

CLASSE

DELTA SERIES

CP-800

stereo preamplifier/processor



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The vast majority of high-end preamplifiers available today are direct descendants of products that have been made for decades, rooted in the world of analog sources. The CP-800 is something new. The CP-800 combines key building blocks of a contemporary high-end audio system in a unique way to improve and simplify the signal path.

New technology is applied to realize the benefits of modern computer-based audio. For the first time, a CD ripped to a computer has the potential to sound better than it could if played in a CD player. For the first time, a Classé-designed Switch Mode Power Supply (SMPS) with Power Factor Correction (PFC) delivers higher performance at a lower price. For the first time, convenient and feature-rich access to your music library is possible with simultaneous state-of-the-art playback. For the first time, there is no compromise at a reasonable price.

And there is much more...

USB

Computer audio does not have to mean mp3 compression or downloading high resolution recordings from the limited library online. It means putting your CDs on a computer or other storage device and preserving them at full resolution, then organizing and accessing them from an iPad®, iPhone® or iPod Touch®. While this used to mean choosing between convenience and performance, the CP-800 lets you have it all with no compromise.

BASS MANAGEMENT

When positioning left and right speakers, accepted practice is to give priority to symmetry and sound-staging—not low frequency performance. No matter how well your speakers reproduce bass, they are almost certainly not located in the optimum place in your room to do so. The solution is mono or stereo subwoofers, which until the CP-800, has always involved compromise. Although a stereo preamp, the CP-800 uses advanced Sigma DSPs to provide subwoofer outputs with selectable crossover frequencies and slopes in the digital domain prior to conversion to analog. The result is deep, smooth bass response and no compromise whatsoever.

PEQ

Whether or not your speakers and subwoofer(s) are in the optimum location in the room, chances are there will be room modes that can only be addressed with equalization. In most rooms, the three primary dimensions contribute to three low frequency modes where the room actually reinforces the response at those frequencies. The CP-800 offers parametric equalization to help address these real world problems. Performed in the digital domain, these high quality filters allow optimization of low frequency response without any compromise whatsoever.



ANALOG QUALITY

Make no mistake, the CP-800 is also our best analog preamplifier ever. With pure Analog Bypass available for legacy sources (so pure, in fact, that when selected the digital clocks are turned off), fully balanced circuitry and completely isolated symmetrical left and right channels, your analog sources will sound better than ever. The CP-800 makes digital processing available to all sources, but when you want pure analog, there is no digital noise nor is there any compromise.

TONE CONTROL

Banished from legitimate high-end preamps since the seventies, the tone control makes a come-back in the CP-800, but with a very modern implementation. In the past, tone controls required additional analog circuitry. The CP-800 introduces a flexible tone control feature that is entirely digital. If you've ever wanted to soften the top end of a recording a little or add a little warmth in the bottom, you will appreciate the convenience and subtlety of the CP-800's tone control feature. After more than forty years, the tone control is back, and now it works as intended: without compromise.

HAVE IT ALL

The CP-800 puts world-class performance into one flexible and attractively priced chassis. Separate CD players and USB DACs require additional circuitry and interconnect cables plus a separate preamp, giving the CP-800 an obvious advantage in both performance and value. The additional features like Bass management, PEQ and Tone Control make better real world performance a reality. If you are building a no-compromise high-end audio system, the CP-800 is unique. It is the first and only preamp/processor that lets you have it all.

Apple Certification is your indication that the Classé Design team has taken the time to make sure that the CP-800 works properly within the Apple ecosystem.

Apple Certification

Recording music without storing and/or processing it in a computer is almost unheard of today. That has been the case for several decades now. What has changed are the ways in which consumers may access music and manage music files with their computers. Thanks to Apple's iconic iPod® and iTunes interface, and its subsequent string of smashingly successful innovations, computer audio for consumers has arrived.

Using a computer running iTunes, it is possible to copy CDs without losing any of the data. These full resolution files can be stored on your computer and played from its USB connector. Your computer gets connected to the corresponding USB connector located on the rear panel of the CP-800. Alternatively these music files may be loaded onto most iPod® and all current iPhone® and iPad® models* to supply bit-perfect digital audio via our USB host connector on the front of the CP-800.

The USB connector on the front of the CP-800 is dedicated to Apple portable devices. An Apple authentication chip inside the CP-800 enables the digital connection for music and allows charging of the device. The CP-800 remote can also provide basic transport controls through this connection. Apple Certification is your indication that the Classé Design team has taken the time to make sure that the CP-800 works properly within the Apple ecosystem.

