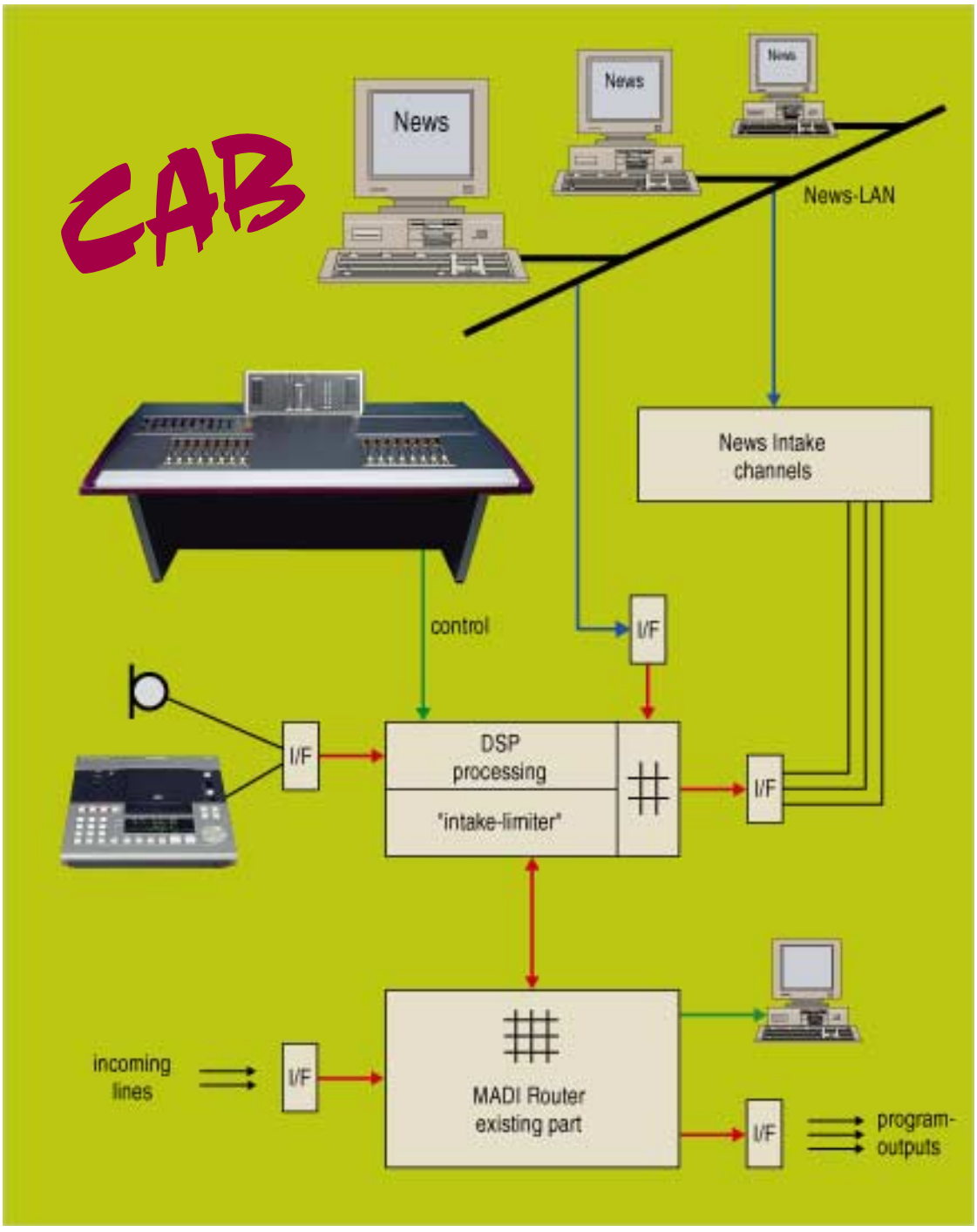
SWISS SOUND

NEWS AND VIEWS FROM STUDER

SWISS SOUND
A PUBLICATION OF
STUDER
PROFESSIONAL
AUDIO AG



October 1997
No 41

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Front-page

Dear SWISS SOUND Reader

Bruno Hochstrasser

Over the past years the broadcasting environment has changed profoundly. In many countries the broadcasting monopolies have been abolished which prepared the way for private radio and television stations. New technologies permit the dissemination of an unprecedented wealth of information and new ways and means of serving the consumer even better are continuously becoming available.

As a result of this development in the market and the technological revolution, new approaches in broadcasting are taken in order to satisfy the new requirements. On the one hand, planning and operation of broadcasting services focuses on economic considerations and on the other hand on the design and originality of the services to be offered.

The computer industry which is developing at a breathtaking pace and continually offers more powerful computers at ever lower prices, has exercised a strong influence on the equipment of broadcasting systems. CAB (computer-assisted broadcasting) systems are increasingly playing an important role whereas traditional studio components, such as tape machines, are superseded by computer structures. Conventionally organized studios are replaced by DJ studios with computer-assisted systems and greatly simplified user interfaces that make them more efficient to operate.

Already some time ago STUDER has recognized these developments and introduced systems like STUDER Digimedia and STUDER Numisys to the market. A considerable number of medium and larger systems are successfully operating in private as well as public broadcasting stations in Europe and the Middle East.

The number of CAB systems and their significance for STUDER have increased year after year. This means that this market development will be a key element of our strategic planning.

As a consequence we have initiated intensive cooperation in the field of development and sales with the German D.A.V.I.D. GmbH which is also part of the Harman Group. The highly innovative D.A.V.I.D. products are already well established in several European countries and today are standard equipment of modern broadcasting studios. Also the cooperation with STUDER Digitec in Paris will be intensified. The development and sales of CAB products with STUDER in Regensdorf will be coordinated so that future synergies can be exploited and solutions can be offered to our customer that optimally suit their requirements.

As a continuation of our reports on the CAB sector we are introducing interesting D.A.V.I.D. products in this edition of SWISS SOUND and present you an overview of the current developments on the STUDER Numisys II systems. Also in the next issue of SWISS SOUND we will discuss this topic and share with you information on new technological achievements and our latest products.

Our activities in the field of digital mixing consoles will reach a new culmination point at the AES in New York where the latest version of the new D950 large frame mixing console will be introduced. Whereas at the ITVS in June the broadcast version D950B was shown, STUDER will present in New York the "Surround Version" D950S. The performance and the unique concept of the advanced technology used in this new mixing console generation now allows a multitude of capabilities with moderate development effort. Please do not miss our upcoming D950 reports in subsequent SWISS SOUND editions.

For us the topic "Surround Formats" and their implementation on mixing console user interfaces has great significance. Especially the newly introduced media such as DVD and digital TV with multichannel sound will impose demanding requirements at the production level with respect to functionality, ease of use, and flexibility. STUDER considers this market development to be highly important not only for digital production mixing consoles, but also the functionality of the proven analog mixing consoles of the series STUDER 928 and STUDER 980 will be continually enhanced in this domain in order to satisfy the growing requirement of our customers.

We are pleased to present also a report on the hot topic of DVD.

I hope that you enjoy reading the material we have prepared for you.

