STUDER
professional audio equipment

Studer D827 MCH

24/48 track DASH Tape Recorders

Product Information

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Contents page

What are the reasons to buy the D827 DASH Machine

Simply stated there is not just one reason but rather a multitude of them to buy the D827 MCH. Studer has built a machine that is suited for all of today's high tech Studio environments.

Digital environments

It can easily be connected together with digital mixing consoles via a digital link, which usually is MADI. Smaller digital consoles still interface through SDIF, which is available as an option for the D827-MCH also.

Optional converters

A/D- and D/A-converters are usually integrated into digital consoles. This makes it unnecessary to have additional converters in the recording device. All the more reason for Studer to make them optional.

MADI interface

The D827 MCH base version is already equipped with a MADI interface and is therefore the most competitive package in the digital multitrack recorder competition for applications with digital consoles.

EDR option

Digital mixing consoles offer 24 bit audio output. Studer can offer the only multitrack recorder available which can deal with this wordlength. The D827 MCH offers an optional upgrade which makes 24 bit recording possible. In order to record this 24 bit channel two tape tracks have to be used. By implementing a high sophisticated 24 bit processing device, a 24-track, 24 bit recording on a D827-48 is possible while maintaining the DASH format and allowing for full resolution punch-in and punch-out crossfade calculation.

With its *superb sound quality,* modular design, fastest tape transport available and futuristic approach the D827 MCH is the machine one has to buy to be a big player in the business.

Additional highlights are listed below:

- **Modular Concept**
  The D872 MCH is the only machine offering a digital only version to ideally match the users requirements of a digital mixing console environment.

- **24bit Recording**
  The only multitrack device in the market offering 24bit recording capabilities. A unique system provides full 24bit processing throughout all stages including full punch-in/out capability. This format does not differ from the standard DASH format at all. It is even possible to play 24bit recorded tapes back on any standard 16bit DASH device.

- **24-Track Upgrade ability to 48 Tracks**
  The D827-24 can be upgraded without any compromise to a D827-48 with all options required. No other competitor allows for this to be done. If a customer already knows at the time of purchase of his 24-track machine that he will upgrade to 48-tracks sooner or later, he can purchase the machine with a 48-track head assembly.

- **Noise Shaper**
  Most advanced converter technology built in digital recording devices today is offered in the D827 MCH. A Noise Shaper option allows for sonic 18bit performance through a 16bit media.

- **4-Channel Sound Memory with up to 180 sec. Storage Capacity**
  Our approach to the number of channels for the Sound Memory is unique. Competitive products only allow for 2-channel recording with a maximum capacity of 45 seconds.

- **Fastest Tape Transport**
  The D827 MCH has the fastest transport of the industry. It offers a 20% higher maximum wind speed compared to competitive products and

its dynamic behavior surpasses even pinch rollerless designs.

- **Software Controlled Configuration**
  Fast and easy setup is possible through total software configuration of the machine. All calibration parameters are accessible with a simple push of a button. No potentiometer alignments are necessary for the user. All parameters can be displayed and saved on a computer using setup handler software.

- **Single Cable Remote**
  All D827-MCH remotes are connected through a single cable. Even power is feed to the remotes via this cable. No mains connection of the remotes is necessary.

- **Software assisted Service Tools**
  All alignment can be performed using software. This speeds up service in the field. A headblock can be exchanged in less than an hour, having the replacement delivered pre-aligned with its parameters on a floppy disk.

- **DASH lock**
  With software version 2.0, Studer introduced another key feature for the D827 MCH -> DASH-lock. It allows for the synchronization of Studer digital machines based on another type of control information (CTL) provided at the machine output by one of our competitors. It is now possible to make sample accurate clones with machines of a different brand.

A brief description

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

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

Specifications

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

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

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

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

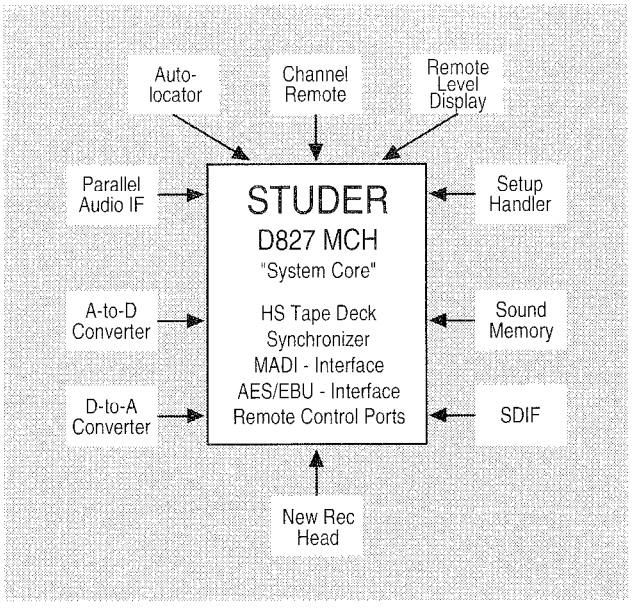
Of course, we were able to benefit from the extensive experience gained with the D820 MCH. That which had proven itself we wanted to incorporate in the D827 MCH on a 1:1 basis. We therefore concentrated our efforts on those aspects where we found room for optimization. And where the latest technologies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

Development phase

For more than one year our development activities concentrated on this project.
The development team designed a new, optimum platform that had to be modular but affordable.

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

The latest recommendations on achieving products that conform to EC and UL requirements were incorporated without compromise. Stringent EMC requirements were established to ensure reliable operation.
Also the forthcoming laws on material recycling (an aspect that a company dedicated to ecological thinking cannot ignore) were taken into consideration.