* See the "works with" listing in the specifications section for compatible models.

Power Supply

The Classé Design team has developed a superb new Switch Mode Power Supply (SMPS). In addition to audio performance benefits described in a separate white paper, the SMPS is smaller, weighs less and is more efficient than conventional linear power supplies. With the very high dynamic range of today's best audio sources, the benefits of SMPS technology justify the effort required to implement it optimally.

The CP-800's SMPS provides four separate outputs: L&R analog circuits, digital circuits and the USB subsystem. An added benefit of this power supply design is that fully isolated USB devices including the iPad® (which requires a whopping 2.1 amps to charge at full power) may charge while connected to and playing through the CP-800.

The front panel USB connector is designed for use with Apple portable devices including the iPhone®, iPad® and most iPod® models*



Power Factor Correction (PFC)

Ideally, power would be pulled from the wall in a smoothly efficient manner. Since power is the product of voltage and current, it is easier (more efficient) to pull power from the wall by aligning current demands with the available voltage cycle. Power supplies without PFC only draw current during a brief period of the voltage cycle, resulting in greater peak current draw, lower efficiency and high frequency harmonics reflecting back onto the AC mains. (Fig.1)

Power Factor is the ratio of real power (power that the product actually uses) to the apparent power (power drawn from the AC mains). A power supply without PFC typically has a PF of about 0.6, indicating that a significant amount of energy is being wasted.

For the Classé SMPS, the PFC circuit achieves a Power Factor approaching unity, i.e. >0.95 at its working load. The circuit topology uses an active configuration that controls the amount of power drawn by the systems' load, allowing the current waveform to remain a smooth sine wave, in phase with the voltage. This allows the ratio of real power to apparent power to approach unity and avoids distortion of the voltage waveform. (Fig. 2)

In this way the CP-800 smoothly and efficiently pulls only the power it needs from the wall, performing its task unflinchingly for the CP-800 while causing no degradation of the power used by adjacent audio components.

Fig. 1: Voltage and Current without PFC

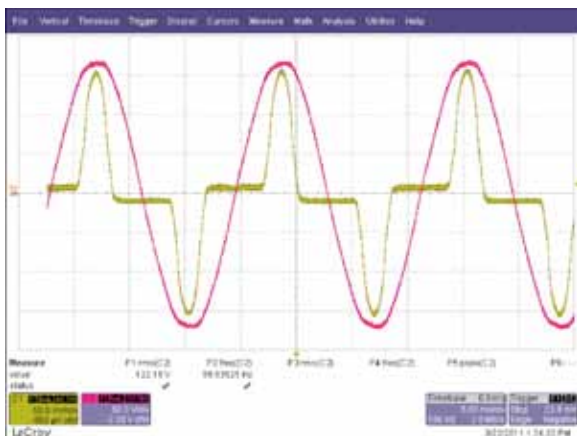
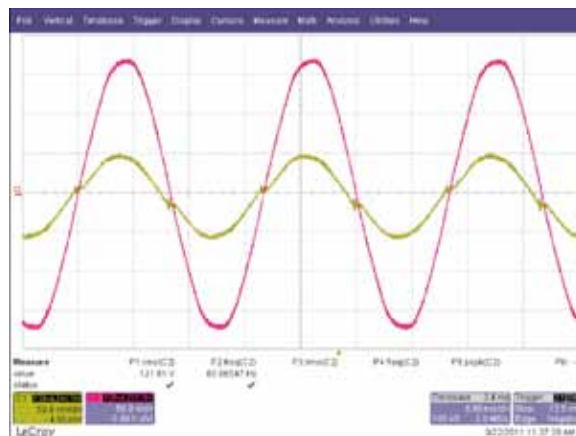


Fig. 2: Voltage and Current with PFC (CP-800)





USB Audio

The USB subsystem uses galvanic isolation to prevent noise from connected USB devices from coupling into the audio circuitry. This means that no direct electrical connection exists between the USB source and anything else inside the CP-800.

Most audiophile USB/DACs employ off-the-shelf USB microcontroller chips, designed into the system according to their application notes.

Synchronous USB (not used in the CP-800)

The problem posed by the standard USB/DAC approach is that the USB source (your computer or portable device) is ultimately responsible for the jitter in the system. Further, the USB source may degrade the performance of DACs, power supplies and analog circuitry by polluting the environment with noise coupling through power, control, signal and electromagnetic pathways.

