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Title		Video File Types for i2 Pro	
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Introduction

This document is written to help explain how video files are played in i2 Pro and the different types of video files.

Video File Details

Video files are played on a computer by processing the information through a Directshow filter. A Directshow filter is considered the method for which a program processes the codec and wrapper of a video file. Often times the names "filter", "codec" and "wrapper" get interchanged. In simple terms a wrapper is the envelope which contains the media to be played, either video or audio. The codec is the language of the information written inside the envelope.

Codec

A codec is used during the recording phase of capturing video. It defines how to save or encode the frames a video camera sees into the video file. A separate codec defines how to save the audio information. Just like a set of instructions or an encoding ring. A codec is also used during playback of the video file as a set of instructions on how to extract or decode the video file.

Common video codecs include H.264, MPEG2, MJPG, DV, WMV

Common audio codecs include MP3, AAC, WMA

To confuse things even more, there are many manufacturers of the same codec each with their own tweaks. Some are compatible with others and some aren't. Not all codecs are created equal. Each one will typically have some advantage and some disadvantage over the others. Some have great video quality. Some are very fast at encoding and decoding. Some do a great job compressing while others don't.

File Types

The file extension, such as .MPG, .AVI, .WMV, .MOV or .MP4 are essentially different wrappers. Each file type is not limited to a select single codec, rather most of them accept many different codecs. So it can be confusing to figure out what codec you have just from the file type extension.

Video Compression

Each video file fits into one of two categories, compressed or uncompressed. Some common file types:

<u>File Type</u>	<u>Codec</u>	<u>Type</u>
.AVI	MJPEG (motion jpeg)	uncompressed
.MP4	H.264	compressed
.MPG	MPEG2	compressed
.WMV	WMV8	compressed

A compressed file type offers a smaller physical file size. This allows more for longer videos or more video files to be recorded on a memory card. However, the decoding of the compressed video will be very computer intensive. Running multiple videos at the same time on a computer will be next to impossible because the computer becomes overloaded.

An uncompressed file type will be much bigger than the compressed version. Easily more than 3 times larger than a compressed file. Its advantage is during playback when no decoding is necessary because nothing is compressed. So the computer can play back multiple video files without running into limitations.

The file size and quality level go hand in hand. If you want better quality then the file size will increase. A common goal is to increase the quality of the video while lowering the file size. This requires more compression to make the file sizes smaller while increasing the computer processing power required to decode or uncompress the video.

Here are some notes to remember for i2 Pro use:

- Compressed files won't allow the user to scroll frame by frame in i2 Pro. Uncompressed files will.
- Compressed files have difficulty playing multiple streams or videos at the same time. For example, when overlaying two laps and playing them side by side. Uncompressed videos can easily play back multiple laps and views all at the same time even on the slowest laptops.
- Compressed files are smaller and take up less disk space. Uncompressed files are large.
- Compressed files can be recorded at a higher quality. This is important when playing back in full screen or on a large scale TV. Uncompressed video is often a lesser quality due to file size limitations.

Highest Quality: Typically the H.264 codec wrapped in a .MP4 file will offer the highest quality and the smallest file sizes. It is often the codec of choice for High Definition recorders, but will also be used in some standard definition recorders too. When playing back on a big screen, this file type will look the best. The downside is that i2 Pro cannot play multiple streams at the same time (either multiple recording views or overlaying laps in i2 Pro).

Best Performance: The uncompressed MJPEG or motion jpeg codec often found as a .AVI file type will play the best in i2 Pro. You can play back multiple views and overlay laps perfectly all the time. It will also allow frame by frame movement. The downside is its very large file size, and less quality.

Good Compromise: The MPEG2 codec often found as a .MPG file type will offer a good compromise between being compressed and small, while still being able to play multiple streams on faster computers.

