

Weiss Engineering Gambit Series SFC2 and dCS 972 Converters

by Dr. Frederick J. Bashour

My experience with these two units over the past few months changed my opinion of sample rate conversion by 180 degrees. I had thought the process of changing digital data's sample rate from one frequency to another as a necessary evil - one to be avoided at all costs.

I had not, however, heard the results of conversion through state-of-the-art hardware. Having done so, I now view sample frequency conversion (SFC) as another important and useful tool in the audio engineers toolbox.

The first hint that I needed to change my opinion came even before I received the first of these two boxes. Bascom King, PAR's bench test writer, warned me in advance that he believed the simple act of playing a 44.1 kHz CD through the 972, up-sampling it to 192 kHz and listening back through the dCS 954 DAC at the same high sampling rate actually made a significant improvement in the sound quality - as compared with leaving everything in the 44.1 kHz domain.

To make a long story short, King was correct. I have never heard better sound from my CDs as when played back using this scenario. My audiophile Wadia DAC has finally met its match! But this is just the tip of the iceberg - I've found the sonic characteristics of up-sampling SFC, as implemented by both the boxes under scrutiny here, to be an improvement, never a reduction, in sound quality.

Features: Weiss Engineering Gambit Series SFC2

The SFC2 is a one-rack-space unit containing two separate synchronous sampling frequency converter circuits and, thus, can simultaneously up-sample a digital audio signal, output it to a high sample rate piece of effects equipment, receive the effected signal and then down-sample it to the sample frequency it originally had. A possible reason for doing this is not difficult to understand.

Most of us appreciate the limitations upon frequency response and linearity of phase behavior imposed upon digital signals by the exigencies of the Nyquist frequency - half the sampling frequency. A digital equalizer, for instance, is often modeled upon its analog counterpart with the aid of bilinear transformation. This transformation has the property of mapping the analog frequency range to a foreshortened digital frequency range from 0 Hz to the Nyquist frequency - 22.05 kHz in a standard 44.1 kHz system.

Designing a digital equalizer, or compressor with extended linear performance for that matter, is much less problematic when done at higher sampling rates such as 88.2, 96, or even 176.4 or 192 kHz. The Weiss SFC2 can prepare digital signals for use in such processing equipment.

Its front panel is very clearly laid out. One of four LEDs lights up when the unit locks to the input sampling frequency. The user simply pushes one of four large pushbuttons (which illuminate when activated) to select the output frequency: 44.1, 48, 88.2 and 96 kHz.

Another section with three LEDs and two pushbuttons selects between output wordlengths of 16 or 20 bits (the SFC features 24 bit throughput when this option is not chosen), and whether appropriate noise shaped dither is applied to the wordlength-reduced outputs. A final switch selects auto-blackening to eliminate dither noise during periods of "digital black."

The power toggle switch is on the front panel. The rear panel contains two pairs of male and female XLR connectors for outputs A and B and a universal I.E.C. connector.

Features dCS 972

The dCS 972 is a two-rack-space unit that converts any one of 12 sampling frequencies (from 11.025 kHz to 192 kHz and DSD) in any format (AES, coaxial S/PDIF, optical S/PDIF, or SDIF-2) to any of the 12 sampling frequencies - simultaneously - to all formats. It can sync to the input or to word clock or AES reference. In addition to its SFC functions, it can convert from PCM to DSD and vice versa, remove DC offset, apply three types of dither and 10 different noise shaping options, control output level and stereo balance - with a maximize level setting function and apply multiple filters on many of its sample rate conversions.

The dCS 972 also allows the user to monitor bit activity, stereo level, CRC, parity and invalid flag errors in the input data. It features a high quality 160 dB signal generator with mHz resolution, whose output can also be dithered and/or noise shaped and truncated from 24 bits to 8 bits in one bit steps. Function setups can be stored in one of nine recallable and editable memory locations.

If this description is starting to sound like I'm talking about a synth, the reader is particularly astute. In fact, the dCS 972 allows the user to access its multitudinous functions via a set of four good-sized pushbuttons and a data entry soft knob and LCD screen rather reminiscent of their counterparts on my Kurzweil 2600XS keyboard.

The rear panel sports as many ins and outs as is possible on a two-rack space piece of gear. For inputs, there is a pair of AES jacks (supporting both high speed and double-wide protocol) and a single AES clock connector, and three S/PDIF ports - in BNC and RCA coax and Toslink optical, as well as another BNC jack, for use with future video sync capabilities.

There are also three BNC SDIF-2 input connectors and three SDIF-2 output connectors. These are for both DSD use but also function for all PCM rates from 11.025 to 96 kHz. The other output connectors mirror the input ones except for the fact that whatever this box does to one's signal is output simultaneously to all connectors. Above the universal IEC AC connector and a pair of DB-9 ports for remote control from a PC or for downloading software updates.

Unfortunately, I can't fully discuss all the menu functions here, but consider that the top menu level contains eight (sample rate conversion, format conversion, error monitor, test, info, bit activity monitor, level meters and display), and each of these items has up to seven menu choices itself - some of which also have their own nested choices. Luckily for the user, this is all explained clearly in the owner's manual.

