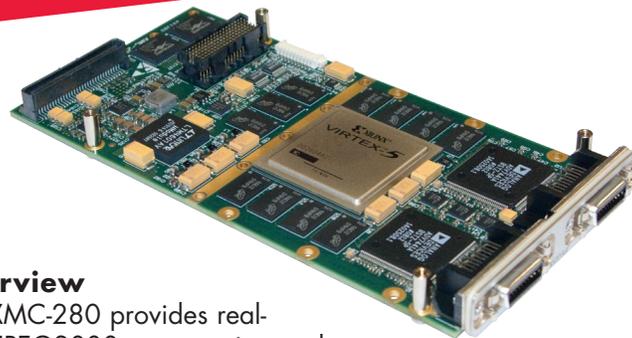




# XMC-280

## High-definition Real-time JPEG2000 Mezzanine



### Features

- ◆ Supports flexible video rates up to high-definition 1080p60 and 1920x1200 (60Hz)
- ◆ High-quality real-time JPEG2000 compression and decompression at full resolution and frame rate
- ◆ Co-processor mode for host to host compression and decompression
- ◆ Designed to minimize latency between capture and availability of encoded video
- ◆ Programmable compression ratios
- ◆ DVI, RGB and CVBS input as standard with active loop-through to DVI output
- ◆ Available as an XMC module designed for deployment in a wide range of defense and aerospace applications
- ◆ Fully integrated with Curtiss-Wright Controls Embedded Computing's video distribution and recording product families

### Overview

The XMC-280 provides real-time JPEG2000 compression and decompression of two video channels at resolutions up to 1920x1200 pixels at 60Hz depending on the performance grade. This state-of-the-art capability makes it ideal for high-definition video distribution and recording applications.

JPEG2000 offers low latency, resilience against errors and retention of detail at high-compression ratios.

FPGA-based processing is required to implement the computationally-intensive JPEG2000 algorithm in real-time. Three performance grades provide the optimal balance of price and capability.

The XMC-280 can be supplied in two configurations, supporting either compression or decompression.

### Compression

In this variant, the XMC-280 captures two video input channels, each of which can be DVI, RGB or CVBS. Real-time and full frame-rate compression of two 1080p60 inputs is possible with the highest performance grade. The compressed video is transferred to the memory of the host processor over the XMC-280's PCI Express® (PCIe) interface. The input video channels are looped through to the DVI outputs during operation.

The XMC-280 when configured for compression supports co-processor operation as described below.

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## Decompression

Hardware decoding of JPEG2000 is beyond the capabilities of current software solutions at high-resolution and frame rate.

The XMC-280's decoder mode takes two channels of compressed JPEG2000 video over the PCIe interface, decodes them and displays them on two DVI digital outputs.

The XMC-280 when configured for decompression supports co-processor operation as described below.