Inside a USB/DAC is the USB microcontroller where the incoming audio data are loaded into a buffer. They are clocked out of the buffer into the DAC, synchronous to the USB source. In other words, the computer or portable device is in charge and as with S/PDIF, introduces jitter into the system that no amount of post processing can remove. The two clocks are kept synchronized by continually adjusting the rate of the clock pulling data out of the buffer and into the DAC. From an audio perspective, this approach is backwards as it forces the USB DAC to lock to a high jitter and compromised clock system.

This synchronous technique is also known as Adaptive USB, since the output rate adapts itself to the average rate of the incoming data. Given all the ways in which this basic approach is susceptible to noise and clock degradation, many tweaks may be applied upstream of the USB input that result in audible changes but do not solve the fundamental problem.

Fig. 3 Synchronous (Adaptive) USB

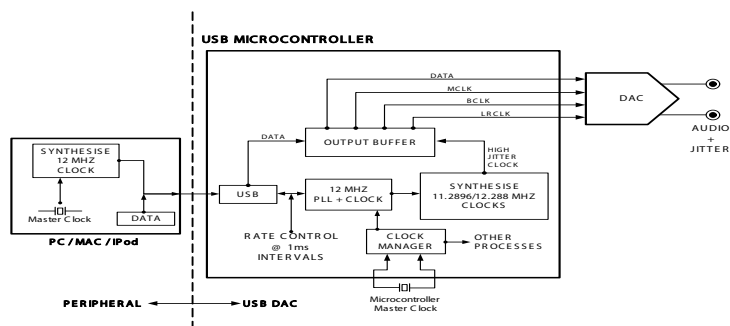
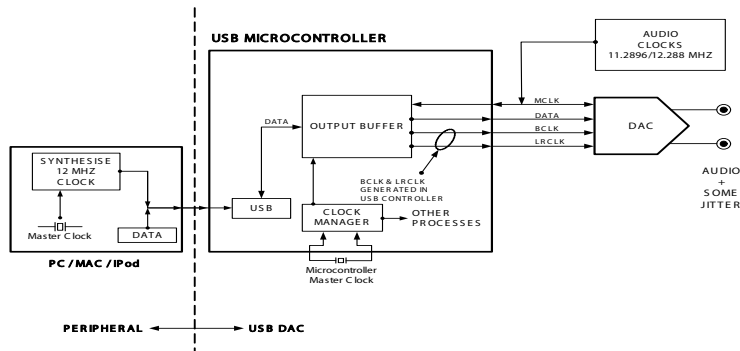


Fig. 4 Non-Optimal Asynchronous USB



The USB subsystem uses galvanic isolation to prevent noise from connected USB devices from coupling into the audio circuitry.

Asynchronous USB

Improvements to the performance of the USB subsystem are made possible by external control options offered with certain USB microcontroller chips. The most basic improvement involves taking charge of the clock. By controlling the clock locally in the USB/DAC, we make it asynchronous to the clock in the computer or portable USB device. The USB microcontroller now controls the flow of data from the source rather than the other way around. In the CP-800 dedicated master clocks are used for the different sampling frequencies. (Fig. 4)

With this technique, we can isolate the USB/DAC from noise propagated from the source. The CP-800 uses complete galvanic isolation, severing all electrical pathways from the source to ensure unwanted noise is kept out of the audio system. This is where most others stop. The Classé Design team, however, went further.

Single Clock Substrate

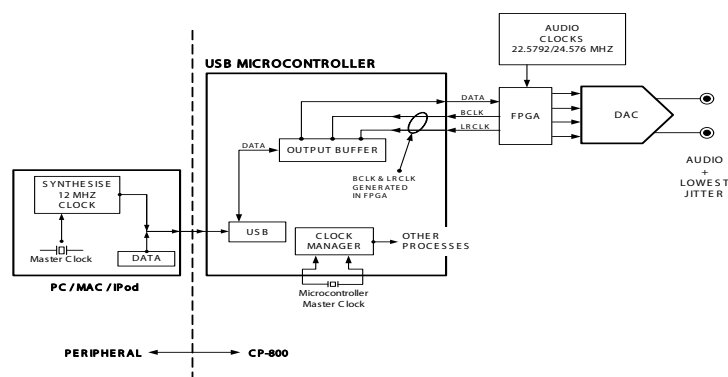
There are several ways in which the performance of the master clock may be degraded. The CP-800 employs a technique we call Single Clock Substrate to ensure the best possible performance.