With best regards
Bruno Hochstrasser

Front page picture:
We at the STUDER see CAB not only as a net of PCs but as a complete solution including routing, continuity consoles and all peripherals required.

SWISS SOUND

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STUDER CAB:

The actual NUMISYS II System

Nora Ikene

NUMISYS II is today a well-proven system for mid-size to large applications. Among many successful installations WESTFUNK (Germany) with 27 substations, RSR Lausanne (Switzerland) with 34 workstations and new also EUROPE 1 (Paris) with a layout for up to 60 journalists can be used as references.

1. System Description

The system covers today most of the tasks performed in radio, such as recording, editing and acquisition of audio elements, selection listening of linear or bit reduced sound, creation of program schedules, and broadcasting of play-lists in full automatic or live-assist mode.

NUMISYS II supports multi-user access to centrally-based resources allowing a real efficiency by providing powerful data processing features through computerised control. The automation has been especially designed around a central library managed by a powerful data base in order to associate descriptive data to each audio item available in the system.

The main aim of the Central Library is to provide storage of the programs elements: audio files and texts, play-lists, auxiliary list, log files of transmission. This crucial tool may be shared in several servers and hard disks functionally specified and completed by storage units such as juke-boxes with audio or data processing media.

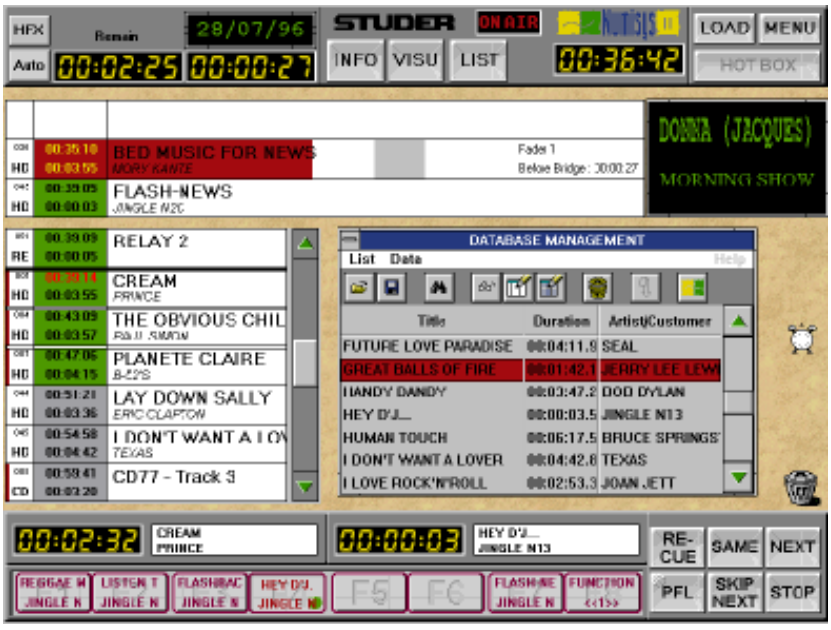


Fig. 1:
RSR On-Air Workstation

Fig. 2: NUMISYS II Database

Depending on the size and the system type, audio may be a collection of one or several servers like : Audio CDs Juke-boxes (500CDs-) and CD-ROM Juke-boxes (500CD-Roms) allowing large capacities of music titles using Wave or MPEG.

The sound data base recorded in NUMISYS II is accessible to all workstations simultaneously by simple Drag & Drop instructions.

Fig. 3: NUMISYS II Intake Module

2. Access Rights

Every user in a radio automation system should have easy access to all modules he will need for his work, but should not have the right to modify certain parts in the data base if he is not entitled to do so. Hence in the Administration Module a new Access Rights tool has been installed.

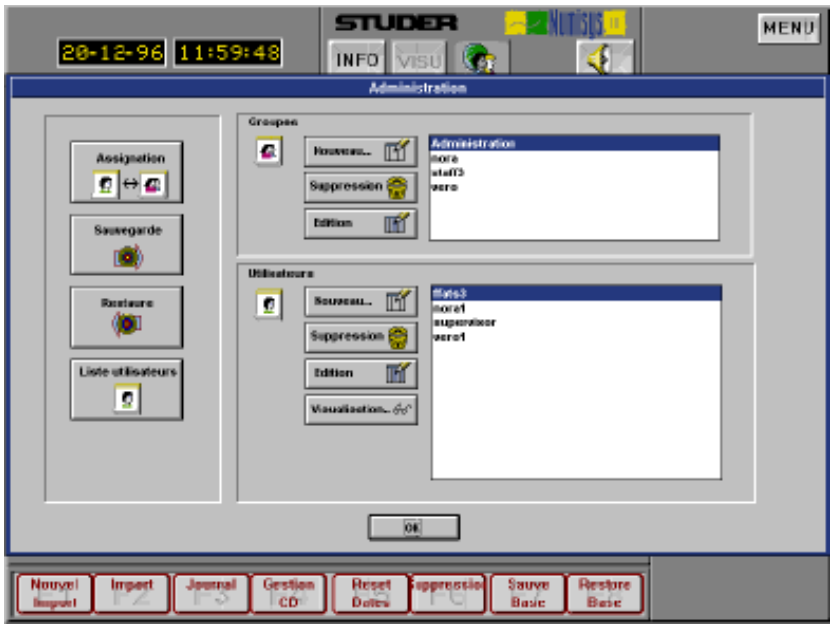


Fig. 4:
Access Rights Window

Because integrity is a crucial point, NUMISYS II system foresees for each user an identification code and a password defined by the administrator of the system in order to secure all the applications access which principally concerns display, creation, modification, and suppression of cards in the data base.

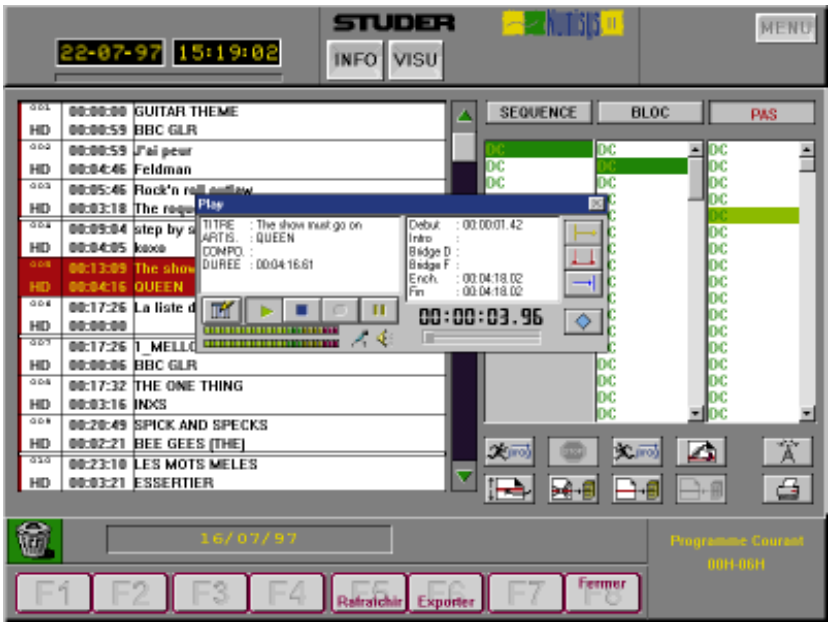


Fig. 5:
NUMISYS II Recorder

3. Link Adjustment

In the Scheduling and Broadcasting modules users may easily adjust links during the playlists scheduling and during the assisted broadcasting in order to ensure best audio quality links between two audio items.

