



Rugged Video Applications Cookbook

Volume 1



**Advanced Micro
Peripherals**

THE EMBEDDED VIDEO EXPERTS



Advanced Micro Peripherals' video products allow designers to implement efficient, reliable solutions for a wide range of rugged, demanding applications. But what are these applications, and how are AMP's hardware and software products deployed within them?

This Rugged Video Applications Reference Book offers practical, real-world answers to these questions. It shows how AMP's products are already being used in many different situations around the world. We invite you to browse the examples shown and find inspiration for your own project, however demanding it may be.

Lee Foss
CEO and Founder of
Advanced Micro Peripherals

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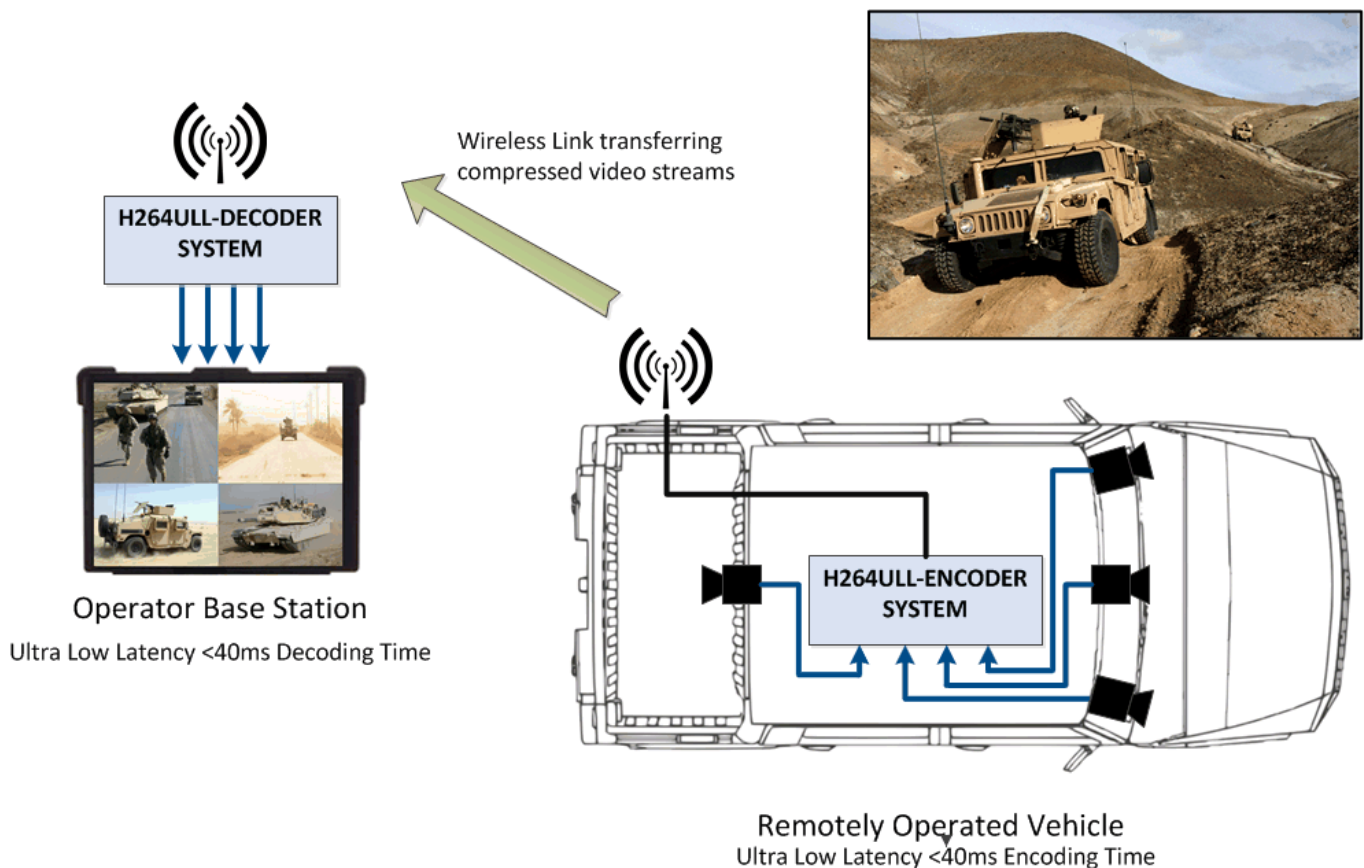
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Ultra Low Latency (ULL) Video solutions are essential for safe and effective control of remotely operated ground vehicles. The configuration shown here reduces both camera to Ethernet and Ethernet to NTSC/PAL/RS-170 display to below 40ms allowing remote control of vehicles travelling in excess of 50mph.

The diagram below shows the video link configuration. The Military vehicle is fitted with four cameras: Two forward-facing visible-light, one forward-facing FLIR and one rear-facing visible light type. All four camera outputs are ULL compressed to H.264 and streamed over a secure wireless Ethernet link. The remote control station's ultra low latency receiver decodes the Ethernet data, rendering it into four video streams for the remote driver's screen.



AMP products used – Ultra Low Latency Streamer for vehicle

PC/104-Plus host CPU (with Linux pre-installed)

H264ULL-ENCODER-Ext (4-channel Ultra Low Latency NTSC-to-H264 ENCODER)

AMP demo Ultra Low Latency RTSP Video Streaming ENCODER Application

AMP products used – Ultra Low Latency Decoder for Remote Control Station

PC/104-Plus host CPU (with Linux pre-installed)

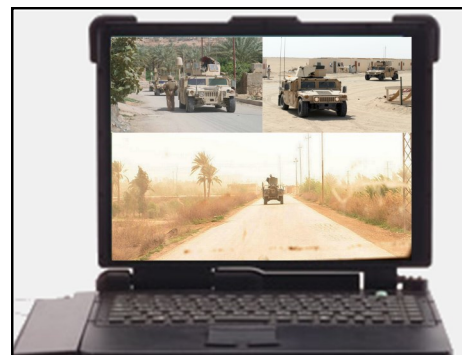
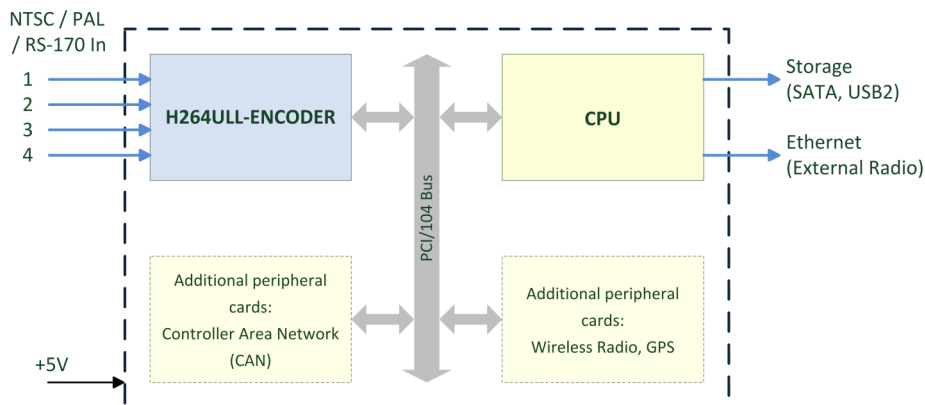
H264ULL-DECODER-Ext (4-channel Ultra Low Latency DECODER)

