1. INTRODUCTION

These FAQs (Frequently Asked Questions) have been updated with the release 4.10 of the DVI-Ramp.

2. DOCUMENTATION AVAILABLE

- DVI-Ramp User's Manual
- API (Application Programming Interface) available on demand for developers.

3. FIRMWARE

Firmware update packages are available for bug-fixes and feature enhancement. These updates are made via the serial port. If you need such an update, it will be available through Miranda's technical support (http://www.miranda.com/support.php).

There are two flavors of the DVI-Ramp hardware that are supported for firmware updates : hardware version 3.20 (sometimes referred to as PCB300) and 4.20 (PCB400). To use an appropriate update package, you need to know what hardware version is your unit. The hardware and firmware versions can be found in the "Advanced" or "Versions" tab of the control software (available at www.miranda.com/software.php). You can also get this information from the "DVI-Ramp information" package.

****** Warning the firmware upgrade process could render your unit unusable. Please make sure the upgrade is necessary and if so read carefully the documentation in the upgrade package before upgrading.***

4. FREQUENTLY ASKED QUESTIONS (FAQ)

4.1 What graphic card can I use with the DVI-Ramp ?

The answer to this question depends on the features required by your application. There are three major features to look for in a graphic card (referred to as GFX) as described in the following sub-sections.

4.1.1 GFX must be able to generate the desired DVI format

The desired DVI format is dependant on the SD/HD SDI signal you want at the output of the DVI-Ramp. The auto-detection of the DVI format on the DVI-Ramp allows it to accept any DVI input for conversion to an RGBHV analog signal. But you need to choose a DVI format that is compatible with your desired SD/HD SDI format. See FAQ 4.2 for details on choosing an appropriate DVI resolution for a desired SD/HD SDI output. Once you have chosen a DVI format(s), you can start selecting a graphic card.

When possible, it is suggested to use VESA standard resolutions since they are supported by most graphic cards. This would give you the option to interchange graphic cards with no impact on your system. The most useful and standard resolutions for the DVI-Ramp applications are shown below:

If those resolutions fit your application, then almost any graphic card would do. The graphic cards that have been tested with the DVI-Ramp are listed below:

- 6210 = WildcatIII 6210 (from 3D Labs, see 3D Labs users)
- VP990 = Wildcat VP990 (from 3D Labs, see 3D Labs users)
- FX2000 = Quadro FX 2000 (from Nvidia, see Nvidia users)
- FX3000G = Quadro FX 3000G with genlock (from Nvidia, see Nvidia users)
- Quad900 = Quadro4 900 XGL (from Nvidia, see Nvidia users)
- Rad7000 = Radeon 7000 (from ATI, see ATI users)
- Rad9800 = Radeon 9800 Pro (from ATI, see ATI users)
- Parhelia = Parhelia (from Matrox, see Matrox users)
- Others graphic cards could be used but have not been tested. Specifically, there are many derivatives of the above cards that could be used.

See Table 1 for details on the graphic card and resolutions tested.

4.1.2 OPTIONAL feature: Ability to genlock the GFX to the "SYNC OUT" signal of the DVI-Ramp

See FAQs 4.7 and 4.8 to see if you need this feature for your graphic card.

4.1.3 OPTIONNAL feature: Ability to use the GFX with the dual-head mode of the DVI-Ramp

If you plan to use the dual-head-mode of the DVI-Ramp, you must choose a GFX that meets certain specifications. See FAQ 4.14 for reasons to use the dual-head mode and for details on the GFXs supporting this mode.

The list of DVI formats tested is shown below with the graphic cards used (more formats and cards could be used but have not been tested).

Table 1. Graphic cards and DVI resolutions tested.

