Swiss Sound

News and Views from Studer

50 Years Studer

STUDER
professional audio equipment

5 0   Y e a r s
S t u d e r

50 **Y** e a r s

Bruno Hochstrasser

Dear Swiss Sound reader,

A 50-year company jubilee is sufficient reason to focus the attention briefly on the past and to recall, what has happened in this long period of time. The most important events - and for us these are the technological milestones which our company has set in the past - we have summarized in a brief review.

However, this review should not let us forget the present, a time characterized by enormous technological and structural changes. Representative of this development is our new corporate identity that manifests itself also in the design of this Swiss Sound edition. We therefore invite you to a brief tour of our company and introduce to you some of our employees in Regensdorf and our bases throughout the world; it is they who in diverse locations but with a common goal work as a team to tackle the main tasks of our company.

Last, but not least, we also take this opportunity to look forward. The task of mastering new technology changes at a continually accelerating pace we shall solve through intensified cooperation within the Harman Group and in cooperation with research institutes; to achieve this new innovation management concepts are needed (page 10). And finally we can provide you also with information on various new developments, for example, the progress in virtual surround panning and new approaches to clock signal generation and distribution.

You may have been perplexed when looking at our front page - also this is an example of advanced technology. It is a graphically alienation of an application example of the first, Studer-developed high-performance audio DSP chip referred to as PUMA which we will shortly install in our equipment. More information will be provided in the next Swiss Sound edition!

Enjoy your reading!

Yours Bruno Hochstrasser

1948 Willi Studer establishes a factory for electronic equipment.

1949 Willi Studer develops its first tape recorder under the trade name «Dynavox».

1951 The first ReVox tape recorder type T26 are produced. Studer introduces the first prototype of a professional studio tape recorder (Studer 27).

1953 Introduction of the first consumer tape deck with three motors: ReVox A36.

1955 The professional studio tape recorders A37 and B37 are created.

1960 The studio machine C37 enters series production. Over 1,000 units will eventually be built. Willi Studer starts cooperation with EMT Wilhelm Franz with the objective of opening the world market.

1964 With the J37 Studer inaugurates the age of multitrack recording technology.

1966 The prototype of the Studer A80 is created. With its multitrack versions it becomes the world's most successful professional tape recorder.

1967 The first Studer mixing console is developed.

1973 The first 24-channel version of the A80 and the corresponding mixing console 189 appear.

1975 With the TLS 2000 synchronization system the digital age begins at Studer.

1979 The mixing console series 269 and 369 are introduced to the market.

1980 The DASH format is defined.

1982 The series on-air 900 mixing console is developed. It remains successful on the market for 15 years.

1983 The first sampling frequency converter with 16 bit (SFC 16) appears.

1985 The new digitally controlled tape machine A820 and the on-air mixing console series 961/962 are introduced. STUDER demonstrates its first professional CD player; it is developed in a joint venture with Philips.

1986 A new analog tape recorder (A807) and the first digital tape recorder (D820X) are introduced.

1989 The first digital multitrack machine (D820MCH) and the analog multitrack machine A827 appear.

1990 The first digital mixing console (D920) and the first digitally controlled analog mixing controlled (990) are created.

1994 The first digital production console (D940) is shipped.

1995 With the analog mixing console type 980 with digital control the surround production technology begins at Studer. NISKO, the broadcast complex of DRS Zurich comprising four D941 on-air consoles and a MADI router go into operation.
In North-Rhine Westphalia the largest local broadcasting system with 27 stations, all equipped with NUMISYS II, is installed.

1997 D950, the new generation of digital production consoles is introduced to the market. Free configurability, functional layout, and an enormously powerful DSP core are the principal characteristics.

Rambling through the company...

Despite software tools the testing of the D950 digital mixing console still requires a keen eye for details

The buzzword «forefront of technology» enters the mind of every visitor who can take an exploratory visit through the Studer company at Althardstrasse 30 in Regensdorf (Switzerland). The concentration on the latest technological developments on the one side, and the ongoing service on equipment of previous years on the other, characterize the company which in its jubilee knows how to combine tradition and progress.

Testing of the D19 MicVALVE, a microphone preamplifier with high-quality AD converter and switch-controlled tube stage for sound influencing.

The modern digital mixing console On-Air 2000 with «Touch 'n Action» operation via touch-sensitive LCD screens has conquered a firm place, particularly in small continuity studios.

Service on the rugged veterans (shown is a 16 track machine type A80) is an important part of our daily work.
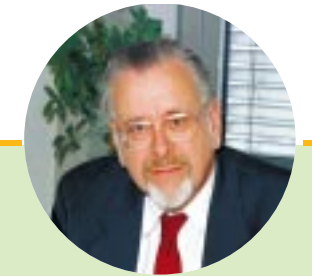
Engineering and studio planning are performed with the most advanced tools (CAD).

SMD is the name of a new mounting and soldering process in which components are not inserted into the circuit board but first mounted to the surface and then soldered. This procedure allows a much higher packing density and greater reliability.

Home in Regensdorf

Reception area, first impression of the house.

The weekly management meeting defines the directions for the company.

Research and Development:
PCs are the daily tools.

Bruno Hochstrasser, MD, and Anita Lobsiger, his assistant.

Production line of the Radio Automation System DigiMedia: Server and Workstations.

The coffee break is the information exchange for the sales crew.

Always ready to go on road: the Service Department.

Karl Otto Bäder

After a successful career the well-deserved retirement…

Karl Otto Bäder is one of those engineers who had the chance to play a leading role in the most interesting step in audio engineering: the advancement from originally low quality to high technology. After finishing his education - Engineering at the Technische Universität Berlin and Music at the Hochschule für Musik - he joined EMT Franz in Lahr (Germany). Developments in the domains of disk reproduction, reverberation, audio measurement and signal processing (limiters/compressors) made him well-known in the industry. The AES honoured him with the fellowship, and the ITG (Society for Information Technology) made him a member of its audio committee. At the AES Convention 1976 in Zürich Karl Otto Bäder presented the first electronic reverberation unit in the world that he had developed together with Barry Blesser. Further generations with enhanced algorithms followed as well as the first units for digital recording. Many of his ideas found wide acceptance and the units manufactured after his designs are still found in many recording studios and broadcast facilities all over the world, 1988 he changed to Studer. As a "senior consultant" he contributed to the definition of new products and represented our company worldwide with lectures and seminars. 1997 he officially finished his career. We asked him, however, to continue to help us as a consultant in public relation matters, especially in technical education and as the editor of the Swiss Sound. With this issue of the Swiss Sound he now says goodbye to our readers. We all like to thank him very much for his dedicated efforts and his creativity which he has shared with us. Karl Otto Bäder leaves as a friend to enjoy his well-deserved retirement. Dear Mr. Bäder, we all will miss your personality and professionality and wish you all the best, good health and a lot of joy in your new life span.

Bruno Hochstrasser

Studer
abroad

Robert Habersaat

Studer S. E. Asia Singapore

Studer Korea, Seoul

Studer Austria, Vienna

Studer Germany, Berlin

Studer Japan, Tokyo

Studer Austria opens its doors

Since January 1, 1998 Studer products are sold and serviced in Austria through its own subsidiary. Under the management of engineer Reinhold Fliedl the Studer Austria team can already look back on a number of successes.