This powerful tool for audio file editing allows to modify links and cueing parameters of a list, to add one or several voice-over sounds and to audit it before broadcasting.

All audio files in the Shaper Module may be immediately imported to the On-Air position after recording and editing thanks to Drag & Drop control mechanisms.

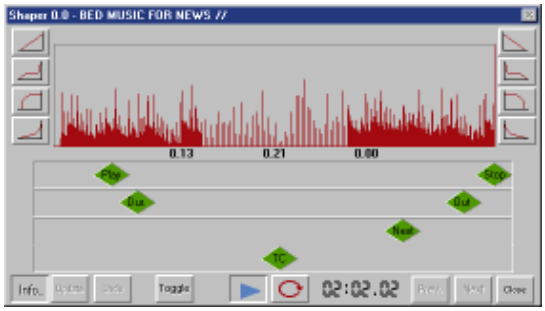


Fig. 6: Shaper Module in the On-Air Workstation

4. The new NUMISYS II Recorder

This new and efficient module allows to record new items with simultaneous listening or playing to the On-Air Module, also controlled by simple drag & drop commands.

All types of sound (HD, CD, archived sound) may be played through it live on the On-Air Workstation, if necessary.

More than listen and play, it is possible to modify audio items from any module position which has the allowance to data base access. The user may create audio cards for later use in the Editing Module, and set tags and cue parameters. ■

STUDER CAB:

Editors from D.A.V.I.D.

Andreas Hildebrand

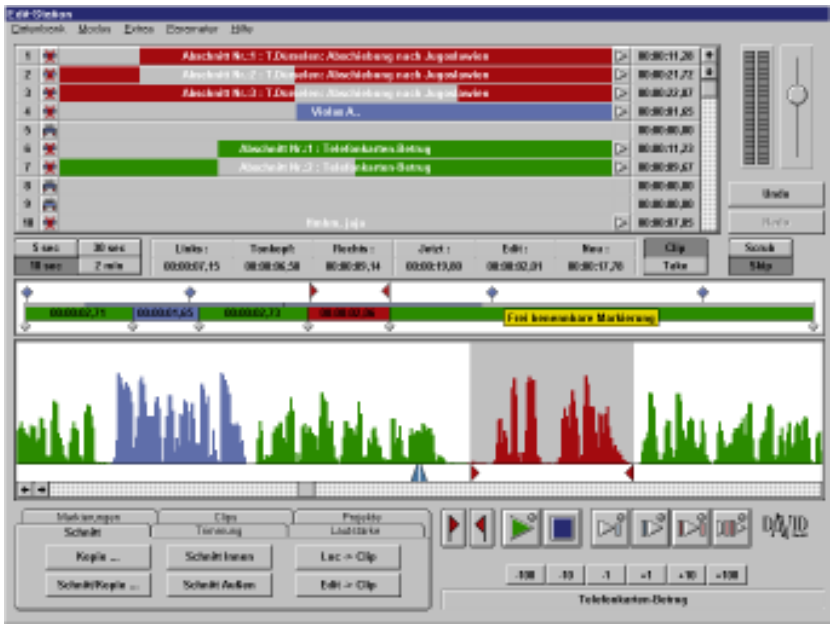
1. Edigas Edit Station V2.0

The Edigas 2.0 editing software is the mainstay of the DigAS product family from D.A.V.I.D. Due to its convincing product features Edigas 2.0 was able to establish itself with nearly 2,000 installations throughout Europe. This means that Edigas 2.0 is the most widely used editing software within the ARD German Broadcasting Corporations, and also in the national broadcasting companies of Scandinavia Edigas 2.0 is the absolute number one.

Despite its comprehensive editing facilities Edigas 2.0 offers a graphically easy-to-grasp user interface. This becomes evident, for example, in an enlarged representation of the waveform which in play mode synchronously passes a fixed “head”.

A clipboard allows convenient editing in complex productions with several takes. Up to one hundred clips from fifty different takes can be handled. All clips can be named by the user as desired.

The functions for edit and clipboard handling are organized in a Windows type card index system and reflect the user guidance of the self-labeling LCD menu keys of the EdiDesk hardware controller.



For use in music data bases Edigas 2.0 has been expanded by a number of special marking functions that allow definition of fade in/out, mark in/out times as well as various intro points, etc. The individual labeling of markers simplifies the search for specific runs.

The Storage of projects together with all sound files that have been used, or only the edit lists, allows temporary saving of the intermediate product with the ability to use undo functions in a subsequent session. Based on the new file structure that is based on the MusiFile standard the edit station supports linear editing and direct server edit mode without loading times between workstation and server.

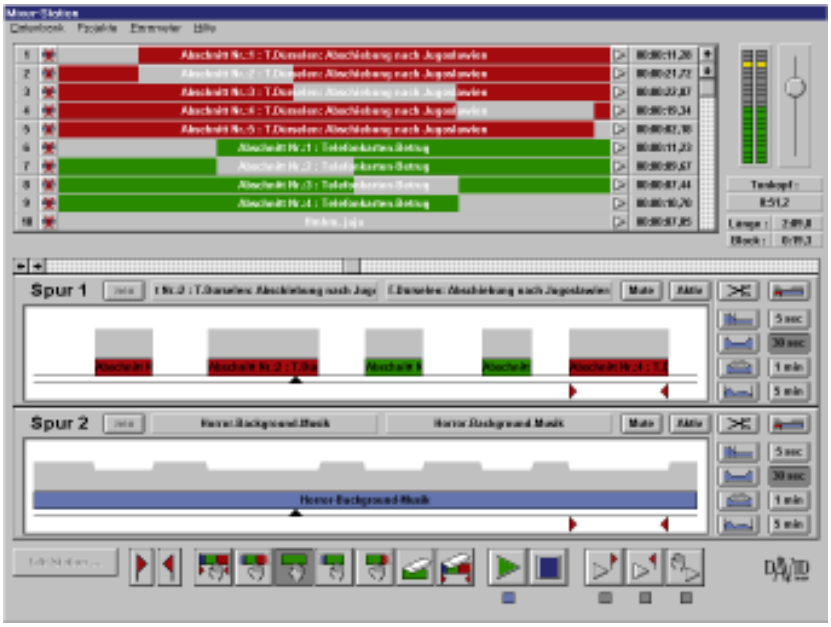
Different audio formats can be processed by using the comprehensive format conversion tool. The Time Stretch command allows the current length of a selection to be matched to a specified period of time.

