STUDER REVOX

SWISS SOUND

VIEWS AND NEWS FROM SWITZERLAND

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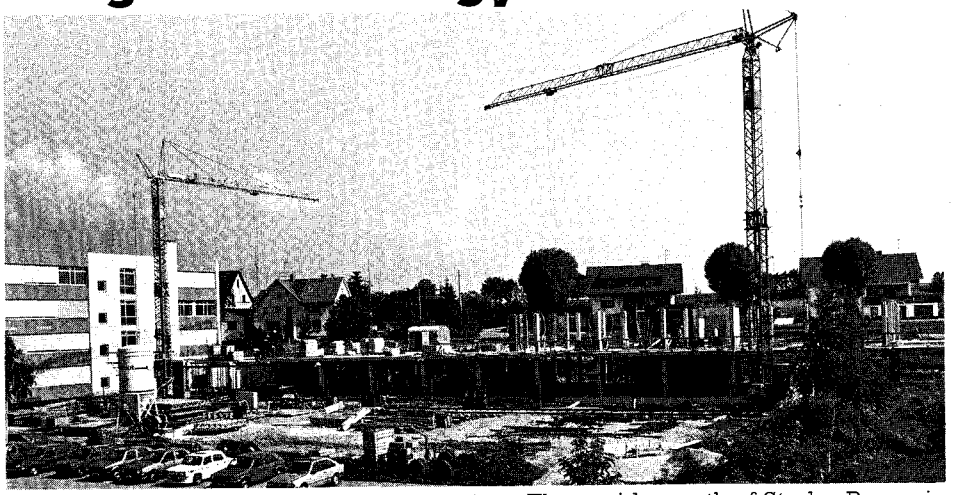
Editorial

Long-term strategy



Activities of Studer Revox Germany started in July 1964 with the foundation of the Willi Studer GmbH in Löffingen, a Black Forest area in the South of Germany. Two acres of acquired land and an almost immediate establishment of the company premises were the opening phase for a continuous growth of the company.

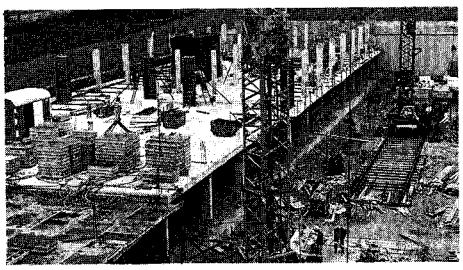
In 1965, the production of the Revox tape recorder G 36 was taken up in Löffingen; Willi Studer GmbH took over the distribution for Germany. The fast development of the company resulted in the further expansion of production premises in Germany and Switzerland.

1969, factory premises in Löffingen were enlarged and Ewattingen branch – Wutach today – was opened. For the realization of urgently required additional capacity, a further branch was opened at Bonndorf in 1972. A new company set-up in Bad Säckingen followed in 1973.

In July 1979, Studer Revox moved into new office premises at the Löffingen plant. Only twelve months later, new organizational structures of the German company group were adopted and the distribution of studio equipment detached to be carried out under separate management.

Today, Studer Revox is represented in Germany by three companies: the Studer Holding GmbH as the roof organization, its daughter companies Willi Studer GmbH as manufacturers and Studer Revox GmbH as distributors.

The rapid growth of Studer Revox is no mere expansion, as all decisions made were based on a long-term strategy. Following such careful methods, it was decided to give a greater scope to production capacity in Löffingen in order to include new products. The premises required for such expansion, covering an area of 30.000 sq. ft., will be taken over in the course of this year.



A forthcoming project, official approval still pending, is the extension of the Ewattingen branch by approx. 15.000 sq. ft. More projects of significant worth for future development such as construction plans at the Bonndorf and Bad Säckingen premises as well as the expansion of the print production in Bonndorf are still in the evaluation and planning stage.

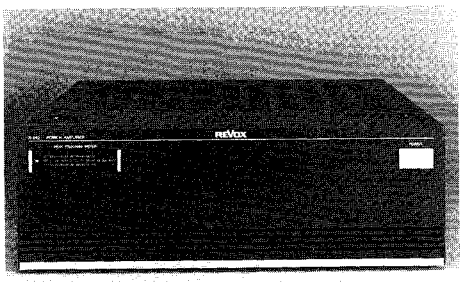
In resuming we may say that the upward-trend persists; the protection of our medium and long-term strategies will shortly result in investments of larger extent.

Rolf Neumaier

New high-power output stage Revox B242

Superb performance

"Power houses" they are called, the heavy output stages that look impressive even with an empty front panel. It's what's inside that counts. Even if the performance of power amplifier is principally defined by the output available on the terminals, there are still a number of factors that make up a Revox output stage. This is what its developer has to say about it.



High-performance output stage Revox B242.

The amplifier stage Revox B242 supersedes the well-known output stage B740. The objective of the new development was to introduce a product to the market that outperforms its predecessor not only with respect to power but also the technical ratings. This has been accomplished with advanced circuit engineering and consistent use of high-quality components.

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Main assemblies of the B242
Three assemblies are chiefly responsible for the quality of any power amplifier:

- Power supply
- Output stages
- Cooling system

The **power supply** (Fig. 2) of the Revox B242 consists of two totally separate power transformers and power supplies. Both power supplies offer a switch-selectable operating voltage (85 V or 64 V) to the output stages. Large input capacitors with 4 times 22,000 µF ensure ample current reserve when driving with low frequencies. An additional filtered voltage of 110 V is made available to the predriver stage. In this way the output stage can be optimally controlled which manifests itself in the improved efficiency.

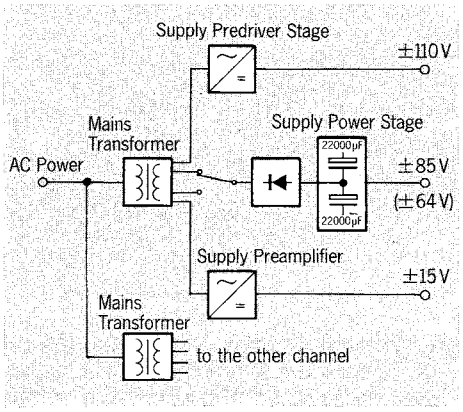


Fig. 2: Block diagram of the power supply (one channel).

The **output stages** (Fig. 3) are engineered in such a way that they feature very low distortion already without negative feedback, plus a sufficiently large bandwidth in order to attain a fast rise time.

Two push-pull cascode differential amplifiers with current reflector are responsible for the high linearity of the input stage and also for the low offset voltage on the amplifier output.

Cascode power sources, also in push-pull arrangement, are used in the predriver stages. The critical operation is not only the required gain but also optimal control of the driver stages. The design specifications call for minimal distortion (large quiescent current to signal current ratio) for achieving a very short rise time (quick charging of the input capacitor of the driver transistors).

