DIRAC-PRO

Advanced Wavelet Compression Product range

Every Compression Counts
**DIRAC-PRO**

Dirac Pro was specifically developed for high-end production such as Digital Intermediate, live broadcast, studio operations and post production where there is a need for light compression and low latency. The standard was developed by the BBC to be open technology and is currently being considered by SMPTE for standardisation as VC-2.

The DPD-100 & DPE-100 products (which are compliant with the proposed VC-2 specification) were developed for 1080P59.94/50 production to allow the re-use of existing studio infrastructure that was originally designed for 1080i59.94/50.

This approach, called dirac Pro 1.5 has some advantages over the 3G SDI (SMPTE 424M) solution to high frame rate distribution. Dirac Pro 1.5 compressed video is fully compliant with SMPTE 292M so it will pass transparently through existing HD infrastructure such as routers, switchers and frame synchronisers and will reliably operate to 150m using Belden 1694A coax. Since Dirac Pro 1.5 encoded HDSDI is compliant with SMPTE 292M, standard monitoring equipment such as the Tektronix WFM700M can be used to evaluate bit-stream parameters such as jitter, return loss and signal integrity.

The compressed bit stream is recognisable if displayed as a 1080i signal because a coarsely quantised, interlaced version of the picture is encoded in the most-significant bits of the compressed signal.

The 3G SDI standard is more suited to new system installations where the 3G capability can be designed-in from the outset. In practice there is scope for both standards to coexist for sometime.

In order to bridge between new routing infrastructure using 3G SDI and existing infrastructure using SMPTE 292M, Numedia is one of the first adopters of 3G SDI technologies in its Dirac Pro products.

**CHAMELEON SERIES**

Chameleon is a 1RU modular platform that can take up to 4 modules. With dual redundant power supply and hot-swap capability, Chameleon is well suited to transmission applications requiring a high degree of reliability. Each unit can accept any combination of modules.
### DIRAC-PRO SERIES Compression Products

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dirac Pro 1.5</strong></td>
<td>New - Available now to order</td>
</tr>
<tr>
<td>DPD-100</td>
<td>HDSDI single link to HDSDI dual link de-compressor</td>
</tr>
<tr>
<td>DPD-100M</td>
<td>HDSDI single link to HDSDI dual link de-compressor with monitoring DVI and audio</td>
</tr>
<tr>
<td>DPE-100</td>
<td>HDSDI dual-link to HDSDI single-link compressor</td>
</tr>
<tr>
<td><strong>Dirac Pro 270</strong></td>
<td>In development – shipping Summer/Fall 2007</td>
</tr>
<tr>
<td>DPLD-100</td>
<td>SDI 270Mbit/s to HDSDI de-compressor</td>
</tr>
<tr>
<td>DPLD-100M</td>
<td>SDI 270Mbit/s to HDSDI de-compressor with monitoring DVI and audio</td>
</tr>
<tr>
<td>DPLE-100</td>
<td>HDSDI to SDI 270Mbit/s compressor</td>
</tr>
<tr>
<td><strong>HD Conversion</strong></td>
<td>New – Available now to order</td>
</tr>
<tr>
<td>MDL-100</td>
<td>HDSDI dual-link to 3G SDI single-link converter with monitoring DVI and audio outputs</td>
</tr>
<tr>
<td>M3G-100</td>
<td>3G SDI to dual link HDSDI converter with monitoring DVI and audio outputs</td>
</tr>
</tbody>
</table>

### CHAMELEON SERIES Compression Products

**In development – shipping Summer/Fall 2007**

- NMR-A: Chameleon Rack with active front panel
- NMR-B: Chameleon Rack with passive front panel
- DPD-100R: HDSDI single link to HDSDI dual link de-compressor
- DPE-100R: HDSDI dual-link to HDSDI single-link compressor
The DPD-100 is a stand-alone interface unit that implements the Dirac Pro 1.5 de-compressor algorithm (currently under proposal to SMPTE as VC-2). The DPD-100 is used to generate a dual-link HDSDI output (372M) from a Dirac Pro 1.5 encoded HDSDI input (292M). The DPD-100M version includes a digital RGB DVI output and monitoring audio phono jacks which can be connected to any DVI-HDTV display with 1080P capability. Input standard detection and diversity switching is automatic. Power is supplied via a 12V external PSU with locking DC connector (supplied) and the unit has PWR and input status indicators.

Applications Information

DPD-100 is suitable for contribution or distribution of high-frame rate 1080P59.94/50 progressive signals using existing plant and equipment infrastructure. The DPD-100 facilitates the reuse of existing equipment that was originally developed for single link 1080i signals. The DPD-100 de-compressor has a processing delay of less than 3 video lines making it particularly suitable for live production and wireless applications.

