

Yamaha RIVAGE PM10 Digital Mixing Console

By: Mel Lambert

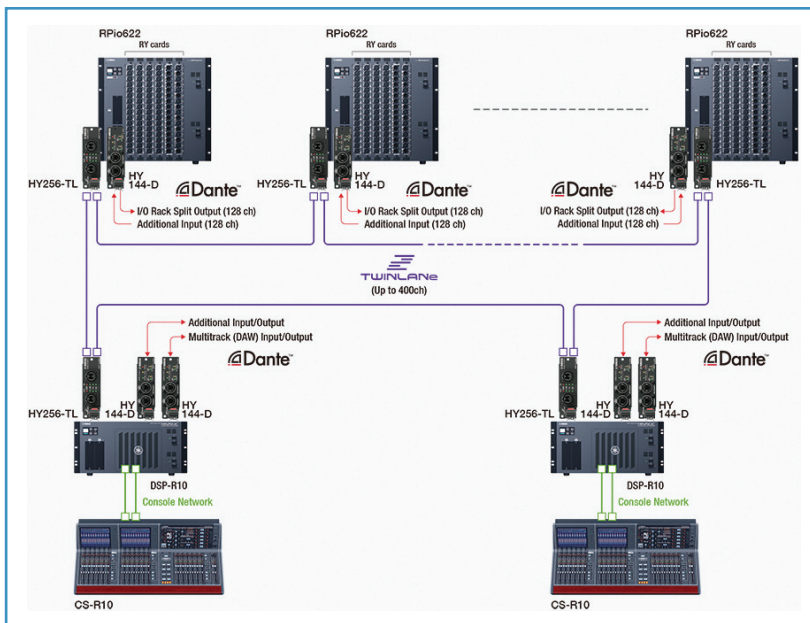
It is often overlooked that Yamaha Corporation has been building mixing consoles for more than 40 years, during which the PM, TF, QL, and CL Series designs have come to be recognized as benchmarks throughout the live-performance industry. Not being a brand to rest on its laurels, last year the firm unveiled a remarkable innovation aimed at extending its hard-earned reputation for carefully crafted offerings that combine state-of-the-art technologies with new user interfaces. After all, the well-regarded Yamaha PM1D and PM5D digital consoles are now more than a decade old, a period that has seen major changes in the live-performance marketplace.

The new RIVAGE PM10 digital mixing console, which made its North American debut at InfoComm last June, is described as taking the best of the current PM Series with added user features and enhanced technical performance. The PM10 comprises the CS-R10 control surface, DSP-R10 DSP engine, and RPiO622 I/O Rack. For added flexibility, three types of RY interface cards and two types of HY interface cards can be added to configure an I/O topology of mixed analog and digital ports that precisely match the scale and functional requirements of any application.

Newly developed hybrid microphone preamplifiers for the PM10's analog section are said to provide a pure, natural sound. Using a proprietary Virtual Circuitry Modeling (VCM) technology, these key channel elements use DSP to model and combine Yamaha's characteristic analog mic preamp with Rupert Neve Designs' transformer circuits and SILK processing for added "depth, space, and air."



CS-R10 control surface, front view.



The Yamaha RIVAGE PM10 comprises the CS-R10 control surface, DSP-R10 DSP engine and RPiO622 I/O rack. For added flexibility, three types of RY interface cards and two types of HY interface cards can be added to configure an I/O topology of mixed analog and digital ports.

Silk processing is provided as standard on suitably equipped RY-format analog input cards as well as the Omni inputs situated on the console's rear panel. Based on the natural compression and saturation of audio transformers—a subject about which Neve is said to be especially passionate—Silk processing features selectable red and blue modes, with a continuously vari-

able texture control that enables signal processing at the input stage, a capability that adds—as Yamaha puts it—“musical sparkle or power as required.”

The familiar PM Series channel equalization and dynamics functions have been enhanced with three extra DSP algorithms or EQ types, in addition to legacy functions. A new “pre-

cise” algorithm adds Q/bandwidth parameters on the low- and high-frequency shelving sections that enable user control of filter overshoot for additional musical “impact.” A new “aggressive” algorithm is said to provide an enhanced musical response, while the new “smooth” algorithm is described as offering “smooth, natural control while retaining the fundamental character of the source.” Two dynamics stages are provided, each of which can be set under user control as a gate, compressor, ducker, or de-esser. The “legacy comp” compressor features parameters found on current Yamaha digital consoles, while Comp 260 is a VCM-enabled model of the popular mid-’70s dbx Model 260 analog dynamics unit; it is the default compressor on every channel without utilizing extra DSP.

