SWISS SOUND

NEWS AND VIEWS FROM STUDER

Editorial

The first edition of SWISS SOUND, the magazine for STUDER customers all over the world, appeared in 1982. Within a relatively short time it achieved a circulation of 20'000 copies (15'000 English). On the tenth anniversary it had reached its peak which was followed by a period of reflection, and the restructuring of the entire company, but also a recessionary phase that has extended to the entire audio industry. Many companies had to adopt restrictive measures.

We have used this uncomfortable situation for restructuring our product range and to integrate new areas and technologies. The turn-around point was the AES in Berlin where not only new products but also a new innovative product design was introduced. «The STUDER Look and Feel» has become synonymous with the pleasure of working professionally with high-quality, application-oriented systems.

The long silence of SWISS SOUND has resulted in many inquiries. As an example I would like to quote a letter form St. Petersburg (CIS). Mr. Vikultsev writes to us: «I have lost the contact to your company».

This is exactly what we would like to prevent. With additional editions of SWISS SOUND, i.e. with information directly from the user-base, with reports on the latest audio technology of the entire STUDER Group.

And last but not least, the face lift, i.e. the new font and color should also be an indication that new life has been injected into SWISS SOUND.

Marcel Siegenthaler

OCTOBER 1993
No 33

In this issue:

STUDER D827 MCH

The "Reel" Joy

by Thomas Knäple

Thomas Knäple

At the exhibition of the 95th AES convention which took place in New York in October 1993, the veil of secrecy was lifted: the D820 MCH 24/48 channel DASH recorder has a successor: small but bold, in the new Studer design and with highly technical competence, even more than equal to the «big D820 MCH», this latest member, the 24/48 track DASH tape recorder D827 MCH, has become the pride of the Swiss STUDER family.

In May 1990 the digital multitrack era was inaugurated at STUDER with the delivery of the first D820 MCH. In the meantime many renowned recording studios throughout the world have installed such a machine and admire it because of its excellent sound. Confronted with the trend toward progressing «digitalization» in the recording studios - which is often accompanied by new production methods - this machine also demonstrated its optimization capabilities.

In view of the certainty that the digital multitrack tape will not be displaced in the foreseeable future by any medium with a comparable price/performance ratio (the tape of a 14" reel can store over 25 Gigabyte of data), we decided in the fall of 1992 to develop the D827 MCH, a successor to our multitrack digital recording equipment.

Specifications
The design specifications were easy to define: The D827 MCH had to be the tape-based multitrack recording unit of the future:

- Suited to system integration in a mixed audio-video environment
- Modularly expandable according to the corresponding studio requirements
- Equipped with the fastest tape deck
- Uncompromising sound quality
- Rugged and mobile

But also the workplace of the audio engineer needs to be optimized: he is now increasingly surrounded by ever more complex «glass-surfaces». What he needs is an ergonomical, ideal user interface that is reduced to essentials, with fast access to the principal functions.

In an environment with frequently changing studio applications simple (re-)configurability is a must.

Of course, we were able to benefit from the extensive experience gained with the D820 MCH. That which had proven itself we wanted to incorporate in the D827 MCH on a 1:1 basis. We therefore concentrated our efforts on those aspects where we found room for optimization. And where the latest technologies enabled us to offer new capabilities, the new «baby» was correspondingly endowed.

Development phase
For more than one year our development activities concentrated on this project.

The development team designed a new, optimum platform that had to be modular but affordable.

Industrial designers developed user interfaces and housings that were optimized to customer requirements.
Production and quality assurance investigated new approaches to ensure outstanding quality despite the modularity and short production times.

The latest recommendations on achieving products that conform to EC and UL requirements were incorporated without compromise. Stringent EMC requirements were established to ensure reliable operation.

Also the forthcoming laws on material recycling (an aspect that a company dedicated to ecological thinking cannot ignore) were taken into consideration.
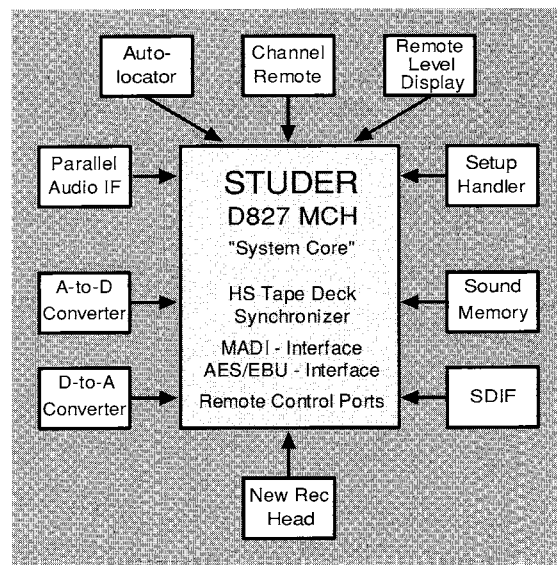
And lastly - the close cooperation between all departments involved enabled us to stick to our ambitious timetable.

The result: Modularity
Equipment that is ideally matched to the corresponding studio environment - and indirectly also to the studio budget - today has top priority in product development. Our prime objective was to take this aspect into consideration, of course without sacrificing quality or performance.

The key to the solution was a machine with extensive modularity.

System nucleus
The core issue for all future open-reel recorder applications is still the tape deck performance. The dynamic behavior and absolute tape positioning speed significantly influence the «unproductive times» of such a unit.

For this reason we took the proven tape deck of the D820 MCH, which after systematic enhancement in collaboration with the Swiss Institute of Technology in Zurich was easily able to outperform all existing competitive products.

In the D827 MCH certain components were again optimized, which results in further improvement of the dynamic behavior without sacrificing the reliability of our basic design.

The question of optimum, i.e. cost-effective design of the audio signal transmission is even a hotter topic for recording studios in a «fully digital» age. Among the most expensive components in digital audio equipment are the converters. They determine the sound quality, which means that cost cutting here would be highly counterproductive.

But the trend is that the users want to invest in converters only once (i.e. in one unit) and not in all of them. This investment usually concentrates on the (digital) audio mixers to which all (digital) signals are routed and where they are monitored. In this configuration the recording device does not need a converter because the audio signals are transmitted digitally.