And lastly - the close cooperation between all departments involved enabled us to stick to our ambitious timetable.

The result: Modularity

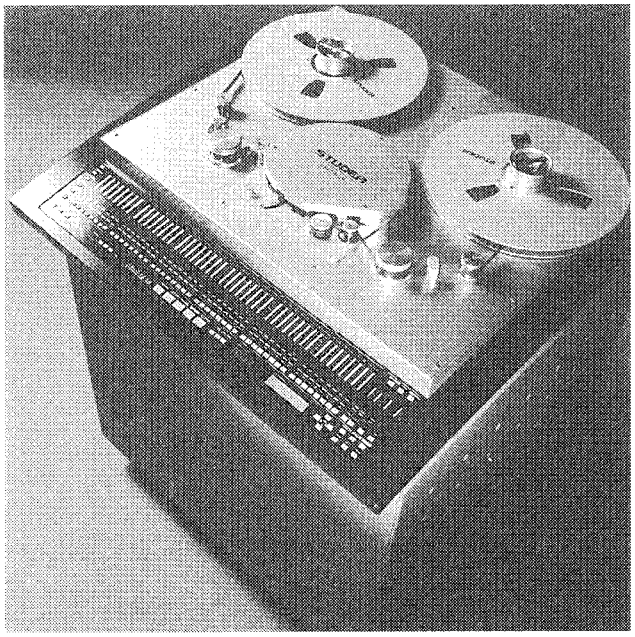
Equipment that is ideally matched to the corresponding studio environment - and indirectly also to the studio budget - today has top priority in product development. Our prime objective was to take this aspect into consideration, of course without sacrificing quality or performance.
The key to the solution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

System nucleus

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

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

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



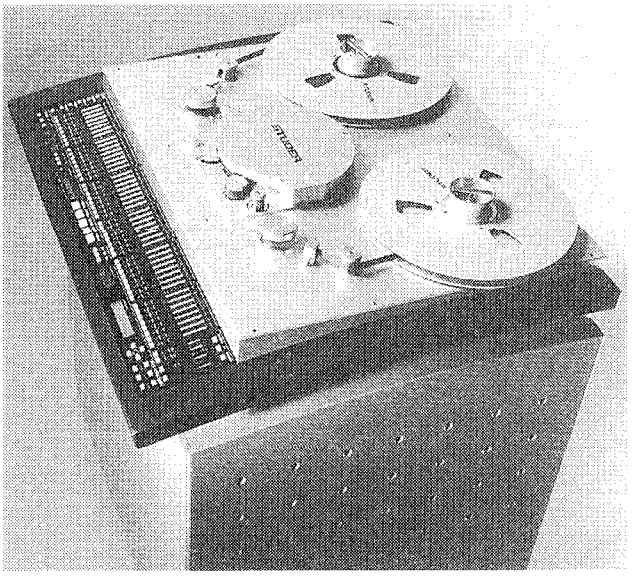
The question of optimum, i.e. cost-effective design of the audio signal transmission is even a hotter topic for recording studios in a «fully digital» age. Among the most expensive components in digital audio equipment are the converters. They determine the sound quality, which means that cost cutting here would be highly counterproductive.
But the trend is that the users want to invest in converters only once (i.e. in one unit) and not in all of them. This investment usually concentrates on the (digital) audio mixers to which all (digital) signals are routed and where they are monitored. In this configuration the recording device does not need a converter because the audio signals are transmitted digitally.

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

The system nucleus of digital multitrack recorders should also comprise a built-in synchronizer. Fast copying (in synchronism with TC or RT) from one machine to another is now desired so frequently that this should no longer be an option. Also in this area we have invested our full know-how: Already in the basic version you receive a built-in synchronizer with full editing capabilities. It is also suitable for TC-/RT- accurate punch-in in synchronism with another machine.
Parallel remote control, e.g. from your external synchronizer, is also possible at any time. This is a standard studio application, which in our opinion should not be a separately priced option.

Optional converters

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



But nothing is so perfect that there is no room for improvement. This was amply demonstrated by our developers, who came up with a new A/D converter. Extensive listening tests were conducted in many studios (with the «golden ears» rather than mathematical simulation) to reveal the «sound determining» characteristics of analog-digital converters. The result was packaged for the D827 MCH.

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

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

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

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

SDIF to complete the range

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

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

Sound memory for creative post production

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

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

This is an exclusive STUDER feature!

Second record head

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

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

Does modularity have its price?

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

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

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

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

The pleasure of using the D827 MCH

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

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

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

Once more - a unique STUDER feature!

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

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

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

Accessories that are taken for granted

Much has not been mentioned yet, for example, remote level indication or the interface for parallel remote control from the mixing consoles. And much more.
These STUDER «mute points» you are already familiar with.

Open-reel has a future

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

Now you will certainly understand the introductory heading:

«STUDER D827 MCH - The Reel Joy».

NOISE SHAPING

Imagine ...

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

... you ignore the problem

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

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

... or you use a Noise Shaper

The aforementioned effects can be eliminated by adding dither [4] before the requantization to 16 bits. This additional noise increases the noise floor, which in turn would reduce the dynamic range. The ear's sensitivity near the audibility threshold is strongly frequency dependent. It is most sensitive at 4 kHz, but at frequencies above 14 kHz much higher amplitudes are required.
This fact is exploited by the noise shaper, which shifts the main portion of the noise into those frequency bands to which the human ear is less sensitive. Important is that in the sensitive hearing range the noise floor drops below the limit theoretically achievable with ideal 16-bit converters. The goal of closely maintaining the original resolution is thereby achieved.

