

TV One's CORIO2 Technology Offers More Than Meets the Eye

CORIO, as in "choreography" refers to TV One's mission of choreographing video. As video formats and standards continue to evolve, the format landscape becomes more complex. The heart of CORIO technology is its ability to level the format playing field and allow the user to freely move between various computer, video, analog, digital, standard and high definition video formats. CORIO technology was initially developed as a high quality method of computer-to-video scan conversion before third party video scaling chipsets were on the market. Even with the advent of such chips, CORIO's advantages in terms of image quality and flexibility were strong enough that it was continually used in TV One products. CORIO technology has steadily advanced since its inception in 1994 to its present level, called CORIO2. The continuity and cumulative expertise of the design team established CORIO2 as the leading video scaling technology available today and will insure that position is maintained into the future.

When competitors design a video scaler or other video conversion device, they generally look to several chip manufacturers to provide a chipset for the actual video conversion and scaling. Once a chipset is chosen, the support circuitry is designed. However, the majority of these chips are designed for a completely different task, primarily for scaling incoming video to the format required for LCD and Plasma Displays. These same chips are then adapted for use in standalone video scalers, often with a high degree of success, but always with one major limitation. The chip does only what it was originally designed to do and handles a predetermined set of input and output standards, resolutions and formats. Therefore, a video scaler using a third-party chipset will never go beyond the initial capability. What you see on day one is generally what you get throughout the product's entire lifespan.

The chipset manufacturers follow the same firmware development path as we do with CORIO2 technology at first. The huge difference is that when they determine the design is finished, they freeze the code with a known set of parameters. After that point, changes or bug fixes can only be done with external circuitry and some aren't even capable of being fixed. The advantage of this approach is that the resulting chip can be mass produced at a lower cost if demand is sufficient. The disadvantage is that any existing bugs are also permanent and the cost to make a new chip with corrections is prohibitive.

CORIO2 technology is completely different and the firmware is not permanently committed to a chip. Instead the firmware is loaded into a FPGA (Field Programmable Gate Array) to perform the task. That FPGA becomes the core of the finished product and can be changed at any time to fix bugs, add input/output resolutions or provide additional features. Since access to the FPGA is always available via a serial interface port, new firmware can be downloaded from the TV One Tech Support website and upgraded in a matter of minutes. Because the actual inner working of the FPGA is being altered, the hardware is effectively being changed by the firmware upgrade. A user with a model several years old can usually upgrade that unit to the same level as a brand new version of that same model. This means that product features are dynamic in CORIO2 products and provide "obsolescence insurance" to the end-user.

A real world example of the benefits of CORIO2 technology is the introduction of Edge Blending at Infocomm 2006. Using multiple projectors to show a single image has become very popular, but it is undesirable to show a hard edge between these images. A seamless blending of the edges can be accomplished by overlapping the images and feathering them together making the overlap point undetectable to the eye. Edge Blending can take place with projectors equipped with this capability or by an external hardware device. Instead of creating a product just for Edge Blending, it was added as a standard feature to the already existent C2-7000 series. Not only was that a powerful addition to the C2-7000 series, but an existing owner of a product in the C2-7000 series can add this feature by going to the support website and downloading the latest firmware version.

Special applications can generally be addressed by firmware changes thanks to the enormous flexibility of the CORIO2 architecture. Often, users will have a special requirement that necessitates some code changes by our engineering staff. This can be accommodated by writing some additional code, adding it to the firmware and uploading it as a new version into the unit. If the requirement is unique, it may only be available to a specific user or group of users. However, if it is a good feature or product improvement, it can be added to the general firmware and made available to all users with the next firmware release.

The ability to upload new firmware to TV One products should not be confused with some competitor's ability to do a seemingly similar thing. They are solely re-programming the micro-controller in charge of the scaling chip. They aren't capable of adding extra features at the hardware level using such a method. Also, CORIO2 firmware updates are not limited to video scaling. For example, the audio processor at the heart of the new C2-7300 HD-SDI Video-Audio Processor is also based on a FPGA, making it easy to add or change features or standards. This is

extremely important in the digital audio market, since it provides flexibility to give the customer exactly what they want. Off the shelf audio processing chips are just like video scalers and can't adapt to new markets or standards.

When a user takes possession of a CORIO2 based product, registering it on TV One's support website is encouraged. This keeps a communication link open between TV One and the customer to insure that the latest features are always available. When a new firmware version is announced, an email is sent to all registered users of the affected models. A list of the additional features and a list of bug fixes, when applicable, is provided in the email. The user can then determine if it is essential to their application to make the firmware upgrade. Some users may even skip a couple of firmware releases until one comes along that is of interest, in which case, all of the benefits of previous firmware upgrades accrue when the latest version is used.

Not all changes require new firmware downloads. For example, even though the unit comes with a predefined set of input and output resolutions, new ones can be added by the user. A resolution calculator within TV One's Windows Control Panel software lets the user create new resolutions and add them to the unit's firmware quickly and efficiently. This is particularly important for medical, radar, scientific and other applications where the source or display is not a standard computer or video device.

The design philosophy at TV One is to create a product family instead of just one product. CORIO2 technology makes this easy and cost-effective since the firmware is scalable and as product features are removed, the code is reduced, allowing for a smaller FPGA. For instance, the C2-7100 is a powerful Dual Channel, Multi-format, Video Switcher/Scaler that perform up, down and cross conversion. After its successful launch, a group of derivative products were created that perform specific tasks and functions found in the C2-7100 but at reduced prices. So far, twenty products have been designed and launched based on this philosophy and more will follow.

Video scaling and conversion products aren't the only products being derived from the C2-7000, but traditional video devices are also in the pipeline. Products such as frame synchronizers, keyers, standards converters, color correctors, D-A and A-D converters, audio embedders and extractors are relatively easy to produce in short order. In fact, it is possible that as many as 50 products will eventually be derived from the original C2-7000 series. This is a unique advantage of the CORIO2 technology and will be carried forward to subsequent product families.

CORIO2 technology affords other advantages over competitive approaches to product development. The FPGA is not restricted to containing firmware exclusively for video conversion and scaling. In fact, dozens of other tasks can be simultaneously performed within the same FPGA. This results in an amazingly small signal delay of no more than two video frames from input to output. This provides an obvious advantage when dealing with lip synch problems often found with competitive products. The minimal delay is maintained even when additional processing like windowing or keying is performed since it is all done within the FPGA at relatively the same time. The ability to do such processes in parallel, rather than serially, is a tremendous advantage. Any additional features added into new firmware can also be added using this parallel method, right inside the heart of the video processor.

The ability to include multiple features within the same FPGA provides a definite cost advantage over competitive products simply because it reduces the total parts in CORIO2 based products. TV One can provide a product with more features at a significantly lower cost. Another important factor with having exclusive proprietary scaling technology is that we can adapt it to suit the ancillary chips in the product's circuitry. This means we can pick and choose the particular DVI receiver, video encoder or other device and make the FPGA suit it instead of the other way around.

CORIO2 has a technological leg up on the competition but also has a huge cost advantage. Firmware upgrades to CORIO2 products guarantee that TV One products will have a much longer life in the field and is something that the competition does not offer. It is also worth noting that CORIO is a registered trademark in the UK, Europe and the USA. With each successive product, we want to ensure that customers recognize the word CORIO and associate it with product excellence.