



With this master clock generator, ESOTERIC tackles the fundamental problem of timing management between digital audio devices. An ultra-precise clock is used to centrally manage a group of devices so as to maximize their audio reproduction potential.

The G-0s is designed to maximize all aspects of digital audio performance. It has three systems capable of providing word clocks at optimal frequencies for SUPER AUDIO CD/CD transport, D/A converters, and other devices. Each of these systems has its own complete set of output ports. In addition, the G-0s has a universal clock output which provides a 100-kHz word clock to devices such as a DVD transport, enabling word sync to be extended to video signals. The outputs are also designed to handle PAL film DVDs.

When a DVD created from a PAL film is played, the audio and video are played four percent faster due to the way it is formatted.

To address this problem, the outputs have a PAL Film mode capable of supplying a clock for playback at the original film speed.

Functions

Three separate output systems

The G-0s has three separate output systems which can separately output 1x, 2x, and 4x multiples of the base frequency series (44.1 kHz, 48 kHz, 48 P (PAL film frequency, which is four percent slower than 48 kHz)). Each of these systems has two output ports, making it possible to supply word clocks to up to six devices. It is also possible to cancel the output from any unused system to prevent sound quality degradation due to unnecessary interference.

External 10-MHz signal input port

The G-0s has an input port capable of inputting a 10-MHz reference signal from the exterior. This port can be connected with devices such as an ultra-precise cesium atomic oscillator as a "system upgrade" for special applications.

Proprietary universal clock output

ESOTERIC has developed a universal clock which serves as a new Word Sync format for A/V connections. The G-0s is the first product equipped with this universal clock. The universal clock can be supplied to compatible devices which will be available from ESOTERIC in the future, allowing the ultra-precise oscillator to centrally manage everything from audio to video.

Standby mode for quicker startup

Rubidium oscillators require anywhere from several minutes to nearly an hour to preheat once they are first powered on. Without ESOTERIC's standby design feature, the listener would have less listening time waiting for the clock to stabilize each time the power supply is turned on. To address this issue, a main power switch is installed on the rear panel, and a standby mode switch is placed on the front panel. In standby mode, the rubidium oscillator is kept in a preheated and stabilized idle state so that the user can enjoy listening to music immediately upon demand.

RUBIDIUM

The workings of a rubidium oscillator

By using the alkaline metal element rubidium Rb85 and its isotope Rb87, the oscillator output is regulated precisely to rubidium element's characteristic transition frequencies of 6.834682612GHz. Gaseous Rb is taken to Rb87 resonance after eliminating the unwanted frequency of 780nm, and then brought to luminescence from a lamp filled with Rb87 by optical filtering of Rb85. By using the physical property that the luminescence is attenuated when the precise transition frequency microwave is irradiated to the resonance cell, the oscillator outputs an ultra-high precision 10MHz signal based on this irradiated microwave. Rubidium oscillators are used for special professional use such as a highly precise master clock oscillators. To take the performance level to the absolute maximum, the ESOTERIC G-0s employs uncompromising components, materials and design techniques within the power supply, circuit PCB, body construction, etc.



Main Specifications

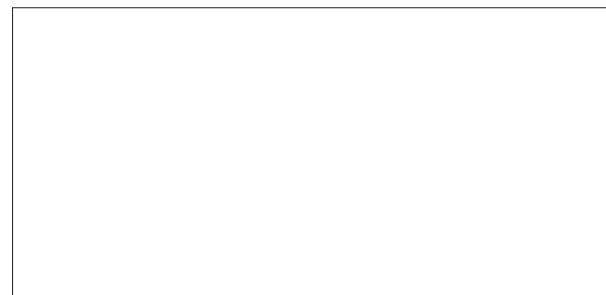
Supported Sampling Frequency:	44.1k/88.2k/176.4kHz, 48k/96k/196kHz 46.08k / 92.16k / 184.32k (PAL FILM) 100k/96k (UNIVERSAL CLOCK)	Power supply:	AC 230V, 50Hz (Europe model) AC 120V, 60Hz (U.S.A./Canada model) AC 220V, 60Hz (Korea model)
External Reference Frequency:	10MHz (less than ±10ppm)	Power Consumption:	75W (G-0s max), 31W (G-0s stable condition) 13.5W (G-0 stable condition)
Output Frequency Accuracy:	±0.05ppb±0.00005ppm (G-0s) ±0.1ppm (G-0)	External Dimensions (W x H x D):	442 x 155 x 351 mm (17-1/2" x 6-1/8" x 13-7/8")
Word Sync Output Terminals:	x6 (gold-plated BNC)	Weight:	18.5 kg, 40.8 lbs (G-0s) 17.8 kg, 39.3 lbs (G-0)
Universal Clock Output Terminals:	x2 (gold-plated BNC)		
External 10MHz Signal Input Terminal:	x1 (gold-plated BNC)		

