

OMEGA with Bluefin

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Putting Sound in the Picture





The growth of HD production demands that all broadcast consoles handle 5.1 content. Omega with Bluefin meets the needs of HD production and live to air delivery, now and into the future.

Why Omega with Bluefin?

The audio needs of live production and on-air broadcast operations are continually evolving.

Now, with the enthusiastic take-up of new, larger, widescreen and high definition TV displays by consumers worldwide, the role played by sound will become even more critical. This growing "home theater" audience is unlikely to be satisfied by anything less than the best quality video and audio content.

Demand for multi-channel surround sound production is increasing.

Popular television programming is now being originated in high definition with 5.1 surround audio. Even where HD programming has not yet become commonplace, content owners routinely want to produce high definition versions of their sports, music and live events, with 5.1 audio to match, so as to guarantee extended shelf-life and future income.

Whatever the scale of your operation, from national network to playout station, the need to process multi-channel audio will soon be unavoidable.

The question is: how can you equip yourself with the increased audio mixing capacity required in the most practical and cost-efficient way?

Omega with Bluefin High Density Signal Processing (HDSP) technology provides the innovative solution. This all digital audio console designed for live production and on-air use, provides the flexibility to handle mono, stereo and 5.1 surround sources in a compact, cost-effective and user friendly package.

Omega with Bluefin provides the industry’s most advanced, economical and practical way to deliver up to 240 channel processing paths.

What
is Omega with Bluefin?

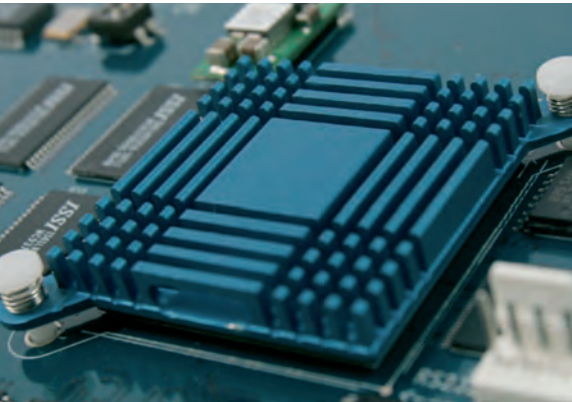
Bluefin has an unequalled ability to manage large numbers of surround sources. Omega with Bluefin provides up to 240 channel processing paths on just one DSP card, with full EQ and dynamics on all channels, groups and main outputs.

As with every Calrec digital console, all elements of the system design focus on simplicity and reliability. The assignable control surface minimizes screen usage enabling direct access to the majority of console functions, and the PC provides control over a number of user defined options such as monitor and metering setups.

In addition, the system provides a significant amount of audio delay to cope with the increasing AV synchronization problems, resulting from mixed format HD/SD production, for example. Bluefin signal processing provides 432 mono elements of up to 2.73 seconds of audio delay, which can be inserted exactly where the operator needs it.



- Up to 56 dual layer faders
- Up to 240 channel processing paths
- 8 x mono, stereo or 5.1 surround audio groups
- Additional VCA-style grouping system
- 2 main (program) stereo or 5.1 surround outputs
- 20 mono auxiliary busses configurable up to 10 stereo
- 48 multi-track outputs for IFB or recording
- Different mix-minus output from every channel or group
- Simultaneous LCRS, stereo and mono outputs available from each 5.1 main output
- Every channel can route to every buss, at the same time, without restrictions
- All channels, groups and mains have 4-band EQ, 2-band filters, Compressor/Limiter and Expander/Gate
- Separate 2-band EQ and 2-band filters for Dynamics side-chain
- 19.6 minutes of audio delay made up of 432 mono elements of up to 2.73 seconds
- Console operates independently of PC
- Console and racks boot from power on in less than 20 seconds
- Full control system reset in less than 15 seconds with no loss of audio
- Highly resilient: all modules are hot-pluggable with automatic redundant DSP, control and power systems



Bluefin High Density Signal Processing (HDSP) is a revolutionary, award-winning system which provides twice the signal processing capacity in a fraction of the space of conventional systems, at no extra cost, on just one DSP card.

