MULTI FORMAT

Roland

An Introduction to the

VC-300HD

Multi-Format Converter

-Why you need a real-time video converter in your workflow-

Introduction

Now that digital broadcasting service areas are expanding, and with the appearance of high-definition content on Blu-ray and HD DVD media, there is a strong demand for high definition content production.

Until these recent developments, HD content production had been comparatively simple, with the source of input being mainly limited to HD camera recordings. With television shifting to high definition and the rapid spread of high-definition video cameras for consumer use, location shooting in consumer HDV format with inexpensive cameras is becoming more popular. Meanwhile the transition to a tapeless era for broadcasting is underway. Overall, an extremely complex situation has arisen. If this had been a complete shift towards digital data in files handled by codecs, IP and the world of networking, this may not have presented so many challenges. In reality, we cannot ignore the world of real-time transmissions in which data streams of various formats are distributed via cable connection.

When viewed as, “Hi-Def”, the various HD formats probably look the same to many. In reality, however, video from different sources are likely to have different resolutions, bit rates, and frame rates. Moreover, when these are transmitted, it may be physically impossible to access files with different formats. It is getting so that you can’t easily manage simple tasks like dubbing or monitoring.

What is needed for this world of many formats is a multi-format converter that can convert from many formats to any other form. While it is possible to get devices that can specifically convert between just about any of the existing formats, for example between component and SDI, they are not cost effective or bi-directional.

To resolve the various challenges, Roland has designed the Edirol VC-300HD. This product has been shipping since March 2007 and has already proved to be very popular. This has occurred because production studios, broadcast facilities and duplication houses are pro-actively looking for multi-format converter solutions to avoid format compatibility issues and speed up the conversion process, saving time and money.

This document is designed for people who are considering the purchase of a multi-format converter. Here you will discover detailed information about the features and benefits of the VC-300HD. We hope that you will find valuable and informative in this challenging world of multi-formats.

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Writer: Nobuyoshi Kodera Cover photos: Shinya Aizawa
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Why you need a real-time converter

In no time at all, formats for HD recording have multiplied. Although the mainstream format for delivery of commercial broadcasting is HDCAM, an infrastructure to accommodate HDCAM-SR is also gradually coming into mainstream. On the other hand, the SD format is still being widely used for news coverage and the introduction of non-linear HD media such as XDCAM and P2 is being considered. As long as the video is output as HD-SDI, interoperability is possible.

It is not unusual for TV programs and promotion videos to be shot and recorded with cameras that use consumer HDV video formats. Moreover, from the adoption of SD, real time output from PC monitors was being recorded and broadcasted. Of course, this method is also effective in an HD environment. No matter how quickly you may have embraced HD, however, the advantages of non-linear editing are often hindered. Whenever real-time multi-format conversion is unavailable, you can suffer from three types of loss.

・Time wasted in conversion process

In some cases today, production companies are loading footage that needs converting to a non-linear editing system (NLE), and using software to convert to the desired format. This methodology is not practical or an efficient use of your NLE system. The process of loading each time into the NLE, rendering with software and then outputting may seem quick and convenient at first glance, but in many it just ends up taking more time than initially expected.

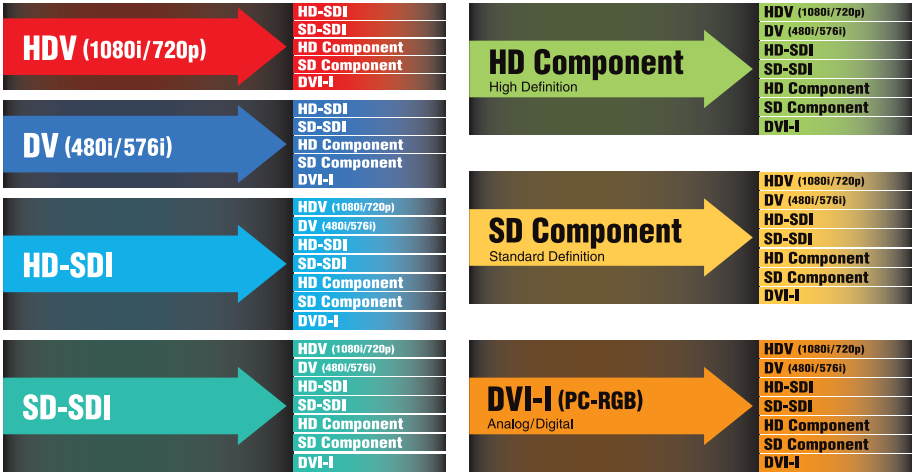
・Unnecessary investment in equipment

Conversion can tie up the entire NLE for long periods of time, and results in a shortage of temporary drive space and increases costs. Moreover, converting using an NLE system is a non-editing task that can unnecessarily tie up an expert editor. Thus, all the temporary storage space, which you need for a margin of safety during conversion, can add significantly to operating costs.

Monitoring various video formats is another issue. A monitor compatible with the format of the data needing conversion may not always be readily available. HD video can be checked on a PC monitor, but if you want to check output on a projector or consumer TV, you can only use HD-SDI or HDV.

・Lost business opportunities

In a fast paced production environment where speed, ease of use and reliability are essential, format compatibility can kill a project. As a result, we tend to avoid dealing with formats we are not sure about or we consider to be a hassle. If your studio doesn't deal with certain formats you may find yourself turning down business.
The production side examines work right down to the fine details and trouble avoidance is given high priority. If you have long-term relationships with clients, both sides know what the other can and cannot do. Of course, this may seem like an ideal way of working, but it can also mean loss of future business by refusing new clients with special format or conversion requirements. If your company can only deal with a limited number of formats it always runs the risk of not being competent to deal with large projects using formats beyond your capabilities.



