

imaging Series

DVI-Ramp

User's Manual

M669-9900-201

*DVI to HD/SD-SDI
Interface*

*Copyright 2005 Miranda Technologies Inc.
Specifications may be subject to change
Printed in Canada
January 2005*



**Miranda
Technologies inc.**
3499 Douglas-B. Floreani
St-Laurent, Québec, Canada H4S 1Y6

Tel. 514-333-1772
Fax. 514-333-9828
www.miranda.com

DVI-Ramp

Safety Compliance Information

Safety Compliance

This equipment complies with:

- CSA C22.2 No. 60950-1-03 / Safety of Information Technology Equipment, Including Electrical Business Equipment.
- UL 60950-1 (1st Edition) / Safety of Information Technology Equipment, Including Electrical Business Equipment.
- IEC 60950-1 (1st Edition) Incorporating A1, A2, A3, A4, and A11/ Safety of Information Technology Equipment, Including Electrical Business Equipment.

CAUTION

These servicing instructions are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel. Servicing should be done in a static-free environment.

Electromagnetic Compatibility

- This equipment has been tested for verification of compliance with FCC Part 15, Subpart B, class A requirements for Digital Devices.
- This equipment complies with the requirements of:
EN 55022 Class A, Electromagnetic Emissions,
EN 61000-3-2 & -3-3, Disturbance in Supply Systems
EN 61000-4-2, -3, -4, -5, -6, -8 & -11 Electromagnetic Immunity

CONTACT MIRANDA

For technical assistance, please contact the Miranda Technical support centre nearest you:

Americas

Telephone:

+1-800-224-7882

e-mail:

techsupp@miranda.com

Asia

Telephone:

+81-3-5730-2987

e-mail:

asiatech@miranda.com

Europe, Middle East, Africa, UK

Telephone:

+44 (0) 1491 820222

e-mail:

eurotech@miranda.com

France (only)

Telephone:

+33 (0) 1 55 86 87 88

e-mail:

francetech@miranda.com

Visit our web site at www.miranda.com

Table of Contents

1	DVI-Ramp	1
1.1	Introduction	1
1.2	Features	1
1.3	Functional Block Diagram	2
1.4	Front and Rear Panel views	2
1.5	Typical Applications	3
2	Installation	5
2.1	Unpacking	5
2.2	Mechanical Installation	5
2.3	Connections	5
2.4	Control Interface	6
3	Operation	7
3.1	Powering Up	7
3.2	Front Panel Status LEDs	7
3.3	BYPASS mode	8
3.4	Synchronizing the DVI-Ramp and the graphics card	8
3.5	Key channel support	8
3.6	DVI format considerations	9
3.6.1	Spatial compatibility	9
3.6.2	Refresh rate compatibility	9
4	Technical Specifications	10
4.1	Input	10
4.2	Output	10
4.3	Format	11
4.4	Control	11
4.5	Processing Performance	11
4.6	Chassis	11

1 DVI-Ramp

1.1 Introduction

The DVI-Ramp is designed to provide a high-speed digital connection for visual data types that are intended to be displayed with PC workstations and desktops in digital content creation applications.

The DVI-Ramp provides a connection between a computer and two display devices: the high-resolution computer monitor and a professional digital video monitor. This functionality allows the user interface to be displayed on a standard, non-interlaced, high-resolution computer monitor, while the portion of the user interface containing video content (video window) is extracted and output on a broadcast video monitor. Depending on the video format being selected by the application running on the workstation, the DVI-Ramp outputs a high definition serial digital video signal (SMPTE-292M) or a standard definition serial digital video signal (SMPTE-259M-C).

The DVI-Ramp provides a set of programmable Look-Up Tables for each of the High resolution analog R,G,B and the SD-SDI/HD-SDI outputs allowing the user to account for gamma differences in the two monitors.

The DVI-Ramp also provides a TTL-level VSYNC output to synchronize the workstation graphic card with the house sync.

