YAMAHA

DIGITAL MIXING CONSOLE

CL SERIES

The standards stay, but innovation never ends.

The pursuit of perfection is ongoing and will probably never end, but along the way Yamaha has introduced a number of innovations that have become industry standards offering performance and familiarity that discerning users continue to demand. By definition, “standards” are best kept as they are. With evolutionary refinements, of course.

Yamaha CL series digital mixing consoles represent a new level of refinement. They offer an evolved experience in accessible mixing, plus sonic purity with sound shaping capabilities that will give the most imaginative engineer unprecedented creative freedom. The CL series embodies the leading standards in live sound in their most advanced, most expressive form.

CL SERIES

DIGITAL MIXING CONSOLE **CL5 / CL3 / CL1**
I/O RACK **Rio3224-D / Rio1608-D**

A creative console for expressive engineering

Premium Rack

Every engineer, artist, and audience agrees that sound quality is the bottom line. That's a given. Through thorough analysis, review, and refinement of every detail of the circuitry and technology used, Yamaha CL series consoles deliver naturally superior sound plus a comprehensive range of "coloring" options that give the sonic craftsmen who will use them extraordinary creative freedom. The signal processors provided are plentiful and of the highest quality, including extraordinary Portico 5033/5043 EQ and compressor devices that bring Yamaha VCM technology together with the legendary talents of Rupert Neve. The platform is pure and natural, so the engineer can create and deliver the ideal sound.

Efficient, enjoyable operation

Centralogic

A truly useful sound reinforcement console is one that can keep pace with the rapidly and dramatically changing demands of live sound applications. Efficient, intuitive operation is essential. Yamaha's acclaimed Centralogic concept is the core of a refined user interface that offers a new, unprecedented level of operating efficiency in the CL series, from visual feedback right down to the form and feel of the faders and controls. The CL consoles are also ready for seamlessly integrated remote control and offline editing via an Apple iPad® or other computer. Control is familiar and intuitive, while at the same time offering extensive freedom.

Scalable, versatile network capabilities

Rio3224-D

Network capabilities are rapidly becoming fundamental and indispensable in today's fast-paced world of digital live sound. CL series consoles feature separate console and I/O rack components that communicate via the Dante™ network audio protocol, allowing fast, efficient design and deployment of capable systems from the most basic to the dazzlingly complex. The ability to add Lake® processing via expansion slots also adds to the system's versatility and adaptability to the widest range of mixing needs.

DIGITAL MIXING CONSOLE

CL5

With a three-section fader layout for efficient hands-on control, the CL5 is the ideal choice for a diverse spectrum of live sound systems.

- Input channels: 72 mono, 8 stereo.
- Fader configuration: 16-fader left section, 8-fader Centralogic section, 8-fader right section, 2-fader master section .
- Aluminum stay for iPad support.
- Built-in meter bridge.

DIGITAL MIXING CONSOLE

CL1

Dual 8-fader sections in a space-saving console that can be used alone or cascaded to another CL console for input expansion.

- Input channels: 48 mono, 8 stereo.
- Fader configuration: 8-fader left section, 8-fader Centralogic section, 2-fader master section .
- Meter bridge optional.

Consistent Features & Performance

All specifications other than channel capacity are consistent throughout the lineup, so you get the same capabilities and performance whichever model you choose for your application. This also means consistent performance and operation in systems that implement multiple consoles.

24 mixes / 8 matrices*1	8 Premium Racks	300 Scene Memories	Dante	CL Editor
16 DCAs / 8 Mute Groups	8 Effect Racks	16 User Defined Keys	USB Memory Recorder	CL StageMix
Input Delay	16 GEQ Racks	4 User Defined Knobs	Dante Virtual Soundcard	Console File Converter
Output Port Delay	Channel PEQ / Dynamics	Fader Bank	GPI*2	3 MY Slots

*1 Input to Matrix supported. *2 GPI functionality to be supported in an upcoming firmware update.

DIGITAL MIXING CONSOLE

CL3

An ideal blend of compact size and channel capacity for a variety of live and installed applications.

- Input channels: 64 mono, 8 stereo.
- Fader configuration: 16-fader left section, 8-fader Centralogic section, 2-fader master section .
- Aluminum stay for iPad support.
- Meter bridge optional.

I/O RACK

Rio1608-D
Rio3224-D

Two I/O rack options support a wide range of applications.

Two rack-mountable I/O units with different input and output capacities are available for use with the CL series consoles. The 5U size Rio3224-D provides 32 ins, 16 outs, and four AES/EBU outputs, while the 3U size Rio1608-D has 16 ins and 8 outs. Both types connect to the console via Dante network protocol for low-jitter, low-latency digital audio communication.

■Rear Panel

Options

- ■ Meter Bridge MBCL
- ■ Power Supply PW800W
- ■ Power Supply Link Cable PSL360
- ■ Gooseneck Lamp LA1L

MBCL

Creating the Ideal Natural Sound Platform

The full impact of the most advanced digital audio technology available has been applied throughout the CL series to deliver natural sound that provides a perfect foundation for the artist's and engineer's imagination. This type of sonic quality cannot be realized through specifications alone. Repeated listening evaluations and refinements by some of the most reliable ears and respected minds in the business are an indispensable part of the process. The CL series digital mixing consoles are proof that the time and effort involved have been well spent.

The Sound Is In the Details

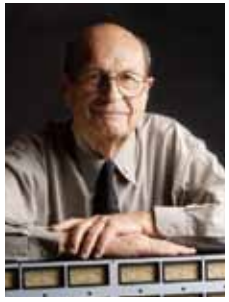
The challenge begins right from the console's inputs. In order to achieve the required level of sound quality, individual components, power supply, grounding, circuit layout, mechanical construction, and countless other details of the initial input stages must be selected and designed with the utmost care. Listening evaluation becomes an important part of the development process right from this first stage as well. Changing even a single electronic component can alter the sound in unexpected ways, and the tiniest variations must be noted and evaluated as development proceeds. Extreme measures have been taken to maximize AD and DA conversion performance as well, right down to making detailed spectral analyses of the AD/DA master clock and adjusting the FPGA clock signal routing so that the most natural, musical sound is achieved. Another critical part of any audio system is the power supply. Of course the capacity of the supply is important, but so are the types of capacitors used, and the grounding must be engineered to ensure the lowest possible impedance. The resultant sound is an eminently natural representation of the input signal, providing an ideal foundation for processing and effects that will lead to the final, polished sound.

Prodigious Quality & Creative Potential

In creating the best possible sound for a profusion of venues and artist requirements, sound engineers draw on their experience and imagination to make a multitude of practical as well as creative decisions. The engineer's primary hands-on tool, the mixing console, must be able to accommodate them all. Of course the bottom line is sound quality, and this is just one of the areas in which the CL series consoles excel. They also feature some of the most advanced analog circuitry modeling technology available to add unprecedented character and shape to the sound as needed, while maintaining the utmost sonic quality.