Multi-format conversion options

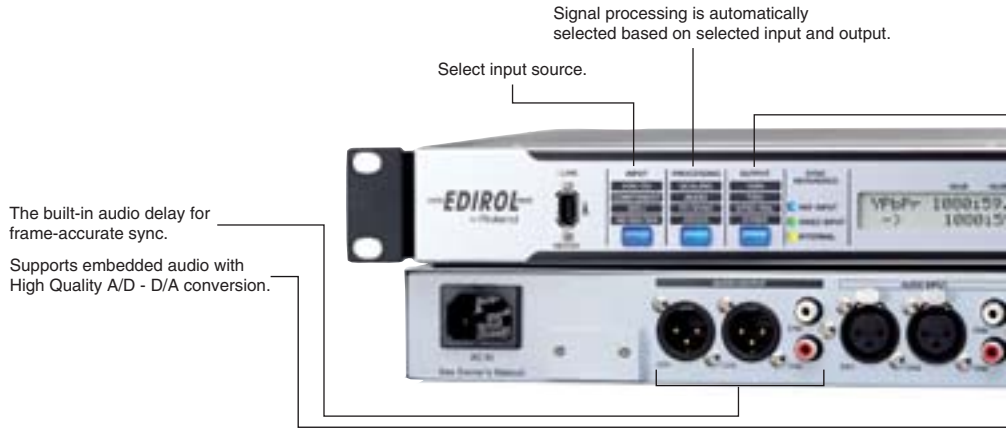
Support for various formats

The VC-300HD enables conversion between many all of the formats currently used in video production. It is a multi-format converter. Four connector types provide different data sources and destinations: IEEE1394, analog component, SDI, and DVI-I. HDMI connectivity is enabled through the use of a DVI-I conversion cable.

These different connectors provide access to a diverse variety of HD, SD and other resolutions. Naturally, to ensure conversion between resolutions, up conversion and down conversion are supported. Even in HD format, conversion from 720p to 1080i is far from unusual. This type of resolution conversion plus Interlace/ Progressive conversion is possible with the VC-300HD.

Moreover, output to a PC monitor can be converted to HDV and HD-SDI output. This makes it possible to capture PowerPoint slides and other software applications as immediately usable video content. Going the other way, video pro VCR content can be converted to data that can be viewed on PC monitors, via projectors, and on consumer TV screens.

Moreover, while China is geographically close to Japan, China is in the PAL region. When the 2008 Olympics are held in Beijing, Japan is bound to have to quickly deal with a lot more PAL content. The VC-300HD is not limited to NTSC format. It takes the different frame rates and resolution from PAL to NTSC output and vice versa. Up to now, no other converter has been available that enables you to convert just about all existing formats and provide bi-directional conversion.



Actual conversion procedure

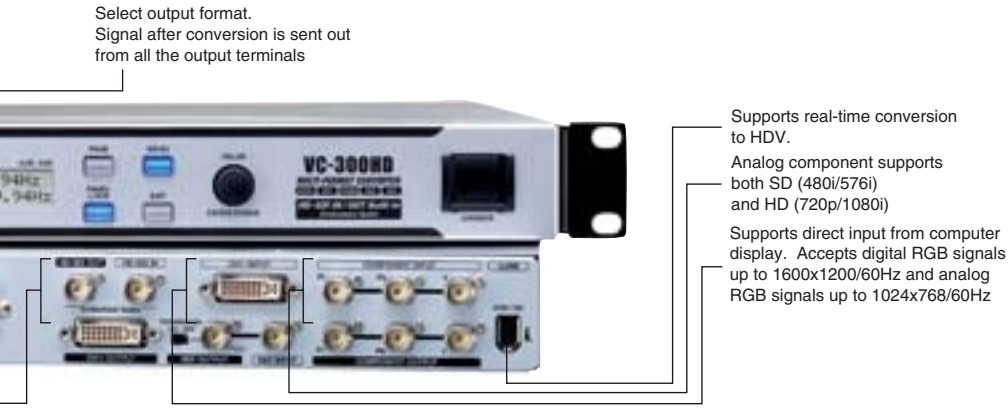
What does format conversion actually involve with the VC series? It's so simple that almost anyone who has operated video equipment can do it just by looking at the panel and selecting the settings. For instance, let's see how HDV content is converted and output to other formats.

Using a Firewire cable, connect the HDV camera output to the i.LINK input. While there is an i.LINK port at the rear of the unit, an i.LINk connector was added to the front for convenience. However, you can only use one at time, and one i.LINK port must be closed when the other is in use. You can leave the other output terminals - HD-SDI, DVI-I and analog component - permanently connected to devices or monitors.

Three function buttons on the front panel from left to right are labeled. From the left they are labeled INPUT, PROCESSING, and OUTPUT. After you press INPUT, it lights up blue. The display shows the name of the input connector being used. The unit automatically senses the type of incoming signal. All you have to do is check and select the active input connection. Turning the knob on the right, you cycle to i.LINK and select by pushing the knob. All the basic selection operations are done by turning the knob and pushing into select the displayed item.

Let's now take a look at the OUTPUT function. Once you selected the output format, the converter will automatically convert and output the video format desired. If the unit's automatic settings are acceptable, there is no need to access the PROCESSING button to adjust the parameters.

Furthermore, the VC-300HD can output the converted data via any of the connectors. For example, if you select 1080/59.94i, full HD video can be sent out parallel via the Analog Component, HD-SDI, and DVI-I connectors. That means that you don't have to actually select the output connector. This feature is convenient when you want to send converted video output to more than one device. Naturally, if you select 480/59.94i, the video is down converted to SD and can be output via all the connectors. In this instance, HD-SDI is automatically output as SD-SDI.



So, let's see what kinds of things you can do with PROCESSING. When you press the button, you can cycle through five parameters - Scaling Type, Out Zoom, Audio Delay Time, Sync Source, and TC Generate - and select settings for each.

