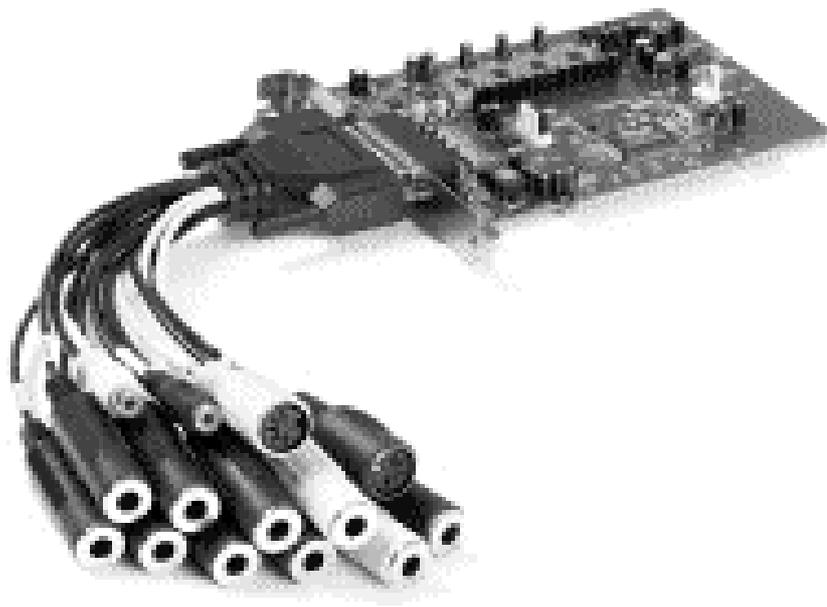


# PHASE 28

24 Bit/192 kHz Multi I/O Recording Interface



TERRATEC PRODUCER/PHASE 28

English Manual

Version 1.0, last revised: June 2003

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CE Declaration

We:

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

hereby declare that the product:

PHASE 28,

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

EN 50013, EN 50022

The following are the stipulated operating conditions 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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**Safety note.**

Be sure that all analog devices are turned off before plugging them in. This will protect you from any possible - even weak - electrical shocks, and will protect your speakers and your hearing from sudden, loud pops. For digital devices, be sure to at least lower the volume on your playback equipment.



## 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 28 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 enjoy reading about the PHASE 28 system, and find great satisfaction in using it.

Sincerely, Your TerraTec Producer Team

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**The widest variety of connecting equipment.** The PHASE 28 system features a range of professional connection options, which predestine it to become the audiophile hub of your home or project studio.

With two balanced inputs and eight outputs, a low-latency MIDI interface and multipurpose digital I/Os, the PHASE 28 audio system offers breakout cables with sufficient connections in all directions. 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.

- For everything you need to know about connections, see ➞ page 16.

**The nerve center - The software.** As you know, a professional AudioSystem is not a sound card for wild-eyed gamers, but instead it is the heart of your day-to-day computerized studio work. And despite the extensive connection options of the PHASE 28 system, 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 ControlPanel, see ➞ page 27.

**The drivers provided for the PHASE 28 series, 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-based sound generation and audio output.

- For information on the topic of drivers, see the section beginning on ➞ page 22.

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## From unpacking the PHASE 28 system to installation.

Before installing the PCI card into your computer and running cables to the PHASE 28 PCI card, 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.

Please observe the following instructions to ensure a trouble-free installation. If you still have difficulties, please review carefully the relevant chapter in this manual.

Our Service Hotline is also available to help. The telephone number, as well as the current hotline hours, can be found in the Support area of the TerraTec website [www.terratec.com](http://www.terratec.com).

### Scope of delivery.

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

The scope of delivery of the PHASE 28 system includes at least the following:

- 1 PCI card
- 1 cable whip with numerous connection jacks
- 1 thin sync cord for cascading via "EWS Connect"
- 1 driver CD, including software and music!
- 1 customer service card
- 1 registration card with the serial number
- This manual
- Besonic Premium Account

Please return the enclosed registration card to us at the earliest possible opportunity, or register online at [www.terratec.net/register.htm](http://www.terratec.net/register.htm). This is important for support and hotline services.

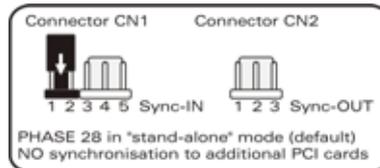
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## The setup - Short and simple for busy professionals.

- Before installing the PCI card, please check the Sync-In and Sync-Out connections (PHASE/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.