A Digital Approach to Acclaimed Analog Quality

Rupert Neve is a legend. His contributions to the fields of audio recording and production began at the dawn of the era and continue to this day in the form of microphone preamplifiers, equalizers, compressors, and mixing consoles that are the gold standards of professional audio.



RUPERT NEVE DESIGNS

Clearly Mr. Neve is very serious about his sound, so it's an honor that he and his company, Rupert Neve Designs, have officially recognized Yamaha's original VCM (Virtual Circuitry Modeling) technology as being the first of its kind that is capable of accurately modeling the rich, expressive analog sound they have championed for so long. With VCM technology, digital audio is at last capable of matching analog designs for sonic quality.

VCM, developed by Toshi Kunimoto ("Dr. K") and his team at Yamaha's innovative "K's Lab" division, is a circuit modeling concept that effectively simulates the most detailed characteristics of individual circuit components, right down to capacitors and resistors, resulting in astonishingly realistic circuit simulations that easily outclass conventional digital simulations. But accuracy isn't the only consideration, musicality is essential as well, and VCM modeling delivers both. The CL series consoles come equipped with VCM models of the renowned Neve Portico 5033 equalizer and Portico 5043 compressor/limiter, both developed through close cooperation with Rupert Neve Designs. A valuable range of other VCM equalizers, compressors, and studio-quality effects is also included. You will hear the difference.

Toshifumi Kunimoto
Engineering Manager at
Corporate Research & Development Center

Centralogic at the Heart of an Evolved Interface

Centralogic™

Yamaha's Centralogic user interface has already proven its value as the most user-friendly digital operating environment available, even for engineers who were previously only comfortable with analog consoles. Founded solidly on Centralogic roots, the CL series takes intuitive, efficient operation to an even higher level, offering an operating experience that engineers will not only feel immediately familiar with, but will be able to grow with into the future.

Overview –Analog Style Intimacy

Clear visual continuity from the Centralogic section's physical faders to virtual on-screen controls via the console's elegantly curved panel matches the unambiguous directness of analog console channel modules. Any of the console's input and output channels can be instantly assigned to the Centralogic section in 8-channel groups.

Selected Channel – Another Industry Standard from Yamaha

The Selected Channel display provides a comprehensive view of the many controls and functions available for the currently selected channel. The corresponding physical controllers to the left of the display are labeled and laid out in the same way as the on-screen controls, for confident access and operation. The CL series includes a number of refinements to this now-standard interface for unprecedented operating ease.

Every Detail Designed for Optimum Operating Feel

The way CL series functions and controls work together is a perfect example of how a whole can be greater than the sum of its parts. Within the larger framework of the user interface, the visibility, feel, and precision of individual faders, knobs, and switches are an essential part of the overall operating experience. The visual flow of the control layout across the consoles' sweeping curves makes a significant contribution to smooth operation as well. The outstanding balance of the entire system, plus refinements such as programmable channel names/colors and user defined knobs, add up to operation that is, in a word, sublime.

Newly Designed Faders

No detail of form or function has been overlooked, right down to how the curvature of the elegant fader knobs comfortably fit the fingers at any angle. The fader knobs even have non-slip inserts that provide ideal friction for smooth, slip-free fades. Visibility is important too, so the knob edges are sculpted to provide a clear view of the fader scale from just about any angle.

Editable Channel Names and Colors

Editable channel name displays above each fader automatically switch to a larger character size for short names, and show pan and fader values as well. Below each channel name display is a color bar that illuminates in any of eight selectable colors, the same as those used in the central touch screen, for at-a-glance channel and group identification. Brightness can be adjusted for optimum visibility under any ambient lighting conditions.

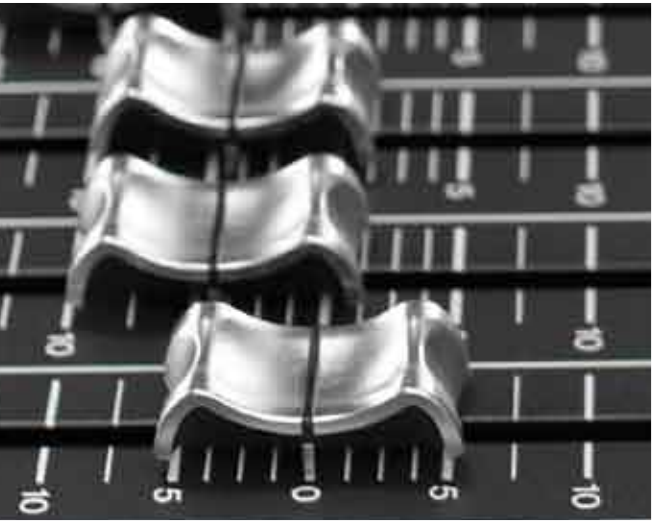
Direct Access to the Parameters You Need

The User Defined Keys provided on Yamaha digital consoles are already a standard. The User Defined Knobs provided on the CL series consoles will quickly achieve the same status. Just about any of the console's variable parameters can be assigned to the four User Defined Knobs for direct, instant access. Another advanced control feature is Custom Fader Bank selection, allowing the faders in each section to be instantly reordered as required.

Harmony in Form and Function

The sweeping form of the CL consoles is not only elegant, but it provides the best possible view of all controls and displays from the operator's position. The visual continuity from the Centralogic faders to the display is seamless. The hand rest is genuine oak with a gorgeous ebony finish that matches the visual and tactile sophistication of the overall design.


YAMAHA



The CL series brings sublime sound together with operability that gives artists and engineers deep, intimate access to the full gamut of the system's vast sonic capabilities with unprecedented directness and efficiency. This refined blend of sound and control delivers a truly musical mixing experience.

Dante for Fast, Flexible Networking

The complexity and variety of today's live sound systems makes fast, adaptable configuration and setup capability vital. Of course the highest level of sonic performance must be maintained at the same time. CL series consoles use the Dante network protocol developed by Audinate to allow flexible connection to multiple I/O rack units configured and located according to the needs of the application, while at the same time providing redundancy for superior reliability.

Up to Eight I/O Rack Units

Dante directly supports star network configurations, so up to eight I/O rack units can be connected to any single CL series console and conveniently located wherever they are needed most. A few simple DIP switch settings are all that is required to change to daisy-chain networking as required.

Simple Setup

The ability to set up even complex systems quickly and easily is another benefit of Dante networking. In most cases devices on the network are recognized and set up automatically. And since patching operations that usually require a separate computer can be carried out directly from the CL console, changes to the initial setup are painless as well.

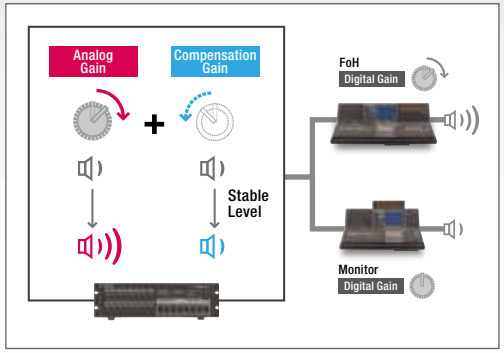
Redundancy for Reliability

Dante also makes it easy to maximize system reliability. Star networks allow the use of redundant primary and secondary lines for each device, for the utmost reliability in critical applications. With this type of setup a malfunction in a cable or other network component won't bring the whole system down. The show will go on.