AMP demo Ultra Low Latency RTSP Video Streaming DECODER Application



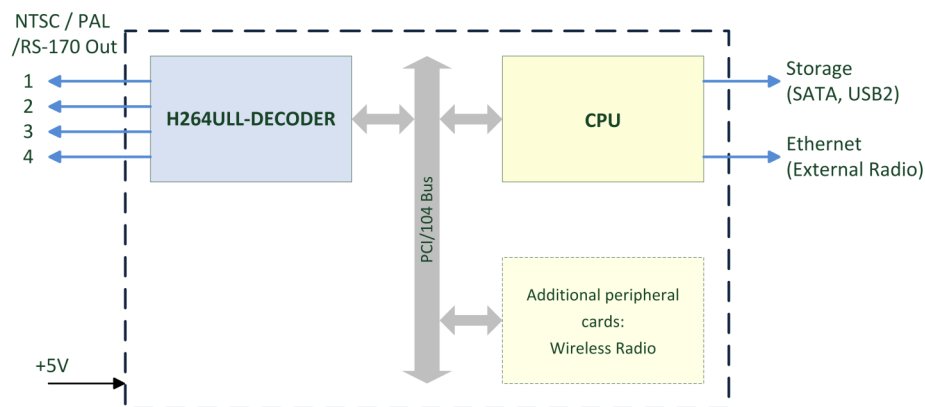


H264ULL-ENCODER System



- ◆ Headless, autonomous system
- ◆ Real time 4x full size H.264 encode at full frame rate
- ◆ Composite NTSC/PAL/RS-170 video input
- ◆ Ultra Low Latency technology with latency below 40ms
- ◆ Optional local storage for archival purposes (SATA, USB2)
- ◆ Optional meta data embedded in data stream.

H264ULL-DECODER System



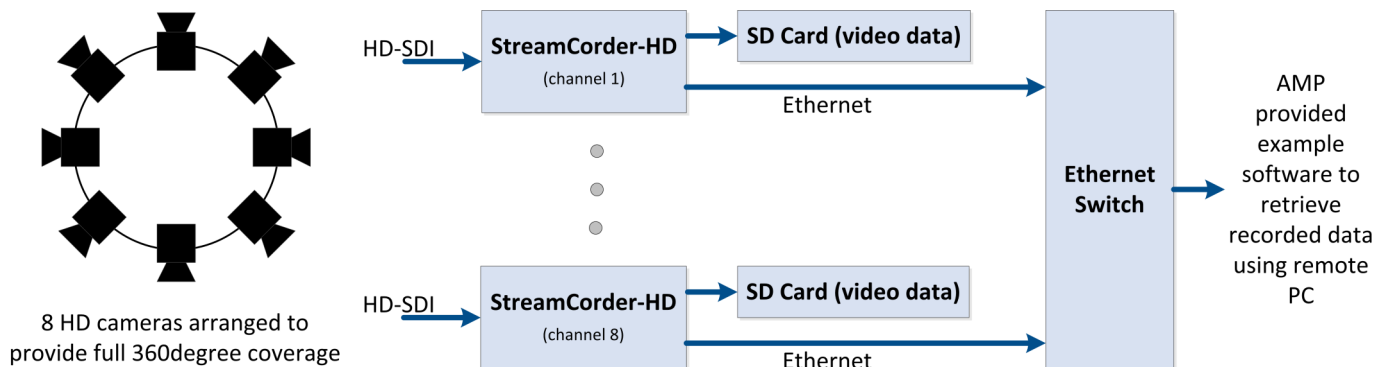
- ◆ Real time 4x full size H.264 decode at full frame rate
- ◆ 4x Composite NTSC/PAL/RS-170 video output
- ◆ H.264/MPEG-4 AVC (Part 10) decoder
- ◆ Ultra Low Latency technology with a latency below 40ms
- ◆ Optional local storage for control end archive, mission review.

Have a question or need more information?
 Email AMP at techsales@amp ltd.com

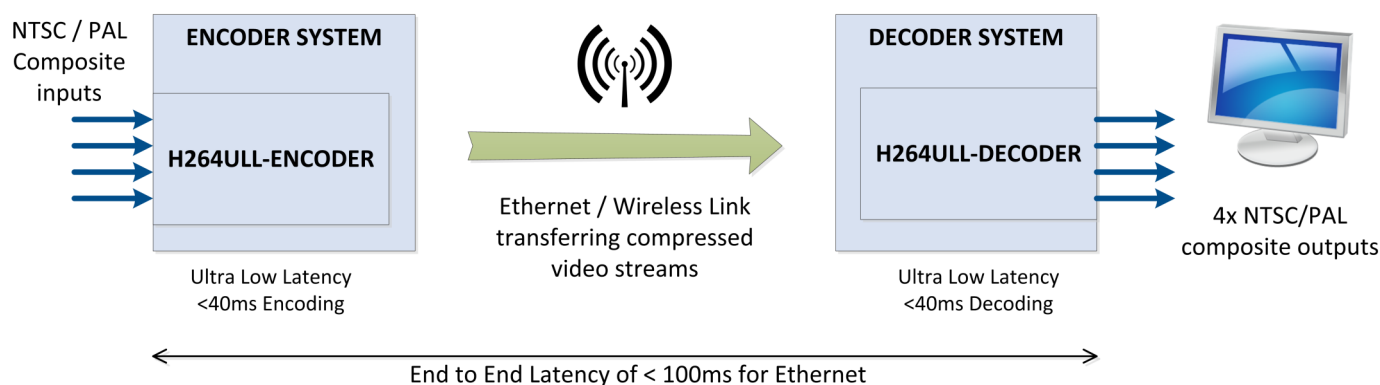


With increasing demand for mineral resources and pressure to exploit existing assets in more efficient ways, careful survey and data analysis of mines for safety and viability can yield huge gains.

A rugged 8-channel, high-definition video recording system, mounted on a UGV provides all round, detailed visual coverage. Such a recorder, built using 8 StreamCorder-HD modules is able to continuously record high definition video streams to per-channel local solid state storage. Once the survey system has been recovered the video data can be retrieved over Ethernet and analysed. The distributed nature of the storage, along with the overlap of the cameras, is a major advantage in providing data redundancy.



A separate real-time video feedback loop for remotely driving the UGV is implemented using a H264ULL-ENCODER/H264ULL-DECODER set.



