# Apogee Big Ben

## 192 kHz master word clock

by Mitch Gallagher

**Type:** Master digital clock source/distribution system
**Price:** $1,495
**Contact:** Apogee Digital, www.apogeedigital.com

**Inputs:** 2 AES (XLR), S/PDIF (RCA), S/PDIF/ADAT/SMUX (optical) word clock (BNC)
**Outputs:** 2 AES (XLR), S/PDIF (RCA), S/PDIF/ADAT/SMUX (optical), 6 word clock (BNC)
**Clock frequencies:** 44.1, 48, 88.2, 96, 176, 192 kHz, Superclock, DSD
**Options:** FireWire card

The clocks built into digital gear have certainly improved over the years, but as a rig reaches a certain size and level, it becomes more and more important to have a central clock that can be referenced. As important is a good means to distribute the clock to the system without degrading it.

Apogee's Big Ben is intended to be the last word in digital clock. More than just a stable clock reference, it can process external clocks, convert clock formats, and distribute clock to up to ten different devices. And there's even more lurking under the hood.

### VITAL REFERENCE

Big Ben uses Apogee's C777 Clock Technology to generate clock frequencies whose jitter is said to be virtually unmeasurable. In addition to its own internal clock, Big Ben can accept clock signals from external sources and optimize them to reduce jitter. The range of clock rates supported includes 44.1, 48, 88.2, 96, 176, and 192 kHz. 256x Superclock is also supported, as is DSD. All sample rates can be pulled-up/pulled-down or "VSOed" as much as –44/+78% for ±999 cents of pitch change (displayed as frequency, percent change, or cents).

A feature called "SureLock" ensures that should the external clock fail, Big Ben's outputs will remain stable — sort of like AC power conditioning and un-interruptible power backup for digital clock.

Big Ben can accept a variety of digital formats: AES, S/PDIF, word clock, video, ADAT, and with an option card, FireWire. Output can be in any or all of the preceding formats. There's support for high-frequency clocks in multiple formats, including single- and dual-wire AES, S/MUX 2 (four channels of 88.2 or 96 kHz carried over ADAT optical), and S/MUX 4 (two channels of 176.4 or 192 kHz carried over ADAT optical). Four of the word clock outs transmit regular frequency clocks, while the remaining two can also send DSD or multiples of the clock frequency up to 256x (Superclock).

If you're working with video, Big Ben can lock to video up to 192k, and Apogee says that it can even generate DSD clocks synced to video (I was unable to test DSD operation). Big Ben will automatically detect the video format (NTSC, PAL, or B&W). Apogee has designed it to support non-standard combinations of format and pull-up/pull-down (*e.g.,* NTSC ±4%) for those sessions where you might have to deal with someone in the production chain who either made a mistake or didn't know what they were doing.

Clock can be converted from one format to another. In fact, Big Ben can send clock out in any format that supports the incoming sample rate. For example, an incoming coaxial S/PDIF 192 kHz clock could go out on single-wire or double-wire AES, S/PDIF (coax), S/MUX 4, and on the word clock outs. However, it couldn't be sent on optical S/PDIF, for example, since that format doesn't support 192 kHz. There are other exceptions as well; when Big Ben is using AES as a high-frequency clock source, AES can only be sent out in the same format. So at 192 kHz, you can't convert single-wire AES to dual-wire, and vice-versa.

When converting formats, the digital output format always fills as many channels as possible; if a 2-channel format is feeding an 8-channel format all eight channels will be used. If, for example, a 48 kHz source is coming in on AES, it will be multed so the left channel comes out on


**BIG BEN HAS MORE LIGHTS THAN A CHRISTMAS TREE — IT'S EASY TO SEE AT A GLANCE WHAT'S GOING ON WITH THE CLOCK SIGNAL IN YOUR SYSTEM. THE FIRST COLUMN DISPLAYS CLOCK FORMAT, THE SECOND PULL UP/DOWN, AND THE THIRD THE WORD CLOCK FREQUENCY OF OUTPUTS 5 AND 6.**

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ADAT channels 1, 3, 5, and 7, and the right channel appears on 2, 4, 6, and 8. This works with SMUX2 and SMUX4 output as well.