How
does Bluefin work?

Bluefin is a patent-pending implementation of FPGA (Field-Programmable Gate Array) technology which can provide an entire mixing console on a single card.

Recent impressive increases in the resource density and speed of FPGA technology have enabled Calrec engineers to exploit the full potential of these versatile chips in order to produce a breathtaking 5000% improvement in efficiency compared with equivalent platforms using conventional DSP chips.

This means that even in our largest Alpha console, only one Bluefin DSP card is required, instead of 24 conventional ones, whilst at the same time the number of channels is more than doubled.

Calrec is the first company to implement FPGA technology in this way.

The advantages of such a dramatic reduction in the number of DSP cards required, include proportional reductions in power usage, heat generation and the chance of component failure.

In short, the FPGA provides a DSP system that is much more powerful and reliable than a conventional design, for around the same cost. With system resilience reinforced by a second, redundant card, it's like having another console as a hot spare.

Bluefin also provides full EQ and dynamics to all channels, groups and mains, with 2 x 5.1 main outputs, 8 x 5.1 groups, 48 multi-track/IFB outputs and 20 auxiliary outputs.

There are no second chances in live broadcast. Audio operators are under real pressure and need to be able to mix instinctively. Calrec consoles are purpose designed for this testing environment, which is why broadcasters instinctively trust Calrec to keep them at the top of their game.



What are the benefits?

Reliability

Calrec consoles are famous for their reliability and purpose designed not to let you down. But in the demanding environment of live-to-air broadcasting, you can't afford to leave anything to chance. That's why we go the extra mile and provide full redundancy at all system-critical points with fully redundant power supplies, DSP cards and processing cards. All cards and panels are pluggable under power and initialize on insertion. Our proprietary operating system and independent DSP ensure audio continuity, and eliminate the need for a PC for sustained operation or boot up.

This means that PC failure or reset has no effect on the audio signal and accounts for a boot time, from cold, of less than 20 seconds, and a full control system reset in less than 15 seconds, with no loss of audio.

Ease of Operation

We have been designing live production and live-to-air broadcast audio mixing consoles for over 35 years, and in 1981, we introduced the world's first digitally controlled assignable mixing console. The Calrec assignable control surface, now in its fifth generation, integrates many years of user experience and feedback.

The console operation is intuitive, with a fast learning curve. Use of the PC is minimal across our whole console range and layering is limited to two independent signal paths. Calrec's compact fader width enables operators to control more faders at any given time – eight faders take up only 250mm/9.85 inches, providing more physical faders in a given space than any other console manufacturer.

Power

Fully redundant power is provided from compact supplies which take up minimal rack space. High DC voltage power distribution allows for wide variations of AC power without dropping DC operating voltages.

The AC voltage can drop to about 80v before the 24v output starts to drop. This makes the system highly tolerant of cable voltage drops and AC mains brown outs.

Processing

The channel count of Calrec consoles is never diminished, no matter how many output busses are in use. Using any of the output busses on some other consoles can reduce the number of input channels that can be used, but with Calrec desks output busses are more like the physical busses of an analog desk – and they are all available without reducing the input channel capability.

As the transition from stereo to surround sound gathers pace, consoles used in production and live-to-air broadcast need more than just increased channel capacity. Precision control and management of all these new sources is equally important.



Surround Sound

As well as providing the vastly increased channel capacity needed to handle the surround sound future, our Bluefin generation of consoles has been designed with all the advanced functions needed to maintain comprehensive control in this more complex multi-channel environment.

Our consoles provide all the mixing output paths and monitoring facilities required in a busy surround sound environment, including an insert for a Dolby® DP570 multichannel audio tool which can be remotely controlled directly from the monitor panel.

Calrec consoles also provide 8 x groups that are fully equipped for 5.1 surround, as well as all main outputs, and allow full control of the

stereo downmix of the surround main outputs. This is often necessary when doing simultaneous HD and SD transmissions.