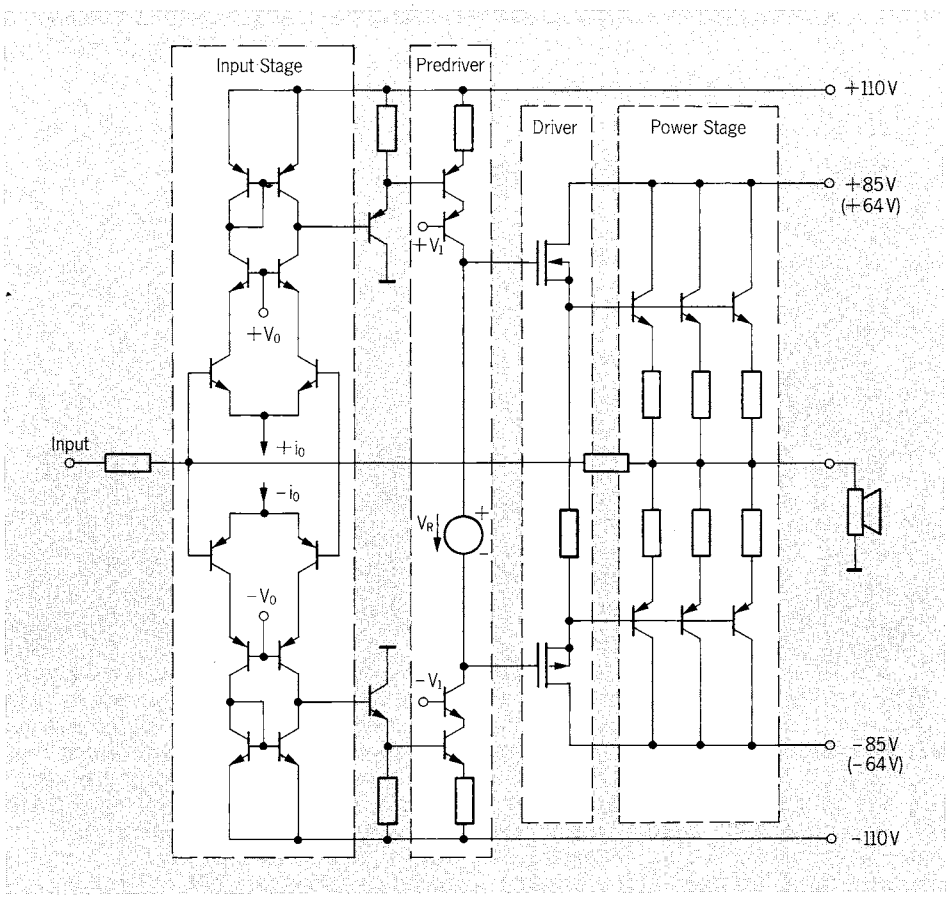


Fig. 3: Block diagram (one channel).

Fig. 4: The power amplifier stage Revox B242 features balanced and unbalanced inputs as standard feature. The gold-plated speaker sockets are laid out for cable cross-sections up to 10 mm².

The driver transistors are implemented with MOSFETs in source follower arrangement. Two times three parallel-connected 200 W transistors together supply a music power of 300 W per channel driven into a speaker impedance of 8, 4, or 2 ohms.

The **cooling** of the output stages is implemented with a so-called heat-kicker (heat pipe with convector) that provides a cooling surface of approx. 0.8 m². The heat exchange is supported by a low-noise ventilator. In normal use it runs very slowly and keeps the temperature of the equipment surface low. It runs somewhat faster under extreme peak loads to ensure adequate heat dissipation.

Other interesting details
The Wattage and the sound quality are not the sole criteria for a power output stage; the quality and usefulness are determined by other factors such as:

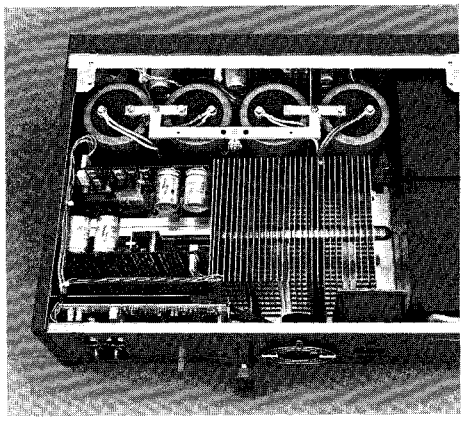
- The amplifier features balanced inputs for professional applications (Fig. 4). The outputs of the balanced input stages can be tapped on the connector panel. An equalizer for frequency response corrections necessitated by the acoustics of the room can be inserted between these outputs and the normal unbalanced cinch inputs for hi-fi applications.
- The B242 power output stage can be programmed with three rear-panel switches:

The first switch is used for selecting the correct supply voltage of the output stage for high-impedance (8 ohms) or low-impedance (4 or 2 ohms) speakers.

The second switch enables the automatic power ON/OFF circuit. With this feature the B242 output stage can remain continually switched on (standby function, power consumption only approx. 7 Watts). As soon as audio signals become available on the amplifier input, the unit switches back to normal operation. If no audio signals are available for approximately 7 minutes, the automatic circuit switches the amplifier back to standby mode.

The third switch selects between mono and stereo mode. In mono mode the two output stages (controlled by the left-hand input channel) work in phase opposition. In this so-called bridge circuit in which the speaker is connected floating between the two output stage outputs, an aggregate music power of 600 Watts is available to a single speaker.

- The only front-panel controls (Fig. 4) are the power switch with corresponding LED (power on), a pilot LED (heat) that turns on when the output stage is overheated(protective cutout), two potentiometers for adjusting the input sensitivity as well as the output meters for the two channels.
- Efficient protective circuits ensure safe operation:
  - Temperature monitoring of the heat sink and the power transformers.
  - DC voltage protection for the speakers.
  - Protection against power transistor overloading.



Emil Siki (40)
Graduated in 1970 as an electrical engineer from the Technical University, Budapest, with special training in studio engineering. From 1970 to 1972 he worked as an audio engineer for the Hungarian Broadcasting Service.
Development engineer at Studer since 1972. Development of regulation and control systems for A80, B77, A81, and A800. Since 1979 active in PCM laboratory on the development of the first laboratory specimen. Transfer to the Revox development department in 1983. After development of the microprocessor control for the B285 receiver, manager of the B242 development project.

Key technical specifications:
- Peak power: 300 W/channel, 600 W mono.
- Sine wave power: 200 W/channel, 400 W mono.
- Continuous power: 70 W/channel.
- Harmonic distortion: <0.03 % from 50 mW to 200 W/channel, 20 Hz ... 20 kHz.
- Signal-to-noise ratio: >117 dB.
- Damping factor: 200 for 8 ohms.
- Rise time: 4 µs.

Emil Siki

3-D coordinate measuring machine JOHANSSON Cordimet 1200

The Micrometer Computer

At the beginning of the industrial revolution there was the insight that series production would probably never be feasible without appropriate measuring devices. The same applied later to the manufacture of electronic assemblies. The following report on the new JOHANSSON is intended to give a brief description of how the mechanical measuring techniques in our modern CNC production are currently changing and what the consequences of this development are.

The term "quality inspection" has been losing its importance for some time. Quality used to be largely influenced by the performance of skilled workers. The key criterion was the inspection result, i.e. either "go" or "no go".

From quality inspection to quality engineering
By contrast, the emphasis today is on avoiding defects or deviations from the nominal size in order to eliminate those factors that adversely affect the quality right from the start. This means that components and assemblies must be inspected in all manufacturing steps so that only the interaction of mechanical parts and electronic assemblies and the adherence to the performance specifications need to be checked in the final product.

The modular design which STUDER REVOX has refined in its products over decades has greatly facilitated this approach of continuous inspection. But if quality is to be integrated in a modern and cost-conscious manufacturing system, also the efficiency of the inspections is of considerable importance. Particulary the large-scale use of CNC production machinery makes it necessary to employ programmable measuring techniques (CNC = Computer Numeric Control). Programmed measuring operations are clearly defined not only with respect to their sequence but they are fully reproducable at any time and are not subject to human peculiarities. They execute much faster and the results can be neatly and accurately logged by a printer.

This means that the measuring data can be fed back into the production more quickly and that they can be entered into the corresponding machine in the form of numeric correction data, either manually or even automatically.