ESOTERIC

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ESOTERIC

Master Clock Generator G-0s/G-0



English version

Master clock generator providing unprecedented clock accuracy, challenging the limits of digital audio

G-0s/G-0 Master Clock Generator

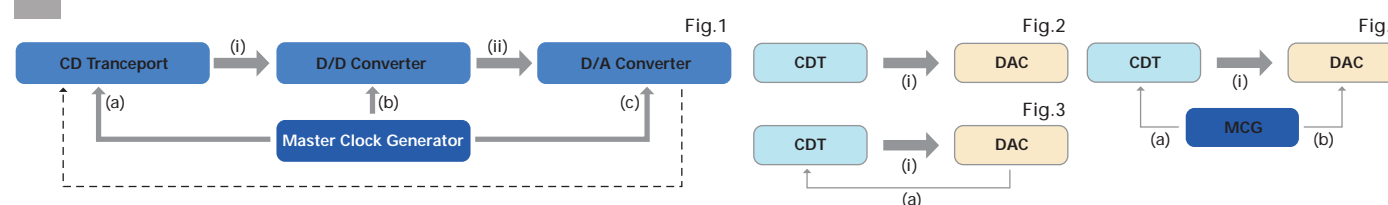


rubidium oscillator



Master Clock Generator

"Master Clock Generator" ---this phrase is frequently spoken within the high-end audio scene these days. The accuracy of the reproduced sound is achieving its highest level with even higher resolution achieved by completely eliminating jitter. You can get to this level of accuracy by connecting a Master Clock Generator to every digital component with WORD SYNC input terminals and then controlling these components in complete synchronization by using the ultra-high accuracy master clock signal output from the Master Clock Generator.



In order to achieve higher digital audio quality, many audiophiles prefer to use separated source components. Some of these source components are:

CD transports (CDT):

P-0s, P-70

D/D converters (DDC):

(P-0s, P-70 includes D/D converter)

D/A converters (DAC):

(D-70)

Master clock generators (MCG):

G-0/G-0s

The flow of the signals is:

(i) digital audio signal:

16bit/44.1kHz S/PDIF, AES/EBU

(ii) digital audio signal:

24bit/176.4kHz AES3

(a)-(c) Word sync signals:

44.1kHz, 88.2kHz or 176.4kHz

The simplest system consists of two components: CDT and DAC. With this simple system, sometimes the CDT and DAC are connected without using word synchronization. If the system is capable of word synchronization, the word signal is output from the DAC and input to the

CDT (the signal flow is illustrated with a broken line on the illustration above). Why is the sound quality improved by the use of word synchronization? To answer this question, you will have to expand your knowledge concerning digital audio interface (DAI/O) and the mechanics of word sync.

Every digital component has a clock oscillator to operate internal IC chips. If you connect more than two digital components, each component has to be operated by the same clock signal (or "synchronized"). If these two components are operated by their own separate internal clock signals, precise data exchange cannot be expected. One component has to be the slave of the clock signal of the other's.

The data format of the digital audio signal ((i) and (ii)) is several 10kHz (44.1kHz, 176kHz and so on), but the pulse of the transmitted data can be several MHz to several 10MHz.

Fig.2 is the normal connection without word sync. CDT is the master, and the DAC is the slave. In this case, the internal circuit of the DAC extracts several 10kHz of the formatted signal from the received signal, synchronizing this acquisition to the received signal. Thus, the time variances of

the signal that occurs during the signal transmission to signal reception greatly influences reproduction quality of the whole system. The purpose of word sync is to virtually eliminate this influence.