The feature that Bascom King pointed out to me - up-sampling a 44.1 kHz signal all the way to 192 kHz and then keeping it there - requires a 192 kHz DAC. I was lucky enough to have the complementary dCS 954 DAC unit (as well as the 904 ADC box) and, in fact, I've used that 954 DAC as my studio's reference DAC for the past two months. I wish I could afford to keep it, as it's the best sounding digital to analog converter I've ever encountered.

In use

The equipment setup I used to compare the Weiss and dCS units was as follows: My various digital sources were connected to a Z-Systems Z-16.16 patchbay, two of whose outputs fed the Weiss and dCS sample rate converters. Their outputs were

taken back to other inputs in the Z-Systems router; those outputs were patched simultaneously to the dCS 954 DAC, two channels of one of my Merging Technologies Sphynx boxes, the DAC section of an Apogee PSX-100 and to the diminutive Lucid Technology DA 9624.

These are the only 96 kHz-capable DACs I had on hand; the dCS 954 was the only one that could decode all the way up to 192 kHz. After I configured a few appropriate presets, the Z-Systems router let me switch inputs and outputs among the various devices quickly and efficiently.

Analog equipment was all audiophile vacuum tube gear: Eclair Engineering monitor preamp, Manley MB 300 power amps, and Manley Tannoy loudspeakers. I also used a pair of Stax SRX Mk. III Pro electrostatic headphones.

I first tried King's scenario - playing a few CDs and comparing straight 44.1 kHz playback with the results of up-sampling via the Weiss and dCS equipment. I listened mainly to my own classical recordings, as I knew them inside out, but I also played a few good sounding pop and jazz CDs.

The sound was more improved going to 96 kHz than to 88.2, contrary to my previous simpleminded rationalization about doubling the sampling frequency. A Weiss white paper reminded me that all the common sample frequencies in use today have a common least multiple of 14.112 MHz; for 192 kHz it is 28.224 MHz.

The Weiss SFC2 sounded best in this test, with a richer and more detailed low frequency presentation, more liquid midrange and sweeter highs. The dCS was a trifle leaner and the upper midrange frequencies sounded a little strange to me. Please understand that this was a very subtle difference and that both units improved the sound over straight playback at 44.1 kHz.

These results were consistent regardless which DAC I used, although the nicest sound came, of course, from the super expensive dCS 954 box. I was impressed, actually, how good the lower priced DACs fared. At 96 kHz they all sounded better than my previous reference, the Wadia Model 27. The improvement in openness in the high frequency range was not at all subtle.

I continued to ascend the sample rate ladder, moving up to 176.4 and 192 kHz and monitoring, of course, with the dCS 954. What a difference! Up-sampled to 192 kHz and played back at that rate with the dCS DAC, my CDs and master sound files sounded unbelievably smooth.

This time the dCS box beat the Weiss unit, for I finally noticed a certain constriction in the sound of the SFC2 (at only 96 kHz, of course), which was conspicuously lacking in the dCS 972 at 192 kHz. The highs were extremely smooth and relaxed sounding.

Further tests, in which I changed my source material's original sample rate from higher to lower (i.e., 96 kHz or 48 kHz down to 44.1 kHz) revealed no major difference in sound between the two units, other than the increase in digital boxiness I have now learned to hear at the lower rates.

Summary

Space constraints prohibit me from extolling the virtues of some of the other features of the dCS 972 box, but every DSP function I tried did exactly what I expected and did so without any noticeable degradation of the sound whatsoever.

Its gain changing functions introduced no undesirable sonic artifacts, its noise shaping, dither and filter options were not only effective but also - due to the extreme transparency of the unit - extremely easy to compare, and enabled one to quickly select appropriate settings for various uses. You can view its detailed owner's manual at the dCS Web site, www.dcsLtd.co.uk.

The Weiss SFC2, at about half the cost of the dCS unit, sounds absolutely killer at 96 kHz. The company is working a mod that combines its two sections to successfully sample rate convert data up to 192 kHz; check the Weiss Web site, www.weiss.ch, for further information.

Take your pick; I'd be happy to have either unit here at Studio Dufay. 192 kHz rules!

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At a Glance

Applications: Recording studios; high-end project studios

Key Features: Both units feature up and down sample rate conversion; the dCS 972 adds numerous DSP functions and conversion to and from DSD

Price: Weiss SFC2: \$3,500; dCS 972: \$6,320

Contact: dCS/Independent Audio at 207-773-2424; or circle Reader Service XXX; Weiss Engineering at 212-765-3415; or circle Reader Service XXX.

Product Points

Weiss Engineering Gambit Series SFC2 and dCS 972 Converters

Plus

Superb sound

Actually improves the sound of material fed through the units

Minus

Expensive

dCS 972 has a rather steep learning curve

The Score

If your studio desires the Rolls Royce of sample frequency converters, one of these two units is bound to satisfy your needs.