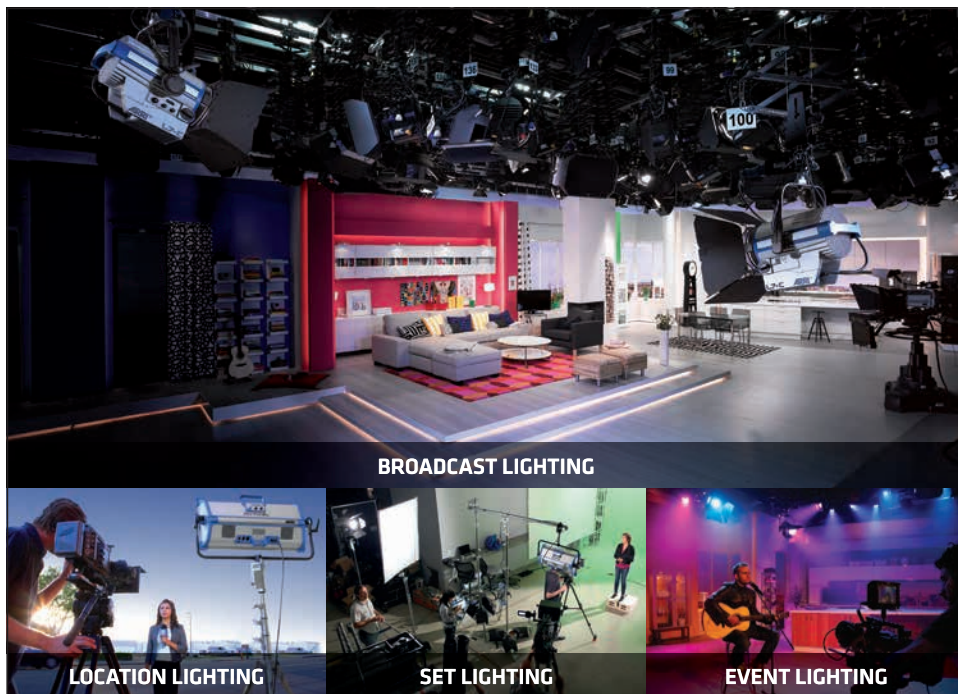
The DSP engine can be set by the user to run at 44.1kHz, 48kHz, 88.2kHz, or 96kHz sample frequencies, to provide a maximum mixing capacity of 144 input channels, 72 mix busses, and 36 matrix busses, plus two stereo busses—A and B—(or mono versions), Cue A and B, and Monitor A and B. In addition to the on-board EQ and dynamics processing functions, the PM10 ships with a total of 45 plug-ins, including new app elements that were developed in collaboration with leading manufacturers. Liaison with Rupert Neve Designs resulted in Rupert EQ 773, Rupert Comp 754, Rupert EQ 810, and Rupert Comp 830 plug-ins, which comprises VCM-enabled models of ’70s and ’80s outboards. An alliance with TC Electronic resulted in two new reverb plug-ins: VSS4HD room simulation, which offers several reflection settings, and NON LIN2, which can function as an envelope-filtered gate reverb without the need for an external trigger. Cooperation with Eventide has produced the H3000-LIVE harmonizer, a reproduction of the famous H3000 Ultra Harmonizer algorithm, coupled with a new interface streamlined for live-sound applications.

CS-R10 control surface

Like previous Yamaha offerings, the CS-R10 control surface features the familiar “selected channel” section, which enables all parameters to be controlled simultaneously from a central position. Two large 15" LCD touch-sensitive screens provide full channel-strip continuity with horseshoe-ring encoder/parameter displays and level-control faders in 12-channel sections, a layout that matches the Centralogic interface utilized in Yamaha’s CL Series consoles. The touch-based

Centralogic interface is said to simplify digital operation to the point where ease of user operation matches that of analog consoles. The total on-surface fader count is 38: three bays, or sections, with 12 faders per section plus two masters. The custom fader banks comprise 6 x 2 on each bay, with a total of 48 user-defined keys (12 x 4 banks) and 16 user-defined knobs (4 x 4 banks).