The DVI-Ramp provides a feature-rich solution for exporting both SD and HD video from PC workstations and desktops, which meets the demands of the professional media creation.

1.2 Features

Dual and Single head DVI input with high resolution R,G,B analog loop-through

SDI or HD SDI output depending on the mode of operation

Digital video signal extracted from DVI full-sized raster (Pixel to pixel mapping)

Separate programmable gamma Look-Up Tables for the DVI and the digital video signal outputs

RGB (4:4:4) to YCbCr (4:2:2) color space conversion with programmable matrix

RS-232/422 control port for:

- Video window position and size tracking
- Video in/out format selection
- Gamma Look Up Table download
- Field upgrade
- Reference format selection and video field identification
- Video output blanking, individually or both simultaneously
- Selectable SD (NTSC/PAL) or HD (tri-level sync) reference input with passive loop-through
- and other controls

Stable outputs even with no reference connected

TTL-level VSYNC output to synchronize workstation graphic card

Convenient 1RU rack-mount or table-mount chassis with removable brackets

Support for Key (Alpha) channel for SD-SDI formats

1.3 Functional Block Diagram

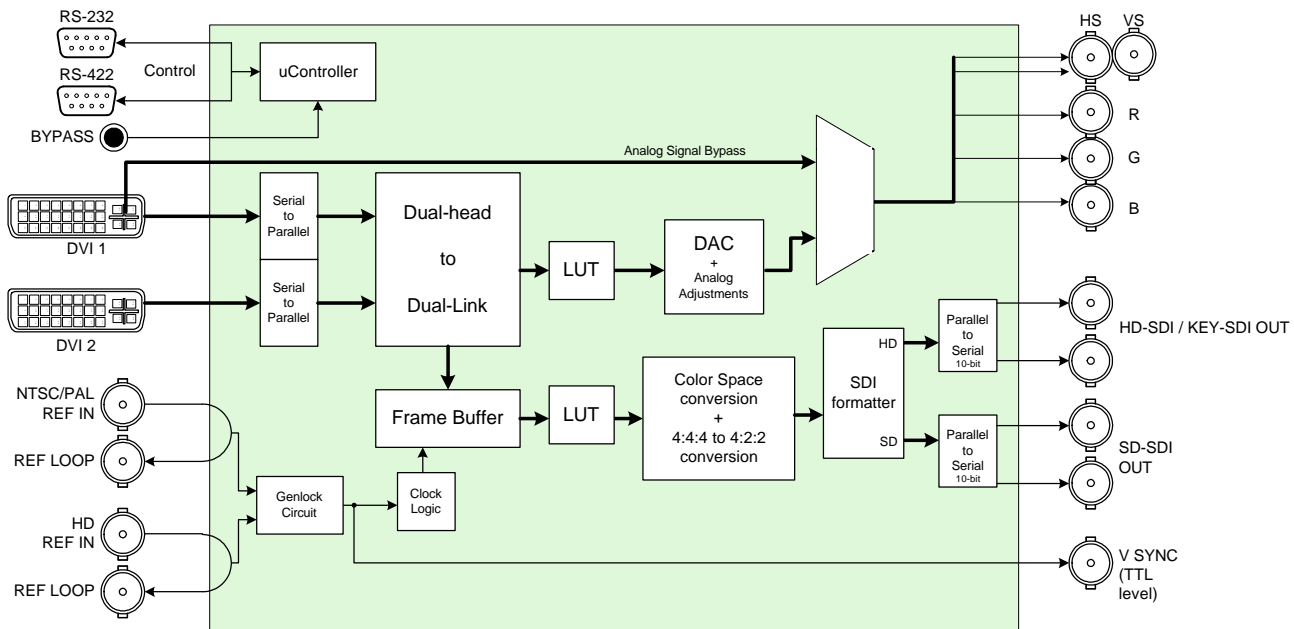


Figure 1.1 DVI-Ramp Functional Block Diagram

1.4 Front and Rear Panel views

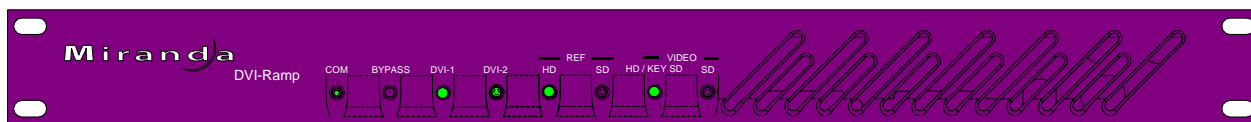


Figure 1.2 DVI-Ramp front panel

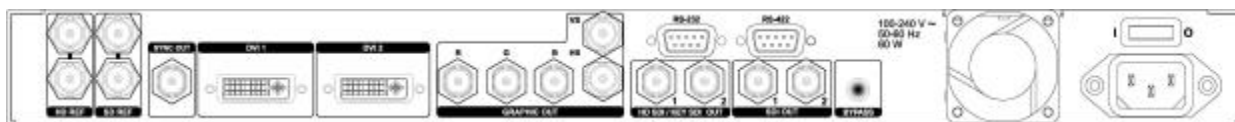


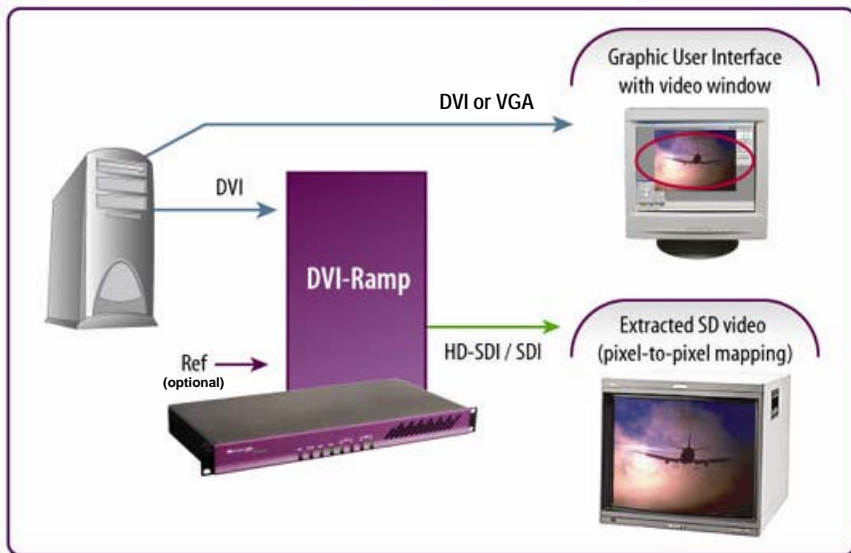
Figure 1-3 DVI-Ramp rear panel

1.5 Typical Applications

Three typical applications of the DVI-Ramp are shown in below. As shown in this figure, the DVI-Ramp generates a "TTL sync" signal that can trigger the refresh of a graphic card. The "TTL sync" is derived from a broadcast reference signal referred to as "house sync". The graphic card then drives DVI data (synchronized to the "house sync") into the DVI-Ramp. The DVI-Ramp can accept dual-head DVI input. The DVI input is "looped-through" the analog graphic output (VGA style) of the DVI-Ramp to drive a workstation's monitor.

