DiGiCo Quantum 338T Digital Mixing Console

By: Mel Lambert

Unveiled at NAMM 2020, the original Quantum 338 handles 128 input channels, 64 output busses, and a 24-x-24 matrix together with full-channel processing based on seventh-generation FPGAs. An all-new design offers a trio of high-brightness displays with individual TFT channel displays; the outer pair shows system channel settings while the central screen follow master functions and includes scrollable cue lists. The Quantum chassis provides 36 assignable channel faders arranged in three banks of 12, plus a pair of dedicated master faders with metering. Master output is to LR/LCR/LCRS or 5.1-channel. DiGiCo's familiar theatrical-mode software can also now be run on a Quantum 338 without a hardware change, resulting in the new Quantum 338T configuration, with a suggested pro-user price of $122,869. The unique, application-specific enhancements are fast to implement—just a handful of seconds—and just as fast to return to the regular live configuration, should the need arise. As a result, the Quantum 338T offers a flexible solution for both end users and rental companies that have a fixed console inventory.

But first, some scene-setting about DiGiCo's digital console series, which started with D5 Live, followed by the SD-Range. From the rackmount SD11 to the flagship SD7, the SD-Range utilized Super FPGA technology to offer high I/O capabilities and a powerful dynamics toolbox. Launched in 2015, the S-Series offered mixing power in a compact package; in 2016, Stealth Core 2 software enhanced the SD-Range. Unveiled in 2018, Quantum 7 incorporated a trio of seventh-generation FPGAs working in unison for enhanced DSP, higher channel counts,


DiGiCo Quantum 338T.

and new operational features, including the patented Nodal Processing and True Solo; 2020 saw expansion of the Quantum range with the Quantum 5 and Quantum 338, the latter adding new hardware features such as 32-bit local I/O and high-resolution touch screens. The advanced FPGA-based hardware is said to have been developed in conjunction with Audiotonix Group partners, including Allen & Heath, Calrec, and Solid State Logic. The new Quantum 225 console handles 72 inputs with 24+1 on-surface touch-sensitive faders routing to 36 buses and LR/LCR master buses; a single 17" screen handles operational functions.

Originally unveiled in 2021 as an adjunct to the Quantum 7, the Quantum 338T console with T Series theatrical software retains DiGiCo's Mustard Processing, Spice Rack, True Solo, and Nodal Processing, with triple-redundant MADI and Optocore interfaces for enhanced connectivity. Each touch-sensitive screen offers two

rows of rotary encoders that control channel parameters. A master section to the right of the center screen controls some snapshot functions and solo functions, plus four layers of ten user-assignable LCD macros that can be triggered with fader movements, GPI, MIDI, and keyboard functions.

Currently, SD5 and SD7 consoles can receive a Quantum engine as a field upgrade to become the Quantum 5 and Quantum 7, respectively; Quantum 338 and Quantum 225, being newer offerings, are fully Quantum-powered. In addition to the SD7T/Quantum 7T and Quantum 338T, several SD-Range consoles can also run the company's theatre-software package, including the SD12T (reviewed in *LSA,* June 2017), SD10T, and SD9T. Initial Quantum 338T sales have been made to The National Theatre and Autograph Sound, both in London; Elgin Winter Garden Theatre in Toronto; and The National Theatre, Oslo, Norway.

