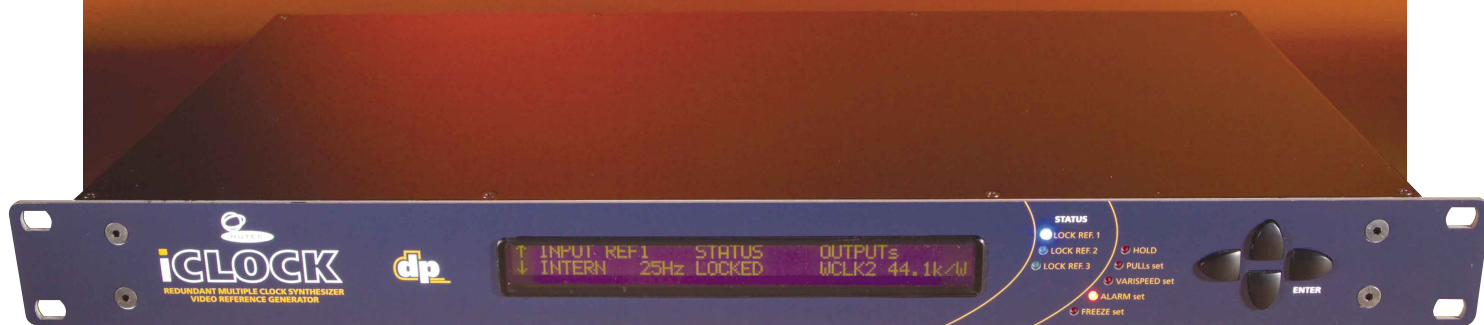


Mutec iClock



Photos: Mike Cameron

Master Digital Clock

This new master clock generator from Mutec can transmit a bewildering array of clock signals at many different rates simultaneously.

Hugh Robjohns

The Mutec iClock is an astonishingly flexible and very sophisticated master clock generator that delivers both video and digital audio clocks, synchronising to external references and generating an unlimited combination of different clock rates simultaneously.

Overview

The 1U rackmounting unit's dark-blue front panel is mostly given over to a large backlit display — the lighting can be set to turn off after a period of control inactivity. Eight status LEDs highlight critical operational conditions, and four cursor keys are provided to navigate the configuration menus.

The rear panel carries an impressive collection of interfacing, starting with three external clock inputs: two 'universal' inputs on BNCs, plus an AES input on an XLR. There are then four video sync outputs, eight word-clock outputs, four AES outputs, and two S/PDIF outputs (all configurable in pairs). In addition, there is a 15-pin D-Sub connector which, if the iC-Alarm option card is installed, delivers remote alarm signals in case of system failure. An RS485 port provides remote control. The review model was the 'DP' version, with dual redundant power supplies (the standard model has a single mains power supply), and thus featured

duplicated IEC mains inlets — making it ideal for broadcast applications or any role where fail-safe operation is required.

A small blanking panel on the rear of the unit can be removed to allow installation of an 'option module' — the only current one

SOUND ON SOUND

Mutec iClock

pros

- Effectively unlimited combination of different clock outputs.
- Truly universal reference inputs.
- Glitch-free operation even when a reference input fails.
- Redundant internal power-supply option.
- Expansion options.
- Logical menu configuration.

cons

- Review version wouldn't accept the UK's atomic clock reference signal, as broadcast via long-wave from Rugby.
- Er...
- That's it.

summary

An exceptionally versatile master clock system, able to provide unlimited simultaneous combinations of digital and video reference clock rates. The iClock is equipped with three reference inputs able to accept virtually every known form of reference clock, and can switch seamlessly between them and the internal crystal oscillator in case of failure.

adding a further four word-clock outputs. The operation of the module is configurable through additional menu pages which become accessible automatically when a module is installed, the clock and sync rates being set up in output pairs in exactly the same way as are the unit's other outputs.

The iClock works in a very different way to most master clocks, using Mutec's Direct Digital Synthesis (DDS) process to generate any standard video or digital reference signal, and with different clock rates at different outputs at the same time if required. Clock signals are derived from an internal 172.8MHz master clock, which is referenced from either an internal temperature-compensated crystal oscillator (with a burned-in and 'pre-aged' crystal for maximum stability), or from any one of the three external reference inputs. The specifications of the DDS system are impressive, with a claimed clock jitter of less than 1ps (RMS), and an accuracy of better than 0.1ppm. That jitter figure is 20 times better than that of the Smart Clock, and the clock accuracy is ten times better than the AES Grade 1 requirements.