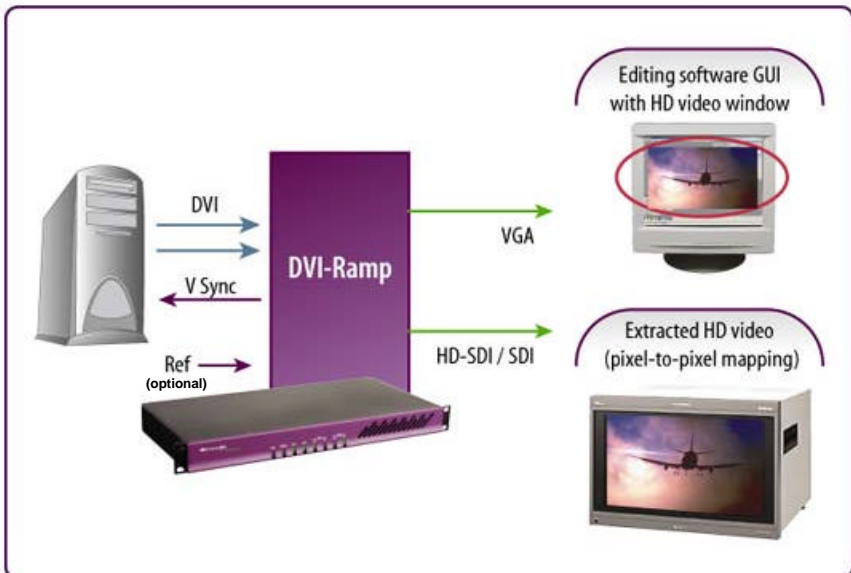
Typical application:

Single head DVI and active frame sync for synchronized SDI output



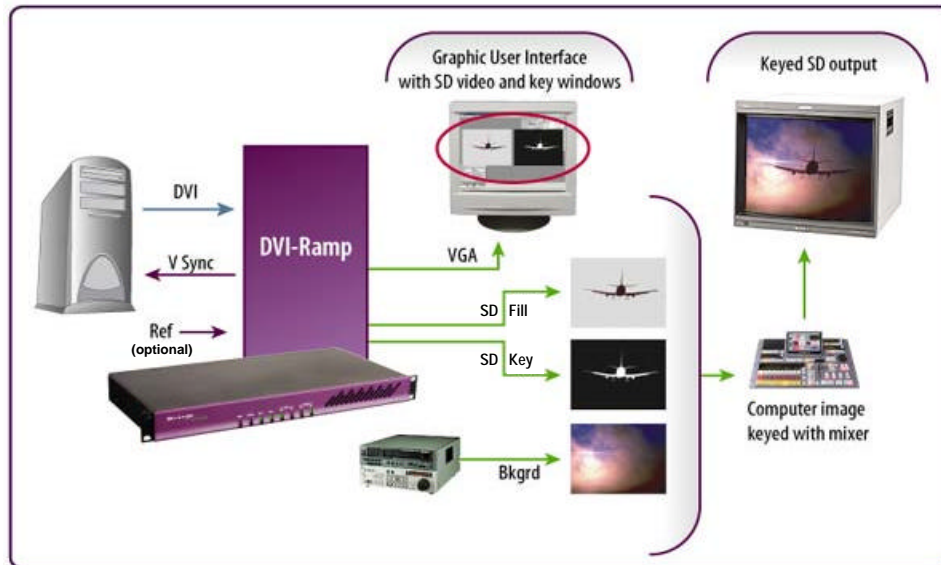
High resolution post-production application:

Graphic cards outputs synchronized with VSync, Dual head DVI for up to 2304 x 1440



Broadcast application:

Video + Key window over a single head DVI, Video + Key extracted separately for downstream key applications.



The DVI-Ramp extracts a video window, called the player, from its DVI input. The data contained in the player is transformed into an SDI output (HDTV or SDTV).

The dimension of the player window must be smaller or equal to the spatial resolution of the desired SDI output. If the player window is smaller than the SDI resolution, the player data will be in the center of the SDI output whose background will be black.

2 Installation

2.1 Unpacking

Make sure the following items have been shipped with your DVI-Ramp. If any of the following items are missing, contact your distributor or Miranda Technologies Inc.

