

mc²90

No compromises

A New Milestone in the Audio Industry. The mc²90.



Networking Audio Systems





The wheel, the printing press, the steam engine – without great inventions, today's civilisation would not have been possible. And without the phonograph, the talkies, and the DVD, modern audio technology would be unthinkable. These crucial milestones have opened the path to the future, and all-important innovations are based on our continuous effort to turn something good into the best. In this spirit of continuous improvement and the search for perfection, has emerged a new high-end mixing console from Lawo – the mc²90, a new milestone in the development of audio technology.





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When Perfection is the Goal

We know – whoever creates a new benchmark for top-of-the-range mixing consoles must meet the highest demands, and develop an audio tool that not only wins you over with its size and power, flexibility and reliability, and a well thought-out operating surface, but also with its modern, intuitive design. For only when, in the most complex situations and in every conceivable production environment, your individual needs are fulfilled, have we reached our aim: offering a mixing console that sets new standards.





The Gramophone

Invented in 1887 by Emil Berliner, the gramophone enabled the mechanical recording of sound, and was one of the precursors of the mass distribution of musical media.

When a High Degree of Modularity and Confidence are Crucial

You want a mixing console that can be easily transformed from use in an on-air control room to a surround-sound radio drama studio? A console that offers over 200 faders in a clearly arranged layout, without you having to lose direct access to every control? A console that guarantees, even for the utmost requirements, the security of your studio production – 24 hours a day, 365 days per year? Then we are delighted to present a mixing console that, with its maximum redundancy, optimal modularity and well conceived user-friendliness, answers all these questions – and when it comes to quality and functionality, says just one thing: no compromises.





As Flexible as your Requirements

With the mc²90 you have everything under control – all of the time. The console offers a modular centre section that enables you to adapt the control layout to match your individual requirements. Whether it be live broadcast, recording, post-production or live sound reinforcement, the mc²90 allows you to position the most significant modules exactly where you want them, so that you can access them more easily. In addition, external control devices can be integrated smoothly into the mc²90 control surface – from up to 5U in the clever integration of a 19" rack, to Danner modules that can be fitted in the meterbridge or on the control surface.



☀ The New Modularity

The totally new mc²90 centre section has a completely modular design. This allows you to place nearly all the 'master' modules, Machine Control, Bus Assign, etc., freely within the centre section. The benefit is obvious: the modules that are most important for your particular production can be placed for best access; you benefit from a high degree of flexibility as well as from the console ergonomics and a previously undiscovered efficiency. In spite of this modular concept, we have managed to build an easily understandable control surface.



Decentralised Central Operation – Now Available

One of the exceptional characteristics of the mc²90 is an innovative operating philosophy that meets the highest standards of functionality and user-friendliness. A core item in this regard is the Iso Bay Access function that gives you maximum control at any time and in any situation, by allowing you to copy central control operations to other areas of the console. With this groundbreaking tool, the mc²90 facilitates the best possible multi-user operation, and separate monitoring options can also be provided, thanks to additional AFL and PFL buses. Furthermore, enhanced user feedback and a clearly structured control surface always guarantee – in spite of the comprehensive range of functions – the best possible overview of the current state of the console. Every audio module has



easily understandable colour coding that assists this overview, even in critical situations. Moreover, decentralised operation has been deliberately designed to be easy to operate as it follows the same colour coding of the central controls. Another plus point: modern OLED displays assist your day-to-day work with their pin-sharp output, and show the maximum level of information in an unambiguous way.



The Condenser Microphone

In a condenser microphone, sound waves are transformed into electrical signals via a vibrating condenser membrane. Presented in 1928 by Georg Neumann, this technology is still a dominating force in modern recording.

■ Form Follows Function

Intelligent use of colour and style, and the open design of all the audio modules, gives the user a fantastic overview, even in critical live situations. Thanks to their clever visual design, EQs and dynamics in the centre section can be distinguished from one another at one glance, and designations on the individual audio modules are almost superfluous. Furthermore, not only are all the audio modules in the central control section colour coded – you will also find the same colour coding on the fader strips, depending on which function is currently assigned to a Free Control. This distinctive marking of the audio modules helps ease your complete understanding of the console, and gives you absolute confidence that you have everything under control, during any stage of the production.

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Absolute Security thanks to Dual Redundancy

Infallible redundancy has always been the hallmark of Lawo mixing consoles. Since the design of the Nova73 HD router and the mc²66 console, the mc²90 has now reached a completely new level of hardware redundancy. The proof of this is that the Lawo-developed 'Dual Star Technology' has now found its way into the console control surface. Not only are all panels connected to the control processor using star topology but, in addition, the mc²90 now has a second redundant control processor that is also connected in star mode to every single panel. With this Dual Star Technology within the control surface, Lawo has established a further milestone in reliability and redundancy, thus setting new standards in the design of mixing consoles and HD cores.