Feature summary:

- Digital editor for mono/stereo takes in various Musicam formats or linear
- Tailored specifically to the requirements of editing work
- Stand-alone or networked version
- Two different complexity levels: Easy Page and Full Page
- Fast and comprehensive postproduction facilities
- Logical sequences through the combination of system functions similar to a card index structure
- Fades without passing a mixer
- Any number of marking points
- Special music data base marker (fade-in, fade-out, intro, etc.)
- Loop or scrub function selectively possible
- Complete and expanded undo functions, resolution of edit contents possible in any sequence
- Silent insert function
- Convenient trim functions
- Fully integrated linear editing
- Full utilization of the MusiFile standard, including header
- Each file contains a header and a trailer marker, edit lists, clip lists and enveloping curve information
- Local mode or file processing directly on the server, therefore no delays by loading times in shuttle mode
- Optimized time compression function without perceptible change of the audio signal

2. EdiMix V 1.7 mixer station

As an extension to Edigas 2.0 the mixer software EdiMix 1.7 is available. This add-on enhances Edigas with 2-track mixing capability. In this way it is possible, for example, to add background music or ambience to a program.



The features in detail:

- Direct integration to the Edigas edit station
- Fast and functionally arranged mixing and synchronization capabilities through individual access to the desired areas
- Up to 100 clips can be imported directly from the Edigas edit station
- Markers from the Edigas edit station are also transferred to the mixer stations and serve as synchronization points
- Insertion of pauses of any length
- Fade-in/out, Duck Fade and Define Fades for each track
- Special Play/Hold function for intuitive synchronization, e.g. in a simultaneous translation
- Auto-Duck Fade function for automatic dimming of a track
- Immediate monitoring, especially of the fades
- Mute function for muting a track
- Any volume envelope curve representation with full zoom function for optimum positioning of synchronization points
- Sequence and fade representation for intelligible display of all audio blocks and fades

3. Multitrack editor

The latest member of the DigAS product family is the multitrack editor, an editing software for multitrack production. Any number of tracks can be managed. When these are reproduced via the PCX card they can be mixed down on 2 tracks and played back. Versatile functions and the simple operating concept that has been a traditional hallmark of Edigas, allow efficient creation of simple multitrack productions (e.g. promotions, packaging elements, etc.) within a very short time.

Also for this product the features have been chosen and optimized with the targeted user group in mind. For example, a so-called Reporter Box was integrated that allows fast and efficient production of outside broadcasts from self-produced texts and inserted original sounds in a single process.

Feature summary:

- Object-related user interface
- Virtual memory management, that is, free allocation of tracks to physical outputs
- Grouping of any number of virtual tracks into an object on one audio output
- Management of ghost tracks (not visible on display)
- Different track representation possibilities
- Versatile clipboard settings
- Crossfade mixer with superposition of two objects on one track
- Free and object-related assignment of sync points
- Play/Hold function
- Record concurrently with playback of other tracks
- Freely definable, large time displays
- Reporter box for live production of programs
- Integration to the DigAS drag-and-drop interface (DDE)
- Import of Edigas projects
- Wave and MusiFile standards
- Easy integration of several PCX cards, ready for installing other sound cards
- Macro programming (search within track, by level, etc. interface functions, etc.)
- True 32-bit version for Windows 95 and Windows NT

4. Integration

Due to the open interface concept it is possible to integrate all DigAS products into systems of other manufacturers. Uniform interfaces have been developed that are based on standardized methods of the Windows operating system.

For example, the communication via DDE, the data exchange via drag-and-drop and the data base access via a DLL as an interface ensure smooth integration of the DigAS modules into other system environments. Edigas and EdiMix are, therefore, also integrated in the DigiMedia and NUMISYS systems from STUDER. ■

Surround Formats:

STUDER D950S

Rudolf Kiseljak

After an extremely well received world debut of the D950B console at the ITVS show at Montreux in June, STUDER is already introducing the second product from the D950 family - the D950S surround sound version. The D950S will be shown for the first time at the AES New York Convention in September.

Surround, or „Multiformat Sound" as it is more generally known, has played an important role in the film and TV feature film for some time. With the advent of DVD, more and more projects will be done in a variety of surround formats. In addition, old stereo releases are being remixed for surround in preparation for DVD releases. The general trend is to utilise the enhanced spatial experience that is made possible by using more than two loudspeakers for sound reproduction, now that the appropriate medium is available.

Obviously, more reproduction channels impose new requirements on the mixing console used for surround productions. The new STUDER D950S Digital Mixing System takes care of all the aspects of surround production in a modular and advanced fashion.

1. The Multiformat World

The following is a list of current formats used in various Surround applications (only main formats are listed):

Type	CH	Channels	Total	Application
mono	1		1	S / TV / F
stereo	2		2	S / TV / F / DVD
Dolby Stereo	2 (matrixed)	L/C/R/S	4	F
Dolby Surround	2 (matrixed)	L/C/R/S	4	TV
DTS Stereo	2 (matrixed)	L/C/R/S	4	F
Dolby Digital SR.D	5.1	$L/C/R/L_S/R_S$/SUB	6	F
DTS	5.1	$L/C/R/L_S/R_S$ /SUB	6	F
Proposal HDTV 1	5	$L/C/R/L_S/R_S$	5	TV
Proposal HDTV 2	5.1	$L/C/R/L_S/R_S$ /SUB	6	TV
Proposal DVD 1	5.1	$L/C/R/L_S/R_S$ /SUB	6	TV, DVD
Proposal DVD 2	7.1	$L/L_C/C/R_C/L_S/R_S$ /SUB	8	TV, DVD
SDDS	7.1	L/L_C /C/R_C /$R/L_S/R_S$ /SUB	8	F
IMAX	6	$L/C/R/T_C/L_S/R_S$	6	F

S = Stereo
TV = Television
F = Film
DVD = General DVD Application
SUB = Low frequency channel, also called LFE (low frequency enhanced)

2. The Configurability

It is shown that a great variety of formats exists. There is a great chance of new formats being added to this list, so the D950S Multiformat Monitoring and Panning is configurable, in order to allow for easy future expansion. This is the natural consequence of the Session Configuration and Scalability concepts of the D950, as described in an article in SWISS SOUND No 40.

3. The Components of a Surround Production

The D950S can be equipped with a variety of panning and monitoring components. Panning, Monitoring, Machine Control, REC/PB and TAPE/BUS control, as well as sophisticated Bus assignments all play a part in the Surround production.

3.1. Panning

It is customary to use intensity (signal level) panning to move sources across the Surround sound image stage. With powerful and configurable DSP, it is also possible for the D950 to use several new inventive ways to do panning. Head Related Transfer Functions add extra possibility of introducing room reflections and ambience on a stochastic basis, using a simple model of the room consisting of a room preset, a distance, and a size parameter. Ambience is adjustable from 0 ... 100%, selecting the proportion of discrete localised sound to diffuse reverberation sound coming out of the rear speakers.

From stereo to 8-channel with free format selection per channel, and additional functions such as Ambience, Distance or Room Size, the engineer is now equipped with enhanced creative tools, all without need to revert to external devices.

In order to facilitate the panning itself, the D950S can be equipped with one or more newly designed Multiformat Panning Units (MPU). The MPU features two motorised and automated joysticks *(fig. 2)*, that can be assigned to any of the D950's channels *(fig. 1)*. Although the channels strips themselves contain the necessary Rotary Encoders and switches to operate all the Surround features, it is much more convenient to use the joysticks for the panning.