*Figure: The EWS Connect connection*

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 32)

- The PHASE 28 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. Also, remember that the heavy cable whip hangs down, and that there are cables connected to it.
- You will need one (1) IRQ. If you want to install multiple audio systems of the TerraTec family, you can do so with no problem– all PCI cards use the so-called IRQ sharing mode (for details on cascading, see ➔ page 32).
- The driver installation in Windows (98SE to XP) follows the standardized 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](http://www.terratec.com) in the SUPPORT area.

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**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.
- After installing the drivers, open the Device Manager and check for yellow exclamation marks. If you find any, you can usually solve the problem by repeating the installation according to the instructions. Also refer to the FAQs (frequently asked questions) provided on the product CD for other suggested solutions.
- After the drivers have been installed, install the software. You can start the installation using the autostart function of the CD, for example. The PHASE 28 ControlPanel has to be installed in all circumstances. Full functionality is not provided using the standard Windows Mixer.
- 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” (in other words, it is always available for applications needing it and cannot be selected manually). The respective buffer sizes are configured in the PHASE ControlPanel (not the Windows ControlPanel).

**Notes for Macintosh users:**

- The PHASE 28 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 OS10(X) is built exclusively on the OS10 core audio/MIDI concept.

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## Installation of the PHASE PCI card - step by step.

- Switch off your computer and all connected peripheral devices such as your printer and monitor. Leave the power supply cable connected for the time being, so that your computer is still grounded.
- Touch the metal chassis at the rear of the computer to ground yourself and discharge static electricity from yourself. Now unplug the power supply cable.
- Remove the housing cover from your computer or open it.
- Find a free PCI slot, remove the screw securing the metal cover over the slot and remove the cover itself. 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 or 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 board.**
- Align the audio card so that the strip with the gold 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 on and booting up the system, the driver installation follows (see ➡ page 11).

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## Installing the driver software.

The PHASE 28 system is shipped with drivers for the Windows 98SE, ME, Windows 2000, XP and MAC OS10 (X) operating systems. Windows 95/98 and Windows NT 4 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 28 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 28\Driver\Windows\. Alternatively, you can also select the path to the best driver of your PHASE 28 PCI system using the mouse by clicking “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 window prompts you to perform an action that you are not sure about it, pressing the Enter key is generally the safe way to go.

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 28 ControlPanel 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 ControlPanel 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”.

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### **Driver installation under Windows Me.**

1. Boot your computer after installing the PHASE 28 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 28\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 28 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".

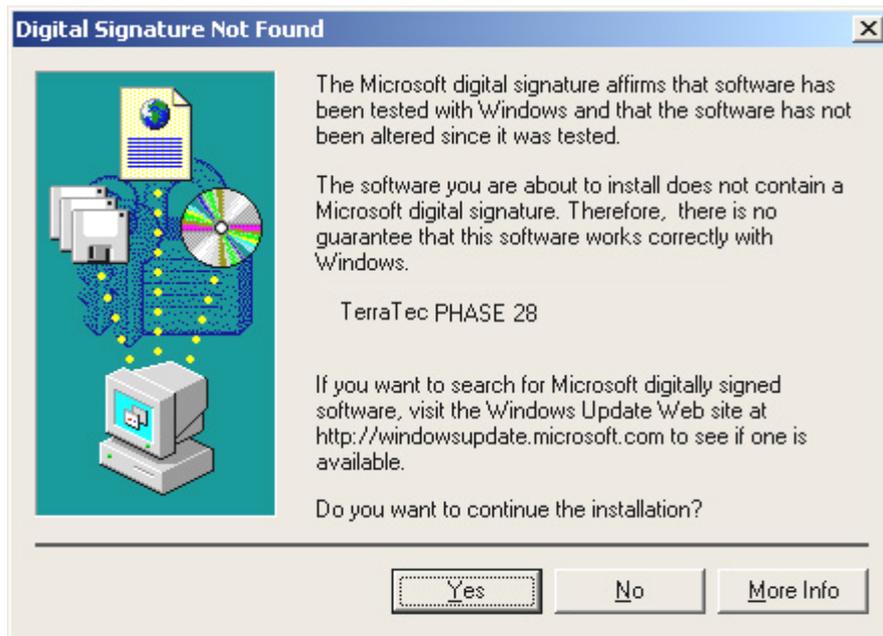
After successful driver installation, the PHASE 28 ControlPanel can be installed easily using the autorun option (`<CD>:\autorun.exe`).

Follow the instructions on the screen to install the various bundled software programs. The ControlPanel application can also easily be removed from your system. To do so, access "Add/Remove Programs" from the Control Panel and 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 28 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>:\driver\`). Click "Next" to start the installation.
6. The following dialog box may appear at this point or later in the installation:



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 28 ControlPanel 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 ControlPanel application can also easily be removed from your system. To do so, access “Add/Remove Programs” from the Control Panel and 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.

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## Installation under Windows XP.

