DVP-7421BE

4 Channel Triplex
MPEG-1/2/4
Video/Audio Codec Card
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CE notification
The DVP-7421BE, developed by ADVANTECH CO., LTD., has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

On-line Technical Support
For technical support and service, please visit our support website at: http://www.advantech.com/support

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# Contents

## CHAPTER 1 GENERAL INFORMATION ......................................................... 5

1.1 INTRODUCTION .................................................................................. 6  
1.2 PRODUCTION FEATURE ................................................................. 7  
1.3 PRODUCT SPEC .............................................................................. 10  
   1.3.1 Hardware Requirements ..................................................... 11  
   1.3.2 Software Requirement ....................................................... 11  
   1.3.3 Block Diagram .................................................................... 11  
   1.3.4 Packing List .......................................................................... 12  
   1.3.5 Dimensions ........................................................................ 12  
   1.3.6 OVERVIEW ........................................................................... 14  
   1.3.7 CONNECTOR AND PIN DEFINITION .................................... 15

## CHAPTER 2 PRODUCT INSTALLATION ................................................... 19

2.1 HARDWARE INSTALLATION ............................................................... 21  
2.2 SOFTWARE / DRIVER INSTALLATION ............................................. 22  
2.3 DEMO PROGRAM FUNCTIONALITY .................................................. 29  
   2.3.1 Channel Select ..................................................................... 29  
   2.3.2 Video Standard .................................................................... 30  
   2.3.3 Encoding Format .................................................................. 30  
   2.3.4 Resolution ........................................................................... 31  
   2.3.5 Encoding Mode .................................................................... 31  
   2.3.6 Playback Mode ..................................................................... 32  
   2.3.7 Preview Mode ....................................................................... 34  
   2.3.8 Snapshot ............................................................................... 35  
   2.3.9 Motion Detect ....................................................................... 36  
   2.3.10 Setting Save ......................................................................... 38  
   2.3.11 Sensor Control .................................................................... 39  
   2.3.12 GPIO control ....................................................................... 41  
   2.3.13 ENC control ......................................................................... 42  
   2.3.14 EE Control .......................................................................... 43  
   2.3.15 Convert Function .................................................................. 44  
   2.3.16 Multi-Board ID Reorganization ............................................ 45

## CHAPTER 3 DVP-7421BE TRIPLEX EXPERIMENT ................................. 47
3.1 PLATFORM : P4 PLATFORM ............................................. 52
3.2 APPENDIX : MPEG4 SOFTWARE DECODER ....................... 54
Chapter 1  General Information

1.1  Introduction

The DVP-7421BE is a high-end video capture board with a hardware codec (simultaneous compression/decompression, or encode/decode) engine. It supports 4-channel live preview, video/audio compression and playback at D1 resolution and 120/100 fps. Up to four DVP-7421BE boards can be installed in one PC for concurrent live viewing, compression and playback of up to 16 channels at D1 resolution and 480/400 fps. The programmer can use the comprehensive SDK to load protection code or system parameters into the on-board 128-byte EEPROM. The SDK comes with sample code for reference. The hardware codec engine makes the DVP-7421BE the ideal platform for applications like network video servers, Video conferencing and high-end digital video recorders.
1.2 Production Feature

The photo is the main interface of DVP-7421BE sample program. The DVP-7421BE feature is like below:

A. EEPROM function ready product
Customer can write the value in EEPROM and check the value before surveillance software boot up. System Integrator can design protection to protect software system. Valid offset values are between 0-127, Valid output values are in the range of 0 and 255.

B. Full D1, real time, MPEG1/2/4, Video and Stereo Audio Hardware Encode
The DVP-7421BE support the full D1 resolution, real time (encode frame rate 30 fps). Moreover, the DVP-7421BE can encode the stereo audio input to MPEG1-LayerII format.

C. Full D1, real time, MPEG1/2/4, Video and Stereo Audio Hardware Decode
Like encode model, the DVP-7421BE can decode D1 resolution, real time, and stereo audio out. The user can easily playback the compression by the
DVP-7421BE hardware capability.