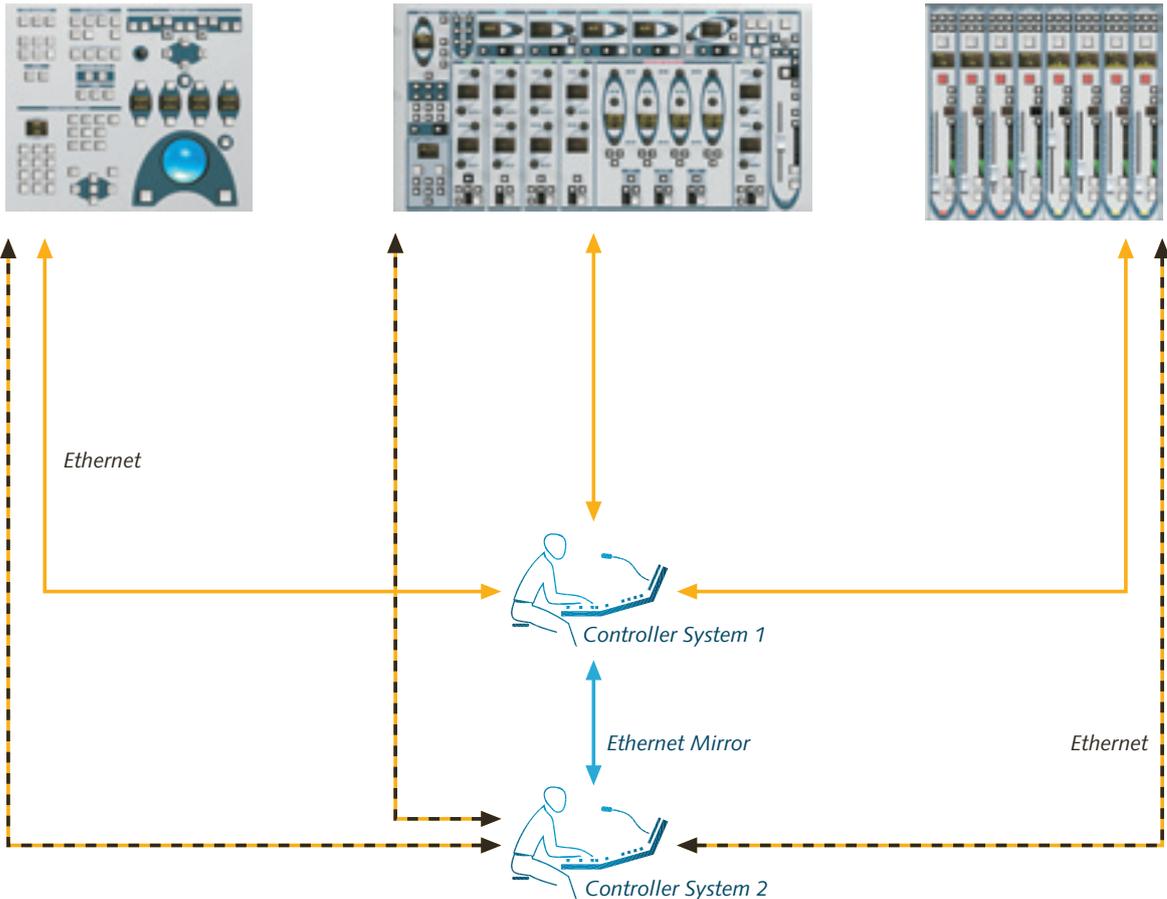
Redundancy Control

The mc²90 features a completely redundancy-capable control structure – from the redundant control processor to the Dual Star interconnection of individual panels. This results in a redundant control processor that constantly mirrors itself with the active control processor and, in an emergency, can swiftly take over control. The mc²90 offers maximum security for every production, day after day.

Dual Star Technology

Every module in the mc²90 is linked via Ethernet to both control processors via a point-to-point connection. This 'Dual Star' technology, previously developed for Lawo's HD Core, provides a redundant link for all the control surface panels.





The Magnetophon

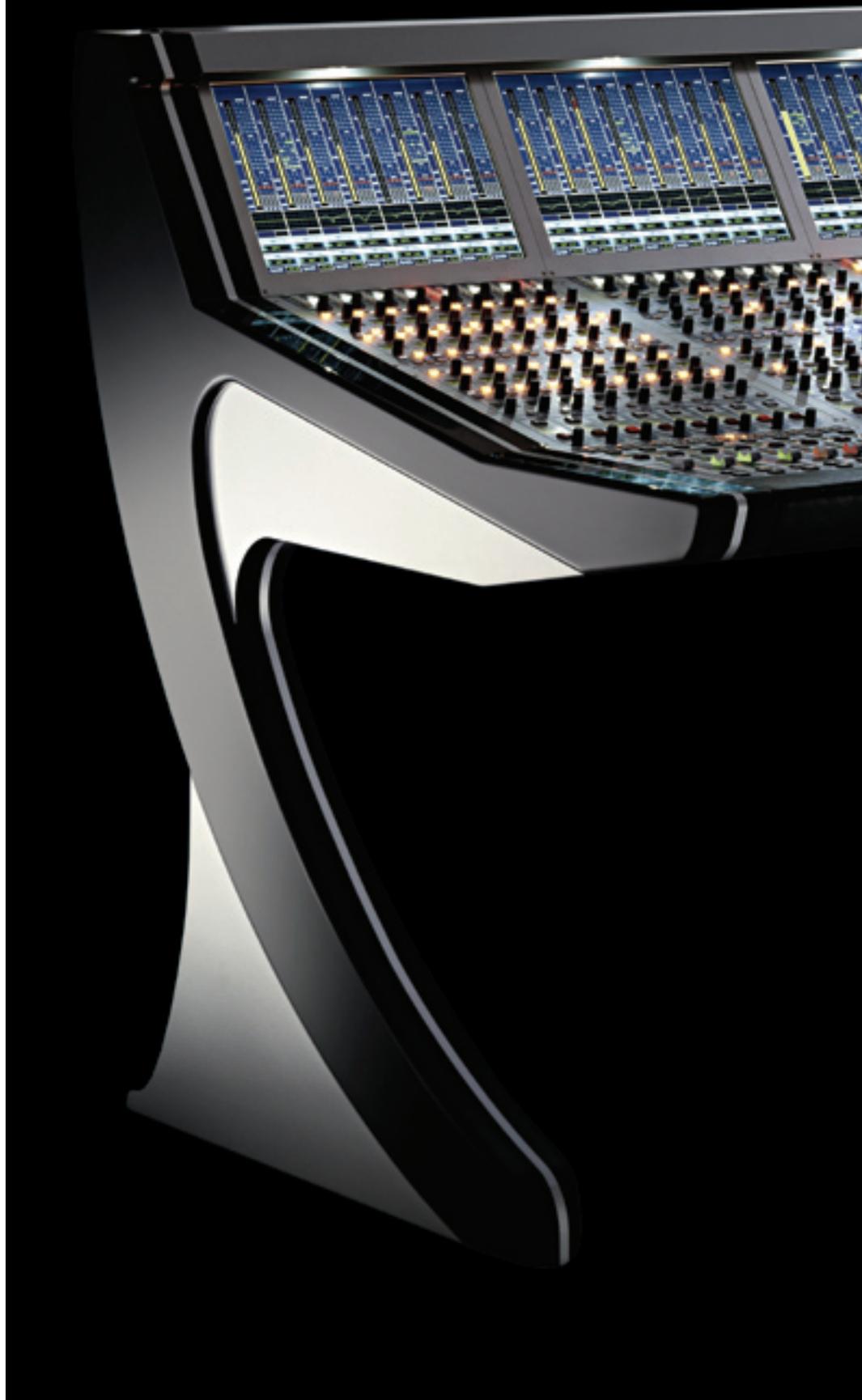
Used for the first time in 1936 to record a concert by the London Philharmonic Orchestra, the AEG-developed Magnetophon rapidly replaced the wax plates used by radio broadcasters and, in the following years, considerably shaped the development of audio technology.