In this way it is possible to satisfy the objectives of quality engineering – the result is uniformly high manufacturing quality, fewer rejects, less waste, and fewer headaches.

To prepare the way for this concept, considerable investments had to be made, around half a million Swiss Francs, excluding peripheral equipment and training!

Programmable 3-D coordinate measuring machine in the shop
This subtitle explicitly mentions "shop" in order to preclude possible misunderstandings. The Cordimet 1200 M from the renowned Swedish precision equipment manufacturer JOHANSSON is a measuring machine designed for

shop use and not for a specially air-conditioned room, even though its measuring accuracy is comparable to many machines that can only be operated in special measuring rooms.

The Cordimet weighs a hefty 4000 kg, alone the measuring table made of "Diabas", a rare black granite, weighs two tons. This type of rock which is some 500 million years old is considered to be the hardest and densest known granite and features a unique bending strength. Through the unsurpassed aging, these precision-ground and lapped stone slabs become ideal tension-free reference surfaces. Why this is so important can be demonstrated by the fact that the measuring accuracy is a few thousandths of a millimeter (micrometer) throughout the entire measuring range.

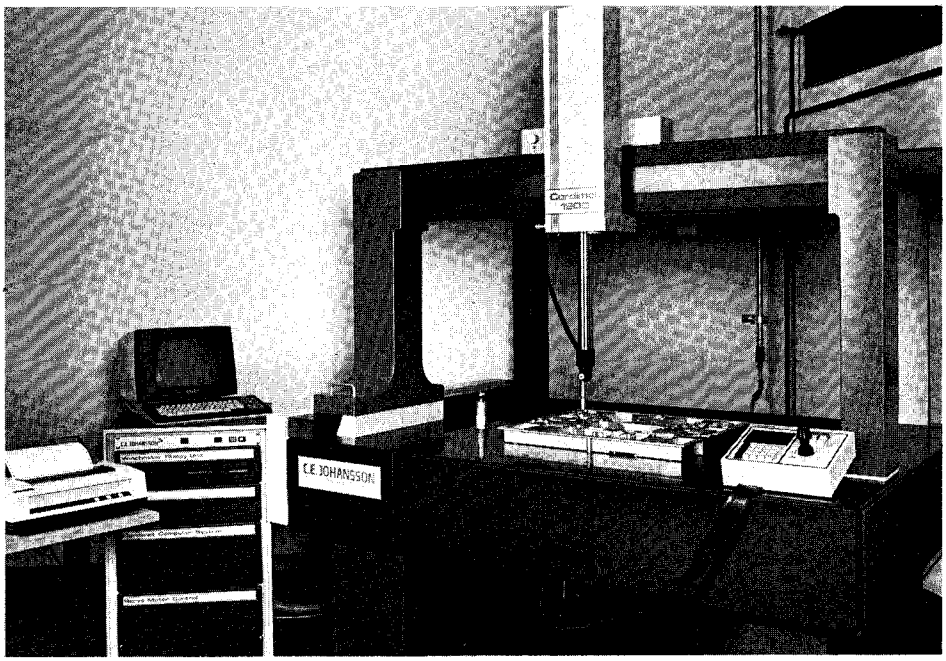


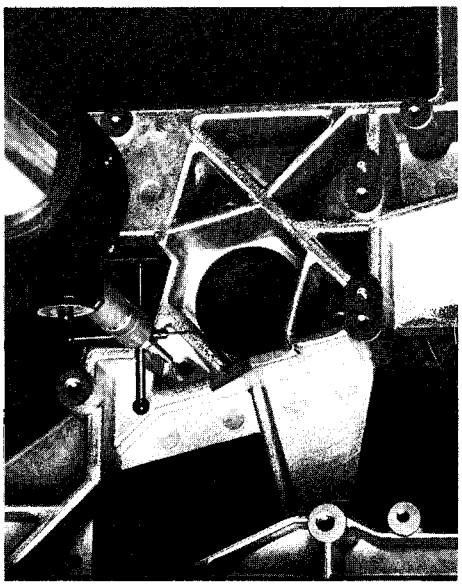
Fig. 1: 3-D measuring machine JOHANSSON Cordimet 1200.

Fig. 2: The measuring specialist interacts with the computer via hand-held terminal.

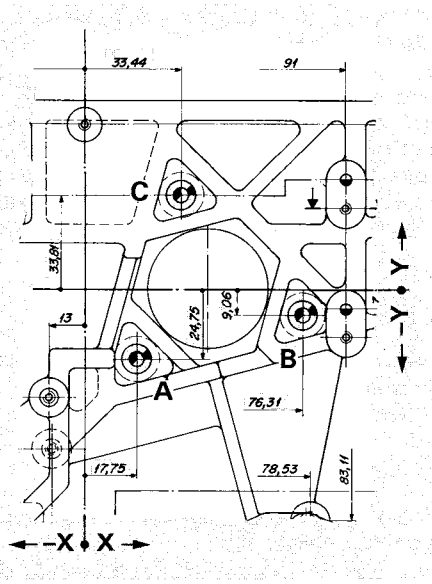
As the name implies, this 3-D measuring machine works in three axes (X = width 1200 mm, Y = depth 800 mm, Z = height 550 mm) with a stylus head that can be positioned anywhere within this space. A bridge travels across the measuring table in the Y-direction. The bridge support is also made of granite on which the sensing head mount travels in the Y-direction. For Z-axes the sensing head is moved vertically. All positioning movements are performed by electric motors and are generated either by the computer program or they can be controlled directly from a terminal (Fig. 2) in all three axes by means of a joystick. Because of the air bearing there is virtually no friction in the sliding motions. If the weight is unevenly distributed (e.g. sensing head mount on the far right), the resulting error is automatically compensated.

The machine operates very smoothly; the travel speeds from measuring location to measuring location can be controlled or programmed in increments of 0.01 to 10 mm per second or from 0.1 to 100 mm per second. The sensing head can be equipped with different probes fitted with ruby tips. These high-precision probes contact the workpiece with a force of only around 10 grams!

When the engineer has mounted the workpiece to be measured, the machine first calibrates the three axes on a stylus ball of accurately defined dimensions. During this process the fine deflections of the probe are measured and compared with the reference value. The inevitable deviations due to the finite deflection and time lag (from the measuring point to the measuring instant) are stored and compensated in all subsequent measurements.



Here the mounting holes for the capstan motor in the A820 tape transport chassis are being measured.



The corresponding drawing section illustrates the measurements for the capstan motor mounting holes.

NO.	RESULT.		IST ACT.VAL.	SOLL NOM.VAL.	Toleranz +TOL.	Toleranz -TOL.	Abweichung DEV.	Fehler ERROR
1	DURCHM.		5.340	5.300	.050	.000	.040	
2	X-DIST.	A	17.766	17.750	.100	-.100	.016	
3	Y-DIST.		-24.807	-24.750	.100	-.100	.057	
4	DURCHM.		5.313	5.300	.050	.000	.013	
5	X-DIST.	B	76.338	76.310	.100	-.100	.028	
6	Y-DIST.		-9.105	-9.060	.100	-.100	.045	
7	DURCHM.		5.340	5.300	.050	.000	.040	
8	X-DIST.	C	33.485	33.440	.100	-.100	.045	
9	Y-DIST.		33.765	33.810	.100	-.100	-.045	

The printed measurement report gives detailed information on the actual and the nominal size as well as the specified tolerances, the deviation, and possible errors. Resolution: 1/1000 mm.

