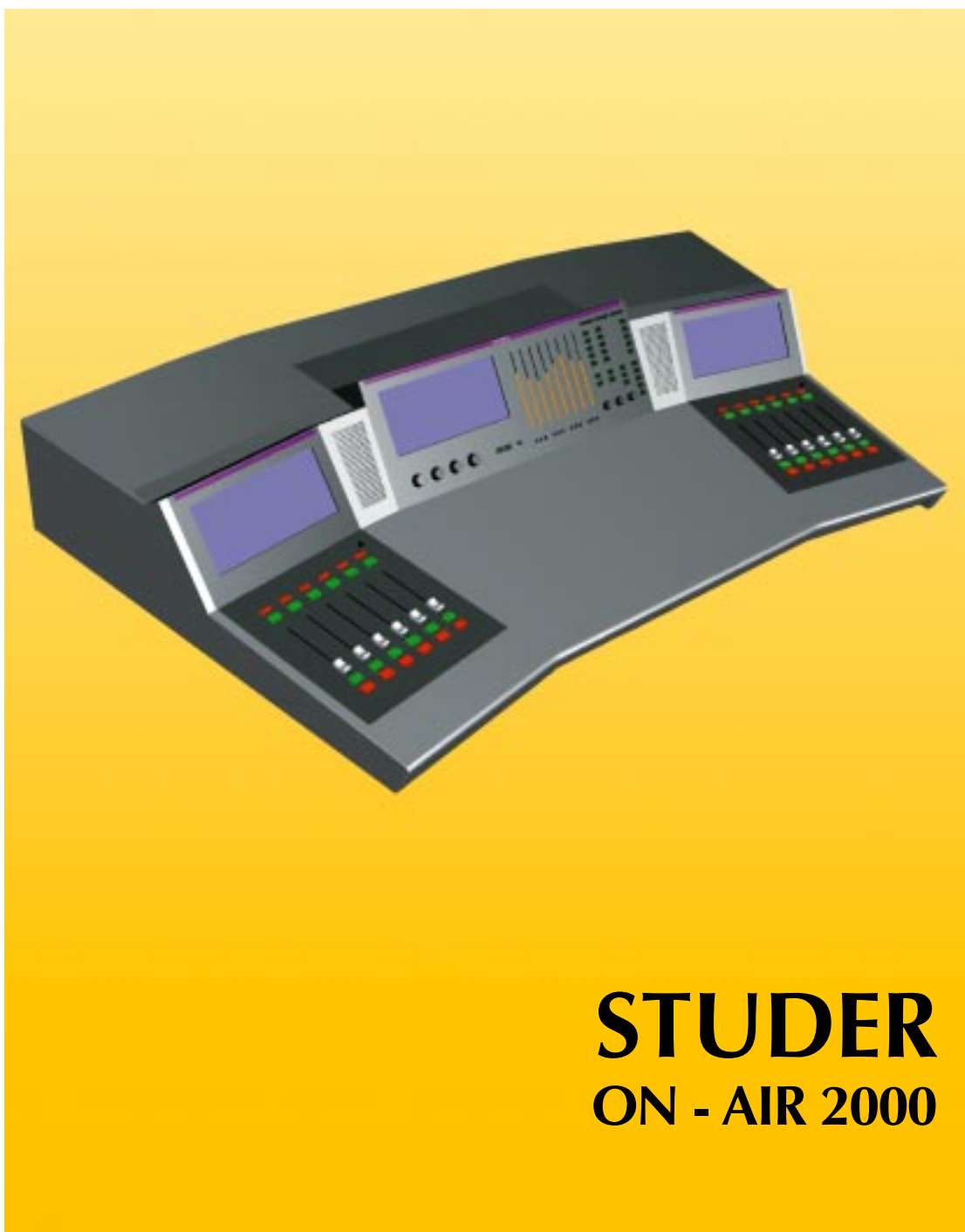


SWISS SOUND

NEWS AND VIEWS FROM STUDER

SWISS SOUND
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PROFESSIONAL
AUDIO AG



STUDER
ON - AIR 2000

MAY 1996
No 37

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Dear SWISS SOUND reader,



Bruno Hochstrasser

We are saddened to report the recent death of Dr. Willi Studer, who founded the STUDER company in 1948. Though retired from active involvement - he was 84 when he died on March 1st, 1996 - Dr. Studer nevertheless kept in touch with progress at the firm.

Those of us who knew him will always recall a man of great personality, who developed a world-class company with the highest reputation in the field of professional and consumer audio. Dr. Studer's life was centered around innovation and the endeavour to develop new products. Therefore I am convinced that we are acting completely according to his intentions by continuing to place milestones along the advancement of professional audio. In particular, we are now achieving high levels of integration in digital mixing consoles; our development of a VLSI-DSP (Very large scale

integration - Digital Signal Processor) makes a new generation of mixing desks feasible, the first - the new continuity desk STUDER ON-AIR 2000 - is described starting on the following page. More new products you will find in our D19 line, in the new analog mixing console STUDER 928 which combines high functionality with a very economic price, and last but not least in our new STUDER D424-2 MO Recorder, a product designed to replace the analog 1/4" tape recorders which once made STUDER famous all over the world.

All of these new products - and more - which carry the traditions of STUDER into the digital era, will be on show at the 100th AES Convention in Copenhagen. And I am sure, Dr. Studer would - if he would be still with us - be delighted to hear of these new milestones in our product range. ■

STUDER Sales Seminar

SWISS SOUND

Editor

Karl Otto Bäder

Desktop Publishing

Max Pfister

Contributors of this issue:

Dr. Thomas Frohn
Bruno Hochstrasser
Eberhard Kaulbach
Rudolf Kiseljak
Robert Müller
Andreas von Ow
Steen Peitersen
Marcel Siegenthaler

Please mail your letters to:

SWISS SOUND STUDER
Althardstrasse 30
CH-8105 Regensdorf
Switzerland

A Harman International Company

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The exchange of information is today more than ever a necessary prerequisite for a successful interaction between sales engineer and client. Hence STUDER regularly invites key representatives to join for seminars in their main offices.



And so it came about that 40 experts met in January 1996 in Regensdorf; the work was partially undertaken in full session (right: *Marino Ludwig* explains aspects of radio automation systems), partially in small workshop groups (left: *Simon Egli* discusses digital multitrack recording technology). ■

Digital audio console STUDER ON-AIR 2000



Andreas Von Ow

Digital mixing consoles: A brief introduction

For many years it has been claimed that the era of analog audio technology will be superseded by the digital technology. In the field of recording equipment this has largely become true. The market for effect machines is dominated by digital equipment. Also the audio dubbing of films is now often handled by digital systems, so-called DAWs (Digital Audio Workstations).

The last stronghold of analog technology is the mixing consoles. There are various reasons for this. A decisive point is the cost which in the past was much higher for digital mixing console. Another point was the audio quality, particularly the greater dynamic range available in analog signal processing. Since digital mixing consoles are very complex systems with a large number of microprocessors, some of the older mixing consoles had software stability problems. As a result some users lost their confidence in the digital technology.

