



# FlipFactory<sup>®</sup>

## USING DOLBY E WITH FLIPFACTORY

This App Note  
applies to  
FlipFactory  
versions  
7.0 & later

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# Synopsis

Though the audio quality of Dolby Digital (AC-3) is excellent, multiple encode/decode cycles can cause degradation in audio quality and packetized AC-3 data to lose synchronization with video frames.

Dolby E solves these problems by providing audio encoding and decoding technology that enables up to eight channels of compressed audio to be carried in an AES-3 serial digital audio interface. Dolby E audio frames are aligned with video frames ensuring edits that are free from undesired audio artifacts. This allows switching, routing, and editing without the need for decoding and re-encoding.

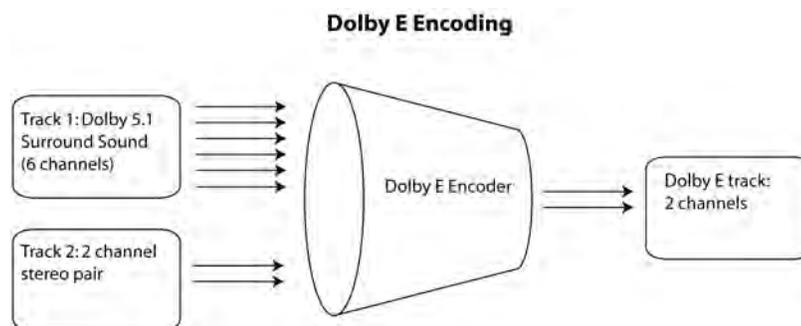
Broadcast facility infrastructures are typically set up for two-channel audio, making multi-channel audio difficult to manage without adding costly new equipment and cabling. Dolby E allows distribution of multi-channel audio within the existing two-channel environment. Up to eight channels of broadcast-quality audio, plus metadata, can be distributed over a single AES-3 pair recorded on just two audio tracks.

The advantages of Dolby E include:

- Most two-channel digital audio equipment can be used in multi-audio channel applications without modification or replacement
- Ten or more encode/decode generations (typically required during distribution), can be performed without significant degeneration in audio quality
- Only one frame of video is required for encoding (or decoding) resulting in simplified audio/video synchronization
- Dolby Digital metadata is conveniently transported within the Dolby E bit-stream.

Dolby E works at 48 kHz sample rate and with most standard frame rates (20, 29.97, 25, 24, and 23.98 fps). Video recorders using 20-bit or 16-bit audio words easily accommodate Dolby E. When using 20-bit words, Dolby E supports up to eight audio channels, while 16-bit words support up to six channels.

Using Dolby E, producers can provide a variety of mixes tailored for different audiences on the same media. For example, a 5.1-channel Dolby Surround Sound (6 channels) and an uncompressed stereo audio pair (2 channels), can be encoded into Dolby E and carried on one pair of audio tracks.



# Qualifying FlipFactory for Dolby E Decoding & Pass-through Workflows

There are many different ways that Dolby E audio can be carried in media files. In many cases some engineering work will be required to enable FlipFactory to decode Dolby E from a given file. Before purchasing the Dolby E Decode Option, Telestream requests that you provide samples of Dolby E files you plan to decode. Our engineering staff will evaluate what (if any) changes are required to decode your Dolby E files, and provide an estimate of the time required to complete this work. Once your files have been qualified, Telestream will provide you an updated Dolby E Decode Option for your testing purposes, including FlipFactory installation instructions.

As with the Dolby E decode workflow, a pass-through workflow also needs to be examined on a case-by-case basis by the Telestream engineering staff. Since Dolby E audio can be carried in media files in different ways, even in a pass-through workflow engineering work may be required to reconfigure the Dolby E into the output format.

Telestream cannot support or guarantee the functionality of any Dolby E decoding or pass-through workflow that has not been qualified. Please contact your Telestream representative for more information.

# Dolby E Audio Processing in FlipFactory

Telestream has introduced Dolby E audio processing in FlipFactory as an optional licensed feature. To obtain a license, send an E-mail to [license@telestream.net](mailto:license@telestream.net) or contact your Telestream representative.

FF can support the processing of up to 32 separate audio channels in media files. When decoding Dolby E in media files, you can submit media that includes multiple audio tracks, including one or more Dolby E tracks, provided that the decoded (uncompressed) audio channels in the output file does not exceed 32 channels.

Dolby E tracks decode into a maximum of 8 channels. Other audio channels pass through unchanged. FlipFactory decodes (expands) all audio tracks into individual channels in the same order as the input. When a Dolby track is decoded (for example, a 5.1 surround sound track expands to 6 channels), any following channels are moved to the next ordinal channel number.