Scaling Type lets you set the aspect ratio. Since selecting 4:3 would otherwise cut strips from the sides of the screen, you can choose between Squeeze or Letterbox. Appropriate options are also available for 16:9 video as well.

Out Zoom is especially effective when down converting. You can adjust the zoom amount from 50% through 150%, and when enlarging the screen, you can set positioning via menu options. There is more about this in the description of PROCESSING parameters on page 10.

By setting Audio Delay Time you can adjust the amount of delay between the video and soundtrack. This is especially useful if spoken words are out of synch with the movement of lips with the video. Fine tuning and adjustment can be as little as 0.01 frames. The default setting is 1.00 f to compensate the audio timing to match the delay resulting from the video conversion process.

Sync Source lets you set the reference for synchronization. The VC-300HD provides three options: Internal, Video Input, and REF Input. If not set manually, the optimal source will be automatically be selected. When converting between PAL and NTSC, if input and output are out of sync, internal synchronization is selected. If no external synchronization signal input is detected, synchronization is almost always set to Video Input. When conversion is output to a recorder, the input signal of the recording device works as the reference. Consequently, Auto detection usually presents no problems. When input is to a switcher or other source that requires synchronization, sync is accomplished via an external input.

With TC Generate you can select what to do about the embedded time code when using i.LINK and HD-SDI connections. When OFF is set, no code is output. Free Run uses the value set in the VC-300HD. When Thru is set, the time code that is sent via i.LINK and HD-SDI is embedded as it is. Using Offset, output can be adjusted with an embedded value applied to the time code. Thru output applied to incoming HDV is particularly convenient when you want to match offline and online time code data.

Picture quality evaluation

Although the VC-300HD is capable of diverse format conversions, the video quality is not compromised. Examine these frequently used resolutions in same-sized format conversion, down conversion and up conversion. These samples were converted via two-way connection between i.LINK (HDV/DV) and HD-SDI.

Original input video (HDCAM format). After conversion, each of the video samples have been cropped to remove the surrounding margin.

■HD/SD-SDI to i.LINK (HDV/DV) conversion

①	
Input	HD-SDI 1080/59.94i
Process	Format conversion
Output	1080/59.94i

②	
Input	HD-SDI 720/59.94p
Process	Format conversion
Output	1080/59.94i

③	
Input	HD-SDI 1080/59.94i
Process	Down conversion
Output	480/59.94i

④	
Input	SD-SDI 480/59.94i
Process	Up conversion
Output	1080/59.94i

①

Image after format conversion

②

Image after format conversion

③

Image after down conversion

④

Image after up conversion

HD-SDI video input was output via i.LINK. After the i.LINK output was captured in a non-linear system, the video samples were output as HD-SDI from a board installed in the non-linear system. In the conversion from HD-SDI to HDV, internal base-band input is encoded in real-time to MPEG2. This provides real-time encoder performance test results. When the 1080/59.94i output is selected, the cross conversion resolution is actually output at 1440 (horizontal) pixels.

■ i.LINK (HDV/DV) to HD/SD-SDI conversion

①	
Input	HDV 1080/59.94i
Process	Format conversion
Output	1080/59.94i

②	
Input	HDV 720/59.94p
Process	Format conversion
Output	1080/59.94i

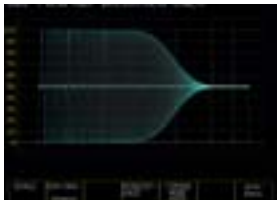
③	
Input	HDV 1080/59.94i
Process	Down conversion
Output	480/59.94i

④	
Input	DV 480/59.94i
Process	Up conversion
Output	1080/59.94i

The figure shows image samples and waveforms after the original video has been converted to HDV/DV format using the VC-300HD and then, again using the VC-300HD, converted to HD/SD-SDI output. In the conversion from HDV, once the MPEG2 decoding has been done, the scaler carries out processing to magnify or shrink the image. In the 1080i output, you can see that the HDV characteristics are output more or less unaltered.

① 

Image after format conversion



Multiburst waveform

② 

Image after format conversion

Multiburst waveform

③ 

Image after down conversion

Multiburst waveform

④ 

Image after up conversion

Multiburst waveform

'The Processing'—More than just a converter

The VC-300HD has functions that make it considerably more than just a simple format converter. Among the parameters you can access via the MENU button, you will find parameters related to video processing. For example, you can accent converted video with additional corrections and trimming. Below is a description of the parameters covered by the processing functions.

<table>
<tr><th>Item Number</th><th>Item Name</th><th>Description and Available Settings</th></tr>
<tr><td>200</td><td>Scaling Type</td><td>Sets the scaling type.
Squeeze: Uses the same aspect ratio as the input. Original Image 4 : 3 16 : 9
4:3 NTSC / 480i, PAL / 576i, 1024 x 768, 800 x 600, 640 x 480
4:3 (Letterbox), NTSC / 480i PAL / 576i
4:3 (Squeeze), NTSC / 480i PAL / 576i
16:9, 1080i, 720p
Side Panel/Let Box: Shows the entire image, with black shown in portions where there is no video image.
4:3, NTSC / 480i, PAL / 576i. 1024 x 768 800 x 600. 640 x 480
4:3 (Letterbox), NTSC / 480i PAL / 576i
4:3 (Squeeze), NTSC / 480i PAL / 576i
16:9, 1080i, 720p
Crop: Displays the image so as to fill the entire screen; does not show the portions extending outside.
4:3, NTSC / 480i, PAL / 576i, 1024 x 768 800 x 600, 640 x 480
4:3 (Letterbox), NTSC / 480i PAL / 576i
4:3 (Squeeze), NTSC / 480i PAL / 576i
16:9, 1080i, 720p</td></tr>
<tr><td>210</td><td>Out Zoom</td><td>Adjusts the magnification of the output video.
50—100—200%: Larger numerical values make the image larger.
* The maximum value that can be selected changes according to the combination of the input video format and the output format.</td></tr>
<tr><td>211</td><td>Out H Position</td><td>Adjusts the horizontal position of the output video when the aspect ratios of the input video and the output format are different and "Side Panel/Let" or "Crop" is selected with "200: Scaling Type."
-100—0— +100 %: Larger values move the image right.</td></tr>
<tr><td>212</td><td>Out V Position</td><td>Adjusts the vertical position of the output video when the aspect ratios of the input video and the output format are different and "Side Panel/Let" or "Crop" is selected with "200: Scaling Type."
-100—0— +100 lines: Larger values move the image up.</td></tr>
<tr><td>220</td><td>Noise Reduction</td><td>Obscures noise in the input video so it is unnoticeable. If it is set too strong, the video resolution may be reduced.
Off : Do not use 1—63:
The strength of the Noise Reduction</td></tr>
</table>