Routine measurements with tutoring program or direct programming from dimensioned drawings

The Cordimet is equipped with an integrated computer system that includes a movable operator terminal which features a joystick and control keys for the sensing head movements plus a keyboard and monitor screen for direct dialog with the computer. The computer issues the necessary operator prompts and controls the sensitive machine.

A tutoring program can store and subsequently repeat as often as required all operating and measuring tasks that are to be performed based on a sample. No special alignment of the workpiece is necessary: the computer automatically determines the base levels and is also able to use any line as the base line for determining the dimensions.

The computer can be programmed based on the dimension drawings even before an actual sample exists. This means that already the first production sample can be measured immediately, regardless of its geometric complexity. This is obviously a prerequisite for achieving minimal idle times on expensive manufacturing equipment.

However, the Cordimet is not limited to measuring freshly machined workpieces. Because of its 3-D measuring capabilities, high measuring accuracy, and comprehensive computer software, it can also be used for measuring installed objects such as a completely installed tape transport assembly.

In summary, the Cordimet is a valuable investment for assuring the mechanical manufacturing accuracy and the quality of our products.

Marcel Siegenthaler

New Revox Piccolo Satellite System

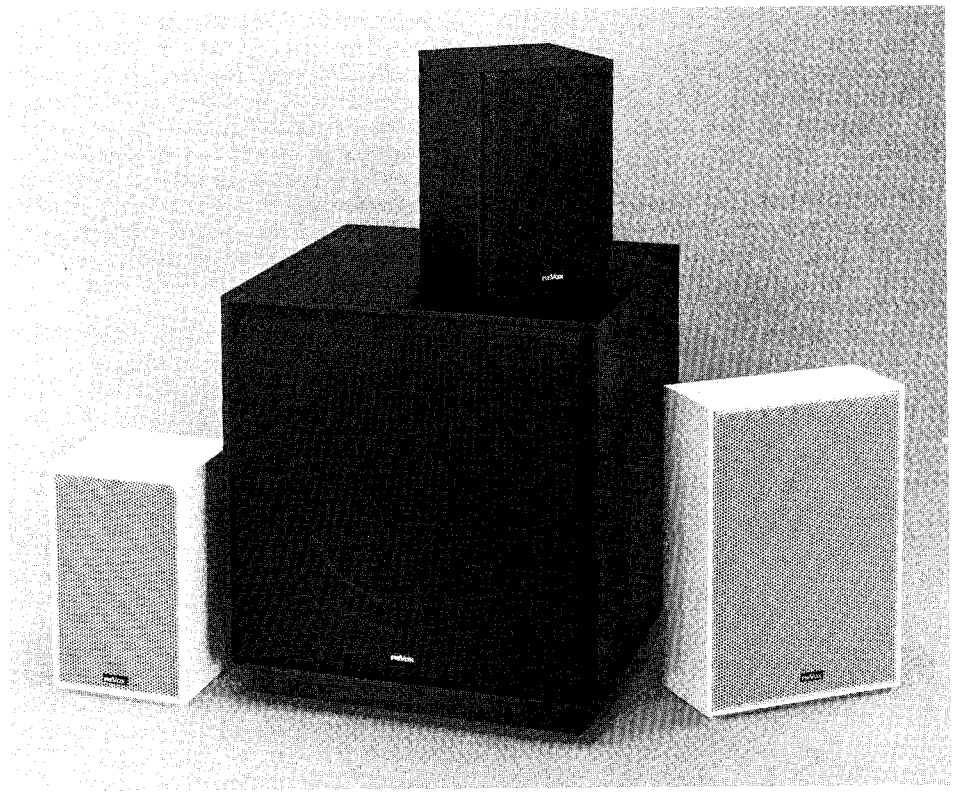
Understatement

Small speakers should not be scoffed at because it has long been proven that there is no linear relationship between sound quality and speaker size. The well-known Revox Piccolo has been redesigned and a new Flat box and a subwoofer system have been created.

Revox Piccolo MKII

The designation MKII indicates that this is an advanced model of a very successful speaker. The moving coil system has been fitted with a new rubber surround with improved roll-off and damping behavior as well as a new high-temperature resistant voice coil. The magnet system now features a protruding pole shank (like Piccolo Bass). The improved symmetry of the field lines results in a lower distortion factor.

The very powerful tweeter with a membrane diameter of only 17 mm is characterized by its outstanding sound radiation behavior. Its membrane weighs only 200 mg which means that it provides a fast response to frequencies up to 30 kHz.



Elegant and stylish: the Revox Piccolo satellite system with subwoofer, bookshelve speaker MKII, and wall-mounted Flat box.

The loss of components that are serially integrated into a speaker, i.e. choke coils or audio frequency capacitors, should be as low as possible because only in this way will the controlling amplifier be able to load the speaker.

For this reason the choke of the Piccolo bass chassis has an internal resistance of only 100 mOhm.

Revox Piccolo Flat
The completely new Piccolo Flat has been specifically designed for wall mounting. The box with the size of a DIN A4 page and a depth of only 95 mm has been optimized for wall radiation. This is accomplished by the crossover of the Flat because the speakers are identical to those in the Piccolo MKII.

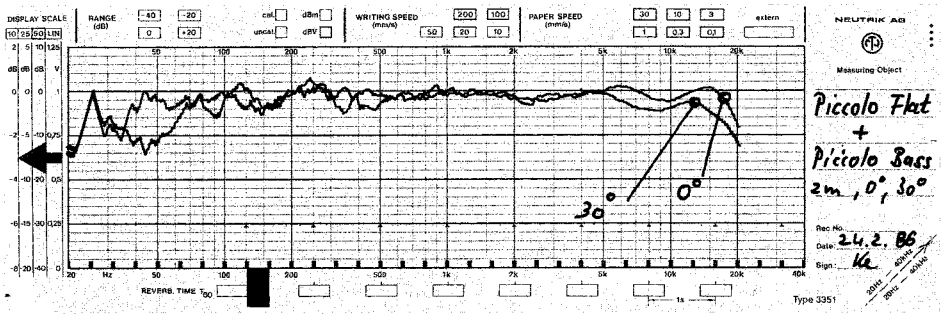
The Piccolo MKII and Flat have an outstanding radiation behavior – even outside the symmetry axis of the speakers.

Revox satellite system with Piccolo Bass
The central unit of the satellite system is a newly developed subwoofer, the Piccolo "Bass". Either Piccolo bookshelve speakers (MKII) or wall-mounted (Flat) speakers can be connected. The satellite system is based on the principle that low frequencies, radiated as spheric waves, cannot be located by the human ear. Since music signals are characterized and spacially assigned based on their harmonic content, it is possible to radiate bass frequencies as mono signals. A useful side effect of this principle is that the connected satellite speakers are relieved in the bass frequency range.

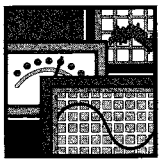
The stereo base is consequently processed by very small satellites that can handle frequencies down to at least 120 Hz. The lower the crossover frequency the less critical the positioning of the bass speaker in the room. With crossover frequencies of less than 100 Hz it would even be conceivable to position the bass speaker outside the stereo base.

Other novelties in the Revox speaker program will be described in one of the upcoming editions of SWISS SOUND.

Wolfgang Kelpin



The frequency response curves, measured in the listening chamber of our Ewattingen factory, show not only the excellent linearity but also the outstanding radiation capability of the system. Curves measured at the distance of 2 m, in the axis of symmetry and at an angle of 30°.