Products used – Survey System

8x AMP **StreamCorder-HD** High Definition Standalone video recorders, each supporting 1x HD-SDI input.
 AMP demo Remote File retrieval software (runs on remote Windows PC to retrieve HD video recordings)
 Ethernet switch module (to consolidate and connect 8 Ethernet ports into 1 Ethernet)

Products used – Driving system

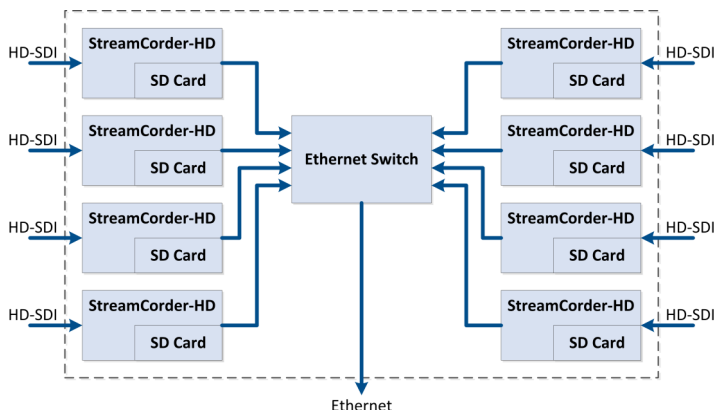
UGV (Unmanned Ground Vehicle)

PCI/104 host CPU (with Linux pre-installed)
 AMP **H264ULL-ENCODER-Ext** (4-channel Ultra Low Latency NTSC-to-H264 ENCODER)

Control Terminal

PCI/104 host CPU (with Linux pre-installed)
 AMP **H264ULL-DECODER-Ext** (4-channel Ultra Low Latency DECODER)

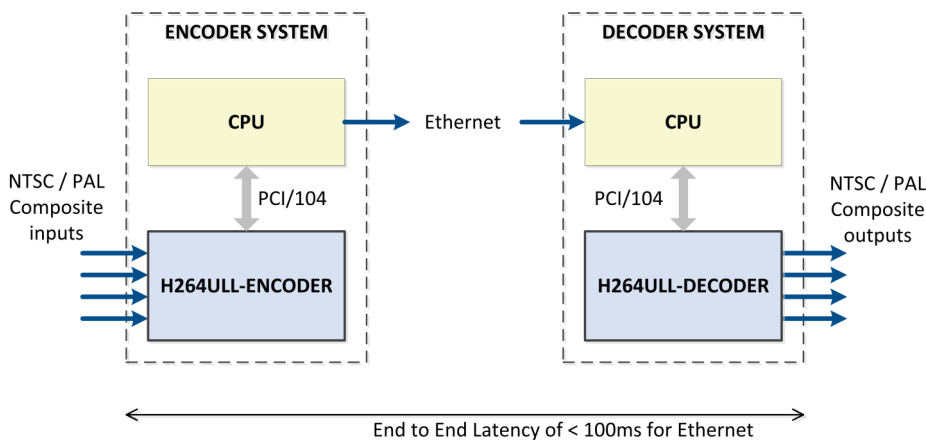
Survey System



- ◆ Eight independent HD-SDI channels.
- ◆ Flexible control of encoding parameters, bitrate, quality, fps.
- ◆ Individual solid state storage per channel for rugged redundancy.
- ◆ Single Ethernet connection for data retrieval.



Driving System



- ◆ Real time 4x full size live streams at full frame rate
- ◆ End to end latency for driving system of <100ms when connected over Ethernet
- ◆ Ultra-Low latency Hardware decoding to reduce CPU requirements.
- ◆ Full size display of each stream allows accurate driving control.



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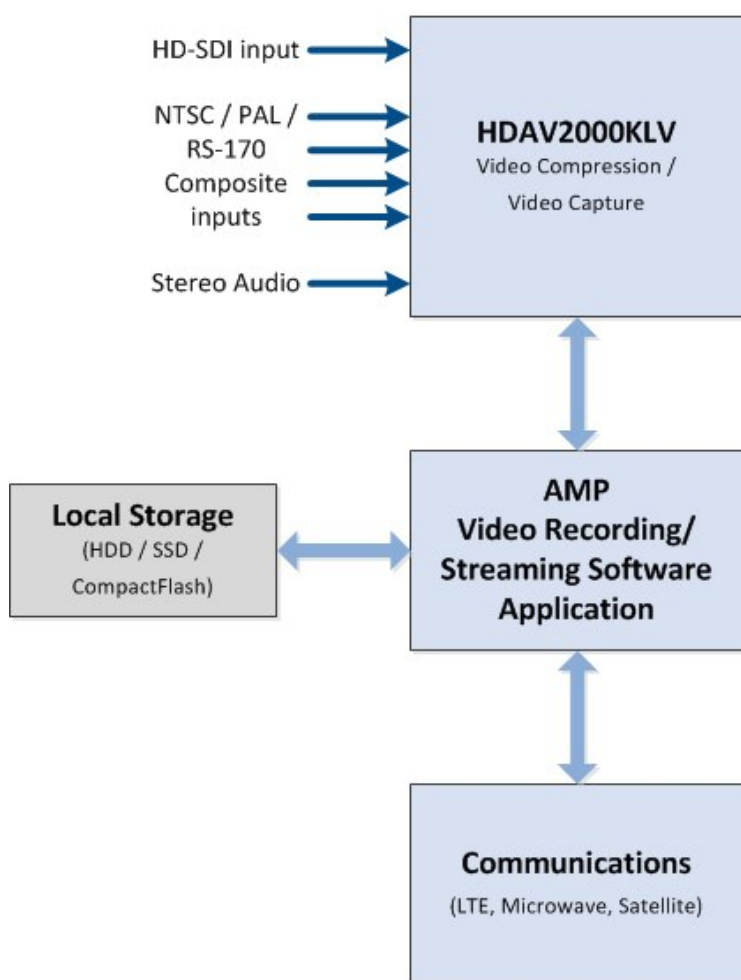




HD Real-time Video for Border Security

In response to rising threats governments across the world are increasing border surveillance to enforce their homeland security and counter criminal activities. HD video surveillance is a key part of a multi-layered approach involving video, audio, radar, and sensors (thermal, vibration) that combine to give a complete border protection and surveillance system. The real-time video provides enhanced safety, reduced cost and more effectively helps to stop border incursions.

A system built around the HDAV2000KLV supports a single HD-SDI input channel for HD video surveillance data for inspection and recording and 4x NTSC/PAL/RS-170 video channels for SD sources. KLV data from external sensors can be extracted from VANC embedded metadata on the HD-SDI input and inserted into the H.264 transport stream. The H.264 streams can be streamed to a remote control station for real-time monitoring and stored to local disk for evidential purposes.



Integrated Fixed Towers (IFT)
Source: www.cbp.gov Photo: James Tourtellotte

Encoded Video (HD/SD) & Audio to Control / Command center



Products used

- AMP **HDAV2000KLV** (Ultra Low Latency High Definition Video Codec with KLV extraction)
- AMP Video Recording/Streaming software demo application build on AMP Software Development Kits.
- PCI/104 Host CPU (with Linux pre-installed)

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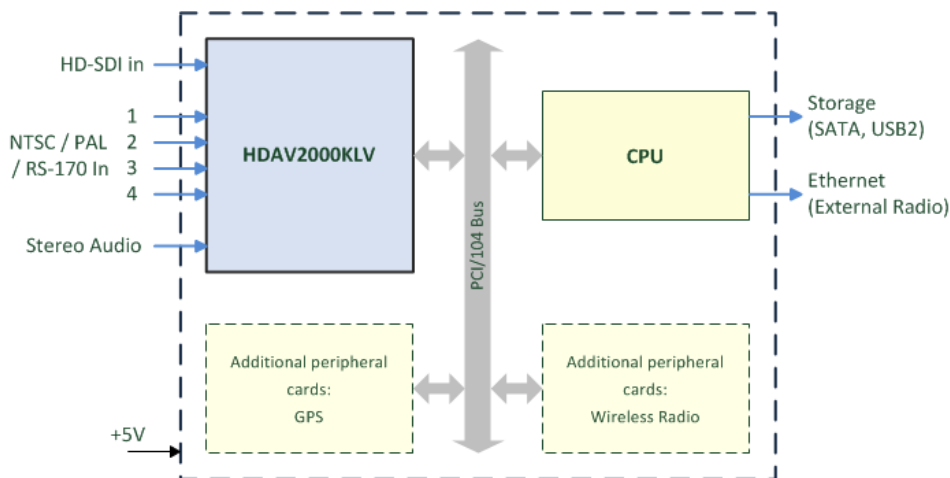
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Surveillance System