Single-head configuration		
DVI format	**Graphic card**	
1280x1024@59.94	6210	
1280x1024@60	ALL graphic cards tested	
1280x1024@71.928	Rad9800***	
1280x1024@72	ALL graphic cards tested	
1280x1024@75	ALL graphic cards tested	
1600x1200@59.94	6210	
1600x1200@60	ALL graphic cards tested	
1600x1200@50	6210	
1920x1080@47.952	6210, Rad9800***	
1920x1080@48	6210, Rad9800***	
1920x1080@50	6210, Rad9800***	
1920x1080@59.94	6210, Rad9800***	
1920x1080@60	6210, VP990, Rad9800***	
1920x1080@71.928	6210	
1920x1080@72	6210	
1920x1154@47.952	6210	
1920x1154@48	6210	
1920x1154@50	6210, FX3000G	
1920x1154@59.94*	6210	
1920x1154@60*	6210, FX2000, FX300G	
1920x1200@47.95	6210	
1920x1200@48	6210	
1920x1200@50	6210	
1920x1200@59.94*	6210	
1920x1200@60*	6210, VP990	
Dual-head configuration		
DVI format	**H resolution per head**	**Graphic card**
1920x1200@60	960	6210, VP990
1920x1200@59.94	960	6210
1920x1200@71.928	960	6210
1920x1200@72	960	6210, VP990
1920x1200@75	960	6210, VP990
2304x1440@47.952	1152	6210
2304x1440@48	1152	6210
2304x1440@50	1152	6210, VP990
2304x1440@59.94	1152	6210
2304x1440@60	1152	6210, VP990
2208x1380@71.928	1104	6210
2208x1380@72	1104	6210
2144x1340@75	1072	6210
3200x1200@60**	1600	6210, Parhelia

Notes:

- More details and resolutions are available in the documents specific to each manufacturer of graphic card (see 3D Labs, ATI, Matrox, Nvidia).

- See FAQ 4.14 for explanation on dual-head mode.
- The above DVI resolutions marked with an "*" may have reduced blanking intervals (relative to standard formats) in order to have a pixel rate below the budget of 165Mpixels/sec imposed by the DVI standard (see FAQ 4.13 for details on this issue). The RGBHV output of the DVI-Ramp being an analog replica of the DVI input, the blanking intervals of this output follow those of the input. Some CRT monitors may not be able to sync on an RGBHV signal having reduced blanking. If you have such problems, see the specification of your monitor for the minimum blanking intervals required and compare with the timings detected by the DVI-Ramp.
- The above DVI resolutions marked with an "**" generate an RGBHV signal whose bandwidth exceeds the specification of the DVI-Ramp's DAC. In this case, the quality of the RGBHV output may be slightly lower than usual.
- The above DVI resolutions/graphic-card marked with an "***" have been obtained with the use of the "PowerStrip" shareware (http://www.entechtaiwan.net/ps.htm)

4.2 What DVI formats should I use ?

All supported DVI resolutions are progressive scan formats. The auto-detection of the DVI input format allows the DVI-Ramp to accept almost any DVI conversion to an analog RGBHV output (analog loop-out). But the DVI resolutions 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.

4.2.1 Spatial compatibility

The DVI dimension must be larger or equal to the SDI dimension 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.

4.2.2 Refresh rate compatibility

In the following, 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.

When the frame-sync function (see FAQ 4.7) is OFF, the following table of refresh rate compatibilities applies:

DVI refresh (Hz)	SDI output formats supported
47.95	1920x1080@23.98psf, SD-525**, 1920x1080@29.97i**, 1920x1035@29.97i**, 1920x1080@24psf*, 1920x1080@30i*/**
48.00	1920x1080@24psf, 1920x1080@30i**, 1920x1080@23.98psf*, 1920x1080@29.97i*/**, 1920x1035@29.97i*/**
50.00	SD-625, 1920x1080@25i
59.94	SD-525, 1280x720@59.94p, 1920x1080@29.97i, 1920x1035@29.97i, 1280x720@60p*, 1920x1080@30i*
60.00	1280x720@60p, 1920x1080@30i, 1280x720@59.94p*, 1920x1080@29.97i*, 1920x1035@29.97i*
71.93	1920x1080@23.98psf, SD-525**, 1920x1080@29.97i**, 1920x1035@29.97i**, 1920x1080@24psf*, 1920x1080@30i*/**
72.00	1920x1080@24psf, 1920x1080@30i**, 1920x1080@23.98psf*, 1920x1080@29.97i*/**, 1920x1035@29.97i*/**
75.00	SD-625, 1920x1080@25i