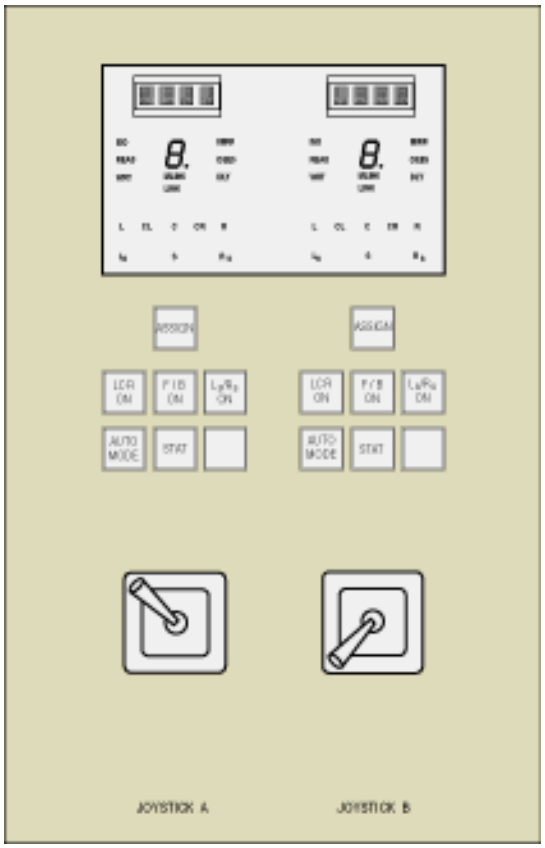


Fig. 1

3.2. Multiformat Monitoring

The Multiformat Monitoring Unit (MMU) is a software-controlled monitor controller, featuring assignable source selection keys with associated displays *(fig. 3)*. Since it is reconfigurable, the source keys may be labelled to show which sources are currently assigned to the keys. The number of source selector keys can be varied, depending on the application.

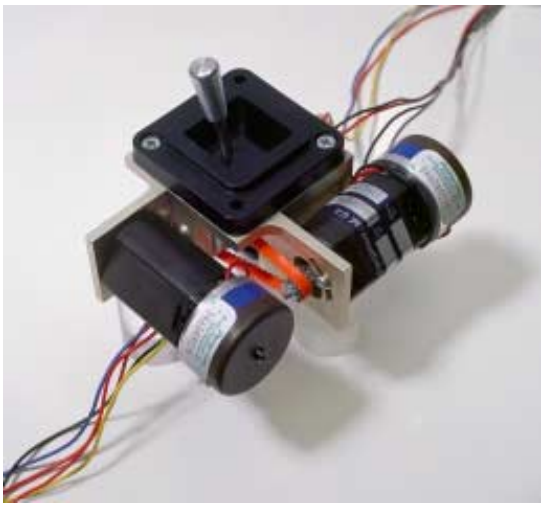


Fig. 2:
Joystick with automation. Visible are the two motors and the two position encoders (on motor axle), one each per coordinate.

Other features of the MMU include:

- monitor format selection with loudspeaker designation display
- pre/post decoder monitoring
- meter-to-monitor and PFL-to-monitor switch
- additive mode selector

Depending on the format selected, the display shows the names of the loudspeaker channels. Loudspeakers are turned on automatically with the format selection. Each speaker output can be SOLOed or MUTEd individually. The loudspeaker outputs can be calibrated (usually used in Film mixing), and the dot matrix display can show the volume level in dB.

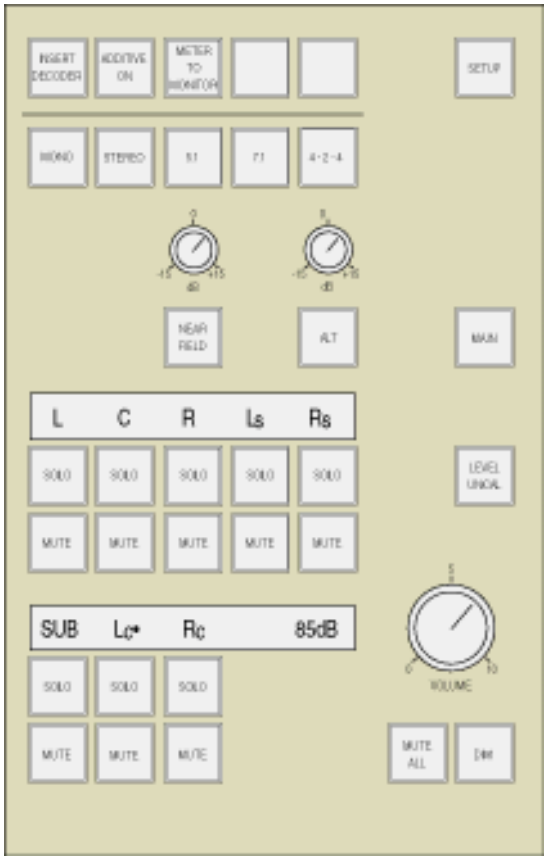


Fig. 3

For all applications a stereo and a mono output are required simultaneously to the main Surround format. An automatic Format Reduction Matrix that reduces any Surround format to mono and stereo is incorporated in the system. The stereo and mono outputs of the reduction matrix are used for studio feeds, alternate listening on small speakers, backup or test recording, etc.

3.3. Dynamic Stem Control

For Film style mixing, bits and pieces of film sound are put together from a variety of Surround formats ranging from mono to 8-channels. Very often, there may be hundreds of audio sources that need to be mixed together and put into the right spatial image. In order to bring some order to such a vast number of sources and formats, the concept of Stems is often used.

A Stem is a group of sounds (i.e. audio summing busses) that belong together. Stems can

be 1-channel to 8-channel wide. For example, a console may be configured to have:

2 stereo stems for music
3 LCR stems for simple effects
1 5.1 stem for spatial effects
1 stereo stem for dialogue, etc.
2 8-CH stems for effects
2 Dolby Surround (4-CH) stems for predubs

Since the Stems often need to be reconfigured as different sound sources are processed, the D950S features what we call "Dynamic Stems". In this way, Stems may be configured and reconfigured as the need arises.There is no restriction to the stem number, width or name. The only restriction is the number of busses (D950's Mono for a certain Session Configuration Group and/or Track busses).