New Microprocessor development system HP 9050

CAD for Software

Without microprocessors, progress today seems to be virtually impossible! What started in 1978 with the initial use of an MP in the newly developed multichannel tape recorder A800, has long since become the standard approach. Not only the tape transport and motor functions but also the audio controls today are digitalized and implemented with microprocessors; other complex operation sequences such as can be found in time code synchronizing systems or in the PCM technology would be impossible to master without programmable logic elements. The software, without which all microprocessors remain unintelligent semiconductor packages, therefore plays a decisive role also in the future of our products. The following report gives a brief overview of our software development capacity which has been expanded a year ago.

With the addition of an HP 9050, the existing microprocessor development system (HP 64000) was expanded into a respectable main frame (host). The capacity for creating microprocessor software in the development departments automation, analog and digital machines, was thereby increased by 200 %, i.e. from 6 to 18 workstations. The system can be further expanded by 9 additional workplaces.

In contrast to the original system no standalone computers but only terminals are needed. The maximum configuration of the µP development system is 29 development workstations, all of which can be concurrently active.

Of particular importance in this expansion was the important fact that we were able to fully integrate the existing HP 64000 into the new host system. A special high-speed link permits fast data exchange between the two systems. Corresponding software controls all communications and ensures total compatibility.

But the benefits of the HP 9050 are not limited to the increase in the number of workstations:
- Both systems can share peripheral equipment (high-speed printer, plotter for software documentation, convenient EPROM programming units).
- Data protection and backup for both systems is performed on the HP 9050 and is fully automated, i.e. the daily and weekly backup procedures are initiated automatically by a digital time switch.

Peeking over the shoulders of the specialists ...
The new system is used strictly for software development, i.e. the creation and correction of microprocessor programs. Nowadays such programs can be very large, 50 Kbytes are no longer unusual!

In order not to lose track of what is going on inside such a "bulky" program structuring methods must be employed. The program is segmented into several independent blocks. Each of these program blocks is described graphically by so-called structograms.

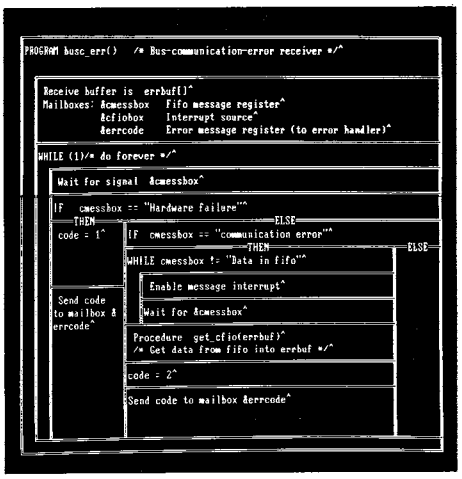
With the aid of these structograms the programmer can give his original text (source text) the required block

structure right from the beginning. Today the programmers have access to special programming "tools" for producing the structograms.

This means that the program sequences can be entered into the HP 9050 in the form of structograms which can be set up and modified by entering only a few commands. For high-level languages such as Pascal, the source text can be generated automatically from the structogram.

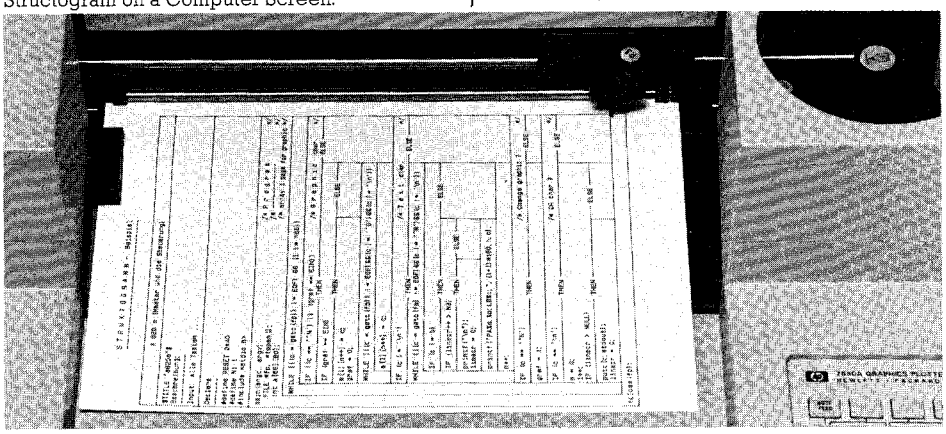
The software development tools also strongly support documentation of the software, i.e. the output of the programs on diskettes or paper. For documentation in printed from the structograms are drawn by a graphic plotter. If modifications are necessary, the structograms can be updated directly on the screen.

Since the introduction of the system, the implementation of in-house software and the use of soft keys on the terminals has greatly simplified the system operation. This applies particularly to the text editor on the host as well as to file transfers (via high-speed link) and the backup.

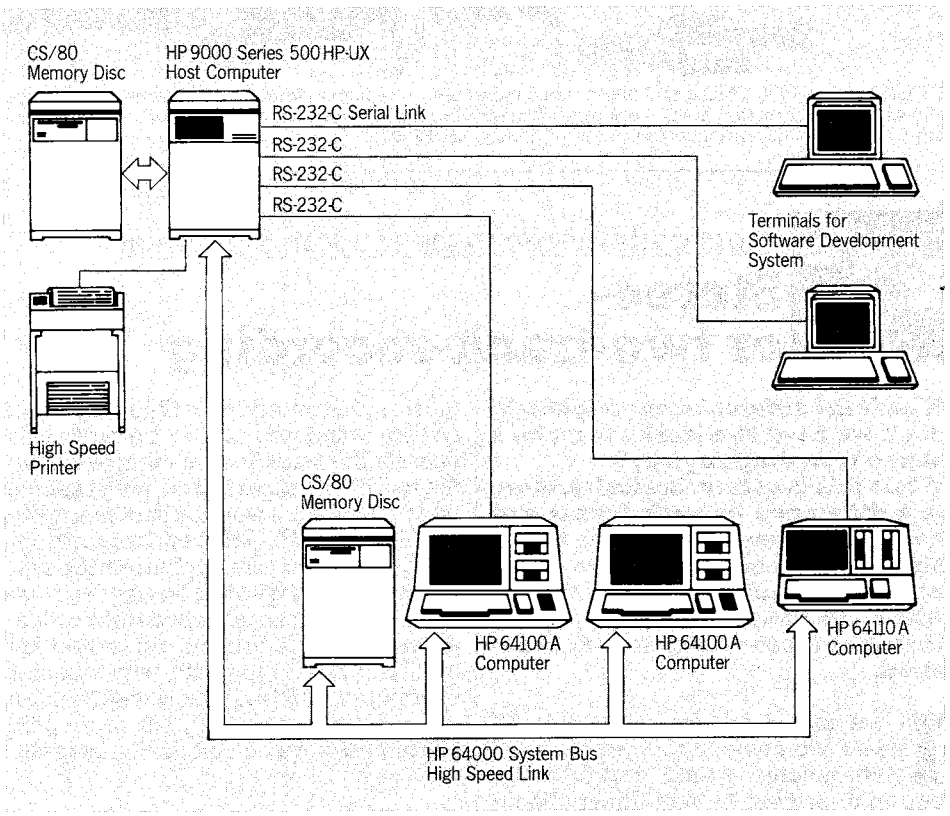


Structogram on a Computer Screen.

Of course, a comprehensive and complex program cannot be written to execute error-free in the first run. In addition corrections are always made necessary by practical tests. An emulator is, therefore, loaded with the program for testing and debugging so that all operations in the CPU (central processing unit in the microprocessor) can be traced step by step. Simple, in-house development emulators are used for the 6803 microprocessor while comfortable HP 64000 real-time emulators are available for the 6801/03 and 68000 processors.