Calrec Surround Channels give operators the ability to control a full 5.1 source as a single channel, in a similar way to a stereo channel. This free assignability of mono, stereo or 5.1 channels delivers the optimal solution for handling and controlling surround sound sources in live production.

Surround Channels use the resources of 2 x stereo channels (for L/R and Ls/Rs) and 2 x mono channels (for Center and LFE). These resources are automatically allocated from the available mono and stereo channels as the Surround Channel

is assigned, and can be individually controlled on a dedicated Surround Spill panel on the control surface.

The advantages of using two stereo channels for the L/R and Ls/Rs rather than four monos are:

- it allows faster operation compared with 4 x mono channels when the signals need to be adjusted separately from the Surround Channel.
- it ensures that during adjustment, the overall balance of the Surround Channel is not upset (for example by adjusting the EQ of L and then R).
- it allows adjustment to the front and rear width of the surround signal – impossible if treated as mono signals.

Hydra Audio Networking provides a flexible, reliable and cost effective method of developing your I/O infrastructure and maximizing studio flexibility.

Hydra

Hydra provides a powerful solution for sharing network I/O resources and control data between Calrec digital mixing consoles. Hydra uses Gigabit Ethernet fabric, the highest speed network infrastructure commonly available. Very high bandwidth and a scalable, flexible architecture allow the network to be tailored precisely to the requirements of each installation. A variety of Hydra I/O, analog or digital, may be connected to the network.

- Cost effective and user-friendly
- Reliable, with scope for comprehensive system redundancy
- Very high bandwidth – data rate of 1000Mbps over copper or optical fiber
- Up to 585 bi-directional channels
- Network constructed from standardized, structured cabling or fiber-optics

Modular Hydra I/O boxes provide a versatile way to devise a vast range of alternative I/O schemes. They allow selections of analog input, output and AES modules to closely tailor port combinations to exact requirements.

For installations which do not need this level of custom flexibility, Calrec can supply one or more fixed format boxes, providing a highly cost effective form of I/O.

Using a natural and logical extension of our existing console operational screens and panels, control of the network is remarkably user-friendly.



Larger studios and outdoor spaces present their own unique problems for networked connectivity – easily overcome with Calrec’s simple, elegant and cost-effective fixed format I/O boxes.



Fixed Format boxes

Calrec offer a range of fixed format 2 to 4U I/O boxes.

The fixed format boxes all come with redundant internal power supplies and optional dual IEC power connections, as well as redundant Gigabit Ethernet ports.

For distances up to 90m/295ft, Calrec’s I/O boxes can use Cat 5e Gigabit Ethernet ports. In addition to standard RJ45 ports, the adoption of plug-in GBIC modules means interfaces for either multi- or single mode fibers are available via duplex connectors. This offers connectivity over much greater cable runs, such as in larger studio or Outside Broadcast environments, of up to five kilometers.

All fixed format boxes offer fully redundant connections for both RJ45 and GBIC connectors as standard.

Calrec provide a variety of fixed format configurations:

- 2U 24/8: 24 mic/line input, 8 analog output
- 2U 12/4: 12 mic/line input, 4 analog output
- 3U 32/32: 32 input, 32 output AES-3
- 4U 48/16: 48 mic/line input, 16 analog output

Today’s systems include HD SDI video, with embedded audio and encoding by Dolby®E. A single Calrec SDI Hydra box can provide up to 128 legs of audio from a number of SDI streams.

The Calrec SDI Hydra box will also:

- De-embed all audio groups from an SDI stream
- De-embed synchronous and asynchronous audio from an SDI stream using sample rate converters
- De-code up to 8 DolbyE signals
- Route any incoming pair to any DolbyE decoder

TFT

Calrec's TFT metering provides full operator configurability of layout, size and color. Each meter can be mono, stereo, M/S, 5.1 surround or a phase display and automatically detect whether the channel is mono, stereo or 5.1.

Monitoring

In live broadcast you need immediate access to many different sources. Calrec monitor panels can be configured to select up to 60 mono, stereo or 5.1 sources, and these can be banked together for ease of access.