- DVI-Ramp unit
- AC power cord
- Rack-mount brackets (optional)
- this manual
- CD-ROM with software

2.2 Mechanical Installation

If rack mounting is desired, it is first necessary to attach the optional rack-mount brackets to the sides of the DVI-Ramp case using the using the provided screws.

Install the DVI-Ramp into a standard equipment rack using four bolts through the front-panel mounting holes.

2.3 Connections

All inputs and outputs are located on the rear panel of the DVI-Ramp. Signals and connector types are listed below. The rear panel labels indicate the appropriate connection point for each signal.

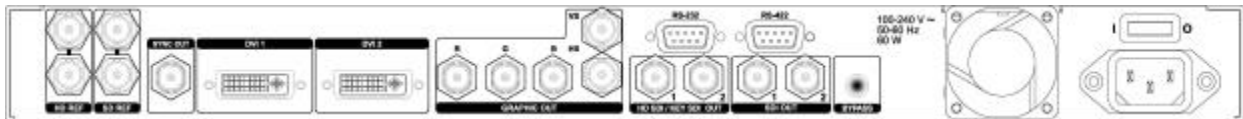


Figure 2.1 Rear panel and connectors

Signal connections :

2 DVI inputs	(DVI connectors)
1 reference SD video input and passive loop-through	(BNC connectors)
1 reference HD video input and passive loop-through	(BNC connectors)
1 Sync output (Vsync at TTL level)	(BNC connector)
1 component analog (RGBHV) output	(BNC connectors)
2 HD SDI / KEY SDI outputs	(BNC connectors)
2 SD SDI outputs	(BNC connectors)

For optimum performance, good DVI cables should be used. One recommended cable model is D-766 from Cable4PC (www.cable4pc.com)

Communication connections:

External control (RS232)	(DE-9 connector)
External control (RS422)	(DE-9 connector)

See the Typical Applications in section 1.5 for examples of how these inputs and outputs are connected in typical operating setups.

2.4 Control Interface

The DVI-Ramp has no local controls beyond the power switch and the BYPASS pushbutton. All adjustment is done using a software interface running on a PC connected via the RS-232 port.

Note: Miranda has developed software for this purpose. The software and documentation can be downloaded from Miranda's website at www.miranda.com. The software is Windows-compatible. Linux and Macintosh platforms are not supported.

Alternatively, users may create their own software. Programming documentation is available at the Miranda website.

The control interface is RS-232 or RS-422. The connectors used are 1 DE-9S for RS-232 and 1 DE-9S for RS-422. Only one connection at a time can be used. It is mechanically impossible to connect two standard serial cable to the two DE-9 connectors simultaneously. If two connections are forced, the behaviour of the DVI-Ramp will be unpredictable.

A pin-to-pin serial cable is required to connect a PC to the DVI-Ramp. No hardware handshake is implemented (no flow control). For RS-232, only the RX (2) and TX (3) pins are used. For RS-422, only the RX+/RX- and TX+/TX- pins are used. The bit rate on the serial port is fixed at: 38.4 Kbauds.

3 Operation

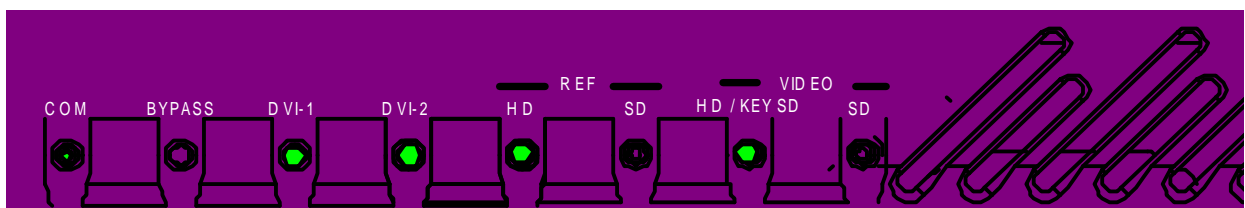
The DVI-Ramp has no local controls beyond the power switch and the BYPASS pushbutton. Operational concerns are outlined here, but for detailed operating instructions, see the documentation accompanying the software (see section 2.4).