D. Software Decoder to AVI
The DVP-7421BE support software decode that can convert compression MPEG file to AVI format (*.Divx). It is convenient for customer integrate the function to their software system.

E. GPIO access control
User can integrate the DI/DO device, like warning alarm or IR sensor. The demo program can show and feedback the signal information connection or not. It’s a function good for SI combine various device to establish powerful surveillance system.

F. Smart Quad Real-time Raw Data Preview
This special characteristic function can support the user raw data to further advantage. For example, one can use the function in the domain of intelligent analysis, image comparison and optical Inspection, etc. The Smart Quad raw data can provide the 4CIF video files that combined in D1 resolution block. The customer also can choices one of Quad to advance operation.

G. Hardware Motion Detection
The DVP-7421BE hardware support motion detection. User can set nine areas to monitor the video changes. The degree of changes could set by library code. It is a benefit for software develops less effort on motion function.
H. Video Configuration
The DVP-7421BE can configure the most feature of video. User can set GOP frames, GOP type, Video Format, Frame rate, Video Bit rate, Average Video Bit Rate, Audio Bit rate, Audio Sampling rate, etc.

![Encoding parameters setting](image)
# 1.3 Product Spec

<table>
<thead>
<tr>
<th><strong>Video</strong></th>
<th><strong>Audio</strong></th>
<th><strong>Software &amp; Development Kit</strong></th>
<th><strong>Hardware</strong></th>
<th><strong>Environment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Video Standard</strong></td>
<td><strong>Audio Input</strong></td>
<td><strong>Operating System</strong></td>
<td><strong>Host Interface</strong></td>
<td><strong>Temperature</strong></td>
</tr>
<tr>
<td>Composite for NTSC/PAL</td>
<td>4 x stereo inputs (8 x BNC connectors)</td>
<td>Supports Microsoft Windows XP and Windows 2000</td>
<td>PCI bus</td>
<td>-10 ~ 60°C, Operating -20 ~ 70°C</td>
</tr>
<tr>
<td><strong>Video Input</strong></td>
<td><strong>Audio Output</strong></td>
<td><strong>DirectX Required</strong></td>
<td><strong>Max. Card</strong></td>
<td><strong>Dimensions (W x L)</strong></td>
</tr>
<tr>
<td>4 x BNC connectors</td>
<td>4 x stereo outputs from decoder</td>
<td>Version 9 or above</td>
<td>4</td>
<td>182.6 x 106.9 mm (7.2&quot; x 4.2&quot;)</td>
</tr>
<tr>
<td><strong>Capture Resolution</strong></td>
<td><strong>Audio Encoding</strong></td>
<td><strong>Demo Program</strong></td>
<td><strong>DIO</strong></td>
<td></td>
</tr>
<tr>
<td>D1 (NTSC: 720 x 480; PAL: 720 x 576)</td>
<td>Supports MPEG1-Layer II</td>
<td>Complete demo program with VC++ sample code for reference</td>
<td>TTL/CMOS level 3.3 V, 4 DI/4 DO</td>
<td></td>
</tr>
<tr>
<td><strong>Frame Rate</strong></td>
<td><strong>Video Encoding</strong></td>
<td></td>
<td><strong>Power Consumption</strong></td>
<td></td>
</tr>
<tr>
<td>30/25 fps (NTSC/PAL) for each channel (total 120/100 fps @ D1 resolution)</td>
<td>MPEG-1/2/4 (CBR/VBR 128 kbps to 15 Mbps)</td>
<td></td>
<td>5 V DC @ 3 A, 12 V DC @ 0.5 A</td>
<td></td>
</tr>
<tr>
<td><strong>Image Processing</strong></td>
<td><strong>Video Output</strong></td>
<td></td>
<td><strong>Temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Hardware adjustment of hue, contrast, saturation, and brightness</td>
<td>PCI preview/playback stream</td>
<td></td>
<td>-10 ~ 60°C, Operating -20 ~ 70°C</td>
<td></td>
</tr>
<tr>
<td><strong>Video Loop-through</strong></td>
<td><strong>Video Loop-through</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 X BNC Connectors</td>
<td>4 X BNC Connectors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 1.1 Product spec*
1.3.1 Hardware Requirements