Wild Controls

Omega with Bluefin provides two wild controls for each fader. Almost any rotary control on the console can be assigned. Wild controls have an LED display providing clear visual feedback to the operator.

Faders

The Omega with Bluefin console can incorporate up to 56 physical faders. Calrec's 5.1 surround channels provide the ability to control a discrete 5.1 source on a single fader.

The Omega with Bluefin console features an assignable control surface which incorporates Calrec's vast experience designing live production and live-to-air broadcast audio mixing consoles.

Calrec introduced the world's first digitally controlled assignable mixing console in 1981. Our assignable control surface is now in its fifth generation, integrating many years of user experience and feedback.



PC

All Calrec consoles have a proprietary operating system and are entirely independent of the PC for sustained operation or boot up. This means that PC failure or reset has no effect on the audio signal.

Surround Spill

Calrec's Surround Spill panel allows an operator to adjust the individual legs of a surround channel, group or main. Surround channels use the resources of 2 x stereo channels (for L/R and Ls/Rs) and 2 x mono channels (for Center and LFE) and are automatically allocated from the available mono and stereo channels.

The enhanced flexibility of our TFT metering system solves the problems of dealing with 5.1 sources using conventional metering.



Metering

Working in a 5.1 environment presents users with very specific problems. Operators see an increasing number of 5.1 sources coming into the console. They need to know that that all six legs are present and at the expected level, but on conventional metering systems it is very difficult to display a 5.1 input, especially in the space of a single fader width. It also follows that with many more 5.1 outputs, even more metering is required.

Calrec's TFT metering provides full operator configurability of layout, size and color as well as ensuring a high degree of redundancy, without increasing the cost over conventional bargraphs. Each meter can be mono, stereo, M/S, 5.1 surround or a phase display. Our meters automatically detect whether the signal format is mono, stereo or 5.1 and display the signal appropriately.

The system allows up to three rows of meters per TFT screen, and can incorporate mixed sizes: 1/3, 2/3, 1/2 and full height. Meter size, location and color are user definable, as is screen brightness.

As well as enabling a greater density of signals to be displayed, TFT metering provides users with absolute flexibility. For example, a typical meter set-up could have one screen metering Tracks 1-24, A Paths 1-8 and B Paths 1-8. In the center of the console, an operator could set up a screen to display full height hi-res monitoring of Main Outputs 1-4 in 5.1 and a Meter Selector in 5.1 (or stereo when a stereo source is selected).

- The following signals can be metered:
- Channel inputs, A and B paths (simultaneously, or set to follow A/B assign button)
 - Main Outputs
 - Groups
 - Auxiliary Outputs
 - Track Outputs
 - External Inputs
 - AFL/PFL/APFL
 - Meter Selectors
 - CRLS
 - Mix-minus

With an impressive 36dB of pre-fader headroom, Calrec consoles have the dynamic range to handle even the most excitable broadcast commentators.

The audio stays clean even when channel faders have to be pulled back well below the -30 mark.



Calrec consoles are designed to deliver excellent audio quality – in other words, an open, transparent sound with high input headroom and low noise.

Audio Quality

Audio quality is of paramount importance. It's been at the core of our business for more than 30 years. Over the years all console manufacturers have tempted customers with more and more facilities and features, yet Calrec's reputation for audio quality has never been compromised.

All our products are renowned for their very clean, uncolored sound quality, with very high headroom and low noise.

- Maximum Mic input headroom of +36 dB
- 24 bit converters for all I/O
- Sample Rate Converters on every AES input
- Low Latency (from an input port to a channel path, routed to a group buss, in turn routed to a main buss, to an output port)
- <1.25ms digital input to digital output
- <3ms analog input to analog output



With complex modern working practices, it is increasingly important to simplify workflow procedures and reduce costs.

External Control Interfacing

Prestigious productions require an experienced audio engineer to operate the console, delivering a smooth result with levels and transitions that sound perfect. But with rising production costs there are also times when an entire production gallery is run by a single operator, such as late night news bulletins.