More Power with Networking

The optional networking facilities offer the possibility to network up to 16 Lawo consoles. This enables you to distribute your resources totally freely within the networked system and, via Netlink (MADI, ATM, AES or analogue audio), interlink different Lawo consoles to one large central matrix. The benefits are obvious:

- Complex networked systems appear to the user as a single matrix
- Local sources and objects are selected within the network at the push of a button
- Each console on the network can access the parameters of any control, such as mic preamps, high pass filters, SRC, etc., regardless of whether local or shared sources and objects are concerned.

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Perfect sound. Stylish to look at.

Not only does the mc²90's audio technology meet the highest demands. You will be drawn to the console by its exciting shape and stylish construction, which makes the mc²90 the visual focus in any studio. Even when superb design shines when combined with perfect functionality, the design is supplemented by logical detailing that, thanks to optimized ergonomics and intuitive user feedback, will make your day-to-day productions significantly easier.

For example: To assist in keeping an overview of up to 200 faders, the mc²90 offers colour coding of the fader strips similar to that commonly used in analogue days. However, with the mc²90 you don't need to manually change the fader caps because the fader strips are designated using modern LED technology, according to the channel type or your individual requirements. This allows you to easily keep track of any fader at any stage in the production.

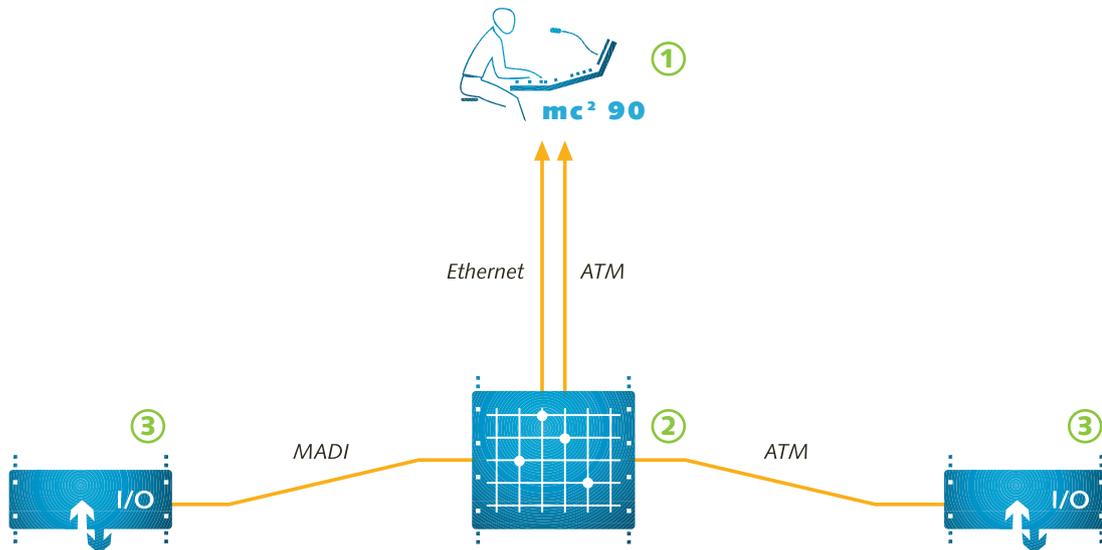


The Compact Disc

Jointly presented in 1981 by Philips and Sony in a world premiere at the Funkausstellung in Berlin, this optical mass-memory media revolutionised the music industry and, in the following years, supplanted vinyl discs as the most important audio storage medium.



Structure mc²90



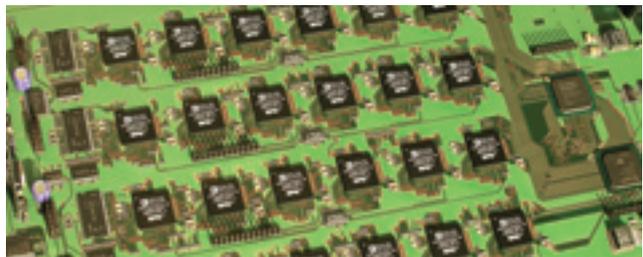
The **system** consists of three parts:

- ① Mixing console surface with integrated control system
- ② DSP and routing matrix (HD core)
- ③ DALLIS I/O interfaces

Control system and HD core communicate via an Ethernet link and an ATM link, both with redundant design.

The DALLIS stage boxes are connected by multimode optical fibre. This allows distances of up to 2 km.

Optionally available is a monomode link that allows distances of up to 8 km.



The **audio processing** is performed on the DSP boards in the core. They work optionally at 48 or 96 kHz at a 24-bit-resolution and an internal processing of 40 bits floating point. This results in an internal dynamic range of 1,000 dB.