Mobile Video Surveillance System (MVSS)
Source: www.cbp.gov Photo: Donna Burton

- ◆ Capture from HD-SDI at up to 1080p30
- ◆ 4x Composite NTSC/PAL/RS-170 inputs
- ◆ Real time, full size H.264 encoding at full frame rate.
- ◆ KLV extraction of VANC data embedded in HD-SDI input
- ◆ Ultra Low Latency technology with latency below 40ms
- ◆ Stream multiple channels to remote command station
- ◆ Optional local storage for archival and evidential purposes (SATA, USB2)

Optional Enhancements

- ◆ The HDAV2000KLV has a stereo audio output that can be used as a talkback channel from remote command post to surveillance system allowing live interaction with on going situation.
- ◆ For mobile surveillance systems (ground vehicle, air, sea), CAN (Controller Area Network) and GPS PCI/104 modules can be added to the system and used as metadata sources to be synchronized and embedded in the data stream.



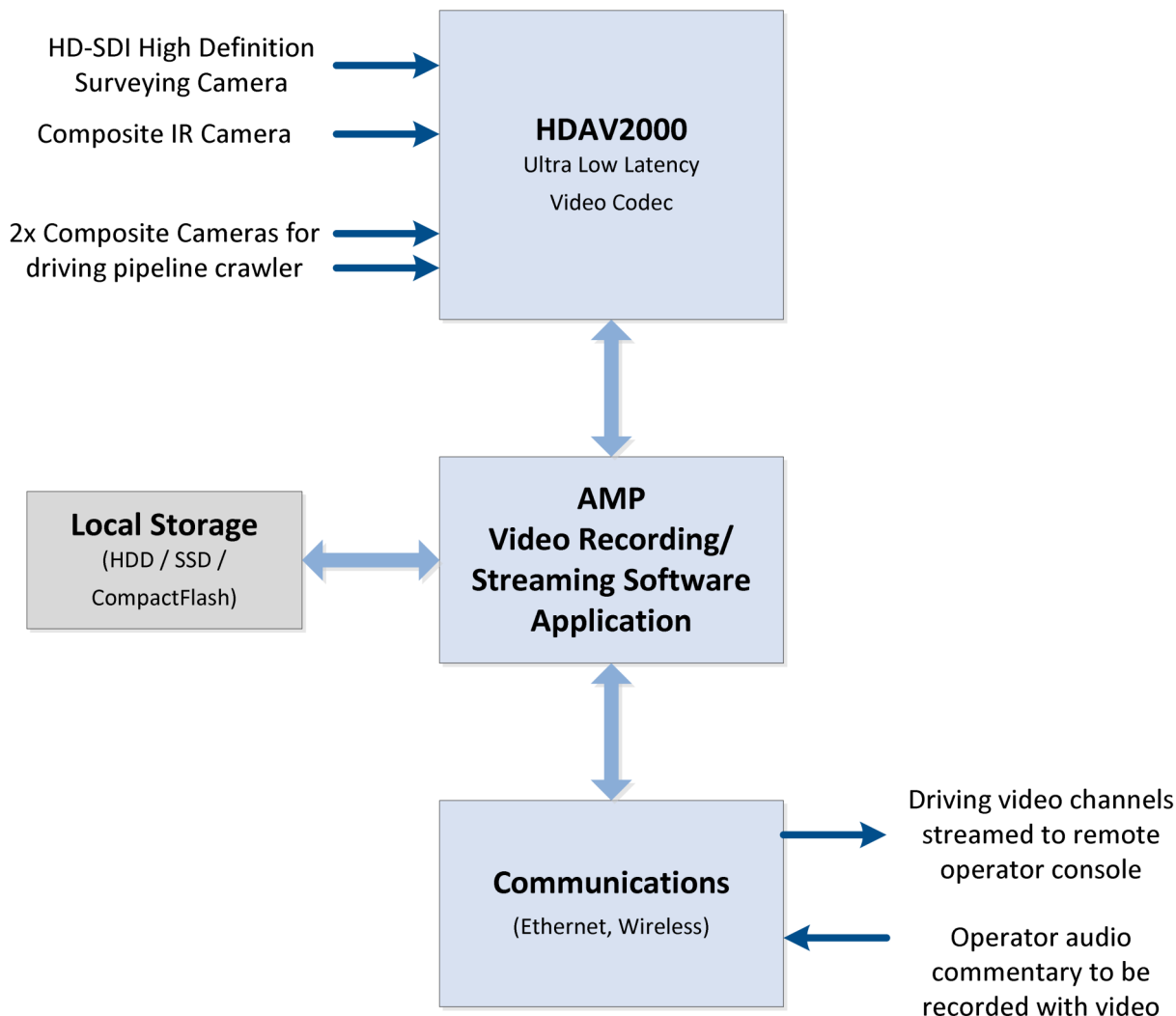
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Regular inspection of Pipelines is vital to ensuring the condition of major infrastructure and avoiding expensive environmental damage.

This system uses the HDAV2000 to provide video capture and encoding for both driving the pipeline crawler and carrying out the High definition video survey of the pipeline. Two SD composite video channels are encoded and streamed to a remote operator console for controlling the movement of the pipeline inspection crawler. The input from a High definition source and an optional infrared source are encoded and saved to local storage for later retrieval and analysis. Audio commentary from the remote operator is recorded with the survey recording.

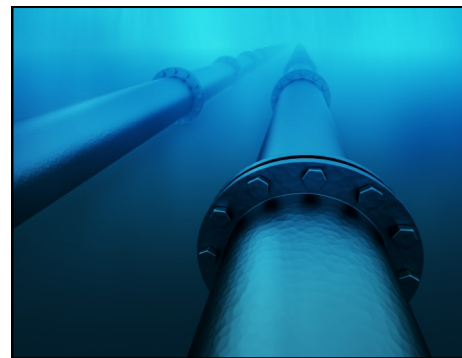
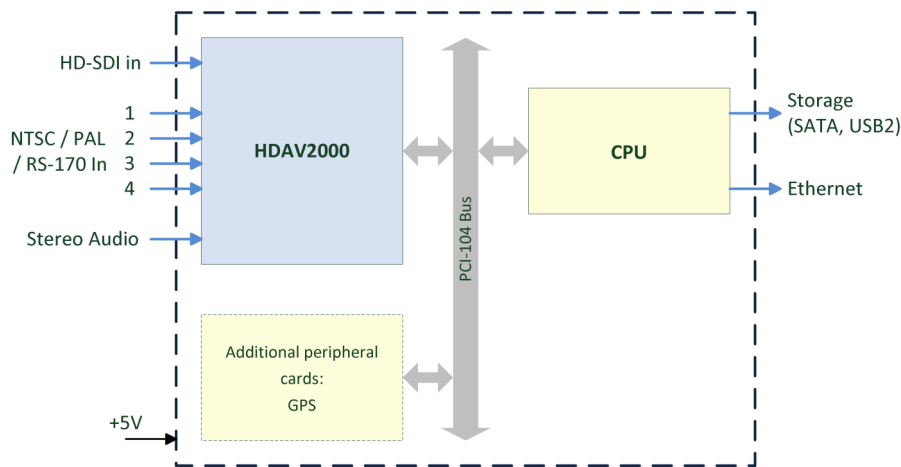