- CPU: Intel Pentium III 800MHz or above
- RAM: 256 MB SD RAM or above
- PCI slot: One PCI Slot or above
- VGA: AGP 4X above

1.3.2 Software Requirement

- Support Microsoft DirectX 9 or above
- Microsoft Windows 2000/XP
- Support Complete demo program with VC++ Builder programming language sample code for reference

1.3.3 Block Diagram

*Use four DVP-7421BE to consist of 16 channels application

Figure 1.1 Block diagram
1.3.4 Packing List

- 1 x DVP-7421BE video codec card
  P/N: 9692742100E

- 1 x Drive & Utility CD
  P/N: 2066742100

- 2 x 30 cm Dsub-15 to 8 x BNC connector
  P/N: 1700001618

- Board product warranty card
  P/N: 2190000902

1.3.5 Dimensions

![Diagram of dimensions]

**Figure 1.2 Dimensions**
**Figure 1.3 Bracket I/O definition**

### Audio Pig-tail cable

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ch1 Audio In</td>
</tr>
<tr>
<td>2</td>
<td>Ch2 Audio In</td>
</tr>
<tr>
<td>3</td>
<td>Ch3 Audio In</td>
</tr>
<tr>
<td>4</td>
<td>Ch4 Audio In</td>
</tr>
<tr>
<td>5</td>
<td>Ch1 Audio Loop out</td>
</tr>
<tr>
<td>6</td>
<td>Ch2 Audio Loop out</td>
</tr>
<tr>
<td>7</td>
<td>Ch3 Audio Loop out</td>
</tr>
<tr>
<td>8</td>
<td>Ch4 Audio Loop out</td>
</tr>
</tbody>
</table>

### Video Pig-tail cable

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ch1 Video In</td>
</tr>
<tr>
<td>2</td>
<td>Ch2 Video In</td>
</tr>
<tr>
<td>3</td>
<td>Ch3 Video In</td>
</tr>
<tr>
<td>4</td>
<td>Ch4 Video In</td>
</tr>
<tr>
<td>5</td>
<td>Ch1 Video Loop out</td>
</tr>
<tr>
<td>6</td>
<td>Ch2 Video Loop out</td>
</tr>
<tr>
<td>7</td>
<td>Ch3 Video Loop out</td>
</tr>
<tr>
<td>8</td>
<td>Ch4 Video Loop out</td>
</tr>
</tbody>
</table>
1.3.6 Overview

Extra Audio Input Stereo (L/R)
Extra Video Output
Extra Audio Output Stereo (L/R)
DIO Connector

4 x BNC Mono Audio In
4 x BNC Mono Audio Loop
4 x BNC Video In
4 x BNC Video Loop

Audio Pig-tail cable
- No1: Ch1 Audio in
- No2: Ch2 Audio in
- No3: Ch3 Audio in
- No4: Ch4 Audio in
- No5: Ch1 Audio Loop out
- No6: Ch2 Audio Loop out
- No7: Ch3 Audio Loop out
- No8: Ch4 Audio Loop out

Video Pig-tail cable
- No1: Ch1 Video in
- No2: Ch2 Video in
- No3: Ch3 Video in
- No4: Ch4 Video in
- No5: Ch1 Video Loop out
- No6: Ch2 Video Loop out
- No7: Ch3 Video Loop out
- No8: Ch4 Video Loop out

Smart-Quad TV Out
4 x BNC Mono Audio In
4 x BNC Mono Audio Loop
1.3.7 Connector and Pin Definition

A. Extra Video Output

<table>
<thead>
<tr>
<th>Pin</th>
<th>Type</th>
<th>Def</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Out</td>
<td>Video 1 Out</td>
</tr>
<tr>
<td>2</td>
<td>Out</td>
<td>Video 2 Out</td>
</tr>
<tr>
<td>3</td>
<td>Out</td>
<td>Video 3 Out</td>
</tr>
<tr>
<td>4</td>
<td>Out</td>
<td>Video 4 Out</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>GND</td>
</tr>
</tbody>
</table>