Full Integration of FOH and Monitor Control

Multiple CL series consoles can share control of the same I/O rack unit, allowing unprecedented system flexibility and efficient use of system resources. A new Gain Compensation function adds the ability to combine FOH and monitor control via a single network, for comprehensive digital live sound integration.

I/O Rack Unit Sharing with Gain Compensation



One obvious drawback of connecting multiple consoles to a single I/O rack unit is that gain adjustments made from one console can cause unexpected gain changes at the other consoles. The Gain Compensation function implemented in the CL consoles ensures that when the analog gain stage is adjusted from one of the consoles, corresponding compensation is automatically applied at the digital stage so that the level sent from the I/O rack unit to the connected CL consoles remains constant.

Digital Gain Control

Gain compensation applied after any initial analog gain levels are set is carried out entirely in the digital domain. Digital gain control is another original CL series feature that contributes to extraordinarily smooth, efficient operation and integration of the entire system.

A Complete Live Sound Toolkit

The quality and variety of internal effects have become major factors in choosing a digital live sound console. Studio quality sound is a must, but so is having the right processors for the job at hand. CL series consoles feature virtual effect racks that are packed with a selection of effects that have been chosen and developed to meet the real-world needs of live sound professionals. Everything you need to create perfectly polished sound for your application is right here.

Premium Rack Brings Studio Standards to the Live Stage

As the name implies, "virtual racks" provided in the CL series consoles let you combine signal processors you need for your application in one easily accessible location, much like traditional analog outboard racks. The new CL series Premium Rack can accommodate up to eight instances of the six expressive EQ and dynamics effects provided, including the Rupert Neve Designs Portico 5033 equalizer and Portico 5043 compressor/limiter. The ability to use some of the most highly regarded studio effects in live mixes can help you deliver unprecedented sonic quality in any venue.

Effect Rack With More Than 50 Effects

In addition to the Premium Rack described above, the CL consoles feature an Effect Rack that allows simultaneous use of up to 8 effects from a selection of 46 ambience effects and 8 insertion effects, all of outstanding quality. Although a separate EQ rack is provided for the output buses, any of the 8 effects in the Effect Rack can be replaced by graphic EQ units as needed.

32-channel Graphic Equalizer Rack

The CL consoles also feature a GEQ rack that allows graphic EQ to be inserted into the output buses as required for room equalization and other functions. Up to 16 31-band GEQ units can be mounted in the rack for simultaneous use, and those GEQ units can be individually switched to Flex15GEQ mode, effectively providing two EQ channels that allow up to 15 bands to be used at a time. With a full rack of GEQ units all functioning in Flex15GEQ mode, you have a total of 32 GEQ channels for extensive equalization capacity.

A Comprehensive Range of Valued Devices

VCM technology delivers refined, musical tonality in the outstanding lineup of devices provided in the CL series Premium Rack and Effect Rack.

Portico5033
Portico5043

Premium Rack

These devices immaculately model the full sonic depth and breadth of the original analog equalizer and compressor/limiter modules by Rupert Neve. They are not only ideal for adding first-class studio-quality processor sound to your mix, but are also remarkably easy to set up for optimum effect. Merely inserting these outstanding models in the signal path can enhance the sound.

U76

Premium Rack

A studio standard that is ideal for a wide range of applications. It even features a RATIO "ALL" button that simulates the effect of engaging all of the ratio buttons on the original.

Opt-2A

Premium Rack

This is a model of one of the most widely used optical studio compressors from the 1960's. The distinctive and highly regarded compression and release characteristics of the original are recreated with remarkable precision.

EQ-1A

Premium Rack

The classic studio equalizer that is the basis for this model is still in demand today, highly prized for the musical response of its vacuum tube and transformer EQ circuitry, as well as its distinctive boost/cut characteristics.

Dynamic EQ

Premium Rack

An original dynamics processor that applies compression / expansion / limiting in response to level changes detected in specified frequency bands. A well designed interface makes achieving the ideal sound a fast, easy process.

Comp 276

Effect Rack

This model is a composite of several analog compressors that were popular in recording studios in the 70's. Anyone who is familiar with the originals will recognize the characteristic punch and fatness this device delivers.

Open Deck

Effect Rack

Here's a unique effect that models both the analog circuitry of well-known professional tape decks plus the characteristics of the tape used with them. You can simply choose a deck that offers the sound you need, or combine different recording and playback decks for a range of useful variations.

Comp 260

Effect Rack

The compressor/limiter modeled in this device was all the rage in the late 70's, featuring solid-state RMS level detection circuitry and VCAs for level control. The sonic signature of this model is unmistakable.

EQ 601

Effect Rack

For a sweet analog EQ sound, this model recreates a popular circuit topology from the 70's.

Two Ways to Record Live

CL series consoles offer two live recording solutions: convenient 2-track recording direct to USB memory, and high-performance multitrack recording to a digital audio workstation via Dante. Whether it's for a simple web upload, a commercial release, or just material to be used for a virtual sound check the next day, you have all the recording capability you need.

*Appearance may differ in final version

Seamless Integration with Nuendo Live for Serious Multitrack Recording

The Nuendo Live DAW application has been specifically designed for live multitrack recording, providing comprehensive control and overview for smooth operation under the most demanding live situations. An extension plug-in provides seamless integration with CL console features, such as channel names, markers, transport control, and more.

steinberg
Creativity First

Dante Virtual Soundcard

Dante Virtual Soundcard driver software enables direct multitrack recording to a Windows or Mac based DAW without the need for an audio interface between the console and computer. A high-performance DAW application such as Steinberg Nuendo Live can be used to record up to 64 tracks with studio quality and editing capabilities.

Virtual Sound Check

DAW playback can be instantly patched to the CL console's input channels so that multitrack recordings can be used for "virtual" sound checks when the performers aren't available. Recordings of the previous day's performance can be used for sound check on the following day!

Convenient 2-track Recording to USB Memory

2-track recording in mp3 format couldn't be easier. Simply plug a USB memory into the USB connector on the front panel of the console and start recording. No other equipment is required. Of course playback from the USB memory is possible as well, making it a convenient source for BGM or sound effects.

Features Optimized for Live Sound

Although there are as many ways to use a mixing console as there are sound engineers, extensive feedback from audio professionals has made it possible to provide a feature set that is ideally suited to the real-world needs of demanding live sound applications.

300 Scene Memories

Up to 300 console setups can be stored as "scenes" and instantly recalled whenever needed. Recall Safe, Focus, and Preview* functions are also provided.

* To be supported in an upcoming firmware update.

Versatile Input and Output Delays

Up to 1000 ms delay on input channels facilitates precise microphone phase compensation, while up to 1000 ms delay on the output ports is useful for speaker distance compensation and room tuning.

Ample EQ and Dynamics Processing

All channels feature 4-band parametric EQ and two dynamics processors (one dynamic processor per output). The processors include an HPF for every input, and one also functions as a highly effective de-esser with advanced processing algorithms and a bandpass mode.