All mix controls provided for each channel—aside from the individual motorized faders—can be accessed



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via the two display screens using the “overview” or “selected channel” function, which serves as the console’s default display modes. A standard view of the targeted 12 channels can be selected via navigation keys, which, for added convenience, are laid out in a replica of the console’s 12-channel groups and bring to the surface those controls via one button-press for adjustment via the corresponding multi-function encoders immediately below the display screen. Having pressed the channel’s SEL button, the

user simply presses and then rotates the console’s physical PAN control to adjust the left/center/right channel panning; the same applies to preamp gain, dynamics, high-pass filter, EQ, and bus-send level control. Each adjustment is shown clearly on the corresponding parameter display as they are being made, together with the status of all mix parameters for a currently selected channel. For enhanced control, the user can also zoom in on any of the on-screen parameters by simply touching the screen; the multi-

function encoders below the display screen automatically follow the corresponding on-screen parameter displays.

Each full-function signal path/input channel features an A/B source select, gain adjust, digital gain trim, high-pass filter, low-pass filter, four-band parametric EQ two dynamics functions, channel delay, two insert points with four plug-ins on each insert, and direct out. A built-in MS (mid/side) decoder is provided for adjacent odd- and even-numbered channels. Each output channel includes a separate high-pass filter, low-pass filter, eight-band parametric EQ, dynamics section, delay (on channel path and output port), and two insert points with four plug-ins on each insert. The PM10 offers a total of 384 plug-in slots that can be freely assigned across any of the preconfigured and fully virtual signal paths; the maximum number of plug-ins available simultaneously at any one time varies on the type of plug-in assigned, since some require more processing functionality—reverbs being one example—than others.

Various types of graphical equalization (GEQ) and parametric equalization (PEQ) are available at programmable inset points, comprising forty-eight 31-band GEQ, 96 Flex15 GEQ, and 96 eight-band PEQ, with user-selectable gain ranges of $\pm 15\text{dB}$, $\pm 12\text{dB}$, and $\pm 6\text{dB}$ (boost/cut) or -24dB (cut-only). A GEQ section can also be configured as a 121-band, 1/12 octave real-time spectrum analyzer.

Within the four-band parametric EQ settings, the user can select one of four equalization types: precise, aggressive, smooth, or legacy, with switchable A/B parameter settings. The frequency values for each band can be set in 1/12 octave steps or, for more precise adjustment, in 1/24 steps. The low and high bands can also be switched to shelving mode. The default precise EQ mode “strives for ultimate precision and controllability,” and enables users to zero in on



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adjustment points, with low/high shelving filters that feature a useful “Q” or bandwidth parameter to adjust knee characteristics. Aggressive EQ is described as musical and effective, for adding “a powerful, creative edge” for artistic expression. Smooth EQ focuses on smooth sound qualities, Yamaha claims, and “contributes to a natural sound without changing the atmosphere of the original.” Legacy EQ is the standard equalization type provided on the firm’s digital mixers since the PM1D and PM5D models. The precise and legacy equalizers provide constant-Q EQ, while the aggressive and smooth feature proportional-Q processing.

Two dynamics processor modules are provided per input, and can be assigned to one of six functions, including gate, de-esser, expander, ducker, and compressor. LEGACY COMP is the standard compressor that has been provided on the firm’s digital mixers since the PM1D and PM5D, while COMP 260 is described as an “analog-flavored compressor” that uses Yamaha’s proprietary VCM technology to emulate the sound characteristics of mid-1970s compressors and limiters. This compressor is said to faithfully model the classic voltage-controlled amplifier/VCA circuit and root mean square/RMS detection circuit. Compression curve or knee can be set to hard, medium, or soft. Although attack and release times also can be adjusted, the preset settings are said to reproduce the fixed response of the original units being modeled for live-sound reinforcement.