The first two D950 units that Studer was able to deliver went to Graz and Vienna in OB vans of ORF, and by the end of February already five large Austrian private radio stations had decided on on-air consoles and automation systems from Studer (Radio Eins, Antenne Wien, Antenne Tirol, Radio Osttirol, Radio U1). A great success for the young Studer Austria Team! On January 14 and 15, Studer Austria was able to welcome over 50 customers to the official opening of the new, modern premises at Lemböckgasse 49. At the center of the interest was the brand new D950S as well as the On-Air 2000 console 1998 and the broadcast automation DigiMedia which in its latest version offers some interesting enhancements. With professional presentations, the ability to extensively test all exhibited products and last but not least with excellent snacks and beverages Studer Austria was able to fully satisfy its customers. The newly founded Studer Austria underscores the endeavour of Studer to offer total solutions to the customers and excellent local customer service. With a good mix of extensive experience and fresh engagement Reinhold Fliedl is supported by a well-coordinated team. Sigurd Ilgner, Helmut Mondl, Martin Schafhauser, and Jadranka Marinovic are competent contact persons for our customers. Thanks to the traditionally good contacts to Austrian system builders, Studer Austria with domicile in Vienna, is also an important window to Eastern Europe. ∎

Studer UK reformatted

After many years in Borehamwood and an interlude in Potters Bar, Studer UK has found a permanent home: To inaugurate the new year Studer moved into new premises in St. Albans.

The relocation coincided with the hire of Kim Templeman-Holmes who will manage the largely renewed sales and service team. Kim was formerly a recording engineer with a series of golden and silver record prizes before he became an international sales director at Focusrite (where he worked together with Ruper Neve) and later moved on to Trident Audio.

The sales team was joined by Jamie Dunn, a graduate of the sound engineering school at the University of Surrey, who worked as an audio editor in classical music recordings. His special responsibilities are broadcast systems, especially On-Air 2000, Digi Media and MADI Router.

The service team is managed by Raymond Budd. He comes from Amek where he was responsible for the final inspection of analog and digital mixing consoles. ∎

Studer U.K., London

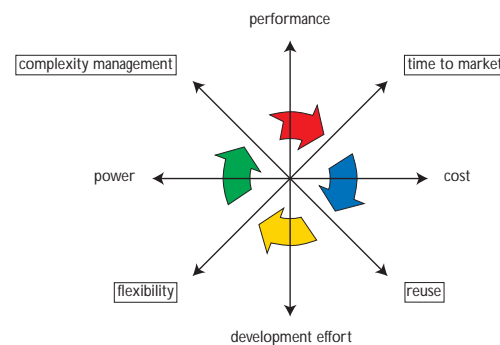**More affiliate companies are situated on the american continent (Studer Canada, Toronto and Studer USA, Nashville).**

Cooperative innovation management

Evolutionary changes also affect the structures in which research and development have in the past been conducted. Cost pressure and ever shorter times to market for new technological solutions require a changed outlook in the management of industrial R & D departments.

Hans R. Hässig

Also we at Studer cannot escape this trend. Our answer is: «Innovation cooperation». On the one hand we exploit synergy effects that are available through the technology exchange within the Harman Group; on the other hand we are strongly expanding our cooperation with universities. The objective is neither to outsource development nor to purchase services from third parties. Innovation cooperation ventures function only if both sides contribute their core competencies (Fig. 2) actively in an open manner. The basis for this is mutual trust, that is, mutual insight into the processes and strategies, as well as clarity on the strengths and weaknesses of the cooperating partners. The willingness to accept changes by the innovation partners is an essential precondition for the 'common language' as well as the continued improvement of technologies and processes. Initially it is of central importance to accurately formulate the expecta-

tions and to have a clear picture of the desired market performance profile. In an innovation cooperation venture, different cultures meet at several levels; through systematic management, however, very ambitious goals can be attained. The contact with a different environment makes the own culture more dynamic and accelerates the progress through competitive ideas. At the same time strong benefits can be reaped at the socio-cultural level because the corresponding teams can be deployed in accordance with their culture-specific know-how and skills (cultural strength sourcing). The coinnovator (cooperation partner) contributes not only part of the development but influences also the processes of the innovator. This clearly shows that very high social competencies are essential on both sides. The following two cases demonstrate how such a cooperation can be handled.

performance
complexity management
time to market
power
cost
flexibility
reuse
development effort

PUMA (Parallel Universal Music Architecture)

The objective of this development was the implementation of a digital mixing console on a chip. At that time no semiconductor manufacturer had built a chip that was powerful enough and fit for our requirements for audio processing. For this reason we decided to build it ourselves.

Our goal was to integrate all audio processing and peripheral blocks for a digital mixing console on a chip, that is, all audio inputs and outputs are implemented serially so that A/D converters, etc. are connected without 'glue logic'. For expanding the number of channels the chips can be simply cascaded. The power consumption is low and the space requirement much smaller than in a design with discrete signal processors.

In cooperation with the Design Center 3Ci of EPFL (Prof. D. Mlynek) in Lausanne we have developed a processor which in respect of complexity is one of the largest chips ever developed in Europe.

Based on the table below which contains information on the performance and connectivity it is possible to compare the power of the PUMA with currently available signal processors.

DEVICE	GOPS processing	MIPS	ser. Audio IN/-OUT
PUMA	1,2	165	144
TMS320C6x	0,96	120	4+
5630x	0,33	66	16+
SHARC	0,2	40	24+
5600x	0,1	20	5+
TMS320C3x	0,1	20	4+

Fig. 1 Comparison of the different DSP performances +without glue logic
The information for the PUMA chips take into consideration that it contains 5 DSPs.

GOPS = Giga (10^9) operations per second
MIPS = Mega (10^6) instructions per second

D950 B&S:

The objective of developing the new digital mixing console system was the implementation of an absolutely freely configurable mixing console with automatic code generation in order to minimize the adaptation effort for different customers.

The challenges were improvements with respect to:

➔ Price (2) / performance (2) / form factor (2) = 8 where the price decay and technological progress had to be taken into consideration.
➔ Creation of a technology base for future new applications.
➔ Fully featured from the first day (that is, with automation).

Implementation horizon = 20 months

Studer Professional Audio AG	Partner
– Opportunity (familiarity with realities) and experience – Image and prestige – Link to success (marketability) Interface to the market – Applicational know-how	– Leading edge technology – Willingness and ability to cooperate – New ideas, viewpoints – Technological know-how

Fig. 2 Core competencies of both partners in an innovation cooperation.

In cooperation with Professor Anton Gunzinger at the Swiss Federal Institute of Technology (ETH) in Zurich the team has accepted this challenge: A clear, scaleable system architecture, orthogonal structures, and systematic utilization of industry-standard platforms for the control system resulted in 2 to 3 times greater productivity in software development. But only the culture change induced by the cooperation enabled us to tackle a project of this dimension and complexity. The performance of the D950 core (19"/6U) when fully configured corresponds to the performance of 140 Pentium II PCs. ■

Studer *Virtual Surround Panning (VSP)*

Ulrich Horbach

On the occasion of the 103rd AES convention in New York, Studer introduced the surround version D950S of the D950 mixing console series which offers novel processes for sound positioning in a room. These processes carry the designation «Virtual Surround Panning» (abbreviated VSP) and are capable of realistically projecting virtual acoustical scenes by means of conventional surround formats. The algorithms and a few application examples will be briefly introduced in the following report.

Studer D950S

Positioning of sound sources

It is generally known that potentials of conventional stereophonic transmission processes to create a realistic impression are severely limited. With the aid of a suitable stereo microphone or panorama potentiometer (panpot) so-called phantom sound sources can be produced that do not appear to come directly from the speaker but are perceivable in the room. However, they can originate only from a certain distance which corresponds to the average distance of the listener to the two stereo speakers on both sides and occur only between these two and not outside the stereo base. For this reason two-dimensional reproduction has its limitations.

Another very important aspect is to create the illusion that the sound does evolve within a room. In conventional stereophony the two speakers radiate into the reproduction room. If this room is sufficiently absorbing, the natural reflections contained in the recording dominate, but they are reproduced only from the front. It is known, however, that in particular the distance perception is determined by lateral reflections. The atmosphere of a concert hall is additionally influenced by diffuse, late reflections (reverberation) arriving from all sides.