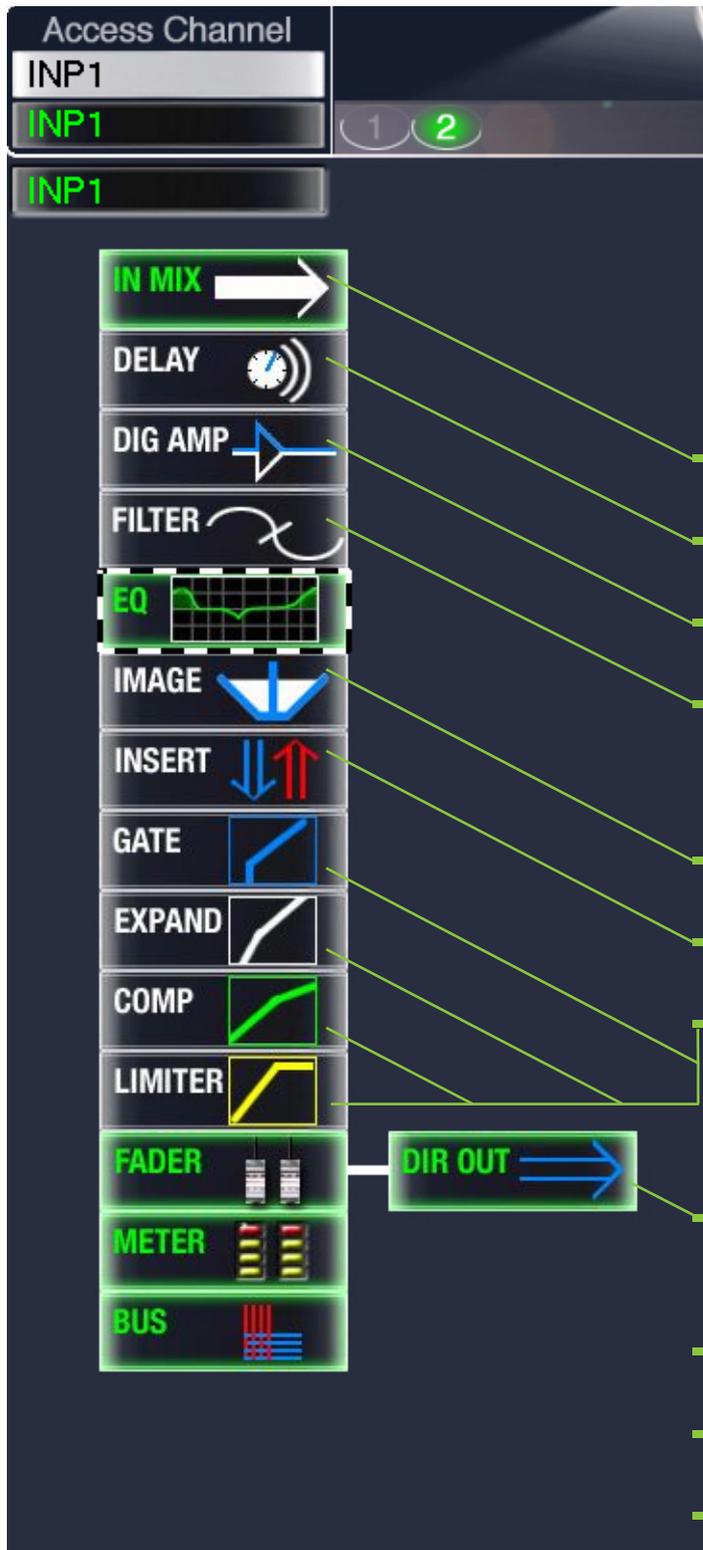
In case of a DSP-board failure a redundant DSP board takes over all crosspoints and DSP parameters within a few milliseconds.

High-quality algorithms guarantee high-quality audio processing. Naturally, every setting of the DSP is noiseless so that also the delay can be set during runtime without clicks.

Up to 384 full DSP channels offer all audio modules like input mixing, filter, EQ, dynamics, delay, stereo image and surround panning at any time. From every channel it is always possible to collect 32 aux/sends.

Different DSP configurations facilitate to categorise the DSP resources for different production requirements. Changing the configuration is possible anytime while the system is in operation without the loss of production data and without unpleasant noises. Even the parameters of no longer existing channels remain stored so that after a further change of the DSP configuration the settings are available again.

DSP Channel



Every one of the 384 full **DSP channels** includes always all audio modules no matter whether it is an input, group, sum, monitor or aux channel.

INMIX controls the pre-amplification in the stage box for analogue sources

DELAY allows a delay of up to 1800 ms represented as frames, ms or m

The **DIGIAMP** changes the amplification within the channel

Both the 4-band **EQ** and the 2-band **FILTER** offer bell, shelving, notch EQ as well as high and low pass – so the channel offers a flexible sound design

The stereo **IMAGE** allows to enlarge your stereo image or position it precisely without losing the stereo effect

The **INSERT** can be activated anytime without affecting the channel's delay

The four dynamic units (**EXP**, **GATE**, **COMP**, **LIM**) with the advanced "Look Ahead" function create pleasant sound characteristics even at large dynamic changes. The limiter can be used as high-quality final broadcast limiter

DIR OUT with mute and adjustable output

Up to 48 groups, 32 sums and 96 tracks can be assigned via bus assign

The **AUX** monitoring point for 32 aux sends is AF, PF or PEQ

For every channel, every module can be moved individually to any position within the channel structure

Central Control Section

Clearly designed Central Control Section

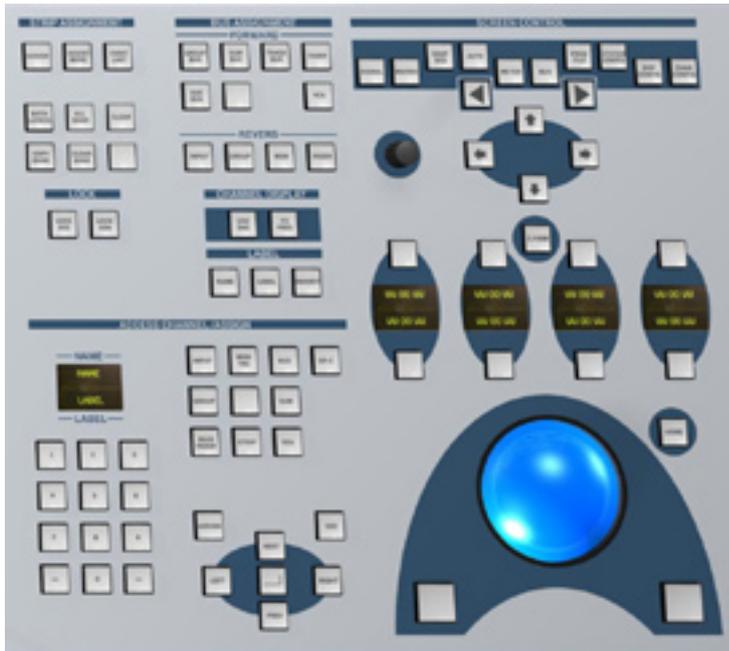
Every module within the DSP channel can be controlled directly via dedicated operating units in the central control section, in a clear order following the typical signal flow.

