

Code is Right on Time

By Richard Cadena

If you had a chance to see the Eurovision Song Contest (ESC) lin May, either live or on television, then you know how much technology was used in the show. Besides the fact that it had a huge stage and arena filled with lighting, video (including 12 Barco HDQ40 projectors, 10 High End Systems MMS mirrors, lots of LED video displays, and a high-resolution LED floor), automated set pieces controlled by Cyberhoists (and BlackTrax on one song), pyro, CO2 jets, and, most importantly, multiple mirror balls with positionable motors, all synchronized to a soundtrack, the production involved choreographing 22 cameras, including two mounted on Moviebird 45' cranes, one on a 19m Cascade crane, three rail cams, three Steadicams, two handheld cams, seven dolly cams, and more. It was a very dynamic show with a fast pace, and it had lots of moving parts, all very precisely timed and really well executed.

As production manager Ola Melzig put it, despite the fact that there were 22 cameras operating simultaneously, "I challenge you to watch any of the broadcasts and try to see another camera. You won't. It's perfectly executed and impressive to watch." That was due, in no small part, to a very talented and experienced crew who rehearsed the show to within an inch of its life, and also the fact that the show was pre-programmed well ahead of the event and played back using time code triggers.

A time code display unit guides programmers and operators and helps them ensure the proper synchronization of all the proper elements of a show.

A university student recently emailed me, asking if I thought MIDI show control (MSC) was a useful tool. Although he asked specifically about MSC, I interpreted his question to encompass time code in general, including SMPTE time code, MIDI time code, and maybe even MIDI show control.

Time code has it origins in the film world. In the early days, there was no way to record audio on film, so it was recorded separately on an audio recorder. In order to synchronize the two, a clapperboard was used. Unless you live under a rock, I'm sure you're familiar with the iconic clapperboard on which production personnel would write the name of the production, director's name, date, scene, and take, and which, before every shot, would be filmed making a clapping sound. That sound would subsequently be used to synch the audio with the film. An engineer would simply move the audio deck to the point at which the clapping sound was heard, roll the film, and play the audio when he or she saw the clap on film. Then the film and audio would run in synch.

Later on, when video became commercially viable, the opportunity arose to encode video with timing informa-

Photo: M&M Productions

tion, including absolute time in hours, minutes, and seconds, plus the frame number. This eliminated the need for synching with a clapperboard and enabled the opportunity to synch multiple cameras fairly easily, using an internally generated time code. In 1969, the Society of Motion Picture and Television Engineers (SMPTE—pronounced "simp'tee") standardized it as an ANSI standard known as SMPTE Time Code.

SMPTE time code is fundamentally an analog signal, so, in 1986, Evan Brooks, of Digidesign, and Chris Meyer, of Sequential Circuits, developed a way of transmitting SMPTE time code digitally, so it could more readily be used by digital devices like computers, consoles, and musical instruments. The resulting standard is MIDI (musical instrument digital interface) Time Code. In 1991, Charlie Richmond, of Richmond Sound Design, organized a working group to create a standard for using MIDI to trigger lighting cues and other effects, the result of which was the standard referred to as MIDI Show Control (MSC).

Most lighting consoles now have the ability to chase time code using MTC or MSC. MTC is referred to in some lighting consoles as linear time code (LTC), because it can be recorded on audio or videotape linearly, along the edge of the tape, instead of in a back-and-forth fashion, as is a video signal. It can be recorded at various frame rates to correspond to the video format. Common frame rates include 24, 25, and 30 frames per second to accommodate film (24fps), NTSC (30fps), or PAL video (50fps). There is also a drop-frame time code to accommodate the 29.97fps rate of NTSC video, which, as the name implies, drops frames periodically to compensate for the fractional frame rate. Since it's impossible to drop fractions of a frame, it waits until a full frame error has accumulated before dropping one frame, which keeps it synched properly.

Ola Melzig, technical director for Eurovision Song Contest, oversees the technical aspects of the live production, including the programming and synch.

Photo: Ralph Larmann

In the case of Eurovision Song Contest, I don't think there was any possible way that this event could have been pulled off with the accuracy needed to synchronize all of the programmed elements without using time code. The production team started with Cuebase, a non-linear editing software for recording, editing, and mixing audio, and recorded each song with a time code stripe. The software can generate time code, and the digital audio work station can output MTC, which is used to synch all of the consoles. This allowed for playback of each song and program cues to be triggered at specific times.

If you had a chance to see any of the pictures from ESC taken during pre-production, you might have seen a picture of the front of house with a SMPTE time code display unit. The self-contained display shows the current hour:minute:second:frame in large numbers so that every programmer and operator could plainly see it. It left no question about whether or not every device was synched properly. The video content was played back using 19 Green Hippo Hippotizer media servers, triggered by MA Lighting grandMA2 lighting consoles, which were synched to time code from the MTC input on the back of each console.

During pre-programming, every programmer had the ability to switch between the master clock and internal console clock, using a simple A/B switch. This allowed them to switch out of the master synch, to make quick changes during rehearsals, and to switch back to the master clock. Otherwise, they would have no control of their consoles to try out their changes.

Time code was one of the keys to pulling off this magnificent show, with its 25,300 parameters, 71,000,002 pixels, and 1,828 lighting fixtures. Of course, without a stellar crew to set it up, program it, and play it back, it would just be a pile of hardware. Not all shows require this level of technology to be precisely executed, but the more elements that need to be synched, and the faster the pace of the show, the more need there is for time code.