For digital multitrack transmission a format has established itself which is offered by most manufacturers of digital mixing consoles as a standard interface: MADI (Multitrack Digital Audio Interface) which can transmit up to 56 channels in a single data stream (on a «single line»). In addition to the 2-channel AES/EBU
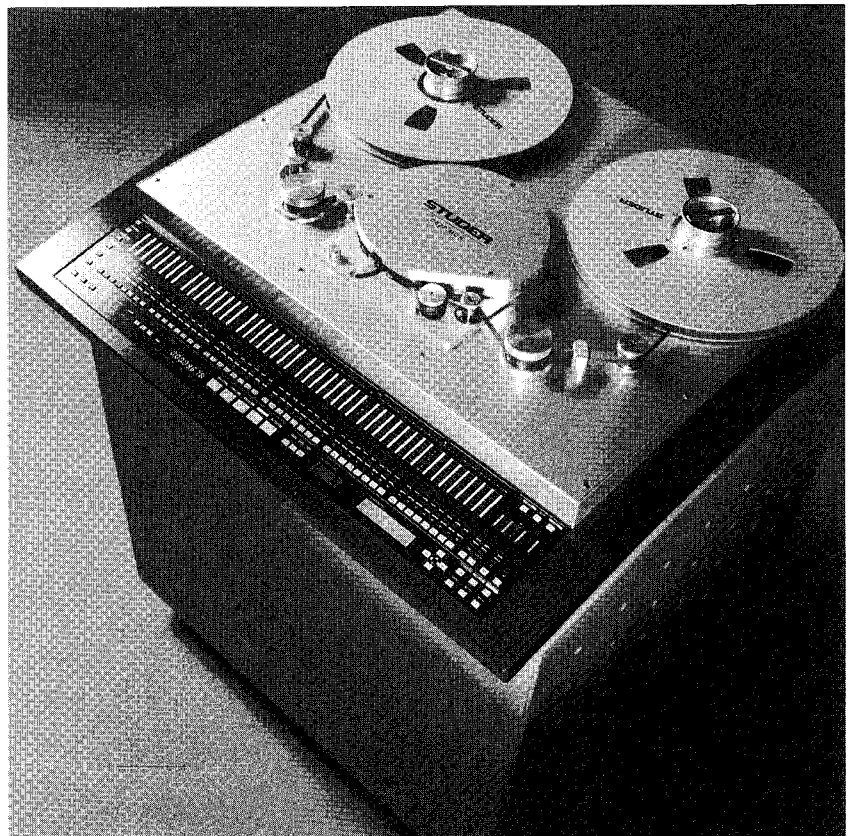
format the MADI interface is standard equipment of every D827 MCH.

The system nucleus of digital multitrack recorders should also comprise a built-in synchronizer. Fast copying (in synchronism with TC or RT) from one machine to another is now desired so frequently that this should no longer be an option. Also in this area we have invested our full know-how: Already in the basic version you receive a built-in synchronizer with full editing capabilities. It is also suitable for TC-/RT- accurate punch-in in synchronism with another machine.

Parallel remote control, e.g. from your external synchronizer, is also possible at any time. This is a standard studio application, which in our opinion should not be a separately priced option.

Optional converters
A studio that is not equipped with a digital mixing console still needs converters in the D827 MCH. Also here the high ambitions of the Studer developers are evident. The sound quality of the predecessor, the D820 MCH, was highly famed. Studer's long experience in the design of analog components was successfully demonstrated in the development of these converters.

But nothing is so perfect that there is no room for improvement. This was amply demonstrated

by our developers, who came up with a new A/D converter. Extensive listening tests were conducted in many studios (with the «golden ears» rather than mathematical simulation) to reveal the «sound determining» characteristics of analog-digital converters. The result was packaged for the D827 MCH.

One aspect remained unsatisfactory: The DASH standard «dictates» that we use a 16-bit recording medium.

Consequently we were looking for solutions on how 18-bit performance can be achieved with a 16-bit medium.
Impossible? Not so! Studer's answer is called Noise Shaping.

This dream is made possible by a small piggy-back board which is available as an option for the A/D converter board. Refer to the separate report on Noise Shaping, page 5 of this issue.

No question: The D/A converter, a far less critical component of digital audio equipment, has also been enhanced and is available as an option.

SDIF to complete the range
The range of audio interfaces also includes the SDIF multitrack format which, of course, is also available as an option.

Important to studios working with more than one format: All audio interfaces, i.e. A/D and D/A converters, MADI, AES/EBU and SDIF can be configured to coexist in a machine, if this is required.

Sound memory for creative post production
The sound memory, a RAM for temporarily storing the information contained in tape sections, has now become a standard facility of digital multitrack recorders. This sound memory permits simple editing of recorded
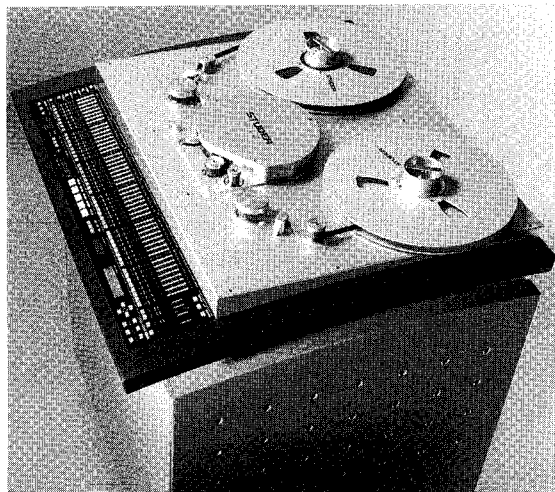
music passages and easy reinsertion in any other tape location without the need for external equipment.

Also for this application we offer an option: up to 180 seconds of mono sound or one and a half minutes of stereo can be stored. This suffices for editing even longer music passages.

This is an exclusive STUDER feature!

Second record head
The STUDER design employs two record heads and one reproduce head (write-read-write arrangement). This allows tape/source monitoring in so-called NEW REC mode (first record head) or electronic editing in assemble mode or the almost universally used insert record mode (read before write - second record head).

The utilization of the first record head in NEW REC mode is limited to a few applications. For this reason this relatively costly component has become an option.

Does modularity have its price?
This question we can answer negatively. All components have been designed in such a way that they can be retrofitted even in the field without the need for special conversion or extension kits.

Every D827-24 can, of course, be upgraded to a 48-channel version, as was already the case with the D820 MCH. But by choosing a version with a lower number of channels you do not sacrifice any functionality, except the additional 24 tracks.

Also in this respect STUDER has no competition in the field of digital multitrack machines.

Attractive is that you only play for what you really need. And you do not have to accept any compromises in your initial investment.

The pleasure of using the D827 MCH
Even a technically sophisticated piece of equipment must be a pleasure to use. And a pleasure it will be only if it is easy to operate, if it simplifies the daily routine tasks (thus saving time and money), if it fits smoothly into the studio environment, and on top of it represents a «stylish enhancement» of the studio.

The user interfaces have been completely redesigned and are fully geared to ergonomical requirements.

As for the D820 MCH a program package is available through which all parameters of the D827 MCH can be recalled, displayed and stored on diskette. The Setup Handler which can be installed on any Macintosh computer, allows you to store all production parameters on diskette. Without exception! This means also the hundreds of CUE addresses or your production memos such as the track sheet. Forget the paper shuffling, forget the reprogramming of the cue addresses when production is resumed!

Once more - a unique STUDER feature!

Adaptation to clock signals is a frequent problem in a synchronous environment. We have greatly simplified this problem: all common «formats» are available. Also exotic sampling rates as 47.952 kHz (48 kHz for NTSC applications).

The time code (TC) is continuously available at the output. Also during winding and in «Stop» mode. Adaptation of the move pulse (e.g. to your synchronizer), with which you are familiar from other machines, is no longer needed.

If you look at the «styling» of our D827 MCH you understand why we say: «STUDER D827 MCH - the eyes are listening too !».

Accessories that are taken for granted
Much has not been mentioned yet, for example, remote level indication or the interface for parallel remote control from the mixing consoles. And much more.

These STUDER «mute points» you are already familiar with.

Open-reel has a future
The digital multitrack tape is an attractive medium. The price and performance are unsurpassed. Also in the foreseeable future.
With the D827 MCH Studer now offers a recording device that is ideally matched to your personal studio environment. It can satisfy also tight budget constraints. And it grows with your requirements.