B. Extra Video Input

<table>
<thead>
<tr>
<th>Pin</th>
<th>Type</th>
<th>Def</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In</td>
<td>Video 1 In</td>
</tr>
<tr>
<td>2</td>
<td>In</td>
<td>Video 2 In</td>
</tr>
<tr>
<td>3</td>
<td>In</td>
<td>Video 3 In</td>
</tr>
<tr>
<td>4</td>
<td>In</td>
<td>Video 4 In</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>GND</td>
</tr>
</tbody>
</table>
C. Extra Audio Input (Stereo L/R)

<table>
<thead>
<tr>
<th>Audio Left Channel Input CON</th>
<th>Audio Right Channel Input CON</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pin</strong></td>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>1</td>
<td>In</td>
</tr>
<tr>
<td>2</td>
<td>In</td>
</tr>
<tr>
<td>3</td>
<td>In</td>
</tr>
<tr>
<td>4</td>
<td>In</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>
D. Extra Audio Output (Stereo L/R)

<table>
<thead>
<tr>
<th>Audio Left Channel Output CON</th>
<th>Audio Right Channel Output CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin</td>
<td>Type</td>
</tr>
<tr>
<td>1</td>
<td>Out</td>
</tr>
<tr>
<td>2</td>
<td>Out</td>
</tr>
<tr>
<td>3</td>
<td>Out</td>
</tr>
<tr>
<td>4</td>
<td>Out</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>
### E. DI/O connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Type</th>
<th>Def</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Out</td>
<td>GPIO 4</td>
</tr>
<tr>
<td>2</td>
<td>Out</td>
<td>GPIO 5</td>
</tr>
<tr>
<td>3</td>
<td>Out</td>
<td>GPIO 6</td>
</tr>
<tr>
<td>4</td>
<td>Out</td>
<td>GPIO 7</td>
</tr>
<tr>
<td>5</td>
<td>In</td>
<td>GPIO 0</td>
</tr>
<tr>
<td>6</td>
<td>In</td>
<td>GPIO 1</td>
</tr>
<tr>
<td>7</td>
<td>In</td>
<td>GPIO 2</td>
</tr>
<tr>
<td>8</td>
<td>In</td>
<td>GPIO 3</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>VCC</td>
</tr>
<tr>
<td>10</td>
<td>-</td>
<td>GND</td>
</tr>
</tbody>
</table>
CHAPTER 2

Product Installation
Chapter 2  Product Installation
To facilitate the installation of the DVP-7421BE device drivers and utility software, you should read the instructions in this chapter carefully before you attempt installation. The device drivers and demo program for the DVP-7421BE board are located on the 「Driver & Utility CD」.

Please install Driver & Utility software before install hardware into PCI slot.
2.1. Hardware Installation

1. Turn off your computer and unplug the power cord.
2. Remove the cover of your computer.
3. Touch the metal part on the surface of your computer to neutralize any static electricity that might be on your body.
4. Place the DVP-7421BE into the Motherboard’s PCI slot and connect corresponding pigtail cable to the back bracket of DVP-7421BE.
5. Replace the cover of your computer chassis.
6. Plug in the power cord and turn on the computer.

*Note: Keep the anti-static bag for future use. You might need the original bag to store the Module if you have to remove the card from the PC or transport it elsewhere.*

*Install 4 x DVP-7421BE codec card into one system can establish of 16 channels hardware compression DVR platform.*
2.2. Software/ Driver Installation

1. Insert the driver CD into your system's CD-ROM drive. Double-click the autorun icon. Then, a message pops up telling you to start the installation. Please click continue.

2. Click "Installation" to proceed to the next step.
3. Choose the video capture card that you want to install.

4. Click "Next" when you see the following message.
5. Please read the following license agreement and select "Yes" or "No" to next status.

6. Click "Next" when you see the following message.
7. There’re 3 kind of installation (Typical / Compact / Custom) can be selected. Choose “Typical” or “Compact” and click next then follow the step 11. Choose “Custom” and click next then follow the step 9.

8. Please choose the destination folder and click “Next”.
9. Please choose the items you want to install, and click “Next” after that.