Depicted below is an example of how twelve channels of audio are decoded into 22 channels of uncompressed audio using the Dolby E Option in FlipFactory:



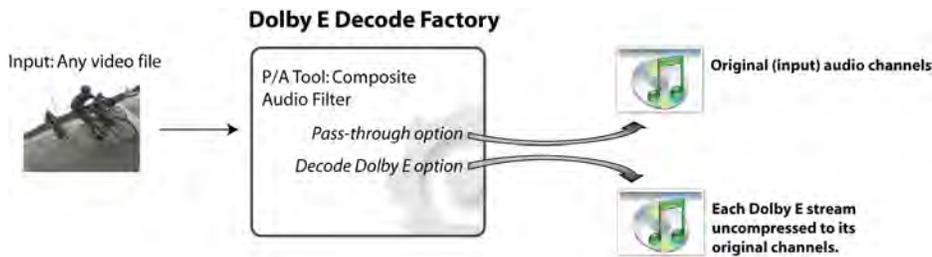
Notice that four of these channels are Dolby E encoded: one pair encoded as *7.1 Surround Sound*, the other as *5.1 Surround Sound*. These two pairs of Dolby E are decoded into a total of fourteen channels of uncompressed audio, whereas the remaining eight channels are passed through unmodified.

Also provided in FlipFactory is the *Audio Channels* filter that provides a way to rearrange the order of the channels in the output file.

# Creating a Dolby E Decode Factory Workflow

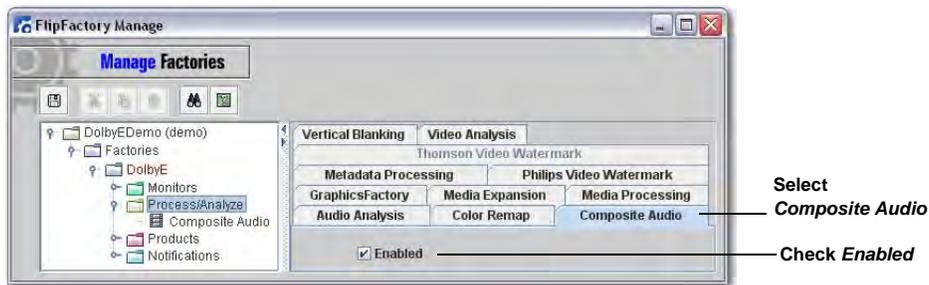
**Note:** This example assumes that you know how to create and configure factories in FlipFactory and how to submit jobs. Review the *FlipFactory User's Guide* for details.

This example uses FlipFactory to decode Dolby E audio. Dolby E audio contains up to eight channels of embedded audio. A *composite audio* Process/Analyze tool, which has two options, is employed. When the *Pass-through* option is selected, audio input is passed through as two-channel uncompressed audio to the output. The output file must match the input file in bit-resolution (16 or 24) and sampling rate (48 kHz). When using the *Decode Dolby E* option, audio input is decoded into any output that supports audio and a Channel Map filter can be used to re-map the audio. The diagram below depicts a typical (but not the only possible) workflow:

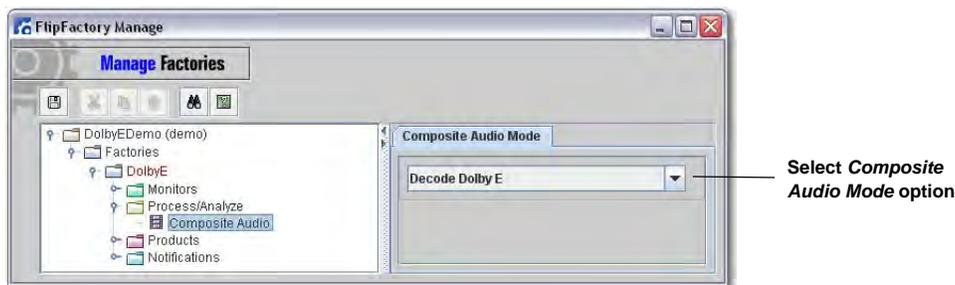


Follow these steps to create a factory to decode Dolby E audio in FlipFactory:

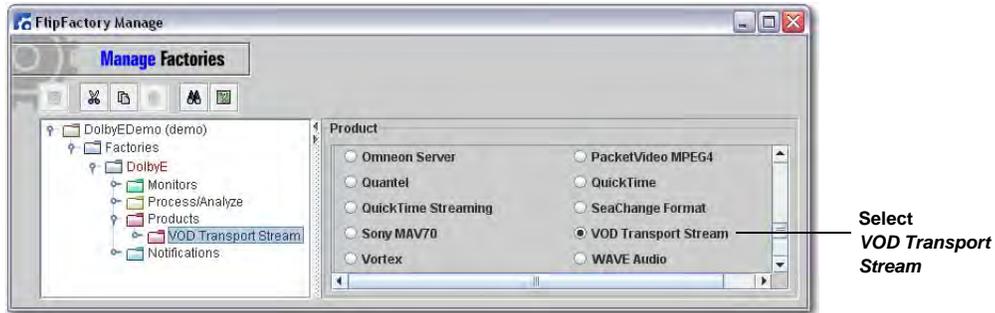
1. Create a factory and add a local monitor folder to place input media files containing Dolby E audio to be processed by FlipFactory. (Alternatively, you can submit jobs manually.)
2. Click *Process/Analyze*, select *Composite Audio*, and check *Enabled* to add this Process/Analyze tool to your factory:



3. Click *Composite Audio* and select the *Decode Dolby E* option from the pull-down menu. This option causes the Composite Audio to decompose the Dolby E stream into up to eight channels of uncompressed audio:

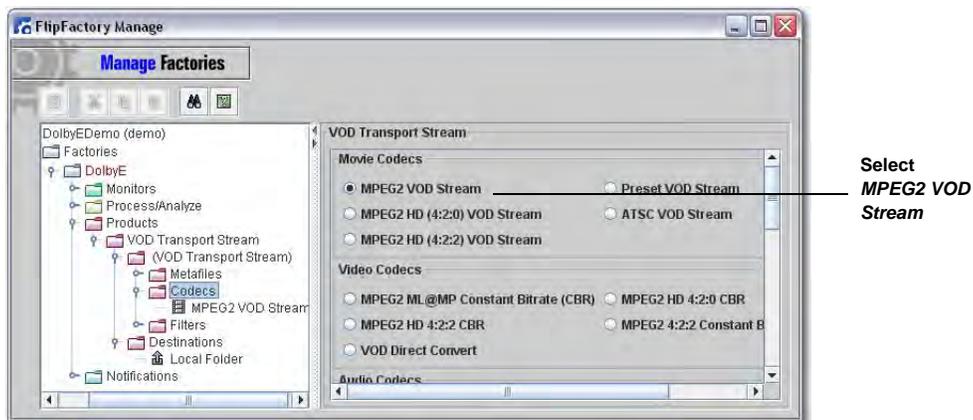


4. Right-click *Products* and select *New Product*, then select *VOD Transport Stream* from the list of products:

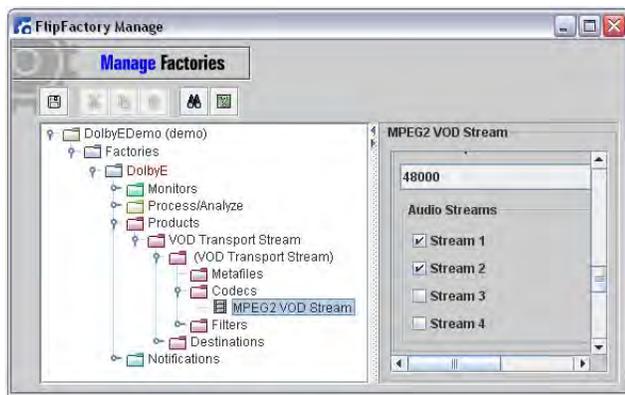


**Note:** In this example the product is “VOD Transport Stream”, though any product that supports up to eight-channel audio (depending on the number of channels in your input file) could be employed.

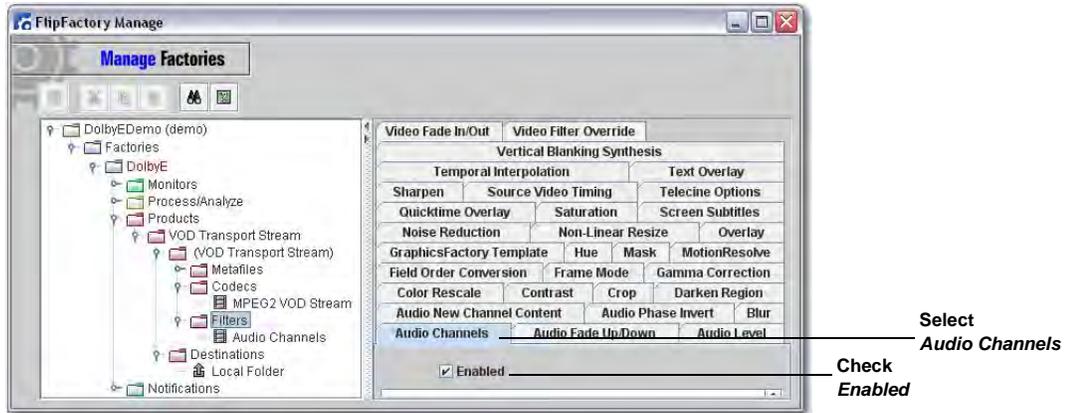
5. Click *Codecs* and select *MPEG2 VOD Stream*.



