A PUBLICATION OF STUDER REVOX

December 1990, No. 30

SWISS SOUND

NEWS AND VIEWS FROM SWITZERLAND

STUDER REVOX

D820 MCH: Analog signal processing

Analog for Digital

The introduction of digital technology has had a profound influence on audio recording. The sensational success of the compact disc has also had an effect on the professional sector: digital audio recording is now increasingly used in recording studios. With the D820-MCH Studer has created an ideal machine for multichannel recording wich supports the DASH format and features 48 audio channels on 1/2" tape. With a tape speed of 30 ips and stationary heads, the topology corresponds largely to an analog machine: each channel is assigned a track on the tape on which the data are stored sequentially.

With this report we intend to shed some light on the inner workings of the D820-MCH and describe a section of this machine which is only indirectly related to "digital" technology: The analog signal processing in the reproduce electronics of the D820-MCH. This circuitry ensures that the data recorded on the tape can be read back without errors and consequently fulfills an important function in the machine. At this point we should briefly explain the most important processes on the recording side.

Recording

Before an analog signal can be recorded digitally, it must be processed by an analog-to-digital converter. For various reasons the output signal of such a converter is not suited for direct recording on tape. For this reason it is transformed into a better digital signal by a special process. This stage is broadly referred to as a pulse code modulator (hence the name PCM) and supplies a signal whose information is represented as a sequence of polarity changes (edges) with the following characteristics:

- Edges can only occur in fixed time intervals. With a sampling rate of 48 kHz this interval is 434 ns.
- The space between two edges is an integer multiple of the time interval and can have a value between 3 and 9.
- The spaces between the edges contain the actual digital information, i. e. during reproduction it is only necessary to determine how many sampling intervals are located between two recorded edges.
- The signal is biphase, i. e. it makes no difference whether the polarity changes from high to low or vice versa. The information is simply represented by the presence of an edge.
- Except for a few exceptions, the time pattern with which these edges may occur is not restricted; all possible combinations are allowed in any sequence.

Figure 1 illustrates a possible pattern of the recording signal with corresponding edge spacing.

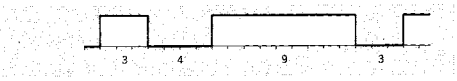

Fig. 1: Recording signal

Playback

Less technically oriented readers may be surprised that the analog signal processing in the reproduce electronics of a digital machine plays an important role. We must remember, however, that the reproduce head cannot supply any digital signals but only very low analog voltage pulses of approx. 30 µV which are superimposed by very strong noise.

In this respect the D820-MCH is no different than other digital storage devices with magnetic recording media: the floppy disk of a computer supplies similar signals. The digitally recorded signal must be recovered from the minute analog reproduce voltages of the read head.

In the D820-MCH this task is performed by the reproduce electronics which essentially consists of a preamplifier, equalizer, data detector and digital PLL. The task and functions of these elements are described in more detail in the following sections.

Preamplifier

The head signal is conducted via a short cable directly to the preamplifier where it is amplified by a factor of about 30,000 (90 dB). A peak voltage of approx. 1 V is now available at the output. With the aid of a special field effect transistor the inherent noise of the amplifier can be kept very low, which together with the large bandwidth of over 1MHz ensures correct reproduction of the signal.

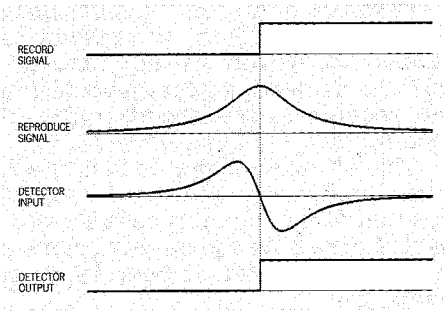

Fig. 2: Individual pulse

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Data detection

The main function of the analog reproduce electronics is to process the signals of the preamplifier in such a way that the output supplies a digital signal that corresponds as accurately as possible to the originally recorded data. For recovering the digital signal the peak values of the reproduce signal must be converted to digital edges as shown in Fig. 2. In the D820-MCH this is accomplished by differentiating the reproduce voltage. By differentiation each peak value is converted to a zero crossing which can then be accurately evaluated with the aid of a comparator. This evaluation is also referred to as data detection. At the output of the detector a digital signal is created (at least for an individual edge) which corresponds exactly to the recording signal.

Peak shift

In practice, however, this process is unfortunately not that simple. In order to store as much information on the tape as possible, the edges recorded on the tape are spaced very closely. The minimum distance between two edges on the tape of a D820-MCH is only 1µm! Due to the limited bandwidth of the record head / tape / reproduce head system, the timing of the peak reproduce voltages is shifted. This shift is caused by the preceding and succeeding pulses and is referred to as intersymbol interference or peak shift. However, since the information is actually conveyed by the time sequence of the edges, errors occur, i. e. the recorded data are reproduced incorrectly.

This effect is illustrated in figure 3. The reproduce signal is a linear superposition of individual pulses according to figure 2. As can be seen, closely spaced edges tend to move away from each other.

If this shift exceeds a certain magnitude, the spacing between the edges can no longer be correctly detected by the digital electronics, and a CRC error occurs. As in other digital storage media, an individual error does not lead to loss of data because the system is equipped with redundance and error correction facilities.

But under normal conditions the reproduce electronics should be able to detect the data without errors.

Equalizer

For this reason a circuit must be inserted before the data detection which shifts the peak values back to their correct locations. Since the error is caused by the insufficient bandwidth of the transmission system, a correction can be accomplished by electronically increasing the bandwidth. The corresponding circuit is referred to as an equalizer, because it basically has no other effect than boosting the high end of the frequency response. In contrast to conventional circuits (e. g. treble control on the amplifier) this boost must be phase linear, otherwise the desired effect would not be achieved.

Normally a delay line with several tapping points is used for this purpose. For the D820-MCH Studer has introduced a totally new solution. It is based on the vast experience in filter technology and is amazingly simple.

It is a straightforward passive series resonant circuit which, when correspondingly wired, causes a phase linear treble boost. In accordance with the machine concept, the magnitude of the treble boost can be controlled digitally in 8 steps. As a result the machine does not have to be aligned on the reproduce side with 48 potentiometers. The experience gained so far has shown that the manufacturing tolerances of the reproduce heads are relatively small, which means that it is not necessary to deviate from the default equalizer setting = 4. Individual alignment of the reproduce electronics is, therefore, not necessary. The machine can be switched on and used straight away.

Figure 4 illustrates the effect of the equalizer: The output signal corresponds to the recorded data and is virtually free of time errors. However, there is still a small problem with widely spaced edges: the differentiated signal drops to the zero line even though there is no edge in this position. The comparator must not respond here under any circumstances. For this reason it is disabled during this time by a supplementary circuit in the D820-MCH.