16 DCA Groups

16 DCA groups allow flexible grouping of multiple input channels for simultaneous control.

8 Mute Groups

Multiple channels can be assigned to any of 8 mute groups for instant muting or un-muting, with a new Dimmer Level function.

16 User Defined Keys

A large number of console functions including Sends on Fader, Tap Tempo, and Set by Sel can be assigned to 16 User Defined Keys for instant hands-on access.

Multiple User Key Sets

Limited access to CL console functions can be provided for less experienced operators and accident prevention via multiple User Key sets that can be stored in the console itself* as well as on USB memory.

* To be supported in an upcoming firmware update.

5-in/5-out GPI Interface

A 5-input/5-output GPI interface allows the CL consoles to respond to input from external switches, as well as to transmit on/off status to external devices.

* To be supported in an upcoming firmware update.

Help File

Simply tap the on-screen "Help" button to access the onboard operation manual. Once loaded all essential information is available directly via the console's display, so you won't need to keep the printed manual with you.

New Remote Control Freedom

With the CL StageMix application, an iPad becomes a wireless remote controller that can be used to set up and operate CL consoles from anywhere on stage or in the audience seating area. There's even a built-in iPad stay on the CL5 and CL3 panels, providing a convenient mount for an iPad to be used for additional control functionality. There's also the CL Editor application for computers running Windows or Mac operating systems, for both extended online operation and offline setup and editing. In addition to full Selected Channel and Overview display operation, the CL Editor facilitates scene data management, patch list editing, channel name editing, and much more. It's even possible to use the CL StageMix and CL Editor applications at the same time.

CL StageMix

CL Editor

Available on the App Store

* CL StageMix can be downloaded from Apple's App Store at no charge.
* Apple, the Apple logo, and iPad are trademarks of Apple Inc., registered in the U.S. and other countries.

Today's Data for Tomorrow's Show

The Yamaha Console File Converter is an application that allows data to be shared between a number of Yamaha digital mixing consoles, and the CL series consoles are included in the latest version. You can share data between CL series, PM5D, M7CL, and LS9 consoles, so data from one show doesn't have to be completely reprogrammed from scratch for the next, even if different consoles are used.

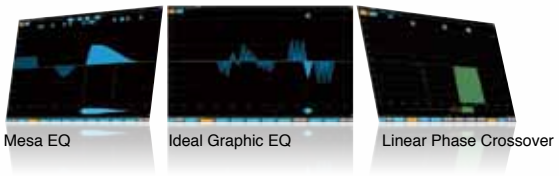
Expandable and Adaptable

Three Mini-YGDAI card slots on the CL consoles provide easy I/O expansion as well as extra processing capabilities. New additions to the expansion card lineup include an MY8-LAKE card that integrates Lake Processing, a staple in today's live sound field, into the console, and a Dugan-MY16 card that adds the most advanced automated microphone cueing and gain control available.

See the entire Mini-YGDAI card lineup at the Yamaha Pro Audio website : **http://www.yamahaproaudio.com/**

Increased Power with Lake Speaker Processing Power

Lake processing has become a standard for loudspeaker processing in live sound applications. An alliance between Yamaha and Lab.gruppen brings Lake Processing right into the CL series mixing consoles, via the MY8-LAKE expansion card. The MY8-LAKE card provides 8-in/8-out in Mesa (system EQ), 4-in/12-out Contour (crossover), and 4-in/4-out and 2-in/6-out Mesa & Contour (combination) modes. Although primarily intended for speaker processing, the asymmetrical Mesa EQ can also be very useful on input sources. The Lake Controller application running on a compatible computer allows management of multiple Lake devices in the system, while close compatibility with Smaart® Live contributes to smooth, efficient speaker system tuning.



Mesa EQ | Ideal Graphic EQ | Linear Phase Crossover

Automatic Gain Control for Up To 16 Microphone Inputs

Dan Dugan Sound Design

The Dugan-MY16 automatic mixer card, developed in cooperation with Dan Dugan Sound Design, provides smoothly automated microphone cueing and gain control for up to 16 input channels. Rather than using gates to open and close channels, the Dugan system uses gain sharing and fades for smooth, natural level changes.

Cascade Link

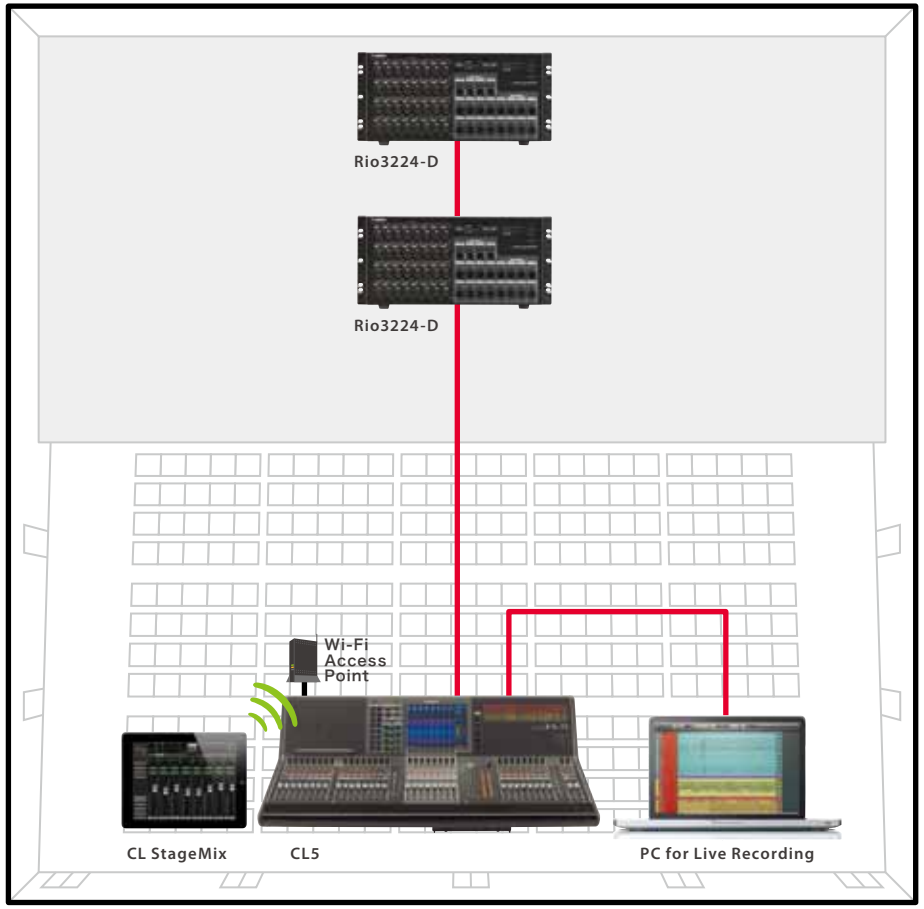
For applications that require a large number of input channels, CL consoles can be cascade-connected via I/O cards such as the MY16-AE installed in their Mini-YGDAI expansion card slots.