Advantages of the digital technology

These disadvantages have now been largely eliminated. Signals can now be processed with a width of at least 24 bits which results in a dynamic range of over 130 dB when appropriate algorithms are used. The weakest point is still the analog/digital and digital/analog converters. But also here the latest technologies achieve dynamic ranges of more than 100 dB. New digital mixing consoles show that they function very reliably. Today's digital mixing consoles are hardly more expensive than analog mixing consoles with similar features.

A key advantage of the digital technology is the controllability of all parameters. Whereas in the analog technology full automation is very difficult to achieve with reasonable effort, practically every parameter of a digital mixing console can be set automatically. Digital signal processing is not subject to aging nor temperature-dependent which means that no compensation of parameters is necessary.

Design of conventional digital mixing consoles

Larger digital mixing consoles are generally assembled from a large number of standard DSPs (Digital Signal Processors). As a rule these chips are not custom designed for audio processing and therefore have to be adapted to the re-

quirements of a mixing console by means of additional electronic components. The major problem is the integration of the DSPs into the master bus. Whereas in analog mixing consoles a master bus is very easy to implement, this is a complex task in the case of digital mixing consoles. A frequently used solution is to incorporate a TDM (Time Division Multiplex) bus. In the TDM bus the audio data are connected in parallel to a common bus with their full word width. To prevent collisions, each channel may connect its data only within a specific time slot assigned to the corresponding channel. In a system with 256 time slots, each time slot has a width of only 81 ns!

The Studer D940 and D941 mixing consoles are designed according to the TDM bus principle and have proven themselves in the field. Systems with TDM bus are relatively complex and therefore not well suited to smaller audio mixers. One advantage is that the TDM bus can also be used as a router, as demonstrated by the Studer MAD1 router.

Very small digital mixing consoles can be built without a TDM bus. Often the interfaces existing on the DSPs are used for interconnecting a number of DSPs. This is a highly economical solution but suitable only for mixing consoles with fewer than eight input channels.

Through the utilization of an ASIC (Application Specific Integrated Circuit) which STUDER developed especially for digital mixing consoles, it is now possible to close the gap between the two systems described above. This large-scale integrated ASIC called PUMA (Parallel Universal Music Architecture) allows the design of digital mixing consoles with reduced chip count.

Concept of the STUDER ON-AIR 2000

The ON-AIR 2000 has been specifically designed as an on-air mixing console for radio broadcasting applications. It is completely digital and PUMA chips are used for signal processing. Special attention has been paid to simple operation which can be learned intuitively.

The mixing console features a modular design and comprises a central control panel with up to four channel assemblies with six channel units each. Consequently the smallest configuration has six input channels, the largest 24 input channels. Each input channel can be fitted with one of four different input modules.

A channel unit has only three keys and one fader. All other settings such as equalizer, pre gain, balance, etc. are established on the central control panel. A graphic display with touch screen above the channel assemblies shows the parameters that have been set for each channel. Although the operation is centralized, a comprehensive overview is assured at all times.

All outputs can optionally be fitted with analog or digital interface modules. Also available are modules for controlling telephone hybrids and for synchronizing the mixing console. The ON-AIR 2000 is equipped with an internal clock. A radio-controlled clock (DCF 77) can be connected through an RS232 interface.

Mechanically the console has a low-profile design which allows excellent eye contact with the guests in the studio. In addition, monitors of radio automation systems can be placed on top of the mixing console. Due to the utilization of large-scale-integrated electronics the ON-AIR 2000 mixing console is highly compact and consumes relatively little power. The entire electronics, including the power supply, is integrated in the mixing console. No costly external racks are required.

A powerful microcontroller is used as a control computer. In contrast to mixing consoles controlled by a PC, the start-up time of the system is very much shorter.

Audio inputs

By configuring different input modules the ON-AIR 2000 can be adapted to practically

all requirements. Each channel unit can be fitted with one of the following input modules:

- **Line input module:** Stereo input with A/B changeover, either with or without transformer.
- **MIC input module:** Microphone input with analog insert and A/B changeover.
- **Digital input module:** AES/EBU or S/PDIF input with SFC and A/B changeover.
- **Source selector module:** Stereo input with 6-way input selector

The modules are equipped with faderstart and locate outputs. In addition the audio input features a control input. For microphone inputs a mute key, and for line inputs (e.g. the ready signal of a CD player) is connected to the control input.

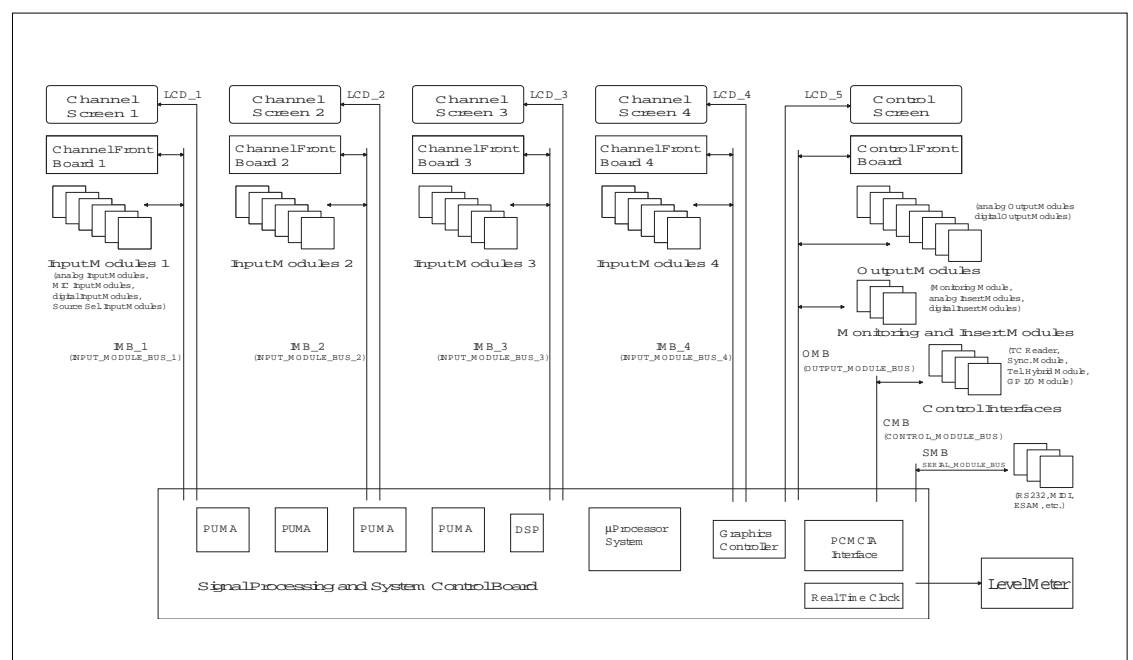
Audio outputs

A fully equipped ON-AIR 2000 offers the following outputs:

- Program output
- Record output
- Audition output
- 2 (N-1) outputs (clean feed)
- 2 AUX outputs

All outputs can be configured either as stereo or mono outputs. The following output modules are available:

- **Line output module:** Stereo output, optionally with or without transformer
- **Digital output module:** AES/EBU or S/PDIF output



Operation

The operation is based on the «Touch 'n Action» concept which has been patented by STUDER. This greatly simplifies the operation which is particularly useful for modern broadcasting operations because the operator is no longer confronted with technical challenges. Directly accessible elements of the channel units are the fader as well as the «ON», «OFF» and «PFL» keys. All other settings are established via the central control panel. A touch screen at each channel assembly shows the current setting of all channel functions. If a setting needs to be changed, only the corresponding field on the touch screen of the channel assembly needs to be touched and the function can be immediately accessed via the central control panel. In normal operation it is not necessary to navigate to specific functions via menus and submenus.