3.1 Powering Up

The power switch is located on the rear panel of the DVI-Ramp, just above the power cord. Plug the cord into an appropriate AC power supply, and set the switch to ON (I).

3.2 Front Panel Status LEDs

There are eight Status LEDs which are mounted on the front edge of the DVI-Ramp's circuit board, and which can be seen through holes in the front panel of the case.



COM	Flashing GREEN when communication is in progress through the COM port (RS-232 or RS-422)
BYPASS	ORANGE when the DVI-Ramp is bypassed (analog graphic input passed directly to analog graphic output and SD/HD SDI outputs blanked). OFF when in normal mode.
DVI-1	GREEN when a DVI-1 Input detected (not necessarily valid) RED when no input is detected on DVI-1
DVI-2	GREEN when a DVI-2 Input detected (not necessarily valid) RED when no input is detected on DVI-2
REF-HD	GREEN when an HD REF is selected and detected RED when an HD REF is selected but not detected OFF when an HD REF is not selected Flashing ORANGE when there is a mismatch between the selected REF and the Video output
REF-SD	GREEN when an SD REF is selected and detected RED when an SD REF is selected but not detected OFF when an SD REF is not selected Flashing ORANGE when there is a mismatch between the selected REF and the Video output
VIDEO-HD/ VIDEO-KEY SD	GREEN when HD Video Out is selected or Key mode enabled (SD-only) ORANGE when the output is blank and HD Video is selected or Key mode enabled OFF when HD Video is not selected or Key mode is OFF
VIDEO-SD	GREEN when SD Video Out is selected ORANGE when the output is blank and SD Video is selected OFF when SD Video is not selected

SPECIAL CASES:

- GENERAL FAILURE: COM flashes RED, all others are either solid RED or flashing RED depending on failure severity.
- BOOTUP: All LEDs RED during the first part of the boot process.

3.3 BYPASS mode

In BYPASS mode, the analog graphic input found on the DVI-1 connector is passed directly to the analog graphic output and the SD/HD SDI outputs are blanked. The DVI-Ramp can be placed in BYPASS mode through the software interface, or using the rear-panel BYPASS pushbutton. The pushbutton cycles the DVI-RAMP between NORMAL and BYPASS modes; hold the button down for about two seconds to change modes.

The front-panel BYPASS LED is ORANGE in BYPASS mode, and OFF in NORMAL mode.

3.4 Synchronizing the DVI-Ramp and the graphics card

The DVI-Ramp generates a "TTL-sync" signal (equivalent to a V-sync at TTL level) that can be used to trigger the refresh of the graphic card (DVI source). The TTL-sync is generated from an internal reference (free-run mode) or from an external broadcast reference (line-lock mode). If the graphic card is synchronized by the TTL-sync, the DVI data it drives will be synchronized to the SDI V-sync. In this case, we can consider the data flow of the input (DVI) and output (SDI) to be the same.

However, if the TTL-sync is not used to synchronize the graphic card, there will be a mismatch between the DVI and SDI data rates. Normally, this would cause overflow/underflow of the DVI-Ramp's frame buffers. To avoid this situation, the "frame-sync" function of the DVI-Ramp is enabled. This feature corrects the mismatch of data rates by dropping or repeating SDI frames when the frame buffers are about to overflow/underflow. The frame-sync will drop frames when the DVI rate is larger than the SDI rate. Conversely, it will repeat frames when the DVI rate is smaller than the SDI rate.

The DVI-Ramp can accept dual-head input coming from specialized graphic cards and drivers. See release notes or contact Miranda technologies (www.miranda.com) for more details. When in "bypass" mode, the DVI-Ramp can loop-through the analog part of the DVI-1 connector to its analog graphic output (VGA style). Since the DVI-Ramp appears as a Digital Flat Panel to the graphic cards, some of them will not drive an analog signal into the DVI connector.

