

Dolby DP600 and DP600-C Program Optimizer Overview for Broadcast and Ad Insertion

The Dolby® DP600 is an innovative audio platform that provides a file-based work-flow solution for loudness correction, audio conversion, and upmixing. The DP600 includes the world's first intelligent audio analysis and automated loudness normalization engine, and the ability to encode, decode, convert, and transcode Dolby Digital, Dolby Digital Plus, Dolby Pulse, and Dolby E. It also features a newly designed algorithm for upmixing your legacy two-channel audio for 5.1-channel delivery. These features, along with support for many of the most common broadcast media file and audio formats in use today, make the DP600 particularly well-suited for integration into your day-to-day file-based work-flow environment.

The Dolby DP600 enables broadcasters to automatically normalize the loudness of their file-based programming and commercials without impacting the original dynamic range.¹ For compressed audio formats that include metadata (for example, Dolby Digital, Dolby Digital Plus, Dolby Pulse, and Dolby E), the Dolby DP600 can automatically set the dialogue normalization parameter or correct a previously set dialogue normalization parameter. It can also perform loudness normalization on audio that does not contain metadata.

The DP600-C version of the Program Optimizer provides faster-than-real-time file-based encoding and decoding of Dolby Digital, Dolby Digital Plus, Dolby Pulse, Dolby E, MPEG-1 LII, AAC, HE AAC, and HE AAC v.2. Additionally, this version enables multichannel audio conversion into and out of all of these formats, plus PCM. The DP600-C can also perform highly efficient, single-step transcoding of Dolby Digital to Dolby Digital Plus without having to decode and reencode.

An optional software upgrade adds an intelligent file-based upmixing capability for customers interested in enhancing legacy two-channel audio for use in 5.1-channel applications. This process is based on a newly developed Dolby algorithm which creates a wider natural-sounding sweet spot and ensures that subsequent downmixing is free from artifacts typically found with other solutions.

To ensure the highest possible work-flow integration and efficiency, the DP600 offers open access (via Web services) to Dolby's unique audio processing engines as well as coding technologies traditionally found only in real-time hardware.

¹ In very rare cases involving extreme loudness corrections that require gain, soft limiting will occur only during program peak levels that would exceed clipping after applying this type of loudness correction.

For example, the DP600 feature set complements several types of third-party applications and products, including the following:

- Archiving
- Automation
- Content conversion
- Content transport
- Distribution
- Media asset management
- Production

A Quick Look Under the Hood

The DP600 includes a number of audio and media file processing engines for utilization in many applications, as shown in Figure 1.