This facilitates the clear and fast setting of the audio parameters for every channel. The graphic of the Main Display supports by a perfect overview. On- and off states are represented in different colours; all parameters are visualised either numerically or in characteristic curves.

An access fader in the central control section completes the channel handling.



Screen Control



The **Screen Control** module operates all GUI pages.

Dedicated GUI buttons lead you to the pages:

- Signal List, Matrix List
- Snapshot
- Sequence
- Channel Configuration
- Metering
- System Settings
- Bus Assignment
- Automation

“Access” and “Assign” configure the assignment of channels to faders.

6 banks per 2 layers can be allocated individually and copied to each other.

- Comprehensive copy functions allow to assign every parameter of the DSP channel as well as the free control assignments fast and individually to any channel. Parameters of different DSP types can be copied. Individual modules can be reset to default.
- With the fader control it is possible to set elements directly, like digital amp, aux send gain and input gain.
- Individual faders can be isolated from the snapshot management as well as from the surface assignment.

Decentral Control Section

Every **channel strip** includes:

- Fader with select and mute
- PFL/AFL
- 6 freely programmable softkeys
- Module activating for EQ, PAN, DELAY and COMPRESSOR
- 8 free controls with Select/On-Off button
- Local input mixer with 48V activation, PAD, high-pass filter and A/B input
- Graphic PPM in different scales with bus assignments
- Parameter display with automated switching to the parameter activated by the sense-function
- Name and label for two layers
- Isolated bank and layer switching for every 8-fader bay. Optionally with 2nd PFL/AFL; optionally with isolated SEL-button
- Detailed Fader-Haptic Modes with fader notch, fader brake and fader “rubber band” as well as PFL backstop



Production/Snapshot

Comprehensive **snapshot** options store control panel assignment, DSP settings, matrix connects and I/O parameters. Filter functions facilitate the recall of individual parts.

All functions can be recalled directly on the snapshot page as well as on a specific snapshot/sequence operating unit.

Sequences are compiled from snapshots whose order can be changed anytime. There is no limit of the number of snapshots per sequence.

All data can be imported and exported via network or USB.

Access Channel
INP9
INP9

10:52:13
Snapshots

Olympic Games 2006
snapshot0015

LAWO

Selected Folder
Music 2005

Snapshots	Date	Time	P
1. Act 3. Scene	04/27/06	10:48:04	
1. Act Opening	04/27/06	10:48:04	
1. Act 12. Scene	04/27/06	10:48:05	
1. Act 12. Scene(1)	04/27/06	10:48:05	
2. Act 1. Scene	04/27/06	10:48:05	
snapshot0005	04/27/06	10:48:05	
1. Act 7. Scene	04/27/06	10:48:05	
1. Act 11. Scene	04/27/06	10:48:06	
snapshot0008	04/27/06	10:48:06	
snapshot0009	04/27/06	10:48:06	
snapshot0010	04/27/06	10:48:06	
snapshot0011	04/27/06	10:48:06	
snapshot0012	04/27/06	10:48:07	
snapshot0013	04/27/06	10:48:07	
snapshot0014	04/27/06	10:48:07	
snapshot0015	04/27/06	10:48:07	

Memo

Last Snap

Automation/Sequences

The concept behind our completely new dynamic **Automation** system was developed especially for use in modern production studios and mobile control rooms. The automation system follows the operating philosophy of the mc²90, providing fast and easy access with maximum flexibility. Great importance was attached to the parameters being directly set using an 'Assign at Destination' philosophy, which allows an engineer to meet the client's demands immediately and precisely.

A mix pass tree graphic enables you to resume work on any pass, at any time.

The Dynamic Automation system facilitates the comprehensive timecode-based backup of all signal processing parameters. Individual processing modules or module groups can be stored dynamically or in snapshots.

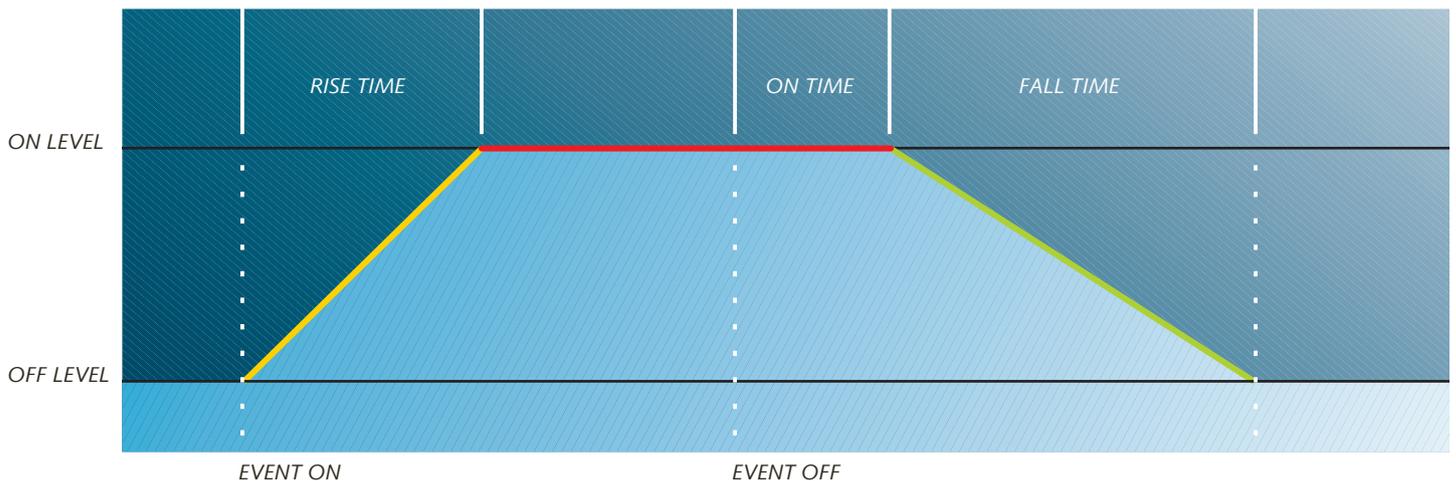
Different stepout modes, absolute and relative trim modes, copy, preview, and bypass functions allow for convenient and individual mixing.