The USB microcontroller is itself a rather noisy place, with its own clock and that of the source device that's loading its buffer. These microcontrollers are good at many things, but keeping clocks isolated is not among them. You can partition functions on the silicon but you cannot isolate them.

The solution developed for the CP-800 was to place a Field Programmable Gate Array (FPGA) near the DACs and master clock oscillators. Data from the USB microcontroller on the digital input board are received and buffered by the FPGA located adjacent to the DACs on the motherboard. Data are transferred to the DACs synchronous to the CP-800 master audio clock (the only clock used in the FPGA), which is of course synchronous with the data arriving into the buffer via the USB microcontroller asynchronous transfer algorithm. This topology ensures the greatest isolation of clocks and data from all upstream artifacts.

The digital signal, arriving at the DACs with all of the correct data, and timing that is as precise as it can be, is in position to be converted to analog. Up to this point, the CP-800 has managed to technically outperform even the best CD players.

Fig. 5 Optimal Asynchronous USB with FPGA (Single Clock Substrate)



The CP-800 introduces a new architecture for high-end preamplifiers.

A few words about execution...

Details of the many different parts chosen for the CP-800 may be of interest to the technically inclined consumer, and the Classé Design team does nothing to conceal their identity. In fact, a list of parts and a schematic diagram would not be nearly enough information to reverse-engineer the CP-800 or duplicate its performance. There are exclusive Classé technologies employed in the FPGA (Single Clock Substrate) and power supply (SMPS with PFC) that are not readily apparent or discoverable. But if one were to ask which are the most important parts, the answer would be the circuit boards themselves. The power supply, digital input and motherboard are all six-layer circuit boards. (Fig. 6)

The layout of Classé-designed circuit boards is always done by hand. No computer programmed auto-routing scheme could approach the results possible when each part, pad, plane and trace is painstakingly considered and located for optimal performance. This time-consuming approach is costly, but there is no substitute. Literally thousands of decisions are made that, taken in isolation, may or may not be audible. Taken as a whole, these decisions make all the difference. Through the difficult work of pcb layout, the Classé Design team transforms a schematic diagram and component parts into a synchronized and functional electronic masterpiece. Add in proprietary Classé technology and the CP-800 has no peer.

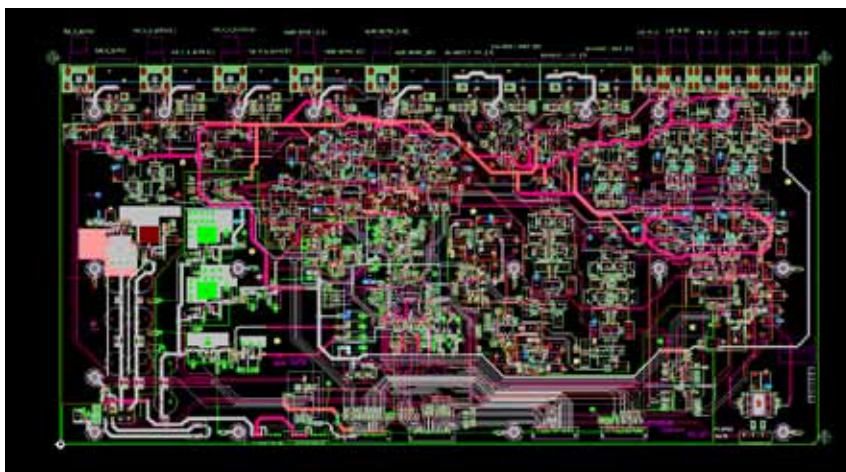
Summary

By combining the functions of a USB DAC, digital processor and analog stereo preamplifier in a way that optimizes the performance of every source, the CP-800 offers a unique solution for the most demanding audiophile.