The surround technology offers a decisive progress if appropriate recording techniques (which microphones?) and production tools (which signal processing?) are used. In our discussion we essentially concentrate on the latter, the processing of sound sources that exist only in the form of individual signals on the channel inputs. The purpose of this processing is to «place» these objects in the desired position within the room. However, with the panpots that are widely used on account

of their simplicity the result will be very imperfect. As mentioned previously, positioning outside the stereo base is not feasible. Lateral phantom sound sources are not feasible also in the well-known 3/2 surround arrangement (Fig. 1), neither is it possible to project sources into the room within the circle enclosed by the speakers. This has been confirmed by recent investigations at the Institute for Broadcast Technology (IRT) in Munich. As will subsequently be explained in detail, VSP

exploits two important sound localization cues of human hearing.

Depending on the apparent direction of the sound source, frequency-dependent time and intensity differences occur between the left and right ear caused by the shadowing effect of the head. The perception of the distance in a room is largely determined by the temporal and spatial distribution of the reflections (not just by the ratio of energies from direct to reflected sound, as is often stated in a simplifying manner).

As illustrated in Fig. 1 VSP can create a virtual room in which sound sources are perceived as on a stage. The impression of a realistic envelopment of the listener is assisted through correct control of the surround speakers with diffuse signal components. The base width can extend beyond the speakers, provided the listener is located within the so-called «sweet spot».

Direction of the source: Frequency-dependent panpots

As mentioned above the localization mechanisms for left/right (L/R) and front/back positioning are completely different. In order to define the incoming direction of a sound object that is to be positioned on the front stage, the L/R panpot is used. If we
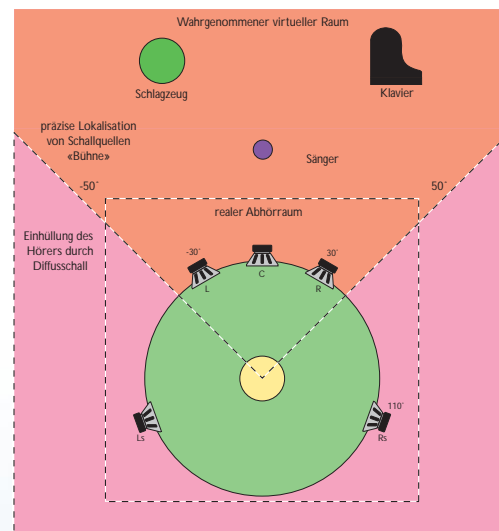
disregard the center speaker at the moment, these results are applicable to the conventional stereo arrangement. Fig. 2 shows a stereo panpot in which the signal is split simply via two coefficients to the stereo master.
Fig. 3 shows the frequency-dependent VSP panpot. After passage through various filters the signal is again put on the stereo master. The coefficients of these filters vary, depending on the selected panpot angle. With the delay line the direction-dependent interaural time difference is represented, that is, the time difference with which the signal arrives at the left and right ear.

The principal function of the variable FIR filter is the implementation of non-integer multiples of a sampling interval, as well as the prevention of noise when the controls are actuated. With the filters referred to as «HRTF», interaural intensity differences are to be simulated. These become effective at frequencies above approx. 400 Hz. Signal components below this threshold are fed to the stereo speakers with different time delay but identical intensity. Another
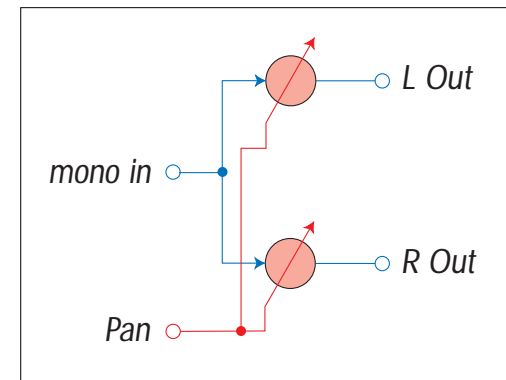

Fig. 2: Conventional stereo panpot

novelty are the allpass filters through which a uniform phase rotation of up to 180° can be set above a certain cutoff frequency. In this way sources can be placed outside the speaker base (in Fig. 1 -50° to +50° with a speaker set-up angle of +/-30°).

The head related filters are standardized in such a way that optimum, uncoloured reproduction via the speakers is achieved, as is the case with head related microphones transmission techniques. Examples of this are the ORTF arrangement, or the sphere microphone of THEILE. The frequency response of these microphone types can be selected with the «Pan Format» control so that for certain applications compatibility with an existing stereo main microphone is achieved.
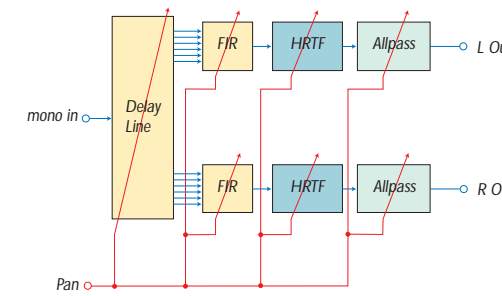

Fig. 3: VSP stereo panpot

Distance of the source: Automatic echo generation

In order to place a sound source at a certain distance on the stage behind the speakers, VSP generates an individual number of echoes for each channel and distributes these optimally to all surround speakers as a function of the selected pan position (sound incidence angle). The algorithms are based on stochastic models which can be set with a few «perceptive» control parameters. Fig. 4 plots the resulting echo distribution in a channel for 19 different discrete distances, selectable with a «distance» control. For each distance value 30 echoes are distributed to the 5-channel surround arrangement indicated in the center. The source in this example has been positioned on the right-hand side at an angle of 45°. With increasing distance from the center the amplitude of the echo decreases and the time delay increases (max. 8000 samples). When a large distance is set, the early reflections move closer to the sound source (violet-blue), with small values they move out further (yellow-orange). With the control parameter «room size» the entire room can be scaled and consequently also the maximum possible echo distance. Another control element, the «Absorption», causes frequency-dependent damping. In this way the sound character can be varied, from cold, non-absorbing halls to warm, strongly absorbing living rooms. Finally, the amplitude of all echoes and consequently the entire effect can be boosted or suppressed with the «Ambience» control. This means that VSP can also be used as an effect tool.

In the design of the algorithm, care was taken that no unnatural sound colorations occur. A large distance of the source is perceived without any significant change in the sound characteristic. In practice, however, it is advisable to additionally connect a high-quality reverberation unit to the master output. It is already planned to offer such a unit in the future as a software plug-in for the D950.
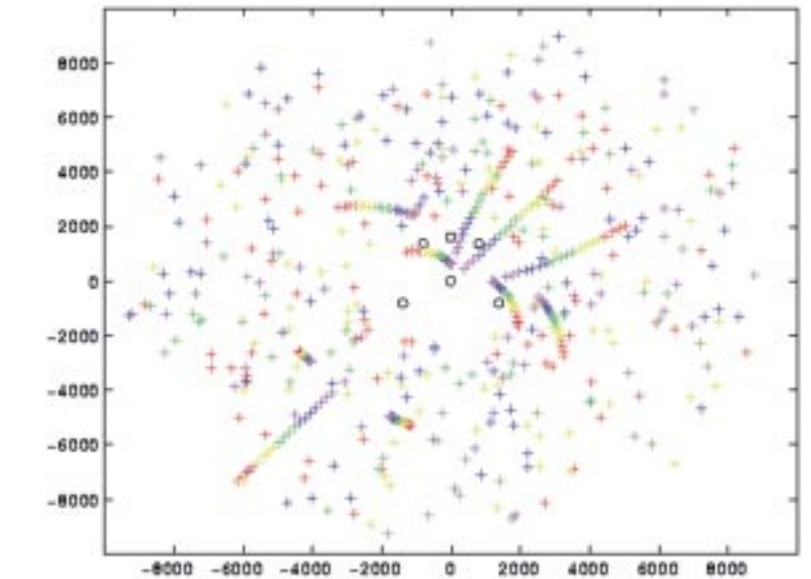

Fig. 4: Echo distribution

Sound field format

VSP can be inserted at the channel output (after the fader) in place of a normal multiformat panpot. In this case a multi channel bus is supplied directly (e.g. 5.1 format). However, capacity does then not permit to transmit every echo via the frequency-dependent panpot as shown in Fig. 3. To overcome this difficulty the internal sound field format shown in Fig. 5 was developed. In this case the master bus does not directly represent the speaker channels but channels that have been assigned to different room directions (here 9). Through a weighting matrix the corresponding directions are assigned to the direct sound components and echoes. After summing across all individual channels the desired output format is generated in a decoder that contains the pan filters and needs to exist only

once in the system. The principal advantage is that the echoes, with minimal demand on computing performance, are subjected to direction filtering in the same sophisticated manner as the direct content. This process has been patented by Studer and can also be successfully used in multimedia applications (MPEG-4). Another decisive advantage to the user is that he can easily obtain different output formats by switching the output decoder (e.g. mono, stereo, ProLogic 3/1, 3/2, 7.1, etc.). The mixdown needs to be created only once.