The central control panel consists of a touch screen with incremental transmitters arranged below it, and a keyboard that is essentially used for controlling the monitoring. On the right-hand side of the screen the system time and the stopwatch are displayed. To the left of the clock there is a row with keys for those operating functions not related to any channel. These are used, for example, for accessing the snapshots and the configuration menu, and for controlling the telephone hybrids, the AUX master controller and the studio monitoring.

On the left-hand side of the touch screen the parameters of the functions selected on the channel assembly are displayed. The parameters can be set by means of the four incremental transmitters located below the screen. As another patented innovation of the ON-AIR 2000, the incremental transmitters have function-dependent end stops and detent points. This results in tactile feedback the user is already accustomed to analog mixing consoles. The settings established on the central control panel are simultaneously shown on the display of the corresponding channel assembly.



Configuration and snapshots

Through the configuration menu the ON-AIR 2000 can be adapted to the specific application requirements. For example, labels can be assigned to all inputs and these labels are sub-

sequently displayed on the channel assembly. An integrated PCMCIA slot is available through which the entire mixing console configuration can be stored in an external RAM. Of course, the PCMCIA can also be used to download the configuration from the RAM into the mixing console.

Another application of the PCMCIA cards is to save snapshots and so-called «Mic settings». Snapshots define all settings of the mixing console with the exception of the faders and the PFL key. Mic settings apply only to an individual channel unit that is fitted with a Mic input module. Mic settings can be copied to all microphone inputs.

Signal processing

The signals are processed by PUMA chips. These signal processors which are optimized for audio applications have an enormous computing power. A STUDER patented architecture is used to combine five high-performance DSPs on a single chip. In the largest possible configuration of the ON-AIR 2000 with 24 input channels only four PUMA chips are used. The master bus problem is solved through a very fast serial connection between the chips.

The signal processing comprises the following functions:

- Calibration (Line input) or Gain (Mic input)
- Stereo mode (LR / RL / LL /RR)
- Phase (normal / inverted)
- Equalizer (3-band)
- AUX1 and AUX2 level (AF or PF)
- Balance (stereo input) or panning (mono input)
- Master selection (program and record master)

Microphone inputs are additionally equipped with a switch-controlled analog high-pass filter as well as an insert before the A/D converter.

Interface modules

In addition to the audio signal modules described above a number of interface modules are available for the ON-AIR 2000. Some of these are listed below:

- **Sync module:** Module for external synchronization of the mixing console
- **Tel. hybrid module:** Module for controlling two telephone hybrids
- **RS232 interface:** Connection for radio clock (DCF 77)

Concluding remarks

The technology employed in the ON-AIR 2000 project sets new standards for digital mixing consoles. The ON-AIR 2000 is only the first of a new generation of mixing consoles that will help the digital technology to achieve a breakthrough also in this equipment category. ■

STUDER 928

A new economical analog mixing console concept



Karl Otto Bäder

The market for analog consoles is still existent. This is especially true for mid-size consoles, where digital compact consoles are too small and not flexible enough, and where large scale digital consoles despite of their superior functionality are far too expensive to compare.

The new STUDER 928 console features a modular 30 mm concept with mechanical frames for 12 or 16 units. So different size consoles can be built, the maximum would be 96 input units. Both, mono and stereo input units are available. The standard configuration contains 8 mono groups, 2 stereo masters, 6 mono and 2 stereo AUX channels, and 2 monitor modules for studio and Control Room monitoring.

The functionality of the console is high, and is not compromised by the economical pricing. Included as standard are n-1 circuits, (instant clean feed) direct outs from every input stage, a sophisticated EQ stage and a high number of AUX channels, limiters in each group and master stage and dedicated on-air-switching features normally found only in much more expensive designs.

The gain control in all stages is effected via VCAs which allow the formation of VCA groups. In every input unit the VCA can be locked to

one of four VCA groups, and the group master fader is a linear fader in the monitor module.

To cope with special customer requirements the meter bridge is able to house all STUDER 170 mm units. In addition, STUDER EURO cards can be installed in the lower chassis.

No automation is provided in the concept.

The main application of the desk is in the classical range for STUDER 963 consoles. Nevertheless, the 963 line will be continued, and will still be available in the future. The application profile is consequently very similar to the existing 963 range, and comprises:

- Live transmission in radio and TV
- Recording
- Theatre and Opera
- Sound reinforcement
- OB van applications

Also this development shows the STUDER standard of quality the audio world is used to see in our mixing consoles. STUDER transformers are used at inputs and outputs, gold plated contacts or semiconductor devices for all audio switches, and high quality VCAs to maintain STUDER's standard of «good sound» and reliability.



On the next page the functions of the single units are depicted:

- blue/brown: The input channel faders can operate directly with the group or master faders (blue) or be organized in four VCA groups with the linear master faders being in the monitor and in the communication unit (brown).
- pink: The AUX channels 1 - 6 (mono) and 7 - 8 (stereo) are fed by the pots in the input and group units; the master faders for the even channels are in the master unit A and for the odd channel in the master unit B.
- yellow: The four band parametric equalizer features Q-switching in the two center bands.
- green: The group and master units include a limiter/compressor which can be inserted in the input channels via the patch bay.
- purple: Source selector for input and group units.
- orange: group and master bus selector.