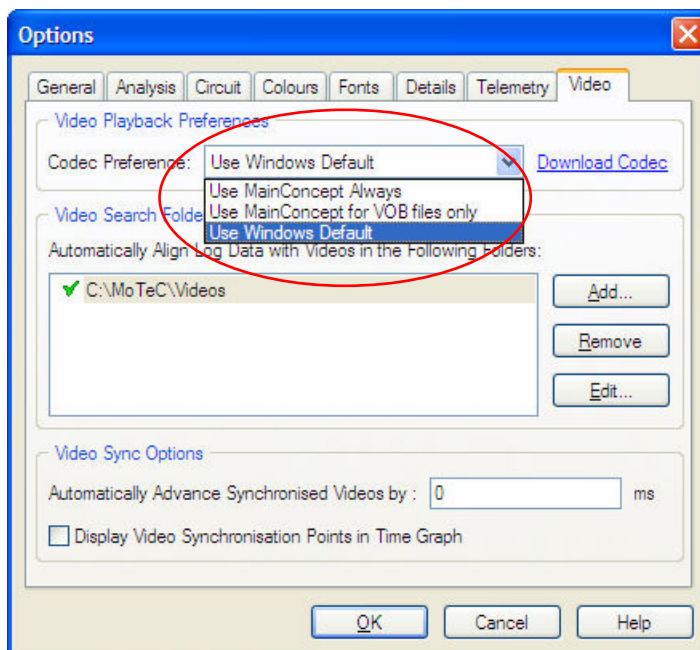
Ultimate Solution: The best solution is to record in a high quality compressed video format (H.264), then convert that to an uncompressed video format (MJPEG). Keeping both files will allow you to choose which one to view based on your need for quality versus performance. This solution will require a conversion of the high quality compressed recorded file type to an uncompressed file type. This conversion may take up to 8-10 minutes to complete for a 30 minute session on track. But the ability to go frame by frame and overlay different laps becomes important in the analysis of data combined with video.

How does i2 play Video?

MoTeC's i2 cannot play video on its own. It must rely on a video player to handle all these wrappers and codecs. There are two players which i2 can access and use. One is **Windows Media Player** and the other is **MediaConcept Showcase Player**. These are both players, not codecs or wrappers. Windows Media Player comes installed on all versions of Windows software. MediaConcept Showcase Player must be downloaded and installed by the user, which can be found on the MoTeC web site under software. They are also the only two players which i2 Pro can use.

The player takes care of all the decoding of the video file based on the codec required. Many times a computer will have multiple codecs installed for the same type of video file. Each player might also come with its own set of codecs, which may or may not be used by that player or other players. The exact codec chosen depends on many things including a merit scale. If more than one codec exists on a computer, the player decides which codec to use based off the merit scale.

In i2 Pro you can select a preference for which player and codec to use. This selection is a pull down menu found under Tools | Options | Video as in the picture below. Note this is a preference that may be ignored depending on the video format being played.



Notes on Vista / Win 7

By default the Windows Media Player which comes in Vista and Windows 7 should play most file types all by itself. If you must have more control over the codecs and playback properties, you will need overwrite the Windows default functionality by installing: Win7DSFilterTweaker_4_1.exe

Notes on Windows XP

By default the Windows Media Player which comes in XP does not play .MPG or .MP4 file types. It is possible and quite common for XP machines to have non-Microsoft codes installed which are compatible with .MPG but unlikely for .MP4 files. Below is a list of video players for different file types.

<u>File Type</u>	<u>Codec</u>	<u>Recommended Video Player</u>
.AVI	MJPEG (motion jpeg)	Windows Media Player
.MP4	H.264	MediaConcept with ffdshow
.MPG / .VOB	MPEG1, MPEG2	MediaConcept

For the best control and performance, it is best to install the following software programs on winXP:

MediaConcept Showcase Player: this player and included codecs provides the best and fastest .MPG codec available, and is the basis for playing .MP4 files.