The DPD-100 increases the distribution cable run length when compared to up-sampling to 3 Gbit/sec using SMPTE 424M. The compressed bit stream is fully compliant with SMPTE 292M specification.

Key Features

- Dual multi-standard input supporting encoded 1080P59.94/50
- Digital RGB DVI-D option compliant with DVI-HDTV
- 150m cable run length using Belden 1694A
- Monitoring audio option
- De-compressor delay < 3 video lines
- Embedded audio and data transparency
- 1920x1200 Apple HD Cinema Display Capable
- Ethernet Browser Control & monitoring

Technological Specifications

VIDEO INPUTS:

- INPUTS: 2 x SMPTE-292M Diversity selectable
- FORMATS: SMPTE-274M, 1080i59.94, 1080i50
- CABLE LENGTH: 150m Belden 1694A (292M)
- RETURN LOSS/JITTER: as per SMPTE-292M

VIDEO OUTPUTS:

- OUTPUTS: 2 x SMPTE-372M FORMATS:
  - SMPTE-372M: 1080P59.94, 1080P50
  - CABLE LENGTH: 150m Belden 1694A (292M)
  - RETURN LOSS/JITTER: as per SMPTE-292M

DVI

- OUTPUT: Digital fixed GBR (DVI)
- CONNECTOR: DVI-D, Female, DVI 1.0 pinout
- FORMAT: DVI EIA/CEA-861-B Compliant

AUDIO

- OUTPUT: 2 Channel unbalanced
- CONNECTOR: Analogue 2 x RCA Phono

CONTROL

- IP: Resident Web Page in unit
- ADDRESS: DHCP

INDICATORS

- POWER: OK (Green)
- INPUT CRC: Error (Red)

PROCESSING

- VIDEO PROCESSING: 10-bit YCbCR
- ALGORITHM: SMPTE VC-2 (Proposed)
- DE-COMPRESSOR DELAY: < 3H
- AUDIO PROCESSING: 24-bit DAC

OTHER

- POWER CONNECTOR
  - Locking 2.1mm jack
- POWER REQUIREMENT:
  - 10W Max with ext. 12V PSU
- TEMPERATURE: 0 TO 35 deg Coperating
- DIMENSIONS: W 145 D 140 H 37 mm
- WEIGHT: 425 grams

Ordering Information

DPD-100: Dirac Pro 1.5 HDSDI to dual link HDSDI (SMPTE 372M)
DPD-100M: Dirac Pro 1.5 HDSDI to dual link HDSDI (SMPTE 372M) with DVI and 2x Analogue Audio (RCA)
**DPE-100**

**HDSDI dual-link to HDSDI single-link compressor**

The DPE-100 is a stand-alone interface unit that implements the Dirac Pro 1.5 mezzanine encoding algorithm (currently under proposal to SMPTE as VC-2). The DPE-100 is used to generate a single-link HDSDI output (SMPTE 292M) from a dual-link SMPTE 372M formatted HDSDI input or from a single link 3G SDI (SMPTE 425M Level B) input.

The compressed bit stream is recognisable if displayed as a 1080i signal because a coarsely quantised, interlaced version of the picture is encoded in the most-significant bits of the compressed signal.

Input standard detection and diversity switching is automatic. Power is supplied via a 12V external PSU with locking DC connector (supplied) and the unit has PWR and input status indicators.

**Applications Information**

The DPE-100 is suitable for contribution or distribution of high-frame rate 1080P59.94/50 progressive signals using existing plant and equipment infrastructure. The DPE-100 facilitates the reuse of existing equipment that was originally developed for single link 1080i signals. The DPE-100 compressor has a processing delay of less than 3 video lines making it particularly suitable for live production and wireless applications.

The DPE-100 increases the distribution cable run length when compared to up-sampling to 3Gbit/sec using SMPTE 424M.

The compressed bit stream can be monitored using industry standard HDSDI test equipment such as Tektronix WFM700M.