A very useful gain-compensation function has been included in the PM10. While analog gain of the I/O modules can be controlled by the control surface’s gain control, normally this will also change the input level to DSP engines or recording devices that share the same input. But if gain compensation is used to maintain levels within the I/O rack, the signal output to the audio network can be kept con-

stant. In other words, raising/lowering analog gain causes the compensation gain within the I/O rack to decrease/increase. And because the mix-input level can be modified using a digital gain function within the DSP engine, levels can be optimized for various signal paths to match the specific application. Even if, for whatever reason, gain-compensation mode is turned off, analog-gain and compensation-gain parameters will reset to their original settings when compensation is re-initiated. In this way, signal

levels output to the user-configured audio network will remain unchanged, and analog gain can be adjusted for optimal signal-to-noise ratio with digital gain being used to independently adjust input levels.

Any input signal can be routed to a total of 72 mix busses as well as direct sends to 36 matrix busses, for a total assignment of 108 summing outputs. Send points can be selected pre-filter, pre-EQ, pre-dynamics, and/or pre-fader, or post-EQ and post-fader on a per-channel or per-bus basis; a useful

Shown Actual Weight.

Of course the SSM bodypack transmitter is small - in fact, it is smaller than any other full-featured transmitter on the market. But you might not know how light it is. At 2.3 oz. (65.2 g.) with battery, it is half the weight of the most popular alternative, making it easier to conceal and less bothersome to the talent. Even still, the housing is all metal so it is still just as rugged as any other Lectrosonics transmitter. Other cool features include remote setting capable with a smartphone app, superb audio quality with Digital Hybrid Wireless® and a 75 Mhz (3-block) tuning range. Check it out in person sometime soon - it’s even smaller and lighter than it looks in the picture.



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“pan link” function enables the signal being sent from an input channel to the mix/matrix busses to follow the stereo send pan, regardless of the send point.

A total of 1,000 user-programmable scene memories is available, each capable of holding a complete snapshot of every programmable control-surface switch, knob, and fader. Individual snapshot modes comprise: “recall safe,” to retain current settings; “focus recall” to a target section; “fade time,” for transitions or crossfades

from one snapshot to another; “pre-view,” for rehearsing settings; “overlay filter,” to map only targeted functions to key sections; and “isolate,” to hold back settings when implementing a change of snapshot.

New features extend the usefulness of scene memory. Isolate lets the operator specify which channel-module settings—including EQ and dynamics libraries, etc.—will be protected from recall operations without upsetting Recall Safe settings; this is a particularly useful feature where a

scene memory is in high use. To apply temporary offsets to fader and mix/matrix send levels independently from scene recall, the overlay filter mode can be superimposed on a current mix—a valuable function where the user needs to access instant changes with the ability to quickly revert to the original console settings. A total of 24 programmable DCA groups are available, together with 12 fully programmable mute groups.

In addition to a pair of touch and turn knobs, the CS-R10 control surface usefully features eight analog inputs and eight outputs for local audio sources—maybe a CD player—and monitoring, in addition to a pair of MY-format slots that can accommodate a range of I/O modules in different formats, a pair of AES/EBU-format digital I/Os (four-in/four-out, with sample rate conversion per source or destination), eight GPI I/Os, and word clock out plus MIDI in/out. A total of five USB ports handle peripheral connections, including two-track 96kHz Wav-format recording with sample rate conversion. Power conditioning is via a built-in, dual-redundant PSU. The unit measures 61.0" by 16.4" by 33.4" (W x H x D), and weighs 187lb.

TWINLANe ring network

As with the majority of current-generation assignable digital consoles, very little audio flows within the control surface—aside from onboard I/O cards, a talkback mic, and headphone output. Instead, user commands are extracted from buttons, rotary controls, and faders, with corresponding displays, and are sent to a separate DSP rack that houses the digital signal processing elements that create cross connections between input and output ports via user-controlled DPS pathways.

The PM10's CS-R10 control surface connects to the DSP-R10 DSP engine, which handles all mixing, plug-in, and audio processing via a dedicated CAT5e-based network, while the DSP engine links to RPi0622 I/O racks via

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Yamaha's newly developed TWINLANE ring network via multi-mode fiber-optic cables. The use of simple-ring networks provides built-in redundancy and enhanced system reliability. Yamaha's proprietary 32-bit TWINLANE protocol can accommodate a low-latency transfer of up to 400 simultaneous digital signals at a sample rate of 44.1kHz, 48, 88.2kHz, or 96kHz over distances up to 900'; for larger topologies, a pair of DSP-R10 engines and up to eight RPi622 I/O racks can be interconnected within a single ring topology using Neutrik opticalCON DUO multi-mode fiber optic cables. Input signals also can be shared between multiple DSP engines; a ring topology provides redundancy that keeps the network running even in the rare event of a cable failure. Quoted network latency is 11 samples at a 44.1kHz sampling frequency (0.25mS), down to 12 samples at a 96kHz sampling frequency (0.13 mS).