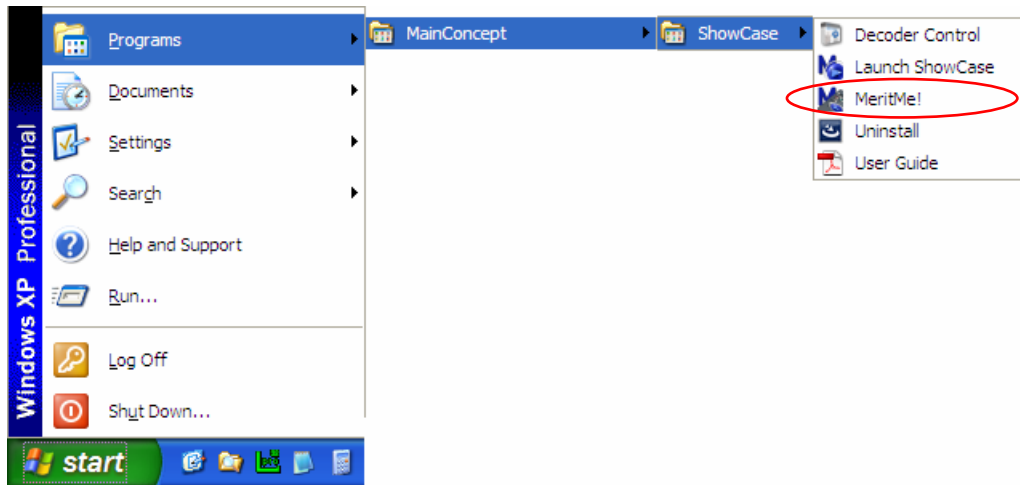
ffdshow: this set of codecs and tools allows AAC audio to be played (commonly found in H.264 files) and allows for a large set of deinterlacing filters which can be applied to improve the quality of playback.

Below are notes on how to install and setup both pieces of software.

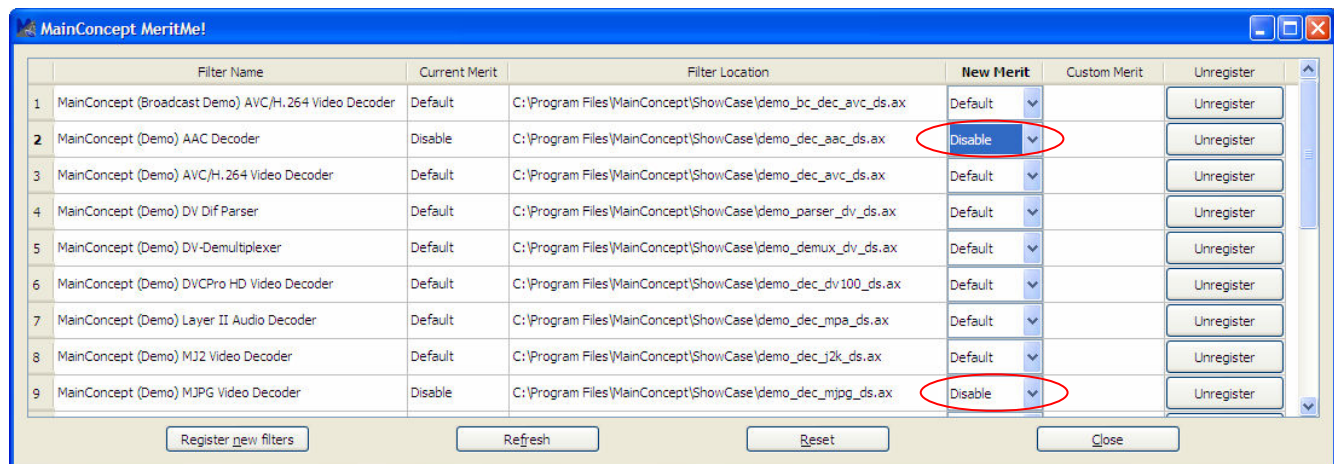
MainConcept - Showcase Media Player

This is the recommended player for many video file types. It contains the fastest and best .MPG and .VOB codec available! Therefore with a fast computer you should be able to play two .MPG or .VOB files side by side. This player is also required for H.264 files to be played in i2 Pro. Below are the instructions for installing and setting up this player.