**Key Features**

- Dual multi-standard input: 1080P59.94/50
- Dual Link (372M) and 3G-SDI (425M Level B)
- Compressed bit stream is fully 292M compliant
- 150m cable run length using Belden 1694A
- Embedded source image for monitoring
- 10 bit 4:2:2 visually loss-less compression
- Compressor delay < 3 video lines
- Embedded audio and data transparency
- Ethernet Browser Control & monitoring

**Technical Specifications**

**VIDEO INPUTS:**

- INPUTS: 2 x (292M or 424M)
- FORMATS: SMPTE-372M: 1080P59.94, 1080P50:
  - SMPTE 424M: 1080P59.94, 1080P50
- CABLE LENGTH: 150m Belden 1694A (292M)
  - 70m Belden 1694A (424M)
- RETURN LOSS/JITTER: as per SMPTE 292M

**VIDEO OUTPUTS**

- OUTPUTS: 2 x SMPTE-292M with embedded source
- FORMATS: SMPTE-292M: 1080P59.94, 1080P50
- CABLE LENGTH: 150m Belden 1694A (292M)
- RETURN LOSS/JITTER: as per SMPTE 292M

**CONTROL**

- IP: Resident Web Page in unit (RJ45)
- ADDRESS: DHCP

**INDICATORS**

- POWER: OK (Green)
- INPUT CRC: Error (Red)

**PROCESSING**

- VIDEO PROCESSING: 10-bit YCbCR
- ALGORITHM: SMPTE VC-2 (Proposed)
- DE-COMPRESSOR DELAY: < 3H
- AUDIO PROCESSING: 24-bit DAC

**OTHER**

- POWER CONNECTOR: Locking 2.1mm jack
- POWER REQUIREMENT: 10W Max
- with ext. 12v PSU
- TEMPERATURE: 0 TO 35 deg C operating
- DIMENSIONS: W 145 D 140 H 37 mm
- WEIGHT: 425 grams

**Ordering Information**

DPE-100: Dirac Pro 1.5 HDSDI dual link (SMPTE 372M) to HDSDI single link (SMPTE 292M)
The MDL-100 is a stand-alone interface unit that converts dual link SMPTE 372M formatted inputs into 2-off 3G SDI SMPTE-425M level B formatted outputs. Input standard & format detection is automatic via payload identification. Dual-link inputs are converted to RGB for display monitoring using DVI-D interface.

Power is supplied via a 12V external PSU with locking DC connector (supplied) and the unit has PWR and input status indicators.

**Technical Specifications**

**VIDEO INPUTS:**
- INPUTS: 2 x SMPTE-292M
- FORMATS: SMPTE-372M: 1080P59.94, 1080P50
- CABLE LENGTH: 150m Belden 1694A (292M)
- RETURN LOSS/JITTER: as per SMPTE-292M

**VIDEO OUTPUTS:**
- OUTPUTS: 2 x SMPTE-424M
- FORMATS: SMPTE-425M Level B
- CABLE LENGTH: 70m Belden 1694A
- RETURN LOSS/JITTER: as per SMPTE-424M

**DVI**
- OUTPUT: Digital fixed GBR (DVI)
- CONNECTOR: DVI-D, Female, DVI 1.0 pinout
- FORMAT: DVI EIA/CEA-861-B Compliant

**AUDIO**
- OUTPUT: 2 Channel unbalanced
- CONNECTOR: Analogue 2 x RCA Phono

**CONTROL**
- IP: Resident Web Page in unit (RJ45)
- ADDRESS: DHCP

**INDICATORS**
- POWER: OK (Green)
- INPUT CRC: Error (Red)

**PROCESSING**
- VIDEO PROCESSING: 10-bit YCbCR
- DVI: internal 10 bit – RGB output 8 bit

**OTHER**
- POWER CONNECTOR: Locking 2.1mm jack
- POWER REQUIREMENT: 10W Max with ext. 12v PSU
- TEMPERATURE: 0 TO 35 deg C operating
- DIMENSIONS: W 145 D 140 H 37 mm
- WEIGHT: 425 grams

**Key Features**

- Multi-standard input: 1080P59.94/50
- SMPTE-372M
- Digital RGB DVI-D compliant with DVI-HDTV
- 1920x1200 Apple HD Cinema Display Capable
- 150m cable run length using Belden 1694A
- Dual 3G SDI Outputs (425M Level B)
- Embedded audio and data transparency
- Ethernet Browser Control & monitoring

**Ordering Information**

MDL-100: Dual-Link (372M) to 3G SDI (425M Level B) with monitoring DVI-D and 2x Analogue Audio (RCA)
M3G-100
3G SDI to dual link HDSDI converter with monitoring DVI and audio outputs

The M3G-100 is a stand-alone interface unit that converts 3G SDI inputs (SMPTE 424M Level B) into dual link SMPTE 372M formatted outputs. Input format and standard detection is automatic via payload identification. Inputs are converted to RGB for display monitoring using DVI –D interface. Power is supplied via a 12V external PSU with locking DC connector (supplied) and the unit has PWR and input status indicators.

Applications Information

For contribution or distribution of high-frame rate 1080P59.94/50 progressive signals using 3G SDI links (SMPTE 424M Level B).