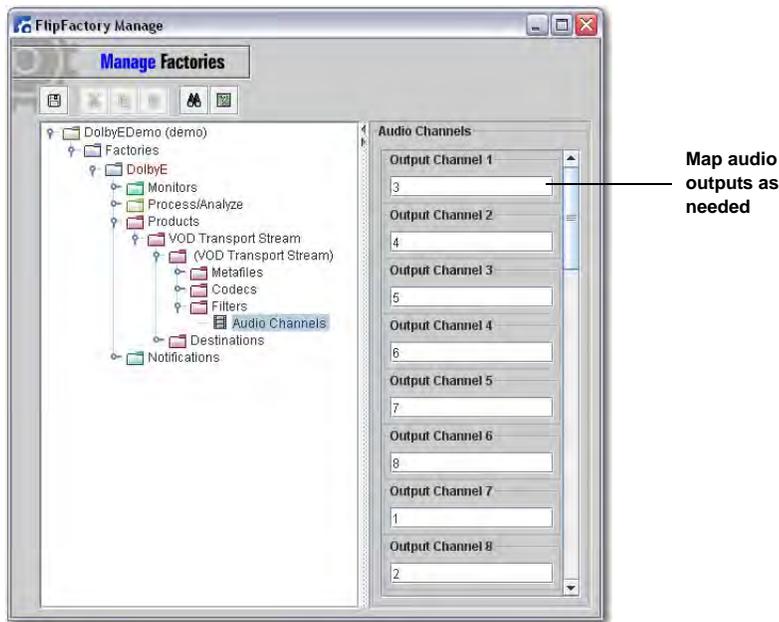
6. Click *MPEG2 VOD Stream* and select the *Audio Streams* to be used -- in this example, two streams are checked to produce two-channel audio output:



- To allow mapping of the audio outputs, add an Audio Channels filter by clicking *Filters*, selecting the *Audio Channels* tab, and checking *Enabled*:



- Click *Audio Channels* and map the outputs for Audio Channels as needed. Such mapping allows any rearrangement of the audio input channels as needed in the output media:



- Add a destination to provide a place for output file to be saved. This destination can be a local folder or remote location.
- Click the Save icon to save the factory settings.

## Testing Your Dolby E Decode Workflow

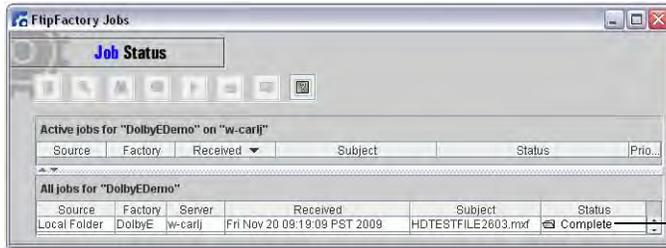
Now that you have created a factory to decode Dolby E audio, it should be tested to ensure that decoding has been successful:

1. In FlipFactory, open the *Job Status* window to monitor factory progress.
2. Submit a Dolby E audio file to be decoded by placing it into the monitored folder.



Place Dolby E file in monitor folder

3. Wait for the *Job Status* window to display "Complete":



Wait for status "Complete"

4. Examine the destination folder to ensure that the file has been created, then play the file to ensure that the that the Dolby E audio has been successfully decoded, and mapped to the correct output channels:

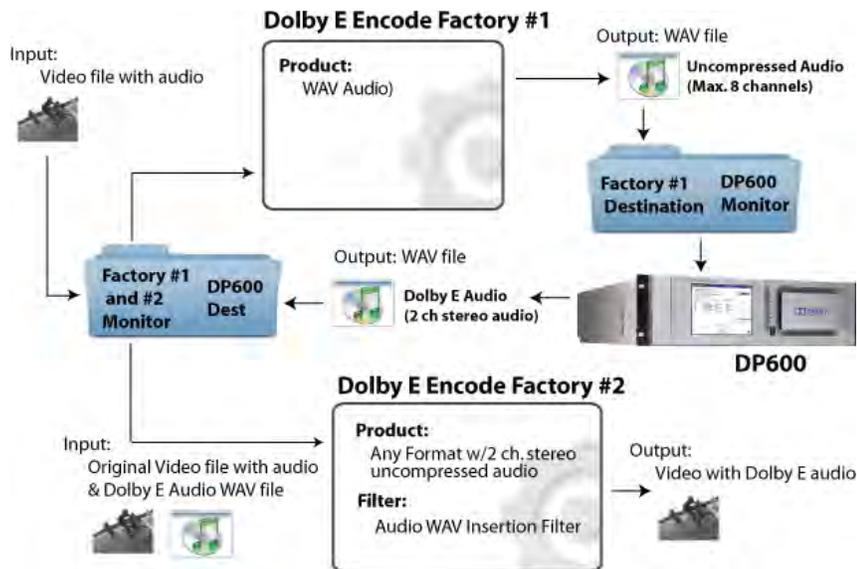


Find file in destination folder

# Creating a Dolby E Encode Factory Workflow

**Note:** This example assumes that you know how to create and configure factories in FlipFactory and how to submit jobs. Review the FlipFactory User's Guide for details.