VSP operation

The current available control parameters are listed below (Table 1). The left-hand column contains the setting of the operating mode. All common pan formats are supported (multiformat panning). In addition to the familiar amplitude panning several relevant microphone techniques as well as an optimized HRTF pan mode can be set. The center column contains the panpots
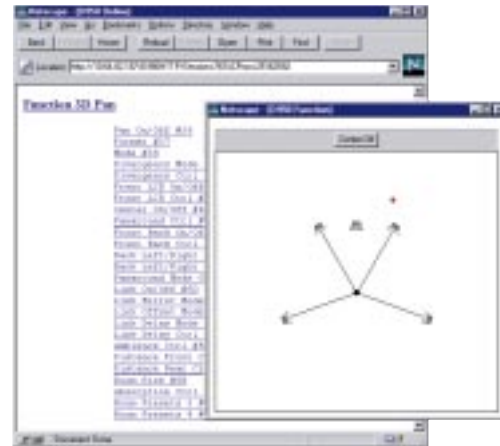

Fig. 6 Graphic User Interface

that can also be operated via a centrally coupled joystick module. Familiar features such as Divergence or Panaround are, of course, supported. When the frequency-dependent pan mode (AB, ORTF, etc.) is selected the front/back control remains active. This corresponds to the combination of a frequency-dependent L/R characteristic with a purely amplitude-dependent front/back progression. The right-hand side contains the control parameters of the echo mode as described in the previous sections. This module can be configured separately in the channel so that computing power is not wasted when the module is not needed.

In addition to the technical parameters listed in the table and the aforementioned joystick an optional, JAVA programmable graphic user interface will be available with which the sound objects can be positioned directly (Fig. 6). All necessary parameters are adjusted automatically in an optimal manner. Here, a software interface is created which in the future will give the D950 the ability to directly interpret virtual
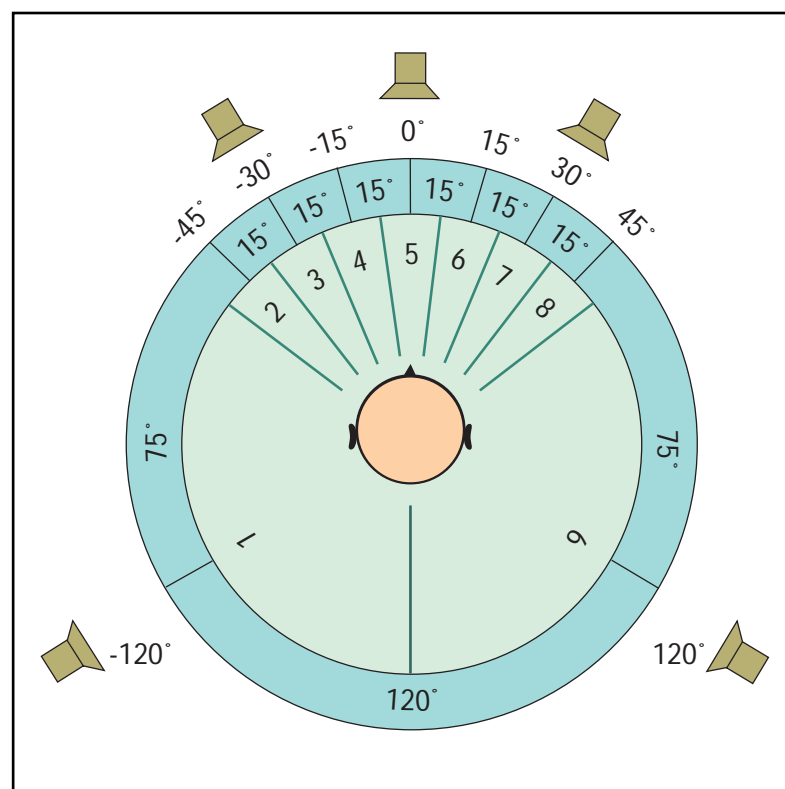

Fig. 5 Sound field format

Pan On/Off	Front LCR On/Off	Ambience CTRL
	Front LCR CTRL	(0..100) %
Pan Format 2Ch, LCR, LCRS, 5-1, 7-1, IMAX	Front/Back On/Off Front/Back CTRL	Distance Front (0..100) %
Pan Mode AMPL, AB, ORTF, SPHERE, HRTF	BACK LR On/OFF BACK LR CTRL	Distance Back (0..100) %
PAN with Center On/Off	Divergence Mode Divergence CTRL Panaround Mode Panaround CTRL	Room Size (3..15) m Absorption 0..1

Table I: Control functions

scenes that have been represented in an Internet description language (VRML, MPEG-4 BIFS).

VSP applications

In conclusion we shall list a few typical VSP applications. Surround recordings of an orchestra in a concert hall or recording studio.

A surround main microphone (e.g. the KFM360 proposed by BRUCK) is supported by several spot microphones. The correspondingly supported instrument groups can be correctly positioned in the room by means of VSP without impairing the natural sound and space balance defined by the main microphone.

Design of a fully synthetic stage. Suitable as sources are natural mono sources that have been recorded in the studio as well as synthetic sounds, created for example, by a MIDI device. This opens new possibilities in the field of pop music.

Simulating the reproduction in a cinema. Echoes (distance effects) are systematically added so that the reproduction at home approaches the cinema experiences as closely as possible. Suitable for a special DVD mix.

Utilization of VSP as an effect machine for film mixdowns. Mobile sources can emerge, for example, from a distance and arrive close to the listener.

Summary

With VSP the following enhancements are achieved over conventional surround panpots:

➜ Placement of sound sources now outside the stereo base, in particular on the side in surround arrangements, by means of head related filtering
➜ Ability to set the distance of sound sources
➜ Correct mixdown of support microphones without impairing the spatial sound balance defined by the main microphone
➜ Better utilization of the new surround techniques to supply the listener with natural spatial information. All speakers are automatically controlled correctly without the need for external effect units.
➜ Easy convertibility to different stereo and surround formats. ■

Literature:

U. Horbach: New Techniques for the Production of Multichannel Sound. 103. AES Convention, New York, 1997, preprint 4624.

Studer V-Eight

Dominik Tarqua

The desire for greater resolution without affecting the recording duration, coupled with the requirement for fast exchangeability of recording media, has induced Studer to introduce a modular 20 bit 8 channel recorder to the market.

The Studer V-Eight is a recorder that is based on the S-VHS principle. It is equipped with all functions required in professional audio applications. To satisfy the demanding requirements of a studio environment the unit is based on a highly stable and distortion-free die cast aluminum chassis. The module concept allows sample-accurate intercoupling of several units via a simple synchronous bus.

Studer V-Eight

The linear 20 bit recording format

The Studer V-Eight is based on the ADAT type II format which is an enhancement of the existing ADAT format. It is capable of recording either with 16 or 20 bit resolution. The resolution is defined before the start of the recording by simply pressing a control button. When a recorded cassette

is read in the V-Eight automatically detects whether the recording was made with 20 or 16 bit resolution. Of course, 16 bit recordings are fully compatible between Studer V-Eight, Alesis ADAT as well as ADAT-XT and M20.