3.5 Key channel support

For SD-SDI output formats (525 or 625 lines), a key (Alpha) output can be generated simultaneously with the video output. The video is output on the "SDI OUT" BNCs while the key signal is output on the "HD SDI / KEY SDI OUT" BNCs. The key signal is luminance only (chroma value forced to 512 in 10 bits). There are two modes of operation for the key channel support:

- 1) Two player windows are defined, one to extract the video output and one to extract the key output.
- 2) One player window is defined for both the video and Key outputs. The video is extracted normally. The Key channel generated is dependant on the video data. When the video luminance is within a programmed range the key output takes on one value; otherwise it takes on another value. These two values can be set to any of the following levels:
 - a) White
 - b) Black
 - c) Video luminance

Selection of the mode of operation and key output levels is accomplished through software control.

3.6 DVI format considerations

All supported DVI resolutions are progressive scan formats. The DVI resolution that you should use depends on your desired SDI (HD/SD) output. In other words, the DVI and SDI formats must be "compatible" with each other. There are two compatibility issues: 1) spatial resolution and 2) refresh rate.

3.6.1 Spatial compatibility

The DVI dimensions must be larger or equal to the SDI dimensions in order for the SDI window to be contained within the DVI picture. If this is not the case, the SDI output will be as follows: the entire DVI source will appear as a window centered on a black background (no scaling) that has the dimensions of the targeted SDI format.

3.6.2 Refresh rate compatibility

The refresh rate of SDI formats is specified in terms of frame rate regardless of the scan type (progressive or interlaced). Thus, a refresh rate of 59.94 fields per second is specified as 29.97 frames per second. Also, SDI-525 is referred to as NTSC and SDI-625 is referred to as PAL.

When the frame-sync function is OFF, the following table of refresh rate compatibilities applies:

DVI refresh rate (Hz)	SDI output formats supported
47.95	1920x1080@23.98psf, NTSC*, 1920x1080@29.97i*, 1920x1035@29.97i*
48.00	1920x1080@24psf, 1920x1080@30i*
50.00	PAL, 1920x1080@25i
59.94	NTSC, 1280x720@59.94p, 1920x1080@29.97i, 1920x1035@29.97i
60.00	1280x720@60p, 1920x1080@30i
71.93	1920x1080@23.98psf, NTSC*, 1920x1080@29.97i*, 1920x1035@29.97i*
72.00	1920x1080@24psf, 1920x1080@30i*
75.00	PAL, 1920x1080@25i

NOTES:

- SDI formats marked with an * are obtained through a 3:2 pull-down process from the DVI source.
- When the frame-sync is OFF, the graphic card MUST be genlocked.
- At the time of writing, the above compatibility table applies only for the "single-head" mode of the DVI-Ramp. For "dual-head" modes see the FAQ documentation.

When the frame-sync function is ON, ADDITIONAL compatibilities apply, as listed below:

DVI refresh rate (Hz)	SDI output formats supported (in addition to those in the table above)
47.95	1920x1080@24psf, 1920x1080@30i*
48.00	1920x1080@23.98psf, 1920x1080@29.97i*, 1920x1035@29.97i*
50.00	
59.94	1280x720@60p, 1920x1080@30i
60.00	1280x720@59.94p, 1920x1080@29.97i, 1920x1035@29.97i
71.93	1920x1080@24psf, 1920x1080@30i*
72.00	1920x1080@23.98psf, 1920x1080@29.97i*, 1920x1035@29.97i*
75.00	

4 Technical Specifications

4.1 Input

GRAPHIC SIGNAL:	Dual-head Digital Visual Interface (DVI-I) (DVI Revision 1.0, 02 April 1999)
SD EXT REF:	SMPTE 170M/PAL ITU 624-4 or 2Vp-p/4Vp-p composite sync with passive loop-through.
HD EXT REF:	HD tri-level sync with passive loop-through (SMPTE-296M, 274M and 240M).