ZA MASTER ZB

7 8

5 6 GROUP

3 4

1 2

TB DIR/OUT N-1

46V

LINE

10 20 30 40 50 60 70 80

0 5 10 15 20 30 40 50 60

MIC

15 15 15 L.LINE

4k 8k HF

2k 1k 16k

2k 4k MHF

500 8k 1k

250 125 2k LMF

60 125 250 LF

30 Hz 500

EQ

INS

AUX8 7 LEVEL PAN

AUX7 6 LEVEL PAN

AUX 5+6 PRE

AUX 3+4 PRE

AUX 1+2 PRE

DIR OUT → AUX 1 DIR

PAN TO GROUPS

PAN M L R

IN 4

EXT. MUTE

CUE

10 5 0 +6 0 -8 -30

15 20 30 40 50 60 ∞

START

MONO 928

ZA MASTER ZB

5-6 7-8 GROUP

1-2 3-4

ZA MASTER ZB

INP EXT GRP

MONO

L BAL R

LEVEL

0 +10

DN

PFL

STEREO RETURN

13 15 110

12 11.5 RATIO LIM

MIN MAX REL TIME

5 10 LINK

GAIN

GROUP INSERT

LIM/CDMPR IN

INS

AUX8 7 LEVEL PAN

AUX7 6 LEVEL PAN

AUX 5+6 PRE

AUX 3+4 PRE

AUX 1+2 PRE

PAN M L R

IN GR1

EXT. MUTE

CUE

10 5 0 +6 0 -8 -30

15 20 30 40 50 60 ∞

GROUP 928

POWER SUPPLY STATUS

PHANTOM

AUDIO

LOGIC

DN AIR

INS

AUX8 7 LEVEL PAN

AUX7 6 LEVEL PAN

AUX 5 AFL

AUX 3 AFL

AUX 1 AFL

AUX MASTER

MONO OUTPUT PRE AFL

EXT. MUTE

CUE

10 5 0 +6 0 -8 -30

15 20 30 40 50 60 ∞

MASTER1 928

INS

AUX8 7 LEVEL PAN

AUX7 6 LEVEL PAN

AUX 5 AFL

AUX 4 AFL

AUX 2 AFL

AUX MASTER

MONO OUTPUT PRE AFL

EXT. MUTE

CUE

10 5 0 +6 0 -8 -30

15 20 30 40 50 60 ∞

MASTER2 928

8 7 6 5 4 3 2 1

EXT. SOURCE

6 5 4 3 2 1

MONO SOURCE L R

HEADPHONE

3 4 5 6 7 8 9

SPLIT

MONITOR L SP

PHASE

NEAR FIELD NF

L BAL R

3 4 5 6 7 8 9

2 1

L SOURCE EXT

R MONO

EXT MUTE L R

EXT DIM

3 4 5 6 7 8 9

2 1

TB RETURN

CUE TO MONITOR

3 4 5 6 7 8 9

2 1

CUE AFL AFL

RESET CUE CUE MASTER

VCA MASTER

10 5 0 +6 0 -8 -30

15 20 30 40 50 60 ∞

MONITOR 928

100 K 10K 1K 100

FREQ

TEST GEN DN

3 4 5 6 7 8 9

2 1

LEVEL

EBU ZA ZB

SLATE TO DIR OUT

TB

USER 2

USER 1

MIN MAX TB

EXT

A7 AB

A5 A6

AUX A3 A4

A1 A2

TALK TO GROUPS GRP

MASTER ZA ZB

STUDIO TB LEVEL

STUDIO

DN AIR CUT

TALK BACK

3 4 5 6 7 8 9

2 1

H/P GUEST

3 4 5 6 7 8 9

2 1

H/P STUDIO OR MONITOR CRM

MASTER A ZA

AUX 7 A7

EXTERN EXT

3 4 5 6 7 8 9

2 1

STUDIO

EXT MUTE

MUTE

DIM

VCA MASTER

10 5 0 +6 0 -8 -30

15 20 30 40 50 60 ∞

COMM 928

5396 ST1

Greenland Radio (KNR)**Greenland on the way towards the year 2000**

Steen Peitersen

When Greenland Radio (KNR) had to choose a supplier for 3 complete studios, they chose STUDER once again. KNR has used STUDER-REVOX equipment for decades and they had no doubt about the best choice of a supplier for building two On-Air radio studios and one On-Air/music studio.

Due to the special geographic situation of Greenland, it was a must to have equipment and a business partner that could be trusted. The equipment should be state-of-the-art, durable and with plenty of modern features.

The intention was to renovate three old studios so that the old studios 1, 2 and 3 were transformed into two modern On-Air studios. Furthermore a new studio (Studio 1) had to be built as support for the On-Air studios and for future projects such as recording, editing and training of the KNR technicians in modern pop music. Studio 1 was also to be the first studio with digital equipment at KNR to get experience for later use.

A STUDER 980 mixing console with its rigid construction, unique combination of On-Air facilities and every possibility for multitrack recording of modern music was chosen for studio 1. The heart of this studio was built around the STUDER 980: a 48 ch frame equipped with 32 ch, 8 sub groups, 4 masters and patch panel. The studio it also equipped with D731 CD-Player, D740 CD-Recorder and 2 x A820 Master tape recorders. As multitrack machines a refurbished A80 16 track 1" tape and a complete 24 CH Alesis ADAT digital system is used. Furthermore a complete Dyaxis II harddisk system with 20" colour monitor was connected. The studio was also equipped with Revox C270 tape machines and a complete studio talkback system.



Around these core facilities some outboard gear such as Lexicon PCM 80, Alesis Q2, Genelec 1037A monitor system and Alesis Monitor One and Two were installed. Existing older microphones have been maintained, including a Neumann U87.

Studio 2 and 3, which are purely On-Air studios, have been identically built around existing STUDER 902 consoles. Both studios have D730 CD Players with remotes, D780 DAT machines, A723 studio monitors, DSP digital telephone hybrids, talkback systems, A764 tuners and C270 reel tape machines to supplement existing STUDER A80 machines.



The project started November 1994 when *Stefan Stocker* from STUDER and me went to Nuuk (Godthåb) in Greenland to talk to KNR. During our 5 day stay we obtained a very good impression of KNR's wishes for the future, and preliminary plans of the project were prepared.

It is important to understand that KNR is not able to shop cables, connectors etc. locally. Everything has to be sailed or flown in.

Our quotation was accepted in April 1995 and the installation started in October 1995. The installation was planned by our service manager *Kim B. Petersen* in cooperation with STUDER.

The installation took 3 weeks and was performed by STUDER engineer *Anastasios Kalimeridis* and our *Kim Rasmussen* (lower picture). Both had three hectic weeks, not only with installa-

tion of new equipment but also with renovation of a number of old A80 machines. The actual installation time of three studios with completely new cabling, patch panels, racks etc. was 14 days. Racks, patch panels etc. were prewired at STUDER Regensdorf before shipping.

The mixing console and the major part of the equipment were sent by sea via Aalborg in Denmark. The total freight time amounted to more than three weeks. As the photo shows, a

wall had to be torn down to get the console inside.

At the same time as the installation work equipment training was given to the KNR staff. I would like to take the opportunity to thank Studer and KNR's management and engineers for the fantastic cooperation and the confidence shown by KNR during this project. We congratulate KNR for these three new studios and wish them all the best in the future. ■

WDR with digital drama production

The Westdeutsche Rundfunk in Cologne (Germany) has a substantial production for drama and other features; up to six shifts work in parallel monday to friday in this sector. Hence it was obvious that the WDR tried to take advantage of the operational benefits of a digital production installation also in this domain.

Since approx. one year a STUDER D940 Digital Console is in operation in Studio 7 - since November 1995 with full dynamic automation - to the full satisfaction of the customer. The recording is effected on a 24 channel audio

workstation, and the combination of console and harddisk system allows a fast and comfortable way of producing. Monitoring is effected with low levels, therefore fan or harddisk noise was not tolerated. By a wise split-up of the components between the control room and an adjacent technical room the resultant noise floor is in the inaudible range.