Item Number	Item Name	Description and Available Settings
221	Enhancement	Emphasizes the edges of the input video. If set too strong, the edges may look jagged. Off : Do not use 1—63: Strength of Enhancement
222	Video Red Gain	Sets the gain value for red in the video being output. 0 —100%: Larger numerical values indicate a stronger red color.
223	Video Green Gain	Sets the gain value for green in the video being output. 0 —100%: Larger numerical values indicate a stronger green color.
224	Video Blue Gain	Sets the gain value for blue in the video being output. 0 —100%: Larger numerical values indicate a stronger blue color.
240	AudioDelay Time	Sets the delay applied to the output audio. 0.00— 1.00 —15.00f * The time per frame changes according to the frame rate in the value set in "300:Video Out Format." Therefore, the range of values displayed on the screen (???.? ms) is as follows. 0.00 — 500.5 -When the frame rate is 59.94i/59.94p 0.00 — 600.0 -When the frame rate is 50i/50p
250	Audio Low Gain	Sets the low-range gain value for the sound being output. -12dB— 0 — +12dB: Increasing the numerical value increases the low-range gain value.
251	Audio Mid Gain	Sets the mid-range gain value for the sound being output. -12dB— 0 — +12dB: Increasing the numerical value increases the mid-range gain value.
252	Audio High Gain	Sets the high-range gain value for the sound being output. -12dB— 0 — +12dB: Increasing the numerical value increases the high-range gain value.
260	Sync Source	Sets the synchronizing signal input source. Auto : Selected automatically. REF Input: Selects the REF INPUT connector. Video Input: Selects the video being used. Internal: Uses the synchronizing signal generated internally.
261	Sync Adjust	Fine tunes the synchronizing signal. -1000— 0 — +1000 clock: May be adjusted in this range.
270	TC Generate	Selects the timecode to embed in the HDV, DV, or HD-SDI output. * On the VC-200HD, this is set to "Off" at the factory. Off : Time code is not embedded. Free Run: Timecode is generated internally. The timecode is generated from when the power is turned on or when “271: TC Offset” is set. Free Run: The time code starts (preset) from the moment settings are made with "271: TC Offset." Thru : Use the timecode input from an external source. The timecode that is used will be that which is embedded in the signal of the video connector being used. * This setting is ignored when the frame rates of the input video and the output format are different The time code output here is the same as when "Free Run" is set. Offset: Output the timecode input from an external source with the offset set with “271: TC Offset” appended to it. The TC that is used will be that which is embedded in the signal of the video connector being . used.
271	TC Offset	Sets the offset to apply when “Offset” is selected with “270: TC Generate.” This value will be the time code's preset value when "Free Run" is set for "270: TC Generate." The hour (h), minute (m), second (s), and frame (f) values can be set independently for this item. 00h00m00s00f —23h59m59s24f 00h00m00s00f —23h59m59s24f 00h00m00s00f —23h59m59s29f (When the frame rate value set for "300:Video Out Format" is 59.94i or 59.94p) * The available range for this parameter changes when the "300: Video Out Format" parameter is changed. * When "Free Run" is set for "270: TC Generate," the time code count is reset when this item setting is changed.
274	User Bit	Sets the user bit embedded in the timecode when "Free Run" is set with "270: TC Generate." * Because there is no impact when the value set for "270: TC Generate" is not "Free Run," the input user bit is passed through without any change. If no user bit is input, "FF FF FF FF" is output. This item sets each value independently. 00 —FF, 00 - FF, 00 —FF, 00 - FF: May be adjusted in this range.
275	Drop Frame	Selects drop frame/non-drop frame for the time code when "Free Run" is set with "270: TC Generate." Drop : Selects Drop Frame. Non Drop: Selects Non-drop Frame. * The setting is not valid when "1080/50p," "1080/50i," "720/50p," "576/50p," or "576/50i" is selected with "300: Video Out Format."

* For items 201-212 and 220-224, please adjust while confirming on a video monitor.

* The values enclosed in a box are the factory defaults.

Superior picture quality after down conversion—Interview Shinji Kobukata

Though he is not a celebrity, image creator Shinji Kobukata is well known in the industry as a major player behind the scenes. (Photo 1)

Among his numerous productions are many promotion videos for artists belonging to a Japanese major label. He has also had a major hand in editing and directing the opening titles of Japanese TV shows. More recently, he was in charge of editing the live DVD of Japan's most popular female singer, Ayumi Hamasaki. Mr. Kobukada was a perfect candidate to put the VC-300HD through its paces.

First of all, how do you like the way it operates?

It was very easy to use and very intuitive. I was actually able to do nearly everything without needing to look in the manual. To take full advantage of it's feature set, especially the extra processing features, I looked through the manual.

You must have tried out various conversions. What did you like best?