This example uses FlipFactory to transcode various audio formats into Dolby E audio. This encoding process encodes up to eight channels of PCM audio into WAV audio with SMPTE 337M formatted Dolby E using the Dolby DP600. The Dolby E audio is then inserted into the output media.

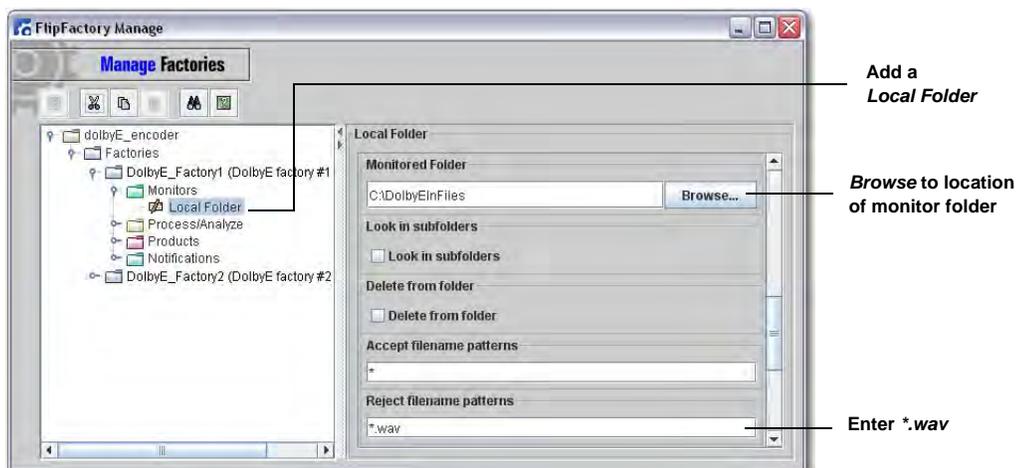


This workflow has two stages, thus, two FlipFactory factories are required. The stage-one factory transcodes audio inputs into multi-channel WAV Audio format; the stage-two factory embeds Dolby E audio into a media file. Between these two factories the Dolby DP600 is used to encode Dolby E audio from the uncompressed audio in your input media file.

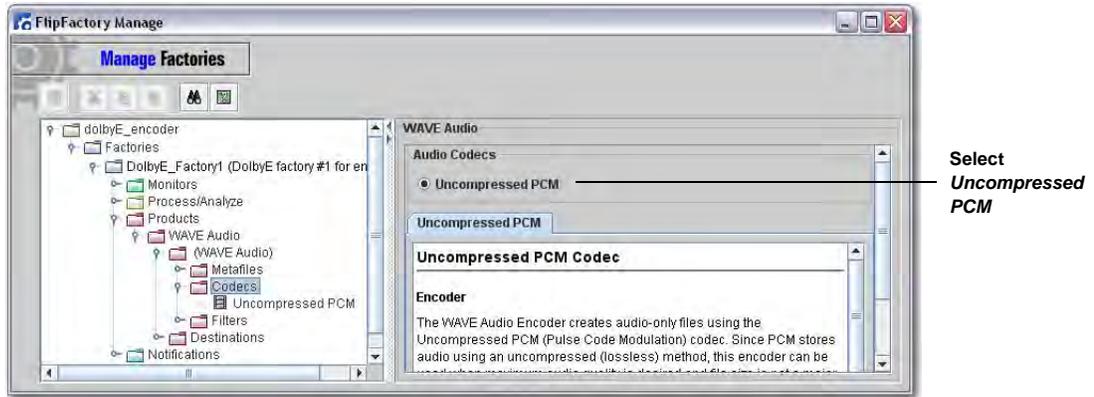
**Note:** This workflow may also be applicable to other workflows where DP600 is required to manipulate audio before it is inserted into a FlipFactory output (i.e. audio up-mixing).