## IN USE

Big Ben's user interface is quite simple, but can require a lot of button pushing. There's four buttons on the front panel. Two are used to move through seven parameters, two are used to scroll through the parameter values. For example, push once to select the input source parameter, and push repeatedly to scroll through the various sources. Push again to select sample rate for word clock output 6, push repeatedly to scroll through the available rates, etc.

I set up Big Ben as the heart of my rig, clocking digital recorders, effects, digital mixers, and computer interfaces. Big Ben worked fine for everything, but there are some features I really like, such as being able to stabilize S/PDIF and AES audio signals. I routed the S/PDIF out from my CD player to Big Ben, and selected it as the clock source. I routed the S/PDIF out from Big Ben to my A/D converter. Big Ben stabilizes the clock coming from the CD player, reducing jitter. There were immediate improvements such as increased clarity and depth. And when you multiply the improvement across numerous pieces of gear during tracking and again during mixing, there's no question the value of Big Ben — the difference is audible. Beyond the audio improvements — which are enough in and of themselves — having a system clocked to a central sources is a great thing. There's no need to change clock sources when moving from tracking to mixing or when changing the digital routing and configuration of your studio rig.

> Having a stable clock source is essential for today's digital-based studios.

When you're locking to an external clock source, Big Ben will give you an indication of how stable that incoming clock is with "narrow" and "wide" indicators. Most modern gear has a relatively stable clock built-in, but for those instances where you do find yourself having to lock your rig to something with a less-than-stellar internal clock, Big Ben can definitely up the clock quality, and in doing so, the audio quality. Apogee says that in most cases there's no discernable difference between using Big Ben's internal clock and locking to/optimizing even a poor quality external clock. This will be important to you if you're forced to sync your system to one of the many lower-priced effects boxes and synthesizers/samplers that have a digital out but no word clock or digital input. ➤

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It's cool to be able to verify the 75-ohm termination status for your word clock connections. Big Ben indicates no termination (no light), good termination (green light), and over-termination (red light).

The SureLock feature works well. If incoming clock fails, Big Ben continues sending out clock at the last received frequency. I ran a S/PDIF clock into Big Ben, and clocked the rest of my system from it. While audio was playing, I yanked (gently, of course) the S/PDIF cable. The result? No loss of lock anywhere in the rest of the rig. Note that if you lose lock and SureLock takes over, there can be hiccups when Big Ben restores lock back to the original incoming clock.

## ON TIME

Having a stable clock source is essential for today's digital-based studios. There's the whole issue of reducing jitter for the sake of improving audio quality — this is Job One for any clock. But there are other considerations as well: Using a central clock removes the hassle of having to reset clock sources when tracking, mixing, or changing your gear configuration.

Apogee's Big Ben, along with most dedicated external clock sources, can provide excellent clock and allow for system configuration changes, although many of the others will require a separate clock distribution box, where Big Ben doesn't — and Big Ben's claimed unmeasurable jitter certainly raises the bar on audio quality. But all the extras that Big Ben throws in tip the balance: Being able to optimize external clocks is a *huge* deal — I've been waiting for this feature for a long time. Clock format conversion, ability to deal with high sample rates, video lock, word clock termination sensing, all very cool features. And let's not forget SureLock . . . if constant, glitch-free clock is essential for your studio or live rig, you'll instantly appreciate the value of this feature. Combine it with an un-interruptible AC power supply, and your rig can ride out the worst catastrophes without jeopardizing critical recordings. All in all, Big Ben is an amazing central digital clock system.

The final word? If you're looking to move to an external clock/distribution system, Apogee's Big Ben should be at the top of your must-check-out list. There are few (if any) clock sources/distributors/processors out there that can do as much and can do it as well — and can do it for this price. EQ

**Strengths:**

- Support for multiple formats
- Termination verification
- High-frequency clocking
- Multiple clock outs
- Format conversion
- SureLock maintains clock even with loss of input

**Limitations:**

- After SureLock takes over, there may be glitches when incoming clock is restored
- High sample rate single-wire AES can't be format-changed to dual-wire AES, and vice-versa