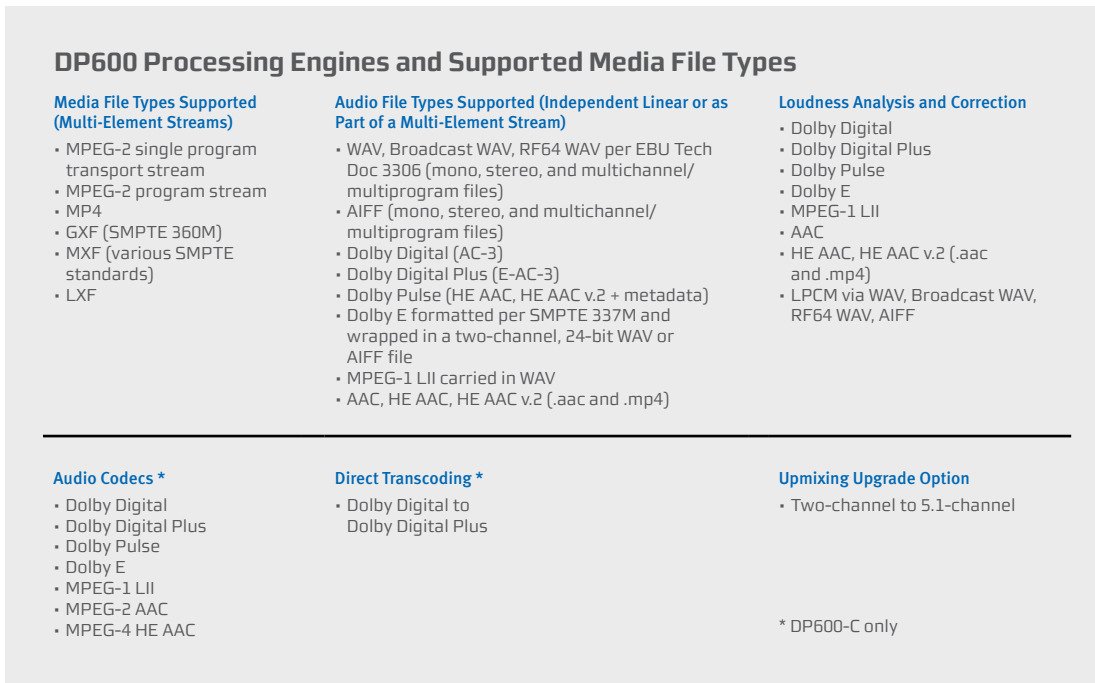


Figure 1 DP600 Processing Engines and Supported Media File Types

Uses in Broadcast and Ad Insertion

The DP600 Program Optimizer can be utilized in a number of broadcast and ad insertion applications.

- Ingest file audio analysis and loudness correction
- Ingest file audio conversion

- Digital program insertion (DPI) file analysis and loudness correction
- Broadcast media file (GXF, MXF, and others) audio conversion and transcoding
- Broadcast media file QC and loudness correction

Newly ingested content can be routed through the DP600 for loudness analysis and correction, encoding, decoding, conversion, and transcoding processes before being moved to your media storage library or play-out server.

Newly ingested ad content can be passed directly to the DP600 for loudness analysis and correction before it's placed in your storage archive or ad server.

Designed for Work-Flow Flexibility and Ease of Use

The DP600 is designed to fit seamlessly into your existing work flow through one of three methods:

- Manual control—Users can set up and initiate processing jobs on an individual basis from a simple-to-use Web browser interface.
- Third-party control via Web services—The DP600's processing engines are also available as a set of Web services. Manufacturers can directly integrate these engines, at any level, into their work flow to create a seamless user experience without impacting day-to-day operations.
- Automatic hot-folder ingest process—Users can create hot folders and predefine a work order profile for each one. The profile governs the DP600's behavior with specific broadcast media types. All media files moved to a hot folder are automatically processed based on the folder's profile and delivered to a user-defined folder upon completion. Hot folders are easy to set up and use, and can greatly speed integration time within some facilities.

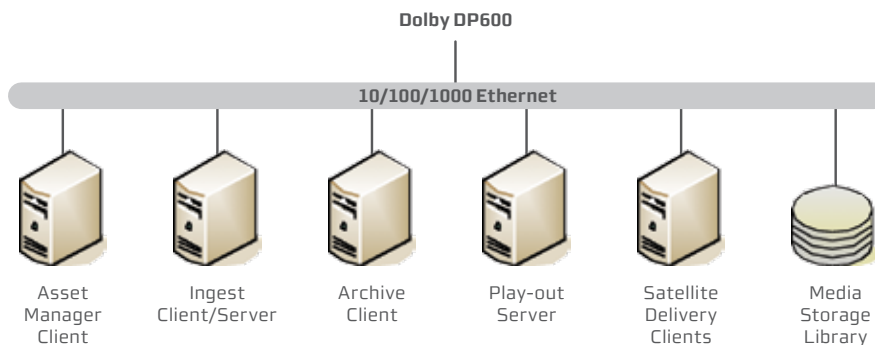


Figure 2 DP600 Integration Overview

Integration and Control

The DP600 integrates easily into an existing file-based network infrastructure. Once connected and configured, the DP600 becomes an intelligent processing node

that can be readily adapted to day-to-day operations and work flow (see Figures 2 and 3), including:

- Ad insertion—Newly ingested ad content can be passed directly to the DP600 for loudness analysis and correction before being placed in your storage archive or ad server.
- Program ingest, audio transcoding, and QC—Newly ingested content (for example, on an Omneon server) can be routed through the DP600-C for loudness analysis and correction as well as conversion from/to audio formats such as Dolby Digital, Dolby Digital Plus, Dolby Pulse, Dolby E, PCM, and MPEG-1 LII before being moved to your media storage library or play-out server.
- Media archive processing—Previously ingested content (ads and longer form content) stored in your media archive can be analyzed, logged, and, if necessary, corrected in faster than real time before being placed back into your media archive. In addition, the DP600-C can provide audio conversion and upmixing capabilities for your archived content.

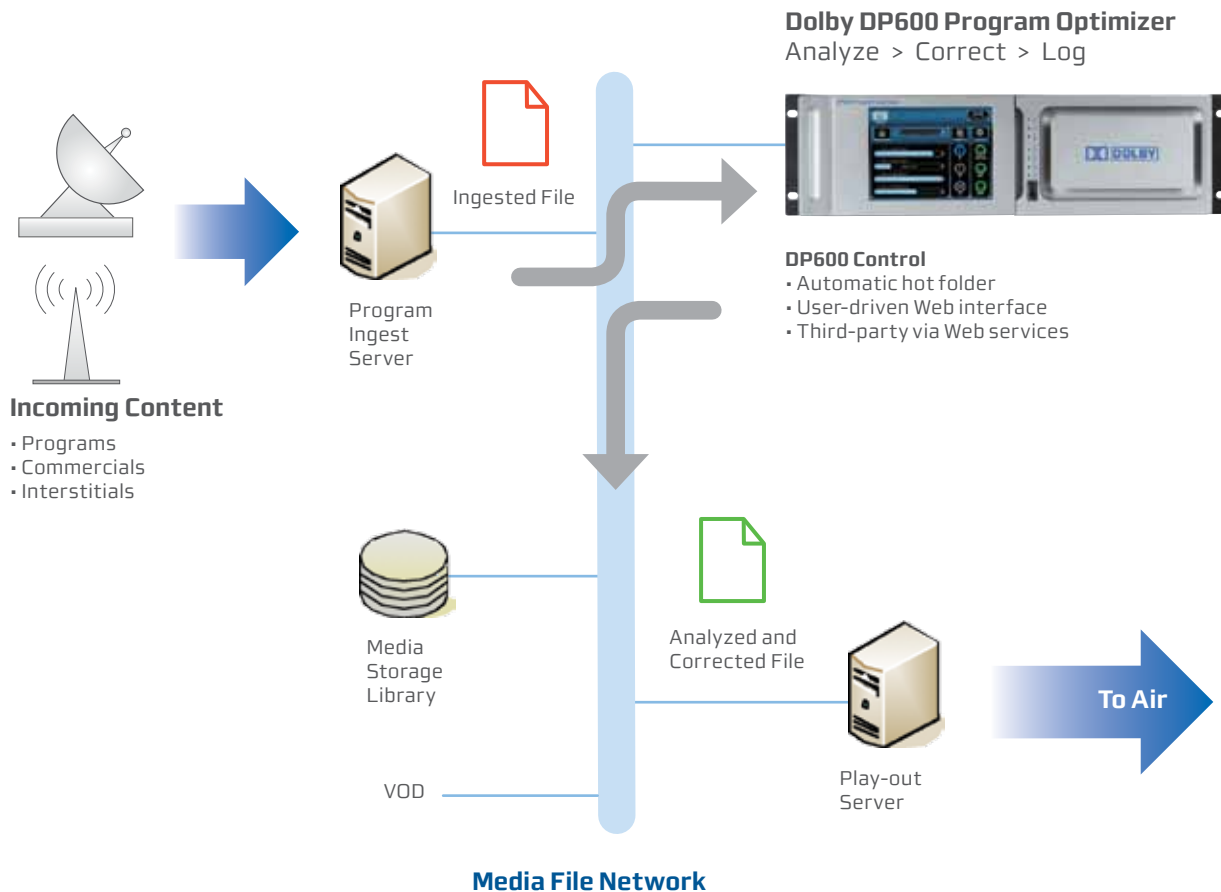


Figure 3 Example of Media File Work Flow (Loudness Analysis and Correction)