10. Start copying file, please click “Next”
11. Following message shows that it's copying file to your computer.

12. When installing driver, there will be a windows pops up. Please click “Continue Anyway” to install driver.
13. Click “Finish” to complete the driver installation.
2.3. Demo Program Functionality

Start demo program from 「Start Advantech 「DVP7421B」
Following is demo program window.

2.3.1 Channel Select

Each “Channel” is representative of one codec chip. There are four channels for each DVP-7421BE. User can set different parameters to different channel.
2.3.2  Video Standard
Set the video standard of your camera and display.
Set the video and audio codec broadcast television systems.

2.3.3  Encoding Format
Set the encoding format for customize needs.
2.3.4 Resolution
Set the video encoding resolution.
D1 (NTSC : 720 x 480 ; PAL : 720 x 576)
VGA(NTSC : 640 x 480 ; PAL : 640 x 576)
QVGA(NTSC : 320 x 240 ; PAL : 320 x 288)
SIF (NTSC : 352 x 240 ; PAL : 352 x 288)
QCIF (NTSC : 176 x 120 ; PAL : 176 x 144)

2.3.5 Encoding Mode
Click 「 Encode 」 start encode video.
The bottom of the windows will show the file size of the encode file if the encode function is proceed.
2.3.6 Playback Mode

There are two ways to show the result of playback.
1. Enable 「Display Windows」 watch the result in the display of host PC.
2. Connect the BNC cable out to the external display.
enable will shown on the host PC display
2.3.7 Preview Mode

The User can preview on host PC using 「Preview Mode」 demo program. First select the button 「Preview」 there will show the preview resolution setting windows. Ones choice the preview resolution 'Quad in a D1 preview windows and switch audio on/off. Then user can preview the video on screen.
2.3.8 **Snapshot**

Only on Preview Mode effect that can enable Snapshot function. Like the above figure, press the 「Snapshot」 to get the image data of specific channel video input. The snap image will be show on the up panel.

The snapshot saves in C:\Program Files\Advantech\DVP7421B
2.3.9 Motion Detect
Only on 「Encoding Mode」 enforce, then press the 「Motion Detect」 to enable the function that 「the movement」 of object will be connect the assigned command.

The detail 「Motion Detect」 parameter can refer the below figure.
The motion detect configure please refer the graph above.

Total 9 Areas compose D1(720x480) resolution
Area = 15x10 blocks
The block =16x16 pixel
2.3.10 Setting Save
Specify the path and filename for encode data.

Separate encode data into specify size.
2.3.11 Sensor Control
To set the brightness, contrast, hue and saturation of specific channel. Please refer to Chapter 2, 「DVP-7421BE Functions Library Summary」:

DVP7421B_SetBrightness
DVP7421B_GetBrightness
DVP7421B_SetContrast
DVP7421B_GetContrast
DVP7421B_SetSaturation
DVP7421B_GetSaturation
DVP7421B_SetHue
DVP7421B_GetHue
DVP-2420E_GetBrightness
2.3.12 GPIO control
To get a specified 4 DI value or to set a specified 4 DO value.

The user can connect the GPIO device. For example, ones
connect DI 1 and DO 2. When user push "Get" button, the blank will
show the hook. The GPIO can confirm connection.
2.3.13 ENC control
The encode parameter are tuned more detail to tune in this item.

GOP frame : Set the value of Group Of Pictures between 1~256.
GOP type : Set type of mpeg I.P.B frame sequence.
Frame rate : Set the NTSC/PAL and the encode frame rate per second.

Video bit rate : Set the encode video compression rate between 128~15000kbps
Average Video bit rate : Set the average encode video compression rate between 128~9000kbps
Audio bit rate : Set the encode audio compression rate
Press the button 「EE control」, the user can write two fields to EEPROM. When system shut down, the value will store. The user can write the key to protect the rights of the software. The numeric range of Address are 0~127, and the numeric range of Value are 0~255.
2.3.15 Convert Function
press the button” Mpeg4 to Divx” could convert the movie format from mpeg to Divx format video file.
2.3.16 Multi-Board ID Reorganization

Maximum performance Triplex example: The DVP-7421BE could preview, encode and playback simultaneously with four codec chip.

One system can install four DVP-7421BE capacities; it is notice below to recognize the board ID of multi-card.

