

Nanoclocks is a word clock distributor with integrated audio master clock generator, dual inputs with frequency status indicators and programmable output matrix – a flexible tool for all extensive digital audio installations. The unit provides two transformer isolated word clock inputs and 12 word clock outputs to receive and distribute word clock signals over long distances. Ground potential variations, similar to earth-loop induced hum in analog audio, can cause jitter in clock signals, a transformer isolated input eliminates this effect.



nanoclocks
DIGITAL AUDIO CLOCK SERVER

by ROSENDAHL



↑ frequency ↑ status indicators for both inputs

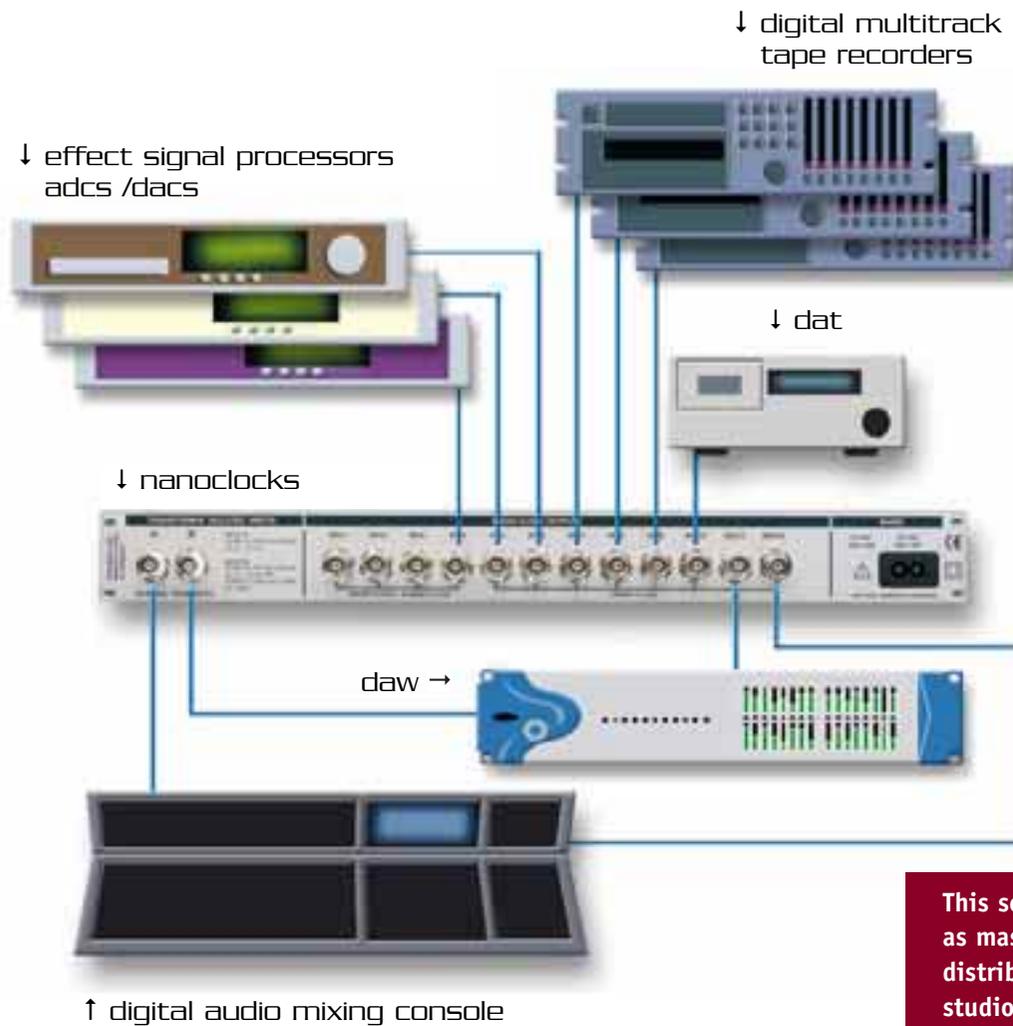
↑ source indicators for all 12 outputs



↙ 2 transformer isolated word clock inputs

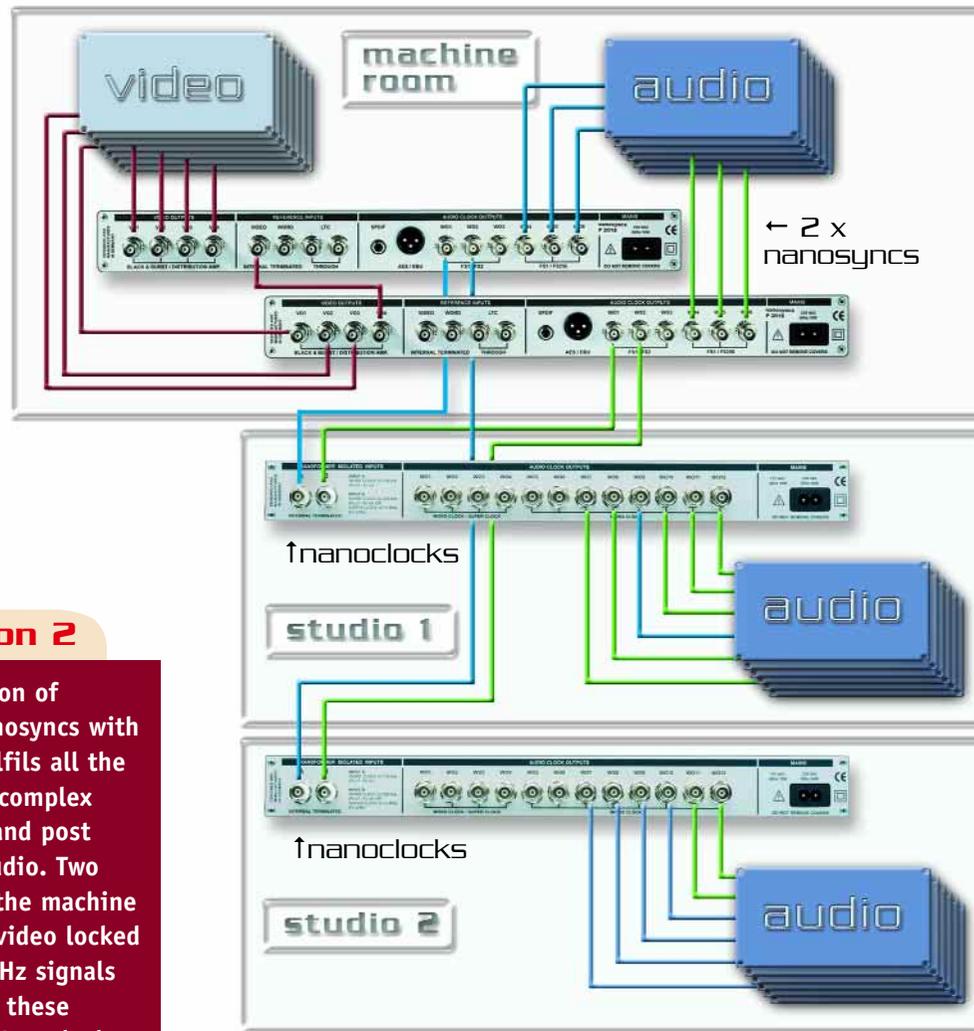
↑ 12 word clock outputs
 outputs 1-4: word clock ($F_s \times 1$ - $F_s \times 4$)
 or superclock ($F_s \times 256$)
 outputs 5-12: word clock ($F_s \times 1$ - $F_s \times 4$)

← linear power supply



application 1

This setup shows the Nanoclocks as master clock generator and distributor in the digital audio studio. By switching the unit into the distributor mode it is possible to select one of the input signals as the clock master. In the example shown, the DAW, digital mixer or the Nanoclocks itself can be routed as the system master, without repatching the word clock cables.



application 2

The combination of Rosendahl Nanosyncs with Nanoclocks fulfils all the demands of a complex digital audio and post production studio. Two Nanosyncs in the machine room provide video locked 48 and 44.1 kHz signals and distribute these clocks to the Nanoclocks into the two studios. Each word clock output of the Nanoclocks can be individually selected to drive Word Clock A or Word Clock B signals.

- video syncs
- word clock A
- word clock B

- In operation mode **DISTRIBUTOR** the two inputs A and B can be routed individually to each of the 12 outputs. Ten LEDs on the front panel indicate the sample rate of the incoming signals. Input B also accepts $F_s \times 256$ signals (also known as super clock).
- **GENERATOR** mode changes the unit into a ultra low jitter audio master clock generator with 12 programmable outputs. Supported sample rates are 44.1, 48, 88.2, 96, 176.4 and 192 kHz as well as the respective super clocks ($F_s \times 256$).