Automated Loudness and Metadata Correction

The DP600 builds on the technology developed for the award-winning Dolby LM100 Broadcast Loudness Meter with Dialogue Intelligence™ and closes the loop in the measurement and correction process. It gives users the ability to automatically

normalize the loudness of all their file-based content in faster than real time while preserving their original dynamic range.

This unique process guarantees that important metadata parameters such as dialogue normalization are set properly for every file (program) without user intervention and without the time-consuming measurement and correction processes that were previously done in real time.

For example, for coded audio data types that include metadata, such as Dolby Digital, Dolby Digital Plus, Dolby Pulse, and Dolby E, the loudness normalization process is achieved by automatically analyzing the audio bitstream and then comparing this analysis with the stream’s metadata. If a mismatch is detected, the DP600 will automatically correct the metadata values without having to decode and reencode the audio stream (see Figure 4).

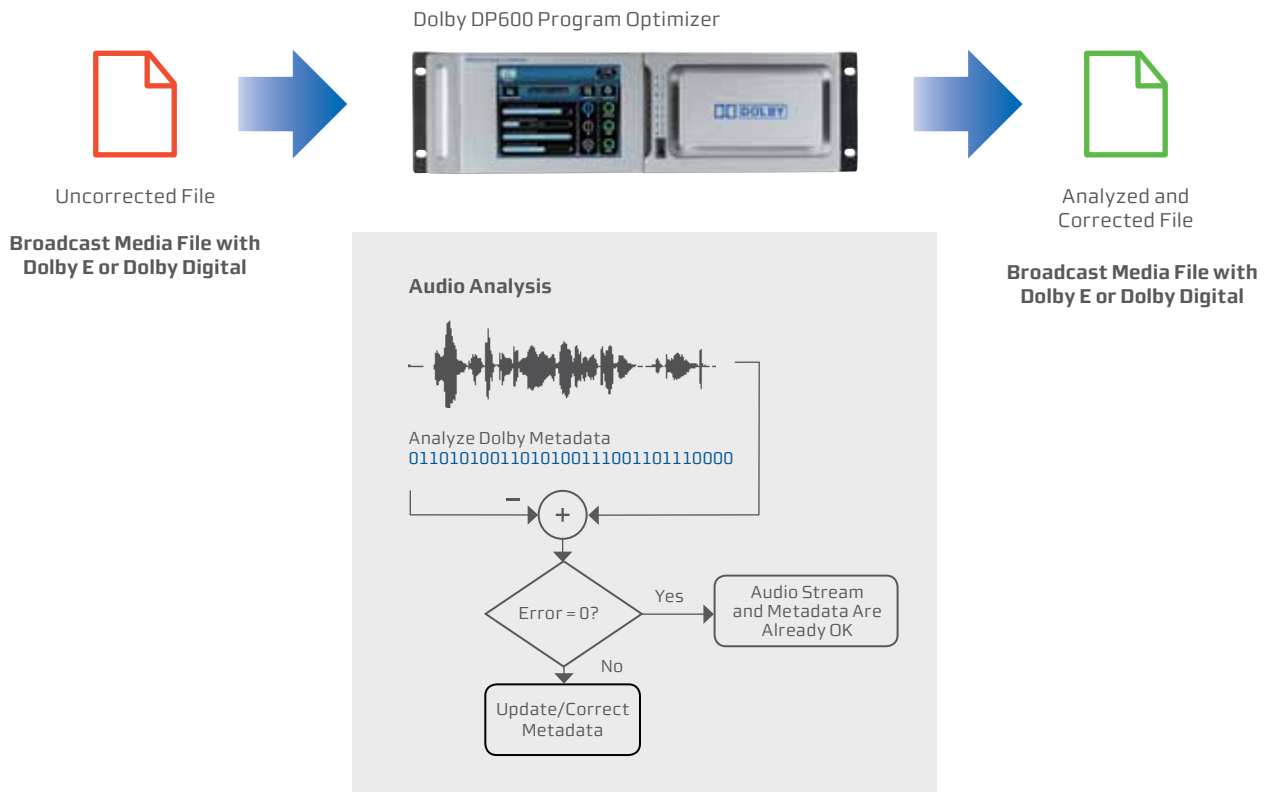


Figure 4 Coded Audio with Metadata Analysis and Correction

The DP600 can also correct coded and linear audio data types that do not include metadata, such as MPEG-1 LII and LPCM. For these audio data types, the loudness normalization process is achieved by automatically analyzing the audio bitstream and then comparing this analysis with a user-defined target loudness value. If a mismatch is detected, the DP600 will automatically scale the loudness to match the target value (see Figure 5).