1. Install the MainConcept Showcase media player. You can download a version from the MoTeC web site, or directly from MainConcepts web site.
2. Once installed, go under Programs | MainConcept | ShowCase | and choose MeritMe!



3. This will open up a configuration window that looks like the picture below. Here you should click on the line containing the AAC Decoder and choose the Disable option. Next click on MJPEG Video Decoder line and also choose the Disable option.



4. When finished click Close.

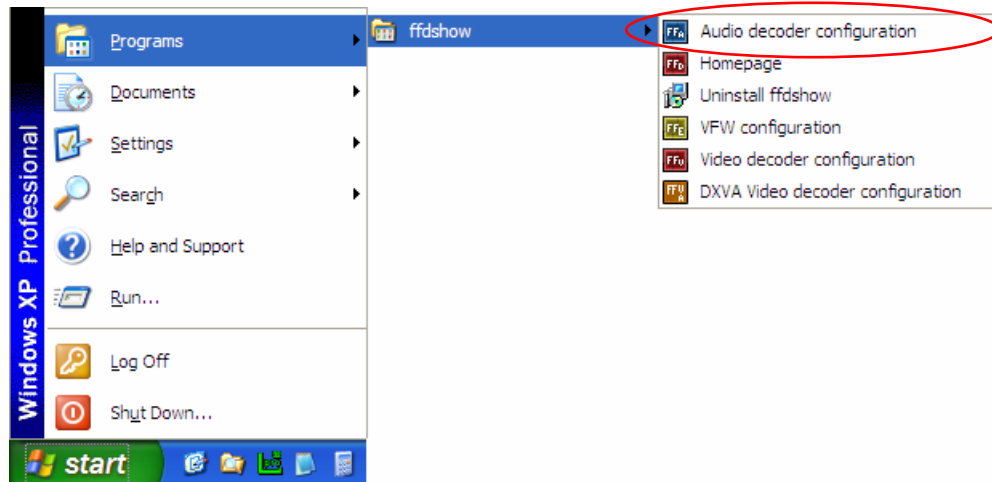
The AAC Decoder in this player is limited to only 30 seconds of video. A good work around is to install the ffdshow collection of codecs as discussed in the next section, and let ffdshow play the audio portion of the video instead.

The original Microsoft codec for MJPG (.avi motion jpeg) videos will work better than MediaConcepts which has proven difficult at times. Therefore, disable this as well and let the standard Microsoft codec take over.