System Examples: Live Sound

Simple, flexible setup in any venue.

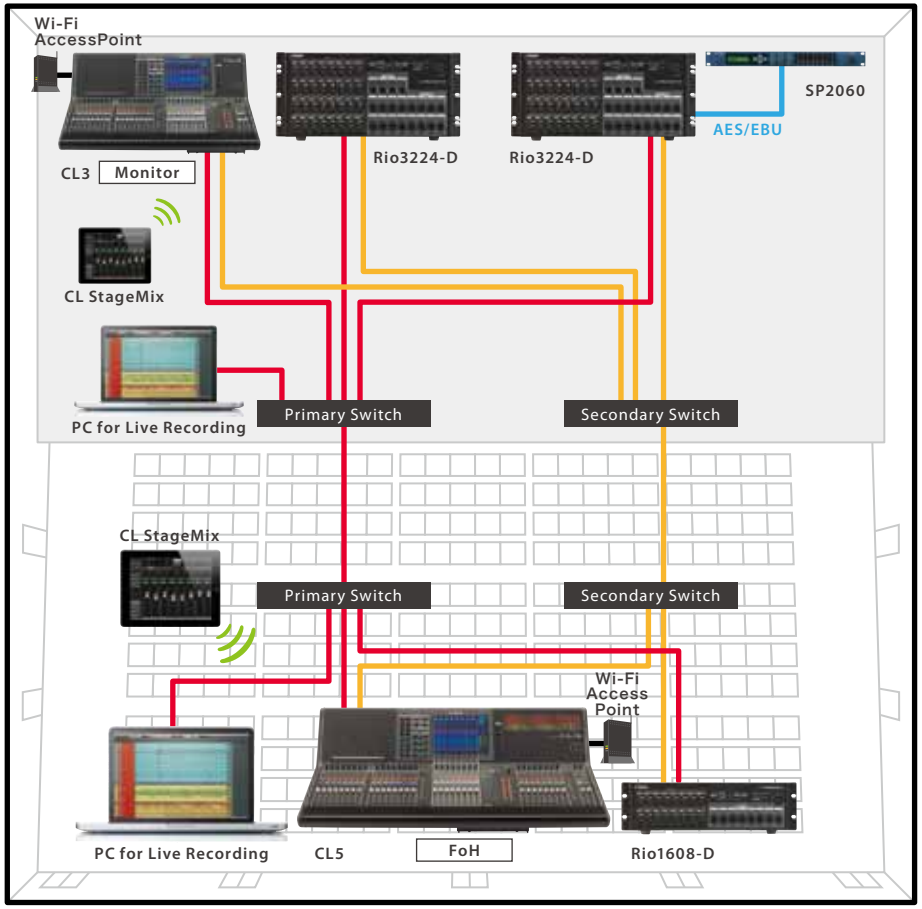
A Simple Daisy-chain System

Internal port switches allow the CL series to be easily set up for daisy-chain or star network configurations. In this example the Console at FOH position is directly connected to the I/O rack at the side of the stage. The network is self-configured. Of course the CL StageMix iPad app can be used even in simple systems like this one, and Dante Virtual Soundcard can be used to enable multitrack recording to a DAW such as Steinberg's Nuendo Live.



A Flexible, Redundant Star Network

Star topologies can be configured with network switches. In this configuration, redundant connections to each device on the network ensure that a malfunction in one cable or network device will not disrupt the entire system. The Gain Compensation feature allows multiple consoles to control analog gain for a single I/O rack, for seamless integration of FOH and monitor operation. Multiple computers can be used for live recording, too.

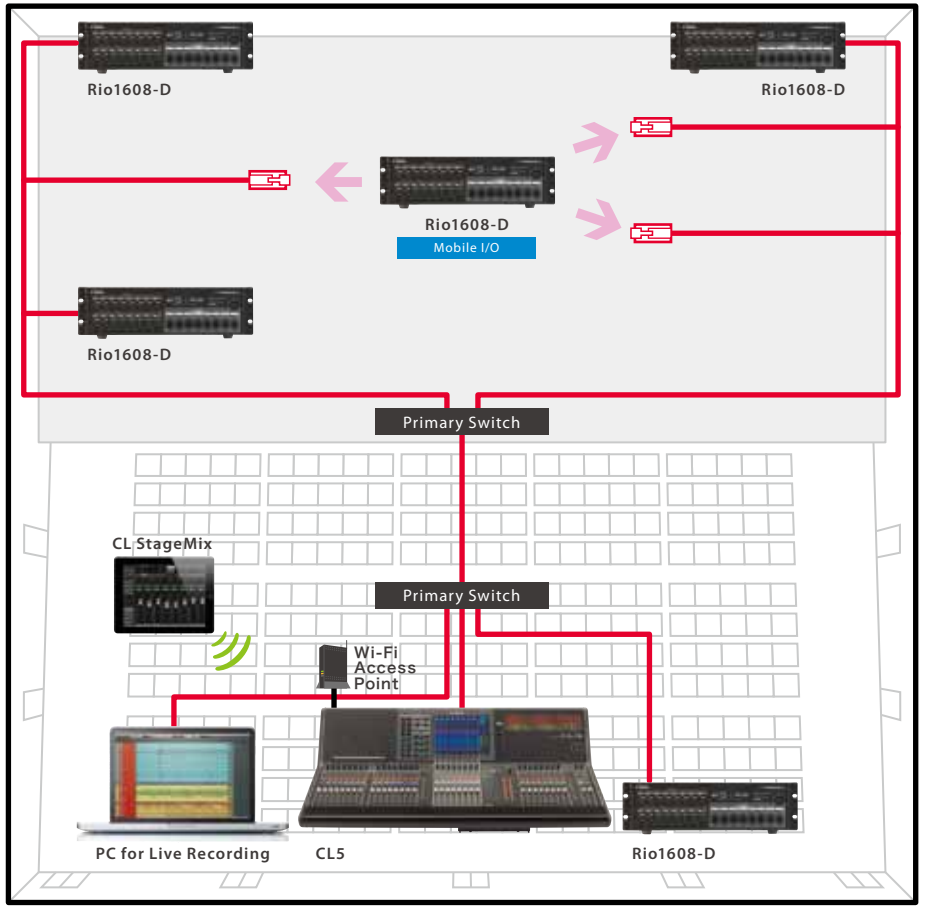


System Examples: Halls and Theaters

Versatility and reliability for a wide range of applications.

