



## Mutec iClock

**HUGH ROBJOHNS MIBS reviews an unusually versatile digital master clock.**

The Mutec iClock is an extremely sophisticated video and digital audio clock generator which can be synchronised to a vast range of external references with a high level of fail-safe security. Primarily intended for sophisticated audio-visual installations where accurate synchronisation between video and digital equipment is paramount – the iClock is particularly useful in mastering or transfer rooms too. However, the key feature of the iClock is that it can generate a virtually unlimited combination of different clock rates simultaneously, thanks to its innovative ‘Direct Digital Synthesis’ system.

Clocks are derived from an internal 172.8MHz master 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 are impressive, with jitter claimed to be less than 1ps (rms), and an accuracy better than 0.1ppm – ten times better than the AES Grade 1 requirements.

### Smart Box

The iClock is a 1U rack mounting unit extending 240mm behind the rack ears. Its dark blue front panel is largely given over to a backlit fluorescent alphanumeric display and eight status LEDs which highlight critical operational conditions. A quartet of cursor buttons are provided to navigate the configuration menu system.

The rear panel carries an impressive collection of interfacing, starting with three external reference clock inputs: two ‘universal’ inputs on BNCs (with switchable 75 Ohm termination and isolated ground options to make interfacing very straightforward and reliable), plus an AES3 input on an XLR. There are then four video sync outputs, eight wordclock outputs, four AES3 outputs and two S/PDIF outputs (all configurable in pairs). If the optional ic-ALARM card is installed a 15-pin D-sub connector provides failure alarm signals, and an RS485 port is provided for remote control. The review model was running V1.10 software and was the ‘dp’ version equipped with dual redundant power supplies (and thus featured duplicated IEC mains inlets), making it ideal for broadcast applications or any role where failsafe operation is required. The standard model has a single mains power supply.

A small blanking panel on the rear of the unit can be removed to allow installation of an ‘option module.’ Currently only a module providing an additional four wordclock outputs is available, but other options may be added in future. The operating software recognises when a module is installed and extends the configuration options automatically.

### Excellent References

The range of external reference signals that the iClock will accept is vast. The dedicated AES3 input accommodates sample rates from 32 to 192kHz, and the two ‘universal’ inputs will accept virtually anything with a reliable repetition rate! Both PAL and NTSC video syncs (at any standard frame rate) can be used, as well as any wordclock rate from 8kHz to 24.576MHz (512 times 48kHz) – which includes all the standard PCM rates plus the two Digidesign Superclock rates. The unit also recognises the DSD-64, DSD-128 and DXD word clock rates used for SACD production, and both unbalanced AES3 (AES-3id) and S/PDIF inputs with sample rates from 32 to 192kHz.

Other less familiar but still acceptable clock references include GPS signals at 1.0, 2.5, 5.0, or 10.0MHz, telecoms standard frame rates at 1.024 and 2.048MHz, and DCF at 77kHz. The last is the German atomic clock signal broadcast on Long Wave from Frankfurt. An updated iClock software (V1.11) is available for UK users wishing to use Rugby’s MSF 60kHz signal as a reference instead.

A range of sophisticated options determine the tolerance window for each of the three external reference inputs, their priority order when more than one is provided, and the switching delay should one fail. The DDS system ensures that a lost (or restored) external reference does not cause any glitches in the output clocks, which are always maintained in perfect phase alignment with each other and with extreme stability.

On the output side, the video outputs can be configured independently in two pairs for any standard frame rate and sync format. An optional second video generator can also be installed to provide simultaneous PAL and NTSC video formats, if required.

The eight wordclock outputs are also configured in independent pairs for any of 36 standard clock rates

between 8kHz and 24.576MHz, and there are a further eight options between 24 and 60Hz for synchronising 'pilot tone' resolvers and film projection systems! The electrical format of these outputs can be changed too, with options to switch off unused outputs, or to select a 3.5V/22 Ohm mode (to cater for particularly long cables) instead of the standard 2.5V/75 Ohm default condition. A third mode is specifically designed to

## Prices

Standard iClock	£1099
DP iClock	£1299
Optional WC module	£230
Extra video generator option	£340
ic-ALARM option	£200
All prices exclude VAT	

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optimise Superclock transmission.

The four AES3 and two S/PDIF clock outputs are configured in pairs again, with any standard sample rate between 16 and 192kHz. These outputs can also be set up to pass audio and subcode data received at the AES or S/PDIF reference inputs - a useful function for distributing station line up tones, for example. Other configuration options

include setting the output status flags to indicate a specific wordlength (16-24 bits), pro 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 silent AES (AES-11) which apparently helps to reduce recovered clock jitter in some AES receivers.

The iClock's stunning flexibility goes even further, with the ability to dial in non-standard clock references spanning a  $\pm 20\%$  range from normal - useful for setting up alternative tuning or replay speeds. All the usual broadcast-related pull-up and pull-down rates are here too, with  $\pm 0.1\%$  options for transferring between film and NTSC video, and +4.16% and -4.0% modes for transferring between film and PAL video.

## Conclusion

The iClock is surely the most sophisticated and versatile master clock generator currently available. Despite its flexibility it is surprisingly easy to configure, and the display provides clear warnings of any reference clock 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, and surprisingly affordable to boot.

**ibs**