Accuracy

The required accuracy of the data detection becomes evident from the

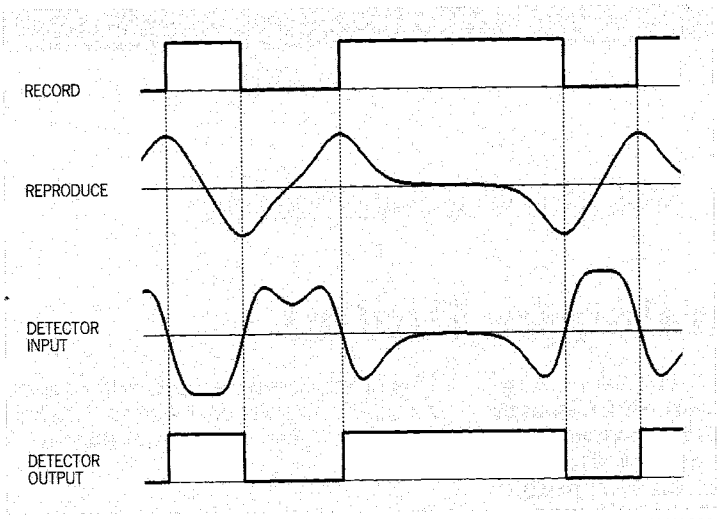


Fig. 3: Peak shift

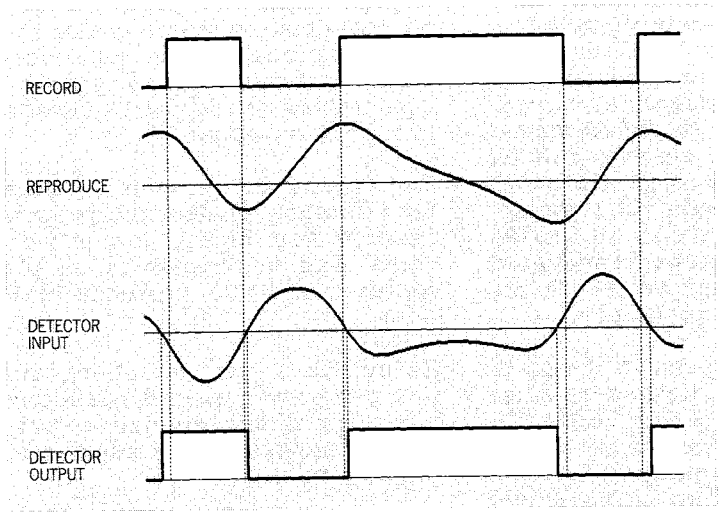


Fig. 4: Equalizer

description of the record signal. Since the only information required is the number of time intervals between two adjacent edges, the shift of the two edges must never exceed one half interval. In absolute terms this means a threshold of less than 217 ns!

Time shifts that exceed this threshold can no longer be compensated by the subsequent digital PLL and cause a CRC error.

Digital PLL

The digital PLL is responsible for the synchronization with the remaining digital electronic circuits and is consequently the final signal processing stage. It corrects all remaining time errors of the detector that are smaller than one half of a time interval, and it supplies a jitter-free, synchronized signal to the decoding electronics where the originally digital signal is restored.

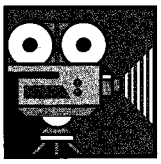
Practice

In practical applications the circuits described above have given excellent results. They are characterized by a large working range, their alignment is not critical and they perform well with tapes that have been overwritten many times (the machine does not have an erase head).

Compatibility with DASH machines of other manufacturers was a key requirement during the design phase and has in the meantime been confirmed by user reports. The error rates are generally less than 200 ppm, i. e. fewer than 200 errors in 1 million blocks (approx. 100 million edges). Most of the remaining errors are due to drop-outs which are either caused by defects in the oxide coating of the tape or a transient loss of tape-head contact caused by dust particles, or by tape deformation in the magnitude of a few micrometers.

Matthias Zbinden

Matthias Zbinden (30) Studied electronics from 1980 to 1986 at the Swiss Institute of Technology (ETH) in Zurich. After his graduation he joined Studer as development engineer in the applications laboratory. Fields of activity: Audio circuits with transformers, low-noise amplifiers, analog reproduce electronics of the D820-MCH. Since March 1990 he has been working in product range A (audio recording) as group leader where he is responsible for professional tape recorders.

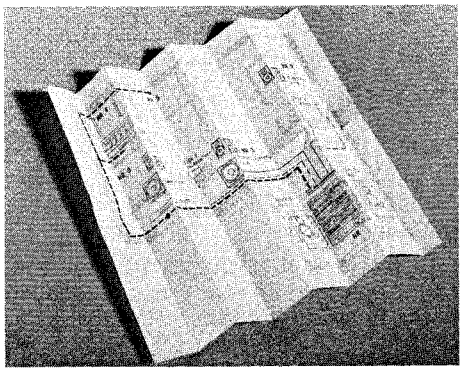


Revox Multiroom Remote Control System

A System behind the Screen

Remote control has a bright future. Different types of remote control devices for various audio and video equipment have been available for some time. Adaptive remote controls have been a bright spot in the jungle of remote controlled entertainment. But all houses and most apartments comprise more than one room, a characteristic that is totally ignored by traditional remote control units. Revox Multiroom is a modern system specifically designed for multiroom environments. It is adaptive and controls both video and audio sources.

The operating ease of the Revox components discreetly hides many facilities that are not readily noticeable. One of the principal assets of the current generation is that it is already equipped for future applications. For many equipment generations it has been the declared development objective of Studer Revox to offer to the user a range of value-retaining equipment that is beyond the fashion cycles of conventional hi-fi electronics. This means that even with the introduction of the new styling the link to the past has not be broken and no novelties of questionable value have been adopted.



In terms of far-sighted product development this means: Not only infrared remote control capability, but full support of the comprehensive code family is required if all relevant equipment is to be integrated into a communicating system by means of additional peripheral devices. In this respect, equipment feedback capability has top priority. No action should have to be taken without complete knowledge of the status of all hi-fi components involved. This is essential for achieving complete and meaningful convenience control. This is particularly important when commands (user requests) are initiated from ancillary rooms from where there is no line of sight between the equiment and the listener. But this is only feasible if powerful microcomputer systems are installed which in addition to their principal function of equipment control have sufficient capacity available for communicating with the outside world. The necessary information must be transmitted with a sufficiently high data rate so that the response time can be kept very short.

This applies particularly to values that are subject to rapid changes such as the counter reading of a tape deck or the playing time of a compact disc.

This is how the requirements are satisfied:

The series 200-S and 200 differ only in design but are technically absolutely identical.