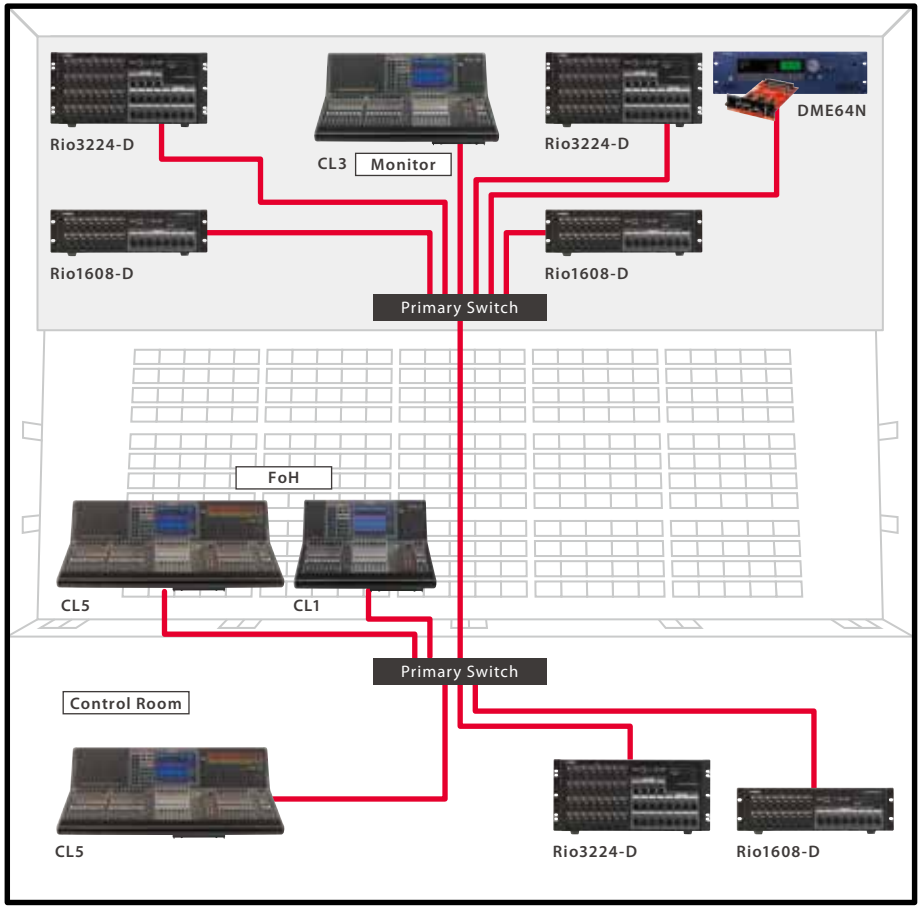
A Streamlined Multi-purpose Installation

The ability to network with up to eight I/O racks located wherever they're needed makes the CL series an excellent choice for halls and theaters that host a wide variety of shows. The I/O racks can be connected to any switch on the network, so the number of I/O racks used and their locations can be easily changed to suit different events.



Multiple Consoles

The CL series allows up to four CL consoles to be connected via a single Dante network. Each console on the network functions independently, allowing completely separate mixing to be carried out in a control room, on stage, and at FOH, for example. In situations like this the Gain Compensation feature prevents problems caused by unexpected analog gain changes from one console affecting the operation of others. In this example the FOH CL1 and CL5 are cascade connected to provide greater channel capacity.



CL5/CL3/CL1 Specifications

General Specifications

Sampling Frequency	Internal	44.1kHz 48kHz	
	External	44.1kHz +4.1667%, +0.1%, -0.1%, -4.0%	±200ppm
		48kHz +4.1667%, +0.1%, -0.1%, -4.0%	±200ppm
Signal Delay	Less than 2.5ms, OMNI IN to OMNI OUT, Fs=48kHz		
Fader	100mm motorized, Resolution=1024steps, +10dB to -138dB, -∞dB all faders		
Frequency Response	+0.5, -1.5dB 20Hz-20kHz, refer to +4dBu output @1kHz, OMNI IN to OMNI OUT		
Total Harmonic Distortion*3	Less than 0.05% 20Hz-20kHz@+4dBu into 600Ω, OMNI IN to OMNI OUT, Input Gain = Min.		
Hum & Noise*4	-128dBu typ., Equivalent Input Noise, Input Gain=Max., -88dBu, Residual output noise, ST master off		
Dynamic Range	112dB typ., DA Converter, 108dB typ., OMNI IN to OMNI OUT, Input Gain = Min.		
Crosstalk@1kHz	-100dB*1, adjacent OMNI IN/OMNI OUT channels, Input Gain = Min.		
Dimensions (WxHxD) and Net Weight	CL5: 1053mm x 299mm x 667mm (41 1/2in x 11 3/4in x 26 1/4in), 36kg (79.4lb) CL3: 839mm x 299mm*2 x 667mm (33 1/8in x 11 3/4in x 26 1/4in), 29kg (63.9lb)*2 CL1: 648mm x 299mm*2 x 667mm (25 5/8in x 11 3/4in x 26 1/4in), 24kg (52.9lb)*2		
Power Requirements (wattage)	CL5/CL3/CL1: 170W, Internal Power Supply CL5/CL3/CL1: 200W, Simultaneous use of Internal PSU and External PW800W		
Power Requirements (voltage and hertz)	US/Canada: 120V 60Hz, Japan: 100V 50/60Hz, China: 110-240V 50/60Hz Korea: 220V 60Hz, Other: 110-240V 50/60Hz		
Temperature Range	Operating temperature range: 0 - 40℃, Storage temperature range: -20 - 60℃		

*1 Crosstalk is measured with a 30dB/octave filter @22kHz *2 Excluded MBCL optional meter bridge.
*3 Total Harmonic Distortion is measured with 18dB/octave filter @80kHz *4 Hum & Noise are measured with A-Weight filter.

Analog Input Characteristics

Input Terminals	GAIN	Actual Load Impedance	For Use With Nominal	Input Level			Connector
				Sensitivity*1	Nominal	Max. before clip	
OMNI IN 1-8	+66dB	10kΩ	50-600Ω Mics & 600Ω Lines	-82dBu (61.6μV)	-62dBu (0.616mV)	-42dBu (6.16mV)	XLR-3-31 type (Balanced) *2
	+18dB			-34dBu (15.5mV)	-14dBu (155mV)	+6dBu (1.55V)	
	+17dB	3kΩ		-33dBu (17.4mV)	-13dBu (174mV)	+7dBu (1.74V)	
	-6dB			-10dBu (245mV)	+10dBu (2.45V)	+30dBu (24.5V)	
TALKBACK	+64dB	10kΩ	50-600Ω Mics & 600Ω Lines	-70dBu (0.245mV)	-60dBu (0.775mV)	-40dBu (7.75mV)	XLR-3-31 type (Balanced) *2
	+20dB			-26dBu (38.8mV)	-16dBu (0.123V)	+4dBu (1.23V)	

*1. Sensitivity is the lowest level that will produce an output of +4dBu(1.23V) or the nominal output level when the unit is set to maximum gain.(all faders and level controls are maximum position.)
*2. XLR-3-31 type connectors are balanced.(1=GND, 2=HOT, 3=COLD) *3. In these specifications, 0dBu = 0.775 Vrms. *4. All input AD converters are 24bit linear, 128times oversampling.
*5. +48V DC (phantom power) is supplied to OMNI IN (1-8) and TALKBACK XLR type connectors via each individual software controlled switches.