- **FAILSAFE** mode is a broadcast application, which monitors the two input signals and performs an automatic switch over of all 12 outputs if the primary word clock signal fails.

word clock input A
transformer isolated
BNC, 75 ohms internal terminated
32 – 100 kHz ($F_s \times 1$ – $F_s \times 2$)
minimum level = 0.7 Vpp

word clock input B
transformer isolated
BNC, 75 ohms internal terminated
32 – 200 kHz ($F_s \times 1$ – $F_s \times 4$) or
10 – 13 MHz ($F_s \times 256$)
minimum level = 0.7 Vpp

word clock outputs
3,5 Vpp @ 75 ohms, 12 x BNC
outputs 1-4: $F_s \times 1$ – $F_s \times 4$ or $F_s \times 256$
(super clock)
outputs 5-12: $F_s \times 1$ – $F_s \times 4$

internal clock generator
48 kHz, 96 kHz, 192 kHz,
12.288 MHz (XTAL 1)
44.1 kHz, 88.2 kHz 176.4 kHz,
11.2896 MHz (XTAL 2)
Crystal accuracy tuning +/- 5 ppm
@ ambient temperature 15 – 30° Celcius
clock jitter < 10 ps RMS (20 Hz – 20 kHz)

power supply
internal linear regulated power
supply two versions available:
1) 230 VAC / 50 Hz / 10 W
2) 115 VAC / 60 Hz / 10 W

dimensions
19"
1U rackmount
125 mm (D)
2 kg

design notes

As in analog circuits the jitter of a clock signal can be worsened by interference and noise. It is therefore important to use analog design methods when designing clock generators to optimise jitter performance.

There are 4 main sources of noise to be considered:

- Power supply and ground plane noise (ground bounce)
- Interlogic interference in highly integrated logic arrays
- Cable interference
- Increased noise and clock skew due to loop through signal distribution in a digital audio studio

Nanoclocks is designed to minimise all the above problems and has the following features, ensuring digital audio clocking with jitter down in the picosecond range.

- Each channel and processing logic block is individually power supply and ground decoupled.
- Low gate count logic ICs are used throughout.
- Inputs are transformer isolated to reduce cable interference allowing longer cable feeds from main clock generator.
- Clock distribution with 12 outputs allows a digital audio studio to be synchronised using a fan out as opposed to a loop through method.

The results of this design approach were measured with a special jitter measuring unit which has a resolution of one ps and can show the audio spectrum of clock jitter.

Comparative tests were carried out and in the above cases comparative improvements of up to 30dB measured.

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