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

Compare for yourself

The 18-bit original signal (1 kHz, -80 dBFS sine wave) is compared with the 16-bit truncated version (Fig. 1).

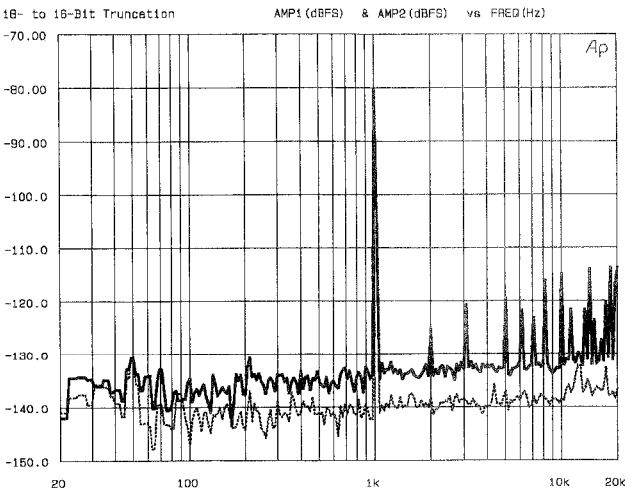


Fig. 1: 1 kHz, -80 dBFS: Comparison between truncation to 16 bits and 18 bit original signal (bold curve truncated to 16 bit; pointed curve 18 bit original signal).

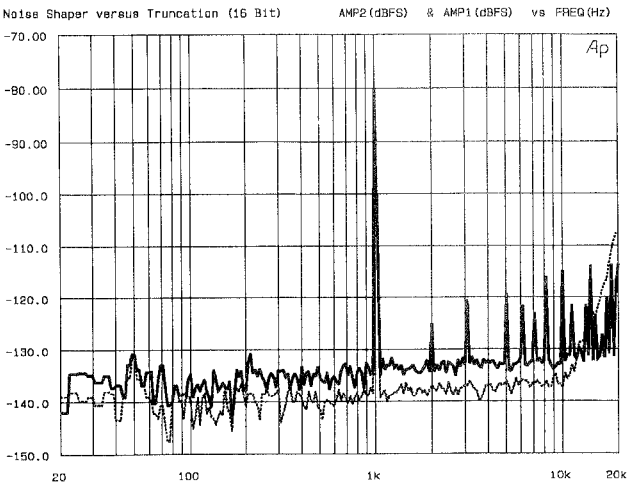


Fig. 2: 1 kHz, -80 dBFS: Comparison between truncation and noise shaping (bold curve truncated to 16 bit; pointed curve reduced to 16 bit by noise shaping).

The spectrum shows that the noise floor is increased and harmonic distortions are produced.

Fig. 2 shows the same signal that has been reduced to 16 bits by noise shaping. The harmonics have disappeared and the noise floor has a characteristic that is optimized to the human hearing. Note that the noise level up to approx. 12 kHz is at the 18-bit level!

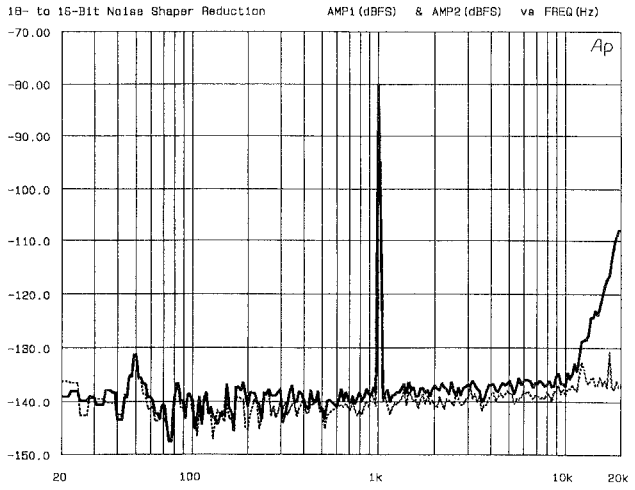


Fig. 3: Comparison between Noise Shaping and 18 bit original signal.

Yes, but ...

In physics, every effect produces a counter-effect. Fig. 2 shows that viewed across the entire frequency band the aggregate noise power is greater than in Fig. 1. The listener, however, and he is the ultimate judge, perceives a clearly improved sound.

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

STUDER noise shaper

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

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

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

[1] Quantization
Mapping of a continuous signal to discrete staircase steps. With 16 bits it is possible to represent 65536 steps. The larger the number of steps the smaller the difference between the original and the quantisized representation.

[2] Harmonic distortions
Distortions caused by non-linearities. New frequencies are produced in the signal (e.g. second, third ... harmonic of the signal).

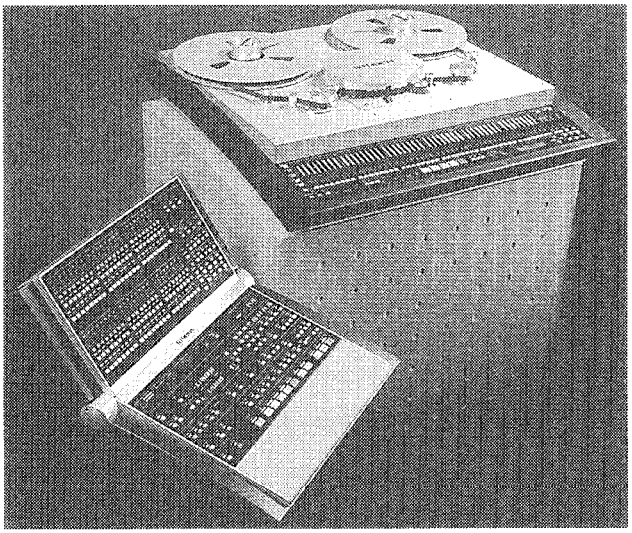
[3] Noise modulation
If the background noise is not constant but depends on the input signal, we speak of noise modulation.