Analog Output Characteristics

Output Terminals	Actual Source Impedance	For Use With Nominal	GAIN SW*5	Output Level		Connector
				Nominal	Max. before clip	
OMNI OUT 1-8	75Ω	600Ω Lines	+24dB (default)	+4dBu (1.23 V)	+24dBu (12.3 V)	XLR-3-32 type (Balanced)*1
			+18dB	-2dBu (616mV)	+18dBu (6.16V)	
PHONES	15Ω	8Ω Phones	-	75mW*6	150mW	Stereo Phone Jack (TRS) (Unbalanced)*2
		40Ω Phones	-	65mW*6	150mW	

*1. XLR-3-32 type connectors are balanced.(1=GND, 2=HOT, 3=COLD) *2. PHONES stereo phone jack is unbalanced.(Tip=LEFT, Ring=RIGHT, Sleeve=GND) *3. In these specifications, 0dBu = 0.775 Vrms.
*4. All output DA converters are 24bit, 128times oversampling. *5. There are switches inside the body to preset the maximum output level. *6. The position of the level control is 10dB lowered from Max.

Digital Input & Output Characteristics

Terminal	Format	Data length	Level	Audio	Connector
Primary/Secondary	Dante	24bit or 32bit	1000Base-T	64ch Input/64ch Output @48kHz	etherCON Cat5e

Digital Output Characteristics

Terminal		Format	Data length	Level	Connector
DIGITAL OUT	AES/EBU	AES/EBU Professional Use	24bit	RS422	XLR-3-32 type (Balanced)*1

*1. XLR-3-32 type connectors are balanced. (1=GND, 2=HOT, 3=COLD)

I/O Slot (1-3) Characteristics

Each I/O Slot accepts a Mini-YGDAI card. Only Slot1 has a serial interface.

Control I/O Characteristics

Terminal		Format	Level	Connector
MIDI	IN	MIDI	-	DIN Connector 5P
	OUT	MIDI	-	DIN Connector 5P
WORD CLOCK	IN	-	TTL/75Ω terminated	BNC Connector
	OUT	-	TTL/75Ω	BNC Connector
GPI (5IN/5OUT)		-	-	D-Sub Connector 15P (Female) ※1
NETWORK		IEEE802.3	10BASE-T/100Base-TX/	RJ-45
LAMP (CL5=3, CL3=2, CL1=1)		-	0V - 12V	XLR-4-31 type ※2
USB HOST		USB 2.0	-	USB A Connector (Female)
Meter Bridge (CL3/CL1 only)		-	-	D-Sub Connector 9P (Female)

*1. Input pins: Internal TTL-level pull-up resistors provided (47kΩ). Output pins: Open-drain output (Vmax = 12V, max. sink current/pin = 75mA)
Power pins: Output voltage Vp = 5V, max. output current Imax = 300mA
*2. Pin 4 = +12V, Pin 3 = GND, lamp rating 5W. Software voltage control.

Rio3224-D/Rio1608-D Specifications

General Specifications

Sampling Frequency	Internal	44.1kHz 48kHz 88.2kHz 96kHz	
	External	44.1kHz +4.1667%, +0.1%, -0.1%, -4.0%	±200ppm
		48kHz +4.1667%, +0.1%, -0.1%, -4.0%	±200ppm
		88.2kHz +4.1667%, +0.1%, -0.1%, -4.0%	±200ppm
		96kHz +4.1667%, +0.1%, -0.1%, -4.0%	±200ppm
Signal Delay	Less than 3ms INPUT to OUTPUT, connect with CL5 using Dante, Dante Receive Latency set to 0.25ms (one way), Fs=48kHz		
Frequency Response	+0.5, -1.5dB 20Hz-20kHz, refer to +4dBu output @1kHz, INPUT to OUTPUT, Fs=44.1kHz, 48kHz +0.5, -1.5dB 20Hz-40kHz, refer to +4dBu output @1kHz, INPUT to OUTPUT, Fs=88.2kHz, 96kHz		
Total Harmonic Distortion*3	Less than 0.05% 20Hz-20kHz@+4dBu into 600Ω, Fs=44.1kHz, 48kHz Less than 0.05% 20Hz-40kHz@+4dBu into 600Ω, Fs=88.2kHz, 96kHz INPUT to OUTPUT, Input Gain = Min.		
Hum & Noise*4	-128dBu typ., Equivalent Input Noise, Input Gain=Max. -88dBu Residual output noise, ST master off.		
Dynamic Range	108dB typ., INPUT to OUTPUT, Input Gain = Min.		
Crosstalk@1kHz	-100dB*1, adjacent INPUT/OUTPUT channels, Input Gain = Min.		
Dimensions (WxHxD) and Net Weight	Rio3224-D: 480mm x 232mm*2 x 361.5mm (18 7/8in x 9 1/4in x 14 1/4in), 12.4kg (27.3lb) Rio1608-D: 480mm x 144mm*2 x 361.5mm (18 7/8in x 5 3/4in x 14 1/4in), 8.8kg (19.4lb)		
Power Requirements (wattage)	Rio3224-D: 120W Rio1608-D: 70W		
Power Requirements (voltage and hertz)	US/Canada: 120V 60Hz, Japan: 100V 50/60Hz, China: 110-240V 50/60Hz Korea: 220V 60Hz, Other: 110-240V 50/60Hz		
Temperature Range	Operating temperature range: 0 - 40℃ Storage temperature range: -20 - 60℃		

*1 Crosstalk is measured with a 30dB/octave filter @22kHz *2 Including rubber feet. *3 Total Harmonic Distortion is measured with 18dB/octave filter @80kHz *4 Hum & Noise are measured with A-Weight filter.

Analog Input Characteristics

Input Terminals	GAIN	Actual Load Impedance	For Use With Nominal	Input Level		Connector
				Nominal	Max. before clip	
INPUT 1-16	+66dB	10kΩ	50-600Ω Mics & 600Ω Lines	-62dBu (0.616mV)	-42dBu (6.16mV)	XLR-3-31 type (Balanced)*1
	+18dB			-14dBu (155mV)	+6dBu (1.55V)	
	+17dB	3kΩ		-13dBu (174mV)	+7dBu (1.74V)	
	-6dB			+10dBu (2.45V)	+30dBu (24.5V)	
INPUT 17-32*5	+66dB	10kΩ	50-600Ω Mics & 600Ω Lines	-62dBu (0.616mV)	-42dBu (6.16mV)	XLR-3-31 type (Balanced)*1
	+18dB			-14dBu (155mV)	+6dBu (1.55V)	
	+17dB	3kΩ		-13dBu (174mV)	+7dBu (1.74V)	
	-6dB			+10dBu (2.45V)	+30dBu (24.5V)	

*1. XLR-3-31 type connectors are balanced.(1=GND, 2=HOT, 3=COLD) *2. In these specifications, 0dBu = 0.775 Vrms. *3. All input AD converters are 24bit linear, 128times oversampling.
*4. +48V DC (phantom power) is supplied to INPUT XLR type connectors via each individual software controlled switch. *5. Rio3224-D only

Analog Output Characteristics

Output Terminals	Actual Source Impedance	For Use With Nominal	Max.Output Level Select SW*4	Output Level		Connector
				Nominal	Max. before clip	
OUTPUT 1-8	75Ω	600Ω Lines	+24dB (default)	+4dBu (1.23 V)	+24dBu (12.3V)	XLR-3-32 type (Balanced)*1
			+18dB	-2dBu (616mV)	+18dBu (6.16V)	
OUTPUT 9-16*5	75Ω	600Ω Lines	+24dB (default)	+4dBu (1.23 V)	+24dBu (12.3V)	XLR-3-32 type (Balanced)*1
			+18dB	-2dBu (616mV)	+18dBu (6.16V)	

*1. XLR-3-32 type connectors are balanced.(1=GND, 2=HOT, 3=COLD) *2. In these specifications, 0dBu = 0.775 Vrms. *3. All output DA converters are 24bit, 128times oversampling.
*4. There are switches inside the body to preset the maximum output level. *5. Rio3224-D only

Digital Input & Output Characteristics

Terminal	Format	Data length	Level	Audio	Connector
Primary/Secondary	Dante	24bit or 32bit	1000Base-T	24ch Input/32ch Output (Rio3224-D) 8ch Input/16ch Output (Rio1608-D)	etherCON Cat5e

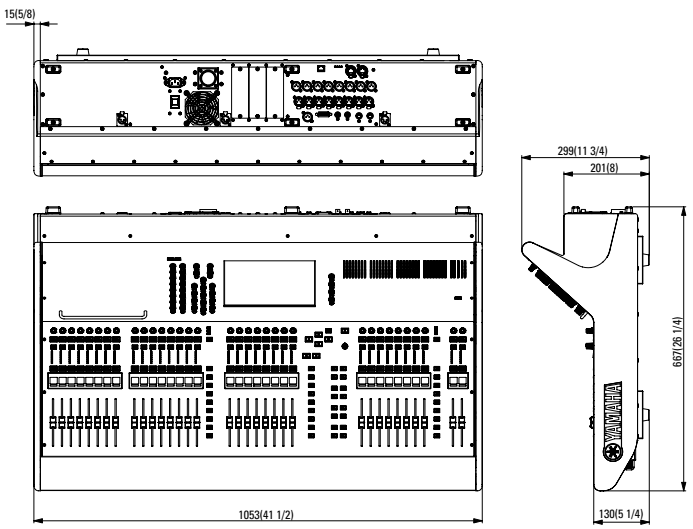
Digital Output Characteristics

Terminal	Format	Data length	Level	Connector
AES/EBU OUT 1/2 - 7/8*1	AES/EBU Professional Use	24bit	RS422	XLR-3-32 type (Balanced)*2

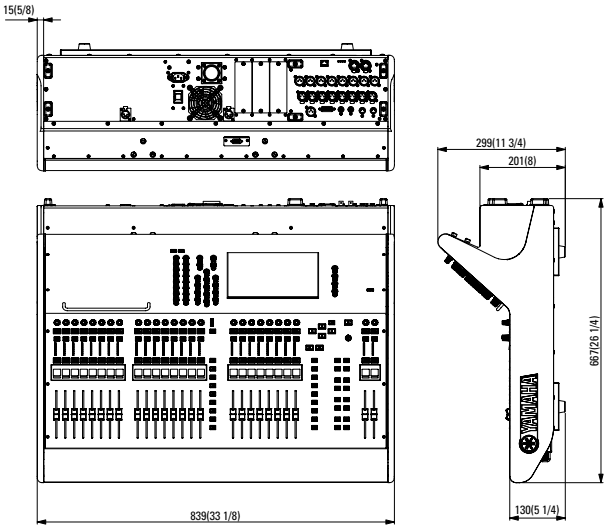
*1 Rio3224-D only *2. XLR-3-32 type connectors are balanced.(1=GND, 2=HOT, 3=COLD)

Dimensions

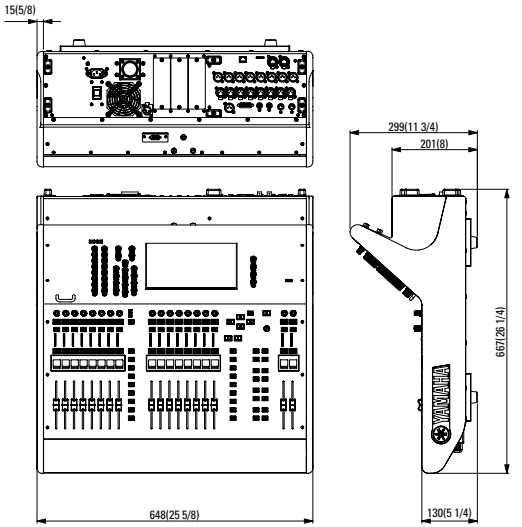
CL5



CL3

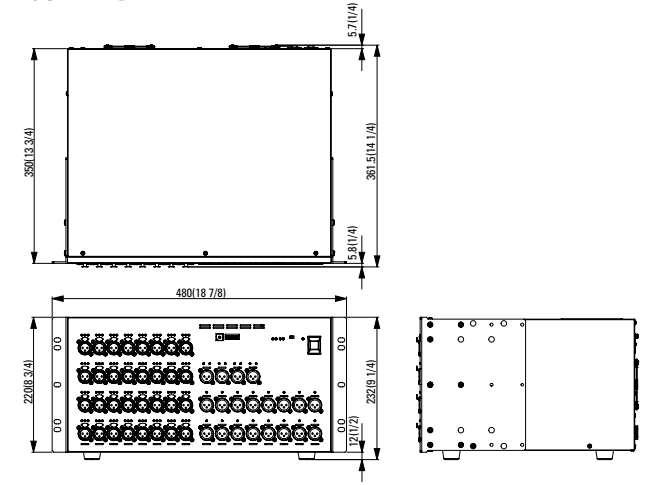


CL1



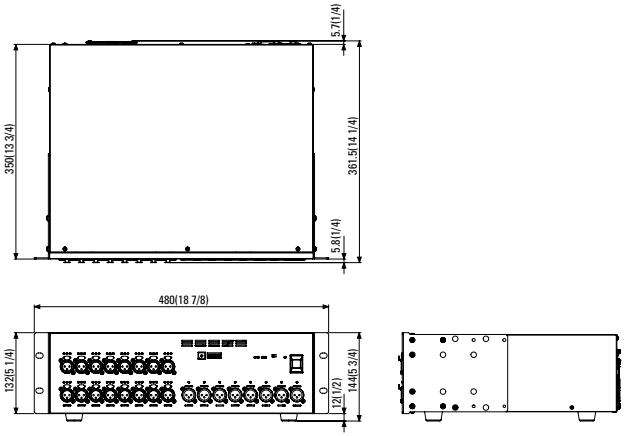
Rio3224-D

5U

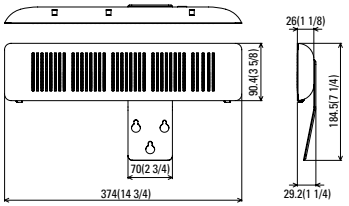


Rio1608-D

3U



MBCL



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