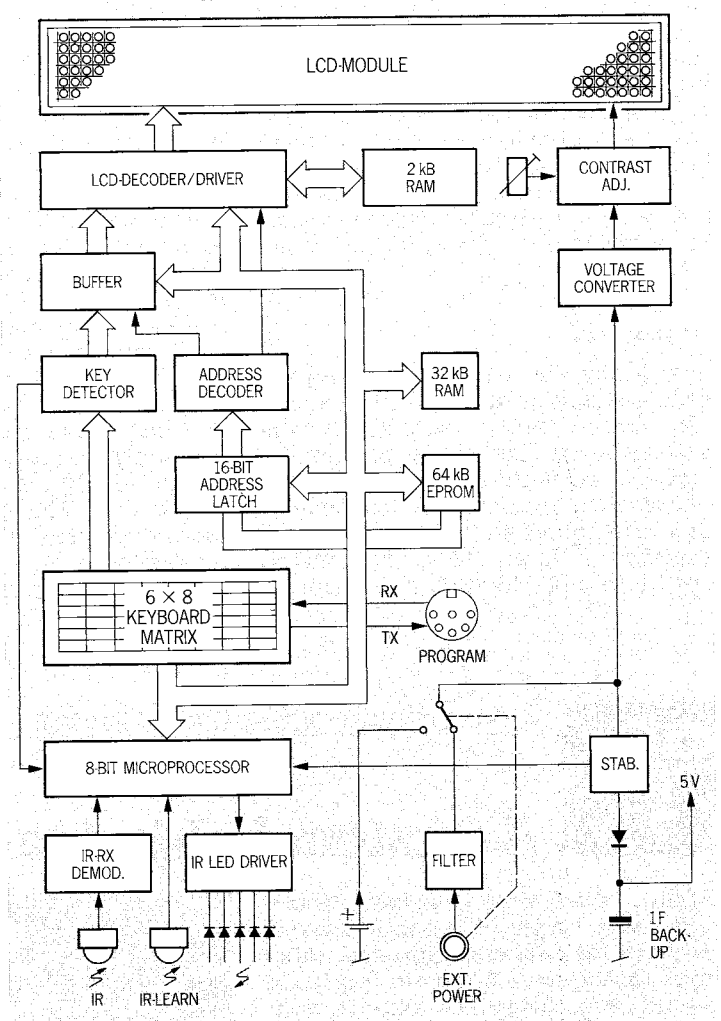
Together with the B200-S or B200 AUDIO/VIDEO CONTROLLER they support a wireless 2-way connection, i. e. transmission of IR commands from the hand-held B208 transmitter or the B210 desktop terminal to the system, and feedback of the system status to the B210 terminal.

Through the multiroom structure the feedback capability is basically available for ancillary rooms. The availability depends on the invest-

B 210 · Terminal

Circuit arrangement of the B 210 – some special features

The processor executes the commands originating from the keypad matrix and drives the LCD matrix display with 240 × 64 pixels by means of a special display decoder chip. This chip operates with a multiplex rate of 1:64. The IR commands leave the terminal via 5 power LEDs.
The received IR signals pass through the synchronous demodulator and are subsequently evaluated directly in the processor. The 8-bit system is organized in page mode because the RAM and ROM areas together exceed the address space of 64 K-bytes. The complete Revox instruction set is stored in ROM. All edited menus as well as all learned commands (up to approx. 120) are stored in the generously dimensioned RAM. With a special operating mode (COPY MODE) the complete RAM content can be copied within approx. 23 s to a second B210 via a 3-wire cable. This is highly useful for the dealer and simplifies the programming by strictly application-oriented customers. All circuit elements must be rated and designed in such a way that when the unit is switched to sleep mode after a selectable timeout (factory set to 10 s to extend the battery life), the power consumption does not exceed 150 µA.



Block diagram B210

ment of the owner. The full operating convenience can be achieved in phases, by first implementing a simple remote control from an ancillary room and later replacing the B208 with a B207 and B210, without requiring any changes in the installed cabling. If the owner already owns a B100 system with a CONNECTOR BOX, he can replace it with a series 200 system in the main room and integrate the series 100 components in the system by installing them in an ancillary room.

A particularly attractive feature of a system with B100 components: The CONNECTOR BOX is a low-cost alternative to the B200 which would otherwise be required to achieve maximum convenience. This box interconnects all SERIAL LINK interfaces of the system with the amplifier, connects the audio bus REC-OUT to the MULTIROOM cable, and also permits access to the REC-OUT which is required for tape copying between two units.

The most important limitation is the lack of feedback in the main room and from the MULTIROOM bus, as well as the lack of a compound control (one-button operation from the main or ancillary room).

How is such a communication system designed so that it can be physically installed without difficulty?

The generously dimensioned circuit technology of the Revox equipment with its very powerful output circuits (i. e. low output impedance across the entire frequency range) is one of the principal reasons why even in the most simple multiroom concept, with the connector box, long cables can be operated. For extreme cases the B200-S controller is generously configured: the balanced line management, traditionally used in professional applications, is suited for bridging even the greatest distances in residential installations. An additional advantage of this transmission method is its virtual immunity against interference signals. The fact that a bidirectional data flow is maintained in the same channel without affecting the audio data, clearly demonstrates the quality of the entire transmission concept.

Explanations to the block diagram of the B210 TERMINAL

The portable and battery powered B210 terminal features a carefully engineered circuitry around the HD 63B03 microprocessor (CMOS version) with 64 K-Byte EPROM and 34 K-byte RAM. The requirements are very demanding because a maximum current consumption of 50 mA with an operating voltage of 6 V was specified. In addition the RAM content had to be buffered during the time required for a battery change. For this purpose a capacitor rated at 1 Farad (!) has been used for the first time. It can buffer the memory for at least 30 minutes. The B210 circuitry can roughly be subdivided into 4 blocks:
– Equipment management with keypad scanning and command generation (in the case of externally learned commands also commands in non-Revox format).
– Decoding and control of the graphic LC display with 240 × 64 pixels.
– Two IR receivers for various transmissions formats as well as power stages for the 5 IR transmitter diodes.
– Special monitoring and stabilization circuits for the power supply of the processor system and the display.

Already during the early development phase, careful consideration was given to the selection of a suitable cable. This resulted in a range of pre-

fabricated cables, connectors, junctions and connecting boxes that can be configured to suit any environment, be they for fixed or temporary installation, planned into the design of a new home, or subsequently integrated into rooms to which structural changes are inadmissible. The same system can be used to achieve identical results with respect to high-quality audio and data transmission.

Structure of the MULTIROOM system

The full configuration with Revox audio components in the main room comprises the following equipment types (the example is based on the series B200-S but also applies to the B200:

- 1 × B250-S integrated amplifier with B200-S controller
- 1 × B260-S FM tuner
- 1 × B226-S CD player
- 2 × B215-S cassette deck
- 1 × B291-S turntable

For remote control:

- 1 × B210
- 1 × B207
- optionally also B208

The maximum configuration for a B100 system is as follows:

- 1 × B150 integrated amplifier, with connector box
- plus up to 4 units with SERIAL LINK connection
  (from the equipment series B160, B126, B215 and B291)
- up to 2 connections for B206 IR receivers
- as well as B208 remote control

It is also possible to include series B200 equipment into a B100 system, if feedback is not required.

What is required for installing a multiroom system?

In the main room:

- B250-S
- B200-S
- Source units as required, normally at least one Revox unit B260-S, B226-S, B215-S or B291-S
- B208
- In addition 4 source units with audio and video signal inputs can be connected to the system via the B200-S:
  – TV set B232-S or B234-S
  – 2 video recorders type B230-S, of which one with complete S-VHS connection
  – 1 additional video source such as a video disc player

Additionally required for bidirectional communication:

- 1 × B210
- 1 × B207
- and optionally also B208

For the ancillary room:

- B209, connected to an active speaker POWER CUBE or AGORA II
- External DC power supply, 12...15 V (if no active speaker)
- An external, local source unit or even a non-Revox system is feasible, but not required.