Also with respect to the system environment full compatibility is ensured. The ADAT Synch as well as the ADAT Optical interfaces use the same format as existing Alesis models which allows full integration of the V-Eight. The optical interface supports full 20 bit data transfer. However, the device also has the ability to reduce the data width to 16 bits through dithering in order to achieve maximum quality when copying to 16 bit media.

The direct drive tape deck

Fast access to tape locations and highly gentle tape processing have been achieved by using a fully professional tape deck. The unit is equipped with a direct drive capstan (fast stop/play transition), two independent spooling motors (neither idler wheel nor mechanical brakes are needed), independent tape tension sensors, as well as tacho information

of the spooling motors. With the aid of the proven technology it was possible to develop a fully software controlled and consequently optimized tape deck.
Another feature of the tape deck is that two additional linear tracks can be recorded. One is used for time code recording. This means that continuous reading of the SMPTE/EBU time code during winding as well as in jog/shuttle mode is feasible. The second track is an analog AUX track. The information of this track can be recorded either from internally derived signals or via separate XLR inputs/outputs. The V-Eight can be programmed in such a way that all signals that are recorded on the eight digital tracks are automatically recorded also on the AUX track. With this analog track true wheel rocking can be implemented. It is obvious that this greatly simplifies the location of cue and edit points.

Control panel in «night design»

In order to cope with the lighting situation also in a dark studio environment the controls feature a «night design». All keys are dimly lit which makes it easy to locate them. The intensity of this basic light is adjusted automatically to the measured ambient light.
The level meters as well as the tape deck status are shown on separate displays. These custom made display units allow an uncluttered design of the control panel. For example, the level meters, input states, tape counter, offset and locate addresses, device settings and much more can be read directly off the two luminous vacuum displays.

Integrated SMPTE/EBU synchronizer

To ensure maximum utility of the V-Eight in professional time code applications, this

unit features an integrated SMPTE/EBU time code reader/generator as a standard feature. As mentioned above it is possible to synchronize to the separate TC track or to the absolute time. The synchronization as well as the TC generator can work relative to all standard frame rates (24, 25, 29.97 and 30 images/second).

Jog/shuttle function

Through the direct controllability of the tape deck true jog/shuttle functions can be implemented in the V-Eight. The function of the jog/shuttle wheel can be selected either via a shift key or by pressing the wheel. In jog mode a specific audio position can be found in which case the audio is reproduced from the AUX track referred to above. In shuttle mode the audio is read from the AUX track within the speed range of 1/4 play to ten times play. This allows searching of a tape location across a wider speed range.

Studer audio quality

The world-renowned audio quality of the Studer products is also an integral part of the V-Eight. The utilization of 24 bit A/D and 20 bit D/A converter technology which is a technical refinement from the well-known D827 DASH machine, ensure sound reproduction with absolute fidelity.

Unique monitoring

For producing a headphone and monitor mix without an external mixing console a monitor mixer has been integrated directly into the unit. The signal mixed in this way is available on the headphone as well as on a monitor output. The mixer features an additional input (return input of effect units or daisy-chaining of additional eight-channel units). In a multimachine system

A stack of four units allows multichannel recording with 32 tracks.

the master signal can be input to the return input of the next V-Eight. Via a separate return potentiometer the first eight channels are mixed down with those of the second device to a 16-channel monitor mix. This circuit arrangement can be expanded as desired.

Cockpit

Cockpit is the name of the remote control for the V-Eight. Up to eight machines or 64 channels can be operated from this remote control. Like the V-Eight also the cockpit features a night design that backlights the keys. The 19 inch wide, ergonomically designed remote control can be mounted with four screws on a D827 remote control stand. The supply voltage and control sig-

V-Eight Cockpit

nals are transmitted from the V-Eight via a single cable. The housing of the cockpit is made of aluminum with hard plastic side parts and is rugged enough to withstand demanding studio duty.

Remote Level Display «RLD»

The remote level display is a 2U, 19" wide meter bridge that simultaneously displays the level of 32 tracks or four machines. With the «Bank» switch on the remote control the user can toggle between tracks 1-32 and 33-64. This means that eight V-Eight units can be connected to an RLD.

Like the remote control the RLD obtains its supply voltage from the V-Eight and starts automatically when the recorder is switched on. The remote level display can easily be mounted on the cockpit. This arrangement has a similar appearance as the remote control of a D827 DASH machine. Rack ears are also available that allow the RLD to be rack mounted; as a third possibility it can be used as a standalone desktop unit.

Options

The housing of the V-Eight can be installed in a rail rack system (option) so that the not exactly light machine is conveniently accessible during head cleaning or service work.

The V-Eight basic model does not contain an AES/EBU board. This PCB is available as an option and features 8 digital inputs and 8 digital outputs.

Studer's know-how in the field of professional audio recording, combined with the highly suitable ADAT Type II format ensures that the Studer V-Eight can satisfy the demanding requirements of broadcasting and recording studios. ■

Studer Digitec
Smart'Log

Logging system on the PC

J.Ph. Blanchard

Most radio broadcast are nowadays recorded, be it for legal reasons, for subsequent reutilization, or for other purposes. This work is performed almost exclusively by tape machines (open reel, cassette, DAT) with all their disadvantages: limited reliability, elaborate maintenance, high media costs, insufficient recording duration and inconvenient search of defined events. The Smart'Log software was developed by Studer Digitec as a digital replacement of today's logging systems and runs on a conventional PC with Sound Blaster cards. This economically interesting solution results in very high reliability at low costs. The Smart'Log can be easily and quickly adapted to virtually all requirements and its operation is highly intuitive. The recording can be defined in various quality levels and types: manual, automatic, according to schedule, or automatic based on external control command.

All data are recorded in the .wav format and contain time information that allows quick location of the audio file. As a storage medium the internal hard disk (e.g. 4 GB for 32 days) or an optional external drive such as a CD ROM or JAZ can be used. In addition the Smart'Log recognizes transmission pauses caused by technical problems and on request can play an emergency program from hard disk, CD or CD-ROM.

Smart'Log has been designed as a complete, economical and easy-to-use logging toll for radio stations but also finds application in security areas (hospitals, banks, insurance companies, police stations, fire departments). ■
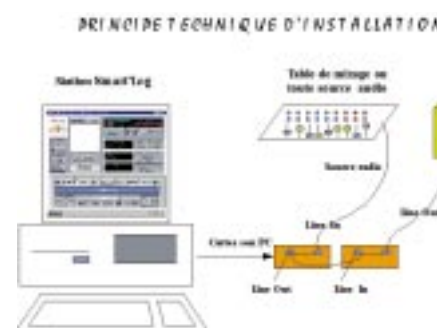
Block diagram of the system.

Screenshot of the operating station.

24 bit AD converter in D19m system

Meinrad Lienert

Professional users increasingly demand converters with higher resolution.

For technical and application reasons this is understandable and desirable. From the beginning of the digital technology, Studer has established a reputation with well-sounding names and the D820 DASH machine (16 bit) is probably the most renowned example. After the 16 and 20 bit versions our R&D department now introduces the first 24 bit AD converter of the D19m series. Although DVD supports audio formats up to 24 bits, the CD with its 16 bit resolution will remain the principal storage medium for many applications for a long period of time. To allow full utilization of these 16 bits in the finished product, the recording, the mixdown and the processing must be performed with larger word width. This ensures that the truncation (elimination of the additional bits resulting from multiplication) and rounding errors do not cause undesired artifacts.

At peak level a 16 bit converter theoretically supplies a THD and noise of -97 dB. Even if this value is not fully achieved it is adequate for most converters. However, when the level is lower by 30 dB this value is down to -67 dB and declines further with decreasing level. If we compare these values with a true 24 bit converter they are approximately -99 dB at peak level and -80 dB for a level that is down by 30 dB. For these values also a 19 bit converter would do. What are then the real improvements of a 24 bit converter?