Now you will certainly understand the introductory heading:

«STUDER D827 MCH - The Reel Joy».　■

STUDER D827 MCH

NOISE SHAPING

by Silvio Gehri

Imagine ...
that you are using an extremely good A/D converter with 18-bit resolution but you can record only 16 bits on your tape. You have two alternatives: Either you cancel the excess bits and thereby sacrifice the extended dynamic range of your system, or the information of these bits is encoded by suitable means in a 16-bit word. For the first case we assume that

... you ignore the problem
Simple truncation of the low-order bits means that quantization steps [1] become larger, which increases the noise level. The effect on signals with a sufficiently high level is minimal, but low-level signals show undesirable effects which range from harmonic distortions [2] to noise modulation [3].

The theoretical dynamic range of 98 dB, which is given by the remaining 16 bits, is achieved by the A/D converters of the D827 MCH within 1.5 dB.
Either you are satisfied with this

... or you use a Noise Shaper
The aforementioned effects can be eliminated by adding dither [4] before the requantization to 16 bits. This additional noise increases the noise floor, which in turn would reduce the dynamic range. The ear's sensitivity near the audibility threshold is strongly frequency dependent. It is most sensitive at 4 kHz, but at frequencies above 14 kHz much higher amplitudes are required.

Silvio Gehri

This fact is exploited by the noise shaper, which shifts the main portion of the noise into those frequency bands to which the human ear is less sensitive. Important is that in the sensitive hearing range the noise floor drops below the limit theoretically achievable with ideal 16-bit converters. The goal of closely maintaining the original resolution is thereby achieved.

Pleasant side effect: Non-linearities in D/A converters are trivialized.

Compare for yourself
The 18-bit original signal (1 kHz, -80 dBFS sine wave) is compared with the 16-bit truncated version (Fig. 1). The spectrum shows that the noise floor is increased and harmonic distortions are produced.

Fig. 2 shows the same signal that has been reduced to 16 bits by noise shaping. The harmonics have disappeared and the noise floor has a characteristic that is optimized to the human
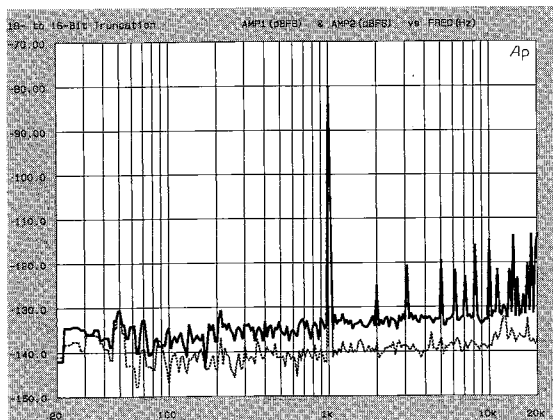

Fig. 1: 1 kHz, -80 dBFS: Comparison between truncation to 16 bits and 18 bit original signal (bold curve truncated to 16 bit; pointed curve 18 bit original signal).
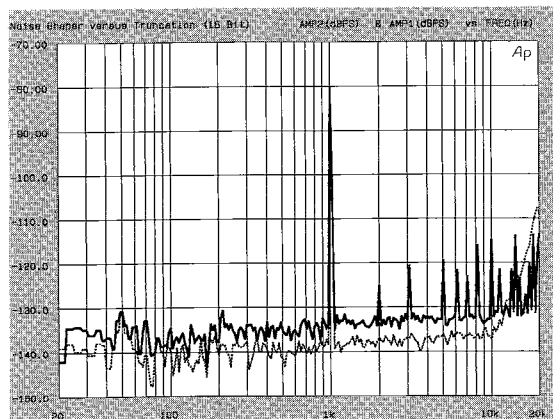

Fig. 2: 1 kHz, -80 dBFS: Comparison between truncation and noise shaping (bold curve truncated to 16 bit; pointed curve reduced to 16 bit by noise shaping).

hearing. Note that the noise level up to approx.12 kHz is at the 18-bit level!

Yes, but ...
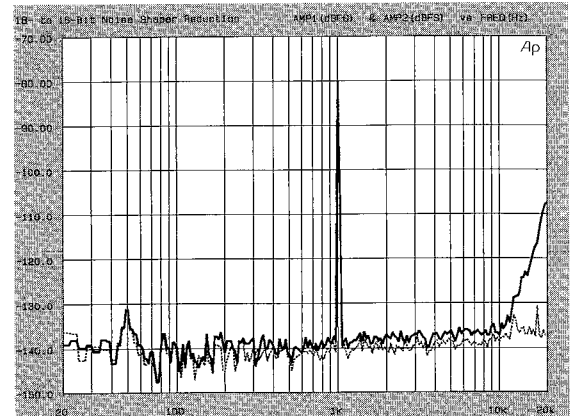In physics, every effect produces a counter-effect. Fig. 2 shows that viewed across the entire

Fig. 3: Comparison between Noise Shaping and 18 bit original signal.

frequency band the aggregate noise power is greater than in Fig. 1. The listener, however, and he is the ultimate judge, perceives a clearly improved sound.

Obviously, also measurements of systems that contain noise shapers must be seen in perspective. The system shown in Fig. 1 has a THD+N of -96.8 dBFS at 1 kHz and -30 dBFS input, whereas the system in Fig. 2 yields only -76 dBFS; linear weighting of measurements is no longer appropriate when noise shapers are involved.

STUDER noise shaper
For the D827 MCH a noise shaper board is available that offers all of the above benefits. The STUDER ST-G2 curve tailored to the A/D converters achieves an unsurpassed sound improvement. It will make it difficult for you to distinguish an 18-bit recording from a 16-bit recording produced with the ST-G2 noise shaper.

Multichannel applications are also supported in that the 48 channels are equipped with uncorrelated [5] dither algorithms. In this way the noise is not added in the same degree as the signal and thus ensures that the background noise always fills the entire space so that it cannot be localized at a specific point within the stereo pattern.

The STUDER D827 MCH is a 16-bit DASH recorder, unless the ST-G2 noise shaper is configured, but that you will be able to hear yourself ...   ■

STUDER 990

Graphic user interface

by Boris Balin

The digitally controlled 990 mixing console, available on the market for approx. 2½ years, has proven itself in a large variety of applications, in radio and TV studios, stationary and OB applications, radio drama and pop music production.

All parameters and settings of this mixing console can be stored and all switching functions and fader positions can be restored with the push of a button (snapshot function). Theater applications can be conveniently handled with the sequence function which allows the audio setup to be charged with the push of a button when the scene changes. All these functions were standard already in the basic version.
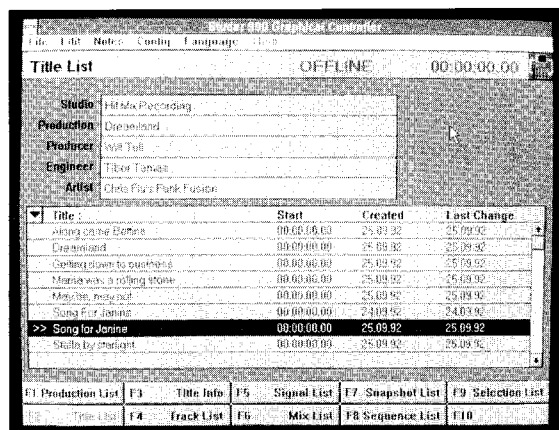
With the newly available «graphical controller» (GC) the operation of the mixing console is significantly enhanced and becomes even more convenient.

These are the highlights of the GC:

* Operation via keyboard and mouse/trackball
* Data structures with production and title
* Snapshots/sequences with names up to 30 characters long
* Electronic labeling with 8-character display
* Comprehensive notepad function
* «Fast» recall function for potentiometer set tings
* Dynamic automation for faders and switching functions
* Cue lists and track lists

The keyboard has been specifically designed for the GC. Fixed function keys provide direct access to the main functions. Particularly in live

situations this is much more advantageous than mouse-only operation. To enhance the clarity, full screens are always used.