The DSP engine provides four HY-format and two MY-format card slots, as well as control I/O, including word clock in/out, MIDI in/out, time code in, and GPI ports plus remote control and fault output. Like other primary system components, the engine features two redundant power supply units.

For analog and AES/EBU digital audio I/O, the RPi622 I/O rack will accommodate a total of six RY-format interface cards, two MY-format cards, and two HY-format cards, with the TWINLANE network card installed in HY card slot #1. Two power supply units are featured, thereby providing redundant power. Three types of RY-format 16-channel I/O cards are available to match user requirements.

The RY16-ML-SILK 16-channel mic/line analog input card incorporates a newly developed mic preamp and Rupert Neve Designs' Silk processing modeled within the digital domain, using Yamaha's proprietary VCM technology, which is said to faithfully replicate the processing built into several high-end RND-developed audio

devices. Based on the "natural compression and saturation of audio transformers, a matter about which Rupert Neve is especially passionate," users can choose one of two characteristics, blue or red, with a continuously variable texture control that affects the tone and accompanying overtones to add "power" and "brilliance," and "recover the sense of air that tends to be lost in the mix."

The red Silk circuit is described as reducing negative feedback on the DSP-generated output transformer,

adding harmonic content as the texture is increased. The setting is said to accentuate saturation in the mid and high frequencies; changing the texture control adds or reduces the amount of coloration/distortion. Magic indeed.

The RY16-DA 16-channel analog output card features level-setting switches on each channel for +15, +18, and +24dBu interfaces, while the RY16-AE 16-channel AES/EBU-format I/O card features sample rate converters on all ins and outs.

The HY256-TL TWINLANE interface

The advertisement features a woman's face split vertically. The left side is in daylight with natural skin tones, while the right side is in blacklight with vibrant colors. A Zylight Flat Fresnel fixture is shown at the bottom, with a beam of light illuminating the woman's face.

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The RY16-ML-SILK 16-channel mic/line analog input card incorporates a newly developed mic pre-amp and Rupert Neve Designs' Silk processing modeled within the digital domain using Yamaha's proprietary VCM technology.



The RY16-DA 16-channel analog output card features level-setting switches on each channel.



The RY16-AE 16-channel AES/EBU-format I/O card features sample rate conversion on all ins and outs.

card supports 256-in/256-out of Yamaha's proprietary transfer-network protocol via multi-mode optical fiber cables (50/125µm) such as Neutrik's opticalCON DUO that handle transmissions between devices up to 900' apart; a ring

topology ensures network redundancy. The HY144-D Audinate Dante interface card transfers up to 144 channels of audio signals at a sampling frequency of 96kHz; transmission up to 300' is possible using 1Gbit CAT5e/CAT6 Ethernet cable.

For multi-track recording, an external computer can also be connected to the PM10; the PC also provides access to Yamaha's NUAGE Advanced Production System, as well as plug-and-play connectivity with Yamaha CL and QL Series consoles, plus other external units via Audinate Dante networks. Designed for simple connection with a wide range of pro-audio devices, Dante is said to work well alongside TWINLANe networks; Dante also offers additional flexibility and system reliability, in addition to multitrack recording/playback via the new high-capacity HY144-D card. Virtual sound checks also are a breeze via the HY144-D card, since all inputs to the console can be routed at the push of a button from the touch screen. An alternate way to record is to use the "split out" feature, whereby an HY144-D card in slot 2 of an RPi0622 stage box allows for all channels on that stage rack to be recorded directly to a DAW. Since mic preamps also remain active on a channel-by-channel basis, if a featured artist needs to sing or play along with playback, those channels can be patched easily from the RPi0622 during virtual sound check.