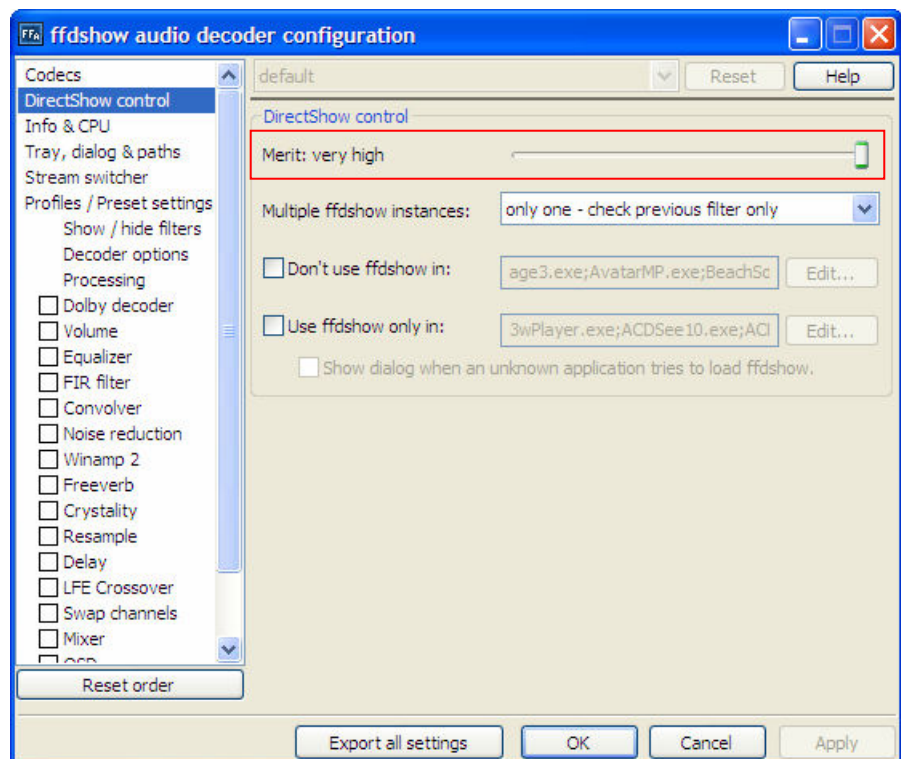
ffdshow - video & audio codecs

The software package called ffdshow contains various codecs and a very nice configuration program which lets the user control many different playback settings! It is required to playback any AAC based audio, commonly found in H.264 or .MP4 file types.

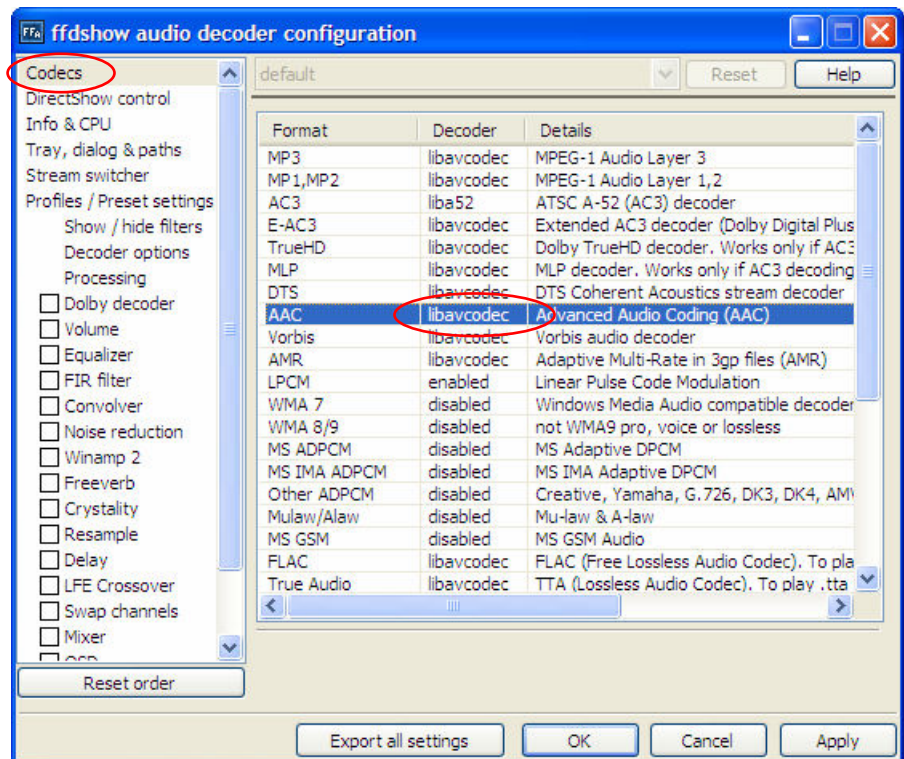
1. Install the ffdshow. This can be downloaded from various sources online.
2. Once installed, go under Programs | ffdshow | and choose Audio decoder configuration.