Photo 1. Edit Puffin Director Shinji Kobukata

I was most impressed by the down-converted picture quality. Right now at home I have an ordinary HD VTR and it has a built-in down-converter. The results are so obviously different to the output of the VC-300HD. I was surprised when I checked the line between the bright and dark areas. Usually, along the boundary, you see blurring. But with the VC-300HD there wasn't any. The overall level of detail is incredible. It's so beautiful. (Photos 2 and 3)

I also used to do a lot of chroma key editing with down-conversion. Frequently shooting is done in HD and editing and final output are in SD. But after down-conversion the results are not good. Despite the time it took, I sometimes did the keying in HD and then down-converted to SD. I tended to feel that the results of down conversion could have been better. When comparing to the output of the VC-300HD, I discovered that what I've done up until now doesn't look that great. I think I'll be making good use of the VC-300HD.

What did you think about the outline correcting feature?

Ah, yes, it works well, too. You don't need to use it but when you do it is good to be able to adjust the output level. Even so, noise reduction can do the opposite and make things fuzzy. I think I can find a use for it around here.

It's not just a converter. You can make internal adjustments. It's good for changing final image

Photo 2. Image down-converted by an ordinary HD VTR and output to a TV.

Photo 3. Image output from an ordinary HD VTR via HD-SDI and down-converted by the VC-300HD. Parameters and other settings were not adjusted.

positioning, when you magnify the picture.

Do you often use magnify?

In many cases, commercial films are shot, captured to HD with telecine, and finished with SD. If you have it in HD, you can pan and zoom in SD. So, it's great that you can magnify the picture and shift the frame a bit. In that respect, it has more functions than a simple converter. You can also do it after you get the video into a non-linear system, but then it has to do the rendering and it bogs down because of the huge file sizes.

I've heard that still only about 4 or 5% of commercials are delivered in HD.

No-one's shooting commercials directly to HD yet. The stance is that it can't yet be done efficiently at the PC level. Although it is OK to use PCs for simple cut editing or transitions of dissolve only, computers just don't have the power to deal with the heavy tasks of putting everything together.

What about the conversion options?

Component, SDI, DV... it seems to cover everything that the industry currently uses. I don't need more than that. I was just about to buy an HDV deck. But the one with HD-SDI costs a serious amount of money. But now I might get a much cheaper one and use this VC-300HD for HD-SDI.

Coming at it the other way, you also gain a path from HD-SDI to HDV.

As far as editing is concerned, you might be able to edit in HDV format. For instance, if you want to use HD-SDI for capture to Final Cut Pro, you need an input/output board. That means you need to move to a Mac Pro in a tower case. But now you can run the HDV data through this [VC-300HD]. Even if the video is HDCAM, it lets you do the editing in HDV on a MacBook Pro. Then again, if you are working with archives, rather than taking it to HDCAM, you can do it with HDV. You can burn it on a Blu-ray recorder via FireWire. You have a number of alternatives.

Wanting to make full use of HDV—Interview with a VC-300HD developer

The idea was for the VC-300HD to be able to deal with most of the popular formats at present. So why did they want to have a go at perfecting the huge number of conversion patterns other manufacturers weren't interested in? Let's take a look at initial product concept and the technical backbone. Let's interview Hironori Mikami of Roland, the person in charge of VC -300HD development.

To start, what was the initial impulse for development? What was it that triggered the process?

The plan got underway with the idea "We want to record to HDV simply and easily." The company already makes the V-440HD, a multi-format video mixer and can output from it be recorded or not? At Roland, we often have events that call for use of the V-440HD, but it is not that easy to record the events. We felt that many V-440HD users must have the same desire and need for recording from the mixer.

Currently, the only option for line recording in HD is expensive broadcasting equipment that has HD-SDI. It is not easy, however, to prepare and afford this kind of equipment for recording live events. Then, even if we did record on it, it's better to convert it down to HDV, since we can't justify keeping the expensive format unchanged just to have it always easily on hand for editing.

Hironori Mikami, in charge Roland VC-300HD development

When DV first came out, everyone was putting converters on the market. With HDV we've hardly seen the same kind of thing. What's more, virtually nothing has become available for two-way conversion of HDV-baseband. This situation has opened the market for the VC-300HD.

In designing the hardware, it must have been hard to choose a processor and come up with algorithms to do conversion in real time.

Real-time conversion was an extremely high priority for us. After all, one of the things that all Roland products share is a capability for use in live show production. That goes for both music and images.

Coming down to specific technology, the company already had some converter know-how that we could apply. Our way into the market was via experience with scaling control, which has been built up from dealing with video mixer products. When talking about video conversion, you may assume audio is a comparatively minor concern. But, as you know, audio processing technology involves a mass of expertise with real-time processing as well.

Products, of course, can't be created simply by combining existing devices, so we carried out various technical surveys. These were not confined within the company. We also needed

the cooperation of people in the industry. We had to get hold of technical standards, use our connections with chip manufacturers, and collaborate with camera manufacturers. I suppose you could say that we studied pretty much 24/7.

When it comes to imaging devices, I think Roland makes good use of analog technology.

The thing I like about analog is that you can connect to anything inexpensively. For example, the thing that HDV, DVCPRO HD, and HDCAM all have in common is analog component output. There's hardly ever a problem with connection compatibility.

Naturally, analog implementation technology has been cultivated for musical instruments and audio equipment. There is also a manageable risk during development. Eventually, our image devices also got some attention when, 13 years ago, Roland started selling the 'Video-kun' desktop video editor. It was a board that installed in a PC. Since then we have been putting energy into analog video.

Recently, the price of cameras with built-in SDI has come down below the $10,000 mark so, from now on, SDI will be used more and more. Even so, for live shows, the superiority of analog input–output will continue for a while.