NOTES:
- SDI formats marked with an * are available when the frame-sync function is enabled. When the frame-sync is OFF, the graphic card MUST be genlocked (see FAQ 4.1 for more details).
- SDI formats marked with an ** have been obtained through a 3:2 pull-down process from the DVI source.

4.3 Why does my interlaced SDI output have its fields inverted ?

There are two possible causes for field inversion as described below.

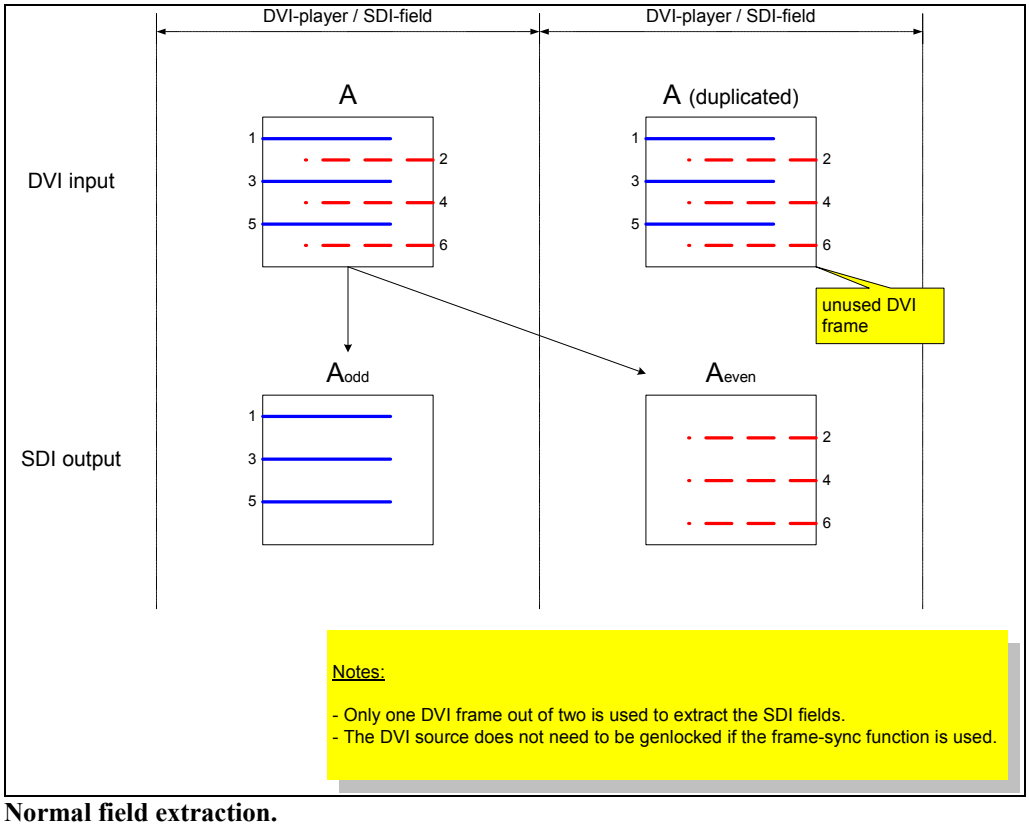
4.3.1 Constant field inversion

This depends on the vertical position of the player window programmed into the DVI-Ramp relative to the position of the video rendered on the graphic card. The DVI-Ramp interprets the first line of its player window as the first line of field 1. If the rendered video is position such that the first line of the DVI-Ramp's player window does NOT belong to field 1, then the output fields will be inverted. To correct the problem, move your video player up or down by an odd number of lines.