Figure 1: Functional block diagram of XMC-280 as encoder

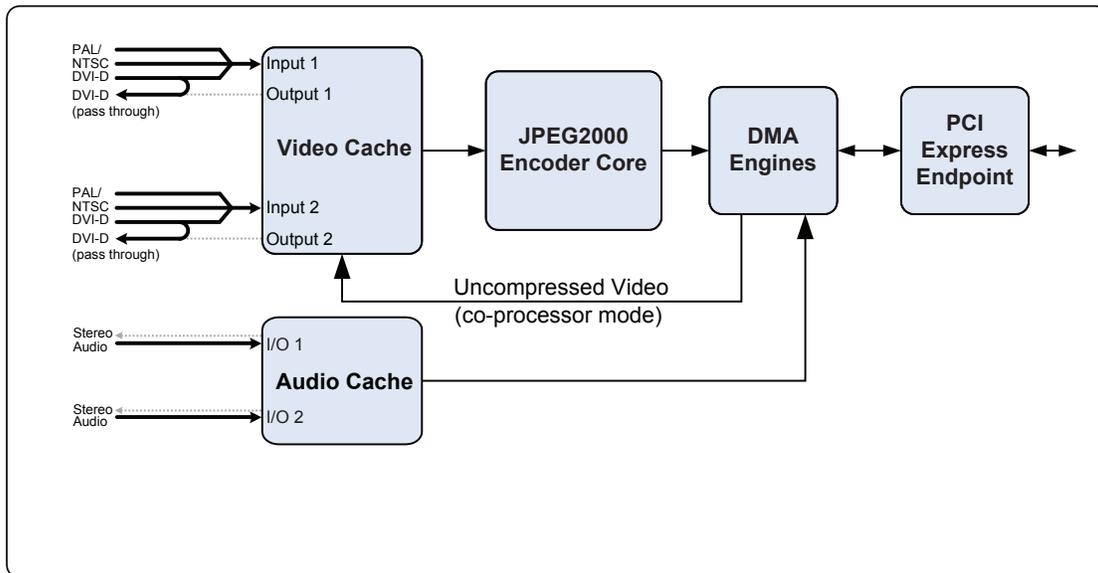
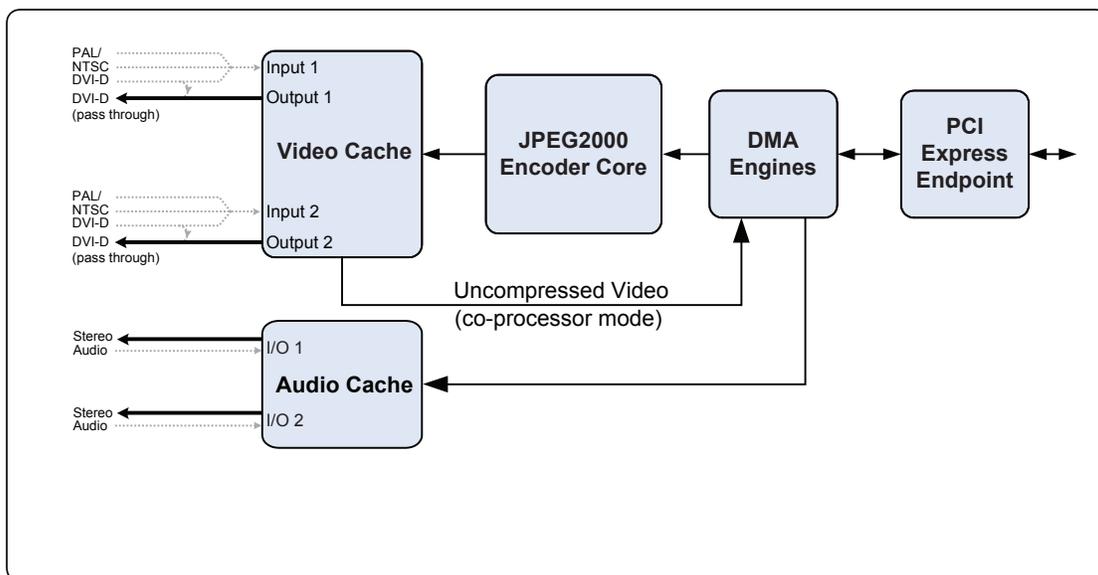


Figure 2: Functional block diagram of XMC-280 as decoder





## Co-processing

In co-processor mode the video inputs and outputs are not used: the XMC-280 acts as a JPEG2000 compression or decompression engine with both compressed and uncompressed video being transferred over the PCIe interface.

Example applications of co-processor mode are:

- ◆ Multiple channels of video need to be decoded without being displayed – compressed video received from a network that needs to be decompressed into host memory for subsequent image processing.
- ◆ Multiple frames of uncompressed video are received from an external sensor or generated synthetically and need to be compressed before distribution over a data link.

This mode is capable of processing the highest frame rate that the performance grade supports (subject to the bandwidth of the PCIe interface and host processor) regardless of the number of video streams.

**Table 1: XMC-280 Video Performance**

	1HD	2HD	4HD
1920 x 1200	30	60	120
1080p (1920 x 1080)	35	70	140
1600 x 1200	>35	>70	>140
1280 x 1024	>50	>100	>200
1024 x 768	>90	>180	>360

Note that all performance grades are capable of capturing two full frame-rate 1080p60 streams. The table shows aggregate frame rate that the compression engine can support for each grade. For example, the 1HD grade supports compression of a single 1080p30 stream at full rate, or two 1080p30 streams at 15 frames per second. The 4HD grade support simultaneous compression of two 1080p60 streams.

## Typical Applications

Many applications have requirements for the distribution or storage of video. These applications have, until now, been challenging because of the combined need for high-compression and high-quality.

With the advent of the XMC-280 and the real-time JPEG2000 compression and decompression it provides, standard Gigabit Ethernet (GbE) networks can be used to distribute high-definition video. Furthermore, JPEG2000

preserves fine detail such as text on a screen or lines on a chart. This makes the XMC-280 well-suited to applications that need low latency, robust and high-quality video to be moved between video sources (such as cameras, sensors and computer graphics cards) and video destinations (such as digital video recorders, image processing systems and displays).

- ◆ **Low-latency:** The XMC-280 has been designed to minimize the time required for incoming video frames to be compressed and transferred to the host processor.
- ◆ **Robust:** because JPEG2000 compresses video on a frame-by-frame basis, an error in one frame does not propagate to other frames. In a single frame the extent of corruption as a result of a bit error affects a relatively small area.
- ◆ **High-quality:** higher compression ratios can be tolerated with JPEG2000 than with earlier compression standards. Compression rates of 10:1 to 20:1 are typically visually lossless with JPEG2000. For certain types of video the degradation at 100:1 compression is not perceptible.