The first value of -99 dB is influenced by the analog input stage and is so high that it has practically no significance.

If we examine the -80 dB THD & N more closely we find that this value is defined only by the noise. The distortion itself is still better than 100 dB.

In addition such a converter achieves a linearity that is within about one dB up to a value of 130 dB below peak level.

Thanks to the Delta-Sigma technology with a high oversampling rate, phase errors and minor ripple in the frequency response are also easy to master.

For a good A/D converter, however, additional measures were required for achieving optimum performance:

➜ All supply voltages are carefully filtered and mutually decoupled. The critical supply voltage for the converters is created on the board itself.

➜ The screen surface on the board for clock generation is isolated from the remaining circuitry.

➜ The PLL for jitter suppression is also implemented directly on the board so that the clocks cannot be influenced by long lines.

There are no clocks on the board that are not in synchronism with the sampling frequency. This solution, together with the proven Studer transformer input stages contribute to the excellent sound of the new 24 bit converters. ∎

D19 MasterSync and D19 MultiFeed

Rainer Kunzi

Due to the progressing digitalization in the audio world, components are needed that tackle in a simple manner the specific problem areas of the digital technology: synchronization and distribution.

With the introduction of two new products - Studer D19 MasterSync and Studer D19 MultiFeed - we want to provide a simple solution to this application gap. Both devices are designed as individual units in the 19" 1U format and can be integrated directly in a digital environment without special configuration efforts.

The Studer D19 MultiFeed is a distribution amplifier unit for wordclock and AES/EBU signals, whereas in the Studer D19 Master Sync also a synchronization generator is installed that can be synchronized also to a video reference signal.

For this reason two distribution amplifiers are integrated in the D19 MultiFeed:

➜ one is dedicated to wordclock distribution = 1 input to 6 outputs;

➜ the other allows freely configurable AES/EBU signal distribution with up to 4 inputs and 16 outputs.

As synchronization as well as the distribution of the most important signals can be of «vital significance» to a digital system (e.g. master control rooms or continuity rooms), a redundant power supply can optionally be installed or - a far more elegant solution - two Studer D19 MultiFeed units can be interconnected via a cable (redundancy link). If a
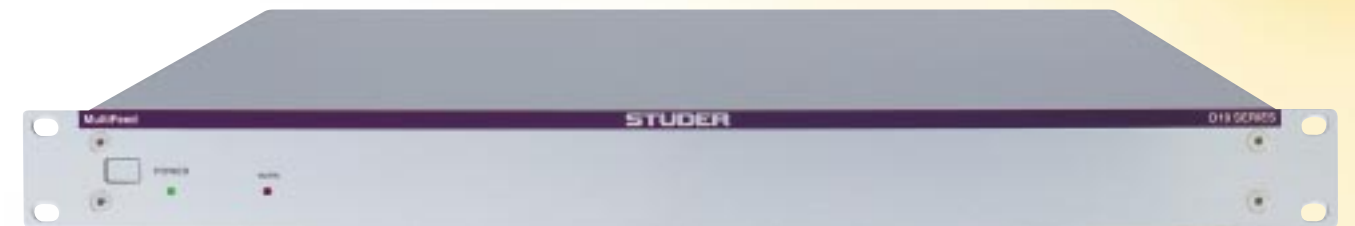
Studer D19 MuliFeed

Studer D19 MultiFeed

In practically every digital environment two tasks must be solved:

➜ Distribution of some AES/EBU signals (e.g. master output of a mixing console)

➜ Distribution of a synchronization signal (wordclock or AES/EBU frame clock, mostly both).

supply voltage fails it is supplied by the other unit.

The supply voltage pins in the connector are recessed which means that it can be inserted and unplugged also in operation. With the «WARN» LED a possible fault in the internal supply is indicated. However, the

unit continues to operate with the voltage supplied by the second unit. This «Warning» state can be signaled also via the alarm socket on the rear panel.

To allow simple direct wiring the input and the 6 outputs are implemented as BNC sockets. If required the input can internally be terminated with 75 ohms by means of a
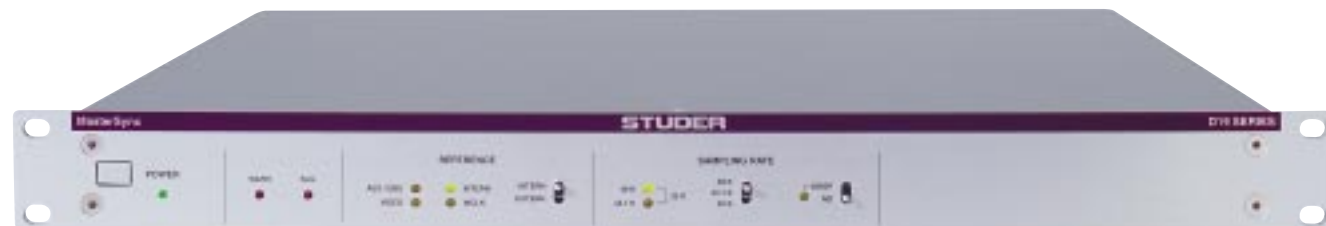
Studer D19 MasterSync

jumper. The input sensitivity is 1Vss and is independent of an exisiting DC level. The polarity of outputs 4 to 6 can be inverted by means of an internal jumper so that also devices can be integrated that are sensitive to the phase relationship of the synchronization signal (principally semiprofessional units or such of the 1st digital generation). Often an AES/EBU signal - e.g. the mixing console masteroutputs - as well as an AES/EBU frame signal (DARS) must be distributed for synchronization of the connected equipment. For this reason the distribution amplifier for AES/EBU signals is configurable and can distribute up to 4 inputs to maximum 16 outputs. The settings are established via dip switches on the rear panel. The following combinations are possible:
➜ 1 input distributed to 16 outputs (1 to 16)
➜ 2 inputs to 8 outputs each (2 to 8)
➜ 4 inputs to 4 outputs each (4 to 4)
Also unusual combinations such as 1 to 8 (e.g. for the Sync signal) and 2 to 4 (e.g. for masteroutputs) are feasible. Particularly the latter combination is suitable for synchronization a complete on-air mixing console and to perform the signal distribution of the masteroutputs.
The inputs and outputs are wired to 15 pin D-type male and female connectors. Via a dip switch also the AES/EBU input with XLR socket can be used.

Studer D19 MasterSync

In the Studer D19 MasterSync the distribution amplifier function of the D19 MultiFeed has been expanded with a generator section.

The generator section can be synchronized with a wordclock or an AES/EBU signal. The changeover is performed automatically. The video signal has the highest priority, followed by the AES/EBU signal and finally the wordclock signal.
If no external reference is connected to the generator a highly accurate internal reference (1 ppm) can be used.
The internal reference can also be activated by actuating a toggle switch on the front panel.

Redundancy

Analogously to the D19 MultiFeed also two D19 MasterSync units can be coupled via a redundancy link. In addition to the power supply also the internal generator signal is
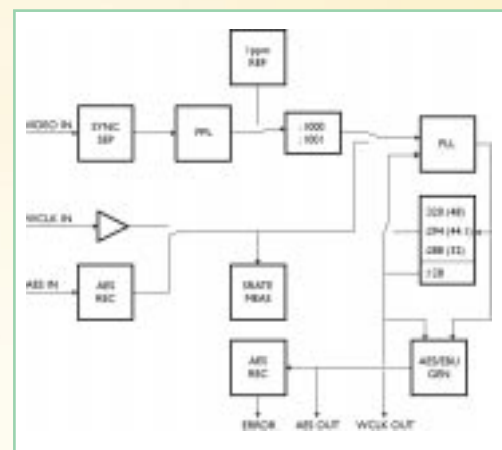
Block diagram of the generator

supplied to the second unit so that in case one generator fails the signal of the other generator is automatically connected.