From the point of view of broadcasting, NTSC—PAL conversion is valuable by its scarcity. I expect, however, pursuing a niche like this will turn out to be a thorny path when things like operation validation are taken into consideration.

That function was certainly a tough one. If it can easily perform conversions, I think the applications will open up. It is tough to achieve conversion between 60 and 50 fields. But since conversion from SD to 720p and vice versa is one type of frame rate conversion, we needed to provide that function.

Validating the conversions was really tough. We started by making stuff we could use for verification. We had to choose recording equipment that could provide frame forwarding and field forwarding. Then we had to check all the camera and VTR connections, and more. It involved a great deal of work.

On the plus side, while we were doing this, we became aware of just how valuable the VC-300HD would be. Even in the non-linear world, where everything seems possible, we were put through the ringer when it came to making samples for validation. For the catalog, we have drawn up a basic conversion matrix of the formats. It lists frame rates, image pixels, digital and analog, and types of media and so on. The number of combinations of matrices we used for validation is an amazing 3,200. Only after each one was operable, could we then pass the test.

Well, you started shipping the product in March 2007, are you likely to bring out upgraded versions of the product? And, does it have all the functions that were planned for it?

We have been thinking about upgrading. Function expansion: that's another feature of the VC-300HD. We were keen to include a lot more functions in the first model, but opted first to get the product out. This way we were able to further develop the product by listening to what everyone said about it and use that feedback to expand the functions and improve usability.

System proposal—Flexible format conversion is the key

So, how does the VC-300HD fit into the work done in a studio? Below you can see some of the concrete advantages it offers in typical systems.

Figure 1. Non-Linear Editing System

Non-linear HD editing has just about reached a level where it can realistically cope with native format HDV and DVCPROHD. One of the reasons that this is practical is because IEEE1394 can handle the transfers. When it comes to uncompressed HD-SDI data, however, the threshold is still high. For a start, you need to have a board with HD-SDI input–output and a large amount of extra storage space. Many things still stand in the way of dealing, in real time, with multiple streams of uncompressed data.

However, if various formats are converted to HDV and the data is acquired, native editing in HDV can be done for video sourced from any format. What is more, HDCAM, DVCPROHD, and other sources with HD-SDI can be down converted and acquired as DV. If the final form is SD, say for DVD, work can be done more efficiently.

Figure 2. Dubbing

In post-production work, much dubbing work is needed for the materials and complete package. In particular, it is expected that there will be a rapid increase in the need to bring video up from HDV and, conversely, to drop it down to HDV. Meanwhile, it is still true that the work of dubbing to obsolete VHS will not completely disappear. For the most frequently occurring conversion tasks, one approach is to install a number of fixed format converters. For less frequently encountered conversions, however, multi-format converters provide an effective solution. In dubbing rooms where a combination of devices such as matrix switchers and routers are assembled, it can avoid the need for unnecessary cabling.

Figure 3. Live recording

When shooting live concerts and other stage events, producers generally switch between several cameras. For recording at times like this,

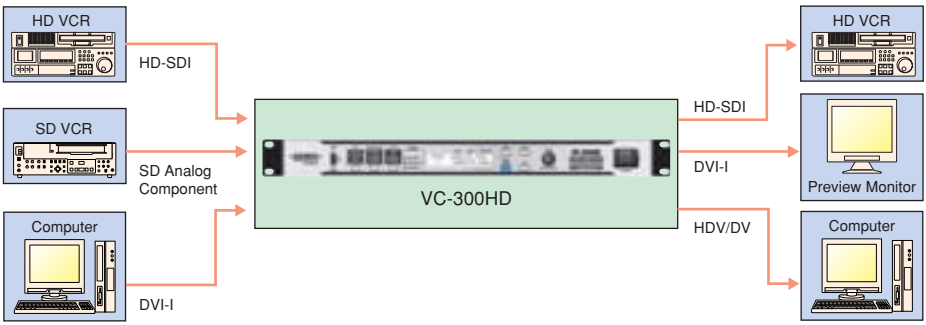


Figure 1. Using the VC-300HD various video formats can be acquired as HDV or DV.

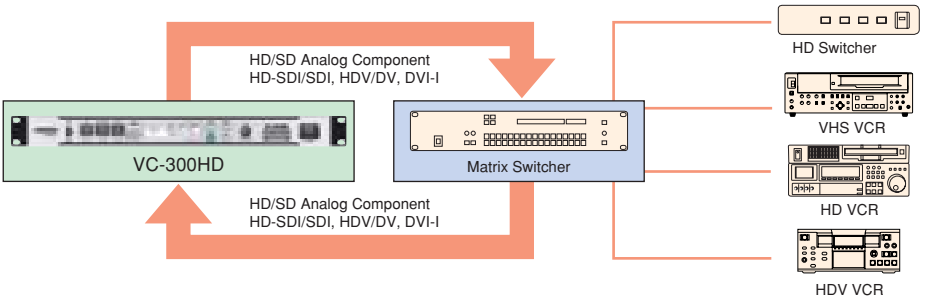


Figure 2. A multi-format converter is indispensable during post production, when many and varied video formats have to be dealt with. Used together with a matrix switcher, the VC-300HD can greatly boost efficiency and simplify conversion tasks from basic conversion to aspect ratio control, color adjustment, and other tweaks.