Structogram Print-out (Plotter).



Hosted Development System (simplified sample configuration) for Microprocessor Software.

The system currently supports two microprocessors (others possible with different software and other emulators):

- 8-bit processor 6801/03 (assembler, Pascal compiler)
- 16-bit processor 68000 (assembler, C compiler)

In addition each development terminal can also be used for technical computations on the host (languages: C, Pascal, Fortran).

Key technical data of the HP 9050 system:

- 32-bit CPU (optionally two additional CPUs can be installed).
- 3.5 MBytes of RAM, expandable.
- 132 MByte disc with 64 MByte tape drive.
- 24 Serial interfaces RS232, expandable.
- High-speed printer, 300 lpm.

- Graphic plotter (format DIN A4 and A3), automatic cut sheet feeder, 8 pens.
- Unix operation system for 32 users.

Miodrag Milicevic

Miodrag Milicevic Graduated as an electrical engineer from the Technical University of Belgrad in 1968. Two years of development activity at Siemens-Albis in Zurich. At Studer since 1971. Project manager for language trainer development, Unisette cassette machine, CAMOS system for broadcast automation, commercials broadcasting system, and system controller SC 4016.

Visit of the ARD/ZDF production managers

Impressed visitors

For many years the production managers of the ARD/ZDF (German TV network) have been holding an annual meeting. The production managers of NOS (Netherlands), ORF (Austria), and SRG (Switzerland) are always invited as guests.

This year the production managers met in Zurich. Special work groups were set up for discussing all aspects of television production and for sharing experience and opinions. Such a meeting is usually concluded with a visit to a company that is engaged in the field of professional audio and video. The obvious company to visit this year was Studer.

The visitors were particularly impressed by the quality and precision-consciousness of our company and the well-illuminated and comfortable workplaces. Our guests were able to see for themselves that the precision, ruggedness and longevity of our products are not talked but rather built into our products even today when cost cutting and automation are the general trend.

Jean-François Raoult

Joint Venture Philips – Studer signed

On July 8, 1986 Philips and Studer have signed the recently announced J.V. agreement for research and development of CD-related professional studio systems. Each partner is holding a 50 percent interest in the newly founded Studer and Philips CD Systems AG. The management is formed on an equal share basis. Dr. h.c. Willi Studer will be the Chairman of the Board. Dr. Pieter Berkhout from Philips will hold the post of Managing Director.

The new products will be developed by the J.V. company using resources of both parent companies, pursuing mutually agreed product oriented goals. These will also be the bases of the distribution strategy for future products.

Dallas, April 14, 1986: Philips and Studer announced their intention to form a Joint Venture. Our picture shows the product managers W. Verkaik (Philips) and Bruno Hochstrasser (Willi Studer AG) behind existing professional CD products (Studer A725, Philips LHH 2000).

From early Stereo to the modern TC-format

Stereo- or two-track-recording

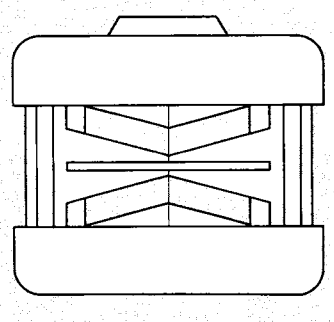
What's the difference, one might ask, don't we need two tracks to make a stereo recording anyway? While this is correct basically, there is a difference in track format and head configuration, when the aim is strictly at recording the two channels of a sterophonic sound event or when the greater flexibility, as afforded by the two-track format, is desired.

If we look back for more than 30 years, we come to the period when stereophonic sound reproduction began to appear in high-fidelity home music systems in the late fifties and early sixties. Standards had to be written to specify the track formats for recording the two channels required, and it seems that first mention was made of this in the well-known NAB 1965 Standard for Magnetic Tape (reel to reel). Therein it is said in paragraph 1.09 it shall be standard that the recorded tracks for two-track monophonic or stereophonic recording be 0.082 in. (2.1 mm) in width, with a center spacing of 0.156 in., which results in an unrecorded area of 0.074 in. or roughly 1.88 mm, as a quick calculation reveals.

The careful reader will have noted that two-track monophonic recording is mentioned as well, in other words, a format which allows a doubling of the tape's capacity when recording monophonic sound events. With the tracks being separated by 2 mm approximately, cross-talk between the two tracks would not be a problem, in fact a figure of not less than 60 dB in the range from 200 cps to 10 kc was specified. Cycles per second and kilocycles are terms used that time, they are replaced by Hertz nowadays.

The above mentioned track dimensions compare quite well with those mentioned in DIN 45500 part 1, issue 1971 (and possibly earlier ones as well) wherein the two-track dimension is specified with 2 mm for each track and giving a track separation of 1.85 mm, also specifying the same cross-talk performance of 60 dB.

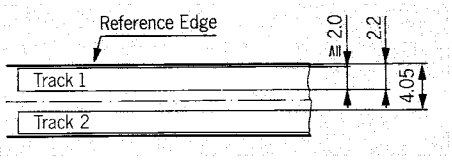
In both cases, therefore, the idea was that two separate monophonic recordings should be possible as well in addition to stereo, and this ment an erase head of suitable design was an essential requirement, to permit individual or simultaneous track erasure – a two-track erase head so to speak.



Butterfly head.

Comparing this with IEC recommendation 94 of 1986, we find for both, the two-track monophonic and stereophonic track formats, only the guard band specified, which shall measure at least 0.03 in. (0.75 mm), while a small note says: a guard track of 0.08 in. (2 mm) is sometimes used. No reference to cross-talk performance can be found, and it is rather doubtful that 60 dB could ever be reached with the mentioned track separation of only 0.03 in. (0.75 mm).

Reference flux was not very well specified in America in those days. A first paper on this subject, authored by John G. McKnight appeared in the journal of the AES in 1967 (with several revisions later on), while DIN had specified the flux level in 1955 already. For the recording speed of 15 ips (38 cm/s) it was given as 32 milli-Maxwell per millimeter (mM/mm) which added up to 200 mM on a



Two-track recording with 2 mm wide tracks.

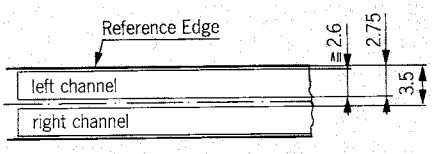
0.246 in. (6.25 mm) wide tape. In reality the flux amounted to 189 mM, because the recorded area on the tape is only 0.232 in. (5.9 mm) wide.

When German broadcasting systems began to make their recordings in stereo already, while their stations were still transmitting in mono, it was found to be an unsatisfy situation that such a stereo recording, when being played on a full-track reproducer, did not produce the same signal level as that available from a 200 mM full-track recording. The two 2 mm tracks with their flux levels of 64 mM each added up on rms basis, namely:

$$\sqrt{64^2 + 64^2}$$

thus their combined output fell short by some 6.4 dB of that from a full-track tape.

To compensate for this, it was decided to make the tracks wider, thereby resulting in less separation, because reduced cross-talk performance can be



Stereo recording with 0.03 in. (0.75 mm) track separation.

tolerated in stereo, thus coming to the 0.03 in. (0.75 mm) of guard band as mentioned in IEC 94. The same figure for the guard band can be found in DIN 45511, part 1, with the track width specified as being 0.102 in. (2.6 mm) each.