Calrec is at the forefront of providing interfacing to systems such as the OverDrive from Ross Video. Calrec's versatile interfaces allow individual control of faders, Cuts and PFL of up to 192 faders on the Calrec console directly from the Ross Overdrive Automated Production Control (APC) System.

This high level of integration enables the control of both audio and video on a given broadcast from the vision switcher or OverDrive system, significantly reducing production costs.

In a high pressure broadcast environment, speed of access is paramount.

Ergonomic design for ease of operation

Getting control of channels in live broadcasting should take as few steps as possible. Having them buried on hidden layers or banks can be a real problem, especially when you need to use elements that are hidden three or more layers deep.

On Calrec consoles there are two signal paths available to each fader and access to either is via a single button press. Assignable controls have the great advantage of enabling ready access to as many controls as possible, rather than having them spread across the width and height of the board. Local assignable controls are also provided for setting IFBs and mic gains etc. This means that the majority of controls you need are just one button press away.

This attention to ergonomic design also extends to our buss architecture. Although it is often assumed that digital consoles – like analog consoles – have all their facilities available at all times, this is not always true. Some desks offer a pool of busses that can be used for different things, but not simultaneously. Some can also lose DSP functions, such as EQ and dynamics, as busses are used. Calrec desks do not 'pool' resources in this way. Our buss structure is designed to provide everything you need, all of the time.





Originally built to house one of the most famous worker-producer textile co-operatives in England, the nineteenth century Nutclough Mill, (left and below) is now home to one of the broadcast industry's most technologically advanced manufacturing companies.



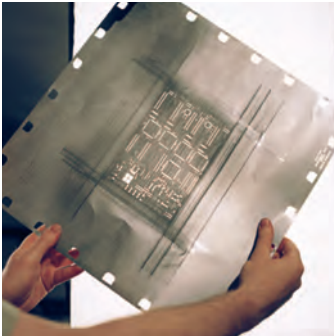
Meeting your changing needs

Established in 1964, Calrec Audio has more than forty years of pro audio expertise. Since the launch of our first mixing console in 1971 we have been exclusively dedicated to the design and manufacture of live broadcast audio mixing consoles.

This consistent focus on the needs of broadcast customers has given us a deep understanding of the ergonomic and system specifications required for modern production. We understand what's most important to you and how best to meet the changing needs of the broadcast environment.

Calrec was the first company in the world to design and manufacture a commercially available stereo mixing desk for broadcast stereo sound, the first to develop a single-point surround-sound microphone and the first to launch a commercially available digitally controlled assignable broadcast console. With the launch of our Bluefin range, we were the first to provide a truly practical and cost-effective solution to the needs of multi-channel surround sound mixing.

Our expertise, our experience and our technology is trusted and endorsed by the world's most successful broadcasters.



Clockwise from left; Ersascope Visual Inspection Camera, Cross section of wild control panel in final assembly, solder paste stencil, DSP cards in test rack, MYDATA MY19 SMT placement machine.

Key to Calrec's outstanding reputation for innovation and reliability within the broadcast industry is the integrity of the product development process. From original concept, through R&D, to state-of-the art production, every element – even the metalwork for frames and racks – is carried out in-house.

System Specification

Digital Inputs	
Formats Supported	AES/EBU (AES3) 24-bit Also suitable for use with SPDIF (IEC958 Type 2) signals
Interface	110 Ohm transformer balanced, 5V Pk-Pk 75 Ohm unbalanced (BNC), 1V Pk-Pk
Sample Rate Conversion	24-Bit switchable on all digital inputs
SRC THD+N	-117dB @ 1kHz, 0.00014%
Digital Outputs	
Formats Supported	AES/EBU (AES3) 24-bit
Interface	110 Ohm transformer balanced 4V Pk-Pk (nominal) into 110 Ohm load 75 Ohm unbalanced 1V Pk-Pk (nominal) into 75 Ohm load (BNC)
Analog Inputs	
Analog - Digital Conversion	24-Bit
Input	Electronically Balanced
Input Impedance	>1k Ohms for Mic gains 10k Ohms for Line gains
Sensitivity	+18 / -78dB on Mic/Line Input Card +18/-24dB on Line Only Input Card.
Equivalent Input Noise	-126dB (150 Ohm source)
Distortion	-1dBFS @ 1kHz - Better than 0.003% -20dBFS @ 1kHz - Better than 0.006% -60dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.5dB on Mic/Line Input Card 20Hz to 20kHz +/- 0.25dB on Line Only Input Card
Input CMR (Common Mode Rejection)	>70 dB (Typical 80dB) on Line Inputs >75 dB (Typical 85dB) on Mic Inputs
Analog Outputs	
Digital - Analog Conversion	24-Bit
Output Balance	Electronically Balanced, 20Hz to 20kHz, Better than -35dB, typically -45dB
Output Impedance	<40 Ohms
Distortion	-1dBFS @ 1kHz - Better than 0.006% -20dBFS @ 1kHz - Better than 0.003% -60dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.25dB