DiGiCo points out that SD-Range
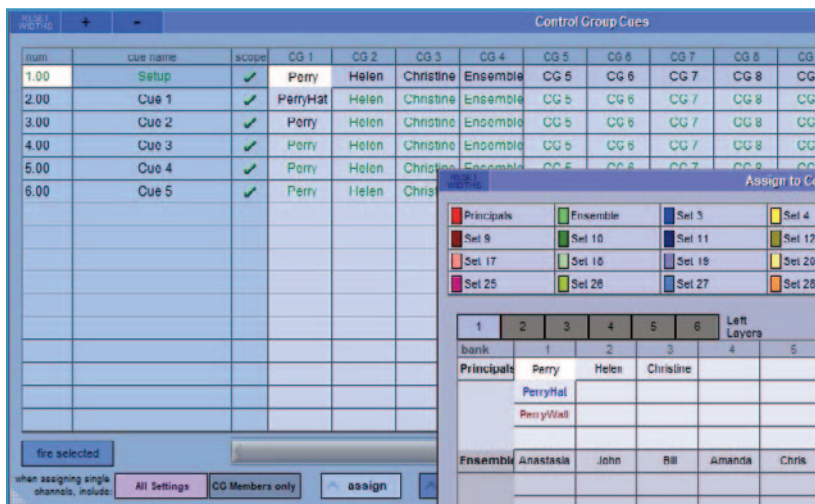
Central to programming is the ability to handle membership of control groups throughout the cue list. The CG Cues Panel shows a list of cues down the left column, then a grid of control troups with their membership. A tick indicates that any changes in CG membership will be recalled when the cue is fired; a cross that any changes will not be recalled.

consoles will remain supported for the foreseeable future since they are in widespread use and, even though outperformed by the new Quantum Engine, still offer a lot of processing and flexibility. The target market for the larger Quantum 7T is Broadway and West End musical theatre; the smaller, multi-screen 338T is aimed at parallel markets, especially regional and touring theatre. Workflow is similar between SD and Quantum consoles, while the work surfaces are based around similar ergonomic principles, thereby streamlining the transition from one format to another, despite some physical engine differences, including the number of MADI ports, DMI slots, etc.

Theatre-targeted Quantum consoles

The all-new Quantum 338T combines "in-the-box" mixing to dramatically reduce the need for outboard processing from a lightweight control surface. The addition of a theatre-specific workflow offers sound designers and operators an enhanced cue-based show control that includes DiGiCo's Auto Update and cue-data management tools. Auto Update lets users set up intricate inter-cue relationships, with changes made to targeted chan-

nel settings being automatically propagated to related cues. An Alias function handles character variations, which often result from costume and prop changes, with cast changes being managed through a Players function.

Identical to the channel processing and mixing functions offered by the live-focused Quantum 338, the Quantum 338T adds individual nodal delays and matrix aliases tailored for theatrical applications. This enhanced matrixing system plays a key role within complex theatre output processing, without compromising any of the Quantum 338T's general processing capabilities. The theatre matrix provides up to 1.3 seconds of loudspeaker or monitor delay on each node.

Quantum 338T is equipped with custom-developed Mustard processing strips selectable on up to 36 mono channel strips that operate alongside standard Quantum processing. For example, standard processing can be augmented with an opto-style Mustard compressor post-fader to offer additional creative options. The four current Mustard options are based on an opto compressor, a FET limiter, a vintage VCA compressor, and a classic DiGiCo module, all with mix controls

for parallel processing. The pre-amp modeler section offers both a simple tube-style version and a more comprehensive one with more controls. Mustard EQ features fourth-order high- and low-pass filters plus parametric EQ all-pass filters, the latter providing a 180° phase shift at the chosen frequency and with a small Q-value that is said to deliver a more linear phase shift over the audio spectrum. (One targeted use occurs with multiple mics on the same source—maybe a pair on a snare but with different distances to the skins—where an all-pass filter-based EQ can help signal summing.)

Quantum processing also adds a Dark Mode app for the three high-brightness multitouch screens, thereby enabling display of both software-based quick-select buttons and a meter bridge on each monitor. DiGiCo HOME is a new launcher portal that incorporates quick links to console applications and configuration setups, to simplify operation, configuration, and routine maintenance. Dark Mode refreshes the high-contrast graphics while reportedly helping to reduce eye fatigue and thereby improve screen legibility. A total of 70 individual TFT channel displays and the floating Quantum chassis incorporate a total of 38 four-inch touch-sensitive faders in three blocks of 12 programmable fader banks, in addition to a pair of dedicated user-assignable faders, each with high-resolution metering. High-precision 32-bit A-to-D and D-to-A converters are featured, as well as either six single MADI connections or three redundant MADI connections, dual DMI slots, and a built-in MADI-USB recording interface.