Due to the good experience gained with the D940 an equivalent installation is planned now for studio TBR 93. ■



STUDER D19 MultiDAC

8 channel D/A Converter with MixMonitor Function



Rudolf Kiseljak

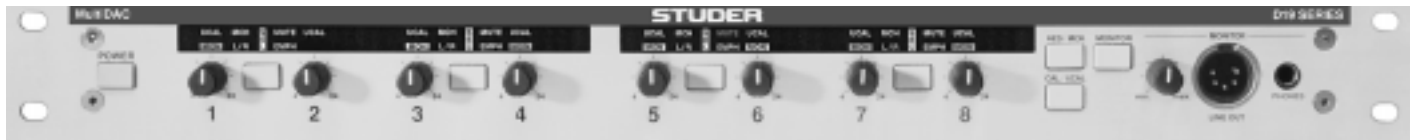
The STUDER D19 MultiDAC already represents the third variant in this new line; the basic intention behind this unit was to enhance the D19 Series with a product complementary to the already established D19 MicAD, but also to be useable as stand-alone unit. The D19 MultiDAC is packed into 1 HU 19" rack and contains 8 independent 23 bit D/A converters. Rather than just having basic D/A converter functions, some enhancement features have been included. For this reason, a few simple and ergonomically laid out operating elements are found on the MultiDAC. Eight potentiometers have a dual function - they serve as output level controls in the «uncalibrated» mode and/or as monitor level controls. In the calibrated position, the output level is set internally via trim potentiometers. LED indicators for signal quality (MUTE) and the activity of the de-emphasis filter (EMPF) are also included. A SEL button selects a channel to the central operating area.

be selected to the Monitor output for checking or measurement. In the calibrated mode the line outputs have a fixed gain and the channel potentiometers only influence the monitor mix. So, the MultiDAC is not only a high quality D/A converter, but is also a 8 channel mixer.

Audio Connections

To simplify system connections the MultiDAC is equipped with exactly the same audio interface types as the MicAD. The MultiDAC is delivered with 4 AES/EBU inputs as standard and there is a selection of ADAT or TDIF-1 multi-channel input cards as options. This enables direct connection of the popular 8 channel Modular Digital Multitrack recorders.

Any channel pair can be selected to take its signal either from the AES/EBU inputs or from the corresponding channel of the multichannel card. The 8 analog outputs are transformer balanced and have XLR connectors.



MixMonitor

Next to a high quality conversion there is always the wish for suitable monitoring. The MixMonitor allows front panel listening of any of the outputs in mono or stereo, allowing easy and quick control of any of the channels. In addition, any combination of the output channels can be mixed to the monitor output in mono or stereo for listening to up to 8 channels! The MixMonitor controls are situated on the right side of the front panel and comprise a headphone jack, a 5-pin balanced line level XLR output and a volume control.

With the MixMonitor function a variety of tasks can be performed, such as direct off-track monitoring when the unit is used in conjunction with a MDM recorder for direct-to-track recording. Obviously, any channel can also individually

Synchronization

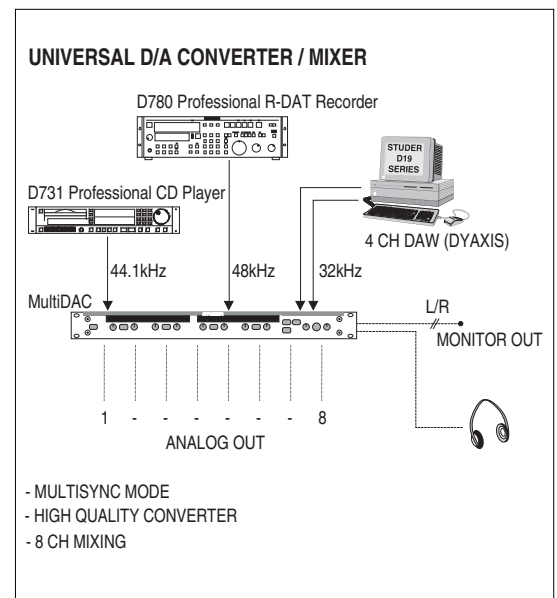
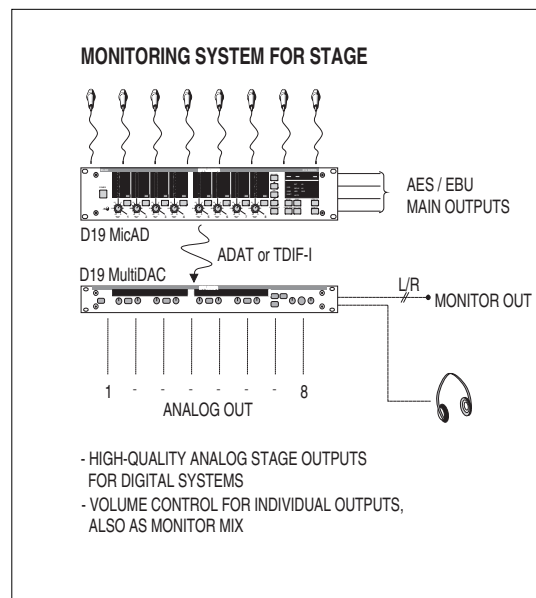
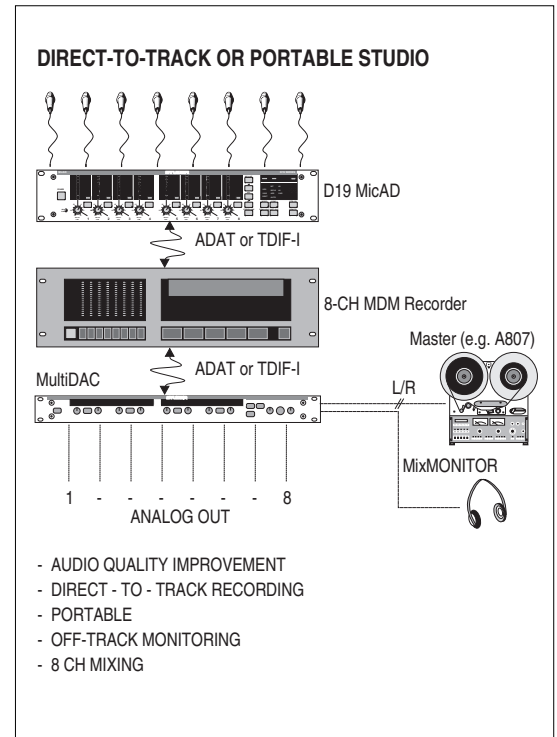
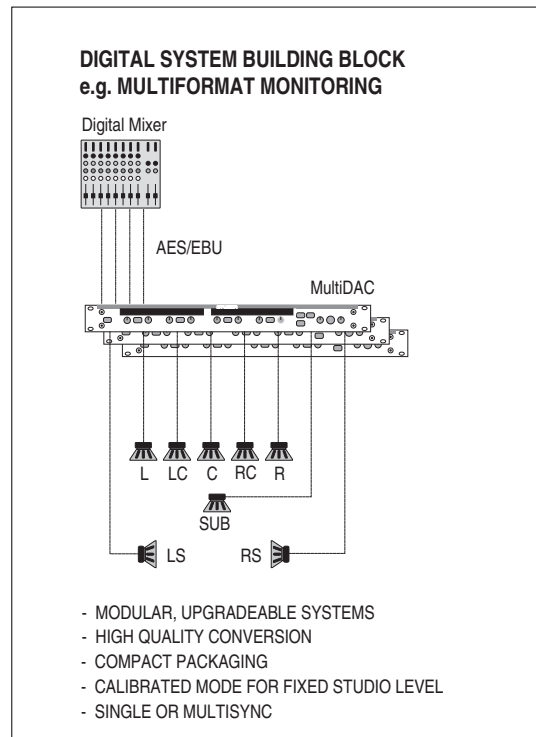
The eight individual D/A converters can operate from a wide range of sampling frequencies. There is no need for an external sync signal because each D/A converter is equipped with an asynchronous sampling frequency converter and will synchronize to the incoming signals. In other words, each input can work with a different sampling rate if needed.