To create a Dolby E encoding workflow using the DP600, follow these steps:

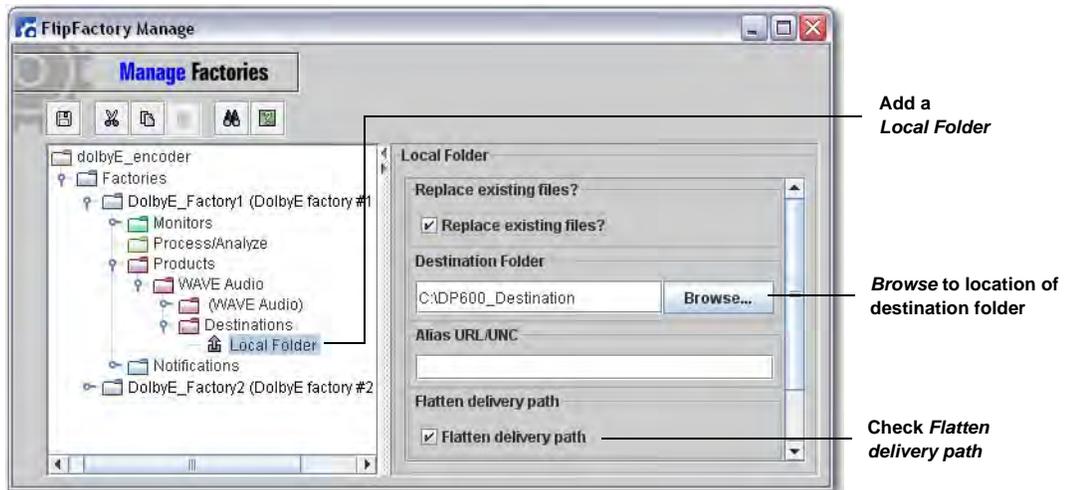
1. Create a FlipFactory factory (Factory #1) and add a *Local Folder* to monitor input media files processed by FlipFactory (you can also submit jobs manually). Click *Browse* and navigate to the location of the monitor folder. Enter *\*.wav* into *Reject filename patterns*. This causes files placed by the DP600 to be ignored (see step 4 below):



2. Right-click *Products*, select *New Product*, and select *WAVE Audio*, then click *Codecs* and select *Uncompressed PCM*:

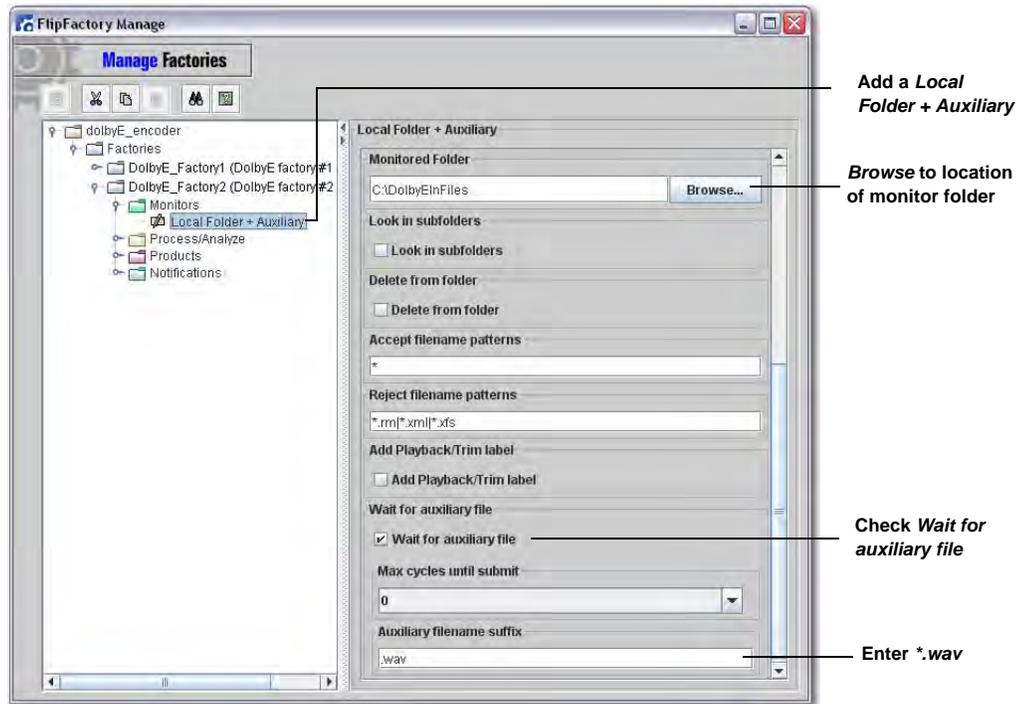


3. Click *Destinations*, add a *Local Folder*, and *Browse* to the location where the output WAV file can be found and processed by the DP600. Also check *Flatten delivery path*:

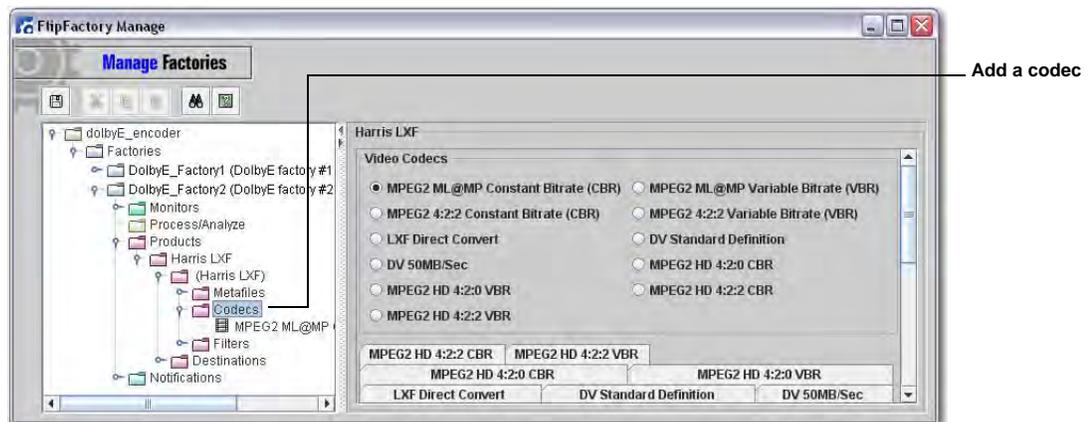


4. After the WAV file has been created, it must be processed by the Dolby DP600 to encode it into Dolby E format. This DP600 output file must be placed into the *Factory #1* monitor folder (created in step one above) where it, and the input media file, can be monitored by *Factory #2*. (Please consult the *Dolby DP600 Program Optimizer Manual* for details on how to use the DP600.)

5. Create a second FlipFactory factory (Factory #2) that encodes Dolby E audio into a media file. To do this, add a *Local Folder + Auxiliary* monitor to require the input media file and the DP600 output file to be processed together. Click *Browse* and navigate to the location of the monitor folder. Check *Wait for auxiliary file* and enter *\*.wav* into *Auxiliary filename suffix*:

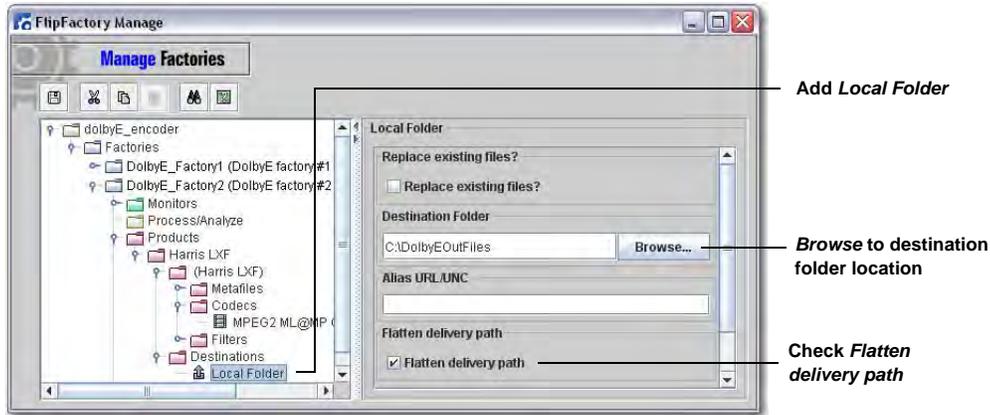


6. Right-click *Products* and select *New Product*, then select *Harris Format* from the list of products. Click *Codecs* and select the desired codec to be employed (*MPEG2 MI* in this example):

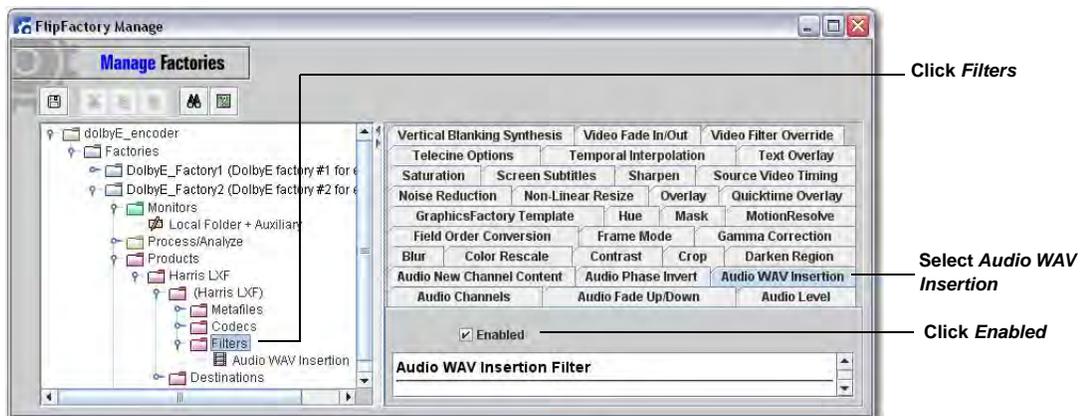


**Note:** In this example the product used is Harris Format, though any product that allows you to put uncompressed audio in the output media file could be employed. The input audio must be 48kHz and is typically 24 bits.