The mc²90 Sequence Automation offers the option to manage several snapshot sequences without the necessity to export data. Functions such as the fading of individual parameters between two snapshots, and the ability to output MIDI commands at the same time, complete the functionality of the Sequence Automation system.



Audio-follows-Video

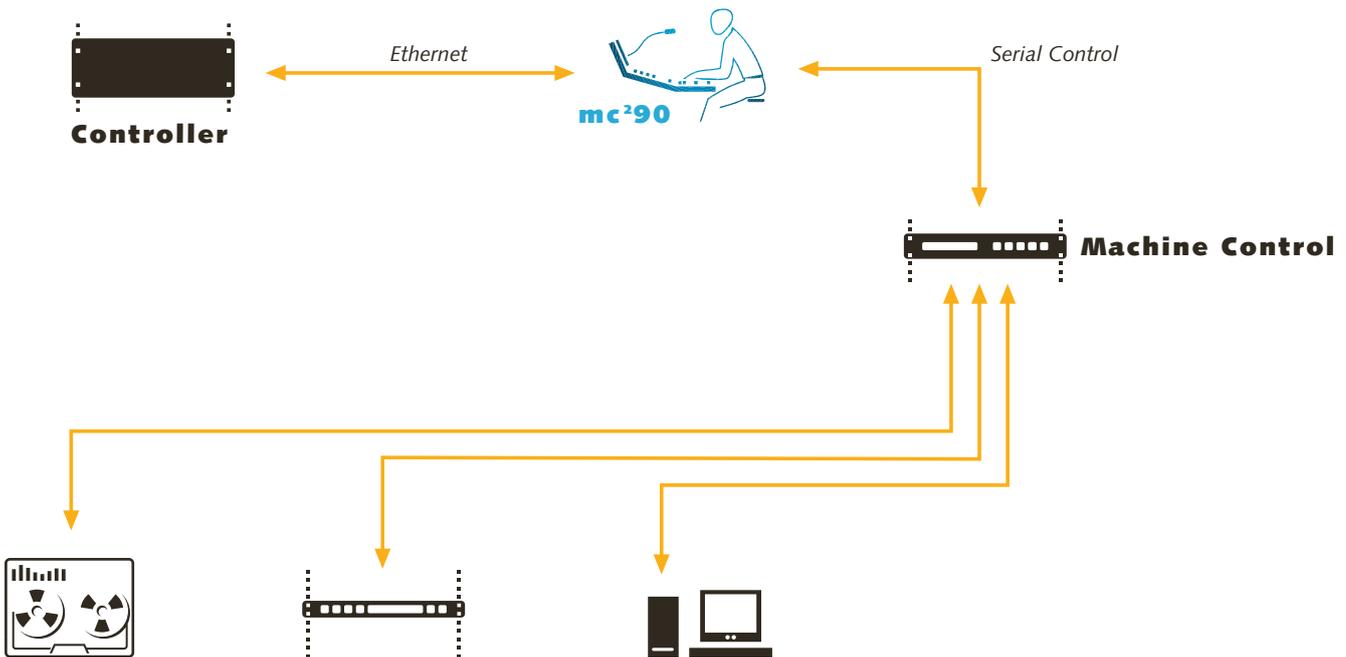
The mc²90 offers a flexible and comprehensive **Audio-follows-Video** function for every DSP channel. An event is assigned to every camera. This event can be selected in either one or several channels. The console provides 128 events. Adjusting the parameter Rise Time, On Time, and Fall Time controls the envelope. This function allows a smooth fade from one camera to another. Advanced parameters provide the possibility of starting short sequences event-controlled.



Control

In modern production environments, **communication** between the individual components in an audio system takes on more and more importance. Using our Remote MNOPL protocol, the mc²90 communicates with a highly flexible language that offers a range of all-encompassing control options. Apart from simple crosspoints, you can also control DSP parameters in the matrix as well as in the console. Whether it be an Audio-follows-Video event or the most recent change on an HD SDI board, almost every parameter in the system can be remotely controlled using an external control device. We support, amongst others, VSM, BFE and Jupiter control protocols.

Whenever many independent devices must work together, smoothly and dependably, the mc²90 is always the right choice.



GPC

The **General Purpose Channel**, also known as a 'GPC', is an mc²90 system control channel. It provides all the facilities on a typical input channel (input mixer, EQ, dynamics, panning, fader level, auxes, Audio-follows-Video, etc.). The mc²90 console offers 256 General Purpose Channels.

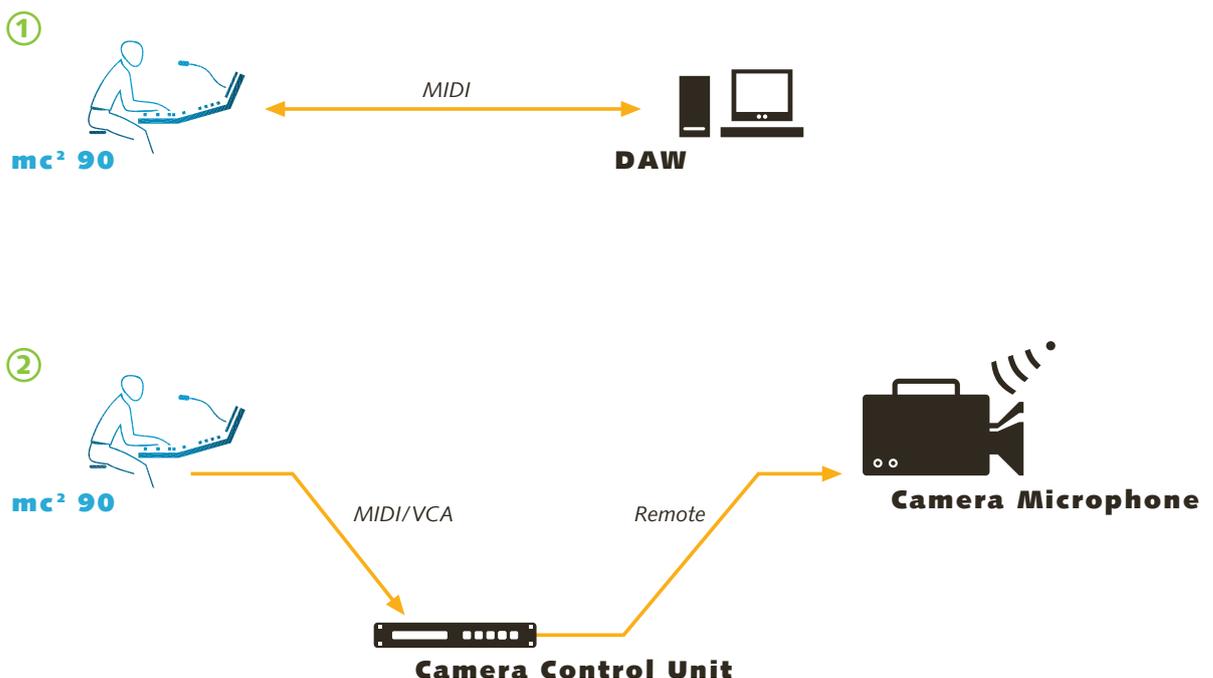
A GPC is not linked to the console's signal processing but is connected to the mc²90's MIDI and Ethernet interfaces. The system provides different mapping tables to allow control of digital audio workstations or a variety of other MIDI-based devices.