Word-clock implementation depends upon the I/O topology scheme. Via a TWINLANe network, only one DSP engine is the master for a single network; if two DSP engines are connected on a single network, one will be the master and the other the slave. The master clock on a TWINLANe network can be either the DSP engine's internal clock (44.1kHz, 48kHz, 88.2kHz, 96kHz) or an external clock linked to the word clock port on the master DSP engine. (Because the slave DSP engine uses word clock being sent

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The HY256-TL TWINLANE interface card supports 256-in/256-out of Yamaha's proprietary transfer-network protocol via multi-mode optical fiber cables.



The HY144-D Audinate Dante interface card transfers up to 144 channels of audio signals at a sampling frequency of 96kHz; transmission up to 300' is possible using 1Gbit CAT5e or better Ethernet cable.

via the TWINLANE network, HY SLOT #1 is selected; if that clock is interrupted, the slave DSP engine becomes a substitute master.) And since sample-rate conversion is built into all AES-format I/O channels—one SRC for

every two channels—all signals are fully synchronized to the RIVAGE PM10 system's master clock.

Summing up

As will be readily appreciated, the RIVAGE PM10 is an evolutionary mixing system, taking the best of Yamaha's undeniable legacy of developing sweet-sounding digital circuitry that provides a range of flexible signal paths. The user interface takes full advantage of assignability and layering, with target control settings never more than a minimum number of button pushes away from the surface elements. The hybrid Mic preamplifier concept with Silk processing combines highly valued aspects of vintage Yamaha consoles with an enhanced level of signal processing that offer a wide range of sound colors and expressive control for live-sound engineers.

The familiar "selected channel"



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interface has been augmented with enhanced signal-access functions; the result is a fast, elegant user interface with unprecedented access to key functions. Notable new features include isolate and overlay filters for improved scene-memory operation and follow mode for the send masters and directs, together with flexible live recording and dual monitor outs. The large LCD touch screens provide logical continuity with channel faders with Centralogic-style control of simultaneous parameters. Dramatic changes to channel/output EQ and dynamics—in addition to an array of powerful DSP plug-ins—will put a lot of creative power into the hands of RIVAGE PM10 users.

My thanks to Kevin Kimmel, Yamaha Corporation of America's systems application engineer, and Les Harrison and John Conard from Hollywood Sound, Burbank, for providing access to a fully featured PM10 console within the dealer's elegantly equipped demonstration suite.

Top five features/functions

1. *Great-Sounding Front End/Mic Preamplifiers.*
With new Yamaha-designed head amp, emulated Rupert Neve Silk processing and transformer feature.
2. *What Yamaha Has Done with DSP Plug-Ins.*
Spotlighting the innovative work of Dr. K's famed Yamaha Research Laboratory.
3. *Routing of All Input Sources via Multiple Patches to Any Output.*
Different pick-off points to every bus enable inserts/plug-ins to be placed anywhere in signal path.
4. *Inclusion of 24 DCA Busses for Enhanced User Flexibility.*
For full grouping of stems and submixes for FOH and monitor setups.
5. *Innovative and Easy-to-Use Ring Connectivity via TWINLANe Networking.*
Offering 400 channels of 32-bit/96kHz digital audio with an accuracy of 12 samples.

Late-Breaking News: The first two Yamaha Rivage PM10 Digital Audio Consoles to be shipped in the US are being used to handle front of house and monitors for Carrie Underwood's *The Storyteller Tour*. "We are honored to introduce [these consoles] on such a high-profile tour," stated Todd Hudson, VP of operations. "For years

we have been delivering Yamaha consoles to our clients; we trust their products."

"My first thought is that I love this console; it's amazing to get around on," added Kirk 'Eek' Schreiner, front-of-house engineer for Carrie Underwood. "The Yamaha PM10 is the first digital desk that sounds analog to

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me. Using the transformers [stages] and Silk, I definitely noticed a huge difference when I combined the two.” Cam Beachley, Carrie Underwood’s monitor engineer, has been using the PM10 since the beginning of 2016. “It’s super-easy to get around on, intuitive, and sounds amazing,” he says. “With transformers on every channel, you can definitely hear the difference. Not so much width as field of depth.” Look for a report on the Carrie Underwood tour in next month’s issue. 📡

Mel Lambert has been intimately involved with production industries on both sides of the Atlantic for more years than he cares to remember. He is principal of Content Creators, a Los Angeles-based copywriting and editorial service, and can be reached at mel.lambert@content-creators.com; 818.558-3924. He is also a 30-year member of the UK’s National Union of Journalists.

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