



TRACE D4 TRACE D4 SRC

User's Guide



The Trace D4 and Trace D4 SRC conform the following standards:

EN 55022: 1998 + A1: 2000 + A2: 2003; class A

EN 55024: 1998 + A1: 2000 + A2: 2003; class A

In order for an installation of this product maintain compliance with the limits of a class A device, shielded audio cables must be used, not longer than 50 cm. Attention: This is a device of the Class A and can cause interference to radio or television reception within the residential area. The user is encouraged to try to correct the interference by suitable measures.

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Hardware Design by MARIAN

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MARIAN is not liable for any damage to the software, hardware and data and costs resulting from it, which are caused by improper handling or installation of the hardware.

The Trace D4 and the Trace D4 SRC meet the CE regulations

Technical changes are reserved.

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Welcome

Congratulations and thank you very much that you decided in favour of a product of MARIAN. You have chosen an innovative and powerful sound system, created according to your needs, the needs of our faithful customers. We proudly present to you: the TRACE D4.

With this fine piece of high technology with topnotch 192 kHz technique you are well equipped for the future of digital audio signal processing. The concept of the TRACE D4 with four stereo AES/EBU connectors available at the same time follows the current development of high definition digital technology in a trend setting manner.

But the TRACE D4 is not just simply a recording system with professional connections in crystal-clear audio quality of 24 bit and 192 kHz – once installed it will upgrade your computer to a most flexible digital audio workstation. It offers you possibilities realized yet with expensive additional equipment only and hardly ever within a computer. You can, e.g. mix input signals and playback signals of a software without any delay on a comfortable mixer surface.

Due to the high quality input sample rate converters of the TRACE D4 SRC you achieve a flexibility in distributing AES/EBU signals unheard-of so far. Thanks to the unique Output Control extensive routings of all available single- and mix-signals are set up, saved and recalled in a jiffy – just like at a digital patchbay.

As the special feature, the TRACE D4 includes the all-new TDM SyncBus. This amazing and mighty tool of digital signal processing is integrated directly within the powerful DSP mixer. With the help of the TDM SyncBus all available signals can easily be directed to the input of a TRACE D4 or other Marian Soundcards with TDM SyncBus option, and are available there like “real” physical input signals. The resulting routing- and mix-capabilities are almost unlimited.

Please take your time to go through the next pages of this manual also. Besides helpful explanations for the installation, it offers many valuable hints on how to use the Mixer and the Output Control effectively and profitably. If you run in on technical terms while reading, which are unknown to you, the glossary at the end of this manual will helpfully serve you for their clearance.

Now, we do wish you lots of success in working with the TRACE D4. We hope it will bring you just as much fun, as we had developing it.

Your MARIAN Team

Features

Your TRACE D4 comes with a lot of great functions. Here you can find a small list of properties and capabilities.

- ✓ 8 channel PCI Busmaster card
- ✓ full duplex support
- ✓ 4 digital stereo I/O in AES/EBU format
- ✓ 4 high-quality sample rate converters for the AES/EBU inputs (TRACE D4 SRC only)
- ✓ 24 bit / 192 kHz resolution
- ✓ complete balanced signal circuits for all connectors
- ✓ 16 channel DSP Mixer; hardware-based; latency-free
- ✓ Flexible and extensive mix-, monitor- and routing possibilities
- ✓ DAT-marker support
- ✓ MARIAN SyncBus compatible
- ✓ Word clock input with software switch able termination
Synchronization as clock master (output of internal clock on AES/EBU outputs or SyncBus)
- ✓ Synchronization as clock slave (using external clock on Word Clock- AES/EBU inputs or SyncBus)
- ✓ highly-developed multi-client driver for Windows™ 2000/XP/2003 Server/Vista each in the 32-Bit Version
- ✓ MME, ASIO 2.0, GSIF 2.0, WDM-Audio, DirectSound

Installation

Scope of supply

After opening the package of the TRACE D4, please check if the following components are included and undamaged.

- ✓ 1 x TRACE D4 PCI slot card
- ✓ 1 x XLR breakout cables
- ✓ 1 x adapter cable for XLR breakout cable
- ✓ 1 x CD-ROM with driver software
- ✓ 1 x CD-ROM with bundle software
- ✓ this manual with quick installation guide

System requirements

For successful and orderly operation of the TRACE D4, the following basic requirements have to be met.

- ✓ Intel Pentium-, or AMD CPU with at least 1 GHz clock and 256 MB RAM
- ✓ Operating system Windows™ 2000/XP/2003 Server/Vista each in the 32-Bit Version
- ✓ Direct X 9c
- ✓ One free PCI slot

Please note that depending on the operating system and audio application used, the system requirements might increase.

Installation of Hardware and Software

On the quick start guide and in the interactive tutorial on the driver CD you will find all important installation steps explained graphically. If you have any further questions concerning the installation, please contact our support service. At the end of this manual you will find the different ways of contacting us.

Updating Drivers and Firmware

Sometimes we offer a driver update for the TRACE D4 in the download area of the MARIAN homepage. This may include:

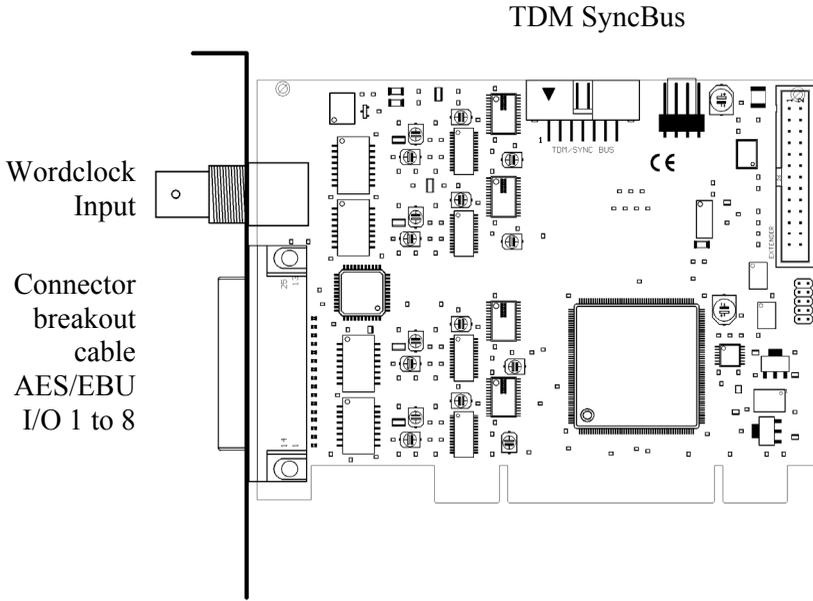
- functional improvements of the driver and/or the manager
- adjustments to new operating systems and/or their new components (updates and service packs)
- improvements of compatibility towards other audio applications

In case of a driver update, please follow the instructions of the “readme.htm” file. This file is included in the packed folder of the new driver files.

Important: Along with a driver update it might be necessary to update the firmware of the TRACE D4. It can only be determined after the installation of the new driver if a firmware update is needed. If that is the case, the update will then be performed automatically and will have to be finished with a restart of the PC-system. The MARIAN fail-safe firmware update technology will prevent the TRACE D4 of errors resulting from an interruption of the update process caused by e.g. a power disruption. Would this usually lead to a complete unavailability of the soundcard, the fail-safe technology now takes care, that with the next initialization of the TRACE D4 a root firmware is loaded, ensuring correct recognition of the soundcard by the Windows™ system.

Please note: Subsequently to a successful firmware update, Microsoft Windows™ 2000/XP/2003 Server/Vista will find a new hardware after reboot, since the hardware ID of the TRACE D4 will have changed due to the firmware update. Since the driver files have already been installed, you only need to choose “install software automatically” in the appearing windows hardware wizard.

Connectors on the TRACE D4



Wordclock Input

Connect the Wordclock output of a digital clock device here, if the TRACE D4 is to be synchronized externally.

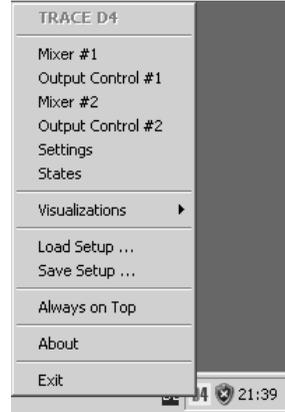
TDM SyncBus

If other MARIAN sound systems with TDM SyncBus option are installed, they can be connected here using a TDM SyncBus cable. Other MARIAN sound systems with SyncBus option only, can be connected using an adapter cable. Both cables can be ordered at the MARIAN web shop.

The TRACE D4 in Detail

The first contact

After the successful installation the symbol of the TRACE D4 manager appears in the Windows™ taskbar of your computer. It offers you direct access to important driver settings, the clock status display, the DSP-based 16 channel Mixer and the Output Control of the TRACE D4. Furthermore, you can save and load the setups for Mixer and Output Control. “Info” shows the current driver version of the TRACE D4. This is needed when consulting our support service with certain questions. The menu is opened with a single mouse click, with another on the corresponding entry the window of it is being opened. Via clicking the option “Always on Top” it is prevented that any other window can cover the Mixer or the Output Control. This option is helpful, when working simultaneous with other windows, while wanting constant direct access on Mixer and Output Control.



▷ *If several TRACE D4 have been installed, the entries for Mixer and Output Control will appear accordingly with the extension „#2“, „#3“ and so on. The settings of the sound systems are managed via **one** window.*

The Mixer



What is it all about?

This window shows all input channels and the master section of the TRACE D4 Mixer. You can see physical inputs, these are the AES/EBU inputs on the TRACE D4 (AES IN 1 to 8), the channels of the TDM SyncBus (TDM In 1 to 8) and the playback channels of an audio application. (Play 1 to 8) The TRACE D4 offers an application with 16 playback channels as Play 1-2 to 15-16. Within the mixer though, only Play 1 up to 8 are shown as separate input channel strips. The Mixer treats all shown types of channel equally.

Handling

Every element of the mixer may be adjusted or moved with the computer mouse. Knobs are opened/closed with circular motion of the mouse. The further away the mouse is from the center of a knob, the finer will the adjustment of values be. Double clicking a numeric field allows setting up the value for a fader or knob via the computer keyboard. The entries are confirmed with the Enter-key.

The channels

All channel strips may be operated in mono- or stereo configuration. The stereo-mode combines 2 channels into a stereo couple. (e.g. 1+2 or 5+6) You may switch the mode via the stereo-button at the lower end of each channel pair. As an example for all types of channels, let's take a look at input channel "1" from top to bottom.

First we have the "GAIN"-knob. It serves for adjusting the audio level directly at the input of a channel. This adjustment is relevant within the mixer only. That means a change right here, has no influence on the level with which a software application is recording from this input.

Beneath "GAIN", "AUX 1", "AUX 2" and so on are placed. Pulling up knob "AUX 1" will result in a volume increase of the signal in the signal sum aux 1, pulling up knob "AUX 2" increases the volume of the signal in signal sum aux 2 and so forth. Hence the aux knobs have the same function like the fader at the end of the channel, except: not for the master sum, but for each aux signal sum.

Besides the aux knobs the "PRE"-button is located. If it is activated with a mouse click, the fader at the end of the channel loses its influence on the corresponding aux knob. Thus, the fader can, for example, be placed on position "-60" while still a signal reaches the Output Control of the TRACE D4 via the affected aux knob. Between "AUX 1" and "AUX 2" as well as "AUX 3" and "AUX 4" and so on a link-button is situated. If clicked on, aux volume and pre buttons for aux 1 and 2, aux 3 and 4 and so on are connected functionally. That means: when opening up "AUX 1", "AUX 2" is equally pulled up. Just like that, "PRE"-button of "AUX 2" is activated when pushing "PRE"-button of



▷ *Instructions on how to monitor these aux sums on the TRACE D4, you will find in section "The Output Control".*

▷ *Examples on how to use pre buttons and aux sums correctly please refer to the "hands on"-part.*

▷ *The number of shown aux controls depends on the operation mode of the TRACE D4!*

▷ *If you set up different volumes for “AUX 1” and “AUX 2” without the link-button activated, this relation remains with the link-button pushed.*

▷ *The solo button has no influence on the aux sums!*

▷ *Double clicking the field next to the Pre button allows you to enter volumes numerically in dB values.*

“AUX 1”.

Now the balance knob “BAL” follows. It regulates the volume relation between left and right channel of the signal, the way it shall appear in the master sum.

If the “Solo”-button is active in one or more channels, the mix out of the TRACE D4 provides only the signal of these channels.

If the “Mute”-button is active in one or more channels, the mix out of the TRACE D4 **and** the affected aux sums do not carry these signals. The aux busses of these channels are not muted if their “PRE”-button is active.

With the help of the fader at the end of the channel strip, the portion of volume of the channel on the master sum is regulated. Next to it, the level meter with clipping LED (up) and “PRE”-button (down) are located.

If “PRE” is active, the level of the signal is shown independently of the position or *before* the gain knob. If “PRE” is not active, it is measured and shown “post” – that means *after* the fader. This applies to all channel types.

This ends our little overview on the input channels of the TRACE D4 Mixer. Now, you know how to set up the volume of a channel on the master sum or the aux sums. The only thing that’s missing is a possibility to control the level of all of these sum signals. That’s what the master channel on the right side of the Mixer is all about.

The master channel

The upper knobs regulate the volume of the aux sums. Between “AUX 1” and “AUX 2” as well as “AUX 3” and “AUX 4” and so forth a link-button is situated. If clicked on, the concerning Aux-knobs are connected functionally. That means: when opening up “AUX 1”, “AUX 2” is equally pulled up.

▷ *If you set up different volumes for “AUX 1” and “AUX 2” or the right and the left fader without the link-button activated, this relation remains with the link-button pushed.*

If the Solo-button has been switched on in any channel, the master channel will indicate this with a lit “Solo” LED. Using the “X”-button next to “Solo” you can deactivate all solo buttons of all channels simultaneously.

The master faders serve as regulators for the volume of the main sum. They are assigned either to the left or the right channel. As long as link-button is pushed, they are moved synchronously.

Adaptable – changing the view of the TRACE D4 Mixer

In the bottom left corner of the Mixer you may find three buttons for “AES”, “TDM” and “PLAY”. These allow, with a click on the button, to hide or show the affected channels.





▷ *Note: Hidden channels are still active, just like they were shown.*

In order to further adjust the look of the Mixer according to your needs, single rows of control elements can be hid or shown with the help of “Parts”. This applies to all gain-, aux- or bal knobs.

All these functions can be very handy for saving precious space on your computer screen. But they’re also useful if you wish to secure certain setups of faders or knobs from accidentally being changed.

Of course, apart from all these functions, the window can be sized horizontally.

If multiple TRACE D4 have been installed, you can bring up the Mixer of every sound system using the drop-down list in the top bar of the window. The lock-symbol in the upper right corner of the window prevents coverage by other windows. This way the Mixer is always on top and accessible.



You may save certain visual configurations along with the current mixer settings in a “snapshot”. For this, click on one of the three buttons beneath “snaps” on the row “save”. If you wish to recall a snapshot, click on the “load”-button situated beneath the previously saved snapshot.

▷ *Snapshots are independent of setups (see chapter “Saving and loading Setups”). Thus, they will not be overwritten by a setup.*

The number of aux sums

The TRACE D4 can be operated in 3 different modes. Depending on the mode, only a limited number of aux-sums will be available. On samplerates up to 48 kHz 6 aux-sums will be available. On 96 kHz there will be 2 aux-sums. On 192 kHz, no aux-sum will be available.

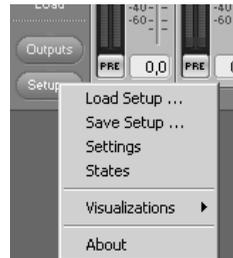
That's why the drop-down list of Mixer and Output Control will be automatically adjusted accordingly.

Further functions

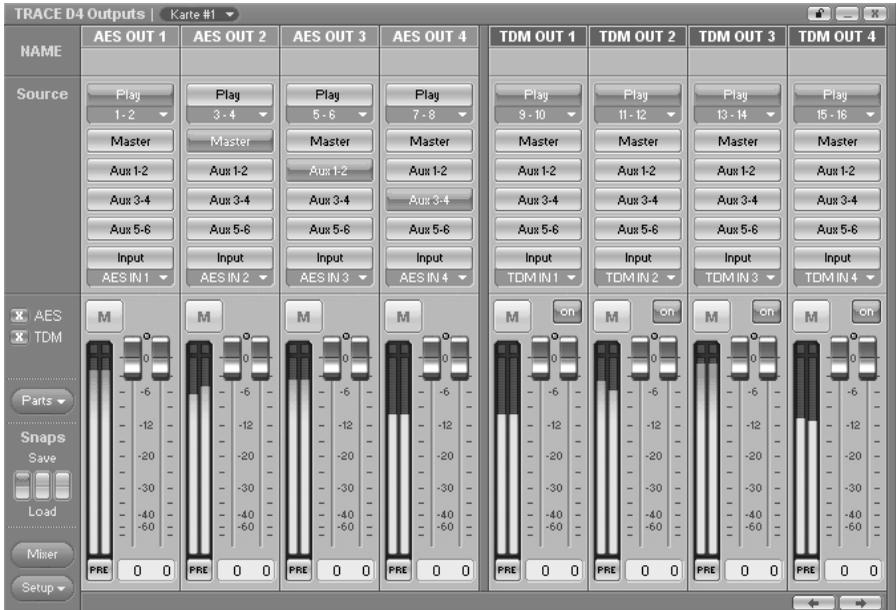
In the lower left corner of the Mixer 2 function buttons can be found. Via "Setup" the same context menu is opened as when clicking on the TRACE D4 symbol in the task bar. Here you will find fast access to important functions and windows of the TRACE D4 sound system.

"Outputs" opens the Output Control. There again you can quickly switch to the mixer surface using the "Mixer" button.

▷ In section "The TRACE D4 settings" you get to know, how to switch between the modes and what the outcome will be.



The Output Control



So far, we have taken a look at signals, which either entered the TRACE D4 via a physical input or as a playback signal of a software.

The Output Control allows controlling all signals, leaving the TRACE D4. It is opened with single click on “Output Control” via e.g. the TRACE D4 symbol on the Windows™ taskbar.

You probably figure, that this window looks pretty much like the Mixer window, save it doesn't have gain-, aux and bal knobs, but routing buttons instead.

Handling

Every element of the output control may be adjusted or moved with the computer mouse. Double clicking a numeric field allows setting up the value for a fader via the computer keyboard. The entries are confirmed with the Enter-key.

What is it all about?

This window shows the four AES/EBU- and the four TDM outputs of the TRACE D4 as stereo channel strips with the name “AES OUT”, or “TDM OUT”.

In the Output Control the signals of the TRACE D4 can be routed completely freely to an available AES/EBU output or a TDM Bus channel. This applies to any input signal, any play signal and all stereo aux-sums.

This is how you do it: Example: you wish to monitor the sum “AUX 1-2” at the digital output 1-2 of the TRACE D4. Thus, push the “AUX 1-2” knob in the output channel with the title “AES OUT 1”. That’s easy - isn’t it?

The same works for input signals. Example: you wish to route the signal of the digital input AES/EBU 1 of the TRACE D4 to the output AES/EBU 2? – No problem. Just push the “Input”-knob on the input channel strip “AES OUT 2. In the drop-down menu below “Input” choose “AES IN 1”. – DONE!

For a playback signal of an audio application push “Play” in the appropriate output channel strip. After that, choose the desired channel in the drop-down menu.

If you choose a signal for an output channel under “SOURCE” you may adjust its volume with the fader at the bottom of that channel strip. The “Mute”-, “PRE”- and link-buttons as well as the level meter and clipping indicator work just the same way as you learned from the Mixer.

TDM channels become active with a click on the “ON”-button. If 2 or more TDM-capable cards have been installed in a computer system, an “ON”-button for a TDM channel can be

▷ *Just like aux- and master-sums the play channels 9-17 are audible on the output of the TRACE D4, only when assigned in the Output Control!*

▷ *Aux 1 and aux 2, aux 3 and aux 4 and so on are grouped to stereo-couples.*

▷ *Another example you can find in the “hands on”-part. in “The TRACE D4 as Mixing and Routing*

▷ *The routing of input signal of the TRACE D4 takes place directly within the hardware of the soundcard and is thereby latency-free.*

▷ For details on the TDM Bus, please read section “The TRACE D4 TDM SyncBus

activated in one Output Control, only. If a TDM channel is already active on one soundcard, and you try to activate the same channel on another soundcard, an warning message will appear.

Adaptable – changing the view of the Output Control

▷ Important on this one: Those channels are not deactivated but simply visually faded out!

Similar to the Mixer, there are two buttons for “AES” and “TDM” in the bottom left corner of the Output Control. With click on the button the channels of this type can be either hid or shown.

Furthermore, you may hide or display certain rows of the Output Control via “parts”.

If multiple TRACE D4 have been installed, you can bring up the Output Control of every sound system using the drop-down list in the top bar of the window. The lock-symbol in the upper right corner of the window prevents coverage by other windows. This way the Output Control is always on top and accessible.



▷ Snapshots are independent of setups (see chapter “Saving and loading Setups”). Thus, they will not be overwritten by a setup.

You may save certain visual configurations along with the current Output Control settings in a “snapshot”. For this, click on one of the three buttons beneath “snaps” on the row “save”. If you wish to recall a snapshot, click on the “load”-button situated beneath the previously saved snapshot.

Now you should have gained an extensive overview for your daily work with the two most important windows of the TRACE D4manager. For in-depth comprehension we recommend you to read the articles of the “hands on” part, which are of interest to you.

The clock status panel



The screenshot shows a window titled "TRACE D4 Status" with a dropdown menu set to "Karte #1". The window contains a table with 7 columns: AES In 1, AES In 2, AES In 3, AES In 4, WC In, Sync Bus, and Intern. Each column has a green LED icon on the left and a status value on the right. The Sync Bus column has a small 'M' icon next to its value.

AES In 1	AES In 2	AES In 3	AES In 4	WC In	Sync Bus	Intern
kHz 44.1	kHz 48.0	kHz error	kHz error	kHz 48.0	M kHz 44.1	kHz 44.1
SRC active	SRC active	SRC error	SRC error			

What is it all about?

The TRACE D4 clock status panel quickly reports about sample rates, clock-sources, validity of a clock and the state of the sample rate-converters (TRACE D4 SRC only) of every installed TRACE D4. If multiple TRACE D4 have been installed, you can bring up the states panel of every sound system using the drop-down list in the top bar of the window.

The lock-symbol in the upper right corner of the window prevents coverage by other windows. This way the status panel is always on top and accessible.

Clock-status and sample rate

The first row of the panel tells you, which sample rate is captured on which connector or input (AES In 1 to 4; Wordclock; SyncBus) or is set up for the internal clock. The green LED on each left side, shows, whether or not the clock has been derived correctly from the corresponding input. If no clock source was detected on a connector, the red LED lights up. Additionally the hint “error” shows up. If this input has been chosen clock-source in the settings of the TRACE D4, the corresponding column will appear red. The input actually used as clock-source will be marked whitely.

▷ *Settings for clock-source and samplerate-converters are handled in the settings window of the TRACE D4 manager. When using the ASIO interface they are done via the software application.*

Samplerate converter

▷ *The settings of the samplerate-converter are done via the settings window of the TRACE D4 manager.*

▷ *If you have questions concerning digital clock and samplerate, please read chapter „The TRACE D4 in connection with digital devices“.*

▷ *The sample rate converters are available on the TRACE D4 SRC, only.*

The second row shows the status of the samplerate-converter of the AES/EBU inputs 1 to 4. If the green LED lights up in a column, the samplerate-converter of this input is active and functional. If the red LED lights up, the samplerate-converter is active, though either no clock can be captured from this input, or the samplerate of this input differs in ratio more than 1:16/16:1 in reference to the clock currently set up and active. If neither of control LED is illuminated, the samplerate-converter of this input is deactivated.

Saving and loading setups

Within the TRACE D4 manager the options “Save Setup...” and “Load Setup...” can be found. With those you can save all current settings (the setup) of the TRACE D4 Mixer and the Output Control into one single file and recall it when needed.

Clicking “Save Setup...” opens the Windows™ file browser where location and file name of a setup are to be assigned. You can save many, many different setups.

Clicking on “Load Setup...” opens Windows™ file browser, where the location of an already saved setup is to be assigned. If a file is chosen, clicking “open” will delete all current settings of Mixer and Output Control and overwrite them with the settings of the new setup file.

▷ *Choose very clear and direct names for your setups, e.g. the date of a session like “recording 2007-09-01”. Also memorize this location well, so you will find this setup quickly next time you need it.*

▷ *For quick and separate saving of certain settings of the Mixer or the Output Control, snapshots are a good tool!*

The MARIAN TDM SyncBus

Principles of the TDM SyncBus

The TDM SyncBus is the collective transport of digital audio- and synchronization signals. With the help of the TDM SyncBus all signals of an audio system featuring the TDM SyncBus may be send out to other Marian sound cards with TDM SyncBus option or returned to an audio application again. The principle of operation of the TDM SyncBus can be compared quite well with the pneumatic dispatch or tube system within one or between several office buildings.

Imagine this: Ms. Smith, from the press department sends out a press report on channel 1 of the tube system. It arrives at the distribution central. If Mr. Mayer from the financial department wishes to read the report, he needs to call for it at the central. He will then receive it in the inbox of channel 1.

The same way as Ms. Smith uses a tube channel to send out a document within the building, you can use a TDM channel to send out a signal to the TDM SyncBus via the Output Control. The same way as Mr. Mayer receives the document in the inbox, the audio signal of the TDM SyncBus lands up in the input of the TRACE D4 Mixer.

This is also possible: Mr. Miller from the neighboring building may also request the message of Ms. Smith. For this, the distribution central simply copies the document and sends it out a second time to Mr. Miller.

That means: If several Marian sound cards with TDM SyncBus are installed in a computer, the signals of the TDM channel are available to the other sound cards as well.

BUT: The capacities of the pneumatic dispatch are limited. E.g. if Mr. Miller from the neighboring building also wishes to send a document, he must not use channel 1, since Ms. Smith from the press department is already sending out his stuff here. All in all there are only 8 channels, that's why Mr. Miller must decide for channel 2 to 8.

For the TDM SyncBus this means: only one signal in one channel but eight channels at the maximum can be distributed simultaneously. That is to say that a certain TDM channel may only be active in once Output Control.

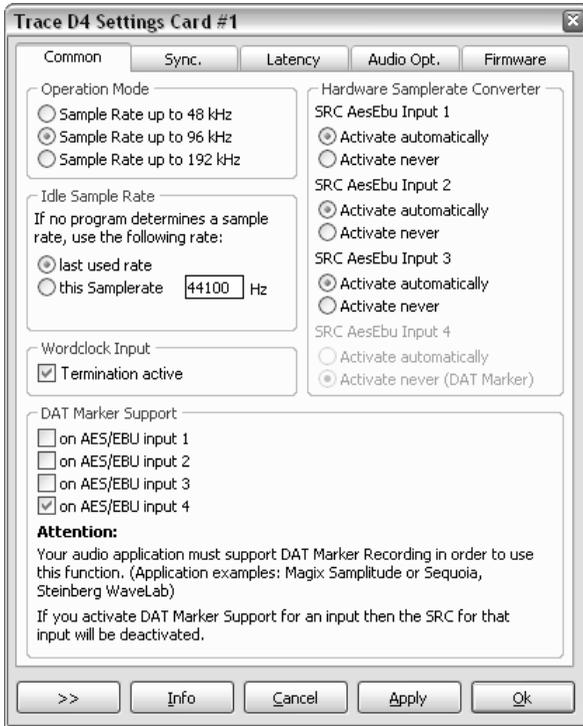
Using the TDM SyncBus

As already described, the TRACE D4 offers 16 playback channels. These can be used with one or more software applications. Where these signals are actually played back or where they are sent to, is completely up to you.

E.g. in order to send the playback signal “TRACE D4 1-2” to the TDM SyncBus, all you need to do is to push “Play” of the desired TDM channel in the Output Control and choose the playback signal from the drop down list.

In order to record the signal of this TDM channel, you need to choose the input “TRACE D4 9-10” in the software application, whereas “TRACE D4 9-10” to “TRACE D4 16-17” correspond to the TDM channels “1” to “4”.

The settings



The following chapter is all about the system settings of the TRACE D4. You open the corresponding window via the TRACE D4 symbol on the taskbar. Should questions remain, we recommend taking a look at the “hands on”-part of this manual. Especially the section “The TRACE D4 in connection with digital devices” contains simple examples for right handling of the clock settings.

General

Operation modes

Operation Mode

- Sample Rate up to 48 kHz
- Sample Rate up to 96 kHz
- Sample Rate up to 192 kHz

The TRACE D4 can be operated in three modes. By choosing one of these options, you define which maximum sample rate the TRACE D4 can be operated with. This also affects the number of aux-sums available besides the master-sum. In 192 kHz Mode no additional mix sum besides the master sum is available. Therefore, in this mode, the mixer and the Output Control do not offer any aux knobs or buttons. When choosing the option “samplerrates up to 48 kHz” there will be 6 aux-sums available. When choosing the option “samplerrates up to 96 kHz” there will be 2 aux-sums available.

Idle Sample Rate

Idle Sample Rate

If no program determines a sample rate, use the following rate:

- last used rate
- this Samplerate Hz

In the section “Use this sample rate”, you can type in, which sample rate the TRACE D4 shall work with, if it is not busy with playing back or recording tasks of an audio application. For example, if you use the TRACE D4 purely as a digital mixer.

In choosing “last used rate”, the sample rate, which was used last by a recording or a playback through a software, is kept by the TRACE D4.

Word clock input

Wordclock Input

- Termination active

If you operate the TRACE D4 as last unit in a word clock chain, you can set the termination for the word clock input right here.

DAT Marker Support

DAT Marker Support

- on AES/EBU input 1
- on AES/EBU input 2
- on AES/EBU input 3
- on AES/EBU input 4

Attention:
Your audio application must support DAT Marker Recording in order to use this function. (Application examples: Magix Samplitude or Sequoia, Steinberg WaveLab)

If you activate DAT Marker Support for an input then the SRC for that input will be deactivated.

This section gives access to set up the DAT marker support for each AES/EBU input individually. Note that for recording DAT markers a compatible software is required. When activating a DAT marker

the sample rate converter of an input will be disabled.

Sample rate conversion (Trace D4 SRC only)

Hardware Samplerate Converter

SRC AesEbu Input 1

- Activate automatically
- Activate never

SRC AesEbu Input 2

- Activate automatically
- Activate never

SRC AesEbu Input 3

- Activate automatically
- Activate never

SRC AesEbu Input 4

- Activate automatically
- Activate never (DAT Marker)

Here you can find the options of the sample rate converter for each AES/EBU input. Activating the option “activate automatically” will generally allow sample rate conversion on that input, except if the clock source of that input was chosen. On “Never active” the sample rate converter is deactivated permanently. Note: With this setting only, the transmission of DAT markers like from a DAT recorder will be possible.

Synchronization

When working with digital audio signals, a clock is always required. The settings listed here, define where this clock comes from. If no clock is available or a wrong clock setting is made, playback errors or even system malfunction can be the result.

The TRACE D4 as clock master

If “Internal Clock” is chosen, the TRACE D4 itself generates the clock. External devices can receive this clock signal via the AES/EBU outputs or the SyncBus of the TRACE D4. This lifts the TRACE D4 to clock master status. If external devices are configured as clock slaves, they will work synchronously to the TRACE D4.

The TRACE D4 as clock slave

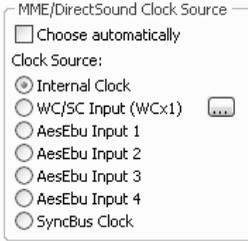
If one of the following three options is chosen, the TRACE D4 will work synchronously to connected digital devices and therefore turn into a clock slave.

- When choosing “AesEbu Input 1” to “AesEbu Input 4” the clock is extracted out of the corresponding digital audio input signal.
- When choosing “Wordclock Input” the clock at the Wordclock input (WC IN) is interpreted as Wordclock and used as such.
- When choosing “SyncBus Clock” the clock from the SyncBus connector on the TRACE D4 is used. For this to work, the option “Card is SyncBus Master” must not be chosen.

The TRACE D4 as SyncBus master

If you own two or more MARIAN PCI sound systems and have connected them all in your computer using a SyncBus cable, you can now define, which card supplies the digital clock in this setup using the option “Card is SyncBus Master”. On all other cards, this option has to be inactive. On the SyncBus Master card any clock source may be chosen. All other MARIAN PCI sound systems are now running synchronously to this clock.

MME/DirectSound Clock Source



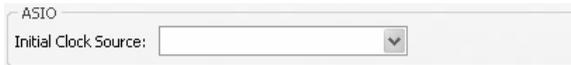
By selecting “choose automatically” the TRACE D4 driver will set up the valid clock source by itself depending on the recording- or playback-situation. In that case, please pay attention to the specialties dealt with in chapter “Important notes on TRACE D4 and digital clock”.

Attention: If the connected device is not synchronized with the TRACE D4 and still you are recording from this digital input, the recording will suffer digital errors. These are possibly not instantly perceptible while quickly checking, but can ruin a recording by periodical “clicks” and “cracks” in the long run.

Important: The clock settings of the TRACE D4 manager will be ignored and overwritten if an audio application accesses the card via the ASIO driver. These settings will be done by this application. Commonly there is a drop down list showing all available clock sources of the TRACE D4 besides the field where the “ASIO TRACE D4” driver is chosen. After quitting the ASIO application the clock settings of the TRACE D4 manager will be restored.

The TRACE D4 can be operated in 3 different clock modes. The following section will explain these and sort the different options of clock sources accordingly.

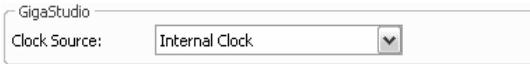
ASIO



For most audio applications using the ASIO interface, the clock source for the TRACE D4 may be chosen directly in the application. But some applications do not support this. This is why the TRACE D4 Manager allows with “Initial clock source” to set up a certain clock source in the drop down list, which will be used after the start of such application.

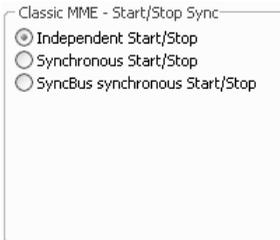
With respect on the multi-client capabilities of the TRACE D4 it is not possible to change the clock source for running ASIO applications here.

GigaStudio



This section is available only if a Tascam GigaStudio application is installed. In the drop-down list, “clock-source” you can define, to which clock signal GigaStudio is to be synchronously operated to.

Classic MME Start/Stop Sync



The start/stop synchronization can be turned on or off for all audio devices. If this option is active, the audio data transfer of all audio devices is started and stopped simultaneously.

What effect does that have?

Let’s suppose you wish to play back four stereo audio tracks from an audio application on different devices of the TRACE D4 (“TRACE D4 1-2” to “TRACE D4 7-8”). If all devices would be started and stopped asynchronously, it could happen, that track one (here: “TRACE D4 1-2”) starts first with playing back, and track four (here: “TRACE D4 7-8”) starts last with playing back. This offset can distinctively be hearable. But if you choose “synchronous start/stop” the playback of all tracks will start sample precise. There is no offset between (“TRACE D4 1-2” to “TRACE D4 1-2”. The same applies for a recording situation.

▷ *You can activate the „classical“ MME drivers in the system settings under “Audio Options”.*

This option is only relevant, when working with “classical” MME drivers. In case of ASIO or GSIF, the synchronization is automatically ensured. For WDM/DirectSound the start/stop synchronization is, according to the specifications, not possible.

This function is not available on Windows™ Vista

Latency

DMA Buffersize (Samples)

These settings apply to all installed Trace D4.
Changes at these settings are used immediately. Thus, it is not necessary to click "Apply" or "Ok".



64 128 1536

Test Tone at "Trace D4 1-2" (1 kHz, -6 dB, 44,1 kHz)

Resulting Latency (depends on samplerate):

kHz	22,05	32	44,1	48	64	88,2	96	176,4	192
ms	5,80	4,00	2,90	2,67	2,00	1,45	1,33	0,73	0,67

DMA Buffer Size

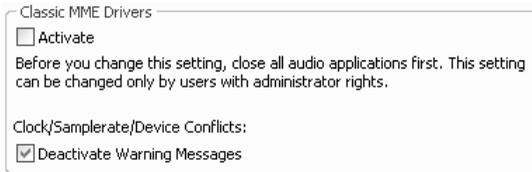
Via the upper slider you can adjust the minimal latency of the TRACE D4. Here, the size of the buffer, shown in samples, is changed for the audio transport between PCI bridge and TRACE D4. If you operate the soundcard with e.g. 44.1kHz, 88 samples will result in a latency of around 2ms. On 88,2kHz, this number of samples would mean a latency of 1ms. The cart "resulting latency" shows these connections for some important samplerates.

By activating "Play test tone at TRACE D4 1-2" a sine tone is played back at the digital output 1-2 on the TRACE D4 with -6dbfs. Monitor this signal and adjust the value for the DMA buffer to be as small as possible, but without receiving distortions when playing back the sine wave.

▷ *The DMA buffer size is always simultaneously changing the latency for the GSIF interface.*

▷ *Important hints on how to set up the latency you will find in the „hands-on“-part and section "DMA bus master technology".*

Audio Options



Classical MME Drivers

On Windows™ XP, the MME drivers function via WDM. This may result in certain disadvantages. By activating this option, all in- and outputs of the TRACE D4 can be used via the “classical” MME interface. They appear with the suffix “(MME)” on recording and playback devices within an audio application. Please quit all audio applications prior to activating this option.

This function is not available on Windows™ Vista

Clock/Sample rate/Device Conflicts

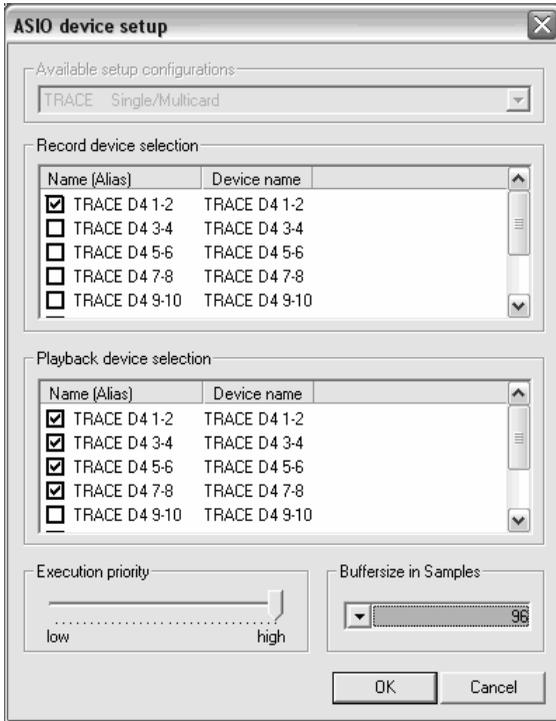
As you can see in chapter “Important notes on TRACE D4 and digital clock”, situations can occur, where certain requirements to the TRACE D4 can not be met. For example:

Using the classical MME drivers, encountering a situation, which can not be established, the driver of the TRACE D4 can inform you about this with an appropriate error message or warning. Oftentimes, this can be insufficient since some applications test all available devices of the TRACE D4 on system startup. This test, would certainly lead to an accumulation of such messages. You’d be busy for quite a while confirming these by clicking “OK”. By standard, error- and warning messages are therefore deactivated.

For diagnostic purposes it is recommended to deactivate this option, since it can provide a good hint on searching causes for problems in this field.

This function is not available on Windows™ Vista

ASIO Device Setup



Due to small latency time, the ASIO interface has become a standard in professional music production. The ASIO device setup offers important settings for the TRACE D4 using the ASIO interface. It is opened from within the audio application, which supports the ASIO standard. Most times there is a button called “control panel” next to the field where the ASIO driver is selected – a click on it opens the ASIO device setup.

▷ *Please consult the manual of your audio application to get to know, where exactly the configuration of the ASIO driver is made.*

In this window you can see all in- and outputs the TRACE D4 offers. If one entry is checked, then the corresponding in- or output is activated and usable for the audio application.

▷ *Hint: some audio applications require additional steps of activation, so the in- or outputs of the TRACE D4 can actually be used. For further details, please take a look at the manual of the audio application.*

▷ *Changing the “Execution Priority” and the ASIO “Buffersize” might be helpful when encountering distortion noise such as digital errors while playing back or recording. Please read chapter “Setting up the Latency” in the “hands-on”-part*

With a click on an entry of an in- or output in the column “name (alias)”, you can change its name. This name will also appear this way in the ASIO application. For example: You re-name “TRACE D4 AES/EBU In” to “From CD-Player”. Now you can see in the audio program at first glance, which signal origins from the CD-player.

In the bottom left corner of the window, the “Execution priority”-slider is situated. It can be moved between “high” and “low” by dragging it. In position “high” the transfer of the audio data between ASIO audio application and TRACE D4 receives the highest priority. That means the CPU of the computer processes them preferably.

In position “low” the calculation of plug-in effects is given the highest priority, the audio data transfer is cared about secondarily.

In the bottom right corner of the window, the “buffersize in samples”-field is situated. This value defines the delay time (latency) of the audio data transfer for ASIO.

Example: When working with a sample rate of 44.1 kHz, a buffer size of 176 samples will give you a delay time of 4ms. Working with a sample rate of 88.2 kHz, 176 samples will give 2ms delay.

The TRACE D4 in the connection with digital devices

Background

As you probably already know, there is one big difference between analog and digital audio signals: analog audio signals are continuous. That means at any given time you can measure this signal and retrieve a defined measuring value. As opposed to digital audio signals. They consist of many single values (samples), which follow each other in a certain frequency (sample rate). Here it is not possible to receive a measuring value at any time, but only as often as the sample rate defines. Example: having a sample rate returning one value a second, you can't measure a value at half a second.

What is a clock?

As you can see, there has to be something governing, at which moment of time a digital value is to be measured. This is exactly the task of the clock. It is the impulse- or rate generator. The rate, given by the clock, defines the sample rate.

Let's make this a little clearer with an example: Imagine an orchestra with a conductor. The maestro lifts and lowers the baton – he gives the beat. Depending on the beat, the musicians play either fast or slow. The conductor is thereby the clock and the speed the orchestra plays with, that is the sample rate.

What happens if an orchestra plays without a conductor? – complete chaos! Every musician plays just like he wants in a different speed. The same happens if you connect digital audio devices. Just like in the orchestra example, there has to be defined, who is maestro (the master) and who are the musicians (the slaves).

The rules in the digital audio world

Connecting digital audio devices the following three simple rules have to be maintained.

1. All devices have to be synchronized with each other. (Using the clock)
2. There can only be one! That is the device (the master) governing the rate. All other devices have to lock in on this rate (the clock) of the master and are thereby slaves.
3. Digital audio connections mostly include a clock. (S/PDIF; ADAT or AES/EBU). Besides that, the synchronization can be ensured using Wordclock- or superclock connections. But within a compound of digital audio devices, the clock has to be the same – everywhere.

Important notes on TRACE D4 and digital clock.

Clock settings when using ASIO

If you work with an audio application using the ASIO interface of the TRACE D4, all clock settings will be managed by that program and overwrite the current settings in the manager! Which clock source is used, can still be read in the clock settings within the TRACE D4 manager. The manual of the application should give you report about which clock source the audio application chooses under which circumstance. If the audio application is closed (communication with the ASIO driver is terminated), all previous clock settings are being reset.

Level metering in the TRACE D4 Mixer

In order for the TRACE D4 Mixer to show the levels of a digital input signal, it has to use the clock of this input. That means: If the clock source is not read from this input, no digital input signal can be used or shown, save you activate the sample rate converter for this digital input.

In that case, the sample rate on the input is adjusted to the currently active clock, in order to allow correct displaying. Now the level of that input port can also be shown. If the sample rate conversion is switched off, the affected input channel will have a small red square in the level meter.

Different sample rates when playing back

You already work with certain in- or outputs of the TRACE D4 with a certain sample rate. Now you wish to use other in- or outputs simultaneously, but with another sample rate. Since the TRACE D4 can be operated with one sample rate, only, the driver will inhibit the usage of the additional in- or outputs. The simultaneous operation of the TRACE D4 with different sample rates is possible using the standard-MME or directSound driver, only.

Samplerate when recording

Please note, that a certain samplerate for the TRACE D4 can only be set, if the used clock-source is the internal clock. If synchronized externally (Clock is being read from an AES/EBU input or from the SyncBus), the samplerate will be defined by the connected devices.

Simultaneous playback on one channel

Example: You are playing back on a certain device (e.g. "AesEbu 1-2") of the TRACE D4. Now you wish to playback another signal of another software application via the same device. The TRACE D4 driver will inhibit this, except if the simultaneous playback of several audio programs via the same device happens using the standard-MME or directSound drivers.

Overview

The following chart shows the different situations for recording and playback.

Situation: Recording and level capturing of one or more inputs, where the input signal is not synchronized with the current clock of the TRACE D4.

Current clock-source:	Recording/Level-metering of:	
	One input	Several inputs
Internal clock	X	X
Any clock and SRC active	✓	✓
Clock of input active	✓	✓ (for this input only; other inputs need SRC)

Note: A recording is generally possible, if the input signals are synchronized with the TRACE D4.

Situation: Playback of one, or several applications

Current clock-source:	Playback:	
	One application via one output	Several applications via one output
Internal clock	✓	Only when using standard MME or DirectSound driver

Situation: Defining the samplerate

Current clock-source:	Samplerate
Internal clock	Defined by TRACE D4 (Software application)
Any clock and SRC active	Defined by clock-source
Clock of input active	Defined by input signal

Parallel recording and playback

Example: A playback is running on the TRACE D4, using the internal clock source. Now you wish to start a recording simultaneously. Without the sample rate converters for this a switching of the clock-source is required. But this would cause distortion signals on the running playback. The TRACE D4 manager and driver will always inhibit a switching of the clock-source, if a playback or recording is already going on.

The Channel References

The following charts show you the different physical input and output channels of the TRACE D4 and how they are assigned to devices available to an audio application.

Playback line

Software Playback device	Mixer	Output Control
„TRACE D4 1-2“ to „TRACE D4 7-8”	Available as „PLAY 1-2“ to „PLAY 7-8”	Routable to any output via the „Play“ button and the drop down list
„TRACE D4 9-10“ to „TRACE D4 15-16”	Not available	Routable to any output via the „Play“ button and the drop down list

Record line

Physical inputs on the TRACE D4	Mixer	Software recording device
Input 1 to 8	„AES IN 1“ to „AES IN 8“	„TRACE D4 1-2“ to „TRACE D4 7-8“
TDM input 1 to 8	„TDM IN 1“ to „TDM IN 8“	„TRACE D4 9-10“ to „TRACE D4 15-16“

PCI Bus Master Technology

As opposed to PCI cards with PCI target chip, the TRACE D4 is constructed as PCI bus master card. The PCI bus master technology offers some important advantages: It allows extremely small latencies while keeping the CPU load very small. Such qualities are fundamental key functions for a powerful digital audio workstation (DAW). Unfortunately, the PCI bus master technology also has a disadvantage.

Background: The principle of operation allows for a PCI card to independently initiate a data communication with the main board of the computer. The parameter for the time wise length of such data transfer is called “PCI Latency Timer”.

Problem: If this time is very long, a PCI card may perfectly and effectively exchange data with the main board, but on the other hand, it may block other components, trying to do the same. That’s why it could happen, that e.g. a network card or a hard drive controller might hinder the operation of the TRACE D4, if the PCI Latency Timer for this component is set up very high.

Solution: If, even with correct driver- and DMA latency time, digital clicks or distortions appear on a recording or a playback when using the TRACE D4 with a lot of channels on high samplersates, it may appear necessary to perform changes at the PCI Latency Timer. Some BIOS allows changing the PCI Latency Timer for every PCI slot separately. That means, if you figure out, that e.g. the latency time for the network card of the computer is set up quite high (64 or more) and thereby hinders the TRACE D4, the PCI Latency Timer for this component has to be reduced. Some other BIOS allows only global changes of the PCI Latency Timer parameter. In that case the time frame may only be changed for all components equally. But also on the Internet several programs are offered, that allow adjustments of the PCI Latency Timer for different components

Hands on the TRACE D4

The TDM SyncBus

The situation

You have created a pretty large setup using Mixer and Output Control: via all physical outputs signals are being played back – all outputs are occupied. Additionally you created a stereo master sum and several aux-sums. The question arises: where and how could those mix-signals be monitored, even though all physical outputs of the card are already in use?

The solution

Use another TRACE D4 and the TDM SyncBus! In the Output Control of card 1, click on “Master” in the TDM Out 1 and activate the bus with the “On” button. The master sum is now lead to TDM channel 1. In the Output Control of the card 2 click on “Input” and choose “TDM IN 1” in the channel where you wish the signal to appear – finished! Now the master sum is monitored on the second TRACE D4.

You may proceed similar with the aux-sums using the remaining TDM channels.

The second situation

You have created a nice mix down of input- and playback signal using the TRACE D4. You wish to record this mix, but you don't own a second recording the system with the required AES/EBU inputs.

And its solution

Again the solution is named: TDM SyncBus! TDM channel are available as input signals to any audio recording application. Just assign the input “TRACE D4 9-10” to a stereo channel in you preferred recording software. This channel includes the signal of TDM channel 1. All you have to do then is to feed TDM channel 1 with the mix sum. For this, click on “Master” in the TDM Out 1 in the Output Control and activate the bus with the “On” button. Now the master sum is fed to the TDM channel 1.

Sample rate conversion

The situation

Let's suppose the following situation: You have connected a DAT recorder with S/PDIF output and an external signal processor (e.g. reverb generator) with AES/EBU output to your TRACE D4 system. In your music project, if you wish to record both signals or simply want to monitor them via the TRACE D4 Mixer, this usually turns out to be a problem. Because, even if both devices play back at 44.1 kHz, this sample rate differs unequally strongly between both devices. That means there is not one single clock source with one single sample rate only, as required for digital signal routing. This makes at least one input signal unusable because of digital errors. Normally, this type of problem is solved by synchronizing all devices externally. But only few DAT recorders and only very professional signal processors provide the necessary word clock input.

The Solution

Activate the sample rate conversion for the AES/EBU input of the effect unit. The sample rate is now caught from the S/PDIF input (that means from the DAT recorder. This is now the clock source for the TRACE D4 system. The sample rate converter on the AES/EBU input converts the 44.1 kHz of the reverb unit and makes it fit to S/PDIF input. This way, the TRACE D4 can process even those signals, and the recording succeeds distortion-free.

Setting up the latency

In digital systems the processing of audio data always comes along with a certain delay time. Here is where you get to know, how to set up and optimize this delay time (latency) for the TRACE D4.

Background

Within a computer, digital audio data is transported in small packages, the so called buffers. Thus, an audio signal is split up in little portions (data packages) and is send away piece by piece. Looking at the TRACE D4, these buffers have to be send from audio application to the driver of the TRACE D4. This one takes care, that the buffers find their way via the PCI socket (PCI Controller) to the TRACE D4. If a recording is to be managed with the TRACE D4, all of the mentioned happens in reverse.

Let's make this a little clearer with an example: A composer wants to write a little piece for a piano player. So in just five minutes he fills the first piece of paper with lots of notes. He then hands the paper to the musician who instantly starts to transform these notes into beautiful melodies. He, too, is now busy for five minutes. The composer could have written two pieces of paper in ten minutes, just as well, while the musician continues to play one piece of paper in five minutes. In order for the musician to continuously play, so the music won't stop, the composer must not write less then one score in five minutes.

In this example, the piece of paper is the audio buffer. Just like it contains notes, the buffer contains audio data. The composer is the audio application sending buffers via the audio driver. The musician is the TRACE D4, which receives these buffers via the PCI Controller. The PCI Controller operates with the DMA latency defined by the DMA buffer. In order for the continuous data stream to not break up, the buffers of the audio application must not be smaller than the DMA latency (DMA buffer size)

Setting up the “DMA Latency”

▷ *Please note: the smaller the latency, the higher the system load to the CPU of your computer. For many purposes, e.g. audio editing, mixing, and mastering, small delay times are not relevant. In case of such application - field setting up a higher latency for smaller system load is recommended.*

▷ *For ASIO-applications the DMA-Latency is set up in the ASIO settings.*

1. Connect your monitor with the digital output 1-2 on the TRACE D4
2. Activate “Play Test Tone at “TRACE D4 1-2”” in the settings window.
3. Wait approx. 2 to 4 seconds to check if distortions appear during the playback
4. If “clicks” and distortions appear continuously during the playback of the test tone, move the slider one position further to the right. If no distortions appear, move the slider one position to the left.
5. Repeat step 3 and 4 until an optimal playback without distorted playback is steadily ensured.
6. Depending on your computers performance, the resulting value should be around 2-8 ms.

Setting up the audio driver latency

Possibly, this value has to be readjusted, when working with MME- or DirectSound applications.

1. Open the audio application
2. Start playing back a simple signal (e.g. a stereo track) and control it via the TRACE D4.
3. Go to the audio setup of the audio application
4. For DirectSound- and MME applications, there is a setup field for the buffer size, defining the latency, mostly within the application.
5. Decrease the buffer size or latency as far as needed, but without causing the playback signal sound distorted

The TRACE D4 as mixing and controlling surface

Situation

Imagine this situation: a radio broadcast studio is to be set up. The desk of the radio DJ must offer a comfortable control of all audio broadcast signals from one single surface – a perfect example for the TRACE D4 SRC! So we are going to put together step by step a complete studio to show you the extensive mixing- and routing-possibilities of the TRACE D4 SCR.

Hardware routing

At first we give our studio two professional CD player with AES/EBU output, to be able to blend over two pieces of music (we don't do mp3 – we count on quality!). Those we connect to stereo input one and two of the TRACE D4.

Next our DJ gets the biggest microphone available for money upfront his nose. This one, and some other mic for at least one guest we connect to the TRACE D3 input three via a mic preamp with A/D converter and AES/EBU output.

In order to give our broadcast profile a kind of modern touch, we plug a multi effect unit with AES/EBU connectors into our rack. (This allows us to add some reverb to the DJ at times, or present our guest with the famous Mickey Mouse effect.) The stereo output number four of the TRACE D4 SRC is connected with the effect unit and lead back again to the stereo input number four.

In order for our DJ and the guest to hear themselves and the music. We put them under two comfortable headphones. Those get powered by a headphone amplifier, connected to stereo output number three of the TRACE D4 SRC.

Finally, we connect a DAT recorder to output two of the TRACE D4 SRC. With that one, we wish to record every thing that went out on air and have it available always for the last two weeks according to the current regulations.

The Settings

Everyone acquainted with digital gear, would now friendly but distinctively point out to us, that on our cabling session we did forget an important device: the clock master. (remember that master-slave-thing from earlier?) But we will generously overlook that one, because our gear might not be capable of being synchronized. In order to dodge additional cabling and extensive gear tuning, we take a look at the settings of the TRACE D4 SRC. This is where we find an pretty useful option: sample rate converter: “activate automatically”. As you can read in chapter “The sample rate conversion of the TRACE D4 SRC”, this option is definitely the right thing to get all the different digital input signals together. In our case, we are activating every sample rate converter for every input and choose “Internal” as clock source in the settings of the TRACE D4 SRC. Additionally we define right here, what the maximum sample rate is going to be –e.g. 48kHz.

Software routing

At first we need a broadcast mix. That’s a sum signal of all single signals (CD player, microphones, etc.) For this we use the stereo sum of the TRACE D4 SRC Mixer. All input signals connected to the TRACE D4 SRC (by the way also all mp3 playback signals and likewise from the computer) are routed automatically to the stereo sum. (for stereo signals combine 2 channels into a stereo pair) That means, we only have to take care of getting this sum out of the TRACE D4 SRC twice – one broadcast mix and a copy for the record on DAT. That’s why we hit “Master” on “AES OUT 1” and “AES OUT 2” in the Output Control. Now we can adjust the level, with which the signals is to reach the certain medium.

Secondly, we take care that the DJ and the guest may hear themselves and possibly the music, too. Here we use an aux sum. On every channel that must be heard via the headphones, we open up aux 1-2. The link button is a great helper... When activated, the stereo signals are displayed correctly on the headphones also. Additionally we switch on the “Pre” button for all used aux knobs. This makes the mix of signals on the headphones independent of our broadcast mix allowing the DJ to easily talk into the music, without getting distracted by it. He only has to turn down the aux knobs of the CD channels („AES IN 1“ and „AES IN 2“) – the broadcast mix is not affected by the level setting. In order to get out this aux mix out of the TRACE D4 SRC, we push “Aux 1-2” on output “AES OUT 3” in the

Output Control. There we can also adjust the main volume of the headphone mix.

At last we want to set up an effect send. The radio DJ shall appear with a reverb effect for the listener. For this we also use a aux sum. On the input channel of the DJ we pull up aux 3-4. In the Output Control we send out this aux sum on output “AES OUT 4” with a click on “Aux 3-4”. Now part of the signal of the DJ reaches the effect unit. The reverb effect returns to TRACE D4 SRC via input “AES IN 4”. The only important thing is, that we stay away from pulling up aux 3-4 on that channel – a feedback would be the annoying response. For the aux track of the DJ we do not activate the “Pre” button. Else, a certain signal would always reach the reverb unit, even if when the DJ turned down his volume or muted his track. It would mess up our broadcast sum.

The following table will give a schematic overview of the complete routing.

Origin	CD 1		CD 2		MicPre		Reverb	
Mixer channel	AES 1	AES 2	AES 3	AES 4	AES 5	AES 6	AES 7	AES 8
Output control	AES 1		AES 2		AES 3		AES 4	
Sum signal	Main mix (Master)		Main mix (Master)		Aux 1-2		Aux 3-4	
Destination	Radio mix		DAT		HP Preamp		Reverb	

The TRACE D4 as hard-disk-recording-system

With the following example, we would like to show you, how to set up and optimize the TRACE D4 as a reliable hard disk recorder.

Situation

Let's recall our high class broadcast studio. Suppose we wish to have a broadcast record, where all signals are available single, that means unmixed. (That makes four music tracks and two narrators, since they got acquainted to narrate on running music)

What's there to care about?

Amount of data

Digital audio-data requires memory space – quite a lot...

It depends mostly upon the used sample rate. That means: double the sample rate and you will need the double of memory space. This is a little example for a one hour recording, with 6 tracks, recording at 192 kHz:

- $24 \text{ bit} * 192\,000\text{Hz} = 4\,608\,000 \text{ bit per second}$
- $4\,608\,000 \text{ bit/s} = 562 \text{ Kbyte/second}$
- $60 \text{ seconds} * 60 \text{ minutes} * 6 \text{ tracks} = 21\,600 \text{ seconds}$
- $562\text{Kbyte} * 21\,600 \text{ seconds} = \text{approx. } 12 \text{ Gbyte}$

Depending on the audio software, there is mostly more data stored. Always plan about 1/3 more memory than calculated.

That means you need quite a modern hard drive with at least 16 Gbyte of memory and a high saving rate.

Needless to say, the affected computer should be of a newer date, to reliably process that amount of data in the given time.

The software

▷ *This could be e.g. Magix Samplitude, Ableton Live, Cakewalk Sonar, Steinberg Cubase, Adobe Audition...*

You need a multitrack-capable software, which can reliably record the audio signals of the TRACE D4. The software communicates with the TRACE D4 via the audio driver. In our example there are actually two that would apply: the “classical” MME drivers, or the ASIO drivers.

The setup

▷ *See section “Audio Latency” in “The TRACE D4 Settings”!*

▷ *We urgently recommend activating the options “Classical MME-driver” and “Start/Stop Synchronization” within the TRACE D4 manager.*

▷ *Read section “Setting up the latency of the TRACE D4.*

Since, when recording, the audio data has to be transported between the computer and the TRACE D4 distortion-free and error-less, the audio latency has to be adjusted perfectly. Check the corresponding settings! Choose bigger values (e.g. 10-20ms) to keep the system load small. Start your preferred audio application and choose the “ASIO TRACE D4”-driver or the Multimedia driver, in “Audio Settings” or “Audio Options” from within the software. The in- and outputs of the TRACE D4 appear in the format “AES/EBU 1-2 (MME)” Using the ASIO driver, all wanted in- and outputs have to be activated via the ASIO device setup. Using the multimedia driver, all wanted in- and outputs are commonly activated via the audio software. Set up the latency for MME/ASIO. Again: rather enter bigger or more buffers, for a more relaxed system load.

Create the desired number of tracks in the software and assign them to the different inputs of the TRACE D4. Put the tracks to record ready, push “record” and there you go...!

Glossary

ASIO

ASIO stands for “Audio Streaming Input Output” and is a driver interface for soundcards developed by the company Steinberg. With ASIO very small latency times can be achieved. The ASIO driver is not multi-client capable. That means, different audio applications may not use the same audio device simultaneously.

Audio Device

In the field of digital audio processing, this mostly names an in- or output of an audio system, the way it appears in an audio application.

Aux

In the audio world “Aux” or “Auxiliary” names an additional in- or output. That means a physical in- or output or a mix signal besides the main mix signal.

Buffersize/Buffer

When transporting audio data within a computer (e.g. recording or playing back a signal), they are chopped in equal blocks called “buffer”. That means, they are a certain time frame out of a complete signal. The number and size of the buffer defines the delay time (latency).

Direct Sound / Direct X

DirectX is a Windows™ system-software, which allows hardware manufacturers, to support different input-, graphic- or sound functions with their hardware and thereby accelerate it. DirectSound is a part of DirectX. A DirectSound driver creates less CPU load and enables faster latency times than a standard MME driver.

Driver

A driver is a package of software, consisting of a couple of single programs or a part of a software, which ensures communication between a hardware device and other drivers or software applications on standardized level. Certain interfaces are used doing this.

DSP

DSP stands for “Digital Signal Processing”. Most times this names an electrical component, processing audio signals digitally. It calculates, for example, the sum of two signals or an effect into an audio signal.

GSIF

GSIF stands for “GigaStudio InterFace” and is a driver interface for soundcards developed by the company TASCAM. GSIF is mainly used for the Tascam software “Giga Sampler” and “GigaStudio”.

Interface

Interface names a part of a device or software, which other devices or software applications can communicate and possibly exchange data with.

Latency

Latency is, in the field of digital audio signal processing, another word for “delay time”. Example: if you connect a microphone signal to the TRACE D4, it takes some time until it comes from the TRACE D4input all the way to an audio application (e.g. your recording software). Similar, it needs some time, until a playback signal of an audio application actually can be heard at the TRACE D4. This time is called latency and is specified in milliseconds.

Metering

Or level metering. Means the visualization of volume relations of an audio signal.

Pitch

In the field of audio techniques, this means the difference of a sample rate from a pre-defined one. If several digital audio devices are present, this fluctuation of sample rate has to be supported by all devices.

Routing

This word describes which paths on switches audio signals and clock signals take within a system.

Sample rate

In order to convert analog audio signals into digital audio data, they are chopped into a time grid. In this rate, the volume of the audio signal is measure, e.g. 44100 times a second. The smaller the grid, the better is the resulting audio quality.

S/PDIF

S/PDIF stands for “Sony Philips Digital Interface” and was developed by the companies Sony and Philips. With it a digital audio signal is transported either with a light conductor cable (TOSLINK) or a RCA coaxial cable.

WDM

WDM stands for “Windows™ Driver Model” and is an extensive driver model developed by the company Microsoft. Other drivers can build upon this. A derivation of it is used, to handle digital audio data within the computer – see Direct X.

Wordclock

Is the name for a synchronization signal for digital audio systems. It ensures, for all devices connected, to work with the identical sample rate (e.g. 44.1 kHz). Most digital audio formats transmit a clock besides the audio information. E.g. S/PDIF, AES/EBU or ADAT. If no synchronization is possible via the audio connection (e.g. TDIF), digital audio devices have to be supplied with the Wordclock signal. Please don't confuse this with MIDI clock or time code synchronization (e.g. SMTPE).

Technical Facts

Digital inputs:		
4x XLR AES/EBU via breakout cable, galvanically separated		
	Input level	from 0,2 V _{ss}
	Lock range	30 kHz to 200 kHz
Sampleraten converting (TRACE D4 SRC, only)		
	SRC Sample frequency ratio	1:16 / 16:1
	SRC dynamik range	140 dB
	SRC THD+N	-140 dB
Digital outputs:		
4x XLR AES/EBU via breakout cable, galvanically separated		
	Output level	4 V _{ss} on 110 Ohm
	Sample frequency	28 kHz to 212 kHz in Single Wire Mode
1x BNC Wordclock input		
	Input impedance	10 kOhm
		Software controlled termination on 75 Ohm
	Input sensibility	1V _{ss} - 5,6V _{ss}
		Schmitt-Trigger input
		No DC-Offset
		Protection for exceeding levels

Service and Support

Warranty

Each TRACE D4 leaving us, is put under extensive functionality checks. We allow full 24 month of warranty. A copy of the receipt or bill serves as proof of purchase. If there is a deficiency occurring during the time of warranty, you can exchange the unit at your dealer. Damages originating in inappropriate handling or false operation are excluded of the warranty.

You can still send the unit in to us for repair after the warranty has expired. You can decide to have it repaired, after receiving a calculation of the approximate repair costs. For this, please get in contact with our support service.

Contact

If you have any questions or problems when installing or operating the TRACE D4, please proceed as follows:

1. Make sure, the newest driver is installed. The current driver-files can be found on: www.marian.de/en/downloads
2. If still any questions remain, you can contact us via the internet using our support form at: www.marian.de/en/support
3. Or talk to us personally. Dial: +49 341 589 32 22

Interesting news, information as well as information about our products and authorized dealers can be found on www.marian.de.