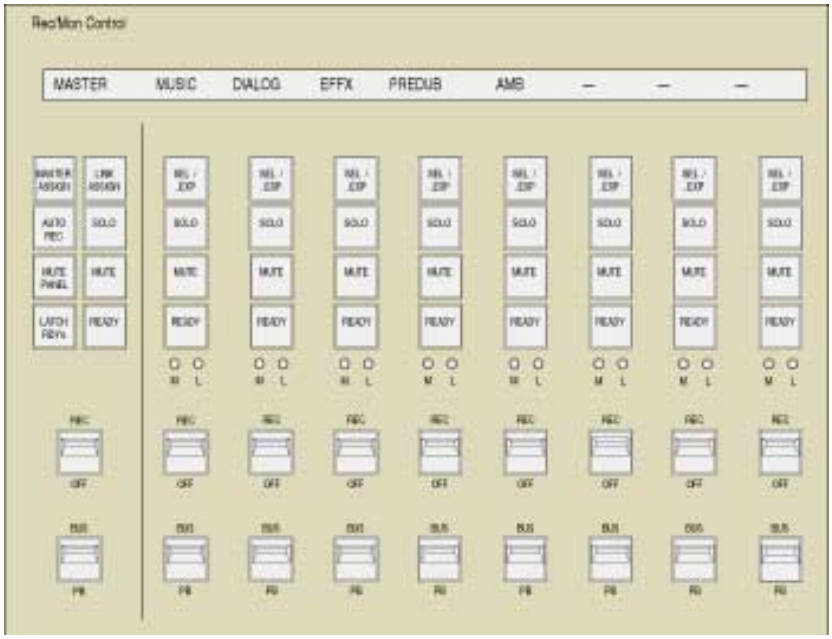


Abb. 4

3.4. Machine Control

Most studios working in Surround use a number of playback and record machines on which source material and the final product are played back or recorded. Such setups may be simple two or three machine arrangements, but can also involve several dozen machines, as is the case in large film mixing studios. The D950S features a modular machine control system that may be expanded and adapted to match the application requirements.

A simple, one machine control interface is basically included in the AutoTouch Dynamic Automation system. As an alternative, an expandable multimachine control system can be specified.

3.5. Film-Style Monitor Features

Film mixing studios generally require a complex multimachine setup to cater foe all the sound sources and predubs usually used in a large Film production. As an option, the D950S can be equipped with the Record/Monitor Control Unit (RCU). The RCU *(fig. 4)* allows direct access to important machine and monitoring functions.

The RCU works in conjunction with the machine control system and in fact controls recorder track arming as well as the record status of each machine track. Up to 128 machine tracks can be interfaced to the panel and controlled individually or in groups using the grouping facility of the RCU.

In addition, the RCU is equipped with switches for control of the monitoring paths and allows easy switching between console's send (Bus) and recorder returns (PB), so it is also interfaced to the D950's monitoring system. Up to 4 RCU's can be defined in a system, in order to allow multi-operator arrangements that are common in Film mixing.

In the film industry, BUS is also sometimes called DIR for direct console signal. PB is sometimes called PEC, which stands for Photo Electric Cell and is related to the return of the optical film machines which were traditionally used as players in film dubbing stages, so very often the BUS/PB function is referred to as the PEC/DIRECT function.

4. Conclusion

The new D950S is a sophisticated Surround Production and Postproduction console. Due to the modularity of the components and the configurability of the DSP core, the D950S can be used in any Music, Production or Postproduction application that involves Surround sound. Innovative Panning and Stem Setup features put enormous power at the fingertips of the operator, allowing the operator to fully concentrate on creativity and the production at hand.

For Film mixing, the D950S operating desk can be configured in a Multi-Operator fashion, where each operator has his or her RCU, AutoTouch Automation control and up to 10 assignable desk layers. Such specially designed features for Film use, together with the D950's scalable DSP power allow a degree of freedom in Film mixing that is difficult to match. ■

Surround Formats:

STUDER 928 and 980

Karl Otto Bäder

Also with analog mixing consoles it is possible to create recordings in Surround format, even though the flexibility with respect to changing configurations is not as high as in digital solutions. For this reason they are more likely to be used in smaller to medium size productions. Often the required adaptations are less complex that one would initially suspect. This report contains information on possible solutions.

STUDER 928

In the standard configuration this mixing console features eight mono groups, all of which contain direct outputs that can be used as Surround channels. However, direction selection is limited: the input units have LR intensity panorama potentiometers that can be programmed for one or several group pairs. If a movement in the room is desired, a corresponding assignment of the groups to the room information is necessary.

A more elegant solution for solving this task is to use additional joysticks which can also be retrofitted into the mixing console. The input is tapped at the insert points of the desired channel, the outputs are connected to the corresponding group channels.

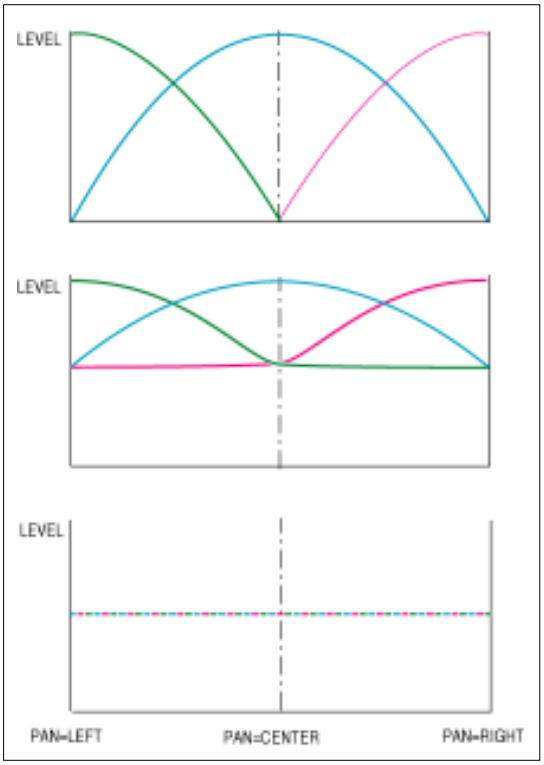


Fig. 1:
Panpot properties for left (green), center (blue) and right channel (red) with divergence = 0 (top), = half (middle) and = ∞ (bottom)

The joystick illustrated on page 8 can be used; for the STUDER 928 mixing console it is also available in a simplified version without motors.

The multichannel multiformat monitoring panel that has been built specifically for the STUDER 980 mixing console can also be installed in the 928 so that multichannel monitoring before and after the codec is possible.

STUDER 980

This mixing console is available in a special film and TV version that differs from the radio broadcast version with respect to the configuration of the buses. Whereas the standard version is equipped with eight mono groups and four masters, the Surround version features six groups and six master. There are also difference with respect to the input units: The Surround version has one LCR panorama potentiometer, an additional potentiometer for front/back, as well as a separate divergence control. This version is described in SWISS SOUND edition No 35.

The Divergence Control is especially important for all formats which contain 3 (or more) speakers in front *(Fig. 1)*.

The multichannel multiformat monitoring panel is a standard feature of the STUDER 980 Surround version.

New is that also this mixing console can be fitted with one or several joystick units. The simple version as well as the automation control (motor operated) version can be used; the former is recommended if the mixing console is operated without dynamic automation. If, however, dynamic automation is implemented (Uptown), also the joysticks should be automated. The automation interface corresponds exactly to the motor controllers. Two channels are required for each joystick. As the joystick is freely movable in one direction, each ordinate requires a position encoder and a motor.

The joystick units can be easily retrofitted into existing mixing consoles. ■

The new data storage medium for multimedia applications:

DVD Production at Warner

Walter Wrobel

Warner Music Manufacturing Europe in Alsdorf/Germany is a subsidiary of the world's largest media conglomerate, Time Warner. This is where records and music cassettes, and subsequently all CD formats and laser discs were produced.