For example, a typical application is the external control of digital audio workstations, such as Pro Tools or Sequoia, using faders and rotary controls on the mc²90. In this application, the HUI protocol is employed.

Naturally, all the parameter settings can be stored in snapshots and recalled anytime. In addition, the mc²90 allows you to use dynamic automation, as well as the Audio-follows-Video function, with the GPC parameters.

Another GPC application is the direct control of camera mics from the mc²90 console. The benefit: you can set up the camera mic amps remotely and store the settings in snapshots. In this way, you are able to store and recall all the audio parameters of all the cameras used in the production.

Examples of GPC applications

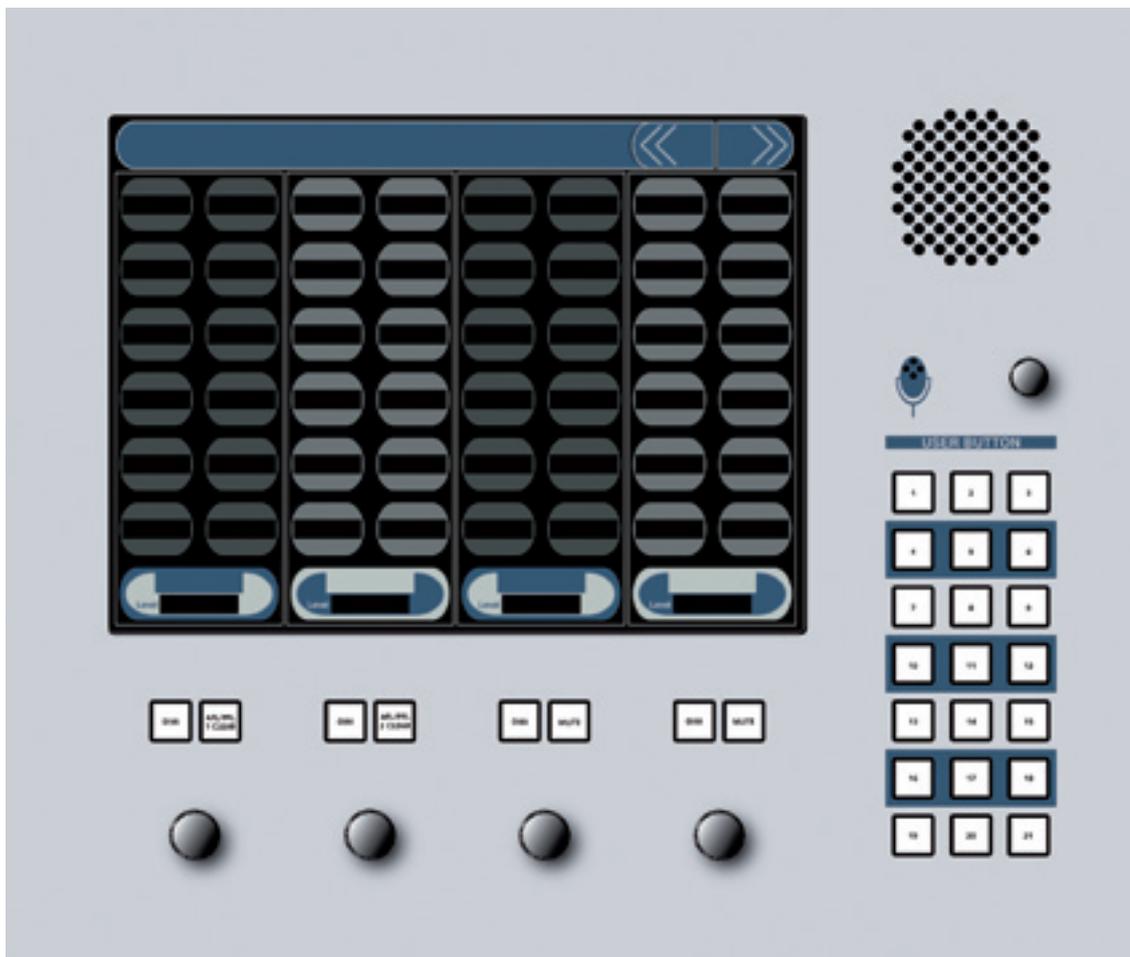


Monitoring

The mc²90 includes different **monitoring systems** with four that can be operated at the same time. Control Room Monitoring is prepared for up to 7.1 monitoring, Monitoring 2 is designed as stereo.

The monitoring is processed directly in the HD core. Thus, more monitoring units, e. g. for video control rooms, can be realised also in the HD core and can be trimmed from the operating surface. With a further unit, they can be controlled from the User Panel.

Extensive trim functions allow the setting of every single loudspeaker, the dim level and the mono attenuation in the range between -128 and +15 dB. These settings are stored with the production.