[4] Dither
Digitally produced white noise.

[5] Correlation
If two signals are mutually dependent in any way, either with respect to amplitude, frequency or phase, they are said to correlate.

Extended Digital Resolution - or: 24 bits for the future

Bigger, faster, wider - these often are attributes that describe modern technologies. In digital recording, the technological characteristics are often expressed as the number of processed or storable bits - the smallest information unit in digital signal processing. The aim is to have as many of them as possible, that is, to use the largest possible word length for recording the data.



Aside from earlier experiments, the 16 bit quantization of data soon became the standard in digital audio studio technology. A (theoretical) signal-to-noise ratio of S/N = 6.02 x 16 (bit) + 1.76 [dB] = 98.08 dB is remarkable. There are, of course, other advantages over analog recordings such as loss-free creation of copies, etc.

A word length of 16 bits has become establish across the entire audio technology, on the CD, the DAT recorder, as well as in professional recording equipment such as the DASH tape machines.

Why now 24 bits?

Bigger, faster, wider - yes, even 16 bits have their limit which is easy to demonstrate. An analog signal basically has an infinitely fine resolution. But 16 bits allow only $2^{16} = 65,536$ steps for approximating the original, that is, not even close to infinity. By contrast, 24 bits give a resolution of $2^{24} = 16,777,216$ steps.

Admittedly, this is still far from the (infinite) analog truth, but at least the original analog signal can be recorded with a resolution that is 256 times more accurate than in 16 bit technology. (Using the same formula above this results in a theoretical signal-to-noise ratio of amazing 146.24 dB).

From theory to practice

The advantages described above do not sufficiently explain why a recording should be made in 24 bit technology when the origin is possibly limited to a 18 bit A/D conversion or when the ultimate playback device, as for example the CD, is limited to 16 bit.

A significant advantages of the signal-to noise ratio is that a much larger headroom can now be used without sacrificing the resolution. But this is only one side of the coin.

But (digital) recording should not be regarded as an isolated process. In most cases the (digitally) recorded signal requires further processing, mixing, frequency response corrections, etc. Ideally, these tasks should also be performed at the digital level in order to prevent unavoidable losses in D/A - A/D conversion. This work can be performed most conveniently on a digital mixing console for which the D827 MCH with the EDR option is the ideal (recording) partner.

Let us take another brief excursion into the naked theory and technology, that is, the principles of digital mixing consoles.

Modern signal processor architectures, like those found in the STUDER D940, use words with a width of up to 56 bits for all signal processing algorithms. Why? A rule applicable to calculations with binary numbers states that the multiplication of two data words with the width «n» (i.e. «n» bits)

results in the word width «2n». For example, when two 16 bit words are multiplied in a digital mixing console, the result contains 32 bits.

The axiom is: keep the resolution as high as possible

It is desirable to maintain this high-resolution result as long as possible because losses occur inevitably in every conversion from a larger to a smaller word width.
Ideally, the word width should only be reduced to 16 bits in the final processing step, for example, the CD mastering. Usually, a special process is used for this purpose.

Large data volume

Recording with a larger word length also results in larger data volumes which means that greater storage capacity is needed. Up to now, magnetic tape still offers the best price/performance ratio for large storage capacities. With the enormous capacity of 25 Gigabytes of 1/2" tape on a 14" reel, 24 bit recording in DASH technology would be absolutely feasible, at least from an economical viewpoint. But the standardized DASH format does not forsee this application.

A change of the DASH format does not make sense. Compatibility must be maintained with the installed base of over 1000 DASH multitrack machines. But this is only achievable with a trick.

The solution is «Bitmapping»

Without changing the DASH format, the EDR option for the D827 MCH realizes the linear 24 bit recording of up to 24 channels. To accomplish this the (24 bit) data of a recording channel are distributed to two physical tracks of the tape.

The most significant 16 bits of the 24 bit word are recorded on track A, the least significant 8 bits on the associated track B. This approach is not new and is known from other solutions.

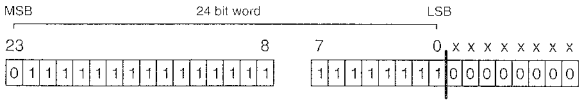


Fig. 1a: Original 24 bit word, allocated to two 16 bit tracks

New and unique, however, is that 24 bit processing is also possible on the recording device. This is essential if the 24 bit quality is to be continually preserved, for example, also during punch-in or punch-out. For these operations the recorder must calculate cross-fades - in 24 bit resolution of course - and this is where external solutions do not work.

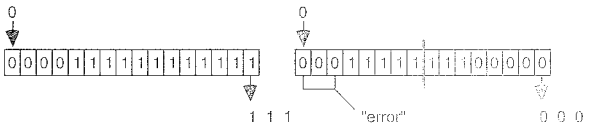


Fig. 1b: Independent 16 bit processing of two 16 bit words
Example: Division /8 (3 x shift right)

The principle is illustrated in Fig. 1: A 24 bit word is allocated to two 16 bit tracks, for example, in the manner shown in Fig. 1a. If the tracks are processed independently (Fig. 1b), that is, if two independent 16 bit cross-fades are performed during a punch-in, this results in an error.
However, if both tracks are processed jointly (Fig. 1c), unimpaired 24 bit quality is ensured also during cross-fades.