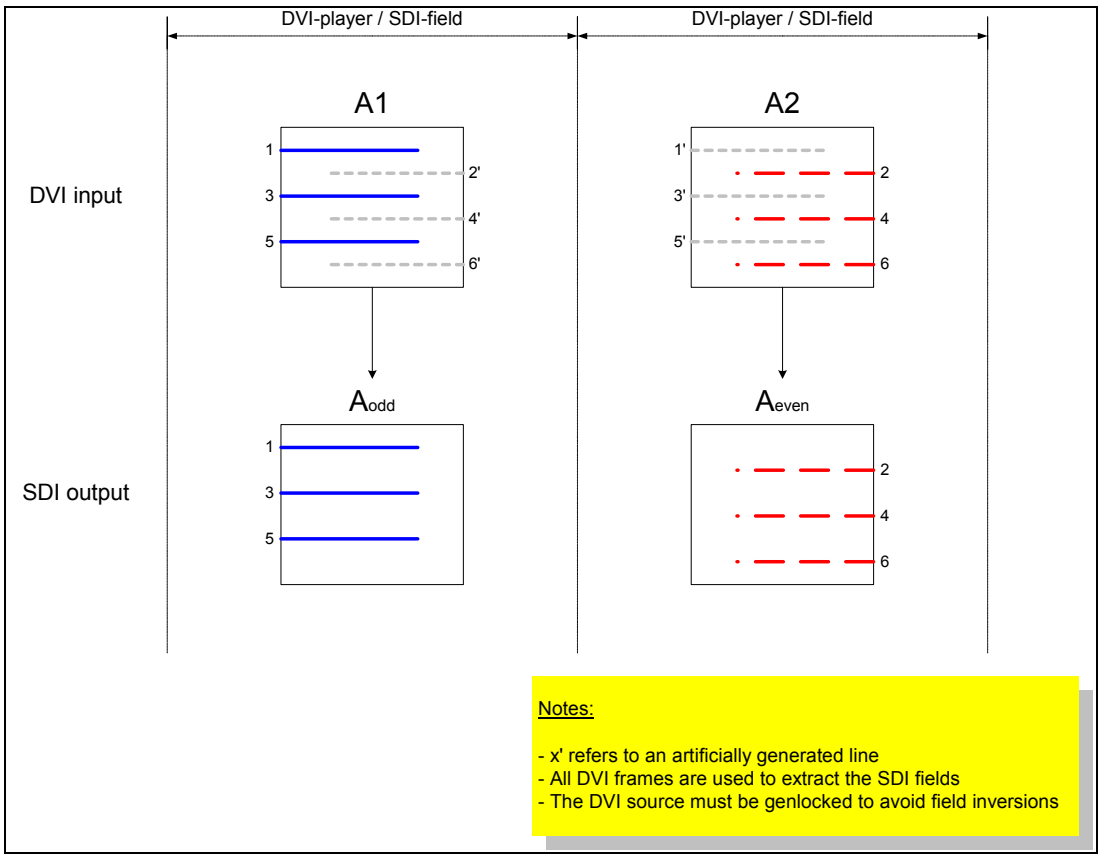
4.3.2 Intermittent field inversion

This can occur in a special mode of operation of the DVI-Ramp. Normally, both SDI fields are extracted from a single DVI frame. You are in this normal mode when the "Field extraction" checkbox is unchecked in the control software. If you are in the normal field extraction with the frame-sync (see FAQ 4.7) enabled and the player window adjusted vertically, your SDI output should be OK.

If you use the special mode of field extraction, the DVI source MUST be genlocked with the DVI-Ramp. The figures below explain the two different mode s of field extraction.