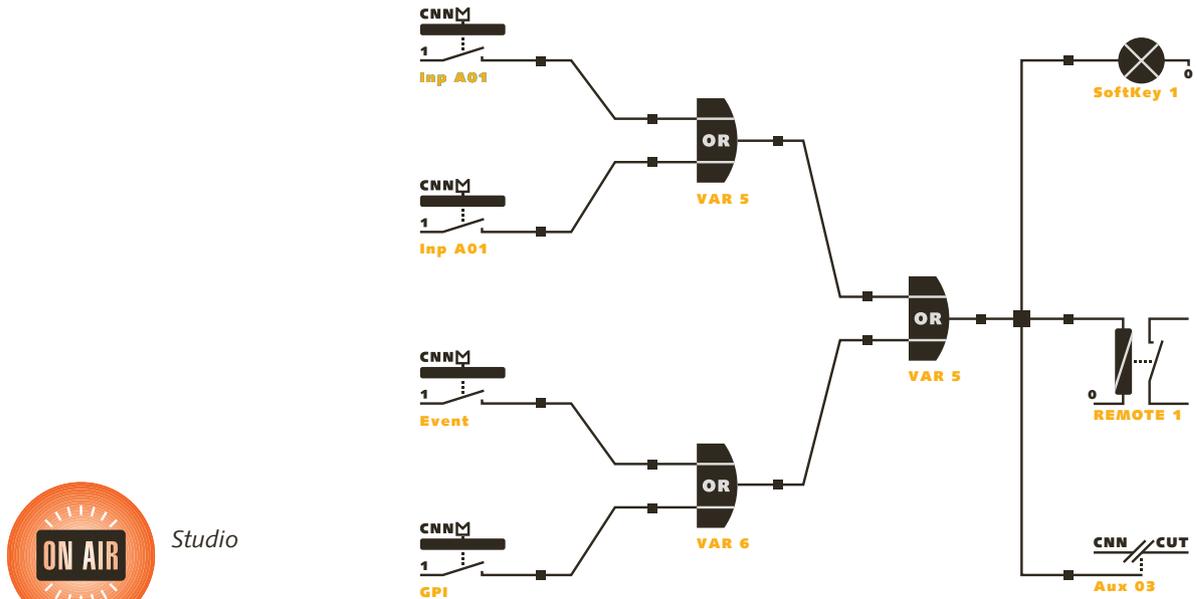
HD Core

In combination with the **integrated routing matrix** the **mixing console** allows maximum flexibility for I/O interfaces and DSP resources.



- Maximum of 8 DSP boards with up to 384 full DSP channels, up to 96 kHz
- Up to 144 summing buses
- MADI, ATM or AES interfaces directly at the core
- All common analogue and digital I/Os and control interfaces via DALLIS
- Matrix capacity: from 3072 x 3072 to 8192 x 8192 mono channels

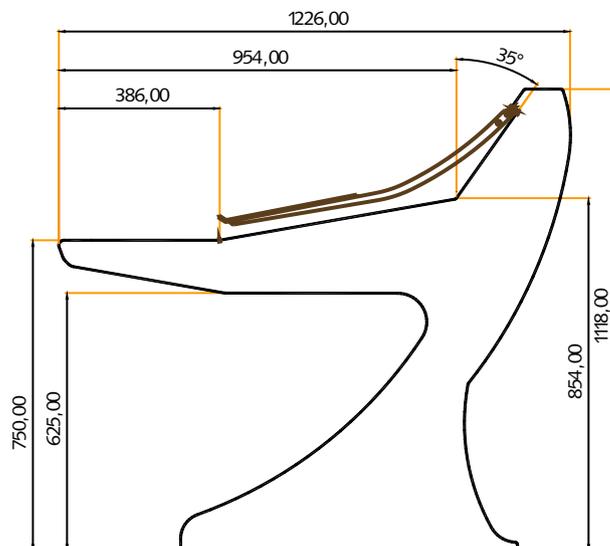
TCL



By using the TCL (**Tool Command Language**) functions can be configured individually. Tally states, automated input allocation and faderstarts can be programmed freely in a boolean matrix. This allows the logical interlinking of GPIs, softkeys and events. Customised adaptations can thus be created fast and flexibly.

Up to 100 softkeys in the control surface as well as six freely assignable buttons in every channel strip can serve as logic source.

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TECHNICAL DETAILS

Control Panel

- Frames from 16 + 8 faders to 96 + 8 faders, with doubled fader bay up to 192 + 8 faders.
- 6 banks per 2 layers, 2 layers in direct access. Iso Bay for isolated bank/layer switching.
- 100mm faders + 10 rotary controls, Channel Display for every fader with sense-triggered change of module display in the Channel Display
- Up to 5U 19" integration
- Danner format integration

Signal Processing

- 512 channels and 144 summing buses, 40 bit floating point
- Surround formats: DTS/Dolby Digital 5.1, Dolby Pro-logic 4.0, DTS ES / Dolby EX 6.1, SDDS 7.1, Lawo 7.1, diverse panning characteristics
- 2*AFL: 1*surround 8-channel, 1*stereo
- 2*PFL stereo
- 32 aux sends
- Audio-follows-Video with 128 events, control either via Remote MNOPL or via GPI, adjustable envelope up to 10 s fade time
- Solo In Place
- Permanent input measuring point in the fader, adjustable measuring points INPUT, PF, AF, DIROUT in the Channel Display
- Modules: Inmix, Digital Amp, 2-band fully parametric Filter, 4-band fully parametric EQ, 2-band fully parametric Sidechain Filter, Insert, Delay up to 1800 ms, units in frm, ms and m, Expander, Gate, Compressor, Limiter, Image, Meter, Direct Out

Routing Matrix

- Routing of up to 8192 x 8192 mono channels
- 96 kHz, 24 bit
- Fully redundant signal path

Interfaces

- Mic/Line, Line Out, AES, SDI, MADI, ATM, GPIO, serial (for details see DALLIS product information)
- Monitoring systems stereo and surround

Synchronisation

- 2 redundant inputs with automatic detection of Blackburst, Wordclock, AES3, MADI
- Redundancies
- PSUs, DSP boards, router board
- Fully redundant signal path
- PSU for control system and control panel

Control

- Iso Bay with separate layer and bank switching as well as 2nd PFL/AFL bus
- Mix-minus control with 2 conference systems
- Diverse tally- and faderstart modes
- Programme switch
- Machine control
- Audio-follows-Video
- Manifold T/B integration

External Control Systems

- Remote control via network
- External matrix controller BFE, VSM, Jupiter

Remote Maintenance

- Connection via ISDN or VPN
- Software updates, error diagnostics, remote

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