Additionally required for bidirectional communication:

- B207

Between the main room and the ancillary rooms:

a) For permanent installation:

- Special cable MULTIROOM
- Junction box(es)
  AP (surface mounted),
  UP (flush mounted)

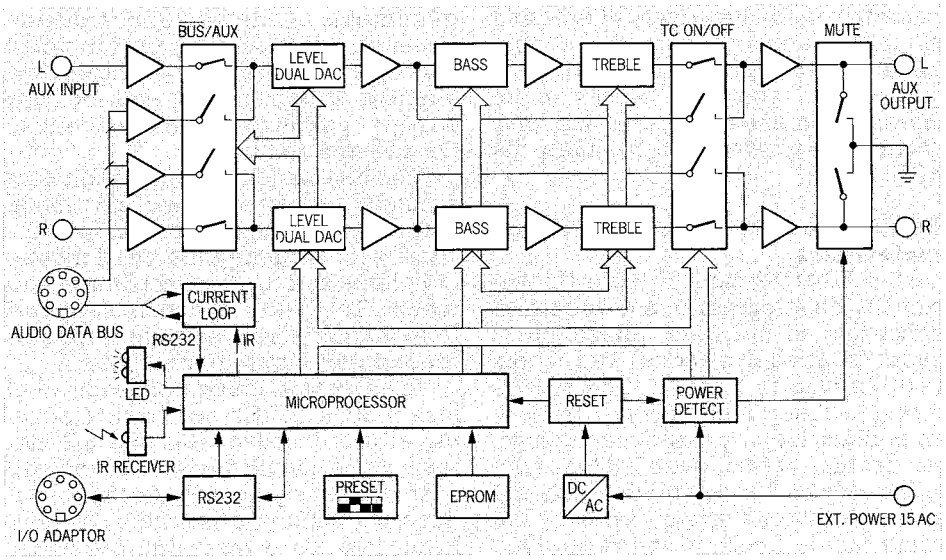
b) For temporary installation:

- T-junction boxes
- Prefabricated MULTIROOM cables (2.5 / 5 / 10 m) with connectors

Only one B208 or B210 IR transmitter is required because it can be carried from the main room to the ancillary rooms. However, additional B208s in the ancillary rooms enhance the operating convenience.

A system configured in this manner enables the user to select one of up to 10 audio sources from an ancillary room (the video sources are qualitatively equivalent to the entire Revox level and can also be used as straight audio sources without limitations).

This source selection is independent of the audio source momentarily active in the main room. This means that there is a free choice between audio information from the MULTIROOM bus and the locally selectable equipment installed individually in the ancillary room.



Block diagram B209

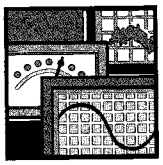
Explanations to the block diagram of the B209 SUBCONTROLLER

With the B209, a 2-channel audio signal can be looped from a preamplifier output to the input of a power amplifier (active speaker, separate amplifier, or non-Revox system). This signal path can be used for remote controlling the volume, balance, bass, and treble potentiometers via IR commands. The volume and bass controls are implemented with DACs. The volume can be adjusted within a range of 72 dB, the minimum step width is 1 dB. The level potentiometer is controlled by a microprocessor system via an 8-bit data bus. This microprocessor operates in the so-called expanded mode with external program code in EPROM. The IR receiver checks the validity of the received codes and converts them either to a local control command or, if required, translates them into a different code before it places them on the multiroom bus to the main system.
The status feedback requested from the main room is supplied to the Easyline bus in the RS-232 format and is taken to the B207 I/O ADAPTOR which modulates the local carrier frequency with the data stream.
The processor system is also used for correctly timing the power on/off muting as well as for reading the operating parameters set with the DIP switches.

How do you install such a system? The installation work itself differs little from ordinary electrical installations, such as mounting of plastic tubes, installation of wall sockets (surface or flush mount) and drawing in of the MULTIROOM cable. The conductors can be connected with screw terminals. The correct wiring arrangement is clearly described and illustrated in an installation handbook.

The post-installation test with the B210 is very easy because the dynamic feedbacks can be checked on the display in real time by pressing the corresponding source selection key. In this way both data signal paths are simultaneously checked for correct installation and wiring.

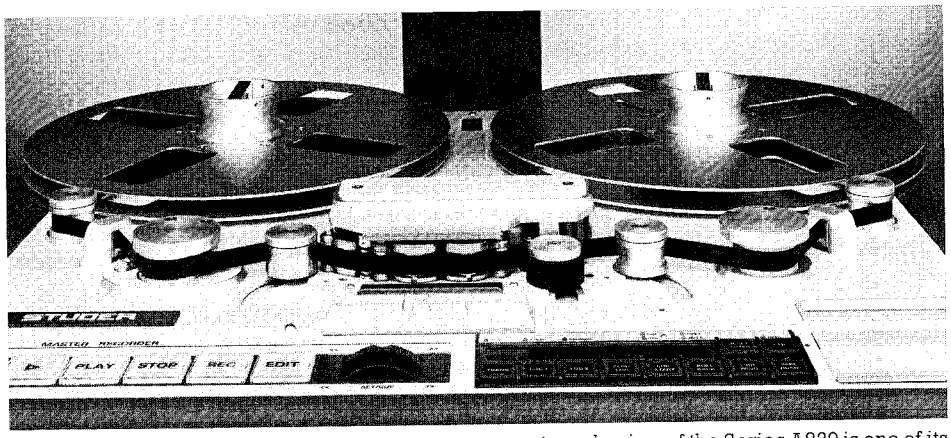
Marino Ludwig



Studer Master Recorder A820 MR

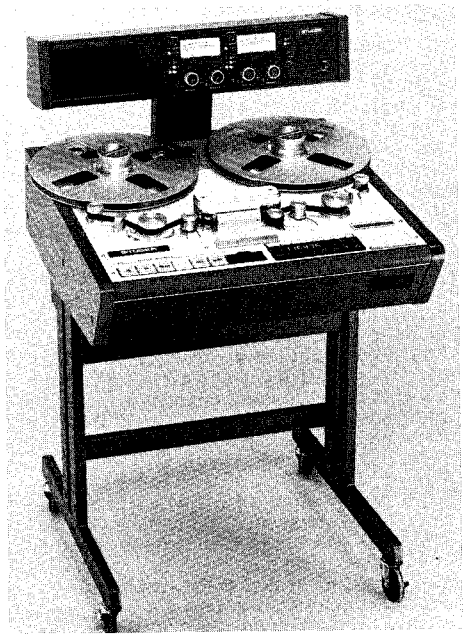
The Master is Back

The source material for high-speed cassette duplicating machines must be produced by high quality master machines. In such machines the design requirements of the headblock components, for example, are very demanding because the phase stability at low tape speed must be kept as high as possible. Because it is impossible to subsequently correct phase errors or wow and flutter errors, the development of master machines is a highly challenging task.



Tape deck of the A820 MR – the excellent tape transport mechanism of the Series A820 is one of its great strengths.

Worldwide many cassette duplicating factories are equipped with the master version of the Studer A80. For this reason the development of a corresponding machine from the A820 series was a logical step. Due to its excellent audio and tape deck characteristics, the A820 is eminently suited for use as a master machine. The microprocessor control that ensures gentle tape handling is only one aspect, equally important is the capability of entering all tape parameters on the control panel and that all audio data for each tape speed and tape type can be stored in memory. These are only some of the advanced features the A820 offers.