The driver of the video capture device in the DVP-7421B is a DirectShow source filter. In the DirectShow, the device source filters are enumerated by the System Device Enumerator.

Because enumerate sequence is not by PCI Slot in proper ordering, there cannot know the video capture filter that is belong to which capture card owns. We use the below way to mapping video capture filter and capture card.

In the driver of the video codec chip, the instance of the video codec chip can be got corresponding to the order of the PCI slot.

We use the first codec chip to set the board ID (Refer to the SDK manual, DVP7421B_SetBoardID function.)

After setting the board ID, the board LED will show the board ID. Next step, the video capture device filter will read the board ID (Refer to the SDK manual, DVP7421B_GetBoardID function), so the video capture device filter is belong to corresponding capture card.
CHAPTER 3

DVP-7421BE
Triplex Function Experiment
Chapter 3 DVP-7421BE

Triplex Function Experiment

3.1 Platform: P4 Platform

Motherboard: Advantech AIMB-741E2-00A1 Motherboard

(Intel 845E+ICH4)

CPU: Intel Pentium 4, 2.4 GHz
Memory: KINGMAX DDR-433/400, 256MB
PCI bus: PCI 32-bit/33 MHz, 5 slots
VGA: Nvidia GeForce2 MX 400, AGP, 64MB
OS: XP Professional, SP2

HDD: WD, 40G
Experiment Parameter:
Video Standard: NTSC
Capture Frame Rate: real time, 30/25 fps for NTSC/PAL
Full D1 (NTSC: 720 x 480), QVGA (320 x 240)

<table>
<thead>
<tr>
<th>Input Video Channel</th>
<th>Function Setting</th>
<th>Each Capture Resolution</th>
<th>Average CPU load (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Preview</td>
<td>Full D1</td>
<td>30%</td>
</tr>
<tr>
<td>16</td>
<td>Encode</td>
<td>Full D1</td>
<td>10%</td>
</tr>
<tr>
<td>16</td>
<td>Decode</td>
<td>Full D1</td>
<td>10%</td>
</tr>
<tr>
<td>16</td>
<td>Host PC Display</td>
<td>Full D1</td>
<td>30%</td>
</tr>
<tr>
<td>16</td>
<td>Preview+ Encode</td>
<td>Full D1 (Preview QVGA*)</td>
<td>40%</td>
</tr>
<tr>
<td>16</td>
<td>Decode+ Host PC Display</td>
<td>Full D1 (Preview QVGA*)</td>
<td>40%</td>
</tr>
<tr>
<td>16</td>
<td>Preview+ Encode+ Decode</td>
<td>Full D1 (Preview QVGA*)</td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>Preview</td>
<td>Full D1</td>
<td>15%</td>
</tr>
<tr>
<td>4</td>
<td>Encode</td>
<td>Full D1</td>
<td>0~5%</td>
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<tr>
<td>4</td>
<td>Decode</td>
<td>Full D1</td>
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<tr>
<td>4</td>
<td>Host PC Display</td>
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<td>4</td>
<td>Preview+ Encode</td>
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<tr>
<td>4</td>
<td>Decode+ Host PC Display</td>
<td>Full D1</td>
<td>15%</td>
</tr>
<tr>
<td>4</td>
<td>Preview+ Encode+ Decode</td>
<td>Full D1</td>
<td>20%</td>
</tr>
</tbody>
</table>

*Depends on user’s MB design, PCI bandwidth consideration.
3.2 Appendix: Mpeg4 Software Decoder

The Document File,"MPEG4 Software Decoder", include two files.
First,"mpgviddec.ax" : Vweb MPEG4 Decoder Filter
Second,"VwebDemuxFilter2R.ax" : Vweb MPEG4 Demux Filter

(this file is a "Filter" separate the Video and Audio)
(File name can change by user)

User Guide Line:
In command line execute "command"
regsvr32 mpgviddec.ax  →  install
regsvr32 /u mpgviddec.ax  →  uninstall

regsvr32 VwebDemuxFilter2R.ax  →  install
regsvr32 /u VwebDemuxFilter2R.ax  →  uninstall