4.2 Output

GRAPHIC SIGNAL:	Analog R,G and B with separate TTL Hsync and Vsync (VESA).
Output Impedance:	75 Ω

When internal DAC is selected:

V _{p-p} NOMINAL:	0.7 V
FREQUENCY RESPONSE:	
F _{3dB} :	50 MHz
NOISE (unweighted):	< 30 mV
RETURN LOSS:	>15dB up to 100MHz and >10dB up to 150Mhz
EQUALIZATION:	Programmable for 0-50, 50-100, 100-200 feet with Belden cable 1694A
ABSOLUTE MAXIMUMS:	
Pixel rate:	300 Mpixel/sec (300 Msamples/sec per component)
Maximum cable length:	200 feet with Belden cable 1694A

When Analog signal bypass is selected:

No processing except cable drive and equalization.

SDTV SIGNAL (2):	4:2:2 SMPTE 259M (270Mbps, 10-bit)
RETURN LOSS:	> 20 dB up to 270 MHz
JITTER ¹ :	< 0.2 UI p-p

HDTV SIGNAL (2):	4:2:2 SMPTE 292M (1.485Gbps, 10-bit)
RETURN LOSS:	> 13 dB up to 1.5 GHz
JITTER ² :	0.6 UI. This was measured as follows. Two external signals were used: an HD reference signal (REF) and the pixel clock (REF-CLK) used to generate the REF signal. The DVI-Ramp was set to "genlock" on the REF signal. The pixel clock re-synthesized by the DVI-Ramp (RS-CLK) from the REF signal was measured with a scope triggered on the REF-CLK signal. The jitter measured on RS-CLK was assumed to be the jitter present on the HD-SDI signal.

SYNC SIGNAL:	TTL-Level SYNC. Specific to application.
--------------	------------------------------------------

¹ Assuming video content has ITU-601 compliant transitions. If this condition is not met, there could be an increase of 20% on the jitter measured but with no loss of functionality.

² Same remark as for the jitter of the SDTV signal.

4.3 Format

DVI IN RES in DUAL-HEAD ³ mode:	Spatial resolution auto-detected
DVI IN RES in SINGLE-HEAD mode:	Spatial resolution auto-detected
DVI REFRESH RATE:	Auto-detected but only the following refresh rates are supported to generate a valid SDI output: 47.952, 48, 50, 59.94, 60, 71.928, 72, 75 Hz.
SDTV OUTPUT RES:	SMPTE 259M-C (270 Mbps) 720x486: 59.94i (525) 720x576: 50i (625)
HDTV OUTPUT RES:	SMPTE 296M 1280x720: 59.94p, 60p SMPTE 274M 1920x1080: 23.976psf, 24psf, 25psf, 29.97psf, 30psf, 50i, 59.94i, 60i

4.4 Control

COMMUNICATION (2):	RS-232 or RS-422
--------------------	------------------

4.5 Processing Performance

SIGNAL PATH:	8-bit RGB to 10-bit YCbCr (Pixel to pixel mapping) RGB (4:4:4) to YCbCr (4:2:2) color space conversion Separate programmable gamma LUT for RGB Analog and SD/HDSDI (default gamma set to linear)
PROCESSING DELAY:	Maximum delay of 2 video frames. Actual delay depends on processing mode.

4.6 Chassis

I/O CONNECTORS:	75 Ω BNC (14) DVI-I (2) DE-9S (2)
DIMENSIONS:	1RU 1.75"X 19"X 10"
WEIGHT:	2.1 Kg
TEMP RANGE:	0° -40° C
POWER INPUT:	120-264 V/60-50 Hz (40 Watts max.)

³ Dual-head modes require special graphic cards and drivers. See release notes for details.