Normal field extraction.



Special mode of field extraction.

4.4 I have a custom DVI format that I would like to use. What can I do ?

The DVI input format being auto-detected, all formats are supported. For a given SDI output, you should consult the DVI/SDI compatibility FAQ (4.2 What DVI formats should I use ?) to choose a DVI format.

4.5 Is there any scaling?

No. A video window of SDI dimensions is extracted from the DVI source in a "pixel-to-pixel" fashion. This pixel-to-pixel transfer insures the highest fidelity possible to the DVI source. Scaling would surely introduce artifacts that are unacceptable for high quality transfers.

4.6 Why is my SDI output flickering ?

To keep the DVI-Ramp as transparent as possible, the DVI to SDI conversion is done without an anti-flicker filter. When the SDI output is interlaced (most SDI formats), you will see flickering when the DVI source contains sharp transitions (especially sharp horizontal lines). For example: the detailed file display of the "windows explorer" would be flickering at the output of the DVI-Ramp. It is the responsibility of the "player software" to provide a video sequence that is ready for the video domain (pre-filtered for smoother transitions). Progressive SDI formats (like 1280x720p) do not have this flicker problem.

4.7 What is the purpose of the frame-sync function?

This function is normally used when the DVI source (graphic card) is NOT genlocked to the DVI-Ramp (through the TTL-sync output of the DVI-Ramp). In this case, the frame rates of the DVI source and the SDI output are very likely to be different or to "drift" one relative to the other. 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 must be enabled. This feature will correct the mismatch of frame 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 frequency of the repeat/drop event depends on how big a difference between the DVI and SDI frame rates.

Example:

Let's assume that you are using a graphic card running at a refresh rate of exactly 60Hz and that you want to generate an SDI output at 59.94 fields/sec. In this case, the DVI-Ramp with the frame-sync function activated would drop a frame at every 1000 frames : 59.94 = 60 x (1000/1001).

4.8 Why use a graphic card that can be genlocked ?

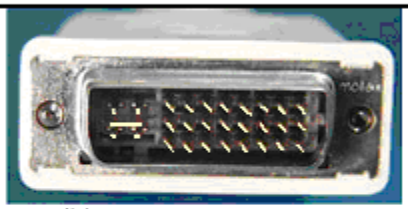
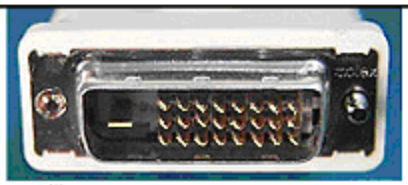
For some applications, dropping or repeating SDI frames is not acceptable. A typical example of such an application is a frame-accurate editing software. In that case, you need a graphic card that can be "genlocked" to the DVI-Ramp with the "SYNC OUT" (TTL-sync) signal. With the graphic card genlocked, you will not need the frame-sync function (see FAQ 4.7) and no SDI frames will be repeated or dropped. At the time of this writing, only the following cards have a genlock capability:

- WildcatIII 6210 (from 3D Labs, see 3D Labs users for details)
- Wildcat4 7210 (from 3D Labs, see 3D Labs users for details)
- To be available in near future: Quadro FX 3000G (from Nvidia, see Nvidia users)

4.9 What kind of DVI cable should I use ?

There are many types and qualities of DVI cables. It is recommended to use a high quality DVI cable like the WD-766 from CABLE4PC (www.cable4pc.com) or DVI cables from Altinex. Other cable manufacturers or models may be used but have not been tested.