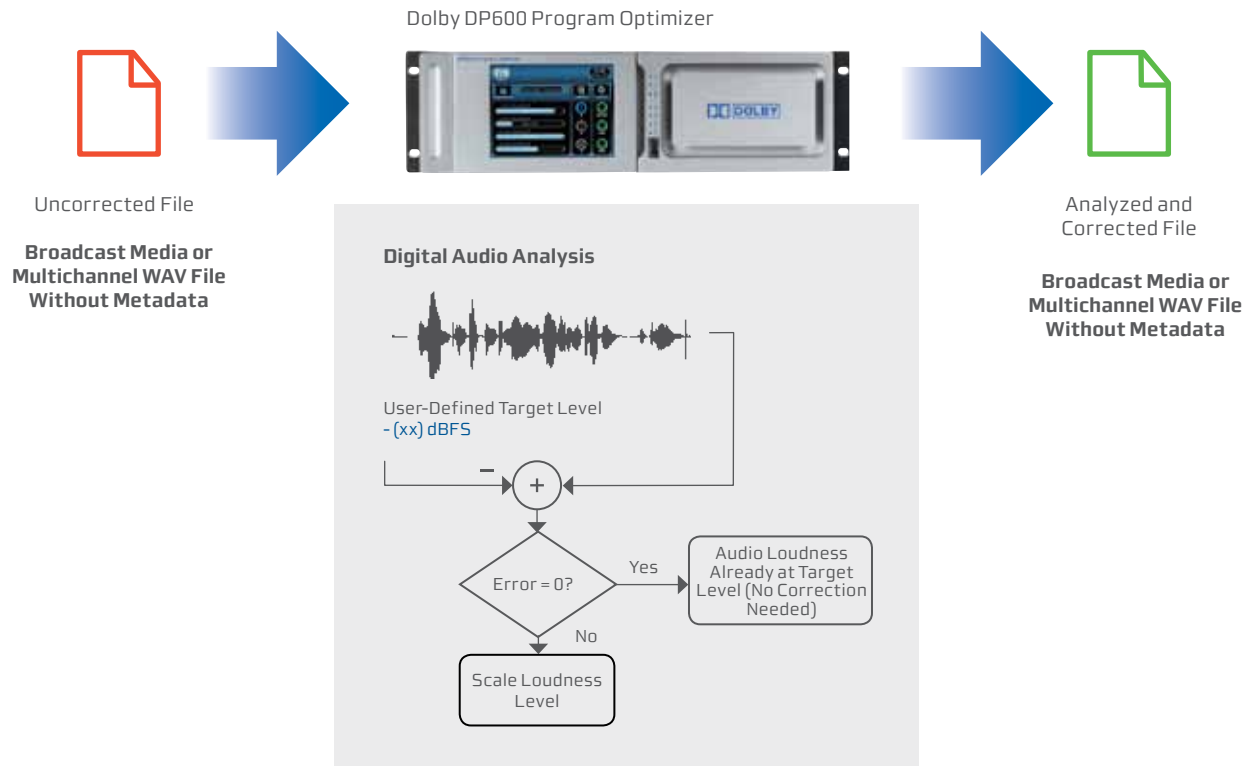


Figure 5 Audio Analysis and Correction for Audio Types Without Metadata

File-Based Encoding/Decoding and Cross-Conversion

The DP600-C version of the Program Optimizer offers direct access to Dolby technologies typically found in real-time codecs. These processes can be easily combined with each other or with the intelligent loudness analysis and correction engine to adapt to a wide range of content needs, including file-based conversion of content stored in the Dolby E format to Dolby Digital, Dolby Digital Plus, and Dolby Pulse.

The DP600-C provides file-based encoding, decoding, and conversion between the following audio formats.

In/Out	Dolby Digital	Dolby Digital Plus	Dolby Pulse*	Dolby E	PCM	MPEG-1 LII
Dolby Digital		✓	✓	✓	✓	✓
Dolby Digital Plus	✓		✓	✓	✓	✓
Dolby Pulse	✓	✓		✓	✓	✓
Dolby E	✓	✓	✓		✓	✓
PCM**	✓	✓	✓	✓		✓
MPEG-1 LII	✓	✓	✓	✓	✓	

* Includes support for all AAC formats (AAC, HE AAC, HE AAC v.2)

** PCM input to one to eight channels via WAV or AIFF

The DP600 supports preexisting metadata or generates new metadata for all Dolby formats and PCM (via the WAV metadata chunk).²

Dolby Digital to Dolby Digital Plus Transcoding