In addition to the special STUDER input keyboard also other external keyboards may be used. The information is displayed either on a flat panel that can be incorporated in the console, or on an external CRT monitor.

Snapshots and sequences are displayed on the screen where they can be processed.

The selection function allows to limit the recalled snapshot to certain parts of the console. With the GC the corresponding section can be conveniently defined on the screen.

Using the «electronic labeling» function it is possible to assign the desired description of each channel to an 8-character display above the fader.

The recall functions is used to restore those parameters, which cannot be controlled directly by the computer; on the 990 mixing console only the rotary potentiometers have to be processed this way. Due to the refined and ergonomically optimized data presentation on the console and on screen, the actual recall time is significantly shortened. As a special feature the 990 mixing console is equipped with a «display by function» facility, which makes it possible to selectively update only one parameter, e.g. the panorama setting, on all channels. In this case this setting may also be displayed on the channel bargraph instruments; this ensures excellent correlation between potentiometer and the indication of memorized/actual value.


Boris Balin
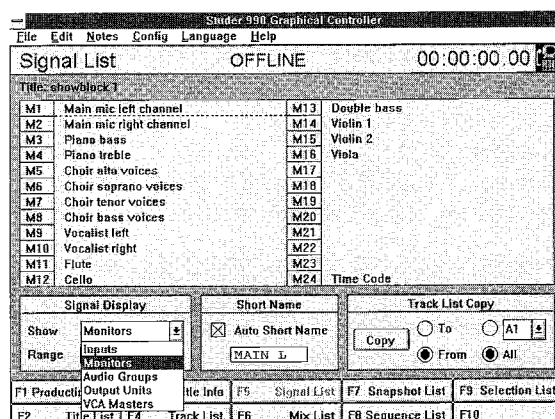
In dynamic automation the fader movements and switching operations are recorded relative to the time code and automatically reproduced. In addition to the main fader and its MUTE function, a large number of other parameters are automated in the 990 mixing console:

- Monitor fader (small fader)
- Monitor MUTE function
- Aux send ON/OFF, PRE/POST
- EQ IN/OUT
- Bus selection
- etc.
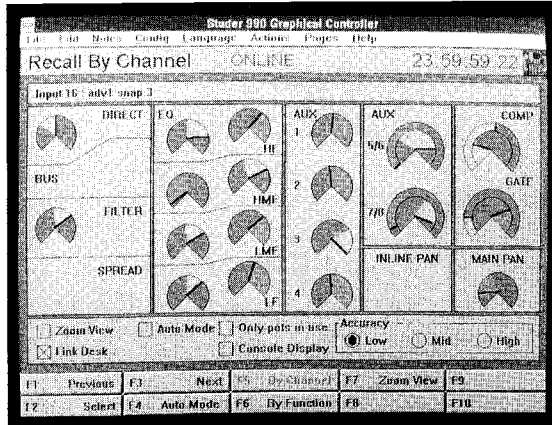
In this way also tone control or reverberation settings can be automatically changed during a mixdown.

In summary we can say that the graphical user interface significantly enhances the 990 mixing console.

All mixing consoles of the Series 990 may be retrofitted with the GC and the automation system, which means that all users can benefit from these new capabilities. ∎

Sampling rate converter

Sampling rate converter in IC dimensions

by Meinrad Lienert

Meinrad Lienert

Up to now, audio signals are usually processed in analog form even though digital storage media are used. The digital outputs of a CD player or R-DAT recorder are normally used only for 1:1 copying. The growing utilization of digital mixing consoles or fully digital studios changes this situation.

One of the major problems is the synchronization. For a smooth exchange of data it is necessary that all equipment installed within a broadcast house be synchronized with the same clock. Where this is not feasible, e.g. because the source material has been recorded with different sampling rates, an appropriate sampling rate converter is required.

Operating principle of the sampling rate converter
Fig. 1 shows the principle of a sampling rate converter, and Fig. 2 the corresponding signals. In the first stage the sampling rate is increased by inserting zeros between the individual sam-

ples. Subsequently the samples are taken via a lowpass filter to the decimation stage in which only those samples are output that coincide with the sampling rate of the output.

Up to now it was possible to convert the signal from a fixed sampling rate to another rate by means of a synchronous sampling rate converter. But this method is only suitable for synchronizable equipment.

Through elaborate calculation of the sampling rate ratio and clock jitter reduction, dynamic adaptation is possible so that the sampling rate converter can be operated asynchronously.

Asynchronous sampling rate converter
Based on the patents of STUDER REVOX AG (see also under Patent News), a chip (AD 1890 /91, Analog Devices) is now available that permits low-cost implementation of an asynchronous sampling rate converter.

Its principal benefits are:

- Connection of equipment with any sampling rate as long as it does not differ by more than a factor of 2 from the sampling rate of the output.
- Connection of non-synchronizable equipment.

Fig. 1

- Possibility of changing the speed of a digital source while maintaining a constant sampling rate at the output.

It is also possible to circumvent problems if several units are to be synchronized by a video source. Practice has shown that the division ratios are frequently not sufficiently accurate to get from one video source to the corresponding sampling rate.

AUDIO DATA TO CONVERT

AUDIO DATA AFTER INCREASING THE SAMPLING RATE

AUDIO DATA AFTER THE LOW PASS FILTER
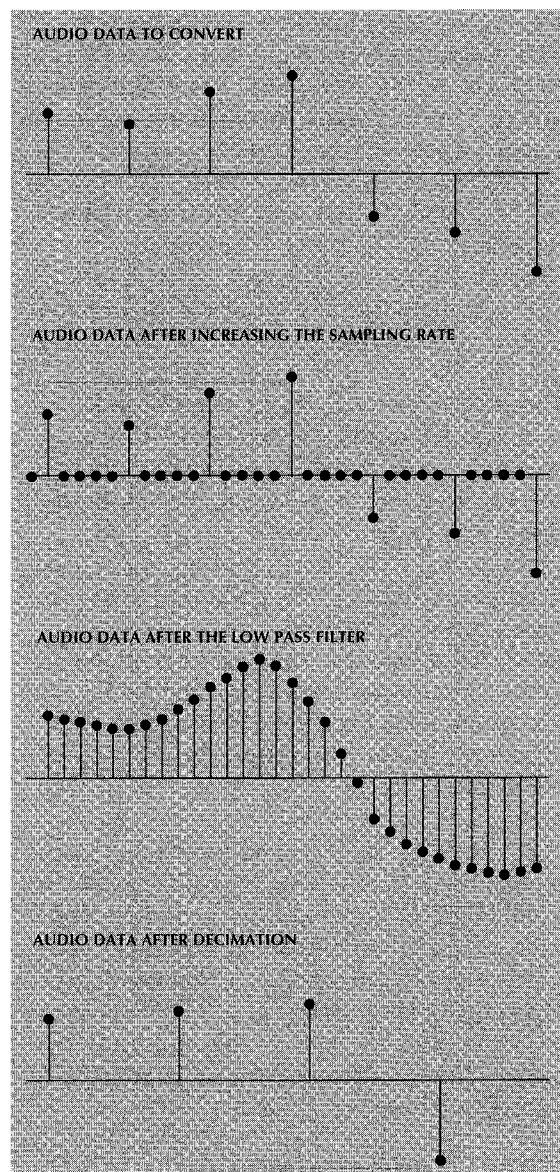
AUDIO DATA AFTER DECIMATION

Fig. 2

What the future will look like is still uncertain. Various scenarios are feasible:

- The broadcasting houses are equipped with an internal clock to which all units synchronize.

- There are certain islands that are synchronized among themselves. If real-time is not required, the data could be exchanged asynchronously via a computer interface.

- The inputs of all units are equipped with a sampling rate converter and can be coupled as desired.

The only certainty is that a digital studio will not be able to operate without sampling rate conversion due to the various fixed sampling rates of CDs, broadcast equipment or existing software.

For its new D730/31/32 CD player generation STUDER offers an option through which the digital output can operate with a fixed sampling rate of 48 kHz or in conjunction with external synchronization with any value between 28 and 53 kHz, independently of the varispeed.

On the D920 digital control room mixing console the synchronous sampling rate converter has been substituted by an asynchronous version.

Also in development is a plug-in board for the DSD rack which can be used as an input for a digital mixing console, either independently ■ in conjunction with a MADI module.

Right on success

Radio Alpha, Prague

From Radio Alpha, a private radio station in Prague (Czech Republic), we received an order for audio studio equipment valued at SFr. 650'000.-. Radio Alpha is located in the center of Prague where it employs over 40 persons.

Three studios with two control rooms will be furnished with STUDER equipment. The order comprises two model 962 mixing consoles, two DYAXIS LITE, four A807 tape machines, five R-DAT 780 and one D740 recorder as well as four D730 CD players. For broadcast automation our NUMISYS II system is used. The complete installation work will be handled by our representative in Prague, AUDITECH.

Radio Alpha received its broadcasting licence on Feb. 11, 1993. Already in September of this year a 24-hours' program will be broadcasted via the Eutel satellite and 8 FM transmitters so that it can be received throughout the Czech Republic. Full broadcast automation is scheduled for October 1993.

Erich Hermann

TDM Technology for audio routing and distribution in radio and TV stations

MADI router

Martine Pion - Studer Digitec

Martine Pion

MADI router is the most recently launched product in the STUDER DIGITEC range of switching equipment. MADI router is a routing system based on cascadable high capacity routing nodes, featuring coaxial or fibre-optic MADI [1] inputs and outputs. Analog and digital inputs and outputs are linked to these nodes through multiplexing and demultiplexing satellites.

A very compact routing node for high capacity

The central routing node consists in a 19", 9U high DS-P frame, designed for digital audio processing systems. It includes a Time Division Multiplex bus allowing up to 256 audio connections. Using a mix of MADI input and output boards, it enables routing of up to 1344 elementary signals to 256 destinations. Several frames can be coupled in order to extend the output capacity to n x 256 signals. MADI links can be either coaxial cable or optical fibre type. Signal Processing Boards can be inserted in each frame to provide processing facilities often required when preparing and adapting signals which include delays, equalisation and summing.

Flexible and evolutive inputs and outputs

Besides this direct MADI interfacing, the input/output organisation of the system is made very flexible and adaptable, through the use of «satellite» I/O units. Namely: MADI multiplexers concentrate each up to 56 elementary signals in analogue or AES format into a MADI interface. MADI demultiplexers generate each from a MADI interface up to 56 analog or AES signals. Each unit may include up to 15 I/O boards of 2 types : either A/D or D/A converters or digital AES I/O boards; each handling 4 analog or 2 AES signals respectively. DS-D MUX and DS-D DEMUX frames are 19", 3 U high, housing Eurocard format modules.

The main advantage of this modular architecture is to allow any combination of analogue and AES inputs and outputs, making easy on-site reconfiguration by simple exchange or addition of boards.

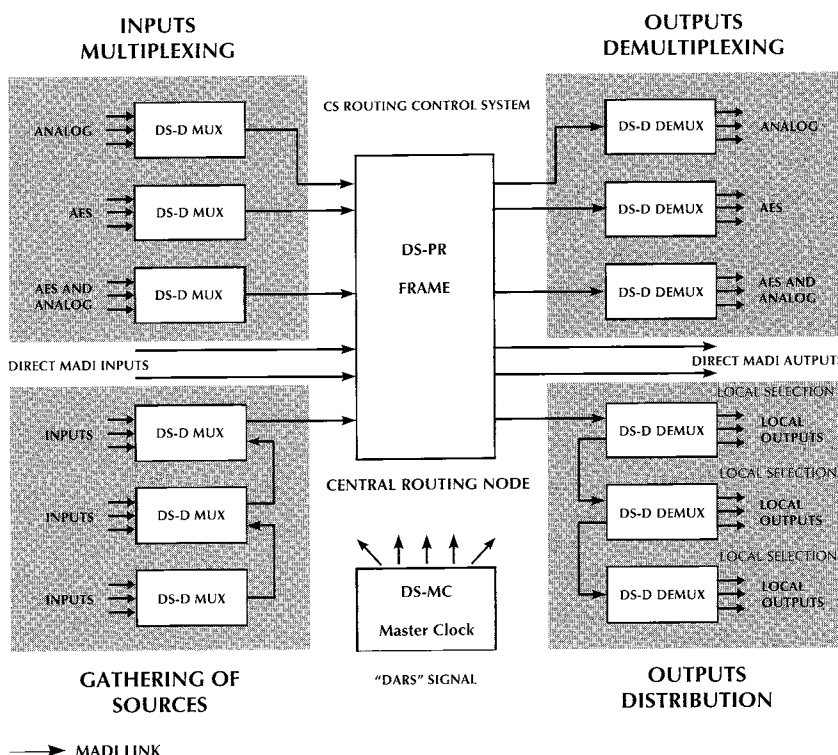## Decentralisation of I/O, gathering of sources, distribution of outputs

The satellites can be installed on remote sites, where the primary sources or destinations are benefiting most from the MADI format efficiency regarding wiring (one cable for up to 56 signals).

This capability proves to be especially cost effective when the distances become significant ; optical fibres are of course recommended in such cases. When only a few sources originate from each remote site, it is also possible to chain the corresponding multiplexers in order to gather the sources from the various places and accumulate them in the same MADI link towards the routing center.

Similarly, a single MADI link may be distributed to several locations where it is divided into separate AES or analog signals in order to distribute the outputs.

Synchronisation and data management

A central synchronisation sub-system DS-MC, locked onto the system video reference in a video installation, is provided for the synchronisation of the MADI router components as well as other devices, conforming to AES11 recommandation.

INPUTS MULTIPLEXING — CS ROUTING CONTROL SYSTEM — OUTPUTS DEMULTIPLEXING

ANALOG → DS-D MUX   DS-D DEMUX → ANALOG
AES → DS-D MUX   DS-D DEMUX → AES
AES AND ANALOG → DS-D MUX   DS-PR FRAME   DS-D DEMUX → AES AND ANALOG
DIRECT MADI INPUTS   DIRECT MADI AUTPUTS
INPUTS → DS-D MUX   LOCAL SELECTION   DS-D DEMUX → LOCAL OUTPUTS
INPUTS → DS-D MUX   CENTRAL ROUTING NODE   LOCAL SELECTION   DS-D DEMUX → LOCAL OUTPUTS
INPUTS → DS-D MUX   DS-MC Master Clock   LOCAL SELECTION   DS-D DEMUX → LOCAL OUTPUTS

GATHERING OF SOURCES   "DARS" SIGNAL   OUTPUTS DISTRIBUTION

→ MADI LINK

The management of data associated to audio is not forgotten, thanks to absolute conformity to AES3 and AES18 standards, transparency in the transport and routing of user bit as well as channel status. The provision for data insertion/extraction boards in the satellites, according to the new AES 18 «labelling» standard, allows full implementation of data services like RDS, Time code or DAB.

A well proven control system for a new techonology based routing switcher
Control of the MADI router - central main routing, and local routing in satellites - is provided by STUDER DIGITEC control modules, already widely used with crosspoint analogue and digital audio matrices and third party video matrices, in numerous TV and radio switching centers. In addition to basic switching and maintenance functions, these products offer innovative facilities which perfectly fit the MADI router features, e.g. automatic insertion of treatments, handling and grouping of both mono and stereo signals and management of «operator» view and «logical» matrices. The ease of use of these controls allows traditional operation and therefore a confident implementation of a MADI router based switching center. Such a system has already been ordered by SRG -

Swiss Broadcasting Organisation - for its Zürich studio with a view to generalize in all the other DRS centres.

MADI router : the right choice for a future-proof routing & distribution infrastructure
Benefits brought by the MADI router pass beyond the simple technical largeness to use an innovative high-tech equipment. Minimisation of wiring, compact equipment giving easy transition from analog to digital by simple I/O card exchange are obviously money saving factors. The possibility to integrate mixing and processing facilities in central nodes, easy handling of any mono signal with AES, MADI & analogue I/O, easy combination of local & central routing and use of a proven and user-friendly control system, bring great flexibility in operation.

Among various technologies and solutions, MADI router is one of the safest choice to succeed in the transition from an analogue era to a full digital era. MADI router is the route towards Multimedia Broadcasting. ∎

(1) MADI is an AES standard multiplexing 56 digital audio channels and associated data on one link, with a useful data rate transfer of 100 Mbits/s.

STUDER D730-Series

STUDER with new, complete CD product range

by David Roth

STUDER has developed and produced professional CD players for 10 years. Thousands of A725, A725QC, A727 and A730 are now in use. At the beginning of 1993 STUDER introduced a completely new CD generation to the market.

D730 / D731
The new standard in radio broadcasting
The success of the new D730 (desktop model) and D731 (rack model) CD players is so overwhelming that the delivery lead-times have grown considerably. Steps have now been taken to step up production in order to reduce the order backlog. Which are the reasons for the success of the new CD players? Ergonomics, styling ... and much more. Everything down to the last detail such as the label field for clean labeling of the CD player must be perfect.

In this report we shall discuss some of the major innovations:

• **Playability of CD-Rs without TOC**
For CD-Rs that have not been fixed-up yet, the CD-player D730 / D731 creates a table of contents by scanning the disc, after which the CD-R can be processed like a normal CD.
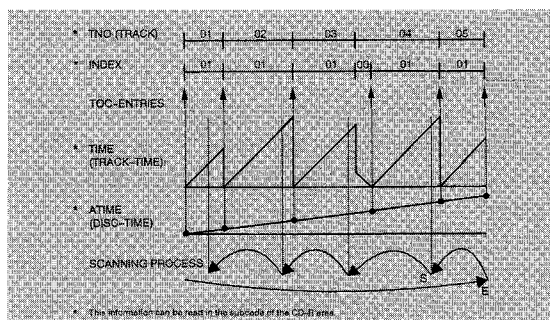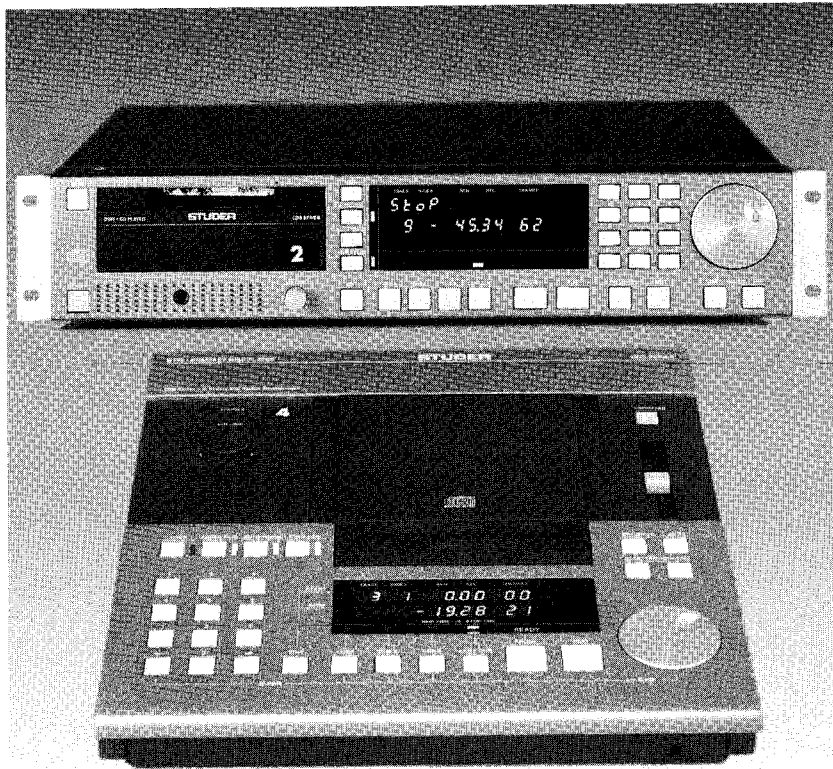

David Roth

• **Interpretation of SKIP functions**
As soon as the TOC of the CD-R has been written (fix-up), all skip functions are interpreted correctly. Of course, the CD player can also be
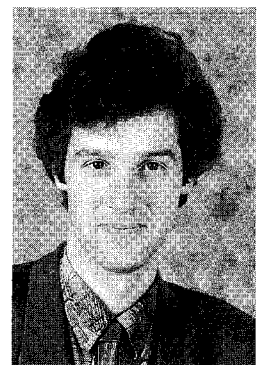
programmed to ignore the skip functions. In this way the skip functions of the STUDER D740 CD recorder can be fully exploited.

• User-defined start and stop points
Start and stop points can be set anywhere on the CD via: track input, track and index input, time input via numeric keypad, manual setting via the cue wheel or by automatic modulation detection.

• Accurate remaining time indication
The moderator must be able to rely on accurate remaining time indication. For this reason the D730 / D 731 remaining time indication always relates to the stop point which does not necessarily have to coincide with the end of the track. The skips are taken into consideration in the calculation of the displayed remaining time!

• Intro mode
The intro mode is another application of the stop point (intro end). With the cue wheel this point is set «on the fly» at the end of the intro-duction.
During playback an accurate countdown to the intro end is displayed. The CD player then continues in play mode and displays the time remaining to the end of the track.
In this way the end of an announcement can be easily timed so that it coincides with the end of the intro.

• Power interruption: a desaster!
This no longer creates havoc with the new CD players!

The CD player automatically repositions at the last point before the power outage fail. Operating states such as READY, ON LINE, LOOP, AUTOPAUSE ... are, of course, retained!

• CD quality indication
Unfortunately the quality of CD(-R)s is not always perfect. For this reason the CD player evaluates a number of error signals. When a critical threshold is exceeded, these errors are displayed in the form of a 3-digit number which provides information on whether servo problems, high error rates or interpolations exist.

The tests in our laboratories with all kinds of «horror CDs» have demonstrated that the playability of the new CD players is excellent.

Of course, every system has its limits. If a section of the CD(-R) should no longer be reproducible, the CD quality warning should normally become active before the CD player is muted. This is made possible because the geometry of the laser beam allows a certain preview.
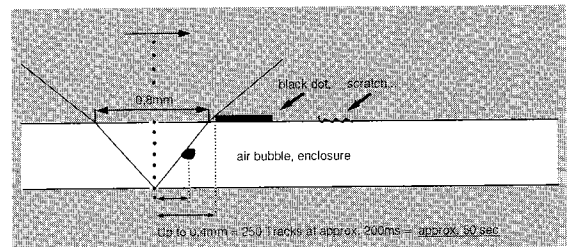
• Digital sampling rate converter
In view of the DAB (digital audio broadcasting) the optional sampling rate converter is of great importance. It can be synchronized externally via a word clock or AES/EBU reference signal within the rage of 32 to 48 kHz.

## D739 - The comfortable remote control for up to four CD players
An important feature of the new D730 / D 731 CD players is the possiblility to connect an external keyboard.

The D739 remote control is such an external keyboard which can be assigned to one of up to four type D730 and/or D731 CD players by means of four selector keys. The D739 is equipped with all control keys, displays, cue wheel and a linear potentiometer for varispeed control.

Since the D739 uses the intelligence of the CD player itself, the operating concept of the remote control and the CD player are absolutely identical. This is of decisive importance in on-air operation.

In addition to the status feedbacks of the selected CD player, the READY and ON LINE states of all 4 CD players are indicated below the corresponding selection keys.

The priority control defines whether or not alternate operation between the CD player and
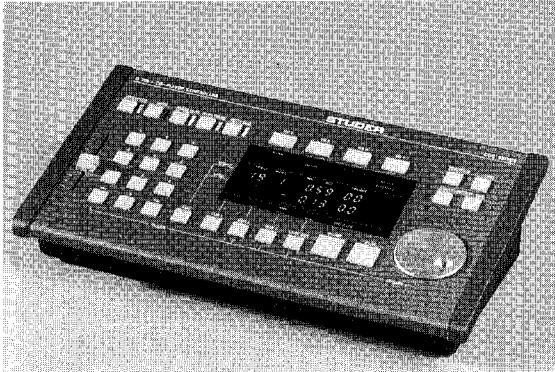
the D739 remote control shall be allowed. If this must be denied for safety reasons, priority control can be activated. In play mode the CD player can now only be interrupted by the control (CD player or remote control) from which it has been switched to play mode.

The D739 remote control will be available at the end of 1993.

D732
The solution for your budget - on a professional level
With the D731 STUDER has certainly created a flagship that has its price. In many applications, not all features of the D730 / D731 are needed. What many users want is a simple, reliable and rugged CD player with professional interfaces. With the D732 STUDER fully satisfies these requirements.

The D732 features an automatic modulation search. With the cue buttons the starting point can be positioned audibly and accurately. The start and end can be reviewed with the prelisten keys. The AUTO PAUSE function switches the CD player automatically to stop at the end of a music selection. The large LED panels is characterized by a high contrast and large viewing angle. On the display field the time can be indicated with an accuracy of one frame (1/75 of a second).

Like the D731 also the D732 is equipped with a visible and illuminated CD, a label field for
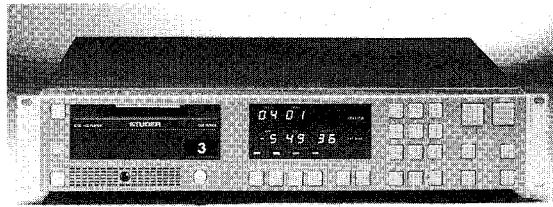
clean labeling or numbering of the CD player, as well as a monitor speaker and headphones socket. The connection facilities of the D732 leave nothing to be desired: balanced LINE outputs, CINCH outputs, digital XLR output (SPDIF format), remote control connection with fader signals.

The externally synchronizable digital sampling rate converter can be installed as an option and also provides a digital output conforming to the AES/EBU format.

The D732 will be available at the end of 1993 and is principally intended for radio and TV studios, music control rooms and PA applications, i.e. wherever an economical CD player with professional capabilities is required.

D731QC - The world has again a QC player
The Studer A725QC CD player is worldwide THE reference CD player for checking the quality of CDs. With the introduction of recordable CDs there is a distinct requirement in broadcasting for a CD reference player that can test also CD-Rs that have not been fixed up yet.

Based on the well-proven D731, STUDER will offer the D731QC at the end of 1993. The D731QC looks exactly like the D731 and has identical operating facilities. It differs principally in that it features additional interfaces to the QC evaluation electronics.

In the D731 and D731QC the Philips error correction IC SAA7310 is used which offers maximum error correction possibilities. However, since the «Sony» error flags have become the de-facto standard in conjunction with the STUDER A725QC, the D731QC has been equipped with 2 decoder circuits. This means that the «Philips» error flags and the «Sony» error flags can be evaluated externally at the same time!

In addition various calibrated servo signals are made available. In this way the optical disc thickness, the disc warp, radial noise, push-pull, etc. can be measured. A calibrated RF signal is also available for measuring I_3, I_{11}, I_{top}, jitter, asymetric, etc.

The selected CD drive mechanism is based on the same design as the CD drive mechanism of the A725QC. This ensures that the error signals of the D731QC and A725QC are compatible.

The D731QC is eminently suited to quality inspection in CD stamping plants.

The D731QC can also be used by CD distributors for inspecting the CDs received from the manufacturers and for verifying complaints.

In radio broadcasting the D731QC is suitable for checking the quality of the received CDs, for checking the quality of critical programs before going on air, for checking the quality during the broad-cast in the background, and for checking the quality of the studio's own CD-R productions. ∎

Right on success

NISKO project at Swiss Radio DRS

For some time Radio DRS in Zurich has planned to renew their main studios. This project has been given the code name NISKO (new information and transmission complex). It soon became evident that a new building, incorporating the beautiful interconnection tract, would be the most efficient solution and a building project was developed and quickly initiated.

The selection of the studio technology caused far more headaches because at the time of the evaluation an analog, a digital, or a combined analog/digital solution was feasible. The first planning steps went in the direction of analog technology, but it quickly became clear that a digital solution would be highly advantageous, particularly with respect to switching room installation and operating convenience. A visit of the Radio DRS planning engineers to Namur, Belgium, where such a system is installed, and other studio visits in Paris, convincingly demonstrated the advanced technology of our French subsidiary, STUDER DIGITEC.

Fourteen suppliers responded to the offer inquiries. After careful evaluation by Radio DRS, two were short listed, one of which was STUDER.
The project tended toward a digital switching room from STUDER DIGITEC and analog mixing consoles of a competing Swiss company. In the course of the project the idea crystallized of building the first fully digital SRG studio in Zurich.

To ensure cost-effective commissioning of the new complex, we also tendered an offer for the installation work and after tough negotiations we received the complete order for the switching room, digital mixing consoles, and the installation.

The total order comprises the following equipment:

4 Studios are equipped with one digital console each. The connection to the central MADI router is established via one pair of fiber optic conductors each. Each of these can simultaneously transmit up to 56 audio channels. The peripheral architecture around the MADI router with signal multiplexers permits flexible handling of digital and analog signal sources.

The MADI switching matrix is operated via terminals in the different studios, i.e. the studio engineer or the DJ on the mixing console connects his studio to the correct line and pulls in audio input lines from other studios, from the house of parliament, or from other locations.

An electronic logbook is maintained automatically that records all switching states. Depending on the task also setups that are needed later can be prepared and instantaneously recalled with the push of a button. The operator can format the screen in such a way that the display optimally satisfies his requirements and that only that information is displayed which he actually needs for his production or broadcast.

With this equipment, Radio DRS in Zurich will be the most advanced SRG radio complex and become a trendsetter also for radio studios in other countries.

J. François Raoult

Reporter Console on ISDN

Reportis 469

Serge de Jaham - Studer Digitec

A reporter console is generally connected on a basic telephone line or a leased «wide-band» line for the transmission of reports to radio or TV centres, often with a feed back for monitoring.

Broadcasters are now showing increasing interest in utilizing the ISDN service for that purpose because it possesses a number of advantages:

- its digital nature allows for improved audio quality, thanks to various coding techniques; «codecs» exploiting this feature are now available.
- for the same reason, simultaneous data communication is possible on the same media.
- ISDN is much cheaper than leased lines. In vestment in ISDN devices often gives quick returns.

The ISDN gives the end user a digital access to the public network, allowing telephone communication or transparent end to end digital transmission. An ISDN access point provides a number of independent «B» data channels with a data rate of 64 kbit/s each. A basic rate access point, named S0, includes two B channels.

Description of the console
More than just a codec, REPORTIS 469 is a stand-alone reporter console, conforming to EBU recommandation, integrating the following functions:

- ISDN network interface;
- Audio coding/decoding;
- Audio mixing and monitoring;
- On air signalling;
- Data transmission.

The console can also be coupled with a PC compatible computer for complementary advanced data functions and audio recording. In the broadcast centre we will find a similar «Codec» device, with basic audio facilities, connected to the audio and data processing devices of a studio or control room.

Use and coding of the B channels
One B channel is dedicated to programme transmission and carries G722 coded audio (7kHz bandwidth). This coding technique, also

provides a larger dynamic range than a standard telephone transmission and is well adapted to live reports with its total coding-decoding delay below 4 ms, allowing real time feedback.

The programme link has a frame structure (H221) wherein the audio programme occupies 56 kbit/s. The remaining bit rate is used for a 4800 bauds V24/RS232 transparent link, on-air signalling and remote control functions can be operated via this line.

The other B channel is optionally used for audio coordination (talkback), with standard telephone quality.

Network access is controlled from a dedicated keyboard and a LCD display whereby calls may be sent by directly dialling numbers. However directory functions are also available.
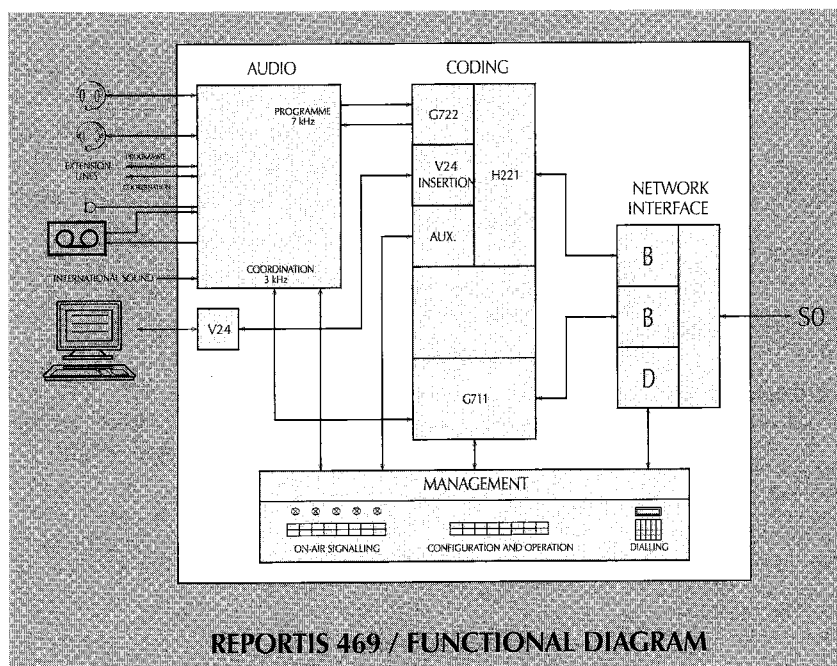
REPORTIS 469 / FUNCTIONAL DIAGRAM

Audio functions
The console provides two commentator positions (connection of headphone sets). Each microphone is amplified and routed to the programme or talkback channel. The right ear of the headphone receives the programme feedback and the left one, a selectable sum of the programme feedback, talkback return, «international sound» and tape playback. The audio level in each ear is adjustable on the desk.

The second position may also be replaced either by an interviewee microphone or an input coming from a tape recorder for delayed transmission.

An «international soun» (ambience sound, etc.) contributes to the programme. It is automatically faded when a reporter speaks. The resulting programme signal goes through a limiter that prevents hard clipping at the G722 coder.

Extension lines enable direct external access to the programme and talkback channels, for using REPORTIS just as a codec. On-air signalling («Call», «On air», etc.) is available through push-buttons and LED indicators, with some additional signals open for user-defined applications.

Data transmission
The V24/RS232 transparent link is available concurrently with the programme transmission and on-air signalling, within the same B channel. For example, a newsroom automation system can be accessed during report.

More powerful data transmission functions are possible when connecting the console to a portable PC and using the second B channel for data communication instead of audio talkback. The following are just examples of the possible applications:

- File transfer to/from the remote centre
- Fax transmission
- Consultation of a data base server.

The latter example is of great interest for reporters, who could avoid the use of paper «data bases».

Application examples

Standard operation
The programme is transmitted using only one B channel. Simple coordination with the studio is possible due to on-air signalling. It is also possible for the studio to send service messages to the commentator over the programme return link. The second operating position enables an interview or the addition of a second commentator.

By using an additional B channel for talkback, a second operator can manage off-air coordination with the studio.

Access to a central data base
In addition to the above operation, the V24/RS232 interface enables the users to connect to the computer system of the centre, e.g. for text transmission or access to a data base. A practical example of application is the access to a news automation system.

Integrated application
Advanced applications can be implemented within a broadcast centre equipped with an ISDN PABX handling several private S0 links.

A codec may be installed in a studio and connected to the local audio production and signalling systems. This basic configuration is possible without the need for a PABX, with one codec required for each studio.

Another possibility is to connect one or several codecs to the switching centre, which will route the audio channels to the right studio and manage the signalling. An audio server connected to grouped lines coming from the PABX might also store messages or reports for delayed use. The V24 link allows the transaction between the remote operator and the server.

Compatibility issues

The ISDN is still in its development curve and is almost absent in some countries, but Europe is ahead of the rest of the world in this respect. It is still an issue to ensure compatibility of a device with the ISDN of a given country. The situation will improve in '94 with the adoption of «Euro-ISDN» by all European countries.

By now, REPORTIS 469 is being tested in various European countries, and has seen its first on-air events. As an example, it was used by AFP for the covering of Roland Garros Tennis Tournament in Paris. ■

Patent News

License agreement for sampling rate converter
On July 28, 1993, we concluded a licensing agreement with Analog Devices, Inc. under which this company is granted the right to use the STUDER REVOX owned European patents No. 52847, 84592, 137323, 173530 and 176946 and the corresponding patents in the USA, Canada and Japan.

The first product based on these patents is the AD1890 / AD1891 sampling rate converter. This is a chip that is able to convert between any two sampling frequencies. The application potential of this chip is significant. It is expected that in the future every input will be equipped with such a chip. Only in this way can the problems with different, astable and non-synchronous sampling frequencies be overcome.

Paul Zwicky