During the introduction of the DVD the Time Warner Group had for the first time participated intensively in the early development phase of a technology and collected corresponding experience from this pioneering effort. In the meantime over one million DVDs have left the factory.

1. Premastering

1.1. Video and audio encoding

As the DVD contains a data structure that is similar to a CD ROM and due to the large volume of data to be stored, the video and audio data must be preprocessed *(Fig. 1)*.

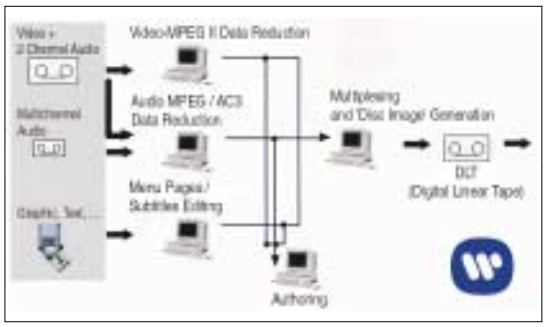


Fig. 1

For this purpose a D 1 (BTS DCR 100) is connected to the STUDER DVD 320 video encoder, the sound is processed in the MPEG audio encoder STUDER DVD 310 *(Fig 2)*. For encoding in the AC 3 format a Dolby 561 B is used.

Fig. 2:
BTS D1, STUDER DVD 320 Videoencoder Barco Monitore, STUDER DVD 310 Audioencoder, STUDER DVD 315 Audiodecoder, (STUDER D780 DAT Recorder)

For multichannel sound a Tascam DA 88 is available. For the ADAT format a STUDER V8 machine will shortly be added.

In the first step an analysis of the video is performed. For each half frame the data rate required for encoding is determined. It is governed by the mean and peak data rate specified by the operator. In practice a two-hour program gives a mean data rate of about 4 Mb/s. After the analysis run it is possible to correct the determined values for critical scenes. After many hours of analysis and video encoding it has become apparent that so far this was necessary in none of the cases, not even for the special MPEG test sequences on the Rohde & Schwarz DVTS test tape.

In the second pass the actual video encoding is performed. For each tape an MPEG2 file is created and temporarily stored on a hard drive. As in the analysis before this takes place in real time. For stereo sound from the D 1 tape the sound is converted simultaneously in the audio encoder to an MPEG audio file or a PCM file. The synchronism of video and sound is ensured through time code controlled processing. If separate video and audio storage media are used such as in multichannel sound, the corresponding time code values must be known; an offset can also be set. In this case the encoding is independent of the video.

1.2. Multiplexing

Now the two basic components of a DVD video are available, the video and audio files. Before they can be played back they must be interleaved (multiplexed). This task is performed by the multiplexer, a program that processes the data appropriately. In practice several video and audio files, subtitles, subpictures as well as menu pages for interactive operator control of the playback device exist. The linking of these modules is referred to as authoring. The result is a so-called DDF file that supplies the multiplexer with the processing syntax for the individual components.

From this input the multiplexer generates a so-called VOBS file, that can be played back linearly via a decoder which is integrated in the system.

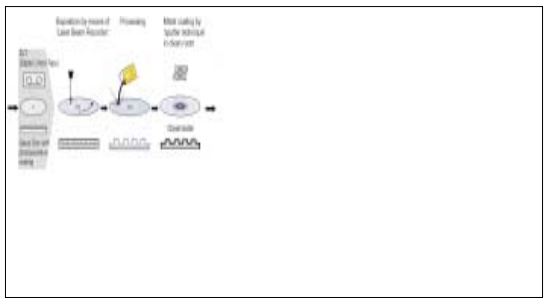


Fig. 3

This allows qualitative assessment of video, sound and synchronism, an A B comparison with the D1 tape on a screen via the Barco Vivaldi system. As the last premastering step the VOBS file is copied to a DLT tape in the form of a disc image. This is the tape that is subsequently used for mastering.

2. Mastering

The heart of the mastering equipment *(Fig. 3)* is the laser beam recorder where the digital program data are exposed on a photoresist-coated, rotating glass plate by means of a laser beam. Subsequently the final information structure in the form of microscopically small pits is formed through a chemical development process. The length of these pits is between 0.4 µm and 1.9 µm with a track pitch of 0.7 µm. A metal coating is subsequently deposited in a high vacuum system. This glass master serves as the starting point for the subsequent production steps.

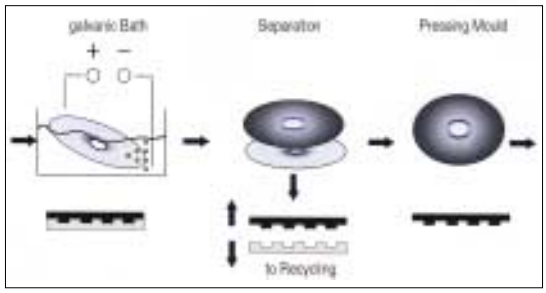


Fig. 4

3. Electroplating

The stamping matrices for producing the discs are created through an electroplating process *(Fig. 4)*. In a chemical bath a negative of the glass master structure is created. This stamping matrix is mechanically separated from the glass master, polished, and cut to the correct diameter.

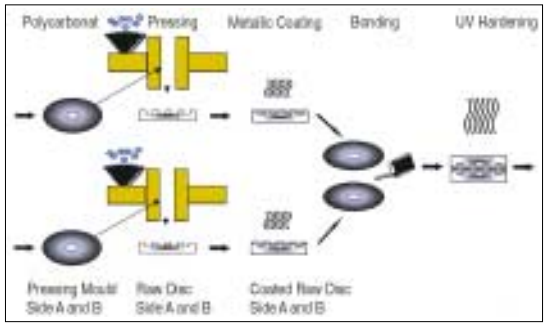


Fig. 5

Fig. 6

4. Production

The electroplated matrices are installed in the tool of the injection molding machine. Two sides are always needed for a DVD *(Fig. 5)*, regardless of whether both or only one side contain an information layer. In Fig. 6 the two disc stacks and the feeding mechanism to the carrousel are clearly visible. This is were a thin metal film is deposited for producing the reflective layer required for sampling the disc by a laser beam. In subsequent processing steps the half sides are coated with an adhesive and glued together. The adhesive is hardened by UV light.

5. Printing

In the printing machine the now playable discs are imprinted with a label. Depending on the requirements either screen or offset printing is used.

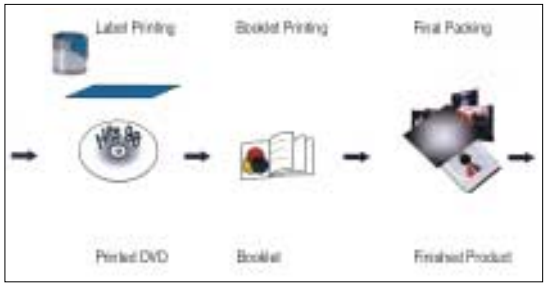


Fig. 7

6. Finishing

In parallel to the disc production the company's own print shop produces the printed material that is packaged with the discs. In a packing line the discs, printed inserts and the packing material itself are assembled to the finished DVD product *(Fig. 7)*. Of course, the most advanced measuring systems are used at all levels of production to ensure that the customer receives a product of immaculate quality. ■

News from the STUDER World

- This year's International Television Symposium in Montreux (ITVS) saw the premiere of the new STUDER D950 digital mixing console. Many visitors took the opportunity to familiarize themselves with this new product.