When you output the digital audio signal from CDT (= slave) to DAC (=master), providing several 10MHz format signal as word sync signal from the DAC (=master) to CDT (=slave), the internal clock oscillator of the DAC uniformly controls the clock signal of the whole system (fig.3).

As the quality of the internal oscillator of the DAC gets higher, the quality of the word sync operation also gets higher.

If you add MCG to your system, all the digital components are synchronized by the master clock signal which is several times more precise than the components' internal clock oscillator (fig.4), then the complicated large-scale system is uniformly controlled by the ultra-high precision clock signal.

The ESOTERIC G-0 employs crystal clock oscillator, the precision of which is +/- 0.1ppm (factory default). The ESOTERIC G-0s employs a rubidium clock oscillator, the precision of which is

+/-0.05ppb (0.00005ppm ppb = part per billion), no component has ever employed such a highly precise controlling system.

Adding MCG to your system is also valuable in the point that the oscillator has its own chassis and power supply separated from other devices. Ideal operation is possible without receiving any influence from the surrounding components to the oscillator. When you use external master clock devices, the precision of the internal crystal clock of the connected devices is an important factor to the system sound quality because the connected devices utilize an external master clock signal to synchronize it to their internal clock, not that they use the input clock signal itself. Therefore the precision of the internal crystal clock of each component is also important for the system sound quality. That is why ESOTERIC uses very high quality internal crystal clocks accurate to +/- 3ppm precision in their products.

Advanced Technology

Ultra-high-performance oscillator core

The G-0s uses a rubidium oscillator (0.05-ppb (parts per billion) frequency precision) for extremely high accuracy root clock signals in the clock generator core. In addition, proprietary specifications designed by ESOTERIC are used to optimize sound quality and stability. A rubidium oscillator is over 1,000,000 more accurate than a crystal controlled oscillator normally used in audio and video components.

Power supply equipped with large capacitors and a high-efficiency WB transformer

The power supply uses a WB type transformer. WB transformers are highly efficient, providing a tremendous performance improvement over the R core transformers and toroidal transformers typically used in high-end audio equipment.

Unlike conventional transformers, the WB transformer is structured with the core wrapped around the coil. This unique structure provides a very short magnetic path resulting in extremely low magnetic resistance. Moreover, it has very little magnetic flux leakage and excellent instantaneous current supply capabilities. This results in excellent transformer efficiency and improved voltage conversions and stability within the transformer. With these and other design features, the WB transformer provides much greater stability than any other type of transformer with the same volumetric area. Combined with high-speed Schottky barrier diodes, low-impedance smooth chemical capacitors, and other power supply components, the WB transformer provides the most stable electronic platform to supply power to the internal circuitry.

Proprietary gold-plated BNC ports

In conjunction with a component manufacturer, ESOTERIC has developed new goldplated BNC ports providing very reliable electrical contact. In addition, these ports are securely fastened to the rear panel, so they are robust enough to handle the attachment of even the heaviest and thickest audiophile high grade cabling.



Version up service

ESOTERIC offers a G-0 to G-0s upgrade service for a fee. A G-0 can be upgraded to a G-0s by adding the rubidium oscillator. You can gradually upgrade your system as your budget expands. (NOTE: The silk-screened print on the front panel cannot be changed).

Mechanically inert and structurally refined for optimal performance

The G-0s housing is designed with high rigidity throughout in the tradition of Esoteric's product line. The base consists of an 8 mm-thick steel plate with three pinpoint feet (patent pending) made of quenched steel, allowing the unit to be completely stabilized during installation. These features, combined with a thick aluminum exterior and multiple internal reinforcement materials, provide for a very strong housing. The housing blocks small vibrations which could affect clock precision, allowing the oscillator to operate at its full potential.

User-friendly interface

Until now, commercial clock devices have been difficult to operate. In contrast, it is easy to control all the functions in the user-friendly G-0s simply by pressing the buttons on the front panel. Equipment operations can be checked at a glance on the high-quality display. In addition, the LED has two different brightness levels--a useful feature in home theaters where excessive light is not desired.