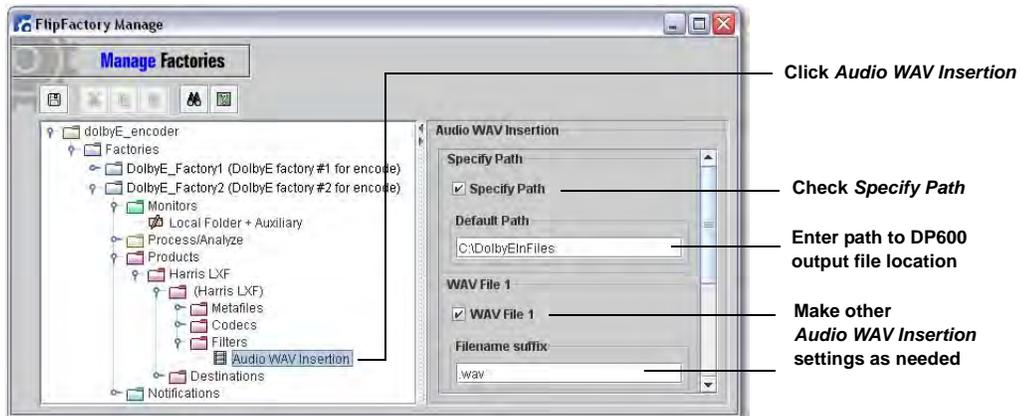
- Click *Destinations*, add a *Local Folder*, and *Browse* to the location where the output file is saved. Check *Flatten delivery path*:



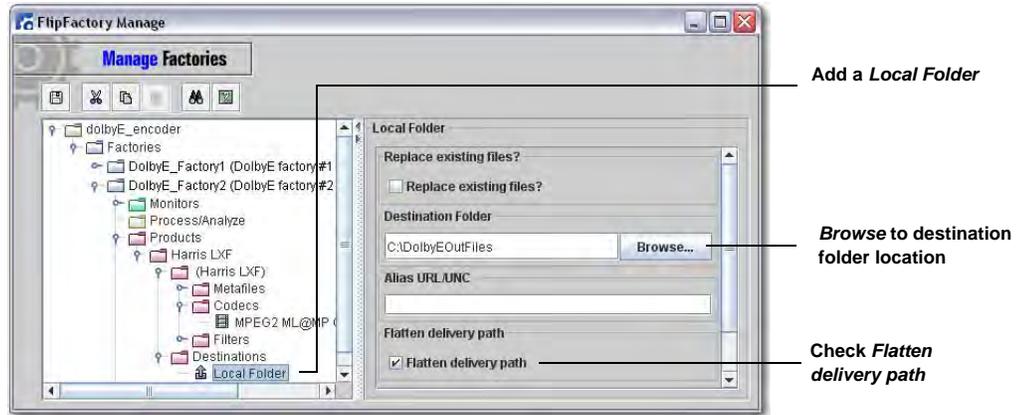
- In order to replace the audio in your input file with Dolby E audio produced by the DP600, click *Filters*, select *Audio WAV Insertion*, and click *Enabled* to add the WAV File Insertion Filter:



- Click *Audio WAV Insertion*, enter the path to the location of the DP600 WAV output file (the *Factory #2* monitor folder), and make other *Audio WAV Insertion* settings as needed (consult the *Audio WAV Insertion* on-line help for details):



10. Click *Destinations*, add a *Local Folder* and *Browse* to where the output file will be placed. Check *Flatten delivery path*:



11. Test your Dolby E workflow by following the steps similar to those presented in [Testing Your Dolby E Decode Workflow](#).

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FlipFactory has been designed for professionals skilled in the art of digital media transformation and workflow automation, to facilitate the automation of complex media operations and workflow that require a multitude of input and output media formats, delivery to numerous types of media devices and file systems, and notification of media systems including broadcast automation systems and media asset management systems.

The FlipFactory architecture and user interface is designed to provide maximum flexibility in the setup and configuration of these complex media transformations and workflow. In providing this high degree of flexibility, it is possible for media transformation and workflow processes to be configured that are impractical, likely to result in unexpected or unintended results, or beyond the limits of FlipFactory to perform satisfactorily. Additionally, FlipFactory may be executed on a platform that lacks the performance or capacity to perform the media transformations and workflow you've configured, which is your responsibility to specify. Telestream has chosen to implement FlipFactory to provide the greatest flexibility without limiting its functionality to only those transformations and workflow that are known with certainty to be within its performance capabilities, including those limits imposed by the platform upon which you have installed FlipFactory.

Therefore, you acknowledge that you may create transformations and workflow that are impractical or beyond your FlipFactory installation's limits, and Telestream does not warrant that each transformation or workflow you specify or use will complete without error.

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