For these reasons JPEG2000 is perfect for applications such as:

- ◆ Transmitting video from a UAV down to a ground station over what is typically a low-bandwidth down-link
- ◆ Recording the output from surveillance cameras and situational awareness cameras for extended durations at high-resolution
- ◆ Recording radar screens and tactical displays for later replay and mission analysis or forensic investigation
- ◆ Video distribution over an Ethernet network in an aircraft, naval platform or land vehicle to send the output from a camera to multiple crew stations

## XMC (VITA 42)

The VITA 42 standard and subsidiary specifications define the XMC mezzanine module format which adds high-speed data interfaces and I/O capability to the PMC standard.

The XMC-280 employs the Pn5 (host interface) connector in order to support high-speed PCIe signals. The host interface of the XMC-280 supports a 4-lane PCIe (VITA 42.3) interface, providing up to 1GB/s theoretical peak bi-directional bandwidth. The XMC-280 can sustain over 500MB/s in each direction over its PCIe interface.



On air-cooled variants with front-panel connectors the Pn4 (PMC I/O) connector is used for DVI video output and audio I/O. Video inputs are supported via two MDR-20 front-panel connectors.

On conduction-cooled variants (and air-cooled derivatives), the Pn6 connector is used to carry all video and audio I/O; there is no front-panel I/O.

The XMC-280 is a single-width XMC module. Air-cooled modules are designed in accordance with the IEEE 1386 and 1386.1 specifications. Conduction-cooled modules are designed in accordance with ANSI/VITA 20-2005, Conduction-cooled PCI Mezzanine Standard. The cooling surfaces provided are the Primary and Secondary Thermal Interface Regions.

## Specifications

- ◆ Video Inputs
  - Two video inputs, each of which can be:
    - Digital DVI
    - Analog RGB
    - Analog CVBS
  - Maximum resolution: 1920 x 1200
- ◆ Audio Inputs
  - Two stereo channels
  - 16-bit 44.1kHz sampling
  - WAV and PCM encoding
- ◆ Video outputs
  - Two digital DVI outputs for decompressed video or loop-through
  - Maximum resolution: 1920 x 1200
- ◆ Audio outputs
  - Two stereo channels
  - 16-bit 44.1kHz sampling
  - WAV and PCM encoding
- ◆ Video compression
  - JPEG2000 ISO/IEC15444-1 standard (DCI profile)
  - 9/7 irreversible wavelet compression
  - JPEG2000 compression ratio is configurable
  - Visually lossless with appropriate compression ratios
  - Support for 4:2:2 and 4:4:4 video encoding
- ◆ PCIe interface
  - PCIe optimized to provide in excess of 500MB/s in each direction
  - 4-lane PCIe 1.1
- ◆ Software support
  - Fully integrated with Curtiss-Wright Controls' Sentric2/VDS for video recording and distribution
  - Driver support for Windows® and Wind River® Linux® on x86 hosts
  - Driver support for Wind River® GPP Linux® and Wind River® VxWorks on PowerPC™ hosts
  - For support for other platforms please contact the design center
- ◆ Environmental specifications
  - Air-cooled Level 0
    - Operating temperature 0°C to +50°C
    - Storage temperature -40°C to +85°C
  - Air-cooled Level 100
    - Operating temperature -40°C to +71°C
    - Storage temperature -55°C to +125°C
  - Conduction-cooled Level 200 (1HD and 2HD versions only)
    - Operating temperature -40°C to +85°C
    - Storage temperature -55°C to +125°C
    - For further details please see the Curtiss-Wright Ruggedization Table at <http://www.cwembedded.com/0/0/208.html>
- ◆ Power Requirements
  - XMC-280 requires 3.3V and 5V from host card
  - Power consumption max: 23W (1HD), 24W (2HD), 28W (4HD)



Table 2: Example host platforms for which the XMC-280 is supported. To confirm support for other host platforms please contact Curtiss-Wright Controls.

Product	Form Factor	Host Interface	I/O Interface	Operating System Support
SVME/DMV-1901 Core™2 Duo SBC (Air-cooled)	6U VME	PCIe x4	Pn4	Windows®, Wind River® GPP Linux® 2.6 or later, Wind River® VxWorks®
VPX3-1252 Core™2 Duo SBC (Conduction-cooled)	3U VPX	PCIe x8	Pn6	Windows®, Wind River® GPP Linux® 2.6 or later, Wind River® VxWorks®
PC (rack-mount and desktop)	Various	PCIe x4	Via carrier card	Sentric2/VDS

## Warranty

This product has a one year warranty.

## Contact Information

To find your appropriate sales representative:

Website: [www.cwembedded.com/sales](http://www.cwembedded.com/sales)

Email: [sales@cwembedded.com](mailto:sales@cwembedded.com)

## Technical Support

For technical support:

Website: [www.cwembedded.com/support1](http://www.cwembedded.com/support1)

Email: [support1@cwembedded.com](mailto:support1@cwembedded.com)

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