Products used –

- AMP **HDAV2000** (Ultra Low latency High Definition video codec)
- AMP Video Recording and Streaming Demo Application
- PCI-104 host CPU



Driving and Survey System



- ◆ Capture from HD-SDI at up to 1080p30
- ◆ 4x Composite NTSC/PAL/RS-170 inputs
- ◆ Real time, full size H.264 encoding at full frame rate.
- ◆ Ultra Low Latency technology with latency below 40ms
- ◆ Stream driving channels to remote operator console
- ◆ Mix operator commentary with survey recording
- ◆ Local storage for later retrieval of survey recording (High Definition, Infrared and operator audio commentary)

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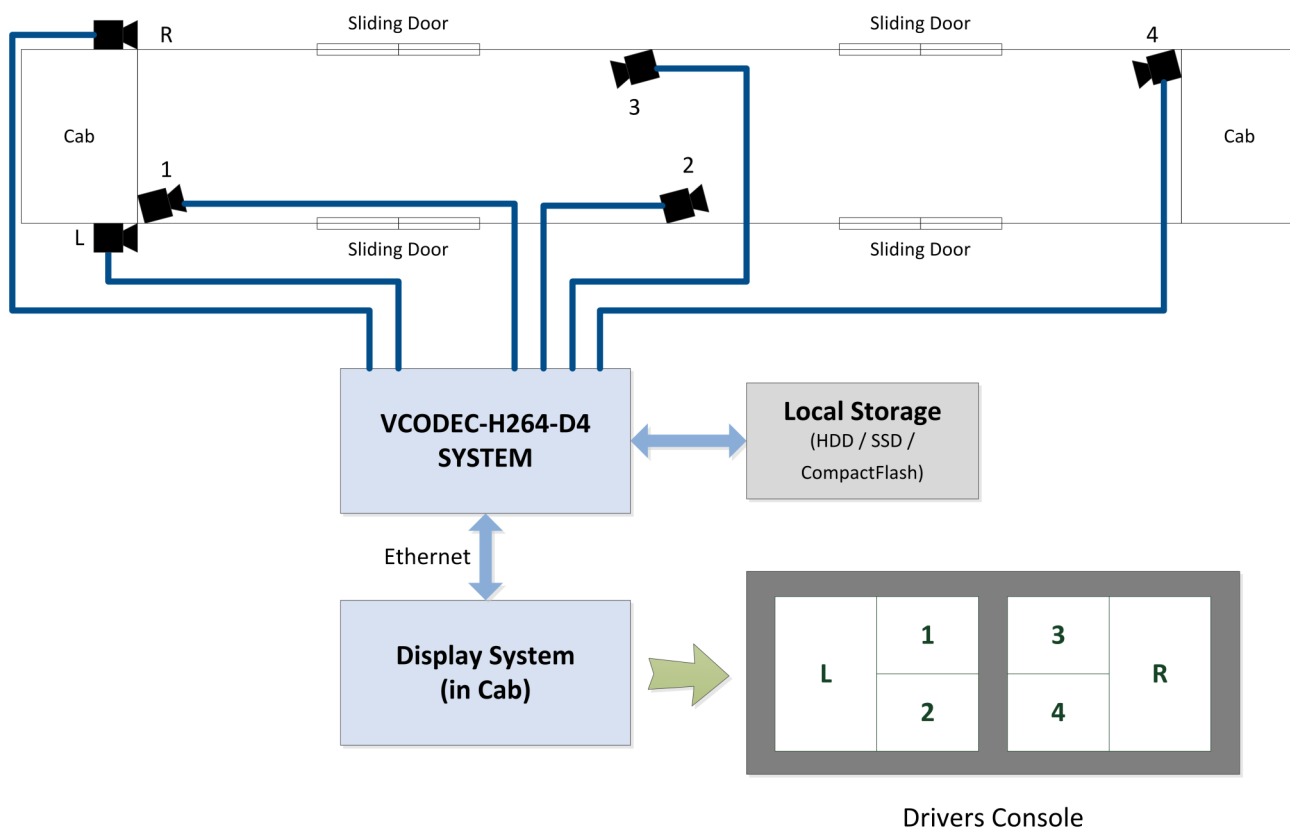
Safety Monitoring in Mass Transit Systems

Mass transit system operators are increasingly looking to automation to improve safety and increase efficiency of commuter transportation.

The VCODEC-H264-D4 Recording and Preview feature provides all round situational awareness to the train driver for increased passenger safety, while high quality multi-channel video recording provides material for archival and evidential purposes.

The block diagram shows a recent solution for underground/metro commuter trains based on the VCODEC-H264-D4 and provides the following features:-

- ◆ 4 cameras inside car—2 pointing forward, 2 pointing backwards
- ◆ 2 cameras monitoring right and left door closure
- ◆ Groups of 4-6 cameras (plus status from external sensors) display on drivers console with less than 100ms latency
- ◆ Automatic full size recording of each camera for 10 days continuous operation.

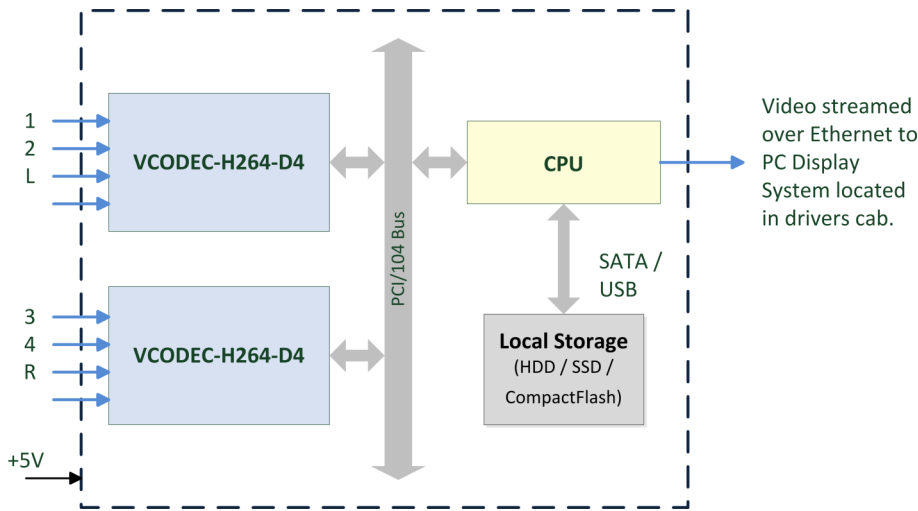


Products used

2x AMP **VCODECH264-D4** (4 channel, full frame rate, H.264 encoder / decoder for PC/104-Plus)
 AMP Video Recording and Streaming software demo application build on AMP Software Development Kits.
 PCI/104 Host CPU (with Linux pre-installed)



System



- ◆ 8x Composite NTSC/PAL/RS-170 inputs (system uses 6)
- ◆ Real time, full size H.264 encoding at full frame rate for each channel.
- ◆ Video Streaming Latency below 100ms for display on drivers console
- ◆ Per channel video Flipping/Mirroring
- ◆ Full size, high quality, local storage of each channel for evidential and archival requirements.
- ◆ Display PC uses standard H.264 streaming clients.
- ◆ Display PC can flexibly position and scale video streams as required for display mode.