Benefits include:

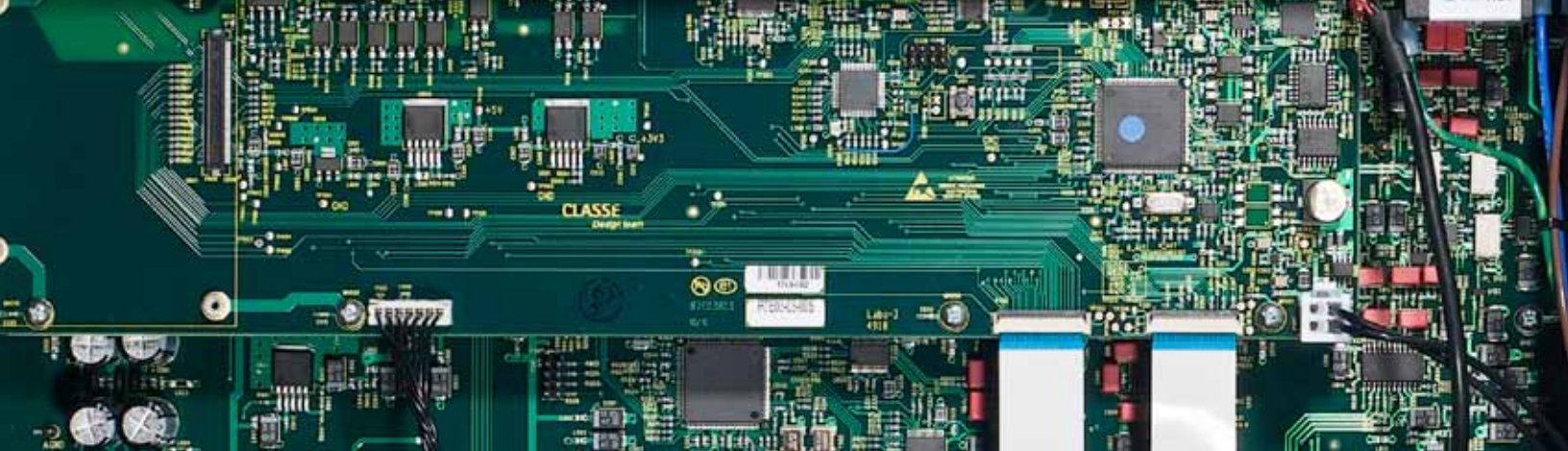
- A shorter, more direct signal path than any combination of CD player or USB DAC and stereo preamplifier.
- Asynchronous handling of computer-based USB audio sources using Classé-developed Single Clock Substrate technology.
- Optimized handling of legacy analog and digital sources.
- Highly efficient, high-performance, Classé-designed power supply that is quiet inside the chassis and a good neighbor to other system components.
- Performance-enhancing processing benefits available to all sources, including parametric EQ, tone control, bass management with selectable crossover points and slopes.

Fig. 6 Signal Routing CP-800 Motherboard



The CP-800 introduces a new architecture for high-end preamplifiers. Capitalizing on the potential for computer-based audio and employing powerful processing tools, the CP-800 offers compelling performance, features and value.





Specifications

Frequency response	8 Hz - 200 kHz < 1 dB, stereo analog bypass 8 Hz - 20 kHz < 0.5 dB, all other sources	Channel separation	better than 100 dB
Channel Matching (left to right)	better than 0.05 dB	Crosstalk (any input to any output)	better than -130 dB @ 1 kHz
Distortion (THD+noise)	.0005%, digital source/bypassed analog source .004%, processed analog source	Standby power consumption	<1 W
Maximum input level (single-ended)	2 Vrms (DSP), 4.5 Vrms (bypass)	Rated power consumption	31 W
Maximum input level (balanced)	4 Vrms (DSP), 9 Vrms (bypass)	Mains Voltage	90-264 V, 50/60 Hz
Maximum output level (single-ended)	9 Vrms	Overall dimensions	Width: 17.5" (445 mm) Depth: 17.5" (445 mm) (excluding connectors) Height: 4.78" (121 mm)
Maximum output level (balanced)	18 Vrms	Net weight	23 lbs (10.43 kg)
Gain Range	-100 dB to +14 dB	Shipping weight	33 lbs (15 kg)
Input impedance	50 kΩ (balanced) 100 kΩ (single-ended)	Made for	iPod touch (4th generation) iPod nano (6th generation) iPod touch (3rd generation) iPod nano (5th generation) iPod touch (2nd generation) iPod nano (4th generation) iPod touch (1st generation) iPod nano (3rd generation) iPod classic iPod nano (2nd generation)
Output impedance (main output)	300 Ω (balanced), 100 Ω (single-ended)	Made for	iPhone 4 iPhone 3G iPhone 3GS iPhone
Signal-to-noise ratio (ref. Bal. 4 Vrms input, unweighted)	104 dB, bypassed analog source 101 dB, processed analog source 105 dB, digital source (ref. full-scale input, unweighted)	Made for iPad	

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