The major types of DVI cables are shown below (taken from RAM electronics web site):

DVI Connector Pictures	
DVI-I (Digital and Analog)	
DVI-I Dual Link (notice the three rows of eight pins and that the "flat blade" contact seen to the left has two contacts above and below it)	**DVI-I Single Link** (notice the three rows have two missing pins in the center and that the "flat blade" contact seen to the left has two contacts above and below it)
 DVI-I can possibly connect to DVI-I, DVI-A, DVI-D or DFP.	 DVI-I will connect to DVI-I, DVI-A, DVI-D or DFP
DVI-D (Digital only)	
DVI-D Dual Link (notice the three rows of eight pins and that the "flat blade" contact seen to the left has ***no*** contacts above and below it)	**DVI-D Single Link** (notice the three rows have two missing pins in the center and that the "flat blade" contact seen to the left has ***no*** contacts above and below it)
 DVI-D will connect to DVI-I, DVI-D or DFP.	 DVI-D will connect to DVI-I, DVI-D or DFP.

You need to use the DVI-I cable only if you are going to use the analog signal coming from the graphic card. The analog signal is used when the DVI-Ramp is setup in bypass mode. Most graphic card do not drive the analog signal when connected to the DVI-Ramp (detected as a Digital flat Panel). If you do not plan to use the analog signal, the DVI-D cable is OK for you.

The current version of the DVI-Ramp (as of 2003-08-26) only supports dual-head mode with each head being a single-link. Thus you do not need a dual-link cable but it will not be a problem if you use one. In conclusion, a single-link DVI-D cable is satisfactory for most usage.

4.10 When I put the DVI-Ramp in *bypass* mode, the RGBHV analog output is "dead". Why is that ?

The bypass mode is designed to take the analog RGBHV signal present at the DVI-1 input connector and loop it out to the RGBHV analog output. Since the DVI-Ramp appears as a Digital Flat Panel to the graphic cards, most of them do not drive the analog signal along with the digital signal on the DVI-I connector. In that case, the analog RGBHV output of the DVI-Ramp would be inactive since the analog input is absent. The bypass mode is mostly useful in dual-head mode with the WildcatIII 6210 (and Wildcat4 7210). If you use a graphic card that drives both the DVI an analog signal and you still do not have a valid RGBHV output then your DVI cable might not have the wires to carry the analog signal (see previous FAQ 4.9).

4.11 When I put the DVI-Ramp in *bypass* mode, the SDI output is "blacked out". Why is that ?

In bypass mode, the DVI-Ramp automatically blanks ("black out") the SDI output.

4.12 I have an invalid SDI and RGBHV output. What could be wrong ?

It is possible that the graphic card is not driving any DVI (digital) signal. Check, the DVI-1 and DVI-2 LEDs on the front panel of the DVI-Ramp. A red LED means that no DVI signal has been detected on the corresponding DVI input connector. A green LED means that a DVI signal has been detected. These LEDs only represent the presence of the DVI signal, not its validity.

4.13 Why can I use a high resolution graphic on my analog monitor but not on the DVI-Ramp ?

The DVI-Ramp accepts only DVI inputs. The bandwidth (pixel rate) limit of the DVI standard is 165Mpixels/sec per DVI link. The analog pixel rate can be much higher. The pixel rate (pixel clock) is given by the following formula:

```
PixelClock = H_total x V_total x refreshRate

Where
   H_total = [Horizontal active picture + Horizontal blanking interval]   (in pixels)
   V_total = [Vertical active picture + Vertical blanking interval]       (in lines)
   RefreshRate = Number of frames refreshed per seconds                   (in frames per second)
```

4.14 Dual-head mode (why are there two DVI connectors) ?

Some application require a graphic resolution that is above the bandwidth limit of the DVI standard (165Mpixels/sec per DVI link). For those cases, the DVI-Ramp can accept two DVI inputs to double the effective pixel rate of the DVI input. This mode of operation is referred to as the "dual-head" mode of the DVI-Ramp. To be used in that mode, both DVI inputs must have the exact same format (same spatial resolution and same refresh rate). Also, the skew between the two DVI inputs must be smaller than a certain specification. At the time of this writing, the only graphic cards known to meet this specification are the following:

- WildcatIII 6210 (from 3D Labs, see 3D Labs users for details on usage and timing files)
- Wildcat4 7210 (from 3D Labs, see 3D Labs users for details on usage and timing files)
- Wildcat VP990 (from 3D Labs, see 3D Labs users for details on usage and timing files)

In this mode, the DVI-Ramp internally merges the two DVI inputs to form one high resolution input. The left part of this high resolution image is provided by the signal found on the DVI-1 connector while the right part is found on the DVI-2 connector. Conceptually, the dual-head input can be thought of as a single DVI image having twice the width of each of the DVI inputs. For example if both DVI inputs (DVI-1 and DVI-2) have a resolution of 960x1200@60Hz, then the effective dual-head input would be 1920x1200@60Hz. A player window can cross the boundary between the 2 DVI inputs without any problem.

In dual-head mode, the RGBHV analog output can reach a maximum pixel rate of 330Mpixels/sec (2x165Mpixels/sec). But the DAC of the RGBHV output is specified to a maximum of 300Mpixels/sec. Beyond this rate the quality of the RGBHV output will start to decline.

4.15 I want to use the HD-SDI output in a 1920x1080 format. What are my options in terms of graphic card ?

See FAQs 4.1and 4.2.

4.16 When I use a LUT other than the linear one, I get washed-up colors. Why?

Most digital content is already gamma compensated, hence most applications should use the default linear LUTs.

4.17 How can I communicate with the DVI-Ramp if I do not have a serial port on my workstation ?

If your workstation does not have a serial port, it is very likely to have a USB port. There are many USB-to-serial adapters on the market that make a USB port appear as a serial port to the software. We have tried the "High Speed USB Serial Adapter" from Keyspan. The Keyspan company supports this product on the most popular Operating System (see http://www.keyspan.com/products/usb/USA19W/). We have only tested this product on a windows XP machine. Other manufacturers offer similar products. More information on Keyspan serial products can be found below:
http://www.keyspan.com/products/homepage-Serial.spml

4.18 The DVI-Ramp does not detect my HD reference signal. Why ?

The detection of the HD reference input is not very tolerant to reference signals that do not comply to SMPTE recommendations. To avoid problems with HD references, the following rules should be followed:

1. Use a "black" reference signal (no video content in the reference signal).
2. Terminate the reference signal with a 75 ohms termination.

4.19 In the DVI-Ramp's SDI (SD or HD) output there are some pixel values that lie outside the recommended range of SMPTE. Why ?

This typically happens when driving graphic images into the DVI-Ramp. Graphic generation software usually uses the full range of possible pixel values. In 8 bits, this full range translates into quantization levels [0 to 255] and in 10 bits this means levels [0 to 1023].

On the other hand, video equipment and engineers follow SMPTE recommendations for Luma and Chroma ranges : Luma=[64 to 940], Chroma=[64 to 960]. This difference of dynamic range between the graphic and video worlds must be compensated. When going from the graphic world to the video world, a "compression" of the graphic dynamic range must be performed to fit into the video dynamic range.

By default, the DVI-Ramp does not modify the dynamic range of its input to generate its output. This behavior makes the DVI-Ramp as transparent as possible.
Thus full-range graphic going through the DVI-Ramp would generate full-range video that would be out of the recommended levels of SMPTE.

Developers can change this behavior by programming different values for the matrix and offsets coefficients of the DVI-Ramp's color-space-conversion engine. The default matrix coefficients would need to be multiplied by a "compressing gain". In the example above this gain would be something like :

```
Gain for Luma coefficients   = (940 - 64 + 1) / (1023 - 0 + 1)) = 0.856
Gain for Chroma coefficients = (960 - 64 + 1) / (1023 - 0 + 1)) = 0.876
```

The offset coefficients (added to result of matrix output) would be as follows:

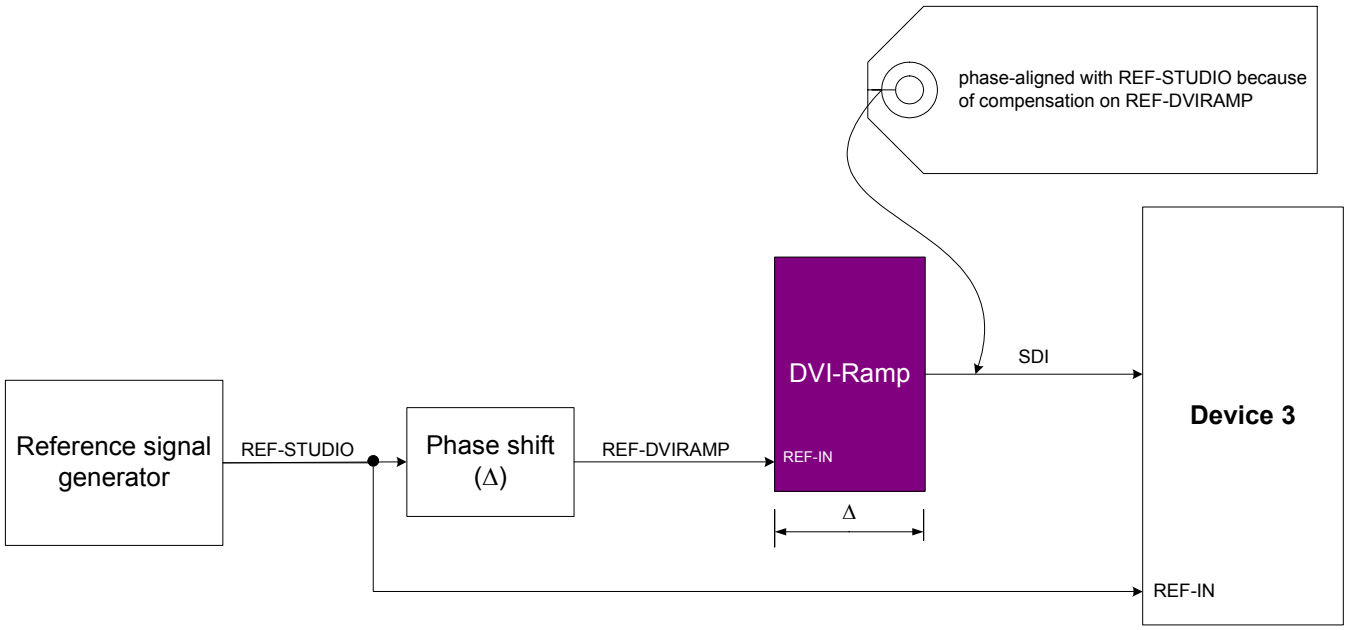
```
Offset for Luma   = 64
Offset for Chroma = 512       (chroma values swing about level 512)
```

4.20 My SD/HD SDI output is stable but horizontally off-center of my display. Why ?

This could happen if the DVI-Ramp is genlocked to a reference signal (call it REF-DVIRAMP) and its output is fed to another device genlocked to the same reference signal. The explanation and solution of this issue lies in the processing delay of the DVI-Ramp that depends on the type of conversion performed. This delay is composed of two parts: a temporal delay (an integer number of fields/frames) and a horizontal delay (a fraction of a line). For this issue, only the horizontal delay is of importance.

When the DVI-Ramp is genlocked to REF-DVIRAMP, the horizontal delay will create a phase difference between the V-sync of REF-DVIRAMP and the V-sync of its SDI output (they will be locked but not phase-aligned). This delay (phase misalignment) is in the order of a few microseconds (0% to 25% of a line).

To align the V-sync of the SDI output with the "studio" reference (REF-STUDIO), you need to phase-shift the REF-DVI-RAMP to compensate the horizontal delay as show in the figure below.



A typical application of where this issue is pertinent is shown here.