An Apple iPad control app lets operators control via Wi-Fi any of the Quantum 338T's major parameters. The iPad can serve not only as a remote-control surface, but also an expansion of the console control surface by adding an extra 256 macro buttons to provide quick access functions via a hand-sized surface, leaving the primary Quantum console for show
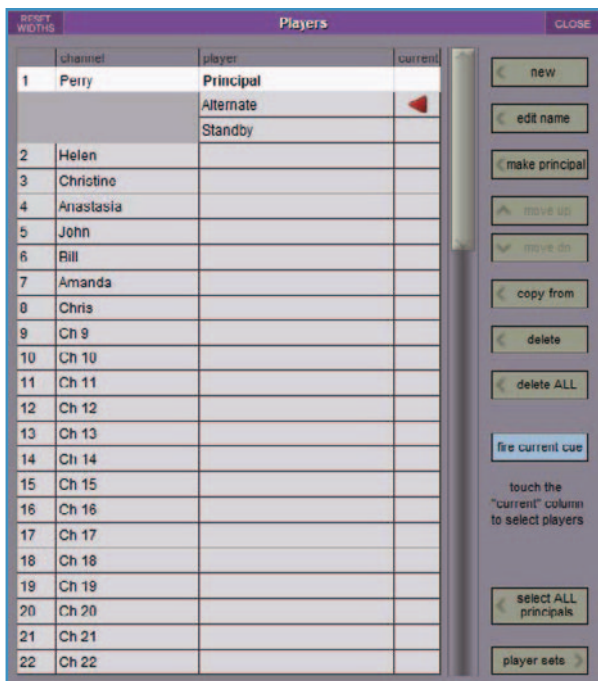
The Players Panel allows several actors' names and channel settings to be associated with an input channel and one to be selected as the current player.
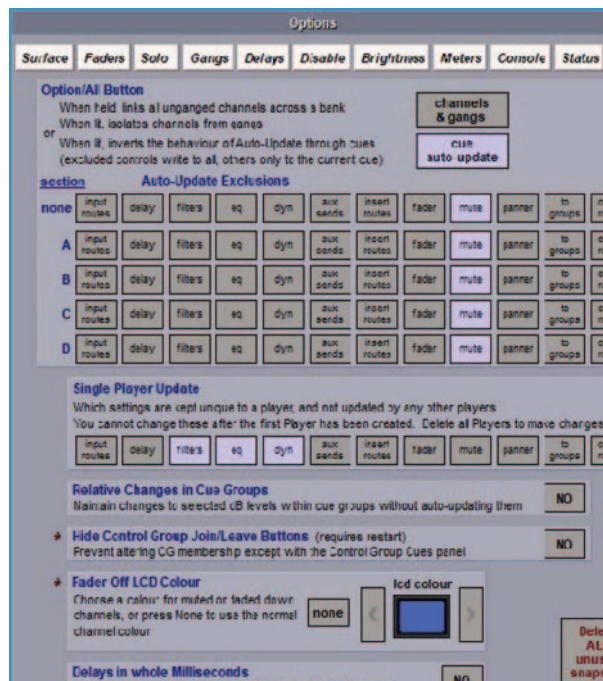
Theatre Tab selects Channel Gangs and Cue Auto Update. Standard mode offers live-style functions, with operations on entire banks of controllers. Cue Auto-Update eliminates Gang functions and inverts the Auto-Update function.

mixing.

Six types of DMI (digital multichannel interface) slots, capable of delivering 64 channels of I/O per module, are available: DMI-KLANG, which provides ultra-low latency KLANG immersive processing for up to 16 two-channel mixes, with 64 inputs at 48 or 96kHz sample rates; DMI-MADI-B, which can be used to connect a standard MADI stream at 48 or 96kHz sample rates, or a DiGiCo Rack; DMI-HYDRA 2, which provides 56 input and 56 output channels at 48kHz with primary and secondary (backup) optical connections; DMI-AVIOM, which provides 16 output channels at 48kHz (with sample-rate conversion) and support of Aviom's proprietary A-Net Pro16 protocol; DMI-WAVE, which provides 64 input and 64 output channels at 48 or 96kHz to a SoundGrid Network via a pair of CAT5E connections; and DMI-DANTE 64@96, which provides 64 input and 64 output channels at both 48 and 96kHz via primary and secondary (backup) Gigabit Ethernet ports to a Dante network.