1. Boot your computer after installing the PHASE 28 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. Next, mark the "Install the software automatically [Recommended]" checkbox and click "Next".
3. The hardware wizard will now inform you that it will search for drivers for a "Multimedia Audio Controller".
4. The following dialog box may appear at this point or later in the installation:



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

5. 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 28 ControlPanel 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 ControlPanel application can also easily be removed from your system. To do so,

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access “Add/Remove Programs” from the Control Panel and 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 in the Control Panel under “System” > “Hardware”. Then click the “Device Manager” button.

## **Driver installation for Macintosh OS 10.x (OS X)**

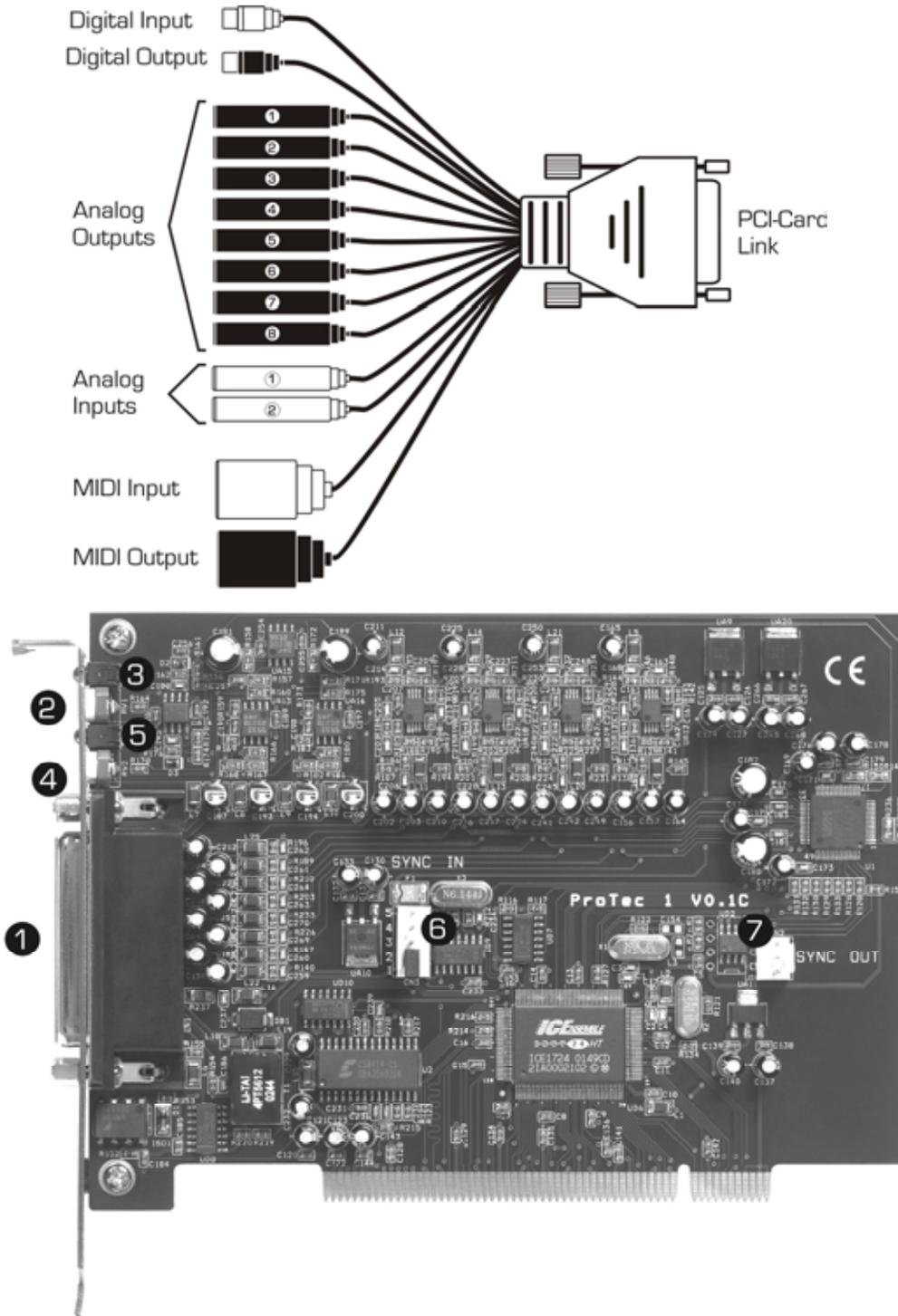
In the OS10 version, we recommend the Apple operating system update called “Jaguar” (current version 10.2.6). This update, which can be obtained for an extra charge, contains some improvements specially geared towards audio applications. The system requirements are OS10.1 or higher. Furthermore, in order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

To install the PHASE 28 MAC OS X –driver and the ControlPanel application, select the program PHASE 28 OS10 Installer.pkg from the directory <CD>:\PHASE 28\Driver\MAC\ of the PHASE 28 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 28 ControlPanel from the directory Macintosh HD -> Programs.

