



Nexeon HD User Manual

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Company Information

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Introduction

This manual describes the operation of the Nexeon HD PCI Express frame grabber from dPict Imaging.

System Requirements

The following are the minimum system requirements for the Nexeon HD.

- IBM compatible PC with Pentium II or later processor
- Available PCI Express bus slot
- 512 MB of system memory
- Microsoft Windows® 2000 or Windows® XP
- DirectDraw® compatible VGA display card
- A dPict Imaging Nexeon HD PCI Express board

Installation Procedures

The following is the installation procedures for the Nexeon HD frame grabber.

New Installations

- Insert the Nexeon HD into an available PCI Express slot.
- Upon starting Windows, the New Hardware Wizard will detect the Nexeon HD and prompt for the drivers to be installed. Insert the Nexeon Setup Disk and Windows will find the nexeonhd.inf file to complete the driver installation. After a successful installation, the Windows Device Manager will report the Nexeon HD as a dPict Imaging Device.
- Insert the Nexeon Setup CD into the system's CD ROM drive.
- If the system has the autorun feature enabled for the CD ROM device, the installation should begin automatically. If not, browse the CD and launch the setup.exe program to begin the installation.
- At the Welcome Screen, click NEXT and read the license agreement carefully. Select the "I accept the terms of the license agreement" button and click NEXT to begin installation.
- Click NEXT to approve the default destination location of the installation. If you would like to change installation locations, click CHANGE and enter or browse for the new installation location and click OK.
- Click INSTALL to begin the copying of files to the selected location.
- Click FINISH to complete the installation and click YES to allow the system to reboot to have the changes take effect.

Removing Installations

To remove the Nexeon Setup installation from your system ...

- Insert the Nexeon Setup CD into the system's CD ROM drive.
- Run setup.exe from the CD if the installer does not launch automatically.
- Select the REMOVE button and click NEXT and REMOVE to begin the uninstall.
- Click FINISH and allow the system to reboot for the changes to take effect.

OR

- In the system's CONTROL PANEL, launch the ADD OR REMOVE PROGRAMS application.
- Find the Nexeon HD program in the list of currently installed programs and select REMOVE.
- Click YES to begin the uninstall.
- Click FINISH and allow the system to reboot for the changes to take effect.

Nexeon HD Hardware Description

Nexeon HD is a full-featured PCI Express video capture board for standard or high-definition video inputs in analog or digital formats. Nexeon HD supports the capture and display of HDTV or VGA display through analog or HDMI digital inputs. Nexeon comes equipped with an on-board DSP and plenty of memory for fast and reliable video data transfer to system or display memory.

Nexeon HD Specifications

Video Input

- Standard or High-Definition analog or digital
- YPrPb/RGB, S-Video, or composite video input
- DVI or HDMI input support

SD Video Acquisition

- NTSC (J,M, 4.43) PAL (B,D,G,H,I,M,N,Nc,60) and SECAM (B,D,G,K,K1,L) support
- Programmable control of contrast, brightness, hue, and saturation
- High-quality 10-bit digitization
- Square-pixel and CCIR-601 resolution support
- On-board EEPROM for calibration settings

HD Video Acquisition

- Up to 150 MHz acquisition rate
- Progressive scan input support
- HDTV standard support up to 1080i
- VGA display resolution support up to 1280x1024 @75Hz

Video Formatting

- Smooth interpolated scaling to randomly sized windows
- Bus-mastered video transfers to system, display, or overlay memory
- 64 MB on-board frame buffer
- Area of interest transfers to system memory
- Configurable LUT
- RGB 32/24/16/15/8 and YUV 4:2:2 pixel formats
- Extensive interrupt control for robust capture

I/O Control

- 4 general-purpose I/O triggers
- Programmable between input and output triggers
- Automatic display mode and sync detection
- +12V DC power output

Nexeon HD Architecture

Block Diagram

The Nexeon HD block diagram is shown below in Figure 1.