The console connects to primary stage racks via Optocore, via MADI—using the built-in ports/DMI cards—or maybe via Dante ports, dependent on the chosen topology. Supported systems include the compact 9U D2-Rack, with a fixed-format 48 inputs with 16 outputs as standard, which can be increased to 32 outputs by populating the two spare output slots; inputs can be specified as either 48 mic in or 24 mic/24 AES-format In. The SD-Rack features up to 192kHz high-resolution A-to-D I/O converters, with multiple simultaneous digital formats, including MADI, AES/EBU, Dante, AES-42, ADAT or Aviom.

The 4U rack is based on the same Stealth FPGA technology utilized in the SD and Quantum console engines, which means it can run an optical loop at 96kHz while also providing a down-sampled 48kHz output, for example, to a broadcast truck from a MADI output stream. DiGiCo's Gain Tracking offers +/- 40dB of independent digital gain, either on a channel-by-channel basis or automatically. The rack accepts SD analog/digital I/O cards; MADI connectivity is standard, with

optical as an option. The SD-NANO Rack is a 2U stage box that handles half the I/O of the SD-MiNi via Optocore ports.

The Spice Rack supports plug-in-style native FPGA processing options, enabling operators to develop a customized rack of up to eight insertable channel processors, much like an external plug-in system. The first option is Chilli 6, which comprises a six-band compressor—four separated by crossover filters with a shared crossover slope plus two parametric bands—that can be assigned anywhere with full control of all parameters, including DiGiCo's patented Release Shape control, which is designed for shaping vocals and instruments as well as focusing on problem frequencies. Also available: Naga 6 with six freely assignable parametric bands that enable operators to focus on multiple problem frequencies, or to achieve specific effects. Both Mustard and Spice Rack functions will be extended in later software versions to include additional choice of modules and processing options.

Nodal processing can be used, for example, on auxiliary sends while mixing monitors. Maybe a guitar input is included on several IEM or wedge mixes for a stage band. If the guitarist wants a different EQ, or the source to be more prominent in the mix, while other band members require different processing, on other consoles an operator has to double-route the input and select different EQ values. The Quantum 338T software allows each aux send from that channel to feature different EQ and dynamics without wasting a channel path. Or, if the same Quantum 338T console is used to mix front of house and monitors simultaneously, conventional processing can be used on front of house, and nodal processing on monitor aux sends for band monitors.

True Solo enables monitor mixes to be checked as the artist will hear it, including any processing on the auxiliary master feeding IEMs or wedges. Functioning much like a conventional PFL, True Solo can temporarily apply the processing of that buss to the solo bus. Simplicity epitomized!

Theatre-specific software extension

DiGiCo's theatre-specific software extension, already familiar to users of the Quantum 7T, SD10T, SD12T, and SD9T, can be added to any Quantum 338, using a simple unlock code. While all processing remains the same, T software completely changes the way the console's snapshot or cue programming system functions for a custom workflow.

As will be quickly realized, theatre is a demanding environment in which to mix and deliver consistent show sound from performance to performance, venue to venue, and with changing cast members. The theatre extension was designed to add enhanced user flexibility via scenes and cues that comprise mix-level, channel processing, and I/O routing snapshots. Since many theatre operators prefer to mix hands-on, DiGiCo's software develop-

Brian Tsieh, of DnB Design, with a Quantum 338T console in 3G Productions' warehouse.

ers added functions that allow the Quantum 388T to take care of routine operations, including intuitive cue-list automation and editing, together with an ability via Advanced Cue Update to modify previously programmed cues as the production progresses.