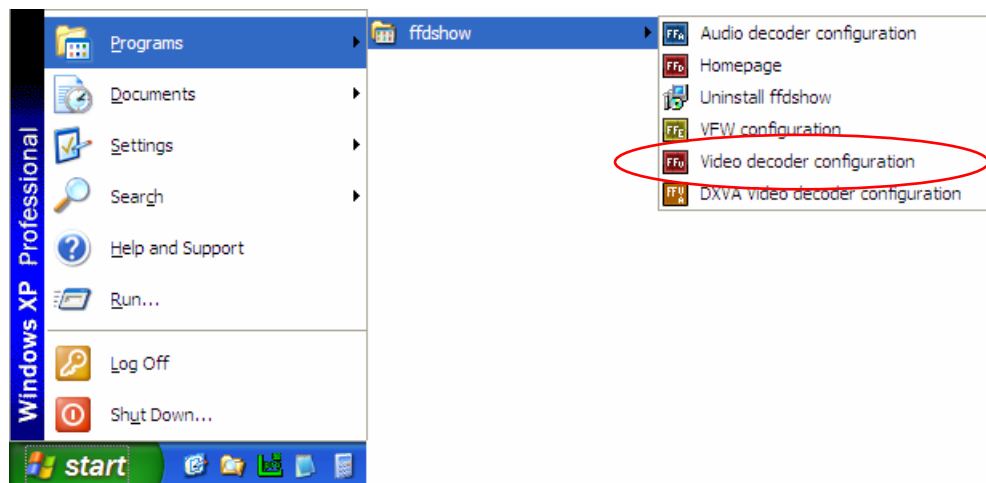
3. Here you should click the DirectShow control selection on the left hand side to bring up a menu for setting Merits. Then slide the Merit level all the way to the right, which is a setting of "very high".



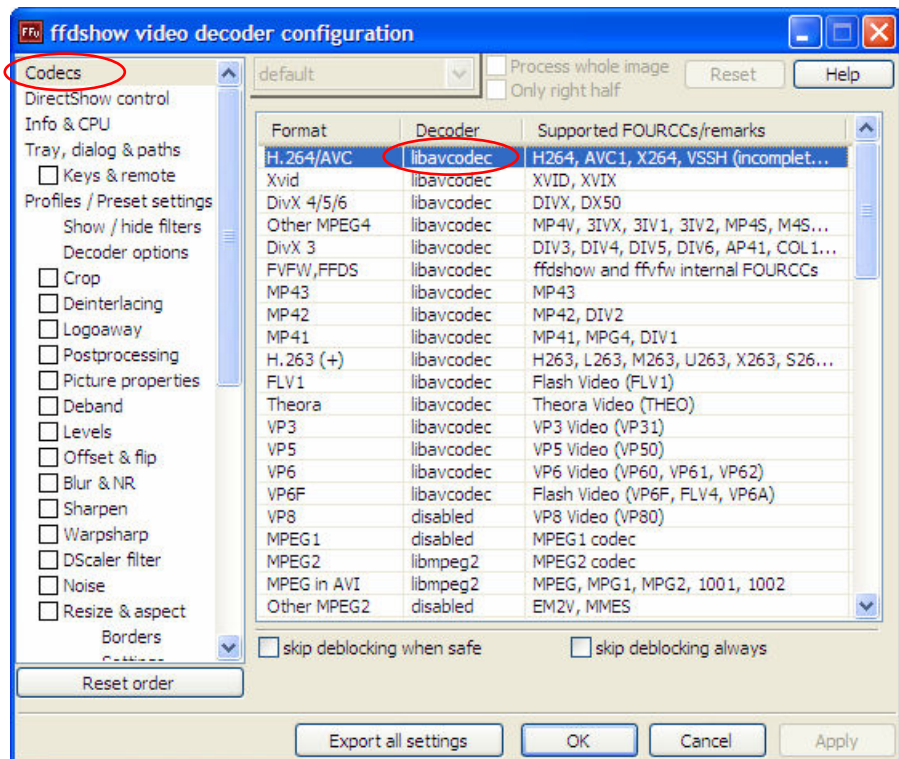
4. On the left hand list of settings, click on Codecs. Verify in the list that AAC has a decoder selected and is not listed as disabled.
5. Click "OK" to close the audio settings



6. Now go back under Programs | ffdshow | and choose Video decoder configuration.



7. On the left hand list of settings, click on Codecs. Verify in the list that H.264/AVC has a decoder selected and is not listed as disabled.



8. It is recommended to check the box for a tray icon. This will allow you to have easy access to various settings during playback for things like Deinterlacing settings which can improve the video quality. When done for the Audio decoder as well, the little tray icon will be a good identification that i2 Pro is busy syncing video.