On the other hand, should a fixed sync reference be required in order to avoid phase problems in system installations, the MultiDAC can be internally switched to use one of the inputs (any AES or MCH) as a reference for all D/A converters.



Applications

As an indication of the versatility of the unit, the following drawings illustrate some application examples.



Preliminary Technical Data

D/A Converter	23 bit resolution
Signal to noise	>116 dB, unweighted, 20Hz....20KHz
Crosstalk	< -100 dB, 20Hz....20KHz
THD+N	< -116 dB _{fs} , -30dB _{fs}
Output level	+24 dBu, into 600 Ohm, transformer balanced 3-pin XLR
Deemphasis	50/15 μs, automatic
Monitor output	+24 dBu max output level, balanced 5-pin XLR for left/right outputs
Headphones	1/4" stereo headphone jack

European premiere in Copenhagen**MO Recorder STUDER D424**

Robert Müller

In edition 35 of Swiss Sound the magneto - optical technology and its place in our product line was explained for the first time. The following report describes the new STUDER D424-2 MO recorder which will be demonstrated for the first time in Europe at the AES convention in Copenhagen.

SPDIF as well as AES/EBU signals can be connected as digital sources. Corresponding outputs are also provided.

For connecting analog signals an optional converter board is available. Top quality 20-bit Delta Sigma A/D converters (64 times over-



The STUDER D424-2 MO recorder can be easily operated through its control panel because the operating concept is closely related to that of STUDER's well-known 1/4" tape recorders. For rack-mounted units a convenient desk-top remote control is available. In addition to the «tape deck» keys, both the control panel and the remote control feature a jog/shuttle wheel, LED output meters, channel control, editing field, and numeric-key pad.

Electronic editing

Nondestructive electronic editing is possible with the CUT, ERASE and INSERT functions. CUT corresponds to the cutting of an analog tape where the second tape segment is «spliced» to the first one which reduces the total playing time. By contrast ERASE replaces the edited section with «digital null» which has no effect on the total playing time.

INSERT allows copying, insertion and repetition of segments in different locations of a recording.

Formats and signal connections

The traditional STUDER philosophy «reproduction with maximum fidelity and optimum sound» is maintained also by the D424-2. And depending on chosen recording time the user can freely choose between 16, 20, and 24 bit resolution.

sampling) and 20-bit Delta Sigma D/A converters (128 times oversampling) are used. Of course, this board is equipped with transformer decoupled inputs and electronic output balancing which allows also single-ended operation.

Synchronization

The basic unit is equipped with a time code reader and generator, together with a chase synchronizer. It supports synchronization to all standardized (24, 25, 29.97 DF and 30 NDF) as well as nonstandard (29.97 NDF, 30 DF) time codes. In addition the STUDER D424-2 can be synchronized to an internal clock as well as to an external video signal (PAL, NTSC), AES-11 or wordclock.

Hard disks

The future-proof open architecture, based on an SCSI interface, allows high-speed data transfer as well as adaptation to optical disk models that will become available in the future. In the first phase 2.2 GB (pioneer) MO disks are offered (1.3 GB (ISO) in preparation). The 2.2 GB disk accommodates a maximum stereo recording time of 87 minutes per side at 48 kHz and 16 bit resolution, whereas the 1.3 GB hard disk accommodates about 54 minutes per side.

The SCSI interface can also be used to connect a STUDER D741 CD recorder so that direct transfer from the MO recorder to CD-Rs is possible.

also features a serial 9-pin RS422 interface and a parallel port for faderstart and other inputs and outputs. It is also possible to control the D424-2 via an Ethernet port (network mode). ■

Interfaces

In addition to the controller interface for the STUDER remote control the connector panel



STUDER Service Seminars in 1996 / 2

96091E	Training Course	D424	english	11.09. - 13.09.96	3 days
MO-technology, operation, applications, explanation, servicing.					
96092E	Service Course	D741	english	16.09. - 17.09.96	2 days
CD-R-technology in general, operation, explanation of circuits, disassembling/assembling, alignments and servicing.					
96093E	Service Course	D730, D731, D731 QC D732, C221	english	18.09. - 20.09.96	3 days
CD-technology in general, operation, explanation of circuits, disassembling/assembling, alignments and servicing.					
96094	Service Course	A827	english	23.09. - 26.09.96	4 days
Operation, applications, ports, alignment of audio section, explanations of various circuits.					

(This List represents the actual situation. As changes are possible please check again prior to registration).

On Tour



.... to Regensdorf: Cooperation with China

STUDER is establishing technical links with competent companies in China with the aim of producing tape recorders for the Chinese market locally. The agreements contain also provisions for the necessary know-how-transfer; hence a Chinese delegation stayed several weeks in Switzerland for training.

The group picture shows not only the guests but also *Rolf Breitschmid* (first from left) and *Markus Kleeb* (4th from left), and *Rudolf Thomsen* (second row) who is responsible for the technical training.

Training Experts from Egypt

ERTU is one of the largest radio stations on the African Continent and STUDER has supplied a significant part of its audio equipment. At regular intervals the experts from this organization receive information updates, in this case hosted by *Antrainig Yereaztian* (facing audience).



Dr. Thomas Frohn

... and in Germany

Very often it is almost impossible to inform a user in all details during a busy exhibition. But how can we improve the communication? The idea was born in an instant: STUDER starts a tour across Germany.

Each major german city should be reached. So we decided to do a demo tour with 7.5 tons of technical material, a lorry and a car, which covered 1500 km in 12 days.

Our customers had been invited by letter and took plenty of advantage of the opportunity to study our products in detail. All new units



were included, so there was no lack of topics in our discussions. Especially in the systems business not only equipment but also services are in demand. And one of the most important one is and will be mutual exchange of information.

Report ORB — East German Radio Brandenburg



Eberhard Kaulbach

Following the German reunification the East German broadcasting system was restructured. This resulted in the creation of MDR (Mid German Radio) with its headquarters in Leipzig for the German States of Saxony, Saxony-Anhalt and Thuringia, whereas ORB for Brandenburg and Mecklenburg-Vorpommern was affiliated with NDR (North German Radio, Hamburg). ORB was based at the site of the former UFA film center (subsequently DEFA), in Potsdam-Babelsberg. Because of the time pressure and because property ownership was not yet clarified, ORB was installed in a large number of smaller buildings of the former DEFA. The television center was installed in House 38 and put into service on January 1, 1992.