To prevent a phase jump in such a changeover both units are mutually synchronized. If one of the generators or a supply voltage fails, the «WARN» LED lights up. However, both units can still be operated. Only if the generator is unable to generate a valid AES/EBU signal despite the second unit for redundancy improvement, the «FAIL» LED does light up. Both states can be signalled also via the alarm socket on the rear panel of the unit.

AES/EBU wordclock distribution

As in the case of the D19 MultiFeed a distribution amplifier for distributing wordclock and AES/EBU signals is available. The number of inputs and outputs and the configuration possibilities are identical to those of the D19 MultiFeed.
Of course, the wordclock outputs can be connected not only to the wordclock input but also to the internal generator (selectable with dip switch on the rear panel). Equally the AES/EBU distributor can be switched between the internal generator signal and the AES/EBU inputs in groups of 4 outputs.

In this way the outputs of the unit can be used independently for distributing any signal as well as for distributing the generator signal. Combinations of both are also feasible.

Generator

The Generator has an internal reference of 1 ppm and can be switched between 32 kHz, 44.1 kHz, 44.056 kHz, 48 kHz and 47.952 kHz. The frequencies 44.056 kHz and 47.952 kHz are derived from the basic frequency (44.1 kHz or 48 kHz respectively) with the switch setting «Drop».

This allows useful synchronization in practically all applications.
From an external source the generator can be synchronized with a video signal (25 or 29.97 frames), an AES/EBU or a wordclock signal (optionally also by an optical MADI signal). The changeover is automatic. The wordclock input is identical to the one of the wordclock distribution amplifier.

With a wordclock or AES/EBU synchronization signal the received frequency is displayed (without drop or non-drop detection). If the generator is referenced to a video signal the sampling rate is created in accordance with the switch setting. From 29.97, for example either 44.056 or 44.1 kHz can be generated - depending on the setting of the DROP switch. ■
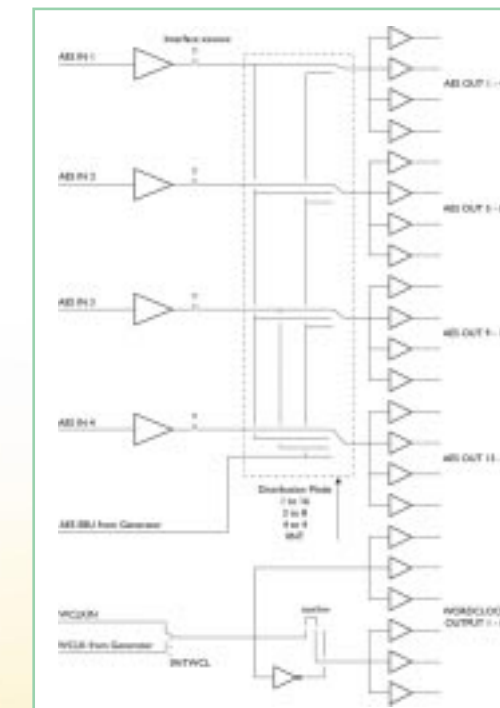
Block diagram of the signal distribution

Studer *News*

Studer broadcast automation: the favorite choice of private radio stations

Robert Habersaat

Studer DigiMedia and On-Air 2000 at Radio Grischa, Chur (CH)

In Switzerland the Studer broadcast automation systems are the unchallenged Number 1 of the private radio stations, and in Austria already four large private radio stations have decided on Studer DigiMedia.

Modern private radio stations have demanding requirements with respect to automation systems. Less and less personnel is available for sophisticated radio programs. Whereas a decade ago a round-the-clock program was achievable only with significant personnel and technical resources, today even smaller stations produce full programs; even during the night moderated programs are offered to the listeners without any staff being present in the studio. Such services are possible only with automation systems which in addition to the most advanced applications such as dynamic RDS or Internet interfacing also have to offer high reliability and maximum ease of operation.

State-of-the-art technology

All these attributes are one of the reasons why Studer is so successful in this sector. Also the fact that Studer has sold, for example, DigiMedia also to stations that already have experience with automation systems, speaks for itself. In Switzerland alone large private radio stations such as Radio Förderband in Berne, Radio 32 in Solothurn, Radio Sunshine in Zug, or Radio Grischa in Chur have converted to Studer DigiMedia. Radio Grischa was keen on acquiring not only an advanced and economical automation system but also on obtaining top-quality support from the supplier. For Radio Sunshine in Zug and Radio Pilatus in Lucerne it was important to protect its prior investments through the ability of importing existing audio files and data base entries into DigiMedia.

Market leader in Switzerland

One of the reasons why Radio Zürichsee, as the fifteenth Swiss private radio station, decided in January on a Studer broadcast automation system, was that DigiMedia is able to simultaneously execute several programs and strings of commercials from the same system.

Radio 32, Solothurn (CH)

Together with Radio Zürichsee six of the ten most successful Swiss private radio stations work with Studer automation systems - in Switzerland 55% of all private radio listeners are supplied through Studer automation systems (daily reach; private radio study 96/97 of Publica Data AG).

For the media training center MAZ in Lucerne the simple and logical arrangement of the user interface as well as the fact that DigiMedia is the market leader were the decisive criteria for deciding on Studer. The probability is high that the MAZ students will work on a Studer automation system after they have completed their training.

Success in Austria

For Antenne Wien, Antenne Tirol, Radio U1 and Radio Osttirol in Austria the compatibility with specialized software components as well as the commercials' scheduling system, music programming tool or audio editor were a decisive factor. The open architecture of DigiMedia allows seamless integration of existing software such as «Selector» from RCS or «Radio Manager» from ALUP. In addition, all of these stations use the News System components from the DigAS series of DAVID which harmonize smoothly with DigiMedia. ■

WDR decides on additional Studer D941 consoles

As reported already in an earlier edition of Swiss Sound, mixing consoles of the Studer 941 series have been installed in the regional studios of WDR in Wuppertal, Cologne, Bielefeld and Dortmund. In daily production as well as in on-air operation these mixing consoles demonstrate their reliability and exceptional ease of use. These user experiences and the reliable operation have ultimately led to the decision to use six additional Studer D941 digital mixing consoles for the WDR studios in Essen, Siegen, Aachen and Münster.

Important criteria were: intelligible operation in on-air mode, paired with the simultaneous availability of all processing facilities required for preproduction. Particularly for this dual application the ergonomical design of the D941 is ideal. The modular mechanical architecture of the console also allows optimum design of the work environment. The individual control blocks can be arranged in almost any form and integrated in studio furniture. Due to the built-in audio router the number of channels can be reduced in comparison with conventional on-air mixing consoles.

All these points lead to an exemplary, user-optimized design of the work environment in the «on-air and production control room». This design prevents operating errors and - together with the technically reliably operation of the mixing console - allows trouble-free operation. ■

Expansion of the master control room at TSR in Geneva with Studer multiformat routing and control system

Rainer Kunzi

Christophe Sigot

For upgrading the master control switch of TSR (Television Suisse Romande) in Geneva which so far had been equipped with analog technology, a multiformat routing system for the audio section and the control technology for the overall system (including video section) was supplied by Studer.

For switching the video signals an SDI router from Sony is used. The SDI signal consists of a digital video channel and four audio channels which are transported in multiplex mode on a carrier and are set simultaneously by means of a crosspoint. Of course, there is a large number of sources and sinks that consist only of audio signals. For this reason, an upgrade of the entire system with SDI routers was not economically justifiable. In addition to the SDI router also a Studer audio router in multiformat technology was, therefore, planned for this project. Very important for the operability and ergonomics of this system is that the control system can establish links between the strictly audio system and the SDI section in the most transparent manner possible. Furthermore the control system must be able to administer the individual levels (Video and four audio levels) in such a way that they can be switched jointly, but if necessary individually.

As one of the few systems on the market this demanding flexibility is offered by the Studer CS-PC/3 control system.