The DP600-C supports a unique, quality-preserving Dolby Digital to Dolby Digital Plus transcoder. This provides a simple migration path for next-generation services utilizing existing file-based content. For example, VOD files that currently include a multichannel Dolby Digital audio elementary stream can produce a Dolby Digital Plus audio elementary stream without the need to demux, decode, reencode, and remux the original file-based audio stream.

Upmixing Functionality

An optional software upgrade adds the ability to adapt legacy two-channel audio for use in 5.1-channel applications. This process engine is based on a specially developed Dolby algorithm that is not prone to center channel build-up and creates a wider natural-sounding sweet spot. This algorithm also ensures that subsequent downmixing is free from artifacts typically found with other solutions.

Supported File Formats

The DP600 supports several of the most common broadcast media file formats and audio types found today.

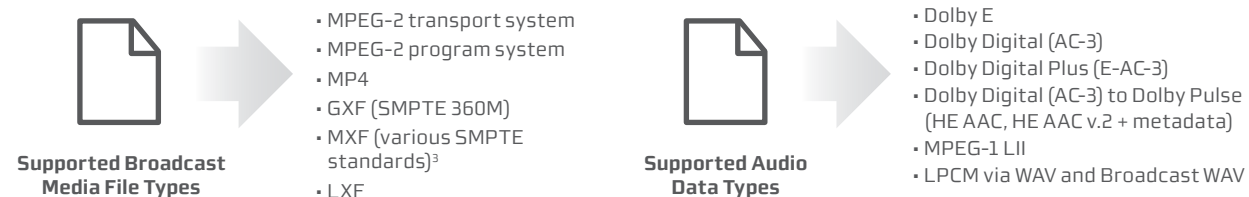


Figure 6 DP600 Supported File Formats and Audio Data Types

² For more information on the Dolby audio metadata chunk, please contact us.

³ MXF Operational Patterns per SMPTE 390M (OP-Atom); SMPTE 378M (OP-1a); SMPTE 391M (OP-1b with internal essence file formats only).

MXF Container (essence) support per SMPTE 379M (GC); SMPTE 381M (GC-MPEG); SMPTE 383M (GC-DV minus support for audio essence interleaved in DV); SMPTE 382M (GC-AESBWF).



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