For the 24-hour regional program ORB III, the ARD early evening and evening program, and a reserve capacity 3 continuity control rooms with STUDER 963 mixing consoles were installed, as well as STUDER tape machines, CD players, CD recorders and telephone hybrids. In addition video editing stations, audio dubbing rooms, magnetic media copying rooms, graphic complexes and recording studios were created, mostly based on analog technology.

Now, after almost four years, ORB has been granted property rights to its own section of the Babelsberg site. Planning for the ORB television center in Potsdam-Babelsberg, budgeted at over DEM 120 million, and its equipment

with new technology is now under way. Within 18 months a new building will be constructed and all the equipment will have to be installed.

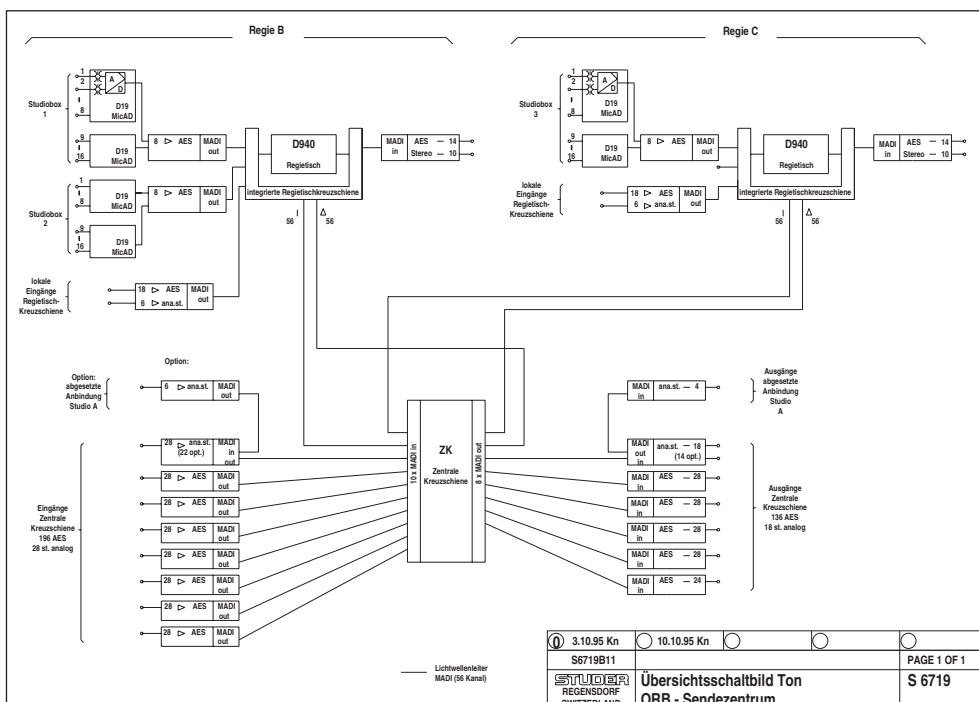
A new television switching centre and three broadcasting lines will be created. During the transition period a link to the existing continuity room A will be established; in parallel the two new studios B + C will be put in service.

The project covers video and audio postproduction, new editing stations, media copying and conversion facilities, a graphics department and for new, advanced video and audio continuity rooms.

ORB has decided to equip its new broadcasting centre with the latest technology, where operational reliability has been given priority over technical refinement. Over 60 employees will work with a large number of PC-controlled, networked equipment. Proven network technology rather than ATM was chosen.

STUDER, together with the general contractor BFE, will supply all the equipment for the audio section which will comprise two STUDER D940 digital mixing consoles as well as a large central MADI router. The choice of STUDER equipment also in the peripheral area demonstrates again the reliability of our equipment. A decisive point for choosing STUDER technology was the local service domiciled in Berlin

and the satisfaction of the ORB staff with the existing STUDER products. ■



News from the **STUDER - World**

- A Japanese technical magazine has appointed the STUDER D730 CD-Player «Component of the year».
- Based on the positive experience in the information and continuity complex (NISKO) situated in Zurich the French speaking sister organization Radio Suisse Romande (RSR) has also decided to purchase STUDER D941 digital consoles. Two consoles will be linked with the already existing MADI Router. The system will be completed by a NUMISYS II Radio Automation System with 36 satellite stations. A second, smaller NUMISYS II system will be used for training.
- STUDER DIGIMEDIA, after its relaunch last year, is gaining ground. Radio Pilatus, a private radio station near the lake of Lucerne starts operating a system with three large Pioneer CD-changers. This provides availability of up to 1500 CDs for immediate transmission. Control of the system can also be effected from a OB Van via telephone modem. For jingles and commercials the NUMISYS II hard disk system has been integrated in the system. In total worldwide 20 DIGIMEDIA systems are now in operation, as far afield as Portugal and Taiwan.
- Korean Broadcast Systems (KBS) goes digital: four STUDER D940 digital consoles have been ordered for the production department. A fifth unit will be integrated in an OB Van built by Shooke Electronics in San Antonio, Texas.
- RAI in Italy ordered for the production centres in Torino and Naples one STUDER D940 digital console each.
- ORB, the radio organization for the Brandenburg State in Germany, plans a TV production center. A small and a large production studio will be linked with two identical control rooms, equipped with one STUDER D940 digital console each. A MADI routing system enables not only the free allocation of external sources but also of the control rooms with respect to the studios. The MADI format is also used for the connection of stage boxes equipped mit STUDER D19 MicAD units (see also detailed report on page 15).
- The complete studio installation for Swazi Broadcasting in South Africa is supplied by STUDER. The order comprises 2 STUDER 916 mixing consoles, 3 A807 tape recorders plus speakers, cabling, and other peripheral devices.
- STUDER establishes very often cooperations with other companies mainly from the video domain in order to be able to offer a turnkey job. BTS (Germany) supplied the video equipment for a TV production studio in Warsaw (Poland); Studer supplied the audio part, especially a 980 mixing console. The customer PTV (Polskie Television) based this decision on the fact that the STUDER 980 is able to produce in DOLBY Surround as well as in 3/2-HDTV formats.
- Magyar TV (Budapest) started operation in the production studio 4, equipped with a STUDER 980 mixing console which allows the recording of different multichannel TV sound formats. An identical studio is under construction and is expected to open until the end of this year.
- China is expanding the infrastructure for international transmissions. For the new center of Chinese Radio International - actually being constructed - 30 mixing consoles STUDER 961 and one 962 were ordered.
- A large order from RAI (Italy) covering 80 STUDER CD Players and 10 A812 tape recorders underlines the good name the STUDER equipment has gained in the daily operation over the past years.
- The bilingual local radio station Canal 3 in Biel (Switzerland) decided to purchase a second DIGIMEDIA system for the french channel, after good experiences with a first system in the german service.
- The first private TV station in Europe, MTV in Finland, has decided to have an analog console in a digital news and production studio and installed a STUDER 980 40/8/4-2. Main reasons for the choice were the design flexibility in response to special requirements and «ease of use» in live situations without compromises in the functional performance.
- Joel Levy of Criteria Studio in Miami is now a proud owner of a STUDER D 827 MCH digital multichannel machine. After a short test phase he was convinced by the better sound.