EDR for MADI and AES/EBU

In order to accomplish this, a special processing unit has been designed (Fig. 2 and 3) in which a 24 bit process is superposed on the standard 16 bit process.

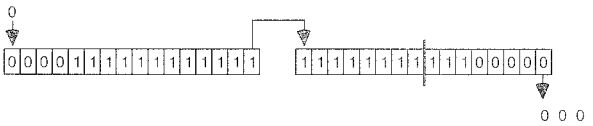


Fig. 1c: True 24 bit processing
Example: Division /8 (3x shift right)

Access to this unit is implemented through the multichannel audio digital interface, MADI (simultaneous for all tracks, coaxial or fiber-optic) or the AES/EBU interface for up to 2 tracks simultaneously. Both formats are already specified for 24 bit transmission.

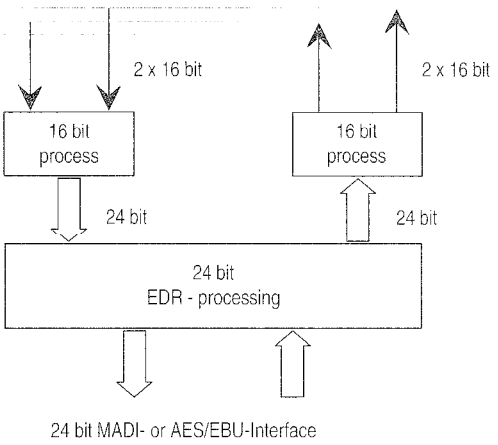
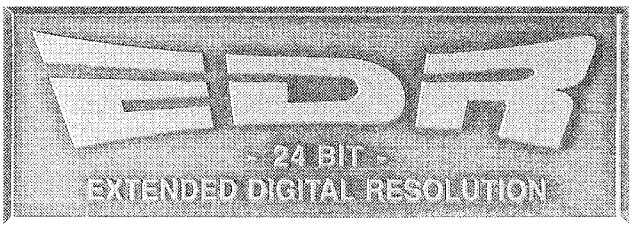


Fig. 2: Schematic representation of the 24 bit recording mode used by the D827 MCH

Compatibility

The data are distributed on the tape in such a way that high-order 16 of the 24 bit input data word are recorded in the DASH format on tracks 1 to 24, whereas the low-order bits are recorded on tracks 25-48. There is a fixed track relationship: track number B is always A+24.
The least significant 8 bits of the 24 bit words are recorded in bit positions 0..7 of the B tracks, the most significant bits 8..15 of the B tracks are filled with zeros. (Fig. 4).

The advantage of this allocation is that a tape recorded in EDR mode can be played on a standard DASH machine without problems. The «A tracks» represent the recording in 16 bit quality. The «B tracks» are reproduced as «noise» with a level of approximately -50 dB below the maximum digital full scale (dFS).



16 or 24 bits - switchable

An important aspect of the EDR option is that the D827 MCH can also be operated in standard 16 bit mode. With the push of a button (through a simple menu setting) recording and playback of 48 tracks in 16 bit mode, or 24 tracks in 24 bit quality can be selected. Both formats are available without any hardware modifications.

Economy

Due to the modular concept of the D827 MCH, the basic configuration can be enhanced with the EDR option. For interconnection with a digital mixing console, no A/D and D/A converters are needed in the tape recorder which results in a highly favorable price/performance ratio.

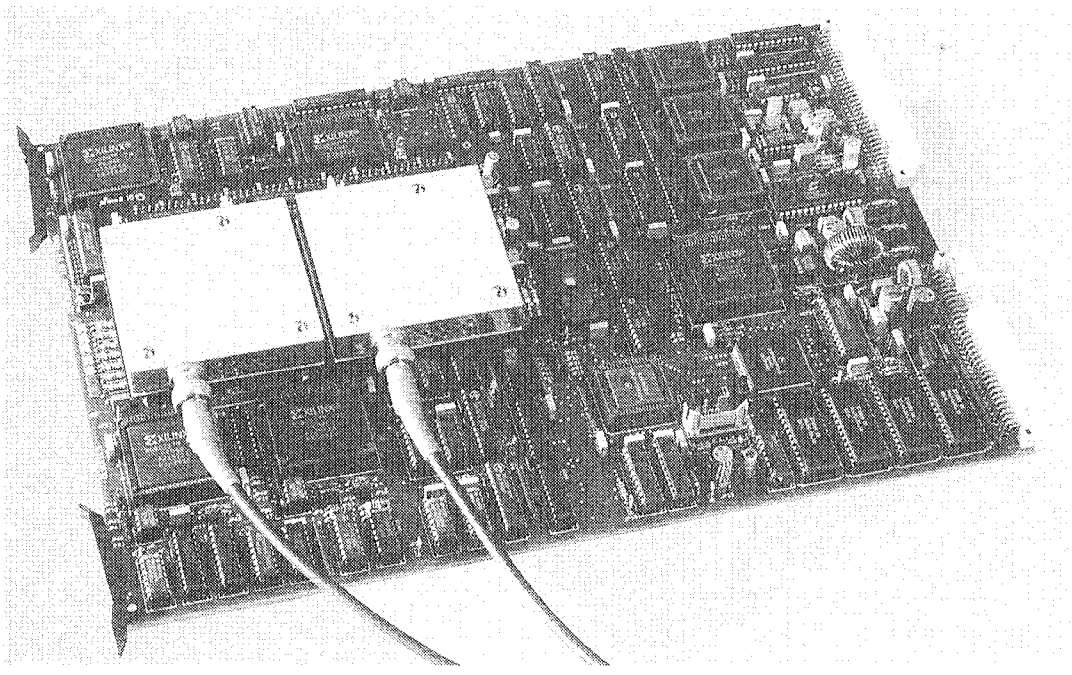


Fig. 3: 24 bit MADI interface board with DSP

The EDR option can be retrofitted in a D827 MCH at any time. This work can be performed in the field and takes just a few minutes. An appropriate time may be when the investment in a digital mixing console is planned.