Studer A820 MR-2-1/2" VU with 14" tape reels.

Highly specialized headblock characteristics

On the A820 MR the 1/2" tapes (1" version in development) are recorded according to the track allocation of cassette tapes, i. e. tracks 1 and 3 (convertible also to 1 and 2). The source tape is subsequently played back in an endless loop by a duplicating master machine at 64 or even 128 times the nominal speed and copied to cassette slave machines that run faster by the same factor. Because the reproduce speed in the duplicating machine cannot be infinitely high, low tape speeds are essential for the master machine. For this reason the A820 MR is designed for 3.75 and 7.5 ips tape speeds.

This in turn imposes severe requirements on the headblock design because the tape deck performance must achieve an extremely high level already at the low speed of only 3.75 ips, particularly with respect to the phase stability.

The headblock chassis is built from a single precision-milled aluminium block that contains only a few recesses for mounting the head mounting plates and the tape guidance elements. The latter are manufactured from highly wear-resistant sapphire ground with ultrahigh precision.

In order to achieve a phase error of max. ± 20° at 10 kHz, mechanical accuracies of 1/2 thousandths of a millimeter must be maintained in the head gap zone! To satisfy such requirements it does not suffice to machine only the headblock zone with high precision. Also the quality of the tape itself and

the tape guidance throughout the entire machine must satisfy correspondingly high requirements. The secret: accuracy and stability (without which repeatable performance parameters could not be achieved).

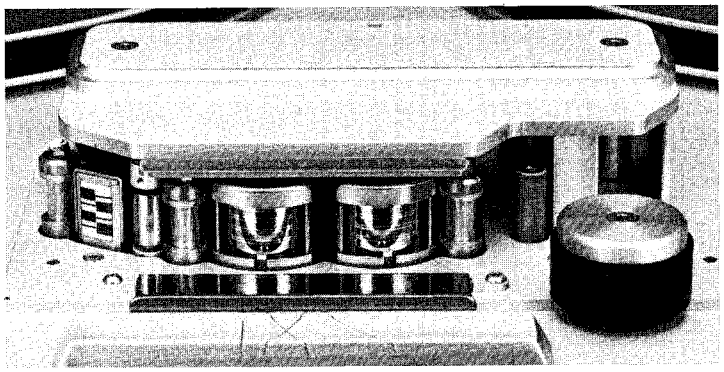
Only the sum of all characteristics makes a master recorder

The Studer A820 MR master machines offer numerous special characteristics. Essentially these comprise:

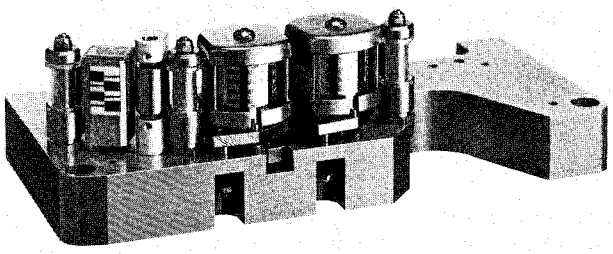
- Headblock equipped super long-life soundheads made from amorphous glass metal.
- Separately adjustable and storable parameters for ferric oxide and chromium or chromium equivalent tapes.
- Equalizations: NAB and CCIR, switchable.
- Equipped with switchable Dolby® HX Pro for achieving maximum dynamic range at high frequencies.
- Electronically balanced inputs and outputs (transformerless) for excellent sonic performance.
- Various optional serial interfaces [RS 232; RS 422 (SMPTE/EBU)]; transport remote controls and remote counter; noise reduction system interface) available for adapting the machine to special application requirements.

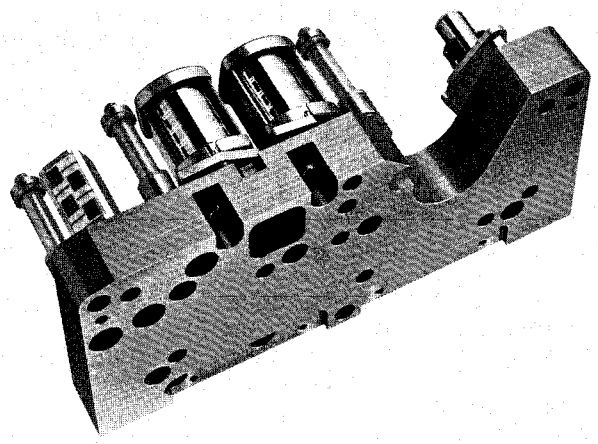
Cassette duplication is a delicate operation which for price reasons must be highly efficient. The Studer A820 MR has been specifically designed for this purpose based on the motto: „What is not on the master will never be on the cassette".

Marcel Siegenthaler

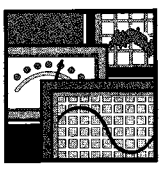


Headblock of the 1/2" version with sapphire tape guidance elements.





This paste-up illustrates the design of the 1/2" and 1" headblock versions together with the highly stable chassis machined from a solid block.



Studer Automatic Alignment Program

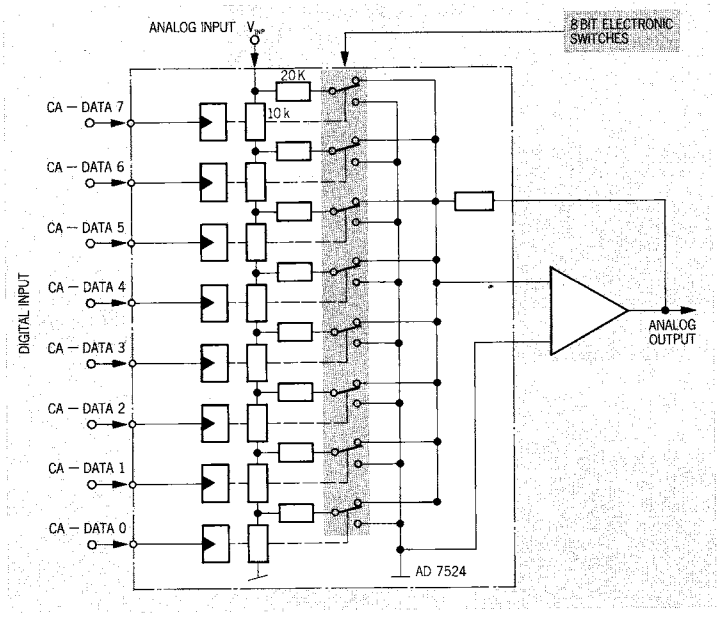
Automatic calibration of tape recorders

The calibration of a tape recorder is a time-consuming unproductive task. An ideal tool for minimizing such idle times is the computer-controlled automatic calibration. In the following report the author explains the automatic calibration process and the measuring equipment configuration.