## The connections of the PHASE 28 system.

The PHASE 28 audio interface offers you numerous connections for connecting professional studio peripherals. Following is a detailed overview of its technical and electrical characteristics:



*The PHASE 28 PCI system*

- 
1. **Connection for the PHASE 28 cable adapter.** Please ensure that the connector strip is firmly screwed onto the PCI system, as the weight of the cable can otherwise cause it to come unplugged.
  2. **Gain controller for analog input 1.** Here, the present signal can be optimally adjusted to the converter level. Any clipping is indicated by the corresponding LED (3).
  3. **Clipping LED for analog input 1.** As soon as the signal reaches the clipping level (-1dB @ 2.1 Volt RMS, 1kHz), the LED is lit. In this case, push back the gain with the appropriate gain controller (2) until the LED stops blinking. If the setting range is not sufficient to go below the clipping range, reduce the output level on your external equipment (e.g. mixer).
  4. **Gain controller for analog input 2.** Here, the present signal can be optimally adjusted to the converter level. Any clipping is indicated by the respective LED (4).
  5. **Clipping LED for analog input 2.** As soon as the signal reaches the clipping level (-1dB @ 2.1 Volt RMS, 1kHz), the LED is lit. In this case, decrease the amplification using the appropriate gain controller (4) just to the point where the LED stops blinking. If the setting range is not sufficient to go below the clipping range, reduce the output level on your external equipment (e.g. mixer).
  6. **EWS® Connect Sync-IN connection.** For the internal synchronization of up to 4 EWS/PHASE PCI cards (5 contacts, the jumper must remain on the master card). For more information, please read Chapter “Cascading and internal synchronization.” starting on ➔ page 32.
  7. **EWS® Connect Sync-OUT connection.** For the synchronization of up to 4 EWS/PHASE PCI systems (2 contacts).

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## Analog outputs.

The analog outputs of the PHASE 28 system operate with musician-friendly line levels of +4dBu (plus headroom, typically 2.1 volts RMS). Here, you can connect a mixing board, active speakers, or amplifiers.



The PHASE 28 system is equipped with 8 analog outputs, which you can address independently of one other. The connections are in 6.3mm cinch format and offer a balanced signal path to minimize interference.

In the driver as well as the PHASE ControlPanel, the outputs are always treated as pairs (thus, for example 1/2, 3/4, 5/6, 7/8), when the application in use supports pairs. 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 is set to approximately +4dBu and also offers sufficient headroom if required in your productions (including headroom, typically 2.1 volts RMS).

**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.



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## Analog inputs.

The analog inputs of the PHASE 28 system are equipped with high-quality preamplifiers, with which you can manually control the gain of the converter. Here, you can connect the AUX or TAPE outputs of a mixing board, instruments with line level output, a tape recorder or similar peripheral gear.



The PHASE 28 system offers you two high-quality analog input jacks, which can be addressed separately. The connections are in 6.3 mm cinch format and offer a balanced signal path to minimize interference. Of course, non-balanced mono cinch cords can also be connected; the unused phase is then automatically connected to the analog signal.

On the slot plate of the PCI card, there are two control sliders, which you can use to adjust the input stages manually and very precisely to your needs. To do so, please use a small flathead screwdriver. However, never insert it into your power supply's fan! ;-)

Beginning at approximately -1 dB (0 dB corresponds to 2.1 V RMS @ 1kHz), the red LEDs signal the threat of clipping at the inputs. The exact level converted by the 24-bit A/D convertors can be viewed using the PHASE ControlPanel or common audio software.

If, despite being manually turned to the maximum level, a connected device supplies too low of a signal, you can use the controllers in the PHASE ControlPanel to **additionally** increase the level in 0.5 dB increments. However, this amplifier stage does not provide optimal signal quality.

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.



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

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



If you want to transfer music digitally from the computer to other devices, or record audio data using the computer, you can do so using the digital interface of the PHASE 28 system. One coaxial (RCA/Cinch) jack is available for both 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 28 system can receive rates up to 96,000 Hz and send rates up to 192,000 Hz. You should keep this difference in mind if you plan to exchange digital data, for example using a ProTools system or a VST System Link.

The correct driver for recording digital sources is called “PHASE 28 WAVE”.

You can find detailed information on the digital interface settings in the PHASE Control-Panel beginning on ➔ page 27.

**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).



**Advertisement ;-)** TerraTec's Vice Versa is a compact S/PDIF 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](http://www.terratec.com).