Channel Aliases are useful when an actor needs to change costume or character, for example. All the actor's unique channel settings—dynamic EQ, dynamics, and more—can be transferred to the target channel, thereby updating the retained programming and cue-to-cue changes. Or maybe an understudy has taken the lead for tonight's performance, but the director or stage manager is unsure until the last minute who will play that character. A new Player tool allows the operator to apply settings stored in a pre-programmed list of several actors under the same character name, and then load those settings; the production settings are automatically updated with all of the appropriate settings, including EQ, dynamics, and filters, but without overwriting specific cue-to-cue programming. And if the cast of a contemporary theatre production includes child actors—who are often limited in the hours they're allowed to work—several child actors can be assigned the same role and changed on the night.

And, with removable hats being among the most common theatrical props used by theatre actors several times during a production, the output of lavalier microphones—head-worn or circled across the actor's cheek—will often need substantial EQ changes to compensate for headwear via an Alias that can be quickly recalled into a new cue.

New for T software, Matrix Nodal Delays adds over 500 individually storable delay settings that are handy for aligning and positioning groups of theatre speakers. The matrix provides up to 1.3 seconds of total delay on each node. A VCA programming map allows the operator to view group master changes throughout the show, a feature that is especially useful on shows that are cue-heavy.

Programming cues and snapshots

Theatrical mode adds an Auto Update System so that the operator can apply setting changes to a channel that is assigned to more than one cue. For example, changing EQ on Channel #1 in a cue will update the same EQ in all cues in the show snapshot that have matching equalization. Usefully, the Automatic Update rule functions alongside the Alias system; if a channel uses more than one alias, changes

How Digital Mixing Revolutionized the Creative Art of Theatre Sound

It is often said that technology enables creative innovation. In the heady world of sound design for opera and musical theatre, without key features operators cannot deliver and update cue-based workflows. One console probably triggered that paradigm change: the compact Cadac J-Series digitally controlled analog console, developed by the English firm during the late '80s and '90s. Many consider that the J-Series, with 12 aux sends and six groups/matrix modules controlled from VCA-style mastefaders, resulted in a serious game change.

But such mixing hardware is only as useful as its programmable software. In 1983, Cadac's founder and managing director, Clive Green, and computer-expert Derek Dearden built a system designed to store and recall control-group assignments via a series of cues that route target channels to a VCA control section where the operator—usually working in darkened conditions—controlled relative levels of key performers, sound effects, and music. Such developments were continued in collaboration with London-based Autograph Sound, a leading theatre-sound design and rental operation, whose founder, Andrew Bruce, helped refine the J-Series' features and functions, including modular layout and a flexible output matrix.

It was soon realized that large-format analog consoles take up valuable theatre seating. Assignability offered by all-digital mixers was the way to go, of course, and so Cadac and other manufacturers looked for viable alternatives. In the mid-'90s, with the help of Andrew Bruce, Soundcraft developed The Broadway, an all-digital design which, for myriad reasons, sadly never got off the ground. Meanwhile the Cadac J-Type with SAM software continued to offer a temporary, albeit analog, solution and was first used in 1999 by Autograph on *Mamma Mia!*, the ABBA-inspired stage musical; a fledgling, all-digital design was floated by Cadac but considered too expensive to develop.

In 2002, DiGiCo unveiled the first of its all-digital series, the D5 Live, which, while fully assignable and hence featuring a smaller control surface, was based on software-controlled libraries of I/O snapshots and level/EQ/dynamics settings that could be stored, recalled, and modified. Recognizing its potential for theatrical sound design, Autograph Sound reached out to DiGiCo regarding show workflows based on cue sequences.

As well as remapping channels to put groups of channels under the operator's direct control at the centralized VCA bank, what DiGiCo termed as Aliases—to reflect its theatrical relevance—streamlined the modification of cues to accommodate changes to channel settings, EQ, etc., for example, as onstage performers add or remove hats.