Optional Enhancements

- ◆ Metadata from car sensors, including speed, door status, location can be synchronized with the video data and embedded in the data stream for later analysis.

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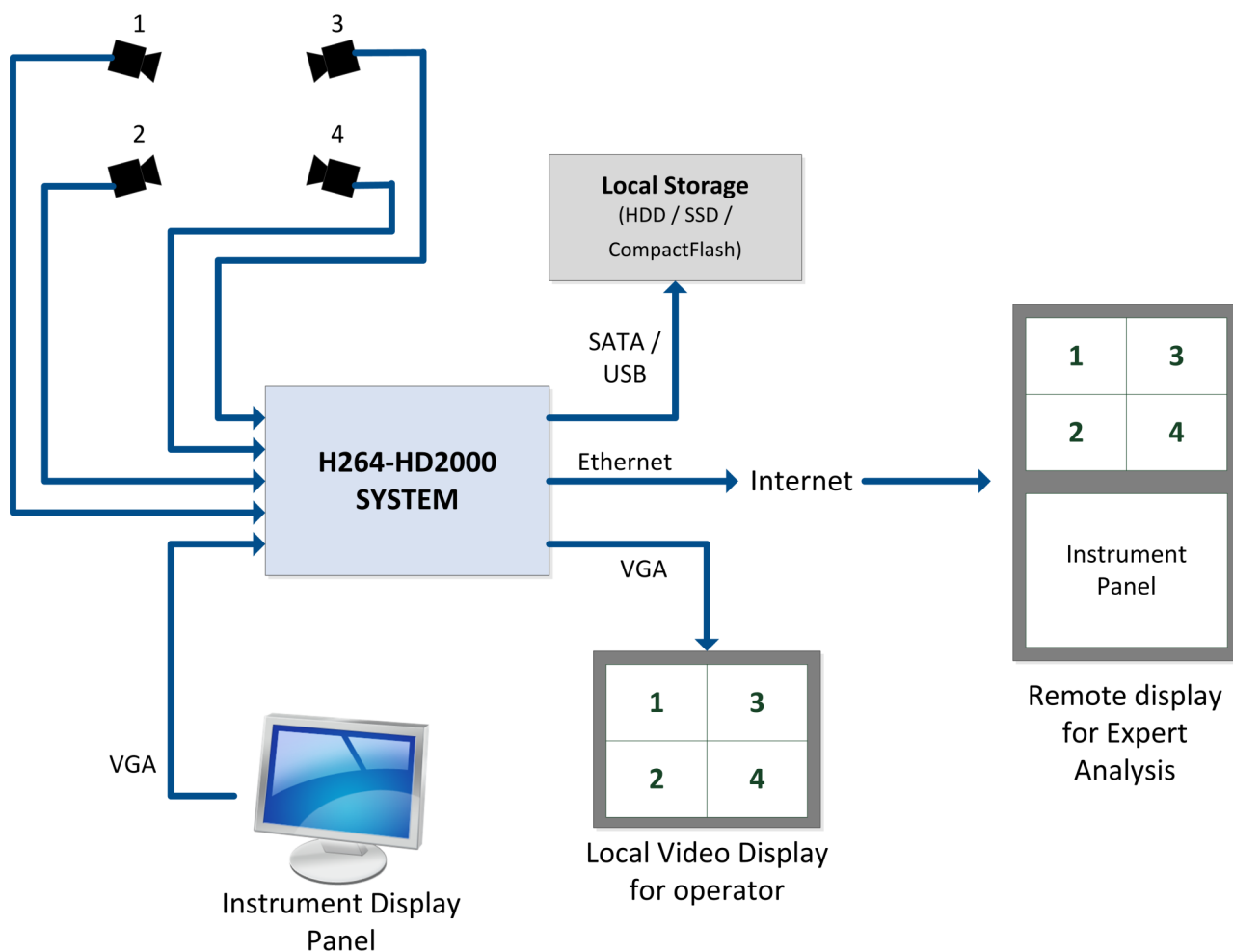




Heavy lifting equipment tend to be very large and the operator/driver is often some distance from the lifting head of the crane. One of the many challenges for the driver is to accurately pick up and position the load without direct line-of-sight.

The solution below takes advantage of the standard definition (SD) and high definition (HD) capture and Ultra Low Latency encoding capabilities of the H264-HD2000 to provide real-time visual feedback to the crane driver's cab. The 4x SD cameras give a complete view of the lift from multiple angles. A unique feature of the H264-HD2000 is the ability to capture and encode both the cameras and the VGA output of the crane operator console.

This allows remotely located experts and managers to observe and direct delicate lifting and positioning operations from remote locations around the world across the internet.



Products used

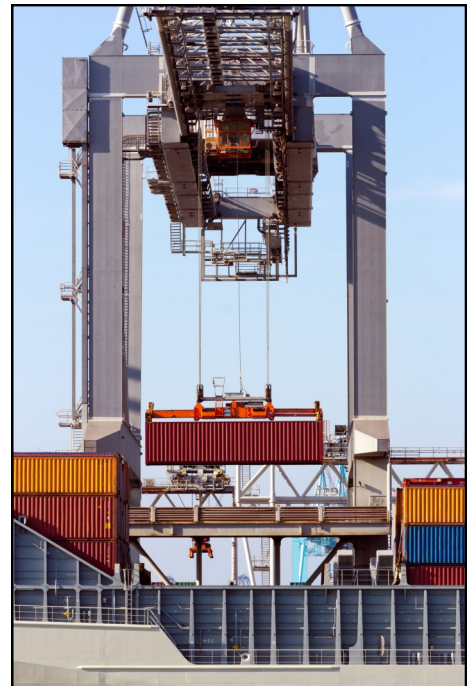
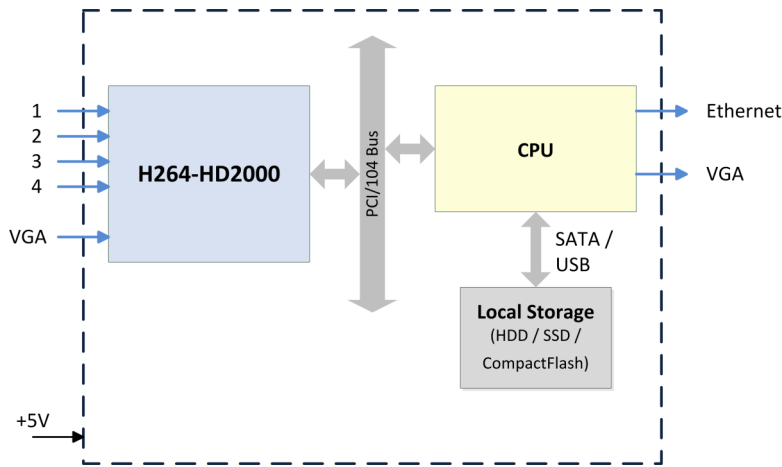
AMP H264-HD2000 (SD/HD PCI/104 Ultra Low Latency H.264 Compression Card)

AMP Video Recording and Streaming software demo application build on AMP Software Development Kits.