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## MIDI interface.

The MIDI interface of the PHASE 28 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 always 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 28 system 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.



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## The drivers (Windows operating system).

The PHASE 28 audio interface features a range of drivers for a variety of applications. All drivers support every bitrate between 8 and 32 bit with all common sampling rates between 8 and 96 kHz, and even 192 kHz (with the exception of the digital input). 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 28 Wave” for recording and playback. The device structure corresponds to the format defined by Microsoft for WDM audio devices. If the PHASE 28 system is selected as the standard output device (e.g. Windows: Sounds and Multimedia Properties; MAC OS X: System Settings -> Sound) audio is output via channels 1/2 and parallel via the digital output.

In order to directly address all five stereo outputs (four analog and one digital), there is a numbering system within the corresponding audio applications (e.g. Cubase or WaveLab), which corresponds to the five output pairs: 1/2, 3/4, 5/6 and 7/8, as well as 9/10 for the digital output.

If you have multiple cascading audio interfaces, (see ➡ page 32), 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 over which we (unfortunately) have no influence.

Additionally, and depending on the application software, the driver names are appended to include other information that refers to the operating system's proprietary audio architecture: MME, WDM or DirectSound (see below for more information).

### The ASIO driver.

Programs that make use of Steinbergs ASIO interface are indicated in the corresponding dialogs of the PHASE 28's ASIO drivers. With ASIO, programs achieve extremely short delays (latency) during audio recording and playback. Therefore, a latency of significantly less than 10ms should be targeted. For fast, well organized systems, even latencies of less than 2 ms are possible at sampling rates of higher than 88.2kHz!

The ASIO driver is listed in compatible programs under “ASIO for PHASE 28”. 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

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➡ page 32). In many cases, only the left channel of the output pair (1/2, 3/4, 5/6, 7/8 and S/PDIF 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 28 GSIF (n)” and lead directly to the outputs of the PHASE 28 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 28 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.

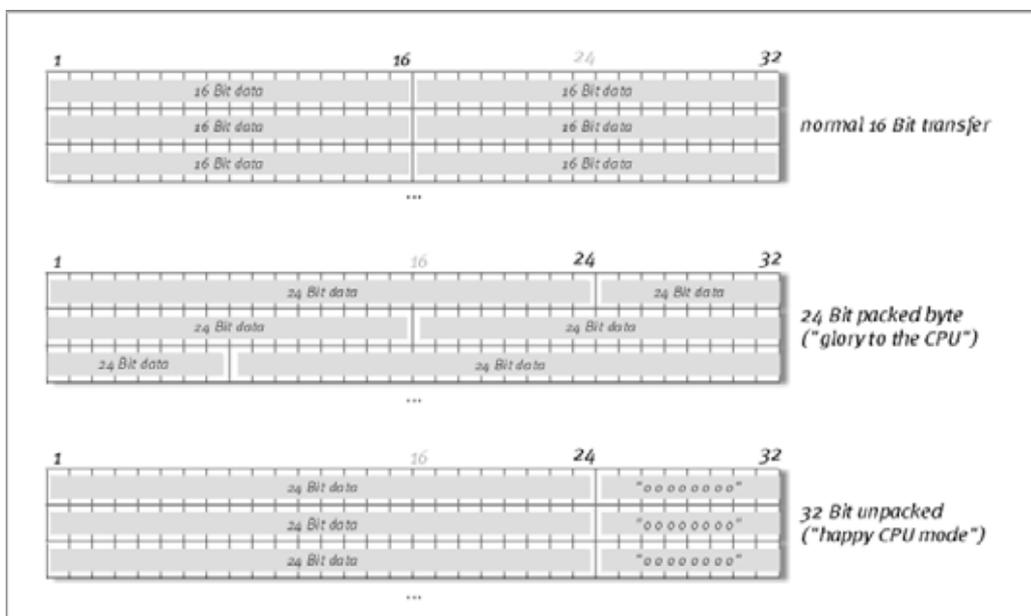
The following contains in-depth information for those with the need to know. Less experienced users won't encounter any problems if they skip over this section.

### 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 Computer 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 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

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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 are interpolated as required and their pitch is not affected.

An SR conversion/interpolation does always result in a certain loss of quality, however. You should therefore ensure that you do not use several programs simultaneously with differing sample rates for applications in which the highest possible audio quality is vital. 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.

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## **The MAC OS X drivers.**

The driver version available for the current, first shipment is based completely on the MAC OS X CoreAudio or CoreMDI concept. With the help of the CoreAudio support, the PHASE 28 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 28 support is planned.