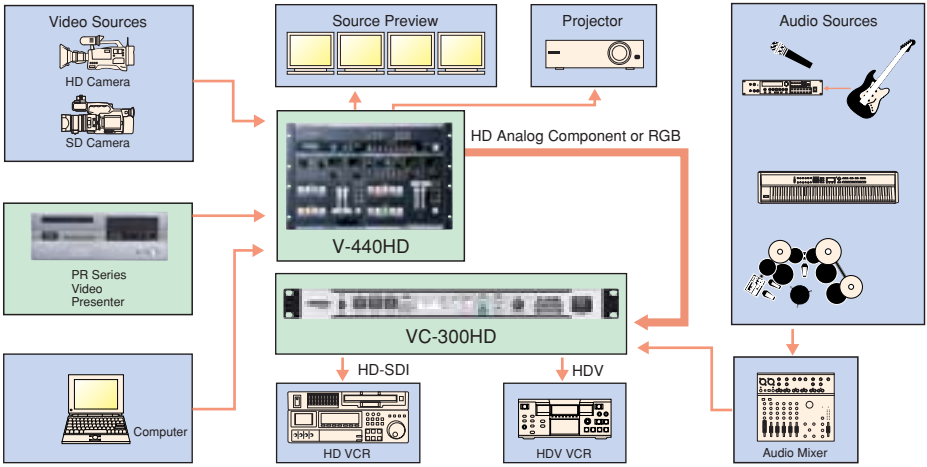


Figure 3. Production of live performance and studio video shot using various sources can be carried out using video mixing systems such as the Edirol V-440HD multi-format video mixer. If a VC-300HD is included in the system, the video line and audio can be combined during acquisition. Audio delay control, built into the VC-300HD, enables audio to be synchronized with the video.

there is often a need for so-called line recording. Simple video switchers do not usually have DV and HDV outputs. If you want to output in these formats, the VC-300HD is your only option.

This is because, being more than a simple image converter, the VC-300HD can be used for merging output from an audio mixer line and then enabling recording of the embedded DV or HDV output. Before now, to record this type of input, it was necessary to take along a studio deck to handle separate image and sound input. Recording is easier with a VC-300HD, even when using things like HDV cameras.

Multi Format conversion with Multiple Interfaces in one unit

Video Input Format

IEEE1394 (i-LINK)	HDV: 1080/59.94i, 1080/50i, 720/59.94p, 720/50p DV: 480/59.94i, 576/50i
Component	Y/Pb/Pr: 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 480/59.94p, 576/50p, 480/59.94i, 576/50i
DVI-I	Digital: 1600x1200/60 Hz, 1400x1050/60/75 Hz, 1360x768/60 Hz, 1280x1024/60/75 Hz, 1280x768/60 Hz, 1280x960/60 Hz, 1152x864/75 Hz, 1024x768/60/75 Hz, 800x600/60/75 Hz, 640x480/60/75 Hz, 1080/59.94p, 1080/50p, 1080/59.94i, 1080/50i, 720/59.94p, 720/50p Analog: 1024x768/60 Hz, 800x600/60/75 Hz, 640x480/60/75 Hz
HD-SDI/SDI *	1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 480/59.94i, 576/50i
Video Sampling Rate	SD: 4:4:4 (Y/Cb/Cr), 10 bits, 13.5 MHz HD: 4:4:4 (Y/Pb/Pr), 10 bits, 74.1758 MHz/74.25 MHz RGB: 4:4:4 (R/G/B), 10 bits, 25 MHz to 90 MHz

Video Output Format

IEEE1394 (i-LINK)	HDV: 1080/59.94i, 1080/50i, 720/59.94p, 720/50p DV: 480/59.94i, 576/50i
Component	Y/Pb/Pr: 1080/59.94p, 1080/50p, 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 480/59.94p, 576/50p, 480/59.94i, 576/50i
DVI-I	Digital (RGB): 1080/59.94p, 1080/50p, 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 480/59.94p, 576/50p, 480/59.94i, 576/50i Analog (Y/Pb/Pr): 1080/59.94p, 1080/50p, 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 480/59.94p, 576/50p, 480/59.94i, 576/50i
HD-SDI/SDI *	1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 480/59.94i, 576/50i

Audio Input

IEEE1394	HDV: MPEG1 Layer II 16 bit 48 kHz 384 kbps DV: Linear PCM 16 bit 48 kHz, Nonlinear PCM 12 bit 32 kHz(2ch)
Analog	Balanced XLR Type (ch1,ch2) : +4 dBu, -2 dBu, -4 dBu, -10 dBu Selectable Unbalanced RCA phono type(ch3,ch4) : +0 dBu, -6 dBu, -8 dBu, -14 dBu Selectable Audio Sampling Rate: 24 bit, 48 kHz / 32 kHz
HD-SDI/SDI Embedded Audio *	Linear PCM 24 bit 48 kHz

Audio Output

IEEE1394	HDV: MPEG1 Layer II 16 bit, 48 kHz, 384 kbps DV: Linear PCM 16 bit, 48 kHz, Nonlinear PCM 12 bit, 32 kHz(2ch)
Analog	Balanced XLR Type (ch1,ch2) : +4 dBu, -2 dBu, -4 dBu, -10 dBu Selectable Unbalanced RCA phono type (ch3,ch4) : +0 dBu, -6 dBu, -8 dBu, -14 dBu Selectable Audio Sampling Rate: 24 bit, 48 kHz / 32 kHz
HD-SDI/SDI Embedded Audio *	Linear PCM 24 bit, 48 kHz

0dBu=0.775Vrms * VC-300HD Only

Multi Format conversion with Multiple Connectors in one unit

■Processing

Video Processing	Scaling: Scaling between the specified input and output Frame Sync: Built in frame synchronizer and genlock to external device Frame Rate Conversion: from 59.94 to 50 Hz etc. I/P Conversion: De-interlace function built-in
Audio Processing	Delay: Adjustment with Millisecond or Frame Sample Rate Conversion: from 32 to 48 kHz etc.