PCI/104 Host CPU (with Linux pre-installed)



System



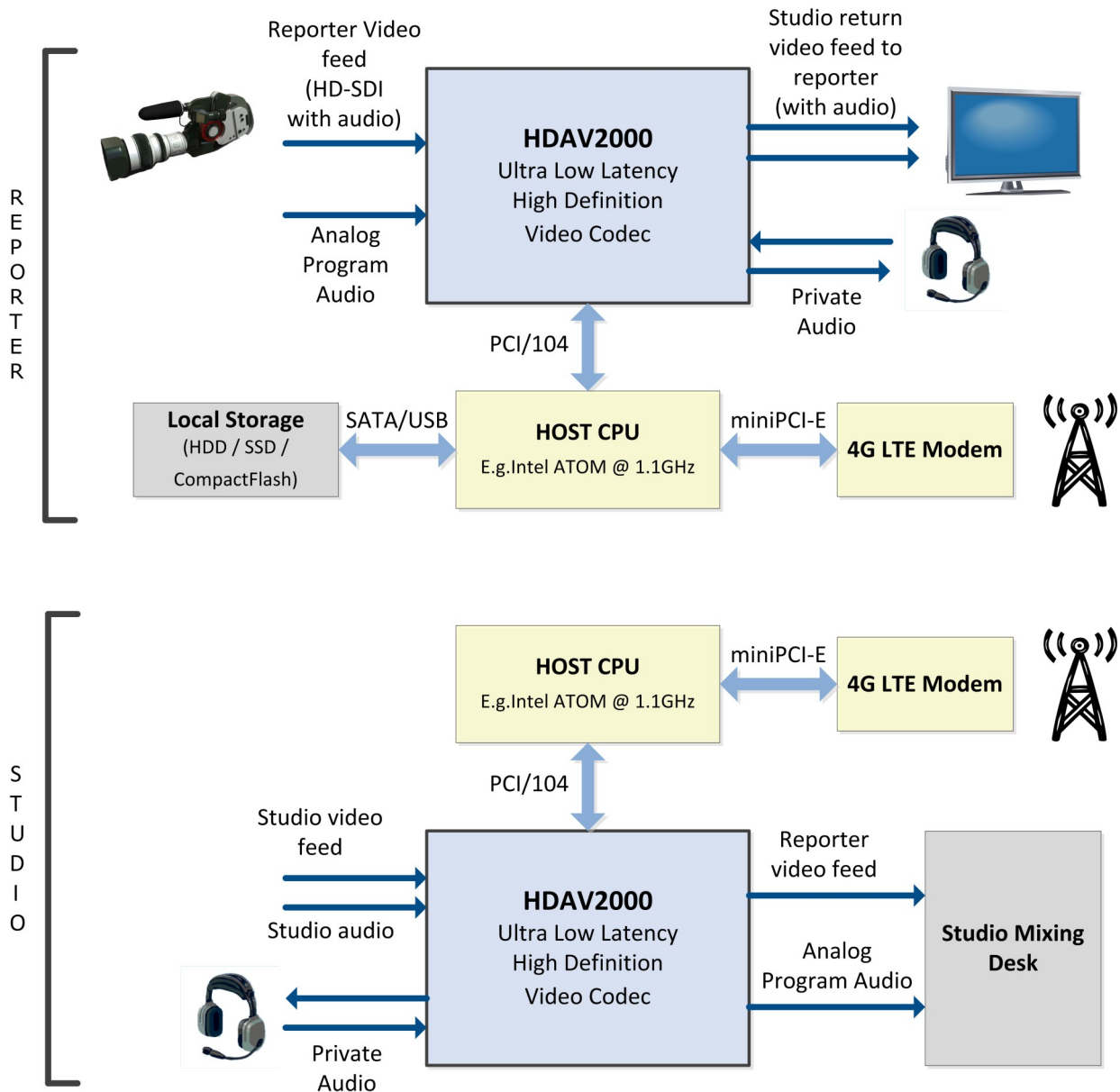
- ◆ 4x Composite NTSC/PAL/RS-170 inputs
- ◆ VGA capture of 1280x1024 @ 60Hz
- ◆ Real time, full size H.264 encoding at full frame rate for each channel.
- ◆ Full size, high quality, local storage of each channel for training and archival requirements.
- ◆ Streaming of camera inputs and driver display console (VGA) allows remote supervision and expert guidance.

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With the wide spread deployment of 4G networks, news gathering and broadcast organizations are looking to make considerable savings by using LTE / 4G network links. The use of LTE / 4G network offer significant cost savings to more traditional microwave links for real-time delivery of media events to the studio.

The solution below, based on the HDAV2000, provides a two-way audio-visual communications between the studio (anchor man, program director) and the outside broadcast team (reporter, camera man) in tandem with the high definition stream from the camera to the mixing console at the studio.

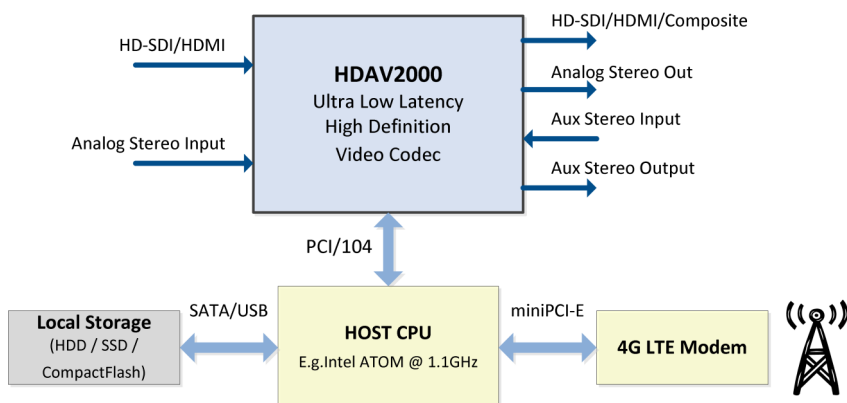


Products used

- AMP **HDAV2000** (Ultra Low Latency High Definition Video Codec)
- PCI/104 Host CPU (with Linux pre-installed)
- 4G LTE Modem module (miniPCI-E)



Outside Broadcast System



- ◆ HD-SDI / HDMI capture at 1080p30.
- ◆ Program audio captured from either analog audio input or from audio data embedded in HD-SDI/HDMI input.
- ◆ Return composite video feed to allow reported in field to see studio anchor or broadcast feed.
- ◆ Two-way Private audio talkback channel for communication between studio and outside broadcast crew.
- ◆ Local storage for saving reports to be transmitted later.

Studio System

- ◆ Studio system uses exact same hardware as outside broadcast system simply connected differently. Maximizes return on investment from single hardware platform.



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RSVP—Rapid Synthesis Video Platform



RSVP Highlights



RSVP includes all essential hardware and software building blocks to rapidly realize an industrial strength, semi-custom video solution.

RSVP integrates our mature Recording and Streaming SDK's with a robust turnkey application and a customizable user interface. This combination fully exposes the capabilities of the AMP video hardware and the host OS.

How RSVP works:

1. Simply tell us the requirements for your system. Our online application profile makes it easy to get started. We'll take it from there.
2. For a fixed price & schedule, we will rapidly configure, integrate, test and deliver your system. AMP RSVP software typically meets 80% of streaming DVR applications without modifications.
3. For unique features, our team has thousands of man-hours experience customizing & integrating the RSVP code base and video hardware into embedded Linux & Windows systems.