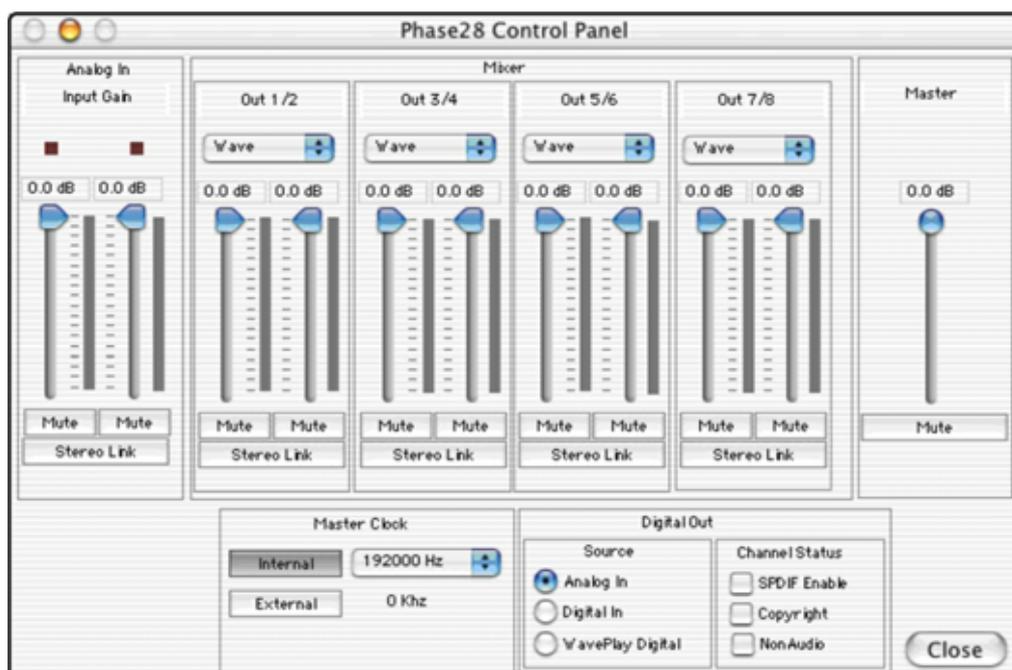
Under System Settings -> Sound, the PHASE 28 system can be set up as the default audio system in OS X.

## The ControlPanel

The PHASE ControlPanel is - next to 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.



*The Windows ControlPanel*



*The OSX ControlPanel*

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## How does the ControlPanel work?

The Phase ControlPanel and the routing (signal flow within the card) is very easy to understand. If you move the mouse over one of the elements, you can read a short explanation of each item (Windows only). This should spare even less well-versed users from having to look through this (oh-so-entertaining) manual. You still want to know what it is all about? Very well: the following are the individual function blocks, from left to right:

### Analog In.

As you surely already know from reading the chapter “The connections of the PHASE 28 system.”, ↻ page 16, you can control the sensitivity of the inputs using both sliders on the slot plate of the PHASE 28 system. If the recording situation requires it, you can control the second preamplifier portion via the software.

The gain stage also features a multicolored Clip LED. These give you a visual warning of excessive levels and impending distortion. Yellow light signals the -1dB threshold, red indicates overmodulation of the 0dB mark, which may result in audible distortion.

### Wave Record Select.

Here, you can select whether to record a signal by analog or digital input. The signal can be recorded via the “PHASE 28 WAVE” driver by the application you choose.

When recording from digital sources, you should pay attention that the sampling rate is synchronized correctly (see Master Clock below).

Note: Applications based on the PHASE 26's ASIO driver (Windows) or CoreAudio (MAC OS X), have simultaneous access to the analog and digital inputs

### Analog Out.

In the Analog Out area of the PHASE ControlPanel, you can control the output volumes of the individual analog outputs, which are addressed by the output drivers (WAVE). Using the drop-down menus of each channel, you also have the option of listening in to the digital or analog output instead of a WAVE device.

**Practical tip:** If you are working with common audio/MIDI sequencers, you should also use this software for volume control. The advantage is that the settings are usually saved together with your project (song, arrangement etc.), and do not need to be loaded first from the PHASE ControlPanel.



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## Master Clock.

Here we're dealing with the sample rate used by the PHASE 28 audio interface. This is a very important point, as the system 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 32 to 192 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 "Sample Rate Locked" switch also allows you to set the sampling frequency to a specified value (or when using external synchronization, the externally preset value). Doing so ensures that only this sample rate will be accepted by the PHASE 28 system. However, remember that in "non-ASIO" mode, the operating system's own sampling rate converter (SRC) may convert automatically to the required values. Example: The PHASE 28 system is set to 44.1 kHz and Windows Media Player, or I-Tunes on MAC OS X systems, is playing a 48-kHz file. In this case, the signal is down-sampled to 44.1 kHz, and every form of SRC leads to a certain degree of quality loss.

