirectShow application you use ...:
  - ... action is needed: Click Apply for changes to take effect.
  - ... changes made to AVT features on the AVT property pages may not be mirrored on the standard DirectShow pages and vice versa.

Figure 35: Camera control tab (DirectShow)
**Camera Control tab (DirectShow)**

This tab is for adjusting:
- Zoom: not implemented
- Focus: not implemented
- Exposure: mapped to shutter
- Iris: not implemented
- Pan: not implemented
- Roll: not implemented
- Tilt: mapped to auto exposure

<table>
<thead>
<tr>
<th>Control element</th>
<th>Use for adjusting...</th>
<th>Further elements (description)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slider</td>
<td>Focus</td>
<td>This feature is not implemented.</td>
</tr>
<tr>
<td>Slider</td>
<td>Zoom</td>
<td>This feature is not implemented.</td>
</tr>
<tr>
<td>Slider</td>
<td>Exposure</td>
<td>AVT has mapped this feature to <strong>shutter</strong>.</td>
</tr>
<tr>
<td>Slider</td>
<td>Iris</td>
<td>This feature is not implemented.</td>
</tr>
<tr>
<td>Slider</td>
<td>Pan</td>
<td>This feature is not implemented.</td>
</tr>
<tr>
<td>Slider</td>
<td>Roll</td>
<td>This feature is not implemented.</td>
</tr>
<tr>
<td>Slider</td>
<td>Tilt</td>
<td>AVT has mapped this feature to <strong>auto exposure</strong>.</td>
</tr>
</tbody>
</table>

*Note: All changes take effect immediately.*

Table 20: **Camera control** tab (DirectShow)

**Capture tab (DirectShow)**

This tab is just for information about available formats and media types.
**Video Proc Amp tab (DirectShow)**

This tab is for adjusting:

- Brightness
- Contrast: mapped to gain
- Hue
- Saturation
- Sharpness
- Gamma
- White balance: mapped to white balance VR
- Back light compensation: mapped to white balance UB
- Gain
- Color enable: mapped to mirror image
- PowerLine Frequency (Anti Flicker)

![Video Proc Amp tab (DirectShow)](image)

Figure 36: **Video Proc Amp** tab (DirectShow)
Working with the examples

As already mentioned in Table 6: AVT Direct Stream Package example viewer project on page 30, AVT Direct Stream Package comes with one example viewer project and one project containing the source code listed in Chapter Quick start for programmers on page 32ff. You can open these projects and adjust them to your needs.

In these projects, some environment variables were used to allow you successful compilation without the need of adjusting project options. They are:

<table>
<thead>
<tr>
<th>Environment variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATH_PSDK</td>
<td>for the path to the platform SDK</td>
</tr>
<tr>
<td>PATH_DX9</td>
<td>for the path to DirectShow 9</td>
</tr>
<tr>
<td>PATH_DSHOW_BASECLASSES_DEBUG</td>
<td>for the path to the debug version of strmbase.lib</td>
</tr>
<tr>
<td>PATH_DSHOW_BASECLASSES_RELEASE</td>
<td>for the path to the release version of strmbase.lib</td>
</tr>
</tbody>
</table>

Table 21: Environment variables

Note

If User Account Control (UAC) is activated, the example projects cannot be compiled directly (i.e. from the C:\Program Files directory).

In this case you get one or more error messages:

- e.g. Could not create output directory

The reason for these messages are missing write permission due to User Account Control (UAC).

Read Chapter Workaround for UAC problems on page 68.

For basic information on User Account Control (UAC) read Chapter User Account Control (UAC) on page 69.

Workaround for UAC problems

To solve the compiling problems under UAC, perform the following steps:

1. Locate the installation directory:

   e.g.

   C:\Program files\Allied Vision Technologies\DirectStreamPackage

2. Copy DirectStreamPackage directory to your desktop (or one of your user directories).

3. On desktop open Samples directory and search for *.sln.

5. You can work with this files as usual (e.g. compile) without getting the error messages listed above.

**User Account Control (UAC)**

**Compiling projects** To compile the example project under Windows Vista / Windows 7, copy the project to a user-writable location as described in Chapter *Workaround for UAC problems* on page 68.

**Note** For more information on Microsoft Vista / Windows 7 User Account Control (UAC) read Chapter *Special advice when working with Windows Vista / Windows 7* on page 10.

**UAC warning** An example of an UAC warning when a program wants to write in a system folder is the following:

![UAC warning example](image)

Figure 37: UAC warning: example

In this case just click **Yes** and go on working.
Redistribution

Introduction

Distribution of AVT Direct Stream Package-based software also requires the redistribution of AVT Direct Stream Package components.

This section describes the redistribution of components on a file basis. When this approach is chosen, it lies in the responsibility of the packager that all required components are installed on the target system.

Alternatively, the whole installer package provided by AVT may be integrated in third-party installers.

Mandatory requirements

You should always include the Direct Stream driver AVT1394DSPCamera.sys as well as AVT1394DSPCamera.inf and AVT1394DSPCamera.cat in your distribution package and make sure the user installs it before starting your application.

For this, either distribute the DSP1394DriverInstaller.exe and if required the files needed for XP installation (1394driverfiles.xml and the files in the XPSP1_data sub-directory) with your package or write a short documentation how to install the driver manually.

If you create an application using AVT Direct Stream Package, your distribution package should include the file AVT1394DirectStreamProperty.ax, which contains the property pages to control AVT cameras.

This DLL must be registered on the end-user’s system before the application can use it.

Therefore, you may want your setup program to register this DLL when the application is installed. You can do it by passing the complete path to AVT1394DirectStreamProperty.ax as an argument to regsvr32.exe, or you can write your own setup program to register this DLL directly instead.

**Info**

- Under 64-bit systems this DLL should be registered twice:
  - For the 64-bit system: in system32 folder
  - For the 32-bit system: in syswow64 folder
Additional requirements

For complete support of color cameras, the transform filter for color conversion 
AVT_Convert.ax should also be installed and registered.
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