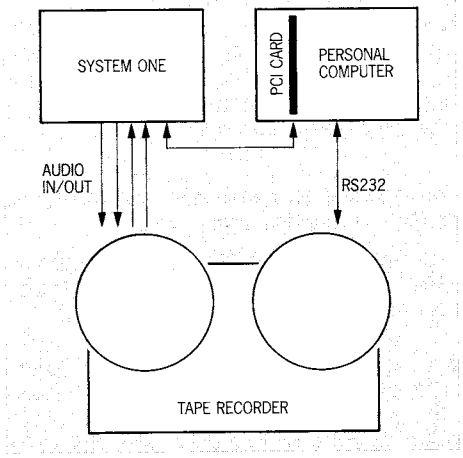
The most important prerequisite for automatically calibrating a tape recorder is to install multiplaying digital/analog converters (so-called MDACs) in the audio paths. This eliminates the need for conventional potentiometers, and the audio parameters (record and reproduce settings) can be established by the microprocessor via the data bus. Since the parameters can be set by the microprocessor, they can also be downloaded from a PC into the microprocessor via the RS 232 interface. The MDACs used in Studer machines have a resolution of 8 bits or 256 steps per adjustment range. The first Studer machine featuring such components was the A810. Already in the color brochure of the A810, printed in 1983, the automatic calibration facility was mentioned.

Automatic calibration of an A820 MCH

The Studer A820 is the first professional tape recorder on which the automatic calibration is menu driven.



The DAC is the link between the digital control electronics and the analog audio electronics.



System configuration

Within 30 seconds, the corresponding parameter can be set simultaneously for all 24 channels. Of course, the channels can also be aligned individually.

Studer Automatic Alignment Program "SAAP"

Of course, automatic calibration and setup logging saves much time not only on multichannel machines but also on 2-channel machines. For this reason a host resident "Auto Alignment Program" has been developed. The impetus for this development arose out of an interesting situation:

Four years ago, Bob Metzler, board chairman of Audio Precision, Oregon, USA, demonstrated to us a small calibration routine that was able to align the frequency response of an A820-¼". This meeting resulted in intensive cooperation between the specialists of his company and those of STUDER REVOX Nashville (USA) and STUDER INTERNATIONAL AG, Switzerland. The softwareprogram was continually enhanced and is currently managed completely by STI. It is important, however, to continually adapt the program to new requirements.

This program can be used for calibrating the 2-channel tape recorders A807, A810, A812 and A820. A personal computer and a SYSTEM ONE measuring instrument (from Audio Precision) are required for this purpose. The PC must be configured with 640 kB of memory, a hard disk, a serial interface (Com 1) and a parallel port for the printer and a vacant slot for the SYSTEM ONE interface board (PCI).

During the calibration process the computer program sequentially controls the measuring instrument (SYSTEM ONE) and the tape recorder. The audio control data are transmitted via the RS 232 to the CPU and from there to the DACs which adjust the audio path until the program records the desired level from the measuring instrument.

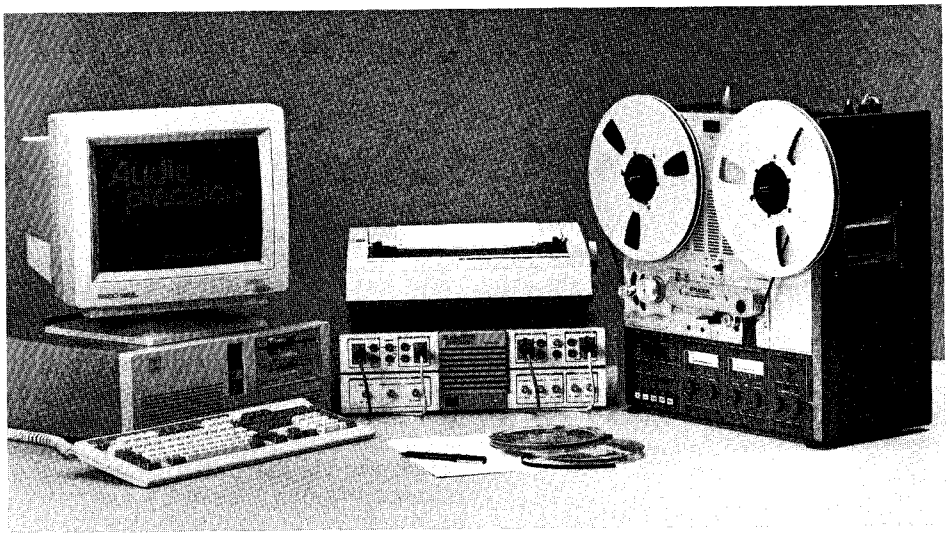
In addition to the audio control data, also tape deck commands and status inquiries are transmitted. The interaction of all units under central control of the PC results in a closed loop that remains in effect until the calibration process is terminated.

Functions of the individual program blocks

a) Repro

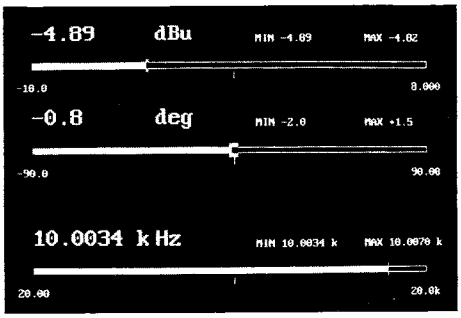
The Repro function establishes all reproduce settings. In the first menu the user can select the desired line level, the reference tape, the equalization, the machine type, and the model number, and decide whether the parameters are to be stored in the register for tape type A or B. The reference flux must also be specified.

In the next menu the user can select: Calibration only, measurement only, or both. For measurements that are outside the tolerance, the user can specify whether a warning tone is to be activated and whether or not the program should stop. The user can then mount the reference tape and start the program. First the azimuth alignment is



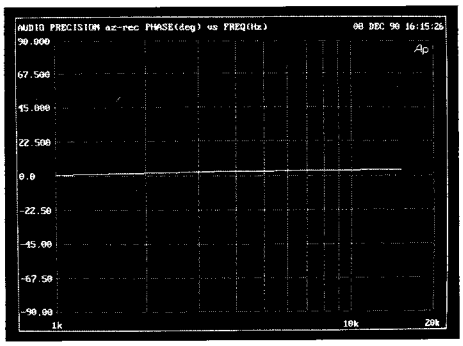
Calibration configuration for a Studer A807 with SYSTEM ONE from Audio Precision, and a personal computer.

performed. This procedure runs semiautomatically because the reproduce head must be adjusted mechani-



Azimuth alignment

cally with a screwdriver. When the user is satisfied with the setting, he can confirm this by pressing a key and continue. The remainder of the calibration process runs fully automatically: The level and the treble boost are adjusted. The tape is then rewound and



Azimuth alignment

the machine switches to play so that the calibration can be checked. For this purpose the levels of each frequency are compared with the values in the tolerance list. This process is repeated for all tape speeds to be calibrated. The time required for each speed is approximately 2 minutes.

b) Record

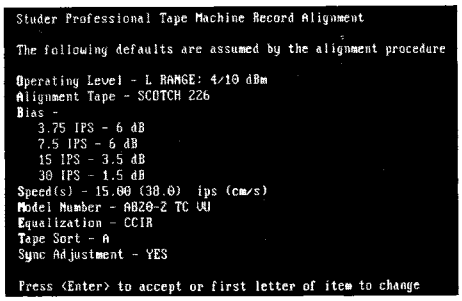
The record alignment is started by loading the record routine. In contrast to the repro section, all 4 possible speeds can be calibrated without manual intervention in the automatic process. The only exception is the azimuth alignment which only needs to be performed once at the lowest selected tape speed.