**Practical tip:** 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. This process is now controlled by the operating system. Therefore, make sure when outputting your production (if not earlier) that the sampling rate of your project matches the audio interface's sampling rate.



## Digital Out.

As in the drop-down menus of the Analog Out area, here you can select one of three signals for digital output: the analog input, its digital counterpart, or the WAVE output (in other words: your audio application).

## Channel Status.

Here, you can define whether a signal you send via the digital interface conforms to the S/PDIF protocol, or should contain certain copy-protection information. 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.

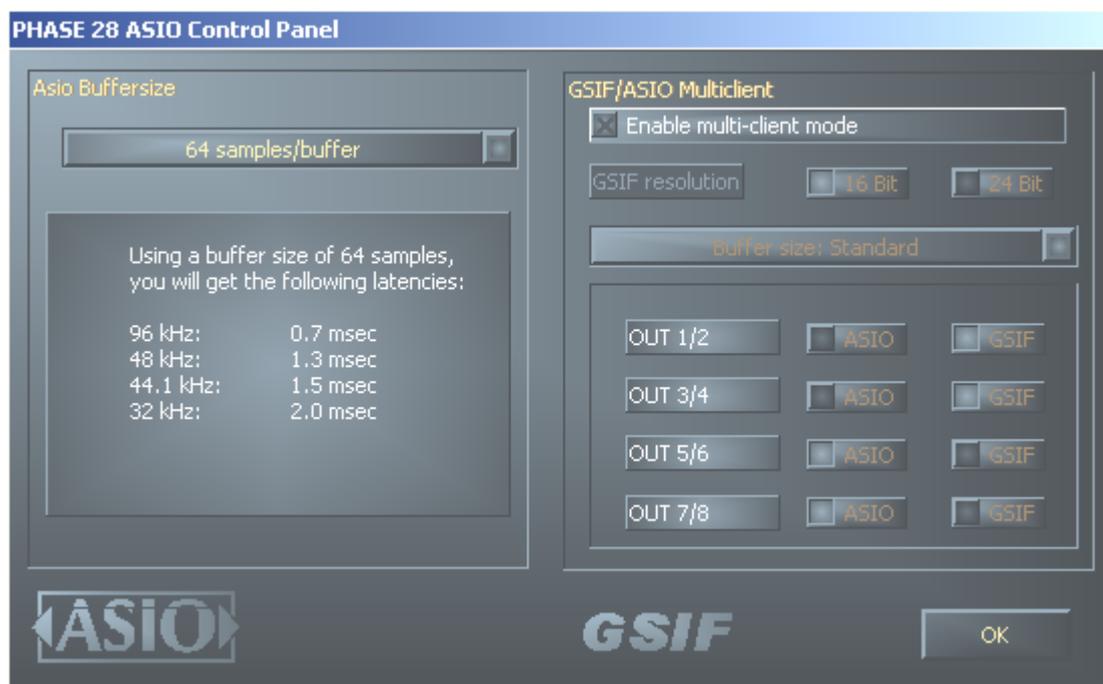
- **S/PDIF Enable** defines the outgoing signals as S/PDIF data stream. This is the most commonly available transfer protocol and is “understood” by most professional and consumer devices.
- **Copyright** adds a (S/PDIF) copy-protection ID to the signal or filters it out when deactivating copy protection. This function sets the so-called “copy protection bit” which ensures that no digital copies can be made of the signal. Please note that this “protection” process, like other similar processes, only provides extremely marginal protection of your work.
- **Non-Audio** adds information to the data stream that defines it as “anything, but not only audio” so that it can be reproduced in RAW format (e.g. for AC-3 / DVD Audio, see below).

### Master Out.

Indeed, you can use this to control the master volume of the PHASE 28 audio interface. When doing so, the master controller adjusts all volumes relative to the levels already set for the individual outputs.

### ASIO (Windows).

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. ASIO and the Nemesys GigaStudio can access the PHASE 28 hardware simultaneously (multi-client). To accomplish this, activate the corresponding mode and select which output pair should be available to which application.



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## The ASIO buffer size (Windows)

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 such dropouts occur, increase the number of buffers. The “conversion” into time values is displayed just below the menu.

## Colors.

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.

## Other tips for operation:

You can change the names displayed in the Analog Out area add clarity to your overview. Simply double-click on Out 1/2 ... 3/4 and enter a new name (for example, the name of a 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.

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## Cascading and internal synchronization.

The functions listed in the following sections will be available in future software updates. Check out [www.terratec.com](http://www.terratec.com) every so often for news about current updates.



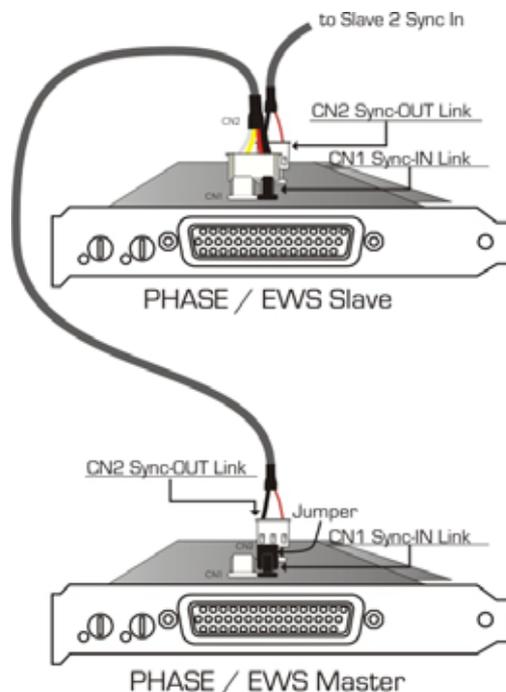
Up to 4 TerraTec audio interfaces can be installed in a computer, and can even be operated in a closed system, if they have what are known as EWS connections.

You can therefore conveniently increase the number of input and output channels which can also access directly from most Windows/MAC 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.

### The internal connection (recommended).

There are two short pin sets next to each other on the PCI card: a 3-pin and a 5-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 EWS ControlPanel.



### The pin rows.

If you only have one card in the system, just leave everything the way it is: on the CN 1 (5-pin) there is a jumper which sets the card as the so-called “Master”.

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When connecting additional cards, connect the thin cable included on the “master” card to the 3-pin plug CN 2. The other end replaces the second card's 5-pin connector. Make sure to keep this (leftover) connector handy for later use.

Still more cards? No problem: Simply attach another cable from the CN 2 of the second card to CN 1 of the third. And, last but not least, a cable from the CN 2 of the third, to the CN 1 of the fourth (and last) PCI card.

### **The PHASE ControlPanel ...**

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 sample 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.

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## Appendix A - Technical Data

- PCI card
- Playback of 8 analog channels at up to 24 bit/192 kHz
- Recording of 2 analog channels at up to 24 bit/192 kHz
- Symmetrically arranged analog connections, 6.3 mm cinch cord
- Coaxial digital interface for S/PDIF, AC3 and DTS formats
- Stereo digital input with up to 24 bit/96 kHz resolution and hardware sampling rate recognition
- Stereo digital output with up to 24 bit/192 kHz resolution
- EWS Connect\* connection for synchronized cascading of additional PCI systems
- Non-Audio mode for transfer of AC3 or DTS streams via the digital interface
- VU meter for every channel on the ControlPanel display
- 24 bit/192 kHz A/D converter with 102 dB (A) SNR\*\*, typically 100 dB (A)
- 24 bit/192 kHz A/D converter with 106 dB (A) SNR\*\*, typically 105 dB (A)
- 2 gain controllers on the front of the slot plate for setting levels for analog inputs (adjustment range of -19 dB to +12 dB)
- 2 clipping LEDs on the front of slot
- MIDI interface with 16 channels total
- Input level: 2.1 volts/RMS @ 1 kHz
- Output level: 2.1 volts/RMS @ 1 kHz
- Bus master transfer supports 24-bit, 4-byte mode (32 bit)
- 4 inputs and 10 outputs total

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\* Audio systems with a EWS Connect connection can be cascaded and synchronized. Up to four systems can be controlled with only one driver and one ControlPanel.

\*\* This information depends on the technical data of the convertor used.

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## Software

- WDM drivers for Windows 98SE/ME/2000 and Windows XP
- MAC driver for MAC OS 10
- Support for ASIO 2.0 and GigaSampler/Studio (GSIF)
- ASIO/GSIF multi-client mode
- WDM kernel streaming (e.g. for Sonar™)
- MME and DirectSound support
- ControlPanel for Windows 98SE/ME/2000, Windows XP and MAC OS 10

## System requirements PC

- Pentium II 450 MHz or faster
- VGA video card, 800x600 / 256 colors
- 128 MB RAM
- Windows 98SE/ME/2000 or Windows XP

## System requirements - MAC

- G3 400 MHz
- VGA video card, 800x600 / 256 colors
- 128 MB RAM
- OS X

## System recommendations - PC

- Intel Pentium III 1 GHz, Celeron 900 MHz or AMD K7 Athlon 1 GHz
- VGA video card, 1024x768 / HiColor
- > 256 MB RAM
- Windows XP

## System recommendations - MAC

- VGA video card, 1024x768 / HiColor
- > 256 MB RAM
- MAC OS X Jaguar >= 10.2