DVXPERT 5110 BROADCAST ENCODER
DVXPERT 6210 PROFESSIONAL ENCODER

MPEG-2 Encoding for Digital Video Broadcast and Video Distribution Applications

MPEG encoding is critical to effective digital video broadcasting. Encoding increases the channel efficiency of satellite transponders and cable networks by compressing video signals before they are transmitted or stored. Several important applications such as Direct Broadcast Satellite (DBS) uplink or cable head-end broadcast, wireless video broadcast, and satellite news gathering are enabled by this technology.

DVX™ is a revolutionary new multimedia architecture from C-Cube Microsystems that achieves a superior video compression ratio to optimize bandwidth, while producing the highest quality output images. The architecture employs C-Cube's proprietary PerfectView™ encoding algorithm to deliver the best images currently available at significant bit rate savings. DVX is the latest stage in a video encoding evolution that has earned C-Cube an Emmy Award and established the company’s technology as the industry’s quality reference standard.

The DVXPERT™ product line implements C-Cube's DVX architecture in digital video broadcast and distribution applications. Each DVXPERT product has its own set of downloadable microcode for compressing video into a particular type of MPEG-2 format.

DVXPERT 5110 Broadcast Encoder is a single-chip MPEG-2 Main Level @Main Profile encoder. It also offers special features designed to optimize multichannel broadcast applications, including Statistical Multiplexing and real-time variable input resolutions.

DVXPERT 6210 Professional Encoder can compress video images into either MPEG-2 Main-Level @4:2:2 Profile for video distribution applications, or into MPEG-2 Main Level @Main Profile for general broadcast applications. This two-chip encoder handles video streams at up to 50 Mbps with excellent image quality, making it the premier choice for high-bandwidth applications such as studio-to-studio video distribution.
**KEY FEATURES**

- Flexible bit rate control options, including real-time variable bit rate, constant bit rate (internally controlled or externally signaled), and Statistical Multiplexing
- Fast changing, at 1/60th of a second, of encoding parameters such as horizontal resolution, Group-of-Picture structure, and bit rate control in real time
- Flexible, cost-effective programmable preprocessing filters that can accommodate encoding widths of 720, 704, 640, 544, 480, 384, 368, 352, or 320 pixels
- Programmable temporal noise-reduction filters for better image quality
- Automatic scene-change detection for more effective motion estimation during compression
- Frame-by-frame data insertion capability for added flexibility
- Optimized pipelining to maximize efficiency by minimizing encoding delay

**DVXPERT 5110 BROADCAST ENCODER**

The DVXPERT 5110 Broadcast Encoder offers a compact, high-quality encoding solution for multichannel broadcast applications on a single chip. The encoder performs adaptive field/frame (AFF) encoding at compressed data rates of 2 to 15 Mbps, and ensures optimal channel efficiency with the Statistical Multiplexing feature. C-Cube's PerfectView encoding technology delivers excellent quality images with capabilities like Inverse Telecine and Error Masking.

In addition to providing wide motion estimation search ranges with half-pel accuracy for high-quality compressed video images, DVXPERT 5110 also offers flexible, real-time control of Group-of-Picture (GOP) and horizontal resolution parameters. As a result, DVXPERT 5110 delivers the most advanced encoding solution currently available in the video broadcast market.

**DVXPERT 6210 PROFESSIONAL ENCODER**

The DVXPERT 6210 Professional Encoder is a two-chip encoder solution that provides the most efficient image compression available for video distribution applications. The encoder's highly optimized AFF 4:2:2 encoding software supports bit rates from 2 to 50 Mbps, while also delivering the image quality required for video distribution applications.

The DVXPERT 6210 offers all the powerful features of the DVXPERT 5110, including Statistical Multiplexing, Picture User Data Insertion, and Closed Captioning. But because it provides 4:2:2 chroma sampling, the DVXPERT 6210 eliminates the problem of generation
loss which can result from the multiple encoding and decoding operations typical of video distribution. In addition, the DVXPERT 6210 is capable of encoding vertical resolutions of 512 lines NTSC and 608 lines PAL, in full compliance with the MPEG-2 Main Level @ 4:2:2 Profile specification. Consequently, DVXPERT 6210 meets the high performance and quality demands of today's professional video broadcasting and distribution markets.

PerfectView Encoding Algorithm

PerfectView, C-Cube’s patented encoding algorithm technology, produces superior MPEG-2 image quality at all bit rates. The DVXPERT 5110 Broadcast Encoder and DVXPERT 6210 Professional Encoder both support the PerfectView features described below.

Multilayer Motion Estimation. This technique is used to determine the extent of changes between frames of a video sequence, comparing pixels of a reference frame with pixels of previous and subsequent frames. C-Cube’s multilayer, hierarchical search methodology yields precise matches, at half-pel resolution, without the need for exhaustive, time-consuming pixel-by-pixel comparisons.

Error Masking. This C-Cube MPEG encoding algorithm technique controls data distribution by searching for and hiding an undesirable compression artifact called ringing, a fuzz-like pattern that surrounds low-activity images produced by over-quantized AC coefficients. C-Cube’s masking algorithm determines where ringing would be visible in an image and budgets data bandwidth to eliminate these artifacts.

Inverse Telecine. This feature improves encoding efficiency for video material that originated as film by detecting and dropping repeated fields that have been introduced by the telecine process in the course of converting the film frame rate to the video rate.

Optimal Bit Allocation. Through the use of proprietary quality metrics, the encoder is able to output data at the desired bit rate while redistributing bits among individual frames to boost overall quality. The manner in which bits are distributed during compression is largely determined by motion estimation, the process of predicting from a previous or subsequent frame what the contents of the current frame are. When there is little motion—and, therefore, minimal change—between frames, the majority of the available data budget is spent on “intra” or predicted frames. However, when there is rapid movement from one frame to the next, the data budget is distributed more evenly using bidirectional frames.
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<td>2 to 50 Mbps</td>
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<td>I-only, IP, IBP, IB, IBBP</td>
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<td>720, 704, 640, 544, 480, 384, 368, 352, 320</td>
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<td>±202 pels</td>
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<td>±124 pels</td>
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<td>NTSC</td>
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<td>29.97 Hz</td>
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<td>PAL</td>
<td>25 Hz</td>
<td>25 Hz</td>
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<tr>
<td>Film</td>
<td>23.976 Hz</td>
<td>23.976 Hz</td>
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