Future included

The D827 MCH has been enhanced with another world exclusive option. For the first time, linear 24 bit recording is now possible in multitrack technology. Compatible - and without using data reduction or compression.

Regardless of whether you produce in «conventional» analog technology and have come to appreciate the STUDER converters, or whether you want to record in 24 bit digital - or both, sooner or later - the D827 MCH is your ideal partner.

Bigger, faster, wider - as you see, is no problem with the future-oriented concept of the STUDER D827 MCH.

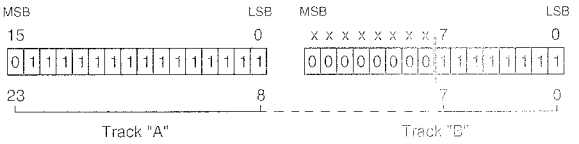
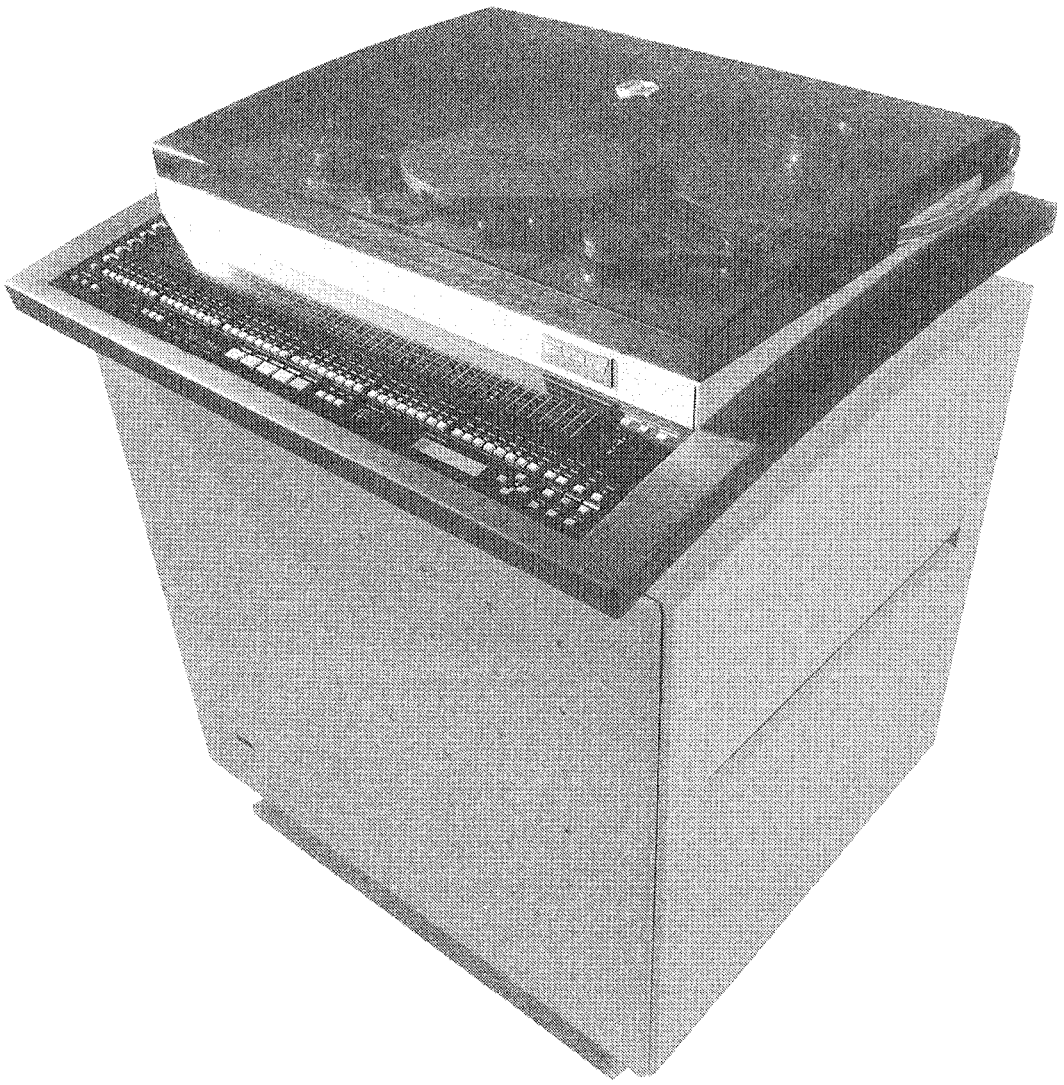