- The newly appointed STUDER distributor in Norway, LydRommet AS, has signed a turnkey project for rebuilding the control room K15 with the associated studios S15 & S19 at NRK in Oslo. Due to budget reasons the studio could not be build in digital technology. To achieve, however, the same performance a STUDER 980 console with 24 Mic/Line with VCA faders, 4 stereo Mic/

Line with VCA faders and EQ, 8 stereo line/line Mic/Line with VCA faders and EQ was chosen, completed by 8 mono group and two stereo master channels. Customized producer talk back and monitoring facilities make this console ready to fulfill all the requirements asked for in a digital environment but with an analog prize tag. ■

A new branch in the STUDER organization

STUDER Paris

Not only from the aspect of culture or «high cuisine» it is good to have a branch in Paris - in our case the reasons were experience in the digital signal processing domain. A technical team reporting directly to Regensdorf is busy as a «center of excellence» within the STUDER-family especially in the field of software design.

On the picture we see from left to right, first row: *Luzheng Lu, Isabelle Douceron, Rudolphe Archimbault* and *Thierry Douceron*. Second row: *Alain Desavre, Patrick Guillou, Stephane Paul* and *François Charbonnel*. Not on the picture is *Alain Guillemin*.

The group is lead by Alain Desavre. ■



In memoriam

Audio Pioneer Dr. h.c. Willi Studer

Dec. 17, 1912 - March 1, 1996



Marcel Siegenthaler

We are stunned and grieved. Never again will we see our respected former boss, or «father», as many long-time employees endearingly called him. His distinctly soft voice is silent, his charismatic image has now become part of the fascinating audio history.

Willi Studer started his entrepreneurial career in 1948 in Zurich by building a small electronics equipment factory. The first products assembled by the small group of three employees were special oscillographs. But shortly afterwards, he started to specialize in the field of audio technology. The experience gained from the adaptation of US tape recorders for the European market gave Studer the confidence that he would be able to design and build such equipment himself and that it would be

even better and more reliable. He demonstrated this with the development of the now legendary «Dynavox». To keep up with production he expanded his operation to 25 employees by the end of 1950. In the following year he founded his own sales company, ELA AG. For his tape recorders he chose the brand name REVOX, the Dynavox became the Revox T26. In Parallel to this he started to develop a «big» tape machine with a 3-motor tape deck, the STUDER 27, for radio stations.

The first opportunity to test his new creation came sooner than expected. In his characteristically modest manner Willi Studer reminisced about the event in the editorial «Market-oriented products - The key to success» which

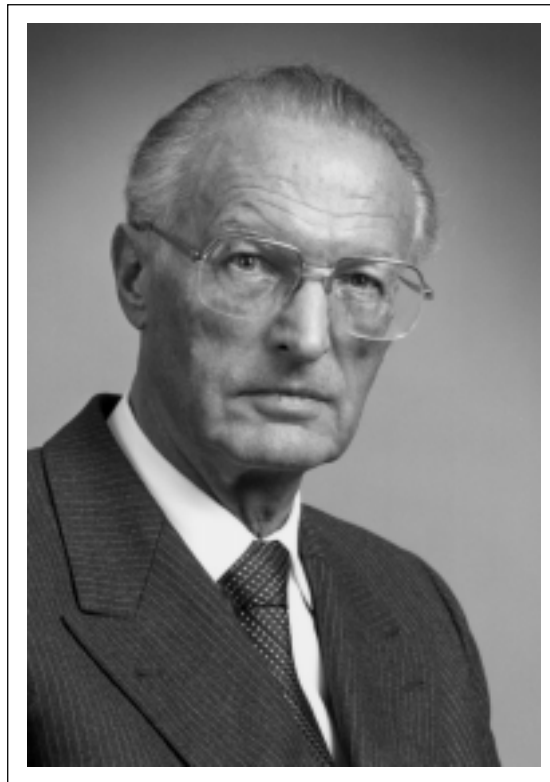
appeared in the January 1985 edition of the company's own technical journal, «Swiss Sound». It started with the following introduction: «In August 1951 I was given the opportunity to use a laboratory prototype of our first studio machine 027 in order to record

the concerts of the International Music Festival Lucerne together with the staff of the Radio Studio Basel. These were worrying hours because no-one knew whether the machine would last through the concerts of an entire evening and whether the tape pancake, which exceeded the 300 mm reel flange by as much as 10 mm, would do me the favour of not collapsing. Everything went well.»

The ice was broken, a stormy phase began. The next Revox tape recorder, the A36, was also equipped with a 3-motor tape deck. To

the delight of the tape hobbyists and the shock of the competitors, the Revox B36, with three heads followed in 1956. Professional tape/source monitoring possibility opened the non-professional market and degraded the existing recording technology to a consumer playground. With the A77 series in 1967, STUDER REVOX finally established a reputation for high-quality hi-fi systems. The series of pioneering developments, such as a servo-controlled capstan unit with a rugged asynchronous motor continued.

The years 1959 and 1960 were economically trying to the company. The new headquarters in Regensdorf-Zurich was under construction. At the same time technical problems occurred



in the conversion of the existing mono units to the new stereo tape recorder D36. Enormous delivery delays had to be overcome and an important development project, the Studer C37, was approaching the series production stage. This machine, which has become so famous today, helped Studer to further solidify its market share in the professional studio sector.

Almost at the same time distributorships were established, in England with F.W.O. Bauch Ltd., London, and in Spain with Telco Electronics S.A., Madrid. During this difficult period started the successful cooperation with EMT Wilhelm Franz GmbH, Wettingen/Switzerland, the purpose of which was to open the world market for professional Studer products. With the shipment of a Studer J37, the multichannel version of the C37, to the «Abbey Road Studios» in London for recording «The Beatles» a new milestone was achieved. The international breakthrough had become reality.

In 1965 a new plant for producing Revox tape recorders was opened just across the German border in Löffingen; this created the necessary room for expanding the professional product area. A new studio technology department began its activities in 1968. With the series production of the Studer 089 mixing console, it demonstrated that it was capable of producing high-quality audio mixers. This established the basis for broadening the professional product range.

What followed was the development «normal»

to a company with an ambitious founder at the helm. He systematically invested his earnings into the development of his life work. He showed little interest in private wealth, moreover «feeding» shareholders was diametrically opposed to his intentions. The charming, modest man and patron of classical music, Willi Studer, never believed in fancy words. Speeches which he was unable to avoid were always brief and to the point. As a man who rose early he was always the first one at work and took vacations only when other employees of his age were ready to retire. He was over 70 when he started the largest project in the history of his company, the development of a digital multichannel DASH tape recorder. Studer remained the only non-Japanese manufacturer to produce such highly complex machines.

The culminating point in the company's development was the year 1986. The Studer Revox Group had 2000 employees in its production centers and subsidiaries in 10 countries. The annual turnover reached SFr. 220 million.

In 1978 Willi Studer was awarded an honorary doctorate in Technical Sciences by the Swiss Federal Institute of Technology in Zurich. The greatest honour awarded by the audio industry, the gold medal of the «Audio Engineering Society», was bestowed on the audio pioneer, Dr. h.c. Willi Studer, at the 1982 AES Convention in Montreux.

We, his former employees and business friends, mourn the loss of a benevolent person.