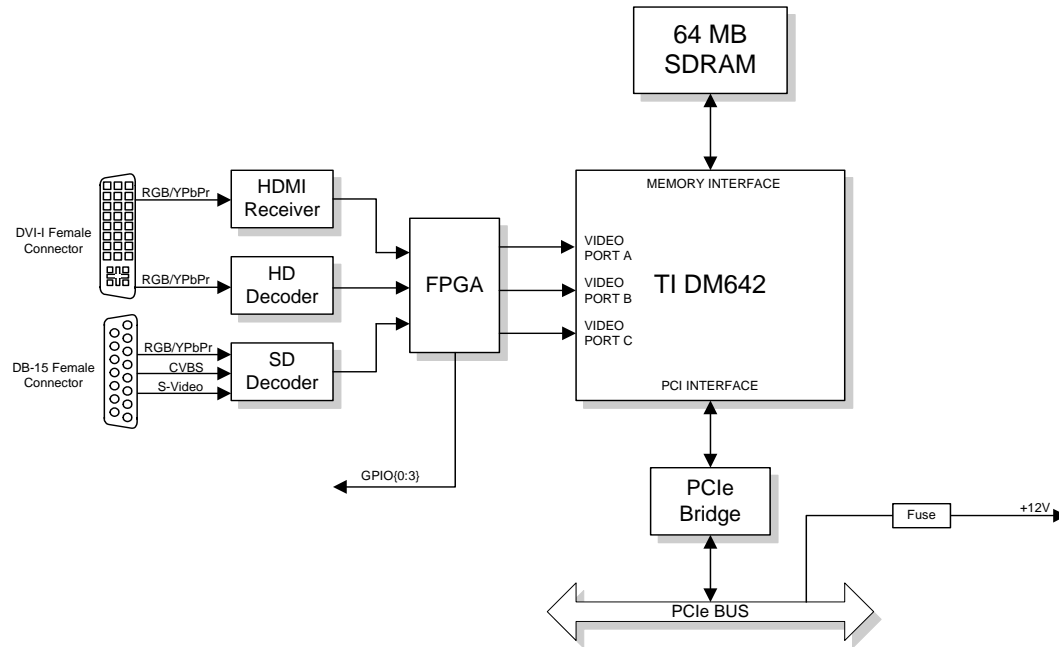


Figure 1. Nexeon HD Block Diagram

HDMI Receiver

Nexeon HD comes equipped with an HDMI receiver for the reception of digital video streams from HDMI transmission devices. Nexeon HD supports RGB 8-bit, 4:4:4 YCrCb 8-bit, and YCrCb 4:2:2 (8, 10, and 12-bit) data formats.

HD Decoder

The HD video decoder digitizes the incoming analog HDTV or VGA display data from the high-definition inputs. The HD decoder's A/D converters and PLL circuitry is optimized for capture and display of YPbPr and RGB video from 12 MHz up to 150 MHz pixel clock frequencies. The HD supports HDTV resolutions up to 1080i and display resolutions up to 1280x1024 @ 75Hz. The Nexeon HD supports both separate H and V sync or sync on green inputs.

SD Decoder

The SD video decoder is responsible for digitizing the incoming analog video from the standard definition inputs. The SD video decoder is capable of accepting video from component RGB or YprPb, S-Video, or composite video camera inputs in both NTSC and PAL standards. Video is digitized using 10-bit A/D converters and can be sampled in both

square pixel and CCIR-601 pixel rates. The decoder also provides for video adjustment for gain, offset, hue, and sharpness.

FPGA

The FPGA controls the flow of the digital video data from the video decoders and HDMI receiver to the DM642 video processor. It multiplexes data between the DM642's video input ports. The FPGA also controls the timing for the general-purpose I/O (GPIO {0:3}) triggers.

TI DM642 Video Processor

The TI DM642 is a high-performance video processor. It comes equipped with a VLIW 32-bit DSP, 64 MB of SDRAM, a video I/O interface, an I²C master interface, and a PCI bus interface. The DM642 receives the video data from the HDMI Receiver and stores the frames into local memory before being transferred to the host via its PCI bus interface. Video data can be simultaneously transferred to system memory, display or overlay memory of the host system. While in memory, the video data can also be scaled to any arbitrary window size or formatted to several different data formats.

PCIe Bridge

The PCIe bridge is a PCI to PCIe bridge that converts the 64-bit PCI data from the DM642 to the 1x PCI Express interconnect. The PCIe bridge can sustain data throughput rates at up to 190 MB/sec.

Connecting Video

Nexeon HD comes with two video connectors as shown below in Figure 2. The analog and digital HD video is supported through the DVI-I connector, and the analog standard definition video is supported through the DB15 connector.

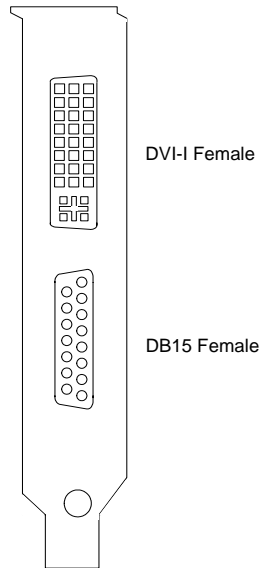


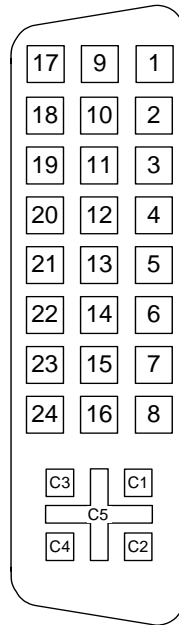
Figure 2. Nexeon HD Bracket Connector

Connecting HD Video

The DVI-I connector on the Nexeon HD supports both analog and digital high-definition (HDTV) video up to 1080i, or VGA display resolutions up to 1280x1024 (60 Hz). Table 1 below describes the pin-out of the DVI-I connector. Figure 3 on the next page shows the DVI-I pin-out.

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	Data 1-	9	Data 1-	17	Data 0-	C1	Analog Red
2	Data 1+	10	Data 1+	18	Data 0+	C2	Analog Green
3	GND	11	GND	19	GND	C3	Analog Blue
4	NC	12	NC	20	GND	C4	Analog H Sync
5	NC	13	NC	21	GND	C5	GND
6	DDC Clock	14	DVI VCC	22	GND		
7	DDC Data	15	GND	23	Clock+		
8	AV Sync	16	Hot Plug	24	Clock-		

Table 1. Nexeon HD DVI Connector Signal Names

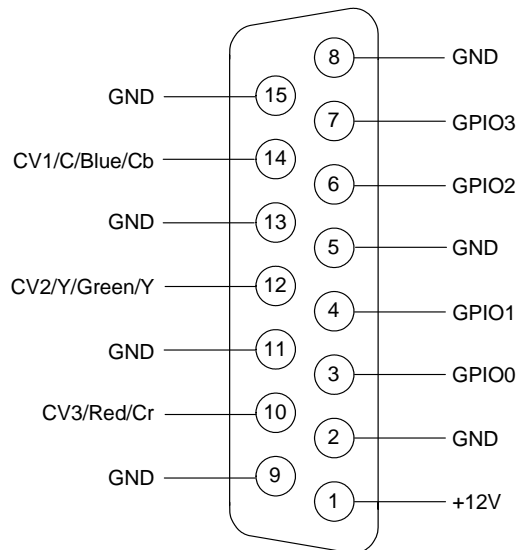


DVI-I Female

Figure 3. Nexeon HD DVI Connector

Connecting SD Video

Standard-definition video must be applied using the DB15 connector. Figure 4. below shows the DB15 connector pin-out.



DSub 15-pin Female
Samtec DSM-318-A-15

Figure 4. Analog SD Connector Pin-out

Nexeon HD Analog Cable

For standard-definition analog video sources, the Nexeon HD Analog Cable (part number 99006) can be used. Figure 5 below shows the cable diagram of the Nexeon HD Analog Cable.

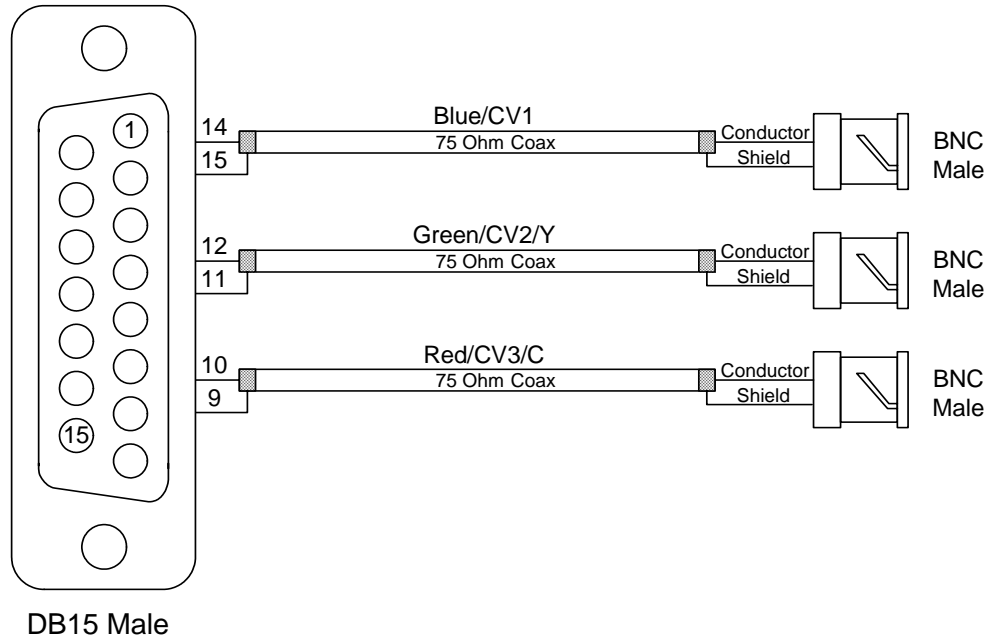


Figure 5. Nexeon HD Analog Cable

Nexeon HD Xtra Hardware Description

Nexeon HD Xtra is a full-featured PCI Express video capture board for real-time viewing and capture of HDTV or VGA display video inputs. Nexeon HD Xtra supports both digital SDI or HDMI digital inputs as well as analog component HDTV. Nexeon HD Xtra comes equipped with an on-board DSP and plenty of memory for fast and reliable video data transfer to system or display memory.

Nexeon HD Xtra Specifications

Video Input

- Standard or High-Definition analog or digital
- Serial Digital Interface (SDI)
- YPbPr/RGB analog support
- HDMI input support

Video Acquisition

- Up to 150 MHz acquisition rate
- Progressive scan input support
- 3G-SDI support (2.97 Gb/s)
- HDTV standard support up to 1080i
- VGA display resolution support up to 1280x1024 @75Hz

Video Formatting

- Smooth interpolated scaling to randomly sized windows
- Bus-mastered video transfers to system, display, or overlay memory
- 64 MB on-board frame buffer
- Area of interest transfers to system memory
- Configurable LUT
- RGB 32/24/16/15/8 and 4:2:2 pixel formats (HDTV/VGA)
- YCbCr 10-bit and 20-bit (SDI)
- Extensive interrupt control for robust capture

I/O Control

- 4 general-purpose I/O triggers
- Programmable between input and output triggers
- Automatic display mode and sync detection

Nexeon HD Xtra Architecture

Block Diagram

The Nexeon HD Xtra block diagram is shown below in Figure 6.

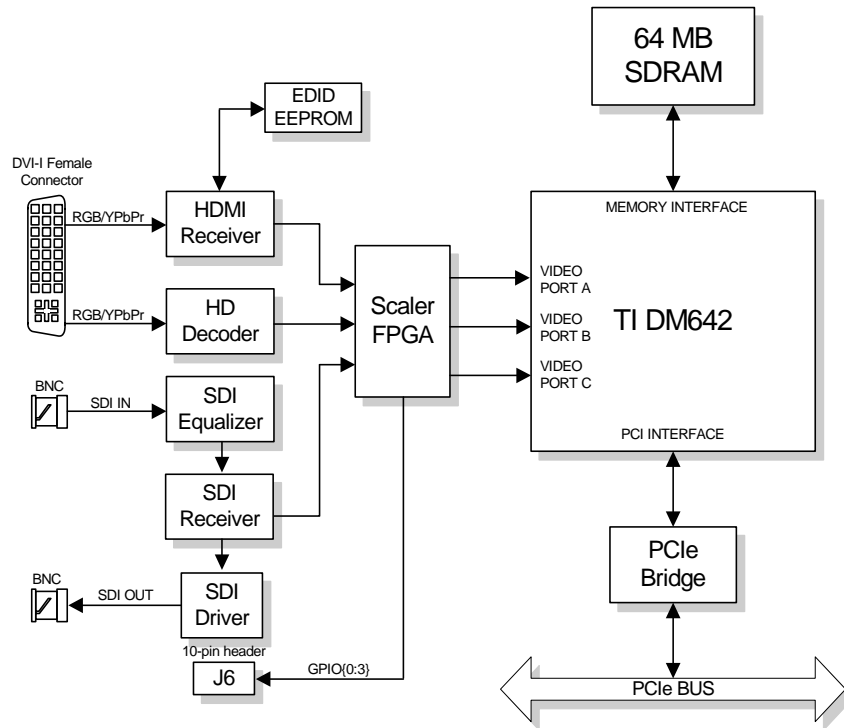


Figure 6. Nexeon HD Xtra Block Diagram

HDMI Receiver

Nexeon HD comes equipped with an HDMI receiver for the reception of digital video streams from HDMI transmission devices. Nexeon HD supports RGB 8-bit, 4:4:4 YCbCr 8-bit, and YCbCr 4:2:2 (8, 10, and 12-bit) data formats.

HD Decoder

The HD video decoder digitizes the incoming analog HDTV or VGA display data from the high-definition inputs. The HD decoder's A/D converters and PLL circuitry is optimized for capture and display of YPbPr and RGB video from 12 MHz up to 150 MHz pixel clock frequencies. The HD supports HDTV resolutions up to 1080i and display resolutions up to 1280x1024 @ 75Hz. The Nexeon HD supports both separate H and V sync or sync on green inputs.

SDI Equalizer/Receiver

The SDI Equalizer/Equalizer is a multi-format SDI receiver and accompanying equalizer which includes complete SMPTE processing and cable signal restoration as per SMPTE 425M, 292M and SMPTE 259M-C specifications with data rates up to 2.97 Gbits/sec. The Equalizer/Receiver can accept and support SDI video from SDI, HD-SDI, or 3G-SDI formats.

Scaler FPGA

The Scaler FPGA controls the flow of the digital video data from the HDMI receiver, HD Decoder, and SDI Receiver to the DM642 video processor. It switches and multiplexes data between the DM642's video input ports. The Scaler FPGA also incorporates an interpolated scaler while also controlling the timing for the general-purpose I/O (GPIO {0:3}) triggers.

TI DM642 Video Processor

The TI DM642 is a high-performance video processor. It comes equipped with a VLIW 32-bit DSP, 32 MB of SDRAM, a video I/O interface, an I²C master interface, and a PCI bus interface. The DM642 receives the video data from the Camera Link Receiver and stores the frames into local memory before being transferred to the host via its PCI bus interface. Video data can be simultaneously transferred to system memory, display or overlay memory of the host system. While in memory, the video data can also be scaled to any arbitrary window size or formatted to several different data formats. The DM642 also handles bayer filter conversion to RGB/YUV pixel formats in real time.

PCIe Bridge

The PCIe bridge is a PCI to PCIe bridge that converts the 64-bit PCI data from the DM642 to the 1x PCI Express interconnect. The PCIe bridge can sustain data throughput rates at up to 190 MB/sec.

Nexeon HD Xtra Connectors

The Nexeon HD Xtra comes equipped with two BNC connectors for SDI input and SDI loopthrough and a DVI connector for the HDTV, HDMI, and VGA display video inputs.

Figure 7 below shows Nexeon HD Xtra bracket connector.

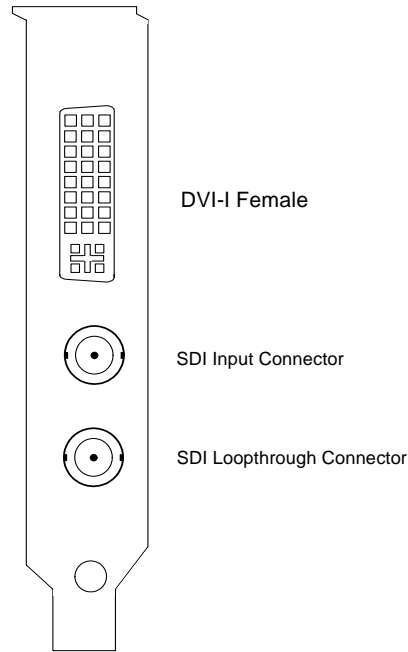


Figure 7. Nexeon HD Xtra Bracket Connector

Table 2. and Figure 14 provide the signal names and pin numbers for the DVI connector. Nexeon HD Xtra uses a DVI-I dual-link connector connected in single link mode. See figure 3 in the Nexeon HD hardware description for a pin-out drawing of the Nexeon HD Xtra DVI connector.

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	Data 1-	9	Data 1-	17	Data 0-	C1	Analog Red
2	Data 1+	10	Data 1+	18	Data 0+	C2	Analog Green
3	GND	11	GND	19	GND	C3	Analog Blue
4	NC	12	NC	20	GND	C4	Analog H Sync
5	NC	13	NC	21	GND	C5	GND
6	DDC Clock	14	DVI VCC	22	GND		
7	DDC Data	15	GND	23	Clock+		
8	AV Sync	16	Hot Plug	24	Clock-		

Table 2. Nexeon HD Xtra DVI Connector Signal Names

dPiction HD

dPiction HD is a Windows capture and display program for the Nexeon HD. It can also be accessed by the Windows Start Menu under the dPict program group. This section describes the dPiction HD application.

Video Preview

When the dPiction HD application starts, the video that is connected to the Nexeon HD can be seen in the preview window. This is indicated by the Live tab being selected in the video preview window.

The information frame on the left shows the detected boards installed in the system and shows the dPiction application version details. For convenience in saving video, live video can be paused by clicking on the Pause Video icon. Figure 6 below shows the Live Video Preview window.

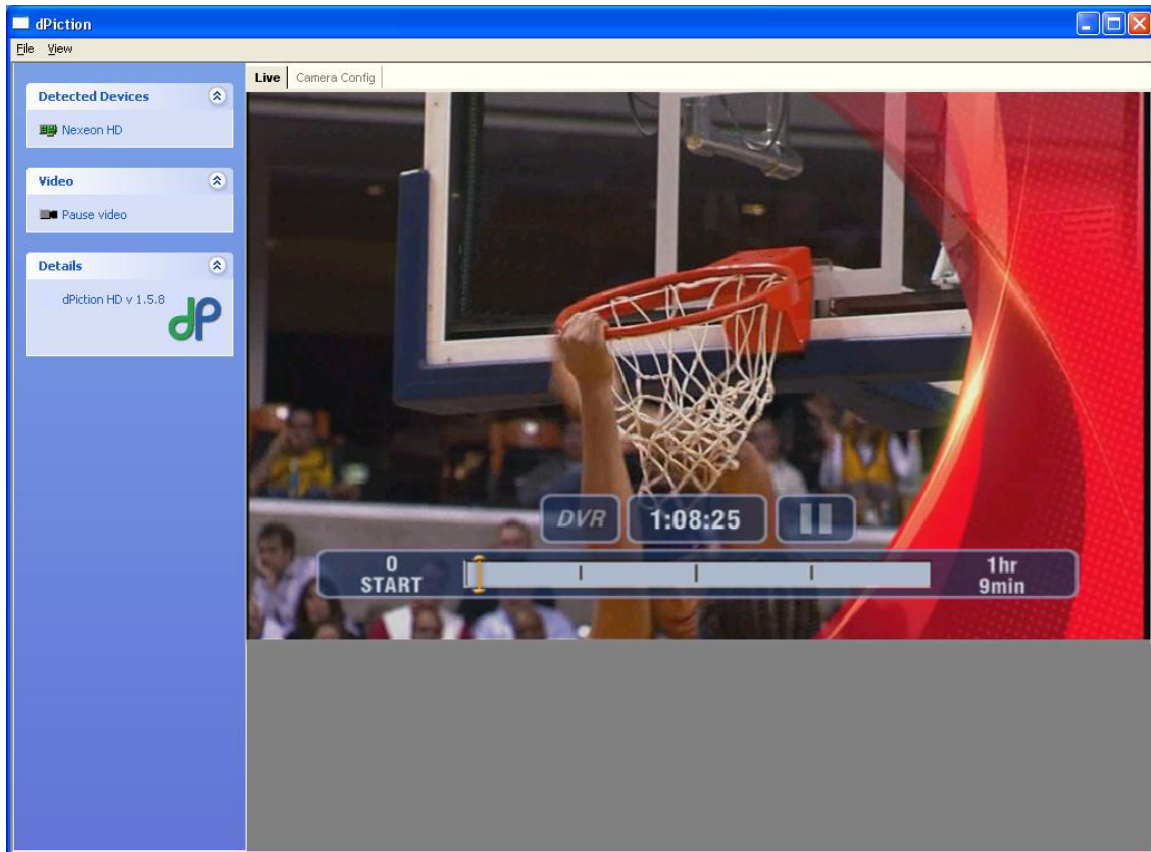


Figure 6. dPiction HD Live Preview Window

Video Capture

dPiction HD supports the frame capture of video to a file. To save an image, select Save Image from the File menu at the top of the dPiction application window. Files can be saved in the bmp format.

Video View Settings

The live video in the preview menu may be viewed in scaled or full size. By default, dPiction HD starts in Scaled to Fit mode. In this mode, the video is scaled to fit the size of the dPiction HD application window. The dPiction HD application can be scaled to any arbitrary size up to the size of the system's display. For view full size, select Full Size under the Video View menu.

In full size mode, video is displayed up to the size of the display system's settings. If the video input is larger than the system's display setting, the video will be cropped and panning is enabled with slider bars on the horizontal and vertical sides of the video preview window.

Video Configuration

Video settings can be configured in the Camera Configuration tab. Figure 7 below shows the Camera Configuration menu.

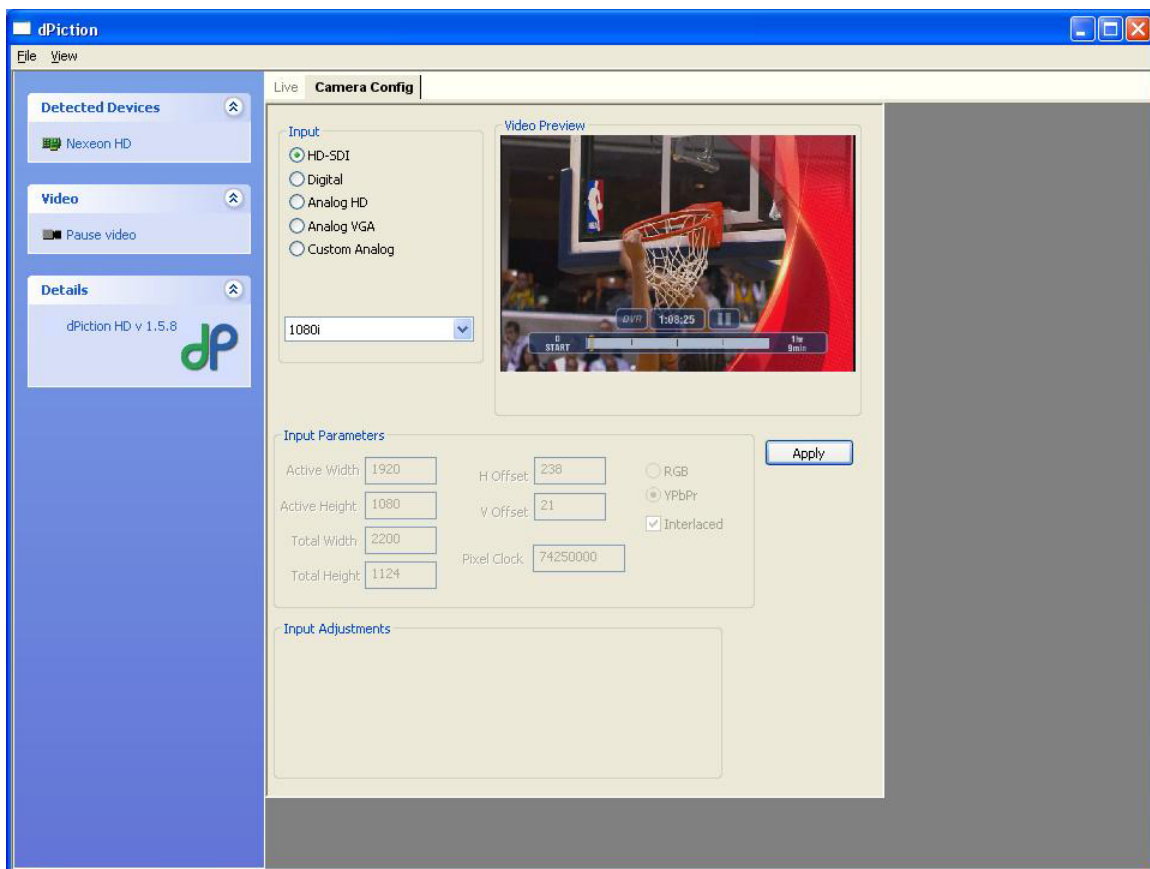


Figure 7. Camera Configuration Menu

Digital Input Configuration

For digital HDMI video, select the Digital button in the Camera Configuration menu and click Apply. Nexeon HD automatically aligns the video. The Video Preview windows can be used to verify the proper alignment of the video.

Analog HD Input Configuration

For analog HDTV video, select the Analog HD button in the Camera Configuration menu. Then select the proper format in the pull-down menu and click Apply. Verify the proper alignment of the video by the Video Preview window.

Analog VGA Input Configuration

For analog VGA display video, select the Analog VGA button in the Camera Configuration menu. Then select the proper format in the pull-down menu and click Apply. Verify the proper alignment of the video by the Video Preview window.

Custom Analog Configuration

dPicition also allows for custom video types to be entered in the Camera Configuration menu. For custom video types, enter the Total and Active resolution of the input, the pixel clock, horizontal and vertical offset, and the video format type and select Apply. Verify the proper alignment of the video by the Video Preview window.

By default, predefined values will be loaded into the custom configuration menu based on the input format last selected in input section. This allows for fine adjustment of the video settings for those video types.

DirectShow®

DirectShow® is a multimedia framework developed by Microsoft® to enable video streaming in applications conforming to the DirectShow API. Nexeon HD Setup installs the DirectShow driver for the Nexeon HD, named dpictds_hd.ax, in the Windows/System32 directory. With the Nexeon HD DirectShow® driver, the Nexeon HD can be used to view and capture video with third-party applications that support the DirectDraw® framework.