Fig. 4: Data allocation in EDR mode



STUDER D827 MCH-24 bit EDR, with cover

STUDER D827 MCH DASH Tape Recorders 24/48 Tracks

Technical Data

Recording Format:	**DASH-F**
Number of Tracks:	**Digital Audio:** D827-48 **48 Tracks** D827-24 **24 Tracks** (upgradeable to 48 tracks) **Auxiliary Tracks:** D827 MCH **Reference Track** **TC Track** **2 CUE Tracks**
Sampling Rate:	**48 kHz, 44.1 kHz, 44.056 kHz** (switchable)
Tape Speed:	**30 ips** (76.2 cm/s) @ fs=48 kHz
Varispeed:	± **12.5 %**
Recording Time:	**app. 60 min.** (14" reel, 2680 m) @ f_S=48 kHz **app. 65 min.** (14" reel, 2680 m) @ f_S=44.1 kHz
Winding Time:	**app. 3 min** (14" reel, 2680 m)
Quantisation:	**16 bit** linear
Frequency Response:	**20 Hz...20 kHz,** ± 0.3 dB [1]
THD + N:	**< -90 dB** (-30 dBFS, Emphasis off) [1] **< -96 dB** (-30 dBFS, Emphasis on) [1]
Crosstalk Attenuation:	**> 88 dB** [1]
Dynamic Range:	**> 93 dB** (Emphasis off) [1] **> 97 dB** (Emphasis on)
Emphasis:	**50 µs / 15 µs** (selectable for individual channels) [2]
TC-Generator:	**SMPTE** Standard 24, 25, 29.97 D, 29.97 ND, 30 D, 30 ND Frames/s
Analog Inputs:	**Digital Audio Tracks:** [2] transformer balanced, impedance >10 kOhm input level: **+ 14 ... + 28 dBu** (0.1 dB steps) **CUE-Tracks:** transformer balanced, impedance >10 kOhm input level: **+ 14 ... + 24 dBu** (0.1 dB steps)
Analog Outputs:	**Digital Audio Tracks:** [2] electronically balanced, impedance <50 Ohm output level: **+ 14 ... + 28 dBu** (0.1 dB steps) **CUE-Spuren:** electronically balanced, impedance <50 Ohm output level: **+ 14 ... + 24 dBu** (0.1 dB steps)
Digital Inputs:	**AES/EBU,** XLR , 3 pin female **MADI,** BNC **SDIF-2,** D-sub , 50 pin male [2]
Digital Outputs:	**AES/EBU,** XLR , 3 pin male **MADI,** BNC **SDIF-2,** D-sub , 50 pin female [2]
Clock Inputs:	**Wordclock,** TTL level, BNC **Sector Clock,** TTL level, BNC **Video Sync** (with loop-through), BNC **Square Wave** (with loop-through), BNC
Clock Outputs:	**Wordclock,** TTL level, BNC **Sector Clock,** TTL level, BNC
Other Inputs:	**TC** (SMPTE Standard) (with loop-through), XLR / 3 pin female **RT** (Reference Track) (with loop-through), TTL level, BNC
Other Outputs:	**TC** (SMPTE Standard) XLR / 3 pin male **RT** (Reference Track) TTL level, BNC
Control Ports:	**REMBUS** (with loop-through) balanced, Studer Standard (for Autolocator, Channel Controller and Parallel Audio Interface) **Level Display** balanced, Studer Standard (for Remote Level Display) **Setup Control** balanced RS-422 (for Setup Handler and Service Access) **ES-Bus** (with loop-through) balanced **Parallel Remote & Synchronizer** GPI **Master Tallies Input** **Terminal** unbalanced (for Service Access)
Power Supply:	**115 V,** voltage range 90...127 V, 50/60 Hz **230 V,** voltage range 180...254 V, 50/60 Hz
Power Consumption:	**800 W** (48 CH, all options fitted, PLAY) **1500 W** Peak
Safety and EMC:	**Safety Standards** EN 60065 / 1993 IEC 65 / 1985 **EMC Standards** EN 50081-1 / 1992 EN 50082-1 / 1992
Operating Temperature:	**+ 5 ... + 40 °C**
Humidity:	**20 % ... 90 %,** (non condensing)
Dimensions:	**880 (W) x 1000 (H) x 800 (D) mm**
Weight:	**app. 240...260 kg** (depending on options fitted)

[1] Measurement Conditions: A/D-D/A, 20 Hz...20 kHz, f_S = 48 kHz
[2] available as an option

Ordering Informationen

D827-48-1/2" (Base Version) DASH Tape Recorder 48 Tracks	60.218.20620
D827-24/24-1/2" (Base Version) DASH Tape Recorder 24 Tracks (upgradeable to 48 tracks)	60.218.20621
D827-24/48-1/2" (Base Version) DASH Tape Recorder 24 Tracks, equipped with 48 track headblock, (upgradeable to 48 tracks)	60.218.20622
D827 MCH Upgrade Kit 24/24-48 Modification Kit to upgrade D827-24/24-1/2" to D827-48	on request
D827 MCH Upgrade Kit 24/48-48 Modification Kit to upgrade D827-24/48-1/2" to D827-48	on request

Options

D827 MCH A/D 8CH A/D Converter, for 8 channels	20.863.552.00
D827 MCH Noise Shaper Noise Shaper Option for A/D Converter, for 8 channels	20.863.553.00
D827 MCH D/A 8CH D/A Converter, for 8 channels	20.863.554.00
D827 MCH SDIF-2 Interface 24CH SDIF-2 Multichannel-Interface, for 24 channels	20.863.555.00
D827 MCH NEW Record Head 48CH NEW Record Head, for confidence playback, for D827-48 and D827-24/48	20.863.556.00
D827 MCH NEW Record Head 24CH NEW Record Head, for confidence playback, for D827-24/24	20.863.557.00
D827 MCH Sound Memory 45s RAM Memory for sound editing, 45s total storage capacity, splittable across up to 4 tracks	20.863.558.00
D827 MCH Sound Memory 180s RAM Memory for sound editing, 180s total storage capacity, splittable across up to 4 tracks	20.863.559.00
D827 MCH 19" - Rack Mounting Kit for mounting of 19" racks up to 3HU in rear connector field	20.863.560.00