Performance	
Digital to Digital (AES/EBU) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.002%
Digital to Digital (with SRC) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.0002%
Frequency Response (Analog Input to Output)	20Hz to 20kHz +/- 0.5dB
Synchronization	
48kHz synchronization	NTSC/PAL Video Internal Crystal Reference TTL Wordclock (48kHz) AES/EBU Digital input (48kHz)

Environmental Considerations		
	Operating	Non-Operating
Temperature Range	0°C to +30°C (32°F to +86°F)	-20°C to +60°C (-4°F to +140°F)
Relative Humidity	25% to 80% Non-condensing	0% to 90% Non-condensing
Maximum Altitude	2,000 Meters (6500ft)*	15,000 Meters (49,000ft)

- Analog input for 0dBFS can be pre-set globally to +28, +24, +22, +20, +18 or +15dBu
- Pre-fader headroom on mic inputs is adjustable globally from +24 to +36dB in 2dB steps
- Analog output for 0dBFS Matches input setting into >1kOhms (+24dBu max into 600 Ohms)

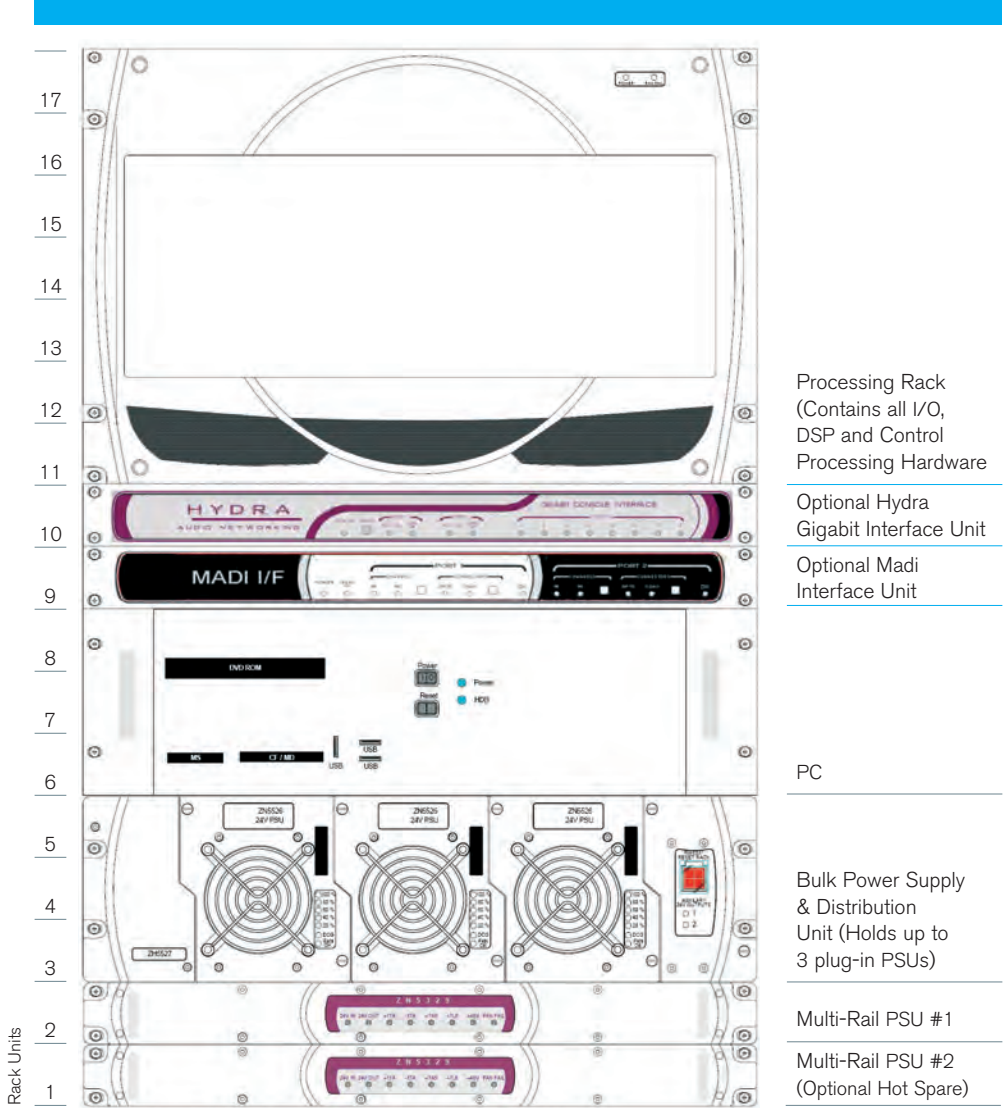
The system can be pre-set with up to five external sync sources, plus internal, such that if the 1st source fails, it will automatically switch to the 2nd, and so on. *This is the limit to which the safety tests are valid.

Maximum Cable Lengths		
Maximum cable lengths between Control Surface and Digital I/O Rack		
Cables	Maximum Length	
Frame Size	Feet	Meters
Up to 32 faders	492	150
40 faders	459	140
48 faders	394	120
56 faders	328	100
KVM necessary to provide console data connections for distances greater than 10m (33ft)		

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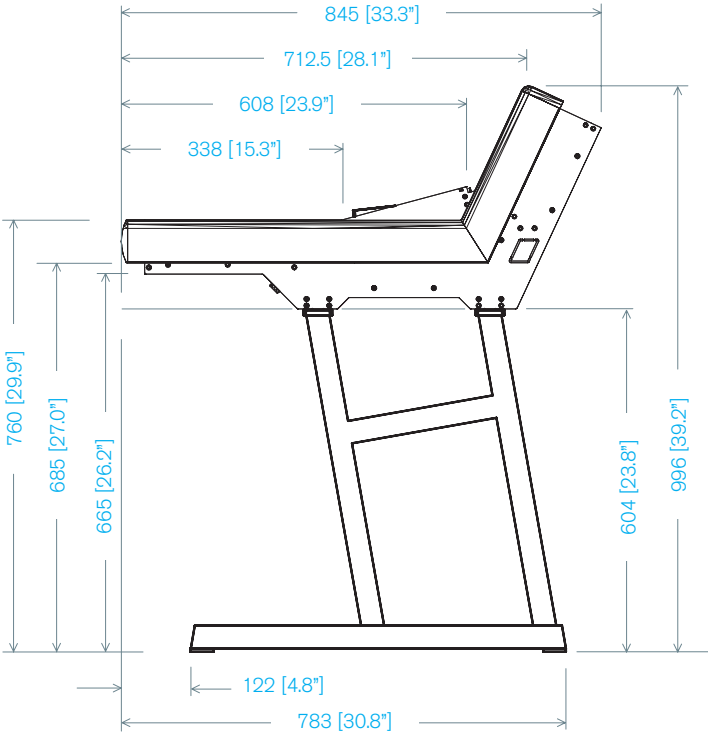
Typical Rack Layout



Control Surface Frame Sizes

Frame Size	Length inches / mm		Depth inches / mm	
24 fader frame	30.9	785	33.3	845
40 fader frame	50.8	1291	33.3	845
56 fader frame	70.7	1797	33.3	845

Control Surface End Profile



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