For further information on RSVP and to visit our online application profile visit <http://www.ampltd.com/rapid-synthesis-video-platform.php>



Video Capture and Compression

PCI-104

H264-HD2000

Dual HD PCI/104 H.264 Compression card

H264-ULL-SD4

Ultra Low Latency Quad H.264 Encoder

H264ULL-Encoder

Ultra Low Latency Quad H.264 Encoder

H264ULL-Decoder

Ultra Low Latency Quad H.264 Decoder

HDAV2000

Ultra Low Latency Quad High Definition Video Codec

PC/104-Plus

MPEG4000-D4

4 channel full frame rate MPEG-4 codec

MPEG4000WA

4 channel MPEG-4, MPEG-2 and M-JPEG codec

VCODEC-H264-D4

4 channel full frame rate H.264 codec

CompactPCI

H264-cPCI8

8-channel H.264 Video Codec

H264-ULL-cPCI

Dual HD Ultra Low Latency H.264 Encoder

MPEG4cPCI

4 channel full frame rate MPEG-4 codec

PCI

H264-ULL-PCI

HD Ultra Low Latency H.264 Encoder

Stand Alone

StreamCorder-HD

HD-SDI Video Recorder and Streamer

StreamCorder-SD4

4x D1 H.264 Video Recorder and Streamer

CompactPCI

H264-cPCI8

8-channel H.264 Video Codec

H264-ULL-cPCI

Dual HD Ultra Low Latency H.264 Encoder

MPEG4cPCI

4 channel full frame rate MPEG-4 codec

miniPCI

microH264-D4

4 channel full frame rate H.264 codec

microMPEG4-D4

4 channel full frame rate MPEG-4 codec

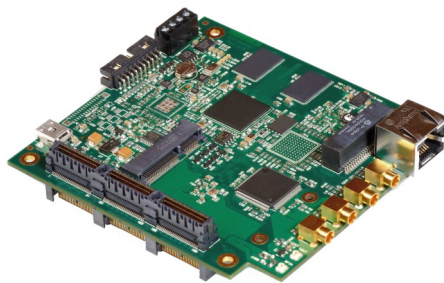
PMC

H264-PMC8

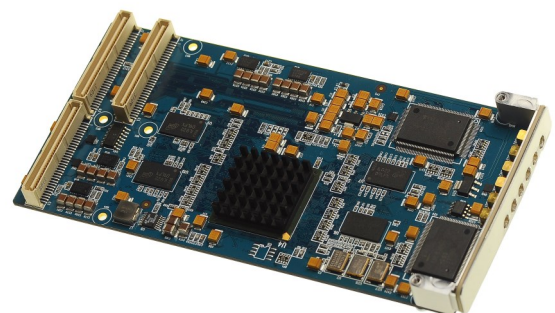
8 channel H.264 video codec

H264-ULL-PMC

Dual HD Ultra Low Latency H.264 Encoder



StreamCorder-HD
HD-SDI Video Recorder and Streamer



H264-ULL-PMC
Dual HD Ultra Low Latency H.264 Encoder





Raw Video Capture—Frame Grabbers

miniPCI

microGrabber

4 channel Video Capture and Overlay Controller

miniPCIe

AVC8000nano

8x D1 Video Frame Grabber

nanoFlame

IEEE-1394 FireWire Controller

PC/104-Plus

AVC2000-V

Video Frame Grabber

AVC4000

4 channel Video Frame Grabber

FireSpeed2000

IEEE-1394 FireWire Controller

Quadgrabber

4 channel Video Capture & Overlay Controller

PC/104-Express

AVC8000X

8 channel Frame Grabber

PCI-104

HDGrabber-DVI

HDMI/DVI Video Capture Controller

PCI-Express

AVC8000S

8x D1 Video Frame Grabber



AVC8000nano
8x D1 Video Frame Grabber

Video Annotation and Overlay

PCI-104

eVAC2000

Live PAL/NTSC Video Annotation Controller

PC/104-Plus

AVC4000

4 channel Video Frame Grabber

VAC2000

Multi channel Video Annotation & Overlay Controller

PC/104

VMIX104

Video Annotation & Overlay Controller



eVAC2000
Live PAL/NTSC Video Annotation Controller





Video Scan Converters

PCI-104

VGASTANAG

VGA to STANAG 3350 Scan Converter

Stand Alone

nanoVTV

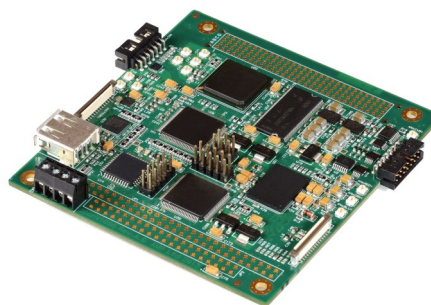
Intelligent VGA-to-NTSC/RS170 Converter

Scanverter

Multi input/output type Video Standards Conversion

VTV2000IS

VGA to TV Scan Converter



Scanverter

Multi input/output type Video Standards Conversion



VGASTANAG

VGA to STANAG 3350 Scan Converter



VTV2000IS

VGA to TV Scan Converter

Single Board Computers

PCI-104

TinyLX2

Ultra Low Power Computer

PCI-104-Express

Tiny-PPC837

Power PC Communications Controller



TinyLX2

Ultra Low Power Computer





Communications

PC/104-Plus

AirLAN2000
 WirelessLAN Controller

CAN4000
 4 channel Isolated CANbus plus Serial Port Controller

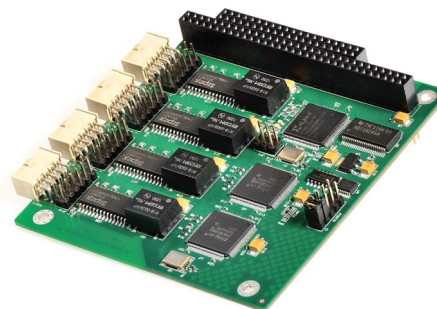
Serial2000
 8 channel Serial Port Controller

LANSwitch
 5-port Ethernet Switch

PC/104

HDLC104
 HDLC Communications Controller

Synchro104
 SDLC/HDLC Serial Communications Controller



HDLC104
 HDLC Communications Controller

Peripherals, Audio and PSU's

PC/104-Plus

Audio2000
 Multi-channel Sound Card

ATA2000-PSU
 Multi-function PSU & IDE ATA/CompactFlash Adapter

mPCI-4
 Quad slot miniPCI Adapter



ATA2000-PSU
 Multi-function PSU & IDE ATA/CompactFlash Adapter

For further information on AMP's product range
 visit <http://www.ampltd.com/products.php>





Notes

A large, empty rectangular area intended for taking notes.





Contacting AMP—Sales

AMP's sales team is always available to assist you in choosing the board that best meets your requirements. Contact your local sales office or hotline.

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Contacting AMP—Technical Support

Comprehensive technical information is available on our websites (see above).

If you can't find the information or solution you require, AMP has a team of technical support engineers / embedded video experts available to provide a quick and free response to your technical queries.

Please submit your technical support query to the appropriate email address:

Technical Support Global

Email: support@ampltd.com

Technical Support US

Email: support@amp-usa.com





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