Accessories

Channel Remote Controller D827-48	1.328.700.00
Channel Remote Controller D827-24	1.328.705.00
Autolocator D827 MCH incl. Sound Memory -Controller	1.328.710.00
Setup-Handler application program for Macintosh computers, for parameter backup and remote setup, incl. 3m connection cable	21.863.995.00
Remote Level Display D827-48 incl. 15m connection cable	21.328.730.00
Remote Level Display D827-24 incl. 15m connection cable	21.328.735.00
Parallel Audio Interface D820 MCH / D827 MCH incl. 15m connection cable	21.328.630.00
REMBUS-connection cable 0.6m for REMBUS remotes	1.862.420.00
REMBUS-connection cable 15m for REMBUS remotes	1.862.421.00
SERBUS-connection cable 15m for Remote Level Display	1.862.422.00
Remote Stand for Channel Remote Controller, Autolocator and Sound Memory Controller	1.328.192.00

Subject to change.

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Customer Reference List

Country	City	Customer	Application	Comments
Canada	Montreal	National Filmboard	Post Production	
Canada	Toronto	Telemedia	Post Production	
Denmark	Copenhagen	Danish Radio	Post Production Recording. OB Van	
UK	London	Hilton Sound	Rental Service	
UK	London	Hilton Sound	Rental Service	
Germany	München	Bayrischer Rundfunk	Post Production	
Germany	Ludwigsburg	Studio Bauer	Recording	
Germany	Hamburg	NDR	Recording	
Italy	Florence		Music Production	
Italy	Bologna	Sant' Anna Recording	Music Production	
Japan	Tokyo	Amuse Studio	Recording	
Japan	Tokyo	Chiyoda Institute of Technical	Recording	
Japan	Tokyo	Chiyoda Institute of Technical	Recording	
Japan	Tokyo	Cricket Studio	Recording	
Japan	Tokyo	Tokyo Broadcasting System Inc.	Post Production	
Japan	Tokyo	Tokyo Broadcasting System Inc.	Post Production	
Japan	Tokyo	Tokyo Broadcasting System Inc.	Post Production	
Japan	Kobe	Takarazuka Music Hall	Recording & Playback	
Japan	Kobe	Takarazuka Music Hall	Playback	
Japan	Tokyo	Japan Foundation Forum	Recording	
Japan	Osaka	Power City Inc.	Recording Mobile	
Japan	Osaka	Power City Inc.	Recording Mobile	
Netherlands	Volendam	Studio Arnold Mühren	Recording	
Netherlands	Hilversum	NOB	Broadcast Production	
Sweden	Stockholm	Sveriges Television	Post Production	
Switzerland	Geneva	Dinemec	Music Recording + Post Production	
USA	Nashville, Tennessee	Masterfonics Recording	Recording	
USA	New York City	Right Track Studio	Recording	
USA	New York City		Recording	
USA	Orlando, Florida	Disneyland	Post Production	
USA	Bocaratton, Florida	Elysian Recording	Recording	
USA	New York City	Toy Specialist	Rental	
USA	New York City	Clinton Recording	Recording	
USA	New Jersey, Mendham	NIPPY	Recording	

D827 MCH Ordering Sheet

Customer _____

Contact _____

Address _____

_____

_____

City _____

Country _____

Phone _____ **Fax** _____

Distributor _____

for internal use only

V-Number:

Order Number:

Delivery date _____

Application _____

D827 MCH Base version			24 ☐	60.218.20621	24/48 ☐	60.218.20622	48 ☐	60.218.20620
New Record Head			24 ☐	20.863.557.00	48 ☐	20.863.556.00	48 ☐	20.863.556.00
A/D Converter			3x ☐	20.863.552.00			6x ☐	20.863.552.00
Noise Shaper			3x ☐	20.863.553.00			6x ☐	20.863.553.00
D/A-Converter			3x ☐	20.863.554.00			6x ☐	20.863.554.00
SDIF-Interface			1x ☐	20.863.555.00			2x ☐	20.863.555.00
Remote (Autolocator, Channel Remote, Stand and cable)			24 ch ☐	20.863.561.00			48 ch ☐	20.863.562.00
Remote level display			24 ch ☐	21.328.735.00			48 ch ☐	21.328.730.00
Mating pin connectors (1 per 8 analog ch)	Input	(male)	3x ☐	20.020.303.39			6x ☐	20.020.303.39
	Output	(female)	3x ☐	20.020.303.38			6x ☐	20.020.303.38
Sound Memory			45 sec. ☐	20.863.558.00			180 sec. ☐	20.863.559.00
MADI			Optical ☐	20.863.564.00			BNC ☐	standard
Power supply			117V ☐				230V ☐	
24 Bit Option (for 48 ch version only)							☐	20.863.666.20
Parallel audio interface							☐	21.328.630.00
adapter for 19" rear rack							☐	20.863.560.00
Setup handler							☐	21.863.995.00
Dust cover							☐	1.863.118.00
Rear bumper							2x ☐	1.863.314.00
Diagram/spare parts manual							☐	10.27.3670
Master tally cable for PCM 3324/PCM3348							☐	1.023.781.00

Remark: please make check-mark (x) per option
(only one x per line)

Place and date:

Signature: