

DESCRIPTION
REAL COMPETENCE

PHASE 88

24 Bit/96 kHz Multi I/O Recording Interface



TERRATEC PRODUCER/PHASE 88

English Manual

Version 1.0, last revised: August 2003

CE Declaration

We:

TerraTec Electronic GmbH, Herrenpfad 38, D-41334 Nettetal, Germany

hereby declare that the product:

PHASE 88,

to which this declaration refers is in compliance with the following standards or standardizing documents:

EN 50013, EN 50022, EN 60065

The following are the stipulated operating and environmental conditions for said compliance:

residential, business and commercial environments and small-company environments.

This declaration is based on:

Test report(s) of the EMC testing laboratory



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Welcome!

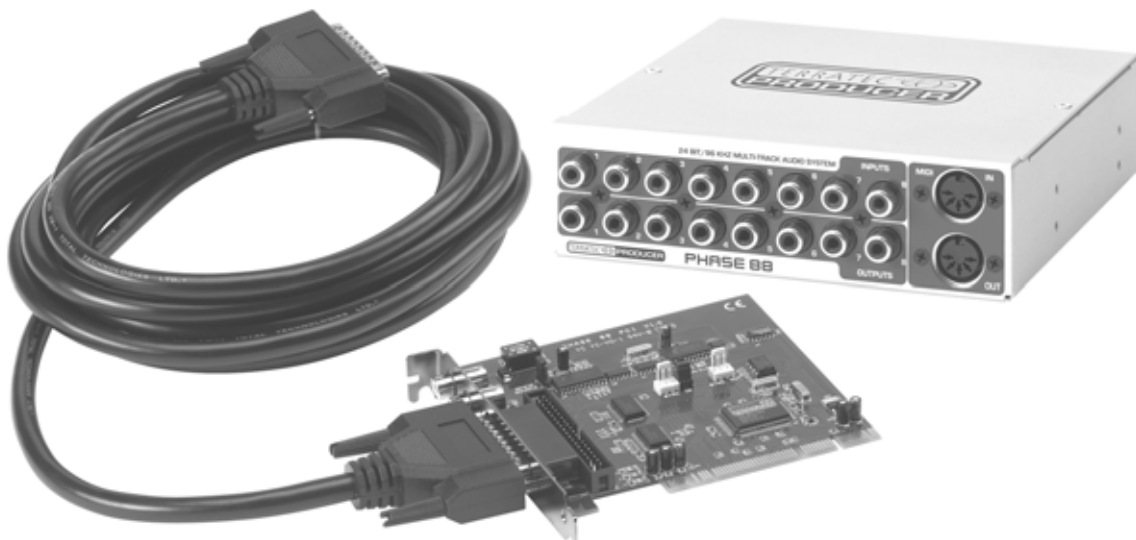
We are pleased that you have chosen a TerraTec Producer Audio Interface for your musical endeavors and would like to congratulate you on your decision. With the PHASE 88 Audio System, you've purchased a sophisticated product representing the state of the art of studio technology - and we're convinced this innovative development will prove extremely useful to you in the coming years and, above all, provide you with a great deal of entertainment.

We hope that this brochure is helpful to you while using the product. It is designed to illustrate technical relationships based on practical examples from the studio environment. However, it is designed not only for beginners, but also for those more advanced in this complex matter: Ambitious professionals, too, will surely learn something new here and there.

We hope you find this manual both informative and entertaining to read, and hope you find lots of pleasure in the PHASE 88 audio system.

Sincerely, Your TerraTec Producer Team

Here's an overview of what you can expect to find when you unpack the box:



Connection options and sound. The PHASE 88 audio system features a range of professional connection options, which predestine it to become the tonal hub of your home or project studio. The finest convertor elements and a well-thought-out motherboard design allow crystal-clear recording and the reproduction of high-resolution 5.1/7.1 Surround productions.

The included 5¼" breakout box contains modern 24-bit converter modules with a resolution of up to 96 kHz. This gives the system a signal-noise ratio of as much as 109 dB(A) at the analog outputs!

With a really "tight" MIDI interface and a variety of usable digital I/Os the PHASE 88 audio system also has enough connections in all directions.

► For everything you need to know about connections, see ➞ page 19.

Complex routing - very easy. As you know, a professional AudioSystem is no sound card for wild-eyed gamers, but the heart of your day-to-day studio work with your PC. And despite the extensive routing options, the PHASE software always provides you with a clear overview and- depending on the complexity of your switching needs- remains transparent and intuitive.

► For everything you need to know about the PHASE control panel, see ➞ page 28.

The drivers provided for the PHASE 88 System, too, leave nothing to be desired. A highly developed software architecture guarantees problem-free use with all modern Windows and Apple operating systems.

The ASIO drivers - thoroughly proven throughout years of application and often used as a reference - allow the lowest possible latency between the software and audio interfaces.

► For all about driver usage see ➞ page 23 (Windows) and ➞ page 27 (MAC OS).

From unpacking the PHASE 26 to installing it.

Before installing the PCI card into your computer and running cables to the PHASE 88 audio system, take note of any special points pertaining to the configuration of your computer. Also refer to the manual of your computer and other studio peripheral devices for their settings.

If you follow the instructions, the installation should run without any problems. If you still have difficulties, please review carefully the relevant chapter in this manual.

Our service hotline team will be happy to help you if you have any other questions about the product. The phone numbers can be found in the Appendix of this documentation.

Scope of delivery.

Start by making sure that the contents of the package are complete.

The PHASE 88 System package should contain the following items:

- PHASE 88 PCI card
- PHASE 88 breakout box
- Internal/external adapter card
- Rubber feet
- Set of screws
- External link cable (4m)
- Internal link cable
- EWS[®] connect sync cable
- PHASE CD-ROM (driver and software)
- This manual
- Service request form
- Registration documents
- Besonic Premium Account

Please return the enclosed registration card to us at the earliest possible opportunity or register online at <http://www.terratec.com/register.htm>. This is important for support and hotline services.

The setup - Short and simple for busy professionals.

- Before installing the PCI card, please check the Sync-In and Sync-Out connections (EWS[®] Connect) on the PCI card. If you do not have any other TerraTec PCI systems with EWS[®] Connect connections in your computer, the following applies:
Sync-In (CN1) - the jumper must be positioned at 1-2;
Sync Out (CN2) - this connection remains free.
- If you have other TerraTec PCI systems with EWS[®]-Connect connectors in your computer, and want to synchronize them, please first read the chapter entitled "Cascading and internal synchronization." (➔ page 39)
- The PHASE 88 Audio Interface is a PCI card with bus-mastering support. Please choose a slot that is as far away from the graphics card(s) and SCSI/RAID controllers as possible - usually as close to the "bottom" as possible in most installations. You should keep in mind that the S/PDIF connections and the heavy connecting cables hang down, and when the breakout box is installed in the front of the computer remember the audio and MIDI wiring.
- You will need one (1) IRQ (for additional IRQ tips see ➔ page 42). If you want to install multiple audio systems of the TerraTec range, you can do this in Windows without difficulty - all PCI cards operate in IRQ-sharing mode (please note the details on cascading here (➔ page 39)).
- The driver installation in Windows (98SE to XP) follows the established defaults set by the operating system manufacturer. You can find the drivers on the accompanying CD-ROM or on the Internet at www.terratec.com in the SUPPORT area.

Notes for Windows users:

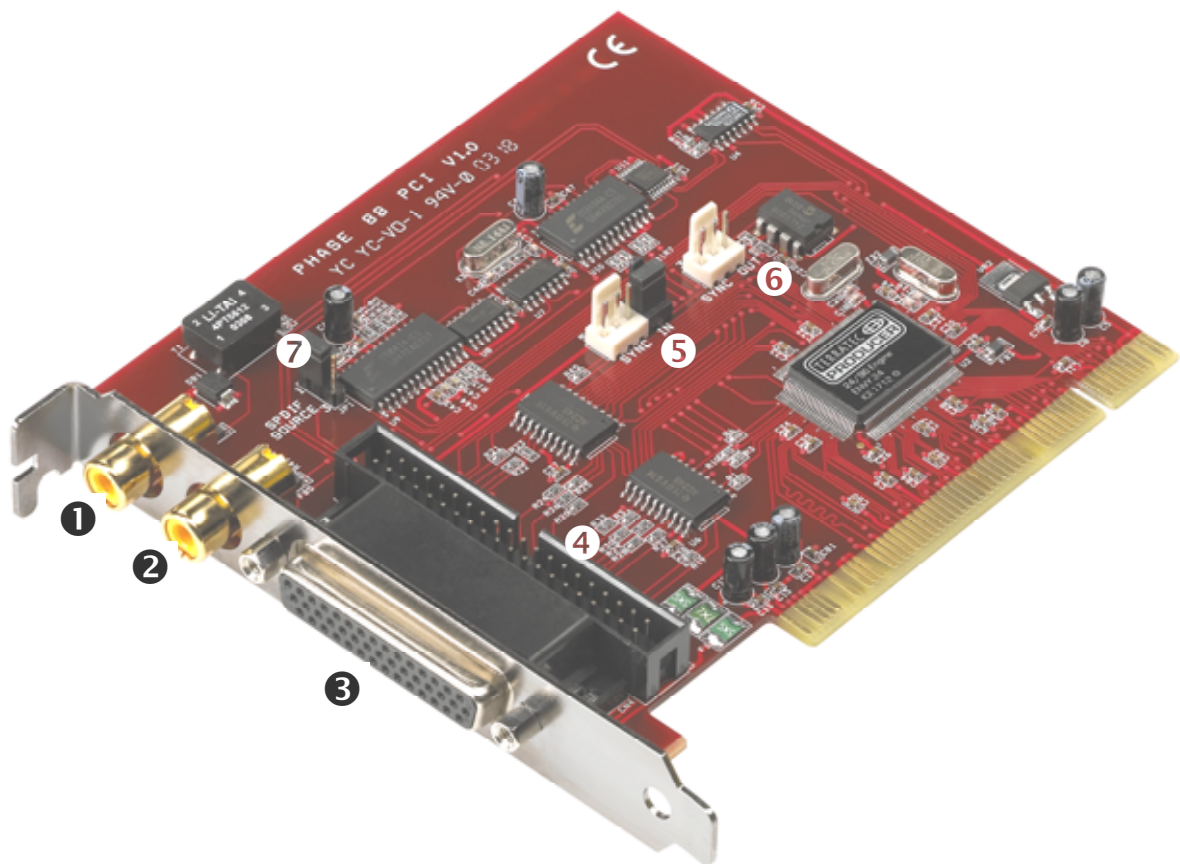
- The drivers have not been certified by Microsoft. You will receive a warning to this effect in Windows 2000 and XP, which you can safely ignore. **You can continue the installation without concern.**
- Like the drivers, the PHASE Control Panel must also be installed. Functionality of the card is not provided using the standard Windows Mixer. Open the installation via the CD-ROM autostarter (or don't forget to download the control panel when you are downloading the drivers in the Internet).
- The WDM audio drivers can be selected in the applications as usual. ASIO drivers are available in compatible programs; WDM kernel streaming is "not visible" (i.e. it is always available for applications and cannot be selected explicitly). The buffer sizes are configured in the **PHASE Control Panel**.

Notes for Macintosh users:

- The PHASE 88 system is shipped with driver support for MAC OS 10 (OS X). In the OS10 version, we recommend the Apple operating system update called "Jaguar" (current version 10.2.6). A version update, which can be obtained for an extra charge, contains some improvements specially geared towards audio applications.

-
- The audio and MIDI connection using OS 10(X) is built exclusively on the OS10 core audio/MIDI concept.
 - Multiple cards cannot be cascaded under the MAC OS at present.

Structure of the PHASE 88 PCI card.



1. Digital output (S/PDIF and RAW data)
2. Digital input (S/PDIF and RAW data)
3. Connection for breakout box (external)
4. Connection for breakout box (internal)
5. Sync-IN connection for cascading (5-pin, the jumper must remain set on the master card!)
6. Sync-OUT connection for cascading (3-pin)
7. Jumper for selection of S/PDIF source (only in connection with a PHASE 88 rack or Mic 2/8 module)

PHASE 88 breakout box



The PHASE 88 audio system includes a module with 8 analog inputs and outputs (I/Os) and two MIDI sockets. It includes high-quality 24-bit A/D-D/A converters and can be installed in the front of your computer or externally. With the metal shielding of the housing you usually don't need to worry about “catching” any interference noises when you install the module. You will probably place the breakout box externally, e.g. to have it near the mixing console or synthesizer or just because it looks attractive.

Note: The breakout box must not be disconnected from the card while it is operating! This may destroy it in some circumstances.



Installation of the PHASE PCI card - step by step.

- Switch off your PC and all connected peripheral devices such as your printer and monitor. Leave the AC cable connected for the time being, so that your computer is still grounded.
- Touch the metal chassis at the rear of the PC to ground and to discharge static. Now unplug the cord from the AC socket.
- Remove the housing cover from your computer or open it.
- If you want to use the breakout box **internally**, select a free bay on the front of the computer. You may need to remove the CE-compliant metal cover with suitable tools. Please be very careful if you do this, because sharp edges can cause severe injuries... .

Tip: select a bay that is **under** a CD/DVD drive. Otherwise suspended cables will interfere every time you change media.



- Connect the flat cable for the internal connection with the aid of the adapter plate on the breakout box and slide it carefully into the bay. Fasten the module with the screws (always use the serrated washers for a secure electrical connection between the module and the computer case).
If you wish to cascade multiple PHASE PCI cards, you should connect the sync cable now. It is a very fiddly operation if it is done after the PCI card has been inserted into place. For more useful tips see ➔ page 39.
- Select a free PCI expansion slot that if possible does not share an IRQ with any other slot (for more information see the appendix ➔ page 42), if necessary remove the screw that retains the slot cover and remove the cover. Should it be necessary to break a cover out of the case, do so with care to avoid injury.
- To ensure the optimal function of your system, look for an expansion slot that is not immediately next to an already-installed card. Some cards, such as video or SCSI/RAID adapters, can send out signals which can interfere with the sound card. We also recommend a slot as close to the bottom of the computer as possible, as you can / must connect several cables directly to the card itself. Due to certain physical properties of our planet, it is very likely that these cables will dangle downward. ;-)
- Carefully remove the PCI card from its packaging. To do so, place one hand on a metal part of the computer case while picking the card up by the edges. This will ensure that your body is completely discharged (no joke) of static electricity via your computer, so that no damage is done to the card.
Please do not touch the components on the card.
- Align the audio card so that the strip with the golden connector pins is located exactly over the PCI slot.
Insert the card into the slot. You might have to press the card firmly into the slot to make good contact. Take care to ensure that the contacts are exactly in line. If they are not, you could do damage to the audio card or your computer's motherboard.

-
- Fasten the card in place using the screw you removed earlier from the slot cover (if there was one).
 - After switching the system on and booting it, you can now install the drivers (see ↻ page 14 for Windows, ↻ page 18 for MAC OS X).

Driver installation in Windows.

The PHASE 88 system is shipped with drivers for the Windows 98SE, Windows ME, Windows 2000, Windows XP and MAC OS10 x operating systems. Windows 95/98/NT 4 as well as MAC OS9.x are not supported. You should therefore determine which operating system you are using before installing the card. For information on your operating system and its version number, please check the "System" dialog in the Windows Control Panel.

In the following driver installation descriptions, <CD> stands for the drive letter of the CD-ROM drive containing the PHASE driver CD.

Driver installation under Windows 98 SE.

1. Boot your computer after installing the PHASE 88 PCI card.
2. During the boot-up process, the Windows hardware wizard will identify the new hardware as a "PCI Multimedia Audio Device". Confirm by clicking "Next".
3. The hardware wizard will ask you how you would like to continue. Select the "Search for the best driver for my device (Recommended)" item and confirm with "Next".
4. Check the "Specify a location" box and enter the path to the driver on the CD. <CD>:\PHASE 88\Driver\Windows\. Otherwise you can also select the path to the drivers for your PHASE 88 PCI system with the mouse by clicking on "Browse". Confirm by clicking "Next".
5. In the last window, the hardware wizard will report that the driver software has been installed successfully. Close the wizard by clicking "Finish".

If contrary to all expectations a request should appear for you to perform some action and you are not sure about it, then pressing the Enter key is generally a safe action. If Windows requests a second driver file, please refer to the aforementioned directory on the PHASE CD-ROM. It is also possible (e.g. if this is the first sound card installation in your system) that some additional Windows extensions have to be installed. Please have your Windows CD ready for this purpose.

After successful driver installation, the PHASE 88 control panel can be installed easily using the autorun option (<CD>:\autorun.exe).

Follow the instructions on the screen to install the various bundled software programs. The control panel application is also easy to remove from your system. To do so, open the "Add/Remove Programs" dialog from the Control Panel. Search for the program to be deleted, select it and click "Change/Remove".

After a successful driver installation, you should verify that your Windows 98SE system is functioning properly. The Device Manager presents an overview of hardware components installed and recognized on your computer. The Device Manager can be found in the Control Panel under "System".

Driver installation under Windows Me.

1. Boot your computer after installing the PHASE 88 PCI card.
2. During the boot, the Windows hardware wizard will identify the new hardware as a "PCI Multimedia Audio Device". Select here "Specify the location of the driver (Advanced)" and confirm with "Next".
3. Now activate the "Specify a location:" checkbox and enter the path `<CD>:\PHASE 88\Driver\Windows\`. Confirm by clicking "Next". Alternatively, you can change to the respective directory by clicking on "Browse...".
4. The hardware wizard will now search for the AudioSystem PHASE 88 driver and will display the location of the driver. Confirm by clicking "Next".
5. In the final window, the hardware wizard will report that the driver software has been installed successfully. Close the wizard by clicking "Finish".

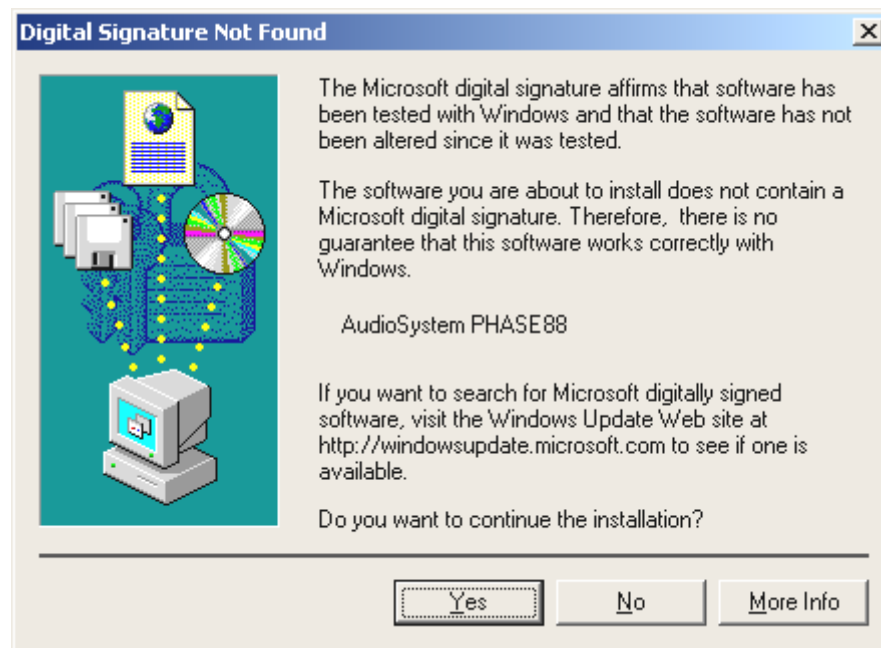
After successful driver installation, the PHASE 88 control panel can be installed easily using the autorun option (`<CD>:\autorun.exe`).

Follow the instructions on the screen to install the various bundled software programs. The control panel application is also easy to remove from your system. To do so, open the "Add/Remove Programs" dialog from the Control Panel. Search for the program to be deleted, select it and click "Change/Remove".

After a successful driver installation, you should verify the correct condition of your Windows ME system. The Device Manager presents an overview of installed and recognized hardware components of your computer. The Device Manager can be found on the Control Panel under "System" > "Hardware". Then click the "Device Manager" button.

Installation under Windows 2000.

1. Boot your computer after installing the PHASE 88 PCI card.
2. During the boot, the Windows hardware wizard will identify the new hardware as a "Multimedia Audio Controller". Confirm by clicking "Next".
3. Mark the "Search for a suitable driver for my device (recommended)" checkbox and insert the PHASE CD if you have not done so already. Click "Next".
4. The hardware wizard will now inform you that it will search for drivers for a "Multimedia Audio Controller". Activate the checkbox "CD-ROM drives" and confirm with "Next".
5. The hardware wizard will now indicate that it has found a suitable driver for the "Multimedia Audio Controller" on the CD-ROM (`<CD>:PHASE 88\driver\Windows`). Click "Next" to start the installation.
6. The following dialog box will now appear as the installation is continued:



This is no cause for alarm. Click “Yes” to continue. The installation will now be executed.

If contrary to all expectations an additional request should appear for you to perform some action and you are not sure about it, then pressing the Enter key is generally a safe action.

If Windows requests a second driver file, please refer to the aforementioned directory on the PHASE CD-ROM. It is also possible (e.g. if this is the first sound card installation in your system) that some additional Windows extensions have to be installed. Please have your Windows CD ready for this purpose.

After successful driver installation, the PHASE 88 control panel can be installed easily using the autorun option (<CD>:\autorun.exe).

Follow the instructions on the screen to install the various bundled software programs. The control panel application is also easy to remove from your system. To do so, open the “Add/Remove Programs” dialog from the Control Panel. Search for the program to be deleted, select it and click “Change/Remove”.

After a successful driver installation, you should verify the correct condition of your Windows 2000 system. The Device Manager presents an overview of installed and recognized hardware components of your computer. The Device Manager can be found on the Control Panel under “System” > “Hardware”. Then click the “Device Manager” button.

Installation under Windows XP.

1. Boot your computer after installing the PHASE 88 PCI card.
2. During the boot, the Windows hardware wizard will identify the new hardware as a “Multimedia Audio Controller”. If you have not done so already, insert the PHASE CD-

ROM now. Finally enable the checkbox “Install software from a specific source [for advanced users]” and confirm with “Next”.

3. In the next window enable the checkbox “Search removable media (diskette, CD,...)” and confirm with “Next”.
4. The following dialog box will now appear as the installation is continued:



5. This is no cause for alarm. Click “Continue Anyway” to continue. The installation will now be executed.
6. In the final window, the hardware wizard will report that the driver software has been installed successfully. Close the wizard by clicking “Finish”.

If contrary to all expectations an additional request should appear for you to perform some action and you are not sure about it, then pressing the Enter key is generally a safe action.

If Windows requests a second driver file, please refer to the aforementioned directory on the PHASE CD-ROM. It is also possible (e.g. if this is the first sound card installation in your system) that some additional Windows extensions have to be installed. Please have your Windows CD ready for this purpose.

After successful driver installation, the PHASE 88 control panel can be installed easily using the autorun option (<CD>:\autorun.exe).

Follow the instructions on the screen to install the various bundled software programs. The control panel application is also easy to remove from your system. To do so, open the “Add/Remove Programs” dialog from the Control Panel. Search for the program to be deleted, select it and click “Change/Remove”.

After a successful driver installation, you should verify the correct condition of your Windows XP system. The Device Manager presents an overview of installed and recognized hardware components of your computer. The Device Manager can be found

on the Control Panel under “System” > “Hardware”. Then click the “Device Manager” button.

Driver installation for Macintosh OS X.

In the OS10 version, we recommend the Apple operating system update called “Jaguar” (current version 10.2.6). A version update, which can be obtained for an extra charge, contains some improvements specially geared towards audio applications. The system requirements are OS10.1 or higher. Furthermore, in order to install the drivers, you must have administrator rights on the system.

To install the PHASE 88 MAC OS X-driver and the ControlPanel application, start the install program from the directory <CD>:\PHASE 88\Driver\MAC\ of the PHASE 88 product CD. For identification, enter your name and your OS X password. During installation, you will be asked for the target drive; select the desired target drive. Follow the instructions of the installer and complete the installation by rebooting your system.

After restarting the system, you can select the PHASE 88 Control Panel from the directory **Macintosh HD -> Programs.**

The connections of the PHASE 88 audio system.

The PHASE 88 audio interface offers you numerous connections for connecting professional studio peripherals. Following is a detailed overview of its technical and electrical characteristics:

Analog outputs.

The analog outputs of the PHASE 88 operate with music-compatible line levels of either -10dBV (typically 0.56Vrms) or +4dBu (typically 2.1Vrms). Here, you can connect a mixing card, active speakers, or amplifiers.



The PHASE 88 system has eight high-quality analog outputs (labeled on the breakout box as OUTPUTS), which can be independently addressed. The terminals are cinch connectors and are always shown in pairs on the driver side and in the PHASE Control Panel (i.e. 1/2, 3/4, 5/6, 7/8). Of course, you can also control the channels separately (in mono). However, you will usually control the volumes from within the audio software application you use.

The output level of all channels can be globally switched between -10dBV and +4dBu in the PHASE Control Panel under “Settings”.

Practical tip: Make full use of the 24-bit support of up-to-date software applications and connected digital peripherals - even if you are planning to “just” release your production on CD. The additional sound quality is audibly worthwhile, both in the sum of the signals and, above all, during digital post-production.



Analog inputs.

The sensitivity of the line inputs on the PHASE 88 audio system can be adjusted individually. They can be switched from -10 dBV (typically 0.55Vrms) to +4 dBu (typically 2.1Vrms) and a gain controller is also available for complete usage of the 24-bit converter.



The PHASE 88 system has eight high-quality analog inputs (labeled on the breakout box as INPUTS), which can be independently addressed. The terminals are cinch connectors and are always shown in pairs on the driver side (i.e. 1/2, 3/4, 5/6, 7/8).

The input sensitivity of the channels can be switched separately between -10dBV and +4dBu in the PHASE Control Panel under “Analog Inputs”. -10 dBV is very common in home studios (at this level the signals are relatively quiet and the input compensates for this with a higher sensitivity). +4 dBu is generally used professionally (the devices have enough power and therefore the system input is less sensitive).

If the level of a device that you have connected to the front module is too low, you can increase the signal in 0.5 dB steps with the controllers in the PHASE Control Panel. The pixel LED, the sensitivity of which can be adjusted (0, -1, -2, -3dB), displays any potential overcontrol.

In the drivers as well as in the PHASE ControlPanel, the inputs are viewed as a stereo pair. As a rule, you can also combine the two channels for mono use in common audio editors.

Practical tip: While recording, try to achieve as high a recording level as possible to benefit best from the wide dynamic range of the 24-bit converter. As a rule of thumb for good recordings, always take the following into account: a clean “take” is much more valuable than the best plug-in for later sound correction.



Digital interface (S/PDIF, RAW, AC3).

Devices that can process the S/PDIF protocol or Dolby AC3 signals can be connected to the coaxial digital interface (cinch plugs). This includes, for example, DAT recorders and many hi-fi components, or even other computers that you want to connect to the audio network (VST System Link).



Use the digital interface of your PHASE 88 PCI card to transfer music digitally from your computer to other devices, or to record audio data with your computer. There are two separate coaxial jacks (RCA / cinch) for recording and playback.

The cables for digital connections are always connected “crosswise,” meaning OUT to IN and vice-versa. Pulses are transmitted together with the audio data when the S/PDIF protocol is used. This is known as the sample rate. The interface of the PHASE 88 system can send and receive up to 96 kHz.

The correct driver for recording digital sources is called “PHASE 88 Digital”.

► You can find detailed information on the digital interface settings in the PHASE Control Panel beginning on ➡ page 31.

Practical tip: If possible, use specially shielded RCA cables for transferring audio data, at least if it is important to have an absolutely clean, jitter-free signal path (for example, when mastering). For more tips see ➡ page 46.



Advertisement ;-) TerraTec's Vice Versa is a compact digital converter, which allows audio devices to be connected with optical TosLink connections to electrical cinch connections and vice-versa. This clever switching technique allows you to select whether to use Vice Versa as a bi-directional converter or as a signal repeater. For more information, go to www.terratec.com.



MIDI interface.

The MIDI interface of the PHASE 88 audio system allows you to connect the device with properly equipped peripherals such as MIDI keyboards, DAW controllers and countless other devices. The cables for MIDI connections are always connected “crosswise”, meaning OUT to IN and vice-versa. MIDI sequencer software usually offers you to loop MIDI data through, using the Through function.

Practical tip: Even if your input keyboard (master keyboard) has a USB connection available, you should use the MIDI input (IN) of the PHASE 88 whenever possible: the “direct connection” to the PCI data bus of the computer, and thus to the MIDI software, allows a substantially faster and more stable timing than most USB-MIDI interfaces. Of course, the same is true for the output when it is needed.



The drives (Windows operating system).

The PHASE 88 audio interface features a range of drivers for a variety of applications. The drivers support all bit rates between 8 and 32 bits with all common sample rates between 8 and 96 kHz. As a rule, the sample rates are not “interpolated”. In other words, the system always automatically sets itself to the sample rate with which an application is recording or playing back. This prevents quality losses due to internal sample rate conversions. There are exceptions, however, which we will be covering below.

But now to the individual drivers.

The Wave driver.

In most Windows programs, you will encounter drivers with the designation “PHASE 88Wave x/x” for recording and playback. In order to address the outputs of the Audio Interface, you will also find a numbering that corresponds to five output pairs: 1/2, 3/4, 5/6 and 7/8, as well as Digital Left/Right.

If you have multiple cascading audio interfaces, the operating system, as a rule, numbers the driver names from 1 to 4. “As a rule” means, in plain English, that there can be exceptions under Windows over which we (unfortunately) have no influence.

Depending on the application software, the driver names are displayed with supplements that refer to the audio architecture of the operating system: MME, WDM or DirectSound (see below for more information).

The ASIO driver.

Programs that make use of Steinberg's ASIO interface indicate in the corresponding dialogs the ASIO drivers of the PHASE 88 System. With ASIO, programs achieve extremely short delays (latency) during audio recording and playback. Therefore, a latency of significantly less than 10 ms should be targeted. For fast, well organized systems, even latencies of less than 1 ms are possible at sampling rates of 96kHz!

The ASIO driver is listed in compatible programs under “ASIO for PHASE 88”. The inputs and outputs (usually “buses”) available in the programs are called “PHASE (n) Out”, where n is used to distinguish between multiple PHASE interfaces (1 to 4, see ↻ page 39). In many cases, only the left channel of the output pair (1/2, 3/4, 5/6, 7/8 and Digital Left/Right) is stated, it applies for both channels however.

The GSIF driver.

The GSIF driver of the audio interfaces is also visible only in certain programs. The GigaStudio sampler application and other Tascam / Nemesys products can also access the hardware in a very fast and direct manner. The outputs available in each program are called here “PHASE 88 GSIF (n)” and lead directly to the outputs of the PHASE 88 audio system.

The MIDI driver.

For the recording and playback of MIDI data via the MIDI IN and OUT jacks, a separate driver is available. The driver, which is designated as “PHASE 88 MIDI” in the system, can be selected in any situation in which its use is appropriate.

Practical tip: If MIDI files, which can be played back using Windows' media players, are also to be transferred to externally connected devices, open the “Sounds and Multimedia Properties” dialog window from the Windows Control Panel and set the “MIDI Music Playback” device to the driver mentioned above.



In detail - special properties of the drivers.

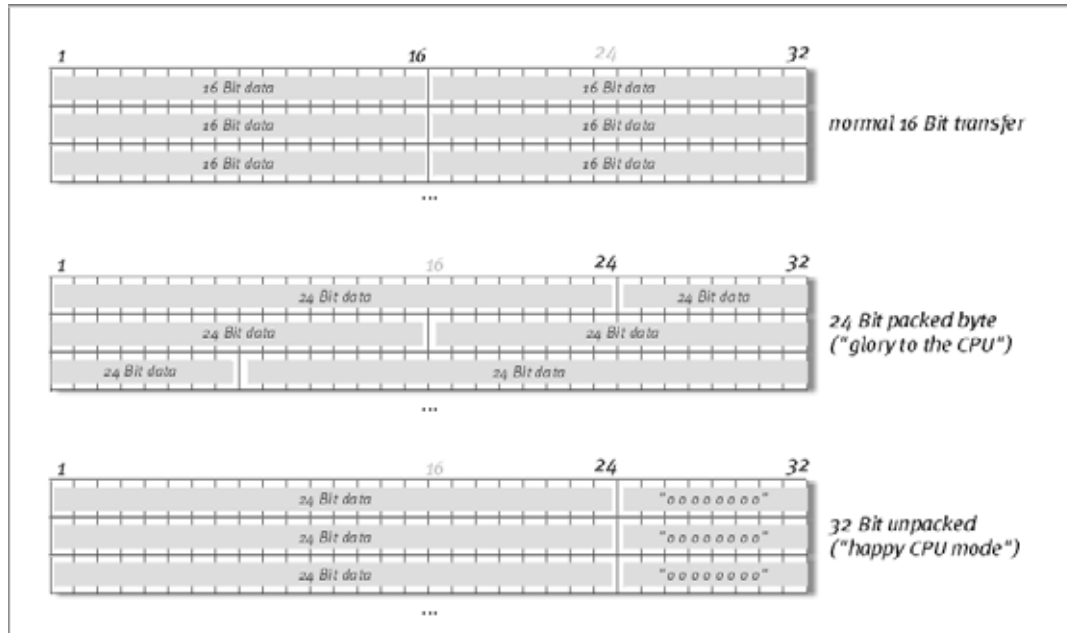
The following contains in-depth information for those with the need to know. Less experienced users won't encounter any problems if they skip over this section.

32-bit data transfer.

The drivers support a special data transfer format known as "32-bit unpacked". Audio data streams are transferred to the computer's main memory via the PCI bus. The PCI bus features 32 "lines" (32-bit). A PC generally takes care to ensure that its data lines are well-utilized. For this reason, 8-bit audio data is always sent on its way in groups of four packets ($4 \times 8 = 32$), and 16-bit data ($2 \times 16 = 32$) in groups of two (top of diagram).

The situation is a bit more complicated from the processing standpoint with 24-bit audio data: suddenly there's "only" 24 sweet-sounding bits available, i.e. 8 bits are "missing". The "24-bit packed" process solves this problem in the following manner: the computer CPU (your Pentium, for example) divides the 24-bit data into multiples of 32 (middle of diagram). That costs computing power and isn't really necessary.

The "32-bit unpacked" process fills the remaining bits with zeroes and the driver sends suitable 32-bit packets on their merry way. Most commonly-used applications currently support this process, which is particularly easy on the computer's resources (bottom of diagram).



DirectSound & WDM.

It goes without saying that the drivers of the PHASE 88 system also support Microsoft's DirectSound or DirectSound 3D interface. What's more, the software complies strictly with Microsoft's WDM specification. WDM (Windows Driver Model) is a recent driver concept from that popular Redmond-based software manufacturer which also involves a number

of innovations in the audio sector. For example, the drivers are able to play back audio data streams from multiple applications in parallel (multi-client, a “luxury” that faithful TerraTec customers have enjoyed since 1997).

WDM sample rate (SR) interpolation.

The multi-client capability of the WDM architecture also permits the simultaneous playback of multiple audio data streams with differing sample rates. The sampler frequency used for all streams is based on the file called up first. All further data streams - those called up during the run time of the first file - are interpolated as required and their pitch is not affected.

Because SR conversion and interpolation always involves a certain loss of quality, if you are using applications where the highest possible audio quality is important, make sure that multiple programs are not using different sampling rates simultaneously. For example, it's best to only have the playback software running when transferring a piece of music at 44.1 kHz to a DAT recorder.

WDM kernel streaming.

WDM kernel streaming also represents a new technology for Microsoft. Like already established models such as Steinberg's ASIO interface, kernel streaming permits extremely fast access to the audio hardware. The deployed software (such as audio/MIDI sequencers or software synthesizers) must support the WDM function directly, however. One of these programs, for example, is the “Sonar” recording software produced by the Cakewalk company.

The MAC OS X drivers.

The driver version available for the current, first shipment is based completely on the MACOS X CoreAudio or CoreMDI concept. With the help of the CoreAudio support, the PHASE 88 system can be used with extremely low latencies within an Audio/MIDI sequencer (e.g. Emagic Logic or Cubase SX). A special ASIO driver is not mandatory. As soon as the software products announced by the Steinberg company allow direct ASIO connection to the hardware, the development of corresponding PHASE 88 PCI card support is planned.

Under System Settings -> Sound, the PHASE 88 system can be set up as the default audio device in OS X.

The Control Panel.

The PHASE Control Panel is - beside the drivers - by far the most important piece of software in the package. Here, depending on the requirements of each situation, you can have total control of the audio interface, reduce volumes (take this literally!), control one of the two input preamplifiers, as well as load and save settings.

Note: the functions and the position of the control elements are as identical as possible under Windows and MAC OS. The following illustrations correspond to the Windows version of the Control Panel.

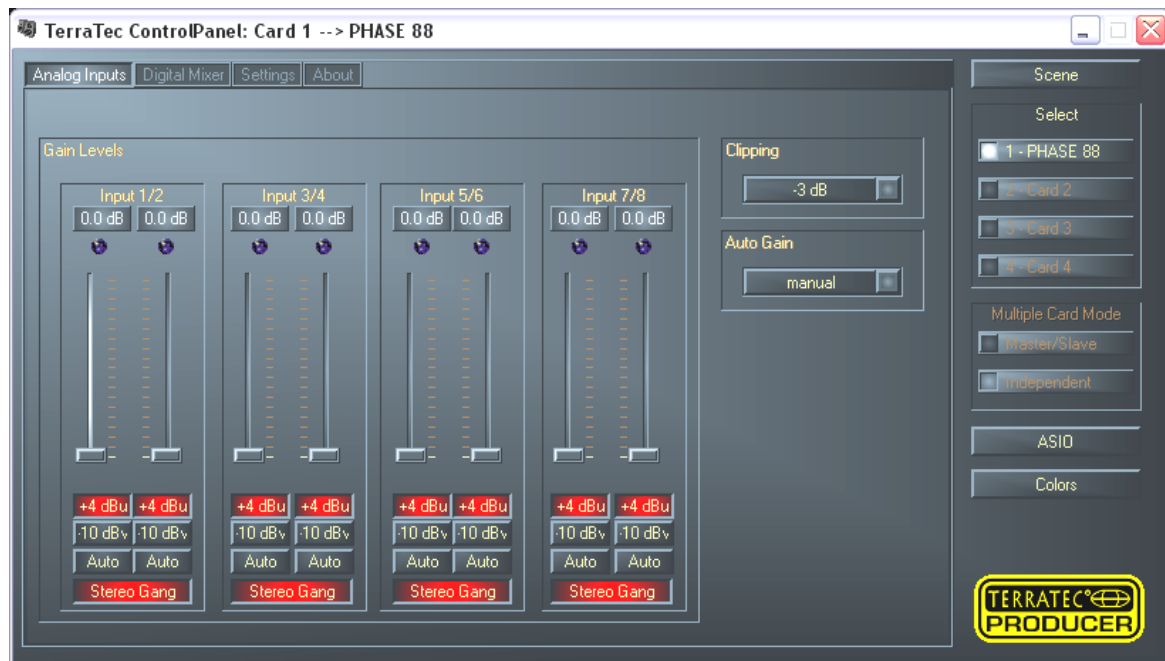


How does the Control Panel work?

The Phase Control Panel and the routing (signal flow within the card) is very easy to understand. You still want to know what it is all about? Very well: the following are the individual function blocks, from left to right:

Analog Inputs

When the Control Panel is opened, the start page will appear first, where the sensitivities (gain levels) of the eight analog inputs can be adjusted.



From left to right you first set the input level at which an audio signal enters the PHASE 88 system. -10 dBV is very common in home studios (at this level the signals are relatively quiet and the input compensates for this with a higher sensitivity). +4 dBu is generally used professionally (the devices have enough power and therefore the system input is less sensitive).

If the level of a device that you have connected to the front module is too low, you can increase the signal in 0.5 dB steps with the controllers. Make sure that the Clip LED does not flash - if it does, the input is overloaded and this can result in unpleasant distortions in the recording.

Clipping.

You can use the "Clipping" pop-up beside the sliders to set the input level at which the LEDs signal an overload (-3 dB is a good choice here; if the LEDs flash occasionally, the signal should be well controlled).

AutoGain.

But there's more: the signal can be automatically controlled with the "AutoGain" function. You can now set various sampling rates (scan 3/5/10 sec), during which the software analyses the pending audio signal and then sets the best possible gain level (during this period the signal should be as constant as possible). This process is started by pressing the "Auto" button below the relevant duct (if two channels are combined into one stereo pair with "stereo set", the automatic level adjustment is run for both simultaneously).

Digital Mixer.

The PHASE 88 audio system includes an internal 36-bit digital mixer, which you can use or bypass if you don't require it.



The Digital Mixer mixes all signals played back by the drivers and it also combines the signals pending at the physical inputs. Switch between the 'Wave' and 'Input' pages to see the level and to control the volumes.

The total of all mixed signals can be regulated with 'Master Volume', and then the 'Digital Mixer' entry in the routing dialog (settings page) can be used to send the signals to the analog outputs 1+2 and to Digital Out.

If you want to use the PHASE 88 audio system and an "in-out card" only for your audio/MIDI sequencer, you don't really need the Digital Mixer. As described in several places above, in this case the software that you use controls the volume and panorama settings. In practice it goes directly from the software to the outputs.

Settings.



Master Clock.

Here we're dealing with the sample rate used by the PHASE 88 System. This is a very important point, as the card can be clocked by an external signal (External, e.g. from a DAT recorder) or it can set a sampler rate itself and provide this signal to other devices.

You can choose from all commonly used sampler rates from 8 to 96 kHz - the actual bit rate is not important at this point. In the case of external synchronization (i.e. via a signal applied to the digital interfaces or the internal connection to cascade multiple cards), the external sampler rate will be displayed. If no signal is available or the connection has been interrupted, the message "No Signal" will be returned.

The audio controller of the PCI card does *not* feature a sample rate converter. This module - which is common on consumer sound cards - normally lets you play back signals with a variety of sampler rates by "interpolating", as needed, the sample rates in real time to a specific frequency. When using the WDM or CoreAudio drivers you can also play back audio from multiple programs simultaneously. In this case also all "pending" sample rates are converted by the operating system (interpolated).

Caution: The software-based interpolation through the operating system involves an audible loss of quality. For professionally oriented recording and playback of audio material make sure that the sampling rate of the card is matched to the desired recording and playback sampling rate. Otherwise you can also use the ASIO driver - in this case the sampling rate is fixed in the application used.



The “**Sampler Rate Locked**” switch also permits the sampler frequency to be set to a fixed (or externally specified) value. If playback or recording is started with a different sampling rate, the Windows or MAC OSX operating system runs a software-based sample rate conversion to the hardware frequency. Applications with ASIO support are an exception: they report sampling rate conflicts or automatically synchronize themselves to the hardware sampling rate.

The I/O card.

An extremely simple range of the PHASE 88 Control Panel. If the breakout box is disconnected from the PCI card (how can this occur if it is screwed in place?), the converter should be recalibrated. This process takes exactly 250 ms and doesn't hurt a bit. However, always make sure that the module is not removed or docked during the operation. This could damage it.

Wave Playback/Record mode (Windows only).

The Wave Playback/Record mode determines whether you want to work with one program only (e.g. audio sequencer) or with multiple programs simultaneously. As previously seen above (“The master clock”), multiple programs with different sampling rates cannot be used without interpolation (under Windows via the WDM driver). This is not a problem with the same recording and/or playback frequencies: just switch to the “Multi-Application” mode. In the “Multi-Track” mode all WavePlay drivers (or WaveRecord) are only available for an open program. This will generally be your preferred hard disk recording application. The special mode is exactly appropriate for this rule, because in Multi-Track mode all drivers (WavePlay 1/2, 3/4, 5/6 etc.) must not only be available simultaneously for the application but also start sample synchronously (absolutely simultaneously). An extremely important property, which is essential in professional recording use.

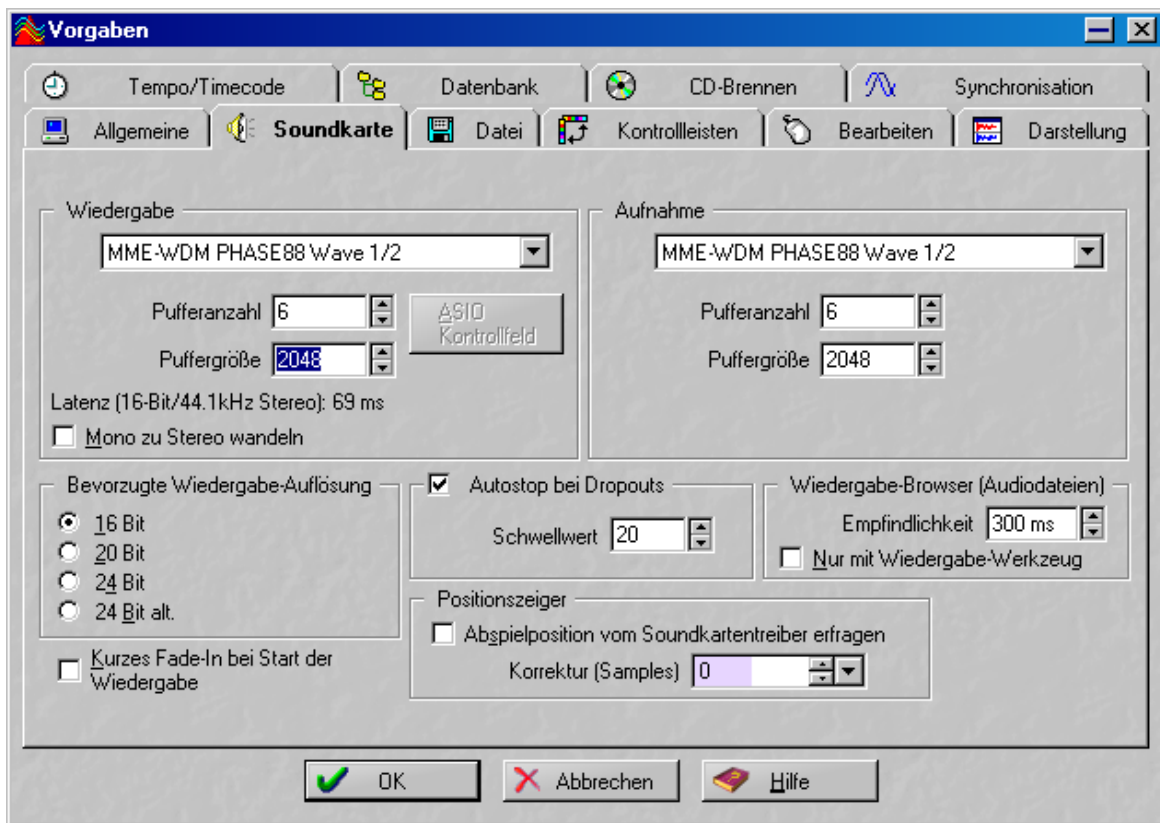
S/PDIF Out.

Here you can specify the inclusion of protective information in a signal that you are sending across a digital interface. It is possible to add copy-protection information (original) to your recording when transferring it to another device. This can be useful when recording a composition to DAT or a MiniDisk as a demo to prevent (digital) copies from being made.

- Copyright adds a copy-protection ID to the signal or filters it out when deactivating copy protection. This function sets the so-called “copy protection bit” which ensures that no digital copies can be made of the signal.
- Original activates the so-called “generation bit”, permitting exactly one digital copy to be made. Disabling this function sets the bit to 0 - you can then copy to your heart's content.
- Non-audio allows transfer of additional control information and thus enables playback in RAW format (e.g. for AC3).

The DMA Buffer Transfer Latency (Windows only).

A long phrase with high information value - at least if you want to or must use software without ASIO support. Here you determine how fast an application (e.g. a software synthesizer) can access the Windows MME and WDM drivers. You might think faster is better, but there's a catch: The setting is system-dependent and - with a slow computer - causes audible gaps during recording and playback. If you detect dropouts when playing back audio tracks with your hard disk recording program, increase the DMA buffer transfer latency. The "tuning" of your application is also important in this regard, however. Many programs offer setting options for the audio buffer.



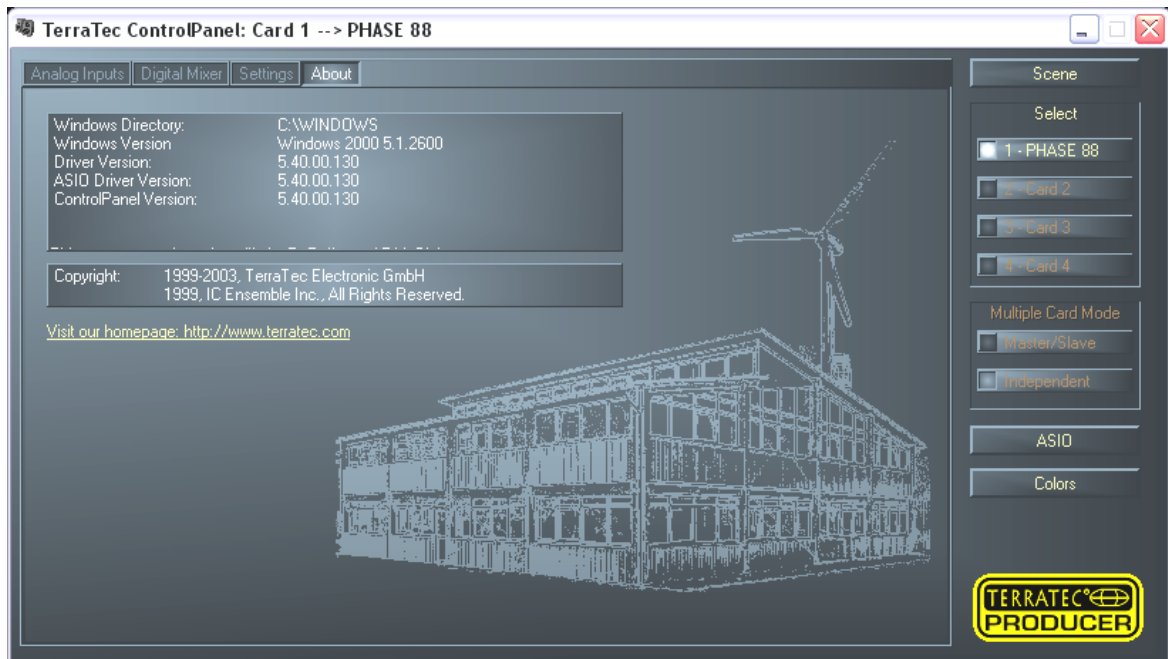
Setting the buffer sizes in WaveLab 4.

A tip for balancing: If speed is important - i.e. a low delay during playback - try to keep the number of buffers and their size as low as possible. Lower the DMA buffer transfer latency step-by-step in the PHASE 88 Control Panel. The drivers are cleanly programmed and have been designed for speed. This should yield reasonable values that will be a pleasure to work with on appropriately configured systems.

Note: the settings for the DMA buffer transfer latency do not affect the performance of the ASIO or GSIF drivers (see ↻ page 23).



The About page.



The About page contains some important system information, which could be helpful if you need to contact the help line or you need driver updates - as well as a picture of our company headquarters in Nettetal on the lower Rhine that looks like a potato stamp (unfortunately only Windows ...). Hover over the info area with the mouse cursor for additional information.

The PHASE 88 Control Panel in the Windows taskbar.

The PHASE 88 Control Panel icon in the Windows taskbar (bottom right near the clock) appears when the PHASE 88 Control Panel has been loaded. You can click it with the right mouse button to access some functions that can also be controlled from the panel - see the relevant sections above for an explanation.

- **Show / Hide.** Displays the panel or hides it.
- **Select Card.** In cascaded audio systems, select the card you want to control here. You can also do this using the keyboard. Press the keys 1 to 4 on the numerical keypad.
- **Select Page.** Directly selects a page of the panel. The dialogs for scene management, colors and ASIO/GSIF settings can also be selected via the keyboard.
- **Advanced - Direct Monitoring** This function can be used to enable or disable the Direct Monitoring support of the PHASE 88 system. ASIO 2.0 enables direct “monitoring” over suitable audio hardware like the PHASE 88 system. If this function is enabled in the audio application (e.g. Emagic Logic: disable the “Softmonitoring” option, in Cubase VST: enable the “DirectMonitoring” option in the control panel), the corresponding channel in the Digital Mixer of the PHASE 88 Control Panel “demuted” as soon as recording is enabled. In addition, volume and panorama settings are continuously sent from the sequencer mixer to the digital mixer of the PHASE 88 audio system. The playback path (not the recording path) now no longer runs over the sequencer. Instead the relevant input signals are sent directly through the digital mixer to the output 1/2 and/or Digital Out (if the routing of the PHASE 88 system has been appropriately set in the setting window of the Control Panel). Because the signals are sent directly to the hardware of the PHASE 88 without a detour, absolutely latency-free monitoring is possible.
- **Exit.** ... or Alt+F4. Done. Finished. Basta. Outtahere. That's all, folks.

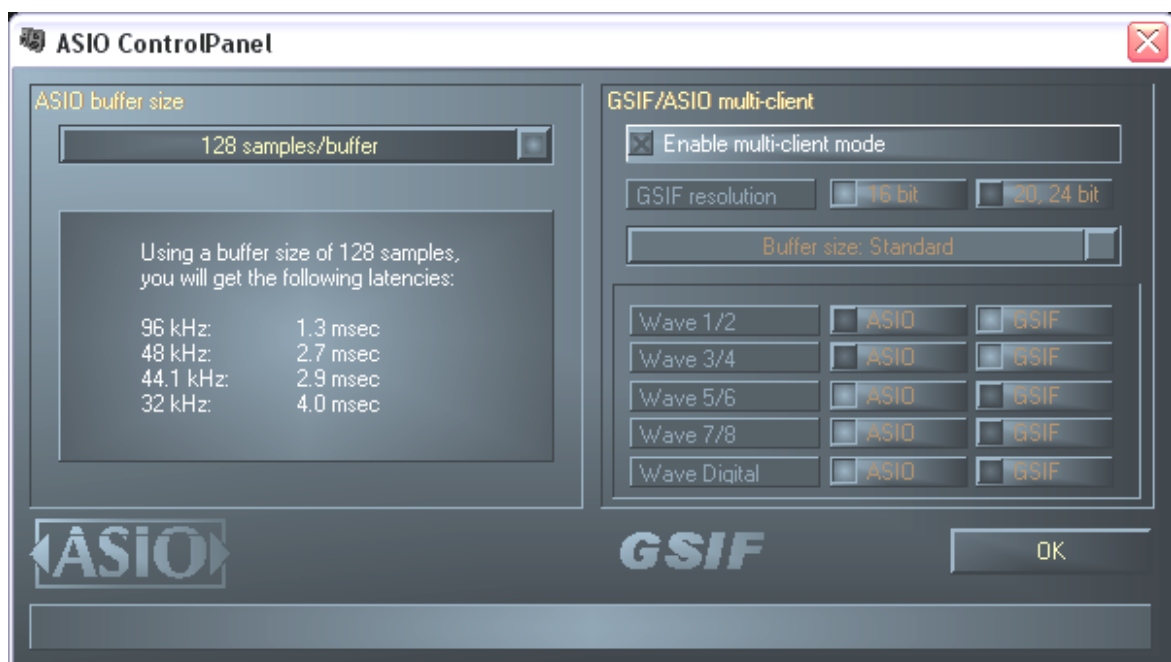
Managing scenes and cascaded cards (Windows only).

With modern digital mixing consoles this is referred to as “TotalRecall” - PC experts would call in “loading” and “saving”: Under the “Scene” button on the right edge of the PHASE 88 Control Panel you have the option of saving all card settings (Save), loading (Load) or deleting previously saved scenes (Delete). Use “Cancel” to exit the dialog without saving.

The card selector (Select) is also always accessible at the right-hand side. Here you switch the view for operation with multiple cards of the EWS/PHASE family if they are installed. Please note that the scene memory function always saves all settings for all of the cards.

ASIO Control Panel (Windows only).

Programs that support Steinberg's ASIO feature dialogs containing special settings for these drivers. The properties of the PHASE hardware can be set up in the ASIO Control-Panel.



The ASIO buffer size has a direct effect on the latency (“speed”) of the ASIO driver; if the value is too low it may impair the overall performance of your system, however. On fast systems (1 GHz or higher), you should be able to set values of less than 512 samples/buffer (this corresponds to a latency of less than 5 ms at 96 kHz) without problems.

“Without problems” means that you will not detect any dropouts during audio recording or playback. If dropouts occur, increase the buffer size or the number of samples per buffer.

The “conversion” into time values is displayed just below the menu.

GSIF/ASIO multi-client

To be able to use applications that use the different GSIF and ASIO driver models simultaneously (e.g. GigaStudio with Cubase SX), the GSIF/ASIO multi-client mode can be enabled. Two programs can thus share access to the hardware while you decide which output will be used by which application.

- **GSIF resolution.** Choose whether you prefer playback with 16- or 20/24-bit dynamics here. The bit depth you select here applies to ASIO as well as GSIF applications.
- **Buffer size.** Depending on the performance of your system, you can choose between small, standard and large buffers here. Select the buffer sizes “by ear” as described above - do dropouts occur, or do all of your applications work correctly?
- **Output selection.** Allocate the outputs to their respective drivers here.

Card(s) used for ASIO.

Here select the cards that are to be combined into “one card” in an ASIO combination - with cascaded EWS/PHASE systems. The highlighted cards then appear in the application as one (1) ASIO device with the corresponding number of inputs and outputs.

Colors (Windows only).

Here you can configure perhaps the most vital system settings within the PHASE ControlPanel. No matter where you look, our days are filled with color. After all, life is beautiful, and there's nothing like pink buttons and delicate green reflections to breathe life and good cheer into your boring Windows desktop. Have fun...! ;-)

But seriously, folks - this section contains a number of truly useful settings that not only beautify your PHASE ControlPanel, but which improve the overview of its display:

A click on the Background, Text, Static Controls and Peakmeter buttons opens the Windows dialog to change the colors.

The “Reflections off” option disables the attractive reflections of the elements. This can be helpful for slower systems.

Test the settings made above in the right-hand part of the window and save them when you're satisfied.

Once saved, you can find your personal color settings in the dropdown menu, which already contains a number of examples. The “Windows System” color set uses only colors that display correctly at an 8-bit color depth.

Additional tips on using the Control Panel.

You can change the names displayed in the digital mixer area add clarity to your overview. Simply double-click WavePlay 1/2 ... 3/4 ... or Input 1/2 ... 3/4 ... and enter a new name (for example that of the connected device).

Hover over one of the colorful VU meters briefly with the mouse cursor and the current peak signal level will be displayed.

The VU displays can be disabled with a right-click to conserve system resources.

A mute switch silences the relevant signal completely, whereas it can still be heard faintly when the fader has been pulled all the way down.

The stereo link function (enabled by default) permits the left and right signals to be adjusted simultaneously.

Cascading and internal synchronization.

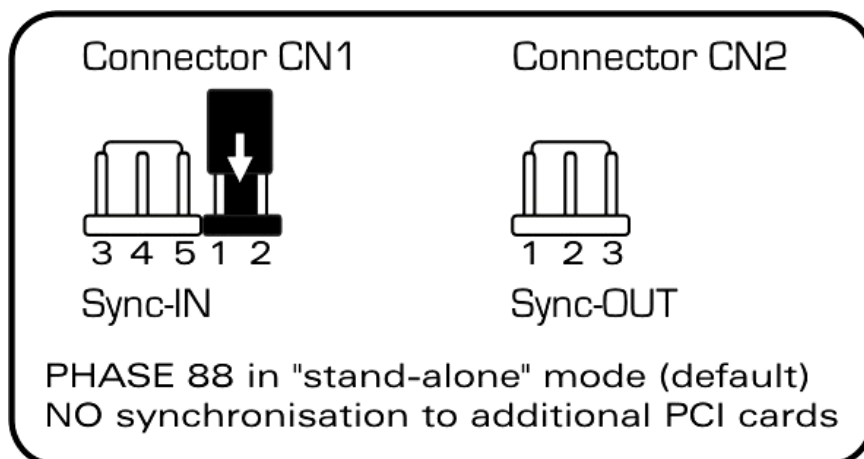
Up to 4 audio interfaces from TerraTec Producer (PHASE 88, EWS 88 MT/D and Mic2/8) can be installed in a computer and run together as a closed system.

You can therefore conveniently increase the number of input and output channels which can also access directly from most Windows applications. A fully loaded system containing four PHASE and/or EWS models thus features a total of 40 inputs and outputs - and all of that with virtually the same low latency!

For no-error operation, the PCI cards must be connected to each other using a special cable (included with each card) or the WordClock module, which is available separately (EWS-ClockWork, see also ► www.terratec.com).

The internal connection (absolutely recommended).

There are two short pin sets next to each other on the PCI card: Sync In (5-pin) and Sync Out (3-pin). These are necessary to ensure that multiple cards in one system can function properly. As soon as you install another card in the system, these must be connected to each other. Additionally, the "MasterClock" must be configured later in the PHASE ControlPanel.



The PHASE/EWS Connect connections of the PHASE 88.

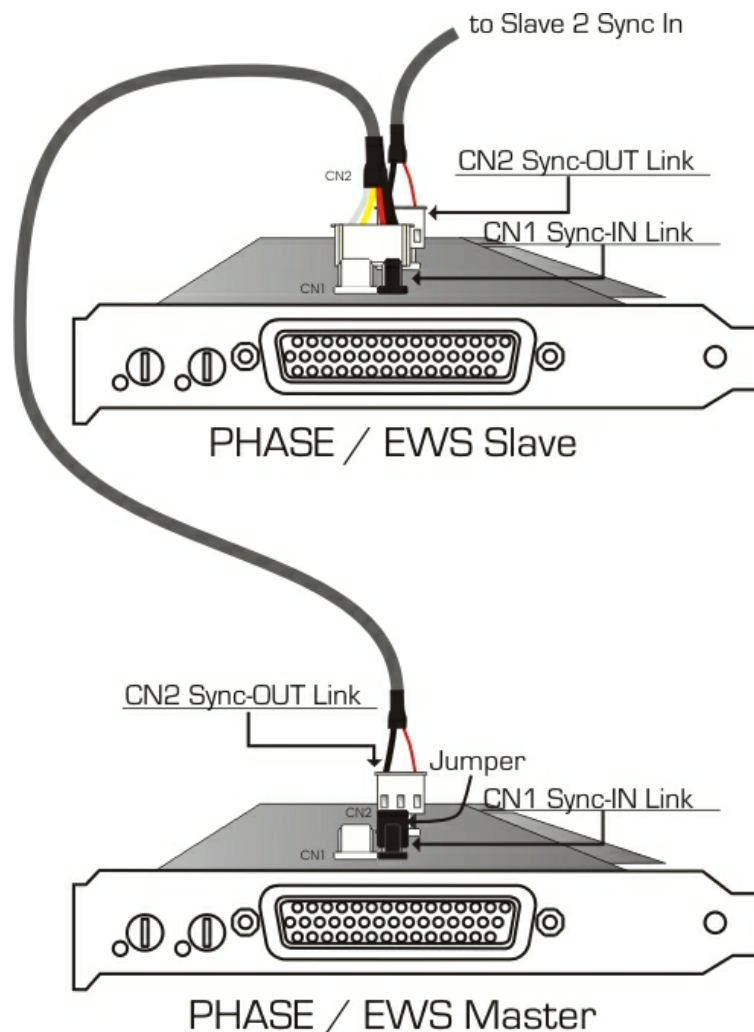
Sync In - Sync Out.

If you only have one card in the system, just leave everything the way it is: on the Sync In there is a jumper on the black pins 1-2, which sets the card as a master. Sync Out remains empty.

When connecting additional cards, connect the 3-pin end of the included EWS connect cable with the Sync Out on the master card. The other

5-pin end is connected with the Sync In on the second card. Please keep the remaining jumper on the second card.

Still more cards? No problem: Simply attach another cable from the Sync Out of the second card to the Sync In of the third. And, last but not least, a cable from the Sync Out of the third, to the Sync In of the fourth (and last) PCI card.



The PHASE Control Panel ...

The PHASE ControlPanel (or EWS ControlPanel of older models) will now automatically configure the MasterClock settings, since the cards are now digitally synchronized. The clock of the first (master) card is now set to "Internal". All additional cards (you can select the models on the right-hand side of the ControlPanel with "Select Card#") are now set to external synchronization.

All interfaces will now run using the sampler frequency set on the master. If you would like to also use an external clock for the first card (using a DAT recorder, for example), set its master clock to "External" as well. The sync information are transmitted accordingly.

Tips, tricks & things worth knowing.

Multiple audio cards in a single system.

Modern PC systems can accommodate multiple audio cards from a variety of manufacturers and can run them in parallel. The extent to which the audio interfaces can be combined in practice depends on the software used. There are also generally no problems operating an onboard sound chip in parallel.

You have numerous connection options when using multiple audio systems from TerraTec. In short, all PCI cards of the TerraTec family can be operated together in a computer without any problems. This also applies for consumer products such as DMX 6fire 24/96 and others.

The PCI audio systems of the TerraTec Producer series (at printing time: EWS88 MT, EWS88 D, EWS MIC2, EWS MIC8, PHASE 88) can also be synchronized over an internal cable connection and configured over a common PHASE 88 Control Panel. In an ASIO environment, the system is then displayed as a single device with up to 40 inputs and outputs. For more information on cascading the products see ➔ page 39.

About IRQs and other interrupts.

Basics:

IRQ stands for “Interrupt Request”. An IRQ is used to inform the processor that a device wants to perform a specific action. This is done over what are known as interrupt lines, which can stop the processor and demand it perform a calculation.

Since the introduction of the PIC (Programmable Interrupt Controller) a PC has 16 interrupt lines, most of which are already in use, as you can see below. More modern motherboards generally use an APIC (Advanced Programmable Interrupt Controller), which can manage more than 32 IRQs.

IRQ	Device
0	System timer
1	Keyboard
2	Cascaded for IRQ 8 to 15; from AT replaced by IRQ 9
3	Serial port (COM2)
4	Serial port (COM1)
5	Free
6	Disk drive controller
7	Parallel port (LPT1)
8	Real-time clock
9	Free
10	Free
11	Free
12	PS/2 Mouse
13	Mathematical coprocessor
14	Primary IDE controller
15	Secondary IDE controller

Unfortunately the computer does not run like that, because at that time a graphics card was not considered. In addition, most modern PCs have at least one USB controller, often a network, possibly a Raid controller and even onboard sound. As you can see, there is a shortage of IRQs, particularly if another card is installed in a PCI slot.

Please disable all devices that are not required (e.g. the COM ports are only rarely used) in the computer BIOS. See the documentation for your motherboard to do this. The “free” IRQs can now be used in the PCI bus.

PCI Bus:

There are generally only four “real” interrupt inputs available for the PCI bus, eight with modern motherboards with APIC. This means that even if you have six PCI slots on your motherboard, they have to make do with four or eight IRQs. The AGP port, USB and possibly the Raid controller also use these IRQs and with newer cards there is also onboard LAN, 1394 (FireWire) and SATA (serial ATA - new transfer standard for hard disks). It is impossible to avoid sharing an interrupt between multiple PCI slots. Unfortunately, there are no rules covering this and the motherboard documentation is the only refuge. Every motherboard has an IRQ table for the PCI bus; we will explain this assignment in more detail with the example of the “ABIT KT7A-Raid” and the “ASUS A7V8X”:

ABIT KT7A-Raid

Device	A	B	C	D
PCI Slot 1	shared	-	-	-
PCI Slot 2	-	shared	-	-
PCI Slot 3	-	shared	-	-
PCI Slot 4	-	-	-	shared
PCI Slot 5	-	-	shared	
PCI Slot 6				shared
AGP Slot	shared	-	-	-
USB Controller	-	-	-	shared
Raid Controller			shared	

A to D stands for the four available IRQs on the PCI bus.

- A is available for PCI slot 1 and AGP slot.
- B is available for PCI slot 2 and 3.
- C is available for PCI slot 5 and the Raid controller.
- D is available for PCI slot 4, 6 and the USB controller.

The result is that:

- PCI slot 1 and AGP slot share an IRQ
- PCI slot 2 and 3 share an IRQ
- PCI slot 4, 6 and USB controller share an IRQ
- PCI slot 5 and Raid controller share an IRQ

ASUS A7V8X

Device	A	B	C	D	E	F	G	H
PCI Slot 1	-	-	-	shared	-	-	-	-
PCI Slot 2	shared	-	-	-	-	-	-	-
PCI Slot 3	-	shared	-	-	-	-	-	-
PCI Slot 4	-	-	shared	-	-	-	-	-
PCI Slot 5	-	-	-	shared	-	-	-	-
PCI Slot 6	shared	-	-	-	-	-	-	-
AGP Slot	shared	-	-	-	-	-	-	-
USB 1.1 UHCI 1	-	-	-	-	-	shared	-	-
USB 1.1 UHCI 2	-	-	-	-	-	shared	-	-
USB 1.1 UHCI 3	-	-	-	-	-	shared	-	-
USB 2.0 EHCI	-	-	-	-	-	shared	-	-
AC 97 Codec	-	-	-	-	-	-	used	-
Onboard LAN	-	-	shared	-	-	-	-	-
Onboard 1394	-	shared	-	-	-	-	-	-
Onboard SATA	-	shared	-	-	-	-	-	-
Onboard IDE	-	-	-	-	used	-	-	-

A to H stands for the eight available IRQs on the PCI bus.

- A is available for PCI slot 2, 6 and the AGP slot.
- B is available for PCI slot 3, onboard 1394 (FireWire) and SATA.
- C is available for PCI slot 4 and onboard LAN.
- D is available for PCI slot 1 and 5.
- E is available for the IDE controller.
- F is available for the USB controllers.
- G is available for AC 97 sound chip.
- H is not used.

The result is that:

- PCI slot 2, 6 and AGP port share an IRQ.
- PCI slot 3, onboard 1394 (FireWire) and SATA share an IRQ.
- PCI slot 4 and onboard LAN share an IRQ.
- PCI slot 1 and 5 share an IRQ.
- the IDE controller has its own IRQ.
- the USB controllers have their own IRQ.
- the AC97 sound chip has its own IRQ.

As you can see the installation position has a great influence on the IRQ assignment in the system, and to assign an IRQ to a device you can, for example, use the second PCI slot on the ABIT board but then you must leave the third free. For example, on the ASUS board that would be slots 1 and 5.

To check the IRQ assignments in your system, open the Device Manager in Windows 98 and ME, double-click System, and you will find the IRQ list there. In Windows 2000 and XP the Control Panel does not usually show the IRQ assignments correctly because of virtual CPI IRQ assignments. In these operating systems you must view the PCI Device List, which appears briefly during the boot process. The “actual” IRQ assignments are shown there, but with modern PCs there is usually no time to look at the list during startup, because it appears and disappears much too quickly. Tip: select the floppy disk drive as the first boot device and insert an empty diskette. When the error message warning of a missing operating system appears, you will also be able to see the PCI Device List ;-).

Exclusive or shared IRQ?

Basically, all modern PCI cards with WDM drivers support IRQ sharing, but under some circumstances this can cause problems. For example, if the sound card requests an interrupt request during playback or recording of an audio file but the request cannot be carried out immediately, perhaps because the ISDN card is also using this IRQ and the IRQ controller must first query which device is actually requesting the IRQ, this can cause interference like static and crackling as a result of missing samples.

Our hearing is (fortunately) one of our most sensitive organs and therefore every sample that is missed during playback is immediately obvious. Your eyes would not even notice a brief delay during web surfing caused by the ISDN card not reacting immediately, but your ears are less forgiving. So this applies for sound cards: give it its own IRQ to keep your ears happy!

Always with the beat - digital synchronization.

When recording with the digital interface, make sure that the sampling frequency (rate) of the card matches that of the device from which you are recording. To ensure correct synchronization of the devices, you must switch the MasterClock to “External” in the PHASE 88 Control Panel (see also ↻ page 31).

If you forget this step, audible errors such as dropouts and clicks may occur during recording - and already when monitoring the signal. And also in the reverse situation (an external device should run at the same rate as the audio system), make sure that settings of your additional peripherals match. The PHASE Control Panel must be set to “Internal” in this case (such as during operation without externally connected digital devices). If the devices are to be permanently connected to one another in both directions, you must decide which device will provide the clock signal.

The digital interface of the PHASE 88 audio system transfers all bit resolutions between 8 and 24 bits and all sampling rates between 8 and 96 kHz. Please note that not all devices can process sample rates higher than 48 kHz. To transfer a signal recorded at 96 kHz to a DAT recorder, it's necessary to use suitable software to convert the file(s) to 44.1 kHz or 48 kHz first.

Dolby AC3 and DTS.

The digital interfaces of the PHASE 88 system can also be used independently of the S/PDIF standard (see also ↻ page 31; S/PDIF Out at "Non-audio"). Various manufacturers of software DVD players support playback of DVD studio material over the PHASE series of TerraTec Producer. Signals in Dolby AC3 or DTS format can therefore also be transferred using the digital interfaces.

Useful information about digital cables (optical waveguides and AES/EBU).

Even when transmitting audio data via optical fibers, a few, usually inaudible, errors may occur. You should therefore be sure to use high-quality cables that are not too long: flexible plastic cables should have a maximum length of 1.5 m, the less-flexible glass fiber cables may be up to 5 m long.

Audio differences with digital cables seem improbable at first glance, but they can happen nevertheless. This is due to the fact that error correction algorithms are obviously used more frequently at some times than at others to compensate for quality differences between individual cables. However, these audio losses are usually so minimal that you need to be careful not to mix up the myth with the reality. If you're interested, there are a number of somewhat entertaining militant newsgroups dealing with this subject on the Internet ;-).

Devices with AES/EBU interfaces cannot normally be used on S/PDIF interfaces - ambitious tinkering with simple adapter plugs will not get you anywhere. As the AES/EBU protocol is nearly identical to S/PDIF and the transmission essentially only differs in the signal strength, you can make your own converter with a bit of soldering.

Appendix A - Technical Data

- PCI audio interface with shielded 5 ¼" breakout box
- 4 m connector cable between PCI card and breakout box
- Total of 10 inputs and outputs (can be expanded up to 40 inputs and outputs)
- 8 analog inputs, cinch, switchable between +4 dBu (2.1 Vrms) and -10 dBv (0.55 Vrms)
- Input control with +18 dB increase in 0.5 dB steps
- 8 analog outputs, cinch, switchable between +4 dBu (2.1 Vrms) and -10 dBv (0.56 Vrms)
- Coaxial digital input, Cinch
- Coaxial digital output, Cinch
- MIDI interface with 5 pin DIN connection
- up to 24 bit/96 kHz signal processing of the analog and digital inputs and outputs
- Coaxial digital interface for S/PDIF, AC3 or DTS formats
- 24 bit/96 kHz A/D converter with 100 dB (A) SNR*, typically 100 dB (A)
- 24 bit/96 kHz D/A converter with 110 dB (A) SNR*, typically 109 dB (A)
- Hardware VU meter for every channel on the Control Panel
- Bus master transfer supports 24-bit, 4-byte mode (32 bit)
- EWS Connect connection for synchronized cascading of additional PCI systems**

*) This information depends on the technical data of the convertor used

***) You can cascade and synchronize PHASE 88, EWS 88 MT/D and Mic 2/8 audio systems with an EWS® Connect connection. You can control up to four systems in one PC with only one driver and one Control Panel.

DESCRIPTION
REAL COMPETENCE

PHASE 88

24 Bit/96 kHz Multi I/O Recording Interface