In the first menu the user can again select the line level, the machine type, and the model number, and decide whether the audio parameters are to be stored in the register for tape type A or B.

He can also select one of over 20 tape types. As a very user-friendly feature, the correct bias values are automatically loaded, based on this selection. After the desired equalization and tape speed have been selected, the second menu is called which offers the same functions as in the reproduce alignment.

First a coarse level and bias alignment is performed, followed by the azimuth alignment for which mechanical adjustment of the record head is neccessary. The remaining procedure is fully automatic. The level and the bias are fine adjusted. With treble and repro bass the corresponding equalizations are set. The reproduce equalization (bass) is set in record mode due to the fringing effect. As the last step, the level and equalization (treble and bass) for the synch channel are adjusted. The calibration process is now completed.

All measurements for the log are now performed, compared with the tolerance table and stored. The entire calibration process for an A820-1/4" with synch channel and 4 tape speeds takes approximately 20 minutes.



The automatic calibration process is simple and easy to follow because it is menu driven.

c) Report

With the report routine it is possible to display the data of the calibrated machine on the screen or printed on a 2 to 3 page log. This report essentially contains the deviations in the frequency response and the values for distortion, phase, cross talk, wow and flutter, end erase efficiency. The audio parameters, tape tensions and (if the machine permits) also the software date are read out and printed.

"SAAP", the calibration program created by professionals for professionals

The "Studer Auto Alignment Program" is characterized by outstanding user-friendliness and flexibility. For example the user can expand the table of record and reproduce tape types himself and create or modify the corresponding bias and threshold tables. The program can be used for service purposes, quality assessment, or data comparison, as required for example in broadcasting corporations. The objective of this program is to save valuable time and to ensure uniformly high calibration accuracy. The users are relieved from monotonous but nevertheless demanding routine work, and even less experiences users will find it easy to calibrate a tape machine.

This program is continually updated, based on user feedback, new equipment versions, and new features in the tape machines. Also the customer support will not be neglected. As with all Studer products, we provide information and assistance in the event of problems and also conduct introductory courses at Studer International AG.

Marcel Cattani

SSL controls STUDER TLS ES-BUS Synchronizer

Studer has recently completed an installation for a postproduction studio at the BOP Radio in Bophuthatswana.

The system consists of a Studer A820-24 track recorder, two A820¼" master recorders all with integrated Dolby SR/A and a JVC PR 900 Umatic.

All machines are provided with Studer TLS4000 synchronizers. Also supplied is an SSL 4000G mixing console with synchronizer controller. The speciality of this system is that, for the first time in the Video/Audio postproduction environment, the SSL studio computer controls the TLS synchronizers via an ES-Bus interface specially built for this purpose by a British manufacturer CB Electronics. SSL uses the Adams-Smith protocol, and the CB interface converts it to ES-Bus, thus implementing all commands and features from the SSL machine control repertoire and adding some new ones like the virtual master mode and manual synchronizer control.

Rudolf Kiseljak

Studer Revox Group

"Who's who"

This column is reserved for the introduction of personalities from our companies and representatives in Europe and overseas.

Lee Cochran

President and Chief Executive Officer of Studer Editech Corporation, Menlo Park, California ● born 1939 in Scottsbluff, Nebraska ● worked in electronics and radar divisions of the U.S. Navy ● studied electrical engineering and accounting at the University of Colorado, Boulder, and received a B.Sc. degree 1965.

Lee Cochran looks back on years of experience in various fields. He held the position of senior vice president at the Fortune Computer Company and was later appointed president of Tymnet a networking company with public and local area networks. As general manager of Ampex he became involved with professional audio and was later controller of the Ampex audio/video division. Later he joined Peat Marwick Mitchel as a certified public accountant.

In 1989 Studer went West and bought Integrated Media Systems (IMS), located in Menlo Park, California, founded 1984, manufacturers of DYAXIS hard disk systems. IMS was formed into a new company called Studer Editech Corporation (SEC), of which Lee Cochran took over general management. The wide area of his responsibilities includes engineering, manufacturing, marketing, sales and finance. It was on Lee's special initiative that IMS merged with Studer. Today the company team consists of some 23 employees and has sold more than 450 Dyaxis systems to international markets. These hard disk based workstations are used in radio, television and recording facilities, in the film industry, CD mastering, music recording and since recently, in cassette duplicating. In March 1990, Lee Cochran started to hold seminars on Editech products for affiliated Studer companies and distributors in Europe, the Far East, Australia and New Zealand. In his sparetime he favours traditional activities such as fishing and golf; he also enjoys swimming, reading and photograph.

Asked about his principles in business, he states: "People are our prime asset, and managing that asset must be a joint responsibility of all of us."

Renate Ziemann

Studer Editech Corporation, Menlo Park, California

Complementing the introduction of Editech's president in this volume of our magazine, is a portrait of the company as introduced by Lee Cochran at the Montreux AES earlier this year:

Studer Editech Corporation (SEC) started as the result of an acquisition of Integrated Media Systems by Studer capital on August 31, 1989. IMS was founded in 1984 to design and produce communication and audio conversion devices (analog to digital) to meet specific broadcast and industrial needs. The first I.M.S. product – an automated switching system and a high-quality analog to digital converter – established IMS as a supplier to the growing digital audio market.

In June 1987, IMS introduced Analog Dyaxis, the first of a family of systems providing random-access digital recording and editing of sound. The key elements of the Dyaxis system were the audio processor, the Apple computer, application software (MacMix), hard-disk magnetic drives and the integration of these elements into the Dyaxis system. I.M.S. introduced its digital I/O system in November 1988 with first shipments of its new products to follow a month later. Market acceptance of Dyaxis has been excellent in 1989 and is expected to still increase. Approx. 25% of all installations have been sold to Europe, and the remainder to Canada and U.S.A.; the presence of a strong Studer team in the Pacific Rim is seen as a key market opportunity for Dyaxis installations. Editech will be supporting its Pacific dealers with demonstration and training as a first push into those markets. Other opportunities will no doubt arise with the restructuring of the East European economies. Sales were also made to the Soviet Union for classical musing editing and here, an increase will also be anticipated. The 300th system has just been completed and installed in Los Angeles, at one of the key suppliers of CD mastering in the world were Editech also installed its first 760 MB drive.

S.E.C. is located in the Peninsula area near San Francisco and San Jose in the South, known as "Silicon Valley", hi-tech center of the U.S.; it provides an ample market for contractors, assembly houses and a source of experienced people. The company has its domicile in a 10,000 square foot building which houses enginering, manufacturing, marketing and administration.

THE STUDER SPIRIT

by Lee Cochran
President and CEO of
Studer Editech Corporation,
Menlo Park, California

Fifty years ago, two Stanford University graduates, Bill Hewlett and Dave Packard, went from their studies to a garage not far from the present Studer Editech facility, where they built and sold eight audio oscillators to Walt Disney. Today, that garage has exploded into a multi-billion dollar company and is recognized as the birthplace of the "Silicon Valley". The valley has been the birthplace of many other international companies, including Apple, Intel, National Semiconductor and more. Each of these companies started with an idea and an entrepreneurial spirit which provided them with the base on which to build. Studer Editech and the entire Studer organization were established the same way on opposite sides of the world. As a result of the 1989 acquisition, we are now able to combine our knowledge and entrepreneurial spirit and apply them to new products and applications. This cooperation will assist us in our competitive posture in the future. Cooperative efforts take advantage of targeted investments and design resources.

By utilizing the skill of consultants and cottage contractors in manufacturing, 23 employees are able to handle several engineering projects at the same time and also engage in shipping a substantial number of systems per month in a single work shift. Eight of the 23 employess, including Editech's vice president of engineering, David Hayes, work in the engineering division, eight in manufacturing. The remaining seven are in marketing and training supervised by Gerry Kearby, and in administration and accounting. Main challenge the company faces is to educate its sales organization and customers on hard disk recording/editing in order to make their work easier. For this purpose, Matt Ward, training specialist, and Gerry Kearby developed the Dyaxis training manual and application tutorial which have been used in formal training courses in California and in Regensdorf. Training along with step-by-step instructions on demonstration methods of the Dyaxis system will enable the Studer Editech sales team to provide excellent information on the recognized advantages of the DYAXIS system.

Lee Cochran

Mauritius

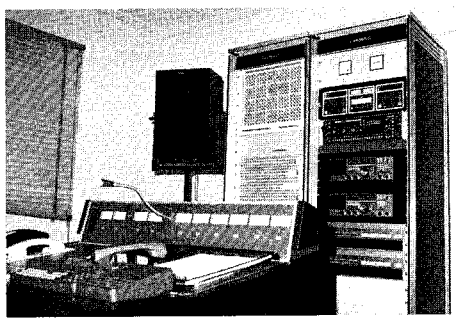
Not only white Beaches, happy Holidays and the famous Blue Stamp . . .

. . . are synonymous for Mauritius, an island located in the immediate vicinity of Madagascar in the Indian Ocean. It is much more the great hospitality of the islanders and, especially for Studer, "Mauritius Broadcasting Company" (MaBC) who left a lasting impression.

Following the policy of the Government for a modern Mauritius for the year 2000 and beyond, the MaBC in its quest for modernization under the dynamic leadership of its Director General, Mr. D. Suraj Bali, launched a program for the complete refurbishing of all its five radio studios and the master control room. Upon recommendation of its engineers, the contract for a turnkey project was finally awarded to Studer.

Control Room of Studio G

Identical equipment is used in four of the five studios, essentially comprising a Studer 970 mixing console, tailormade to suit MaBC purposes, and each with two A807 tape recorders, 948 EMT turntables, A727 CD players, A721 cassette players, ITC Delta jingly players, telephone hybrids, one Lexicon digital reverberator and all the peripherals.



Master Control Room of MaBC

The master control room consists of a Studer 900 monitoring/switching control desk, two 19" racks equipped with a Ghielmetti 40 × 40 crossbar system, in and outgoing limiter amplifiers, equalizers, AM and FM tuners and a FRB patch panel. To cope with the popular phone-in programs, the MCR is also equipped with a PABX built by ALCATEL/STR for managing the telephone hybrids installed in the Studer 970 mixing console of each studio control room.

The new studios and MCR were officially handed over to MaBC at the end of June 1990, although they had all been in operation before then. In order to avoid the interruption of the current transmission program, one studio was completed at a time, then integrated into the daily broadcasting service, before work on the next studio commenced. In ideal cooperation with technical staff of MaBC and two Studer technicians, four studios and the master control room were installed in only

four weeks. The finalization of the MaBC project was interesting experience and we wish to thank management and staff of MaBC for their valuable support.

Rolf Breitschmid, STI

D. Ramputh and P. Seebaluck, Chief Engineers of MaBC.

New Patents

Method for recording audio signals that are free of spectral content in the audio frequency range.

According to the invention of Braunmühl and Weber in 1941, a high frequency pulsed signal is superposed on the audio signal in order to produce a magnetic recording. As shown by an exact analysis of the recording process, only the time pattern of the maximum current amplitude is responsible for the resulting magnetization.

This means that the annoying sync track crosstalk can be eliminated, if the high frequency pulsed signal is produced in such a manner that it does not contain any signal component with a frequency lying in the frequency range of the audio signal to be recorded.

This patent of Paul Zwicky was registered with the US Patent Office, on July 18, 1989 under the number 4,849,837.

Method for regulating the rotational speed of an electric motor in a four quadrant mode of operation.

In certain applications such as tape recorders, the electric motor must be able to accelerate and decelerate in both senses of rotation. In addition the motor speed must be constantly monitored and regulated. Information concerning the rotational speed and sense of rotation are required for this purpose.

A regulating apparatus ensures that the motor movement follows the desired value.

Tacho generators are frequently used as sensors which supply a frequency that is proportional to the rotational speed. In order to determine the sense of rotation a second pulse generator is used whose output signals are shifted by 90° relative to the first one.

The invention shows how the second tacho generator can be eliminated. An ingenious logic circuit evaluates additional information. If we produce a list of all possible operating states, it becomes clear that only very specific transitions are feasible for physical reasons. For example a transition from clockwise rotation to counterclockwise rotation is only feasible after a standstill has occurred. The operating state of the motor can thus be determined by tracking the history and the feasible transitions. This means that no directional information from a second pulse generator is needed.

This patent by Kurt Heinz and Johannes Felber was registered with the US Patent Office on April 4, 1989, under the number 4,818,923.

Magnet system for a dynamic loudspeaker

Dynamic speakers are equipped with a permanent magnet that creates a magnetic field in the air gap. This field, together with the voice coil current, provides the driving force acting on the diaphragm. Unfortunately the field in the air gap is also influenced by the voice coil current itself. This leads to distortions by even numbered harmonics.

The invention combats this effect by creating within the magnetic circle a zone that is saturated so strongly that a change in the excitation can no longer cause a flux change.

This patent by Paul Zwicky was registered with the European Patent Office on April 11, 1990 number 0 208 907 B1.

Paul Zwicky

Consoles Unlimited

Canada promotes mixing console range

The following advertisement underlines the commitment Studer Revox Canada Limited demonstrates in connection with the Studer Mixing Console Range:

To meet the growing requirements of its clients, Studer Revox Canada Limited announces the formation of the SRCL console division. It has been purposely established for system design, manufacturing, installation and maintenance, and was also designed to meet the exacting needs of our customers in Canada's communication industry.

Heading up to Console Division as Manager, Sales & Engineering, Special Projects, is Podromos Constantinou, who has over 25 years experience in the design and manufacture of professional audio equipment and communication systems.

Bill Onn, Special Projects Engineer, has over 40 years worked in planning, installation and commissioning of both studio and transmitter facilities.

Doug Smith, Special Projects Engineer, who has been designing equipment for the broadcast industry, will be responsible for the design and manufacture of custom consoles.

These appointments and the formation of the Console Division continues to demonstrate the total commitment which Studer Revox Canada is making to Canada's broadcasting industry.

Renate Ziemann

Editor: Marcel Siegenthaler

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Publisher: WILLI STUDER AG, Althardstr. 30, CH-8105 Regensdorf

Printed in Switzerland by WILLI STUDER AG
10.23.8210 (Ed. 1290)