■Video Connectors

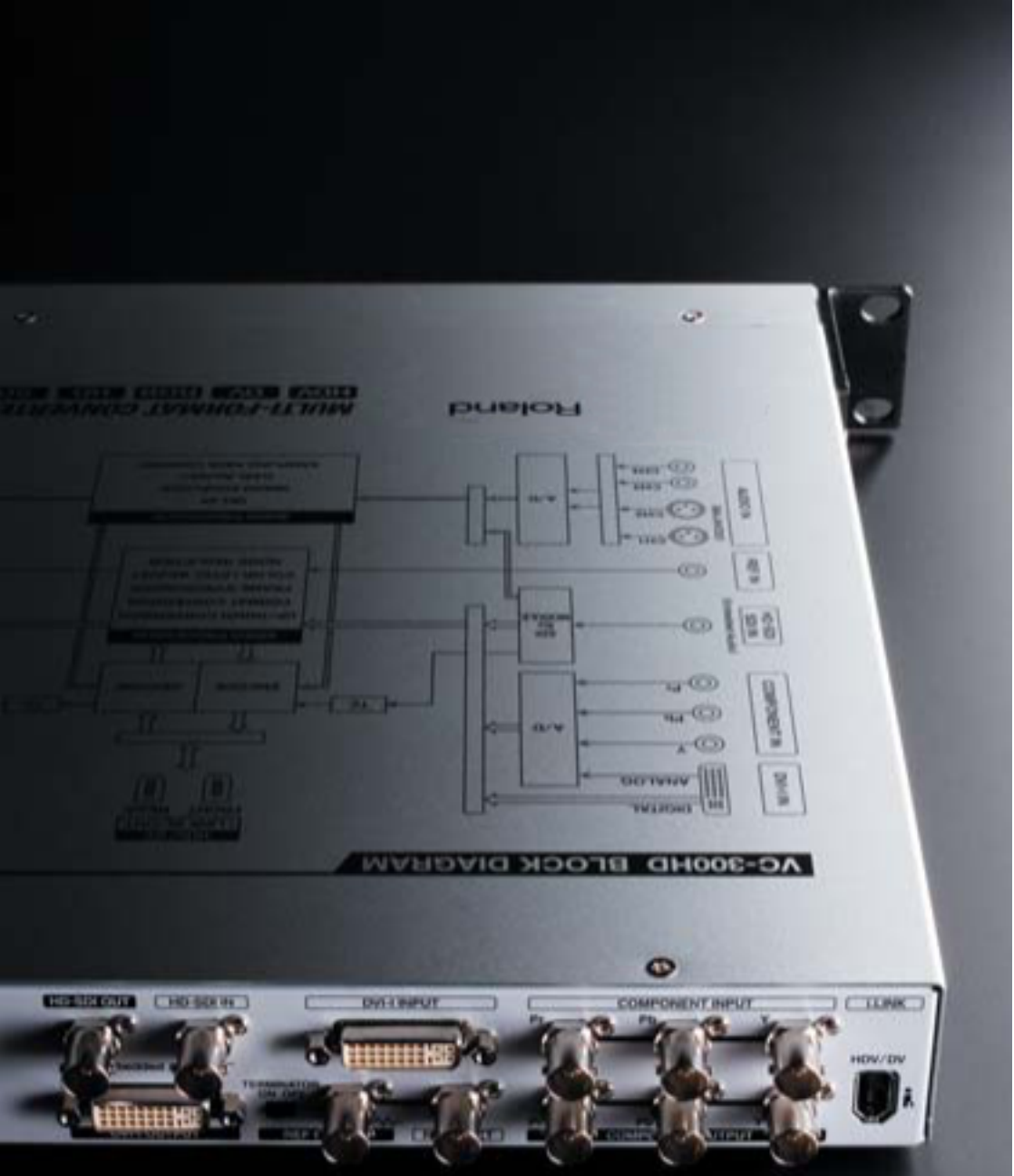
IEEE1394 Connector (i.LINK)	6-pin Type	Conforms to IEEE1394, HDV standards, Same connector on front and rear
COMPONENT Input Connector	BNC Type	HD/SD: Y/Pb/Pr (75 ohms), Bi-Level, Tri-Level Sync
DVI-I Input Connector	DVI 29-pin single link	RGB (8 bit each) Digital RGB dot clock: 25-161MHz (VGA to UXGA) Analog RGB: R/G/B 0.7 Vp-p, 75 ohms, H/V 5VTTL, RGB dot clock: 25-90MHz(VGA to XGA)
HD-SDI/SDI Input Connector *	BNC Type	Supports embedded audio Conforms to SMPTE259M, SMPTE272M, SMPTE292M, SMPTE299M
COMPONENT Output Connector	BNC Type	HD/SD: Y/Pb/Pr (75 ohms), Bi-Level, Tri-Level Sync
DVI-I Output Connector	DVI 29-pin single link	RGB (8 bit each) Digital RGB: same timing as analog component Analog Component: Y/Pb/Pr (75 ohms)
HD-SDI/SDI Output Connector *	BNC Type	Supports embedded audio Conforms to SMPTE259M, SMPTE272M, SMPTE292M, SMPTE299M
REF Input	BNC Type	Black Burst, Bi-Level, Tri-Level Sync
REF Output	BNC Type	Loop Thru Output

■Audio Connectors

Input CH1, CH2	XLR type	20 k ohms
Input CH3, CH4	RCA phono type	20 k ohms
Output CH1, CH2	XLR type	600 ohms
Output CH3, CH4	RCA phono type	1 k ohms

■Others

Display	Character Type LCD: 20 characters, 2 lines (backlit LCD)
Power Supply	AC 117 V, AC 230 V, AC 240 V (50/60 Hz), AC 220 V (60 Hz)
Power Consumption	60 W
Dimensions	482 (430 without rack mount bracket) (W) x 309 (D) x 44 (H) mm * EIA-1U Rack Mount Size 19 (16-15/16 without rack mount bracket) (W) x 12-3/16 (D) x 1-3/4 (H)
Weight	4.5 kg, 9 lbs 15 oz
Accessories	Owner's Manual, Rubber Foot x 4, Power Cord



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