These wider tracks are now containing a flux of 83.2 mM per track, thus totaling 117.7 mM when combining them on the rms basis. Against the 200 mM (actually 189 mM) full-track tape, we are still lacking 4.1 dB. To compensate for this, oxide formulations were improved until 4.1 dB more magnetic flux could be recorded without any increase in distortion. Raising the 32 mM/mm by 4.1 dB, calculating

$$32 \times 10^{\left(\frac{4.1}{20}\right)}$$

we arrive at 51.4 mM/mm or 514 nWb/m, as we are used to specifying tape flux in our day and age. The two 2.6 mm wide tracks when combined are now yielding 189 mM and stereo-mono level compatibility was thus achieved.

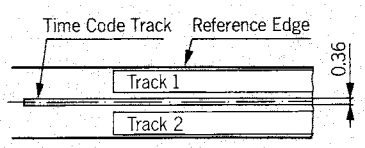
All this seems very simple when doing these calculations on paper. The difficulties are beginning, however, when it comes to construction of a head with only 0.03 in. (0.75 mm) separation of the two core sections. Where can the windings be accommodated? The solution is to be found in spreading the two cores apart in a V-like manner, to provide space for the coils. So the Butterfly head was created.

Equipped with such a head, the recorder is suitable for stereo work only – no two-track mono anymore, no separate erasure of the tracks – therefore, stereo recorders could now be equipped with full-track erase heads.

This was then practiced for many years to come, until new technologies and new methods of work began to enter the field.

It has become a widely accepted practice in the recording studios to interlock multitrack recorders with the help of the SMPTE/EBU time code to increase track capacity, and it is known that there has been at least one famous recording session (Donna Summer, "State of Independence"), in which eleven (!) 24-track machines were used to end up with the required number of tracks to cope with a particularly complex recording.

The time code interlocking technique slowly began to find its way into the video postproduction studios as well. There, however, one needs only two tracks for stereo at best, so we are left



Two-track recording with 0.08 in. (2 mm) wide tracks and 0.014 in. (0.36 mm) TC-track.

with the question, where to put the time code (TC) track. Back to the drawing board, one might say, and so the old track format for two-track monophonic was revived again (DIN 55511, part 7), because its 2 mm guard band provides sufficient space to accommodate the 0.014 in. (0.36 mm) wide TC-track, which is required.

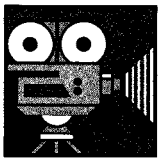
This, in turn, creates a new situation as far as erasure is concerned, because not always may it be desirable to wipe out the TC-track as well when making a new audio recording, For this reason, machines for time code work with sound heads for 2 mm wide audio tracks can be equipped with two-track erase heads, so as not to affect the TC-track which is on tape already. The Models A820-2 and A820-2 VU are an example. In other applications, however, a machine may be required which is capable of reading and recording the time code between the audio tracks. Here, individual erasure of audio and TC must be possible, as is the case on the A820-2 TC and A820-2 TC VU models.

By contrast, a true stereo recorder, such as the A820-0.75, will be equipped with a full-track erase head. Then there is the A820-0.75 VU, a machine which provides channel mode selection from the VU-panel, yet which will be used for stereo work only. On this version, the erase head is of the so-called overlapping type to ensure erasure the full width of the tape when making a new stereo recording.

A final consideration point to the question, as to whether it is worth nowadays to start paying attention to the differencies in the flux levels as used for stereo and mono work, because level compatibility can no longer be achieved, due to the fact that TC-tapes have only 2 mm wide audio tracks. By taking into account that modern tapes can be modulated up to 1000 nWb/m and more, it would seem to be a waste to stick to the old 320 nWb/m of DIN – a level which dates back to 1955 – when aligning systems in which PPM-metering is used.

If level compatibility for reasons of international program exchange does not dictate otherwise, it appears to be best to adopt 250 nWb/m (or perhaps even 320 nWb/m) as the operating level, when calibrating a system with VU-meters to the 0 VU deflection, because the VU-meters' lag of to 10 to 12 dB (see NAB 1965, footnote 4, and DIN 45406, explanations) behind true peaks will result in safe and undistorted recording of nearly all signal peaks. A peak program meter (PPM) – not being a true peak indicator as its name implies – is also lagging by some 2 to 4 dB, therefore, in systems with PPM-metering, the 510 nWb/m reference for 0-deflection will then result in flux levels for signal peaks similar to those in a VU-meter system, with the result, that VU versus PPM level compatibility will be achieved at least.

Josef Dorner



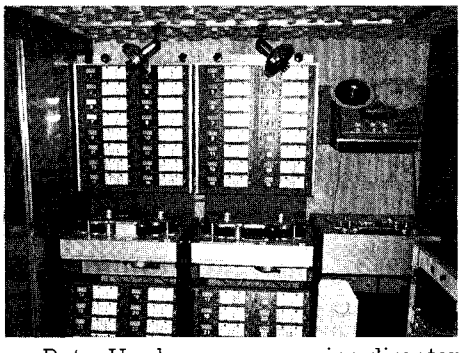
New sound production on wheels
by Audiocom Inc., Kerzers (Switzerland)

"Le mobile"

Having five years of experience in live productions for broadcast, television and record industry, Audiocom Inc. decided to realize a new, larger mobile sound studio.

The van, which was to be used, a Mercedes 1419 model, gave room for a mixing console of 218 cm (86 in.) maximum width, containing 36 inputs, 24 outputs and integrated patchbay. A Harrison MR-4 console was chosen; for recording purposes, two 24-track recorders Studer A80 VU-24-2" Mk IV equipped with audio remote control and autolocator were installed. As two-channel recorders, Studer A67 and PR99 were selected. An additional distribution panel in front of the mixing console for microphone inputs, communication lines and the two 24-channel outputs of the A80 recorders as well as a 30-pole connector panel in the mixing console's body were realized within the short time of three months between signature of the contract and first recording sessions. Specially designed 19 inch units with Studer Euro PC-boards containing a stereo limiter and a distribution amplifier for connection to external TV and broadcast remote pick-up vans are integrated into 19 inch racks together with a Studer CD player A725 and cassette tape decks A710.

"Le mobile" was acoustically insulated and pre-wired by the bodywork company and than delivered to Studer. Here the van was completed with mixing console and recording equipment within three days including tests of the entire system.



Peter Heuberger, managing director and joint-owner of Audiocom Inc., plans to install a Studer TLS 4000 in order to synchronize both of the A80 recorders, and also intends to add digital two-track and multi-track tape recorders. However, being a pure service company for other studios, "Le mobile" cannot afford to decide for any digital technology yet, but prefers to wait for the decision of the market – especially, as in general the success of the very promising DASH-format recorders is still to be expected.

We wish to "Le mobile" all the best and much success.

Bernhard Kohler

The Studer Group of Companies

"Who is who"

This column has been reserved for introduction of personalities of our companies and representatives in Europe and Overseas.

Roberto Beppato

Co-proprietor and president of Audio International S.r.l. (professional product range) and Audium S.r.l. (hifi equipment) ● born 1939 and grown up in Milane ● after compulsory school, studies at the Milane technical highschool ● commercial and technical training at Siemens Karlsruhe, West Germany ● married, 2 daughters.

Roberto Beppato gained first experience in the technical sales area with the Siemens group, at the ELA film sound department. In 14 years of employment with Siemens, he was busy setting up sound studios in Romania and Greece, and specialized in the installation of professional studio facilities. In addition, he participated in the establishment of sound reinforcement systems for two world exhibitions, namely Montreal (1966) and Osaka (1970).

After his return from Osaka, Japan, a mutual company was founded on the initiative of his business-minded spouse, Signora Guiseppa Munafó, mainly for the distribution of Neumann and Dolby products. 1975, Roberto Beppato got into business relations with Studer whose audio products the young enterprise sold to Italy's broadcast company – RAI.