- Radio Förderband, a private radio station in Bern, Switzerland, was the first customer who put a STUDER ON-AIR 2000 digital mixing console into service. The decision to install a digital mixing console was taken because of the ever growing number of digital sources, be it from CD, R-DAT or radio automation systems. The STUDER product was ultimately chosen because of its ease of operation.

- In addition to the number of additional private radio stations also Swiss Television in Geneva, Kuwait Broadcasting Corporation, Radio China, Radio Byalistok, Südwestfunk Germany, and Radio Svizzera Italiana are awaiting delivery of their mixing consoles.

- Turner Entertainment in Atlanta, USA, which is part of Turner Productions, specializes in audio dubbing of trick films and commercials. Users are the well-known Cartoon Network as well as CNN, the news channel of the Turner Group. The heart of the studio is a STUDER D940 digital mixing console.

- For many years the Egyptian Radio and Television (ERTU) has maintained excellent relationships with STUDER which manifest themselves in frequent mutual visits with detailed technical discussions. STUDER technology is strongly represented not only at the headquarters in Cairo but almost every Egyptian local radio studio is using our

equipment. STUDER has again been chosen for the next expansion phase: In April a contract worth nearly 2 million Swiss Francs was signed in Cairo which comprises the delivery of the audio section for three television studios, one satellite broadcasting studio, and four on-air studios. The list of equipment includes, among others, seven series 900 mixing consoles, six transportable mixing consoles type STUDER 961, and eighteen A812 tape recorders.

- After a thorough market evaluation in which all vendors were compared, Polygram Hong Kong decided on the STUDER D940 digital mixing console. Another console for D & M Studios in Hongkong will soon be on its way.

- Shortly after the world premiere of the STUDER D950 digital console the ORF (Austrian Broadcast Organisation) decided to use this mixing desk for the new Radio OB-Vans. Totaly nine consoles are planned.

- KBS in Seoul (Korea) has supplemented its fully digital equipment with a digital OB-Van which was built by SHOOK in San Antonio (Texas). The heart of this van is a STUDER D940 digital mixing console which increases the number of digital STUDER mixing consoles in Korea to six. ■

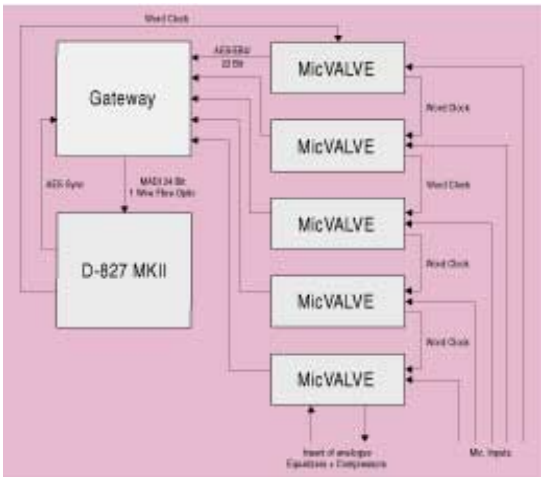
3-D-Echo, an English rock-band recently recorded their latest album using Studer Gateway technology. Dominik Tarqua, Producer of the band, reports about his experience.

Rock by Gateway

Dominik Tarqua

When the band recently approached me to produce their latest album I was not quite sure whether to do it in analogue or digital. After a few discussions and after contemplating the issue we decided to use digital. I knew that STUDER had come out with a box called Gateway. This unit could transfer higher bit rates than 16 bits via MADI onto a D827 running in EDR 24 bit mode.

After having spoken with experts at STUDER we decided to put the following system together:



Synchronisation was done using the D827 as a master. The wordclock output was brought to the first MicVALVE and then carried through all the other MicVALVEs by daisy chain. The Gateway was synchronised by an AES signal provided by the D827.

The audio signal provided by the microphones was plugged into the preamplifier of the MicVALVE. If equalisation or compression was required we used the insert point of the unit. Using the super ADC converters built into the MicVALVEs the analogue signal was converted into a 22bit AES/EBU signal. The AES/EBU output of each MicVALVE was then carried to the AES/EBU inputs of the Gateway. The Gateway then converted the AES/EBU signal into a MADI signal. The MADI signal was then fed to the D827 via a single fibre optic wire.

It was surprisingly easy to set the system up. All we had to do was plug the microphone lines which would usually arrive at the console into the MicVALVEs, pull the fibre optic cable through the wall leading into the machine room and plug up the synchronisation. 30 minutes after we had arrived at the studio

the set-up was running and completed. In terms of reliability, there is not much to say apart of that the system was running absolutely perfect throughout the entire three week session.

The advantages of using this method of recording was the following. By using the MicVALVE units we were able to completely bypass the mixing console to provide the shortest and most high quality signal path to the recorder. We also managed to record a 22bit signal on to tape.

The preamplifiers of the MicVALVE units are definitely one of the best I have ever heard and so are the converters. The results were literally speaking for themselves. The sounds were crystal clear and we achieved great dynamic behaviour. After all it was certainly the finest way of recording I have ever experienced. And I am now impatiently looking forward to mix this record. ■

STUDER D941 in the regional country studios of WDR

Benno Germann

Like many other radio broadcasters also the Westdeutsche Rundfunk (WDR) in Cologne operates not only a large main studio but several regional studios in the major cities of its coverage area. These studios disconnect several times a day from the main program (WDR2) in order to broadcast local news for their own region.

As some of the equipment in these studios has been in use for many years and relocations to new buildings were planned in various cities, a plan for new equipment was prepared. Under the name CURS (computer-aided regional broadcasting) a project was developed that systematically exploits this new technology. This includes hard disk recording and editing in a network that can be accessed by the production studio as well as the editorial rooms.

With respect to the on-air mixing consoles the ability to set and store all parameters, as well as simple, ergonomic system operation was required. This reduced the choice to digitally controlled analog mixing consoles or fully digital mixing consoles.

The decision was ultimately taken in favor of the STUDER D941 because this mixing console is available at a reasonable price and offers ease of use for on-air operation as well as preproduction of the regional programs. In addition the modular design allows ergonomical incorporation of the mixing console into the studio furnishings. Due to the integrated on-air matrix a smaller number of input channels is needed than with conventional mixing consoles which further enhances the ergonomics.

A positive point was also the adaptability of the monitoring and measuring facilities as well as various remote control modules to the specific WDR requirements.

An order was ultimately placed for two nearly identical mixing consoles for the on-air and production studio which differ only in the number of channel feeders and the configuration of the input, output and DSP cards. The mixing consoles for the studios in Wuppertal, Cologne and Bielefeld were delivered at the beginning of this year and were phased into service during spring. An additional mixing console destined for Dortmund will be delivered in late summer, bringing the total to six D941 in the WDR. ■