Using The iClock

The iClock is primarily intended for sophisticated audio-visual installations where accurate synchronisation between video and digital equipment is paramount — but its remarkably sophisticated and unusual multiple clock feature would be very useful in mastering or transfer rooms too, where different sample rates are often required simultaneously. For example, it was very easy to configure the iClock to provide 96kHz clocks to control my Genex hard disk

MUTEC ICLOCK

► recorder, Yamaha console and SADiE DAW, at the same time as providing 44.1kHz to clock a sample-rate converter feeding a CD recorder, and 48kHz to clock a second sample-rate converter feeding a digital video recorder. I chose to use the iClock's internal crystal as the master reference, but I could just as easily have hooked it up to any stable external reference, without imposing any restrictions on the output rates generated.

In fact, the range of acceptable external reference signals is one of the most impressive features of the unit. The two 'universal' reference inputs will accept pretty much anything that can lay claim to being a clock signal of some sort — and the switchable 75Ω termination and isolated ground options make interfacing very straightforward and reliable. PAL or NTSC video syncs at any standard frame rate are accepted, along with any word-clock rate from 8kHz to 24.576MHz (512 times 48kHz), which includes all the standard PCM rates as well as the two Digidesign Super Clock rates. The unit also recognises the standard DSD64, DSD128 and DXD word-clock rates used for SACD production, and both the unbalanced

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with any standard frame rate and various sync format options, and an optional second video generator can be installed to allow simultaneous PAL and NTSC formats. The only possibility not apparently catered for at present is the tri-level sync format employed in High Definition video systems, but I doubt that this will be a concern to most potential users of the iClock.

The eight word-clock outputs can be

known as AES11) which apparently helps to reduce recovered clock jitter in some AES receivers. The two S/PDIF outputs are configured as a pair, with similar setup options to the AES outputs.

And the iClock's stunning flexibility in terms of setting different clock rates on different outputs goes even further still, because the unit can provide a 'varispeed' clock reference over a ± 20 percent range, allowing completely non-standard rates to be used to provide alternative tuning or replay speeds. All the usual broadcast-related pull-up and pull-down rates are here too, with ± 0.1 percent options for transferring between film and NTSC video, and +4.16 percent and -4 percent modes for transferring between film and PAL video.

Finally, there is a range of sophisticated options to determine the tolerance range of input reference clocks, the priority of the three reference inputs, and the switching delays should one fail. A lost (or restored) external reference does not cause glitches in the output clocks, which are maintained in perfect phase alignment and with absolute rate stability at all times.



form of AES3 (AES3id) and S/PDIF clocks from 32kHz to 192kHz. Other accepted clock references include GPS signals at 1.0, 2.5, 5.0, or 10.0MHz, telecoms standard rates at 1.024MHz and 2.048MHz, and DCF at 77kHz. The last is the German atomic clock reference signal broadcast on long-wave from Frankfurt — the equivalent of the UK's MSF clock transmitted from Rugby (which runs at 60kHz). However, it is surprising, given the versatility of the iClock, that it will not currently accept the MSF reference. Mutec say this facility is only a software update away, and not a Germanic snub of Rugby! [*The company informed us just before we went to press that MSF is supported as of OS v1.2 — Ed.*] In fact, they seem generally very willing to extend the range of clock-reference, output, and pull-up/down options if a case can be argued for their addition. The dedicated AES3 reference input will accept all clock rates from 32kHz to 192kHz.

On the output side, the four video outputs can be selected independently in two pairs

configured independently in pairs for any of 36 standard clock rates between 8kHz and 24.576MHz, which offers an enormous amount of flexibility. There are also a further eight options between 24Hz and 60Hz for synchronising 'pilot tone' resolvers and film-projection systems too. The electrical format of the outputs can be changed too, with an option to switch off unused outputs, or to select a 3.5V/22Ω mode (to cater for particularly long cables) instead of the standard 2.5V/75Ω option. There is a third option specifically designed to optimise Super Clock transmission too.

The four AES clock outputs are configured in independent pairs, and will output any standard rate between 16kHz and 192kHz. The AES and S/PDIF clock outputs can be set up to pass through any audio and sub-code data received at the AES or S/PDIF reference inputs, thus serving as a distribution hub. Other configuration options include setting the output status AES flags to indicate a specific word length (16-24 bits), professional or consumer modes, audio or non-audio, reference grade status, and lock status. There is also a facility to introduce a DC offset when distributing a 'blank' AES reference (in other words an AES signal with no audio content,

Without doubt, the iClock is the most sophisticated and versatile master clock generator currently available, but despite the complexity of rates and options it is surprisingly easy to configure and use, and the display provides clear warnings of any problem. Anyone setting up or looking to re-equip an audio-for-video facility, a mobile recording truck, a transfer or mastering suite, or a broadcast station should investigate the iClock without delay. This is a seriously impressive piece of kit. **SCS**

information

£ iClock, £1292; iClockDP, £1527; P/NVSG02 video sync generator option, £399.50; iC-Alarm alarm signal output option, £235; ICWC04 word-clock output expansion option, £270.25. Prices include VAT.

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Test Spec

Mutec iClock OS v1.00.