A special incident links Roberto Beppato with RAI: on the occasion of a competition initiated by RAI in 1949 (the significancy of the Italian landscape was to be described), the young Roberto was awarded first prize for an article on the beauty of the river Po plains: a trip to Rome, accompanied by his parents. The very early connection with RAI was maintained by the winner up to this date.

At a time when colour television was already introduced in Europe, broadcast institutions also widened their technical horizon. Audio International S.r.l. represents Neumann, Dolby and a range of famous audio products; with Studer, the company increases its activities. Numerous studios in the market of Italy receive their equipment from Audio International; Studer comes first. 11 employees handle a respectable turnover which has multiplied since business started. Studer also increases its product range; prominent interested people – Adriano Celentano, RCA, Idea Studios, Baby Studios Milano – become customers and accomodate their studios with Studer machines. Audio International keeps close record of such installations by way of photo index, indicating all studio fittings. This facilitates efficient and expert complementation of existing equipment. "The customer comes first" – under this heading, Audio International S.r.l. has organized AES group travels in 1972 which have ever since enjoyed enthusiastic participation.

Roberto Beppato, an amiable personality, fluent in several languages, is a tough business man when it comes to retaining market shares; he does not even spare his suppliers. With an expert nose for possibilities in a business world filled with competitors, his generous attitude does not permit any mediocrity – an issue to which his staff has well adjusted.

Expert support in matters of administration, accounting and advertising is given by Mrs. Beppato, who turns the wheel of the company in addition to raising children and supervising the household.

On January 1, 1982, Roberto Beppato acquires the distribution rights for Revox hifi equipment, sold and serviced by

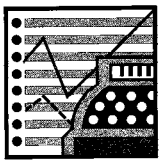
Firmly as a captain Mr. Beppato directs his company.

Audium S.r.l. throughout Italy. For better coordination of all sales and service activities, Audium and Audio International S.r.l. are accomodated at new company premises on the outskirts of Milane, combining sales and service for Studer Revox and other product lines.

His spare time is scarce, and there is hardly any left to maintain a hobby. Roberto Beppato collects audio old timers and has got a good selection of recorders, turntables, microphones etc. of early make in his possession.

Utter dedication to the needs of the customer is one of his principles. He reserves the common procedure and says "service first, sales after", and "put your money where your mouth is". His devotion to the job does not even spare his private sphere; he can be reached any time, even when on holiday. The genuine engagement for product and customers requirements has not only given him a firm position in the market; he also enjoys great esteem and prestige among his business partners.

Renate Ziemann



Right on Success

Studer worldwide

Denmark

Danmarks Radio DR

The Danish Broadcasting System has ordered four model A800 24-track recorders. In addition, thirteen type A810-0.75 and one A80 VU-3 layback recorder have already been delivered. By the way, 24 type A725 CD-players are in use at Danmarks Radio.

Chile

TV Channel 13

The first 900 series mixing console in South America was a 903 console with mastermix-automation for the Chilean television station "Channel 13". This was complemented by a 24-track model A800 tape recorder and one A810 with TLS 4000 synchronizer.

Shortly afterwards three 902 consoles were purchased by the state-owned Mexican television network Imevision, and two of the same 902 consoles were purchased by Coraven in Venezuela.

Sweden

Sveriges Television

Swedish Television was one of the first European television networks that decided to purchase the new Studer A812 tape recorder. Ten units of the type A812-2 TC and seven of the universal type A810 timecode-pilot tone machines will be delivered during the coming months.

Canada

CBC

An outstandingly large order was placed by the Canadian Broadcasting Corporation (CBC). It encompasses 77 A810 tape recorders, three A820, one A800 24-track, 22 PR99 tape recorders, four 069 and three 169 mixing console, as well as one 269 and one 902 console. In addition, the CBC has five A725 CD-players in use.

Orders from other Canadian studios were totaling two A820, three A810, one A800 24-track and two A80 VU 24-track.

From the record manufacturers Capitol Records and CBS and from one cassette duplicating company orders received add up to two A80 MR and two A80 QC machines.

Hungary

Magyar Radio

The state-owned Hungarian Magyar Radio has ordered another tape recorder Studer A800-24-2" and a mixing console 903 with VCA technology, 34 mono and three stereo inputs, 24 direct and eight group outputs. This console will be used in a OB van the first time in Hungary.

Yugoslavia

RTV Zagreb

Several regional broadcast stations in Croatia (Adria coast) have placed orders for totally three mixing consoles 962, one 961, 23 tape machines A812-0.75, one A80 VU-24-2", 16 Studer monitor speakers 2706, one tuner A726 and two tape recorders PR99.

New Patents

Speed control in a Motor Drive System

Several new patents have been granted to Willi Studer AG recently. This invention was made by Dr. Willi Studer and Arturo E. Stosberg. US patent 4,571,529 was granted on February 18, 1986.

For measuring the speed of motor drives, a tacho generator is used which supplies a frequency proportional to the speed. However, such generators are affected by interferences. The invention has a solution to this problem, as the tacho generator supplies an FM-modulated signal only, which has to be demodulated afterwards. After demodulation the signal is almost free of interferences.

Measuring the Time Difference between Two Sampling Times

This invention was made by Guy W. W. McNally, Dr. Roger Lagadec and Daniele P. C. Pelloni. The date of US patent 4,564,918 is January 14, 1986.

Within PCM systems an exact measurement of the first sampling rate is needed. Between the pulses determining the period the clock pulses of a stable oscillator are measured. The clock pulses are accumulated and divided by the number of cycles. This way, an optionally high precision is achieved.

Recording of Digital Data

US patent 4,562,489 of December 31, 1985 deals with the recording of digital data. Inventors are Philip S. Gaskell, Dr. Roger Lagadec and Guy W. W. McNally.

An additional channel of a multitrack digital tape recorder carries auxiliary data related to the signals in the channels. During recording sessions, this data is formatted into a block format by the electronics, compatible with the data format on channels.

Paul Zwicky

Forthcoming events

1986 August 27 - September 1
Fera, Zürich

1986 August 27 - September 7
Firato, Amsterdam

1986 August 30 - September 4
Peking Recording '86, Peking

1986 September 4 - 8
SIM, Milan

1986 September 15 - 21
SONIMAG, Barcelona

1986 September 19 - 23
IBC (International Broadcasting Convention), Brighton UK

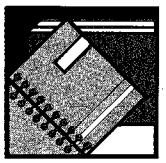
1986 November 7 - 9
Musicom, Nieuwe-Geim, Netherlands

1986 November 13 - 16
AES Convention, Los Angeles

1986 November 19 - 21
Inter-BEE, Tokyo

1986 November 19 - 22
Sound Engineer's Convention, Munich

1986 December 16 - 18
CTEAP, Paris



From the printers

10.29.0740 **PR99, B77 MKII** reprint from Swiss Sound (g)
10.29.0750 **PR99, B77 MKII** reprint from Swiss Sound (e)
10.29.0760 **Agora B** reprint (f)
10.26.0451 **Studer A807** leaflet (e)
10.26.0380 **Studer A820** technical data (g)
10.26.0390 **Studer A820** technical data (e)

Editors:
Marcel Siegenthaler, Franck M. Bürgi
Contributors of this issue:
Josef Dorner, Wolfgang Kelpin, Bernhard Kohler, Miodrag Milicevic, Rolf Neumaier, Jean-François Raoult, Heinz Schiess, Emil Siki, Renate Ziemann, Paul Zwicky.
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For further information please contact