To enhance the DiGiCo D5 digital console's theatre potential within music theatre and related applications, the SD variant of T software was rewritten from the ground up, drawing on the experiences the designers gained with D5T, and with continued input from Bruce. The resultant SD-7T resulted in other console offerings, including the new Quantum 338T.

Key background material for this sidebar was secured from two articles authored in 2014 for www.fast-and-wide.com by Tim Goodyer. — **ML**

to a module—for example, equalization—will only be updated to cues that have a matching alias. An opt-out option enables, for example, channel delay to be restricted only to the cue in which it is changed to track actors around a stage, cue-by-cue. Or a channel's routing might need to be changed cue-by-cue between several different groups. Updates across cues are also modified by Auto Update Exclusions, ensuring that changes to the excluded module will only occur in the single cue being modified. Another powerful option allows settings to be applied to different players of the same role in the particular show. (For example, if several actors or vocalists are playing the same role in different performances, individual settings for any can be recalled according to who is playing the role on the night. Settings for such players can also be auto-updated by changes to others, or remain isolated from these updates.)

It is also possible to protect controllers and channels from Auto Update. The Cues/Scope/Group and Auto Update Scope allow protection on an individual-channel basis. For example, items marked with a red cross in this scope panel will not be updated by the Auto Update system. Relative changes in cue groups can also be globally enabled/disabled. The Cue Mode Indicators panel, which can be positioned anywhere on the console, will show the status of both Auto-Update (on/off) and relative changes in cue groups.

A handy Channel Set function can contain any combination of channels; a channel can also be a member of any number of sets. Such sets can be used to assign members to control groups, thereby enabling fast selection of pre-defined groups—or sets—of channels; a Set Spill function also makes use of such sets. Usefully, any channel(s) can be quickly added to a set via an on-screen soft key, with user-selectable names and color codes.

The key to successfully program-

ming a theatrical performance is an ability to control the membership of control groups throughout the cue list. An intuitive Control Group Cues panel allows easy assignment of members and shows a list of cues down the left column, then a grid of control groups, with their membership. A Ripple Down function changes settings in following cues until a change of state is met, when change of assignment halts. Other system settings allow assignments to be selected individually or as groups, with fill renaming and color coding.

A VCA Programming Map allows the operator to view—and plan—group master changes throughout a show. Targeted programming is essential for a successful performance, especially for the shows that are cue-heavy—with the result that fast access to labelled VCA faders with fast muting can alleviate a great deal of operator stress.

A powerful digital console for theatrical productions

As will be readily appreciated, musical theatre and related events require custom-developed features that enable fast programming of cues and then updating to respond, for example, to on-the-day cast changes. The Quantum 338T features a familiar and intuitive user interface with three display screens and 38 on-surface faders—hence that "338 designation." Custom-developed software streamlines the setting of level, panning, and system parameters with centralized VCA-style group masters, together with the assembly of snapshot cues into last/next sequences to handle fast changes. T software directly addresses the unique demands of theatrical sound design, with line-by-line mixing, extended cue stacks, and routing to large distributed loudspeaker systems via an output matrix. All screen displays are remarkably clear and easy-to-read, even in low light conditions. An Auto Update function dramatically streamlines necessary changes that

ripple through downstream cues, while Alias and Player functions enable fast system-wide changes as props and cast members are swapped—even during an interval, if necessary.

My sincere thanks to Brian Hsieh from DnB Design, a seasoned theatrical sound designer and current owner of an SD9T, two SD10Ts, and a Quantum 338T console, for a guided tour through the intricacies of the new DiGiCo offering at Clair Global | LA and 3G Productions in Cerritos, Orange County, south of Los Angeles. Hsieh most recently handled production sound for *Jagged Little Pill*, a new musical inspired by the Alanis Morissette album now touring the US. Also, thanks to: Dan Page, DiGiCo brand and product ambassador/theatre specialist; Matt Larson, national sales manager—professional audio products, with Group One, US distributor of DiGiCo products; and Maria Fiorellino from DiGiCo HQ in Surrey, UK. 🔊

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