Audio and video section (hardware)

As mentioned, a Studer multiformat router (Route 56) and an SDI router from Sony are used. The subrouters are interconnections via a few cross-connections with corresponding embedders and disembedders (for integrating or extracting the audio portion in the SDI bit stream).

Because of its finely structured modularity, the Studer Route 56 multiformat router allows selection of audio format (e.g. analog; AES/EBU; …) for four inputs and outputs each. For this reason the system can be easily integrated in an analog environment, but because of its modularity it represents a future-proof investment. Since the highly successful acceptance test in December 1997 the system has been in round-the-clock operation. Due to the stable system behaviour and the acclaimed optimal ergonomics - particularly in interaction with video with embedded audio - a further extension on the basis of the same technology is planned. ■
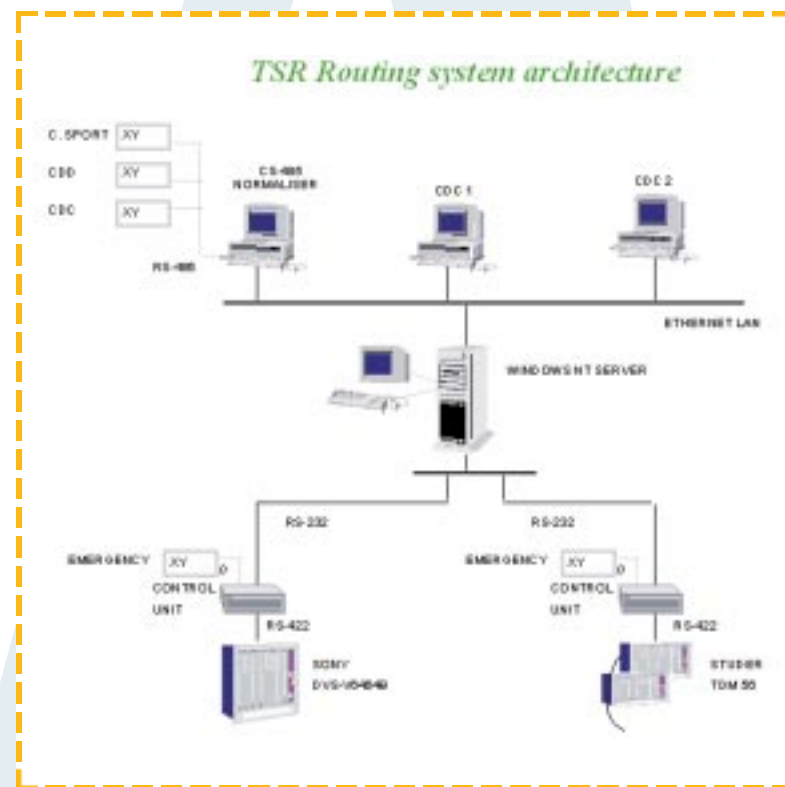
Block diagram of the system

Europe I in Paris with new news system.

At Europe 1, the large French radio station, 100 journalists work on a Numisys II system and produce daily three large news blocks in the morning, at noon, from 19:00 to 20:00 and in addition a News Flash at the top of each hour. It is understandable that with this wealth of material the preproduction represents an important element. In a competitive bid against major suppliers in this field, Studer Digitec won the tender invitation with a combination of DAVID Edigas editors and a Numisys II system. Twenty stations are used for recording and editing reports, 14 stations are used for broadcast planning, and 5 on-air stations for continuity in the various studios - all of which are, of course, fully networked.

Pierre André Teillier, broadcast operations manager at Europe 1 comments: «We have chosen Numisys because of the ergonomical displays and the performance of the multiuser broadcast planning. In addition, there was a strong support by the employees of Studer Digitec.»

The installation work was subdivided between the customer and the supplier. The engineers of Europe 1 installed the FDDI network and the special work furniture, we installed the workstations and the three servers. A pair of these stores on 20 gigabytes 280 hours of mono information, the third one is used for backup.

The installation phase was followed by the training. First eight «Super Users» (operators who know the overall system) were instructed over a period of two weeks. Subsequently the journalists completed their training in groups of four during one and a half days each.

«Most journalists became familiar quickly», said Christian Duclos, customer support manager at Studer Digitec. «As computers were already used for reading the agency reports the changeover was not difficult. And because our systems operate fast and without downtimes, confidence grew rapidly». In October 1997 the system was put into operation; already in November all tape machines were removed from the on-air studios. Recently the decision was taken to replace the previously used Nagra machines by Nagra Ares C: Numisys can transfer the data directly from the PCMCIA memories of these units into its own audio data base. *(Yanic Gornet)* ■

At Radio Europe 1: hectic business all day

Studer D950S digital mixing console systems at ORF

Reinhold Fliedl

The renowned Austrian broadcasting company, ORF, uses Studer D950 digital mixing console systems in its new radio OB vans of the regional studios.

The Studer 950S was chosen after an in-depth evaluation of various internationally renowned manufacturers.

A new digital audio mixing console must, of course, satisfy the special requirements of the Austrian broadcasting company. For this reason the regional studios have insisted on maximum flexibility, says Peter Ganner, certified engineer and manager of technical planning at ORF.

«The Studer D950 surround appears to be an optimum choice for us. When we evaluated a new mixing console we concentrated on reliability, flexibility and a future-proof concept that allows easy integration of additional functions such as multiformat monitoring or dynamic automation.

With the redundancy in DSP, power supply and hot plug functions in full operation the D950 ensures the reliability we need in live transmissions.

Additional reasons were our experience that the Studer planning department is able to solve also complex custom monitoring and control functions.»

The D950S is complemented by two stage boxes interfaced by ruggedized fiber-optic links through which microphone & line inputs as well as return lines, studio signalling and pre-amp remote control instructions can be connected. ■

News from the pinboard...

➔ Radio France expands its preproduction and orders five type 928 consoles from us. The mixing consoles are configured differently, depending on the application. Mutual module interchange and future upgrade capabilities were other decisive factors for the purchase.
This order is supplemented by ten D730 CD players.

➔ *With joy and pride Studer signed an agreement with a total value of CHF 1.3 million at its long-standing customer and partner, ERTU in Cairo. This order comprises among other equipment 25 D424 MO recorders, 25 CD players and 15 CD recorders.*

Qur'an Radio has put the first fully digital broadcast studio into operation in Lebanon: the Studer DigiMedia automation goes on air via the 12-channel Studer On-Air 2000. The NT server (Windows NT 4.0 with Arabic letters) of Digi-Media can access supplementary CD changers in addition to its own hard disk. The programs from Dar-al-Fatwa are realized with DigAS editing software from DAVID plus two additional units from Studer as well as the D741 CD recorders, two D732 CD players, two PR99 tape recorders and a DSP telephone hybrid.

➔ *The National Theater Weimar (Germany), a location with tradition, is expanding its electro-acoustic facilities. The mixing console will be a large, digitally controlled analog Studer 990 with 4 frame modules.*

➔ **Radio Algiers makes a major investment in production. Four type 980 and four type 961 on-air Studer mixing consoles were purchased.**

➔ For distributing the program and intercom signals France 2 installed 2 MADI routers complete with interfaces of the D19 m series. For enhancing the fail-safe operation not only the routers themselves but also the interfaces are equipped with redundant power supplies.

The order is complemented by 3 type 928 mixing consoles.

ZDF in Mainz is building a new OB van for multiformat productions. Part of the audio equipment is a Studer D950 digital mixing console with 143 channels. This console is a special version with numerous custom features.

An interesting detail is that two operator consoles access the same DSP core; a larger one for the main program, a smaller one for VTR and source mixing.

This console is designed for surround technology. Various formats and listening positions can be configured. This system is complemented by stage boxes; these contain the microphone preamplifiers and line connections and are linked to the mixing console via fiber-optic conductors.

➔ The technical academy in Wuppertal (North Rhine-Westphalia) expands its training facilities with a modern audio installation. The choice was made in favor of the new Studer D950 digital on-air mixing console as the training is to be based on the most advanced technology.