Conversion between 3G SMPTE 424M/425M single link and dual-link HDSDI signals.

High quality monitoring of 3G SDI video and embedded audio inputs.

Key Features

- Multi-standard input: 1080P59.94/50
- SMPTE-425M Level B Compliant
- Digital RGB DVI-D option compliant with DVI-HDTV
- 1920x1200 Apple HD Cinema Display Capable
- 70m cable run length using Belden 1694A (424M)
- Dual 3G Inputs
- Embedded audio and data transparency
- Ethernet Browser Control & monitoring

Technical Specifications

VIDEO INPUTS:
- INPUTS: 2 x SMPTE-424M with diversity switch
- FORMATS: SMPTE-424M Level B: 1080P50, 1080P59.94
- CABLE LENGTH: 70m Belden 1694A (424M)
- RETURN LOSS/JITTER: as per SMPTE-424M

VIDEO OUTPUTS
- OUTPUTS: 2 x SMPTE 292M
- FORMATS: SMPTE-372M 1080P50, 1080P59.94
- CABLE LENGTH: 150m (292M) Belden 1694A
- RETURN LOSS/JITTER: as per SMPTE 292M

DVI
- OUTPUT: Digital fixed GBR (DVI)
- CONNECTOR: DVI-D, Female, DVI 1.0 pinout
- FORMAT: DVI EIA/CEA-861-B Compliant

AUDIO
- OUTPUT: 2 Channel unbalanced
- CONNECTOR: Analogue 2 x RCA Phono

CONTROL
- IP: Resident Web Page in unit (RJ45)
- ADDRESS: DHCP

INDICATORS
- POWER: OK (Green)
- INPUT CRC: Error (Red)

PROCESSING
- VIDEO PROCESSING: 10-bit YCbCR
- DVI: internal 10 bit – RGB output 8 bit

OTHER
- POWER CONNECTOR: Locking 2.1mm jack
- POWER REQUIREMENT: 10W Max with ext. 12V PSU
- TEMPERATURE: 0 TO 35 deg C operating
- DIMENSIONS: W 145 D 140 H 37 mm
- WEIGHT: 425 grams

Ordering Information

M3G-100: 3G SDI (425M Level B) to dual link (372M) with DVI-D and 2x Analogue Audio (RCA)
**DPLD-100/DPLD-100M**

**SDI 270Mbit/s to HDSDI de-compressor**

The DPLD-100 is a stand-alone interface unit that implements the Dirac Pro 270 de-compressor algorithm (currently under proposal to SMPTE as VC-2). The DPLD-100 is used to generate an HDSDI (292M) output from a 270Mbit/s SDI (259M) encoded input.

**Applications Information**

For contribution or distribution of HDSDI rate signals such as 1080i59.94/50 using standard definition studio and routing infrastructure.

**Key Features**

- Dual multi-standard input: SMPTE 259M
- 300m cable run length using Belden 1694A
- Digital RGB DVI-D option
- Monitoring audio option
- Low latency
- Embedded audio and data transparency
- Ethernet Browser Control & monitoring

**DPLE-100**

**HDSDI to SDI 270Mbit/s compressor**

The DPLE-100 is a stand-alone interface unit that implements the Dirac Pro 270 compressor algorithm (currently under proposal to SMPTE as VC-2). The DPLE-100 is used to generate a 270Mbit/s SDI (259M) output from an HD SDI (292M) input.

**Applications Information**

For contribution or distribution of HDSDI rate signals such as 1080i59.94/50 using standard definition studio and routing infrastructure.

**Key Features**

- Multi-standard input
- SMPTE 274M 1080i59.94/50, SMPTE 296M 720P59.94/50
- Compressed bit stream is fully 259M compliant
- 300m cable run length using Belden 1694A
- Compatible Picture Monitor
- 10 bit 4:2:2 visually loss-less compression
- Low latency
- Embedded audio and data transparency up to SDI (259M) capacity.
- Ethernet Browser Control & monitoring
Numedia technology was founded in 2004 to develop innovative and cutting-edge products for the professional broadcast and digital cinema markets.

New products at NAB 2007 include a range of wavelet-based compression codecs that were developed in conjunction with BBC Research Engineers to allow 1080P50/59.94 formats to utilise HDSDI infrastructure originally designed for 1080i59.94/50 formats.

The algorithm used in the Dirac Pro 1.5 and Dirac Pro 270 codecs was developed specifically for low latency and visually loss-less compression and has been proposed to SMPTE for standardisation as VC-2, which is currently at draft level.

As one of the first adopters of the SMPTE 424M – 3Gbit/s serial data format, Numedia products facilitate the cost effective migration of production and distribution to high frame rate HD.

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